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THE
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A

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OF

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ELEVENTH EDITION

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J. L. E. D.	JOHN LOUIS EMIL DREYER. Director of Armagh Observatory. Author of *Planetary Systems from Thales to Kepler*; &c.	**Observatory.**
J. M. By.	J. M. BRYDON. Architect of Chelsea Town Hall and Polytechnic, &c.	**Nesfield.**
J. M. M.	JOHN MALCOLM MITCHELL. Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London College (University of London). Joint-editor of Grote's *History of Greece.*	**Naucrary;** **Neoplatonism** (*in part*).
J. P. Pe.	REV. JOHN PUNNETT PETERS, PH.D., D.D. Canon Residentiary, P. E. Cathedral of New York. Formerly Professor of Hebrew in the University of Pennsylvania. Director of the University Expedition to Babylonia, 1888–1895. Author of *Nippur, or Explorations and Adventures on the Euphrates.*	**Nejef;** **Nippur.**
J. Si.*	REV. JAMES SIBREE, F.R.G.S. Principal Emeritus, United College (L.M.S. and F.F.M.A.), Antanànarivo, Madagascar. Member de l'Académie Malgache. Author of *Madagascar and its People*; *Madagascar before the Conquest*; *A Madagascar Bibliography*; &c.	**Nossi-bé.**
J. S. Bl.	REV. JOHN SUTHERLAND BLACK, M.A., LL.D. Assistant-editor of the 9th edition of the *Encyclopaedia Britannica.* Joint-editor of the *Encyclopaedia Biblica.*	**Nestorius** (*in part*).
J. S. F.	JOHN SMITH FLETT, D.Sc., F.G.S. Petrographer to H.M. Geological Survey. Formerly Lecturer on Petrology in Edinburgh University. Neill Medallist of the Royal Society of Edinburgh. Bigsby Medallist of the Geological Society of London.	**Mylonite; Napoleonite;** **Neck; Nepheline-Syenite;** **Nephelinites; Obsidian.**
J. S. K.	JOHN SCOTT KELTIE, LL.D., F.S.S., F.S.A. (Scot.). Secretary, Royal Geographical Society. Knight of Swedish Order of North Star. Commander of the Norwegian Order of St Olaf. Hon. Member, Geographical Societies of Paris, Berlin, Rome, &c. Editor of *Statesman's Year Book.* Editor of the *Geographical Journal.*	**National Debt** (*in part*).
J. T. Be.	JOHN THOMAS BEALBY. Joint-author of Stanford's *Europe.* Formerly Editor of the *Scottish Geographical Magazine.* Translator of Sven Hedin's *Through Asia*, *Central Asia and Tibet*; &c.	**Nikolayev** (*in part*); **Nizhniy-Novgorod** (*in part*); **Novgorod** (*in part*).
J. T. C.	JOSEPH THOMAS CUNNINGHAM, M.A., F.Z.S. Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow of University College, Oxford. Assistant Professor of Natural History in the University of Edinburgh. Naturalist to the Marine Biological Association.	**Mussel** (*in part*); **Nautilus;** **Octopus.**
J. T. S.*	JAMES THOMSON SHOTWELL, PH.D. Professor of History in Columbia University, New York City.	**Necker** (*in part*).
J. W.	JAMES WILLIAMS, M.A., D.C.L., LL.D. All Souls' Reader in Roman Law in the University of Oxford, and Fellow of Lincoln College.	**Navigation Laws.**
J. W.*	JAMES WARD, LL.D. See the biographical article: WARD, JAMES.	**Naturalism.**
Jno. W.	JOHN WESTLAKE, K.C., LL.D., D.C.L. Professor of International Law, Cambridge, 1888–1908. One of the Members for United Kingdom of International Court of Arbitration under the Hague Convention, 1900–1906. Author of *A Treatise on Private International Law, or the Conflict of Laws*; *Chapters on the Principles of International Law*: part i. "Peace"; part ii. "War."	**Naturalization.**
J. W. G.	JOHN WALTER GREGORY, D.Sc., F.R.S. Professor of Geology at the University of Glasgow. Professor of Geology and Mineralogy in the University of Melbourne, 1900–1904. Author of *The Dead Heart of Australia*; &c.	**New South Wales:** *Geology*; **New Zealand:** *Geology.*
J. W. L. G.	JAMES WHITBREAD LEE GLAISHER, M.A., D.Sc., F.R.S. Fellow of Trinity College, Cambridge. Formerly President of the Cambridge Philosophical Society, and the Royal Astronomical Society. Editor of *Messenger of Mathematics* and the *Quarterly Journal of Pure and Applied Mathematics.*	**Napier, John.**
K. S.	KATHLEEN SCHLESINGER. Editor of the *Portfolio of Musical Archaeology.* Author of *The Instruments of the Orchestra.*	**Musical Box;** **Nail Violin;** **Nay; Oboe** (*in part*).

L. J. S.	Leonard James Spencer, M.A. Assistant in Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the *Mineralogical Magazine.*	**Muscovite;** **Nepheline;** **Niccolite.**
L. R. F.	Lewis Richard Farnell, M.A., Litt.D. Fellow and Senior Tutor of Exeter College, Oxford University Lecturer in Classical Archaeology; Wilde Lecturer in Comparative Religion. Corresponding Member of Imperial German Archaeological Institute. Author of *Evolution of Religion*; &c.	**Mystery.**
L. V.*	Luigi Villari. Italian Foreign Office (Emigration Dept.). Formerly Newspaper Correspondent in East of Europe. Italian Vice-Consul in New Orleans, 1906, Philadelphia, 1907, and Boston, U.S.A., 1907–1910. Author of *Italian Life in Town and Country*; &c.	**Naples, Kingdom of.**
L. W. K.	Leonard William King, M.A., F.S.A. King's College, Cambridge. Assistant in Department of Egyptian and Assyrian Antiquities, British Museum; Lecturer in Assyrian at King's College and London University. Author of *The Seven Tablets of Creation*; &c.	**Nippur:** *The Deluge Fragment.*
M. Ja.	Morris Jastrow, Ph.D. Professor of Semitic Languages, University of Pennsylvania. Author of *Religion of the Babylonians and Assyrians*; &c.	**Nebo; Nergal; Ninib;** **Nusku; Oannes.**
M. N. T.	Marcus Niebuhr Tod, M.A. Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of *Catalogue of the Sparta Museum.*	**Nauarchia.**
N.	The Rt. Hon. Lord Northcliffe. Founder of the *Daily Mail*; Chief Proprietor of *The Times*, and other papers and periodicals. Chairman of the Associated Newspapers, Ltd., and the Amalgamated Press, Ltd.	**Newspapers:** *Price of Newspapers.*
N. D. M.	Newton Dennison Mereness, A.M., Ph.D. Author of *Maryland as a Proprietary Province.*	**New York** (*in part*).
O. J. R. H.	Osbert John Radcliffe Howarth, M.A. Christ Church, Oxford. Geographical Scholar, 1901. Assistant Secretary of the British Association.	**Norway:** *Geography and Statistics.*
O. K.	Otto Krümmel, Ph.D. Professor of Geography in the University of Kiel, and Lecturer in the Imperial Naval Academy. Author of *Handbuch der Ozeanographie.*	**Ocean and Oceanography** (*in part*).
P. A. K.	Prince Peter Alexeivitch Kropotkin. See the biographical article: Kropotkin, Prince P. A.	**New Siberia Archipelago;** **Nikolayev** (*in part*); **Nizhniy-Novgorod** (*in part*); **Novgorod** (*in part*).
P. G.	Percy Gardner, LL.D., Litt.D., F.S.A. See the biographical article: Gardner, Percy.	**Myron.**
P. Gi.	Peter Giles, M.A., LL.D., Litt.D. Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University Reader in Comparative Philology. Formerly Secretary of the Cambridge Philological Society. Author of *Manual of Comparative Philology.*	**N.** **O.**
P. G. K.	Paul George Konody. Art Critic of the *Observer* and the *Daily Mail.* Formerly Editor of *The Artist.* Author of *The Art of Walter Crane*; *Velasquez, Life and Work*; &c.	**Neer, Van der** (*in part*).
P. La.	Philip Lake, M.A., F.G.S. Lecturer on Physical and Regional Geography in Cambridge University. Formerly of the Geological Survey of India. Author of *Monograph of British Cambrian Trilobites.* Translator and Editor of Keyser's *Comparative Geology.*	**Norway:** *Physical Geography.*
R. A. W.	Robert Alexander Wahab, C.B., C.M.G., C.I.E. Colonel, Royal Engineers. Formerly H.M. Commissioner, Aden Boundary Delimitation, and Superintendent, Survey of India. Served with Tirah Expeditionary Force, 1897–1898; Anglo-Russian Boundary Commission, Pamirs, 1895; &c.	**Nejd.**
R. C. T.	Sir Richard Carnac Temple, Bart., C.I.E. Lieut.-Colonel. Formerly Chief Commissioner, Andaman and Nicobar Islands. Hon. Fellow of Trinity Hall, Cambridge. Joint-author of *Andamanese Language*; &c.	**Nicobar Islands.**
R. G.	Richard Garnett, LL.D., D.C.L. See the biographical article: Garnett, Richard.	**Newman, Francis William;** **Newton, Sir C. T.**
R. J. M.	Ronald John MacNeill, M.A. Christ Church, Oxford. Barrister-at-Law. Formerly Editor of the *St James's Gazette*, London.	**Murray, Lord George.**
R. L.*	Richard Lydekker, M.A., F.R.S., F.G.S., F.Z.S. Member of the Staff of the Geological Survey of India, 1874–1882. Author of *Catalogue of Fossil Mammals, Reptiles and Birds in British Museum*; *The Deer of All Lands*; *The Game Animals of Africa*; &c.	**Muntjac;** **Musk Ox;** **Mylodon.**
R. La.	Robert Latouche. Archivist of the department of Tarn et Garonne. Author of *Histoire du comté du Maine au X. et au XI. siècle.*	**Normandy.**

R. N. B.	Robert Nisbet Bain (d. 1909). Assistant Librarian, British Museum, 1883–1909. Author of *Scandinavia: the Political History of Denmark, Norway and Sweden, 1513–1900*; *The First Romanovs, 1613–1725*; *Slavonic Europe: the Political History of Poland and Russia from 1469 to 1796*; &c.	**Nádasdy; Nansen, Hans; Nikon.**
R. S. B.	Sir Robert Stawell Ball, F.R.S., LL.D. Lowndean Professor of Astronomy and Geometry, University of Cambridge. Director of the Cambridge Observatory and Fellow of King's College. Royal Astronomer of Ireland, 1874–1892. Author of *The Story of the Heavens*; &c.	**Nebular Theory.**
R. S. P.	Reginald Stuart Poole, LL.D. See the biographical article: Poole, Reginald Stuart.	**Numismatics** (*in part*).
R. S. T.	Ralph Stockman Tarr. Professor of Physical Geography, Cornell University. Special Field Assistant of the U.S. Geological Survey. Author of *Physical Geography of New York State.*	**New York** (*in part*).
S. A. C.	Stanley Arthur Cook, M.A. Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Editor for the Palestine Exploration Fund. Examiner in Hebrew and Aramaic, London University, 1904–1908. Council of Royal Asiatic Society, 1904–1905. Author of *Glossary of Aramaic Inscriptions*; *The Law of Moses and the Code of Hammurabi*; *Critical Notes on Old Testament History*; *Religion of Ancient Palestine*; &c.	**Nabataeans** (*in part*); **Nazarite** (*in part*).
St C.	Viscount St Cyres. See the biographical article, Iddesleigh, 1st Earl of.	**Nicole.**
S. H. V.*	Sydney Howard Vines, M.A., D.Sc., F.R.S., F.L.S. Professor of Botany in the University of Oxford. Fellow of Magdalen College, Oxford. Hon. Fellow of Christ's College, Cambridge. Fellow of the University of London. Author of *Student's Text Book of Botany*; &c.	**Naegeli.**
S. K.	Sten Konow, Ph.D. Professor of Indian Philology in the University of Christiania. Officier de l'Académie Française. Author of *Samavidhana Brahmana*; *The Karpuramanjari*; *Munda and Dravidian.*	**Mundās.**
S. N.	Simon Newcomb, D.Sc., LL.D. See the biographical article: Newcomb, Simon.	**Neptune** (*Planet*).
T. As.	Thomas Ashby, M.A., Litt.D. Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of *The Classical Topography of the Roman Campagna.*	**Nemorensis Lacus; Nepi; Nola; Nomentana, Via; Nomentum; Nora; Norba; Novara; Nuceria Alfaterna; Nuoro.**
T. A. C.	Timothy Augustine Coghlan, I.S.O. Agent-General for New South Wales. Government Statistician, New South Wales, 1886–1905. Author of *Wealth and Progress of New South Wales*; *Statistical Account of Australia and New Zealand*; &c.	**New South Wales:** *Geography and Statistics.*
T. A. I.	Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.	**Name:** *Law*; **Octroi.**
T. A. J.	Thomas Athol Joyce, M.A. Assistant in Department of Ethnography, British Museum. Hon. Sec. Anthropological Society.	**Negro** (*in part*).
T. Ba.	Sir Thomas Barclay. Member of the Institute of International Law. Member of the Supreme Council of the Congo Free State. Officer of the Legion of Honour. Author of *Problems of International Practice and Diplomacy*; &c. M.P. for Blackburn, 1910.	**Neutrality;** **North Sea Fisheries Convention.**
T. F. C.	Theodore Freylinghuysen Collier, Ph.D. Assistant Professor of History, Williams College, Williamstown, Mass.	**Neo-Caesarea, Synod of.**
T. H.	Thomas Hodgkin, LL.D., Litt.D. See the biographical article: Hodgkin, Thomas.	**Narses** (*Roman General*).
T. H. H.*	Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., D.Sc., F.R.S. Colonel in the Royal Engineers. Superintendent, Frontier Surveys, India, 1892–1898. Gold Medallist, R.G.S. (London), 1887. H.M. Commissioner for the Perso-Beluch Boundary, 1896. Author of *The Indian Borderland*; *The Gates of India*; &c.	**Muscat;** **North-West Frontier Province.**
T. M. L.	Rev. Thomas Martin Lindsay, M.A., D.D. Principal and Professor of Church History, United Free Church College, Glasgow. Author of *Life of Luther*; &c.	**Occam, William of.**
T. W. R. D.	Thomas William Rhys Davids, LL.D., Ph.D. Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Secretary and Librarian of Royal Asiatic Society, 1885–1902. Author of *Buddhism*; *Sacred Books of the Buddhists*; *Early Buddhism*; *Buddhist India*; *Dialogues of the Buddha*; &c.	**Nāgārjuna; Nikāya.**
V. M.	Victor Charles Mahillon. Principal of the Conservatoire Royal de Musique at Brussels. Chevalier of the Legion of Honour.	**Oboe** (*in part*).

W. A. B. C.	Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D. (Bern). Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880–1881. Author of *Guide du Haut Dauphiné*; *The Range of the Tödi*; *Guide to Grindelwald*; *Guide to Switzerland*; *The Alps in Nature and in History*; &c. Editor of *The Alpine Journal*, 1880–1881; &c.	**Neuchâtel.**
W. A. P.	Walter Alison Phillips, M.A. Formerly Exhibitioner of Merton College and Senior Scholar of St John's College, Oxford. Author of *Modern Europe*; &c.	**Murat; Nibelungenlied; Nicholas I.** (*of Russia*).
W. Bl.	William Blain, C.B. (d. 1908). Principal Clerk and First Treasury Officer of Accounts, 1903–1908.	**National Debt:** *Conversions* (*in part*).
W. Cr.	Walter Crane. See the biographical article: Crane, Walter.	**Mural Decoration** (*in part*).
W. E. G.	Sir William Edmund Garstin, G.C.M.G. Governing Director, Suez Canal Co. Formerly Inspector-General of Irrigation, Egypt. Adviser to the Ministry of Public Works in Egypt, 1904–1908.	**Nile** (*in part*).
W. F. C.	William Feilden Craies, M.A. Barrister-at-Law, Inner Temple. Lecturer on Criminal Law, King's College, London. Editor of Archbold's *Criminal Pleading* (23rd edition).	**Nonfeasance;** **Obscenity.**
W. F. R.	William Fiddian Reddaway, M.A. Censor of Non-Collegiate Students, Cambridge. Fellow and Lecturer of King's College. Author of "Scandinavia," in Vol. xi. of the *Cambridge Modern History*.	**Norway:** *History, 1397–1814*.
W. F. W.	Walter Francis Willcox, LL.B., Ph.D. Chief Statistician, United States Census Bureau. Professor of Social Science and Statistics, Cornell University. Member of the American Social Science Association and Secretary of the American Economical Association. Author of *The Divorce Problem: A Study in Statistics*; *Social Statistics of the United States*; &c.	**Negro** (*United States*).
W. G.*	Walcot Gibson, D.Sc., F.G.S. H.M. Geological Survey. Author of *The Gold-Bearing Rocks of the S. Transvaal*; *Mineral Wealth of Africa*; *The Geology of Coal and Coal-mining*; &c.	**Natal:** *Geology*.
W. H. Be.	Rev. William Henry Bennett, M.A., D.D., D.Litt. Professor of Old Testament Exegesis in New and Hackney Colleges, London. Formerly Fellow of St John's College, Cambridge; Lecturer in Hebrew at Firth College, Sheffield. Author of *Religion of the Post-Exilic Prophets*; &c.	**Nimrod;** **Noah.**
W. H. F.	Sir William Henry Flower, F.R.S. See the biographical article: Flower, Sir W. H.	**Narwhal.**
W. H. P.	Walter Herries Pollock, M.A. Trinity College, Cambridge. Editor of *Saturday Review*, 1883–1894. Author of *Lectures on French Poets*; *Impressions of Henry Irving*; &c.	**Musset, Alfred de.**
W. J. H.	William Jacob Holland, A.M., D.D., LL.D., D.Sc., Ph.D. Director of the Carnegie Institute, Pittsburg. President of the American Association of Museums, 1907–1909. Editor of *Annals* and *Memoirs* of Carnegie Museum.	**Museums of Science.**
W. L. F.	Walter Lynwood Fleming, A.M., Ph.D. Professor of History in Louisiana State University. Author of *Documentary History of Reconstruction*; &c.	**Nullification.**
W. L. G.	William Lawson Grant, M.A. Professor of Colonial History, Queen's University, Kingston, Canada. Formerly Beit Lecturer in Colonial History, Oxford University. Editor of *Acts of the Privy Council* (Canadian Series).	**New Brunswick** (*Canada*).
W. Mo.	William Morris. See the biographical article: Morris, William.	**Mural Decoration** (*in part*).
W. M. D.	William Morris Davis, D.Sc., Ph.D. Professor of Geology in Harvard University. Formerly Professor of Physical Geography. Author of *Physical Geography*; &c.	**North America.**
W. M. R.	William Michael Rossetti. See the biographical article: Rossetti, Dante G.	**Murillo.**
W. O. M.	William O'Connor Morris (d. 1904). Formerly Judge of County Courts, Ireland; and Professor of Law to the King's Inns, Dublin. Author of *Great Commanders of Modern Times*; *Irish History*; *Ireland, 1798–1898*; &c.	**O'Connell, Daniel.**
W. P. R.	The Hon. William Pember Reeves. Director of London School of Economics. Agent-General and High Commissioner for New Zealand, 1896–1909. Minister of Education, Labour, and Justice, New Zealand, 1891–1896. Author of *The Long White Cloud: a History of New Zealand*; &c.	**New Zealand.**
W. R. E. H.	William Richard Eaton Hodgkinson, Ph.D., F.R.S. (Edin.), F.C.S. Professor of Chemistry and Physics, Ordnance College, Woolwich. Formerly Professor of Chemistry and Physics, R.M.A., Woolwich. Part-author of Valentin-Hodgkinson's *Practical Chemistry*; &c.	**Nitroglycerin.**

W. R. M.	WILLIAM RICHARD MORFILL, M.A. (d. 1910). Formerly Professor of Russian and other Slavonic Languages in the University of Oxford. Curator of the Taylorian Institution, Oxford. Author of *Russia*; *Slavonic Literature*; &c.	**Nestor.**
W. R. M.*	WILLIAM ROBERT MARTIN. Captain, R.N. Formerly Lecturer at the Royal Naval College, Greenwich. Author of *Treatise on Navigation and Nautical Astronomy*; &c.	**Navigation.**
W. R. S.	WILLIAM ROBERTSON SMITH, LL.D. See the biographical article: SMITH, WILLIAM ROBERTSON.	**Nabataeans** (*in part*); **Nazarite** (*in part*); **Numeral;** **Obadiah** (*in part*).
W. S. M.	WILLIAM SYMINGTON M'CORMICK, M.A., LL.D. Secretary to the Carnegie Trust of the Scottish Universities. Formerly Professor of English, University College, Dundee. Author of *Lectures on Literature*; &c.	**Occleve.**
W. T. A.	WALKER TALLMADGE ARNDT, M.A.	**New York** (*in part*).
W. W. R.*	WILLIAM WALKER ROCKWELL, LIC.THEOL. Assistant Professor of Church History, Union Theological Seminary, New York.	**Nimes, Councils of.**

PRINCIPAL UNSIGNED ARTICLES

Munich.
Murad.
Muratori.
Mushroom.
Mutilation.
Mysore.
Narcissus.
Narcotics.
Nashville.
Nassau.
Nebraska.
Nevada.
New Caledonia
Newcastle, Dukes of.
Newcastle-upon-Tyne.
New England.
New Guinea.
New Hampshire.
New Hebrides.
New Jersey.
New Mexico.
New Orleans.
New York City.
Ney.
Niam-Niam.
Nicaragua.
Nice.
Nickel.
Nightingale, Florence.
Nîmes.
Nitro-Compounds.
Nitrogen.
Norfolk, Earls and Dukes of.
Norfolk.
Northampton, Earls and Marquesses of.
Northamptonshire.
North Carolina.
North Dakota.
Northumberland, Earls and Dukes of.
Northumberland.
Norwich.
Nottingham.
Nottinghamshire
Novaya Zemlya.
Nuremberg.
Nursing.
Nut.
Oak.
Oates, Titus.

ENCYCLOPÆDIA BRITANNICA

ELEVENTH EDITION

VOLUME XIX

MUN, ADRIEN ALBERT MARIE DE, Count (1841–), French politician, was born at Lumigny, in the department of Seine-et-Marne, on the 28th of February 1841. He entered the army, saw much service in Algeria (1862), and took part in the fighting around Metz in 1870. On the surrender of Metz, he was sent as a prisoner of war to Aix-la-Chapelle, whence he returned in time to assist at the capture of Paris from the Commune. A fervent Roman Catholic, he devoted himself to advocating a patriarch type of Christian Socialism. His eloquence made him the most prominent member of the Cercles Catholiques d'Ouvriers, and his attacks on Republican social policy at last evoked a prohibition from the minister of war. He thereupon resigned his commission (Nov. 1875), and in the following February stood as Royalist and Catholic candidate for Pontivy. The influence of the Church was exerted to secure his election, and the pope during its progress sent him the order of St Gregory. He was returned, but the election was declared invalid. He was re-elected, however, in the following August, and for many years was the most conspicuous leader of the anti-Republican party. "We form," he said on one occasion, "the irreconcilable Counter-Revolution." As far back as 1878 he had declared himself opposed to universal suffrage, a declaration that lost him his seat from 1879 to 1881. He spoke strongly against the expulsion of the French princes, and it was chiefly through his influence that the support of the Royalist party was given to General Boulanger. But as a faithful Catholic he obeyed the encyclical of 1892, and declared his readiness to rally to a Republican government, provided that it respected religion. In the following January he received from the pope a letter commending his action, and encouraging him in his social reforms. He was defeated at the general election of that year, but in 1894 was returned for Finistère (Morlaix). In 1897 he succeeded Jules Simon as a member of the French Academy. This honour he owed to the purity of style and remarkable eloquence of his speeches, which, with a few pamphlets, form the bulk of his published work. In *Ma vocation sociale* (1908) he wrote an explanation and justification of his career.

MUN, THOMAS (1571–1641), English writer on economics, was the third son of John Mun, mercer, of London. He began by engaging in Mediterranean trade, and afterwards settled down in London, amassing a large fortune. He was a member of the committee of the East India Company and of the standing commission on trade appointed in 1622. In 1621 Mun published *A Discourse of Trade from England unto the East Indies.* But it is by his *England's Treasure by Forraign Trade* that he is remembered in his history of economics. Although written possibly about 1630, it was not given to the public until 1664, when it was "published for the Common good by his son John," and dedicated to Thomas, earl of Southampton, lord high treasurer. In it we find for the first time a clear statement of the theory of the balance of trade.

MUNCHAUSEN, Baron. This name is famous in literary history on account of the amusingly mendacious stories known as the *Adventures of Baron Munchausen.* In 1785 a little shilling book of 49 pages was published in London (as we know from the *Critical Review* for December 1785), called *Baron Munchausen's Narrative of his Marvellous Travels and Campaigns in Russia.* No copy is known to exist, but a second edition (apparently identical) was printed at Oxford early in 1786. The publisher of both these editions was a certain Smith, and he then sold it to another bookseller named Kearsley, who brought out in 1786 an enlarged edition (the additions to which were stated in the 7th edition not to be by the original author), with illustrations under the title of *Gulliver Reviv'd: the Singular Travels, Campaigns, Voyages, and Sporting Adventures of Baron Munnikhouson, commonly pronounced Munchausen; as he relates them over a bottle when surrounded by his friends.* Four editions rapidly succeeded, and a free German translation by the poet Gottfried August Bürger, from the fifth edition, was printed at Göttingen in 1786. The seventh English edition (1793), which is the usual text, has the moral sub-title, *Or the Vice of Lying properly exposed*, and had further new additions. In 1792 a *Sequel* appeared, dedicated to James Bruce, the African traveller, whose *Travels to Discover the Nile* (1790) had led to incredulity and ridicule. As time went on *Munchausen* increased in popularity and was translated into many languages. Continuations were published, and new illustrations provided (*e.g.* by T. Rowlandson, 1809; A. Crowquill, 1859; A. Cruikshank, 1869; the French artist Richard, 1878; Gustave Doré, 1862; W. Strang and J. B. Clark, 1895). The theme of Baron Munchausen, the "drawer of the long-bow" *par excellence*, has become part of the common stock of the world's story-telling.

The original author was at first unknown, and until 1824 he was generally identified with Bürger, who made the German translation of 1786. But Bürger's biographer, Karl von Reinhard, in the Berlin *Gesellschafter* of November 1824, set the matter at rest by stating that the real author was Rudolf Erich Raspe (*q.v.*). Raspe had apparently become acquainted at Göttingen with Hieronymus Karl Friedrich, Freiherr von Münchhausen, of Bodenwerder in Hanover. This Freiherr von Münchhausen (1720–1797) had been in the Russian service and served against the Turks, and on retiring in 1760 he lived on his estates at Bodenwerder and used to amuse himself and his friends, and puzzle the quidnuncs and the dull-witted, by relating extraordinary instances of his prowess as soldier and sportsman. His stories became a byword among his circle, and Raspe, when hard up for a living in London, utilized the suggestion for his little brochure. But his narrative owed much also to such sources, known to Raspe, as Heinrich Bebel's *Facetiae bebelianae* (1508), J. P. Lange's *Deliciae academicae* (1665), a section of which is called *Mendacia ridicula*, Castiglione's *Cortegiano* (1528), the *Travels of the Finkenritter*, attributed to Lorenz von Lauterbach in the 16th century, and other works of this sort. Raspe can only be held responsible for the nucleus of the book; the additions were made by booksellers' hacks, from such sources as Lucian's *Vera historia*, or the *Voyages imaginaires* (1787), while suggestions were taken from Baron de Tott's Memoirs (Eng. trans. 1785), the contemporary aeronautical feats of Montgolfier and Blanchard, and any topical "sensations" of the moment, such as Bruce's explorations in Africa. *Munchausen* is thus a medley, as we have it, a classical instance of the fantastical mendacious literary genre.

See the introduction by T. Seccombe to Lawrence and Bullen's edition of 1895. Adolf Ellisen, whose father visited Freiherr von Münchhausen in 1795 and found him very uncommunicative, brought out a German edition in 1849, with a valuable essay on pseudology in general. There is useful material in Carl Muller-Fraureuth's *Die deutschen Lügendichtungen auf Münchhausen* (1881) and in Griesbach's edition of Bürger's translation (1890).

MÜNCH-BELLINGHAUSEN, ELIGIUS FRANZ JOSEPH, Freiherr von (1806–1871), Austrian poet and dramatist (who wrote under the pseudonym "Friedrich Halm"), was born at Cracow on the 2nd of April 1806, the son of a district judge. Educated at first at a private school in Vienna, he afterwards attended lectures at the university, and in 1826, at the early age of twenty, married and entered the government service. In 1840 he became Regierungsrat, in 1845 Hofrat and custodian of the royal library, in 1861 life member of the Austrian Herrenhaus (upper chamber), and from 1869 to 1871 was intendant of the two court theatres in Vienna. He died at Hütteldorf near Vienna on the 22nd of May 1871. Münch-Bellinghausen's dramas, among them notably *Griseldis* (1835; publ. 1837; 11th ed., 1896), *Der Adept* (1836; publ. 1838), *Camoens* (1838), *Der Sohn der Wildnis* (1842; 10th ed., 1896), and *Der Fechter von Ravenna* (1854; publ. 1857; 6th ed., 1894), are distinguished by elegance of language, melodious versification and clever construction, and were for a time exceedingly popular.

His poems, *Gedichte*, were published in Stuttgart, 1850 (new ed., Vienna, 1877). His works, *Sämtliche Werke*, were published in eight volumes (1856–1864), to which four posthumous volumes were added in 1872. *Ausgewählte Werke*, ed. by A. Schlossar, 4 vols. (1904). See F. Pachler, *Jugend und Lehrjahre des Dichters F. Halm* (1877); J. Simiani, *Gedenkblätter an F. Halm* (1873). Halm's correspondence with Enk von der Burg has been published by R. Schachinger (1890).

MUNCIE, a city and the county-seat of Delaware county, Indiana, U.S.A., on the West Fork of the White river, about 57 m. N.E. of Indianapolis. Pop. (1880), 5210; (1890), 11,345; (1900) 20,942, of whom 1235 were foreign-born; (1910 census) 24,005. It is served by the Central Indiana, the Chicago, Cincinnati & Louisville, the Cleveland, Cincinnati, Chicago & St Louis, the Pittsburgh, Cincinnati, Chicago & St Louis, the Fort Wayne, Cincinnati & Louisville, and the Lake Erie & Western railways, and by the Indiana Union Traction, the Dayton & Muncie Traction, and the Muncie & Portland Traction (electric inter-urban) railways. The city is built on level ground (altitude 950 ft.), and has an attractive residential section. It is one of the principal manufacturing centres in Indiana, owing largely to its situation in the natural gas belt. In 1900 and in 1905 it was the largest producer of glass and glassware in the United States, the value of its product in 1905 being $2,344,462. Muncie (named after the Munsee Indians, one of the three principal divisions of the Delawares) was settled about 1833 and was chartered as a city in 1865.

MUNDĀS. The Mundā (*Muṇḍā*) family is the least numerous of the linguistic families of India. It comprises several dialects spoken in the two Chota Nagpur plateaux, the adjoining districts of Madras and the Central Provinces, and in the Mahadeo hills. The number of speakers of the various dialects, according to the census of 1901, are as follow: Santālī, 1,795,113; Mundārī, 460,744; Bhumij, 111,304; Birhår, 526; Kōdā, 23,873; Hō, 371,860; Tūrī, 3880; Asurī, 4894; Korwā, 16,442; Korkū, 87,675; Khariā, 82,506; Juāng, 10,853; Savara, 157,136; Gadabā, 37,230; total, 3,164,036. Santālī, Mundārī, Bhumij, Birhår, Kōdā, Hō, Tūrī, Asurī and Korwā are only slightly differing forms of one and the same language, which can be called Kherwārī, a name borrowed from Santālī tradition. Kherwārī is the principal Mundā language, and quite 88% of all the speakers of Mundā tongues belong to it. The Korwā dialect, spoken in the western part of Chota Nagpur, connects Kherwārī with the remaining Mundā languages. Of these it is most closely related to the Kūrkū language of the Mahadeo hills in the Central Provinces. Kūrkū, in its turn, in important points agrees with Khariā and Juāng, and Khariā leads over to Savara and Gadabā. The two last-mentioned forms of speech, which are spoken in the north-east of the Madras Presidency, have been much influenced by Dravidian languages.

The Mundā dialects are not in sole possession of the territory where they are spoken. They are, as a rule, only found in the hills and jungles, while the plains and valleys are inhabited by people speaking some Aryan language. When brought into close contact with Aryan tongues the Mundā forms of speech are apt to give way, and in the course of time they have been partly superseded by Aryan dialects. There are accordingly some Aryanized tribes in northern India who have formerly belonged to the Mundā stock. Such are the Cheros of Behar and Chota Nagpur, the Kherwars, who are found in the same localities, in Mirzapur and elsewhere, the Savaras, who formerly extended as far north as Shahabad, and others. It seems possible to trace an old Mundā element in some Tibeto-Burman dialects spoken in the Himalayas from Bashahr eastwards.

By race the Mundās are Dravidians, and their language was likewise long considered as a member of the Dravidian family. Max Müller was the first to distinguish the two families. He also coined the name Mundā for the smaller of them, which has later on often been spoken of under other denominations, such as Kolarian and Kherwarian. The Dravidian race is generally considered as the aboriginal population of southern India. The Mundās, who do not appear to have extended much farther towards the south than at present, must have mixed with the Dravidians from very early times. The so-called Nahālī dialect of the Mahadeo hills seems to have been originally a Mundā form of speech which has come under Dravidian influence, and finally passed under the spell of Aryan tongues. The same is perhaps the case with the numerous dialects spoken by the Bhils. At all events, Mundā languages have apparently been spoken over a wide area in central and north India. They were then early superseded by Dravidian and Aryan dialects, and at the present day only scanty remnants are found in the hills and jungles of Bengal and the Central Provinces.

Though the Mundā family is not connected with any other languages in India proper, it does not form an isolated group. It belongs to a widely spread family, which extends from India in the west to Easter Island in the eastern Pacific in the east. In the first place, we find a connected language spoken by the Khasis of the Khasi hills in Assam. Then follow the Mōn-Khmēr languages of Farther India, the dialects spoken by the aboriginal inhabitants of the Malay Peninsula, the Nancowry of the Nicobars, and, finally, the numerous dialects of Austronesia, viz. Indonesic, Melanesic, Polynesic, and so on. Among the various members of this vast group the Mundā languages are most closely related to the Mōn-Khmēr family of Farther India. Kūrkū, Khariā, Juāng, Savara and Gadabā are more closely related to that family than is Kherwārī, the principal Mundā form of speech.

We do not know if the Mundās entered India from without.

If so, they can only have immigrated from the east. At all events they must have been settled in India from a very early period. The Sabaras, the ancestors of the Savaras, are already mentioned in old Vedic literature. The Mundā languages seem to have been influenced by Dravidian and Aryan forms of speech. In most characteristics, however, they differ widely from the neighbouring tongues.

The Mundā languages abound in vowels, and also possess a richly developed system of consonants. Like the Dravidian languages, they avoid beginning a word with more than one consonant. While those latter forms of speech shrink from pronouncing a short consonant at the end of words, the Mundās have the opposite tendency, viz. to shorten such sounds still more. The usual stopped consonants—viz. *k*, *c* (*i.e.* English *ch*), *t* and *p*—are formed by stopping the current of breath at different points in the mouth, and then letting it pass out with a kind of explosion. In the Mundā language this operation can be abruptly checked half-way, so that the breath does not touch the organs of speech in passing out. The result is a sound that makes an abrupt impression on the ear, and has been described as an abrupt tone. Such sounds are common in the Mundā languages. They are usually written *k'*, *c'*, *t'* and *p'*. Similar sounds are also found in the Mōn-Khmēr languages and in Indo-Chinese.

The vowels of consecutive syllables to a certain extent approach each other in sound. Thus in Khērwārī the open sounds *å* (nearly English *a* in all) and *ä* (the *a* in care) agree with each other and not with the corresponding close sounds *o* (the *o* in pole) and *e* (the *e* in pen). The Santālī passive suffix *ok'* accordingly becomes *åk'* after *ä* or *å*; compare *sän-åk'*, go, but *dal-ok'*, to be struck.

Words are formed from monosyllabic bases by means of various additions, suffixes (such as are added after the base), prefixes (which precede the base) and infixes (which are inserted into the base itself). Suffixes play a great rôle in the inflexion of words, while prefixes and infixes are of greater importance as formative additions. Compare Kurku *k-ōn*, Savara *ōn*, son; Kharia *ro-mong*, Kherwārī *mū̃*, nose; Santālī *bor*, to fear; *bo-to-r*, fear; *dal*, to strike; *da-pa-l*, to strike each other.

The various classes of words are not clearly distinguished. The same base can often be used as a noun, an adjective or a verb. The words simply denote some being, object, quality, action or the like, but they do not tell us how they are conceived.

Inflexion is effected in the usual agglutinative way by means of additions which are "glued" or joined to the unchanged base. In many respects, however, Mundā inflexion has struck out peculiar lines. Thus there is no grammatical distinction of gender. Nouns can be divided into two classes, viz. those that denote animate beings and those that denote inanimate objects respectively. There are three numbers—the singular, the dual and the plural. On the other hand, there are no real cases, at least in the most typical Mundā languages. The direct and the indirect object are indicated by means of certain additions to the verb. Certain relations in time and space, however, are indicated by means of suffixes, which have probably from the beginning been separate words with a definite meaning. The genitive, which can be considered as an adjective preceding the governing word, is often derived from such forms denoting locality. Compare Santālī *hår-rä*, in a man; *hår-rän*, of a man.

Higher numbers are counted in twenties, and not in tens as in the Dravidian languages.

The pronouns abound in different forms. Thus there are double sets of the dual and the plural of the pronoun of the first person, one including and the other excluding the person addressed. The Rev. A. Nottrott aptly illustrates the importance of this distinction by remarking how it is necessary to use the exclusive form if telling the servant that "we shall dine at seven." Otherwise the speaker will invite the servant to partake of the meal. In addition to the usual personal pronouns there are also short forms, used as suffixes and infixes, which denote a direct object, an indirect object, or a genitive. There is a corresponding richness in the case of demonstrative pronouns. Thus the pronoun "that" in Santālī has different forms to denote a living being, an inanimate object, something seen, something heard, and so on. On the other hand, there is no relative pronoun, the want being supplied by the use of indefinite forms of the verbal bases, which can in this connexion be called relative participles.

The most characteristic feature of Mundā grammar is the verb, especially in Kherwārī. Every independent word can perform the function of a verb, and every verbal form can, in its turn, be used as a noun or an adjective. The bases of the different tenses can therefore be described as indifferent words which can be used as a noun, as an adjective, and as a verb, but which are in reality none of them. Each denotes simply the root meaning as modified by time. Thus in Santālī the base *dāl-ket'*, struck, which is formed from the base *dal*, by adding the suffix *ket'* of the active past, can be used as a noun (compare *dal-ket'-ko*, strikers, those that struck), as an adjective (compare *dal-ket'-hår*, struck man, the man that struck), and as a verb. In the last case it is necessary to add an *a* if the action really takes place; thus, *dal-ket'-a*, somebody struck.

It has already been remarked that the cases of the direct and indirect object are indicated by adding forms of the personal pronouns to the verb. Such pronominal affixes are inserted before the assertive particle *a*. Thus the affix denoting a direct object of the third person singular is *e*, and by inserting it in *dal-ket'-a* we arrive at a form *dal-ked-e-a*, somebody struck him. Similar affixes can be added to denote that the object or subject of an action belongs to somebody. Thus Santālī *håpån-iñ-e dal-ket'-tako-tiñ-a*, son-my-he struck-theirs-mine, my son who belongs to me struck theirs.

In a sentence such as *har kōrā-e dal-ked-e-a*, man boy-he struck-him, the man struck the boy, the Santals first put together the ideas man, boy, and a striking in the past. Then the *e* tells us that the striking affects the boy, and finally the *-a* indicates that the whole action really takes place. It will be seen that a single verbal form in this way often corresponds to a whole sentence or a series of sentences in other languages. If we add that the most developed Mundā languages possess different bases for the active, the middle and the passive, that there are different causal, intensive and reciprocal bases, which are conjugated throughout, and that the person of the subject is often indicated in the verb, it will be understood that Mundā conjugation presents a somewhat bewildering aspect. It is, however, quite regular throughout, and once the mind becomes accustomed to these peculiarities, they do not present any difficulty to the understanding.

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MUNDAY (or MONDAY), **ANTHONY** (*c.* 1553–1633), English dramatist and miscellaneous writer, son of Christopher Monday, a London draper, was born in 1553–1554. He had already appeared on the stage when in 1576 he bound himself apprentice for eight years to John Allde, the stationer, an engagement from which he was speedily released, for in 1578 he was in Rome. In the opening lines of his *English Romayne Lyfe* (1582) he avers that in going abroad he was actuated solely by a desire to see strange countries and to learn foreign languages; but he must be regarded, if not as a spy sent to report on the English Jesuit College in Rome, as a journalist who meant to make literary capital out of the designs of the English Catholics resident in France and Italy. He says that he and his companion, Thomas Nowell, were robbed of all they possessed on the road from Boulogne to Amiens, where they were kindly received by an English priest, who entrusted them with letters to be delivered in Reims. These they handed over to the English ambassador in Paris, where under a false name, as the son of a well-known English Catholic, Munday gained recommendations which secured his reception at the English College in Rome. He was treated with special kindness by the rector, Dr Morris, for the sake of his supposed father. He gives a detailed account of the routine of the place, of the dispute between the English and Welsh students, of the carnival at Rome, and finally of the martyrdom of Richard Atkins (? 1559–1581). He returned to England in 1578–1579, and became an actor again, being a member of the Earl of Oxford's company between 1579 and 1584. In a Catholic tract entitled *A True Reporte of the death of——M. Campion* (1581), Munday is accused of having deceived his master Allde, a charge which he refuted by publishing Allde's signed declaration to the contrary, and he is also said to have been hissed off the stage. He was one of the chief witnesses against Edmund Campion and his associates, and wrote about this time five anti-popish pamphlets, among them the savage and bigoted tract entitled *A Discoverie of Edmund Campion and his Confederates——whereto is added the execution of Edmund Campion, Raphe Sherwin, and Alexander Brian*, the first part of which was read aloud from the scaffold at Campion's death in December 1581. His political services against the Catholics were rewarded in 1584 by the post of messenger to her Majesty's chamber, and from this time he seems to have ceased to appear on the stage. In 1598–1599, when he travelled with the earl of Pembroke's men in the Low Countries, it was in the capacity of playwright to furbish up old plays. He devoted himself to writing for the booksellers and the theatres, compiling religious works, translating *Amadis de Gaule* and other French romances, and putting words to popular airs. He was the chief pageant-writer for the City from 1605 to 1616, and it is likely that he supplied most of the pageants between 1592 and 1605, of which no authentic record has been kept. It is by these entertainments of his, which rivalled in success those of Ben Jonson and Middleton, that he won his greatest fame; but of all the achievements of his versatile talent the only one that was noted in his epitaph in St Stephens, Coleman Street, London, where he was buried on the 10th of August 1633, was his enlarged edition (1618) of Stow's *Survey of London*. In some of his pageants he signs himself "citizen and draper of London," and in his later years he is said to have followed his father's trade.

Of the eighteen plays between the dates of 1584 and 1602 which are assigned to Munday in collaboration with Henry Chettle, Michael Drayton, Thomas Dekker and other dramatists, only four are extant. *John a Kent and John a Cumber*, dated 1595, is supposed to be the same as *Wiseman of West Chester*, produced by the Admiral's men at the Rae Theatre on the 2nd of December 1594. A ballad of *British Sidanen*, on which it may have been founded was entered at Stationers' Hall in 1579. *The Downfall of Robert Earl of Huntingdon, afterwards called Robin Hood of merrie Sherwodde* (acted in February 1599) was followed in the same month by a second part, *The Death of Robert Earl of Huntingdon* (printed 1601), in which he collaborated with Henry Chettle. Munday also had a share with Michael Drayton, Robert Wilson and Richard Hathway in the *First Part of the history of the life of Sir John Oldcastle* (acted 1599), which was printed in 1600, with the name of William Shakespeare, which was speedily withdrawn, on the title page. William Webbe (*Discourse of English Poetrie*, 1586) praised him for his pastorals, of which there remains only the title, *Sweet Sobs and Amorous Complaints of Shepherds and Nymphs*; and Francis Meres (*Palladis Tamia*, 1598) gives him among dramatic writers the exaggerated praise of being "our best plotter." Ben Jonson ridiculed him in *The Case is Altered* as Antonio Balladino, pageant poet. Munday's works usually appeared under his own name, but he sometimes used the pseudonym of "Lazarus Piot." A. H. Bullen identifies him with the "Shepherd Tony" who contributed "Beauty sat bathing by a spring" and six other lyrics to *England's Helicon* (ed. Bullen, 1899, p. 15).

The completest account of Anthony Munday is T. Seccombe's article in the *Dict. Nat. Biog.* A life and bibliography are prefixed to the Shakespeare Society's reprint of *John a Kent and John a Cumber* (ed. J. P. Collier, 1851). His two "Robin Hood" plays were edited by J. P. Collier in *Old Plays* (1828), and his *English Romayne Lyfe* was printed in the *Harleian Miscellany*, vii. 136 seq. (ed. Park, 1811). For an account of his city pageants see F. W. Fairholt, *Lord Mayor's Pageants* (Percy Soc., No. 38, 1843).

MUNDELLA, ANTHONY JOHN (1825–1897), English educational and industrial reformer, of Italian extraction, was born at Leicester in 1825. After a few years spent at an elementary school, he was apprenticed to a hosier at the age of eleven; He afterwards became successful in business in Nottingham, filled several civic offices, and was known for his philanthropy. He was sheriff of Nottingham in 1853, and in 1859 organized the first courts of arbitration for the settlement of disputes between masters and men. In November 1868 he was returned to parliament for Sheffield as an advanced Liberal. He represented that constituency until November 1885, when he was returned for the Brightside division of Sheffield, which he continued to represent until his death. In the Gladstone ministry of 1880 Mundella was vice-president of the council, and shortly afterwards was nominated fourth charity commissioner for England and Wales. In February 1886 he was appointed president of the board of trade, with a seat in the cabinet, and was sworn a member of the privy council. In August 1892, when the Liberals again came into power, Mundella was again appointed president of the board of trade, and he continued in this position until 1804, when he resigned office. His resignation was brought about by his connexion with a financial company which went into liquidation in circumstances calling for the official intervention of the board of trade. However innocent his own connexion with the company was, it involved him in unpleasant public discussion, and his position became untenable. Having made a close study of the educational systems of Germany and Switzerland, Mundella was an early advocate of compulsory education in England. He rendered valuable service in connexion with the Elementary Education Act of 1870, and the educational code of 1882, which became known as the "Mundella Code," marked a new departure in the regulation of public elementary schools and the conditions of the Government grants. To his initiative was chiefly due the Factory Act of 1875, which established a ten-hours day for women and children in textile factories; and the Conspiracy Act, which removed certain restrictions on trade unions. It was he also who established the labour department of the board of trade and founded the *Labour Gazette*. He introduced and passed bills for the better protection of women and children in brickyards and for the limitation of their labours in factories; and he effected substantial improvements in the Mines Regulation Bill, and was the author of much other useful legislation. In recognition of his efforts, a marble bust of himself, by Boehm, subscribed for by 80,000 factory workers, chiefly women and children, was presented to Mrs Mundella. He died in London on the 21st of July 1897.

MUNDEN, JOSEPH SHEPHERD (1758–1832), English actor, was the son of a London poulterer, and ran away from home to join a strolling company. He had a long provincial experience as actor and manager. His first London appearance was in 1790 at Covent Garden, where he practically remained until 1811, becoming the leading comedian of his day. In 1813 he was at Drury Lane. He retired in 1824, and died on the 6th of February 1832.

MÜNDEN, a town of Germany, in the Prussian province of Hanover, picturesquely situated at the confluence of the Fulda and the Werra, 21 m. N.E. of Cassel by rail. Pop. (1905), 10,755. It is an ancient place, municipal rights having been granted to it in 1247. A few ruins of its former walls still survive. The large Lutheran church of St Blasius (14th–15th centuries) contains the sarcophagus of Duke Eric of Brunswick-Calenberg (d. 1540). The 13th-century Church of St Aegidius was injured in the siege of 1625–26 but was subsequently restored. There is a new Roman Catholic church (1895). The town hall (1619), and the ducal castle, built by Duke Eric II. about 1570, and rebuilt in 1898, are the principal secular buildings. In the latter is the municipal museum. There are various small industries and a trade in timber. Münden, often called "Hannoversch-Münden" (*i.e.* Hanoverian Münden), to distinguish it from Prussian Minden, was founded by the landgraves of Thuringia, and passed in 1247 to the house of Brunswick. It was for a time the residence of the dukes of Brunswick-Lüneburg. In 1626 it was destroyed by Tilly.

See Willigerod, *Geschichte von Münden* (Göttingen, 1808); and Henze, *Führer durch Münden und Umgegend* (Münden, 1900).

MUNDRUCUS, a tribe of South American Indians, one of the most powerful tribes on the Amazon. In 1788 they completely defeated their ancient enemies the Muras. After 1803 they lived at peace with the Brazilians, and many are civilized.

MUNDT, THEODOR (1808–1861), German author, was born at Potsdam on the 19th of September 1808. Having studied philology and philosophy at Berlin, he settled in 1832 at Leipzig, as a journalist, and was subjected to a rigorous police supervision. In 1839 he married Klara Müller (1814–1873), who under the name of Luise Mühlbach became a popular novelist, and he removed in the same year to Berlin. Here his intention of entering upon an academical career was for a time thwarted by his collision with the Prussian press laws. In 1842, however, he was permitted to establish himself as *privatdocent*. In 1848 he was appointed professor of literature and history in Breslau, and in 1850 ordinary professor and librarian in Berlin; there he died on the 30th of November 1861. Mundt wrote extensively on aesthetic subjects, and as a critic he had considerable influence in his time. Prominent among his works are *Die Kunst der deutschen Prosa* (1837); *Geschichte der Literatur der Gegenwart* (1840); *Aesthetik; die Idee der Schönheit und des Kunstwerks im Lichte unserer Zeit* (1845, new ed. 1868); *Die Götterwelt der alten Völker* (1846, new ed. 1854). He also wrote several historical novels; *Thomas Münzer* (1841); *Mendoza, der Vater der Schelmen* (1847) and *Die Matadore* (1850). But perhaps Mundt's chief title to fame was his part in the emancipation of women, a theme which he elaborated in his *Madonna, Unterhaltungen mit einer Heiligen* (1835).

MUNICH (Ger. *München*), a city of Germany, capital of the kingdom of Bavaria, and the third largest town in the German Empire. It is situated on an elevated plain, on the river Isar, 25 m. N. of the foot-hills of the Alps, about midway between Strassburg and Vienna. Owing to its lofty site (1700 ft. above the sea) and the proximity of the Alps, the climate is changeable, and its mean annual temperature, 49° to 50° F., is little higher than that of many places much farther to the north. The annual rainfall is nearly 30 in. Munich lies at the centre of an important network of railways connecting it directly with Strassburg (for Paris), Cologne, Leipzig, Berlin, Rosenheim (for Vienna) and Innsbruck (for Italy via the Brenner pass), which converge in a central station.

Munich is divided into twenty-four municipal districts, nineteen of which, including the old town, lie on the left bank of the Isar, while the suburban districts of Au, Haidhausen, Giesing, Bogenhausen and Ramersdorf are on the opposite bank. The old town, containing many narrow and irregular streets, forms a semicircle with its diameter towards the river, while round its periphery has sprung up the greater part of modern Munich, including the handsome Maximilian and Ludwig districts. The walls with which Munich was formerly surrounded have been pulled down, but some of the gates have been left. The most interesting is the Isartor and the Karlstor, restored in 1835 and adorned with frescoes. The Siegestor (or gate of victory) is a modern imitation of the arch of Constantine at Rome, while the stately Propylaea, built in 1854–1862, is a reproduction of the gates of the Athenian Acropolis.

Munich owes its architectural magnificence largely to Louis I. of Bavaria, who ascended the throne in 1825, and his successors; while its collections of art entitle it to rank with Dresden and Berlin. Most of the modern buildings have been erected after celebrated prototypes of other countries and eras, so that, as has been said by Moriz Carrière, a walk through Munich affords a picture of the architecture and art of two thousand years. In carrying out his plans Louis I. was seconded by the architect Leo von Klenze, while the external decorations of painting and sculpture were mainly designed by Peter von Cornelius, Wilhelm von Kaulbach and Schwanthaler. As opportunity offers, the narrow streets of the older city are converted into broad, straight boulevards, lined with palatial mansions and public buildings. The hygienic improvement effected by these changes, and by a new and excellent water supply, is shown by the mortality averages—40·4 per thousand in 1871–1875, 30·4 per thousand in 1881–1885, and 20·5 per thousand in 1903–1904. The architectural style which has been principally followed in the later public buildings, among them the law courts, finished in 1897, the German bank, St Martin's hospital, as well as in numerous private dwellings, is the Italian and French Rococo, or Renaissance, adapted to the traditions of Munich architecture in the 17th and 18th centuries. A large proportion of the most notable buildings in Munich are in two streets, the Ludwigstrasse and the Maximilianstrasse, the creations of the monarchs whose names they bear. The former, three-quarters of a mile long and 40 yds. wide, chiefly contains buildings in the Renaissance style by Friedrich von Gärtner. The most striking of these are the palaces of Duke Max and of Prince Luitpold; the Odeon, a large building for concerts, adorned with frescoes and marble busts; the war office; the royal library, in the Florentine palatial style; the Ludwigskirche, a successful reproduction of the Italian Romanesque style, built in 1829–1844, and containing a huge fresco of the Last Judgment by Cornelius; the blind asylum; and, lastly, the university. At one end this street is terminated by the Siegestor, while at the other is the Feldherrenhalle (or hall of the marshals), a copy of the Loggia dei Lanzi at Florence, containing statues of Tilly and Wrede by Schwanthaler. Adjacent is the church of the Theatines, an imposing though somewhat over-ornamented example of the Italian Rococo style; it contains the royal burial vault. In the Maximilianstrasse, which extends from Haidhausen on the right bank of the Isar to the Max-Joseph Platz, King Maximilian II. tried to introduce an entirely novel style of domestic architecture, formed by the combination of older forms. At the east end it is closed by the Maximilianeum, an extensive and imposing edifice, adorned externally with large sculptural groups and internally with huge paintings representing the chief scenes in the history of the world. Descending the street, towards the west are passed in succession the old buildings of the Bavarian national museum, the government buildings in which the Composite style of Maximilian has been most consistently carried out, and the mint. On the north side of the Max-Joseph Platz lies the royal palace, consisting of the Alte Residenz, the Königsbau, and the Festsaalbau. The Alte Residenz dates from 1601 to 1616; its apartments are handsomely fitted up in the Rococo style, and the private chapel and the treasury contain several crowns and many other interesting and valuable objects. The Festsaalbau, erected by Klenze in the Italian Renaissance style, is adorned with mural paintings and sculptures, while the Königsbau, a reduced copy of the Pitti Palace at Florence, contains a series of admirable frescoes from the *Niebelungenlied* by Julius Schnorr von Carolsfeld. Adjoining the palace are two theatres, the Residenz or private theatre, and the handsome Hoftheater, accommodating 2500 spectators. The Allerheiligen-Hofkirche, or court-church, is in the Byzantine style, with a Romanesque façade.

The Ludwigstrasse and the Maximilianstrasse both end at no great distance from the Frauenplatz in the centre of the old town. On this square stands the Frauenkirche, the cathedral church of the archbishop of Munich-Freising, with its lofty cupola capped towers dominating the whole town. It is imposing from its size, and interesting as one of the few examples of indigenous Munich art. On the adjacent Marienplatz are the old town-hall, dating from the 14th century and restored in 1865, and the new town-hall, the latter a magnificent modern Gothic erection, freely embellished with statues, frescoes, and stained-glass windows, and enlarged in 1900–1905. The column in the centre of the square was erected in 1638, to commemorate the defeat of the Protestants near Prague by the Bavarians during the Thirty Years' War.

Among the other churches of Munich the chief place is due to St Boniface's, an admirable copy of an early Christian basilica. It is adorned with a cycle of religious paintings by Heinrich von Hess (1798–1863), and the dome is supported by sixty-four monoliths of grey Tyrolese marble. The parish church of Au, in the Early Gothic style, contains gigantic stained-glass windows and some excellent wood-carving; and the church of St John in Haidhausen is another fine Gothic structure. St Michael's in the Renaissance style, erected for the Jesuits in 1583–1595, contains the monument of Eugène Beauharnais by Thorwaldsen. The façade is divided into storeys, and the general effect is by no means ecclesiastical. St Peter's is interesting as the oldest church in Munich (12th century), though no trace of the original basilica remains. Among newer churches the most noticeable are the Evangelical church of St Luke, a Transitional building, with an imposing dome, finished in 1896, and the Gothic parochial church of the Giesing suburb, with a tower 312 ft. high and rich interior decorations (1866–1884).

The valuable collections of art are enshrined in handsome buildings, mostly in the Maximilian suburb on the north side of the town. The old Pinakothek, erected by Klenze in 1826–1836, and somewhat resembling the Vatican, is embellished externally with frescoes by Cornelius and with statues of twenty-four celebrated painters from sketches by Schwanthaler. It contains a valuable and extensive collection of pictures by the earlier masters, the chief treasures being the early German and Flemish works and the unusually numerous examples of Rubens. It also affords accommodation to more than 300,000 engravings, over 20,000 drawings, and a large collection of vases. Opposite stands the new Pinakothek, built 1846–1853, the frescoes on which, designed by Kaulbach, show the effects of wind and weather. It is devoted to works by painters of the last century, among which Karl Rottmann's Greek landscapes are perhaps the most important. The Glyptothek, a building by Klenze in the Ionic style, and adorned with several groups and single statues, contains a valuable series of sculptures, extending from Assyrian and Egyptian monuments down to works by Thorwaldsen and other modern masters. The celebrated Aeginetan marbles preserved here were found in the island of Aegina in 1811. Opposite the Glyptothek stands the exhibition building, in the Corinthian style, it was finished in 1845, and is used for periodic exhibitions of art. In addition to the museum of plaster casts, the *Antiquarium* (a collection of Egyptian, Greek and Roman antiquities under the roof of the new Pinakothek) and the Maillinger collection, connected with the historical museum, Munich also contains several private galleries. Foremost among these stand the Schack Gallery, bequeathed by the founder, Count Adolph von Schack, to the emperor William II. in 1894, rich in works by modern German masters, and the Lotzbeck collection of sculptures and paintings. Other structures and institutions are the new buildings of the art association; the academy of the plastic arts (1874–1885), in the Renaissance style; and the royal arsenal (Zeughaus) with the military museum. The Schwanthaler museum contains models of most of the great sculptor's works.

The immense scientific collection in the Bavarian national museum, illustrative of the march of progress from the Roman period down to the present day, compares in completeness with the similar collections at South Kensington and the Musée de Cluny. The building which now houses this collection was erected in 1894–1900. On the walls is a series of well-executed frescoes of scenes from Bavarian history, occupying a space of 16,000 sq. ft. The ethnographical museum, the cabinet of coins, and the collections of fossils, minerals, and physical and optical instruments, are also worthy of mention. The art union, the oldest and most extensive in Germany, possesses a good collection of modern works. The chief place among the scientific institutions is due to the academy of science, founded in 1759. The royal library contains over 1,300,000 printed volumes and 30,000 manuscripts. The observatory is equipped with instruments by the celebrated Josef Fraunhofer.

At the head of the educational institutions of Munich stands the university, founded at Ingolstadt in 1472, removed to Landshut in 1800, and transferred thence to Munich in 1826. In addition to the four usual faculties there is a fifth—of political economy. In connexion with the university are medical and other schools, a priests' seminary, and a library of 300,000 volumes. The polytechnic institute (*Technische Hochschule*) in 1899 acquired the privilege of conferring the degree of doctor of technical science. Munich contains several gymnasia or grammar-schools, a military academy, a veterinary college, an agricultural college, a school for architects and builders, and several other technical schools, and a conservatory of music. The general prison in the suburb of Au is considered a model of its kind; and there is also a large military prison. Among other public buildings, the crystal palace (*Glas-palast*), 765 ft. in length, erected for the great exhibition of 1854, is now used, as occasion requires, for temporary exhibitions. The Wittelsbach palace, built in 1843–1850, in the Early English Pointed style, is one of the residences of the royal family. Among the numerous monuments with which the squares and streets are adorned, the most important are the colossal statue of Maximilian II. in the Maximilianstrasse, the equestrian statues of Louis I. and the elector Maximilian I., the obelisk erected to the 30,000 Bavarians who perished in Napoleon's expedition to Moscow, the Wittelsbach fountain (1895), the monument commemorative of the peace of 1871, and the marble statue of Justus Liebig, the chemist, set up in 1883.

The English garden (*Englischer Garten*), to the north-east of the town, is 600 acres in extent, and was laid out by Count Rumford in imitation of an English park. On the opposite bank of the Isar, above and below the Maximilianeum, extend the Gasteig promenades, commanding fine views of the town. To the south-west of the town is the Theresienwiese, a large common where the popular festival is celebrated in October. Here is situated the Ruhmeshalle or hall of fame, a Doric colonnade containing busts of eminent Bavarians. In front of it is a colossal bronze statue of Bavaria, 170 ft. high, designed by Schwanthaler. The botanical garden, with its large palm-house, the Hofgarten, surrounded with arcades containing frescoes of Greek landscapes by Rottmann, and the Maximilian park to the east of the Isar, complete the list of public parks.

The population of Munich in 1905 was 538,393. The permanent garrison numbers about 10,000 men. Of the population, 84% are Roman Catholic, 14% Protestants, and 2% Jews.

Munich is the seat of the archbishop of Munich-Freising and of the general Protestant consistory for Bavaria. About twenty newspapers are published here, including the *Allgemeine Zeitung*. Some of the festivals of the Roman Church are celebrated with considerable pomp; and the people also cling to various national fêtes, such as the Metzgersprung, the Schäfflertanz, and the great October festival.

Munich has long been celebrated for its artistic handicrafts, such as bronze-founding, glass-staining, silversmith's work, and wood-carving, while the astronomical instruments of Fraunhofer and the mathematical instruments of Traugott Lieberecht von Ertel (1778–1858) are also widely known. Lithography, which was invented at Munich at the end of the 18th century, is extensively practised here. The other industrial products include wall-paper, railway plant, machinery, gloves and artificial flowers. The most characteristic industry, however, is brewing. Four important markets are held at Munich annually. The city is served by an extensive electric tramway system.

History.—The Villa Munichen or *Forum ad monachos*, so called from the monkish owners of the ground on which it lay, was first called into prominence by Duke Henry the Lion, who established a mint here in 1158, and made it the emporium for the salt coming from Hallein and Reichenhall. The Bavarian dukes of the Wittelsbach house occasionally resided at Munich, and in 1255 Duke Louis made it his capital, having previously surrounded it with walls and a moat. The town was almost entirely destroyed by fire in 1327, after which the emperor Louis the Bavarian, in recognition of the loyalty of the citizens, rebuilt it very much on the scale it retained down to the beginning of the 19th century. Among the succeeding rulers those who did most for the town in the erection of handsome buildings and the foundation of schools and scientific institutions were Albert V., William V., Maximilian I., Max Joseph and Charles Theodore. In 1632 Munich was occupied by Gustavus Adolphus, and in 1705, and again in 1742, it was in possession of the Austrians. In 1791 the fortifications were razed.

Munich's importance in the history of art is entirely of modern growth, and may be dated from the acquisition of the Aeginetan marbles by Louis I., then crown prince, in 1812. Among the eminent artists of this period whose names are more or less identified with Munich were Leo von Klenze (1784–1864), Joseph Daniel Ohlmüller (1791–1839), Friedrich von Gärtner (1792–1847), and Georg Friedrich Ziebland (1800–1873), the architects; Peter von Cornelius (1783–1867), Wilhelm von Kaulbach (1804–1874), Julius Schnorr von Carolsfeld (1794–1872), and Karl Rottmann, the painters; and Ludwig von Schwanthaler, the sculptor. Munich is still the leading school of painting in Germany, but the romanticism of the earlier masters has been abandoned for drawing and colouring of a realistic character. Karl von Piloty (1826–1886) and Wilhelm Diez (1839–1907) long stood at the head of this school.

See *Mittheilungen des statistischen Bureaus der Stadt München* (vols. i.–v., 1875–1882); Söltl, *München mit seinen Umgebungen* (1854); Reber, *Bautechnischer Führer durch die Stadt München* (1876); Daniel, *Handbuch der Geographie* (new ed., 1895); Prantl, *Geschichte der Ludwig-Maximilians Universität* (Munich, 1872); Goering, *30 Jahre München* (Munich, 1904); von Ammon, *Die Gegend von München geologisch geschildert* (Munich, 1895); Kronegg, *Illustrierte Geschichte der Stadt München* (Munich, 1903); the *Jahrbuch für Münchener Geschichte*, edited by Reinhardstöttner and Trautmann (Munich, 1887–1894); Aufleger and Trautmann, *Alt-München in Bild und Wort* (Munich, 1895); Rohmeder, *München als Handelsstadt* (Munich, 1905); H. Tinsch, *Das Stadtrecht von München* (Bamberg, 1891); F. Pecht, *Geschichte der münchener Kunst im 19 Jahrhundert* (Munich, 1888); and Trautwein, *Führer durch München* (20th ed., 1906). There is an English book on Munich by H. R. Wadleigh (1910).

MUNICIPALITY, a modern term (derived from Lat. *municipium;* see below), now used both for a city or town which is organized for self-government under a municipal corporation, and also for the governing body itself. Such a corporation in Great Britain consists of a head as a mayor or provost, and of superior members, as aldermen and councillors, together with the simple corporators, who are represented by the governing body; it acts as a person by its common seal, and has a perpetual succession, with power to hold lands subject to the restrictions of the Mortmain laws; and it can sue or be sued. Where necessary for its primary objects, every corporation has power to make by-laws and to enforce them by penalties, provided they are not unjust or unreasonable or otherwise inconsistent with the objects of the charter or other instrument of foundation.

See BOROUGH, COMMUNE, CORPORATION, LOCAL GOVERNMENT, FINANCE, &c., and for details of the functions of the municipal government see the sections under the general headings of the different countries and the sections on the history of these countries.

MUNICIPIUM (Lat. *munus*, a duty or privilege, *capere*, to take), in ancient Rome, the term applied primarily to a *status*, a certain relation between individuals or communities and the Roman state; subsequently and in ordinary usage to a community, standing in such a relation to Rome. Whether the name signifies the taking up of burdens or the acceptance of privileges is a disputed point. But as ancient authorities are unanimous in giving *munus* in this connexion the sense of "duty" or "service," it is probable that the chief feature of municipality was the performance of certain services to Rome.[1] This view is confirmed by all that we know about the towns to which the name was applied in republican times. The status had its origin in the conferment of citizenship upon Tusculum in 381 B.C. (Livy vi. 26; cf. Cic. *pro Planc.* 8, 19), and was widely extended in the settlement made by Rome at the close of the Latin War in 338 B.C. (see ROME, *History*). Italian towns were then divided into three classes: (1) *Coloniae civium Romanorum*, whose members had all the rights of citizenship; (2) *municipia*, which received partial citizenship; (3) *foederatae civitates* (including the so-called Latin colonies), which remained entirely separate from Rome, and stood in relations with her which were separately arranged by her for each state by treaty (*foedus*). The *municipia* stood in very different degrees of dependence on Rome. Some, such as Fundi (Livy viii. 14; cf. *ibid.* 19), enjoyed a local self-government only limited in the matter of jurisdiction; others, such as Anagnia (Livy ix. 43; Festus, *de verb. significatione, s.v.* "municipium," p. 127, ed. Müller), were governed directly from Rome. But they all had certain features in common. Their citizens were called upon to pay the same dues and perform the same service in the legions as full Roman citizens, but were deprived of the chief privileges of citizenship, those of voting in the Comitia (*jus suffragii*), and of holding Roman magistracies (*jus honorum*). It would also appear from Festus (*op. cit. s.v. praefectura*, p. 233) that jurisdiction was entrusted in every *municipium* to *praefecti juri dicundo* sent out from Rome to represent the Praetor Urbanus.[2] The conferment of municipality can therefore hardly have been regarded as other than an imposing of burdens, even in the case of those cities which retained control of their own affairs. But after the close of the second Punic War, when Rome had become the chief power, not only in Italy, but in all the neighbouring lands round the Mediterranean, we can trace a growing tendency among the Italian cities to regard citizenship of this great state as a privilege, and to claim complete citizenship as a reward of their services in helping to build up the Roman power. During the 2nd century B.C. the *jus suffragii* and *jus honorum* were conferred upon numerous *municipia* (Livy xxxviii. 36, 37), whose citizens were then enrolled in the Roman tribes. They can have exercised their public rights but seldom, owing to their distance from Rome; but the consulships of C. Marius, a *municeps* of Arpinum (between 107 and 100 B.C.), and the strength of the support given to Tiberius Gracchus in the assembly by the voters from Italian towns (133 B.C.) show what an important influence the members of these *municipia* could occasionally exercise over Roman politics. The cities thus privileged, however, though receiving complete Roman citizenship, were not, as the logic of public law might seem to demand, incorporated in Rome, but continued to exist as independent urban units; and this anomaly survived in the municipal system which was developed, on the basis of these grants of citizenship, after the Social War. That system recognized the *municeps* as at once a citizen of a self-governing city community, and a member of the city of Rome, his dual capacity being illustrated by his right of voting both in the election of Roman magistrates and in the election of magistrates for his own town.

The result of the Social War which broke out in 91 B.C. (see ROME: *History*) was the establishment of a new uniform municipality throughout Italy, and the obliteration of any important distinction between the three classes established after the Latin War. By the Lex Julia of 90 B.C. and the Lex Plautia Papiria of 89 B.C. every town in Italy which made application in due form received the complete citizenship. The term *municipium* was no longer confined to a particular class of Italian towns but was adopted as a convenient name for all urban communities of Roman citizens in Italy. The organization of a municipal system, which should regulate the governments of all these towns on a uniform basis, and define their relation to the Roman government, was probably the work of Sulla, who certainly gave great impetus to the foundation in the provinces of citizen colonies, which were the earliest *municipia* outside Italy, and enjoyed the same status as the Italian towns. Julius Caesar extended the sphere of the Roman municipal system by his enfranchisement of Cisalpine Gaul, and the consequent inclusion of all the towns of that region in the category of *municipia.* He seems also to have given a more definite organization to the *municipia* as a whole. But, excepting those in Cisalpine Gaul, the municipal system still embraced no towns outside Italy other than the citizen colonies. Augustus and his successors adopted the practice of granting to existing towns in the provinces either the full citizenship, or a partial *civitas* known as the *jus Latii.* This partial *civitas* does not seem to have been entirely replaced, as in Italy, by the grant of full privileges to the communities possessing it, and the distinction survived for some time in the provinces between *coloniae*, *municipia juris Romani*, and *municipia juris Latini.* But the uniform system of administration gradually adopted in all three classes rendered the distinction entirely unimportant, and the general term *municipium* is used of all alike. The incorporation of existing towns, hitherto non-Roman, in the uniform municipal system of the principate took place mainly in the eastern part of the Empire, where Greek civilization had long fostered urban life. In the west city communities rapidly sprang up under direct Roman influence. The development of towns of the municipal type on the sites where legions occupied permanent quarters can be traced in several of the western provinces; and it cannot be doubted that this development became the rule wherever a body of Roman subjects settled down together for any purpose and permanently occupied a region. At any rate by the end of the 1st century of the principate *municipia* are numerous in the western as well as the eastern half of the Empire, and the towns are everywhere centres of Roman influence.

Of the internal life of the *municipia* very little is known before the Empire. For the period after Julius Caesar, however, we have two important sources of information. A series of municipal laws gives us a detailed knowledge of the constitution imposed, with slight variations, on all the *municipia*; and a host of private inscriptions gives particulars of their social life.

The municipal constitution of the 1st century of the principate is based upon the type of government common to Greece and Rome from earliest times. The government of each town consists of magistrates, senate and assembly, and is entirely independent of the Roman government except in certain cases of higher civil jurisdiction, which come under the direct cognisance of the praetor urbanus at Rome. On the other hand, each community is bound to perform certain services to the Imperial government, such as the contribution of men and horses for military service, the maintenance of the imperial post through its neighbourhood, and the occasional entertainment of Roman officials or billeting of soldiers. The citizens were of two classes: (1) *cives*, whether by birth, naturalization or emancipation, (2) *incolae*, who enjoyed a partial citizenship based on domicile for a certain period. Both classes were liable to civic burdens, but the *incolae* had none of the privileges of citizenship except a limited right of voting. The citizens were grouped in either tribes or *curiae*, and accordingly the assembly sometimes bore the name of Comitia Tributa, sometimes that of Comitia Curiata. The theoretical powers of these comitia were extensive both in the election of magistrates and in legislation. But the growing influence of the senate over elections on the one hand, and on the other hand the increasing reluctance of leading citizens to become candidates for office (see below), gradually made popular election a mere form. The senatorial recommendation of the necessary number of candidates seems to have been merely ratified in the comitia; and a Spanish municipal law of the 1st century makes special provision for occasions on which an insufficient number of candidates are forthcoming. In Italy, however, the reality of popular elections seems to have survived to a later date. The inscriptions at Pompeii, for instance, give evidence of keenly contested elections in the 2nd century. The local senate, or *curia*, always exercised an important influence on municipal politics. Its members formed the local nobility, and at an early date special privileges were granted by Rome to provincials who were senators in their native towns. For the composition, powers, and history of the provincial senate see Decurio. The magistrates were elected annually, and were six in number, forming three pairs of colleagues. The highest magistrates were the *IIviri* (*Duoviri*) *juri dicundo*, who had charge, as their name implies, of all local jurisdiction, and presided over the assembly. Candidates for this office were required to be over 25 years of age, to have held one of the minor magistracies, and to possess all the qualifications required of members of the local senate (see Decurio). Next in dignity were the IIviri aediles, who had charge of the roads and public buildings, the games and the corn-supply, and exercised police control throughout the town. They appear to have been regarded as subordinate colleagues (*collegae minores*) of the *IIviri juri dicundo*, and in some towns at least to have had the right to convene and preside over the *comitia* in the absence of the latter. Indeed many inscriptions speak of IVviri (*Quattuorviri*) consisting of two *IVviri juri dicundo* and two *IVviri aediles*; but in the majority of cases the former are regarded as distinct and superior magistrates. The two *quaestores*, who appear to have controlled finance in a large number of *municipia*, cannot be traced in others; and it is probable that in the *municipia*, as at Rome, the quaestorship was locally instituted, as need arose, to relieve the supreme magistrates of excessive business. Other municipal magistrates frequently referred to in the inscriptions are the *quinquennales* and *praefecti*. The *quinquennales* superseded the *IIviri* or *IVviri juri dicundo* every five years, and differed from them only in possessing, in addition to their other powers, those exercised in Rome before the time of Sulla by the censors. Two classes of *praefecti* are found in the municipalities under the Empire, both of which are to be distinguished from the officials who bore that name in the *municipia* before the Social War. The first class consists of those *praefecti* who were nominated as temporary delegates by the IIviri, when through illness or compulsory absence they were unable to discharge the duties of their office. The second class, referred to in inscriptions by the name of *praefecti ab decurionibus creati lege Petronia*, seem to have been appointed by the local senate in case of a complete absence of higher magistrates, such as would have led in Rome to the appointment of an interrex.

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[1] For a contrary view, however, see Marquardt, *Röm. Staatsverw.* i. p. 26, n. 2 (2nd ed., Leipzig, 1881), and authorities there cited.

[2] For a different view see Willems, *Droit public romain*, p. 381 (Louvain, 1874).

From a social point of view the *municipia* of the Roman Empire may be treated under three heads: (1) as centres of local self-government, (2) as religious centres, (3) as industrial centres. (1) The chief feature of the local government of the towns is the widespread activity of the municipal authorities in improving the general conditions of life in the town. In the municipalities, as in Rome, provision was made out of the public funds for feeding the poorest part of the population, and providing a supply of corn which could be bought by ordinary citizens at a moderate price. In Pliny's time there existed in many towns public schools controlled by the municipal authorities, concerning which Pliny remarks that they were a source of considerable disturbance in the town at the times when it was necessary to appoint teachers. He himself encouraged the establishment of another kind of municipal school at Como, where the leading townspeople subscribed for the maintenance of the school, and the control, including the appointment of teachers, remained in the hands of the subscribers. Physicians seem to have been maintained in many towns at the public expense. The water-supply was also provided out of the municipal budget, and controlled by magistrates appointed for the purpose. To enable it to bear the expense involved in all these undertakings, the local treasury was generally assisted by large benefactions, either in money or in works, from individual citizens; but direct taxation for municipal purposes was hardly ever resorted to. The treasury was filled out of the proceeds of the landed possessions of the community, especially such fruitful sources of revenue as mines and quarries, and out of import and export duties. It was occasionally subsidized by the emperor on occasions of sudden and exceptional calamity.

2. The chief feature in the religious life of the towns was the important position they occupied as centres for the cult of the emperor. Caesar-worship as an organized cult developed spontaneously in many provincial towns during the reign of Augustus, and was fostered by him and his successors as a means of promoting in these centres of vigour and prosperity a strong loyalty to Rome and the emperor, which was one of the firmest supports of the latter's power. The order of *Augustales*, officials appointed to regulate the worship of the emperor in the towns, occupied a position of dignity and importance in provincial society. It was composed of the leading and the wealthiest men among the lower classes of the population. By the organization of the order on these lines Augustus secured the double object of maintaining Caesar-worship in all the most vigorous centres of provincial life, and attracting to himself and his successors the special devotion of the industrial class which had its origin in the *municipia* of the Roman Empire, and has become the greatest political force in modern Europe.

3. The development of this free industrial class is the chief feature of the *municipia* considered as centres of industry and handicraft. The rise to power of the equestrian order in Rome during the last century of the Republic had to some extent modified the old Roman principle that trade and commerce were beneath the dignity of the governing class; but long after the fall of the Republic the aristocratic notion survived in Rome that industry and handicrafts were only fit for slaves. In the provincial towns, however, this idea was rapidly disappearing in the early years of the Empire, and even in the country towns of Italy the inscriptions give evidence not much later of the existence of a large and flourishing free industrial class, proud of its occupation, and bound together by a strong *esprit de corps*. Already the members of this class show a strong tendency to bind themselves together in gilds (*collegia*, *sodalitates*), and the existence of countless associations of the kind is revealed by the inscriptions. The formation of societies for religious and other purposes was frequent at Rome from the earliest times in all classes of the free population. After the time of Sulla these societies were regarded by the government with suspicion, mainly on account of the political uses to which they were turned, and various measures were passed for their suppression in Rome and Italy. This policy was continued by the early emperors and extended to the whole Empire, but in spite of opposition the gilds in the provincial towns grew and flourished. The ostensible objects of nearly all such *collegia* of which we have any knowledge were twofold, the maintenance of the worship of some god, and provision for the performance of proper funerary rights for its members. But under cover of these two main objects, the only two purposes for which such combinations were allowed under the Empire, associations of all kinds grew up. The organization of the gilds was based on that of the municipality. Each elected its officers and treasurers at an annual meeting, and every five years a revision of the list of members was held, corresponding to that of the senators held quinquennially by the city magistrates. It is doubtful how far these societies served to organize and improve particular industries. There is no evidence to show that any societies during the first three centuries consisted solely of workers at a single craft. But there can be little doubt that the later craft gilds were a development, through the industrial gilds of the provincial towns, of one of the most ancient features of Roman life.

Remarkable concord seems generally to have existed in the *municipia* between the various classes of the population. This is accounted for partly by the strong civic feeling which formed a bond of unity stronger than most sources of friction, and partly to the general prosperity of the towns, which removed any acute discontent. The wealthy citizen seems always to have had to bear heavy financial burdens, and to have enjoyed in return a dignity and an actual political preponderance which made the general character of municipal constitutions distinctly timocratic.

The policy adopted by the early emperors of encouraging, within the limits of a uniform system, the independence and civic patriotism of the towns, was superseded in the 3rd and 4th centuries by a deliberate effort to use the towns as instruments of the imperial government, under the direct control of the emperor or his representatives in the provinces. This policy was accompanied by a gradual decay of civic feeling and municipal enterprise, which showed itself mainly in the unwillingness of the townsmen to become candidates for local magistracies, or to take up the burdens entailed in membership of the municipal senate. Popular control of the local government of the towns was ceasing to be a reality as early as the end of the 1st century of the Empire. Two centuries later local government was a mere form. And the self-governing communities of the middle ages were a restoration, rather than a development, of the flourishing and independent municipalities of the age of Augustus and his immediate successors.

Authorities.—C. Bruns, *Fontes juris romani*, c. III., No. 18, and c. IV. (Freiburg, 1893), for Municipal Laws and references to Mommsen's commentary in *C.I.L.*; E. Kuhn, *Städtische u. bürgerliche Verfassung des röm. Reichs* (Leipzig, 1864): Marquardt, *Römische Staatsverwaltung*, I. i. (Leipzig, 1881); Toutain, in Daremberg-Saglio *Dictionnaire des antiquités grecques et romaines*, *s.v.* "Municipium"; S. Dill, *Roman Society from Nero to Marcus Aurelius*, c. 2 and 3 (London, 1904). For the gilds see Mommsen, *De collegiis et sodaliciis Romanorum* (Keil, 1843); Liebenam, *Geschichte u. Organisation des röm. Vereinswesens* (Leipzig, 1890). (A. M. Cl.)

MUNIMENT, a word chiefly used in the plural, as a collective term for the documents, charters, title-deeds, &c. relating to the property, rights and privileges of a corporation, such as a college, a family or private person, and kept as "evidences" for defending the same. Hence the medieval usage of the word *munimentum*, in classical Latin, a defence, fortification, from *munire*, to defend.

MUNI RIVER SETTLEMENTS, or Spanish Guinea, a Spanish protectorate on the Guinea Coast, West Africa, rectangular in form, with an area of about 9800 sq. m. and an estimated population of 150,000. The protectorate extends inland about 125 miles and is bounded W. by the Atlantic, N. by the German colony of Cameroon, E. and S. by French Congo. The coastline, 75 m. long, stretches from the mouth of the Campo in 2° 10′ N. to the mouth of the Muni in 1° N., on the north arm of Corisco Bay. The small islands of Corisco (*q.v.*), Elobey Grande, Elobey Chico and Bana in Corisco Bay also belong to Spain.

From the estuary of the Campo the coast trends S.S.W. in a series of shallow indentations, until at the bold bluff of Cape San Juan it turns eastward and forms Corisco Bay. The coast plain, from 12 to 25 m. wide, is succeeded by the foot-hills of the Crystal Mountains, which traverse the country in a north to south direction. These are a table-land, from which rise granitic hills 700 to 1200 ft. above the general level, which is about 2500 ft. above the sea. The mountainous region, which extends inland beyond the Spanish frontier, contains many narrow valleys and marshy depressions. The greater part of the country forms the basin of the river Benito, which, rising in French Congo a little east of the frontier, flows through the centre of the Spanish protectorate and enters the sea, after a course of 300 m., about midway between the Campo and Muni estuaries. The southern bank of the lower course of the Campo and the northern bank of the lower course of the Muni, form part of the protectorate. The mouths of the Campo and Benito are obstructed by sand bars, whereas the channel leading to the Muni is some 36 ft. deep and the river itself is more than double that depth. It is from this superiority of access that the country has been named after the Muni River. The course of all the rivers is obstructed by rapids in their descent from the table-land to the plain. The greater part of the country is covered with dense primeval forest. This forest growth is due to the fertility of the soil and the great rainfall, Spanish Guinea with the neighbouring Cameroon country possessing one of the heaviest rain records of the world. The humidity of the climate joined to the excessive heat (the average temperature is 78° F.) makes the climate trying. In the eastern parts of the protectorate the forest is succeeded by more open country. Among the most common trees are oil-palms, rubber-trees, ebony and mahogany. The forests are the home of monkeys and of innumerable birds and insects, often of gorgeous colouring. In the north-east of the country elephants are numerous.

The inhabitants are Bantu-Negroid, the largest tribe represented being the Fang (*q.v.*), called by the Spaniards *Pamues*. They are immigrants from the Congo basin and have pushed before them the tribes, such as the Benga, which now occupy the coast-lands. The villages of the Fang are usually placed on the top of small hills. They cultivate the yam, banana and manioc, and are expert fishers and hunters. The European settlements are confined to the coast. There are trading stations at the mouths of the Campo, Benito and Muni rivers, at Bata, midway between the Campo and Benito, and on Elobey Chico. There are cocoa, coffee and other plantations, but the chief trade is in natural products, rubber, palm oil and palm kernels, and timber. Cotton goods and alcohol are the principal imports. Trade is largely in the hands of British and German firms. The annual value of the trade in 1903–1906 was about £100,000.

Spain became possessed of Fernando Po at the end of the 18th century, and Spanish traders somewhat later established "factories" on the neighbouring coasts of the mainland, but no permanent occupation appears to have been contemplated. During the 19th century a number of treaties were concluded between Spanish naval officers and the chiefs of the lower Guinea coast, and when the partition of Africa was in progress Spain laid claim to the territory between the Campo river and the Gabun. Germany and France also claimed the territory, but in 1885 Germany withdrew in favour of France. After protracted negotiations between France and Spain a treaty was signed in June 1900 by which France acknowledged Spanish sovereignty over the coast region between the Campo and Muni rivers and the hinterland as far east as 11° 20′ E. of Greenwich, receiving in return concessions from Spain in the Sahara (see Rio de Oro), and the right of pre-emption over Spain's West African possessions. In 1901–1902 the eastern frontier was delimited, being modified in accordance with natural features. The newly acquired territories were placed under the superintendence of the governor-general of Fernando Po, sub-governors being stationed at Bata, Elobey Chico and Corisco.

See R. Beltrán y Rózpide, *La Guinea española* (Madrid, 1901), and *Guinea continental española* (Madrid, 1903); H. Lorin, "Les colonies espagnoles du golfe de Guinée" in *Quest. dip. et col.*, vol. xxi. (1906); E. L. Perea, "Estado actual de los territorios españoles de Guinea" in *Revista de geog. colon. y mercantil* (Madrid, 1905); J. B. Roche, *Au pays des Pahouins* (Paris, 1904). A good map compiled by E. d'Almonte on the scale of 1:200,000 was published in Madrid in 1903. Consult also the works cited under Fernando Po.

MUNKÁCS, a town of Hungary, in the county of Bereg, 220 m. E.N.E. of Budapest by rail. Pop. (1900), 13,640. It is situated on the Latorcza river, and on the outskirts of the East Beskides mountains, where the hills touch the plains. Its most noteworthy buildings are the Greek Catholic cathedral and the beautiful castle of Count Schönborn. In the vicinity, on a steep hill 580 ft. high, stands the old fort of Munkács, which played an important part in Hungarian history, and was especially famous for its heroic defence by Helene Zrinyi, wife of Emeric Tököli and mother of Francis Rákóczy II., for three years against the Austrians (1685–1688). It was afterwards used as a prison. Ypsilanti, the hero of Greek liberty, and Kazinczy, the regenerator of Hungarian letters, were confined in it. According to tradition, it was near Munkács that the Hungarians, towards the end of the 9th century, entered the country. In 1896 in the fort was built one of the "millennial monuments" established at seven different points of the kingdom.

MUNKACSY, MICHAEL VON (1844–1900), Hungarian painter, whose real name was MICHAEL (MISKA) LEO LIEB, was the third son of Michael Lieb, a collector of salt-tax in Munkács, Hungary, and of Cäcilia Röck. He was born in that town on the 20th of February 1844. In 1848 his father was arrested at Miskolcz for complicity in the Hungarian revolution, and died shortly after his release; a little earlier he had also lost his mother, and became dependent upon the charity of relations, of whom an uncle, Röck, became mainly responsible for his maintenance and education. He was apprenticed to a carpenter, Langi, in 1855, but shortly afterwards made the acquaintance of the painters Fischer and Szamossy, whom he accompanied to Arad in 1858. From them he received his first real instruction in art. He worked mainly at Budapest during 1863–1865, and at this time first adopted, from patriotic motives, the name by which he is always known. In 1865 he visited Vienna, returning to Budapest in the following year, and went thence to Munich, where he contributed a few drawings to the *Fliegende Blätter*. About the end of 1867 he was working at Düsseldorf, where he was much influenced by Ludwig Knaus, and painted (1868–1869) his first picture of importance, "The Last Day of a Condemned Prisoner," which was exhibited in the Paris Salon in 1870, and obtained for him a *médaille unique* and a very considerable reputation. He had already paid a short visit to Paris in 1867, but on the 25th of January 1872 he took up his permanent abode in that city, and remained there during the rest of his working life. Munkacsy's other chief pictures are "Milton dictating *Paradise Lost* to his Daughters" (Paris Exhibition, 1878), "Christ before Pilate" (1881), "Golgotha" (1883), "The Death of Mozart" (1884), "Arpad, chief of the Magyars, taking possession of Hungary," painted for the new House of Parliament in Budapest, and exhibited at the Salon in 1893, and "Ecce Homo." He had hardly completed the latter work when a malady of the brain overtook him, and he died on the 30th of April 1900, at Endenich, near Bonn. Just before his last illness he had been offered the directorship of the Hungarian State Gallery at Budapest. Munkacsy's masterly characterization, force and power of dramatic composition secured him a great vogue for his works, but it is doubtful if his reputation will be maintained at the level it reached during his lifetime. "Christ before Pilate" and "Golgotha" were sold for £32,000 and £35,000 respectively to an American buyer. Munkacsy received the following awards for his work exhibited at Paris: Medal, 1870; Medal, 2nd class; Legion of Honour, 1877; Medal of Honour, 1878; Officer of the Legion, 1878; Grand Prix, Exhibition of 1889; Commander of the Legion, 1889.

See F. Walther Ilges, "M. von Munkacsy," *Künstler Monographien* (1899); C. Sedelmeyer, *Christ before Pilate* (Paris, 1886); J. Beavington Atkinson, "Michael Munkacsy," *Magazine of Art* (1881). (E. F. S.)

MÜNNICH, BURKHARD CHRISTOPH, COUNT (1683–1767), Russian soldier and statesman, was born at Neuenhuntorf, in Oldenburg, in 1683, and at an early age entered the French service. Thence he transferred successively to the armies of Hesse-Darmstadt and of Saxony, and finally, with the rank of general-in-chief and the title of count, he joined the army of Peter II. of Russia. In 1732 he became field-marshal and president of the council of war. In this post he did good service in the re-organization of the Russian army, and founded the cadet corps which was destined to supply the future generations of officers. In 1734 he took Danzig, and with 1736 began the Turkish campaigns which made Münnich's reputation as a soldier. Working along the shores of the Black Sea from the Crimea, he took Ochakov after a celebrated siege in 1737, and in 1739 won the battle of Stavutschina, and took Khotin (or Choczim), and established himself firmly in Moldavia. Marshal Münnich now began to take an active part in political affairs, the particular tone of which was given by his rivalry with Biron, or Bieren, duke of Courland. But his activity was brought to a close by the revolution of 1741; he was arrested on his way to the frontier, and condemned to death. Brought out for execution, and withdrawn from the scaffold, he was later sent to Siberia, where he remained for several years, until the accession of Peter III. brought about his release in 1762. Catherine II., who soon displaced Peter, employed the old field-marshal as director-general of the Baltic ports. He died in 1767. Feldmarschall Münnich was a fine soldier of the professional type, and many future commanders, notably Loudon and Lacy, served their apprenticeship at Ochakov and Khotin. As a statesman he is regarded as the founder of Russian Philhellenism. He had the grade of count of the Holy Roman Empire. The Russian 37th Dragoons bear his name.

He wrote an *Ébauche pour donner une idée de la forme de l'empire de Russie* (Leipzig, 1774), and his voluminous diaries have appeared in various publications—Herrmann, *Beiträge zur Geschichte des russischen Reichs* (Leipzig, 1843). See Hempel, *Leben Münnichs* (Bremen, 1742); Halem, *Geschichte des F. M. Grafen Münnich* (Oldenburg, 1803; 2nd ed., 1838); Kostomarov, *Feldmarschall Münnich* (*Russische Geschichte in Biographien*, v. 2).

MUNRO, SIR HECTOR (1726–1805), British general, son of Hugh Munro of Novar, in Cromarty, was born in 1726, and entered the army in 1749. He went to Bombay in 1761, in command of the 89th regiment, and in that year effected the surrender of Mahé from the French. Later, when in command of the Bengal army, he suppressed a mutiny of sepoys at Patna, and on the 23rd of October 1764 won the victory of Buxar against Shuja-ud-Dowlah, the nawab wazir of Oudh, and Mir Kasim, which ranks amongst the most decisive battles ever fought in India. Returning home, he became in 1768 M.P. for the Inverness Burghs, which he continued to represent in parliament for more than thirty years, though a considerable portion of this period was spent in India, whither he returned in 1778 to take command of the Madras army. In that year he took Pondicherry from the French, but in 1780 he was defeated by Hyder Ali near Conjeeveram, and forced to fall back on St Thomas's Mount. There Sir Eyre Coote took over command of the army, and in 1781 won a signal victory against Hyder Ali at Porto Novo, where Munro was in command of the right division. Negapatam was taken by Munro in November of the same year; and in 1782 he returned to England. He died on the 27th of December 1805.

MUNRO, HUGH ANDREW JOHNSTONE (1819–1885), British scholar, was born at Elgin on the 19th of October 1819. He was educated at Shrewsbury school, where he was one of Kennedy's first pupils, and proceeded to Trinity College, Cambridge, in 1838. He became scholar of his college in 1840, second classic and first chancellor's medallist in 1842, and fellow of his college in 1843. He became classical lecturer at Trinity College, and in 1869 was elected to the newly-founded chair of Latin at Cambridge, but resigned it in 1872. The great work on which his reputation is mainly based is his edition of Lucretius, the fruit of the labour of many years (text only, 1 vol., 1860; text, commentary and translation, 2 vols., 1864). As a textual critic his knowledge was profound and his judgment unrivalled; and he made close archaeological studies by frequent travels in Italy and Greece. In 1867 he published an improved text of *Aetna* with commentary, and in the following year a text of Horace with critical introduction, illustrated by specimens of ancient gems selected by C. W. King. His knowledge and taste are nowhere better shown than in his *Criticisms and Elucidations of Catullus* (1878). He was a master of the art of Greek and Latin verse composition. His contributions to the famous volume of Shrewsbury verse, *Sabrinae corolla*, are among the most remarkable of a remarkable collection. His *Translations into Latin and Greek Verse* were privately printed in 1884. Like his translations into English, they are characterized by minute fidelity to the original, but never cease to be idiomatic. He died at Rome on the 30th of March 1885.

See *Memoir* by J. D. Duff, prefixed to a re-issue of the trans. of Lucretius in "Bohn's Classical Library" (1908).

MUNRO, MONRO or MONROE, **ROBERT** (d. *c.* 1680), Scots general, was a member of a well-known family in Ross-shire, the Munroes of Foulis. With several of his kinsmen he served in the continental wars under Gustavus Adolphus; and he appears to have returned to Scotland about 1638, and to have taken some part in the early incidents of the Scottish rebellion against Charles I. In 1642 he went to Ireland, nominally as second in command under Alexander Leslie, but in fact in chief command of the Scottish contingent against the Catholic rebels. After taking and plundering Newry in April 1642, and ineffectually attempting to subdue Sir Phelim O'Neill, Munro succeeded in taking prisoner the earl of Antrim at Dunluce. The arrival of Owen Roe O'Neill in Ireland strengthened the cause of the rebels (see O'Neill), and Munro, who was poorly supplied with provisions and war materials, showed little activity. Moreover, the civil war in England was now creating confusion among parties in Ireland, and the king was anxious to come to terms with the Catholic rebels, and to enlist them on his own behalf against the parliament. The duke of Ormonde, Charles's lieutenant-general in Ireland, acting on the king's orders, signed a cessation of hostilities with the Catholics on the 15th of September 1643, and exerted himself to despatch aid to Charles in England. Munro in Ulster, holding his commission from the Scottish parliament, did not recognize the armistice, and his troops accepted the solemn league and covenant, in which they were joined by many English soldiers who left Ormonde to join him. In April 1644 the English parliament entrusted Munro with the command of all the forces in Ulster, both English and Scots. He thereupon seized Belfast, made a raid into the Pale, and unsuccessfully attempted to gain possession of Dundalk and Drogheda. His force was weakened by the necessity for sending troops to Scotland to withstand Montrose; while Owen Roe O'Neill was strengthened by receiving supplies from Spain and the pope. On the 5th of June 1646 was fought the battle of Benburb, on the Blackwater, where O'Neill routed Munro, but suffered him to withdraw in safety to Carrickfergus. In 1647 Ormonde was compelled to come to terms with the English parliament, who sent commissioners to Dublin in June of that year. The Scots under Munro refused to surrender Carrickfergus and Belfast when ordered by the parliament to return to Scotland, and Munro was superseded by the appointment of Monk to the chief command in Ireland. In September 1648 Carrickfergus was delivered over to Monk by treachery, and Munro was taken prisoner. He was committed to the Tower of London, where he remained a prisoner for five years. In 1654 he was permitted by Cromwell to reside in Ireland, where he had estates in right of his wife, who was the widow of Viscount Montgomery of Ardes. Munro continued to live quietly near Comber, Co. Down, for many years, and probably died there about 1680. He was in part the original of Dugald Dalgetty in Sir Walter Scott's *Legend of Montrose*.

See Thomas Carte, *History of the Life of James, Duke of Ormonde* (6 vols., Oxford, 1851); Sir J. T. Gilbert, *Contemporary History of Affairs in Ireland 1641–1652* (3 vols., Dublin, 1879–1880) and *History of the Irish Confederation and the War in Ireland* (7 vols., Dublin, 1882–1891); John Spalding, *Memorials of the Troubles in Scotland and England* (2 vols., Aberdeen, 1850); *The Montgomery MSS., 1603–1703*, edited by G. Hill (Belfast, 1869); Sir Walter Scott, *The Legend of Montrose*, author's preface.

MUNRO, SIR THOMAS (1761–1827), Anglo-Indian soldier and statesman, was born at Glasgow on the 27th of May 1761, the son of a merchant. Educated at Glasgow University, he was at first intended to enter his father's business, but in 1789 he was appointed to an infantry cadetship in Madras. He served with his regiment during the hard-fought war against Hyder Ali (1780–83), and again in the first campaign against Tippoo (1790–92). He was then chosen as one of four military officers to administer the Baramahal, part of the territory acquired from Tippoo, where he remained for seven years, learning the principles of revenue survey and assessment which he afterwards applied throughout the presidency of Madras. After the final downfall of Tippoo in 1799, he spent a short time restoring order in Kanara; and then for another seven years (1800–1807) he was placed in charge of the northern districts "ceded" by the nizam of Hyderabad, where he introduced the *ryotwari* system of land revenue. After a long furlough in England, during which he gave valuable evidence upon matters connected with the renewal of the company's charter, he returned to Madras in 1814 with special instructions to reform the judicial and police systems. On the outbreak of the Pindari War in 1817, he was appointed as brigadier-general to command the reserve division formed to reduce the southern territories of the Peshwa. Of his signal services on this occasion Canning said in the House of Commons: "He went into the field with not more than five or six hundred men, of whom a very small proportion were Europeans. . . . Nine forts were surrendered to him or taken by assault on his way; and at the end of a silent and scarcely observed progress he emerged . . . leaving everything secure and tranquil behind him." In 1820 he was appointed governor of Madras, where he founded the systems of revenue assessment and general administration which substantially remain to the present day. His official minutes, published by Sir A. Arbuthnot, form a manual of experience and advice for the modern civilian. He died of cholera on the 6th of July 1827, while on tour in the "ceded" districts, where his name is preserved by more than one memorial. An equestrian statue of him, by Chantrey, stands in Madras city.

See biographies by G. R. Gleig (1830), Sir A. Arbuthnot (1881) and J. Bradshaw (1894).

MUNSHI, or Moonshi, the Urdu name of a writer or secretary, used in India of the native language teachers or secretaries employed by Europeans.

MÜNSTER, GEORG, Count zu (1776–1844), German palaeontologist, was born on the 17th of February 1776. He formed a famous collection of fossils, which was ultimately secured by the Bavarian state, and formed the nucleus of the palaeontological museum at Munich. Count Münster assisted Goldfuss in his great work *Petrefacta Germaniae*. He died at Bayreuth on the 23rd of December 1844.

MÜNSTER, SEBASTIAN (1489–1552), German geographer, mathematician and Hebraist, was born at Ingelheim in the Palatinate. After studying at Heidelberg and Tübingen, he entered the Franciscan order, but abandoned it for Lutheranism about 1529. Shortly afterwards he was appointed court preacher at Heidelberg, where he also lectured in Hebrew and Old Testament exegesis. From 1536 he taught at Basel, where he published his *Cosmographia universalis* in 1544, and where he died of the plague on the 23rd of May 1552. A disciple of Elias Levita, he was the first German to edit the Hebrew Bible (2 vols., fol., Basel, 1534–1535); this edition was accompanied by a new Latin translation and a large number of annotations. He published more than one Hebrew grammar, and was the first to prepare a *Grammatica chaldaica* (Basel, 1527). His lexicographical labours included a *Dictionarium chaldaicum* (1527), and a *Dictionarium trilingue*, of Latin, Greek and Hebrew (1530). But his most important work was his *Cosmographia*, which also appeared in German as a *Beschreibung aller Länder*, the first detailed, scientific and popular description of the world in Münster's native language, as well as a supreme effort of geographical study and literature in the Reformation period. In this Münster was assisted by more than one hundred and twenty collaborators.

The most valued edition of the *Cosmographia* or *Beschreibung* is that of 1550, especially prized for its portraits and its city and costume pictures. Besides the works mentioned above we may notice Münster's *Germaniae descriptio* of 1530, his *Novus orbis* of 1532, his *Mappa Europae* of 1536, his *Rhaetia* of 1538, his editions of Solinus, Mela and Ptolemy in 1538–1540 and among non-geographical treatises his *Horologiographia*, 1531, on dialling (see Dial), his *Organum uranicum* of 1536 on the planetary motions, and his *Rudimenta mathematica* of 1551. His published maps numbered 142.

See V. Hantzsch, *Sebastian Münster* (1898), in vol. xviii. of the *Publications of the Royal Society of Sciences of Saxony, Historical-Philological Section*).

MÜNSTER, a town of Germany, in the district of Upper Alsace, 16 m. from Colmar by rail, and at the foot of the Vosges Mountains. Pop. (1905), 6078. Its principal industries are spinning, weaving and bleaching. The town owes its origin to a Benedictine abbey, which was founded in the 7th century, and at one time it was a free city of the empire. In its neighbourhood is the ruin of Schwarzenberg. The Münstertal, or Gregoriental, which is watered by the river Fecht, is famous for its cheese.

See Rathgeber, *Münster-im-Gregoriental* (Strassburg, 1874) and F. Hecker, *Die Stadt und das Tal zu Münster im St Gregoriental* (Münster, 1890).

MÜNSTER, a town of Germany, capital of the Prussian province of Westphalia, and formerly the capital of an important bishopric. It lies in a sandy plain on the Dortmund-Ems canal, at the junction of several railways, 107 m. S.W. of Bremen on the line to Cologne. Pop. (1885), 44,060; (1905) 81,468. The town preserves its medieval character, especially in the "Prinzipal-Markt" and other squares, with their lofty gabled houses and arcades. The fortifications were dismantled during the 18th century, their place being taken by gardens and promenades. Of the many churches of Münster the most important is the cathedral, one of the most striking in Germany, although disfigured by modern decorations. It was rebuilt in the 13th and 14th centuries, and exhibits a combination of Romanesque and Gothic forms; its chapter-house is specially fine. The beautiful Gothic church of St Lambert (14th century) was largely rebuilt after 1868; on its tower, which is 312 ft. in height, hang three iron cages in which the bodies of John of Leiden and two of his followers were exposed in 1536. The church of St Ludger, erected in the Romanesque style about 1170, was extended in the Gothic style about 200 years later; it has a tower with a picturesque lantern. The church of St Maurice, founded about 1070, was rebuilt during the 19th century, and the Gothic church of Our Lady dates from the 14th century. Other noteworthy buildings are the town-hall, a fine Gothic building of the 14th century, and the Stadtkeller, which contains a collection of early German paintings. The room in the town-hall called the Friedens Saal, in which the peace of Westphalia was signed in October 1648, contains portraits of many ambassadors and princes who were present at the ceremony. The Schloss, built in 1767, was formerly the residence of bishops of Münster. The private houses, many of which were the winter residences of the nobility of Westphalia, are admirable examples of German domestic architecture in the 16th, 17th and 18th centuries. The university of Münster, founded after the Seven Years' War and closed at the beginning of the 19th century, was reopened as an academy in 1818, and again attained the rank of a university in 1902. It possesses faculties of theology, philosophy and law. In connexion with it are botanical and zoological gardens, several scientific collections, and a library of 120,000 volumes. Münster is the seat of a Roman Catholic bishop and of the administrative and judicial authorities of Westphalia, and is the headquarters of an army corps. The Westphalian society of antiquaries and several other learned bodies also have their headquarters here. Industries include weaving, dyeing, brewing and printing, and the manufacture of furniture and machines. There is a brisk trade in cattle, grain and other products of the neighbourhood.

History.—Münster is first mentioned about the year 800, when Charlemagne made it the residence of Ludger, the newly-appointed bishop of the Saxons. Owing to its distance from any available river or important highway, the growth of the settlement round the *monasterium* was slow, and it was not until after 1186 that it received a charter, the name Münster having supplanted the original name of Mimegardevoord about a century earlier. During the 13th and 14th centuries the town was one of the most prominent members of the Hanseatic League. At the time of the Reformation the citizens were inclined to adopt the Protestant doctrines, but the excesses of the Anabaptists led in 1535 to the armed intervention of the bishop and to the forcible suppression of all divergence from the older faith. The Thirty Years' War, during which Münster suffered much from the Protestant armies, was terminated by the peace of Westphalia, sometimes called the peace of Münster, because it was signed here on the 24th of October 1648. The authority of the bishops, who seldom resided at Münster, was usually somewhat limited, but in 1661 Bishop Christoph Bernhard von Galen took the place by force, built a citadel, and deprived the citizens of many of their privileges. During the Seven Years' War Münster was occupied both by the French and by their foes. Towards the close of the 18th century the town was recognized as one of the intellectual centres of Germany.

The bishopric of Münster embraced an area of about 2500 sq. m. and contained about 350,000 inhabitants. Its bishops, who resided generally at Ahaus, were princes of the empire. In the 17th century Bishop Galen, with his army of 20,000 men, was so powerful that his alliance was sought by Charles II. of England and other European sovereigns. The bishopric was secularized and its lands annexed to Prussia in 1803.

See Geisberg, *Merkwürdigkeiten der Stadt Münster* (1877); Erhard, *Geschichte Münsters* (1837); A. Tibus, *Die Stadt Münster* (Münster, 1882); Hellinghaus, *Quellen und Forschungen zur Geschichte der Stadt Münster* (Münster, 1898); Pieper, *Die alte Universität Münster 1773–1818* (Münster, 1902). See also Tücking, *Geschichte des Stifts Münster unter C. B. von Galen* (Münster, 1865).

MUNSTER, a province of Ireland occupying the S.W. part of the island. It includes the counties Clare, Tipperary, Limerick, Kerry, Cork and Waterford (*q.v.* for topography, &c.). After the occupation of Ireland by the Milesians, Munster (*Mumha*) became nominally a provincial kingdom; but as the territory was divided between two families there was constant friction and it was not until 237 that Oliol Olum established himself as king over the whole. In 248 he divided his kingdom between his two sons, giving Desmond (*q.v., Des-Mumha*) to Eoghan and Thomond (*Tuadh-Mumha*) or north Munster to Cormac. He also stipulated that the rank of king of Munster should belong in turn to their descendants. In this way the kingship of Munster survived until 1194; but there were kings of Desmond and Thomond down to the 16th century. Munster was originally of the same extent as the present province, excepting that it included the district of Ely, which belonged to the O'Carrols and formed a part of the present King's County. During the 16th century, however, Thomond was for a time included in Connaught, being declared a county under the name of Clare (*q.v.*) by Sir Henry Sidney. Part of Munster had been included in the system of shiring generally attributed to King John. In 1570 a provincial presidency of Munster (as of Connaught) was established by Sidney, Sir John Perrot being the first president, and lasted until 1672. Under Perrot a practically new shiring was carried out.

MÜNSTER AM STEIN, a watering-place of Germany, in the Prussian Rhine province, on the Nahe, 2½ m. S. of Kreuznach, on the railway from Bingerbrück to Strassburg. Pop. (1905), 915. Above the village are the ruins of the castle of Rheingrafenstein (12th century), formerly a seat of the count palatine of the Rhine, which was destroyed by the French in 1689, and those of the castle of Ebernburg, the ancestral seat of the lords of Sickingen, and the birthplace of Franz von Sickingen, the famous landsknecht captain and protector of Ulrich von Hutten, to whom a monument was erected on the slope near the ruins in 1889. The spa (saline and carbonate springs), specific in cases of feminine disorders, is visited by about 5000 patients annually.

See Welsch, *Das Sol- und Thermalbad Münster am Stein* (Kreuznach, 1886) and Messer, *Führer durch Bad Kreuznach und Münster am Stein* (Kreuznach, 1905).

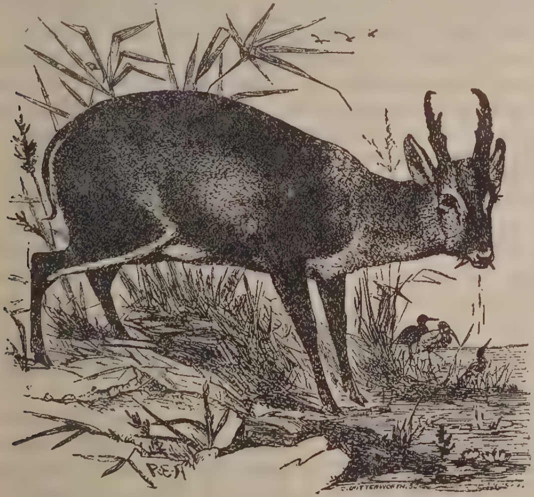
MÜNSTERBERG, HUGO (1863–), German-American psychophysiologist, was born at Danzig. Having been extraordinary professor at Freiburg-im-Breisgau, he became in 1892 professor of psychology at Harvard University. Among his more important works are *Beiträge zur experimentellen Psychologie* (4 vols., Freiburg, 1889–1892); *Psychology and Life* (New York, 1899); *Grundzüge der Psychologie* (Leipzig, 1900); *American Traits from the Point of View of a German* (Boston, 1901); *Die Amerikaner* (several ed.; Eng. trans. 1904); *Science and Idealism* (New York, 1906); *Philosophie der Werte* (Leipzig, 1908); *Aus Deutsch-Amerika* (Berlin, 1908); *Psychology and Crime* (New York, 1908). He has been prominently identified with the modern developments of experimental psychology (see Psychology), and his sociological writings display the acuteness of a German philosophic mind as applied to the study of American life and manners.

MÜNSTERBERG, a town of Germany, in the Prussian province of Silesia, on the Ohlau, 36 m. by rail S. of Breslau. Pop. (1905), 8475. It is partly surrounded by medieval walls. It has manufactures of drain-pipes and fireproof bricks; there are also sulphur springs. Münsterberg was formerly the capital of the principality of the same name, which existed from the 14th century down to 1791, when it was purchased by the Prussian crown. Near the town is the former Cistercian abbey of Heinrichau.

MUNTANER, RAMON (1265–1336?), Catalan historian, was born at Peralada (Catalonia) in 1265. The chief events of his career are recorded in his chronicle. He accompanied Roger de Flor to Sicily in 1300, was present at the siege of Messina, served in the expedition of the Almogavares against Asia Minor, and became the first governor of Gallipoli. Later he was appointed governor of Jerba or Zerbi, an island in the Gulf of Gabes, and finally entered the service of the infante of Majorca. On the 15th of May 1325 (some editions give the year 1335) he began his *Chronica, o descripcio dels fets, e hazanas del inclyt rey Don Iaume Primer*, in obedience, as he says, to the express command of God who appeared to him in a vision. Muntaner's book, which was first printed at Valencia in 1558, is the chief authority for the events of his period, and his narrative, though occasionally prolix, uncritical and egotistical, is faithful and vivid. He is said to have died in 1336.

His chronicle is most accessible in the edition published by Karl Lanz at Stuttgart in 1844.

MUNTJAC, the Indian name of a small deer typifying the genus *Cervulus*, all the members of which are indigenous to the southern and eastern parts of Asia and the adjacent islands, and are separated by marked characters from all their allies. For the distinctive features of the genus see Deer. As regards general characteristics, all muntjacs are small compared with the majority of deer, and have long bodies and rather short limbs and neck. The antlers of the bucks are small and simple; the main stem or beam, after giving off a short brow-tine, inclining backwards and upwards, being unbranched and pointed, and when fully developed curving inwards and somewhat downwards at the tip. These small antlers are supported upon pedicles, or processes of the frontal bones, longer than in any other deer, the front edges of these being continued downwards as strong ridges passing along the sides of the face above the eyes. From this feature the name rib-faced deer has been suggested for the muntjac. The upper canine teeth of the males are large and sharp, projecting outside the mouth as tusks, and loosely implanted in their sockets. In the females they are much smaller.



The Indian Muntjac (*Cervulus muntjac*).

Muntjacs are solitary animals, even two being rarely seen together. They are fond of hilly ground covered with forests, in the dense thickets of which they pass most of their time, only coming to the skirts of the woods at morning and evening to graze. They carry the head and neck low and the hind-quarters high, their action in running being peculiar and not elegant, somewhat resembling the pace of a sheep. Though with no power of sustained speed or extensive leaping, they are remarkable for flexibility of body and facility of creeping through tangled underwood. A popular name with Indian sportsmen is "barking deer," on account of the alarm-cry—a kind of short shrill bark, like that of a fox, but louder. When attacked by dogs, the males use their sharp canine teeth, which inflict deep and even dangerous wounds.

In the Indian muntjac the height of the buck is from 20 to 22 in.; allied types, some of which have received distinct names, occur in Burma and the Malay Peninsula and Islands. Among these, the Burmese *C. muntjac grandicornis* is noteworthy on account of its large antlers. The Tibetan muntjac (*C. lachrymans*), from Moupin in eastern Tibet and Hangchow in China, is somewhat smaller than the Indian animal, with a bright reddish-brown coat. The smallest member of the genus (*C. reevesi*) occurs in southern China and has a reddish-chestnut coat, speckled with yellowish grey and a black band down the nape. The Tenasserim muntjac (*C. feae*), about the size of the Indian species, is closely allied to the hairy-fronted muntjac (*C. crinifrons*) of eastern China, but lacks the tuft of hair on the forehead. The last-mentioned species, by its frontal tuft, small rounded ears, general brown coloration, and minute antlers, connects the typical muntjacs with the small tufted deer or tufted muntjacs of the genus *Elaphodus* of eastern China and Tibet. These last have coarse bristly hair of a purplish-brown colour with light markings, very large head-tufts, almost concealing the minute antlers, of which the pedicles do not extend as ribs down the face. They include *E. cephalophus* of Tibet, *E. michianus* of Ningpo, and *E. ichangensis* of the mountains of Ichang. (R. L.*)

MÜNZER, THOMAS (*c.* 1489–1525), German religious enthusiast, was born at Stolberg in the Harz near the end of the 15th century, and educated at Leipzig and Frankfort, graduating in theology. He held preaching appointments in various places, but his restless nature prevented him from remaining in one position for any length of time. In 1520 he became a preacher at the church of St Mary, Zwickau, and his rude eloquence, together with his attacks on the monks, soon raised him to influence. Aided by Nicholas Storch, he formed a society the principles of which were akin to those of the Taborites, and claimed that he was under the direct influence of the Holy Spirit. His zeal for the purification of the Church by casting out all unbelievers brought him into conflict with the governing body of the town, and he was compelled to leave Zwickau. He then went to Prague, where his preaching won numerous adherents, but his violent language brought about his expulsion from this city also. At Easter 1523 Münzer came to Allstedt, and was soon appointed preacher at the church of St John, where he made extensive alterations in the services. His violence, however, aroused the hostility of Luther, in retaliation for which Münzer denounced the Wittenberg teaching. His preaching soon produced an uproar in Allstedt, and after holding his own for some time he left the town and went to Mühlhausen, where Heinrich Pfeiffer was already preaching doctrines similar to his own. The union of Münzer and Pfeiffer caused a disturbance in this city and both were expelled. Münzer went to Nuremberg, where he issued a writing against Luther, who had been mainly instrumental in bringing about his expulsion from Saxony. About this time his teaching became still more violent. He denounced established governments, and advocated common ownership of the means of life. After a tour in south Germany he returned to Mühlhausen, overthrew the governing body of the city, and established a communistic theocracy. The Peasants' War had already broken out in various parts of Germany; and as the peasantry around Mühlhausen were imbued with Münzer's teaching, he collected a large body of men to plunder the surrounding country. He established his camp at Frankenhausen; but on the 15th of May 1525 the peasants were dispersed by Philip, landgrave of Hesse, who captured Münzer and executed him on the 27th at Mühlhausen. Before his death he is said to have written a letter admitting the justice of his sentence.

His *Aussgetrückte Emplössung des falschen Glaubens* has been edited by R. Jordan (Mühlhausen, 1901), and a life of Münzer, *Die Histori von Thome Müntzer des Anfengers der döringischen Uffrur*, has been attributed to Philip Melanchthon (Hagenau, 1525). See G. T. Strobel, *Leben, Schriften und Lehren Thomä Müntzers* (Nuremberg, 1795); J. K. Seidemann, *Thomas Munzer* (Leipzig, 1842); O. Merx, *Thomas Münzer und Heinrich Pfeiffer* (Göttingen, 1889); G. Wolfrau, *Thomas Münzer in Allstedt* (Jena, 1852).

MUNZINGER, WERNER (1832–1875), Swiss linguist and traveller, was born at Olten in Switzerland, on the 21st of April 1832. After studying natural science, Oriental languages and history, at Bern, Munich and Paris, he went to Egypt in 1852 and spent a year in Cairo perfecting himself in Arabic. Entering a French mercantile house, he went as leader of a trading expedition to various parts of the Red Sea, fixing his quarters at Massawa, where he acted as French consul. In 1855 he removed to Keren, the chief town of the Bogos, in the north of Abyssinia, which country he explored during the next six years. In 1861 he joined the expedition under T. von Heuglin to Central Africa, but separated from him in November in northern Abyssinia, proceeding along the Gash and Atbara to Khartum. Thence, having meantime succeeded Heuglin as leader of the expedition, he travelled in 1862 to Kordofān, failing, however, in his attempt to reach Darfur and Wadai. After a short stay in Europe in 1863, Munzinger returned to the north and north-east borderlands of Abyssinia, and in 1865, the year of the annexation of Massawa by Egypt, was appointed British consul at that town. He rendered valuable aid to the Abyssinian expedition of 1867–68, among other things exploring the almost unknown Afar country. In acknowledgment of his services he received the C.B. In 1868 he was appointed French consul at Massawa, and in 1871 was named by the khedive Ismail governor of that town with the title of bey. In 1870, with Captain S. B. Miles, Munzinger visited southern Arabia. As governor of Massawa he annexed to Egypt the Bogos and Hamasen provinces of northern Abyssinia, and in 1872 was made pasha and governor-general of the eastern Sudan. It is believed that it was on his advice that Ismail sanctioned the Abyssinian enterprise, but on the war assuming larger proportions in 1875 the command of the Egyptian troops in northern Abyssinia was taken from Munzinger, who was selected to command a small expedition intended to open up communication with Menelek, king of Shoa, then at enmity with the negus Johannes (King John) and a potential ally of Egypt. Leaving Tajura Bay on the 27th of October 1875 Munzinger started for Ankober with a force of 350 men, being accompanied by an envoy from Menelek. The desert country to be traversed was in the hands of hostile tribes, and on reaching Lake Aussa the expedition was attacked during the night by Gallas—Munzinger, with his wife and nearly all his companions, being killed.

Munzinger's contributions to the knowledge of the country, people and languages of north-eastern Africa are of solid value. See *Proc. R.G.S.*, vol. xiii.; *Journ. R.G.S.*, vols. xxxix., xli. and xlvi. (obituary notice); *Petermanns Mitteilungen* for 1858, 1867, 1872 et seq.; Dietschi and Weber, *Werner Munzinger, ein Lebensbild* (1875); J. v. Keller-Zschokke, *Werner Munzinger Pasha* (1890). Munzinger published the following works: *Über die Sitten und das Recht der Bogos* (1859); *Ostafrikanische Studien* (1864; 2nd ed., 1883; his most valuable book); *Die deutsche Expedition in Ostafrika* (1865); *Vocabulaire de la langue de Tigré* (1865), besides papers in the geographical serials referred to, and a memoir on the northern borders of Abyssinia in the *Zeitschrift für allgemeine Erdkunde*, new series, vol. iii.

MURAD, or AMURATH, the name of five Ottoman sultans.

MURAD I., surnamed Khudavendighiar (1319–1389), was the son of Orkhan and the Greek princess Nilofer, and succeeded his father in 1359. He was the first Turkish monarch to obtain a definite footing in Europe, and his main object throughout his career was to extend the European dominions of Turkey. The revolts of the prince of Caramania interfered with the realization of this plan, and trouble was caused from this quarter more than once during his reign until the decisive battle of Konia (1387), when the power of the prince of Caramania was broken. The state of Europe facilitated Murad's projects: civil war and anarchy prevailed in most of the countries of Central Europe, where the feudal system was at its last gasp, and the small Balkan states were divided by mutual jealousies. The capture of Adrianople, followed by other conquests, brought about a coalition under the king of Hungary against Murad, but his able lieutenant Lalashahin, the first *beylerbey* of Rumélia, defeated the allies at the battle of the Maritsa in 1363. In 1366 the king of Servia was defeated at Samakov and forced to pay tribute. Kustendil, Philippopolis and Nish fell into the hands of the Turks; a renewal of the war in 1381 led to the capture of Sofia two years later. Europe was now aroused; Lazar, king of Servia, formed an alliance with the Albanians, the Hungarians and the Moldavians against the Turks. Murad hastened back to Europe and met his enemies on the field of Kossovo (1389). Victory finally inclined to the side of the Turks. When the rout of the Christians was complete, a Servian named Milosh Kabilovich penetrated to Murad's tent on pretence of communicating an important secret to the sultan, and stabbed the conqueror. Murad was of independent character and remarkable intelligence. He was fond of pleasure and luxury, cruel and cunning. Long relegated to the command of a distant province in Asia, while his brother Suleiman occupied an enviable post in Europe, he became revengeful; thus he exercised great cruelty in the repression of the rebellion of his son Prince Sauji, the first instance of a sultan's son taking arms against his father. Murad transferred the Ottoman capital from Brusa to Adrianople, where he built a palace and added many embellishments to the town. The development of the feudal system of *timars* and *ziamets* and its extension to Europe was largely his work.

MURAD II. (1403–1451) succeeded his father Mahommed I. in 1421. The attempt of his uncle Prince Mustafa to usurp the throne, supported as it was by the Greeks, gave trouble at the outset of his reign, and led to the unsuccessful siege of Constantinople in 1422. Murad maintained a long struggle against the Bosnians and Hungarians, in the course of which Turkey sustained many severe reverses through the valour of Janos Hunyadi. Accordingly in 1444 he concluded a treaty at Szegedin for ten years, by which he renounced all claim to Servia and recognized George Brancovich as its king. Shortly after this, being deeply affected by the death of his eldest son Prince Ala-ud-din, he abdicated in favour of Mahommed, his second son, then fourteen years of age. But the treacherous attack, in violation of treaty, by the Christian powers, imposing too hard a task on the inexperienced young sovereign, Murad returned from his retirement at Magnesia, crushed his faithless enemies at the battle of Varna (Novemebr 10, 1444), and again withdrew to Magnesia. A revolt of the janissaries induced him to return to power, and he spent the remaining six years of his life in warfare in Europe, defeating Hunyadi at Kossovo (October 17–19, 1448). He died at Adrianople in 1451, and was buried at Brusa. By some considered as a fanatical devotee, and by others as given up to mysticism, he is generally described as kind and gentle in disposition, and devoted to the interests of his country.

MURAD III. (1546–1595), was the eldest son of Selim II., and succeeded his father in 1574. His accession marks the definite beginning of the decline of the Ottoman power, which had only been maintained under Selim II. by the genius of the all-powerful grand vizier Mahommed Sokolli. For, though Sokolli remained in office until his assassination in October 1578, his authority was undermined by the harem influences, which with Murad III. were supreme. Of these the most powerful was that of the sultan's chief wife, named Safié (the pure), a beautiful Venetian of the noble family of Baffo, whose father had been governor of Corfu, and who had been captured as a child by Turkish corsairs and sold into the harem. This lady, in spite of the sultan's sensuality and of the efforts, temporarily successful, to supplant her in his favour, retained her ascendancy over him to the last. Murad had none of the qualities of a ruler. He was good-natured, though cruel enough on occasion: his accession had been marked by the murder, according to the custom then established, of his five brothers. His will-power had early been undermined by the opium habit, and was further weakened by the sensual excesses that ultimately killed him. Nor had he any taste for rule; his days were spent in the society of musicians, buffoons and poets, and he himself dabbled in verse-making of a mystic tendency.

His one attempt at reform, the order forbidding the sale of intoxicants so as to stop the growing intemperance of the janissaries, broke down on the opposition of the soldiery. He was the first sultan to share personally in the proceeds of the corruption which was undermining the state, realizing especially large sums by the sale of offices. This corruption was fatally apparent in the army, the feudal basis of which was sapped by the confiscation of fiefs for the benefit of nominees of favourites of the harem, and by the intrusion, through the same influences of foreigners and rayahs into the corps of janissaries, of which the discipline became more and more relaxed and the temper increasingly turbulent. In view of this general demoralization not even the victorious outcome of the campaigns in Georgia, the Crimea, Daghestan, Yemen and Persia (1578–1590) could prevent the decay of the Ottoman power; indeed, by weakening the Mussulman states, they hastened the process, since they facilitated the advance of Russia to the Black Sea and the Caspian.

Murad, who had welcomed the Persian War as a good opportunity for ridding himself of the presence of the janissaries, whom he dreaded, had soon cause to fear their triumphant return. Incensed by the debasing of the coinage, which robbed them of part of their pay, they invaded the Divan clamouring for the heads of the sultan's favourite, the *beylerbey* of Rumelia, and of the *defterdar* (finance minister), which were thrown to them (April 3, 1589). This was the first time that the janissaries had invaded the palace: a precedent to be too often followed. The outbreak of another European war in 1592 gave the sultan an opportunity of ridding himself of their presence. Murad died in 1595, leaving to his successor a legacy of war and anarchy.

It was under Murad III. that England's relations with the Porte began. Negotiations were opened in 1579 with Queen Elizabeth through certain British merchants; in 1580 the first Capitulations with England were signed; in 1583 William Harebone, the first British ambassador to the Porte, arrived at Constantinople, and in 1593 commercial Capitulations were signed with England granting the same privileges as those enjoyed by the French. (See CAPITULATIONS.)

MURAD IV. (1611–1640) was the son of Sultan Ahmed I., and succeeded his uncle Mustafa I. in 1623. For the first nine years of his reign his youth prevented him from taking more than an observer's part in affairs. But the lessons thus learnt were sufficiently striking to mould his whole character and policy. The minority of the sultan gave full play to the anarchic elements in the state; the soldiery, spahis and janissaries, conscious of their power and reckless through impunity, rose in revolt whenever the whim seized them, demanding privileges and the heads of those who displeased them, not sparing even the sultan's favourites. In 1631 the spahis of Asia Minor rose in revolt, in protest against the deposition of the grand vizier Khosrev; their representatives crowded to Constantinople, stoned the new grand vizier, Hafiz, in the court of the palace, and pursued the sultan himself into the inner apartments, clamouring for seventeen heads of his advisers and favourites, on penalty of his own deposition. Hafiz was surrendered, a voluntary martyr; other ministers were deposed; Mustafa Pasha, aga of the janissaries, was saved by his own troops. But Murad was now beginning to assert himself. Khosrev was executed in Asia Minor by his orders; a plot of the spahis to depose him was frustrated by the loyalty of Koes Mahommed, aga of the janissaries, and of the spahi Rum Mahommed (Mahommed the Greek); and on the 29th of May 1632, by a successful personal appeal to the loyalty of the janissaries, Murad crushed the rebels, whom he surrounded in the Hippodrome. At the age of twenty he found himself possessed of effective autocratic power.

His severity has remained legendary. Death was the penalty for the least offence, and no past services—as Koes Mahommed was to find to his cost—were admitted in extenuation. The use of tobacco, coffee, opium and wine were forbidden on pain of death; eighteen persons are said to have been put to death in a single day for infringing this rule. During his whole reign, indeed, supposed offenders against the sultan's authority were done to death, singly or in thousands. The tale of his victims is said to have exceeded 100,000.

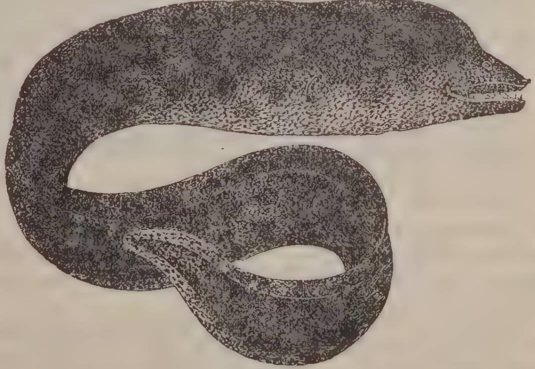
But if he was the most cruel, Murad was also one of the most manly, of the later sultans. He was of gigantic strength, which he maintained by constant physical exercises. He was also fond of hunting, and for this reason usually lived at Adrianople. He broke through the alleged tradition, bequeathed by Suleiman the Magnificent to his successors, that the sultan should not command the troops in person, and took command in the Persian war which led to the capture of Bagdad (1638) and the conclusion of an honourable peace (May 7, 1639). Early in 1640 he died, barely twenty-nine years of age. The cause of his death was acute gout brought on by excessive drinking. In spite of his drunkenness, however, Murad was a bigoted Sunni, and the main cause of his campaign against Persia was his desire to extirpate the Shia heresy. In the intervals of his campaignings and cruelties the sultan would amuse his entourage by exhibiting feats of strength, or compose verses, some of which were published under the pseudonym of Muradi.

See, for details of the lives of the above, J. von Hammer-Purgstall, *Geschichte des osmanischen Reiches* (Pest, 1840), where further authorities are cited.

MURAD V. (1840–1904), eldest son of Sultan Abd-ul-Mejid, was born on the 21st of September 1840. On the accession of his uncle Abd-ul-Aziz, Prince Mahommed Murad Effendi—as he was then called—was deprived of all share in public affairs and imprisoned, owing to his opposition to the sultan's plan for altering the order of succession. On the deposition of Abd-ul-Aziz on the 30th of May 1876, Murad was haled from his prison by a mob of softas and soldiers of the "Young Turkey" party under Suleiman Pasha, and proclaimed "emperor by the grace of God and the will of the people." Three months later, however, his health, undermined by his long confinement, gave way; and on the 31st of August he was deposed to make room for his younger brother, Abd-ul-Hamid II. He was kept in confinement in the Cheragan palace till his death on the 29th of August 1904.

See Kératry, *Mourad V., prince, sultan, prisonnier d'état 1840–1876* (Paris, 1878); Djemaleddin Bey, *Sultan Murad V., the Turkish Dynasty Mystery, 1876–1895* (London, 1895).

MURAENA, the name of an eel common in the Mediterranean, and highly esteemed by the ancient Romans; it was afterwards applied to the whole genus of fishes to which the Mediterranean species belongs, and which is abundantly represented in tropical and sub-tropical seas, especially in rocky parts or on coral reefs. Some ninety species are known. In the majority a long fin runs from the head along the back, round the tail to the vent,


Muraena picta, from the Indo-Pacific.

but all are destitute of pectoral and ventral fins. The skin is scaleless and smooth, in many species ornamented with varied and bright colours, so that these fishes are frequently mistaken for snakes. The mouth is wide, the jaws strong and armed with formidable, generally sharply pointed, teeth, which enable the *Muraena* not only to seize its prey (which chiefly consists of other fishes) but also to inflict serious, and sometimes dangerous, wounds on its enemies. It attacks persons who approach its places of concealment in shallow water, and is feared by fishermen.

Some of the tropical *Muraenas* exceed a length of 10 ft., but most of the species, among them the Mediterranean species, attain to only half that length. The latter, the "morena" of the Italians and the *Muraena helena* of ichthyologists, was considered by the ancient Romans to be one of the greatest delicacies, and was kept in large ponds and aquaria. It is not confined to the coasts of southern Europe, but is spread over the Indian Ocean, and is not uncommon on the coasts of Australia. Its body is generally of a rich brown, marked with large yellowish spots, each of which contains smaller brown spots.

MURAL DECORATION, a general term for the art of ornamenting wall surfaces. There is scarcely one of the numerous branches of decorative art which has not at some time or other been applied to this purpose.[1] For what may be called the practical or furnishing point of view, see WALL-COVERINGS. Here the subject is treated rather as part of the history of art.

1. *Reliefs sculptured in Marble or Stone.*—This is the oldest method of wall-decoration, of which numerous examples exist. The tombs and temples of Egypt are rich in this kind of mural ornament of various dates, extending over nearly 5000 years. These sculptures are, as a rule, carved in low relief; in many cases they are "counter-sunk," that is, the most projecting parts of the figures do not extend beyond the flat surface of the ground. Some unfinished reliefs discovered in the rock-cut tombs of Thebes show the manner in which the sculptor set to work. The plain surface of the stone was marked out by red lines into a number of squares of equal size. The use of this was probably twofold: first, as a guide in enlarging the design from a small drawing, a method still commonly practised; second, to help the artist to draw his figures with just proportions, following the strict canons which were laid down by the Egyptians. No excessive realism or individuality of style arising from a careful study of the life-model was permitted.[2] When the surface had been covered with these squares, the artist drew with a brush dipped in red the outlines of his relief, and then cut round them with his chisel.

When the relief was finished, it was, as a rule, entirely painted over with much minuteness and great variety of colours. More rarely the ground was left the natural tint of the stone or marble, and only the figures and hieroglyphs painted. In the case of sculpture in hard basalt or granite the painting appears often to have been omitted altogether. The absence of perspective effects and the severe self-restraint of the sculptors in the matter of composition show a sense of artistic fitness in this kind of decoration. That the rigidity of these sculptured pictures did not arise from want of skill or observation of nature on the part of the artists is apparent when we examine their representations of birds and animals; the special characteristics of each creature and species were unerringly caught by the ancient Egyptian, and reproduced in stone or colour, in a half-symbolic way, suggesting those peculiarities of form, plumage, or movement which are the "differentia" of each, other ideas bearing less directly on the point being eliminated.

The subjects of these mural sculptures are endless; almost every possible incident in man's life here or beyond the grave is reproduced with the closest detail. The tomb of Tîh at Sakkarah (about 4500 B.C.) has some of the finest and earliest specimens of these mural sculptures, especially rich in illustrations of the domestic life and occupations of the Egyptians. The latter tombs, as a rule, have sculptures depicting the religious ritual and belief of the people, and the temples combine these hieratic subjects with the history of the reigns and victories of the Egyptian kings.

The above remarks as to style and manner of execution may be applied also to the wall-sculptures from the royal palaces of Nineveh and Babylon, the finest of which are shown by inscriptions to date from the time of Sennacherib to that of Sardanapalus (from 705 to 625 B.C.). These are carved in low relief with almost gem-like delicacy of detail on enormous slabs of white marble. The sacred subjects, generally representing the king worshipping one of the numerous Assyrian gods, are mostly large, often colossal in scale. The other subjects, illustrating the life and amusements of the king, his prowess in war or hunting, or long processions of prisoners and tribute-bearers coming to do him homage, are generally smaller and in some cases very minute in scale (fig. 1). The arrangement of these reliefs in long horizontal bands, and their reserved conventional treatment are somewhat similar to those of ancient Egypt, but they show a closer attention to anatomical truth and a greater love for dramatic effect than any of the Egyptian reliefs. As in the art of Egypt, birds and animals are treated with greater realism than human figures. A relief in the British Museum, representing a lioness wounded by an arrow in her spine and dragging helplessly her paralysed hind legs, affords an example of wonderful truth and pathos. Remarkable technical skill is shown in all these sculptures by the way in which the sculptors have obtained the utmost amount of effect with the smallest possible amount of relief, in this respect calling strongly to mind a similar peculiarity in the work of the Florentine Donatello.

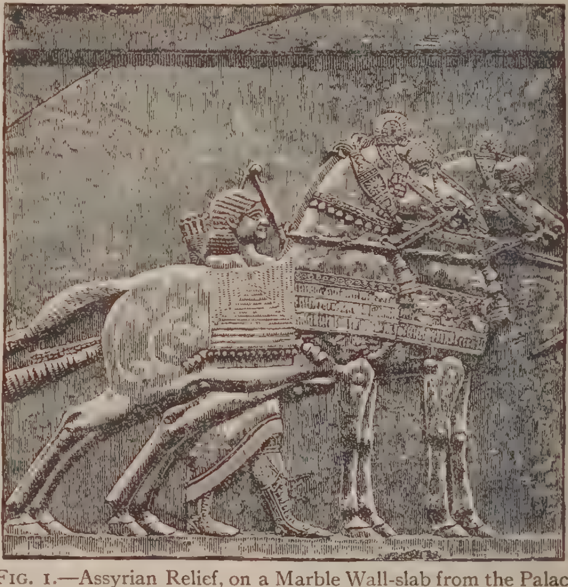


FIG. 1.—Assyrian Relief, on a Marble Wall-slab from the Palace of Sardanapalus at Nineveh.

The palace at Mashita on the ḥajj road in Moab, built by the Sasanian Chosroes II. (A.D. 614–627), is ornamented on the exterior with beautiful surface sculpture in stone. The designs are of peculiar interest as forming a link between Assyrian and Byzantine art, and they are not remotely connected with the decoration on Moslem buildings of comparatively modern date.[3]

Especially in Italy during the middle ages a similar treatment of marble in low relief was frequently used for wall-decoration. The most notable example is the beautiful series of reliefs on the west front of Orvieto Cathedral, the work of Giovanni Pisano and his pupils in the early part of the 14th century. These are small reliefs, illustrative of the Old and New Testaments, of graceful design and skilful execution. A growth of branching foliage serves to unite and frame the tiers of subjects.

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[1] See also CERAMICS; MOSAIC; PAINTING; SCULPTURE; TAPESTRY; TILES; also EGYPT; *Art and Archaeology*; GREEK ART; ROMAN ART; &c.

[2] During the earliest times—more than 4000 years before our era—there appear to have been exceptions to this rule.

[3] Among the Mashita carvings occurs that oldest and most widely spread of all forms of Aryan ornament—the sacred tree between two animals. The sculptured slab over the "lion-gate" at Mycenae has the other common variety of this motive—the fire-altar between the beasts. These designs, occasionally varied by figures of human worshippers instead of the beasts, survived long after their meaning had been forgotten; even down to the present day they frequently appear on carpets and other textiles of Oriental manufacture.

Of a widely different class, but of considerable importance in the history of mural decoration, are the beautiful reliefs, sculptured in stone and marble, with which Moslem buildings in many parts of the world are ornamented. These are mostly geometrical patterns of great intricacy, which cover large surfaces, frequently broken up into panels by bands of more flowing ornament or Arabic inscriptions. The mosques of Cairo, India and Persia, and the domestic Moslem buildings of Spain are extremely rich in this method of decoration. In western Europe, especially during the 15th century, stone panelled-work with rich tracery formed a large part of the scheme of decoration in all the more splendid buildings. Akin to this, though without actual relief, is the stone tracery—inlaid flush into rough flint walls—which was a mode of ornament largely used for enriching the exteriors of churches in the counties of Norfolk and Suffolk. It is almost peculiar to that district, and is an example of the skill and taste with which the medieval builders adapted their method of ornamentation to the materials in hand.

2. *Marble Veneer.*—Another widely used method of mural decoration has been the application of thin marble linings to wall-surfaces, the decorative effect being produced by the natural beauty of the marble itself and not by sculptured reliefs. One of the oldest buildings in the world, the so-called "Temple of the Sphinx" among the Giza pyramids, is built of great blocks of granite, the inside of the rooms being lined with slabs of semi-transparent African alabaster about 3 in. thick. In the 1st century thin veneers of richly coloured marbles were largely used by the Romans to decorate brick and stone walls. Pliny (*H. N.* xxxvi. 6) speaks of this practice as being a new and degenerate invention in his time. Many examples exist at Pompeii and in other Roman buildings. Numerous Byzantine churches, such as St Saviour's at Constantinople, and St George's, Thessalonica, have the lower part of the internal walls richly ornamented in this way. It was commonly used to form a dado, the upper part of the building being covered with mosaic. The cathedral of Monreale and other Siculo-Norman buildings owe a great deal of their splendour to these linings of richly variegated marbles. In most cases the main surface is of light-coloured marble or alabaster, inlaid bands of darker tint or coloured mosaic being used to divide the surface into panels. The peculiar Italian-Gothic of northern and central Italy during the 14th and 15th centuries, and at Venice some centuries earlier, relied greatly for its effects on this treatment of marble. St Mark's at Venice and the cathedral of Florence are magnificent examples of this work used externally. Both inside and out most of the richest examples of Moslem architecture owe much to this method of decoration; the mosques and palaces of India and Persia are in many cases completely lined with the most brilliant sorts of marble of contrasting tints.

3. *Wall-Linings of Glazed Bricks or Tiles.*—This is a very important class of decoration, and from its almost imperishable nature, its richness of colour, and its brilliance of surface is capable of producing a splendour of effect only rivalled by glass mosaics. In the less important form—that of bricks modelled or stamped in relief with figures and inscriptions, and then coated with a brilliant colour in siliceous enamel—it was largely used by the ancient Egyptians and Assyrians as well as by the later Sasanians of Persia. In the 11th and 12th centuries the Moslems of Persia brought this art to great perfection, and used it on a large scale, chiefly, though not invariably, for internal walls. The main surfaces were covered by thick earthenware tiles, overlaid with a white enamel. These were not rectangular, but of various shapes, mostly some form of a star, arranged so as to fit closely together. Delicate and minute patterns were then painted on the tiles, after the first firing, in a copper-like colour with strong metallic lustre, produced by the deoxidization of a metallic salt in the process of the second firing. Bands and friezes with Arabic inscriptions, modelled boldly in high relief, were used to break up the monotony of the surface. In these, as a rule, the projecting letters were painted blue, and the flat ground enriched with very minute patterns in the lustre-colour. This combination of bold relief and delicate painting produces great vigour and richness of effect, equally telling whether viewed in the mass or closely examined tile by tile. In the 15th century lustre-colours, though still largely employed for plates, vases and other vessels, especially in Spain, were little used for tiles; and another class of ware, rich in the variety and brilliance of its colours, was extensively used by Moslem builders all over the Mahommedan world. The most sumptuous sorts of tiles used for wall-coverings are those of the so-called "Rhodian" and Damascene wares, the work of Persian potters at many places. Those made at Rhodes are coarsely executed in comparison with the produce of the older potteries at Isfahān and Damascus (see CERAMICS). These are rectangular tiles of earthenware, covered with a white "slip," and painted in brilliant colours with slight conventionalized representations of various flowers, especially the rose, the hyacinth and the carnation. The red used is applied in considerable body, so as to stand out in slight relief. Another class of design is more geometrical, forming regular repeats; but the most beautiful compositions are those in which the natural growth of trees and flowers is imitated, the branches and blossoms spreading over a large surface covered by hundreds of tiles without any repetition. One of the finest examples is the "Mecca wall" in the mosque of Ibrahim Agha, Cairo; and other Egyptian mosques are adorned in the same way (fig. 2). Another variety, the special production of Damascus, has the design almost entirely executed in blue. It was about A.D. 1600, in the reign of Shah Abbas I., that this class of pottery was brought to greatest perfection, and it is in Persia that the most magnificent examples are found, dating from the 12th to the 17th centuries. The most remarkable examples for beauty and extent are the mosque at Tabrīz, built by Ali Khoja in the 12th century, the ruined tomb of Sultan Khodabend (A.D. 1303–1316) at Sultaniyas, the palace of Shah Abbas I. and the tomb of Abbas II. (d. A.D. 1666) at Isfahān, all of which buildings are covered almost entirely inside and out.

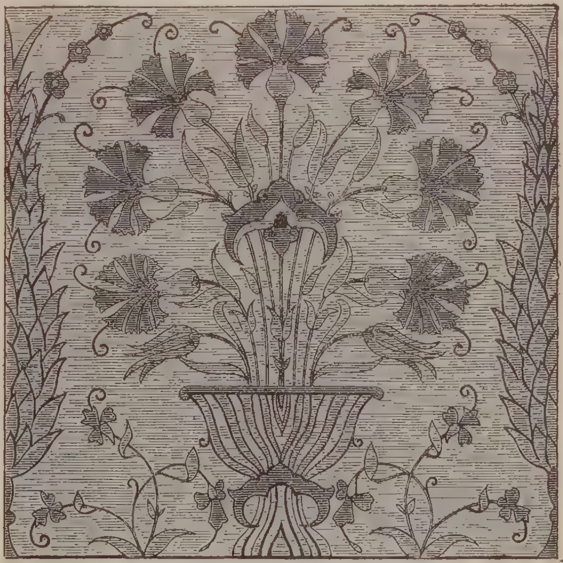

FIG. 2.—One of the Wall-tiles from the Mosque of Ibrahim Agha, Cairo. (10 in. square.)

Another important class of wall-tiles are those manufactured by the Spanish Moors, called "azulejos," especially during the 14th century. These are in a very different style, being designed to suggest or imitate mosaic. They have intricate interlacing geometrical patterns marked out by lines in slight relief; brilliant enamel colours were then burned into the tile, the projecting lines forming boundaries for the pigments. A rich effect is produced by this combination of relief and colour. They are mainly used for dadoes about 4 ft. high, often surmounted by a band of tiles with painted inscriptions. The Alhambra and Generalife Palaces at Granada, begun in the 13th century, but mainly built and decorated by Yūsuf I. and Mahommed V. (A.D. 1333–1391), and the Alcazar at Seville have the most beautiful examples of these "azulejos." The latter building chiefly owes its decorations to Pedro the Cruel (A.D. 1364), who employed Moorish workmen for its tile-coverings and other ornaments. Many other buildings in southern Spain are enriched in the same way, some as late as the 16th century.

Almost peculiar to Spain are a variety of wall-tile the work of Italians in the 16th and 17th centuries. These are effective, though rather coarsely painted, and have a rich yellow as the predominant colour. The Casa de Pilatos and Isabel's Chapel in the Alcazar Palace, both at Seville, have the best specimens of these, dating about the year 1500. In other Western countries tiles have been used more for pavements than for wall-decoration.

4. *Wall-Coverings of Hard Stucco, frequently enriched with Reliefs.*—The Greeks and Romans possessed the secret of making a hard kind of stucco, creamy in colour, and capable of receiving a polish like that of marble; it would stand exposure to the weather. Those of the early Greek temples which were built, not of marble, but of stone, such as the Doric temples at Aegina, Phigaleia, Paestum and Agrigentum, were all entirely coated inside and out with this material, an admirable surface for the further polychromatic decoration with which all Greek buildings seem to have been ornamented. Another highly artistic use of stucco among the Greeks and Romans, for the interiors of buildings, consisted in covering the walls and vaults with a smooth coat, on which while still wet the outlines of figures, groups and other ornaments were sketched with a point; more stucco was then applied in lumps and rapidly modelled into delicate relief before it had time to set. Some tombs in Magna Graecia of the 4th century B.C. are decorated in this way with figures of nymphs, cupids, animals and wreaths, all of which are models of grace and elegance, and remarkable for the dexterous way in which a few rapid touches of the modelling tool or thumb have produced a work of the highest artistic beauty (fig. 3). Roman specimens of this sort of decoration are common, fine examples have been found in the baths of Titus and numerous tombs near Rome, as well as in many of the houses of Pompeii. These are mostly executed with great skill and frequently with good taste, though in some cases, especially at Pompeii, elaborate architectural compositions with awkward attempts at effects of violent perspective, modelled in slight relief on flat wall-surfaces, produce an unpleasing effect. Other Pompeian examples, where the surface is divided into flat panels, each containing a figure or group, have great merit for their delicate richness, without offending against the canons of wall-decoration, one of the first conditions of which is that no attempt should be made to disguise the fact of its being a solid wall and a flat surface.

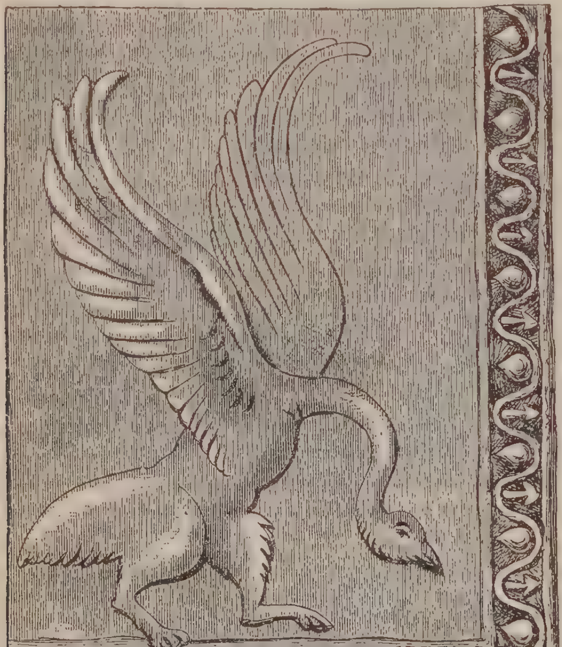

FIG. 3.—Modelled Stucco Wall-Relief, from a Tomb in Magna Graecia. (About half full size.)

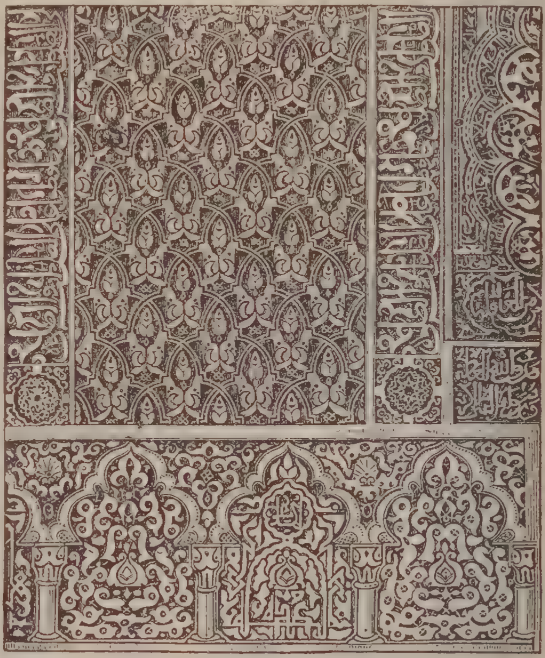

FIG. 4.—Stucco Wall-Relief, from the Alhambra.

The Moslem architects of the middle ages made great use of stucco ornament both for external and internal walls. The stucco is modelled in high or low relief in great variety of geometrical patterns, alternating with bands of more flowing ornament or long Arabic inscriptions. Many of their buildings, such as the mosque of Tulún at Cairo (A.D. 879), owe nearly all their beauty to this fine stucco work, the purely architectural shell of the structure being often simple and devoid of ornament. These stucco reliefs were, as a rule, further decorated with delicate painting in gold and colours. The Moorish tower at Segovia in Spain is a good example of this class of ornament used externally. With the exception of a few bands of brick and the stone quoins at the angles, the whole exterior of the tower is covered with a network of stucco reliefs in simple geometrical patterns. The Alhambra at Granada and the Alcazar at Seville have the richest examples of this work. The lower part of the walls is lined with marble or tiles to a height of about 4 ft. and above that in many cases the whole surface is encrusted with these reliefs, the varied surface of which, by producing endless gradations of shadow, takes away any possible harshness from the brilliance of the gold and colours (fig. 4).

During the 16th century, and even earlier, stucco wall-reliefs were used with considerable skill and decorative effect in Italy, England and other Western countries. Perhaps the most graceful examples are the reliefs with which Vasari in the 16th century encrusted pillars and other parts of the court in the Florentine Palazzo Vecchio, built of plain stone by Michelozzo in 1454. Some are of flowing vines and other plants winding spirally round the columns. The English examples of this work are effectively designed, though coarser in execution. The outside of a half-timbered house in the market-place at Newark-upon-Trent has high reliefs in stucco of canopied figures, dating from the end of the 15th century. The counties of Essex and Suffolk are rich in examples of this work used externally; and many 16th-century houses in England have fine internal stucco decoration, especially Hardwicke Hall (Derbyshire), one of the rooms of which has the upper part of the wall enriched with life-sized stucco figures in high relief, forming a deep frieze all round.

5. *Sgraffito.*—This is a variety of stucco work used chiefly in Italy from the 16th century downwards, and employed only for exteriors of buildings, especially the palaces of Tuscany and northern Italy. The wall is covered with a coat of stucco made black by an admixture of charcoal; over this a second thin coat of white stucco is laid. When it is all hard the design is produced by cutting and scratching away the white skin, so as to show the black under-coat. Thus the drawing appears in black on a white ground. This work is effective at a distance, as it requires a bold style of handling, in which the shadows are indicated by cross-hatched lines more or less near together.[1] Flowing arabesques mixed with grotesque figures occur most frequently in sgraffito. In recent years the sgraffito method has been revived; and the result of Mr Moody's experiments may be seen on the east wall of the Royal College of Science in Exhibition Road, London.

6. *Stamped Leather.*—This was a magnificent and expensive form of wall-hanging, chiefly used during the 16th and 17th centuries. Skins, generally of goats or calves, were well tanned and cut into rectangular shapes. They were then covered with silver leaf, which was varnished with a transparent yellow lacquer making the silver look like gold. The skins were then stamped or embossed with patterns in relief, formed by heavy pressure from metal dies, one in relief and the other sunk. The reliefs were then painted by hand in many colours, generally brilliant in tone. Italy and Spain (especially Cordova) were important seats of this manufacture; and in the 17th century a large quantity was produced in France. Fig. 5 gives a good example of Italian stamped leather of the 16th century. In England, chiefly at Norwich, this manufacture was carried on in the 17th and 18th centuries. In durability and richness of effect stamped leather surpasses most other forms of movable wall-decoration.

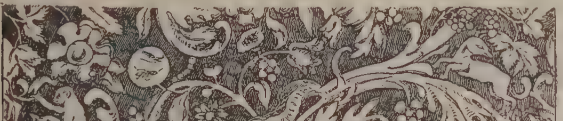

FIG. 5.—Italian Stamped Leather; 16th century.

7. *Painted Cloth.*—Another form of wall-hanging, used most largely during the 15th and 16th centuries, and in a less extensive way a good deal earlier, is canvas painted to imitate tapestry. English medieval inventories both of ecclesiastical and domestic goods frequently contain items such as these: "stayned cloths for hangings," "paynted cloths with stories and batailes," or "paynted cloths of beyond sea work," or "of Flaunder's work." Many good artists working at Ghent and Bruges during the first half of the 15th century produced fine work of this class, as well as designs for real tapestry. Several of the great Italian artists devoted their skill in composition and invention to the painting of these wall-hangings. The most important existing example is the series of paintings of the triumph of Julius Caesar executed by Andrea Mantegna (1485–1492) for Ludovico Gonzaga, duke of Mantua, and now at Hampton Court. These are usually, but wrongly, called "cartoons," as if they were designs meant to be executed in tapestry; this is not the case, as the paintings themselves were used as wall-hangings. They are nine in number and each compartment, 9 ft. square, was separated from the next by a pilaster. They form a continuous procession, with life-sized figures, remarkable for their composition, drawing and delicate colouring—the latter unfortunately much disguised by "restoration." Like most of these painted wall-hangings, they are executed in tempera, and rather thinly painted, so that the pigment might not crack off through the cloth falling slightly into folds. Another remarkable series of painted cloth hangings are those at Reims Cathedral. In some cases dyes were used for this work. A MS. of the 15th century gives receipts for "painted cloth," showing that sometimes they were dyed in a manner similar to those Indian stuffs which were afterwards printed, and are now called chintzes. These receipts are for real dyes, not for pigments, and among them is the earliest known description of the process called "setting" the woad or indigo vat, as well as a receipt for removing or "discharging" the colour from a cloth already dyed. Another method employed was a sort of "encaustic" process; the cloth was rubbed all over with wax, and then painted in tempera; heat was then applied so that the colours sank into the melting wax, and were thus firmly fixed upon the cloth.

8. *Printed Hangings and Wall-Papers.*—The printing of various textiles with dye-colours and mordants is probably one of the most ancient arts. Pliny (*H. N.* xxxv.) describes a dyeing process employed by the ancient Egyptians, in which the pattern was probably formed by printing from blocks. Various methods have been used for this work—wood blocks in relief, engraved metal plates, stencil plates and even hand-painting; frequently two or more of these methods have been employed for the same pattern. The use of printed stuffs is of great antiquity among the Hindus and Chinese, and was certainly practised in western Europe in the 13th century, and perhaps earlier. The Victoria and Albert Museum has 13th-century specimens of block-printed silk made in Sicily, of beautiful design. Towards the end of the 14th century a great deal of block-printed linen was made in Flanders, and largely imported into England.

Wall-papers did not come into common use in Europe till the 18th century, though they appear to have been used much earlier by the Chinese. A few rare examples exist in England which may be as early as the 16th century; these are imitations, generally in flock, of the fine old Florentine and Genoese cut velvets, and hence the style of the design in no way shows the date of the wall-paper, the same traditional patterns being reproduced for many years with little or no change. Machinery enabling paper to be made in long strips was not invented till the end of the 18th century, and up to that time wall-papers were printed on small square pieces of hand-made paper, difficult to hang, disfigured by numerous joints, and comparatively costly; on these accounts wall-papers were slow in superseding the older modes of mural decoration. A little work by Jackson of Battersea, printed in London in 1744, throws some light on the use of wall-papers at that time. He gives reduced copies of his designs, mostly taken from Italian pictures or antique sculpture during his residence in Venice. Instead of flowing patterns covering the wall, his designs are all pictures—landscapes, architectural scenes or statues—treated as panels, with plain paper or painting between. They are all printed in oil, with wooden blocks worked with a rolling press, apparently an invention of his own. They are all in the worst possible taste, and yet are offered as great improvements on the Chinese papers which he says were then in fashion. Fig. 6 is a good English example of 18th-century wall-paper printed on squares of stout hand-made paper 22 in. wide. The design is apparently copied from an Indian chintz.

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[1] A good description of the process is given by Vasari, *Tre arti del disegno*, cap. xxvi.

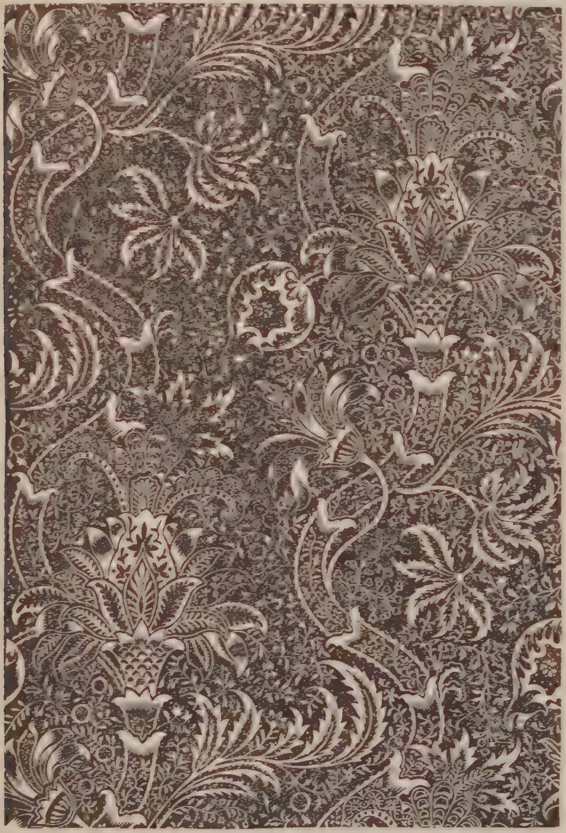


FIG. 6.—Early 18th-century Wall-Paper. (22 in. wide.)

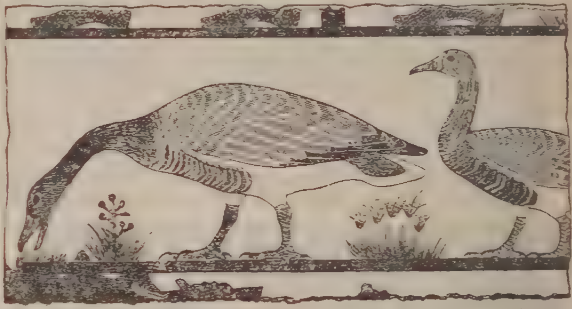
In the 19th century in England, a great advance in the designing of wall-papers was made by William Morris and his school.

9. *Painting.*—This is naturally the most important and the most widely used of all forms of wall-decoration, as well as perhaps the earliest.

Egyptian Paintings.

Egypt (see EGYPT: *Art and Archaeology*) is the chief storehouse of ancient specimens of this, as of almost all the arts. Owing to the intimate connexion between the sculpture and painting of early times, the remarks above as to subjects and treatment under the head of Egyptian wall-sculpture will to a great extent apply also to the paintings. It is an important fact, which testifies to the antiquity of Egyptian civilization, that the earliest paintings, dating more than 4000 years before our era, are also the cleverest both in drawing and execution. In later times the influence of Egyptian art, especially in painting, was important even among distant nations. In the 6th century B.C. Egyptian colonists, introduced by Cambyses into Persepolis, influenced the painting and sculpture of the great Persian Empire and throughout the valley of the Euphrates. In a lesser degree the art of Babylon and Nineveh had felt considerable Egyptian influence several centuries earlier. The same influence affected the early art of the Greeks and the Etrurians, and it was not till the middle of the 5th century B.C. that the further development and perfecting of art in Greece obliterated the old traces of Egyptian mannerism. After the death of Alexander the Great, when Egypt came into the possession of the Lagidae (320 B.C.), the tide of influence flowed the other way, and Greek art modified though it did not seriously alter the characteristics of Egyptian painting and sculpture, which retained much of their early formalism and severity. Yet the increased sense of beauty, especially in the human face, derived from the Greeks was counterbalanced by loss of vigour; art under the Ptolemies became a dull copyism of earlier traditions.

The general scheme of mural painting in the buildings of ancient Egypt was complete and magnificent. Columns, mouldings and other architectural features were enriched with patterns in brilliant colours; the flat wall-spaces were covered with figure-subjects, generally in horizontal bands, and the ceilings were ornamented with sacred symbols, such as the vulture or painted blue and studded with gold stars to symbolize the sky. The wall-paintings are executed in tempera on a thin skin of fine lime, laid over the brick, stone or marble to form a smooth and slightly absorbent coat to receive the pigments, which were most brilliant in tone and of great variety of tint. Not employing fresco, the Egyptian artists were not restricted to "earth colours," but occasionally used purples, pinks and greens which would have been destroyed by fresh lime. The blue used is very beautiful, and is generally laid on in considerable body—it is frequently a "smalt" or deep-blue glass, coloured by copper oxide, finely powdered. Red and yellow ochre, carbon-black, and powdered chalk-white are most largely used. Though in the paintings of animals and birds considerable realism is often seen (fig. 7), yet for human figures certain conventional colours are employed, *e.g.* white for females' flesh, red for the males, or black to indicate people of negro race. Heads are painted in profile, and little or no shading is used. Considerable knowledge of harmony is shown in the arrangement of the colours; and otherwise harsh combinations of tints are softened and brought into keeping by thin separating lines of white or yellow. Though at first sight the general colouring, if seen in a museum, may appear crude, yet it should be remembered that the internal paintings were much softened by the dim light in Egyptian buildings, and those outside were subdued by contrast with the brilliant sunshine under which they were always seen.



(Taken from Loftie's *Ride in Egypt.*)

FIG. 7.—Egyptian Wall-Painting of the Ancient Empire in the Bulak Museum.

Etruscan Painting.

The rock-cut sepulchres of the Etrurians supply the only existing specimens of their mural painting; and, unlike the tombs of Egypt, only a small proportion appear to have been decorated in this way. The actual dates of these paintings are very uncertain, but they range possibly from about the 8th century B.C. down to almost the Christian era. The tombs which possess these paintings are mostly square-shaped rooms, with slightly-arched or gabled roofs, excavated in soft sandstone or tufa hillsides. The earlier ones show Egyptian influence in drawing and in composition: they are broadly designed with flat unshaded tints, the faces in profile, except the eyes, which are drawn as if seen in front. Colours, as in Egypt, are used conventionally—male flesh red, white or pale yellow for the females, black for demons. In one respect these paintings differ from those of the Egyptians; few colours are used—red, brown, and yellow ochres, carbon-black, lime or chalk-white, and occasionally blue are the only pigments. The rock-walls are prepared by being covered with a thin skin of lime stucco, and lime or chalk is mixed in small quantities with all the colours; hence the restriction to "earth pigments," made necessary by the dampness of these subterranean chambers. The process employed was in fact a kind of fresco, though the stucco ground was not applied in small patches only sufficient for the day's work; the dampness of the rock was enough to keep the stucco skin moist, and so allow the necessary infiltration of colour from the surface. Many of these paintings when first discovered were fresh in tint and uninjured by time, but they are soon dulled by exposure to light. In the course of centuries great changes of style naturally took place; the early Egyptian influence, probably brought to Etruria through the Phoenician traders, was succeeded by an even more strongly-marked Greek influence—at first archaic and stiff, then developing into great beauty of drawing, and finally yielding to the Roman spirit, as the degradation of Greek art advanced under their powerful but inartistic Roman conquerors.

Throughout this succession of styles—Egyptian, Greek and Graeco-Roman—there runs a distinct undercurrent of individuality due to the Etruscans themselves. This appears not only in the drawing but also in the choice of subjects. In addition to pictures of banquets with musicians and dancers, hunting and racing scenes, the workshops of different craftsmen and other domestic subjects, all thoroughly Hellenic in sentiment, other paintings occur which are very un-Greek in feeling. These represent the judgment and punishment of souls in a future life. Mantus, Charun and other infernal deities of the Rasena, hideous in aspect and armed with hammers, or furies depicted as black-bearded demons winged and brandishing live snakes, terrify or torture shrinking human souls. Others, not the earliest in date, represent human sacrifices, such as those at the tomb of Patroclus—a class of subjects which, though Homeric, appears rarely to have been selected by Greek painters. The constant import into Etruria of large quantities of fine Greek painted vases appears to have contributed to keep up the supremacy of Hellenic influence during many centuries, and by their artistic superiority to have prevented the development of a more original and native school of art. Though we now know Etruscan painting only from the tombs, yet Pliny mentions (*H. N.* xxxv. 3) that fine wall-paintings existed in his time, with colours yet fresh, on the walls of ruined temples at Ardea and Lanuvium, executed, he says, before the founding of Rome. As before mentioned, the actual dates of the existing paintings are uncertain. It cannot therefore be asserted that any existing specimens are much older than 600 B.C., though some, especially at Veii, certainly appear to have the characteristics of more remote antiquity. The most important of these paintings have been discovered in the cemeteries of Veii, Caere, Tarquinii, Vulci, Cervetri and other Etruscan cities.

Greek Painting.

Even in Egypt the use of colour does not appear to have been more universal than it was among the Greeks (see GREEK ART), who applied it freely to their marble statues and reliefs, the whole of their buildings inside and out, as well as for the decoration of flat wall-surfaces. They appear to have cared little for pure form, and not to have valued the delicate ivory-like tint and beautiful texture of their fine Pentelic and Parian marbles, except as a ground for coloured ornament. A whole class of artists, called ἀγαλμάτων ἐγκαυσταί, were occupied in colouring marble sculpture, and their services were very highly valued.[1] In some cases, probably for the sake of hiding the joints and getting a more absorbent surface, the marble, however pure and fine in texture, was covered with a thin skin of stucco made of mixed lime and powdered marble. An alabaster sarcophagus, found in a tomb near Corneto, and now in the Etruscan museum at Florence, is decorated outside with beautiful purely Greek paintings, executed on a stucco skin as hard and smooth as the alabaster. The pictures represent combats of the Greeks and Amazons. The colouring, though rather brilliant, is simply treated, and the figures are kept strictly to one plane without any attempt at complicated perspective. Other valuable specimens of Greek art, found at Herculaneum and now in the Naples Museum, are some small paintings, one of girls playing with dice, another of Theseus and the Minotaur. These are painted with miniature-like delicacy on the bare surface of marble slabs; they are almost monochromatic, and are of the highest beauty both in drawing and in gradations of shadow—quite unlike any of the Greek vase-paintings. The first-mentioned painting is signed ΑΛΕΞΑΝΔΡΟΣ ΑΘΗΝΑΙΟΣ. It is probable that the strictly archaic paintings of the Greeks, such as those of Polygnotus in the 5th century B.C., executed with few and simple colours, had much resemblance to those on vases, but Pliny is wrong when he asserts that, till the time of Apelles (*c.* 350–310 B.C.), the Greek painters only used black, white, red and yellow.[2] Judging from the peculiar way in which the Greeks and their imitators the Romans used the names of colours, it appears that they paid more attention to *tones* and *relations* of colour than to actual hues. Thus most Greek and Latin colour-names are now untranslatable. Homer's "wine-like sea" (οἴνοψ), Sophocles's "wine-coloured ivy" (*Œd. Col.*), and Horace's "purpureus olor" probably refer less to what we should call colour than to the chromatic strength of the various objects and their more or less strong powers of reflecting light, either in motion or when at rest. Nor have we any word like Virgil's "flavus," which could be applied both to a lady's hair and to the leaf of an olive-tree.[3]

During the best periods of Greek art the favourite classes of subjects were scenes from poetry, especially Homer and contemporary history. The names πινακοθήκη and στοὰ ποικίλη were given to many public buildings from their walls being covered with paintings. Additional interest was given to the historical subjects by the introduction of portraits; *e.g.* in the great picture of the battle of Marathon (490 B.C.), on the walls of the στοὰ ποικίλη in Athens, portraits were given of the Greek generals Miltiades, Callimachus, and others. This picture was painted about forty years after the battle by Polygnotus and Micon. One of the earliest pictures recorded by Pliny (xxxv. 8) represented a battle of the Magnesians (*c.* 716 B.C.); it was painted by Bularchus, a Lydian artist, and bought at a high price by King Candaules. Many other important Greek historical paintings are mentioned by Pausanias and earlier writers. The Pompeian mosaic of the defeat of the Persians by Alexander is probably a Romanized copy from some celebrated Greek painting; it obviously was not designed for mosaic work.

Landscape painting appears to have been unknown among the Greeks, even as a background to figure-subjects. The poems especially of Homer and Sophocles show that this was not through want of appreciation of the beauties of nature, but partly, probably, because the main object of Greek painting was to tell some definite story, and also from their just sense of artistic fitness, which prevented them from attempting in their mural decorations to disguise the flat solidity of the walls by delusive effects of aerial perspective and distance.

It is interesting to note that even in the time of Alexander the Great the somewhat archaic works of the earlier painters were still appreciated. In particular Aristotle praises Polygnotus, both for his power of combining truth with idealization in his portraits and for his skill in depicting men's mental characteristics; on this account he calls him ὁ ἠθογράφος. Lucian too praises Polygnotus alike for his grace, drawing and colouring. Later painters, such as Zeuxis and Apelles, appear to have produced easel pictures more than mural paintings, and these, being easy to move, were mostly carried off to Rome by the early emperors. Hence Pausanias, who visited Greece in the time of Hadrian, mentions but few works of the later artists. Owing to the lack of existing specimens of Greek painting it would be idle to attempt an account of their technical methods, but no doubt those employed by the Romans described below were derived with the rest of their art from the Greeks. Speaking of their stucco, Pliny refers its superiority over that made by the Romans to the fact that it was always made of lime at least three years old, and that it was well mixed and pounded in a mortar before being laid on the wall; he is here speaking of the thick stucco in many coats, not of the thin skin mentioned above as being laid on marble. Greek mural painting, like their sculpture, was chiefly used to decorate temples and public buildings, and comparatively rarely either for tombs[1] or private buildings—at least in the days of their early republican simplicity.

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[1] This process, *circumlitio*, is mentioned by Pliny (*H. N.* xxxv. 40).

[2] Pliny's remarks on subjects such as this should be received with caution. He was neither a scientific archaeologist nor a practical artist.

[3] So also a meaning unlike ours is attached to Greek technical words—by τόνος they meant, not "tone," but the gradations of light and shade, and by ἁρμογή the relations of colour. See Pliny, *H. N.* xxxv. 5; and Ruskin, *Mod. Painters*, pt. iv. cap. 13.

Roman Painting.

A large number of Roman mural paintings (see also ROMAN ART) now exist, of which many were discovered in the private houses and baths of Pompeii, nearly all dating between A.D. 63, when the city was ruined by an earthquake, and A.D. 79, when it was buried by Vesuvius. A catalogue of these and similar paintings from Herculaneum and Stabiae, compiled by Professor Helbig, comprises 1966 specimens. The excavations in the baths of Titus and other ancient buildings in Rome, made in the early part of the 16th century, excited the keenest interest and admiration among the painters of that time, and largely influenced the later art of the Renaissance. These paintings, especially the "grotesques" or fanciful patterns of scroll-work and pilasters mixed with semi-realistic foliage and figures of boys, animals and birds, designed with great freedom of touch and inventive power, seem to have fascinated Raphael during his later period, and many of his pupils and contemporaries. The "loggie" of the Vatican and of the Farnesina palace are full of carefully studied 16th-century reproductions of these highly decorative paintings. The excavations in Rome have brought to light some mural paintings of the 1st century A.D., perhaps superior in execution even to the best of the Pompeian series (see Plate).

The range of subjects found in Roman mural paintings is large—mythology, religious ceremonies, genre, still life and even landscape (the latter generally on a small scale, and treated in an artificial and purely decorative way), and lastly history. Pliny mentions several large and important historical paintings, such as those with which Valerius Maximus Messala decorated the walls of the Curia Hostilia, to commemorate his own victory over Hiero II. and the Carthaginians in Sicily in the 3rd century B.C. The earliest Roman painting recorded by Pliny was by Fabius, surnamed Pictor, on the walls of the temple of Salus, executed about 300 B.C. (*H.N.* xxxv. 4).

Pliny (xxxv. 1) laments the fact that the wealthy Romans of his time preferred the costly splendours of marble and porphyry wall-linings to the more artistic decoration of paintings by good artists. Historical painting seems then to have gone out of fashion; among the numerous specimens now existing few from Pompeii represent historical subjects; one has the scene of Massinissa and Sophonisba before Scipio, and another of a riot between the people of Pompeii and Nocera, which happened 59 A.D.

Mythological scenes, chiefly from Greek sources, occur most frequently: the myths of Eros and Dionysus are especial favourites. Only five or six relate to purely Roman mythology. We have reason to think that some at least of the Pompeian pictures are copies, probably at third or fourth hand, from celebrated Greek originals. The frequently repeated subjects of Medea meditating the murder of her children and Iphigenia at the shrine of the Tauric Artemis suggest that the motive and composition were taken from the originals of these subjects by Timanthes. Those of Io and Argus, the finest example of which is in the Palatine "villa of Livia" and of Andromeda and Perseus, often repeated on Pompeian walls, may be from the originals by Nicias.

In many cases these mural paintings are of high artistic merit, though they are probably not the work of the most distinguished painters of the time, but rather of a humbler class of decorators, who reproduced, without much original invention, stock designs out of some pattern-book. They are, however, all remarkable for the rapid skill and extreme "verve" and freedom of hand with which the designs are, as it were, flung on to the walls with few but effective touches. Though in some cases the motive and composition are superior to the execution, yet many of the paintings are remarkable both for their realistic truth and technical skill. The great painting of Ceres from Pompeii, now in the Naples Museum, is a work of the highest merit.

In the usual scheme of decoration the broad wall-surfaces are broken up into a series of panels by pilasters, columns, or other architectural forms. Some of the panels contain pictures with figure-subjects; others have conventional ornament, or hanging festoons of fruit and flowers. The lower part of the wall is painted one plain colour, forming a dado; the upper part sometimes has a well-designed frieze of flowing ornaments. In the better class of painted walls the whole is kept flat in treatment, and is free from too great subdivision, but in many cases great want of taste is shown by the introduction of violent effects of architectural perspective, and the space is broken up by complicated schemes of design, studded with pictures in varying scales which have little relation to their surroundings. The colouring is on the whole pleasant and harmonious—unlike the usual chromo-lithographic copies. Black, yellow, or a rich deep red are the favourite colours for the main ground of the walls, the pictures in the panels being treated separately, each with its own background.

Early Christian Painting in Italy.

An interesting series of early Christian mural paintings exists in various catacombs, especially those of Rome and Naples. They are of value both as an important link in the history of art and also as throwing light on the mental state of the early Christians, which was distinctly influenced by the older faith. Thus in the earlier paintings of about the 4th century we find Christ represented as a beardless youth, beautiful as the artist could make him, with a lingering tradition of Greek idealization, in no degree like the "Man of Sorrows" of medieval painters, but rather a kind of genius of Christianity in whose fair outward form the peace and purity of the new faith were visibly symbolized, just as certain distinct attributes were typified in the persons of the gods of ancient Greece. The favourite early subject, "Christ the Good Shepherd" (fig. 8), is represented as Orpheus playing on his lyre to a circle of beasts, the pagan origin of the picture being shown by the Phrygian cap and by the presence of lions, panthers and other incongruous animals among the listening sheep. In other cases Christ is depicted standing with a sheep borne on His shoulders like Hermes Criophoros or Hermes Psychopompos—favourite Greek subjects, especially the former, a statue of which Pausanias (ix. 22) mentions as existing at Tanagra in Boeotia. Here again the pagan origin of the type is shown by the presence in the catacomb paintings of the pan-pipes and pedum, special attributes of Hermes, but quite foreign to the notion of Christ. Though in a degraded form, a good deal survives in some of these paintings, especially in the earlier ones, of the old classical grace of composition and beauty of drawing, notably in the above-mentioned representations where old models were copied without any adaptation to their new meaning. Those of the 5th and 6th centuries follow the classical

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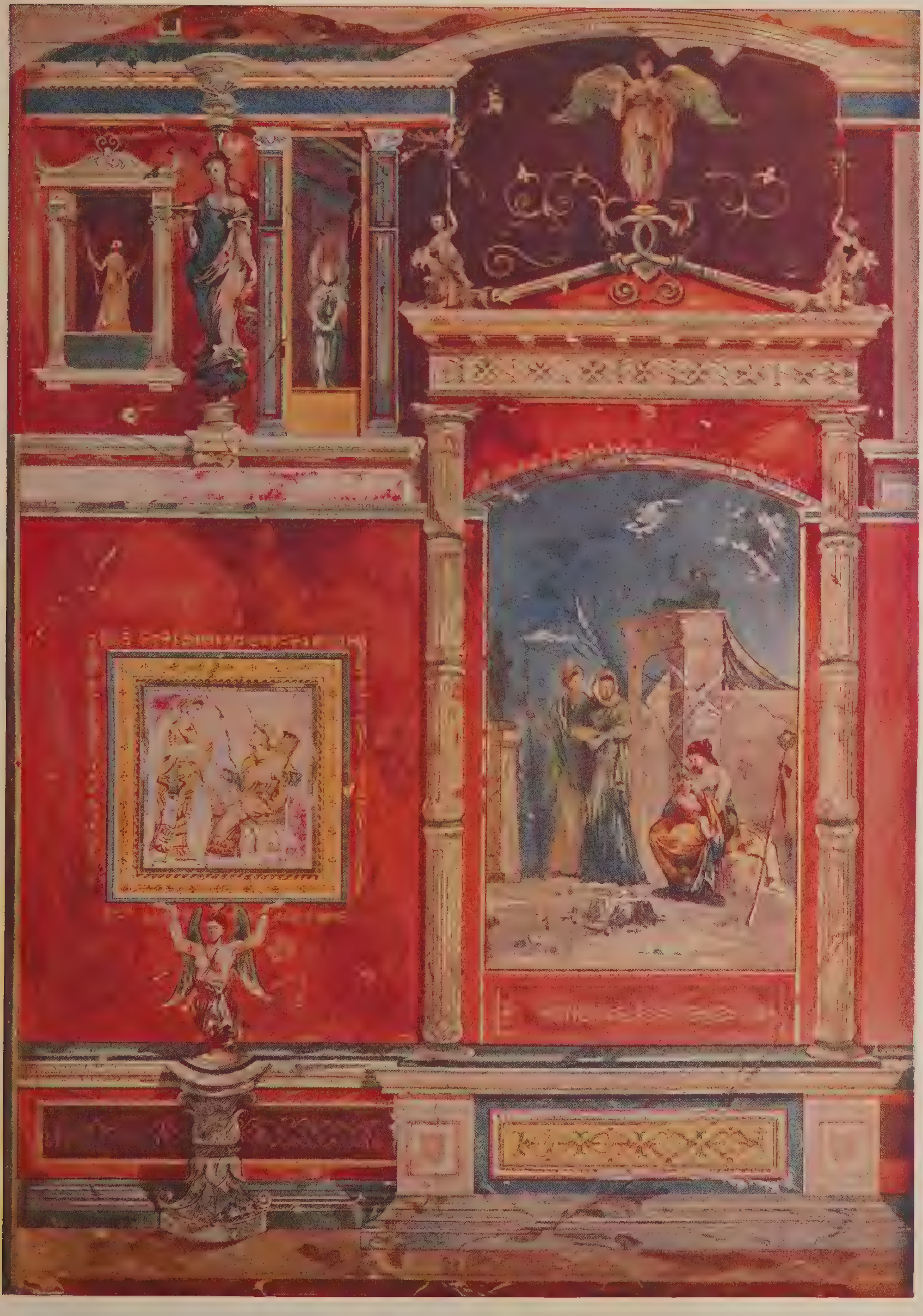
[1] One instance only of a tomb-painting is mentioned by Pausanias (vii. 22). Some fine specimens have been discovered in the Crimea, but not of a very early date; see Stephani, *Compte rendu*, &c., (St Petersburg, 1878), &c.



A WALL PAINTING IN THE MUSEO NAZIONALE, AT ROME, FROM A ROMAN VILLA DISCOVERED IN 1878, EARLY IMPERIAL STYLE

lines, though in a rapidly deteriorating style, until the introduction of a foreign—the Byzantine—element, which created a fresh starting-point on different lines. The old naturalism and survival of classical freedom of drawing is replaced by stiff, conventionally hieratic types, superior in dignity and strength to the feeble compositions produced by the degradation into which the native art of Rome had fallen. The designs of this second period of Christian art are similar to those of the mosaics, such as many at Ravenna, and also to the magnificently illuminated MSS. For some centuries there was little change or development in this Byzantine style of art, so that it is impossible in most cases to be sure from internal evidence of the date of any painting. This to some extent applies also to the works of the earlier or pagan school, though, roughly speaking, it may be said that the least meritorious pictures are the latest in date.

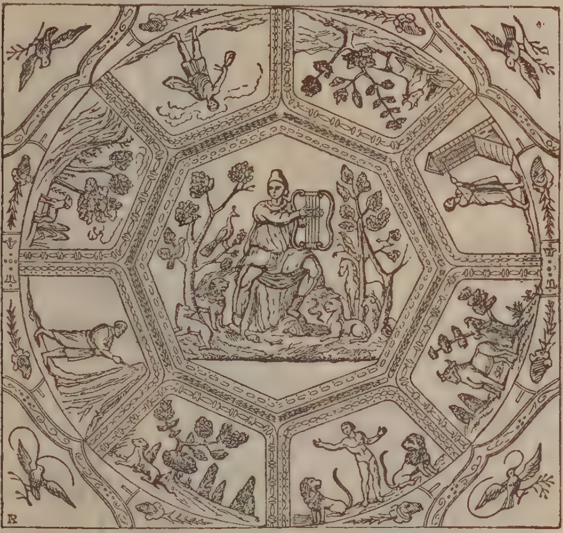


FIG. 8.—Painted Vault from the Catacombs of St Callixtus, Rome. In the centre Orpheus, to represent Christ the Good Shepherd, and round are smaller paintings of various types of Christ.

These catacomb paintings range over a long space of time; some may possibly be of the 1st or 2nd century, *e.g.* those in the cemetery of Domitilla, Rome; others are as late as the 9th century, *e.g.* some full-length figures of St Cornelius and St Cyprian in the catacomb of St Callixtus, under which earlier paintings may be traced. In execution they somewhat resemble the Etruscan tomb-paintings; the walls of the catacomb passages and chambers, excavated in soft tufa, are covered with a thin skin of white stucco, and on that the mural and ceiling paintings are simply executed in earth colours. The favourite subjects of the earliest paintings are scenes from the Old Testament which were supposed to typify events in the life of Christ, such as the sacrifice of Isaac (Christ's death), Jonah and the whale (the Resurrection), Moses striking the rock, or pointing to the manna (Christ the water of life, and the Eucharist), and many others. The later paintings deal more with later subjects, either events in Christ's life or figures of saints and the miracles they performed. A fine series of these exists in the lower church of S. Clemente in Rome, apparently dating from the 6th to the 10th centuries; among these are representations of the passion and death of Christ—subjects never chosen by the earlier Christians, except as dimly foreshadowed by the Old Testament types. When Christ Himself is depicted in the early catacomb paintings it is in glory and power, not in His human weakness and suffering.

Other early Italian paintings exist on the walls of the church of the Tre Fontane near Rome, and in the Capella di S. Urbano alla Caffarella, executed in the early part of the 11th century. The atrium of S. Lorenzo fuori le mura, Rome, and the church of the Quattro Santi Incoronati have mural paintings of the first half of the 13th century, which show no artistic improvement over those at S. Clemente four or five centuries older.

It was not in fact till the second half of the 13th century that stiff traditional Byzantine forms and colouring began to be superseded by the revival of native art in Italy by the painters of Florence, Pisa and Siena. During the first thirteen centuries of the Christian era mural painting appears to have been for the most part confined to the representation of sacred subjects. It is remarkable that during the earlier centuries council after council of the Christian Church forbade the painting of figure-subjects, and especially those of any Person of the Trinity; but in vain. In spite of the zeal of bishops and others, who sometimes with their own hands defaced the pictures of Christ on the walls of the churches, in spite of threats of excommunication, the forbidden paintings by degrees became more numerous, till the walls of almost every church throughout Christendom were decorated with whole series of pictured stories. The useless prohibition was becoming obsolete when, towards the end of the 4th century, the learned Paulinus, bishop of Nola, ordered the two basilicas which he had built at Fondi and Nola to be adorned with wall-paintings of sacred subjects, with the special object, as he says, of instructing and refining the ignorant and drunken people. These painted histories were in fact the books of the unlearned, and we can now hardly realize their value as the chief mode of religious teaching in ages when none but the clergy could read or write.

English Mural Painting.

During the middle ages, just as long before among the ancient Greeks, coloured decoration was used in the widest possible manner not only for the adornment of flat walls, but also for the enrichment of sculpture and all the fittings and architectural features of buildings, whether the material to be painted was plaster, stone, marble or wood. It was only the damp and frosts of northern climates that to some extent limited the external use of colour to the less exposed parts of the outsides of buildings. The varying tints and texture of smoothly worked stone appear to have given no pleasure to the medieval eye; and in the rare cases in which the poverty of some country church prevented its walls from being adorned with painted ornaments or pictures the whole surface of the stonework inside, mouldings and carving as well as flat wall-spaces, was covered with a thin coat of whitewash. Internal rough stonework was invariably concealed by stucco, forming a smooth ground for possible future paintings. Unhappily a great proportion of mural paintings have been destroyed, though many in a more or less mutilated state still exist in England. It is difficult (and doubly so since the so-called "restoration" of most old buildings) to realize the splendour of effect once possessed by every important medieval church. From the tiled floor to the roof all was one mass of gold and colour. The brilliance of the mural paintings and richly coloured sculpture and mouldings was in harmony with the splendour of the oak-work—screens, stalls, and roofs—all decorated with gilding and painting, while the light, passing through stained glass, softened and helped to combine the whole into one mass of decorative effect. Colour was boldly applied everywhere, and thus the patchy effect was avoided which is so often the result of the modern timid and partial use of painted ornament. Even the figure-sculpture was painted in a strong and realistic manner, sometimes by a wax encaustic process, probably the same as the *circumlitio* of classical times. In the accounts for expenses in decorating Orvieto cathedral wax is a frequent item among the materials used for painting. In one place it is mentioned that wax was supplied to Andrea Pisano (in 1345) for the decoration of the beautiful reliefs in white marble on the lower part of the west front.

From the 11th to the 16th century the lower part of the walls, generally 6 to 8 ft. from the floor, was painted with a dado—the favourite patterns till the 13th century being either a sort of sham masonry with a flower in each rectangular space (fig. 9), or a conventional representation of a curtain with regular folds stiffly treated. Above this dado ranges of pictures with figure-subjects were painted in tiers one above the other, each picture frequently surrounded by a painted frame with arch and gable of architectural design. Painted bands of chevron or other geometrical ornament till the 13th century, and flowing ornament afterwards, usually divide the tiers of pictures horizontally and form the top and bottom boundaries of the dado. In the case of a church, the end walls usually have figures to a larger scale. On the east wall of the nave over the chancel arch there was generally a large painting of the "Doom" or Last Judgment. One of the commonest subjects is a colossal figure of St Christopher (fig. 10) usually on the nave wall opposite the principal entrance—selected because the sight of a picture of this saint was supposed to bring good luck for the rest of the day. Figures were also often painted on the jambs of the windows and on the piers and soffit of the arches, especially that opening into the chancel.

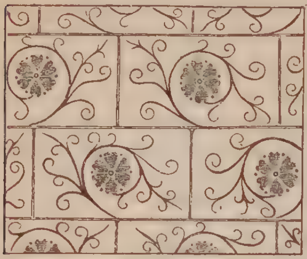


FIG. 9.—Wall-Painting of the 13th century. "Masonry pattern."

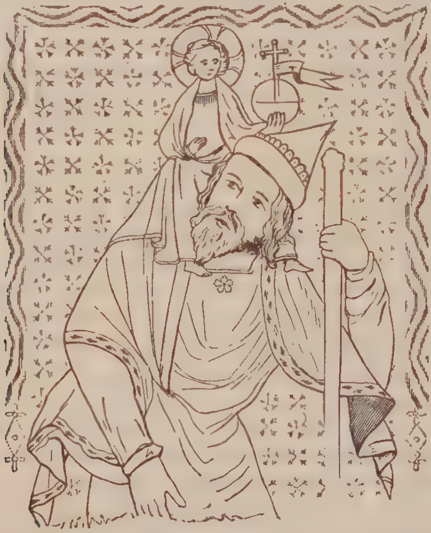


FIG. 10.—Wall-Painting of St Christopher. (Large life-size.)

The little Norman church at Kempley in Gloucestershire (date about 1100) has perhaps the best-preserved specimen of the complete early decoration of a chancel.[1] The north and south walls are occupied by figures of the twelve apostles in architectural niches, six on each side. The east wall had single figures of saints at the sides of the central window, and the stone barrel vault is covered with a representation of St John's apocalyptic vision—Christ in majesty surrounded by the evangelistic beasts, the seven candlesticks and other figures. The chancel arch itself and the jambs and mouldings of the windows have stiff geometrical designs, and over the arch, towards the nave, is a large picture of the "Doom." The whole scheme is very complete, no part of the internal plaster or stonework being undecorated with colour. Though the drawing is rude, the figures and their drapery are treated broadly and with dignity. Simple earth colours are used, painted in tempera on a plain white ground, which covers alike both the plaster of the rough walls and the smooth stone of the arches and jambs.

In the 13th century the painters of England reached a high point of artistic power and technical skill, so that paintings were produced by native artists equal, if not superior, to those of the same period anywhere on the Continent. The central paintings on the walls of the chapter-house and on the retable of the high altar of Westminster Abbey are not surpassed by any of the smaller works even of such men as Cimabue and Duccio di Buoninsegna, who were living when these Westminster paintings were executed. Unhappily, partly through the poverty and anarchy brought about by the French wars and the Wars of the Roses, the development of art in England made little progress after the beginning of the 14th century, and it was not till a time when the renaissance of art in Italy had fallen into decay that its influence reached the British shores. In the 15th century some beautiful work, somewhat affected by Flemish influence, was produced in England (fig. 11), chiefly in the form of figures painted on the oak panels of chancel and chapel screens, especially in Norfolk and Suffolk; but these cannot be said to rival the works of the Van Eycks and other painters of that time in Flanders. To return to the 13th century, the culminating period of English art in painting and sculpture, much was owed to Henry III.'s love for and patronage of the fine arts; he employed a large number of painters to decorate his various castles and palaces, especially the palace of Westminster, one large hall of which was known as the "painted

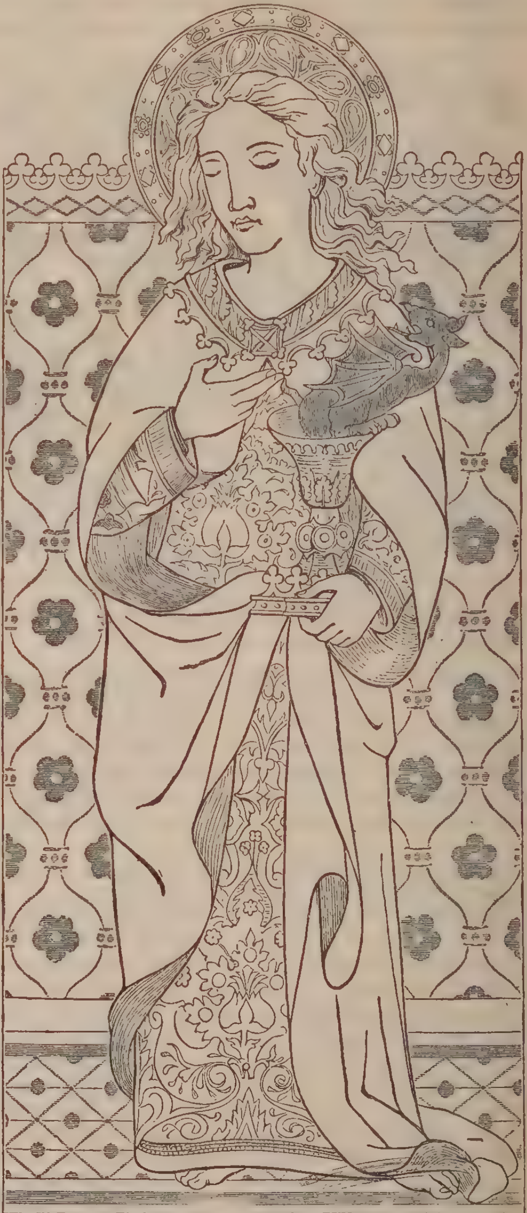


FIG. 11.—15th-century English Painting—St John the Evangelist.

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[1] See *Archaeologia*, vol. xlvi. (1880).

chamber" from the rows of fine pictures with which its walls were covered. After the 13th century the "masonry pattern" was disused for the lower parts of walls, and the chevrony and other stiff patterns for the borders were replaced by more flowing designs. The character of the painted figures became less monumental in style; greater freedom of drawing and treatment was adopted, and they cease to recall the archaic majesty and grandeur of the Byzantine mosaics.

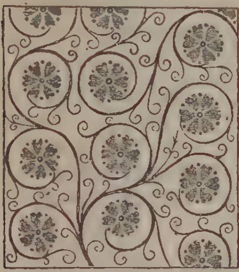

FIG. 12.—Flowing Pattern; English 14th-century Wall-Painting.

It may be noted that during the 14th century wall-spaces unoccupied by figure-subjects were often covered by graceful flowing patterns, drawn with great freedom and rather avoiding geometrical repetition. Fig. 12, from the church of Stanley St Leonard's, Gloucestershire, is a good characteristic specimen of 14th-century decoration; it is on the walls of the chancel, filling up the spaces between the painted figures; the flowers are blue, and the lines red on a white ground. In some cases the motive of the design is taken from encaustic tiles, as at Bengeo Church, Herts, where the wall is divided into squares, each containing an heraldic lion. This imitative notion occurs during all periods—masonry, hanging curtains, tiles and architectural features such as niches and canopies being very frequently represented, though always in a simple decorative fashion with no attempt at actual deception—not probably from any fixed principle that shams were wrong, but because the good taste of the medieval painters taught them that a flat unrealistic treatment gave the best and most decorative effect. Thus in the 15th and 16th centuries the commonest forms of unpictorial wall-decoration were various patterns taken from the beautiful damasks and cut velvets of Sicily, Florence, Genoa and other places in Italy, some form of the "pine-apple" or rather "artichoke" pattern being the favourite (fig. 13), a design which, developed partly from Oriental sources, and coming to perfection at the end of the 15th century, was copied and reproduced in textiles, printed stuffs and wall-papers with but little change down to the present century—a remarkable instance of survival in design. Fig. 14 is a specimen of 15th-century English decorative painting, copied from a 14th-century Sicilian silk damask. Diapers, powderings with flowers, sacred monograms and sprays of blossom were frequently used to ornament large surfaces in a simple way. Many of these are extremely beautiful (fig. 15).

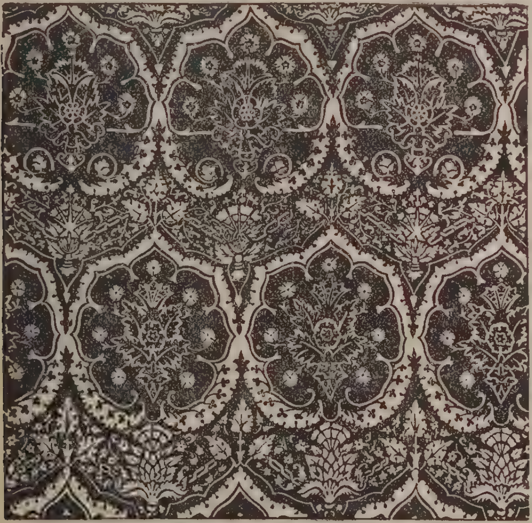

FIG. 13.—15th-century Wall-Painting, taken from a Genoese or Florentine velvet design.

Subjects of Medieval Wall-Paintings.—In churches and domestic buildings alike the usual subjects represented on the walls were specially selected for their moral and religious teaching, either stories from the Bible and Apocrypha, or from the lives of saints, or, lastly, symbolical representations setting forth some important theological truth, such as figures of virtues and vices, or the *Scala humanae salvationis*, showing the perils and temptations of the human soul in its struggle to escape hell and gain paradise—a rude foreshadowing of the great scheme worked out with such perfection by Dante in his *Commedia*. A fine example of this subject exists on the walls of Chaldon church, Surrey.[1] In the selection of saints for paintings in England, those of English origin are naturally most frequently represented, and different districts had certain local favourites. St Thomas of Canterbury was one of the most widely popular; but few examples now remain, owing to Henry VIII.'s special dislike to this saint and the strict orders that were issued for all pictures of him to be destroyed. For a similar reason most paintings of saintly popes were obliterated.

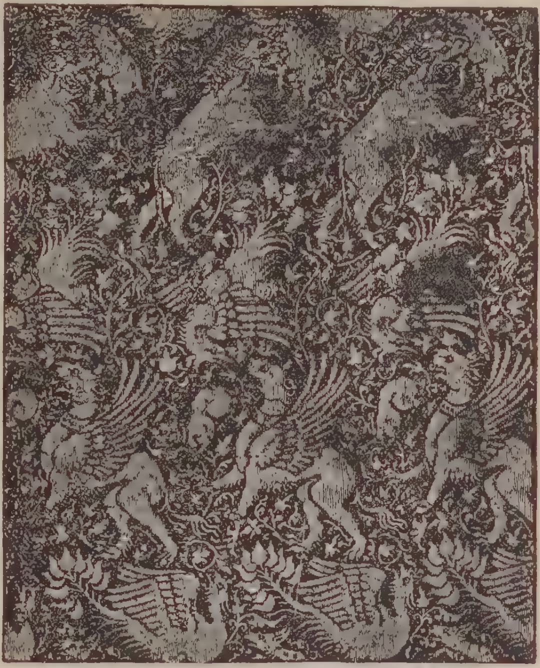

FIG. 14.—15th-century Wall-Painting, the design copied from a 13th-century Sicilian silk damask.

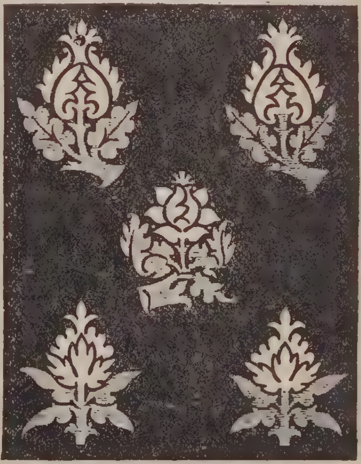

FIG. 15.—Powderings used in 15th-century Wall-Painting.

Methods of Execution.—Though Eraclius, who probably wrote before the 10th century, mentions the use of an oil-medium, yet till about the 13th century mural paintings appear to have been executed in the most simple way, in tempera mainly with earth colours applied on dry stucco; even when a smooth stone surface was to be painted a thin coat of whitening or fine *gesso* was laid as a ground. In the 13th century, and perhaps earlier, oil was commonly used both as a medium for the pigments and also to make a varnish to cover and fix tempera paintings. The Van Eycks introduced the use of *dryers* of a better kind than had yet been used, and so largely extended the application of oil-painting. Before their time it seems to have been the custom to dry wall-paintings laboriously by the use of charcoal braziers, if they were in a position where the sun could not shine upon them. This is specially recorded in the valuable series of accounts for the expenses of wall-paintings in the royal palace of Westminster during the reign of Henry III.; printed in *Vetusta monumenta*, vol. vi. (1842). All the materials used, including charcoal to dry the paintings and the wages paid to the artists, are given. The materials mentioned are *plumbum album et rubeum, viridus, vermilio, synople, ocre, azura, aurum, argentum, collis, oleum, vernix.*

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[1] See *Collections of Surrey Archaeol. Soc.* vol. v. pt. ii. (1871).

Two foreign painters were employed—Peter of Spain and William of Florence—at sixpence a day, but the English painters seem to have done most of the work and received higher pay. William, an English monk in the adjoining Benedictine abbey of Westminster, received two shillings a day. Walter of Durham and various members of the Otho family, royal goldsmiths and moneyers, worked for many years on the adornment of Henry III.'s palace and were well paid for their skill. Some fragments of paintings from the royal chapel of St Stephen are now in the British Museum. They are delicate and carefully painted subjects from the Old Testament, in rich colours, each with explanatory inscription underneath. The scale is small, the figures being scarcely a foot high. Their method of execution is curious. First the smooth stone wall was covered with a coat of red, painted in oil, probably to keep back the damp; on that a thin skin of fine gesso (stucco) has been applied, and the outlines of the figures marked with a point; the whole of the background, crowns, borders of dresses, and other ornamental parts have then been modelled and stamped with very minute patterns in slight relief, impressed on the surface of the gesso while it was yet soft. The figures have then been painted, apparently in tempera, gold leaf has been applied to the stamped reliefs, and the whole has been covered with an oil varnish. It is difficult to realize the labour required to cover large halls such as the above chapel and the "painted chamber," the latter about 83 ft. by 27 ft., with this style of decoration.

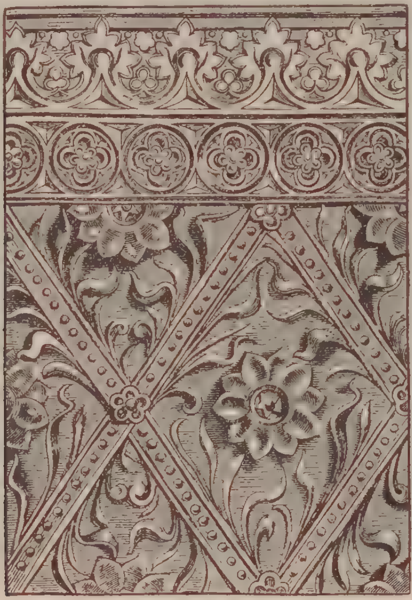

Fig. 16.—Pattern in Stamped and Moulded Plaster, decorated with gilding and transparent colours; 15th-century work.

In many cases the grounds were entirely covered with shining metal leaf, over which the paintings were executed; those parts, such as the draperies, where the metallic lustre was wanted, were painted in oil with transparent colours, while the flesh was painted in opaque tempera. The effect of the bright metal shining through the rich colouring is magnificent. This minuteness of much of the medieval wall-decoration is remarkable. Large wall-surfaces and intricate mouldings were often completely covered by elaborate gesso patterns in relief of almost microscopic delicacy (fig. 16). The cost of stamps for this is among the items in the Westminster accounts. These patterns when set and dry were further adorned with gold and colours. So also with the architectural painting; the artist was not content simply to pick out the various members of the mouldings in different colours, but he also frequently covered each bead or fillet with painted flowers and other patterns, as delicate as those in an illuminated MS.—so minute and highly-finished that they are almost invisible at a little distance, but yet add greatly to the general richness of effect. All this is neglected in modern reproductions of medieval painting, in which both touch and colour are coarse and harsh—caricatures of the old work, such as disfigure the Sainte Chapelle in Paris, and many cathedrals in France, Germany and England. Gold was never used in large quantities without the ground on which it was laid being broken up by some such delicate reliefs as that shown in fig. 16, so its effect was never dazzling. (W. Mo.; J. H. M.)

Mural painting in England fell into disuse in the 16th century, until attempts to revive it were made in the 19th century. For domestic purposes wood panelling, stamped leather, and tapestry were chiefly used as wall-coverings. In the reign of Henry VIII., probably in part through Holbein's influence, a rather coarse tempera wall-painting, German in style, appears to have been common.[1] A good example of arabesque painting of this period in black and white, rudely though boldly drawn and Holbeinesque in character, was discovered in 1881 behind the panelling in one of the canons' houses at Westminster. Other examples exist at Haddon Hall (Derbyshire) and elsewhere.

Many efforts have been made in England to revive fresco painting. The Houses of Parliament bear witness to this, the principal works there being those of William Dyce and Daniel Maclise. That of G. F. Watts, whose easel work also is generally distinguished by its mural feeling, is full of serious purpose and dignity of conception. "Buono fresco" (the painting in tempera upon a freshly laid ground of plaster while wet), "spirit fresco" or Gambier-Parry method (the painting with a spirit medium upon a specially prepared plaster or canvas ground [2]), and "water-glass" painting (wherein the method is similar to water-colour painting on a prepared plastered wall, the painting when finished being covered with a chemical solution which hardens and protects the surface), have all been tried. Other processes are also in the experimental stage, such as that known as Keim's, which has been successfully tried by Mrs Merritt in a series of mural paintings in a church at Chilworth. Unless, however, some means can be found of enabling the actual painted wall to resist the natural dampness of the English climate, it does not seem likely that true fresco painting can ever be naturalized in Great Britain. Of two of the few modern artists entrusted with important mural work in England, Ford Madox Brown and Frederick J. Shields, the former distinguished especially for his fine series of mural paintings in the Manchester town-hall, in the later paintings there adopted the modern method of painting the design upon canvas in flat oil colour, using a wax medium, and afterwards affixing the canvas to the wall by means of white lead. This is a usual method with modern decorators. Mr Shields has painted the panels of his scheme of mural decoration in the chapel of the Ascension at Bayswater, London, also upon canvas in oils, and has adopted the method of fixing them to slabs of slate facing the wall so as to avoid the risk of damp from the wall itself. Friezes and frieze panels or ceilings in private houses are usually painted upon canvas in oil and affixed to the wall or inserted upon their strainers, like pictures in a frame. (Walter Crane has used fibrous plaster panels, painting in ordinary oil colours with turpentine as a medium, as in Redcross Hall.) Recently there has been a revival of tempera painting, and a group of painters are producing works on panel and canvas painted in tempera or fresco secco, with yolk of egg as a medium, according to the practice of the early Italian painters and the directions of Cennino Cennini. A pure luminous quality of colour is produced, valuable in mural decoration and also durable, especially under varnish. (W. Cr.)

MURANO (anc. *Ammariuno*), an island in the Venetian lagoon about 1 m. north of Venice. It is 5 m. in circumference, and a large part of it is occupied by gardens. It contained 5436 inhabitants in 1901, but was once much more populous than it is at present, its inhabitants numbering 30,000. It was a favourite resort of the Venetian nobility before they began to build their villas on the mainland; and in the 15th and 16th centuries its gardens and casinos, of which some traces remain, were famous. It was here that the literary clubs of the Vigilanti, the Studiosi and the Occulti, used to meet.

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[1] Shakespeare, *Henry IV.*, Part. II. act II. sc. i: "*Falstaff.* And for thy walls, a pretty slight drollery, or the story of the prodigal, or the German hunting in *waterwork*, is worth a thousand of these bed-hangings and these fly-bitten tapestries."

[2] It was in this method that the lunettes by Lord Leighton at the Victoria and Albert Museum were painted on the plaster wall. The same painter produced a fresco at Lyndhurst Church, Hants.

The town is built upon one broad main canal, where the tidal current runs with great force, and upon several smaller ones. The cathedral, S. Donato, is a fine basilica, of the 12th century. The pavement (of 1111) is as richly inlaid as that of St Mark's, and the mosaics of the tribune are remarkable. The exterior of the tribune is beautiful, and has been successfully restored. The church of St Peter the Martyr (1509) contains a fine picture by Gentile Bellini and other works, and S. Maria degli Angeli also contains several interesting pictures. Murano has from ancient times been celebrated for its glass manufactories. When and how the art was introduced is obscure, but there are notices of it as early as the 11th century; and in 1250 Christoforo Briani attempted the imitation of agate and chalcedony. From the labours of his pupil Miotto sprang that branch of the glass trade which is concerned with the imitation of gems. In the 15th century the first crystals were made, and in the 17th the various gradations of coloured and iridescent glass were invented, together with the composition called "aventurine"; the manufacture of beads is now a main branch of the trade. The art of the glass-workers was taken under the protection of the Government in 1275, and regulated by a special code of laws and privileges; two fairs were held annually, and the export of all materials, such as alum and sand, which enter into the composition of glass was absolutely forbidden. With the decay of Venice the importance of the Murano glass-works declined; but A. Salviati (1816–1890) rediscovered many of the old processes, and eight firms are engaged in the trade, the most renowned being the Venezia Murano Company and Salviati. The municipal museum contains a collection of glass illustrating the history and progress of the art.

The island of Murano was first peopled by the inhabitants of Altino. It originally enjoyed independence under the rule of its tribunes and judges, and was one of the twelve confederate islands of the lagoons. In the 12th century the doge Vital Micheli II. incorporated Murano in Venice and attached it to the Sestiere of S. Croce. From that date it was governed by a Venetian nobleman with the title of podestà whose office lasted sixteen months. Murano, however, retained its original constitution of a greater and a lesser council for the transaction of municipal business, and also the right to coin gold and silver as well as its judicial powers. The interests of the town were watched at the ducal palace by a nuncio and a solicitor; and this constitution remained in force till the fall of the republic.

See *Venezia e le sue Lagune*; Paoletti, *Il Fiore di Venezia*; Bussolin, *Guida alle fabbriche vetrarie di Murano*; Romanin, *Storia documentata di Venezia*, i. 41.

MURAS, a tribe of South-American Indians living on the Amazon, from the Madeira to the Purus. Formerly a powerful people, they were defeated by their neighbours the Mundrucus in 1788. They are now partly civilized. Each village has a chief whose office is hereditary, but he has little power. The Muras are among the lowest of all Amazonian tribes.

MURAT, JOACHIM (1767–1815), king of Naples, younger son of an innkeeper at La Bastide-Fortunière in the department of Lot, France, was born on the 25th of March 1767. Destined for the priesthood, he obtained a bursary at the college of Cahors, proceeding afterwards to the university of Toulouse, where he studied canon law. His vocation, however, was certainly not sacerdotal, and after dissipating his money he enlisted in a cavalry regiment. In 1789 he had attained the rank of *maréchal des logis*, but in 1790 he was dismissed the regiment for insubordination. After a period of idleness, he was enrolled, through the good offices of J. B. Cavaignac, in the new Constitutional Guard of Louis XVI. (1791). In Paris he gained a reputation for his good looks, his swaggering attitude, and the violence of his revolutionary sentiments. On the 30th of May 1792, the guard having been disbanded, he was appointed sub-lieutenant in the 21st Chasseurs à cheval, with which regiment he served in the Argonne and the Pyrénées, obtaining in the latter campaign the command of a squadron. After the 9th Thermidor, however, and the proscription of the Jacobins, with whom he had conspicuously identified himself, he fell under suspicion and was recalled from the front.

Returning to Paris (1795), he made the acquaintance of Napoleon Bonaparte, another young officer out of employment, who soon gained a complete ascendancy over his vain, ambitious and unstable nature. On the 13th Vendémiaire, when Bonaparte, commissioned by Barras, beat down with cannon the armed insurrection of the Paris sections against the Convention, Murat was his most active and courageous lieutenant, and was rewarded by the lieutenant-colonelcy of the 21st Chasseurs and the appointment of first aide de camp to General Bonaparte in Italy. In the first battles of the famous campaign of 1796 Murat so distinguished himself that he was chosen to carry the captured flags to Paris. He was promoted to be general of brigade, and returned to Italy in time to be of essential service to Bonaparte at Bassano, Corona and Fort St Giorgio, where he was wounded. He was then sent on a diplomatic mission to Genoa, but returned in time to be present at Rivoli. In the advance into Tirol in the summer of 1797 he commanded the vanguard, and by his passage of the Tagliamento hurried on the preliminaries of Leoben. In 1798 he was for a short time commandant at Rome, and then accompanied Bonaparte to Egypt. At the battle of the Pyramids he led his first famous cavalry charge, and so distinguished himself in Syria that he was made general of division (October, 1799). He returned to France with Bonaparte, and on the 18th Brumaire led into the orangery of Saint Cloud the sixty grenadiers whose appearance broke up the Council of Five Hundred. After the success of the *coup d'état* he was made commandant of the consular guard, and on the 20th of January 1800 he married Caroline Bonaparte, youngest sister of the first consul. He commanded the French cavalry at the battle of Marengo, and was afterwards made governor in the Cisalpine Republic. As commander of the army of observation in Tuscany he forced the Neapolitans to evacuate the Papal States and to accept the treaty of Florence (March 28, 1801). In January 1804 he was given the post of governor of Paris, and in this capacity appointed the military commission by which the duc d'Enghien was tried and shot (March 20); in May he was made marshal of the empire; in February 1805 he was made grand admiral, with the title of prince, and invested with the grand eagle of the Legion of Honour. He commanded the cavalry of the Grand Army in the German campaign of 1805, and was so conspicuous at Austerlitz that Napoleon made him grand duke of Berg and Cleves (March 15, 1806). He commanded the cavalry at Jena, Eylau, and Friedland, and in 1808 was made general-in-chief of the French armies in Spain. He entered Madrid on the 25th of March, and on the 2nd of May suppressed an insurrection in the city. He did much to prepare the events which ended in the abdication of Charles IV. and Ferdinand VII. at Bayonne; but the hopes he had cherished of himself receiving the crown of Spain were disappointed. On the 1st of August, however, he was appointed by Napoleon to the throne of Naples, vacated by the transference of Joseph Bonaparte to Spain.

King Joachim Napoleon, as he styled himself, entered Naples in September, his handsome presence and open manner gaining him instantaneous popularity. Almost his first act as king was to attack Capri, which he wrested from the British; but, this done, he returned to Naples and devoted himself to establishing his kingship according to his ideas, a characteristic blend of the vulgarity of a *parvenu* with the essential principles of the Revolution. He dazzled the *lazzaroni* with the extravagant splendour of his costumes; he set up a sumptuous court, created a new nobility, nominated marshals. With an eye to the overthrow of his legitimate rival in Sicily, he organized a large army and even a fleet; but he also swept away the last relics of the effete feudal system and took efficient measures for suppressing brigandage. From the first his relations with Napoleon were strained. The emperor upbraided him sarcastically for his "monkey tricks" (*singeries*); Murat ascribed to the deliberate ill-will of the French generals who served with him, and even to Napoleon, the failure of his attack on Sicily in 1810. He resented his subordination to the emperor, and early began his pose as an Italian king by demanding the withdrawal of the French troops from Naples and naturalization as Neapolitans of all Frenchmen in the service of the state (1811). Napoleon, of course, met this demand with a curt refusal. A breach between the brothers-in-law was only averted by the Russian campaign of 1812 and Napoleon's invitation to Murat to take command of the cavalry in the Grand Army. This was a call which appealed to all his strongest military instincts, and he obeyed it. During the disastrous retreat he showed his usual headstrong courage; but in the middle of December he suddenly threw up his command and returned to Naples. The reason of this was the suspicion, which had been growing on him for two years past, that Napoleon was preparing for him the fate of the king of Holland, and that his own wife, Queen Caroline, was plotting with the emperor for his dethronement. To Marshal Davout, who pointed out to him that he was only king of Naples "by grace of the emperor and the blood of Frenchmen," he replied that he was king of Naples as the emperor of Austria was emperor of Austria, and that he could do as he liked. He was, in fact, already dreaming of exchanging his position of a vassal king of the French Empire for that of a national Italian king. In the enthusiastic reception that awaited him on his return to Naples on the 4th of February there was nothing to dispel these illusions. All the Italian parties flocked round him, flattering and cajoling him: the patriots, because he seemed to them loyal and glorious enough to assume the task of Italian unification; the partisans of the dispossessed princes, because they looked upon him as a convenient instrument and as simple enough to be made an easy dupe.

From this moment dates the importance of Murat in the history of Europe during the next few years. He at once, without consulting his minister of foreign affairs, despatched Prince Cariati on a confidential mission to Vienna; if Austria would secure the renunciation of his rights by King Ferdinand and guarantee the possession of the kingdom of Naples to himself, he would place his army at her disposal and give up his claims to Sicily. Austria herself, however, had not as yet broken definitively with Napoleon, and before she openly joined the Grand Alliance, after the illusory congress of Prague, many things had happened to make Murat change his mind. He was offended by Napoleon's bitter letters and by tales of his slighting comments on himself; he was alarmed by the emperor's scarcely veiled threats; but after all he was a child of the Revolution and a born soldier, with all the soldier's instinct of loyalty to a great leader, and he grasped eagerly at any excuse for believing that Napoleon, in the event of victory, would maintain him on his throne. Then came the emperor's advance into Germany, supported as yet by his allies of the Rhenish Confederation. On the fatal field of Leipzig Murat once more fought on Napoleon's side, leading the French squadrons with all his old valour and dash. But this crowning catastrophe was too much for his wavering faith. On the evening of the 16th of October, the first day of the battle, Metternich found means to open a separate negotiation with him: Great Britain and Austria would, in the event of Murat's withdrawal from Napoleon's army and refusal to send reinforcements to the viceroy of Italy, secure the cession to him of Naples by King Ferdinand, guarantee him in its possession, and obtain for him further advantages in Italy. To accept the Austrian advances seemed now his only chance of continuing to be a king. At Erfurt he asked and obtained the emperor's leave to return to Naples; "our adieux," he said, "were not over-cordial."

He reached Naples on the 4th of November and at once informed the Austrian envoy of his wish to join the Allies, suggesting that the Papal States, with the exception of Rome and the surrounding district, should be made over to him as his reward. On the 31st of December Count Neipperg, afterwards the lover of the empress Marie Louise, arrived at Naples with powers to treat. The result was the signature, on the 11th of January 1814, of a treaty by which Austria guaranteed to Murat the throne of Naples and promised her good offices to secure the assent of the other Allies. Secret additional articles stipulated that Austria would use her good offices to secure the renunciation by Ferdinand of his rights to Naples, in return for an indemnity to hasten the conclusion of peace between Naples and Great Britain, and to augment the Neapolitan kingdom by territory embracing 400,000 souls at the expense of the states of the Church.

The project of the treaty having been communicated to Castlereagh, he replied by expressing the willingness of the British government to conclude an armistice with "the person exercising the government of Naples" (Jan. 22), and this was accordingly signed on the 3rd of February by Bentinck. It was clear that Great Britain had no intention of ultimately recognizing Murat's right to reign. As for Austria, she would be certain that Murat's own folly would, sooner or later, give her an opportunity for repudiating her engagements. For the present the Neapolitan alliance would be invaluable to the Allies for the purpose of putting an end to the French dominion in Italy. The plot was all but spoilt by the prince royal of Sicily, who in an order of the day announced to his soldiers that their legitimate sovereign had not renounced his rights to the throne of Naples (Feb. 20); from the Austrian point of view it was compromised by a proclamation issued by Bentinck at Leghorn on the 14th of March, in which he called on the Italians to rise in support of the "great cause of their fatherland." From Dijon Castlereagh promptly wrote to Bentinck (April 3) to say that the proclamation of the prince of Sicily must be disavowed, and that if King Ferdinand did not behave properly Great Britain would recognize Murat's title. A letter from Metternich to Marshal Bellegarde, of the same place and date, insisted that Bentinck's operations must be altered; the last thing that Austria desired was an Italian national rising.

It was, indeed, by this time clear to the allied powers that Murat's ambition had o'erleaped the bounds set for them. "Murat, a true son of the Revolution," wrote Metternich, in the same letter, "did not hesitate to form projects of conquest when all his care should have been limited to simple calculations as to how to preserve his throne. . . . He dreamed of a partition of Italy between him and us. . . . When we refused to annex all Italy north of the Po, he saw that his calculations were wrong, but refused to abandon his ambitions. His attitude is most suspicious." "Press the restoration of the grand-duke in Tuscany," wrote Castlereagh to Bentinck; "this is the true touchstone of Murat's intentions. We must not suffer him to carry out his plan of extended dominion; but neither must we break with him and so abandon Austria to his augmented intrigues."

Meanwhile, Murat had formally broken with Napoleon, and on the 16th of January the French envoy quitted Naples. But the treason by which he hoped to save his throne was to make its loss inevitable. He had betrayed Napoleon, only to be made the cat's-paw of the Allies. Great Britain, even when condescending to negotiate with him, had never recognized his title; she could afford to humour Austria by holding out hopes of ultimate recognition, in order to detach him from Napoleon; for Austria alone of the Allies was committed to him, and Castlereagh well knew that, when occasion should arise, her obligations would not be suffered to hamper her interests. With the downfall of Napoleon Murat's defection had served its turn; moreover, his equivocal conduct during the campaign in Italy[1] had blunted the edge of whatever gratitude the powers may have been disposed to feel; his ambition to unite all Italy south of the Po under his crown was manifest, and the statesmen responsible for the re-establishment of European order were little likely to do violence to their legitimist principles in order to maintain on his throne a revolutionary sovereign who was proving himself so potent a centre of national unrest.

At the very opening of the congress of Vienna Talleyrand, with astounding effrontery, affected not to know "the man" who had been casually referred to as "the king of Naples"; and he made it the prime object of his policy in the weeks that followed to secure the repudiation by the powers of Murat's title, and the restoration of the Bourbon king. The powers, indeed, were very ready to accept at least the principle of this policy. "Great Britain," wrote Castlereagh to Lord Liverpool on the 3rd of September from Geneva, "has no objection, but the reverse, to the restoration of the Bourbons in Naples."[1] Prussia saw in Murat the protector of the malcontents in Italy.[2] Alexander I. of Russia had no sympathy for any champion of Liberalism in Italy save himself. Austria confessed "sub sigillo" that she shared "His Most Christian Majesty's views as to the restoration of ancient dynasties."[3] The main difficulties in the way were Austria's treaty obligations and the means by which the desired result was to be obtained.

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[1] He had contributed to the defeats of the viceroy Prince Eugène in January and February 1814, but did not show any eagerness to press his victories to the advantage of the Allies, contenting himself with occupying the principality of Benevento.

Talleyrand knew well that Austria, in the long run, would break faith with Murat and prefer a docile Bourbon on the throne of Naples to this incalculable child of the Revolution; but he had his private reasons for desiring to "score off" Metternich, the continuance of whose quasidiplomatic *liaison* with Caroline Murat he rightly suspected. He proposed boldly that, since Austria, in view of the treaty of Jan. 11, 1814, was naturally reluctant to undertake the task, the restored Bourbon king of France should be empowered to restore the Bourbon king of Naples by French arms, thus reviving once more the ancient Habsburg-Bourbon rivalry for dominion in Italy.[4]

Metternich, with characteristic skill, took advantage of this situation at once to checkmate France and to disembarrass Austria of its obligations to Murat. While secretly assuring Louis XVIII., through his confidant Blacas, that Austria was in favour of a Bourbon restoration in Naples, he formally intimated to Talleyrand that a French invasion of Italian soil would mean war with Austria.[5] To Murat, who had appealed to the treaty of 1814, and demanded a passage northward for the troops destined to oppose those of Louis XVIII., he explained that Austria, by her ultimatum to France, had already done all that was necessary, that any movement of the Neapolitan troops outside Naples would be a useless breach of the peace of Italy, and that it would be regarded as an attack on Austria and a rupture of the alliance. Murat's suspicions of Austrian sincerity were now confirmed;[6] he realized that there was no question now of his obtaining any extension of territory at the expense of the states of the Church, and that in the Italy as reconstructed at Vienna his own position would be intolerable. Thus the very motives which had led him to betray Napoleon now led him to break with Austria. He would secure his throne by proclaiming the cause of united Italy, chasing the Austrians from the peninsula, and establishing himself as a national king.

To contemporary observers in the best position to judge the enterprise seemed by no means hopeless. Lord William Bentinck, the commander of the English forces in Italy, wrote to Castlereagh[7] that, "having seen more of Italy," he doubted whether the whole force of Austria would be able to expel Murat; "he has said clearly that he will raise the whole of Italy; and there is not a doubt that under the standard of Italian independence the whole of Italy will rally." This feeling, continued Bentinck, was due to the foolish and illiberal conduct of the restored sovereigns; the inhabitants of the states occupied by the Austrian troops were "discontented to a man"; even in Tuscany "the same feeling and desire" universally prevailed. All the provinces, moreover, were full of unemployed officers and soldiers who, in spite of Murat's treason, would rally to his standard, especially as he would certainly first put himself into communication with Napoleon in Elba; while, so far as Bentinck could hear of the disposition of the French army, it would be "dangerous to assemble it anywhere or for any purpose." The urgency of the danger was, then, fully realized by the powers even before Napoleon's return from Elba; for they were well aware of Murat's correspondence with him. On the first news of Napoleon's landing in France, the British government wrote to Wellington[8] that this event together with "the proofs of Murat's treachery" had removed "all remaining scruples" on their part, and that they were now "prepared to enter into a concert for his removal," adding that Murat should, in the event of his resigning peaceably, receive "a pension and all consideration." The rapid triumph of Napoleon, however, altered this tone. "Bonaparte's successes have altered the situation," wrote Castlereagh to Wellington on the 24th, adding that Great Britain would enter into a treaty with Murat, if he would give guarantees "by a certain redistribution of his forces" and the like, and that in spite of Napoleon's success he would be "true to Europe." In a private letter enclosed Castlereagh suggested that Murat might send an auxiliary force to France, where "his personal presence would be unseemly."[9]

Clearly, had King Joachim played his cards well he had the game in his hands. But it was not in his nature to play them well. He should have made the most of the chastened temper of the Allies, either to secure favourable terms from them, or to hold them in play until Napoleon was ready to take the field. But his head had been turned by the flatteries of the "patriots"; he believed that all Italy would rally to his cause, and that alone he would be able to drive the "Germans" over the Alps, and thus, as king of united Italy, be in a position to treat on equal terms with Napoleon, should he prove victorious; and he determined to strike without delay. On the 23rd the news reached Metternich at Vienna that the Neapolitan troops were on the march to the frontier. The Allies at once decided to commission Austria to deal with Murat; in the event of whose defeat, Ferdinand IV. was to be restored to Naples, on promising a general amnesty and giving guarantees for a "reasonable" system of government.[10]

Meanwhile, in Naples itself there were signs enough that Murat's popularity had disappeared. In Calabria the indiscriminate severity of General Manhès in suppressing brigandage had made the government hated; in the capital the general disaffection had led to rigorous policing, while conscripts had to be dragged in chains to join their regiments.[11] In these circumstances an outburst of national enthusiasm for King Joachim was hardly to be expected; and the campaign in effect proved a complete fiasco. Rome and Bologna were, indeed, occupied without serious opposition; but on the 12th of April Murat's forces received a check from the advancing Austrians at Ferrara and on the 2nd of May were completely routed at Tolentino. The

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[1] F.O. Vienna Congress, vii.

[2] Mem. of Hardenberg, F.O. Cong. Pruss. Arch. 20. Aug. 14–June 15.

[3] Metternich to Bombelles. Jan. 13, 1815, enclosed in Castlereagh to Liverpool of Jan. 25. F.O. Congr. Vienna, xi.

[4] Sorel, viii. 411 seq.

[5] Cf. a "most secret" communication to be made to M. de Blacas (in Metternich to Bombelles, Vienna, Jan. 13, 1815). Murat's aggressive attitude, and the unrest in Italy, are largely due to the threatening attitude of France. . . . H.I.M. is not prepared to risk a rising of Italy under "the national flag." How will France coerce Naples? By sending an army into Italy across our states, which would thus become infected with revolutionary views? . . . The emperor could not allow such an expedition. When Italy is settled—and we will not allow Murat to keep the Marches . . . he will lose prestige, and then . . . will be the time for Austria to give effect to the views which, all the time, she shares with His Most Christian Majesty." (In Castlereagh to Liverpool, "private," Jan. 25, 1815. F.O. Vienna Congr. xi.)

[6] That they were fully justified is clear from the following extract from a letter of Metternich to Bombelles at Paris (dated Vienna, Jan. 13, 1815). "Whether Joachim or a Bourbon reigns at Naples is for *us* a very subordinate question. . . . When Europe is established on solid foundations the fate of Joachim will no longer be problematical, but do not let us risk destroying Austria and France and Europe, in order to solve this question at the worst moment it would be put on the *tapis*. . . . This is no business of the Congress, but *let the Bourbon Powers declare that they maintain their claims*." (In Castlereagh's private letter to Lord Liverpool, Jan. 15, 1815, F.O. Vienna Congr. xi.)

[7] Letter dated Florence, Jan. 7, 1815. F.O. Vienna Congr. xi.

[8] F.O. Vienna Congr. xii., Draft to Wellington dated March 12.

[9] F.O. Vienna Congr. xii.

[10] Ibid. Wellington to Castlereagh, Vienna, March 25.

[11] F.O. Cong. xi.; Munster to Castlereagh, Naples, Jan. 22.

Austrians advanced on Naples, when Ferdinand IV. was duly restored, while Queen Caroline and her children were deported to Trieste.

Murat himself escaped to France, where his offer of service was contemptuously refused by Napoleon. He hid for a while near Toulon, with a price upon his head; then, after Waterloo, refusing an asylum in England, he set out for Corsica (August). Here he was joined by a few rash spirits who urged him to attempt to recover his kingdom. Though Metternich offered to allow him to join his wife at Trieste and to secure him a dignified position and a pension, he preferred to risk all on a final throw for power. On the 28th of September he sailed for Calabria with a flotilla of six vessels carrying some 250 armed men. Four of his ships were scattered by a storm; one deserted him at the last moment, and on the 8th of October he landed at Pizzo with only 30 companions. Of the popular enthusiasm for his cause which he had been led to expect there was less than no sign, and after a short and unequal contest he was taken prisoner by a captain named Trenta-Capilli, whose brother had been executed by General Manhes. He was imprisoned in the fort of Pizzo, and on the 13th of October 1815 was tried by court-martial, under a law of his own, for disturbing the public peace, and was sentenced to be shot in half an hour. After writing a touching letter of farewell to his wife and children, he bravely met his fate, and was buried at Pizzo.

Though much good may be said of Murat as a king sincerely anxious for the welfare of his adopted country, his most abiding title to fame is that of the most dashing cavalry leader of the age. As a man he was rash, hot-tempered and impetuously brave; he was adored by his troopers who followed their idol, the "golden eagle," into the most terrible fire and against the most terrible odds. Napoleon lived to regret his refusal to accept his services during the Hundred Days, declaring that Murat's presence at Waterloo would have given more concentrated power to the cavalry charges and might possibly have changed defeat into victory.

By his wife Maria Annunciata Carolina Murat had two sons. The elder, Napoleon Achille Murat (1801–1847), during his father's reign prince royal of the Two Sicilies, emigrated about 1821 to America, and settled near Tallahassee, Florida, where in 1826–1838 he was postmaster. In 1826 he married a great-niece of Washington. He published *Lettres d'un citoyen des États-Unis à un de ses amis d'Europe* (Paris, 1830); *Esquisse morale et politique des États-Unis* (ibid. 1832); and *Exposition des principes du gouvernement républicain tel qu'il a été perfectionné en Amérique* (ibid. 1833). He died in Florida on the 15th of April 1847.

The second son, Napoleon Lucien Charles Murat (1803–1878), who was created prince of Ponte Corvo in 1813, lived with his mother in Austria after 1815, and in 1824 started to join his brother in America, but was shipwrecked on the coast of Spain and held for a while a prisoner. Arriving in 1825, two years later he married in Baltimore a rich American, Georgina Frazer (d. 1879); but her fortune was lost, and for some years his wife supported herself and him by keeping a girls' school. After several abortive attempts to return to France, the revolution of 1848 at last gave him his opportunity. He was elected a member of the Constituent Assembly and of the Legislative Assembly (1849), was minister plenipotentiary at Turin from October 1849 to March 1850, and after the *coup d'état* of the 2nd of December 1851 was made a member of the consultative commission. On the proclamation of the Empire, he was recognized by Napoleon III. as a prince of the blood royal, with the title of Prince Murat, and, in addition to the payment of 2,000,000 fr. of debts, was given an income of 150,000 fr. As a member of the Senate he distinguished himself in 1861 by supporting the temporal power of the pope, but otherwise he played no conspicuous part. The fall of the Empire in September 1870 involved his retirement into private life. He died on the 10th of April 1878, leaving three sons and two daughters. (1) Joachim, Prince Murat (1834–1901), in 1854 married Maley Berthier, daughter of the Prince de Wagram, who bore him a son, Joachim (b. 1856), who succeeded him as head of the family, and two daughters, of whom the younger, Anna (b. 1863), became the wife of the Austrian minister Count Goluchowski. (2) Achille (1847–1895), married Princess Dadian of Mingrelia. (3) Louis (b. 1851), married in 1873 to the widowed Princess Eudoxia Orbeliani (*née* Somov), was for a time orderly officer to Charles XV. of Sweden. (4) Caroline (b. 1832), married in 1850 Baron Charles de Chassiron and in 1872 Mr John Garden (d. 1885). (5) Anna (b. 1841), married in 1865 Antoine de Noailles, duc de Mouchy.

Authorities.—See A. Sorel, *L'Europe et la révolution française* (8 vols., 1885–1892) *passim*, but especially vol. viii. for Murat's policy after the 1812; Helfert, *Joachim Murat, seine letzten Kämpfe und sein Ende* (Vienna, 1878); G. Romano, *Ricordi muratiani* (Pavia, 1890); *Correspondance de Joachim Murat, Juillet 1791–Juillet 1808*, ed. A. Lumbroso (Milan, 1899); Count Murat, *Murat, lieutenant de l'empereur en Espagne* (Paris, 1897); Guardione, *Gioacchino Murat in Italia* (Palermo, 1899); M. H. Weil, *Prince Eugène et Murat* (5 vols., Paris, 1901–1904); Chavenon and Saint-Yves, *Joachim Murat* (Paris, 1905); Lumbroso, *L'Agonia di un regno; Gioacchino Murat al Pizzo* (Milan, 1904). See also the bibliography to Napoleon I. (W. A. P.)

MURATORI, LUDOVICO ANTONIO (1672–1750), Italian scholar, historian and antiquary, was born of poor parents at Vignola in the duchy of Modena on the 21st of October 1672. While young he attracted the attention of Father Bacchini, the librarian of the duke of Modena, by whom his literary tastes were turned toward historical and antiquarian research. Having taken minor orders in 1688, Muratori proceeded to his degree of doctor *in utroque jure* before 1694, was ordained priest in 1695 and appointed by Count Carlo Borromeo one of the doctors of the Ambrosian library at Milan. From manuscripts now placed under his charge he made a selection of materials for several volumes (*Anecdota*), which he published with notes. The reputation he acquired was such that the duke of Modena offered him the situation of keeper of the public archives of the duchy. Muratori hesitated, until the offer of the additional post of librarian, on the resignation of Father Bacchini, determined him in 1700 to return to Modena. The preparation of numerous valuable tracts on the history of Italy during the middle ages, and of dissertations and discussions on obscure points of historical and antiquarian interest, as well as the publication of his various philosophical, theological, legal, poetical and other works absorbed the greater part of his time. These brought him into communication with the most distinguished scholars of Italy, France and Germany. But they also exposed him in his later years to envy. His enemies spread abroad the rumour that the pope, Benedict XIV., had discovered in his writings passages savouring of heresy, even of atheism. Muratori appealed to the pope, repudiating the accusation. His Holiness assured him of his protection, and, without expressing his approbation of the opinions in question of the learned antiquary, freed him from the imputations of his enemies. Muratori died on the 23rd of January 1750, and was buried with much pomp in the church of Santa Maria di Pomposa, in connexion with which he had laboured as parish priest for many years. His remains were removed in 1774 to the church of St Augustin.

Muratori is rightly regarded as the "father of Italian history." This is due to his great collection, *Rerum italicarum scriptores*, to which he devoted about fifteen years' work (1723–1738). The gathering together and editing some 25 huge folio volumes of texts was followed by a series of 75 dissertations on medieval Italy (*Antiquitates italicae medii aevi*, 1738–1742, 6 vols. folio). To these he added a *Novus thesaurus inscriptionum* (4 vols., 1739–1743), which was of great importance in the development of epigraphy. Then, anticipating the action of the learned societies of the 19th century, he set about a popular treatment of the historical sources he had published. These *Annali d'Italia* (1744–1749) reached 12 volumes, but were imperfect and are of little value. In addition to this national enterprise (the *Scriptores* were published by the aid of the Società palatina of Milan) Muratori published *Anecdota ex ambrosianae bibliothecae codd.* (2 vols. 4to, Milan, 1697, 1698; Padua, 1713); *Anecdota graeca* (3 vols. 4to, Padua, 1709); *Antichita Estens*

(2 vols. fol., Modena, 1717); *Vita e rime di F. Petrarca* (1711), and *Vita ed opere di L. Castelvetro* (1727).

In biblical scholarship Muratori is chiefly known as the discoverer of the so-called Muratorian Canon, the name given to a fragment (85 lines) of early Christian literature, which he found in 1740, embedded in an 8th-century codex which forms a compendium of theological tracts followed by the five early Christian creeds. The document contains a list of the books of the New Testament, a similar list concerning the Old Testament having apparently preceded it. It is in barbarous Latin which has probably been translated from original Greek—the language prevailing in Christian Rome until *c.* 200. There is little doubt that it was composed in Rome and we may date it about the year 190. Lightfoot inclined to Hippolytus as its author. It is the earliest document known which enumerates the books in order.

The first line of the fragment is broken and speaks of the Gospel of St Mark, but there is no doubt that its compiler knew also of St Matthew. Acts is ascribed to St Luke. He names thirteen letters of St Paul but says nothing of the Epistle to the Hebrews. The alleged letters of Paul to the Laodiceans and Alexandrians he rejects, "for gall must not be mixed with honey." The two Epistles of Peter and the Epistle of James are not referred to, but that of Jude and two of John are accepted. He includes the Apocalypse of John and also the Apocalypse of Peter. The *Shepherd* of Hermas he rejects as not of apostolic origin, but this test of canonicity is not consistently applied for he allows the "Wisdom written by the friends of Solomon in his honour." He rejects the writings of the Gnostics Valentinus and Basilides, and of Montanus.

The list is not an authoritative decree, but a private register of what the author considers the prevailing Christian sentiment in his neighbourhood. He notes certain differences among the Gospels, because not all the evangelists were eye-witnesses of the life of Jesus; yet Mark and Luke respectively have behind them the authority of Peter and of Paul, who is thus regarded as on a footing with the Twelve. The Fourth Gospel was written by John at the request of the other apostles and the bishops on the basis of a revelation made to Andrew. The letters of Paul are written to four individuals and to seven different churches, like the seven letters in the Apocalypse of John.

It is interesting to notice the coincidence of his list with the evidence gained from Tertullian for Africa and from Irenaeus for Gaul and indirectly for Asia Minor. Before the year 200 there was widespread agreement in the sacred body of apostolic writings read in Christian churches on the Lord's Day along with the Old Testament.

Muratori's *Letters*, with a *Life* prefixed, were published by Lazzari, (2 vols., Venice, 1783). His nephew, F. G. Muratori, also wrote a *Vita del celebre Ludov. Ant. Muratori* (Venice, 1756). See also A. G. Spinelli "Bibliographia delle lettere e stampa di L. A. Muratori" in *Bolletino dell' instituto storico italiano* (1888), and Carducci's preface to the new *Scriptores*. The Muratorian Canon is given in full with a translation in H. M. Gwatkin's *Selections from Early Christian Writers*. It is also published as No. 1 of H. Lietzmann's *Kleine Texte für theologische Vorlesungen* (Bonn, 1902). See also *Journal of Theological Studies*, viii. 537.

MURAVIEV, MICHAEL NIKOLAIEVICH, Count (1845–1900), Russian statesman, was born on the 19th of April 1845. He was the son of General Count Nicholas Muraviev (governor of Grodno), and grandson of the Count Michael Muraviev, who became notorious for his drastic measures in stamping out the Polish insurrection of 1863 in the Lithuanian provinces. He was educated at a secondary school at Poltava, and was for a short time at Heidelberg University. In 1864 he entered the chancellery of the minister for foreign affairs at St Petersburg, and was soon afterwards attached to the Russian legation at Stuttgart, where he attracted the notice of Queen Olga of Württemberg. He was transferred to Berlin, then to Stockholm, and back again to Berlin. In 1877 he was second secretary at the Hague. During the Russo-Turkish War of 1878 he was a delegate of the Red Cross Society in charge of an ambulance train provided by Queen Olga of Württemberg. After the war he was successively first secretary at Paris, chancellor of the embassy at Berlin, and then minister at Copenhagen. In Denmark he was brought much into contact with the imperial family, and on the death of Prince Lobánov in 1897 he was appointed by the Tsar Nicholas II. to be his minister of foreign affairs. The next three and a half years were a critical time for European diplomacy. The Chinese and Cretan questions were disturbing factors. As regards Crete, Count Muraviev's policy was vacillating; in China his hands were forced by Germany's action at Kiaochow. But he acted with singular *légèreté* with regard at all events to his assurances to Great Britain respecting the leases of Port Arthur and Talienwan from China; he told the British ambassador that these would be "open ports," and afterwards essentially modified this pledge. When the Tsar Nicholas inaugurated the Peace Conference at the Hague, Count Muraviev extricated his country from a situation of some embarrassment; but when, subsequently, Russian agents in Manchuria and at Peking connived at the agitation which culminated in the Boxer rising of 1900, the relations of the responsible foreign minister with the tsar became strained. Muraviev died suddenly on the 21st of June 1900, of apoplexy, brought on, it was said, by a stormy interview with the tsar.

MURCHISON, SIR RODERICK IMPEY (1792–1871), British geologist, was born at Tarradale, in eastern Ross, Scotland, on the 19th of February 1792. His father, Kenneth Murchison (d. 1796), came of an old Highland clan in west Ross-shire, and having been educated as a medical man, acquired a fortune in India; while still in the prime of life he returned to Scotland, where, marrying one of the Mackenzies of Fairburn, he purchased the estate of Tarradale and settled for a few years as a resident Highland landlord. Young Murchison left the Highlands when three years old, and at the age of seven was sent to the grammar school of Durham, where he remained for six years. He was then placed at the military college, Great Marlow, to be trained for the army. With some difficulty he passed the examinations, and at the age of fifteen was gazetted ensign in the 36th regiment. A year later (1808) he landed with Wellesley in Galicia, and was present at the actions of Roriça and Vimiera. Subsequently under Sir John Moore he took part in the retreat to Corunna and the final battle there. This was his only active service. The defeat of Napoleon at Waterloo seeming to close the prospect of advancement in the military profession, Murchison, after eight years of service, quitted the army, and married the daughter of General Hugonin, of Nursted House, Hampshire. With her he then spent rather more than two years on the Continent, particularly in Italy, where her cultivated tastes were of signal influence in guiding his pursuits. He threw himself with all the enthusiasm of his character into the study of art and antiquities, and for the first time in his life tasted the pleasures of truly intellectual pursuits.

Returning to England in 1818, he sold his paternal property in Ross-shire and settled in England, where he took to field sports. He soon became one of the greatest fox-hunters in the midland counties; but at last, getting weary of such pursuits and meeting Sir Humphry Davy, who urged him to turn his energy to science, he was induced to attend lectures at the Royal Institution. This change in the current of his occupations was much helped by the sympathy of his wife, who, besides her artistic acquirements, took much interest in natural history. Eager and enthusiastic in whatever he undertook, he was fascinated by the young science of geology. He joined the Geological Society of London and soon showed himself one of its most active members, having as his colleagues there such men as Sedgwick, W. D. Conybeare, W. Buckland, W. H. Fitton and Lyell. Exploring with his wife the geology of the south of England, he devoted special attention to the rocks of the north-west of Sussex and the adjoining parts of Hants and Surrey, on which, aided by Fitton, he wrote his first scientific paper, read to the society in 1825. Though he had reached the age of thirty-two before he took any interest in science, he developed his taste and increased his knowledge so rapidly that in the first three years of his scientific career he had explored large parts of England and Scotland, had obtained materials for three important memoirs, as well as for two more written in conjunction with Sedgwick, and had risen to be a prominent member of the Geological Society and one of its two secretaries. Turning his attention for a little to Continental geology, he explored with Lyell the volcanic region of Auvergne, parts of southern France, northern Italy, Tirol and Switzerland. A little later, with Sedgwick as his companion, he attacked the difficult problem of the geological structure of the Alps, and their joint paper giving the results of their study will always be regarded as one of the classics in the literature of Alpine geology.

It was in the year 1831 that Murchison found the field in which the chief work of his life was to be accomplished. Acting on a suggestion made to him by Buckland he betook himself to the borders of Wales, with the view of endeavouring to discover whether the greywacke rocks underlying the Old Red Sandstone could be grouped into a definite order of succession, as the Secondary rocks of England had been made to tell their story by William Smith. For several years he continued to work vigorously in that region. The result was the establishment of the Silurian system—under which were grouped for the first time a remarkable series of formations, each replete with distinctive organic remains older than and very different from those of the other rocks of England. These researches, together with descriptions of the coal-fields and overlying formations in south Wales and the English border counties, were embodied in *The Silurian System* (London, 1839), a massive quarto in two parts, admirably illustrated with map, sections, pictorial views and plates of fossils. The full import of his discoveries was not at first perceived; but as years passed on the types of existence brought to light by him from the rocks of the border counties of England and Wales were ascertained to belong to a geological period of which there are recognizable traces in almost all parts of the globe. Thus the term "Silurian," derived from the name of the old British tribe Silures, soon passed into the vocabulary of geologists in every country.

The establishment of the Silurian system was followed by that of the Devonian system, an investigation in which, aided by the palaeontological assistance of W. Lonsdale, Sedgwick and Murchison were fellow-labourers, both in the south-west of England and in the Rhineland. Soon afterwards Murchison projected an important geological campaign in Russia with the view of extending to that part of the Continent the classification he had succeeded in elaborating for the older rocks of western Europe. He was accompanied by P. E. P. de Verneuil (1805–1873) and Count A. F. M. L. A. von Keyserling (1815–1891), in conjunction with whom he produced a magnificent work on *Russia and the Ural Mountains*. The publication of this monograph in 1845 completes the first and most active half of Murchison's scientific career. In 1846 he was knighted, and in the same year he presided over the meeting of the British Association at Southampton. During the later years of his life a large part of his time was devoted to the affairs of the Royal Geographical Society, of which he was in 1830 one of the founders, and he was president 1843–1845, 1851–1853, 1856–1859 and 1862–1871. So constant and active were his exertions on behalf of geographical exploration that to a large section of the contemporary public he was known rather as a geographer than a geologist. He particularly identified himself with the fortunes of David Livingstone in Africa, and did much to raise and keep alive the sympathy of his fellow-countrymen in the fate of that great explorer.

The chief geological investigation of the last decade of his life was devoted to the Highlands of Scotland, where he believed he had succeeded in showing that the vast masses of crystalline schists, previously supposed to be part of what used to be termed the Primitive formations, were really not older than the Silurian period, for that underneath them lay beds of limestone and quartzite containing Lower Silurian (Cambrian) fossils. Subsequent research, however, has shown that this infraposition of the fossiliferous rocks is not their original place, but has been brought about by a gigantic system of dislocations, whereby successive masses of the oldest gneisses have been torn up from below and thrust bodily over the younger formations.

In 1855 Murchison was appointed director-general of the geological survey and director of the Royal School of Mines and the Museum of Practical Geology in Jermyn Street, London, in succession to Sir Henry De la Beche, who had been the first to hold these offices. Official routine now occupied much of his time, but he found opportunity for the Highland researches just alluded to, and also for preparing successive editions of his work *Siluria* (1854, ed. 5, 1872), which was meant to present the main features of the original *Silurian System* together with a digest of subsequent discoveries, particularly of those which showed the extension of the Silurian classification into other countries. His official position gave him further opportunity for the exercise of those social functions for which he had always been distinguished, and which a considerable fortune inherited from near relatives on his mother's side enabled him to display on a greater scale. His house in Belgrave Square was one of the great centres where science, art, literature, politics and social eminence were brought together in friendly intercourse. In 1863 he was made a K.C.B., and three years later was raised to the dignity of a baronet. The learned societies of his own country bestowed their highest rewards upon him: the Royal Society gave him the Copley medal, the Geological Society its Wollaston medal, and the Royal Society of Edinburgh its Brisbane medal. There was hardly a foreign scientific society of note which had not his name enrolled among its honorary members. The French Academy of Sciences awarded him the prix Cuvier, and elected him one of its eight foreign members in succession to Faraday.

One of the closing public acts of Murchison's life was the founding of a chair of geology and mineralogy in the university of Edinburgh, for which he gave the sum of £6000, an annual sum of £200 being likewise provided by a vote in parliament for the endowment of the professorship. While the negotiations with the Government in regard to this subject were still in progress, Murchison was seized with a paralytic affection on 21st of November 1870. He rallied and was able to take interest in current affairs until the early autumn of the following year. After a brief attack of bronchitis he died on the 22nd of October 1871. Under his will there was established the Murchison Medal and geological fund to be awarded annually by the council of the Geological Society in London.

See the *Life of Sir Roderick I. Murchison*, by Sir A. Geikie (2 vols., 1875). (A. Ge.)

MURCIA, a maritime province of south-eastern Spain, bounded on the E. by Alicante, S.E. and S. by the Mediterranean Sea, W. by Almería and Granada and N. by Albacete. Pop. (1900), 577,987; area, 4453 sq. m. The extent of coast is about 75 m.; from Cape Palos westwards to Villaricos Point (where Almería begins) it is fringed by hills reaching their greatest elevation immediately east of Cartagena; northwards from Cape Palos to the Alicante boundary a low sandy tongue encloses the shallow lagoon called Mar Menor. Eastward from the Mar Menor and northward from Cartagena stretches the plain known as El Campo de Cartagena, but the surface of the rest of the province is diversified by ranges of hills, belonging to the same system as the Sierra Nevada, which connect the mountains of Almería and Granada with those of Alicante. The general direction of these ranges is from south-west to north-east; they reach their highest point (5150 ft.) on the Sierra de Espuña, between the Mula and Sangonera valleys. They are rich in iron, copper, argentiferous lead, alum, sulphur, and saltpetre. Mineral springs occur at Mula, Archena (hot sulphur), and Alhama (hot chalybeate). The greater part of the province drains into the Mediterranean, chiefly by the Segura, which enters it in the north-west below Hellin in Albacete, and leaves it a little above Orihuela in Alicante; within the province it receives on the left the Arroyo del Jua, and on the right the Caravaca, Quipar, Mula, and Sangonera. The smaller streams of Nogalte and Albujon fall directly into the Mediterranean and the Mar Menor respectively. The climate is hot and dry, and agriculture is largely dependent on irrigation, which, where practicable, has been carried on since the time of the Moors. Wheat, barley, maize, hemp, oil, and wine (the latter somewhat rough in quality) are produced; fruit, especially the orange, is abundant along the course of the Segura; mulberries for sericulture are extensively grown around the capital; and the number of bees kept is exceptionally large. Esparto grass is gathered on the sandy tracts. The live stock consists chiefly of asses, mules, goats and pigs; horses, cattle and sheep being relatively few. Apart from agriculture, the principal industry is mining, which has its centre near Cartagena. Large quantities of lead and esparto, as well as of zinc, iron and copper ores, and sulphur, are exported. The province is traversed by a railway which connects Murcia with Albacete and Valencia; from Alcantarilla there is a branch to Lorca and Baza. Near the capital and other large towns there are good roads, but the means of communication are defective in the remoter districts. This deficiency has somewhat retarded the development of mining, and, although it has been partly overcome by the construction of light railways, many rich deposits of ore remain unworked. The chief towns are Murcia, the capital, Cartagena, Lorca, La Unión, Mazarrón, Yecla, Jumilla, Águilas, Caravaca, Totana, Cieza, Mula, Moratalla, and Cehegín. Other towns with more than 7000 inhabitants are Alhama, Bullas, Fuente Álamo, Molina and Torre Pacheco.

The province of Murcia was the first Spanish possession of the Carthaginians, by whom Nova Carthago was founded. The Romans included it in Hispania Tarraconensis. Under the Moors the province was known as Todmír, which included, according to Edrisi, the cities Murcia, Orihuela, Cartagena, Lorca, Mula and Chinchilla. The kingdom of Murcia, which came into independent existence after the fall of Omayyads (see Caliphate) included the present Albacete as well as Murcia. It became subject to the crown of Castile in the 13th century. Until 1833 the province of Murcia also included Albacete.

MURCIA, the capital of the Spanish province of Murcia; on the river Segura, 25 m. W. of the Mediterranean Sea. Pop. (1900), 111,539. Murcia is connected by rail with all parts of Spain, and is an important industrial centre, sixth in respect of population among the cities of the kingdom. It has been an episcopal see since 1291. It is built nearly in the centre of a low-lying fertile plain, known as the *huerta* or garden of Murcia, which includes the valleys of the Segura and its right-hand tributary the Sangonera, and is surrounded by mountains. Despite the proximity of the sea, the climate is subject to great variations, the summer heat being severe, while frosts are common in winter. The city is built mainly on the left bank of the Segura, which curves north-eastward after receiving the Sangonera below Murcia, and falls into the Mediterranean about 30 m. N.E. A fine stone bridge of two arches gives access to the suburb of San Benito, which contains the bull-ring. As a rule the streets are broad, straight and planted with avenues of trees, but the Calle de Platería and Calle de la Trapería, which contain many of the principal shops, are more characteristically Spanish, being lined with old-fashioned balconied houses, and so narrow that wheeled traffic is in most parts impossible. In summer these thoroughfares are shaded by awnings. The Malecon, or embankment, is a fine promenade skirting the left bank of the Segura; the river is here crossed by a weir and supplies power to several silk-mills. The principal square is the Arenál or Plaza de la Constitución, planted with orange trees and adjoining the Glorieta Park The cathedral, dating from 1388–1467, is the work of many architects; in the main it is late Gothic, but a Renaissance dome and a tower 480 ft. high were added in 1521, while a Corinthian façade was erected in the 18th century. There are some good paintings and fine wood-carving in the interior. Other noteworthy buildings are the colleges of San Fulgencio and San Isidro, the bishops' palace, the hospital of San Juan de Dios, the Moorish Alhondiga, or grain warehouse, the buildings of the municipal and provincial councils and the Contraste, which is adorned with sculptured coats-of-arms, and was originally designed to contain standard weights and measures; it has become a picture-gallery. There are two training schools for teachers, a provincial institute and a museum. Since 1875 the industrial importance of Murcia has steadily increased. Mulberries (for silkworms), oranges and other fruits are largely cultivated in the *huerta*, and the silk industry, which dates from the period of Moorish rule, is still carried on. Manufactures of woollen, linen and cotton goods, of saltpetre, flour, leather and hats, have been established in more modern times, and Murcia is the chief market for the agricultural produce of a large district. A numerous colony of gipsies has settled in the west of the city.

Murcia was an Iberian town before the Punic Wars, but its name then, and under Roman rule, is not known, though some have tried to identify it with the Roman Vergilia. To the Moors, who took possession early in the 8th century, it was known as Medinat Mursiya. Edrisi described it in the 12th century as populous and strongly fortified. After the fall of the caliphate of Cordova it passed successively under the rule of Almería, Toledo and Seville. In 1172 it was taken by the Almohades, and from 1223 to 1243 it became the capital of an independent kingdom. The Castilians took it at the end of this period, when large numbers of immigrants from north-eastern Spain and Provence settled in the town; French and Catalan names are still not uncommon. Moorish princes continued to rule in name over this mixed population, but in 1269 a rising against the suzerain, Alphonso the Wise, led to the final incorporation of Murcia (which then included the present province of Albacete) into the kingdom of Castile. During the War of the Spanish Succession Bishop Luis de Belluga defended the city against the archducal army by flooding the *huerta*. In 1810 and 1812 it was attacked by the French under Marshal Soult. It suffered much from floods in 1651, 1879 and 1907, though the construction of the Malecon has done much to keep the Segura within its own channel. In 1829 many buildings, including the cathedral, were damaged by an earthquake.

MURDER, in law, the unlawful killing of a person with malice aforethought (see Homicide). The O. Eng. *morðor* comes ultimately from the Indo-European root *mar*–, to die, which has also given Lat. *mors*, death, and all its derivatives in English, French and other Rom. languages; cf. Gr. *βροτός*, for *μορτός*, mortal. The O. Eng. form, Latinized as *murdrum*, *murtrum*, whence Fr. *meurtre*, is represented in other Teutonic languages by a cognate form, *e.g.* Ger. *Mord*, Du. *moord*.

MURDOCK, WILLIAM (1754–1839), British inventor, was born near the village of Auchinleck in Ayrshire on the 21st of August 1754. His father, John Murdoch (as the name is spelt in Scotland), was a millwright and miller, and William was brought up in the same occupation. In 1777 he entered the employment of Boulton & Watt in the Soho works at Birmingham, and about two years afterwards he was sent to Cornwall to superintend the fitting of Watt's engines. It is said that while staying at Redruth he carried a series of experiments in the distillation of coal so far that in 1792 he was able to light his cottage and offices with gas, but the evidence is not conclusive. However, after his return to Birmingham about 1799, he made such progress in the discovery of practical methods for making, storing and purifying gas that in 1802 a portion of the exterior of the Soho factory was lighted with it in celebration of the peace of Amiens, and in the following year it was brought into use for the interior. Murdock was also the inventor of important improvements in the steam-engine. He was the first to devise an oscillating engine, of which he made a model about 1784; in 1786 he was busy—somewhat to the annoyance of both Boulton and Watt—with a steam carriage or road locomotive; and in 1799 he invented the long D slide valve. He is also believed to have been the real deviser of the sun and planet motion patented by Watt in 1781. In addition his ingenuity was directed to the utilization of compressed air, and in 1803 he constructed a steam gun. He retired from business in 1830, and died at Soho on the 15th of November 1839.

At the celebration of the centenary of gas lighting in 1892, a bust of Murdock was unveiled by Lord Kelvin in the Wallace Monument.

Stirling, and there is also a bust of him by Sir F. L. Chantrey at Handsworth Church, where he was buried. His "Account of the Application of Gas from Coal to Economical Purposes" appeared in the *Phil. Trans.* for 1808.

MURE, SIR WILLIAM (1594–1657), Scottish writer, son of Sir William Mure of Rowallan, was born in 1594. His mother was Elizabeth, sister of the poet Alexander Montgomerie (*q.v.*). He was a member of the Scottish parliament in 1643, and took part in the English campaign of 1644. He was wounded at Marston Moor, but a month later was commanding a regiment at Newcastle. He died in 1657. He wrote *Dido and Aeneas*; a translation (1628) of Boyd of Trochrig's Latin *Hecatombe Christiana; The True Crucifixe for True Catholikes* (1629); a paraphrase of the Psalms; the *Historie and Descent of the House of Rowallane*; *A Counter-buff to Lysimachus Nicanor*; *The Cry of Blood and of a Broken Covenant* (1650); besides much miscellaneous verse and many sonnets.

A complete edition of his works was edited by William Tough for the Scottish Text Society (2 vols., 1898). Mure's *Lute-Book*, a musical document of considerable interest, is preserved in the Laing collection of MSS. in the library of the university of Edinburgh.

MURE, WILLIAM (1799–1860), Scottish classical scholar, was born at Caldwell, Ayrshire, on the 9th of July 1799. He was educated at Westminster School and the universities of Edinburgh and Bonn. From 1846 to 1855 he represented the county of Renfrew in parliament in the Conservative interest, and was lord rector of Glasgow University in 1847–1848. For many years he devoted his leisure to Greek studies, and in 1850–1857 he published five volumes of a *Critical History of the Language and Literature of Ancient Greece*, which, though uncompleted and somewhat antiquated, is still useful. He died in London on the 1st of April 1860.

MURENA, the name of a Roman plebeian family from Lanuvium, belonging to the Licinian gens, said to be derived from the fondness of one of the family for lampreys (*murenae*). The principal members of the family were Lucius Licinius Murena, who was defeated by Mithradates in Asia in 81 B.C., and his son Lucius Licinius Murena, who was defended by Cicero in 62 B.C. against a charge of bribery (Cic. *Pro Murena*). The son was for several years legate of Lucius Licinius Lucullus in the third Mithradatic War. In 65 he was praetor and made himself popular by the magnificence of the games provided by him. As administrator of Transalpine Gaul after his praetorship he gained the goodwill of both provincials and Romans by his impartiality. In 62 he was elected consul, but before entering upon office he was accused of bribery by Servius Sulpicius, an unsuccessful competitor, supported by Marcus Porcius Cato the younger and Servius Sulpicius Rufus, a famous jurist and son of the accuser. Murena was defended by Marcus Licinius Crassus (afterwards triumvir), Quintus Hortensius and Cicero, and acquitted, although it seems probable that he was guilty. During his consulship he passed a law (*lex Junia Licinia*) which enforced more strictly the provision of the *lex Caecilia Didia*—that laws should be promulgated three *nundinae* before they were proposed to the comitia, and further enacted that, in order to prevent forgery, a copy of every proposed statute should be deposited before witnesses in the aerarium.

MURETUS, the Latinized name of MARC ANTOINE MURET (1526–1585), French humanist, who was born at Muret near Limoges on the 12th of April 1526. At the age of eighteen he attracted the notice of the elder Scaliger, and was invited to lecture in the archiepiscopal college at Auch. He afterwards taught Latin at Villeneuve, and then at Bordeaux. Some time before 1552 he delivered a course of lectures in the college of Cardinal Lemoine at Paris, which was largely attended, Henry II. and his queen being among his hearers. His success made him many enemies, and he was thrown into prison on a disgraceful charge, but released by the intervention of powerful friends. The same accusation was brought against him at Toulouse, and he only saved his life by timely flight. The records of the town show that he was burned in effigy as a Huguenot and as shamefully immoral (1554). After a wandering and insecure life of some years in Italy, he received and accepted the invitation of the Cardinal Ippolyte d'Este to settle in Rome in 1559. In 1561 he revisited France as a member of the cardinal's suite at the conference between Roman Catholics and Protestants held at Poissy. He returned to Rome in 1563. His lectures gained him a European reputation, and in 1578 he received a tempting offer from the king of Poland to become teacher of jurisprudence in his new college at Cracow. Muretus, however, who about 1576 had taken holy orders, was induced by the liberality of Gregory XIII. to remain in Rome, where he died on the 4th of June 1585.

Complete editions of his works: editio princeps, Verona (1727–1730); by D. Ruhnken (1789), by C. H. Frotscher (1834–1841); two volumes of *Scripta selecta*, by J. Frey (1871); *Variae lectiones*, by F. A. Wolf and J. H. Fäsi (1791–1828). Muretus edited a number of classical authors with learned and scholarly notes. His other works include *Juvenilia et poemata varia*, *orationes* and *epistolae*.

See monograph by C. Dejob (Paris, 1881); J. E. Sandys, *Hist. Class. Schol.*, (2nd ed., 1908), ii. 148–152.

MUREXIDE ($NH_4\cdot C_8H_4N_5O_6,H_2O$), the ammonium salt of purpuric acid. It may be prepared by heating alloxantin in ammonia gas to 100° C., or by boiling uramil with mercuric oxide (J. v. Liebig, F. Wöhler, *Ann.*, 1838, 26, 319), $2C_4H_5N_3O_3+O=NH_4\cdot C_8H_4N_5O_6+H_2O$. W. N. Hartley (*Jour. Chem. Soc.*, 1905, 87, 1791) found considerable difficulty in obtaining specimens of murexide sufficiently pure to give concordant results when examined by means of their absorption spectra, and consequently devised a new method of preparation for murexide. In this process alloxantin is dissolved in a large excess of boiling absolute alcohol, and dry ammonia gas is passed into the solution for about three hours. The solution is then filtered from the precipitated murexide, which is washed with absolute alcohol and dried. The salt obtained in this way is in the anhydrous state. It may also be prepared by digesting alloxan with alcoholic ammonia at about 78° C.; the purple solid so formed is easily soluble in water, and the solution produced is indistinguishable from one of murexide.

On the constitution of murexide see also O. Piloty (*Ann.*, 1904, 333, 30); R. Mohlau (*Ber.*, 1904, 37, 2686); and M. Slimmer and J. Stieglitz (*Amer. Chem. Jour.*, 1904, 31, 661).

MURFREESBORO, a city and the county-seat of Rutherford county, Tennessee, U.S.A., near the Stone River, 32 m. S.E. of Nashville. Pop. (1890), 3739; (1900), 3999 (2248 negroes); (1910), 4679. It is served by the Nashville Chattanooga & St Louis railway. It is in an agricultural region where cotton is an important crop, and has a considerable trade in red cedar, hardwood, cotton, livestock and grain; it has also various manufactures. At Murfreesboro are Soule College for girls (Methodist Episcopal South; 1852), Tennessee College for girls (Baptist, 1906), Mooney School for boys (1901), and Bradley Academy for negroes. Murfreesboro was settled in 1811; was incorporated in 1817, and from 1819 to 1825 was the capital of the state. It was named in honour of Colonel Hardy Murfree (1752–1809), a native of North Carolina, who served as an officer of North Carolina troops in the War of Independence, and after 1807 lived in Tennessee. About 2 m. west of the city the battle of Murfreesboro, or Stone River (*q.v.*), was fought on the 31st of December 1862 and the 2nd of January 1863.

MURGER, HENRY (1822–1861), French man of letters, was born in Paris on the 24th of March 1822. His father was a German *concierge* and a tailor. At the age of fifteen Murger was sent into a lawyer's office, but the occupation was uncongenial and his father's trade still more so; and he became secretary to Count Alexei Tolstoi. He published in 1843 a poem entitled *Via dolorosa*, but it made no mark. He also tried journalism, and the paper *Le Castor*, which figures in his *Vie de Bohême* as having combined devotion to the interests of the hat trade with recondite philosophy and elegant literature, is said to have existed, though shortlived. In 1848 appeared the collected sketches called *Scènes de la vie de Bohême*. This book describes the fortunes and misfortunes, the loves, studies, amusements and sufferings of a group of impecunious students, artists and men of letters, of whom Rodolphe represents Murger himself, while the others have been more or less positively identified. Murger, in fact, belonged to a clique of so-called Bohemians, the most remarkable of whom, besides himself, were Privat d'Anglemont and Champfleury. *La Vie de Bohême*, arranged for the stage in collaboration with Théodore Barrière, was produced at the Variétés on the 22nd of November 1849, and was a triumphant success; it afterwards formed the basis of Puccini's opera, *La Bohême* (1898). From this time it was easy for Murger to live by journalism and general literature. He was introduced in 1851 to the *Revue des deux mondes*. But he was a slow, fastidious and capricious worker, and his years of hardship and dissipation had impaired his health. He published among other works *Claude et Marianne* in 1851; a comedy, *Le Bonhomme Jadis* in 1852; *Le Pays Latin* in 1852; *Adeline Protat* (one of the most graceful and innocent if not the most original of his tales) in 1853; and *Les Buveurs d'eau* in 1855. This last, the most powerful of his books next to the *Vie de Bohême*, traces the fate of certain artists and students who, exaggerating their own powers and disdaining merely profitable work, come to an evil end not less rapidly than by dissipation. Some years before his death, which took place in a *maison de santé* near Paris on the 28th of January 1861, Murger went to live at Marlotte, near Fontainebleau, and there he wrote an unequal book entitled *Le Sabot rouge* (1860), in which the character of the French peasant is uncomplimentarily treated.

See an article by A. de Pontmartin in the *Revue des deux mondes* (October 1861).

MURGHAB, a river of Afghanistan, which flows into Russian territory. It rises in the Firozkhoi highlands, the northern scarp of which is defined by the Band-i-Turkestan, and after traversing that plateau from east to west it turns north through deep defiles to Bala Murghab. Beyond this, in the neighbourhood of Maruchak, it forms for a space the boundary-line between Afghan and Russian Turkestan; then joining the Kushk river at Pul-i-Khishti (Tash Kupri) it runs north to Merv, losing itself in the sands of the Merv desert after a course of about 450 m., its exact source being unknown. In the neighbourhood of Bala Murghab it is 50 yds. broad and some 3 ft. deep, with a rapid current. In the lower part of its course it is flanked by a remarkable network of canals. The ancient city of Merv, which was on its banks, was the great centre of medieval Arab trade, and Buddhist caves are found in the scarped cliffs of its right bank near Panjdeh.

MURI, a province of the British protectorate of Northern Nigeria. It lies approximately between 9° and 11° 40′ E. and 7° 10′ and 9° 40′ N. The river Benue divides it through its length, and the portion on the southern bank of the river is watered by streams flowing from the Cameroon region to the Benue. The province is bordered S. by Southern Nigeria, S.E. by German territory (Cameroon), E. by the province of Yola, N. by Bauchi, W. by Nassarawa and Bassa. The district of Katsena-Allah extends south of the Benue considerably west of 9° E., the approximate limit of the remainder of the province. Muri has an area of 25,800 sq. m. and an estimated population of about 828,000. The province is rich in forest products and the Niger Company maintains trading stations on the river. Cotton is grown, and spinning thread, weaving and dyeing afford occupation to many thousands. The valley of the Benue has a climate generally unhealthy to Europeans, but there are places in the northern part of the province, such as the Fula settlement of Wase on a southern spur of the Murchison hills, where the higher altitude gives an excellent climate. Muri includes the ancient Jukon empire together with various small Fula states and a number of pagan tribes, among whom the Munshi, who extend into the provinces of Nassarawa and Bassa, are among the most turbulent. The Munshi occupy about 4000 sq. m. in the Katsena-Allah district. The pagan tribes in the north of the province are lawless cannibals who by constant outrages and murders of traders long rendered the main trade route to Bauchi unsafe, and cut off the markets of the Benue valley and the Cameroon from the Hausa states. Only two routes, one via Wase and the other via Gatari, pass through this belt. In the south of the province a similar belt of hostile pagans closed the access to the Cameroon except by two routes, Takum and Beli. For Hausa traders to cross the Muri province was a work of such danger and expense that before the advent of British administration the attempt was seldom made.

Muri came nominally under British control in 1900. The principal effort of the administration has been to control and open the trade routes. In 1904 an expedition against the northern cannibals resulted in the capture of their principal fortresses and the settlement and opening to trade of a large district, the various routes to the Benue being rendered safe. In 1905 an expedition against the Munshi, rendered necessary by an unprovoked attack on the Niger Company's station at Abinsi, had a good effect in reducing the riverain portion of this tribe to submission. The absence of any central native authority delayed the process of bringing the province under administrative control. Its government has been organized on the same system as the rest of Northern Nigeria, and is under a British resident. It has been divided into three administrative divisions—east, central and west—with their respective headquarters at Lau, Amar and Ibi. Provincial and native courts of justice have been established. The telegraph has been carried to the town of Muri. Muri is one of the provinces in which the slave trade was most active, and its position between German territory and the Hausa states rendered it in the early days of the British administration a favourite route for the smuggling of slaves.

MURILLO, BARTOLOMÉ ESTEBAN (1617–1682), Spanish painter, son of Gaspar Esteban Murillo and Maria Perez, was born at Seville in 1617, probably at the end of the year, as he was baptized on the first of January 1618. Esteban-Murillo appears to have been the compound surname of the father, but some inquirers consider that, in accordance with a frequent Andalusian custom, the painter assumed the surname of his maternal grandmother, Elvira Murillo, in addition to that of his father. His parents (the father an artisan of a humble class), having been struck with the sketches which the boy was accustomed to make, placed him under the care of their distant relative, Juan del Castillo, the painter. Juan, a correct draughtsman and dry colourist, taught him all the mechanical parts of his profession with extreme care, and Murillo proved himself an apt pupil. The artistic appliances of his master's studio were not abundant, and were often of the simplest kind. A few casts, some stray fragments of sculpture and a lay figure formed the principal aids available for the Sevillian student of art. A living model was a luxury generally beyond the means of the school, but on great occasions the youths would strip in turn and proffer an arm or a leg to be studied by their fellows. Objects of still life, however, were much studied by Murillo, and he early learnt to hit off the ragged urchins of Seville. Murillo in a few years painted as well as his master, and as stiffly. His two pictures of the Virgin, executed during this period, show how thoroughly he had mastered the style, with all its defects. Castillo was a kind man, but his removal to Cadiz in 1639–1640 threw his favourite pupil upon his own resources. The fine school of Zurbaran was too expensive for the poor lad; his parents were either dead or too poor to help him, and he was compelled to earn his bread by painting rough pictures for the "feria" or public fair of Seville. The religious daubs exposed at that mart were generally of as low an order as the prices paid for them. A "pintura de la feria" (a picture for the fair) was a proverbial expression for an execrably bad one; yet the street painters who thronged the market-place with their "clumsy saints and unripe Madonnas" not unfrequently rose to be able and even famous artists. This rough-and-ready practice, partly for the market-place, partly for converts in Mexico and Peru, for whom Madonnas and popular saints were produced and shipped off by the dozen, doubtless increased Murillo's manual dexterity; but, if we may judge from the picture of the "Virgin and Child" shown in the Murillo-room at Seville as belonging to this period, he made little improvement in colouring or in general strength of design. Struck by the favourable change which travel had wrought upon the style of his brother artist Pedro de Moya, Murillo in 1642 resolved to make a journey to Flanders or Italy. Having bought a large quantity of canvas, he cut it into squares of different sizes, which he converted into pictures of a kind likely to sell. The American traders bought up his pieces, and he found himself sufficiently rich to carry out his design. He placed his sister, who was dependent on him, under the care of some friends, and without divulging his plans to any one set out for Madrid. On reaching the capital he waited on Velazquez, his fellow-townsman—then at the summit of his fortune—and asked for some introduction to friends in Rome. The master liked the youth, and offered him lodging in his own house, and proposed to procure him admission to the royal galleries of the capital. Murillo accepted the offer, and here enjoyed the masterpieces of Italy and Flanders without travelling beyond the walls of Madrid. The next two years were chiefly spent in copying from Ribera, Vandyck and Velazquez; and in 1644 he so astonished the latter with some of his efforts that they were submitted to the king and the court. His patron now urged him to go to Rome, and offered him letters to smooth his way; but Murillo preferred returning to his sister and his native Seville.

The friars of the convent of San Francesco in Seville had about this time determined to adorn the walls of their small cloister in a manner worthy of their patron saint. But the brotherhood had no money; and after endless begging they found themselves incapable of employing an artist of name to execute the task. Murillo was needy, and offered his services; after balancing their own poverty against his obscurity the friars bade him begin. Murillo covered the walls with eleven large pictures of remarkable power and beauty—displaying by turns the strong colouring of Ribera, the lifelike truthfulness of Velazquez, and the sweetness of Vandyck. Among them were to be found representations of San Francesco, of San Diego, of Santa Clara and of San Gil. These pictures were executed in his earliest style, commonly called his *frio* or cold style. It was based chiefly on Ribera and Caravaggio, and was dark with a decided outline. This rich collection is no longer in Seville; Marshal Soult carried off ten of the works. The fame of these productions soon got abroad, and " El Claustro Chico " swarmed daily with artists and critics. Murillo was no longer friendless and unknown. The rich and the noble of Seville overwhelmed him with their commissions and their praises.

In 1648 Murillo married a wealthy lady of rank, Doña Beatriz de Cabrera y Sotomayor, of the neighbourhood of Seville, and his house soon became the favourite resort of artists and connoisseurs. About this time he was associated with the landscape-painter Yriarte—the two artists interchanging figures and landscapes for their respective works; but they did not finally agree, and the co-operation came to an end. Murillo now painted the well-known " Flight into Egypt," and shortly afterwards changed his earliest style of painting for his *calido* or warm style. His drawing was still well defined, but his outlines became softer and his figures rounder, and his colouring gained in warmth and transparency. His first picture of this style, according to Cean Bermudez, was a representation of " Our Lady of the Conception," and was painted in 1652 for the brotherhood of the True Cross; he received for it 2500 reals (£26). In 1655 he executed his two famous paintings of " San Leandro " and " San Isidoro " at the order of Don Juan Federigo, archdeacon of Carmona, which are now in the cathedral of Seville. These are two noble portraits, finished with great care and admirable effect, but the critics complain of the figures being rather short. His next picture, the " Nativity of the Virgin," painted for the chapter, is regarded as one of the most delightful specimens of his *calido* style. In the following year (1656) the same body gave him an order for a vast picture of San Antonio de Padua, for which he received 10,000 reals (£104). This is one of his most celebrated performances, and still hangs in the baptistery of the cathedral. It was " repaired " in 1833; the grandeur of the design, however, and the singular richness of the colouring may still be traced. The same year saw him engaged on four large semicircular pictures, designed by his friend and patron Don Justino Neve y Yevenes, to adorn the walls of the church of Santa Maria la Blanca. The first two (now in Madrid) were meant to illustrate the history of the Festival of Our Lady of the Snow, or the foundation of the Roman basilica of Santa Maria Maggiore. The one represents the wealthy but childless Roman senator and his lady asleep and dreaming; the other exhibits the devout pair relating their dream to Pope Liberius. Of these two noble paintings the Dream is the finer, and in it is to be noticed the commencement of Murillo's third and last style, known as the *vaporoso* or vapoury. It should be noted, however, that the three styles are not strictly separable into date-periods; for the painter alternated the styles accordingly to his subject-matter or the mood of his inspiration, the *calido* being the most frequent. In the *vaporoso* method the well-marked outlines and careful drawing of his former styles disappear, the outlines are lost in the misty blending of the light and shade, and the general finish betrays more haste than was usual with Murillo. After many changes of fortune, these two pictures now hang in the Academy at Madrid. The remaining pieces executed for this small church were a " Virgin of the Conception " and a figure of " Faith." Soult laid his hands on these also, and they have not been recovered.

In 1658 Murillo undertook and consummated a task which had hitherto baffled all the artists of Spain, and even royalty itself. This was the establishing of a public academy of art. By superior tact and good temper he overcame the vanity of Valdes Leal and the presumption of the younger Herrera, and secured their co-operation. The Academy of Seville was accordingly opened for the first time in January 1660, and Murillo and the second Herrera were chosen presidents. The former continued to direct it during the following year; but the calls of his studio induced him to leave it in other hands. It was then flourishing, but not for long.

Passing over some half-length pictures of saints and a dark-haired Madonna, painted in 1668 for the chapter-room of the cathedral of his native city, we enter upon the most splendid period of Murillo's career. In 1661 Don Miguel Mañara Vicentelo de Leca, who had recently turned to a life of sanctity from one of the wildest profligacy, resolved to raise money for the restoration of the dilapidated Hospital de la Caridad, of whose pious gild he was himself a member. Mañara commissioned his friend Murillo to paint eleven pictures for this edifice of San Jorge. Three of these pieces represented the " Annunciation," the " Infant Saviour," and the " Infant St John." The remaining eight are considered Murillo's masterpieces. They consist of " Moses striking the Rock," the " Return of the Prodigal," " Abraham receiving the Three Angels," the "Charity of San Juan de Dios," the " Miracle of the Loaves and Fishes," " Our Lord healing the Paralytic," " St Peter released from Prison by the Angel," and " St Elizabeth of Hungary." These works occupied the artist four years, and in 1674 he received for his eight great pictures 78,115 reals or about £800. The " Moses," the " Loaves and Fishes," the " San Juan," and the three subjects which we have named first, are still at Seville; the French carried off the rest, but the " St Elizabeth " and the " Prodigal Son " are now back in Spain. For compass and vigour the " Moses " stands first; but the " Prodigal's Return " and the " St Elizabeth " were considered by Bermudez the most perfect of all as works of art. The front of this famous hospital was also indebted to the genius of Murillo; five large designs in blue glazed tiles were executed from his drawings. He had scarcely completed the undertakings for this edifice when his favourite Franciscans again solicited his aid. He accordingly executed some twenty paintings for the humble little church known as the Convent de los Capucinos. Seventeen of these Capuchin pictures are preserved in the Museum of Seville. Of these the " Charity of St Thomas of Villanueva " is reckoned the best. Murillo himself was wont to call it " su lienzo " (his own picture). Another little piece of extraordinary merit, which once hung in this church, is the "Virgin of the Napkin," believed to have been painted on a "servilleta" and presented to the cook of the Capuchin brotherhood as a memorial of the artist's pencil.

In 1670 Murillo is said to have declined an invitation to court, preferring to labour among the brown coats of Seville. Eight years afterwards his friend the canon Justino again employed him to paint three pieces for the Hospital de los Venerables: the "Mystery of the Immaculate Conception," "St Peter Weeping," and the "Blessed Virgin." As a mark of esteem, Murillo next painted a full-length portrait of the canon. The spaniel at the feet of the priest has been known to call forth a snarl from a living dog. His portraits generally, though few, are of great beauty. Towards the close of his life Murillo executed a series of pictures illustrative of the life of "the glorious doctor" for the Augustinian convent at Seville. This brings us to the last work of the artist. Mounting a scaffolding one day at Cadiz (whither he had gone in 1681) to execute the higher parts of a large picture of the "Espousal of St Catherine," on which he was engaged for the Capuchins of that town, he stumbled, and fell so violently that he received a hurt from which he never recovered. The great picture was left unfinished, and the artist returned to Seville to die. He died as he had lived, a humble, pious, brave man, on the 3rd of April 1682 in the arms of the chevalier Pedro Nuñez de Villavicencio, an intimate friend and one of his best pupils. Another of his numerous pupils was Sebastian Gomez, named "Murillo's Mulatto." Murillo left two sons (one of them at first an indifferent painter, afterwards a priest) and a daughter—his wife having died before him.

Murillo has always been one of the most popular of painters—not in Spain alone. His works show great technical attainment without much style, and a strong feeling for ordinary nature and for truthful or sentimental expression without lofty beauty or ideal elevation. His ecstasies of Madonnas and Saints are the themes of some of his most celebrated achievements. Take as an example the "Immaculate Conception" (or "Assumption of the Virgin," for the titles may, with reference to Murillo's treatments of this subject, almost be interchanged) in the Louvre, a picture for which, on its sale from the Soult collection, one of the largest prices on record was given in 1852, some £24,600. His subjects may be divided into two great groups—the scenes from low life (which were a new experiment in Spanish art, so far as the subjects of children are concerned), and the Scriptural, legendary and religious works. The former, of which some salient specimens are in the Dulwich Gallery, are, although undoubtedly truthful, neither ingenious not sympathetic; sordid unsightliness and roguish squalor are their foundation. Works of this class belong mostly to the earlier years of Murillo's practice. The subjects in which the painter most excels are crowded compositions in which some act of saintliness, involving the ascetic or self-mortifying element, is being performed—subjects which, while repulsive in some of their details, emphasize the broadly human and the expressly Catholic conceptions of life. A famous example is the picture, now in the Madrid Academy, of St Elizabeth of Hungary washing patients afflicted with the scab or itch, and hence commonly named "El Tiñoso." Technically considered, it unites his three styles of painting, more especially the cold and the warm. His power of giving atmosphere to combined groups of figures is one of the marked characteristics of Murillo's art; and he may be said to have excelled in this respect all his predecessors or contemporaries of whatever school.

Seville must still be visited by persons who wish to study Murillo thoroughly. A large number of the works which used to adorn this city have, however, been transported elsewhither. In the Prado Museum at Madrid are forty-five specimens of Murillo—the "Infant Christ and the Baptist" (named "Los Niños della Concha"), "St Ildefonso vested with a Chasuble by the Madonna," &c.; in the Museo della Trinidad, "Christ and the Virgin appearing to St Francis in a Cavern" (an immense composition), and various others. In the National Gallery, London, the chief example is the "Holy Family"; this was one of the master's latest works, painted in Cadiz. In public galleries in the United Kingdom there are altogether twenty-four examples by Murillo; in those of Spain, seventy-one. Murillo, who was the last pre-eminent painter of Seville, was an indefatigable and prolific worker, hardly leaving his painting-room save for his devotions in church; he realized large prices, according to the standard of his time, and made a great fortune. His character is recorded as amiable and soft, yet independent, subject also to sudden impulses, not unmixed with passion.

See Stirling, *Annals of the Artists of Spain* (3 vols., London, 1848); Richard Ford, *Handbook for Spain* (London, 1855); Curtis, *Catalogue of the Works of Velasquez and Murillo* (1883); L. Alfonso, *Murillo, el hombre*, &c. (1886); C. Justi, *Murillo* (illustrated, 1892); P. Lefort, *Murillo et ses élèves* (1892); F. M. Tubino, *Murillo, su epoca*, &c. (1864; Eng. trans., 1879); Dr G. C. Williamson, *Murillo* (1902); C. S. Ricketts, *The Prado* (1903). (W. M. R.)

MURIMUTH, ADAM (*c.* 1274–1347), English ecclesiastic and chronicler, was born in 1274 or 1275 and educated in the civil law at Oxford. Between 1312 and 1318 he practised in the papal curia at Avignon. Edward II. and Archbishop Winchelsey were among his clients, and his legal services secured for him canonries at Hereford and St Paul's, and the precentorship of Exeter Cathedral. In 1331 he retired to a country living (Wraysbury, Bucks), and devoted himself to writing the history of his own times. His *Continuatio chronicarum*, begun not earlier than 1325, starts from the year 1303, and was carried up to 1347, the year of his death. Meagre at first, it becomes fuller about 1340 and is specially valuable for the history of the French wars. Murimuth has no merits of style, and gives a bald narrative of events. But he incorporates many documents in the latter part of his book. The annals of St. Paul's which have been edited by Bishop Stubbs, are closely related to the work of Murimuth, but probably not from his pen. The *Continuatio* was carried on, after his death, by an anonymous writer to the year 1380.

The only complete edition of the *Continuatio chronicarum* is that by E. M. Thompson (Rolls series, 1889). The preface to this edition, and to W. Stubbs's *Chronicles of Edward I. and II.*, vol. i. (Rolls series, 1882), should be consulted. The anonymous continuation is printed in T. Hog's edition of Murimuth (*Eng. Hist. Soc.*, London, 1846). (H. W. C. D.)

MURNER, THOMAS (1475–1537?), German satirist, was born on the 24th of December 1475 at Oberehnheim near Strassburg. In 1490 he entered the order of Franciscan monks, and in 1495 began a wandering life, studying and then teaching and preaching in Freiburg-in-Breisgau, Paris, Cracow and Strassburg. The emperor Maximilian I. crowned him in 1505 *poeta laureatus*; in 1506, he was created *doctor theologiae*, and in 1513 was appointed custodian of the Franciscan monastery in Strassburg, an office which, on account of a scurrilous publication, he was forced to vacate the following year. Late in life, in 1518, he began the study of jurisprudence at the university of Basel, and in 1519 took the degree of *doctor juris*. After journeys in Italy and England, he again settled in Strassburg, but, disturbed by the Reformation, sought an exile at Lucerne in Switzerland in 1526. In 1533 he was appointed priest of Oberehnheim, where he died in 1537, or, according to some accounts, in 1536. Murner was an energetic and passionate character, who made enemies wherever he went. There is not a trace of human kindness in his satires, which were directed against the corruption of the times, the Reformation, and especially against Luther. His most powerful satire—and the most virulent German satire of the period—is *Von dem grossen lutherischen Narren, wie ihn Dr Murner beschworen hat.* Among others may be mentioned *Die Narrenbeschwörung* (1512); *Die Schelmenzunft* (1512); *Die Gäuchmatt*, which treats of enamoured fools (1519), and a translation of Virgil's *Aeneid* (1515) dedicated to the emperor Maximilian I. Murner also wrote the humorous *Chartiludium logicae* (1507) and the *Ludus studentum freiburgensium* (1511), besides a translation of Justinian's *Institutiones* (1519).

All Murner's more important works have been republished in critical editions; a selection was published by G. Balke in Kürschner's *Deutsche Nationalliteratur* (1890). Cf. W. Kawerau, *Murner und die Kirche des Mittelalters* (1890); and by the same writer, *Murner und die deutsche Reformation* (1891); also K. Ott, *Über Murners Verhältniss zu Geiler* (1896).

MUROM, a town of Russia, in the government of Vladimir, on the craggy left bank of the Oka, close to its confluence with the Tesha, 108 m. by rail S.E. of the city of Vladimir. Pop. (1900), 12,874. Muron has an old cathedral. It is the chief entrepôt for grain from the basin of the lower Oka, and carries on an active trade with Moscow and Nizhniy-Novgorod. It is famed, as in ancient times, for kitchen-gardens, especially for its cucumbers and seed for canaries. Its once famous tanneries have lost their importance, but the manufacture of linen has increased; it has also steam flour-mills, distilleries, manufactories of soap and of iron implements.

MURPHY, ARTHUR (1727–1805), Irish actor and dramatist, son of a Dublin merchant, was born at Clomquin, Roscommon, on the 27th of December 1727. From 1738 to 1744, under the name of Arthur French, he was a student at the English college at St Omer. He entered the counting-house of a merchant at Cork on recommendation of his uncle, Jeffery French, in 1747. A refusal to go to Jamaica alienated French's interest, and Murphy exchanged his situation for one in London. By the autumn of 1752 he was publishing the *Gray's Inn Journal*, a periodical in the style of the *Spectator*. Two years later he became an actor, and appeared in the title-rôles of *Richard III.* and *Othello*; as Biron in Southerne's *Fatal Marriage*; and as Osmyn in Congreve's *Mourning Bride*. His first farce, *The Apprentice*, was given at Drury Lane on the 2nd of January 1756. It was followed, among other plays, by *The Upholsterer* (1757), *The Orphan of China* (1759), *The Way to Keep Him* (1760), *All in the Wrong* (1761), *The Grecian Daughter* (1772), and *Know Your Own Mind* (1777). These were almost all adaptations from the French, and were very successful, securing for their author both fame and wealth. Murphy edited a political periodical, called the *Test*, in support of Henry Fox, by whose influence he was called to the bar at Lincoln's Inn, although he had been refused at the Middle Temple in 1757 on account of his connexion with the stage. Murphy also wrote a biography of Fielding, an essay on the life and genius of Samuel Johnson and translations of Sallust and Tacitus. Towards the close of his life the office of a commissioner of bankrupts and a pension of £200 were conferred upon him by government. He died on the 18th of June 1805.

MURPHY, JOHN FRANCIS (1853–), American landscape painter, was born at Oswego, New York, on the 11th of December 1853. He first exhibited at the National Academy of Design in 1876, and was made an associate in 1885 and a full academician two years later. He became a member of the Society of American Artists (1901) and of the American Water Color Society.

MURPHY, ROBERT (1806–1843), British mathematician, the son of a poor shoemaker, was born at Mallow, in Ireland, in 1806. At the age of thirteen, while working as an apprentice in his father's shop, he became known to certain gentlemen in the neighbourhood as a self-taught mathematician. Through their exertions, after attending a classical school in his native town, he was admitted to Caius College, Cambridge, in 1825. Third wrangler in 1829, he was elected in the same year a fellow of his college. A course of dissipation led him into debt; his fellowship was sequestered for the benefit of his creditors, and he was obliged to leave Cambridge in December 1832. After living for some time with his relations in Ireland, he repaired to London in 1836, a penniless literary adventurer. In 1838 he became examiner in mathematics and physics at London University. He had already contributed several mathematical papers to the *Cambridge Philosophical Transactions* (1831–1836), *Philosophical Magazine* (1833–1842), and the *Philosophical Transactions* (1837), and had published *Elementary Principles of the Theories of Electricity* (1833). He now wrote for the "Library of Useful Knowledge" a *Treatise on the Theory of Algebraical Equations* (1839). He died on the 12th of March 1843.

MURPHYSBORO, a city and the county-seat of Jackson county, Illinois, U.S.A., in the south part of the state, on the Big Muddy River, about 57 m. N. of Cairo. Pop. (1890), 3880; (1900), 6463, including 557 foreign-born and 456 negroes; (1910), 7485. It is served by the Illinois Central, the Mobile & Ohio and the St Louis, Iron Mountain & Southern railways. It is the centre for a farming region, in which there are deposits of coal, iron, lead and shale, and there are various manufactures in the city. Murphysboro was incorporated in 1867, and re-incorporated in 1875.

MURRAIN (derived through O. Fr. *morine*, from Lat. *mori*, to die), a general term for various virulent diseases in domesticated animals, synonymous with plague or epizooty. The principal diseases are dealt with under RINDERPEST; PLEURO-PNEUMONIA; ANTHRAX; and FOOT AND MOUTH DISEASE. See also VETERINARY SCIENCE.

MURRAY (or MORAY), **EARLS OF.** The earldom of Moray was one of the seven original earldoms of Scotland, its lands corresponding roughly to the modern counties of Inverness and Ross. Little is known of the earls until about 1314, when Sir Thomas Randolph, a nephew of King Robert Bruce, was created earl of Moray (*q.v.*), and the Randolphs held the earldom until 1346, when the childless John Randolph, 3rd earl of this line and a soldier of repute, was killed at the battle of Neville's Cross. According to some authorities the earldom was then held by John's sister Agnes (*c.* 1312–1369) and her husband, Patrick Dunbar, earl of March or Dunbar (*c.* 1285–1368). However this may be, in 1359 an English prince, Henry Plantagenet, duke of Lancaster (d. 1361), was made earl of Moray by King David II.; but in 1372 John Dunbar (d. 1391), a grandson of Sir Thomas Randolph and a son-in-law of Robert II., obtained the earldom. The last of the Dunbar earls was James Dunbar, who was murdered in August 1429, and after this date his daughter Elizabeth and her husband, Archibald Douglas (d. 1455), called themselves earl and countess of Moray.

The next family to bear this title was an illegitimate branch of the royal house of Stuart, James IV. creating his natural son, James Stuart (*c.* 1499–1544), earl of Moray. James died without sons, and after the title had been borne for a short time by George Gordon, 4th earl of Huntly (*c.* 1514–1562), who was killed at Corrichie in 1562, it was bestowed in 1562 by Mary Queen of Scots upon her half-brother, an illegitimate son of James V. This was the famous regent, James Stuart, earl of Moray, or Murray (see below), who was murdered in January 1570; after this event a third James Stuart, who had married the regent's daughter Elizabeth (d. 1591), held the earldom. He, who was called the "bonny earl," was killed by his hereditary enemies, the Gordons, in February 1592, when his son James (d. 1638) succeeded to the title. The earldom of Moray has remained in the Stuart family since this date. Alexander, the 4th earl (d. 1701), was secretary of state for Scotland from 1680 to 1689; and in 1796 Francis, the 9th earl (1737–1810), was made a peer of the United Kingdom as Baron Stuart.

See vol. vi. of Sir R. Douglas's *Peerage of Scotland*, new ed. by Sir J. B. Paul (1909).

MURRAY, ALEXANDER STUART (1841–1904), British archaeologist, was born at Arbroath on the 8th of January 1841, and educated there, at Edinburgh high school and at the universities of Edinburgh and Berlin. In 1867 he entered the British Museum as an assistant in the department of Greek and Roman antiquities under Sir Charles Newton, whom he succeeded in 1886. His younger brother, George Robert Milne Murray (b. 1858), was made keeper of the botanical department in 1895, the only instance of two brothers becoming heads of departments at the museum. In 1873 Dr Murray published a *Manual of Mythology*, and in the following year contributed to the *Contemporary Review* two articles—one on the Homeric question—which led to a friendship with Mr Gladstone, the other on Greek painters. In 1880–1883 he brought out his *History of Greek Sculpture*, which at once became a standard work. In 1886 he was selected by the Society of Antiquaries of Scotland to deliver the Rhind lectures on archaeology, out of which grew his *Handbook of Greek Archaeology* (1892). In 1894–1896 Dr Murray directed some excavations in Cyprus undertaken by means of a bequest of £2000 from Miss Emma Tournour Turner. The objects obtained are described and illustrated in *Excavations in Cyprus*, published by the trustees of the museum in 1900. Among Dr Murray's other official publications are three folio volumes on *Terra-cotta Sarcophagi*, *White Athenian Vases* and *Designs from Greek Vases*. In 1898 he wrote for the *Portfolio* a monograph on Greek bronzes, founded on lectures delivered at the Royal Academy in that year, and he contributed many articles on archaeology to standard publications. In recognition of his services to archaeology he was made LL.D. of Glasgow University in 1887 and elected a corresponding member of the Berlin Academy of Sciences in 1900. He died in March 1904.

MURRAY, DAVID (1849–), Scottish painter, was born in Glasgow, and spent some years in commercial pursuits before he practised as an artist. He was elected an associate of the Royal Academy in 1891 and academician in 1905; and also became an associate of the Royal Scottish Academy and of the Royal Society of Painters in Water Colours, and a member of the Royal Scottish Water Colour Society. He is a landscape painter of distinction, and two of his pictures, "My Love is gone a-sailing" (1884) and "In the Country of Constable" (1903), have been bought for the National Gallery of British Art. "Young Wheat," painted in 1890, is one of his most noteworthy works.

MURRAY, EUSTACE CLARE GRENVILLE (1824–1881), English journalist, was born in 1824, the natural son of the 2nd duke of Buckingham. Educated at Magdalen Hall (Hertford College), Oxford, he entered the diplomatic service through the influence of Lord Palmerston, and in 1851 joined the British embassy at Vienna as attaché. At the same time he agreed to act as Vienna correspondent of a London daily paper, a breach of the conventions of the British Foreign Office which cost him his post. In 1852 he was transferred to Hanover, and thence to Constantinople, and finally, in 1855, was made consul-general at Odessa. In 1868 he returned to England, and devoted himself to journalism. He contributed to the early numbers of *Vanity Fair*, and in 1869 founded a clever but abusive society paper, the *Queen's Messenger*. For a libel published in this paper Lord Carrington horsewhipped him on the doorstep of a London club. Murray was subsequently charged with perjury for denying on oath his authorship of the article. Remanded on bail, he escaped to Paris, where he subsequently lived, acting as correspondent of various London papers. In 1874 he helped Edmund Yates to found the *World*. Murray died at Passy on the 20th of December 1881.

His score of books, several of which were translated into French and published in Paris, include *French Pictures in English Chalk* (1876–1878); *The Roving Englishman in Turkey* (1854); *Men of the Second Empire* (1872); *Young Brown* (1874); *Sidelights on English Society* (1881); and *Under the Lens: Social Photographs* (1885).

MURRAY, LORD GEORGE (1694–1760), Scottish Jacobite general, fifth son of John, 1st duke of Atholl, by his first wife, Catherine, daughter of the 3rd duke of Hamilton, was born at Huntingtower, near Perth, on the 4th of October 1694. He joined the army in Flanders in June 1712; in 1715, contrary to their father's wishes, he and his brothers, the marquis of Tullibardine and Lord Charles Murray, joined the Jacobite rebels under the earl of Mar, each brother commanding a regiment of men of Atholl. Lord Charles was taken prisoner at Preston, but after the collapse of the rising Lord George escaped with Tullibardine to South Uist, and thence to France. In 1719 Murray took part in the Jacobite attempt in conjunction with the Spaniards in the western highlands, under the command of Tullibardine and the earl marischal, which terminated in "the affair of Glenshiel" on the 10th of June, when he was wounded while commanding the right wing of the Jacobites. After hiding for some months in the highlands he reached Rotterdam in May 1720. There is no evidence for the statement that Murray served in the Sardinian army, and little is known of his life on the continent till 1724, when he returned to Scotland, where in the following year he was granted a pardon. The duke of Atholl died in 1724 and was succeeded in the title by his second son James, owing to the attainder of Tullibardine; and Lord George leased from his brother the old family property of Tullibardine in Strathearn, where he lived till 1745.

On the eve of the Jacobite rising of 1745 the duke of Perth made overtures to Lord George Murray on behalf of the Pretender; but even after the landing of Charles Edward in Scotland in July, accompanied by Tullibardine, Murray's attitude remained doubtful. He accompanied his brother the duke to Crieff on the 21st of August to pay his respects to Sir John Cope, the commander of the government troops, and he permitted the duke to appoint him deputy-sheriff of Perthshire. It has been suggested that Murray acted with duplicity, but his hesitation was natural and genuine; and it was not till early in September, when Charles Edward was at Blair Castle, which had been vacated by the duke of Atholl on the prince's approach, that Murray decided to espouse the Stuart cause. He then wrote to his brother explaining that he did so for conscientious reasons, while realizing the risk of ruin it involved. On joining the Jacobite army Lord George received a commission as lieutenant-general, though the prince ostentatiously treated him with want of confidence; and he was flouted by the Irish adventurers who were the Pretender's trusted advisers. At Perth Lord George exerted himself with success to introduce discipline and organization in the army he was to command, and he gained the confidence of the highland levies, with whose habits and methods of fighting he was familiar. He also used his influence to prevent the exactions and arbitrary interference with civil rights which Charles was too ready to sanction on the advice of others. At Prestonpans, on the 21st of September, Lord George, who led the Jacobite left wing in person, was practically commander-in-chief, and it was to his able generalship that the victory was mainly due. During the six weeks' occupation of Edinburgh he did useful work in the further organization and disciplining of the army. He opposed Charles's plan of invading England, and when his judgment was overruled he prevailed on the prince to march into Cumberland, which he knew to be favourable ground for highlander tactics, instead of advancing against General Wade, whose army was posted at Newcastle. He conducted the siege of Carlisle, but on the surrender of the town on the 14th of November he resigned his command on the ground that his authority had been insufficiently upheld by the prince, and he obtained permission to serve as a volunteer in the ranks of the Atholl levies. The dissatisfaction, however, of the army with the appointment of the duke of Perth to succeed him compelled Charles to reinstate Murray, who accordingly commanded the Jacobites in the march to Derby. Here on the 5th of December a council was held at which Murray urged the necessity for retreat, owing to the failure of the English Jacobites to support the invasion and the absence of aid from France. As Murray was supported by the council the retreat was ordered, to the intense chagrin of Charles, who never forgave him; but the failure of the enterprise was mainly chargeable to Charles himself, and it was not without justice that Murray's aide de camp, the chevalier Johnstone, declared that "had Prince Charles slept during the whole of the expedition, and allowed Lord George Murray to act for him according to his own judgment, he would have found the crown of Great Britain on his head when he awoke." Lord George commanded the rear-guard during the retreat; and this task, rendered doubly dangerous by the proximity of Cumberland in the rear and Wade on the flank, was made still more difficult by the incapacity and petulance of the Pretender. By a skilfully fought rear-guard action at Clifton Moor, Lord George enabled the army to reach Carlisle safely and without loss of stores or war material; and on the 3rd of January 1746 the force entered Stirling, where they were joined by reinforcements from Perth. The prince laid siege to Stirling Castle, while Murray defeated General Hawley near Falkirk; but the losses of the Jacobites by sickness and desertion, and the approach of Cumberland, made retreat to the Highlands an immediate necessity, in which the prince was compelled to acquiesce; his resentment was such that he gave ear to groundless suggestions that Murray was a traitor, which the latter's failure to capture his brother's stronghold of Blair Castle did nothing to refute.

In April 1746 the Jacobite army was in the neighbourhood of Inverness, and the prince decided to give battle to the duke of Cumberland. Charles took up a position on the left bank of the Nairn river at Culloden Moor, rejecting Lord George's Murray advice to select a much stronger position on the opposite bank. The battle of Culloden, where the Stuart cause was ruined, was fought on the 16th of April 1746. On the following day the duke of Cumberland intimated to his troops that "the public orders of the rebels yesterday was to give us no quarter"; Hanoverian news-sheets printed what purported to be copies of such an order, and the historian James Ray and other contemporary writers gave further currency to a calumny that has been repeated by modern authorities. Original copies of Lord George Murray's "orders at Culloden" are in existence, one of which is among Cumberland's own papers, while another was in the possession of Lord Hardwicke, the judge who tried the Jacobite peers in 1746, and they contain no injunction to refuse quarter. After the defeat Murray conducted a remnant of the Jacobite army to Ruthven, and prepared to organize further resistance. Prince Charles, however, had determined to abandon the enterprise, and at Ruthven Lord George received an order dismissing him from the prince's service, to which he replied in a letter upbraiding Charles for his distrust and mismanagement. Charles's belief in the general's treachery was shared by several leading Jacobites, but there appears no ground for the suspicion. From the moment he threw in his lot with the exiled prince's cause Lord George Murray never deviated in his loyalty and devotion, and his generalship was deserving of the highest praise; but the discipline he enforced and jealousy of his authority made enemies of some of those to whom Charles was more inclined to listen than to the general who gave him sound but unwelcome advice.

Murray escaped to the continent in December 1746, and was graciously received in Rome by the Old Pretender, who granted him a pension; but in the following year when he went to Paris Charles Edward refused to see him. Lord George lived at various places abroad until his death, which occurred at Medemblik in Holland on the 11th of October 1760. He married in 1728 Amelia, daughter and heiress of James Murray of Strowan and Glencarse, by whom he had three sons and two daughters. His eldest son John became 3rd duke of Atholl in 1764; the two younger sons became lieutenant-general and vice-admiral respectively in the British service.

See *A Military History of Perthshire*, ed. by the marchioness of Tullibardine (2 vols., London, 1908), containing a memoir of Lord George Murray and a facsimile copy of his orders at Culloden; *The Atholl Chronicles*, ed. by the duke of Atholl (privately printed); The Chevalier James de Johnstone, *Memoirs of the Rebellion in 1745* (3rd ed., London, 1822); James Ray, *Compleat Historie of the Rebellion, 1745–1746* (London, 1754); Robert Patten, *History of the late Rebellion* (2nd ed., London, 1717); *Memoirs of Sir John Murray of Broughton*, ed. by R. F. Bell (Edinburgh, 1898); Andrew Henderson, *History of the Rebellion, 1745–1746* (2nd ed., London, 1748). (R. J. M.)

MURRAY, JAMES (*c.* 1719–1794), British governor of Canada, was a younger son of Alexander Murray, 4th Lord Elibank (d. 1736). Having entered the British army, he served with the 15th Foot in the West Indies, the Netherlands and Brittany, and became lieutenant-colonel of this regiment by purchase in 1751. In 1757 he led his men to North America to take part in the war against France. He commanded a brigade at the siege of Louisburg, was one of Wolfe's three brigadiers in the expedition against Quebec, and commanded the left wing of the army in the famous battle in September 1759. After the British victory and the capture of the city, Murray was left in command of Quebec; having strengthened its fortifications and taken measures to improve the morale of his men, he defended it in April and May 1760 against the attacks of the French, who were soon compelled to raise the siege. The British troops had been decimated by disease, and it was only a remnant that Murray now led to join General Amherst at Montreal, and to be present when the last batch of French troops in Canada surrendered. In October 1760 he was appointed governor of Quebec, and he became governor of Canada after this country had been formally ceded to Great Britain in 1763. In this year he quelled a dangerous mutiny, and soon afterwards his alleged partiality for the interests of the French Canadians gave offence to the British settlers; they asked for his recall, and in 1766 he retired from his post. After an inquiry in the House of Lords, he was exonerated from the charges which had been brought against him. In 1774 Murray was sent to Minorca as governor, and in 1781, while he was in charge of this island, he was besieged in Fort St Philip by a large force of French and Spaniards. After a stubborn resistance, which lasted nearly seven months, he was obliged to surrender the place; and on his return to England he was tried by a court-martial, at the instance of Sir William Draper, who had served under him in Minorca as lieutenant-governor. He was acquitted and he became a general in 1783. He died on the 18th of June 1794. Murray's only son was James Patrick Murray (1782–1834), a major-general and member of parliament.

MURRAY, SIR JAMES AUGUSTUS HENRY (1837–), British lexicographer, was born at Denholm, near Hawick, Roxburghshire, and after a local elementary education proceeded to Edinburgh, and thence to the university of London, where he graduated B.A. in 1873. Sir James Murray, who received honorary degrees from several universities, both British and foreign, was engaged in scholastic work for thirty years, from 1855 to 1885, chiefly at Hawick and Mill Hill. During this time his reputation as a philologist was increasing, and he was assistant examiner in English at the University of London from 1875 to 1879 and president of the Philological Society of London from 1878 to 1880, and again from 1882 to 1884. It was in connexion with this society that he undertook the chief work of his life, the editing of the *New English Dictionary*, based on materials collected by the society. These materials, which had accumulated since 1857, when the society first projected the publication of a dictionary on philological principles, amounted to an enormous quantity, of which an idea may be formed from the fact that Dr Furnivall sent in "some ton and three-quarters of materials which had accumulated under his roof." After negotiations extending over a considerable period, the contracts between the society, the delegates of the Clarendon Press, and the editor, were signed on the 1st of March 1879, and Murray began the examination and arrangement of the raw material, and the still more troublesome work of re-animating and maintaining the enthusiasm of "readers." In 1885 he removed from Mill Hill to Oxford, where his *Scriptorium* came to rank among the institutions of the University city. The first volume of the dictionary was printed at the Clarendon Press, Oxford, in 1888. A full account of its beginning and the manner of working up the materials will be found in Murray's presidential address to the Philological Society in 1879, while reports of its progress are given in the addresses by himself and other presidents in subsequent years. In addition to his work as a philologist, Murray was a frequent contributor to the transactions of the various antiquarian and archaeological societies of which he is a member; and he wrote the article on the English language for this Encyclopaedia. In 1885 he received the honorary degree of M.A. from Balliol College; he was an original fellow of the British Academy, and in 1908 he was knighted.

MURRAY (or MORAY), **JAMES STUART,** EARL OF (*c.* 1531–1570), regent of Scotland, was an illegitimate son of James V. of Scotland by Margaret Erskine, daughter of John Erskine, earl of Mar. In 1538 he was appointed prior of the abbey of St Andrews in order that James V. might obtain possession of its funds. Educated at St Andrews University, he attacked, in September 1549, an English force which had made a descent on the Fife coast, and routed it with great slaughter. In addition to the priory of St Andrews, he received those also of Pittenweem and Mâcon in France, but manifested no vocation for a monastic life. The discourses of Knox, which he heard at Calder, won his approval, and shortly after the return of the reformer to Scotland in 1559, James Stuart left the party of the queen regent and joined the lords of the congregation, who resolved forcibly to abolish the Roman service. After the return of Queen Mary in 1561, he became her chief adviser, and his cautious firmness was for a time effectual in inducing her to adopt a policy of moderation towards the reformers. At the beginning of 1562 he was created earl of Murray, a dignity also held by George Gordon, earl of Huntly, who, however, had lost the queen's favour. Only a few days later he was made earl of Mar, but as this title was claimed by John, Lord Erskine, Stuart resigned it and received a second grant of the earldom of Murray, Huntly by this time having been killed in battle. Henceforward he was known as the earl of Moray, the alternative Murray being a more modern and less correct variant. About this time the earl married Anne (d. 1583), daughter of William Keith, 1st Earl Marischal.

After the defeat and death of Huntly, the leader of the Catholic party, the policy of Murray met for a time with no obstacle, but he awakened the displeasure of the queen by his efforts in behalf of Knox when the latter was accused of high treason; and as he was also opposed to her marriage with Darnley, he was after that event declared an outlaw and took refuge in England. Returning to Scotland after the murder of Rizzio, he was pardoned by the queen. He contrived, however, to be away at the time of Darnley's assassination, and avoided the tangles of the marriage with Bothwell by going to France. After the abdication of Queen Mary at Lochleven, in July 1567, he was appointed regent of Scotland. When Mary escaped from Lochleven (May 2, 1568), the duke of Châtelherault and other Catholic nobles rallied to her standard, but Murray and the Protestant lords gathered their adherents, defeated her forces at Langside, near Glasgow (May 13, 1568), and compelled her to flee to England. Murray displayed promptness in baffling Mary's schemes, suppressed the border thieves, and ruled firmly, resisting the temptation to place the crown on his own head. He observed the forms of personal piety; possibly he shared the zeal of the reformers, while he moderated their bigotry. But he reaped the fruits of the conspiracies which led to the murders of Rizzio and Darnley. He amassed too great a fortune from the estates of the Church to be deemed a pure reformer of its abuses. He pursued his sister with a calculated animosity which would not have spared her life had this been necessary to his end or been favoured by Elizabeth. The mode of producing the casket letters and the false charges added by Buchanan, deprive Murray of any claim to have been an honest accuser. His reluctance to charge Mary with complicity in the murder of Darnley was feigned, and his object was gained when he was allowed to table the accusation without being forced to prove it. Mary remained a captive under suspicion of the gravest guilt, while Murray ruled Scotland in her stead, supported by nobles who had taken part in the steps which ended in Bothwell's deed. During the year between his becoming regent and his death several events occurred for which he has been censured, but which were necessary for his security: the betrayal to Elizabeth of the duke of Norfolk and of the secret plot for the liberation of Mary; the imprisonment of the earl of Northumberland, who after the failure of his rising in the north of England had taken refuge in Scotland; and the charge brought against Maitland of Lethington of complicity in Darnley's murder. Lethington was committed to custody, but was rescued by Kirkaldy of Grange, who held the castle of Edinburgh, and while there "the chameleon," as Buchanan named Maitland in his famous invective, gained over those in the castle, including Kirkaldy. Murray was afraid to proceed with the charge on the day of trial, while Kirkaldy and Maitland held the castle, which became the stronghold of the deposed queen's party. It has been suspected that Maitland and Kirkaldy were cognizant of the design of Hamilton of Bothwellhaugh to murder Murray, for he had been with them in the castle. This has been ascribed to private vengeance for the ill-treatment of his wife; but the feud of the Hamiltons with the regent is the most reasonable explanation. As he rode through Linlithgow Murray was shot on the 21st of January 1570 from a window by Hamilton, who had made careful preparation for the murder and his own escape. He was buried in the south aisle of St Giles Cathedral, Edinburgh, amid general mourning. Knox preached the sermon and Buchanan furnished the epitaph, both panegyrics. The elder of his two daughters, Elizabeth, married James Stuart (d. 1592), son of James, 1st Lord Doune, who succeeded to the earldom of Murray in right of his wife.

The materials for the life of Murray are found in the records and documents of the time, prominent among which are the various *Calendars of State Papers*. Mention must also be made of the many books which treat of Mary, Queen of Scots, and of the histories of the time—especially J. A. Froude, *History of England*, and Andrew Lang, *History of Scotland*.

MURRAY, JOHN, the name for several generations of a great firm of London publishers, founded by John McMurray (1745–1793), a native of Edinburgh and a retired lieutenant of marines, who in 1768 bought the book business of William Sandby in Fleet Street, and, dropping the Scottish prefix, called himself John Murray. He was one of the twenty original proprietors of the *Morning Chronicle*, and started the monthly *English Review* (1783–1796). Among his publications were Mitford's *Greece*, Langhorne's *Plutarch's Lives*, and the first part of Isaac D'Israeli's *Curiosities of Literature*. He died on the 6th of November 1793.

JOHN MURRAY (2) (1778–1843), his son, was then fifteen. During his minority the business was conducted by Samuel Highley, who was admitted a partner, but in 1803 the partnership was dissolved. Murray soon began to show the courage in literary speculation which earned for him later the name given him by Lord Byron of "the Anak of publishers." In 1807 he took a share with Constable in publishing *Marmion*, and became part owner of the *Edinburgh Review*, although with the help of Canning he launched in opposition the *Quarterly Review* (Feb. 1809), with William Gifford as its editor, and Scott, Canning, Southey, Hookham Frere and John Wilson Croker among its earliest contributors. Murray was closely connected with Constable, but, to his distress, was compelled in 1813 to break this association on account of Constable's business methods, which, as he foresaw, led to disaster. In 1811 the first two cantos of *Childe Harold* were brought to Murray by R. C. Dallas, to whom Byron had presented them. Murray paid Dallas 500 guineas for the copyright. In 1812 he bought the publishing business of William Miller (1769–1844), and migrated to 50, Albemarle Street. Literary London flocked to his house, and Murray became the centre of the publishing world. It was in his drawing-room that Scott and Byron first met, and here, in 1824, after the death of Lord Byron, the MS. of his memoirs, considered by Gifford unfit for publication, was destroyed. A close friendship existed between Byron and his publisher, but for political reasons business relations ceased after the publication of the 5th canto of *Don Juan*. Murray paid Byron some £20,000 for his various poems. To Thomas Moore he gave nearly £5000 for writing the life of Byron, and to Crabbe £3000 for *Tales of the Hall*. He died on the 27th of June 1843.

His son, JOHN MURRAY (3) (1808–1892), inherited much of his business tact and judgment. "Murray's Handbooks" for travellers were issued under his editorship, and he himself wrote several volumes (see his article on the "Handbooks" in *Murray's Magazine*, November 1889). He published many books of travel; also Campbell's *Lives of the Chancellors*, *The Speaker's Commentary*, Smith's *Dictionaries*; and works by Hallam, Gladstone, Lyell, Layard, Dean Stanley, Borrow, Darwin, Livingstone and Samuel Smiles. He died on the 2nd of April 1892, and was succeeded by his eldest son, JOHN MURRAY (4) (b. 1851), under whom, in association with his brother, A. H. Hallam Murray, the firm was continued.

See Samuel Smiles, *A Publisher and his Friends, Memoirs and Correspondence of the late John Murray . . .* (1891), for the second John Murray; a series of three articles by F. Espinasse on "The

House of Murray," in *The Critic* (Jan. 1860); and a paper by the same writer in *Harper's New Monthly Magazine* (Sept. 1885). See the *Letters and Journals* of Byron (ed. Prothero, 1898–1901).

MURRAY, JOHN (1778–1820), Scottish chemist, was born at Edinburgh in 1778 and died there on the 22nd of July 1820. He graduated M.D. at St Andrews in 1814, and attained some reputation as a lecturer on chemistry and materia medica. He was an opponent of Sir Humphry Davy's theory of chlorine, supporting the view that the substance contained oxygen, and it was in the course of experiments made to disprove his arguments that Dr John Davy discovered phosgene or carbonyl chloride. He was a diligent writer of textbooks, including *Elements of Chemistry* (1801); *Elements of Materia Medica and Pharmacy* (1804); *A System of Chemistry* (1806), and (anonymously) *A Comparative View of the Huttonian and Neptunian Systems of Geology*. He is sometimes confused with another John Murray (1786–1851), a popular lecturer at mechanics' institutes. The two men carried on a dispute about the invention of a miners' safety lamp in the *Phil. Mag.* for 1817.

MURRAY, SIR JOHN (1841–), British geographer and naturalist, was born at Coburg, Ontario, Canada, on the 3rd of March 1841, and after some years' local schooling studied in Scotland and on the Continent. He was then engaged for some years in natural history work at Bridge of Allan. In 1868 he visited Spitsbergen on a whaler, and in 1872, when the voyage of the "Challenger" was projected, he was appointed one of the naturalists to the expedition. At the conclusion of the voyage he was made principal assistant in drawing up the scientific results, and in 1882 he became editor of the *Reports*, which were completed in 1896. He compiled a summary of the results, and was part-author of the *Narrative of the Cruise* and of the *Report on Deep-sea Deposits*. He also published numerous important papers on oceanography and marine biology. In 1898 he was made K.C.B., and the received many distinctions from the chief scientific societies of the world. Apart from his work in connexion with the "Challenger" *Reports*, he went in 1880 and 1882 on expeditions to explore the Faeroe Channel, and between 1882 and 1894 was the prime mover in various biological investigations in Scottish waters. In 1897, with the generous financial assistance of Mr Laurence Pullar and a staff of specialists, he began a bathymetrical survey of the fresh-water lochs of Scotland, the results of which, with a fine series of illustrations and maps, were published in 1910 in six volumes. He took a leading part in the expedition which started in April 1910 for the physiological and biological investigation of the North Atlantic Ocean on the Norwegian vessel "Michael Sars."

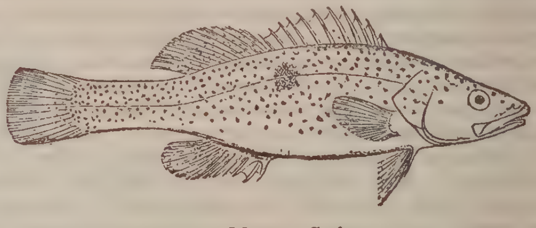
MURRAY, LINDLEY (1745–1826), Anglo-American grammarian, was born at Swatara, Pennsylvania, on the 22nd of April 1745. His father, a Quaker, was a leading New York merchant. At the age of fourteen he was placed in his father's office, but he ran away to a school in Burlington, New Jersey. He was brought back to New York, but his arguments against a commercial career prevailed, and he was allowed to study law. On being called to the bar he practised successfully in New York. In 1783 he was able to retire, and in 1784 he left America for England. Settling at Holgate, near York, he devoted the rest of his life to literary pursuits. His first book was *Power of Religion on the Mind* (1787). In 1795 he issued his *Grammar of the English Language*. This was followed, among other analogous works, by *English Exercises*, and the *English Reader*. These books passed through several editions, and the *Grammar* was the standard textbook for fifty years throughout England and America. Lindley Murray died on the 16th of January 1826.

See the *Memoir of the Life and Writings of Lindley Murray* (partly autobiographical), by Elizabeth Frank (1826); *Life of Murray*, by W. H. Egle (New York, 1885).

MURRAY (or MORAY), **SIR ROBERT** (*c.* 1600–1673), one of the founders of the Royal Society, was the son of Sir Robert Murray of Craigie, Ayrshire, and was born about the beginning of the 17th century. In early life he served in the French army, and, winning the favour of Richelieu, rose to the rank of colonel. On the outbreak of the Civil War he returned to Scotland and collected recruits for the royal cause. The triumph of Cromwell compelled him for a time to return to France, but he took part in the Scottish insurrection in favour of Charles II. in 1650, and was named lord justice clerk and a privy councillor. These appointments, which on account of the overthrow of the royal cause proved to be at the time only nominal, were confirmed at the Restoration in 1660. Soon after this Sir Robert Murray began to take a prominent part in the deliberations of a club instituted in London for the discussion of natural science, or, as it was then called, the "new philosophy." When it was proposed to obtain a charter for the society he undertook to interest the king in the matter, the result being that on the 15th of July 1662 the club was incorporated by charter under the designation of the Royal Society. Murray was its first president. He died in June 1673.

MURRAY, the largest river in Australia. It rises in the Australian Alps in 36° 40′ S. and 147° E., and flowing north-west skirts the borders of New South Wales and Victoria until it passes into South Australia, shortly after which it bends southward into Lake Alexandrina, a shallow lagoon, whence it makes its way to the sea at Encounter Bay by a narrow opening at 35° 35′ S. and 138° 55′ E. Near its source the Murray Gates, precipitous rocks, tower above it to the height of 3000 ft.; and the earlier part of its course is tortuous and uneven. Farther on it loses so much by evaporation in some parts as to become a series of pools. Its length till it debouches into Lake Alexandrina is 1120 m., its average breadth in summer is 240 ft., its average depth about 16 ft.; and it drains an area of about 270,000 sq. m. For small steamers it is navigable as far as Albury. Periodically it overflows, causing wide inundations. The principal tributaries of the Murray are those from New South Wales, including the Edward River, the united streams of the Murrumbidgee and Lachlan, and the Darling or Callewatta. In 1829 Captain Sturt traced the Murrumbidgee River till it debouched into the Murray, which he followed down to Lake Alexandrina, but he was compelled, after great hardships, to return without discovering its mouth. In 1831 Captain Barker, while attempting to discover this, was murdered by the natives.

MURRAY COD (*Oligorus macquariensis*), one of the largest of the numerous fresh-water Perciform fishes of Australia, and the most celebrated for its excellent flavour. It belongs to the family Serranidae. Its taxonomic affinities lie in the direction of the perch and not of the cod family. The shape of the body is that of a perch, and the dorsal fin consists of a spinous and rayed portion, the number of spines being eleven. The length of the spines varies with age, old individuals having shorter spines—that is, a lower dorsal fin. The form of the head and the dentition also resemble those of a perch, but none of the bones of the head has a serrated margin. The scales are small. The colour varies in different localities; it is generally brownish, with a greenish tinge and numerous small dark green spots. As implied by the name, this fish has its headquarters in the Murray River and its tributaries, but it occurs also in the northern parts of New South Wales. It is the most important food fish of these rivers, and is said to attain a length of more than 3 ft. and a weight of 120 lb.



Murray Cod.

MURREE, a town and sanatorium of British India, in the Rawalpindi district of the Punjab, 7517 ft. above the sea, about five hours' journey by cart-road from Rawalpindi town, and the starting-point for Kashmir. The houses are built on the summit and sides of an irregular ridge, and command magnificent views over forest-clad hills and deep valleys, studded with villages and cultivated fields, with the snow-covered peaks of Kashmir in the background. The population in 1901 was 1844; but these figures omit the summer visitors, who probably number 10,000. The garrison generally consists of three mountain batteries. Since 1877 the summer offices of the provincial government have been transferred to Simla. The Murree brewery, one of the largest in India, is the chief industrial establishment. The Lawrence Military Asylum for the children of European soldiers is situated here.

MURSHIDABAD, or Moorsheedabad, a town and district of British India, in the Presidency division of Bengal. The administrative headquarters of the district are at Berhampur. The town of Murshidabad is on the left bank of the Bhagirathi or old sacred channel of the Ganges. Pop. (1901), 15,168. The city of Murshidabad was the latest Mahommedan capital of Bengal. In 1704 the nawab Murshid Kulia Khan changed the seat of government from Dacca to Maksudabad, which he called after his own name. The great family of Jagat Seth maintained their position as state bankers at Murshidabad from generation to generation. Even after the conquest of Bengal by the British, Murshidabad remained for some time the seat of administration. Warren Hastings removed the supreme civil and criminal courts to Calcutta in 1772, but in 1775 the latter court was brought back to Murshidabad again. In 1790, under Lord Cornwallis, the entire revenue and judicial staffs were fixed at Calcutta. The town is still the residence of the nawab, who ranks as the first nobleman of the province with the style of nawab bahadur of Murshidabad, instead of nawab nazim of Bengal. His palace, dating from 1837, is a magnificent building in Italian style. The city is crowded with other palaces, mosques, tombs, and gardens, and retains such industries as carving in ivory, gold and silver embroidery, and silk-weaving. A college is maintained for the education of the nawab's family.

The District of Murshidabad has an area of 2143 sq. m. It is divided into two nearly equal portions by the Bhagirathi, the ancient channel of the Ganges. The tract to the west, known as the Rarh, consists of hard clay and nodular limestone. The general level is high, but interspersed with marshes and seamed by hill torrents. The Bagri or eastern half belongs to alluvial plains of eastern Bengal. There are few permanent swamps; but the whole country is low-lying, and liable to annual inundation. In the north-west are a few small detached hillocks, said to be of basaltic formation. Pop. (1901), 1,333,184, showing an increase of 6·6% in the decade. The principal industry is that of silk, formerly of much importance, and now revived with government assistance. A narrow-gauge railway crosses the district, from the East Indian line at Nalhati to Azimganj on the Bhagirathi, the home of many rich Jain merchants; and a branch of the Eastern Bengal railway has been opened.

MUS, the name of a Roman family of the plebeian Decian gens. (1) Publius Decius Mus won his first laurels in the Samnite War, when in 343 B.C., while serving as tribune of the soldiers, he rescued the Roman main army from an apparently hopeless position (Livy vii. 34). In 340, as consul with T. Manlius Torquatus as colleague, he commanded in the Latin War. The decisive battle was fought near Mt Vesuvius. The consuls, in consequence of a dream, had agreed that the general whose troops first gave way should devote himself to destruction, and so ensure victory. The left wing under Decius became disordered, whereupon, repeating after the chief pontiff the solemn formula of self-devotion he dashed into the ranks of the Latins, and met his death (Livy viii. 9). (2) His son, also called Publius, consul for the fourth time in 295, followed the example of his father at the battle of Sentinum, when the left wing which he commanded was shaken by the Gauls (Livy x. 28). The story of the elder Decius is regarded by Mommsen as an unhistorical "doublette" of what is related on better authority of the son.

MUSAEUS, the name of three Greek poets. (1) The first was a mythical seer and priest, the pupil or son of Orpheus, who was said to have been the founder of priestly poetry in Attica. According to Pausanias (i. 25) he was buried on the Museum hill, south-west of the Acropolis. He composed dedicatory and purificatory hymns and prose treatises, and oracular responses. These were collected and arranged in the time of Peisistratus by Onomacritus, who added interpolations. The mystic and oracular verses and customs of Attica, especially of Eleusis, are connected with his name (Herod. vii. 6; viii. 96; ix. 43). A *Titanomachia* and *Theogonia* are also attributed to him (G. Kinkel, *Epicorum graecorum fragmenta*, 1878). (2) The second was an Ephesian attached to the court of the kings of Pergamum, who wrote a *Perseis*, and poems on Eumenes and Attalus (Suïdas, *s.v.*). (3) The third (called Grammaticus in all the MSS.) is of uncertain date, but probably belongs to the beginning of the 6th century A.D., as his style and metre are evidently modelled after Nonnus. He must have lived before Agathias (530–582) and is possibly to be identified with the friend of Procopius whose poem (340 hexameter lines) on the story of Hero and Leander is by far the most beautiful of the age (editions by F. Passow, 1810; G. H. Schäfer, 1825; C. Dilthey, 1874). The little love-poem *Alpheus and Arethusa* (*Anthol. pal.* ix. 362) is also ascribed to Musaeus.

MUSA KHEL, a Pathan tribe on the Dera Ghazi Khan border of the Punjab province of India. They are of Kakar origin, numbering 4670 fighting men. They enter British territory by the Vihowa Pass, and carry on an extensive trade, but are not dependent on India for the necessaries of life. They are a peaceful and united race, and have been friendly to the British, but at enmity with the Khetrans and the Baluch tribes to the south of their country. In 1879 the Musa Khels and other Pathan tribes to the number of 5000 made a demonstration against Vihowa, but the town was reinforced and they dispersed. In 1884 they were punished, together with the Kakars, by the Zhob Valley Expedition.

MUSÄUS, JOHANN KARL AUGUST (1735–1787), German author, was born on the 29th of March 1735 at Jena, studied theology at the university, and would have become the pastor of a parish but for the resistance of some peasants, who objected that he had been known to dance. In 1760 to 1762 he published in three volumes his first work, *Grandison der Zweite*, afterwards (in 1781–1782) rewritten and issued with a new title, *Der deutsche Grandison*. The object of this book was to satirize Samuel Richardson's hero, who had many sentimental admirers in Germany. In 1763 Musäus was made master of the court pages at Weimar, and in 1769 he became professor at the Weimar gymnasium. His second book—*Physiognomische Reisen*—did not appear until 1778–1779. It was directed against Lavater, and attracted much favourable attention. In 1782 to 1786 he published his best work *Volksmärchen der Deutschen*. Even in this series of tales, the substance of which Musäus collected among the people, he could not refrain from satire. The stories, therefore, lack the simplicity of genuine folk-lore. In 1785 was issued *Freund Heins Erscheinungen in Holbeins Manier* by J. R. Schellenberg, with explanations in prose and verse by Musäus. A collection of stories entitled *Straussfedern*, of which a volume appeared in 1787, Musäus was prevented from completing by his death on the 28th of October 1787.

The *Volksmärchen* have been frequently reprinted (Düsseldorf, 1903, &c.). They were translated into French in 1844, and three of the stories are included in Carlyle's *German Romance* (1827); Musäus's *Nachgelassene Scriften* were edited by his relative, A. von Kotzebue (1791). See M. Müller, *J. K. A. Musäus* (1867), and an essay by A. Stern in *Beiträge zur Literaturgeschichte des 18. Jahrhunderts* (1893).

MUSCAT, Muskat or Maskat, a town on the south-east coast of Arabia, capital of the province of Oman. Its value as a naval base is derived from its position, which commands the entrance to the Persian Gulf. The town of Gwadar, the chief port of Makrān, belongs to Muscat, and by arrangement with the sultan the British occupy that port with a telegraph station of the Indo-Persian telegraph service. An Indian political residency is established at Muscat. In geographical position it is isolated from the interior of the continent. The mountains rise behind it in a rugged wall, across which no road exists. It is only from Matrah, a northern suburb shut off by an intervening spur which reaches to the sea, that land communication with the rest of Arabia can be maintained. Both Muscat and Matrah are defended from incursions on the landward side by a wall with towers at intervals. Muscat rose to importance with the Portuguese occupation of the Persian Gulf, and is noted for the extent of Portuguese ruins about it. Two lofty forts, of which the most easterly is called Jalāli and the western Merāni, occupy the summits of hills on either side the cove overlooking the town; and beyond them on the seaward side are two smaller defensive works called Sirat. All these are ruinous. A low sandy isthmus connects the rock and fortress of Jalāli with the mainland, and upon this isthmus stands the British residency. The sultan's palace is a three-storeyed building near the centre of the town, a relic of Portuguese occupation, called by the Arabs El Jereza, a corruption of Igrezia (church). This term is probably derived from the chapel once attached to the buildings which formed the Portuguese governor's residence and factory. The bazaar is insignificant, and its most considerable trade appears to be in a sweetmeat prepared from the gluten of maize. Large quantities of dates are also exported.

History.—The early history of Muscat is the history of Portuguese ascendancy in the Persian Gulf. When Albuquerque first burnt the place after destroying Karyāt in 1508, Kalhat was the chief port of the coast and Muscat was comparatively unimportant. Kalhat was subsequently sacked and burnt, the great Arab mosque being destroyed, before Albuquerque returned to his ships, "giving many thanks to our Lord." From that date, through 114 years of Portuguese ascendancy, Muscat was held as a naval station and factory during a period of local revolts, Arab incursions, and Turkish invasion by sea; but it was not till 1622, when the Portuguese lost Hormuz, that Muscat became the headquarters of their fleet and the most important place held by them on the Arabian coast. In 1650 the Portuguese were finally expelled from Oman. Muscat had been reduced previously by the humiliating terms imposed upon the garrison by the imam of Oman after a siege in 1648. For five years the Persians occupied Oman, but they disappeared in 1741. Under the great ruler of Oman, Said ibn Sultan (1804–1856), the fortunes of Muscat attained their zenith; but on his death, when his kingdom was divided and the African possessions were parted from western Arabia, Muscat declined. In 1883–1884, when Turki was sultan, the town was unsuccessfully besieged by the Indabayin and Rehbayin tribes, led by Abdul Aziz, the brother of Turki. In 1885 Colonel Miles, resident at Muscat, made a tour through Oman, following the footsteps of Wellsted in 1835, and confirmed that traveller's report of the fertility and wealth of the province. In 1898 the French acquired the right to use Muscat as a coaling station.

See Stiffe, "Trading Ports of Persian Gulf;" vol. ix. *Geog. Journal*, and the political reports of the Indian government from the Persian Gulf. Colonel Miles's explorations in Oman will be found in vol. vii. *Geog. Journal* (1896). (T. H. H.*)

MUSCATINE, a city and the county-seat of Muscatine county, Iowa, U.S.A., on the Mississippi river (here crossed by a wagon bridge), at the apex of the "great bend," in the south-east part of the state. Pop. (1890), 11,454; (1900), 14,073, of whom 2352 were foreign-born; (1910 census) 16,178. It is served by the Chicago Milwaukee & Saint Paul, the Chicago Rock Island & Pacific, and the Muscatine North & South railways. It is built on high rocky bluffs, and is the centre of a pearl-button industry introduced in 1891 by J. F. Boepple, a German, the buttons being made from the shells of the fresh-water mussel found in the neighbourhood; and there are other manufactures. Coal is mined in the vicinity, and near the city are large market-gardens, the water-melons growing on Muscatine Island (below the city) and sweet potatoes being their most important products. The municipality owns and operates the waterworks. Muscatine began as a trading-post in 1833. It was laid out in 1836, incorporated as a town under the name of Bloomington in 1839, and first chartered as a city, under its present name, in 1851.

MUSCHELKALK, in geology, the middle member of the German Trias. It consists of a series of calcareous, marly and dolomitic beds which lie conformably between the Bunter and Keuper formations. The name Muschelkalk (Fr., *calcaire coquillier*; *conchylien*, formation of D'Orbigny) indicates a characteristic feature in this series, viz. the frequent occurrence of lenticular banks composed of fossil shells, remarkable in the midst of a singularly barren group. In its typical form the Muschelkalk is practically restricted to the German region and its immediate neighbourhood; it is found in Thuringia, Harz, Franconia, Hesse, Swabia, and the Saar and Alsace districts. Northward it extends into Silesia, Poland and Heligoland. Representatives are found in the Alps, west and south of the Vosges, in Moravia, near Toulon and Montpellier, in Spain and Sardinia; in Rumania, Bosnia, Dalmatia, and beyond this into Asia in the Himalayas, China, Australia, California, and in North Africa (Constantine). From the nature of the deposits, as well as from the impoverished fauna, the Muschelkalk of the type area was probably laid down within a land-locked sea which, in the earlier portion of its existence, had only imperfect communications with the more open waters of the period. The more remote representatives of the formation were of course deposited in diverse conditions, and are only to be correlated through the presence of some of the Muschelkalk fossils.

In the "German" area the Muschelkalk is from 250–350 ft. thick; it is readily divisible into three groups, of which the upper and lower are pale thin-bedded limestones with greenish-grey marls, the middle group being mainly composed of gypsiferous and saliniferous marls with dolomite. The *Lower Muschelkalk* consists, from below upwards, of the following rocks, the ochreous Wellen Dolomit, lower Wellen Kalk, upper Wellen Kalk (so called on account of the wavy character of the bedding) with beds of "Schaumkalk" (a porous cellular limestone), and Oolite and the Orbicularis beds (with *Myophoria orbicularis*). In the Saar and Alsace districts and north Eifel, these beds take on a sandy aspect, the "Muschelsandstein." The *Middle Muschelkalk* or Anhydrite group, as already indicated, consists mainly of marls and dolomites with beds of anhydrite, gypsum and salt. The salt beds are worked at Hall, Friedrichshall, Heilbronn, Stettin and Erfurt. It is from this division that many of the mineral springs of Thuringia and south Germany obtain their saline contents. The cellular nature of much of the dolomite has given rise to the term "Zellendolomit." The *Upper Muschelkalk* (*Hauptmuschelkalk*, *Friedrichshallkalk* of von Alberti) consists of regular beds of shelly limestone alternating with beds of marl. The lower portion or "Trochitenkalk" is often composed entirely of the fragmentary stems of *Encrinus liliiformis*; higher up come the "Nodosus" beds with *Ceratites compressus*, *C. nodosus*, and *C. semipartitus* in ascending order. In Swabia and Franconia the highest beds are platy dolomites with *Tringonodus Sandergensis* and the crustacean *Bairdia*. Stylolites are common in all the Muschelkalk limestones. The Alpine Muschelkalk differs in many respects from that of the type area, and shows a closer relationship with the Triassic Mediterranean sea; the more important local phases will be found tabulated in the article TRIAS.

In addition to the fossils mentioned above, the following are Muschelkalk forms: *Terebratulina vulgaris*, *Spiriferina Mantzeli* and *S. hirsuta*, *Myophoria vulgaris*, *Rhynchotites hirundo*, *Ceratites Münsteri*, *Ptychites studeri*, *Balatonites balatonicus*, *Aspidura scutellata*, *Daonella Lommeli*, and in the Alpine region several rock-forming Algae, *Bactryllium*, *Gyroporella*, *Diplopora*, &c. (J. A. H.)

MUSCLE AND NERVE (*Physiology*).[1] Among the properties of living material there is one, widely though not universally present in it, which forms the pre-eminent characteristic of

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[1] The anatomy of the muscles is dealt with under MUSCULAR SYSTEM, and of the nerves under NERVE and NERVOUS SYSTEM.

Muscle.

Contractility.

muscular cells. This property is the liberation of some of the energy contained in the chemical compounds of the cells in such a way as to give mechanical work. The mechanical work is obtained by movement resulting from a change, it is supposed, in the elastic tension of the framework of the living cell. In the fibrils existing in the cell a sudden alteration of elasticity occurs, resulting in an increased tension on the points of attachment of the cell to the neighbouring elements of the tissue in which the cell is placed. These yield under the strain, and the cell shortens between those points of its attachment. This shortening is called *contraction.* But the volume of the cell is not appreciably altered, despite the change of its shape, for its one diameter increases in proportion as its other is diminished. The manifestations of contractility by muscle are various in mode. By *tonic* contraction is meant a prolonged and equable state of tension which yields under analysis no element of intermittent character. This is manifested by the muscular walls of the hollow viscera and of the heart, where it is the expression of a continuous liberation of energy in process in the muscular tissue, the outcome of the latter's own intrinsic life, and largely independent of any connexion with the nervous system. The muscular wall of the blood-vessels also exhibits tonic contraction, which, however, seems to be mainly traceable to a continual excitation of the muscle cells by nervous influence conveyed to them along their nerves, and originating in the great *vaso motor centre* in the bulb. In the ordinary striped muscles of the skeletal musculature, *e.g. gastrocnemius*, tonic contraction obtains; but this, like the last mentioned, is not autochthonous in the muscles themselves; it is indirect and *neural*, and appears to be maintained reflexly. The *receptive* organs of the muscular sense and of the semicircular canals are to be regarded as the sites of origin of this *reflex* tonus of the skeletal muscles. Striped muscles possessing an autochthonous tonus appear to be the various sphincter muscles.

Another mode of manifestation of contractility by muscles is the *rhythmic*. A tendency to rhythmic contraction seems discoverable in almost all muscles. In some it is very marked, for example in some viscera, the spleen, the bladder, the ureter, the uterus, the intestine, and especially in the heart. In several of these it appears not unlikely that the recurrent explosive liberations of energy in the muscle tissue are not secondary to recurrent explosions in nerve cells, but are attributable to decompositions arising *sua sponte* in the chemical substances of the muscle cells themselves in the course of their living. Even small strips of the muscle of the heart, if taken immediately after the death of the animal, continue, when kept moist and warm and supplied with oxygen, to "beat" rhythmically for hours. Rhythmic contraction is also characteristic of certain groups of skeletal muscles, *e.g.* the respiratory. In these the rhythmic activity is, however, clearly secondary to rhythmic discharges of the nerve cells constituting the respiratory centre in the bulb. Such discharges descend the nerve fibres of the spinal cord, and through the intermediation of various spinal nerve cells excite the respiratory muscles through their motor nerves. A form of contraction intermediate in character between the tonic and the rhythmic is met in the auricle of the heart of the toad. There slowly successive phases of increased and of diminished tonus regularly alternate, and upon them are superposed the rhythmic "beats" of the pulsating heart.

"The beat," *i.e.* the short-lasting explosive contraction of the heart muscle, can be elicited by a single, even momentary, application of a stimulus, *e.g.* by an induction shock. Similarly, such a single stimulus elicits from a skeletal muscle a single "beat," or, as it is termed, a "twitch." In the heart muscle during a brief period after each beat, that is, after each single contraction of the rhythmic series, the muscle becomes *inexcitable*. It cannot then be excited to contract by any agent, though the inexcitable period is more brief for strong than for weak stimuli. But in the skeletal, voluntary or striped muscles a second stimulus succeeding a previous so quickly as to fall even during the continuance of the contraction excited by a first, elicits a second contraction. This second contraction starts from whatever phase of previous contraction the muscle may have reached at the time. A third stimulus excites a third additional contraction, a fourth a fourth, and so on. The increments of contraction become, however, less and less, until the succeeding stimuli serve merely to maintain, not to augment, the existing degree of contraction. We arrive thus by synthesis at a summation of "beats" or of simple contractions in the compound, or "tetanic," or summed contraction of the skeletal muscles. The tetanic or summed contractions are more extensive than the simple, both in space and time, and liberate more energy, both as mechanical work and heat. The tension developed by their means in the muscle is many times greater than that developed by a simple twitch.

Excitability.

Muscle cells respond by changes in their activity to changes in their environment, and thus are said to be "excitable." They are, however, less excitable than are the nerve cells which innervate them. The change which excites them is termed a *stimulus.* The least stimulus which suffices to excite is known as the *stimulus of threshold value.* In the case of the heart muscle this threshold stimulus evokes a beat as extensive as does the strongest stimulus; that is, the intensity of the stimulus, so long as it is above threshold value, is not a function of the amount of the muscular response. But in the ordinary skeletal muscles the amount of the muscular contraction is for a short range of quantities of stimulus (of above threshold value) proportioned to the intensity of the stimulus and increases with it. A value of stimulus, however, is soon reached which evokes a *maximal* contraction. Further increase of contraction does not follow further increase of the intensity of the stimulus above that point.

Just as in a nerve fibre, when excited by a localized stimulus, the excited state spreads from the excited point to the adjacent unexcited ones, so in muscle the "contraction," when excited at a point, spreads to the adjacent uncontracted parts. Both in muscle and in nerve this spread is termed *conduction.* It is propagated along the muscle fibres of the skeletal muscles at a rate of about 3 metres per second. In the heart muscle it travels much more slowly. The disturbance travels as a *wave* of contraction, and the whole extent of the wave-like disturbance measures in ordinary muscles much more than the whole length of any single muscle fibre. That the excited state spreads only to previously unexcited portions of the muscle fibre shows that even in the skeletal variety of muscle there exists, though only for a very brief time, a period of inexcitability. The duration of this period is about $\frac{1}{600}$ of a second in skeletal muscle.

When muscle that has remained inactive for some time is excited by a series of single and equal stimuli succeeding at intervals too prolonged to cause summation the succeeding contractions exhibit progressive increase up to a certain degree. The tenth contraction usually exhibits the culmination of this so-called "staircase effect." The explanation may lie in the production of CO_2 in the muscle. That substance, in small doses, favours the contractile power of muscle. The muscle is a machine for utilizing the energy contained in its own chemical compounds. It is not surprising that the chemical substances produced in it by the decomposition of its living material should not be of a nature indifferent for muscular life. We find that if the series of excitations of the muscle be prolonged beyond the short stage of initial improvement, the contractions, after being well maintained for a time, later decline in force and speed, and ultimately dwindle even to vanishing point. This decline is said to be due to *muscular fatigue.* The muscle recovers on being allowed to rest unstimulated for a while, and more quickly on being washed with an innocuous but non-nutritious solution, such as ·6%, NaCl in water. The washing seems to remove excreta of the muscle's own production, and the period of repose removes them perhaps by diffusion, perhaps by breaking them down into innocuous material. Since the muscle produces lactic acids during activity, it has been suggested that acids are among the "fatigue substances" with which muscle poisons itself when deprived of circulating blood. Muscles when active seem to pour into the circulation substances which, of unknown chemical composition, are physiologically recognizable by their stimulant action on the respiratory nervous centre. The effect of the fatigue substances upon the contraction of the tissue is manifest especially in the relaxation process. The contracted state, instead of rapidly subsiding after discontinuance of the stimulus, slowly and only partially wears off, the muscle remaining in a condition of physiological "contracture." The alkaloid veratrin has a similar effect upon the contraction of muscle; it enormously delays the return from the contracted state, as also does epinephrin, an alkaloid extracted from the suprarenal gland.

Neuron Theory.

Peripheral Fatigue.

Nervous System.—The work of Camillo Golgi (Pavia, 1885 and onwards) on the minute structure of the nervous system has led to great alteration of doctrine in neural physiology. It had been held that the branches of the nerve cells, that is to say, the fine nerve fibres—since all nerve fibres are nerve cell branches, and all nerve cell branches are nerve fibres—which form a close felt-work in the nervous centres, there combined into a network actually continuous throughout. This *continuum* was held to render possible conduction in all directions throughout the grey matter of the whole nervous system. The fact that conduction occurred preponderantly in certain directions was explained by appeal to a hypothetical resistance to conduction which, for reasons unascertained, lay less in some directions than in others. The intricate felt-work has by Golgi been ascertained to be a mere interlacement, not an actual anastomosis network; the branches springing from the various cells remain lifelong unattached and unjoined to any other than their own individual cell. Each neuron or nerve cell is a morphologically distinct and discrete unit connected functionally but not structurally with its neighbours, and leading its own life independently of the destiny of its neighbours. Among the properties of the neuron is conductivity in all directions. But when neurons are linked together it is found that nerve impulses will only pass from neuron A to neuron B, and not from neuron B to neuron A; that is, the transmission of the excited state or nervous impulse, although possible in each neuron both up and down its own cell branches, is possible from one nerve cell to another in one direction only. That direction is the direction in which the nerve impulses flow under the conditions of natural life. The *synapse*, therefore, as the place of meeting of one neuron with the next is called, is said to valve the nerve circuits. This determinate sense of the spread is called *the law of forward direction*. The synapse appears to be a weak spot in the chain of conduction, or rather to be a place which breaks down with comparative ease under stress, *e.g.* under effect of poisons. The axons of the motor neurons are, inasmuch as they are nerve fibres in nerve trunks, easily accessible to artificial stimuli. It can be demonstrated that they are practically indefatigable—repeatedly stimulated by electrical currents, even through many hours, they, unlike muscle, continue to respond with unimpaired reaction. Yet when the muscular contraction is taken as index of the response of the nerve, it is found that unmistakable signs of fatigue appear even very soon after commencement of the excitation of the nerve, and the muscle ceases to give any contraction in response to stimuli applied indirectly to it through its nerve. But the muscle will, when excited directly, *e.g.* by direct application of electric currents, contract vigorously after all response on its part to the stimuli (nerve impulses) applied to it indirectly through its nerve has failed. The inference is that the "fatigue substances" generated in the muscle fibres in the course of their prolonged contraction injure and paralyse the motor end plates, which are places of synapsis between nerve cell and muscle cell, even earlier than they harm the contractility of the muscle fibres themselves. The alkaloid *curarin* causes motor paralysis by attacking in a selective way this junction of motor nerve cell and striped muscular fibre. Non-myelinate nerve fibres are as resistant to fatigue as are the myelinate.

Solidarity of Neuron.

The neuron is described as having a cell body or *perikaryon* from which the cell branches—dendrites and axon—extend, and it is this perikaryon which, as its name implies, contains the nucleus. It forms the trophic centre of the cell, just as the nucleus-containing part of every cell is the trophic centre of the whole cell. Any part of the cell cut off from the nucleus-containing part dies down: this is as true of nerve cells as of amoeba, and in regard to the neuron it constitutes what is known as the *Wallerian degeneration*. On the other hand, in some neurons, after severance of the axon from the rest of the cell (spinal motor cell), the whole nerve cell as well as the severed axon degenerates, and may eventually die and be removed. In the severed axon the degeneration is first evident in a breaking down of the naked nerve filaments of the motor end plate. A little later the breaking down of the whole axon, both axis cylinder and myelin sheath alike, seems to occur simultaneously throughout its entire length distal to the place of severance. The complex fat of the myelin becomes altered chemically, while the other components of the sheath break down. This death of the sheath as well as of the axis cylinder shows that it, like the axis cylinder, is a part of the nerve cell itself.

Tonic Activity of Neurons.

In addition to the trophic influence exerted by each part of the neuron on its other parts, notably by the perikaryon on the cell branches, one neuron also in many instances influences the nutrition of other neurons. When, for instance, the axons of the ganglion cells of the retina are severed by section of the optic nerve, and thus their influence upon the nerve cells of the visual cerebral centres is set aside, the nerve cells of those centres undergo secondary atrophy (*Gadden's atrophy*). They dwindle in size; they do not, however, die. Similarly, when the axons of the motor spinal cells are by severance of the nerve trunk of a muscle broken through, the muscle cells undergo "degeneration"—dwindle, become fatty, and alter almost beyond recognition. This trophic influence which one neuron exerts upon others, or upon the cells of an extrinsic tissue, such as muscle, is exerted in that direction which is the one normally taken by the natural nerve impulses. It seems, especially in the case of the nexus between certain neurons, that the influence, loss of which endangers nutrition, is associated with the occurrence of something more than merely the nervous impulses awakened from time to time in the leading nerve cell. The wave of change (nervous impulse) induced in a neuron by advent of a stimulus is after all only a sudden augmentation of an activity continuous within the neuron—a transient accentuation of one (the disintegrative) phase of the metabolism inherent in and inseparable from its life. The nervous impulse is, so to say, the sudden evanescent glow of an ember continuously black-hot. A continuous lesser "change" or stream of changes sets through the neuron, and is distributed by it to other neurons in the same direction and by the same synapses as are its nerve impulses. This gentle continuous activity of the neuron is called its *tonus*. In tracing the tonus of neurons to a source, one is always led link by link against the current of nerve force—so to say, "up stream"—to the first beginnings of the chain of neurons in the sensifacient surfaces of the body. From these, as in the eye, ear, and other sense organs, tonus is constantly initiated. Hence, when cut off from these sources, the nutrition of the neurons of various central mechanisms suffers. Thus the tonus of the motor neurons of the spinal cord is much lessened by rupture of the great afferent root cells which normally play upon them. A prominent and practically important illustration of neural tonus is given by the skeletal muscles. These muscles exhibit a certain constant condition of slight contraction, which disappears on severance of the nerve that innervates the muscle. It is a muscular tonus of central source consequent on the continual glow of excitement in the spinal motor neuron, whose outgoing end plays upon the muscle cells, whose ingoing end is played upon by other neurons—spinal, cerebral and cerebellar.

It is with the neural element of muscle tonus that *tendon phenomena* are intimately associated. The earliest-studied of these, the "*knee-jerk*," may serve as example of the class. It is a brief extension of the limb at the knee-joint, due to a simple contraction of the extensor muscle, elicited by a tap or other short mechanical stimulus applied to the muscle fibres through the tendon of the muscle. The jerk is obtainable only from muscle fibres possessed of neural tonus. If the sensory nerves of the extensor muscle be severed, the "jerk" is lost. The brevity of the interval between the tap on the knee and the beginning of the resultant contraction of the muscle seems such as to exclude the possibility of reflex development. A little experience in observations on the knee-jerk imparts a notion of the average strength of the "jerk." Wide departures from the normal standard are met with and are symptomatic of certain nervous conditions. Stretching of the muscles antagonistic to the extensors—namely, of the flexor muscles—reduces the jerk by inhibiting the extensor spinal nerve cells through the nervous impulses generated by the tense flexor muscles. Hence a favourable posture of the limb for eliciting the jerk is one ensuring relaxation of the hamstring muscles, as when the leg has been crossed upon the other. In sleep the jerk is diminished, in deep sleep quite abolished. Extreme bodily fatigue diminishes it. Conversely, a cold bath increases it. The turning of attention towards the knee interferes with the jerk; hence the device of directing the person to perform vigorously some movement, which does not involve the muscles of the lower limb, at the moment when the light blow is dealt upon the tendon. A slight degree of contraction of muscle seems the *substratum* of all attention. The direction of attention to the performance of some movement by the arm ensures that looseness and freedom from tension in the thigh muscles which is essential for the provocation of the jerk. The motor cells of the extensor muscles, when preoccupied by cerebral influence, appear refractory. T. Ziehen has noted exaltation of the jerk to follow extirpation of a cortical centre.

Conduction in Neurons.

Although the cell body or perikaryon of the neuron, with its contained nucleus, is essential for the maintenance of the life of the cell branches, it has become recognized that the actual process and function of "conduction" in many neurons can, and does, go on without the cell body being directly concerned in the conduction. S. Exner first showed, many years ago, that the nerve impulse travels through the spinal ganglion at the same speed as along the other parts of the nerve trunk—that is, that it suffers no delay in transit through the perikarya of the afferent root-neurons. Bethe has succeeded in isolating their perikarya from certain of the afferent neurons of the antennule of *Carcinus*. The conduction through the amputated cell branches continues unimpaired for many hours. This indicates that the conjunction between the conducting substance of the dendrons and that of the axon can be effected without the intermediation of the cell body. But the proper nutrition of the conducting substance is indissolubly dependent on the cell branches being in continuity with the cell body and nucleus it contains. Evidence illustrating this nexus is found in the visible changes produced in the perikaryon by prolonged activity induced and maintained in the conducting branches of the cell. As a result the fatigued cells appear shrunken, and their reaction to staining reagents alters, thus showing chemical alteration. Most marked is the decrease in the volume of the nucleus, amounting even to 44% of the initial volume. In the myelinated cell branches of the neuron, that is, in the ordinary nerve fibres, no visible change has ever been demonstrated as the result of any normal activity, however great—a striking contrast to the observations obtained on the perikarya. The chemical changes that accompany activity in the nerve fibre must be very small, for the production of CO_2 is barely measurable, and no production of heat is observable as the result of the most forced tetanic activity.

Growth in Nervous System.

The nerve cells of the higher vertebrata, unlike their blood cells, their connective tissue cells, and even their muscle cells, early, and indeed in embryonic life, lose power of multiplication. The number of them formed is definitely closed at an early period of the individual life. Although, unlike so many other cells, thus early sterile for reproduction of their kind, they retain for longer than most cells a high power of individual growth. They continue to grow, and to thrust out new branches and to lengthen existing branches, for many years far into adult life. They similarly possess power to repair and to regenerate their cell branches where these are injured or destroyed by trauma or disease. This is the explanation of the repair of nerve trunks that have been severed, with consequent degeneration of the peripheral nerve fibres. As a rule, a longer time is required to restore the motor than the sensory functions of a nerve trunk.

Cerebral Cortex.

Whether examined by functional or by structural features, the conducting paths of the nervous system, traced from beginning to end, never *terminate* in the centres of that system, but pass through them. All ultimately emerge as efferent channels. Every efferent channel, after entrance in the central nervous system, subdivides; of its subdivisions some pass to efferent channels soon, others pass further and further within the cord and brain before they finally reach channels of outlet. All the longest routes thus formed traverse late in their course the cortex of the cerebral hemisphere. It is this relatively huge development of cortex cerebri which is the pre-eminent structural character of man. This means that the number of "longest routes" in man is, as compared with lower animals, disproportionately great. In the lower animal forms there is no such nervous structure at all as the cortex cerebri. In the frog, lizard, and even bird, it is thin and poorly developed. In the marsupials it is more evident, and its excitation by electric currents evokes movements in the musculature of the crossed side of the body. Larger and thicker in the rabbit, when excited it gives rise in that animal to movements of the eyes and of the fore-limbs and neck; but it is only in much higher types, such as the dog, that the cortex yields, under experimental excitation, definitely localized foci, whence can be evoked movements of the fore-limb, hind-limb, neck, eyes, ears and face. In the monkey the proportions it assumes are still greater, and the number of foci, for distinct movements of this and that member, indeed for the individual joints of each limb, are much more numerous, and together occupy a more extensive surface, though relatively to the total surface of the brain a smaller one.

Experiment shows that in the manlike (anthropoid) apes the differentiation of the foci or "centres" of movement in the motor field of the cortex is even more minute. In them areas are found whence stimuli excite movements of this or that finger alone, of the upper lip without the lower, of the tip only of the tongue, or of one upper eyelid by itself. The movement evoked from a point of cortex is not always the same; its character is determined by movements evoked from neighbouring points of cortex immediately antecedently. Thus a point A will, when excited soon subsequent to point B, which latter yields protrusion of lips, itself yield lip-protrusion, whereas if excited after C, which yields lip-retraction, it will itself yield lip-retraction. The movements obtained by point-to-point excitation of the cortex are often evidently imperfect as compared with natural movements—that is, are only portions of complete normal movements. Thus among the tongue movements evoked by stigmatic stimulation of the cortex undeviated protrusion or retraction of the organ is not found. Again, from different points of the cortex the assumption of the requisite positions of the tongue, lips, cheeks, palate and epiglottis, as components in the act of sucking, can be provoked singly. Rarely can the whole action be provoked, and then only gradually, by prolonged and strong excitation of one of the requisite points, *e.g.* that for the tongue, with which the other points are functionally connected. Again, no single point in the cortex evokes the act of ocular convergence and fixation. All this means that the execution of natural movements employs simultaneous co-operative activity of a number of points in the motor fields on both sides of the brain together.

The accompanying simple figure indicates better than any verbal description the topography of the main groups of foci in the motor field of a manlike ape (chimpanzee). It will be noted from it that there is no direct relation between the extent of a cortical area and the mass of muscles which it controls. The mass of muscles in the trunk is greater than in the leg, and in the leg is greater than in the arm, and in the arm is many times greater than in the face and head; yet for the last the cortical area is the most extensive of all, and for the first-named is the least extensive of all.

The motor field of the cortex is, taken altogether, relatively to the size of the lower parts of the brain, larger in the anthropoid than in the inferior monkey brains. But in the anthropoid brain still more increased even than the motor field are the great regions of the cortex outside that field, which yield no definite movements under electric excitation, and are for that reason known as "silent." The motor field, therefore, though absolutely larger, forms a smaller fraction of the whole cortex of the brain than in the lower forms. The statement that in the anthropoid (orang-outan) brain the groups of foci in the motor fields of the cortex are themselves separated one from another by surrounding inexcitable cortex, has been made and was one of great interest, but has not been confirmed by subsequent observation. That in man the excitable foci of the motor field are islanded in excitable surface similarly and even more extensively, was a natural inference, but it had its chief basis in the observations on the orang, now known to be erroneous.

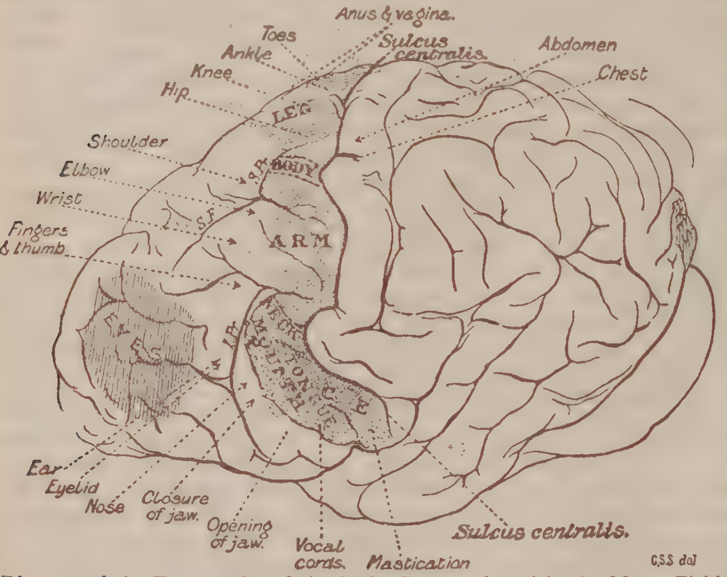


Diagram of the Topography of the Main Groups of Foci in the Motor Field of Chimpanzee.

In the diagram there is indicated the situation of the cortical centres for movement of the vocal cords. Their situation is at the lower end of the motor field. That they should lie there is interesting, because that place is close to one known in man to be associated with management of the movements concerned in speech. When that area in man is injured, the ability to utter words is impaired. Not that there is paralysis of the muscles of speech, since these muscles can be used perfectly for all acts other than speech. The area in man is known as the motor centre for speech; in most persons it exists only in the left half of the brain and not in the right. In a similar way damage of a certain small portion of the temporal lobe of the brain produces loss of intelligent apprehension of words spoken, although there is no deafness and although words seen are perfectly apprehended. Another region, "the angular region," is similarly related to intelligent apprehension of words *seen*, though not of words *heard*.

When this differentiation of cortex, with its highest expression in man, is collated with the development of the cortex as studied in the successive phases of its growth and ripening in the human infant, a suggestive analogy is obvious. The nervous paths in the brain and cord, as they attain completion, come to be furnished more and more with fibres that are fully myelinate. At the beginning of its history each is unprovided with myelinate nerve fibres. The excitable foci of the cerebral cortex are well myelinated long before the unexcitable are so. The regions of the cortex, whose conduction paths are early completed, may be arranged in groups by their connexions with sense-organs: eye-region, ear-region, skin and somaesthetic region, olfactory and taste region. The areas of intervening cortex, arriving at structural completion later than the above *sense-spheres*, are called by some *association-spheres*, to indicate the view that they contain the neural mechanisms of reactions (some have said "ideas") associated with the sense perceptions elaborated in the several sense-spheres.

Sensori-motor Centres.

The name "motor area" is given to that region of cortex whence, as D. Ferrier's investigations showed, motor reactions of the facial and limb muscles are regularly and easily evoked. This region is often called the *sensori-motor cortex*, and the term *somaesthetic* has also been used and seems appropriate. It has been found that disturbance of sensation, as well as disturbance of movement, is often incurred by its injury. Patients in whom, for purposes of diagnosis, it has been electrically excited, describe, as the initial effect of the stimulation, tingling and obscure but locally-limited sensations, referred to the part whose muscles a moment later are thrown into co-ordinate activity. The distinction, therefore, between the movement of the eyeballs, elicited from the occipital (visual) cortex, and that of the hand, elicited from the cortex in the region of the central sulcus (somaesthetic), is not a difference between motor and sensory, for both are sensori-motor in the nature of their reactions; the difference is only a difference between the kind of sense and sense-organ in the two cases, the muscular apparatus in each case being an appanage of the sensual.

That the lower types of vertebrate, such as fish, *e.g.* carp, possess practically no cortex cerebri, and nevertheless execute "volitional" acts involving high co-ordination and suggesting the possession by them of *associative memory*, shows that for the existence of these phenomena the cortex cerebri is in them not essential. In the dog it has been proved that after removal from the animal of every vestige of its cortex cerebri, it still executes habitual acts of great motor complexity requiring extraordinarily delicate adjustment of muscular contraction. It can walk, run and feed; such an animal, on wounding its foot, will run on three legs, as will a normal dog under similar mischance. But signs of associative memory are almost, if not entirely, wanting. Throughout three years such a dog failed to learn that the attendant's lifting it from the cage at a certain hour was the preliminary circumstance of the feeding-hour; yet it did exhibit hunger, and would refuse further food when a sufficiency had been taken. In man, actually gross sensory defects follow even limited lesions of the cortex. Thus the rabbit and the dog are not absolutely blinded by removal of the entire cortex, but in man destruction of the occipital cortex produces total blindness, even to the extent that the pupil of the eye does not respond when light is flashed into the eye.

Cerebellum.

Examination of the cerebellum by the method of Wallerian degeneration has shown that a large number of spinal and bulbar nerve cells send branches up into it. These seem to end, for the most part, in the grey cortex of the median lobe, some, though not the majority, of them decussating across the median line. The organ seems also to receive many fibres from the parietal region of the cerebral hemisphere. From the organ there emerge fibres which cross to the opposite red nucleus, and directly or indirectly reach the thalamic region of the crossed hemisphere. The pons or middle peduncle, which was regarded, on the uncertain ground of naked-eye dissection of human anatomy, as commissural between the two lateral lobes of the cerebellum, is now known to constitute chiefly a cerebro-cerebellar decussating path. Certain cerebellar cells send processes down to the cell-group in the bulb known as the nucleus of Deiters, which latter projects fibres down the spinal cord. Whether there is any other or direct emergent path from the cerebellum into the spinal cord is a matter on which opinion is divided.

Injuries of the cerebellum, if large, derange the power of executing movements, without producing any detectable derangement of sensation. The derangement gradually disappears, unless the damage to the organ be very wide. A reeling gait, oscillations of the body which impart a zigzag direction to the walk, difficulty in standing, owing to unsteadiness of limb, are common in cerebellar disease. On the other hand, congenital defect amounting to absence of one cerebellar hemisphere has been found to occasion practically no symptoms whatsoever. Not a hundredth part of the cerebellum has remained, and yet there has existed ability to stand, to walk, to handle and lift objects in a fairly normal way, without any trace of impairment of cutaneous or muscular sensitivity. The damage to the cerebellum must, it would seem, occur abruptly or quickly in order to occasion marked derangement of function, and then the derangement falls on the execution of movements. One aspect of this derangement, named by Luciani *astasia*, is a tremor heightened by or only appearing when the muscles enter upon action—"intention tremor." Vertigo is a frequent result of cerebellar injury: animals indicate it by their actions; patients describe it. To interpret this vertigo, appeal must be made to disturbances, other than cerebellar, which likewise occasion vertigo. These include, besides ocular squint, many spatial positions and movements unwonted to the body: the looking from a height, the gliding over ice, sea-travel, to some persons even travelling by train, or the covering of one eye. Common to all these conditions is the synchronous rise of perceptions of spatial relations between the self and the environment which have not, or have rarely, before arisen in synchronous combination. The tactual organs of the soles, and the muscular sense organs of limbs and trunk, are originating perceptions that indicate that the self is standing on the solid earth, yet the eyes are at the same time originating perceptions that indicate that the solid earth is far away below the standing self. The combination is hard to harmonize at first; it is at least not given as *innately* harmonized. Perceptions regarding the "me" are notoriously highly charged with "feeling," and the conflict occasions the feeling insufficiently described as "giddiness." The cerebellum receives paths from most, if not from all, of the afferent roots. With certain of these it stands associated most closely, namely, with the vestibular, representing the sense organs which furnish data for appreciation of positions and movements of the head, and with the channels, conveying centripetal impressions from the apparatus of skeletal movement. Disorder of the cerebellum sets at variance, brings discord into, the space-perceptions contributory to the movement. The body's movement becomes thus imperfectly adjusted to the spatial requirements of the act it would perform.

In the physiological basis of sense exist many impressions which, apart from and devoid of psychical accompaniment, reflexly influence motor (muscular) innervation. It is with this sort of habitually apsychical reaction that the cerebellum is, it would seem, employed. That it is apparently devoid of psychical concomitant need not imply that the impressions concerned in it are crude and inelaborate. The seeming want of reaction of so much of the cerebellar structure under artificial stimulation, and the complex relay system revealed in the histology of the cerebellum, suggest that the impressions are elaborate. Its reaction preponderantly helps to secure co-ordinate innervation of the skeletal musculature, both for maintenance of attitude and for execution of movements.

Sleep.—The more obvious of the characters of sleep (*q.v.*) are essentially nervous. In deep sleep the threshold-value of the stimuli for the various senses is very greatly raised, rising rapidly during the first hour and a half of sleep, and then declining with gradually decreasing decrements. The muscles become less tense than in their waking state: their tonus is diminished, the upper eyelid falls, and the knee-jerk is in abeyance. The respiratory rhythm is less frequent and the breathing less deep; the heart-beat is less frequent; the secretions are less copious; the pupil is narrow; in the brain there exists arterial anaemia with venous congestion, so that the blood-flow there is less than in the waking state.

Theories of Sleep.

It has been suggested that the gradual cumulative result of the activity of the nerve cells during the waking day is to load the brain tissue with "fatigue-substances" which clog the action of the cells, and thus periodically produce that loss of consciousness, &c., which is sleep. Such a drugging of tissue by its own excreta is known in muscular fatigue, but the fact that the depth of sleep progressively increases for an hour and more after its onset prevents complete explanation of sleep on similar lines. It has been urged that the neurons retract during sleep, and that thus at the synapses the gap between nerve cell and nerve cell becomes wider, or that the supporting cells expand between the nerve cells and tend to isolate the latter one from the other. Certain it is that in the course of the waking day a great number of stimuli play on the sense organs, and through these produce disintegration of the living molecules of the central nervous system. Hence during the day the assimilatory processes of these cells are overbalanced by their wear and tear, and the end-result is that the cell attains an atomic condition less favourable to further disintegration than to reintegration. That phase of cell life which we are accustomed to call "active" is accompanied always by disintegration. When in the cell the assimilative processes exceed dissimilative, the external manifestations of energy are liable to cease or diminish. Sleep is not exhaustion of the neuron in the sense that prolonged activity has reduced its excitability to zero. The nerve cell just prior to sleep is still well capable of response to stimuli, although perhaps the threshold-value of the stimulus has become rather high, whereas after entrance upon sleep and continuance of sleep for several hours, and more, when all spur to the dissimilation process has been long withheld, the threshold-value of the sensory stimulus becomes enormously higher than before. The exciting cause of sleep is therefore no complete exhaustion of the available material of the cells, nor is it entirely any paralysing of them by their excreta. It is more probably abeyance of external function during a periodic internal assimilatory phase.

Two processes conjoin to initiate the assimilatory phase. There is close interconnexion between the two aspects of the double activity that in physiological theory constitute the chemical life of protoplasm, between dissimilation and assimilation. Hering has long insisted on a self-regulative adjustment of the cell metabolism, so that action involves reaction, increased catabolism necessitates after-increase of anabolism. The long-continued incitement to catabolism of the waking day thus of itself predisposes the nerve cells towards rebound into the opposite phase; the increased catabolism due to the day's stimuli induces increase of anabolism, and though recuperation goes on to a large extent during the day itself, the recuperative process is slower than, and lags behind, the disintegrative. Hence there occurs a cumulative effect, progressively increasing from the opening till the closing hours. The second factor inducing the assimilative change is the withdrawal of the nervous system from sensual stimulation. The eyes are closed, the maintenance of posture by active contraction is replaced by the recumbent pose which can be maintained by static action and the mere mechanical consistence of the body, the ears are screened from noise in the quiet chamber, the skin from localized pressure by a soft, yielding couch. The effect of thus reducing the excitant action of the environment is to give consciousness over more to mere revivals by memory, and gradually consciousness lapses. A remarkable case is well authenticated, where, owing to disease, a young man had lost the use of all the senses save of one eye and of one ear. If these last channels were sealed, in two or three minutes' time he invariably fell asleep.

If natural sleep is the expression of a phase of decreased excitability due to the setting in of a tide of anabolism in the cells of the nervous system, what is the action of narcotics? They lower the

Narcotics.

external activities of the cells, but do they not at the same time lower the internal, reparative, assimilative activity of the cell that in natural sleep goes vigorously forward preparing the system for the next day's drain on energy? In most cases they seem to lower both the internal and the external activity of the nerve cells, to lessen the cell's entire metabolism, to reduce the speed of its whole chemical movement and life. Hence it is not surprising that often the refreshment, the recuperation, obtained from and felt after sleep induced by a drug amounts to nothing, or to worse than nothing. But very often refreshment is undoubtedly obtained from such narcotic sleep. It may be supposed that in the latter case the effect of the drug has been to ensure occurrence of that second predisposing factor mentioned above, of that withdrawal of sense impulses from the nerve centres that serves to usher in the state of sleep. In certain conditions it may be well worth while by means of narcotic drugs to close the portals of the senses for the sake of thus obtaining stillness in the chambers of the mind; their enforced quietude may induce a period in which natural rest and repair continue long after the initial unnatural arrest of vitality due to the drug itself has passed away.

Hypnotism.—The physiology of this group of "states" is, as regards the real understanding of their production, eminently vague (see also HYPNOTISM). The conditions which tend to induce them contain generally, as one element, constrained visual attention prolonged beyond ordinary duration. Symptoms attendant on the *hypnotic* state are closure of the eyelids by the hypnotizer without subsequent attempt to open them by the hypnotized subject; the pupils, instead of being constricted, as for near vision, dilate, and there sets in a condition superficially resembling sleep. But in natural sleep the action of all parts of the nervous system is subdued, whereas in the hypnotic the reactions of the lower, and some even of the higher, parts are exalted. Moreover, the reactions seem to follow the sense impressions with such fatality, that, as an inference, absence of will-power to control them or suppress them is suggested. This reflex activity with "paralysis of will" is characteristic of the *somnambulistic* state. The threshold-value of the stimuli adequate for the various senses may be extraordinarily lowered. Print of microscopic size may be read; a watch ticking in another room can be heard. Judgment of weight and texture of surface is exalted; thus a card can in a dark room be felt and then re-selected from the re-shuffled pack. Akin to this condition is that in which the power of maintaining muscular effort is increased; the individual may lie stiff with merely head and feet supported on two chairs; the limbs can be held outstretched for hours at a time. This is the *cataleptic* state, the phase of hypnotism which the phenomena of so-called "animal hypnotism" resemble most. A frog or fowl or guinea-pig held in some unnatural pose, and retained so forcibly for a time, becomes "set" in that pose, or rather in a posture of partial recovery of the normal posture. In this state it remains motionless for various periods. This condition is more than usually readily induced when the cerebral hemispheres have been removed. The decerebrate monkey exhibits "cataleptoid" reflexes. Father A. Kircher's *experimentum mirabile* with the fowl and the chalk line succeeds best with the decerebrate hen. The attitude may be described as due to prolonged, not very intense, discharge from reflex centres that regulate posture and are probably intimately connected with the cerebellum. A sudden intense sense stimulus usually suffices to end this tonic discharge. It completes the movement that has already set in but had been checked, as it were, half-way, though tonically maintained. Coincidently with the persistence of the tonic contraction, the higher and volitional centres seem to lie under a spell of inhibition; their action, which would complete or cut short the posture-spasm, rests in abeyance. Suspension of cerebral influence exists even more markedly, of course, when the cerebral hemispheres have been ablated.

But a potent—according to some, the most potent—factor in hypnotism, namely, *suggestion,* is unrepresented in the production of so-called animal hypnotism. We know that one idea suggests another, and that volitional movements are the outcome of ideation. If we assume that there is a material process at the basis of ideation, we may take the analogy of the concomitance between a spinal reflex movement and a skin sensation. The physical "touch" that initiates the psychical "touch" initiates, through the very same nerve channels, a reflex movement responsive to the physical "touch," just as the psychical "touch" may be considered also a response to the same physical event. But in the decapitated animal we have good arguments for belief that we get the reflex movement alone as response; the psychical touch drops out. Could we assume that there is in the adult man reflex machinery which is of higher order than the merely spinal, which employs much more complex motor mechanisms than they, and is connected with a much wider range of sense organs; and could we assume that this reflex machinery, although usually associated in its action with memorial and volitional processes, may in certain circumstances be sundered from these latter and unattendant on them—may in fact continue in work when the higher processes are at a standstill—then we might imagine a condition resembling that of the somnambulistic and cataleptic states of hypnotism.

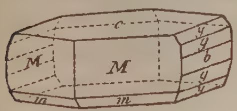
Such assumptions are not wholly unjustified. Actions of great complexity and delicacy of adjustment are daily executed by each of us without what is ordinarily understood as volition, and without more than a mere shred of memory attached thereto. To take one's watch from the pocket and look at it when from a familiar clock-tower a familiar bell strikes a familiar hour, is an instance of a habitual action initiated by a sense perception outside attentive consciousness. We may suddenly remember dimly afterwards that we have done so, and we quite fail to recall the difference between the watch time and the clock time. In many instances hypnotism seems to establish quickly reactions similar to such as usually result only from long and closely attentive practice. The sleeping mother rests undisturbed by the various noises of the house and street, but wakes at a slight murmur from her child. The ship's engineer, engaged in conversation with some visitor to the engine-room, talks apparently undisturbed by all the multifold noise and rattle of the machinery, but let the noise alter in some item which, though unnoticeable to the visitor, betokens importance to the trained ear, and his passive attention is in a moment caught. The warders at an asylum have been hypnotized to sleep by the bedside of dangerous patients, and "suggested" to awake the instant the patients attempt to get out of bed, sounds which had no import for them being inhibited by suggestion. Warders in this way worked all day and performed night duty also for months without showing fatigue. This is akin to the "repetition" which, read by the schoolboy last thing overnight, is on waking "known by heart." Most of us can wake somewhere about a desired although unusually early hour, if overnight we desire much to do so.

Two theories of a physiological nature have been proposed to account for the separation of the complex reactions of these conditions of hypnotism from volition and from memory. R. P. H. Heidenhain's view is that the cortical centres of the hemisphere are inhibited by peculiar conditions attaching to the initiatory sense stimuli. W. T. Preyer's view is that the essential condition for initiation is fatigue of the will-power under a prolonged effort of undivided attention.

Hypnotic somnambulism and hypnotic catalepsy are not the only or the most profound changes of nervous condition that hypnosis can induce. The physiological derangement which is the basis of the abeyance of volition may, if hypnotism be profound, pass into more widespread derangement, exhibiting itself as the *hypnotic lethargy*. This is associated not only with paralysis of will but with profound anaesthesia. Proposals have been made to employ hypnotism as a method of producing anaesthesia for surgical purposes, but there are two grave objections to such employment. In order to produce a sufficient degree of hypnotic lethargy the subject must be made extremely susceptible, and this can only be done by repeated hypnotization. It is necessary to hypnotize patients every day for several weeks before they can be got into a degree of stupor sufficient to allow of the safe execution of a surgical operation. But the state itself, when reached, is at least as dangerous to life as is that produced by inhalation of ether, and it is more difficult to recover from. Moreover, by the processes the subject has gone through he has had those physiological activities upon which his volitional power depends excessively deranged, and not improbably permanently enfeebled. (C. S. S.)

MUSCOVITE, a rock-forming mineral belonging to the mica group (see MICA). It is also known as potash-mica, being a potassium, hydrogen and aluminium orthosilicate, $H_2KAl_3(SiO_4)_3$.

As the common white mica obtainable in thin, transparent cleavage sheets of large size it was formerly used in Russia for window panes and known as "Muscovy glass"; hence the name muscovite, proposed by J. D. Dana in 1850. It crystallizes in the monoclinic system; distinctly developed crystals, however, are rare and have the form of rough six-sided prisms or plates: thin scales without definite crystal outlines are more common. The most prominent feature is the perfect cleavage parallel to the basal plane (*c* in the figure), on which the lustre is pearly in character. The hardness is 2–2½, and the spec. grav. 2·8–2·9. The plane of the optic axes is perpendicular to the plane of symmetry and the acute bisectrix nearly normal to the cleavage; the optic axial angle is 60–70°, and double refraction is strong and negative in sign.



Muscovite frequently occurs as fine scaly to almost compact aggregates, especially when, as is often the case, it has resulted by the alteration of some other mineral, such as felspar, topaz, cyanite, &c.; several varieties depending on differences in structure have been distinguished. Fine scaly varieties are damourite, margarodite (from Gr. μαργαρίτης, a pearl), gilbertite, sericite (from σηρικός, silky), &c. In sericite the fine scales are united in fibrous aggregates giving rise to a silky lustre: this variety is a common constituent of phyllites and sericite-schists. Oncosine (from ὄγκοσις, intumescence) is a compact variety forming rounded aggregates, which swell up when heated before the blowpipe. Closely related to oncosine are several compact minerals, included together under the name pinite, which have resulted by the alteration of iolite, spodumene and other minerals. Other varieties depend on differences in chemical composition. Fuchsite or "chrome-mica" is a bright green muscovite containing chromium; it has been used as a decorative stone. Oellacherite is a variety containing some barium. In phengite there is more silica than usual, the composition approximating to $H_2KAl_3(Si_3O_8)_3$.

Muscovite is of wide distribution and is the commonest of the micas. In igneous rocks it is found only in granite, never in volcanic rocks; but it is abundant in gneiss and mica-schist, and in phyllites and clay-slates, where it has been formed at the expense of alkali-felspar by dynamo-metamorphic processes. In pegmatite-veins traversing granite, gneiss or mica-schist it occurs as large sheets of commercial value, and is mined in India, the United States and Brazil (see MICA), and to a limited extent, together with felspar, in southern Norway and in the Urals. Large sheets of muscovite were formerly obtained from Solovetsk Island, Archangel. (L. J. S.)

MUSCULAR SYSTEM (*Anatomy*[1]). The muscular tissue (Lat. *musculus*, from a fancied resemblance of certain muscles to a little mouse) is of three kinds: (1) *voluntary* or *striped muscle*; (2) *involuntary* or *unstriped muscle*, found in the skin, walls of hollow viscera, coats of blood and lymphatic vessels, &c.; (3) *heart muscle*. The microscopical differences of these different kinds are discussed in the article on CONNECTIVE TISSUES. Here only the voluntary muscles, which are under the control of the will, are to be considered.

The voluntary muscles form the red flesh of an animal, and are the structures by which one part of the body is moved at will upon another. Each muscle is said to have an origin and an insertion, the former being that attachment which is usually more fixed, the latter that which is more movable. This distinction, however, although convenient, is an arbitrary one, and an example may make this clear. If we take the *pectoralis major*, which is attached to the front of the chest on the one hand and to the upper part of the arm bone on the other, the effect of its contraction will obviously be to draw the arm towards the chest, so that its origin under ordinary circumstances is said to be from the chest while its insertion is into the arm; but if, in climbing a tree, the hand grasps a branch above, the muscular contraction will draw the chest towards the arm, and the latter will then become the origin. Generally, but not always, a muscle is partly fleshy and partly tendinous; the fleshy contractile part is attached at one or both ends to cords or sheets of white fibrous tissue, which in some cases pass round pullies and so change the direction of the muscle's action. The other end of these cords or *tendons* is usually attached to the periosteum of bones, with which it blends. In some cases, when a tendon passes round a bony pulley, a sesamoid bone is developed in it which diminishes the effects of friction. A good example of this is the patella in the tendon of the *rectus femoris* (fig. 1, P.).

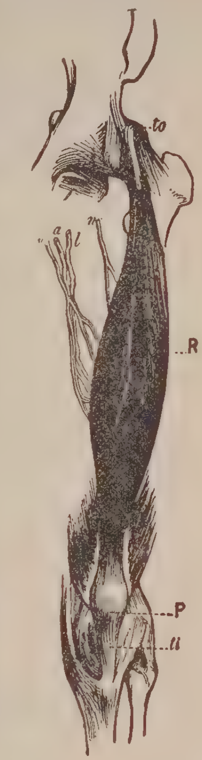


FIG. 1.—The Rectus Muscle of the Thigh; to show the constituent parts of a muscle.
R, The fleshy belly.
to, Tendon of origin.
ti, Tendon of insertion.
n, Nerve of supply.
a, Artery of supply.
v, Vein.
l, Lymphatic vessel.
P, The patella.

Every muscle is supplied with blood vessels and lymphatics (fig. 1, *v*, *a*, *l*), and also with one or more nerves. The nerve supply is very important both from a medical and a morphological point of view. The approximate attachments are also important, because unless they are realized the action of the muscle cannot be understood, but the exact attachments are perhaps laid too great stress on in the anatomical teaching of medical students. The study of the actions of muscles is, of course, a physiological one, but teaching the subject has been handed over to the anatomists, and the results have been in some respects unfortunate. Until very recently the anatomist studied only the dead body, and his one idea of demonstrating the action of a muscle was to expose and then to pull it, and whatever happened he said was the action of that muscle. It is now generally recognized that no movement is so simple that only one muscle is concerned in it, and that what a muscle may do and what it really does do are not necessarily the same thing. As far as the deeper muscles are concerned, we still have only the anatomical method to depend upon, but with the superficial muscles it should be checked by causing a living person to perform certain movements and then studying which muscles take part in them.

For a modern study of muscular actions, see C. E. Beevor's *Croonian Lectures for 1903* (London, 1904).

Muscles have various shapes: they may be fusiform, as in fig. 1, conical, riband-like, or flattened into triangular or quadrilateral sheets. They may also be attached to skin, cartilage or fascia instead of to bone, while certain muscles surround openings which they constrict and are called *sphincters*. The names of the muscles have gradually grown up, and no settled plan has been used in giving them. Sometimes, as in the *coraco-brachialis* and *thyro-hyoid*, the name describes the origin and insertion of the muscle, and, no doubt, for the student of human anatomy this is the most satisfactory plan, since by learning the name the approximate attachments are also learnt. Sometimes the name only indicates some peculiarity in the shape of the muscle and gives no clue to its position in the body or its attachments; examples of this are *biceps*, *semitendinosus* and *pyriformis*. Sometimes, as in the *flexor carpi ulnaris* and *corrugator supercilii*, the use of the muscle is shown. At other times the position in the body is indicated, but not the attachments, as in the *tibialis anticus* and *peroneus longus*, while, at other times, as in the case of the *pectineus*, the name is only misleading. Fortunately the names of the describers themselves are very seldom applied to muscles; among the few examples are *Horner's muscle* and the

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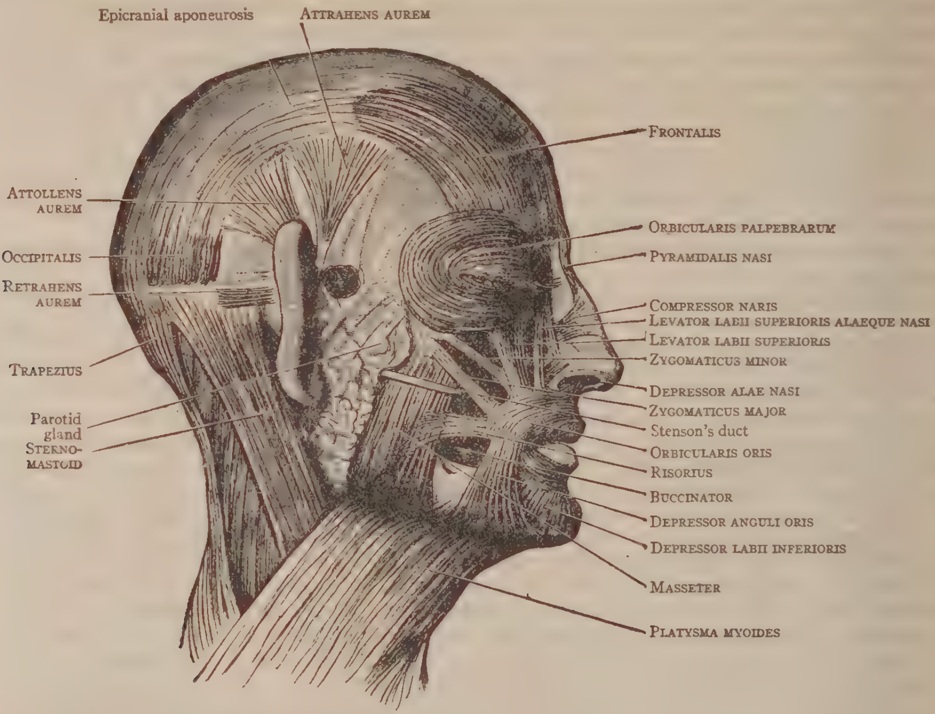
[1] For physiology, see MUSCLE AND NERVE.

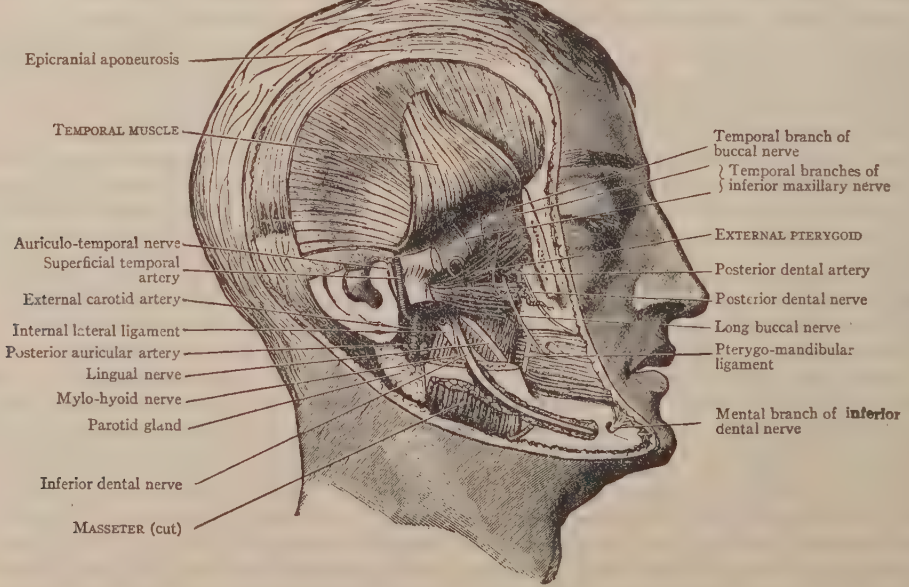
muscular band of Treitz. The German anatomists at the Basel conference lately proposed a uniform Latin and Greek nomenclature, which, though not altogether satisfactory, is gaining ground on the European continent. As there are some four hundred muscles on each side of the body it will be impossible here to attempt more than a mere sketch of them; for the details the anatomical textbooks must be consulted.


Epicranial aponeurosis
Attrahens aurem
Frontalis
Attollens aurem
Occipitalis
Retrahens aurem
Trapezius
Parotid gland
Sterno-mastoid
Orbicularis palpebrarum
Pyramidalis nasi
Compressor naris
Levator labii superioris alaeque nasi
Levator labii superioris
Zygomaticus minor
Depressor alae nasi
Zygomaticus major
Stenson's duct
Orbicularis oris
Risorius
Buccinator
Depressor anguli oris
Depressor labii inferioris
Masseter
Platysma myoides

From A. M. Paterson, Cunningham's *Text Book of Anatomy.*

FIG. 2.—The Muscles of the Face and Scalp (muscles of expression).

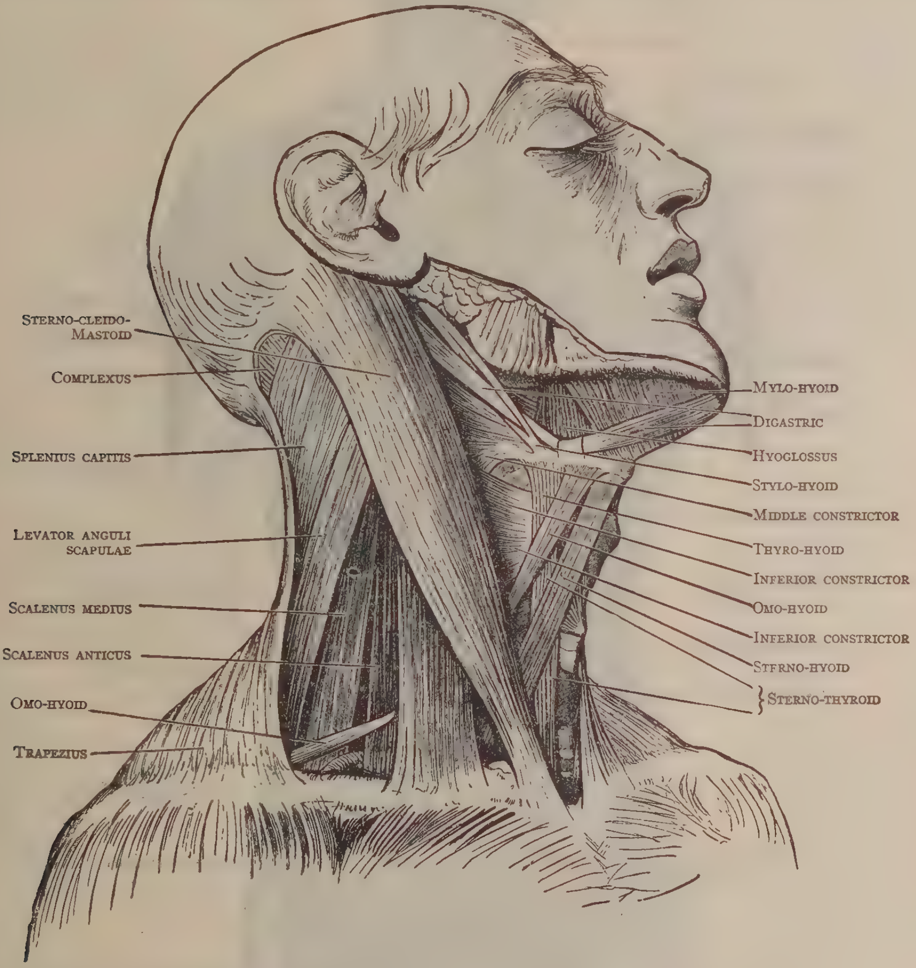
MUSCLES OF THE HEAD AND FACE (see fig. 2).—The scalp is moved by a large flat muscle called the *occipito-frontalis*, which has two muscular bellies, the *occipitalis* and *frontalis*, and an intervening *epicranial aponeurosis*; this muscle moves the scalp and causes the transverse wrinkles in the forehead. The *anterior, posterior* and *superior auricular muscles* are present but are almost functionless in man. The *orbicularis palpebrarum* forms a sphincter round the eyelids, which it closes, though there is little doubt that parts of the muscle can act separately and cause various expressions. The side of the nose has several muscles, the actions of which are indicated by their names; they are the *compressor*, two *dilatores* and the *depressor alae nasi*, while the *levator labii superioris et alae nasi* sometimes goes to the nose. Raising the upper lip, in addition to the last named, are the *levator labii superioris proprius* and the *levator anguli oris*, while the *zygomaticus major* draws the angle of the mouth outward. The lower lip is depressed by the *depressor labii inferioris* and *depressor anguli oris*, while the *orbicularis oris* acts as a sphincter to the mouth.


Epicranial aponeurosis
Temporal muscle
Auriculo-temporal nerve
Superficial temporal artery
External carotid artery
Internal lateral ligament
Posterior auricular artery
Lingual nerve
Mylo-hyoid nerve
Parotid gland
Inferior dental nerve
Masseter (cut)
Temporal branch of buccal nerve
Temporal branches of inferior maxillary nerve
External pterygoid
Posterior dental artery
Posterior dental nerve
Long buccal nerve
Pterygo-mandibular ligament
Mental branch of inferior dental nerve

From A. M. Paterson, Cunningham's *Text Book of Anatomy.*

FIG. 3.—Pterygoid Region.

The *buccinator muscle* in the substance of the cheeks rises from the upper and lower jaws and runs forward to blend with the *orbicularis oris*. All the foregoing are known as muscles of expression and all are supplied by the seventh or facial nerve. The *temporal muscle* at the side of the cranium (fig. 3) and the *masseter* (fig. 2), which rises from the zygoma, close the mouth, since both are inserted into the ramus of the mandible; while, rising from the pterygoid plates, are the *external* and *internal pterygoid muscles* (fig. 3), the former of which pulls forward the condyle, and so the whole mandible, while the latter helps to close the mouth by acting on the angle of the lower jaw. This group of muscles forms the masticatory set, all of which are supplied by the third division of the fifth nerve. For the muscles of the orbit, see EYE; for those of the soft palate and pharynx, see PHARYNX; and for those of the tongue, see TONGUE

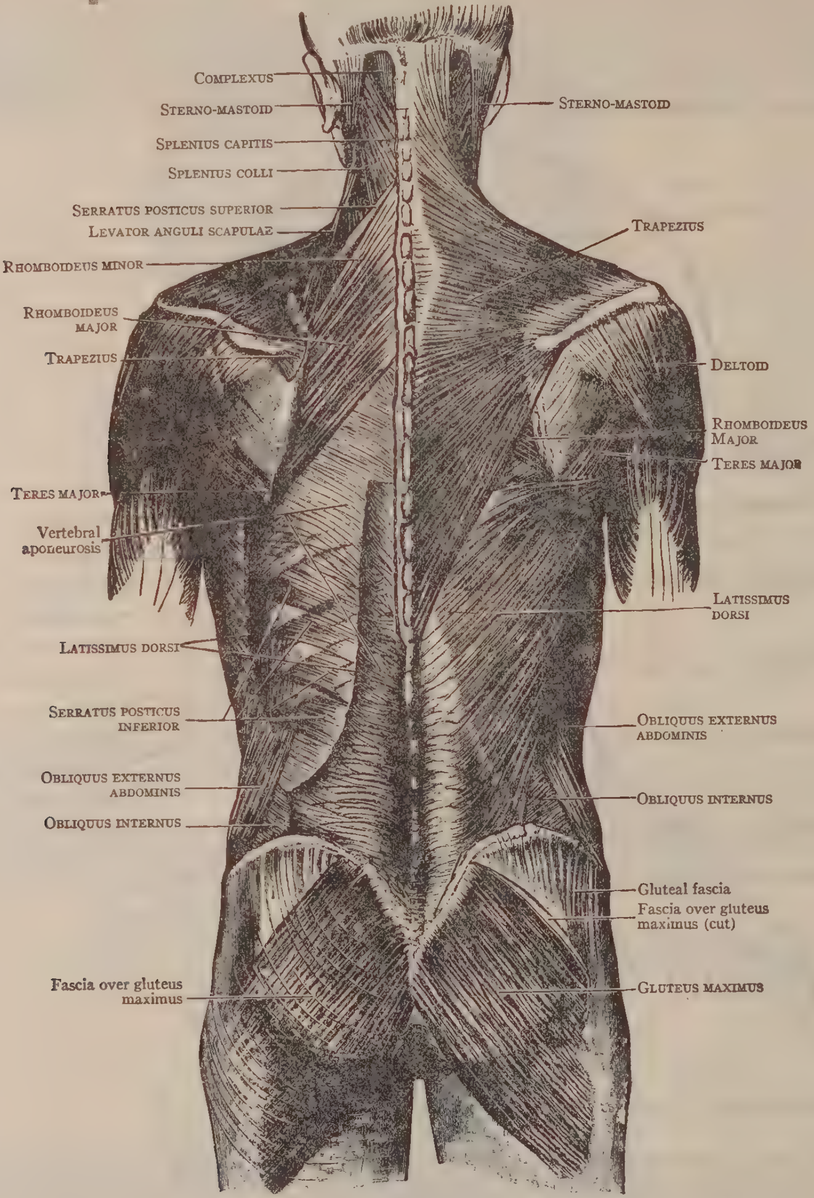


From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 4.—The Triangles of the Neck (muscles).

MUSCLES OF THE NECK (fig. 4).—Just below the mandible is the *digastric*, which, as its name shows, has two bellies and a central tendon; the anterior belly, supplied by the fifth nerve, is attached to the mandible near the symphysis, the posterior supplied by the seventh of the mastoid process, while the central tendon is bound to the hyoid bone. Stretching across from one side of the lower jaw to the other and forming a floor to the mouth is the *mylo-hyoid muscle*; posteriorly this reaches the hyoid bone, and in the mid-line has a tendinous raphe separating the two halves of the muscle. Rising from the manubrium sterni and inner part of the clavicle is the *sterno-cleido-mastoid*, which is inserted into the mastoid process and superior curved lines of the occipital bone; when it contracts it makes the face look over the opposite shoulder, and it is supplied by the spinal accessory nerve as well as by branches from the cervical plexus. It is an important surgical landmark, and forms a diagonal across the quadrilateral outline of the side of the neck, dividing it into an anterior triangle with its apex downward and a posterior with its apex upward. In the anterior triangle the relative positions of the hyoid bone, thyroid cartilage and sternum should be realized, and then the *hyo-glossus*, *thyro-hyoid*, *sterno-hyoid* and *sterno-thyroid* muscles are explained by their names. The *omo-hyoid* muscle rises from the upper border of the scapula and runs across both triangles to the hyoid bone. Where it passes deep to the sterno-mastoid it has a central tendon which is bound to the first rib by a loop of cervical fascia. Rising from the styloid process are three muscles, the *stylo-glossus*, *stylo-hyoid* and *stylo-pharyngeus*, the names of which indicate their attachments. Covering these muscles of the anterior triangle is a thin sheet, close to the skin, called the platysma, the upper fibres of which run back from the mouth over the cheek and are named the *risorius* (fig. 2); this sheet is one of the few remnants in man of the skin musculature or *panniculus carnosus* of lower Mammals. With regard to the nerve supply of the anterior triangle muscles, all those which go to the tongue are supplied by the hypoglossal or twelfth cranial nerve, while the muscles below the hyoid bone are apparently supplied from this nerve but really from the upper cervical nerves (see NERVE, CRANIAL; and NERVE, SPINAL). The posterior triangle is formed by the *sterno-mastoid* in front, the *trapezius* behind, and the clavicle below; in its floor from above downward part of the following muscles are seen: *complexus*, *splenius*, *levator anguli scapulae*, *scalenus medius* and *scalenus anticus*. Sometimes a small piece of the *scalenus posticus* is caught sight of behind the *scalenus medius*. The *splenius* rotates the head to its own side, the *levator anguli scapulae* raises the upper angle of the scapula, while the three *scalenes* run from the transverse processes of the cervical vertebrae and fix or raise the upper ribs. The *trapezius* (fig. 5) arises from the spines of the thoracic vertebrae and the ligamentum nuchae, and is inserted into the outer third of the clavicle and the spine of the scapula; it is used in shrugging the shoulders and in drawing the upper part of the scapula toward the mid-dorsal line. Its nerve supply is the spinal accessory and third and fourth cervical nerves. When the superficial muscles and complexus are removed from the back of the neck, the *sub-occipital triangle* is seen beneath the occipital bone. Externally it is bounded by the *superior oblique*, running from the transverse process of the atlas to the lateral part of the occipital bone, internally by the *rectus capitis posticus major*, passing from the spine of the axis to the lateral part of the occipital bone, and inferiorly by the *inferior oblique* joining the spine of the axis to the transverse process of the atlas. These muscles move the head on the atlas and the atlas on the axis. They are supplied by the posterior branch of the first cervical nerve.

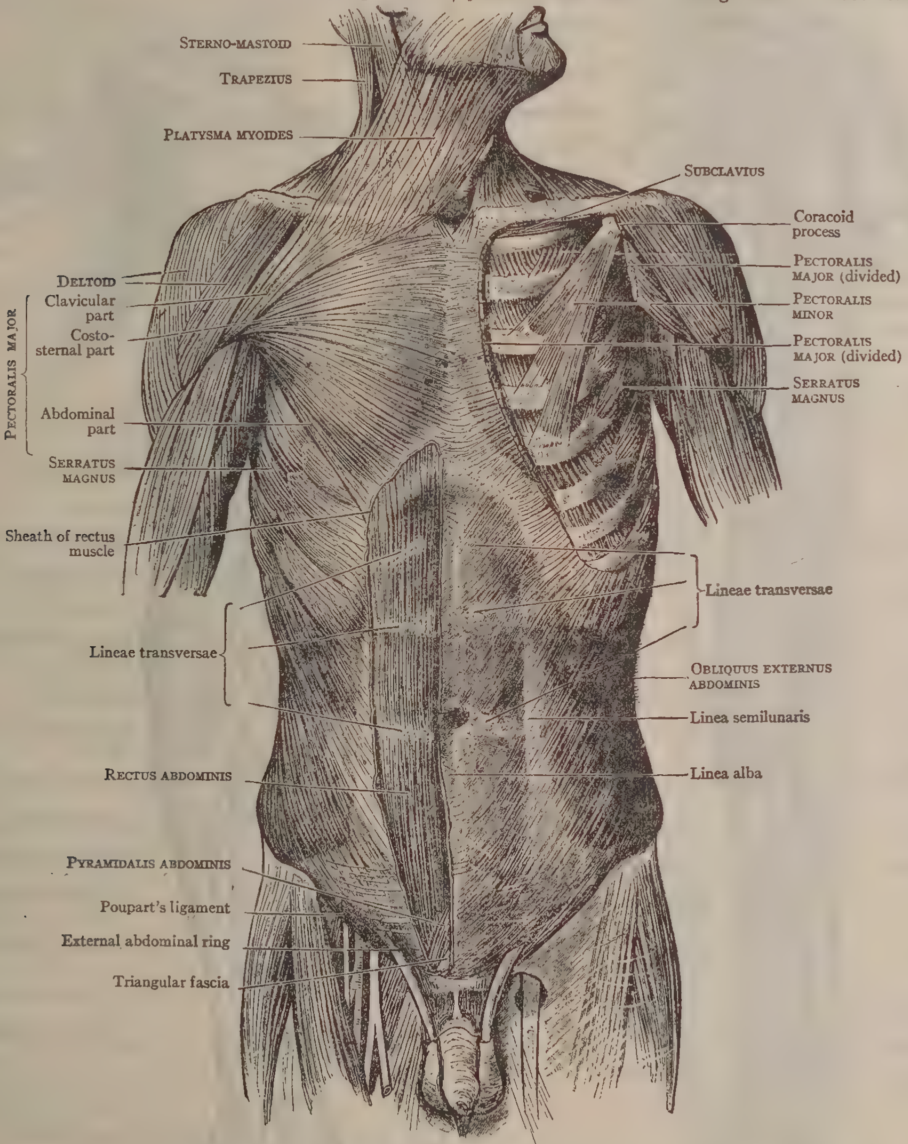
MUSCLES OF THE TRUNK.—The *trapezius* has already been described as a superficial muscle of the upper part of the back; in the loin region the *latissimus dorsi* (fig. 5) is the superficial muscle, its origin being from the lower thoracic spines, lower ribs and lumbar fascia, and it is inserted into the upper part of the arm bone or humerus. When the trapezius is cut, the *rhomboid* muscles (major and minor) passing from the upper thoracic spines to the vertebral border of the scapula are seen, and deep to these is the *serratus posticus superior* passing from nearly the same spines to the upper ribs. On reflecting the latissimus dorsi the *serratus posticus inferior* is seen running from the lower thoracic spines to the lower ribs. When these muscles are removed the great mass of the *erector spinae* is exposed, familiar to every one as the upper cut of the sirloin or ribs of beef; it runs all the way up the dorsal side of the vertebral column from the pelvis to the occiput, the complexus already mentioned being its extension to the head. It is longitudinally segmented into many different bundles to which special names are given, and it is attached to the various vertebrae and ribs as it goes up, thus straightening the spinal column. Deep to the erector spinae are found shorter bundles passing from one vertebra to another and forming the *semispinalis* and *multifidus spinae* muscles. The latissimus dorsi and rhomboids are supplied by branches of the brachial plexus of nerves, while the deeper muscles get their nerves from the posterior primary divisions of the spinal nerves (see NERVE, SPINAL). On the anterior part of the thoracic region the *pectoralis major* runs from the clavicle, sternum and ribs, to the humerus (fig. 6); deep to this is the *pectoralis minor*, passing from the upper ribs to the coracoid process. The *serratus magnus* is a large muscle rising by serrations from the upper eight ribs, and running back to the vertebral border of the scapula, which it draws forward as in the fencer's lunge. Between the ribs are the *external* and *internal intercostal* muscles; the former beginning at the tubercle and ending at the junctions of the ribs with their cartilages, while the latter only begin at the angle of the ribs but are prolonged on to the sternum, so that an interchondral as well as an intercostal part of each muscle is recognized. The fibres of the external intercostals run downward and forward, those of the internal downward and backward (see RESPIRATION). The abdominal walls are formed of three sheets of muscle, of which the most superficial or *external oblique* (fig. 6) is attached to the outer surfaces of the lower ribs; its fibres run downward and forward to the pelvis and mid-line of the abdomen, the middle one or *internal oblique* is on the same plane as the ribs, and its fibres run downward and backward, while the *transversalis*


COMPLEXUS
STERNO-MASTOID
SPLENIUS CAPITIS
SPLENIUS COLLI
SERRATUS POSTICUS SUPERIOR
LEVATOR ANGULI SCAPULAE
RHOMBOIDEUS MINOR
RHOMBOIDEUS MAJOR
TRAPEZIUS
TERES MAJOR
Vertebral aponeurosis
LATISSIMUS DORSI
SERRATUS POSTICUS INFERIOR
OBLIQUUS EXTERNUS ABDOMINIS
OBLIQUUS INTERNUS
Fascia over gluteus maximus
STERNO-MASTOID
TRAPEZIUS
DELTOID
RHOMBOIDEUS MAJOR
TERES MAJOR
LATISSIMUS DORSI
OBLIQUUS EXTERNUS ABDOMINIS
OBLIQUUS INTERNUS
Gluteal fascia
Fascia over gluteus maximus (cut)
GLUTEUS MAXIMUS

From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 5.—Superficial Muscles of the Back.

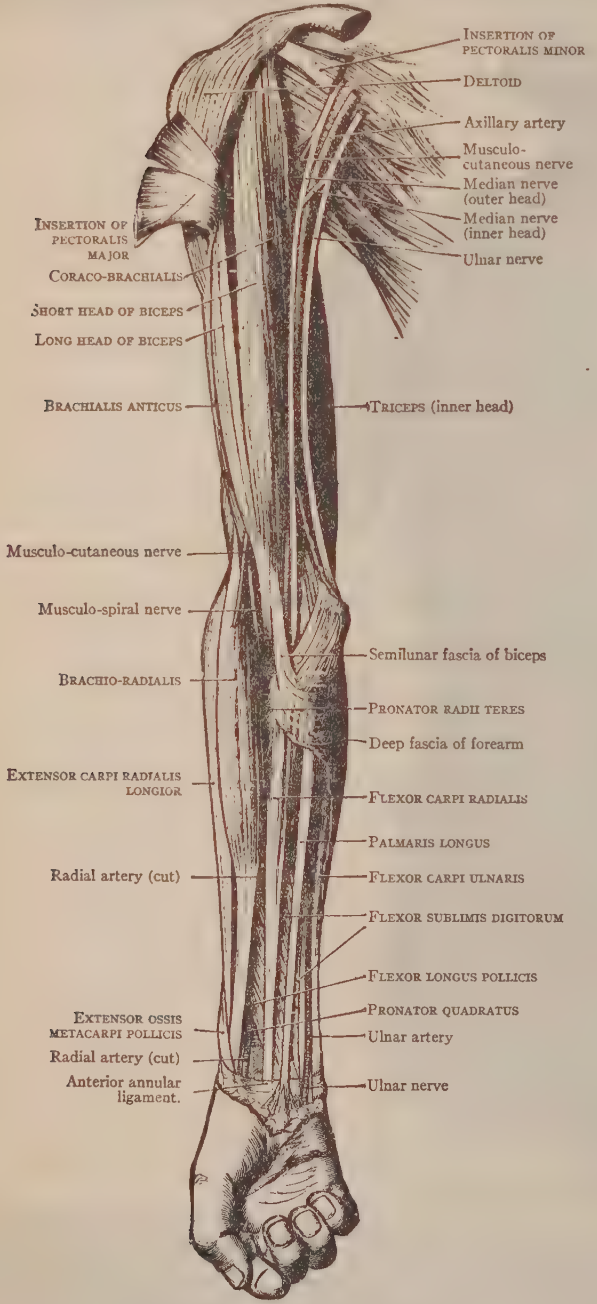
is attached to the deep surfaces of the ribs, and its fibres run horizontally forward. Below, all these muscles are attached to the crest of the ilium and to Poupart's ligament, which is really the lower free edge of the external oblique, while, behind, the two deeper ones, at all events, blend with the fascia lumborum. As they approach the mid-ventral line they become aponeurotic and form the *sheath of the rectus.* The *rectus abdominis* (fig. 6) is a flat muscular band which runs up on each side of the linea alba or mid-ventral line of the abdomen from the pubis to the ribs and sternum. This muscle has certain tendinous intersections or *lineae transversae*, the positions of which are noticed in the article ANATOMY (*Superficial and Artistic*), and the morphology of which is referred to later. In front of the lowest part of the rectus is sometimes a small triangular muscle called the *pyramidalis.* The *quadratus lumborum* is a muscle at the back of the abdominal wall which runs between the last rib and the crest of the ilium. In front of the bodies of the vertebrae is a prevertebral or hypaxial musculature, of which the *rectus capitis anticus major* and *minor* muscles and *longus colli* in the neck and the *psoas* in the loins form the chief parts, the latter being familiar as the undercut of the sirloin of beef, while the pelvis is closed below by a muscular floor formed by the levator ani and coccygeus muscles. The diaphragm is explained in a separate article.


STERNO-MASTOID
TRAPEZIUS
PLATYSMA MYOIDES
SUBCLAVIUS
Coracoid process
PECTORALIS MAJOR (divided)
PECTORALIS MINOR
PECTORALIS MAJOR (divided)
SERRATUS MAGNUS
DELTOID
PECTORALIS MAJOR
Clavicular part
Costo-sternal part
Abdominal part
SERRATUS MAGNUS
Sheath of rectus muscle
Lineae transversae
Lineae transversae
OBLIQUUS EXTERNUS ABDOMINIS
Linea semilunaris
RECTUS ABDOMINIS
Linea alba
PYRAMIDALIS ABDOMINIS
Poupart's ligament
External abdominal ring
Triangular fascia

From A. M. Paterson, Cunningham's *Text Book of Anatomy.*

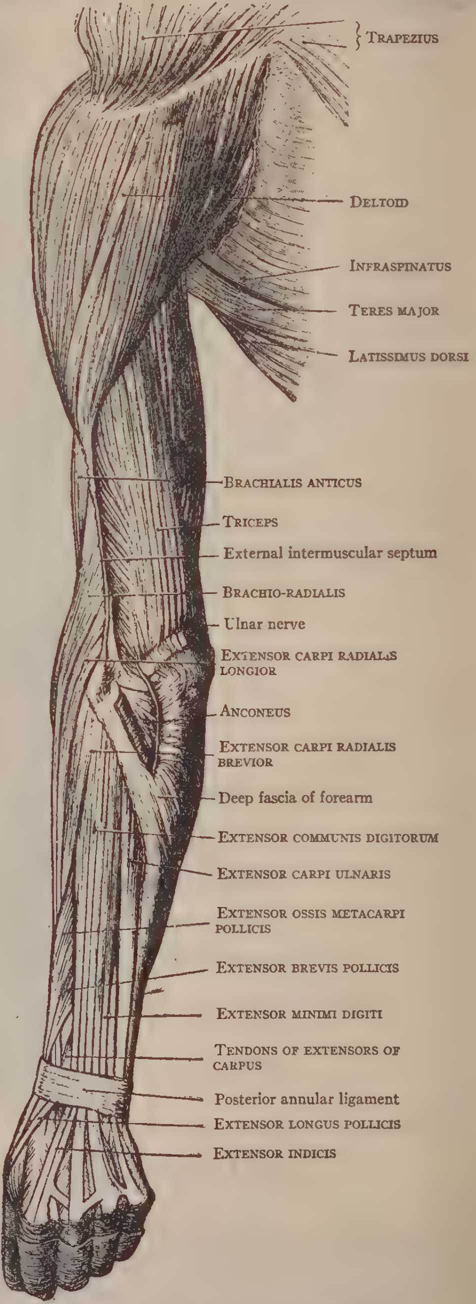
FIG. 6.—Anterior Muscles of the Trunk.

MUSCLES OF THE UPPER EXTREMITY.—The *deltoid* (see figs. 7 and 8) is the muscle which forms the shoulder cap and is used in abducting the arm to a right angle with the trunk; it runs from the clavicle, acromial process and spine of the scapula, to the middle of the humerus, and is supplied by the circumflex nerve. Several short rotating muscles pass from the scapula to the upper end of the humerus; these are the *subscapularis* passing in front of the shoulder joint, the *supraspinatus* above the joint, and the *infraspinatus* and *teres minor* behind. The *teres major* (fig. 5) comes from near the lower angle of the scapula, and is inserted with the latissimus dorsi into the front of the surgical neck of the humerus. The *coracobrachialis* (fig. 7) passes from the coracoid process to the middle of the humerus in front of the shoulder joint, while the *brachialis anticus* passes in front of the elbow from the humerus to the coronoid process of the ulna. Passing in front of both shoulder and elbow is the *biceps* (fig. 7), the long head of which rises from the top of the glenoid cavity inside the joint, while the short head comes from the coracoid process. The insertion is into the tubercle of the radius. These three muscles are all supplied by the same (musculo-cutaneous) nerve. At the back of the arm is the *triceps* (fig. 8) which passes behind both shoulder and elbow joints and is the great extensor muscle of them; its long head rises from just below the glenoid cavity of the scapula, while the inner and outer heads come from the back of the humerus. It is inserted into the olecranon process of the ulna and is supplied by the musculo-spinal nerve. The muscles of the front of the forearm form superficial and deep sets (see fig. 7). Most of the superficial muscles come from the internal condyle of the humerus. From without inward they are the *pronator radii teres* going to the radius, the *flexor carpi radialis* to the base of the index metacarpal bone, the *palmaris longus* to the palmar fascia, the *flexor sublimis digitorum* to the middle phalanges of the fingers, and the *flexor carpi ulnaris* to the pisiform bone. The important points of practical interest about these muscles are noticed in the article ANATOMY (*Superficial and Artistic*). In addition to these the brachio-radialis is a flexor of the forearm, though it arises from the outer supracondylar ridge of the humerus. It is supplied by the musculo-spiral nerve, the flexor carpi ulnaris by the ulnar, the rest by the median. The deep muscles of the front of the forearm consist of the *flexor longus pollicis* running from the radius to the terminal phalanx of the thumb, the *flexor profundus digitorum* from the ulna to the terminal phalanges of the fingers, and the *pronator quadratus* passing across from the lower third of the ulna to the same amount of the radius. These three muscles are supplied by the anterior interosseous branch of the median nerve, but the flexor profundus digitorum has an extra twig from the ulnar. The extensor muscles at the back of the forearm are also divided into superficial and deep sets (see fig. 8). The former rise from the region of the external condyle of the humerus, and consist of the *extensor carpi radialis longior* and *brevior* inserted into the index and medius metacarpal bones, the *extensor communis digitorum* to the middle and distal phalanges of the fingers, the *extensor minimi digiti*, the *extensor carpi ulnaris* passing to the metatarsal bone of the minimus, and the *supinator brevis* wrapping round the neck of the radius to which it is inserted. The *aconeus* which runs from the external condyle to the olecranon process is really a part of the triceps. The deep muscles rise from the posterior surfaces of the radius and ulna, and are the *extensor ossis metacarpi pollicis*, the name of which gives its insertion, the *extensor brevis pollicis* to the proximal phalanx, and the *extensor longus pollicis* to the distal phalanx of the thumb, while the *extensor indicis* joins the extensor communis slip to the index finger; all these posterior muscles are supplied by the posterior interosseous nerve. In front and behind the wrist the tendons are bound down by the anterior and posterior annular ligaments, while on the flexor surface of each finger is a strong fibrous sheath or *theca* for the flexor tendons. The ball of the thumb is occupied by short muscles called the *thenar* group, while *hypothenar* muscles are found in the ball of the little finger. The four *lumbrical* muscles (fig. 9, *d*) run from the flexor profundus digitorum tendons to those of the


Insertion of pectoralis minor
Deltoid
Axillary artery
Musculo-cutaneous nerve
Median nerve (outer head)
Median nerve (inner head)
Ulnar nerve
Insertion of pectoralis major
Coraco-brachialis
Short head of biceps
Long head of biceps
Brachialis anticus
Triceps (inner head)
Musculo-cutaneous nerve
Musculo-spiral nerve
Semilunar fascia of biceps
Brachio-radialis
Pronator radii teres
Deep fascia of forearm
Extensor carpi radialis longior
Flexor carpi radialis
Palmaris longus
Radial artery (cut)
Flexor carpi ulnaris
Flexor sublimis digitorum
Flexor longus pollicis
Pronator quadratus
Extensor ossis metacarpi pollicis
Ulnar artery
Radial artery (cut)
Anterior annular ligament.
Ulnar nerve

From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 7.—Superficial Muscles on the Front of the Arm and Forearm.


Trapezius
Deltoid
Infraspinatus
Teres major
Latissimus dorsi
Brachialis anticus
Triceps
External intermuscular septum
Brachio-radialis
Ulnar nerve
Extensor carpi radialis longior
Anconeus
Extensor carpi radialis brevior
Deep fascia of forearm
Extensor communis digitorum
Extensor carpi ulnaris
Extensor ossis metacarpi pollicis
Extensor brevis pollicis
Extensor minimi digiti
Tendons of extensors of carpus
Posterior annular ligament
Extensor longus pollicis
Extensor indicis

From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 8.—The Muscles on the Back of the Arm, Forearm and Hand.

extensor communis between the heads of the metacarpal bones, while rising from the shafts of these bones, are the three *palmar* and four *dorsal interosseous* muscles (fig. 9, *e*) which also are inserted into the extensor tendons. The two outer lumbricals and the *thenar* muscles are supplied by the median nerve; all the other hand muscles by the ulnar.

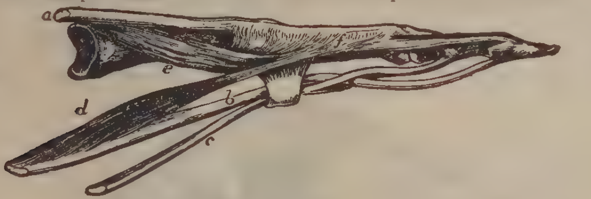
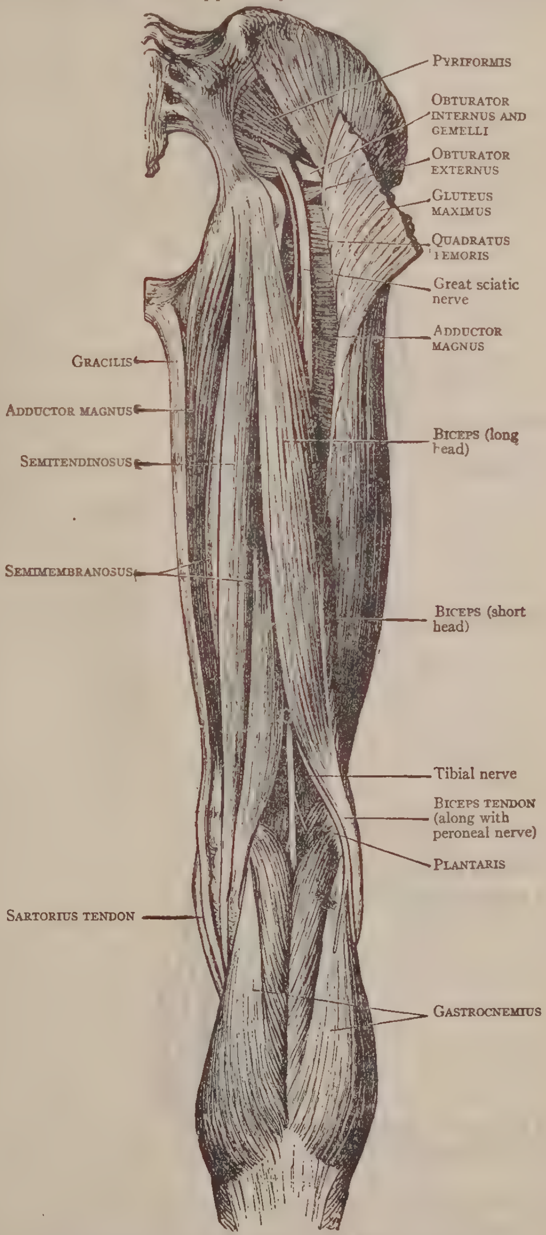


FIG. 9.—Tendons attached to a Finger.

a, The extensor tendon.
b, Deep flexor.
c, Superficial flexor.
d, A lumbrical muscle.
e, An interosseous muscle.
f, Tendinous expansion from the lumbrical and interosseous muscles joining the extensor tendon.

MUSCLES OF THE LOWER EXTREMITY.—On the front of the thigh the *quadriceps extensor* muscles are the most important: there are four of these, the *rectus femoris* (fig. 1) with its straight and reflected heads rising from just above the acetabulum, the *crureus*, deep to this, from the front of the femur, and the *vastus externus* and *internus* wrapping round the femur on each side from the linea aspera. All these are inserted into the patella, or rather the patella is a sesamoid bone developed where their common tendon passes round the lower end of the femur when the knee is bent. The distal part of this tendon, which passes from the patella to the tubercle of the tibia, is the *ligamentum patellae*. The *sartorius* is a long riband-like muscle running from the anterior superior spine of the ilium to the inner surface of the tibia, obliquely across the front of the thigh. It forms the outer boundary of *Scarpa's triangle*, the inner limit of which is the adductor longus and the base Poupart's ligament. The floor is formed by the *iliacus* from the iliac fossa of the pelvis, which joins the psoas, to be inserted with it into the lesser trochanter, and by the *pectineus* running from the upper ramus of the pubis to just below the insertion of the last muscles. The *adductor* muscles, *longus*, *brevis* and *magnus*, all rise from the subpubic arch, and are inserted into the linea aspera of the femur, so that they draw the femur toward the middle line. The *gracilis* (fig. 10) is part of the adductor mass, though its insertion is into the upper part of the tibia. The extensor muscles of the front of the thigh are supplied by the anterior crural nerve, but the adductor group on the inner side from the obturator. The pectineus is often supplied from both sources. On the back of the thigh the *gluteus maximus* (figs. 5 and 10) plays an important part in determining man's outline (see ANATOMY: *Superficial and Artistic*). It rises from the sacral region, and is inserted into the upper part of the femur and the deep fascia of the thigh, which is very thick and is known as the *fascia lata*; the muscle is a great extensor of the hip and raises the body from the stooping position. The *gluteus medius* rises from the ilium, above the hip joint, and passes to the great trochanter; it abducts the hip and enables the body to be balanced on one leg, as in taking a step forward. The *gluteus minimus* is covered by the last muscle, and passes from the ilium to the front of the great trochanter, thus rotating the hip joint inward. Some of its anterior fibres are sometimes separate from the rest, and are then called the *scansorius* (see JOINTS). When the gluteus maximus is removed, a number of short externally rotating muscles are seen, rising from the pelvis and inserted into the great trochanter (fig. 10); these are, from above downward, the *pyriformis*, *gemellus superior*, *obturator internus*, *gemellus inferior* and *quadratus femoris*. They are all supplied by special branches of the sacral plexus. On cutting the quadratus femoris a good deal of the *obturator externus* can be seen, coming from the outer surface of the obturator membrane and passing to the digital fossa of the great trochanter. Unlike the rest of this group, it is supplied by the obturator nerve. Coming from the anterior part of the crest of the ilium is the *tensor fasciae femoris*, which is inserted into the fascia lata, as is part of the gluteus maximus, and the thickened band of fascia which runs down the outer side of the thigh from these to the head of the tibia is known as the *ilio tibial band*. The tensor fasciae femoris, gluteus medius and minimus, are supplied by the superior gluteal nerve, the gluteus maximus by the inferior gluteal. At the back of the thigh are the *hamstrings* rising from the tuberosity of the ischium (fig. 10); these are the *semimembranosus* and *semitendinosus*, passing to the inner part of the upper end of the tibia and forming the internal hamstrings, and the *biceps femoris* or external hamstring, which has an extra head from the shaft of the femur and is inserted into the head of the fibula. These muscles are supplied by the great sciatic nerve and extend the hip joint while they flex the knee. In the leg, as distinguished from the thigh, are three groups of muscles, anterior, external and posterior. The anterior group (fig. 11) all come from the front of the tibia and fibula, and consist of the *extensor longus digitorum*, extending the middle and distal phalanges of the four outer toes, the *extensor proprius hallucis*, extending the big toe, and the *peroneus tertius*, a purely human muscle inserted into the base of the fifth metatarsal bone. All these are supplied by the anterior tibial nerve.

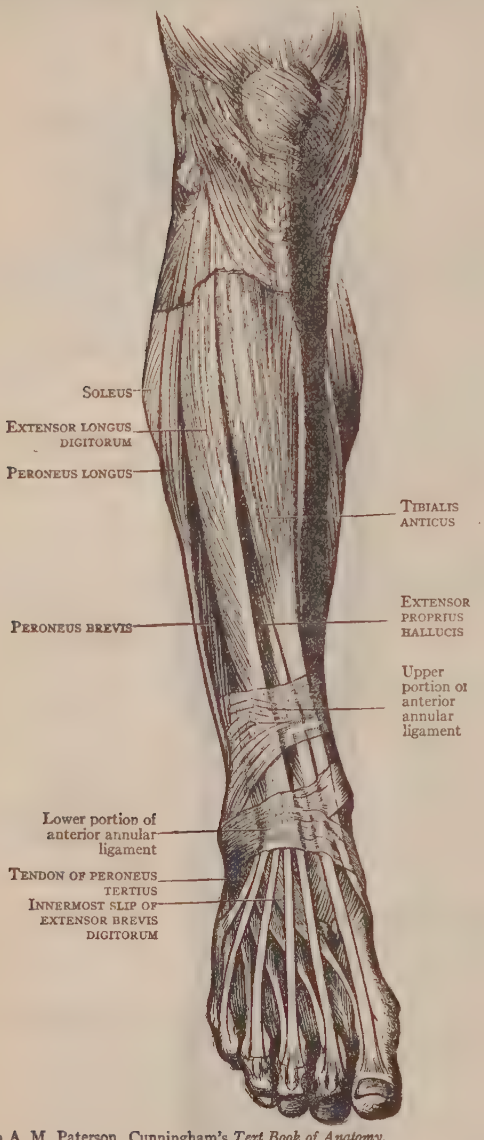
The external group comprises the *peroneus longus* and *brevis*, rising from the outer surface of the fibula and inserted into the tarsus (fig. 11), the longus tendon passing across the sole to the base of the first metatarsal bone, the brevis to the base of the fifth metatarsal. These are supplied by the musculo-cutaneous nerve.



From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 10.—The Muscles on the Back of the Thigh.

The posterior group is divided into a superficial and a deep set. The superficial is composed of the *gastrocnemius*, the two heads of which rise from the two condyles of the femur, the *soleus*, which rises from the upper parts of the back of the tibia and fibula, the *plantaris*, which comes from just above the external condyle of the femur, and the *popliteus* which, although on a deeper plane, really belongs to this group and rises by a tendon from the outer condyle while its fleshy part is inserted into the upper part of the back of the tibia. The gastrocnemius and soleus unite to form the *tendo Achillis*, which is attached to the posterior part of the calcaneum, while the plantaris runs separately as a very thin tendon to the same place. These muscles are supplied by the internal popliteal nerve. The deep set is formed by three muscles which rise from the posterior surfaces of the tibia and fibula, the *flexor longus digitorum*, the *tibialis posticus*, and the *flexor longus hallucis* from within outward. Their tendons all pass into the sole, that of the flexor longus digitorum being inserted into the terminal phalanges of the four outer toes, the flexor longus hallucis into the terminal phalanx of the big toe, while the tibialis posticus sends expansions to most of the tarsal bones. The nerve supply of this group is the posterior tibial. On the dorsum of the foot is the *extensor brevis digitorum* (fig. 11), which helps to extend the four inner toes, while in the sole are four layers of short muscles, the most superficial of which consists of the *abductor hallucis*, the *flexor brevis digitorum*, and the *abductor minimi digiti*, the names of which indicate their attachments. The second layer is formed by muscles which are attached to the flexor longus digitorum tendon; they are the *accessorius*, running forward to the tendon from the lower surface of the calcaneum, and the four *lumbricales*, which rise from the tendon after it has split for the four toes and pass between the toes to be inserted into the tendons of the extensor longus digitorum on the dorsum. The third layer comprises the *flexor brevis hallucis*, *adductor obliquus* and *adductor transversus hallucis* and the *flexor brevis minimi digiti*. The fourth layer contains the three *plantar* and four *dorsal interosseous muscles*, rising from the metatarsal bones and inserted into the proximal phalanges and extensor tendons in such a way that the plantar muscles draw the toes towards the line of the second toe while the dorsal draw them away from that line. Of these sole muscles the flexor brevis digitorum, flexor brevis hallucis, abductor hallucis and the innermost lumbrical are supplied by the internal plantar nerve, while all the rest are supplied by the external plantar.

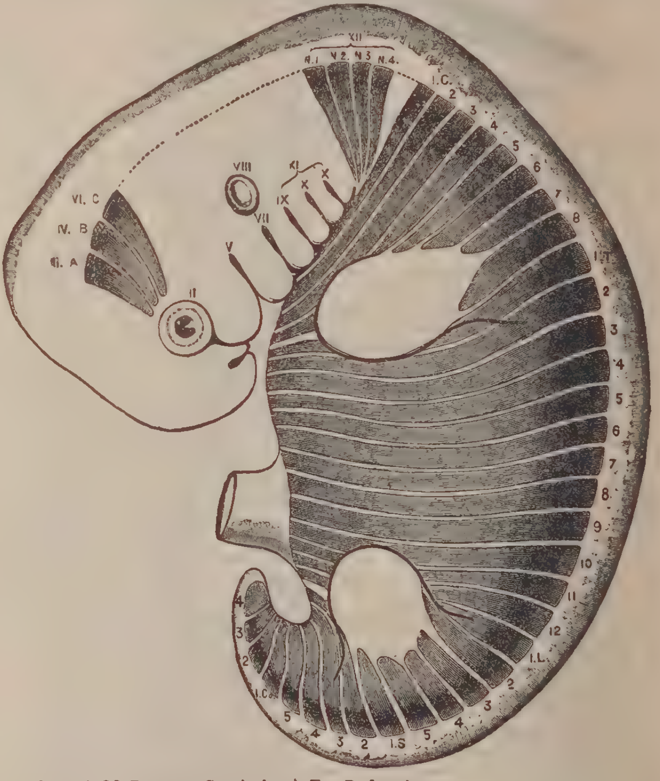

SOLEUS
EXTENSOR LONGUS DIGITORUM
PERONEUS LONGUS
TIBIALIS ANTICUS
EXTENSOR PROPRIUS HALLUCIS
PERONEUS BREVIS
Upper portion of anterior annular ligament
Lower portion of anterior annular ligament
TENDON OF PERONEUS TERTIUS
INNERMOST SLIP OF EXTENSOR BREVIS DIGITORUM

From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 11.—Muscles of the Front of the Right Leg and Dorsum of the Foot.

Embryology.

The development of the muscular system is partly known from the results of direct observation, and partly inferred from the study of the part of the nervous system whence the innervation is derived. The unstriped muscle is formed from the mesenchyme cells of the somatic and splanchnic layers of the mesoderm (see EMBRYOLOGY), but never, as far as we know, from the mesodermic somites. The heart muscle is also developed from mesenchymal cells, though the changes producing its feebly striped fibres are more complicated. The skeletal or real striped muscles are derived either from the mesodermic somites or from the branchial arches. As the mesodermic somites are placed on each side of the neural canal in the early embryo, it is obvious that the greater part of the trunk musculature spreads gradually round the body from the dorsal to the ventral side and consists of a series of plates called *myotomes* (fig. 12). The muscle fibres in these plates run in the long axis of the embryo, and are at first separated from those of the two neighbouring plates by thin fibrous intervals called *myocommata*. In some cases these myocommata persist and even become ossified, as in the ribs, but more usually they disappear early, and the myotomes then unite with one another to form a great muscular sheet. In the whole length of the trunk a longitudinal cleavage at right angles to the surface occurs, splitting the musculature into a dorsal and ventral part, supplied respectively by the dorsal and ventral primary divisions of the spinal nerves. From the dorsal part the various muscles of the erector spinae series are derived by further longitudinal cleavages either tangential or at right angles to the surface, while the ventral part is again longitudinally split into mesial and lateral portions. A transverse section of the trunk at this stage, therefore, would show the cut ends of three longitudinal strips of muscle: (1) a mesial ventral, from which the rectus, pyramidalis sterno-hyoid, omohyoid and sterno-thyroid muscles are derived; (2) a lateral ventral, forming the flat muscles of the abdomen, intercostals and part of the sternomastoid and trapezius; and (3) the dorsal portion already noticed. The mesial ventral part is remarkable for the persistence of remnants of myocommata in it, forming the lineae transversae of the rectus and the central tendon of the omo-hyoid. The lateral part in the abdominal region splits tangentially into three layers,



From A. M. Paterson, Cunningham's *Text Book of Anatomy*.

FIG. 12.—Scheme to Illustrate the Disposition of the Myotomes in the Embryo in Relation to the Head, Trunk and Limbs.

A, B, C, First three cephalic myotomes.
N, 1, 2, 3, 4, Last persisting cephalic myotomes.
C, T, L, S, Co., The myotomes of the cervical, thoracic, lumbar, sacral and caudal regions.
I., II., III., IV., V., VI., VII., VIII., IX., X., XI., XII., Refer to the cranial nerves and the structures with which they may be embryologically associated.

the external and internal oblique and the transversalis, the fibres of which become differently directed. In the thoracic region the intercostals probably indicate a further tangential splitting of the middle or internal oblique layer, because the external oblique is continued headward superficially to the ribs and the transversalis deeply to them. The more cephalic part of the external oblique layer probably disappears by a process of pressure or crowding out owing to the encroachment of the serratus magnus, a muscle which its nerve supply indicates is derived from the lower cervical myotomes. The deeper parts of the lateral mass of muscles spread to the ventral surface of the bodies of the vertebrae, and form the *hypaxial muscles*—such as the psoas, longus colli and recti capitis antici. The nerve supply indicates that the lowest myotomes taking part in the formation of the abdominal walls are those supplied by the first and second lumbar nerves, and are represented by the cremaster muscle in the scrotum. In the perineum, however, the third and fourth sacral myotomes are represented, and these muscles are differentiated largely from the primitive sphincter which surrounds the cloacal orifice, though partly from vestigial tail muscles (see P. Thompson, *Journ. Anat. and Phys.*, vol. xxxv; and R. H. Paramore, *Lancet*, May 21, 1910). In the head no distinct myotomes have been demonstrated in the mammalian embryo, but as they are present in more lowly vertebrates, it is probable that their development has been slurred over, a process often found in the embryology of the higher forms. Probably nine cephalic myotomes originally existed, of which the first gives rise to the eye muscles supplied by the third nerve, the second to the superior oblique muscle supplied by the fourth nerve, and the third to the external rectus supplied by the sixth nerve. The fourth, fifth and sixth myotomes are suppressed, but the seventh, eighth and ninth possibly form the muscles of the tongue supplied by the twelfth cranial nerve.

Turning now to the branchial arches, the first branchiomere is innervated by the fifth cranial nerve, and to it belong the masseter, temporal, pterygoids, anterior belly of the digastric, mylo-hyoid, tensor tympani and tensor palati, while from the second branchiomere, supplied by the seventh or facial nerve, all the facial muscles of expression and the stylo-hyoid and posterior belly of the digastric are derived, as well as the platysma, which is one of the few remnants of the panniculus carnosus or skin musculature of the lower mammals. From the third branchiomere, the nerve of which is the ninth or glossopharyngeal, the stylo-pharyngeus and upper part of the pharyngeal constrictors are formed, while the fourth and fifth gill arches give rise to the muscles of the larynx and the lower part of the constrictors supplied by the vagus or tenth nerve. It is possible that parts of the sterno-mastoid and trapezius are also branchial in their origin, since they are supplied by the spinal accessory or eleventh nerve, but this is unsettled. The limb musculature is usually regarded as a sleeve-like outpushing of the external oblique stratum of the lateral ventral musculature of the trunk, and it is believed that parts of several myotomes are in this way pushed out in the growth of the limb bud. This process actually occurs in the lower vertebrates, and the nerve supplies provide strong presumptive evidence that this is the real phylogenetic history of the higher forms, though direct observation shows that the limb muscles of mammals are formed from the central mesoderm of the limb and at first are quite distinct from the myotomes of the trunk. A possible explanation of the difficulty is that this is another example of the slurring over of stages in phylogeny, but this is one of many obscure morphological points. The muscles of each limb are divided into a dorsal and ventral series, supplied by dorsal and ventral secondary divisions of the nerves in the limb plexuses, and these correspond to the original position of the limbs as they grow out from the embryo, so that in the upper extremity the back of the arm, forearm and dorsum of the hand are dorsal, while in the lower the dorsal surface is the front of the thigh and leg and the dorsum of the foot.

For further details see *Development of the Human Body*, by J. P. McMurrich (London, 1906), and the writings of L. Bolk, *Morphol. Jahrb.* vols. xxi-xxv.

Comparative Anatomy.

In the acrania (*e.g.* amphioxus) the simple arrangement of myotomes and myocommata seen in the early human embryo is permanent. The myotomes or muscle plates are < shaped, with their apices pointing towards the head end, each being supplied by its own spinal nerve. In the fishes this arrangement is largely persistent, but each limb of the < is bent on itself, so that the myotomes have now the shape of a ≷, the central angle of which corresponds to the lateral line of the fish. In the abdominal region, however, the myotomes fuse and rudiments of the recti and obliqui abdominis muscles of higher types are seen. In other regions too, such as the fins of fish and the tongue of the Cyclostomata (lamprey), specialized muscular bundles are separated off and are coincident with the acquirement of movements of these parts in different directions. In the Amphibia the limb musculature becomes much more complex as the joints are formed, and many of the muscles can be homologized with those of mammals, though this is by no means always the case, while, in the abdominal region, a superficial delamination occurs, so that in many forms a *superficial* and *deep rectus abdominis* occurs as well as a *cutaneus abdominis* delaminated from the external oblique. It is probable that this delamination is the precursor of the panniculus carnosus or skin musculature of mammals. The branchial musculature also becomes much more complex, and the mylo-hyoid muscle, derived from the first branchial arch and lying beneath the floor of the mouth, is very noticeable and of great importance in breathing.

In the reptiles further differentiation of the muscles is seen, and with the acquirement of costal respiration the external and internal intercostals are formed by a delamination of the internal oblique stratum. In the dorsal region several of the longitudinal muscles which together make up the erector spinae are distinct, and a very definite sphincter cloacae is formed round and cloacal aperture. In mammals certain muscles vary in their attachments or presence and absence in different orders, sub-orders and families, so that, were it not for the large amount of technical knowledge required in recognizing them, they might be useful from a classificatory point of view. There is, however, a greater gap between the musculature of Man and that of the other Primates than there is between many different orders, and this is usually traceable either directly or indirectly to the assumption of the erect position.

The chief causes which produce changes of musculature are: (1) splitting, (2) fusion, (3) suppression either partial or complete, (4) shifting of origin, (5) shifting of insertion, (6) new formation, (7) transference of part of one muscle to another. In many of these cases the nerve supply gives an important clue to the change which has been effected. Splitting of a muscular mass is often the result of one part of a muscle being used separately, and a good example of this is the deep flexor mass of the forearm. In the lower mammals this mass rises from the flexor surface of the radius and ulna, and supplies tendons to the terminal phalanges of all five digits, but in man the thumb is used separately, and, in response to this, that part of the mass which goes to the thumb is completely split off into a separate muscle, the flexor longus pollicis. The process, however, is going farther, for we have acquired the habit of using our index finger alone for many purposes, and the index slip of the flexor profundus digitorum is in us almost as distinct a muscle as the flexor longus pollicis. Fusion may be either collateral or longitudinal. The former is seen in the case of the flexor carpi ulnaris. In many mammals (*e.g.* the dog), there are two muscles inserted separately into the pisiform bone, one rising from the internal condyle of the humerus, the other from the olecranon process, but in many others (*e.g.* man) the two muscles have fused. Longitudinal fusion is seen in the digastric, where the anterior belly is part of the first (mandibular) branchial arch and the posterior of the second or hyoid arch; in this case, as one would expect, the anterior belly is supplied by the fifth nerve and the posterior by the seventh. Partial suppression of a muscle is seen in the rhomboid sheet; in the lower mammals this rises from the head, neck and anterior (cephalic) thoracic spines, but in man the head and most of the neck part is completely suppressed. Complete suppression of a muscle is exemplified in the omo-trachelian, a muscle which runs from the cervical vertebrae to the acromian process and fixes the scapula for the strong action of the triceps in pronograde mammals; in man this strong action of the triceps is no longer needed for progression, and the fixing muscle has disappeared. Shifting of origin is seen in the short head of the biceps femoris. This in many lower mammals (*e.g.* rabbit) is a muscle running from the tail to the lower leg; in many others (*e.g.* monkeys and man) the origin has slipped down to the femur, and in the great anteater it is evident that the agitator caudae has been used as a *muscle slide*, because the short head of the biceps or tenuissimus has once been found rising from the surface of this muscle. Shifting of an insertion is not nearly as common as shifting of an origin; it is seen, however, in the peroneus tertius of man, in which part of the extensor longus digitorum has acquired a new attachment to the base of the fifth metatarsal bone. The new formation of a muscle is seen in the *stylo-hyoideus alter*, an occasional human muscle; in this the stylo-hyoid ligament has been converted into a muscle. The transference of part of one muscle to another is well shown by the human adductor magnus; here the fibres which pass from the tuber ischii to the condyle of the femur have a nerve supply from the great sciatic instead of the obturator, and in most lower mammals are a separate part of the hamstrings known as the *presemimembranosus*.

For further details see Bronn's *Classen und Ordnungen des Thierreichs*; "The Muscles of Mammals," by F. G. Parsons, *Jour. Anat. and Phys.* xxxii. 428; also accounts of the musculature of mammals, by Windle and Parsons, in *Proc. Zool. Soc.* (1894, seq.); Humphry, *Observations in Myology* (1874). (F. G. P.)

MUSES, THE (Gr. Μοῦσαι, the thinkers), in Greek mythology, originally nymphs of springs, then goddesses of song, and, later, of the different kinds of poetry and of the arts and sciences generally. In Homer, who says nothing definite as to their names or number, they are simply goddesses of song, who dwell among the gods on Olympus, where they sing at their banquets under the leadership of Apollo Musagetes. According to Hesiod (*Theog.* 77), who first gives the usually accepted names and number, they were the daughters of Zeus and Mnemosyne, the personification of memory; others made them children of

Uranus and Gaea. Three older Muses (Mneme, Melete, Aoide) were sometimes distinguished, whose worship was said to have been introduced by the Aloidae on Mt Helicon (Pausanias ix. 29). It is probable that three was the original number of the Muses, which was increased to nine owing to their arrangement in three groups of three in the sacred choruses. Round the altar of Zeus they sing of the origin of the world, of gods and men, of the glorious deeds of Zeus; they also honour the great heroes; and celebrate the marriages of Cadmus and Peleus, and the death of Achilles. As goddesses of song they protect those who recognize their superiority, but punish the arrogant—such as Thamyris, the Thracian bard, who for having boasted himself their equal was deprived of sight and the power of song. From their connexion with Apollo and their original nature as inspiring nymphs of springs they also possess the gift of prophecy. They are closely related to Dionysus, to whose festivals dramatic poetry owed its origin and development. The worship of the Muses had two chief seats—on the northern slope of Mt Olympus in Pieria, and on the slope of Mt Helicon near Ascra and Thespiae in Boeotia. Their favourite haunts were the springs of Castalia, Aganippe and Hippocrene. From Boeotia their cult gradually spread over Greece. As the goddesses who presided over the nine principal departments of letters, their names and attributes were: Calliope, epic poetry (wax tablet and pencil); Euterpe, lyric poetry (the double flute); Erato, erotic poetry (a small lyre); Melpomene, tragedy (tragic mask and ivy wreath); Thalīa, comedy (comic mask and ivy wreath); Polyhymnia (or Polymnia), sacred hymns (veiled, and in an attitude of thought); Terpsichore, choral song and the dance (the lyre); Clio, history (a scroll); Urania, astronomy (a celestial globe). To these Arethusa was added as the muse of pastoral poetry. The Roman poets identified the Greek Muses with the Italian Camenae (or Casmenae), prophetic nymphs of springs and goddesses of birth, who possessed a grove near the Porta Capena at Rome. One of the most famous of these was Egeria, the counsellor of King Numa.

See H. Deiters, *Ueber die Verehrung der Musen bei den Griechen* (1868); P. Decharme, *Les Muses* (1869); J. H. Krause, *Die Musen* (1871); F. Rödiger, *Die Musen* (1875); O. Navarre in Daremberg and Saglio's *Dictionnaire des antiquités*, and O. Bie in Roscher's *Lexikon der Mythologie*, the latter chiefly for representations of the Muses in art.

MUSET, COLIN (*fl.* 1200), French *trouvère*, was poet and musician, and made his living by wandering from castle to castle singing his own songs. These are not confined to the praise of the conventional love that formed the usual topic of the *trouvères*, but contain many details of a singer's life. Colin shows naïve gratitude for presents in kind from his patrons, and recommends a poet repulsed by a cruel mistress to find consolation in the *bons morceaux qu'on mange devant un grand feu*. One of his patrons was Agnès de Bar, duchess of Lorraine (d. 1226).

See *Hist. litt. de la France*, xxiii. 547–553; also a thesis, *De Nicolas Museto* (1893), by J. Bédier.

MUSEUMS OF ART.[1] The later 19th century was remarkable for the growth and development of museums, both in Great Britain and abroad. This growth, as Professor Stanley Jevons predicted, synchronizes with the advancement of education. Public museums are now universally required; old institutions have been greatly improved, and many new ones have been founded. The British parliament has passed statutes conferring upon local authorities the power to levy rates for library and museum purposes, while on the continent of Europe the collection and exhibition of objects of antiquity and art has become a recognized duty of the state and municipality alike.

A sketch of the history of museums in general is given below, under Museums of Science. The modern museum of art differs essentially from its earlier prototypes. The aimless collection of curiosities and bric-à-brac, brought together without method or system, was the feature of certain famous collections in bygone days, of which the Tradescant Museum, formed in the 17th century, was a good example. This museum was a miscellany without didactic value; it contributed nothing to the advancement of art; its arrangement was unscientific, and the public gained little or no advantage from its existence. The modern museum, on the other hand, should be organized for the public good, and should be a fruitful source of amusement and instruction to the whole community. Even when Dr Waagen described the collections of England, about 1840, private individuals figured chiefly among the owners of art treasures. Nowadays in making a record of this nature the collections belonging to the public would attract most attention. This fact is becoming more obvious every year. Not only are acquisitions of great value constantly made, but the principles of museum administration and development are being more closely defined. What Sir William Flower, an eminent authority, called the "new museum idea" (*Essays on Museums*, p. 37) is pervading the treatment of all the chief museums of the world. Briefly stated, the new principle of museum development—first enunciated in 1870, but now beginning to receive general support—is that the first aim of public collections shall be education, and their second recreation. To be of teaching value, museum arrangement and classification must be carefully studied. Acquisitions must be added to their proper sections; random purchase of "curios" must be avoided. Attention must be given to the proper display and cataloguing of the exhibits, to their housing and preservation, to the lighting, comfort and ventilation of the galleries. Furthermore, facilities must be allowed to those who wish to make special study of the objects on view. "A museum is like a living organism: it requires continual and tender care; it must grow, or it will perish" (Flower, p. 13).

Classification.

Great progress has been made in the classification of objects, a highly important branch of museum work. There are three possible systems—namely, by date, by material and by nationality. It has been found possible to combine the systems to some extent; for instance, in the ivory department of the Victoria and Albert Museum, South Kensington, London, where the broad classification is by material, the objects being further subdivided according to their age, and in a minor degree according to their nationality. But as yet there is no general preference of one system to another. Moreover, the principles of classification are not easily laid down; *e.g.* musical instruments: should they be included in art exhibits or in the ethnographical section to which they also pertain? Broadly speaking, objects must be classified according to the quality (apart from their nature) for which they are most remarkable. Thus a musket or bass viol of the 16th century, inlaid with ivory and highly decorated, would be properly included in the art section, whereas a common flute or weapon, noteworthy for nothing but its interest as an instrument of music or destruction, would be suitably classified as ethnographic. In England, at any rate, there is no uniformity of practice in this respect, and though it is to be hoped that the ruling desire to classify according to strict scientific rules may not become too prevalent, it would nevertheless be a distinct advantage if, in one or more of the British museums, some attempt were made to illustrate the growth of domestic arts and crafts according to classification by date. Examples of this classification in Munich, Amsterdam, Basel, Zürich and elsewhere afford excellent lessons of history and art, a series of rooms being fitted up to show in chronological order the home life of our ancestors. In the National Museum of Bavaria (Munich) there is a superb suite of rooms illustrating the progress of art from Merovingian times down to the 19th century. Thus classification, though studied, must not check the elasticity of art museums; it should not be allowed to interfere with the mobility of the exhibits—that is to say, it should always be possible to withdraw specimens for the closer inspection of students, and also to send examples on loan to other museums and schools of art—an invaluable system long in vogue at the Victoria and Albert Museum, and one which should be still more widely adopted. An axiom of museum law is that the exhibits shall be properly shown. "The value of a museum is to be tested by the treatment of its contents" (Flower, p. 24). But in many museums the chief hindrance to study and enjoyment is overcrowding of exhibits. Although a truism, it is necessary to state that each object should be properly seen, cleaned and safeguarded; but all over the world this rule is forgotten. The rapid acquisition of objects is one cause of overcrowding, but a faulty appreciation of the didactic purpose of the collection is more frequently responsible.

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[1] Under the term "museum" (Gr. μουσεῖον, temple of the muses) we accept the ordinary distinction, by which it covers a collection of all sorts of art objects, while an art gallery (*q.v.*) confines itself practically to pictures.

Growth and Progress.

In Great Britain, museum progress is satisfactory. Visitors are numbered by millions, access is now permitted on Sundays and week-days alike, and entrance fees are being consistently reduced; in this the contrast between Great Britain and some foreign countries is singular. A generation or so ago the national collections of Italy used to be always open to the public. Pay-days, however, were gradually established, with the result that the chief collections are now only visible without payment on Sundays. In Dresden payment is obligatory five days a week. The British Museum never charges for admission. On the other hand, the increase in continental collections is more rapid than in Great Britain, where acquisitions are only made by gift, purchase or bequest. In other European countries enormous collections have been obtained by revolutions and conquest, by dynastic changes, and by secularizing religious foundations. Some of the chief treasures of provincial museums in France were spoils of the Napoleonic armies, though the great bulk of this loot was returned in 1815 to the original owners. In Italy the conversion of a monastery into a museum is a simple process, the Dominican house of San Marco in Florence offering a typical example. A further stimulus to the foundation of museums on the continent is the comparative ease with which old buildings are obtained and adapted for the collections. Thus the Germanisches Museum of Nuremberg is a secularized church and convent; the enormous collections belonging to the town of Ravenna are housed in an old Camaldulensian monastery. At Louvain and Florence municipal palaces of great beauty are used; at Nîmes a famous Roman temple; at Urbino the grand ducal palace, and so on. There are, however, certain disadvantages in securing both building and collection ready-made, and the special care devoted to museums in Great Britain can be traced to the fact that their cost to the community is considerable. Immense sums have been spent on the buildings alone, nearly a million sterling being devoted to the new buildings for the Victoria and Albert Museum in London. Had it been possible to secure them without such an outlay the collections themselves would have been much increased, though in this increase itself there would have been a danger, prevalent but not yet fully realized in other countries, of crowding the vacant space with specimens of inferior quality. The result is that fine things are badly seen owing to the masses of second-rate examples; moreover, the ample space available induces the authorities to remove works of art from their original places, in order to add them to the museums. Thus the statue of St George by Donatello has been taken from the church of Or San Michele at Florence (on the plea of danger from exposure), and is now placed in a museum where, being dwarfed and under cover, its chief artistic value is lost. The desire to make financial profit from works of art is a direct cause of the modern museum movement in Italy. One result is to displace and thus depreciate many works of art, beautiful in their original places, but quite insignificant when put into a museum. Another result is that, owing to high entrance fees, the humbler class of Italians can rarely see the art treasures of their own country. There are other collections, akin to art museums, which would best be called biographical museums. They illustrate the life and work of great artists or authors. Of these the most notable are the museums commemorating Dürer at Nuremberg, Beethoven at Bonn, Thorwaldsen at Copenhagen, Shakespeare at Stratford and Michelangelo at Florence. The sacristies of cathedrals often contain ecclesiastical objects of great value, and are shown to the public as museums. Cologne, Aachen, Milan, Monza and Reims have famous treasuries. Many Italian cathedrals have small museums attached to them, usually known as "Opera del Duomo."

British Museum.

United Kingdom.—The influence and reputation of the British Museum are so great that its original purpose, as stated in the preamble of the act by which it was founded (1753, c. 22), may be quoted: "Whereas all arts and sciences have a connexion with each other, and discoveries in natural philosophy and other branches of speculative knowledge, for the advancement and improvement whereof the said museum or collection was intended, do, or may in many instances give help and success to the most useful experiments and undertakings . . ." The "said museum" above mentioned referred to the collection of Sir Hans Sloane, to be purchased under the act just quoted. Sir Hans Sloane is therein stated, "through the course of many years, with great labour and expense, to have gathered together whatever could be procured, either in our own or foreign countries, that was rare and curious." In order to buy his collections and found the museum a lottery of £300,000 was authorized, divided into 50,000 tickets, the prizes varying from £10 to £10,000. Provision was made for the adequate housing of Sir Robert Cotton's books, already bought in 1700 (12 and 13 Will. III. c. 7). This act secured for the nation the famous Cottonian manuscripts, "of great use and service for the knowledge and preservation of our constitution, both in church and state." Sir Robert's grandson had preserved the collection with great care, and was willing that it should not be "disposed of or embeziled," and that it should be preserved for public use and advantage. This act also sets forth the oath to be sworn by the keeper, and deals with the appointment of trustees. This is still the method of internal government at the British Museum, and additions to the Board of Trustees are made by statute, as in 1824, in acknowledgment of a bequest. The trustees are of three classes: (*a*) three principal trustees, namely the Primate, the Lord Chancellor and the Speaker; (*b*) general trustees, entitled *ex officio* to the position in virtue of ministerial office; (*c*) family, bequest and nominated trustees. A standing committee of the trustees meets regularly at the museum for the transaction of business. The great departments of the museum (apart from the scientific and zoological collections, now placed in the museum in Cromwell Road, South Kensington) are of printed books, MSS., Oriental books, prints and drawings, Egyptian and Assyrian antiquities, British and medieval antiquities, coins and medals. Each of these eight departments is under a keeper, with an expert staff of subordinates, the head executive officer of the whole museum being styled director and chief librarian. The museum has been enriched by bequests of great importance, especially in the library. Recent legacies have included the porcelain bequeathed by Sir Wollaston Franks, and the valuable collection of works of art (chiefly enamels and gold-smithery) known as the Waddesdon bequest—a legacy of Baron F. de Rothschild. The most important group of acquisition by purchase in the history of the museum is the series of Greek sculptures known as the Elgin Marbles, bought by act of parliament (56 Geo. III. c. 99).

Museums of the Board of Education.

There are four national museums controlled by the Board of Education, until recently styled the Department of Science and Art. The chief of these is the Victoria and Albert Museum at South Kensington. This museum has a dependency at Bethnal Green, the Dublin and Edinburgh museums having been now removed from its direct charge. There is also a museum of practical geology in Jermyn Street, containing valuable specimens of pottery and majolica. The Victoria and Albert Museum owed its inception to the Exhibition of 1851, from the surplus funds of which 12 acres of land were bought in South Kensington. First known as the Department of Practical Art, the museum rapidly established itself on a broad basis. Acquisitions of whole collections and unique specimens were accumulated. In 1857 the Sheepshanks gallery of pictures was presented; in 1879 the India Office transferred to the department the collection of Oriental art formerly belonging to the East India Company; in 1882 the Jones bequest of French furniture and decorative art (1740–1810) was received;

in 1884 the Patent Museum was handed over to the department. Books, prints, MSS. and drawings were bequeathed by the Rev. A. Dyce and Mr John Forster. Meanwhile, gifts and purchases had combined to make the collection one of the most important in Europe. The chief features may be summarized as consisting of pictures, including the Raphael cartoons lent by the king; textiles, silks and tapestry; ceramics and enamels; ivory and plastic art, metal, furniture and Oriental collections. The guiding principle of the museum is the illustration of art applied to industry. Beauty and decorative attraction is perhaps the chief characteristic of the exhibits here, whereas the British Museum is largely archaeological. With this object in view, the museum possesses numerous reproductions of famous art treasures: casts, facsimiles and electrotypes, some of them so well contrived as to be almost indistinguishable from the originals. An art library with 75,000 volumes and 25,000 prints and photographs is at the disposal of students, and an art school is also attached to the museum. The museum does considerable work among provincial schools of art and museums, "circulation" being its function in this connexion. Works of art are sent on temporary loan to local museums, where they are exhibited for certain periods and on being withdrawn are replaced by fresh examples. The subordinate museum of the Board of Education at Bethnal Green and that at Edinburgh call for no comment, their contents being of slender value. The Dublin Museum, though now controlled by the Irish Department, may be mentioned here as having been founded and worked by the Board of Education. Apart from the fact that it is one of the most suitably housed and organized museums in the British Isles, it is remarkable for its priceless collection of Celtic antiquities, belonging to the Royal Irish Academy, and transferred to the Kildare Street Museum in 1890. Among its most famous specimens of early Irish art may be mentioned the shrine and bell of St Patrick, the Tara brooch, the cross of Cong and the Ardagh chalice. The series of bronze and stone implements is most perfect, while the jewels, gold ornaments, torques, fibulae, diadems, and so forth are such that, were it possible again to extend the galleries (thus allowing further classification and exhibition space), the collection would surpass the Danish National Museum at Copenhagen, its chief rival in Europe.

Other National and Quasi-National Museums.

The famous collections of Sir Richard Wallace (d. 1890) having been bequeathed to the British nation by his widow, the public has acquired a magnificent gallery of pictures, together with a quantity of works of art, so important as to make it necessary to include Hertford House among national museums. French art predominates, and the examples of bronze, furniture, and porcelain are as fine as those to be seen in the Louvre. Hertford House, however, also contains a most remarkable collection of armour, and the examples of Italian faience, enamels, bijouterie, &c., are of first-rate interest. The universities of Cambridge and Oxford have museums, the latter including the Ashmolean collections, a valuable bequest of majolica from D. Fortnum, and some important classical statuary, now in the Taylorian Gallery. Christ Church has a small museum and picture gallery. Trinity College, Dublin, has a miniature archaeological collection, containing some fine examples of early Irish art. The National Museum of Antiquities of Scotland, controlled by the Board of Manufactures, was formed by the Scottish Society of Antiquaries, and has a comprehensive collection of Scottish objects, lay and religious. The Tower of London contains armour of historic and artistic interest, and the Royal College of Music has an invaluable collection of musical instruments, presented by Mr George Donaldson. Art museums are also to be found in several public schools in the United Kingdom.

Municipal Museums.

The Museums Act of 1845 enabled town councils to found and maintain museums. This act was superseded by another passed in 1850, by Mr William Ewart, which in its turn has been replaced by amending statutes passed in 1855, 1866, 1868 and 1885. The Museums and Gymnasiums Act of 1891 sanctioned the provision and maintenance of museums for the reception of local antiquities and other objects of interest, and allows a ½d. rate, irrespective of other acts. Boroughs have also the right to levy special rates under private municipal acts, Oldham affording a case in point. Civic museums must still be considered to be in their infancy. Although the movement is now firmly established in municipal enterprise, the collections, taken as a whole, are still somewhat nondescript. In many cases collections have been handed over by local societies, particularly in geology, zoology and other scientific departments. There are about twelve museums in which Roman antiquities are noticeable, among them being Leicester, and the Civic Museum of London, at the Guildhall. British and Anglo-Saxon relics are important features at Sheffield and Liverpool; in the former case owing to the Bateman collection acquired in 1876; while the Mayer collection presented to the latter city contains a highly important series of carved ivories. At Salford, Glasgow and Manchester industrial art is the chief feature of the collections. Birmingham, with perhaps the finest provincial collection of industrial art, is supported by the rates to the extent of £4200 a year. Its collections (including here, as in the majority of great towns, an important gallery of paintings) are entirely derived from gifts and bequests. Birmingham has made a reputation for special exhibitions of works of art lent for a time to the corporation. These loan exhibitions, about which occasional lectures are given, and of which cheap illustrated catalogues are issued, have largely contributed to the great popularity and efficiency of the museum. Liverpool, Preston, Derby and Sheffield owe their fine museum buildings to private generosity. Other towns have museums which are chiefly supported by subscriptions, *e.g.* Chester and Newcastle, where there is a fine collection of work by Bewick the engraver. At Exeter the library, museum, and art gallery, together with schools of science and art, are combined in one building. Other towns may be noted as having art museums: Stockport, Nottingham (Wedgwood collection), Leeds, Bootle, Swansea, Bradford, Northampton (British archaeology), and Windsor. There are museums at Belfast, Larne, Kilkenny and Armagh. The cost of the civic museum, being generally computed with the maintenance of the free library, is not easily obtained. In many cases the librarian is also curator of the museum; elsewhere no curator at all is appointed, his work being done by a caretaker. In some museums there is no classification or cataloguing and the value of existing collections is impaired both by careless treatment and by the too ready acceptance of worthless gifts; often enough the museums are governed by committees of the corporation whose interest and experience are not great.

Foreign Museums.—Art museums are far more numerous on the continent of Europe than in England. In Germany progress has been very striking, their educational aspect being closely studied. In Italy public collections, which are ten times more numerous than in England, are chiefly regarded as financial assets. The best examples of classification are to be found abroad, at Vienna, Amsterdam, Zürich, Munich and Gizeh in Egypt. The Musée Carnavalet, the historical collection of the city of Paris, is the most perfect civic museum in the world. The buildings in which the objects can be most easily studied are those of Naples, Berlin and Vienna. The value of the aggregate collections in any single country of the great powers, Russia excepted, probably exceeds the value of British collections. At the same time, it must be remembered that masses of foreign collections represent expropriations by the city and the state, together with the inheritance of royal and semi-royal collectors. In Germany and Italy, for instance, there are at least a dozen towns which at one time were capitals of principalities. In some countries the public holds over works of art the pre-emptive right of purchase. In Italy, under the law known as the Editto Pacca, it is illegal to export the more famous works of art. Speaking generally, the cost of maintaining municipal museums abroad is very small, many being without expert or highly-paid officials, while admission fees are often considerable. Nowhere in the United Kingdom are the collections neglected in a manner through which certain towns in Italy and Spain have gained an unenviable name.

Germany and Austria.

Berlin and Vienna have collections of untold richness, and the public are freely admitted. Berlin, besides its picture gallery and architectural museum, has a collection of Christian antiquities in the university. The old museum, a royal foundation, is renowned for its classical sculpture and a remarkable collection of medieval statuary, in which Italian art is well represented. The new museum is also noteworthy for Greek marbles, and contains bronzes and engravings, together with one of the most typical collections of Egyptian art. Schliemann's discoveries are housed in the Ethnographic Museum. The Museum of Art and Industry, closely similar in object and arrangement to the Victoria and Albert Museum in London, contains collections of the same character—enamels, furniture, ceramics, &c. Vienna also has one of these museums (Kunstgewerbe), in which the great value of the examples is enhanced by their judicious arrangement. The Historical Museum of this city is interesting, and the Imperial Museum (of which the structure corresponds almost exactly with a plan of an ideal museum designed by Sir William Flower) is one of the most comprehensive extant, containing armour of world-wide fame and the choicest specimens of industrial art. Prague, Innsbruck and Budapest are respectively the homes of the national museums of Bohemia, Tirol and Hungary. The National Museum of Bavaria (Munich) has been completed, and its exhibition rooms, 100 in number, show the most recent methods of classification, Nuremberg, with upwards of eighty rooms, being its only rival in southern Germany. Mainz and Trier have Roman antiquities. Hamburg, Leipzig and Breslau have good "Kunstgewerbe" collections. In Dresden there are four great museums—the Johanneum, the Albertinum, the Zwinger and the Grüne Gewölbe—in which opulent art can best be appreciated; the porcelain of the Dresden galleries is superb, and few branches of art are unrepresented. Gotha is remarkable for its ceramics, Brunswick for enamels (in the ducal cabinet). Museums of minor importance exist at Hanover, Ulm, Würzburg, Danzig and Lübeck.

France.

The central museum of France, the Louvre, was founded as a public institution during the Revolutionary period. It contains the collections of François I., Louis XIV., and the Napoleons. Many works of art have been added to it from royal palaces, and collections formed by distinguished connoisseurs (Campana, Sauvageot, La Caze) have been incorporated in it. The Greek sculpture, including the Venus of Melos and the Niké of Samothrace, is of pre-eminent fame. Other departments are well furnished, and from a technical point of view the manner in which the officials have overcome structural difficulties in adapting the palace to the needs of an art museum is most instructive. The Cluny Museum, bought by the city in 1842, and subsequently transferred to the state, supplements the medieval collections of the Louvre, being a storehouse of select works of art. It suffers, however, from being overcrowded, while for purposes of study it is badly lighted. At the same time the Maison Cluny is a well-furnished house, decorated with admirable things, and as such has a special didactic value of its own, corresponding in this respect with Hertford House and the Poldi-Pezzoli Gallery at Milan—collections which are more than museums, since they show in the best manner the adaptation of artistic taste to domestic life. The French provincial museums are numerous and important. Twenty-two were established early in the 19th century, and received 1000 pictures as gifts from the state, numbers of which were not returned in 1815 to the countries whence they were taken. The best of these museums are at Lyons; at Dijon, where the tombs of Jean sans Peur and Philip the Bold are preserved; at Amiens, where the capital Musée de Picardie was built in 1850; at Marseilles and at Bayeux, where the "Tapestry" is well exhibited. The collections of Lille, Bordeaux, Toulouse, and Avignon are also important. The objects shown in these museums are chiefly local gleanings, consisting largely of church plate, furniture, together with sculpture, carved wood, and pottery, nearly everything being French in origin. In many towns Roman antiquities and early Christian relics are preserved (*e.g.* Autun, Nîmes, Arles and Luxeuil). Other collections controlled by municipalities are kept at Rouen, Douai, Montpellier, Chartres (14th-century sculptures), Grenoble, Toulon, Ajaccio, Épinal (Carolingian objects), Besançon, Bourges, Le Mans (with the remarkable enamel of Geoffrey of Anjou), Nancy, Aix and in many other towns. As a rule, the public is admitted free of charge, special courtesy being shown to foreigners. In many cases the collections are ill cared for and uncatalogued, and little money is provided for acquisitions in the civic museums; indeed, in this respect the great national institutions contrast unfavourably with British establishments, to which purchase grants are regularly made.

Italy.

The national, civic and papal museums of Italy are so numerous that a few only can be mentioned. The best arranged and best classified collection is the Museo Nazionale at Naples, containing many thousand examples of Roman art, chiefly obtained from the immediate neighbourhood. For historical importance it ranks as *primus inter pares* with the collections of Rome and the Vatican. It is, however, the only great Italian museum where scientific treatment is consistently adopted. Other museums of purely classical art are found at Syracuse, Cagliari and Palermo. Etruscan art is best displayed at Arezzo, Perugia (in the university), Cortona, Florence (Museo Archeologico), Volterra and the Vatican. The Florentine museums are of great importance, consisting of the archaeological museum of antique bronzes, Egyptian art, and a great number of tapestries. The Museo Nazionale, housed in the Bargello (A.D. 1260), is the central depository of Tuscan art. Numerous examples of Della Robbia ware have been gathered together, and are fixed to the walls in a manner and position which reduce their value to a minimum. The plastic arts of Tuscany are represented by Donatello, Verrocchio, Ghiberti, and Cellini, while the Carrand collection of ivories, pictures, and varied medieval specimens is of much interest. This museum, like so many others, is becoming seriously overcrowded, to the lasting detriment of churches, market-places, and streets, whence these works of art are being ruthlessly removed. The public is admitted free one day a week, and the receipts are devoted to art and antiquarian purposes ("tasse . . . destinate . . . alla conversazione dei monumenti, all' ampliamento degli scavi, ed' all' incremento dei instituti . . . nella città."—Law of 1875, §5). The museums of Rome are numerous, the Vatican alone containing at least six—Museo Clementino, of classical art, with the Laocoon, the Apollo Belvedere, and other masterpieces; the Chiaramonti, also of classical sculpture; the Gallery of Inscriptions; the Egyptian, the Etruscan and the Christian museums. The last is an extensive collection corresponding with another papal museum in the Lateran Palace, also known as the Christian Museum (founded 1843), and remarkable for its sarcophagi and relics from the catacombs. The Lateran has also a second museum known as the Museo Profano. Museums belonging to the state are equally remarkable. The Kircher Museum deals with prehistoric art, and contains the "Preneste Hoard." The Museo Nazionale (by the Baths of Diocletian), the Museo Capitolino, and the Palazzo dei Conservatori contain innumerable specimens of the finest classical art, vases, bronzes, mosaics, and statuary, Greek as well as Roman. Among provincial museums there are few which do not possess at least one or two objects of signal merit. Thus Brescia, besides a medieval collection, has a famous bronze Victory. Pesaro, Urbino, and the Museo Correr at Venice have admirable examples of majolica; Milan, Pisa and Genoa have general archaeology combined with a good proportion of mediocrity. The civic museum of Bologna is comprehensive and well arranged, having Egyptian, classical, and Etruscan collections, besides many things dating from the "Bella Epoca" of Italian art. At Ravenna alone can the Byzantine art of Italy be properly understood, and it is most deplorable that the superb collections in its fine galleries should remain uncatalogued and neglected. Turin, Siena, Padua, and other towns have civic museums.

Belgium and Holland.

The Ryks Museum at Amsterdam, containing the national collections of Holland, is a modern building in which a series of historical rooms are furnished to show at a glance the artistic progress of the Dutch at any given period. Nine rooms are also devoted to the chronological display of ecclesiastical art. Besides the famous paintings, this museum (the sole drawback of which is the number of rooms which have no top light) contains a library, many engravings, a comprehensive exhibit of armour, costume, metal-work, and a department of maritime craftsmanship. Arnhem and Haarlem have municipal collections. At Leiden the university maintains a scholarly collection of antiquities. The Hague and Rotterdam have also museums, but everything in Holland is subordinated to the development of the great central depository at Amsterdam, to which examples are sent from all parts of the country. In Belgium the chief museum, that of ancient industrial art, is at Brussels. It contains many pieces of medieval church furniture and decoration, but in this respect differs only in size from the civic museums of Ghent and Luxemburg and the Archbishop's Museum at Utrecht. In Brussels, however, there is a good show of Frankish and Carolingian objects. The city of Antwerp maintains the Musée Plantin, a printing establishment which has survived almost intact, and presents one of the most charming and instructive museums in the world. As a whole, the museums of Belgium are disappointing, though, *per contra*, the churches are of enhanced interest, not having been pillaged for the benefit of museums.

Russia.

New museums are being founded in Russia every year. Kharkoff and Odessa (the university) have already large collections, and in the most remote parts of Siberia it is curious to find carefully chosen collections. Krasnoyarsk has 12,000 specimens, a storehouse of Buriat art. Irkutsk the capital, Tobolsk, Tomsk (university), Khabarovsk, and Yakutsk have now museums. In these Russian art naturally predominates. It is only at Moscow and St Petersburg that Western art is found. The Hermitage Palace in the latter city contains a selection of medieval objects of fabulous value, there being no less than forty early ivories. But from a national point of view these collections are insignificant when compared with the gold and silver objects illustrating the primitive arts and ornament of Scythia, Crimea and Caucasia, the high standard attained proving an advanced stage of manual skill. At Moscow (historical museum) the stone and metal relics are scarcely less interesting. There is also a museum of industrial art, the specimens of which are not of unusual value, but being analogous to the Kunstgewerbe movement in Germany, it exercises a wholesome influence upon the designers who study in its schools.

America.

American museums are not committed to traditional systems, and scientific treatment is allowed its fullest scope. They exist in great numbers, and though in some cases their exhibits are chiefly ethnographic, a far wider range of art objects is rapidly being secured. The National Museum at Washington, a branch of the Smithsonian Institution (*q.v.*), while notable for its American historical and ethnological exhibits, has the National Gallery of Art. The Metropolitan Museum of Art (held by trustees for the benefit of the city of New York) has in the Cesnola collection the most complete series of Cypriot art objects. It has also departments of coins, Greek sculpture and general examples of European and American art. The Museum of Fine Arts at Boston is very comprehensive, and has a remarkable collection of ceramics, together with good reproductions of antique art. There are museums at St Louis, Chicago, Pittsburg, Brooklyn, Cincinnati, Buffalo and Washington, as well as Montreal in Canada; and the universities of Harvard, Chicago, Pennsylvania and Yale have important collections.

Various Countries.

The Swiss National Museum is situated at Zürich, and though of medium size (50 rooms), it is a model of arrangement and organization. Besides the special feature of rooms illustrating the historical progress of art, its collection of stained glass is important. Basel also (historical museum) is but little inferior in contents or system to the Zürich establishment. Geneva has three collections. Lausanne holds the museum of the canton, and Bern has a municipal collection. All these institutions are well supported financially, and are much appreciated by the Swiss public. The art museums of Stockholm, Christiania and Copenhagen rank high for their intrinsic excellence, but still more for their scientific and didactic value. Stockholm has three museums: that of the Royal Palace, a collection of costume and armour; the Northern Museum, a large collection of domestic art; the National Museum, containing the prehistoric collections, gold ornaments, &c., classified in a brilliant manner. The National Museum of Denmark at Copenhagen is in this respect even more famous, being probably the second national collection in the world. The arrangement of this collection leaves little to be desired, and it is to be regretted that some British collections, in themselves of immense value, cannot be shown, as at Copenhagen, in a manner which would display their great merits to the fullest degree. There is also at Copenhagen a remarkable collection of antique busts (Gamle Glyptotek), and the Thorwaldsen Museum connected with the sculptor of that name. Norse antiquities are at Christiania (the university) and Bergen. Athens has three museums, all devoted to Greek art: that of the Acropolis, that of the Archaeological Society (vases and terra-cotta) and the National Museum of Antiquities. The state owns all discoveries and these are accumulated at the capital, so that local museums scarcely exist. The collections, which rapidly increase, are of great importance, though as yet they cannot vie with the aggregate in other European countries. The Museum of Egyptian Antiquities (Cairo), founded by Mariette Bey at Bulak, afterwards removed to the Giza palace and developed by Maspero, is housed in a large building erected in 1902, well classified, and liberally supported with money and fresh acquisitions. Minor museums exist at Carthage and Tunis. At Constantinople the Turkish Museum contains some good classical sculpture and a great deal of rubbish. The Museo del Prado and the Archaeological Museum at Madrid are the chief Spanish collections, containing numerous classical objects and many specimens of Moorish and early Spanish art. In Spain museums are badly kept, and their contents are of indifferent value. The museums of the chief provinces are situated at Barcelona, Valencia, Granada and Seville. Cadiz and Cordova have also sadly neglected civic collections. The National Museum of Portugal at Lisbon requires no special comment. The progress of Japan is noticeable in its museums as in its industrial enterprise. The National Museum (Weno Park, Tōkyō) is large and well arranged in a new building of Western architecture. Kiōtō and Nara have excellent museums, exclusively of Oriental art, and two or three other towns have smaller establishments, including commercial museums. There are several museums in India, the chief one being at Calcutta, devoted to Indian antiquities.

The best history of museums can be found in the prefaces and introductions to their official catalogues, but the following works will be useful for reference: Annual Reports presented to Parliament (official) of British Museum and Board of Education; Civil Service Estimates, Class IV., annually presented to Parliament; Second Report of Select Committee of House of Commons on Museums of Science and Art Department (official; 1 vol., 1898); Annual Reports of the Museum Association (London); Edward Edwards, *The Fine Arts in England* (London, 1840); Professor Stanley Jevons, "Use and Abuse of Museums," printed in *Methods of Social Reform* (London, 1882); Report of Committee on Provincial Museums. Report of British Association (London, 1887); Thos. Greenwood, *Museums and Art Galleries* (London, 1888); Professor Brown Goode, *Museums of the Future*, Report on the National Museum for 1889 (Washington, 1891); *Principles of Museum Administration*; Report of Museum Association (London, 1895); Mariotti, *La Legislazione delle belle arti.* (Rome, 1892); L. Bénédite, *Rapport sur l'organisation . . . dans les musées de la Grande Bretagne* (official; Paris, 1895); Sir William Flower, *Essays on Museums* (London, 1898); *Le Gallerie nazionali italiane* (3 vols., Rome, 1894); D. Murray, *Museums: Their History and Use, with Bibliography and List of Museums in the United Kingdom* (3 vols., 1904). (B.)

MUSEUMS OF SCIENCE. The ideal museum should cover the whole field of human knowledge. It should teach the truths of all the sciences, including anthropology, the science which deals with man and all his works in every age. All the sciences and all the arts are correlated. The wide separation of collections illustrative of the arts (see MUSEUMS OF ART above) from those illustrative of the sciences, and their treatment as if belonging to a wholly different sphere, is arbitrary. Such separation, which is to-day the rule rather than the exception, is due to the circumstances of the origin of many collections, or in other cases to the limitations imposed by poverty or lack of space. Many of the national museums of continental Europe had their beginnings in collections privately acquired by monarchs, who, at a time when the modern sciences were in their infancy, entertained themselves by assembling objects which appealed to their love of the beautiful and the curious. The pictures, marbles, bronzes and bric-à-brac of the palace became the nucleus of the museum of to-day, and in some notable cases the palace itself was converted into a museum. In a few instances these museums, in which works of art had the first place, have been enriched and supplemented by collections illustrative of the advancing sciences of a later date, but in a majority of cases these collections have remained what they were at the outset, mere exponents of human handicraft in one or the other, or all of its various departments. Some recent great foundations have copied the more or less defective models of the past, and museums devoted exclusively to the illustration of one or the other narrow segment of knowledge will no doubt continue to be multiplied, and in spite of their limited range, will do much good. A notable illustration of the influence of lack of space in bringing about a separation of anthropological collections from collections illustrative of other sciences is afforded by the national collection in London. For many years the collections of the British Museum, literary, artistic and scientific, were assembled in ideal relationship in Bloomsbury, but at last the accumulation of treasure became so vast and the difficulties of administration were so pressing that a separation was decided upon, and the natural history collections were finally removed to the separate museum in Cromwell Road, South Kensington. But the student of museums can never fail to regret that the necessities of space and financial considerations compelled this separation, which in a measure destroyed the ideal relationship which had for so many years obtained.

The ancient world knew nothing of museums in the modern sense of the term. There were collections of paintings and statuary in the temples and palaces of Greece and Rome; the homes of the wealthy were everywhere adorned by works of art; curious objects of natural history were often brought from afar, as the skins of the female gorillas, which Hanno after his voyage on the west coast of Africa hung up in the temple of Astarte at Carthage; Alexander the Great granted to his illustrious teacher, Aristotle, a large sum of money for use in his scientific researches, sent him natural history collections from conquered lands, and put at his service thousands of men to collect specimens, upon which he based his work on natural history; the museum of Alexandria, which included within its keeping the Alexandrian library, was a great university composed of a number of associated colleges; but there was nowhere in all the ancient world an institution which exactly corresponded in its scope and purpose to the modern museum. The term "museum," after the burning of the great institution of Alexandria, appears to have fallen into disuse from the 4th to the 17th century, and the idea which the word represented slipped from the minds of men.

The revival of learning in the 15th century was accompanied by an awakening of interest in classical antiquity, and many persons laboured eagerly upon the collection of memorials of the past. Statuary, inscriptions, gems, coins, medals and manuscripts were assembled by the wealthy and the learned. The leaders in this movement were presently followed by others who devoted themselves to the search for minerals, plants and curious animals. Among the more famous early collectors of objects of natural history may be mentioned Georg Agricola (1490–1555), who has been styled "the father of mineralogy." By his labours the elector Augustus of Saxony was induced to establish the *Kunst und Naturalien Kammer*, which has since expanded into the various museums at Dresden. One of his contemporaries was Conrad Gesner of Zürich (1516–1565), "the German Pliny," whose writings are still resorted to by the curious. Others whose names are familiar were Pierre Bélon (1517–1564), professor at the Collège de France; Andrea Cesalpini (1519–1603), whose herbarium is still preserved at Florence; Ulissi Aldrovandi (1522–1605), remnants of whose collections still exist at Bologna; Ole Worm (1588–1654), a Danish physician, after whom the so-called "Wormian bones" of the skull are named, and who was one of the first to cultivate what is now known as the science of prehistoric archaeology. At a later date the collection of Albert Seba (1665–1736) of Amsterdam became famous, and was purchased by Peter the Great in 1716, and removed to St Petersburg. In Great Britain among early collectors were the two Tradescants; Sir John Woodward (1665–1728), a portion of whose collections, bequeathed by him to Cambridge University is still preserved there in the Woodwardian or Geological Museum; Sir James Balfour (1600–1657), and Sir Andrew Balfour (1630–1694), whose work was continued in part by Sir Robert Sibbald (1641–1722). The first person to elaborate and present to modern minds the thought of an institution which should assemble within its walls the things which men wish to see and study was Bacon, who in his *New Atlantis* (1627) broadly sketched the outline of a great national museum of science and art.

The first surviving scientific museum established upon a substantial basis was the Ashmolean Museum at Oxford, founded by Elias Ashmole. The original collection had been made by the Tradescants, father and son, gardeners who were in the employment of the duke of Buckingham and later of King Charles I. and his queen; it consisted of "twelve cartloads of curiosities," principally from Virginia and Algiers, which the younger Tradescant bequeathed to Ashmole, and which, after much litigation with Tradescant's widow, he gave to Oxford upon condition that a suitable building should be provided. This was done in 1682 after plans by Sir Christopher Wren. Ashmole in his diary makes record, on the 17th of February 1683, that "the last load of my rareties was sent to the barge, and this afternoon I relapsed into the gout."

The establishment of the German academy of *Naturae Curiosi* in 1652, of the Royal Society of London in 1660, and of the Académie des Sciences of Paris in 1666, imparted a powerful impulse to scientific investigation, which was reflected not only in the labours of a multitude of persons who undertook the formation of private scientific collections, but in the initiation by crowned heads of movements looking toward the formation of national collections, many of which, having their beginnings in the latter half of the 17th century and the early years of the 18th century, survive to the present day.

The most famous of all English collectors in his time was Sir Hans Sloane (1660–1753), whose vast collection, acquired at a great outlay of money, and including the collections of Petiver, Courten, Merret, Plukenet, and Buddle—all of which he had purchased—was by his will bequeathed to the British nation on condition that parliament should pay to his heirs the sum of £20,000, a sum far less than that which he had expended upon it, and representing, it is said, only the value of the coins which it contained. Sloane was a man who might justly have said of himself "humani nihil a me alienum puto"; and his collection attested the catholicity of his tastes and the breadth of his scientific appetencies. The bequest of Sloane was accepted upon the terms of his will, and, together with the library of George II., which had likewise been bequeathed to the nation, was thrown open to the public at Bloomsbury in 1759 as the British Museum. As showing the great advances which have occurred in the administration of museums since that day, the following extract taken from *A Guide-Book to the General Contents of the British Museum*, published in 1761, is interesting: ". . . fifteen persons are allowed to view it in one Company, the Time allotted is two Hours; and when any Number not exceeding fifteen are inclined to see it, they must send a List of their Christian and Sirnames, Additions, and Places of Abode, to the Porter's Lodge, in order to their being entered in the Book; in a few Days the respective Tickets will be made out, specifying the Day and Hour in which they are to come, which, on being sent for, are delivered. If by any Accident some of the Parties are prevented from coming, it is proper they send their Ticket back to the Lodge, as nobody can be admitted with it but themselves. It is to be remarked that the fewer Names there are in a List, the sooner they are likely to be admitted to see it."

The establishment of the British Museum was coincident in time with the development of the systematic study of nature, of which Linnaeus was at that time the most distinguished exponent. The modern sciences, the wonderful triumphs of which have revolutionized the world, were just emerging from their infancy. Museums were speedily found to furnish the best agency for preserving the records of advancing knowledge, so far as these consisted of the materials upon which the investigator had laboured. In a short time it became customary for the student, either during his lifetime or at his death, to entrust to the permanent custody of museums the collections upon which he had based his studies and observations. Museums were thenceforth rapidly multiplied, and came to be universally regarded as proper repositories for scientific collections of all kinds. But the use of museums as repositories of the collections of the learned came presently to be associated with their use as seats of original investigation and research. Collections of new and rare objects which had not yet received attentive study came into their possession. Voyages of exploration into unknown lands, undertaken at public or private expense, added continually to their treasures. The comparison of newer collections with older collections which had been already made the subject of study, was undertaken. New truths were thus ascertained. A body of students was attracted to the museums, who in a few years by their investigations began not only to add to the sum of human knowledge, but by their publications to shed lustre upon the institutions with which they were connected. The spirit of inquiry was wisely fostered by private and public munificence, and museums as centres for the diffusion of scientific truth came to hold a well-recognized position. Later still, about the middle of the 19th century, when the importance of popular education and the necessity of popularizing knowledge came to be more thoroughly recognized than it had heretofore been, museums were found to be peculiarly adapted in certain respects for the promotion of the culture of the masses. They became under the new impulse not merely repositories of scientific records and seats of original research, but powerful educational agencies, in which by object lessons the most important truths of science were capable of being pleasantly imparted to multitudes. The old narrow restrictions were thrown down. Their doors were freely opened to the people, and at the beginning of the 20th century the movement for the establishment of museums assumed a magnitude scarcely, if at all, less than the movement on behalf of the diffusion of popular knowledge through public libraries. While great national museums have been founded and all the large municipalities of the world through private or civic gifts have established museums within their limits, a multitude of lesser towns, and even in some cases villages, have established museums, and museums as adjuncts of universities, colleges and high schools have come to be recognized as almost indispensable. The movement has assumed its greatest proportions in Great Britain and her colonies, Germany, and the United States of America, although in many other lands it has already advanced far.

There are now in existence in the world, exclusive of museums of art, not less than 2000 scientific museums which possess in themselves elements of permanence, some of which are splendidly supported by public munificence, and a number of which have been richly endowed by private benefactions.

Great Britain and Ireland.—The greatest museum in London is the British Museum. The natural history department at South Kensington, with its wealth of types deposited there, constitutes the most important collection of the kind in the world. The Museum of Practical Geology in Jermyn Street contains a beautiful and well-arranged collection of minerals and a very complete series of specimens illustrative of the petrography and the invertebrate paleontology of the British Islands. The botanical collections at Kew are classic, and are as rich in types as are the zoological collections of the British Museum. The Hunterian Museum of the Royal College of Surgeons contains a notable assemblage of specimens illustrating anatomy, both human and comparative, as well as pathology. In London also a number of private owners possess large collections of natural history specimens, principally ornithological, entomological and conchological, in some instances destined to find a final resting place in the national collection. One of the most important of these great collections is that formed by F. Ducane Godman, whose work on the fauna of middle America, entitled *Biologia centrali-americana*, is an enduring monument to his learning and generosity. The Hon. Walter Rothschild has accumulated at Tring one of the largest and most important natural history collections which has ever been assembled by a single individual. It is particularly rich in rare species which are either already extinct or verging upon extinction, and the ornithological and entomological collections are vast in extent and rich in types. Lord Walsingham has at his country seat, Merton Hall, near Thetford, the largest and most perfect collection of the microlepidoptera of the world which is in existence.

The Ashmolean Museum and the University Museum at Oxford, and the Woodwardian Museum and the University Museum at Cambridge, are remarkable collections. The Free Public Museum at Liverpool is in some respects one of the finest and most successfully arranged museums in Great Britain. It contains a great wealth of important scientific material, and is rich in types, particularly of birds. The Manchester Museum of Owens College and the museum in Sheffield have in recent years accomplished much for the cause of science and popular education. The Bristol Museum has latterly achieved considerable growth and has become a centre of much enlightened activity. The Royal Scottish Museum, the herbarium of the Royal Botanical Garden, and the collections of the Challenger Expedition Office in Edinburgh, are worthy of particular mention. The museum of the university of Glasgow and the Glasgow Museum contain valuable collections. The museum of St Andrews University is very rich in material illustrating marine zoology, and so also are the collections of University College at Dundee. The Science and Art Museum of Dublin and the Public Museum of Belfast, in addition to the works of art which they contain, possess scientific collections of importance.

There are also in Great Britain and Ireland some two hundred smaller museums, in which there are collections which cannot be overlooked by specialists, more particularly by those interested in geology, paleontology and archaeology.

India.—The Indian Museum, the Geological Museum of the Geological Survey of India, and the herbarium of the Royal Botanic Garden in Calcutta, are richly endowed with collections illustrating the natural history of Hindostan and adjacent countries. The finest collection of the vertebrate fossils of the Siwalik Hills is that found in the Indian Museum. The Victoria and Albert Museum in Bombay and the Government Museum in Madras are institutions of importance.

Australia.—The Queensland Museum, and the museum of the Geological Survey of Queensland located in Brisbane, and the National Museum at Melbourne, Victoria, represent important beginnings. Sydney, the capital of New South Wales, is the centre of considerable scientific activity. The museums connected with the university of Sydney, the museum of the Geological Survey of New South Wales, and the Australian Museum, all possess valuable collections. The museum at Adelaide is noteworthy.

New Zealand.—Good collections are found in the Otago Museum, Dunedin, the Canterbury Museum at Christ Church, the Auckland Museum at Auckland, and the Colonial Museum at Wellington.

South Africa.—The South African Museum at Capetown is a flourishing and important institution, which has done excellent work in the field of South African zoology. A museum has been established at Durban, Natal, which gives evidence of vitality.

Egypt.—Archaeological studies overshadow all others in the land of the Nile, and the splendid collections of the great museum of antiquities at Cairo find nothing to parallel them in the domain of the purely natural sciences. A geological museum was, however, established in the autumn of 1903, and in view of recent remarkable paleontological discoveries in Egypt possesses brilliant opportunities.

Canada.—In connexion with the *Université Laval* in Quebec, the McGill University in Montreal, and the university of Toronto in Ontario, beginnings of significance have been made. The Peter Redpath Museum of McGill College contains important collections in all branches of natural history, more particularly botany. The provincial museum at Victoria, British Columbia, is growing in importance. A movement has been begun to establish at Ottawa a museum which shall in a sense be for the Dominion a national establishment.

France.—Paris abounds in institutions for the promotion of culture. In possession of many of the institutions of learning, such as the *École Nationale Supérieure des Mines*, the *Institut National Agronomique*, and the various learned societies, are collections of greater or less importance which must be consulted at times by specialists in the various sciences. The *Muséum d'Histoire Naturelle* in the *Jardin des Plantes* is the most comprehensive and important collection of its kind in the French metropolis, and while not as rich in types as the British Museum, nevertheless contains a vast assemblage of classic specimens reflecting the labours of former generations of French naturalists. Unfortunately, much of the best material, consisting of the types of species obtained by the naturalists of French voyages of exploration, have been too long exposed to the intense light which fills the great building and have become bleached and faded to a great degree. The zeal to popularize knowledge by the display of specimens has conflicted with the purpose to preserve the records of science, a fact which French naturalists themselves universally admit. As in England, so also in France, there are a number of *virtuosi*, who have amassed fine private collections. One of the very largest and finest of all the entomological collections of the world is that at Rennes, belonging to the brothers Oberthür, upon which they have expended princely sums. The *Muséum des Sciences Naturelles* of Lyons is in some respects an important institution.

Belgium.—Brussels has been called "a city of museums." The *Musée du Congo* and the *Musée Royal d'Histoire Naturelle du Belgique* are the two most important institutions from the standpoint of the naturalist. The former is rich in ethnographic and zoological material brought from the Congo Free State, and the latter contains very important paleontological collections.

Holland.—The zoological museum of the *Koninklijk Zoologisch Genootschap*, affiliated with the university at Amsterdam, is well known. The royal museums connected with the university of Leiden are centres of much scientific activity.

Denmark.—The National Museum at Copenhagen is particularly rich in Scandinavian and Danish antiquities.

Sweden.—In Stockholm, the capital, the *Nordiska Museet* is devoted to Scandinavian ethnology, and the *Naturhistoriska Riks-Museum* is rich in paleontological, botanical and archaeological collections. Great scientific treasures are also contained in the museums connected with the university of Upsala.

Norway.—Classic collections especially interesting to the student of marine zoology are contained in the university of Christiania.

Germany.—Germany is rich in museums, some of which are of very great importance. The *Museum für Naturkunde*, the ethnographical museum, the anthropological museum, the mineralogical museum and the agricultural museum in Berlin are noble institutions, the first mentioned being particularly rich in classical collections. Hamburg boasts an excellent natural history museum and ethnographical museum, the Museum Godeffroy and the Museum Umlauff. There are a number of important private collections in Hamburg. The municipal museum in Bremen is important from the standpoint of the naturalist and ethnologist. The Roemer Museum at Hildesheim is one of the best provincial museums in Germany. Dresden even more justly than Brussels may be called "a city of museums," and the mineralogical, archaeological, zoological and anthropological museums are exceedingly important from the standpoint of the naturalist. Here also in private hands is the greatest collection of palaearctic lepidoptera in Europe, belonging to the heirs of Dr Otto Staudinger. The ethnographical museum at Leipzig is rich in collections brought together from South and Central America. The natural history museum, the anatomical museum and the ethnographical museum in Munich are important institutions, the first mentioned being particularly rich in paleontological treasures. The natural history museum of Stuttgart is likewise noted for its important paleontological collections. The *Senckenbergische Naturforschende Gesellschaft* museum at Frankfort-on-the-Main contains a very important collection of ethnographical, zoological and botanical material. The museum of the university at Bonn, and more particularly the anatomical museum, are noteworthy. In connexion with almost all the German universities and in almost all the larger towns and cities are to be found museums, in many of which there are important assemblages illustrating not only the natural history of the immediate neighbourhood, but in a multitude of cases containing important material collected in foreign lands. One of the most interesting of the smaller museums lately established is that at Lübeck, a model in its way for a provincial museum.

Austro-Hungary.—The Imperial Natural History Museum in Vienna is one of the noblest institutions of its kind in Europe, and possesses one of the finest mineralogical collections in the world. It is rich also in botanical and conchological collections. There are important ethnographical and anthropological collections at Budapest. The natural history collections of the Bohemian national museum at Prague are well arranged, though not remarkably extensive.

Russia.—The Rumiantsof Museum in Moscow possesses splendid buildings, with a library of over 700,000 volumes in addition to splendid artistic treasures, and is rich in natural history specimens. It is one of the most magnificent foundations of its kind in Europe. There are a number of magnificent museums in St Petersburg which contain stores of important material. Foremost among these is the museum of the Imperial Academy of Sciences, rich in collections illustrating the zoology, paleontology and ethnology, not only of the Russian Empire, but also of foreign lands. There are a number of provincial museums in the larger cities of Russia which are growing in importance.

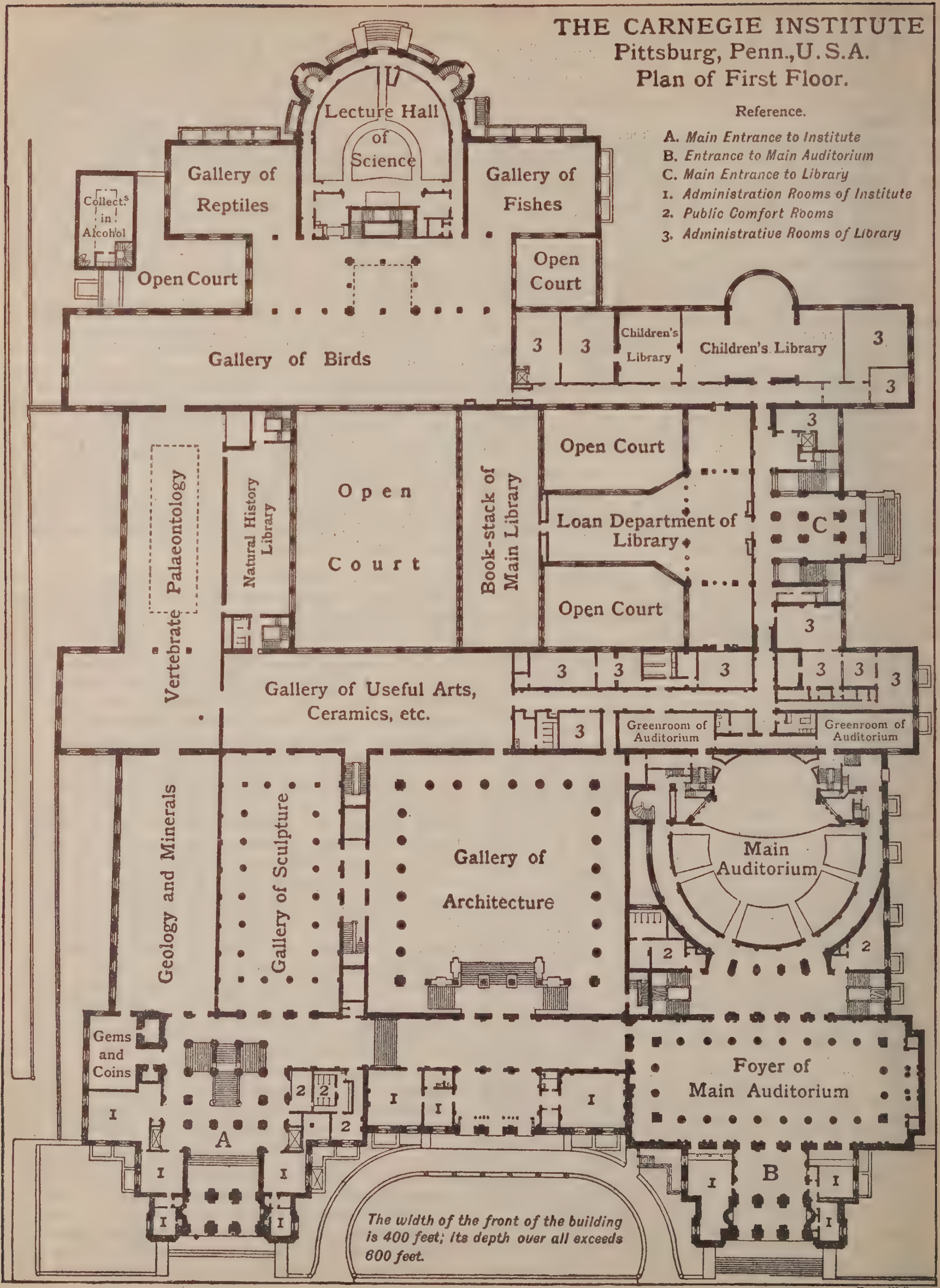
Italy.—Italy is rich in museums of art, but natural history collections are not as strongly represented as in other lands. Connected with the various universities are collections which possess more or less importance from the standpoint of the specialist. The *Museo Civico di Storia Naturale* at Genoa, and the collections preserved at the marine biological station at Naples, have most interest for the zoologist.

Spain.—There are no natural history collections of first importance in Spain, though at all the universities there are minor collections, which are in some instances creditably cared for and arranged.

Portugal.—The natural history museum at Lisbon contains important ornithological treasures.

Eastern Asia.—The awakening of the empire of Japan has resulted among other things in the cultivation of the modern sciences, and there are a number of scientific students, mostly trained in European and American universities, who are doing excellent work in the biological and allied sciences. Very creditable beginnings have been made in connexion with the Imperial University at Tokio for the establishment of a museum of natural history. At Shanghai there is a collection, gathered by the Chinese branch of the Royal Asiatic Society, which is in a decadent state, but contains much good material. Otherwise as yet the movement to establish museums has not laid strong hold upon the inhabitants of eastern Asia. At Batavia in Java, and at Manila in the Philippine Islands, there are found the nuclei of important collections.

United States.—The movement to establish museums in the United States is comparatively recent. One of the very earliest collections (1802), which, however, was soon dispersed, was made by Charles Willson Peale (*q.v.*). The Academy of Natural Sciences in Philadelphia, established in 1812, is the oldest society for the promotion of the natural sciences in the United States. It possesses a very important library and some most excellent collections, and is rich in ornithological, conchological and botanical types. The city of Philadelphia also points with pride to the free museum of archaeology connected with the university of Pennsylvania, and to the Philadelphia museums, the latter museums of commerce, but which incidentally do much to promote scientific knowledge, especially in the domain of ethnology, botany and mineralogy. The Wistar Institute of Anatomy is well endowed and organized. The zoological museum at Harvard University, Cambridge, Massachusetts, is associated with the names of Louis and Alexander Agassiz, the former of whom by his learning and activity as a collector, and the latter by his munificent gifts, as well as by his important researches, not only created the institution, but made it a potent agency for the advancement of science. The Peabody Museum of American Archaeology and Ethnology, likewise connected with Harvard University, is one of the greatest institutions of its kind in the New World. The Essex Institute at Salem, Massachusetts, is noteworthy. The Butterfield Museum, Dartmouth College, Hanover, New Hampshire, and the Fairbanks Museum of Natural Science (1891) at St Johnsbury, Vermont, are important modern institutions. In the museum of Amherst College are preserved the types of the birds described by J. J. Audubon, the shells described by C. B. Adams, the mineralogical collections of Charles Upham Shepard, and the paleontological collections of President Hitchcock. In Springfield (1898) and Worcester, Massachusetts, there are excellent museums. The Peabody Museum of Natural History at Yale University, New Haven, Connecticut, contains much of the paleontological material described by Professor O. C. Marsh. The New York State Museum at Albany is important from a geological and paleontological standpoint. The American Museum of Natural History in New York City, founded in 1869, provision for the growth and enlargement of which upon a scale of the



THE CARNEGIE INSTITUTE
Pittsburg, Penn., U.S.A.
Plan of First Floor.

Reference.

- A. *Main Entrance to Institute*
- B. *Entrance to Main Auditorium*
- C. *Main Entrance to Library*
- 1. *Administration Rooms of Institute*
- 2. *Public Comfort Rooms*
- 3. *Administrative Rooms of Library*

The width of the front of the building is 400 feet; its depth over all exceeds 600 feet.

Lecture Hall of Science
Gallery of Reptiles
Gallery of Fishes
Collects in Alcohol
Open Court
Open Court
Gallery of Birds
3
3
Children's Library
Children's Library
3
3
3
Vertebrate Palaeontology
Natural History Library
Open Court
Book-stack of Main Library
Open Court
Loan Department of Library
C
Open Court
3
3
3
3
3
3
3
Gallery of Useful Arts, Ceramics, etc.
3
Greenroom of Auditorium
Greenroom of Auditorium
Geology and Minerals
Gallery of Sculpture
Gallery of Architecture
Main Auditorium
2
2
Gems and Coins
I
2
2
2
A
I
I
I
I
I
Foyer of Main Auditorium
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B
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Emery Walker sc.

utmost magnificence has been made, is liberally supported both by public and private munificence. The ethnographical, paleontological and archaeological material gathered within its walls is immense in extent and superbly displayed. The museum of the New York botanical garden in Bronx Park is a worthy rival to the museums at Kew. The Brooklyn Institute of Arts and Sciences combines with collections illustrative of the arts excellent collections of natural history, many of which are classic.

The United States National Museum at Washington, under the control of the Smithsonian Institution, of which it is a department, has been made the repository for many years past of the scientific and artistic collections coming into the possession of the government. The growth of the material entrusted to its keeping has, more particularly in recent years, been enormous, and the collections have wholly outgrown the space provided in the original building, built for it during the incumbency of Professor Spencer F. Baird as secretary of the Smithsonian Institution. The congress of the United States has in recent years made provision for the erection of a new building upon the Mall in Washington, to which the natural history collections are ultimately to be transferred, the old buildings to be retained for the display of collections illustrating the progress of the arts, until replaced by a building of better construction for the same purpose. The United States National Museum has published a great deal, and has become one of the most important agencies for the diffusion of scientific knowledge in the country. It is liberally supported by the government, and makes use of the scientific men connected with all the various departments of activity under government control as agents for research. The collections of the United States Geological Survey, as well as many of the more important scientific collections made by the Department of Agriculture, are deposited here.

As the result of the great Columbian international exposition, which took place in 1893, a movement originated in the city of Chicago, where the exposition was held, to form a permanent collection of large proportions. The great building in which the international exposition of the fine arts was displayed was preserved as the temporary home for the new museum. Marshall Field contributed $1,000,000 to the furtherance of the enterprise, and in his honour the institution was called "The Field Columbian Museum." The growth of this institution was very rapid, and Mr. Field, at his death, in 1906, bequeathed to the museum $8,000,000, half to be applied to the erection of a new building, the other half to constitute an endowment fund, in addition to the revenues derived from the endowment already existing. The city of Chicago provides liberally for the support of the museum, the name of which, in the spring of 1906, was changed to "The Field Museum of Natural History." The city of St Louis has taken steps, as the result of the international exposition of 1904, to emulate the example of Chicago, and the St Louis Public Museum was founded under hopeful auspices in 1905.

Probably the most magnificent foundation for the advancement of science and art in America which has as yet been created is the Carnegie Institute in the city of Pittsburg. The Carnegie Institute is a complex of institutions, consisting of a museum of art, a museum of science, and a school for the education of youth in the elements of technology. Affiliated with the museums of art and science, and under the same roof, is the Central Free Library of Pittsburg. The buildings erected for the accommodation of the institute, at the entrance to Schenley Park, cost $8,000,000, and Mr Andrew Carnegie provided liberally for the endowment of the museums of art and science and the technical school, leaving to the city of Pittsburg the maintenance of the general library. The natural history collections contained in the museum of science, although the institution was only founded in 1896, are large and important, and are particularly rich in mineralogy, geology, paleontology, botany and zoology. The entomological collections are among the most important in the new world. The conchological collections are vast, and the paleontological collections are among the most important in America. The great Bayet collection is the largest and most complete collection representing European paleontology in America. The Carnegie Museum contains natural history collections aggregating over 1,500,000 specimens, which cost approximately £125,000, and these are growing rapidly. The ethnological collections, particularly those illustrating the Indians of the plains, and the archaeological collections, representing the cultures more particularly of Costa Rica and of Colombia, are large.

In connexion with almost all the American colleges and universities there are museums of more or less importance. The Bernice Pauahi Bishop museum at Honolulu is an institution established by private munificence, which is doing excellent work in the field of Polynesian ethnology and zoology.

Other American Countries.—The national museum in the city of Mexico has in recent years been receiving intelligent encouragement and support both from the government and by private individuals, and is coming to be an institution of much importance. National museums have been established at the capitals of most of the Central American and South American states. Some of them represent considerable progress, but most of them are in a somewhat languishing condition. Notable exceptions are the national museum in Rio de Janeiro, the *Museu Paraense* (Museu Goeldi), at Pará, the *Museu Paulista* at São Paulo, and the national museum in Buenos Aires. The latter institution is particularly rich in paleontological collections. There is an excellent museum at Valparaiso in Chile, which in recent years has been doing good work. (W. J. H.)

MUSGRAVE, SAMUEL (1732–1780), English classical scholar and physician, was born at Washfield, in Devonshire, on the 29th of September 1732. Educated at Oxford and elected to a Radcliffe travelling fellowship, he spent several years abroad. In 1766 he settled at Exeter, but not meeting with professional success removed to Plymouth. He ruined his prospects, however, by the publication of a pamphlet in the form of an address to the people of Devonshire, in which he accused certain members of the English ministry of having been bribed by the French government to conclude the peace of 1763, and declared that the Chevalier d'Eon de Beaumont, French minister plenipotentiary to England, had in his possession documents which would prove the truth of his assertion. De Beaumont repudiated all knowledge of any such transaction and of Musgrave himself, and the House of Commons in 1770 decided that the charge was unsubstantiated. Thus discredited, Musgrave gained a precarious living in London by his pen until his death, in reduced circumstances, on the 5th of July 1780. He wrote several medical works, now forgotten; and his edition of Euripides (1778) was a considerable advance on that of Joshua Barnes.

See W. Munk, *Roll of the Royal College of Physicians*, ii. (1878).

MUSH, the chief town of a sanjak of the same name of the Bitlis vilayet of Asiatic Turkey, and an important military station. It is situated at the mouth of a gorge in the mountains on the south side of the plain, the surrounding hills being covered with vineyards and some oak scrub. There are few good houses; the streets are ill-paved and winding, while the place and its surroundings are extremely dirty. The castle, of which there are some remains, is said to have been built by Mushig, an Armenian king of the province Daron, who founded the town. A khan, with two stone lions (Arab or Seljuk) in bas-relief, deserves notice, but the bazaar is poor, although pretty embroidered caps are produced. Good roads lead to Erzerum and Bitlis. There are 1400 inhabitants, consisting of Kurds and Armenians, about equally divided. The climate is healthy but cold in winter, with a heavy snow fall. Mush is the seat of the Gregorian and Roman Catholic Armenian bishops and some American mission schools. Some miles to the west at the edge of the plain is the celebrated monastery of Surp Garabed or St John the Baptist, an important place of Armenian pilgrimage.

Mush plain, 35 m. long by 12 broad, is very fertile, growing wheat and tobacco, and is dotted with many thriving Armenian villages. The Murad or eastern Euphrates traverses the western end of the plain and disappears into a narrow mountain gorge there. Vineyards are numerous and a fair wine is produced.

Wood is scarce and the usual fuel is *tezek* or dried cow-dung. There are several sulphur springs, and earthquakes are frequent and sometimes severe. It was on the plain of Mush that Xenophon first made acquaintance with Armenian houses, which have little changed since his day.

MUSHROOM.[1] There are few more useful, more easily recognized, or more delicious members of the vegetable kingdom than the common mushroom, known botanically as *Agaricus campestris* (or *Psalliota campestris*). It grows in short grass in the temperate regions of all parts of the world. Many edible fungi depend upon minute and often obscure botanical characters for their determination, and may readily be confounded with worthless or poisonous species; but that is not the case with the common mushroom, for, although several other species of *Agaricus* somewhat closely approach it in form and colour, yet the true mushroom, if sound and freshly gathered, may be distinguished from all other fungi with great ease. It almost invariably grows in rich, open, breezy pastures, in places where the grass is kept short by the grazing of horses, herds and flocks. Although this plant is popularly termed the "meadow mushroom," it never as a rule grows in meadows. It never grows in wet boggy places, never in woods, or on or about stumps of trees. An exceptional specimen or an uncommon variety may sometimes be seen in the above-mentioned abnormal places, but the best, the true, and common variety of the table is the produce of short, upland, wind-swept pastures. A true mushroom is never large in size; its cap very seldom exceeds 4, at most 5 in. in diameter. The large examples measuring from 6 to 9 or more in. across the cap belong to *Agaricus arvensis*, called from its large size and coarse texture the horse mushroom, which grows in meadows and damp shady places, and though generally wholesome is coarse and sometimes indigestible. The mushroom usually grown in gardens or hot-beds, in cellars, sheds, &c., is a distinct variety known as *Agaricus hortensis*. On being cut or broken the flesh of a true mushroom remains white or nearly so, the flesh of the coarser horse mushroom changes to buff or sometimes to dark brown. To summarize the characters of a true mushroom—it grows only in pastures; it is of small size, dry, and with unchangeable flesh; the cap has a frill; the gills are free from the stem, the spores brown-black or deep purple-black in colour, and the stem solid or slightly pithy. When all these characters are taken together no other mushroom-like fungus—and nearly a thousand species grow in Britain—can be confounded with it.

The parts of a mushroom consist chiefly of stem and cap; the stem has a clothy ring round its middle, and the cap is furnished underneath with numerous radiating coloured gills. Fig. 1 (1) represents a section through an infant mushroom, (2) a mature example, and (3) a longitudinal section through a fully developed mushroom. The cap D, E is fleshy, firm and white within, never thin and watery; externally it is pale brown, dry, often slightly silky or floccose, never viscid. The cuticle of a mushroom readily peels away from the flesh beneath, as shown at F. The cap has a narrow dependent margin or frill, as shown at G, and in section at H; this dependent frill originates in the rupture of a delicate continuous wrapper, which in the infancy of the mushroom entirely wraps the young plant; it is shown in its continuous state at J, and at the moment of rupture at K. The gills underneath the cap L, M, N are at first white, then rose-coloured, at length brown-black. A point of great importance is to be noted in the attachment of the gills near the stem at O, P; the gills in the true mushroom are (as shown) usually more or less free from the stem, they never grow boldly against it or run down it; they may sometimes just touch the spot where the stem joins the bottom of the cap, but never more; there is usually a slight channel, as at P, all round the top of the stem. When a mushroom is perfectly ripe and the gills are brown-black in colour, they throw down a thick dusty deposit of fine brown-black or purple-black spores; it is essential to note the colour. The spores on germination make a white felted mat, more or less dense, of mycelium; this, when compacted with dry, half-decomposed dung, is the mushroom spawn of gardeners. The stem is firm, slightly pithy up the middle, but never hollow; it bears a floccose ring near its middle, as illustrated at Q, Q; this ring originates by the rupture of the thin general wrapper K of the infant plant.

Like all widely spread and much-cultivated plants, the edible mushroom has numerous varieties, and it differs in different places and under different modes of culture in much the same way as our kitchen-garden plants differ from the type they have been derived from, and from each other. In some instances these differences are so marked that they have led some botanists to regard as distinct species many forms usually esteemed by others as varieties only.

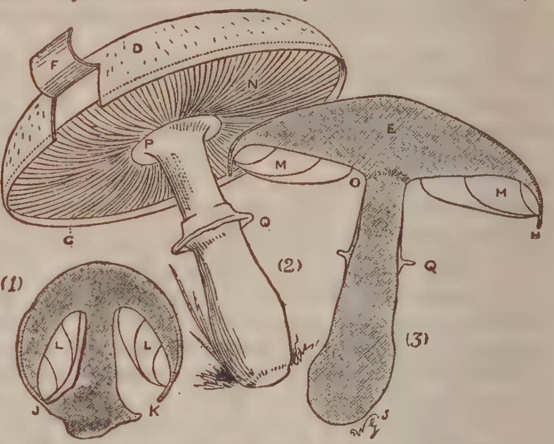

FIG. 1.—Pasture Mushroom (*Agaricus campestris*).

A small variety of the common mushroom found in pastures has been named *A. pratensis*; it differs from the type in having a pale reddish-brown scaly top, and the flesh on being cut or broken changes to pale rose-colour. A variety still more marked, with a darker brown cap and the flesh changing to a deeper rose, and sometimes blood-red, has been described as *A. rufescens*. The well-known compact variety of mushroom-growers, with its white cap and dull purplish clay-coloured gills, is *A. hortensis*. Two sub-varieties of this have been described under the names of *A. Buchanani* and *A. elongatus*, and other distinct forms are known to botanists. A variety also grows in woods named *A. silvicola*; this can only be distinguished from the pasture mushroom by its elongated bulbous stem and its externally smooth cap. There is also a fungus well known to botanists and cultivators which appears to be intermediate between the pasture variety and the wood variety, named *A. vaporarius*. The large rank horse mushroom, now generally referred to as *A. arvensis*, is probably a variety of the pasture mushroom; it grows in rings in woody places and under trees and hedges in meadows; it has a large scaly round cap, and the flesh quickly changes to buff or brown when cut or broken; the stem too is hollow. An unusually scaly form of this has been described as *A. villaticus* and another as *A. augustus*.

A species, described by Berkeley and Broome as distinct from both the pasture mushroom and horse mushroom, has been published under the name of *A. elvensis*. This grows under oaks, in clusters—a most unusual character for the mushroom, and is said to be excellent for the table. An allied fungus peculiar to woods, with a less fleshy cap than the true mushroom, with hollow stem, and strong odour, has been described as a close ally of the pasture mushroom under the name of *A. silvaticus*; its qualities for the table have not been recorded.

Many instances are on record of symptoms of poisoning, and even death, having followed the consumption of plants which have passed as true mushrooms; these cases have probably arisen from the examples consumed being in a state of decay, or from some mistake as to the species eaten. It should always be specially noted whether the fungi to be consumed are in a fresh and wholesome condition, otherwise they act as a poison in precisely the same way as does any other semi-putrid vegetable. Many instances are on record where mushroom-beds have been invaded by a growth of strange fungi and the true mushrooms have been ousted to the advantage of the new-comers. When mushrooms are gathered for sale by persons unacquainted with the different species mistakes are of frequent occurrence. A very common spurious mushroom in markets is *A. velutinus*, a slender, ringless, hollow-stemmed, black-gilled fungus, common in gardens and about dung and stumps; it is about the size of a mushroom, but thinner in all its parts and far more brittle; it has a black hairy fringe hanging round the edge of the cap when fresh. Another spurious mushroom, and equally common in dealers' baskets, is *A. lacrymabundus*; this grows in the same positions as the last, and is somewhat fleshier and more like a true mushroom; it has a hollow stem and a slight ring, the gills are black-brown mottled and generally studded with tear-like drops of moisture. In both these species the gills distinctly touch and grow on to the stem. Besides these there are numerous other black-gilled species which find a place in baskets—some species far too small to bear any resemblance to a mushroom, others large and deliquescent, generally belonging to the stump- and dung-borne genus *Coprinus*. The true mushroom itself is to a great extent a dung-borne species, therefore mushroom-beds are always liable to an invasion from other dung-borne forms. The spores of all fungi are constantly floating about in the air, and when the spores of dung-infesting species alight on a mushroom-bed they find a nidus already prepared that exactly suits them; and if the spawn of the new-comer becomes more profuse than that of the mushroom the stranger takes up his position at the expense of the mushroom. There is also a fungus named *Xylaria vaporaria*, which sometimes fixes itself on mushroom-beds and produces such an enormous quantity of string-like spawn that the entire destruction of the bed results. This spawn is sometimes so profuse that it is pulled out of the beds in enormous masses and carted away in barrows.

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[1] The earlier 15th-century form of the word was *musseroun*, *muscheron*, &c., and was adapted from the French *mousseron*, which is generally connected with *mousse*, moss.

Sometimes cases of poisoning follow the consumption of what have really appeared to gardeners to be true bed-mushrooms, and to country folks as small horse mushrooms. The case is made more complicated by the fact that these highly poisonous forms now and then appear upon mushroom-beds to the exclusion of the mushrooms. This dangerous counterfeit is *A. fastibilis*, or sometimes *A. crustuliniformis*, a close ally if not indeed a mere variety of the first. A description of one will do for both, *A. fastibilis* being a little the more slender of the two. Both have fleshy caps, whitish, moist and clammy to the touch; instead of a pleasant odour, they have a disagreeable one; the stems are ringless, or nearly so; and the gills, which are palish-clay-brown, distinctly touch and grow on to the solid or pithy stem. These two fungi usually grow in woods, but sometimes in hedges and in shady places in meadows, or even, as has been said, as invaders on mushroom-beds. The pale clay-coloured gills, offensive odour, and clammy or even viscid top are decisive characters. A reference to the accompanying illustration (fig. 2), which is about one-half natural size, will give a good idea of *A. fastibilis*; the difference in the nature of the attachment of the gills near the stem is seen at R, the absence of a true ring at S, and of a pendent frill at T. The colour, with the exception of the gills, is not unlike that of the mushroom. In determining fungi no single character must be relied upon as conclusive, but all the characters must be taken together. Sometimes a beautiful, somewhat slender, fungus peculiar to stumps in woods is mistaken for the mushroom in *A. cervinus*; it has a tall, solid, white, ringless stem and somewhat thin brown cap, furnished underneath with beautiful rose-coloured gills, which are free from the stem as in the mushroom, and which never turn black. It is probably a poisonous plant, belonging, as it does, to a dangerous cohort. Many other species of *Agaricus* more or less resemble *A. campestris*, notably some of the plants found under the sub-genera *Lepiota*, *Volvaria*, *Pholiota* and *Psalliota*; but when the characters are noted they may all with a little care be easily distinguished from each other. The better plan is to discard at once all fungi which have not been gathered from open pastures; by this act alone more than nine-tenths of worthless and poisonous species will be excluded.

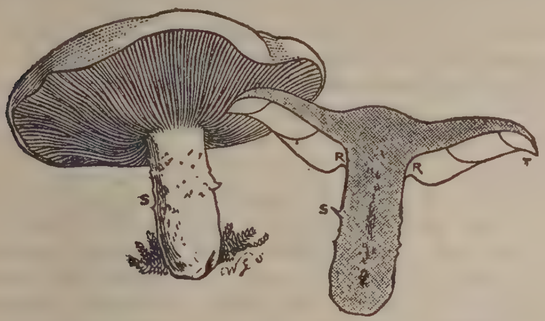

Fig. 2.—Poisonous Mushroom (*Agaricus fastibilis*).

In cases of poisoning by mushrooms immediate medical advice should be secured. The dangerous principle is a narcotic, and the symptoms are usually great nausea, drowsiness, stupor and pains in the joints. A good palliative is sweet oil; this will allay any corrosive irritation of the throat and stomach, and at the same time cause vomiting.

Paris mushrooms are cultivated in enormous quantities in dark underground cellars at a depth of from 60 to 160 ft. from the surface. The stable manure is taken into the tortuous passages of these cellars, and the spawn introduced from masses of dry dung where it occurs naturally. In France mushroom-growers do not use the compact blocks or bricks of spawn so familiar in England, but much smaller flakes or "leaves" of dry dung in which the spawn or mycelium can be seen to exist. Less manure is used in these cellars than we generally see in the mushroom-houses of England, and the surface of each bed is covered with about an inch of fine white stony soil. The beds are kept artificially moist by the application of water brought from the surface, and the different galleries bear crops in succession. As one is exhausted another is in full bearing, so that by a systematic arrangement a single proprietor will send to the surface from 300 ℔ to 3000 ℔ of mushrooms per day. The passages sometimes extend over several miles, the beds sometimes occupying over 20 m., and, as there are many proprietors of cellars, the produce of mushrooms is so large that not only is Paris fully supplied, but vast quantities are forwarded to the different large towns of Europe; the mushrooms are not allowed to reach the fully expanded condition, but are gathered in a large button state, the whole growth of the mushroom being removed and the hole left in the manure covered with fine earth. The beds remain in bearing for six or eight months, and then the spent manure is taken to the surface again for garden and field purposes. The equable temperature of these cellars and their freedom from draught is one cause of their great success; to this must be added the natural virgin spawn, for by continually using spawn taken from mushroom-producing beds the potency for reproduction is weakened. The beds produce mushrooms in about six weeks after this spawning.

The common mushroom (*Agaricus campestris*) is propagated by spores, the fine black dust seen to be thrown off when a mature specimen is laid on white paper or a white dish; these give rise to what is known as the "spawn" or mycelium, which consists of whitish threads permeating dried dung or similar substances, and which, when planted in a proper medium, runs through the mass, and eventually develops the fructification known as the mushroom. This spawn may be obtained from old pastures, or decayed mushroom beds, and is purchased from nurserymen in the form of bricks charged with the mycelium, and technically known as mushroom spawn. When once obtained, it may be indefinitely preserved. It may be produced by placing quantities of horse-dung saturated with the urine of horses, especially of stud horses, with alternate layers of rich earth, and covering the whole with straw, to exclude rain and air; the spawn commonly appears in the heap in about two months afterwards. The droppings of stall-fed horses, or of such as have been kept on dry food, should be made use of.

The old method of growing mushrooms in ridges out of doors, or on prepared beds either level or sloping from a back wall in sheds or cellars, may generally be adopted with success. The beds are formed of horse-droppings which have been slightly fermented and frequently turned, and may be made 2 or 3 ft. broad and of any length. A layer of dung about 8 or 10 in. thick is first deposited, and covered with a light dryish earth to the depth of 2 in.; and two similar layers with similar coverings are added, the whole being made narrower as it advances in height. When the bed is finished, it is covered with straw to protect it from rain, and also from parching influences. In about ten days, when the mass is milkwarm, the bed will be ready for spawning, which consists of inserting small pieces of spawn bricks into the sloping sides of the bed, about 6 in. asunder. A layer of fine earth is then placed over the whole, and well beaten down, and the surface is covered with a thick coat of straw. When the weather is temperate, mushrooms will appear in about a month after the bed has been made, but at other times a much longer period may elapse. The principal things to be attended to are to preserve a moderate state of moisture and a proper mild degree of warmth; and the treatment must vary according to the season.

These ordinary ridge beds furnish a good supply towards the end of summer, and in autumn. To command a regular supply, however, at all seasons, the use of a mushroom-house will be found very convenient. The material employed in all cases is the droppings of horses, which should be collected fresh, and spread out in thin layers in a dry place, a portion of the short litter being retained well moistened by horse-urine. It should then be thrown together in ridges and frequently turned, so as to be kept in an incipient state of fermentation, a little dryish friable loam being mixed with it to retain the ammonia given off by the dung. With this or a mixture of horse-dung, loam, old mushroom-bed dung, and half-decayed leaves, the beds are built up in successive layers of about 3 in. thick, each layer being beaten firm, until the bed is 9 or 10 in. thick. If the heat exceeds 80°, holes should be made to moderate the fermentation. The beds are to be spawned when the heat moderates, and the surface is then covered with a sprinkling of warmed loam, which after a few days is made up to a thickness of 2 in., and well beaten down. The beds made partly of old mushroom-bed dung often contain sufficient spawn to yield a crop, without the introduction of brick or cake spawn, but it is advisable to spawn them in the regular way. The spawn should be introduced an inch or two below the surface when the heat has declined to about 75°, indeed the bed ought never to exceed 80°. The surface is to be afterwards covered with hay or litter. The atmospheric temperature should range from 60° to 65° till the mushrooms appear, when it may drop a few degrees, but not lower than 55°. If the beds require watering, water of about 80° should be used, and it is preferable to moisten the covering of litter rather than the surface of the beds themselves. It is also beneficial, especially in the case of partially exhausted beds, to water with a dilute solution of nitre. For a winter supply the beds should be made towards the end of August, and the end of October. Slugs and woodlice are the worst enemies of mushroom crops.

The Fairy-ring Champignon.—This fungus, *Marasmius Oreades*, is more universally used in France and Italy than in England, although it is well known and frequently used both in a fresh and in a dry state in England. It is totally different in appearance from the pasture mushroom, and, like it, its characters are so distinct that there is hardly a possibility of making a mistake when its peculiarities are once comprehended. It has more than one advantage over the meadow mushroom in its extreme commonness, its profuse growth, the length of the season in which it may be gathered, the total absence of varietal forms, its adaptability for being dried and preserved for years, and its persistent delicious taste. It is by many esteemed as the best of all the edible fungi found in Great Britain. Like the mushroom, it grows in short open pastures and amongst the short grass of open roadsides; sometimes it appears on lawns, but it never occurs in woods or in damp shady places. Its natural habit is to grow in rings, and the grassy fairy-rings so frequent amongst the short grass of downs and pastures in the spring are generally caused by the nitrogenous manure applied to the soil in the previous autumn by the decay of a circle of these fungi. Many other fungi in addition to the fairy-ring champignon grow in circles, so that this habit must merely be taken with its other characters in cases of doubt.

A glance at the illustration (fig. 3) will show how entirely the fairy-ring champignon differs from the mushroom. In the first place, it is about one-half the size of a mushroom, and whitish-buff in every part, the gills always retaining this colour and never becoming salmon-coloured, brown or black. The stem is solid and corky, much more solid than the flesh of the cap, and perfectly smooth, never being furnished with the slightest trace of a ring. The buff-gills are far apart (v), and in this they greatly differ from the somewhat crowded gills of the mushroom; the junction of the gills with the stem (w) also differs in character from the similar junction in the mushroom. The mushroom is a semi-deliquescent fungus which rapidly falls into putridity in decay, whilst the champignon dries up into a leathery substance in the sun, but speedily revives and takes its original form again after the first shower. To this character the fungus owes its generic name (*Marasmius*) as well as one of its most valuable qualities for the table, for examples may be gathered from June to November, and if carefully dried may be hung on strings for culinary purposes and preserved without deterioration for several years; indeed, many persons assert that the rich flavour of these fungi increases with years. Champignons are highly esteemed (and especially is this the case abroad) for adding a most delicious flavour to stews, soups and gravies.

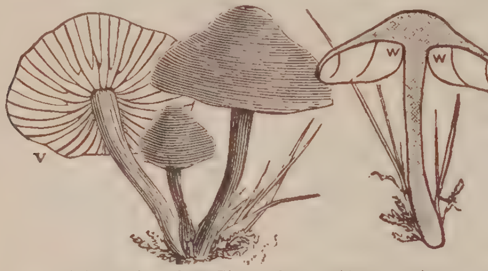

FIG. 3.—The Fairy-ring Champignon (*Marasmius oreades*).

A fungus which may carelessly be mistaken for the mushroom is *M. peronatus*, but this grows in woods amongst dead leaves, and has a hairy base to the stem and a somewhat acrid taste. Another is *M. urens*; this also generally grows in woods, but the gills are not nearly so deep, they soon become brownish, the stem is downy, and the taste is acrid. An *Agaricus* named *A. dryophilus* has sometimes been gathered in mistake for the champignon, but this too grows in woods where the champignon never grows; it has a hollow instead of a solid stem, gills crowded together instead of far apart, and flesh very tender and brittle instead of tough. A small esculent ally of the champignon, named *M. scovodonius*, is sometimes found in pastures in Great Britain; this is largely consumed on the Continent, where it is esteemed for its powerful flavour of garlic. In England, where garlic is not used to a large extent, this fungus is not sought for. Another small and common species, *M. porreus*, is pervaded with a garlic flavour to an equal extent with the last. A third species, *M. alliaceus*, is also strongly impregnated with the scent and taste of onions or garlic. Two species, *M. impudicus* and *M. foetidus*, are in all stages of growth highly fœtid. The curious little edible *Agaricus esculentus*, although placed under the sub-genus *Collybia*, is allied by its structure to *Marasmius*. It is a small bitter species common in upland pastures and fir plantations early in the season. Although not gathered for the table in England, it is greatly prized in some parts of the Continent.

MUSIC.—The Greek *μουσική* (*sc.* *τέχνη*), from which this word is derived, was used very widely to embrace all those arts over which the Nine Muses (Μοῦσαι) were held to preside. Contrasted with *γυμναστική* (gymnastic) it included those branches of education concerned with the development of the mind as opposed to the body. Thus such widely different arts and sciences as mathematics, astronomy, poetry and literature generally, and even reading and writing would all fall under *μουσική*, besides the singing and setting of lyric poetry. On the educational value of music in the formation of character the philosophers laid chief stress, and this biased their aesthetic analysis. Ἁρμονία (harmony), or *ἁρμονική* (sc. *τεχνή*), rather than *μουσική*, was the name given by the Greeks to the art of arranging sounds for the purpose of creating a definite aesthetic impression, with which this article deals.

I.—General Sketch

1. *Introduction.*—As a mature and independent art music is unknown except in the modern forms realized by Western civilization; ancient music, and the non-European music of the present day, being (with insignificant exceptions of a character which confirms the generalization) invariably an adjunct of poetry or dance, in so far as it is recognizable as an art at all. The modern art of music is in a unique position; for, while its language has been wholly created by art, this language is yet so perfectly organized as to be in itself natural; so that though the music of one age or style may be at first unintelligible to a listener who is accustomed to another style, and though the listener may help himself by acquiring information as to the characteristics and meaning of the new style, he will best learn to understand it by merely divesting his mind of prejudices and allowing the music to make itself intelligible by its own self-consistency. The understanding of music thus finally depends neither upon technical knowledge nor upon convention, but upon the listener's immediate and familiar experience of it; an experience which technical knowledge and custom can of course aid him to acquire more rapidly, as they strengthen his memory and enable him to fix impressions by naming them.

Beyond certain elementary facts of acoustics (see SOUND), modern music shows no direct connexion with nature independently of art; indeed, it is already art that determines the selection of these elementary acoustic facts, just as in painting art determines the selection of those facts that come under the cognizance of optics.[1] In music, however, the purely acoustic principles are incomparably fewer and simpler than the optical principles of painting, and their artistic interaction transforms them into something no less remote from the laboratory experiments of acoustic science than from the unorganized sounds of nature. The result is that while the ordinary non-artistic experiences of sight afford so much material for plastic art that the vulgar conception of good painting is that it is deceptively like nature, the ordinary non-artistic experience of sound has so little in common with music that musical realism is, with rare though popular exceptions, generally regarded as an eccentricity.

This contrast between music and plastic art may be partly explained by the mental work undergone, during the earliest infancy both of the race and of the individual, in interpreting sensations of space. When a baby learns the shape of objects by taking them in his hands, and gradually advances to the discovery that his toes belong to him, he goes through an amount of work that is quite forgotten by the adult, and its complexity and difficulty has perhaps only been fully realized through the experience of persons who have been born blind but have acquired sight at a mature age by an operation. Such work gives the facts of normal adult vision an amount of organic principle that makes them admirable raw material for art. The power of distinguishing sensations of sound is associated with no such mental skill, and is no more complex than the power of distinguishing colours. On the other hand, sound is the principal medium by which most of the higher animals both express and excite emotion; and hence, though until codified into human speech it does not give any raw material for art, yet so powerful are its primitive effects that music (in the bird-song sense of sound indulged in for its own attractiveness) is as long prior to language as the brilliant colours of animals and flowers are prior to painting (see SONG). Again, sound as a warning or a menace is eminently important in the history of the instinct of self-preservation; and, above all, its production is instantaneous and instinctive.

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[1] Thus Chinese and Japanese art has attained high organization without the aid of a veracious perspective; while, on the other hand, its carefully formulated decorative principles, though not realistic, certainly rest on an optical and physiological basis. Again, many modern impressionists justify their methods by an appeal to phenomena of complementary colour which earlier artists possibly did not perceive and certainly did not select as artistic materials.

All these facts, while they tend to make musical expression an early phenomenon in the history of life, are extremely unfavourable to the early development of musical art. They invested the first musical attempts with a mysterious power over listener and musician, by re-awakening instincts more powerful, because more ancient and necessary, than any that could ever have been appealed to by so deliberate a process as that of drawing on a flat surface a series of lines calculated to remind the eye of the appearance of solid objects in space. It is hardly surprising that music long remained as imperfect as its legendary powers were portentous, even in the hands of so supremely artistic a race as that of classical Greece; and whatever wonder this backwardness might still arouse in us vanishes when we realize the extreme difficulty of the process by which the principles of the modern art were established.

2. *Non-harmonic and Greek Music.*—Archaic music is of two kinds—the unwritten, or spontaneous, and the recorded, or scientific. The earliest musical art-problems were far too difficult for conscious analysis, but by no means always beyond the reach of a lucky hit from an inspired singer; and thus folk-music often shows real beauty where the more systematic music of the time is merely arbitrary. Moreover, folk-music and the present music of barbarous and civilized non-European races furnish the study of musical origins with material analogous to that given by the present manners and customs of different races in the study of social evolution and ancient history. We may mention as examples the accurate comparison of the musical scales of non-European races undertaken by A. J. Ellis (*On the Musical Scales of Various Nations*, 1885); the parallel researches and acute and cautious reasoning of his friend and collaborator, A. J. Hipkins (*Dorian and Phrygian reconsidered from a Non-harmonic Point of View*, 1902); and, perhaps most of all, the study of Japanese music, with its remarkable if uncertain signs of the beginning of a harmonic tendency, its logical coherence, and its affinity to Western scales, points in which it seems to show a great advance upon the Chinese music from which most of it is derived (*Music and Musical Instruments of Japan*, by J. F. Piggott, 1893). The reader will find detailed accounts of ancient Greek music in the article on that subject in Grove's *Dictionary of Music and Musicians* (new ed., ii. 223) and in Monro's *Modes of Ancient Greek Music* (Clarendon Press, 1894), while both the Greek music itself, and the steps by which it passed through Graeco-Roman and early Christian phases to become the foundation of the modern art, are traced as clearly as is consistent with accuracy in *The Oxford History of Music*, vol. i., by Professor Wooldridge. Sir Hubert Parry's *Evolution of the Art of Music* ("International Scientific Series," originally published under the title of *The Art of Music*) presents the main lines of the evolution of modern musical ideas in the clearest and most readable form yet attained.

Sir Hubert Parry illustrates in this work the artificiality of our modern musical conceptions by the word "cadence," which to a modern musician belies its etymology, since it normally means for him no "falling" close but a pair of final chords *rising* from dominant to tonic. Moreover, in consequence of our harmonic notions we think of scales as constructed from the bottom upwards; and even in the above-mentioned article in Grove's *Dictionary* all the Greek scales are, from sheer force of habit, written upwards. But the ancient and, almost universally, the primitive idea of music is like that of speech, in which most inflections are in fact cadences, while rising inflexions express less usual sentiments, such as surprise or interrogation. Again, our modern musical idea of "high" and "low" is probably derived from a sense of greater and less vocal effort; and it has been much stimulated by our harmonic sense, which has necessitated a range of sounds incomparably greater than those employed in any non-harmonic system. The Greeks derived their use of the terms from the position of notes on their instruments; and the Greek *hypatē* was what we should call the lowest note of the mode, while *netē* was the highest. Sir George Macfarren has pointed out (*Ency. Brit.*, 9th ed., art. "Music") that Boethius (*c.* A.D. 500) already fell into the trap and turned the Greek modes upside down.[1]

Another radical though less grotesque misconception was also already well exploded by Macfarren; but it still frequently survives at the present day, since the study of non-harmonic scales is, with the best of intentions, apt rather to encourage than to dispel it. The more we realize the importance of differences in position of intervals of various sizes, as producing differences of character in scales, the more irresistible is the temptation to regard the ancient Greek modes as differing from each other in this way. And the temptation becomes greater instead of less when we have succeeded in thinking away our modern harmonic notions. Modern harmonization enormously increases the differences of expression between modes of which the melodic intervals are different, but it does this in a fashion that draws the attention almost entirely away from these differences of interval; and without harmony we find it extremely difficult to distinguish one mode from another, unless it be by this different arrangement of intervals. Nevertheless, all the evidence irresistibly tends to the conclusion that while the three Greek *genera*—diatonic, chromatic, and enharmonic—were scales differing in intervals, the Greek *modes* were a series of scales identical in arrangement of interval, and differing, like our modern keys, only in pitch. The three genera were applied to all these modes or keys, and we have no difficulty in understanding their modifying effects. But the only clue we have to the mental process by which in a preharmonic age different characteristics can be ascribed to scales identical in all but pitch, is to be found in the limited compass of Greek musical sounds, corresponding as it does to the evident sensitiveness of the Greek ear to differences in vocal effort. We have only to observe the compass of the Greek scale to see that in the most esteemed modes it is much more the compass of speaking than of singing voices. Modern singing is normally at a much higher pitch than that of the speaking voice, but there is no natural reason, outside the peculiar nature of modern music, why this should be so. It is highly probable that all modern singing would strike a classical Greek ear as an outcry; and in any case such variations of pitch as are inconsiderable in modern singing are extremely emphatic in the speaking voice, so that they might well make all the difference to an ear unaccustomed to organized sound beyond the speaking compass. Again, much that Aristoxenus and other ancient authorities say of the character of the modes (or keys) tends to confirm the view that that character depends upon the position of the *mese* or keynote within the general compass. Thus Aristotle (*Politics*, v. (viii.) 7, 1342 b. 20) states that certain low-pitched modes suit the voices of old men, and thus we may conjecture that even the position of tones and semitones might in the Dorian and Phrygian modes bring the bolder portion of the scale in all three genera into the best regions of the average young voice, while the Ionian and Lydian might lead the voice to dwell more upon semitones and enharmonic intervals, and so account for the heroic character of the former and the sensual character of the latter (Plato, *Republic*, 398 to 400).

Of the Greek genera, the chromatic and enharmonic (especially the latter) show very clearly the origin of so many primitive scales in the interval of the downward fourth. That interval (*e.g.* from C to G) is believed to be the earliest melodic relationship which the ear learnt to fix; and most of the primitive scales were formed by the accretion of auxiliary notes at the bottom of this interval, and the addition of a similar interval, with similar accretions, below the former. In this way a pentatonic scale, like that of so many Scotch melodies, can easily be formed (thus, C, A, G; F, D, C); and though some primitive scales seem to have been on the nucleus of the rising fifth, while the Siamese now use two scales of which not a single note within the octave can be accounted for by any known principle, still we may consider that for general historic purposes the above example is typical. The Greeks divided their downward fourth into four notes, called a *tetrachord*; and by an elaborate system of linking tetrachords together they gave their scale a compass of two octaves. The enharmonic tetrachord, being the most ancient, gathered the lower three notes very closely to the bottom, leaving the second note no less than a major third from the top, thus—C,A♭, G′, G; (where G′ stands for a note between A♭ and G). The chromatic tetrachord was C, B♭♭, A♭, G; and the diatonic tetrachord was C, B♭, A♭, G. It is this last that has become the foundation of modern music, and the Greeks themselves soon preferred it to the other genera and found a scientific basis for it. In the first place they noticed that its notes (and, less easily, the notes of the chromatic scale) could be connected by a series of those intervals which they recognized as concordant. These were, the fourth; its converse, or inversion, the fifth; and the octave. The notes of the enharmonic tetrachord could not be connected by any such series. In the articles on HARMONY and SOUND account is given of the historic and scientific foundations of the modern conception of concord; and although this harmonic conception applies to simultaneous notes, while the Greeks concerned themselves only with successive notes, it is nevertheless permissible to regard the Greek sense of concord in successive notes as containing the germ of our harmonic sense. The stability of the diatonic scale was assured as early as the 6th century B.C. when Pythagoras discovered (if he did not learn from Egypt or India) the extremely simple mathematical proportions of its intervals. And this discovery was of unique importance, as fixing the intervals by a criterion that could never be obscured by the changes of taste and custom otherwise inevitable in music that has no conscious harmonic principles to guide it. At the same time, the foundation of a music as yet immature and ancillary to drama, on an acoustic science ancillary to a priori mathematics, was not without disadvantage to the art; and it is arguable that the great difficulty with which during the medieval beginnings of modern harmony the concords of the third and sixth were rationalized may have been increased by the fact that the Pythagorean system left these intervals considerably out of tune. In preharmonic times mathematics could not direct even the most observant ear to the study of those phenomena of *upper partials* of which Helmholtz, in 1863, was the first to explain the significance; and thus though the Greeks knew the difference between a major and minor tone, on which half the question depended, they could not possibly arrive at the modern reasons for adding both kinds of tone in order to make the major third. (See SOUND.)

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[1] It is worth adding that in the 16th century the great contrapuntal composer Costanzo Porta had been led by doubts on the subject to the wonderful conclusion that ancient Greek music was polyphonic, and so constructed as to be invertible; in illustration of which theory he and Vincentino composed four-part motets in each of the Greek genera (diatonic, chromatic and enharmonic), Porta's being constructed like the 12th and 13th fugues in Bach's *Kunst der Fuge* so as to be equally euphonious when sung upside down! (See Hawkins's *History of Music*, i. 112.)

Here we must digress in order to illustrate what is implied by our modern harmonic sense; for the difference that this makes to our whole musical consciousness is by no means universally realized. Music, as we now understand it, expresses itself in the interaction of three elements—rhythm, melody and harmony. The first two are obviously as ancient as human consciousness itself. Without the third a musical art of permanent value and intelligibility has not been known to attain independent existence. With harmony music assumes the existence of a kind of space in three dimensions, none of which can subsist without at least implying the others. When we hear an unaccompanied melody we cannot help interpreting it in the light of its most probable harmonies. Hence, when it does not imply consistent harmonies it seems to us quaint or strange; because, unless it is very remote from our harmonic conceptions, it at least implies at any given moment some simple harmony which in the next moment it contradicts. Thus our inferences as to the expression intended by music that has not come under European influence are unsafe, and the pleasure we take in such music is capricious. The effort of thinking away our harmonic preconceptions is probably the most violent piece of mental gymnastics in all artistic experience, and furnishes much excuse for a sceptical attitude as to the artistic value of preharmonic music, which has at all events never become even partially independent of poetry and dance. Thus the rhythm of classical Greek music seems to have been entirely identical with that of verse, and its beauty and expression appreciated in virtue of that identity. From the modern musical point of view the rhythm of words is limited to a merely monotonous uniformity of flow, with minute undulations which are musically chaotic (see RHYTHM). The example of Greek tragedy, with the reports of its all-pervading music (in many cases, as in that of Aeschylus, composed by the dramatist himself) could not fail to fire the imaginations of modern pioneers and reformers of opera; and Monteverde, Gluck and Wagner convinced themselves and their contemporaries that their work was, amongst other things, a revival of Greek tragedy. But all that is known of Greek music shows that it represents no such modern ideas, as far as their really musical aspect is concerned. It represents, rather, an organization of the rise and fall of the voice, no doubt as elaborate and artistic as the organization of verse, no doubt powerful in heightening the emotional and dramatic effect of words and action, but in no way essential to the understanding or the organization of the works which it adorned. The classical Greek preference for the diatonic scale indicates a latent harmonic sense and also that temperance which is at the foundation of the general Greek sense of beauty; but, beyond this and similar generalities, all the research in the world will not enable us to understand the Greek musician's mind. Non-harmonic music is a world of two dimensions, and we must now inquire how men came to rise from this "flatland" to the solid world of sound in which Palestrina, Bach, Beethoven and Wagner live.

3. *Harmonic Origins.*—Although the simultaneous blending of different sounds was never seriously contemplated by the Greeks, yet in classical times they were fond of singing with high and low voices in octaves. This was called *magadizing*, from the name of an instrument on which playing in octaves was rendered easy by means of a bridge that divided the strings at two-thirds of their length. While the practice was esteemed for the beauty of the blending of different voices, it was tolerated only because of the peculiar effect of identity furnished by the different notes of the octave, and no other interval was so used by the Greeks. In the article on HARMONY the degrees of identity-in-difference which characterize the simpler harmonic intervals are analysed, and the main steps are indicated by which the more complicated medieval magadizing uses of the fourth and fifth (the *symphonia*, *diaphonia* or *organum* of Hucbald) gave way (partly by their own interchange and partly through experiments in the introduction of ornaments and variety) to the modern conception of harmony as consisting of voices or parts that move independently to the exclusion of such parallel motion. In *The Oxford History of Music*, vols. i. and ii., will be found abundant examples of every stage of the process, which begins with the *organum* or *diaphony* that prevailed until the death of Guido of Arezzo (about 1050) and passes through the *discant*, or measured music, of the 13th century, in which rhythm is first organized on a sufficiently firm basis to enable voices to sing contrasted rhythms simultaneously, while the new harmonic criterion of the independence of parts more and more displaces and shows its opposition to the old criterion of parallelism.

The most extraordinary example of these conflicting principles is the famous rota "Sumer is icumen in," a 13th-century round in four parts on a canonic ground-bass in two. Recent researches have brought to light a number of works in the forms of *motet*, *conductus*, *rondel* (neither the later rondo nor the round, but a kind of triple counterpoint), which show that "Sumer is icumen in" contains no unique technical feature; but no work within two centuries of its date attains a style so nearly intelligible to modern ears. Its richness and firmness of harmony are such that the frequent use of consecutive fifths and octaves, in strict accordance with 13th-century principles, has to our ears all the effect of a series of grammatical blunders, so sharply does it contrast with the smooth counterpoint of the rest. In what light this smooth counterpoint struck contemporaries, or how its author (who may or may not be the writer of the Reading MS., John of Fornsete) arrived at it, is not clear, though W. S. Rockstro's amusing article, "Sumer is icumen in," in Grove's *Dictionary*, is very plausible. All that we know is that music in England in the 13th century must have been at a comparatively high state of development; and we may also conjecture that the tuneful character of this wonderful rota has something in common with the unwritten but famous songs of the aristocratic troubadours, or *trouvères*, of the 12th and 13th centuries, who, while disdaining to practise the art of accompaniment or the art of scientific and written music, undoubtedly set the fashion in melody, and, being themselves poets as well as singers, formed the current notions as to the relations between musical and poetic rhythm. The music of Adam de la Hale, surnamed Le Bossu d'Arras (*c.* 1230–1288), shows the transformation of the troubadour into the learned musician; and, nearly a century later, the more ambitious efforts of a greater French poet (like his contemporary Petrarca, one of Chaucer's models in poetic technique), Guillaume de Machault (*fl.* 1350), mark a further technical advance, though they are not appreciably more intelligible to the modern ear.

In the next century we find an Englishman, John Dunstable, who had as early as 1437 acquired a European reputation; while his works were so soon lost sight of that until recently he was almost a legendary character, sometimes revered as the "inventor" of counterpoint, and once or twice even identified with St Dunstan! Recently a great deal of his work has come to light, and it shows us (especially when taken in connexion with the fact that the early Netherlandish master, G. Dufay, did not die until 1474, twenty-one years after Dunstable) that English counterpoint was fully capable of showing the composers of the Netherlands the path by which they were to reach the art of the "Golden age." In such examples of Dunstable's work as that appended to the article "Dunstable" in Grove's *Dictionary* (new ed., i. 744) we see music approaching a style more or less consistently intelligible to a modern ear; and in *English Carols of the 15th Century* (1891) several two-part compositions of the period, in a style resembling Dunstable's, have been made accessible to modern readers and filled out into four-part music by the editor "in accordance with the rules of the time." And though it may be doubted whether Mr Rockstro's skill would not have been held in the 15th century to savour overmuch of the Black Art, still the success of his attempt shows that the musical conceptions he is dealing with are no longer radically different from those of our modern musical consciousness.

4. *The Golden Age.*—The struggle towards the realization of mature musical art seems incredibly slow when we do not realize its difficulty, and wonderfully rapid as soon as we attempt to imagine the effort of first forming those harmonic conceptions which are second nature to us. Even at the time of Dunstable and Dufay the development of the contrapuntal idea of independence of parts had not yet so transformed the harmonic consciousness that the ancient parallelisms or consecutive fourths and fifths that were the backbone of discant could be seen in their true light as contradictory to the contrapuntal method. By the beginning of the 16th century, however, the laws of counterpoint were substantially fixed; practice was for a while imperfect, and aims still uncertain, but skill was increasing and soon became marvellous; and in 16th-century music we leave the archaic world altogether. Henceforth music may show various phenomena of crudeness, decadence and transition, but its transition-periods will always derive light from the past, whatever the darkness of the future.

In the best music of the 16th century we have no need of research or mental gymnastics, beyond what is necessary in all art to secure intelligent presentation and attention. Its materials show us the "three dimensions" of music in their simplest state of perfect balance. Rhythm, emancipated from the tyranny of verse, is free to co-ordinate and contrast a multitude of melodies which by the very independence of their flow produce a mass of harmony that passes from concord to concord through ordered varieties of transitional discord. The criterion of discord is no longer that of mere harshness, but is modified by the conception of the simplicity or remoteness of the steps by which the flux of independent simultaneous melodies passes from one concord, or point of repose, to another. When the music reaches a climax, or its final conclusion, the point of repose is, of course, greatly emphasized. It is accordingly the "cadences" or full closes of 16th-century music that show the greatest resemblance to the harmonic ideas of the present day; and it is also at these points that certain notes were most frequently raised so as to modify the ecclesiastical modes which are derived more or less directly from the melodic diatonic scale of the Greeks, and misnamed, according to inevitable medieval misconceptions, after the Greek modes.[1]

In other passages our modern ears, when unaccustomed to the style, feel that the harmony is strange and lacking in definite direction; and we are apt to form the hasty conclusion that the mode is an archaic survival. A more familiar acquaintance with the art soon shows that its shifting and vague modulations are no mere survival of a scale inadequate for any but melodic purposes, but the natural result of a state of things in which only two species of chord are available as points of repose at all. If no successions of such chords were given prominence, except those that define key according to modern notions based upon a much greater variety of harmony, the resulting monotony and triviality would be intolerable. Moreover, there is in this music just as much and no more of formal antithesis and sequence as its harmony will suffice to hold together. Lastly, we shall find, on comparing the masterpieces of the period with works of inferior rank, that in the masterpieces the most archaic modal features are expressive, varied and beautiful; while in the inferior works they are often avoided in favour of ordinary modern ideas, and, when they occur, are always accidental and monotonous, although in strict conformity with the rules of the time. The consistent limitations of harmony, form and rhythm have the further consequence that the only artistic music possible within them is purely vocal. The use of instruments is little more than a necessary evil for the support of voices in case of insufficient opportunity for practice; and although the origins of instrumental music are already of some artistic interest in the 16th century, we must leave them out of our account if our object is to present mature artistic ideas in proper proportions.

The principles of 16th-century art-forms are discussed in more detail in the article on CONTRAPUNTAL FORMS. Here we will treat the formal criteria on a general basis; especially as with art on such simple principles the distinction between one art-form and another is apt to be either too external or too subtle for stability. With music there is a stronger probability than in any other art that merely mechanical devices will be self-evident, and thus they may become either dangerous or effective. With the masters of the Netherlands they speedily became both. Two adjacent groups of illustrations in Burney's

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[1] The technical nature of the subject forbids us to discuss the origin and characteristics of the great Ambrosian and Gregorian collections of melodic church music on which nearly all medieval and 16th-century polyphony was based, and from which the ecclesiastical modes were derived. Professor Wooldridge in *The Oxford History of Music*, i. 20–44, has shown the continuity of this early Christian music with the Graeco-Roman music, and the origin of its modes in the Ptolemaic modification (c. A.D. 150) of the Greek diatonic scale; while a recent defence of the ecclesiastical tradition of a revision by St Gregory will be found in the article on "Gregorian music" in Grove's *Dictionary* (new ed.), ii. 235.

History of Music will show on the one hand the astonishing way in which early polyphonic composers learnt to "dance in fetters," and, on the other hand, the expressive power that they attained by that discipline. Burney quotes from the venerable 15th-century master Okeghem, or Okenheim, some canons so designed as to be singable in all modes. They are by no means extreme cases of the ingenuity which Okenheim and his pupils often employed; but though they are not very valuable artistically (and are not even correctly deciphered by Burney)[1] they prove that mechanical principles may be a help rather than a hindrance to the attainment of a smooth and plastic style. Burney most appropriately follows them with Josquin Des Près's wonderful *Deploration de Jehan Okenheim*, in which the tenor sings the plain chant of the Requiem a degree below its proper pitch, while the other voices sing a pastoral dirge in French. The device of transposing the plain chant a note lower, and making the tenor sing it in that position throughout the whole piece, is obviously as mechanical as any form of acrostic: but it is happily calculated to impress our ears, even though, unlike Josquin's contemporaries, most of us are not familiar with the plain chant in its normal position; because it alters the position of all the semitones and gives the chant a plaintive minor character which is no less impressive in itself than as a contrast to the orthodox form. And the harmonic superstructure is as fine an instance of the expressive possibilities of the church modes at their apogee from modern tonality as could be found anywhere. A still nobler example, which we may perhaps acclaim as the earliest really sublime masterpiece in music, is Josquin's *Miserere*, which is accessible in a modern edition. In this monumental work one of the tenor parts is called *Vagans*, because it sings the burden *Miserere mei Deus* at regular intervals, in an almost monotonous wailing figure, wandering through each successive degree of the scale throughout the composition. The effect, aided as it is by consummate rhetorical power in every detail of the surrounding mass of harmony and counterpoint, is extremely expressive; and the device lends itself to every shade of feeling in the works of the greatest of all Netherland masters, Orlando di Lasso. Palestrina is less fond of it. Like all more obvious formal devices it is crowded out of his Roman art by the exquisite subtlety of his sense of proportion, and the exalted spirituality of his style which, while it allows him to set the letters of the Hebrew alphabet in the Lamentations of Jeremiah in much the same spirit as that in which they would be treated in an illuminated Bible, forbids him to stimulate a sense of form that might distract the mind from the sense of mystery and awe proper to objects of devout contemplation. Yet in one of his greatest motets, *Tribularer si nescirem*, the burden of Josquin's *Miserere* appears with the same treatment and purpose as in its prototype.

But with the lesser Flemish masters, and sometimes with the greatest, such mechanical principles often became not only inexpressive but absolutely destructive to musical effect. The ingenuity necessary to make the stubborn material of music plastic was not so easily attainable as the ingenuity necessary to turn music into a mathematical game; and when Palestrina was in his prime the inferior composers so outnumbered the masters to whom music was a devout language, and so degraded the art, not only by ousting genuine musical expression but by foisting secular tunes and words into the church services, that one of the minor questions with which the Council of Trent was concerned was whether polyphonic church music should be totally abolished with other abuses, or whether it was capable of reform. Legendary history relates that Palestrina submitted for judgment three masses of which the *Missa papae Marcelli* proved to be so sublime that it was henceforth accepted as the ideal church music (see PALESTRINA). This tale is difficult to reconcile with the chronology of Palestrina's works, but there is no doubt that Palestrina was officially recognized by the Church as a bulwark against bad taste. But we must not allow this to mislead us as to the value of church music before Palestrina. Nor must we follow the example of Baini, who, in his detestation of what he is pleased to call *fiammingo squalore*, views with uncritical suspicion any work in which Palestrina does not confine himself to strictly Italian methods of expression. A notion still prevails that Josquin represents counterpoint in an anatomical perfection into which Palestrina was the first to breathe life and soul. This gives an altogether inadequate idea of 16th-century music. Palestrina brought the century to a glorious close and is undoubtedly its greatest master, but he is *primus inter pares*; and in every part of Europe music was represented, even before the middle of the century, by masters who have every claim to immortality that sincerity of aim, completeness of range, and depth and perfection of style can give. It has been rightly called the golden age of music, and our chronological table at the end of this article gives but an inadequate idea of the number of its masters whom no lover of music ought to neglect. It is not exclusively an age of church music. It is also the age of madrigals, both secular and spiritual; and, small as was its range of expression, there has been no period in musical art when the distinctions between secular and ecclesiastical style were more accurately maintained by the great masters, as is abundantly shown by the test cases in which masses of the best period have been based on secular themes. (See MADRIGAL.)

5. *The Monodic Revolution and its Results*.—Like all golden ages, that of music vanished at the first appearance of a knowledge beyond its limitations. The first and simplest realization of mature art is widespread and nourishes a veritable army of great men; its masterpieces are innumerable, and its organization is so complete that no narrowness or specialization can be felt in the nature of its limitations. Yet these are exceedingly close, and the most modest attempt to widen them may have disastrous results. Many experiments were tried before Palestrina's death and throughout the century, notably by the elder and younger Gabrieli. Perhaps Palestrina himself is the only great composer of the time who never violates the principles of his art. Orlando di Lasso, unlike Palestrina, wrote almost as much secular as sacred music, and in his youth indulged in many eccentricities in a chromatic style which he afterwards learnt to detest. But if experiments are to revolutionize art it is necessary that their novelty shall already embody some artistic principle of coherence. No such principle will avail to connect the Phrygian mode with a chord containing A♯; and, however proud the youthful Orlando di Lasso may be at being the first to write A♯, neither his early chromatic experiments nor those of Cipriano di Rore, which he admired so much, left a mark on musical history. They appealed to nothing deeper than a desire for sensational variety of harmony; and, while they carried the successions of chords far beyond the limits of the modes, they brought no new elements into the chords themselves.

By the beginning of the 17th century the true revolutionary principles were vigorously at work, and the powerful genius of Monteverde speedily made it impossible for men of impressionable artistic temper to continue to work in the old style when such vast new regions of thought lay open to them. In the year of Palestrina's death, 1594, Monteverde published, in his third book of madrigals, works in which without going irrevocably beyond the letter of 16th-century law he showed far more zeal for emotional expression than sense of euphony. In 1599 he published madrigals in which his means of expression involve harmonic principles altogether incompatible with 16th-century ideas. But he soon ceased to place confidence in the madrigal as an adequate art-form for his new ideals of expression, and he found an unlimited field in musical drama. Dramatic music received its first stimulus from a group of Florentine dilettanti, who aspired amongst other things to revive the ideals of Greek tragedy. Under their auspices the first true opera ever performed in public, Jacopo Peri's *Euridice*, appeared in 1600. Monteverde found the conditions of dramatic music more favourable to his experiments than those of choral music, in which both voices and ears are at their highest sensibility to discord. Instruments do not blend like voices; and players, producing their notes by more mechanical means, have not the singer's difficulty in making combinations which the ear does not readily understand.

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[1] The correct version will be found in *The Oxford History of Music*, ii. 215.

The one difficulty of the new art was fatal: there were no limitations. When Monteverde introduced his unprepared discords, the effect upon musical style was like that of introducing modern metaphors into classical Greek. There were no harmonic principles to control the new material, except those which just sufficed to hold together the pure 16th-century style; and that style depended on an exquisite continuity of flow which was incompatible with any rigidity either of harmony or rhythm. Accordingly there were also no rhythmic principles to hold Monteverde's work together, except such as could be borrowed from types of secular and popular music that had hitherto been beneath serious attention. If the 17th century seems almost devoid of great musical names it is not for want of incessant musical activity. The task of organizing new resources into a consistent language was too gigantic to be accomplished within three generations. Its fascinating dramatic suggestiveness and incalculable range disguised for those who first undertook it the fact that the new art was as difficult and elementary in its beginnings as the very beginning of harmony itself in the 13th and 14th centuries. And the most beautiful compositions at the beginning of the 17th century are rather those which show the decadence of 16th-century art than those in which the new principles were most consistently adopted. Thus the madrigals of Monteverde, though often dull and always rough, contain more music than his operas. On the other hand, almost until the middle of the 17th century great men were not wanting who still carried on the pure polyphonic style. Their asceticism denotes a spirit less comprehensive than that of the great artists for whom the golden age was a natural environment; but in parts of the world where the new influences did not yet prevail even this is not the case, and a composer like Orlando Gibbons, who died in 1625, is well worthy to be ranked with the great Italian and Flemish masters of the preceding century.

But the main task of composers of the 17th century lay elsewhere; and if the result of their steady attention to it was trivial in comparison with the glories of the past, it at least led to the glories of the greater world organized by Bach and Handel. The early monodists, Monteverde and his fellows, directed attention to the right quarter in attempting to express emotion by means of single voices supported by instruments; but the formless declamation of their dramatic writings soon proved too monotonous for permanent interest, and such method as it showed became permanent only by being codified into the formulas of *recitative*, which are, for the most part, very happy idealizations of speech-cadence, and which accordingly survive as dramatic elements in music at the present day, though, like all rhetorical figures, they have often lost meaning from careless use.[1] It was all very well to revolutionize current conceptions of harmony, so that chords were no longer considered, as in the days of pure polyphony, to be the result of so many independent melodies. But in art, as elsewhere, new thought eventually shows itself as an addition to, not a substitute for, the wisdom of ages. Moreover, it is a mistake, though one endorsed by high authorities, to suppose that the 16th-century composers did not appreciate the beauty of successions of chords apart from polyphonic design. On the contrary, Palestrina and Orlando di Lasso themselves are the greatest masters the world has ever seen of a style which depends wholly on the beauty of masses of harmony, entirely devoid of polyphonic detail, and held together by a delicately balanced rhythm in which obvious symmetry is as carefully avoided as it is in the successions of chords themselves. Nevertheless, the monody of the 17th century is radically different in principle, not only because chords are used which were an outrage on 16th-century ears, but because the fundamental idea is that of a solo voice declaiming phrases of paramount emotional interest, and supported by instruments that play such chords as will heighten the poignancy of the voice. And the first advance made on this chaotic monody consisted, not in the reintroduction of vitality into the texture of the harmonies, but in giving formal symmetry and balance to the vocal surface. This involved the strengthening of the harmonic system, so that it could carry the new discords as parts of an intelligible scheme, and not merely as uncontrollable expressions of emotion. In other words, the chief energies of the successors of the monodists were devoted to the establishment of the modern key-system; a system in comparison with which the subtle variety of modal concord sounded vague and ill-balanced, until the new key-system itself was so safely established that Bach and Beethoven could once more appreciate and use essentially modal successions of chords in their true meaning.

The second advance of the monodic movement was in the cultivation of the solo voice. This developed together with the cultivation of the violin, the most capable and expressive of the instruments used to support it. Monteverde already knew how to make interesting experiments with violins, such as directing them to play *pizzicato*, and accompanying an excited description of a duel by rapidly repeated strokes on a major chord, followed by sustained dying harmonies in the minor. By the middle of the century violin music is fairly common, and the distinction between *Sonata da chiesa* and *Sonata da camera* appears (see SONATA). But the cultivation of instrumental technique had also a great effect on that of the voice; and Italian vocal technique soon developed into a monstrosity that so corrupted musical taste as not only to blind the contemporaries of Bach and Handel to the greatness of their choral art, but, in Handel's case, actually to swamp a great deal of his best work. The balance between a solo voice and a group of instruments was, however, successfully cultivated together with the modern key-system and melodic form; with the result that the classical *aria*, a highly effective art-form, took shape. This, while it totally destroyed the dramatic character of opera for the next hundred years, yet did good service in furnishing a reasonably effective means of musical expression which could encourage composers and listeners to continue cultivating the art until the day of small things was past. The operatic aria, as matured by Alessandro Scarlatti, is at its worst a fine opportunity for a gorgeously dressed singer to display feats of vocal gymnastics, either on a concert platform, or in scenery worthy of the Drury Lane pantomime. At its best it is a beautiful means of expression for the devout fervour of Bach and Handel. At all times it paralyses dramatic action, and no more ironic revenge has ever overtaken iconoclastic reformers than the historic development by which the purely dramatic declamation of the monodists settled down into a series of about thirty successive displays of vocalization, designed on rigidly musical conventions, and produced under spectacular conditions by artificial sopranos as the highest ideal of music-drama.

The principal new art-forms of the 17th century are then, firstly, the aria (not the opera, which was merely a spectacular condition under which people consented to listen to some thirty arias in succession); and, secondly, the polyphonic instrumental forms, of which those of the *suite* or *sonata da camera* were mainly derived from the necessity for ballet music in the opera (and hence greatly stimulated by the taste of the French court under Louis XIV.), while those of the *sonata da chiesa* were also inspired by a renaissance of interest in polyphonic texture. The *sonata da chiesa* soon settled into a conventionality only less inert than that of the aria because violin technique had wider possibilities than vocal; but when Lulli settled in France and raised to a higher level of effect the operatic style suggested by Cambert, he brought with him just enough of the new instrumental polyphony to make his typical form of French overture (with its slow introduction in dotted rhythm, and its quasi-fugal allegro) worthy of the important place it occupies in Bach's and Handel's art.

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[1] The "invention" of recitative is frequently ascribed to this or that monodist, with as little room for dispute as when we ascribe the invention of clothes to Adam and Eve. All monody was recitative, if only from inability to organize melodies.

Meanwhile great though subordinate activity was also shown in the evolution of a new choral music dependent upon an instrumental accompaniment of more complex function than that of mere support. This, in the hands of the Neapolitan masters, was destined to lead straight to the early choral music of Mozart and Haydn, both of whom, especially Mozart, subsequently learnt its greater possibilities from the study of Handel. But the most striking choral art of the time came from the Germans, who never showed that thoughtless acquiescence in the easiest means of effect which was already the bane of Italian art. Consequently, while the German output of the 17th century fails to show that rapid attainment of modest maturity which gives much Italian music of the period a permanent if slight artistic value, there is, in spite of much harshness, a stream of noble polyphonic effort in both organ and choral music in Germany from the time of H. Schütz (who was born in 1585 and who was a great friend and admirer of Monteverde) to that of Bach and Handel just a century later. Nor was Germany inactive in the dramatic line, and the 17th-century Italian efforts in comic opera, which are so interesting and so unjustly neglected by historians, found a parallel, before Handel's maturity, in the work of R. Keiser, and may be traced through him in Handel's first opera, *Almira*.

The best proof of the insufficiency of 17th-century resources is to be found in the almost tragic blending of genius and failure shown by our English church music of the Restoration. The works of Pelham Humfrey and Blow already show the qualities which with Purcell seem at almost any given moment to amount to those of the highest genius, while hardly a single work has any coherence as a whole. The patchiness of Purcell's music was, no doubt, increased by the influence of French taste then predominant at court. When Pelham Humfrey was sixteen, King Charles II., as Sir Hubert Parry remarks, "achieved the characteristic and subtle stroke of humour of sending him over to France to study the methods of the most celebrated composer of theatrical music of the time in order to learn how to compose English church music." Yet it is impossible to see how such ideas as Purcell's could have been presented in more than French continuity of flow by means of any designs less powerful than those of Bach and Handel. Purcell's ideas are, like those of all great artists, at least sixty years in advance of the normal intellect of the time. But they are unfortunately equally in advance of the only technical resources then conceivable; and Purcell, though one of the greatest contrapuntists that ever lived, is probably the only instance in music of a man of really high genius born out of due time. Musical talent was certainly as common in the 17th century as at any other time; and if we ask why, unless we are justified in counting Purcell as a tragic exception, the whole century shows not one name in the first artistic rank, the answer must be that, after all, artistic talent is far more common than the interaction of environment and character necessary to direct it to perfect artistic results.

6. *Bach and Handel.*—It was not until the 18th century had begun that two men of the highest genius could find in music a worthy expression of their grasp of life. Bach and Handel were born within a month of each other, in 1685, and in the same part of Saxony. Both inherited the tradition of polyphonic effort that the German organists and choral writers had steadily maintained throughout the 17th century; and both profited by the Italian methods that were penetrating Germany. In Bach's case it was the Italian art-forms that appealed to his sense of design. Their style did not affect him, but he saw every possibility which the forms contained, and studied them the more assiduously because they were not, like polyphonic texture, his birthright. In recitative his own distinctively German style attained an intensity and freedom of expression which is one of the most moving things in art. Nevertheless, if he handled recitative in his own way it was not for want of acquaintance with the Italian formulas, nor even because he despised them; for in his only two extant Italian works the scraps of recitative are strictly in accordance with Italian convention, and the arias show (when we allow for their family likeness with Bach's normal style) the most careful modelling upon Italian forms. Again, as is well known, Bach arranged with copious additions and alterations many concertos by Vivaldi (together with some which though passing under Vivaldi's name are really by German contemporaries); and, while thus taking every opportunity of assimilating Italian influences in instrumental as well as in vocal music, he was no less alive to the importance of the French overture and suite forms. Moreover, he is very clear as to where his ideas come from, and extremely careful to maintain every art-form in its integrity. Yet his style remains his own throughout, and the first impression of its resemblance to that of his German contemporaries diminishes the more the period is studied. Bach's art thus forms one of the most perfectly systematic and complete records a life's work has ever achieved. His art-forms might be arranged in a sort of biological scheme, and their interaction and genealogy has a clearness which might almost be an object of envy to men of science even if Bach had not demonstrated every detail of it by those wonderful re-writings of his own works which we have described elsewhere (see Bach).

Handel's methods were as different from Bach's as his circumstances. He soon left Germany and, while he never betrayed his birthright as a great choral writer, he quickly absorbed the Italian style so thoroughly as to become practically an Italian. He also adopted the Italian forms, but not, like Bach, from any profound sense of their possible place in artistic system. To him they were effective, and that was all. He did not trouble himself about the permanent idea that might underlie an art-form and typify its expression. He has no notion of a form as anything higher than a rough means of holding music together and maintaining its flow; but he and Bach, alone among their contemporaries, have an unfailing sense of all that is necessary to secure this end. They worked from opposite points of view: Bach develops his art from within, until its detail, like that of Beethoven's last works, becomes dazzling with the glory of the whole design; Handel at his best is inspired by a magnificent scheme, in the execution of which he need condescend to finish of detail only so long as his inspiration does not hasten to the next design. Nevertheless it is to the immense sweep and breadth of Handel's choral style, and its emotional force, that all subsequent composers owe their first access to the larger and less mechanical resources of music. (See Handel.)

7. *The Symphonic Classes.*—After the death of Bach and Handel another change of view, like that Copernican revolution for which Kant sighed in philosophy, was necessary for the further development of music. Once again it consisted in an inversion of the relation between form and texture. But, whereas at the beginning of the 17th century the revolution consisted mainly in directing attention to chords as, so to speak, harmonic lumps, instead of moments in a flux of simultaneous melodies; in the later half of the 18th century the revolution concerned the larger musical outlines, and was not complicated by the discovery of new harmonic resources. On the contrary, it led to an extreme simplicity of harmony. The art of Bach and Handel had given perfect vitality to the forms developed in the 18th century, but chiefly by means of the reinfusion of polyphonic life. The formal aspects (that is, those that decree the shapes of aria and suite-movement and the balance and contrasts of such choruses as are not fugues) are, after all, of secondary importance; the real centre of Bach's and Handel's technical and intellectual activity is the polyphony; and the more the external shape occupies the foreground the more the work assumes the character of light music. In the article Sonata Forms we show how this state of things was altered, and attention is there drawn to the dramatic power of a music in which the form is technically prior to the texture. And it is not difficult to understand that Gluck's reform of opera would have been a sheer impossibility if he had not dealt with music in the sonata style, which is capable of changing its character as it unfolds its designs.

The new period of transition was neither so long nor so interesting as that of the 17th century. The contrast between the squalid beginnings of the new art and the glories of Bach and Handel is almost as great as that between the monodists and Palestrina, but it appeals far less to our sympathies, because it seems like a contrast between noble sincerity and idle elegance. The new art seems so easy-going and empty that it conceals from us the necessity of the sympathetic historical insight for which the painful experiments of the monodists almost seem to cry aloud. And its boldest rhetorical experiments, such as the fantasias of Philipp Emanuel Bach, show a security of harmony which, together with the very vividness of their realization of modern ideas, must appear to a modern listener more like the hollow rhetoric of a decadent than the prophetic inspiration of a pioneer. And, just as in the 17th century, so in the time before Haydn and Mozart, the work that is most valuable artistically tends to be that which is of less importance historically. The cultivation of the shape of music at the expense of its texture was destined to lead to greater things than polyphonic art had ever dreamt of; but no living art could be achieved until the texture was brought once more into vital, if subordinate, relation to the shape. Thus, far more interesting artistically than the epoch-making earlier pianoforte works of Philipp Emanuel Bach are his historically less fruitful oratorios, and his symphonies, and the rich polyphonic modifications of the new principles in the best works of his elder brother Friedemann. Yet the transition-period is hardly second in historic importance to that of the 17th century; and we may gather from it even more direct hints as to the meaning of the tendencies of our own day.

As in the 17th century, so in the 18th the composers and critics of Haydn's youth, not knowing what to make of the new tendencies, and conscious rather of the difference between new and old ideas than of the true nature of either, took refuge in speculations about the emotional and external expression of music; and when artistic power and balance fail it is very convenient to go outside the limits of the art and explain failure away by external ideas. Fortunately the external ideas were capable of serious organic function through the medium of opera, and in that art-form music was passing out of the hands of Italians and assuming artistic and dramatic life under Gluck. The metaphysical and literary speculation which overwhelmed musical criticism at this time, and which produced paper warfares and musical party-feuds such as that between the Gluckists and the Piccinists, at all events had this advantage over the Wagnerian and anti-Wagnerian controversies of the last generation and the disputes about the legitimate function of instrumental music at the present day—that it was speculation applied exclusively to an art-form in which literary questions were directly concerned, an art-form which moreover had up to that time been the grave of all the music composers chose to put into it. But as soon as music once more attained to consistent principles all these discussions became but a memory. If Gluck's music had not been more musical as well as more dramatic than Piccini's, all its foreshadowing of Wagnerian principles would have availed it no more than it availed Monteverde.

When the new art found symphonic expression in Haydn and Mozart, it became music pure and simple, and yet had no more difficulty than painting or poetry in dealing with external ideas, when these were naturally brought into it by the human voice or the conditions of dramatic action. It had once more become an art which need reject or accept nothing on artificial or extraneous grounds. Beethoven soon showed how gigantic the scale and range of the sonata style could be, and how tremendous was its effect on the possibilities of vocal music, both dramatic and choral. No revolution was needed to accomplish this. The style was perfectly formed, and for the first and so far the only time in musical history a mature art of small range opened out into an equally perfect one of gigantic range, without a moment of decadence or destruction. The chief glory of the art that culminates in Beethoven is, of course, the instrumental music, all of which comes under the head of the sonata-forms (*q.v.*).

Meanwhile Mozart raised comic opera, both Italian and German, to a height which has never since been approached within the classical limits, and from which the operas of Rossini and his successors show a decadence so deplorable that if "classical music" means "high art" we must say that classical *opera buffa* begins and ends in Mozart. But Gluck, finding his dramatic ideas encouraged by the eminent theatrical sensibilities of the French, had already given French opera a stimulus towards the expression of tragic emotion which made the classics of the French operatic school well worthy to inspire Beethoven to his one noble operatic effort and Weber to the greatest works of his life. Cherubini, though no more a Frenchman than Gluck, was Gluck's successor in the French classical school of dramatic music. His operas, like his church music, account for Beethoven's touching estimation of him as the greatest composer of the time. In them his melodies, elsewhere curiously cold and prosaic, glow with the warmth of a true classic; and his tact in developing, accelerating and suspending a dramatic climax is second only to Mozart's. Scarcely inferior to Cherubini in mastery and dignity, far more lovable in temperament, and weakened only by inequality of invention, Méhul deserves a far higher place in musical history than is generally accorded him. His most famous work, *Joseph*, is of more historical importance than his others, but it is by no means his best from a purely musical point of view, though its Biblical subject impelled Méhul to make extremely successful experiments in "local colour" which had probably considerable influence upon Weber, whose admiration of the work was boundless. One thing is certain, that the romantic opera of Weber owes much of its inspiration to the *opéra comique* of these masters.[1]

8. *From Beethoven to Wagner.*—After Beethoven comes what is commonly though vaguely described as the "romantic" movement. In its essentials it amounts to little more than this, that musicians found new and prouder titles for a very ancient and universal division of parties. The one party set up a convenient scheme of form based upon the average procedure of all the writers of sonatas except Haydn and Beethoven, which scheme they chose to call classical; while the other party devoted itself to the search for new materials and new means of expression. The classicists, if so they may be called, did not quite approve of Beethoven; and while there is much justification for the charge that has been brought against them of reducing the sonata-form to a kind of game, they have for that very reason no real claim to be considered inheritors of classical traditions. The true classical method is that in which matter and form are so united that it is impossible to say which is prior to the other. The pseudo-classics are the artists who set up a form conveniently like the average classical form, and fill it with something conveniently like the average classical matter, with just such difference as will seem like an advance in brilliance and range. The romanticists are the artists who realize such a difference between their matter and that of previous art as impels them to find new forms for it, or at all events to alter the old forms considerably. But if they are successful the difference between their work and that of the true classics becomes merely external; they are classics in a new art-form. As, however, this is as rare as true classical art is at the best of times, romanticism tends to mean little more than the difference between an unstable artist who cannot master his material and an artist who can, whether on the pseudo-classical or the true classical plane. The term "romantic opera" has helped us to regard Weber as a romanticist in that sphere, but when we call his instrumental works "romantic" the term ceases to have really valuable meaning. As applied to pieces like the *Concertstück*, the *Invitation à la danse*, and other pieces of which the external subject is known either from Weber's letters or from the titles of the pieces themselves, the term means simply "programme-music" such as we have seen to be characteristic of any stage in which the art is imperfectly mastered. Weber's programme-music shows no advance on Beethoven in the illustrative resources of the art; and the application of the term "romantic"

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[1] We must remember in this connexion that the term *opéra comique* means simply opera with spoken dialogue, and has nothing to do with the comic idea.

to his interesting and in many places beautiful pianoforte sonatas has no definite ground except the brilliance of his pianoforte technique and the helplessness in matters of design (and occasionally even of harmony) that drives him to violent and operatic outbreaks.

Schubert also lends some colour to the opposition between romantic and classical by his weakness in large instrumental designs, but his sense of form was too vital for his defective training to warp his mind from the true classical spirit; and the new elements he introduced into instrumental music, though not ratified by concentration and unity of design, were almost always the fruits of true inspiration and never mere struggles to escape from a difficulty. His talent for purely instrumental music was incomparably higher than Weber's, while that for stage-drama, as shown in the most ambitious of his numerous operas, *Fierrabras*, was almost nil. But he is the first and perhaps the greatest classical song writer. It was Beethoven's work on a larger scale that so increased the possibilities of handling remote harmonic sequences and rich instrumental and rhythmic effects as to prepare for Schubert a world in which music, no less than literature, was full of suggestions for that concentrated expression of a single emotion which distinguishes true lyric art. And, whatever the defects of Schubert's treatment of larger forms, his construction of small forms which can be compassed by a single melody or group of melodies is unsurpassable and is truly classical in spirit and result.

Schumann had neither Schubert's native talent for larger form nor the irresponsible spirit which allowed Schubert to handle it uncritically. Nor had he the astounding lightness of touch and perfect balance of style with which Chopin controlled the most wayward imagination that has ever found expression in the pianoforte lyric. But he had a deep sense of melodic beauty, a mastery of polyphonic expression which for all its unorthodox tendency was second only to that of the greatest classics, and an epigrammatic fancy which enabled him to devise highly artistic forms of music never since imitated with success though often unintelligently copied. In his songs and pianoforte lyrics his romantic ideas found perfectly mature expression. Throughout his life he was inspired by a deep reverence which, while it prevented him from attempting to handle classical forms with a technique which he felt to be inadequate, at the same time impelled him as he grew older to devise forms on a large scale externally resembling them. The German lyric poetry, which he so perfectly set to music, strengthened him in his tendency to present his materials in an epigrammatic and antithetic manner; and, when he took to writing orchestral and chamber music, the extension of the principles of this style to the designing of large spaces in rigid sequence furnished him with a means of attaining great dignity and weight of climax in a form which, though neither classical nor strictly natural, was at all events more true in its relationship to his matter than that of the pseudo-classics such as Hummel or even Spohr. Towards the end of his short life, before darkness settled upon his mind, he rose perhaps to his greatest height as regards solemnity of inspiration, though none of his later works can compare with his early lyrics for artistic perfection. Be this as it may, his last choral works, especially the latter parts of *Faust* (which, unlike the first part, was written before his powers failed), show that the sense of beauty and polyphonic life with which he began his career was always increasing; and if he was led to substitute an artificial and ascetic for a natural and classical solution of the difficulties of the larger art-forms it was only because of his insight into artistic ideals which he felt to be beyond his attainment. He shared with Mendelssohn the inevitable misunderstanding of those contemporaries who grouped all music under one or other of the two heads, Classical and Romantic.

There is good reason to believe that Mendelssohn died before he had more than begun to show his power, though this may be denied by critics who have not thought of comparing Handel's career up to the age at which Mendelssohn's ceased. And his mastery, resting, like Handel's, on the experience of a boyhood comparable only to Mozart's, was far too easy to induce him as a critic to reconcile the idea of high talent with distressing intellectual and technical failure. This same mastery also tended to discredit his own work, both as performer and composer, in the estimation of those whose experience encouraged them to hope that imperfection and over-excitement were infallible signs of genius. And as his facility actually did co-operate with the tendencies of the times to deflect much of his work into pseudo-classical channels, while nevertheless his independence of form and style kept him at all times at a higher level of interest and variety than any mere pseudo-classic, it is not to be wondered that his reputation became a formidable object of jealousy to those apostles of new ideas who felt that their own works were not likely to make way against academic opposition unless they called journalism to their aid.

Nothing has more confused, hindered and embittered the careers of Wagner and Liszt and their disciples than the paper warfare which they did everything in their power to encourage. No doubt it had a useful purpose, and, as nothing affords a greater field for intrigue than the production of operas, it is at least possible that the gigantic and unprecedentedly expensive works of Wagner might not even at the present day have obtained a hearing if Wagner himself had been a tactful and reticent man and his partisans had all been discreet lovers and practisers of art. As to Wagner's achievement there is now no important difference of opinion. It has survived all attacks as the most monumental result music has achieved with the aid of other arts. Its antecedents must be sought in many very remote regions. The rediscovery, by Mendelssohn, of the choral works of Bach, after a century of oblivion, revealed the possibilities of polyphonic expression in a grandeur which even Handel rarely suggested; and inspired Mendelssohn with important ideas in the designing of oratorios as wholes. The complete fusion of polyphonic method with external and harmonic design had, under the same stimulus, been carried a step further than Beethoven by means of Schumann's more concentrated harmonic and lyric expression. That wildest of all romanticists, Berlioz, though he had less polyphonic sense than any composer who ever before or since attained distinction, nevertheless revealed important new possibilities in his unique imagination in orchestral colour. The breaking down of the barriers that check continuity in classical opera was already indicated by Weber, in whose *Euryanthe* the movements frequently run one into the other, while at least twenty different themes are discoverable in the opera, recurring, like the Wagnerian *leit-motif*, in apt transformation and logical association with definite incidents and persons.

But many things undreamed of by Weber were necessary to complete the breakdown of the classical barriers; for the whole pace of musical motion had to be emancipated from the influence of instrumental ideas. This was the most colossal reformation ever attempted by a man of real artistic balance; and even the undoubted, though unpolished, dramatic genius shown in Wagner's libretti (the first in which a great composer and dramatist are one) is but a small thing in comparison with the musical problems which Wagner overcomes with a success immeasurably outweighing any defects his less perfect literary mastery allowed to remain in his dramatic structure and poetic diction. Apart from the squabbles of Wagnerian and anti-Wagnerian journalism, the chief difficulty of his supporters and antagonists really lay in this question of the pace of the music and the consequent breadth of harmony and design. The opening of the *Walküre*, in which, before the curtain rises, the sound of driving rain is reproduced by very simple sequences that take sixteen long bars to move a single step, does not, as instrumental music, compare favourably for terseness and variety with the first twenty bars of the thunderstorm in Beethoven's *Pastoral Symphony*, where at least four different incidents faithfully portray not only the first drops of rain and the distant thunder, but all the feelings of depression and apprehension which they inspire, besides carrying the listener rapidly through three different keys in chromatic sequence. But Beethoven's storm is idealized, in its whole rise and fall, within a space of five minutes. Wagner's task is to select five real minutes near the end of the storm and to treat them with no greater variety than the action of the drama demands. When we have learnt to dissociate our minds from irrelevant ideas of an earlier instrumental art, we find that Wagner's broad spaces contain all that is necessary. Art on a large scale will always seem to have empty spaces, so long as we expect to find in it the kind of detail appropriate to art on a smaller scale.

Wagner's new harmonic resources are of similar and more complex but not less legitimate origin. In *Der fliegende Holländer* they are, like his wider rhythmic sweep, imperfectly digested; in fact, much of his work before the *Meistersinger* is, in patches, debased by the influence of Meyerbeer. But in his later works the more closely his harmonic language is studied the more conclusively does it show itself to be a logical and mastered thing. His treatment of key is, of course, adapted to a state of things in which the designs are far too long for the mind to attach any importance to the works ending in the key in which it began. To compare Wagner's key-system with that of a symphony is like comparing the perspective and composition of a panorama with the perspective and composition of an easel picture. Indeed the differences are precisely analogous in the two cases; and Wagner's sense of harmony and key turns out on investigation to be the classical sense truly adapted to its new conditions. For this very reason it is in detail quite irrelevant to symphonic art; and there was nothing anti-Wagnerian in the reasons why Brahms had so little to do with it in his music, although every circumstance of the personal controversies and thinly disguised persecutions of Brahms's youth were enough to give any upholder of classical symphonic art a rooted prejudice to everything bearing the name of "romantic."

Side by side with Wagner many enthusiasts place Liszt; and it is indisputable that Liszt had in mind a larger and slower flow of musical sequence closely akin to Wagner's, and, no doubt, partly independent of it; and moreover, that one of Liszt's aims was to apply this to instrumental music. Also his mastery and poetic power as a pianoforte player were faithfully reflected in his later treatment of the orchestra, and ensured an extraordinary rhetorical plausibility for anything he chose to say. But neither the princely magnanimity of his personal character, which showed itself in his generosity alike to struggling artists and to his opponents, nor the great stimulus he gave (both by his compositions and his unceasing personal efforts and encouragement) to new musical ideas on romantic lines, ought at this time of day to blind us to the hollowness and essential vulgarity of his style. These unfortunate qualities did not secure for his compositions immediate popular acceptance; for they were outweighed by the true novelty of his aims. But recently they have given his symphonic poems an attractiveness which, while it has galvanized a belated interest in those works, has made many critics blind to their historical importance as the foundation of new forms which have undergone a development of sensational brilliance under Richard Strauss.

Meanwhile the party politics of modern music did much to distract public attention from the works of Brahms, who carried on the true classical method of the sonata-forms in his orchestral and chamber music, while he was no less great and original as a writer of songs and choral music of all kinds. He also developed the pianoforte lyric and widened its range. Without losing its characteristic unity it assumed a freedom and largeness of expression hitherto only attained in sonatas. Hence, however, Brahms's work, like Bach's, seemed, from its continuity with the classical forms, to look backward rather than forward. Indeed Brahms's reputation is in many quarters that of an academic reactionary; just as Bach's was, even at a time when the word "academic" was held to be rather a title of honour than of reproach. When the contemporary standpoints of criticism are established by the production of works of art in which the new elements shall no longer be at war with one another and with the whole, perhaps it will be recognized once more that the idea of progress has no value as a critical standard unless it is strictly applied to that principle by which every work of art must differ in every part of its form from every other work, precisely as far as its material differs and no further. Then, perhaps, as the conservative Bach after a hundred years of neglect revealed himself as the most profoundly modern force in the music of the 19th century, while that of his gifted and progressive sons became a forgotten fashion as soon as their goal was attained by greater masters, so may the musical epoch that seems now to have closed be remembered by posterity as the age, not of Wagner and the pioneer Liszt. but the age of Wagner and Brahms.

It will also in all probability be remembered as the age in which the performer ceased to be necessarily the intellectual inferior of the composer and musical scholar. With the exception of Wagner and Berlioz every great composer, since Palestrina sang in the papal choir, has paid his way as a performer; but Joseph Joachim was the first who threw the whole mind of a great composer into the career of an interpreter; and the example set by him, Bülow, Clara Schumann and Jenny Lind, though followed by very few other artists, sufficed to dispel for ever the old association of the musical performer with the mountebank.

Joachim's influence on Brahms was incalculable. The two composers met at the time when new musical tendencies were beginning to arouse violent controversy. At the age of twenty-one Joachim had produced in his *Hungarian Concerto* a work of high classical mastery and great nobility, and his technique in form and texture was then considerably in advance of Brahms's. For some years Joachim and Brahms interchanged contrapuntal exercises, and many of the greatest and most perfect of Brahms's earlier works owe much to Joachim's criticism. Yet it is impossible to regret that Joachim did not himself carry on as a composer the work he so nobly began, when we realize the enormous influence of his playing in the history of modern music. By it we have become familiar with a standard of truthfulness in performance which all the generous efforts of Wagner and Liszt could hardly have rendered independent of their own special propaganda. And by it the record of classical music has been made a matter of genuine public knowledge, with a unique freedom from those popularizing tendencies which invest vulgar error with the authority of academic truth.

In this respect there is a real change in the nature of modern musical culture. No serious composer at the present day would dedicate a great work to an artist who, like F. Clément, for whom Beethoven wrote his *Violin Concerto*, would perform the work in two portions and between them play a sonata for the violin on one string with the violin upside down. But it is hardly true that Wagner and Liszt produced a real alteration in the standard of general culture among musicians. Their work, especially Wagner's, appealed, like Gluck's, to many specific literary and philosophical interests, and they themselves were brilliant talkers; but music will always remain the most self-centred of the arts, and men of true culture will measure the depth and range of the musician's mind by the spontaneity and truthfulness of his musical expression rather than by his volubility on other subjects. The greatest musicians have not often been masters of more than one language; but they have always been men of true culture. Their humanity has been illuminated by the constant presence of ideals which their artistic mastery keeps in touch with reality.

Chronological Table

Pythagoras, *c.* 582–500 B.C. Determines the ratios of the diatonic scale.
Aristoxenus, *fl.* 320 B.C. Our chief authority on classical Greek music.
Ptolemy, *fl.* A.D. 130. Astronomer, geographer, mathematician and writer on music. Reforms the Greek modes so as to prepare the way for the ecclesiastical modes.
St Ambrose. Arranges the Ambrosian tones of church music, A.D. 384.
Hucbald, *c.* 840–930. Systematizer of *Diaphonia* or *Organum* (called by him *Symphonia*), and inventor of a simple and ingenious notation which did not survive him.

Guido of Arezzo, *c.* 990–1050. Theorist and systematizer of musical notation and solmization.

Franco of Cologne, 11th century author of treatises on musical rhythm. Works under the name of Franco appear at dates and places which have led to the assumption of the existence of three different authors, who, however, have been partly explained away again; and the 11th century is sometimes called the Franconian period of discant.

Discantus positio vulgaris. An anonymous treatise written before 1150; is said to contain the earliest rules for "measured music," *i.e.* for music in which different voices can sing different rhythms.

The Reading MS., *c.* 1240 (British Museum, MS. Harl., 978, fol. 11 b.), contains the rota "Sumer is icumen in."

Walter Odington, *fl.* 1280. English writer on music, and composer.

Adam de la Hale, 1230–1288 } Connecting-links between the troubadours and the archaic contrapuntists.
Machault, *fl.* 1350

John Dunstable, died 1453. English contrapuntal composer.

G. Dufay, died 1474. Netherland contrapuntal composer.

(These two are the principal founders of artistic counterpoint.)

Josquin Des Près, 1445–1521. The first great composer.

Masters of the Golden Age

[In the following list when a name is not qualified as "church composer" or "madrigalist," the composer is equally great in both lines; but the qualification must not be taken as exclusive.]

Netherland Masters.

J. Arcadelt, *c.* 1514–1560. Madrigalist.

Clemens non Papa, died before 1558.

Orlando di Lasso, born between 1520 and 1530; died 1594.

Jan P. Sweelinck, 1562–1621. Organist, theorist and church composer.

French Masters.

E. Genet, surnamed Carpentrasso, *fl.* 1520. Church composer.

C. Goudimel. Killed in the massacre of Lyons, 1572.

Italian Masters.

Palestrina, *c.* 1525–1594.

L. Marenzio, *c.* 1560; died 1599.

Anerio, Felice *c.* 1560–1630, and G. Francesco, *c.* 1567–1620, brothers. Church composers.

Spanish Masters.

C. Morales, 1512–1553
F. Guerrero, *c.* 1528–1599
T. L. de Victoria or Vittoria, *fl.* 1580
} Exclusively church composers.

English Masters.

T. Tallis, *c.* 1515; died 1585. Church composer.

W. Byrd, 1542 or 1543–1623. Greatest as church composer.

J. Wilbye, *fl.* 1600. Madrigalist.

T. Morley, *fl.* 1590. Theorist and madrigalist.

Orlando Gibbons, 1583–1625.

German Masters.

J. Handl, or Gallus, *c.* 1550–1591.

Hans Leo Hasler or Hassler, 1564–1612. Church composer.

G. Aichinger, *c.* 1565–1628. Church composer.

The Monodists

Cavalieri's *La Rappresentazione di Anima e di Corpo*, posthumously produced in 1600. The first oratorio, one of the first works dependent on instrumental accompaniment, and one of the first with a "figured bass" indicating by figures what chords are to be used.

Peri's *Euridice*, 1600. The first opera.

Monteverde, 1567–1643. Great pioneer of modern harmony.

The Renaissance of Texture

H. Schütz, 1585–1672. Combines monodic and polyphonic principles in German church music and Italian madrigal.

G. Frescobaldi, 1583–1644. Organ composer.

Alessandro Scarlatti, 1659–1725. Founder of the aria-form of Handelian opera, and of the Neapolitan school of composition.

J. B. Lulli, 1633–1687. The first classic of French opera.

H. Purcell, *c.* 1658; died 1695.

A. Corelli, 1653–1713. The first classic of the violin in the forms of suite (or sonata da camera), sonata da chiesa and concerto.

F. Couperin, 1668–1733. French composer of suites (*ordres*) and much addicted to giving fanciful titles to his pieces which are sometimes "programme music" in fact as well as name.

J. P. Rameau, 1683–1764. French opera writer, harpsichordist and theorist.

D. Buxtehude, 1637–1707.

J. S. Bach, 1685–1750.

G. F. Handel, 1685–1759.

The Sonata Epoch

Domenico Scarlatti, 1685–1757, son of Alessandro. Harpsichord virtuoso and master of a special early type of sonata.

K. Philipp Emanuel Bach, 1714–1788, third son of Sebastian Bach. The principal pioneer of the sonata style.

C. W. Gluck, 1714–1787. Reformer of opera, and the first classic of essentially dramatic music.

F. J. Haydn, 1732–1809.

W. A. Mozart, 1756–1791.

Beethoven, 1770–1827.

Cherubini, 1760–1842. A classic of French opera and of church music.

The Lyric and Dramatic or "Romantic" Period

[In this list the only qualifications given are those of which the complex conditions of modern art make definition easy as well as desirable; and, as throughout this table, the definitions must not be taken as exclusive. The choice of names is, however, guided by the *different* developments represented: thus accounting for glaring omissions and artistic disproportions.]

Weber, 1786–1826. Master of romantic opera.

Schubert, 1797–1828. The classic of song.

Mendelssohn, 1809–1847.

Chopin, 1809–1849. Composer of pianoforte lyrics.

Berlioz, 1803–1869. Master of impressionist orchestration.

Schumann, 1810–1856.

Wagner, 1813–1883. Achieves absolute union of music with drama.

Liszt, 1811–1886. Pianoforte virtuoso and pioneer of the symphonic poem.

Bruckner, 1824–1896. The symphonist of the Wagnerian party.

Brahms, 1833–1897. Classical symphonic and lyric composer.

Joachim, 1831–1907. Violinist, composer and teacher. Brahms's chief fellow-worker in continuing the classical tradition.

Tschaïkovsky, 1840–1893.

Dvořák, 1841–1904.

Richard Strauss, 1864– . Development of the symphonic poem. (D. F. T.)

II.—Recent Music

Under separate biographical headings, the work of the chief modern composers in different countries is dealt with; and here it will be sufficient to indicate the general current of the art, and to mention some of the more prominent among recent composers.

Germany.—On the death of Brahms, the great German composers seemed, at the close of the 19th century, to have left no successor. Such merely epigonal figures as A. Bungert (b. 1846) and Cyrill Kistler (1848–1907) could not be regarded as important; and E. Humperdinck's (b. 1854) striking success with *Hänsel und Gretel* (1893) was a solitary triumph in a limited genre. The outstanding figure, at the opening of the 20th century, was Richard Strauss (*q.v.*); but it was not so much now in composition, as in the high excellence of executive art, that Germany still kept up her hegemony in European music, by her schools, her great conductors and instrumentalists, and her devotion as a nation to the production of musical works.

France.—From the earliest days of their music, the French have had the enviable power of assimilating the great innovations which were originated in other countries, without losing their habit of warmly appreciating that which their own countrymen produce. That which happened with the Netherlandish composers of the 16th century, and with Lulli in the 17th, was repeated, more or less exactly, with Rossini in the early part of the 19th century and with Wagner at its close. During the last quarter of the 19th century all that is represented by the once-adored name of Gounod was discarded in favour of a style as different as possible from his. The change was mainly due to the Belgian musician, César Auguste Franck (1822–1890), who established a kind of informal school of symphonic and orchestral composition, as opposed to the conventional methods pursued at the Paris Conservatoire. Massenet was left as almost the only representative of the older school, and from Edouard Lalo (1823–1892) to G. Charpentier (b. 1860), all the younger composers of France adopted the newer style. With these may be mentioned Alfred Bruneau (b. 1857), and Gabriel Fauré (b. 1845). Camille Saint-Saëns (b. 1835), however, remained the chief representative of the sound school of composition, if only by reason of his greater command of resources of every kind and his success in all forms of music. Among the newer school of composers the most original unquestionably was Debussy (*q.v.*), and among others may be mentioned Ernest Reyer (b. 1823), the author of some ambitious and sterling operas; F. L. V. de Joncières (b. 1839), an enthusiastic follower of Wagner, and a composer of merit; Emanuel Chabrier (1841–1894), a man of extraordinary gift, who wrote one of the finest *opéras comiques* of modern times, *Le Roi malgré lui* (1887); Charles Marie Widor (b. 1845), an earnest musician of great accomplishment; and Vincent d'Indy (b. 1851), a strongly original writer, alike in dramatic, orchestral and chamber compositions. In the class of lighter music, which yet lies above the level of *opéra bouffe*, mention must be made of Léo Delibes (1836–1891) and André Messager (b. 1855). In describing the state of music in France, it would be wrong to pass over the work done by the great conductors of various popular orchestral concerts, such as Jules E. Pasdeloup (1819–1887), Chas. Lamoureux (1834–1899), and Judas [Édouard] Colonne (b. 1838).

Italy.—In Italy during the last quarter of the 19th century many important changes took place. The later development in the style of Verdi (*q.v.*) was only completed in *Otello* (1887) and *Falstaff* (1893), while his last composition, the four beautiful sacred vocal works, show how very far he had advanced in reverence, solidity of style and impressiveness, from the time when he wrote his earlier operas. And Arrigo Boito's *Mefistofele* had an immense influence on modern Italian music. Among the writers of "absolute" music the most illustrious are G. Sgambati (b. 1843) and G. Martucci (b. 1856), the latter's symphony in D minor being a fine work. Meanwhile a younger operatic school was growing up, of which the first production was the *Flora mirabilis* of Spiro Samara (b. 1861), given in 1886. Its culmination was in the *Cavalleria rusticana* (1890) of Pietro Mascagni (b. 1863), the *Pagliacci* (1892) of R. Leoncavallo (b. 1858), and the operas of Giacomo Puccini (b. 1858), notably *Le Villi* (1884), *Manon Lescaut* (1893), *La Bohème* (1896), *Tosca* (1900), and *Madama Butterfly* (1904). The oratorios of Don Lorenzo Perosi (b. 1872) had an interesting influence on the church music of Italy (see PALESTRINA).

Russia.—The new Russian school of music originated with M. A. Balakirev (b. 1836), who was instrumental in founding the Free School of Music at St Petersburg, and who introduced the music of Berlioz and Liszt into Russia; he instilled the principles of "advanced" music into A. P. Borodin (1834–1887), C. A. Cui (b. 1835), M. P. Moussorgsky (1839–1881), and N. A. Rimsky-Korsakov (1844–1908), all of whom, as usual with Russian composers, were, strictly speaking, amateurs in music, having some other profession in the absence of any possible opportunity for making money out of music in Russia. The most remarkable man among their contemporaries was undoubtedly Tschaikovsky (*q.v.*). A. Liadov (b. 1855) excels as a writer for the pianoforte, and A. Glazounov (b. 1865) has composed a number of fine orchestral works.

United States.—Of the older American composers, only John Knowles Paine (d. 1906) and Dudley Buck (d. 1909), both born in 1839, and Benjamin Johnson Lang (1837–1909), need be mentioned. Paine, professor of music at Harvard University, and composer of oratorios, orchestral music, &c., ranks with the advanced school of romantic composers. Dudley Buck was one of the first American composers whose names were known in Europe; and if his numerous cantatas and church music do not reach a very high standard according to modern ideas, he did much to conquer the general apathy with regard to the existence of original music in the States. Lang, prominent as organist and conductor, also became distinguished as a composer. George Whitefield Chadwick (b. 1854) has produced many orchestral and vocal works of original merit. Though the works of Clayton Johns (b. 1857) are less ambitious, they have won more popularity in Europe, and his songs, like those of Arthur Foote (b. 1853), Reginald De Koven (b. 1859), and Ethelbert Nevin (1862–1901), are widely known. Edward Alexander McDowell (*q.v.*) may be regarded as the most original modern American composer. Walter Johannes Damrosch (b. 1862), the eminent conductor of the New York Symphony Orchestra, and of various operatic undertakings, has established his position as an original and poetic composer, not only by his opera, *The Scarlet Letter*, but by such songs as the intensely dramatic "Danny Deever." Dr Horatio William Parker's (b. 1863) oratorio settings of the hymn "Hora novissima" and of "The Wanderer's Psalm" are deservedly popular. Their masterly workmanship and his power of expression in sacred music mark him as a distinct personality. Numerous orchestral as well as vocal works have not been heard out of America, but a group of songs, newly set to the words of familiar old English ditties, have obtained great success. Mrs H. H. A. Beach, the youngest of the prominent composers of the United States and an accomplished pianist, has attained a high reputation as a writer in all the more ambitious forms of music. Many of her songs and anthems have obtained wide popularity. The achievements of the United States are, however, less marked in the production of new composers than in the attention which has been paid to musical education and appreciation generally. Henry E. Krehbiel (b. 1854), the well-known critic, was especially prominent in drawing American attention to Wagner and Brahms. The New York Opera has been made a centre for the finest artists of the day, and the symphony concerts at Boston and Chicago have been unrivalled for excellence. It is worthy of note that no country has produced a greater number of the most eminent of recent singers. Mesdames E. Eames, Nordica, Minnie Hauck, Susan Strong, Suzanne Adams, Sybil Sanderson, Esther Palliser, Evangeline Florence, and very many more among leading sopranos, with Messrs E. E. Oudin, D. Bispham and Denis O'Sullivan, to name but three out of the host of excellent male artists, proved the natural ability of the Americans in vocal music; and it might also be said that the more notable English-speaking pupils of the various excellent French schools of voice-production are American with hardly an exception.

United Kingdom.—English music requires more detailed notice, if only because of the striking change in the national feeling with regard to it. The nation had been accustomed for so long to consider music as an exotic, that, notwithstanding the glories of the older schools of English music, the amount of attention paid to everything that came from abroad, and the rich treasures of traditional and distinctively English music scattered through the country, the majority of educated people adhered to the common belief that England was not a musical country. The beauty and the enormous quantity of traditional Irish music, the enthusiasm created in Scotland by trumpery songs written in what was supposed to be an imitation of the Scottish style, the existence of the Welsh Eisteddfodau, were admitted facts; but England was supposed to have had no share in these gifts of nature or art, and the vogue of foreign music, from Italian opera to classical symphonies, was held as evidence of her poverty, instead of being partly the reason of the national sterility. In the successive periods during which the music of Handel and Mendelssohn respectively had been held as all-sufficient for right-thinking musicians, success could only be attained, if at all, by those English musicians who deliberately set themselves to copy the style of these great masters; the few men who had the determination to resist the popular movement were either confined, like the Wesleys, to one branch of music in which some originality of thought was still allowed, that of the Church, or, like Henry Hugo Pierson in the days of the Mendelssohn worship, were driven to seek abroad the recognition they could not obtain at home. For a time it seemed as if the great vogue of Gounod would exalt him into a third artistic despot; but no native composer had even the energy to imitate his *Faust*; and, by the date of *The Redemption* (1882) and *Mors et vita* (1885), a renaissance of English music had already begun.

For a generation up to the 'eighties the affairs of foreign opera in England were rather depressing; the rival houses presided over by the impresarios Frederick Gye (1810–1878) and Colonel J. H. Mapleson (1828–1901) had been going from bad to worse; the traditions of what were called "the palmy days" had been forgotten, and with the retirement of Christine Nilsson in 1881, and the death of Therese J. A. Tietjens in 1877, the race of the great queens of song seemed to have come to an end. It is true that Mme Patti was in the plenitude of her fame and powers, but the number of her impersonations, perfect as they were, was so small that she alone could not support the weight of an opera season, and her terms made it impossible for any manager to make both ends meet unless the rest of the company were chosen on the principle enunciated by the husband of Mme Catalani, "Ma femme et quatre ou cinq poupées." Mme Albani (b. 1851) had made her name famous, but the most important part of her artistic career was yet to come. She had already brought *Tannhäuser* and *Lohengrin* into notice, but in Italian versions, as was then usual; and the great vogue of Wagner's operas did not begin until the series of Wagner concerts given at the Royal Albert Hall in 1877 with the object of collecting funds for the preservation of the Bayreuth scheme, which after the production of the Nibelungen trilogy in 1876 had become involved in serious financial difficulties. The two seasons of German opera at Drury Lane under Dr Hans Richter (b. 1843) in 1882 and 1884, and the production of the trilogy at Her Majesty's in 1882, under Angelo Neumann's managership, first taught stay-at-home Englishmen what Wagner really was, and an Italian opera as such (*i.e.* with Italian as the exclusive language employed and the old "star" system in full swing) ceased to exist as a regular institution a few years after that. The revival of public interest in the opera only took place after Mr (afterwards Sir) Augustus Harris (1852–1896) had started his series of operas at Drury Lane in 1887. In the following season Harris took Covent Garden, and since that time the opera has been restored to greater public favour than it ever enjoyed, at all events since the days of Jenny Lind. The clever manager saw that the public was tired of operas arranged to suit the views of the prima donna and no one else, and he cast the works he produced, among which were *Un Ballo in maschera* and *Les Huguenots*, with due attention to every part. The brothers Jean and Édouard de Reszké, both of whom had appeared in London before—the former as a baritone and the latter during the seasons 1880–1884—were even stronger attractions to the musical public of the time than the various leading sopranos, among whom were Mme Albani, Miss M. Macintyre, Mme Melba, Frau Sucher and Mme Nordica, during the earlier seasons, and Mme Eames, Mlle Ravogli, MM. Lassalle and P. H. Plançon, and many other Parisian favourites later. As time went on, the excellent custom obtained of giving each work in the language in which it was written, and among the distinguished German artists who were added to the company were Frau M. Ternina, Frau E. Schumann-Heink, Frau Lilli Lehmann and many more. Since Harris's death in 1896 the traditions started by him were on the whole well maintained, and as a sign of the difference between the present and the former position of English composers, it may be mentioned that two operas by F. H. Cowen, *Signa* and *Harold*, and two by Stanford, *The Veiled Prophet* and *Much Ado about Nothing*, were produced. To Signor Lago, a manager of more enterprise than good fortune, belongs the credit of reviving Gluck's *Orfeo* (with the masterly impersonation of the principal character by Mlle Giulia Ravogli), and of bringing out *Cavalleria rusticana*, Tschaikovsky's *Eugen Onegin* and other works.

If it be just to name one institution and one man as the creator of such an atmosphere as allowed the genius of English composers to flourish, then that honour must be paid to the Crystal Palace and August Manns, the conductor of its Saturday concerts. At first engaged as sub-conductor, under a certain Schallehn, at the building which was the lasting result of the Great Exhibition of 1851, he became director of the music in 1855; so for the better part of half a century his influence was exerted on behalf of the best music of all schools, and especially in favour of anything of

English growth. Through evil report and good report he supported his convictions, and for many years he introduced one English composer after another to a fame which they would have found it hard to gain without his help and that of Sir George Grove, his loyal supporter. In 1862, when Arthur Sullivan had just returned from his studies in Leipzig, his *Tempest* music was produced at the Crystal Palace, and it is beyond question that it was this success and that of the succeeding works from the same hand which first showed Englishmen that music worth listening to might be produced by an English hand. Sullivan reached the highest point of his achievement in *The Golden Legend* (1886), his most important contribution to the music of the renaissance. An important part of the Crystal Palace music was that the concerts did not follow but led, popular taste; the works of Schubert, Schumann and many other great masters were given constantly, and the whole repertory of classical music was gone through, so that a constant attendant at these concerts would have become acquainted with the whole range of the best class of music. From 1859 onwards the classical chamber-music could be heard at the Popular Concerts started by Arthur Chappell, and for many years their repertory was not less catholic than that of the Crystal Palace undertaking; that in later times the habit increased to a lamentable extent of choosing only the "favourite" (*i.e.* hackneyed) works of the great masters does not lessen the educational value of the older concerts. The lovers of the newer developments of music were always more fully satisfied at the concerts of the Musical Union, a body founded by John Ella in 1844, which lasted until 1880. From 1879 onwards the visits of Hans Richter, the conductor, were a feature of the musical season, and the importance of his work, not only in spreading a love of Wagner's music, but in regard to every other branch of the best orchestral music, cannot be exaggerated. Like the popular concerts, the Richter concerts somewhat fell away in later years from their original purpose, and their managers were led by the popularity of certain pieces to give too little variety. The importance of Richter's work was in bringing forward the finest English music in the years when the masters of the renaissance were young and untried. Here were to be heard the orchestral works of Sir Hubert Parry, Sir Charles Villiers Stanford, Sir A. Campbell Mackenzie and Dr F. H. Cowen; and the names of these composers were thus brought into notice much more effectually than could have been the case in other surroundings. Meanwhile outside London the work of the renaissance was being carried on, notably at Cambridge, where by the amalgamation of various smaller societies with the University Musical Society, Stanford created in 1875 a splendid institution which did much to foster a love of the best music for many years; and at Oxford, where private meetings in the rooms of Hubert Parry brought about the institution of the Musical Club, which has borne fruit in many ways, though only in the direction of chamber-music. The Bach Choir, founded by Mr Arthur Duke Coleridge in 1875, and conducted for the first ten years of its existence by Mr Otto Goldschmidt and subsequently by Professor Stanford, worked on purely uncommercial lines ever since its foundation, and besides many important works of Bach, it brought forward most important compositions by Englishmen, and had a prominent share in the work of the renaissance. Parry's earlier compositions had a certain austerity in them which, while it commanded the homage of the cultivated few, prevented their obtaining wide popularity; and it was not until the date of his choral setting of Milton's *Ode at a Solemn Musick* that he found his true vein. In this and its many successors, produced at the autumn festivals, though very rarely given in London, there was a nobility of utterance, a sublimity of conception, a mastery of resource, that far surpass anything accomplished in England since the days of Purcell; while his "Symphonic Variations" for orchestra, and at least two of his symphonies, exhibit his command of the modern modifications of classical forms in great perfection. Like Parry, Stanford first caught the ear of the public at large with a choral work, the stirring ballad-setting of Tennyson's *Revenge*; and in all his earlier and later works alike, which include compositions in every form, he shows himself a supreme master of effect; in dramatic or lyrical handling of voices, in orchestral and chamber-music, his sense of beauty is unfailing, and while his ideas have real distinction, his treatment of them is nearly always the chief interest of his works. The work of the musical renaissance has been more beneficially fostered by these two masters than by any other individuals, through the medium of the Royal College of Music. In 1876 the National Training School of Music was opened with Sullivan as principal; he was succeeded by Sir John Stainer in 1881, and the circumstance that such artists as Mr Eugen d'Albert and Mr Frederic Cliffe received there the foundation of their musical education is the only important fact connected with the institution, which in 1882 was succeeded by the Royal College of Music, under the directorship of Sir George Grove, and with Parry and Stanford as professors of composition. In 1894 Parry succeeded to the directorship, and before and after this date work of the best educational kind was done in all branches of the art, but most of all in the important branch of composition. Mackenzie's place among the masters of the renaissance is assured by his romantic compositions for orchestra—such as *La Belle dame sans merci* and the two "Scottish Rhapsodies"; some of his choral works, such as the oratorios, show some tendency to fall back into the conventionalities from which the renaissance movement was an effort to escape; but in *The Cottar's Saturday Night*; *The Story of Sayid*; *Veni, Creator Spiritus*, and many other things, not excepting the opera *Colomba* or the witty "Britannia" overture, he shows no lack of spontaneity or power. As principal of the Royal Academy of Music (he succeeded Macfarren in 1888) he revived the former glories of the school, and the excellent plan by which it and the Royal College unite their forces in the examinations of the Associated Board is largely due to his initiative. The opera just mentioned was the first of the modern series of English operas brought out from 1883 onwards by the Carl Rosa company during its tenure of Drury Lane Theatre: at the time it seemed as though English opera had a chance of getting permanently established, but the enterprise, being a purely private and individual one, failed to have a lasting effect upon the art of the country, and after the production of two operas by Mackenzie, two by Arthur Goring Thomas, one by F. Corder, two by Cowen and one by Stanford, the artistic work of the company grew gradually less and less important. In spite of the strong influence of French ideals and methods, the music of Arthur Goring Thomas was remarkable for individuality and charm; in any other country his beautiful opera *Esmeralda* would have formed part of the regular repertory; and his orchestral suites, cantatas and a multitude of graceful and original songs, remain as evidence that if his career had been prolonged, the art of England might have been enriched by some masterpiece it would not willingly have let die. After a youth of extraordinary precocity, and a number of variously successful attempts in the more ambitious and more serious branches of the art, Cowen found his chief success in the treatment of fanciful or fairy subjects, whether in cantatas or orchestral works; here he is without a rival, and his ideas are uniformly graceful, excellently treated and wonderfully effective. His second tenure of the post of conductor of the Philharmonic Society showed him to be a highly accomplished conductor.

In regard to English opera two more undertakings deserve to be recorded. In 1891 the Royal English Opera House was opened with Sullivan's *Ivanhoe*, a work written especially for the occasion: the absence of anything like a repertory, and the retention of this one work in the bills for a period far longer than its attractions could warrant, brought the inevitable result, and shortly after the production of a charming French comic opera the theatre was turned into the Palace Music Hall. The charming and thoroughly characteristic *Shamus O'Brien* of Stanford was successfully produced in 1896 at the Opéra Comique theatre. This work brought into public prominence the conductor Mr Henry J. Wood (b. 1870), who exercised a powerful influence on the art of the country by means of his orchestra, which was constantly to be heard at the Queen's Hall, and which attained, by continual performance together, a degree of perfection before unknown in England. It achieved an important work in bringing music within the reach of all classes at the Promenade Concerts given through each summer, as well as by means of the Symphony Concerts at other seasons.

The movement thus started by Mr Wood increased and spread remarkably in later years. His training of the Queen's Hall Orchestra was characterized by a thoroughness and severity previously unknown in English orchestras. This was partly made possible by the admirable business organization which fostered the movement in its earlier years; so many concerts were guaranteed that it was possible to give the players engagements which included a large amount of rehearsing. The result was soon apparent, not only in the raising of the standard of orchestral playing, but also in the higher and more intelligent standard of criticism to which performances were subjected both by experts and by the general public. The public taste in London for symphonic music grew so rapidly as to encourage the establishment of other bodies of players, until in 1910 there were five first-class professional orchestras giving concerts regularly in London—the Philharmonic Society, the Queen's Hall Orchestra, the London Symphony Orchestra (described by Dr Hans Richter as "the finest orchestra in the world"), the New Symphony Orchestra under Mr Landon Ronald (b. 1873), a composer and conductor of striking ability, and Mr Thomas Beecham's Orchestra. Mr Beecham, who had come rapidly to the front as a musical enthusiast and conductor, paid special attention to the work of British composers. Manchester, Birmingham, Liverpool and Edinburgh, had their own orchestras; and it might be said that the whole of the United Kingdom was now permeated with a taste for and a knowledge of orchestral music. The effect of this development has influenced the whole of the musical life of England. The symphony and the symphonic poem have taken the place so long held by the oratorio in popular taste; and English composers of any merit or ability find it possible to get a hearing for orchestral work which at the end of the 19th century would have had to remain unperformed and unheard. The result has been the rapid development of a school of English orchestral composers—a school of considerable achievement and still greater promise.

The new school of English writers contains many names of skilled composers. Sir Edward Elgar established his reputation by his vigorous *Caractacus* and the grandiose imaginings of his *Dream of Gerontius*, as by orchestral and chamber compositions of decided merit and individuality, and by being the composer of a symphony which attained greater and wider fame than any similar work since the symphonies of Tschaikovsky. Mr Edward German (b. 1862) won great success as a writer of incidental music for plays, and in various lighter forms of music, for which his great skill in orchestration and his knowledge of effect stand him in good stead. The quality of Mr Frederic Cliffe's orchestral works is extremely high. Dr Arthur Somervell (b. 1863), who succeeded Stainer as musical adviser to the Board of Education, first came into prominence as a composer of a number of charming songs, notably a fine song-cycle from Tennyson's *Maud*, but his *Mass* and various orchestral works and cantatas and pianoforte pieces show his conspicuous ability in other forms. Various compositions written by Mr Hamish MacCunn (b. 1868), while still a student at the Royal College of Music, were received with acclamation; but his later work was not of equal value, though his operas *Jeanie Deans* and *Diarmid* were successful. Mr Granville Bantock (b. 1868), an ardent supporter of the most advanced music, has written many fine things for orchestra, and Mr William Wallace (b. 1861), in various orchestral pieces played at the Crystal Palace and elsewhere, and in such things as his "Freebooter" songs, has shown strong individuality and imagination. Mr Arthur Hinton (b. 1869) has produced things of fanciful beauty and quaint originality. Miss Ethel M. Smyth, whose *Mass* was given at the Royal Albert Hall in most favourable conditions, had her opera *Fantasio* produced at Weimar and Carlsruhe, and *Der Wald* at Covent Garden. Miss Maud Valerie White's graceful and expressive songs brought her compositions into wide popularity; and Mme Liza Lehmann made a new reputation by her cycles of songs after her retirement from the profession of a singer. The first part of Mr S. Coleridge-Taylor's (b. 1875) *Hiawatha* scenes was performed while he was still a student at the Royal College, and so great was its popularity that the third part of the trilogy was commissioned for performance by the Royal Choral Society. Mr Cyril Scott is a composer who aims high, though with a somewhat strained originality. Dr H. Walford Davies (b. 1869) and W. Y. Hurlstone (1876–1906) excel in the serious kind of chamber-music and use the classic forms with notable skill; and Mr R. Vaughan Williams, in his songs and other works, has shown perhaps the most conspicuous talent among all of the younger school.

English executive musicians have never suffered from foreign competition in the same degree as English composers, and the success of such singers as Miss Anna Williams, Miss Macintyre, Miss Marie Brema, Miss Clara Butt, Miss Agnes Nicholls, Messrs Santley, Edward Lloyd, Ben Davies, Plunket Greene and Ffrangcon Davies; or of such pianists as Miss Fanny Davies and Mr Leonard Borwick, is but a continuance of the tradition of British excellence.

The scientific study of the music of the past has more and more decidedly taken its place as a branch of musical education; the learned writings of W. S. Rockstro (1823–1895), many of them made public first in the *Encyclopaedia Britannica* and Grove's *Dictionary of Music*, made the subject clear to many who had been groping in the dark before; and the actual performance of old music has been undertaken not only by the Bach Choir, but by the Magpie Madrigal Society under Mr Lionel Benson's able direction. In vocal and instrumental music alike the musical side of the International Exhibition of 1885 did excellent work in its historical concerts; and in that branch of archaeology which is concerned with the structure and restoration of old musical instruments, important work has been done by Mr A. J. Hipkins (1826–1903; so long connected with the firm of Broadwood), the Rev. F. W. Galpin, Arnold Dolmetsch and others. The formation of the Folk-Song Society in 1899 drew attention to the importance and extent of English traditional music, and did much to popularize it with singers of the present day.

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MUSICAL-BOX, an instrument for producing by mechanical means tunes or pieces of music. The modern musical-box is an elaboration of the elegant toy musical snuff-box in vogue during the 18th century. The notes or musical sounds are produced by the vibration of steel teeth or springs cut in a comb or flat plate of steel, reinforced by the harmonics generated in the solid steel back of the comb. The teeth are graduated in length from end to end of the comb or plate, the longer teeth giving the deeper notes; and the individual teeth are accurately attuned, where necessary, by filing or loading with lead. Each tone and semitone in the scale is represented by three or four separate teeth in the comb, to permit of successive repetitions of the same note when required by the music. The teeth are acted upon and musical vibrations produced by the revolution of a brass cylinder studded with projecting pins, which, as they move round, raise and release the proper teeth at due intervals according to the nature of the music. A single revolution of the cylinder completes the performance of each of the several pieces of music for which the apparatus is set, but upon the same cylinder there may be inserted pins for performing as many as thirty-six separate airs. This is accomplished by making both the points of the teeth and the projecting pins which raise them very fine, so that a very small change in the position of the cylinder is sufficient to bring an entirely distinct set of pins in contact with the teeth. In the more elaborate musical-boxes the cylinders are removable, and may be replaced by others containing distinct sets of music. In these also there are combinations of bell, drum, cymbal and triangle effects, &c. The revolving motion of the cylinder is effected by a spring and clock-work which on some modern instruments will work continuously for an hour and a half without winding, and the rate of revolution is regulated by a fly regulator. The headquarters of the musical-box trade is Geneva, where the manufacture gives employment to thousands of persons.

The musical-box is a type of numerous instruments for producing musical effects by mechanical means, in all of which a revolving cylinder or barrel studded with pins is the governing feature. The position of the pins on the barrel is determined by two considerations: those of pitch and of time or rhythm. The degrees of pitch or semitones of the scales are in the direction of the length of the cylinder, while those of time, or the beats in the bars, are in the path of the revolution of the cylinder. The action of the pins is practically the same for all barrel instruments; each pin serves to raise some part of the mechanism for one note at the exact moment and for the exact duration of time required by the music to be played, after which, passing along with the revolution of the cylinder, it ceases to act. The principle of the barrel operating by friction, by percussion or by wind on reeds, pipes or strings governs carillons or musical bells, barrel organs, mechanical flutes, celestial voices, harmoniphones, violin-pianos and the orchestrions and polyphons in which a combination of all orchestral effects is attempted. In the case of wind instruments, such as flutes, trumpets, oboes, clarinets, imitated in the more complex orchestrions, the pins raise levers which open the valves admitting air, compressed by mechanical bellows, to various kinds of flue-pipes, and to others fitted with beating and free reeds. The sticks used for striking bells, drums, cymbals and triangles are set in motion in a similar manner. A fine set of full-page drawings, published at Frankfort in 1615,[1] makes the whole working of the pinned barrel quite clear, and establishes the exact relation of the pins to the music produced by the barrel so unmistakably that some bars of the piece of music set on the cylinder can be made out. The prototype of the 19th-century musical-box is to be found in the Netherlands where during the 15th century the dukes of Burgundy encouraged the invention of ingenious mechanical musical curiosities such as "organs which played of themselves," musical snuff-boxes, singing birds, curious clocks, &c. A principle of more recent introduction than the studded cylinder consists of sheets of perforated paper or card, somewhat similar to the Jacquard apparatus for weaving. The perforations correspond in position and length to the pitch and duration of the note they represent, and as the web or long sheet of paper passes over the instrument the perforated holes are brought in proper position and sequence under the influence of the suction or pressure of air from a bellows, and thereby the notes are either directly acted on, as in the case of reed instruments, or the opening and closing of valves set in motion levers or liberate springs which govern special notes. The United States are the original home of the instruments controlled by perforated paper known as orguinettes, organinas, melodeons, &c. All these instruments are being gradually replaced in popular favour by the piano-players and the gramophone. (K. S.)

MUSICAL NOTATION, a pictorial method of representing sounds to the ear through the medium of the eye. It is probable that the earliest attempts at notation were made by the Hindus and Chinese, from whom the legacy was transferred to Greece. The exact nature of the Greek notation is a subject of dispute, different explanations assigning 1680, 1620, 990, or 138 signals to their alphabetical method of delineation. To Boethius we owe the certainty that the Greek notation was not adopted by the Latins, although it is not certain whether he was the first to apply the fifteen letters of the Roman alphabet to the scale of sounds included within the two octaves, or whether he was only the first to make record of that application. The reduction of the scale to the octave is ascribed to St Gregory, as also the naming of the seven notes, but it is not safe to assume that such an ascription is accurate or final. Indications of a scheme of notation based, not on the alphabet, but on the use of dashes, hooks, curves, dots and strokes are found to exist as early as the 6th century, while specimens in illustration of this different method do not appear until the 8th. The origin of these signs, known as neumes (*νεύματα*, or nods), is the full stop (*punctus*), the comma (*virga*), and the mound or undulating line (*clivus*), the first indicating a short sound, the second a long sound, and the third a group of two notes. The musical intervals were suggested by the distance of these signals from the words of the text. The variety of neumes employed at different times, and the fluctuations due to handwriting, have made them extremely difficult to decipher. In the 10th century a marked advance is shown by the use of a red line traced horizontally above the text to give the singer a fixed note (F=fa), thus helping him to approximate the intervals. To this was added a second line in yellow (for C=ut), and finally a staff arose from the further addition of two black lines over these. The difficulty of the subject is complicated for the student by the fact that an incredible variety of notations coexisted at one period, all more or less representing attempts in the direction of the modern system. A variety of experiments resulted in the assignment of the four-lined staff to sacred music and of the five-lined staff to secular music. The yellow and red colours were replaced by the use of the letters F and C (fa and ut) on the lines. This use of letters to indicate clef is forestalled in a manuscript of Guido of Arezzo's *Micrologus*, dating from the 12th century, in which is the famous hymn to St John, printed with neumes on a staff of three lines (see GUIDO OF AREZZO). The use of letters for indicating clefs has survived to the present day, our clef signatures being modified forms of the letters C, F and G, which have passed through a multitude of shapes. Before the 12th century there is no trace of a measured notation (*i.e.* of a numerical time division separating the component parts of a piece of music). It is at the time of Franco of Cologne[2] that measured music takes its rise, together with the black notation in place of neumes, which disappeared altogether by the end of the 14th century. Writing four hundred years after St Gregory, Cottonius complains bitterly of the defects in the system of neumes: "The same marks which Master Trudo sang as thirds, were sung as fourths by Master Albinus; while Master Salomo asserts that fifths are the notes meant, so at last there were as many methods of singing as teachers of the art." Possibly the reckless multiplication of lines in the staff may have contributed to the obscurity of which Cottonius complains. In the black notation, which led to the modern system, the square note with a tail (𝆷) is the long sound; the square note without a tail (■) is the *breve*; and the lozenge shape (♦) is the *semibreve*. In a later development there were added the *double long* ▀ and the minum (𝅗𝅥). The breve, according to Franco of Cologne, was the unit of measure. The development of a fixed time division was further continued by Philippe de Vitry. It has been noted with well-founded astonishment that at this time the double time (*i.e.* two to the bar) was unknown, in spite of this being the time used in marching and also illustrated in the process of breathing. Triple time (*i.e.* three to the bar) was regarded as the most perfect because it was indivisible. It was as if there lay some mysterious enchantment in a number that could not be divided into equal portions without the fraction. "Triple time," says Jean de Muris, "is called *perfect*, according to Franco, a man of much skill in his art, because it hath its name from the Blessed Trinity which is pure and true perfection." Vitry championed the rights of imperfect time and invented signs to distinguish the two. The perfect circle ○ represented the perfect or triple time; the half circle 𝄴 the imperfect or double-time. This 𝄴 has survived in modern notation to indicate four-time, which is twice double-time; when crossed 𝄵 it means double-time. The method of dividing into perfect and imperfect was described as *prolation*. The addition of a point to the circle or semi-circle (⊙ Ͼ) indicated major prolation; its absence, minor prolation. The substitution of white for black notation began with the first year of the 14th century and was fully established in the 15th century.

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[1] See S. de Caus, *Les forces mouvantes*; and article BARREL ORGAN.

[2] The principles of Franco are found in the treatises of Walter Odington, a monk of Evesham who became archbishop of Canterbury in 1228.

It has already been shown how the earlier form of alphabetical notation was gradually superseded by one based on the attempt to represent the relative height and depth of sounds pictorially. The alphabetical nomenclature, however, became inextricably associated with the pictorial system. The two conceptions reinforced each other; and from the hexachordal scale, endowed with the solmization of *ut*, *re*, *mi*, *fa*, *sol*, *la*—which was a device for identifying notes by their names when talked of, rather than by their positions when seen on a page of music—arose the use of what are now known as accidentals. Of these it may here be said that the flat originated from the necessity of sinking the B of the scale in order to form a hexachord on the note F in such a way as to cause the semitone to fall in the right place—which in the case of all hexachords was between the third and fourth notes. This softened B was written in a rounded form thus: ♭ (*rotundum*), while the original B remained square thus: ♮ (*quadrum*). The original conception of the sharp was to cross or lattice the square B, by which it was shown that it was neither to be softened nor to remain unchanged. The flat, which originated in the 10th century, appears to have been of far earlier date than the sharp, the invention of which has been ascribed to Josquin Des Près (1450–1521). The B-sharp was called B *cancellatum*, the cross being formed thus ※. The use of key signatures constructed out of these signs of sharp and flat was of comparatively late introduction. The key signature states at the beginning of a piece of music the sharps and flats which it contains within the scale in which it is written. It is a device to avoid repeating the sign of sharp and flat with every fresh occasion of their occurring. The exact distinction between what were accidental sharps or flats, and what were sharps or flats in the key, was still undetermined in the time of Handel, who wrote the Suite in E containing the "Harmonious Blacksmith" with three sharps instead of four. The double ♭♭ (sometimes written ♭ or β) and the double sharp x (sometimes written ※, ⁜ or ♯) are conventions of a much later date, called into existence by the demands of modern music, while the sign of natural (♮) is the outcome of the original B quadration or square B ♮.

The systems known as Tonic Sol Fa and the Galin-Paris-Chevé methods do not belong to the subject of notation, as they are ingenious mechanical substitutes for the experimentally developed systems analysed above. The basis of these substitutes is the reference of all notes to key relationship and not to pitch.

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MUSIC HALLS. The "variety theatre" or "music-hall" of to-day developed out of the "saloon theatres" which existed in London about 1830–1840; they owed their form and existence to the restrictive action of the "patent" theatres at that time. These theatres had the exclusive right of representing what was broadly called the "legitimate drama," which ranged from Shakespeare to Monk Lewis, and from Sheridan and Goldsmith to Kotzebue and Alderman Birch of Cornhill, citizen and poet, and the founder of the turtle-soup trade. The patent houses defended their rights when they were attacked by the "minor" and "saloon" theatres, but they often acted in the spirit of the dog in the manger. While they pursued up to fine and even imprisonment the poachers on their dramatic preserves, they too often neglected the "legitimate drama" for the supposed meretricious attractions offered by their illegitimate competitors. The British theatre gravitated naturally to the inn or tavern. The tavern was the source of life and heat, and warmed all social gatherings. The inn galleries offered rather rough stages, before the Shakespeare and Alleyn playhouses were built. The inn yards were often made as comfortable as possible for the "groundlings" by layers of straw, but the tavern character of the auditorium was never concealed. Excisable liquor was always obtainable, and the superior members of the audience, who chose to pay for seats at the side of the stage or platform (like the "avant-scène" boxes at a Parisian theatre), were allowed to smoke Raleigh's Virginian weed, then a novel luxury. This was, of course, the first germ of a "smoking-theatre."

While the drama progressed as a recognized public entertainment in England, and was provided with its own buildings in the town, or certain booths at the fairs, the Crown exercised its patronage in favour of certain individuals, giving them power to set up playhouses at any time in any parts of London and Westminster. The first and most important grant was made by Charles II. to his "trusty and well-beloved" Thomas Killigrew "and Sir William Davenant." This was a personal grant, not connected with any particular sites or buildings, and is known in theatrical history as the "Killigrew and Davenant patent." Killigrew was the author of several unsuccessful plays, and Sir William Davenant, said to be an illegitimate child of William Shakespeare, was a stage manager of great daring and genius. Charles II. had strong theatrical leanings, and had helped to arrange the court ballets at Versailles for Louis XIV. The Killigrew and Davenant patent in course of time descended, after a fashion, to the Theatres Royal, Covent Garden and Drury Lane, and was and still is the chief legal authority governing these theatres. The "minor" and outlying playhouses were carried on under the Music and Dancing Act of George II., and the annual licences were granted by the local magistrates.

The theatre proper having emancipated itself from the inn or tavern, it was now the turn of the inn or tavern to develop into an independent place of amusement, and to lay the foundation of that enormous middle-class and lower middle-class institution of interest which we agree to term the music hall. It rose from the most modest, humble and obscure beginning—from the public-house bar-parlour, and its weekly "sing-songs," chiefly supported by voluntary talent from the "harmonic meetings" of the "long-room" upstairs, generally used as a Foresters' or Masonic club-room, where one or two professional singers were engaged and a regular chairman was appointed, to the "assembly-room" entertainments at certain hotels, where private balls and school festivals formed part of an irregular series. The district "tea-garden," which was then an agreeable feature of suburban life—the suburbs being next door to the city and the country next door to the suburbs—was the first to show dramatic ambition, and to erect in some portion of its limited but leafy grounds a lath-and-plaster stage large enough for about eight people to move upon without incurring the danger of falling off into the adjoining fish pond and fountain. A few classical statues in plaster, always slightly mutilated, gave an educational tone to the place, and with a few coloured oil-lamps hung amongst the bushes the proprietor felt he had gone as near the "Royal Vauxhall Gardens" as possible for the small charge of a sixpenny refreshment ticket. There were degrees of quality, of course, amongst these places, which answered to the German beer-gardens, though with inferior music. The Beulah Spa at Norwood, the White Conduit House at Pentonville, the Yorkshire Stingo in the Marylebone Road, the Monster at Pimlico, the St Helena at Rotherhithe, the Globe at Mile End, the Red Cow at Dalston, the Highbury Barn at Highbury, the Manor House at Mare Street, Hackney, the Rosemary Branch at Hoxton, and other *rus-in-urbe* retreats, were up to the level of their time, if rarely beyond it.

The suspended animation of the law—the one Georgian act, which was mainly passed to check the singing of Jacobite songs in the tap-rooms and tea-gardens of the little London of 1730, when the whole population of the United Kingdom was only about six millions—encouraged the growth eventually of a number of "saloon theatres" in various London districts, which were allowed under the head of "Music and Dancing" to go as far on the light dramatic road as the patent theatres thought proper to permit. The 25 Geo. II. c. 36, which in later days was still the only act under which the music halls of forty millions and more of people were licensed, was always liberally interpreted, as long as it kept clear of politics.

The "saloon theatres," always being taverns or attached to taverns, created a public who liked to mix its dramatic amusements with smoking and light refreshments. The principal "saloons" were the Effingham in the Whitechapel Road, the Bower in the Lower Marsh, Lambeth, the Albert at Islington, the Britannia at Hoxton, the Grecian in the City Road, the Union in Shoreditch, the Stingo at Paddington and several others of less importance. All these places had good companies, especially in the winter, and many of them nourished leading actors of exceptional merit. The dramas were chiefly rough adaptations from the contemporary French stage, occasionally flying as high as Alexandre Dumas the elder and Victor Hugo. Actors of real tragic power lived, worked and died in this confined area. Some went to America, and acquired fame and fortune; and among others, Frederick Robson, who was trained at the Grecian, first when it was the leading saloon theatre and afterwards when it became the leading music hall (a distinction with little difference), fought his way to the front after the abolition of the "patent rights" and was accepted as the greatest tragi-comic actor of his time. The Grecian saloon theatre, better known perhaps, with its pleasure garden or yard, as the Eagle Tavern, City Road, which formed the material of one of Charles Dickens's *Sketches by Boz*, was a place managed with much taste, enterprise and discretion by its proprietor, Mr Rouse. It was the "saloon" where the one and only attempt, with limited means, was ever made to import almost all the original repertory of the Opéra Comique in Paris, with the result that many musical works were presented to a sixpenny audience that had never been heard before nor since in England. Auber, Hérold, Adolphe Adam, Boieldieu, Grétry, Donizetti, Bellini, Rossini and a host of others gave some sort of advanced musical education, through the Grecian, to a rather depressing part of London, long before board schools were established. The saloon theatres rarely offended the patent houses, and when they did the law was soon put in motion to show that Shakespeare could not be represented with impunity. The Union Saloon in Shoreditch, then under the direction of Mr Samuel Lane, who afterwards, with his wife, Mrs Sara Lane, at the Britannia Saloon, became the leading local theatrical manager of his day, was tempted in 1834 to give a performance of *Othello*. It was "raided" by the then rather "new police," and all the actors, servants, audience, directors and musicians were taken into custody and marched off to Worship Street police station, confined for the remainder of the night, and fined and warned in the morning. The same and only law still exists for those who are helping to keep a "disorderly house," but there are no holders of exclusive dramatic patent rights to set it in motion. The abolition of this privileged monopoly was effected about this time by a combination of distinguished literary men and dramatists, who were convinced, from observation and experience, that the patent theatres had failed to nurse the higher drama, while interfering with the beneficial freedom of public amusements.

The effect of Covent Garden and Drury Lane on the art of acting had resulted chiefly in limiting the market for theatrical employment, with a consequent all-round reduction of salaries. They kept the Lyceum Theatre (or English Opera House) for years in the position of a music hall, giving sometimes two performances a night, like a "gaff" in the New Cut or Whitechapel. They had not destroyed the "star" system, and Edmund Kean and the boy Betty—the "Infant Roscius"—were able to command sensational rewards. In the end Charles Dickens, Sir Edward Bulwer-Lytton, Sir Thomas Noon Talfourd and others got the patents abolished, and the first step towards free trade in the drama was secured.

The effect of this change was to draw attention to the "saloon theatres," where during the performances smoking, drinking, and even eating were allowed in the auditorium. An act was soon passed, known as the Theatres Act (1843), appointing a censor of stage-plays, and placing the London theatres under the control of a Crown officer, changing with ministries. This was the lord chamberlain for the time being. The lord chamberlain of this period drew a hard-and-fast line between theatres under his control, where no smoking and drinking were allowed "in front," and theatres or halls where the old habits and customs of the audience were not to be interfered with. These latter were to go under the jurisdiction of the local magistrates, or other licensing authorities, under the 25 Geo. II. c. 36—the Music and Dancing Act—and so far a divorce was decreed between the taverns and the playhouses. The lord chamberlain eventually made certain concessions. Refreshment bars were allowed at the lord chamberlain's theatres in unobstrusive positions, victualled under a special act of William IV., and private smoking-rooms were allowed at most theatres on application. All this implied that stage plays were to be kept free from open smoking and drinking, and miscellaneous entertainments were to enjoy their old social freedom. The position was accepted by those "saloon theatres" which were not tempted to become lord chamberlain houses, and the others, with many additions, started the first music halls.

Amongst the first of these halls, and certainly the very first as far as intelligent management was concerned, was the Canterbury in the Lower Marsh, Lambeth, which was next door to the old Bower Saloon, then transformed into a "minor theatre." The Canterbury sprang from the usual tavern germ, its creator being Mr Charles Morton, who honourably earned the name of the "doyen of the music halls." It justified its title by cultivating the best class of music, and exposed the prejudice and unfairness of Planché's sarcasm in a Haymarket burlesque—"most music hall—most melancholy." Mr Charles Morton added pictorial art to his other attractions, and obtained the support of *Punch*, which stamped the Canterbury as the "Royal Academy over the water." At this time by a mere accident Gounod's great opera of *Faust*, through defective international registration, fell into the public domain in England and became common property. The Canterbury, not daring to present it with scenery, costumes and action, for fear of the Stage-play Act, gave what was called "An Operatic Selection," the singers standing in plain dresses in a row, like pupils at a school examination or a chorus in an oratorio at Exeter Hall. The music was well rendered by a thoroughly competent company, night after night, for a long period, so that by the time the opera attracted the tardy attention of the two principal opera managers at Her Majesty's Theatre in the Haymarket and Covent Garden Theatre, the tunes most popular were being whistled by the "man in the street," the "boy in the gutter" and the tradesman waiting at the door for orders.

With the Canterbury Hall, and its brother the Oxford in Oxford Street—a converted inn and coaching yard—built and managed on the same lines by Mr Charles Morton, the music halls were well started. They had imitators in every direction—some large, some small, and some with architectural pretensions, but all anxious to attract the public by cheap prices and physical comforts not attainable at any of the regular theatres.

With the growth and improvement of these "Halls," the few old cellar "singing-rooms" gradually disappeared. Evans's in Covent Garden was the last to go. Rhodes's, or the Cyder Cellars in Maiden Lane, at the back of the Adelphi Theatre; the Coal Hole, in the Strand, which now forms the site of Terry's Theatre; the Doctor Johnson, in Fleet Street (oddly enough, within the precincts of the City of London) disappeared one by one, and with them the compound material for Thackeray's picture of "The Cave of Harmony." This "Cave," like Dickens's "Old Curiosity Shop," was drawn from the features of many places. To do the "cellars" a little justice, they represented the manners of a past time—heavy suppers and heavy drinks, and the freedom of their songs and recitations was partly due to the fact that the audience and the actors were always composed of men. Thackeray clung to Evans's to the last. It was his nightly "chapel of ease" to the adjoining Garrick Club. In its old age it became decent, and ladies were admitted to a private gallery, behind screens and a convent grille. Before its death, and its revival in another form as a sporting club, it admitted ladies both on and off the stage, and became an ordinary music hall.

The rise and progress of the London music halls naturally excited a good deal of attention and jealousy on the part of the regular theatres, and this was increased when the first Great Variety Theatre was opened in Leicester Square. The building was the finest example of Moorish architecture on a large scale ever erected in England. It was burnt down in the 'eighties, and the present theatre was built in its place. Originally it was "The Panopticon," a palace of "recreative science," started under the most distinguished direction on the old polytechnic institution lines, and with ample capital. It was a commercial failure, and after being tried as an "American Circus," it was turned into a great variety theatre, the greatest of its kind in Europe, under the name of the Alhambra Palace. Its founder was Mr E.T. Smith, the energetic theatrical manager, and its developer was Mr Frederick Strange, who came full of spirit and money from the Crystal Palace. He produced in 1865 an ambitious ballet—the Dagger Ballet from Auber's *Enfant prodigue*, which had been seen at Drury Lane Theatre in 1851, translated as "Azaël."

The Alhambra was prosecuted in the superior courts for infringing the Stage-play Act—the 6 & 7 Vict. c. 68. The case is in the law reports—*Wigan* v. *Strange*; the ostensible plaintiffs being the well-known actors and managers Horace Wigan and Benjamin Webster, supported by J. B. Buckstone, and many other theatrical managers. A long trial before eminent judges, with eminent counsel on both sides, produced a decision which was not very satisfactory, and far from final. It held that, as far as the entertainment went, according to the evidence tendered, it was not a ballet representing any distinct story or coherent action, but it might have been a "divertissement"—a term suggested in the course of the trial. A short time after this a pantomime scene was produced at the same theatre, called *Where's the Police?* which had a clown, a pantaloon, a columbine and a harlequin, with other familiar characters, a mob, a street and even the traditional red-hot poker. This inspired proceedings by the same plaintiffs before a police magistrate at Marlborough Street, who inflicted the full penalties—£20 a performance for 12 performances, and costs. An appeal was made to the Westminster quarter sessions, supported by Serjeant Ballantine and opposed by Mr Hardinge Giffard (afterwards Lord Chancellor Halsbury), and the conviction was confirmed. Being heard at quarter sessions, there is no record in the law reports.

These and other prosecutions suggested the institution of a parliamentary inquiry, and a House of Commons select committee was appointed in 1866, at the instigation of the music halls and variety theatres. The committee devoted much time to the inquiry, and examined many witnesses—amongst the rest Lord Sydney, the lord chamberlain, who had no personal objection to undertake the control of these comparatively young places of amusement and recreation. Much of the evidence was directed against the Stage-play Act, as the difficulty appeared to be to define what was *not* a stage play. Lord Denman, Mr Justice Byles, and other eminent judges seemed to think that any song, action or recitation that excited the emotions might be pinned as a stage-play, and that the old definition—"the representation of any action by a person (or persons) acting, and not in the form of narration"—could be supported in the then state of the law in any of the higher courts. The variety theatres on this occasion were encouraged by what had just occurred at the time in France. Napoleon III., acting under the advice of M. Michel Chevalier, passed a decree known as *La Liberté des théâtres*, which fixed the status of the Parisian and other music halls. Operettas, ballets of action, ballets, vaudevilles, pantomimes and all light pieces were allowed, and the managers were no longer legally confined to songs and acrobatic performances. The report of the select committee of 1866, signed by the chairman, Mr (afterwards Viscount) Goschen, was in favour of granting the variety theatres and music halls the privileges they asked for, which were those enjoyed in France and other countries.

Parliamentary interference and the introduction of several private bills in the House of Commons, which came to nothing, checked, if they did not altogether stop, the prosecutions. The variety theatres advanced in every direction in number and importance. Ballets grew in splendour and coherency. The lighting and ventilation, the comfort and decoration of the various "palaces" (as many of them were now called) improved, and the public, as usual, were the gainers. Population increased, and the six millions of 1730 became forty millions and more. The same and only act (25 Geo. II. c. 36), adequate or inadequate, still remained. London is defined as the "administrative county of London," and its area—the 20-miles radius—is mapped out. The Metropolitan Board of Works retired or was discharged, and the London County Council was created and has taken its place. The London County Council, with extended power over structures and structural alterations, acquired the licensing of variety theatres and music halls from the local magistrates (the Middlesex, Surrey, Tower Hamlets and other magistrates) within the administrative county of London. The L. C. C. examine and enforce their powers. They have been advised that they can separate a music from a dancing licence if they like, and that when they grant the united licence the dancing means the dancing of paid performers on a stage, and not the dancing of the audience on a platform or floor, as at the short-lived but elegant Cremorne Gardens, or an old-time "Casino." They are also advised that they can withhold licences, unless the applicants agree not to apply for a drink licence to the local magistrates sitting in brewster sessions, who still retain their control over the liquor trade. Theatre licences are often withheld unless a similar promise is made—the drink authority in this case being the Excise, empowered by the Act of William IV. (5 & 6 Will. IV. c. 39, s. 7).

The spread of so-called "sketches"—a kind of condensed drama or farce—in the variety theatres, and the action of the London County Council in trying to check the extension of refreshment licences to these establishments, with other grounds of discontent on the part of managers (individuals or "limited companies"), led to the appointment of a second select committee of the House of Commons in 1892 and the production of another blue-book. The same ground was gone over, and the same objections were raised against a licensing authority which is elected by public votes, only exists for three years before another election is due, and can give no guarantee for the continuity of its judgments. The consensus of opinion (as in 1866) was in favour of a state official, responsible to parliament—like the Home Office or the Board of Trade—the preference being given to the lord chamberlain and his staff, who know much about theatres and theatrical business. The chairman of the committee was the Hon. David Plunkett (afterwards Lord Rathmore), and the report in spirit was the same as the one of 1866. Three forms of licence were suggested: one for theatres proper, one for music halls, and one for concert rooms.

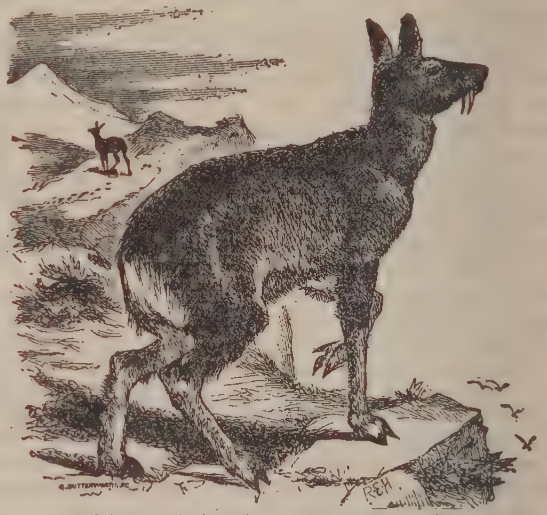
Though the rise and progress of the music hall and variety theatre interest is one of the most extraordinary facts of the last half of the 19th century, the business has little or no corporate organization, and there is nothing like a complete registration of the various properties throughout the United Kingdom. In London the "London Entertainments Protection Association," which has the command of a weekly paper called the *Music Hall and Theatre Review*, looks after its interests. In London alone over five millions sterling of capital is said to be invested in these enterprises, employing 80,000 persons of all grades, and entertaining during the year about 25,000,000 people. The annual applications for music licences in London alone are over 300. (J. Hd.)

MUSK (Med. Lat. *muscus*, late Gr. *μόσχος*, possibly Pers. *mushk*, from Sansk. *mushka*, the scrotum), the name originally given to a perfume obtained from the strong-smelling substance secreted in a gland by the musk-deer (*q.v.*), and hence applied to other animals, and also to plants, possessing a similar odour. The variety which appears in commerce is a secretion of the musk-deer; but the odour is also emitted by the musk-ox and musk-rat of India and Europe, by the musk-duck (*Biziura lobata*) of West Australia, the musk-shrew, the musk-beetle (*Calichroma moschata*), the alligator of Central America, and by several other animals. In the vegetable kingdom it is present in the common musk (*Mimulus moschatus*), the musk-wood of the Guianas and West Indies (*Guarea*, spp.), and in the seeds of *Hibiscus Abelmoschus* (musk-seeds). To obtain the perfume from the musk-deer the animal is killed and the gland completely removed, and dried, either in the sun, on a hot stone, or by immersion in hot oil. It appears in commerce as "musk in pod," *i.e.* the glands are entire, or as "musk in grain," in which the perfume has been extracted from its receptacle. Three kinds are recognized: (1) Tong-king, Chinese or Tibetan, imported from China, the most valued; (2) Assam or Nepal, less valuable; and (3) Karbardin or Russian (Siberian), imported from Central Asia by way of Russia, the least valuable and hardly admitting of adulteration. The Tong-king musk is exported in small, gaudily decorated caddies with tin or lead linings, wherein the perfume is sealed down; it is now usually transmitted direct by parcel post to the merchant.

Good musk is of a dark purplish colour, dry, smooth and unctuous to the touch, and bitter in taste. It dissolves in boiling water to the extent of about one-half; alcohol takes up one-third of the substance, and ether and chloroform dissolve still less. A grain of musk will distinctly scent millions of cubic feet of air without any appreciable loss of weight, and its scent is not only more penetrating but more persistent than that of any other known substance. In addition to its odoriferous principle, it contains ammonia, cholesterin, fatty matter, a bitter resinous substance, and other animal principles. As a material in perfumery it is of the first importance, its powerful and enduring odour giving strength and permanency to the vegetable essences, so that it is an ingredient in many compounded perfumes.

Artificial musk is a synthetic product, having a similar odour to natural musk. It was obtained by Baur in 1888 by condensing toluene with isobutyl bromide in the presence of aluminium chloride, and nitrating the product. It is a symtrinitro-ψ-butyl toluene. Many similar preparations have been made, and it appears that the odour depends upon the symmetry of the three nitro groups.

MUSK-DEER (*Moschus moschiferus*), an aberrant member of the deer family constituting the sub-family *Cervidae Moschinae* (see Deer). Both sexes are devoid of antler appendage; but in this the musk-deer agrees with one genus of true deer (*Hydrelaphus*), and as in the latter, the upper canine teeth of the males are long and sabre-like, projecting below the chin, with the ends turned somewhat backwards. In size the musk-deer is rather less than the European roe-deer, being about 20 in. high at the shoulder. Its limbs, especially the hinder pair, are long; and the feet remarkable for the great development of the lateral pair of hoofs and for the freedom of motion they all present, which must be of assistance to the animal in steadying it in its agile bounds among the crags of its native haunts. The ears are large, and the tail rudimentary. The hair covering the body is long, coarse, and of a peculiarly brittle and pith-like character, breaking easily; it is generally of a greyish-brown colour, sometimes inclined to yellowish-red, and often variegated with lighter patches. The musk-deer inhabits the forest districts in the Himalaya as far west as Gilgit, always, however, at great elevations—being rarely found in summer below 8000 ft. above the sea-level, and ranging as high as the limits of the thickets of birch, rhododendron and juniper, among which it mostly conceals itself in the day-time. The range extends into Tibet, Siberia and north-western China; but the musk-deer of Kansu has been separated as a distinct species, under the name of *M. sifanicus*. Musk-deer are hardy, solitary and retiring animals, chiefly nocturnal in habits, and almost always found alone, rarely in pairs and never in herds. They are exceedingly active and surefooted, having perhaps no equal in traversing rocks and precipitous ground; and they feed on moss, grass, and leaves of the plants which grow on the mountains.



The Musk-deer (*Moschus moschiferus*).

Most mammals have certain portions of the skin specially modified and provided with glands secreting odorous and fatty substances characteristic of the particular species. The special gland of the musk-deer, which has made the animal so well known, and has proved the cause of unremitting persecution to its possessor, is found in the male only, and is a sac about the size of a small orange, situated beneath the skin of the abdomen, the orifice being immediately in front of the preputial aperture. The secretion with which the sac is filled is dark brown or chocolate in colour, and when fresh of the consistence of "moist gingerbread," but becoming dry and granular after keeping (see Musk). The Kansu (*M. sifanicus*) differs from the typical species in having longer ears, which are black on the outer surface.

MUSKEGON, a city and the county-seat of Muskegon county, Michigan, U.S.A., on Muskegon lake, an expansion of Muskegon river near its mouth, about 4 m. from Lake Michigan and 38 m. N.W. of Grand Rapids. Pop. (1890), 22,702; (1900), 20,818, of whom 6236 were foreign-born;

(1910 census) 24,062. It is served by the Grand Trunk, the Père Marquette, the Grand Rapids & Indiana, and the Grand Rapids, Grand Haven & Muskegon (electric) railways, and by steamboat lines to Chicago, Milwaukee and other lake ports. There are several summer resorts in the vicinity. As the gifts of Charles H. Hackley (1837–1905), a rich lumberman, the city has an endowment fund to the public schools of about $2,000,000; a manual training school, which has an endowment of $600,000, and is one of the few endowed public schools in the United States; a public library, with an endowment of $275,000; a public hospital with a $600,000 endowment; and a poor fund endowment of $300,000. In Hackley Park there are statues of Lincoln and Farragut, and at the Hackley School there is a statue of McKinley; all three are by C. H. Niehaus. The municipality owns and operates its water-works. Muskegon lake is 5 m. long and 1½ m. wide, with a depth of 30 to 40 ft., and is ice-free throughout the year. The channel from Muskegon lake to Lake Michigan has been improved to a depth of 20 ft. and a width of 300 ft. by the Federal government since 1867. From Muskegon are shipped large quantities of lumber and market-garden produce, besides the numerous manufactures of the city. The total value of all factory products in 1904 was $6,319,441 (39·6% more than in 1900), of which more than one-sixth was the value of lumber. A trading post was established here in 1812, but a permanent settlement was not established until 1834. Muskegon was laid out as a town in 1849, incorporated as a village in 1861, and chartered as a city in 1869. The name is probably derived from a Chippewa word, *màskeg* or *muskeg*, meaning "grassy bog," still used in that sense in north-western America.

MUSKET (Fr. *mousquet*, Ger. *Muskete*, &c.), the term generally applied to the firearm of the infantry soldier from about 1550 up to and even beyond the universal adoption of rifled small arms about 1850–1860. The word originally signified a male sparrowhawk (Italian *moschetto*, derived perhaps ultimately from Latin *musca*, a fly) and its application to the weapon may be explained by the practice of naming firearms after birds and beasts (cf. falcon, basilisk). Strictly speaking, the word is inapplicable both to the early hand-guns and to the arquebuses and calivers that superseded the hand-guns. The "musket" proper, introduced into the Spanish army by the duke of Alva, was much heavier and more powerful than the arquebus. Its bullet retained sufficient striking energy to stop a horse at 500 and 600 yards from the muzzle. A writer in 1598 (quoted *s.v.* in the *New English Dictionary*) goes so far as to say that "One good musket may be accounted for two callivers." Unlike the arquebus, it was fired from a rest, which the "musketeer" stuck into the ground in front of him. But during the 17th century the musket in use was so far improved that the rest could be dispensed with (see GUN). The musket was a matchlock, weapons with other forms of lock being distinguished as wheel-locks, firelocks, snaphances, &c., and soldiers were similarly distinguished as musketeers and fusiliers. On the disuse, about 1690–1695, of this form of firing mechanism, the term "musket" was, in France at least, for a time discontinued in favour of "fusil," or flint-lock, which thenceforward reigned supreme up to the introduction of a practicable percussion lock about 1830–1840. But the term "musket" survived the thing it originally represented, and was currently used for the firelock (and afterwards for the percussion weapon). To-day it is generically used for military firearms anterior to the modern rifle. The original meaning of the word *musketry* has remained almost unaltered since 1600; it signifies the fire of infantry small-arms (though for this "rifle fire" is now a far more usual term), and in particular the art of using them (see INFANTRY and RIFLE). Of the derivatives, the only one that is not self-explanatory is *musketoon*. This was a short, large-bore musket somewhat of the blunderbuss type, originally designed for the use of cavalry, but afterwards, in the 18th century, chiefly a domestic or coachman's weapon.

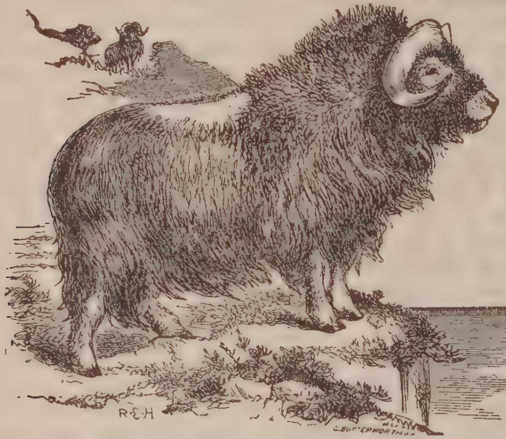
MUSKHOGEAN STOCK, a North American Indian stock. The name is from that of the chief tribe of the Creek confederacy, the Muskogee. It includes the Creeks, Choctaws, Chickasaws, Seminoles and other tribes. Its territory was almost the whole state of Mississippi, western Tennessee, eastern Kentucky, Alabama, most of Georgia, and later nearly all Florida. Muskhogean traditions assign the west and north-west as the original home of the stock. Its history begins in 1527, on the first landing of the Spaniards on the Gulf Coast. The Muskhogean peoples were then settled agriculturists with an elaborate social organization, and living in villages, many of which were fortified (see INDIANS: *North American*).

MUSKOGEE, a city and the county-seat of Muskogee county, Oklahoma, U.S.A., about 3 m. W. by S. of the confluence of the Verdigris, Neosho (or Grand) and Arkansas rivers, and about 130 m. E.N.E. of Oklahoma City. Pop. (1900), 4154; (1907), 14,418, of whom 4298 were negroes and 332 Indians; (1910), 25,278. It is served by the St Louis & San Francisco, the Midland Valley, the Missouri, Kansas & Texas, and the Missouri, Oklahoma & Gulf railways. Fort Gibson (pop. in 1910, 1344), about 5 m. N.E. on the Neosho, near its confluence with the Arkansas, is the head of steam-boat navigation of the Arkansas; it is the site of a former government fort and of a national cemetery. Muskogee is the seat of Spaulding Institute (M.E. Church, South) and Nazareth Institute (Roman Catholic), and at Bacone, about 2 m. north-east, is Indian University (Baptist, opened 1884). Muskogee is the commercial centre of an agricultural and stock-raising region, is surrounded by an oil and natural gas field of considerable extent producing a high grade of petroleum, and has a large oil refinery, railway shops (of the Midland Valley and the Missouri, Oklahoma & Gulf railways), cotton gins, cotton compresses, and cotton-seed oil and flour mills. The municipality owns and operates the water-works, the water supply being drawn from the Neosho river. Muskogee was founded about 1870, and became the chief town of the Creek Nation (Muskogee) and the metropolis and administrative centre of the former Indian Territory, being the headquarters of the Union Indian Agency to the Five Civilized Tribes, of the United States (Dawes) Commission to the Five Civilized Tribes, and of a Federal land office for the allotment of lands to the Creeks and Cherokees, and the seat of a Federal Court. The city was chartered in 1898; its area was enlarged in 1908, increasing its population.

MUSK-OX, also known as musk-buffalo and musk-sheep, an Arctic American ruminant of the family Bovidae (*q.v.*), now representing a genus and sub-family by itself. Apparently the musk-ox (*Ovibos moschatus*) has little or no near relationship to either the oxen or the sheep; and it is not improbable that its affinities are with the Asiatic takin (*Budorcas*) and the extinct European *Criotherium* of the Pliocene of Samos. The musky odour from which the animal takes its name does not appear to be due to the secretion of any gland.

In height a bull musk-ox stands about 5 ft. at the shoulder. The head is large and broad. The horns in old males have extremely broad bases, meeting in the middle line, and covering the brow and crown of the head. They are directed at first downwards by the side of the face, and then turn upwards and forwards, ending in the same plane as the eye. The basal half is dull white, oval in section and coarsely fibrous, the middle part smooth, shining and round, and the tip black. In females and young males the horns are smaller, and their bases separated by a space in the middle of the forehead. The ears are small, erect, pointed, and nearly concealed in the hair. The space between the nostrils and the upper lip is covered with short close hair, as in sheep and goats, without any trace of the bare muzzle of oxen. The greater part of the animal is covered with long brown hair, thick, matted and curly on the shoulders, so as to give the appearance of a hump, but elsewhere straight and hanging down—that of the sides, back and haunches reaching as far as the middle of the legs and entirely concealing the very short tail. There is also a thick woolly under-fur, shed in summer, when the whole coat comes off in blanket-like masses. The hair on the lower jaw, throat and chest is long and straight, and hangs down like a beard or dewlap, though there is no loose fold of skin in this situation. The limbs are stout and short, terminating in unsymmetrical hoofs, the external being rounded, the internal pointed, and the sole partially covered with hair.

Musk-oxen at the present day are confined to the most northern parts of North America, where they range over the rocky Barren Grounds between lat. 64° and the shores of the Arctic Sea. Its southern range is gradually contracting, and it appears that it is no longer met with west of the Mackenzie river, though formerly abundant as far as Eschscholtz Bay. Northwards and eastwards it extends through the Parry Islands and Grinnell Land to north Greenland, reaching on the west coast as far south as Melville Bay; and it also occurs at Sabine Island on the east coast. The Greenland animal is a distinct race (*O. m. wardi*), distinguished by white hair on the forehand; and it is suggested that the one from Grinnell Land forms a third race. As proved by the discovery of fossil remains, musk-oxen ranged during the Pleistocene period over northern Siberia and the plains of Germany and France, their bones occurring in river-deposits along with those of the reindeer, mammoth, and woolly rhinoceros. They have also been found in Pleistocene gravels in several parts of England, as Maidenhead, Bromley, Freshfield near Bath, Barnwood near Gloucester, and in the brick-earth of the Thames valley at Crayford, Kent; while their remains also occur in Arctic America.

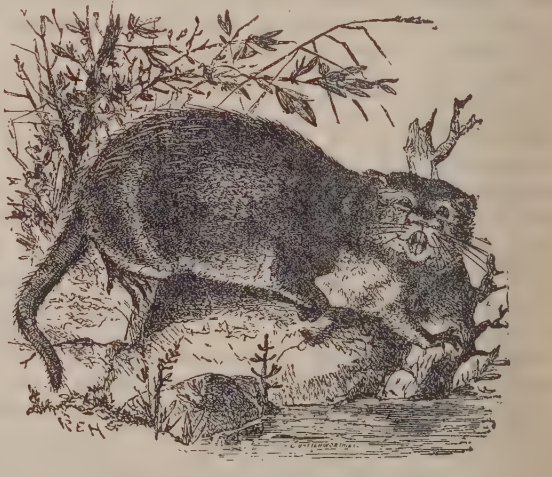


The Musk-ox (*Ovibos moschatus*).

Musk-oxen are gregarious in habit, assembling in herds of twenty or thirty head, or sometimes eighty or a hundred, in which there are seldom more than two or three full-grown males. They run with considerable speed, notwithstanding the shortness of their legs. They feed chiefly on grass, but also on moss, lichens and tender shoots of the willow and pine. The female brings forth one young in the end of May or beginning of June, after a gestation of nine months. The Swedish expedition to Greenland in 1899 found musk-oxen in herds of varying size—some contained only a few individuals, and in one case there were sixty-seven. The peculiar musky odour was perceived from a distance of a hundred yards; but according to Professor Nathorst there was no musky taste or smell in the flesh if the carcase were cleaned immediately the animals were killed.

Of late years musk-oxen have been exhibited alive in Europe; and two examples, one of which lived from 1899 till 1903, have been brought to England. The somewhat imperfect skull of an extinct species of musk-ox from the gravels of the Klondike has enabled Mr W. H. Osgood to make an important addition to our knowledge of this remarkable type of ruminant. The skull, which is probably that of a female, differs from the ordinary musk-ox by the much smaller and shorter horn-cores, which are widely separated in the middle line of the skull, where there is a groove-like depression running the whole length of the forehead. The sockets of the eyes are also much less prominent, and the whole fore-part of the skull is proportionately longer. On account of these and other differences (for which the reader may refer to the original paper, published in vol. xlviii. of the *Smithsonian Miscellaneous Collections*) its describer refers the Klondike skull to a new genus, with the title *Symbos tyrrelli*, the specific name being given in honour of its discoverer. This, however, is not all, for Mr Osgood points out that a skull discovered many years ago in the vicinity of Fort Gibson, Oklahoma, and then named *Ovibos* or *Bötherium cavifrons*, evidently belongs to the same genus. That skull indicates a bull, and the author suggests that it may possibly be the male of *Symbos tyrrelli*, although the wide separation of the localities made him hesitate to accept this view. Perhaps it would have been better had he done so, and taken the name *Symbos cavifrons* for the species. A third type of musk-ox skull is, however, known from North America, namely one from the celebrated Big-Bone Lick, Kentucky, on which the genus and species *Bötherium bombifrons* was established, which differs from all the others by its small size, convex forehead and rounded horn-cores, the latter being very widely separated, and arising from the sides of the skull. This specimen has been regarded as the female of *Symbos cavifrons*; but this view, as pointed out by Mr Osgood, is almost certainly incorrect, and it represents an entirely distinct form.

This, however, is not the whole of the past history of the musk-ox group; and in this connexion it may be mentioned that palaeontological discoveries are gradually making it evident that the poverty of America in species of horned ruminants is to a great extent a feature of the present day, and that in past times it possessed a considerable number of representatives of this group. One of the latest additions to the list is a large sheep-like animal from a cave in California, apparently representing a new generic type, which has been described by E. L. Furlong in the publications of the University of California, under the name of *Preptoceras sinclairi*. It is represented by a nearly complete skeleton, and has doubly-curved horns and sheep-like teeth. In common with an allied ruminant from the same district, previously described as *Euceratherium*, it seems probable that *Preptoceras* is related on the one hand to the musk-ox, and on the other to the Asiatic takin, while it is also supposed to have affinities with the sheep. If these extinct forms really serve to connect the takin with the musk-ox, their systematic importance will be very great. From a geographical point of view nothing is more likely, for the takin forms a type confined to Eastern Asia (Tibet and Szechuen), and it would be reasonable to expect that, like so many other peculiar forms from the same region, they should have representatives on the American side of the Pacific. (R. L.*)



The Musk-rat (*Fiber zibethicus*).

MUSK-RAT, or MUSQUASH, the name of a large North American rat-like rodent mammal, technically known as *Fiber zibethicus*, and belonging to the mouse-tribe (*Muridae*). Aquatic in habits, this animal is related to the English water-rat and therefore included in the sub-family *Microtinae* (see VOLE). It is, however, of larger size, the head and body being about 12 in. in length and the tail but little less. It is rather a heavily-built animal, with a broad head, no distinct neck, and short limbs, the eyes are small, and the ears project very little beyond the fur. The fore-limbs have four toes and a rudimentary thumb, all with claws; the hind limbs are larger, with five distinct toes, united by short webs at their bases. The tail is laterally compressed, nearly naked, and scaly. The hair much resembles that of a beaver, but is shorter; it consists of a thick soft under-fur, interspersed with longer stiff, glistening hairs, which overlie and conceal the former, on the upper surface and sides of the body. The general colour is dark umber-brown, almost black on the back and grey below. The tail and naked parts of the feet are black. The musky odour from which it derives its name is due to the secretion of a large gland situated in the inguinal region, and present in both sexes.

The ordinary musk-rat is one of several species of a genus peculiar to America, where it is distributed in suitable localities in the northern part of the continent, extending from the Atlantic to the Pacific, and from the Rio Grande to the barren grounds bordering the Arctic seas. It lives on the shores of lakes and rivers, swimming and diving with facility, feeding on the roots, stems and leaves of water-plants, or on fruits and vegetables which grow near the margin of the streams it inhabits. Musk-rats are most active at night, spending the greater part of the day concealed in their burrows in the bank, which consist of a chamber with numerous passages, all of which open under the surface of the water. For winter quarters they build more elaborate houses of conical or dome-like form, composed of sedges, grasses and similar materials plastered together with mud. As their fur is an important article of commerce, large numbers are annually killed, being either trapped or speared at the mouths of their holes. (See also RODENTIA.)

MUSK-SHREW, a name for any species of the genus *Crocidura* of the family *Soricidae* (see INSECTIVORA). The term is generally used of the common grey musk-shrew (*C. coerulea*) of India. Dr Dobson believed this to be a semi-domesticated variety of the brown musk-shrew (*C. murina*), which he considered the original wild type. The head and body of a full-grown specimen measure about 6 in.; the tail is rather more than half that length; and bluish-grey is the usual colour of the fur, which is paler on the under surface. Dr Blanford states that the story of wine or beer becoming impregnated with a musky taint in consequence of this shrew passing over the bottles, is less credited in India than formerly owing to the discovery that liquors bottled in Europe and exported to India are not liable to be thus tainted.

MUSLIM IBN AL-ḤAJJĀJ, the Imam, the author of one of the two books of Mahommedan tradition called *Ṣaḥīḥ*, "sound," was born at Nishapur at some uncertain date after A.D. 815 and died there in 875. Like al-Bukhārī (*q.v.*), of whom he was a close and faithful friend, he gave himself to the collecting, sifting and arranging of traditions, travelling for the purpose as far as Egypt. It is plain that his sympathies were with the traditionalist school or opposed to that which sought to build up the system of canon law on a speculative basis (see MAHOMMEDAN LAW). But though he was a student and friend of Aḥmad ibn Ḥanbal (*q.v.*) he did not go in traditionalism to the length of some, and he defended al-Bukhārī when the latter was driven from Nishapur for refusing to admit that the utterance (*lafz*) of the Koran by man was as uncreated as the Koran itself (see MAHOMMEDAN RELIGION; and Patton's *Ahmad ibn Hanbal*, 32 sqq.). His great collection of traditions is second in popularity only to that of al-Bukhārī, and is commonly regarded as more accurate and reliable in details, especially names. His object was more to weed out illegitimate accretions than to furnish a traditional basis for a system of law. Therefore, though he arranged his material according to such a system, he did not add guiding rubrics, and he regularly brought together in one place the different parallel versions of the same tradition. His book is thus historically more useful, but legally less suggestive. His biographers give almost no details as to his life, and its early part was probably very obscure. One gives a list of as many as twenty works, but only his *Ṣaḥīḥ* seems to have reached us.

See further, de Slane's transl. of Ibn Khallikān, iii. 348 sqq, and of Ibn Khaldūn's *Prolégomènes*, ii. 470, 475; Goldziher, *Muhammedanische Studien*, ii. 245 sqq., 255 sqq.; Brockelmann, *Geschichte der arab. Litt.*, i. 760 seq.; Macdonald, *Development of Muslim Theology*, 80, 147 seq.; Dhahabī *Tadhkira* (edit. of Hyderabad), ii. 165 sqq. (D. B. MA.)

MUSLIN (through Fr. *mousseline* from It. *mussolino*, diminutive of *Mussolo*, *i.e.* the town Mosul in Kurdistan) a light cotton cloth said to have been first made at Mosul, a city of Mesopotamia. Muslins have been largely made in various parts of India, whence they were imported to England towards the end of the 17th century. Some of these Indian muslins were very fine and costly. Among the specialties are *Arni muslin*, made in the Madras presidency, and *Dacca muslin*, made at Dacca in Bengal. Muslins of many kinds are now made in Europe and America, and the name is applied to both plain and fancy cloths, and to printed calicoes of light texture. *Swiss muslin* is a light variety, woven in stripes or figures, originally made in Switzerland. *Book muslin* is made in Scotland from very fine yarns. Mulls, jaconets, lenos, and other cloths exported to the East and elsewhere are sometimes described as muslins. Muslin is used for dresses, blinds, curtains, &c.

MUSONIUS RUFUS, a Roman philosopher of the 1st century A.D., was born in Etruria about A.D. 20–30. He fell under the ban of Nero owing to his ethical teachings, and was exiled to the island of Gyarus on a trumped-up charge of participation in Piso's conspiracy. He returned under Galba, and was the friend of Vitellius and Vespasian. It was he who dared to bring an accusation against P. Egnatius Celer (the Stoic philosopher whose evidence had condemned his patron and disciple Soranus) and who endeavoured to preach a doctrine of peace and goodwill among the soldiers of Vespasian when they were advancing upon Rome. So highly was he esteemed in Rome that Vespasian made an exception in his case when all other philosophers were expelled from the city. As to his death, we know only that he was not living in the reign of Trajan. His philosophy, which is in most respects identical with that of his pupil, Epictetus, is marked by its strong practical tendency. Though he did not altogether neglect logic and physics, he maintained that virtue is the only real aim of men. This virtue is not a thing of precept and theory but a practical, living reality. It is identical with philosophy in the true sense of the word, and the truly good man is also the true philosopher.

Suidas attributes numerous works to him, amongst others a number of letters to Apollonius of Tyana. The letters are certainly unauthentic; about the others there is no evidence. His views were collected by Claudius (or Valerius) Pollio, who wrote Ἀπομνημονεύματα Μουσωνίου τοῦ φιλοσόφου, from which Stobaeus obtained his information. See Ritter and Preller §§ 477, 488, 489; Tacitus, *Annals*, xv. 71 and *Histories*, iii. 81; and compare articles STOICS and EPICTETUS.

MUSPRATT, JAMES (1793–1886), British chemical manufacturer, was born in Dublin on the 12th of August 1793. At the age of fourteen he was apprenticed to a wholesale druggist, but his apprenticeship was terminated in 1810 by a quarrel with his master, and in 1812 he went to Spain to take part in the Peninsular War. Lack of influence prevented him from getting a commission in the cavalry, but he followed the British army on foot far into the interior, was laid up with fever at Madrid, and, narrowly escaping capture by the French, succeeded in making his way to Lisbon. There he joined the navy, but after taking part in the blockade of Brest he was led to desert, through the harshness of the discipline on the second of the two ships in which he served. Returning to Dublin about 1814, he began the manufacture of chemical products, such as hydrochloric and acetic acids and turpentine, adding prussiate of potash a few years later. He also had in view the manufacture of alkali from common salt by the Leblanc process, but on the one hand he could not command the capital for the plant, and on the other saw that Dublin was not well situated for the experiment. In 1822 he went to Liverpool, which was at once a good port and within easy reach of salt and coal, and took a lease of an abandoned glass-works on the bank of the canal in Vauxhall Road. At first he confined himself to prussiate of potash, until in 1823, when the tax on salt was reduced from 15s. to 2s. a bushel, his profits enabled him to erect lead-chambers for making the sulphuric acid necessary for the Leblanc process. In 1828 he built works at St Helen's and in 1830 at Newton; at the latter place he was long harassed by litigation on account of the damage done by the hydrochloric acid emitted from his factory, and finally in 1850 he left it and started new works at Widnes and Flint. In 1834–1835, in conjunction with Charles Tennant, he purchased sulphur mines in Sicily, to provide the raw material for his sulphuric acid; but on the imposition of the Neapolitan government of a prohibitive duty on sulphur Muspratt found a substitute in iron pyrites, which was thus introduced as the raw material for the manufacture of sulphuric acid. He was always anxious to employ the best scientific advice available and to try every novelty that promised advantage. He was a close friend of Liebig, whose mineral manures were compounded at his works. He died at Seaforth Hall, near Liverpool, on the 4th of May 1886. After his retirement in 1857 his business was continued in the hands of four of his ten children.

His eldest son, JAMES SHERIDAN MUSPRATT (1821–1871), studied chemistry under Thomas Graham at Glasgow and London and under Liebig at Giessen, and in 1848 founded the Liverpool College of Chemistry, an institution for training chemists, of which he also acted as director. From 1854 to 1860 he was occupied in preparing a dictionary of *Chemistry . . . as applied and relating to the Arts and Manufactures*, which was translated into German and Russian, and he published a translation of Plattner's treatise on the blow-pipe in 1845, and *Outlines of Analysis* in 1849. His original work included a research on the sulphites (1845), and the preparation of toluidine and nitro-aniline in 1845–1846 with A. W. Hofmann.

MUSSCHENBROEK, PIETER VAN (1692–1761), Dutch natural philosopher, was born on the 14th of March 1692 at Leiden, where his father Johann Joosten van Musschenbroek (1660–1707) was a maker of physical apparatus. He studied at the university of his native city, where he was a pupil and friend of W. J. s'G. Gravesande. Graduating in 1715 with a dissertation, *De aeris praesentia in humoribus animalium*, Musschenbroek was appointed professor at Duisburg in 1719. In 1723 he was promoted to the chair of natural philosophy and mathematics at Utrecht. In 1731 he declined an invitation to Copenhagen, and was promoted in consequence to the chair of astronomy at Utrecht in 1732. The attempt of George II. of England in 1737 to attract him to the newly-established university of Göttingen was also unsuccessful. At length, however, the claims of his native city overcame his resolution to remain at Utrecht, and he accepted the mathematical chair at Leiden in 1739, where, declining all offers from abroad, he remained till his death on the 9th of September 1761.

His first important production was *Epitome elementorum physico-mathematicorum* (12mo, Leiden, 1726)—a work which was afterwards gradually altered as it passed through several editions, and which appeared at length (posthumously, ed. by Johann Lulofs, one of his colleagues as Leiden) in 1762, under the title of *Introductio ad philosophiam naturalem*. The *Physicae experimentales et geometricae dissertationes* (1729) threw new light on magnetism, capillary attraction, and the cohesion of bodies. A Latin edition with notes (1731) of the Italian work *Saggi di naturali esperienze fatte nell-l'Accademia del Cimento* contained among many other investigations a description of a new instrument, the pyrometer, which Musschenbroek had invented, and of several experiments which he had made on the expansion of bodies by heat. Musschenbroek was also the author of *Elementa physica* (8vo, 1729), and his name is associated with the invention of the Leyden jar (*q.v.*).

MUSSEL (O. Eng. *muscle*, Lat. *musculus*, diminutive of *mus*, mouse, applied to small sea fish and mussels), a term applied in England to two families of Lamellibranch Molluscs—the marine *Mytilacea*, of which the edible mussel, *Mytilus edulis*, is the representative; and the fresh-water *Unionidae*, of which the river mussel, *Unio pictorum*, and the swan mussel, *Anodonta cygnea*, are the common British examples. It is not obvious why these fresh-water forms have been associated popularly with the *Mytilacea* under the name mussel, unless it be on account of the frequently very dark colour of their shells. They are somewhat remote from the sea mussels in structure, and have not even a common economic importance.

The sea mussel (*Mytilus edulis*) belongs to the second order of the class *Lamellibranchia* (*q.v.*), namely the Filibranchia, distinguished by the comparatively free condition of the gill-filaments, which, whilst adhering to one another to form gill-plates, are yet not fused to one another by concrescence. It is also remarkable for the small size of its foot and the large development of two glands in the foot—the byssus-forming and the byssus-cementing glands. The byssus is a collection of horny threads by which the sea mussel (like many other Lamellibranch or bivalve molluscs) fixes itself to stones, rocks or submerged wood, but is not a permanent means of attachment, since it can be discarded by the animal, which, after a certain amount of locomotion, again fixes itself by new secretion of byssus from the foot. Such movement is more frequent in young mussels than in the full-grown. *Mytilus* possesses no siphonal tube-like productions of the margin of the mantle-skirt, nor any notching of the same, representative of the siphons which are found in its fresh-water ally, the *Dreissensia polymorpha*.

Mytilus edulis is an exceedingly abundant and widely distributed form. It occurs on both sides of the northern Atlantic and in the Mediterranean basin. It presents varieties of form and colour according to the depth of water and other circumstances of its habitat. Usually it is found on the British coast encrusting rocks exposed at low tides, or on the flat surfaces formed by sandbanks overlying clay, the latter kind of colonies being known locally as "scalps." Under these conditions it forms continuous masses of individuals closely packed together, sometimes extending over many acres of surface and numbering millions. The readiness with which the young *Mytilus* attaches itself to wicker-work is made the means of artificially cultivating and securing these molluscs for the market both in the Bay of Kiel in North Germany and at the mouth of the Somme and other spots on the coast of France.

Natural scalps are subject to extreme vicissitudes: an area of many acres may be destroyed by a local change of current producing a deposit of sand or shingle over the scalp, or by exposure to frost at low tide in winter, or by accumulation of decomposing vegetable matter. The chief localities of natural scalps on the British coast are Morecambe Bay in Lancashire and the flat eastern shores, especially that of the Wash of Lincoln, and similar shallow bays. These scalps are in some cases in the hands of private owners, and the Fisheries Department has made arrangements by which some local authorities, *e.g.* the corporation of Boston, can lease layings to individuals for the purpose of artificial cultivation.

The sea mussel is scarcely inferior in commercial value to the oyster. In 1873 the value of mussels exported from Antwerp alone to Paris to be used as human food was £280,000. In Britain their chief consumption is in the deep-sea line fishery, where they are held to be the most effective of all baits. Twenty-eight boats engaged in haddock-fishing at Eyemouth used between October 1882 and May 1883 920 tons of mussels (about 47,000,000 individuals), costing nearly £1800 to the fishermen, about one-half of which sum was expended on the carriage of the mussels. The quantity of mussels landed on Scottish coasts has decreased in recent years owing to the decline in the line fisheries. In 1896 the quantity was over 243,000 cwts., valued at £14,950; in 1902 it was only 95,663 cwts., valued at £5976. In the statistics for England and Wales mussels are not separately distinguished. Many thousand tons of mussels are wastefully employed as manure by the farmers on lands adjoining scalp-producing coasts, as in Lancashire and Norfolk, three half-pence a bushel being the price quoted in such cases. It is a curious fact, illustrative of the ignorant procedure and arbitrary fashions of fisher-folk, that on the Atlantic seaboard of the United States the sea mussel, *Mytilus edulis*, though common, is not used as bait nor as food. Instead, the soft clam, *Mya arenaria*, a Lamellibranch not used by English or Norwegian fishermen, though abundant on their shores, is employed as bait by the fishermen to the extent of $1\frac{1}{4}$ million bushels per annum, valued at £120,000. At the mouth of the river Conway in North Wales the sea mussel is crushed in large quantities in order to extract pearls of an inferior quality which are occasionally found in these as in other Lamellibranch molluscs (Gwyn Jeffreys).

Mytilus edulis is considered of fair size for eating when it is 2 in. in length, which size is attained in three years after the spat or young mussel has fixed itself. Under favourable circumstances it will grow much larger than this, specimens being recorded of 9 in. in length. It is very tolerant of fresh water, fattening best, as does the oyster, in water of density 1014 (the density of the water of the North Sea being 1026). Experiments made by removing mussels from salt water to brackish, and finally to quite fresh water show that it is even more tolerant of fresh water than the oyster; of thirty mussels so transferred all were alive after fifteen days. *Mytilus edulis* is occasionally poisonous, owing to conditions not satisfactorily determined.

The fresh-water Mussels, *Anodonta cygnea*, *Unio pictorum*, and *Unio margaritiferus* belong to the order Eulamellibranchia of Lamellibranch Molluscs, in which the anterior and posterior adductor muscles are equally developed. An account of the anatomy of *Anodon* is given in the article LAMELLIBRANCHIA. *Unio* differs in no important point from *Anodonta* in internal structure. The family *Unionidae*, to which these genera belong, is of world-wide distribution, and its species occur only in ponds and rivers. A vast number of species arranged in several genera and sub-genera have been distinguished, but in the British Islands the three species above named are the only claimants to the title of "fresh-water mussel."

Anodonta cygnea, the Pond Mussel or Swan Mussel, appears to be entirely without economic importance. *Unio pictorum*, the common river mussel (Thames), appears to owe its name to the fact that the shells were used at one time for holding water-colour paints as now shells of this species and of the sea mussel are used for holding gold and silver paint sold by artists' colourmen, but it has no other economic value. *Unio margaritiferus*, the pearl mussel, was at one time of considerable importance as a source of pearls, and the pearl mussel fishery is to this day carried on under peculiar state regulations in Sweden and Saxony, and other parts of the continent. In Scotland and Ireland the pearl mussel fishery was also of importance, but has altogether dwindled into insignificance since the opening up of commercial intercourse with the East and with the islands of the Pacific Ocean, whence finer and more abundant pearls than those of *Unio margaritiferus* are derived.

In the last forty years of the 18th century pearls were exported from the Scotch fisheries to Paris to the value of £100,000; round pearls, the size of a pea, perfect in every respect, were worth £3 or £4. The pearl mussel was formerly used as bait in the Aberdeen cod fishery.

LITERATURE.—For an account of the anatomy of *Mytilus edulis* the reader is referred to the treatise by Sabatier on that subject (Paris, 1875). The essay by Charles Harding on *Molluscs used for Food or Bait*, published by the committee of the London International Fisheries Exhibition (1883), may be consulted as to the economic questions connected with the sea mussel. The development of this species is described by Wilson in *Fifth Ann. Rep. Scot. Fish. Board* (1887). (E. R. L.; J. T. C.)

MUSSELBURGH, a municipal and police burgh of Midlothian, Scotland, 5½ m. E. of Edinburgh by the North British railway. Pop. (1901), 11,711. The burgh, which stretches for a mile along the south shore of the Firth of Forth, is intersected by the Esk and embraces the village of Fisherrow on the left bank of the river. Its original name is said to have been Eskmouth, its present one being derived from a bed of mussels at the mouth of the river. While preserving most of the ancient features of its High Street, the town has tended to become a suburb of the capital, its fine beach and golf course hastening this development. The public buildings include the town-hall (dating from 1762 and altered in 1876), the tolbooth (1590), and the grammar school. Loretto School, one of the foremost public schools in Scotland, occupies the site of the chapel of Our Lady of Loretto, which was founded in 1534 by Thomas Duthie, a hermit from Mt Sinai. This was the favourite shrine of Mary of Guise, who betook herself hither at momentous crises in her history. The 1st earl of Hertford destroyed it in 1544, and after it was rebuilt the Reformers demolished it again, some of its stones being used in erecting the tolbooth. In the west end of the town is Pinkie House, formerly a seat of the abbot of Dunfermline, but transformed in 1613 by Lord Seton. It is a fine example of a Jacobean mansion, with a beautiful fountain in the middle of the court-yard. The painted gallery, with an elaborate ceiling, 100 ft. long, was utilized as a hospital after the battle of Pinkie in 1547. Prince Charles Edward slept in it the night following the fight at Prestonpans (1745). Near the tolbooth stands the market cross, a stone column with a unicorn on the top supporting the burgh arms. At the west end of High Street is a statue of David Macbeth Moir ("Delta," 1798–1851), Musselburgh's most famous son. The antiquity of the town is placed beyond doubt by the Roman bridge across the Esk and the Roman remains found in its vicinity. The chief bridge, which carries the high road from Edinburgh to Berwick, was built by John Rennie in 1807. The principal industries include paper-making, brewing, the making of nets and twine, bricks, tiles and pottery, tanning and oil-refining, besides saltworks and seed-crushing works. The fishery is confined to Fisherrow, where there is a good harbour. The Links are the scene every year of the Edinburgh race meetings and of those of the Royal Caledonian Hunt which are held every third year. Archery contests also take place at intervals under the auspices of the Royal Company of Archers. Most of the charitable institutions—for instance, the convalescent home, fever hospital, home for girls and Red House home—are situated at Inveresk, about 1½ m. up the Esk. About 1 m. south-east is the site of the battle of Pinkie, and 2½ m. south-east, on the verge of Haddingtonshire, is Carberry Hill, where Mary surrendered to the lords of the Congregation in 1567, the spot being still known as Queen Mary's Mount. Musselburgh joins with Leith and Portobello (the Leith Burghs) in returning one member to parliament.

MUSSET, LOUIS CHARLES ALFRED DE (1810–1857), French poet, play-writer and novelist, was born on the 11th of December 1810 in a house in the middle of old Paris, near the Hôtel Cluny. His father, Victor de Musset, who traced his descent back as far as 1140, held several ministerial posts of importance. He brought out an edition of J. J. Rousseau's works in 1821, and followed it soon after with a volume on the Genevan's life and writing. In Alfred de Musset's childhood there were various things which fostered his imaginative power. He and his brother Paul (born 1804, died 1880), who afterwards wrote a biography of Alfred, delighted in reading old romances together, and in assuming the characters of the heroes in those romances. But it was not until about 1826 that Musset gave any definite sign of the mental force which afterwards distinguished him. In the summer of 1827 he won the second prize (at the Collège Henri IV.) by an essay on "The Origin of our Feelings." In 1828, when Eugène Scribe, Joseph Duveyrier, who under the name of Mélesville, was a prolific playwriter and sometimes collaborator with Scribe, and others of note were in the habit of coming to Mme de Musset's house at Auteuil, where drawing-room plays and charades were constantly given, Musset, excited by this companionship, wrote his first poem. This, to judge from the extracts preserved, was neither better nor worse than much other work of clever boys who may or may not afterwards turn out to be possessed of genius. He took up the study of law, threw it over for that of medicine, which he could not endure, and ended by adopting no set profession. Shortly after his first attempt in verse he was taken by Paul Foucher to Victor Hugo's house, where he met such men as Alfred de Vigny, Prosper Mérimée, Charles Nodier and Sainte-Beuve. It was under Hugo's influence, no doubt, that he composed a play. The scene was laid in Spain, and some lines, showing a marked advance upon his first effort, are preserved. In 1828, when the war between the classical and the romantic school of literature was growing daily more serious and exciting, Musset had published some verses in a country newspaper, and boldly recited some of his work to Sainte-Beuve, who wrote of it to a friend, "There is amongst us a boy full of genius." At eighteen years old Musset produced a translation, with additions of his own, of De Quincey's "Opium-Eater." This was published by Mame, attracted no attention, and has been long out of print. His first original volume was published in 1829 under the name of *Contes d'Espagne et d'Italie*, had an immediate and striking success, provoked bitter opposition, and produced many unworthy imitations. This volume contained, along with far better and more important things, a fantastic parody in verse on certain productions of the romantic school, which made a deal of noise at the time. This was the famous "Ballade à la lune" with its recurring comparison of the moon shining above a steeple to the dot over an *i*. It was, to Musset's delight, taken quite seriously by many worthy folk.

In December 1830 Musset was just twenty years old, and was already conscious of that curious double existence within him so frequently symbolized in his plays—in Octave and Célio for instance (in *Les Caprices de Marianne*), who also stand for the two camps, the men of matter and the men of feeling—which he has elsewhere described as characteristic of his generation. At this date his piece the *Nuit vênitienne* was produced by Harel, manager of the Odéon. The exact causes of its failure might now be far to seek; unlucky stage accidents had something to do with it, but there seems reason to believe that there was a strongly organized opposition. However this may be, the result was disastrous to the French stage; for it put a complete damper on the one poet who, as he afterwards showed both in theoretical and in practical writings, had the fine insight which took in at a glance the merits and defects both of the classical and of the romantic schools. Thus he was strong and keen to weld together the merits of both schools in a new method which, but for the fact that there has been no successor to grasp the wand which its originator wielded, might well be called the school of Musset. The serious effect produced upon Musset by the failure of his *Nuit vênitienne* is curiously illustrative of his character. A man of greater strength and with equal belief in his own genius might have gone on appealing to the public until he compelled them to hear him. Musset gave up the attempt in disgust, and waited until the public were eager to hear him without any invitation on his part. In the case of his finest plays this did not happen until after his death; but long before that he was fully recognized as a poet of the first rank and as an extraordinary master of character and language in prose writing. In his complete disgust with the stage after the failure above referred to there was no doubt something of a not ignoble pride, but there was something also of weakness—of a kind of weakness out of which it must be said sprang some of his most exquisite work, some of the poems which could only have been written by a man who imagined himself the crushed victim of difficulties which were old enough in the experience of mankind, though for the moment new and strange to him.

Musset now belonged, in a not very whole-hearted fashion, to the "Cénacle," but the connexion came to an end in 1832. In 1833 he published the volume called *Un Spectacle dans un fauteuil*. One of the most striking pieces in this—"Namouna"—was written at the publisher's request to fill up some empty space; and this fact is noteworthy when taken in conjunction with the horror which Musset afterwards so often expressed of doing anything like writing "to order"—of writing, indeed, in any way or at any moment except when the inspiration or the fancy happened to seize him. The success of the volume seemed to be small in comparison with that of his *Contes d'Espagne*, but it led indirectly to Musset's being engaged as a contributor to the *Revue des deux mondes*. In this he published, in April 1833, *André del Sarto*, and he followed this six weeks later with *Les Caprices de Marianne*. This play afterwards took and holds rank as one of the classical pieces in the repertory of the *Théâtre Français*. After the retirement in 1887 from the stage of the brilliant actor Delaunay the piece dropped out of the Français repertory until it was replaced on the stage by M. Jules Claretie, administrator-general of the *Comédie Française*, on the 19th of January 1906. *Les Caprices de Marianne* affords a fine illustration of the method referred to above, a method of which Musset gave something like a definite explanation five years later. This explanation was also published in the *Revue des deux mondes*, and it set forth that the war between the classical and the romantic schools could never end in a definite victory for either school, nor was it desirable that it should so end. "It was time," Musset said, "for a third school which should unite the merits of each." And in *Les Caprices de Marianne* these merits are most curiously and happily combined. It has perhaps more of the Shakespearian quality—the quality of artfully mingling the terrible, the grotesque, and the high comedy tones—which exists more or less in all Musset's long and more serious plays, than is found in any other of these. The piece is called a comedy, and it owes this title to its extraordinary brilliance of dialogue, truth of characterization, and swiftness in action, under which there is ever latent a sense of impending fate. Many of the qualities indicated are found in others of Musset's dramatic works and notably in *On ne badine pas avec l'amour*, where the skill in insensibly preparing his hearers or readers through a succession of dazzling comedy scenes for the swift destruction of the end is very marked. But *Les Caprices de Marianne* is perhaps for this particular purpose of illustration the most compact and most typical of all.

The appearance of *Les Caprices de Marianne* in the *Revue* (1833) was followed by that of "Rolla," a symptom of the *maladie du siècle*. Rolla, for all the smack which is not to be denied of Wertherism, has yet a decided individuality. The poem was written at the beginning of Musset's *liaison* with George Sand, and in December 1833 Musset started on the unfortunate journey to Italy. It was well known that the rupture of what was for a time a most passionate attachment had a disastrous effect upon Musset, and brought out the weakest side of his moral character. He was at first absolutely and completely struck down by the blow. But it was not so well known until Paul de Musset pointed it out that the passion expressed in the *Nuit de décembre*, written about twelve months after the journey to Italy, referred not to George Sand but to another and quite a different woman. The story of the Italian journey and its results are told under the guise of fiction from two points of view in the two volumes called respectively *Elle et lui* by George Sand, and *Lui et elle* by Paul de Musset. As to the permanent effect on Alfred de Musset, whose irresponsible gaiety was killed by the breaking off of the connexion, there can be no doubt.

During Musset's absence in Italy *Fantasio* was published in the *Revue*, *Lorenzaccio* is said to have been written at Venice, and not long after his return *On ne badine pas avec l'amour* was written and published in the *Revue*. In 1835 he produced *Lucie*, *La Nuit de mai*, *La Quenouille de Barberine*, *Le Chandelier*, *La Loi sur la presse*, *La Nuit de décembre*, and *La Confession d'un enfant du siècle*, wherein is contained what is probably a true account of Musset's relations with George Sand. The *Confession* is exceptionally interesting as exhibiting the poet's frame of mind at the time, and the approach to a revulsion from the Bonapartist ideas amid which he had been brought up in his childhood. To the supreme power of Napoleon he in this work attributed that moral sickness of the time which he described. "One man," he wrote, "absorbed the whole life of Europe; the rest of the human race struggled to fill their lungs with the air that he had breathed." When the emperor fell, "a ruined world was a resting-place for a generation weighted with care." The *Confession* is further important, apart from its high literary merit, as exhibiting in many passages the poet's tendency to shun or wildly protest against all that is disagreeable or difficult in human life—a tendency to which, however, much of his finest work was due. To 1836 belong the *Nuit d'août*, the *Lettre à Lamartine*, the *Stances à la Malibran*, the comedy *Il ne faut jurer de rien*, and the beginning of the brilliant letters of Dupuis and Cotonet on romanticism. *Il ne faut jurer de rien* is as typical of Musset's comedy work as is *Les Caprices de Marianne* of the work in which a terrible fatality underlies the brilliant dialogue and keen polished characterization. In 1837 was published *Un Caprice*, which afterwards found its way to the Paris stage by a curious road. Mme Allan-Despréaux, the actress, heard of it in St Petersburg as a Russian piece. On asking for a French translation of the play she received the volume *Comédies et proverbes* reprinted from the *Revue des deux mondes*. In 1837 appeared also some of the *Nouvelles*. In 1839 Musset began a romance called *Le Poète déchu*, of which the existing fragments are full of passion and insight. In 1840 he passed through a period of feeling that the public did not recognize his genius—as, indeed, they did not—and wrote a very short but very striking series of reflections headed with the words "À trente ans," which Paul de Musset published in his *Life*. In 1841 there came out in the *Revue de Paris* Musset's "Le Rhin allemand," an answer to Becker's poem which appeared in the *Revue des deux mondes*. This fine war-song made a great deal of noise, and brought to the poet quantities of challenges from German officers. Between this date and 1845 he wrote comparatively little. In the last named year the charming "proverbe" *Il faut qu'une porte soit ouverte ou fermée* appeared. In 1847

Un Caprice was produced at the Théâtre Français, and the employment in it of such a word as "rebonsoir" shocked some of the old school. But the success of the piece was immediate and marked. It increased Musset's reputation with the public in a degree out of proportion to its intrinsic importance; and indeed freed him from the burden of depression caused by want of appreciation. In 1848 *Il ne faut jurer de rien* was played at the Théâtre Français and the *Chandelier* at the Théâtre Historique. Between this date and 1851 *Bettine* was produced on the stage and *Carmosine* written; and between this time and the date of his death, from an affection of the heart, on the 2nd of May 1857, the poet produced no large work of importance.

Alfred de Musset now holds the place which Sainte-Beuve first accorded, then denied, and then again accorded to him—as a poet of the first rank. He had genius, though not genius of that strongest kind which its possessor can always keep in check. His own character worked both for and against his success as a writer. He inspired a strong personal affection in his contemporaries. His very weakness and his own consciousness of it produced such beautiful work as, to take one instance, the *Nuit d'octobre*. His *Nouvelles* are extraordinarily brilliant; his poems are charged with passion, fancy and fine satiric power; in his plays he hit upon a method of his own, in which no one has dared or availed to follow him with any closeness. He was one of the first, most original, and in the end most successful of the first-rate writers included in the phrase "the 1830 period." The wilder side of his life has probably been exaggerated; and his brother Paul de Musset has given in his *Biographie* a striking testimony to the finer side of his character. In the later years of his life Musset was elected, not without opposition, a member of the French Academy. Besides the works above referred to, the *Nouvelles et contes* and the *Œuvres posthumes*, in which there is much of interest concerning the great tragic actress Rachel, should be specially mentioned.

The biography of Alfred de Musset by his brother Paul, partial as it naturally is, is of great value. Alfred de Musset has afforded matter for many appreciations, and among these in English may be mentioned the sketch (1890) of C. F. Oliphant and the essay (1855) of F. T. Palgrave. See also the monograph by Arvède Barine (Madame Vincens) in the "Grands écrivains français" series. Musset's correspondence with George Sand was published intact for the first time in 1904.

A monument to Alfred de Musset by Antonin Mercié, presented by M. Osiris, and erected on the Place du Théâtre Français, was duly "inaugurated" on the 24th of February 1906. The ceremony took place in the vestibule of the theatre, where speeches were delivered by Jules Claretie, François Coppée and others, and Mounet-Sully recited a poem, written for the occasion by Maurice Magre. (W. H. P.)

MUSSOORIE, or MASURI, a town and sanitarium of British India, in the Dehra Dun district of the United Provinces, about 6600 ft. above the sea. Pop. (1901), 6461, rising to 15,000 in the hot season. It stands on a ridge of one of the lower Himalayan ranges, amid beautiful mountain scenery, and forms with Naini Tal the chief summer resort for European residents in the plains of the United Provinces. The view from Mussoorie over the valley of the Dun and across the Siwalik hills to the plains is very beautiful, as also is the view towards the north, which is bounded by the peaks of the snowy range. Mussoorie practically forms one station with Landaur, the convalescent depot for European troops, 7362 ft. above the sea. Some distance off, on the road to Simla, is the cantonment of Chakrata, 7300 ft. It was formerly approached by road from Saharanpur in the plains, 58 m. distant, but in 1900 the railway was opened to Dehra, 21 m. by road. There are numerous schools for Europeans, including St George's college, the Philander-Smith institute, the Oak Grove school of the East Indian railway, and several Church of England and Roman Catholic institutions, together with a cathedral of the latter faith. The first brewery in India was established here in 1850. The town has botanical gardens, and is the summer headquarters of the Trigonometrical Survey.

MUSTAFA RESHID PASHA (1800–1858), Turkish statesman and diplomatist, was born at Constantinople in 1800. He entered the public service at an early age and rose rapidly, becoming ambassador at Paris in 1834 and in London 1836, minister for foreign affairs 1837, again ambassador in London 1838, and in Paris 1841. Appointed vali of Adrianople in 1843, he returned as ambassador to Paris in the same year. Between 1845 and 1857 he was six times grand vizier. One of the greatest and most brilliant statesmen of his time, thoroughly acquainted with European politics, and well versed in affairs, he was a convinced if somewhat too ardent partisan of reform and the principal author of the legislative remodelling of Turkish administrative methods known as the Tanzimat. His ability was recognized alike by friend and by foe. In the settlement of the Egyptian question in 1840, and during the Crimean War and the ensuing peace negotiations, he rendered valuable services to the state.

MUSTANG, the wild or semi-wild horse of the prairies of America, the descendant of the horses imported by the Spaniards after the conquest in the 16th century (see HORSE). The word appears to be due to two Spanish words, *mestrenco*, or *mostrenco*, defined by Minsheu (1599) as "a strayer." *Mestrenco* (now *mesteno*) means "wild, having no master," and appears to be derived from *mesta*, a grazier-association, which among other functions appropriated any wild cattle found with the herds.

MUSTARD. The varieties of mustard-seed of commerce are produced from several species of the genus *Brassica* (a member of the natural order Cruciferae). Of these the principal are the black or brown mustard, *Brassica nigra* (*Sinapis nigra*), the white mustard, *Brassica alba*, and the Sarepta mustard, *B. juncea*. Both the white and black mustards are cultivated to some extent in various parts of England. The white is to be found in every garden as a salad plant; but it has come into increasing favour as a forage crop for sheep, and as a green manure, for which purpose it is ploughed down when about to come into flower. The black mustard is grown solely for its seeds, which yield the well-known condiment. The name of the condiment was in French *moustarde*, mod. *moutarde*, as being made of the seeds of the plant pounded and mixed with must (Lat. *mustum*, *i.e.* unfermented wine).[1] The word was thus transferred to the plant itself. When white mustard is cultivated for its herbage it is sown usually in July or August, after some early crop has been removed. The land being brought into a fine tilth, the seed, at the rate of 12 ℔ per acre, is sown broadcast, and covered in the way recommended for clover seeds. In about six weeks it is ready either for feeding off by sheep or for ploughing down as a preparative for wheat or barley. White mustard is not fastidious in regard to soil. When grown for a seed crop it is treated in the way about to be described for the other variety. For this purpose either kind requires a fertile soil, as it is an exhausting crop. The seed is sown in April, is once hoed in May, and requires no further culture. As soon as the pods have assumed a brown colour the crop is reaped and laid down in handfuls, which lie until dry enough for thrashing or stacking. In removing it from the ground it must be handled with great care, and carried to the thrashing-floor or stack on cloths, to avoid the loss of seed. The price depends much on its being saved in dry weather, as the quality suffers much from wet. This great evil attends its growth, that the seeds which are unavoidably shed in harvesting the crop remain in the soil, and stock it permanently with what proves a pestilent weed amongst future crops.

White mustard is used as a small salad—generally accompanied by garden cress—while still in the seed leaf. To keep up a supply the seed should be sown every week or ten days. The sowings in the open ground may be made from March till October, earlier or later according to the season. The ground should be light and rich, and the situation warm and sheltered. Sow thickly in rows 6 in. apart, and slightly cover the seed, pressing the surface smooth with the back of the spade. When gathering the crop, cut the young plants off even with the ground, or pull them up and cut off the roots, beginning at one end of a row. From October to March the seeds should be sown thickly in shallow boxes and placed in a warm house or frame, with a temperature not below 65°.

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[1] There were two kinds of *mustum*, one the best for keeping, produced after the first treading of the grapes, and called *mustum lixivum*; the other, *mustum tortivum*, obtained from the mass of trodden grapes by the wine-press, was used for inferior purposes.

Brassica nigra occurs as a weed in waste and cultivated ground throughout England and the south of Scotland, but is a doubtful native. It is a large branching annual 2 to 3 ft. high with stiff, rather rough, stem and branches, dark green leaves ranging from lyrate below to lanceolate above, short racemes of small bright yellow flowers one-third of an inch in diameter and narrow smooth pods. *B. alba* is more restricted to cultivated ground and has still less claim to be considered a native of Great Britain; it is distinguished from black mustard by its smaller size, larger flowers and seeds, and spreading rough hairy pods with a long curved beak.

The peculiar pungency and odour to which mustard owes much of its value are due to an essential oil developed by the action of water on two peculiar chemical substances contained in the black seed. These bodies are a glucoside termed by its discoverers myronate of potassium, but since called sinigrin, $C_{10}H_{18}KNS_2O_{10}$, and an albuminoid body, myrosin. The latter substance in presence of water acts as a ferment on sinigrin, splitting it up into the essential oil of mustard, a potassium salt, and sugar. It is worthy of remark that this reaction does not take place in presence of boiling water, and therefore it is not proper to use very hot water (above 120° F.) in the preparation of mustard. The explanation is that myrosin is decomposed by water above this temperature. Essential oil of mustard is in chemical constitution an isothiocyanate of allyl C_3H_5NCS. It is prepared artificially by a process; discovered by Zinzin, which consists in treating bromide of allyl with thiocyanate of ammonium and distilling the resultant thiocyanate of allyl. The seed of white mustard contains in place of sinigrin a peculiar glucoside called sinalbin, $C_{30}H_{44}N_2S_2O_{16}$, in several aspects analogous to sinigrin. In presence of water it is acted upon by myrosin, present also in white mustard, splitting it up into acrinyl isothiocyanate, sulphate of sinapin and glucose. The first of these is a powerful rubefacient, whence white mustard, although yielding no volatile oil, forms a valuable material for plasters. The seeds of *Brassica juncea* have the same constitution and properties as black mustard, as a substitute for which they are extensively cultivated in southern Russia; the plant is also cultivated abundantly in India.

Both as a table condiment and as a medicinal substance, mustard has been known from a very remote period. Under the name of *νᾶπυ* it was used by Hippocrates in medicine. The form in which table mustard is now sold in the United Kingdom dates from 1720, about which time Mrs Clements of Durham hit on the idea of grinding the seed in a mill and sifting the flour from the husk. The bright yellow farina thereby produced under the name of "Durham mustard" pleased the taste of George I., and rapidly attained wide popularity. As it is now prepared mustard consists essentially of a mixture of black and white farina in certain proportions. Several grades of pure mustard are made containing nothing but the farina of mustard-seed, the lower qualities having larger amounts of the white cheaper mustard; and corresponding grades of a mixed preparation of equal price, but containing certain proportions of wheaten or starch flour, are also prepared and sold as "mustard condiment." The mixture is free from the unmitigated bitterness and sharpness of flavour of pure mustard, and it keeps much better.

The volatile oil distilled from black mustard seeds after maceration with water is official in the British Pharmacopeia under the title *Oleum sinapis volatile*. It is a yellowish or colourless pungent liquid, soluble only in about fifty parts of water, but readily so in ether and in alcohol. From it is prepared, with camphor, castor oil and alcohol, the *linimentum sinapis*. The official *sinapis* consists of black and white mustard seeds powdered and mixed. The advantage of mixture depends upon the fact that the white mustard seeds have an excess of the ferment myrosin, and the black, whilst somewhat deficient in myrosin, yield a volatile body as compared with the fixed product of the white mustard seeds. From this mixture is prepared the *charta sinapis*, which consists of cartridge paper covered with a mixture of the powder and the *liquor caoutchouc*, the fixed oil having first been removed by benzol, thus rendering the glucoside capable of being more easily decomposed by the ferment.

Used internally as a condiment, mustard stimulates the salivary but not the gastric secretions. It increases the peristaltic movements of the stomach very markedly. One drachm to half an ounce of mustard in a tumblerful of warm water is an efficient emetic, acting directly upon the gastric sensory nerves, long before any of the drug could be absorbed so as to reach the emetic centre in the medulla oblongata. The heart and respiration are reflexly stimulated, mustard being thus *the only stimulant emetic*. Some few other emetics act without any appreciable depression, but in cases of poisoning with respiratory or cardiac failure mustard should never be forgotten. In contrast to this may be mentioned, amongst the external therapeutic applications of mustard, its frequent power of relieving vomiting when locally applied to the epigastrium.

The uses of mustard leaves in the treatment of local pains are well known. When a marked counter-irritant action is needed, mustard is often preferable to cantharides in being more manageable and in causing a less degree of vesication; but the cutaneous damage done by mustard usually takes longer to heal. A mustard sitz bath will often hasten and alleviate the initial stage of menstruation, and is sometimes used to expedite the appearance of the eruption in measles and scarlatina. The domestic remedy of hot water and mustard for children's feet in cases of cold or threatened cold may be of some use in drawing the blood to the surface and thus tending to prevent an excessive vascular dilatation in the nose or bronchi. The proportion of an ounce of mustard to a gallon of water is a fair one and easily remembered. But by far the most important therapeutic application of mustard is as a unique emetic.

MUSTARD OILS, organic chemical compounds of general formula $R\cdot NCS$. They may be prepared by the action of carbon bisulphide on primary amines in alcoholic or ethereal solution, the alkyl dithio-carbamic compounds formed being then precipitated with mercuric chloride, and the mercuric salts heated in aqueous solution,

$$2R\cdot NH_2 \xrightarrow{CS_2} CS\begin{matrix}\diagup NHR\\ \diagdown S\cdot NH_3R\end{matrix} \xrightarrow{HgCl_2} [RHNCS_2]_2Hg \longrightarrow HgS+H_2S+2RNCS;$$

or the isocyanic esters may be heated with phosphorus pentasulphide (A. Michael and G. Palmer, *Amer. Chem. Jour., 1884*, 6, 257). They are colourless liquids with a very pungent irritating odour. They are readily oxidized, with production of the corresponding amine. Nascent hydrogen converts them into the amine, with simultaneous formation of thio-formaldehyde, $RNCS+4H=R\cdot NH_2+HCSH$. When heated with acids to 100° C, they decompose with formation of the amine and liberation of carbon bisulphide and sulphuretted hydrogen. They combine directly with alcohols, mercaptans, ammonia, amines and with aldehyde ammonia.

Methyl mustard oil, CH_3NCS, melts at 35° C. and boils at 119° C. *Allyl mustard oil*, C_3H_5NCS, is the principal constituent of the ordinary mustard oil obtained on distilling black mustard seeds. These seeds contain potassium myronate ($C_{10}H_{18}NS_2O_{10}K$) which in presence of water is hydrolysed by the myrosin present in the seed;

$$C_{10}H_{18}NS_2O_{10}K=C_6H_{12}O_6+KHSO_4+C_3H_5NCS.$$

It may also be prepared by heating allyl sulphide with potassium sulphocyanide. It is a colourless liquid boiling at 150·7° C. It combines directly with potassium bisulphite. *Phenyl mustard oil*, C_6H_5NCS, is obtained by boiling sulphocarbanilide with concentrated hydrochloric acid, some triphenylguanidine being formed at the same time. It is a colourless liquid boiling at 222° C. When heated with copper powder it yields benzonitrile.

MUSTER (Mid. Eng. *mostre*, *moustre*, adapted from the similar O. Fr. forms; Lat. *monstrare*), originally an exhibition, show, review, an exhibition of strength, prowess or power. One of the meanings of this common Romanic word, viz. pattern, sample, is only used in commercial usage in English (*e.g.* in the cutlery trade), but it has passed into Teutonic languages, Ger. *Muster*, Du. *mouster*. The most general meaning is for the assembling of soldiers and sailors for inspection and review, and more particularly for the ascertainment and verification of the numbers on the roll. This use is seen in the Med. Lat. *monstrum* and *monstratio*, "*recensio militum*" (Du Cange, *Gloss. s.v.*). In the "enlistment" system of army organization during the 16th and 17th centuries, and later in certain special survivals, each regiment was "enlisted" by its colonel and reviewed by special officers, "muster-masters," who vouched for the members on the pay roll of the regiment representing its actual strength. This was a necessary precaution in the days when it was in the power of the commander of a unit to fill the muster roll with the names of fictitious men, known in the military slang of France and England as *passe-volants* and "faggots" respectively. The chief officer at headquarters was the muster-master-general, later commissary general of musters. In the United States the term is still commonly used, and a soldier is "mustered out" when he is officially discharged from military service.

MUSURUS, MARCUS (*c.* 1470–1517), Greek scholar, was born at Rhithymna (*Retimo*) in Crete. At an early age he became a pupil of John Lascaris at Venice. In 1505 he was made professor of Greek at Padua, but when the university was closed in 1509 during the war of the league of Cambrai he returned to Venice, where he filled a similar post. In 1516 he was summoned to Rome by Leo X., who appointed him archbishop of Monemvasia (*Malvasia*) in the Peloponnese, but he died before he left Italy. Since 1493 Musurus had been associated with the famous printer Aldus Manutius, and belonged to the "Neacademia," a society founded by Manutius and other learned men for the promotion of Greek studies. Many of the Aldine classics were brought out under Musurus's supervision, and he is credited with the first editions of the scholia of Aristophanes (1498), Athenaeus (1514), Hesychius (1514), Pausanias (1516).

See R. Menge's *De M. Musuri vita studiis ingenio*, in vol. 5 of M. Schmidt's edition of Hesychius (1868).

MUTE (Lat. *mutus*, dumb), silent or incapable of speech. For the human physical incapacity see Deaf and Dumb. In phonetics (*q.v.*) a "mute" letter is one which (like *p* or *g*) represents no individual sound. The name of "mutes" is given, for obvious reasons, to the undertaker's assistants at a funeral. In music a "mute" (Ital. *sordino*, from Lat. *surdus*, deaf) is a device for deadening the sound in an instrument by checking its vibrations. Its use is marked by the sign *c.s.* (*con sordino*), and its cessation by *s.s.* (*senza sordino*). In the case of the violin and other stringed instruments this object is attained by the use of a piece of brass, wood or ivory, so shaped as to fit on the bridge without touching the strings and hold it so tightly as to deaden or muffle the vibrations. In the case of brass wind instruments a leather, wooden or papier mâché pad in the shape of a pear with a hole through it is placed in the bell of the instrument, by which the passage of the sound is impeded. The interference with the pitch of the instruments has led to the invention of elaborately constructed mutes. Players on the horn and trumpet frequently use the left hand as a mute. Drums are muted or "muffled" either by the pressure of the hand on the head, or by covering with cloth. In the side drum this is effected by the insertion of pieces of cloth between the membrane and the "snares," or by loosening the "snares." The muting of a pianoforte is obtained by the use of the soft-pedal.

MUTIAN, KONRAD (1471–1526), German humanist, was born in Homberg on the 15th of October 1471 of well-to-do parents named Mut, and was subsequently known as Konrad Mutianus Rufus, from his red hair. At Deventer under Alexander Hegius he had Erasmus as schoolfellow; proceeding (1486) to the university of Erfurt, he took the master's degree in 1492. From 1495 he travelled in Italy, taking the doctor's degree in canon law at Bologna. Returning in 1502, the landgraf of Hesse promoted him to high office. The post was not congenial; he resigned it (1503) for a small salary as canonicus in Gotha. Mutian was a man of great influence in a select circle especially connected with the university of Erfurt, and known as the *Mutianischer Bund*, which included Eoban Hess, Crotus Rubeanus, Justus Jonas and other leaders of independent thought. He had no public ambition; except in correspondence, and as an epigrammatist, he was no writer, but he furnished ideas to those who wrote. He may deserve the title which has been given him as "precursor of the Reformation," in so far as he desired the reform of the Church, but not the establishment of a rival. Like Erasmus, he was with Luther in his early stage, but deserted him in his later development. Though he had personally no hand in it, the *Epistolae obscurorum virorum* (due especially to Crotus Rubeanus) was the outcome of the Reuchlinists in his *Bund*. He died at Gotha on the 30th of March (Good Friday) 1526.

See F. W. Kampschulte, *Die Universität Erfurt* (1858–1860); C. Krause, *Eobanus Hessus* (1879); L. Geiger, in *Allgemeine Deutsche Biog.* (1886); C. Krause, *Der Briefwechsel des Mutianus Rufus* (1885); another collection by K. Gillert (1890). (A. Go.*)

MUTILATION (from Lat. *mutilus*, maimed). The wounding, maiming and disfiguring of the body is a practice common among savages and systematically pursued by many entire races. The varieties of mutilation are as numerous as the instances of it are widespread. Nearly every part of the body is the object of mutilation, and nearly every motive common to human beings—vanity, religion, affection, prudence—has acted in giving rise to what has been proved to be a custom of great antiquity. Some forms, such as tattooing and depilation, have stayed on as practices even after civilization has banished the more brutal types; and a curious fact is that analogous mutilations are found observed by races separated by vast distances, and proved to have had no relations with one another, at any rate in historic times. Ethnical mutilations have in certain races a great sociological value. It is only after submission to some such operation that the youth is admitted to full tribal rights (see Initiation). Tattooing, too, has a semi-religious importance, as when an individual bears a representation of his totem on his body; and many mutilations are tribe marks, or brands used to know slaves.

Mutilations may be divided into: (1) those of the skin; (2) of the face and head; (3) of the body and limbs; (4) of the teeth; (5) of the sexual organs.

1. The principal form of skin-mutilation is tattooing (*q.v.*), the ethnical importance of which is very great. A practice almost as common is depilation, or removal of hair. This is either by means of the razor, *e.g.* in Japan, by depilatories, or by tearing out the hairs separately, as among most savage peoples. The parts thus mutilated are usually the eyebrows, the face, the scalp and the pubic regions. Many African natives tear out all the body hair, some among them (*e.g.* the Bongos) using special pincers. Depilation is common, too, in the South Sea Islands. The Andaman islanders and the Botocudos of Brazil shave the body, using shell-edges and other primitive instruments.

2. Mutilations of the face and head are usually restricted to the lips, ears, nose and cheeks. The lips are simply perforated or distended to an extraordinary degree. The Botocudos insert disks of wood into the lower lip. Lip-mutilations are common in North America, too, on the Mackenzie river and among the Aleutians. In Africa they are frequently practised. The Manganja women pierce the upper lips and introduce small metal shields or rings. The Mittu women bore the lower lip and thrust a wooden peg through. In other tribes little sticks of rock crystal are pushed through, which jingle together as the wearer talks. The women of Senegal increase the natural thickness of the upper lip by pricking it repeatedly until it is permanently inflamed and swollen. The ear, and particularly the lobe, is almost universally mutilated, from the ear-rings of the civilized West to the wooden disks of the Botocudos. The only peoples who are said not to wear any form of ear ornament are the Andaman islanders, the Neddahs, the Bushmen, the Fuegians and certain tribes of Sumatra. Ear mutilation in its most exaggerated form is practised in Indo-China by the Mois of Annam and the Penangs of Cambodia, and in Borneo by the Dyaks. They extend the lobe by the insertion of wooden disks, and by metal rings and weights, until it sometimes reaches the shoulder. In Africa and Asia earrings sometimes weigh nearly half a pound. Livingstone said that the natives of the Zambesi distend the perforation in the lobe to such a degree that the hand closed could be passed through. The Monbuttus thrust through a perforation in the body of the ear rolls of leaves, or of leather, or cigarettes. The Papuans, the inhabitants of the New Hebrides, and most Melanesian peoples carry all sorts of things in their ears, the New Caledonians using them as pipe-racks. Many races disfigure the nose with perforations. The young dandies of New Guinea bore holes through the septum and thrust through pieces of bone or flowers, a mutilation found, too, among New Zealanders, Australians, New Caledonians and other Polynesian races. In Africa the Bagas and Bongos hang metal rings and buckles on their noses; the Aleutians cords, bits of metal or amber. In women it is the side of the nose which is usually perforated; rings and jewelled pendants (as among Indian and Arabic women, the ancient Egyptians and Jews), or feathers, flowers, coral, &c. (as in Polynesia), being hung there. Only one side of the nose is usually perforated, and this is not always merely decorative. It may denote social position, as among the Ababdes in Africa, whose unmarried girls wear no rings in their noses. The male Kulus of the Himalaya wear a large ring in the left nostril. Malays and Polynesians sometimes deform the nose by enlarging its base, effecting this by compression of the nasal bones of the newly born.

The cheeks are not so frequently mutilated. The people of the Aleutian and Kurile Islands bore holes through their cheeks and place in them the long hairs from the muzzles of seals. The Guaranis of South America wear feathers in the same manner. In some countries the top of the head or the skin behind the ears of children is burnt to preserve them from sickness, traces of which mutilation are said to be discoverable on some neolithic skulls; while some African tribes cut and prick the neck close to the ear. By many peoples the deformation of the skull was anciently practised. Herodotus, Hippocrates and Strabo mention such a custom among peoples of the Caspian and Crimea. Later similar practices were found existing among Chinese mendicant sects, some tribes of Turkestan, the Japanese priesthood, in Malaysia, Sumatra, Java and the south seas. In Europe it was not unknown. But the discovery of America brought to our knowledge those races which made a fine art of skull-deformities. At the present day the custom is still observed by the Haidas and Chinooks, and by certain tribes of Peru and on the Amazon, by the Kurds of Armenia, by certain Malay peoples, in the Solomon Islands and the New Hebrides. The reasons for this type of mutilation are uncertain. Probably the idea of distinguishing themselves from lower races was predominant in most cases, as for example in that of the Chinook Indians, who deformed the skull to distinguish themselves from their slaves. Or it may have been through a desire to give a ferocious appearance to their warriors. The deformation was always done at infancy, and often in the case of both sexes. It was, however, more usually reserved for boys, and sometimes for a single caste, as at Tahiti. Different methods prevailed: by bands, bandages, boards, compresses of clay and sandbags, a continued pressure was applied to the half-formed cranial bones to give them the desired shape. Hand-kneading may also possibly have been employed.

3. Mutilations of the body or limbs by maiming, lopping off or deforming, are far from rare. Certain races (Bushmen, Kaffirs and Hottentots) cut off the finger joints as a sign of mourning, especially for parents. The Tongans do the same, in the belief that the evil spirits which bring diseases into the body would escape by the wound. Diseased children are thus mutilated by them. Contempt for female timidity has caused a curious custom among the Gallas (Africa). They amputate the mammae of boys soon after birth, believing no warrior can possibly be brave who possesses them. The fashion of distorting the feet of Chinese ladies of high rank has been of long continuance and only recently prohibited.

4. Mutilations of the teeth are among the most common and the most varied. They are by breaking, extracting, filing, inlaying or cutting away the crown of the teeth. Nearly every variety of dental mutilation is met with in Africa. In a tribe north-east of the Albert Nyanza it is usual to pry out with a piece of metal the four lower incisors in children of both sexes. The women of certain tribes on the Senegal force the growth of the upper incisors outwards so as to make them project beyond the lower lips. Many of the aboriginal tribes of Australia extract teeth, and at puberty the Australian boys have a tooth knocked out. The Eskimos of the Mackenzie River cut down the crown of the upper incisors so as not to resemble dogs. Some Malay races, too, are said to blacken their teeth because dogs have white teeth. This desire to be unlike animals seems to be at the bottom of many dental mutilations. Another reason is the wish to distinguish tribe from tribe. Thus some Papuans break their teeth in order to be unlike other Papuan tribes which they despise. In this way such practices become traditional. Finally, like many mutilations, those of the teeth are trials of endurance of physical pain, and take place at ceremonies of initiation and at puberty. The Mois (Stiengs) of Cochin-China break the two upper middle incisors with a flint. This is always ceremoniously done at puberty to the accompaniment of feasting and prayers for those mutilated, who will thus, it is thought, be preserved from sickness. Among Malay races the filing of teeth takes place with similar ceremony at puberty. In Java, Sumatra and Borneo the incisors are thinned down and shortened. Deep transverse grooves are also made with a file, a stone, bamboo or sand, and the teeth filed to a point. The Dyaks of Borneo make a small hole in the transverse groove and insert a pin of brass, which is hammered to a nail-head shape in the hollow, or they inlay the teeth with gold and other metals. The ancient Mexicans also inlaid the teeth with precious stones.

5. Mutilations of the sexual organs are more ethnically important than any. They have played a great part in human history, and still have much significance in many countries. Their antiquity is undoubtedly great, and nearly all originate with the idea of initiation into full sexual life. The most important, circumcision (*q.v.*), has been transformed into a religious rite. Infibulation (Lat. *fibula*, a clasp), or the attaching a ring, clasp, or buckle to the sexual organs, in females through the labia majora, in males through the prepuce, was an operation to preserve chastity very commonly practised in antiquity. At Rome it was in use; Strabo says it was prevalent in Arabia and in Egypt, and it is still native to those regions (Lane, *Modern Egyptians*, i. 73; *Arabic Lexicon*, *s.v.* "*hafada*"). Niebuhr heard that it was practised on both shores of the Persian Gulf and at Bagdad (*Description de l'Arabie*, p. 70). It is common in Africa (see Sir H. H. Johnston, *Kilimanjaro Expedition*, 1886), but is there often replaced by an operation which consists in stitching the labia majora together when the girl is four or five years old. Castration is practised in the East to supply guards for harems, and was employed in Italy until the time of Pope Leo XIII. to provide "soprani" for the papal choir; it has also been voluntarily submitted to from religious motives (see Eunuch). The operation has, however, been resorted to for other purposes. Thus in Africa it is said to have been used as a means of annihilating conquered tribes. The Hottentots and Bushmen, too, have the curious custom of removing one testicle when a boy is eight or nine years old, in the belief that this partial emasculation renders the victim fleeter of foot for the chase. The most dreadful of these mutilations is that practised by certain Australian tribes on their boys. It consists of cutting open and leaving exposed the whole length of the urethral canal and thus rendering sexual intercourse impossible. According to some authorities it is hatred of the white man and dread of slavery which are the reasons of this racial suicide. Among the Dyaks and in many of the Melanesian islands curious modes of ornamentation of the organs (such as the *kalang*) prevail, which are in the nature of mutilations.

Penal Use.—Mutilation as a method of punishment was common in the criminal law of many ancient nations. In the earliest laws of England mutilation, maiming and dismemberment had a prominent place. "Men branded on the forehead, without hands, feet, or tongues, lived as examples of the danger which attended the commission of petty crimes and as a warning to all churls" (Pike's *History of Crime in England*, 1873). The Danes were more severe than the Saxons. Under their rules eyes were plucked out; noses, ears and upper lips cut off; scalps town away; and sometimes the whole body flayed alive. The earliest forest-laws of which there is record are those of Canute (1016). Under these, if a freedman offered violence to a keeper of the king's deer he was liable to lose freedom and property; if a serf, he lost his right hand, and on a second offence was to die. One who killed a deer was either to have his eyes put out or lose his life. Under the first two Norman kings mutilation was the punishment for poaching. It was, however, not reserved for that, as during the reign of Henry I. some coiners were taken to Winchester, where their right hands were lopped off and they were castrated. Under the kings of the West Saxon dynasty the loss of hands had been a common penalty for coining (*The Obsolete Punishments of Shropshire*, by S. Meeson Morris). Morris quotes a case in John's reign at the Salop Assizes in 1203, where one Alice Crithecreche and others were accused of murdering an old woman at Lilleshall. Convicted of being accessory, Crithecreche was sentenced to death, but the penalty was altered to that of having her eyes plucked out. During the Tudor and Stuart periods mutilations were a common form of punishment extra-judicially inflicted by order of the privy council and the Star Chamber. There are said to be preserved at Playford Hall, Ipswich, instruments of Henry VIII.'s time for cutting off ears. This penalty appears to have been inflicted for not attending church. By an act of Henry VIII. (33 Hen. VIII. c. 12) the punishment for "striking in the king's court or house" was the loss of the right hand. For writing a tract on *The Monstrous Regimen of Women* a Nonconformist divine (Dr W. Stubbs) had his right hand lopped off. Among many cases of severe mutilations during Stuart times may be mentioned those of Prynne, Burton, Bastwick and Titus Oates.

MUTINY (from an old verb "mutine," O. Fr. *mutin, meutin*, a sedition; cf. mod. Fr. *émeute*; the original is the Late Lat. *mota*, commotion, from *movere*, to move), a resistance by force to recognized authority, an insurrection, especially applied to a sedition in any military or naval forces of the state. Such offences are dealt with by courts-martial. (See Military Law and Court Martial.)

MUTSU, MUNEMITSU, Count (1842–1896), Japanese statesman, was born in 1842 in Wakayama. A vehement opponent of "clan government"—that is, usurpation of administrative posts by men of two or three fiefs, an abuse which threatened to follow the overthrow of the Tokugawa *shogunate*—he conspired to assist Saigo's rebellion and was imprisoned from 1878 until 1883. While in prison he translated Bentham's *Utilitarianism*. In 1886, after a visit to Europe, he received a diplomatic appointment, and held the portfolio of foreign affairs during the China-Japan War (1894–95), being associated with Prince (then Count) Ito as peace plenipotentiary. He negotiated the first of the revised treaties (that with Great Britain), and for these various services he received the title of count. He died in Tōkyō in 1896. His statue in bronze stands before the foreign office in Tōkyō.

MUTSU HITO, Mikado, or Emperor, of Japan (1852–), was born on the 3rd of November 1852, succeeded his father, Osahito, the former emperor, in January 1867, and was crowned at Osaka on the 31st of October 1868. The country was then in a ferment owing to the concessions which had been granted to foreigners by the preceding shōgun Iyemochi, who in 1854 concluded a treaty with Commodore Perry by which it was agreed that certain ports should be open to foreign trade. This convention gave great offence to the more conservative daimios, and on their initiative the mikado suddenly decided to abolish the shogunate. This resolution was not carried out without strong opposition. The reigning shōgun, Keiki, yielded to the decree, but many of his followers were not so complaisant, and it was only by force of arms that the new order of things was imposed on the country. The main object of those who had advocated the change was to lead to a reversion to the primitive condition of affairs, when the will of the mikado was absolute and when the presence in Japan of the hated foreigner was unknown. But the reactionary party was not to be allowed to monopolize revolutions. To their surprise and discomfiture, the powerful daimios of Satsuma and Chōshū suddenly declared themselves to be in favour of opening the country to foreign intercourse, and of adopting many far-reaching reforms. With this movement Mutsu Hito was cordially in agreement, and of his own motion he invited the foreign representatives to an audience on the 23rd of March 1868. As Sir Harry Parkes, the British minister, was on his way to this assembly, he was attacked by a number of two-sworded samurai, who, but for his guard, would doubtless have succeeded in assassinating him. The outrage was regarded by the emperor and his ministers as a reflection on their honour, and they readily made all reparation within their power. While these agitations were afoot, the emperor, with his advisers, was maturing a political constitution which was to pave the way to the assumption by the emperor of direct personal rule. As a step in this direction, Mutsu Hito transferred his capital from Kiōtō to Yedo, the former seat of the shōguns' government, and marked the event by renaming the city Tōkyō, or Eastern Capital. In 1869 the emperor paid a visit to his old capital, and there took as his imperial consort a princess of the house of Ichijō. In the same year Mutsu Hito bound himself by oath to institute certain reforms, the first of which was the establishment of a deliberative assembly. In this onward movement he was supported by the majority of the daimios, who in a supreme moment of patriotism surrendered their estates and privileges to their sovereign. This was the death-knell of the feudalism which had existed for so many centuries in Japan, and gave Mutsu Hito the free hand which he desired. A centralized bureaucracy took the place of the old system, and the nation moved rapidly along the road of progress. Everything European was eagerly adopted, even down to frock-coats and patent-leather boots for the officials. Torture was abolished (1873), and a judicial code, adapted from the Code Napoléon, was authorized. The first railway—that from Yokohama to Tōkyō—was opened in 1872; the European calendar was adopted, and English was introduced into the curriculum of the common schools. In all these reforms Mutsu Hito took a leading part. But it was not to be expected that such sweeping changes could be effected without opposition, and thrice during the period between 1876 and 1884 the emperor had to face serious rebellious movements in the provinces. These he succeeded in suppressing; and even amid these preoccupations he managed to inflict a check on his huge neighbour, the empire of China. As the government of this state declared that it was incapable of punishing certain Formosan pirates for outrages committed on Japanese ships (1874), Mutsu Hito landed a force on the island, and, having inflicted chastisement on the bandits, remained in possession of certain districts until the compensation demanded from Peking was paid. The unparalleled advances which had been made by the government were now held by the emperor and his advisers to justify a demand for the revision of the foreign treaties, and negotiations were opened with this object. They failed, however, and the consequent disappointment gave rise to a strong reaction against everything foreign throughout the country. Foreigners were assaulted on the roads, and even the Russian cesarevich, afterwards the tsar Nicholas II., was attacked by would-be assassins in the streets of Tōkyō. A renewed attempt to revise the treaties in 1894 was more successful, and in that year Great Britain led the way by concluding a revised treaty with Japan. Other nations followed, and by 1901 all those obnoxious clauses suggestive of political inferiority had finally disappeared from the treaties. In the same year (1894) war broke out with China, and Mutsu Hito, in common with his subjects, showed the greatest zeal for the campaign. He reviewed the troops as they left the shores of Japan for Korea and Manchuria, and personally distributed rewards to those who had won distinction. In the war with Russia, 1904–5, the same was the case, and it was to the virtues of their emperor that his generals loyally ascribed the Japanese victories. In his wise patriotism, as in all matters, Mutsu Hito always placed himself in the van of his countrymen. He led them out of the trammels of feudalism; by his progressive rule he lived to see his country advanced to the first rank of nations; and he was the first Oriental sovereign to form an offensive and defensive alliance with a first-rate European power. In 1869 Mutsu Hito married Princess Haru, daughter of Ichijō Tadaka, a noble of the first rank. He has one son and several daughters, his heir-apparent being Yoshi Hito, who was born on the 31st of August 1879, and married in 1900 Princess Sada, daughter of Prince Kujō, by whom he had three sons before 1909. Mutsu Hito adopted the epithet of Meiji, or "Enlightened Peace," as the *nengo* or title of his reign. Thus the year 1901, according to the Japanese calendar, was the 34th year of Meiji.

MUTTRA, or MATHURA, a city and district of British India in the Agra division of the United Provinces. The city is on the right bank of the Jumna, 30 m. above Agra; it is an important railway junction. Pop. (1901), 60,042. It is an ancient town, mentioned by Fa Hien as a centre of Buddhism about A.D. 400; his successor Hsüan Tsang, about 650, states that it then contained twenty Buddhist monasteries and five Brahmanical temples. Muttra has suffered more from Mahommedan plunder than most towns of northern India. It was sacked by Mahmud of Ghazni in 1017–18; about 1500 Sultan Sikandar Lodi utterly destroyed all the Hindu shrines, temples and images; and in 1636 Shah Jahan appointed a governor expressly to "stamp out idolatry." In 1669–70 Aurangzeb visited the city and continued the work of destruction. Muttra was again captured and plundered by Ahmad Shah with 25,000 Afghan cavalry in 1756. The town still forms a great centre of Hindu devotion, and large numbers of pilgrims flock annually to the festivals. The special cult of Krishna with which the neighbourhood is associated seems to be of comparatively late date. Much of the prosperity of the town is due to the residence of a great family of seths or native bankers, who were conspicuously loyal during the Mutiny. Temples and bathing-stairs line the river bank. The majority are modern, but the mosque of Aurangzeb, on a lofty site, dates from 1669. Most of the public buildings are of white stone, handsomely carved. There are an American mission, a Roman Catholic church, a museum of antiquities, and a cantonment for a British cavalry regiment. Cotton, paper and pilgrims' charms are the chief articles of manufacture.

The DISTRICT OF MUTTRA has an area of 1445 sq. m. It consists of an irregular strip of territory lying on both sides of the Jumna. The general level is only broken at the south-western angle by low ranges of limestone hills. The eastern half consists for the most part of a rich upland plain, abundantly irrigated by wells, rivers and canals, while the western portion, though rich in mythological association and antiquarian remains, is comparatively unfavoured by nature. For eight months of the year the Jumna shrinks to the dimensions of a mere rivulet, meandering through a waste of sand. During the rains, however, it swells to a mighty stream, a mile or more in breadth. Formerly nearly the whole of Muttra consisted of pasture and woodland, but the roads constructed as relief works in 1837–1838 have thrown open many large tracts of country, and the task of reclamation has since proceeded rapidly. The population in 1901 was 763,099, showing an increase of 7 % in the decade. The principal crops are millets, pulse, cotton, wheat, barley and sugar cane. The famine of 1878 was severely felt. The eastern half of the district is watered by the Agra canal, which is navigable, and the western half by branches of the Ganges canal. A branch of the Rajputana railway, from Achnera to Hathras, crosses the district; the chord line of the East India, from Agra to Delhi, traverses it from north to south; and a new line, connecting with the Great Indian Peninsula, was opened in 1905.

The central portion of Muttra district forms one of the most sacred spots in Hindu mythology. A circuit of 84 kos around Gokul and Brindaban bears the name of the Braj-Mandal, and carries with it many associations of earliest Aryan times. Here Krishna and his brother Balarama fed their cattle upon the plain; and numerous relics of antiquity in the towns of Muttra, Gobardhan, Gokul, Mahaban and Brindaban still attest the sanctity with which this holy tract was invested. During the Buddhist period Muttra became a centre of the new faith. After the invasion of Mahmud of Ghazni the city fell into insignificance till the reign of Akbar; and thenceforward its history merges in that of the Jats of Bharatpur, until it again acquired separate individuality under Suraj Mal in the middle of the 18th century. The Bharatpur chiefs took an active part in the disturbances consequent on the declining power of the Mogul emperors, sometimes on the imperial side, and at others with the Mahrattas. The whole of Muttra passed under British rule in 1804.

See F. S. Growse, *Mathura* (Allahabad, 1883).

MUTULE (Lat. *mutulus*, a stay or bracket), in architecture the rectangular block under the soffit of the cornice of the Greek Doric temple, which is studded with *guttae*. It is supposed to represent the piece of timber through which the wooden pegs were driven in order to hold the rafter in position, and it follows the rake of the roof. In the Roman Doric order the mutule was horizontal, with sometimes a crowning fillet, so that it virtually fulfilled the purpose of the modillion in the Corinthian cornice.

MUZAFFAR-ED-DĪN, shah of Persia (1853–1907), the second son of Shah Nasr-ed-Dīn, was born on the 25th of March 1853. He was in due course declared *valī ahd*, or heir-apparent, and invested with the governorship of Azerbaijan, but on the assassination of his father in 1896 it was feared that his elder brother, Zill-es-Sultan, the governor of Isfahan, might prove a dangerous rival, especially when it was remembered that Muzaffar-ed-Dīn had been recalled to Teheran by his father upon his failure to suppress a Kurd rising in his province. The British and Russian governments, in order to avoid widespread disturbances, agreed however to give him their support. All opposition was thus obviated, and Muzaffar-ed-Dīn was duly enthroned on the 8th of June 1896, the Russian general Kosakowsky, commander of the Persian Cossacks, presiding over the ceremony with drawn sword. On this occasion the new shah announced the suppression of all purchase of civil and military posts, and then proceeded to remit in perpetuity all taxes on bread and meat, thus lightening the taxation on food, which had caused the only disturbances in the last reign. But whatever hopes may have been aroused by this auspicious beginning of the reign were soon dashed owing to the extravagance and profligacy of the court, which kept the treasury in a chronic state of depletion. Towards the end of 1896 the Amin-es-Sultan, who had been grand vizier during the last years of Nasr-ed-Dīn's reign, was disgraced, and Muzaffar-ed-Dīn announced his intention of being in future his own grand vizier. The Amin-ad-Dowla, a less masterful servant, took office with the lower title of prime minister. During his short administration an elaborate scheme of reforms was drawn up on paper, and remained on paper. The treasury continued empty, and in the spring of 1898 Amin-es-Sultan was recalled with the special object of filling it. The delay of the British government in sanctioning a loan in London gave Russia her opportunity. A Russian loan was followed by the establishment of a Russian bank at Teheran, and the vast expansion of Russian influence generally. At the beginning of 1900 a fresh gold loan was negotiated with Russia, and a few months later Muzaffar-ed-Dīn started on a tour in Europe by way of St Petersburg, where he was received with great state. He subsequently went to Paris to visit the Exhibition of 1900, and while there an attempt on his life was made by a madman named François Salson. In spite of this experience the shah so enjoyed his European tour that he determined to repeat it as soon as possible. By the end of 1901 his treasury was again empty; but a fresh Russian loan replenished it and in 1902 he again came to Europe, paying on this occasion a state visit to England. On his way back he stopped at St Petersburg, and at a banquet given in his honour by the tsar toasts were exchanged of unmistakable significance. None the less, during his visit to King Edward VII. the shah had been profuse in his expressions of friendship for Great Britain, and in the spring of 1903 a special mission was sent to Teheran to invest him with the Order of the Garter.

The shah's misguided policy had created widespread disaffection in the country, and the brunt of popular disfavour fell on the atabeg (the title by which the Amin-es-Sultan was now known), who was once more disgraced in September 1903. The war with Japan now relaxed the Russian pressure on Teheran, and at the same time dried up the source of supplies; and the clergy, giving voice to the general misery and discontent, grew more and more outspoken in their denunciations of the shah's misrule. Nevertheless Muzaffar-ed-Dīn defied public opinion by making another journey to Europe in 1905; but, though received with the customary distinction at St Petersburg, he failed to obtain further supplies. In the summer of 1906 popular discontent culminated in extraordinary demonstrations at Teheran, which practically amounted to a general strike. The shah was forced to yield, and proclaimed a liberal constitution, the first parliament being opened by him on the 12th of October 1906. Muzaffar-ed-Dīn died on the 8th of January 1907, being succeeded by his son Mahommed Ali Mirza.

MUZAFFARGARH, a town and district of British India, in the Multan division of the Punjab. The town is near the right bank of the river Chenab, and has a railway station. Pop. (1901), 4018. Its fort and a mosque were built by Nawab Muzaffar Khan in 1794–1796.

The DISTRICT OF MUZAFFARGARH occupies the lower end of the Sind-Sagar Doab. Area, 3635 sq. m. In the northern half of the district is the wild *thal* or central desert, an arid elevated tract with a width of 40 m. in the extreme north, which gradually contracts until it disappears about 10 m. south of Muzaffargarh town. Although apparently a table-land, it is really composed of separate sandhills, with intermediate valleys lying at a lower level than that of the Indus, and at times flooded. The towns stand on high sites or are protected by embankments; but the villages scattered over the lowlands are exposed to annual inundations, during which the people abandon their grass-built huts, and take refuge on wooden platforms attached to each house. Throughout the cold weather large herds of camels, belonging chiefly to the Povindah merchants of Afghanistan, graze upon the sandy waste.

The district possesses hardly any distinct annals of its own, having always formed part of Multan (*q.v.*). The population in 1901 was 405,656, showing an increase of 6·4% in the decade, due to the extension of irrigation. The principal crops are wheat, pulse, rice and indigo. The most important domestic animal is the camel. The district is crossed by the North-Western railway, and the boundary rivers are navigable, besides furnishing numerous irrigation channels, originally constructed under native rule.

MUZAFFARNAGAR, a town and district of British India, in the Meerut division of the United Provinces. The town is 790 ft. above the sea, and has a station on the North-Western railway. Pop. (1901), 23,444. It is an important trading centre and has a manufacture of blankets. It was founded about 1633 by the son of Muzaffar Khan, Khan-i-Jahan, one of the famous Sayid family who rose to power under the emperor Shah Jahan.

The DISTRICT OF MUZAFFARNAGAR has an area of 1666 sq. m. It lies near the northern extremity of the Doab or great alluvial plain between the Ganges and the Jumna, and shares to a large extent in the general monotony of that level region. A great portion is sandy and unfertile; but under irrigation the soil is rapidly improving, and in many places the villagers have succeeded in introducing a high state of cultivation. Before the opening of the canals Muzaffarnagar was liable to famines caused by drought; but the danger from this has been minimized by the spread of irrigation. It is traversed by four main canals, the Ganges, Anupshahr, Deoband and Eastern Jumna. Its trade is confined to the raw materials it produces. The climate of the district is comparatively cool, owing to the proximity of the hills; and the average annual rainfall is 33 in. The population in 1901 was 877,188, showing an increase of 13·5 % in the decade, which was a period of unexampled prosperity. The principal crops are wheat, pulse, cotton and sugar-cane. The district is crossed by the North-Western railway from Delhi to Saharanpur.

Hindu tradition represents Muzaffarnagar as having formed a portion of the Pandava kingdom of the *Mahābhārata*; authentic history, however, dates from the time of the Moslem conquests in the 13th century, from which time it remained a dependency of the various Mahommedan dynasties which ruled at Delhi until the practical downfall of the Mogul Empire in the middle of the 18th century. In 1788 the district fell into the hands of the Mahrattas. After the fall of Aligarh, the whole Doab as far north as the Siwalik hills passed into the hands of the British without a blow, and Muzaffarnagar became part of Saharanpur. It was created a separate jurisdiction in 1824. During the Mutiny there was some disorder, chiefly occasioned by official weakness, but no severe fighting.

See *Muzaffarnagar District Gazetteer* (Allahabad, 1903).

MUZAFFARPUR, a town and district of British India, in the Patna division of Bengal. The town is on the right bank of the Little Gandak river, and has a railway station. Pop. (1901), 45,617. The town is well laid out, and is an important centre of trade, being on the direct route from Patna to Nepal. It is the headquarters of the Behar Light Horse volunteer corps and has a college established in 1899.

The District of Muzaffarpur has an area of 3035 sq. m. It was formed in January 1875 out of the great district of Tirhoot, which up to that time was the largest and most populous district of Lower Bengal. The district is an alluvial plain between the Ganges and the Great Gandak, the Baghmat and Little Gandak being the principal rivers within it. South of the Little Gandak the land is somewhat elevated, with depressions containing lakes toward the south-east. North of the Baghmat the land is lower and marshy, but is traversed by elevated dry ridges. The tract between the two rivers is lowest of all and liable to floods. Pop. (1901), 2,754,790, showing an increase of 1·5 % in the decade. Average density, 914 per sq. m., being exceeded in all India only by the neighbouring district of Saran. Indigo (superseded to some extent, owing to the fall in price, by sugar) and opium are largely grown. Rice is the chief grain crop, and cloth, carpets and pottery are manufactured. The district is traversed in several directions by the Tirhoot system of the Bengal and North-Western railway. It suffered from drought in 1873–1874, and again in 1897–1898.

See *Muzaffarpur District Gazetteer* (Calcutta, 1907).

MUZIANO, GIROLAMO (1528–1592), Italian painter, was born at Acquafredda, near Brescia, in 1528. Under Romanino, an imitator of Titian, he studied his art, designing and colouring according to the principles of the Venetian school. But it was not until he had left his native place, still in early youth, and had repaired to Rome about 1550, that he came into notice. There his pictures soon gained for him the surname of *Il Giovane de' paesi* (the young man of the landscapes); chestnut-trees are predominant in these works. He next tried the more elevated style of historical painting. He imitated Michelangelo in giving great prominence to the anatomy of his figures, and became fond of painting persons emaciated by abstinence or even disease. His great picture of the "Resurrection of Lazarus" at once established his fame. Michelangelo praised it, and pronounced its author one of the first artists of that age. It was placed in the church of Santa Maria Maggiore, but was afterwards transferred to the Quirinal Palace. Muziano, with dogged perseverance (at one time he shaved his head, so as not to be tempted to go out of doors), continued to proceed in the path on which he had entered. He grew excellent in depicting foreign and military costumes, and in introducing landscapes into his historical pieces after the manner of Titian. Mosaic working also occupied his attention while he was employed as superintendent at the Vatican; and it became under his hands a perfect imitation of painting. His ability and industry soon gained for him a handsome fortune. Part of this he expended in assisting to found the Academy of St Luke in Rome. He died in 1592, and was buried in the church of Santa Maria Maggiore.

Many of Muziano's works are in the churches and palaces of Rome; he also worked in Orvieto and Loreto. In Santa Maria degli Angeli, Rome, is one of his chief works, "St Jerome preaching to Monks in the Desert"; his "Circumcision" is in the church of the Gesù, his "Ascension" in the Araceli, and his "St Francis receiving the Stigmata" in the church of the Conception. A picture by him, representing Christ washing the feet of His disciples, is in the cathedral of Reims.

MUZZIOLI, GIOVANNI (1854–1894), Italian painter, was born in Modena, whither his family had removed from Castelvetro, on the 10th of February 1854. From the time that he began to attend the local academy at the age of thirteen he was recognized as a prodigy, and four years later, by the unanimous vote of the judges, he gained the Poletti scholarship entitling him to four years' residence in Rome and Florence. After his return to Modena, Muzzioli visited the Paris Exhibition, and there came under the influence of Sir L. Alma Tadema. His first important picture was "In the Temple of Bacchus" (1881); and his masterpiece, "The Funeral of Britannicus," was one of the chief successes of the Bologna Exhibition of 1888. From 1878 to his death (August 5, 1894) Muzzioli lived in Florence, where he painted the altar-piece for the church of Castelvetro.

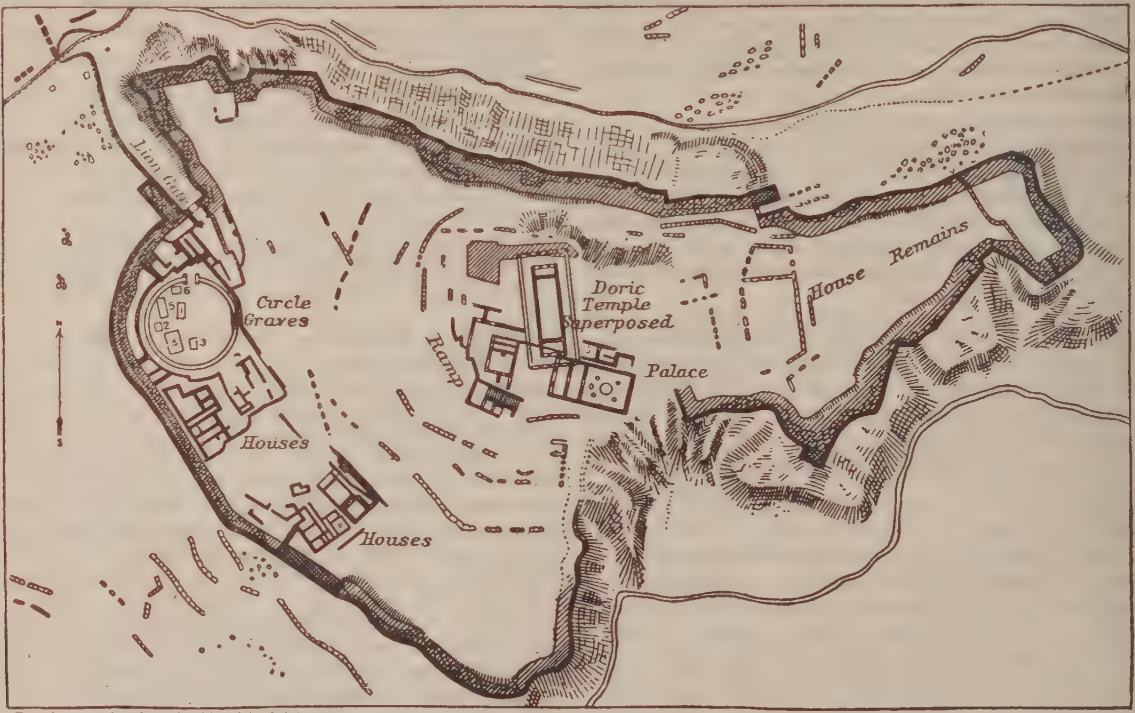
See *History of Modern Italian Art*, by A. R. Willard (London, 1898).

MWERU, a large lake of Eastern Central Africa, traversed by the Luapula or upper Congo. It lies 3000 ft. above the sea; measures about 76 m. in length by some 25 in breadth, and is roughly rectangular, the axis running from S.S.W. to N.N.E. It is cut a little south of its centre by 9° S. and through its N.E. corner passes 29° E. At the south end a shallow bay extends to 9° 31′ S. East of this, and some miles further north, the Luapula enters from a vast marsh inundated at high water; it leaves the lake at the north-west corner, making a sharp bend to the west before assuming a northerly direction. Besides the Luapula, the principal influent is the Kalungwizi, from the east. Near the south end of the lake lies the island of Kilwa, about 8 m. in length, rising into plateaus 600 ft. above the lake. Here the air is cool and balmy, the soil dry, with short turf and clumps of shady trees, affording every requirement for a sanatorium. Mweru was reached by David Livingstone in 1867, but its western shore was first explored in 1890 by Sir Alfred Sharpe, who two years later effected its circumnavigation. The eastern shores from the Luapula entrance to its exit, together with Kilwa Island, belong to British Central Africa; the western to the Belgian Congo.

MYAUNGMYA, a district in the Irrawaddy division of lower Burma, formed in 1893 out of a portion of Bassein district, and reconstituted in 1903. It has an area of 2663 sq. m., and a population (1901) of 278,119, showing an increase of 49% in the decade and a density of 104 inhabitants to the square mile. Among the population were about 12,800 Christians, mostly Karens. The district is a deltaic tract, bordering south on the sea and traversed by many tidal creeks. Rice cultivation and fishing occupy practically all the inhabitants of the district. The town of Myaungmya had 4711 inhabitants in 1901.

MYCENAE, one of the most ancient cities of Greece, was situated on a hill above the northern extremity of the fertile Argive plain—μύχῳ Ἄργεος ἱπποβότοιο. Its situation is exceedingly strong, and it commands all the roads leading from Corinth and Achaea into the Argive plain. The walls of Mycenae are the greatest monument that remains of the Heroic age in Greece; part of them is similar in style and doubtless contemporary in date with the walls of the neighbouring town Tiryns. There can therefore be little doubt that the two towns were the strongholds of a single race, Tiryns commanding the sea-coast and Mycenae the inner country. Legend tells of the rivalry between the dynasties of the Pelopidae at Mycenae and of the Proetidae at Argos. In early historic times Argos had obtained the predominance. The Mycenaeans, who had temporarily regained their independence with the help of Sparta, fought on the Greek side at Plataea in 479 B.C. The long warfare between the two cities lasted till 468 B.C., when Mycenae was dismantled and its inhabitants dispersed. The city never revived; Strabo asserts that no trace of it remained in his time, but Pausanias describes the ruins. For the character of Mycenaean art and of the antiquities found at Mycenae see AEGEAN CIVILIZATION.

The extant remains of the town of Mycenae are spread over the hill between the village of Charvati and the Acropolis. They consist of some traces of town walls and of houses, and of an early bridge over the stream to the east, on the road leading to the Heraeum. The walls of the Acropolis are in the shape of an irregular triangle, and occupy a position of great natural strength between two valleys. They are preserved to a considerable height on all sides, except where the ravine is precipitous and they have been carried away by a landslip; they are for the most part built of irregular blocks of great size in the so-called "Cyclopian" style; but certain portions, notably that near the chief gate, are built in almost regular courses of squared stones; there are also some later repairs in polygonal masonry. The main entrance is called the Lion Gate, from the famous triangular relief which fills the space above its massive lintel. This represents two lions confronted, resting their front legs on a low altar-like structure on which is a pillar which stands between them. The device is a translation into stone of a type not uncommon in gem-cutter's and goldsmith's work of the "Mycenaean" age. The gate is approached by a road commanded on one side by the city wall, on the other by a projecting tower. There is also a postern gate on the north side of the wall, and at its eastern extremity are two apertures in the thickness of the wall. One of these leads out on to the rocks above the southern ravine, the other leads to a long staircase, completely concealed in the wall and the rocks, leading down to a subterranean well or spring. Just within the Lion Gate is a projection of the wall surrounding a curious circular enclosure, consisting of two concentric circles of thin slabs of stone set up on end, with others laid across the top of them; at the part of this enclosure nearest to the Lion Gate is an entrance. Some have supposed the circle of slabs to be the retaining wall of a tumulus; but its structure is not solid enough for such a purpose, and it can hardly be anything but a sacred enclosure. It was within this circle that Dr H. Schliemann found the five graves that contained a marvellous wealth of gold ornaments and other objects; a sixth was subsequently found. Above one of the graves was a small circular altar, and there were also several sculptured slabs set up above them. The graves themselves were mere shafts sunk in the rock. Dr Schliemann identified them with the graves of Agamemnon, Cassandra, and their companions, which were shown to Pausanias within the walls; and there can be little doubt that they are the graves that gave rise to the tradition, though the historical identity of the persons actually buried in them is a more difficult question. Outside the circle, especially to the south of it, numerous remains of houses of the Mycenaean age have been found, and others, terraced up at various levels, occupy almost the whole of the Acropolis. On the summit, approached by a well-preserved flight of steps, are the remains of a palace of the Mycenaean age, similar to that found at Tiryns, though not so complicated or extensive. Above them are the foundations of a Doric temple, probably dating from the last days of Mycenaean independence in the 5th century.



Based on a plan in Schuchhardt's *Schliemann's Excavations.*

FIG. 1.—Plan of the Citadel of Mycenae.

Numerous graves have been found in the slopes of the hills adjoining the town of Mycenae. Most of these consist merely of a chamber, usually square, excavated in the rock, and approached by a "dromos" or horizontal approach in the side of a hill. They are sometimes provided with doorways faced with stucco, and these have painted ornamentation. Many of these tombs have been opened, and their contents are in the Athens museum. Another and much more conspicuous kind of tomb is that known as the beehive tomb. There are eight of them at Mycenae itself, and others in the neighbourhood. Some of them were visible in the time of Pausanias, who calls them the places where Atreus and his sons kept their treasures. There can, however, be no doubt that they were the tombs of princely families. The largest and best preserved of them, now commonly called the Treasury of Atreus, is just outside the Lion Gate. It consists of a circular domed chamber, nearly 50 ft. in diameter and in height; a smaller square chamber opens out of it. It is approached by a horizontal avenue 20 ft. wide and 115 ft. long, with side walls of squared stone sloping up to a height of 45 ft. The doorway was flanked with columns of alabaster, with rich spiral ornament, now in the British Museum; and the rest of the façade was very richly decorated, as may be seen from Chipiez's fine restoration. The inside of the vault was ornamented with attached bronze ornaments, but not, as is sometimes stated, entirely lined with bronze. It is generally supposed that these tombs, as well as those excavated in the rock, belong to a later date than the shaft-tombs on the Acropolis.

See H. Schliemann, *Mycenae* (1879); C. Schuchhardt, *Schliemann's Excavations* (Eng. trans., 1891); Chr. Tsountas, Μυκῆναι καὶ Μυκηναικὸς πολιτισμός (1893); Tsountas and Manatt, *The Mycenaean Age* (1897); Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. vi., *L'art Mycénéenne.* Various reports in Πρακτικὰ τῆς ἀρχ. ἑταιρίας and in 'Εφημερὶς ἀρχαιολογική. (E. Gr.)

MYCETOZOA (Myxomycetes, Schleimpilze), in zoology, a group of organisms reproducing themselves by spores. These are produced in or on sporangia which are formed in the air and the spores are distributed by the currents of air. They thus differ from other spore-bearing members of the animal kingdom (which produce their spores while immersed in water or, in the case of parasites, within the fluids of their hosts), and resemble the Fungi and many of the lower green plants. In relation with this condition of their fructification the structures formed at the spore-bearing stage to contain or support the spores present a remarkable resemblance to the sporangia of certain groups of Fungi, from which, however, the Mycetozoa are essentially different.

Although the sporangial and some other phases have long been known, and Fries had enumerated 192 species in 1829, the main features of their life-history were first worked out in 1859–1860 by de Bary (1 and 2). He showed that in the Mycetozoa the spore hatches out as a mass of naked protoplasm which almost immediately assumes a free-swimming flagellate form (*zoospore*), that after multiplying by division this passes into an amoeboid phase, and that from such amoebae the plasmodia arise, though the mode of their origin was not ascertained by him.

The *plasmodium* of the Mycetozoa is a mass of simple protoplasm, without a differentiated envelope and endowed with the power of active locomotion. It penetrates the interstices of decaying vegetable matter, or, in the case of the species *Badhamia utricularis*, spreads as a film on the surface of living fungi; it may grow almost indefinitely in size, attaining under favourable conditions several feet in extent. It constitutes the dominant phase of the life-history. From the plasmodium the sporangia take their origin. It was Cienkowski who (in 1863) contributed the important fact that the plasmodia arise by the fusion with one another of numbers of individuals in the amoeboid phase—a mode of origin which is now generally recognized as an essential feature in the conception of a plasmodium, whether as occurring among the Mycetozoa or in other groups (7). De Bary clearly expressed the view that the life-history of the Mycetozoa shows them to belong not to the vegetable but to the animal kingdom.

The individual sporangia of the Mycetozoa are, for the most part, minute structures, rarely attaining the size of a mustard-seed, though, in the composite form of aethalia, they may form cake-like masses an inch or more across (fig. 21). They are found, stalked or sessile, in small clusters or distributed by the thousand over a wide area many feet in diameter, on the bark of decaying trees, on dead leaves or sticks, in woods and shrubberies, among the stems of plants on wet moors, and, generally, at the surface in localities where there is a substratum of decaying vegetable matter sufficiently moist to allow the plasmodium to live. Tan-heaps have long been known as a favourite habitat of *Fuligo septica*, the plasmodia of which, emerging in bright yellow masses at the surface prior to the sporangial (in this case aethalial) phase, are known as "flowers of tan." The film-like, expanded condition of the plasmodium, varying in colour in different species and traversed by a network of vein-like channels (fig. 5), has long been known. The plasmodial stage was at one time regarded as representing a distinct group of fungi, to which the generic name *Mesenterica* was applied. The species of Mycetozoa are widely distributed over the world in temperate and tropical latitudes where there is sufficient moisture for them to grow, and they must be regarded as not inconsiderable agents in the disintegrating processes of nature, by which complex organic substances are decomposed into simpler and more stable chemical groups.

Classification.—The Mycetozoa, as here understood, fall into three main divisions. The Endosporeae, in which the spores are contained within sporangia, form together with the Exosporeae, which bear their spores on the surface of sporophores, a natural group characterized by forming true plasmodia. They constitute the Euplasmodida. Standing apart from them is the small group of the mould-like Sorophora, in which the amoeboid individuals only come together immediately prior to spore-formation and do not completely fuse with one another.

A number of other organisms living on vegetable and animal bodies, alive or dead, and leading an entirely aquatic life, are included by Zopf (31) under the Mycetozoa, as the "Monadina," in distinction from the "Eumycetozoa," consisting of the three groups above mentioned. The alliance of some of these (*e.g. Protomonas*) with the Mycetozoa is probable, and was accepted by de Bary, but the relations of other Monadina are obscure, and appear to be at least as close with the Heliozoa (with which many have in fact been classed). The limits here adopted, following de Bary, include a group of organisms which, as shown by their life-history, belong to the animal stock, and yet alone among animals[1] they have acquired the habit, widely found in the vegetable kingdom, of developing and distributing their spores in air.

Class MYCETOZOA.
Sub-class 1.—EUPLASMODIDA.[2]
Division 1.—*Endosporeae.*
Cohort 1.—Amaurosporales.
Sub-cohort 1.—Calcarineae.
Order 1. Physaraceae. Genera: *Badhamia, Physarum, Physarella, Trichamphora, Erionema, Cienkowskia, Fuligo, Craterium, Leocarpus, Chondrioderma, Diachaea.*
Order 2. Didymiaceae. Genera: *Didymium, Spumaria, Lepidoderma.*
Sub-cohort 2.—Amaurochaetineae.
Order 1. Stemonitaceae. Genera: *Stemonitis, Comatricha, Enerthenema, Echinostelium, Lamproderma, Clastoderma.*
Order 2. Amaurochaetaceae. Genera: *Amaurochaete, Brefeldia.*
Cohort 2.—Lamprosporales.
Sub-cohort 1.—Anemineae.
Order 1. Heterodermaceae. Genera: *Lindbladia, Cribraria, Dictydium.*
Order 2. Licaeceae. Genera: *Licea, Orcadella.*
Order 3. Tubulinaceae. Genera: *Tubulina, Siphoptychium, Alwisia.*
Order 4. Reticulariaceae. Genera: *Dictydiaethalium, Enteridium, Reticularia.*
Order 5. Lycogalaceae. Genus: *Lycogala.*
Sub-cohort 2.—Calonemineae.
Order 1. Trichiaceae. Genera: *Trichia, Oligonema, Hemitrichia, Cornuvia.*
Order 2. Arcyriaceae. Genera: *Arcyria, Lachnobolus, Perichaena.*
Order 3. Margaritaceae. Genera: *Margarita, Dianema, Prototrichia, Listerella.*
Division 2.—*Exosporeae.*
Order 1. Ceratiomyxaceae. Genus: *Ceratiomyxa.*
Sub-class 2.—SOROPHORA.
Order 1. Guttulinaceae. Genera: *Copromyxa, Guttulina, Guttulinopsis.*
Order 2. Dictyosteliaceae. Genera: *Dictyostelium, Acrasis, Polysphondylium.*

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[1] *Bursulla*, a member of Zopf's Monadina, likewise forms its spores in air.

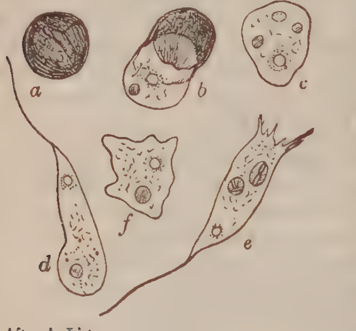
[2] The classification of the Euplasmodida here given is that of A. and G. Lister (22), the outcome of a careful study of the group extending over more than twenty-five years. The writer of this article desires to express his indebtedness to the opportunities he has had of becoming familiar with the work of his father, Mr A. Lister, F.R.S., whose views on the affinities and life-history of the Mycetozoa he has endeavoured herein to summarize.

LIFE-HISTORY OF THE MYCETOZOA

EUPLASMODIDA

Endosporeae.

We may begin our survey of the life-history at the point where the spores, borne on currents of air, have settled among wet decaying vegetable matter. Shrunken when dry, they rapidly absorb water and resume the spherical shape which is found in nearly all species. Each is surrounded by a *spore wall*, sheltered by which the protoplasm, though losing moisture by drying, may remain alive for as many as four years. In several cases it has been found to give the chemical reaction of cellulose. It is smooth or variously sculptured according to the species. Within the protoplasm may be seen the *nucleus*, and one or more contractile vacuoles make their appearance. After the spore has lain in water for a period varying from a few hours to a day or two the wall bursts and the contained protoplasm slips out and lies free in the water as a minute colourless mass, presenting amoeboid movements (fig. 1, *c*). It soon assumes an elongated piriform shape, and a flagellum is developed at the narrow end, attaining a length equal to the rest of the body. The minute *zoospore*, thus equipped, swims away with a characteristic dancing motion. The protoplasm is granular within but hyaline externally (fig. 1, *d*). The nucleus, lying at the end of the body where it tapers into the flagellum, is limited by a definite wall and contains a nuclear network and a nucleolus. It often presents the appearance of being drawn out into a point towards the flagellum, and a bell-like structure [first described by Plenge (27)], staining more darkly than the rest of the protoplasm, extends from the base of the flagellum and invests the nucleus (fig 2, *a* and *c*). The other end of the zoospore may be evenly rounded (fig. 1, *d*) or it may be produced into short pseudopodia (fig. 1, *e*). By means of these the zoospore captures bacteria which are drawn into the body and enclosed in digestive vacuoles. A contractile vacuole is also present near the hind end. Considerable movement may be observed among the granules of the interior, and in the large zoospores of *Amaurochaete atra* this may amount to an actual streaming, though without the rhythm characteristic of the plasmodial stage.



After A. Lister.

FIG. 1.[1]—Stages in the Hatching of the Spores of *Didymium difforme*.

a, The unruptured spore.
b, The protoplasmic contents of the spore emerging. It contains a nucleus with the (light) nucleolus, and a contractile vacuole (shaded).
c, The same, free from the spore wall.
d, Zoospore, with nucleus at the base of the flagellum, and contractile vacuole.
e, A zoospore with pseudopodial processes at the posterior end, to one of which a bacillus adheres. Two digestive vacuoles in the interior contain ingested bacilli.
f, Amoeboid phase with retracted flagellum.

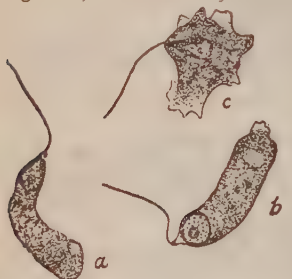
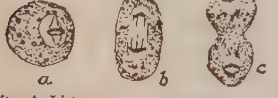


FIG. 2.—Zoospores of *Badhamia panicea*, stained.

In *a* and *c* the bell-like structure investing the nucleus is clearly seen.

Other shapes may be temporarily assumed by the zoospore. Attaching itself to an object it may become amoeboid, either with (fig. 1, *f*) or without (fig. 2, *c*) the temporary retraction of the flagellum; or it may take an elongated slug-like shape and creep with the flagellum extended in front, with tactile and apparently exploratory movements.



After A. Lister.

FIG. 3.—Three stages in the division of the Zoospore of *Reticularia Lycoperdon*.

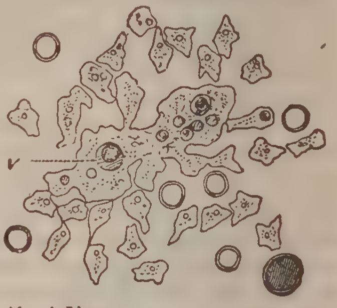
That the zoospores of many species of the Endosporeae feed on bacteria has been shown by A. Lister (18). New light has recently been thrown on the matter by Pinoy (26), who has worked chiefly with Sorophora, in which, as shown below, the active phase of the life-history is passed mainly in the state of isolated amoebae. Pinoy finds that the amoebae of this group live on particular species of bacteria, and that the presence of the latter is a necessary condition for the development of the Sorophora, and even (as has been recognized by other workers) for the hatching of their spores. Pinoy's results indicate, though not so conclusively, that bacteria are likewise the essential food of the Euplasmodida in the early phases of their life-history. The zoospores do, however, ingest other solid bodies, *e.g.* carmine granules (Saville Kent, 15).

The zoospores multiply by binary fission, the flagellum being withdrawn and the nucleus undergoing mitotic division, with the formation of a well-marked achromatic spindle (fig. 3).

It is probable that fission occurs more than once in the zoospore stage; but there is not satisfactory evidence to show how often it may be repeated.[2]

At this, as at other phases of the life-history, a resting stage may be assumed as the result of drying, but also from other and unknown causes. The flagellum is withdrawn and the protoplasm, becoming spherical, secretes a cyst wall. The organism thus passes into the condition of a *microcyst*, from which when dry it may be awakened to renewed activity by wetting.

At the end of the zoospore stage the organism finally withdraws its flagellum and assumes the amoeboid shape. It is now known as an *amoebula*. The amoebulae become endowed, as was first recognized by Cienkowski, with mutual attraction, and on meeting fuse with one another. Fig. 4 represents a group of such amoebulae. Several have already united to form a common mass, to which others, still free, are converging. The protoplasmic mass thus arising is the *plasmodium*. The fusion between the protoplasmic bodies of the amoebulae which unite to form it is complete. Their nuclei may be traced for some time in the young plasmodium and no fusion between them has been observed at this stage (20). As the plasmodium increases in size by the addition of amoebulae the task of following the fate of the individual nuclei by direct observation becomes impossible.



After A. Lister.

FIG. 4.—Amoebulae of *Didymium difforme* uniting to form a Plasmodium. The common mass contains digestive vacuoles (*v*). The clear spherical bodies are microcysts and an empty spore-shell is seen to the left.

The appearance of an active plasmodium of *Badhamia utricularis*, which, as we have seen, lives and feeds on certain fungi, is shown in fig. 5. It consists of a film of protoplasm, of a bright yellow colour, varying in size up to a foot or more in diameter. It is traversed by a network of branching and anastomosing channels, which divide up and are gradually lost as they approach the margin where the protoplasm forms a uniform and lobate border. Elsewhere the main trunks of the network may lie free with little or no connecting film between them and their neighbours. The plasmodia of other species, which live in the interstices of decaying vegetable matter, are less easily observed, but on emerging on the surface prior to

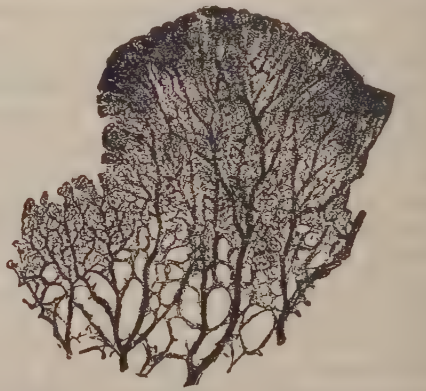


FIG. 5.—Part of the Plasmodium of *Badhamia utricularis*.

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[1] Figures 1, 4, and 11–22 are from the British Museum Guide to the British Mycetozoa. The other figures are from Lankester's *Treatise on Zoology*, part 1. Introduction and Protozoa. Fascicle 1. Article Mycetozoa.

[2] Pinoy states (26) that the spores of *Spumaria alba*, cultivated with bacteria on solid media, hatch out into amoebae, which under these conditions do not assume the flagellate stage. The amoeba from a spore was observed to give rise by three successive divisions to eight amoebulae.

spore formation they present an essentially similar appearance. There is, however, great variety in the degree of concentration or expansion presented by plasmodia, in relation with food supply, moisture and other circumstances. The plasmodia move slowly about over or in the substratum, concentrating in regions where food supply is abundant, and leaving those where it is exhausted.

On examining under the microscope a film which has spread over a cover-slip, the channels are seen to be streams of rapidly moving granular protoplasm. This movement is rhythmic in character, being directed alternately towards the margin of an advancing region of the plasmodium, and away from it. As a channel is watched the stream of granules is seen to become slower, and after a momentary pause to begin in the opposite direction. In an active plasmodium the duration of the flow in either direction varies from a minute and a half to two minutes, though it is always longer when in the direction of the general advance over the substratum. When the flow of the protoplasm is in this latter direction the border becomes turgid, and lobes of hyaline protoplasm are seen (under a high magnification) to start forward, and soon to become filled with granular contents. When the flow is reversed, the margin becomes thin from the drainage away of its contents. A delicate hyaline layer invests the plasmodium, and is apparently less fluid than the material flowing in the channels. The phenomena of the rhythmic movement of the protoplasm are not inconsistent with the view that they result from alternating contraction and relaxation of the outer layer in different regions of the plasmodium, but any dogmatic statement as to their causation appears at present inadvisable.

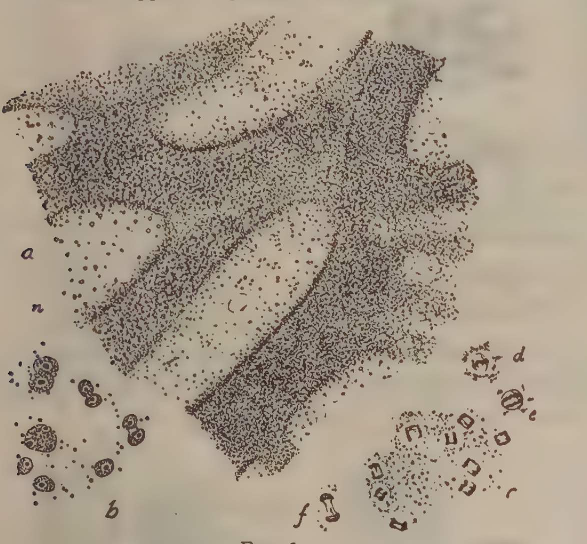

FIG. 6.

a, Part of a stained Plasmodium of *Badhamia utricularis.*
n, Nuclei.
b, Nuclei, some in process of simple (amitotic) division.
c, Part of a Plasmodium in which the nuclei are in simultaneous mitotic division.
d-f, Other stages in this process.

Minute *contractile vacuoles* may be seen in great numbers in the thin parts of the plasmodium between the channels. In stained preparations nuclei, varying (in *Badhamia utricularis*) from 2·5 to 5 micromillimeters in diameter, are found abundantly in the granular protoplasm (fig. 6, *b*). They contain a nuclear reticulum and one or more well-marked nucleoli. In any stained plasmodium some nuclei may be found, as shown in the figure *b*, which appear to be in some stage of simple (amitotic) division, and this is, presumably, the chief mode in which the number of the nuclei keeps pace with the rapidly growing plasmodium. There is, however, another mode of nuclear division in the plasmodium which has hitherto been observed in one recorded instance (19, p. 541), the mitotic (fig. 6, *c-f*), and this appears to befall all the nuclei of a plasmodium simultaneously. What the relation of these two modes of nuclear division may be to the life-history is obscure.

That the amitotic is the usual mode of nuclear division is indicated by the very frequent occurrence of these apparently dividing nuclei and also by the following experiment. A plasmodium of *Badhamia utricularis* spreading over pieces of the fungus *Auricularia* was observed to increase in size about fourfold in fourteen hours, and during this time a small sample was removed and stained every quarter of an hour. The later stainings showed no diminution in the number of nuclei in proportion to the protoplasm, and yet none of the sample showed any sign of mitotic division (20, p. 9). It would appear therefore that the mode of increase of the nuclei during this period was amitotic.

Prowazek (28) has recently referred to nuclear stages, similar to those here regarded as of amitotic division, but has interpreted them as nuclear fusions. He does not, however, discuss the mode of multiplication of nuclei in the plasmodium.

In the group of the Calcareae, granules of carbonate of lime are abundant in the plasmodia, and in all Mycetozoa other granules of undetermined nature are present. The *colour* of plasmodia varies in different species, and may be yellow, white, pink, purple or green. The colouring matter is in the form of minute drops, and in the Calcareae these invest the lime granules.

Nutrition.—The plasmodium of *Badhamia utricularis*, advancing over the pilei of suitable fungi, feeds on the superficial layer dissolving the walls of the hyphae (17). The protoplasm may be seen to contain abundant foreign bodies such as spores of fungi or sclerotium cysts (*vide infra*) which have been taken in and are undergoing digestion. It has been found experimentally (11) that pieces of coagulated proteids are likewise taken in and digested in vacuoles. On the other hand it has been found that plasmodia will live, ultimately producing sporangia, in nutrient solutions (9).[1] It would appear therefore that the nutrition of plasmodia is effected in part by the ingestion of solid foodstuffs, and in part by the absorption of material in solution, and that there is great variety in the complexity of the substances which serve as their food.

Sclerotium.—As the result of drought, the plasmodium, having become much denser by loss of water, passes into the sclerotial condition. Drawing together into a thickish layer, the protoplasm divides up into a number of distinct masses, each containing some 10 to 20 nuclei, and a cyst wall is excreted round each mass (fig. 7). The whole has now a hard brittle consistency. In this state the protoplasm will remain alive for two or three years. On the addition of water the cyst walls are ruptured and in part absorbed, their contents join together, and the active streaming condition of the plasmodium is resumed. It is to be noted, however, that the sclerotial condition may be assumed under other conditions than dryness, and sclerotia may even be formed in water.

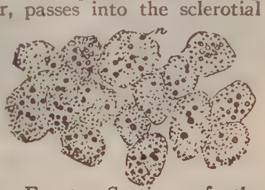

FIG. 7.—Section of the Plasmodium of *Badhamia utricularis* when passing into the condition of sclerotium. *n*, The nuclei contained in the young sclerotial cysts.

The existence of the sclerotial stage affords a ready means of obtaining the plasmodium for experimental purposes. If a cultivation of the plasmodium of *Badhamia utricularis* on suitable fungi (*Stereum*, *Auricularia*) is allowed to become partially dry the plasmodium draws together and would, if drying were continued, pass into the sclerotial stage on the fungus. If now strips of wet blotting-paper are placed so as to touch the plasmodium, the latter, attracted by the moisture, crawls on the blotting-paper. If this is now removed and allowed to dry rapidly, the plasmodium passes into sclerotium on it.[2] By this means the plasmodium is removed from the partially disintegrated and decayed fungus on which it has been feeding, and a clean sclerotium is obtained, which, as above stated, remains alive for years (21, p. 7). An easy method for obtaining small plasmodia for microscopic examination is to scatter small fragments, scraped from a piece of the hard sclerotium, over cover-slips wetted with *rain*-water and kept in a moist atmosphere. In twelve to twenty-four hours small plasmodia will be seen spreading on the cover-slips and these may be mounted for observation.

The plasmodial stage ends by the formation of the *sporangia.* The plasmodium withdraws from the interstices of the material among which it has fed, and emerges on the surface in a diffuse or concentrated mass. In the case of *Badhamia utricularis* it may withdraw from the fungus on which it has been feeding, or change into sporangia on it. The mode of formation of the sporangia will be described in the case of *Badhamia*, some of the chief differences in the process and in the structure of the sporangia in other forms being subsequently noticed.

When the change to sporangia begins the protoplasm of the plasmodium becomes gradually massed in discrete rounded lobes, about a half to one millimeter in diameter and scattered in clusters over the area occupied by the plasmodium. The reticulum of channels of the plasmodium becomes meanwhile less and less marked. When the whole of the protoplasm is drawn in to the lobes, the circulation ceases. The lobes are the young sporangia. Meanwhile foreign bodies, taken in with the food, are ejected, and the protoplasm secretes on its outer surface a pellicle of mucoid, transparent substance which dries as the sporangia ripen. This invests the young sporangia, and as they rise above the substratum falls together at their bases forming the stalks; extended over the substratum it forms the hypothallus, and in contact with the rounded surface of the sporangium it forms the sporangium-wall. While the sporangium-wall is formed externally a secretion of similar material occurs along branching and anastomosing tracts through the protoplasm of the sporangium, giving rise to the *capillitium*. The greater part of the lime granules pass out of the protoplasm and are deposited in the capillitium, which in the ripe sporangia of *Badhamia* is white and brittle with the contained lime (cf. fig. 8). In this genus some granules are found also in the sporangium-wall. Strasburger concludes that the sporangium-wall of *Trichia* is a modification of cellulose (29).

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[1] A solution which has thus been found favourable contains the following mineral salts: KH_2PO_4, K_2HPO_4,$MgSO_4$, KNO_3, $CA\ (NO_3)_2$, a free acid, and 5% of dextrine.

[2] If the plasmodium is slowly dried it is very apt to pass into sporangia.

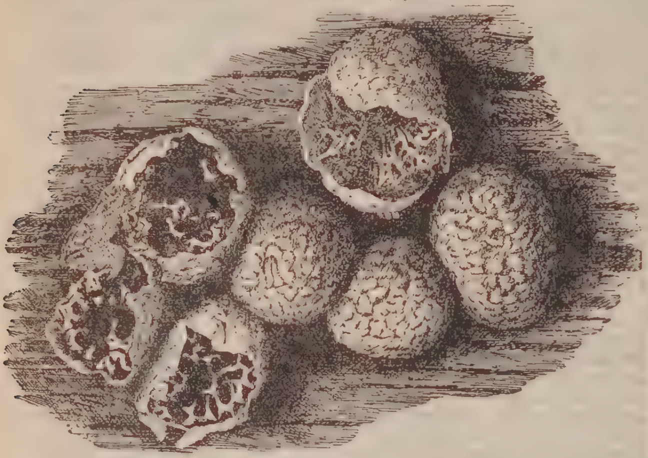

FIG. 8.—Sporangia of *Badhamia panicea*, some intact, others (to left) ruptured, exposing the black masses of spores and the capillitium. The latter is white with deposited lime granules. An empty sporangium is seen above.

It has been stated (16), but the observation requires confirmation, that a fusion of the nuclei in pairs occurs early in the development of the sporangium.

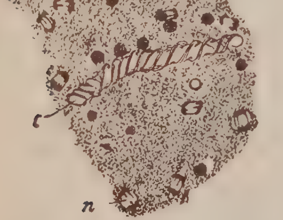

FIG. 9.—Part of a section through a young Sporangium of *Trichivaria*, showing the mitotic division of the nuclei (*n*) prior to spore formation.
c, Capillitium thread.

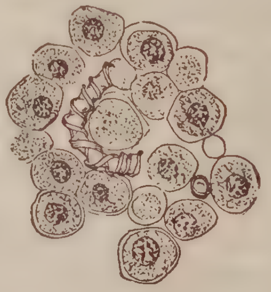

FIG. 10.—Part of a section through a Sporangium of *Trichia varia* after the spores are formed.

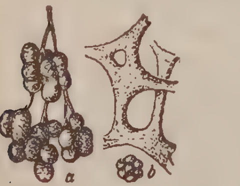

FIG. 11.—*Badhamia utricularis.*
a, Sporangia.
b, Capillitium and cluster of spores.

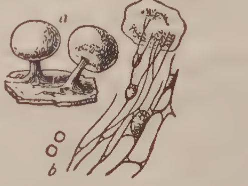

FIG. 12.—*Physarum nutans.*
a, Sporangia.
b, Capillitium threads, with fragment of the sporangium-wall attached, lime knots at the junctions and spores.

At a later stage, after the capillitium is formed, the nuclei undergo a mitotic division which affects all the nuclei of a sporangium simultaneously. This was first described by Strasburger (29). While it is in progress the protoplasm of the sporangium divides, into successively smaller masses, until each daughter nucleus is the centre of a single mass of protoplasm.[1] These nucleated masses are the young spores. A spore-wall is soon secreted and the sporangium has now resolved itself into a mass of spores, traversed by the strands of the capillitium and enclosed in a sporangium-wall, connected with the substratum by a stalk. As ripening proceeds, the wall becomes membranous and readily ruptures, and the dry spores may be carried abroad on the currents of air or washed out by rain.

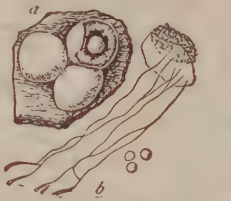

FIG. 13.—*Chondrioderma testaceum.*
a, Group of three Sporangia.
b, Capillitium, fragment of sporangium-wall and spores.

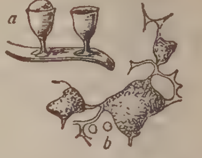

FIG. 14.—*Craterium pedunculatum.*
a, Two Sporangia, in one the lid has fallen away.
b, Capillitium with lime knots and spores.

We may now review some of the main differences in structure presented by the sporangia. They may be stalked or sessile (fig. 13). If the former, the stalk is usually, as in *Badhamia utricularis*, the continuation of the sporangium-walls (figs. 11 and 12), but in *Stemonitis* and its allies (figs. 17 and 18) it is an axial structure. A central *columella* may project into the interior of the sporangium, either in stalked (fig. 15) or sessile (fig. 13) forms.

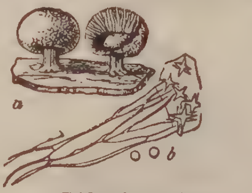

FIG. 15.—*Didymium effusum.*
a, Two Sporangia, one showing the columella and capillitium.
b, Capillitium, fragment of sporangium-wall with carbonate of lime in crystals, and spores.

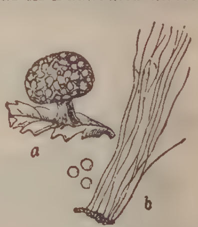

FIG. 16.—*Lepidoderma tigrinum.*
a, Sporangium; the crystal-line disks of lime are seen attached to the sporangium-wall.
b, Capillitium and spores.

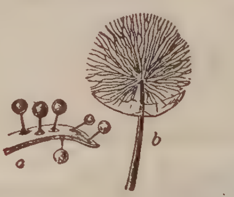

FIG. 17.—*Lamproderma irlaeum.*
a, Sporangia.
b, A Sporangium deprived of spores, showing the capillitium and remains of the sporangium-wall.

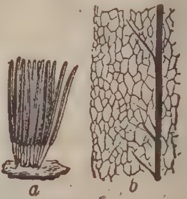

FIG. 18.—*Stemonitis splendens.*
a, Group of Sporangia (nat. size).
b, Portion of columella and capillitium, the latter branching to form a superficial network.

The sporangium-wall may be most delicate and evanescent (fig. 17), or consist of a superficial network of threads (fig. 18), which in *Dictydium* (fig. 19) present a beautifully regular arrangement.

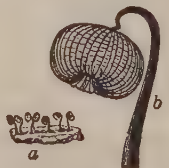

FIG. 19.—*Dictydium umblicatum.*
a, Group of Sporangia, nat. size.
b, A Sporangium after dispersion of the spores.

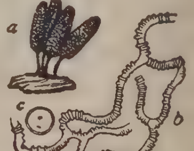

FIG. 20.—*Arcyria punicea.*
a, Group of Sporangia.
b, Capillitium.
c, Spore.

In *Chondrioderma* (fig. 13) the wall is double, the inner layer being membranous, the outer thickly encrusted with lime granules. In *Craterium* the upper part of the sporangium-wall is lid-like and falls away, leaving the spores in an open cup (fig. 14).

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[1] In some genera such as *Arcyria* and *Trichia* (illustrated in figs. 9 and 10) the division of the protoplasm does not occur until the nuclei have undergone this division. The protoplasm then divides up about the daughter nuclei to form the spores.

The condition of the capillitium is very various. In the Calcarineae the lime may be generally distributed through it (fig. 11), or aggregated at the nodes of the network in "lime-knots" (figs. 12 and 14) or it may be absent from the capillitium altogether. The capillitium attains its highest development in the Calonemineae in which the threads, distinct (in which case they are known as elaters, figs. 9 and 10) or united into a network (fig. 20), present regular thickenings in the form of spiral bands or transverse bars. These threads, altering their shape with varying states of moisture, are efficient agents in distributing the spores. In another group, the Anemineae, the capillitium is absent altogether.

The Didymiaceae are characterized by the fact that the lime, though present in a granular form in the plasmodium, is deposited on the sporangium-wall in the form of crystals, either in radiating groups (fig. 15) or in disks (fig. 16).

In most Endosporeae the sporangia are separate symmetrical bodies, but in many genera a form of fructification occurs in which the spores are produced in masses of more or less irregular outline, retaining in extreme cases much of the diffuse character of the plasmodium. With the spores they contain capillitium, but there are no traces of sporangial walls to be found in their interior. They are known as *plasmodiocarps* (fig. 22). They are characteristic of certain species, but in others they may be formed side by side with separate sporangia from the same plasmodium. There is indeed no sharp line to be drawn between sporangia and plasmodiocarps. On the other hand, the crowded condition of the sporangia of some species forms a transition to the large compound fructifications known as *aethalia* (fig. 21). These, either in their young stages or up to maturity, retain some evidence of their formation by a coalescence of sporangia, and in addition to the capillitium they are generally penetrated by the remains of the walls of the sporangia which have thus united.

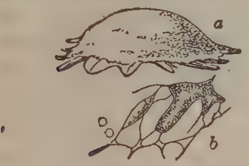


FIG. 21.—*Fuligo septica.*
a, Aethalium.
b, Capillitium threads (with lime-knots) and two spores.

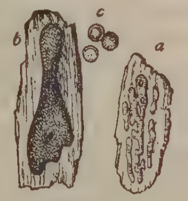
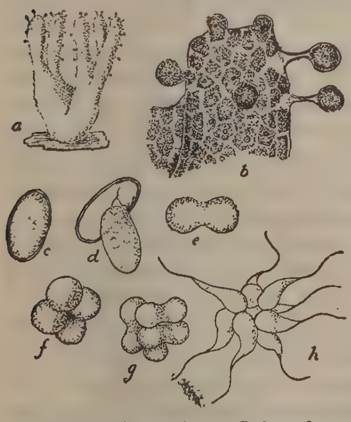


FIG. 22.—*Licea flexuosa.*
a, Group of Plasmodiocarps.
b, A continuous Plasmodiocarp
c, Spores.

Exosporeae.

It will be convenient to begin our survey of the life-history of *Ceratiomyxa*, the single representative of the Exosporeae, at the stage at which the plasmodium emerges from the rotten wood in which it has fed. At this stage it has been observed to spread as a film over a slide, and to exhibit the network of channels and rhythmic flow of the protoplasm in a manner precisely similar to that seen in the Endosporeae (20, p. 10). It soon, however, draws together into compact masses, from the surface of which finger-like or antler-like lobes grow upwards. Here too the secretion of a transparent mucoid substance occurs, which is at first penetrated by the anastomosing strands of the protoplasm, but gradually the latter tends more and more to form a reticular and ultimately a nearly continuous superficial investment, covering the mucoid material. The latter eventually dries and forms the exceedingly delicate support of the spores or *sporophore* (fig. 23, *a*).



From Lankester's *Treatise on Zoology*; figs. *a* and *c-h* after A. Lister; fig. *b* after Famintzin and Woronin.

FIG. 23.—*Ceratiomyxa mucida.*
a, Ripe sporophore.
b, Maturing sporophore showing the development of the spores.
c, Ripe spore. Instead of the single nucleus here indicated there should be four nuclei, as in *d*.
d, Hatching spore.
e-h, Stages in the development of the zoospores.

The investing protoplasm, with its nuclei, having become arranged in an even layer, undergoes cleavage and thus forms a pavement-like layer of protoplasmic masses, each occupied by a single nucleus (fig. 23, *b*). Each of these masses now grows out perpendicularly to the surface of the sporophore. As it does so an envelope is secreted, which, closing in about the base forms a slender stalk. The minute mass, borne on the stalk, becomes the ellipsoid spore, surrounded by the spore-wall. In this manner the whole of the protoplasmic substance of the plasmodium is converted into spores, borne on supporting structures (stalks and sporophores), which are formed by secretion of the protoplasm.

In the course of the development of which the external features have now been traced nuclear changes occur of which accounts have been given by Jahn (14) and by Olive (24 and 25). Jahn has shown that prior to the cleavage of the protoplasm a mitotic division of the nuclei takes place, the daughter nuclei of which are those occupying the protoplasmic masses seen in fig. 23 *b*.[1] After the spore has risen on its stalk two further mitotic divisions occur in rapid succession, and the four-nucleated condition characteristic of the spore of *Ceratiomyxa*, is thus attained. The spores, on being brought into water, soon hatch (fig. 23, *d*), and the four nuclei contained in them undergo a mitotic division Meanwhile the protoplasm divides, at first into four, then into eight masses, and the latter acquire flagella, although for some time remaining connected with their fellows (fig. 23, *e-h*). On separating each is a free zoospore.

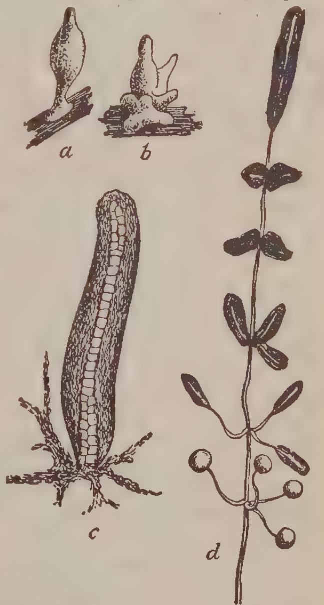
From observation of cultivations of zoospores the impression is that here, as in the Endosporeae, they multiply by binary division, though no exact observations of the process have been recorded. The zoospores lose their flagella and become amoebulae, but the fusion of the latter to form plasmodia has not been directly observed in *Ceratiomyxa*, although from analogy with the Endosporeae it can hardly be doubted that such fusions occur.

Sorophora.

The Sorophora of Zopf (Acrasiae of Van Tieghem) are a group of microscopic organisms inhabiting the dung of herbivorous animals and other decaying vegetable matter. As Pinoy (26) has shown, the presence of a particular species of bacteria with the spores is necessary for their hatching and as the essential food of the amoebulae which emerge from them. There is no flagellate stage, and it is in the form of amoebulae, multiplying by fission, that the vegetative stage of the life-history is passed. At the end of this stage numbers of amoebulae draw together to form a "pseudo-plasmodium." This appears to be merely an aggregation of amoebulae prior to spore formation. The outlines of the individual amoebulae are maintained, and there is no fusion between them, as in the formation of the plasmodium of the Euplasmodida.

In some genera certain of the amoebulae constituting the pseudo-plasmodium are modified into a stalk (simple in *Guttulina* and *Dictyostelium*, branched in *Polysphondylium*, fig. 24, *d*), along which the other units creep to encyst, and become *spores* at the end or ends of the stalk. In other cases (*Copromyxa*, fig. 24, *a* and *b*) the pseudo-plasmodium is transformed into a mass of encysted spores without the differentiation of supporting structures.

It is not impossible that the Myxobacteriaceae of Thaxter may, as that author suggests, be allied to the Sorophora (30).



From Lankester's *Treatise on Zoology*; *a* and *b* after Fayod; *c* and *d* after Brefeld from Zopf.

FIG. 24.—*a* and *b*, *Copromyxa protea*, slightly magnified.
c and *d*, *Polysphondylium violaceum.*
c, A young sorus, seen in optical section. A mass of elongated amoebulae are grouped round the stalk, and others are extended about the base.
d, A sorus approaching maturity.

Review of the Life-Histories of the Mycetozoa.—The data for a comparison of the life-history of the Mycetozoa with those of other Protozoa in respect of nuclear changes are at present incomplete.

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[1] Jahn (14) described two mitotic divisions at this stage, but in "Myxomycetenstudien 7—Ceratiomyxa," *Ber. deut. bot. Gesellsch.* xxvi. a (1908) he shows that only one mitotic division occurs in the maturing sporophore prior to cleavage. Olive gives a preliminary account of a fusion of nuclei prior to cleavage, but as he has not seen the mitotic division which certainly occurs at this stage his results cannot be accepted as secure.

At some stage or other we are led by analogy to expect that a division of nuclei would occur in which the number of chromosomes would be reduced by one half, that this would be followed by the formation of gametes, and that the nuclei of the latter would subsequently fuse in karyogamy.

It is clear that both in the Endosporeae and Exosporeae a mitotic division of nuclei immediately precedes spore-formation. This is regarded by Jahn as a reduction division. If this is the case, the zoospores or the amoebulae must in some way represent the gametes. The fusion of the latter to form plasmodia appears to offer a process comparable with the conjugation of gametes, but though the fusion of the protoplasm of the amoebulae has been often observed no fusion of their nuclei (karyogamy) has been found to accompany it. A fusion of nuclei has indeed been described as occurring in the plasmodium, or at stages in the development of the sporangia or sporophores, but in no case can the evidence be regarded as satisfactory.[1] Until we have clear evidence on this point the nuclear history of the mycetozoa must remain incomplete.

Jahn's observation of the mitotic division of nuclei preceding spore-formation in *Ceratiomyxa* gives a fixed point for comparison of the Exosporeae with the Endosporeae. Starting from this division it seems clear that the spore of *Ceratiomyxa* is comparable with the spore of the Endosporeae except that the nucleus of the former has undergone two mitotic divisions.

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MYCONIUS, FRIEDRICH (1490–1546), Lutheran divine, was born on the 26th of December 1490, at Lichtenfels on the Main, of worthy and pious parents, whose family name, Mecum, gave rise to proud uses of the word as it appears in various places in the Vulgate, whereas Myconius, from the island Myconus, was a proverb for meanness. His schooling was in Lichtenfels and at Annaberg, where he had a memorable encounter with the Dominican, Tetzel, his point being that indulgences should be given *pauperibus gratis*. His teacher, Staffelstein, persuaded him to enter (July 14, 1510) the Franciscan cloister. That same night a pictorial dream turned his thoughts towards the religious standpoint which he subsequently reached as a Lutheran. From Annaberg he passed to Franciscan communities at Leipzig and Weimar, where he was ordained priest (1516); he had endeavoured to satisfy his mind with scholastic divinity, but next year his " eyes and ears were opened " by the theses of Luther, whom he met when Luther touched at Weimar on his way to Augsburg. For six years he preached his new gospel, under difficulties, in various seats of his order, lastly at Zwickau, whence he was called to Gotha (Aug. 1524) by Duke John at the general desire. Here he married Margaret Jäcken, a lady of good family. He was intimately connected with the general progress of the reforming movement, and was especially in the confidence of Luther. Twice he was entrusted (1528 and 1533) with the ordering of the churches and schools in Thuringia. In all the religious disputations and conferences of the time he took a leading part. At the Convention of Smalkald (1537) he signed the articles on his own behalf and that of his friend Justus Menius. In 1538 he was in England, as theologian to the embassy which hoped to induce Henry VIII. on the basis of the Augsburg Confession, to make common cause with the Lutheran reformation; a project which Myconius caustically observed might have prospered on condition that Henry was allowed to be pope. Next year he was employed in the cause of the Reformation in Leipzig. Not the least important part of his permanent work in Gotha was the founding and endowment of its gymnasium. In 1541 his health was failing, but he lived till the 7th of April 1546. He had nine children, four of whom were living in 1542.

Though he published a good many tracts and pamphlets, Myconius was not distinguished as a writer. His *Historia reformationis*, referring especially to Gotha, was not printed till 1715. See Melchior Adam, *Vitae theologorum* (1706); J. G. Bosseck, *F. Myconii Memoriam . . .* (1739); C. K. G. Lommatzsch, *Narratio de F. Myconio* (1825); K. F. Ledderhose, *F. Myconius* (1854); also in *Allgemeine deutsche Biog.* (1886); O. Schmidt and G. Kawerau in Hauck's *Realencyklopädie* (1903). (A. Go.*)

MYCONIUS, OSWALD (1488–1552), Zwinglian divine, was born at Lucerne in 1488. His family name was Geisshüsler; his father was a miller; hence he was also called MOLITORIS. The name Myconius seems to have been given him by Erasmus. From the school at Rottweil, on the Neckar, he went (1510) to the university of Basel, and became a good classic. From 1514 he obtained schoolmaster posts at Basel, where he married, and made the acquaintance of Erasmus and of Holbein, the painter. In 1516 he was called, as schoolmaster, to Zürich, where (1518) he attached himself to the reforming party of Zwingli. This led to his being transferred to Lucerne, and again (1523) reinstated at Zürich. On the death of Zwingli (1531) he migrated to Basel, and there held the office of town's preacher, and (till 1541) the chair of New Testament exegesis. His spirit was comprehensive; in confessional matters he was for a union of all Protestants; though a Zwinglian, his readiness to compromise with the advocates of consubstantiation gave him trouble with the Zwinglian stalwarts. He had, however, a distinguished follower in Theodore Bibliander. He died on the 14th of October 1552.

Among his several tractates, the most important is *De H. Zwinglii vita et obitu* (1536), translated into English by Henry Bennet (1561). See Melchior Adam, *Vita theologorum* (1620); M. Kirchhofer, *O. Myconius* (1813); K. R. Hagenbach, *J. Oekolampad und O. Myconius* (1859); F. M. Ledderhose, in *Allgemeine deutsche Biog.* (1886); B. Riggenbach and Egli, in Hauck's *Realencyklopädie* (1903). (A. Go.*)

MYDDELTON (or MIDDLETON), **SIR HUGH**, BART. (*c.* 1560–1631), contractor of the New River scheme for supplying London with water, was a younger son of Sir Richard Myddelton, governor of Denbigh Castle. Hugh became a successful London goldsmith, occupying a shop in Bassihaw, or Basinghall Street; he made money by commercial ventures on the Spanish main, being associated in these with Sir Walter Raleigh; and he was also interested in cloth-making. He was an alderman, and then recorder of Denbigh, and was member of parliament for this borough from 1603 to 1628. In 1609 Myddelton took over from the corporation of London the projected scheme for supplying the city with water obtained from springs near Ware, in Hertfordshire. For this purpose he made a canal about 10 ft. wide and 4 ft. deep and over 38 m. in length, which discharged its waters into a reservoir at Islington called the New River Head. The completion of this great undertaking put a severe strain upon Myddelton's financial resources, and in 1612 he was successful in securing monetary assistance from James I. The work was completed in 1613 and Myddelton was made the first governor of the company, which, however, was not a financial success until after his death. In recognition of his services he was made a baronet in 1622. Myddelton was also engaged in working some lead and silver mines in Cardiganshire and in reclaiming a piece of the Isle of Wight from the sea. He died on the 10th of December 1631, and was buried in the church of St Matthew, Friday Street, London. He had a family of ten sons and six daughters.

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[1] In the work cited in the last footnote Jahn described a fusion of nuclei as occurring in *Ceratiomyxa* at the stage at which the plasmodium is emerging to form sporophores. Jahn was at first inclined to regard this fusion as the sexual karyogamy of the life-cycle, but the writer learns by correspondence (July 1910) that he is inclined to regard this fusion as pathological, and to look for the essential karyogamy elsewhere.

One of Sir Hugh's brothers was Sir Thomas Myddelton (*c.* 1550–1631), lord mayor of London, and another was William Myddelton (*c.* 1556–1621), poet and seaman, who died at Antwerp on the 27th of March 1621.

Sir Thomas was a member of parliament under Queen Elizabeth and was chosen lord mayor on the 29th of September 1613, the day fixed for the opening of the New River. Under James I. and Charles I. he represented the city of London in parliament, and he helped Rowland Heylyn to publish the first popular edition of the Bible in Welsh. He died on the 12th of August 1631. Sir Thomas's son and heir, Sir Thomas Myddelton 1586–1666), was a member of the Long Parliament, being an adherent of the popular party. After the outbreak of the Civil War he served in Shropshire and in north Wales, gaining a signal success over the royalists at Oswestry in July 1644, and another at Montgomery in the following September. In 1659, however, he joined the rising of the royalists under Sir George Booth, and in August of this year he was forced to surrender his residence, Chirk Castle. His eldest son, Thomas (d. 1663), was made a baronet in 1660, a dignity which became extinct when William the 4th baronet died in 1718.

MYELAT, a division of the southern Shan States of Burma, including sixteen states, none of any great size, with a total area of 3723 sq. m., and a population in 1901 of 119,415. The name properly means "the unoccupied country," but it has been occupied for many centuries. All central Myelat and great parts of the northern and southern portions consist of rolling grassy downs quite denuded of jungle. It has a great variey of different races, Taungthus and Danus being perhaps the most numerous. They are all more or less hybrid races. The chiefs of the Myelat are known by the Burmese title of *gwegunhmu, i.e.* chiefs paying the revenue in silver. The amount paid by the chiefs to the British government is Rs. 99,567. The largest state, Loi Lông, has an area of 1600 sq. m., a great part of which is barren hills. The smallest, Nam Hkon, had no more than 4 sq. m., and has been recently absorbed in a neighbouring state. The majority of the states cover less than 100 sq. m. Under British administration the chiefs have powers of a magistrate of the second class. The chief cultivation besides rice is sugar-cane, and considerable quantities of crude sugar are exported. There is a considerable potato cultivation, which can be indefinitely extended when cheaper means of export are provided. Wheat also grows very well.

MYELITIS (from Gr. μυελός, marrow) a disease which by inflammation induces destructive changes in the tissues composing the spinal cord. In the *acute* variety the nerve elements in the affected part become disintegrated and softened, but repair may take place; in the *chronic* form the change is slower, and the diseased area tends to become denser (sclerosed), the nerve-substance being replaced by connective tissue. Myelitis may affect any portion of the spinal cord, and its symptoms and progress will vary accordingly. Its most frequent site is in the lower part, and its existence there is marked by the sudden or gradual occurrence of weakness of motor power in the legs (which tends to pass into complete paralysis), impairment or loss of sensibility in the parts implicated, nutritive changes affecting the skin and giving rise to bed-sores, together with bladder and bowel derangements. In the acute form, in which there is at first pain in the region of the spine and much constitutional disturbance, death may take place rapidly from extension of the disease to those portions of the cord connected with the muscles of respiration and the heart, from an acute bed-sore, which is very apt to form, or from some intercurrent disease. Recovery to a certain extent may, however, take place; or, again, the disease may pass into the chronic form. In the latter the progress is usually slow, the general health remaining tolerably good for a time, but gradually the strength fails, the patient becomes more helpless, and ultimately sinks exhausted or is cut off by some complication. The chief causes of myelitis are injuries or diseases affecting the spinal column, extension of inflammation from the membranes of the cord to its substance (see MENINGITIS), exposure to cold and damp, and occasionally some pre-existing constitutional morbid condition, such as syphilis or a fever. Any debilitating cause or excess in mode of life will act powerfully in predisposing to this malady. The disease is most common in adults. The treatment for myelitis in its acute stage is similar to that for spinal meningitis. When the disease is chronic the most that can be hoped for is the relief of symptoms by careful nursing and attention to the condition of the body and its functions. Good is sometimes derived from massage and the use of baths and douches to the spine.

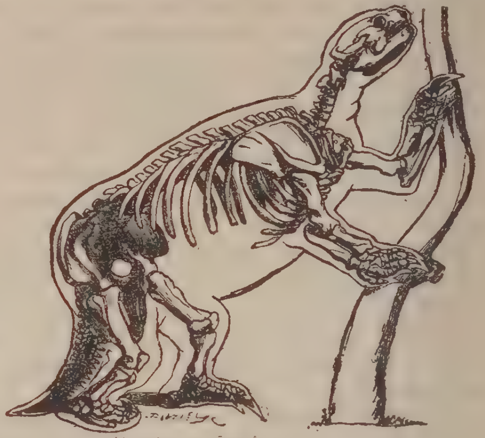
MYERS, FREDERIC WILLIAM HENRY (1843–1901), English poet and essayist, son of Frederic Myers of Keswick—author of *Lectures on Great Men* (1856) and *Catholic Thoughts* (first collected 1873), a book marked by a most admirable prose style—was born at Keswick, Cumberland, on the 6th of February 1843, and educated at Cheltenham and Trinity College, Cambridge, where he won a long list of honours and in 1865 was appointed classical lecturer. He had no love for teaching, which he soon discontinued, but he took up his permanent abode at Cambridge in 1872, when he became a school inspector under the Education Department. Meanwhile he published, in 1867, an unsuccessful essay for the Seatonian prize, a poem entitled *St Paul*, which met at the hands of the general public with a success that would be difficult to explain, for it lacks sincerity and represents views which the writer rapidly outgrew. It was followed by small volumes of collected verses in 1870 and 1882: both are marked by a flow of rhetorical ardour which culminates in a poem of real beauty, "The Renewal of Youth," in the 1882 collection. His best verse is in heroic couplets. Myers is more likely to be remembered by his two volumes of *Essays, Classical and Modern* (1883). The essay on Virgil, by far the best thing he ever wrote, represents the matured enthusiasm of a student and a disciple to whom the exquisite artificiality and refined culture of Virgil's method were profoundly congenial. Next to this in value is the carefully wrought essay on Ancient Greek Oracles (this had first appeared in *Hellenica*). Scarcely less delicate in phrasing and perception, if less penetrating in insight, is the monograph on *Wordsworth* (1881) for the "English Men of Letters" series. In 1882, after several years of inquiry and discussion, Myers took the lead among a small band of explorers (including Henry Sidgwick and Richard Hodgson, Edmund Gurney and F. Podmore), who founded the society for Psychical Research. He continued for many years to be the mouthpiece of the society, a position for which his *perfervidum ingenium*, still more his abnormal fluency and alertness, admirably fitted him. He contributed greatly to the coherence of the society by steering a mid-course between extremes (the extreme sceptics on the one hand, and the enthusiastic spiritualists on the other), and by helping to sift and revise the cumbrous mass of

Proceedings, the chief concrete results being the two volumes of *Phantasms of the Living* (1886), to which he contributed the introduction. Like many theorists, he had a faculty for ignoring hard facts, and in his anxiety to generalize plausibly upon the alleged data, and to hammer out striking formulae, his insight into the real character of the evidence may have left something to be desired. His long series of papers on subliminal consciousness, the results of which were embodied in a posthumous work called *Human Personality and its Survival of Bodily Death* (2 vols. 1903), constitute his own chief contribution to psychical theory. This, as he himself would have been the first to admit, was little more than provisional; but Professor William James has pointed out that the series of papers on subliminal consciousness is "the first attempt to consider the phenomena of hallucination, hypnotism, automatism, double personality and mediumship, as connected parts of one whole subject." The last work published in his lifetime was a small collection of essays, *Science and a Future Life* (1893). He died at Rome on the 17th of January 1901, but was buried in his native soil at Keswick.

MYINGYAN, a district in the Meiktila division of Upper Burma. It lies in the valley of the Irrawaddy, to the south of Mandalay, on the east bank of the river. Area, 3137 sq. m. Pop. (1901), 356,052, showing an increase of 1% in the decade and a density of 114 inhabitants to the square mile. The greater part of the district is flat, especially to the north and along the banks of the Irrawaddy. Inland the country rises in gently undulating slopes. The most noticeable feature is Popa hill, an extinct volcano, in the south-eastern corner of the district. The highest peak is 4962 ft. above sea-level. The climate is dry and healthy, with high south winds from March till September. The annual rainfall averages about 35 in. The temperature varies between 106° and 70° F. The ordinary crops are millet, sesamum, cotton, maize, rice, gram, and a great variety of peas and beans. The district as a whole is not well watered, and most of the old irrigation tanks had fallen into disrepair before the annexation. There are no forests, but a great deal of low scrub. The lacquer ware of Nyaung-u and other villages near Pagan is noted throughout Burma. A considerable number of Chinese inhabit Myingyan and the larger villages. The headquarters town, MYINGYAN, stands on the Irrawaddy, and had a population in 1901 of 16,139. It is the terminus of the branch railway through Meiktila to the main line from Mandalay to Rangoon. The steamers of the Irrawaddy Flotilla Company also call here. A cotton-pressing machine was erected here in the time of independent Burma, and still exists.

MYITKYINA, the most northerly of the districts of Upper Burma in the Mandalay division, separated from Bhamo district in 1895. It is cut up into strips by comparatively low parallel ranges of hills running in a general way north and south. The chief plain is that of Myitkyina, covering 600 sq. m. To the east of the Irrawaddy, which bisects the district, it is low-lying and marshy. To the west it rises to a higher level, and is mostly dry. Except in the hills inhabited by the Kachin tribes there are practically no villages off the line of the Irrawaddy. The Indawgyi lake, a fine stretch of water measuring 16 m. by 6, lies in the south-west of the district. A very small amount of cultivation is carried on, mostly without irrigation. Area, 10,640 sq. m.; estimated population (1901) 67,399, showing a density of six persons to the square mile. More than half the total are Kachins, who inhabit the hills on both sides of the Irrawaddy. The headquarters town, MYITKYINA, had in 1901 a population of 3618. It is the limit of navigation on the Irrawaddy, and the terminus of the railway from Rangoon and Sagaing.

MYLODON (Gr. for "mill-tooth" from *μυλών* and *ὀδούς*), a genus of extinct American edentate mammals, typified by a species (*M. harlani*) from the Pleistocene of Kentucky and other parts of the United States, but more abundantly represented in the corresponding formations of South America, especially Argentina and Brazil. The mylodons belong to the group of ground-sloths, and are generally included in the family *Megatheriidae*, although sometimes made the type of a separate family. From *Megatherium* these animals, which rivalled the Indian rhinoceros in bulk, differ in the shape of their cheek-teeth; these (five above and four below) being much smaller, with an ovate section, and a cupped instead of a ridged crown-surface, thus resembling those of the true sloths. In certain species of mylodon the front pair of teeth in each jaw is placed some distance in front of the rest and has the crown surface obliquely bevelled by wearing against the corresponding teeth in the opposite jaw. On this account such species have been referred to a second genus, under the name of *Lestodon*, but the distinction scarcely seems necessary. The skull is shorter and lower than in *Megatherium*, without any vertical expansion of the middle of the lower jaw, and the teeth also extend nearly to the front of the jaws; both these features being sloth-like. In the fore feet the three inner toes have large claws, while the two outer ones are rudimentary and clawless; in the hind-limbs the first toe is wanting, as in *Megatherium*, but the second and third are clawed. The skin was strengthened by a number of small deeply-embedded bony nodules.


From Owen.

Skeleton of *Mylodon robustus* (Pleistocene, South America).

Although the typical *M. harlani* is North American, the mylodons are essentially a South American group, a few of the representatives of which effected an entrance into North America when that continent became finally connected with South America. Special interest attaches to the recent discovery in the cavern of Ultima Esperanza, South Patagonia, of remains of the genus *Glossotherium*, or *Grypotherium*, a near relative of *Mylodon*, but differing from it in having a bony arch connecting the nasal bones of the skull with the premaxillae; these include a considerable portion of the skin with the hair attached. Ossicles somewhat resembling large coffee-berries had been previously found in association with the bones of *Mylodon*, and in *Glossotherium* nearly similar ossicles occur embedded on the inner side of the thick hide. The coarse and shaggy hair is somewhat like that of the sloths. The remains, which include not only the skeleton and skin, but likewise the droppings, were found buried in grass which appears to have been chopped up by man, and it thus seems not only evident that these ground-sloths dwelt in the cave, but that there is a considerable probability of their having been kept there in a semi-domesticated state by the early human inhabitants of Patagonia. The extremely fresh condition of the remains has given rise to the idea that *Glossotherium* may still be living in the wilds of Patagonia.

Scelidotherium is another genus of large South American Pleistocene ground-sloths, characterized, among other features, by the elongation and slenderness of the skull, which thus makes a decided approximation to the anteater type, although retaining the full series of cheek-teeth, which were, of course, essential to an herbivorous animal. The feet resemble those of *Megatherium*. A much smaller South American species represents the genus *Nothrotherium*.

In North America *Mylodon* was accompanied by another gigantic species typifying the genus *Megalonyx*, in which the fore part of the skull was usually wide, and the third and fourth front toes carried claws. Another genus has been described from the Pleistocene of Nebraska, as *Paramylodon*; it has only four pairs of teeth, and an elongate skull with an inflated muzzle. All the above genera differ from *Megatherium* in having a foramen on the inner side of the lower end of the humerus. A presumed large ground-sloth from Madagascar has been described, on the evidence of a limb-bone, as *Bradytherium*, but it is suggested by Dr F. Ameghino that the specimen really belongs to a lemuroid. Be this as it may, the North American mammals described as *Moropus* and *Morotherium*, in the belief that they were ground-sloths, are really referable to the ungulate group Ancylopoda.

Although a few of the Pleistocene ground-sloths, such as *Nothropus* and *Nothrotherium* (=*Coelodon*), were of comparatively small size, in the Santa Cruz beds of Patagonia few of the representatives of the family much exceeded a modern sloth in size. The best-known generic types are *Eucholoeops*, *Hapalops* and *Pseudahapalops*, of which considerable portions of the skeleton have been disinterred. In these diminutive ground-sloths the crowns of the cheek-teeth approached the prismatic form characteristic of *Mega[lo]therium*, as distinct from the subcylindrical type occurring in *Mylodon*, *Glossotherium*, &c.

By many palaeontologists a group of North American Lower Tertiary mammals, known as Ganodonta, has been regarded as representing the ancestral stock of the ground-sloths and those of other South American edentates; but according to Professor W. B. Scott this view is incorrect and there is no affinity between the two groups. If this be so, we are still in complete darkness as to the stock from which the South American edentates are derived.

See W. B. Scott, *Mammalia of the Santa Cruz Beds, Edentata*, Rep., Princeton Exped. to Patagonia, vol. v. (1903–1904); B. Brown *A New Genus of Ground-Sloth from the Pleistocene of Nebraska*, Bull. Amer. Mus. Nat. Hist., xix, 569 (1903). (R. L.*)

MYLONITE (Gr. μυλών, a mill), in petrology, a rock which has been crushed and ground down by earth movement and at the same time rendered compact by pressure. Mylonites are fine-grained, sometimes even flinty, in appearance, and often banded in parallel fashion with stripes of varying composition. The great majority are quartzose rocks, such as quartzite and quartz-schist; but in almost any type of rock mylonitic structure may be developed. Gneisses of various kinds, hornblende-schists, chlorite-schists and limestones are not infrequently found in belts of mylonitic rock. The process of crushing by which mylonites are formed is known also as "granulitization" and "cataclasis," and mylonites are often described as granulites, though the two terms are not strictly equivalent in all their applications. Mylonites occur in regions where there has been considerable metamorphism. Thrust planes and great reversed faults are often bounded by rocks which have all been crushed to fine slabby mylonites, that split readily along planes parallel to the direction in which movement has taken place. These "crush-belts" may be only a few feet or several hundred yards broad. The movements have probably taken place slowly without great rise of temperature, and hence the rocks have not recrystallized to any extent.

Crushing and movement on so extensive a scale are to be expected principally in regions consisting of rocks greatly folded and compressed. Hence mylonites are commonest in Archean regions, but may be found also in Carboniferous and later rocks where the necessary conditions have prevailed. Within a short space it is often possible to trace rocks from a normal to a highly mylonized condition, and to follow by means of the microscope all the stages of the process. A sandstone, grit, or fine quartzose conglomerate, for example, when it approaches a mylonitic zone begins to lose its clastic or pebbly structure. The rounded grains of quartz become cracked, especially near their edges, and are then surrounded by narrow borders, consisting of detached granules: this is due to the pebbles being pressed together and forced to pass one another as the rock yields to the pressures which overcome its rigidity. Then each quartz grain breaks up into a mosaic of little angular fragments; the rounded pebbles are flattened out and become lenticular or cake-shaped. Finally only a small oval patch of fine interlocking quartz grains is left to indicate the position of the pebble, and if the matrix is quartzose this gradually blends with it and a uniform fine-grained quartzose rock results. If felspar is present it may become crushed like quartz, but often tends to recrystallize as quartz and muscovite, the minute scales of white mica being parallel to the foliation or banding of the rock, and a finely granulitic or mylonitic quartz-schist is the product. In hornblendic rocks, such as epidiorite, amphibolite and hornblende-schist, the mineral composition may remain unchanged, but very often chlorite, carbonates and biotite develop, epidote and sphene being also frequent. Biotite- and muscovite-gneisses yield very perfect mylonites, in which the micas have parallel orientation, giving the rock a flat banding and marked schistosity (see PETROLOGY, Pl. iv., fig. 6). When these mylonitic gneisses contain pink garnet (often with kyanite or sillimanite) they pass into normal granulites; limestones, if fossiliferous, become changed into finely crystalline masses, often fissile, sometimes with lenticular or *augen* structure. An interesting variety of mylonite, developed in granite-porphyry and gneiss, is fine, dark and almost vitreous in appearance, consisting mainly of very minute grains of quartz and felspar and resembling flint in appearance. These form threads and vein-like streaks ramifying through the normal rocks. Examples are furnished by the flinty-crushes of west Scotland and the "trap-shotten" gneisses of south India. (J. S. F.)

MYMENSINGH, or MAIMANSINGH, a district of British India, in the Dacca division of Eastern Bengal and Assam. It occupies a portion of the alluvial valley of the Brahmaputra east of the main channel (called the Jamuna) and north of Dacca. The administrative headquarters are at Nasirabad, sometimes called Mymensingh town. Area, 6332 sq. m. Pop. (1901), 3,915,068, showing an increase of 12·8 % in the decade. The district is for the most part level and open, covered with well-cultivated fields, and intersected by numerous rivers. The Madhupur jungle is a slightly elevated tract, extending from the north of Dacca district into the heart of Mymensingh; its average height is about 60 ft. above the level of the surrounding country, and it nowhere exceeds 100 ft. The jungle contains abundance of *sāl*, valuable both as timber and for charcoal. The only other elevated tract in the district is on the southern border, where the Susang hills rise. They are for the most part covered with thick thorny jungle, but in parts are barren and rocky. The Jamuna forms the western boundary of Mymensingh for a course of 94 m. It is navigable for large boats throughout the year; and during the rainy season it expands in many places to 5 or 6 m. in breadth. The Brahmaputra enters Mymensingh at its north-western corner near Karaibari, and flows south-east and south till it joins the Meghna a little below Bhairab Bazar. The gradual formation of *chars* and bars of sand in the upper part of its course has diverted the main volume of water into the present channel of the Jamuna, which has in consequence become of much more importance than the Brahmaputra proper. The Meghna only flows for a short distance through the south-east portion of the district, the eastern and south-eastern parts of which abound in marshes. The staple crops of the country are rice, jute and oil-seeds. A branch line of the Eastern Bengal railway runs north from Dacca through Nasirabad, &c., to the Jamuna. The district was severely affected by the earthquake of the 12th of June 1897.

MYNGS, SIR CHRISTOPHER (1625–1666), British admiral, came of a Norfolk family. Pepys' story of his humble birth is said to be erroneous. It is probable that he saw a good deal of sea-service before 1648. He first appears prominently as the captain of the "Elisabeth," which after a sharp action brought in a Dutch convoy with two men-of-war as prizes. From 1653 to 1655 he continued to command the "Elisabeth," high in favour with the council of state and recommended for promotion by the flag officers under whom he served. In 1655 he was appointed to the "Marston Moor," the crew of which was on the verge of mutiny. His firm measures quelled the insubordinate spirit, and he took the vessel out to the West Indies, where he remained for some years. The Restoration government retained him in his command, and in 1664 he was made vice-admiral in Prince Rupert's squadron. As vice-admiral of the White he flew his flag at Lowestoft in 1665, and for his share in that action received the honour of knighthood. In the following year he served under the new lord high admiral, Sandwich, as vice-admiral of the Blue. He was on detachment with Prince Rupert when the great Four Days' Battle began, but returned to the main fleet in time to take part, and in this action he received a wound of which he died.

MYONEMES, in Infusoria and some Flagellates, the differentiated threads of ectosarc, which are contractile and doubly refractive, performing the function of muscular fibres in the Metazoa.

MYRA (mod. *Dembre*), an ancient town of Lycia situated a short distance inland between the rivers Myrus and Andracus. In common with that of most other Lycian towns its early history is not known, and it does not play any part of importance in either Greek or Roman annals. Its fame begins with Christianity. There St Paul touched on his last journey westward (A.D. 62), and changed into "a ship of Alexandria sailing into Italy." In the 3rd century the great St Nicholas, born at Patara, was its bishop, and he died and was buried at Myra. His tomb is still shown, but his relics are supposed to have been translated to Bari in Italy in the 11th century. Theodosius II. made Myra the Byzantine capital of Lycia, and as such it was besieged and taken by Harun al-Rashid in 808. The town seems shortly afterwards to have decayed. A small Turkish village occupied the plain at the foot of the acropolis, and a little Greek monastery lay about a mile westward by the church of St Nicholas. The latter has formed the nucleus of modern Dembre, which has been increased by settlers from the Greek island of Castelórizo. Myra has three notable sights, its carved cliff-cemetery, its theatre, and its church of St Nicholas. The first is the most remarkable of the Lycian rock-tomb groups. The western scarp of the acropolis has been sculptured into a number of sepulchres imitating wooden houses with pillared façades, some of which have pediment reliefs and inscriptions in Lycian. The theatre lies at the foot of this cliff and is partly excavated out of it, partly built. It is remarkable for the preservation of its corridors. The auditorium is perfect in the lower part, and the scena still retains some of its decoration—both columns and carved entablature. The church of St Nicholas lies out in the plain, at the western end of Dembre, near a small monastery and new church recently built with Russian money. Its floor is far below the present level of the plain, and until recently the church was half filled with earth. The excavation of it was undertaken by Russians about 1894 and it cost Dembre dear; for the Ottoman government, suspicious of foreign designs on the neighbouring harbour of Kékova, proceeded to inhibit all sale of property in the plain and to place Dembre under a minor state of siege. The ancient church is of the domed basilica form with throne and seats still existent in the tribunal. In the south aisle as a tomb with marble balustrade which is pointed out as that wherein St Nicholas was laid. The locality of the tomb is very probably genuine, but its present ornament, as well as the greater part of the church, seems of later date (end of 7th century ?). None the less this is among the most interesting early Christian churches in Asia Minor. There are also extensive ruins of Andriaca, the port of Myra, about 3 m. west, containing churches, baths, and a great grain store, inscribed with Hadrian's name. They lie along the course of the Andraki river, whose navigable estuary is still fringed with ruinous quays.

See E. Petersen and F. v. Luschan, *Reisen in Lykien, &c.* (1889). (D. G. H.)

MYRIAPODA (Gr. for "many-legged"), arthropod animals of which centipedes and millipedes are familiar examples. Linnaeus included them in his Insecta Aptera together with Crustacea and Arachnida; in 1796 P. A. Latreille designated them as Myriopoda, making of them, along with the Crustacean *Oniscus*, one of the seven orders into which he divided the Aptera of Linnaeus. Later on J. C. Savigny, by study of the mouth-parts, clearly distinguished them from Insects and Crustacea. In 1814 W. E. Leach defined them and divided them into Centipedes and Millipedes. In 1825 Latreille carried further the observations of Leach, and suggested that the two groups were very distinct, the millipedes being nearer Crustacea and the centipedes approaching Arachnida and Insecta. Although Latreille's suggestion has not been adopted, it is recognized that centipedes and millipedes are too far apart to be united as Myriapoda, and they are now treated as separate classes of the Arthropoda. See CENTIPEDE (Chilopoda) and MILLIPEDE (Diplopoda).

MYRMIDONES, in Greek legend, an Achaean race, in Homeric times inhabiting Phthiotis in Thessaly. According to the ancient tradition, their original home was Aegina, whence they crossed over to Thessaly with Peleus, but the converse view is now more generally accepted. Their name is derived from a supposed ancestor, son of Zeus and Eurymedusa, who was wooed by the god in the form of an ant (Gr. μύρμηξ); or from the repeopling of Aegina (when all its inhabitants had died of the plague) with ants changed into men by Zeus at the prayer of Aeacus, king of the island. The word "myrmidon" has passed into the English language to denote a subordinate who carries out the orders of his superior without mercy or consideration for others.

See Strabo viii. 375, ix. 433; Homer, *Iliad*, ii. 681; schol. on Pindar *Nem.* iii. 21; Clem. Alex., *Protrepticon*, p. 34, ed. Potter.

MYROBALANS, the name given to the astringent fruits of several species of *Terminalia*, largely used in India for dyeing and tanning and exported for the same purpose. They are large deciduous trees and belong to the family Combretaceae. The chief kinds are the chebulic or black myrobalan, from *Terminalia Chebula*, which are smooth, and the beleric, from *T. belerica*, which are five-angled and covered with a greyish down.

MYRON, a Greek sculptor of the middle of the 5th century B.C. He was born at Eleutherae on the borders of Boeotia and Attica. He worked almost exclusively in bronze: and though he made some statues of gods and heroes, his fame rested principally upon his representations of athletes, in which he made a revolution, by introducing greater boldness of pose and a more perfect rhythm. His most famous works according to Pliny (*Nat. Hist.*, 34, 57) were a cow, Ladas the runner, who fell dead at the moment of victory, and a discus-thrower. The cow seems to have earned its fame mainly by serving as a peg on which to hang epigrams, which tell us nothing about the pose of the animal. Of the Ladas there is no known copy. But we are fortunate in possessing several copies of the discobolus, of which the best is in the Massimi palace at Rome (see GREEK ART, Pl. iv. fig. 68). The example in the British Museum has the head put on wrongly. The athlete is represented at the moment when he has swung back the discus with the full stretch of his arm, and is about to hurl it with the full weight of his body. The head should be turned back toward the discus.

A marble figure in the Lateran Museum (see GREEK ART, Pl. iii. fig. 64), which is now restored as a dancing satyr, is almost certainly a copy of a work of Myron, a Marsyas desirous of picking up the flutes which Athena had thrown away (Pausanias, i. 24, 1). The full group is copied on coins of Athens, on a vase and in a relief which represent Marsyas as oscillating between curiosity and the fear of the displeasure of Athena.

The ancient critics say of Myron that, while he succeeded admirably in giving life and motion to his figures, he did not succeed in rendering the emotions of the mind. This agrees with the extant evidence, in a certain degree, though not perfectly. The bodies of his men are of far greater excellence than the heads. The face of the Marsyas is almost a mask; but from the attitude we gain a vivid impression of the passions which sway him. The face of the discus-thrower is calm and unruffled; but all the muscles of his body are concentrated in an effort.

A considerable number of other extant works are ascribed to the school or the influence of Myron by A. Furtwängler in his suggestive *Masterpieces of Greek Sculpture* (pp. 168–219). These attributions, however, are anything but certain, nor do the arguments by which Furtwängler supports his attributions bear abridgment.

A recently discovered papyrus from Egypt informs us that Myron made statues of the athlete Timanthes, victorious at Olympia in 456 B.C., and of Lycinus, victorious in 448 and 444. This helps us to fix his date. He was a contemporary, but a somewhat older contemporary, of Pheidias and Polyclitus. (P.G.)

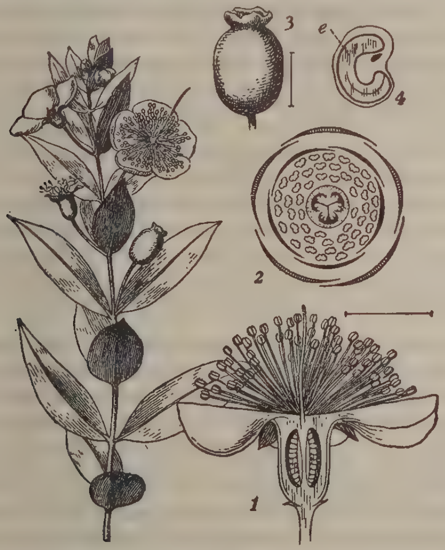
MYRRH (from the Latinized form *myrrha* of Gr. μύῤῥα; the Arabic *murr*, bitter, was applied to the substance from its bitterness), a gum-resin highly esteemed by the ancients as an unguent and perfume, used for incense in temples and also in embalming. It was one of the gifts offered by the Magi, and a royal oblation of gold, frankincense and myrrh is still annually presented by the sovereign on the feast of Epiphany in the Chapel Royal in London, this custom having been in existence certainly as early as the reign of Edward I.[1] True myrrh is the product of *Balsamodendron* (*Commiphora*) *Myrrha*, a small tree of the natural order Amyridaceae that grows in eastern Africa and Arabia, but the name is also applied to gum resins obtained from other species of *Balsamodendron*.

1. *Baisa Bol*, *Bhesa Bol* or *Bissa Bol*, from *Balsamodendron Kataf*, resembles true myrrh in appearance, but has a disagreeable taste and is scarcely bitter. It is used in China, mixed with food, to give to milch cows to improve the quality and increase the quantity of milk, and when mixed with lime as a size to impart a gloss to walls. (2) Opaque bdellium produced by *B. Playfairii*, when shaken with water forms a slight but permanent lather, and on this account is used by the Somali women for cleansing their hair, and by the men to whiten their shields; it is known as *meena hărma* in Bombay, and was formerly used there for the expulsion of the guinea-worm. (3) African bdellium is from *B. africanum*, and like opaque bdellium lacks the white streaks which are characteristic of myrrh and bissa bol, both are acrid, but have scarcely any bitterness or aroma. (4) Indian bdellium, probably identical with the Indian drug googul obtained in Sind and Baluchistan from *B. Mukul* and *B. pubescens*, Hook, is of a dark reddish colour, has an acrid taste and an odour resembling cedar-wood, and softens in the hand.

As met with in commerce true myrrh occurs in pieces of irregular size and shape, from ½ in. to 2 or 3 in. in diameter, and of a reddish-brown colour. The transverse fracture has a resinous appearance with white streaks; the flavour is bitter and aromatic, and the odour characteristic. It consists of a mixture of resin, gum and essential oil, the resin being present to the extent of 25 to 40%, with 2½ to 8% of the oil, myrrhol, to which the odour is due.

Myrrh has the properties of other substances which, like it, contain a volatile oil. Its only important application in medicine is as a carminative to lessen the griping caused by some purgatives such as aloes. The volatile oils have for centuries been regarded as of value in disorders of the reproductive organs, and the reputation of myrrh in this connexion is simply a survival of this ancient but ill-founded belief.

MYRTLE. The *μύρτος* of the Greeks, the *myrtus* of the Romans, and the myrtle, *Myrtus communis* (see fig.), of botanists, as now found growing wild in many parts of the Mediterranean region, doubtless all belong to one and the same species. It is a low-growing, evergreen shrub, with opposite leaves, varying in dimensions, but always small, simple, dark-green, thick in texture, and studded with numerous receptacles for oil. When the leaf is held up to the light it appears as if perforated with pinholes owing to the translucency of these oil-cysts. The fragrance of the plant depends upon the presence of this oil. Another peculiarity of the myrtle is the existence of a prominent vein running round the leaf within the margin. The flowers are borne on short stalks in the axils of the leaves. The flower-stalk is dilated at its upper end into a globose or ovoid receptacle enclosing the 2- to 4-partitioned ovary. From its margin proceed the five sepals, and within them the five rounded, spoon-shaped, spreading, white petals. The stamens spring from the receptacle within the petals and are very numerous, each consisting of a slender white filament and a small yellow two-lobed anther. The style surmounting the ovary is slender, terminating in a small button-like stigma. The fruit is a purplish berry, consisting of the receptacle and the ovary blended into one succulent investment enclosing very numerous minute seeds. The embryo-plant within the seed is usually curved. In cultivation many varieties are known, dependent on variations in the size and shape of the leaves, the presence of so-called double flowers, &c. The typical species is quite hardy in the south of England. The Chilean species, *M. Ugni*, a shrub with ovate, dark green leaves and white flowers succeeded by globular red or black glossy fruit with a pleasant smell and taste, is a greenhouse shrub, hardy in south-west Britain. The common myrtle is the sole representative in Europe of a large genus which has its headquarters in extra-tropical South America, whilst other members are found in Australia and New Zealand. The genus *Myrtus* also gives its name to a very large natural order, Myrtaceae, the general floral structure of which is like that of the myrtle above described, but there are great differences in the nature of the fruit or seed-vessel according as it is dry or capsular, dehiscent, indehiscent or pulpy; minor differences exist according to the way in which the stamens are arranged. The aromatic oil to which the myrtle owes its fragrance, and its use in medicine and the arts, is a very general attribute of the order, as may be inferred from the fact that the order includes, amongst other genera, *Eucalyptus* (*q.v.*), *Pimenta* and *Eugenia* (cloves). *Myrtol*, a constituent of myrtle oil, has been given in doses of 5–15 minims on sugar or in capsules for pulmonary tuberculosis, fetid bronchitis, bronchiectasis, and similar conditions. It appears to lessen expectoration in such cases. The leaves of *Myrtus chekan* are aromatic and expectorant, and have been used in chronic bronchitis.



Myrtle (*Myrtus communis*).

1. Vertical section of flower, enlarged.
2. Plan of flower in horizontal plane.
3. Berry, enlarged.
4. Seed with contained embryo, *e*, much enlarged.

MYSIA, the district of N.W. Asia Minor in ancient times inhabited by the Mysi. It was bounded by Lydia and Phrygia on the S., by Bithynia on the N.E., and by the Propontis and Aegean Sea on the N. and W. But its precise limits are difficult to assign, the Phrygian frontier being vague and fluctuating, while in the north-west the Troad was sometimes included in Mysia, sometimes not. Generally speaking, the northern portion was known as Mysia Minor or Hellespontica and the southern as Major or Pergamene.

The chief physical features of Mysia (considered apart from that of the Troad) are the two mountain-chains, Olympus (7600 ft.) in the north and Temnus in the south, which for some distance separates Mysia from Lydia, and is afterwards prolonged through Mysia to the neighbourhood of the Gulf of Adramyttium. The only considerable rivers are the Macestus and its tributary the Rhyndacus in the northern part of the province, both of which rise in Phrygia, and, after diverging widely through Mysia, unite their waters below the lake of Apollonia about 15 m. from the Propontis. The Caïcus in the south rises in Temnus, and from thence flows westward to the Aegean Sea, passing within a few miles of Pergamum. In the northern portion of the province are two considerable lakes, Artynia or Apolloniatis (Abulliont Geul), and Aphnitis (Maniyas Geul), which discharge their waters into the Macestus from the east and west respectively.

The most important cities were Pergamum (*q.v.*) in the valley of the Caïcus, and Cyzicus (*q.v.*) on the Propontis. But the whole sea-coast was studded with Greek towns, several of which were places of considerable importance; thus the northern portion included Parium, Lampsacus and Abydos, and the southern

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[1] *Liber quotidianus contra-rotulatoris garderobae Edw. I.* (London, 1787), pp, xxxii. and 27.

Assus, Adramyttium, and farther south, on the Elaitic Gulf, Elaea, Myrina and Cyme.

Ancient writers agree in describing the Mysians as a distinct people, like the Lydians and Phrygians, though they never appear in history as an independent nation. It appears from Herodotus and Strabo that they were kindred with the Lydians and Carians, a fact attested by their common participation in the sacred rites at the great temple of Zeus at Labranda, as well as by the statement of the historian Xanthus of Lydia that their language was a mixture of Lydian and Phrygian. Strabo was of opinion that they came originally from Thrace (cf. BITHYNIA), and were a branch of the same people as the Mysians or Moesians (see MOESIA) who dwelt on the Danube—a view not inconsistent with the preceding, as he considered the Phrygians and Lydians also as having migrated from Europe into Asia. According to a Carian tradition reported by Herodotus (i. 171) Lydus and Mysus were brothers of Car—an idea which also points to the belief in a common origin of the three nations. The Mysians appear in the list of the Trojan allies in Homer and are represented as settled in the Caïcus valley at the coming of Telephus to Pergamum; but nothing else is known of their early history. The story told by Herodotus (vii. 20) of their having invaded Europe in conjunction with the Teucrians before the Trojan War is probably a fiction; and the first historical fact we learn is their subjugation, together with all the surrounding nations, by Lydian Croesus. After the fall of the Lydian monarchy they remained under the Persian Empire until its overthrow by Alexander. After his death they were annexed to the Syrian monarchy, of which they continued to form a part until the defeat of Antiochus the Great (190 B.C.), after which they were transferred by the Romans to the dominion of Eumenes of Pergamum. After the extinction of the Pergamenian dynasty (130 B.C.) Mysia became a part of the Roman province of Asia, and from this time disappears from history. The inhabitants probably became gradually Hellenized, but none of the towns of the interior, except Pergamum, ever attained to any importance.

See C. Texier, *Asie mineure* (Paris, 1839); W. J. Hamilton, *Researches* (London, 1842); J. A. R. Munro in *Geogr. Journal* (1897, Hellespontica); W. von Diest, *Petermanns Mitth.* (Ergänzungsheft 94; Gotha, 1889; Pergamene). (F. W. HA.)

MYSLOWITZ, a town of Germany, in the Prussian province of Silesia. Pop. (1905), 15,845. It lies on the navigable Przemsa, across which an iron bridge leads to the Polish town of Modrzejow, 120 m. S.E. from Breslau by rail, and an important junction of lines to Oswiecim-Lemberg and Vienna. It contains a Protestant and three Roman Catholic churches, a palace and a gymnasium, and other schools. Extensive coal-mines are worked, and among its other industries are flax-spinning and brick-making. It became a town in 1857.

See Lustig, *Geschichte von Myslowitz* (Myslowitz, 1867).

MYSORE, a native state of southern India, almost surrounded by the Madras presidency, but in political relations with the governor-general. It is naturally divided into two regions of distinct character—the hill country called the Malnad, on the west, and the more open country known as the Maidan, comprising the greater part of the state, where the wide-spreading valleys and plains are covered with villages and populous towns. The drainage of the country, with a slight exception, finds its way into the Bay of Bengal, and is divisible into three great river systems—that of the Kistna on the north, the Cauvery on the south, and the Northern and Southern Pennar and Palar on the east. Owing to either rocky or shallow beds none of the Mysore rivers is navigable, but some are utilized for floating down timber at certain seasons. The main streams, especially the Cauvery and its tributaries, support an extensive system of irrigation by means of channels drawn from immense dams (*anicuts*), which retain the water at a high level and permit only the overflow to pass down stream. The streams which gather from the hill-sides and fertilize the valleys are embanked at every favourable point in such a manner as to form a series of reservoirs or tanks, the outflow from one at a higher level supplying the next lower, and so on, all down the course of the stream at short intervals. These tanks, varying in size from small ponds to extensive lakes, are dispersed throughout the country to the number of 20,000; the largest is the Sulekere lake, 40 m. in circumference.

Mysore is perhaps the most prosperous native state in India. Situated on a healthy plateau, it receives the benefit of both the south-west and north-east monsoons, a natural advantage which, in conjunction with its irrigation system, has brought to Mysore a larger degree of immunity from famine than almost any other internal tract of India (always excepting the great calamity of 1876–1877, when one-fourth of the population are believed to have perished). Coffee, sandal-wood, silk, gold and ivory are among the chief products. The famous Kolar gold-fields are worked by electric power, which is conveyed for a distance of 92 m. from the Cauvery Falls. This was the first electric power scheme of magnitude in Asia. A long period of administration by British officers led to the introduction of a system based on British models, which has been maintained under a series of exceptionally able native ministers, and the state can boast of public works, hospitals, research laboratories, &c., unsurpassed in India.

The total area of the state is 29,433 sq. m., subdivided into 8 districts, namely: Bangalore, Kolar, Tumkur, Mysore, Hassan, Kadur, Shimoga and Chitaldrug. Pop. (1901), 5,539,399, showing an increase of 18% between 1881 and 1891, and of 12% between 1891 and 1901. The proportion of Hindus (92·1%) is larger than in any province of India, showing how ineffectual was the persecution of Hyder and Tippoo. The Christians (apart from native converts, who are chiefly Roman Catholics) largely consist of the garrison at Bangalore, the families of military pensioners at the same town, coffee-planters and gold-miners. The finances of the state have been very successfully managed under native rule, assisted by large profits from railways and gold-mines. The revenue amounts to about £1,400,000, of which nearly half is derived from land. In accordance with the "instrument of transfer," Mysore pays to the British government a tribute of £234,000, as contribution to military defence; but the full amount was not exacted until 1896. The state maintains a military force, consisting of two regiments of *silladar* cavalry and three battalions of infantry—total, about 2800 men; and also a regiment of imperial service lancers, with a transport corps. An interesting political experiment has been made, in the constitution of a representative assembly, composed of 350 representatives of all classes of the community, who meet annually to hear an account of the state administration for the previous year. The assembly has no power to enact laws, to vote supplies, or to pass any resolution binding upon the executive. But it gives to the leading men of the districts a pleasant opportunity of visiting the capital, and to a limited extent brings the force of public opinion to bear upon the minister. Since 1891 this representative assembly has been elected by local boards and other public bodies.

In the earliest historical times the northern part of Mysore was held by the Kadamba dynasty, whose capital, Banawasi, is mentioned by Ptolemy; they reigned with more or less splendour during fourteen centuries, though latterly they became feudatories of the Chalukyas. The Cheras were contemporary with the Kadambas, and governed the southern part of Mysore till they were subverted by the Cholas in the 8th century. Another ancient race, the Pallavas, held a small portion of the eastern side of Mysore, but were overcome by the Chalukyas in the 7th century. These were overthrown in the 12th century by the Ballalas (Hoysalas), an enterprising and warlike race professing the Jain faith. They ruled over the greater part of Mysore, and portions of the modern districts of Coimbatore, Salem and Dharwar, with their capital at Dwarasamudra (the modern Halebid); but in 1310 the Ballala king was captured by Malik Kafur, the general of Ala-ud-din; and seventeen years later the town was entirely destroyed by another force sent by Mahommed Tughlak. After the subversion of the Ballala dynasty, a new and powerful Hindu sovereignty arose at Vijayanagar on the Tungabhadra.

In 1565 a confederation of the Mahommedan kingdoms defeated the Vijayanagar sovereign at the battle of Talikota; and his descendants ultimately became extinct as a ruling house. During the feeble reign of the last king, the petty local chiefs (*palegars*) asserted their independence. The most important of these was the *wodeyar* of Mysore, who in 1610 seized the fort of Seringapatam, and so laid the foundation of the present state. His fourth successor, Chikka Deva Raja, during a reign of 34 years, made his kingdom one of the most powerful in southern India. In the middle of the 18th century the famous Mahommedan adventurer Hyder Ali usurped the throne, and by his military prowess made himself one of the most powerful princes of India. His dynasty, however, was as brief as it was brilliant, and ended with the defeat and death of his son Tippoo at Seringapatam in 1799. A representative of the ancient Hindu line was then replaced on the throne. This prince, Krishnaraja Wodeyar, was only five years old, and until he came of age in 1811 the state was under the administration of Purnaiya, the Brahman minister of Hyder and Tippoo. When Krishnaraja took over the management of his state he received an orderly and contented principality with a surplus of two crores of rupees. Within twenty years he had driven his subjects into rebellion and involved himself and his state in heavy debt. The British government therefore assumed the administration in 1831, and placed it in the hands of commissioners. In 1862 no less than 88 lakhs of state debts and of the maharaja's own liabilities had been liquidated; the entire administration had been reformed, a revised system of land revenue introduced, and many public works executed. The maharaja therefore pressed his claims to a restoration of his powers, but the British government refused the application as incompatible with the true interests of the people of Mysore, and as not justified by any treaty obligation. In the same year Chamarajendra Wodeyar, afterwards maharaja, was born of the Bettada Kote branch of the ruling house; and in June 1865 Maharaja Krishnaraja adopted him as his son and successor, although he had been informed that no adoption could be recognized except to his own private property, already once more heavily weighted with private debts. In 1867 the policy of government underwent a change; it was determined to secure the continuance of native rule in Mysore, by acknowledging the adoption upon certain conditions which would secure to the people the continued benefits of good administration enjoyed by them under British control. The old maharaja died on the 27th of March 1868, and Chamarajendra Wodeyar was publicly installed as the future ruler of Mysore on the 23rd of September 1868. His education was taken in hand, abuses which had grown up in the palace establishment were reformed, the late maharaja's debts were again paid off, and the whole internal administration perfected in every branch during the minority. On the 25th of March 1881 Maharaja Chamarajendra, having attained the age of 18 years, was publicly entrusted with the administration of the state. He made over to the British government, with full jurisdiction, a small tract of land at Bangalore, forming the "civil and military station," and received in return the island of Seringapatam. But the most important incident of the change was the signing of the "instrument of transfer," by which the young maharaja, for himself and his successors, undertook to perform the conditions imposed upon him. To that agreement the maharaja steadfastly adhered during his reign, and the instrument is a landmark in the history of British relations with the protected states of India. The maharaja's first minister was Ranga Charlu, who had been trained in the British administration of Mysore. He signalized the restoration of native rule by creating the representative assembly. In 1883 Sheshadri Aiyar succeeded Ranga Charlu, and to him Mysore is indebted for the extension of railways and schemes of irrigation, the development of the Kolar goldfields, and the maintenance of the high standard of its administration. The maharaja died at Calcutta on the 28th of December 1894. His eldest son, Krishnaraja Wodeyar, born in 1884, succeeded him, and his widow, Maharani Vanivilas, was appointed regent, until in 1902 the maharaja was formally invested with full powers by the viceroy in person.

See B. L. Rice, *Mysore* (2nd ed., Bangalore, 1897); *Mysore and Coorg Gazetteer* (Calcutta, 1908).

MYSORE, capital of the state of Mysore, India, 10 m. S.W. of Seringapatam on the Mysore State railway. Pop. (1901), 68,111. The city, which is spread over an area of about 7½ sq. m., has its nucleus at the foot of the Chamundi hill, in a valley formed by two parallel ridges running north and south. The fort stands in the south of the town, forming a quarter by itself; the ground-plan is quadrangular, each of the sides being about 450 yds. long. The old palace of the maharaja within the fort, built in an extravagant style of Hindu architecture, was partly destroyed by fire in 1897, whereupon a new palace was built on the same site. The principal object of interest in the old palace was the throne, which is said to have been presented to Chikka Deva Raj by the emperor Aurangzeb. The houses of the European residents are for the most part to the east of the town. The residency or government house was built in 1805. The building afterwards used for the district offices was originally built by Colonel Wellesley (duke of Wellington) for his own occupation. The domed building for the public offices in Gordon Park, the Maharaja's College, the Victoria Jubilee Institute, and the law courts are conspicuous. Mysore, though the dynastic capital of the state, was superseded by Seringapatam as the seat of the court from 1610 to 1799, and in 1831, on the British occupation, the seat of administration was removed to Bangalore.

MYSTERY (Gr. *μυστήριον*, from *μύστης*, an initiate, *μύειν*, to shut the mouth), a general English term for what is secret and excites wonder, derived from the religious sense (see below). It is not to be confounded with the other old word "mystery," or more properly "mistery," meaning a trade or handicraft (Lat. *ministerium*, Fr. *métier*). For the medieval plays, called mysteries, see DRAMA; they were so called (Skeat) because acted by craftsmen.

Greek Mysteries.—It is important to obtain a clear conception of the exact significance of the Greek term *μυστήριον*, which is often associated and at times appears synonymous with the words *τελετή*, *ὄργια*. We may interpret "mystery" in its original Greek meaning as a "secret" worship, to which only certain specially prepared people—*οἱ μυηθέντες*—were admitted after a special period of purification or other preliminary probation, and of which the ritual was so important and perilous that the "catechumen" needed a hierophant or expounder to guide him aright. In the ordinary public worship of the state or the private worship of the household the sacrifice with the prayer was the chief act of the ceremony; in the "mysterion" something other than a sacrifice was of the essence of the rite; something was shown to the eyes of the initiated, the mystery was a *δρᾶμα μυστικόν*, and *δρᾶν* and *δρησμοσύνη* are verbal terms expressive of the mystic act. We have an interesting account given us by Theo Smyrnaeus[1] of the various elements and moments of the normal mystic ceremony: first is the *καθαρμός* or preliminary purification; secondly, the *τελετῆς παράδοσις*, the mystic communication which probably included some kind of *λόγος*, a sacred exegesis or exhortation; thirdly, the *ἐποπτεία* or the revelation to sight of certain holy things, which is the central point of the whole; fourthly, the crowning with the garland, which is henceforth the badge of the privileged; and finally, that which is the end and object of all this, the happiness that arises from the friendship or communion with the deity. This exposition is probably applicable to the Greek mysteries in general, though it may well have been derived from his knowledge of the Eleusinian. We may supplement it by a statement of Lucian's that "no mystery was ever celebrated without dancing" (*De saltat.* 15), which means that it was in some sense a religious drama, ancient Greek dancing being generally mimetic, and represented some *ἱερός λόγος* or sacred story as the theme of a mystery-play.

Before we approach the problem as to the content of the mysteries, we may naturally raise the question why certain ancient cults in Greece were mystic, others open and public. An explanation often offered is that the mystic cults are the Pelasgic or pre-Hellenic and that the conquered populations desired to shroud their religious ceremonies from the profane eyes of the invaders. But we should then expect to find them administered chiefly by slaves and the lower population; on the contrary they are generally in the hands of the noblest families, and the evidence that slaves possessed in any of them the right of initiation is only slight. Nor does the explanation in other respects fit the facts at all. The deities who are worshipped with mystic rites have in most cases Hellenic names and do not all belong to the earliest stratum of Hellenic religion. Besides those of Demeter, by far the most numerous in the Hellenic world, we have record of the mysteries of Ge at Phlye in Attica, of Aglauros and the Charities at Athens, of Hecate at Aegina; a shrine of Artemis *Μυσία* on the road between Sparta and Arcadia points to a mystic cult of this goddess, and we can infer the existence of a similar worship of Themis. Now these are either various forms of the earth-goddess, or are related closely to her, being powers that we call "chthonian," associated with the world below, the realm of the dead. We may surmise then that the mystic setting of a cult arose in many cases from the dread of the religious miasma which emanated from the nether world and which suggested a prior ritual of purification as necessary to safeguard the person before approaching the holy presence or handling certain holy objects. This would explain the necessity of mysteries in the worship of Dionysus also, the Cretan Zagreus, Trophonius at Lebadeia, Palaemon-Melicertes on the Isthmus of Corinth. They might also be necessary for those who desired communion with the deified ancestor or hero, and thus we hear of the mysteries of Dryops at Asine, of Antinoüs the favourite of Hadrian at Mantineia. Again, where there was hope or promise that the mortal should by communion be able to attain temporarily to divinity, so hazardous an experiment would be safeguarded by special preparation, secrecy and mystic ritual; and this may have been the prime motive of the institution of the Attis-Cybele mystery. (See GREAT MOTHER OF THE GODS.)

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[1] *De util. math.*, Herscher, p. 15.

For the student of Hellenism, the Eleusinian and Orphic ceremonies are of paramount importance; the Samothracian, which vied with these in attractiveness for the later Hellenic world, were not Hellenic in origin, nor wholly hellenized in character, and cannot be considered in an article of this compass.

As regards the Eleusinia, we are in a better position for the investigation of them than our predecessors were; for the modern methods of comparative religion and anthropology have at least taught us to ask the right questions and to apply relevant hypotheses; archaeology, the study of vases, excavations on the site, yielding an ever-increasing hoard of inscriptions, have taught us much concerning the external organization of the mysteries, and have shown us the beautiful figures of the deities as they appeared to the eye or to the mental vision of the initiated.

As regards the inner content, the secret of the mystic celebration, it is in the highest degree unlikely that Greek inscriptions or art would ever reveal it; the Eleusinian scenes that appear on Attic vases of about the 5th century cannot be supposed to show us the heart of the mystery, for such sacrilegious rashness would be dangerous for the vase-painter. If we are to discover it, we must turn to the ancient literary records. These must be handled with extreme caution and a more careful scrutiny than is often applied. We must not expect full enlightenment from the Pagan writers, who convey to us indeed the poetry and the glow of this fascinating ritual, and who attest the deep and purifying influence that it exercised upon the religious temperament, but who are not likely to tell us more. It is to the Christian Fathers we must turn for more esoteric knowledge, for they would be withheld by no scruple from revealing what they knew. But we cannot always believe that they knew much, for only those who, like Clement and Arnobius, had been Pagans in their youth, could ever have been initiated. Many of them uncritically confuse in the same context and in one sweeping verdict of condemnation Orphic, Phrygian-Sabazian and Attis-Mysteries with the Eleusinian; and we ought not too lightly to infer that these were actually confused and blended at Eleusis. We must also be on our guard against supposing that when Pagan or Christian writers refer vaguely to "mysteria," they always have the Eleusinian in their mind.

The questions that the critical analysis of all the evidence may hope to solve are mainly these: (*a*) What do we know or what can we infer concerning the personality of the deities to whom the Eleusinian mysteries were originally consecrated, and were new figures admitted at a later period? (*b*) When was the mystery taken over by Athens and opened to all Hellas, and what was the state-organization provided? (*c*) What was the inner significance, essential content or purport of the Eleusinia, and what was the source of their great influence on Hellas? (*d*) Can we attribute any ethical value to them, and did they strongly impress the popular belief in immortality? Limits of space allow us only to adumbrate the results that research on the lines of these questions has hitherto yielded.

The paramount divine personalities of the mystery were in the earliest period of which we have literary record, the mother and the daughter, Demeter and Kore, the latter being never styled Persephone in the official language of Eleusis; while the third figure, the god of the lower world known by the euphemistic names of Pluto (Plouton) and at one time Eubouleus, the ravisher and the husband, is an accessory personage, comparatively in the background. This is the conclusion naturally drawn from the Homeric hymn to Demeter, a composition of great ritualistic value, probably of the 7th century B.C., which describes the abduction of the daughter, the sorrow and search of the mother, her sitting by the sacred well, the drinking of the *κυκεών* or sacred cup and the legend of the pomegranate. An ancient hymn of Pamphos, from which Pausanias freely quotes and which he regards as genuine,[1] appears to have told much the same story in much the same way. As far as we can say, then, the mother and daughter were there in possession at the very beginning. The other pair of divinities known as *ὁ θεός ἡ θεά*, that appear in a 5th-century inscription and on two dedicatory reliefs found at Eleusis, have been supposed to descend from an aboriginal period of Eleusinian religion when deities were nameless, and when a peaceful pair of earth-divinities, male and female, were worshipped by the rustic community, before the earth-goddess had pluralized herself as Demeter and Kore, and before the story of the *madre dolorosa* and the lost daughter had arisen.[2] But for various reasons the contrary view is more probable, that *ὁ θεός* and *ἡ θεά* are later cult-titles of the married pair Pluto-Cora (Plouton-Kore), the personal names being omitted from that feeling of reverential shyness which was specially timid in regard to the sacred names of the deities of the underworld. And it is a fairly familiar phenomenon in Greek religion that two separate titles of the same divinity engender two distinct cults.

The question as to the part played by Dionysus in the Eleusinia is important. Some scholars, like M. Foucart, have supposed that he belonged from the beginning to the inner circle of the mystery; others that he forced his way in at a somewhat later period owing to the great influence of the Orphic sects who captured the stronghold of Attic religion and engrafted the Orphic-Sabazian *ἱερὸς λόγος*, the story of the incestuous union of Dionysus-Sabazius with Demeter-Kore, and of the death and rendering of Zagreus, upon the primitive Eleusinian faith. A saner and more careful criticism rejects this view. There is no genuine trace discovered as yet in the inner circle of the mysteries of any characteristically Orphic doctrine; the names of Zagreus and Phanes are nowhere heard, the legend of Zagreus and the death of Dionysus are not known to have been mentioned there. Nor is there any print within or in the precincts of the *τελεστήριον*: the hall of the *Μύσται*, of the footsteps of the Phrygian deities, Cybele, Attis, Sabazius.

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[1] i. 38, 3; i. 39, 1.

[2] See Dittenberger, *Sylloge*, 13; *Corp. inscr. att.* 2, 1620 c, 3, 1109; *Ephem. archaiol.* (1886), *πίν.* 3; Heberdey in *Festschrift für Benndorf*, p. 3, Taf. 4; Von Prott in *Athen. Mittheil.* (1899), p. 262.

The exact relation of Dionysus to the mysteries involves the question as to the divine personage called Iacchus; who and what was Iacchus? Strabo (p. 468), who is a poor authority on such matters, describes him as "the daemon of Demeter, the founder of the leader of the mysteries." More important is it to note that "Iacchus" is unknown to the author of the Homeric hymn, and that the first literary notice of him occurs in the well-known passage of Herodotus (viii. 65), who describes the procession of the mystae as moving along the sacred way from Athens to Eleusis and as raising the cry Ἴακχε. We find Iacchus the theme of a glowing invocation in an Aristophanic Ode (*Frogs*, 324-398), and described as a beautiful "young god"; but he is first explicitly identified with Dionysus in the beautiful ode of Sophocles' *Antigone* (1119); and that this was in accord with the popular ritualistic lore is proved by the statement of the scholiast on Aristophanes (*Frogs*, 482) that the people at the Lenaea, the winter-festival of Dionysus, responded to the command of "Invoke the god!" with the invocation "Hail, Iacchus, son of Semele, thou giver of wealth!" We are sure, then, that in the high tide of the Attic religious history Iacchus was the youthful Dionysus, a name of the great god peculiar to Attic cult; and this is all that here concerns us to know.

We can now answer the question raised above. This youthful Attic Dionysus has his home at Athens; he accompanies his votaries along the sacred way, filling their souls with the exaltation and ecstasy of the Dionysiac spirit; but at Eleusis he had no temple, altar or abiding home; he comes as a visitor and departs. His image may have been carried into the Hall of the Mysteries, but whether it played any part there in a passion-play we do not know. That he was a primary figure of the essential mystery is hard to believe, for we find no traces of his name in the other Greek communities that at an early period had instituted mysteries on the Eleusinian model. Apart from Iacchus, Dionysus in his own name was powerful enough at Eleusis as in most other localities. And the votaries carried with them no doubt into the hall the Bacchic exaltation of the Iacchus procession and the nightly revel with the god that preceded the full initiation; many of them also may have belonged to the private Dionysiac sects and might be tempted to read a Dionysiac significance into much that was presented to them. But all this is conjecture. The interpretation of what was shown would naturally change somewhat with the changing sentiment of the ages; but the mother and the daughter, the stately and beautiful figures presented to us by the author of the homeric hymn, who says no word of Dionysus, are still found reigning paramount and supreme at Eleusis just before the Gothic invasion in the latter days of Paganism. Triptolemus the apostle of corn-culture, Eubouleus—originally a euphemistic name of the god of the under-world, "the giver of good counsel," conveying a hint of his oracular functions—these are accessory figures of Eleusinian cult and mythology that may have played some part in the great mystic drama that was enacted in the hall.

The development and organization of the Eleusinia may now be briefly sketched. The legends concerning the initiation of Heracles and the Dioscuri preserve the record of the time when the mysteries were closed against all strangers, and were the privilege of the Eleusinians alone. Now the Homeric hymn in its obvious appeal to the whole of the Greek world to avail themselves of these mysteries gives us to suppose that they had already been thrown open to Hellas; and this momentous change, abolishing the old gentile barriers, may have naturally coincided with, or have resulted from, the fusion of Eleusis and Athens, an event of equal importance for politics and religion which we may place in the prehistoric period. The reign of Peisistratus was an era of architectural activity at Eleusis; but the construction of the μυστικὸς σηκός was one of the achievements of the Periclean administration. Two inscriptions, containing decrees passed during the supremacy of Pericles, the one proclaiming a holy truce of three months for the votaries that came from any Greek community,[1] the other bidding the subject allies and inviting the independent states to send ἀπαρχαί or tithe-offerings of corn to Eleusis,[2] record the far-sighted policy of Periclean Athens, her determination to find a religious support for her hegemony.

At least from the 5th century onwards, the external control and all questions of the organization of the mysteries were in the hands of the Athenian state, the rule holding in Attica as elsewhere in Hellas that the state was supreme over the Church. The head of the general management was the king-archon (*archon-basileus*) who with his *paredros* and the four "epimeletai" formed a general committee of supervision, and matters of importance connected with the ritual were decided by the Boulé or Ecclesia. But the claim of Eleusis as the religious metropolis was not ignored. The chief of the two priestly families, in whose hands lay the mystic celebration itself and the formal right of admission, was the Eleusinian "gens" of the Eumolpidae; it was to their ancestor that Demeter had entrusted her ὄργια, and the recognition of their claims maintained the principle of apostolic succession. To them belonged the hierophant (ἱεροφάντης), the high priest of the Eleusinia, whose function alone it was to "reveal the orgies," to show the sacred things, and who alone—or perhaps with his consort-priestess—could penetrate into the innermost shrine in the hall; an impressive figure, so sacred in person that no one could address him by his personal name, and bound, at one period at least, by a rule of celibacy. We hear also of two "hierophantides," female attendants on the older and younger goddesses. In fact, while the male priest predominates in this ritual, the women play a prominent part: as we should expect, considering that the sister-festival of the Thesmophoria was wholly in their hands.

The other old priestly family was that of the "Kerykes," to whom the δᾳδοῦχος belonged, "the holder of the torch," the official second in rank to the ἱεροφάντης. It is uncertain whether this family was of Eleusinian origin; and in the 4th century it seems to have died out, and the office of the δᾳδοῦχος passed into the hands of the Lycomidae, a priestly family of Phlye, suspected of being devotees of Orphism.

Turning now to the celebration itself, we can only sketch the more salient features here. On the 13th of Boedromion, the Attic month corresponding roughly to our September, the Ephebi (*q.v.*) marched out to Eleusis, and returned to Athens the next day bringing with them the "holy things" (ἱερά) to the "Eleusinion" in the city; these ἱερά probably included small images of the goddesses. The 16th was the day of the ἀγυρμός, the gathering of the catechumens, when they met to hear the address of the hierophant, called the πρόρρησις. This was no sermon, but a proclamation bidding those who were disqualified or for some reason unworthy of initiation to depart. The legally qualified were all Hellenes and subsequently all Romans above a certain—very youthful—limit of age, women, and as it appears even slaves; barbarians, and those uncleansed of some notorious guilt, such as homicide, were disqualified. We are sure that there was no dogmatic test, nor would time allow of any searching moral scrutiny, and only the Samothracian rites, in this respect unique in the world of classical religion, possessed a system of confessional. The hierophant appealed to the conscience of the multitude; but we are not altogether sure of the terms of his proclamation, which can only be approximately restored from late Pagan and early Christian writers. We know that he demanded of each candidate that he should be "of intelligible speech (*i.e.* an Hellene) and pure of hand"; and he catechized him as to his condition of ritualistic purity—the food he had eaten or abstained from. It appears also from Libanius that in the later period at least he solemnly proclaimed that the catechumen should be "pure of soul,"[3] and this spiritual conception of holiness had arisen already in the earlier periods of Greek religious thought. On the other hand we must bear in mind the criticism that Diogenes is said to have passed upon the Eleusinia, that many bad characters were admitted to communion, thereby securing a promise of higher happiness than an uninitiated Epaminondas could aspire to.

An essential preliminary was purification and lustration, and after the assembly the "mystae" went to the sea-shore (ἄλαδε μύσται) and purified themselves with sea-water, and probably with sprinkling of pigs' blood, a common cathartic medium. After their return from the sea, a sacrifice of some kind was offered as an essential condition of μύησις, but whether as a sacrament or a gift-offering to the goddesses it is impossible to determine. On the 19th of Boedromion the great procession started along the sacred way bearing the "fair young god" Iacchus; and as they visited many shrines by the way the march must have continued long after sunset, so that the 20th is sometimes spoken of as the day of the exodus of Iacchus. On the way each wore a saffron band as an amulet; and the ceremonious reviling to which the "mystai" were subjected as they crossed the bridge of the Cephissus answered the same purpose of averting the evil eye. Upon the arrival at Eleusis, on the same night or on the following, they celebrated a midnight revel under the stars with Iacchus, which Aristophanes glowingly describes.

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[1] *Corp. inscr. att.* i. 1.

[2] Dittenberger, *Sylloge*, 13.

[3] *Or. Corinth*, iv. 356.

The question of supreme interest now arises: What was the mystic ceremony in the hall? what was said and what was done? We can distinguish two grades in the celebration; the greater was the τέλεα and ἐποπτικά, the full and satisfying celebration, to which only those were admitted who had passed the lesser stage at least a year before. As regards the actual ritual in the hall of the mystae, much remains uncertain in spite of the unwearying efforts of many generations of scholars to construct a reasonable statement out of fragments of often doubtful evidence. We are certain at least that something was acted there in a religious drama or passion-play, the revelation was partly a pageant of holy figures; the accusations against Aeschylus and Alcibiades would suffice to prove this; and Porphyry speaks of the hierophant and the δᾳδοῦχος acting divine parts. What the subject of this drama was may be gathered partly from the words of Clement—"Deo (Demeter) and Kore became the personages of a mystic drama, and Eleusis with its δᾳδοῦχος celebrates the wandering, the abduction and the sorrow" (*Protrept.*, p. 12 Potter), partly from Psyche's appeal to Demeter in Apuleius (*Metamorph.* 6)—"by the unspoken secrets of the mystic chests, the winged chariots of thy dragon-ministers, the bridal descent of Proserpine [Persephone], the torch-lit wanderings to find thy daughter and all the other mysteries that the shrine of Attic Eleusis shrouds in secret." We may believe then that the great myth of the mother's sorrow, the loss and the partial recovery of her beloved was part of the Eleusinian passion-play. Did it also include a ἱερὸς γάμος? We should naturally expect that the sacred story acted in the mystic pageant would close with the scene of reconciliation, such as a holy marriage of the god and the goddess. But the evidence that this was so is mainly indirect, apart from a doubtful passage in Asterius, a writer of questionable authority in the 4th century A.D. (*Econom. martyr.* p. 194, Combe). At any rate, if a holy marriage formed part of the passion-play, it may well have been acted with solemnity and delicacy. We have no reason to believe that even to a modern taste any part of the ritual would appear coarse or obscene; even Clement, who brings a vague charge of obscenity against all mysteries in general, does not try to substantiate it in regard to the Eleusinia, and we hear from another Christian writer of the scrupulous purity of the hierophant.

It would be interesting to know if the birth of a holy child, a babe Iacchus, for example, was a motive of the mystic drama. The question seems at first sight to be decided by a definite statement of Hippolytus (*Philosoph.* 5, 8), that at a certain moment in the mysteries the hierophant cried aloud: "The lady-goddess Brimo has borne Brimos the holy child." But a careful consideration of the context almost destroys the value of his authority. For he does not pretend to be a first-hand witness, but admits that he is drawing from Gnostic sources, and he goes on at once to speak of Attis and his self-mutilation. The formula may then refer to the Sabazian-Phrygian mystery, which the Gnostics with their usual spirit of religious syncretism would have no scruple in identifying with the Eleusinian. And the archaeological evidence that has been supposed to support the statement of Hippolytus is deceptive.

Finally, we must not suppose that there could be any very elaborate scenic arrangements in the hall for the representation of Paradise and the Inferno, whereby the rewards of the faithful and the punishments of the damned might be impressively brought home to the mystae. The excavations on the site have proved that the building was without substructures or underground passages. A large number of inscriptions present us with elaborate accounts of Eleusinian expenditure; but there is no item for scenic expenses or painting. We are led to suppose that the pageant-play produced its effect by means of gorgeous raiment, torches and stately figures.

But the mystic action included more than the pageant-play. The hierophant revealed certain holy objects to the eyes of the assembly. There is reason to suppose that these included certain primitive idols of the goddesses of immemorial sanctity; and, if we accept a statement of Hippolytus (*loc. cit.*) we must believe that the *epoptae* were also shown "that great and marvellous mystery of perfect revelation, a cut corn-stalk." The value of this definite assertion, which appears to be an explicit revelation of the secret, would be very great, if we could trust it; but unfortunately it occurs in the same suspicious context as the Brimo-Brimos formula, and we again suspect the same uncritical confusion of Eleusinian with Phrygian ritual, for we know that Attis himself was identified in his mysteries with the "reaped corn," the στάχυς ἄμητος, almost the very phrase used by Hippolytus. Only, it is in the highest degree probable, whether Hippolytus knew anything or not, that a corn-token was shown among the sacred things of a mystery which possessed an original agrarian significance and was intended partly to consecrate and to foster the agricultural life. But to say this is by no means the same as to admit the view of Lenormant[1] and Dr Jevons[2] that the Eleusinians worshipped the actual corn, or revered it as a clan-totem. For of direct corn-worship or of corn-totemism there is no trace either at Eleusis or elsewhere in Greece.

Among the δρώμενα or "things done" may we also include a solemn sacrament, the celebration of a holy communion, in which the votary was united to the divinity by partaking of some holy food or drink? We owe to Clement of Alexandria (*Protrept.* p. 18, Potter) an exact transcription of the pass-word of the Eleusinian mystae; it ran as follows (if we accept Lobeck's emendation of ἐγγευσάμενος for ἐργασάμενος): "I have fasted, I have drunk the barley-drink, I have taken [the things] from the sacred chest, having tasted thereof I have placed them into the basket and again from the basket into the chest." We gather from this that some kind of sacrament was at least a preliminary condition of initiation; the mystae drank of the same cup as the goddess drank in her sorrow, partly—as we say—"in memory of her," partly to unite themselves more closely with her. We know also from an inscription that the priest of the Samothracian mysteries broke sacred bread and poured out drink for the mystae (*Arch. epigr. Mitth.* 1882, p. 8, No. 14). But neither in these nor in the Eleusinian is there any trace of the more mystic sacramental conception, any indication that the votaries believed themselves to be partaking of the actual body of their divinity;[3] for there is no evidence that Demeter was identified with the corn, still less with the barley-meal of which the κυκεών was compounded. Nor is it likely that the sacrament was the pivot of the whole mystery or was part of the essential act of the μύησις itself. In the first place we have an almost certain representation of the Eleusinian sacrament on an archaic vase in Naples,[4] probably of Attic *provenance*, and the artistic reproduction of a holy act would have been impious and dangerous, if this had belonged to the inner circle of the mystery. Again, there is no mention of sacrament or sacrifice among the five essential parts of μύησις given by Theo

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[1] Daremberg et Saglio, *Dictionnaire*, ^{1}, p. 1066.

[2] *Introduction to the Study of Religion.*

[3] This is Dr Jevons's supposition—*op. cit*—on which he bases an important theory of the whole Eleusinian mysteries and their intrinsic attraction.

[4] Farnell, *Cults.* vol. iii. pl. xv^{b}.

Smyrnaeus, nor in the imaginary narrative of the late rhetorician Sopatros,[1] who supposes the strange case of a man being initiated by the goddesses in a dream: they admit him to their full communion merely by telling him something and showing him something.

Besides the δρώμενα, then, there were also certain things said in the hall, or in the earlier stages of initiation, which we would gladly discover. Part of these were mystic formulae, one of which has been discussed already, the pass-word of the votaries. We gather also from Proclus and Hippolytus[2] that in the Eleusinian rites they gazed up to heaven and cried aloud "rain"—ὕε—and gazed down upon the earth and cried "conceive"—κύε. This ritual charm—we cannot call it prayer—descends from the old agrarian magic which underlay the primitive mystery. What else the votaries may have uttered, whether by way of thanksgiving or solemn litany, we do not know.[3] But there was also a certain ἱερὸς λόγος, some exposition accompanying the unfolding of the mysteries; for it was part of the prestige of the hierophant that he was chief spokesman, "who poured forth winning utterance and whose voice the catechumen ardently desired to hear" (*Anth. Pal.*, app. 246); and Galen speaks of the rapt attention paid by the initiated "to the things done and said in the Eleusinian and Samothracian mysteries" (*De usu part.* 7. 14). But we have no trustworthy evidence as to the real content of the λόγος of the hierophant. We need not believe that the whole of his discourse was taken up with corn-symbolism, as Varro seems to imply (Aug. *De civit. Dei.* 20), or that he taught natural philosophy rather than theology, or again, the special doctrine of Euhemerus, as two passages in Cicero (*De natur. deor.* i. 42; *Tusc.* i. 13) might prompt us to suppose. His chief theme was probably an exposition of the meaning and value of the ἱερά, as in an Australian initiation rite it is the privilege of the elders to explain the nature of the "churinga" to the youths. And his discourse on these may have been coloured to some extent by the theories current in the philosophic speculation of the day. But though in the time of Julian he appears to have been a philosopher of Neo-platonic tendencies, we ought not to suppose that the hierophant as a rule would be able or inclined to rise above the anthropomorphic religion of the times. Whatever symbolism attached to the ἱερά, the sacred objects shown, was probably simple and natural; for instance, in the Eleusinian, as in Egyptian eschatology, the token of the growing corn may have served as an emblem—though not a proof—of man's resurrection. The doctrine of the continuance of the soul after death was already accepted by the popular belief, and the hierophant had no need to preach it as a dogma; the votaries came to Eleusis to ensure themselves a happy immortality. And in our earliest record, the Homeric hymn, we find that the mysteries already hold out this higher promise. How, we may ask, were the votaries assured? M. Foucart in *Les grands mystères d'Eleusis* has maintained that the object of the mysteries was much the same as that of the Egyptian *Book of the Dead*; to provide the mystae with elaborate rules for avoiding the dangers that beset the road to the other world, and for attaining at last to the happy regions; that for this purpose the hierophant recited magic formulae whereby the soul could repel the demons that it might encounter on the path; and that it was to seek this deliverance from the terrors of hell that all Greece flocked to Eleusis. This is in accord with his whole "egyptizing" theory concerning the Eleusinia, a theory which, though Egyptian influence cannot a priori be ruled out, is not found in harmony with the facts of the two religious systems. And the particular hypothesis just stated is altogether wanting in direct evidence, or—we may say—in *vraisemblance*. There is no hint or allusion to be found in the ancient sources suggesting that the recital of magic formulae was part of the ceremony. The λόγος, whatever it was, was comparatively unimportant. And the Greek public in general, in its vigorous period when the Eleusinian religion reached its zenith, was not tormented, as modern Europe has at times been, by ghostly terrors of judgment.

The assurance of the hope of the Eleusinian votary was obtained by the feeling of friendship and mystic sympathy, established by mystic contact, with the mother and the daughter, the powers of life after death. Those who won their friendship by initiation in this life would by the simple logic of faith regard themselves as certain to win blessing at their hands in the next.

It is obvious that the mysteries made no direct appeal to the intellect, nor on the other hand revolted it by any oppressive dogmatism. As regards their psychic effect, we have Aristotle's invaluable judgment: "The initiated do not learn anything so much as feel certain emotions and are put into a certain frame of mind" (Synes. *Dion.* p. 48*a*). The appeal was to the eye and to the imagination through a form of religious mesmerism working by means that were solemn, stately and beautiful. To understand the quality and the intensity of the impression produced, we should borrow something from the modern experiences of Christian communion-service, mass, and passion-play, and bear in mind also the extraordinary susceptibility of the Greek mind to an artistically impressive pageant.

That the Eleusinia preached a higher morality than that of the current standard is not proved. That they exercised a direct and elevating influence on the individual character is nowhere explicitly maintained, as Diodorus (v. 49) maintains concerning the Samothracian. But on general grounds it is reasonable to believe that such powerful religious experience as they afforded would produce moral fruit in many minds. The genial Aristophanes (*Frogs*, 455) intimates as much, and Andocides (*De myster.* p. 36, § 31; p. 44, § 125) assumes that those who had been initiated would take a juster and sterner view of moral innocence and guilt, and that foul conduct was a greater sin when committed by a man who was in the official service of the mother and the daughter.

Besides the greater mysteries at Eleusis, we hear of the lesser mysteries of Agrae on the banks of the Ilissos. Established, perhaps, originally by Athens herself at a time when Eleusis was independent and closed her rites to strangers, they became wholly subordinated to the greater, and were put under the same management and served merely as a necessary preliminary to the higher initiation into them. Sacrifice was offered to the same great goddesses at both; but we have the authority of Duris (*Athenae*, 253*d*), the Samian historian, and the evidence of an Attic painting, called the *πίναξ* of Nannion,[4] that the predominant goddess in the mysteries at Agrae was Kore. And this agrees with the time of their celebration, in the middle of Anthesterion, when Kore was supposed to return in the young corn. Stephanus (*s.v.* Ἄγρα), drawing from an unknown source, declares that the Dionysiac story was the theme of their mystic drama. Hence theorists have supposed that their content was wholly Orphic or that their central motive was the marriage of Dionysus and Kore. The theory has no archaeological or literary support except the passage in Stephanus, nor have we reason for believing that the marriage of these two divinities was recognized in Attic state ritual.

The influence of Eleusis in early times must have been great, for we find offshoots of its cult, whether mystic or not, in other parts of Greece. In Boeotia, Laconia, Arcadia, Crete and Thera, Demeter brought with her the title of "Eleusinia"; and no other explanation is so probable as the obvious one that this name designates "the goddess of Eleusis," and though there may have been other places called "Eleusis," the only famous religious centre was the Attic. The initiation rites of Demeter at Celeae near Phlius, at Lerna in Argolis, and at Naples, were organized after the pattern of the Eleusinian. But of these and the other Demeter mysteries in the Greek world, there is little to record that is certain and at the same time of primary importance for the history of religion. The Arcadian city of Pheneus possessed a mystery that boasted an Eleusinian character and origin, yet in the record of it there is no mention of Kore, and we may suspect that, like other Demeter-worships in the Peloponnese, it belonged to a period when the earth-goddess was revered as a single personality and Kore had not yet emanated from her. We know much more of the details of the great Andanian mysteries in Messenia, owing to the discovery of the important and much-discussed Andanian inscription of 91 B.C.[1] But what we know are facts of secondary importance only. We gather from Pausanias (4. 33. 4; cf. 4. 1. 5. and 4. 26. 8; 4. 27. 6) that the rites, which he regards as second in solemnity and prestige to the Eleusinian alone, were consecrated to the Μεγάλαι θεαί, . . . the great goddesses, . . . and that Kore enjoyed the mystic title of Hagnē, "the holy one." The inscription has been supposed to correct and to refute Pausanias, but it does not really controvert his statements, which are attested by other evidence; it proves only that other divinities came at a later time to have a share in the mysteries, such as the Μεγάλοι θεοί who were probably the Cabeiri (*q.v.*). It is clear that the Andanian mysteries included a sacred drama, in which women personated the goddesses. The priestesses were married women, and were required to take an oath that they had lived "in relation to their husbands a just and holy life." We hear also of grades of initiation, purification-ceremonies, but of no sacrament or eschatologic promise; yet it is probable that these mysteries, like the Eleusinian, maintained and secured the hope of future happiness.

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[1] *Rhet. graec.* viii. 121.

[2] *In Tim.* 293^c; *Ref. Omn. Haer.* 5, 7, p. 146.

[3] The other formula which the scholiast on Plato (*Gorg.* 497 c.) assigns to the Eleusinian rite: "I have eaten from the timbrel, I have drunk from the cymbal, I have carried the sacred vessel, I have crept under the bridal-chamber," belongs, not to Eleusis, but, as Clement and Firmicus Maternus themselves attest, to Phrygia and to Attis.

[4] Farnell, *Cults of the Greek States*, vol. iii. p. 242, pl. xvi.

The Eleusinian faith is not wholly unattested by the grave-inscriptions of Hellas, though it speaks but rarely on these. The most interesting example is the epitaph of a hierophant who proclaims that he has found that "death was not an evil, but a blessing."[2]

Of equal importance for the private religion of Greece were the Orphic mystic societies, bearing a Thraco-Phrygian tradition into Greece, and associated originally with the name of Dionysus, and afterwards with Sabazius also and the later cult-ideas of Phrygia.[3] The full account of the Dionysiac mysteries would demand a critical study of the Dionysiac religion as a whole, as well as of the private sects that sprang up under its shadow. It is only possible here to indicate the salient characteristics of those which are of primary value for the history of religion.

Originally a great nature-god of the Thraco-Phrygian stock, powerful over all vegetation and especially revealing his power in the vine, Dionysus was forcing his way into Greece at least as early as the Homeric period, and by the 6th century was received into the public cults of most of the Greek communities. We can gather with some certainty or probability his aboriginal characteristics and the form of his worship. Being a god of the life of the earth, he was also a nether divinity, the lord of the world of souls, with whom the dead votary entered into privileged communion; his rites were mystic, and nightly celebrations were frequent, marked by wild ecstasy and orgiastic self-abandonment, in which the votary became at one with the divinity and temporarily possessed his powers; women played a prominent part in the ritual; a savage form of sacramental communion was in vogue, and the animal victim of whose flesh and blood the votaries partook was at times regarded as the incarnation of the divinity, so that the god himself might be supposed to die and to rise again; finally we may regard certain cathartic ideas as part of the primeval tradition of this religion. Admitted among the soberer cults of the Greek communities, it lost most of its wildness and savagery, while still retaining a more emotional ecstatic character than the rest. But this cooling process was arrested by a new wave of Dionysiac fervour that spread over Greece from the 7th century onwards, bringing with it the name of Orpheus,[4] and engendering at some later date the Orphic brotherhoods (*thiasi*). This religious movement may have started like the earlier one from the lands north of Greece; but Crete and even Egypt are supposed to have contributed much to the Orphic doctrine and ritual. Our earliest authority for the proceedings of the mystery-practitioner who used the name of Orpheus is the well-known passage in Plato's *Republic* (p. 364*a*), in which he speaks contemptuously of the itinerant ritualists who knock at the doors of the rich, the vendors of magic incantations, who promise absolution from sins and happiness in the next world to be attained by a ritual of purification and mystic initiation. This record brings to our notice a phenomenon unknown elsewhere in Greek religion; the missionary spirit, the impulse to preach to all who would hear, which foreshadows the breaking down of the gentile religious barriers of the ancient world. And it is probable that some kind of "Orphic" propagandism, whether through books or itinerant mystery-priests, or both, had been in vogue some time before Plato. We may fairly conjecture that it has to some extent inspired the glowing eschatology of Pindar, who describes the next world as a place of penance and purgation from ancestral or personal taint and of final reward for the purified soul, and who unites this belief with a doctrine of reincarnation. In the *Hippolytus* of Euripides, Theseus taunts his son with cloaking his immorality under hypocritical "Orphic" pretensions to purity, the pharisaic affectation, for instance, of a vegetarian diet (952–954). Still more important is the fragment of the *Cretans* of Euripides, attesting the strength of the antiquity of these mystic Dionysiac associations in Crete. The initiated votary proclaims himself as sanctified to Zeus of Ida, to Zagreus—the Orphic name of the nether-world Dionysus—and to the mountain-goddess Rhea-Cybele; he has fulfilled "the solemn rite of the banquet of raw flesh," and henceforth he "robes himself in pure white and avoids the taint of child-birth and funerals and abstains from meat." And—what is most significant—he calls himself by the very name of his god—he is himself Βάκχος. In spirit and in most of its details the passage accords well with the *Bacchae* of Euripides, which reflects not so much the public worship of Greece, but rather the mystic Dionysiac brotherhoods. Throughout this inspired drama the votary rejoices to be one with his divinity and to call himself by his name, and this mystic union is brought about partly, though Euripides may not have known it, through "the meal of raw flesh" or the drinking of the blood of the goat or the kid or the bull. The sacramental intention of this is confirmed by abundant proof; even in the state-cult of Tenedos they dressed up a bull-calf as Dionysus and reverentially sacrificed it (Ael. *Nat. an.* 12. 34); those who partook of the flesh were partaking of what was temporarily the body of their god. The Christian fathers at once express their abhorrence of this savage ὠμοφαγία and reveal its true significance (Arnob. *Adv. nat.* 5. 119); and Firmicus Maternus (*De error.*, p. 84) attests that the Cretans of his own day celebrated a funeral festival in honour of Dionysus in which they enacted the life and the death of the god in a passion-play and "rent a living bull with their teeth."

But the most speaking record of the aspirations and ideas of the Orphic mystic is preserved in the famous gold tablets found in tombs near Sybaris, one near Rome, and one in Crete. These have been frequently published and discussed; and here it is only possible to allude to the salient features that concern the general history of religion. They contain fragments of a sacred hymn that must have been in vogue at least as early as the 3rd century B.C., and which was inscribed in order to be buried with the defunct, as an amulet that might protect him from the dangers of his journey through the under-world and open to him the gates of Paradise. The verses have the power of an incantation. The initiated soul proclaims its divine descent: "I am the son of Earth and Heaven": "I am perishing with thirst, give me to drink of the waters of memory": "I come from the pure": "I have paid the penalty of unrighteousness": "I have flown out of the weary, sorrowful circle of life." His reward is assured him: "O blessed and happy one, thou hast put off thy mortality and shalt become divine." The strange formula ἔριφος ἐς γάλ' ἔπετον, "I a kid fell into the milk," has been interpreted by Dieterich (*Eine Mithras—Liturgie*, p. 174) with great probability as alluding to a conception of Dionysus himself as ἐρίφιος, the divine kid, and to a ritual of milk-baptism in which the initiated was born again.

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[1] See Sauppe, *Mysterieninschrift von Andania*; cf. Foucart's commentary in Le Bas, *Voyage archéol.* 2, No. 326^{a}; H. Collitz, *Dialect-inschriften*, 4689.

[2] *Eph. arch.* (1883), p. 81.

[3] The best account of the origin and development of the Dionysiac religion is in Rohde's *Psyche*, vol. i.; for Orphic ritual and doctrine see article on "Orpheus" in Roscher's *Ausführliches Lexikon der griechischen und römischen Mythologie*; Miss Harrison, *Prolegomena to the Study of Greek Religion*, pp. 455–659, with critical appendix by G. Murray on the Orphic tablets discovered in Crete, near Rome, and in south Italy.

[4] The name Ὀρφεύς first occurs in Ibycus, *Frag.* 10: ὀνομακλυτὸν Ὀρφήν.

We discern, then, in these mystic brotherhoods the germs of a high religion and the prevalence of conceptions that have played a great part in the religious history of Europe. And as late as the days of Plutarch they retained their power of consoling the afflicted (*Consol. ad uxor.*, c. 10).

The Phrygian-Sabazian mysteries, associated with Attis, Cybele and Sabazius, which invaded later Greece and early imperial Rome, were originally akin to these and contained many concepts in common with them. But their orgiastic ecstasy was more violent, and the psychical aberrations to which the votaries were prone through their passionate desire for divine communion were more dangerous. Emasculation was practised by the devotees, probably in order to assimilate themselves as far as possible to their goddess by abolishing the distinction of sex, and the high-priest himself bore the god's name. Or communion with the deity might be attained by the priest through the bath of blood in the taurobolion (*q.v.*), or by the gashing of the arm over the altar. A more questionable method which lent itself to obvious abuses, or at least to the imputation of indecency, was the simulation of a sacred marriage, in which the catechumen was corporeally united with the great goddess in her bridal chamber (Dieterich, *op. cit.* pp. 121–134). Prominent also in these Phrygian mysteries were the conception of rebirth and the belief, vividly impressed by solemn pageant and religious drama, in the death and resurrection of the beloved Attis. The Hilaria in which these were represented fell about the time of our Easter; and Firmicus Maternus reluctantly confesses its resemblance to the Christian celebration.[1]

The Eleusinian mysteries are far more characteristic of the older Hellenic mind. These later rites breathe an Oriental spirit, and though their forms appear strange and distorted they have more in common with the subsequent religious phenomena of Christendom. And the Orphic doctrine may have even contributed something to the later European ideals of private and personal morality.[2]

LITERATURE.—For citation of passages in classical literature bearing on Greek mysteries in general see Lobeck's *Aglaophamus* (1829); and the collection of material for Demeter mysteries in L. R. Farnell, *Cults of the Greek States* (1906), iii. 343–367. For general theory and discussion see Dr Jevons, *Introduction to the Study of Religion*; Farnell, *Cults of the Greek States*, iii. 127–213; Dyer's *The Gods of Greece* (1891), ch. v.; M. P. Foucart, *Les Grands mystères d'Eleusis* (1900); Andrew Lang, *Myth, Ritual and Religion* (1887), pp. 264–276; Goblet d'Alviella, *Eleusinia* (1903). See further articles DIONYSUS; GREAT MOTHER OF THE GODS; DEMETER. (L. R. F.)

MYSTICISM (from Gr. *μύειν*, to shut the eyes; *μύστης*, one initiated into the mysteries), a phase of thought, or rather perhaps of feeling, which from its very nature is hardly susceptible of exact definition. It appears in connexion with the endeavour of the human mind to grasp the divine essence or the ultimate reality of things, and to enjoy the blessedness of actual communion with the Highest. The first is the philosophic side of mysticism; the second, its religious side. The first effort is theoretical or speculative; the second, practical. The thought that is most intensely present with the mystic is that of a supreme, all-pervading, and indwelling power, in whom all things are one. Hence the speculative utterances of mysticism are always more or less pantheistic in character. On the practical side, mysticism maintains the possibility of direct intercourse with this Being of beings—intercourse, not through any external media such as an historical revelation, oracles, answers to prayer, and the like, but by a species of ecstatic transfusion or identification, in which the individual becomes in very truth "partaker of the divine nature." God ceases to be an object to him and becomes an experience. In the writings of the mystics, ingenuity exhausts itself in the invention of phrases to express the closeness of this union. Mysticism differs, therefore, from ordinary pantheism in that its inmost motive is religious; but, whereas religion is ordinarily occupied with a practical problem and develops its theory in an ethical reference, mysticism displays a predominatingly speculative bent, starting from the divine nature rather than from man and his surroundings, taking the symbolism of religious feeling as literally or metaphysically true, and straining after the present realization of an ineffable union. The union which sound religious teaching represents as realized in the submission of the will and the ethical harmony of the whole life is then reduced to a passive experience, to something which comes and goes in time, and which may be of only momentary duration. Mysticism, it will be seen, is not a name applicable to any particular system. It may be the outgrowth of many differing modes of thought and feeling. Most frequently it appears historically, in relation to some definite system of belief, as a reaction of the spirit against the letter. When a religion begins to ossify into a system of formulas and observances, those who protest in the name of heart-religion are not unfrequently known by the name of mystics. At times they merely bring into prominence again the ever-fresh fact of personal religious experience; at other times mysticism develops itself as a powerful solvent of definite dogmas.

A review of the historical appearances of mysticism will serve to show how far the above characteristics are to be found, separately or in combination, in its different phases.

Eastern Systems.

In the East, mysticism is not so much a specific phenomenon as a natural deduction from the dominant philosophic systems, and the normal expression of religious feeling in the lands in which it appears. Brahmanic pantheism and Buddhistic nihilism alike teach the unreality of the seeming world, and preach mystical absorption as the highest goal; in both, the sense of the worth of human personality is lost. India consequently has always been the fertile mother of practical mystics and devotees. The climate itself encourages to passivity, and the very luxuriance of vegetable and animal life tends to blunt the feeling of the value of life. Silent contemplation and the total deadening of consciousness by perseverance for years in unnatural attitudes are among the commonest forms assumed by this mystical asceticism. But the most revolting methods of self-torture and self-destruction are also practised as a means of rising in sanctity. The sense of sin can hardly be said to enter into these exercises—that is, they are not undertaken as penance for personal transgression. They are a despite done to the principle of individual or separate existence.

The so-called mysticism of the Persian Sufis is less intense and practical, more airy and literary in character. Sufism (*q.v.*) appears in the 9th century among the Mahommedans of Persia as a kind of reaction against the rigid monotheism and formalism of Islam. It is doubtless to be regarded as a revival of ancient habits of thought and feeling among a people who had adopted the Koran, not by affinity, but by compulsion. Persian literature after that date, and especially Persian poetry, is full of an ardent natural pantheism, in which a mystic apprehension of the unity and divinity of all things heightens the delight in natural and in human beauty. Such is the poetry of Hafiz and Saadi, whose verses are chiefly devoted to the praises of wine and women. Even the most licentious of these have been fitted by Mahommedan theologians with a mystical interpretation.

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[1] Farnell, *Cults*, iii. 299–302.

[2] See *Archiv für Religionswiss.* (1906), article by Salomon Reinach.

The delights of love are made to stand for the raptures of union with the divine, the tavern symbolizes an oratory, and intoxication is the bewilderment of sense before the surpassing vision. Very often, if not most frequently, it cannot be doubted that the occult religious significance depends on an artificial exegesis; but there are also poems of Hafiz, Saadi, and other writers, religious in their first intentions. These are unequivocally pantheistic in tone, and the desire of the soul to escape and rest with God is expressed with all the fervour of Eastern poetry. This speculative mood, in which nature and beauty and earthly satisfaction appear as a vain show, is the counterpart of the former mood of sensuous enjoyment.

For opposite reasons, neither the Greek nor the Jewish mind lent itself readily to mysticism: the Greek, because of its clear and sunny naturalism; the Jewish, because of its rigid monotheism and its turn towards worldly realism and statutory observance. It is only with the exhaustion of Greek and Jewish civilization that mysticism becomes a prominent factor in Western thought. It appears, therefore, contemporaneously with Christianity, and is a sign of the world-weariness and deep religious need that mark the decay of the old world. Whereas Plato's main problem had been the organization of the perfect state, and Aristotle's intellect had ranged with fresh interest over all departments of the knowable, political speculation had become a mockery with the extinction of free political life, and knowledge as such had lost its freshness for the Greeks of the Roman Empire. Knowledge is nothing to these men if it does not show them the infinite reality which is able to fill the aching void within. Accordingly, the last age of Greek philosophy is theosophical in character, and its ultimate end is a practical satisfaction. Neoplatonism seeks this in the ecstatic intuition of the ineffable One. The systematic theosophy of Plotinus and his successors does not belong to the present article, except so far as it is the presupposition of their mysticism; but, inasmuch as the mysticism of the medieval Church is directly derived from Neoplatonism through the speculations of the pseudo-Dionysius, Neoplatonic mysticism fills an important section in any historical review of the subject.

Neoplatonism.

Neoplatonism owes its form to Plato, but its underlying motive is the widespread feeling of self-despair and the longing for divine illumination characteristic of the age in which it appears. Before the rise of Neoplatonism proper we meet with various mystical or semi-mystical expressions of the same religious craving. The contemplative asceticism of the Essenes of Judaea may be mentioned, and, somewhat later, the life of the Therapeutae on the shores of Lake Moeris. In Philo, Alexandrian Judaism had already seized upon Plato as "the Attic Moses," and done its best to combine his speculations with the teaching of his Jewish prototype. Philo's God is described in terms of absolute transcendency; his doctrine of the Logos or Divine Sophia is a theistical transformation of the Platonic world of ideas; his allegorical interpretation of the Old Testament represents the spiritualistic dissolution of historical Judaism. Philo's ethical ideal is renunciation, contemplation, complete surrender to the divine influence. Apollonius of Tyana and the so-called Neopythagoreans drew similar ethical consequences from their eclectic study of Plato. Wonder-workers like Alexander the Paphlagonian exhibit the grosser side of the longing for spiritual communion. The traits common to Neoplatonism and all these speculations are well summed up by Zeller (*Philos. der Griechen*, iii. 2. 214) as consisting in: "(1) the dualistic opposition of the divine and the earthly; (2) an abstract conception of God, excluding all *knowledge* of the divine nature; (3) contempt for the world of the senses, on the ground of the Platonic doctrines of matter and of the descent of the soul from a superior world into the body; (4) the theory of intermediate potencies or beings, through whom God acts upon the world of phenomena; (5) the requirement of an ascetic self-emancipation from the bondage of sense and faith in a higher revelation to man when in a state called enthusiasm." Neoplatonism appears in the first half of the 3rd century, and has its greatest representative in Plotinus. He develops the Platonic philosophy into an elaborate system by means of the doctrine of emanation. The One, the Good, and the Idea of the Good were identical in Plato's mind, and the Good was therefore not deprived of intelligible essence. It was not separated from the world of ideas, of which it was represented as either the crown or the sum. By Plotinus, on the contrary, the One is explicitly exalted above the *νοῦς* and the "ideas"; it transcends existence altogether (*ἐπέκεινα τῆς οὐσίας*), and is not cognizable by reason. Remaining itself in repose, it rays out, as it were, from its own fullness an image of itself, which is called *νοῦς*, and which constitutes the system of ideas of the intelligible world. The soul is in turn the image or product of the *νοῦς*, and the soul by its motion begets corporeal matter. The soul thus faces two ways—towards the *νοῦς*, from which it springs, and towards the material life, which is its own product. Ethical endeavour consists in the repudiation of the sensible; material existence is itself estrangement from God. (Porphyry tells us that Plotinus was unwilling to name his parents or his birthplace, and seemed ashamed of being in the body.) Beyond the *καθάρσεις*, or virtues which purify from sin, lies the further stage of complete identification with God (*οὐκ ἔξω ἁμαρτίας εἶναι; ἀλλὰ θεὸν εἶναι*). To reach the ultimate goal, thought itself must be left behind; for thought is a form of motion, and the desire of the soul is for the motionless rest which belongs to the One. The union with transcendent deity is not so much knowledge or vision as ecstasy, coalescence, *contact* (*ἔκστασις ἅπλωσις, ἀφή*, *Ennead.*, vi. 9. 8–9). But in our present state of existence the moments of this ecstatic union must be few and short; "I myself," says Plotinus simply, "have realized it but three times as yet, and Porphyry hitherto not once."

It will be seen from the above that Neoplatonism is not mystical as regards the faculty by which it claims to apprehend philosophic truth. It is first of all a system of complete rationalism; it is assumed, in other words, that reason is capable of mapping out the whole system of things. But, inasmuch as a God is affirmed beyond reason, the mysticism becomes in a sense the necessary complement of the would-be all-embracing rationalism. The system culminates in a mystical act, and in the sequel, especially with Iamblichus and the Syrian Neoplatonists, mystical practice tended more and more to overshadow the theoretical groundwork.

It was probably about the end of the 5th century, just as ancient philosophy was dying out in the schools of Athens, that the speculative mysticism of Neoplatonism made a definite lodgment in Christian thought through the literary forgeries of the pseudo-Dionysius (see DIONYSIUS THE AREOPAGITE). The doctrines of Christianity were by that time so firmly established that the Church could look upon a symbolical or mystical interpretation of them without anxiety. The author of the *Theologia mystica* and the other works ascribed to the Areopagite proceeds, therefore, to develop the doctrines of Proclus with very little modification into a system of esoteric Christianity. God is the nameless and supra-essential One, elevated above goodness itself. Hence "negative theology," which ascends from the creature to God by dropping one after another every determinate predicate, leads us nearest to the truth. The return to God (*ἕνωσις, θέωσις*) is the consummation of all things and the goal indicated by Christian teaching. The same doctrines were preached with more of churchly fervour by Maximus the Confessor (580–622). St Maximus represents almost the last speculative activity of the Greek Church, but the influence of the pseudo-Dionysian writings were transmitted to the West in the 9th century by Erigena, in whose speculative spirit both the scholasticism and the mysticism of the middle ages have their rise. Erigena translated Dionysius into Latin along with the commentaries of Maximus, and his system is essentially based upon theirs. The negative theology is adopted, and God is stated to be predicateless Being, above all categories, and therefore not improperly called Nothing. Out of this Nothing or incomprehensible essence the world of ideas or primordial causes is eternally created. This is the Word or Son of God, in whom all things exist, so far as they have substantial existence. All existence is a theophany, and as God is the beginning of all things, so also is He the end. Erigena teaches the restitution of all things under the form of the Dionysian *adunatio* or *deificatio*. These are the permanent outlines of what may be called the philosophy of mysticism in Christian times, and it is remarkable with how little variation they are repeated from age to age.

In Erigena mysticism has not yet separated itself in any way from the dogma of the Church. There is no revulsion, as later, from dogma as such, nor is more stress laid upon one dogma than upon another; all are treated upon the same footing, and the whole dogmatic system is held, as it were, in solution by the philosophic medium in which it is presented. No distinction is drawn, indeed, between what is reached by reason and what is given by authority; the two are immediately identical for Erigena. In this he agrees with the speculative mystics everywhere, and differentiates himself from the scholastics who followed him. The distinguishing characteristic of scholasticism is the acceptance by reason of a given matter, the truth of which is independent of rational grounds, and which remains a presupposition even when it cannot be understood. Scholasticism aims, it is true, in its chief representatives, at demonstrating that the content of revelation and the teaching of reason are identical. But what was matter of immanent assumption with Erigena is in them an equating of two things which have been dealt with on the hypothesis that they are separate, and which, therefore, still retain that external relation to one another. This externality of religious truth to the mind is fundamental in scholasticism, while the opposite view is equally fundamental in mysticism. Mysticism is not the voluntary demission of reason and its subjection to an external authority. In that case, all who accept a revelation without professing to understand its content would require to be ranked as mystics; the fierce sincerity of Tertullian's *credo quia absurdum*, Pascal's reconciliation of contradictions in Jesus Christ, and Bayle's half-sneering subordination of reason to faith would all be marks of this standpoint. But such a temper of mind is much more akin to scepticism than to mysticism; it is characteristic of those who either do not feel the need of philosophizing their beliefs, or who have failed in doing so and take refuge in sheer acceptance. Mysticism, on the other hand, is marked on its speculative side by even an overweening confidence in human reason. Nor need this be wondered at if we consider that the unity of the human mind with the divine is its underlying presupposition. Hence where reason is discarded by the mystic it is merely reason overleaping itself; it occurs at the end and not at the beginning of his speculations. Even then there is no appeal to authority; nothing is accepted from without. The appeal is still to the individual, who, if not by reason then by some higher faculty, claims to realize absolute truth and to taste absolute blessedness.

Bernard of Clairvaux.

Mysticism first appears in the medieval Church as the protest of practical religion against the predominance of the dialectical spirit. It is so with Bernard of Clairvaux (1090–1153), who condemns Abelard's distinctions and reasonings as externalizing and degrading the faith. St Bernard's mysticism is of a practical cast, dealing mainly with the means by which man may attain to the knowledge and enjoyment of God. Reason has three stages, in the highest of which the mind is able, by abstraction from earthly things, to rise to *contemplatio* or the vision of the divine. More exalted still, however, is the sudden *ecstatic* vision, such as was granted, for example, to Paul. This is the reward of those who are dead to the body and the world. Asceticism is thus the counterpart of medieval mysticism; and, by his example as well as by his teaching in such passages, St Bernard unhappily encouraged practices which necessarily resulted in self-delusion. Love grows with the knowledge of its object, he proceeds, and at the highest stage self-love is so merged in love to God that we love ourselves only for God's sake or because God has loved us. "To lose thyself in some sort, as if thou wert not, and to have no consciousness of thyself at all—to be emptied of thyself and almost annihilated—such is heavenly conversation. . . . So to be affected is to become God." "As the little water-drop poured into a large measure of wine seems to lose its own nature entirely and to take on both the taste and the colour of the wine; or as iron heated red-hot loses its own appearance and glows like fire; or as air filled with sunlight is transformed into the same brightness so that it does not so much appear to be illuminated as to be itself light—so must all human feeling towards the Holy One be self-dissolved in unspeakable wise, and wholly transfused into the will of God. For how shall God be all in all if anything of man remains in man? The substance will indeed remain, but in another form, another glory, another power" (*De diligendo Deo*, c. 10). These are the favourite similes of mysticism, wherever it is found.

The Victorines.

Mysticism was more systematically developed by Bernard's contemporary Hugh of St Victor (1096–1141). The Augustinian monastery of St Victor near Paris became the headquarters of mysticism during the 12th century. It had a wide influence in awakening popular piety, and the works that issued from it formed the textbooks of mystical and pietistic minds in the centuries that followed. Hugh's pupil, Richard of St Victor, declares, in opposition to dialectic scholasticism, that the objects of mystic contemplation are partly above reason, and partly, as in the intuition of the Trinity, contrary to reason. He enters at length into the conditions of ecstasy and the yearnings that precede it. Walter, the third of the Victorines, carried on the polemic against the dialecticians. Bonaventura (1221–1274) was a diligent student of the Victorines, and in his *Itinerarium mentis ad Deum* maps out the human faculties in a similar fashion. He introduces the terms "apex mentis" and "scintilla" (also "synderesis" or συντήρησις) to describe the faculty of mystic intuition. Bonaventura runs riot in phrases to describe the union with God, and his devotional works were much drawn upon by mystical preachers. Fully a century later, when the system of scholasticism was gradually breaking up under the predominance of Occam's nominalism, Pierre d'Ailly (1350–1425), and his more famous scholar John Gerson (1363–1429), chancellor of the university of Paris, are found endeavouring to combine the doctrines of the Victorines and Bonaventura with a nominalistic philosophy. They are the last representatives of mysticism within the limitations imposed by scholasticism.

Early German Mystics.

From the 12th and 13th centuries onward there is observable in the different countries of Europe a widespread reaction against the growing formalism and worldliness of the Church and the scandalous lives of many of the clergy. Men began to feel a desire for a theology of the heart and an unworldly simplicity of life. Thus there arose in the Netherlands the Beguines and Beghards, in Italy the Waldenses (without, however, any mystical leaning), in the south of France and elsewhere the numerous sect or sects of the Cathari, and in Calabria the apocalyptic gospel of Joachim of Floris, all bearing witness to the commotion of the time. The lay societies of the Beghards and the Beguines (for men and women respectively) date from the end of the 12th century, and soon became extremely popular both in the Low Countries and on the Rhine. They were free at the outset from any heretical taint, but were never much in favour with the Church. In the beginning of the 13th century the foundation of the Dominican and Franciscan orders furnished a more ecclesiastical and regular means of supplying the same wants, and numerous convents sprang up at once throughout Germany. The German mind was a peculiarly fruitful soil for mysticism, and, in connexion either with the Beguines or the Church organization, a number of women appear about this time, combining a spirit of mystical piety and asceticism with sturdy reformatory zeal directed against the abuses of the time. Even before this we hear of the prophetic visions of Hildegard of Bingen (a contemporary of St Bernard) and Elizabeth of Schönau. In the 13th century

Elizabeth of Hungary, the pious landgravine of Thuringia, assisted in the foundation of many convents in the north of Germany. (For an account of the chief of these female saints see the first volume of W. Preger's *Geschichte der deutschen Mystik.*) Mechthild of Magdeburg appears to have been the most influential, and her book *Das fliessende Licht der Gottheit* is important as the oldest work of its kind in German. It proves that much of the terminology of German mysticism was current before Eckhart's time. Mechthild's clerico-political utterances show that she was acquainted with the "eternal gospel" of Joachim of Floris. Joachim had proclaimed the doctrine of three world-ages—the kingdom of the Father, of the Son, and of the Spirit. The reign of the Spirit was to begin with the year 1260, when the abuses of the world and the Church were to be effectually cured by the general adoption of the monastic life of contemplation. Very similar to this in appearance is the teaching of Amalric of Bena (d. 1207); but, while the movements just mentioned were reformatory without being heretical, this is very far from being the case with the mystical pantheism derived by Amalric from the writings of Erigena. His followers held a progressive revelation of God in the ages of the Father, Son, and Holy Spirit. Just as the Mosaic dispensation came to an end with the appearance of Christ, so the sacraments of the new dispensation have lost their meaning and efficacy since the incarnation of God as Holy Spirit in the Amalricans. With this opposition to the Church they combine a complete antinomianism, through the identification of all their desires with the impulses of the divine Spirit. Amalric's teaching was condemned by the Church, and his heresies led to the public burning of Erigena's *De divisione naturae* in 1225. The sect of the New Spirit, or of the Free Spirit as it was afterwards called, spread widely through the north of France and into Switzerland and Germany. They were especially numerous in the Rhineland in the end of the 13th and during the 14th century; and they seem to have corrupted the originally orthodox communities of Beghards, for Beghards and Brethren of the Free Spirit are used henceforward as convertible terms, and the same immoralities are related of both. Such was the seed-ground in which what is specifically known as German mysticism sprang up.

Eckhart.

In Meister Eckhart (? 1260–1327) the German mind definitively asserts its pre-eminence in the sphere of speculative mysticism. Eckhart was a distinguished son of the Church; but in reading his works we feel at once that we have passed into quite a different sphere of thought from that of the churchly mystics; we seem to leave the cloister behind and to breathe a freer atmosphere. The scholastic mysticism was, for the most part, practical and psychological in character. It was largely a devotional aid to the realization of present union with God; and, so far as it was theoretical, it was a theory of the faculties by which such a union is attainable. Mysticism was pieced on somewhat incongruously to a scholastically accepted theology; the feelings and the intellect were not brought together. But in Eckhart the attitude of the churchman and traditionalist is entirely abandoned. Instead of systematizing dogmas, he appears to evolve a philosophy by the free exercise of reason. His system enables him to give a profound significance to the doctrines of the Church; but, instead of the system being accommodated to the doctrines, the doctrines—and especially the historical facts—acquire a new sense in the system, and often become only a mythical representation of speculative truth. The freedom with which Eckhart treats historical Christianity allies him much more to the German idealists of the 19th century than to his scholastic predecessors.

The political circumstances of Germany in the first half of the 14th century were in the last degree disastrous. The war between the rival emperors, Frederick of Austria and Louis of Bavaria, and the interdict under which the latter was placed in 1324 inflicted extreme misery upon the unhappy people. From some places the interdict was not removed for twenty-six years. Men's minds were pained and disquieted by the conflict of duties and the absence of spiritual consolation. The country was also visited by a succession of famines and floods, and in 1348 the Black Death swept over Europe like a terrible scourge. In the midst of these unhappy surroundings religion became more inward in men of real piety and the desire grew among them to draw closer the bonds that united them to one another. Thus arose the society of the Friends of God (*Gottesfreunde*) in the south and west of Germany, spreading as far as Switzerland on the one side and the Netherlands on the other. They formed no exclusive sect. They often took opposite sides in politics and they also differed in the type of their religious life; but they uniformly desired to strengthen one another in living intercourse with God. Among them chiefly the followers of Eckhart were to be found. Such were Heinrich Suso of Constance (1295–1366) and Johann Tauler of Strassburg (1300–1361), the two most celebrated of his immediate disciples. Nicolas of Basel, the mysterious layman from whose visit Tauler dates his true religious life, seems to have been the chief organizing force among the Gottesfreunde. The society counted many members among the pious women in the convents of southern Germany. Such were Christina Ebner of Engelthal near Nuremberg, and Margaretha Ebner of Medingen in Swabia. Laymen also belonged to it, like Hermann of Fritzlar and Rulman Merswin, the rich banker of Strassburg (author of a mystical work, *Buch der neun Felsen*, on the nine rocks or upwards steps of contemplation). It was doubtless one of the Friends who sent forth anonymously from the house of the Teutonic Order in Frankfort the famous handbook of mystical devotion called *Eine deutsche Theologie*, first published in 1516 by Luther.

The "Gottesfreunde."

Ruysbroeck.

Jan van Ruysbroeck (1294–1381), the father of mysticism in the Netherlands, stood in connexion with the Friends of God, and Tauler is said to have visited him in his seclusion at Groenendal (Vauvert, Grünthal) near Brussels. He was decisively influenced by Eckhart, though there is noticeable occasionally a shrinking back from some of Eckhart's phraseology. Ruysbroeck's mysticism is more of a practical than a speculative cast. He is chiefly occupied with the means whereby the *unio mystica* is to be attained, whereas Eckhart dwells on the union as an ever-present fact, and dilates on its metaphysical implications. Towards the end of Ruysbroeck's life, in 1378, he was visited by the fervid lay-preacher Gerhard Groot (1340–1384), who was so impressed by the life of the community at Groenendal that he conceived the idea of founding a Christian brotherhood, bound by no monastic vows, but living together in simplicity and piety with all things in common, after the apostolic pattern. This was the origin of the Brethren of the Common Lot (or Common Life). The first house of the Brethren was founded at Deventer by Gerhard Groot and his youthful friend Florentius Radewyn; and here Thomas à Kempis (*q.v.*) received his training. Similar brother-houses soon sprang up in different places throughout the Low Countries and Westphalia, and even Saxony.

Mystics and the Reformation.

It has been customary for Protestant writers to represent the mystics of Germany and Holland as precursors of the Reformation. In a sense this is true. But it would be false to say that these men protested against the doctrines of the Church in the way the Reformers felt themselves called upon to do. There is no sign that Tauler, for example, or Ruysbroeck, or Thomas à Kempis had felt the dogmatic teaching of the Church jar in any single point upon their religious consciousness. Nevertheless, mysticism did prepare men in a very real way for a break with the traditional system. Mysticism instinctively recedes from formulas that have become stereotyped and mechanical. On the other hand its claim for spiritual freedom was soon to be found in opposition also to the Reformers.

Later German Mystics.

The wild doctrines of Thomas Münzer and the Zwickau prophets, merging eventually into the excesses of the Peasants' War and the doings of the Anabaptists in Münster, first roused Luther to the dangerous possibilities of mysticism as a disintegrating force. He was also called upon to do battle for his principle against men like Caspar Schwenkfeld (1490–1561) and Sebastian Franck (1500–1545), the latter of whom developed a system of pantheistic mysticism, and went so far in his opposition to the letter as to declare the whole of the historical element in Scripture to be but a mythical representation of eternal truth. Valentin Weigel (1533–1588), who stands under manifold obligations to Franck, represents also the influence of the semi-mystical physical speculation that marked the transition from scholasticism to modern times. The final breakdown of scholasticism as a rationalized system of dogma may be seen in Nicolas (or Nicolaus) of Cusa (1401–1464), who distinguishes between the *intellectus* and the discursively acting *ratio* almost precisely in the style of later distinctions between the reason and the understanding. The intellect combines what the understanding separates; hence Nicolas teaches the principle of the *coincidentia contradictoriorum.* If the results of the understanding go by the name of knowledge, then the higher teaching of the intellectual intuition may be called ignorance—ignorance, however, that is conscious of itself, *docta ignorantia.* "Intuitio," "speculatio," "visio sine comprehensione," "comprehensio incomprehensibilis," "mystica theologia," "tertius caelus," are some of the terms he applies to this knowledge above knowledge; but in the working out of his system he is remarkably free from extravagance. Nicolas's doctrines were of influence upon Giordano Bruno and other physical philosophers of the 15th and 16th centuries. All these physical theories are blended with a mystical theosophy, of which the most remarkable example is, perhaps, the chemico-astrological speculations of Paracelsus (1493–1541). The influence of Nicolas of Cusa and Paracelsus mingled in Valentin Weigel with that of the *Deutsche Theologie*, Andreas Osiander, Schwenkfeld and Franck. Weigel, in turn, handed on these influences to Jakob Boehme (1575–1624), *philosophus teutonicus*, and father of the chief developments of theosophy in modern Germany (see BOEHME).

Other Forms of Mysticism.

Mysticism did not cease within the Catholic Church at the Reformation. In St Theresa (1515–1582) and John of the Cross the counter-reformation can boast of saints second to none in the calendar for the austerity of their mortifications and the rapture of the visions to which they were admitted. But, as was to be expected, their mysticism moves in that comparatively narrow round, and consists simply in the heaping up of these sensuous experiences. The speculative character has entirely faded out of it, or rather has been crushed out by the tightness with which the directors of the Roman Church now held the reins of discipline. Their mysticism represents, therefore, no widening or spiritualizing of their theology; in all matters of belief they remain the docile children of their Church. The gloom and harshness of these Spanish mystics are absent from the tender, contemplative spirit of François de Sales (1567–1622); and in the quietism of Mme Guyon (1648–1717) and Miguel de Molinos (1627–1696) there is again a sufficient implication of mystical doctrine to rouse the suspicion of the ecclesiastical authorities. Quietism, name and thing, became the talk of all the world through the bitter and protracted controversy to which it gave rise between Fénelon and Bossuet.

In the 17th century mysticism is represented in the philosophical field by the so-called Cambridge Platonists, and especially by Henry More (1614–1687), in whom the influence of the Kabbalah is combined with a species of christianized Neoplatonism. Pierre Poiret (1646–1719) exhibits a violent reaction against the mechanical philosophy of Descartes, and especially against its consequences in Spinoza. He was an ardent student of Tauler and Thomas à Kempis, and became an adherent of the quietistic doctrines of Mme Bourignon. His philosophical works emphasize the passivity of the reason. The first influence of Boehme was in the direction of an obscure religious mysticism. J. G. Gichtel (1638–1710), the first editor of his complete works, became the founder of a sect called the Angel-Brethren. All Boehme's works were translated into English in the time of the Commonwealth, and regular societies of Boehmenists were formed in England and Holland. Later in the century he was much studied by the members of the Philadelphian Society, John Pordage, Thomas Bromley, Jane Lead, and others. The mysticism of William Law (1686–1761) and of Louis Claude de Saint Martin in France (1743–1803), who were also students of Boehme, is of a much more elevated and spiritual type. The "Cherubic Wanderer," and other poems, of Johann Scheffler (1624–1677), known as Angelus Silesius, are more closely related in style and thought to Eckhart than to Boehme.

The religiosity of the Quakers, with their doctrines of the "inner light" and the influence of the Spirit, has decided affinities with mysticism; and the autobiography of George Fox (1624–1691), the founder of the sect, proceeds throughout on the assumption of supernatural guidance. Stripped of its definitely miraculous character, the doctrine of the inner light may be regarded as the familiar mystical protest against formalism, literalism, and scripture-worship. Swedenborg, though selected by Emerson in his *Representative Men* as the typical mystic, belongs rather to the history of spiritualism than to that of mysticism as understood in this article. He possesses the cool temperament of the man of science rather than the fervid Godward aspiration of the mystic proper; and the speculative impulse which lies at the root of this form of thought is almost entirely absent from his writings. Accordingly, his supernatural revelations resemble a course of lessons in celestial geography more than a description of the beatific vision.

Philosophy since the end of the 18th century has frequently shown a tendency to diverge into mysticism. This has been especially so in Germany. The term mysticism is indeed often extended by popular usage and philosophical partisanship to the whole activity of the post-Kantian idealists. In this usage the word would be equivalent to the more recent and scarcely less abused term, transcendentalism, and as such it is used even by a sympathetic writer like Carlyle; but this looseness of phraseology only serves to blur important distinctions. However absolute a philosopher's idealism may be, he is erroneously styled a mystic if he moves towards his conclusions only by the patient labour of the reason. Hegel therefore, to take an instance, can no more fitly be classed as a mystic than Spinoza can. It would be much nearer the truth to take both as types of a thoroughgoing rationalism. In either case it is of course open to anyone to maintain that the apparent completeness of synthesis really rests on the subtle intrusion of elements of feeling into the rational process. But in that case it might be difficult to find a systematic philosopher who would escape the charge of mysticism; and it is better to remain by long-established and serviceable distinctions. So, again, when Récéjac defines mysticism as "the tendency to draw near to the Absolute in moral union by symbolic means," the definition, as developed by him, is one which would apply to the philosophy of Kant. Récéjac's interesting work, *Les Fondements de la connaissance mystique* (Eng. trans. 1899), though it touches mysticism at various points, and quotes from mystic writers, is in fact a protest against the limitations of experience to the data of the senses and the pure reason to the exclusion of the moral consciousness and the deliverances of "the heart." But such a position is not describable as mysticism in any recognized sense. On the other hand, where philosophy despairs of itself, exults in its own overthrow, and yet revels in the "mysteries" of a speculative Christianity, as in J. G. Hamann (1730–1788), the term mysticism may be fitly applied. So, again, it is in place where the movement of revulsion from a mechanical philosophy takes the form rather of immediate assertion than of reasoned demonstration, and where the writers, after insisting generally on the spiritual basis of phenomena, either leave the position without further definition or expressly declare that the ultimate problems of philosophy cannot be reduced to articulate formulas. Examples of this are men like Novalis, Carlyle and Emerson, in whom philosophy may be said to be impatient of its own task. Schelling's explicit appeal in the *Identitäts-philosophie* to an intellectual intuition of the Absolute, is of the essence of mysticism, both as an appeal to a supra-rational faculty and as a claim not merely to know but to realize God. The opposition of the reason to the understanding, as formulated by S. T. Coleridge, is not free from the first of these faults. The later philosophy of Schelling and the philosophy of Franz von Baader, both largely founded upon Boehme, belong rather to theosophy (*q.v.*) than to mysticism proper.

AUTHORITIES.—Besides the sections on mysticism in the general histories of philosophy by Erdmann, Ueberweg and Windelband, and in works on church history and the history of dogma, reference may be made for the medieval period to Heinrich Schmid, *Der Mysticismus in seiner Entstehungsperiode* (1824); Charles Schmidt, *Essai sur les mystiques du* 14^{me} *siècle* (1836); Ad. Helfferich, *Die christliche Mystik* (1842); L. Noack, *Die christliche Mystik des*

Mittelalters (1853); J. Görres, *Die christliche Mystik* (new ed., 1879–1880); Rufus M. Jones, *Studies in Mystical Religion* (1909). On the German mystics see W. Preger's *Geschichte der deutschen Mystik* (vol. i. 1874; vol. ii. 1881; vol. iii. 1893). The works of Eckhart and his precursors are contained in F. Pfeiffer's *Deutsche Mystiker des 14. Jahrhunderts* (1845–1857). (A. S. P.-P.)

MYTHOLOGY (Gr. *μυθολογία*, the science which examines *μῦθοι*, myths or legends of cosmogony and of gods and heroes. Mythology is also used as a term for these legends themselves. Thus when we speak of "the mythology of Greece" we mean the whole body of Greek divine and heroic and cosmogonic legends. When we speak of the "science of mythology" we refer to the various attempts which have been made to explain these ancient narratives. Very early indeed in the history of human thought men awoke to the consciousness that their religious stories were much in want of explanation. The myths of civilized peoples, as of Greeks and the Aryans of India, contain two elements, the rational and what to modern minds seems the irrational. The rational myths are those which represent the gods as beautiful and wise beings. The Artemis of the *Odyssey* "taking her pastime in the chase of boars and swift deer, while with her the wild wood-nymphs disport them, and high over them all she rears her brow, and is easily to be known where all are fair," is a perfectly rational mythic representation of a divine being. We feel, even now, that the conception of a "queen and huntress, chaste and fair," the lady warden of the woodlands, is a beautiful and natural fancy which requires no explanation. On the other hand, the Artemis of Arcadia, who is confused with the nymph Callisto, who, again, is said to have become a she-bear, and later a star, and the Brauronian Artemis, whose maiden ministers danced a bear-dance, are goddesses whose legend seems unnatural, and is felt to need explanation. Or, again, there is nothing not explicable and natural in the conception of the Olympian Zeus as represented by the great chryselephantine statue of Zeus at Olympia, or in the Homeric conception of Zeus as a god who "turns everywhere his shining eyes" and beholds all things. But the Zeus whose grave was shown in Crete, or the Zeus who played Demeter an obscene trick by the aid of a ram, or the Zeus who, in the shape of a swan, became the father of Castor and Pollux, or the Zeus who was merely a rough stone, or the Zeus who deceived Hera by means of a feigned marriage with an inanimate object, or the Zeus who was afraid of Attes, is a being whose myth is felt to be unnatural and in great need of explanation. It is this irrational and unnatural element—as Max Müller says, "the silly, savage and senseless element"—that makes mythology the puzzle which men have so long found it.

Early Explanations of Myths.—The earliest attempts at a crude science of mythology were efforts to reconcile the legends of the gods and heroes with the religious sentiment which recognized in these beings objects of worship and respect. Closely as religion and myth are intertwined, it is necessary to hold them apart for the purposes of this discussion. Religion may here be defined as the conception of divine, or at least supernatural powers entertained by men in moments of gratitude or of need and distress, in hours of weakness, when, as Homer says, "all folk yearn after the gods." Now this conception may be rude enough, and it is nearly related to purely magical ideas, to efforts to secure supernatural aid by magical ceremonies. Still the roughest form of spiritual prayer has for its basis the hypothesis of beneficent beings, visible or invisible. The senseless stories or myths about the gods are soon felt to be at variance with this hypothesis. As an example we may take the instance of Qing, the Bushman hunter. Qing, when first he met white men, was asked about his religion. He began to explain, and mentioned Cagn. Mr Orpen, the chief magistrate of St John's Territory, asked: "Is Cagn good or malicious? how do you pray to him?" Answer (in a low imploring tone): "'O Cagn! O Cagn! are we not your children? do you not see our hunger? give us food;' and he gives us both hands full" (*Cape Monthly Magazine*, July 1874). Here we see the *religious* view of Cagn, the Bushman god. But in the *mythological* account of Cagn given by Qing he appears as a kind of grasshopper, supernaturally endowed, the hero of a most absurd cycle of senseless adventures. Even religion is affected by these irrational notions, and the gods of savages and of many civilized peoples are worshipped with cruel, obscene, and irrational rites. But, on the whole, the religious sentiment strives to transcend the mythical conceptions of the gods, and is shocked and puzzled by the mythical narratives. As soon as this sense of perplexity is felt by poets, by priests, or by most men in an age of nascent criticism, explanations of what is most crude and absurd in the myths are put forward. Men ask themselves why their gods are worshipped in the form of beasts, birds, and fishes; why their gods are said to have prosecuted their amours in bestial shapes; why they are represented as lustful and passionate—thieves, robbers, murderers and adulterers. The answers to these questions sometimes become myths themselves. Thus both the Mangaians and the Egyptians have been puzzled by their own gods in the form of beasts. The Egyptians invented an explanation—itself a myth—that in some moment of danger the gods concealed themselves from their foes in the shapes of animals.[1] The Mangaians, according to W. W. Gill, hold that "the heavenly family had taken up their abode in these birds, fishes, and reptiles."[2]

A people so curious and refined as the Greeks were certain to be greatly perplexed by even such comparatively pure mythical narratives as they found in Homer, still more by the coarser legends of Hesiod, and above all by the ancient local myths preserved by local priesthoods. Thus, in the 6th century before Christ, Xenophanes of Colophon severely blamed the poets for their unbecoming legends, and boldly called certain myths "the fables of men of old."[3] Theagenes of Rhegium (520 B.C.?), according to the scholiast on *Iliad*, xx. 67,[4] was the author of a very ancient system of mythology. Admitting that the fable of the battle of the gods was "unbecoming," if literally understood, Theagenes represented it as an allegorical account of the war of the elements. Apollo, Helios, and Hephaestus were fire, Hera was air, Poseidon was water, Artemis was the moon, *καὶ τὰ λοιπὰ ὁμοίως*. Or, by another system, the names of the gods represented moral and intellectual qualities. Heraclitus, too, disposed of the myth of the bondage of Hera as allegorical philosophy. Socrates, in the *Cratylus* of Plato, expounds "a philosophy which came to him all in an instant," an explanation of the divine beings based on crude philological analyses of their names. Metrodorus, rivalling some recent flights of conjecture, resolved not only the gods but even heroes like Agamemnon, Hector and Achilles "into elemental combinations and physical agencies."[5] Euripides makes Pentheus (but he was notoriously impious) advance a "rationalistic" theory of the story that Dionysus was stitched up in the thigh of Zeus.

When Christianity became powerful the heathen philosophers evaded its satire by making more and more use of the allegorical and non-natural system of explanation. That method has two faults. First (as Arnobius and Eusebius reminded their heathen opponents), the allegorical explanations are purely arbitrary, depend upon the fancy of their author, and are all equally plausible and equally unsupported by evidence.[6] Secondly, there is no proof at all that, in the distant age when the myths were developed, men entertained the moral notions and physical philosophies which are supposed to be "wrapped up," as Cicero says, "in impious fables." Another system of explanation is that associated with the name of Euemerus (316 B.C.). According to this author, the myths are history in disguise. All the gods were once men, whose real feats have been decorated and distorted by later fancy. This view suited Lactantius, St Augustine and other early Christian writers very well. They were pleased to believe that Euemerus "by historical research had ascertained that the gods were once but mortal men." Precisely the same convenient line was taken by Sahagun in his account of Mexican religious myths. As there can be no doubt that the ghosts of dead men have been worshipped in many lands, and as the gods of many faiths are tricked out with attributes derived from ancestor-worship, the system of Euemerus retains some measure of plausibility. While we need not believe with Euemerus and with Herbert Spencer that the god of Greece or the god of the Hottentots was once a man, we cannot deny that the myths of both these gods have passed through and been coloured by the imaginations of men who practised the worship of real ancestors. For example, the Cretans showed the tomb of Zeus, and the Phocians (Pausanias x. 5) daily poured blood of victims into the tomb of a hero, obviously by way of feeding his ghost. The Hottentots show many tombs of their god, Tsui-Goab, and tell tales about his death; they also pray regularly for aid at the tombs of their own parents.[1] We may therefore say that, while it is rather absurd to believe that Zeus and Tsui-Goab were once real men, yet their myths are such as would be developed by people accustomed, among other forms of religion, to the worship of dead men. Very probably portions of the legends of real men have been attracted into the mythic accounts of gods of another character, and this is the element of truth at the bottom of Euemerism.

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[1] Plutarch, *De Iside et Osiride*.

[2] *Myths and Songs from the South Pacific*, p. 35 (1876).

[3] Xenoph. *Fr.* i. 42.

[4] Dindorf's ed., iv. 231.

[5] Grote, *Hist. of Greece*, (ed. 1869) i. 404.

[6] Cf. Lobeck, *Aglaophamus*, i. 151–152, on allegorical interpretation of myths in the mysteries.

Later Explanations of Mythology.—The ancient systems of explaining what needed explanation in myths were, then, physical, ethical, religious and historical. One student, like Theagenes, would see a physical philosophy underlying Homeric legends. Another, like Porphyry, would imagine that the meaning was partly moral, partly of a dark theosophic and religious character. Another would detect moral allegory alone, and Aristotle expresses the opinion that the myths were the inventions of legislators "to persuade the many, and to be used in support of law" (*Met.* xi. 8, 19). A fourth, like Euemerus, would get rid of the supernatural element altogether, and find only an imaginative rendering of actual history. When Christians approached the problem of heathen mythology, they sometimes held, with St Augustine, a form of the doctrine of Euemerus.[2] In other words, they regarded Zeus, Aphrodite and the rest as real persons, diabolical not divine. Some later philosophers, especially of the 17th century, misled by the resemblance between Biblical narratives and ancient myths, came to the conclusion that the Bible contains a pure, the myths a distorted, form of an original revelation. The abbé Banier published a mythological compilation in which he systematically resolved all the Greek myths into ordinary history.[3] Bryant published (1774) *A New System, or an Analysis of Ancient Mythology, wherein an Attempt is made to divest Tradition of Fable*, in which he talked very learnedly of "that wonderful people, the descendants of Cush," and saw everywhere symbols of the ark and traces of the Noachian deluge. Thomas Taylor, at the end of the 18th century, indulged in much mystical allegorizing of myths, as in the notes to his translation of Pausanias (1794). At an earlier date (1760) De Brosses struck on the true line of interpretation in his little work *Du Culte des dieux fétiches, ou parallèle de l'ancienne religion de l'Égypte avec la religion actuelle de Nigritie.* In this tract De Brosses explained the animal-worship of the Egyptians as a survival among a civilized people of ideas and practices springing from the intellectual condition of savages, and actually existing among negroes. A vast symbolical explanation of myths and mysteries was attempted by Friedrich Creuzer.[4] The learning and sound sense of Lobeck, in his *Aglaophamus*, exploded the idea that the Eleusinian and other mysteries revealed or concealed matter of momentous religious importance. It ought not to be forgotten that Lafitau, a Jesuit missionary in North America, while inclined to take a mystical view of the secrets concealed by Iroquois myths, had also pointed out the savage element surviving in Greek mythology.[5]

Recent Mythological Systems.—Up to a very recent date students of mythology were hampered by orthodox traditions, and still more by ignorance of the ancient languages and of the natural history of man. Only recently have Sanskrit and the Egyptian and Babylonian languages become books not absolutely sealed. Again, the study of the evolution of human institutions from the lowest savagery to civilization is essentially a novel branch of research, though ideas derived from an unsystematic study of anthropology are at least as old as Aristotle. The new theories of mythology are based on the belief that "it is man, it is human thought and human language combined, which naturally and necessarily produced the strange conglomerate of ancient fable."[6] But, while there is now universal agreement so far, modern mythologists differed essentially on one point. There was a school (with internal divisions) which regarded ancient fable as almost entirely "a disease of language," that is, as the result of confusions arising from misunderstood terms that have survived in speech after their original significance was lost. Another school (also somewhat divided against itself) believes that misunderstood *language* played but a very slight part in the evolution of mythology, and that the irrational element in myths is merely the survival from a condition of *thought* which was once common, if not universal, but is now found chiefly among savages, and to a certain extent among children. The former school considered that the state of thought out of which myths were developed was produced by decaying language; the latter maintains that the corresponding phenomena of language were the reflection of thought. For the sake of brevity we might call the former the "philological" system, as it rests chiefly on the study of language, while the latter might be styled the "historical" or "anthropological" school, as it is based on the study of man in the sum of his manners, ideas and institutions.

The System of Max Müller.—The most distinguished and popular advocate of the philological school was Max Müller, whose views may be found in his *Selected Essays* and *Lectures on Language*. The problem was to explain what he calls "the silly, savage and senseless element" in mythology (*Sel. Ess.* i. 578). Max Müller says (speaking of the Greeks), "their poets had an instinctive aversion to everything excessive or monstrous, yet they would relate of their gods what would make the most savage of Red Indians creep and shudder"—stories, that is, of the cannibalism of Demeter, of the mutilation of Uranus, the cannibalism of Cronus, who swallowed his own children, and the like. "Among the lowest tribes of Africa and America we hardly find anything more hideous and revolting."

Max Müller refers the beginning of his system of mythology to the discovery of the connexion of the Indo-European or, as they are called, "Aryan" languages. Celts, Germans, speakers of Sanskrit and Zend, Latins and Greeks, all prove by their languages that their tongues may be traced to one family of speech. The comparison of the various words which, in different forms, are common to all Indo-European languages must inevitably throw much light on the original meaning of these words. Take, for example, the name of a god, Zeus, or Athene, or any other. The word may have no intelligible meaning in Greek, but its counterpart in the allied tongues, especially in Sanskrit or Zend, may reveal the original significance of the terms. "To understand the origin and meaning of the names of the Greek gods, *and to enter into the original intention of the fables told of each*, we must take into account the collateral evidence supplied by Latin, German, Sanskrit and Zend philology" (*Lect. on Lang.*, 2nd series, p. 406). A name may be intelligible in Sanskrit which has no sense in Greek. Thus Athene is a divine name without meaning in Greek, but Max Müller advances reasons for supposing that it is identical with *akana*, "the dawn," in Sanskrit. It is his opinion, apparently, that whatever story is told of Athene must have originally been told of the dawn, and that we must keep this before us in attempting to understand the legends of Athene. Thus again (*op. cit.* p. 410), he says, "we have a right to explain all that is told of him" (Agni, "fire") "as originally meant for fire." The system is simply this: the original meaning of the names of gods must be ascertained by comparative philology. The names, as a rule, will be found to denote elemental phenomena. And the silly, savage and senseless elements in the legends of the gods will be shown to have a natural significance, as descriptions of sky, storms, sunset, water, fire, dawn, twilight, the life of earth, and other celestial and terrestrial existences. Stated in the barest form, these results do not differ greatly from the conclusions of Theagenes of Rhegium, who held that “ Hephaestus was fire, Hera was air, Poseidon was water, Artemis was the moon, *καὶ τὰ λοιπὰ ὁμοίως*.” But Max Müller's system is based on scientific philology, not on conjecture, and is supported by a theory of the various processes in the evolution of myths out of language.

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[1] Hahn, *Tsuni-Goam, the Supreme Being of the Khoi-Khoi*, p. 113.

[2] *De civ. dei.*, vii. 18; viii. 26.

[3] *La Mythologie et les fables expliquées par l'histoire* (Paris, 1738; 3 vols. 4to).

[4] *Symbolik und Mythologie der alten Völker* (Leipzig and Darmstadt, 1836–1843).

[5] *Mœurs des sauvages* (Paris, 1724).

[6] Max Müller. *Lectures on Language* (1864), 2nd series, p. 410.

It is no longer necessary to give an elaborate analysis of this theory, because neither in its philological nor mythological side has it any advocates who need be reckoned with. The attempt to disengage the history of times forgotten and unknown, by means of analysis of roots and words in Aryan languages, has been unsuccessful, or has at best produced disputable results. Max Müller's system was a result of the philological theories that indicated the linguistic unity of the Indo-European or “ Aryan ” peoples, and was founded on an analysis of their language. But myths precisely similar in irrational and repulsive character, even in minute details, to those of the Aryan races, exist among Australians, South Sea Islanders, Eskimo, Bushmen in Africa, among Solomon Islanders, Iroquois, and so forth. The facts being identical, an identical explanation should be sought, and, as the languages in which the myths exist are essentially different, an explanation founded on the Aryan language is likely to prove too narrow. Once more, even if we discover the original meaning of a god's name, it does not follow that we can explain by aid of the significance of the name the myths about the god. For nothing is more common than the attraction of a more ancient story into the legend of a later god or hero. Myths of unknown antiquity, for example, have been attracted into the legend of Charlemagne, just as the *bons mots* of old wits are transferred to living humorists. Therefore, though we may ascertain that Zeus means “ sky ” and Agni “ fire,” we cannot assert, with Max Müller, that all the myths about Agni and Zeus were originally told of fire and sky. When these gods became popular they would inevitably inherit any current exploits of earlier heroes or gods. These exploits would therefore be explained erroneously if regarded as originally myths of sky or fire. We cannot convert Max Müller's proposition “ there was nothing told of the sky that could not in some form or other be ascribed to Zeus ” into “ there was nothing ascribed to Zeus that had not at some time or other been told of the sky.” This is also, perhaps, the proper place to observe that names derived from natural phenomena—sky, clouds, dawn and sun—are habitually assigned by Brazilians, Ojibways, Australians and other savages to living men and women. Thus the story originally told of a man or woman bearing the name “ sun,” “ dawn,” “ cloud,” may be mixed up later with myths about the real celestial dawn, cloud or sun. For all these reasons the information obtained from philological analysis of names is to be distrusted. We must also bear in mind that early men when they conceived, and savage men when they conceive, of the sun, moon, wind, earth, sky and so forth, have no such ideas in their minds as we attach to these names. They think of sun, moon, wind, earth and sky as of living human beings with bodily parts and passions. Thus, even when we discover an elemental meaning in a god's name, that meaning may be all unlike what the word suggests to civilized men. A final objection is that philologists differ widely as to the true analysis and real meaning of the divine names. Max Müller, for example, connects Kronos (*Κρόνος*) with *χρόνος*, “ time ”; Preller with *κραίνω*, “ I fulfil,” and so forth.

The civilized men of the Mythopoeic age were not obliged, as Max Müller held, to believe that all phenomena were persons, because the words which denoted the phenomena had gender-terminations. On the other hand, the gender-terminations were survivals from an early stage of thought in which personal characteristics, including sex, had been attributed to all phenomena. This condition of thought is demonstrated to be, and to have been, universal among savages, and it may notoriously be observed among children. Thus Max Müller's theory that myths are “ a disease of language ” seems destitute of evidence, and inconsistent with what is historically known about the relations between the language and the social, political and literary condition of men.

Theory of Herbert Spencer.—The system of Herbert Spencer, as explained in *Principles of Sociology*, has many points in common with that of Max Müller. Spencer attempts to account for the state of mind (the foundation of myths) in which man personifies and animates all phenomena. According to his theory, too, this habit of mind may be regarded as the result of degeneration, for in his view, as in Max Müller's, it is not primary, but the result of misconceptions. But, while language is the chief cause of misconceptions with Max Müller, with Spencer it is only one of several forces all working to the same result. Statements which originally had a different significance are misinterpreted, he thinks, and names of human beings are also misinterpreted in such a manner that early races are gradually led to believe in the personality of phenomena. He too notes “ the defect in early speech ”—that is, the “ lack of words free from implications of vitality ”—as one of the causes which “ favour personalization.” Here, of course, we have to ask Spencer, with Max Müller, *why* words in early languages “ imply vitality.” These words must reflect the thought of the men who use them before they react upon that thought and confirm it in its misconceptions. So far Spencer seems at one with the philological school of mythologists, but he warns us that the misconstructions of language in his system are “ different in kind, and the erroneous course of thought is opposite in direction.” According to Spencer (and his premises, at least, are correct), the names of human beings in an early state of society are derived from incidents of the moment, and often refer to the period of the day or the nature of the weather. We find, among Australian natives, among Abipones in South America, and among Ojibways in the North, actual people named Dawn, Gold Flower of Day, Dark Cloud, Sun, and so forth. Spencer's argument is that, given a story about real people so named, in process of time and forgetfulness the anecdote which was once current about a man named Storm and a woman named Sunshine will be transferred to the meteorological phenomena of sun and tempest. Thus these purely natural agents will come to be “ personalized ” (*Prin. Soc.* 392), and to be credited with purely human origin and human adventures. Another misconception would arise when men had a tradition that they came to their actual seats from this mountain, or that lake or river, or from lands across the sea. They will mistake this tradition of local origin for one of actual parentage, and will come to believe that, like certain Homeric heroes, they are the sons of a river (now personified), or of a mountain, or, like a tribe mentioned by Garcilasso de la Vega, that they are descended from the sea. Once more, if their old legend told them that they came from the rising sun, they will hold, like many races, that they are actually the children of the sun. By this process of forgetfulness and misinterpretation, mountains, rivers, lakes, sun and sea would receive human attributes, while men would degenerate from a more sensible condition into a belief in the personality and vitality of inanimate objects. As Spencer thinks ancestor-worship the first form of religion, and as he holds that persons with such names as sun, moon and the like became worshipped as ancestors, his theory results in the belief that nature-worship and the myths about natural phenomena—dawn, wind, sky, night and the rest—are a kind of transmuted worship of ancestors and transmuted myths about real men and women. “ Partly by confounding the parentage of the race with a conspicuous object marking the natal region of the race, partly by literal interpretation of birth names, and partly by literal interpretation of names given in eulogy ” (such as Sun and Bull, among the Egyptian kings), and also through “ implicit belief in the statements of forefathers,” there has been produced belief in descent from mountains, sea, dawn, from animals which have become constellations, and from persons once on earth who now appear as sun and moon. A very common class of myths (see TOTEMISM) assures us that certain stocks of men are descended from beasts, or from gods in the shape of beasts. Spencer explains these by the theory that the remembered ancestor of a stock had, as savages often have, an animal name, as Bear, Wolf, Coyote, or what not. In time his descendants came to forget that the name was a mere name, and were misled into the opinion that they were children of a real coyote, wolf or bear. This idea, once current, would naturally stimulate and diffuse the belief that such descents were possible, and that the animals are closely akin to men.

The chief objection to these processes is that they require, as a necessary condition, a singular amount of memory on the one hand and of forgetfulness on the other. The lowest contemporary savages remember little or nothing of any ancestor farther back than the grandfather. But men in Spencer's Mythopoeic age had much longer memories. On the other hand, the most ordinary savage does not misunderstand so universal a custom as the imposition of names peculiar to animals or derived from atmospheric phenomena. He calls his own child Dawn or Cloud, his own name is Sitting Bull or Running Wolf, and he is not tempted to explain his great-grandfather's name of Bright Sun or Lively Raccoon on the hypothesis that the ancestor really was a raccoon or the sun. Moreover, savages do not worship ancestresses or retain lively memories of their great-grandmothers, yet it is through the female line in the majority of cases that the animal or other ancestral name is derived. The son of an Australian male, whose kin or totem name is Crane, takes, in many tribes, his mother's kin-name, Swan or Cockatoo, or whatever it may be, and the same is a common rule in Africa and America among races who rarely remember their great-grandfathers. On the whole, then (though degeneracy, as well as progress, is a force in human evolution), we are not tempted to believe in so strange a combination of forgetfulness with long memory, nor so excessive a degeneration from common sense into a belief in the personality of phenomena, as are required no less by Spencer's system than by that of Max Müller.

Preliminary Problems.—We have stated and criticized the more prominent modern theories of mythology. It is now necessary first to recapitulate the chief points in the problem, and then to attempt to explain them by a comparison of the myths of various races. The difficulty of mythology is to account for the following among other apparently irrational elements in myths: the wild and senseless stories of the beginnings of things, of the origin of men, sun, stars, animals, death, and the world in general; the infamous and absurd adventures of the gods; why divine beings are regarded as incestuous, adulterous, murderous, thievish, cruel, cannibals, and addicted to wearing the shapes of animals, and subject to death in some stories; the myths of metamorphosis into plants, beasts and stars; the repulsive stories of the state of the dead; the descents of the gods into the place of the dead, and their return thence. It is extremely difficult to keep these different categories of myths separate from each other. If we investigate myths of the origin of the world, we often find gods in animal form active in the work of world-making. If we examine myths of human descent from animals, we find gods busy there, and if we try to investigate the myths of the origin of the gods, the subject gets mixed up with the mythical origins of things in general.

Our first question will be, Is there any stage of human society, and of the human intellect, in which facts that appear to us to be monstrous and irrational are accepted as ordinary occurrences of every day life? E. W. Lane, in his preface to the *Arabian Nights*, says that the Arabs have an advantage over us as story-tellers. They can introduce such incidents as the change of a man into a horse, or of a woman into a dog, or the intervention of an *afreet*, without any more scruple than our own novelists feel in describing a duel or the concealment of a will. Among the Arabs the actions of magic and of spirits are regarded as at least as probable and common as duels and concealments of wills in European society. It is obvious that we need look no farther for the explanation of the supernatural events in Arab romances. Now let us apply this system to mythology. It is admitted that Greeks, Romans, Aryans of India in the age of the Sanskrit commentators, Egyptians of the Ptolemaic and earlier ages, were as much puzzled as we are by the mythical adventures of their gods. But is there any known stage of the human intellect in which these divine adventures, and the metamorphoses of men into animals, trees, stars, and converse with the dead, and all else that puzzles us in the civilized mythologies, are regarded as possible incidents of daily human life? Our answer is that everything in the civilized mythologies which we regard as irrational seems only part of the accepted and rational order of things (at least in the case of "medicine-men" or magicians) to contemporary savages, and in the past seemed equally rational and natural to savages concerning whom we have historical information. Our theory is, therefore, that the savage and senseless element in mythology is, for the most part, a legacy from ancestors of the civilized races who were in an intellectual state not higher than that of Australians, Bushmen, Red Indians, the lower races of South America, Mincopies, and other worse than barbaric peoples. As the ancestors of the Greeks, with the Aryans of India, the Egyptians, and others advanced in civilization, their religious thought was shocked and surprised by myths (originally dating from the period of savagery, and natural in that period) which were preserved down to the time of Pausanias by local priesthoods, or which were stereotyped in the ancient poems of Hesiod and Homer, or in the *Brahmanas* and *Vedas* of India, or were retained in the popular religion of Egypt. This theory recommended itself to Lobeck. "We may believe that ancient and early tribes framed gods like themselves in action and in experience, and that the allegorical element in myths is the addition of later peoples who had attained to purer ideas of divinity, yet dared not reject the religion of their ancestors" (*Aglaoph.* i. 153). The senseless element in the myths would by this theory be for the most part a "survival." And the age and condition of human thought from which it survived would be one in which our most ordinary ideas about the nature of things and the limits of possibility did not yet exist, when all things were conceived of in quite other fashion—the age, that is, of savagery. It is universally admitted that "survivals" of this kind do account for many anomalies in out institutions, in law, politics, society, even in dress and manners. If isolated fragments of an earlier age abide in these, it is still more probable that other fragments will survive in anything so closely connected as mythology with the conservative religious sentiment.

If this view of mythology can be proved, much will have been done to explain a problem which we have not yet touched, namely, *the distribution of myths*. The science of mythology has to account, if it can, not only for the existence of certain stories in the legends of certain races, but also for the presence of stories practically the same among almost all races. In the long history of mankind it is impossible to deny that stories may conceivably have spread from a single centre, and been handed on from races like the Indo-European and the Semitic to races as far removed from them in every way as the Zulus, the Australians, the Eskimo, the natives of the South Sea Islands. But, while the possibility of the diffusion of myths by borrowing and transmission must be allowed for, the hypothesis of the origin of myths in the savage state of the intellect supplies a ready explanation of their wide diffusion. Archaeologists are acquainted with objects of early art and craftsmanship, rude clay pipkins and stone weapons, which can only be classed as "human," and which do not bear much impress of any one national taste and skill. Many myths may be called "human" in this sense. They are the rough products of the early human mind, and are not yet characterized by the differentiations of race and culture. Such myths might spring up anywhere among untutored men, and anywhere might survive into civilized literature. Therefore where similar myths are found among Greeks, Australians, Egyptians, Mangaians and others, it is unnecessary to account for their wide diffusion by any hypothesis of borrowing, early or late. The Greek "key" pattern found on objects in Peruvian graves was not necessarily borrowed from Greece, nor did Greeks necessarily borrow from Aztecs the "wave" pattern which is common to both. The same explanation may be applied to Greek and Aztec myths of the deluge, to Australian and Greek myths of the original theft of fire. Borrowed they may have been, but they may as probably have been independent inventions.

It is true that some philologists deprecate as unscientific the comparison of myths which are found in languages not connected with each other. The objection rests on the theory that myths are a disease of language, a morbid offshoot of language, and that the legends in unconnected languages must therefore be kept apart. But, as the theory which we are explaining does not admit that *language* is more than a subordinate cause in the development of myths, as it seeks for the origin of myths in a given condition of *thought* through which all races have passed, we need do no more than record the objection.

The Intellectual Condition of Savages.—Our next step must be briefly to examine the intellectual condition of savages, that is, of races varying from the condition of the Andaman Islanders to that of the Solomon Islanders and the ruder Red Men of the American continent. In a developed treatise on the subject of mythology it would be necessary to criticize, with a minuteness which is impossible here, our evidence for the very peculiar mental condition of the lower races. Max Müller asked (when speaking of the mental condition of men when myths were developed), "was there a period of temporary madness through which the human mind had to pass, and was it a madness identically the same in the south of India and the north of Iceland?" To this we may answer that the human mind had to pass through the savage stage of thought, that this stage was for all practical purposes "identically the same" everywhere, and that to civilized observers it does resemble "a temporary madness." Many races are still abandoned to that temporary madness; many others which have escaped from it were observed and described while still labouring under its delusions. Our evidence for the intellectual ideas of man in the period of savagery we derive partly from the reports of voyagers, historians, missionaries, partly from an examination of the customs, institutions, and laws in which the lower races gave expression to their notions.

As to the first kind of evidence, we must be on our guard against several sources of error. Where religion is concerned, travellers in general and missionaries in particular are biased in several distinct ways. The missionary is sometimes anxious to prove that religion can only come by revelation, and that certain tribes, having received no revelation, have no religion or religious myths at all. Sometimes the missionary, on the other hand, is anxious to demonstrate that the myths of his heathen flock are a corrupted version of the Biblical narrative. In the former case he neglects the study of savage myths; in the latter he unconsciously accommodates what he hears to what he calls "the truth." The traveller who is not a missionary may either have the same prejudices, or he may be a sceptic about revealed religion. In the latter case he is perhaps unconsciously moved to put burlesque versions of Biblical stories into the mouths of his native informants, or to represent the savages as ridiculing the Scriptural traditions which he communicates to them. Yet again we must remember that the leading questions of a European inquirer may furnish a savage with a thread on which to string answers which the questions themselves have suggested. "Have you ever had a great flood?" "Yes" "Was any one saved?" The question starts the invention of the savage on a deluge-myth, of which, perhaps, the idea has never before entered his mind. There still remain the difficulties of all conversation between civilized men and unsophisticated savages, the tendency to hoax, and other sources of error and confusion. By this time, too, almost every explorer of savage life is a theorist. He is a Spencerian, or a believer in the universal prevalence of the faith in an "All-Father," or he looks everywhere for gods who are "spirits of vegetation." In receiving this kind of evidence, then, we need to know the character of our informant, his means of communicating with the heathen, his power of testing evidence, and his good faith. His testimony will have additional weight if supported by the "undesigned coincidences" of other evidence, ancient and modern. If Strabo and Herodotus and Pomponius Mela, for example, describe a custom, rite or strange notion in the Old World, and if mariners and missionaries find the same notion or custom or rite in Polynesia or Australia or Kamchatka, we can scarcely doubt the truth of the reports. The evidence is best when given by ignorant men, who are astonished at meeting with an institution which ethnologists are familiar with in other parts of the world.

Another method of obtaining evidence is by the comparative study of savage laws and institutions. Thus we find in Asia, Africa, America and Australia that the marriage laws of the lower races are connected with a belief in kinship or other relationship with animals. The evidence for this belief is thus entirely beyond suspicion. We find, too, that political power, sway and social influence are based on the ideas of magic, of metamorphosis, and of the power which certain men possess to talk with the dead and to visit the abodes of death. All these ideas are the stuff of which myths are made, and the evidence of savage institutions, in every part of the world, proves that these ideas are the universal inheritance of savages.

Savage Ideas about the World.

Savage men are like ourselves in curiosity and anxiety *causas cognoscere rerum*, but with our curiosity they do not possess our powers of attention. They are as easily satisfied with an explanation of phenomena as they are eager to possess an explanation. Inevitably they furnish themselves with their philosophy out of their scanty stock of acquired ideas, and these ideas and general conceptions seem almost imbecile to civilized men. Curiosity and credulity, then, are the characteristics of the savage intellect. When a phenomenon presents itself the savage requires an explanation, and that explanation he makes for himself, or receives from tradition, in the shape of a *myth*. The basis of these myths, which are just as much a part of early conjectural science as of early religion, is naturally the experience of the savage *as construed by himself*. Man's craving to know "the reason why" is already "among rude savages an intellectual appetite," and "even to the Australian scientific speculation has its germ in actual experience."[1] How does he try to satisfy this craving? E. B. Tylor replies, "When the attention of a man in the myth-making stage of intellect is drawn to any phenomenon or custom which has to him no obvious reason, he invents and tells a story to account for it." Against this statement it has been urged that men in the lower stages of culture are not curious, but take all phenomena for granted. If there were no direct evidence in favour of Tylor's opinion, it would be enough to point to the nature of savage myths themselves. It is not arguing in a circle to point out that almost all of them are nothing more than explanations of intellectual difficulties, answers to the question, How came this or that phenomenon to be what it is? Thus savage myths answer the questions—What was the origin of the world, and of men, and of beasts? How came the stars by their arrangement and movements? How are the motions of sun and moon to be accounted for? Why has this tree a red flower, and this bird a black mark on the tail? What was the origin of the tribal dances, or of this or that law of custom or etiquette? Savage mythology, which is also savage science, has a reply to all these and all similar questions, and that reply is always found in the shape of a story. The answers cannot be accounted for without the previous existence of the questions.

We have now shown how savages come to have a mythology. It is their way of satisfying the early form of scientific curiosity, their way of realizing the world in which they move. But they frame their stories, necessarily and naturally, in harmony with their general theory of things, with what we may call "savage metaphysics." Now early man, as Max Müller says, "not only did not think as we think, but did not think as we suppose he ought to have thought." The chief distinction between his mode of conceiving the world and ours is his vast extension of the theory of personality. To the savage, and apparently to men more backward than the most backward peoples we know, all nature was a congeries of animated personalities. The savage's notion of personality is more a universally diffused feeling than a reasoned conception, and this feeling of a personal self he impartially distributes all over the world as known to him. One of the Jesuit missionaries in North America thus describes the Red Man's philosophy:[2] "Les sauvages se persuadent que non seulement les hommes et les autres animaux, mais aussi que toutes les autres choses sont animées." Crevaux, in the Andes, found that the Indians believed that the beasts have *piays* (sorcerers and doctors) like themselves.[3] This opinion we may name *personalism*, and it is the necessary condition of savage (and, as will be seen, of civilized) mythology. The Jesuits could not understand how spherical bodies like sun and moon could be mistaken for human beings. Their catechumens put them off with the answer that the drawn bows of the heavenly bodies gave them their round appearance. "The wind was formerly a person; he became a bird," say the Bushmen, and *g' ōō ka! kai*, a respectable Bushman once saw the personal wind at Haarfontein.[4] The Egyptians, according to Herodotus (iii. 16), believed fire to be *θηρίον ἔμψυχον*, a live beast. The Bushman who saw the Wind meant to throw a stone at it, but it ran into a hill. From the wind as a person the Bhinyas in India (Dalton, p. 140) claim descent, and in Indian epic tradition the leader of the ape army was the son of the wind. The Wind, by certain mares, became the father of wind-swift steeds mentioned in the *Iliad*. The loves of Boreas are well known. These are examples of the animistic theory applied to what, in our minds, seems one of the least personal of natural phenomena. The sky (which appears to us even less personal) has been regarded as a personal being by Samoyeds, Red Indians, Zulus,[5] and traces of this belief survive in Chinese, Greek and Roman religion.

We must remember, however, that to the savage, Sky, Sun, Sea, Wind, are not only persons, but they are savage persons. Their conduct is not what civilized men would attribute to characters so august; it is what uncivilized men think probable and befitting among beings like themselves.

Savage Theory of Man's Relations with the World.

The savage regards all animals as endowed with personality. "Ils tiennent les poissons raisonnables, comme aussi les cerfs," says a Jesuit father about the North-American Indians (*Relations*, *loc. cit.*). In Australia the natives believe that the wild dog has the power of speech, like the cat of the Coverley witch in the *Spectator*. The Breton peasants, according to P. Sébillot, credit all birds with language, which they even attempt to interpret. The old English and the Arab superstitions about the language of beasts are examples of this opinion surviving among civilized races. The bear in Norway is regarded as almost a man, and his dead body is addressed and his wrath deprecated by Samoyeds and Red Indians. "The native bear

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[1] E. B. Tylor, *Primitive Culture*, i. 369 (1871).

[2] *Relations* (1636), p. 114.

[3] *Voyages*, p. 159.

[4] *South African Folk-Lore Journal* (May 1880).

[5] E. B. Tylor, *op. cit.* ii. 256.

Kur-bo-roo is the sage counsellor of the aborigines in all their difficulties. When bent on a dangerous expedition, the men will seek help from this clumsy creature, but in what way his opinions are made known is nowhere recorded.”[1] H. R. Schoolcraft mentions a Red Indian story explaining how “ the bear does not die,” but this tale Schoolcraft (like Herodotus in Egypt) “ cannot bring himself to relate.” He also gives examples of Iowas conversing with serpents. These may serve as examples of the savage belief in the human intelligence of animals. Man is on an even footing with them, and with them can interchange his ideas. But savages carry this opinion much further. Man in their view is actually, and in no figurative sense, akin to the beasts. Certain tribes in Java “ believe that women when delivered of a child are frequently delivered at the same time of a young crocodile.”[2] The common European story of a queen accused of giving birth to puppies shows the survival of the belief in the possibility of such births among civilized races, while the Aztecs had the idea that women who saw the moon in certain circumstances would produce mice. But the chief evidence for the savage theory of man’s close kinship with the lower animals is found in the institution called *totemism* (*q.v.*)—the belief that certain stocks of men in the various tribes are descended by blood descent from, or are developed out of, or otherwise connected with, certain objects animate or inanimate, but especially with beasts. The strength of the opinion is proved by its connexion with very stringent marriage laws. No man (according to the rigour of the custom) may marry a woman who bears the same kin name as himself, that is, who is descended from the same inanimate object or animal. Nor may people (if they can possibly avoid it) eat the flesh of animals who are their kindred. Savage man also believes that many of his own tribe-fellows have the power of assuming the shapes of animals, and that the souls of his dead kinsfolk revert to animal forms.

E. W. Lane, in his introduction to the *Arabian Nights* (i. 58), says he found the belief in these transmigrations accepted seriously in Cairo. H. H. Bancroft brings evidence to prove that the Mexicans supposed pregnant women would turn into beasts, and sleeping children into mice, if things went wrong in the ritual of a certain solemn sacrifice. There is a well-known Scottish legend to the effect that a certain old witch was once fired at in her shape as a hare, and that where the hare was hit there the old woman was found to be wounded. J. F. Lafitau tells the same story as current among his Red Indian flock, except that the old witch and her son took the form of birds, not of hares. A Scandinavian witch does the same in the Egil saga. In Lafitau’s tale the birds were wounded by the magic arrows of a medicine man, and the arrow-heads were found in the bodies of the human culprits. In Japan[3] people chiefly transform themselves into badgers. The sorcerers of Honduras (Bancroft, i. 740) “ possessed the power of transforming men into wild beasts.” J. F. Regnard, the French dramatist, found in Lapland (1681) that witches could turn men into cats, and could themselves assume the forms of swans, crows, falcons and geese. Among the Bushmen[4] “ sorcerers assume the form of beasts and jackals.” M. Dobrizhofer, a missionary in Paraguay (1717–1791), learned that “ sorcerers arrogate to themselves the power of changing men into tigers ” (Eng. trans., i. 63). He was present at a conversion of this sort, though the miracle beheld by the people was invisible to the missionary. Near Loanda Livingstone noted that “ a chief may metamorphose himself into a lion, kill any one he chooses, and resume his proper form.” The same accomplishments distinguish the Barotse and Balonda.[5] Among the Mayas of Central America sorcerers could transform themselves “ into dogs, pigs and other animals; their glance was death to a victim ” (Bancroft, ii. 797). The Thlinkeets hold that their shamans have the same powers.[6] A bamboo in Sarawak is known to have been a man. Metamorphoses into stones are as common among Red Indians and Australians as in Greek mythology. Compare the cases of Niobe and the victims of the Gorgon’s head.[7] Zulus, Red Indians, Aztecs,[8] Andaman Islanders and other races believe that their dead assume the shapes of serpents and of other creatures, often reverting to the form of the animal from which they originally descended. In ancient Egypt “ the usual prayers demand for the deceased the power of going and coming from and to everywhere *under any form they like.*”[9] A trace of this opinion may be noticed in the *Aeneid*. The serpent that appeared at the sacrifice of Aeneas was regarded as possibly a “ manifestation ” of the soul of Anchises (*Aeneid*, v. 84)—

> “ Dixerat haec, adytis quum lubricus anguis ab imis
> Septem ingens gyros, septena volumina, traxit,”

and Aeneas is

> “ Incertus, geniumne loci, famulumne parentis
> Esse putet.”

On the death of Plotinus, as he gave up the ghost, a snake glided from under his bed into a hole in the wall.[10] Compare Pliny[11] on the cave “ in quo manes Scipionis Africani majoris custodire draco dicitur.”

The last peculiarity in savage philosophy to which we need call attention here is the belief in spirits and in human intercourse with the shades of the dead. With the savage natural death is not a universal and inevitable ordinance. “ All men must die ” is a generalization which he has scarcely reached; in his philosophy the proposition is more like this—“ all men who die die by violence.” A natural death is explained as the result of a sorcerer’s spiritual violence, and the disease is attributed to magic or to the action of hostile spirits. After death the man survives as a spirit, sometimes taking an animal form, sometimes invisible, sometimes to be observed “ in his habit as he lived ” (see APPARITIONS). The philosophy of the subject is shortly put in the speech of Achilles (*Iliad*, xxiii. 103) after he has beheld the dead Patroclus in a dream: “ Ay me, there remaineth then even in the house of Hades a spirit and phantom of the dead, *for* all night long hath the ghost of hapless Patroclus stood over me, wailing and making moan.” It is almost superfluous to quote here the voluminous evidence for the intercourse with spirits which savage chiefs and medicine men are believed to maintain. They can call up ghosts, or can go to the ghosts, in Australia, New Caledonia, New Zealand, North America, Zululand, among the Eskimo, and generally in every quarter of the globe. The men who enjoy this power are the same as they who can change themselves and others into animals. They too command the weather, and, says an old French missionary, “ are regarded as very Jupiters, having in their hands the lightning and the thunder ” (*Relations*, *loc. cit.*). They make good or bad seasons, and control the vast animals who, among ancient Persians and Aryans of India, as among Zulus and Iroquois, are supposed to grant or withhold the rain, and to thunder with their enormous wings in the region of the clouds.

Another fertile source of myth is magic, especially the magic designed to produce fertility, vegetable and animal. From the natives of northern and central Australia to the actors in the ritual of Adonis, or the folk among whom arose the customs of crowning the May king or the king of the May, all peoples have done magic to encourage the breeding of animals as part of the food supply, and to stimulate the growth of plants, wild or cultivated. In the opinion of J. G. Frazer, the human representatives or animal representatives, in the rites, of the spirit of vegetation; of the corn spirit; of the changing seasons, winter or summer, have been developed into many forms of gods, with appropriate myths, explanatory of the magic, and of the sacrifice of the chief performer. In the same way the adoration of living human beings, the deification of living kings—whose title survives in our king or queen of the May, and in the *rex nemorensis*, the priest of Diana in the grove of Aricia—has been most fruitful in myths of divine beings. These human beings are often sacrificed, for various reasons, actual or hypothetical, and gods and heroes are almost as likely to be explained as spirits of vegetation now, as they were likely to become solar mythological figures in the system of Max Müller. It is certainly true that divine beings in most mythologies are apt to acquire solar with other elemental attributes, including vegetable attributes. But that the origins of such mythical beings were, *ab initio*, either solar or vegetable, or, for that matter, animal, it would often be hard to prove.

Frazer’s ideas are to be found in a work of immense erudition, *The Golden Bough* (London, 1900). Two studies by him, pursuing the same set of ideas in more detail, are *Adonis, Attis, Osiris* (1906) and *Lectures on the Early History of the Kingship* (1905). See A. Lang, *Magic and Religion* (London, 1901), for a criticism in detail of the general theory as set forth in *The Golden Bough*. Whatever may be said, Frazer has certainly made the most important of recent contributions to the study of mythology. He has fixed the attention of students on a mass of early ideas, previously much neglected save by W. Mannhardt, and on the facts of ritual, which preserve these ideas and represent them in a kind of mystery plays.

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[1] R. Brough Smyth, *Aborigines of Victoria*, i. 446 (1878).

[2] J. Hawkesworth, *Voyages*, iii. 756.

[3] Lord Redesdale, *Tales of Old Japan* (1871).

[4] Bleek, *Brief Account of Bushman Folk-Lore*, pp. 15, 40.

[5] *Missionary Travels*, pp. 615, 642.

[6] W. H. Dall, *Alaska*, p. 423 (1870).

[7] Dorman, *Origin of Primitive Superstitions*, pp. 130, 134.

[8] Sahagun, French trans., p. 226.

[9] *Records of the Past*, x. 10.

[10] *Plotini vita*, pp. 2, 95.

[11] *H. N.* xv. 44, 85.

We are now in a position to sum up the ideas of savages about man's relations to the world. We started on this inquiry because we found that savages regarded sky, wind, sun, earth and so forth as practically men, and we had then to ask, what sort of men, men with what powers? The result of our examination, so far, is that in savage opinion sky, wind, sun, sea and many other phenomena have, being personal, all the powers attributed to real human persons. These powers and qualities are: (1) relationship to animals and ability to be transformed and to transform others into animals and other objects; (2) magical accomplishments, as—(*a*) power to visit or to procure the visits of the dead; (*b*) other magical powers, such as control over the weather and over the fertility of nature in all departments. Once more, the great forces of nature, considered as persons, are involved in that inextricable confusion in which men, beasts, plants, stones, stars, are all on one level of personality and animated existence. This is the philosophy of savage life, and it is on these principles that the savage constructs his myths, while these, again, are all the scientific explanations of the universe with which he has been able to supply himself.

Examples of Mythology.—Myths of the origin of the world and man are naturally most widely diffused. Man has everywhere asked himself whence things came and how, and his myths are his earliest extant form of answer to this question. So confused and inconsistent are the mythical answers that it is very difficult to classify them according to any system. If we try beginning with myths of creative gods, we find that the world is sometimes represented as pre-existent to the divine race. If we try beginning with myths of the origin of the world, we frequently find that it owes its origin to the activity of pre-existent supernatural beings. According to all modern views of creation, the creative mind is prior to the universe which it created. There is no such consistency of opinion in myths, whether of civilized or savage races. Perhaps the plan least open to objection is to begin with myths of the gods. But when we speak of gods, we must not give to the word a modern significance. As used here, gods merely mean non-natural and powerful beings, sometimes "magnified non-natural men," sometimes beasts, birds or insects, sometimes the larger forces and phenomena of the universe conceived of as endowed with human personality and passions. When Plutarch examined the Osirian myth (*De Isid.* xxv.) he saw that the "gods" in the tale were really "demons," "stronger than men, but having the divine part not wholly unalloyed"—"magnified non-natural men," in short. And such are the gods of mythology.

In examining the myths of the gods we shall begin with the conceptions of the most backward tribes, and advance to the divine legends of the ancient civilized races. It will appear that, while the non-civilized gods are often theriomorphic, made in accordance with the ideas of non-civilized men, the civilized gods retain many characteristics of the savage gods, and these characteristics are the "irrational element" in the divine myths.

Myths of Gods: Savage Ideas.—It is not easy to separate the discussion of savage myths of gods from the problem, Whence and how arose the savage belief in gods? The orthodox anthropological explanation has been that of E. B. Tylor, which closely resembles Herbert Spencer's "ghost theory." By reflection on dreams, in which the self, or "spirit," of the savage seems to wander free from the bounds of time and space, to see things remote, and to meet and recognize dead friends or foes; by speculation on the experiences of trance and of phantasms of the dead or living, beheld with waking eyes; by pondering on the phenomena of shadows, of breath, of death and life, the savage evolved the idea of a separable soul or spirit capable of surviving bodily death. The spirit of the dead may tenant a material object, a "fetish," or may roam hungry and comfortless and need propitiation by food, for unpropitiated it is dangerous, or may be reincarnated, or may "go to its own herd" in another world. Again, it is naturally kind to its living kinsfolk, and so may be addressed in prayer. These are the doctrines of animism (*q.v.*), and, according to the usual anthropological theory, these spirits come to thrive to god's estate in favourable circumstances, as where the dead man, when alive, had great *mana* or *wakan*, a great share of the ether, so to speak, which, in savage metaphysics, is the viewless vehicle of magical influences. Thus the ghost of the hero or medicine man of a kin or tribe may be raised to divine rank, while again—the doctrine of spirits once developed, and spirits once allotted to the great elemental forces and phenomena of nature, sky, thunder, the sea, the forests—we have the beginnings of departmental deities, such as Agni, god of fire; Poseidon, god of the sea; Zeus, god of the sky—though in recent theories Zeus appears to be regarded as primarily the god of the oak tree, a spirit of vegetation.

On this theory animism, the doctrine of spirits, is the source of all belief in gods. But it is found that among the lowest or least cultured races, such as the south-eastern tribes of Australia, who do not propitiate ancestral spirits by offerings of food, or address them in prayer, there often exists a belief in an "All-Father," to use Howitt's convenient expression. This being cannot have been evolved out of the cult of ancestors, where ancestors are not worshipped; and he is not even regarded as a spirit, but, in Matthew Arnold's phrase, as "a magnified non-natural man." He existed before death came into the world, and he still exists. His home is in or above the sky, but there was a time when he walked the earth, a potent magic-worker; endowed mankind with such arts and institutions as they possess; and left to them certain rules of life, ethics and ritual. Often he is regarded as the maker of things, or of most things, and of mankind; or mankind are his children, descended from disobedient sons of his, whom he cast out of heaven. Very frequently he is the judge of souls, and sends the good and bad to their own places of reward and punishment. He is usually supposed to watch over human conduct, but this is by no means invariably the case. Sometimes he, like the Atnatu of the Kaitish tribe of central Australia, is only vigilant in matters of ritual, such as circumcision, subincision and the use of the sacred bull-roarer, the Greek ῥόμβος. As an almost universal rule, in the lowest culture, no prayers are addressed to this being; he has no sacrifices, no dwelling made with hands; and the images of him, in clay, that are made and danced round with invocations of his name at the tribal ceremonies of initiation, are destroyed at the close of the performances. If the name of "god" is denied to such beings because they receive little cult, it may still be admitted that the belief might easily develop into a form of theism, independent of and underived from animism, or the ghost theory.

Australian Savages.

The best account of this All-Father belief in the lowest culture is to be read in R. Howitt's *Native Races of South-East Australia*. Under the names of Baiame, Pundjel, Mulkari, Daramulun and many others, the south-eastern tribes (both those who reckon descent in the female and those who reckon by the male line) have this faith in an All-Father, the attributes varying in various communities. The most highly developed All-Father is the Baiame or Byamee of the Euahlayi tribe of north-western New South Wales, to whom prayers for the welfare of the souls of the dead are, or recently were, addressed—the tribe dwelling a hundred miles away from the nearest missionary station (Protestant).[1]

In the centre of Australia, Atnatu, self-created, is known, as has been said, to the Kaitish tribe, next neighbours of the Arunta of the Macdonnell Hills. Among the Arunta, Mr Strehlow (*Globus*, May 1907) finds such a being as Atnatu, and also among some other adjacent tribes, as the Luritja. See, too, Strehlow and von Leonhardi, in *Veröffentlichungen aus dem städtischen Völker-Museum* (Frankfurt-am-Main, 1907, vol. i.). But Messrs B. Spencer and F. J. Gillen, who discovered Atnatu, did not find any trace of an All-Father among the Arunta, or any other of the tribes to the north and north-east of the centre. Mr Strehlow's branch of the Arunta they did not examine.

It is plain that the All-Father belief, in favourable circumstances, especially if ghost worship remained undeveloped, might be evolved into theism. But all over the savage world, especially in Africa, spirit worship has sprung up and choked the All-Father, who, however, in most savage regions, abides as a name, receiving no sacrifice, and, save among the Masai, seldom being addressed in prayer. A list of such otiose great beings in the background of religion is given in Lang's *The Making of Religion* (1898). Since the publication of that book much additional evidence has accrued from Africa and Melanesia, where the belief occurs in a few islands, but, in the majority, is absent or unrecorded. Most of the fresh evidence is given in *La Notion de l'être suprême chez les peuples non-civilisés*, by René Hoffmann (Geneva, 1907). See also the *Journal of the Anthropological Institute* (1899–1907), vols. xxix., xxxii., xxxiv., xxxv., and the works of Miss Mary Kingsley, and Spieth, *Die Ewe-Stämme*, Reimer (Berlin, 1906), and Sundermann in Warneck's *Allgemeine Missionszeitschrift*, vol. xi. An excellent statement is that of Père Schmidt, S.V.D., in *Anthropos*, Bd. III., Hft. 3 (1908), pp. 559–611. Tylor's efforts to show that these All-Fathers were derived from missionary or other European influences (*Nineteenth*

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[1] See Mrs Langloh Parker's *The Euahlayi Tribe.*

Century, 1892) have not been successful (see Lang, *Magic and Religion*, "The Theory of Loan Gods") and N.W. Thomas in *Man* (1905), v., 49 et seq. The All-Father belief is most potent among the lowest races, and always tends to become obsolete under the competition of serviceable ancestral spirits, or gods made in the image of such spirits, who can be bribed by sacrifices or induced by prayers to help man in his various needs.

The belief in the All-Father in south-eastern Australia is concealed from the women and children who, at most, know his exoteric name, often meaning "Our Father," and is revealed only to the initiate, among whom are a very few white men, like Howitt. Mrs Langloh Parker, of course, was not initiated (indeed, no white man has gone through the actual and very painful rites), but confidences were made to her with great secrecy. The All-Father, even at his best, among the Kurnai, Kamilaroi and Euahlayi, is the centre of many grotesque and sportive myths. He usually has a wife and children, not in all cases born, but rather they are emanations. One of these children is often his mediator with men, and has the charge of the rites and the mystic bull-roarer. The relation is that of Apollo to Zeus in Greek myth.

Many of the wilder myths are the expressions of the sportive and humorous faculties. Some arise naturally thus: Baiame, say, originated everything, therefore he originated the grotesque mummeries and dances of the mysteries. To explain these, myths have been developed to show that they arose in some grotesque incident of Baiame's personal existence on earth. Many Greek myths, most derogatory to the dignity of Demeter, Dionysus, Zeus or Hera, arose in the same way, as explanations of buffooneries in the Eleusinian or other mysteries. In medieval literature the most sacred persons of our religion have grotesque associations attached to them in the same manner.

While the All-Father belief is common in the tribes of south-eastern Australia, the tribes round Lake Eyre, the Arunta (as known to Messrs Spencer and Gillen), and the other central and northern tribes, are credited with no germs of belief in what is called a *supreme*, and may truly be styled a *superior* being. That being, in many cases, but not so commonly in Australia, has a malevolent opposite who thwarts his work, an Ahriman to his Ormuzd. In one district, where the superior being is a crow, his opposite is an eagle-hawk. These two birds in many tribes give names to the two great exogamous and intermarrying divisions; in their case there is a *va et vient* of divine, human and theriomorphic elements, just as in the Greek myths of Zeus. As a rule, however, the Australian All-Father is anthropomorphic, and fairly well described in the native term when they speak English as "the Big Man," powerful, deathless, friendly, "able to go everywhere and do everything," "to see whatever you do." The existence of the belief in this being was accepted by T. Waitz, and, though disputed by many squatters and most anthropologists, is now admitted on the strength of the evidence of Howitt, Cameron, Mrs Langloh Parker, Dawson, W. E. Roth in *Ethnological Studies*, and many other close observers. The belief being esoteric, a secret of the initiated, necessarily escaped casual inquirers.

Meanwhile, among some of the Arunta of the centre, among the Dieri and Urabunna tribes near Lake Eyre and their congeners, and among the tribes north by east of the Arunta, no such belief has been discovered by Messrs Spencer and Gillen, from whom the tribes kept no secrets, or by Mr Siebert, a missionary among the now all but extinct Dieri. There is just a trace of a dim sky-dwelling being, Arawotja, possibly an all but obliterated survival of an All-Father. Howitt speaks too of the Dieri Kutchi, who inspires medicine-men with ideas, but about him our information is scanty. Among all these tribes religion now takes another line, the belief in a supernormal race of Titanic beings, with no superior, who were the first dwellers on earth; who possessed powers far exceeding those of the medicine-men of to-day; and who, in one way or another, were connected with, or developed from, the totem animals, vegetables and other objects. These beings modified the face of the country; in Arunta belief rocks and trees arose to mark the places where they finally "went into the ground" (*Oknanikilla*), and their spirits still haunt certain places such as these; and are reincarnated in native women who pass by. These beings, in Arunta called "the people of the *Alcheringa*, or dream time" (but cf. Strehlow in *Globus*, *ut supra*), originated the tribal rites of initiation. In Dieri they are called *Mura-Mura*, and to them prayers are made for rain, accompanied by rain-making magic ceremonies, which in this case may be a symbolical expression of the prayers. There is a large body of myths about the *Alcheringa* folk, or *Mura-Mura* (see Spencer and Gillen, *Native Tribes of Central Australia*, *Native Tribes of Northern Australia*, and Howitt, *Native Tribes of South-Eastern Australia*), and the myths of their wanderings, prodigies and institution of rites and magic are represented in the dances of the mysteries. Most of the magic is worked (*Intichiuma* in Arunta) by the members of each totem kin or group for the behoof of the totem as an article of food supply. These rites are common in North America, but are worked by members of gilds or societies, not by totem kins.

The belief in these *Mura-Mura* or *Alcheringa* folk may obviously develop, in favourable circumstances, into a polytheism like that of Greece, or of Egypt, or of the Maoris. The old Irish gods in the poetic romances appear to have the same origin and shade away into the fairies. The baser Greek myths of the wanderings, amours and adventures of the gods, myths ignored by Homer, are parallel to the adventures of the *Alcheringa* people, and the fable of the mutilation of Osiris and the search for the lost organ by Isis, actually occurs among the Alcheringa tales of Messrs Spencer and Gillen. Among the Arunta, the Alcheringa folk are part of a strangely elaborate theory of evolution and of animism, which leaves no room for a creative being, or for a future life of the spirit, which is merely reincarnated at intervals.

Thus the doctrines of evolution and of creation, or the making of things, stand apart, or blend, in the metaphysics and religion of the lowest and least progressive of known peoples. The question as to which theory came first, whether Alcheringaism is a scientific effort that swept away All-Fatherism, or whether All-Fatherism is a religious reaction in despair of science and of the evolutionary doctrine, is settled by each inquirer in accordance with his personal bias. It has been argued that All-Fatherism is an advance, conditioned by coastal influences—more rain and more food—concomitant with a social advance to individual marriage, and reckoning of kin in the male line. But tribes far from the sea, as in northern New South Wales and Queensland, have the All-Father belief, with individual marriage and female descent, while tribes of the north coast, with male descent, are credited with no All-Father; and the Arunta, as far as possible from the sea, have no All-Father (save in Strehlow's district), and have individual marriage and male reckoning of descent in matters of inheritance; while the Urabunna and Dieri, with female descent and the custom of *pirrauru* (called "group marriage" by Howitt), are not credited with the All-Father belief. Thus coastal conditions have clearly no causal influence on the development of the All-Father belief. If they had, the natives of central Queensland, remote from the sea, should not have their All-Father (Mulkari), and the natives of the northern and north-eastern coasts should have an All-Father, who is still to seek. The Arunta of Messrs Spencer and Gillen may have possessed and deposed the Altjira superior being of the Arunta known to Mr Strehlow, like the Atnatu of the adjacent Kaitish, or the All-Father of the neighbouring Luritja; or these beings may be more recent divergences of doctrine, departures from pure Alcheringaism with no All-Father. At present, at least, it is premature to dogmatize on these problems.[1]

African Savages.

The chief being among the supernatural characters of Bushman mythology is the insect called the Mantis.[2] Cagn or Ikaggen, the Mantis, is sometimes regarded with religious respect as a benevolent god. But his adventures are the merest nightmares of puerile fancy. He has a wife, an adopted daughter, whose real father is the "swallower" in Bushman swallowing myths, and the daughter has a son, who is the Ichneumon. The Mantis made an eland out of the shoe of his son-in-law. The moon was also created by the Mantis out of his shoe, and it is red, because the shoe was covered with the red dust of Bushman-land. The Mantis is defeated in an encounter with a cat which happened to be singing a song about a lynx. The Mantis (like Poseidon, Hades, Metis and other Greek gods) was once swallowed, but disgorged alive. The swallower was the monster Ilkhwāi-hemm. Like Heracles when he leaped into the belly of the monster which was about to swallow Hesione, the Mantis once jumped down the throat of a hostile elephant, and so destroyed him. The heavenly bodies are gods among the Bushmen, but their nature and adventures must be discussed among other myths of sun, moon and stars. As a creator Cagn is sometimes said to have "given orders, and caused all things to appear to be made." He struck snakes with his staff and turned them into men, as Zeus did with the ants in Aegina. But the Bushmen's mythical theory of the origin of things must, as far as possible, be kept apart from the fables of the Mantis, the Ichneumon and other divine beings. Though animals, these gods have human passions and character, and possess the usual magical powers attributed to sorcerers.

Concerning the mythology of the Hottentots and Namas, we have a great deal of information in a book named *Tsuni-Goam, the Supreme Being of the Khoi-Khoi* (1881), by Dr T. Hahn. This author collected the old notices of Hottentot myths, and added material from his own researches. The chief god of the Hottentots is a being named Tsuni-Goam, who is universally regarded by his worshippers as a deceased sorcerer. According to one old believer, "Tsui-Goab" (an alternative reading of the god's name) "was a great powerful chief of the Khoi-Khoi—in fact, he was the first Khoi-Khoib from whom all the Khoi-Khoi tribes took their name." He is always represented as at war (in the usual crude dualism of savages) with "another chief" named Gaunab. The prayers addressed to Tsui-Goab are simple and natural in character, the "private ejaculations" of men in moments of need or distress. As usual, religion is more advanced than mythology. It appears that, by some accounts, Tsui-Goab lives in the red sky and Gaunab in the dark sky. The neighbouring race of Namas have another old chief for god, a being called Heitsi Eibib. His graves are shown in many places, like those of Osiris, which, says Plutarch, abounded in Egypt. He is propitiated by passers-by at his sepulchres. He has intimate relations in peace and war with a variety of animals whose habits are sometimes explained (like those of the serpent in Genesis) as the result of the curse of Heitsi Eibib. Heitsi Eibib was born in a mysterious way from a cow, as Indra in the *Black Yajur-Veda* entered into and was born from the womb of a being who also bore a cow. The *Rig-Veda* (iv. 18, 1) remarks, "His mother, a cow, bore Indra, an unlicked calf"—probably a metaphorical way of speaking. Heitsi Eibib, like countless other gods and heroes, is also said to have been the son of a virgin who tasted a particular plant, and so became pregnant, as in the German and Gallophrygian märchen of the almond tree, given by Grimm and Pausanias. Incest is one of the feats of Heitsi Eibib. Tsui-Goab, in the opinion of his worshippers, as we have seen, is a deified dead sorcerer, whose name means Wounded Knee, the sorcerer having been injured in the knee by an enemy. Dr Hahn tries to prove (by philology's "artful aid") that the name really means "red dawn," and is a Hottentot way of speaking of the infinite. The philological arguments advanced are extremely weak, and by no means convincing. If we grant, however, for the sake of argument, that the early Hottentots worshipped the infinite under the figure of the dawn, and that, by forgetting their own meaning, they came to believe that the words which really meant "red dawn" meant "wounded knee" we must still admit that the devout have assigned to their deity all the attributes of an ancestral sorcerer. In short, "their Red Dawn," if red dawn he be, is a person, and a savage person, adored exactly as the actual fathers and grandfathers of the Hottentots are adored. We must explain this legend, then, on these principles, and not as an allegory of the dawn as the dawn appears to civilized people. About Gaunab (the Ahriman to Tsui-Goab's Ormuzd) Dr Hahn gives two distinct opinions. "Gaunab was at first a ghost, a mischief-maker and evil-doer" (*op. cit.* p. 85). But Gaunab he declares to be "the night-sky" (p. 126). Whether we regard Gaunab, Heitsi Eibib and Tsui-Goab as originally mythological representations of natural phenomena, or as deified dead men, it is plain that they are now venerated as non-natural human beings, possessing the customary attributes of sorcerers. Thus of Tsui-Goab it is said, "He could do wonderful things which no other man could do, because he was very wise. He could tell what would happen in future times. He died several times, and several times he rose again" (statement of old Kχarab in Hahn, p. 61).

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[1] The drawback to knowledge is the rarity of full acquaintance with native languages. Strehlow, Roth and Ridley seem best equipped on the linguistic side. Spencer and Gillen do not tell us that they have a colloquial knowledge of any Australian language. Gason, author of a work on the Dieri tribe, knew their language well, but several of his statements appear to be inaccurate. Mrs Langloh Parker describes her methods of checking and controlling native statements made in English.

[2] Accounts of the Mantis and of his performances will be found in the *Cape Monthly Magazine* (July 1874), and in Dr Bleek's *Brief Account of Bushman Folk-Lore.*

The mythology of the Zulus as reported by H. Callaway (*Unkūlunkūlu*, 1868–1870) is very thin and uninteresting. The Zulus are great worshippers of ancestors (who appear to men in the form of snakes), and they regard a being called Unkūlunkūlu as their first ancestor, and sometimes as the creator, or at least as the maker of men. It does not appear they identify Unkūlunkūlu, as a rule, with "the lord of heaven," who, like Indra, causes the thunder. The word answering to our lord is also applied," even to beasts, as the lion and the boa." The Zulus, like many distant races, sometimes attribute thunder to the "thunder-bird," which, as in North America, is occasionally seen and even killed by men. "It is said to have a red bill, red legs and a short red tail like fire. The bird is boiled for the sake of the fat, which is used by the heaven-doctors to puff on their bodies, and to anoint their lightning-rods." The Zulus are so absorbed in propitiating the shades of their dead (who, though in serpentine bodies, have human dispositions) that they appear to take little pleasure in mythological narratives. At the same time, the Zulus have many "nursery tales," the plots and incidents of which often bear the closest resemblance to the heroic myths of Greece, and to the märchen of European peoples.[1] These indications will give a general idea of African divine myths. On the west coast the "ananzi" or spider takes the place of the mantis insect among the Bushmen. For some of his exploits Dasent's *Tales from the Norse* (2nd ed., Appendix) may be consulted. For South African religion see Lang. *Magic and Religion*; Dennett, *At the Back of the Black Man's Mind*; Junod, *Les Barotsa*; Spieth, *Die Ewe-Stämme*; Frazer, *The Golden Bough*.

Melanesian Savages.

Turning from the natives of Australia, and from African races of various degrees of culture, to the Papuan inhabitants of Melanesia, we find that mythological ideas are scarcely on a higher level. An excellent account of the myths of the Banks Islanders and Solomon Islanders was given in *Journ. Anthropol. Inst.* (Feb. 1881) by the Rev. R. H. Codrington. The article contains a critical description of the difficulty with which missionaries obtain information about the prior creeds. The people of the Banks Islands are chiefly ancestor-worshippers, but they also believe in, and occasionally pray to, a being named I Qat, one of the prehuman race endowed with supernatural powers who here, as elsewhere, do duty as gods. Here is an example of a prayer to Qat—the devotee is supposed to be in danger with his canoe: "Qate! Marawa! look down on me, smooth the sea for us two that I may go safely on the sea. Beat down for me the crests of the tide-rip; let the tide-rip settle down away from me, beat it down level that it may sink and roll away, and I may come to a quiet landing-place." Compare the prayer of Odysseus to the river, whose mouth he had reached after three days' swimming on the tempestuous sea. "'Hear me, O king, whosoever thou art, unto thee I am come as to one to whom prayer is made . . . nay, pity me, O king, for I avow myself thy suppliant.' So spake he, and the god stayed his stream, and withheld his waves, and made the water smooth before him" (*Odyssey* v. 450). The prayer of the Melanesian is on rather a higher religious level than that of the Homeric hero. The myths of Qat's adventures, however, are very crude, though not so wild as some of the Scandinavian myths about Odin and Loki, while they are less immoral than the adventures of Indra and Zeus. Qat was born in the isle of Vanua Levu; his mother was either a stone at the time of his birth, or was turned into a stone afterwards, like Niobe. The mother of Apollo, according to Aelian, had the misfortune to be changed into a wolf. Qat had eleven brothers, not much more reputable than the Osbaldistones in *Rob Roy*. The youngest brother was "Tangaro Loloqong, the Fool." His pastime was to make wrong all that Qat made right, and he is sometimes the Ahriman to Qat's Ormuzd. The creative achievements of Qat must be treated of in the next section. Here it may be mentioned that, like the hero in the Breton märchen, Qat "brought the dawn" by introducing birds whose notes proclaimed the coming of morning. Before Qat's time there had been no night, but he purchased a sufficient allowance of darkness from I Qong, that is, night considered as a person in accordance with the law of savage thought already explained. Night is a person in Greek mythology, and in the fourteenth book of the *Iliad* we read that Zeus abstained from punishing Sleep "because he feared to offend swift Night." Qat produced dawn, for the first time, by cutting the darkness with a knife of red obsidian. Afterwards "the fowls and birds showed the morning." On one occasion an evil power (Vui) slew all Qat's brothers, and hid them in a food-chest. As in the common "swallowing-myths" which we have met among bushmen and Australians, and will find among the Greeks, Qat restored his brethren to life. Qat is always accompanied by a powerful supernatural spider named Marawa. He first made Marawa's acquaintance when he was cutting down a tree for a canoe. Every night (as in the common European story about bridge-building and church-building) the work was all undone by Marawa, whom Qat found means to conciliate. In all his future adventures the spider was as serviceable as the cat in *Puss in Boots* or the other grateful animals in European legend. Qat's great enemy, Qasavara, was dashed against the hard sky, and was turned into stone, like the foes of Perseus. The stone is still shown in Vanua Levu, like the stone which was Zeus in Laconia. Qat, like so many other "culture-heroes," disappeared mysteriously, and white men arriving in the island have been mistaken for Qat. His departure is sometimes connected with the myth of the deluge. In the New Hebrides, Tagar takes the rôle of Qat, and Suqe of the bad principle, Loki, Ahriman, Tangaro Loloqong, the Australian Crow and so forth. These are the best known divine myths of the Melanesians. For their All-Fathers see Holmes, *J. A. I.*, vol. xxxv., and O'Farrell, *J. A. I.*, vol. xxxiv., with Sundermann in Warneck's *Allgemeine Missionszeitschrift*, vol. xi. 1884.

American Savages.

It is "a far cry" from Vanua Levu to Vancouver Island, and, ethnologically, the Ahts of the latter region are extremely remote from the Papuans with their mixture of Malay and Polynesian blood. The Ahts, however, differ but little in their mythological beliefs from the races of the Banks Islands or of the New Hebrides. In Sproat's *Scenes from Savage Life* (1868) there is a good account of Aht opinions by a settler who had won the confidence of the natives between 1860 and 1868. "There is no end to the stories which an old Indian will relate," says Mr Sproat, when "one quite possesses his confidence." "The first Indian who ever lived" is a divine being, something of a creator, something of a first father, like Unkūlunkūlu among the Zulus. His name is Quawteaht. He married a pre-existent bird, the thunder-bird Tootah (we have met him among the Zulus), and by the bird he became the father of Indians. Wispohahp is the Aht Noah, who, with his wife, his two brothers and their wives escaped from the deluge in a canoe. Quawteaht is inferior as a deity to the Sun and Moon. He is the Yama of an Aht paradise, or home of the dead, where "everything is beautiful and abundant." From all that is told of Quawteaht he seems to be an ideal and powerful Aht, imaginatively placed at the beginning of things, and quite capable of intermarriage with a bird. His creative exploits must be considered later. Quawteaht is the Aht Prometheus Purphoros, or fire-stealer.

Passing down the American continent from the north-west, we find Yehl the chief hero-god and mythical personage among the Tlingits. Like many other heroes or gods, Yehl had a miraculous birth. His mother, a Tlingit woman, whose sons had all been slain, met a friendly dolphin, which advised her to swallow a pebble and a little sea-water. The birth of Yehl was the result. In his youth he shot a supernatural crane, and can always fly about in its feathers, like Odin and Loki in Scandinavian myth. He is usually, however, regarded as a raven, and holds the same relation to men and the world as the eagle-hawk Pund-jel does in Australia. His great opponent (for the eternal dualism comes in) is Khanukh, who is a wolf, and the ancestor or totem of the wolf-race of men as Yehl is of the raven. The opposition between the Crow and Eagle-hawk in Australia will be remembered. Both animals or men or gods take part in creation. Yehl is the Prometheus Purphoros of the Tlingits, but myths of the fire-stealer would form matter for a separate section. Yehl also stole water, in his bird-shape, exactly as Odin stole "Suttung's mead" when in the shape of an eagle.[1] Yehl's powers of metamorphosis and of flying into the air are the common accomplishments of sorcerers, and he is a rather crude form of first father, "culture-hero" and creator.[2]

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[1] These are collected by Callaway, *Zulu Nursery Tales* (1868). Similar Kafir stories, also closely resembling the popular fictions of European races, have been published by Theal. Many other examples are published in the *South African Folk-Lore Journal* (1879, 1880).

Among the Karok Indians we find the great hero and divine benefactor in the shape of, not a raven, nor an eagle-hawk, nor a mantis insect, nor a spider, but a coyote. Among both Karok and Navaho the coyote is the Prometheus Purphoros, or, as the Aryans of India call him, Matarisvan the fire-stealer. Among the Papagos, on the eastern side of the Gulf of California, the coyote or prairie wolf is the creative hero and chief supernatural being. In Oregon the coyote is also the "demiurge," but most of the myths about him refer to his creative exploits, and will be more appropriately treated in the next section.

Moving up the Pacific coast to British Columbia, we find the musk-rat taking the part played by Vishnu, when in his avatar as a boar he fished up the earth from the waters. Among the Tinneh a miraculous dog, who, like an enchanted fairy prince, could assume the form of a handsome young man, is the chief divine being of the myths. He too is chiefly a creative or demiurgic being, answering to Purusha in the *Rig Veda*. So far the peculiar mark of the wilder American tribe legends is the bestial character of the divine beings, which is also illustrated in Australia and Africa, while the bestial clothing, feathers or fur, drops but slowly off Indra, Zeus and the Egyptian Ammon, and the Scandinavian Odin. All these are more or less anthropomorphic, but retain, as will be seen, numerous relics of a theriomorphic condition.

See C. Hill-Tout and F. Boas in various publications, and, generally, the volumes of the Bureau of American Ethnology, Washington, U.S.A. For Ti-ra-wa, "the Ruler of the Universe," also styled A-ti-us, "father," among the Pawnees, see G. B. Grinnell, *Pawnee Hero Stories* (1893).

Maori and Polynesian Beliefs.—Passing from the lower savage myths, of which space does not permit us to offer a larger selection, we turn to races in the upper strata of barbarism. Among these the Maoris of New Zealand, and the Polynesian people generally, are remarkable for a mythology largely intermixed with early attempts at more philosophical speculation. The Maoris and Mangaians, and other peoples, have had speculators among them not very far removed from the mental condition of the earliest Greek philosophers, Empedocles, Anaximander, and the rest. In fact the process from the view of nature which we call personalism to the crudest theories of the physicists was apparently begun in New Zealand before the arrival of Europeans. In Maori mythology it is more than usually difficult to keep apart the origin of the world and the origin and nature of the gods. Long traditional hymns give an account of the "becoming out of nothing" which resulted in the evolution of the gods and the world. In the beginning (as in the Greek myths of Uranus and Gaea), Heaven (Rangi, conceived of as a person) was indissolubly united to his wife Earth (Papa), and between them they begat gods which necessarily dwelt in darkness. These gods were some in vegetable, some in animal form; some traditions place among these gods Tiki the demiurge, who (like Prometheus) made men out of clay. The offspring of Rangi and Papa (kept in the dark as they were) held a council to determine how they should treat their parents, "Shall we slay them, or shall we separate them?" In the Hesiodic fable, Cronus separates the heavenly pair by mutilating his oppressive father Uranus. Among the Maoris the god Tutenganahan cut the sinews which united Earth and Heaven, and Tane Mahuta wrenched them apart, and kept them eternally asunder. The new dynasty now had earth to themselves, but Tawhiramatea, the wind, abode aloft with his father. Some of the gods were in the forms of lizards and fishes; some went to the land, some to the water. As among the gods and Asuras of the *Vedas*, there were many wars in the divine race, and as the incantations of the Indian *Brahmanas* are derived from those old experiences of the Vedic gods, so are the incantations of the Maoris. The gods of New Zealand, the greater gods at least, may be called "departmental"; each person who is an elementary force is also the god of that force. As Te Heu, a powerful chief, said, there is division of labour among men, and so there is among gods. "One made this, another that; Tane made trees, Ru mountains, Tanga-roa fish, and so forth."[3] The "departmental" arrangement prevails among the polytheism of civilized peoples, and is familiar to all from the Greek examples. Leaving the high gods whose functions are so large, while their forms (as of lizard, fish and tree) are often so mean, we come to Maui, the great divine hero of the supernatural race in Polynesia. Maui in some respects answers to the chief of the Adityas in Vedic mythology; in others he answers to Qat, Quawteaht, and other savage divine personages. Like the son of the Vedic Aditi,[4] Maui is a rejected and abortive child of his mother, but afterwards attains to the highest reputation. As Qat brought the hitherto unknown night, so Maui settled the sun and moon in their proper courses. He induced the sun to move orderly by giving him a violent beating. A similar feat was performed by the Sun-trapper, a famous Red Indian chief. These tales belong properly to the department of solar myths. Maui himself is thought by E. B. Tylor to be a myth of the sun, but the sun could hardly give the sun a drubbing. Maui slew monsters, invented barbs for fish-hooks, frequently adopted the form of various birds, acted as Prometheus Purphoros the fire-stealer, drew a whole island up from the bottom of the deep; he was a great sorcerer and magician. Had Maui succeeded in his attempt to pass through the body of Night (considered as a woman) men would have been immortal. But a little bird which sings at sunset wakened Night, she snapped up Maui, and men die. This has been called a myth of sunset, but the sun does what Maui failed to do, he passes through the body of Night unharmed. The adventure is one of the myths of the origin of death, which are almost universally diffused. Maui, though regarded as a god, is not often addressed in prayer.[5]

The whole system, as far as it can be called a system, of Maori mythology is obviously based on the savage conceptions of the world which have already been explained. The Polynesian system differs mainly in detail; we have the separation of heaven and earth, the animal-shaped gods, the fire-stealing, the exploits of Maui, and scores of minor myths in W. W. Gill's *Myths and Songs of the South Pacific*, in the researches of W. Ellis, of Williams, in G. Turner's *Polynesia*, and in many other accessible works.

Mexican and Peruvian Beliefs.—The Maoris and other Polynesian peoples are perhaps the best examples of a race which has risen far above the savagery of Bushmen and Australians, but has not yet arrived at the stage in which great centralized monarchies appear. The Mexican and Peruvian civilizations were far ahead of Maori culture, in so far as they possessed the elements of a much more settled and highly-organized society. Their religion had its fine lucid intervals, but their mythology and ritual were little better than savage ideas, elaborately worked up by the imagination of a cruel and superstitious priesthood. In cruelty the Aztecs surpassed perhaps all peoples of the Old World, except certain Semitic stocks, and their gods, of course, surpassed almost all other gods in bloodthirstiness. But in grotesque and savage points of faith the ancient Egyptians, the Greeks, and the Vedic Indians ran even the Aztecs pretty close.

Bernal Diaz, the old "conquistador," has described the hideous aspect of the idols which Cortes destroyed, "idols in the shape of hideous dragons as big as calves," idols half in the form of men, half of dogs, and serpents which were worshipped as divine. The old contemporary missionary Sahagun has left one of the earliest detailed accounts of the natures and myths of these gods, but, though Sahagun took great pains in collecting facts, his speculations must be accepted with caution. He was convinced (like Caxton in his *Destruction of Troy*, and like St Augustine) that the heathen gods were only dead men worshipped. Ancestor-worship is a great force in early religion, and the qualities of dead chiefs and sorcerers are freely attributed to gods, but it does not follow that each god was once a real man, as Sahagun supposes. Euemerism cannot be judiciously carried so far as this. Of Huitzilopochtli, the famed god, Sahagun says that he was a necromancer, loved "shape-shifting," like Odin, metamorphosed himself into animal forms, was miraculously conceived, and, among animals, is confused with the humming-bird, whose feathers adorned his statues."[6] This humming-bird god should be compared with the Roman Picus (Servius, 189). That the humming-bird (Nuitziton), which was the god's old shape, should become merely his attendant (like the owl of Pallas, the mouse of Apollo, the goose of Priapus, the cuckoo of Hera), when the god received anthropomorphic form, is an example of a process common in all mythologies. Plutarch observes that the Greeks, though accustomed to the conceptions of the animal attendants of their own gods, were amazed when they found animals worshipped as gods by the Egyptians. Müller[7] mentions the view that the humming-bird, as the most beautiful flying thing, is a proper symbol of the heaven, and so of the heaven-god, Huitzilopochtli. This vein of symbolism is so easy to work that it must be regarded with distrust. Perhaps it is safer to attribute theriomorphic shapes of gods, not to symbolism (Zeus was a cuckoo), but to survivals from that quality of early thought which draws no line between man and god and beast and bird and fish. If spiders may be great gods, why not the more attractive humming-birds? Like many other gods, Huitzilopochtli slew his foes at his birth, and hence received names analogous to Δειμός and Φόβος: Tylor (*Primitive Culture*, ii. 307) calls Huitzilopochtli an "inextricable compound parthenogenetic god." His sacrament, when paste idols of him were eaten by the communicants, was at the winter solstice, whence it may, perhaps, be inferred that Huitzilopochtli was not only a war-god but a nature-god—in both respects anthropomorphic, and in both bearing traces of the time when he was but a humming-bird, as Yehl was a raven (Müller, *op. cit.* p. 595). As a humming-bird, Huitzilopochtli led the Aztecs to a new home, as a wolf led the Hirpini, and as a woodpecker led the Sabines. Quetzalcoatl, the Toltec deity, is as much a sparrow (or similar small bird) as Huitzilopochtli is a humming-bird. Acosta says he retained the sparrow's head in his statue. For the composite character of Quetzalcoatl as a "culture-hero" (a more polished version of Qat), as a "nature-god," and as a theriomorphic god see Müller (*op. cit.* pp. 583–584). Müller frankly recognizes that not only are animals symbols of deity and its attributes, not only are they companions and messengers of deity (as in the period of anthropomorphic religion), but they have been divine beings in and for themselves during the earlier stages of thought. The Mexican "departmental" gods answer to those of other polytheisms; there is an Aztec Ceres, an Aztec Lucina, an Aztec Vulcan, an Aztec Flora, an Aztec Venus. The creative myths and sun myths are crude and very early in character.

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[1] Dasent, *Bragi's Telling: Younger Edda*, p. 94.

[2] Bancroft, vol. iv.

[3] Taylor, *New Zealand*, p. 108

[4] *Rig Veda*, x. 72, 1, 8; Muir, *Sanskrit Texts*, iv. 13, where the fable from the *Satapatha-Brahmana* is given.

[5] The best authorities for the New Zealand myths are the old traditional priestly hymns, collected and translated in the works of Sir George Grey, in Taylor's *New Zealand*, in Shortland's *Traditions of New Zealand* (1857), in Bastian's *Heilige Sage der Polynesier*, and in White's *Ancient History of the Maori*, i. 8–13.

[6] See also Bancroft, iii. 288-290, and Acosta, pp. 352-361.

[7] *Geschichte der amerikanischen Urreligionen*, p. 592.

Egyptian Myths.—On a much larger and more magnificent scale, and on a much more permanent basis, the society of ancient Egypt somewhat resembled that of ancient Mexico. The divine myths of the two nations had points in common, but there are few topics more obscure than Egyptian mythology. Writers are apt to speak of Egyptian religion as if it were a single phenomenon of which all the aspects could be observed at a given time. In point of fact Egyptian religion (conservative though it was) lasted through perhaps five thousand years, was subject to innumerable influences, historical, ethnological, philosophical, and was variously represented by various schools of priests. We cannot take the Platonic speculations of Iamblichus about the nature and manifestations of Egyptian godhead as evidence for the belief of the peoples who first worshipped the Egyptian gods an innumerable series of ages before Iamblichus and Plutarch. Nor can the esoteric and pantheistic theories of priests (according to which the various beast-gods were symbolic manifestations of the divine essence) be received as an historical account of the origin of the local animal-worships. It has already been shown that the lowest and least intellectual races indulge in local animal-worship, each stock having its parent bird, beast, fish, or even plant, or inanimate object. It has also been shown that these backward peoples recognize a non-natural race of men or animals, or both, as the first fathers, heroes, and, in a sense, gods. Such ideas are consonant with, and may be traced to the confused and nebulous condition of, savage thought. Precisely the same ideas are found at various periods among the ancient Egyptians. If we are to regard the Egyptian myths about the gods in animal shape, and about the non-natural superhuman heroes, and their wars and loves, as esoteric allegories devised by civilized priests, perhaps we should also explain Pund-jel, Qat, Quawteaht, the Mantis god, the Spider creator, the Coyote and Raven gods as priestly inventions, put forth in a civilized age, and retained by Australians, Bushmen, Hottentots, Ahts, Thlinkeets, Papuans, who preserve no other vestiges of high civilization. Or we may take the opposite view, and regard the story of Osiris and his war with Seth (who shut him up in a box and mutilated him) as a dualistic myth, originally on the level of the battle between Gaunab and Tsui-Goab, or between Tagar and Suqe. We may regard the local beast- and plant-gods of Egypt as survivals of totems and totem-gods like those of Australia, India, America, Africa, Siberia and other countries. In this article the latter view is adopted. The beast-gods and dualistic and creative myths of savages are looked on as the natural product of the savage reason and fancy. The same beast-gods and myths in civilized Egypt are looked on as survivals from the rude and early condition of thought to which such conceptions are natural.

In the most ancient Egyptian records the gods are not pictorially represented, and we have not obtained from these records any descriptions of adoration and sacrifice. There is a prayer to the Sky on the coffin of the king of Dynasty IV., known as Mycerinus to the Greeks. The king describes himself as the child of Sky and Earth. He also somewhat obscurely identifies himself with Osiris.

We thus find Osiris very near the beginning of what is known about Egyptian religion. This being is rather a culture-hero, a member of a non-natural race of men like Qat or Manabozho, than a god. His myth, to be afterwards narrated, is found pictorially represented in a tomb and in the late temple of Philae, is frequently alluded to in the litanies of the dead about 1400 B.C., is indicated with reverent awe by Herodotus, and after the Christian era is described at full length by Plutarch. Whether the same myth was current in the far more distant days of Mycerinus, it is, of course, impossible to say with dogmatic certainty. The religious history of Egypt, from perhaps Dynasty X. to Dynasty XX., is interrupted by an invasion of Semitic conquerors and Semitic ideas. Prior to that invasion the gods, when mentioned in monuments, are always represented by animals, and these animals are the object of strictly local worship. The name of each god is spelled in hieroglyphs beside the beast or bird. The jackal stands for Anup, the hawk for Har, the frog for Hekt, the baboon for Tahuti, and Ptah, Asiri, Hesi, Nebhat, Hat-hor, Neit, Khnum and Amun-hor are all written out phonetically, but never represented in pictures. Different cities had their different beast-gods. Pasht, the cat, was the god of Bubastis; Apis, the bull, of Memphis; Hapi, the wolf, of Sioot; Ba, the goat, of Mendes. The evidence of Herodotus, Plutarch and the other writers shows that the Egyptians of each district refused to eat the flesh of the animal they held sacred. So far the identity of custom with savage totemism is absolute. Of all the explanations, then, of Egyptian animal-worship, that which regards the practice as a survival of totemism and of savagery seems the most satisfactory. So far Egyptian religion only represented her gods in theriomorphic shape. Beasts also appeared in the royal genealogies, as if the early Egyptians had filled up the measure of totemism by regarding themselves as actually descended from animals.

With one or two exceptions, "the first (semi-anthropomorphic) figures of gods known in the civilized parts of Egypt are on the granite obelisk of Bezig in the Fayyúm, erected by Usertesen I. of Dynasty XII., and here we find the forms all full-blown at once. The first group of deities belongs to a period and a district in which Semitic influences had undoubtedly begun to work" (Petrie). From this period the mixed and monstrous figures, semi-theriomorphic, semi-anthropomorphic, hawk-headed and ram-headed and jackal-headed gods become common. This may be attributed to Semitic influence, or we may suppose that the process of anthropomorphizing theriomorphic gods was naturally developing itself; for Mexico has shown us and Greece can show us abundant examples of these mixed figures, in which the anthropomorphic god retains traces of his theriomorphic past. The heretical worship of the solar disk interrupted the course of Egyptian religion under some reforming kings, but the great and glorious Ramesside Dynasty (XIX.) restored "Orus and Isis and the dog Anubis" with the rest of the semi-theriomorphic deities. These survived even their defeat by the splendid human gods of Rome, and only "fled from the folding star of Bethlehem."

Though Egypt was rich in gods, her literature is not fertile in myths. The religious compositions which have survived are, as a rule, hymns and litanies, the funereal service, the "Book of the Dead." In these works the myths are taken for granted, are alluded to in the course of addresses to the divine beings, but, naturally, are not told in full. As in the case of the *Vedas*, hymns are poor sources for the study of mythology, just as the hymns of the Church would throw little light on the incidents of the gospel story or of the Old Testament. The "sacred legends" which the priests or temple servants freely communicated to Herodotus are lost through the pious reserve of the traveller. Herodotus constantly alludes to the most famous Egyptian myth, that of Osiris, and he recognizes the analogies between the Osirian myth and mysteries and those of Dionysus. But we have to turn to the very late authority of Plutarch (*De Iside et Osiride*) for an account, confessedly incomplete and expurgated, of what mythology had to tell about the great Egyptian "culture-hero," "daemon," and god. Osiris, Horus, Typhon (Seth), Isis and Nephthys were the children of Seb (whom the Greeks identified with Cronus); the myths of their birth were peculiarly savage and obscene. Osiris introduced civilization into Egypt, and then wandered over the world, making men acquainted with agriculture and the arts, as Pund-jel in his humbler way did in Australia. On his return Typhon laid a plot for him. He had a beautiful carved chest made which exactly fitted Osiris, and at an entertainment offered to give it to any one who could lie down in it. As soon as Osiris tried, Typhon had the box nailed up, and threw it into the Tanaite branch of the Nile. Isis wandered, mourning, in search of the body, as Demeter sought Persephone, and perhaps in Plutarch's late version some incidents may be borrowed from the Eleusinian legend. At length she found the chest, which in her absence was again discovered by Typhon. He mangled the body of Osiris (as so many gods of all races were mangled), and tossed the fragments about. Wherever Isis found a portion of Osiris she buried it; hence Egypt was as rich in graves of Osiris as Namaqualand in graves of Heitsi Eibib. The phallus alone she did not find, but she consecrated a model thereof; hence (says the myth) came the phallus-worship of Egypt. Afterwards Osiris returned from the shades, and (in the form of a wolf) urged his son Horus to revenge him on Typhon. The gods fought in animal shape (Birch, in Wilkinson, iii. 144). Plutarch purposely omits as "too blasphemous" the legend of the mangling of Horus. Though the graves of these non-natural beings are shown, the priests (*De Is. et Os.* xxi.) also show the stars into which they were metamorphosed, as the Eskimo and Australians and Aryans of India and Greeks have recognized in the constellations their ancient heroes. Plutarch remarked the fact that the Greek myths of Cronus, of Dionysus, of Apollo and the Python, and of Demeter, "all the things that are shrouded in mystic ceremonies and are presented in rites," "do not fall short in absurdity of the legends about Osiris and Typhon." Plutarch naturally presumed that the myths which seem absurd shrouded some great moral or physical mystery. But we apply no such explanation to similar savage legends, and our theory is that the Osirian myth is only one of these retained to the time of Plutarch by the religious conservatism of a race which, to the time of Plutarch, preserved in full vigour most of the practices of totemism. As a slight confirmation of the possibility of this theory we may mention that Greek mysteries retained two of the features of savage mysteries. The first was the rite of daubing the initiated with clay.[1] This custom prevails in African mysteries, in Guiana, among Australians, Papuans, and Andaman Islanders. The other custom is the use of the *turndun*, as the Australians call a little fish-shaped piece of wood tied to a string, and waved so as to produce a loud booming and whirring noise and keep away the profane, especially women. It is employed in New Mexico, South Africa, New Zealand and Australia. This instrument, the *κῶνος*, was also used in Greek mysteries.[2] Neither the use of the *κῶνος* nor of the clay can very well be regarded as a civilized practice retained by savages. The hypothesis that the rites and the stories are savage inventions surviving into civilized religion seems better to meet the difficulty. That the Osirian myth (much as it was elaborated and allegorized) originated in the same sort of fancy as the Tacullie story of the dismembered beaver out of whose body things were made is a conclusion not devoid of plausibility. Typhon's later career, "committing dreadful crimes out of envy and spite, and throwing all things into confusion," was parallel to the proceedings of most of the divine beings who put everything wrong, in opposition to the being who makes everything right. This is perhaps an early "dualistic" myth.

Among other mythic Egyptian figures we have Ra, who once destroyed men in his wrath with circumstances suggestive of the Deluge; Khnum, a demiurge, is represented at Philae as making man out of clay on a potter's wheel. Here the wheel is added to the Maori conception of the making of man. Khnum is said to have reconstructed the limbs of the dismembered Osiris. Ptah is the Egyptian Hephaestus; he is represented as a dwarf; men are said to have come out of his eye, gods out of his mouth—a story like that of Purusha in the *Rig Veda*. As creator of man, Ptah is a frog. Bubastis became a cat to avoid the wrath of Typhon. Ra, the sun, fought the big serpent Apap, as Indra fought Vrittra. Seb is a goose, called "the great cackler"; he laid the creative egg.[3]

Divine Myths of the Aryans of India. Indra.—The gods of the *Vedas* and *Brahmanas* (the ancient hymns and canonized ritual-books of Aryan India) are, on the whole, of the usual polytheistic type. More than many other gods they retain in their titles and attributes the character of elemental phenomena personified. That personification is, as a rule, anthropomorphic, but traces of theriomorphic personification are still very apparent. The ideas which may be gathered about the gods from the hymns are (as is usual in heathen religions) without consistency. There is no strict orthodoxy. As each bard of each bardic family celebrates his favourite god he is apt to make him for the moment the pre-eminent deity of all. This way of thinking about the gods leads naturally in the direction of a pantheistic monotheism in which each divine being may be regarded as a manifestation of the one divine essence. No doubt this point of view was attained in centuries extremely remote by sages of the civilized Vedic world. It is easy, however, to detect certain peculiar characteristics of each god. As among races much less advanced in civilization than the Vedic Indians, each of the greater powers has his own separate department, however much his worshippers may be inclined to regard him as an absolute premier with undisputed latitude of personal government. Thus Indra is mainly concerned with thunder and other atmospheric phenomena; but Vayu is the wind, the Maruts are wind-gods, Agni is fire or the god of fire, and so connected with lightning. Powerful as Indra is in the celestial world, Mitra and Varuna preside over night and day. Ushas is the dawn, and Tvashtri is the mechanic among the gods, corresponding to the Egyptian Ptah and the Greek Hephaestus. Though lofty moral qualities and deep concern about the conduct of men are attributed to the gods in the Vedic hymns, yet the hymns contain traces (and these are amplified in the ritual books) of a divine *chronique scandaleuse*. In this *chronique* the gods, like other gods, are adventurous warriors, adulterers, incestuous, homicidal, given to animal transformations, cowardly, and in fact charged with all human vices, and credited with magical powers.[4] It would be difficult to speak too highly of the ethical nobility of many Vedic hymns. The "hunger and thirst after righteousness" of the sacred poet recalls the noblest aspirations and regrets of the Hebrew psalmist. But this aspect of the Vedic deities is essentially matter for the science of religion rather than of mythology, which is concerned with the stories told about the gods. Religion is always forgetting, or explaining away, or apologizing for these stories. Now the Vedic deities, so imposing when regarded as vast natural forces (as such forces seem to us), so benignant when appealed to as forgivers of sins, have also their mythological aspect. In this aspect they are natural phenomena still, but phenomena as originally conceived of by the personifying imagination of the savage, and credited, like the gods of the Maori or the Australian, with all manner of freaks, adventures and disguises. The *Veda*, it is true, does not usually dilate much on the worst of these adventures. The *Veda* contains devotional hymns; we can no more expect much narrative here than in the Psalms of David. Again, the religious sentiment of the *Veda* is half-consciously hostile to the stories. As M. A. Barth says, "Le sentiment religieux a écarté la plupart de ces mythes, mais il ne les a écartés tous." The *Brahmanas*, on the other hand, later compilations, canonized books for the direction of ritual and sacrifice, are rich in senseless and irrational myths. Sometimes these myths are probably later than the *Veda*, mere explanations of ritual incidents devised by the priests. Sometimes a myth probably older than the *Vedas*, and maintained in popular tradition, is reported in the *Brahmanas*. The gods in the *Veda* are by no means always regarded as equal in supremacy. There were great and small, young and old gods (*R. V.* i. 27, 13). Elsewhere this is flatly contradicted: "None of you, oh gods, is small or young, ye are all great" (*R. V.* viii. 30, 1). As to the immortality and the origin of the gods, there is no orthodox opinion in the *Veda*. Many of the myths of the origin of the divine beings are on a level with the Maori theory that Heaven and Earth begat them in the ordinary way. Again, the gods were represented as the children of Aditi. This may be taken either in a refined sense, as if Aditi were the "infinite" region from which the solar deities rise,[5] or we may hold with the *Taittirya-Brahmana*[6] that Aditi was a female who, being desirous of offspring, cooked a *brahmandana* offering for the Sadhyas. Various other fathers and mothers of the gods are mentioned. Some gods, particularly Indra, are said to have won divine rank by "austere fervour" and asceticism, which is one of the processes that makes gods out of mortals even now in India.[7] The gods are not always even credited with inherent immortality. Like men, they were subject to death, which they overcame in various ways. Like most gods, they had struggles for pre-eminence with Titanic opponents, the Asuras, who partly answer to the Greek Titans and the Hawaiian foes of the divine race, or to the Scandinavian giants and the enemies who beset the savage creative beings. Early man, living in a state of endless warfare, naturally believes that his gods also have their battles. The chief foes of Indra are Vrittra and Ahi, serpents which swallow up the waters, precisely as frogs do in Australian and Californian and Andaman myths. It has already been shown that such creatures, thunder-birds, snakes, dragons, and what not, people the sky in the imagination of Zulus, Red Men, Chinese, Peruvians, and all the races who believe that beasts hunt the sun and moon and cause eclipses.[8] Though hostile to Asuras, Indra was once entangled in an intrigue with a woman of that race, according to the *Atharva-Veda* (Muir, *S. T.* v. 82). The gods were less numerous than the Asuras, but by a magical stratagem turned some bricks into gods (like a creation of new peers to carry a vote)—so says the *Black Yajur-Veda*.[9]

Turning to separate gods, Indra first claims attention, for stories of Heaven and Earth are better studied under the heading of myths of the origin of things. Indra has this zoomorphic feature in common with Heitsi Eibib, the Namaqua god,[10] that his mother, or one of his mothers, was a cow (*R. V.* iv. 18, 1). This statement may be a mere way of speaking in the *Veda*, but it is a rather Hottentot way.[11] Indra is also referred to as a ram in the *Veda*, and in one myth this ram could fly, like the Greek ram of the fleece of gold. He was certainly so far connected with sheep that he and sheep and the Kshatriya caste sprang from the breast and arms of Prajapati, a kind of creative being. Indra was a great drinker of soma juice; a drinking-song by Indra, much bemused with soma, is in *R. V.* x. 119. On one occasion Indra got at the soma by assuming the shape of a quail. In the *Taitt. Samh.* (ii. 5; i. 1) Indra is said to "have been guilty of that most hideous crime, the killing of a Brāhmana."[12] Once, though uninvited, Indra drank some soma that had been prepared for another being. The soma disagreed with Indra; part of it which was not drunk up became Vrittra the serpent, Indra's enemy. Indra cut him in two, and made the moon out of half of his body. This serpent was a universal devourer of everything and everybody, like Kwai Hemm, the all-devourer in Bushman mythology. If this invention is a late priestly one, the person who introduced it into the *Satapatha-Brahmana* must have reverted to the intellectual condition of Bushmen. In the fight with Vrittra, Indra lost his energy, which fell to the earth and produced plants and shrubs. In the same way plants, among the Iroquois, were made of pieces knocked off Chokanipok in his fight with Manabozho. Vines, in particular, are the entrails of Chokanipok. In Egypt, wine was the blood of the enemies of the gods. The Aryan versions of this sensible legend will be found in *Satapatha-Brahmana*.[1] The civilized mind soon wearies of this stuff, and perhaps enough has been said to prove that, in the traditions of Vedic devotees, Indra was not a god without an irrational element in his myth. Our argument is, that all these legends about Indra, of which only a sample is given, have no necessary connexion with the worship of a pure nature-god as a nature-god would now be constructed by men. The legends are survivals of a time in which natural phenomena were regarded, not as we regard them, but as persons, and savage persons, *Alcheringa* folk, in fact, and became the centres of legends in the savage manner. Space does not permit us to recount the equally puerile and barbarous legends of Vishnu, Agni, the loves of Vivasvat in the form of a horse, the adventures of Soma, nor the Vedic amours (paralleled in several savage mythologies) of Pururavas and Urvasi.[2]

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[1] Demosthenes, *De corona*, p. 313, *καὶ καθαίρων τοὺς τελουμένους καὶ ἀπομάττων τῷ πηλῷ καὶ τοῖς πιτύροις.*

[2] *Κῶνος ξυλάριον οὗ ἐξῆπται τὸ σπαρτίον, καὶ ἐν ταῖς τελεταῖς ἐδονεῖτο ἵνα ῥοιζῇ.* Quoted by Lobeck, *Aglaophamus*, i. 700, from Bastius ad Gregor., 241, and from other sources; cf. Arnobius, v. c. 19, where the word *turbines* is the Latin term.

[3] Wilkinson, iii. 62, see note by Dr Birch. A more detailed account of Egyptian religion is given under EGYPT. Unfortunately Egyptologists have rarely a wide knowledge of the myths of the lower races, while anthropologists are seldom or never Egyptologists.

[4] For examples of the lofty morality sometimes attributed to the gods, see Max Müller, *Hibbert Lectures*, p. 284; *Rig-Veda*, ii. 28; iv. 12, 4; viii. 93 seq.; Muir, *Sanskrit Texts*, v. 218.

[5] Müller, *Hibbert Lectures*, p. 230.

[6] Muir, *S. T.*, v. 55; i. 27.

[7] See Sir A. Lyall, *Asiatic Studies*. For Vedic examples, see *R.-V.* x. 167, 1; x. 159, 4; Muir, *S. T.* v. 15.

[8] See Tylor, *Primitive Culture*, i. 288, 329, 356.

[9] The chief authority for the constant strife between gods and Asuras is the *Satapatha-Brahmana*, of which one volume is translated in *Sacred Books of the East* (vol. xii.).

[10] Hahn, *Tsuni-Goam, the Supreme Being of the Hottentots*, p. 68.

[11] See Muir, *S. T.*, v. 16, 17, for Indra's peculiar achievements with a cow.

[12] *Sacred Books of the East*, xii. 1, 48.

Divine Myths of Greece.—If any ancient people was thoroughly civilized the Greeks were that people. Yet in the mythology and religion of Greece we find abundant survivals of savage manners and of savage myths. As to the religion, it is enough to point to the traces of human sacrifice and to the worship of rude fetish stones. The human sacrifices at Salamis in Cyprus and at Alos in Achaia Phthiotis may be said to have continued almost to the conversion of the empire (Grote i. 125, ed. 1869). Pausanias seems to have found human sacrifices to Zeus still lingering in Arcadia in the 2nd century of our era. "On this altar on the Lycaean hill they sacrifice to Zeus in a manner that may not be spoken, and little liking had I to pry far into that sacrifice. But let it be as it is, and as it hath been from the beginning." Now "from the beginning" the sacrifice, according to Arcadian tradition, had been a human sacrifice. In other places there were manifest commutations of human sacrifice, as at the altar of Artemis the Implacable at Patrae, where Pausanias saw the wild beasts being driven into the flames.[3] Many other examples of human sacrifice are mentioned in Greek legend. Pausanias gives full and interesting details of the worship of rude stones, the oldest worship, he says, among the Greeks. Almost every temple had its fetish stone on a level with the pumice stone, which is the Poseidon of the Mangaians.[4] The Argives had a large stone called Zeus Cappotas. The oldest idol of the Thespians was a rude stone. Another has been found beneath the pedestal of Apollo in Delos. In Achaean Pharae were thirty squared stones, each named by the name of a god. Among monstrous images of the gods which Pausanias, who saw them, regarded as the oldest idols, were the three-headed Artemis, each head being that of an animal, the Demeter with the horse's head, the Artemis with the fish's tail, the Zeus with three eyes, the ithyphallic Hermes, represented after the fashion of the Priapic figures in paintings on the walls of caves among the Bushmen. We also hear of the bull and the bull-footed Dionysus. Phallic and other obscene emblems were carried abroad in processions in Attica both by women and men. The Greek custom of daubing people all over with clay in the mysteries results as we saw in the mysteries of negroes, Australians and American races, while the Australian *turndun* was exhibited among the toys at the mysteries of Dionysus. The survivals of rites, objects of worship, and sacrifices like these prove that religious conservatism in Greece retained much of savage practice, and the Greek mythology is not less full of ideas familiar to the lowest races. The authorities for Greek mythology are numerous and various in character. The oldest sources as literary documents are the Homeric and Hesiodic poems. In the *Iliad* and *Odyssey* the gods and goddesses are beautiful, powerful and immortal anthropomorphic beings. The name of Zeus (Skr. *Dyaus*) clearly indicates his connexion with the sky. But in Homer he has long ceased to be merely the sky conceived of as a person; he is the chief personage in a society of immortals, organized on the type of contemporary human society. "There is a great deal of human nature" in his wife Hera (Skr. *Svar*, Heaven).[5] It is to be remembered that philologists differ widely as to the origin and meaning of the names of almost all the Greek gods. Thus the light which the science of language throws on Greek myths is extremely uncertain. Hera is explained as "the feminine side of heaven" by some authorities. The quarrels of Hera with Zeus (which are a humorous anthropomorphic study in Homer) are represented as a way of speaking about winter and rough weather. The other chief Homeric deities are Apollo and Artemis, children of Zeus by Leto, a mortal mother raised to divinity. Apollo is clearly connected in some way with light, as his name φοῖβος seems to indicate, and with purity.[6] Homer knows the legend that a giant sought to lay violent hands on Leto (*Od.* xi. 580). Smintheus, one of Apollo's titles in Homer, is connected with the field-mouse (σμίνθος), one of his many sacred animals. His names, Λύκιος, Λυκηγενής, were connected by antiquity with the wolf, by most modern writers with the light. According to some legends Leto had been a were-wolf.[7] The whole subject of the relations of Greek gods to animals is best set forth in the words of Plutarch (*De Is. et Os.* lxxi.), where he says that the Egyptians worship actual beasts, "whereas the Greeks both speak and believe correctly, saying that the dove is the sacred animal of Aphrodite, the raven of Apollo, the dog of Artemis," and so forth. Each Greek god had a small menagerie of sacred animals, and it may be conjectured that these animals were originally the totems of various stocks, subsumed into the worship of the anthropomorphic god. For the new theory of vegetation spirits and corn spirits see *The Golden Bough.* Apollo, in any case, is the young and beautiful archer-god of Homer; Artemis, his sister, is the goddess of archery, who takes her pastime in the chase. She holds no considerable place in the *Iliad*; in the *Odyssey*, Nausicaa is compared to her, as to the pure and lovely lady of maidenhood. Her name is commonly connected with ἀρτεμής—pure, unpolluted. Her close relations (un-Homeric) with the bear and bear-worship have suggested a derivation from ἄρκτος—Ἄρκτεμις. In Homer her "gentle shafts" deal sudden and painless death; she is a beautiful Azrael. A much more important daughter of Zeus in Homer is Athene, the "grey-eyed" or (as some take γλαυκῶπις, rather improbably) the "owl-headed" goddess. Her birth from the head of Zeus is not explicitly alluded to in Homer.[8] In Homer, Athene is a warlike maiden, the patron-goddess of wisdom and manly resolution. In the twenty-second book of the *Odyssey* she assumes the form of a swallow, and she can put on the shape of any man. She bears the aegis, the awful shield of Zeus. Another Homeric child of Zeus, or, according to Hesiod (*Th.* 927), of Hera alone, is Hephaestus, the lame craftsman and artificer. In the *Iliad*[9] will be found some of the crudest Homeric myths. Zeus or Hera throws Hephaestus or Ate out of heaven, as in the Iroquois myth of the tossing from heaven of Ataentsic. There is, as usual, no agreement as to the etymology of the name of Hephaestus. Preller inclines to a connexion with ἧφθαι, to kindle fire, but Max Müller differs from this theory. About the close relations of Hephaestus with fire there can be no doubt. He is a rough, kind, good-humoured being in the *Iliad*. In the *Odyssey* he is naturally annoyed by the adultery of his wife, Aphrodite, with Ares. Ares is a god with whom Homer has no sympathy. He is a son of Hera, and detested by Zeus (*Iliad*, v. 890). He is cowardly in war, and on one occasion was shut up for years in a huge brazen pot. This adventure was even more ignominious than that of Poseidon and Apollo when they were compelled to serve Laomedon for hire. The payment he refused, and threatened to "cut off their ears with the sword" (*Iliad*, xxi. 455). Poseidon is to the sea what Zeus is to the air, and Hades to the underworld in Homer.[10] His own view of his social position may be stated in his own words (*Iliad*, xv. 183, 211). "Three brethren are we, and sons of Cronus, sons whom Rhea bare, even Zeus and myself, and Hades is the third, the ruler of the people in the underworld. And in three lots were all things divided, and each drew a lot of his own,[11] and to me fell the hoary sea, and Hades drew the mirky darkness, and Zeus the wide heaven in clear air and clouds, but the earth and high Olympus are yet common to all."

Zeus, however, is, as Poseidon admits, the elder-born, and therefore the revered head of the family. Thus Homer adopts the system of primogeniture, while Hesiod is all for the opposite and probably earlier custom of *Jüngsten-recht*, and makes supreme Zeus the youngest of the sons of Cronus. Among the other gods Dionysus is but slightly alluded to in Homer as the son of Zeus and Semele, as the object of persecution, and as connected with the myth of Ariadne. The name of Hermes is derived from various sources, as from ὁρμᾶν and ὁρμή, or, by Max Müller, the name is connected with Sarameya (Sky). If he had originally an elemental character, it is now difficult to distinguish, though interpreters connect him with the wind. He is the messenger of the gods, the bringer of good luck, and the conductor of men's souls down the dark ways of death. In addition to the great Homeric gods, the poet knows a whole "Olympian consistory" of deities, nymphs, nereids, sea-gods and goddesses, river-gods, Iris the rainbow goddess, Sleep, Demeter who lay with a mortal, Aphrodite the goddess of love, wife of Hephaestus and leman of Ares, and so forth. As to the origin of the gods, Homer is not very explicit. He is acquainted with the existence of an older dynasty now deposed, the dynasty of Cronus and the Titans. In the *Iliad* (viii. 478) Zeus says to Hera, "For thine anger reck I not, not even though thou go to the nethermost bounds of earth and sea, where sit Iapetus and Cronus . . . and deep Tartarus is round about them." "The gods below that are with Cronus" are mentioned (*Il.* xiv. 274; xv. 225). Rumours of old divine wars echo in the *Iliad*, as (i. 400) where it is said that when the other immortals revolted against and bound Zeus, Thetis brought to his aid Aegaeon of the hundred arms. The streams of Oceanus (*Il.* xiv. 246) are spoken of as the source of all the gods, and in the same book (290) "Oceanus and mother Tethys" are regarded as the parents of the immortals. Zeus is usually called Cronion and Cronides, which Homer certainly understood to mean "son of Cronus," yet it is expressly stated that Zeus "imprisoned Cronus beneath the earth and the unvintaged sea." The whole subject is only alluded to incidentally. On the whole it may be said that the Homeric deities are powerful anthropomorphic beings, departmental rulers, united by the ordinary social and family ties of the Homeric age, capable of pain and pleasure, living on heavenly food, but refreshed by the sacrifices of men (*Od* v. 100, 102), able to assume all forms at will, and to intermarry and propagate the species with mortal men and women. Their past has been stormy, and their ruler has attained power after defeating and mediatizing a more ancient dynasty of his own kindred.

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[1] *Sacred Books of the East*, xii. 176, 177.

[2] On the whole subject, Dr Muir's *Ancient Sanskrit Texts*, with translations, Ludwig's translation of the *Rig Veda*, the version of the *Satapatha-Brahmana* already referred to, and the translation of the *Aitareya-Brahmana* by Haug, are the sources most open to English readers. Max Müller's translation of the *Rig Veda* unfortunately only deals with the hymns to the Maruts. The Indian epics and the *Puranas* belong to a much later date, and are full of deities either unknown to or undeveloped in the *Rig Veda* and the *Brahmanas*. It is much to be regretted that the *Atharva-Veda*, which contains the magical formulae and incantations of the Vedic Indians, is still untranslated, though, by the very nature of its theme, it must contain matter of extreme antiquity and interest.

[3] Pausanias iii. 16; vii. 18. Human sacrifice to Dionysus, Paus. vii. 21; Plutarch, *De Is. et Os.* 35; Porphyry, *De Abst.* ii. 55.

[4] Gill, *Myths and Songs from the South Pacific*, p. 60.

[5] Cf. Preller, *Griechische Mythologie*, i. 128, note 1, for this and other philological conjectures.

[6] The derivation of Ἀπόλλων remains obscure. The derivation of Leto from λαθεῖν, and the conclusion that her name means "the concealer"—that is, the night, whence the sun is born—is disputed by Curtius (Preller i. 190, 191, note 4), but appears to be accepted by Max Müller (*Selected Essays*, i. 386) Latmos being derived from the same root as Leto, Latona, the night.

[7] Aristotle, *H. An.* 6; Aelian, *N. A.* iv. 4.

[8] Her name, as usual, is variously interpreted by various etymologists.

[9] xiv. 257; xviii. 395; xix. 91, 132.

[10] The root of his name is sought in such words as πότος and ποταμός.

[11] We learn from the *Odyssey* (xiv. 209) that this was the custom of sons on the death of their father.

From Hesiod we receive a much more elaborate—probably a more ancient, certainly a more barbarous—story of the gods and their origin. In the beginning the gods (here used in a wide sense to denote an early non-natural race) were begotten by Earth and Heaven, conceived of as beings with human parts and passions (Hesiod, *Theog.* 45). This idea recurs in Maori, Vedic and Chinese mythology. Heaven and Earth, united in an endless embrace, produced children which never saw the light. In New Zealand, Chinese, Vedic, Indian and Greek myths the pair had to be sundered.[1] Hesiod enumerates the children whom Earth bore "when couched in love with Heaven." They are Ocean, Coeus, Crius, Hyperion, Iapetus, Theia, Rhea, Themis, Mnemosyne, Phoebe, Tethys and the youngest, Cronus, "and he hated his glorious father." Others of this early race were the Cyclopes, Bronte, Sterope and Arge, and three children of enormous strength, Cottus, Briareus (Aegaeon) and Gyes, each with one hundred hands and fifty heads. Uranus detested his offspring, and hid them in crannies of Earth. Earth excited Cronus to attack the father, whom he castrated with a sickle. From the blood of Uranus (this feature is common in Red Indian and Egyptian myths) were born furies, giants, ash-nymphs and Aphrodite. A number of monsters, as Echidna, Geryon and the hound of hell, were born of the loves of various elemental powers. The chief stock of the divine species was continued by the marriage of Rhea (probably another form of the Earth) with Cronus. Their children were Hestia, Demeter, Hera, Hades and Poseidon. All these Cronus swallowed; and this "swallow-myth" occurs in Australia, among the Bushmen, in Guiana, in Brittany (where Gargantua did the swallow-trick) and elsewhere. At last Rhea bore Zeus, and gave Cronus a stone in swaddling bands, which he disposed of in the usual way. Zeus grew up, administered an emetic to Cronus (some say Metis did this), and had the satisfaction of seeing all his brothers and sisters disgorged alive. The stone came forth first, and Pausanias saw it at Delphi (Paus. x. 24). Then followed the wars between Zeus and the gods he had rescued from the maw of Cronus against the gods of the elder branch, the children of Uranus and Gaea—Heaven and Earth. The victory remained with the younger branch, the immortal Olympians of Homer. The system of Hesiod is a medley of later physical speculation and of poetic allegory, with matter which we, at least, regard as savage survivals, like the mutilation of Heaven and the swallow-myth.[2]

In Homer and in Hesiod myths enter the region of literature, and become, as it were, national. But it is probable that the local myths of various cities and temples, of the "sacred chapters" which were told by the priests to travellers and in the mysteries to the initiated, were older in form than the epic and national myths. Of these "sacred chapters" we have fragments and hints in Herodotus, Pausanias, in the mythographers, like Apollodorus, in the tragic poets, and in the ancient *scholia* or notes on the classics. From these sources come almost all the more inhuman, bestial and discreditable myths of the gods. In these we more distinctly perceive the savage element. The gods assume animal forms: Cronus becomes a horse, Rhea a mare; Zeus begets separate families of men in the shape of a bull, an ant, a serpent, a swan. His mistress from whom the Arcadians claim descent becomes a she-bear. It is usual with mythologists to say that Zeus is the "All-Father," and that his amours are only a poetic way of stating that he is the parent of men. But why does he assume so many animal shapes? Why did various royal houses claim descent from the ant, the swan, the she-bear, the serpent, the horse and so forth? We have already seen that this is the ordinary pedigree of savage stocks in Asia, Africa, Australia and America, while animals appear among Irish tribes and in Egyptian and ancient English genealogies.[3] It is a plausible hypothesis that stocks which once claimed descent from animals, *sans phrase*, afterwards regarded the animals as avatars of Zeus. In the same way "the Minas, a non-Aryan tribe of Rajputana, used to worship the pig; when the Brahmans got a turn at them, the pig became an avatar of Vishnu" (Lyall, *Asiatic Studies*). The tales of divine cannibalism to which Pindar refers with awe, the mutilation of Dionysus Zagreus, the unspeakable abominations of Dionysus, the loves of Hera in the shape of a cuckoo, the divine powers of metamorphosing men and women into beasts and stars—these tales come to us as echoes of the period of savage thought. Further evidence on this point will be given below in a classification of the principal mythic legends. The general conclusion is that many of the Greek deities were originally elemental, the elements being personified in accordance with the laws of savage imaginations. But we cannot explain each detail in the legends as a myth of this or that natural phenomenon or process as understood by ourselves. Various stages of late and early fancy have contributed to the legends. Zeus is the sky, but not our sky; he had originally a personal character, and that a savage or barbarous character. He probably attracted into his legend stories that did not originally belong to him. He became anthropomorphic, and his myth was handled by local priests, by family bards, by national poets, by early philosophers. His legend is a complex embroidery on a very ancient tissue. The other divine myths are equally complex.

See L. R. Farnell, *Cults of the Greek States*; Miss Jane Harrison, *Prolegomena to Greek Religion*; and Frazer, *The Golden Bough*, especially as regards the vegetable or "probably arboreal" aspect of Zeus.

Scandinavian Divine Myths.—The Scandinavian myths of the gods are numerous and interesting, but the evidence on which they have reached us demands criticism for which we lack space. That there are in the *Eddas* and *Sagas* early ideas and later ideas tinged by Christian legend seems indubitable, but philological and historical learning has by no means settled the questions of relative purity and antiquity in the myths. The Eddic songs, according to F. Y. Powell, one of the editors of the *Corpus poeticum septentrionale* (the best work on the subject), "cannot date earlier" in their present form "than the 9th century," and may be vaguely placed between A.D. 800–1100. The collector of the *Edda* probably had the old poems recited to him in the 13th century, and where there was a break in the memory of the reciters the lacuna was filled up in prose. "As one goes through the poems, one is ever and anon face to face with a myth of the most childish and barbaric type," which "carries one back to prae-Aryan days." Side by side with these old stories come fragments of a different stratum of thought, Christian ideas, the belief in a supreme God, the notion of Doomsday. The Scandinavian cosmogonic myth (with its parallels among races savage and civilized) is given elsewhere. The most important god is Odin, the son of Bestla and Bor, the husband of Frigg, the father of Balder and many other sons, the head of the Aesir stock of gods. Odin's name is connected with that of Wuotan, and referred to the Old High-German verb *watan wuot = meare, cum impetu ferri* (Grimm, *Teut. Myth.*, Eng. transl.,

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[1] See Tylor, *Prim. Cult.* i. 326.

[2] Bleek, *Bushman Folk-Lore*, pp. 6–8. Max Müller suggests another theory (*Selected Essays*, i. 460): "Κρόνος did not exist till long after Ζεύς in Greece." The name Κρονίων, or Κρονίδης, looks like a patronymic. Müller, however, thinks it originally meant only "connected with time, existing through all time." Very much later the name was mistaken for a genuine patronymic, and "Zeus the ancient of days" became "Zeus the son of Cronus." Having thus got a Cronus, the Greeks—and "the misunderstanding could have happened in Greece only"—needed a myth of Cronus. They therefore invented or adapted the "swallow-myth" so familiar to Bushmen and Australians. This singular reversion to savagery itself needs some explanation. But the hypothesis that Cronus is a late derivation from Κρονίδης and Κρονίων is by no means universally accepted. Others derive Κρόνος from κραίνω, and connect it with κρόνια, a kind of harvest-home festival. Schwartz (*Prähistorisch-anthropologische Studien*) readily proves Cronus to be the storm, swallowing the clouds. Perhaps we may say of Schwartz's view, as he says of Preller's—"das ist Gedankenspiel, aber nimmermehr Mythologie."

[3] Elton, *Origins of English History*, pp. 298–301.

i. 131). Odin would thus (if we admit the etymology) be the swift goer, the "ganger," and it seems superfluous to make him (with Grimm) "the all-powerful, all-permeating being," a very abstract and scarcely an early conception. Odin's brethren (in *Gylfi's Mocking*) are Vile and Ve, who with him slew Ymir the giant, and made all things out of the fragments of his body. They also made man out of two stocks. In the *Hava-Mal* Odin claims for himself most of the attributes of the medicine-man. In *Loka Senna*, Loki, the evil god, says that "Odin dealt in magic in Samsey." The goddess Frigg remarks, "Ye should never talk of your old doings before men, of what ye two Aesir went through in old times." But many relics of these "old times," many traces of the medicine-man and the "skin-shifter," survive in the myth of Odin. When he stole Suttung's mead (which answers somewhat to nectar and the Indian soma), he flew away in the shape of an eagle.[1] The hawk is sacred to Odin; one of his names is "the Raven-god." He was usually represented as one-eyed, having left an eye in pawn that he might purchase a draught from Mimir's well. This one eye is often explained as the sun. Odin's wife was Frigg; their sons were Thor (the thunder-god) and Balder, whose myth is well known in English poetry. The gods were divided into two—not always friendly—stocks, the Aesir and Vanir. Their relations are, on the whole, much more amicable than those of the Asuras and Devas in Indian mythology. Not necessarily immortal, the gods restored their vigour by eating the apples of Iduna. Asa Loki was a being of mixed race, half god, half giant, and wholly mischievous and evil. His legend includes animal metamorphoses of the most obscene character. In the shape of a mare he became the mother of the eight-legged horse of Odin. He borrowed the hawk-dress of Freya, when he recovered the apples of Iduna. Another Eddic god, Hoene, is described in phrases from lost poems as "the long-legged one," "lord of the ooze," and his name is connected with that of the crane. The constant enemies of the gods, the giants, could also assume animal forms. Thus in Thiodolf's *Haust-long* (composed after the settlement of Iceland) we read about a shield on which events from mythology were painted; among these was the flight of "giant Thiazzi in an ancient eagle's feathers." The god Herindal and Loki once fought a battle in the shapes of seals. On the whole, the Scandinavian gods are a society on an early human model, of beings indifferently human, animal and divine—some of them derived from elemental forces personified, holding sway over the elements, and skilled in sorcery. Probably after the viking days came in the conceptions of the last war of gods, and the end of all, and the theory of Odin All-Father as a kind of emperor in the heavenly world. The famous tree that lives through all the world is regarded as "foreign, Christian, and confined to few poems." There is, almost undoubtedly, a touch of the Christian dawn on the figure and myth of the pure and beloved and ill-fated god Balder, and his descent into hell. The whole subject is beset with critical difficulties, and we have chiefly noted features which can hardly be regarded as late, and which correspond with widely distributed mythical ideas.

Dasent's *Prose or Younger Edda* (Stockholm, 1842); the *Corpus Septentrionale* already referred to; C. F. Keary's *Mythology of the Eddas* (1882); Pigott's *Manual of Scandinavian Mythology* (1838); and Laing's *Early Kings of Norway* may be consulted by English students.

Classification of Myths.—It is now necessary to cast a hasty glance over the chief divisions of myths. These correspond to the chief problems which the world presents to the curiosity of untutored men. They ask themselves (and the answers are given in myths) the following questions: What is the Origin of the World? The Origin of Man? Whence came the Arts of Life? Whence the Stars? Whence the Sun and Moon? What is the Origin of Death? How was Fire procured by Man? The question of the origin of the marks and characteristics of various animals and plants has also produced a class of myths in which the marks are said to survive from some memorable adventure, or the plants and animals to be metamorphosed human beings. Examples of all these myths are found among savages and in the legends of the ancient civilizations. A few such examples may now be given.

Myths of the Origin of the World.—We have found it difficult to keep myths of the gods apart from myths of the origin of the world and of man, because gods are frequently regarded as creative powers. The origin of things is a problem which has everywhere exercised thought, and been rudely solved in myths. These vary in quality with the civilization of the races in which they are current, but the same ideas which we proceed to state pervade all cosmogonical myths, savage and civilized. All these legends waver between the theory of creation, or rather of manufacture, and the theory of evolution. The earth, as a rule, is supposed to have grown out of some original matter, perhaps an animal, perhaps an egg which floated on the waters, perhaps a fragment of soil fished up out of the floods by a beast or a god. But this conception does not exclude the idea that many of the things in the world—minerals, plants, people, and what not—are fragments of the frame of an animal or non-natural magnified man, or are excretions from the body of a god. We proceed to state briefly the various forms of these ideas. The most backward races usually assume the prior existence of the earth.

The aborigines of the northern parts of Victoria (Australia) believe that the earth was made by Pund-jel, the bird-creator, who sliced the valleys with a knife. Another Australian theory is that the men of a previous race, the Nooralie (very old ones), made the earth.

The problem of the origin of the world seems scarcely to have troubled the Bushmen. They know about "men who brought the sun," but their doctrines are revealed in mysteries, and Qing, the informant of Mr Orpen (*Cape Monthly Magazine*, July 1874), "did not dance that dance"—that is, had not been initiated into all the secret doctrines of his tribe. According to Qing, creation was the work of Cagn (the mantis insect), "he gave orders and caused all things to appear." Elsewhere in the myth Cagn made or manufactured things by his skill.

As a rule the most backward races, while rich in myths of the origin of men, animals, plants, stones and stars, do not say much about the making of the world. Among people a little more advanced, the earth is presumed to have grown out of the waters. In the Iroquois myth (Lafitau, *Mœurs des sauvages*, 1724), a heavenly woman was tossed out of heaven, and fell on a turtle, which developed into the world. Another North-American myth assumes a single island in the midst of the waters, and this island grew into the world. The Navaho and the Digger Indians take earth for granted as a starting-point in their myths. The Winnebagos, not untouched by Christian doctrine, do not go farther back. The Great Manitou awoke and found himself alone. He took a piece of his body and a piece of earth and made a man. Here the existence of earth is assumed (Bancroft iv. 228). Even in Guatemala, though the younger sons of a divine race succeed in making the earth where the elder son (as usual) failed, they all had a supply of clay as first material. The Pima, a Central-American tribe, say the earth was made by a powerful being, and at first appeared "like a spider's web." This reminds one of the Ananzi or spider creator of West Africa. The more metaphysical Tacullies of British Columbia say that in the beginning nought existed but water and a musk-rat. The musk-rat sought his food at the bottom of the water, and his mouth was frequently filled with mud. This he kept spitting out, and so formed an island, which developed into the world. Among the Tinneh, the frame of a dog (which could assume the form of a handsome young man) became the first material of most things. The dog, like Osiris, Dionysus, Purusha and other gods, was torn to pieces by giants; the fragments became many of the things in the world (Bancroft i. 106). Even here the existence of earth for the dog to live in is assumed.

Coming to races more advanced in civilization, we find the New Zealanders in possession of ancient hymns in which the origin of things is traced back to nothing, to darkness, and to a metaphysical process from nothing to something, from being to becoming. The hymns may be read in Sir George Grey's *Polynesian Mythology*, and in Taylor's *New Zealand*. It has been suggested that these hymns bear traces of Buddhist and Indian influence; in any case, they are rather metaphysical than mystical. Myth comes in when the Maoris represent Rangi and Papa, Heaven and Earth, as two vast beings, male and female, united in a secular embrace, and finally severed by their children, among whom Tane Mahuta takes the part of Cronus in the Greek myth. The gods were partly elemental, partly animal in character; the lists of their titles show that every human crime was freely attributed to them. In the South Sea Islands, generally, the fable of the union and separation of Heaven and Earth is current; other forms will be found in Gill's *Myths and Songs from the South Pacific*.

The cosmogonic myths of the Aryans of India are peculiarly interesting, as we find in the *Vedas* and *Brahmanas* and *Puranas* almost every fiction familiar to savages side by side with the most abstract metaphysical speculations. We have the theory that earth grew, as in the Iroquois story of the turtle, from a being named Uttanapad (Muir v. 335). We find that Brahmanaspati "blew the gods forth from his mouth," and one of the gods, Tvashtri, the mechanic among the deities, is credited with having fashioned the earth and the heaven (Muir v. 354). The "Purusha Sukta," the 90th hymn of the tenth book of the *Rig Veda*, gives us the Indian version of the theory that all things were made out of the mangled limbs of Purusha, a magnified non-natural man, who was sacrificed by the gods. As this hymn gives an account of the origin of the castes (which elsewhere are scarcely recognized in the

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[1] Indra was a hawk when, "being well-winged, he carried to men the food tasted by the gods" (*R. V.* iv. 26, 4). Yehl, the Tlingit god-hero, was a raven or a crane when he stole the water (Bancroft iii. 100–102). The prevalence of animals, or of god-animals, in myths of the stealing of water, soma and fire, is very remarkable. Among the Andaman Islanders, a kingfisher steals fire for men from the god Puluga (*Anthrop. Journal*, November 1882).

Rig Veda), it is sometimes regarded as a late addition. But we can scarcely think the main conception late, as it is so widely scattered that it meets us in most mythologies, including those of Chaldaea and Egypt, and various North-American tribes. Not satisfied with this myth, the Aryans of India accounted for the origin of species in the following barbaric style. A being named Purusha was alone in the world. He differentiated himself into two beings, husband and wife. The wife, regarding union with her producer as incest, fled from his embraces as Nemesis did from those of Zeus, and Rhea from Cronus, assuming various animal disguises. The husband pursued in the form of the male of each animal, and from these unions sprang the various species of beasts (*Satapatha-Brahmana*, xiv. 4, 2; Muir i. 25). The myth of the cosmic egg from which all things were produced is also current in the *Brahmanas*. In the *Puranas* we find the legend of many successive creations and destructions of the world a myth of world-wide distribution.

As a rule, destruction by a deluge is the most favourite myth, but destructions by fire and wind and by the wrath of a god are common in Australian, Peruvian and Egyptian tradition. The idea that a boar, or a god in the shape of a boar, fished up a bit of earth, which subsequently became the world, out of the waters, is very well known to the Aryans of India, and recalls the feats of American musk-rats and coyotes already described.[1] The tortoise from which all things sprang, in a myth of the *Satapatha-Brahmana*, reminds us of the Iroquois turtle. The Greek and Mangaian myth of the marriage of Heaven and Earth and its dissolution is found in the *Aitareya-Brahmana* (Haug's trans. ii. 308; *Rig Veda*, i. lxii.).

So much for the Indian cosmogonic myths, which are a collection of ideas familiar to savages, blended with sacerdotal theories and ritual mummeries. The philosophical theory of the origin of things, a hymn of remarkable stateliness, is in *Rig Veda*, x. 129. The Scandinavian cosmogonic myth starts from the abyss, Ginnungagap, a chaos of ice, from which, as it thawed, was produced the giant Ymir. Ymir is the Scandinavian Purusha. A man and woman sprang from his armpit, like Athene from the head of Zeus. A cow licked the hoar-frost, whence rose Bur, whose children, Odin, Vile and Ve, slew the giant Ymir. "Of his flesh they formed the earth, of his blood seas and waters, of his bones mountains, of his teeth rocks and stones, of his hair all manner of plants." This is the story in the *Prose Edda*, derived from older songs, such as the *Grimnersmal*. However the distribution of this singular myth may be explained, its origin can scarcely be sought in the imagination of races higher in culture than the Tinneh and Tacullies, among whom dogs and beavers are the theriomorphic form of Purusha or Ymir.

Myths of the Origin of Man.—These partake of the conceptions of evolution and of creation. Man was made out of clay by a supernatural being. *Australia*: man was made by Pund-jel. *New Zealand*: man was made by Tiki; "he took red clay, and kneaded it with his own blood." *Mangaia*: the woman of the abyss made a child from a piece of flesh plucked out of her own side. *Melanesia*: "man was made of clay, red from the marshy side of Vanua Levu"; woman was made by Qat of willow twigs. *Greece*: men were πλάσματα πηλοῦ, figures baked in clay by Prometheus.[2] *India*: men were made after many efforts, in which the experimental beings did not harmonize with their environment, by Prajapati. In another class of myths, man was evolved out of the lower animals —lizards in Australia; coyotes, beavers, apes and other beasts in America. The Greek myths of the descent of the Arcadians, Myrmidons, children of the swan, the cow, and so forth, may be compared. Yet again, men came out of trees or plants or rocks: as from the Australian wattle-gum, the Zulu bed of reeds, the great tree of the Ovahereros, the rock of the tribes in Central Africa, the cave of Bushman and North-American and Peruvian myth, "from tree or stone" (*Odyssey*, xix. 163). This view was common among the Greeks, who boasted of being autochthonous. The Cephisian marsh was one scene of man's birth according to a fragment of Pindar, who mentions Egyptian and Libyan legends of the same description.

Myths of the Arts of Life.—These are almost unanimously attributed to "culture-heroes," beings theriomorphic or anthropomorphic, who, like Pund-jel, Qat, Quawteaht, Prometheus, Manabozho, Quetzalcoatl, Cagn and the rest, taught men the use of the bow, the processes (where known) of pottery, agriculture (as Demeter), the due course of the mysteries, divination, and everything else they knew. Commonly the teacher disappears mysteriously. He is often regarded by modern mythologists as the sun.

Star Myths.—"The stars came otherwise," says Browning's Caliban. In savage and civilized myths they are usually metamorphosed men, women and beasts. In Australia, the Pleiades, as in Greece, were girls. Castor and Pollux in Greece, as in Australia, were young men. Our Bear was a bear, according to Charlevoix and Lafitau, among the North-American Indians; the Eskimo, according to Egede, who settled the Danish colony in Greenland, regarded the stars "very nonsensically," as "so many of their ancestors"; the Egyptian priests showed Plutarch the stars that had been Isis and Osiris. Aristophanes, in the *Pax*, shows us that the belief in the change of men into stars survived in his own day in Greece. The Bushmen (Bleek) have the same opinion. The *Satapatha-Brahmana* (*Sacred Books of the East*, xii. 284) shows how Prajapati, in his incestuous love, turned himself into a roebuck, his daughter into a doe, and how both became constellations. This is a thoroughly good example of the savage myths (as in Peru, according to Acosta) by which beasts and anthropomorphic gods and stars are all jumbled together.[3] The *Rig Veda* contains examples of the idea that the good become stars.

Solar and Lunar Myths.—These are universally found, and are too numerous to be examined here. The sun and moon, as in the Bulgarian ballad of the *Sun's Bride* (a mortal girl), are looked on as living beings. In Mexico they were two men, or gods of a human character who were burned. The Eskimo know the moon as a man who visits earth, and, again, as a girl who had her face spotted by ashes which the Sun threw at her. The Khasias make the sun a woman, who daubs the face of the moon, a man. The Homeric hymn to Helios, as Max Müller observes, "looks on the sun as a half-god, almost a hero, who had once lived on earth." This is precisely the Bushman view; the sun was a man who irradiated light from his armpit. In New Zealand and in North America the sun is a beast, whom adventurers have trapped and beaten. Medicine has been made with his blood. In the Andaman Islands the Sun is the wife of the Moon (*Jour. of Anth. Soc.*, 1882). Among aboriginal tribes in India (Dalton, p. 186) the Moon is the Sun's bride; she was faithless and he cut her in two, but occasionally lets her shine in full beauty. The Andaman Islanders account for the white brilliance of the moon by saying that he is daubing himself with white clay, a custom common in savage and Greek mysteries. The Red Men accounted to the Jesuits for the spherical forms of sun and moon by saying that their appearance was caused by their bended bows. The Moon in Greek myths loved Endymion, and was bribed to be the mistress of Pan by the present of a fleece, like the Dawn in Australia, whose unchastity was rewarded by a gift of a red cloak of opossum skin. Solar and lunar myths usually account for the observed phenomena of eclipse, waning and waxing, sunset, spots on the moon, and so forth by various mythical adventures of the animated heavenly beings. In modern folk-lore the moon is a place to which bad people are sent, rather than a woman or a man. The mark of the hare in the moon has struck the imagination of Germans, Mexicans, Hottentots, Sinhalese, and produced myths among all these races.[4]

Myths of Death.—Few savage races regard death as a natural event. All natural deaths are supernatural with them. Men are assumed to be naturally immortal, hence a series of myths to account for the origin of death. Usually some custom or "taboo" is represented as having been broken, when death has followed. In New Zealand, Maui was not properly baptized. In Australia, a woman was told not to go near a certain tree where a bat lived; she infringed the prohibition, the bat fluttered out, and men died. The Ningphoos were dismissed from Paradise and became mortal, because one of them bathed in water which had been tabooed (Dalton, p. 13). In the *Atharva Veda*, Yama, like Maui in New Zealand, first "spied out the path to the other world," which all men after him have taken. In the *Rig Veda* (x. 14), Yama "sought out a road for many." In the Solomon Islands (*Jour. Anth, Inst.*, Feb. 1881), "Koevari was the author of death, by resuming her cast-off skin." The same story is told in the Banks Islands. In the Greek myth (Hesiod, *Works and Days*, 90), men lived without "ill diseases that give death to men" till the cover was lifted from the forbidden box of Pandora. As to the myths of Hades, the place of the dead, they are far too many to be mentioned in detail. In almost all the gates of hell are guarded by fierce beasts, and in Ojibway, Finnish, Greek, Papuan and Japanese myths no mortal visitor may escape from Hades who has once tasted the food of the dead.

Myths of Fire-stealing.—Those current in North America (where an animal is commonly the thief) will be found in Bancroft, vol. iv. The Australian version, singularly like one Greek legend, is given by Brough Smyth. Stories of the theft of Prometheus are recorded by Hesiod, Aeschylus, and their commentators. Muir and Kuhn may be consulted for Vedic fire-stealing.

Heroic and Romantic Myths.—In addition to myths which are clearly intended to explain facts of the universe, most nations have their heroic and romantic myths. Familiar examples are the stories of Perseus, Odysseus, Sigurd, the Indian epic stories, the adventures of Ilmarinen and Wainamoinen in the *Kalewala*, and so forth. To discuss these myths as far as they can be considered apart from divine and explanatory tales would demand more space than we have at our disposal. It will become evident to any student of the romantic myths that they consist of different arrangements of a rather limited set of incidents. These incidents have been roughly classified by Von Hahn.[1] We may modify his arrangement as follows.

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[1] *Black Yajur-Veda* and *Satapatha-Brahmana*; Muir, i. 52.

[2] Aristophanes, *Aves*, 686; *Etym. Magn.*, *s.v.* Ἰκόνιον. Pausanias saw the clay (Paus. x. iv.). The story is also quoted by Lactantius from Hesiod.

[3] See also *Vishnu Purana*, i. 131.

[4] See *Cornhill Magazine*, "How the Stars got their Names" (1882, p. 35), and "Some Solar and Lunar Myths" (1882, p. 440); Max Müller, *Selected Essays*, i. 609–611.

There is (1) the story of a bride or bridegroom who transgresses a commandment of a mystic nature, and disappears as a result of the sin. The bride sins as in Eros and Psyche, Freja and Oddur, Pururavas and Urvasi.[2] The sin of Urvasi and Psyche was seeing their husbands—naked in the latter case. The sin was against "the manner of women." Now the rule of etiquette which forbids seeing or naming the husband (especially the latter) is of the widest distribution. The offence in the Welsh form of the story is naming the partner—a thing forbidden among early Greeks and modern Zulus. Presumably the tale (with its example of the sanction) survives the rule in many cases. (2) "Penelope formula." The man leaves the wife and returns after many years. A good example occurs in Chinese legend. (3) Formula of the attempt to avoid fate or the prophecy of an oracle. This incident takes numerous shapes, as in the story of the fatal birth of Perseus, Paris, the Egyptian prince shut up in a tower, the birth of Oedipus. (4) Slaughter of a monster. This is best known in the case of Andromeda and Perseus. (5) Flight, by aid of an animal usually, from cannibalism, human sacrifice, or incest. The Greek example is Phrixus, Helle, and the ram of the golden fleece. (6) Flight of a lady and her lover from a giant father or wizard father. Jason and Medea furnish the Greek example. (7) The youngest brother the successful adventurer, and the head of the family. We have seen the example of Greek mythic illustrations of "Jüngsten-recht," or supremacy of the youngest, in the Hesiodic myth of Zeus, the youngest child of Cronus. (8) Bride given to whoever will accomplish difficult adventures or vanquish girl in race. The custom of giving a bride without demanding bride-price, in reward for a great exploit, is several times alluded to in the *Iliad*. In Greek heroic myth Jason thus wins Medea, and (in the race) Milanion wins Atalanta. In the *Kalewala* much of the Jason cycle, including this part, recurs. The rider through the fire wins Brunhild but this may belong to another cycle of ideas. (9) The grateful beasts, who, having been aided by the hero, aid him in his adventures. Melampus and the snakes is a Greek example. This story is but one specimen of the personal human character of animals in myths, already referred to the intellectual condition of savages. (10) Story of the strong man and his adventures, and stories of the comrades Keen-eye, Quick-ear, and the rest. Jason has comrades like these, as had Ilmarinen and Heracles, the Greek "strong man." (11) Adventure with an ogre, who is blinded and deceived by a pun of the hero's. Odysseus and Polyphemus is the Greek example. (12) Descent into Hades of the hero. Heracles, Odysseus, Wainamoinen in the *Kalewala*, are the best-known examples in epic literature. These are twelve specimens of the incidents, to which we may add (13) "the false bride," as in the poem of *Berte aux grans Piés*, and (14) the legend of the bride said to produce beast-children. The belief in the latter phenomenon is very common in Africa, and in the *Arabian Nights*, and we have seen it in America.

Of these formulae (chosen because illustrated by Greek heroic legends)—(1) is a sanction of barbarous nuptial etiquette; (2) is an obvious ordinary incident; (3) is moral, and both (3) and (1) may pair off with all the myths of the origin of death from the infringement of a taboo or sacred command; (4) would naturally occur wherever, as on the West Coast of Africa, human victims have been offered to sharks or other beasts; (5) the story of flight from a horrible crime, occurs in some stellar myths, and is an easy and natural invention; (6) flight from wizard father or husband, is found in Bushman and Namaqua myth, where the husband is an elephant; (7) success of youngest brother, may have been an explanation and sanction of "Jüngsten-recht"—Maui in New Zealand is an example, and Herodotus found the story among the Scythians; (8) the bride given to successful adventurer, is consonant with heroic manners as late as Homer; (9) is no less consonant with the belief that beasts have human sentiments and supernatural powers; (10) the "strong man," is found among Eskimo and Zulus, and was an obvious invention when strength was the most admired of qualities; (11) the baffled ogre, is found among Basques and Irish, and turns on a form of punning which inspires an "ananzi" story in West Africa; (12) descent into Hades, is the natural result of the savage conception of Hades, and the tale is told of actual living people in the Solomon Islands and in New Caledonia; Eskimo Angekoks can and do descend into Hades—it is the prerogative of the necromantic magician; (13) "the false bride," found among the Zulus, does not permit of such easy explanation—naturally, in Zululand, the false bride is an animal; (14) the bride accused of bearing beast-children, has already been disposed of; the belief is inevitable where no distinction worth mentioning is taken between men and animals. English folk-lore has its woman who bore rabbits.

The formulae here summarized, with others, are familiar in the märchen of Samoyeds, Zulus, Bushmen, Hottentots and Red Indians. For an argument intended to show that Greek heroic myths may be adorned and classified märchen, in themselves survivals of savage fancy, see *Fortnightly Review*, May 1872, "Myths and Fairy Tales." The old explanation was that märchen are degenerate heroic myths. This does not explain the märchen of African, and perhaps not of Siberian races.

In this sketch of mythology that of Rome is not included, because its most picturesque parts are borrowed from or adapted into harmony with the mythology of Greece. Greece, India and Scandinavia will supply a fair example of Aryan mythology (without entering on the difficult Slavonic and Celtic fields). (A. L.)

MYXOEDEMA (or *athyrea*), the medical term for a constitutional disease (see METABOLIC DISEASES) due to the degeneration of the thyroid gland, and occurring in adults; it may be contrasted with cretinism, which is a condition appearing in early childhood. There are two forms, myxoedema proper and operative myxoedema (*cachexia strumipriva*). (1) Myxoedema has been termed "Gull's Disease" from Sir William Gull's observations in 1873. Women are more often the victims than men, in a ratio of 6 to 1. It frequently affects members of the same family and may be transmitted through the mother, and it has been observed sometimes to follow exophthalmic goitre. The symptoms are a marked increase in bulk and weight of the body, puffy appearance of skin which does not pit on pressure, the line of the features becoming obliterated and getting coarse and broad, the lips thick and nostrils enlarged, with loss of hair, subnormal temperature and marked mental changes. There is striking slowness of thought and action, the memory becomes defective, and the patient becomes irritable and suspicious. In some instances the condition progresses to that of dementia. The thyroid gland itself is diminished in size, and may become completely atrophied and converted into a fibrous mass. The untreated disease is progressive, but the course is slow and the symptoms may extend over 12 to 15 years, death from asthenia or tuberculosis being the most frequent ending. (2) Symptoms similar to the above may follow complete removal of the thyroid gland. Kocher of Bern found that, in the total removal of the gland by operation, out of 408 cases operative myxoedema occurred in 69, but it is thought that if a small portion of the gland is left, or if accessory glands are present, these symptoms will not develop. The treatment of myxoedema is similar to that of cretinism.

MYZOSTOMIDA, a remarkable group of small parasitic worms which live on crinoid echinoderms; they were first discovered by Leuckart in 1827. Some species, such as *Myzostoma cirriferum*, move about on the host; others, such as *M. glabrum*, remain stationary with the pharynx inserted in the mouth of the crinoid. *M. deformator* gives rise to a "gall" on the arm of the host, one joint of the pinnule growing round the worm so as to enclose it in a cyst (see fig. E); whilst *M. pulvinar* lives actually in the alimentary canal of a species of *Antedon*.

A typical myzostomid (see A, B, C) is of a flattened rounded shape, with a thin edge drawn out into delicate radiating cirri. The skin is ciliated. The dorsal surface is smooth; ventrally there are five pairs of parapodia, armed with supporting and hooked setae, by means of which the worm adheres to its host. Beyond the parapodia are four pairs of organs, often called suckers, but probably of sensory nature, and comparable to the lateral sense organs of Capitellids (Wheeler). The mouth and cloacal aperture are generally at opposite ends of the ventral surface. The former leads to a protrusible pharynx (B), from which the oesophagus opens into a wide intestinal chamber with branching lateral diverticula. There appears to be no vascular system. The nervous system consists of a circumoesophageal nerve, with scarcely differentiated brain, joining below a large ganglionic mass no doubt representing many fused ganglia (B). The dorsoventral and the parapodial muscles are much developed, whilst the coelom is reduced mostly to branched spaces in which the genital products ripen. Full-grown myzostomids are hermaphrodite. The male organ (C) consists of a branched sac opening to the exterior on each side. The paired ovaries discharge their products into a median coelemic chamber with lateral branches (C), often called the uterus, from which the ripe ova are discharged by a median dorsal pore into the terminal region of the rectum (cloaca). Into this same cloacal chamber open ventrally a pair of ciliated tubes communicating by funnels with the coelom (Nansen and Wheeler); these are possibly nephridia, and excretory in function.

The Myzostomida are protandric hermaphrodites, being functional males when small, hermaphrodite later, and finally

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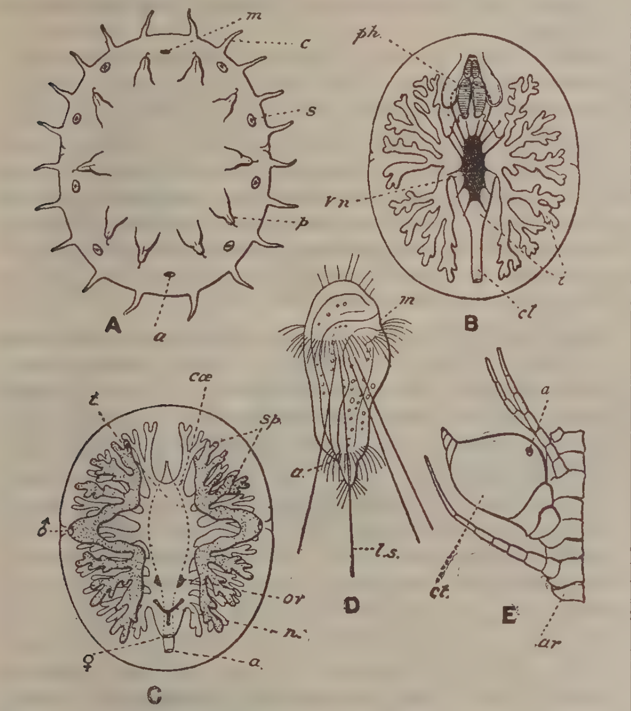
[1] *Griechische und albanesische Märchen*, i. 45.

[2] Tenth Book of *Rig Veda* and "Brahmana" of *Yajur-Veda*; Müller. *Selected Essays*, i. 410.

functional females (Wheeler). Small "males" are in some species constantly associated with large hermaphrodites, but according to Beard there are in some cases true dwarf males, comparable to the complementary males described by Darwin in the Cirripedia. The embryology of *Myzostoma* has been studied by Metchnikoff and Beard. Cleavage leads to the formation of an epibolic gastrula and ciliated embryo which hatches as a free-swimming larva remarkably like that of a Polychaete worm (D). The larva is provided with postoral and perianal ciliated bands, and on either side with a bunch of long provisional setae. The mesoderm becomes segmented, and the parapodia subsequently develop from before backwards; but almost all internal traces of segmentation are lost in the adult. The structure and development of the Myzostomida seem to show that they are nearly related to Polychaeta (see CHAETOPODA), though highly modified in relation to their parasitic mode of life.



A, Ventral view of *Myzostoma*.
B, Diagram of *Myzostoma*, showing the nervous and alimentary systems.
C, Diagram of *Myzostoma*, showing the genital organs (*from v. Graff and Wheeler*).
D, Larva of *Myzostoma glabrum*. (After Beard.)
E, Portion of the arm of *Pentacrinus*, showing a cyst containing *Myzostoma*.

a,	Cloacal aperture.
ar,	Arm.
c,	Cirrus.
cl,	"Cloaca."
coe,	Coelom.
ct,	Swollen pinnule forming a cyst.
i,	Intestine and its caeca.
ls,	Larval setae.
m,	Mouth.
n,	Ciliated tube (nephridium?).
o,	Opening.
ov,	Ovary.
p,	Parapodium.
ph,	Pharynx.
s,	Sense organ.
sp,	Sperm-sac.
vn,	Ventral ganglionic mass.
♂,	Male opening.
♀,	Female opening.

AUTHORITIES.—L. v. Graff, *Das Genus Myzostoma* (Leipzig, 1877); and "The Myzostomida," *Challenger Reports* (1884), vol. x.; E. Metchnikoff, *Zeit. Wiss. Zool.* (1866), vols. v., xvi.; J. Beard, *Mitth. Z. St Neapel* (1884), vol. v.; W. M. Wheeler, ibid. (1896), vol. xii. (E. S. G.)

MZABITES, or BENI-MZAB, a confederation of Berber tribes, now under the direct authority of France. Of all the Berber peoples the Mzabites have remained freest from foreign admixture. Their own country is a region of the Algerian Sahara, about 100 m. south of El-Aghuat. It consists of five oases close together, viz. Ghardaia, Beni-Isguen, El-Ateuf, Melika and Bu Nura, and two isolated oases farther north, Berrian and Guerrara. The total population numbered at the 1906 census 45,996, of whom about 100 were Europeans and a very small proportion Arabs and Jews. The Mzabites are of small and slender figure, with very short necks and under-developed legs. Their faces are flat, with short nose, thick lips and very deep-set eyes, and their complexion pale. Their dress is a shirt of thick wool, usually many-coloured. They are agriculturists, and are also famed as traders. The butchers, fruiterers, bath-house keepers, road-sweepers and carriers of the African littoral from Tangier to Tripoli are nearly all Mzabites. Their industries, too, are highly organized. The Mzabite burnouses and carpets are found throughout North Africa. Their commercial honesty is proverbial. Nearly all read and write Arabic, though in talking among themselves they use the Zenata dialect of the Berber language, for which, in common with other Berber peoples, they have no written form surviving. They are Mahommedans, of the Ibadite sect, and are regarded as heretics by the Sunnites.

According to tradition the Ibadites, after their overthrow at Tiaret by the Fatimites, took refuge during the 10th century in the country to the south-west of Wargla, where they founded an independent state. In 1012, owing to further persecutions, they fled to their present quarters, where they long remained invulnerable. After the capture of El-Aghuat by the French, the Mzabites concluded with the Algerian government, in 1853, a convention by which they engaged to pay an annual contribution of £1800 in return for their independence. In November 1882 the Mzab country was definitely annexed to Algeria. Ghardaia (pop. 7868) is the capital of the confederation, and next in importance is Beni-Isguen (4916), the chief commercial centre. Since the establishment of French control, Beni-Isguen has become the dépôt for the sale of European goods. French engineers have rendered the oases much more fertile than they used to be by a system of irrigation works. (See also ALGERIA.)

See A. Coyne, *Le Mzab* (Algiers, 1879); Rinn, *Occupation du Mzab* (Algiers, 1885); Amat, *Le M'Zab et les M'Zabites* (Paris, 1888). Also ALGERIA and BERBERS.

N A letter which regularly follows M in the alphabet, and, like it in its early forms has the first limb longer than the others; thus, written from right to left, 𐤍. The Semitic languages gradually diminish the size of the other two limbs, while the Greek and Latin alphabets tend to make all three of equal length. The earliest name of the symbol was *Nūn*, whence comes the Greek *ny* (*νῦ*). The sound of *n* varies according to the point at which the contact of the tongue with the roof of the mouth is made; it may be dental, alveolar, palatal or guttural. In Sanskrit these four sounds are distinguished by different symbols; the last two occur in combination with stops or affricates of the same series. The French or German *n* when standing by itself is dental, the English alveolar, *i.e.* pronounced like the English *t* and *d* against the sockets of the teeth instead of the teeth themselves. The guttural nasal is written in English *ng* as in *ring*; for the palatal *n* as in *lynch* there is no separate symbol. The sound of *n* stands in the same relation to *d* as *m* stands to *b*; both are ordinarily voiced and the mouth position for both is the same, but in pronouncing *n* the nasal passage is left open, so that the sound of *n* can be continued while that of *d* cannot. This is best observed by pronouncing syllables where the consonant comes last as *in* and *id*. When the nasal passage is closed, as when one has a bad cold, *m* and *n* cannot be pronounced; attempts to pronounce *moon* result only in *bood*. Two important points arise in connexion with nasals: (1) sonant nasals, (2) nasalization of vowels. The discovery of sonant nasals by Dr Karl Brugman in 1876 (Curtius, *Studien*, 9, pp. 285-338) explained many facts of language which had been hitherto obscure and elucidated many difficulties in the Indo-European vowel system. It had been observed, for example, that the same original negative prefix was represented in Sanskrit by *a*, Greek by *α*, in Latin by *in* and in Germanic by *un*, and these differences had not been accounted for satisfactorily. Dr Brugman argued that in these and similar cases the syllable was made by the consonant alone, and the nasal so used was termed a sonant nasal and written *n̥*. In most cases Sanskrit and Greek lost the nasal sound altogether and replaced it by a vowel *a*, *α*, while in Latin and Germanic a vowel was developed independently before the nasal. In the accusative singular of consonant stems Sans. *pādam*, Gr. *πόδα*, Lat. *pedem*, Sanskrit and Greek did not, as generally, agree, but it was shown that in such cases there were originally two forms according to the nature of the sound beginning the next word in the sentence. Thus an original Indo-European **pedm̥*, would not be treated precisely in the same way if the next word began with a vowel as it would when a consonant followed. Sanskrit had adopted the form used before vowels, Greek the form before consonants and each had dropped the alternative form. The second point—the nasalizing of vowels—is difficult for an Englishman to understand or to produce, as the sounds do not exist in his language. Thus in learning to pronounce French he tends to replace the nasalized vowels by the nearest sounds in English, making the Fr. *on* a nasalized vowel (*ǫ́*), into Eng. *ong*, a vowel followed by a guttural consonant. The nasalized vowels are produced by drawing forward the uvula, the "tab" at the end of the soft palate, so that the breath escapes through the nose as well as the mouth. In the French nasalized vowels, however, many phoneticians hold that, besides the leaving of the nasal passage open, there is a change in the position of the tongue in passing from *a* to *ą*. The nasalized vowels are generally written with a hook below, upon the analogy of the transliteration of such sounds in the Slavonic languages, but as the same symbol is often used to distinguish an "open" vowel from a "close" one, the use is not without ambiguity. On the other hand, it is not admissible to write *ã* for the nasalized vowel in languages which have accent signs, *e.g.* Lithuanian. It is possible to nasalize some consonants as well as vowels; nasalized spirants play an important part in the so-called "Yankee" pronunciation of Americans. (P. Gi.)

NAAS (pron. *Nace*, as in *place*), a market town of Co. Kildare, Ireland, 20 m. S.W. from Dublin on branches of the Great Southern and Western railway and of the Grand Canal. Pop. (1901) 3836. It is situated among the foothills of the Wicklow Mountains, close to the river Liffey. The town is of great antiquity, and was a residence of the kings of Leinster, the place of whose assemblies is marked by a neighbouring rath or mound. Naas returned two members to the Irish parliament from 1559 until the union in 1800. Of a castle taken by Cromwell in 1650, and of several former abbeys, there are no remains. Punchestown racecourse, 2½ m. S.E., is the scene of well-known steeplechases.

NABATAEANS, a people of ancient Arabia, whose settlements in the time of Josephus (*Ant.* i. 12. 4; comp. Jerome, *Quaest. in Gen.* xxv.) gave the name of Nabatene to the border-land between Syria and Arabia from the Euphrates to the Red Sea. Josephus suggests, and Jerome, apparently following him, affirms, that the name is identical with that of the Ishmaelite tribe of Nĕbāiōth (Gen. xxv. 13; Isa. lx. 7), which in later Old Testament times had a leading place among the northern Arabs, and is associated with Kedar (Isa. lx. 7) much as Pliny v. 11 (12) associates *Nabataei* and *Cedrei*. The identification is rendered uncertain by the fact that the name Nabataean is properly spelled with *ṭ* not *t* (on the inscriptions, cf. also Arabic *Nabaṭ*, *Nabīṭ*, &c.). Thus the history of the Nabataeans cannot certainly be carried back beyond 312 B.C., at which date they were attacked without success by Antigonus I. *Cyclops* in their mountain fortress of Petra. They are described by Diodorus (xix. 94 seq.) as being at this time a strong tribe of some 10,000 warriors, pre-eminent among the nomadic Arabs, eschewing agriculture, fixed houses and the use of wine, but adding to pastoral pursuits a profitable trade with the seaports in myrrh and spices from Arabia Felix, as well as a trade with Egypt in bitumen from the Dead Sea. Their arid country was the best safeguard of their cherished liberty; for the bottle-shaped cisterns for rain-water which they excavated in the rocky or argillaceous soil were carefully concealed from invaders. Petra (*q.v.*) or Selaʽ was the ancient capital of Edom; the Nabataeans must have occupied the old Edomite country, and succeeded to its commerce, after the Edomites took advantage of the Babylonian captivity to press forward into southern Judaea.[1] This migration, the date of which cannot be determined, also made them masters of the shores of the Gulf of ʽAḳaba and the important harbour of Elath. Here, according to Agatharchides (*Geog. Gr. Min.*, i. 178), they were for a time very troublesome, as wreckers and pirates, to the reopened commerce between Egypt and the East, till they were chastised by the Greek sovereigns of Alexandria.

The Nabataeans had already some tincture of foreign culture when they first appear in history. That culture was naturally Aramaic; they wrote a letter to Antigonus "in Syriac letters," and Aramaic continued to be the language of their coins and inscriptions when the tribe grew into a kingdom, and profited by the decay of the Seleucids to extend its borders northward over the more fertile country east of the Jordan. They occupied Ḥaurān, and about 85 B.C. their king Aretas (Ḥāritha) became lord of Damascus and Coele-Syria. Allies of the first Hasmonaeans in their struggles against the Greeks (1 Macc. v. 25, ix. 35; 2 Macc. v. 8), they became the rivals of the Judaean dynasty in the period of its splendour, and a chief element in the disorders which invited Pompey's intervention in Palestine. The Roman arms were not very successful, and King Aretas retained his whole possessions, including Damascus, as a Roman vassal.[1] As "allies" of the Romans the Nabataeans continued to flourish throughout the first Christian century. Their power extended far into Arabia, particularly along the Red Sea; and Petra was a meeting-place of many nations, though its commerce was diminished by the rise of the Eastern trade-route from Myoshormus to Coptos on the Nile. Under the Roman peace they lost their warlike and nomadic habits, and were a sober, acquisitive, orderly people, wholly intent on trade and agriculture (Strabo xvi. 4). They might have long been a bulwark between Rome and the wild hordes of the desert but for the short-sighted cupidity of Trajan, who reduced Petra and broke up the Nabataean nationality (105 A.D.). The new Arab invaders who soon pressed forward into their seats found the remnants of the Nabataeans transformed into *fellāḥīn*, and speaking Aramaic like their neighbours. Hence Nabataeans became the Arabic name for Aramaeans, whether in Syria or Iraḳ, a fact which has been incorrectly held to prove that the Nabataeans were originally Aramaean immigrants from Babylonia. It is now known, however, that they were true Arabs—as the proper names on their inscriptions show—who had come under Aramaic influence.

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[1] See Edom, and (for the view that Mal. i. 1-5, refers to the expulsion of Edomites from their land) Malachi.

See especially on this last point (against Quatremère, *Journ. asiat.* xv., vol. ii., 1835), Nöldeke in *Zeit. d. morgenländ. Gesell.* xvii. 705 seq., xxv. 122 seq. The so-called "Nabataean Agriculture" (*Falāḥa Nabaṭīya*), which professes to be an Arabic translation by Ibn Waḥshīya from an ancient Nabataean source, is a forgery of the 10th century (see A. von Gutschmid, *Z. d. morgenl. Ges.* xv. 1 seq.; Nöldeke, *ib.* xxix. 445 seq.). Complete bibliographical information is given by E. Schürer in his sketch of Nabataean history appended to *Gesch. d. Jüd. Volkes* (1901, vol. i.; cf. Eng. edition, 1890, i. 2, pp. 345 sqq.); to this may be added the article by H. Vincent, *Rev. bibl.* vii. 567 sqq., and, for more general information, R. Dussaud, *Les Arabes en Syrie* (1907). For early external evidence see H. Winckler, *Keil. u. Alte Test.*^{3} p. 151 seq.; M. Streck, *Mitteil. d. vorderasiat. Gesell.* (1906). pt. iii., and *Klio*, 1906, p. 206 seq. The Nabataean inscriptions (see SEMITIC LANGUAGES) are collected in the *Corpus Inscr. Semiticarum* of the French Academy, pt. ii.; see also the Academy's *Répertoire d'épigr. sém.*; and the discussions, &c., in the writings of Clermont-Ganneau (*Rec. d'archéol. Orient.*) and M. Lidzbarski (*Handbuch d. nord-semit. Epig.*; *Ephemeris f. sem. Epig.*). For English readers the selection in G. A. Cooke, *North-Semitic Inscriptions* (Oxford, 1903) is the most useful.

(W. R. S.; S. A. C.)

NABBES, THOMAS (b. 1605), English dramatist, was born in humble circumstances in Worcestershire. He entered Exeter College, Oxford, in 1621, but left the university without taking a degree, and about 1630 began a career in London as a dramatist. His works include: *Covent Garden* (acted 1633, printed 1638), a prose comedy of small merit; *Tottenham Court* (acted 1634, printed 1638), a comedy the scene of which is laid in a holiday resort of the London tradesmen; *Hannibal and Scipio* (acted 1635, printed 1637), a historical tragedy; *The Bride* (1638), a comedy; *The Unfortunate Mother* (1640), an unacted tragedy; *Microcosmus, a Morall Maske* (printed 1637); two other masques, *Spring's Glory* and *Presentation intended for the Prince his Highnesse on his Birthday* (printed together in 1638); and a continuation of Richard Knolles's *Generall Historie of the Turkes* (1638). His verse is smooth and musical, and if his language is sometimes coarse, his general attitude is moral. The masque of *Microcosmus*—really a morality play, in which Physander after much error is reunited to his wife Bellanima, who personifies the soul—is admirable in its own kind, and the other two masques, slighter in construction but ingenious, show Nabbes at his best.

Nabbes's plays were collected in 1639; and *Microcosmus* was printed in Dodsley's *Old Plays* (1744). All his works, with the exception of his continuation of Knolles's history, were reprinted by A. H. Bullen in his *Old English Plays* (second series, 1887). See also F. G. Fleay, *Biog. Chron. of the English Drama* (1891).

NABHA, a native state of India, within the Punjab. Area, 966 sq. m. Pop. (1901) 297,949. Its territories are scattered; one section, divided into twelve separate tracts, lies among the territories of Patiala and Jind, in the east and south of the Punjab; the other section is in the extreme south-east. The whole of the territories belong physically to a plain; but they vary in character from the great fertility of the Pawadh region to the aridity of the Rajputana desert. Nabha is one of the Sikh states, founded by a member of the Phulkian family, which established its independence about 1763. The first relations of the state with the British were in 1807–1808, when the raja obtained protection against the threatened encroachments of Ranjit Singh. During the Mutiny in 1857 the raja showed distinguished loyalty, and was rewarded by grants of territory to the value of over £10,000. The imperial service troops of the raja Hira Singh (b. *c.* 1843; succeeded in 1871) did good service during the Tirah campaign of 1897–98. The chief products of the state are wheat, millets, pulses, cotton and sugar. The estimated gross revenue is £100,000; no tribute is paid. The territory is crossed by the main line and also by several branches of the North-Western railway, and is irrigated by the Sirhind canal.

The town of Nabha, founded in 1755, has a station on the Rajpura-Bhatinda branch of the North-Western railway. Pop. (1901) 18,468.

See *Phulkian States Gazetteer* (Lahore, 1909).

NĀBIGHA DHUBYĀNĪ [Ziyād ibn Muʿawīyya] (6th and 7th centuries), Arabian poet, was one of the last poets of pre-Islamic times. His tribe, the Bani Dhubyān, belonged to the district near Mecca, but he himself spent most of his time at the courts of Hira and Ghassān. In Hira he remained under Mondhir (Mundhir) III., and under his successor in 562. After a sojourn at the court of Ghassān, he returned to Hira under Nuʿmān. He was, however, compelled to flee to Ghassān, owing to some verses he had written on the queen, but returned again about 600. When Nuʿmān died some five years later he withdrew to his own tribe. The date of his death is uncertain, but he does not seem to have known Islam. His poems consist largely of eulogies and satires, and are concerned with the strife of Hira and Ghassān, and of the Bani Abs and the Bani Dhubyān. He is one of the six eminent pre-Islamic poets whose poems were collected before the middle of the 2nd century of Islam, and have been regarded as the standard of Arabian poetry. Some writers consider him the first of the six.

His poems have been edited by W. Ahlwardt in the *Diwans of the six ancient Arabic Poets* (London, 1870), and separately by H. Derenbourg (Paris, 1869, a reprint from the *Journal asiatique* for 1868). (G. W. T.)

NABOB, a corruption of the Hindostani *nawab*, originally used for native rulers. In the 18th century, when Clive's victories made Indian terms familiar in England, it began to be applied to Anglo-Indians who returned with fortunes from the East.

NABUA, a town in the extreme S. of the province of Ambos Camarines, Luzon, Philippine Islands, on the Bicol river, about 22 m. S.S.E. of Nueva Cáceres, the capital. Pop. (1903) 18,893. Nabua is in the district known as La Rinconada—a name originally given to it on account of its inaccessibility. It is connected by road, railway and the Bicol river (navigable for light-draft boats) with Nueva Cáceres. Nabua is the centre of an agricultural region, which produces much rice and some Indian corn, sugar and pepper. The language is Bicol.

NACAIRE, NAKER, NAQUAIRE (Arab. *naqāra*), the medieval name for the kettledrum, the earliest representation of which appears in the unique MS. known as the Vienna Genesis (5th or 6th century). The nacaire was, according to Froissart, among the instruments used at the triumphal entry of Edward III. into Calais. The Chronicles of Joinville describe the instrument as a kind of drum: "Lor il fist sonner les tabours que l'on appelle nacaires." Chaucer, in his description of the tournament in the *Knight's Tale*, line 1653, also refers to this early kettledrum.

NACHMANIDES (NAḤMANIDES), the usual name of MOSES BEN NAḤMAN (known also as RAMBAN), Jewish scholar, was born in Gerona in 1194 and died in Palestine *c.* 1270. His chief work, the *Commentary* on the Pentateuch, is distinguished by originality and charm. The author was a mystic as well as a philologist, and his works unite with peculiar harmony the qualities of reason and feeling. He was also a Talmudist of high repute, and wrote glosses on various Tractates, Responsa and other legal works. Though not a philosopher, he was drawn into the controversy that arose over the scholastic method of Maimonides (*q.v.*). He endeavoured to steer a middle course between the worshippers and the excommunicators of Maimonides, but he did not succeed in healing the breach. His homiletic books, *Epistle on Sanctity* (*Iggereth ha-qodesh*) and *Law of Man* (*Torath ha-Adam*), which deal respectively with the sanctity of marriage and the solemnity of death, are full of intense spirituality, while at the same time treating of ritual customs—a combination which shows essential Rabbinism at its best. He occupies an important position in the history of the acceptance by medieval Jews of the Kabbala (*q.v.*); for, though he made no fresh contributions to the philosophy of mysticism, the fact that this famous rabbi was himself a mystic induced a favourable attitude in many who would otherwise have rejected mysticism as Maimonides did. In 1263 Naḥmanides was forced to enter into a public disputation with a Jewish-Christian, Pablo Christiani, in the presence of King James of Aragon. Though Nachmanides was assured that perfect freedom of speech was conceded to him, his defence was pronounced blasphemous and he was banished for life. In 1267 he went to Palestine and settled at Acre. He died about 1270.

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[1] Compare 2 Cor. xi. 32. The Nabataean Aretas or Aeneas there mentioned reigned from 9 B.C. to A.D. 40.

See S. Schechter, *Studies in Judaism*, first series, pp. 120 seq.; Graetz, *History of the Jews* (English translation vol. iii. ch. xvi. and xvii.). (I. A.)

NÁCHOD, a town of Bohemia, Austria, 109 m. E.N.E. of Prague by rail. Pop. (1900) 9899, mostly Czech. It is situated on the Mettau river, at the entrance of the Lewin-Nachod pass. The old castle contains a collection of historical paintings and archives, and there are several old churches, of which that of St Lawrence is mentioned as the parish church in 1350. The town originally gathered round the castle of Náchod, of which the first lord was a member of the powerful family of Hron, in the middle of the 13th century. It suffered much during the Hussite Wars, and in 1437 was captured by the celebrated robber knight Kolda of Žampach, and retaken by George of Podebrad in 1456 and included in his estates. It was sold in 1623, and in 1634 given to Ottavio Piccolomini; finally, after many changes of ownership, the castle and titular lordship came in 1840 to the princes of Schaumburg-Lippe. The important engagements fought near the town on the 27th and 28th of June 1866 opened Bohemia to the victorious Prussians.

NACHTIGAL, GUSTAV (1834–1885), German explorer in Central Africa, son of a Lutheran pastor, was born at Eichstedt in the Mark of Brandenburg, on the 23rd of February 1834. After medical study at the universities of Halle, Würzburg and Greifswald, he practised for a few years as a military surgeon. Finding the climate of his native country injurious to his health, he went to Algiers and Tunis, and took part, as a surgeon, in several expeditions into the interior. Commissioned by the king of Prussia to carry gifts to the sultan of Bornu in acknowledgment of kindness shown to German travellers, he set out in 1869 from Tripoli, and succeeded after two years' journeyings in accomplishing his mission. During this period he visited Tibesti and Borku, regions of the central Sahara not previously known to Europeans. From Bornu he went to Bagirmi, and, proceeding by way of Wadai and Kordofan, emerged from darkest Africa, after having been given up for lost, at Khartum in the winter of 1874. His journey, graphically described in his *Sahara und Sudan* (3 vols., 1879–1889), placed the intrepid explorer in the front rank of discoverers. On the establishment of a protectorate over Tunisia by France, Nachtigal was sent thither as consul-general for the German empire, and remained there until 1884, when he was despatched by Prince Bismarck to West Africa as special commissioner, ostensibly to inquire into the condition of German commerce, but really to annex territories to the German flag. As the result of his mission Togoland and Cameroon were added to the German empire. On his return voyage he died at sea off Cape Palmas on the 20th of April 1885, and was buried at Grand Bassam.

Nachtigal's travels are summarized in *Gustav Nachtigal's Reisen in der Sahara und im Sudan*, by Dr Albert Frankel (Leipzig, 1887). A French translation, by J. van Vollenhoven, of that part of his work concerning Wadai, appeared in the *Bull. du comité de l'Afriq. française* for 1903 under the title of "Le Voyage de Nachtigal au Ouadai." Nachtigal died before transcribing his notes on Wadai, and they were edited in the German edition by E. Groddeck.

NÁDASDY, TAMÁS I., Count, called the great palatine (1498–1562), Hungarian statesman, was the son of Francis I. Nádasdy and was educated at Graz, Bologna and Rome. In 1521 he accompanied Cardinal Cajetan (whom the pope had sent to Hungary to preach a crusade against the Turks) to Buda as his interpreter. In 1525 he became a member of the council of state and was sent by King Louis II. to the diet of Spires to ask for help in the imminent Turkish war. During his absence the Mohács catastrophe took place, and Nádasdy only returned to Hungary in time to escort the queen-widow from Komárom to Pressburg. He was sent to offer the Hungarian crown to the archduke Ferdinand, and on his coronation (Nov. 3rd, 1527) was made commandant of Buda. On the capture of Buda by Suleiman the Magnificent, Nádasdy went over to John Zapolya. In 1530 he successfully defended Buda against the imperialists. In 1533 his jealousy of the dominant influence of Ludovic Gritti caused him to desert John for Ferdinand, to whom he afterwards remained faithful. He was endowed with enormous estates by the emperor, and from 1537 onwards became Ferdinand's secret but most influential counsellor. Subsequently, as ban of Croatia-Slavonia, he valiantly defended that border province against the Turks. He did his utmost to promote education, and the school which he founded at Új-Sziget, where he also set up a printing-press, received a warm eulogy from Philip Melanchthon. In 1540 Nádasdy was appointed grand-justiciar; in 1547 he presided over the diet of Nagyszombat, and finally, in 1559, was elected palatine by the diet of Pressburg. In his declining years he aided the heroic Miklós Zrinyi against the Turks.

See Mihály Horváth, *The Life of Thomas Nádasdy* (Hung.) (Buda, 1838); T. Nádasdy, *Family correspondence of Thomas Nádasdy* (Hung.) (Budapest, 1882). (R. N. B.)

NADEN, CONSTANCE CAROLINE WOODHILL (1858–1889), English author, was born at Edgbaston, on the 24th of January 1858, her father being an architect. Her mother died just after the child's birth, and Constance was brought up in the home of her grandfather. In 1881 she began to study physical science at Mason College, Birmingham. In 1881 she published *Songs and Sonnets of Springtime*; in 1887, *A Modern Apostle, and other Poems*. Her poems made such an impression on W. E. Gladstone that he included her, in an article in the *Speaker*, among the foremost English poetesses of the day. After her grandfather's death Miss Naden found herself rich, and she travelled in the East and then (1888) settled in London. She died on the 23rd of December 1889. After 1876 she had paid increasing attention to philosophy, with her friend Dr Robert Lewins, and the two had formulated a system of their own, which they called "Hylo-Idealism." Her main ideas on the subject are contained in a posthumous volume of her essays (*Induction and Deduction*, 1890), edited by Dr Lewins.

NADIA, or Nuddea, a district of British India, in the Presidency division of Bengal. The administrative headquarters are at Krishnagar. Area, 2793 sq. m.; pop. (1901) 1,667,491. It is a district of great rivers. Standing at the head of the Gangetic delta, its alluvial surface, though still liable to periodical inundation, has been raised by ancient deposits of silt sufficiently high to be permanent dry land. Along the entire north-eastern boundary flows the main stream of the Ganges or Padmā, of which all the remaining rivers of the district are offshoots. The Bhāgirathī on the eastern border, and the Jalangi and the Matabhanga meandering through the centre of the district, are the chief of those offshoots, called distinctively the "Nadia rivers." But the whole surface of the country is interlaced with a network of minor streams, communicating with one another by side channels. All the rivers are navigable in the rainy season for boats of the largest burthen, but during the rest of the year they dwindle down to shallow streams, with dangerous sandbanks and bars. In former times the Nadia rivers afforded the regular means of communication between the upper valley of the Ganges and the seaboard; and much of the trade of the district still comes down to Calcutta by this route during the height of the rainy season. But the railways, with the main stream of the Ganges and the Sundarbans route, now carry by far the larger portion of the traffic. Rice is the staple crop; but the district is not as a whole fertile, the soil being sandy and the methods of cultivation backward. It is traversed by the main line and also by several branches of the Eastern Bengal railway. The battlefield of Plassey was situated in this district, but the floods of the Bhāgirathī have washed away some part of it.

NADIA or NABADWIP, an ancient capital of Bengal, was formerly situated on the east bank of the Bhāgirathī, which has since changed its course. Pop. (1901) 10,880. It is celebrated for the sanctity and learning of its pundits, and as the birthplace of Chaitanya, the Vaishnav reformer of the 16th century. Its Sanskrit schools, called *tols*, are well known and of ancient foundation.

NADĪM [Abulfaraj Maḥommed ibn Isḥāq ibn abī Yaʿqūb un-Nadīm] (d. 995), of Bagdad, the author of one of the most interesting works in Arabic literature, the *Fihrist ul-ʿUlūm* (“ list of the books of all nations that were to be found in Arabic ”) with notices of the authors and other particulars, carried down to the year 988. A note in the Leiden MS. places the death of the author eight years later. Of his life we know nothing. His work gives us a complete picture of the most active intellectual period of the Arabian empire. He traces the rise and growth of philology and belles-lettres, of theology, orthodox and heretical, of law and history, of mathematics and astronomy, of medicine and alchemy; he does not despise the histories of knights errant, the fables of Kalila and Dimna, the facetiae of the “ boon companions,” the works of magic and divination. But to us no part of his work is more interesting than his account of the beliefs of sects and peoples beyond Islam. Here, fortunately, still more than in other parts of his work, he goes beyond the functions of the mere cataloguer; he tells what he learned of China from a Christian missionary of Nejrān, of India from a description of its religion compiled for the Barmecide Yaḥya; his full accounts of the Sabians of Harran and of the doctrines of Mani are of the first importance for the historian of Asiatic religions.

Imperfect manuscripts of the *Fihrist* exist in Paris, Leiden and Vienna. The text was prepared for publication by G. Flügel, and edited after his death by J. Rödiger and A. Müller (2 vols., Leipzig, 1871–1872). Flügel had already given a full analysis of the work in the *Journal of the German Oriental Society*, vol. xiii. (1859), pp. 559-650; cf. E. G. Browne, *A Literary History of Persia* (London, 1902), pp. 383-387. T. Houtsma supplied a lacuna in Flügel's edition in the *Vienna Oriental Journal*, vol. iv. pp. 217 sqq.

NADIR (Arabic *nadīr*, “ opposite to,” used elliptically for *nadīr-es-semt*, “ opposite to the zenith ”), a term used in astronomy for the point in the heavens exactly opposite to the zenith, the zenith and nadir being the two poles of the horizon. It is thus used figuratively of the lowest depth of a person's spirits or the lowest point in a career.

NAEGELI, KARL WILHELM VON (1817–1891), Swiss botanist, was born on the 27th of March 1817 near Zurich. He studied botany under A. P. de Candolle at Geneva, and graduated with a botanical thesis at Zurich in 1840. His attention having been directed by M. J. Schleiden, then professor of botany at Jena, to the microscopical study of plants, he engaged more particularly in that branch of research. Soon after graduation he became *Privatdozent* and subsequently professor extraordinary, in the university of Zurich; in 1852 he was called to fill the chair of botany in the university of Freiburg-in-Breisgau; and in 1857 he was promoted to Munich, where he remained as professor until his death on the 11th of May 1891. Among his more important contributions to science were a series of papers in the *Zeitschrift für wissenschaftliche Botanik* (1844–1846); *Die neuern Algensysteme* (1847); *Gattungen einzelliger Algen* (1849); *Pflanzenphysiologische Untersuchungen* (1855–1858), with C. E. Cramer; *Beiträge zur wissenschaftlichen Botanik* (1858–1868); a number of papers contributed to the Royal Bavarian Academy of Sciences, forming three volumes of *Botanische Mitteilungen* (1861–1881); and, finally, his volume, *Mechanisch-physiologische Theorie der Abstammungslehre*, published in 1884.

The more striking of his many and varied discoveries are embodied in the *Zeitsch. für wiss. Bot.* In this we begin with Naegeli's extension of Robert Brown's discovery of the nucleus to the principal families of Cryptogams, and the assertion of its universal occurrence in plants, together with the recognition of its vesicular structure. There is further his investigation of the “ mucous layer ” (*Schleimschicht*) lining the wall of all normal cells, where he shows that it consists of granular “ mucus,” which, at an earlier stage, filled the cell-cavity, and which differs chemically from the cell-wall in that it is nitrogenous. This layer he proved to be never absent from living cells—to be, in fact, itself the living part of the cell, a discovery which was simultaneously (1846) made by Hugo von Mohl (1805–1872), who gave to the living matter of the plant-body the name “ protoplasm.” In connexion with these discoveries, Naegeli controverted Schleiden's view of the universality of free-cell-formation as the mode of cell-multiplication, and showed that in the vegetative organs, at least, new cells are formed by division. In the *Zeitschrift*, too, is Naegeli's most important algological work—such as the paper on *Caulerpa*, which brought to light the remarkable unseptate structure of the Siphoneae, and his research on *Delesseria*, which resulted in the discovery of growth by a single apical cell. This discovery led Naegeli on to the study of the growing-point in other plants. He consequently gave the first accurate account of the apical cell, and of the mode of growth of the stem in various Mosses and Liverworts. Subsequently he observed that in *Lycopodium* and in Angiosperms the growing-point has no apical cell, but consists of a small-celled meristem, in which the first differentiation of the permanent tissues can be traced. One of the most remarkable discoveries recorded in the *Zeitschrift* is that of the antheridia and spermatozoids of Ferns and of *Pilularia*. The *Beiträge zur wiss. Botanik* consists almost entirely of researches into the anatomy of vascular plants, while the main feature of the *Pflanzenphysiologische Untersuchungen* is the exhaustive work on the structure, development and various forms of starch-grains. The *Botanische Mitteilungen* include a number of papers in all departments of botany, many of them being continuations and extensions of his earlier work. In his *Theorie der Abstammungslehre* Naegeli introduced the idea of a definite material basis for heredity; the substance he termed “ idioplasm.” His theory of evolution is that the idioplasm of any one generation is not identical with that of either its progenitors or its progeny: it is always increasing in complexity, with the result that each successive generation marks an advance upon its predecessor. Hence variation takes place determinately, and in the higher direction only; while variability is the result of internal causes, and natural selection plays but a small part in evolution. Whereas, on the Darwinian theory, all organization is adaptive, according to Naegeli the development of higher organization is the outcome of the spontaneous evolution of the idioplasm.

More detailed accounts of Naegeli's life and work are to be found in *Nature*, 16th October 1891, and in *Proc. Roy. Soc.*, vol. li. (S. H. V.*)

NAESTVED, a town of Denmark, in the *amt* (county) of Praestö, near the S.W. coast of Zealand, 59 m. by rail S.W. of Copenhagen. Pop. (1901) 7162. From 1140 to the Reformation it was one of the most important towns of the kingdom, though dependent upon the monastery of St Peter (founded here in 1135). North of the town (1¼ m.) lies Herlufsholm, where Admiral Herluf Trolle founded a Latin school in 1567, still extant.

NAEVIUS, GNAEUS (*c.* 264–? 194 B.C.), Latin epic poet and dramatist. There is great uncertainty in regard to his life. From the expression of Gellius (i. 24. 1) characterizing his epitaph as written in a vein of “ Campanian arrogance ” it has been inferred that he was born in one of the Latin communities settled in Campania. But the phrase “ Campanian arrogance ” seems to have been used proverbially for “ gasconade ”; and, as there was a plebeian *gens Naevia* in Rome, it is quite as probable that he was by birth a Roman citizen. He served either in the Roman army or among the *socii* in the first Punic War, and thus must have reached manhood before 241. His career as a dramatic author began with the exhibition of a drama in or about the year 235, and continued for thirty years. Towards the close he incurred the hostility of some of the nobility, especially, it is said, of the Metelli, by the attacks which he made upon them on the stage, and at their instance he was imprisoned (Plautus, *Mil. Glor.* 211). After writing two plays during his imprisonment, in which he is said to have apologized for his former rudeness (Gellius iii. 3. 15), he was liberated through the interference of the tribunes of the commons; but he had shortly afterwards to retire from Rome (in or about 204) to Utica. It may have been during his exile, when withdrawn from his active career as a dramatist, that he composed or completed his poem on the first Punic war. Probably his latest composition was the epitaph already referred to, written like the epic in Saturnian verse:—

> "Immortales mortales si foret fas flere,
> Flerent divae Camenae Naevium poetam;
> Itaque postquam est Orci traditus thesauro
> Obliti sunt Romai loquier lingua Latina."[1]

If these lines were dictated by a jealousy of the growing ascendancy of Ennius, the life of Naevius must have been prolonged considerably beyond 204, the year in which Ennius began his career as an author in Rome. As distinguished from Livius Andronicus, Naevius was a native Italian, not a Greek; he was also an original writer, not a mere adapter or translator. If it was due to Livius that the forms of Latin literature were, from the first, moulded on those of Greek literature, it was due to Naevius that much of its spirit and substance was of native growth.

Like Livius, Naevius professed to adapt Greek tragedies and comedies to the Roman stage. Among the titles of his tragedies are *Aegisthus*, *Lycurgus*, *Andromache* or *Hector Proficiscens*, *Equus Trojanus*, the last named being performed at the opening of Pompey's theatre (55). The national cast of his genius and temper was shown by his deviating from his Greek originals, and producing at least two specimens of the *fabula praetexta* (national drama) one founded on the childhood of Romulus and Remus (*Lupus* or *Alimonium Romuli et Remi*), the other called *Clastidium*, which celebrated the victory of M. Claudius Marcellus over the Celts (222). But it was as a writer of comedy that he was most famous, most productive and most original. While he is never ranked as a writer of tragedy with Ennius, Pacuvius or Accius, he is placed in the canon of the grammarian Volcacius Sedigitus third (immediately after Caecilius and Plautus) in the rank of Roman comic authors. He is there characterized as ardent and impetuous in character and style. He is also appealed to, with Plautus and Ennius, as a master of his art in one of the prologues of Terence. His comedy, like that of Plautus, seems to have been rather a free adaptation of his originals than a rude copy of them, as those of Livius probably were, or an artistic copy like those of Terence. The titles of most of them, like those of Plautus, and unlike those of Caecilius and Terence, are Latin, not Greek. He drew from the writers of the old political comedy of Athens, as well as from the new comedy of manners, and he attempted to make the stage at Rome, as it had been at Athens, an arena of political and personal warfare. A strong spirit of partisanship is recognized in more than one of the fragments; and this spirit is thoroughly popular and adverse to the senatorial ascendancy which became more and more confirmed with the progress of the second Punic war. Besides his attack on the Metelli and other members of the aristocracy, the great Scipio is the object of a censorious criticism on account of a youthful escapade attributed to him. Among the few lines still remaining from his lost comedies, we seem to recognize the idiomatic force and rapidity of movement characteristic of the style of Plautus. There is also found that love of alliteration which is a marked feature in all the older Latin poets down even to Lucretius. In one considerable comic fragment attributed to him—the description of a coquette—there is great truth and shrewdness of observation. But we find no trace of the exuberant comic power and geniality of his great contemporary.

He was not only the oldest native dramatist, but the first author of an epic poem (*Bellum Punicum*)—which, by combining the representation of actual contemporary history with a mythical background, may be said to have created the Roman type of epic poetry. The poem was one continuous work, but was divided into seven books by a grammarian of a later age. The earlier part of it treated of the mythical adventures of Aeneas in Sicily, Carthage and Italy, and borrowed from the interview of Zeus and Thetis in the first book of the *Iliad* the idea of the interview of Jupiter and Venus; which Virgil has made one of the cardinal passages in the *Aeneid*. The later part treated of the events of the first Punic war in the style of a metrical chronicle. An important influence in Roman literature and belief, which had its origin in Sicily, first appeared in this poem—the recognition of the mythical connexion of Aeneas and his Trojans with the foundation of Rome. The few remaining fragments produce the impression of vivid and rapid narrative, to which the flow of the native Saturnian verse, in contradistinction to the weighty and complex structure of the hexameter, was naturally adapted.

The impression we get of the man is that, whether or not he actually enjoyed the full rights of Roman citizenship, he was a vigorous representative of the bold combative spirit of the ancient Roman commons. He was one of those who made the Latin language into a great organ of literature. The phrases still quoted from him have nothing of an antiquated sound, while they have a genuinely idiomatic ring. As a dramatist he worked more in the spirit of Plautus than of Ennius, Pacuvius, Accius or Terence; but the great Umbrian humorist is separated from his older contemporary, not only by his breadth of comic power, but by his general attitude of moral and political indifference. The power of Naevius was the more genuine Italian gift—the power of satiric criticism—which was employed in making men ridiculous, not, like that of Plautus, in extracting amusement from the humours, follies and eccentricities of life. Although our means of forming a fair estimate of Naevius are scanty, all that we do know of him leads to the conclusion that he was far from being the least among the makers of Roman literature, and that with the loss of his writings there was lost a vein of national feeling and genius which rarely reappears.

Fragments (dramas) in L. Müller, *Livi Andronici et Cn. Naevi Fabularum Reliquiae* (1885), and (*Bellum Punicum*) in his edition of Ennius (1884); monographs by E. Klussmann (1843); M. J. Berchem (1861); D. de Moor (1877); Mommsen, *History of Rome*, bk. iii., ch. 14. On Virgil's indebtedness to Naevius and Ennius, see V. Crivellari, *Quae praecipue hausit Vergilius ex Naevio et Ennio* (1889).

NAEVUS, a term in surgery signifying that form of tumour which is almost entirely composed of enlarged blood-vessels. There are three principal varieties: (1) the capillary naevus, consisting of enlarged capillaries, frequently of a purplish colour, hence the term "port-wine stain"; (2) the venous naevus, in which the veins are enlarged, of a bluish colour; (3) the arterial naevus, in which there is distinct pulsation, it being composed of enlarged and tortuous arteries. The naevus can be lessened in size by pressure. It generally occurs in the skin or immediately under it; sometimes it lies in the mouth in connexion with the mucous membrane. It is often congenital, hence the term "mother's mark," or it may appear in early childhood. It often grows rapidly, sometimes slowly, and sometimes growth is checked, and it may gradually diminish in size, losing its vascularity and becoming fibrous and non-vascular. This natural cure is followed by less deformity than a cure by artificial means. Various methods are used by surgeons when an operation is called for: (1) the tumour may be excised; (2) a ligature tightly tied may be applied to the base of the tumour; (3) inflammation may be set up in the growth by the injection of irritating agents,—in this way its vascularity may be checked and the formation of fibrous tissue encouraged; (4) the blood in the enlarged vessels may be coagulated by the injection of coagulating agents or by electrolysis.

NAGA HILLS, a district of British India in the Hills division of Eastern Bengal and Assam. It forms part of the mountainous borderland lying between the Brahmaputra valley and Upper Burma. Area, 3070 sq. m.; pop. (1901) 102,402. Towards the N. lie the Patkoi hills, over which British jurisdiction has never been extended; but since 1904 the southern tract, formerly known as the "area of political control," has been incorporated in the district, thus extending its E. boundary from the Dikho to the Tizic river. The whole country forms a wild expanse of forest, mountain and stream. The valleys are covered with dense jungle, dotted with small lakes and marshes. Coal is known to exist in many localities, as well as iron ore and petroleum. The administrative headquarters of the district are at Kohima (pop. 3093), which is garrisoned by two companies of native infantry and a battalion of military police. The Dimapur-Manipur cart-road crosses the hills, connecting Kohima with the Assam-Bengal railway.

Naga means "naked," and is the term applied by the Assamese to the wild tribes of the hills, of which the chief clans are called Angami, Ao, Shota, Sema and Rengma. These tribes have shown extraordinary obstinacy in their resistance to the British arms. Between 1832 and 1849 ten armed expeditions were despatched to chastise them, and from 1866 to 1887 there were eight more, a record which exceeds that of the most turbulent tribes on the North-West Frontier. Since 1892, however, little trouble has been experienced.

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[1] "If it were permitted that immortals should weep for mortals, the divine Camenae would weep for Naevius the poet; for since he hath passed into the treasure-house of death men have forgotten at Rome how to speak in the Latin tongue."

See *Naga Hills District Gazetteer* (Calcutta, 1905).

NAGAR, formerly Bednur, a village and ruined city of Mysore, India; pop. (1901) 715. About 1640 the seat of government of the rajas of Keladi was transferred to this place. When taken by Hyder Ali in 1763, it is said to have yielded a plunder of twelve millions. In 1783 it surrendered to a British detachment under General Matthews, but being shortly after invested by Tippoo Sultan, the garrison capitulated on condition of safe conduct to the coast. Tippoo violated the stipulation, put General Matthews and the principal officers to death, and imprisoned the remainder of the force.

NĀGĀRJUNA, a celebrated Buddhist philosopher and writer. He is constantly quoted in the literature of the later schools of Buddhism, and a very large number of works in Sanskrit is attributed to him. None of these has been critically edited or translated; and there is much uncertainty as to the exact date of his career, and as to his opinions. The most probable date seems to be the early part of the 3rd century A.D. He seems to have been born in the south of India, and to have lived under the patronage of a king of southern Kosala, the modern Chattisgarh. Chinese and Tibetan authorities differ as to the name of this monarch; but it apparently is meant to represent an Indian name Sātavāhana, which is a dynastic title, not a personal name. Of the works he probably wrote one was a treatise advocating the Mādhyamaka views of which he is the reputed founder; another a long and poetical prose work on the stages of the Bodhisattva career; and a third a voluminous commentary on the *Mahāprajñā-pāramitā Sūtra.* Chinese tradition ascribes to him special knowledge of herbs, of astrology, of alchemy and of medicine. Two medical treatises, one on prescriptions in general, the other on the treatment of eye-disease, are said, by Chinese writers, to be by him. Several poems of a didactic character are also ascribed to him. The best known of these poems is *The Friendly Epistle* addressed to King Udayana. A translation into English of a Tibetan version of this piece has been published by Dr Wenzel.

Authorities.—H. Wenzel, Journal of the *Pali Text Society* (1866), pp. 1-32; T. Watters, *On Yuan Chwāng*, ed. by Rhys Davids and S. W. Bushell (London, 1904–1905). Tāranātha's *Geschichte des Buddhismus in Indien*, trans. Anton Schiefner (Leipzig, 1869); W. Wassiljew, *Der Buddhismus* (Leipzig, 1860). (T. W. R. D.)

NAGASAKI, a town on the south-west of the island of Kiushiu, Japan, in 32° 44′ N., 129° 51′ E., with 163,324 (1905) inhabitants, and a foreign settlement containing a population of 400 (excluding Chinese). The first port of entry for ships coming from the south or the west to Japan, it lies at the head of a beautiful inlet some 3 m. long, which forms a splendid anchorage, and is largely used by ships coming to coal and by warships. Marine products, coal and cotton goods are the chief exports, and raw cotton, iron, as well as other metals and materials used for shipbuilding, constitute the principal imports. The value of imports approaches £2,000,000 annually. That of exports has fluctuated considerably. In 1889 it was £1,005,367, but in 1894 it was only £444,839, and does not generally exceed £450,000. The most important industries of the town are represented by the engine works of Aka-no-ura, three large docks and a patent slip, the property of the Mitsu Bishi Company. Steamers of over 6000 tons have been constructed at these docks, which, as well as the engine works, are situated on the western shore of the inlet. The brisk atmosphere of business that pervades them does not reach the town on the eastern side, which lies under the shadow of forests of tombstones that cover the over-looking hills. Nagasaki is noted as a coaling station. The coal is obtained chiefly from Takashima, an islet 8 m. S.E. of the entrance to the harbour, and in lesser quantities from two other islets, Naka-no-shima and Ha-shima, which lie about 1 m. farther out. These sources of supply, however, show signs of exhaustion. There are several favourite health resorts in the neighbourhood of Nagasaki, notably Unzen, with its sulphur springs.

Nagasaki owed its earliest importance to foreign intercourse. Originally called Fukae-no-ura (Fukae Bay), it was included in the fief of Nagasaki Kotaro in the 12th century, and from him it took its name. But it remained an insignificant village until the 16th century, when, becoming the headquarters of Japanese Christianity, and subsequently the sole emporium of foreign trade in the hands of the Dutch and the Chinese, it developed considerable prosperity. The opening of the port of Moji for export trade deprived Nagasaki of its monopoly as a coaling station, and the visits of war vessels were reduced when Russia acquired Port Arthur, Great Britain Wei-hai-wei and Germany Kiaochow. On the north side of the channel by which the harbour is entered there stands a cliff called Takaboko, which, under the name of Pappenberg, has long been rendered notorious by a tradition that thousands of Christians were precipitated from it in the 17th century because they refused to trample on the Cross. It has been conclusively proved that the legend is untrue.

NAGAUR or Nagore, a town in India, in Jodhpur state of Rajputana, with a station on the Jodhpur-Bikanir railway. Pop. (1901) 13,377. Nagaur is surrounded by a wall more than 4 m. in circuit. It has given its name to a famous breed of cattle.

NÄGELSBACH, CARL FRIEDRICH (1806–1859), German classical scholar, was born at Wöhrd near Nuremburg on the 28th of March 1806. After studying at Erlangen and Berlin, he accepted in 1827 an appointment at the Nuremberg gymnasium, and was professor of classics at Erlangen from 1842 till his death on the 21st of April 1859. Nägelsbach is chiefly known for his excellent *Lateinische Stilistik* (1846; 9th ed. by Ivan Müller, 1905). Two other important works by him are *Die Homerische Theologie* (1840; 3rd ed. by G. Autenrieth, 1886) and *Die Nachhomerische Theologie* (1857).

See J. L. Doederlein, *Gedächtnissrede für Herrn K. F. Nägelsbach* (1859); article by G. Autenrieth in *Allgemeine Deutsche Biographie*, xxiii. (1886).

NAGINA, a town of British India, in Bijnor district of the United Provinces, on the Oudh & Rohilkhand railway, 48 m. N.W. of Moradabad. Pop. (1901) 21,412. There is considerable trade in sugar, besides manufactures of guns, glassware (especially bottles for the use of pilgrims carrying the sacred water of the Ganges from Hardwar), ebony wares, hemp-sacking and cotton cloth.

NAGODE, a native state of Central India, in the Baghelkhand agency. Area, 501 sq. m. Pop. (1901) 67,092, showing a decrease of 20% in the decade, due to famine; estimated revenue, £11,000. The chief, whose title is raja, is a Rajput of the Parihar clan. The town of Nagode is 17 m. W. of the British station of Sutna. Pop. (1901) 3887. It was formerly a military cantonment, and has an Anglo-vernacular school and dispensary. The former capital (until 1720) was Unchahra.

NAGOYA, the capital of the province of Owari, Japan, on the great trunk railway of Japan, 235 m. from Tokyo and 94 m. from Kioto. Pop. (1903) 284,829. It is the fifth of the chief cities in Japan. It lies near the head of the shallow Isenumi Bay, about 30 m. from the port of Yokkaichi, with which it communicates by light-draught steamers and by rail. The castle of Nagoya, erected in 1610, never suffered in war, but in modern times became a military depôt; the interior contains much splendid decoration. The central keep of the citadel is a remarkable structure, covering close upon half an acre, but rapidly diminishing in each of its five storeys till the top room is only about 12 yds. square. Gabled roofs and hanging rafters break the almost pyramidal outline; and a pair of gold-plated dolphins 8 ft. high form a striking finial. Both were removed in 1872, and one of them was at the Vienna Exhibition in 1873; but they have been restored to their proper site. The religious buildings of Nagoya include a very fine Buddhist temple, Higashi Hongwanji. Nagoya is well known as one of the great seats of the pottery trade; 13½ m. distant are the potteries of Seto, where the first glazed pottery made in Japan was produced by Kato Shirozaemon, after a visit to China in 1229. From Kato's time Seto continued, during several centuries, to be the chief centre of ceramic production in Japan, the manufacture of porcelain being added to that of pottery in the 19th century. All the products of the flourishing industry now carried on there and at other places in the province are transported to Nagoya, for sale there or for export. Cotton mills have been established, and an extensive business is carried on in the embroidery of handkerchiefs. Another of its celebrated manufactures is *arimatsu-shibori*, or textile fabrics (silk or cotton), dyed so as to show spots in relief from which the colour radiates. It is further distinguished as the birthplace of *cloisonné* enamelling in Japan, all work of that nature before 1838—when a new departure was made by Kaji Tsunekichi—having been for purposes of subordinate decoration. Quantities of *cloisonné* enamels are now produced in the town.

NAGPUR, a city, district and division of British India, in the Central Provinces. The city is 1125 ft. above the sea; railway station, 520 m. E. of Bombay. Pop. (1901) 127,734. The town is well laid out, with several parks and artificial lakes, and has numerous Hindu temples. The prettily wooded suburb of Sitabaldi contains the chief government buildings, the houses of Europeans, the railway station and the cantonments, with fort and arsenal. In the centre stands Sitabaldi Hill, crowned with the fort. Beyond the station lies the broad sheet of water known as the Jama Talao, and farther east is the city, completely hidden in a mass of foliage. Handsome tanks and gardens, constructed by the Mahratta princes, lie outside the city. The palace, built of black basalt and profusely ornamented with wood carving, was burnt down in 1864, and only the great gateway remains. The garrison consists of detachments of European and native infantry from Kampti. Nagpur is the headquarters of two corps of rifle volunteers. It is the junction of two important railway systems—the Great Indian Peninsula to Bombay and the Bengal-Nagpur to Calcutta. The large weaving population maintain their reputation for producing fine fabrics. There are steam cotton mills and machinery for ginning and pressing cotton. The gaol contains an important printing establishment. Education is provided by two aided colleges—the Hislop and the Morris, called after a missionary and a former chief commissioner; four high schools; a law school; an agricultural school, with a class for the scientific training of teachers; a normal school; a zenana mission for the management of girls' schools; an Anglican and two Catholic schools for Europeans. There are several libraries and reading rooms, and an active Anjuman or Mahommedan society.

The District of Nagpur has an area of 384 sq. m. Pop. (1901) 751,844. It lies immediately below the great tableland of the Sātpura range. A second line of hills shuts in the district on the south-west, and a third runs from north to south, parting the country into two plains of unequal size. These hills are all offshoots of the Sātpuras, and nowhere attain any great elevation. Their heights are rocky and sterile, but the valleys and lowlands yield rich crops of corn and garden produce. The western plain slopes down to the river Wardhā, is watered by the Jām and Madār, tributaries of the Wardhā, and contains the most highly-tilled land in the district, abounding in fruit trees and the richest garden cultivation. The eastern plain (six times the larger), stretching away to the confines of Bhandāra and Chānda, consists of a rich undulating country, luxuriant with mango groves and dotted towards the east with countless small tanks. It is watered by the Kanhān, with its tributaries, which flows into the Waingangā beyond the district. The principal crops are millets, wheat, oil-seeds and cotton. There are steam factories for ginning and pressing cotton at the military cantonment of Kampti, which was formerly the chief centre of trades. An important new industry is manganese mining. The district is traversed by the two lines of railway which meet at Nagpur city, and several branches are under construction.

The Division of Nagpur comprises the five districts of Nagpur, Bhandāra, Chānda, Wardhā and Balaghat. Area, 23,521 sq. m. Pop. (1901) 3,728,063, showing a decrease of 9% in the decade. See *Nagpur District Gazetteer* (Bombay, 1908).

NAGYKANIZSA, a town of Hungary, in the county of Zala, 137 m. S.W. of Budapest by rail. Pop. (1900) 23,255. It possesses distilleries and brick-making factories, and has trade in cereals and cattle. Nagykanizsa once ranked as the second fortress of Hungary, and consequently played an important part during the wars with the Turks, who, having gained possession of it in 1600, held it until, in 1690, after a siege of two years, it was recovered by the Austrian and Hungarian forces. In 1702 the fortifications were destroyed.

NAGYKIKINDA, a town of Hungary, in the county of Torontál, 152 m. S.E. of Budapest by rail. Pop. (1900) 24,843, of which about 60% are Servians. Being one of the centres of production of the famous wheat of the Banat, its flour industry is important. Fruit-farming and cattle-rearing are extensively carried on in the neighbourhood.

NAGYSZEBEN (Ger. *Hermannstadt*, Rumanian *Sibiu*), a town of Hungary, in Transylvania, the capital of the county of Szeben, 122 m. S.S.E. of Kolozsvar by rail. Pop. (1900) 26,077, of whom 16,141 were Saxons (Germans), 7106 Rumanians, and 5747 Magyars. It is beautifully situated at an altitude of 1411 ft. in the fertile valley of the Cibin (Hungarian, *Szeben*), encircled on all sides by the Transylvanian Alps. It is the seat of a Greek Orthodox (Rumanian) archbishop, and of the superintendent of the Protestants for the Transylvanian circle. Some parts of Nagyszeben have a medieval appearance, with houses built in the old German style. The most noteworthy of its public buildings is the handsome Protestant Church, begun in the 14th century and finished in 1520, in the Gothic style, containing a beautiful cup-shaped font, cast by Meister Leonhardus in 1438, and a large mural painting of the Crucifixion by Johannes von Rosenau (1445). In the so-called New Church, comprising the west part of the whole building, which is an addition of the 16th century, are many beautiful memorials of Saxon notables. Other buildings are: the Roman Catholic parish church, founded in 1726; the church of the Ursuline nuns, built in 1474; the town hall, an imposing building of the 15th century, purchased by the municipality in 1545 and containing the archives of the "Saxon nation." The Brukenthal palace, built in 1777–1787 by Baron Samuel von Brukenthal (1721–1803), governor of Transylvania, contains an interesting picture-gallery with good examples of the Dutch school, and a library. The museum contains a natural history section with the complete fauna and flora of Transylvania, and a rich ethnographical section. Nagyszeben has a law academy, a seminary for Greek Orthodox priests, a military academy and several secondary schools. There are manufactures of cloth, linen, leather, caps, boots, soap, candles, ropes, as well as breweries and distilleries.

The German name of the town is traceable to Hermann, a citizen of Nuremberg, who about the middle of the 12th century established a colony on the spot. In the 13th century it bore the name of *Villa Hermanni*. Under the last monarchs of the native Magyar dynasty Hermannstadt enjoyed exceptional privileges, and its commerce with the East rose to importance. In the course of the 15th and 16th centuries it was several times besieged by the Turks. At the beginning of 1849 it was the scene of several engagements between the Austrians and Hungarians; and later in the year it was several times taken and retaken by the Russians and Hungarians.

NAGYSZOMBAT (Ger. *Tyrnau*), a town of Hungary, in the county of Pozsony, 115 m. N.W. of Budapest by rail. Pop. (1900) 12,422. It is situated on the Trnava, and has played an important rôle in the ecclesiastical history of Hungary. It gained prominence after 1543, when the archbishop of Esztergom and primate of Hungary made it his residence after the capture of Esztergom by the Turks. In consequence numerous churches and convents were built, and the town acquired the title of "Little Rome." It possesses a Roman Catholic seminary for priests, and was the seat of a university founded in 1635, which was transferred to Budapest in 1777. In 1820 the archbishop's residence was again removed to Esztergom. It has an active trade in cereals and cattle.

NAGY-VÁRAD (Ger. *Grosswardein*), a town of Hungary, capital of the county of Bihar, 153 m. E.S.E. of Budapest by rail. Pop. (1900) 47,018. It is situated in a plain on both banks of the river Sebeskörös, and is the seat of a Roman Catholic and of a Greek (Old-United) bishopric. Among its principal buildings are the St Ladislaus parish church, built in 1723, which contains the remains of the king St Ladislaus (d. 1095), the Roman Catholic cathedral, built in 1752–1779, the Greek cathedral, the large palace of the Roman Catholic bishop, built in 1778 in the rococo style, the archaeological and historical museum, with an interesting collection of ecclesiastical art, and the county and town hall. Among the educational establishments are a law academy, a seminary for priests, a modern school, a Roman Catholic and a Calvinistic gymnasium, a commercial academy, a training school for teachers and a secondary school for girls. Nagy-Várad is an important railway junction; it possesses extensive manufactures of pottery and large distilleries, and carries on a brisk trade in agricultural produce, cattle, horses, fruit and wine. About 6 m. S. of the town is the village of Hajó, which contains the Püspök Fürdö or Bishop's Baths, with warm saline and sulphurous waters (92° to 103° F.), used both for drinking and bathing in cases of anaemia and scrofula.

Nagy-Várad is one of the oldest towns in Hungary. Its bishopric was founded by St Ladislaus in 1080. The town was destroyed by the Tatars in 1241. Peace was concluded here on the 24th of February 1538 between Ferdinand I. of Austria and his rival John Zápolya, voivode of Transylvania. In 1556 it passed into the possession of Transylvania, but afterwards reverted to Austria. In 1598 the fortress was unsuccessfully besieged by the Turks, but it fell into their hands in 1660 and was recovered by the Austrians in 1692. The Greek Old-United or Catholic bishopric was founded in 1776.

NAHE, a river of Germany, a left-bank tributary of the Rhine, rises near Selbach in the Oldenburg principality of Birkenfeld. For some distance it forms the boundary between the Bavarian Palatinate and the Prussian Rhine Province, and it falls into the Rhine at Bingen. Its length is 78 m., but it is too shallow and rocky to be navigable. Its picturesque valley, through which runs the railway from Bingerbrück to Neunkirchen, is largely visited by tourists.

See Schneegans, *Geschichte des Nahetals* (Kreuznach, 1890).

NAHUATLAN STOCK, a North and Central American Indian stock. Nahuas or Nahuatlecas was the collective name for the dominant Indian peoples of Mexico at the time of the Spanish conquest, and the Nahuatlan stock consisted of the Nahuas (or Aztecs) and a few scattered tribes in Central America.

NAHUM (Hebrew for "rich in comfort [is God]"), an Old Testament prophet. The name occurs only in the book of Nahum; in Nehemiah vii. 7 it is a scribal error for "Rehum." Of the prophet himself all that is known is the statement of the title that he was an *Elkoshite*. But the locality denoted by the designation is quite uncertain. Later tradition associated Nahum with the region of Nineveh, against which he prophesied, and hence his tomb has been located at a place bearing the name of *Alkush* near Mosul (anc. *Nineveh*) and is still shown.[1] According to Jerome, the prophet was a native of a village in Galilee, which bore the name of Elkesi in the 4th century A.D. (the Galilean town of Capernaum, which probably means "village of Nahum," may also point in the same direction; but cf. John vii. 29, which seems to imply that in the time of Christ no prophet was supposed to have come out of Galilee). E. Nestle has proposed to locate Elkesi "beyond Betogabra" (*i.e.* Eleutheropolis, mod. *Beit Jibrin*) in the tribe of Simeon (cf. *Pal. Expl. Fund Quart. Statement*, 1879, pp. 136-138).

Book of Nahum.—The original heading of Nahum's prophecy is contained in the second part of the superscription: "[The book of] the vision of Nahum the Elkoshite" (cf. the similar headings in Isaiah, Obadiah and Habakkuk). The first part ("Oracle concerning Nineveh") is a late editorial insertion, but correctly describes the main contents of the little book.

Contents of the Book. (1) *Chapters i. and ii.*—The prophecy against Nineveh in its present form really begins with chap. ii. 1, followed immediately by *v.* 3, and readily falls into three parts, viz. (*a*) ii. 1, 3-10; (*b*) ii. 11-13; and (*c*) iii. Here (*a*) describes in language of considerable descriptive power the assault on Nineveh—the city is mentioned by name in ii. 8 (9 Heb. text)—its capture and sack; (*b*) contains an oracle of Yahweh directed against the king of Assyria ("Behold, I am against thee, saith the Lord of Hosts," *v.* 13); (*c*) again gives a vivid picture of war and desolation which are to overtake and humiliate Nineveh, as they have already overtaken No-Amon (*i.e.* Egyptian Thebes, *vv.* 8-10); the defence is pictured as futile and the ruin complete. The absence of distinctly religious motive from these chapters is remarkable; the divine name occurs only in the repeated refrain, "Behold, I am against thee, saith the Lord of Hosts," ii. 13, iii. 5. They express little more than merely human indignation at the oppression of the world-power, and picture with undisguised satisfaction the storm of war which overwhelms the imperial city.

(2) *Chapter i.* forms the exordium to the prophecy of doom against Nineveh in the book as it lies before us. Its tone is exalted, and a fine picture is given of Yahweh appearing in judgment: "The Lord (Yahweh) is a jealous God and avengeth; the Lord avengeth and is full of wrath." The effects of the divine anger on the physical universe are forcibly described (*vv.* 3-6); on the other hand, God cares for those "that put their trust in Him" (*v.* 7), but overwhelms His enemies (*vv.* 8-12*a*); in the following verses (12*b*-15) the joyful news is conveyed to Judah of the fall of the oppressor:—"Behold upon the mountains the feet of him that bringeth good tidings, that publisheth peace! Keep thy feasts, O Judah, perform thy vows; for the wicked one shall no more pass through thee; he is utterly cut off" (*v.* 15).

Regarding chap. i. and ii. 2(=i. and ii. 1, 3, Heb. text) there has been much discussion in recent years. It was long ago noticed that traces of an alphabetic acrostic survive in this section of the book; throughout the whole of chap. i. there is no reference to Nineveh, though in some of the verses (8-12*a*, 14) the enemies of Yahweh are addressed, who have usually been identified with the people or city of Nineveh; in *vv.* 12*b*, 13 and (certainly) *v.* 15 (=ii. 1 Heb.) Judah appears to be addressed. The text of i. 1-15, ii. 1-2 has been reconstructed by H. Gunkel and G. Bickell so as to form a complete alphabetic psalm with contents of an eschatological character, and is regarded by them as a later addition to the book. It may be a "generalizing supplement" prefixed by the editor, possibly because the original introduction to the oracle had been mutilated. It is generally held by critical scholars that i. 1-8, 13, 15, and ii. 2 certainly do not proceed from Nahum; i. 9-12 may, however, belong to the prophet. The phenomena are conflicting and a completely satisfactory solution seems to be impossible.

Date of Nahum's Oracle.—The date of the composition of Nahum's prophecy must lie between 607–606, when Nineveh was captured and destroyed by the Babylonians and Medes, and the capture of Thebes (No-Amon) which is alluded to in iii. 8–10. This was effected for the second time and most completely by Assur-bani-pal in 663 or 662 B.C. The tone of the prophecy suggests, on the one hand, that the fall of Nineveh is imminent, while, on the other, the reference to Thebes suggests that the disaster that had befallen it was still freshly remembered. On the whole a date somewhat near 606 is more probable. It is noteworthy that no reference is made to the restoration of the northern kingdom of Israel, or the return of its exiles. The poetry of the book is of a high order.

Bibliography.—The Commentaries on the Minor Prophets, especially those of J. Wellhausen, D. W. Nowack and K. Marti (all German); G. A. Smith, *The Book of the Twelve Prophets* (2 vols.); A. B. Davidson, *Nahum, Habakkuk and Zephaniah* (Camb. Bible, 1896). (G. H. Bo.)

NAIK, or Nayak, from a Sanskrit word meaning a leader, a title used in India in various senses. In the army it denotes a rank corresponding to that of corporal; and Hyder Ali of Mysore was proud of being called Haidar Naik, analogous to "le petit caporal" for Napoleon. It was also the title of the petty dynasties that arose in S. India on the downfall of the Hindu empire of Vijayanagar in the 16th century.

NAIL (O. Eng. *naegal*, cf. Dutch, Ger., Swed. *nagel*; the word is also related to Lat. *unguis*, Gr. ὄνυξ, Sans. *nakhās*) a word applied both to the horny covering to the upper surface of the extremities of the fingers and toes of man and the Quadrumana (see Skin and Dermal Skeleton), and also to a headed pin or spike of metal, commonly of iron. The principal use of nails is in woodwork (joinery and carpentery), but they are also employed in numerous other trades. Size, form of head, nature of point, and special uses all give names to different classes of nails. Thus we have tacks, sprigs and brads for very small nails; rose, clasp and clout, according to the form of head; and flat points or sharp points according to the taper of the spike. According to the method of manufacture nails fall into four principal classes: (1) hand-wrought nails; (2) machine-wrought and cut nails; (3) wire or French nails; and (4) cast nails.

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[1] Jonah's grave has been located similarly in Nineveh itself.

The nailer handicraft was formerly a great industry in the country around Birmingham. The nails are forged from nail-rods heated in a small smith's hearth, hammered on an anvil, the nail length cut off on a chisel and the head formed by dropping the spike into a hole in a "bolster" of steel, from which enough of the spike is left projecting to form the head. In the case of clasp nails the head is formed with two strokes of the hammer, while rose nails require four. The heads of the larger-sized nails are made with an "oliver" or mechanical hammer, and for ornamental or stamped heads "swages" or dies are employed. The conditions of life and labour among the hand nailers in England were exceedingly unsatisfactory: married women and young children of both sexes working long hours in small filthy sheds attached to their dwellings; their employment was controlled by middle-men or nail-masters, who supplied them with the nail-rods and paid for work done, sometimes in money and sometimes in kind on the truck system. Machine-wrought and cut nails have supplanted most corresponding kinds of hand-made nails. Horse nails are still made by hand-labour. These are made from the finest Swedish charcoal iron, hammered out to a sharp point. They must be tough and homogeneous throughout, so that there may be no danger of their breaking over and leaving portions in the hoof.

In 1617 Sir D. Bulmer devised a machine for cutting nail-rods, and in 1790 T. Clifford patented a device for shaping the rods, but the credit of perfecting machinery mainly belongs to American enterprise (the first American patent appears to be that of Ezekiel Reed, dated 1786). The machine, fed with heated (to black heat only) strips of metal, usually mild steel, having a breadth and thickness sufficient for the nail to be made, shears off by its slicer the "nail blank," which, falling down, is firmly clutched at the neck till a heading die strikes against its upper end and forms the head, the completed nail passing out through an inclined shoot. In large nails the taper of the shank and point is secured by the sectional form to which the strips are rolled; brads, sprigs and small nails, on the other hand, are cut from uniform strips in an angular direction from head to point, the strip being turned over after each blank is cut so that the points and heads are taken from opposite sides alternately, and a uniform taper on two opposite sides of the nail, from head to point, is secured. The machines turn out nails with wonderful rapidity, varying with the size of the nails produced from about 100 to 1000 per minute. Wire or French nails are made from round wire, which is unwound, straightened, cut into lengths and headed by a machine either by intermittent blows or by pressure, but the pointing is accomplished by the pressure of dies. Cast nails, which are cast in sand moulds by the ordinary process, are used principally for horticultural purposes, and the hob-nails or tackets of shoemakers are also cast.

See Peter Barlow, *Encyclopaedia of Arts, Manufactures and Machinery* (1848); Bucknall Smith, *Wire, Its Manufacture and Uses* (New York, 1891).

NAIL VIOLIN (Ger. *Nagelgeige*, *Nagelharmonica*), a musical curiosity invented by Johann Wilde, a musician in the imperial orchestra at St Petersburg. The nail violin or harmonica consists of a wooden soundboard about 1½ ft. long and 1 ft. wide bent into a semicircle. In this soundboard are fixed a number of iron or brass nails of different lengths, tuned to give a chromatic scale. Sound is produced by friction with a strong bow, strung with black horsehair. An improved instrument, now in the collection of the Hochschule in Berlin, has two half-moon sound-chests of different sizes, one on the top of the other, forming terraces. In the rounded wall of the upper sound-chest are two rows of iron staples, the upper giving the diatonic scale, and the lower the intermediate chromatic semitones. History records the name of a single virtuoso on this instrument, which has a sweet bell-like tone but limited technical possibilities; he was a Bohemian musician called Senal, who travelled all over Germany with his instrument about 1780–1790. (K. S.)

NAINI TAL, a town and district of British India, in the Kumaon division of the United Provinces. The town is 6400 ft. above sea-level. Pop. (1901) 7609. Naini Tal is a popular sanatorium for the residents in the plains, and the summer head-quarters of the government of the province. It is situated on a lake, surrounded by high mountains, and is subject to landslides; a serious catastrophe of this kind occurred in September 1880. The approach from the plains is by the Rohilkhand and Kumaon railway from Bareilly, which has its terminus at Kathgodam, 22 m. distant by cart road. There are several European schools, besides barracks and convalescent depôt for European soldiers.

The DISTRICT OF NAINI TAL comprises the lower hills of Kumaon and the adjoining Tarai or submontane strip. Area, 2677 sq. m. Pop. (1901) 311,237, showing a decrease of 15·4% in the decade. The district includes the Gagar and other foothills of the Himalayas, which reach an extreme height of nearly 9000 ft. The Bhabar tract at their base consists of boulders from the mountains, among which the hill streams are swallowed up. Forests cover vast tracts of the hill-country and the Bhabar. Beyond this is the Tarai, moist and extremely unhealthy. Here the principal crops are rice and wheat. In the hills a small amount of tea is grown, and a considerable quantity of fruit. The only railway is the line to Kathgodam.

See *Naini Tal District Gazetteer* (Allahabad, 1904).

NAIRN, a royal, municipal and police burgh and county town of Nairnshire, Scotland. Pop. of the royal burgh (1901) 5089. It is situated on the Moray Firth, at the mouth of the Nairn and on its left bank, 15¼ m. N.E. of Inverness by the Highland railway. The town, though of immemorial age, shows no signs of its antiquity, being bright, neat and modern. It attracts many summer visitors by its good sea bathing and excellent golf-course. The industries include salmon fishing, deep-sea fishing, the making of rope and twine and the freestone quarries of the neighbourhood. There is a commodious harbour with breakwater and pier. Nairn belongs to the Inverness district group of parliamentary burghs (Forres, Fortrose, Inverness and Nairn). Nairn was originally called Invernarne (the mouth of the Nairn). It was made a royal burgh by Alexander I. (d. 1124), but this charter having been lost it was confirmed by James VI. in 1589.

NAIRNE, CAROLINA, BARONESS (1766–1845), Scottish song writer, was born in the "auld hoose" of Gask, Perthshire, on the 16th of August 1766. She was descended from an old family which had settled in Perthshire in the 13th century, and could boast of kinship with the royal race of Scotland. Her father, Laurence Oliphant, was one of the foremost supporters of the Jacobite cause, and she was named Carolina in memory of Prince Charles Edward. In the schoolroom she was known as "pretty Miss Car," and afterwards her striking beauty and pleasing manners earned for her the name of the "Flower of Strathearn." In 1806 she married W. M. Nairne, who became Baron Nairne (see below) in 1824. Following the example set by Burns in the *Scots Musical Museum*, she undertook to bring out a collection of national airs set to appropriate words. To the collection she contributed a large number of original songs, adopting the signature "B. B."—"Mrs Bogan of Bogan." The music was edited by R. A. Smith, and the collection was published at Edinburgh under the name of the *Scottish Minstrel* (1821–1824). After her husband's death in 1830 Lady Nairne took up her residence at Enniskerry, Co. Wicklow, but she spent much time abroad. She died at Gask on the 26th of October 1845.

Her songs may be classed under three heads: (1) those illustrative of the characters and manners of the old Scottish gentry, such as "The Laird o' Cockpen," "The Fife Laird," and "John Tod"; (2) Jacobite songs, composed for the most part to gratify her kinsman Robertson, the aged chief of Strowan, among the best known of which are perhaps "Wha 'll be King but Charlie?" "Charlie is my darling," "The Hundred Pipers," "He's owre the Hills," and "Bonnie Charlie's noo awa"; and (3) songs not included under the above heads, ranging over a variety of subjects from "Caller Herrin'" to the "Land o' the

Leal." For vivacity, genuine pathos and bright wit her songs are surpassed only by those of Burns.

Lady Nairne's husband, William Murray Nairne (1757–1830). He was descended from Sir Robert Nairne of Strathord (*c.* 1620–1683), a supporter of Charles II., who was created Baron Nairne in 1681. After his death without issue the barony passed to his son-in-law, Lord William Murray (*c.* 1665–1726), the husband of his only daughter Margaret (1669–1747) and a younger son of John Murray, 1st marquess of Athole. William, who took the name of Nairne and became 2nd Baron Nairne, joined the standard of the Jacobites in 1715; he was taken prisoner at the battle of Preston and was sentenced to death. He was, however, pardoned, but his title was forfeited. His son John (*c.* 1691–1770), who but for this forfeiture would have been the 3rd Baron Nairne, was also taken prisoner at Preston, but he was soon set at liberty. In the rising of 1745 he was one of the Jacobite leaders, being present at the battles of Prestonpans, of Falkirk and of Culloden, and consequently he was attainted in 1746; but escaped to France. His son John (d. 1782) was the father of William Murray Nairne, who, being restored to the barony of Nairne in 1824, became the 5th baron. The male line became extinct when his son William, the 6th baron (1808–1837), died unmarried. The next heir was a cousin, Margaret, Baroness Keith of Stonehaven Marischal (1788–1867), wife of Auguste Charles Joseph, comte de Flahaut de la Billarderie, but she did not claim the title. In 1874, however, the right of her daughter, the wife of the 4th marquess of Lansdowne, was allowed by the House of Lords.

For Lady Nairne's songs, see *Lays from Strathearn, arranged with Symphonies and Accompaniments for the Pianoforte by Finlay Dun* (1846); vol. i. of the *Modern Scottish Minstrel* (1857); *Life and Songs of the Baroness Nairne, with a Memoir and Poems of Caroline Oliphant the Younger*, edited by Charles Rogers (1869, new ed. 1886). See also T. L. Kington-Oliphant, *Jacobite Lairds of Gask* (1870).

NAIRNSHIRE, a north-eastern county of Scotland, bounded W. and S. by Inverness-shire, E. by Elginshire and N. by the Moray Firth. It has an area of 103,429 acres or 161·6 sq. m., and a coast line of 9 m. and is the fourth smallest county in Scotland. The seaboard, which is skirted by sandbanks dangerous to navigation, is lined by low dunes extending into Elginshire. Parallel with the coast there is a deposit of sand and gravel about 90 ft. high stretching inland for 4 or 5 m. This and the undulating plain behind are a continuation westward of the fertile Laigh of Moray. From this region southward the land rises rapidly to the confines of Inverness-shire, where the chief heights occur. Several of these border hills exceed 2000 ft. in altitude, the highest being Carn Glas (2162 ft.). The only rivers of importance are the Findhorn and the Nairn, both rising in Inverness-shire. The Findhorn after it leaves that county takes a mainly north-easterly direction down Strathdearn for 17 m. and enters the sea to the north of Forres in Elginshire after a total course of 70 m. The Nairn, shortly after issuing from Strathnairn, flows towards the N.E. for 12 m. out of its complete course of 38 m. and falls into the Moray Firth at the county town. There are eight lochs, all small, but the loch of Clans is of particular interest because of its examples of crannogs, or lake-dwellings. Nairnshire contains many beautiful woods and much picturesque and romantic scenery.

Geology.—The county is divided geologically into two clearly-marked portions. The southern and larger portion is composed of the eastern, Dalradian or younger Highland schists with associated granite masses; this forms all the higher ground. The low-lying northern part of the country bordering Moray Firth is occupied by Old Red Sandstone. The schistose rocks are mainly thin bedded micaceous gneisses, schists and quartzites; between Dallaschyle and Creag an Daimb a more massive higher horizon appears in the centre of a synclinal fold. Porphyritic gneiss is found on the flanks of Carn nan tri-tighearnan. The schists are frequently intersected by dikes of granite, amphibolite, &c. Three masses of granite are found penetrating the schists; the largest lies on the eastern boundary and extends from about Lethen Bar Hill southward by Ardclach and Glenferness to the Bridge of Dulsie. The second mass on the opposite side of the county belongs mainly to Inverness but the granite reaches into Nairn on the slopes of Bein nan Creagan and Ben Buidhe Mhor. A smaller mass near Rait Castle, with large pink crystals of orthoclase, has been employed as a building stone. On the denuded surface of the schists the Old Red Sandstone was deposited and formerly doubtless covered most of the county; outlying patches still remain near Drynachan Lodge and near Highland Boath in Muckle Burn. The Lower Old Red rocks are basal breccias followed by shales with calcareous nodules containing fossil fish. The Upper Old Red, which is found usually nearer the coast, is unconformable on the Lower series; it consists of red shales and clays and obliquely bedded sandstones. Glacial deposits are widely spread; they comprise a Lower Boulder Clay, a series of gravels and sands, followed by an Upper Boulder Clay, above which comes a series of gravel deposits forming ridges on the moorland between the Nairn and Findhorn rivers. A fine kame, resting on the plain of sand and gravel, lies between Meikle Kildrummie and Loch Flemington, south of the railway. Traces of the old marine terraces at 100 ft., 50 ft. and 25 ft. are found near the coast, as well as considerable accumulations of blown sand.

Climate and Industries.—The climate is healthy and equable. The temperature for the year averages 47° F., for January 38° F., and for July, 58° F. The mean annual rainfall is 25 in. The soil of the alluvial plain, or Laigh, is light and porous and careful cultivation has rendered it very fertile; and there is some rich land on the Findhorn. Although the most advanced methods of agriculture are in use, but a small proportion of the surface is capable of tillage, only one-fifth of the whole area being under crops. The hills are mostly covered with heath and pasture, suitable for sheep, and cattle are kept on the lower lying ground. The county accords many facilities for sport. A few distilleries, some sandstone and granite quarries and the sea and salmon fisheries of the Nairn practically represent the industries of the shire, apart from agriculture. The Highland Railway from Forres to Inverness crosses the north of the shire.

Population and Government.—In 1891 the population numbered 9155 and in 1901 it was 9291, or 57 persons to the sq. m. Besides the county town of Nairn (pop. 5089), there are the parishes of Ardclach (pop. 772), and Auldearn (pop. of parish 1292, of village 313). Nairn and Elgin shires combine to return one member to parliament, and the county town belongs to the Inverness district group of parliamentary burghs (Forres, Fortrose, Inverness and Nairn). The shire forms a sheriffdom with Inverness and Elgin and a sheriff-substitute sits alternately at Nairn and Elgin.

History.—The country was originally peopled by the Gaelic or northern Picts. Stone circles believed to have been raised by them are found at Moyness, Auldearn, Urchany, Ballinrait, Dalcross and Croy, the valley of the Nairn being especially rich in such relics. To the north of Dulsie Bridge is a monolith called the Princess Stone. A greater number of the mysterious prehistoric stones with cup-markings occur in Nairn than anywhere else in Scotland. Mote hills are also common. Whether there was any effective Roman occupation of the land so far north is an open question, but there is little evidence of it in Nairn, beyond the occasional finding of Roman coins. Columba and his successors made valiant efforts to Christianize the Picts, but it was long before their labours began to tell, although the saint's name was preserved late in the 19th century in the annual fair at Auldearn called "St Colm's Market," while to his biographer Adamnan—corrupted into Evan or Wean—was dedicated the church at Cawdor, where an old Celtic bell also bears this name. By the dawn of the 10th century the Picts had been subdued with the help of the Norsemen, and Nairn, which was one of the districts colonized by the Scandinavians, as part of the ancient province of Moray, soon afterwards became an integral portion of the kingdom of Scotland. Macbeth was one of the kings that Moray gave to Scotland, and his name and memory survive to the present day. Hardmuir, between Brodie and Nairn, is the reputed heath where Macbeth met the witches. Territorially Moray was greatly contracted in the reign of David I., and thenceforward the history of Nairn merges in the main in that of the bishopric and earldom of Moray (see Elgin). The thane of Cawdor was constable of the king's castle at Nairn, and when the heritable sheriffdom was established towards the close of the 14th century this office was also filled by the thane of the time.

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NAIROBI, capital of the British East Africa protectorate and of the province of Ukamba, 327 m. by rail N.W. of Mombasa and 257 m. S.E. of Port Florence on Victoria Nyanza. Pop.

(1907) 4737, including 350 Europeans and 1752 Indians. Nairobi is built on the Athi plains, at the foot of the Kikuyu hills and 5450 ft. above the sea; it commands magnificent views of Kilimanjaro and Mt. Kenya. It is the headquarters of the Uganda railway, of the military forces in the protectorate, and of the Colonists' Association. It is divided into European, Indian and native quarters. Midway between the European and Indian quarters stands the town hall. The other public buildings include railway works, places of worship (Protestant, Roman Catholic, Mahommedan and Hindu) and schools, an Indian bazaar, a general hospital and waterworks—the water being obtained from springs 13 m. distant.

The site of Nairobi was selected as the headquarters of the Uganda railway, and the first buildings were erected in 1899. For some time nearly all its inhabitants were railway officials and Indian coolies engaged in the construction of the line. In 1902 the surrounding highlands were found to be suitable for European settlement, and Nairobi speedily grew in importance; in 1907 the headquarters of the administration were transferred to it from Mombasa. The town is provided with clubs, cricket and athletic grounds and a racecourse.

NAIVASHA, the name of a lake, town and province, in British East Africa. The lake, which is roughly circular with a diameter of some 13 m., lies at an altitude of 6135 ft. on the crest of the highest ridge in the eastern rift-valley between the Kikuyu escarpment on the east and the Mau escarpment on the west. It is fed from the north by the rivers Gilgal and Morendat, but has no known outlet. The rivers, which have a minimum discharge of 100 cub. ft. per second, run in deep gullies. The water of the lake is fresh; the shore in many places is lined with papyrus. North and north-west the lake is closed in by the volcanic Buru hills; to the south towers the extinct volcano of Longonot. Hippopotami and otters frequent the lake, and on an island about 1 m. from the shore are large numbers of antelopes and other game. Naivasha was discovered in 1883 by Gustav Adolf Fischer (1848–1886), one of the early explorers of the Tana and Masai regions, and the first to demonstrate the continuance of the rift-valley through equatorial Africa. Fischer was followed later in the same year by Joseph Thomson, the Scottish explorer. The railway from Mombasa to Victoria Nyanza skirts the eastern side of the lake, and on the railway close to the lake is built the town of Naivasha, 6230 ft. above the sea, 391 m. N.W. by rail of Mombasa and 193 m. S.E. by rail of Port Florence on Victoria Nyanza. Naivasha province contains much land suitable for colonization by white men, and large areas were leased to Europeans by the British authorities in 1903 and subsequent years. The East Africa Syndicate acquired a lease of 500 sq. m. in the valley of the Gilgal and surrounding country north of Lake Naivasha. North-west of the lake and along the Molo river the 3rd Lord Delamere obtained a grant of 155 sq. m.

NAJARA, ISRAEL BEN MOSES, Hebrew poet, was born in Damascus and wrote in the latter part of the 16th century (1587–1599). He was inspired by the mystical school, and his poems are marked by their bold, sensuous images, as well as by a depth of feeling unequalled among the Jewish writers of his age. He often adapted his verses to Arabic and Turkish melodies. To tunes which had been associated with light and even ribald themes, Najara wedded words which reveal an intensity of religious emotion which often takes a form indistinguishable from love poetry. Some pietist contemporaries condemned his work for this reason; but this did not prevent many of his poems from attaining wide popularity and from winning their way into the prayer-book. In fact, Najara could claim the authority of the Biblical "Song of Songs" (mystically interpreted) for his combination of the language of human love with the expression of the relationship between God and humanity.

He published during his lifetime a collection of his poems, *Songs of Israel* (*Zemiroth Israel*), in Safed in 1587; an enlarged edition appeared in Venice (1599–1600). Others of his poems were published at various times, and W. Bacher has described some previously unknown poems of Najara (*Revue des études juives*, Nos. 116 seq.).

NAJIBABAD, a town of British India, in the Bijnor district of the United Provinces, 31 m. S.E. of Hardwar. Pop. (1901) 19,568. It was founded in the middle of the 18th century by a Rohilla chief, and still contains several architectural monuments of Rohilla magnificence. It has a station on the Oudh & Rohilkhand railway, with a junction for the branch to Kotdwara. There is considerable trade in timber, sugar and grain, and manufactures of metal-ware, shoes, blankets and cotton cloth.

NAKHICHEVAN, or NAKHJEVAN, a city of Russian Armenia, in the government of Erivan, 85 m. S.E. of the town of Erivan. It occupies the brow of a spur of the Kara-bagh mountains, 2940 ft. above the sea, and looks out over the valley of the Aras. Pop. (1863) 6251, (1897) 8845. Built and rebuilt again and again, Nakhichevan is full of half-obliterated evidences of former prosperity. The present houses have for the most part been quarried from ancient ruins; of the palace of the princes of Azerbaijan there remains a gateway with a Persian inscription, flanked by two brick towers; and at a little distance stands the so-called Tower of the Khans, a richly decorated twelve-sided structure, 102 ft. in circumference and 75 ft. in height, dating, to judge by the inscription which runs around the cornice, from the 12th century. There are also ruins of a large mosque. Situated on the highroad to Tabriz and Teheran, Nakhichevan has a large transit trade. In the Persian period the city is said to have had 40,000 inhabitants; the population now consists chiefly of Tatars and Armenians, who carry on gardening, make wine and produce silk, salt and millstones.

Armenian tradition claims Noah as the founder of Nakhichevan (the *Naxuana* of Ptolemy), and a mound of earth in the city is still visited by many pilgrims as his grave. Laid waste by the Persians in the 4th century, Nakhichevan sank into comparative insignificance, but by the 10th century had recovered its prosperity. In 1064 it was taken by Alp Arslan, sultan of the Seljuk Turks, and in the 13th century it fell a prey to the Mongols of Jenghiz Khan. It afterwards suffered frequently during the wars between the Persians, Armenians and Turks, and it finally passed into Russian possession by the peace of Turkman-chai in 1828.

NAKHICHEVAN-ON-THE-DON, a town of southern Russia, in the Don Cossacks territory, 6 m. by rail N.E. of the town of Rostov and on the right bank of the Don. Pop. (1900) 30,883. It was founded in 1780 by Armenian immigrants. It soon became a wealthy place, and still is the administrative centre of the "Armenian district," a narrow strip along the banks of the Don, with a population of 27,250. The town has tobacco and wadding factories, tallow-melting works, soap-works, brickworks and tanneries. There is a large trade in cereals and timber.

NAKHON SRI TAMMARAT (also known as LAKHON and formerly as LIGORE), a town of southern Siam, in the division of the same name, about 380 m. S. of Bangkok, on the east coast of the Malay Peninsula. It is one of the most ancient cities of Siam, and contains many buildings and ruins of antiquarian interest. The trade consists chiefly of the export of rice. In the bay, a short distance off, ships can lie safely at all seasons. The population (7000) is chiefly Siamese, but there is an admixture of Burmese, the descendants of prisoners of war and of refugees from Tenasserim. The town is the headquarters of a governor under the high commissioner at Singora. It has for long been a centre of the American Presbyterian Mission to Siam. It was once the capital of a feudatory state, the chief of which ruled the greater part of the Malay Peninsula in the name of the kings of Siam and bore the brunt of all the wars with Malacca and other Malay states. It lies, however, north of the limit of Malay expansion, and has never at any time come under Malay rule. With the fall of the Siamese capital of Ayuthia in 1767 it became independent, but returned to its allegiance on the founding of Bangkok. In the 17th century British, Portuguese and Dutch merchants had factories here and carried on an extensive trade.

NAKSKOV, a seaport of Denmark, in the *amt* (county) of Maribo, on a wide bay of the Laalands belt at the west end of the island of Laaland, 31 m. by rail W. of Nykjöbing. Pop. (1901) 8310. The church dates from the beginning of the 15th century. There is a large sugar factory. A great dike, extending S.E. to Rödby (20 m.), protects the coast against inundation, a serious inroad of the sea having occurred in 1872.

NAMAQUALAND, a region of south-western Africa, extending along the west coast over 600 m. from Damaraland (22° 43′ S.) on the north to 31° S., and stretching inland 80 to 350 m. It is divided by the lower course of the Orange river into two portions—Little Namaqualand to the south and Great Namaqualand to the north. Little Namaqualand forms part of Cape Colony (*q.v.*), and Great Namaqualand is the southern portion of German South-West Africa (*q.v.*). The people of Namaqualand are the purest surviving type of Hottentots, and number some twenty to thirty thousand.

NAMASUDRA, the name adopted by the great caste or tribe who inhabit the swamps of Eastern Bengal, India, whom the higher castes are wont to designate by the opprobrious term of *Chandal*. Their number in 1901 exceeded 2 millions; but if the cognate Pods and also the Mahommedans of the same ethnical stock were to be added, the total would probably reach 11 millions.

NAME (O. Eng. *nama*; cognate forms in Teutonic languages are Dutch *naam*, Ger. *Name*, &c., but the word is common to all Indo-European languages; cf. Gr. ὄνομα, Lat. *nomen*, Sans. *nāman*, &c.), the distinguishing appellation by which a person, place, thing or class of persons or things is known.

Local Names.—The study of names and of their survival in civilization enables us in some cases to ascertain what peoples inhabited districts now tenanted by races of far different speech. Thus the names of mountains and rivers in many parts of England are Celtic—for example, to take familiar instances, Usk, Esk and Avon. There are also local names (such as Mona, Monmouth, Mynwy and others) which seem to be relics of tribes even older than the Celtic stocks, and "vestiges of non-Aryan people, whom the Celts found in possession both on the Continent and in the British Isles."[1] The later English name is sometimes the mere translation, perhaps unconscious, of the earlier Celtic appellation, often added to the more ancient word. Penpole Point in Somerset is an obvious example of this redoubling of names. The pre-Aryan place-names of the Aegean are much discussed by philologists. Such a name as Corinthos, with all other words in *nthos*, as hyacinthos, is thought to be pre-Hellenic. The river-names Gade, Ver, Test and many other monosyllabic river-names in the home counties, appear to be neither English nor Celtic, but have been neglected, being known to few but anglers and rustics. As to the meaning and nature of ancient local names, they are as a rule purely descriptive. A river is called by some word which merely signifies "the water"; a hill has a name which means no more than "the point," "the peak," "the castle." Celtic names are often of a more romantic tone, as Ardnamurchan, "the promontory by the great ocean," an admirable description of the bold and steep headland which breasts the wash of the Atlantic. As a general rule the surviving Celtic names, chiefly in Ireland, Wales and Scotland, all contain some wide meaning of poetic appropriateness. The English names, on the other hand, commonly state some very simple fact, and very frequently do no more than denote property, such and such a town or hamlet, "ton" or "ham," is the property of the Billings, Uffings, Tootings, or whoever the early English settlers in the district may have been. The same attachment to the idea of property is exhibited in even the local names of petty fields in English parishes. Occasionally one finds a bit of half-humorous description, as when a sour, starved and weedy plot is named "starvacre"; but more usually fields are known as "Thompson's great field," "Smith's small field," "the fouracre," or the like. The name of some farmer or peasant owner or squatter of ancient date survives for centuries, attached to what was once his property. Thus the science of local names has a double historical value. The names indicate the various races (Celtic, Roman and English in Great Britain) who have set in the form of names the seal of their possession on the soil. Again, the meanings of the names illustrate the characters of the various races. The Romans have left names connected with camps (castra, chesters) and military roads; the English have used simple descriptions of the baldest kind, or have exhibited their attachment to the idea of property; the Celtic names (like those which the red men have left in America, or the blacks in Australia) are musical with poetic fancy, and filled with interest in the aspects and the sentiment of nature. The British race carries with it the ancient names of an older people into every continent, and titles perhaps originally given to places in the British Isles by men who had not yet learned to polish their weapons of flint may now be found in Australia, America, Africa and the islands of the farthest seas. Local names were originally imposed in a handy local manner. The settler or the group of cave-men styled the neighbouring river "the water," the neighbouring hill "the peak," and these terms often still survive in relics of tongues which can only be construed by the learned.

Personal Names.—The history of personal names is longer and more complex, but proceeds from beginnings almost as simple. But in personal names the complexity of human character, and the gradual processes of tangling and disentangling the threads of varied human interest, soon come in, and personal names are not imposed once and for all. Each man in very early societies may have many names, in different characters and at different periods of his life. The oldest personal names which we need examine here are those which indicate, not an individual, but a group, held together by the conscious sense or less conscious sentiment of kindred, or banded together for reasons of convenience. An examination of customs prevalent among the most widely separated races of Asia, Africa, Australia and America proves that groups conceiving themselves to be originally of the same kin are generally styled by the name of some animal or other object (animate or inanimate) from which they claim descent. This object is known as the "totem" (see TOTEMISM). The groups of supposed kin, however widely scattered in local distribution, are known as wolves, bears, turtles, suns, moons, cockatoos, reeds and what not, according as each group claims descent from this or that stock, and sometimes wears a mark representing this or that animal, plant or natural object. Unmistakable traces of the same habit of naming exist among Semitic and Teutonic races, and even among Greeks and Romans. The names chosen are commonly those of objects which can be easily drawn in a rude yet recognizable way, and easily expressed in the language of gesture. In addition to the totem names (which indicate, in each example, supposed blood-kindred), *local* aggregates of men received local names. We hear of the "hill-men," "the cave-men," "the bush-men," "the coast-men," the "men of the plain," precisely as in the old Attic divisions of Aktaioi, Pediaioi and so forth. When a tribe comes to recognize its own unity, as a rule it calls itself by some term meaning simply "the men," all other tribes being regarded as barbarous or inferior. Probably other neighbouring tribes also call themselves "the men" in another dialect or language, while the people in the neighbourhood are known by an opprobrious epithet, as *Rakshasas* among the early Aryan dwellers in India, or *Eskimo* (raw-eaters) in the far north of the American continent. Tribal names in Australia are often taken from the tribal term for "yes" or "no"; cf. Languedoc.

Leaving social for personal names, we find that, among most uncivilized races, a name (derived from some incident or natural object) is given at the time of birth by the parents of each newborn infant. Occasionally the name is imposed before the child is born, and the proud parents call themselves father and mother of such an one before the expected infant sees the light. In most cases the name (the earliest name) denotes some phenomenon of nature; thus Dobrizhofer met in the forests a young man styled "Gold flower of day," that is, "Dawn," his father having been named "Sun." Similar names are commonly given by the natives of Australia, while no names are more common among North-American Indians than those derived from sun, moon, cloud and wind.

The names of savage persons are not permanent. The name first given is ordinarily changed (at the ceremony answering to confirmation in the church) for some more appropriate and descriptive nickname, and that, again, is apt to be superseded by various "honour-giving names" derived from various exploits. The common superstition against being "named" has probably produced the custom by which each individual has a secret name and is addressed, when possible, by some wide term of kinship—"brother," "father" and the like. The bad luck which in Zulu customs as in Vedic myths attends the utterance of the real name is evaded by this system of addresses. Could we get a savage—an Iroquois, for example—to explain his titles, we would find that he is, say, "Morning Cloud" (by birth-name), "Hungry Wolf" (by confirmation name), "He that raises the white fellow's scalp" (by honour-giving name), of the Crane totem (by kinship and hereditary name, as understood by ourselves). When society grows so permanent that male kinship and paternity are recognized, the custom of patronymics is introduced. The totem name gives place to a gentile name, itself probably a patronymic in form; or, as in Greece, the gentile name gives place to a local name, derived from the deme. Thus a Roman is called Caius; Julius is his gentile name (of the Julian clan); Caesar is a kind of hereditary nickname A Greek is Thucydides (the name usually derived from the grandfather), the son of Olorus, of the deme of Halimusia.

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[1] Elton, *Origins of English History*, p. 165; Rhys, *Lectures on Celtic Philology*, pp. 181, 182.

This system of names answered the purposes of Greek and Roman civilization. In Europe, among the Teutonic races, the stock-names (conceivably totemistic in origin) survive in English local names, which speak of the "ton" or "ham" of the Billings or Tootings. An examination of these names, as collected in Kemble's *Anglo-Saxons*, proves that they were frequently derived from animals and plants. Such English names as "Noble Wolf" (Ethelwulf), "Wolf of War" and so forth, certainly testify to a somewhat primitive and fierce stage of society. Then came more vulgar nicknames and personal descriptions, as "Long," "Brown," "White" and so forth. Other names are directly derived from the occupation or craft (Smith, Fowler, Sadler) of the man to whom they were given, and yet other names were derived from places. The noble and landowner was called "of" such and such a place (the German *von* and French *de*). while the humbler man was called not "of" but "at" such a place, as in the name "Attewell," or merely by the local name without the particle. The "de" might also indicate merely the place of a person's birth or residence; it was not a proof of *noblesse*. If we add to these names patronymics formed by the addition of "son," and terms derived from Biblical characters (the latter adopted after the Reformation as a reaction against the names of saints in the calendar), we have almost exhausted the sources of modern English and European names. A continual development of custom can be traced, and the analysis of any man's family and Christian names will lead us beyond history into the manners of races devoid of literary records. (A. L.)

Greek Names.—The Greeks had only one, and no family, name; hence the name of a child was left to the discretion of the parents. The eldest son generally took the name of his paternal grandfather, girls that of their grandmother. Genuine patronymics (Phocion, son of Phocus), analogous compounds (Theophrastus, son of Theodorus), or names of similar meaning (Philumenus, son of Eros) also occur. Athenaeus divides names generally into (1) *θεοφόρα*, chiefly derivatives or compounds of the names of gods (Demetrius, Apollonius, Theodorus, Diodotus, Heraclitus, Diogenes); (2) *ἄθεα*, simple or variously compounded names, especially such as were of good omen for a son's future career (Aristides, Pericles, Sophocles, Alexander), although such hopes were frequently belied by the results. Instances of a subsequent change of name are not uncommon; thus, Plato and Theophrastus were originally Aristocles and Tyrtamus.

To obviate the ambiguity and confusion arising from the use of a single name, various expedients were adopted, the commonest being to add the father's name—*Δημοσθένης Δημοσθένους*, *Ἀλκιβιάδης ὁ Κλεινίου*. Sometimes the birthplace was added—*Ἡρόδοτος Ἀλικαρνασσεύς*, *Θουκυδίδης ὁ Ἀθηναῖος*, and sometimes the name of the deme (see CLEISTHENES), *e.g.* *Δημοσθένης Παιανεύς*. Nicknames denoting mental or bodily defects or striking peculiarities (*e.g.* colour of hair) were also favourite methods of discrimination (*e g.* *Ξανθός*, yellow).

Roman Names.—Towards the end of the republic free-born Romans were distinguished by three names and two (or even four) secondary indications. In an inscription the name of Cicero is given in the following form: M. Tullius M.f. M.n. M.pr. Cor(nelia tribu) Cicero. M (=Marcus) is the *praenomen*; Tullius, the *nomen*, the gentile or family name; Cicero, the *cognomen*. This order, always preserved, is the correct one. M.f. (=Marci filius), M.n. (=Marci nepos), M.pr. (=Marci pronepos), Cor(nelia tribu) are only used in formal description.

Praenomen (corresponding to the modern Christian name).—Varro gives a list of 32 *praenomina*, of which 14 had fallen out of use in Sulla's time, the remaining 18 being confined to patrician families. Some of these appear to have been appropriated by particular families, *e.g.* Appius by the Claudii, Mamercus by the Aemilii. In the case of plebeian families there was greater latitude and a larger variety of names, but those which became ennobled followed the patrician usage. After the time of Sulla some of the old *praenomina* were revived, unless they are rather to be regarded as *cognomina*, which in some families displaced the *praenomen* proper, as in the case of a certain Africanus Aemilius Regulus.

The *nomen* (*gentile*, *gentilicium*) belonged to all the individual members of the *gens* and those in any way connected with it (wives, clients, freedmen). In patrician *gentes* the *nomina* nearly all ended in *-ius* (*-aeus*, *-eius*, *-eus*), and are perhaps a sort of patronymic (Iulius from Iulus). In some cases the name indicates the place of origin (Norbanus, Acerranus); *-acus* (Divitiacus) is peculiar to Gallic, *-na* (Caecina, Perperna) to Etruscan, *-enus* (Arulenus) to Umbrian names. Verres as a gentile name stands by itself; perhaps it was originally a cognomen.

The *cognomen* ("surname") was the name given to a Roman citizen as a member of a *familia* or branch of the *gens*, whereby the family was distinguished from other families belonging to the same *gens*. *Cognomina* were either of local origin (Calatinus, Sabinus); or denoted physical peculiarities or moral characteristics (Crassus, Longus, Lentulus, Lepidus, Calvus, Naso); or they were really *praenomina* (Cossus, Agrippa) or derivatives from *praenomina* or *cognomina* (Sextinus, Corvinus, Laevinus). The *tria nomina* ("three names") in the well-known passage of Juvenal (v. 127) was probably at that time a mark of *ingenuitas* rather than of *nobilitas*.

In addition to these three regular names, many Romans had a fourth, *cognomen secundum* (*agnomen* was an introduction of the grammarians of the 4th century). These "second surnames" were chiefly bestowed in recognition of great achievements—Asiaticus, Africanus, Creticus, or were part of the terminology in cases of adoption.

Persons adopted took all the three names of their adoptive father, but at the same time, to keep his origin in mind, they added a second *cognomen*, a derivative in *-anus* or *-inus* from his old gentile name; thus, Publius Cornelius Scipio Aemilianus, son of Lucius Aemilius Paullus, adopted by Publius Cornelius Scipio. After the time of Sulla, the derivative was no longer used, one of the old names being substituted without change—Marcus Terentius Varro Lucullus. Under the empire no fixed rule was observed, the most remarkable thing being the very large number of names borne by one person (as many as 36 occur on an inscription). Especially in the army and amongst the lower orders, nicknames (*signa*, *vocabula*) are of frequent occurrence. Well-known examples are: *Caligula*; *cedo alteram* ("another stick, please!"), given to a centurion of flogging propensities; *manus ad ferrum* ("hand on sword,") of Aurelian when tribune.

Women originally took the name of the head of the family—Caecilia (filia) Metelli, Metella Crassi (uxor). Later, f. (=filia) was added after the name of a daughter. Towards the end of the republic women are denoted by their gentile name alone, while under the empire they always have two—the *nomen* and *cognomen* of the father (Aemilia Lepida, daughter of Lucius Aemilius Lepidus Paullus), or the *nomen* of both father and mother (Valeria Attia, daughter of Attius Atticus and Valeria Sextina).

Slaves originally had no name, but simply took their master's *praenomen* in the genitive followed by -por (=*puer*): Marcipor, Publipor, Quintipor. Later, when the number of slaves was largely increased, by way of distinction names similar to those common in Greece (national, physical or moral qualities) or simply foreign names were given them. The word *puer* was subsequently replaced by *servus* and the form of the name ran: Aphrodisius Ploti Gai servus; under the empire, Eleutherus C. Julii Florentini (the natural order being preserved in the master's name). When a slave exchanged one master for another, he adopted the name of his old master in an adjectival form in *-anus*. Cissus Caesaris (servus) Maecenatianus (formerly a slave of Maecenas). Freedmen used their own name as a *cognomen* and took the *nomen* of him who gave them their freedom and any *praenomen* they pleased: L. Livius Andronicus, freedman of M. Livius Salinator. In the time of Caesar, the freedman took the *praenomen* of the *patronus* and the gentile name of one of the friends of the latter; thus, Cicero calls his slave Dionysius M. Pomponius Dionysius as a token of friendship for T. Pomponius Atticus. (J. H. F.)

Law.—The Christian name, *i.e.* the name given to a person on admission to baptism into the Christian church, dates back to the early history of the Church. It has been said that the practice of giving a name on baptism was possibly imitated from the Jewish custom of giving a personal name at circumcision. In England individuals were for long distinguished by Christian names only, and the surname (see below) or family name is still totally ignored by the Church. As population increased and intercourse became general, it became necessary to employ some further name by which one man might be known from another, and in process of time the use of surnames became universal, the only exceptions in England being the members of the royal family, who sign by their baptismal names only.

Where the ecclesiastical law does not come into conflict with the common law or has not been changed by it, it still prevails, and therefore it may be said that the name given at baptism may be regarded as practically unalterable. But that a baptismal name is not altogether unalterable has been a matter of contention. A constitution of Archbishop Peckham (ob. 1292) directs that "ministers shall take care not to permit wanton names to be given to children baptized, and if otherwise it be done, the same shall be changed by the bishop at confirmation." And before the Reformation the Office for Confirmation must have contemplated the possibility of such a change, as the bishop is directed therein to ask the child's name before anointing him with the chrism, and afterwards, naming him, to sign him with the cross. But in the second and subsequent Prayer-books all mention of the name in the Office for Confirmation is omitted. Lord Coke was of opinion that such a change was permissible and gives examples (1 *Inst.* p. 3), but Dr Burn (*Ecc. Law*, i. 80) held a contrary opinion. Phillimore, however, gives several instances when such a change was made, one, in the diocese of Liverpool, on the 11th of June 1886 (see Phillimore, *Ecc. Law*, i. 517, 518; and also *Notes and Queries*, 4th ser. vol. vi. p. 17, 7th ser. vol. ii. p. 17). In the case of those who have not been baptized, but have a name (other than a surname) given them by their parents, such a name acquires force only by repute. The Registration of Births Act, which requires the registration of every birth, makes provision for the insertion of a name, but such provision is purely permissive, and the only object of entering a name on the register is to have an authoritative record of the commencement of repute.

A clergyman of the Church of England is compelled to perform the ceremony of baptism when required by a parishioner, and to give whatever name or names the godparents select, but although the rubrics do not expressly say so, he can object to any name on religious or moral grounds.

The freedom enjoyed in England and the United States as to the kind of Christian name which may be given to a child is somewhat limited in France and Germany. In France, by a decree of the 11 Germinal, an XI. the only names permitted to be recorded in the civil register as Christian names (*prénoms*) of children were those of saints in the calendar and the names of personages known in ancient history. Even at the present day an official list is issued (revised from time to time) containing a selection of forenames, and no name of a child will be registered unless it occurs in this list. A limitation more or less similar prevails in Germany and other European countries.

As regards the surname (Fr. *surnom*, name in addition), custom has universally decreed that a man shall be known by the name of his father. But in England and the United States, at least, this custom is not legally binding; there is no law preventing a man from taking whatever name he has a fancy for, nor are there any particular formalities required to be observed on adopting a fresh surname; but, on the other hand, if a man has been known for a considerable time by the name of his father, or by a name of repute, and he changes it for another, he cannot compel others to address him or designate him by the new one. Neither does the English law recognize the absolute right of any person in any particular name to the extent of preventing another person from assuming it (*Du Boulay* v. *Du Boulay*, 1869, L.R. 2 P.C. 430). If, however, a person adopts a new name and wishes to have it publicly notified and recognized in official circles, the method of procedure usually adopted is that by royal licence. This is by petition, prepared and presented through the Heralds' Office. If granted, the royal licence is given under the sign manual and privy seal of the sovereign, countersigned by the home secretary. In wills and settlements a clause is often inserted whereby a testator or settler imposes upon the takers of the estate an obligation to assume his name and bear his arms. The stamp duty payable for a royal licence in this case is fifty pounds, but if the application is merely voluntary the stamp duty is ten pounds. Where there is a more formal adoption of a surname, it is usual, for purposes of publicity and evidence, to advertise the change of name in the newspapers and to execute a deed poll setting out the change, and enrol the same in the central office of the Supreme Court.

Both in France and Germany official authorization must be obtained for any change of name. By the German Code 1900 (s. 12) if the right to a new name is disputed by another or his interest is injured thereby, the person entitled can compel the abandonment of the new name.

In England, a wife on marriage adopts the surname of her husband, disregarding entirely her maiden surname; in Scotland the practice usually is for the wife to retain her maiden name for all legal purposes, adding the name of her husband as an alias. On remarriage the rule is for the wife to adopt the name of the new husband, but an exception to this is tacitly recognized in the case of a title acquired by marriage when the holder remarries a commoner. This exception was very fully discussed in *Cowley* v. *Cowley*, 1901, A.C. 450.

Peers of the United Kingdom when signing their names use only their surnames or peerage designations. It is merely a privileged custom, which does not go back further than the Stuart period. Peeresses sign by their Christian names or initials followed by their peerage designation. Bishops sign by their initials followed by the name of the see. In Scotland it is very usual for landowners to affix to their names the designation of their lands, and this was expressly sanctioned by an act of 1672.

See *Ency. Eng. Law*, tits. "Christian Name," "Surname"; W. P. W. Phillimore, *Law and Practice of Change of Name*; Fox-Davies and Carlyon-Britton, *Law concerning Names and Changes of Name.* (T. A. I.)

NAMUR, one of the nine provinces of Belgium. It lies between Hainaut on the one side and Liége and Luxemburg on the other, and extends from Brabant up the Meuse valley to the French frontier. Area, 1414 sq. m.; pop. (1904) 357,759. The part north of the Meuse is very fertile, but the rest is covered with forest and is little suited for agriculture. There are a few iron and coal-mines between the Sambre and Meuse, and the quarries are of great importance. Arboriculture, and especially fruit-tree plantation, is on the increase. The province is divided into the three arrondissements of Namur, Dinant and Philippeville, and there are fifteen cantons for judicial purposes.

NAMUR (Flemish, *Namen*), a town of Belgium, capital of the province of Namur. Pop. (1904) 31,940. It is most picturesquely situated at the junction of the rivers Sambre and Meuse, the town lying on the left banks of the two rivers, while the rocky promontory forming the fork between them is crowned with the old citadel. This citadel is no longer used for military purposes, and the hill on which it stands has been converted into a public park, while the crest is occupied by an enormous hotel to which access is gained by a cogwheel railway. Namur is connected with the citadel by two bridges across the Sambre, and from the east side of the promontory there is a fine stone bridge to the suburb of Jambes. This bridge was constructed in the 11th century and rebuilt in the reign of Charles V. It is the only old bridge in existence over the Meuse in the Belgian portion of its course. The cathedral of St Aubain or Albin was built in the middle of the 18th century. The church of St Loup is a century older, and is noticeable for its columns of red marble from the quarry at St Rémy near Rochefort. There is a considerable local industry in cutlery, and there are numerous tanneries along the river-side.

The hill of the citadel is perhaps identical with Aduaticum, the fortified camp of the Aduatici captured and destroyed by Julius Caesar after the defeat of the Nervii, although many authorities incline to the plateau of Hastédon, north of the Sambre and of Namur itself, as the more probable site of the Belgic position. Many antiquities of the Roman-Gallic period have been discovered in the neighbourhood and are preserved in the local archaeological museum. Here also are deposited the human fossils of the Stone Age discovered at Furfooz on the Lesse. In the feudal period Namur was always a place of some importance, and long formed a marquisate in the Courtenay family. One institution of the medieval period came down to modern times, and was only discontinued in consequence of the fatalities with which it was generally accompanied. This was the annual encounter on the Place d'Armes of rival parties mounted on stilts. Galliot, the historian of Namur, says the origin of these jousts is lost in antiquity, but considers the use of stilts was due to the frequency with which the town was flooded before the rivers were embanked. Don John of Austria made Namur his headquarters during the greater part of his stay in the Netherlands, and died here in 1578. As a fortress Namur did not attain the first rank until after its capture by Louis XIV. in 1692, when Vauban endeavoured to make it impregnable; but it was retaken by William III. in 1695. The French recaptured it in 1702 and retained possession for ten years. In 1815 Marshal Grouchy on his retreat into France fought an action here with the Prussians under General Pirch. In 1888, under the new scheme of Belgian defence, the citadel and its detached works were abandoned, and in their place nine outlying forts were constructed at a distance of from 3 to 5 m. round the town. All these forts are placed on elevated points. They are in their order, beginning on the left bank of the Meuse and ending on the right bank of the same river: (1) St Heribert, (2) Malonne, (3) Suarlée, (4) Emines, (5) Cognelée, (6) Gelbressée, (7) Maizeret, (8) Andoy and (9) Dave. The whole position is correctly described as the "tête de pont" of Namur, and in addition to its strong bomb-proof forts it possesses great natural advantages for the defence of the intervals.

NANA FARNAVIS (1741–1800), the great Mahratta minister at Poona at the end of the 18th century. His real name was Balaji Janardhan Bhanu; but, like many other Mahrattas, he was always known by a kind of nickname. Nana properly means a maternal grandfather; Farnavis is the official title of the finance minister, derived from *fard*=an account and *navis*=a writer. He was born at Satara on the 4th of May 1741, and was the son of a Chitpavan Brahman, of the same class as the Peshwa, who held the hereditary office of *Farnavis*. He escaped from the fatal battle of Panipat in 1761; and from about 1774 was the leading personage in directing the affairs of the Mahratta confederacy, though never a soldier. This was the period when Peshwas rapidly succeeded one another, and there was more than one disputed succession. It was the policy of Nana Farnavis to hold together the confederacy against both internal dissensions and the growing power of the British. He died at Poona on the 13th of March 1800, just before the Peshwa placed himself in the hands of the British and thus broke up the Mahratta confederacy. In an extant letter to the Peshwa, the Marquess Wellesley thus describes him: "The able minister of your state, whose upright principles and honourable views and whose zeal for the welfare and prosperity both of the dominions of his own immediate superiors and of other powers were so justly celebrated."

See Captain A. Macdonald, *Memoir of Nana Furnuwees* (Bombay, 1851).

NANAIMO, a city of British Columbia, on the east coast of Vancouver Island. Pop. (1906) about 6500. It is connected with Victoria by the Esquimalt and Nanaimo railway, and has a daily steamer service to Vancouver, as well as to Comox, Sydney and other points on the coast. It is favourably situated for growing fruit, and mixed farming is carried on to a considerable extent. There is a large export trade in coal from the neighbouring mines, which is sent chiefly to San Francisco.

NANA SAHIB, the common designation of Dandu Panth, an adopted son of the ex-peshwa of the Mahrattas, Baji Rao, who took a leading part in the great Indian Mutiny, and was proclaimed peshwa by the mutineers. Nana Sahib had a grievance against the British government because they refused to continue to him the pension of eight lakhs of rupees (£80,000) which was promised to Baji Rao by Sir John Malcolm on his surrender in 1818. This pension, however, was only intended to be a life grant to Baji Rao himself. For this refusal the Nana bore the British a lifelong grudge, which he washed out in the blood of women and children in the massacres at Cawnpore. In 1859, when the remnants of the rebels disappeared into Nepal, the Nana was among the fugitives. His death was reported some time afterwards, but his real fate remains obscure.

NANCY, a town of north-eastern France, the capital formerly of the province of Lorraine, and now of the department of Meurthe-et-Moselle, 219 m. E. of Paris on the railway to Strassburg. Pop. (1906), town, 98,302; commune (including troops), 110,570. Nancy is situated on the left bank of the Meurthe 6 m. above its junction with the Moselle and on the Marne-Rhine canal. The railway from Paris to Strassburg skirts the city on the south-west side; other railways—to Metz, to Épinal by Mirecourt, to Château Salins—join the main line near Nancy, and make it an important junction. The town consists of two portions—the *Ville-Vieille* in the north-west between the Cours Léopold and the Pépinière gardens, with narrow and winding streets, and the *Ville-Neuve* in the south-east with wide straight streets, allowing views of the hills around the city. Between the two lies the Place Stanislas, a square worthy of a capital city: in the centre stands the statue of Stanislas Leczinski, ruler of Lorraine, and on all sides rise imposing buildings in the 18th-century style—the town hall, episcopal palace, theatre, &c. A fine triumphal arch erected by Stanislas in honour of Louis XV. leads from the Place Stanislas to the Place Carrière, which forms a beautiful tree-planted promenade, containing at its further end the government palace (1760) now the residence of the general commanding the XX. army corps, and adjoins the so-called Pépinière (nursery) established by Stanislas. Other open spaces in the city are the Place d'Alliance (formed by Stanislas, with a fountain in memory of the alliance between Louis XV. and Maria Theresa in 1756), the Place de l'Académie, the Place St Epvre with a statue of Duke René II., the Place Dombasle and the Place de Thiers, the two latter embellished with the statues of Mathieu Dombasle, the agriculturist, and Adolphe Thiers. The cathedral in the Ville-Neuve, built in the 18th century, has a wide façade flanked by two dome-surmounted towers, and a somewhat frigid and sombre interior. Of particular interest is the church of the Cordeliers, in the old town, built by René II. about 1482 to commemorate his victory over Charles the Bold. Pillaged during the Revolution period, but restored to religious uses in 1825, it contains the tombs of Antony of Vaudémont and his wife Marie d'Harcourt, Philippe of Gueldres, second wife of René II., Henry III., count of Vaudémont, and Isabella of Lorraine his wife, René II. (a curious monument raised by his widow in 1515) and Cardinal de Vaudémont (d. 1587). Here also is a chapel built at the beginning of the 17th century to receive the tombs of the princes of the house of Lorraine. The church of St Epvre, rebuilt between 1864 and 1874 on the site of an old church of the 13th, 14th and 15th centuries, has a fine spire and belfry and good stained glass windows. Bonsecours Church, at the end of the St Pierre Faubourg, contains the mausoleums of Stanislas (by whom it was built) and his wife Catherine, and the heart of their daughter Marie, queen of France, as well as the statue of Notre-Dame de Bonsecours, the object of a well-known pilgrimage. Of the old ducal palace, begun in the 15th century by Duke Raoul and completed by René II., there remains but a single wing, partly rebuilt after a fire in 1871. The entrance to this wing, which contains the archaeological museum of Lorraine, is a beautiful specimen of the late Gothic of the beginning of the 16th century. One of the greatest treasures of the collection is the tapestry found in the tent of Charles the Bold after the battle of Nancy. Of the old gates of Nancy the most ancient and remarkable is the Porte de la Craffe (1463). The town hall contains a museum of painting and sculpture, and there is a rich municipal library. A monument to President Carnot, and statues of Jacques Callot, the engraver, and of General Drouot, both natives of Nancy, and of Claude Gellée stand in various parts of the town.

Nancy is the seat of a bishop, a prefect, a court of appeal and a court of assizes, headquarters of the XX. army corps, and centre of an *académie* (educational division) with a university comprising faculties of law, medicine, science and letters, and a higher school of pharmacy. There are also tribunals of first instance and of commerce, a board of trade-arbitrators, lycées and training colleges for both sexes, a higher ecclesiastical seminary, a school of agriculture, the national school of forestry, a higher school of commerce, a technical school (*école professionnelle*), a school of arts and crafts (*école préparatoire des arts et métiers*), a chamber of commerce and a branch of the Bank of France. The industries of Nancy include printing, brewing, cotton- and wool-spinning and the weaving of cotton and woollen goods, and the manufacture of tobacco (by the State), of boots and shoes, straw hats, pottery, casks, embroidery, machinery, engineering material, farm implements and iron goods.

At the close of the 11th century Odelric of Nancy, brother of Gerard of Alsace, possessed at Nancy a castle which enabled him to defy the united assaults of the bishops of Metz and Treves and the count of Bar. In the 12th century the town was surrounded with walls, and became the capital of the dukes of Lorraine; but its real importance dates from the 15th century, when on the 5th of January 1477 Charles the Bold was defeated by René II. and perished at its gates.[1] Enlarged, embellished and admirably refortified by Charles III., it was taken by the French in 1633 (Louis XIII. and Richelieu being present at the siege). After the peace of Ryswick in 1697 it was restored and Duke Leopold set himself to repair the disasters of the past. He founded academies, established manufactures and set about the construction of the new town. But it was reserved for Stanislas Leczinski, to whom Lorraine and Bar were assigned in 1736, to carry out the plans of improvement in a style which made Nancy one of the palatial cities of Europe, and rendered himself the most popular as he was the last of the dukes of Lorraine. The city, which became French in 1766, was occupied by the allies in 1814 and 1815, and put to ransom by the Prussians in 1870. After the Franco-German war the population was greatly increased by the immigration of Alsatians and of people from Metz and its district.

See C. Pfister, *Histoire de Nancy* (Paris and Nancy, 1902); J. Cayon, *Histoire physique, civile, morale et politique de Nancy* (Nancy, 1846).

NANDAIR, or NANDER, a town of India, in the state of Hyderabad, on the left bank of the Godaveri, with a station on the Hyderabad-Godaveri valley railway, 174 m. N.E. of Hyderabad city. Pop. (1901) 14,184. It is a centre of local trade, with a special industry of fine muslin and gold bordered scarves. As the scene of the murder of Guru Govind, it contains a shrine visited by Sikhs from all parts of India.

NANDGAON, a feudatory state of India, in the Chhattisgarh division of the Central Provinces. Area, 871 sq. m.; pop. (1901) 126,356, showing a decrease of 31% in the decade, due to famine; estimated revenue £23,000; tribute £4600. The state has a peculiar history. Its foundation is traced to a religious celibate, who came from the Punjab towards the end of the 18th century. From the founder it passed through a succession of chosen disciples until 1879, when the British government recognized the ruler as an hereditary chief and afterwards conferred upon his son the title of Raja Bahadur. The state has long been well administered, and has derived additional prosperity from the construction of the Bengal-Nagpur railway, which has a station at Raj-Nandgaon, the capital (pop. 11,094). Here there is a steam cotton mill.

NANDI, an East African tribe of mixed Nilotic, Bantu and Hamitic origin. With them are more or less closely allied the Lumbwa (correctly Kipsikīs), Buret (or Puret) and Sotik (Soot) tribes, as well as the Elgonyi (properly Kony) of Mount Elgon. They have also affinities with the Masai tribes. The Nandi-Lumbwa peoples inhabit the country stretching south from Mount Elgon to about 1° S. and bounded east by the escarpment of the eastern rift-valley and west by the territory of the tribes, such as the Kavirondo, dwelling round the Victoria Nyanza. They have given their name to the Nandi plateau. The Hamitic strain in these allied tribes is derived from the Galla; they also exhibit Pygmy elements. Their original home was in the north, and they probably did not reach their present home until the beginning of the 19th century. They differ considerably in physical appearance; some resemble the Masai, being men of tall stature with features almost Caucasian, other are dwarfish with markedly negro features. Like the Masai, Turkana and Suk, the Nandi-Lumbwa tribes were originally nomadic, but they have become agriculturists. They own large herds of cattle. They have a double administrative system, the chief medicine man or *Orkoiyot* being supreme chief and regulating war affairs, while representatives of the people, called *Kiruogik*, manage the ordinary affairs of the tribe. The medicine men are of Masai origin and the office is hereditary. The young men form a separate warrior class to whom is entrusted the care of the country. A period of about 7½ years is spent in this class, and the ceremony of handing over the country from one "age" to the succeeding "age" is of great importance. The arms of the warriors are a stabbing spear, shield, sword and club. Many also possess rifles. All the Nandi are divided into clans, each having its sacred animal or totem. They have no towns, each family living on the land it cultivates. The huts are of circular pattern. The Nandi believe in a supreme deity—Asis—who takes a benevolent interest in their welfare, and to whom prayers are addressed daily. They also worship ancestors and consider earthquakes to be caused by the spirits moving in the underworld. They practise circumcision, and girls undergo a similar operation. Spitting is a sign of blessing. Their scanty clothing consists chiefly of dressed skins. The tribal mark is a small hole bored in the upper part of the ear. Their language is Nilotic and in general construction resembles the Masai. It has been slightly influenced by the Somali tongue. The primitive hunting tribe known as the Wandorobo speak a dialect closely resembling Nandi.

The Nandi at one time appear to have been subject to the Masai, but when the country was first known to Europeans they were independent and occupied the plateau which bears their name. Hardy mountaineers and skilful warriors, they closed their territory to all who did not get special permission, and thus blocked the road from Mombasa to Uganda alike to Arab and Swahili. Caravans that escaped the Masai frequently fell victims to the Nandi, who were adepts at luring them to destruction. When the railway to the Victoria Nyanza was built it had to cross the Nandi country. The tribesmen, who had already shown hostility to the whites, attacked both the railway and the telegraph line and raided other tribes. Eventually (1905–1906) the Nandi were removed by the British to reserves somewhat north of the railway zone (see BRITISH EAST AFRICA). The Lumbwa reserve lies south of the railway, and farther south still are the reserves of the Buret and Sotik.

See A. C. Hollis, *The Nandi: Their Language and Folk-lore*, with introduction by Sir Charles Eliot (Oxford, 1909), and the works there cited.

NANDIDRUG, a hill fortress of southern India, in the Kolar district of Mysore, 4851 ft. above the sea. It was traditionally held impregnable, and its storming by Lord Cornwallis in 1791 was one of the most notable incidents of the first war against Tippoo Sultan. It was formerly a favourite resort for British officials during the hot season.

NANGA, the most primitive form of the ancient Egyptian harp. The nanga consisted of a boat-shaped or vaulted body of wood, the back of which was divided down the centre by a sound bar built into the back; on this bar was fixed a cylindrical stick round which one end of the strings was wound, the soundboard or parchment being stretched over the back without interfering with the stick. The other end of the strings was fastened to pegs set in the side of a curved neck, so that the strings did not lie directly over the soundboard. There were but 3 or 4 strings, one note only being obtained from each. Some of these nangas are to be seen at the British Museum.

NANKEEN, a cotton cloth originally made in China, and now imitated in various countries. The name is derived from Nanking, the city in which the cloth is said to have been originally manufactured. The characteristic yellowish colour of nankeen is attributed to the peculiar colour of the cotton from which it was originally made.

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[1] The battle raged in the district to the S., E. and N. of the town, the operations extending from St Nicolas du Port (S.) to the bridge of Bouxières (N.). The chief struggle took place on the banks of the stream of Bon Secours, which now runs entirely underground, flowing from the S.W. into the Meurthe. Much of the battlefield is now covered by modern buildings, but S.W. of the town a cross marks the spot where the body of Charles the Bold was discovered.

NANKING ("the southern capital"), the name by which Kiang-ning, the chief city in the province of Kiangsu, China, has been known for several centuries. Pop. about 140,000. The city stands in 32° 5′ N., 118° 47′ E., nearly equidistant between Canton and Peking, on the south bank of the Yangtsze Kiang. It dates only from the beginning of the Ming dynasty (1368), although it is built on the site of a city which for more than two thousand years figured under various names in the history of the empire. The more ancient city was originally known as Kin-ling; under the Han dynasty (206 B.C. to A.D. 25) its name was converted into Tan-yang; by the T'ang emperors (A.D. 618–907) it was styled Kiang-nan and Shêng Chow; by the first sovereign of the Ming dynasty (A.D. 1368–1644) it was created the "southern capital" (Nan-king), and was given the distinctive name of Ying-t'ien; and since the accession to power of the present Manchu rulers it has been officially known as Kiang-ning, though still popularly called Nan-king. It was the seat of the imperial court only during the reigns of the first two emperors of the Ming dynasty, and was deserted for Shun-t'ien (Peking) by Yung-lo, the third sovereign of that line, who in 1403 captured the town and usurped the crown of his nephew, the reigning emperor.

The T'aip'ing rebels, who carried the town by assault in 1853, swept away all the national monuments and most of the more conspicuous public buildings it contained, and destroyed the greater part of the magnificent wall which surrounded it. This wall is said by Chinese topographers to have been 96 li, or 32 m., in circumference. This computation has, however, been shown to be a gross exaggeration, and it is probable that 60 li, or 20 m., would be nearer the actual dimensions. The wall, of which only small portions remain, was about 70 ft. in height, measured 30 ft. in thickness at the base, and was pierced by thirteen gates. Encircling the north, east, and south sides of the city proper was a second wall which enclosed about double the space of the inner enclosure. In the north-east corner of the town stood the imperial palace reared by Hung-wu, the imperial founder of the modern city. After suffering mutilation at the overthrow of the Ming dynasty, this magnificent building was burnt to the ground on the recapture of the city from the T'aip'ing rebels in 1864. But beyond comparison the most conspicuous public building at Nanking was the famous porcelain tower, which was designed by the emperor Yung-lo (1403–1428) to commemorate the virtues of his mother. Twelve centuries previously an Indian priest deposited on the spot where this monument afterwards stood a relic of Buddha, and raised over the sacred object a small pagoda of three stories in height. During the disturbed times which heralded the close of the Yuen dynasty (1368) this pagoda was utterly destroyed. It was doubtless out of respect to the relic which then perished that Yung-lo chose this site for the erection of his "token-of-gratitude" pagoda. The building was begun in 1413. But before it was finished Yung-lo had passed away, and it was reserved for his successor to see the final pinnacle fixed in its place, after nineteen years had been consumed in carrying out the designs of the imperial architect. In shape the pagoda was an octagon, and was about 260 ft. in height, or, as the Chinese say, with that extraordinary love for inaccurate accuracy which is peculiar to them, 32 chang (a chang equals about 120 in.) 9 ft. 4 in. and $\frac{9}{10}$ of an inch. The outer walls were cased with bricks of the finest white porcelain, and each of the nine stories into which the building was divided was marked by overhanging eaves composed of green glazed tiles of the same material. The summit was crowned with a gilt ball fixed on the top of an iron rod, which in its turn was encircled by nine iron rings. Hung on chains which stretched from this apex to the eaves of the roof were five large pearls of good augury for the safety of the city. One was supposed to avert floods, another to prevent fires, a third to keep dust-storms at a distance, a fourth to allay tempests, and a fifth to guard the city against disturbances. From the eaves of the several stories there hung one hundred and fifty-two bells and countless lanterns. In bygone days Nanking was one of the chief literary centres of the empire, besides being famous for its manufacturing industries. Satin, crape, nankeen, cloth, paper, pottery, and artificial flowers were among its chief products.

At Nanking, after its capture by British ships in 1842, Sir Henry Pottinger signed the "Nanking treaty." It was made a treaty port by the French treaty of 1858, but was not formally opened. Its proximity to Chinkiang, where trade had established itself while Nanking was still in the hands of the rebels, made its opening of little advantage, and the point was not pressed. In 1899 it was voluntarily thrown open to foreign trade by the Chinese government, and in 1909 it was connected by railway (192 m. long) with Shanghai.

Since 1880 Nanking has been slowly recovering from the ruin caused by the T'aip'ing rebellion. Barely one-fourth of the area within the walls has been reoccupied, and though its ancient industries are reviving, no great progress has been made. As the seat of the provincial government of Kiang-nan, however, which embraces the three provinces of Kiang-su, Kiang-si, and Ngan-hui, Nanking is a city of first-class importance. The viceroy of Kiang-nan is the most powerful of all the provincial satraps, as he controls a larger revenue than any other, and has the command of larger forces both naval and military. He is also superintendent of foreign trade for the southern ports, including Shanghai, a position which gives him great weight in all political questions. The city contains an arsenal for the manufacture of munitions of war, also powder-mills. A naval college was opened in 1890, and an imperial military college a few years later under foreign instructors. The only foreign residents are missionaries (mostly American), and employés of the Chinese government. The only remaining features of interest in Nanking are the so-called Ming Tombs, being the mausolea of Hung-wu, the founder of the Ming dynasty, and of one or two of his successors, which lie outside the eastern wall of the city. They are ill cared for and rapidly going to decay. Since 1899 the foreign trade has shown a steady increase.

NANNING, a treaty port in the province of Kwangsi, China, on the West river, 250 m. above Wuchow and 470 m. from Canton. Pop. about 40,000. It is the highest point accessible for steam traffic on the West river. From Canton to Wuchow the river has a minimum depth of 8 ft., but on the section from Wuchow to Nanning not more than 3 or 4 ft. are found during winter. The town is the chief market on the southern frontier. Its opening was long opposed by the French government, who had acquired the right to build a railway to it from Tongking, by which they hoped to divert the trade through their own possessions. Navigation by small native boats is open westwards as far as Paise.

NANSEN, FRIDTJOF (1861–), Norwegian scientist, explorer and statesman, was born at Fröen near Christiania on the 10th of October 1861. His childhood was spent at this place till his fifteenth year, when his parents removed to Christiania, where he went to school. He entered Christiania university in 1880, where he made a special study of zoology; in March 1882 he joined the sealing-ship "Viking" for a voyage to Greenland waters. On his return in the same year he was appointed curator of the Bergen Museum, under the eminent physician and zoologist Daniel Cornelius Danielssen (1815–1894). In 1886 he spent a short time at the zoological station at Naples. During this time he wrote several papers and memoirs on zoological and histological subjects, and for one paper on "The Structure and Combination of the Histological Elements of the Central Nervous System" (Bergen, 1887) the Christiania university conferred upon him the degree of doctor of philosophy. But his voyage in the "Viking" had indicated Greenland as a possible field for exploration, and in 1887 he set about preparations for a crossing of the great ice-field which covers the interior of that country. The possibility of his success was discountenanced by many Arctic authorities, and a small grant he had asked for was refused by the Norwegian government, but was provided by Augustin Gamel, a merchant of Copenhagen, while he paid from his private means the greater part of the expenses of the expedition. As companions Nansen had Otto Neumann Sverdrup (b. 1855), Captain O. C. Dietrichson (b. 1856), a third compatriot, and two Lapps. The expedition started in May 1888, proceeding from Leith to Iceland, and there joining a sealing-ship bound for the east coast of Greenland. On the 17th of July Nansen decided to leave the ship and force a way through the ice-belt to the land, about 10 m. distant, but the party encountered great difficulties owing to ice-pressures, went adrift with the ice, and only reached the land on the 29th, having been carried far to the south in the interval. They made their way north again, along the coast inside the drift ice, and on the 16th of August began the ascent of the inland ice. Suffering severely from storms, intense cold, and other hardships, they reached the highest point of the journey (8920 ft.) on the 5th of September, and at the end of the month struck the west coast at the Ameralik Fjord. On reaching the settlement of Godthaab it was found that the party must winter there, and Nansen used the opportunity to study the Eskimos and gather material for his book, *Eskimo Life* (English translation, London, 1893). The party returned home in May 1889, and Nansen's book, *The First Crossing of Greenland* (English translation, London, 1890), demonstrates the valuable scientific results of the journey. A report of the scientific results was published in *Petermanns Mitteilungen* (Gotha, 1892). On his return from Greenland Nansen accepted the curatorship of the Zootomic Museum of Christiania university. In September 1889 he married Eva, daughter of Professor Michael Sars of Christiania university, and a noted singer (d. 1907).

In 1890 he propounded his scheme for a polar expedition before the Norwegian Geographical Society, and in 1892 he laid it before the Royal Geographical Society in London (see "How can the North Polar Region be crossed?" *Geogr. Journal*, vol. i.), by which time his preparations were well advanced. His theory, that a drift-current sets across the polar regions from Bering Strait and the neighbourhood of the New Siberia Islands towards the east coast of Greenland, was based on a number of indications, notably the discovery (1884), on drift ice off the south-west coast of Greenland, of relics of the American north polar expedition in the ship "Jeannette," which sank N.E. of the New Siberia Islands in 1881. His intention was therefore to get his vessel fixed in the ice to the north of Eastern Siberia and let her drift with it. His plan was adversely criticized by many Arctic authorities, but it succeeded. The Norwegian parliament granted two-thirds of the expenses, and the rest was obtained by subscription from King Oscar and private individuals. His ship, the "Fram" (*i.e.* "Forward"), was specially built of immense strength and peculiar form, being pointed at bow and stern and having sloping sides, so that the ice-floes, pressing together, should tend, not to crush, but merely to slip beneath and lift her. She sailed from Christiania on the 24th of June 1893. Otto Sverdrup was master; Sigurd Scott Hansen, a Norwegian naval lieutenant, was in charge of the astronomical and meteorological observations; Henrik Greve Blessing was doctor and botanist; and among the rest was Frederik Hjalmar Johansen, lieutenant in the Norwegian army, who shipped as fireman. On the 22nd of September the "Fram" was made fast to a floe in 78° 50′ N., 133° 37′ E.; shortly afterwards she was frozen in, and the long drift began. She bore the pressure of the ice perfectly. During the winter of 1894–1895 it was decided that an expedition should be made northward over the ice on foot in the spring, and on the 14th of March 1895 Nansen, being satisfied that the "Fram" would continue to drift safely, left her in 84° N., 101° 55′ E., and started northward accompanied by Johansen. On the 8th of April they turned back from 86° 14′ N., the highest latitude then reached by man; and they shaped their course for Franz Josef Land. They suffered many hardships, including shortage of food, and were compelled to winter on Frederick Jackson Island (so named by Nansen) in Franz Josef Land from the 26th of August 1895 to the 19th of May 1896. They were uncertain as to the locality, but, after having reached 80° N. on the south coast of the islands, they were travelling westward to reach Spitsbergen, when, on the 17th of June 1896, they fell in with Frederick Jackson and his party of the Jackson-Harmsworth expedition, and returned to Norway in his ship, the "Windward," reaching Vardö on the 13th of August. A week later the "Fram" also reached Norway in safety. She had drifted north after Nansen had left her, to 85° 57′, and had ultimately returned by the west coast of Spitsbergen. An unprecedented welcome awaited Nansen. In England he gave the narrative of his journey at a great meeting in the Albert Hall, London, on the 8th of February 1897, and elsewhere. He received a special medal from the Royal Geographical Society, honorary degrees from the universities of Oxford and Cambridge, and a presentation of books (the "Challenger" Reports) from the British government, and similar honours were paid him in other countries. The English version of the narrative of the expedition is entitled *Farthest North* (London, 1897), and the scientific results are given in *The Norwegian North Polar Expedition 1893–1896; Scientific Results* (London, &c., 1900 sqq.).

In 1905, in connexion with the crisis between Norway and Sweden, which was followed by the separation of the kingdoms, Nansen for the first time actively intervened in politics. He issued a manifesto and many articles, in which he adopted an attitude briefly indicated by the last words of a short work published later in the year: "Any union in which the one people is restrained in exercising its freedom is and will remain a danger" (*Norway and the Union with Sweden*, London, 1905). On the establishment of the Norwegian monarchy Nansen was appointed minister to England (1906), and in the same year he was created G.C.V.O.; but in 1908 he retired from his post, and became professor of oceanography in Christiania university.

NANSEN, HANS (1598–1667), Danish statesman, son of the burgher Evert Nansen, was born at Flensburg on the 28th of November 1598. He made several voyages to the White Sea and to places in northern Russia, and in 1621 entered the service of the Danish Icelandic Company, then in its prime. For many years the whole trade of Iceland, which he frequently visited, passed through his hands, and he soon became equally well known at Glückstadt, then the chief emporium of the Iceland trade, and at Copenhagen. In February 1644, at the express desire of King Christian IV., the Copenhagen burgesses elected him burgomaster. During his northern voyages he had learnt Russian, and was employed as interpreter at court whenever Muscovite embassies visited Copenhagen. His travels had begotten in him a love of geography, and he published in 1633 a "Kosmografi," previously revised by the astronomer Longomontanus. During the siege of Copenhagen by the Swedes in 1658 he came prominently forward. At the meeting between the king and the citizens to arrange for the defence of the capital, Nansen urged the necessity of an obstinate defence. It was he who on this occasion obtained privileges for the burgesses of Copenhagen which placed them on a footing of equality with the nobility; and he was the life and soul of the garrison till the arrival of the Dutch fleet practically saved the city. These eighteen months of storm and stress established his influence in the capital once for all and at the same time knitted him closely to Frederick III., who recognized in Nansen a man after his own heart, and made the great burgomaster his chief instrument in carrying through the anti-aristocratic Revolution of 1660. Nansen used all the arts of the agitator with extraordinary energy and success. His greatest feat was the impassioned speech by which, on October 8th, he induced the burgesses to accede to the proposal of the magistracy of Copenhagen to offer Frederick III. the realm of Denmark as a purely hereditary kingdom. How far Nansen was content with the result of the Revolution—absolute monarchy—it is impossible to say. It appears to be pretty certain that, at the beginning, he did not want absolutism. Whether he subsequently regarded the victory of the monarchy and its corollary, the admittance of the middle classes to all offices and dignities, as a satisfactory equivalent for his original demands; or whether he was so overcome by royal favour as to sacrifice cheerfully the political liberties of his country, can only be a matter for conjecture. After the Revolution Nansen continued in high honour, but he chiefly occupied himself with commerce, and was less and less consulted in purely political matters. He died on the 12th of November 1667.

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NANTERRE, a town of northern France, with a port on the Seine, in the department of Seine, at the foot of Mount Valerien, 8 m. N.W. of Paris on the railway to St Germain. Pop. (1906), town, 11,874; commune, 17,434. The principal manufactures are chemicals, tallow and aluminium; stone quarried in the vicinity; the town is noted also for its cakes. The combined prison and mendicity depôt for the department is a large institution, about 2 m. from the town. Nanterre (the ancient *Nemptodurum* or *Nemetodurum*) owes its origin to the shrine of Ste Geneviève (420–512), the patron-saint of Paris, whose name is still associated with various places in the town and district. The shrine is the object of a pilgrimage in September.

NANTES, a city of western France, capital of the department of Loire-Inférieure, on the right bank of the Loire, 35 m. above its mouth, at the junction of the Orleans, Western and State railways, 55 m. W.S.W. of Angers by rail. In population (town, 118,244; commune, 133,247, in 1906) Nantes is the first city of Brittany. The Loire here divides into several branches forming islands over portions of which the city has spread. It receives on the left hand the Sèvre Nantaise, and on the right the Erdre, which forms the outlet of the canal between Nantes and Brest. The maritime port of Nantes is reached by way of the Loire and the ship canal between the island of Carnet and La Martinière (9½ m.). Vessels drawing as much as 20 ft. 8 in., and at spring tides, 22 ft., can reach the port, which extends over a length of about 1½ m. The outer port as far as the industrial suburb of Chantenay has a length of over half a mile. The principal quays extend along the right bank of the branch which flows past the town, and on the western shore of the island of Gloriette. Their total length used for trading purposes is 5 m., and warehouses cover an area of 17 acres. A slipway facilitates the repairing of ships. The river port occupies the St Félix and Madeleine branches, and has quays extending for half a mile. Finally, on the Erdre is a third port for inland navigation. The quays are bounded by railway lines along the right bank of the river, which the railway to St Nazaire follows. The older quarter of Nantes containing the more interesting buildings is situated to the east of the Erdre.

The cathedral, begun in 1434 in the Gothic style, was unfinished till the 19th century when the transept and choir were added. There are two interesting monuments in the transept—on the right Michel Colomb's tomb of Francis II., duke of Brittany, and his second wife Marguerite de Foix (1507), and on the left that of General Juchault de Lamoricière, a native of Nantes, by Paul Dubois (1879). Of the other churches the most interesting is St Nicolas, a modern building in the style of the 13th century, on the right bank of the Erdre. Between the cathedral and the Loire, from which it is separated only by the breadth of the quay, stands the castle of Nantes, founded in the 9th or 10th century. Rebuilt by Francis II. and the duchess Anne, it is flanked by huge towers and by a bastion erected by Philip Emmanuel duke of Mercœur in the time of the League. A fine façade in the Gothic style looks into the courtyard. From being the residence of the dukes of Brittany, the castle became a state prison in which Jean-François Paul de Gondi, Cardinal de Retz, Nicholas Fouquet, and Marie Louise of Naples, duchess of Berry, were at different times confined; it is now occupied as the artillery headquarters. The chapel in which the marriage of Louis XII. with Anne of Brittany was celebrated was destroyed by an explosion in 1800. The Exchange (containing the tribunal and chamber of commerce), the Grand Theatre, the Prefecture and the town hall are buildings of the last half of the 18th or early 19th century; the law courts date from the middle of the 19th century. Nantes has an archaeological collection in the Dobrée Museum, and in the museum of fine arts a splendid collection of paintings, modern French masters being well represented; it also has a natural history museum, a large library rich in manuscripts and a botanical garden to the east. The Pommeraye Passage, which connects streets on different levels and is built in stages connected by staircases, dates from 1843. Between the Loire and the Erdre run the Cours St Pierre and the Cours St André, adorned at the two ends of the line by statues of Anne of Brittany and Arthur III., Bertrand du Guesclin and Olivier de Clisson, and separated by the Place Louis XVI., with a statue of that monarch on a lofty column. The Place Royale, to the west of the Erdre, the great meeting-place of the principal thoroughfares of the city, contains a monumental fountain with allegorical statues of Nantes and the Loire and its affluents. A flight of steps at the west end of the town leads up from the quay to the colossal cast-iron statue of St Anne, whence a splendid view may be obtained over the valley of the Loire. Several old houses of the 15th and 16th centuries, the fish market and the Salorges (a vast granite building now used as a bonded warehouse) are of interest. Nantes has two great hospitals—St Jacques on the left bank of the Loire, and the Hotel-Dieu in Gloriette Island. It is the seat of a bishopric and a court of assizes, and headquarters of the XI. army corps; it has tribunals of first instance and of commerce, a board of trade-arbitrators, a chamber of commerce and a branch of the Bank of France. The educational institutions include lycées for both sexes, a training college for girls schools of medicine and pharmacy and law, a preparatory school to higher instruction, science and letters, schools of music, art and navigation, technical and commercial schools, and a school for deaf-mutes and the blind.

Among the more important industries of Nantes are sugar-refining, flour-milling, rice-husking, the manufacture of oil, soap, flour pastes and biscuits, and the preparation of tinned provisions (sardines, vegetables, &c.); the manufacture of tin boxes, tiles, chemical manures, acid from chestnut bark, tobacco, leather, wood-pulp for paper, rope, boots and shoes, brushes and glass; saw-milling, shipbuilding, metal founding and the construction of engineering material; and wool and cotton-spinning and the manufacture of cotton and other fabrics, hosiery and knitted goods. Coal and patent fuel (chiefly from Great Britain) are the most important imports; next come phosphates and pyrites; other imports are timber and pulp-wood. The principal exports are bunker-coal (to French colonies), pyrites, slate, hoops and provisions. In the ten years 1898–1907 the average annual value of the imports was £2,657,000; of the exports £795,000. In 1907 there entered from foreign countries 738 vessels (209 British) with tonnage of 584,850, and cleared 778 with 154,720 tons of cargo, and 458,538 tons of ballast. Reckoning ships carrying cargo only the figures for the first and last years of the decade 1898–1907 were: 1898, ships entered, French 209 (tonnage 75,249), foreign 250 (tonnage 154,936); ships cleared, French 173 (tonnage 32,591), foreign 97 (tonnage 27,836): 1907, ships entered, French 186 (tonnage 127,635), foreign 419 (tonnage 361,002); ships cleared, French 126 (tonnage 81,299), foreign 128 (tonnage 45,181).

Before the Roman occupation Nantes was the chief town of the Namnetes and consisted of *Condovicnum*, lying on the hills away from the river, and of *Portus Namnetum*, on the river. Under the Romans it became a great commercial and administrative centre, though its two parts did not coalesce till the 3rd or 4th century. In the middle of the 3rd century Christianity was introduced by St Clair. Clotaire I. got possession of the city in 560, and placed it under the government of St Félix the bishop, who executed enormous works to cause the Loire to flow under the walls of the castle. After being several times subdued by Charlemagne, Brittany revolted under his successors, and Nominoé, proclaimed king in 842, ordered the fortifications of Nantes to be razed because it had sided with Charles the Bald. The Normans held the town from 843 to 936. About this time began the rivalry between Nantes and Rennes, whose counts disputed the sovereignty of Brittany. Pierre de Dreux, declared duke of Brittany by Philip Augustus, made Nantes his capital, surrounded it with fortifications and defended it valiantly against John of England. During the Breton wars of succession Nantes took part first with Jean de Montfort, but afterwards with Charles of Blois, and did not open its gates to Monfort till his success was assured and his English allies had retired. In 1560 Francis II. granted Nantes a communal constitution. In the course of the 15th and 16th centuries the city suffered from several epidemics. Averse to Protestantism, it joined the League along with the duke of Mercœur, governor of Brittany, who helped to raise the country into an independent duchy; and it was not till 1598 that it opened its gates to Henry IV., who here signed on the 2nd of May of that year the famous Edict of Nantes which until its revocation by Louis XIV. in 1685 was the charter of Huguenot liberties in France. It was at Nantes that Henry de Talleyrand, count of Chalais, was punished in 1626 for plotting against Richelieu, that Fouquet was arrested in 1661, and that the Cellamare conspirators were executed under the regent Philip of Orleans. Having warmly embraced the cause of the Revolution in 1789, the city was in 1793 treated with extreme rigour by J. B. Carrier, envoy of the Committee of Public Safety, whose *noyades* or wholesale drownings of prisoners became notorious. Nantes on more than one occasion vigorously resisted the Vendeans. It was here that the duchess of Berry was arrested in 1832 while trying to stir up La Vendée against Louis Philippe.

NANTES, EDICT OF, the law promulgated in April 1598 by which the French king, Henry IV., gave religious liberty to his Protestant subjects, the Huguenots. The story of the struggle for the edict is part of the history of France, and during the thirty-five years of civil war which preceded its grant, many treaties and other arrangements had been made between the contending religious parties, but none of these had been satisfactory or lasting. The elation of the Protestants at the accession of Henry IV. in 1589 was followed by deep depression, when it was found that not only did he adopt the Roman Catholic faith, but that his efforts to redress their grievances were singularly ineffectual. In 1594 they took determined measures to protect themselves; in 1597, the war with Spain being practically over, long negotiations took place between the king and their representatives, prominent among whom was the historian J. A. de Thou, and at last the edict was drawn up. It consisted of 95 general articles, which were signed by Henry at Nantes on the 13th of April 1598, and of 56 particular ones, signed on the 2nd of May. There was also some supplementary matter.

The main provisions of the edict of Nantes may be briefly summarized under six heads: (1) It gave liberty of conscience to the Protestants throughout the whole of France. (2) It gave to the Protestants the right of holding public worship in those places where they had held it in the year 1576 and in the earlier part of 1577; also in places where this freedom had been granted by the edict of Poitiers (1577) and the treaties of Nérac (1579) and of Félix (1580). The Protestants could also worship in two towns in each *bailliage* and *sénéchausée*. The greater nobles could hold Protestant services in their houses; the lesser nobles could do the same, but only for gatherings of not more than thirty people. Regarding Paris, the Protestants could conduct worship within five leagues of the city; previously this prohibition had extended to a distance of ten leagues. (3) Full civil rights were granted to the Protestants. They could trade freely, inherit property and enter the universities, colleges and schools. All official positions were open to them. (4) To deal with disputes arising out of the edict a chamber was established in the parlement of Paris (*le chambre de l'édit*). This was to be composed of ten Roman Catholic, and of six Protestant members. Chambers for the same purpose, but consisting of Protestants and Roman Catholics in equal numbers, were established in connexion with the provincial parlements. (5) The Protestant pastors were to be paid by the state and to be freed from certain burdens, their position being made practically equal to that of the Roman Catholic clergy. (6) A hundred places of safety were given to the Protestants for eight years, the expenses of garrisoning them being undertaken by the king.

In many ways the terms of the edict were very generous to the Protestants, but it must be remembered that the liberty to hold public worship was made the exception and not the rule; this was prohibited except in certain specified cases, and in this respect they were less favourably treated than they were under the arrangement made in 1576.

The edict was greatly disliked by the Roman Catholic clergy and their friends, and a few changes were made to conciliate them. The parlement of Paris shared this dislike, and succeeded in reducing the number of Protestant members of the *chambre de l'édit* from six to one. Then cajoled and threatened by Henry, the parlement registered the edict on the 25th of February 1599. After similar trouble it was also registered by the provincial parlements, the last to take this step being the parlement of Rouen, which delayed the registration until 1609.

The strong political position secured to the French Protestants by the edict of Nantes was very objectionable, not only to the ardent Roman Catholics, but also to more moderate persons, and the payments made to their ministers by the state were viewed with increasing dislike. Thus about 1660 a strong movement began for its repeal, and this had great influence with the king. One after another proclamations and declarations were issued which deprived the Protestants of their rights under the edict; their position was rendered intolerable by a series of persecutions which culminated in the *dragonnades*, and at length on the 18th of October 1685 Louis revoked the edict, thus depriving the Protestants in France of all civil and religious liberty. This gave a new impetus to the emigration of the Huguenots, which had been going on for some years, and England, Holland and Brandenburg received numbers of thrifty and industrious French families.

The history of the French Protestants, to which the edict of Nantes belongs, is dealt with in the articles FRANCE: *History*, and HUGUENOTS. For further details about the edict see the papers and documents published as *Le Troisième centenaire de l'édit de Nantes* (1898); N. A. F. Puaux, *Histoire du Protestantisme français* (Paris, 1894); H. M. Baird, *The Huguenots and the Revocation of the Edict of Nantes* (London, 1895); C. Benoist, *La Condition des Protestants sous le régime de l'édit de Nantes et après sa révocation* (Paris, 1900); A. Lods, *L'Édit de Nantes devant le parlement de Paris* (1899); and the *Bulletin historique et littéraire* of the Société de l'Histoire du Protestantisme Français.

NANTEUIL, ROBERT (1623–1678), French line-engraver, was born about 1623, or, as other authorities state, in 1630, the son of a merchant of Reims. Having received an excellent classical education, he studied engraving under his brother-in-law, Nicholas Regnesson; and, his crayon portraits having attracted attention, he was pensioned by Louis XIV. and appointed designer and engraver of the cabinet to that monarch. It was mainly due to his influence that the king granted the edict of 1660, dated from St Jean de Luz, by which engraving was pronounced free and distinct from the mechanical arts, and its practitioners were declared entitled to the privileges of other artists. He died at Paris in 1678. The plates of Nanteuil, several of them approaching the scale of life, number about three hundred. In his early practice he imitated the technique of his predecessors, working with straight lines, strengthened, but not crossed, in the shadows, in the style of Claude Mellan, and in other prints cross-hatching like Regnesson, or stippling in the manner of Jean Boulanger; but he gradually asserted his full individuality, modelling the faces of his portraits with the utmost precision and completeness, and employing various methods of touch for the draperies and other parts of his plates. Among the finest works of his fully developed period may be named the portraits of Pomponne de Bellièvre, Gilles Ménage, Jean Loret, the duc de la Meilleraye and the duchess de Nemours.

A list of his works will be found in Dumesnil's *Le Peintre-graveur français*, vol. iv.

NANTICOKE, a borough of Luzerne county, Pennsylvania, U.S.A., on the North Branch of the Susquehanna river, opposite West Nanticoke, and 8 m. S.W. of Wilkes-Barre. Pop. (1880), 3884; (1890), 10,044; (1900), 12,116, of whom 5055 were foreign-born; (1910 census) 18,877. It is served by the Pennsylvania, the Delaware, Lackawanna & Western and the

Central of New Jersey railways, and by an interurban electric line. Nanticoke is situated in the anthracite coal region, is surrounded by mines, and its industries consist chiefly in mining and shipping coal; it also has various manufactures, and in 1905 the factory product was valued at $358,091. Nanticoke was laid out in 1793, and was incorporated as a borough in 1874. The name is that of an Algonquian tribe of Indians, conspicuous for their dark complexion, who originally lived in Maryland, were conquered by the Iroquois in 1678 and subsequently scattered; the main body removed to lands along the eastern branch of the Susquehanna, where some of them became merged with the Iroquois, and others removed to the Ohio and became merged with the Delaware.

NANTUCKET, a county and township (coextensive) of Massachusetts, U.S.A. Its principal part is an island of the same name, 28 m. S. of Cape Cod peninsula; it also includes the island of Tuckernuck, which has an area of 1·97 sq. m., and is used for sheep grazing; Muskeget Island, which has excellent hunting, and of which about one-half is a public park; and the Gravel Islands and other islets. Pop. of the county (1905 state census), 2930; (1910) 2962.

The island, with a minimum length of 15 m., an average width of 2½ m., and an area of about 47 sq. m., has a coast-line of 88 m.; it lies within the 10-fathom line, but is separated from the mainland by Nantucket Sound, which is 25 to 30 m. across and has a maximum depth of 50 ft. The surface of Nantucket Island is open, nearly treeless, with a few hills, the highest being 91 ft. above sea-level. The soil is sandy but affords good pasture in some places, and has been farmed with some success; the flora is rich, and includes some rare species. There are a score of fresh-water ponds, the largest being Hummock (320 acres). Copaum (21 acres) was, at the time of the first settlement, a bay and the commonly used harbour, but the present harbour (6 m. long) is that formed by Coatue Beach, a long narrow tongue of land on the N. side of the island. The northern part of Coatue Beach is known as Coskata Beach, and curves to the N.W.; near its tip is Great Point, where a lighthouse was first built in 1784. There have been many terrible wrecks on the coast, and there are life-saving stations on Muskeget Island, near Maddaket, at Surfside and on Coskata Beach. At the W. end of the island is Tuckernuck Bank, a broad submarine platform, on whose edge are the island of Tuckernuck, on which is a village of the same name, and Muskeget Island. In the S.E. extremity of Nantucket Island is Siasconset (locally 'Sconset), a summer resort of some vogue; it has a Marconi wireless telegraph station, connecting with incoming steamers, the Nantucket shoals lightship and the mainland. On a bluff on the S. is the small village of Surfside. Other hamlets are Maddaket, at the W. end of the island; and Polpis, Quidnet and Wauwinet (at the head of Nantucket harbour) in its E. part.

The principal settlement and summer resort is the town of Nantucket (on the S.W. end of the harbour), which is served by steamers from New Bedford, Martha's Vineyard and Wood's Hole, and is connected with Siasconset by a primitive narrow-gauge railway. Here there are large summer hotels, old residences built in the prosperous days of whaling, old lean-to houses, old graveyards and an octagonal towered windmill built in 1746. There are two libraries; one founded in 1836, and now a public library in the Atheneum building; and the other in what is now the School of Industrial and Manual Training (1904), founded in 1827 as a Lancasterian school by Admiral Sir Isaac Coffin (1759–1839), whose ancestors were Nantucket people. The Jethro Coffin House was built in 1686, according to tradition; the Old North Vestry, the first Congregational meeting-house, built in 1711, was moved in 1767, and again in 1834 to its present site on Beacon Hill. The old South Church Tower, a steeple and clock tower, 144 ft. above sea-level, has a fine Portuguese bell, made in 1810. Another old house, built in 1725, was the home of Elihu Coleman, an anti-slavery minister of the Society of Friends, who were very strong here until the close of the first quarter of the 19th century. Near the old Friends' School is the building of the Nantucket Historical Society, which has a collection of relics. Nantucket was the home of Benjamin Franklin's mother, Abiah, whose father, Peter Folger, was one of the earliest settlers (1663); of Maria Mitchell, and of Lucretia Mott. Adjoining the Maria Mitchell homestead is a memorial astronomical observatory and library, containing the collections of Miss Mitchell and of her brother, Professor Henry Mitchell (1830–1902), a distinguished hydrographer. The industries of the island are unimportant; there is considerable cod and scallop fishing. Sheep-raising was once an important industry. Nantucket was long famous as a whaling port. As early as the beginning of the 18th century its fleets vied with those of eastern Long Island. In 1712 a Nantucket whaler, Christopher Hussey, blown out to sea, killed some sperm whales and thus introduced the sperm-oil industry and put an end to the period in which only drift- and shore- or boat-whaling had been carried on—the shore fishery died out about 1760. In 1757 whaling was the only livelihood of the people of Nantucket; and in 1750–1775, although whaling fleets were in repeated danger from French and Spanish privateers, the business, with the allied coopers and other trades, steadily increased. In 1775 the Nantucket fleet numbered 150, and the population was between 5000 and 6000, about 90% being Quakers; but by 1785 the fleet had been shattered, 134 ships being destroyed or captured during the war. Tallow candles as a substitute for whale-oil had been introduced, and the British market was closed by a duty of £18 a ton on oil; a bounty offered by the Massachusetts legislature (£5 on white and £3 on yellow or brown spermaceti, and £2 on whale-oil per ton) was of slight assistance. During the war of 1812 the Nantucket fleet was the only one active; it suffered severely during the war, and in the decade 1820–1830 Nantucket lost its primacy to New Bedford, whose fleet in 1840 was twice as large. Nantucket's last whaler sailed in 1869. Subsequently the island has been chiefly important as a summer resort.

Title to Nantucket and the neighbouring islands was claimed under grants of the Council for New England both by William Alexander, Lord Stirling, and by Sir Ferdinando Gorges. Lord Stirling's agent sold them in 1641 to Thomas Mayhew (1592–1682) of Watertown, Mass., and his son Thomas (*c.* 1616–1657) for £40, and a little later the elder Mayhew obtained another deed for Martha's Vineyard from Gorges. In 1659 the elder Mayhew sold a joint interest in the greater part of the island of Nantucket for £30 and two beaver hats to nine partners; early in the following year the first ten admitted ten others as equal proprietors, and later, in order to encourage them to settle here, special half-grants were offered to tradesmen. The original twenty proprietors, however, endeavoured to exclude the tradesmen from any voice in the government, and this caused strife. Both factions appealed to the governor of New York, that province having claimed jurisdiction over the islands under the grant to the duke of York in 1664, and, becoming increasingly dissatisfied with that government, sought a union with Massachusetts until the islands were annexed to that province by its new charter of 1691. The town of Nantucket was settled in 1661 and was incorporated in 1671. By order of Governor Francis Lovelace it was named Sherburne in 1673, but in 1795 the present name was adopted. Its original site was Maddaket on the W. end of the island; in 1672 it was moved to its present site, then called Wescoe. When counties were first organized in New York, in 1683, Nantucket and the neighbouring islands were erected into Dukes county, but in 1695, after annexation to Massachusetts, Nantucket Island, having been set apart from Dukes county, constituted Nantucket county, and in 1713 Tuckernuck Island was annexed to it.

See the bulletins (1896 sqq.) of the Nantucket Historical Society, established in 1894; F. B. Hough, *Papers relating to the Island of Nantucket . . . while under the Colony of New York* (Albany, N.Y., 1856); M. S. Dudley, *Nantucket Centennial Celebration*; *Historic Sites and Historic Buildings* (Nantucket, 1895); Obed Macy, *History of Nantucket* (Boston, 1835); L. S. Hinchman, *Early Settlers of Nantucket* (Philadelphia, 1896; 2nd ed., 1901); W. S. Bliss, *Quaint Nantucket* (Boston, 1896); and N. S. Shaler, *Geology of Nantucket* (Washington, 1889), being U.S. Geological Survey Bulletin, No. 53.

NANTWICH, a market town in the Crewe parliamentary division of Cheshire, England, 161 m. N.W. of London, on the London & North-Western and Great Western railways. Pop. of urban district (1901) 7722. It lies on the river Weaver, in the upper part of its flat, open valley. The church of St Mary and St Nicholas is a cruciform building in red sandstone, of the Decorated and Perpendicular periods, with a central octagonal tower. The fine old carved stalls are said to have belonged to Vale Royal Abbey, near Winsford in this county. Nantwich retains not a few old timbered houses of the 16th and 17th centuries, but the town as a whole is modern in appearance. The grammar school was founded in 1611. The salt industry, still the staple of several towns lower down the vale of the Weaver, was so important here in the time of Henry VIII. that there were three hundred salt-works. Though this industry has lapsed, there are brine baths, much used in cases of rheumatism, gout and general debility, and the former private mansion of Shrewbridge Hall is converted into a hotel with a spa. Nantwich has tanneries, a manufacture of boots and shoes, and clothing factories; and corn-milling and iron-founding are carried on. The town is one of the best hunting centres in the county, being within reach of several meets.

From the traces of a Roman road between Nantwich and Middlewich, and the various Roman remains that have been found in the neighbourhood, it has been conjectured that Nantwich was a salt-town in Roman times, but of this there is no conclusive evidence. The Domesday Survey contains a long account of the laws, customs and values of the salt-works at that period, which were by far the most profitable in Cheshire. The salt-houses were divided between the king, the earl of Chester and certain resident freemen of the neighbourhood. The name of the town appears variously as Wych Manbank, Wie Malban, Nantwich, Lache Mauban, Wysmanban, Wiens Malbanus, Namptewiche. About the year 1070 William Malbedeng or Malbank was created baron of Nantwich, which barony he held of the earl of Chester. In the 13th century the barony fell to three daughters and co-heiresses, and further subdivisions followed. This probably accounts for the lack of privileges belonging to Nantwich as a corporate town. The only town charter is one of 1567–1568, in which Queen Elizabeth confirms an ancient privilege of the burgesses that they should not be upon assizes or juries with strangers, relating to matters outside the town. It is stated in the charter that the right to this privilege had been proved by an inquisition taken in the 14th century, and had then already been held from time immemorial. There was a gild merchant and also a town bailiff, but the latter office was of little real significance and was soon dropped. There is documentary evidence of a castle at Nantwich in the 13th century. There is a weekly market on Saturday, held by prescription. In 1283 a three-days' fair to be held at the feast of St Bartholomew was granted to Robert Burnell, bishop of Bath and Wells (then holder of a share of the barony of Nantwich). This is the "Old Fair" or "Great Fair" now held on the 4th of September. Earl Cholmondeley received a grant of two fairs in 1723. Fairs are now held on the first Thursday in April, June, September and December, and a cheese fair on the first Thursday in each month except January. The salt trade declined altogether in the 18th century, with the exception of one salt-works, which was kept open until 1856. There was a shoe trade in the town as early as the 17th century, and gloves were made from the end of the 16th century until about 1863. Weaving and stocking trades also flourished in the 18th century. The one corn-mill of Nantwich was converted into a cotton factory in 1789, but was closed in 1874.

See James Hall, *A History of Nantwich or Wich Milbank* (1883).

NAOROJI, DADABHAI (1825–), Indian politician, was born at Nasik on the 4th of September 1825, the son of a Parsi priest. During a long and active life, he played many parts: professor of mathematics at the Elphinstone college (1854); founder of the *Rast Goftar* newspaper; partner in a Parsi business firm in London (1855); prime minister of Baroda (1874); member of the Bombay legislative council (1885); M.P. for Central Finsbury (1892–1895), being the first Indian to be elected to the House of Commons; three times president of the Indian National Congress. Many of his numerous writings are collected in *Poverty and Un-British Rule in India* (1901).

NAP, the pile on cloth, the surface of short fibres raised by special processes, differing with the various fabrics, and then smoothed and cut. Formerly the word was applied to the roughness on textiles before shearing. "Nap" in this sense appears in many Teutonic languages, cf. Ger. *Noppe*, Dutch *nop*, Nor. *napp*; the verbal form is *noppen* or *nappen*, to trim, cut short. The word nap also means a short sleep or doze (O. Eng. *hnappian*). In "napkin," a square of damask or other linen, used for wiping the hands and lips or for protecting the clothes at meals, the second part is a common English suffix, sometimes of diminutive force, and the first is from "nape,"[1] Low Lat. *napa* or *nappa*, a corrupt form of *mappa*, table-cloth. Nape still survives in "napery," a name for household linen in general.

NAPHTALI, in the Bible, the name of an Israelite tribe, the "son" of Jacob by Bilhah, Rachel's maid, and the uterine brother of Dan (Gen. xxx. 8). It lay to the south of Dan in the eastern half of upper Galilee (Josh. xix. 32-39), a fertile mountainous district (cf. Gen. xlix. 21; Deut. xxxiii. 23), open to the surrounding influences of Phoenicia and Aram. Apart from its share in the war against Sisera (Judg. iv. seq., see DEBORAH), little is known of it. It evidently suffered in the bloody conflicts of Damascus with Israel (1 Kings xv. 20), and was depopulated by Tiglath-Pileser IV. (2 Kings xv. 29; Isa. ix. 1). Naphtali and Dan are "brothers," perhaps partly on geographical grounds, but Dan also had a seat in the south (south-west of Ephraim), and the name of the "mother" Bilhah is apparently connected with Bilhan, an Edomite and also a Benjamite name (Gen. xxxvi. 27; 1 Chron. vii. 10).

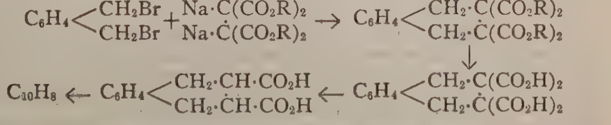
For the view connecting Naphtali (perhaps a geographical rather than a tribal term), or rather its Israelite inhabitants, with the south see the full discussion by H. W. Hogg, *Ency. Bib.* iii. col. 3332 sqq. with references.

NAPHTHA, a word originally applied to the more fluid kinds of petroleum, issuing from the ground in the Baku district of Russia and in Persia. It is the *νάφθα* of Dioscorides, and the *naphtha*, or *bitumen liquidum candidum* of Pliny. By the alchemists the word was used principally to distinguish various highly volatile, mobile and inflammable liquids, such as the ethers, sulphuric ether and acetic ether having been known respectively as *naphtha sulphurici* and *naphtha aceti*.

The term is now seldom used, either in commerce or in science, without a distinctive prefix, and we thus have the following:—

1. *Coal-tar Naphtha.*—A volatile commercial product obtained by the distillation of coal-tar (see COAL-TAR).
2. *Shale Naphtha.*—Obtained by distillation from the oil produced by the destructive distillation of bituminous shale (see PARAFFIN).
3. *Petroleum Naphtha.*—A name sometimes given (*e.g.* in the United States) to a portion of the more volatile hydrocarbons distilled from petroleum (see PETROLEUM).
4. *Wood Naphtha.*—Methyl alcohol (*q.v.*).
5. *Bone Naphtha.*—Known also as bone oil or Dippel's oil. A volatile product of offensive odour obtained in the carbonization of bones for the manufacture of animal charcoal.
6. *Caoutchouc Naphtha.*—A volatile product obtained by the destructive distillation of rubber. (B. R.)

NAPHTHALENE, $C_{10}H_8$, a hydrocarbon discovered in the "carbolic" and "heavy oil" fractions of the coal-tar distillate (see COAL-TAR) in 1819 by A. Garden. It is a product of the action of heat on many organic compounds, being formed when the vapours of ether, camphor, acetic acid, ethylene, acetylene, &c., are passed through a red-hot tube (M. Berthelot, *Jahresb.*, 1851), or when petroleum is led through a red-hot tube packed with charcoal (A. Letny, *Ber.*, 1878, 11, p. 1210). It may be synthesized by passing the vapour of phenyl butylene bromide over heated soda lime (B. Aronheim, *Ann.*, 1874, 171, p. 219); and by the action of ortho-xylylene bromide on sodium ethane tetracarboxylic ester, the resulting tetra-hydronaphthalene tetracarboxylic ester being hydrolysed and heated, when it yields hydronaphthalene dicarboxylic acid, the silver salt of which decomposes on distillation into naphthalene and other products (A. v. Baeyer and W. H. Perkin, junr., *Ber.*, 1884, 17, p. 451):—



$$C_6H_4{<}\begin{matrix}CH_2Br\\CH_2Br\end{matrix} + \begin{matrix}Na{\cdot}C(CO_2R)_2\\Na{\cdot}\dot{C}(CO_2R)_2\end{matrix} \rightarrow C_6H_4{<}\begin{matrix}CH_2{\cdot}C(CO_2R)_2\\CH_2{\cdot}\dot{C}(CO_2R)_2\end{matrix}$$

$$\downarrow$$

$$C_{10}H_8 \leftarrow C_6H_4{<}\begin{matrix}CH_2{\cdot}CH{\cdot}CO_2H\\CH_2{\cdot}\dot{C}H{\cdot}CO_2H\end{matrix} \leftarrow C_6H_4{<}\begin{matrix}CH_2{\cdot}C(CO_2H)_2\\CH_2{\cdot}\dot{C}(CO_2H)_2\end{matrix}$$

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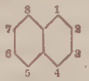
[1] "Nape," the back of the neck, is of doubtful origin; it may be a variant of "knap," a knob or protuberance.

It is a colourless solid, which melts at 80° C., and boils at 218° C. It crystallizes in the monoclinic system; it is to be noted that α- and β-naphthol assume almost identical forms, so that these three compounds have been called isomorphous. It is insoluble in water, but is readily soluble in alcohol, and ether. It has a characteristic smell, and is very volatile, distilling readily in a current of steam. It acts as a weak antiseptic. It is used for enriching coal gas, as a vermin killer, in the manufacture of certain azo dyes, and in the preparation of phthalic acid (*q.v.*). When passed through a red-hot tube packed with carbon it yields ββ-dinaphthyl, $(C_{10}H_7)_2$. It forms a crystalline compound with picric acid. It readily forms addition products with chlorine and with hydrogen; the dichloride, $C_{10}H_8Cl_2$, is obtained as a yellow liquid by acting with hydrochloric acid and potassium chlorate; the solid tetrachloride, $C_{10}H_8Cl_4$, results when chlorine is passed into naphthalene dissolved in chloroform. Numerous hydrides are known; heated with red phosphorus and hydriodic acid the hydrocarbon yields mixtures of hydrides of composition $C_{10}H_{10}$ to $C_{10}H_{20}$. Sodium in boiling ethyl alcohol gives the α-dihydride, $C_{10}H_{10}$ (E. Bamberger, *Ber.*, 1887, 20, p. 1705); and with boiling amyl alcohol the β-tetrahydride, $C_{10}H_{12}$ (E. Bamberger, *Ber.*, 1890, 23, p. 1561). The α-tetrahydronaphthalene is formed when naphthalene is heated with phosphonium iodide at 170°-190° (A. v. Baeyer). Structurally naphthalene may be represented as a fusion of two benzene nuclei, the hydrogen atoms being numbered as in the inset formula 

; 1, 4, 5, 8 are α-positions, 2, 3, 6, 7 are β; 1-5 or 4-8 diderivatives are ana, whilst 1-8 or 4-5 are peri (see CHEMISTRY, ORGANIC).

α-*Nitronaphthalene*, $C_{10}H_7 \cdot NO_2$, is formed by the direct nitration of naphthalene. For its commercial preparation see O. Witt, *Die chemische Industrie*, 1887, 10, p. 215. It crystallizes in yellow needles, which melt at 61° C., and are readily soluble in alcohol. By the action of nitro-sulphuric acid it is converted into a mixture of 1·5 and 1·8 dinitronaphthalenes (P. Friedlander, *Ber.*, 1899, 32, p. 3531). When heated with aniline and its salts it yields phenylrosindulin (German patent 67339 (1888)). β-*Nitronaphthalene* is prepared by acting with ethyl nitrite on an alcoholic solution of 2-nitro-α-naphthylamine in the presence of sulphuric acid (E. Lellmann and A. Remy, *Ber.*, 1886, 19, p. 237), or with freshly prepared potassium cupronitrite on β-naphthalene diazonium sulphate (A. Hantzsch, *Ber.*, 1900, 33, p. 2553). It crystallizes in small yellow needles which melt at 78° C. and are volatile in steam.

Sulphonic Acids.—Two monosulphonic acids (α and β) result by acting with sulphuric acid on the hydrocarbon, the α-acid predominating at low temperatures (80° C. and under) and the β-acid at higher temperatures (170°-200° C.). They are crystalline, hygroscopic compounds and are employed for the manufacture of the naphthols. Numerous *di-* and *tri*-sulphonic acids are known.

α-*Naphthoquinone*, $C_{10}H_6O_2$, resembles benzoquinone, and is formed by the oxidation of many α-derivatives of naphthalene with chromic acid. It crystallizes in yellow needles which melt at 125° C. It sublimes readily, is volatile in steam and reduces to the corresponding dihydroxynaphthalene. β-*Naphthoquinone* is formed by oxidizing 2-amino-α-naphthol (from β-naphthol-orange by reduction) with ferric chloride. It crystallizes in red needles, which melt at 115° C; it has no smell and is non-volatile (cf. phenanthrenequinone). *Alizarin black*, $C_{10}H_4(OH)_2O_2 \cdot NaHSO_3$, the sodium bisulphite compound of 7·8 dioxy-α-naphthoquinone, is a dyestuff used for printing on cotton in the presence of a chromium mordant. The naphthoquinone is prepared by the action of zinc and concentrated sulphuric acid on α-dinitronaphthalene. A 2·6 naphthoquinone results on oxidizing 2·6 dihydroxynaphthalene with lead peroxide.

α-*Naphthoic acid*, $C_{10}H_7 \cdot CO_2H$, is formed by hydrolysis of the nitrile, obtained by distilling potassium-α-naphthalene sulphonate with potassium cyanide (V. Merz, *Zeit. f. Chemie*, 1868, p. 34), or by heating the sulphonate with sodium formate (V. Meyer, *Ann.*, 1870, 156, p. 274). It forms needles which melt at 160° C. β-*Naphthoic acid*, obtained by boiling β-methylnaphthalene with dilute nitric acid, or by hydrolysis of its nitrile (formed when formyl-β-naphthalide is heated with zinc dust), crystallizes from alcohol in needles which melt at 184° C.

NAPHTHOLS, or HYDROXYNAPHTHALENES, $C_{10}H_7OH$, the naphthalene homologues of the phenols. The hydroxyl group is more reactive than in the phenols, the naphthols being converted into naphthylamines by the action of ammonia, and forming ethers and esters much more readily.

α-*Naphthol* may be prepared by fusing sodium-α-naphthalene sulphonate with caustic soda; by heating α-naphthylamine sulphate with water to 200° C. (English Patent 14301 (1892)); and by heating phenyl isocrotonic acid (R. Fittig and H. Erdmann, *Ann.* 1885, 227, p. 242): $C_6H_5CH{:}CH \cdot CH_2 \cdot CO_2H = C_{10}H_7OH + H_2O$. It forms colourless needles which melt at 94° C.; and is readily soluble in alcohol, ether, chloroform, and caustic alkalis. It is volatile in steam. With ferric chloride it gives a dark-blue precipitate of α-dinaphthol, $HO \cdot C_{10}H_6 \cdot C_{10}H_6 \cdot OH$. Alkaline potassium permanganate oxidizes it to phenyl-glyoxyl-ortho-carboxylic acid, $HO_2C \cdot C_6H_4 \cdot CO \cdot CO_2H$. It is reduced by sodium in boiling amyl alcohol solution to "aromatic" tetrahydro-α-naphthol (reduction occurring in the ring which does not contain the hydroxyl group). When heated with hydrazine hydrate at 160° C. it gives α-naphthyl hydrazine, $C_{10}H_7NH \cdot NH_2$ (L. Hoffmann, *Ber.*, 1898, 31, p. 2909). Nitric acid converts it into nitro-compounds, which are occasionally used for dyeing silk and wool.

Martius yellow, $C_{10}H_5(NO_2)_2ONa \cdot H_2O$, the sodium salt of 2·4 dinitro-α-naphthol (for notation see NAPHTHALENE), is prepared by the action of nitric acid on α-naphthol-2·4-disulphonic acid. It forms orange-yellow plates and dyes wool a golden yellow (from an acid bath). *Naphthol yellow S.*, $C_{10}H_4(ONa)(NO_2)_2SO_3Na$, prepared by the action of nitric acid on α-naphthol-2·4·7-trisulphonic acid, is an orange-yellow powder which dyes wool and silk yellow (from an acid bath).

Numerous mono-, di- and trisulphonic acids of α-naphthol are employed in the preparation of azo dyes. The most important is *Nevile and Winther's acid*, $C_{10}H_6(OH)(SO_3H)(1 \cdot 4)$, formed when diazotized naphthionic acid (α-naphthylamine-4-sulphonic acid) is boiled with dilute sulphuric acid (Nevile and Winther, *Ber.*, 1880, 13, p. 1949), or when sodium naphthionate is heated with concentrated caustic soda solution under pressure at 240°–260° C. (German patent 46307 (1888)). It melts at 170° C., and is readily soluble in water. With ferric chloride it gives a blue coloration.

β-*Naphthol*, $C_{10}H_7OH$, prepared by fusing sodium β-naphthalene sulphonate with caustic soda, crystallizes in plates which melt at 122° C. With ferric chloride it gives a green colouration, and after a time a white flocculent precipitate of a dinaphthol. With sodium in boiling amyl alcohol solution it gives a mixture of alicyclic and aromatic tetrahydro-β-naphthols (E. Bamberger, *Ber.*, 1890, 23, p. 197). When heated with ammonium formate to 150° C. it forms β-naphthylamine. With nitrosodimethylaniline hydrochloride it forms *Meldola's Blue* (dimethylaminonaphthophenoxazonium chloride), $C_{18}H_{15}N_2OCl$ (R. Meldola, *Ber.*, 1879, 12, p. 2065).

The β-naphthol sulphonic acids find extensive application in the colour industry. The most important members are shown in the table:—

FORMULA.	METHOD OF PREPARATION.	REMARKS.
2-oxy-8-sulphonic (Baeyer's acid)	From β-naphthol and concentrated sulphuric acid at 50°–60° C.	Sodium salt soluble in strong alcohol.
2-oxy-6-sulphonic (Schaffer's acid)	From β-naphthol and concentrated sulphuric at 100° C.	Sodium salt insoluble in alcohol.
2-oxy-7-sulphonic (F-acid)	By fusion of naphthalene 2·7-disulphonic acid with caustic soda at 200°–250° C.	Very soluble in water and alcohol.
2-oxy-3·6-disulphonic (R-acid)	Both R- and G-acid from β-naphthol and concentrated sulphuric acid at 100°–110°C.	The sodium salts separated by crystallization. R-salt insoluble in alcohol; G-salt soluble.
2-oxy-6·8-disulphonic (G-acid)		
2-oxy-3·6·8-trisulphonic	From β-naphthol and fuming sulphuric acid at 140°–160°C.	Alkaline solutions show green fluorescence.

Nitrosonaphthols or *naphthoquinone-oximes*, $C_{10}H_6(OH)(NO)$ or $C_{10}H_6({:}NOH){:}O$. Two are known, namely ***4-nitroso-α-naphthol*** or *α-naphthoquinone-oxime*, formed by the action of nitrous acid on α-naphthol or of hydroxylamine hydrochloride on α-naphthoquinone (H. Goldschmidt and H. Schmidt, *Ber.*, 1884, 17 p. 2064); and *2-nitroso-α-naphthol* (β-naphthoquinone-oxime), formed by the action of hydroxylamine hydrochloride on β-naphthoquinone.

NAPHTHYLAMINES, or AMINONAPHTHALENES, $C_{10}H_7NH_2$, the naphthalene homologues of aniline, in contrast to which they may be prepared by heating the naphthols with ammonia-zinc chloride.

α-Naphthylamine is prepared by reducing α-nitronaphthalene with iron and hydrochloric acid at about 70° C., the reaction mixture being neutralized with milk of lime, and the naphthylamine steam-distilled. It may also be prepared (in the form of its acetyl derivative) by heating α-naphthol with sodium acetate, ammonium chloride and acetic acid (A. Calm, *Ber.*, 1882, 15, p. 616); by heating α-naphthol with calcium chloride-ammonia to 270° C.; and by heating pyromucic acid, aniline, zinc chloride and lime to 300° C. (F. Canzonieri and V. Oliveri, *Gazz.*, 1886, 16, p. 493). It crystallizes in colourless needles which melt at 50° C. It possesses a disagreeable faecal odour, sublimes readily, and turns brown on exposure to air. Oxidizing agents (ferric chloride, &c.) give a blue precipitate with solutions of its salts. Chromic acid converts it into α-naphthoquinone. Sodium in boiling amyl alcohol reduces it to aromatic tetrahydro-α-naphthylamine, a substance having the properties of an aromatic amine, for it can be diazotized and does not possess an ammoniacal smell. Since it does not form an addition product with bromine, reduction must have taken place in one of the nuclei only, and on account of the aromatic character of the compound it must be in that nucleus which does not contain the amino group. This tetrahydro compound yields adipic acid, $(CH_2)_4(CO_2H)_2$, when oxidized by potassium permanganate. The α-naphthylamine sulphonic acids are used for the preparation of azo dyes, these dyes possessing the important property of dyeing unmordanted cotton. The most important is *naphthionic acid*, 1-amino-4-sulphonic acid, produced by heating α-naphthylamine and sulphuric acid to 170-180° C. with about 3% of crystallized oxalic acid. It forms small needles, very sparingly soluble in water. With diazotized benzidine it gives Congo red.

β-Naphthylamine is prepared by heating β-naphthol with zinc chloride-ammonia to 200-210° (V. Merz and W. Weith, *Ber.*, 1880, 13, 1300); or in the form of its acetyl derivative by heating β-naphthol with ammonium acetate to 270-280° C. It forms odourless, colourless plates which melt at 111-112° C. It gives no colour with ferric chloride. When reduced by sodium in boiling amyl alcohol solution it forms alicyclic tetrahydro-β-naphthylamine, which has most of the properties of the aliphatic amines; it is strongly alkaline in reaction, has an ammoniacal odour and cannot be diazotized. On oxidation it yields ortho-carboxy-hydrocinnamic acid, $HO_2C{\cdot}C_6H_4{\cdot}CH_2{\cdot}CH_2{\cdot}CO_2H$. Numerous sulphonic acids derived from β-naphthylamine are known, the more important of which are the 2·8 or Badische, the 2·5 or Dahl, the 2·7 or δ, and the 2·6 or Bronner acid. Of these, the δ-acid and Bronner's acid are of more value technically, since they combine with ortho-tetrazoditolyl to produce fine red dye-stuffs.

NAPIER, SIR CHARLES (1786–1860), British admiral, was the second son of Captain the Hon. Charles Napier, R.N., and grandson of Francis, fifth Lord Napier. He was born at Merchiston Hall, near Falkirk, on the 6th of March 1786. He became a midshipman in 1800, and was promoted lieutenant in 1805. He was appointed to the "Courageux" (74), and was present in her at the action in which the squadron under Sir J. B. Warren took the French "Marengo" (80) and "Belle Poule" (40), on the 13th of March 1806 in the West Indies. After returning home with Warren he went back to the West Indies in the "St George" and was appointed acting commander of the "Pultusk" brig. The rank was confirmed on the 30th of November 1807. In August 1808 he was moved into the "Recruit" (18), and in her fought an action with the "Diligent" (18), in which his thigh was broken. In April 1809 he took part in the capture of the "Hautpoult" (74), and was promoted acting post captain. His rank was confirmed, but he was put on half-pay, when he came home with a convoy. He spent some time at the university of Edinburgh, and then went to Portugal to visit his cousins in Wellington's army. In 1811 he served in the Mediterranean, and in 1813 on the coast of America and in the expedition up the Potomac. The first years of his leisure he spent in Italy and in Paris, but speculated so much in a steamboat enterprise that by 1827 he was quite ruined. In that year he was appointed to the "Galatea" (42), and was at the Azores when they were held by the count de Villa Flor for the queen of Portugal. He so much impressed the constitutional leaders that they begged him to take command of the fleet, which offer he accepted in February 1833. With it he destroyed the Miguelite fleet off Cape St Vincent on July 5, and on the demand of France was struck off the English navy list. Continuing his Portuguese services, he commanded the land forces on the successful defence of Lisbon in 1834, when he was made Grand Commander of the Tower and Sword, and Count Cape St Vincent in the peerage of Portugal. On his return to England he was restored to his former rank in the navy 1836, and received command of the "Powerful" (84), in 1838. When troubles broke out in Syria he was appointed second in command, and distinguished himself by leading the storming column at Sidon on September 26, 1840, and by other services, for which he was made a K.C.B. He went on half-pay in 1841, and was in 1842 elected M.P. for Marylebone in the Liberal interest, but lost his seat in 1846. He was promoted rear-admiral the same year, and commanded the Channel fleet from 1846 to 1848. On the outbreak of the Russian War he received the command of the fleet destined to act in the Baltic, and hoisted his flag in February 1854. He refused to attack Cronstadt, and a great outcry was raised against him for not obeying the orders of the Admiralty and attempting to storm the key of St Petersburg; but his inaction has been thoroughly justified by posterity. On his return in December 1854 he was not again offered a command. He was elected M.P. for Southwark in February 1855, and maintained his seat, though broken in health, until his death on the 6th of November 1860. Sir Charles Napier was a man of undoubted energy and courage, but of no less eccentricity and vanity. He caused great offence to many of his brother officers by his behaviour to his superior, Admiral Stopford, in the Syrian War, and was embroiled all his life in quarrels with the Admiralty.

See Major-General E. Napier's *Life and Correspondence of Admiral Sir Charles Napier, K.C.B.* (2 vols., London, 1862); Napier's own *War in Syria* (2 vols., 1842); *The Navy: its past and present state, in a series of letters*, edited by Sir W. F. P. Napier (1851); and *The History of the Baltic Campaign of 1854, from documents and other materials furnished by Vice-Admiral Sir C. Napier, K.C.B.* (1857). See also *The Life and Exploits of Commodore Napier* (1841); and *Life of Vice-Admiral Sir C. Napier* (1854).

NAPIER, SIR CHARLES JAMES (1782–1853), British soldier and statesman, was born at Whitehall, London, in 1782, being the eldest son of Colonel George Napier (a younger son of the fifth lord Napier), and of his wife, the Lady Sarah Lennox who had charmed King George III. After the custom of those times Charles Napier had been gazetted an ensign in the 33rd regiment in 1794, and in 1797 his father secured for him the appointment of aide-de-camp to Sir James Duff, commanding the Limerick district. Longing for more active service, Napier obtained a commission as lieutenant in the 95th Manningham's Rifles (Rifle Brigade) in 1800. This newly formed corps was designed to supply a body of light troops for the English army fit to cope with the French voltigeurs and tirailleurs, and was specially trained, at first under the eye of Colonel Coote Manningham, and then at Shorncliffe under the immediate supervision of Sir John Moore. Moore speedily perceived the military qualities of the Napiers, and inspired the three brothers—Charles of the Rifles, George of the 52nd and William of the 43rd—with an enthusiasm which lasted all their lives; but, though happy in his general, Charles Napier quarrelled bitterly with William Stewart, the lieutenant-colonel, and in 1803 left the regiment to accompany General H. E. Fox to Ireland as aide-de-camp. The great influence of his uncle, the duke of

Richmond, and of his cousins, Charles James Fox and the general, procured him in 1804 a captaincy in the staff corps, and in the beginning of 1806 a majority in the Cape regiment. On his way to the Cape, however, he exchanged into the 50th regiment, with which he served in the short Danish campaign under Lord Cathcart in 1807. Shortly after his return from Denmark the 50th was ordered to Portugal, and in command of it Napier shared all the glories of the famous retreat to Corunna. At the battle of Corunna, one of the last sights of Sir John Moore before he fell mortally wounded was the advance of his own old regiment under the command of Charles Napier and Edward Stanhope, and almost his last words were "Well done, my majors!" The 50th suffered very severely and both the majors were left for dead upon the field. Napier's life was saved by a French drummer named Guibert, who brought him safely to the headquarters of Marshal Soult. Soult treated him with the greatest kindness, and he was allowed by Ney to return to England to his "old blind mother" instead of being interned. After about a year he heard that his exchange had been arranged, and, volunteering for the Peninsula, he joined the light division before Ciudad Rodrigo. As a volunteer he served in the actions on the Coa, and again at Busaco, where he was badly wounded in the face. He was ordered to England, but refused to go, and in March 1811, though barely recovered, he hurried to the front to take part in the pursuit of Masséna. After the battle of Fuentes d'Onor, he received the lieutenant-colonelcy of the 102nd regiment, which had become entirely demoralized at Botany Bay, and when he joined it at Guernsey in 1811 was one of the worst regiments in the service. When he left it in 1813 it was one of the best. He accompanied it in June 1812 from Guernsey to Bermuda, where he wrought a wonderful change in the spirit both of officers and men. By treating his men as friends he won their love and admiration, and became in a peculiar degree the hero of the British soldiers. After seeing further active service against the United States in September 1813 he exchanged back into the 50th regiment, and in December 1814, believing all chance of active service to be at an end, went on half-pay. He was gazetted one of the first C.B.'s on the extension of the order of the Bath in 1814, and was present as a volunteer at the capture of Cambray, but he just missed the great battle of Waterloo. Though an officer of some experience and more than thirty years of age, he now entered the military college at Farnham, and completed his military education. In 1819 he was appointed inspecting field officer at Corfu, in 1820 was sent on a mission to Ali Pasha at Iannina, and in 1821 visited Greece, where he became an ardent supporter of the patriot party. From Corfu he was moved in 1822 to Cephalonia, where he remained for eight years as governor and military resident. He was the model of an absolute colonial governor, and showed all the qualities of a benevolent despot. He made good roads and founded great institutions, but everything must be done by him, and he showed himself averse to interference, whether from the high commissioner of the Ionian Islands, whom it was his duty to obey, or from the feudal magnates of his own little colony, over whom it was his duty to exercise strict supervision. An interesting episode in his command was his communication with Lord Byron when he touched at Cephalonia on his way to take part in the Greek War of Independence. Byron sent a letter to the Greek committee in London recommending Napier's appointment as commander-in-chief. But after many negotiations the scheme came to nothing. In 1827 Napier, who had two years before been made a colonel in the army, quarrelled with Sir Frederick Adam, the new high commissioner, and in 1830, when Napier was in England on leave, Adam seized his papers and forbade him to return. Napier thereupon, refusing promotion to the residency of Zante, retired in disgust, living for some years in the south of England and, after the death of his wife in 1833, in Normandy. Here he wrote his work on the colonies, and also an historical romance on William the Conqueror. Another work, entitled *Harold*, has disappeared. In 1834 he refused the governorship of Australia, still hoping for military employment. In 1837 he was promoted major-general with his brother George, in 1838 he returned to England and was made a K.C.B.; but he was to wait till 1839 before he received an offer of employment. In that year he was made commanding officer in the northern district, and found his command no sinecure, owing to the turbulent state of the Chartists in the towns of Yorkshire, Lancashire and the Midlands. His behaviour during the tenure of his command is described by William Napier in his life of his brother, and his inability to hold a command which did not carry supreme authority is plainly portrayed. In this particular instance his sympathies were on the popular side, and, though he maintained law and order with the necessary rigour, he resigned as soon as the crisis had passed, and went to India. He was stationed at Poona, and in September 1842, when troubles were expected there, was ordered to Sind.

His command in Sind from 1842 till August 1847 is the period of his life during which, according to his brother, he made good his title to fame, but his acts, more especially at first, have been most severely criticized. There can be little doubt that from the moment he landed in the province he determined to conquer the amirs, and to seek the first opportunity of doing so. He was to be accompanied by James Outram (*q.v.*), who had been resident in Sind during the Afghan War, and who felt a great admiration for him, but who had also a warm affection for the amirs, and believed that he could put off the day of their destruction. On the 15th of February 1843, Outram was treacherously assailed at Hyderabad, and on the 17th Napier attacked the Baluch army 30,000 strong with but 2800 men. With these 2800 men, including the 22nd regiment, which would do anything for him, he succeeded in winning the brilliant and decisive victory of Meeanee, one of the most amazing in the history of the British army, in which generals had to fight like privates, and Sir Charles himself engaged in the fray. In the March following, after marching without transport in the most intense heat, he finally destroyed the army of the amirs at the battle of Hyderabad. His success was received with enthusiasm both by the governor-general, Lord Ellenborough, and by the English people, and he was at once made a G.C.B. Whether or not the conquest of Sind at that particular period can be justified, there can be no doubt that Charles Napier was the best administrator who could be found for the province when conquered. Sind, when it came under English rule, was in a state of utter anarchy, for the Baluchis had formed a military government not unlike that of the Mamelukes in Egypt, which had been extremely tyrannical to the native population. This native population was particularly protected by Sir Charles Napier, who completed the work of the destruction of the Baluch supremacy which he had commenced with the victory of Meeanee. The labour of administration was rendered more difficult by the necessity of repressing the hill tribes, which had been encouraged to acts of lawlessness by the licence which followed the Afghan War. The later years of his administration were made very stormy by the attacks on the policy of the conquest which had been made in England. He left Sind, after quarrelling with every authority of the presidency of Bombay, and nearly every authority of the whole of India, in August 1847, and received a perfect ovation on his return from all the hero-worshippers of the Napiers, of whom there were many in England. His short stay in England was occupied with incessant struggles with the directors of the East India Company; but the news of the indecisive victory of Chillianwalla created a panic in England, and the East India Company was obliged by public opinion to summon the greatest general of the day to command its armies. Sir Charles started almost at a moment's notice, but on reaching India found that the victory of Gujrat had been won and the Sikh War was over. No taint of envy was in his nature, and he rejoiced that he had not had to supersede Lord Gough in the moment of defeat. His restless and imperious spirit was met by one equally imperious in the governor-general, Lord Dalhousie. The two men were good friends until, in the absence of Dalhousie at sea, Napier took upon himself to alter the regulations regarding the allowances to native troops; the occasion was urgent, as the troops were in a state of mutiny, but on his return Dalhousie reprimanded the commander-in-chief and reversed his decision. Napier immediately handed in his resignation, and when the duke of Wellington supported Lord Dalhousie and repeated the reprimand he returned to England. He had been credited with foreseeing the Mutiny of 1857, and on the whole with justice. On one occasion he wrote that mutiny was "one of the greatest, if not the greatest, danger threatening India—a danger that may come unexpectedly, and if the first symptoms be not carefully treated, with a power to shake Leadenhall." On the mutiny of the 66th native regiment at Govindgarh he disbanded it, and handed its colours over to a Gurkha regiment, thus showing that he distrusted the high-class Brahman, and recognized the necessity of relying upon a more warlike and more disciplined race. His constitution was undermined by the Indian climate, especially by his fatiguing command in Sind, and on the 29th of August 1853 he died at Portsmouth. The bronze statue of him by G. G. Adams, which stands in Trafalgar Square, London, was erected by public subscription, by far the greater number of the subscribers being, as the inscription records, private soldiers.

The chief authority for Sir Charles Napier's life is his *Life and Opinions* by his brother (1857); consult also MacColl, *Career and Character of C. J. Napier* (1857); M'Dougall, *General Sir C. J. Napier, Conqueror and Governor of Scinde* (1860); W. N. Bruce, *Sir Charles Napier* (1855); and T. R. E. Holmes, *Four Famous Soldiers* (1889). His own works are *Memoir on the Roads of Cephalonia* (1825); *The Colonies, treating of their value generally and of the Ionian Islands in particular*; *Strictures on the Administration of Sir F. Adam* (1833); *Colonization, particularly in Southern Australia* (1835); *Remarks on Military Law and the Punishment of Flogging* (1837); *A Dialogue on the Poor Laws* (1838?); *A Letter on the Defence of England by Corps of Volunteers and Militia* (1852); *Lights and Shadows of Military Life* (trans. from the French, 1840); and *A Letter to the Right Honourable Sir J. C. Hobhouse on the Baggage of the Indian Army* (1849); *Defects, Civil and Military, of the Indian Government* (1853); *William the Conqueror, a Historical Romance*, edited by Sir W. Napier (1858). On Sind, consult primarily Sir W. Napier, *The Conquest of Scinde* (1845); *The Administration of Scinde* (1851); *Compilation of General Orders issued by Sir C. Napier* (1850); and Outram, *The Conquest of Scinde, a Commentary* (1846). For his command-in-chief, and the controversy about his resignation, consult J. Mawson, *Records of the Indian Command of General Sir C. J. Napier* (Calcutta, 1851); *Minutes on the Resignation of the late General Sir C. Napier, by Field-Marshal the Duke of Wellington, &c.* (1854); *Comments by Sir W. Napier on a Memorandum of the Duke of Wellington* (1854); Sir William Napier, *General Sir C. Napier and the Directors of the East India Company* (1857); Sir W. Lee Warner, *Life of Lord Dalhousie* (1904).

NAPIER, JOHN (1550–1617), Scottish mathematician and inventor of logarithms, was born at Merchiston near Edinburgh in 1550, and was the eighth Napier of Merchiston. The first Napier of Merchiston, "Alexander Napare," acquired the Merchiston estate before the year 1438, from James I. of Scotland. He was provost of Edinburgh in 1437, and was otherwise distinguished. His eldest son Alexander, who succeeded him in 1454, was provost of Edinburgh in 1455, 1457 and 1469; he was knighted and held various important court offices under successive monarchs; at the time of his death in 1473 he was master of the household to James III. His son, John Napier of Rusky, the third of Merchiston, belonged to the royal household in the lifetime of his father. He also was provost of Edinburgh at various times, and it is a remarkable instance of the esteem in which the lairds of Merchiston were held that three of them in immediate lineal succession repeatedly filled so important an office during perhaps the most memorable period in the history of the city. He married a great-granddaughter of Duncan, 8th earl of Levenax (or Lennox), and besides this relationship by marriage the Napiers claimed a lineal male cadency from the ancient family of Levenax. His eldest son, Archibald Napier of Edinbellie, the fourth of Merchiston, belonged to the household of James IV. He fought at Flodden and escaped with his life, but his eldest son Alexander, (fifth of Merchiston) was killed. Alexander's eldest son (Alexander, sixth of Merchiston) was born in 1513, and fell at the battle of Pinkie in 1547. His eldest son was Archibald, seventh of Merchiston, and the father of John Napier, the subject of this article.

In 1549 Archibald Napier, at the early age of about fifteen, married Janet, daughter of Francis Bothwell, and in the following year John Napier was born. In the criminal court of Scotland, the earl of Argyll, hereditary justice-general of the kingdom, sometimes presided in person, but more frequently he delegated his functions; and it appears that in 1561 Archibald Napier was appointed one of the justice-deputes. In the register of the court, extending over 1563 and 1564, the justice-deputes named are "Archibald Naper of Merchistoune, Alexander Bannatyne, burgess of Edinburgh, James Stirling of Keir and Mr Thomas Craig." About 1565 he was knighted at the same time as James Stirling, his colleague, whose daughter John Napier subsequently married. In 1582 Sir Archibald was appointed master of the mint in Scotland, with the sole charge of superintending the mines and minerals within the realm, and this office he held till his death in 1608. His first wife died in 1563, and in 1572 he married a cousin, Elizabeth Mowbray, by whom he had three sons, the eldest of whom was named Alexander.[1]

As already stated, John Napier was born in 1550, the year in which the Reformation in Scotland may be said to have commenced. In 1563, the year in which his mother died, he matriculated at St Salvator's College, St Andrews. He early became a Protestant champion, and the one extant anecdote of his youth occurs in his address "to the Godly and Christian reader" prefixed to his *Plaine Discovery*. He writes:—

> "In my tender yeares, and barneage in Sanct-Androis at the Schooles, having, on the one parte, contracted a loving familiaritie with a certaine Gentleman, &c. a Papist; And on the other part, being attentive to the sermons of that worthie man of God, Maister Christopher Goodman, teaching upon the Apocalyps, I was so mooved in admiration, against the blindnes of Papists, that could not most evidently see their seven hilled citie Rome, painted out there so lively by Saint John, as the mother of all spiritual whoredome, that not onely bursted I out in continual reasoning against my said familiar, but also from thenceforth, I determined with my selfe (by the assistance of Gods spirit) to employ my studie and diligence to search out the remanent mysteries of that holy Book: as to this houre (praised be the Lorde) I have bin doing at al such times as conveniently I might have occasion."

The names of nearly all Napier's classfellows can be traced as becoming *determinantes* in 1566 and masters of arts in 1568; but his own name does not appear in the lists. The necessary inference is that his stay at the university was short, and that only the groundwork of his education was laid there. Although there is no direct evidence of the fact, there can be no doubt that he left St Andrews to complete his education abroad, and that he probably studied at the university of Paris, and visited Italy and Germany. He did not, however, as has been supposed, spend the best years of his manhood abroad, for he was certainly at home in 1571, when the preliminaries of his marriage were arranged at Merchiston; and in 1572 he married Elizabeth, daughter of Sir James Stirling of Keir. About the end of the year 1579 his wife died, leaving him one son, Archibald (who in 1627 was raised to the peerage by the title of Lord Napier), and one daughter, Jane. A few years afterwards he married again, his second wife being Agnes, daughter of Sir James

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[1] The descent of the first Napier of Merchiston has been traced to "Johan le Naper del Counte de Dunbretan," who was one of those who swore fealty to Edward I. in 1296 and defended the castle of Stirling against him in 1304; but there is no authority for this genealogy. The legend with regard to the origin of the name Napier was given by Sir Alexander Napier, eldest son of John Napier, in 1625, in these words: "One of the ancient earls of Lennox in Scotland had issue three sons: the eldest, that succeeded him to the earldom of Lennox; the second, whose name was Donald; and the third, named Gilchrist. The then king of Scotland having wars, did convocate his lieges to battle, amongst whom that was commanded was the earl of Lennox, who, keeping his eldest son at home, sent his two sons to serve for him with the forces that were under his command. . . . After the battle, as the manner is, every one drawing and setting forth his own acts, the king said unto them, ye have all done valiantly, but there is one amongst you who hath Na-Peer (*i.e.* no equal); and calling Donald into his presence commanded him, in regard to his worthy service, and in augmentation of his honour, to change his name from Lennox to Napier, and gave him the lands of Gosford, and lands in Fife, and made him his own servant, which discourse is confirmed by evidences of mine, wherein we are called Lennox *alias* Napier."

Chisholm of Cromlix, who survived him. By her he had five sons and five daughters.

In 1588 he was chosen by the presbytery of Edinburgh one of its commissioners to the General Assembly.

On the 17th of October 1593 a convention of delegates was held at Edinburgh at which a committee was appointed to follow the king and lay before him in a personal interview certain instructions relating to the punishment of the rebellious Popish earls and the safety of the church. This committee consisted of six members, two barons, two ministers and two burgesses—the two barons selected being John Napier of Merchiston and James Maxwell of Calderwood. The delegates found the king at Jedburgh, and the mission, which was a dangerous one, was successfully accomplished. Shortly afterwards another convention was held at Edinburgh, and it was resolved that the delegates sent to Jedburgh should again meet the king at Linlithgow and repeat their former instructions. This was done accordingly, the number of members of the committee being, however, doubled. These interviews took place in October 1593, and on the 29th of the following January Napier wrote to the king the letter which forms the dedication of the *Plaine Discovery*.

The full title of this first work of Napier's is given below.[1] It was written in English instead of Latin in order that "hereby the simple of this Iland may be instructed"; and the author apologizes for the language and his own mode of expression in the following sentences:—

> "Whatsoever therfore through hast, is here rudely and in base language set downe, I doubt not to be pardoned thereof by all good men, who, considering the necessitie of this time, will esteem it more meete to make hast to prevent the rising againe of Antichristian darknes within this Iland, then to prolong the time in painting of language"; and "I graunt indeede, and am sure, that in the style of wordes and utterance of language, we shall greatlie differ, for therein I do judge my selfe inferiour to all men: so that scarcely in these high matters could I with long deliberation finde wordes to express my minde."[2]

Napier's *Plaine Discovery* is a serious and laborious work, to which he had devoted years of care and thought. In one sense it may be said to stand to theological literature in Scotland in something of the same position as that occupied by the *Canon Mirificus* with respect to the scientific literature, for it is the first published original work relating to theological interpretation, and is quite without a predecessor in its own field. Napier lived in the very midst of fiercely contending religious factions; there was but little theological teaching of any kind, and the work related to what were then the leading political and religious questions of the day.

After the publication of the *Plaine Discovery*, Napier seems to have occupied himself with the invention of secret instruments of war, for in the Bacon collection at Lambeth Palace there is a document, dated the 7th of June 1596 and signed by Napier, giving a list of his inventions for the defence of the country against the anticipated invasion by Philip of Spain. The document is entitled "Secrett Inventionis, proffitabill and necessary in theis dayes for defence of this Iland, and withstanding of strangers, enemies of God's truth and religion,"[3] and the inventions consist of (1) a mirror for burning the enemies' ships at any distance, (2) a piece of artillery destroying everything round an arc of a circle, and (3) a round metal chariot, so constructed that its occupants could move it rapidly and easily, while firing out through small holes in it. It has been asserted (by Sir Thomas Urquhart) that the piece of artillery was actually tried upon a plain in Scotland with complete success, a number of sheep and cattle being destroyed.

In 1614 appeared the work which in the history of British science can be placed as second only to Newton's *Principia*. The full title is as follows: *Mirifici Logarithmorum Canonis descriptio, Ejusque usus, in utraque Trigonometria; ut etiam in omni Logistica Mathematica, Amplissimi, Facillimi, & expeditissimi explicatio. Authore ac Inventore Ioanne Nepero, Barone Merchistonii, &c., Scoto. Edinburgi, ex officinâ Andreae Hart Bibliopolae, CIƆ.DC.XIV.* This is printed on an ornamental title-page. The work is a small-sized quarto, containing fifty-seven pages of explanatory matter and ninety pages of tables.

The nature of logarithms is explained by reference to the motion of points in a straight line, and the principle upon which they are based is that of the correspondence of a geometrical and an arithmetical series of numbers. The table gives the logarithms of sines for every minute to seven figures. This work contains the first announcement of logarithms to the world, the first table of logarithms and the first use of the name logarithm, which was invented by Napier.

In 1617 Napier published his *Rabdologia*,[4] a duodecimo of one hundred and fifty-four pages; there is prefixed to it as preface a dedicatory epistle to the high chancellor of Scotland. The method which Napier terms "Rabdologia" consists in the use of certain numerating rods for the performance of multiplications and divisions. These rods, which were commonly called "Napier's bones," will be described further on. The second method, which he calls the "Promptuarium Multiplicationis" on account of its being the most expeditious of all for the performance of multiplications, involves the use of a number of lamellae or little plates of metal disposed in a box. In an appendix of forty-one pages he gives his third method, "local arithmetic," which is performed on a chess-board, and depends, in principle, on the expression of numbers in the scale of radix 2. In the *Rabdologia* he gives the chronological order of his inventions. He speaks of the canon of logarithms as "a me longo tempore elaboratum." The other three methods he devised for the sake of those who would prefer to work with natural numbers; and he mentions that the promptuary was his latest invention. In the preface to the appendix containing the local arithmetic he states that, while devoting all his leisure to the invention of these abbreviations of calculation, and to examining by what methods the toil of calculation might be removed, in addition to the logarithms, rabdologia and promptuary, he had hit upon a certain tabular arithmetic, whereby the more troublesome operations of common arithmetic are performed on an abacus or chess-board, and which may be regarded as an amusement rather than a labour, for, by means of it, addition, subtraction, multiplication, division and even the extraction of roots are accomplished simply by the motion of counters. He adds that he has appended it to the *Rabdologia*, in addition to the promptuary, because he did not wish to bury it in silence nor to publish so small a matter by itself. With respect to the calculating rods, he mentions in the dedication that they had already found so much favour as to be almost in common use, and even to have been carried to foreign countries; and that he has been advised to publish his little work relating to their mechanism and use, lest they should be put forth in some one else's name.

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[1] *A Plaine Discovery of the whole Revelation of Saint Iohn: set downe in two treatises: The one searching and proving the true interpretation thereof: The other applying the same paraphrastically and historically to the text. Set foorth by John Napier, L. of Marchistoun younger. Whereunto are annexed certaine Oracles of Sibylla, agreeing with the Revelation and other places of Scripture. Edinburgh, printed by Robert Walde-grave, printer to the King's Majestie*, 1593. *Cum privilegio Regali.*

[2] A Dutch translation was published at Middelburg in 1600 and a second edition in 1607. The work was translated into French by George Thomson, a naturalized Scotsman residing in La Rochelle, and published by him at that town in 1602, under the title *Ouverture de tous les secrets de l'Apocalypse. . . . Par Jean Napeir* (c. a. d.) *Nonpareil, Sieur de Merchiston, reveue par lui-mesme, et mise en François par Georges Thomson, Escossois.* Subsequent editions were published in 1603, 1605 and 1607. German translations were published at Gera in 1611 and at Frankfort in 1605 and 1627. The second edition in English appeared at Edinburgh in 1611, and in the preface to it Napier states he intended to have published an edition in Latin soon after the original publication in 1593, but that, as the work had now been made public by the French and Dutch translations, besides the English editions, and as he was "advertised that our papistical adversaries wer to write larglie against the said editions that are alreadie set out," he defers the Latin edition "till having first seene the adversaries objections, I may insert in the Latin edition an apologie of that which is rightly done, and an amends of whatsoever is amisse." No criticism on the work was published, and there was no Latin edition. A third edition appeared at Edinburgh in 1645. Corresponding to the first two Edinburgh editions, copies were issued bearing the London imprint and dates 1594 and 1611.

[3] A facsimile of this document is given by Mark Napier in his *Memoirs of John Napier* (1834), p. 248.

[4] *Rabdologiae, seu Numerationis per virgulas Libri duo: Cum Appendice de expeditissimo Multiplicationis promptuario. Quibus accessit & Arithmeticae Localis Liber unus. Authore & Inventore Ioanne Nepero, Barone Merchistonii, &c., Scoto. Edinburgi, Excudebat Andreas Hart* (1617). Foreign editions were published in Italian at Verona in 1623, in Latin at Leiden in 1626 and 1628, and in Dutch at Gouda in 1626. In 1623 Ursinus published *Rhabdologia Neperiana* at Berlin, and the rods or bones were described in several other works.

John Napier died on the 4th of April 1617, the same year as that in which the *Rabdologia* was published. His will, which is extant, was signed on the fourth day before his death. No particulars are known of his last illness, but it seems likely that death came upon him rather suddenly at last. In both the *Canonis descriptio* and the *Rabdologia*, however, he makes reference to his ill-health. In the dedication of the former he refers to himself as "mihi jam morbis penè confecto," and in the "Admonitio" at the end he speaks of his "infirma valetudo"; while in the latter he says he has been obliged to leave the calculation of the new canon of logarithms to others "ob infirmam corporis nostri valetudinem."

It has been usually supposed that John Napier was buried in St Giles's church, Edinburgh, which was certainly the burial-place of some of the family, but Mark Napier (*Memoirs*, p. 426) quotes Professor William Wallace, who, writing in 1832, gives strong reasons for believing that he was buried in the old church of St Cuthbert.

Professor Wallace's words are—

> "My authority for this belief is unquestionable. It is a Treatise on Trigonometry, by a Scotsman, James Hume of Godscroft, Berwickshire, a place still in possession of the family of Hume. The work in question, which is rare, was printed at Paris, and has the date 1636 on the title-page, but the royal privilege which secured it to the author is dated in October 1635, and it may have been written several years earlier. In his treatise (page 116) Hume says, speaking of logarithms, 'L'inuenteur estoit un Seigneur de grande condition, et duquel la posterité est aujourd'huy en possession de grandes dignitéz dans le royaume, qui estant sur l'age, et grandement trauaillé des gouttes ne pouvait faire autre chose que de s'adonner aux sciences, et principalment aux mathematiques et à la logistique, à quoy il se plaisoit infiniment, et auec estrange peine, a construict ses Tables des Logarymes, imprimees à Edinbourg en l'an 1614. . . . Il mourut l'an 1616, et fut enterré hors la Porte Occidentale d'Edinbourg, dans l'Eglise de Sainct Cudbert.'"

There can be no doubt that Napier's devotion to mathematics was not due to old age and the gout, and that he died in 1617 and not in 1616; still these sentences were written within eighteen years of Napier's death, and their author seems to have had some special sources of information. Additional probability is given to Hume's assertion by the fact that Merchiston is situated in St Cuthbert's parish. It is nowhere else recorded that Napier suffered from the gout. It has been stated that Napier's mathematical pursuits led him to dissipate his means. This is not so, for his will (*Memoirs*, p. 427) shows that besides his large estates he left a considerable amount of personal property.

The *Canonis Descriptio* on its publication in 1614, at once attracted the attention of Edward Wright, whose name is known in connexion with improvements in navigation, and Henry Briggs, then professor of geometry at Gresham College, London. The former translated the work into English, but he died in 1615, and the translation was published by his son Samuel Wright in 1616. Briggs was greatly excited by Napier's invention and visited him at Merchiston in 1615, staying with him a whole month; he repeated his visit in 1616 and, as he states, "would have been glad to make him a third visit if it had pleased God to spare him so long." The logarithms introduced by Napier in the *Descriptio* are not the same as those now in common use, nor even the same as those now called Napierian or hyperbolic logarithms. The change from the original logarithms to common or decimal logarithms was made by both Napier and Briggs, and the first tables of decimal logarithms were calculated by Briggs, who published a small table, extending to 1000, in 1617, and a large work, *Arithmetica Logarithmica*,[1] containing logarithms of numbers to 30,000 and from 90,000 to 100,000, in 1624. (See LOGARITHM.)

Napier's *Descriptio* of 1614 contains no explanation of the manner in which he had calculated his table. This account he kept back, as he himself states, in order to see from the reception met with by the *Descriptio*, whether it would be acceptable. Though written before the *Descriptio* it had not been prepared for press at the time of his death, but was published by his son Robert in 1619 under the title *Mirifici Logarithmorum Canonis Constructio*.[2] In this treatise (which was written before Napier had invented the name logarithm) logarithms are called "artificial numbers."

The different editions of the *Descriptio* and *Constructio*, as well as the reception of logarithms on the continent of Europe, and especially by Kepler, whose admiration of the invention almost equalled that of Briggs, belong to the history of logarithms (*q.v.*). It may, however, be mentioned here that an English translation of the *Constructio* of 1619 was published by W. R. Macdonald at Edinburgh in 1889, and that there is appended to this edition a complete catalogue of all Napier's writings, and their various editions and translations, English and foreign, all the works being carefully collated, and references being added to the various public libraries in which they are to be found.

Napier's priority in the publication of the logarithms is unquestioned and only one other contemporary mathematician seems to have conceived the idea on which they depend. There is no anticipation or hint to be found in previous writers,[3] and it is very remarkable that a discovery or invention which was to exert so important and far-reaching an influence on astronomy and every science involving calculation was the work of a single mind.

The more one considers the condition of science at the time, and the state of the country in which the discovery took place, the more wonderful does the invention of logarithms appear. When algebra had advanced to the point where exponents were introduced, nothing would be more natural than that their utility as a means of performing multiplications and divisions should be remarked; but it is one of the surprises in the history of science that logarithms were invented as an arithmetical improvement years before their connexion with exponents was known. It is to be noticed also that the invention was not the result of any happy accident. Napier deliberately set himself to abbreviate multiplications and divisions—operations of so fundamental a character that it might well have been thought that they were *in rerum natura* incapable of abbreviation; and he succeeded in devising, by the help of arithmetic and geometry alone, the one great simplification of which they were susceptible—a simplification to which nothing essential has since been added.

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[1] The title runs as follows: *Arithmetica Logarithmica, sive Logarithmorum chiliades triginta. . . . Hos numeros primus invenit clarissimus vir Iohannes Neperus Baro Merchistonij; eos autem ex eiusdem sententia mutavit, eorumque ortum et usum illustravit Henricus Briggius. . . .*

[2] The full title was: *Mirifici Logarithmorum Canonis Constructio; Et eorum ad naturales ipsorum numeros habitudines; unà cum Appendice, de aliâ eâque praestantiore Logarithmorum specie condendâ. Quibus accessere Propositiones ad triangula sphaerica faciliore calculo resolvenda: Unà cum Annotationibus aliquot doctissimi D. Henrici Briggii, in eas & memoratam appendicem. Authore & Inventore Ioanne Nepero, Barone Merchistonii, &c. Scoto. Edinburgi, Excudebat Andreas Hart, Anno Domini* 1619. There is also preceding this title-page an ornamental title-page, similar to that of the *Descriptio* of 1614; the words are different, however, and run—*Mirifici Logarithmorum Canonis Descriptio . . . Accesserunt Opera Posthuma: Primò, Mirifici ipsius canonis constructio, & Logarithmorum ad naturales ipsorum numeros habitudines. Secundò, Appendix de aliâ, eâque praestantiore Logarithmorum specie construenda. Tertiò, Propositiones quaedam eminentissimae, ad Triangula sphaerica mirâ facilitate resolvenda. . . .* It would appear that this title-page was to be substituted for the title-page of the *Descriptio* of 1614 by those who bound the two books together.

[3] The work of Justus Byrgius is described in the article LOGARITHM. In that article it is mentioned that a Scotsman in 1594 in a letter to Tycho Brahe held out some hope of logarithms; it is likely that the person referred to is John Craig, son of Thomas Craig, who has been mentioned as one of the colleagues of John Napier's father as justice-depute.

When Napier published the *Canonis Descriptio* England had taken no part in the advance of science, and there is no British author of the time except Napier whose name can be placed in the same rank as those of Copernicus, Tycho Brahe, Kepler, Galileo, or Stevinus. In England, Robert Recorde had indeed published his mathematical treatises, but they were of trifling importance and without influence on the history of science. Scotland had produced nothing, and was perhaps the last country in Europe from which a great mathematical discovery would have been expected. Napier lived, too, not only in a wild country, which was in a lawless and unsettled state during most of his life, but also in a credulous and superstitious age. Like Kepler and all his contemporaries he believed in astrology, and he certainly also had some faith in the power of magic, for there is extant a deed written in his own handwriting containing a contract between himself and Robert Logan of Restalrig, a turbulent baron of desperate character, by which Napier undertakes "to serche and sik out, and be al craft and ingyne that he dow, to tempt, trye, and find out" some buried treasure supposed to be hidden in Logan's fortress at Fastcastle, in consideration of receiving one-third part of the treasure found by his aid. Of this singular contract, which is signed, "Robert Logane of Restalrige" and "Jhone Neper, Fear of Merchiston," and is dated July 1594, a facsimile is given in Mark Napier's *Memoirs*. As the deed was not destroyed, but is in existence now, it is to be presumed that the terms of it were not fulfilled; but the fact that such a contract should have been drawn up by Napier himself affords a singular illustration of the state of society and the kind of events in the midst of which logarithms had their birth. Considering the time in which he lived, Napier is singularly free from superstition: his *Plaine Discovery* relates to a method of interpretation which belongs to a later age; he shows no trace of the extravagances which occur everywhere in the works of Kepler; and none of his writings contain allusions to astrology or magic.

After Napier's death his manuscripts and notes came into the possession of his second son by his second marriage, Robert, who edited the *Constructio*; and Colonel Milliken Napier, Robert's lineal male representative, was still in the possession of many of these private papers at the close of the 18th century. On one occasion when Colonel Napier was called from home on foreign service, these papers, together with a portrait of John Napier and a Bible with his autograph, were deposited for safety in a room of the house at Milliken, in Renfrewshire. During the owner's absence the house was burned to the ground, and all the papers and relics were destroyed. The manuscripts had not been arranged or examined, so that the extent of the loss is unknown. Fortunately, however, Robert Napier had transcribed his father's manuscript *De Arte Logistica*, and the copy escaped the fate of the originals in the manner explained in the following note, written in the volume containing them by Francis, seventh Lord Napier: "John Napier of Merchiston, inventor of the logarithms, left his manuscripts to his son Robert, who appears to have caused the following pages to have been written out fair from his father's notes, for Mr Briggs, professor of geometry at Oxford. They were given to Francis, the fifth Lord Napier, by William Napier of Culcreugh, Esq., heir-male of the above-named Robert. Finding them in a neglected state, amongst my family papers, I have bound them together, in order to preserve them entire.—NAPIER, 7th March 1801."

An account of the contents of these manuscripts was given by Mark Napier in the appendix to his *Memoirs of John Napier*, and the manuscripts themselves were edited in their entirety by him in 1839 under the title *De Arte Logistica Joannis Naperi Merchistonii Baronis Libri qui supersunt. Impressum Edinburgi* M.DCCC.XXX.IX., as one of the publications of the Bannatyne Club. The treatise occupies one hundred and sixty-two pages, and there is an introduction by Mark Napier of ninety-four pages. The *Arithmetic* consists of three books, entitled—(1) De Computationibus Quantitatum omnibus Logisticae speciebus communium; (2) De Logistica Arithmetica; (3) De Logistica Geometrica. At the end of this book occurs the note—"I could find no more of this geometricall pairt amongst all his fragments." The *Algebra Joannis Naperi Merchistonii Baronis* consists of two books: (1) "De nominata Algebrae parte; (2) De positiva sive cossica Algebrae parte," and concludes with the words, "There is no more of his algebra orderlie sett doun." The transcripts are entirely in the handwriting of Robert Napier himself, and the two notes that have been quoted prove that they were made from Napier's own papers. The title, which is written on the first leaf, and is also in Robert Napier's writing, runs thus: "The Baron of Merchiston his booke of Arithmeticke and Algebra. For Mr Henrie Briggs, Professor of Geometrie at Oxforde."

These treatises were probably composed before Napier had invented the logarithms or any of the apparatuses described in the *Rabdologia*; for they contain no allusion to the principle of logarithms, even where we should expect to find such a reference, and the one solitary sentence where the *Rabdologia* is mentioned ("sive omnium facillime per ossa Rhabdologiae nostrae") was probably added afterwards. It is worth while to notice that this reference occurs in a chapter "De Multiplicationis et Partitionis compendiis miscellaneis," which, supposing the treatise to have been written in Napier's younger days, may have been his earliest production on a subject over which his subsequent labours were to exert so enormous an influence.

Napier uses *abundantes* and *defectivae* for positive and negative, defining them as meaning greater or less than nothing ("Abundantes sunt quantitates majores nihilo: defectivae sunt quantitates minores nihilo"). The same definitions occur also in the *Canonis Descriptio* (1614), p. 5: "Logarithmos sinuum, qui semper majores nihilo sunt, abundantes vocamus, et hoc signo +, aut nullo praenotamus. Logarithmos autem minores nihilo defectivos vocamus, praenotantes eis hoc signum −." Napier may thus have been the first to use the expression "quantity less than nothing." He uses "radicatum" for power (for root, power, exponent, his words are radix, radicatum, index).

Apart from the interest attaching to these manuscripts as the work of Napier, they possess an independent value as affording evidence of the exact state of his algebraical knowledge at the time when logarithms were invented. There is nothing to show whether the transcripts were sent to Briggs as intended and returned by him, or whether they were not sent to him. Among the Merchiston papers is a thin quarto volume in Robert Napier's writing containing a digest of the principles of alchemy; it is addressed to his son, and on the first leaf there are directions that it is to remain in his charter-chest and be kept secret except from a few. This treatise and the transcripts seem to be the only manuscripts which have escaped destruction.

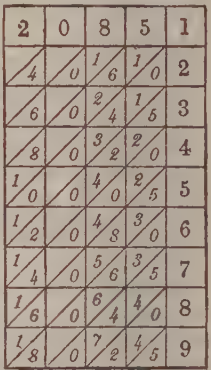

FIG. 1.

The principle of "Napier's bones" may be easily explained by imagining ten rectangular slips of cardboard, each divided into nine squares. In the top squares of the slips the ten digits are written, and each slip contains in its nine squares the first nine multiples of the digit which appears in the top square. With the exception of the top squares, every square is divided into two parts by a diagonal, the units being written on one side and the tens on the other, so that when a multiple consists of two figures they are separated by the diagonal. Fig. 1 shows the slips corresponding to the numbers 2, 0, 8, 5 placed side by side in contact with one another, and next to them is placed another slip containing, in squares without diagonals, the first nine digits. The slips thus placed in contact give the multiples of the number 2085, the digits in each parallelogram being added together; for example, corresponding to the number 6 on the right-hand slip, we have 0, 8+3, 0+4, 2, 1; whence we find 0, 1, 5, 2, 1 as the digits, written backwards, of 6×2085. The use of the slips for the purpose of multiplication is now evident; thus to multiply 2085 by 736 we take out in this manner the multiples corresponding to 6, 3, 7, and set down the digits as they are obtained, from right to left, shifting them back one place and adding up the columns as in ordinary multiplication, viz. the figures as written down are—

$$\begin{array}{r} 12510 \\ 6255 \\ 14595 \\ \hline 1534560 \end{array}$$

Napier's rods or bones consist of ten oblong pieces of wood or other material with square ends. Each of the four faces of each rod contains multiples of one of the nine digits, and is similar to one of the slips just described, the first rod containing the multiples of 0, 1, 9, 8, the second of 0, 2, 9, 7, the third of 0, 3, 9, 6, the fourth of 0, 4, 9, 5, the fifth of 1, 2, 8, 7, the sixth of 1, 3, 8, 6, the seventh of 1, 4, 8, 5, the eighth of 2, 3, 7, 6, the ninth of 2, 4, 7, 5, and the tenth of 3, 4, 6, 5. Each rod therefore contains on two of its faces multiples of digits which are complementary to those on the other two faces; and the multiples of a digit and of its complement are reversed in position. The arrangement of the numbers on the rods will be evident from fig. 2, which represents the four faces of the fifth rod. The set of ten rods is thus equivalent to four sets of slips as described above, and by their means we may multiply every number less than 11,111, and also any number (consisting of course of not more than ten digits) which can be formed by the top digits of the bars when placed side by side. Of course two sets of rods may be used, and by their means we may multiply every number less than 111,111,111 and so on. It will be noticed that the rods only give the multiples of the number which is to be multiplied, or of the divisor, when they are used for division, and it is evident that they would be of little use to any one who knew the multiplication table as far as 9×9. In multiplications or divisions of any length it is generally convenient to begin by forming a table of the first nine multiples of the multiplicand or divisor, and Napier's bones at best merely provide such a table, and in an incomplete form, for the additions of the two figures in the same parallelogram have to be performed each time the rods are used. The *Rabdologia* attracted more general attention than the logarithms, and as has been mentioned, there were several editions on the Continent. Nothing shows more clearly the rude state of arithmetical knowledge at the beginning of the 17th century than the universal satisfaction with which Napier's invention was welcomed by all classes and regarded as a real aid to calculation. Napier also describes in the *Rabdologia* two other larger rods to facilitate the extraction of square and cube roots. In the *Rabdologia* the rods are called "virgulae," but in the passage quoted above from the manuscript on arithmetic they are referred to as "bones" (ossa).

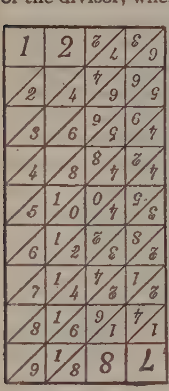

FIG. 2.

Besides the logarithms and the calculating rods or bones, Napier's name is attached to certain rules and formulae in spherical trigonometry. "Napier's rules of circular parts," which include the complete system of formulae for the solution of right-angled triangles, may be enunciated as follows. Leaving the right angle out of consideration, the sides including the right angle, the complement of the hypotenuse, and the complements of the other angles are called the circular parts of the triangle. Thus there are five circular parts, a, b, $90°—A$, $90°—c$, $90°—B$, and these are supposed to be arranged in this order (*i.e.* the order in which they occur in the triangle) round a circle. Selecting any part and calling it the middle part, the two parts next it are called the adjacent parts and the remaining two parts the opposite parts. The rules then are—

$$\begin{aligned}\text{sine of the middle part} &= \text{product of tangents of adjacent parts}\\ &= \text{product of cosines of opposite parts.}\end{aligned}$$

These rules were published in the *Canonis Descriptio* (1614), and Napier has there given a figure, and indicated a method, by means of which they may be proved directly. The rules are curious and interesting, but of very doubtful utility, as the formulae are best remembered by the practical calculator in their unconnected form.

"Napier's analogies" are the four formulae—

$$\tan\tfrac{1}{2}(A+B)=\frac{\cos\frac{1}{2}(a-b)}{\cos\frac{1}{2}(a+b)}\cot\tfrac{1}{2}C,\qquad \tan\tfrac{1}{2}(A-B)=\frac{\sin\frac{1}{2}(a-b)}{\sin\frac{1}{2}(a+b)}\cot\tfrac{1}{2}C;$$

$$\tan\tfrac{1}{2}(a+b)=\frac{\cos\frac{1}{2}(A-B)}{\cos\frac{1}{2}(A+B)}\tan\tfrac{1}{2}c,\qquad \tan\tfrac{1}{2}(a-b)=\frac{\sin\frac{1}{2}(A-B)}{\sin\frac{1}{2}(A+B)}\tan\tfrac{1}{2}c.$$

They were first published after his death in the *Constructio* among the formulae in spherical trigonometry, which were the results of his latest work. Robert Napier says that these results would have been reduced to order and demonstrated consecutively but for his father's death. Only one of the four analogies is actually given by Napier, the other three being added by Briggs in the remarks which are appended to Napier's results. The work left by Napier is, however, rough and unfinished, and it is uncertain whether he knew of the other formulae or not. They are, however, so simply deducible from the results he has given that all the four analogies may be properly called by his name. An analysis of the formulae contained in the *Descriptio* and *Constructio* is given by Delambre in vol. i. of his *Histoire de l'Astronomie moderne*.

To Napier seems to be due the first use of the decimal point in arithmetic. Decimal fractions were first introduced by Stevinus in his tract *La Disme*, published in 1585, but he used cumbrous exponents (numbers enclosed in circles) to distinguish the different denominations, primes, seconds, thirds, &c. Thus, for example, he would have written 123·456 as 123⓪4①5②6③. In the *Rabdologia* Napier gives an "Admonitio pro Decimali Arithmetica," in which he commends the fractions of Stevinus and gives an example of their use, the division of 861094 by 432. The quotient is written 1993,273 in the work, and $1993{,}2'7''3'''$ in the text. This single instance of the use of the decimal point in the midst of an arithmetical process, if it stood alone, would not suffice to establish a claim for its introduction, as the real introducer of the decimal point is the person who first saw that a point or line as separator was all that was required to distinguish between the integers and fractions, and used it as a permanent notation and not merely in the course of performing an arithmetical operation. The decimal point is, however, used systematically in the *Constructio* (1619), there being perhaps two hundred decimal points altogether in the book.

The decimal point is defined on p. 6 of the *Constructio* in the words: "In numeris periodo sic in se distinctis, quicquid post periodum notatur fractio est, cujus denominator est unitas cum tot cyphris post se, quot sunt figurae post periodum. Ut 10000000·04 valet idem, quod $10000000\frac{4}{100}$. Item 25·803, idem quod $25\frac{803}{1000}$. Item 9999998·0005021, idem valet quod $9999998\frac{5021}{10000000}$, & sic de caeteris." On p. 8, 10·502 is multiplied by 3·216, and the result found to be 33·774432; and on pp. 23 and 24 occur decimals not attached to integers, viz. ·4999712 and ·0004950. These examples show that Napier was in possession of all the conventions and attributes that enable the decimal point to complete so symmetrically our system of notation, viz. (1) he saw that a point or separatrix was quite enough to separate integers from decimals, and that no signs to indicate primes, seconds, &c., were required; (2) he used ciphers after the decimal point and preceding the first significant figure; and (3) he had no objection to a decimal standing by itself without any integer. Napier thus had complete command over decimal fractions and the use of the decimal point. Briggs also used decimals, but in a form not quite so convenient as Napier. Thus he prints 63·0957379 as $63\underline{0957379}$, viz. he prints a bar under the decimals; this notation first appears without any explanation in his "Lucubrationes" appended to the *Constructio*. Briggs seems to have used the notation all his life, but in writing it, as appears from manuscripts of his, he added also a small vertical line just high enough to fix distinctly which two figures it was intended to separate: thus he might have written $63\underline{\vert 095}7379$. The vertical line was printed by Oughtred and some of Briggs's successors. It was a long time before decimal arithmetic came into general use, and all through the 17th century exponential marks were in common use. There seems but little doubt that Napier was the first to make use of a decimal separator, and it is curious that the separator which he used, the point, should be that which has been ultimately adopted, and after a long period of partial disuse.

The hereditary office of king's poulterer (Pultrie Regis) was for many generations in the family of Merchiston, and descended to John Napier. The office, Mark Napier states, is repeatedly mentioned in the family charters as appertaining to the "pultre landis" near the village of Dene in the shire of Linlithgow. The duties were to be performed by the possessor or his deputy; and the king was entitled to demand the yearly homage of a present of poultry from the feudal holder. The pultrelands and the office were sold by John Napier in 1610 for 1700 marks. With the exception of the pultrelands all the estates he inherited descended to his posterity.

With regard to the spelling of the name, Mark Napier states that among the family papers there exist a great many documents signed by John Napier. His usual signature was "Jhone Neper," but in a letter written in 1608, and in all deeds signed after that date, he wrote "Jhone Nepair." His letter to the king prefixed to the *Plaine Discovery* is signed "John Napeir." His own children, who sign deeds along with him, use every mode except Napier, the form now adopted by the family, and which is comparatively modern. In Latin he always wrote his name "Neperus." The form "Neper" is the oldest, as John, third Napier of Merchiston, so spelt it in the 15th century.

Napier frequently signed his name "Jhone Neper, Fear of Merchiston." He was "Fear of Merchiston" because, *more majorum*, he had been invested with the fee of his paternal barony during the lifetime of his father, who retained the liferent. He has been sometimes erroneously called "Peer of Merchiston," and in the 1645 edition of the *Plaine Discovery* he is so styled (see Mark Napier's *Memoirs*, pp. 9 and 173, and *Libri qui supersunt*, p. xciv.).

The bibliography of Napier's work attached to W. R. Macdonald's translation of the *Canonis Constructio* (1889) is complete and valuable. Napier's three mathematical works are reprinted by N. L. W. A. Gravelaar in *Verhandelingen der Kon. Akad. van Wet te Amsterdam*, 1. sectie, deel 6 (1899). (J. W. L. G.)

NAPIER, SIR WILLIAM FRANCIS PATRICK (1785–1860), British soldier and military historian, third son of Colonel George Napier (1751–1804), and brother of Sir Charles James Napier (see above), was born at Celbridge, near Dublin, on the 17th of December 1785. He became an ensign in the Royal Irish Artillery in 1800, but at once exchanged into the 62nd, and was put on half-pay in 1802. He was afterwards made a cornet in the Blues by the influence of his uncle the duke of Richmond, and for the first time did actual military duty in this regiment, but he soon fell in with Sir John Moore's suggestion that he should exchange into the 52nd, which was about to be trained in the famous camp of Snorncliffe. Through Sir John Moore he soon obtained a company in the 43rd, joined that regiment at Shorncliffe and became a great favourite with Moore. He served in Denmark, and was present at the engagement of Kioge, and, his regiment being shortly afterwards sent to Spain, he bore himself nobly through the retreat to Corunna, the hardships of which permanently impaired his health. In 1809 he became aide-de-camp to the duke of Richmond, lord lieutenant of Ireland, but joined the 43rd when that regiment was ordered again to Spain. With the light brigade (the 43rd, 52nd, and 95th), under the command of General Craufurd, he marched to Talavera in the famous forced march which he has described in his *History*, and had a violent attack of pleurisy on the way. He, however, refused to leave Spain, was wounded on the Coa, and shot near the spine at Cazal Nova. His conduct was so conspicuous during the pursuit of Masséna after he left the lines of Torres Vedras that he as well as his brother George was recommended for a brevet majority. He became brigade major, was present at Fuentes d'Onor, but had so bad an attack of ague that he was obliged to return to England. In England he married Caroline Amelia Fox, daughter of General Henry Fox and niece of the statesman Fox. Three weeks after his marriage he again started for Spain, and was present at the storming of Badajoz, where his great friend Colonel M'Leod was killed. In the absence of the new lieutenant-colonel he took command of the 43rd regiment (he was now a substantive major) and commanded it at the battle of Salamanca. After a short stay at home he again joined his regiment at the Pyrenees, and did his greatest military service at the battle of the Nivelle, where, with instinctive military insight, he secured the most strongly fortified part of Soult's position, practically without orders. He served with his regiment at the battles of the Nive, where he received two wounds, Orthes, and Toulouse. For his services he was made brevet lieutenant-colonel, and one of the first C.B.'s. Like his brother Charles he then entered the military college at Farnham. He commanded his regiment in the invasion of France after Waterloo, and remained in France with the army of occupation until 1819, when he retired on half-pay. As it was impossible for him to live on a major's half-pay with a wife and family, he determined to become an artist, and took a house in Sloane Street, where he studied with George Jones, the academician.

The years he had spent in France he had occupied in improving his general education, for, incredible as it seems, the author of the *History of the War in the Peninsula* could not spell or write respectable English till that time. But his career was to be great in literature, not in art. The tendency appeared in an able review of Jomini's works (*Edinburgh Rev.*) in 1821, and in 1823 Mr Bickersteth (afterwards Lord Langdale) suggested to him the expediency of writing a history of the Peninsular War. For some time he did not take kindly to the suggestion, but at last determined to become an author in order to defend the memory of Sir John Moore, and to prevent the glory of his old chief being overshadowed by that of Wellington. The duke of Wellington himself gave him much assistance, and handed over to him the whole of Joseph Bonaparte's correspondence which had been taken at the battle of Vittoria; this was all in cipher, but Mrs Napier, with great patience, discovered the keys. Marshal Soult also took an active interest in the work and arranged for the French translation of Mathieu Dumas. In 1828 the first volume of the *History* appeared. The publisher, John Murray, indeed, was disappointed in the sale of the first volume and Napier published the remainder himself. But it was at once seen that the great deeds of the Peninsular War were about to be fitly commemorated. The excitement which followed the appearance of each volume is proved by the innumerable pamphlets issued by those who believed themselves to be attacked, and by personal altercations with many distinguished officers. But the success of the book was proved still more by the absence of competition than by these bitter controversies. The histories of Southey and Lord Londonderry fell still-born, and Sir George Murray, Wellington's quartermaster-general, who had determined to produce *the* history, gave up the attempt in despair. This success was due to a combination of qualities which have justly secured for Napier the title of being the greatest military historian England has produced. When in 1840 the last volume of the *History* was published, his fame not only in England but in France and Germany was safely established.

His life during these years had been chiefly absorbed in his *History*, but he had warmly sympathized with the movement for political reform which was agitating England. The Radicals of Bath and many other cities and towns pressed him to enter parliament, and Napier was actually invited to become the military chief of a national guard to obtain reforms by force of arms. He refused the dangerous honour on the ground that he was in bad health and had a family of eight children. In 1830 he had been promoted colonel, and in 1842 he was made a major-general and given the lieutenant-governorship of Guernsey. Here he found plenty of occupation in controlling the relations between the soldiers and the inhabitants, and also in working out proposals for a complete scheme of reform in the government of the island. While he was at Guernsey his brother Charles had conquered Sind, and the attacks made on the policy of that conquest brought William Napier again into the field of literature. In 1845 he published his *History of the Conquest of Scinde*, and in 1851 the corresponding *History of the Administration of Scinde*—books which in style and vigour rivalled the great *History*, but which, being written for controversial purposes, were not likely to maintain enduring popularity. In 1847 he resigned his governorship, and in 1848 was made a K.C.B., and settled at Scinde House, Clapham Park. In 1851 he was promoted lieutenant-general. His time was fully occupied in defending his brother, in revising the numerous editions of his *History* which were being called for, and in writing letters to *The Times* on every conceivable subject, whether military or literary. His energy is the more astonishing when it is remembered that he never recovered from the effects of the wound he had received at Cazal Nova, and that he often had to lie on his back for months together. His domestic life was shadowed by the incurable affliction of his only son, and when his brother Charles died in 1853 the world seemed to be darkening round him. He devoted himself to writing the life of that brother, which appeared in 1857, and which is in many respects his most characteristic book. In the end of 1853 his younger brother, Captain Henry Napier, R.N., died, and in 1855 his brother Sir George (see below). Inspired by his work, he lived on till the year 1860, when, broken by trouble, fatigue and ill-health, he died (February 12) at Clapham. Four months earlier he had been promoted to the full rank of general.

As a military historian Sir William Napier is incomparably superior to any other English writer, and his true compeers are Thucydides, Caesar and Davila. All four had been soldiers in the wars they describe; all four possessed a peculiar insight into the mainsprings of action both in war and peace; and each possessed a peculiar and inimitable style. Napier always wrote as if he was burning with an inextinguishable desire to express what he was feeling, which gives his style a peculiar spontaneity, and yet he rewrote the first volume of his *History* no less than six times. His descriptions of sieges and of battles are admirable by themselves, and his analyses of the peculiarly intricate Spanish intrigues are even more remarkable, while the descriptions and analyses are both lit up with flashes of political wisdom and military insight. It is to be noted that he displays the spirit of the partisan, even when most impartial, and defends his opinions, even when most undoubtedly true, as if he were arguing some controverted question. If his style was modelled on anything, it was on Caesar's commentaries, and a thorough knowledge of the writings of the Roman general will often explain allusions in Napier. The portraits of Sir John Moore and Colonel M'Leod, and the last paragraphs descriptive of the storming of Badajoz, may be taken as examples of his great natural eloquence.

His brother, **Sir George Thomas Napier** (1784–1855), entered the army in 1800, and served with distinction under Moore and Wellington in the Peninsula—and lost his right arm at the storming of Badajoz. He became major-general in 1837, K.C.B. in 1838 and lieutenant-general in 1846. He was governor and commander-in-chief at the Cape from 1839 to 1843, during which time the abolition of slavery and the expulsion of the Boers from Natal were the chief events. He was offered, but declined, the chief command in India after Chillianwalla, and also that of the Sardinian army in 1849. He became full general in 1854. He died at Geneva on the 16th of September 1855. His autobiography, *Passages in the Early Military Life of General Sir G. T. Napier*, was published by his surviving son, General W. C. E. Napier (the author of an important work on outpost duty), in 1885.

The youngest brother, Henry Edward Napier (1789–1853), served in the navy during the Napoleonic wars, retired as a captain, and wrote a learned *Florentine History from the earliest authentic Records to the Accession of Ferdinand III. of Tuscany* (1846–1847).

For Sir William Napier's life, see his *Life and Letters*, edited by the Right Honourable H. A. Bruce (Lord Aberdare) (2 vols., 1862).

NAPIER AND ETTRICK, FRANCIS NAPIER, Baron (1819–1898), British diplomatist, was descended from the ancient Scottish family of Napier of Merchistoun, his ancestor Sir Alexander Napier (d. *c.* 1473) being the elder son of Alexander Napier (d. *c.* 1454), provost of Edinburgh, who obtained lands at Merchistoun early in the 15th century. Sir Alexander was comptroller of the household of the king of Scotland, and was often sent to England and elsewhere on public business. Of his descendants one Napier of Merchistoun was killed at Sauchieburn, another fell at Flodden and a third at Pinkie. The seventh Napier of Merchistoun was Sir Archibald Napier (1534–1608), master of the Scottish mint, and the eighth was John Napier (*q.v.*) the inventor of logarithms. John's eldest son, Sir Archibald Napier (*c.* 1576–1645), was treasurer-depute of Scotland from 1622 to 1631, and was created Lord Napier of Merchistoun in 1627. He married Margaret Graham, sister of the great marquess of Montrose, whose cause he espoused, and he wrote some *Memoirs* which were published in Edinburgh in 1793. His son Archibald, the 2nd lord (1625–1658), fought under Montrose at Auldearn, at Alford, at Kilsyth and at Philiphaugh, and was afterwards with his famous uncle on the continent of Europe. His son, Archibald, the 3rd lord (d. 1683), was succeeded by special arrangement in the title, first by his nephew, Thomas Nicolson (1669–1686), a son of his sister Jean and her husband Sir Thomas Nicolson, Bart. (d. 1670), and then by his sister Margaret (d. 1706), the widow of John Brisbane (d. 1684). The 6th lord was Margaret's grandson Francis Scott (*c.* 1702–1773), a son of Sir William Scott, Bart., of Thirlestane (d. 1725). Francis Scott, who took the additional name of Napier, had a large family, his sons including William, the 7th lord, and Colonel George Napier (1751–1804). His famous grandsons are dealt with above. Another literary member of the family was Mark Napier (1798–1879), called by Mr Andrew Lang "the impetuous biographer of Montrose," who wrote *Memoirs of John Napier of Merchiston* (1834), *Montrose and the Covenanters* (1838), *Memoirs of Montrose* (1856), *Memorials of Graham of Claverhouse* (1859–1862), and a valuable legal work, *The Law of Prescription in Scotland* (1839 and again 1854). William, 7th Lord Napier (1730–1775), was succeeded as 8th lord by his son Francis (1758–1823), who, after serving in the English army during the American War of Independence, was lord high commissioner to the general assembly of the Church of Scotland, and compiled a genealogical account of his family which is still in manuscript. His son William John, the 9th lord (1786–1834), who was present at the battle of Trafalgar, was the father of Francis Napier, Lord Napier and Ettrick.

Born on the 15th of September 1819 Francis entered the diplomatic service in 1840, and was employed in successive posts at Vienna, Constantinople, Naples, Washington and the Hague. During this time he earned the highest opinions both at home and abroad. In 1860 he became ambassador at St Petersburg, and in 1864 at Berlin. In 1866 he was appointed governor of Madras, and was at once confronted with a serious famine in the northern districts. In dealing with this and other problems he showed great activity and practical sense, and he encouraged public works, particularly irrigation. In 1872 he acted for a few months as Viceroy, after Lord Mayo's assassination; and on Lord Northbrook's appointment to the office he returned to England, being created a baron of the United Kingdom (Baron Ettrick of Ettrick) for his services. He continued, both in England and in Scotland, to take great interest in social questions. He was for a time a member of the London School Board, and he was chairman of the Crofters' Commission in 1883, the result of which was the appointment of a permanent body to deal with questions affecting the Scottish crofters and cottars. He died at Florence on the 19th of December 1898, leaving a widow and three sons, the eldest of whom, William John George (b. 1846), succeeded to his titles.

NAPIER OF MAGDALA, ROBERT CORNELIS NAPIER, 1st Baron (1810–1890), British field-marshal, son of Major Charles Frederick Napier, who was wounded at the storming of Meester Cornelis (Aug. 26, 1810) in Java and died some months later, was born at Colombo, Ceylon, on the 6th of December 1810. He entered the Bengal Engineers from Addiscombe College in 1826, and after the usual course of instruction at Chatham, arrived in India in November 1828. For some years he was employed in the irrigation branch of the public works department, and in 1838 he laid out the new hill station at Darjeeling. Promoted captain in January 1841, he was appointed to Sirhind, where he laid out cantonments on a new principle—known as the Napier system—for the troops returning from Afghanistan. In December 1845 he joined the army of the Sutlej, and commanded the Engineers at the battle of Mudki, where he had a horse shot under him. At the battle of Ferozeshah on the 31st December he again had his horse shot under him, and, joining the 31st Regiment on foot, was severely wounded in storming the entrenched Sikh camp. He was present at the battle of Sobraon on 10th February 1846, and in the advance to Lahore; was mentioned in despatches for his services in the campaign, and received a brevet majority. He was chief engineer at the reduction of Kote-Kangra by Brigadier-General Wheeler in May 1846, and received the thanks of government. He was then appointed consulting engineer to the Punjab resident and council of regency, but was again called to the field to direct the siege of Multan. He was wounded in the attack on the entrenched position in September 1848, but was present at the action of Shujabad, the capture of the suburbs, the successful storm of Multan on 23rd January 1849, and the surrender of the fort of Chiniot. He then joined Lord Gough, took part, as commanding engineer of the right wing, in the battle of Gujrat in February 1849, accompanied Sir W. R. Gilbert in his pursuit of the Sikhs and Afghans, and was present at the passage of the Jhelum, the surrender of the Sikh army, and the surprise of Attock. For his services he was mentioned in despatches and received a brevet lieutenant-colonelcy. At the close of the war Napier was appointed civil engineer to the board of administration of the annexed Punjab province, and carried out many important public works during his tenure of office. In December 1852 he commanded a column in the first Hazara expedition, and in the following year against the Boris; and for his services in these campaigns was mentioned in despatches, received the special thanks of government and a brevet-colonelcy. He was appointed military secretary and adjutant-general to Sir James Outram's force for the relief of Lucknow in the Indian Mutiny in 1857, and was engaged in the actions which culminated in the first relief of Lucknow. He directed the defence of Lucknow until the second relief, when he was severely wounded in crossing a very exposed space with Outram and Havelock to meet Sir Colin Campbell. He was chief of the staff to Outram in the defence of the Alambagh position, and drew up the plan of operations for the attack of Lucknow, which was approved by Sir Colin Campbell and carried out by Napier, as brigadier-general commanding the Engineers, in March 1858. On the fall of Lucknow Napier was most favourably mentioned in despatches, and made C.B. He joined Sir Hugh Rose as second-in-command in his march on Gwalior, and commanded the 2nd brigade at the action of Morar on the 16th June. On the fall of Gwalior he was entrusted with the task of pursuing the enemy. With only 700 men he came up with Tantia Topi and 12,000 men on the plains of Jaora Alipur, and completely defeated him, capturing all his guns (25), ammunition and baggage. On Sir Hugh Rose's departure he took command of the Gwalior division, captured Paori in August, routed Ferozeshah, a prince of the house of Delhi, at Ranode in December, and, in January 1859, succeeded in securing the surrender of Man Singh and Tantia Topi, which ended the war. For his services Napier received the thanks of parliament and of the Indian government, and was made K.C.B.

In January 1860 Napier was appointed to the command of the 2nd division of the expedition to China under Sir Hope Grant, and took part in the action of Sinho, the storm of the Peiho forts, and the entry to Peking. For his services he received the thanks of parliament, and was promoted major-general for distinguished service in the field. For the next four years Napier was military member of the council of the governor-general of India and, on the sudden death of Lord Elgin, for a short time acted as governor-general, until the arrival of Sir W. T. Denison from Madras. In January 1865 he was given the command of the Bombay army, in March 1867 he was promoted lieutenant-general, and, later in that year, appointed to command the expedition to Abyssinia, selecting his own troops and making all the preparations for the campaign. He arrived at Annesley Bay in the Red Sea early in January 1868, reached Magdala, 420 m. from the coast, in April; stormed the stronghold, freed the captives, razed the place to the ground, returned to the coast, and on the 18th June the last man of the expedition had left Africa. He received for his services the thanks of parliament, a pension, a peerage, the G.C.B. and the G.C.S.I. The freedom of the cities of London and Edinburgh was conferred upon him, with presentation swords, and the universities bestowed upon him honorary degrees. In 1869 he was elected a fellow of the Royal Society. He held the command-in-chief in India for six years from 1870, during which he did much to benefit the army and to encourage good shooting. He was promoted general in 1874, and appointed a colonel-commandant of the Royal Engineers. In 1876 he was the guest of the German crown prince at the military manœuvres, and from that year until 1883 held the government and command of Gibraltar. In the critical state of affairs in 1877 he was nominated commander-in-chief of the force which it was proposed to send to Constantinople. In 1879 he was a member of the royal commission on army organization, and in November of that year he represented Queen Victoria at Madrid as ambassador extraordinary on the occasion of the second marriage of the king of Spain. On the 1st of January 1883 he was promoted to be field-marshal, and in December 1886 appointed Constable of the Tower of London. He died in London on the 14th of January 1890. His remains received a state funeral, and were buried in St Paul's Cathedral on the 21st of January. He was twice married, and left a large family by each wife, his eldest son, Robert William (b. 1845), succeeding to his barony. A statue of him on horseback by Boehm was erected at Calcutta when he left India, and a replica of it was afterwards set up to his memory in Waterloo Place, London.

NAPIER, a seaport on the east coast of North Island, New Zealand, capital of the provincial district of Hawke's Bay, 200 m. by rail N.E. of Wellington. Pop. (1906) 9454. The main portion of the town stretches along the flat shoreland of Hawke's Bay, while the suburbs extend over the hills to the north. The site consists of a picturesque peninsula known as Scinde Island. The harbour (Port Ahuriri) is sheltered by a breakwater. The cathedral church of St John (1888) for the bishopric of Waiapu, is one of the finest ecclesiastical buildings in New Zealand, imitating the Early English style in brick. An athenaeum, a small hospital, a lunatic asylum, a philosophical society and an acclimatization society are among the public institutions. The town (named after Sir Charles James Napier) is under municipal government, and returns a member to the New Zealand House of Representatives. The district is agricultural, and large quantities of wool and tinned and frozen meats are exported. There is railway communication with Wellington, New Plymouth, and the Wairarapa, Wanganui and Manawatu districts. Numerous old native *pas* or fortified villages are seen in the neighbourhood.

NAPLES (Ital. *Napoli*, and Lat. *Neapolis*), formerly the capital of the kingdom of the Two Sicilies, and since 1860 the chief town of the province which bears its name, the smallest province in the kingdom of Italy. It is the largest city in the country, containing 547,503 inhabitants in 1901. It is a prefecture; the see of a cardinal archbishop; the residence of the general commanding the tenth Army Corps and of the admiral commanding the second Naval Department of Italy; and it possesses also an ancient and important university.

Naples disputes with Constantinople the claim of occupying the most beautiful site in Europe. It is situated on the northern shore of the Bay of Naples (*Sinus Cumanus*), in 40° 52′ N., 14° 15′ 45″ E., as taken from the lighthouse on the mole. By rail it is distant 151 m. from Rome, but the line is circuitous, and a direct electric line was contemplated in 1907, to run nearer the coast and shorten the distance from the capital by more than 30 m. (For map, see ITALY.) The circuit of the bay is about 35 m. from the capo di Miseno on the north-west to the Punta della Campanella on the south-east, or more than 52 m. if the islands of Ischia, at the north-west, and of Capri, at the south entrance, be included. At its opening between these two islands it is 14 m. broad; while another 4 m. separates Capri from the mainland at the Punta della Campanella, and from the opening to its head at Portici the distance is 15 m. It affords good anchorage, with nearly 7 fathoms of water, and is well sheltered, except from winds which blow from points between south-east and south-west. In the latter winds Sorrento should be especially avoided, as no safe anchorage can be found there at less than 15 fathoms, and the same remark applies to Capri with winds from S.W. to N.W. There is a perceptible tide of nearly 9 in.

On the north-east shore east of Naples is an extensive flat, forming part of the ancient *Campania Felix*, and watered by the small stream Sebeto and by the Sarno, which last in classical times formed the port of Pompeii. From this flat, between the sea and the range of the Apennines, rises Mount Vesuvius, at the base of which, on or near the sea-shore, are the populous villages of San Giovanni Teduccio, Portici, Resina, Torre del Greco, Torre dell' Annunziata, &c., and the classic sites of Herculaneum and Pompeii. At the south-east extremity of the plain, 3 m. beyond the outlet of the Sarno, a great offshoot of the Apennines, branching from the main range near Cava, and projecting as a peninsula more than 12 m. west, divides the Bay of Naples from the bay of Salerno (*Sinus Paestanus*), and ends in the bold promontory of the Punta della Campanella (Promontorium Minervae), which is separated by a strait of 4 m. from Capri. On the north slope of this peninsula, where the plain ends and the coast abruptly bends to the west, stands the town of Castellammare, near the site of *Stabiae*, at the foot of Monte Sant' Angelo, which rises suddenly from the sea to a height of 4722 ft. Farther west, and nearly opposite to Naples across the bay, are Vico, Meta, Sorrento, Massa and many villages.

The north-west shore to the west of Naples is more broken and irregular. The promontory of Posilipo, which projects due south, divides this part of the bay into two smaller bays—the eastern, with the city of Naples, and the western, or Bay of Baiae, which is sheltered from all winds. A tunnel through the promontory, 2244 ft. long, 21 ft. broad, and in some places as much as 70 ft. high, possibly constructed by Marcus Agrippa in 27 B.C., forms the so-called grotto of Posilipo; at the Naples end stands the reputed tomb of Virgil. Beyond Posilipo is the small island of Nisida (*Nesis*); and at a short distance inland are the extinct craters of Solfatara and Astroni and the lake of Agnano. Farther west, on the coast, and provided with a convenient harbour, stands Pozzuoli (*Puteoli*), a city containing many Roman remains, but now chiefly remarkable for the large gun-works erected by Messrs Armstrong & Co.; and beyond it, round the Bay of Baiae, are Monte Nuovo, a hill thrown up in a single night in September 1538; the classic site of Baiae; the Lucrine Lake; Lake Avernus; the Lake of Fusaro (*Acherusia Palus*); the Elysian Fields; and the port and promontory of Misenum. Still farther to the south-west lie the islands of Procida (*Prochyta*) and Ischia (*Pithecusa*, *Aenaria* or *Inarime*), which divide the Bay of Naples from the extensive Bay of Gaeta. All this country was comprised in classical times under the title of the *Phlegrean Fields*, and was certainly then more actively volcanic than it now is, although the severe shock of earthquake which occurred in the island of Ischia in 1883 completely destroyed Casamicciola, and did serious damage to Forio, Lacco Ameno and Serrara Fontana, shows that there is great seismic activity in the locality. The whole region abounds with fissures from which steam highly charged with hydrochloric acid is continually issuing, and in many places boiling water is found at a very few feet below the surface.

The city of Naples is built at the base and on the slopes of a range of volcanic hills, and, rising from the shore like an amphitheatre, is seen to best advantage from the sea. From the summit occupied by the castle of St Elmo a transverse ridge runs south to form the promontory of Pizzofalcone, and divides the city into two natural crescents. The western crescent, known as the Chiaja ward, though merely a long narrow strip between the sea and Vomero hill, is the fashionable quarter most frequented by foreign residents and visitors. A fine broad street, the Riviera di Chiaja, begun in the close of the 16th century by Count d'Olivares, and completed by the duke de Medina Celi (1695–1700), runs for a mile and a half from east to west, ending in the quarter of Mergellina and Piedigrotta at the foot of the hill of Posilipo. In front lie the Villa Communale (first called Reale and subsequently Nazionale) public gardens, the chief promenade of the city, which were first laid out in 1780, and have been successively extended in 1807, in 1834, and again in recent years; and the whole edge of the bay from the Castel dell' Ovo to Mergellina is lined by a massive embankment and carriage-way, the Via Caracciolo, constructed in 1875–1881. The eastern crescent includes by far the largest as well as the oldest portion of Naples—the ports, the arsenal, the principal churches, &c. The best-known thoroughfare is the historic Toledo (as it is still popularly called, though the official name is Via Roma) which runs almost due north from the Piazza (Largo) del Plebiscito in front of the Palazzo Reale, till, as Strada Nuova Di Capodimonte, crossing the Ponte della Sanità (constructed by Murat across the valley between Santa Teresa and Capodimonte), it reaches the gates of the Capodimonte palace. A drive, the Corso Vittorio Emmanuele, winds along the slopes behind the city from the Str. di Piedigrotta (at the west end of the Riv. di Chiaja) till it reaches the museum by the Via Salvator Rosa. The character of the shore of the eastern crescent has been much altered by the new harbour works, which with the wharves and warehouses have absorbed the Villa del Popolo, or People's Park, originally constructed on land reclaimed from the bay.

The streets of Naples are generally well-paved with large blocks of lava or volcanic basalt. In the older districts there is a countless variety of narrow gloomy streets, many of them steep. The houses are mostly five or six storeys high, are covered with stucco made of a kind of pozzolana which hardens by exposure, and have large balconies and flat roofs. The castle of S. Elmo (S. Ermo, S. Erasmus), which dominates the whole city, had its origin in a fort (Belforte) erected by King Robert the Wise in 1343. The present building, with its rock-hewn fosses and massive ramparts, was constructed by Don Pedro de Toledo at the command of Charles V. in 1535, and was long considered practically impregnable. Damaged by lightning in 1857, it was afterwards restored, and is now a military prison. On a small island (I. del Salvatore, the *Megaris* of Pliny), now joined to the shore at the foot of the Pizzofalcone by an arch-supported causeway, stands the Castel dell' Ovo (so called from its shape, though medieval legend associates the name with the enchanted egg on which the magician Virgil made the safety of the city to depend), which dates from 1154. The walls of its chapel were frescoed by Giotto; but the whole building was ruined by Ferdinand II. in 1495, and had to be restored in the 16th century. Castel Nuovo, a very picturesque building constructed near the harbour in 1283 by Charles I. of Anjou, contains between the round towers of its façade the triumphal arch erected in 1470 to Alphonso I. and renovated in 1905. It numbers among its chambers the Gothic hall of Giovanni Pisano in which Celestine V. abdicated the papal dignity. Castel del Carmine, founded by Ferdinand I. in 1484, was occupied by the populace in Masaniello's insurrection, was used as a prison for the patriots of 1796, became municipal property in 1878, and is now a prison. The royal palace, begun in 1600 by the Count de Lemos, from designs by Domenico Fontana, partly burned in 1837, and since repaired and enlarged by Ferdinand II., is an enormous building with a sea frontage of 800 ft. and a main façade 554 ft. long and 95 ft. high, exhibiting the Doric, Ionic and Composite orders in its three storeys. The statues on the façade of the palace were erected by King Humbert I. in 1885, and represent the titular heads of the various dynasties which have reigned at Naples, beginning with Ruggiero the Norman (1130); followed by Frederick II. of Suabia (1197); Charles I. of Anjou (1266); Alfonso of Aragon (1442); Charles V. of Spain (1527); Charles III. (Bourbon) of Naples (1744); Gioacchino Murat (1808); and Victor Emmanuel II. (1861).

Naples is the see of a Roman Catholic archbishop, always a cardinal. The cathedral has a chapter of thirty canons, and of the numerous religious houses formerly existing very few have in whole or in part survived the suppression in 1868. The city is divided into fifty parishes purely for ecclesiastical purposes, and there are 237 Roman Catholic churches and 57 chapels.

Most of the churches are remarkable rather for richness in internal decoration than for architectural beauty. The cathedral of St Januarius, occupying the site of temples of Apollo and Neptune, and still containing some of their original granite columns, was designed by Nicola Pisano, and erected between 1272 and 1316. Owing to frequent restorations occasioned by earthquakes, it now presents an incongruous mixture of different styles. The general plan is that of a basilica with a nave and two (Gothic vaulted) aisles separated by pilasters. The western façade is of marble and was completed in 1906. Beneath the high altar is a subterranean chapel containing the tomb of St Januarius (San Gennaro), the patron saint of the city; in the right aisle there is a chapel (Cappella del Tesoro) built between 1608 and 1637 in popular recognition of his having saved Naples in 1527 " from famine, war, plague and the fire of Vesuvius "; and in a silver tabernacle behind the high altar of this chapel are preserved the two phials partially filled with his blood, the periodical liquefaction of which forms a prominent feature in the religious life of the city. Accessible by a door in the left aisle of the cathedral is the church of Sta Restituta, a basilica of the 7th century, and the original cathedral. Santa Chiara (14th century) is interesting for a fresco ascribed to Giotto (at one time there were many more), and monuments to Robert the Wise, his queen Mary of Valois and his daughter Mary, empress of Constantinople. San Domenico Maggiore, founded by Charles II. in 1285, but completely restored after 1445, has an effective interior particularly rich in Renaissance sculpture. In the neighbouring monastery is shown the cell of Thomas Aquinas. San Filippo Neri or dei Gerolomini, erected in the close of the 16th century, has a white marble façade and two campaniles, and contains the tombstone of Giambattista Vico. Sta Maria del Parto, in the Chiaja, occupies the site of the house of Sannazaro, and is named after his poem *De Partu Virginis*. San Francesco di Paolo, opposite the royal palace, is an imitation of the Panthéon at Rome by Pietro Bianchi di Lugano (1815–1837), and its dome is one of the boldest in Europe. The church of the Certosa (Carthusian monastery) of San Martino, on the hill below St Elmo's castle, has now become in name, as so many of the churches are in reality, a museum. Dating from the 14th century, and restored by Fonsega in the 17th, it is a building of extraordinary richness of decoration, with paintings and sculpture by Guido Reni, Lanfranco, Caravaggio, D'Arpino, Solimene, Luca Giordano and notably a " Descent from the Cross " by Ribera, conconsidered the finest work of this master. The monastery has been transformed into a medieval museum, where many specimens illustrating the modern history of Naples may be studied, and some fine specimens of majolica from the southern provinces can be inspected. The view from the south-western balcony is incomparable. The marble cloister by Fonsega, though rather flamboyant in character, is one of the finest of its kind in existence. Other churches with interesting monuments are Sant' Anna dei Lombardi, built in 1411 by Guerrello Origlia, which contains some splendid marble sculpture, especially Rosellino's " Nativity " in the Cappella Piccolomini; Sant' Angelo a Nilo, which contains the tomb of Cardinal Brancaccio, the joint work of Donatello and Michelozzo; San Giovanni a Carbonara, built in 1344 and enlarged by King Ladislaus in 1400, which contains among much other remarkable sculpture the tomb of the king, the masterpiece of Andrea Ciccione (1414), and that of Sergiami Caracciolo, the favourite of Joanna II., who was murdered in 1432 (the chapel in which it stands is paved with one of the earliest majolica pavements in Italy); San Lorenzo (1324), the Royal Church of the House of Anjou; and, for purely archaeological interest, the Church of Sant' Aspreno, thought to be the oldest Christian church in Italy, in the crypt of the new Borsa or exchange. Persons interested in frescoes will admire those in the former monastery at the back of the church of S. Maria Donna Regina and those in the cloister of S. Severino and Sossio. A more ancient Christian monument than any of the convents or churches is the catacombs, which extend a great distance underground and are in many respects finer than those at Rome. The entrance is at the Ospizio dei Poveri di San Gennaro (see Schulze's monograph, Jena, 1877).

Of the secular institutions in Naples none is more remarkable than the National Museum, formerly known as the Museo Borbonico. The building, begun in 1586 for vice-regal stables, and remodelled in 1615 for the university, was put to its present use in 1790, when Ferdinand IV. proclaimed it his private property independently of the crown, placed in it the Farnese collection which he had inherited from his father, and all the specimens from Herculaneum, Pompeii, Stabiae, Puteoli, Paestum, &c., which till then had been housed in the palace at Portici, and gave it the name of Real Museo Borbonico. In 1860

Garibaldi, when dictator at Naples, proclaimed the museum and the territory devoted to excavation to be the property of the nation, since which time it has been called the National Museum. Vast numbers of specimens have since been added to it both by purchase and from excavations, and it is now unique as a treasure house of Italo-Greek and Roman antiquities, besides containing a fine library and an important collection of pictures.

A large additional space for exhibits was made in 1904, when the western half of the second floor was added, and the building as now arranged contains the large bronzes and statues on the ground floor; a gallery of Pompeian frescoes in the entresol; the library, picture gallery and small bronzes on the first floor; and the glass, jewelry, arms, papyri, gems, and the unique collection of Italo-Greek vases, on the second floor. The large bronzes are almost the only ones which have survived from classical times, the most famous of them being the seated Mercury and the dancing Faun; the marbles reckon among their vast number the Psyche, the Capuan Venus, the portraits of Homer and Julius Caesar, as well as the huge group called the Toro Farnese (Amphion and Zethus tying Dirce to its horns), the Farnese Hercules, the excellent though late statues of the Balbi on horseback and a very fine collection of ancient portrait busts.

Modern Buildings.—The Galleria Umberto I. is a large cruciform arcade opened in 1890. It somewhat resembles the Milan arcade, and has an octagon in the centre, with a cupola. It is highly ornamented with gilt and stucco. A music-hall occupies the basement. The Galleria Principe di Napoli is in a smaller arcade opposite to the National Museum, mainly occupied by shops where reproductions from the museum are sold. The Galleria Vittoria, opened in 1907, is a circular building with handsome dome, situated near the main entrance of the Villa Communale. It is in great part occupied by offices and shops. The Anglican church in Vico San Pasquale was built in 1862 on ground given to the British community by Garibaldi when dictator, and was the first Protestant church erected in Naples. Since the granting of religious liberty evangelical churches have been built by the Presbyterians, Wesleyans, French, Germans and Italians. A Greek church and a Jewish synagogue have also been opened. The Borsa (or exchange) is a fine building in the Piazza of the same name, built over the remains of the very ancient church of Sant' Aspreno, which are still preserved in the crypt. In front of it is the fine 16th-century Fontana Medina.

Educational and Learned Institutions.—The university of Naples is one of the oldest in Italy, having been founded by Frederick II. in the first half of the 13th century. It had fallen to insignificance under the Bourbons, but since 1860 it has rapidly recovered. It comprises five faculties (literature and philosophy, jurisprudence, mathematics, natural science and medicine), and is well equipped with zoological, mineralogical and geological museums, a physiological institute, a cabinet of anthropology, and botanical gardens. Originally erected in 1557 for the use of the Jesuits, the university buildings are regarded as the best work of Marco di Pino; the quadrangle, surrounded by a simple but effective peristyle, contains statues of Pietro della Vigna (Frederick's chancellor), Thomas Aquinas and Giordano Bruno. The new building, the shell of which was completed in 1906, faces the Rettifilo, a new wide street which leads from the Borsa in a straight line to the railway station; at the back it joins the former building, which is at a higher level. On the other or north side of the ancient building, and at the back of the Strada Constantinopoli, very large annexes have been formed for the medical school. The famous zoological station at Naples, whose aquarium is the principal building in the Villa Communale, is not connected with the university. It was founded by Dr Dohrn in 1872; a large annexe was added to it a few years later on its western side, and a larger annexe on the eastern side was completed in 1907. The aquarium was originally established at Naples because the flora and fauna of the neighbourhood are more varied than those of any district in Europe. Its *Mittheilungen* began to be published in 1878, and portions of a great work on the flora and fauna of Naples come out year by year. It is justly considered the first as well as the oldest of the zoological stations of the world, and the chief universities pay £100 a year for tables to which they send students. At these tables every necessary is provided, each student having his own tanks with salt water laid on for keeping his specimens, and all necessary chemicals being provided. Of other scientific institutions we may mention the observatory on Vesuvius, which is supported entirely by funds from the government, but is annexed informally to the university. Its object is to record earth-movements and volcanic phenomena. The Specola or astronomical observatory is also a government institution, and forms no official part of the university. It is situated on the hill of Capodimonte.

The Royal Society of Naples, dating from 1756, was reconstituted in 1861, and is divided into three academies, namely: moral and political; physical and mathematical; letters, archaeology and fine arts. The famous Accademia Pontaniana, founded by Antonio Becardella (surnamed Panormita owing to his origin from Palermo) and J. J. Pontanus in 1442, was restored in 1808 and still exists. The Royal School for Oriental Languages owes its existence to Matteo Ripa, who in 1732 established a school for Chinese missionaries. The Royal Conservatory of Music in S. Pietro a Majella has existed in one form or other since 1760, and has had many famous pupils.

Elementary education has proceeded with great rapidity, and there are ninety public elementary shools in the city, twenty-three ecclesiastical gratuitous schools and many evangelical schools at a very small payment. The higher grade schools are also numerous, and there are special foreign schools established by private enterprise for the education of the children of foreign residents. There are three schools for the blind and two for deaf-mutes.

Libraries.—The state archives in Vico San Severo e Sossio contain all the records of past governments; the Notarial archives in Via San Paolo contain all the original notarial acts from 1450 onwards, to the number of 800,000. The Royal national library in the building of the national museum contains 364,000 volumes and 7835 manuscripts, many of which are of great value. The musical archives are kept here as a separate department. The Royal library of San Giacomo (100,000 vols.) had its origin in the Palace library of the Bourbon times. There may also be mentioned the Royal University library, the Royal Brancacciana library in Via Donnaromita, with 125,000 vols. and 2000 important MSS., the Gerolomini library, mainly of ecclesiastical books and codices, and the Provincial library in Via Duomo, consisting mainly of technical books. The Biblioteca Communale, and the rich collection of seismic and vulcanological books made by the Italian Alpine Club, are both in charge of the Società di Storia Patria. This literary society was established in 1875, by a committee of private gentlemen anxious to record all possible details of the history of the locality. It has a good though not perfect collection of the early Neapolitan newspapers, a complete file of the principal modern ones and many interesting MSS. The society is governed by a council of literary men, and issues publications from time to time. The Zoological Station or Aquarium has a very fine biological library.

Theatres.—The San Carlo opera-house, with its area of 5157 sq. yds. and its pit capable of seating 1000 spectators, is one of the largest in Europe. It was originally built in 1737 under Charles III., but was destroyed by fire in 1816 and completely rebuilt. It was heavily subsidized in the Bourbon times, but now, except for giving the house, which is the property of the municipality, no assistance is granted from the public funds. The Mercadante is also a municipal theatre, but has no subsidy. The Bellini is a fine opera-house near the museum, and the other chief theatres are the Sannazzaro, Politeama and Fiorentini. Numerous music halls have sprung up of late years, of which the principal is the Salone Margherita in the basement of the Galleria Umberto Primo.

Charities.—Charitable institutions are numerous in Naples. The Reclusorio or poorhouse was founded in the 18th century, and besides being a refuge for the indigent poor has a series of industrial schools attached, at which foundling boys are educated and taught trades. The principal hospitals are the Incurabili, Gesù e Maria, Santa Maria della Pace and a hospital for poor priests, which are all under the same management. The Pellegrini is exclusively surgical; the Santa Maria di Loreto is especially for the inmates of the Reclusorio and for street accidents; the Ospedale Lina for children; and the Ospedale Cotugno for infectious diseases. There is also an International hospital for the treatment of others than Italians, which was built by Lady Harriet Bentinck and is managed by an international committee; a German hospital; and a hospital erected by the representatives of Baron Adolphe de Rothschild. There are two public lunatic asylums in the city, and another at the neighbouring town of Aversa; and many private asylums, among which Fleurent, Miano and Ponti Rossi may be mentioned.

Harbour.—At a very early date the original harbour at Naples, now known in its greatly reduced state as Porto Piccolo, and fit only for boats and lighters, became too small. In 1302 Charles II. of Anjou began the construction of the Porto Grande by forming the Molo Grande or San Gennaro, which stretched eastward into the bay, and was terminated by a lighthouse in the 15th century. By the addition of a new pier running north-east from the lighthouse, and protected by a heavily armed battery, Charles III. in 1740 added greatly to the safety of the harbour. In 1826 the open area to the south of the Porto Grande was formed into the Porto Militare by the construction of the Molo San Vincenzo, 1200 ft. long. Shortly after the formation of the new kingdom of Italy attention was called to the insufficiency of the harbour for modern wants; and new works were begun in 1862. Besides the lengthening of the Molo San Vincenzo to a total of more than 5000 ft., the scheme as now carried out has completely revolutionized the harbour. A cross piece at the end of the Molo San Vincenzo has made the head of that structure into the form of the Greek letter gamma, thus affording considerable protection to the anchorage. New quays have been made all the way from the old Immacolatella landing-place to the new and spacious Capitaneria di Porto, on the eastern side of which is a new harbour used mainly for the coal trade, and piers such that the largest liner can lie alongside the jetty. The outer mole of this harbour runs out from the Castel del Carmine towards the south for some 1500 ft. and forms the inner side of the new steam basin, which when nearly completed in 1906 fell in on the farther side, and had to be reconstructed. The depth of this new harbour is from 25 to 30 ft. There are two projecting moles, one to the inner harbour and the second to the steam basin. In 1905 the total tonnage entering the port amounted to 4,698,872 tons, of which the Italians (including their coasting trade) carried 1,410,192 tons in 3687 vessels; the Germans 1,391,585 tons in 356 vessels; the British 1,136,345 tons in 402 vessels; and the French 245,206 tons in 161 vessels. Naples is the principal port for emigration, chiefly to North and South America; 281 emigrant ships sailed in 1905, carrying 216,103 emigrants. The total imports for that year reached the sum of £5,397,918, and the exports £3,367,805. The articles dealt in are wine, oil, spirits, drugs, tobacco, chemicals, hemp, cotton, wool, silk, timber, paper, leather and hides, metal, glass, cereals and live animals. The largest export was to the United States (£864,562), the next to Great Britain (£701,387), while the largest imports were from Great Britain (£1,233,410) and the United States (£807,564). The specialities of Naples are the manufacture of coral, tortoise-shell, kid gloves and macaroni, but it has been growing also as an industrial centre. The port of Naples is second in the kingdom, and owns no rival save Genoa.

Water Supply.—Since 1884 Naples has had as fine a water supply as any city in Europe. It is derived from the hills in the neighbourhood of Avellino, and is thought to be the effluent of an underground lake. It rushes out from the hillside and is received in a covered masonry canal, whence it flows in large iron pipes till it reaches five enormous reservoirs constructed just opposite to the entrance gates of the royal palace at Capodimonte. Hence it comes by natural gravitation into the town at a pressure of five atmospheres, so that it supplies the highest parts of the town with abundant water. The water is so cold that in the hottest summer perishable articles can be preserved by merely securing them in a closed vessel and allowing the water to drip upon it. The supply was brought into the town just after the terrible cholera outbreak of 1884, and as each new standpipe was erected in the streets every well within 200 yds. of it was closed, so that in a short time no well remained in the town; and thus a fertile source of infection was eliminated. Every house in the town and suburbs is now supplied with a constant supply of pure water. The effect on the health of the city has been extraordinary. Cholera epidemics, which used to be frequent, have become things of the past, and there is now abundant water for public fountains, washing the streets and watering gardens both public and private. The old sewers were found quite inadequate to carry off the large increase of water, and besides they all led directly into the bay, causing a terrible odour and rendering the water near the town unwholesome for bathing. This has been remedied by a system of sewers, which after passing by a tunnel through the hill of Posilipo cross the plain beyond and discharge their contents into the open sea on the deserted coast of Cumae, 17 m. from the city of Naples. The old aqueduct, which was constructed in the 17th century by Carnignano and Criminelli and taps the Isclero at Sant' Agata dei Goti, is still available to a certain extent, but its water was never very wholesome, and as it was not laid on to houses but only supplied fountains and house cisterns which have since been filled up, no account need be taken of it. The solitary Leone fountain, a spring which supplied drinking water to the west end of the town, has been dry for many years.

Modern Growth.—Naples, the most densely peopled city in Europe, has increased in modern times at an enormous rate. On the large areas reclaimed from the sea, vast hotels and mansions let in flats have been erected. The gardens at the west end of the town are all built over. The Vomero, once merely a scattered village, is now an important suburb, and a large workmen's quarter has sprung up beyond the railway station to house the populace which was turned out from the centre of the town when the works of the *risanamento* were undertaken. The increase in population between the census of 1881, when it was 461,962, and the census in 1901 was 85,521. The commune, which includes not only the urban districts (*sezioni*) of San Ferdinando, Chiaja, S. Giuseppe, Monte Calvario, Avvocata, Stella, San Carlo all' Arena, Vicaria, San Lorenzo, Mercato, Pendino and Porto, but also the suburban districts of Vomero, Posilipo, Fuorigrotta, Miano and Piscinola, has been built over in every direction, one great incentive being the creation of an industrial zone to the eastward of the city. This zone has been set aside for the purpose of industrial development, and all persons or companies who set up industrial concerns on it have grants of land at a nominal price, are free of taxes for ten years and have electric force supplied to them at a very low figure. The law came into force in 1906, and was immediately followed by the erection of a large number of factories, for spinning silk, cotton, jute and wool, and the making of railway plant, automobiles, the building of ships, and in fact almost every kind of industry. After the cholera epidemic of 1884, M. Depretis, then premier, visited Naples, and in the course of a public speech gave vent to the famous dictum "*Bisogna sventrare Napoli*"—"Naples must be disembowelled!" Plans were at once made to pull down all the worst slums, and as these lay between the centre of the town and the railway station, a wide street was constructed from the centre of the town to the eastward, and on each side of it wide strips of ground were cleared to afford building sites for shops and offices. The funds for this vast undertaking were found partly by the state, which voted £3,000,000, and as to the rest by the Risanamento Company, which had a capital of £1,200,000. Before beginning operations of demolition it was obviously necessary to provide homes for the poor people who would be turned out, and a large working-class quarter was erected to the north and beyond the railway station. This quarter has wide airy streets and lofty houses, and though perhaps the houses were let at prices which were beyond the purses of the lowest class, the result of their erection was to cause a number of the poorer houses in the old town to be vacated, thus giving an opportunity to the lowest class to be at any rate better housed than they were before. The quarter described above is known as the Rione Vasto. There are also new middle-class quarters at Santa Lucia, Vomero Nuovo and Sant' Efremo, and better houses in the Via Sirignano, on the Riviera di Chiaja, Via Elena and Via Caracciolo at Mergellina, Via Partenope near the Chiatamone, and an aristocratic quarter in the large extensions made in the Rione Amedeo. The narrow alleys of Porto, Pendino and Mercato have nearly all disappeared, and old Naples has been vanishing day by day. One notable result of the widening of the streets has been the spread of the electric tramways, which traverse the town in various directions and are admirably served by a Belgian company. The city is mainly lighted by electricity, which has also found its way into all the public edifices and most private houses.

Folk-lore.—The attention of antiquarians to the charms against the Evil Eye used by the inhabitants of the Neapolitan provinces was first drawn in 1888, when it was shown that they were all derived from the survival of ancient classical legends which had sprung from various sources in connexion with classical sites in the neighbourhood. These may be divided into three classes: first, the sprig of rue in silver, with sundry emblems attached to it, all of which refer to the worship of Diana, whose shrine at Capua was of considerable importance; secondly, the serpent charms, which formed part of the worship of Aesculapius, and were no doubt derived largely from the ancient eastern ophiolatry; and lastly charms derived from the legends of the Sirens. A special confirmation is given in this case, as the Siren is represented mounted on her sea-horse crossing the Styx upon the vase of Pluto and Proserpine in the collection of the Naples Museum. This vase dates about 250 B.C., and the Siren charms represent her in the same way, but usually mounted on two sea-horses. The sea-horse and the Siren alone are commonly found as charms; the Siren being sometimes in her fishtail form and sometimes in the form of a harpy.

History.—All ancient writers agree in representing Naples as a Greek settlement, though its foundation is obscurely and differently narrated. The earliest Greek settlement in the neighbourhood was at Pithecusa (Ischia), but the colonists, being driven out of the island by the frequent earthquakes, settled on the mainland at Cumae, where they found a natural acropolis of great strategic value. From Cumae they colonized Dikearchia (Pozzuoli) and probably subsequently Palaeopolis. The site of Palaeopolis has given rise to much discussion, but the researches by R. T. Günther open completely new ground, and seem to be the correct solution of the problem. He places Palaeopolis at Gaiola Point and has discovered the remains of the harbour, the town hall and various other rudiments of the ancient city. This site, moreover, corresponds with Livy's testimony, and would account for his statement that the towns of Palaeopolis and Neapolis were near together and identical in language and government. This opinion about the site of Palaeopolis has been based on the very considerable alterations which are known to have taken place in the level of the land, and the extensive submerged foundations of buildings off the southern extremity of Posilipo have been identified with those of the old city

Parthenope, as well as Dikearchia, was formed as a new colony from Cumae, and was so called from a legendary connexion of the locality with the siren of that name, whose tomb was still shown in the time of Strabo. Parthenope was situated where Naples now stands, upon the splendid natural acropolis formed by the hill of Pizzofalcone, and defended on the land side by a fosse which is now the Strada di Chiaja, and a massive wall, of which remains may still be traced at the back of the existing houses. To the colonists of Parthenope there came afterwards a considerable addition from Athens and Chalcis, and they built themselves a town which they called *Neapolis*, or the "new city," in contradistinction to the old settlement, which in consequence was styled Palaeopolis or the "old city." The name of Parthenope became lost, and the city of Palaeopolis fell into gradual decadence.

In 328 B.C. the Palaeopolitans having provoked the hostility of Rome by their incursions upon her Campanian allies, the consul Publilius Philo marched against them, and having taken his position between the old and the new city, laid regular siege to Palaeopolis. By the aid of a strong Samnite garrison which they received, the Palaeopolitans were long able to withstand the attacks of the consul; but at length the city was betrayed into the hands of the Romans by two of her citizens. Neapolis possibly surrendered to the consul without any resistance, as it was received on favourable terms, had its liberties secured by a treaty, and obtained the chief authority, which previously seems to have been enjoyed by the older city. From that time Palaeopolis totally disappeared from history, and Neapolis became an allied city (*foederata civitas*)—a dependency of Rome, to whose alliance it remained constantly faithful, even in the most trying circumstances. In 280 B.C. Pyrrhus unsuccessfully attacked its walls; and in the Second Punic War Hannibal was deterred by their strength from attempting to make himself master of the town. During the civil wars of Marius and Sulla a body of partisans of the latter, having entered it by treachery (82 B.C.), made a general massacre of the inhabitants; but Neapolis soon recovered, as it was again a flourishing city in the time of Cicero. It became a *municipium* after the passing of the *lex Julia*; under the empire it is noticed as a *colonia*, but the time when it first obtained that rank is uncertain—possibly under Claudius.

Though a municipal town, Neapolis long retained its Greek culture and institutions; and even at the time of Strabo it had gymnasia and quinquennial games, and was divided into *phratriae* after the Greek fashion. When the Romans became masters of the world, many of their upper classes, both before the close of the republic and under the empire, from a love of Greek manners and literature or from indolent and effeminate habits, resorted to Neapolis, either for the education and the cultivation of gymnastic exercises or for the enjoyment of music and of a soft and luxurious climate. Hence we find Neapolis variously styled—by Horace *otiosa Neapolis*, by Martial *docta Parthenope*, by Ovid *in otia natam Parthenopen*. It was the favourite residence of many of the emperors; Nero made his first appearance on the stage in one of its theatres; Titus assumed the office of its archon; and Hadrian became its demarch. It was chiefly at Neapolis that Virgil composed his *Georgics*; and he was buried on the hill of Pausilypus, the modern Posilipo, in its neighbourhood. It was also the favourite residence of the poets Statius (A.D. 61) and Silius Italicus (A.D. 25), the former of whom was a Neapolitan by birth.

After the fall of the Roman Empire, Neapolis suffered severely during the Gothic wars. Having espoused the Gothic cause in the year 536, it was taken, after a protracted siege, by Belisarius, who turned aside an aqueduct, marched by surprise into the city through its channel, and put many of the inhabitants to the sword. In 542 Totila besieged it and compelled it to surrender, but being soon after recovered by Narses, it remained long a dependency of the exarchate of Ravenna, under the immediate government of a duke, appointed by the East Roman emperors. When the Lombards invaded Italy and pushed their conquests in the southern provinces, the limits of the Neapolitan duchy were considerably narrowed. In the beginning of the 8th century, at the time of the iconoclastic controversy, the emperor Leo the Isaurian having forced compliance to his edict against the worshipping of images, the Neapolitans, encouraged by Pope Gregory III., threw off their allegiance to the Eastern emperors, and established a republican form of government under a duke of their own appointment. Under this régime Neapolis retained independence for nearly four hundred years, though constantly struggling against the powerful Lombard dukes of Benevento, who twice unsuccessfully besieged it. In 1027, however, Pandulf IV., a Lombard prince of Capua, succeeded in making himself master of it; but he was expelled in 1030 by Duke Sergius, chiefly through the aid of a few Norman adventurers. The Normans, in their turn, gradually superseded all powers, whether Greek, Lombard or republican, which had previously divided the south of Italy, and furthermore checked the Saracens in the advances they were making through Apulia.

From the date at which the south of Italy and Sicily were subjugated by the Normans the history of Naples ceases to be the history of a republic or a city, and becomes that of a kingdom, sometimes separate, sometimes merged, with the kingdom of Sicily, in that of the Two Sicilies. The city of Naples henceforth formed the metropolis of the kingdom to which it gave its name, owing this pre-eminence to its advantageous position on the side of Italy towards Sicily, and to the favour of successive princes (see NAPLES, KINGDOM OF).

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NAPLES, KINGDOM OF, the name conventionally given to the kingdom of Sicily on the Italian mainland (Sicily beyond the Pharos), to distinguish it from that of Sicily proper (Sicily on this side of the Pharos, *i.e.* Messina), the title of "King of Naples" having only actually been borne by Philip II. of Spain in the 16th century ("King of England and Naples") and by Joseph Bonaparte and Joachim Murat in the 19th. The history of the kingdom of Naples is inextricably interwoven with that of Sicily, with which for long periods it was united as the kingdom of the Two Sicilies.

For the earlier history of Naples and its territory, as a republic and a dukedom, see NAPLES above, and for the coming of the Normans see SICILY and NORMANS. It is sufficient here to state that the leaders of the house of Hauteville, Robert Guiscard and Richard of Aversa, in 1059 did homage to Pope Nicholas II. (*q.v.*) for all conquests they had made both in the island and upon the mainland, and that in 1130 Roger de Hauteville (Roger II. as "great count" of Sicily) assumed the style of king as Roger I. In this way the south of Italy, together with the adjacent island of Sicily, was converted into one political body, which, owing to the peculiar temper of its Norman rulers and their powerful organization, assumed a more feudal character than any other part of the peninsula. The *regno*, as it was called by the Italians, constituted a state apart, differing in social institutions, foreign relations, and type of home government, from the commonwealths and tyrannies of upper Italy. The indirect right acquired by the popes as lords paramount over this vast section of Italian territory gave occasion to all the most serious disturbances of Italy between the end of the 13th and the beginning of the 16th centuries, by the introduction of the house of Anjou into Naples and the disputed succession of Angevin and Aragonese princes.

The Hohenstaufens.

Roger I. was succeeded in 1154 by William I. "the Bad," who died in 1166, being succeeded by his son William II. "the Good," on whose death in 1189 the crown passed to his illegitimate son Tancred. After the death of Tancred the emperor Henry VI., of the house of Hohenstaufen, who by his marriage with Constance or Costanza d' Altavilla, daughter of Roger I. (d. 1154), was

Tancred's rival for the kingdoms of Naples and Sicily, descended into Italy in 1194. He easily conquered both the mainland and the island, and Tancred's only son William III. surrendered the crown to him. But with the excuse of a pretended plot he put a number of the most conspicuous persons in the kingdoms to death, and had William himself blinded. He then returned to Germany, and during his absence an agitation broke out, provoked by the cruelty of his lieutenants and encouraged by his Norman wife. He hurried back to Italy, and repressed the movement with his usual ferocity, but died in 1197. Costanza then had her son Frederick (b. 1194) proclaimed king, and obtained the support of the Holy See on condition that the kingdom should be once more recognized as a fief of the church. The whole history of the ensuing period of south Italian history turns on the claims of the papacy over the kingdoms of Naples and Sicily, based on the recognition of papal suzerainty in 1053. The Hohenstaufen kings refused to admit this claim; hence the persistent hostility of the popes and the calling in of foreign potentates and armies. Costanza died in 1198, leaving Pope Innocent III. regent and tutor to her son; the pope's authority was contested by various nobles, but in 1209 Frederick married Costanza, daughter of the king of Aragon, with whose help he succeeded in reducing a large part of Sicily to obedience. Two years later he was elected king of the Romans at the diet of Nuremberg in opposition to Otto IV., and in 1220 he was crowned emperor in Rome by pope Honorius III., but continued to reside in Sicily. He quelled a rising of Sicilian barons and Saracens, and confined 60,000 of the latter at Lucera in Capitanata, where they ended by becoming a most loyal colony. After the death of Frederick's wife Pope Honorius III. arranged a marriage for him with Yolande, daughter of John of Brienne (1225). But in 1227 Gregory IX. excommunicated him because he delayed the crusade which he had promised to undertake; and although he sailed the following year, and concluded a treaty with the sultan of Egypt whereby the kingdom of Jerusalem was re-established, the pope was not satisfied and sent an army into Neapolitan territory. On his return Frederick defeated the pontificals, and in 1230 peace was made at San Germano and the excommunication withdrawn. In 1231 he issued the celebrated Constitutions of the Sicilian kingdom at the parliament of Melfi. He had further quarrels with successive pontiffs, and was excommunicated more than once. In 1246 a number of his own barons and officials of the mainland conspired against his rule, but were crushed with great ferocity, and even his faithful secretary, Pietro della Vigna, fell a victim to the emperor's suspicions. Frederick's last years were embittered by the hostilities following on the crusade which the pope proclaimed against him and by rebellions in Naples and Sicily. He died in 1250. His policy was anti-feudal and tended to concentrate power into his own hands; hence the frequent risings of the barons. His court at Palermo had been one of the most brilliant in Europe, and attracted learned men from all over the then known world; his somewhat pagan philosophy was afterwards regarded as marking the beginnings of modern rationalism. He opened schools and universities, and he himself wrote poetry in Sicilian dialect.

The emperor Frederick II.

Manfred.

His son Conrad IV. succeeded to the empire, while to his illegitimate son Manfred he left the principality of Taranto and the regency of the southern kingdom, to be held in Conrad's name. By his political sagacity and moderation Manfred won a strong party to his side and helped Conrad to subjugate the rebellious barons. The emperor died in 1254, leaving an infant son, Conradin (b. 1252), and Manfred was appointed vicar-general during the latter's minority. Manfred, too, encountered the hostility of the popes, against whom he had to wage war, generally with success, and of some of the barons whom the papacy encouraged to rebel; and in 1258, on a rumour of Conradin's death, he was offered and accepted the crown of Naples and Sicily. The rumour proved false, but he retained the crown, promising to leave the kingdom to Conradin at his death and to defend his rights. He now became head of the Ghibellines or Imperialists of Italy, and his position was strengthened by the marriage of his daughter Costanza to Peter, son of King James of Aragon. But he met with opposition from the turbulent nobility and the clergy, who had been deprived of many privileges, and he failed to conciliate the communes, which were oppressed by taxes and beginning to aspire to autonomy. Innocent IV., in his determination to crush the Hohenstaufens, offered the kingdom in turn to Richard, earl of Cornwall, to Edward, son of Henry III. of England, and to Charles of Anjou, brother of Louis IX. of France. After long negotiations with successive popes, Charles was finally induced by Clement IV. to come to Italy in 1265, agreeing to accept the kingdom of the Two Sicilies as a fief of the church, and in 1266 he marched southward with the privileges of a crusader (see CHARLES I., king of Naples and Sicily). The defection of many cities and nobles facilitated his task, and Manfred was forced to retire on Benevento, where, on the 26th of February, owing to the treachery of a part of his troops, he was defeated and killed. As a result of this victory Charles was soon master of almost the whole kingdom, and he entered Naples, which now became the capital instead of Palermo. He persecuted the nobles who had sided with Manfred, and established a military despotism which proved more oppressive than that of the Hohenstaufens had ever been. Old laws, customs and immunities were ruthlessly swept away, the people were ground down with taxes, and the highest positions and finest estates conferred on French and Provençal nobles. Although the southern Italians had long been ruled by foreigners, it was the Angevin domination which thoroughly denationalized them, and initiated that long period of corruption, decadence and foreign slavery which only ended in the 19th century.

Charles I.

Conradin.

Invited by Sicilian malcontents and Ghibellines, Conradin (Ital. Corradino), the last surviving Hohenstaufen, descended into Italy in 1267 at the head of a small army collected in Germany, and he found many supporters; but King Charles on hearing of his arrival abandoned the siege of Lucera and came to intercept him. A battle took place at Tagliacozzo (August 23rd, 1268), in which the Imperialists were defeated, and Conradin himself was subsequently caught and handed over to Charles, who had him tried for high treason and beheaded (see CONRADIN). All who had assisted the unfortunate youth were cruelly persecuted, and the inhabitants of Agosta put to the sword. Thus ended the power of the Hohenstaufens. Although the picturesque figures of Manfred and Conradin awakened sympathy among the people of the kingdom, their authority was never really consolidated and their German knights were hated; which facts rendered the enterprise of another foreigner like the Angevin comparatively easy.

The Sicilian Vespers.

In Sicily, however, Charles's government soon made itself odious by its exactions, the insolence and cruelty of the king's French officials and favourites, the depreciation of the currency, and the oppressive personal services, while the nobles were incensed at the violation of their feudal constitution. Just as Charles was contemplating an expedition to the East, the Sicilians rose in revolt, massacring the French throughout the island. The malcontents were led by the Salernitan noble Giovanni da Procida, a friend of the emperor Frederick and of Manfred, who had taken refuge at the court of Peter III. of Aragon, husband of Manfred's daughter Costanza. He had induced Peter to make good his somewhat shadowy claims to the crown of Sicily, but while preparations were being made for the expedition, the popular rising known as the Sicilian Vespers, which resulted in the massacre of nearly all the French in the island, broke out at Palermo on Easter Day 1282. Peter reached Palermo in September, and by the following month had captured Messina, the last French stronghold. Pope Martin IV. now proclaimed a crusade against the Aragonese, and the war continued for many years. The Sicilian fleet under Ruggiero di Lauria defeated that of the Angevins at Malta in 1283, and 1284 in the Bay of Naples, where the king's son, Charles the Lame, was captured. Charles I. died in 1286, and, his heir being a prisoner, his grandson, Charles

Martel (d. 1295), assumed the regency. Peter died the same year, leaving Aragon to his son Alphonso III. and Sicily to his son James, who was consecrated king in spite of the interdict. The war went on uninterruptedly, for the popes prevented all attempts to arrive at an understanding, as they were determined that the rights of the church should be fully recognized. **Charles II.** Charles the Lame, who had been liberated in 1288, having renounced his rights on Sicily, was absolved from his oath by Pope Nicholas IV., who crowned him king of the Two Sicilies and excommunicated Alphonso. The latter's successor James made peace with Boniface VIII. by renouncing Sicily (in exchange for Sardinia and Corsica and the hand of Charles's daughter) and promising to help the Angevins to reconquer the island. **Frederick III.** But the Sicilians, led by James's brother, Frederick III.,[1] who had been governor of the island and was now proclaimed king, determined to resist. The war went on with varying success, until Charles of Valois, summoned by the pope to conduct the campaign, landed in Sicily and, his army being decimated by disease, made peace with Frederick at Caltabellòtta (1302). The Angevins renounced Sicily in favour of Frederick, who was recognized as king of Trinacria (a name adopted so as not to mention that of Sicily), and he was to marry Leonora, daughter of Charles of Valois; at his death the island would revert to the Angevins, but his children would receive compensation elsewhere. In 1303 the pope unwillingly ratified the treaty. (See CHARLES II., king of Naples and Sicily, and FREDERICK III., king of Sicily.)

Robert. Charles II. died in 1309 and was succeeded by his second son Robert. (His eldest son had predeceased him, leaving a son, Charles Robert, or Caroberto, at this time king of Hungary.) Robert now became leader of the Guelphs in Italy, and war between Naples and Sicily broke out once more, when Frederick allied himself with the emperor Henry VII. on his descent into Italy, and proclaimed his own son Peter heir to the throne. Robert led or sent many devastating expeditions into Sicily, and hostilities continued under King Peter even after Frederick's death in 1337. Peter died in 1342, leaving an infant son Louis; but just as Robert was preparing for another expedition he too died in the same year. Robert had been a capable ruler, a scholar and a friend of Petrarch, but he lost influence as a Guelph leader owing to the rise of other powerful princes and republics, while in Naples itself his authority was limited by the rights of a turbulent and rebellious baronage (see ROBERT, king of Naples). **Joanna I.** His son Charles had died in 1328 and he was succeeded by his granddaughter Joanna, wife of Andrew of Hungary, but the princes of the blood and the barons stirred up trouble, and in 1345 Andrew was assassinated by order of Catherine, widow of Philip, son of Charles II., and of several nobles, not without suspicion of Joanna's complicity.

Andrew's brother Louis, king of Hungary, now came to Italy to make good his claims on Naples and avenge the murder of Andrew. With the help of some of the barons he drove Joanna and her second husband, Louis of Taranto, from the kingdom, and murdered Charles of Durazzo; but as Pope Clement refused to recognize his claims he went back to Hungary in 1348, and the fickle barons recalled Joanna, who returned and carried on desultory warfare with the partisans of Louis of Hungary. Louis of Taranto and Joanna were crowned at Naples by the pope's legate in 1352, but Niccolò Acciaiuoli, the seneschal, became the real master of the kingdom. In 1374 Joanna made peace with Frederick of Sicily, recognizing him as king of Trinacria on condition that he paid her tribute and recognized the pope's suzerainty. She nominated Louis of Anjou her heir, but while the latter was recognized by the antipope Clement VII,, Pope Urban VI. declared Charles of Durazzo (great-grandson of Charles II.) king of Sicily *al di qua del Faro* (*i.e.* of Naples). Charles conquered the kingdom and took Joanna prisoner in 1381, and had her murdered the following year. Louis, although assisted by Amadeus VI. of Savoy, failed to drive out Charles, and died in 1384. **Charles III.** Charles III. died two years later and the kingdom was plunged into anarchy once more, part of the barons siding with his seven-year-old son Ladislas, and part with Louis II. of Anjou. The latter was crowned by the antipope Clement, while Urban regarded both him and his rival as usurpers. **Ladislas.** On Urban's death in 1389 Boniface IX. crowned Ladislas king of Naples, who by the year 1400 had expelled Louis and made himself master of the kingdom. In 1407 he occupied Rome, which Gregory XII. could not hold. But Alexander V., elected pope by the council of Pisa, turned against Ladislas and recognized Louis. Ladislas was defeated in 1411 and driven from Rome, but reoccupied the city on Louis's return to France. **Joanna II.** He died in 1414, and was succeeded by his sister Joanna II. (*q.v.*), during whose reign the kingdom sank to the lowest depths of degradation. In 1415 Joanna married James of Bourbon, who kept his wife in a state of semi-confinement, murdered her lover, Pandolfo Alopo, and imprisoned her chief captain, Sforza; but his arrogance drove the barons to rebellion, and they made him renounce the royal dignity and abandon the kingdom. The history of the next few years is a maze of intrigues between Joanna, Sforza, Giovanni Caracciolo, the queen's new lover, Alphonso of Aragon, whom she adopted as her heir, and Louis III. of Anjou, whom we find pitted against each other in every possible combination. Louis died in 1434 and Joanna in 1435 (see JOANNA II., queen of Naples). The succession was disputed by René of Anjou and Alphonso, but the former eventually renounced his claims and Alphonso was recognized as king of Naples by Pope Eugenius IV. in 1443.

Alphonso the Magnanimous. Under Alphonso, surnamed "the Magnanimous," Sicily was once more united to Naples and a new era was inaugurated, for the king was at once a brilliant ruler, a scholar and a patron of letters. He died in 1458, leaving Naples to his illegitimate son Ferdinand I. (Don Ferrante), and Sicily, Sardinia and Aragon to his brother John. **Ferdinand I.** Ferdinand found, however, that Alphonso had not really consolidated his power, and he had practically to reconquer the whole country. By 1464 he was master of the situation, in spite of the attempt of Pope Calixtus III. to enforce the claims of the papacy, and that of John of Anjou to enter into the heritage of his ancestors. In alliance with Pope Sixtus IV. and the Milanese he waged war on Lorenzo de' Medici in 1479; but that astute ruler, by visiting Ferdinand in person, obtained peace on favourable terms (1479). In 1485 the disaffection of the barons, due to the king's harshness and the arrogance and cruelty of his son, found vent in a revolt led by Roberto Sanseverino and Francesco Coppola, which was crushed by means of craft and treachery. Ferdinand died in 1494 full of forebodings as to the probable effects of the invasion of Charles VIII. of France, and was succeeded by Alphonso (see FERDINAND I., king of Naples). **The invasion of Charles VIII.** The French king entered Italy in September 1495, and conquered the Neapolitan kingdom without much difficulty. Alphonso abdicated, his son Ferrandino and his brother Frederick withdrew to Ischia, and only a few towns in Apulia still held out for the Aragonese. But when the pope, the emperor, Spain and Venice, alarmed at Charles's progress, formed a defensive league against him, he quitted Naples, and Ferrandino, with the help of Ferdinand II. of Spain, was able to reoccupy his dominions. He died much regretted in 1496 and was succeeded by Frederick. The country was torn by civil war and brigandage, and the French continued to press their claims; and although Louis XII. (who had succeeded Charles VIII.) concluded a treaty with Ferdinand of Spain for the partition of Naples, France and Spain fell out in 1502 over the division of the spoils, and with Gonzalo de Cordoba's victory on the Garigliano in December 1502, the whole kingdom was in Spanish hands.

On the death of Ferdinand in 1516, the Habsburg Charles became king of Spain, and three years later was elected emperor as Charles V.; in 1522 he appointed John de Lannoy viceroy of

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[1] He was the second king of that name in Sicily, but was known as Frederick III. because he was the third son of King Peter.

Naples, which became henceforth an integral part of the Spanish dominions. **Naples a Spanish possession.** The old divisions of nobility, clergy and people were maintained and their mutual rivalry encouraged; the nobles were won over by titles and by the splendour of the viceregal court, but many persons of low birth who showed talent were raised to high positions. The viceroy was assisted by the Collateral Council and the Sacred College of Santa Chiara, composed of Spanish and Italian members, and there was an armed force of the two nationalities. Spanish rule on the whole was oppressive and tyrannical, and based solely on the idea that the dependencies must pay tribute to the dominant kingdom. During the rule of Don Pedro de Toledo (one of the best viceroys) Naples became the centre of a Protestant movement which spread to the rest of Italy, but was ultimately crushed by the Inquisition. In Sicily Spanish rule was less absolute, for the island had not been conquered, but had given itself over voluntarily to the Aragonese; and the parliament, formed by the three *bracci* or orders (the *militare* consisting of the nobility, the *ecclesiastico*, of the clergy, and the *demaniale*, of the communes), imposed certain limitations on the viceroy, who had to play off the three *bracci* against each other. **Revolutions.** But the oppressive character of the government provoked several rebellions. In 1598 an insurrection, headed by the philosopher Tommaso Campanella, broke out in Calabria, and was crushed with great severity. In 1647, during the viceroyalty of the marquis de Los Leres in Sicily, bread riots in Palermo became a veritable revolution, and the people, led by the goldsmith Giovanni d' Alessio, drove the viceroy from the city; but the nobles, fearing for their privileges, took the viceroy's part and turned the people against d' Alessio, who was murdered, and Los Leres returned. On the 7th of July 1647, tumults occurred at Naples in consequence of a new fruit tax, and the viceroy, Count d' Arcos, was forced to take refuge in the Castelnuovo. **Masaniello.** The populace, led by an Amalfi fisherman, known as Masaniello (*q.v.*), obtained arms, erected barricades, and, while professing loyalty to the king of Spain, demanded the removal of the oppressive taxes and murdered many of the nobles. D' Arcos came to terms with Masaniello; but in spite of this, and of the assassination of Masaniello, whose arrogance and ferocity had made him unpopular, the disturbances continued, and again the viceroy had to retire to Castelnuovo and make concessions. Even the arrival of reinforcements from Spain failed to restore order, and the new popular leader, Gennaro Annese, now sought assistance from the French, and invited the duke of Guise to come to Naples. The duke came with some soldiers and ships, but failed to effect anything; and after the recall of d' Arcos the new viceroy, Count d'Ognate, having come to an arrangement with Annese and got Guise out of the city, proceeded to punish all who had taken part in the disturbances, and had Annese and a number of others beheaded.

The revolution at Messina. In 1670 disorders broke out at Messina. They began with a riot between the nobles and the burghers, but ended in an anti-Spanish movement; and while the inhabitants called in the French, the Spaniards, who could not crush the rising, called in the Dutch. Louis XIV. sent a fleet under the duc de Vivonne to Sicily, which defeated the Dutch under de Ruyter in 1676. But at the peace of Nijmwegen (1679) Louis treacherously abandoned the Messinese, who suffered cruel persecution at the hands of the Spaniards and lost all their privileges. An anti-Spanish conspiracy of Neapolitan nobles, led by Macchia, with the object of proclaiming the archduke Charles of Austria king of Naples, was discovered; but in 1707 an Austrian army conquered the kingdom, and Spanish rule came to an end after 203 years, during which it had succeeded in thoroughly demoralizing the people.

Sicily under Savoy. In Sicily the Spaniards held their own until the peace of Utrecht in 1713, when the island was given over to Duke Victor of Savoy, who assumed the title of king. In 1718 he had to hand back his new possession to Spain, who, in 1720, surrendered it to Austria and gave Sardinia to Victor Amadeus. In 1733 the treaty of the Escurial between France, Spain and Savoy against Austria was signed. Don Carlos of Bourbon, son of Philip V. of Spain, easily conquered both Naples and Sicily, and in 1738 he was recognized as king of the Two Sicilies, Spain renouncing all her claims. **Charles III.** Charles was well received, for the country now was an independent kingdom once more. With the Tuscan Bernardo Tanucci as his minister, he introduced many useful reforms, improved the army, which was thus able to repel an Austrian invasion in 1744, embellished the city of Naples and built roads. In 1759 Charles III., having succeeded to the Spanish crown, abdicated that of the Two Sicilies in favour of his son Ferdinand, who became Ferdinand IV. of Naples and III. of Sicily. **Ferdinand IV.** Being only eight years old, a regency under Tanucci was appointed, and the young king's education was purposely neglected by the minister, who wished to dominate him completely. The regency ended in 1767, and the following year Ferdinand married the masterful and ambitious Maria Carolina, daughter of the empress Maria Theresa. She had Tanucci dismissed and set herself to the task of making Naples a great power. With the help of John Acton, an Englishman whom she made minister in the place of Tanucci, she freed Naples from Spanish influence and secured a *rapprochement* with England and Austria.

On the outbreak of the French Revolution the king and queen were not at first hostile to the new movement; but after the fall of the French monarchy they became violently opposed to it, and in 1793 joined the first coalition against France, instituting severe persecutions against all who were remotely suspected of French sympathies. Republicanism, however, gained ground, especially among the aristocracy. In 1796 peace with France was concluded, but in 1798, during Napoleon's absence in Egypt and after Nelson's victory at Aboukir, Maria Carolina induced Ferdinand to go to war with France once more. Nelson arrived in Naples in September, where he was enthusiastically received. The king, after a somewhat farcical occupation of Rome, which had been evacuated by the French, hurried back to Naples as soon as the French attacked his troops, and although the *lazzaroni* (the lowest class of the people) were devoted to the dynasty and ready to defend it, he fled with the court to Palermo in a panic on board Nelson's ships. The wildest confusion prevailed, and the *lazzaroni* massacred numbers of persons suspected of republican sympathies, while the nobility and the educated classes, finding themselves abandoned by their king in this cowardly manner, began to contemplate a republic under French auspices as their only means of salvation from anarchy. **The French in Naples and the Parthenopaean republic.** In January 1799 the French under Championnet reached Naples, but the *lazzaroni*, ill-armed and ill-disciplined as they were, resisted the enemy with desperate courage, and it was not until the 20th that the invaders were masters of the city. On the 23rd the Parthenopaean republic was proclaimed. The Republicans were men of culture and high character, but doctrinaire and unpractical, and they knew very little of the lower classes of their own country. The government soon found itself in financial difficulties, owing to Championnet's demands for money; it failed to organize the army, and met with scant success in its attempts to "democratize" the provinces. **Cardinal Ruffo and the Sanfedisti.** Meanwhile the court at Palermo sent Cardinal Fabrizio Ruffo, a wealthy and influential prelate, to Calabria, to organize a counter-revolution. He succeeded beyond expectation, and with his "Christian army of the Holy Faith" (*Esercito Cristiano della Santa Fede*), consisting of brigands, convicts, peasants and some soldiers, marched through the kingdom plundering, burning and massacring. An English squadron approached Naples and occupied the island of Procida, but after a few engagements with the Republican fleet commanded by Caracciolo, an ex-officer in the Bourbon navy, it was recalled to Palermo, as the Franco-Spanish fleet was expected. Ruffo, with the addition of some Russian and Turkish allies, now marched on the capital, whence the French, save for a small force under Méjean, withdrew. The scattered Republican detachments were defeated, only Naples and Pescara holding out. On the 13th of June Ruffo and his hordes reached Naples, and after a desperate battle at the Ponte della Maddalena, entered the city. For weeks the Calabresi and *lozzaroni* continued to pillage and massacre, and Ruffo was unable, even if willing, to restrain them. But the Royalists were not masters of the city, for the French in Castel Sant' Elmo and the Republicans in Castelnuovo and Castel dell' Uovo still held out and bombarded the streets, while the Franco-Spanish fleet might arrive at any moment. Consequently Ruffo was desperately anxious to come to terms with the Republicans for the evacuation of the castles, in spite of the queen's orders to make no terms with the rebels. After some negotiation an armistice was concluded and a capitulation agreed upon, whereby the castles were to be evacuated, the hostages liberated and the garrisons free to remain in Naples unmolested or to sail for Toulon.

Nelson at Naples.

While the vessels were being prepared for the voyage to Toulon all the hostages in the castles were liberated save four; but on the 24th of June Nelson arrived with his fleet, and on hearing of the capitulation he refused to recognize it save in so far as it concerned the French. Ruffo indignantly declared that once the treaty was signed, not only by himself but by the Russian and Turkish commandants and by the British captain Foote, it must be respected, and on Nelson's refusal he said that he would not help him to capture the castles. On the 26th Nelson changed his attitude and authorized Sir William Hamilton, the British minister, to inform the cardinal that he (Nelson) would do nothing to break the armistice; while Captains Bell and Troubridge wrote that they had Nelson's authority to state that the latter would not oppose the embarcation of the Republicans. Although these expressions were equivocal, the Republicans were satisfied and embarked on the vessels prepared for them. But on the 28th Nelson received despatches from the court (in reply to his own), in consequence of which he had the vessels brought under the guns of his ships, and many of the Republicans were arrested. Caracciolo, who had been caught whilst attempting to escape from Naples, was tried by a court-martial of Royalist officers under Nelson's auspices on board the admiral's flagship, condemned to death and hanged at the yard arm. For the part played by Nelson in these transactions see the articles Caracciolo and Nelson.

Bourbon vengeance.

On the 8th of July, King Ferdinand arrived from Palermo, and the state trials, conducted in the most arbitrary fashion, resulted in wholesale butchery; hundreds of persons were executed, including some of the best men in the country, such as the philosopher Mario Pagano, the scientist Cirillo, Manthonè, the minister of war under the republic, Massa, the defender of Castel dell' Uovo, and Ettore Caraffa, the defender of Pescara, who had been captured by treachery, while thousands of others were immured in horrible dungeons or exiled.

War with France continued until March 1801, when peace was made, and after the peace of Amiens in 1802 the court returned to Naples, where it was well received. But when the European war broke out again in the following year, Napoleon (then first consul) became very exacting in his demands on King Ferdinand, who consequently played a double game, appearing to accede to these demands while negotiating with England. After Austerlitz Napoleon revenged himself by declaring that "the Bourbon dynasty had ceased to reign," and sent an army under his brother Joseph to occupy the kingdom.

Joseph Bonaparte.

Ferdinand and Maria Carolina fled to Palermo in January 1805; in February 1806 Joseph Bonaparte entered Naples as king. A cultivated, well-meaning, not very intelligent man, he introduced many useful reforms on a basis of benevolent despotism, abolished feudalism and built roads, but the taxes and forced contributions which he levied proved very burdensome. Joseph's authority did not exist throughout a large part of the kingdom, where royalist risings, led by brigand chiefs, maintained a state of anarchy, and a British force under Sir John Stuart, which landed in Calabria from Sicily, defeated the French at Maida (July 6th, 1806). Both the French and the royalists committed atrocities, and many conspirators in Naples were tried by the French state courts and shot.

Joachim Murat.

In 1808 Napoleon conferred the crown of Spain on Joseph, and appointed Joachim Murat king of Naples. Murat continued Joseph's reforms, swept away many old abuses and reorganized the army; and although he introduced the French codes and conferred many appointments and estates on Frenchmen, his administration was more or less native, and he favoured the abler Neapolitans. His attempts to attack the English in Sicily ended disastrously, but he succeeded in crushing brigandage in Calabria by means of General Manhès, who, however, had to resort to methods of ferocity in order to do so. The king, owing to his charm of manner, his handsome face, and his brilliant personality, gained many sympathies, and began to aspire to absolute independence. He gradually became estranged from Napoleon, and although he followed him to Russia and afterwards took part in the German campaign, he secretly opened negotiations with Austria and Great Britain. In January 1814 he signed a treaty with Austria, each power guaranteeing the dominions of the other, while Sicily was to be left to Ferdinand. The following month he proclaimed his separation from Napoleon and marched against Eugène Beauharnais, the French viceroy of Lombardy. But no important engagements took place, and when Napoleon escaped from Elba, Murat suddenly returned to the allegiance of his old chief. He marched at the head of 35,000 men into northern Italy, and from Rimini issued his famous proclamation in favour of Italian independence, which at the time fell on deaf ears (March 30th, 1815). He was subsequently defeated by the Austrians several times and forced to retreat, and on the 18th of May he sailed from Naples for France (see Murat, Joachim). Generals Guglielmo Pepe and Carrascosa now concluded a treaty with the Austrians at Casalanza on favourable terms, and on the 23rd the Austrians entered Naples to restore Bourbon rule.

The Bourbons in Sicily.

The English constitution.

The restoration in Naples.

Ferdinand and Maria Carolina had continued to reign in Sicily, where the extravagance of the court and the odious Neapolitan system of police espionage rendered their presence a burden instead of a blessing to the island. The king obtained a subsidy from Great Britain and allowed British troops to occupy Messina and Agosta, so that they might operate against the French on the mainland. A bitter conflict broke out between the court and the parliament, and the British minister, Lord William Bentinck, favoured the opposition, forced Ferdinand to resign his authority and appoint his son regent and introduced many valuable reforms. The queen perpetually intrigued against Bentinck, and even negotiated with the French, but in 1812 a more liberal constitution on British lines was introduced, and a Liberal ministry under the princes of Castelnuovo and Belmonte appointed, while the queen was exiled in the following year. But after the fall of Napoleon Sicily ceased to have any importance for Great Britain, and Bentinck, whose memory is still cherished in the island, departed in 1814. Ferdinand succeeded in getting a reactionary ministry appointed, and dissolved parliament in May 1815, after concluding a treaty with Austria—now freed by Murat's defection from her engagements with him—for the recovery of his mainland dominions by means of an Austrian army paid for by himself. On the 9th of June Ferdinand re-entered Naples and bound himself in a second treaty with Austria not to introduce a constitutional government;[1] but at first he abstained from persecution and received many of Murat's old officers into his army in accordance with the treaty of Casalanza. In October 1815 Murat, believing that he still had a strong party in the kingdom, landed with a few companions at Pizzo di Calabria, but was immediately captured by the police and the peasantry, court-martialled and shot.

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[1] The secret article of the treaty of June 12, 1815, runs as follows: "H.M. the King of the Two Sicilies, in re-establishing the government of the kingdom, will not agree to any changes irreconcilable either with the ancient institutions of the monarchy or with the principles adopted by H.I. and R. Austrian Majesty for the internal régime of his Italian provinces." It is to be noted that this did not involve the obligation of interfering with the *ancient* constitution of Sicily, which Metternich desired to see remain undisturbed.

The revolution of 1820.

Ferdinand to some extent maintained French legislation, but otherwise reorganized the state with Metternich's approval on Bourbon lines; he proclaimed himself king of the Two Sicilies at the congress of Vienna, incorporating Naples and Sicily into one state, and abolished the Sicilian constitution (December 1816). In 1818 he concluded a Concordat with the Church, by which the latter renounced its suzerainty over the kingdom, but was given control over education, the censorship and many other privileges. But there was much disaffection throughout the country, and the Carbonarist lodges, founded in Murat's time with the object of freeing the country from foreign rule and obtaining a constitution, had made much progress (see CARBONARI). The army indeed was honeycombed with Carbonari, and General Pepe, himself a member of the society, organized them on a military basis. In July 1820 a military mutiny broke out at Caserta, led by two officers and a priest, the mutineers demanding a constitution although professing loyalty to the king. Ferdinand, feeling himself helpless to resist, acceded to the demand, appointed a ministry composed of Murat's old adherents, and entrusted his authority to his son. The ultra-democratic single-chamber Spanish constitution of 1812 was introduced, but proved utterly unworkable. The new government's first difficulty was Sicily, where the people had risen in rebellion demanding their own charter of 1812, and although the Neapolitan troops quelled the outbreak with much bloodshed the division proved fatal to the prospects of liberty.

The Austrians in Naples.

The outbreak of the military rising in Naples, following so shortly on that in Spain, seriously alarmed the powers responsible for the preservation of the peace in Europe. The position was complicated by the somewhat enigmatic attitude of Russia; for the Neapolitan Liberals, with many of whom Count Capo d' Istria, the Russian minister of foreign affairs, had been on friendly terms, proclaimed that they had the "moral support" of the tsar. This idea, above all, it was necessary for Austria to destroy once for all. The diplomatic negotiations are discussed in the article on the history of Europe (*q.v.*). Here it suffices to say that these issued in the congress of Troppau (October 1820) and the proclamation of the famous Troppau protocol affirming the right of collective "Europe" to interfere to crush dangerous internal revolutions. Both France and Great Britain protested against the general principle laid down in this instrument; but neither of them approved of the Neapolitan revolution, and neither of them was opposed to an intervention in Naples, provided this were carried out, not on the ground of a supposed right of Europe to interfere, but by Austria for Austrian ends. By general consent King Ferdinand was invited to attend the adjourned congress, fixed to meet at Laibach in the spring of the following year. Under the new constitution, the permission of parliament was necessary before the king could leave Neapolitan territory; but this was weakly granted, after Ferdinand had sworn the most solemn oaths to maintain the constitution. He was scarcely beyond the frontiers, however, before he repudiated his engagements, as exacted by force. A cynicism so unblushing shocked even the seasoned diplomats of the congress, who would have preferred that the king should have made a decent show of yielding to force. The result was, however, that the powers authorized Austria to march an army into Naples to restore the autocratic monarchy. This decision was notified to the Neapolitan government by Russia, Prussia and Austria—Great Britain and France maintaining a strict neutrality. Meanwhile the regent, in spite of his declaration that he would lead the Neapolitan army against the invader, was secretly undermining the position of the government, and there were divisions of opinion in the ranks of the Liberals themselves. General Pepe was sent to the frontier at the head of 8000 men, but was completely defeated by the Austrians at Rieti on the 7th of March. On the 23rd the Austrians entered Naples, followed soon afterwards by the king; every vestige of freedom was suppressed, the reactionary Medici ministry appointed, and the inevitable state trials instituted with the usual harvest of executions and imprisonment. Pepe saved himself by flight. (See FERDINAND IV., king of Naples.)

Francis I.

Ferdinand died in 1825, and his son and successor, Francis I., an unbridled libertine, at once threw off the mask of Liberalism; the corruption of the administration under Medici assumed unheard-of proportions, and every office was openly sold. The Austrian occupation lasted until 1827, having cost the state 310,000,000 lire; but in the meanwhile the Swiss Guard had been established as a further protection for autocracy, and the revolutionary outbreak at Bosco on the Cilento was suppressed with the usual cruelty. (See FRANCIS I., king of the Two Sicilies.)

Ferdinand II.

The Bandiera attempt.

Francis died in 1830 and was succeeded by his son, Ferdinand II., who at first awoke hopes that the conditions of the country would be improved. He was not devoid of good qualities, and took an interest in the material welfare of the country, but he was narrow-minded, ignorant and bigoted; he made the administration more efficient, and reorganized the army which became purged of Carbonarism, and such Carbonarist plots as there were in the 'thirties were not severely punished. Ferdinand was impatient of Austrian influence, but on the death of his first wife, Cristina of Savoy, he married Maria Theresa of Austria, who encouraged him in his reactionary tendencies and brought him closer to Austria. An outbreak of cholera in 1837 led to disorders in Sicily, which, having assumed a political character, were repressed by Del Caretto with great severity. The government tended to become more and more autocratic and to rely wholly on the all-powerful police, the spies and the priests; and, although the king showed some independence in foreign affairs, his popularity waned; the desire for a constitution was by no means dead, and the survivors of the old Carbonari gathered round Carlo Poerio, while the *Giovane Italia* society (independent of Mazzini), led by Benedetto Musolino, took as its motto "Unity, Liberty and Independence." But as yet the idea of unity made but little headway, for southern Italy was too widely separated by geographical conditions, history, tradition and custom from the rest of the peninsula, and the majority of the Liberals—themselves a minority of the population—merely aspired to a constitutional Neapolitan monarchy, possibly forming part of a confederation of Italian states. The attempt of the *Giovane Italia* to bring about a general revolution in 1843 only resulted in a few sporadic outbreaks easily crushed. The following year the Venetian brothers Bandiera, acting in concert with Mazzini, landed in Calabria, believing the whole country to be in a state of revolt; they met with little local support and were quickly captured and shot, but their death aroused much sympathy, and the whole episode was highly significant as being the first attempt made by north Italians to promote revolution in the south. In 1847 a pamphlet by L. Settembrini, entitled "A Protest of the People of the Two Sicilies," appeared anonymously and created a deep impression as a most scathing indictment of the government; and at the same time the election of Pius IX., a pope who was believed to be a Liberal, caused widespread excitement throughout Italy. Conspiracy was now rife both in Naples and Sicily, but as yet there was no idea of deposing the king. Many persons were arrested, including Carlo Poerio, who, however, continued to direct the agitation.

The revolution in Sicily.

On the 12th of January 1848 a revolution under the leadership of Ruggiero Settimo broke out at Palermo to the cry of "independence or the 1812 constitution," and by the end of February the whole island, with the exception of Messina, was in the hands of the revolutionists. These events were followed by demonstrations at Naples; the king summoned a meeting of generals and members of his family on the 27th of January, and on the advice of Filangieri (*q.v.*), who said that the army was not to be relied upon, he dismissed the Pietracatella ministry and Del Caretto, and summoned the duke of Serracapriola to form another administration. On the 28th he granted the constitution, and the Liberals Bozzelli and Carlo Poerio afterwards joined the cabinet. The

The constitution of 1848.

The 15th of May.

popular demand was now that Naples should assist the Lombards in their revolt against Austria, for a feeling of Italian solidarity was growing up. The ministry of Carlo Troya succeeded to that of Serracapriola, and after the parliamentary elections, in which many extreme Radicals were elected, Ferdinand declared war against Austria (April 7th, 1848). After considerable delay a Neapolitan army under General Pepe marched towards Lombardy in May, while the fleet sailed for Venice. But a dispute between the king and the parliament concerning the form of the royal oath having arisen, a group of demagogues with criminal folly provoked disturbances and erected barricades (May 14th). The king refused to open parliament unless the barricades were removed, and while the moderate elements attempted to bring about conciliation, the ministry acted with great weakness. A few shots were fired—it is not known who fired first—on the 15th, the Swiss regiments stormed the barricades and street fighting lasted all day. By the evening the Swiss and the royalists were masters of the situation. A new ministry under Prince Cariati was appointed. Parliament was dissolved, the National Guard disbanded and the army recalled from the Po. Fresh elections were held and the new parliament met on the 15th of July, but it had the king, the army and the mob against it, and anti-constitutionalist demonstrations became frequent. After a brief session it was prorogued to the 1st of February 1849, and when it met on that date a deadlock between king and parliament occurred. The Austrian victories in Lombardy had strengthened the court party, or Camarilla as it was called, and on the 13th of March the assembly was again dissolved, and never summoned again. The king was at Gaeta, whither the grand-duke of Tuscany and Pius IX. had also repaired to escape from their rebellious subjects, and the city became the headquarters of Italian reaction.

Sicily.

In Sicily the revolutionists were purely insular in their aspirations and bitterly hostile to the Neapolitans, and the attempts at conciliation, although favoured by Lord Minto, failed, for Naples wanted one constitution and one parliament, whereas Sicily wanted two, with only the king in common. The Sicilian assembly met in March 1848, and Settimo in his inaugural speech declared that the Bourbon dynasty had ceased to reign, that the throne was vacant and that Sicily united her destinies to those of Italy. Settimo was elected president of the government, but the administration was lacking in statesmanship, the treasury was empty, and nothing was done to raise an army. After the Austrian victories King Ferdinand sent a Neapolitan army of 20,000 men under Filangieri to subjugate the island. The troops landed at Messina, of which the citadel had been held by the royalists throughout, and after three days' desperate fighting the city itself was captured and sacked. The British and French admirals imposed a truce with a view to conciliation, and the king offered the Sicilians the Neapolitan constitution and a separate parliament, which they refused. Sicilian troops were now levied throughout the island and the chief command given to the Pole Mieroslawski, but it was too late. Filangieri marched forward taking town after town, and committing many atrocities. In April he reached Palermo while the fleet appeared in the bay; tumults having broken out within the city, the government surrendered on terms which granted amnesty for all except Settimo and forty-two others.

The Neapolitan prisons.

For a few months after the dissolution of the Neapolitan parliament the government abstained from persecution, but with the crushing of the Sicilian revolution its hands were free; and when the commission on the affair of the 15th of May had completed its labours the state trials and arrests began. The arrest of S. Faucitano for a demonstration at Gaeta led to the discovery of the *Unità Italiana* society, whose object was to free Italy from domestic tyranny and foreign domination. Thousands of respectable citizens were thrown into prison, such as L. Settembrini, Carlo Poerio and Silvio Spaventa. The trials were conducted with the most scandalous contempt of justice, and moral and physical torture was applied to extort confessions. The abominable conditions of the prisons in which the best men of the kingdom were immured, linked to the vilest common criminals, was made known to the world by the famous letters of W. E. Gladstone, which branded the Bourbon régime as "the negation of God erected into a system of government." The merest suspicion of unorthodox opinions, the possession of foreign newspapers, the wearing of a beard or an anonymous denunciation, sufficed for the arrest and condemnation of a man to years of imprisonment while the *attendibili*, or persons under police surveillance liable to imprisonment without trial at any moment, numbered 50,000. The remonstrances of Great Britain and France met with no success. Ferdinand strongly resented foreign interference, and even rejected the Austrian proposal for a league of the Italian despots for mutual defence against external attacks and internal disorder. In 1856 his life was unsuccessfully attempted by a soldier, and the same year Baron Bentivegna organized a revolt near Palermo, which was quickly suppressed. In 1857 Carlo Pisacane, an ex-Neapolitan officer who had taken part in the defence of Rome, fitted out an expedition, with Mazzini's approval, from Genoa, and landed at Sapri in Calabria, where he hoped to raise the flag of revolution; but the local police assisted by the peasantry attacked the band, killing many, including Pisacane himself, and capturing most of the rest. The following year, at the instance of Great Britain and France, Ferdinand commuted the sentences of some of the political prisoners to exile. (See FERDINAND II., king of the Two Sicilies).

Pisacane's attempt.

Francis II.

In May 1859 Ferdinand died, and was succeeded by his son, Francis II., who came to the throne just as the Franco-Sardinian victories in Lombardy were sounding the death-knell of Austrian predominance and domestic despotism in Italy (see ITALY: *History*). But although there was much activity and plotting among the Liberals, there was as yet no revolution. Victor Emmanuel, king of Sardinia, wrote to the new king proposing an alliance for the division of Italy, but Francis refused. In June part of the Swiss Guard mutinied because the Bernese government not having renewed the convention with Naples the troops were deprived of their cantonal flag. The mutinous regiments, however, were surrounded by loyal troops and shot down; and this affair resulted in the disbanding of the whole force—the last support of the autocracy. Political amnesties were now decreed, and in September 1859 Filangieri was made prime minister. The latter favoured the Sardinian alliance and the granting of the constitution, and so did the king's uncle, Leopold, count of Syracuse. But Francis rejected both proposals and Filangieri resigned and was succeeded by A. Statella. In April 1860 Victor Emmanuel again proposed an alliance whereby Naples, in return for help in expelling the Austrians from Venetia, was to receive the Marche, while Sardinia would annex all the rest of Italy except Rome. But Francis again refused, and in fact was negotiating with Austria and the pope for a simultaneous invasion of Modena, Lombardy and Romagna.

Garibaldi and the Thousand.

In the meantime, however, events in Sicily were reaching a crisis destined to subvert the Bourbon dynasty. The Sicilians, unlike the Neapolitans, were thoroughly alienated from the Bourbons, whom they detested, and after the peace of Villafranca (July 1859) Mazzini's emissaries, F. Crispi and R. Pilo, had been trying to organize a rising in favour of Italian unity; and although they merely succeeded in raising a few *squadre*, or armed bands, in the mountainous districts, they persuaded Garibaldi (*q.v.*), without the magic of whose personal prestige they knew nothing important could be achieved, that the revolution which he knew to be imminent had broken out. The authorities at Palermo, learning of a projected rising, attacked the convent of La Gangia, the headquarters of the rebels, and killed most of the inmates; but in the meanwhile Garibaldi, whose hesitation had been overcome, embarked on the 5th of May 1860, at Quarto, near Genoa, with 1000 picked followers on board two steamers, and sailed for Sicily. On the 11th the expedition reached Marsala and landed without opposition. Garibaldi was somewhat coldly received by the astonished population; but he set forth at once for

Palermo.

Salemi, whence he issued a proclamation assuming the dictatorship of Sicily in the name of Victor Emmanuel, with Crispi as secretary of state. He continued his march towards Palermo, where the bulk of the 30,000 Bourbon troops were concentrated, gathering numerous followers on the way. On the 15th he attacked and defeated 3000 of the enemy under General Landi at Calatafimi; the news of this brilliant victory revived the revolutionary agitation throughout the island, and Garibaldi was joined by Pilo and his bands. By a cleverly devised ruse he avoided General Colonna's force, which expected him on the Monreale road, and entering Palermo from Misilmeri received an enthusiastic welcome. The Bourbonists, although they bombarded the city from the citadel and the warships in the harbour, gradually lost ground, and after three days' street fighting their commander, General Lanza, not knowing that the Garibaldians had scarcely a cartridge left, asked for and obtained a twenty-four hours' armistice (May 30th). Garibaldi went on board the British flagship to confer with the Neapolitan generals Letizia and Chrétien; Letizia's proposal that the municipality should make a humble petition to the king was indignantly rejected by Garibaldi, who merely agreed to the extension of the armistice until next day. Then he informed the citizens by means of a proclamation of what he had done, and declared that, knowing them to be ready to die in the ruins of their city, he would renew hostilities on the expiration of the armistice. Although unarmed, the people rallied to him as one man, and Lanza became so alarmed that he asked for an unconditional extension of the armistice, which Garibaldi granted. The dictator now had time to collect ammunition, and the Neapolitan government having given Lanza full powers to treat with him, 15,000 Bourbon troops embarked for Naples on the 7th of June, leaving the revolutionists masters of the situation. The Sardinian Admiral Persano's salute of nineteen guns on the occasion of Garibaldi's official call constituted a practical recognition of his dictatorship by the Sardinian (Piedmontese) government. In July further reinforcements of volunteers under Cosenz and Medici, assisted by Cavour, arrived at Palermo with a good supply of arms furnished by subscription in northern Italy. Garibaldi's forces were now raised to 12,000 men, besides the Sicilian *squadre*. Cavour's attempt to bring about the annexation of Sicily to Sardinia failed, for Garibaldi wished to use the island as a basis for an invasion of the mainland. Most of the island had now been evacuated by the Bourbonists, but Messina and a few other points still held out, and when the Garibaldians advanced eastward they encountered a force of 4000 of the enemy under Colonel Bosco at Milazzo; on the 20th of July a desperate battle took place resulting in a hard-won Garibaldian victory. The Neapolitan government then decided on the evacuation of the whole of Sicily except the citadel of Messina, which did not surrender until the following year.

The Neapolitan constitution.

Garibaldi on the mainland.

Victor Emmanuel and Garibaldi.

The fall of Gaeta.

The news of Garibaldi's astonishing successes entirely changed the situation in the capital, and on the 25th of June 1860 the king, after consulting the ministers and the royal family, granted a constitution, and appointed A. Spinelli prime minister. Disorders having taken place between Liberals and reactionaries, Liberio Romano was made minister of police in the place of Aiossa. Sicily being lost, the king directed all his efforts to save Naples; he appealed to Great Britain and France to prevent Garibaldi from crossing the Straits of Messina, and only just failed (for this episode see under LACAITA, G.). Victor Emmanuel himself wrote to Garibaldi urging him to abstain from an attack on Naples, but Garibaldi refused to obey, and on the 19th of August he crossed with 4500 men and took Reggio by storm. He was soon joined by the rest of his troops, 15,000 in all, and although the Neapolitan government had 30,000 men in Calabria alone, the army collapsed before Garibaldi's advance, and the people rose in his favour almost everywhere. Francis offered Garibaldi a large sum of money if he would abstain from advancing farther, and 50,000 men to fight the Austrians and the pope; but it was too late, and on the 6th of September the king and queen sailed for Gaeta. The 40,000 Bourbon troops between Salerno and Avellino fell back panic-stricken, and on the 7th Garibaldi entered Naples alone, although the city was still full of soldiers, and was received with delirious enthusiasm. On the 11th a part of the royalists capitulated and the rest retired on Capua. Cavour now decided that Sardinia must take part in the liberation of southern Italy, for he feared that Garibaldi's followers might induce him to proclaim the republic and attack Rome, which would have provoked French hostility; consequently a Piedmontese army occupied the Marche and Umbria, and entered Neapolitan territory with Victor Emmanuel at its head. On the 1st and 2nd of October 1860 a battle was fought on the Volturno between 20,000 Garibaldians, many of them raw levies, and 35,000 Bourbon troops, and although at first a Garibaldian division under Türr was repulsed, Garibaldi himself arrived in time to turn defeat into victory. On the 26th he met Victor Emmanuel at Teano and hailed him king of Italy, and subsequently handed over his conquests to him. On the 3rd of November a plebiscite was taken, which resulted in an overwhelming majority in favour of union with Sardinia under Victor Emmanuel. Garibaldi departed for his island home at Caprera, while L.C. Farini was appointed viceroy of Naples and M. Cordero viceroy of Sicily. The last remnant of the Bourbon army was concentrated at Gaeta, the siege of which was begun by Cialdini on the 5th of November; on the 10th of January 1861 the French fleet, which Napoleon III. had sent to Gaeta to delay the inevitable fall of the dynasty, was withdrawn at the instance of Great Britain; and although the garrison fought bravely and the king and queen showed considerable courage, the fortress surrendered on the 13th of February and the royal family departed by sea. (See FRANCIS II., King of the Two Sicilies.) The citadel of Messina capitulated a month later, and Civitella del Tronto on the 21st of March. On the 18th of February the first Italian parliament met at Turin and proclaimed Victor Emmanuel king of Italy. Thus Naples and Sicily ceased to be a separate political entity and were absorbed into the united Italian kingdom.

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NAPOLEON I. (1769–1821), Emperor of the French. Napoleon Bonaparte (or Buonaparte, as he almost always spelt the name down the year 1796) was born at Ajaccio in Corsica on the 15th of August 1769. The date of his birth has been disputed, and certain curious facts have been cited in proof of the assertion that he was born on the 7th of January 1768, and that his brother Joseph, who passed as the eldest surviving son, was in reality his junior. Recent research has, however, explained how it came about that a son born on the earlier date received the name Nabulione (Napoleon). The father, Carlo Maria da Buonaparte (Charles Marie de Bonaparte), had resolved to call his three first sons by the names given by his great-grandfather to his sons, namely Joseph, Napoleon and Lucien. This was done; but on the death of the eldest (Joseph) the child first baptized Nabulion received the name Joseph; while the third son (the second surviving son) was called Napoleon. The baptismal register of Ajaccio leaves no doubt as to the date of his birth as given above. For his parents and family see BONAPARTE. The father's literary tastes, general inquisitiveness, and powers of intrigue reappeared in Napoleon, who, however, derived from his mother Letizia (a descendant of the Ramolino and Pietra Santa families) the force of will, the power of forming a quick decision and of maintaining it against all odds, which made him so terrible an opponent both in war and in diplomacy. The sterner strain in the mother's nature may be traced to intermarriage with the families of the wild interior of Corsica, where the vendetta was the unwritten but omnipotent law of the land. The Bonapartes, on the other hand, had long concerned themselves with legal affairs at Ajaccio or in the coast towns of the island. They traced their descent to ancestors who had achieved distinction in the political life of medieval Florence and Sarzana; Francesco Buonaparte of Sarzana migrated to Corsica early in the 16th century. What is equally noteworthy, as explaining the characteristics of Napoleon, is that his descent was on both sides distinctly patrician. He once remarked that the house of Bonaparte dated from the *coup d'état* of Brumaire (November 1799); but it is certain the de Buonapartes had received the title of nobility from the senate of the republic of Genoa which, during the 18th century, claimed to exercise sovereignty over Corsica.

It was in the midst of the strifes resulting from those claims that Napoleon Bonaparte saw the light in 1769. His compatriots had already freed themselves from the yoke of Genoa, thanks to Pasquale Paoli; but in 1764 that republic appealed to Louis XV. of France for aid, and in 1768 a bargain was struck by which the French government succeeded to the nearly bankrupt sovereignty of Genoa. In the campaigns of 1768–69 the French gradually overcame the fierce resistance of the islanders; and Paoli, after sustaining a defeat at Ponte-Novo (9th of May 1769), fled to the mainland, and ultimately to England. Napoleon's father at first sided with Paoli, but after the disaster of Ponte-Novo he went over to the conquerors, and thereafter solicited places for himself and for his sons with a skill and persistence which led to a close union between the Bonapartes and France. From the French governor of Corsica, the comte de Marbeuf, he procured many favours, among them being the nomination of the young Napoleon to the military school at Brienne in the east of France.

Already the boy had avowed his resolve to be a soldier. In the large playroom of the house at Ajaccio, while the others amused themselves with ordinary games, Napoleon delighted most in beating a drum and wielding a sword. His elder brother, Joseph, a mild and dreamy boy, had to give way before him; and it was a perception of this difference of temperament which decided the father to send Joseph into the church and Napoleon into the army. Seeing that the younger boy was almost entirely ignorant of French, he took him with Joseph to the college at Autun at the close of the year 1778. After spending four months at Autun, Napoleon entered the school at Brienne in May 1779. The pupils at Brienne, far from receiving a military education, were grounded in ordinary subjects, and in no very efficient manner, by brethren of the order, or society, of Minims. The moral tone of the school was low; and Napoleon afterwards spoke with contempt of the training of the "monks" and the manner of life of the scholars. Perhaps his impressions were too gloomy; his whole enthusiasm had been for the Corsicans, who still maintained an unequal struggle against the French; he deeply resented his father's espousal of the French cause; and dislike of the conquerors of his native island made him morose and solitary. Apart from decided signs of proficiency in mathematics, he showed no special ability. Languages he disliked, but he spent much of his spare time in reading history, especially Plutarch. The firmness of character which he displayed caused him to be recommended in 1782 for the navy by one of the inspectors of the school; but a new inspector, who was appointed in 1783, frustrated this plan. In October 1784 Bonaparte and three other Briennois were authorized, by a letter signed by Louis XVI., to proceed as gentlemen cadets to the military school at Paris. There the education was more thorough, and the discipline stricter, than at Brienne. Napoleon applied himself with more zest to his studies, in the hope of speedily qualifying himself for the artillery. In this he succeeded. As the result of an examination conducted in September 1785 by Laplace, Bonaparte was included among those who entered the army without going through an intermediate stage.

At the end of October 1785 he closed a scholastic career which had been creditable but not brilliant. He now entered the artillery regiment, La Fère, quartered at Valence, and went through all the duties imposed on privates, and thereafter those of a corporal and a sergeant. Not until January 1786 did he actually serve as junior lieutenant. A time of furlough in Corsica from September 1786 to September 1787 served to strengthen his affection for his mother, and for the island which he still hoped to free from the French yoke. The father having died of cancer at Montpellier in 1785, Napoleon felt added responsibilites, which he zealously discharged. In order to push forward a claim which Letizia urged on the French government, he proceeded to Paris in September 1787, and toyed for a time with the pleasures of the Palais Royal, but failed to make good the family claim. After gaining a further extension of leave of absence from his regiment he returned to Ajaccio and spent six months more in the midst of family and political affairs. Rejoining his regiment, then in the garrison at Auxonne, after a furlough of twenty-one months, the young officer went through a time of much privation, brightened only by the study of history and cognate subjects. Many of the notes and essays written by him at Auxonne bear witness to his indomitable resolve to master all the details of his profession and the chief facts relating to peoples who had struggled successfully to achieve their liberation. Enthusiasm for Corsica was a leading motive prompting him to this prolonged exertion. His notes on English history (down to the time of the revolution of 1688) were especially detailed. Of Cromwell he wrote: "Courageous, clever, deceitful, dissimulating, his early principles of lofty republicanism yielded to the devouring flames of his ambition; and, having tasted the sweets of power, he aspired to the pleasure of reigning alone." At Auxonne, as previously at Valence, Napoleon commanded a small detachment of troops sent to put down disturbances in neighbouring towns, and carried out his orders unflinchingly. To this period belongs his first crude literary effort, a polemic against a Genevese pastor who had criticized Rousseau.

In the latter part of his stay at Auxonne (June 1788–September 1789) occurred the first events of the Revolution which was destined to mould anew his ideas and his career. But his preoccupation about Corsica, the privations to which he and his family were then exposed, and his bad health, left him little energy to expend on purely French affairs. He read much of the pamphlet literature then flooding the country, but he still preferred the more general studies in history and literature, Plutarch, Caesar, Corneille, Voltaire and Rousseau being his favourite authors. The plea of the last named on behalf of Corsica served to enlist the sympathy of Napoleon in his wider speculations, and so helped to bring about that mental transformation which merged Buonaparte the Corsican in Bonaparte the Jacobin and Napoleon the First Consul and Emperor.

Family influences also played their part in this transformation. On proceeding to Ajaccio in September 1789 for another furlough, he found his brother Joseph enthusiastic in the democratic cause and acting as secretary of the local political club. Napoleon seconded his efforts, and soon they had the help of the third brother, Lucien, who proved to be most eager and eloquent. Thanks to the exertions of Saliceti, one of the two deputies sent by the *tiers état* of Corsica to the National Assembly of France, that body, on the 30th of November 1789, declared the island to be an integral part of the kingdom with right to participate in all the reforms then being decreed. This event decided Napoleon to give his adhesion to the French or democratic party; and when, in July 1790, Paoli returned from exile in England (receiving on his way the honours of the sitting by the National Assembly) the claims of nationality and democracy seemed to be identical, though the future course of events disappointed these hopes. Shortly before returning to his regiment in the early weeks of 1791 he indited a letter inveighing in violent terms against Matteo Buttafuoco, deputy for the Corsican *noblesse* in the National Assembly of France, as having betrayed the cause of insular liberty in 1768 and as plotting against it again.

The experiences of Bonaparte at Auxonne during his second stay in garrison were again depressing. With him in his poorly furnished lodgings was Louis Bonaparte, the fourth surviving son, whom he carefully educated and for whom he predicted a brilliant future. For the present their means were very scanty, and, as the ardent royalism of his brother officers limited his social circle, he plunged into work with the same ardour as before, frequently studying fourteen or fifteen hours a day. Then it was, or perhaps at a slightly later date, that he became interested in the relations subsisting between political science and war. From *L'Esprit des lois* of Montesquieu he learnt suggestive thoughts like the following: "L'objet de la guerre, c'est la victoire; celui de la victoire, la conquête; celui de la conquête, l'occupation." Machiavelli taught him the need of speed, decision and unity of command, in war. From the *Traité de tactique* (1772) of Guibert he caught a glimpse of the power which a patriotic and fully armed nation might gain amidst the feeble and ill-organized governments of that age.

External events served to unite him more closely to France. The reorganization of the artillery, which took place in the spring of 1791, brought Bonaparte to the rank of lieutenant in the regiment of Grenoble, then stationed at Valence. He left the regiment La Fère with regret on the 14th of June 1791; but at Valence he renewed former friendships and plunged into politics with greater ardour. Most of his colleagues refused to take the oath of obedience to the Constituent Assembly, after the attempted escape of Louis XVI. to the eastern frontier at midsummer. Bonaparte took the oath on the 4th of July, but said later that the Assembly ought to have banished the king and proclaimed a regency for Louis XVII. In general, however, his views at that time were republican; he belonged to the club of Friends of the Constitution at Valence, spoke there with much acceptance, and was appointed librarian to the club.

At Valence also he wrote an essay for a prize instituted by his friend and literary adviser, Raynal, at the academy of Lyons. The subject was "What truths and sentiments is it most important to inculcate to men for their happiness?" Bonaparte's essay bore signs of study of Rousseau and of the cult of Lycurgus which was coming into vogue. The Spartans were happy, said the writer, because they had plenty of good, suitable clothing and lodging, robust women, and were able to meet their requirements both physical and mental. Men should live according to the laws and dictates of nature, not forgetting the claims of reason and sentiment. The latter part of the essay is remarkable for its fervid presentment of the charms of scenery and for vigorous declamation against the follies and crimes of ambitious men. The judges at Lyons placed it fifteenth in order of merit among the sixteen essays sent in.

Thanks to the friendly intervention of the *maréchal du camp*, baron Duteil, Bonaparte once more gained leave of absence for three months and reached Corsica in September 1791. Opinion there was in an excited state, the priests and the populace being inflamed against the anti-clerical decrees of the National Assembly of France. Paoli did little to help on the Bonapartes; and the advancement of Joseph Bonaparte was slow. Napoleon's admiration for the dictator also began to cool, and events began to point to a rupture. The death of Archdeacon Lucien Bonaparte, the recognized head of the family, having placed property at the disposal of the sons, they bought a house, which became the rendezvous of the democrats and of a band of volunteers whom they raised. In the intrigues for the command of this body Napoleon had his rival, Morati, carried off by force—his first *coup d'état*. The incident led to a feud with the supporters of Morati, among whom was Pozzo di Borgo (destined to be his life-long enemy), and opened a breach between the Bonapartes and Paoli. Bonaparte's imperious nature also showed itself in family matters, which he ruled with a high hand. No one, said his younger brother Lucien, liked to thwart him.

Further discords naturally arose between so masterful a lieutenant as Bonaparte and so autocratic a chief as Paoli. The beginnings of this rupture, as well as a sharp affray between his volunteers and the townsfolk of Ajaccio, may have quickened Bonaparte's resolve to return to France in May 1792, but there were also personal and family reasons for this step. Having again exceeded his time of furlough, he was liable to the severe penalties attaching to a deserter and an *émigré*; but he saw that the circumstances of the time would help to enforce the appeal for reinstatement which he resolved to make at Paris. His surmise was correct. The Girondin ministry then in power had brought Louis XVI. to declare war against Austria (20th of April 1792) and against Sardinia (15th of May 1792). The lack of trained officers was such as to render the employment and advancement of Bonaparte probable in the near future, and on the 30th of August, Servan, the minister for war, issued an order appointing him to be captain in his regiment and to receive arrears of pay. During this stay at Paris he witnessed some of the great "days" of the Revolution; but the sad plight of his sister, Marianna Elisa, on the dissolution of the convent of St Cyr, where she was being educated, compelled him to escort her back to Corsica shortly after the September massacres.

His last time of furlough in Corsica is remarkable for the failure of the expedition in which he and his volunteers took part, against la Maddalena, a small island off the coast of Sardinia. The breach between Paoli and the Bonapartes now rapidly widened, the latter having now definitely espoused the cause of the French republic, while Paoli, especially after the execution of Louis XVI., repudiated all thought of political connexion with the regicides. Ultimately the Bonapartes had to flee from Corsica (11th of June 1793), an event which clinched Napoleon's decision to identify his fortunes with those of the French republic. His ardent democratic opinions rendered the change natural when Paoli and his compatriots declared for an alliance with England.

The arrival of the Bonapartes at Toulon coincided with a time of acute crisis in the fortunes of the republic. Having declared war on England and Holland (1st of February 1793), and against Spain (9th of March), France was soon girdled by foes; and the forces of the first coalition invaded her territory at several points. At first the utmost efforts of the republic failed to avert disaster; for the intensely royalist district of la Vendée, together with most of Brittany, burst into revolt, and several of the northern, central and southern departments rose against the Jacobin rule. The struggle which the constitutionalists and royalists of Marseilles made against the central government furnished Bonaparte with an occasion for writing his first important political pamphlet, entitled "*Le Souper de Beaucaire.*" It purports to be a conversation at the little town of Beaucaire between a soldier (obviously the writer himself) and three men, citizens of Marseilles, Nîmes and Montpellier, who oppose the Jacobinical government and hope for victory over its forces. The officer points out the folly of such a course, and the certainty that the republic, whose troops had triumphed over those of Prussia and Austria, will speedily disperse the untrained levies of Provence. The pamphlet closes with a passionate plea for national unity.

He was now to further the cause of the republic one and indivisible in the sphere of action. The royalists of Toulon had admitted British and Spanish forces to share in the defence of that stronghold (29th of August 1793). The blow to the republican cause was most serious: for from Toulon as a centre the royalists threatened to raise a general revolt throughout the south of France, and Pitt cherished hopes of dealing a death-blow to the Jacobins in that quarter. But fortune now brought Bonaparte to blight those hopes. Told off to serve in the army of Nice, he was detained by a special order of the commissioners of the Convention, Saliceti and Gasparin, who, hearing of the severe wound sustained by Dommartin, the commander of the artillery of the republican forces before Toulon, ordered Bonaparte to take his place. He arrived at the republican headquarters, then at Ollioules on the north-west of Toulon, on the 16th of September; and it is noteworthy that as early as September 10th the commissioners had seen the need of attacking the allied fleet and had paid some attention to the headland behind l'Éguillette, which commanded both the outer and the inner harbour. But there is no doubt that Bonaparte brought to bear on the execution of this as yet vague and general proposal powers of concentration and organization which ensured its success. In particular he soon put the artillery of the besiegers in good order. Carteaux, an ex-artist, at first held the supreme command, but was superseded on the 23rd of October. Doppet, the next commander, was little better fitted for the task; but his successor, Dugommier, was a brave and experienced soldier who appreciated the merits of Bonaparte. Under their direction steady advance was made on the side which Bonaparte saw to be all important; a sortie of part of the British, Spanish and Neapolitan forces on the 30th of November was beaten back with loss, General O'Hara, their commander, being severely wounded and taken prisoner. On the night of the 16th–17th December, Dugommier, Bonaparte, Victor and Muiron headed the storming column which forced its way into the chief battery thrown up by the besieged on the height behind l'Éguillette; and on the next day Hood and Langara set sail, leaving the royalists to the vengeance of the Jacobins. General du Teil, the younger, who took part in the siege, thus commented on Bonaparte's services: "I have no words in which to describe the merit of Bonaparte: much science, as much intelligence and too much bravery. . . . It is for you, Ministers, to consecrate him to the glory of the republic." At Toulon Bonaparte made the acquaintance of men who were to win renown under his leadership—Desaix, Junot, Marmont, Muiron, Suchet and Victor.

It is often assumed that the fortunes of Bonaparte were made at Toulon. This is an exaggeration. True, on the 22nd of December 1793 he was made general of brigade for his services; and in February 1794 he gained the command of the artillery in the French army about to invade Italy; but during the preliminary work of fortification along the coast he was placed under arrest for a time owing to his reconstruction of an old fort at Marseilles which had been destroyed during the Revolution. He was soon released owing to the interposition of the younger Robespierre and of Saliceti. Thereafter he resided successively at Toulon, St Tropez and Antibes, doing useful work in fortifying the coast and using his spare time in arduous study of the science of war. This he had already begun at Auxonne under the inspiring guidance of the baron du Teil. General du Teil, younger brother of the baron, had recently published a work, *L'Usage de l'artillerie nouvelle*; and it is now known that Bonaparte derived from this work and from those of Guibert and Bourcet that leading principle, concentration of effort against one point of the enemy's line, which he had advocated at Toulon and which he everywhere put in force in his campaigns.

On or about the 20th of March 1794 he arrived at the headquarters of the army of Italy. At Colmars, on the 21st of May 1794, he drew up the first draft of his Italian plan of campaign for severing the Piedmontese from their Austrian allies and for driving the latter out of their Italian provinces. A secret mission to Genoa enabled him to inspect the pass north of Savona, and the knowledge of the peculiarities of that district certainly helped him in maturing his plan for an invasion of Italy, which he put into execution in 1796. For the present he experienced a sharp rebuff of fortune, which he met with his usual fortitude. He was suddenly placed under arrest owing to intrigues or suspicions of the men raised to power by the *coup d'état* of Thermidor 9–10 (July 27–28) 1794. The commissioners sent by the Convention, Albitte, Laporte and Saliceti, suspected him of having divulged the plan of campaign, and on the 6th of August ordered his arrest as being the "maker of plans" for the younger Robespierre. On a slighter accusation than this many had perished; but an examination into the details of the mission of Bonaparte to Genoa and the new instructions which arrived from Carnot, availed to procure his release on the 20th of August. It came in time to enable him to share in the operations of the French army against the Austrians that led to the battle of Dego, north of Savona (21st of September), a success largely due to his skilful combinations. But the decline in the energies of the central government at Paris and the appointment of Schérer as commander-in-chief of the army of Italy frustrated the plans of a vigorous offensive which Bonaparte continued to develop and advocate.

Meanwhile he took part in an expedition fitted out in the southern ports to drive the English from Corsica. It was a complete failure, and for a time his prospects were overclouded. In the spring of 1795 he received an order from Paris to proceed to la Vendée in command of an infantry brigade. He declined on the score of ill-health, but set out for Paris in May, along with Marmont, Junot and Louis Bonaparte. At the capital he found affairs quickly falling back into the old ways of pleasure and luxury. "People," he wrote, "remember the Terror only as a dream." That he still pursued his studies of military affairs is shown by the compilation of further plans for the Italian campaign. The news of the ratification of peace with Spain brought at once the thought that an offensive plan of campaign in Piedmont was thenceforth inevitable. Probably these plans gained for him an appointment (20th of August) in the topographical bureau of the committee of Public Safety. But, either from weariness of the life at Paris, or from disgust at clerical work, he sought permission to go to Turkey in order to reorganize the artillery of the Sultan. But an inspection of his antecedents showed the many irregularities of his conduct as officer and led to his name being erased from the list of general officers (September 15th).

Again the difficulty of the republic was to be his opportunity. The action of the Convention in perpetuating its influence by the imposition of two-thirds of its members on the next popularly elected councils, aroused a storm of indignation in Paris, where the "moderate" and royalist reaction was already making headway. The result was the massing of some 30,000 National Guards to coerce the Convention. Confronted by this serious danger, the Convention entrusted its defence to Barras, who appointed the young officer to be one of the generals assisting him. The vigour and tactical skill of Bonaparte contributed very largely to the success of the troops of the Convention over the Parisian malcontents on the famous day of 13 Vendémiaire (October 5th, 1795), when the defenders of the Convention, sweeping the quays and streets near the Tuilleries by artillery and musketry, soon paralysed the movement at its headquarters, the church of St Roch. The results of this day were out of all proportion to the comparatively small number of casualties. With the cost of about 200 killed on either side, the Convention crushed the royalist or malcontent reaction, and imposed on France a form of government which ensured the perpetuation of democracy though in a bureaucratic form—the first of those changes which paved the way to power for Bonaparte. For the constitution of the year 1795 which inaugurated the period of the Directory (1795–1799) see FRENCH REVOLUTION. Here we may notice that the perpetuation of the republic by means of the armed forces tended to exalt the army at the expense of the civil authorities. The repetition of the same tactics by Bonaparte in Fructidor, 1797, served still more decidedly to tilt the balance in favour of the sword, with results which were to be seen at the *coup d'état* of Brumaire 1799.

The events which helped the disgraced officer of August 1795 to impose his will on France in November 1799 now claim our attention. The services which he rendered to the republic at Vendémiaire brought as their reward the hand of Josephine de Beauharnais. The influence of Barras with this fashionable lady helped on the match. At the outset she felt some repugnance for the thin sallow-faced young officer, and was certainly terrified by his ardour and by the imperious egoism of his nature; but she consented to the union, especially when he received the promise of the command of the French army of Italy. The story that he owed this promotion solely to the influence of Barras and Josephine is, however, an exaggeration. It is now known that the plans of campaign which he had drawn up for that army had enlisted the far more influential support of Carnot on his behalf. In January 1796 he drew up another plan for the conquest of Italy, which gained the assent of the Directory. Vendémiaire and the marriage with Josephine (9th of March 1796) were but stepping-stones to the attainment of the end which he had kept steadily in sight since the spring of the year 1794. For the events of this campaign in Italy see FRENCH REVOLUTIONARY WARS. The success at the bridge of Lodi (10th of May) seems first to have inspired in the young general dreams of a grander career than that of a successful general of the Revolution; while his narrow escape at the bridge of Arcola in November strengthened his conviction that he was destined for a great future. The means whereby he engaged the energies of the Italians on behalf of the French Republic and yet refrained from persecuting the Roman Catholic Church in the way only too common among revolutionary generals, bespoke political insight of no ordinary kind. From every dispute which he had with the central authorities at Paris he emerged victorious; and he took care to assure his ascendancy by sending presents to the Directors, large sums to the nearly bankrupt treasury and works of art to the museums of Paris. Thus when, after the crowning victory of Rivoli (14th of January 1797), Mantua surrendered and the Austrian rule in Italy for the time collapsed, Bonaparte was virtually the idol of the French nation, the master of the Directory and potentially the protector of the Holy See.

It may be well to point out here the salient features in Bonaparte's conduct towards the states of northern Italy. While arousing the enthusiasm of their inhabitants on behalf of France, he in private spoke contemptuously of them, mercilessly suppressed all outbreaks caused by the exactions and plundering of his army, and carefully curbed the factions which the new political life soon developed. On his first entry into Milan (15th of May 1796) he received a rapturous welcome as the liberator of Italy from the Austrian yoke; but the instructions of the Directory allowed him at the outset to do little more than effect the organization of consultative committees and national guards in the chief towns of Lombardy. The successful course of the campaign and the large sums which he sent from Italy to the French exchequer served to strengthen his hold over the Directors, and his constructive policy grew more decided. Thus, when the men of Reggio and Modena overthrew the rule of their duke, he at once accorded protection to them, as also to the inhabitants of the cities of Bologna and Ferrara when they broke away from papal authority. He even allowed the latter to send delegates to confer with those of the duchy at Modena, with the result that a political union was decreed in a state called the Cispadane Republic (16th of October 1796). This action was due in large measure to the protection of Bonaparte. The men of Lombardy, emboldened by his tacit encouragement, prepared at the close of the year to form a republic, which assumed the name of Transpadane, and thereafter that of Cisalpine. Its constitution was drawn up in the spring of 1797 by committees appointed, and to some extent supervised, by him; and he appointed the first directors, deputies and chief administrators of the new state (July 1797). The union of these republics took place on the 15th of July 1797. The bounds of the thus enlarged Cisalpine Republic were afterwards extended eastwards to the banks of the Adige by the terms of the treaty of Campo Formio; and in November 1797 Bonaparte added the formerly Swiss district of the Valtelline, north-east of Lake Como, to its territory. Much of this work of reorganization was carried on at the castle of Montebello, or Mombello, near Milan, where he lived in almost viceregal pomp (May–July, 1797). Taking advantage of an outbreak at Genoa, he overthrew that ancient oligarchy, replaced it by a form of government modelled on that of France (June 6th); and subsequently it adopted the name of the Ligurian Republic.

Concurrently with these undertakings, he steadily prepared to strengthen his position in the political life of France; and it will be well to notice the steps by which he ensured the defeat of the royalists in France and the propping up of the directorial system in the *coup d'état* of Fructidor 1797. The unrest in France in the years 1795–1797 resulted mainly from the harshness, incompetence and notorious corruption of the five Directors who, after the 13th of Vendémiaire 1795, practically governed France. All those who wished for peace and orderly government came by degrees to oppose the Directors; and, seeing that the latter clung to Jacobinical catchwords and methods, public opinion tended to become " moderate " or even royalist. This was seen in the elections for one-third of the 750 members composing the two councils of the nation (the *Anciens* and the Council of Five Hundred); they gave the moderates a majority alike in that of the older deputies and in that of the younger deputies (April 1797), and that majority elected Barthélemy, a well-known moderate, as the fifth member of the Directory. Carnot, the ablest administrator, but not the strongest man, soon joined Barthélemy in opposing their Jacobinical colleagues—Barras, Rewbell and Larevellière-Lépeaux. Time was on the side of the moderates; they succeeded in placing General Pichegru, already known for his tendencies towards constitutional monarchy, in the presidential chair of the Council of Five Hundred; and they proceeded to agitate, chiefly through the medium of a powerful club founded at Clichy, for the repeal of the revolutionary and persecuting laws. The three Jacobinical Directors thereupon intrigued to bring to Paris General Lazarre Hoche and his army destined for the invasion of Ireland for the purpose of coercing their opponents; but these, perceiving the danger, ordered Hoche to Paris, rebuked him for bringing his army nearer to the capital than was allowed by law, and dismissed him in disgrace.

The failure of Hoche led the three Directors to fix their hopes on Bonaparte. The commander of the ever-victorious army of Italy had recently been attacked by one of the moderates in the councils for proposing to hand over Venice to Austria. This cession was based on political motives, which Bonaparte judged to be of overwhelming force; and he now decided to support the Directors and overthrow the moderates. Prefacing his action by a violent tirade against the royalist conspirators of Clichy, he sent to Paris General Augereau, well known for his brusque behaviour and demagogic Jacobinism. This officer rushed to Paris, breathing out threats of slaughter against all royalists, and entered into close relations with Barras. In order to discount the chances of failure, Bonaparte warned the three Directors that Augereau was a turbulent politician, not to be trusted overmuch. Events, indeed, might readily have gone in favour of the moderates had Carnot acted with decision; but he relapsed into strange inactivity, while Barras and his military tool prepared to coerce the majority. Before dawn of September the 4th (18 Fructidor) Augereau with 2000 soldiers marched against the Tuileries, where the councils were sitting, dispersed their military guards, arrested several deputies and seized Barthélemy in his bed. Carnot, on receiving timely warning, fled from the Luxemburg palace and made his way to Switzerland. The remembrance of the fatal day of Vendémiaire 1795 perhaps helped to paralyse the majority. In any case exile, and death in the prisons of Cayenne, now awaited the timid champions of law and order; while parliamentary rule sustained a shock from which it never recovered. The Councils allowed the elections to be annulled in forty-nine departments of France, and re-enacted some of the laws of the period of the Terror, notably those against non-juring priests and returned *émigrés*. The election of Merlin of Douay and François of Neufchâtel as Directors, in place of Carnot and Barthélemy, gave to that body a compactness which enabled it to carry matters with a high hand, until the hatred felt by Frenchmen for this soulless revival of a moribund Jacobinism gradually endowed the Chambers with life and strength sufficient to provoke a renewal of strife with the Directory. These violent oscillations not only weakened the fabric of the Republic, but brought about a situation in which Bonaparte easily paralysed both the executive and the legislative powers so ill co-ordinated by the constitution of the year 1795.

In the sphere of European diplomacy, no less than in that of French politics, the results of the *coup d'état* of Fructidor were momentous. The Fructidorian Directors contemptuously rejected the overtures for peace which Pitt had recently made through the medium of Lord Malmesbury at Lille; and they further illustrated their desire for war and plunder by initiating a forward policy in central Italy and Switzerland which opened up a new cycle of war. The *coup d'état* was favourable to Bonaparte; it ensured his hold over the Directors and enabled him to impose his own terms of peace on Austria; above all it left him free for the prosecution of his designs in a field of action which now held the first place in his thoughts—the Orient. Having rivalled the exploits of Caesar, he now longed to follow in the steps of Alexander the Great.

At the time of his first view of the Adriatic (February 1797) he noted the importance of the port of Ancona for intercourse with the Sultan's dominions; and at that city fortune placed in his hands Russian despatches relative to the designs of the Tsar Paul on Malta. The incident reawakened the interest which had early been aroused in the young Corsican by converse with the *savant* Volney, author of *Les Ruines, ou méditation sur les révolutions des empires*. The intercourse which he had with Monge, the physicist and ex-minister of marine, during the negotiations with Austria, served to emphasize the orientation of his thoughts. This explains the eagerness with which he now insisted on the acquisition of the Ionian Isles by France and the political extinction of their present possessor, Venice. That city had given him cause for complaint, of which he made the most unscrupulous use. Thanks to the blind complaisance of its democrats and the timid subserviency of its once haughty oligarchs, he became master of its fleet and arsenal (16th of May 1797). Already, as may be seen by his letters to the Directory, he had laid his plans for the bartering away of the Queen of the Adriatic to Austria; and throughout the lengthy negotiations of the summer and early autumn of 1797 which he conducted with little interference from Paris, he adhered to his plan of gaining the fleet and the Ionian Isles; while the house of Habsburg was to acquire the city itself, together with all the mainland territories of the Republic as far west as the River Adige. In vain did the Austrian envoy, Cobenzl, resist the cession of the Ionian Isles to France; in vain did the Directors intervene in the middle of September with an express order that Venice must not be ceded to Austria, but must, along with Friuli, be included in the Cisalpine Republic. To the subtle tenacity of Cobenzl he opposed a masterful violence: he checkmated the Directors, when they sought to thwart him in this and in other directions, by sending in once more his resignation with a letter in which he accused them of "horrible ingratitude." He was successful at all points. The Directors feared a rupture with the man to whom they owed their existence; and the house of Austria was fain to make peace with the general rather than expose itself to harder terms at the hands of the Directory.

The treaty of Campo Formio, signed on the 17th of October 1797, was therefore pre-eminently the work of Bonaparte. Already at Cherasco and Leoben he had dictated the preliminaries of peace to the courts of Turin and Vienna quite independently of the French Directory. At Campo Formio he showed himself the first diplomatist of the age, and the arbiter of the destinies of Europe. The terms were on the whole unexpectedly favourable to Austria. In Italy she was to acquire the Venetian lands already named, along with Dalmatia and Venetian Istria. The rest of the Venetian mainland (the districts between the rivers Adige and Ticino) went to the newly constituted Cisalpine republic, France gaining the Ionian Isles and the Venetian fleet. The Emperor Francis renounced all claims to his former Netherland provinces, which had been occupied by the French since the summer of 1794; he further ceded the Breisgau to the dispossessed duke of Modena, agreed to summon a congress at Rastatt for the settlement of German affairs, and recognized the independence of the Cisalpine republic. In secret articles the emperor bound himself to use his influence at the congress of Rastatt in order to procure the cession to France of the Germanic lands west of the Rhine, while France promised to help him to acquire the archbishopric of Salzburg and a strip of land on the eastern frontier of Bavaria.

After acting for a brief space as one of the French envoys to the congress of Rastatt, Napoleon returned to Paris early in December and received the homage of the Directors and the acclaim of the populace. The former sought to busy him by appointing him commander-in-chief of the Army of England, the island power being now the only one which contested French supremacy in Europe. In February 1798 he inspected the preparations for the invasion of England then proceeding at the northern ports. He found that they were wholly inadequate, and summed up his views in a remarkable letter to the Directory (23rd of February), wherein he pointed out two possible alternatives to an invasion of England, namely, a conquest of the coast of the north-west of Germany, for the cutting off of British commerce with central Europe, or the undertaking of an expedition to the Orient which would be equally ruinous to British trade. The inference was inevitable that, as German affairs were about to be profitably exploited by France in the bargains then beginning at Rastatt, she must throw her chief energies into the Egyptian expedition.

One of the needful preliminaries of this enterprise had already received his attention. In November 1797 he sent to Malta Poussielgue, secretary of the French legation at Genoa, on business which was ostensibly commercial but (as he informed the Directory) "in reality to put the last touch to the design that we have on that island." The intrigues of the French envoy in corrupting the knights of the order of St John were completely successful. It remained, however, to find the funds needful for the equipment of a great expedition. Here the difficulties were great. The Directory, after the *coup d'état* of Fructidor, had acknowledged a state of bankruptcy by writing off two-thirds of the national debt in a form which soon proved to be a thin disguise for repudiation. The return of a large part of the armed forces from Italy and Germany, where they had lived on the liberated inhabitants, also threw new burdens on the Republic; and it was clear that French money alone would not suffice to fit out an armada. Again, however, the financial situation was improved by conquest. The occupation of Rome in February 1798 enabled Berthier to send a considerable sum to Paris and to style himself "treasurer to the chest of the Army of England." The invasion of Switzerland, which Bonaparte had of late persistently pressed on the Directory, proved to be an equally lucrative device, the funds in several of the cantonal treasuries being transferred straightway to Paris or Toulon. The conquest of north and central Italy also placed great naval resources at the disposal of France, Venice alone providing nine sail of the line and twelve frigates (see Bonaparte's letter of the 15th of November 1797), Genoa, Spezzia, Leghorn, Civita Vecchia and Ancona also supplied their quota in warships, transports, stores and sailors, with the result that the armada was ready for sea by the middle of May 1798. The secrecy maintained as to its destination was equally remarkable. The British government inclined to the belief that it was destined either for Ireland or for Naples. As the British fleet had abandoned the Mediterranean since November 1796 and had recently been disorganized by two serious mutinies, Bonaparte's plan of conquering Egypt was by no means so rash as has sometimes been represented.

The ostensible aims of the expedition, as drawn up by him, and countersigned by the Directory on the 12th of April, were the seizure of Egypt, the driving of the British from all their possessions in the East and the cutting of the Suez canal. But apart from these public aims there were private motives which weighed with Bonaparte. His relations to the Directors were most strained. They feared his ability and ambition; while he credited them with the design of poisoning him. Shortly before his starting, an open rupture was scarcely averted; and he and his brothers allowed the idea to get abroad that he was being virtually banished from France. It is certain, however, that his whole heart was in the expedition, which appealed to his love of romance and of the gigantic. His words to Joseph Bonaparte shortly before sailing are significant: "Our dreams of a republic were youthful illusions. Since the 9th of Thermidor, the republican instinct has grown weaker every day. To-day all eyes are on me: to-morrow they may be on another. . . . I depart for the Orient with all the means of success at my disposal. If my country needs me, if there are additions to the number of those who share the opinion of Talleyrand, Sieyès and Roederer, that war will break out again and that it will be unsuccessful for France, I will return, more sure of the feeling of the nation." He added, however, that if France waged a successful war, he would remain in the East, and do more damage to England there than by mere demonstrations in the English Channel.

The Toulon fleet set sail on the 19th of May; and when the other contingents from the ports of France and Italy joined the flag, the armada comprised thirteen sail of the line, fourteen frigates, many smaller warships and some three hundred transports. An interesting feature of the expedition was the presence on board of several *savants* who were charged to examine the antiquities and develop the resources of Egypt. The chief had lately become a member of the Institute, and did his utmost to inflame in France that love of art and science which he had helped to kindle by enriching the museums of Paris with the treasures of Italy. By good fortune the armada evaded Nelson and arrived safely off Malta. Thanks to French intrigues, the Knights of Malta offered the tamest defence of their capital. During the week which he spent there, Bonaparte displayed marvellous energy in endowing the city with modern institutions; he even arranged the course of studies to be followed in the university. Setting sail for Egypt on the 19th of June, he again had the good fortune to elude Nelson and arrived off Alexandria on the 2nd of July. For an account of the Egyptian and Syrian campaigns see FRENCH REVOLUTIONARY WARS. But here we may point out the influence of the expedition on Egypt, on European politics and on the fortunes of Bonaparte. The chief direct result in the life of the Egyptian people was the virtual destruction of the governing caste of the Mamelukes, the Turks finding it easy to rid themselves of their surviving chiefs and to re-establish the authority of the Sultan. As for the benefits which Bonaparte and his *savants* helped to confer on Egypt, they soon vanished. The great canal was not begun; irrigation works were started but were soon given up. The letters of Kléber and Menou (the successors of Bonaparte) show that the expenditure on public works had been so reckless that the colony was virtually bankrupt at the time of Bonaparte's departure; and William Hamilton, who travelled through Egypt in 1802, found few traces, other than military, of the French occupation. The indirect results, however, were incalculably great. Though for the present the Sultan regained his hold upon Egypt, yet in reality Bonaparte set in motion forces which could not be stayed until the ascendancy of one or other of the western maritime powers in that land was definitely decided.

The effects of the expedition in the sphere of world-politics were equally remarkable and more immediate. The British government, alarmed by Bonaparte's attempt to intrigue with Tippoo Sahib, put forth all its strength in India and destroyed the power of that ambitious ruler. Nelson's capture of Malta (5th of September 1800) also secured for the time a sure base for British fleets in the Mediterranean. A Russo-Turkish fleet wrested Corfu from the French; and the Neapolitan Bourbons, emboldened by the news of the battle of the Nile, began hostilities with France which preluded the war of the Second Coalition. In the domain of science the results of the expedition were of unique interest. The discovery of the Rosetta Stone furnished the key to Egyptian hieroglyphics; and archaeology, no less than the more practical sciences, acknowledges its debt of gratitude to the man who first brought the valley of the Nile into close touch with the thought of the West.

Finally, it should be noted that, amid the failure of the national aims which the Directory and Bonaparte set forth, his own desires received a startlingly complete fulfilment. The war of the Second Coalition having brought about the expulsion of the French from Italy, the Directors were exposed to a storm of indignation in France, not unmixed with contempt; and this state of public opinion enabled the young conqueror within a month of his landing at Fréjus (9th of October 1799) easily to prevail over the Directory and the elective councils of the nation. In the spring of 1798 he had judged the pear to be not ripe in Brumaire 1799 it came off almost at a touch.

In order to understand the sharp swing of the political pendulum back from republicanism to autocracy which took place at Brumaire, it is needful to remember that the virtual failure of the Egyptian Expedition was then unknown. The news of Bonaparte's signal victory over the Turkish army at Aboukir aroused general rejoicings undimmed by any save the vaguest rumours of his reverse at Acre. In the popular imagination he seemed to be the only possible guarantor of victory abroad and order at home. This was unjust to the many men who were working, not without success, to raise the Republic out of its many difficulties. Masséna's triumph at Zurich (September 25th-26th, 1799) paralysed the Second Coalition; and, though the Austrians continued to make progress along the Italian riviera, the French Republic was in little danger on that side so long as it held Switzerland.

The internal condition of France was also not so desperate as has often been represented. True, the Directory seemed on the point of collapse; it had been overcome by the popularly elected Chambers in the insignificant *coup d'état* of 30 Prairial (18th of June) 1799; when Larevellière-Lépeaux and Merlin were compelled to resign. The retirement of Rewbell a short time previously also rid France of a turbulent and corrupt administrator. His place was now filled by Sieyès. This ex-priest, this disillusioned Jacobin and skilful spinner of cobweb constitutions, enjoyed for a time the chief reputation in France. His oracular reserve, personal honesty and consistency of aim had gained him the suffrages of all who hoped to save France from the harpies of the Directory and the violent rhetoricians of the now reconstituted Jacobin Club. He was known to disapprove of the Directory both as an institution in the making of which he had had no hand, and of its *personnel*, with one exception. This was natural. The new Directors, Gohier and Moulin, were honest but incapable and narrow-minded. As for Barras, his venality and vices outweighed even his capacity for successful intrigue. The fifth Director, Ducos, an ex-Girondin, was sure to swim with the stream. Clearly, then, the Directory was doomed.

It was far otherwise with the Councils. A majority of the Ancients was ready to support Sieyès and make drastic changes in the constitution; but in the Council of Five Hundred the prevalent feeling was democratic or even Jacobinical. The aim of Sieyès was to perpetuate the republic, but in a bureaucratic or autocratic form. With this aim in view he sought to find a man possessing ability in war and probity in civil affairs, who would act as figure-head to his long projected constitution. For a time affairs moved as he wished. The Jacobin Club was closed, thanks to the ability of Fouché, the new minister of Police; but the hopes of Sieyès were dashed by the death of General Joubert, commander of the Army of Italy, at the disastrous battle of Novi (15th of August). The dearth of ability among the generals left in France (Kléber and Desaix were in Egypt) was now painfully apparent. Moreau was notoriously lethargic in civil affairs. Bernadotte, Jourdan and Augereau had compromised themselves by close association with the Jacobins. The soldiery had never forgiven Masséna his peculations after the capture of Rome. One name, and one alone, leaped to men's thoughts, that of Bonaparte.

He arrived from Egypt at the psychological moment,and his journey from Fréjus to Paris resembled a triumphant procession. Nevertheless he acted with the utmost caution. A fortnight passed before he decided to support Sieyès in effecting a change in the constitution; and by then he had captivated all men except Bernadotte and a few *intransigeant* Jacobins. Talleyrand, Roederer, Cambacérès and Réal were among his special confidants, his brothers Joseph and Lucien also giving useful advice. Of the generals, Murat, Berthier, Lannes and Leclerc were those who prepared the way for the *coup d'état*. Fouché, pulling the wires through the police, was an invaluable helper. The conduct of Barras was known to depend on material considerations.

All being ready, the Ancients on the 18 Brumaire (9th of November) decreed the transference of the sessions of both Councils to St Cloud, on the plea of a Jacobin plot which threatened the peace of Paris. They also placed the troops in Paris and its neighbourhood under the command of Bonaparte. Thereupon Sieyès and Ducos resigned office. Barras, after a calculating delay, followed suit. Gohier and Moulin, on refusing to retire, were placed under a military guard; and General Moreau showed his political incapacity by discharging this duty, for the benefit of Bonaparte.

Nevertheless the proceedings of St Cloud on the day following bade fair to upset the best-laid schemes of Bonaparte and his coadjutors. The Five Hundred, meeting in the Orangerie of the palace, had by this time seen through the plot; and, on the entrance of the general with four grenadiers, several deputies rushed at him, shook him violently, while others vehemently demanded a decree of outlawry against the new Cromwell. He himself lost his nerve, stammered, nearly fainted, and was dragged out by the soldiers in a state of mental and physical collapse. The situation was saved solely by the skill of his brother Lucien, then president of the Council. He refused to put the vote of outlawry, uttered a few passionate words, cast off his official robes, declared the session at an end, and made his way out under protection of a squad of grenadiers. The *coup d'état* seemed to have failed. In reality matters now rested with the troops outside. Stung to action by some words of Sieyès, Bonaparte appealed to the troops of the line in terms which provoked a ready response. Imprecations uttered by Lucien against the brigands and traitors in the pay of England decided the grenadiers of the Council to march against the deputies whom it was their special duty to protect. Drums beat the charge, Murat led the way through the corridors of the palace to the Orangerie, and levelled bayonets ended the existence of the Council. Within the space of ten and a half years from the summoning of the States-General at Versailles (May 1789), parliamentary government fell beneath the sword.

Lucien now consolidated the work of the soldiery by procuring from the Ancients a decree which named Bonaparte, Sieyès and Ducos as provisional consuls, while a legislative commission was appointed to report on necessary changes in the constitution. Lucien also gathered together a small group of the younger deputies to throw the cloak of legality over the events of the day. The Rump proceeded to expel sixty-one Jacobins from the Council of Five Hundred, adjourned its sessions until the 19th of February 1800, and appointed a commission of twenty-five members with power to act in the meantime. Clearly the success of the *coup d'état* of Brumaire was due in the last resort to Lucien Bonaparte.

The Parisians received the news of the event with joy, believing that freedom was now at last to be established on a firm basis by the man whose name was the synonym for victory in the field and disinterestedness in civil affairs. "People are full of mirth" (wrote Madame Reinhard, wife of the minister for Foreign Affairs, four days later) "believing that they have regained liberty." She added that all the parties except the Jacobins were full of confidence; and that the nobles now cherished hopes of a reaction, seeing that the reduction of the number of rulers from five to three pointed towards monarchy. Her comment on this delusion is instructive. Three consuls had been appointed, she remarked, precisely in order that power might not be vested in the hands of one man.

Only by degrees did the events of the 19th of Brumaire stand out in their real significance; for the new consuls, installed at the Luxemburg palace, and somewhat later at the Tuileries, took care that the new constitution, which they along with the two commissions were now secretly drawing up, should not be promulgated until Paris and France had settled down to the ordinary life of pleasure and toil. In the meantime they won credit by popular measures such as the abolition of forced loans and of the objectionable habit of seizing hostages from the districts of the west where the royalist ferment was still strongly working.

The feelings of suprise at the clemency and moderation with which the victors used their powers predisposed men everywhere to accept their constitution. Sieyès now sketched its outlines in vaguely republican forms; thereupon Bonaparte freely altered them and gave them strongly personal touches. The theorist laid before the joint commission his *projet*, the result of five years of cogitation, only to have it ridiculed by the great soldier. In one respect alone did it suit him. While restoring the principle of universal suffrage, which had been partially abrogated in 1795, Sieyès rendered this system of election practically a nullity. The voters were to choose one-tenth of their number (notabilities of the commune); one-tenth of these would form the notabilities of the department; while by a similar decimal sifting, the notabilities of the nation were selected. The final and all-important act of selection from among these men was, however, to be made by a personage, styled the *proclamateur-électeur*, who chose all the important functionaries, and, conjointly with the notabilities of the nation, chose the members for the Council of State (wielding the chief executive powers), the Tribunate and the Senate. The latter body would, however, have the power to "absorb" the head of the state if he showed signs of ambition. Against this power of absorption Bonaparte declaimed vehemently, asserting also that the *proclamateur-électeur* would be a mere *cochon à l'engrais*. In vain did Sieyès modify his scheme so as to provide for two consuls, one holding the chief executive powers for war, the other for peace. This division of powers was equally distasteful to Bonaparte: he formed a kind of cabal within the joint commission, and there intimidated the theorist, with the result already foreseen by the latter. Sieyès, conscious that his political mechanism would merely winnow the air, until the profoundly able and forceful man at his side adapted it to the work of government, relapsed into silence; and his resignation of the office of consul, together with that of Ducos, was announced as imminent. Bonaparte further brushed aside a frankly democratic constitution proposed by Daunou, and intimidated his opponents in the joint commission by a threat that he would himself draft a constitution and propose it to the people in a mass vote.

This was what really happened. They looked on helplessly while he refashioned the scheme of Sieyès. Keeping the electoral machinery almost unchanged (save that the lists of notables were to be permanent) Bonaparte entirely altered the upper parts of the constitutional pyramid reared by the philosopher. Improving upon the procedure of the Convention in Vendémiaire 1795, Bonaparte procured the nomination of three consuls *in an article of the new constitution*; they were Bonaparte (First Consul), Cambacérès and Lebrun. The latter two, uniting with the two retiring consuls, Sieyès and Ducos, were to form the nucleus of the senate and choose the majority among its full complement of sixty members, the minority being thereafter chosen by co-optation. To the senate, thus chosen "from above," was allotted the important task of supervising the constitution, and of selecting, from among the notabilities of the nation, the members of the *Corps Législatif* and the Tribunate. These two bodies nominally formed the legislature, the Tribunate merely discussing the bills sent to it by an important body, the Council of State; while the *Corps Législatif*, sitting in silence, heard them defended by councillors of state and criticized by members of the Tribunate; thereupon it passed or rejected such proposals by secret voting. Thus, the initiative in law-making lay with the Council of State; but, as its members were all chosen by the First Consul, it is clear that that important duty was vested really in him. The executive powers were placed almost entirely in his hands, as will be seen by the terms of article 41 which defined his functions: "The First Consul promulgates the laws; he appoints and dismisses at will the members of the Council of State, the ministers, the ambassadors and other leading agents serving abroad, the officers of the army and navy, the members of local administrative bodies and the commissioners of government attached to the tribunals. He names all the judges for criminal and civil cases, other than the *juges de paix* (magistrates) and the judges of the *Cour de cassation*, without having the power to discharge them."—As for the second and third consuls, their functions were almost entirely consultative and formal, their opposition being recorded, but having no further significance against the fiat of the First Consul. Bonaparte's powers were subsequently extended in the years 1802, 1804 and 1807; but it is clear that autocracy was practically established by his own action in the secret commission of 1799. The new constitution was promulgated on the 15th of December 1799 and in a plébiscite held during January 1800 it received the support of 3,011,007 voters, only 1562 persons voting against it. The fact that the three new consuls had entered upon office and set the constitutional machinery in motion fully six weeks before the completion of the plébiscite, detracts somewhat from the impressiveness of the *vox populi* on that occasion.

Bonaparte selected his ministers with much skill. They were Talleyrand, Foreign Affairs; Berthier, War; Abrial, Justice; Lucien Bonaparte, Interior; Gaudin, Finance; Forfait, Navy and Colonies. Maret became secretary of state to the consuls. Bonaparte's selection gave general satisfaction, as also did the *personnel* of the Council of State (divided into five sections for the chief spheres of government) and of the other organs of state. Many of the furious Terrorists now became quiet and active councillors or administrators, the First Consul adopting the plan of multiplying "places," of overwhelming all officials with work, and of busying the watch-dogs of the Jacobinical party by "throwing them bones to gnaw."

In our survey of the career of Napoleon, we have now reached the time of the Consulate (November 1799–May 1804), which marks the zenith of his mental powers and creative activity. Externally, and in a personal sense, the period falls into two parts. The former of these extends to August 1802, when the powers of the First Consul, which had been decreed for ten years, were prolonged to the duration of his life. But in another and wider sense the Consulate has a well-defined unity; it is the time when France gained most of her institutions and the essentials of her machinery of government.

The reader is referred to the article FRANCE (*Law and Institutions*) for the information respecting the various codes dating from this period, and to the article CONCORDAT for the famous measure whereby Napoleon re-established official relations between the state and the church in France. More pressing even than that question was the regulation of local government. Bonaparte's action in this matter was so characteristic as to deserve close attention. Undoubtedly the question was one of great importance; for local affairs had fallen into chaos. The aim of the constituent assembly in its departmental system (1789–1790) had been to vest local affairs ultimately in councils elected by universal suffrage, alike in the department and in the three smaller areas within it. These councils and the executive officers dependent on them soon proved to be unable to manage even local affairs efficiently, while they were very lax in the collection of the national taxes unwisely entrusted to them. Lack of central control over the virtually independent communes (over forty thousand in number) led to a sharp rebound under the Convention, when all matters of importance were disposed of by commissioners appointed by that body. The relations between national and local authorities fluctuated considerably during the Directory; and it is noteworthy that the constitution of December 1799 placed local administration merely under the control of ministers at Paris. Everything, therefore, portended a change in this sphere, but few persons expected a change so drastic as that which Bonaparte now brought about in the measure of 28 Pluviôse, year VIII. (16th of February 1800). Certainly no measure marked more clearly the abandonment of democratic ideals. The powers formerly vested in elective bodies were now to be wielded by prefects and sub-prefects, nominated by the First Consul and responsible to him. The elective councils for the department and for the *arrondissement* (a new area which replaced the "districts" of the year 1795) continued to exist, but they sat only for a fortnight in the year and had to deal mainly with the assessment of taxes for their respective areas. They might be consulted by the prefect or sub-prefect; but they had no hold over him. The municipal councils had slightly larger powers, relating to loans, octrois, &c. But the chief municipal officer, the mayor, was chosen by the prefect. The police of all towns containing more than 100,000 inhabitants was controlled by the central government.

It is significant that Bonaparte proposed this bill (drafted in the Council of State) to the Tribunate and the *Corps Législatif* on the very day on which it was first certainly known that France had accepted the new constitution. The opposition in the Tribunate was sharp, but was paralysed by the knowledge of the fact just named and by the lack of a free press. The bill passed there by 71 votes to 25; and in the *Corps Législatif* by 217 to 68. The acquiescence of these bodies in the transition to despotic methods predisposed the public to a similar attitude of mind. At first the sharpness of the change was not fully apparent owing to the tactful choice of prefects made by the First Consul; but before long their very extensive powers were seen to form an important part of the new machinery of autocracy. In this connexion we may note that the disturbances, mainly royalist but sometimes Jacobinical, in several districts of France enabled Bonaparte to propose the establishment in the troubled districts of special tribunals for the trial of all offences tending to disturb the general peace. Here again the Tribunate offered a vehement opposition to the measure, and in spite of official pressure passed the bill only by a majority of eight. Becoming law on 18 Pluviôse, year IX. (6th of February 1801), it enabled the government to supersede the ordinary judicial machinery for political offences in no fewer than thirty-two departments.

Bonaparte signalized his tenure of power by no very important developments in the sphere of elementary education. This was left to the local authorities, and led to little result. The more advanced schools, known as *écoles centrales*, were reconstituted either as *écoles secondaires* or as *lycées* by the law of the 30th of April 1802. The former of these were designed for the completion of the training of the most promising pupils in the communal elementary schools, and were left to local control or even to management by private individuals. Far more important, however, were the *lycées*, where an excellent education was imparted, semi-military in form and under the control of government. It gained valuable powers of patronage by founding 6400 exhibitions (*bourses*) in connexion with the *lycées*; 2400 of which were reserved for the sons of soldiers and government officials. The same centralizing tendency is strongly marked in the organization of the university of France, the general principle of which was set forth in May 1806, while the details were arranged by that of March the 17th, 1808. It was designed to control all the educational institutions of France, both public and private; and it did so with two exceptions, the Museum and the *Collège de France*. The discipline was strict. Fidelity to the emperor and to the teaching of the Roman Catholic doctrine formed part of the aims of this comprehensive corporation. Its officers were required to obey "the statutes of the teaching body, which have for their object uniformity of instruction, and which tend to form for the state citizens attached to their religion, their prince, their country and their family." These words sufficiently illustrate the essentially political character of the institution. Its organization was completed by the decree of the 15th of November 1811. Napoleon's ideas on the education of girls may be judged by this extract from his speech at the Council of State on the 1st of March 1806: "I do not think that we need trouble ourselves with any plan of instruction for young females: they cannot be better brought up than by their mothers. Public education is not suitable for them, because they are never called upon to act in public. Manners are all in all to them, and marriage is all they look to."

Returning to the period of the Consulate, we notice the founding of an institution which also had its complete development during the Empire, namely, the Legion of Honour (19th of May 1802). Napoleon intended it as a protest against the spirit of equality which pervaded revolutionary thought. In one respect the new institution marked an enormous advance on titles of nobility, which had been granted nearly always for warlike exploits, or merely as a mark of the favour of the sovereign. The First Consul, on the other hand, sought to recognize and reward merit in all walks of life. Nevertheless his proposal met with strong opposition in the *Corps Législatif* and Tribunate, where members saw that it portended a revival of the older distinction. This was so: abolished in 1790 by the constituent assembly, titles of nobility were virtually restored by Napoleon in 1806 and legally in 1808. Side by side with them there continued to exist the Legion of Honour. It was organized in fifteen cohorts, each comprising seven grand officers, twenty commanders, thirty officers and 350 legionaries. A stipend, ranging from 5000 francs a year to 250 francs, was attached to each grade of the institution. The benefits attaching to membership and the number of the members were increased during the Empire, when the average number somewhat exceeded thirty thousand. Napoleon's aim of bidding for the support of all able men is disagreeably prominent in all details of this institution, which may be looked upon as the tangible outcome of the conviction which he thus frankly expressed: "In ambition is to be found the chief motive-force of humanity; and a man puts forth his best powers in proportion to his hopes of advancement."

The success of Bonaparte in reorganizing France may be ascribed to his determined practicality and to his perception of the needs of the average man. Since the death of Mirabeau no one had appeared who could strike the happy mean and enforce his will on the extremes on either side. Bonaparte did so with a forcefulness rarely possessed by that usually mediocre creature, the moderate man.

It is time now to notice the chief events which ensured the ascendancy of Bonaparte. Military, diplomatic and police affairs were skilfully made to conduce to that result. In the first of these spheres the victory of Marengo (14th of June 1800) was of special importance, as it consolidated the reputation of Bonaparte at a time when republican opposition was gathering strength. As Lucien Bonaparte remarked, if Marengo had been lost—and it was saved only by Desaix and Kellermann—the Bonaparte family would have been proscribed. Negotiations for peace now followed; but they led to nothing, until Moreau's triumph at Hohenlinden (December 2nd, 1800) brought the court of Vienna to a state of despair. By the treaty with Austria, signed by Joseph Bonaparte at Lunéville on the 9th of February 1801, France regained all that she had won at Campo Formio, much of which had been lost for a time in the war of the Second Coalition. True, she now agreed to recognise the independence of the Cisalpine, Ligurian, Helvetic and Batavian (Dutch) republics; but the masterful acquisitiveness of the First Consul and the weak conduct of Austrian and British affairs at that time soon made that clause of the treaty a dead letter. Bonaparte meanwhile, by dexterous behaviour to Paul I. of Russia, had won the friendship of that potentate, whose resentment against his former allies, Austria and England, facilitated a re-grouping of the Powers. The new Franco-Russian *entente* helped on the formation of the Armed Neutrality League and led to the concoction of schemes for the driving of the British from India. But these undertakings were thwarted in March–April 1801 by the murder of the tsar Paul and by Nelson's victory at Copenhagen. The advent of the more peaceful and Anglophile tsar, Alexander I. (*q.v.*), brought about the dissolution of the League, and the abandonment of the oriental schemes which Bonaparte had so closely at heart. Another disappointment befel him in the same quarter, the surrender of the French forces in Egypt to the British expedition commanded first by General Abercromby and afterwards by General John Hely-Hutchinson (30th of August 1801).

These events disposed both Bonaparte and the British cabinet towards peace. He was all powerful on land, they on the sea; and for the present each was powerless to harm the other. Bonaparte in particular discerned the advantages which peace would bring in the consolidation of his position. The beginning of negotiations had been somewhat facilitated by the resignation of Pitt (4th of February 1801) and the advent to office of Henry Addington. Bonaparte, perceiving the weakness of Addington, both as a man and as a minister, pressed him hard; and both the Preliminaries of Peace, concluded at London on the 1st of October 1801, and the terms of the treaty of Amiens (27th of March 1802) were such as to spread through the United Kingdom a feeling of annoyance. In everything which related to the continent of Europe and to the resumption of trade relations between Great Britain and France, Bonaparte had his way; and he abated his demands only in a few questions relating to India and Newfoundland.

The terms of the treaty of Amiens may be thus summarized: Great Britain restored to France the colonial possessions (almost the whole of the French colonial empire) conquered in the late war. Of their many maritime conquests the British retained only the Spanish island of Trinidad and the Dutch settlements in Ceylon. Their other conquests at the expense of these allies of France were restored to them, including the Cape of Good Hope to the Dutch. France recognized the integrity of the Turkish Empire and promised an indemnity to the House of Orange exiled from the Batavian (Dutch) Republic since 1794. She further agreed to evacuate the papal states, Taranto and other towns in the Mediterranean coasts which she had occupied. The independence of the Ionian Isles (now reconstituted as the Republic of the Seven Islands) was guaranteed. As to Malta, the United Kingdom was to restore it to the order of St John (its possessors previous to 1798) when the Great Powers had guaranteed its independence. It was to receive a Neapolitan garrison for a year, and, if necessary, for a longer time.

No event in the life of Bonaparte was more auspicious than the conclusion of this highly advantageous bargain. By retaining nearly all the continental conquests of France, and by recovering every one of those which the British had made at her expense beyond the seas, he achieved a feat which was far beyond the powers even of Louis XIV. The gratitude of the French for this triumph found expression in a proposal, emanating from the Tribunate, that the First Consul should receive a pledge of the gratitude of the nation. When referred to the senate, the matter underwent secret manipulation, largely through the influence of Cambacérès; but the republican instinct even in the senate was sufficiently strong to thwart the intrigues of the second consul; and that body on the 8th of May merely re-elected Bonaparte for a second term of ten years after the expiration of the first decennial term for which he was chosen. This fell far short of his desires, and he now dexterously referred the whole question to the nation at large. The Council of State, acting on a suggestion made by Cambacérès, now intervened with telling effect. It altered the wording of the senatorial proposal in such a way that the nation was asked to vote on the question: "Is Napoleon Bonaparte to be made Consul for Life?" France responded by an overwhelming affirmative, 3,568,885 votes being cast for the proposal and only 8374 against it.

Napoleon (who now used his Christian name instead of the surname Bonaparte) thereupon sent proposals for various changes in the constitution, which were at once registered by the obsequious Council of State and the Senate on the 4th of August (16 Thermidor) 1802. Besides holding his powers for life, he now gained the right of nominating his successor. He alone could ratify treaties of peace and alliance, and on his nomination fifty-four senators were added to the senate, which thereafter numbered one hundred and twenty members appointed by him alone. This body received the right of deciding by *senatus consulta* all questions not provided for by the constitution; the *Corps Législatif* and Tribunate might also thenceforth be dissolved at its bidding. In short, the First Consul now became the irresponsible ruler of France, governing the country through the ministry, the Council of State and the Senate. As for the chambers, based avowedly on universal suffrage, their existence thenceforth was ornamental or sepulchral. The constitutional changes of August 1802, initiated solely by Bonaparte, made France an absolute monarchy. The name of Empire was not adopted until nearly two years later; but the change then brought about was scarcely more than titular.

In order to understand the utter inability of the old republican party to withstand these changes, it is needful to retrace our steps and consider the skilful use made by Bonaparte of plots and disturbances as they occurred. As was natural, when he sought to steer a middle course between the Scylla of royalism and the Charybdis of Jacobinism, disturbances were to be expected on both sides of the consular ship of state. The first of these was an unimportant affair, probably nursed by the *agents provocateurs* of Fouché's ubiquitous police. It purported to be an undertaking entered into by a few

Jacobins, among them Aréna, a Corsican, for the murder of Bonaparte at the opera. Aréna and his supposed accomplice were arrested (10th of October 1800); and that was virtually the beginning and the end of the plot. Far more serious was the danger to be apprehended from the royalists. Enraged by Bonaparte's contemptuous refusal to encourage the return of "Louis XVIII." to his own, the royalists began to compass the death of the man whom they had at first naïvely looked on as a potential General Monk to their Charles II. Their chief man of action was a sturdy Breton peasant, Georges Cadoudal, whose zeal and courage served to bring to a head plans long talked over by the confidants of the Comte d'Artois (the future Charles X. of France) in London. The outcome of it was the despatch of some five or six Chouan desperadoes to Paris, three of whom exploded an infernal machine close to Bonaparte's carriage in the narrow streets near the Tuileries (3rd Nivôse [24th of December] 1800). Bonaparte and Josephine escaped uninjured, but several bystanders were killed or wounded. Napoleon's vengeance at once took a strongly practical turn. Despite the evidence which Fouché and others brought forward to incriminate the royalists, the First Consul persisted in attributing the outrage to the Jacobins, had a list of suspects drawn up, and caused the Council of State to declare that a special precautionary measure was necessary. The measure proved to be the deportation of the leading Jacobins; and a cloak of legality was cast over this extraordinary proceeding by a special decree of the senate (avowedly the guardian of the constitution) that this act of the government was a "measure tending to preserve the constitution" (5th of January 1801). The body charged with the guarding of the constitution was thus brought by Bonaparte to justify its violation; and a way was thus opened for the legalizing of further irregularities. For the present the connivance of the senate at his *coup d'état* of Nivôse led to the deportation of one hundred and thirty Jacobins; some were interned in the islands of the Bay of Biscay, while fifty were sent to the tropical colonies of France, whence few of them ever returned. It is to be observed that, before the punishment was inflicted, evidence was forthcoming which brought home the outrage of Nivôse to the royalists; but this was all one to Bonaparte; his aim was to destroy the Jacobin party, and it never recovered from the blow. The party which had set up the Committee of Public Safety was now struck down by the very man who through the Directory inherited by direct lineal descent the dictatorial powers instituted in the spring of 1793 for the salvation of the republic. It remains to add that the suspects in the plot of October 1800 were now guillotined (31st of January 1801), and that two of the plotters closely connected with the affair of Nivôse were also executed (21st of April). The institution of the special tribunals (already referred to), which enabled Bonaparte to supersede local government in thirty-two of the departments, was another outcome of the bomb conspiracy.

Far more lenient was Bonaparte's conduct towards a knot of discontented officers who, in April–May 1802, framed a clumsy plot, known as the "Plot of the Placards," for arousing the soldiery against him. He disgraced or imprisoned the ringleaders, ordered Bernadotte (perhaps the fountain head of the whole affair) to take the waters at Plombières and drove from office Fouché, who had sought to screen the real offenders by impugning the royalists.

Bonaparte's action in the years 1800–1802 showed that he feared the old republican party far more than the royalists. In April 1802 he procured the passing of a *senatus consultum* granting increased facilities for the return of the *émigrés*; with few exceptions they were allowed to return, provided that it was before the 23rd of September 1802, and, after swearing to obey the new constitution, they entered into possession of their lands which had not been alienated; but barriers were raised against the recovery of their confiscated lands. Very many accepted these terms, rallied to the First Consul with more or less sincerity; and their return to France to strengthen the conservative elements in French society. The promulgation of the Concordat (18th of April 1802) and the institution of what was in all but name a state religion tended strongly in the same direction, the authority of the priests being generally used in support of the man to whom Châteaubriand applied the epithet "restorer of the altars." Nevertheless, despite Bonaparte's marvellous skill in rallying moderate men of all parties to his side, there remained an unconvinced and desperate minority, whose clumsy procedure enabled the great engineer to hoist them with their own petard and to raise himself to the imperial dignity. But before referring to this last proof of the Machiavellian skill of the great Corsican in dealing with plots, it is needful to notice the events which brought him into collision with the British nation.

The treaty of Amiens had contained germs which ensured its dissolution at no distant date; but even more serious was the conduct of Bonaparte after the conclusion of peace. He carried matters with so high a hand in the affairs of Holland, Switzerland and Italy as seriously to diminish the outlets for British trade in Europe. His action in the matters just named, as also in the complex affair of the secularizations of clerical domains in Germany (February 1803), belongs properly to the history of those countries; but we may here note that, even before the signature of the peace of Amiens (27th of March 1802), he had effected changes in the constitution of the Batavian (Dutch) republic, which placed power in the hands of the French party and enabled him to keep French troops in the chief Dutch fortresses, despite the recently signed treaty of Lunéville which guaranteed the independence of that republic. His treatment of the Italians was equally high-handed. In September 1801 he bestowed on the Cisalpine republic a constitution modelled on that of France. Next, he summoned the chief men of the Francophile party in that republic to Lyons in the early days of 1802, in order to arrange with them the appointment of the chiefs of the executive. It soon appeared that the real aim of the meeting was to make Bonaparte president. He let it be known that he strongly disapproved of their proposal to elect Count Melzi, the Italian statesman most suitable for the post; and a hint given by Talleyrand showed the reason for his disapproval. The deputies thereupon elected Bonaparte. As for the neighbouring land, Piedmont, it was already French in all but name. On the 21st of April 1801 he issued a decree which constituted Piedmont as a military district dependent on France; for various reasons he postponed the final act of incorporation to the 21st of September 1802. The Genoese republic a little earlier underwent at his hand changes which made its doge all-powerful in local affairs, but a mere puppet in the hands of Bonaparte. In central Italy the influence of the First Consul was paramount; for in 1801 he transformed the grand duchy of Tuscany into the kingdom of Etruria for the duke of Parma; and, seeing that that promotion added lustre to the fortunes of the duchess of Parma (a Spanish infanta), Spain consented lamely enough to the cession of Louisiana to France. The effect of these extraordinary changes, then, was the carrying out of Napoleonic satrapies in the north and centre of Italy in a way utterly inconsistent with the treaty of Lunéville; and the weakness with which the courts of London and Vienna looked on at these singular events confirmed Bonaparte in the belief that he could do what he would with neighbouring states. The policy of the French revolutionists had been to surround France with free and allied republics. The policy of the First Consul was to transform them into tributaries which copied with chameleonic fidelity the political fashions he himself set at Paris.

Of all these interventions the most justifiable and beneficent, perhaps, was that which related to the Swiss cantons. Whether his agents did, or did not, pour oil on the flames of civil strife, which he thereupon quenched by his Act of Mediation, 19th of February 1803, is a complex question. The settlement which he thereby imposed was in many ways excellent; but it was dearly purchased by the complete ascendancy of Bonaparte in all important affairs, and by the claim for the services of a considerable contingent of Swiss troops which he thereafter rigorously enforced.

The re-occupation of Switzerland by French troops in October 1802 wrought English opinion to a state of indignation against the autocrat who was making conquests more quickly in time of peace than he had done by his sword; and the irritation increased when, on the 29th of January 1803, he publicly stated: "It is recognized by Europe that Italy and Holland, as well as Switzerland, are at the disposal of France." Another act of his at that time made still more strongly for war. On the 30th of January he caused the official French paper, the *Moniteur*, to publish *in extenso* a confidential report sent by Colonel Sebastiani describing his so-called commercial mission to the Levant. In it there occurred the threatening phrase: "Six thousand French would at present be enough to conquer Egypt." An equally significant hint, that the Ionian Isles might easily be regained by France, further helped to open the eyes of the purblind Addington ministry to the resolve of Napoleon to make the Mediterranean a French lake. Ministers were also deeply concerned at the continued occupation of Holland by French troops, which made that country and, therefore, the Cape of Good Hope, absolutely dependent on France. They accordingly resolved not to give up Malta unless Lord Whitworth, the British ambassador at Paris, "received a satisfactory explanation" relative to the Sebastiani report. Napoleon's refusal to give this, and his complaint that Great Britain had neglected to comply with some of the provisions of the treaty of Amiens, brought Anglo-French relations to an acute phase. By great dexterity he succeeded in turning public attention almost solely to the fact that Britain had not evacuated Malta. This is probably the sense in which we may interpret his tirade against Lord Whitworth at the diplomatic circle on the 13th of March. While not using threats of personal violence, as was generally reported at the time, his language was threatening and offensive. Annoyed by Whitworth's imperturbable demeanour, he ended with these words: "You must respect treaties, then: woe to those who do not respect treaties. They shall answer for it to all Europe." The news of the strengthening of the British army and navy lately announced in the king's speech had perhaps annoyed him; but seeing that his outbursts of passion were nearly always the result of calculation—he once stated, pointing to his chin, that temper only mounted *that high* with him—his design, doubtless, was to set men everywhere talking about the perfidy of Albion. If so, he succeeded. His own violations of the treaties of Lunéville and Amiens were overlooked; and in particular men forgot that the weakening of the Knights of St John by the recent confiscation of their lands in France and Spain, and the protracted delay of Russia and Prussia to guarantee their tenure of power in Malta, furnished England with good reasons for keeping her hold on that island. On the 4th of April the Addington cabinet made proposals with a view to compensation. In return for the great accessions of power to France since the treaty of Amiens (Elba, it may be noted, was annexed in August 1802) Great Britain was to retain Malta for ten years and to acquire the small island of Lampedusa in perpetuity. French troops were also required to withdraw from Holland and Switzerland, and thus fulfil the terms of the treaty of Lunéville. Despite the urgent efforts of Joseph Bonaparte and Talleyrand to bend the First Consul, he refused to listen to these proposals. Finally, on the 7th of May, the British government sent a secret offer to withdraw from Malta as soon as the French evacuated Holland. To this also Napoleon demurred. The rupture, therefore, took place in the middle of May; and on a flimsy pretext the First Consul ordered the detention in France of all English persons.

The reasons for his annoyance are now well known. It is certain that he was preparing to renew the struggle for the mastery of the seas and of the Orient, which must break out if he held to his present resolve to found a great colonial empire. But he needed time in order to build a navy and to prepare for the execution of the schemes for the overthrow of the British power in India, which he had lately outlined to General Decaen, the new governor of the French possessions in that land. The sailing of Decaen's squadron early in March 1803 had alarmed the British ministers and doubtless confirmed their resolve to have the question of peace or war settled speedily. Whitworth also warned them on the 20th of April that "the chief motives for delay are that they (the French) are totally unprepared for a naval war." This was quite correct. Napoleon wished to postpone the rupture for fully eighteen months, as is shown by his secret instructions to Decaen. The British government did not know the whole truth; but, knowing the character of Napoleon, it saw that peace was as dangerous as war. In any case, it sent the proposals of the 4th of April in order to test the sincerity of his recent offer of compensation to England. He refused them, mainly, it would seem, because he could not believe that the Addington ministry could be firm; and in his rage at the discovery of his error he revenged himself ignobly on British tourists and traders in France.

He now threw all his energies into the task of marshalling the forces of France and his vassal states for the overthrow of "perfidious Albion." Naval preparations went on apace at all the dockyards, and numbers of flat-bottomed boats were built or repaired at the northern harbours. Disregarding the neutrality of the Germanic System, Napoleon sent a strong French corps to overrun Hanover, while he despatched General Gouvion St Cyr to occupy Taranto and other dominating positions in the south-east of the kingdom of Naples. Exactions at the expense of Hanover and Naples helped to lighten the burdens of French finance; Napoleon's sale of Louisiana to the United States early in 1803 for 60,000,000 francs brought further relief to the French treasury; and by pressing hard on his ally, Spain, he compelled her to exchange the armed help which he had a right to claim, for an annual subsidy of £2,880,000. Through Spain he then threatened Portugal with extinction unless she too paid a heavy subsidy, a demand with which the court of Lisbon was fain to comply.

Thus the first months of the war served to differentiate the two belligerents. England made short work of the French squadrons and colonies, particularly in the West Indies, while Napoleon became more than ever the master of central and southern Europe. The whole course of the war was to emphasize this distinction between the Sea Power and the Land Power; and in this fact lay the source of Napoleon's ascendancy in France and neighbouring lands, as also of his final overthrow.

Napoleon's utter disregard of the neutrality of neighbouring states was soon to be revealed in the course of a royalist plot which helped him to the imperial title. Georges Cadoudal, General Pichegru and other devoted royalists had concocted with the comte d'Artois (afterwards Charles X. of France) in London a scheme for the kidnapping (or more probably the murder) of the First Consul. The French police certainly knew of the plot, allowed the conspirators to come to Paris, arrested them there, and also on the 16th of February 1804 General Moreau, with whom Pichegru had two or three secret conferences. This was much; for Moreau, though indolent and incapable in political affairs, was still immensely popular in the army (always more republican than the civilians) and might conceivably head a republican movement against the autocrat. But far more was to follow. Failing through his police to lure the comte d'Artois to land in Normandy, Napoleon pounced on a scion of the House of Bourbon who was within his reach. The young duc d'Enghien was then residing at Ettenheim in Baden near the bank of the Rhine. He had served in the army of his grandfather, the prince of Condé, during the recent war; and Bonaparte believed for a time that he was an accomplice to the Cadoudal-Pichegru plot. He therefore sent orders to have him seized by French soldiers and brought to Vincennes near Paris. The order was skilfully obeyed, and the prince was hurried before a court-martial hastily summoned at that castle. Before they passed the verdict, Napoleon came to see that his victim was innocent of any participation in the plot. Nevertheless he was executed (21st of March 1804). It is noteworthy that though Napoleon at times sought to shift the responsibility for this deed on Talleyrand or Savary, yet during his voyage to St Helena, as also in his will, he frankly avowed his responsibility for it and asserted that in the like circumstances he would do the same again.

The horror aroused by this crime did not long deaden the feeling, at least in official circles, that something must be done to introduce the principle of heredity, as the surest means of counteracting the aims of conspirators. The senate, as usual, took the lead in suggesting some such change in the constitution; and it besought Napoleon "to complete his work by rendering it, like his glory, immortal." Other official addresses of the same general tenour flowed in; and even the tribunate showed its docility by proposing that the imperial dignity should be declared hereditary in the family of Bonaparte (3rd of May). Napoleon thereupon invited the senate to "make known to him its thoughts completely." The senate and the tribunate each appointed a commission to deal with the matter, with the result which every one foresaw. Carnot alone in the tribunate protested against the measure. The other councils adopted it almost unanimously. The *Senatus Consultum* of the 18th of May 1804 awarded to Napoleon the title of emperor, the succession (in case he had no heir) devolving in turn upon the descendants of Joseph and Louis Bonaparte (Lucien and Jerome were for the present excluded from the succession owing to their having contracted marriages displeasing to Napoleon). In a *plébiscite* taken on the subject of the imperial title and the law of succession, there were

3,572,329 affirmative votes and only 2569 negatives. In this vote lay the justification of the acts of the First Consul and the pledge for the greatness of the emperor Napoleon. The republicans in nearly every case voted for him: and it is significant of the curious trend of French thought that the new imperial constitution of the 18th of May 1804 opened with the words: "The government of the Republic is confided to an emperor, who takes the title Emperor of the French."

The changes brought about by this constitution were mainly titular. Napoleon's powers as First Consul for Life were so wide as to render much extension both superfluous and impossible; but we may note here that the senate now gained a further accession of authority at the expense of the two legislative bodies: and practically legislation rested with the emperor, who sent his decrees to the senate to be registered as *senatus consulta.* Napoleon's chief aversion, the tribunate, was also divided into three sections, dealing with legislation, home affairs and finance—a division which preluded its entire suppression in 1807. More important were the titular changes Napoleon, as we have seen, did not venture to create an order of nobility until 1808, but he at once established an imperial hierarchy. First came the French princes, namely, the brothers of the emperor; six grand imperial dignities were also instituted, viz. those of the grand elector (Joseph Bonaparte), arch-chancellor of the empire (Cambacérès), arch-chancellor of state (Eugène de Beauharnais), arch-treasurer (Lebrun), constable (Louis Bonaparte), grand admiral (Murat). These six formed the emperor's grand council. Next came the marshals, namely, Berthier, Murat, Masséna, Augereau, Lannes, Jourdan, Ney, Soult, Brune, Davout, Bessières, Moncey, Mortier and Bernadotte. Four generals—Kellermann, Lefèbvre, Pérignon, Serrurier—received the titles of honorary marshals. Next came dignities of a slightly lower rank, such as those of grand almoner (Fesch), grand marshal of the palace (Duroc), grand chamberlain (Talleyrand), grand master of the horse (Caulaincourt), grand huntsman (Berthier), grand master of ceremonies (Ségur). These with a host of lesser dignities built up the imperial hierarchy and enabled the court quickly to develop on the lines of the old monarchy, so far as rules of etiquette and self-conscious efforts could reproduce the courtly graces of the *ancien régime.*

Meanwhile Napoleon was triumphing over the last of the republican generals. Moreau's trial for treason promised to end with an acquittal; but the emperor brought severe pressure to bear on the judges (one of whom he dismissed), with the result that the general was declared guilty of participating in the royalist plot. Thereupon Napoleon, in order to grace the new *régime* by an act of clemency, pardoned Moreau, it being understood that he must leave France. He left immediately for the United States. Sentence of death was passed on the royalist conspirators. On Josephine's entreaties, the emperor commuted the sentence for eight of the well-connected men among them; Cadoudal and others of lower extraction were executed on the 24th of June. The brave Breton peasant thus summed up the results of his plot: "We meant to give France a king and we have given her an emperor." The *mot* was literally true. Victories in the field were not more effective in consolidating Napoleon's power than were his own *coups d'état* and the supremely skilful use which he made of conspiracies directed against him. He showed his sense of the value of Fouché's services in exploiting the royalist plot of 1803–1804 by reconstituting the ministry of police and bestowing it upon him. Thenceforth plots were few. Would-be plotters remained quiet from sheer terror of his power and ability, or from a conviction that conspiracies redounded to his advantage.

Napoleon was now able by degrees to dispense with all republican forms (the last to go was the Republican Calendar, which ceased on the 1st of January 1806), and the scene at the coronation in Notre Dame on the 2nd of December 1804 was frankly imperial in splendour and in the egotism which led Napoleon to wave aside the pope, Pius VII., at the supreme moment and crown himself. It is worthy of note that Josephine then won a triumph over Joseph Bonaparte and his sisters, who had been intriguing to effect a divorce. Napoleon, though he did not bar the door absolutely against such a proceeding, granted her her heart's desire by secretly going through a religious ceremony on the evening before the coronation. It was performed by Fesch, now a cardinal; but Napoleon could afterwards urge the claim that all the legal formalities had not been complied with; and the motive for the marriage may probably be found in the refusal of the pope to appear at the coronation unless the former civil contract was replaced by the religious rite.

As happened at every stage of Napoleon's advancement, the states tributary to France underwent changes corresponding to those occurring at Paris. The most important of these was the erection of monarchy in North Italy. The Italian republic (formerly the Cisalpine republic) became the kingdom of Italy. At first Napoleon desired to endow Joseph, or, on his refusal, Louis, with the crown of the new kingdom. They, however, refused to place themselves out of the line of direct succession in France, as Napoleon required, in case they accepted this new dignity. Finally, he resolved to take the title himself. The obsequious authorities at Milan at once furthered his design by sending an address to him, by requesting the establishment of royalty, and on the 15th of March 1805 by offering the crown to him. On the 26th of May he crowned himself in the cathedral at Milan with the iron crown of the old Lombard kings, amidst surroundings of the utmost splendour. On the 7th of June he issued a decree conferring the dignity of viceroy on Eugène de Beauharnais, his stepson; but everything showed that Napoleon's will was to be law; and the great powers at once saw that Napoleon's promise to keep the crowns of France and Italy separate was meaningless. The matter was of international importance; for by the treaty of Lunéville (February 1801) he had bound himself to respect the independence of the two republics of North Italy, the Cisalpine and the Ligurian. The defiance to Austria was emphasized when, on the 4th of June, he promised a deputation from Genoa that he would grant their request (prompted by his agents) of incorporating the Genoese (or Ligurian) republic in the French empire. In the same month he erected the republic of Lucca into a principality for Bacciochi and his consort, Elisa Bonaparte.

These actions proclaimed so unmistakably Napoleon's intention of making Italy an annexe of France as to convince Francis of Austria and Alexander of Russia that war with him was inevitable. The tsar, as protector of the Germanic System, had already been so annoyed by the seizure of the duc d'Enghien on German territory, and by other high-handed actions against the Hanse cities, as to recall his ambassador from Paris. Napoleon showed his indifference to the opinion of the tsar by ordering the seizure of the British envoy at Hamburg, Sir George Rumbold (24th of October); but set him free on the remonstrance of the king of Prussia, with whom he then desired to remain on friendly terms. Nevertheless, the general trend of his policy was such as powerfully to help on the formation of the Third Coalition against France—a compact which Pitt (who returned to power in May 1804) had found it very difficult to arrange. Disputes with Russia respecting Malta and the British maritime code kept the two states apart for nearly a year; and Austria was too timid to move. But Napoleon's actions, especially the annexation of Genoa, at last brought the three powers to accord, with the general aim of re-establishing the *status quo ante* in Germany, Holland, Switzerland and Italy, or, in short, of restoring the balance of power which Napoleon had completely upset.

Military affairs in this period are dealt with under Napoleonic Campaigns; but it may be noted here that during the anxious days which Napoleon spent at the camp of Boulogne in the second and third weeks of August 1805, uncertain whether to risk all in an attack on England in case Villeneuve should arrive, or to turn the Grand Army against Austria, the only step which he took to avert a continental war was the despatch of General Duroc to Berlin to offer Hanover to Prussia on consideration of her framing a close alliance with France. It was very unlikely that that peace-loving Court would take up arms against its powerful neighbours on behalf of Napoleon, and his proceedings in the previous months had been so recklessly provocative as to arouse doubts whether he intended to invade England and did not welcome the outbreak of a continental war. But in the case of a man so intensely ambitious, determined and egoistic as Napoleon, a decision on this interesting question is hazardous. Little reliance can be placed on his subsequent statements (as, for instance, to Metternich in 1810) that the huge preparations at Boulogne and the long naval campaign of Villeneuve were a mere ruse whereby to lure the Austrians into a premature declaration of war. It is, however, highly probable that he meant to strike at London if naval affairs went well, but that he was glad to have at hand an alternative which would shroud a maritime failure under military laurels. If so, he succeeded. His habit was, as he said, *faire son thème en deux façons,* and he now took the second alternative. On or about the 25th-27th of August he resolved to strike at Austria. He did so with masterly skill and swiftness, and the triumphs of Ulm and Austerlitz hid from view the disaster of Trafalgar; and the only official reference to that crushing defeat was couched in these terms: "Storms caused us to lose some ships of the line after a fight imprudently engaged" (speech to the Legislature, 2nd of March 1806).

The glamour of Austerlitz had very naturally dazzled all Frenchmen. Its results indeed were not only astounding at the time, but were such as to lead up to a new cycle of wars. By the peace of Presburg (26th of December 1805) Napoleon compelled Austria to recognize all the recent changes in Italy, and further to cede Venetia, Istria and Dalmatia to the new kingdom of Italy. The Swabian lands of the Habsburgs went to the South German states (allies of Napoleon), while Bavaria also received Tirol and Vorarlberg. The Electors of Bavaria and Württemberg were recognized as kings.

Nor was this all. Napoleon pressed almost equally hard upon Prussia. That power had been on the point of offering her armed mediation in revenge for his violation of her territory of Anspach; but she was fain to accept the terms which he offered at the sword's point. When modified in February 1806, after Prussia's demobilization, they comprised the occupation of Hanover by Prussia, with the proviso, however, that she should exclude British ships and goods from the whole of the north-west coast of Germany. To this demand (the real commencement of the "Continental System") the Berlin government had to accede, though at the cost of a naval war with England, and the ruin of its maritime trade. Anspach and Bayreuth were also to be handed over to Bavaria, it now being the aim of Napoleon to aggrandize the South German princes who had fought on his side in the late war. In order to strengthen this compact, he arranged a marriage between the daughter of the king of Bavaria and Eugène Beauharnais; and he united the daughter of the Elector of Württemberg in marriage to Jerome Bonaparte, who had now divorced his wife, formerly Miss Paterson of Baltimore, at his brother's behests. Stéphanie de Beauharnais, niece of Josephine, was also betrothed to the son of the duke (now grand duke) of Baden. By these alliances the new Charlemagne seemed to have founded his supremacy in South Germany on sure foundations.

Equally striking was his success in Italy. The Bourbons of Naples had broken their treaty engagements with Napoleon, though in this matter they were perhaps as much sinned against as sinning. After Austerlitz the conqueror fulminated against them, and sent southwards a strong column which compelled an Anglo-Russian force to sail away and brought about the flight of the Bourbons to Sicily (February 1806). This event opened a new and curious chapter in the history of Europe, that of the fortunes of the *Napoléonides*. True to his Corsican instinct of attachment to the family, and contempt for legal and dynastic claims, he now began to plant his brothers and other relatives in what had been republics established by the French Jacobins. Eugène Beauharnais had been established at Milan. Joseph Bonaparte was now advised to take the throne of Naples, and without any undue haggling as to terms, for "those who will not rise with me shall no longer be of my family. I am making a family of kings attached to my federative system." At the end of March 1806 Joseph became king of the Two Sicilies. A little later the emperor bestowed the two papal enclaves of Benevento and Ponte-Corvo on Talleyrand and Bernadotte respectively, an act which emphasized the hostility which had been growing between Napoleon and the papacy. Because Pius VII. declined to exclude British goods from the Papal States, Napoleon threatened to reduce the pope to the level merely of bishop of Rome. He occupied Ancona and seemed about to annex the Papal States outright. That doom was postponed; but Catholics everywhere saw with pain the harsh treatment accorded to a defenceless old man. The prestige which the First Consul had gained by the Concordat was now lost by the overweening emperor.

But it was on the banks of the Rhine that the Napoleonic system received its most signal developments. The duchy of Berg, along with the eastern part of Clèves and other annexes, now went to Murat, brother-in-law of Napoleon (March 1806); and that melodramatic soldier at once began to round off his eastern boundary in a way highly offensive to Prussia. She was equally concerned by Napoleon's behaviour in the Dutch Netherlands, where her influence used to be supreme. On the 5th of June 1806 the Batavian republic completed its chrysalis-like transformations by becoming a kingdom for Louis Bonaparte. "Never cease to be a Frenchman" was the pregnant advice which he gave to his younger brother in announcing the new dignity to him. In that sentence lay the secret of all the disagreements between the two brothers. Louis resolved to govern for the good of his subjects. Napoleon determined that he, like all the Bonapartist rulers, should act merely as a Napoleonic satrap. They were to be to him what the counts of the marches were to Charlemagne, warlike feudatories defending the empire or overawing its prospective foes.

Far more was to follow. On the 17th of July Napoleon signed at Paris a decree that reduced to subservience the Germanic System, the chaotic weakness of which he had in 1797 foreseen to be highly favourable to France. He now grouped together the princes of south and central Germany in the Confederation of the Rhine, of which he was the protector and practically the ruler in all important affairs. The logical outcome of this proceeding appeared on the 1st of August, when Napoleon declared that he no longer recognized the existence of the Holy Roman Empire. The head of that venerable organism, the emperor Francis II., bowed to the inevitable and announced that he thenceforth confined himself to his functions as Francis I., hereditary emperor of Austria, a title which he had taken just two years previously. This tame acquiescence of the House of Habsburg in the reorganization of Germany seemed to set the seal on Napoleon's work. He controlled all the lands from the Elbe to the Pyrenees, and had Spain and Italy at his beck and call. Power such as this was never wielded by his prototype, Charlemagne.

But now came a series of events which transcended all that the mind of man had conceived. As the summer of 1806 wore on, his policy perceptibly hardened. Negotiations with England and Russia served to show the extent of his ambition. Sicily he was determined to have, and that too despite of all the efforts of the Fox-Grenville cabinet to satisfy him in every other direction. In his belief that he could ensnare the courts of London and St Petersburg into separate and proportionately disadvantageous treaties, he overreached himself. The tsar indignantly repudiated a treaty which his envoy, Oubril, had been tricked into signing at Paris; and the Fox-Grenville cabinet (as also its successor) refused to bargain away Sicily. War, therefore, went on. What was more, Prussia, finding that Napoleon had secretly offered to the British Hanover (that gilded hook by which he caught her early in the year), now resolved to avenge this, the last of several insults. Napoleon was surprised by the news of Prussia's mobilization; he had come to regard her as a negligible quantity, and now he found that her unexpected sensitiveness on points of honour was about to revivify the Third Coalition against France.

The war which broke out early in October 1806 (sometimes known as the war of the Fourth Coalition) ran a course curiously like that of 1805 in its main outlines. For Austria we may read Prussia; for Ulm, Jena-Auerstädt; for the occupation of Vienna, that of Berlin; for Austerlitz, Friedland, which again disposed of the belated succour given by Russia. The parallel extends even to the secret negotiations; for, if Austria could have been induced in May 1807 to send an army against Napoleon's communications, his position would have been fully as dangerous as before Austerlitz if Prussia had taken a similar step. Once more he triumphed owing to the timidity of the central power which had the game in its hands; and the folly which marked the Russian tactics at Friedland (14th of June 1807), as at Austerlitz, enabled him to close the campaign in a blaze of glory and shiver the coalition in pieces.

Now came an opportunity far greater than that which occurred after Austerlitz. The Peace of Presburg was merely continental. That of Tilsit was of world-wide importance. But before referring to its terms we must note an event which indicated the lines on which Napoleon's policy would advance. After occupying the Prussian capital he launched against England the famous Berlin Decree (21st of November 1806), declaring her coasts to be in a state of blockade, and prohibiting all commerce with them. No ship coming thence was to be admitted into French or allied harbours; ships transgressing the decree were to be good prize of war; and British subjects were liable to imprisonment if found in French or allied territories. This decree is often called the basis of the Continental System, whereby Napoleon proposed to ruin England by ruining her commerce. But even before Trafalgar he had begun to strike at that most vulnerable form of wealth, as the Jacobins had done before him. Nelson's crowning triumph rendered impossible for the present all other means of attack on those elusive foes; and Napoleon's sense of the importance of that battle may be gauged, not by his public utterances on the subject, but by his persistence in forcing Prussia to close Hanover and the whole coastline of north-west Germany against British goods. That proceeding, in February 1806, constitutes the basis of the Continental System. The Berlin Decree gave it a wide extension. By the mighty blow of Friedland and the astonishing diplomatic triumph of Tilsit, the conqueror hoped speedily to overwhelm the islanders beneath the mass of the world's opposition. Napoleon at Tilsit resembles Polyphemus seeking to destroy Ulysses. The crags which he flung at Britannia did indeed graze the stern and graze the prow of her craft.

The triumph won at Friedland marks in several respects the climax of Napoleon's career. The opportunity was unique; and he now put forth his utmost endeavours to win over to his side the conquered but still formidable tsar. In their first interview, held on a raft in the middle of the river Niemen at Tilsit on the 25th of June, the French emperor, by his mingled strength and suppleness of intellect, gained an easy mastery over the impressionable young potentate. Partly from fear of a national Polish rising which Napoleon held in reserve as a last means of coercion, and partly from a subtle resolve to use the French alliance as a means of securing rich domains at the expense of Turkey, Prussia, Sweden and England, Alexander decided to throw over his allies, Prussia and England, and to seize the spoils to which the conqueror pointed as the natural sequel of a Franco-Russian alliance. Napoleon, therefore, had Prussia completely at his mercy; and his conditions to that power bore witness to the fact. The prayers of Queen Louisa of Prussia failed to bend him from his resolve. He refused even to grant her tearful request for Magdeburg. At a later time he reproached himself for not having dethroned the Hohenzollerns outright; but it is now known that Alexander would have forbidden this step, and that he dissuaded Napoleon from withdrawing Silesia from the control of the House of Hohenzollern. Even so, Prussia was bereft of half of her territories; those west of the river Elbe went to swell the domains of Napoleon's vassals or to form the new kingdom of Westphalia for Jerome Bonaparte; while the spoils which the House of Hohenzollern had won from Poland in the second and third partitions were now to form the duchy of Warsaw, ruled over by Napoleon's ally, the elector (now king) of Saxony. Danzig became nominally a free city, but was to be occupied by a French garrison until the peace. The tsar acquired a frontier district from Prussia, recognized the changes brought about by Napoleon in Germany and Italy, and agreed by a secret article that the Cattaro district on the east coast of the Adriatic should go to France. Equally important was the secret treaty of alliance between France and Russia signed on that same day. By it Napoleon brought the tsar to agree to make war on England in case that power did not accept the tsar's mediation for the conclusion of a general peace. Failing the arrival of a favourable reply from London by the 1st of December 1807, the tsar would help Napoleon to compel Denmark, Sweden and Portugal to close their ports against, and make war on, Great Britain. Napoleon also promised to mediate between Russia and Turkey in the interests of the former, and (in case the Porte refused to accept the proffered terms) to help Russia to drive the Turks from Europe, "the city of Constantinople and the province of Rumelia alone excepted." This enterprise and the acquisition of Finland from Sweden, which Napoleon also dangled before the eyes of the tsar, formed the bait which brought that potentate into Napoleon's Continental System. Both Russia and Prussia now agreed rigorously to exclude British ships and goods from their dominions.

The terms last named indicate the nature of the aims which Napoleon had in view at Tilsit. That compact was not, as has often been assumed, merely the means of assuring to Napoleon the mastery of the continent and the control of a cohort of kings. That eminence he enjoyed before the collision with Prussia in the autumn of 1806; and he frequently, and no doubt sincerely, expressed contempt of conquests *dans cette vieille Europe*. The three coalitions against France had not produced a single warrior worthy of his steel. The treaty of Tilsit may more reasonably be looked on as an expedient for piling up enormous political resources with a view to the coercion of Great Britain. If that end could not be achieved by massing the continental states against her in a solid phalanx of commercial war, then Napoleon intended to ensure her ruin by that other enterprise which he had in view early in 1798 (see his letter of the 23rd of February 1798), namely the conquest of the Orient. An expedition against India had recently occupied his thoughts, as may be seen by the instructions which he issued on the 10th of May 1807 to General Gardane for his mission to Persia. The Orient was, indeed, ever the magnet which attracted him most; and his hostility to England may be attributed to his perception that she alone stood in the way of his most cherished schemes. The treaty of Tilsit, then, far from being merely a European event, was an event of the first importance in what may be termed the *Welt-politik* of Napoleon. His confidence that his vastly enhanced powers would enable him first to coerce, and thereafter to overthrow, the British empire may be illustrated by his allowing the appearance in 1807 of an official atlas of Australia in which about one-third of that continent figures as "Terre Napoléon."

As usually happened in this strife of the land power and the sea power, Napoleon's continental policy attained an almost complete success, while the naval and oriental schemes which he had more nearly at heart utterly miscarried. The continent accepted the new development of his System. After some diplomatic fencing Russia and Prussia broke with England and entered upon what was, officially at least, a state of war with her. Further, owing to the carelessness of the Prussian negotiator, Napoleon was able to require the exaction of impossibly large sums from that exhausted land, and therefore to keep his troops in her chief fortresses. The duchy of Warsaw and the fortress of Danzig formed new outworks of his power and enabled him to overawe Russia. In home affairs as in foreign affairs his actions bespoke the master. On returning from Tilsit to Paris he relieved Talleyrand of the ministry of foreign affairs, softening the fall by creating him a grand dignitary of the empire. The more subservient Champagny now became what was virtually the chief clerk in the French foreign office; and other changes placed in high station men who were remarkable for docility rather than originality and power. Napoleon also suppressed the Tribunate; and in the year 1808 instituted an order of nobility. During the course of a tour in Italy in December 1807 he gave a sharp turn to that world-compelling screw, the Continental System. By the Milan Decree of the 17th of December 1807, he ordained that every ship which submitted to the right of search now claimed by Great Britain would be considered a lawful prize. The imperious terms in which this decree was couched and its misleading reference to the British maritime code showed that Napoleon believed in the imminent collapse of his sole remaining enemy. This was natural. Britain, it was true, acting on the initiative of George Canning, had seized the Danish fleet, thus forestalling an action which Napoleon certainly contemplated; but on the other hand Denmark now allied herself with him; and while in Lombardy he heard of the triumphant entry of his troops into Lisbon—an event which seemed to prelude his domination in the Iberian Peninsula and thereafter in the Mediterranean.

The occupation of Lisbon, which led on to Napoleon's intervention in Spanish affairs, resulted naturally from the treaty of Tilsit. The coercion of England's oldest ally had long been one of Napoleon's most cherished aims, and was expressly provided for in that compact. To this scheme he turned with a zeal whetted by consciousness of his failure respecting the Danish fleet. On the 27th of October 1807 he signed with a Spanish envoy at Fontainebleau a secret convention with a view to the partitioning of Portugal between France and Spain. Another convention of the same date allowed him to send 28,000 French troops into Spain for the occupation of Portugal, an enterprise in which a large Spanish force was to help them; 40,000 French troops were to be cantonned at Bayonne to support the first corps. Seeing that Godoy, the all-powerful minister at Madrid, had given mortal offence to Napoleon early in the Prussian campaign of 1806 by calling on Spain to arm on behalf of her independence, it passes belief how he could have placed his country at the mercy of Napoleon at the end of the year 1807. The emperor, however, successfully gilded the hook by awarding Algarve, the southern province of Portugal, to Godoy. The north of Portugal was to go to the widow of the king of Etruria (a Spanish Infanta); her realm now passing into the hands of Napoleon. Thus Portugal in 1807, like Venice in 1797, was to provide the means for widely extending the operations of his statecraft.

The natural result followed. Portugal was easily overrun by the allies; but Junot's utmost efforts failed to secure the Portuguese fleet, which, under the protection of a British squadron, sailed away to Brazil with the royal family, the ministers and chief grandees of the realm. In other respects all went well. The French reinforcements which entered Spain managed to secure some of the strongholds of the northern provinces; and the disgraceful feuds in the royal family left the country practically at the emperor's mercy.

The situation was such as to tempt Napoleon on to an undertaking on which he had probably set his heart in the autumn of 1806, that of dethroning the Spanish Bourbons and of replacing them by a Bonaparte. Looking at the surface of the life of Spain, he might well believe in its decay. The king, Charles IV., looked on helplessly at the ruin wrought by the subservience of his kingdom to France since 1796, and he was seemingly blind to the criminal intrigues between his queen and the prime minister Godoy. His senile spite vented itself on his son Ferdinand, whose opposition to the all-powerful favourite procured for him hatred at the palace and esteem everywhere else. Latterly the prince had fallen into disgrace for proposing, without the knowledge of Charles IV., to ally himself with a Bonaparte princess. Here, then, were all the conditions which favoured Napoleon's intervention. He allowed the prince to hope for such a union, and thus enhanced the popularity of the French party at Madrid. Godoy, having the prospect of the Algarve before him, likewise offered no opposition to the advance of Napoleon's troops to the capital; and so it came about that Murat, named by Napoleon his Lieutenant in Spain, was able to enter Madrid in force and without opposition from that usually clannish populace. The course of events, and especially the anger of the people, now began to terrify Charles IV., the queen and Godoy. They prepared for flight to America—a step which Napoleon took care to prevent; and a popular outbreak at Aranjuez decided the king then and there to abdicate (19th of March 1808). Murat, now acting very warily in the hope of gaining the crown of Spain for himself, refused to recognize this act as binding, still more so the accession of Ferdinand VII. Charles thereupon declared his abdication to have been made under duress and therefore null and void. The young king, still hoping for Napoleon's favour, now responded to the suggestion, forwarded by Savary, that an interview with the emperor would clear up the situation. The same prospect was held out to Charles IV., the queen and Godoy, with the result that the rivals for the throne proceeded to the north of Spain to meet the arbiter of their destinies. Napoleon journeyed to Bayonne and remained there. The claimants, each not knowing of the movements of the other, crossed the Pyrenees, and Ferdinand on his arrival at Bayonne found himself to be virtually a prisoner in the hands of the emperor. Napoleon had little difficulty in disposing of the father, whose rage against his son blunted his senses in every other direction. As for Ferdinand, the emperor, on hearing the news of a rising in Madrid on the 2nd of May, overwhelmed him with threats, until he resigned the crown into the hands of his father, who had already bargained it away to Napoleon in return for a pension (5th of May 1808). Princely abodes in France and annuities (the latter to be paid by Spain)—such was the price at which Napoleon bought the crown of Spain and the Indies. Naturally nothing more was heard of the partition of Portugal. According to outward appearance nothing was wanting to complete the emperor's triumph. He is said to have remarked with an oath after Jena that he would make the Spanish Bourbons pay for their recent bellicose proclamation. If the story is correct, his acts at Bayonne showed once more his custom of biding his time in order to take an overwhelming revenge. That the son of a Corsican notary should have been able to dispose of the Spanish Bourbons in this contemptuously easy way is one of the marvels of history.

But even in this crowning triumph the cramping egotism of his nature—a mental vice which now grew on him rapidly—fatally narrowed his outlook and led him to commit an irretrievable blunder. In his contempt for the rulers of Spain he forgot the Spanish people. In all the genuine letters of the spring of 1808—that of March 29th to Murat, no. 13,696 of the Correspondence, is acknowledged to be a forgery—there is not a sign that he regarded the Spaniards as of any account. On the 27th of March he offered the crown of Spain to his brother Louis, king of Holland, in these terms: "The climate of Holland does not suit you; besides Holland can never rise from its ruins. I think of you for the throne of Spain. You will be the sovereign of a generous nation of eleven millions of men and of important colonies." On Louis declining the honour, it devolved on Joseph, king of Naples, who vacated that throne for the benefit of Murat—a source of disappointment and annoyance to both. The emperor pushed on his schemes regardless of everything. The first signs of the rising ferment in Spain were wasted on him. He believed that the arrival of so benevolent a king as Joseph, and the promulgation of a number of useful reforms based on those of the French Revolution, would soothe any passing irritation. If not, then his troops could deal with it as Murat had dealt with the men of Madrid on the 2nd of May. He, therefore, pressed on the march of a corps of French and Swiss troops under Dupont towards Cadiz, in order to take possession of the French sail of the line, five in number, which had been in that harbour since Trafalgar. The importance which he then assigned to naval affairs appears in many letters of the months May to June 1808. He intended that Spain should very soon have ready twenty-eight sail of the line—"ce qui est certes bien peu de chose"—so as to drive away the British squadrons, and then he would strike "de grands coups" in the autumn. Evidently then the Spanish dockyards and warships (when vigorously organized) were to count for much in the schemes for assuring complete supremacy in the Mediterranean and the ultimate overthrow of the British and Turkish empires, which he then had closely at heart.

The Spanish rising of May–June 1808 ruined these plans irretrievably. The men of Cadiz compelled the French warships to surrender, and the levies of Andalusia, closing around Dupont, compelled him and some 23,000 men to lay down their arms at Baylen (23rd of July). This disaster, the most serious suffered by the French since Rossbach, sent a thrill through the Napoleonic vassal states and aroused in Napoleon transports of anger against Dupont. "Everything is connected with this event," he wrote on the 2nd of August, "Germany, Poland, Italy." Indeed, along with other serious checks in Spain, which involved the conquest of that land, it cut through the wide meshes of his policy both in Levantine, Central European and commercial affairs. The partition of Turkey had to be postponed; the financial collapse of England could not be expected now that she framed an alliance with the Spanish patriots and had their markets and those of their colonies opened to her; and the discussions with the tsar Alexander, which had not gone quite smoothly, now took a decidedly unfavourable turn. The tsar saw his chance of improving on the terms arranged at Tilsit; and obviously Napoleon could not begin the conquest of Spain until he felt sure of the conduct of his nominal ally. Still worse was the prospect when Sir Arthur Wellesley with a British force landed in Portugal, gained the battle of Vimiero (21st of August), and brought the French commander, Junot, by the so-called convention of Cintra, to agree to the evacuation of the country by all the French troops. The sea power thus gained what had all along been wanting, a sure basis for the exercise of its force against the land power, Napoleon. Still more important, perhaps, was the change in *moral* which the Spanish rising brought about. Napoleon's perfidy at Bayonne was so flagrant as to strip from him the mask of a champion of popular liberty which had previously been of priceless worth. Now he stood forth to the world as an unscrupulous aggressor; moral force, previously marshalled on the side of France, now began to pass to the side of his opponents. The value of that unseen ally he well knew: "Once again, let me tell you," he wrote to General Clarke on the 10th of October 1809, "in war *moral* and opinion are more than half of the reality."

Such were the discouraging conditions which weighed him down at the time of the interview with the tsar at Erfurt (September 27th–October 12th, 1808). That event was so important as to require some preliminary explanation. For some five months past the two emperors had been exchanging their views as to the future of the world. Stated briefly they were these. Napoleon desired to press on the partition of Prussia, Alexander that of Turkey. The tsar, however, was determined to save Prussia if he could; and Napoleon after the first disasters in Spain saw it to be impossible to uproot the Hohenzollerns; while it was clearly to his interest to postpone the partition of Turkey until he had conquered Spain and Sicily. Austria meanwhile had begun to arm as a precautionary measure; and Napoleon, shortly after his return from Bayonne to Paris, publicly declared that, if her preparations went on, he would wage against her a war of extermination. The threat naturally did not tend to reassure statesmen at Vienna; and the tsar now resolved to prevent the total wreck of the European system by screening the House of Habsburg from the wrath of his ally. For the present Napoleon's ire fell upon Prussia. A letter written by the Prussian statesman, Baron vom Stein, had fallen into the hands of the French and revealed to the emperor the ferment produced in Germany by news of the French reverses in Spain. In that letter Stein urged the need of a national rising of the Germans similar to that of the Spaniards, when the inevitable struggle ensued between Napoleon and Austria. The revenge of the autocrat was characteristic. Besides driving Stein from office, he compelled Prussia to sign a convention (8th of September) for the payment to France of a sum of 140,000,000 francs, and for the limitation of the Prussian army to 42,000 men.

Apart from this advantage, placed in his hands by the imprudence of Stein, Napoleon was heavily handicapped at the Erfurt interview. In vain did he seek to dazzle the tsar by assembling about him the vassal kings and princes of Germany; in vain did he exercise all the intellectual gifts which had captivated the tsar at Tilsit; in vain did he conjure up visions of the future conquest of the Orient; external display, diplomatic *finesse*, varied by one or two outbursts of calculated violence—all was useless. The situation now was utterly different from that which obtained at Tilsit. Alexander had succeeded in pacifying Finland, and his troops held the Danubian provinces of Turkey—a pledge, as it seemed, for the future conquest of Constantinople. Napoleon, on the other hand, had utterly failed in his Spanish enterprise; and the tsar felt sure that his rival must soon withdraw French garrisons from the fortresses of the Oder to the frontier of Spain. These facts, and not, as has often been assumed, the treachery of Talleyrand, decided Alexander to assume at Erfurt an attitude of jealous reserve. He refused to join Napoleon in any proposal for the coercion of Austria or the limitation of her armaments. Finally he agreed to join his ally if he (Napoleon) were attacked by the Habsburg power. Napoleon on his side succeeded in adjourning the question of the partition of Turkey; but he awarded the Danubian provinces and Finland to his ally and agreed to withdraw the French garrisons from the Prussian fortresses on the Oder. On the 12th of October both potentates addressed an appeal to George III. to accord peace to the world on the basis of *uti possidetis*. Canning assented, provided that envoys of all the states and peoples concerned took part in the negotiations. Whereupon a reply came from Paris (28th of November) that the French emperor refused to admit the envoys of "the king who reigns in Brazil, the king who reigns in Sicily or the king who reigns in Sweden." The "Spanish insurgents" were equally placed out of court. Clearly, then, Napoleon's desire for peace was conditional on his being allowed to dictate terms to the rulers and peoples concerned.

Already he had shown that the sword must decide affairs in Spain. After spending a short time in Paris in order to supervise the transfer of his forces from Germany to the Pyrenees, he journeyed swiftly southwards, burst upon the Spaniards, and on the 3rd of December received the surrender of Madrid. There, on the 16th of December, he issued a decree (omitted from the official Correspondence) declaring *le nommé Stein* an enemy of France and confiscating his property in the lands allied to France. The great statesman barely succeeded in escaping to Austria, a land in which the hopes of German patriots now centred. Encouraged by the sympathy of all patriotic Germans and the newly found energy of its own subjects, the House of Habsburg now began to prepare for war. Napoleon was then in the midst of operations against Sir John Moore, whose masterly march on Sahagun (near Valladolid) had thwarted the emperor's plans for a general "drive" on to Lisbon. Hoping to punish Moore for his boldness, Napoleon struck quickly north at Astorga, but found that he was too late to catch his foe. At that town he also heard news on the 1st of January 1809, which portended trouble in Germany and perhaps also at Paris. Austria was continuing to arm; and the emperor perceived that the diplomatic failure at Erfurt was now about to entail on him another and more serious struggle. His anxiety was increased by news of sinister import respecting frequent interviews between those former rivals, Talleyrand and Fouché, in which Murat was said to be concerned. Handing over the command to Soult, he hurried back to Paris to trample on the seeds of sedition and to overwhelm Austria by the blows which he showered upon her in the valley of the Danube. Sir John Moore and the statesmen of Austria—the heroic Stadion at their head—failed in their enterprise; but at least they frustrated the determined effort of Napoleon to stamp out the national movement in the Iberian Peninsula. Thereafter he never entered Spain; and the French operations suffered incalculably from the want of one able commander-in-chief.

In the Danubian campaign of 1809 he succeeded; but the stubborn defence of Austria, the heroic efforts of the Tirolese and the spasmodic efforts which foreboded a national rising in Germany, showed that the whole aspect of affairs was changing, even in central Europe, where rulers and peoples had hitherto been as wax under the impress of his will. The peoples, formerly so apathetic, were now the centre of resistance, and their efforts failed owing to the timidity or sluggishness of governments and the incompetence of some of their military leaders. The failure of the archduke John to arrive in time at Wagram (5th of July), the lack of support accorded by the Spaniards to Wellesley before and after the battle of Talavera (28th of July), and the slowness with which the British government sent forth its great armada against Flushing and Antwerp, a fortnight after

Austria sued for an armistice from Napoleon, enabled that superb organizer to emerge victorious from a most precarious situation. The hatred felt for him by Germans found expression in a daring attempt to murder him made by a well-bred youth named Staps on the 12th of October.

Two days later Napoleon, by means of unworthy artifices, hurried the Austrian plenipotentiaries into signing the treaty of peace at Schönbrunn. The House of Habsburg now ceded Salzburg and the Inn-Viertel to Napoleon (for his ally, the king of Bavaria); a great portion of the spoils which Austria had torn from Poland in 1795 went to the grand duchy of Warsaw, or Russia; and the cession of her provinces Carinthia, Carniola and Istria to the French empire cut her off from all access to the sea. After imposing these harsh terms on his enemy, the conqueror might naturally have shown clemency to the Tirolese leader, Andreas Hofer; but that brave mountaineer, when betrayed by a friend, was sentenced to death at Mantua owing to the arrival of a special message to that effect from Napoleon.

In other quarters he achieved for the present a signal success. It was his habit to issue important decrees from the capitals of his enemies; and on the 17th of May 1809 he signed at Vienna an edict abolishing the temporal power of the pope and annexing the Papal States, which the French troops had occupied early in the previous year. On the 6th of July 1809 Pius VII. was arrested at Rome for presuming to excommunicate the successor of Charlemagne, and was deported to Grenoble and later on to Savona. The same year witnessed the downfall of Napoleon's persistent enemy, Gustavus IV. of Sweden, who was dethroned by a military movement (29th of March 1809). His successor, Charles XIII., made peace with France on the 6th of January 1810, and agreed to adopt the provisions of the Continental System. The aim in all these changes, it will be observed, was to acquire control over the seaboard, or, failing that, the commerce of all European states.

As happened in the years 1802–1803, Napoleon extended his "System" as rapidly in time of peace as during war. The year 1810 saw the crown set to that edifice by the annexations of Holland and of the north-west coast of Germany. In both cases the operative cause was the same. Neither Louis Bonaparte nor German *douaniers* could be trusted to carry out in all their stringency the decrees for the entire exclusion of British commerce from those important regions. In the case of King Louis, family quarrels embittered the relations between the two brothers; but it is clear from Napoleon's letters of November–December 1809 that he had even then resolved to annex Holland in order to gain complete control of its customs and of its naval resources. The negotiations which he allowed to go on with England in the spring of 1810, mainly respecting the independence of Holland, are now known to have been insincere. Fouché, for meddling in the negotiations through an agent of his own, was promptly disgraced; and, when neither England was moved by diplomatic cajolery nor Louis Bonaparte by threats, French troops were sent against the Dutch capital. Louis fled from his kingdom, and on the 9th of July 1810 Holland became part of the French empire. In the next months Napoleon promulgated a series of decrees for effecting the ruin of British commerce, and in December 1810 he decreed the annexation of the north-west coast of Germany, as also of Canton Valais, to the French empire. This now stretched from Lübeck to the Pyrenees, from Brest to Rome; while another arm (only nominally severed from the empire by the Napoleonic kingdom of Italy) extended down the eastern shore of the Adriatic to Ragusa and Cattaro, threatening the Turkish empire with schemes of partition always imminent but never achieved.

It is time now to notice two important events in the life of the emperor, namely his divorce of Josephine and his union with Marie Louise of Austria. The former of these had long been foreseen. The Bonapartes had intrigued for it with their usual persistence, and Napoleon was careful never to make it impossible. His triumph over Austria in 1809, and especially the attempt of Staps to murder him, clinched his determination to found a dynasty in his own direct line. From Josephine he could not expect to have an heir. Accordingly, on his return to Paris he caused the news to be broken to her that reasons of state of the most urgent kind compelled him to divorce her. An affecting scene took place between them on the 30th of November 1809; but Napoleon, though moved by her distress, remained firm; and though the clerics made a difficulty about dissolving the religious marriage of the 1st of December 1804, the formalities of which were complete save that the parish priest was absent, yet the emperor instituted a chancery for the archbishop of Paris, with the result that that body pronounced the divorce (January 1810). Josephine retired to her private abode, Malmaison, where her patience and serenity won the admiration of all who saw her.

Meanwhile the deliberations respecting the choice of her successor had already begun. Opinions were divided in the emperor's circle between a Russian and an Austrian princess; but the marked coolness with which overtures for the hand of the tsar's sister were received at St Petersburg, and the skill with which Count Metternich, the Austrian chancellor, let it be known that a union with the archduchess, Marie Louise, would be welcomed at Schönbrunn, helped to decide the matter. The reasons why the emperor Francis acquiesced in the marriage alliance are well known. Only so could his empire survive. A marriage between Napoleon and a Russian princess would have implied the permanent subjection of Austria. By the proposed step she would weaken the Franco-Russian alliance. But why did Napoleon fix his choice on Vienna rather than St Petersburg? Mainly, it would seem, because he desired hurriedly to screen the refusal, which might at any time be expected from the Russian court, under the appearance of a voluntary choice of an Austrian archduchess. Further, an alliance with the House of Habsburg might be expected to wean the Germans from all thought of gaining succour from that quarter. The wedding was celebrated first at Vienna by proxy, and at Notre Dame by the emperor in person on the 2nd of April. Though based on merely political grounds, the union was for the time a happy one. He advised his courtiers to marry Germans—"they are the best wives in the world, good, naïve and fresh as roses." Metternich, on visiting Compiègne and Paris, found the emperor thoroughly devoted to his bride. Napoleon told him that he was now beginning to live, that he had always longed for a home and now at last had one. Metternich thereupon wrote to his master: "He (Napoleon) has possibly more weaknesses than many other men, and if the empress continues to play upon them, as she begins to realize the possibility of doing, she can render the greatest services to herself and all Europe." The surmise was too hopeful. Napoleon, though he never again worked as he had done, soon freed himself from complete dependence on Marie Louise; and he never allowed her to intrude into political affairs, for which, indeed, she had not the least aptitude. His real concern for her was evinced shortly before the birth of their son, the king of Rome, when he gave orders that if the life of both mother and child could not be saved, that of the mother should be saved if possible (20th of March 1811).

This event seemed to place Napoleon's fortunes on a sure basis; but already they were being undermined by events. The marriage negotiations of 1809–1810 had somewhat offended the emperor Alexander; his resentment increased when, at the close of 1810, Napoleon dethroned the duke of Oldenburg, brother-in-law of the tsar; and the breach in the Franco-Russian alliance widened when the French emperor refused to award fit compensation to the duke or to give to the Russian government an assurance that the kingdom of Poland would never be reconstituted. The addition of large territories to the grand duchy of Warsaw after the war of 1809 aroused the fears of the tsar respecting the Poles; and he regarded all Napoleon's actions as inspired by hostility to Russia. He, therefore, despite Napoleon's repeated demands, refused to subject his empire to the hardships imposed by the Continental System; at the close of the year 1810 he virtually allowed the entry of colonial goods (all of which were really British borne) and little by little broke away from Napoleon's system. These actions implied war between France and Russia, unless Napoleon allowed such modifications of his rules (*e.g.* under the license system) as would avert ruin from the trade and finance of Russia; and this he refused to do.

The campaign of 1812 may, therefore, be considered as resulting, firstly, from the complex and cramping effects of the Continental System on a northern land which could not deprive itself of colonial goods; secondly, from Napoleon's refusal to mitigate the anxiety of Alexander on the Polish question; and thirdly, from the annoyance felt by the tsar at the family matters noticed above. Napoleon undoubtedly entered on the struggle with reluctance. He spoke about it as one that lay in the course of destiny. In one sense he was right. If the Continental System was inevitable the war with Russia was inevitable. But that struggle may more reasonably be ascribed to the rigidity with which he carried out his commercial decrees and his diplomacy. He often prided himself on his absolute consistency, and we have Chaptal's warrant for the statement that, after the time of the Consulate, his habit of following his own opinions and rejecting all advice, even when he had asked for it, became more and more pronounced. It was so now. He took no heed of the warnings uttered by those sage counsellors, Cambacérès and Talleyrand, against an invasion of Russia, while "the Spanish ulcer" was sapping the strength of the empire at the other extremity. He encased himself in fatalism, with the result that in two years the mightiest empire reared by man broke under the twofold strain. His diplomacy before the war of 1812 was less successful than that of Alexander, who skilfully ended his quarrel with Turkey and gained over to his side Sweden. That state, where Bernadotte had latterly been chosen as crown prince, decided to throw off the yoke of the Continental System and join England and Russia, gaining from the latter power the promise of Norway at the expense of Denmark.

Napoleon on his side coerced Prussia into an offensive alliance and had the support of Austria and the states of the Rhenish Confederation. At Dresden he held court for a few days in May 1812 with Marie Louise: the emperor Francis, the king of Prussia and a host of lesser dignitaries were present—a sign of the power of the modern Charlemagne. It was the last time that he figured as master of the continent.

The military events of the years 1812–1814 are described under NAPOLEONIC CAMPAIGNS; and we need therefore note here only a few details personal to Napoleon or some considerations which influenced his policy. Firstly we may remark that the Austrian alliance furnished one of the motives which led him to refrain during the campaign of 1812 from reconstituting the Polish realm in its ancient extent. To have done so would have been a mortal affront to his ally, Austria. Certainly he needed her support during that campaign; but many good judges have inclined to the belief that the whole-hearted support of Poles and Lithuanians would have been of still greater value, and that the organization of their resources might well have occupied him during the winter of 1812–1813, and would have furnished him with a new and advanced base from which to strike at the heart of Russia in the early summer of 1813. If the Austrian alliance was chiefly responsible for his rejection of that statesmanlike plan, which he had before him at Smolensk, it certainly deserves all the hard things said of it by the champions of Josephine.

Another consideration which largely conduced to the disasters of the retreat was Napoleon's postponement of any movement back from Moscow to the date of October 19th, and this is known to have resulted from his conviction that the tsar would give way as he had done at Tilsit. Napoleon's habit of clinging to his own preconceptions never received so strange and disastrous an illustration as it did during the month spent at Moscow. On the other hand, his desertion of the army on the 5th of December, not long after the crossing of the river Beresina, is a thoroughly defensible act. He had recently heard of the attempt of a French republican general, Malet, to seize the public offices at Paris, a quixotic adventure which had come surprisingly near to success owing to the assurance with which that officer proclaimed the news of the emperor's death in Russia. In such a case, the best retort was to return in all haste in order to put more energy into the huge centralized organism which the emperor alone could work. His rapid return from Spain early in 1809, and now again from Lithuania at the close of 1812, gives an instructive glimpse into the anxiety which haunted the mind of the autocrat. He believed that, imposing as his position was, it rested on the prestige won by matchless triumphs. Witness his illuminating statement to Volney during the Consulate: "Why should France fear my ambition? I am but the magistrate of the republic. I merely act upon the imagination of the nation. When that fails me I shall be nothing, and another will succeed me."

To this cause we may ascribe his constant efforts to dazzle France by grandiose adventures and by swift, unexpected movements. But she had now come profoundly to distrust him. Her thirst for glory had long since been slaked, and she longed for peaceful enjoyment of the civic boons which he had conferred upon her in that greatest period of his life, the Consulate. That the Russian campaign of 1812 was the last device for assuring the success of the Continental System and the ruin of England was nothing to the great mass of Frenchmen. They were weary of a means of pacification which produced endless wars abroad and misery at home. True, England had suffered, but she was mistress of the seas and had won a score of new colonies. France had subjected half the continent; but her hold on Spain was weakened by Wellington's blow at Salamanca; and now Frenchmen heard that their army in Russia was "dead." At home many industries were suffering from the lack of tropical and colonial produce: cane sugar sold at five, and coffee at seven, shillings the pound. The constant use of chicory for coffee, and of woad for indigo, was apt to produce a reaction in favour of a humdrum peaceful policy; and yet, by a recent imperial decree, Frenchmen had the prospect of seeing the use of the new and imperfectly made beet sugar enforced from the 1st of January 1813, after which date all cane sugar was excluded as being of British origin. Shortly before starting for the Russian expedition Napoleon vainly tried to reassure the merchants and financiers of France then face to face with a sharp financial crisis. Now at the close of 1812 matters were worse, and Napoleon, on reaching Paris, found the nation preoccupied with the task of finding out how many Frenchmen had survived the Russian campaign.

Yet, despite the discontent seething in many quarters, France responded to his appeal for troops; but she did so mechanically and without hope. Early in January 1813 the senate promised that 350,000 conscripts should be enrolled; but 150,000 of them were under twenty years of age, and mobile columns had to be used to sweep in the recruits, especially in Brittany, the Netherlands and the newly annexed lands of North Germany.

In the old provinces of France Napoleon's indomitable will overcame all difficulties of a material kind. Forces, inexperienced but devoted, were soon on foot; and he informed his German allies that he would allow the Russians to advance into Central Germany so as to ensure their destruction. As for the "treason" of General York, who had come to terms with the Russians, it moved him merely to scorn and contempt. He altogether underrated the importance of the national movement in Prussia. If Prussian towns "behaved badly" (he wrote on the 4th of March), they were to be burnt; Eugène was not to spare even Berlin. Prussia (he wrote on the 14th of March) was a weak country. She could not put more than 40,000 men in the field (the number to which he had limited her in September 1808). He therefore heard without dismay at the end of March that Prussia had joined Russia in a league in which Sweden was now an active participant.

It was clear that the spiritual forces of the time were also slipping out of his grasp. Early in January he sought to come to terms with the pope (then virtually a captive at Fontainebleau) respecting various questions then in debate concerning the Concordat. At first the emperor succeeded in persuading the aged pontiff to sign the preliminaries of an agreement, known as the "Fontainebleau Concordat" (25th of January 1813); but, on its insidious character becoming apparent, Pius VII. revoked his consent, as having been given under constraint. Nevertheless Napoleon ordered the preliminary agreement to be considered as a definitive treaty, and on the 2nd of April gave instructions that one of the refractory cardinals should be carried off secretly by night from Fontainebleau, while the pontiff was to be guarded more closely than before. On these facts becoming known, a feeling of pity for the pope became widespread; and the opinion of the Roman Catholic world gradually turned against the emperor while he was fighting to preserve his supremacy in Germany. "I am following the course of events: I have always marched with them." Such were his words uttered shortly before his departure from Paris (15th of April). They proved that he misread events and misunderstood his own position.

The course of the ensuing campaigns was to reveal the hardening of his mental powers. Early in April he sought to gain the help of 100,000 Austrian troops by holding out to Francis of Austria the prospect of acquiring Silesia from Prussia. The offer met with no response, Austria having received from the allies vaguely alluring offers that she might arrange matters as she desired in Italy and South Germany. Napoleon began to suspect his father-in-law, and still more the Austrian chancellor, Metternich; but instead of humouring them, he resolved to stand firm. The Austrian demands, first presented to him on the 16th of May, shortly after his victory of Lützen, were (1) the dissolution of the grand duchy of Warsaw, (2) the withdrawal of France from the lands of north-west Germany annexed in 1810 and (3) the cession to Austria of the Illyrian provinces wrested from her in 1809. Other terms were held in reserve to be pressed if occasion admitted; but these were all that were put forward at the moment. On this basis Austria was ready to offer her armed mediation to the combatants. Napoleon would not hear of the terms. "I will not have your armed mediation. You are only confusing the whole question. You say you cannot act for me; you are strong, then, only against me." This outburst of temper was a grave blunder. His threats alarmed the Austrian court. At bottom the emperor Francis, perhaps also Metternich, wanted peace, but on terms which the exhaustion of the combatants would enable them to dictate. Yet during the armistice which ensued (June 4th–July 20th; afterwards prolonged to August 10th) Napoleon did nothing to soothe the Viennese government, and that, too, despite the encouragement which the allies received from the news of Wellington's victory at Vittoria and the entry of Bernadotte with a Swedish contingent on the scene. Austria now proposed the terms named above with the addition that the Confederation of the Rhine must be dissolved, and that Prussia should be placed in a position as good as that which she held in 1805, that is, before the campaign of Jena. On the 27th of June she promised to join the allies in case Napoleon should not accept these terms.

He was now at the crisis of his career. Events had shown that, even after losing half a million of men in Russia, he was a match for her and Prussia combined. Would he now accept the Austrian terms and gain a not disadvantageous peace, for which France was yearning? These terms, it should be noted, would have kept Napoleon's empire intact except in Illyria; while the peace would have enabled him to reorganize his army and recover a host of French prisoners from Russia. His signing of the armistice seemed to promise as much. To give his enemies a breathing space when they were hard pressed was an insane proceeding unless he meant to make peace. But there is nothing in his words or actions at this time to show that he desired peace except on terms which were clearly antiquated. His letters breathe the deepest resentment against Austria, and show that he burned to chastise her for her "perfidy" as soon as his cavalry was reorganized. His actions at this time have been ascribed to righteous indignation against Metternich's double-dealing; and in a long interview at the Marcolini palace at Dresden on the 26th of June he asked the chancellor point blank how much money England had given him for his present conduct. As for himself he cared little for the life of a million of men. He had married the daughter of the emperor: it was a mistake, but he would bury the world under the ruins. Talk in this Ossian-like vein showed that Napoleon's brain no longer worked clearly: it was a victim to his egotism and passion. July and the first decade of August came and went, but brought no sign of pacification. The emperor Francis made a last effort to influence his son-in-law through Marie Louise. It was in vain. Nothing could bend that cast iron will. Nothing remained but to break it. On the expiration of the armistice at midnight of August 10th-11th Austria declared war.

After the disastrous defeat of Leipzig (17th–19th October 1813), when French domination in Germany and Italy vanished like an exhalation, the allies gave Napoleon another opportunity to come to terms. The overtures known as the Frankfort terms were ostensibly an answer to the request for information which Napoleon made at the field of Leipzig. Metternich persuaded the tsar and the king of Prussia to make a declaration that the allies would leave to Napoleon the "natural boundaries" of France—the Rhine, Alps, Pyrenees and Ocean. The main object of the Austrian chancellor probably was to let Napoleon once more show to the world his perverse obstinacy. If this was his aim, he succeeded. Napoleon on his return to St Cloud inveighed against his ministers for talking so much about peace and declared that he would never give up Holland; France must remain a great empire, and not sink to the level of a mere kingdom. He would never give up Holland; rather than do that, he would cut the dykes and give back that land to the sea. Accordingly on the 16th of November he sent a vague and unsatisfactory reply to the allies; and though Caulaincourt (who now replaced Maret as foreign minister) was on the 2nd of December charged to give a general assent to their terms, yet that assent came too late. The allies had now withdrawn their offer. Napoleon certainly believed that the offer was insincere. Perhaps he was right; but even in that case he should surely have accepted the offer so as to expose their insincerity. As it was, they were able to contrast their moderation with his wrongheadedness, and thereby seek to separate his cause from that of France. In this they only partially succeeded. Murat now joined the allies; Germany, Switzerland and Holland were lost to Napoleon; but when the allies began to invade Alsace and Lorraine, they found the French staunch in his support. He was still the peasants' emperor. The feelings of the year 1792 began to revive. Never did Napoleon and France appear more united than in the campaign of 1814.

Nevertheless it led to his abdication. Once more the allies consented to discuss the terms of a general pacification; but the discussions at the congress of Châtillon (5th of February–19th of March) had no result except to bring to light a proof of Napoleon's insincerity. Thereupon the allies resolved to have no more dealings with him. As his chances of success became more and more desperate, he ventured on a step whereby he hoped to work potently on the pacific desires of the emperor Francis. Leaving Paris for the time to its own resources, he struck eastwards in the hope of terrifying that potentate and of detaching him from the coalition. The move not only failed, but it had the fatal effect of uncovering Paris to the northern forces of the allies. The surrender of the capital, where he had centralized all the governing powers, was a grave disaster. Equally fatal was the blow struck at him by the senate, his own favoured creation. Convoked by Talleyrand on the 1st of April, it pronounced the word abdication on the morrow. For this Napoleon cared little, provided that he had the army behind him. But now the marshals and generals joined the civilians. The defection of Marshal Marmont and his soldiery on the 4th of April rendered further thoughts of resistance futile. To continue the strife when Wellington was firmly established on the line of the Garonne, and Lyons and Bordeaux had hoisted the Bourbon *fleur de lys*, was seen by all but Napoleon to be sheer madness; but it needed the pressure of his marshals in painful interviews at Fontainebleau to bring him to reason.

At last, on the 11th of April, he wrote the deed of abdication. On that night he is said to have tried to end his life by poison. The evidence is not convincing; and certainly his recovery was very speedy. On the 20th he bade farewell to his guard and set forth from Fontainebleau for Elba, which the powers had very reluctantly, and owing to the pressure of the tsar, awarded to him as a possession. He was to keep the title of emperor. Marie Louise was to have the duchy of Parma for herself and her son. She did not go with her consort. Following the advice of her father, she repaired to Vienna along with the little king of Rome. As for France, she received the Bourbons, along with the old frontiers.

Meanwhile Napoleon, after narrow escapes from royalist mobs in Provence, was conducted in the British cruiser "Undaunted" to Elba. There he spent eleven months in uneasy retirement, watching with close interest the course of events in France. As he foresaw, the shrinkage of the great empire into the realm of old France caused infinite disgust, a feeling fed every day by stories of the tactless way in which the Bourbon princes treated veterans of the Grand Army. Equally threatening was the general situation in Europe. The demands of the tsar Alexander were for a time so exorbitant as to bring the powers at the congress of Vienna to the verge of war. Thus, everything portended a renewal of Napoleon's activity. The return of French prisoners from Russia, Germany, England and Spain would furnish him with an army far larger than that which had won renown in 1814. So threatening were the symptoms that the royalists at Paris and the plenipotentiaries at Vienna talked of deporting him to the Azores, while others more than hinted at assassination.

He solved the problem in characteristic fashion. On the 26th of February 1815, when the English and French guardships were absent, he slipped away from Porto Ferrajo with some 1000 men and landed near Antibes on the 1st of March. Except in royalist Provence he received everywhere a welcome which attested the attractive power of his personality and the nullity of the Bourbons. Firing no shot in his defence, his little troop swelled until it became an army. Ney, who had said that Napoleon ought to be brought to Paris in an iron cage, joined him with 6000 men on the 14th of March; and five days later the emperor entered the capital, whence Louis XVIII. had recently fled.

Napoleon was not misled by the enthusiasm of the provinces and Paris. He knew that love of novelty and contempt for the gouty old king and his greedy courtiers had brought about this bloodless triumph; and he felt instinctively that he had to deal with a new France, which would not tolerate despotism. On his way to Paris he had been profuse in promises of reform and constitutional rule. It remained to make good those promises and to disarm the fear and jealousy of the great powers. This was the work which he set before himself in the Hundred Days (19th of March to 22nd of June 1815). Were his powers, physical as well as mental, equal to the task? This is doubtful. Certainly the evidence as to his health is somewhat conflicting. Some persons (as, for instance, Carnot, Pasquier, Lavalette and Thiébault) thought him prematurely aged and enfeebled. Others again saw no marked change in him; while Mollien, who knew the emperor well, attributed the lassitude which now and then came over him to a feeling of perplexity caused by his changed circumstances. This explanation seems to furnish a correct clue. The autocrat felt cramped and chafed on all sides by the necessity of posing as a constitutional sovereign; and, while losing something of the old rigidity, he lost very much of the old energy, both in thought and action. His was a mind that worked wonders in well-worn grooves and on facts that were well understood. The necessity of devising compromises with men who had formerly been his tools fretted him both in mind and body. But when he left parliamentary affairs behind, and took the field, he showed nearly all the power both of initiative and of endurance which marked his masterpiece, the campaign of 1814. To date his decline, as Chaptal does, from the cold of the Moscow campaign is clearly incorrect. The time of lethargy at Elba seems to have been more unfavourable to his powers than the cold of Russia. At Elba, as Sir Neil Campbell noted, he became inactive and proportionately corpulent. There, too, as sometimes in 1815, he began to suffer intermittently from ischury, but to no serious extent. On the whole it seems safe to assert that it was the change in France far more than the change in his health which brought about the manifest constraint of the emperor in the Hundred Days. His words to Benjamin Constant—"I am growing old. The repose of a constitutional king may suit me. It will more surely suit my son"—show that his mind seized the salient facts of the situation; but his instincts struggled against them. Hence the *malaise* both of mind and body.

The attempts of the royalists gave him little concern: the duc d'Angoulême raised a small force for Louis XVIII. in the south, but at Valence it melted away in front of Grouchy's command; and the duke, on the 9th of April, signed a convention whereby they received a free pardon from the emperor. The royalists of la Vendée were later in moving and caused more trouble. But the chief problem centred in the constitution. At Lyons, on the 13th of March, Napoleon had issued an edict dissolving the existing chambers and ordering the convocation of a national mass meeting, or *Champ de Mai*, for the purpose of modifying the constitution of the Napoleonic empire. That work was carried out by Benjamin Constant in concert with the emperor. The resulting *Acte additionel* (supplementary to the constitutions of the empire) bestowed on France an hereditary chamber of peers and a chamber of representatives elected by the "electoral colleges" of the empire, which comprised scarcely one hundredth part of the citizens of France. As Châteaubriand remarked, in reference to Louis XVIII.'s constitutional charter, the new constitution—*La Benjamine*, it was dubbed—was merely a slightly improved charter. Its incompleteness displeased the liberals; only 1,532,527 votes were given for it in the *plêbiscite*, a total less than half of those of the *plêbiscites* of the Consulate. Not all the gorgeous display of the *Champ de Mai* (held on the 1st of June) could hide the discontent at the meagre fulfilment of the promises given at Lyons. Napoleon ended his speech with the words: "My will is that of the people: my rights are its rights." The words rang hollow, as was seen when, on the 3rd of June, the deputies chose, as president of their chamber, Lanjuinais, the staunch liberal who had so often opposed the emperor. The latter was with difficulty dissuaded from quashing the election. Other causes of offence arose, and Napoleon in his last communication to them warned them not to imitate the Greeks of the later Empire, who engaged in subtle discussions when the ram was battering at their gates. On the morrow (12th of June) he set out for the northern frontier. His spirits rose at the prospect of rejoining the army. At St Helena he told Gourgaud that he intended in 1815 to dissolve the chambers as soon as he had won a great victory.

In point of fact, the sword alone could decide his fate, both in internal and international affairs. Neither France nor Europe took seriously his rather vague declaration of his contentment with the rôle of constitutional monarch of the France of 1815. No one believed that he would be content with the "ancient limits." So often had he declared that the Rhine and Holland were necessary to France that every one looked on his present assertions as a mere device to gain time. So far back as the 13th of March, six days before he reached Paris, the powers at Vienna declared him an outlaw; and four days later Great Britain, Russia, Austria and Prussia bound themselves to put 150,000 men into the field to end his rule. Their recollection of his conduct during the congress of Châtillon was the determining fact at this crisis; his professions at Lyons or Paris had not the slightest effect; his efforts to detach Austria from the coalition, as also the feelers put forth tentatively by Fouché at Vienna, were fruitless. The coalitions, once so brittle as to break at the first strain, had now been hammered into solidity by his blows. If ever a man was condemned by his past, Napoleon was so in 1815.

On arriving at Paris three days after Waterloo he still clung to the hope of concerting national resistance; but the temper of the chambers and of the public generally forbade any such attempt. The autocrat and Lucien Bonaparte were almost alone in believing that by dissolving the chambers and declaring himself dictator, he could save France from the armies of the powers now converging on Paris. Even Davout, minister of war, advised him that the destinies of France rested solely with the chambers. That was true. The career of Napoleon, which had lured France far away from the principles of 1789, now brought her back to that starting-point; just as, in the physical sphere, his campaigns from 1796–1814 had at first enormously swollen her bulk and then subjected her to a shrinkage still more portentous. Clearly it was time to safeguard what remained; and that could best be done under Talleyrand's shield of legitimacy. Napoleon himself at last divined that truth. When Lucien pressed him to "dare," he replied "Alas, I have dared only too much already." On the 22nd of June he abdicated in favour of his son, well knowing that that was a mere form, as his son was in Austria. On the 25th of June he received from Fouché, the president of the newly appointed provisional government, an intimation that he must leave Paris. He retired to Malmaison, the home of Josephine, where she had died shortly after his first abdication. On the 29th of June the near approach of the Prussians (who had orders to seize him, dead or alive), caused him to retire westwards towards Rochefort, whence he hoped to reach the United States. But the passports which the provisional government asked from Wellington were refused, and as the country was declaring for the Bourbons, his position soon became precarious. On his arrival at Rochefort (3rd of July) he found that British cruisers cut off his hope of escape. On the 9th of July he received an order from the provisional government at Paris to leave France within twenty-four hours. After wavering between various plans, he decided on the 13th of July to cast himself on the generosity of the British government, and dictated a letter to the prince regent in which he compared himself to Themistocles seating himself at the hearth of his enemy. His counsellor, Las Cases, strongly urged that step and made overtures to Captain Maitland of H.M.S. "Bellerophon." That officer, however, was on his guard, and, while offering to convey the emperor to England declined to pledge himself in any way as to his reception. It was on this understanding (which Las Cases afterwards misrepresented) that Napoleon on the 15th of July mounted the deck of the "Bellerophon." No other course remained. Further delay after the 15th of July would have led to his capture by the royalists, who were now everywhere in the ascendant. In all but name he was a prisoner of Great Britain, and he knew it.

The rest of the story must be told very briefly. The British government, on hearing of his arrival at Plymouth, decided to send him to St Helena, the formation of that island being such as to admit of a certain freedom of movement for the august captive, with none of the perils for the world at large which the tsar's choice, Elba, had involved. To St Helena, then, he proceeded on board of H.M.S. "Northumberland." The title of emperor, which he enjoyed at Elba, had been forfeited by the adventure of 1815, and he was now treated officially as a general. Nevertheless, during his last voyage he enjoyed excellent health even in the tropics, and seemed less depressed than his associates, Bertrand, Gourgaud, Las Cases and Montholon. He landed at St Helena on the 17th of October. He resided first at "The Briars" with the Balcombes, and thereafter at Longwood, when that residence was ready for him. The first governor of the island, General Wilks, was soon superseded, it being judged that he was too amenable to influence from Napoleon; his successor was Sir Hudson Lowe.

Napoleon's chief relaxations at St Helena were found in the dictation of his memoirs to Montholon, and the compilation of monographs on military and political topics. The memoirs (which may be accepted as mainly Napoleon's, though Montholon undoubtedly touched them up) range over most of the events of his life from Toulon to Marengo. The military and historical works comprise *précis* of the wars of Julius Caesar, Turenne and Frederick the Great. He began other accounts of the campaigns of his own age; but they are marred by his having had few trustworthy documents and statistics at hand. On a lower level as regards credibility stands the *Mémorial de Sainte-Hélène*, compiled by Las Cases from Napoleon's conversations with the obvious aim of creating a Napoleonic legend. Nevertheless the *Mémorial* is of great interest—*e.g.* the passage (iv. 451-454) in which Napoleon reflects on the ruin wrought to his cause by the war in Spain, or that (iii. 130) dealing with his fatal mistake in not dismembering Austria after Wagram, and in marrying an Austrian princess—"There I stepped on to an abyss covered with flowers"; or that again (iii. 79) where he represented himself as the natural arbiter in the immense struggle of the present against the past, and asserted that in ten years' time Europe would be either Cossack or republican. It is noteworthy that in Gourgaud's *Journal de Ste. Hélène* there are very few reflections of this kind and the emperor appears in a guise far more life-like. But in the works edited by Montholon and Las Cases, where the political aim constantly obtrudes itself, the emperor is made again and again to embroider on the theme that he had always been the true champion of ordered freedom. This was the *mot d'ordre* at Longwood to his companions, who set themselves deliberately to propagate it. The folly of the monarchs of the Holy Alliance in Europe gained for the writings of Montholon and Las Cases (that of Gourgaud was not published till 1899) a ready reception, with the result that Napoleon reappeared in the literature of the ensuing decades wielding an influence scarcely less potent than that of the grey-coated figure into whose arms France flung herself on his return from Elba. All that he had done for her in the days of the Consulate was remembered; his subsequent proceedings—his tyranny, his shocking waste of human life, his deliberate persistence in war when France and Europe called for a reasonable and lasting peace—all this was forgotten; and the great warrior, who died of cancer on the 5th of May 1821, was thereafter enshrouded in mists of legend through which his form loomed as that of a Prometheus condemned to a lingering agony for his devotion to the cause of humanity. It was this perversion of fact which rendered possible the career of Napoleon III.

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(*c*) Administration, Finance, Education. (For the *Code Napoléon* see CODE.) *J. Pelet de la Lozère, *Opinions de Napoléon sur divers sujets de politique et d'administration* (Paris, 1833); Damas-Hinard, *Napoléon, ses opinions et jugements sur les hommes et sur les choses* (2 vols., Paris, 1838); L. Aucoc, *Le Conseil d'état avant et depuis 1789* (Paris, 1876); E. Monnet, *Histoire de l'administration provinciale, departmentale et communale en France* (Paris, 1885); F. A. Aulard, *Paris sous le Consulat* (Paris, 1903, seq.); L. de Lanzac de Laborie, *Paris sous Napoléon* (Paris, 1905, seq.); A. Edmond-Blanc, *Napoléon I., ses institutions civiles et administratives* (Paris, 1880); H. Welschinger, *La Censure sous le premier Empire* (Paris, 1882); C. van Schoor, *La Presse sous le consulat et l'empire* (Brussels, 1899); M. C. Gaudin (Duc de Gaëte), *Notice historique sur les finances de la France, 1800–1814* (Paris, 1818); R. Stourm, *Les Finances du consulat* (Paris, 1902); J. B. G. Fabry, *Le Génie de la révolution considéré dans l'éducation* (3 vols., Paris, 1817–1818); F. Guizot, *Essai sur l'histoire et l'état actuel de l'instruction publique* (Paris, 1816); C. Schmidt, *La Réforme de l'Université impériale en 1811* (Paris, 1905). The memoirs of Chaptal, Méneval, Mollien, Ouvrard and Pasquier deal largely with these subjects. Those of Bourrienne and Fouché are of doubtful authority; the latter are certainly not genuine.

(*d*) Diplomacy and General Policy: Besides the works named under A, the following may be named as more especially applicable to this section: A. Lefebvre, *Histoire des cabinets de l'Europe pendant le consulat et l'empire* (3 vols., Paris, 1845–1847); C. Auriol, *La France, l'Angleterre, et Napoléon, 1803–1806* (Paris, 1905); B. Bailleu, *Preussen und Frankreich von 1795–1807; Diplomatische Correspondenzen* (2 vols., Leipzig, 1881–1887); Comte D. de Barral, *Étude sur l'histoire diplomatique de l'Europe* (2nd part), *1789–1815*, vol. i. (Paris, 1885); O. Browning, *England and Napoleon in 1803* (London, 1887); H. M. Bowman, *Preliminary Stages of the Peace of Amiens* (Toronto, 1900); *Coquelle, *Napoléon et l'Angleterre, 1803–1815* (Paris, 1904); A. Vandal, *Napoléon et Alexandre I*^{er} (3 vols., Paris, 1891–1893); W. Oncken, *Oesterreich und Preussen im Befreiungskriege* (2 vols., Berlin, 1876); H. A. L. Fisher, *Napoleonic Statesmanship: Germany* (Oxford, 1903); A. Rambaud, *La Domination française en Allemagne* (2 vols., Paris, 1873–1874); G. Roloff, *Die Kolonialpolitik Napoleons I.* (Munich, 1899) and *Politik und Kriegführung während des Feldzuges von 1814* (Berlin, 1891); A. Fournier, *Der Congress von Châtillon* (Vienna and Prague, 1900); F. Gruyer, *Napoléon, roi de l'Île d'Elbe* (Paris, 1906); *H. Houssaye, *1815* (3 vols., Paris, 1898–1905); C. M. Talleyrand (Prince de Benevento), *Lettres inédites à Napoléon, 1800–1809* (Paris, 1889).

IV. Closing Years (from the second abdication, June 22nd 1815, to death). Captain F. L. Maitland, *Narrative of the Surrender of Bonaparte* (London, 1826; new ed., 1904); Sir T. Ussher, *Napoleon's Last Voyages* (London, 1895; new ed., 1906); G. Gourgaud, *Sainte-Hélène: Journal inédite de 1815 à 1818* (2 vols., Paris, 1899); Marquis C. J. de Montholon, *Récits de la captivité de l'empereur Napoléon à Ste Hélène* (2 vols., Paris, 1847); Comte E. P. D. de Las Cases, *Mémorial de Ste Hélène* (4 vols., London and Paris, 1823); Lady Malcolm, *A Diary of St Helena* (London, 1899); W. Forsyth, *History of the Captivity of Napoleon at St Helena* (3 vols., London 1853); R. C. Seaton, *Napoleon's Captivity in Relation to Sir Hudson Lowe* (London, 1903); Basil Jackson, *Notes and Reminiscences of a Staff Officer* (London, 1903); Earl of Rosebery, *Napoleon: the Last Phase* (1900); J. H. Rose, *Napoleonic Studies* (London, 1904).

Many of the works relating to Napoleon's detention at St Helena are perversions of the truth, *e.g.* O'Meara's *A Voice from St Helena* (London. 1822). The works of Las Cases and Montholon should also be read with great caution. The same remark applies to Mrs L. A. Abell's *Recollections of the Emperor Napoleon* (London, 1844), W. Warden's *Letters written on Board H.M.S. "Northumberland"* (London, 1816) and J. Stokoe's *With Napoleon at St Helena* (Eng. ed., London, 1902). Santini's *Appeal to the British Nation* (London, 1817) and the *Manuscrit venu de Ste Hélène d'une manière inconnue* (London, 1817) are forgeries. (J. HL. R.)

NAPOLEON II., emperor of the French, the style given by the Bonapartists to the son of Napoleon I., Napoleon Francis Joseph Charles, duke of Reichstadt (*q.v.*). The fact that in 1814, by Napoleon I.'s abdication in his favour, the king of Rome (as he was then styled) became for a few days titular emperor "by the will of the people," was held by Prince Louis Napoleon to justify his own assumption of the style of Napoleon III. which, as seeming to involve a dynastic claim, gave such offence to the legitimist powers, notably the emperor Nicholas I. of Russia.

NAPOLEON III. [CHARLES LOUIS NAPOLEON BONAPARTE] (1808–1873), emperor of the French, was born on the 20th of April 1808 in Paris at 8 rue Cerutti (now rue Laffitte), and not at the Tuileries, as the official historians state. He was the third son of Louis Bonaparte (see BONAPARTE), brother of Napoleon I., and from 1806 to 1810 king of Holland, and of Hortense de Beauharnais, daughter of General (de) Beauharnais and Josephine Tascher de la Pagerie, afterwards the empress Josephine; hence he was at the same time the nephew and the adopted grandson of the great emperor. Of the two other sons of Louis Bonaparte and Hortense, the elder, Napoleon Charles (1802–1807), died of croup at The Hague; the second, Napoleon Louis (1804–1831), died in the insurrection of the Romagna, leaving no children. Doubts have been cast on the legitimacy of Louis Napoleon; for the discord between Louis Bonaparte, who was ill, restless and suspicious, and his pretty and capricious wife was so violent and open as to justify all conjectures. But definite evidence, in the shape of letters and references in memoirs, enables us to deny that the Dutch Admiral Verhuell was the father of Louis Napoleon, and there is strong evidence of resemblance in character between King Louis and his third son. He early gave signs of a grave and dreamy character. Many stories have been told about his childhood, for example the remark which Napoleon I. is said to have made about him: "Who knows whether the future of my race may not lie in this child." It is certain that, after the abdication and exile of Louis, Hortense lived in France with her two children, in close relation with the imperial court. During the Hundred Days, Louis Napoleon, then a child of seven, witnessed the presentation of the eagles to 50,000 soldiers; but a few weeks later, before his departure for Rochefort, the defeated Napoleon embraced him for the last time, and his mother had to receive Frederick William III. of Prussia and his two sons at the château of Saint-Leu; here the victor and the vanquished of Sedan met for the first time, and probably played together.

After Waterloo, Hortense, suspected by the Bourbons of having arranged the return from Elba, had to go into exile. The ex-king Louis, who now lived at Florence, had compelled her by a scandalous law-suit to give up to him the elder of her two children. With her remaining child she wandered, under the name of duchesse de Saint-Leu, from Geneva to Aix, Carlsruhe and Augsburg. In 1817 she bought the castle of Arenenberg, in the canton of Turgau, on a wooded hill looking over the Lake of Constance. Hortense supervised her son's education in person, and tried to form his character. His tutor was Philippe Le Bas, son of the well-known member of the Convention and follower of Robespierre, an able man, imbued with the ideas of the Revolution, while Vieillard, who instructed him in the rudiments, was a democratic imperialist also inspired with the ideal of nationalism. The young prince also studied at the gymnasium at Augsburg, where his love of work and his mental qualities were gradually revealed; he was less successful in mathematics than in literary subjects, and he became an adept at physical exercises, such as fencing, riding and swimming. It was at this time that he acquired the slight German accent which he never lost. Those who educated him never lost sight of the future; but it was above all his mother, fully confident of the future destiny of the Bonapartes, who impressed on him the idea that he would be king, or at any rate, that he would accomplish some great works. "With your name," she said, "you will always count for something, whether in the old world of Europe or in the new." If we may believe Mme Cornu, he already at the age of twelve had dreams of empire.

In 1823 he accompanied his mother to Italy, visiting his father at Florence, and his grandmother Letitia at Rome, and dreaming with Le Bas on the banks of the Rubicon. He returned to Arenenburg to complete his military education under Colonel Armandi and Colonel Dufour, who instructed him in artillery and military engineering. At the age of twenty he was a "Liberal," an enemy of the Bourbons and of the treaties of 1815; but he was dominated by the cult of the emperor, and for him the liberal ideal was confused with the Napoleonic.

The July revolution of 1830, of which he heard in Italy, roused all his young hopes. He could not return to France, for the law of 1816 banishing all his family had not been abrogated. But the liberal revolution knew no frontiers. Italy shared in the agitation. He had already met some of the conspirators at Arenenberg, and it is practically established that he now joined the associations of the Carbonari. Following the advice of his friend the Count Arese and of Menotti, he and his brother were among the revolutionaries who in February 1831 attempted a rising in Romagna and the expulsion of the pope from Rome. They distinguished themselves at Civita Castellana, a little town which they took; but the Austrians arrived in force, and during the retreat Napoleon Louis, the elder son, took cold, followed by measles, of which he died. Hortense hurried to the spot and took steps which enabled her to save her second son from the Austrian prisons. He escaped into France, where his mother, on the plea of his illness, obtained permission from Louis Philippe for him to stay in Paris. But he intrigued with the republicans, and Casimir-Périer insisted on the departure of both mother and son. In May 1831 they went to London, and afterwards returned to Arenenberg.

For a time he thought of responding to the appeal of some of the Polish revolutionaries, but Warsaw succumbed (September 1831) before he could set out. Moreover the plans of this young and visionary *enfant du siècle* were becoming more definite. The duke of Reichstadt died in 1832. His uncle, Joseph, and his father, Louis, showing no desire to claim the inheritance promised them by the constitution of the year XII., Louis Napoleon henceforth considered himself as the accredited representative of the family. Those who came in contact with him noticed a transformation in his character; he tried to hide his natural sensibility under an impassive exterior, and concealed his political ambitions. He became indeed "*doux entête*" (gentle but obstinate) as his mother called him, persistent in his ideas and always ready to return to them, though at the same time yielding and drawing back before the force of circumstances. He endeavoured to define his ideas, and in 1833 published his *Rêveries politiques, suivies d'un projet de constitution*, and *Considérations politiques et militaires sur la Suisse;* in 1836, as a captain, in the Swiss service, he published a *Manuel d'artillerie*, in order to win popularity with the French army. A phrase of Montesquieu, placed at the head of this work, sums up the views of the young theorist: "The people, possessing the supreme power, should do for itself all that it is able to do; what it cannot do well, it must do through its elected representatives." The supreme authority entrusted to the elect of the people was always his essential idea. But the problem was how to realize it. Louis Napoleon could feel vaguely the state of public opinion in France, the longing for glory from which it suffered, and the deep-rooted discord between the nation and the king, Louis Philippe, who though sprung from the national revolution against the treaties of 1815, was yet a partisan of peace at any price. Both Châteaubriand and Carrel had praised the prince's first writings. Bonapartists and republicans found common ground in the glorious tradition sung by Béranger. A military conspiracy like those of Berton or the sergeants of La Rochelle, seemed feasible to Napoleon. A new friend of his, Fialin, formerly a non-commissioned officer and a journalist, an energetic and astute man and a born conspirator, spurred him on to action.

With the aid of Fialin and Eléonore Gordon, a singer, who is supposed to have been his mistress, and with the co-operation of certain officers, such as Colonel Vaudrey, an old soldier of the Empire, commanding the 4th regiment of artillery, and Lieutenant Laity, he tried to bring about a revolt of the garrison of Strassburg (October 30, 1836). The conspiracy was a failure, and Louis Philippe, fearing lest he might make the pretender popular either by the glory of an acquittal or the aureole of martyrdom, had him taken to Lorient and put on board a ship bound for America, while his accomplices were brought before the court of assizes and acquitted (February 1837). The prince was set free in New York in April; by the aid of a false passport he returned to Switzerland in August, in time to see his mother before her death on the 3rd of October 1837.

At any other time this attempt would have covered its author with ridicule. Such, at least, was the opinion of the whole of the family of Bonaparte. But his confidence was unshaken, and in the woods of Arenenberg the romantic-minded friends who remained faithful to him still honoured him as emperor. And now the government of Louis Philippe, by an evil inspiration, began to act in such a way as to make him popular. In 1838 it caused his partisan Lieutenant Laity to be condemned by the Court of Peers to five years' imprisonment for a pamphlet which he had written to justify the Strassburg affair; then it demanded the expulsion of the prince from Switzerland, and when the Swiss government resisted, threatened war. Having allowed the July monarch to commit himself, Louis Napoleon at the last moment left Switzerland voluntarily. All this served to encourage the mystical adventurer. In London, where he had taken up his abode, together with Arese, Fialin (says Persigny), Doctor Conneau and Vaudrey, he was at first well received in society, being on friendly terms with Count d'Orsay and Disraeli, and frequenting the *salon* of Lady Blessington. He met with various adventures, being present at the famous tournament given by Lord Eglinton, and yielded to the charm of his passionate admirer Miss Howard. But it was a studious life, as well as the life of a dandy, that he led at Carlton House Terrace. Not for a minute did he forget his mission: "Would you believe it," the duke of Wellington wrote of him, "this young man will not have it said that he is not going to be emperor of the French. The unfortunate affair of Strassburg has in no way shaken this strange conviction, and his chief thoughts are of what he will do when he is on the throne." He was in fact evolving his programme of government, and in 1839 wrote and published his book: *Des Idées napoléoniennes*, a curious mixture of Bonapartism, socialism and pacificism, which he represented as the tradition of the First Empire. He also followed attentively the fluctuations of French opinion.

Since 1838 the Napoleonic propaganda had made enormous progress. Not only did certain newspapers, such as the *Capitole* and the *Journal du Commerce*, and clubs, such as the *Culottes de peau* carry it on zealously; but the diplomatic humiliation of France in the affair of Mehemet Ali (*q.v.*) in 1840, with the outburst of patriotism which accompanied it, followed by the concessions made by the government to public opinion, such as, for example, the bringing back of the ashes of Napoleon I., all helped to revive revolutionary and Napoleonic memories.

The pretender, again thinking that the moment had come, formed a fresh conspiracy. With a little band of fifty-six followers he attempted to provoke a rising of the 42nd regiment of the line at Boulogne, hoping afterwards to draw General Magnan to Lille and march upon Paris. The attempt was made on the 6th of August 1840, but failed; he saw several of his supporters fall on the shore of Boulogne, and was arrested together with Montholon, Persigny and Conneau. This time he was brought before the Court of Peers with his accomplices; he entrusted his defence to Berryer and Marie, and took advantage of his trial to appeal to the supremacy of the people, which he alleged, had been disregarded, even after 1830. He was condemned to detention for life in a fortress, his friend Aladenize being deported, and Montholon, Parquin, Lombard and Fialin being each condemned to detention for twenty years. On the 15th of December, the very day that Napoleon's ashes were deposited at the Invalides, he was taken to the fortress of Ham. The country seemed to forget him; Lamartine alone foretold that the honours paid to Napoleon I. would shed lustre on his nephew. His prison at Ham was unhealthy, and physical inactivity was painful to the prince, but on the whole the régime imposed upon him was mild, and his captivity was lightened by Alexandrine Vergeot, "*la belle sabotière*," or Mdlle Badinguet (he was later nicknamed Badinguet by the republicans). His more intellectual friends, such as Mme Cornu, also came to visit him and assisted him in his studies. He corresponded with Louis Blanc, George Sand and Proudhon, and collaborated with the journalists of the Left, Degeorge, Peauger and Souplet. For six years he worked very hard "at this University of Ham," as he said. He wrote some *Fragments historiques*, studies on the sugar-question, on the construction of a canal through Nicaragua, and on the recruiting of the army, and finally, in the *Progrès du Pas-de-Calais*, a series of articles on social questions which were later embodied in his *Extinction du paupérisme* (1844). But the same persistent idea underlay all his efforts. "The more closely the body is confined," he wrote, "the more the mind is disposed to indulge in flights of imagination, and to consider the possibility of executing projects of which a more active existence would never perhaps have left it the leisure to think." On the 25th of May 1846 he escaped to London, giving as the reason for his decision the dangerous illness of his father. On the 27th of July his father died, before he could accomplish a journey undertaken in spite of the refusal of a passport by the representative of Tuscany.

He was again well received in London, and he "made up for his six years of isolation by a furious pursuit of pleasure." The duke of Brunswick and the banker Ferrère interested themselves in his future, and gave him money, as did also Miss Howard, whom he later made comtesse de Beauregard, after restoring to her several millions. He was still full of plans and new ideas, always with the same end in view; and for this reason, in spite of his various enterprises, which were sometimes ridiculous, sometimes unpleasant in their consequences, and his unscrupulousness as to the men and means he employed, he always had a kind of greatness. He always retained his faith in his star. "They will come to me without any effort of my own," he said to Taglioni the dancer; and again to Lady Douglas, who was counselling resignation, he replied, "Though fortune has twice betrayed me, yet my destiny will none the less surely be fulfilled. I wait." He was not to wait much longer.

As he well perceived, the popularity of his name, the vague "legend" of a Napoleon who was at once a democrat, a soldier and a revolutionary hero, was his only strength. But by his abortive efforts he had not yet been able to win over this immense force of tradition and turn it to his own purposes. The events which occurred from 1848 to 1852 enabled him to do so. He behaved with extraordinary skill, displaying in the heat of the conflict all the abilities of an experienced conspirator, knowing, "like the snail, how to draw in his horns as soon as he met with an obstacle" (Thiers), but supple, resourceful and unscrupulous as to the choice of men and means in his obstinate struggle for power.

At the first symptoms of revolutionary disturbance he returned to France; on the 25th of February he offered his services to the Provisional Government, but, on being requested by it to depart at once, resigned himself to this course. But Persigny, Mocquard and all his friends devoted themselves to an energetic propaganda in the press, by pictures and by songs. After the 15th of May had already shaken the strength of the young republic, he was elected in June 1848 by four departments, Seine, Yonne, Charente-Inférieure and Corsica. In spite of the opposition of the executive committee, the Assembly ratified his election. But he had learnt to wait. He sent in his resignation from London, merely hazarding this appeal: "If the people impose duties on me, I shall know how to fulfil them." This time events worked in his favour; the industrial insurrection of June made the middle classes and the mass of the rural population look for a saviour, while it turned the industrial population towards Bonapartism, out of hatred for the republican *bourgeois*. The Legitimists seemed impossible, and the people turned instinctively towards a Bonaparte.

On the 26th of September he was re-elected by the same departments; on the 11th of October the law decreeing the banishment of the Bonapartes was abrogated; on the 26th he made a speech in the Assembly defending his position as a pretender, and cut such a sorry figure that Antony Thouret contemptuously withdrew the amendment by which he had intended to bar him from rising to the presidency. Thus he was able to be a candidate for this formidable power, which had just been defined by the Constituent Assembly and entrusted to the choice of the people, "to Providence," as Lamartine said. In contrast to Cavaignac he was the candidate of the advanced parties, but also of the monarchists, who reckoned on doing what they liked with him, and of the Catholics, who gave him their votes on condition of his restoring the temporal power to Rome and handing over education to the Church. The former rebel of the Romagna, the Liberal *Carbonaro*, was henceforth to be the tool of the priests. In his very triumph appeared the ultimate cause of his downfall. On the 10th of December he was elected president of the Republic by 5,434,226 votes against 1,448,107 given to Cavaignac. On the 20th of December he took the oath "to remain faithful to the democratic Republic . . . to regard as enemies of the nation all those who may attempt by illegal means to change the form of the established government." From this time onward his history is inseparable from that of France. But, having attained to power, he still endeavoured to realize his cherished project. All his efforts, from the 10th of December 1848 to the 2nd of December 1852 tended towards the acquisition of absolute authority, which he wished to obtain, in appearance, at any rate, from the people.

It was with this end in view that he co-operated with the party of order in the expedition to Rome for the destruction of the Roman republic and the restoration of the pope (March 31, 1849), and afterwards in all the reactionary measures against the press and the clubs, and for the destruction of the Reds. But in opposition to the party of order, he defined his own personal policy, as in his letter to Edgard Ney (August 16, 1849), which was not deliberated upon at the council of ministers, and asserted his intention "of not stifling Italian liberty," or by the change of ministry on the 31st of October 1849, when, "in order to dominate all parties," he substituted for the men coming from the Assembly, such as Odilon Barrot, creatures of his own, such as Rouher and de Parieu, the Auvergne *avocats*, and Achille Fould, the banker. "The name of Napoleon," he said on this occasion, "is in itself a programme; it stands for order, authority, religion and the welfare of the people in internal affairs, and in foreign affairs for the national dignity."

In spite of this alarming assertion of his personal policy, he still remained in harmony with the Assembly (the Legislative Assembly, elected on the 28th of May 1849) in order to carry out "a Roman expedition at home," *i.e.* to clear the administration of all republicans, put down the press, suspend the right of holding meetings and, above all, to hand over education to the Church (law of the 15th of March 1850). But the machiavellian pretender, daily growing more skilful at manœuvring between different classes and parties, knew where to stop and how to keep up a show of democracy. When the Assembly, by the law of the 31st of May 1850, restricted universal suffrage and reduced the number of the electors from 9 to 6 millions, he was able to throw upon it the whole responsibility for this *coup d'état bourgeois*. "I cannot understand how you, the offspring of universal suffrage, can defend the restricted suffrage," said his friend Mme Cornu. "You do not understand," he replied, "I am preparing the ruin of the Assembly." "But you will perish with it," she answered. "On the contrary, when the Assembly is hanging over the precipice, I shall cut the rope."

In fact, while trying to compass the destruction of the republican movement of the Left, he was taking careful steps to gain over all classes. "*Prince, altesse, monsieur, monseigneur, citoyen*" (he was called by all these names indifferently at the Elysée), he appeared as the candidate of the most incompatible interests, flattering the clergy by his compliments and formal visits, distributing cigars and sausages to the soldiers, promising the prosperous bourgeoisie "order in the street" and business, while he posed as the "father of the workers," and won the hearts of the peasants. At his side were his accomplices, men ready for anything, whose only hopes were bound up with his fortunes, such as Morny and Rouher; his paid publicists, such as Romieu the originator of the "red spectre"; his cudgel-bearers, the "Ratapoils" immortalized by Daumier, who terrorized the republicans. From the Elysée by means of the mass of officials whom they had at their command, the conspirators extended their activities throughout the whole country.

He next entered upon that struggle with the Assembly, now discredited, which was to reveal to all the necessity for a change, and a change in his favour. In January 1851 he deprived Changarnier of his command of the garrison of Paris. "The Empire has come," said Thiers. The pretender would have preferred, however, that it should be brought about legally, the first step being his re-election in 1852. The Constitution forbade his re-election; therefore the Constitution must be revised. On the 19th of July the Assembly threw out the proposal for revision, thus signing its own death-warrant, and the *coup d'état* was resolved upon. He prepared for it systematically. The cabinet of the 26th of October 1851 gave the ministry for war to his creature Saint-Arnaud. All the conspirators were at their posts—Maupas at the prefecture of police, Magnan at the head of the troops in Paris. At the Elysée, Morny, adulterine son of Hortense, a hero of the Bourse and successful gambler, supported his half-brother by his energy and counsels. The ministry proposed to abrogate the electoral law of 1850, and restore universal suffrage; the Assembly by refusing made itself still more unpopular. By proposing to allow the president of the Assembly to call in armed force, the questors revealed the Assembly's plans for defence, and gave the Elysée a weapon against it ("donnent barre contre elle à l'Elysée"). The proposition was rejected (November 17), but Louis-Napoleon saw that it was time to act. On the 2nd of December he carried out his *coup d'état*.

But affairs developed in a way which disappointed him. By dismissing the Assembly, by offering the people "a strong government," and re-establishing "a France regenerated by the Revolution of '89 and organized by the emperor," he had hoped for universal applause. But both in Paris and the provinces he met with the resistance of the Republicans, who had reorganized in view of the elections of 1852. He struck at them by mixed commissions, deportations and the whole range of police measures. The *décrets-lois* of the year 1852 enabled him to prepare the way for the new institutions. On the 1st of December 1852 he became in name what he was already in deed, and was proclaimed Emperor of the French. He was then 44 years old. "The impassibility of his face and his lifeless glance" showed observers that he was still the obstinate dreamer that he had been in youth, absorbed in his Idea. His unshaken conviction of his mission made him conscious of the responsibility which rested on him, but hid from him the hopeless defect in the *coup d'état*. To carry out his conviction, he had still only a timid will, working through petty expedients; but here again his confidence in the future made him bold. In a people politically decimated and wearied, he was able to develop freely all the Napoleonic ideals. Rarely has a man been able to carry out his system so completely, though perhaps in these first years he had to take more disciplinary measures than he had intended against the Reds, and granted more favours than was fitting to the Catholics, his allies in December 1848 and December 1858.

The aim which the emperor had in view was, by a concentration of power which should make him "the beneficent motive force of the whole social order" (constitution of the 14th of January 1852; administrative centralization; subordination of the elected assemblies; control of the machinery of universal suffrage) to unite all classes in "one great national party" attached to the dynasty. His success, from 1852 to 1856, was almost complete. The nation was submissive, and a few scattered plots alone showed that republican ideas persisted among the masses. As "restorer of the overthrown altars," he won over the "men in black," among them Veuillot, editor-in-chief of *l'Univers*, and allowed them to get the University into their hands. By the aid of former Orleanists, such as Billault, Fould and Morny, and Saint-Simonians such as Talabot and the Pereires, he satisfied the industrial classes, extended credit, developed means of communication, and gave a strong impetus to the business of the nation. By various measures, such as subsidies, charitable gifts and foundations, he endeavoured to show that "the idea of improving the lot of those who suffer and struggle against the difficulties of life was constantly present in his mind." His was the government of cheap bread, great public works and holidays. The imperial court was brilliant. The emperor, having failed to obtain the hand of a Vasa or Hohenzollern, married, on the 29th of January 1853, Eugénie de Montijo, comtesse de Teba, aged twenty-six and at the height of her beauty.

France was "satisfied" in the midst of order, prosperity and peace. But a glorious peace was required; it must not be said that "France is bored," as Lamartine had said when the Napoleonic legend began to spread. The foreign policy of the Catholic party, by the question of the Holy Places and the Crimean War (1853–1856), gave him the opportunity of winning the glory which he desired, and the British alliance enabled him to take advantage of it. In the spring of 1855, as a definite success was still slow to come, he contemplated for a time taking the lead of the expedition in person, but his advisers dissuaded him from doing so, for fear of a revolution. In January 1856 he had the good fortune to win a diplomatic triumph over the new tsar, Alexander II. It was at Paris (February 25–March 30) that the conditions of peace were settled.

The emperor was now at the height of his power. He appeared to the people as the avenger of 1840 and 1815, and the birth to him of a son, Eugène Louis Jean Joseph, on the 16th of March 1856, assured the future of the dynasty. It was then that, strong in "the esteem and admiration with which he was surrounded," and "foreseeing a future full of hope for France," he dreamed of realizing the Napoleonic ideal in its entirety. This disciple of the German philologists, this crowned *Carbonaro*, the friend of the archaeologists and historians who were to help him to write the *Histoire de César*, dreamed of developing the policy of nationalism, and of assisting the peoples of all countries to enfranchise themselves.

From 1856 to 1858 he devoted his attention to the Rumanian nationality, and supported Alexander Cuza. But it was above all the deliverance of Italy which haunted his imagination. By this enterprise, which his whole tradition imposed upon him, he reckoned to flatter the *amour-propre* of his subjects, and rally to him the liberals and even the republicans, with their passion for propagandism. But the Catholics feared that the Italian national movement, when once started, would entail the downfall of the papacy; and in opposition to the emperor's Italian advisers, Arese and Prince Jerome Napoleon, they pitted the empress, who was frivolous and capricious, but an ardent Catholic. Napoleon III. was under his wife's influence, and could not openly combat her resistance. It was the Italian Orsini who, by attempting to assassinate him as a traitor to the Italian nation on the 14th of January 1858, gave him an opportunity to impose his will indirectly by convincing his wife that in the interests of his own security he must "do something for Italy." Events followed each other in quick succession, and now began the difficulties in which the Empire was to be irrevocably involved. Not only did the Italian enterprise lead to strained relations with Great Britain, the alliance with whom had been the emperor's chief support in Europe, and compromised its credit; but the claims of parties and classes again began to be heard at home.

The Italian war aroused the opposition of the Catholics. After Magenta (June 4, 1859), it was the fears of the Catholics and the messages of the empress which, even more than the threats of Prussia, checked him in his triumph and forced him into the armistice of Villafranca (July 11, 1859). But the spread of the Italian revolution and the movement for annexation forced him again to intervene. He appealed to the Left against the Catholics, by the amnesty of the 17th of April 1859. His consent to the annexation of the Central Italian states, in exchange for Savoy and Nice (Treaty of Turin, March 24, 1860) exposed him to violent attacks on the part of the ultramontanes, whose slave he had practically been since 1848. At the same time, the free-trade treaty with Great Britain (January 5, 1860) aroused a movement against him among the industrial *bourgeoisie.*

Thus at the end of 1860, the very time when he had hoped that his personal policy was to rally round him once for all the whole of France, and assure the future of his dynasty, he saw, on the contrary, that it was turning against him his strongest supporters. He became alarmed at the responsibilities which he saw would fall upon him, and imagined that by an appearance of reform he would be able to shift on to others the responsibility for any errors he might commit. Hence the decrees of the 24th of November 1860 (right of address, ministers without portfolio) and the letter of the 14th of November 1861 (financial reform). From this time onward, in face of a growing opposition, anxiety for the future of his régime occupied the first place in the emperor's thoughts, and paralysed his initiative. Placed between his Italian counsellors and the empress, he was ever of two minds. His plans for remodelling Europe had a certain generosity and grandeur; but internal difficulties forced him into endless manœuvre and temporization, which led to his ruin. Thus in October 1862, after Garibaldi's attack on Rome, the clerical côterie of the Tuileries triumphed. But the replacing of M. Thouvenel by M. Drouin de Lhuys did not satisfy the more violent Catholics, who in May 1863 joined the united opposition. Thirty-five opposers of the government were appointed, Republicans, Orleanists, Legitimists or Catholics. The emperor dismissed Persigny, and summoned moderate reformers such as Duruy and Béhic. But he was still possessed with the idea of settling his throne on a firm basis, and uniting all France in some glorious enterprise which should appeal to all parties equally, and "group them under the mantle of imperial glory." From January to June 1863 he sought this appearance of glory in Poland, but only succeeded in embroiling himself with Russia. Then, after Syria and China, it was the "great inspiration of his reign," the establishment of a Catholic and Latin empire in Mexico, enthusiasm for which he tried in vain from 1863 to 1867 to communicate to the French.

But while the strength of France was wasting away at Puebla or Mexico, Bismarck was founding German unity. In August 1864 the emperor, held back by French public opinion, which was favourable to Prussia, and by his idea of nationality, allowed Prussia and Austria to seize the duchies of Schleswig and Holstein. After his failure in Poland and Mexico and in face of the alarming presence of Germany, only one alliance remained possible for Napoleon III., namely with Italy. He obtained this by the convention of the 15th of September 1864 (involving the withdrawal of the French troops from Rome). But the Catholic party redoubled its violence, and the pope sent out the encyclical *Quanta Cura* and the *Syllabus*, especially directed against France. In vain the emperor sought in German affairs a definitive solution of the Italian question. At Biarritz he prepared with Bismarck the Franco-Prussian alliance of April 1866; and hoped to become, to his greater glory, arbiter in the tremendous conflict which was about to begin. But suddenly, while he was trying to rouse public opinion against the treaties of 1815, the news of the battle of Königgrätz came as a bolt from the blue to ruin his hopes. French interests called for an immediate intervention. But the emperor was ill, weary and aged by the life of pleasure which he led side by side with his life of work (as is proved by the letters to Mdlle Bellanger); he was suffering from a first attack of his bladder complaint. He knew, moreover, the insufficiency of his troops. After days of terrible suffering, he resigned himself to the annexation by Prussia of northern Germany. "Now," said M Drouin de Lhuys, "we have nothing left but to weep."

Henceforth the brilliant dream, a moment realized, the realization of which he had thought durable, was at an end. The Empire had still an uncertain and troubled brilliancy at the Exhibition of 1867. But Berezowski's pistol shot, which accentuated the estrangement from the tsar, and the news of the death of Maximilian at Queretaro, cast a gloom over the later fêtes. In the interior the industrial and socialist movement, born of the new industrial development, added fresh strength to the Republican and Liberal opposition. The moderate Imperialists felt that some concessions must be made to public opinion. In opposition to the absolutist "vice-emperor" Rouher, whose influence over Napoleon had become stronger and stronger since the death of Morny, Émile Ollivier grouped the Third Party. Anxious, changeable and distraught, the emperor made the Liberal concessions of the 19th of January 1867 (right of interpellation), and then, when Ollivier thought that his triumph was near, he exalted Rouher (July) and did not grant the promised laws concerning the press and public meetings till 1868. The opposition gave him no credit for these tardy concessions. There was an epidemic of violent attacks on the emperor; the publication of the *Lanterne* and the Baudin trial, conducted by Gambetta, were so many death-blows to the régime. The *Internationale* developed its propaganda. The election of May 1869 resulted in 4,438,000 votes given for the government, and 3,355,000 for the opposition, who also gained 90 representatives. The emperor, disappointed and hesitating, was slow to return to a parliamentary régime. It was not till December that he instructed Ollivier to "form a homogeneous cabinet representing the majority of the Corps Législatif" (ministry of the 2nd of January 1870). But, embarrassed between the *Arcadiens*, the partisans of the absolute régime, and the republicans, Ollivier was unable to guide the Empire in a constitutional course. At the Tuileries Rouher's counsel still triumphed. It was he who inspired the ill and wearied emperor, now without confidence or energy, with the idea of resorting to the *plêbiscite.* "To do away with the risk of a Revolution," "to place order and liberty upon a firm footing," "to ensure the transmission of the crown to his son," Napoleon III. again sought the approbation of the nation. He obtained it with brilliant success, for the last time, by 7,358,786 votes against 1,571,939, and his work now seemed to be consolidated.

A few weeks later it crumbled irrevocably. Since 1866 he had been pursuing an elusive appearance of glory. Since 1866 France was calling for "revenge." He felt that he could only rally the people to him by procuring them the satisfaction of their national pride. Hence the mishaps and imprudences of which Bismarck made such an insulting use. Hence the negotiations of Nikolsburg, the "note d'aubergiste" (innkeeper's bill) claiming the left bank of the Rhine, which was so scornfully rejected; hence the plan for the invasion of Belgium (August 1866), the Luxemburg affair (March 1867), from which M. de Moustier's diplomacy effected such a skilful retreat; hence the final folly which led this government into the war with Prussia (July 1870).

The war was from the first doomed to disaster. It might perhaps have been averted if France had had any allies. But Austria, a possible ally, could only join France if satisfied as regards Italy; and since Garibaldi had threatened Rome (Mentana, 1867), Napoleon III., yielding to the anger of the Catholics, had again sent troops to Rome. Negotiations had taken place in 1869. The emperor, bound by the Catholics, had refused to withdraw his troops. It was as a distant but inevitable consequence of his agreement of December 1848 with the Catholic party that in 1870 the emperor found himself without an ally.

His energy was now completely exhausted. Successive attacks of stone in the bladder had ruined his physique; while his hesitation and timidity increased with age. The influence of the empress over him became supreme. On leaving the council in which the war was decided upon the emperor threw himself, weeping, into the arms of Princess Mathilde. The empress was delighted at this war, which she thought would secure her son's inheritance.

On the 28th of July father and son set out for the army. They found it in a state of utter disorder, and added to the difficulties by their presence. The emperor was suffering from stone and could hardly sit his horse. After the defeat of Reichshoffen, when Bazaine was thrown back upon Metz, he wished to retreat upon Paris. But the empress represented to him that if he retreated it would mean a revolution. An advance was decided upon which ended in Sedan. On the 2nd of September, Napoleon III. surrendered with 80,000 men, and on the 4th of September the Empire fell. He was taken as a prisoner to the castle of Wilhelmshöhe, near Cassel, where he stayed till the end of the war. After the intrigues of Bazaine, of Bismarck, and of the empress, the Germans having held negotiations with the Republic, he was *de facto* deposed. On the 1st of March the assembly of Bordeaux confirmed this deposition, and declared him "responsible for the ruin, invasion and dismemberment of France."

Restored to liberty, he retired with his wife and son to Chislehurst in England. Unwilling even now to despair of the future, he still sought to rally his friends for a fresh propaganda. He had at his service publicists such as Cassagnac, J. Amigues and Hugelmann. He himself also wrote unsigned pamphlets justifying the campaign of 1870. It may be noted that, true to his ideas, he did not attempt to throw upon others the responsibility which he had always claimed for himself. He dreamed of his son's future. But he no longer occupied himself with any definite plans. He interested himself in pensions for workmen and economical stoves. At the end of 1872 his disease became more acute, and a surgical operation became necessary. He died on the 9th of January 1873, leaving his son in the charge of the empress and of Rouher. The young prince was educated at Woolwich from 1872 to 1875, and in 1879 took part in the English expedition against the Zulus in South Africa, in which he was killed. By his death vanished all hope of renewing the extraordinary fortune which for twenty years placed the descendant of the great emperor, the *Carbonaro* and dreamer, at once obstinate and hesitating, on the throne of France.

Bibliography.—The *Œuvres* of Napoleon III. have been published in four volumes (1854–1857) and his *Histoire de Jules César* in two volumes (1865–1869); this latter work has been translated into English by T. Wright. See also Ebeling, *Napoleon III. und sein Hof* (1891–1894); H. Thirria, *Napoléon III. avant l'Empire* (1895); Sylvain-Blot, *Napoléon III.* (1899); Giraudeau, *Napoléon III. intime* (1895); Sir W. A. Fraser, *Napoleon III.* (London, 1895); A. Forbes, *Life of Napoleon III.* (1898); A. Lebey, *Les Trois coups d'état de Louis Napoléon Bonaparte* (1906); *Louis Napoléon Bonaparte et la révolution de 1848* (1908); and F. A. Simpson, *The Rise of Louis Napoleon* (1909). General works which may be consulted are Taxile-Delord, *Histoire du second Empire* (1868–1875); P. de La Gorce, *Histoire du second Empire* (1894–1905); A. Thomas, *Le Second Empire* (1907); and E. Ollivier, *L'Empire libéral* (14 vols., 1895–1909). (A. Ts.)

NAPOLEON, a round game of cards (known colloquially as "Nap"). Any number may play. The cards rank as at whist, and five are dealt to each player. The deal being completed, the player to the dealer's left looks at his hand and declares how many tricks he would play to win against all the rest, the usual rule being that more than one must be declared; in default of declaring he says "I pass," and the next player has a similar option of either declaring to make more tricks or passing, and so on all round. A declaration of five tricks is called "going Nap." The player who declares to make most has to try to make them, and the others, but without consultation, to prevent him. The declaring hand has the first lead, and the first card he leads makes the trump suit. The players, in rotation, must follow suit if able. If the declarer succeeds in making at least the number of tricks he stood for he wins whatever stakes are played for; if not he loses. If the player declaring Nap wins he receives double stakes all round; if he loses he only pays single stakes all round. Sometimes, however, a player is allowed to go "Wellington" over "Nap," and even "Blucher" over "Wellington." In these cases the caller of "Wellington" wins four times the stake and loses twice the stake, the caller of "Blucher" receives six times and loses three times the stake. Sometimes a player is allowed to declare *misère*, *i.e.* no tricks. This ranks, as a declaration, between three and four, but the player pays a double stake on three, if he wins a trick, and receives a single on three if he takes none.

NAPOLEONIC CAMPAIGNS.—1. The era of the Revolutionary and Napoleonic Wars falls into two main divisions, the first of which (1792–1801) is dealt with under the heading French Revolutionary Wars. In the present article are described the campaigns in central and eastern Europe, directed by Napoleon—no longer one amongst many French generals, nor even a simple *primus inter pares*, but "Emperor" in the fullest sense—between the years 1805 and 1814. Napoleon's short Spanish Campaign of 1809 is dealt with under Peninsular War (this article covering the campaigns in Spain, Portugal and southern France 1808–1814), and for the final drama of Waterloo the reader is referred to Waterloo Campaign.

The campaigns described below are therefore—

(*a*) The Austrian War of 1805 (Ulm and Austerlitz).
(*b*) The Conquest of Prussia and the Polish Campaign (Jena, Auerstädt, Eylau and Friedland).
(*c*) The Austrian War of 1809 (Eckmühl, Aspern and Wagram).
(*d*) The Russian War of 1812 (Borodino and the retreat from Moscow).
(*e*) The German "War of Liberation," culminating in the Battle of the Nations around Leipzig.
(*f*) The last campaign in France, 1814.

The naval history of 1803–1815 includes the culmination and the sequel of the struggle for command of the sea which began in 1793 and reached its maximum intensity on the day of Trafalgar.

2. *The Campaign of 1805* may be regarded as a measure of self-defence forced upon Napoleon by the alliance of Russia (April 11th), Austria (August 9th) and other powers with Great Britain. The possibility had long been before the emperor, and his intention in that event to march straight on Vienna by the valley of the Danube is clearly indicated in his reply (November 27th, 1803) to a Prussian proposal for the neutralization of the South German states. In this he says, "It is on the road from Strassburg to Vienna that the French must force peace on Austria, and it is this road which you wish us to renounce." When, therefore, on the 25th of August 1805, he learnt definitely that Villeneuve (see *Naval operations* below) had failed in his purpose of securing the command of the Channel, which was the necessary preliminary to the invasion of England, it was but the affair of a few hours to dictate the dispositions necessary to transfer his whole army to the Rhine frontier as the first step in its march to the Danube. On this date the army actually lay in the following positions:—

I. Corps	Bernadotte	Hanover (Göttingen)
II. ,,	Marmont	Holland
III. ,,	Davout	Camp of Boulogne and other points on the English Channel
IV. ,,	Soult	
V. ,,	Lannes	
VI. ,,	Ney	
VII. ,,	Augereau	
Guard	Bessières	Paris.

The corps were, however, by no means fit for immediate service. Bernadotte's corps in Hanover was almost in the position of a beleaguered garrison, and the marshal could only obtain his transport by giving out that he was ordered to withdraw to France. Marmont and Davout were deficient in horses for cavalry and artillery, and the troops in Boulogne, having been drawn together for the invasion of England, had hardly any transport at all, as it was considered this want could be readily supplied on landing. The composition of the army, however, was excellent. The generals were in the prime of life, had not yet learnt to distrust one another, and were accustomed to work under the emperor and with one another. The regimental officers had all acquired their rank before the enemy and knew how to manage their men, and of the men themselves nearly two-thirds had seen active service. The strength of the army lay in its infantry, for both cavalry and artillery were short of horses, and the latter had not yet acquired mobility and skill in manœuvring. Napoleon's determination to undertake the invasion of England has often been disputed, but it is hard to imagine what other operation he contemplated, for the outbreak of hostilities with his continental enemies found him ill-supplied with intelligence as to the resources of the country he had then to traverse. To remedy this, Murat and other general officers as well as minor agents were sent ahead and instructed to travel through South Germany in plain clothes with a view to collecting information and mastering the topography. The emperor was, moreover, imperfectly acquainted with the degree of preparation of his adversaries' designs, and when he dictated his preliminary orders he was still unaware of the direction that the allies' advance would assume. That he foresaw the march of events which ultimately drew Mack to Ulm is inconceivable. On the 26th of August, however, he learnt that 100,000 Russians were about to enter Bohemia thence to unite with an Austrian army of 80,000 near the junction of the Inn and Danube, and this information compelled him to alter the general direction of his advance so as to traverse the defiles of the Black Forest north of the Neckar, cavalry only observing the passes to the south.

3. *Austrian Army.*—The Austrians after the defeats of 1800 had endeavoured to reorganize their forces on the French model, but they were soon to learn that in matters of organization the spirit is everything, the letter very little. They had copied the organization of the French corps, but could find no corps commanders fit to assume the responsibility for these commands. As always in such conditions, the actual control of the smallest movements was still centralized in the hands of the army commanders, and thus the rate of marching was incredibly slow. They had decided that in future their troops in the field should live by requisition, and had handed over to the artillery, which needed them badly, a large number of horses thus set free from the transport service, but they had not realized that men accustomed to a regular distribution of rations cannot be transformed into successful marauders and pillagers by a stroke of the pen; and they had sent away the bulk of their army, 120,000 under their best general, the archduke Charles, into Italy, leaving Lieut. Field Marshal Mack von Leiberich in Germany, nominally as chief of the staff to the young Prince Ferdinand, but virtually in command, to meet the onset of Napoleon at the head of his veterans. Mack was a man of unusual attainments. He had risen from the ranks in the most caste-ridden army in Europe, and against untold opposition had carried through army reforms which were correct in principle, and needed only time to develop. It was his fate to be made the scapegoat for the disasters which followed, though they need no further explanation than that, at the head of 80,000 men and exercising only restricted powers of command, he was pitted against the greatest strategist of all ages who was responsible to no overlord and commanded, in the fullest sense of the term, an army considerably more than twice as strong.

4. *The March on Ulm.*—The outbreak of the campaign was hastened by the desire of the Austrian government to feed their own army and leave a bare country for Napoleon by securing the resources of Bavaria. It was also hoped that the Bavarians with their army of 25,000 men would join the allies. In the latter hope they were deceived, and the Bavarians under General Wrede slipped away to Bamberg in time. In the former, however, they were successful, and the destitution they left in their wake almost wrecked Napoleon's subsequent combinations. Mack's march to Ulm was therefore a necessity of the situation, and his continuance in this exposed position, if foolhardy against such an adversary, was at any rate the outcome of the high resolve that even if beaten he would inflict crippling losses upon the enemy. Mack knew that the Russians would be late at the rendezvous on the Inn. By constructing an entrenched camp at Ulm and concentrating all the available food within it, he expected to compel Napoleon to invest and besiege him, and he anticipated that in the devastated country his adversary would be compelled to separate and thus fall an easy prey to the Russians. For that blow he had determined to make his own army the anvil. But these views obviously could not be published in army orders, hence the discontent and opposition he was destined to encounter.

5. *Movements of the French.*—It was on the 21st that Napoleon learnt of Mack's presence in Ulm. On that date his army had crossed the Rhine and was entering the defiles of the Black Forest. It was already beginning to suffer. Boots were worn out, greatcoats deficient, transport almost unattainable and, according to modern ideas, the army would have been considered incapable of action.

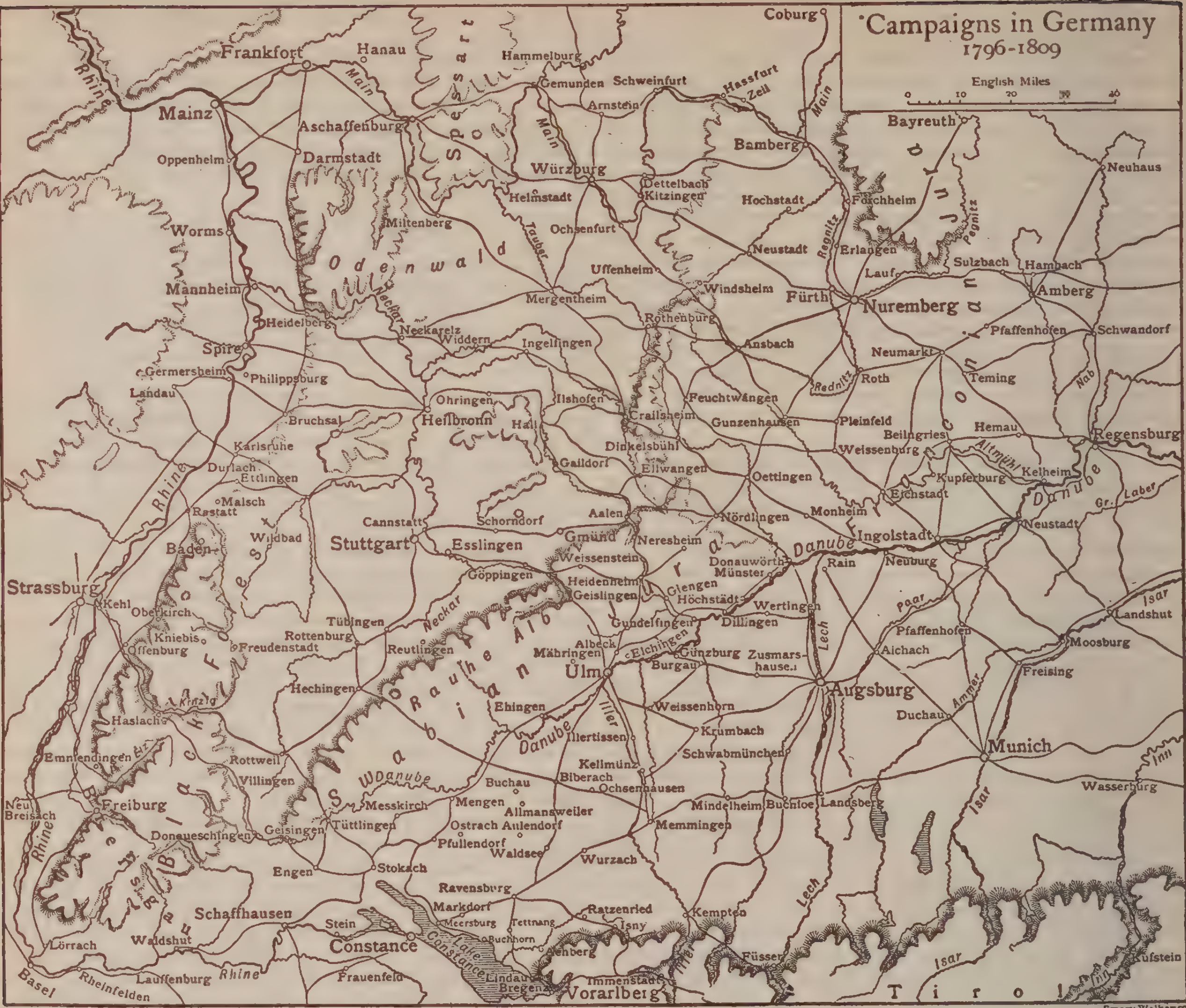
	Sept. 28.	Oct. 6.	Oct. 9.	Oct. 16.
Bernadotte	Würzburg	Anspach	Nürnberg	Regensburg
Marmont	Würzburg	Anspach	Nürnberg	Regensburg
Davout	Mannheim	Mergentheim	Anspach	Dietfurt
Ney	Selz	Crailsheim	Weissenburg	Ingolstadt
Lannes	Strassburg	Gmünd	Nördlingen	Neuburg
Soult	Landau	Aalen	Donauwörth	

On the 26th of September, its deployment beyond the mountains was complete, and as Napoleon did not know of Mack's intention to stay at Ulm and had learned that the Russian advance had been delayed, he directed his columns by the following roads on the Danube, between Donauwörth and Ingolstadt, so as to be in a position to intervene between the Austrians and the Russians and beat both in detail. On the 7th of October this movement was completed—the Austrians abandoned the Danube bridges after a show of resistance, retreating westward—and Napoleon, leaving Murat in command of the V. and VI. corps and cavalry to observe the Austrians, pressed on to Augsburg with the others so as to be ready to deal with the Russians. Learning, however, that these were still beyond striking radius, he determined to deal with Mack's army first, having formed the fixed conviction that a threat at the latter's communications would compel him to endeavour to retreat southwards towards Tirol. Bernadotte in his turn became an army of observation, and Napoleon joining Murat with the main body marched rapidly westward from the Lech towards the Iller.

6. *Austrian Plans.*—Mack's intentions were not what Napoleon supposed. He had meanwhile received (false) information of a British landing at Boulogne, and he was seriously deceived as to the numbers of Napoleon's forces. He was also aware that the exactions of the French had produced deep indignation throughout Germany and especially in Prussia (whose neutrality had been violated, see § 14, below). All this, and the almost mutinous discontent of his generals and his enemies of the court circle, shook his resolution of acting as anvil for the Russians, of whose delay also he was aware, and about the 8th of October he determined to march out north-eastward across the French lines of communication and save his sovereign's army by taking refuge if necessary in Saxony. Believing implicitly in the rumours of a descent on Boulogne and of risings in France which also reached him, and knowing the destitution he had left behind him in his movement to Ulm, when he heard of the westward march of French columns from the Lech he told his army, apparently in all good faith, that the French were in full march for their own country.

Actually the French at this moment were suffering the most terrible distress—up to the Danube they had still found sufficient food for existence, but south of it, in the track of the Austrians, they found nothing. All march discipline disappeared, the men dissolved into hordes of marauders and even the sternest of the marshals wrote piteous appeals to the emperor for supplies, and for permission to shoot some of their stragglers. But to all these Berthier in the emperor's name sent the stereotyped reply—"The emperor has ordered you to carry four days' provisions, therefore you can expect nothing further—you know the emperor's method of conducting war."

7. *Action of Albeck or Haslach.*—Meanwhile Murat, before the emperor joined him, had given Mack the desired opening. The VI. corps (Ney) should have remained on the left bank of the Danube to close the Austrian exit on that side, but by mistake only Dupont's division had been left at Albeck, the rest being


Campaigns in Germany 1796-1809

English Miles 0 10 20 30 40

Coburg
Frankfort
Hanau
Spessart
Hammelburg
Rhine
Main
Gemunden
Schweinfurt
Hassfurt
Zeil
Mainz
Aschaffenburg
Arnstein
Bamberg
Bayreuth
Oppenheim
Darmstadt
Würzburg
Neuhaus
Dettelbach
Kitzingen
Helmstadt
Hochstadt
Forchheim
Miltenberg
Worms
Ochsenfurt
Tauber
Neustadt
Regnitz
Erlangen
Pegnitz
Odenwald
Uffenheim
Lauf
Sulzbach
Hambach
Mannheim
Windsheim
Fürth
Nuremberg
Amberg
Mergentheim
Heidelberg
Neckar
Rothenburg
Neckarelz
Widdern
Ingelfingen
Spire
Ansbach
Pfaffenhofen
Schwandorf
Neumarkt
Germersheim
Philippsburg
Landau
Rednitz
Roth
Teming
Nab
Ohringen
Ilshofen
Feuchtwangen
Crailsheim
Bruchsal
Heilbronn
Hall
Gunzenhausen
Pleinfeld
Beilngries
Hemau
Regensburg
Karlsruhe
Dinkelsbühl
Weissenburg
Durlach
Ettlingen
Gaildorf
Ellwangen
Oettingen
Altmühl
Kupferburg
Kelheim
Eichstadt
Malsch
Rastatt
Aalen
Schorndorf
Nördlingen
Monheim
Danube
Gr. Laber
Cannstatt
Neustadt
Ingolstadt
Wildbad
Baden
Stuttgart
Esslingen
Gmünd
Neresheim
Weissenstein
Donauwörth
Münster
Rain
Neuburg
Strassburg
Göppingen
Heidenheim
Geislingen
Giengen
Höchstädt
Isar
Paar
Kehl
Oberkirch
Wertingen
Landshut
Tübingen
Gundelfingen
Dillingen
Lech
Pfaffenhofen
Kniebis
Rottenburg
Freudenstadt
Albeck
Elchingen
Aichach
Moosburg
Offenburg
Reutlingen
Mähringen
Günzburg
Zusmarshause
Burgau
Ulm
Freising
Hechingen
Rauhe Alb
Swabian
Augsburg
Kinzig
Ehingen
Weissenhorn
Duchau
Amper
Haslach
Iller
Krumbach
Illertissen
Munich
Emmendingen
Rottweil
Kellmünz
Schwabmünchen
Inn
Villingen
Biberach
Ochsenhausen
Buchau
Wasserburg
Neu Breisach
Freiburg
Mengen
Messkirch
Allmansweiler
Mindelheim
Buchloe
Landsberg
Ostrach
Aulendorf
Tüttlingen
Geisingen
Donaueschingen
Memmingen
Pfullendorf
Waldsee
Wurzach
Engen
Stokach
Black Forest
Ravensburg
Markdorf
Tettnang
Ratzenried
Kempten
Schaffhausen
Meersburg
Isny
Stein
Buchhorn
Lake Constance
Constance
Waldshut
Lörrach
Füssen
Kufstein
Basel
Rheinfelden
Lauffenburg
Frauenfeld
Lindau
Bregenz
Immenstadt
Vorarlberg
Tirol

Emery Walker sc.

brought over the river. Mack on the 8th had determined to commence his withdrawal, but fortune now favoured the French. The weather during the whole of October had been unusually wet, the swollen Danube overflowed the low ground and the roads had become quagmires. On the south bank, owing to better natural drainage and a drier subsoil, movement was fairly easy, but the Austrians found it almost impossible. On the 11th of October, when they began their march, the road along the Danube was swept into the river, carrying with it several guns and teams, and hours were consumed in passing the shortest distances. At length in the afternoon they suddenly fell upon Dupont's isolated division at Albeck, which was completely surprised and severely handled. The road now lay completely open, but the Austrian columns had so opened out owing to the state of the roads that the leading troops could not pursue their advantage—Dupont rallied and the Austrians had actually to fall back towards Ulm to procure food.

8. *Elchingen.*—For three more days Mack struggled with an unwilling staff and despondent men to arrange a further advance. During these very three days, through a succession of staff blunders, the French failed to close the gap, and on the morning of the 14th of October both armies, each renewing their advance, came in contact at the bridge of Elchingen. This bridge, all but a few road-bearers, had been destroyed, but now the French gave an example of that individual gallantry which was characteristic of the old revolutionary armies. Running along the beams under a close fire a few gallant men forced their way across. The floor of the bridge was rapidly relaid, and presently the whole of the VI. corps was deploying with unexampled rapidity on the farther side. The Austrians, still in their quagmire, could not push up reinforcements fast enough, and though Mack subsequently alleged deliberate obstruction and disobedience on the part of his subordinates, the state of the roads alone suffices to explain their defeat. Only the right column of the Austrians was, however, involved; the left under General Werneck, to whom some cavalry and the archduke Ferdinand attached themselves, did indeed succeed in getting away, but without trains or supplies. They continued their march, famished but unmolested, until near Heidenheim they suddenly found themselves confronted by what from the diversity of uniforms they took to be an overwhelming force; at the same time the French cavalry sent in pursuit appeared in their rear. Utterly exhausted by fatigue, Werneck with his infantry, some 8000 strong, surrendered to what was really a force of dismounted dragoons and foot-sore stragglers improvised by the commanding officer on the spot to protect the French treasure chests, which at

that moment lay actually in the path of the Austrians. The young archduke with some cavalry escaped.

9. *Mack surrounded.*—The defeat at Elchingen on the 14th of October sealed the fate of the Austrians, though Mack was still determined to endure a siege. As the French columns coming up from the south and west gradually surrounded him, he drew in his troops under shelter of the fortress and its improvised entrenched camp, and on the 15th he found himself completely surrounded. On the 16th the French field-guns fired into the town, and Mack realized that his troops were no longer under sufficient control to endure a siege. When, therefore, next morning, negotiations were opened by the French, Mack, still feeling certain that the Russians were at hand, agreed to an armistice and undertook to lay down his arms if within the next twenty-one days no relief should arrive. To this Napoleon consented, but hardly had the agreement been signed than he succeeded in introducing a number of individual French soldiers into the fortress, who began rioting with the Austrian soldiery. Then, sending in armed parties to restore order and protect the inhabitants, he caused the guards at the gates to be overpowered, and Mack was thus forced into an unconditional surrender.

On the 22nd of October, the day after Trafalgar, the remnant of the Austrian army, 23,000 strong, laid down its arms. About 5000 men under Jellachich had escaped to Tirol, 2000 cuirassiers with Prince Ferdinand to Eger in Bohemia, and about 10,000 men under Werneck, had surrendered at Heidenheim. The losses in battle having been insignificant, there remain some 30,000 to account for—most of whom probably escaped individually by the help of the inhabitants, who were bitterly hostile to the French.

10. *Napoleon's Advance to Vienna.*—Napoleon now hastened to rejoin the group of corps he had left under Bernadotte in observation towards the Russians, for the latter were nearer at hand than even Mack had assumed. But hearing of his misfortune they retreated before Napoleon's advance along the right bank of the Danube to Krems, where they crossed the river and withdrew to an entrenched camp near Olmütz to pick up fresh Austrian reinforcements. The severe actions of Dürrenstein (near Krems) on the 11th, and of Hollabrünn on the 16th of November, in which Napoleon's marshals learned the tenacity of their new opponents, and the surprise of the Vienna bridge (November 14) by the French, were the chief incidents of this period in the campaign.

Austerlitz.

11. *Campaign of Austerlitz.*—Napoleon continued down the right bank to Vienna, where he was compelled by the condition of his troops to call a halt to refit his army. After this was done he continued his movement to Brünn. Thither he succeeded in bringing only 55,000 men. He was again forced to give his army rest and shelter, under cover of Murat's cavalry. The allies now confronted him with upwards of 86,000 men, including 16,000 cavalry. About the 20th of November this force commenced its advance, and Napoleon concentrated in such a manner that within three days he could bring over 80,000 French troops into action around Brünn, besides 17,000 or more Bavarians under Wrede. On the 28th Murat was driven in by the allied columns. That night orders were despatched for a concentration on Brünn in expectation of a collision on the following day; but hearing that the whole allied force was moving towards him he decided to concentrate south-east of Brünn, covering his front by cavalry on the Pratzen heights. Meanwhile he had also prepared a fresh line of retreat towards Bohemia, and, certain now of having his men in hand for the coming battle, he quietly awaited events.

The allies were aware of his position, and still adhering to the old "linear" system, marched to turn his right flank (see AUSTERLITZ). As soon as their strategic purpose of cutting him off from Vienna became apparent, the emperor moved his troops into position, and in the afternoon issued his famous proclamation to his troops, pointing out the enemy's mistakes and his plan for defeating them. At the same time he issued his orders for his first great battle as a supreme commander. The battle of Austerlitz began early next morning and closed in the evening with the thorough and decisive defeat of the allies.

Jena campaign.

12. *Jena, 1806.*—Around the Prussian army, and particularly the cavalry, the prestige of Frederick the Great's glory still lingered; but the younger generation had little experience of actual warfare, and the higher commanders were quite unable to grasp the changes in tactics and in the conduct of operations which had grown out of the necessities of the French Revolution. The individual officers of the executive staff were the most highly trained in Europe, but there was no great leader to co-ordinate their energies. The total number of men assigned to the field army was 110,000 Prussians and Saxons. They were organized in corps, but their leaders were corps commanders only in name, for none were allowed any latitude for individual initiative. Ill-judged economies had undermined the whole efficiency of the Prussian army. Two-thirds of the infantry and one-half of the cavalry were allowed furlough for from ten to eleven months in the year. The men were unprovided with greatcoats. Most of the muskets had actually seen service in the Seven Years' War, and their barrels had worn so thin with constant polishing that the use of full charges at target practice had been forbidden. Above all, the army had drifted entirely out of touch with the civil population. The latter, ground down by feudal tradition and law, and at the same time permeated by the political doctrines of the late 18th century, believed that war concerned the governments only, and formed no part of the business of the "honest citizen." In this idea they were supported by the law itself, which protected the civilian against the soldier, and forbade even in war-time the requisitioning of horses, provisions and transport, without payment. Up to the night of the battle of Jena itself, the Prussian troops lay starving in the midst of plenty, whilst the French everywhere took what they wanted. This alone was a sufficient cause for all the misfortunes which followed.

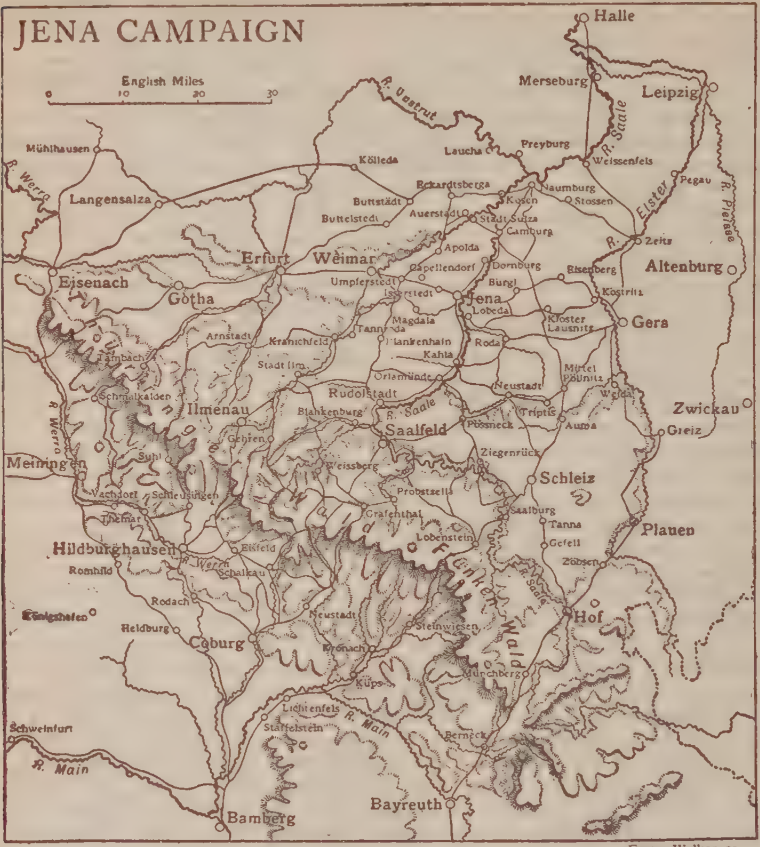
13. *Outbreak of the War.*—During the campaign of Austerlitz Prussia, furious at the violation of her territory of Anspach, had mobilized, and had sent Haugwitz as ambassador to Napoleon's headquarters. He arrived on the 30th of November, and Napoleon, pleading business, put off his official reception till after the battle of Austerlitz. Of course the ultimatum was never presented, as may be imagined; Haugwitz returned and the king of Prussia demobilized at once. But Napoleon, well knowing the man he had to deal with, had determined to force a quarrel upon Prussia at the earliest convenient opportunity. His troops therefore, when withdrawn from Austria, were cantoned in south Germany in such a way that, whilst suspicion was not aroused in minds unacquainted with Napoleonic methods, they could be concentrated by a few marches behind the Thuringian forest and the upper waters of the Main. Here the Grand Army was left to itself to recuperate and assimilate its recruits, and it is characteristic of the man and his methods that he did not trouble his corps commanders with a single order during the whole of the spring and summer.

As the diplomatic crisis approached, spies were sent into Prussia, and simultaneously with the orders for preliminary concentration the marshals received private instructions, the pith of which cannot be better expressed than in the following two quotations from Napoleon's correspondence:—

> "Mon intention est de concentrer toutes mes forces sur l'extrémité de ma droite en laissant tout l'espace entre le Rhin et Bamberg entièrement dégarni, de manière à avoir près de 200,000 hommes réunis sur un même champ de bataille; mes premières marches menacent le cœur de la monarchie prussienne" (No. 10,920). "Avec cette immense supériorité de forces réunis sur un espace si étroit, vous sentez que je suis dans la volonté de ne rien hasarder et d'attaquer l'ennemi partout où il voudra tenir. Vous pensez bien que ce serait une belle affaire que de se porter sur cette place (Dresden) en *un bataillon carré de* 200,000 *hommes*" (Soult, No. 10,941).

14. *Advance of the Grande Armée.*—On the 7th of October the *Grande Armée* lay in three parallel columns along the roads leading over the mountains to Hof, Schleiz and Kronach; on the right lay the IV. corps (Soult) about Bayreuth; with his cavalry in rear, and behind these the VI. corps (Ney) at Pegnitz; in the centre, Bernadotte's I. corps from Nordhalben, with the

III. corps (Davout) Lichtenfels; Guard and headquarters, Bamberg. The left column was composed of the V. (Lannes) at Hemmendorf, with the VII. (Augereau) extending south to the Main at Burgebrach.


JENA CAMPAIGN
English Miles
0
10
20
30
Halle
Merseburg
Leipzig
R. Saale
R. Unstrut
Mühlhausen
Kölleda
Laucha
Freyburg
Weissenfels
Pegau
R. Elster
R. Pleisse
R. Werra
Langensalza
Eckardtsberga
Naumburg
Stossen
Buttstädt
Auerstädt
Kösen
Buttelstedt
Stadt Sulza
Camburg
Zeitz
Apolda
Erfurt
Weimar
Capellendorf
Dornburg
Eisenberg
Altenburg
Eisenach
Umpferstedt
Bürgel
Köstritz
Isserstedt
Jena
Gotha
Lobeda
Magdala
Kloster Lausnitz
Gera
Tannroda
Arnstadt
Kranichfeld
Blankenhain
Roda
Kahla
Stadt Ilm
Orlamünde
Mittel Pöllnitz
Rudolstadt
Neustadt
Weida
Schmalkalden
Ilmenau
Blankenburg
R. Saale
Triptis
Zwickau
Saalfeld
Pössneck
Auma
Greiz
Gehren
Suhl
Ziegenrück
Meiningen
Weissberg
Schleiz
Vachdorf
Schleusingen
Probstzella
Themar
Gräfenthal
Saalburg
Tanna
Lobenstein
Gefell
Plauen
Hildburghausen
Eisfeld
Zobsen
Römhild
Schalkau
Rodach
Königshofen
Neustadt
Hof
Heldburg
Steinwiesen
Coburg
Kronach
Münchberg
Küps
Schweinfurt
Lichtenfels
R. Main
Staffelstein
Berneck
R. Main
Bayreuth
Bamberg

Emery Walker, sc.

Napoleon's object being surprise, all the cavalry except a few vedettes were kept back behind the leading infantry columns and these latter were ordered to advance, on the signal being given, in "masses of manœuvre," so as to crush at once any outpost resistance which was calculated upon the time required for the deployment of ordinary marching columns. This order has never since found an imitator, but deserves attentive study as a masterpiece (see H. Bonnal, *Manœuvre d'Iéna*).

To meet the impending blow the Prussians had been extended in a cordon along the great road leading from Mainz to Dresden, Blücher was at Erfurt, Rüchel at Gotha, Hohenlohe at Weimar, Saxons in Dresden, with outposts along the frontier. An offensive move into Franconia was under discussion, and for this purpose the Prussian staff had commenced a lateral concentration about Weimar, Jena and Naumburg when the storm burst upon them. The emperor gathered little from the confused reports of their purposeless manœuvres, but, secure in the midst of his "battalion square" of 200,000 men, he remained quite indifferent, well knowing that an advance straight on Berlin must force his enemy to concentrate and fight, and as they would bring at most 127,000 men on to the battlefield the result could hardly be doubtful. On the 9th of October the cloud burst. Out of the forests which clothe the northern slopes of the Thuringer Wald the French streamed forth, easily overpowering the resistance of the Prussian outposts on the upper Saale,[1] and once the open country was reached the cavalry under Murat trotted to the front, closely followed by Bernadotte's corps as "general advance guard." The result of the cavalry scouting was however unsatisfactory. On the night of the 10th, the emperor was still unaware of the position of his principal foe, and Murat with Bernadotte behind him was directed on Gera for the 11th, the remainder of the army continuing along the roads previously assigned to them.

In the meanwhile, however, the Saxons had been moving from Naumburg through Gera on Jena, Hohenlohe was near Weimar, and all the other divisions of the army had closed in a march eastwards, the idea of an offensive to the southward which Napoleon had himself attributed to them having already disappeared.

Reaching Gera at 9 A.M. Murat reported the movement of the Saxons on the previous day, but omitted to send a strong detachment in pursuit. The traces of the Saxons were lost, and Napoleon, little satisfied with his cavalry, authorized Lasalle to offer up to 6000 frs. reward for information of the Prussian point of concentration. At 1 A.M. of the 12th Napoleon issued his orders. Murat and Bernadotte via Zeitz to Naumburg; Davout (III. corps and a dragoon division) also to Naumburg; Lannes to Jena, Augereau following; Soult to Gera.

15. *Prussian Movements.*—In the meantime the Prussians were effecting their concentration. Rüchel, who with 15,000 men had been sent into the mountains as an advanced guard for the projected offensive, was recalled to Weimar, which he reached on the 13th. The main body were between Weimar and Apolda during the 12th, and the Saxons duly effected their junction with Hohenlohe in the vicinity of Vierzehnheiligen, whilst the latter had withdrawn his troops all but some outposts from Jena to the plateau about Capellendorf, some 4 m. to the N.W. The whole army, upwards of 120,000 men, could therefore have been concentrated against Lannes and Augereau by the afternoon of the 13th, whilst Soult could only have intervened very late in the day, and Davout and Bernadotte were still too distant to reach the battlefield before the 14th. All the French corps, moreover, were so exhausted by their rapid marches over bad roads that the emperor actually ordered (at 1 A.M. on the 13th) a day of rest for all except Davout, Bernadotte, Lannes and Murat.

The Prussian headquarters, however, spent the 12th and 13th in idle discussion, whilst the troop commanders exerted themselves to obtain some alleviation for the suffering of their starving men. The defeats undergone by their outpost detachment had profoundly affected the nerves of the troops, and on the afternoon of the 11th, on the false alarm of a French approach, a panic broke out in the streets of Jena, and it took all the energy of Hohenlohe and his staff to restore order. On the morning of the 12th the Saxon commanding officers approached Hohenlohe with a statement of the famishing condition of their men, and threatened to withdraw them again to Saxony. Hohenlohe pointed out that the Prussians were equally badly off, but promised to do his best to help his allies. Urgent messages were sent off to the Commissary von Goethe (the poet), at Weimar for permission to requisition food and firewood. These requests, however, remained unanswered, and the Prussians and Saxons spent the night before the battle shivering in their miserable bivouacs.

16. *The 13th of October.*—During the early morning of the 13th the reports brought to Napoleon at Gera partially cleared up the situation, though the real truth was very different from what he supposed. However, it was evident that the bulk of the Prussians lay to his left, and instructions were at once despatched to Davout to turn westward from Naumburg towards Kösen and to bring Bernadotte with him if the two were still together. The letter, however, ended with the words "but I hope he is already on his way to Dornburg." Now Bernadotte

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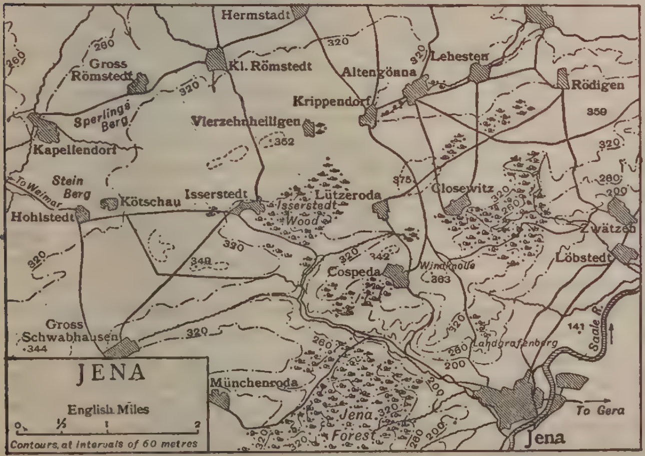
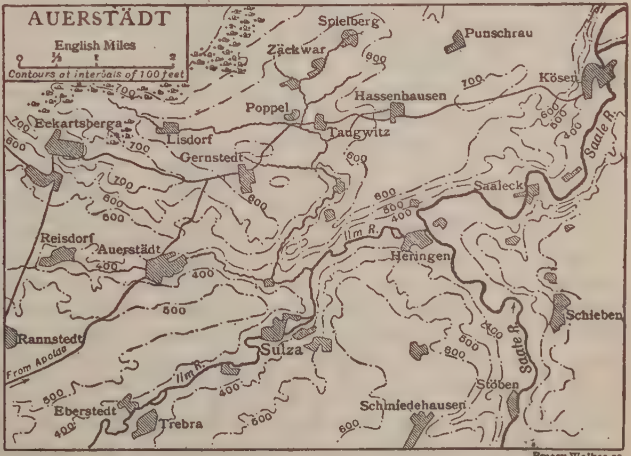
[1] At the action of Saalfeld on the 10th, the young and gallant Prince Louis Ferdinand of Prussia was killed.

had neglected to keep the emperor informed as to his whereabouts. He was still with Davout, but, concluding that he had missed an order directing him to Dornburg, he thought to conceal his error by assuming the receipt of the order evidently alluded to in the last words, and as a result he marched towards Dornburg, and his whole corps was lost to the emperor at the crisis of the next day's battle.

On the road from Gera to Jena Napoleon was met by intelligence from Lannes announcing his occupation of Jena and the discovery of Prussian troops to the northward. Knowing the emperor's methods, he wisely restrained the ardour of his subordinates and asked for instructions whether to attack or wait. The emperor rode forward rapidly, reached Jena about 3 P.M., and with Lannes proceeded to the Landgrafenberg to reconnoitre. From this point his view was, however, restricted to the immediate foreground, and he only saw the camps of Hohenlohe's left wing. At this moment the Prussians were actually on parade and ready to move off to attack, but just then the "evil genius" of the Prussian army, von Massenbach, an officer of the Headquarter Staff, rode up and claiming to speak with the authority of the king and commander-in-chief, induced Hohenlohe to order his troops back to camp. Of all this Napoleon saw nothing, but from all reports he came to the conclusion that the whole Prussian army was actually in front of him, and at once issued orders for his whole army to concentrate towards Jena, marching all night if need be. Six hours earlier his conclusion would have been correct, but early that morning the Prussian headquarters, alarmed for the safety of their line of retreat on Berlin by the presence of the French in Naumburg, decided to leave Hohenlohe and Rüchel to act as rear-guard, and with the main body to commence their retreat towards the river Unstrutt and the Eckhardtsberge where Massenbach had previously reconnoitred an "ideal" battlefield. This belief in positions was the cardinal principle of Prussian strategy in those days. The troops had accordingly commenced their march on the morning of the 13th, and now at 3 P.M. were settling down into bivouac; they were still but a short march from the decisive field.

17. *Battle of Jena.*—On the French side, Lannes' men were working their hardest, under Napoleon's personal supervision, to make a practicable road up to the Landgrafenberg, and all night long the remaining corps struggled through darkness towards the rendezvous. By daybreak on the 14th, the anniversary of Elchingen, upwards of 60,000 men stood densely packed on the narrow plateau of the mountain, whilst, below in the ravines on either flank, Soult on the right, and Augereau on the left, were getting into position. Fortunately a dense fog hid the helpless masses on the Landgrafenberg from sight of the Prussian gunners. Hohenlohe had determined to drive the French into the ravine at daybreak, but had no idea as to the numbers in front of him. For want of room, only a few Prussian battalions were sent forward, and these, delaying their advance till the fog had sufficiently lifted, were met by French skirmishers, and small columns, who rapidly overlapped their flanks and drove them back in confusion. Hohenlohe now brought up the remainder of his command, but in the meanwhile the French had poured across the neck between the Landgrafenberg and the main plateau, and the troops of Soult and Augereau were working up the ravines on either hand. In view of these troops the Prussian line, which had advanced faultlessly as if on parade, halted to prepare its bayonet attack by fire, and, once halted, it was found impossible to get them to go on again. The French who had thrown themselves into houses, copses, &c., picked off the officers, and the flanks of the long Prussian lines swayed and got into confusion. The rival artilleries held each other too thoroughly to be able to spare attention to the infantry, whilst the Prussian cavalry, which had forgotten how to charge in masses of eighty or more squadrons, frittered away their strength in isolated efforts. By 10 A.M. the fourteen battalions which had initiated this attack were outnumbered by three to one, and drifted away from the battlefield. Their places were taken by a fresh body, but this was soon outnumbered and outflanked in its turn. By 2 P.M. the psychic moment had come, and Napoleon launched his guards and the cavalry to complete the victory and initiate the pursuit. Rüchel's division now arrived and made a most gallant effort to cover the retreat, but their order being broken by the torrent of fugitives, they were soon overwhelmed by the tide of the French victory and all organized resistance had ceased by 4 P.M.


JENA
English Miles
0 ½ 1 2
Contours at intervals of 60 metres
Hermstadt
Gross Römstedt
Kl. Römstedt
Altengönna
Lehesten
Rödigen
Krippendorf
Sperlings Berg
Vierzehnheiligen
362
359
Kapellendorf
Stein Berg
To Weimar
Kötschau
Isserstedt
Lützeroda
Isserstedt Wood
375
Closewitz
Hohlstedt
Zwätzen
Löbstedt
Cospeda
Windknolle
363
348
342
Gross Schwabhausen
344
Landgrafenberg
Saale R.
141
Münchenroda
Jena Forest
To Gera
Jena
260
280
320
200


AUERSTÄDT
English Miles
0 ½ 1 2
Contours at intervals of 100 feet
Spielberg
Punschrau
Zäckwar
Kösen
Hassenbausen
Poppel
Taugwitz
Eckartsberga
Lisdorf
Gernstedt
Saaleck
Saale R.
Ilm R.
Reisdorf
Auerstädt
Heringen
Schieben
Rannstedt
From Apolda
Sulza
Stöben
Eberstedt
Trebra
Schmiedehausen
400
500
600
700
800

Emery Walker sc.

Briefly summarized, the battle came to this—in four successive efforts the Prussians failed because they were locally outnumbered. This was the fault of their leaders solely, for, except for the last attack, local superiority was in each case attainable. Organization and tactics did not affect the issue directly, for the conduct of the men and their junior officers gave abundant proof that in the hands of a competent leader the "linear" principle of delivering one shattering blow would have proved superior to that of a gradual attrition of the enemy here, as on the battlefields of the Peninsula and at Waterloo, and this in spite of other defects in the training of the Prussian infantry which simultaneously caused its defeat on the neighbouring field of Auerstädt.

18. *Battle of Auerstädt.*—Here the superiority of French mobility, a consequence of their training and not necessarily of their system, showed its value most conclusively. Davout in obedience to his orders of the previous morning was marching over the Saale at Kösen, when his advanced guard came in contact with that of the Prussian main army. The latter with at least 50,000 men was marching in two columns, and ought therefore to have delivered its men into line of battle twice as fast as the French, who had to deploy from a single issue, and whose columns had opened out in the passage of the Kösen defile and the long ascent of the plateau above. But the Prussians

attacked at the old regulation speed of seventy-five paces to the minute, and the French manœuvred at the quick or double of 120 or 150. The consequence was that the French always succeeded in reinforcing their fighting line in time to avert disaster. Nevertheless by mid-day their strength was well-nigh exhausted, whilst the Prussian reserve, eighteen battalions of guards under Kalckreuth, stood intact and ready to engage. But at the critical moment the duke of Brunswick fell mortally wounded, and Scharnhorst, his chief of the staff, was at the time absent on another part of the field. Meanwhile rumours from the battle-field at Jena, magnified as usual, began to reach the staff, and these may possibly have influenced Kalckreuth, for when appealed to to attack with his eighteen battalions and win the day, he declined to move without the direct order of the commander-in-chief to do so, alleging that it was the duty of a reserve to cover the retreat and he considered himself personally responsible to the king for the guards entrusted to his care. Even then the day might have been saved had Blücher been able to find even twenty squadrons accustomed to gallop together, but the Prussian cavalry had been dispersed amongst the infantry commands, and at the critical moment it proved impossible for them to deliver a united and decisive attack.

Seeing further efforts hopeless, Scharnhorst in the duke's name initiated the retreat and the troops withdrew N.W. towards Buttelstedt, almost unmolested by the French, who this day had put forth all that was in them, and withstood victoriously the highest average punishment any troops of the new age of warfare had as yet endured. So desperate had been their resistance that the Prussians unanimously stated Davout's strength at double the actual figure. Probably no man but Davout could have got so much out of his men, but why was he left unsupported?

Bernadotte, we have seen, had marched to Dornburg, or rather to a point overlooking the ford across the Saale at the village of that name, and reached there in ample time to intervene on either field. But with the struggle raging before him he remained undecided, until at Jena the decision had clearly fallen, and then he crossed the river and arrived with fresh troops too late for their services to be required.

19. *Prussian Retreat.*—During the night the Prussians continued their retreat, the bulk of the main body to Sömmerda, Hohenlohe's corps towards Nordhausen. The troops had got much mixed up, but as the French did not immediately press the pursuit home, order was soon re-established and a combined retreat was begun towards the mouth of the Elbe and Lübeck. Here help was expected to arrive from England, and the tide might yet have turned, for the Russian armies were gathering in the east. It was now that the results of a divorce of the army from the nation began to be felt. Instead of seizing all provisions and burning what they could not remove, the Prussian generals enforced on their men the utmost forbearance towards the inhabitants, and the fact that they were obeyed, in spite of the inhumanity the people showed to their sick and wounded countrymen, proves that discipline was by no means so far gone as has generally been believed. The French marching in pursuit were received with open arms, the people even turning their own wounded out of doors to make room for their French guests. Their servility awakened the bitterest contempt of their conquerors and forms the best excuse for the unparalleled severity of the French yoke. On the 26th of October Davout reached Berlin, having marched 166 m. in twelve days including two sharp rearguard actions, Bernadotte with his fresh troops having fallen behind. The inhabitants of Berlin, headed by their mayor, came out to meet him, and the newspapers lavished adulation on the victors and abuse on the beaten army. On the 28th Murat's cavalry overtook the remnant of Prince Hohenlohe's army near Prenzlau (N. of Berlin) and invited its capitulation. Unfortunately the prince sent Massenbach to discuss the situation, and the latter completely lost his head. Murat boasted that he had 100,000 men behind him, and on his return Massenbach implored his chief to submit to an unconditional surrender, advice which the prince accepted, though as a fact Murat's horses were completely exhausted and he had no infantry whatever within call. Only Blücher now remained in the field, and he too was driven at length into Lübeck with his back to the sea.

20. *Campaigns in Poland and East Prussia.*—Hitherto the French had been operating in a rich country, untouched for half a century past by the ravages of war, but as the necessity for a campaign against the Russians confronted the emperor, he realized that his whole supply and transport service must be put on a different footing. After the wants of the cavalry and artillery had been provided for, there remained but little material for transport work. Exhaustive orders to organize the necessary trains were duly issued, but the emperor seems to have had no conception of the difficulties the tracks—there were no metalled roads—of Poland were about to present to him. Moreover, it was one thing to issue orders, but quite another to ensure that they were obeyed, for they entailed a complete transformation in the mental attitude of the French soldier towards all that he had been taught to consider his duties in the field. Experience only can teach the art of packing wagons and the care of draught animals, and throughout the campaign the small ponies of Poland and East Prussia broke down by thousands from over loading and unskilful packing.

21. *The Russian Army* formed the most complete contrast to the French that it is possible to imagine. Though clad, armed and organized in European fashion, the soldiers retained in a marked degree the traditions of their Mongolian forerunners, their transport wagons were in type the survival of ages of experience, and their care for their animals equally the result of hereditary habit. The intelligence of the men and regimental officers was very low, but on the other hand service was practically for life, and the regiment the only home the great majority had ever known. Hence obedience was instinctive and initiative almost undreamt of. Moreover, they were essentially a war-trained army, for even in peace time their long marches to and fro within the empire had most thoroughly inured them to hardship and privation. Napoleon might have remembered his own saying, "La misère est l'école du bon soldat." In cavalry they were weak, for the Russian does not take kindly to equitation and the horses were not equal to the accepted European standard of weight, while the Cossack was only formidable to stragglers and wounded. Their artillery was numerous and for the most part of heavy calibre—18- and 24-pounders were common—but the strength of the army lay in its infantry, with its incomparable tenacity in defence and its blind confidence in the bayonet in attack. The traditions of Suvarov and his victories in Italy (see FRENCH REVOLUTIONARY WARS) were still fresh, but there was no longer a Suvarov to lead them.

22. *Advance to the Vistula.*—Napoleon had from the first been aware of the secret alliance between Prussia and Russia, sworn by their respective sovereigns over the grave of Frederick the Great, and this knowledge had been his principal reason for precipitating hostilities with the former. He remained, however, in complete ignorance of the degree of preparation attained on the Russian side, and since the seizure of Warsaw together with the control of the resources of Poland in men and material its occupation would afford, was the chief factor in his calculation, he turned at once to the eastward as soon as all further organized resistance in Prussia was ended by the surrender of Prenzlau and Lübeck. Scarcely leaving his troops time to restore their worn-out footgear, or for the cavalry to replace their jaded horses from captured Prussian resources, he set Davout in motion towards Warsaw on the 2nd of November, and the remainder of the army followed in successive echelons as rapidly as they could be despatched.

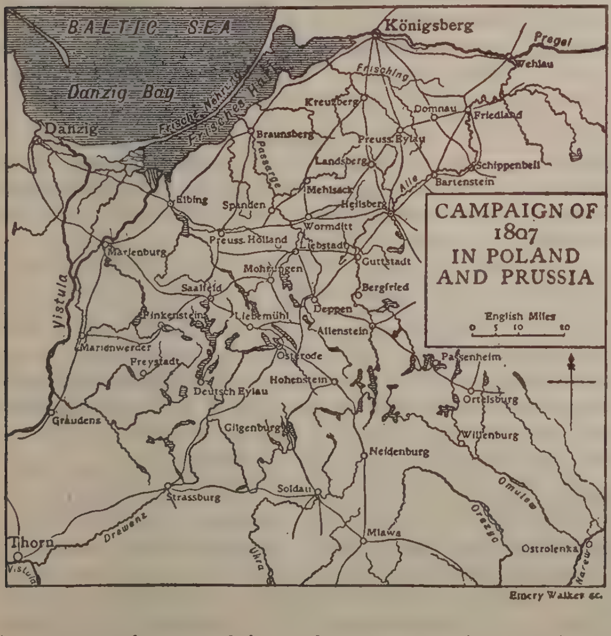
The cavalry, moving well in advance, dispersed the Prussian depôts and captured their horses, as far as the line of the Vistula, where at last they encountered organized resistance from the outposts of Lestocq's little corps of 15,000 men—all that was left of Frederick the Great's army. These, however, gave way before the threat of the advancing French and after a few trifling skirmishes. Davout entered Warsaw on the 30th of

November, being followed by the V., IV. and Guard corps during the succeeding fortnight, whilst the VI. and VII. were echeloned to their left, and the VIII. (Mortier) and IX. (Jerome Napoleon) and X. (Lefebvre), all new formations since the outbreak of the war, followed some marches in the rear. Jerome's corps was composed of the Bavarians, Württembergers and Badensers.

Behind these all Prussia was overrun by newly formed units, (3rd and 4th battalions) raised from depot companies, conscripts for 1807, and old soldiers rejoining after sickness or wounds. Napoleon caused these to be despatched to the front immediately after their formation. He had much territory to occupy, and in the long march of on an average 85 days, he considered that they could be organized, equipped and drilled *en route*.

23. *Pultusk.*—The Russians meanwhile had been moving slowly forward in two bodies, one under Bennigsen (50,000), the other under Buxhowden (25,000), and the French being at this time in Warsaw, they took up threatening positions about Pultusk, Plock and Prassnitz. From this triangle they harried the French communications with Berlin, and to secure a winter's rest for his men Napoleon determined to bring them to action. On the 23rd of December operations were commenced, but the difficulties of securing information and maintaining communication between the respective columns, so unlike what any of the French had previously encountered, led to a very partial success. The idea had been to induce the Russians to concentrate about Pultusk and, turning their position from its left, ultimately to cut them off from Russia, and if possible to surround them. But in this new and difficult country the emperor found it impossible to time his marches. The troops arrived late at their appointed positions, and after a stubborn rearguard action at Pultusk itself and undecisive fighting elsewhere (Soldau-Golymin) the Russians succeeded in retreating beyond the jaws of the French attack, and Napoleon for the first time found that he had exceeded the limit of endurance of his men. Indeed, the rank and file bluntly told him as much as he rode with the marching columns. Yielding to the inevitable, but not forgetting to announce a brilliant victory in a bulletin, he sent his troops into winter quarters along the Passarge and down the Baltic, enjoining on his corps commanders most strictly to do nothing to disturb their adversary.

24. *Campaign of Eylau.*—Bennigsen, now commanding the whole Russian army which with Lestocq's Prussians amounted to 100,000, also moved into winter quarters in the triangle Deutsch-Eylau-Osterode-Allenstein, and had every intention of remaining there, for a fresh army was already gathering in Russia, the 1st corps of which had reached Nur about 50 m. distant from the French right.


CAMPAIGN OF 1807 IN POLAND AND PRUSSIA

Emery Walker sc.

Unfortunately, Ney with his VI. corps about Gilgenberg had received the most poverty-stricken district in the whole region, and to secure some alleviation for the sufferings of his men he incautiously extended his cantonments till they came in contact with the Russian outposts. Apparently seeing in this movement a recommencement of hostilities, Bennigsen concentrated his troops towards his right and commenced an advance westwards towards Danzig, which was still in Prussian hands. Before his advance both Ney and Bernadotte (the latter, between Ney and the Baltic, covering the siege of Danzig) were compelled to fall back. It then became necessary to disturb the repose of the whole army to counter the enemy's intentions. The latter by this movement, however, uncovered his own communication with Russia, and the emperor was quick to seize his opportunity. He received the information on the 28th of January. His orders were at once issued and complied with with such celerity that by the 31st he stood prepared to advance with the corps of Soult, Ney, Davout and Augereau, the Guard and the reserve cavalry (80,000 men on a front of 60 m.) from Myszienec through Wollenberg to Gilgenberg; whilst Lannes on his right towards Ostrolenka and Lefebvre (X.) at Thorn covered his outer flanks.

Bernadotte, however, was missing, and this time through no fault of his own. His orders and the despatch conveying Napoleon's instructions fell into the hands of the Cossacks, and just in time Bennigsen's eyes were opened. Rapidly renouncing his previous intentions, he issued orders to concentrate on Allenstein; but this point was chosen too far in advance and he was anticipated by Murat and Soult at that place on the 2nd of February. He then determined to unite his forces at Joukendorf, but again he was too late. Soult and Murat attacked his rearguard on the 3rd, and learning from his Cossacks that the French corps were being directed so as to swing round and enclose him, he withdrew by a night march and ultimately succeeded in getting his whole army, with the exception of von Lestocq's Prussians, together in the strong position along the Alle, the centre of which is marked by Preussisch-Eylau. The opportunity for this concentration he owed to the time gained for him by his rearguard at Joukendorf, for this had stood just long enough to induce the French columns to swing in to surround him, and the next day was thus lost to the emperor as his corps had to extend again to their manœuvring intervals. The truth is that the days were too short and the roads too bad for Napoleon to carry out the full purpose his "general advanced guard" was intended to fulfil. It was designed to hold the enemy in position by the vigour of its attack, thus neutralizing his independent will power and compelling him to expend his reserves in the effort to rescue the troops engaged. But in forests and snowdrifts the French made such slow progress that no sufficient deployment could be made until darkness put a stop to the fighting. Thus, when late on the 7th of February 1807 Murat and Soult overtook the enemy near Eylau (*q.v.*) the fighting was severe but not prolonged. This time, however, Bennigsen, with over 60,000 men in position and 15,000 Prussians expected to arrive next morning, had no desire to avoid a battle, and deployed for action, his front protected by great batteries of guns, many of them of heavy calibre, numbering some 200 in all.

During the night Augereau and the Guards had arrived, and Ney and Davout were expected on either flank in the forenoon. This time the emperor was determined his enemy should not escape him, and about 8 A.M. ordered Soult and Augereau on the left and right respectively to assail the enemy, Murat and the Guards remaining in the centre as reserve. Napoleon's own forces thus became the "general advanced guard" for Ney and Davout, who were to close in on either side and deliver the decisive stroke. But here too the weather and the state of the roads operated adversely, for Ney came up too late, while Davout, in the full tide of his victorious advance, was checked by the arrival of Lestocq, whose corps Ney had failed to intercept, and the attack of Augereau's corps (VII.), made in a blinding snowstorm, failed with the appalling loss of over 40% killed and wounded. Augereau himself was severely wounded, and the remnant of his corps was subsequently distributed amongst the other corps. Bennigsen, however, drew off on Ney's arrival, and the French were too much exhausted to pursue him. Again the emperor had to admit that his troops could do no more, and bowing to necessity, he distributed them into winter quarters, where, however, the enterprise of the Cossacks, who were no strangers to snow and to forests, left the outposts but little repose.

A protracted period of rest followed, during which the emperor exerted himself unremittingly to re-equip, reinforce and supply his troops. Hitherto he had been based on the entrenched camp of Warsaw, but he had already taken steps to organize a new line of supply and retreat via Thorn, and this was now completed. At the same time Lefebvre was ordered to press the siege of Danzig with all vigour, and on the 5th of May, after a most gallant resistance, Kalckreuth, who redeemed here his failure of Auerstädt, surrendered. English assistance came too late. By the beginning of June the French had more than made good their losses and 210,000 men were available for field service.

25. *Heilsberg and Friedland.*—Meanwhile Bennigsen had prepared for a fresh undertaking, and leaving Lestocq with 20,000 Prussians and Russians to contain Bernadotte, who lay between Braunsberg and Spandau on the Passarge, he moved southwards on the 2nd, and on the 3rd and 4th of June he fell upon Ney, driving him back towards Guttstadt, whilst with the bulk of his force he moved towards Heilsberg, where he threw up an entrenched position. It was not till the 5th that Napoleon received tidings of his advance, and for the moment these were so vague that he contented himself by warning the remainder of his forces to be prepared to move on the 6th. Next day, however, all doubts were set at rest, and as the Russians advanced south of Heilsberg, he decided to wheel his whole force to the right, pivoting on the III. corps, and cut Bennigsen off from Königsberg and the sea. On the 8th the VI., III., VIII. and Guard corps, together with a new cavalry reserve corps under Lannes, in all 147,000, stood ready for the operation, and with Murat and Soult as general advanced guard the whole moved forward, driving the Russian outposts before them. Bernadotte, who was to have attacked Lestocq, again failed to receive his orders and took no part in the following operations.

Murat attacked the Russians, who had halted in their entrenched position, on the 11th and drove in their outposts, but did not discover the entrenchments. Meanwhile Soult had followed with his infantry in close support, and the emperor himself arriving, ordered him to attack at once. Now the Russians uncovered their entrenchments, and in the absence of artillery preparation Soult's leading troops received most severe punishment. Fresh troops arriving were sent in to his support, but these also proved insufficient, and darkness alone put an end to the struggle, which cost the French 12,000 killed and wounded.

Bennigsen, however, learning that his right was threatened by the III. corps, and not having as yet completed his concentration, retreated in the night to Bartenstein, and the following day turned sharp to right towards Schippenbeil. The emperor now pressed on towards Friedland, where he would completely control the Russian communications with Königsberg, their immediate base of supply, but for once the Russians outmarched him and covered their movement so successfully that for the next three days he seems to have completely lost all knowledge of his enemy's whereabouts. Lestocq in the meantime had been forced northwards towards Königsberg, and Soult with Murat was in hot pursuit. The III.,VI., VIII. and Guard corps followed the main road towards Königsberg, and the former had reached Mühlhausen, the remainder were about Preussisch-Eylau, when Latour Maubourg's dragoons sent in intelligence which pointed to the presence of Bennigsen about Friedland. This was indeed the case. The Russians after passing Schippenbeil had suddenly turned northwards, and on the evening of the 13th were taking up a strong position on the river Alle with Friedland as a centre.

What followed presents perhaps the finest instance of the Napoleonic method. The enemy lay direct to his right, and Murat, the IV. and III. corps had well overshot the mark. Lannes's reserve corps (cavalry), to whom Latour Maubourg reported, lay at Domnau some 10 m. to the right. The latter at once assumed the rôle of advanced guard cavalry and was ordered to observe the enemy at Friedland, Ney following in close support. Davout was turned about and directed on the enemy's right, and the VIII. corps (Mortier), the Guards and the reserve cavalry followed as main body. On the 14th (the anniversary of Marengo) Lannes carried out his rôle of fighting advanced guard or screen, the emperor's main body gradually came up, and the battle of Friedland (*q.v.*), notable chiefly for the first display of the new artillery tactics of the French, ended with a general attack about 5 P.M. and the retreat of the Russians, after severe losses, over the Alle. Lestocq was, meanwhile, driven through Königsberg (which surrendered on the 15th) on Tilsit, and now that he was no longer supported by the Russians, the Prussian commander gave up the struggle.

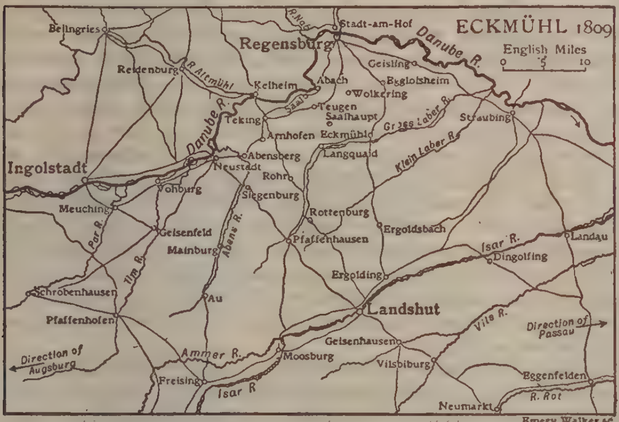
26. *The Austrian Army in 1809.*—Ever since Austerlitz the Austrian officers had been labouring to reconstitute and reform their army. The archduke Charles was the foremost amongst many workers who had realized that numbers were absolutely needed to confront the new French methods. With these numbers it was impossible to attain the high degree of individual efficiency required for the old line tactics, hence they were compelled to adopt the French methods of skirmishers and columns, but as yet they had hardly realized the increased density necessary to be given to a line of battle to enable it to endure the prolonged nervous strain the new system of tactics entailed. Where formerly 15,000 men to the mile of front had been considered ample for the occupation of a position or the execution of an attack, double that number now often proved insufficient, and their front was broken before reinforcements could arrive. Much had been done to create an efficient staff, but though the idea of the army corps command was now no new thing, the senior generals entrusted with these commands were far from having acquired the independence and initiative of their French opponents. Hence the extraordinary slowness of their manœuvres, not because the Austrian infantry were bad marchers, but because the preparation and circulation of orders was still far behind the French standard. The light cavalry had been much improved and the heavy cavalry on the whole proved a fair match for their opponents.

27. *The French Army.*—After the peace of Tilsit the Grand Army was gradually withdrawn behind the Rhine, leaving only three commands, totalling 63,000 men, under Davout in Prussia, Oudinot in west central Germany, and Lefebvre in Bavaria, to assist the princes of the Confederation of the Rhine in the maintenance of order and the enforcement of the French law of conscription, which was rigorously insisted on in all the States comprised in this new federation.

In exchange for the subsistence of the French troops of occupation, a corresponding number of these new levies were moved to the south of France, where they commenced to arrive at the moment when the situation in Spain became acute. The Peninsular War (*q.v.*) called for large forces of the old *Grande Armée* and for a brief period Napoleon directed operations in person; and the Austrians took advantage of the dissemination and weakness of the French forces in Germany to push forward their own preparations with renewed energy.

But they reckoned without the resourcefulness of Napoleon. The moment news of their activity reached him, whilst still in pursuit of Sir John Moore, he despatched letters to all the members of the Confederation warning them that their contingents might soon be required, and at the same time issued a series of decrees to General Clarke, his war minister, authorizing him to call up the contingent of 1810 in advance, and directing him in detail to proceed with the formation of 4th and 5th battalions for all the regiments across the Rhine. By these means Davout's, Oudinot's and Lefebvre's commands were augmented, whilst in February and March new corps were formed and rapidly pushed towards the front.

On his return from Spain, seeing war imminent, he issued a series of march orders (which deserve the closest study in detail) by which on the 15th of April his whole army was to be concentrated for manœuvres between Regensburg, Landshut, Augsburg and Donauwörth, and sending on the Guard in wagons to Strassburg, he despatched Berthier to act as commander-in-chief until his own arrival.



28. *Austrian Offensive.*—The position of assembly was excellently chosen, but unfortunately the Austrians took the initiative. On the 9th of April their main body of six corps crossed the Inn between Braunau and Passau, and simultaneously two additional corps moved from Pilsen in Bohemia on Regensburg. At this moment Davout was entering Regensburg with his leading troops, the remainder still some marches in rear, and it was evident that the whole concentration could no longer be carried out before the Austrians would be in a position to intervene. Berthier received the news while still on his way to the front, and quite failed to grasp the situation. Reaching Donauwörth at 8 P.M. on the 13th of April, he ordered Davout and Oudinot to remain at Regensburg, whilst Lefebvre and Wrede (Bavarians) who had fallen back before the Austrians were directed to reoccupy Landshut. This was in direct contradiction with the instructions Napoleon had given him on the 28th of March in view of this very emergency. Davout obeyed, but remonstrated. On the 16th Berthier went on to Augsburg, where he learnt that Lefebvre's advanced troops had been driven out of Landshut, thus opening a great gap seventy-six miles wide between the two wings of the French army. Meanwhile Napoleon, who had left Paris at 4 A.M. on the 13th of April, was hastening towards the front, but remained still in ignorance of Berthier's doings until on the 16th at Stuttgart he received a letter from the Marshal dated the 13th, which threw him into consternation. In reply he immediately wrote: "You do not inform me what has rendered necessary such an extraordinary measure which weakens and divides my troops"—and—"I cannot quite grasp the meaning of your letter yet, I should have preferred to see my army concentrated between Ingolstadt and Augsburg, the Bavarians in the first line, with the duke of Danzig in his old position, until we know what the enemy is going to do. Everything would be excellent if the duke of Auerstädt had been at Ingolstadt and the duke of Rivoli with the Württembergers and Oudinot's corps at Augsburg, . . . so that just the opposite of what should have been done has been done" (C. N. to Berthier, Ludwigsburg, 16th April).

29. *Napoleon takes command.*—Having despatched this severe reprimand he hastened on to Donauwörth, where he arrived at 4 A.M. on the 17th, hoping to find Berthier, but the latter was at Augsburg. Nevertheless, at 10 A.M. he ordered Davout and Oudinot to withdraw at once to Ingolstadt; and Lefebvre and Wrede on the right to support the movement. About noon Berthier returned and after hearing his explanation Massena received orders to move from Augsburg towards Ingolstadt. "To-morrow will be a day of preparation spent in drawing closer together, and I expect to be able by Wednesday to manœuvre against the enemy's columns according to circumstances."

Meanwhile the Austrians had approached so near that by a single day's march it would have been possible to fall upon and crush by superior numbers either wing of the French army, but though the Austrian light cavalry successfully covered the operations of the following troops they had not yet risen to a conception of their reconnoitring mission, and the archduke, in ignorance of his opportunity and possessed, moreover, with the preconceived idea of uniting at Regensburg with the two corps coming from Bohemia, moved the bulk of his forces in that direction, leaving only a covering body against Davout altogether insufficient to retain him. Davout, however, had left a garrison of 1800 men in Regensburg, who delayed the junction of the Austrian wings until the 20th inst., and on the same day the emperor, having now reunited his whole right wing and centre, overwhelmed the covering detachments facing him in a long series of disconnected engagements lasting forty-eight hours, and the archduke now found himself in danger of being forced back into the Danube. But with the Bohemian reinforcements he had still four corps in hand, and Napoleon, whose intelligence service in the difficult and intersected country had lamentably failed him, had weakened his army by detaching a portion of his force in pursuit of the beaten right wing, and against the archduke's communications.

30. *Eckmühl.*—When, therefore, the latter, on the 22nd, marched southward to reopen his communications by the defeat of the enemy's army, always the surest means of solving this difficulty, he actually reached the neighbourhood of Eckmühl with a sufficient numerical superiority had he only been prompt enough to seize his opportunity. But the French had been beforehand with him. Napoleon, who had personally taken part in the fighting of the previous day, and followed the pursuit as far as Landshut, whence he had despatched Massena to follow the retreating Austrians along the Isar, seems to have realized about 3 A.M. in the morning that it was not the main body of the enemy he had had before him, but only its left wing, and that the main body itself must still be northward towards Regensburg. Issuing orders to Davout, Oudinot and his cavalry to concentrate with all speed towards Eckmühl, he himself rode back along the Regensburg road and reached the battle-field just as the engagement between the advance troops had commenced. Had the Austrians possessed mobility equal to that of the French the latter should have been overwhelmed in detail, but whilst the French covered 17 and 19 m. the Austrians only marched 10, and, owing to the defect in their tactical training alluded to above, the troops actually on the ground could not hold out long enough for their reserves to arrive. The retreat of the front lines involved the following ones in confusion, and presently the whole mass was driven back in considerable disorder. It seemed as if nothing could save the Austrians from complete disaster, but at the critical moment the emperor, yielding to the protestations of his corps commanders, who represented the excessive fatigue of their troops, stopped the pursuit, and the archduke made the most of his opportunity to restore order amongst his demoralized men, and crossed to the north bank of the Danube during the night.

31. *Austrian Retreat.*—On the following morning the French reached Regensburg and at once proceeded to assault its medieval walls, but the Austrian garrison bravely defended it till the last of the stragglers was safely across on the north bank. It was here that for the only time in his career Napoleon was slightly wounded. Then, leaving Davout to observe the archduke's retreat, the emperor himself rode after Massena, who with the major portion of the French army was following the Austrian weaker wing under Hiller. The latter was not so shaken as Napoleon believed, and turning to bay inflicted a severe check on its pursuers, who at Ebelsberg lost 4000 men in three

fruitless assaults. Thus covered by his rearguard Hiller gained space and time to pass his troops over to the north bank of the Danube and remove all boats on the river. This left the direct road to Vienna open, and Napoleon, hoping to find peace in the enemy's capital, pushed the whole of his army down the right bank, and with Murat's cavalry entered the city on the 12th of May, after somewhat severe resistance lasting three days. Meanwhile the archduke and Hiller, both now unmolested, effected their junction in the vicinity of Wagram, picketing the whole line of the Danube with their outposts and collecting all the boats.

32. *Aspern and Wagram.*—The reconnaissance of the river was at once taken in hand by the French upon their arrival in Vienna, and a point opposite the island of Lobau selected for the crossing. Thanks to the Austrian precautions it took four days to collect the necessary material to span the main branch of the river, here some 2000 yds. across, and though Napoleon personally spurred on all to activity nearly four days more were required for its construction. It was not till the night of the 19th of May that orders for the passage were finally issued, and during the night the troops commenced to occupy the island of Lobau. Surprise, of course, was out of the question, but the Austrians did not attempt to dispute the passage, their object being to allow as many French as they felt they could deal with to pass over and then to fall on them. Thus on the 21st of May the battle of Aspern (*q.v.*) or Essling began. It ended on the night of the 22nd with the complete defeat of Napoleon, the first ever inflicted upon him. The French retreated into the island of Lobau. By nightfall upwards of 100,000 men, encumbered with at least 20,000 wounded, were crowded together on the little island scarcely a mile square, short of provisions and entirely destitute of course of all hospital accessories. The question then arose whether the retreat was to be continued across the main stream or not, and for the second time in his career Napoleon assembled his generals to take their opinion. They counselled retreat, but having heard them all he replied, in substance: "If we leave here at all we may as well retire to Strassburg, for unless the enemy is held by the threat of further operations he will be free to strike at our communications and has a shorter distance to go. We must remain here and renew operations as soon as possible."

Immediate orders were despatched to summon every available body of troops to concentrate for the decisive stroke. Practically the lines of communication along the Danube were denuded of combatants, even Bernadotte being called up from Passau, and the viceroy of Italy, who driving the archduke Johann before him (action of Raab) had brought up 56,000 men through Tirol, was disposed towards Pressburg within easy call. The arsenal of Vienna was ransacked for guns, stores and appliances, and preparations in the island pushed on as fast as possible. By the end of June 200,000 troops were stationed within call, and on the 4th July the French began to cross over to the left bank of the Danube. The events which followed are described under WAGRAM. The great battle at this place, fought on the 5th and 6th of July, ended in the retirement of the Austrians. The only other event which occurred before peace was made was an unimportant action at Znaym on the 11th of July.

33. *The Russian War of 1812.*—Whilst the campaign of 1809 had seriously shaken the faith of the marshals and the higher ranks in the infallibility of the emperor's judgment, and the slaughter of the troops at Aspern and Wagram had still further accentuated the opposition of the French people to conscription, the result on the fighting discipline of the army had, on the whole, been for good. The panics of Wagram had taught men and officers alike a salutary lesson.

Aware of the growing feeling against war in France, Napoleon had determined to make his allies not only bear the expenses of the coming campaign, but find the men as well, and he was so far master of Europe that of the 363,000 who on the 24th of June crossed the Niemen no less than two-thirds were Germans, Austrians, Poles or Italians. But though the battlefield discipline of the men was better, the discipline in camp and on the march was worse, for the troops were no longer eager to reach the battlefield, and marched because they were compelled, not of their own goodwill. The result was apparent in a sudden diminution in mobility, and a general want of punctuality which in the event very seriously influenced the course of the campaign. On the other hand, the Russians, once their fatherland was invaded, became dominated by an ever-growing spirit of fanaticism, and they were by nature too obedient to their natural leaders, and too well inured to the hardships of campaigning, to lose their courage in a retreat.

34. *The Strategic Deployment.*—By the middle of June 1812 the emperor had assembled his army along the line of the Niemen. On the extreme right stood the Austrian contingent under Schwarzenberg (34,000 men). Next, centring about Warsaw, a group of three corps (19,000 men) under the chief command of Napoleon's brother Jerome. Then the main army under Napoleon in person (220,000 men; with 80,000 more under the viceroy of Italy on his right rear); and on the extreme left at Tilsit a flanking corps, comprising the Prussian auxiliary corps and other Germans (in all 40,000 strong). The whole army was particularly strong in cavalry; out of the 450,000, 80,000 belonged to that arm, and Napoleon, mindful of the lessons of 1807, had issued the most minute and detailed orders for the supply service in all its branches, and the forwarding of reinforcements, no less than 100,000 men being destined for that purpose in due course of time.

Information about the Russians was very indifferent; it was only known that Prince Bagration with about 33,000 men lay grouped about Wolkowysk; Barclay de Tolly with 40,000 about Vilna; and on the Austrian frontier lay a small corps under Tormassov in process of formation, while far away on the Turkish frontiers hostilities with the sultan retained Tschitschagov with 50,000 more. Of the enemy's plans Napoleon knew nothing, but, in accordance with his usual practice, the position he had selected met all immediate possible moves.

35. *Opening of the Campaign.*—On the 24th of June the passage of the Niemen began in torrid heat which lasted for a few days. The main army, with the emperor in person, covered by Murat and the cavalry, moved on Vilna, whilst Jerome on his right rear at once threatened Bagration and covered the emperor's outer flank. From the very first, however, the inherent weakness of the vast army, and the vicious choice of time for the beginning of the advance, began to make itself felt. The crops being still green, and nothing else available as forage for the horses, an epidemic of colic broke out amongst them, and in ten days the mounted arms had lost upwards of one-third of their strength; men died of sunstroke in numbers, and serious straggling began. Still everything pointed to the concentration of the Russians at Vilna, and Jerome, who on the 5th of July had reached Grodno, was ordered to push on. But Jerome proved quite inadequate to his position, listening to the complaints of his subordinates as to want of supplies and even of pay; he spent four whole days in absolute inertia, notwithstanding the emperor's reprimands. Meanwhile the Russians made good their retreat—Barclay towards the entrenched camp of Drissa on the Dvina, Bagration towards Mohilev.

The emperor's first great *coup* thus failed. Jerome was replaced by Davout, and the army resumed its march, this time in the hope of surrounding and overwhelming Barclay, whilst Davout dealt with Bagration. The want of mobility, particularly in the cavalry, now began to tell against the French. With horses only just recovering from an epidemic, they proved quite unequal to the task of catching the Cossacks, who swarmed round them in every direction, never accepting an engagement but compelling a constant watchfulness for which nothing in their previous experience had sufficiently prepared the French.

Before their advance, however, the Russian armies steadily retired, Barclay from Vilna via Drissa to Vitebsk, Bagration from Wolkowysk to Mohilev. Again arrangments were made for a Napoleonic battle; behind Murat's cavalry came the "general advanced guard" to attack and hold the enemy, whilst the main body and Davout were held available to swing in on his rear. Napoleon, however, failed to allow for the psychology of his opponents, who, utterly indifferent to the sacrifice of life, refused to be drawn into engagements to support an advance or to extricate a rearguard, and steadily withdrew from every position when the French gained touch with them.

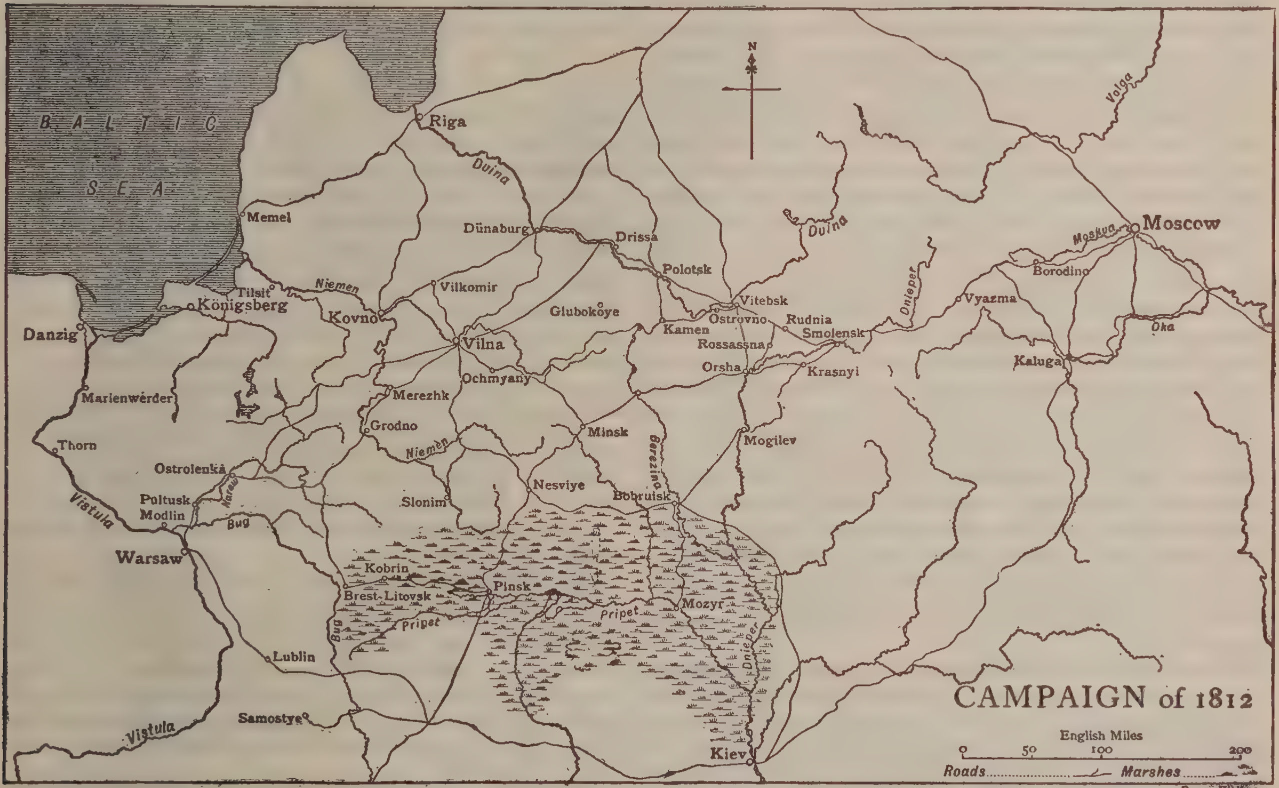
Thus the manœuvre against Vitebsk again miscarried, and Napoleon found himself in a far worse position, numerically and materially, than at the outset of the campaign. Then he had stood with 420,000 men on a front of 160 m., now he had only 229,000 men on a front of 135; he had missed three great opportunities of destroying his enemy in detail, and in five weeks, during which time he had only traversed 200 m., he had seen his troops reduced numerically at least one-third, and, worse still, his army was now far from being the fighting machine it had been at the outset.

36. *Smolensk.*—Meanwhile the Russians had not lost a single gun and the *moral* of their men had been improved by the result of the many minor encounters with the enemy; further, the junction of Bagration and Barclay was now assured in the vicinity of Smolensk. Towards this place the French advance was now resumed, and the Russian generals at the head of a united force of 130,000 men marched forward to meet them. Here, however, the inefficiency of the Russian staff actually saved them from the disaster which must certainly have overtaken them had they realized their intention of fighting the French. The Russians marched in two columns, which lost touch of one another, and as it was quite impossible for either to engage the French single-handed, they both retired again towards Smolensk, where with an advanced guard in the town itself—which possessed an old-fashioned brick *enceinte* not to be breached by field artillery alone—the two columns reunited and deployed for action behind the unfordable Dnieper.

Murat and Ney as "general advanced guard" attacked the town in the morning of the 16th of August, and whilst they fought the main body was swung round to attack the Russian left and rear. The whole of the 17th was required to complete the movement, and as soon as its purpose was sufficiently revealed to the Russians the latter determined to retreat under cover of night. Their manœuvre was carried out with complete success, and then began a series of rearguard actions and nocturnal retreats which completely accomplished their purpose of wearing down the French army. The Russian government, however, failed to see the matter in its true light, and Marshal Kutusov was sent to the front to assume the chief command. His intention was to occupy a strong position and fight one general action for the possession of Moscow, and to this end he selected the line of the Kalatscha where the stream intersects the great Moscow road.

37. *Borodino.*—Here he was overtaken by Murat and Ney, but the French columns had straggled so badly that four whole days elapsed before the emperor was able to concentrate his army for battle and then could only oppose 128,000 men to the Russians' 110,000. About 6 a.m. the battle began, but Napoleon was suffering from one of those attacks of illness and depression which henceforth became such an important factor in his fate. Till about midday he followed the course of the action with his usual alertness; then he appears to have been overcome by a kind of stupor and allowed his marshals to fight by themselves. There was no final decisive effort as at Wagram and the Guard was not even called on to move. Ultimately the sun went down on an undecided field on which 25,000 French and 38,000 Russians had fallen, but the moral reaction on the former was far greater than on the latter.

38. *Moscow.*—Kutusov continued his retreat, and Murat with his now exhausted horsemen followed as best he might. Sebastiani, commanding the advanced guard, overtook the Russians in the act of evacuating Moscow, and agreed with the latter to observe a seven hours' armistice to allow the Russians to clear the town, for experience had shown the French that street fighting in wooden Russian townships always meant fire and the consequent destruction of much-needed shelter and provisions. Towards nightfall Napoleon reached the scene, and the Russians being now clear the troops began to enter, but already fires were observed in the farther part of the city. Napoleon passed the night in a house in the western suburb and next morning rode to the Kremlin, the troops moving to the quarters assigned to them, but in the afternoon a great fire began and, continuing for two days, drove the French out into the country again.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The emperor was now in the direst perplexity. Kutusov was hovering on the outskirts of the city, his main body at Kaluga, some marches to the S.W., where he was in full communication with the richest portion of the empire; and now news arrived that St. Cyr, who had relieved Macdonald on his extreme left, had only 17,000 men left under arms against upwards of 40,000 Russians under Witgenstein; and to the south Tschitschagov's army, being no longer detained on the Turkish frontier, peace having been made, was marching to join Tormassov about Brest-Litewski with forces which would bring the total of the two well over 100,000 men. Meanwhile Schwarzenberg's force opposing these had dwindled to a bare 30,000.

The French army was thus disposed almost in an equilateral triangle with sides of about 570 m., with 95,000 men at the apex at Moscow opposed to 120,000, 30,000 about Brest opposite 100,000, and 17,000 about Drissa confronted by 40,000, whilst in the centre of the base at Smolensk lay Victor's corps, about 30,000. From Moscow to the Niemen was 550 m. In view of this situation Napoleon on the 4th of October sent General Lauriston to the Russian headquarters to treat. Whilst waiting his return Murat was enjoined to skirmish with Kutusov, and the emperor himself worked out a scheme to assume the offensive with his whole army towards St Petersburg, calling in Victor and St Cyr on the way. This project was persisted with, until on the 18th Murat was himself attacked and severely handled (action of Tarutino or Vinkovo). On the morning of the 19th the whole army moved out to accept this challenge, and the French were thoroughly worsted on the 24th in the battle of Maloyaroslavetz.

39. *The Retreat from Moscow.*—Then began the celebrated retreat. It has generally been forgotten that the utter want of march discipline in the French, and not the climatic conditions, was responsible for the appalling disasters which ensued. Actually the frost came later than usual that year, the 27th of October, and the weather was dry and bracing; not till the 8th of November did the cold at night become sharp. Even when the Beresina was reached on the 26th November, the cold was far from severe, for the slow and sluggish stream was not frozen over, as is proved by the fact that Eblé's pioneers worked in the water all through that terrible day. But the French army was already completely out of hand, and the degree to which the panic of a crowd can master even the strongest instinct of the individual is shown by the conduct of the fugitives who crowded over the bridges, treading hundreds under foot, whilst all the time the river was easily fordable and mounted men rode backwards and forwards across it.

To return to the actual sequence of events. Kutusov had been very slow in exploiting his success of the 24th and indeed had begun the pursuit in a false direction; but about the 2nd of November, headquarters of the French being at Vyazma, the Cossacks became so threatening that the emperor ordered the army to march (as in Egypt) in hollow square. This order, however, appears only to have been obeyed by the Guards, with whom henceforward the emperor marched.

Kutusov had now overtaken the French, but fortunately for them he made no effort to close with them, but hung on their flank, molesting them with Cossacks and picking up stragglers. Thus the wreck of the *Grande Armée*, now not more than fifty thousand strong, reached Smolensk on the 9th and there rested till the 14th. The march was then resumed, the Guard leading and Ney commanding the rearguard. Near Krasnoi on the 16th the Russian advanced guard tried to head the column off. Napoleon halted a whole day to let the army close up; and then attacked with his old vigour and succeeded in clearing the road, but only at the cost of leaving Ney and the rearguard to its fate. By a night march of unexampled daring and difficulty Ney succeeded in breaking through the Russian cordon, but when he regained touch with the main body at Orcha only 800 of his 6000 men were still with him (21st).

40. *The Beresina.*—From here Napoleon despatched orders to Victor to join him at Borisov on the Beresina. The cold now gave way and thaw set in, leaving the country a morass, and information came that Tschitschagov from the south had reached Borisov. He now selected Viesselovo as the point of passage and at 1 a.m. on the 23rd sent orders to Oudinot to march thither and construct bridges. In the execution of these orders Oudinot encountered the Russian advanced guard near Borisov and drove the latter back in confusion, though not before they had destroyed the existing bridge there. This sudden reassumption of the offensive threw Tschitschagov into confusion. Thus time was gained for Victor also to come up and for Oudinot to construct the bridges at Studienka near the above-mentioned place, but a spot in many respects better suited for the purpose. Thither therefore Napoleon sent his pontonniers under General Eblé, but on their arrival they found that no preparations had been made and much time was lost. Meanwhile Victor, in doubt as to the real point of passage, had left the road to Studienka open to Wittgenstein, who had followed hard on his heels.

By 4 p.m. on the 26th the bridges were finished and the passage began, but not without resistance by the Russians, who were gradually closing in. The crossing continued all night, though interrupted from time to time by failures of the bridges. All day during the 27th stragglers continued to cross, covered by such combatants as remained under sufficient discipline to be employed. At 8 a.m. on the 28th, however, Tschitschagov and Wittgenstein moved forward on both banks of the river to the attack, but were held off by the splendid self-sacrifice of the few remaining troops under Ney, Oudinot and Victor, until about 1 p.m. the last body of regular troops passed over the bridges, and only a few thousand stragglers remained beyond the river.

The number of troops engaged by the French that day cannot be given exactly. Oudinot's and Victor's men were relatively fresh and may have totalled 20,000, whilst Ney can hardly have had more than 6000 of all corps fighting under him. How many were killed can never be known, but three days later the total number of men reported fit for duty had fallen to 8800 only.

41. *Final Operations.*—Henceforward the retreat of the army became practically a headlong flight, and on the 5th of December, having reached Smorgoni and seeing that nothing further could be done by him at the front, the emperor handed over the command of what remained to Murat, and left for Paris to organize a fresh army for the following year. Travelling at the fullest speed, he reached the Tuileries on the 18th, after a journey of 312 hours.

After the emperor's departure the cold set in with increased severity, the thermometer falling to 23°. On the 8th of December Murat reached Vilna, whilst Ney with about 400 men and Wrede with 2000 Bavarians still formed the rearguard; but it was quite impossible to carry out Napoleon's instructions to go into winter quarters about the town, so that the retreat was resumed on the 10th and ultimately Königsberg was attained on the 19th of December by Murat with 400 Guards and 600 Guard cavalry dismounted.

Meanwhile on the extreme French right Schwarzenberg and his Austrians had drifted away towards their own frontier, and the Prussian contingent, which under Yorck (see Yorck von Wartenburg) formed part of Macdonald's command about Riga, had entered into a convention with the Russians at Tauroggen (December 30) which deprived the French of their last support upon their left. Königsberg thus became untenable, and Murat fell back to Posen, where on the 10th of January he handed over his command to Eugène Beauharnais and returned to Paris.

The Russian pursuit practically ceased at the line of the Niemen, for their troops also had suffered terrible hardships and a period of rest had become an absolute necessity.

42. *The War of Liberation.*—The Convention of Tauroggen became the starting-point of Prussia's regeneration. As the news of the destruction of the *Grande Armée* spread, and the appearance of countless stragglers convinced the Prussian people of the reality of the disaster, the spirit generated by years of French domination burst out. For the moment the king and his ministers were placed in a position of the greatest anxiety, for they knew the resources of France and the boundless versatility of their arch-enemy far too well to imagine that the end of their

sufferings was yet in sight. To disavow the acts and desires of the army and of the secret societies for defence with which all north Germany was honeycombed would be to imperil the very existence of the monarchy, whilst an attack on the wreck of the Grand Army meant the certainty of a terrible retribution from the new armies now rapidly forming on the Rhine.

But the Russians and the soldiers were resolved to continue the campaign, and working in collusion they put pressure on the not unwilling representatives of the civil power to facilitate the supply and equipment of such troops as were still in the field; they could not refuse food and shelter to their starving countrymen or their loyal allies, and thus by degrees the French garrisons scattered about the country either found themselves surrounded or were compelled to retire to avoid that fate. Thus it happened that the viceroy of Italy felt himself compelled to depart from the positive injunctions of the emperor to hold on at all costs to his advanced position at Posen, where about 14,000 men had gradually rallied around him, and to withdraw step by step to Magdeburg, where he met reinforcements and commanded the whole course of the lower Elbe.

43. *Napoleon's Preparations.*—Meanwhile the emperor in Paris had been organizing a fresh army for the reconquest of Prussia. Thanks to his having compelled his allies to fight his battles for him, he had not as yet drawn very heavily on the fighting resources of France, the actual percentage of men taken by the conscriptions during the years since 1806 being actually lower than that in force in continental armies of to-day. He had also created in 1811–1812 a new National Guard, organized in "cohorts" to distinguish it from the regular army, and for home defence *only*, and these by a skilful appeal to their patriotism and judicious pressure applied through the prefects, became a useful reservoir of half-trained men for new battalions of the active army. Levies were also made with rigorous severity in the states of the Rhine Confederation, and even Italy was called on for fresh sacrifices. In this manner by the end of March upwards of 200,000 men were moving towards the Elbe,[1] and in the first fortnight of April they were duly concentrated in the angle formed by the Elbe and Saale, threatening on the one hand Berlin, on the other Dresden and the east.

44. *Spring Campaign of 1813.*—The allies, aware of the gradual strengthening of their enemy's forces but themselves as yet unable to put more than 200,000 in the field, had left a small corps of observation opposite Magdeburg and along the Elbe to give timely notice of an advance towards Berlin; and with the bulk of their forces had taken up a position about Dresden, whence they had determined to march down the course of the Elbe and roll up the French from right to left. Both armies were very indifferently supplied with information, as both were without any reliable regular cavalry capable of piercing the screen of outposts with which each endeavoured to conceal his disposition, and Napoleon, operating in a most unfriendly country, suffered more in this respect than his adversaries.

On the 25th of April Napoleon reached Erfurt and assumed the chief command. On this day his troops stood in the following positions. Eugène, with Lauriston's, Macdonald's and Regnier's corps, on the lower Saale, Ney in front of Weimar, holding the defile of Kösen; the Guard at Erfurt, Marmont at Gotha, Bertrand at Saalfeld, and Oudinot at Coburg, and during the next few days the whole were set in motion towards Merseburg and Leipzig, in the now stereotyped Napoleonic order, a strong advanced guard of all arms leading, the remainder—about two-thirds of the whole—following as "masse de manœuvre," this time, owing to the cover afforded by the Elbe on the left, to the right rear of the advanced guard.

Meanwhile the Russians and Prussians had concentrated all available men and were moving on an almost parallel line, but somewhat to the south of the direction taken by the French. On the 1st of May Napoleon and the advanced guard entered Lützen. Wittgenstein, who now commanded the allies in place of Kutusov, hearing of his approach, had decided to attack the French advanced guard, which he took to be their whole force, on its right flank, and during the morning had drawn together the bulk of his forces on his right in the vicinity of Gross-Görschen and Kaya.

45. *Battle of Lützen.*—About 9 a.m. on May 2nd he began an attack on the French advance guard in Lützen, whilst the remainder of his army was directed against Napoleon's right and rear. Just as the latter were moving off the heads of the French main body suddenly appeared, and at 11 a.m. Napoleon, then standing near the Gustavus Adolphus monument on the field of Lützen, heard the roar of a heavy cannonade to his right rear. He realized the situation in a moment, galloped to the new scene of action, and at once grouped his forces for decisive action—the gift in which he was supreme. Leaving the leading troops to repulse as best they might the furious attack of both Russians and Prussians, and caring little whether they lost ground, he rapidly organized for his own control a battle-reserve. At length when both sides were exhausted by their efforts he sent forward nearly a hundred guns which tore asunder by their case-shot fire the enemy's line and marched his reserve right through the gap. Had he possessed an adequate cavalry force the victory would have been decisive. As it was, the allies made good their retreat and the French were too exhausted for infantry pursuit.

Perhaps no battle better exemplifies the inherent strength of the emperor's strategy, and in none was his grasp of the battlefield more brilliantly displayed, for, as he fully recognized, "These Prussians have at last learnt something—they are no longer the wooden toys of Frederick the Great," and, on the other hand, the relative inferiority of his own men as compared with his veterans of Austerlitz called for far more individual effort than on any previous day. He was everywhere, encouraging and compelling his men—it is a legend in the French army that the persuasion even of the imperial boot was used upon some of his reluctant conscripts, and in the result his system was fully justified, as it triumphed even against a great tactical surprise.

46. *Bautzen.*—As soon as possible the army pressed on in pursuit, Ney being sent across the Elbe to turn the position of the allies at Dresden. This threat forced the latter to evacuate the town and retire over the Elbe, after blowing up the stone bridge across the river. Napoleon entered the town hard on their heels, but the broken bridge caused a delay of four days, there being no pontoon trains with the army. Ultimately on the 18th of May the march was renewed, but the allies had continued their retreat in leisurely fashion, picking up reinforcements by the way. Arrived at the line of the Spree, they took up and fortified a very formidable position about Bautzen (*q.v.*). Here, on the 20th, they were attacked, and after a two days' battle dislodged by Napoleon; but the weakness of the French cavalry conditioned both the form of the attack, which was less effective than usual, and the results of the victory, which were extremely meagre.

The allies broke off the action at their own time and retired in such good order that the emperor failed to capture a single trophy as proof of his victory. The enemy's escape annoyed him greatly, the absence of captured guns and prisoners reminded him too much of his Russian experiences, and he redoubled his demands on his corps commanders for greater vigour in the pursuit. This led the latter to push on without due regard to tactical precautions, and Blücher took advantage of their carelessness when at Haynau (May 26), with some twenty squadrons of Landwehr cavalry, he surprised, rode over and almost destroyed Maison's division. The material loss inflicted on the French was not very great, but its effect in raising the *moral* of the raw Prussian cavalry and increasing their confidence in their old commander was enormous.

Still the allies continued their retreat and the French were unable to bring them to action. In view of the doubtful attitude of Austria, Napoleon became alarmed at the gradual lengthening of his lines of communication and opened negotiations. The enemy, having everything to gain and nothing to lose thereby, agreed finally to a six weeks' suspension of arms. This was perhaps the gravest military error of Napoleon's whole career, and his excuse for it, "want of adequate cavalry," is the strongest testimony as to the value of that arm.

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[1] Napoleon always gave them out as 300,000, but this number was never attained.

47. *The Autumn Campaign.*—As soon as a suspension of arms (to 15th of August) had been agreed to, Napoleon hastened to withdraw his troops from the dangerous position they occupied with reference to the passes leading over the mountains from Bohemia, for he entertained no doubt now that Austria was also to be considered as an enemy. Finally he decided to group his corps round Görlitz and Bautzen whence they could either meet the enemy advancing from Breslau or fall on his flank over the mountains if they attempted to force their way into Saxony by the valley of the Elbe. This latter manœuvre depended, however, on his maintenance of Dresden, and to this end he sent the I. Corps up the Elbe to Pirna and Königstein to cover the fortifications of Dresden itself. His instructions on this point deserve the closest study, for he foresaw the inevitable attraction which a complete entrenched camp would exercise even upon himself, and, therefore, limited his engineers to the construction of a strong bridge head on the right bank and a continuous enceinte, broken only by gaps for counter attack, around the town itself.

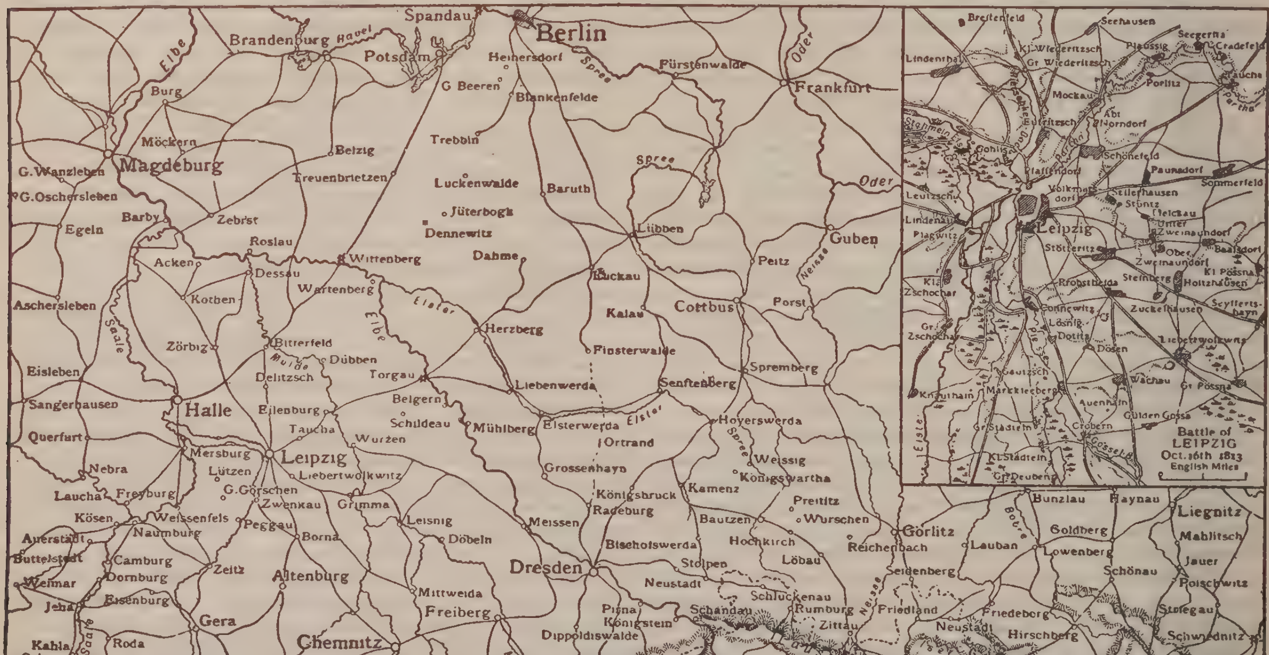
Then he turned his attention to the plan for the coming campaign. Seeing clearly that his want of an efficient cavalry precluded all ideas of a resolute offensive in his old style, he determined to limit himself to a defence of the line of the Elbe, making only dashes of a few days' duration at any target the enemy might present.

Reinforcements had been coming up without ceasing and at the beginning of August he calculated that he would have 300,000 men available about Bautzen and 100,000 along the Elbe from Hamburg via Magdeburg to Torgau. With the latter he determined to strike the first blow, by a concentric advance on Berlin (which he calculated he would reach on the 4th or 5th day), the movement being continued thence to extricate the French garrisons in Küstrin, Stettin and Danzig. The moral effect, he promised himself, would be prodigious, and there was neither room nor food for these 100,000 elsewhere.

Towards the close of the armistice he learned the general situation of the allies. The crown prince of Sweden (Bernadotte), with his Swedes and various Prussian levies, 135,000 in all, lay in and around Berlin and Stettin; and knowing his former marshal well, Napoleon considered Oudinot a match for him. Blücher with about 95,000 Russians and Prussians was about Breslau, and Schwarzenberg, with nearly 180,000 Austrians and Russians, lay in Bohemia. In his position at Bautzen he felt himself equal to all his enemy's combinations.

48. *Dresden.*—The advance towards Berlin began punctually with the expiration of the armistice, but with the main army he himself waited to see more clearly his adversaries' plans. At length becoming impatient he advanced a portion of his army towards Blücher, who fell back to draw him into a trap. Then the news reached him that Schwarzenberg was pressing down the valley of the Elbe, and, leaving Macdonald to observe Blücher, he hurried back to Bautzen to dispose his troops to cross the Bohemian mountains in the general direction of Königstein, a blow which must have had decisive results. But the news from Dresden was so alarming that at the last moment he changed his mind, and sending Vandamme alone over the mountains, he hurried with his whole army to the threatened point. This march remains one of the most extraordinary in history, for the bulk of his forces moved, mainly in mass and across country, 90 m. in 72 hours, entering Dresden on the morning of the 27th, only a few hours before the attack of the allies commenced. For the events which followed see DRESDEN (*battle*).

Dresden was the last great victory of the First Empire. By noon on the 27th August the Austrians and Russians were completely beaten and in full retreat, the French pressing hard behind them, but meanwhile Napoleon himself again succumbed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Bischofswerda
Hochkirch
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Friedland
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Chemnitz
Dippoldiswalde
Zittau
Neustadt
Hirschberg
Schweidnitz
Orlamünde
Neustadt
Peterswalde
Nollendorf
Zwickau
Reichenberg
Landshut
Waldenburg
Rudolstadt
M. Pöllnitz
Zwickau
Tetschen
Gabel
Harrachsdorf
Auma
Greiz
Wildenfels
Kulm
Aussig
Gablonz
Liebau
Friedland
Saalfeld
Priesten
Schleiz
Annaberg
Teplitz
Auscha
Iser
Hohenelbe
Braunau
Saale
Geb
Schwarzenberg
Dux
Leitmeritz
Hirschberg
Munchengrätz
Pilnikau
Thüringer Wald
Lobenstein
Plauen
Brux
Lobositz
Theresienstadt
Neu Paka
Komotau
Jungbunzlau
Jičin
Eger
Budin
Melnik
Hof
Moldau
Asch
Saaz
Schlan
Erz
Seehausen
Breitenfeld
Kl. Wiederitzsch
Gr. Wiederitzsch
Plaussig
Seegeritz
Cradefeld
Lindenthal
Taucha
Podelwitz
Mockau
Abt Naundorf
Eutritzsch
Möckern
Gohlis
Schönefeld
Paunsdorf
Pfaffendorf
Volkmarsdorf
Sellerhausen
Sommerfeld
Leutzsch
Stüntz
Melkau
Lindenau
Plagwitz
Unter Zweinaundorf
Baalsdorf
Stötteritz
Ober Zweinaundorf
Kl. Pössna
Kl. Zschocher
Probstheida
Holtzhausen
Steinberg
Seyfferts-hayn
Connewitz
Zuckelhausen
Gr. Zschocher
Lössnig
Dolitz
Liebertwolkwitz
Dösen
Gautzsch
Wachau
Gr. Pössna
Knauthain
Markkleeberg
Auenhain
Gulden Gossa
Crobern
Gr. Städteln
Kl. Städteln
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Campaign of 1813

Emery Walker sc.

to one of his unaccountable attacks of apparent intellectual paralysis. He seemed unaware of the vital importance of the moment, crouched shivering over a bivouac fire, and finally rode back to Dresden, leaving no specific orders for the further pursuit.

49. *French Defeats.*—The allies, however, continued to retreat, but unfortunately Vandamme, with his single corps and unsupported, issued out of the mountains on their flank, threw himself across their line of retreat near Kulm, and was completely overwhelmed by sheer weight of numbers (29th). In spite of this misfortune, Napoleon could claim a brilliant success for himself, but almost at the same moment news reached him that Oudinot at Grossbeeren near Berlin, and Macdonald on the Katzbach opposed to Blücher, had both been severely defeated.

50. *Napoleon's Movements.*—During the next two days the emperor examined his situation and dictated a series of notes which have been a puzzle to every strategical thinker ever since. In these he seems suddenly to have cut adrift from every principle the truth of which he had himself so brilliantly demonstrated, and we find him discussing plans based on hypothesis, not knowledge, and on the importance of geographical points without reference to the enemy's field army. From these reveries he was at length awakened by news which indicated that the consequences of Macdonald's defeat had been far more serious to the moral of that command than he had imagined. He immediately rode over to establish order, and his manner and violence were so improper that Caulaincourt had the greatest difficulty in concealing the scandal. Blücher, however, hearing of his arrival, at once retreated and the emperor followed, thus uncovering the passes over the Bohemian mountains, a fact of which Schwarzenberg was quick to take advantage. Learning of his approach, Napoleon again withdrew to Bautzen. Then hearing that the Austrians had counter-marched and were again moving towards Dresden, he hastened back there, concentrated as many men as could conveniently be handled, and advanced beyond Pirna and Königstein to meet him. But the Austrians had no intention of attacking him, for time was now working on their side and, leaving his men to starve in the exhausted district, the emperor again returned to Dresden, where for the rest of the month he remained in an extraordinary state of vacillation. On the 4th of October he again drew up a review of the situation, in which he apparently contemplated giving up his communications with France and wintering in and around Dresden, though at the same time he is aware of the distress amongst his men for want of food.

51. *Campaign of Leipzig.*—In the meanwhile Blücher, Schwarzenberg and Bernadotte were working round his flanks. Ney, who had joined Oudinot after Grossbeeren, had been defeated at Dennewitz (6th Sept.), the victory, won by Prussian troops solely, giving the greatest encouragement to the enemy. Suddenly Napoleon's plans are again reviewed and completely changed. Calling up St Cyr, whom he had already warned to remain at Dresden with his command, he decides to fall back towards Erfurt, and go into winter quarters between that place and Magdeburg, pointing out that Dresden was of no use to him as a base and that if he does have a battle, he had much better have St Cyr and his men with him than at Dresden. He then on the 7th of October drew up a final plan, in which one again recognizes the old commander, and this he immediately proceeded to put into execution, for he was now quite aware of the danger threatening his line of retreat from both Blücher and Schwarzenberg and the North Army; yet only a few hours afterwards the portion of the order relating to St Cyr and Lobau was cancelled and the two were finally left behind at Dresden. From the 10th to the 13th Napoleon lay at Düben, again a prey to the most extraordinary irresolution, but on that day he thought he saw his opportunity. Blücher was reported near Wittenberg, and Schwarzenberg was moving slowly round to the south of Leipzig. The North Army under Bernadotte, unknown to Napoleon, lay on Blücher's left around Halle. The emperor decided to throw the bulk of his force on Blücher, and, having routed him, turn south on Schwarzenberg and sever his communications with Bohemia. His concentration was effected with his usual sureness and celerity, but whilst the French moved on Wittenberg, Blücher was marching to his right, indifferent to his communications as all Prussia lay behind him.

This move on the 14th brought him into touch with Bernadotte, and now a single march forward of all three armies would have absolutely isolated Napoleon from France; but Bernadotte's nerve failed him, for on hearing of Napoleon's threat against Wittenberg he decided to retreat northward, and not all the persuasions of Blücher and Gneisenau could move him. Thus if the French movement momentarily ended in a blow in the air, it was indirectly the cause of their ultimate salvation.

52. *The "Battle of the Nations."*—On the 15th Napoleon concentrated his forces to the east of Leipzig, with only a weak detachment to the west, and in the evening the allies were prepared to attack him. Schwarzenberg, with 180,000 men available at once and 60,000 on the following day; Blücher had about 60,000, but Bernadotte now could not arrive before the 18th.

Napoleon prepared to throw the bulk of his force upon Schwarzenberg and massed his troops south-east of the town, whilst Schwarzenberg marched concentrically against him down the valley of the Elster and Pleisse, the mass of his troops on the right bank of the latter and a strong column under Giulay on the left working round to join Blücher on the north. The fighting which followed was most obstinate, but the Austrians failed to make any impression on the French positions, and indeed Giulay felt himself compelled to withdraw to his former position. On the other hand, Blücher carried the village of Möckern and came within a mile of the gates of the town. During the 17th there was only indecisive skirmishing, Schwarzenberg waiting for his reinforcements coming up by the Dresden road, Blücher for Bernadotte to come in on his left, and by some extraordinary oversight Giulay was brought closer in to the Austrian centre, thus opening for the French their line of retreat towards Erfurt, and no imformation of this movement appears to have been conveyed to Blücher. The emperor when he became aware of the movement, sent the IVth Corps to Lindenau to keep the road open.

On the 18th the fighting was resumed and by about noon Bernadotte came up and closed the gap to the N.E. of the town between Blücher and the Austrians. At 2 p.m. the Saxons, who had remained faithful to Napoleon longer than his other German allies, went over to the enemy. All hope of saving the battle had now to be given up, but the French covered their retreat obstinately and by daybreak next morning one-half of the army was already filing out along the road to Erfurt which had so fortunately been left for them.

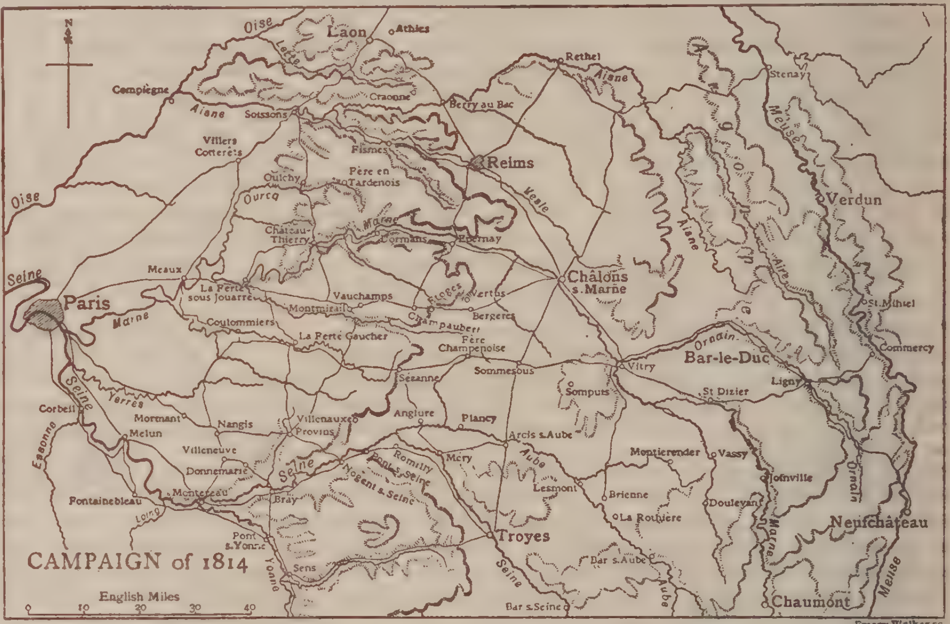
53. *Retreat of the French and Battle of Hanau.*—It took Blücher time to extricate his troops from the confusion into which the battle had thrown them, and the garrison of Leipzig and the troops left on the right bank of the Elster still resisted obstinately—hence no direct pursuit could be initiated and the French, still upwards of 100,000 strong, marching rapidly, soon gained distance enough to be reformed. Blücher followed by parallel and inferior roads on their northern flank, but Schwarzenberg knowing that the Bavarians also had forsaken the emperor and were marching under Wrede, 50,000 strong, to intercept his retreat, followed in a most leisurely fashion. Blücher did not succeed in overtaking the French, but the latter, near Hanau, found their way barred by Wrede with 50,000 men and over 100 guns in a strong position.

To this fresh emergency Napoleon and his army responded in most brilliant fashion. As at Krasnoi in 1812, they went straight for their enemy and after one of the most brilliant series of artillery movements in history, directed by General Drouot, they marched right over their enemy, practically destroying his whole force. Henceforward their march was unmolested, and they reached Mainz on the 5th of November.

54. *The Defensive Campaign.*—When the last of the French troops had crossed to the western bank of the Rhine, divided counsels made their appearance at the headquarters of the allies. Every one was weary of the war, and many felt that it would be unwise to push Napoleon and the French nation to extremes.

Hence a prolonged halt arose, utilized by the troops in renewing their equipment and so forth, but ultimately the Young German party, led by Blücher and the principal fighting men of the army, triumphed, and on the 1st of January 1814 the Silesian army (50,000) began its passage of the Rhine at Kaub. They were to be supported by Schwarzenberg with 200,000 men, who was to advance by Basel and Neu Breisach to the south, and Bernadotte with the Northern army, about 120,000, was to move in support on the right flank through the Netherlands and Laon; this force was not yet ready and did not, in fact, reach the latter place till March.

To meet these forces the emperor could not collect 200,000 men in all, of whom upwards of 100,000 were held by Wellington on the Spanish frontier, and 20,000 more were required to watch the debouches from the Alps. Hence less than 80,000 remained available for the east and north-eastern frontier. If, however, he was weak in numbers, he was now again operating in a friendly country, able to find food almost everywhere and practically indifferent as to his communications.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Champaubert
Bergeres
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Donnemarie
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Lesmont
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Fontainebleau
Loing
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CAMPAIGN of 1814

On the 25th of January, Blücher entered Nancy, and, moving rapidly up the valley of the Moselle, was in communication with the Austrian advanced guard near La Rothière on the afternoon of the 28th. Here his headquarters were surprised and he himself nearly captured by a sudden rush of French troops, and he learnt at the same time that the emperor in person was at hand. He accordingly fell back a few miles next morning to a strong position covering the exits from the Bar-sur-Aube defile. There he was joined by the Austrian advance guard, and together they decided to accept battle—indeed they had no alternative, as the roads in rear were so choked with traffic that retreat was out of the question. About noon the 2nd of February Napoleon attacked them, but the weather was terrible, and the ground so heavy that his favourite artillery, the mainstay of his whole system of warfare, was useless and in the drifts of snow which at intervals swept across the field, the columns lost their direction and many were severely handled by the Cossacks. At nightfall the fighting ceased and the emperor retired to Lesmont, and thence to Troyes, Marmont being left to observe the enemy.

55. *Montmirail.*—Owing to the state of the roads, more perhaps to the extraordinary lethargy which always characterized Schwarzenberg's headquarters, no pursuit was attempted. But on the 4th of February Blücher, chafing at this inaction, obtained the permission of his own sovereign to transfer his line of operations to the valley of the Marne; Pahlen's corps of Cossacks were assigned to him to cover his left and maintain communication with the Austrians.

Believing himself secure behind this screen, he advanced from Vitry along the roads leading down the valley of the Marne, with his columns widely separated for convenience of subsistence and shelter—the latter being almost essential in the terrible weather prevailing. Blücher himself on the night of the 7th was at Sézanne, on the exposed flank so as to be nearer to his sources of intelligence, and the rest of his army were distributed in four small corps at or near Épernay, Montmirail and Étoges; reinforcements also were on their way to join him and were then about Vitry.

In the night his headquarters were again surprised, and he learnt that Napoleon himself with his main body was in full march to fall on his scattered detachments. At the same time he heard that Pahlen's Cossacks had been withdrawn forty-eight hours previously, thus completely exposing his flank. He himself retreated towards Étoges endeavouring to rally his scattered detachments, but Napoleon was too quick for him and in three successive days he defeated Sacken at Montmirail, York at Champ Aubert and Blücher and his main body at Étoges, pursuing the latter towards Vertus. These disasters compelled the retreat of the whole Silesian army, and Napoleon, leaving Mortier and Marmont to deal with them, hurried back to Troyes with his main body to strike the flank of Schwarzenberg's army, which had meanwhile begun its leisurely advance, and again at Mormant on the 17th of February, Montereau the 18th and Méry the 21st, he inflicted such heavy punishment upon his adversaries that they fell back precipitately to Bar-sur-Aube.

56. *Laon.*—In the meantime Blücher had rallied his scattered forces and was driving Marmont and Mortier before him. Napoleon, as soon as he had disembarrassed himself of Schwarzenberg, counter-marched his main body and moving again by Sézanne, fell upon Blücher's left and drove him back upon Soissons. This place had been held by a French garrison, but had capitulated only twenty-four hours beforehand, a fact of which Napoleon was naturally unaware. The Silesian army was thus able to escape, and marching northwards combined with Bernadotte at Laon—this reinforcement bringing the forces at Blücher's disposal up to over 100,000 men.

On the 7th of March Napoleon fell upon the advance guard of this force at Craonne and drove it back upon Laon, where a battle took place on the 9th. Napoleon was here defeated, and with only 30,000 men at his back he was compelled to renounce all ideas of a further offensive, and he retired to rest his troops to Reims. Here he remained unmolested for a few days, for Blücher was struck down by sickness, and in his absence nothing was done. On the 14th of March, however, Schwarzenberg, becoming aware of Napoleon's withdrawal to Reims, again began his advance and had reached Arcis-sur-Aube when the news of Napoleon's approach again induced him to retreat to Brienne.

57. *The Allies March on Paris.*—Thus after six weeks' fighting the allies were hardly more advanced than at the beginning. Now, however, they began to realize the weakness of their opponent, and perhaps actuated by the fear that Wellington from Toulouse might, after all, reach Paris first, they determined

to march to Paris (then an open city), and let Napoleon do his worst to their communications. Actually this was exactly what he was preparing to do. He had determined to move eastward to St Dizier, rally what garrisons he could find, and raise the whole country against the invaders, and had actually started on the execution of this plan when his instructions fell into the enemy's hands and his projects were exposed. Regardless of the threat, the allies marched straight for the capital. Marmont and Mortier with what troops they could rally took up a position on Montmartre heights to oppose them, but seeing further resistance to be hopeless they gave way on the 31st of March, just as Napoleon, with the wreck of the Guards and a mere handful of other detachments, was hurrying across the rear of the Austrians towards Fontainebleau to join them.

This was the end of the First Empire. The story of the Waterloo Campaign is told under its own heading.

The Military Character of Napoleon.

No military career has been examined more often and more freely than that of Napoleon. Yet even so the want of complete documentary evidence upon which to base conclusions has vitiated all but the most recent of the countless monographs and histories that have appeared on the subject. Fortunately the industry and ability of the military history section of the French General Staff have rendered available, by the publication of the original orders issued during the course of his campaigns, a mass of information which, taken in conjunction with his own voluminous correspondence, renders it possible to trace the growth of his military genius with a reasonable approach to accuracy. Formerly we could only watch the evolution of his powers of organization and the purely psychic gifts of resolution and command. The actual working of his mind towards that strategic and tactical ascendancy that rendered his presence on the battlefield, according to the testimony of his opponents, equal to a reinforcement of 40,000 men, was entirely undiscernible.

The history of his youth reveals no special predilection for the military service—the bent of his mind was political far more than military, but unlike the politicians of his epoch he consistently applied scientific and mathematical methods to his theories, and desired above all things a knowledge of facts in their true relation to one another. His early military education was the best and most practical then attainable, primarily because he had the good fortune to come under the influence of men of exceptional ability—Baron du Keile, Bois Roger and others. From them he derived a sound knowledge of artillery and fortification, and particularly of mountain warfare, which latter was destined to prove of inestimable service to him in his first campaigns of 1794–95 and 1796. In these, as well as in his most dramatic success of Marengo in 1800, we can discern no trace of strategical innovation. He was simply a master of the methods of his time. Ceaseless industry, energy and conspicuous personal gallantry were the principal factors of his brilliant victories, and even in 1805 at Ulm and Austerlitz it was still the excellence of the tactical instrument, the army, which the Revolution had bequeathed to him that essentially produced the results.

Meanwhile the mathematical mind, with its craving for accurate data on which to found its plans (the most difficult of all to obtain under the conditions of warfare), had been searching for expedients which might serve him to better purpose, and in 1805 he had recourse to the cavalry screen in the hope of such results. This proved a palliation of his difficulty, but not a solution. Cavalry can only observe, it cannot hold. The facts as to the position of an opponent accurately observed and correctly reported at a given moment, afford no reliable guarantee of his position 48 hours later, when the orders based on this information enter upon execution. This can only be calculated on the ground of reasonable probability as to what it may be to the best interest of the adversary to attempt. But what may seem to a Napoleon the best course is not necessarily the one that suggests itself to a mediocre mind, and the greater the gulf which separates the two minds the greater the uncertainty which must prevail on the side of the abler commander.

It was in 1806 that an improved solution was first devised. The general advanced guard of all arms now followed immediately behind the cavalry screen and held the enemy in position, while the remainder of the army followed at a day's march in a "bataillon carrée" ready to manœuvre in any required direction. The full reach of this discovery seems as yet scarcely to have impressed itself upon the emperor with complete conviction, for in the succeeding campaign in Poland we find that he twice departed from this form—at Pultusk and Heilsberg—and each time his enemy succeeded in escaping him. At Friedland, however, his success was complete, and henceforth the method recurs on practically every battlefield. When it fails it is because its inventor himself hesitates to push his own conception to its full development (Eckmühl 1809, Borodino 1812). Yet it would seem that this invention of Napoleon's was intuitive rather than reasoned; he never communicated it in its entirety to his marshals, and seems to have been only capable of exercising it either when in full possession of his health or under the excitement of action. Thus we find him after the battle of Dresden—itself a splendid example of its efficacy—suddenly reverting to the terminology of the school in which he had been brought up, which he himself had destroyed, only to revive again in the next few days and handle his forces strategically with all his accustomed brilliancy.

In 1814 and in 1815 in the presence of the enemy he again rises supremely to each occasion, only to lapse in the intervals even below the level of his old opponents; and that this was not the consequence of temporary depression naturally resulting from the accumulated load of his misfortunes, is sufficiently shown by the downright puerility of the arguments by which he seeks to justify his own successes in the St Helena memoirs, which one may search in vain for any indication that Napoleon was himself aware of the magnitude of his own discovery. One is forced to the conclusion that there existed in Napoleon's brain a dual capacity—one the normal and reasoning one, developing only the ideas and conceptions of his contemporaries, the other intuitive, and capable only of work under abnormal pressure. At such moments of crisis it almost excelled human comprehension; the mind seems to have gathered to itself and summed up the balance of all human passions arranged for and against him, and to have calculated with unerring exactitude the consequences of each decision.

A partial explanation of this phenomenon may perhaps be found in the economy of nervous energy his strategical method ensured to him. Marching always ready to fight wherever his enemy might stand or move to meet him, his mind was relieved from all the hesitations which necessarily arise in men less confident in the security of their designs. Hence, when on the battlefield the changing course of events left his antagonists mentally exhausted, he was able to face them with will power neither bound nor broken. But this only explains a portion of the mystery that surrounds him, and which will make the study of his career the most fascinating to the military student of all times.

Amongst all the great captains of history Cromwell alone can be compared to him. Both, in their powers of organization and the mastery of the tactical potentialities of the weapons of their day, were immeasurably ahead of their times, and both also understood to the full the strategic art of binding and restraining the independent will power of their opponents, an art of which Marlborough and Frederick, Wellington, Lee and Moltke do not seem ever even to have grasped the fringe.

(F. N. M.)

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NAVAL OPERATIONS

The French navy came under the direct and exclusive control of Napoleon after the 18th Brumaire. At the close of 1799 (see FRENCH REVOLUTIONARY WARS) he had three purposes to serve by the help of his fleet: the relief of the French garrison besieged by the British forces in Malta; the reinforcement of the army he had left in Egypt; and the distraction of Great Britain by the threat of invasion of England across the Channel, or of Ireland. The deficiencies both in number and in quality of his naval resources doomed him to fail in all three. Though he had control of what remained of the navies of Holland and Spain, as well as of the French, he was outnumbered at every point, while the efficiency of the British fleet gave it a mobility which doubled its material superiority. All Napoleon's efforts to support his troops in Malta and Egypt were necessarily made under the hampering obligation to evade the British forces barring the road. The inevitable result was that only an occasional blockade-runner could succeed in escaping detection and attack. The relief thus brought to Malta and Egypt was not sufficient. In February 1800, the "Généreux" (74), one of the few ships which escaped from the Nile, sailed from Toulon with three corvettes, under Rear-admiral Perrée, to relieve Malta. On the 18th she was sighted by the blockading squadron, surrounded and captured. Three other survivors of the Nile were at anchor in Malta—the "Guillaume Tell" (80), and two frigates, the "Diane" and the "Justice." On the 29th of July the "Guillaume Tell" endeavoured to slip out in the night. She was sighted, pursued and overpowered, after a singularly gallant resistance. The frigates made an attempt to get off on the 24th of August, but only the "Justice," a solitary survivor of the squadron which fought at the Nile, reached Toulon. Malta, starved out by the British fleet, surrendered on the 5th of September 1800. Very similar was the fate of the efforts to reach and reinforce the army of Egypt. The British squadrons either stopped the relieving forces at their point of departure, or baffled, when they did not take them, at their landfall. A squadron of seven sail of the line, under Admiral Ganteaume, succeeded in slipping out of Brest, when a gale had driven the British blockading force off the coast. Ganteaume met with some measure of success in capturing isolated British men-of-war, one of them being a 74, the "Swiftsure." But he failed to give effectual help to the Egyptian army. He sailed on the 23rd of January 1801, entered the Mediterranean and, his squadron being in a bad condition, steered for Toulon, which he reached on the 18th of February. On the 19th of March he sailed again for Egypt, but was again driven back by the same causes on the 5th of April. On the 25th he was ordered out once more. Three of his ships had to be sent back as unfit to keep the sea. With the other four he reached the coast of Egypt, on the 7th of May, only to sight a powerful British force, and to be compelled to escape to Toulon, which he did not reach till the 22nd of July. The French in Egypt were in fact beaten before he reached the coast. At the beginning of 1801, a British naval force, commanded by Lord Keith, had sailed from Gibraltar, escorting an army of 18,000 men under General Abercromby. It reached Marmorice Bay, in Asia Minor, on the 31st of January, to arrange a co-operation with the Turks, and after some delay the army was transported and landed in Egypt, on the 7th and 8th of March. Before the end of September the French army was reduced to capitulate. In the interval another effort to carry help to it was made from Toulon. On the 13th of June 1801 Rear-admiral Linois left Toulon with three sail of the line, to join a Spanish squadron at Cadiz and go on to Egypt. In the straits he was sighted by the British squadron under Sir J. Saumarez, and driven to seek the protection of the Spanish batteries in Algeciras. On the 6th of July he beat off a British attack, capturing the "Hannibal," 74. On the 9th a Spanish squadron came to his assistance, and the combined force steered for Cadiz. During the night of the 12th/13th of July they were attacked by Sir J. Saumarez. Two Spanish three-deckers blew up, and a 74-gun ship was taken. The others were blockaded in Cadiz. The invasion scheme was vigorously pushed after the 3rd of March 1801. Flat-bottomed boats were gradually collected at Boulogne. Two attempts to destroy them at anchor, though directed by Nelson himself, were repulsed on the 4th and 16th of August. But the invasion was so far little more than a threat made for diplomatic purposes. On the 1st of October 1801 an armistice was signed in London, and the Peace of Amiens followed, on the 27th of March 1802. (For the operations in the Baltic in 1801, see COPENHAGEN, BATTLE OF.)

The Peace of Amiens proved to be only an uneasy truce, and it was succeeded by open war, on the 18th of May 1803. From that date till about the middle of August 1805, a space of some two years and two months, the war took the form of a most determined attempt on the part of Napoleon to carry out an invasion of Great Britain, met by the counter measures of the British government. The scheme of invasion was based on the Boulogne flotilla, a device inherited from the old French royal government, through the Republic. Its object was to throw a great army ashore on the coast between Dover and Hastings. The preparations were made on an unprecedented scale. The Republic had collected some two hundred and forty vessels. Under the direction of Napoleon ten times as many were equipped. They were divided into: *prames*, ship-rigged, of 35 metres long and 8 wide, carrying 12 guns; *chaloupes cannonières*, of 24 metres long and 5 wide, carrying 5 guns and brig-rigged; *bateaux cannoniers*, of 19 metres long by 1·56 wide, carrying 2 guns and mere boats. All were built to be rowed, were flat-bottomed, and of shallow draft so as to be able to navigate close to the shore, and to take the ground without hurt. They were built in France and the Low Countries, in the coast towns and the rivers—even in Paris—and were collected gradually, shore batteries both fixed and mobile being largely employed to cover the passage. A vast sum of money and the labour of thousands of men were employed to clear harbours for them, at and near Boulogne. The shallow water on the coast made it impossible for the British line-of-battle ships, or even large frigates, to press the attack on them home. Smaller vessels they were able to beat off and so, in spite of the activity of the British cruisers and of many sharp encounters, the concentration was effected at Boulogne, where an army of 130,000 was encamped and was incessantly practised in embarking and disembarking. Before the invasion was taken in hand as a serious policy, there had been at least a profession of a belief that the flotilla could push across the Channel during a calm. Experience soon showed that when the needful allowance was made for the time required to bring them out of harbour (two tides) and for the influence which the Channel currents must have upon their speed, it would be extremely rash to rely on a calm of sufficient length. Napoleon therefore came early to the conclusion that he must bring about a concentration of his seagoing fleet in the Channel, which would give him a temporary command of its waters.

He had a squadron at Brest, ships at L'Orient and Rochefort, some of his vessels had taken refuge at Ferrol on their way back from San Domingo when war broke out, one was at Cadiz, and he had a squadron at Toulon. All these forces were watched by British blockading squadrons. The problem was to bring them together before the British fleet could be concentrated to meet them. Napoleon's solution grew, as time went on and circumstances changed, in scope and complexity. In July 1804 he ordered his admiral commanding at Toulon, Latouche Tréville, to seize an opportunity when Nelson, who was in command of the blockade, was driven off by a northerly gale, to put to sea, with 10 sail of the line, pick up the French ship in Cadiz, join Villeneuve who was in the Aix roads, and then effect a junction with Ganteaume and the 21 sail of the line at Brest. He hoped that if the British ships in the North Sea concentrated with the squadron in the Channel, he would be able to make use of Dutch vessels from the Texel. The death of Latouche Tréville, 20th of August 1804, supplied an excuse for delay. He was succeeded by Villeneuve. Napoleon now modified the simple plan prepared for Latouche Tréville, and began laying elaborate plans by which French vessels were to slip out and sail for distant seas, to draw the British fleet after them, and then return to concentrate in the Channel. A further modification was introduced by the end of 1804. Spain, which was bound by treaty to join Napoleon, was allowed to preserve a show of neutrality by paying a monthly subvention. The British government, treating this as a hostile action—as it was—seized the Spanish treasure ships on their way from America, near Cape Santa Maria, on the 5th of October 1804, and Spain declared war on the 12th of December. New plans were now made including the co-operation of the Spanish fleet. Amid all the variation in their details, and the apparent confusion introduced by Napoleon's habit of suggesting alternatives and discussing probabilities, and in spite of the preparations ostensibly made for an expedition to Ireland, which was to have sailed from Brest and to have carried 30,000 troops commanded by Augereau, the real purpose of Napoleon was neither altered nor concealed. He worked to produce doubt and confusion in the mind of the British government by threats and attacks on its distant possessions, which should lead it to scatter its forces. One of these ventures was actually carried out, without, however, securing the co-operation, or effecting the purpose he had in view. On the 11th of January 1805 Admiral Missiessy left Rochefort with 5 sail of the line, undetected by the British forces on the coast. Missiessy carried out a successful voyage of commerce-destroying, and returned safely to Rochefort on the 20th of May, from the West Indies. But the force sent in pursuit of him was small, and the British government was not deceived into weakening its hold on the Channel. It was in fact well supplied with information by means of the spy service directed by an exiled French royalist, the count d'Antraigues, who was established at Dresden as a Russian diplomatic agent. Through his correspondents in Paris, some of whom had access to Napoleon's papers, the British government was able to learn the emperor's real intentions. The blockade of Brest was so strictly maintained that Ganteaume was allowed no opportunity to get to sea. Villeneuve, who was to have co-operated with Missiessy, did indeed leave Toulon, at a moment when Nelson, whose policy it was to encourage him to come out by not staying too near the port, was absent, on the 17th of January 1805. The British admiral, when informed that the French were at sea, justified Napoleon's estimate of his probable course in such a contingency, by making a useless cruise to Egypt. But Villeneuve's ill-appointed ships, manned by raw crews, suffered loss of spars in a gale, and he returned to Toulon on the 21st. His last start came when he sailed, unseen by Nelson, on the 30th of March. Aided by lucky changes of wind, he reached Cadiz, was joined by 1 French and 6 Spanish ships under Admiral Gravina, which, added to the 11 he had with him, gave him a force of 18 sail. He left Cadiz on the night of the 9th/10th of April, and reached Fort de France in Martinique on the 14th of May. Here he was to have remained till joined by Ganteaume from Brest. On the 1st of June he was joined by a frigate and two line-of-battle ships sent with orders from Rochefort, and was told to remain in the West Indies till the 5th of July, and if not joined by Ganteaume to steer for Ferrol, pick up the French and Spanish ships in the port, and come on to the Channel. Villeneuve learnt on the 8th of June that Nelson had reached Barbadoes in pursuit of him on the 4th. The British admiral, delayed by contrary winds, had not been able to start from the entry to the Straits of Gibraltar till the 11th of May. An action in the West Indies would have ruined the emperor's plan of concentration, and Villeneuve decided to sail at once for Ferrol. Nelson, misled by false information, ranged the West Indies as far south as the Gulf of Paria, in search of his opponent whom he supposed to be engaged in attacks on British possessions. By the 13th of June he had learnt the truth, and sailed for Gibraltar under the erroneous impression that the French admiral would return to Toulon. He sent a brig home with despatches; on the 19th of June, in lat. 33° 12′ N. and long. 58° W., the French were seen by this vessel heading for the Bay of Biscay. Captain Bettesworth who commanded the brig hurried home, and the information he brought was at once acted on by Lord Barham, the First Lord of the Admiralty, who took measures to station a force to intercept Villeneuve outside Ferrol. On the 22nd of July, 35 leagues N.W. of Finisterre, Villeneuve was met by the British admiral sent to intercept him, Sir Robert Calder. A confused action in a fog ended in the capture of 2 Spanish line-of-battle ships. But Sir R. Calder, who had only 15 ships to his opponent's 20 and was nervous lest he should be overpowered, did not act with energy. He retreated to join the blockading fleet off Brest. Villeneuve was now able to join the vessels at Ferrol. Nelson, who reached Gibraltar on the very day the action off Ferrol was fought, was too far away to interfere with him. But Villeneuve, who was deeply impressed by the inefficiency of the ships of his fleet and especially of the Spaniards, and who was convinced that an overwhelming British force would be united against him in the Channel, lost heart, and on the 15th of August sailed south to Cadiz. By this movement he ruined the emperor's elaborate scheme. Napoleon at once broke up the camp at Boulogne and marched to Germany. The further movements of Villeneuve's fleet are told under TRAFALGAR, BATTLE OF.

With the collapse of the invasion scheme, the naval war between Napoleon and Great Britain entered on a new phase. It lost at once the unity given to it by the efforts of the emperor to effect, and of the British government to baffle the passage of the Channel by an army. In place of the movements of great fleets to a single end, we have a nine years' story (1805–1814) of cruising for the protection of commerce, of convoy, of colonial expeditions to capture French, Dutch or Spanish possessions and of combined naval and military operations in which the British navy was engaged in carrying troops to various countries, and in supporting them on shore. Napoleon continued to build line-of-battle ships in numbers from Venice to Hamburg, but only in order to force the British government to maintain costly and wearing blockades. He never allowed his fleets to go to sea to seek battle. The operations of the British fleet were therefore divided between the work of patrolling the ocean roads and ancillary services to diplomacy, or to the armies serving in Italy, Denmark and, after 1808, in Spain. The remaining colonial possessions of France, and of Holland, then wholly dependent on her, were conquered by degrees, and the ports in which privateers were fitted out to cruise against British commerce in distant seas were gradually rendered harmless. Though privateering was carried on by the French with daring and a considerable measure of success, it did not put an appreciable check on the growth of British merchant shipping. The function of the British navy in the long conflict with Napoleon was of the first importance, and its services were rendered in every sea, but their very number, extent and complexity render it impossible here to record them in detail.

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NAPOLEONITE, also called Corsite because the stone is found in the island of Corsica, a variety of diorite which is characterized by orbicular structure. The grey matrix of the stone has the normal appearance of a diorite, but contains many rounded lumps 1 or 2 in. in diameter, which show concentric zones of light and dark colours. In these spheroids also a distinct and well-marked radial arrangement of the crystals is apparent. The centre of the spheroid is usually white or pale grey and consists mainly of felspar; the same mineral makes the pale zones while the dark ones are rich in hornblende and pyroxene. The felspar is a basic variety of plagioclase (anorthite or bytownite). Though mostly rounded, the spheroids may be elliptical or subangular; sometimes they are in contact with one another but usually they are separated by small areas of massive diorite. When cut and polished the rock makes a beautiful and striking ornamental stone. It has been used for making paper-weights and other small ornamental articles.

Spheroidal structure is found in other diorites and in quite a number of granites in various places, such as Sweden, Russia, America, Sardinia, Ireland. It is by no means common, however, and usually occurs in only a small part of a granitic or dioritic mass, being sometimes restricted to an area of a few square yards. In most cases it is found near the centre of the outcrop, though exceptionally it has been found quite close to the margin. It arises evidently from intermittent and repeated crystallization of the rock-forming minerals in successive stages. Such a process would be favoured by complete rest, which would allow of supersaturation of the magma by one of the components. Rapid crystallization would follow, producing deposits on any suitable nuclei, and the crystals then formed might have a radial disposition on the surfaces on which they grew. The magma might then be greatly impoverished in this particular substance, and another deposit of a different kind would follow, producing a zone of different colour. The nucleus for the spheroidal growth is sometimes an early porphyritic crystal, sometimes an enclosure of gneiss, &c., and often does not differ essentially in composition from the surrounding rock. When spheroids are in contact their inner zones may be distinct while the outer ones are common to both individuals having the outlines of a figure of eight. This proves that growth was centrifugal, not centripetal.

Many varieties of spheroids are described presenting great differences in composition and in structure. Some are merely rounded balls consisting of the earliest minerals of the rock, such as apatite, zircon, biotite and hornblende, and possessing no regular arrangement. Others have as centres a foreign fragment such as gneiss or hornfels, with one or more zones, pale or dark, around this. Radial arrangement of the crystals, though often very perfect, is by no means universal. The spheroids are sometimes flattened or egg-shaped, apparently by fluxion movements of the magma at a time when they were semi-solid or plastic. As a general rule the spheroids are more basic and richer in the ferromagnesian minerals than the surrounding rock, though some of the zones are often very rich in quartz and felspar. Graphic or perthitic intergrowths between the minerals of a zone are frequent. The spheroids vary in width up to 1 or 2 ft. In some cases they contain abnormal constituents such as calcite, sillimanite or corundum. (J. S. F.)

NAQUET, ALFRED JOSEPH (1834–), French chemist and politician, was born at Carpentras (Vaucluse), on the 6th of October 1834. He became professor in the faculty of medicine in Paris in 1863, and in the same year professor of chemistry at Palermo, where he delivered his lectures in Italian. He lost his professorship in 1867 with his civic rights, when he was condemned to fifteen months' imprisonment for his share in a secret society. On a new prosecution in 1869 for his book *Religion, propriété, famille* he took refuge in Spain. Returning to France under the government of Émile Ollivier he took an active share in the revolution of the 4th of September 1870, and became secretary of the commission of national defence. In the National Assembly he sat on the extreme Left, consistently opposing the opportunist policy of successive governments. Re-elected to the Chamber of Deputies he began the agitation against the marriage laws with which his name is especially connected. His proposal for the re-establishment of divorce was discussed in May 1879, and again in 1881 and 1882, and became law two years later. Naquet, although he disapproved in principle of a second chamber, secured his election to the senate in 1883 to pilot his measure through that body. In 1886 by his efforts divorce became legal after three years of definite separation on the demand of one of the parties concerned. In 1890 he resigned from the senate to re-enter the Chamber of Deputies, this time for the 5th arrondissement of Paris, and took his seat with the Boulangist deputies. After Boulanger's suicide his political influence declined, and was further compromised by accusations (of which he was legally cleared) in connexion with the Panama scandals.

The thesis written for his doctorate, *Application de l'analyse chimique à la toxicologie* (1859), was followed by many papers on chemistry contributed to learned journals, and his *Principes de chimie fondés sur les théories modernes* (1865) reached its 5th edition in 1890. He is better known by his political works, *Socialisme collectiviste et socialisme libéral* (1890, Eng. trans., 1891), *L'Humanité et la patrie* (1901), *Loi du divorce* (1903), *L'Anarchie et le collectivisme* (1904), *Désarmement ou alliance anglaise* (1908).

NARA, an important water channel in Sind, India, probably representing a former bed of the Indus, though now traversing the desert far E. of the river. Its total length is 250 m.; and by means of cross cuts, weirs and embankments, it has been made to irrigate no less than 429 sq. m., with a navigable length of 425 m.

NARA, a town of Japan, in the province of Yamato, 25½ m. from Osaka by rail. Pop. 32,000. It lies on the slope of a range of picturesque hills, beautifully wooded with cryptomerias, evergreen oaks, &c. This was the first permanent capital of Japan. Up to the beginning of the 8th century the imperial court changed its location at the accession of each sovereign, and the court's place of residence naturally became the official metropolis. But Nara remained the metropolis during seven consecutive reigns (709 to 784), and its seventy-five years of favoured existence sufficed for the building and furnishing of several imposing shrines and temples, for the laying out of a noble park, for the casting of a colossal image of Buddha, and for the execution of many other beautiful specimens of applied art. Not much is known of the Nara palace in its original form, but many of the articles and ornaments used by its inmates survive in a celebrated collection which, during nearly twelve hundred years, had been preserved in a store-house (Shoso-in) near the temple of Todai-ji. This collection cannot be visited by strangers more than once a year, and even then only by special permission. The vigorous growth of the Buddhist creed throughout the Nara epoch was remarkable, and found outward expression in many striking architectural and artistic works. The best of these, namely, those dating from the first half of the 8th century, show Indo-Grecian affinities, which gradually grow fainter as the end of the epoch approaches. The temple called Todai-ji was completed about 750. At present the buildings enclose a quadrangle 520 ft. by 620, the south side being mainly occupied by the huge, ungainly and no longer perpendicular hall containing the Dai Butsu, or colossal statue of Buddha. The casting of this wonderful piece of work was accomplished after eight failures in 749 by Takusho, an artist from Korea. On two occasions the head was melted during the burning of the temple (1180 and 1567) and from 1567 to 1697 the statue stood exposed to the weather. The height of the figure is 53 ft. On a hill to the east of the temple stands a bell-house with a huge bell, cast in 732, 13½ ft. high, 9 ft. across the mouth and weighing 37 tons. The great Buddha is often spoken of as the most remarkable of the Nara relics; but restorations have so marred it that it can no longer be compared with many smaller examples of contemporaneous and subsequent sculpture. More worthy of close attention are two effigies of Brahma and Indra preserved among the relics of Kobuku-ji, which, with Kasuga-no-Miya, Ni-gwatsu-do and Todai-ji, constitute the chief religious edifices. These figures, sculptured in wood, have suffered much from the ravages of time, but nothing could destroy the grandeur of their proportions or the majesty and dignity of their pose. Several other works of scarcely inferior excellence may be seen among the relics, and at the shrine of Kasuga is performed a religious dance called Kagura, in which the costumes and gestures of the dancers are doubtless the same as those of twelve centuries back. Kasuga-no-Miya was founded in 767, and its chapels with their rough red-painted log-work afford fine examples of primitive Japanese architecture. In the temple-park are herds of tame deer; and little images of deer and trinkets from deer's horn are the favourite charms purchased by the pilgrims. Within the enclosure stands a curious old trunk of seven plants entwined, including a camellia, cherry and wistaria. Of the great Buddhist temple Kobuku-ji, founded in 710, and burnt for the third time in 1717, there remains little save two lofty pagodas. A railway now gives access to the town, but every effort is made to preserve all the ancient features of Nara. A museum has been formed, where many antique objects of great interest are displayed, as well as works from the hands of comparatively modern artists. Nara in the days of its prosperity is said to have had a population of a quarter of a million.

NARAINGANJ, or NARAYANGANJ, a town of India, in the Dacca district of eastern Bengal and Assam, situated near the junction of two rivers with the Meghna, 10 m. by rail S. of Decca city. Pop. (1901) 24,472. As the port of Dacca, having steamer communication with both Calcutta and Chittagong, it has become the chief entrepôt for the jute trade of eastern Bengal. There are 73 jute-presses, employing 6000 hands, and the annual export of jute exceeds 300,000 tons. It also ranks as the model municipality of Bengal.

NARBONNE, a city of France, capital of an arrondissement in the department of Aude, situated in a vine-growing plain 5 m. from the Mediterranean, on the railway from Toulouse to Cette, 37 m. E. of Carcassonne. Pop. (1906) 23,289. The Robine canal, a branch of the Canal du Midi, divides Narbonne into two distinct portions, the *bourg* and the *cité*. The latter is one of the oldest and most interesting of French towns. The former cathedral (St Just), which consists only of a choir 130 ft. high and transept, was begun in 1272, and the transept was still unfinished at the end of the 15th century. The towers (194 ft. high) at each extremity of the transept were built about 1480. Some additions towards the west were made early in the 18th century. An unusual effect is produced by a double row of crenellation taking the place of balustrades on the roof of the choir chapels and connecting the pillars of the flying buttresses. Among the sepulchral monuments, which are the chief feature of the interior, may be noticed the alabaster tomb of Cardinal Guillaume Briçonnet, minister of state under Charles VIII. The chapter-house, of the 15th century, has a vaulted roof supported on four free pillars. The treasury preserves many interesting relics. The apse of the cathedral was formerly joined to the fortifications of the archiepiscopal palace, and the two buildings are still connected by a mutilated cloister of the 14th and 15th centuries. On the front of the palace are three square towers of unequal height. Between the Tour des Télégraphes (1318), crenellated and turreted at the corners, and that of St Martial (1374), machicolated and pierced by Gothic openings, a new façade was erected in the style of the 13th century after the plans of Viollet-le-Duc. This portion of the building now serves as hôtel de ville, and its upper stories are occupied by the Narbonne museum of art and archaeology, which includes a fine collection of pottery. The palace garden also contains many fragments of Roman work once built into the now dismantled fortifications; and the Musée Lapidaire in the Lamourguier buildings (formerly the church of a Benedictine convent) has a collection of Roman remains derived from the same source. The church of St Paul, though partly Romanesque, is in the main striking, and for the south of France a rare example of a building of the first half of the 13th century in the Gothic style of the north. It possesses some ancient Christian sarcophagi and fine Renaissance wood carving. Narbonne has a sub-prefecture, tribunals of first instance and of commerce, a board of trade arbitration, a chamber of commerce, a communal college for boys and a school of commerce and industry. It has a good trade in wine and spirituous liquors, and is famous for its honey. The industries include cooperage, sulphur-refining, brandy-distilling and the manufacture of bricks and tiles and verdigris.

Long before the Roman invasion of Gaul Narbonne was a flourishing city, being capital of the Volcae Tectosages. It was there that the Romans in 118 B.C. founded their first colony in Gaul, which bore the name of *Narbo Martius*; they constructed great works to protect the city from inundation and to improve its port, situated on a lake now filled up but at that time communicating with the sea. Capital of Gallia Narbonensis, the seat of a proconsul and a station for the Roman fleet, Narbo Martius became the rival of Massilia. But in A.D. 150 it suffered greatly from a conflagration, and the division of Gallia Narbonensis into two provinces lessened its importance as a capital. Alans, Suevi, Vandals, each held the city for a brief space, and at last, in 413, it was occupied by the Visigoths, whose capital it afterwards became. In 719, after a siege of two years, it was captured by the Saracens, and by them its fortifications were restored and extended. Charles Martel, after the battle of Poitiers, and Pippin the Short, in 752, were both repulsed from its walls; but on a new attempt, after an investment of seven years, and by aid of a traitor, the Franks managed again to force their way into Narbonne. Charlemagne made the city the capital of the duchy of Gothia, and divided it into three lordships—one for the bishop, another for a Frankish lord, and the third for the Jews, who, occupying their own quarter, possessed schools, synagogues and a university famous in the middle ages. The viscounts who succeeded the Frankish lord sometimes acknowledged the authority of the counts of Toulouse, sometimes that of the counts of Barcelona. In the 13th century the crusade against the Albigenses spared the city, but the archbishopric was seized by the pope's legate, Arnaud Amaury, who took the title of viscount of Narbonne. Simon de Montfort, however, deprived him of this dignity, receiving from Philip Augustus the duchy of Narbonne along with the county of Toulouse. By his expulsion of the Jews Philip the Fair hastened the decay of the city; and about the same period the Aude, which had formerly been diverted by the Romans, ceased to flow towards Narbonne and the harbour was silted up, to the further disadvantage of the place. In 1642 Henri Marquis de Cinq-Mars was arrested at Narbonne for conspiring against Richelieu. United to the French crown in 1507, Narbonne was enclosed by a new line of walls under Francis I., but having ceased to be a garrison town it had the last portions of its ramparts demolished in 1870. The archbishopric was founded about the middle of the 3rd century, its first holder being Sergius Paulus; it was suppressed in 1790.

NARBONNE-LARA, LOUIS MARIE JACQUES AMALRIC, COMTE DE (1755–1813), French soldier and diplomatist, was born at Colorno, in the duchy of Parma, on the 24th of August 1755. He was the son of one of the ladies-in-waiting of Elizabeth, duchess of Parma, and his father was either a Spanish nobleman or—as has been alleged—Louis XV. himself. He was brought up at Versailles with the princesses of France, and was made colonel at the age of twenty-five. He became *maréchal-de-camp* in 1791, and, through the influence of Madame de Stael, was appointed minister of war. But he showed incapacity in this post, gave in his resignation, and joined the Army of the North. Incurring suspicion as a *Feuillant* and also by his policy at the war office, he emigrated after the 10th of August 1792, visited England, Switzerland and Germany, and returned to France in 1801. In 1809 he re-entered the army as general of division, and was subsequently minister plenipotentiary at Munich and *aide de camp* to Napoleon. In 1813 he was appointed French ambassador at Vienna, where he was engaged in an unequal diplomatic duel with Metternich (*q.v.*) during the fateful months that witnessed the defection of Austria from the cause of Napoleon to that of the Allies. He died at Torgau, in Saxony, on the 17th of November 1813.

See A. F. Villemain, *Souvenirs contemporains* (Paris, 1854).

NARBOROUGH, SIR JOHN (d. 1688), English naval commander, was descended from an old Norfolk family. He received his commission in 1664, and in 1666 was promoted lieutenant for gallantry in the action with the Dutch fleet off the Downs in June of that year. After the peace he was chosen to conduct a voyage of exploration in the South Seas. He set sail from Deptford on the 26th of November 1669, and entered the Straits of Magellan in October of the following year, but returned home in June 1671 without accomplishing his original purpose. A narrative of the expedition was published at London in 1694 under the title *An Account of several late Voyages and Discoveries to the South and North.* During the second Dutch War Narborough was second captain of the lord high-admiral's ship the

"Prince," and conducted himself with such conspicuous valour at the battle of Solebay (Southwold Bay) in May 1672 that he won special approbation, and shortly afterwards was made rear-admiral and knighted. In 1675 he was sent to suppress the Tripoline piracies, and by the bold expedient of despatching gun-boats into the harbour of Tripoli at midnight and burning the ships he induced the dey to agree to a treaty. Shortly after his return he undertook a similar expedition against the Algerines. In 1680 he was appointed commissioner of the navy, an office he held till his death in 1688. He was buried at Knowlton church, Kent, where a monument has been erected to his memory.

See Charnock, *Biog. Nav.* i.; Hist. MSS. Comm. 12th Rept.

NARCISSUS, in Greek mythology, son of the river god Cephissus and the nymph Leiriope, distinguished for his beauty. The seer Teiresias told his mother that he would have a long life, provided he never looked upon his own features. His rejection of the love of the nymph Echo (*q.v.*) drew upon him the vengeance of the gods. Having fallen in love with his own reflection in the waters of a spring, he pined away (or killed himself) and the flower that bears his name sprang up on the spot where he died. According to Pausanias, Narcissus, to console himself for the death of a favourite twin-sister, his exact counterpart, sat gazing into the spring to recall her features by his own. Narcissus, representing the early spring-flower, which for a brief space beholds itself mirrored in the water and then fades, is one of the many youths whose premature death is recorded in Greek mythology (cf. Adonis, Linus, Hyacinthus); the flower itself was regarded as a symbol of such death. It was the last flower gathered by Persephone before she was carried off by Hades, and was sacred to Demeter and Core (the cult name of Persephone), the great goddesses of the underworld. From its associations Wieseler takes Narcissus himself to be a spirit of the underworld, of death and rest. It is possible that the story may have originated in the superstition (alluded to by Artemidorus, *Oneirocritica*, ii. 7) that it was an omen of death to dream of seeing one's reflection in water.

See Ovid, *Metam.* iii. 341-510; Pausanias ix. 31; Conon, *Narrationes*, 24; F. Wieseler, *Narkissos* (1856); Greve in Roscher's *Lexikon der Mythologie*; J. G. Frazer, *The Golden Bough* (1900), i. 293.

NARCISSUS, a genus of bulbous plants belonging to the family Amaryllidaceae, natives of central Europe and the Mediterranean region; one species *N. Tazetta*, extends through Asia to Japan. From these, or rather from some of these, by cultivation and hybridization, have arisen the very numerous modern varieties. The plants have long narrow leaves springing from the bulb and a central scape bearing one or more generally large, white or yellow, drooping or inclined flowers, which are enveloped before opening in a membranous spathe. The flowers are regular, with a perianth springing from above the ovary, tubular below, with spreading segments and a central corona; the six stamens are inserted within the tube. The most interesting feature botanically is the "corona" or "cup," which springs from the base of the flower-segments. This gives the special character to the flower, and the members of the genus are classified according to the length of this organ as compared with that of the segments. The most probable supposition is that the cup is simply an excrescence or "enation" from the mouth of the flower-tube, and is connected with the fertilization of the flowers by insect agency.

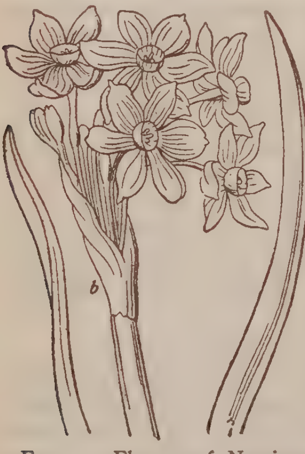

FIG. 1.—Flowers of Narcissus (*Narcissus Tazetta*) bursting from the sheathing bract or spathe, *b*.

There are five well-marked sections.

1. The hoop-petticoat narcissi, sometimes separated as the genus *Corbularia*, are not more than from 3 to 6 in. in height, and have grassy foliage and yellow or white flowers. These have the coronet in the centre of the flower very large in proportion to the other parts, and much expanded, like the old hooped petticoats. They are now all regarded as varieties or forms of the common hoop-petticoat, *N. Bulbocodium*, which has comparatively large bright yellow flowers; *N. tenuifolius* is smaller and somewhat paler and with slender erect leaves; *N. citrinus* is pale lemon yellow and larger; while *N. monophyllus* is white. The small bulbs should be taken up in summer and replanted in autumn and early winter, according to the state of the season. They bloom about March or April in the open air. The soil should be free and open, so that water may pass off readily.

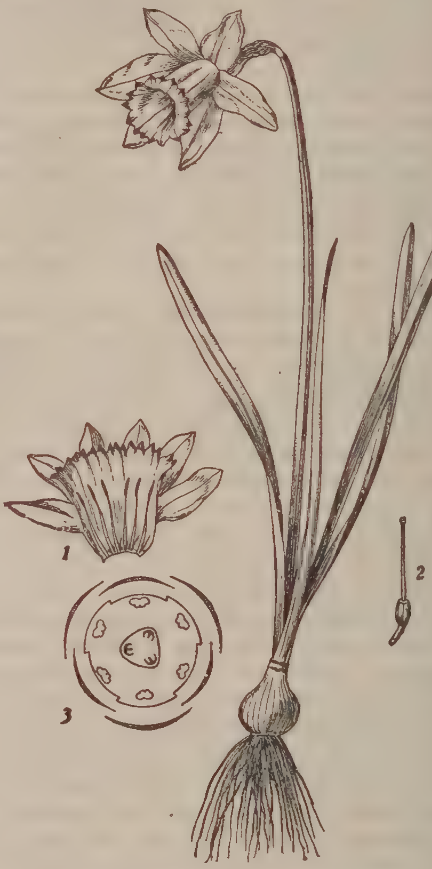

FIG. 2.—Daffodil—(*Narcissus Pseudonarcissus*).
1, Flower cut open; 2, pistil; 3, horizontal plan of flower.

2. A second group is that of the Pseudonarcissi, constituting the genus *Ajax* of some botanists, of which the daffodil, *N. Pseudonarcissus* is the type. The daffodil (fig. 2) is common in woods and thickets in most parts of the north of Europe, but is rare in Scotland. Its leaves are five or six in number, are about 1 ft. in length and 1 in. in breadth, and have a blunt keel and flat edges. The stem is about 18 in. long and the spathe single-flowered. The flowers are large, yellow, scented and a little drooping, with a corolla deeply cleft into six lobes and a bell-shaped corona which is crisped at the margin; they appear in March or April. In this species the corona is also very large and prominent, but is more elongated and trumpet-shaped, while the other members are regarded as subspecies or varieties of this. Of this group the most striking one perhaps is *N. bicolor*, which has the perianth almost white and the corona deep yellow; it yields a number of varieties, some of the best known being Empress, Horsfieldi, Grandee, Ellen Willmott, Victoria, Weardale Perfection, &c. *N. moschatus*, a native of the Pyrenees and the Spanish peninsula, is a cream-coloured subspecies of great beauty with several forms. *N. cyclamineus* is a pretty dwarf subspecies, native of Portugal, with narrow linear leaves and drooping flowers with reflexed lemon-yellow segments and an orange-yellow corona *N. major* is a robust form with leaves $\frac{1}{2}$–$\frac{3}{4}$ in. broad and bright lemon-yellow flowers 2–$2\frac{1}{2}$ in. long; *maximus* is a closely-related but still finer form; *obvallaris* (the Tenby daffodil) is an early form with

uniformly yellow flowers. *N. minor* and *minimus* are miniature repetitions of the daffodil. All these grow well in good garden soil, and blossom from March onwards, coming in very early in genial seasons.

3. Another group, the mock narcissi or star daffodils, with coronets of medium size, includes the fine and numerous varieties of *N. incomparabilis*, one of which, with large, double flowers, is known as butter-and-eggs; *N. odorus*, known as the campernelle jonquil, has two to four uniform bright yellow flowers, and is considered a hybrid between *N. Jonquilla* and *N. Pseudonarcissus*. A form with sweet-scented double flowers is known as Queen Ann's jonquil; *N. juncifolius*, a graceful little plant from Spain, Portugal and south France, has one to four small bright yellow flowers on each scape. The hardier forms of this set thrive in the open border, but the smaller sorts, like Queen Ann's jonquil, are better taken up in autumn and replanted in February; they bloom freely about April or May. *N. triandrus*—Ganymede's Cup—is a pretty little species with white flowers about 1 in. long; in several of its varieties the flowers are a pale or deeper yellow; they make attractive pot plants.

4. The polyanthus or bunch narcissi form another well-marked group, whose peculiarity of producing many flowers on the stem is indicated by the name. In these the corona is small and shallow as compared with the perianth. Some of the hardier forms, as *N. Tazetta* itself, the type of the group, succeed in the open borders in light well-drained soil, but the bulbs should be deeply planted, not less than 6 or 8 in. below the surface, to escape risk of injury from frost. Many varieties of this form of narcissus, such as Grand Monarque, Paper white, Soleil d'or, are grown. They admit of being forced into early bloom, like the hyacinth and tulip. They vary with a white, creamy or yellow perianth, and a yellow, lemon, primrose or white cup or coronet; and, being richly fragrant, they are general favourites amongst spring flowers. Many tons of these flowers are exported from the Scilly Isles to the London markets in spring. The "Chinese sacred lily" or "joss flower" is a form of *N. Tazetta*. The jonquil, *N. Jonquilla*, with yellow flowers, a native of south Europe and Algeria, of which there are single and double flowered varieties, is also grown in pots for early flowering, but does well outside in a warm border.

5. There remains another little group, the poet's or pheasant's-eye narcissi (*N. poeticus*), in which the perianth is large, spreading and conspicuous, and the corona very small and shallow. These pheasant's-eye narcissi, of which there are several well-marked varieties, as *radiiflorus*, *poetarum*, *recurvus*, &c., blossom in succession during April and May, and all do well in the open borders as permanent hardy bulbs. *N. biflorus*, the primrose peerless, a two-flowered whitish yellow-cupped species, equally hardy and easy of culture, is a natural hybrid between *N. poeticus* and *Tazetta*. *N. gracilis*, a yellow-flowered species, has also been regarded as a hybrid between *N. Tazetta* and *N. juncifolius*, and blooms later.

Of late years some remarkably fine hybrids have been raised between the various distinct groups of narcissi, and the prices asked for the bulbs in many cases are exceedingly high. One of the most distinct groups is that known under the name of "Poetaz"—a combination of *poeticus* and *Tazetta*. The best forms of *poeticus ornatus* have been crossed with the bunch-flowered Tazettas, and have resulted in producing varieties with large trusses of exquisite flowers more or less resembling the ornatus parents, and varying in colour from the purest white to yellow, the rim of the corona being in most cases conspicuously and charmingly coloured with red or crimson. This is an excellent group for cutting purposes, but it will take a few more years to make the varieties common.

For an account of the history and culture of the narcissus see F. W. Burbidge, *The Narcissus* (1875); a more recent scientific treatment of the genus will be found in J. G. Baker's *Handbook of Amaryllideae* (1888); see also Nicholson, *Dictionary of Gardening* (1886); and J. Weathers, *Practical Guide to Garden Plants* (1901).

NARCOTICS (Gr. ναρκωτικός, making numb), a general term for substances having the physiological action, in a healthy animal, of producing lethargy or stupor, which may pass into a state of profound coma or unconsciousness along with complete paralysis, terminating in death. Certain substances of this class are used in medicine for the relief of pain, and are then called anodynes, whilst another group produce profound sleep, and are consequently known as hypnotics. In one sense, anaesthetics, such as chloroform and ether, may be held to be narcotics, but, as they are usually volatile substances causing unconsciousness for a comparatively short time, they are conveniently separated from the true narcotics, the effects of which are much more lasting. These distinctions are to a great extent artificial, as it is evident that a substance capable of producing partial insensibility to pain, or sleep, will inevitably in larger doses cause profound coma ending in death. Hence we find the same substances sometimes classed as anodynes and at other times as hypnotics. For example, small doses of opium, or of one or other of its preparations, relieve pain, whilst larger doses act as hypnotics, causing deep sleep passing into coma. Cannabis Indica, belladonna and hyoscyamus, are also anodyne in their action. The chief narcotics are mentioned below.

Opium is the inspissated juice of the *Papaver somniferum*, containing 7·5 to 10·5 % of anhydrous morphine. Besides morphine some of the other alkaloids contained in it are of a narcotic nature, notably papaverine, narceine, meconine, cryptopine and narcotine, but the principal anodyne and narcotic effects are due to the morphine alkaloid. Though seasoned opium takers may take 20 to 30 grs. without noticeable effects, 1 to 3 grs. produces marked symptoms in the western races. Idiosyncrasy is marked in regard to the amount of opium a person can safely take. The medicinal dose is up to 2 grs., and the smallest dose that has been known to cause death in an adult is ½ gr. The narcotic properties of *Morphine* vary as to whether it is taken by the stomach or injected under the skin; 2 grs. by the stomach is dangerous, and a safe medicinal dose by the skin is ⅛ to ⅙ gr. The smallest dose that has produced death in an adult was ¼ gr. given hypodermically. The motor centres of the brain and spinal cord are first stimulated by opium and morphine and later depressed; death in fatal cases being from paralysis of the respiratory centre of the medulla. For the treatment of poisoning see under OPIUM.

Cannabis indica or Indian Hemp (see HEMP).—The part used in medicine is the non-fertilized female spikes of the *Cannabis sativa*. The active constituent is the resin containing cannabin with the active principle cannabinol, the alkaloids cannabinene and tetanocanabine. *Cannabis indica* is sold in the East under various names. A confection of the drug made in Arabia is called hashisch. Churrus is the resin scraped off the leaves, and the dried leaf is called bang, gunga or ganga being the name given to the dried flowering tops sold for smoking. The medicinal dose is ¼ to 1 gr. of the extract, 2 to 3 grs. is a poisonous dose, but there is no recorded fatal case in man. In Eastern countries the smoking of *Cannabis indica* produces a form of mania. The effects of smaller doses are intoxication of a pleasant character, exaltation, hallucinations and delirium, later dilatation of the pupils, drowsiness, sleep and coma. Indian hemp is an uncertain anodyne and hypnotic. When large quantities have been taken an emetic should be given or the stomach pump used, and endeavour to allay excitement until the effects have passed off.

Belladonna and Atropine.—The leaves of the *Atropa Belladonna* or deadly nightshade of which the active principle is atropine principally used as a sulphate. A small dose of belladonna or atropine causes dryness of the throat and mouth, dilatation of the pupils, dimness of vision except for distant objects and often double vision. The pulse becomes quick, rising, in an adult, from 80 to 120 or 160 beats per minute; and there is often a bright red flush over the skin. The intellectual powers are at first acute and strong, but they soon become confused. There is giddiness, confusion of thought, excitement, a peculiar talkative wakeful restiveness, in which the person shows that his mind is occupied by a train of fancies or is haunted by visions and spectres. Often there is violent delirium before sleep comes on. The sleep after a large dose deepens into stupor, with great muscular prostration or paralysis. During all the time the pupils are widely dilated. Death occurs from failure both of the heart's action and of respiration. The minimum lethal dose is not known, but 80 grs. of the root have caused death; $\frac{1}{10}$ to $\frac{1}{15}$ gr. hypodermically have caused dangerous symptoms and ½ gr. would almost certainly be fatal. For the medicinal preparations and treatment of poisoning see BELLADONNA.

Stramonium.—The part of the plant used is the leaves and seed of the *Datura Stramonium* or thorn apple, the alkaloidal constituent being daturine, a variable mixture of hyoscine and atropine. The physiological action is almost identical with belladonna. Poisoning is usually due to children eating the seeds; the lethal dose is unknown. The symptoms produced are divided into three stages—delirium, sleep and deep coma. In case of slight poisoning a rash is one of the toxic symptoms. The treatment of poisoning is to give emetics, wash out the stomach and give stimulants and pilocarpine subcutaneously, also to apply warmth and to use artificial respiration if necessary.

Hyoscyamus, the leaves of the *Hyoscyamus niger* or henbane (*q.v.*). The active principle is hyoscyamine. The physiological action is almost similar to belladonna, with excitement and cardiac stimulation and afterwards depression and stupor, but the action of hyoscyamus on the heart is more powerful. In large doses it is a strong cerebral depressant, and produces dilatation of the pupil; $\frac{1}{60}$ gr. of hyoscamine produces marked effects, sleepiness and dryness of the mouth; ⅓ gr. by subcutaneous injection has produced fatal results. The treatment of hyoscyamus poisoning is similar to that of stramonium.

Hops (the *Humulus Lupulus*), containing the active principle lupuline, and *Lactucarium*, the juice of the *Lactuca virosa* (lettuce), containing an alkaloid lactucine, are very feeble narcotics, causing heaviness and sleep if taken in large doses.

Chloral Hydrate is a pure hypnotic which in larger doses is a powerful narcotic, producing prolonged sleep with depression of the cardiac and motor centres. It is an intrinsic cardiac poison, the heart being arrested in diastole, with coincident respiratory failure. Chloral hydrate is not uniform in its action, some people manifesting great susceptibility to the drug. It is safe in small doses of 10 to 20 grs. It is difficult to say what is a lethal dose. Cases are recorded of recovery after 336 grs. taken with an equal amount of potassium bromide and even after a dose of 595 grs., but in susceptible persons 10 to 15 grs. have produced toxic symptoms and death has occurred after doses of from 30 to 45 grs. If seen early, the treatment is an emetic, but if the poison should have been already absorbed, stimulants, hot coffee, strychnine or digitalin hypodermically, with perhaps artificial respiration, may be required.

Alcohol in large quantities is a strong narcotic, producing the typical stages of preliminary excitement followed by drowsiness and profound coma, during which death may occur. The treatment is washing out the stomach to prevent the absorption of the poison and the use of strychnine hypodermically.

NARDI, JACOPO (b. 1476), Florentine historian, occupied various positions in the service of the Florentine republic after the expulsion of the Medici in 1494, and even on their return in 1512 he continued in the public service. In 1527 he joined in the movement for the expulsion of the family and was instrumental in defeating the Medicean troops under Cardinal Passerini, who were attacking the Palazzo della Signoria. When the Medici again definitely became masters of Florence in 1530, Nardi was exiled from the city and his property confiscated. He spent the rest of his days in various parts of Italy, chiefly in Venice, and wrote a statement of the claims of the Florentine exiles against the Medici, addressed to the emperor Charles V. The exact date of his death is unknown. His chief work is his *Istorie della Città di Firenze*, covering the period from 1498 to 1538, in part based on Biagio Buonaccorsi's *Diario*.

L. Arbib's edition of Nardi's history (Florence, 1842) contains a biography of the author, and so does that of Agenore Gelli (Florence, 1888).

NARES, SIR GEORGE STRONG (1831–), English Arctic explorer, son of a captain in the navy, was educated at the Royal Naval College at New Cross, and entered the navy in 1846. After being employed for some time on the Australian station, in 1852 he became mate of the "Resolute" in the Arctic expedition which was sent out in that year. Serving in the Crimea upon his return, he was appointed lieutenant in charge of the naval cadets on the inauguration of the "Britannia" training ship, and was then employed in surveying work on the N.E. coast of Australia and in the Mediterranean, attaining the rank of captain in 1869. While in command of the "Challenger" (1872–1874), in the famous voyage of deep-sea exploration round the world, he was ordered home to take command of the Arctic expedition which set sail in the spring of 1875 in the ships "Alert" and "Discovery." He published a narrative of the voyage on his return, and for his services was made K.C.B. (1876). Two years later he was sent in command of the "Alert" to survey Magellan Strait. From 1879 to 1896 he was attached to the Harbour Department of the Board of Trade. He retired from active service in 1886, and became a vice-admiral in 1892. (See POLAR REGIONS.)

NARGILE or NARGILEH, the Persian and Turkish name for a "hookah," a tobacco pipe with a long flexible tube for stem passing through a vessel containing water, often perfumed. This bowl was originally made of a coco-nut (Persian *nārgīl*), whence the name, but now glass, metal or porcelain, are also used.

NARNI (anc. Umbrian *Nequinum*, Rom. *Narnia*), a town and episcopal see of the province of Perugia, Italy, 65 m. N. of Rome by rail. Pop. (1901) 5200 (town), 12,773 (commune). It is picturesquely situated on a lofty rock (787 ft. above sea-level), 480 ft. above the Nera valley, at the point where the river traverses a narrow ravine, and commands a fine view. The cathedral and the portico of S. Maria della Pensola are buildings of the 11th century with flat arches; the former has some good Renaissance sculptures. There are other interesting churches; S. Francesco has a good doorway of the 14th century. In the town hall is a "Coronation of the Virgin" by D. Ghirlandaio. The town also contains some picturesque Gothic houses and palaces. Near the station, below the town, are factories of india-rubber and calcium carbide.

The Umbrian Nequinum was taken by the Romans after a long siege in 299 B.C., and a colony planted there against the Umbrians, taking its name from the river. It was among the twelve colonies that were punished for refusing help to Rome in 209 B.C. It was considered a suitable point to oppose a threatened march of Hasdrubal on Rome. It stood on the Via Flaminia, the great bridge of which over the river lies below the town. The original main road ran to Nuceria by Mevania; a branch by Interamna and Spoletium joined it at Forum Flaminii. According to some authors, the emperor Nerva was born at Narnia. The town is mentioned in the history of the Gothic wars. Procopius (*B.G.* i. 17) describes the site of the town, the river and the bridge—the latter as built by Augustus, and as having the highest arches that he knew. In the middle ages Narni was under the papal power. It was the birthplace of the well-known condottiere Erasmo Gattamelata.

See G. Eroli, *Miscellanea Storica Narnese* (2 vols., Narni, 1858–1862), and other works by the same author.

NARRAGANSETT, a township of Washington county, Rhode Island, U.S.A. on the W. shore of Narragansett Bay, about 25 m. S. of Providence and about 8 m. W.S.W. of Newport. Pop. (1890) 1408; (1900) 1523; (1905) 1469; (1910) 1250. Area about 15 sq. m. It is connected at Kingston Station (about 9 m. N.W.) by the Narragansett Pier railway with the shore line of the New York, New Haven & Hartford railway; an electric line connects with Providence. The southern part of the township is a peninsula, lying between the mouth of Narragansett Bay and an inlet separating this part of the township from South Kingstown. Narragansett Pier, within the township, has a fine bathing beach, which extends along the indented coast between the village and the mouth of the Pattaquamscutt river; the force of the surf is somewhat broken by Point Judith, about 5 m. S. (also in the township), on which there is a lighthouse. On a ridge overlooking the ocean and commanding a fine view is the Point Judith Country Club, with golf courses, tennis courts and a polo-field, on which is held a horse show at the close of each season. Many of the summer visitors at Narragansett Pier are from New England, New York and Philadelphia, but there is a sufficient number from Baltimore, Washington, Richmond, Louisville and other Southern cities to give to its society a noticeably Southern tone. Narragansett Pier was so-named from the piers that were built here late in the 18th century and early in the 19th to provide a port for the Narragansett Country, or southern Rhode Island, and it still has a coal wharf, and a yacht landing at the Casino. The development of the place as a summer resort was begun about the middle of the 19th century by the erection of a bathing-house and the conversion of some farm houses into boarding houses. The erection of large hotels and private residences soon followed, and the completion of the railway to the pier in 1876 increased its popularity. The District of Narragansett (in the town of South Kingstown) was organized in 1888 and in 1901 was incorporated as a separate township.

The town is named from the Narraganset Indians, a once-powerful Algonquian tribe, which occupied much of the shore of Narragansett Bay. Under their chief Canonicus (d. 1647) they were friendly to the early Rhode Island settlers, and under Miantonomo (*q.v.*) entered into a tripartite treaty with the Connecticut colonists and the Mohegans; but after the execution of Miantonomo the Narragansets under Miantonomo's son, Canonchet or Nanuntenoo, were less friendly. Their loyalty to the whites was suspected at the time of King Philip's War, and on the 19th of December 1675, at the Great or Cedar Swamp (Narragansett Fort) in the present town of South Kingstown (immediately west of the town of Narragansett), they were decisively defeated by the whites, under Governor Josiah Winslow of the Plymouth Colony. The site of the engagement is marked by a granite monument erected in 1906 by the Rhode Island Society of Colonial Wars. Canonchet escaped, but on the 2nd of August 1676 was captured near Stonington, Connecticut, and on the following day was executed. Most of the survivors of the tribe were later settled among the Niantic, to whom the name Narraganset has been transferred. There are now few survivors of pure Indian blood.

NARSES, NARSEH, NARSEUS, king of Persia, son of Shapur I. He rose as pretender to the throne against his grand-nephew Bahram III. in A.D. 292, and soon became sole king. He attacked the Romans, but after defeating the emperor Galerius near Callinicum on the Euphrates in 296 was completely defeated in 297, and forced to conclude a peace, by which western Mesopotamia and five provinces on the left bank of the upper Tigris were ceded to the Romans and their sovereignty over the kingdom of Armenia was acknowledged. This peace, concluded in 297, lasted for forty years. Narses died in 303 and was succeeded by his son Hormizd II. (Ed. M.)

NARSES (*c.* 478–573) an important officer of Justinian, in the 6th century. He was a eunuch, but we are nowhere distinctly informed that he was of servile origin. A native of Persarmenia (that portion of Armenia which was allotted to Persia by the partition of 384), he may have been prepared and educated by his parents for service in an oriental court. If the statement that he died at the age of ninety-five be correct, he was born about 478. He was probably brought young to Constantinople, and attained a footing in the *officium* of the grand chamberlain. He rose to be one of the three (spectabiles) "chartularii," a position implying some literary attainment, and involving the custody of the archives of the household. Hence, probably in middle life, he became "praepositus sacri cubiculi," an "illustris," and entitled along with the praetorian prefects and the generals to the highest rank at the imperial court. In this capacity, in 530, he received into the emperor's obedience another Narses, a fellow-countryman, with his two brothers, Aratius and Isaac. These Persarmenian generals, having formerly fought under the standard of Persia, now in consequence of the successes of Belisarius transferred their allegiance to the emperor Justinian, came to Constantinople, and received costly gifts from the great minister.

In 532 the insurrection known as the Nika broke out in Constantinople, when for some hours the throne of Justinian seemed doomed to overthrow. It was saved partly by the courage of his wife, Theodora, and partly by the timely prodigality of Narses, who stole out into the capital, and with large sums of money bribed the leaders of the "blue" faction, which was aforetime loyal to the emperor, to shout as of old "Justiniane Auguste tu vincas."

The African and Italian wars followed. In the fourth year of the latter war (538) the splendid successes of Belisarius had awakened both joy and fear in the heart of his master. Reinforcements were sent into Italy, and Narses was placed at their head. Belisarius understood that Narses came to serve under him like any other officer of distinguished but subordinate rank, and he received a letter from Justinian which seemed to support this conclusion. But the friends of Narses continually plied him with suggestions that he, a great officer of the household, in the secrets of the emperor, had been sent to Italy, not to serve as a subaltern, but to hold independent command and win military glory for himself. The truth probably lay between the two. Justinian could not deprive his great general of the supreme command, yet he wished to have a very powerful emissary of the court constantly at his side. He would have him watched but not hampered.

The two generals met (A.D. 538) at Fermo on the Adriatic coast. The first interference of Narses with the plans of Belisarius was beneficial. John, one of the officers highest in rank under Belisarius, had pressed on to Rimini, contrary to the instructions of his chief, leaving in his rear the difficult fortress of Osimo (Auximum) untaken. His daring march had alarmed the Goths for Ravenna, and induced them to raise the siege of Rome; but he himself was now shut up in Rimini, and on the point of being forced by famine to surrender. Belisarius and his followers were prepared to let him pay the penalty of his rashness and disobedience. But his friend Narses so insisted on the blow to the reputation of the imperial arms which would be produced by the surrender of Rimini that he carried the council of war with him, and Belisarius had to plan a brilliant march across the mountains, in conjunction with a movement by the fleet, whereby Rimini was relieved while Osimo was still untaken. When Belisarius and John met, the latter ostentatiously thanked Narses alone for his preservation.

His next use of his authority was less fortunate. Milan, which was holding out for the Romans, was also hard pressed by famine. The two generals who were sent to relieve it loitered disgracefully over their march, and, when Belisarius wished to despatch further reinforcements, the commanders of these new troops refused to stir till Narses gave them orders. Belisarius wrote to the eunuch pointing out the necessity of unity of purpose in the imperial army. At length, grudgingly, Narses gave his consent, and issued the required orders; but it was too late. Milan had been compelled by extremity of famine to surrender, and with it the whole province of Liguria fell into the hands of the enemy. This event forced Justinian to recognize the dangers of even a partially divided command, and he recalled Narses to Constantinople.

Twelve years elapsed before Narses returned to Italy. Meanwhile there had been great vicissitudes of fortune both for the Romans and the Goths. Italy, which appeared to have been won by the sword of Belisarius, had been lost again by the exactions and misgovernment of Alexander. Totila had raised up a new army, had more than kept Belisarius at bay in five difficult campaigns (544–548) and now held nearly all the country. Belisarius, however, in this his second series of campaigns, had never been properly seconded by his master. In the spring of 552 Narses set sail from Salona on the Dalmatian coast with a large and well-appointed army. It was a Roman army only in name. Lombards, Heruli, Huns, Gepidae and even Persians followed the standard of Narses, men equal in physical strength and valour to the Goths, and inspired by the liberal pay which they received, and by the hope of plunder.

The eunuch seems to have led his army round the head of the Adriatic Gulf. By skilfully co-operating with his fleet, he was able to cross the rivers of Venetia without fighting the Gothic general Teias, who intended to dispute their passage. Having mustered all his forces at Ravenna, he marched southward. He refused to be detained before Rimini, being determined to meet the Gothic king as soon as possible with his army undiminished. The occupation of the pass of Furlo (Petra Pertusa) by the Goths prevented his marching by the Via Flaminia, but, taking a short circuit, he rejoined the great road near Cagli. A little farther on, upon the crest of the Appenines, he was met by Totila, who had advanced as far as Tadini, called by Procopius Tagina. Parleys, messages and harangues by each general followed. At length the line of battle was formed, and the Gothic army, probably greatly inferior in number to the Byzantine was hopelessly routed (July 552), the king receiving a mortal wound as he was hurrying from the battlefield.

With Totila fell the last hopes of the Gothic kingdom of Italy. Teias, who was proclaimed his successor, protracted for a few months a desperate resistance in the rocky peninsula of Castellamare, overlooking the bay of Naples. At length want of provisions forced him into the plain, and there by the river Sarno, almost in sight of Pompeii, was fought (553) a battle which is generally named from the overlooking range of Mons Lactarius (Monte Lettere). The actual site of the battle, however, is about half a mile from the little town of Angri, and its memory is still vaguely preserved by the name *Pozzo dei Goti* (well of the Goths). In this battle Teias was killed. He was the last king of the Ostrogoths.

The task of Narses, however, was not yet ended. By the invitation of the Goths an army of 75,000 warlike Alamanni and Franks, the subjects of King Theudibald, crossed the Alps under the command of two Alamannic nobles, the brothers Lothair and Buccelin (553). The great strategic talents of Narses were shown even more conspicuously in this, than in his previous and more brilliant campaigns. Against the small but gallant bands of Totila and Teias he had adopted the policy of rapid marches and imperative challenges to battle. His strategy in dealing with the great host from Gaul was of the Fabian kind. He kept them as long as he could north of the Apennines, while he completed the reduction of the fortresses of Tuscany. At the approach of winter he gathered his troops into the chief cities and declined operations in the field, while the Alamannic brothers marched through Italy, killing and plundering. When the spring of 554 appeared, Lothaire with his part of the army insisted on marching back to Gaul, there to deposit in safety the plunder which they had reaped. In an unimportant engagement near Pesaro he was worsted by the Roman generals, and this hastened his northward march. At Ceneda in Venetia he died of a raging fever. Pestilence broke out in his army, which was so wasted as to be incapable of further operations in Italy. Meanwhile his brother Buccelin, whose army was also suffering grievously from disease, partly induced by free indulgence in the grapes of Campania, encamped at Casilinum, the site of modern Capua. Here, after a time, Narses accepted the offered battle (554). The barbarians, whose army was in the form of a wedge, pierced the Roman centre. But by a most skilful manœuvre Narses contrived to draw his lines into a curve, so that his mounted archers on each flank could aim their arrows at the backs of the troops who formed the other side of the Alamannic wedge. They thus fell in whole ranks by the hands of unseen antagonists. Soon the Roman centre, which had been belated in its march, arrived upon the field and completed the work of destruction. Buccelin and his whole army were destroyed, though we need not accept the statement of the Greek historian (Agathias ii. 9) that only five men out of the barbaric host of 30,000 escaped, and only eighty out of the Roman 18,000 perished.

The only other important military operation of Narses which is recorded—and that indistinctly—is his defeat of the Herulian king Sindbal, who had served under him at Capua, but who subsequently revolted, was defeated, taken captive and hanged by the eunuch's order (565). In the main the thirteen years after the battle of Capua (554–567) were years of peace, and during them Narses ruled Italy from Ravenna with the title of prefect.[1] He rebuilt Milan and other cities destroyed in the Gothic War; and two inscriptions on the Salarian bridge at Rome have preserved to modern times the record of repairs effected by him in the year 564.

His administration, however, was not popular. The effect of the imperial organization was to wring the last *solidus* out of the emaciated and fever-stricken population of Italy, and the belief of his subjects was that no small portion of their contributions remained in the eunuch's private coffers. At the close of 565 Justinian died, and a deputation of Romans waited upon his successor Justin II., representing that they found "the Greeks" harder taskmasters than the Goths, that Narses the eunuch was determined to reduce them all to slavery, and that unless he were removed they would transfer their allegiance to the barbarians. This deputation led to the recall of Narses in 567, accompanied, according to a somewhat late tradition, by an insulting message from the empress Sophia, who sent him a golden distaff, and bade him, as he was not a man, go and spin wool in the apartments of the women. "I will spin her such a hank," Narses is represented as saying, "that she shall not find the end of it in her lifetime"; and forthwith he sent messengers to the Lombards in Pannonia, bearing some of the fruits of Italy, and inviting them to enter the land which bore such goodly produce. Hence came the invasion of Alboin (568), which wrested the greater part of Italy from the empire, and changed the destinies of the peninsula.[2]

Narses, who had retired to Naples, was persuaded by the pope (John III.) to return to Rome. He died there about 573, and his body, enclosed in a leaden coffin, was carried to Constantinople and buried there. Several years after his death the secret of the hiding-place of his vast stores of wealth is said to have been revealed by an old man to the emperor Tiberius II., for whose charities to the poor and the captives they furnished an opportune supply.

Narses was short in stature and lean in figure. His freehandedness and affability made him very popular with his soldiers. Evagrius tells us that he was very religious, and paid especial reverence to the Virgin, never engaging in battle till he conceived that she had given him the signal. Our best authorities for his life are his contemporaries Procopius and Agathias. See Gibbon, *Decline and Fall*, vols. iv. and v., edited by J. B. Bury (1898). (T. H.)

NARSINGHGARH, a native state of Central India, in the Bhopal agency. Area, 741 sq. m.; pop. (1901) 92,093; estimated revenue, £33,000; tribute to Holkar, £4000. The chief, whose title is raja, is a Rajput of the Omat clan. The state was founded about 1681 by a minister of Rajgarh, who compelled the ruler of that state to transfer to him half his territory. The town of Narsinghgarh had a population in 1901 of 8778.

NARSINGHPUR, a town and district of British India, in the Nerbudda division of the Central Provinces. The town is on the river Singri, and has a railway station 52 m. E. of Jubbulpore; pop. (1901) 11,233. The district has an area of 1976 sq. m. It forms a portion of the upper part of the Nerbudda valley. The first of those wide alluvial basins which, alternating with rocky gorges, give so varied a character to the river's course, opens out just below the famous marble rocks in Jubbulpore, and extends westward for 225 m., including the whole of Narsinghpur, together with the greater part of Hoshangabad. The Satpura hills to the south are here a generally regular range, nowhere more than 500 ft. above the plain, and running almost parallel to the river, at a distance of 15 or 20 m. In the intervening valley, the rich level of black wheat land is seldom broken, except by occasional mounds of gravel or nodular limestone, which afford serviceable village sites. Along the foot of the boundary hills the alluvium gives way to belts of red gravelly soil, rice and sugar-cane take the place of wheat, and forest trees that of mango groves. The population in 1901 was 315,518, showing a decrease of 14·5% in the decade, due to famine. The principal crops are wheat, millets, rice, pulses, oil-seeds and cotton. There are manufactures of cotton, silk, brass and iron-ware. At Mohpani are coal-mines. The Great Indian Peninsula railway runs through the district, with a branch to Mohpani.

See *Narsinghpur District Gazetteer* (Bombay, 1906).

NARTHEX (Gr. νάρθηξ, the name of the plant giant-fennel, in Lat. *ferula*), the name applied in architecture, probably from a supposed resemblance in shape to the reed-like plant, to the long arcaded porch forming the entrance into a Christian church, to which the catechumens and penitents were admitted. Sometimes there was a second narthex or vestibule within the church, when the outer one was known as the exonarthex. In Byzantine churches this inner narthex formed part of the main structure of the church, being divided from it by a screen of columns. A narthex is found in some German churches, where, however, it had no ritual meaning but was introduced as a western transept to give more importance to the west end. One of the finest examples to be found in England is that of Ely cathedral, where its northern portion, however, was apparently never completed.

NARVA (*Rugodiv* of Russian annals, also *Ivangorod*), a seaport and fortress of Russia, in the government of St Petersburg, 100 m. by rail W.S.W. of the city of St Petersburg. Pop. (1897) 16,577. It stands on the Narova river, which flows from Lake Peipus or Chudskoye, and enters the Gulf of Finland in Narva Bay, 8 m. below this town. The town was founded in 1223 by Danes, and changed hands between the Teutonic knights, Danes, Swedes and Russians until it was taken by Peter the Great in 1704, after the Russians had suffered here a terrible defeat at the hands of Charles XII. of Sweden four years before. Its fortress, built on the right bank of the river, and known as Ivangorod, has lost its importance, and was abandoned in 1864. The cathedral and the town hall (1683) contain interesting antiquities. There are here an arsenal, a small museum and a school of navigation. Several manufactories utilize the waterfalls of the Narova, *e.g.* cotton-mills, woollen cloth mills, flax and jute mills, saw-mills and steam flour mills. The total trade falls short of half a million sterling annually. A watering-place has grown up at Ust-Narova, or Hungerburg, at the mouth of the Narova.

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[1] Gibbon's statement that Narses was "the first and most powerful of the exarchs" is more correct in substance than in form. The title of exarch does not appear to be given to Narses by any contemporary writer. He is always "Praefectus Italiae," "Patricius" or "Dux Italiae," except when he bears the style of his former offices in the imperial household, "Ex-Praepositus [Cubiculi]" or "Chartularius."

[2] This celebrated story seems to be unknown to strictly contemporary authors. We find no hint of it in Agathias (who wrote between 566 and 582), in Marius (532–596), or in Gregory of Tours (540–594). The possibly contemporary *Liber Pontificalis* and Isidore of Seville (560–636) hint at the invitation to the Lombards. Fredegarius (so-called), who probably wrote in the middle of the 7th century, and Paul the Deacon, towards the close of the 8th, supply the saga-like details, which become more minute the farther the narrators are from the action. On the whole, the transaction, though it is too well vouched for to allow us to dismiss it as entirely fabulous, cannot take its place among the undoubted facts of history.

NARVACAN, a town of the province of Ilocos Sur, Luzon, Philippine Islands, near the coast and on the main road 13 m. S.S.E. of Vigan, the capital. Pop. (1903) 19,575. It lies in a level valley surrounded by mountains, and has a cool and healthy climate. The soil, both in the valley and on the neighbouring mountain-sides, is very fertile, and produces rice, vegetables, Indian corn, indigo, cotton, tobacco, maguey and sugar-cane. Cotton fabrics are woven by the women and sold to the mountain tribes. The language of the town is Ilocano.

NARVAEZ, PÁNFILO DE (*c.* 1480–1528), Spanish adventurer, was an hidalgo of Castile, born at Valladolid about 1480. He was one of the subordinates of Velazquez in the reduction of Cuba, and, after having held various posts under his governorship, was put at the head of the force sent to the Aztec coast to compel Cortes to renounce his command; he was surprised and defeated, however, by his abler and more active compatriot at Cempoalla, and made prisoner with the loss of an eye (1520). After his return to Spain he obtained from Charles V. a grant of Florida as far as the River of Palms; sailing in 1527 with five ships and a force of about 600 men, he landed, probably near Pensacola Bay, in April 1528, and, striking inland with some 300 of his followers, reached "Apalache" on June 25. The prospects of fabulous wealth which had sustained them in their difficult and perilous journey having proved illusory a return to the coast was determined, and the Bahia de los Caballos, at or near St Mark's, was reached in the following month. Having built rude boats, the much-reduced company sailed hence for Mexico on September 22, but the vessel which carried Narvaez was driven to sea in a storm and perished. His lieutenant, Cabeza de Vaca, with three others who ultimately reached land, made his way across Texas to the Gulf of California. (See FLORIDA.)

See Prescott, *Conquest of Mexico*; H. H. Bancroft, *Mexico* (1882–1890); and the *Naufragio* of Alvaro Nuñez Cabeza de Vaca in the *Biblioteca* of Rivadeneyra, xxii.

NARVAEZ, RAMON MARIA (1800–1868), Spanish soldier and statesman, was born at Loja, Granada, on the 4th of August 1800, entered the army at an early age, and saw active service under Mina in Catalonia in 1822. He was in his sympathies a Conservative, and could not go all lengths with the Radical opposition to Ferdinand VII., whom he served after his restoration. When the king died, Narvaez became one of the Conservative supporters of Isabel II. He achieved great popularity by his victory over Gomez, the Carlist general, near Arcos, in November 1836, and after clearing La Mancha of brigands by a vigorous policy of suppression in 1838 he was appointed captain-general of Old Castile, and commander-in-chief of the army of reserve. In 1840, for the part he had taken at Seville in the insurrection against Espartero and the Progresista party, he was compelled to take refuge in France, where, in conjunction with Maria Cristina, he planned the expedition of 1843 which led to the overthrow of his adversary. In 1844 he became prime minister, and was created field-marshal and duke of Valencia, but his policy was too reactionary to be tolerated long, and he was compelled to quit office in February 1846. He now held the post of ambassador at Paris, until again called to preside over the council of ministers in 1847; but misunderstandings with Maria Cristina led to his resignation in the following year. His ministry succeeded that of O'Donnell for a short time in 1856–1857, and he again returned to power for a few months in 1864–1865. He once more replaced O'Donnell in July 1866, and was still in office when he died at Madrid on the 23rd of April 1868.

Some very curious notices of Narvaez may be found in the letters of Prosper Merimée to Panizzi (1881). For his general political career see Hermann Baumgarten, *Geschichte Spaniens v. Ausbruch d. französ. Revol. bis auf unsere Tage* (1865–1871); and the *Historia Contemporanea* of Antonio Pirala (1871–1879).

NARVIK or VICTORIAHAVN, a seaport on the Ofoten Fjord of the north-west coast of Norway, in Nordland *amt* (county), 68° 30′ N. It is wholly modern, developed by the construction and completion (1903) of the Ofoten railway, the most northerly in the world. There are extensive quays, from which is shipped the iron ore from the rich districts traversed by the line. Narvik is 167 m. N.W. of Gellivara, and 982 N. by W. of Stockholm by the railway. In summer express trains cover the whole distance in two days. Narvik is a convenient point from which to visit the beautiful Lofoten Islands.

NARWHAL, the Scandinavian name of a cetacean (*Monodon monoceros*), characterized by the presence in the male of a long horn-like tusk. In the adult of both sexes there are only two teeth, both in the upper jaw, which lie horizontally side by side, and in the female remain throughout life concealed in cavities of the bone. In the male the right tooth usually remains similarly concealed, but the left is immensely developed, attaining a length equal to more than half that of the entire animal. In a narwhal 12 ft. long, from snout to end of tail, the exserted portion of the tusk may measure 6 or 7 and occasionally 8 ft. in length. It projects horizontally forwards from the head in the form of a cylindrical or slightly tapering, pointed tusk, composed of ivory, with a central cavity reaching almost to the apex, without enamel, and with the surface marked by spiral grooves and ridges, running in a sinistral direction. Occasionally both left and right tusks are developed, in which case the direction of the grooves is the same in both. No instance has ever been met with of the complete development of the right tusk associated with a rudimentary condition of the left. In young animals several small additional teeth are present, but these usually disappear soon after birth.

The head is rather short and rounded; the fore limbs or paddles are small and broad compared with those of most dolphins; and (as in the beluga) a dorsal fin, found in nearly all other members of the group, is wanting. The general colour of the surface is dark grey above and white below, variously marbled and spotted with shades of grey.

The narwhal is an Arctic whale, frequenting the icy circumpolar seas, and rarely seen south of 65° N. lat. Four instances have, however, been recorded of its occurrence on the British coasts, one on the coast of Norfolk in 1588, one in the Firth of Forth in 1648, one near Boston in Lincolnshire in 1800, while a fourth entangled itself among rocks in the Sound of Weesdale, Shetland, in September 1808. Like most cetaceans it is gregarious and usually met with in "schools" or herds of fifteen or twenty individuals. Its food appears to be cuttlefishes, small fishes and crustaceans. The purpose served by the tusk—or "horn"—is not known; and little is known of the habits of narwhals. Scoresby describes them as "extremely playful, frequently elevating their horns and crossing them with each other as in fencing." They have never been known to charge and pierce the bottom of ships with their weapons, as the swordfish does. The name "sea-unicorn" is sometimes applied to the narwhal. The ivory of which the tusk is composed is of very good quality, but owing to the central cavity, only fitted for the manufacture of objects of small size. The entire tusks are sometimes used for decorative purposes, and are of considerable, though fluctuating, value. (See CETACEA.) (W. H. F.)

NASCIMENTO, FRANCISCO MANOEL DE (1734–1819), Portuguese poet, better known by the literary name of *Filinto Elysio*, bestowed on him by the Marqueza de Alorna, was the reputed son of a Lisbon boat-owner. In his early years he acquired a love of national customs and traditions which his humanist education never obliterated, while, in addition, he learnt to know the whole range of popular literature (*litteratura de cordel*)—songs, comedies, knightly stories and fairy tales, which were then printed in loose sheets (*folhas volantes*) and sold by the blind in the streets of the capital. These circumstances explain the richness of his vocabulary, and joined to an ardent patriotism they fitted him to become the herald of the literary revival known as Romanticism, which was inaugurated by his distinguished follower Almeida Garrett. Nascimento began to write verses at the age of fourteen. He was ordained a priest in 1754, and shortly afterwards became treasurer of the Chagas church in Lisbon. He led a retired life, and devoted his time to the study of the Latin classics, especially Horace, and to the society of literary friends, among whom were numbered some cultivated foreign merchants. These men nourished the common ambition to restore Camoens, then half forgotten, to his rightful place as the king of the Portuguese Parnassus, and they proclaimed the cult of the Quinhentistas, regarding them as the best poetical models, while in philosophy they accepted the teaching of the French Encyclopaedists.

Nascimento's first publication was a version of one of Metastasio's operas, and his early work consisted mainly of translations. Though of small volume and merit, it sufficed to arouse the jealousy of his brother bards. At this time the Arcadia was working to restore good taste and purify the language of gallicisms, but the members of this society forgot the traditions of their own land in their desire to imitate the classics. Nascimento and other writers who did not belong to the Arcadia, formed themselves into a rival group, which met at the Ribeira das Náos, and the two bodies attacked one another in rhyme without restraint, until the "war of the poets," as it was called, ended with the collapse of the Arcadia. Nascimento now conceived a strong but platonic affection for D. Maria de Almeida, afterwards Condessa da Ribeira, sister of the famous poetess the Marqueza de Alorna. This lady sang the chansonnettes he wrote for her, and their poetical intercourse drew from him some lyrics of profound emotion. This was the happiest epoch of his life, but it did not last long. The accession of D. Maria I. inaugurated an era of reaction against the spirit and reforms of Pombal, and religious succeeded to political intolerance. In June 1778 Nascimento was denounced to the Inquisition on the charge of having given vent to heterodox opinions and read "the works of modern philosophers who follow natural reason." The tribunal held a secret inquiry, and without giving him an opportunity of defence issued an order for his arrest, which was to take place early in the morning of the 14th of July. He had received a warning, and succeeded in escaping to the house of a French merchant, Verdier, where he lay hid for eleven days, at the end of which his friend the Marquez de Marialva put him on board a French ship which carried him to Havre. Nascimento took up his residence in Paris, and his first years there passed pleasantly enough. Soon, however, his circumstances changed for the worse. He received the news of the confiscation of his property by the Inquisition; and though he strove to support himself by teaching and writing he could hardly make both ends meet. In 1792 his admirer Antonio de Araujo, afterwards Conde de Barca, then Portuguese minister to Holland, offered the poet the hospitality of his house at the Hague, but neither the country, the people, nor the language were congenial, and when his host went to Paris on a diplomatic mission in 1797 Nascimento accompanied him, and spent the rest of his life in and near the French capital. He retained to the end an intense love of country, which made him wish to die in Portugal, and in 1796 a royal decree permitting his return there and ordering the restoration of his goods was issued, but delays occurred in its execution, and the flight of the court to the Brazils as a result of the French invasion finally dashed his hopes. Before this the Conde de Barca had obtained him a commission from the Portuguese government to translate the *De Rebus Emanuelis* of Osorio; the assistance of some fellow-countrymen in Paris carried him through his last years, which were cheered by the friendship of his biographer and translator Alexandre Sané and of the Lusophil Ferdinand Dénis. Lamartine addressed an ode to him; he enjoyed the esteem of Chateaubriand; and his admirers at home, who imitated him extensively, were called after him *Os Filintistas*. Exile and suffering had enlarged his ideas and given him a sense of reality, making his best poems those he wrote between the ages of seventy and eighty-five, and when he passed away, it was recognized that Portugal had lost her foremost contemporary poet.

Garrett declared that Nascimento was worth an academy in himself by his knowledge of the language, adding that no poet since Camoens had rendered it such valuable services; but his truest title to fame is that he brought literature once more into touch with the life of the nation. By his life, as by his works, Nascimento links the 18th and 19th centuries, the Neo-Classical period with Romanticism. Wieland's *Oberon* and Chateaubriand's *Martyrs* opened a new world to him, and his *contos* or scenes of Portuguese life have a real romantic flavour; they are the most natural of his compositions, though his noble patriotic odes—those "To Neptune speaking to the Portuguese" and "To the liberty and independence of the United States"—are the most quoted and admired. On leaving Portugal, he abandoned the use of rhyme as cramping freedom of thought and expression; nevertheless his highly polished verses are generally robust to hardness and overdone with archaisms. His translations from Latin, French and Italian, are accurate though harsh, and his renderings of Racine and the Fables of Lafontaine entirely lack the simplicity and grace of the originals. But Nascimento's blank verse translation of the *Martyrs* is in many ways superior to Chateaubriand's prose.

BIBLIOGRAPHY.—The most useful edition of his collected works is that in 22 vols., Lisbon, 1836–1840. See Innocencio da Silva, *Diccionario bibliographico Portuguez*, ii. 446-457 and ix. 332-336; also *Filinto Elysio e a sua Epoca*, by Pereira da Silva (Rio, 1891); and *Filinto Elysio*, by Dr Theophilo Braga (Oporto, 1891).

(E. PR.)

NASEBY, a village of Northamptonshire, England, 7 m. S.S.W. of Market Harborough, famous as the scene of the battle of June 14, 1645, which decided the issue of the first Civil War (see GREAT REBELLION). The army of King Charles I. was less than 10,000 strong, while the "New Model" army of the parliament, commanded by Sir Thomas Fairfax, numbered some 13,000, yet it was not without considerable hopes of victory that the Royalists drew up for battle, for although Lieutenant-General Cromwell had made the New Model cavalry formidable indeed, the Royalist foot had become professionalized in several years of war, whereas the Parliamentarian foot was newly organized, and in part at least but half-trained. Fairfax and Cromwell, however, were still more confident, and with better reason. The battlefield lies between Naseby and Sibbertoft (3 m. N. of Naseby) and is an undulating ridge which, near the centre of England, forms the "divide" between the Avon and the Welland rivers. Across this ridge the two armies were drawn up, the New Model facing north and the king's army south, the horse on the flanks and the foot in the centre in each army.

At the first shock the Royal foot asserted its superiority over the opposing infantry, four out of five regiments in the first line were broken, and Skippon, the major-general of the foot, was wounded. But Fairfax's regiment held its ground, until the second line of infantry advanced and re-established the front. Meantime the Royalist right wing of horse, led by Prince Rupert, had completely routed the horse of Colonel Ireton which opposed them. But the victors as usual indulged in a disorderly pursuit, and attempted to overpower the baggage guard of the enemy near Naseby village. Their incoherent attack was repulsed, and when Rupert, gathering as many of his men as he could, returned to the battlefield, the decisive stroke had been delivered by Cromwell and the right wing of Parliamentary horse. In front of him, in somewhat broken ground, was Sir Marmaduke Langdale's cavalry, which the lieutenant-general with his own well-trained regiments scattered after a short, fierce encounter. Cromwell's "godly" troopers did not scatter in pursuit. A few squadrons were ordered to keep the fugitives on the run, and with the rest, and such of Ireton's broken troops as he could gather, Cromwell attacked the Royalist centre in rear while Fairfax and his foot pressed it in front. Gradually the Royalist infantry, inferior in numbers, was disintegrated into small groups, which surrendered one after the other. But one brigade, called the "Bluecoats," held out to the last, and was finally broken by a combined charge of Fairfax's regiment of foot, led by Cromwell, and the general's personal escort, led by Fairfax himself, who captured a colour with his own hand. The remnant of the king's army, re-formed by Rupert, stood inactive and irresolute while its infantry was being destroyed and then fled. The spoils included 100 standards and colours and the king's private papers. But more important than trophies was the practical annihilation of the last field army of which the king disposed. Half the Royalists were captured, and about 1000 fell, in the battle and the pursuit which followed it. In addition all the artillery and the muskets (to the number of 8000) and ammunition without which the king could scarcely create a new army, fell into the hands of the victors.

NASH, RICHARD (1674–1762), English dandy, better known as "BEAU NASH," was born at Swansea on the 18th of October 1674. He was descended from an old family of good position, but his father from straitened means had become partner in a glass business. Young Nash was educated at Carmarthen grammar school and at Jesus College, Oxford. He obtained a commission in the army, which, however, he soon exchanged for the study of law at the Temple. Here among "wits and men of pleasure" he came to be accepted as an authority in regard to dress, manners and style. When the members of the Inns of Court entertained William III. after his accession, Nash was chosen to conduct the pageant at the Middle Temple. This duty he performed so much to the satisfaction of the king that he was offered knighthood, but he declined the honour, unless accompanied by a pension. As the king did not take the hint, Nash found it necessary to turn gamester. The pursuit of his calling led him in 1705 to Bath, where he had the good fortune almost immediately to succeed Captain Webster as master of the ceremonies. His qualifications for such a position were unique, and under his authority reforms were introduced which rapidly secured to Bath a leading position as a fashionable watering-place. He drew up a new code of rules for the regulation of balls and assemblies, abolished the habit of wearing swords in places of public amusement and brought duelling into disrepute, induced gentlemen to adopt shoes and stockings in parades and assemblies instead of boots, reduced refractory chairmen to submission and civility, and introduced a tariff for lodgings. Through his exertions a handsome assembly-room was also erected, and the streets and public buildings were greatly improved. Nash adopted an outward state corresponding to his nominal dignity. He wore an immense white hat as a sign of office, and a dress adorned with rich embroidery, and drove in a chariot with six greys, laced lackeys and French horns. When the act of parliament against gambling was passed in 1745, he was deprived of an easy though uncertain means of subsistence, but the corporation afterwards granted him a pension of six score guineas a year, which, with the sale of his snuff-boxes and other trinkets, enabled him to support a certain faded splendour till his death on the 3rd of February 1762. He was honoured with a public funeral at the expense of the town. Notwithstanding his vanity and impertinence, the tact, energy and superficial cleverness of Nash won him the patronage and notice of the great, while the success of his ceremonial rule, as shown in the increasing prosperity of the town, secured him the gratitude of the corporation and the people generally. He was a man of strong personality, and considerably more able than Beau Brummell, whose prototype he was.

See Lewis Melville, *Bath under Beau Nash* (1908), with full list of authorities; Oliver Goldsmith, *Life of Richard Nash* (1762). See also *Gentleman's Magazine* (1762); *London Magazine*, vol. xxxi.; "The Monarch of Bath" in *Blackwood's Magazine*, vol. xlviii.

NASHE (or NASH), **THOMAS** (1567–1601), English poet, playwright and pamphleteer, was born at Lowestoft in 1567. His father belonged to an old Herefordshire family, and is vaguely described as a "minister." Nashe spent nearly seven years, 1582 to 1589, at St John's College, Cambridge, taking his B.A. degree in 1585–1586. On leaving the university he tried, like Greene and Marlowe, to make his living in London by literature. It is probable that his first effort was *The Anatomie of Absurditie* (1589) which was perhaps written at Cambridge, although he refers to it as a forthcoming publication in his preface to Greene's *Menaphon* (1589). In this preface, addressed to the gentlemen students of both universities, he makes boisterous ridicule of the bombast of Thomas Kyd and the English hexameters of Richard Stanihurst, but does not forget the praise of many good books. Nashe was really a journalist born out of due time; he boasts of writing "as fast as his hand could trot"; he had a brilliant and picturesque style which, he was careful to explain, was entirely original; and in addition to his keen sense of the ridiculous he had an abundance of miscellaneous learning. As there was no market for his gifts he fared no better than the other university wits who were trying to live by letters. But he found an opening for his ready wit and keen sarcasm in the Martin Marprelate controversy. His share in this war of pamphlets cannot now be accurately determined, but he has, with more or less probability, been credited with the following: *A Countercuffe given to Martin Junior* (1589), *Martins Months Minde* (1589), *The Returne of the renowned Cavaliero Pasquill and his Meeting with Marforius* (1589), *The First Parte of Pasquils Apologie* (1590), and *An Almond for a Parrat* (1590). He edited an unauthorized edition of Sidney's poems with an enthusiastic preface in 1591, and *A Wonderfull Astrologicall Prognostication*, in ridicule of the almanac-makers, by "Adam Fouleweather," which appeared in the same year, has been attributed to him. *Pierce Penilesse, His Supplication to the Divell*, published in 1592, shows us his power as a humorous critic of national manners, and tells incidentally how hard he found it to live by the pen. It seems to Pierce a monstrous thing that brainless drudges wax fat while "the seven liberal sciences and a good leg will scarce get a scholar bread and cheese." In this pamphlet, too, Nashe began his attacks upon the Harveys by assailing Richard, who had written contemptuously of his preface to Greene's *Menaphon*. Greene died in September 1592, and Richard's brother, Gabriel Harvey, at once attacked his memory in his *Foure Letters*, at the same time adversely criticizing *Pierce Penilesse*. Nashe replied, both for Greene and for himself, in *Strange Newes of the intercepting certaine Letters*, better known, from the running title, as *Foure Letters Confuted* (1592), in which all the Harveys are violently attacked. The autumn of 1592 Nashe seems to have spent at or near Croydon, where he wrote his satirical masque of *Summers Last Will and Testament* at a safe distance from London and the plague. He afterwards lived for some months in the Isle of Wight under the patronage of Sir George Carey, the governor. In 1593 he wrote *Christs Teares over Jerusalem*, in the first edition of which he made friendly overtures to Gabriel Harvey. These were, however, in a second edition, published in the following year, replaced by a new attack, and two years later appeared the most violent of his tracts against Harvey, *Have with you to Saffron-walden, or, Gabriell Harveys Hunt is up* (1596). In 1599 the controversy was suppressed by the archbishop of Canterbury. After Marlowe's death Nashe prepared his friend's unfinished tragedy of *Dido* (1596) for the stage. In the next year he was in trouble for a play, now lost, called *The Isle of Dogs*, for only part of which, however, he seems to have been responsible. The "seditious and slanderous matter" contained in this play induced the authorities to close for a time the theatre at which it had been performed, and the dramatist was put in the Fleet prison. Besides his pamphlets and his play-writing, Nashe turned his energies to novel-writing. He may be regarded as the pioneer in the English novel of adventure. He published in 1594 *The Unfortunate Traveller, Or the Life of Jack Wilton*, the history of an ingenious page who was present at the siege of Térouenne, and afterwards travelled in Italy with the earl of Surrey. It tells the story of the earl and Fair Geraldine, describes a tournament held by Surrey at Florence, and relates the adventures of Wilton and his mistress Diamante at Rome after the earl's return to England. The detailed, realistic manner in which Nashe relates his improbable fiction resembles that of Defoe. His last work is entitled *Lenten Stuffe* (1599) and is nominally "in praise of the red herring," but really a description of Yarmouth, to which place he had retired after his imprisonment, written in the best style of a "special correspondent." Nashe's death is referred to in Thomas Dekker's *Knight's Conjuring* (1607), a kind of sequel to *Pierce Penilesse*. He is there represented as joining his boon companions in the Elysian fields "still haunted with the sharp and satirical spirit that followed him here upon earth." Had his patrons understood their duty, he would not, he said, have shortened his days by keeping company with pickled herrings. It may therefore be reasonably supposed that he died from eating bad and insufficient food. The date of his death is fixed by an elegy on him printed in Fitzgeffrey's *Affaniae* (1601).

The works of Thomas Nashe were edited by Dr A. B. Grosart in 1883–1885, and more recently by Ronald B. McKerrow (1904). An account of his work as a novelist may be found in the *English Novel in the Time of Shakespeare*, by J. J. Jusserand (Eng. trans., 1890). *The Unfortunate Traveller* was edited with an introduction by Edmund Gosse in 1892. See also "Nash's Unfortunate Traveller und Head's English Rogue, die beiden Hauptvertreter des englischen Schelmenromans," by W. Kollmann in *Anglia* (Halle, vol. xxii., 1899, pp. 81-140).

NASHUA, a city and one of the county seats of Hillsboro county, New Hampshire, U.S.A., at the confluence of the Nashua and Merrimac rivers, 35 m. S.S.E. of Concord and 40 m. N.W. of Boston by rail. Pop. (1890) 19,311; (1900) 23,898, of whom 8093 were foreign-born; (1910 census) 26,005. Nashua is served by the Boston & Maine railroad, whose several divisions centring here give the city commercial importance, and by electric lines to Hudson, Litchfield, Pelham, Dracut and Tyngsboro. The area of the city in 1906 was 30·71 sq. m. To the N.,W. and S.W. of the city there are beautiful hills and mountains. The church of Saint Francis Xavier and the First Congregational church are architecturally noteworthy. The city has a soldiers' monument, a public library, a court house and two hospitals. There is a United States fish hatchery here, and until after the close of the 18th century fishing was the principal industry of the place, as manufacturing is now. Water-power is furnished by the Nashua river and by Salmon Brook, and the city is extensively engaged in manufactures, notably cotton goods, boots, shoes, and foundry and machine-shop products. The value of the city's factory products increased from $10,096,064 in 1900 to $12,858,382 in 1905, or 27·4%, and in 1905 Nashua ranked second among the manufacturing cities of the state. Nashua is one of the oldest interior settlements of the state. The first settlement here was established about 1665; and in 1673 the township of Dunstable was incorporated by the General Court of Massachusetts. In 1741, when the boundary between Massachusetts and New Hampshire was settled, the jurisdiction of this portion of Dunstable was transferred to New Hampshire; five years later it was incorporated under the laws of that state; and in 1803 the settlement, originally known as Indian Head, was incorporated as a village under the name of Nashua, and in 1836 the township of Dunstable also received the name Nashua. The town of Nashville was set apart from the town of Nashua in 1842, but the two towns were united under a city charter obtained in 1853. In 1795 the first stage coach was run through here from Boston to Amherst, and at about the same time a canal was built around Pawtucket Falls on the Merrimac at Lowell. In 1822 a manufacturing company was formed, which at once began to develop the water-power and in 1825 erected the first cotton mill. Thirteen years later the Nashua & Lowell railroad (now leased to the Boston & Maine) first reached Nashua.

See *The History of the City of Nashua*, edited by E. E. Parker (Nashua, 1897).

NASHVILLE, the capital of Tennessee, U.S.A., and the county-seat of Davidson county, on the Cumberland river, 186 m. S.S.W. of Louisville, Kentucky. Pop. (1890) 76,168; (1900) 80,865, of whom 3037 were foreign-born and 30,044 were negroes; (1910 census) 110,364. Nashville is served by the Tennessee Central, the Louisville & Nashville, and the Nashville, Chattanooga & St Louis railways, and by several steamboat lines. The Cumberland river is crossed here by four foot-bridges. Nashville is situated on and between hills and bluffs in an undulating valley; its streets are paved with brick or granite blocks in the business section and macadamized or paved with asphalt in the residential sections. The city has fine public buildings, many handsome residences, and several beautiful parks. The principal building is the State House, a fine example of pure Greek architecture, on the most prominent hill-top, with a tower 205 ft. in height. On the grounds about it are a bronze equestrian statue of Andrew Jackson, by Clark Mills (1815–1883), and the tomb of President James K. Polk, who lived in Nashville. Other prominent buildings and institutions are the United States Government Building, the County Court House, the City Hall, the Tennessee School for the Blind, the Tennessee Industrial School, the State Library, the Library of the State Historical Society housed in Watkins Institute, a Carnegie library, park buildings, the State Penitentiary, Vendôme Theatre, the Board of Trade Building, the City Hospital, the St Thomas Hospital (Roman Catholic), and, near the city, a Confederate Soldiers' Home and a State Hospital for the Insane. Eleven miles east of the city is the "Hermitage," which was the residence of President Andrew Jackson.

The grounds of the Tennessee Centennial Exposition of 1897 (commemorating the admission of Tennessee into the Union) on the west border of the city now constitute Centennial Park, in which still stand the reproduced Parthenon of Athens, the History Building, which in general outline is a reproduction of the Erectheum and contains a museum and an art gallery, and a monument to the memory of James Robertson (1742–1814), the founder of the city. Besides this there are four other parks: Glendale Park in the south section, a place of much natural beauty; Shelby Park, in the eastern part of the city, fronting the river; Watkins Park, on the north; and Cumberland Driving Park. In Mount Olivet Cemetery is a beautiful Confederate Soldiers' monument surrounded by the graves of 2000 Confederate soldiers, and a little to the north of the city is a National Cemetery in which 16,643 Federal soldiers are buried, the names of 4711 of them being unknown.

Nashville is one of the foremost educational centres in the Southern states. In the western part of the city is Vanderbilt University. This institution, opened in 1875, is under the patronage of the Methodist Episcopal Church, South, and was named in honour of Cornelius Vanderbilt, who contributed $1,000,000 to its funds, and whose son, W. H. Vanderbilt, and grandsons, W. K. Vanderbilt and Cornelius Vanderbilt, gave to the university about $820,000. It is coeducational and embraces an academic department, a biblical department, and departments of engineering, law, medicine, pharmacy and dentistry; in 1909 it had 125 instructors and 959 students. The University of Nashville is a non-sectarian institution embracing a college department, a medical department, a preparatory department, and the George Peabody College for Teachers; it was incorporated under the laws of North Carolina as Davidson Academy in 1785 and under the laws of Tennessee as Cumberland College in 1806, and the present name was adopted in 1826. The George Peabody College for Teachers, an important part of the institution, was opened as a normal school in 1875; in 1907–1908 it had an enrolment (including the summer session) of 647 students. In 1909 it received $1,000,000 from the Peabody Fund, later supplemented by $250,000 from the state, $200,000 from the city and $100,000 from Davidson county. The University of Tennessee, located mainly at Knoxville, has at Nashville its medical and dental departments. Ward Seminary, opened in 1865, Boscobel College, opened in 1889, and Buford, Belmont and Radnor colleges are all non-sectarian institutions of Nashville for the higher education of women. For the education of negroes the city has Fisk University (opened in 1866, incorporated in 1867), under the auspices of the American Missionary Association and the Western Freedman's Aid Commission of the Congregational Church (noted since 1871 for its Jubilee Singers, who raised money for Jubilee Hall, finished in 1876); it embraces a college department, a preparatory department, a normal department and departments of theology, music and physical training; and Walden University, founded as Central Tennessee College in 1866, under the auspices of the

Methodist Episcopal Church, and embracing a college department, a normal department, an industrial department, and departments of English, commerce, law, medicine, dentistry, pharmacy, music, bible training, nurse training and domestic science. The Baptist, the Methodist Episcopal (South), the Cumberland Presbyterian, and the African Baptist and the African Methodist Episcopal churches have publishing houses in Nashville.

The leading manufactures of the city are flour and grist mill products (valued at $4,242,491 in 1905), lumber and timber products—Nashville is one of the greatest hard wood markets in the United States, and in 1905 the value of lumber and timber products was $1,119,162 and of planing-mill products, $1,299,066—construction and repair of steam railway cars ($1,724,007 in 1905), tobacco ($1,311,019 in 1905), fertilizers ($846,511 in 1905), men's clothing ($720,227 in 1905), saddlery, harness, soap and candles. The total value of the products of the factories increased from $15,301,096 in 1900 to $23,109,601 (16·8% of the entire factory product of the state) in 1905, amounts greater than those of any other city in the state. Nashville has a large trade in grain, cotton, groceries, dry goods, drugs, and boots and shoes. The water-works and the electric lighting plant are owned and operated by the municipality.

Nashville was founded in 1780 as "the advance guard of western civilization" by a company of two hundred or more pioneers under the leadership of James Robertson, the nearest settlement being at the time about three hundred miles distant. When first settled it was named Nashborough in honour of Abner Nash (1716–1786), who was at the time governor of North Carolina, or more probably in honour of the Revolutionary general, Francis Nash (1720–1777), a brother of Abner, killed at Germantown; but when, in 1784, it was incorporated as a town by the North Carolina legislature the present name was substituted. In 1806 Nashville was chartered as a city. Although it was not made the capital of the state until 1843, the legislature met here from 1812 with the exception of the period from 1815 to 1826. Many of the pioneers of Nashville were slain by the Creek and Cherokee Indians, and at times the settlement was saved from destruction only by the heroism of Robertson, but in 1794 the savages were dealt a crushing blow at Nickojack on the lower Tennessee and much more peaceful relations were established. On the 3rd of June 1850 a convention, known as the Southern or Nashville Convention, whose action was generally considered a threat of disunion, met here to consider the questions at issue between the North and the South. Since such a meeting had first been proposed by a state convention of Mississippi, the famous Compromise Measures of 1850 had been introduced in Congress and the support of the movement had been greatly weakened thereby except in South Carolina and Mississippi. Nine states, however, were represented by about 100 delegates, mostly Democrats, and the convention denounced the Wilmot Proviso, and, as "an extreme concession on the part of the South," promised to agree that, W. of Missouri, there should be slavery only in the territory S. of 36° 30′ N. lat. At an adjourned meeting in November it expressed its dissatisfaction with the Compromise Measures of Congress, and asserted the right of the South to secede.

During the Civil War Nashville was at first held by the Confederates, but early in 1862 it was occupied by the Federals, who retained possession of it to the end. The battle of Nashville was fought on the 15th and 16th of December 1864 between the Union army under Major-General G. H. Thomas and the Confederates under General J. B. Hood. The Union defences extended in a semicircle round Nashville, the flanks on the river above and below. Hood's army was to the south-east, lightly entrenched, with its flanks on two creeks which empty into the Cumberland above and below Nashville. This position he desired to maintain as long as possible so as to gather recruits and supplies in safety. If Thomas, whose army was of motley composition, attacked, he hoped to defeat him and to enter Nashville on his heels. Thomas, however, would not strike until he had his army organized. Then, on the 15th, he emerged from the entrenchments and by a vigorous attack on the Confederate left forced back Hood's line to a second position 1½ m. to the south. Hood, having detached a part of his army, desired to gain time to bring in his detachments by holding this line for another day. Thomas, however, gave him no respite. On the 16th the Union army deployed in front of him, again over-lapping his left flank, and although a frontal attack was repulsed, the extension of the Federal right wing compelled Hood to extend his own lines more and more. Then the Federals broke the attenuated line of defence at its left centre, and Hood's army drifted away in disorder. The pursuit was vigorous, and only a remnant of the Confederate forces reassembled at Columbia, 40 m. to the south, whence they fell back without delay behind the Tennessee.

NASI, JOSEPH (16th century), Jewish statesman and financier, was born in Portugal of a Jewish (Marano) family. Emigrating from his native land, he founded a banking house in Antwerp. Despite his financial and social prosperity there, he felt it irksome to be compelled to wear the guise of Catholicism, and determined to settle in a Mahommedan land. After two troubled years in Venice, Nasi betook himself to Constantinople. Here he proclaimed his Judaism, and married his beautiful cousin Reyna. He rapidly rose to favour, the sultans Suleiman and Selim promoting him to high office. He founded a Jewish colony at Tiberias which was to be an asylum for the Jews of the Roman Campagna. In 1566 when Selim ascended the throne, Nasi was made duke of Naxos. He had deserved well of Turkey, for he had conquered Cyprus for the sultan. Nasi's influence was so great that foreign powers often negotiated through him for concessions which they sought from the sultan. Thus the emperor of Germany, Maximilian II., entered into direct correspondence with Nasi; William of Orange, Sigismund August II., king of Poland, also conferred with him on political questions of moment. On the death of Selim in 1574, Nasi receded from his political position, but retained his wealth and offices, and passed the five years of life remaining to him in honoured tranquillity at Belvedere (Constantinople). He died in 1579. His career was not productive of direct results, but it was of great moral importance. It was one of the tokens of the new era that was to dawn for the Jews as trusted public officials and as members of the state.

See Graetz, *History of the Jews* (Eng. trans.), vol. iv. chs. xvi.-xvii.; *Jewish Encyclopedia*, ix. 172. (I. A.)

NASIK, a town and district of British India, in the central division of Bombay. The town is on the Godavari river, connected by a tramway (5 m.) with Nasik Road railway station, 107 m. N.E. of Bombay. Pop. (1901) 21,490. It is a very holy place of Hindu pilgrimage, being 30 m. from the source of the Godavari. Shrines and temples line the river banks, and some stand even in the river. In the vicinity there are a number of sacred caves, among which those of Pandu Lena are the most noteworthy. They are ancient Buddhist caves dating from the 3rd century before Christ to the 6th century after. There are numerous inscriptions of the highest historical value. Nasik has manufactures of cotton goods, brass-ware and mineral waters.

The District of Nasik has an area of 5850 sq. m. With the exception of a few villages in the west, the whole district is situated on a tableland from 1300 to 2000 ft. above sea-level. The western portion is hilly, and intersected by ravines, and only the simplest kind of cultivation is possible. The eastern tract is open, fertile and well cultivated. The Sahyadri range stretches from north to south; the watershed is formed by the Chander range, which runs east and west. All the streams to the south of that range are tributaries of the Godavari. To the north of the watershed, the Girna and its tributary the Mosam flow through fertile valleys into the Tapti. The district generally is destitute of trees, and the forests which formerly clothed the Sahyadri hills have nearly disappeared; efforts are now being made to prevent further destruction, and to reclothe some of the slopes. The district contains several old hill forts, the scenes of many engagements during the Mahratta wars. Nasik district became British territory in 1818 on the overthrow of the peshwa. The population in 1901 was 816,504, showing a decrease of 3% in the decade. The principal crops are millet, wheat, pulse, oil-seeds, cotton and sugar cane. There are also some vineyards of old date, and much garden cultivation. Yeola is an important centre for weaving silk and cotton goods. There are flour-mills at Malegaon, railway workshops at Igatpuri, and cantonments at Deolali and Malegaon. At Sharanpur is a Christian village, with an orphanage of the C.M.S., founded in 1854. The district is crossed by the main line and also by the chord line of the Great Indian Peninsula railway.

NĀSIR KHOSRAU (Nasiri Khusru), Abū Mu‘in-ed-din Nāsir b. Khosrau (1004–1088), whose *nom de plume* was Hujjat, the first great didactic poet of Persia, was born, according to his own statement, A.H. 394 (A.D. 1004), at Kubādiyān, near Balkh in Khorāsān. The first forty-two years of his life are obscure; we learn from incidental remarks of his that he was a Sunnite, probably according to the Ḥanifite rite, well versed in all the branches of natural science, in medicine, mathematics, astronomy and astrology, in Greek philosophy, and the interpretation of the Koran; that he was much addicted to worldly pleasures, especially to excessive wine drinking. He had studied Arabic, Turkish, Greek, the vernacular languages of India and Sind, and perhaps even Hebrew; he had visited Multān and Lahore, and the splendid Ghaznavide court under Sultān Mahmūd, Firdousī's patron. Later on he chose Merv for his residence, and was the owner of a house and garden there. In A.H. 437 (A.D. 1045) he appears as financial secretary and revenue collector of the Seljūk sultan Toghrul Beg, or rather of his brother Jāghir Beg, the emīr of Khorāsān, who had conquered Merv in 1037. About this time, inspired by a heavenly voice (which he pretends to have heard in a dream), he abjured all the luxuries of life, and resolved upon a pilgrimage to the holy shrines of Mecca and Medina, hoping to find there the solution of all his religious doubts. The graphic description of this journey is contained in the *Safarnāma*, which possesses a special value among books of travel, since it contains the most authentic account of the state of the Mussulman world in the middle of the 11th century. The minute sketches of Jerusalem and its environs are even now of practical value. During the seven years of his journey (A.D. 1045–1052) Nāsir visited Mecca four times, and performed all the rites and observances of a zealous pilgrim; but he was far more attracted by Cairo, the capital of Egypt, and the residence of the Fātimite sultan Mostanṣir billāh, the great champion of the Shī‘a, and the spiritual as well as political head of the house of ‘Alī, which was just then waging a deadly war against the ‘Abbāside caliph of Bagdād, and the great defender of the Sunnite creed, Toghrul Beg the Seljūk. At the very time of Nāsir's visit to Cairo, the power of the Egyptian Fātimites was in its zenith; Syria, the Hejāz, Africa, and Sicily obeyed Mostanṣir's sway, and the utmost order, security and prosperity reigned in Egypt. At Cairo he became thoroughly imbued with Shī‘a doctrines, and their introduction into his native country was henceforth the sole object of his life. The hostility he encountered in the propagation of these new religious ideas after his return to Khorāsān in 1052 and Sunnite fanaticism compelled him at last to flee, and after many wanderings he found a refuge in Yumgān (about 1060) in the mountains of Badakshān, where he spent as a hermit the last decades of his life, and gathered round him a considerable number of devoted adherents, who have handed down his doctrines to succeeding generations.

Most of Nāsir's lyrical poems were composed in his retirement, and their chief topics are—an enthusiastic praise of ‘Alī, his descendants, and Mostanṣir in particular; passionate outcries against Khorāsān and its rulers, who had driven him from house and home; the highest satisfaction with the quiet solitude of Yumgān; and utter despondency again in seeing himself despised by his former associates and for ever excluded from participation in the glorious contest of life. But scattered through all these alternate outbursts of hope and despair we find precious lessons of purest morality, and solemn warnings against the tricks and perfidy of the world, the vanity of all earthly splendour and greatness, the folly and injustice of men, and the hypocrisy, frivolity and viciousness of fashionable society and princely courts in particular. It is the same strain which runs, although in a somewhat lower key, through his two larger mathnawīs or double-rhymed poems, the *Rushanāināma*, or "book of enlightenment," and the *Sa‘ădatnāma*, or "book of felicity." The former is divided into two sections: the first, of a metaphysical character, contains a sort of practical cosmography, chiefly based on Avicenna's theories, but frequently intermixed both with the freer speculations of the well-known philosophical brotherhood of Basra, the Ikhwān-es-safā'i, and purely Shi‘ite or Isma‘ilite ideas; the second, or ethical section of the poem, abounds in moral maxims and ingenious thoughts on man's good and bad qualities, on the necessity of shunning the company of fools and double-faced friends, on the deceptive allurements of the world and the secret snares of ambitious craving for rank and wealth. It concludes with an imaginary vision of a beautiful world of spirits who have stripped off the fetters of earthly cares and sorrows and revel in the pure light of divine wisdom and love. If we compare this with a similar allegory in Nāsir's dīwān, which culminates in the praise of Moṣtansir, we are fairly entitled to look upon it as a covert allusion to the eminent men who revealed to the poet in Cairo the secrets of the Isma‘ilitic faith, and showed him what he considered the "heavenly ladder" to superior knowledge and spiritual bliss. The passage, thus interpreted, lends additional weight to the correctness of Dr Ethé's reconstruction of the date of the *Rushanāināma*, viz. A.H. 440 (A.D. 1049), which, notwithstanding M. Schefer's objections, is warranted both by the astronomical details and by the metrical requirements of the respective verses. That of course does not exclude the possibility of the bulk of the poem having been composed at an earlier period; it only ascribes its completion or perhaps final revision to Nāsir's sojourn in Egypt.

A similar series of excellent teachings on practical wisdom and the blessings of a virtuous life, only of a severer and more uncompromising character, is contained in the *Sa‘ādatnāma*; and, judging from the extreme bitterness of tone manifested in the "reproaches of kings and emīrs," we should be inclined to consider it a protest against the vile aspersions poured out upon Nāsir's moral and religious attitude during those persecutions which drove him at last to Yumgān. Of all the other works of our author mentioned by Oriental writers there has as yet been found only one, the *Zād-elmusāfirīn* or "travelling provisions of pilgrims" (in the private possession of M. Schefer, Paris), a theoretical description of his religious and philosophical principles; and we can very well dismiss the rest as being probably just as apocryphal as Nāsir's famous autobiography (found in several Persian tadhkiras or biographies of poets), a mere forgery of the most extravagant description, which is mainly responsible for the confusion in names and dates in older accounts of our author.

See Sprenger's *Catalogue of the Libraries of the King of Oudh* (1854); H. Ethé, "Nāsir Chusrau's *Rushanāināma*," in *Zeitschrift der deutschen morgenländischen Gesellschaft*, xxxiii., xxxiv., 1879–1880; E. Fagnan, "Le Livre de la félicité," in vol. xxxiv. of the same journal, 643-674; Ch. Schefer, *Sefer Nameh, publié, traduit et annoté* (Paris, 1881), and by Guy le Strange in *Pilgrims' Text Society* (1888); H. Ethé, in *Göttinger Nachrichten*, 1882, pp. 124-152, *Z.D.M.G.*, 1882, pp. 478-508; and Geiger's *Grundriss der iranischen Philologie* ii. p. 278; Fagnan in *Journ. As.* 7th ser. vol. xiii. pp. 164 seq., and Rieu, *Cat. Pers. MSS. in Br. Mus.*, concluded that the poet and the pilgrim were different persons. The opposite view was developed by Ethé. (H. E.)

NASIRABAD, or Mymensingh, a town of British India, headquarters of Mymensingh district in Eastern Bengal and Assam, situated on the left bank of the old channel of the Brahmaputra, which is only navigable during the rainy season. Pop. (1901) 14,668. It has a station on the branch of the Eastern Bengal railway from Dacca to Jagannathganj, on the Jamuna or main stream of the Brahmaputra. The earthquake of the 12th of June 1897 destroyed the church and the high school, and seriously damaged other public buildings.

Nasirabad is also the name of a town and cantonment in the district of Ajmere, Rajputana. Pop. (1901) 22,494. It forms the headquarters of a brigade in the 5th division of the Southern army.

NASMYTH, ALEXANDER (1758–1840), Scottish portrait and landscape painter, was born in Edinburgh on the 9th of September 1758. He studied at the Trustees' Academy under Runciman, and, having been apprenticed as an heraldic painter to a coachbuilder, he, at the age of sixteen, attracted the attention of Allan Ramsay, who took the youth with him to London, and employed him upon the subordinate portions of his works. Nasmyth returned to Edinburgh in 1778, and was soon largely patronized as a portrait painter. He also assisted Mr Miller of Dalswinton, as draughtsman, in his mechanical researches and experiments; and, this gentleman having generously offered the painter a loan to enable him to pursue his studies abroad, he left in 1782 for Italy, where he remained two years. On his return he painted the excellent portrait of Burns, now in the Scottish National Gallery, well known through Walker's engraving. Political feeling at that time ran high in Edinburgh, and Nasmyth's pronounced Liberal opinions, which he was too outspoken and sincere to disguise, gave offence to many of his aristocratic patrons, and led to the diminution of his practice as a portraitist. In his later years, accordingly, he devoted himself mainly to landscape work, and did not disdain on occasion to set his hand to scene-painting for the theatres. He has been styled, not unjustly, the "father of Scottish landscape art." His subjects are carefully finished and coloured, but are wanting in boldness and freedom. Nasmyth was also largely employed by noblemen throughout the country in the improving and beautifying of their estates, in which his fine taste rendered him especially skilful; and he was known as an architect, having designed the Dean Bridge, Edinburgh, and the graceful circular temple covering St Bernard's Well. Nasmyth died in his native city on the 10th of April 1840. His youngest son, James, was the well-known inventor of the steam-hammer. His six daughters all attained a certain local reputation as artists, but it was in his eldest son, Patrick (1787–1831), that the artistic skill of his family was most powerfully developed. Having studied under his father, Patrick went to London at the age of twenty, and soon attracted attention as a clever landscapist. He was a diligent student of the works of Claude and Richard Wilson, and of Ruysdael and Hobbema, upon whom his own practice was mainly founded. His most characteristic paintings are of English domestic scenery, full of quiet tone and colour, and detailed and minute expression of foliage, and with considerable brilliancy of sky effect. They were executed with his left hand, his right having in early life been injured by an accident.

For an account of the Nasmyth family see James Nasmyth's *Autobiography* (1883).

NASMYTH, JAMES (1808–1890), Scottish engineer, was born in Edinburgh on the 19th of August 1808, and was the youngest son of Alexander Nasmyth, the "father of Scottish landscape art." He was sent to school in his native city, and then attended classes in chemistry, mathematics and natural philosophy at the university. From an early age he showed great fondness for mechanical pursuits, and the skill he attained in the practical use of tools enabled him to make models of engines, &c., which found a ready sale. In 1829 he obtained a position in Henry Maudslay's works in London, where he stayed two years, and then, in 1834, started business on his own account in Manchester. The beginnings were small, but they quickly developed, and in a few years he was at the head of the prosperous Bridgewater foundry at Patricroft, from which he was able to retire in 1856 with a fortune. The invention of the steam-hammer, with which his name is associated, was actually made in 1839, a drawing of the device appearing in his note-book, or "scheme-book," as he called it, with the date 24th November of that year. It was designed to meet the difficulty experienced by the builders of the *Great Britain* steamship in finding a firm that would undertake to forge the large paddle-wheel shaft required for that vessel, but no machine of the kind was constructed till 1842. In that year Nasmyth discovered one in Schneiders' Creuzot works, and he found that the design was his own and had been copied from his "scheme-book." His title, therefore, to be called the inventor of the steam-hammer holds good against the claims sometimes advanced in favour of the Schneiders, though apparently he was anticipated in the idea by James Watt. Nasmyth did much for the improvement of machine-tools, and his inventive genius devised many new appliances—a planing-machine ("Nasmyth steam-arm"), a nut-shaping machine, steam pile-driver, hydraulic machinery for various purposes, &c. In his retirement he lived at Penshurst in Kent, and amused himself with the study of astronomy, and especially of the moon, on which he published a work, *The Moon considered as a Planet, a World and a Satellite*, in conjunction with James Carpenter in 1874. He died in London on the 7th of May 1890.

His *Autobiography*, edited by Dr Samuel Smiles, was published in 1883.

NASR-ED-DIN [Náṣiru'd-Dīn] (1829–1896), shah of Persia, was born on the 4th of April 1829. His mother, a capable princess of the Kajar family, persuaded Shah Mahommed, his father, to appoint him heir apparent, in preference to his elder brothers; and he was accordingly made governor of Azerbaijan. His succession to the throne, 13th October 1848, was vigorously disputed, especially by the followers of the reformer El Bab, upon whom he wreaked terrible vengeance. In 1855 he re-established friendly relations with France, and coming under the influence of Russia, signed a treaty of amity on the 17th of December with that power, but remained neutral during the Crimean war. In 1856 he seized Herat, but a British army under Outram landed in the Persian Gulf, defeated his forces and compelled him to evacuate the territory. The treaty of peace was signed at Paris, on the 4th of March 1857, and to the end of his reign he treated Great Britain and Russia with equal friendship. In 1866 the shah authorized the passage of the telegraph to India through his dominions and reminted his currency in the European fashion. In 1873, and again in 1889, he visited England in the course of his three sumptuous journeys to Europe, 1873, 1878, 1889. The only results of his contact with Western civilization appear to have been the proclamation of religious toleration, the institution of a postal service, accession to the postal union and the establishment of a bank. He gave the monopoly of tobacco to a private company, but was soon compelled to withdraw it in deference to the resistance of his subjects. Abstemious in habits, and devoted to music and poetry, he was a cultured, able and well-meaning ruler, and his reign, already unusually long for an Eastern potentate, might have lasted still longer had it not been for the unpopular sale of the tobacco monopoly, which was probably a factor in his assassination at Teheran on the 1st of May 1896 by a member of the Babi faction. He was succeeded by his son Muzaffar-ed-din.

NASRIDES, THE, of Granada, were the last of the Mahommedan dynasties in Spain. They ruled from 1232 to 1492. They arose at the time when the king of Castile, Fernando the Saint, was conquering Andalusia. The dynasty was of remote Arabic origin, but its immediate source was the mountain range of the Alpujarra, and the founder was Yusuf (or Yahîa) l'Nasr, a chief who was engaged in perpetual conflict with rival chiefs and in particular with the family of Beni-Hud, once kings at Saragossa, who held the fortress of Granada. Yusuf's nephew (or son) Mahommed completed the defeat of the Beni-Hud largely by the help of the king of Castile, to whom he did homage and paid tribute. Mahommed I., called el Ghalib, *i.e.* the Conqueror (1238–1273), served the Christian king against his own co-religionists at the siege of Seville and contrived to escape in the general wreck of the Mahommedan power. The internal history of the dynasty is largely made up of civil dissensions, personal rivalries, palace and harem intrigues. The direct male line of Mahommed el Ghalib ended with the fourth sultan, Nasr, in 1314. Nasr was succeeded by his cousin Imail (1314–1325), who is said to have been connected with the original stock only through women. From Mahommed el-Ghalib to Mahommed XI., called Boabdil, and also the little king "El Rey Chico" by the Christians, who lost Granada in 1492, there are counted twenty-nine reigns of the Nasrides, giving an average of nine years. But there was not the same number of sultans, for several of them were expelled and restored two or three times. Nor did all the members of the house who were allowed to have been sultans reign over all the territory still in Mahommedan hands. There were contemporary reigns in different parts, and tribal or local rivalries between plain and hill, and the chief towns, Granada, Malaga and Guadix. The dissensions of the Nasrides reached their greatest pitch of fury during the very years in which the Catholic sovereigns were conquering their territory piecemeal, 1482–1492. Their position imposed a certain consistency of policy on these sultans. They submitted and paid tribute to the kings of Castile when they could not help doing so, but they endeavoured to use the support of Mahommedan rulers of northern Africa whenever it was to be obtained. Granada became the recognized place of refuge for rebellious subjects of the kings of Castile, and on occasion supported them against rebels. The end came when the weakness of Mahommedan rulers in Morocco coincided with the rule of strong sovereigns in Castile. Frontier wars between Mahommedan and Christian borderers were incessant, and at long intervals the kings of Castile made invasions on a considerable scale, without, however, following up any successes they might gain. The comparative prosperity of Granada was due to the concentration of a large population driven from other parts of Spain, and the consequent necessity for the intensive cultivation of the rich valleys lying among the ranges of mountains which encircle the kingdom, and the extensive "Vega" or plain of Granada. The reputation for civilization which the agitated Mahommedan state enjoys in history is based on the surviving parts of the highly decorated fortress palace of the Alhambra, which was mainly the work of three of the sultans, the founder, Mahommed el Ghalib, and his two successors.

See S. Lane-Poole, *The Mahommedan Dynasties* (London, 1894); and *Historia de Granada*, by Don M. Lafuente Alcántara (Granada, 1884).

NASSARAWA, a province of the British protectorate of northern Nigeria, lying approximately between 6° 40′ and 9° E. and between 7° 40′ and 9° 40′ N. It is situated on the northern bank of the river Benue, which in its windings forms the southern frontier of the province. Nassarawa is bounded E. by the province of Muri, N.E. by Bauchi, N. by Zaria and W. by Nupe and the trans-Nigerian portion of the province of Kabba. It has an area of 18,000 sq. m. and an estimated population of 1,500,000. The province, like that of Bauchi, is traversed by mountainous regions. It possesses valuable forests and many fertile river valleys. Native products include rubber, palm kernels and beni seed. Cotton is grown extensively.

Until the middle of the 18th century Nassarawa appears to have been peopled by many native tribes of a primitive type. About 1750 an important pagan tribe, the Igbira, came from the south-west across the Niger and established two rival kingdoms in the western portion of the province. Later the native inhabitants of Zaria, driven before the Fula, came from the north and occupied the central portion of Nassarawa. Later still (about 1840) certain Fula of Zaria themselves conquered portions of the province, founded Keffi, spread as far as the Benue in the south-west corner and occupied the town and district of Abuja in the west. Fula also made a settlement at the town of Nassarawa and at Darroro in the N.E. A colony from Bornu entered the province and founded the important town of Lafia Berebere in the eastern district. As a result of these movements the aboriginal tribes were driven into the hilly regions of the S.E. and N.E. The Munshi, a truculent and hardy people, hold a portion of the northern bank of the Benue, and the Kagoro and Attakar tribes hold the hilly country to the N.E., through which the road passes from Keffi and Lafia to the Bauchi highlands. Before the British occupation the state of Nassarawa had become a partially subdued Fula emirate, exercising doubtful sway over the native pagans and paying a scarcely less doubtful allegiance on its own part to the Fula ruler of Zaria. The riverain tribes of Nassarawa were among the first to break into open aggression against the British administration established at Lokoja. In January 1900 they attacked a telegraph construction party in the Munshi country on the banks of the Benue. The result was the occupation of Keffi by British troops and the gradual subjugation of the province. In 1902 the first British resident, Captain Moloney, was murdered at Keffi by an official of the emir's court. The emir repudiated all responsibility for the crime, and the murderer fled to Kano, where his reception on friendly terms was among the incidents which determined the Sokoto-Kano campaign of 1903. The British were now recognized as the rulers of Nigeria, and the emir of Nassarawa threw in his lot with the British government. Slave raiding was abolished and the slave trade made illegal. A British court of justice was established at the provincial headquarters and native courts in every district. Roads have been opened and trade is steadily increasing. In 1905 an expedition was required against the Kagoro people, who occupy a vast open plateau having an elevation of about 1800 ft. through which a short road to the Bauchi tin mines passes from the Benue. These people had been raiding the Fula for cattle and murdering traders upon the road. A splendid grazing country, healthy and also rich in rubber, was opened. The road to the tin mines was rendered safe and is now the Bauchi mail route. There is a cart road from Loko on the Benue to Keffi. (F. L. L.)

NASSAU, a territory of Germany, now forming the bulk of the government district of Wiesbaden, in the Prussian province of Hesse-Nassau, but until 1866 an independent and sovereign duchy of Germany. It consists of a compact mass of territory, 1830 sq. m. in area, bounded on the S. and W. by the Main and Rhine, on the N. by Westphalia and on the E. by Hesse. This territory is divided into two nearly equal parts by the river Lahn, which flows from east to west into the Rhine. The southern half is almost entirely occupied by the Taunus Mountains, which attain a height of 2900 ft. in the Great Feldberg, while to the north of the Lahn is the barren Westerwald, culminating in the Salzburgerkopf (2000 ft.). The valleys and low-lying districts, especially the Rheingau, are very fertile, producing abundance of grain, flax, hemp and fruit; but by far the most valuable product of the soil is its wine, which includes several of the choicest Rhenish varieties, such as Johannisberger, Marcobrunner and Assmannshäuser. Nassau is one of the most thickly wooded regions in Germany, about 42% of its surface being occupied by forests, which yield good timber and harbour large quantities of game. The rivers abound in fish, the salmon fisheries on the Rhine being especially important. There are upwards of a hundred mineral springs in the district, most of which formerly belonged to the duke, and afforded him a considerable part of his revenue. The best known are those of Wiesbaden, Ems, Soden, Schwalbach, Schlangenbad, Geilnau and Fachingen. The other mineral wealth of Nassau includes iron, lead, copper, building stone, coals, slate, a little silver and a bed of malachite. Its manufactures, including cotton and woollen goods, are unimportant, but a brisk trade is carried on by rail and river in wine, timber, grain and fruit. There are few places of importance besides the above-named spas; Höchst is the only manufacturing town. Wiesbaden, with 100,955 inhabitants, is the capital of the government district as it was of the duchy. In 1864 the duchy contained 468,311 inhabitants, of whom 242,000 were Protestants, 215,000 Roman Catholics and 7000 Jews. The ecclesiastical jurisdiction was in the hands of the Protestant bishop of Wiesbaden and the Roman Catholic bishop of Limburg. Education was amply provided for in numerous higher and lower schools. The annual revenue of the dukedom was about £400,000 and it furnished a contingent of 6000 men to the army of the German Confederation.

History.—During the Roman period the district enclosed by the Rhine, the Main and the Lahn was occupied by the Mattiaci and later by the Alamanni. The latter were subdued by the Franks under Clovis at the end of the 5th century, and at the partition of Verdun in 843 the country became part of the East Frankish or German kingdom. Christianity seems to have been introduced in the 4th century. The founder of the house of Nassau is usually regarded as a certain Drutwin (d. 1076), who, with his brother Dudo, count of Laurenburg, built a castle on a hill overlooking the Lahn, near the present town of Nassau. Drutwin's descendant Walram (d. 1198) took the title of count of Nassau, and placed his lands under the immediate suzerainty of the German king; previously he had been a vassal of the archbishop of Trier. Then in 1255 Walram's grandsons, Walram and Otto, divided between them their paternal inheritance, which had been steadily increasing in size. Walram took the part of Nassau lying on the left bank of the Lahn and made Wiesbaden his residence; Otto took the part on the right bank of the river and his capital was Siegen. The brothers thus founded the two branches of the house of Nassau, which have flourished to the present time.

The fortunes of the Ottonian, or younger line, belong mainly to the history of the Netherlands. The family was soon divided into several branches, and in the 15th century one of its members, Count Engelbert I. (d. 1442), obtained through marriage lands in Holland. Of his two sons one took the Dutch, and the other the German possessions of the house, but these were united again in 1504 under the sway of John, count of Nassau-Dillenburg, the head of a branch of the family which, in consequence of a series of deaths, the last of which took place in 1561, was a few years later the sole representative of the descendants of Count Otto. John's son was Count William the Rich (d. 1559), and his grandson was the hero, William the Silent, who inherited the principality of Orange in 1544 and surrendered his prospective inheritance in Nassau to his brother John (d. 1606). William and his descendants were called princes of Orange-Nassau, and the line became extinct when the English king William III. died in 1702. Meanwhile the descendants of Count John, the rulers of Nassau, were flourishing. They were divided into several branches, and in 1702 the head of one of these, John William Friso of Nassau-Dietz (d. 1711), whose ancestor had been made a prince of the Empire in 1654, inherited the title of prince of Orange and the lands of the English king in the Netherlands. A few years later in 1743 a number of deaths left John William's son, William, the sole representative of his family, and as such he ruled over the ancestral lands both in Nassau and in the Netherlands. In 1806, however, these were taken from a succeeding prince, William VI., because he refused to join the Confederation of the Rhine. Some of them were given in 1815 to the other main line of the family, the one descended from Count Walram (see below). In 1815 William VI. became king of the Netherlands as William I., and was compensated for this loss by the grant of parts of Luxemburg and the title of grand-duke. When in 1890 William's male line died out Luxemburg, like Nassau, passed to the descendants of Count Walram. In the female line he is now represented by the queen of the Netherlands.

Adolph of Nassau, a son of Walram, the founder of the elder line of the house of Nassau, became German king in 1292, but was defeated and slain by his rival, Albert of Austria, in 1298. The territories of his descendants were partitioned several times, but these branch lines did not usually perpetuate themselves beyond a few generations, and Walram's share of Nassau was again united in 1605 under Louis II. of Nassau-Weilburg (d. 1626). Soon, however, the family was again divided; three branches were formed, those of Saarbrücken, Idstein and Weilburg, the heads of the first two becoming princes of the Empire in 1688. Other partitions followed, but at the opening of the 19th century only two lines were flourishing, those of Nassau-Usingen and Nassau-Weilburg. In 1801 Charles William, prince of Nassau-Usingen, was deprived by France of his lands on the left bank of the Rhine, but both he and Frederick William of Nassau-Weilburg, who suffered a similar loss, received ample compensation. In 1806 both Frederick William and Frederick Augustus, the brother and successor of Charles William, joined the Confederation of the Rhine and received from Napoleon the title of duke, but after the battle of Leipzig they threw in their lot with the allies, and in 1815 joined the German Confederation. As a result of the changes of 1815 Frederick Augustus of Nassau-Usingen ceded some of his newly-acquired lands to Prussia, receiving in return the greater part of the German possessions of the Ottonian branch of the house of Nassau (see above). In March 1816 he died without sons and the whole of Nassau was united under the rule of Frederick William of Nassau-Weilburg as duke of Nassau. Already in 1814 Frederick William had granted a constitution to his subjects, which provided for two representative chambers, and under his son William, who succeeded in 1816, the first landtag met in 1818. At once, however, it came into collision with the duke about the ducal domains, and these dissensions were not settled until 1836. In this year the duchy took an important step in the development of its material prosperity by joining the German Zollverein. In 1848 Duke Adolph, the son and successor of Duke William, was compelled to yield to the temper of the times and to grant a more liberal constitution to Nassau, but in the following years a series of reactionary measures reduced matters to their former unsatisfactory condition. The duke adhered stedfastly to his conservative principles, while his people showed their sympathies by electing one liberal landtag after another. In 1866 Adolph espoused the cause of Austria, sent his troops into the field and asked the landtag for money. This was refused, Adolph was soon a fugitive before the Prussian troops, and on the 3rd of October 1866 Nassau was formally incorporated with the kingdom of Prussia. The deposed duke entered in 1867 into a convention with Prussia by which he retained a few castles and received an indemnity of about £1,500,000 for renouncing his claim to Nassau. In 1890, on the extinction of the collateral line of his house, he became grand-duke of Luxemburg, and he died on the 17th of November 1905.

The town of Nassau (Lat. *Nasonga*) on the right bank of the Lahn, 15 m. above Coblenz, is interesting as the birthplace of the Prussian statesman, Freiherr von Stein. Pop. (1905) 2238. It has a Roman Catholic and an Evangelical church, while its main industries are brewing and mining. Near the town are the ruins of the castle of Stein, first mentioned in 1138, with a marble statue of Stein, while the ruins of the ancestral castle of the house of Nassau may also be seen.

For the history of Nassau see Hennes, *Geschichte der Grafen von Nassau bis 1255* (Cologne, 1843); von Schütz, *Geschichte des Herzogtums Nassau* (Wiesbaden, 1853); von Witzleben, *Genealogie und Geschichte der Fürstenhauses Nassau* (Stuttgart, 1855); F. W. T. Schliephake and K. Menzel, *Geschichte von Nassau* (Wiesbaden, 1865–1889); the *Codex diplomaticus nassoicus*, edited by K. Menzel and W. Sauer (1885–1887); and the *Annalen des Vereins für nassauische Altertumskunde und Geschichtsforschung* (1827 fol.).

NAST, THOMAS (1840–1902), American caricaturist, was born on the 27th of September 1840, in the military barracks of Landau, Germany, the son of a musician in the Ninth regiment Bavarian band. His mother took him to New York in 1846. He studied art there for about a year with Theodore Kaufmann and then at the school of the National Academy of Design. At the age of fifteen he became a draughtsman for *Frank Leslie's Illustrated Newspaper*; three years afterwards for *Harper's Weekly*. In 1860 he went to England for the *New York Illustrated News* to depict the prize-fight between Heenan and Sayers, and then joined Garibaldi in Italy as artist for *The Illustrated London News*. His first serious work in caricature was the cartoon "Peace" in 1862, directed against those in the North who opposed the prosecution of the Civil War. This and his other cartoons during the Civil War and Reconstruction days were published in *Harper's Weekly*; they attracted great attention, and Nast was called by President Lincoln "our best recruiting sergeant." Even more able were Nast's cartoons against the Tweed Ring conspiracy in New York city; his caricature of Tweed being the means of the latter's identification and arrest at Vigo. In 1873, 1885 and 1887 Nast toured the United States as lecturer and sketch-artist, but with the advent of new methods and younger blood his vogue decreased. He had been an ardent Republican in his earlier years; had bitterly attacked President Johnson and his Reconstruction policy; had ridiculed Greeley's candidature, and had opposed inflation of the currency, notably with his famous "rag-baby" cartoons, but his advocacy of civil service reform and his distrust of Blaine forced him to become a Mugwump and in 1884 an open supporter of the Democratic party, from which in 1892 he returned to the Republican party and the support of Harrison. He had lost practically all of his earnings by the failure of Grant and Ward, and in May 1902 was appointed by President Roosevelt consul-general at Guayaquil, Ecuador, where he died on the 7th of December in the same year. He did some painting in oil and some book illustrations, but these were comparatively unimportant, and his fame rests on his caricatures and political cartoons. Nast introduced the donkey to typify the Democratic party, the elephant to typify the Republican party, and the tiger to typify Tammany Hall, and introduced into American cartoons the practice of modernizing scenes from Shakespeare for a political purpose.

See A. B. Paine, *Thomas Nast, his Period and his Pictures* (New York, 1904).

NASTURTIUM, or Indian cress, *Tropaeolum majus,* a perennial climber, native of Peru, but in cultivation treated as a hardy annual. It climbs by means of the long stalk of the peltate leaf which is sensitive to contact like a tendril. The irregular flowers have five sepals united at the base, the dorsal one produced into a spurred development of the axis; of the five petals the two upper are slightly different and stand rather apart from the lower three; the eight stamens are unequal and the pistil consists of three carpels which form a fleshy fruit separating into three one-seeded portions. The flowers are sometimes eaten in salads, and the leaves and young green fruits are pickled in vinegar as a substitute for capers. The pungency of the *nasturtium officinale,* the water-cress, gave it its name *nasi-tortium,* that which twists the nose. The plant should have a warm situation, and the soil should be light and well enriched; sow thinly early in April, either near a fence or wall, or in an open spot, where it will require stakes 6 to 8 ft. high.

The dwarf form known as Tom Thumb (*T. m. nanum*), is an excellent bedding or border flower, growing about a foot high. Sow in April in the beds or borders; and again in May for a succession. Other fine annual Tropaeolums are *T. Lobbianum* with long spurred orange flowers and numerous varieties; and *T. minus,* a kind of miniature *T. majus* with yellow, scarlet and crimson varieties.

The genus *Tropaeolum,* native of South America and Mexico, includes about 35 species of generally climbing annual and perennial herbs with orange, yellow, rarely purple or blue, irregular flowers, *T. peregrinum* is the well-known canary creeper. The flame nasturtium with brilliant scarlet blossoms is *T. speciosum* from Chile; it has tuberous roots, as have also such well-known perennials as *T. polyphyllum, T. pentaphyllum.* Of these *T. speciosum* should be grown in England in positions facing north; it flourishes in Scotland.

NATAL, a maritime province of the Union of South Africa, situated nearly between 27° and 31° S., 29° and 33° E. It is bounded S.E. by the Indian Ocean, S.W. by the Cape province and Basutoland, N.W. by the Orange Free State province, N. and N.E. by the Transvaal and Portuguese East Africa. It has a coast line of 376 m.; its greatest length N. to S. in a direct line is 247 m.; its greatest breadth E. to W., also in a direct line, 200 m. Natal has an area of 35,371 sq. m., being nearly three-quarters the size of England. (For map see South Africa.) The province consists of two great divisions, namely Natal proper and Zululand (*q.v.*). Natal proper has a seaboard of 166 m. and an area of 24,910 sq. m., Zululand, in which is included Amatongaland, a seaboard of 210 m. and an area of 10,461 sq. m. It lies north-east of Natal. In this article the description of the physical features, &c. refers only to Natal proper.

Physical Features.—The terrace formation of the land characteristic of other coast regions of South Africa prevails in Natal. The country may be likened to a steep and gigantic staircase leading to a broad and level land lying beyond its borders. The rocky barrier which shuts off this land is part of the Drakensberg range. From the mountain sides flow many rivers which dash in magnificent waterfalls and through deep gorges to the sea. Falling 8000 or more feet in little over 200 m., these streams are unnavigable. The south-eastern sides of the mountains are in part covered with heavy timber, while the semi-tropical luxuriance of the coast belt has earned for Natal the title of "the garden colony."

The coast trends, in an almost unbroken line, from S.W. to N.E. It extends from the mouth of the Umtamvuna river (31° 4′ S., 30° 12′ E.), which separates Natal from the Cape, to the mouth of the Tugela (29° 15′ S., 31° 30′ E.), which marks the frontier between Natal and Zululand. The only considerable indentation is at Durban, about two-thirds of the distance from the Umtamvuna to the Tugela, where there is a wide and shallow bay, covering with its islands nearly 8 sq. m. The coast, though low and sandy in places, is for the most part rocky and dangerous. The warm Mozambique current sweeps down from the N.E., setting up a back drift close in shore. The southern entrance to Durban harbour is marked by a bold bluff, the Bluff of Natal, which is 250 ft. high and forested to the water's edge. Opposite the Bluff a low sandy spit called the Point forms the northern entrance to the harbour. North of Durban the coast belt, hitherto very narrow, widens out and becomes more flat. But the greater part of the coast region, which has an average depth of 15 m., is broken and rugged. Ranges of hills lead to the first plateau, which has an average elevation of 2000 ft. and is of ill-defined extent. Here the land loses its semi-tropical character and resembles more the plains of the Orange Free State and the Transvaal. The second plateau, reached by a steep ascent, has an elevation of from nearly 4000 to fully 5000 ft. It is an undulating plain, grass-covered, but for the most part without trees or bush. It continues to the foot of the Drakensberg range, the mountains rising towards the S.W., with almost perpendicular sides, 6000 to 7000 ft. above the country at their base. North-west, towards the Transvaal, the mountains are of lower elevation and more rounded contours.

Mountains.—Although the division of the country into terraces separated by ranges of hills is clearly marked in various districts, as for instance between Durban and Colenso, the province is traversed by many secondary chains, as well as by spurs of the Drakensberg. The highest points of that range, and the highest land in Africa south of Kilimanjaro, lie within the borders of Natal. The Drakensberg (*q.v.*), from Majuba Hill on the N.W. to Bushman's Nek in the S.W., form the frontier of the province, the crest of the range being generally within Natal. This is the case in the Mont-aux-Sources (11,170 ft.) and Cathkin Peak or Champagne Castle (10,357 ft.); the top of the third great height, Giant's Castle (9657 ft.), is in Basutoland, but its seaward slopes are in Natal. From Giant's Castle to Mont-aux-Sources, in which, forsaking their general direction, the Drakensberg run S.E. to N.W., the mountains attain an elevation of 10,000 to 11,000 ft., with few breaks in their face. North of Mont-aux-Sources the mountain ridge sinks to 8000 and less feet, and here are several passes leading into the Orange Free State. Laing's Nek is a pass into the Transvaal. The chief heights in Natal between Mont-aux-Sources and Laing's Nek are Tintwa (7500 ft.), Inkwelo (6808 ft.) and the flat-topped Majuba (7000 ft.). Spurs from the Drakensberg, at right angles to the main range, cross the plateaus. The most northern, which runs E. from Majuba to the Lebombo Mountains, coincides roughly with the northern frontier of Natal. It is one of the transverse chains connecting the eastern coast range with the higher terraces and goes under a variety of names, such as Elands Berg and Ingome Mountains. A second range, the Biggarsberg, starts from the Drakensberg near Mount Malani and goes E.S.E. to the junction of Mooi, Buffalo and Tugela rivers. This range contains, in Indumeni (7200 ft.), the highest mountain in Natal outside the main Drakensberg. A third range runs N.E. from Giant's Castle towards the Biggarsberg. It lies north of the Mooi river, and its most general name is Mooi River Heights. A fourth range also diverges from Giant's Castle and ramifies in various branches over a large tract of country, one branch running by Pietermaritzburg to the Berea hills overlooking Durban. The chief height in this fourth range is Spion Kop (7037 ft.), about 25 m. S.E. of Giant's Castle. This is not the Spion Kop rendered famous during the Anglo-Boer War of 1899–1902. That Spion Kop, with Vaal Kranz and Pieter's Hills, are heights on the northern bank of the upper Tugela.

Secondary ranges with heights of 5000 and more feet are numerous, whilst lofty isolated mountains rise from the plateaus. The greatest of these isolated masses is Mahwaqa (6834 ft.), in the south-west part of the country. Of many flat-topped hills the best known is the Table Mountain east of Pietermaritzburg.

Rivers.—All the rivers of Natal not purely coast streams have their origin in the Drakensberg or its secondary ranges. The largest and longest, the Tugela, with the Buffalo, Mooi, Klip and other tributaries is treated separately. The Tugela basin drains the whole country north of a line drawn in a direct line east from Giant's Castle. The Umkomaas ("gatherer of waters") rises in Giant's Castle and flows in a south-easterly course to the sea. Though it makes no large sweeps it has so tortuous a course that its length (some 200 m.) is twice that of the valley through which it flows. Its banks in its upper course are wild and picturesque, with occasional wide deep valleys, with climate and vegetation resembling the coast belt. The Umzimkulu river rises in Bamboo Castle, in the Drakensberg, and, with bolder curves than the Umkomaas, runs in a course generally parallel with that stream S.E. to the sea, its mouth being about 40 m. south of that of the Umkomaas. The Ingwangwane rises in the Drakensberg south of the Umzimkulu, which it joins after a course of some 50 m. Below the junction the Umzimkulu forms for some distance the frontier between Natal and the Griqualand East division of the Cape. The scenery along the river valley (120 m. long) is very striking, in turns rugged and desolate, verdant and smiling, with patches of dense forest and heights wooded to their summit. Port Shepstone is situated at the mouth of the river, which, like that of all others in Natal, is obstructed by a bar. As a result of harbour works, however, a channel has been cleared and steamers can ascend the river for 6 m.

The Pongola rises in the Transvaal in high ground N.E. of Wakkerstroom and flows E., forming, for the greater part of its course, the northern frontier of the province. After piercing the Lebombo Mountains, it turns N. and joins the Maputa, a river emptying into Delagoa Bay. The Umgeni, which rises in the Spion Kop hills some 30 m. S.E. of Giant's Castle, passes through the central part of Natal and reaches the sea 4 m. N. of Durban. It flows alternately through mountainous and pastoral country, and is known for two magnificent waterfalls, both within 12 m. of Pietermaritzburg. The upper fall is close to the village of Howick. Here the Umgeni leaps in a single sheet of water down a precipice over 350 ft. high, more than double the height of Niagara, forming, when the river is swollen by the rains, a spectacle of rare magnificence. Some 12 m. below are the Karkloof or Lower Falls, where in a series of beautiful cascades the water descends to the plain. Other rivers of Natal which rise in the spurs of the Drakensberg or in the higher terraces are the Umvoti, which runs south of the Tugela and gives its name to a county division, the Umlaas (which gives Durban its main water supply, the Illovo, which traverse the country between the Umgeni and Umkomaas, and the Umtamvuna, noteworthy as forming the boundary between Natal and Pondoland. There are also seventeen distinct coast streams in the colony.

[*Geology*.[1]—The general geological structure of Natal and Zululand is simple. It consists of a series of plateaus formed of sedimentary rocks which mainly belong to three formations of widely separated ages, and which rest on a platform of granitic and metamorphic rocks.

The geological formations represented include:—

Post-Cretaceous and Recent	
Cretaceous	Littoral of Zululand.
U. Karroo	Plateau Basalts. Cave Sandstone. Red Beds.
L. Karroo	Stormberg Series. Beaufort Series. Ecca Series. Ecca Glacial Series (Dwyka Conglomerate).
Cape System	Table Mountain Sandstone Series.
Pre-Cape Rocks	Quartzites, Conglomerates and Shales of Nkandhla, Umfolosi river. Gneisses, Schists, Marbles, Granites (Swaziland Series).

Pre-Cape Rocks.—The granites and schists occur in close association. The series covers considerable areas in the lowest parts of the valleys and near the coast. The widest areas are in Zululand. In the Umzimkulu river and in the Tugela river below its junction with the Buffalo, metamorphic limestones are associated with schists, gneisses and granites. A group of highly inclined quartzites, altered conglomerates and jasperoid rocks which crop out on the Umhlatuzi river, between Melmoth and Nkandhla and on the White Umfolosi river above Ulundi Plains, is considered by Anderson to represent some portion of the Lower Witwatersrand series. The conglomerates are true "banket" and are auriferous, but the gold has not been met with in payable quantities.

Table Mountain Sandstone Series.—This rests unconformably on the pre-Cape rocks. Traced northwards, the series becomes thinner and finally dies out. As a rule denudation, which has acted on a magnificent scale, has removed all but a few hundred feet of the basement beds. The maximum thickness of 2000 ft. occurs near Melmoth. The beds are usually thin false-bedded sandstones with an almost complete absence of shales. A conglomerate at the base contains traces of gold. Griesbach mentions the occurrence of some small bivalves in the shales of Greytown, but Anderson failed to find any fossils.

Ecca Glacial Series.—A great unconformity separates the Table Mountain and Ecca series. In the Cape this gap is represented by the Witteberg and Bokkeveld series. The Dwyka conglomerate rarely attains any great thickness though forming wide outcrops. It is usually a hard compact rock containing striated stones. The Umgeni quarries, where the rock is used for road-metal, furnish the best exposures.

Ecca Series.—With the Beaufort series this occupies over two-thirds of the western portion of the province and has wide outcrops in Zululand and in the Vryheid districts. The Ecca shales contain some of the best coals of South Africa, but the seams contain much unmarketable coal. Around Dundee and Newcastle the coals are bituminous. In Zululand they are chiefly anthracitic. The fossils include several species of *Glossopteris* among them: *Glossopteris browniana var indica; Bunb. Phyllotheca Zeilleri eth. fil.; Estheria Greyii, Jones*, indicating a Permo-Carboniferous age.

Beaufort Series.—The Ecca series graduates upwards into the highly coloured sandstones and shales of the Beaufort series. Fossil reptilian remains, chiefly *Dicynodon*, are abundant.

Stormberg Series.—This consists of sandstones and shales with thin seams of coal. The chief outcrops occur around Biggarsberg and along the upper slopes of the Drakensberg. The fossil flora—*Thinnfeldia odontopteroides*, Morr. and a *Pterophyllum*—indicate a Rhaetic age. No reptilian remains have been found.

Upper Karroo.—The Red beds and Cave sandstones occur along the eastern flanks of the Drakensberg.

Cretaceous.—Deposits of this age are confined to the littoral. They are exceedingly prolific in fossils which prove them to be of Upper Cretaceous age. A long list of fossils has been obtained from Umkivelane Hill, Zululand. W.G.*]

Climate.—With a rise in level (not reckoning the mountain tops) of 5500 ft. in a distance of 170 m., Natal possesses several varieties of climate but is nowhere unhealthy. The climate is comparable to that of north Italy. The valleys and coast belt, though practically free from malarial fever, are hot and humid, and fires in dwelling houses are seldom required even in the coolest months; the lower plateaus are cool and the air dry; the uplands are bracing and often very cold, with snow on the ground in winter. The year is divided into two seasons, summer, which begins in October and ends in March, and winter, which fills up the rest of the year. Summer is the rainy season, and May, June and July the driest months of the year. The mean temperature at Durban, records taken at 260 ft. above the sea, is 70° F., varying from 42° in winter to 98° in summer. The average summer humidity is 76%, that of winter 74%. At Pietermaritzburg, 41 m. inland and 2200 ft. above the sea, the temperature is about 64°. In the uplands the heat of summer is often greater than on the coast, but the air is less humid and the nights are generally cool. Both the humidity and the temperature are increased by the great mass of water, the Mozambique current, flowing south from the equatorial regions. At Durban the annual rainfall is about 40 in., at Pietermaritzburg 38. The average for the province is believed to be about 30 in. In 1893, the year of highest recorded rainfall, 70 in. fell on the coast districts. Thunderstorms, averaging nearly one hundred in the year, and violent hailstorms, occur in summer, being most severe in the interior. The storms serve to modify the intense heat, though the lightning and hail cause considerable damage. The prevailing winds on the coast are north-east, warm and humid, and south-west, cool and bracing, though in summer the south-west wind brings rain. Inland, chiefly in early summer, a hot dry wind, often accompanied by a dust storm, blows from the north. These winds, which blow on an average twenty-five days in the year, seldom reach the coast and are generally followed by rain. Inhabitants of Natal are practically exempt from chest diseases.

Flora.—Botanically, Natal is divided into three zones: (1) the coast belt, extending from the sea inland to heights of 1500 ft., and in some cases to 1800 and 2000 ft.; (2) the midland region, which rises to 4000 ft.; (3) the upper regions. In these zones the flora varies from sub-tropical to sub-alpine. The heaths and proteads common at the Cape peninsula, in Basutoland and other parts of South Africa, are rare in Natal, but almost any species of the flora of semi-tropical and temperate countries introduced attains perfection. The trees and plants characteristic of each zone are not always confined to that zone, but in several instances, when common to the coast belt and the midlands, their character alters according to the elevation of the land. The dense bush or jungle of evergreen trees, climbers and flowering shrubs, which up to the middle of the 19th century covered the greater part of the coast belt, has largely disappeared. There are still, however, in the coast belt woods of leguminous evergreens bearing bright-coloured flowers. The trees in these woods are generally from 20 to 50 ft. in height and include the knob-thorn, water-boom, kafir-boom (with brilliant scarlet flowers), the Cape chestnut and milkwoods (*Mimusops*). But the most striking of the coast-belt flora are the tropical forms—the palm, mangrove, wild banana (*Strelitzia augusta*), tree-ferns, tree euphorbia, candelabra spurge and *Caput medusae*. Of palms there are two varieties, the ilala (*Hyphaene crinita*), found only by the sea shore and a mile or two inland, and the isundu (*Phoenix reclinata*), more widespread and found at heights up to 2000 ft. or even higher. The amatungulu or Natal plum, found chiefly near the sea, is one of the few wild plants with edible fruit. Its leaves are of a glossy dark green, its flower white and star-shaped and its fruit resembles the plum. Other wild fruits are the so-called Cape gooseberry (not native to Natal) and the kaw apple or Dingaan apricot, which grows on a species of ebony tree.

The midland region is characterized by grass lands (the Natal grasses are long and coarse) and by considerable areas of flat-topped thorn bush mimosa. The bush is not as a rule dense, nor is it of any great height. A tree peculiar to this zone is the *Alberta magna*. It has dull pink flowers, succeeded by seed vessels, each of which is crowned by two scarlet-coloured leafy lobes. A grass belt separates the thorn bush from the districts carrying heavy timber, found mainly in the upland zone, along the sides of the mountains exposed to the rains and in kloofs. The indigenous timber trees are principally the yellow wood (*Podocarpus*), sneezewood (*Pteroxylon utile*), stinkwood (*Oreodaphne bullata*), black ironwood (*Olea laurifolia*), white ironwood (*Vepris lanceolata*), and umtomboti (*Exoecaria africana*); all are very useful woods, and the yellow wood, sneezewood, stinkwood and ironwood when polished have grain and colour equal to maple, walnut and ebony. The "rooibesje," red pear and milkwood trees are used for boatbuilding. The Australian *Eucalyptus* and *Casuarina* in great variety, and many other imported trees, including syringas, wattles, acacias, willows, pines, cypress, cork and oak all thrive when properly planted and protected from grass fires. The black wattle has been extensively planted and flourishes at elevations of from 1000 to 3000 ft. Its bark forms a valuable article of commerce.

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[1] See C. L. Griesbach, "On the Geology of Natal in South Africa," *Quart. Journ. Geol. Soc.* vol. xxvii. pp. 53-72 (1871); P. C. Sutherland, "Notes on an Ancient Boulder Clay of Natal," *Quart. Journ. Geol. Soc.* vol. xxvi. pp. 514-517 (1870); W. Anderson, *Reports, Geol. Survey, Natal and Zululand* (Pietermaritzburg, 1901; London, 1904); and "Science in South Africa," *Handbook, Brit. Assoc.* pp. 260-272 (Cape Town, 1905).

Flowers which bloom in the early spring are abundant, especially on the edges of forests. Among those found throughout the country are the *Dierama pendula*, the orchid and the "everlasting." As a rule flowers common to all zones are on the coast smaller and with paler colours than they are in the midlands. Aloes are common; in part of the midland zone they form when in bloom with abundance of orange and scarlet flowers a most picturesque sight. Of Cycadaceae the *Stangeria paradoxa* is peculiar to Natal. There is but one cactus indigenous to Natal; it is found hanging from perpendicular rocks in the midlands. There are, however, several species of euphorbia of the miscalled cacti. Climbing plants with gorgeous flowers are common, and there are numerous species of Compositae and about a hundred cinchonaceous plants. Bulbous plants are also very numerous. The most common are the Natal lily with pink and white ribbed bells, the fire-lily, with flame-coloured blossoms, ixias, gladiolas, the Ifafa lily, with fuchsia-like clusters, and the arum lily. A conspicuous veld plant is the orange and crimson *leonotis*, growing 6 ft. high. Geraniums are somewhat scarce. Fern life is abundant; 126 species are indigenous, two being tree-ferns. One of these, *Cyathea dregei*, found in moist places and open land, has a stem 20 ft. high; the stem of the other, *Hemitelia capensis*, sometimes reaches 30 ft. The ferns are most common in the midland zone and in the heavy timber forests. Sixty different species have been identified in one valley not more than 1 m. long and about 100 yds. in breadth. Among fruit trees, besides the wild fruits already mentioned, are the pineapple, mango, papua, guava, grenadilla, rose apple, custard apple, soursop, loquat, naartje, shaddock and citrous fruits.

Fauna.—The larger animals which abounded in Natal in the first half of the 19th century have been exterminated or driven out of the country. This fate has overtaken the elephant, giraffe, the buffalo, quagga, gnu, blesbok, gemsbok and ostrich. If the Vryheid district be excluded, the lion and rhinoceros may be added to this list; and the Vryheid district belongs geographically to Zululand. Hippopotami are still found in the Umgeni river and crocodiles in several of the coast streams. Leopards and panthers are found in thickly wooded kloofs. Hyenas, jackals, wild pig, polecats and wild dogs (*Canis pictus*) of different species are still found in or about bush jungles and forest clumps; elands (*Antilope oreas*) are preserved on some estates, and there are at least ten distinct species of antelope (hartebeest, bushbok, duiker, rietbok, rhebok, rovibok, blauwbok, &c.). In the Vryheid district the kudu, blue wildebeest, waterbuck, reedbuck, impala, steinbok and klipspringer are also found. Several of these species are now preserved. Ant-eaters (*Orycteropus capensis*), porcupines, weasels, squirrels, rock rabbits, hares and cane rats are common in different localities. Baboons (*Cynocephalus porcarius*) and monkeys of different kinds frequent the mountains and rocky kloofs and bush and timber lands. The birds of Natal[1] are of many species; some have beautiful plumage, but none of them, with the exception of the canary, are to be considered as songsters. Among the larger birds are cranes, herons, the ibis, storks, eagles, vultures, falcons, hawks, kites, owls, the secretary birds, pelicans, flamingoes, wild duck and geese, gulls, and of game birds, the paauw, koraan, pheasant, partridge, guinea fowl and quail. The other birds include parrots, toucans, gaudily coloured cuckoos, lories, swallows, shrikes, sun-birds, kingfishers, weavers, finches, wild pigeons and crows. The otter is found in some of the rivers, which are also frequented, near their mouths, by turtles. These last are also found in the coast lagoons and sometimes are of great size. Iguanas, 4 and 5 ft. long, are found on the wooded banks of the rivers; small lizards and chameleons are common, and there are several varieties of tortoise.

Of snakes there are about forty distinct species or varieties. The most dreaded by the natives are called "*imamba*," of which there are at least eight different kinds; these snakes elevate and throw themselves forward, and have been known to pursue a horseman. One sort of imamba, named by the natives "*indhlondhlo*," is crested, and its body is of a bright flame colour. The sluggish puff-adder (*Clotho arietans*) is common and very dangerous. A hooded snake (*Naja haemachates*), the *imfezi* of the natives, is dangerous, and spits or ejects its poison; besides this there are a few other varieties of the cobra species. The largest of the serpent tribe, however, is the python (*Hortulia natalensis*), called *inhlwati* by the natives; its usual haunts are by streams amongst rocky boulders and in jungles, and instances are recorded of its strangling and crushing adult natives. It is common in the coast districts, and is sometimes 20 ft. long. Insects abound in great numbers, the most troublesome and destructive being the tick (*Ixodes natalensis*), which infests the pasturage, and the white ant (*Termes mordax*). Occasionally vast armies of locusts or caterpillars advance over large tracts of country, devouring all vegetation in their line of march. The fish moth, a steel-grey slimy active fish-shaped insect, is found in every house and is very destructive. Fish of excellent quality and in great quantities abound on the coast. They include shad, rock cod, mackerel, mullet, bream and soles; sharks, stingrays, cuttlefish and the octopus are also common in the waters off the coast of Natal. Prawns, crayfish and oysters are also obtainable, and turtle (*Chelonia mydas*) are frequently captured. Freshwater scale-fish are mostly full of bones, but fine eels and barbel are plentiful in the rivers. Trout have been introduced into some of the higher reaches of the rivers.

Inhabitants.—At the census of 1904 the population of the province, including Zululand, was 1,108,754.[2] Of this total 8·8%, or 97,109, were Europeans, 9%, or 100,918, Asiatics and the rest natives of South Africa, mainly of Zulu-Kaffir stock. Of the 824,063 natives, 203,373 lived in Zululand. The white and Asiatic population nearly doubled in the thirteen years since the previous census, allowance being made for the Utrecht and Vryheid districts, which in 1891 formed part of the Transvaal. Of the total population 985,167 live in rural areas, the average density for the whole country being 31·34 per sq. m. The white population is divided into 56,758 males and 40,351 females. Of the white inhabitants the great majority are British. Some 12,500 are of Dutch extraction; these live chiefly in the districts of Utrecht and Vryheid. There are also about 4500 Natalians of German extraction, settled mainly in the New Hanover and Umzimkulu districts. The Asiatics at the 1904 census were divided into 63,497 males and 37,421 females. They include a few high caste Indians, Arabs and Chinese, but the great majority are Indian coolies. The Asiatics are mainly congregated in the coast districts between the Umzimkulu and Tugela rivers. In this region (which includes Durban) the Asiatic population was 61,854. In none of the inland districts did the Asiatic inhabitants number 2000. The coolies are employed chiefly on the sugar, coffee, cotton and other plantations, a small proportion being employed in the coal-mines.

The native inhabitants of Natal proper were almost exterminated by the Zulus in the early years of the 19th century. Before that period the natives of what is now Natal proper were estimated to number about 100,000. In 1838 when the Zulu power was first checked the natives had been reduced to about 10,000. The stoppage of intertribal wars by the British, aided by a great influx of refugees from Zululand, led to a rapid increase of the population. With the exception of a few Bushmen, who cling to the slopes of the Drakensberg, all the natives are of Bantu stock. Before the Zulu devastations the natives belonged to the Ama-Xosa branch of the Kaffirs and are said to have been divided into ninety-four different tribes; to-day all the tribes have a large admixture of Zulu blood (see KAFFIRS, ZULULAND and BANTU LANGUAGES). The Natal natives have preserved their tribal organization to a considerable extent. Nearly 50% live in special reserves or locations, the area set apart for native occupation being about 4000 sq. m. exclusive of Zululand. Most of the remainder are employed on or live upon farms owned by whites, paying annual rents of from £1 to £5 or more. There were, however, in 1904, 69,746 male natives and 10,232 female natives in domestic service. Of the tribes who were in Natal before the Zulu invasion about 1812, the two largest are the Abatembu (who are in five main divisions and number about 30,000) and the Amakwabe (seven divisions and about 20,000 people). Other large tribes are the Amanyuswa (ten divisions—38,000 people), the Amakunu (three divisions—26,000 people), and the Amabomvu (five divisions—25,000 people). The three last tribes are among those which sought refuge in Natal from Zulu persecution, before the establishment of British rule in 1843. The number of half-castes is remarkably small, at the census of 1904 the number of "mixed and others," which includes Griquas and Hottentots and non-aboriginal negroes, was only 6686.

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[1] See R. B. and J. D. Woodward, *Natal Birds* (Maritzburg, 1899).

[2] The following is the official estimate of the population on the 31st of December 1908: Europeans 91,443, natives 998,264 (including 7386 "mixed and others"), Asiatics 116,679; total 1,206,386.

Chief Towns.—The seat of the provincial government is Pietermaritzburg (*q.v.*), commonly called Maritzburg (or P.M.B.), with a population (1904) of 31,199. It is 71 m. by rail N.N.W. of Durban (*q.v.*), the seaport and only large city in Natal, pop. 67,842. Ladysmith (*q.v.*), pop. 5568, ranks next in size. It is in the north-west of the province, is famous for its investment by the Boers in 1899–1900 and is an important railway junction. North-east of Ladysmith are Dundee (2811) and Newcastle (2950). Dundee is the centre of the coal-mining district. Newcastle is also a mining town, but depends chiefly on its large trade in wool. It is named after the duke of Newcastle who was secretary for the colonies in 1852 and 1859. Vryheid (2287) is in the centre of a highly mineralized district. Utrecht (860) lies between Newcastle and Vryheid, and was one of the first towns founded by the Transvaal Boers. There are coal-mines on the town lands. Greytown (2436), a wool and wattle trading centre, is in central Natal. Verulam (1325), 19 m. along the coast north of Durban, serves as centre for sugar, tobacco and fruit plantations. It was founded by emigrants from St Albans, England—whence the name. Port Shepstone, at the mouth of the Umzimkulu river, is the natural outlet for south-west Natal. Estcourt is a trading centre, 75 m. by rail N.N.W. of Pietermaritzburg and is 29 m. distant from the village of Weenen ("Weeping"), so named by the first Boer settlers in memory of a Zulu raid. Another village, Colenso, on the south bank of the Tugela, 16 m. by rail south of Ladysmith, was the headquarters of Sir Redvers Buller at the battle of Colenso on the 15th of December 1899.

Communications.—Durban (Port Natal) is in regular communication with Europe via Cape Town and via Suez by several lines of steamers, the chief being the boats of the Union-Castle line, which sail from Southampton and follow the west coast route, those of the German East Africa line, which sail from Hamburg and go via the east coast route and those of the Austrian Lloyd from Trieste, also by the east coast route. By the Union-Castle boats there is a weekly mail service to England. There are also two direct lines of steamers between London and Durban (a distance of 6993 nautical miles), average passage about twenty-six days; the mail route taking twenty to twenty-two days. Durban is also in regular and frequent communication by passenger steamers with the other South African ports, as well as Mauritius, Zanzibar, &c., and with India, Australia, the United States and South America. The works which have made Port Natal the finest harbour in South Africa are described under DURBAN.

The first railway built in South Africa was a 2-m. line from The Point (or harbour) to the town of Durban. It was opened for traffic in 1860 and in 1874 was extended some 4 m. to the Umgeni river. This line was of 4 ft. 8½ in. gauge and was privately owned, but, when in 1876 the Natal government determined to build and own a railway system which should in time cover the country, the existing line was bought out and the gauge altered to 3 ft. 6 in. On this, the normal South African gauge, all the Natal railways, save a few 2-ft. branch lines, are built. The main line starts from Durban, and passing through Pietermaritzburg (71 m.), Ladysmith (190 m.) and Newcastle (268 m.) pierces the Drakensberg at Laing's Nek by a tunnel 2213 ft. long, and 3 m. beyond Charlestown reaches the Transvaal frontier at mile 307. Thence the railway is continued to Johannesburg, &c. The distances from Durban to the places mentioned by this route are: Johannesburg, 483 m.; Pretoria 511 m.; Kimberley, 793 m.; Bulawayo, 1508 m.; Delagoa Bay, 860 m.

From Ladysmith a branch line runs north-west into the Orange Free State, crossing the Drakensberg at Van Reenen's Pass. This line is continued via Harrismith and Bethlehem to Kroonstad (393 m. from Durban) on the main Cape Town, Bloemfontein and Johannesburg railway and is the shortest route between Durban and Cape Town (1271 m.). It also affords via Bloemfontein the shortest route (622 m.) between Durban and Kimberley. From Glencoe Junction, 42 m. north of Ladysmith on the direct line to Johannesburg, a branch railway goes N.E. to the Dundee coal-fields, Vryheid (59 m.) and Hlobane (76 m.). Two lines branch off from Pietermaritzburg. One (62 m. long) goes N.E. to Greytown, serving the east-central part of the province; the other line (108 m. long) goes S.W. to Riverside Station, forming a link in the scheme for direct communication between Natal and East London and Port Elizabeth.

Durban is the starting-point of two coast lines. The south coast line, which runs close to the sea, goes to Port Shepstone (79 m.). A 2-ft. gauge railway (102 m.), which leaves the south coast line at Alexandra Junction (44 m. from Durban), runs N.W. by Stuartstown and joins the Pietermaritzburg-Riverside line. The north coast railway (167 m. long) crosses the Tugela 70 m. from Durban and continued through Zululand to Somkele, the centre of the Santa Lucia coal-fields.

As might be expected in a country possessing the physical features of Natal, the gradients and curves are exceptionally severe. Not less than 43 m. are upon grades of 1 in 30 and 1 in 35, and curves of 300 to 350 ft. radius, while on over 100 m. more there are grades under 1 in 60 and curves of less than 450 ft. radius. The main trunk line reaches an altitude of 3054 ft. at a point 58 m. distant from Durban; after falling 1000 ft. in its farther progress to Pietermaritzburg, it again rises, 12 m. after leaving that city, to a height of 3700 ft. above the sea; at a point 134 m. from Durban it has reached an altitude of 5152 ft., but on reaching Ladysmith, 191 m. from Durban, the altitude has decreased to 3284 ft. The summit of the Biggarsberg chain is crossed at a point 233 m. from the port, at a height of 4800 ft., and at Laing's Nek the altitude is 5399 ft. The Orange Free State line, after leaving Ladysmith, ascends by steep gradients the whole of its own course in Natal territory, and when it gains the summit at Van Reenen's Pass it is 5500 ft. above the sea. The mileage open in 1910 was 1173. The cost of construction, to the same year, exceeded £14,000,000, the interest earned per cent since 1895 not being less than £3, 12s. in any one year. In outlying districts post carts and ox wagons are the usual means of conveyance. There are about 5000 m. of high roads kept in repair by the government.

There is a well-organized postal and telegraphic service. Land lines connect Natal with every part of South Africa and with Nyasaland and Ujiji. A submarine cable from Durban goes to Zanzibar and Aden, whence there is communication with every quarter of the globe. The first telegraph line in Natal was opened in 1873; in 1878 communication was established with Cape Town and in the following year with Delagoa Bay.

Agriculture and Allied Industries.—The diversity of soil and climate leads to a great diversity in the agricultural produce. The chief drawback to farming in the midland and upper districts is the considerable proportion of stony ground, and, in some cases, the lack of running water. The area of land under tillage is less than a twentieth of the whole surface, the crop most extensively grown being maize or "mealies." This is universally grown by the natives and forms their staple food; it is also grown by the Indians, and by the white farmers for export. Besides maize the crops cultivated by the natives are Kaffir corn or amabele (*Sorghum caffrorum*)—used in the manufacture of *utyuala*, native beer—imfi (*Sorghum saccharatum*), tobacco, pumpkins and sweet potatoes. The chief wealth of the natives consists, however, in their large herds of cattle (see *infra*). While maize thrives in every part of the country, wheat, barley and oats—cultivated by the white farmers—flourish only in the midlands and uplands. More important than the cereal crops are the tropical and sub-tropical products of the coast zone. Besides fruits of nearly all kinds there are cultivated in the low moist regions the sugar-cane, the tea, coffee and tobacco plants, arrowroot, cayenne pepper, cotton, &c. The area under sugar in 1905 was 45,840 acres and the produce 532,067 cwt. (a large quantity of sugar-cane is grown for feeding stock). In the same year the production of tea was 1,633,178 ℔; of coffee, 24,859 ℔; of maize, 2,101,470 bushels; of potatoes, 419,946 bushels; and of sweet potatoes, 181,195 bushels. The tea plant was first introduced in Natal in 1850, but little attention was paid to it until the failure of the coffee plantations about 1875, since when only small quantities of coffee have been produced. In 1877 renewed efforts were made to induce tea cultivation, and by 1881 it had become an established industry. The variety chiefly grown is the Assam indigenous. Most of the tea estates are situated in the coast belt north of Durban. The sugar cane, like tea, was first introduced in 1850, the first canes being brought from Mauritius. The industry is steadily growing, as are the dependent manufactures of molasses and rum. The fruit industry is of considerable importance and by 1905 had reached a turnover of over £100,000 a year.

Extensive areas in the midland and upland districts are devoted to the raising of stock. Horse-breeding is successfully carried on in the upper districts. The higher the altitude the healthier the animals and the greater their immunity from disease. Horse-sickness, a kind of malarial fever, which takes an epidemic form in very wet seasons, causes considerable loss. The Natal horse is small, wiry, and has great powers of endurance. Cattle-breeding is probably the most lucrative branch of stock-farming, the country being pre-eminently adapted for horned cattle. Rinderpest in 1896–1897 swept through South Africa, and probably carried off in Natal from 30 to 40 % of the stock of Europeans, while the natives' losses were even heavier. Serum and bile inoculation were the means of saving a considerable percentage of the herds. The farmers soon began to recover from their losses, but in 1908–1909 another serious loss of stock resulted from the ravages of East Coast fever. The cattle consist chiefly of the Zulu and Africander breeds, but attention has been given to improving the breed by the introduction of Shorthorn, Devon and Holstein (or Friesland) stock. The chief market for cattle is Johannesburg. The principal breed of sheep is the merino, which does well in the higher altitudes. A Scab Act is in force, and is stringently carried out by government inspectors with most satisfactory results. The Angora goat thrives well in certain districts. Ostriches do well in the dry, arid valleys of the Tugela and Mooi rivers. In 1908 Europeans were returned as owning 32,000 horses, 220,000 horned cattle, 765,000 sheep, 68,000 goats, 25,000 pigs, 960 ostriches and 384,000 poultry. Large herds of cattle—over 500,000 in the aggregate—are owned by the natives, who also possess vast flocks of goats and sheep. The dairy industry is well established, and Natal butter commands a ready sale.

Valuable timber is obtained from the forests. Stinkwood is largely employed in the making of wagons, and is also used for making furniture. Black ironwood is likewise used in building wagons, while sneezewood is largely utilized for supports for piers and other marine structures, being impervious to the attacks of the *Teredo navalis*. More important is the cultivation of the black wattle (*Acacia mollissima*), which began in 1886, the bark being exported for tanning purposes, the wood also commanding a ready sale. This wattle thrives well in most localities, but especially in the highlands of central Natal. In 1905 the production of wattle bark was 13,620 tons, and the area planted with the tree over 60,000 acres. Aloes and ramie are cultivated to some extent for their fibre.

The government maintains experimental farms and forestry plantations and a veterinary department to cope with lung sickness, rinderpest, East Coast fever and such like diseases. It also conducts campaigns against locusts and other pests and helps irrigation settlements. By means of an Agricultural Bank it affords assistance to farmers.

Mining.—There are several highly mineralized areas in the country. The existence of coal in the north-east districts on or near the surface of the ground was reported as early as 1839, but it was not until 1880 that steps were taken to examine the coalfields. This was done by F. W. North, who reported in 1881 that in the Klip river (Dundee) district there was an area of 1350 sq. m. that might be depended upon for the supply of coal, which is of all characters from lignite to anthracite. In 1889 the extension of the railway from Ladysmith through the coal area first made coal-mining profitable. In 1896 the total output of coal was 216,106 tons (valued at £108,053 at the pit's mouth), in 1908 it had increased to 1,669,774 tons (valued at the pit's mouth at £737,169). There is a considerable trade in bunker and export coal at Durban, the coal bunkered having increased from 118,740 tons in 1900 to 710,777 in 1908. In the last-named year 446,915 tons of coal were exported. Besides the mines in the Newcastle and Dundee district there are extensive coal-fields at Hlobane in the Vryheid district and in Zululand (*q.v.*). Iron ore is widely distributed and is found in the neighbourhood of all the coal-fields. There are extensive copper and gold-yielding areas, and in some districts these metals are mined. On the lower Umzimkulu, near Port Shepstone, marble is found in great quantities.

Commerce.—The chief exports, not all products of the province, are coal, wool, mohair, hides and skins, wattle bark, tea, sugar, fruits and jams. The import trade is of a most varied character, and a large proportion of the goods brought into the country are in transit to the Transvaal and Orange Free State, Natal affording, next to Delagoa Bay, the shortest route to the Rand. Textiles, largely cotton goods, hardware, mining and agricultural machinery, tobacco and foodstuffs form the bulk of the imports. In 1896 the value of exports was £1,785,000; in 1908 the value was £9,622,000. In 1896 the imports were valued at £5,437,000, in 1908 at £8,330,000 (a decrease of £2,300,000 compared with 1905). The bulk of these exports are to the Transvaal and neighbouring countries, and previously figure as imports, other exports, largely wool and hides, are first imported from the Transvaal. Over three-fifths of the imports are from Great Britain, and about one-seventh of the exports go to Great Britain. The shipping, which in 1874 was 126,000 tons, was in 1884 1,013,000; in 1894, 1,463,000; in 1904 4,263,000; and in 1908, 5,028,000. Over six-sevenths of the shipping is British.

Government and Constitution.—Natal was from 1893 to 1910 a self-governing colony. It is now represented in the Union Parliament by eight senators and seventeen members of the House of Assembly. The qualifications for electors and members of the Assembly are the same, namely men of full age owning houses or land worth £50, or who rent such property of the yearly value of £10; or who, having lived three years in the province, have incomes of not less than £96 a year.

Coloured persons are not, by name, excluded from the franchise, but no persons "subject to special laws and tribunals,"[1] in which category all natives are included, are entitled to vote. Another law,[2] directed against Indians, excludes from the franchise, natives, or descendants of natives in the male line, of countries not possessing elective representative institutions. Exemption from the scope of these provisions may be granted by the governor-general and under such exemption a few Kaffirs are on the roll of electors.

At the head of the provincial government is an administrator, appointed by the Union Ministry, who holds office for five years. He is assisted by an executive committee of four members elected by the provincial council. This council to which is entrusted the management of affairs purely provincial consists of 25 members, elected by the parliamentary voters and each representing a separate constituency. The council sits for a statutory period of three years. For local government purposes the province is divided into counties or magisterial divisions; Zululand being under special jurisdiction. The chief towns—Durban, Maritzburg, Ladysmith, Newcastle and Dundee—are governed by municipal corporations and minor towns by local boards.

Revenue and Expenditure.—Revenue is derived chiefly from customs and excise, railways, land sales, posts and telegraphs and a capitation tax. The expenditure is largely on reproductive works (railways, harbours, post office, &c.), on the judiciary and police, education and military defence. The majority of these services are, since 1910, managed by the Union Government, but the provincial council has power to levy direct taxation, and (with the consent of the Union Government) to raise loans for purely provincial purposes. Its revenues and powers are those pertaining to local government. Some particulars follow as to the financial position of Natal previous to the establishment of the Union.

In 1846, the first year of Natal's separate existence, the revenue was £3073 and the expenditure £6905. In 1852 the revenue was £27,158 and the expenditure £24,296, and in 1862 the corresponding figures were £98,799 and £85,928. In 1872 revenue had risen to £180,499 and expenditure to £132,978. Ten years later the figures were, revenue £657,738, expenditure £659,031. The rise of Johannesburg and the opening up of the Dundee coal-fields, as well as the development of agriculture, now caused a rapid increase on both sides of the account. In 1888 the revenue for the first time exceeded a million, the figures for that year being, revenue £1,130,614, expenditure £781,326; in 1898–1899 the figures were £2,081,349 and £1,914,725. The Anglo-Boer War (1899–1902) caused both revenue and expenditure to rise abnormally, while the depression in trade which followed the war adversely affected the exchequer. In 1903–1904 there was a slight credit balance, the figures being, revenue £4,160,145, expenditure £4,071,439. For the next four years there were deficits, but in 1908–1909 a surplus was realized, the revenue being £3,569,275 and the expenditure £3,530,576. For 1909–1910, the last year of Natal's existence as a colony, the revenue, £4,035,000, again exceeded the expenditure. The public debt, £2,101,500 in 1882, had risen at the close of the Boer War in 1902 to £12,519,000, and was in June 1909, £21,420,000.

Defence.—A small garrison of imperial troops is quartered at Maritzburg. The provincial force consists of a militia, fully equipped and armed with modern weapons. It is divided into mounted riflemen, about 1900 strong, four field batteries of 340 men and two infantry battalions, each of over 800 men. There is also an armed and mounted police force of 870 Europeans. Military training is compulsory on all lads over ten attending government schools. The boys are organized in cadet corps. A senior cadet corps is formed of youths between sixteen and twenty. There are also many rifle associations, the members of which are liable to be called out for defence. Durban harbour is defended by batteries with heavy modern guns. The batteries are manned by the naval corps (150 strong) of the Natal militia. Natal makes an annual contribution of £35,000 towards the upkeep of the British navy.

Law and Justice.—The South Africa Act 1909 established a Supreme Court of South Africa, the former supreme court of Natal becoming a provincial division of the new supreme court. The Roman-Dutch law, as accepted and administered by the courts of Cape Colony up to 1845 (the date of the separation of Natal from the Cape), is the law of the land, save as modified by ordinances and laws enacted by the local legislature, mostly founded upon imperial statute law. The law of evidence is the same as that of the courts of England. Natives, however, are not justiceable under the Roman-Dutch law, but by virtue of letters patent passed in 1848 they are judged by native laws and customs, except so far as these may be repugnant to natural equity. The native laws were first codified in 1878, in 1887 a board was appointed for their revision, and the new code came into operation in 1901. Provision is made whereby a native can obtain relief from the operation of native law and be subject to the colonial law (Law No. 28 of 1865). Special laws have been passed for the benefit of the coolie immigrants. The administration of justice is conducted by magistrates' courts, circuit courts and the provincial division of the supreme court. The magistrates have both civil and criminal jurisdiction in minor cases. Appeals can be made from the magistrates' decisions to the provincial or circuit court. The provincial court, consisting of a judge president and three puisne judges, sits in Pietermaritzburg and has jurisdiction over all causes whether affecting natives or Europeans. The judges also hold circuit courts at Durban and other places. Appeals from the circuit courts can be made to the provincial court; and from the provincial court appeals lie to the appellate division of the Supreme Court of South Africa, sitting at Bloemfontein. Criminal cases are tried before a single judge and a jury of nine—of whom not fewer than seven determine the verdict. There is a vice-admiralty court, of which the judge-president is judge and commissary. In native cases the chiefs have civil jurisdiction in disputes among their own tribesmen and criminal jurisdiction over natives except in capital cases, offences against the person or property of non-natives, pretended witchcraft, cases arising out of marriages by Christian rites, &c. An appeal lies to a magistrates' court from every judgment of a native chief, and from the magistrates' judgment on such appeal to a native high court. This native high court consists of a judge-president and two other judges, and sits in full court at Maritzburg not less than three months and at Eshowe not less than once in the year. There is no jury in this tribunal and single judges may hold circuit courts. With certain exceptions reserved for the provincial court (such as insolvency, ownership of immovable property and divorce), the native high court exercises jurisdiction when all parties to the suit are natives; it also has jurisdiction when the complainant is not a native, but all other parties to the suit are natives.

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[1] Act No. 2 (of the Natal Legislature) of 1883.

[2] Act No. 8 of 1896. The Indians whose names were "rightly contained" in the voters' rolls at the date of the act retain the franchise.

Religion.—The majority of the white inhabitants are Protestants, the bodies with the largest number of adherents being the Anglicans, Dutch Reformed Church, Presbyterians and Wesleyans. The Anglicans are divided into two parties—those belonging to "the Church of the Province of South Africa," the body in communion with the Church of England, and those who act independently and constitute "the Church of England in Natal." The schism arose out of the alleged heterodox views of Bishop Colenso (*q.v.*), who had been created bishop of Natal by letters patent in 1853. In 1863 the metropolitan of Cape Town, as head of the Church of the Province of South Africa, excommunicated Dr Colenso and consecrated a rival bishop for Natal, who took the title of bishop of Pietermaritzburg. Dr Colenso, who obtained a decision of the privy council confirming his claim to be bishop of Natal and possessor of the temporalities attached to the bishopric, died in 1883. After his death those members of the Anglican community who objected to the constitution of the provincial church maintained their organization while the temporalities were placed in the hands of curators. Reunion in spiritual matters has, however, been practically effected. Moreover, an act of the Natal parliament passed in 1909 placed the temporalities into commission in the persons of the bishop and other trustees of the Natal diocese of the Provincial Church; reservations being made in favour of four congregations at that time unwilling to unite with the main body of churchmen.[1] At the census of 1904 the Anglicans numbered 40,880. The Presbyterians numbered 12,184, the Wesleyan Methodists 11,992, the Dutch Reformed Church 11,340, the Lutherans 4852, and the Baptists 2193. The Roman Catholics, at whose head is a vicar-apostolic, numbered 10,419. All these figures are exclusive of natives, of whom the churches named—notably the Anglicans and Wesleyans—have many converts. The Jewish community in 1904 numbered 1496. Of the Asiatics, 87,234 were classed as Hindus and 10,111 as Mahommedans.

Education.—Education other than elementary is controlled by the Union government. Public schools, and private schools aided by provincial grants provide elementary education for white children. Education is neither compulsory nor free; but the fees are low (1s. to 5s. a month) and few children are kept away from school. There are government secondary and art schools at Durban and Maritzburg, and a Technical Institute at Durban. For higher education provision was made by the affiliation of Natal to the Cape of Good Hope University and by exhibitions tenable at English universities. An act of the Natal legislature, passed December 1909, provided for the establishment at Maritzburg of the Natal University College, the course of studies to be such as from time to time prescribed by the Cape University. In 1910 £30,000 was voted for the University College buildings. State aid and inspection is given to private schools for natives. In the native schools—almost all maintained by Christian missions—Zulu and English are taught, the subjects taken being usually reading, writing, arithmetic, grammar, geography and history. The state provides elementary and higher grade schools for Indian children. In 1908 there were 52 government schools and 472 schools under inspection; 304 European, 21 coloured, 168 native and 31 Indian, with an aggregate attendance of 30,598 scholars. There are in addition many private and denominational schools and colleges not receiving state aid. Of these, two of the best known are Hilton College and Hermansberg College, many prominent Natalians having been educated at one or the other of these establishments. To encourage the instruction of children who by reason of distance cannot attend a government or government-aided school, grants-in-aid are made for each pupil attending farm schools.

The Press.—The first newspaper in Natal was the *Natalier*, a Dutch print published at Maritzburg; it was succeeded by the *Patriot.* The first English paper was the *Natal Witness*, started in 1845 and still one of the leading organs of public opinion. In 1851 the *Natal Times* appeared, and is now continued as the *Times of Natal.* Another leading paper, the *Natal Mercury*, dates from 1852. It is a morning newspaper and is issued at Durban. The *Natal Advertizer* is a Durban evening paper. Sir John Robinson, the first premier of Natal under responsible government, was the editor of the *Mercury* from 1860 until he became prime minister in 1893. In 1886 a new Dutch paper, *De Afrikaner*, was started at Maritzburg. The Kaffirs have their own organ, *Ipipa lo Hlunga* (the paper of grievances), issued at Maritzburg, and the Asiatics, *Indian Opinion* a weekly paper started in 1903 and printed in English, Gujarati, Hindi and Tamil. Local papers are published weekly at Ladysmith, Dundee and Greytown. The *Agricultural Journal*, a government publication issued fortnightly, is of great service in the promotion of agricultural knowledge.

History.

Discovery and early history.

Vasco da Gama on his voyage to India sighted the bluff at the entrance to the bay now forming the harbour of Durban on Christmas Day 1497 and named the country Terra Natalis. Da Gama made no landing here and, like the rest of South Africa, Natal was neglected by the Portuguese, whose nearest settlement was at Delagoa Bay. In 1576 Manuel de Mesquita Perestrello, commanded by King Sebastian to explore the coast of South Africa and report on suitable harbours, made a rough chart, even then of little use to navigators, which is of value as exhibiting the most that was known of the country by its discoverers before the advent of their Dutch rivals, who established themselves at Cape Town in 1652. Perestrello states that Natal has no ports but otherwise he gives a fairly accurate description of the country—noting particularly the abundance of animals and the density of the population. The first detailed accounts of the country were received from shipwrecked mariners. In 1683 the English ship "Johanna" went ashore near Delagoa Bay and the crew made a remarkable journey overland to Cape Town, passing through Natal, where they were kindly received by the natives. About the same time (in 1684) an English ship put into Port Natal (as the bay came to be known) and purchased ivory from the natives, who, however, refused to deal in slaves. In May 1685 another English ship the "Good Hope" was wrecked in crossing the bar at Port Natal and in February 1686 the "Stavenisse," a Dutch East Indiaman, was wrecked a little farther south. Survivors of both vessels lived for nearly a year at Port Natal and there built a boat in which they made the voyage to Cape Town in twelve days. They brought with them 3 tons of ivory. This fact and their reports of the immense herds of elephants which roamed the bush led Simon van der Stell, then governor at Cape Town to despatch (1689) the ship "Noord" to Port Natal, with instructions to her commander to open up a trade in ivory and to acquire possession of the bay. From the chief of the Amatuli tribe, who inhabited the adjacent district, the bay was "purchased" for about £50 worth of goods. No settlement was then made and in 1705 the son of the chief repudiated the bargain. In 1721 the Cape government did form a settlement at the bay, but it was soon afterwards abandoned. Thereafter for nearly a hundred years Natal was again neglected by white men. A ship now and again put into the bay, but the dangerous bar at its entrance militated against its frequent use. When in 1824 the next attempt was made by Europeans to form a settlement at the bay, Cape Colony had passed from the Dutch into the possession of Great Britain, while in Natal great changes had come over the land as a result of wars between the natives.

From the records of the 17th and 18th centuries it is apparent that the people then inhabiting Natal were Bantu-negroes of the Kaffir (Ama Xosa) branch. There is no mention of Hottentots, and the few Bushmen who dwelt in the upper regions by the Drakensberg did not come into contact with Europeans. The sailors of the "Stavenisse" reported the most numerous and most powerful tribe to be the Abambo, while that which came most in contact with the whites was the Amatuli, as it occupied a considerable part of the coast-land. These Kaffirs appear to have been more given to agriculture and more peaceful than their neighbours in Kaffraria and Cape Colony. But the quiet of the country was destroyed by the inroads of Chaka, the chief of the Zulus (see ZULULAND). Chaka between 1818 and 1820 ravaged the whole of what is now known as Natal, and after beating his foes in battle, butchered the women, children and old men, incorporating the young men in his impis. The population was greatly reduced and large areas left without a single inhabitant. By right of conquest Chaka became undisputed master of the country.

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[1] For a summary of the Natal church controversy see *The Guardian* (London March 11, 1910).

The first British settlement.

Such was the situation when the first British settlement was made in Natal. In 1823 Francis George Farewell, formerly a lieutenant in the British navy, with other merchants of Cape Town, formed a company to trade with the natives of the south-east coast. In the brig "Salisbury," commanded by James S. King, who had been a midshipman in the navy, Farewell visited Port Natal, St Lucia and Delagoa Bays. The voyage was not successful as a trading venture, but Farewell was so impressed with the possibilities of Natal both for trade and colonization that he resolved to establish himself at the port. He went thither with ten companions, among them Henry Francis Fynn. All the rest save Farewell and Fynn speedily repented of their adventure and returned to the Cape, but the two who remained were joined by three sailors, John Cane, Henry Ogle and Thomas Holstead, a lad. Farewell, Fynn and the others went to the royal kraal of Chaka, and, having cured him of a wound and made him various presents, obtained a document, dated the 7th of August 1824, ceding to "F. G. Farewell & Company entire and full possession in perpetuity" of a tract of land including "the port or harbour of Natal." On the 27th of the same month Farewell hoisted the Union Jack at the port and declared the territory he had acquired a British possession. In 1825 he was joined by King, who had meantime visited England and had obtained from the government a letter of recommendation to Lord Charles Somerset, governor of the Cape, granting King permission to settle at Natal. Farewell, King and Fynn made independent settlements at various parts of the bay, where a few Amatuli still lingered. They lived, practically, as Kaffir chiefs, trading with Chaka and gathering round them many refugees from that monarch's tyranny. Early in 1828 King, accompanied by two of Chaka's indunas, voyaged in the "Elizabeth and Susan," a small schooner built by the settlers, to Port Elizabeth. He appears to have been coldly received by the authorities, who were even unable to ascertain the nature of Chaka's embassy. Soon after his return to Natal King died, and in the same month (September 1828) Chaka was murdered by his brother Dingaan. In the December following Farewell went in the "Elizabeth and Susan" to Port Elizabeth. On this occasion the authorities were more hostile than before to the Natal pioneers, for they confiscated the schooner on the ground that it was unregistered and that it came from a foreign port. Farewell was not daunted, and in September 1829 set out to return overland to Port Natal. He was, however, murdered in Pondoland by a chief who was at enmity with the Zulus. Fynn thus became leader of the whites at the port, who were much at the mercy of Dingaan. In 1831 that chief raided their settlements, the whites all fleeing south of the Umzimkulu; but at Dingaan's invitation they soon returned. Dingaan declared Fynn his representative and "great chief of the Natal Kaffirs." In 1834, however, Fynn accepted a post under the Cape government and did not return to Natal for many years. It was in this year that a petition from Cape Town merchants asking for the creation of a British colony at Natal was met by the statement that the Cape finances would not permit the establishment of a new dependency. The merchants, however, despatched an expedition under Dr Andrew Smith to inquire into the possibilities of the country, and the favourable nature of his report induced a party of Dutch farmers under Piet Uys to go thither also. Both Dr Smith and Uys travelled overland through Kaffraria, and were well received by the English living at the bay. The next step was taken by the settlers at the port, who in 1835 resolved to lay out a town, which they named Durban, after Sir Benjamin d'Urban, then governor of Cape Colony. At the same time the settlers, who numbered about 50, sent a memorial to the governor calling attention to the fact that they were acknowledged rulers over a large tract of territory south of the Tugela, and asking that this territory should be proclaimed a British colony under the name of Victoria and that a governor and council be appointed. To all these requests no official answer was returned. The settlers had been joined in the year named (1835) by Captain Gardiner, a naval officer, whose chief object was the evangelization of the natives. With the support of the traders he founded a mission station on the hill overlooking the bay. In 1837 Gardiner was given authority by the British government to exercise jurisdiction over the traders. They, however, refused to acknowledge Gardiner's authority, and from the Cape government he received no support.[1] It was not until their hand was forced by the occupation of the interior by Dutch farmers that the Cape authorities at length intervened.

Arrival of the Dutch voortrekkers.

The British settlers had, characteristically, reached Natal mainly by way of the sea; the new tide of immigration was by land—the *voortrekkers* streamed through the passes of the Drakensberg, bringing with them their wives and children and vast herds of cattle. The reasons which caused the exodus from the Cape are discussed elsewhere (see SOUTH AFRICA and CAPE COLONY), here it is only necessary to point out that those emigrants who entered Natal shared with those who settled elsewhere an intense desire to be free from British control. The first emigrant Boers to enter the country were led by Pieter Retief (*c.* 1780–1838), a man of Huguenot descent and of marked ability, who had formerly lived on the eastern frontier of Cape Colony and had suffered severely in the Kaffir wars. Passing through the almost deserted upper regions Retief arrived at the bay in October 1837. He went thence to Dingaan's kraal with the object of securing a formal cession of territory to the Dutch farmers. Dingaan consented on condition that the Boers recovered for him certain cattle stolen by another chief; this task Retief accomplished, and with the help of the Rev. F. Owen, a missionary then living at Dingaan's kraal, a deed of cession was drawn up in English and signed by Dingaan and Retief on the 4th of February 1838. Two days after the signature of the deed Retief and all of his party, 66 whites, besides Hottentot servants, were treacherously murdered by Dingaan's orders. The Zulu king then commanded his impis to kill all the Boers who had entered Natal. The Zulu forces crossed the Tugela the same day, and the most advanced parties of the Boers were massacred, many at a spot near where the town of Weenen now stands, its name (meaning wailing or weeping) commemorating the event. Other of the farmers hastily laagered and were able to repulse the Zulu attacks; the assailants suffering serious loss at a fight near the Bushman's river. Nevertheless in one week after the murder of Retief 600 Boers—men, women and children—had been killed by the Zulus. The English settlers at the bay, hearing of the attack on the Boers, determined to make a diversion in their favour, and some 20 men under the command of R. Biggar and with a following of 700 friendly Zulus crossed the Tugela near its mouth. In a desperate fight (April 17) with a strong force of the enemy the English were overwhelmed and only four Europeans escaped to the bay. Pursued by the Zulus, all the surviving inhabitants of Durban were compelled for a time to take refuge on a ship then in harbour. After the Zulus retired, less than a dozen Englishmen returned to live at the port; the missionaries, hunters and other traders returned to the Cape. Meantime the Boers, who had repelled the Zulu attacks on their laagers, had been joined by others from the Drakensberg, and about 400 men under Hendrik Potgieter and Piet Uys advanced to attack Dingaan. On the 11th of April, however, they fell into a trap laid by the Zulus and with difficulty cut their way out. Among those slain were Piet Uys and his son Dirk, aged 15, who rode by his side. The Boer farmers were now in a miserable plight, but towards the end of the year they received reinforcements, and in December 460 men set out under Andries Pretorius to avenge themselves on the Zulus. On Sunday the 16th of December, while laagered near the Umslatos river, they were attacked by over 10,000 Zulus. The Boers had firearms, the Zulus their assegais only, and after a three hours' fight the Zulus were totally defeated, losing thousands killed, while the farmers' casualties were under a dozen. (This memorable victory is annually commemorated by the Boers as Dingaan's Day, while the Umslatos, which ran red with the blood of the slain, was renamed Blood river.) Dingaan fled, the victorious Boers entered the royal kraal, gave decent burial to the skeletons of Retief and his party, and regarded themselves as now undisputed masters of Natal. They had recovered from a leather pouch which Retief carried the deed by which Dingaan ceded " to Retief and his countrymen the place called Port Natal together with all the lands annexed . . . as far as the land may be useful and in my possession." This was the 5th or 6th cession made by Chaka or Dingaan of the same territory to different individuals. In every case the overlordship of the Zulus was assumed.

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[1] Captain Allen Francis Gardiner (1794–1851) left Natal in 1838, subsequently devoting himself to missionary work in South America, being known as the missionary to Patagonia. He died of starvation in Tierra del Fuego.

Returning south, Pretorius and his commando were surprised to learn that Port Natal had been occupied on the 4th of December by a detachment of the 72nd Highlanders sent thither from the Cape. The emigrant farmers had, with the assent of the few remaining Englishmen at Port Natal, in May 1838 issued a proclamation taking possession of the port. This had been followed by an intimation from the governor of the Cape (Major-General Sir George Napier) inviting the emigrants to return to the colony, and stating that whenever he thought it desirable he should take military possession of the port. In sanctioning the occupation of the port the British government of the day had no intention of making Natal a British colony, but wished to prevent the Boers establishing an independent republic upon the coast with a harbour through which access to the interior could be gained. After remaining at the port just over a year the Highlanders were withdrawn, on Christmas Eve 1839. Meantime the Boers had founded Pietermaritzburg and made it the seat of their volksraad. They rendered their power in Natal absolute, for the time, in the following month, when they joined with Panda, Dingaan's brother, in another attack on the Zulu king. Dingaan was utterly defeated and soon afterwards perished, Panda becoming king in his stead by favour of the Boers.

At this time, had the affairs of the Boer community been managed with prudence and sagacity they might have established an enduring state. But their impatience of control, reflected in the form of government adopted, led to disastrous consequences. Legislative power was vested, nominally, in the volksraad (consisting of twenty-four members), while the president and executive were changed every three months. But whenever any measure of importance was to be decided a meeting was called of *het publiek*, that is, of all who chose to attend, to sanction or reject it. " The result," says Theal, " was utter anarchy. Decisions of one day were frequently reversed the next, and every one held himself free to disobey any law that he did not approve of. . . . Public opinion of the hour in each section of the community was the only force in the land" (*History of South Africa 1834–1854*, chap. xliv.). While such was the domestic state of affairs during the period of self-government, the settlers cherished large territorial views. They were in loose alliance with and in quasi-supremacy over the Boer communities which had left the Cape and settled at Winburg and at Potchefstroom. They had declared themselves a free and independent state under the title of " The Republic of Port Natal and adjacent countries,"[1] and sought (September 1840) from Sir George Napier at the Cape an acknowledgment of their independence by Great Britain. Sir George, being without definite instructions from England, could give no decisive answer, but he was friendly disposed to the Natal farmers. This feeling was, however, changed by what Sir George (and many of the Dutch in Natal also) thought a wilful and unjustifiable attack (December 1840) on a tribe of Kaffirs on the southern, or Cape Colony, frontier by a commando under Andries Pretorius, which set out, nominally, to recover stolen cattle. Having at length received an intimation from London that the queen " could not acknowledge the independence of her own subjects, but that the trade of the emigrant farmers would be placed on the same footing as that of any other British settlement, upon their receiving a military force to exclude the interference with or possession of the country by any other European power," Sir George communicated this decision to the volksraad in September 1841. Under the arrangement proposed the Boers might easily have secured the benefits of self-government, subject to an acknowledgment of British supremacy, together with the advantage of military protection, for the British government was then extremely reluctant to extend its colonial responsibilities. The Boers, however, strongly resented the contention of the British that they could not shake off British nationality though beyond the bounds of any recognized British possession, nor were they prepared to see their only port garrisoned by British troops, and they rejected Napier's overtures. Napier, therefore, on the 2nd of December 1841, issued a proclamation in which he stated that in consequence of the emigrant farmers refusing to be treated as British subjects and of their attitude towards the Kaffir tribes he intended resuming military occupation of Port Natal. This proclamation was answered in a lengthy minute, dated the 21st of February 1842, drawn up by J. N. Boshof (afterwards president of the Orange Free State), by far the ablest of the Dutch who had settled in Natal. In this minute the farmers ascribed all their troubles to one cause, namely, the absence of a representative government, which had been repeatedly asked for by them while still living in Cape Colony and as often denied or delayed, and concluded by a protest against the occupation of any part of their territory by British troops. An incident which happened immediately after these events greatly encouraged the Boers to persist in their opposition to Great Britain. In March 1842 a Dutch vessel sent out by G. G. Ohrig, an Amsterdam merchant who sympathized warmly with the cause of the emigrant farmers, reached port Natal, and its supercargo, J. A. Smellekamp (a man who subsequently played a part in the early history of the Transvaal and Orange Free State), concluded a treaty with the volksraad assuring them of the protection of Holland. The Natal Boers believed the Netherlands to be one of the great powers of Europe, and were firmly persuaded that its government would aid them in resisting England.

British and Dutch in conflict.

On the 1st of April Captain T. C. Smith with a force of 263 men left his camp at the Umgazi, on the eastern frontier of Cape Colony, and marching overland reached Durban without opposition, and encamped, on the 4th of May, at the base of the Berea hills. The Boers, cut off from their port, called out a commando of some 300 to 400 men under Andries Pretorius and gathered at Congella at the head of the bay. On the night of the 23rd of May Smith made an unsuccessful attack on the Boer camp, losing his guns and fifty men killed and wounded. On the 26th the Boers captured the harbour and settlement, and on the 31st blockaded the British camp, the women and children being removed, on the suggestion of Pretorius, to a ship in the harbour of which the Boers had taken possession. Meantime, an old Durban resident, Richard (commonly called Dick) King, had undertaken to convey tidings of the perilous position of the British force to the commandant at Graham's Town. He started on the night of the 24th, and escaping the Boer outposts rode through the dense bush and across the bridgeless rivers of Kaffraria at peril of his life from hostile natives and wild beasts, and in nine days reached his destination—a distance of 360 m. in a direct line, and nearly 600 by the route to be followed. This remarkable ride was accomplished with one change of mount, obtained from a missionary in Pondoland. A comparatively strong force under Colonel A. J. Cloete was at once sent by sea to Port Natal, and on the 26th of June Captain Smith was relieved. The besieged had suffered greatly from lack of food. Within a fortnight Colonel Cloete had received the submission of the volksraad at Pietermaritzburg. The burghers represented that they were under the protection of Holland, but this plea was peremptorily rejected by the commander of the British forces.

The British government was still undecided as to its policy towards Natal. In April 1842 Lord Stanley (afterwards 14th earl of Derby), then secretary for the colonies in the second Peel Administration, wrote to Sir George Napier that the establishment of a colony in Natal would be attended with little prospect of advantage, but at the same time stated that the pretensions of the emigrants to be regarded as an independent community could not be admitted. Various measures were proposed which would but have aggravated the situation. Finally, in deference to the strongly urged views of Sir George Napier, Lord Stanley, in a despatch of the 13th of December, received in Cape Town on the 23rd of April 1843, consented to Natal becoming a British colony. The institutions adopted were to be as far as possible in accordance with the wishes of the people, but it was a fundamental condition "that there should not be in the eye of the law any distinction or disqualification whatever, founded on mere difference of colour, origin, language or creed." Sir George then appointed Mr Henry Cloete (a brother of Colonel Cloete) a special commissioner to explain to the Natal volksraad the decision of the government. There was a considerable party of Natal Boers still strongly opposed to the British, and they were reinforced by numerous bands of Boers who came over the Drakensberg from Winburg and Potchefstroom. Commandant Jan Mocke of Winburg (who had helped to besiege Captain Smith at Durban) and others of the "war party" attempted to induce the volksraad not to submit, and a plan was formed to murder Pretorius, Boshof and other leaders, who were now convinced that the only chance of ending the state of complete anarchy into which the country had fallen was by accepting British sovereignty. In these circumstances the task of Mr Henry Cloete was one of great difficulty and delicacy. He behaved with the utmost tact and got rid of the Winburg and Potchefstroom burghers by declaring that he should recommend the Drakensberg as the northern limit of Natal. On the 8th of August 1843 the Natal volksraad unanimously agreed to the terms proposed by Lord Stanley. Many of the Boers who would not acknowledge British rule trekked once more over the mountains into what are now the Orange Free State and Transvaal provinces. At the end of 1843 there were not more than 500 Dutch families left in Natal. Cloete, before returning to the Cape, visited Panda and obtained from him a valuable concession. Hitherto the Tugela from source to mouth had been the recognized frontier between Natal and Zululand. Panda gave up to Natal all the territory between the Buffalo and Tugela rivers, now forming Klip River county.

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[1] Commonly called the Republic of Natalia or Natal.

Natal annexed by Great Britain.

Although proclaimed a British colony in 1843, and in 1844 declared a part of Cape Colony, it was not until the end of 1845 that an effective administration was installed with Mr Martin West as lieutenant-governor, and the power of the volksraad finally came to an end. In that year the external trade of Natal, almost entirely with Cape Colony, was of the total value of £42,000—of which £32,000 represented imported goods.

The new administration found it hard to please the Dutch farmers, who among other grievances resented what they considered the undue favour shown to the Kaffirs, whose numbers had been greatly augmented by the flight of refugees from Panda. In 1843, for instance, no fewer than 50,000 Zulus crossed the Tugela seeking the protection of the white man. The natives were settled in 1846 in specially selected locations and placed under the general supervision of Sir (then Mr) Theophilus Shepstone (*q.v.*). Sir Harry Smith, newly appointed governor of the Cape, met, on the banks of the upper Tugela, a body of farmers preparing to recross the Drakensberg, and by remedying their grievances induced many of them to remain in Natal. Andries Pretorius and others, however, declined to remain, and from this time Pretorius (*q.v.*) ceased his connexion with Natal. Although by this migration the white population was again considerably reduced, those who remained were contented and loyal, and through the arrival of 4500 emigrants from England in the years 1848–1851 and by subsequent immigration from oversea the colony became overwhelmingly British in character. From the time of the coming of the first considerable body of British settlers dates the development of trade and agriculture in the colony, followed somewhat later by the exploitation of the mineral resources of the country. At the same time schools were established and various churches began or increased their work in the colony. Dr Colenso, appointed bishop of Natal, arrived in 1854. In 1856 the dependence of the country on Cape Colony was put to an end and Natal constituted a distinct colony with a legislative council of sixteen members, twelve elected by the inhabitants and four nominated by the crown. At the time the white population exceeded 8000. While dependent on the Cape, ordinances had been passed establishing Roman-Dutch law as the law of Natal, and save where modified by legislation it remained in force.

Indian coolies introduced.

The British settlers soon realized that the coast lands were suited to the cultivation of tropical or semi-tropical products, and from 1852 onward sugar, coffee, cotton and arrow-root were introduced, tea being afterwards substituted for coffee. The sugar industry soon became of importance, and the planters were compelled to seek for large numbers of labourers. The natives, at ease in their locations, did not volunteer in sufficient numbers, and recourse was had to coolie labour from India. The first coolies reached Natal in 1860. They came under indentures, but at the expiration of their contract were allowed to settle in the colony.[1] This proved one of the most momentous steps taken in the history of South Africa, for the Indian population rapidly increased, the "free" Indians becoming market gardeners, farmers, hawkers, traders, and in time serious competitors with the whites. But in 1860 and for many years afterwards these consequences were not foreseen, and alone among the South Africa states Natal offered a welcome to Asiatics.

The Keate awards.

In 1866 the borders of the colony were extended on the south-west by the annexation of part of Kaffraria that had formerly been under the sway of the Pondo chief Faku, who found himself unable to maintain his authority in a region occupied by many diverse tribes. The newly acquired territory was named Alfred county in memory of a visit paid to Natal by Prince Alfred (afterwards duke of Saxe-Coburg-Gotha). In 1867 R. W. Keate (1814–1873) became lieutenant-governor, a post which he filled until 1872. His administration is notable, not so much for internal affairs but from the fact that he twice acted as arbitrator in disputes in which the Boer states were involved. In a dispute between the Transvaal and the Orange Free State he decided (February 1870) that the Klip river and not the upper Vaal was the frontier stream. A more famous decision, that known as the Keate Award, was given in October 1871. It concerned the south-western frontiers of the Transvaal, and the award, which was against the Transvaal pretensions, had important effects on the history of South Africa (see TRANSVAAL and SOUTH AFRICA).

During all this time little was done to alter the condition of the natives. There was scarcely an attempt to copy the policy, deliberately adopted in Cape Colony, of educating and civilizing the black man. Neither was Natal faced with the Cape problem of a large half-caste population. The Natal natives were left very much in the state in which they were before the advent of the white men. While this opportunity of educating and training a docile people was in the main neglected, savage abuse of power by their chiefs was prevented. Under the superintendence of Shepstone the original refugees were quiet and contented, enjoying security from injustice and considerable freedom. This ideal lot, from the native point of view, drew such numbers of immigrants from disturbed districts that with the natural increase of population in thirty years the native inhabitants increased from about 100,000 to fully 350,000. New generations grew up almost as ignorant as their fathers, but not with the same sense of dependence upon the white men. In this way was sown the seed of future trouble between the two races. The first serious collision between the natives and the government occurred in 1873. The Amahlubi, one of the highest in rank of the Bantu tribes of South Africa, fleeing from the cruelties of

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[1] Between 1860 and 1866 some 5000 Indians entered the colony. Immigration then ceased, and was not resumed until 1874. By that year the natives from Portuguese territory and elsewhere who had found employment in Natal had been attracted to the Kimberley diamond mines, and the Natal natives not coming forward (save under compulsion), the importation of Indian coolies was again permitted (see the Natal Blue Book, *Report of the Indian Immigration Commission, 1909*).

Langalibalele's rebellion.

Panda, had been located by the Natal government under their chief Langalibalele (*i.e.* the great sun which shines and burns) in 1848 at the foot of the Drakensberg with the object of preventing the Bushmen who dwelt in the mountains plundering the upland farmers. Here the Amahlubi prospered, and after the diamond fields had been discovered many of the young men who had been to Kimberley brought back firearms. These Langalibalele refused to register, and entered into negotiations with several tribes with the object of organizing a general revolt. Prompt action by Sir Benjamin Pine, then lieutenant-governor of the colony, together with help from the Cape and Basutoland, prevented the success of Langalibalele's plan, and his own tribe, numbering some 10,000 persons, was the only one which rebelled. The chief was captured, and exiled to Cape Colony (August 1874). Permitted to return to Natal in 1886, he died in 1889.

This rebellion drew the attention of the home government to the native question in Natal. The colonists, if mistaken in their general policy of leaving the natives in a condition of mitigated barbarism, had behaved towards them with uniform kindness and justice. They showed indeed in their dealings both with the natives within their borders and with the Zulus beyond the Tugela a disposition to favour the natives at the expense of their white neighbours in the Transvaal and Orange Free State, and their action against Langalibalele was fully justified and the danger of a widespread native revolt real. But there were those, including Bishop Colenso, who thought the treatment of the Amahlubi wrong, and their agitation induced the British government to recall Sir Benjamin Pine, Sir Garnet Wolseley being sent out as temporary governor. Sir Garnet reported the natives as "happy and prosperous—well off in every sense." As a result of consultations with Shepstone certain modifications were made in native policy, chiefly in the direction of more European supervision.

The Colenso affair.

Meantime the colony had weathered a severe commercial crisis brought on in 1865 through over-speculation and the neglect of agriculture, save along the coast belt. But the trade over berg largely developed on the discovery of the Kimberley diamond mines, and the progress of the country was greatly promoted by the substitution of the railway for the ox wagon as a means of transport. There already existed a short line from the Point at Durban to the Umgeni, and on the 1st of January 1876 Sir Henry Bulwer, who had succeeded Wolseley as governor, turned the first sod of a new state-owned railway which was completed as far as Maritzburg in 1880. At this date the white inhabitants numbered about 20,000. But besides a commercial crisis the colony had been the scene of an ecclesiastical dispute which attracted widespread attention. Bishop Colenso (*q.v.*), condemned in 1863 on a charge of heresy, ignored the authority of the court of South African bishops and was maintained in his position by decision of the Privy Council in England. This led to a division among the Anglican community in the colony and the consecration in 1869 of a rival bishop, who took the title of bishop of Maritzburg. Colenso's bold advocacy of the cause of the natives—which he maintained with vigour until his death (in 1883)—attracted almost equal attention. His native name was Usobantu (*father of the people*).

For some years Natal, in common with the other countries of South Africa, had suffered from the absence of anything resembling a strong government among the Boers of the Transvaal, neighbours of Natal on the north. The annexation of the Transvaal to Great Britain, effected by Sir Theophilus Shepstone in April 1877, would, it was hoped, put a period to the disorders in that country. But the new administration at Pretoria inherited many disputes with the Zulus, disputes which were in large measure the cause of the war of 1879. For years the Zulus had lived at amity with the Natalians, from whom they received substantial favours, and in 1872 Cetywayo (*q.v.*), on succeeding his father Panda, had given assurances of good behaviour. These promises were not kept for long, and by 1878 his attitude had become so hostile towards both the Natal and Transvaal governments that Sir Bartle Frere, then High Commissioner for South Africa, determined on his reduction. During the war (see ZULULAND) Natal was used as the British base, and the Natal volunteers rendered valuable service in the campaign, which, after opening with disasters to the British forces, ended in the breaking of the Zulu power. (F. R. C.)

Natal and the war of 1880-81.

Scarcely had the colony recovered from the shock of the Zulu War than it was involved in the revolt of the Transvaal Boers (1880–1881), an event which overshadowed all domestic concerns. The Natalians were intensely British in sentiment, and resented deeply the policy adopted by the Gladstone administration. At Ingogo, Majuba and Laing's Nek, all of them situated within the colony, British forces had been defeated by the Boers. And the treaty of retrocession was never regarded in Natal as anything but a surrender. It was clearly understood that the Boers would aim to establish a republican government over the whole of South Africa, and that the terms of peace simply meant greater bloodshed at no distant date. The protest made by the Natalians against the settlement was in vain. The Transvaal Republic was established, but the prediction of the colonists, ignored at the time, was afterwards fulfilled to the letter. In justice, however, to the colonists of Natal it must be recorded that, finding their protest with regard to the Transvaal settlement useless, they made up their minds to shape their policy in conformity with that settlement. But it was not long before their worst fears with regard to the Boers began to be realized, and their patience was once more severely taxed. The Zulu power, as has been recorded, was broken in 1879. After the war quarrels arose among the petty chiefs set up by Sir Garnet Wolseley, and in 1883 some Transvaal Boers intervened, and subsequently, as a reward for the assistance they had rendered to one of the combatants, demanded and annexed 8000 sq. m. of country, which they styled the "New Republic." As the London Convention had stipulated that there should be no trespassing on the part of the Boers over their specified boundaries, and as Natal had been the basis for those operations against the Zulus on the part of the British in 1879, which alone made such an annexation of territory possible, a strong feeling was once more aroused in Natal. The "New Republic," reduced in area, however, to less than 2000 sq. m., was nevertheless recognized by the British government in 1886, and in 1888 its consent was given to the territory (the Vryheid district) being incorporated with the Transvaal. Meantime, in 1887, the remainder of Zululand had been annexed to Great Britain (see ZULULAND).

In 1884 the discovery of gold in De Kaap Valley, and on Mr Moodie's farm in the Transvaal, caused a considerable rush of colonists from Natal to that country. Railways were still far from the Transvaal border, and Natal not only sent her own colonists to the new fields, but also offered the nearest route for prospectors from Cape Colony or from Europe. Durban was soon thronged; and Pietermaritzburg, which was then practically the terminus of the Natal railway, was the base from which nearly all the expeditions to the goldfields were fitted out. The journey to De Kaap by bullock-waggon occupied about six weeks. "Kurveying" (the conducting of transport by bullock-waggon) in itself constituted a great industry. Two years later, in 1886, the Rand goldfields were proclaimed, and the tide of trade which had already set in with the Transvaal steadily increased. Natal colonists were not merely the first in the field with the transport traffic to the new goldfields; they became some of the earliest proprietors of mines, and for several years many of the largest mining companies had their chief offices at Pietermaritzburg or Durban. In this year (1886) the railway reached Ladysmith, and in 1891 it was completed to the Transvaal frontier at Charlestown, the section from Ladysmith northward opening up the Dundee and Newcastle coalfields. Thus a new industry was added to the resources of the colony.

Growth of industries.

The demand which the growing trade made upon the one port of Natal, Durban, encouraged the colonists to redouble their efforts to improve their harbour. The question of a fairway from ocean to harbour has been a difficult one at nearly every port on the African coast. A heavy sea from the Indian Ocean is always breaking on the shore, even in the finest weather, and at the mouth of every natural harbour a bar occurs. To deepen the channel over the bar at Durban so that steamers might enter the harbour was the cause of labour and expenditure for many years. Harbour works were begun in 1857, piers and jetties were constructed, dredgers imported, and controversy raged over the various schemes for harbour improvement. In 1881 a harbour board was formed under the chairmanship of Mr Harry Escombe. It controlled the operations for improving the sea entrance until 1893, when on the establishment of responsible government it was abolished. The work of improving the harbour was however continued with vigour, and finally, in 1904, such success was achieved that vessels of the largest class were enabled to enter port (see DURBAN). At the same time the railway system was continually developing.

Self-government granted.

For many years there had been an agitation among the colonists for self-government. In 1882 the colony was offered self-government coupled with the obligations of self-defence. The offer was declined, but in 1883 the legislative council was remodelled so as to consist of 23 elected and 7 nominated members. In 1890 the elections to the council led to the return of a majority in favour of accepting self-government, and in 1893 a bill in favour of the proposed change was passed and received the sanction of the Imperial government. At the time the white inhabitants numbered about 50,000. The electoral law was framed to prevent more than a very few natives obtaining the franchise. Restrictions in this direction dated as far back as 1865, while in 1896 an act was passed aimed at the exclusion of Indians from the suffrage. The leader of the party which sought responsible government was Sir John Robinson (1839–1903) who had gone to Natal in 1850, was a leading journalist in the colony, had been a member of the legislative council since 1863, and had filled various official positions. He now became the first premier and colonial secretary with Mr Harry Escombe (*q.v.*) as attorney-general and Mr F. R. Moor as secretary for Native Affairs. The year that witnessed this change in the constitution was also notable for the death of Sir Theophilus Shepstone, Natal's most prominent citizen. In the same year Sir Walter Hely-Hutchinson became governor. His immediate predecessors had been Sir Charles Mitchell (1889–1893) and Sir Arthur Havelock (1886–1889). Sir John Robinson remained premier until 1897, a year marked by the annexation of Zululand to Natal. In the following year Natal entered the Customs Union already existing between Cape Colony and the Orange Free State. Sir John Robinson had been succeeded as premier by Mr Harry Escombe (February-October 1897) and Escombe by Sir Henry Binns, on whose death in June 1899 Lieut.-Colonel (afterwards Sir) Albert Hime formed a ministry which remained in office until after the conclusion of the Anglo-Boer War. Meantime (in 1901) Sir Henry McCallum had succeeded Sir Walter Hely-Hutchinson as governor.

The war of 1899-1902.

For some years Natal had watched with anxiety the attitude of increasing hostility towards the British adopted by the Pretoria administration, and, with bitter remembrance of the events of 1881, gauged with accuracy the intentions of the Boers. So suspicious had the ministry become of the nature of the military preparations that were being made by the Boers, that in May 1899 they communicated their apprehensions to the High Commissioner, Sir Alfred Milner, who telegraphed on the 25th of May to Mr Chamberlain, informing him that Natal was uneasy. The governor expressed his views to the prime minister that the Natal government ought to give the British government every support, and Colonel Hime replied that their support would be given, but at the same time he feared the consequences to Natal if, after all, the British government should draw back. In July the Natal ministry learnt that it was not the intention of the Imperial government to endeavour to hold the frontier in case hostilities arose, but that a line of defence considerably south of the frontier would be taken up. This led to a request on their part that if the Imperial government had any reason to anticipate the breakdown of negotiations, "such steps may be at once taken as may be necessary for the effectual defence of the whole colony." Sir William Penn Symons, the general commanding the British forces in Natal in September, decided to hold Glencoe. On the arrival of Lieut.-General Sir George White from India, he informed the governor that he considered it dangerous to attempt to hold Glencoe, and urged the advisability of withdrawing the troops to Ladysmith. The governor was strongly opposed to this step, as he was anxious to protect the coal supply, and also feared the moral effect of a withdrawal. Eventually Sir Archibald Hunter, then chief of staff to Sir Redvers Buller, was consulted, and stated that in his opinion, Glencoe being already occupied, "it was a case of balancing drawbacks, and advised that, under the circumstances, the troops be retained at Glencoe." This course was then adopted.

On the 11th of October 1899 war broke out. The first act was the seizure by the Boers of a Natal train on the Free State border. On the 12th Laing's Nek was occupied by the Boer forces, who were moved in considerable force over the Natal border. Newcastle was next occupied by the Boers unopposed, and on the 20th of October occurred the battle of Talana Hill outside Dundee. In this engagement the advanced body of British troops, 3000 strong, under Symons, held a camp called Craigside which lay between Glencoe and Dundee, and from this position General Symons hoped to be able to hold the northern portion of Natal. There is no doubt that this policy strongly commended itself to the governor and ministers of Natal, and that they exercised considerable pressure to have it adopted. But from a military point of view it was not at all cordially approved by Sir George White, and it was afterwards condemned by Lord Roberts. Fortunately Symons was able to win a complete victory over one of the Boer columns at Talana Hill. He himself received a mortal wound in the action. Brigadier-General Yule then took command, and an overwhelming force of Boers rendering the further occupation of Dundee dangerous, he decided to retire his force to Ladysmith. On the 21st of October General Sir George White and General (Sir John) French defeated at Elandslaagte a strong force of Boers, who threatened to cut off General Yule's retreat. He again attacked the Boer forces at Rietfontein on the 24th of October, and on the 26th General Yule reached Ladysmith in safety. Ladysmith now became for a time the centre of military interest. The Boers gradually surrounded the town and cut off the communications from the south. Various engagements were fought in the attempt to prevent this movement, including the actions of Farquhar's Farm and Nicholson's Nek on the 30th (see TRANSVAAL). The investment of Ladysmith continued till the 28th of February 1900, when, after various attempts to relieve the beleaguered garrison, Sir Redvers Buller's forces at last entered the town. During the six weeks previous to the relief, 200 deaths had occurred from disease alone, and altogether as many as 8424 were reported to have passed through the hospitals. The relief of Ladysmith soon led to the evacuation of Natal by the Boer forces, who trekked northwards.

During the Boer invasion the government and the loyal colonists, constituting the great majority of the inhabitants of the colony, rendered the Imperial forces every assistance. A comparatively small number of the Dutch colonists joined the enemy, but there was no general rebellion among them. As the war progressed the Natal volunteers and other Natal forces took a prominent part. The Imperial Light Horse and other irregular corps were recruited in Natal, although the bulk of the men in the forces were Uitlanders from Johannesburg. As the nearest colony to the Transvaal, Natal was resorted to by a large number of men, women and children, who were compelled to leave the Transvaal on the outbreak of the war. Refugee and Uitlander committees were formed both at Durban and Maritzburg, and, in conjunction with the colonists, they did all in their power to assist in recruiting irregular corps, and also in furnishing relief to the sick and needy.

As one result of the war, an addition was made to the territory comprised in Natal, consisting of a portion of what had previously been included in the Transvaal. The Natal government originally made two proposals for annexing new territory:—

1. It was proposed that the following districts should be transferred to Natal, viz. the district of Vryheid, the district of Utrecht and such portion of the district of Wakkerstroom as was comprised by a line drawn from the north-eastern corner of Natal, east by Volksrust in a northerly direction to the summit of the Drakensberg Range, along that range, passing just north of the town of Wakkerstroom, to the head waters of the Pongola river, and thence following the Pongola river to the border of the Utrecht district. In consideration of the advantage to Natal from this addition of territory, Natal should take over £700,000 of the Transvaal debt.

Annexations to the northern territories.

2. It was proposed to include in Natal such portions of the Harrismith and Vrede districts as were comprised by a line following the Elands river north from its source on the Basutoland border to its junction with the Wilge river, and thence drawn straight to the point where the boundaries of Natal, the Transvaal and the Orange River Colony meet on the Drakensberg. In consideration of this addition to her territory, Natal should take over a portion of the Orange River Colony debt, to be raised at the end of the war, to the amount of £200,000.

The Imperial government decided to sanction only the first of these two proposals. For this course there were many reasons, the Transvaal territory annexed, or the greater part of it (the Vryheid district), having been only separated from the rest of Zululand in 1883 by a raid of armed Boers. "In handing over this district to the administration which controls the rest of Zululand, His Majesty's government," wrote Mr Chamberlain, under date March 1902, "feel that they are reuniting what ought never to have been separated."

With regard, however, to the proposed transfer of territory from the Orange River Colony, the circumstances were different. "There is," said Mr Chamberlain, "no such historical reason as exists in the case of Vryheid for making the transfer. On the contrary, the districts in question have invariably formed part of the state from which it is now proposed to sever them, and they are separated from Natal by mountains which form a well-defined natural boundary. In these circumstances, His Majesty's government have decided to confine the territory to be transferred to the districts in the Transvaal."

The districts added to Natal contained about 6000 white inhabitants (mostly Dutch), and some 92,000 natives, and had an area of nearly 7000 sq. m., so that this annexation meant an addition to the white population of Natal of about one-tenth, to her native population of about one-tenth also, and to her territory of about one-fourth. An act authorizing the annexation was passed during 1902 and the territories were formally transferred to Natal in January 1903. (A. P. H.; F. R. C.)

Commercial depression and native rebellion.

The period following the war was succeeded by commercial depression, though in Natal it was not so severely felt as in other states of South Africa. The government met the crisis by renewed energy in harbour works, railway constructions and the development of the natural resources of the country. A railway to the Zululand coalfields was completed in 1903, and in the same year a line was opened to Vryheid in the newly annexed territories. Natal further built several railway lines in the eastern half of the Orange River Colony, thus opening up new markets for her produce and facilitating her transit trade. Mr Chamberlain on his visit to South Africa came first to Natal, where he landed in the last days of 1902, and conferred with the leading colonists. In August 1903 the Hime ministry resigned and was succeeded by a cabinet under the premiership of Mr (afterwards Sir) George Sutton, the founder of the wattle industry in Natal and one of the pioneers in the coal-mining industry. In May 1905 Sir George Sutton was replaced by a coalition ministry under Mr C. J. Smythe, who had been colonial secretary under Sir Albert Hime. These somewhat frequent changes of ministry, characteristic of a country new to responsible government, reflected, chiefly, differences concerning the treatment of commercial questions and the policy to be adopted towards the natives. Towards those Dutch colonists who had joined the enemy during the war leniency was shown, all rebels being pardoned.

Conflict with the home government.

The attitude of the natives both in Natal proper and in Zululand caused much disquiet. As early as July 1903 rumours were current that Dinizulu (a son of Cetywayo) was disaffected and the power he exercised as representative of the former royal house rendered his attitude a matter of great moment. Dinizulu, however, remained at the time quiescent, though the Zulus were in a state of excitement over incidents connected with the war, when they had been subject to raids by Boer commandoes, and on one occasion at least had retaliated in characteristic Zulu fashion. Unrest was also manifested among the natives west of the Tugela, but it was not at first cause for alarm. The chief concern of the Natal government was to remodel their native policy where it proved inadequate, especially in view of the growth of the movement for the federation of the South African colonies. During 1903–1904 a Native Affairs' Commission, representative of all the states, obtained much evidence on the status and conditions of the natives. Its investigations pointed to the loosening of tribal ties and to the corresponding growth of a spirit of individual independence. Among its recommendations was the direct political representation of natives in the colonial legislatures on the New Zealand model, and the imposition of direct taxation upon natives, which should not be less than £1 a year payable by every adult male. The commission also called attention to the numerical insufficiency of magistrates and native commissioners in certain parts of Natal. With some of the recommendations the Natal commissioners disagreed; in 1905, however, an act was passed by the Natal legislature imposing a poll-tax of £1 on all males over 18 in the colony, except indentured Indians and natives paying hut-tax (which was 14s. a year). Every European was bound to pay the tax. In 1906 a serious rebellion broke out in the colony, attributable ostensibly to the poll-tax, and spread to Zululand. It was suppressed by the colonial forces under Colonel (afterwards Sir) Duncan McKenzie, aided by a detachment of Transvaal volunteers. An incident which marked the beginning of this rebellion brought the Natal ministry into sharp conflict with the Imperial government (the Campbell-Bannerman administration). Early in the year a farmer who had insisted that the Kaffirs on his farm should pay the poll-tax was murdered, and on the 8th of February some forty natives in the Richmond district forcibly resisted the collection of the tax and killed a sub-inspector of police and a trooper at Byrnetown. Two of the natives implicated were court-martialled and shot (February 15); others were subsequently arrested and tried by court martial. Nineteen were sentenced to death, but in the case of seven of the prisoners the sentence was commuted. On the day before that fixed for the execution Lord Elgin, then Secretary of State for the Colonies, intervened and directed the governor to postpone the execution of the sentence. Thereupon the Natal ministry resigned, giving as their reason the importance of maintaining the authority of the colonial administration at a critical period, and the constitutional question involved in the interference by the imperial authorities in the domestic affairs of a self-governing colony. The action of the British cabinet caused both astonishment and indignation throughout South Africa and in the other self-governing states of the empire. After a day's delay, during which Sir Henry McCallum reiterated his concurrence, already made known in London, in the justice of the sentence passed on the natives, Lord Elgin gave way (March 30). The Natal ministry thereupon remained in office. The guilty natives were shot on the 2nd of April.[1] It was at this time that Bambaata, a chief in the Greytown district who had been deposed for misconduct, kidnapped the regent appointed in his stead. He was pursued and escaped to Zululand, where he received considerable help. He was killed in battle in June, and by the close of July the rebellion was at an end. As has been stated, it was ostensibly attributable to the poll-tax, but the causes were more deep-seated. Though somewhat obscure they may be found in the growing sense of power and solidarity among all the Kaffir tribes of South Africa—a sense which gave force to the "Ethiopian movement," which, ecclesiastical in origin, was political in its development. There were moreover special local causes such as undoubted defects in the Natal administration.[1] Those Africans whose "nationalism" was greatest looked to Dinizulu as their leader, and he was accused by many colonists of having incited the rebellion. Dinizulu protested his loyalty to the British, nor was it likely that he viewed with approval the action of Bambaata, a comparatively unimportant and meddlesome chief. As time went on, however, the Natal government, alarmed at a series of murders of whites in Zululand and at the evidences of continued unrest among the natives, became convinced that Dinizulu was implicated in the rebellious movement. When a young man, in 1889, he had been convicted of high treason and had been exiled, but afterwards (in 1897) allowed to return. Now a force under Sir Duncan McKenzie entered Zululand. Thereupon Dinizulu surrendered (December 1907) without opposition, and was removed to Maritzburg. His trial was delayed until November 1908, and it was not until March 1909 that judgment was given, the court finding him guilty only on the minor charge of harbouring rebels. Meantime, in February 1908, the governor—Sir Matthew Nathan, who had succeeded Sir Henry McCallum in August 1907—had made a tour in Zululand, on which occasion some 1500 of the prisoners taken in the rebellion of 1906 were released.

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[1] Subsequently three other natives, after trial by the supreme court, were condemned and executed for their share in the Byrnetown murders.

Native Affairs' Commission.

The intercolonial commission had dealt with the native question as it affected South Africa as a whole; it was felt that a more local investigation was needed, and in August 1906 a strong commission was appointed to inquire into the condition of the Natal natives. The general election which was held in the following month turned on native policy and on the measures necessary to meet the commercial depression. The election, which witnessed the return of four Labour members, resulted in a ministerial majority of a somewhat heterogeneous character, and in November 1906 Mr Smythe resigned, being succeeded by Mr F. R. Moor, who in his election campaign had criticized the Smythe ministry for their financial proposals and for the "theatrical" manner in which they had conducted their conflict with the home government. Mr Moor remained premier until the office was abolished by the establishment of the Union of South Africa. In August 1907 the report of the Native Affairs' Commission was published. The commission declared that the chasm between the native and white races had been broadening for years and that the efforts of the administration—especially since the grant of responsible government—to reconcile the Kaffirs to the changed conditions of rule and policy and to convert them into an element of strength had been ineffective. It was not sufficient to secure them, as the government had done, peace and ample means of livelihood. The commission among other proposals for a more liberal and sympathetic native policy urged the creation of a native advisory Board entrusted with very wide powers. "Personal rule," they declared, "supplies the keynote of successful native control"—a statement amply borne out by the influence over the natives exercised by Sir T. Shepstone. The unrest in Zululand delayed action being taken on the commission's report. But in 1909 an act was passed which placed native affairs in the hands of four district commissioners, gave to the minister for native affairs direct executive authority and created a council for native affairs on which non-official members had seats. While the district commissioners were intended to keep in close touch with the natives, the council was to act as a "deliberative, consultative and advisory body."

Restrictions on Indians.

Concurrently with the efforts made to reorganize their native policy the colony also endeavoured to deal with the Asiatic question. The rapid growth of the Indian population from about 1890 caused much disquiet among the majority of the white inhabitants, who viewed with especial anxiety the activities of the "free," *i.e.* unindentured Indians. An act of 1895, which did not become effective until 1901, imposed an annual tax of £3 on time-expired Indians who remained in the colony and did not reindenture. In 1897 an Indian Immigration Restriction Act was passed with the object of protecting European traders; in 1903 another Immigration Restriction Act among other things, permitted the exclusion of all would-be immigrants unable to write in the characters of some European language. Under this act thousands of Asiatics were refused permission to land. In 1906 municipal disabilities were imposed upon Asiatics, and in 1907 a Dealers' Licences Act was passed with the object, and effect, of restricting the trading operations of Indians. In 1908 the government introduced a bill to provide for the cessation of Indian emigration at the end of three years; it was not proceeded with, but a strong commission was appointed to inquire into the whole subject. This commission reported in 1909, its general conclusion being that in the interests of Natal the importation of indentured Indian labour should not be discontinued. For sugar, tea and wattle growing, farming, coal-mining and other industries indentured Indian labour appeared to be essential. But the evidence was practically unanimous that the Indian was undesirable in Natal other than as a labourer and the commission recommended compulsory repatriation. While desirous that steps should be taken to prevent an increase in the number of free Asiatic colonists, the commission pointed out that there were in Natal over 60,000 "free" Indians whose rights could not be interfered with by legislation dealing with the further importation of coolies. But these Indians by reindenturing might come under the operation of the repatriation proposal. Nothing further was done in Natal up to the establishment of the Union of South Africa, when all questions specially or differentially affecting Asiatics were withdrawn from the competence of the provincial authorities.

The movement for union.

Not long after the conclusion of the war of 1899–1902 the close commercial relations between the Transvaal and Natal led to suggestions for a union of the two colonies, but these suggestions were not seriously entertained. The divergent interests of the various colonies threatened indeed a tariff and railway war when the Customs Convention (provisionally renewed in March 1906) should expire in 1908. But at the close of 1906 the Cape ministry formally reopened the question of federation, and at a railway conference held in Pretoria in May 1908 the Natal delegates agreed to a motion affirming the desirability of the early union of the self-governing colonies. The movement for union rapidly gained strength, and a National Convention to consider the matter met in Durban in October 1908. In Natal, especially among the older colonists, who feared that in a united South Africa Natal interests would be overborne, the proposals for union were met with suspicion and opposition, and the Natal ministry felt bound to submit the question to the people. A referendum act was passed in April 1909, and in June following the electors by 11,121 votes to 3701 decided to join the Union. (See South Africa.)

Natal was concerned not only with the political aspects of union, and with its natives and Indian problems, but had to safeguard its commercial interests and to deal with a revenue insufficient for its needs. In 1908 an Income Tax and a Land Tax Act was passed; the land tax being a halfpenny in the £ "on the aggregate unimproved value"—it brought in £30,000 in 1908–1909. Meantime it was agreed by the Cape, Transvaal and Natal governments that, subject to Natal entering the Union, its share of the Rand import trade should be 25% before and 30% after the establishment of the Union. Previously Natal had only 22½% of the traffic, and this agreement led to a revival in trade. Moreover, the development of its coal-mines and agriculture was vigorously prosecuted, and in 1910 it was found possible to abolish both the Income Tax and Land Tax and yet have a surplus in revenue. The closing months of Natal's existence as a separate colony thus found her peaceful and prosperous. The governor, Sir Matthew Nathan, had returned to England in December 1909, and Lord Methuen was governor from that time until the 31st of May 1910. On that date the Union of South Africa was established, Natal becoming one of the original provinces of the Union.

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[1] The causes, both local and general, are set forth in a despatch by the governor of the 21st of June 1906 and printed in the Blue Book, Cd. 3247.

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For detailed historical study consult G. M. Theal, *History of South Africa, 1834–1854* (London, 1893), with notes on early books on Natal. Among these the most valuable are: N. Isaacs, *Travels and Adventures in Eastern Africa . . . with a Sketch of Natal* (2 vols., London, 1836); H. Cloete, *Emigration of the Dutch Farmers from the Cape and their Settlement in Natal . . .* (Cape Town, 1856), reprinted as *The History of the Great Boer Trek* (London, 1899), an authoritative record; J. C. Chase, *Natal, a Reprint of all Authentic Notices*, &c. (Grahamstown, 1843); W. C. Holden, *History of the Colony of Natal* (London, 1855); J. Bird, *The Annals of Natal, 1495 to 1845* (2 vols., Maritzburg, 1888), a work of permanent value, consisting of official records, &c.; Shepstone, *Historic Sketch of Natal* (1864). See also *South Africa Handbooks*, useful reprints from the paper *South Africa* (London, N.D. [1900 et seq.]); Martineau's *Life of Sir Bartle Frere*, the *Autobiography of Sir Harry Smith*, and Sir J. Robinson's *A Lifetime in South Africa* (London, 1901); *George Linton, or the First Years of an English Colony* (London, 1876). Bishop A. H. Baynes's *Handbooks of English Church Expansion. South Africa* (London, N.D. [1908]) gives the story of the Colenso controversy and its results.

For further historical works and for information on flora, fauna, climate, law, church, &c. see the bibliography under South Africa. (See also Zululand: *Bibliography*.) (F. R. C.)

NATAL, a city and port of Brazil and capital of the state of Rio Grande do Norte, on the right bank of the Rio Potengy, or Rio Grande do Norte, about 2 m. above its mouth. Pop. of the municipality (1890) 13,725. Natal is the starting-point of the Natal and Nova Cruz railway, and is a port of call for coastwise steamers, which usually anchor outside the bar. It is a stagnant, poorly built town of one-storeyed houses and mud-walled cabins, with few public edifices and business houses of a better type. The only industry of note is the manufacture of cotton. The exports are chiefly sugar and cotton. Natal was founded in 1597 as a military post to check an illicit trade in Brazil-wood. In 1633 it was occupied by the Dutch, who remained until 1654. It became the capital of a province in 1820. In early works it is sometimes termed Cidade dos Reis (City of the Kings).

NATANZ, a minor province of Persia, situated in the hilly district between Isfahan and Kashan, and held in fief by the family of the Hissam es Saltaneh (Sultan Murad Mirza, d. 1882). It contains eighty-two villages and hamlets, has a revenue of about £4000, and a population of about 23,000. It is divided into four districts: Barzrud, Natanzrud, Tarkrud and Badrud. Natanz pears are famous throughout the country. The western part of the province is traversed from north to south by the old high-road between Kashan and Isfahan, with the well-known stations of Kuhrud (7140 ft.) and So (7560 ft.). This road was practically abandoned when the Indian government telegraph line, which ran along it, was removed to a road farther east in 1906. The capital of the little province is Natanz, a large village with a population of about 3000, situated 69 m. north of Isfahan, at an elevation of 5670 ft. It has an old mosque, with a minaret 123 ft. in height, built in 1315.

NATCHEZ, a city and the county-seat of Adams county, Mississippi, U.S.A., on the Mississippi river, about 100 m. S.W. of Jackson. Pop. (1890) 10,101, (1900) 12,210, of whom 7090 were negroes, (1910 census) 11,791. It is served by the Yazoo & Mississippi Valley, the St Louis, Iron Mountain & Southern, the New Orleans & North-Western and the Mississippi Central railways, and by steamboats on the Mississippi river. The city, which has an area of 2·19 sq. m., is mostly on a bluff that rises 200 ft. above the river, the wharfs and landings, and a few old buildings being the only reminders of what was before the Civil War the principal business section. Among the city's institutions are the Fisk Public Library, a charity hospital, two sanatoriums, three orphan asylums, Stanton College for girls (non-sectarian; opened in 1894 and lodged in the old Fisk mansion), St Joseph's College for girls, the Jefferson Military College (1802), 6 m. from the city, and Natchez College for negroes. The city has four public parks, three on the river front, and one, Memorial Park, in honour of Confederate dead, in the heart of the city. On a neighbouring bluff is a national cemetery. Just outside the city limits, at Gloster, the former estate of Winthrop Sargent, first governor of the Territory of Mississippi, are the graves of Sargent and S. S. Prentiss, who lived in Natchez for some years. In and near the city are many handsome old residences typical of *ante-bellum* Natchez, among them being: Monmouth, General Quitman's estate; Somerset and Oakland, long in the Chotard family; and The Briars, the home during girlhood of Varina Howell, the wife of Jefferson Davis. A Roman Catholic cathedral (1841), Trinity Protestant Episcopal Church (1825) and a Presbyterian church (1829) are the principal church buildings. The Prentiss and the Elk are the leading clubs. Mardi Gras is annually celebrated. The leading industries are the shipment of cotton (70,000 to 90,000 bales are handled annually) and the manufacture of cottonseed oil and cake—the first cottonseed-oil mill in the country was built here in 1834—cotton goods, rope and yarns, lumber, brick, drugs and ice. Natchez was the first city in the state to own municipal water-works and sewage system.

The city was named from the Natchez Indians who lived on its site when the country was first settled. In 1716 on the bluff Le Moyne de Bienville built Fort Rosalie for the protection of some French warehouses, and later the French demanded a neighbouring hill for another settlement. This offended the Natchez, and on the 28th of November 1729 they massacred the French and destroyed the fort, which was immediately rebuilt, and in 1764 was handed over to the English in accordance with the treaty of Paris, and became Fort Panmure; in 1779 it was turned over to the Spanish, who held it until 1798, when they withdrew and United States troops occupied the place. Under Spanish rule Natchez was the seat of government of a large district, and from 1798 to 1802 and from 1817 to 1821 it was the capital of Mississippi. It was chartered as a city in 1803. On the 7th of May 1840 a large part of the city was destroyed by a tornado, but it was soon rebuilt, and at the outbreak of the Civil War was a place of considerable wealth and culture. For several years it was the home of General John Anthony Quitman (1799–1858). Natchez surrendered to Union forces during the Vicksburg campaigns, first on the 12th of May 1862, and again on the 13th of July 1863. On the 2nd of September 1862 the Union iron-clad "Essex," commanded by William David Porter, bombarded the city and put an end to the commercial importance of the river front section.

NATHANAEL, a character in the New Testament, who appears in John i. 45 sqq. as one of the first disciples of Jesus. In John xxi. 2 he is described as belonging to Cana of Galilee. The account of his call reveals to us a man of a deeply spiritual and sincere nature. Otherwise we know nothing beyond the mention of his name as one of the seven to whom, after the Resurrection, Christ revealed himself at the sea of Tiberias (John xxi. 2). But the interest he has evoked is shown by the attempts to identify him with other New Testament characters. Of these the one which has found most favour sees in him the apostle Bartholomew (*q.v.*). The actual identification must however remain a matter of pure conjecture. Still less can be said for the attempts to find in Nathanael another name for the apostle Matthew, or for Matthias, or for Paul "the apostle of visions," or even for the writer of the Fourth Gospel himself.

Bibliography.—For the story of Nathanael's call see Archbishop Trench, *Studies in the Gospels*, No. 2, and on his character, J. H. Newman's *Sermons for the Festivals of the Church*, No. 27.

NATHUBHOY, SIR MANGALDAS (1832–1890), Seth or head of the Kapol Bania caste, well known for their thrift and keen commercial instincts. He was born on the 15th of October 1832, of a family whose ancestors emigrated from Diu to Bombay soon after Bombay came into British possession. His grandfather, Ramdas Manordas, amassed a considerable fortune, which, owing to the premature death of his father, came into the sole possession of Mangaldas at the age of eleven. He had to take charge of the business in early life, though he gave some time to English studies. On the death of his wife he established a dispensary at Kalyan in her memory and also a special female ward in connexion with the David Sassoon hospital in Poona. As a merchant Mangaldas was upright and successful. In social matters he stood forth as a reformer, and to him the change to election from hereditary succession to the headship of the caste is due. In 1862 he founded a fellowship in Bombay university to allow graduates to spend some years in Europe. A bequest in his will enabled the university to establish seven similar scholarships. He took keen interest in learning, and in such institutions as the Asiatic and geographical societies. In 1866 he was nominated to the legislative council and sat till 1874. In 1867 he revived the Bombay association, a political body, over which he presided for a time. In 1872 he was made C.S.I., and in 1875 the dignity of Knight Bachelor was conferred on him. Besides a large donation to the Indian Famine Fund, Sir Mangaldas is known to have expended £500,000 on charities. He died at Bombay on the 9th of March 1890.

NATICK, a township of S.E. Middlesex county, Massachusetts, U.S.A., on the S.E. end of Cochituate Lake. Pop. (1890) 9118; (1900) 9488, of whom 1788 were foreign-born; (1910 census) 9866. The area of the township is 12·375 sq. m. The township's largest village, also named Natick, lying 18 m. W.S.W. of Boston, is served by the Boston & Albany railroad; it has the Walnut Hill preparatory school, the Leonard Morse hospital, and a public library, the Morse institute, which was given by Mary Ann Morse (1825–1862) and was built in 1873. In the village of South Natick is the Bacon Free Library (1880), in which is housed the Historical, Natural History and Library Society. In 1905 the factory product was valued at $3,453,094; the boots and shoes manufactured in 1905 were valued at $2,896,110 or 83·9% of the town's total, the output of brogans being especially important. Other distinctive manufactures are shirts and base-balls. Natick is the Indian name, signifying "our land," or "hilly land," of the site (originally part of Dedham) granted in 1650 to John Eliot, for the "praying" Indians. There was an Indian church in Natick, at what is now called South Natick or "Oldtown," from 1660 to 1716; and for some years the community was governed, in accordance with the eighteenth chapter of Exodus, by "rulers of tens," "rulers of fifties," and "rulers of hundreds." Until 1719 the Indians held the land in common. In 1735 the few Indians remaining were put under guardianship. The township owns a copy of Eliot's Indian Bible. An Eliot monument was erected in 1847 on the Indian burying-ground near the site of the Indian church, now occupied by a Unitarian church. Of the Eliot oaks, made famous by Longfellow's sonnet, one was cut down in 1842, the other still stands. Henry Wilson learned to make shoes here, and in the presidential campaign in 1840 gained the sobriquet of the "Natick cobbler." By the colonial authorities Natick was considered as a "plantation" until the establishment of the church; in 1762 the parish (erected in 1745) became a district, and in 1781 this was incorporated as a town.

See "Natick," by S. D. Hosmer, Daniel Wight and Austin Bacon, in vol. 2 of S. A. Drake's *History of Middlesex County* (Boston, 1880); and Oliver N. Bacon, *History of the Town of Natick* (Boston, 1856).

NATIONAL ANTHEMS OR HYMNS. The selection of some particular songs, words and music, as the formal expression of national patriotism, is a comparatively modern development of ceremonial usage. In Europe the chief national anthems are: *The United Kingdom*: "God save the king" (see below); *France*: "The Marseillaise," by Rouget de Lisle; *Germany*: "Heil dir im Siegeskranz," words by Balthasar Gerhard Schumacher, music of "God save the King"; *Switzerland*: "Rufst du, mein Vaterland," music of "God save the King"; *Italy*: the "Royal March" by G. Gabetti; *Austria*: "Gott erhalte unsern Kaiser," words by L. L. Haschka, music by Haydn; *Hungary*: "Isten ald meg a Magyart"; *Belgium*: "La Brabançonne," by F. Campenhout; *Holland*: "Wien Nierlansch"; *Denmark*: "Heil dir, dem Liebenden," words by H. Harries, music of "God save the King," and "King Kristian stod ved hojen mast," words by Ewald, music by Hartman; *Sweden*: "Ur Svenska hjertans"; *Russia*: "Bozhe Zaria chrany," words by J. J. Canas, music by D. Jenko; *Rumania*: "Traeasca Regale," words by V. Alexandri, music by E. A. Hübsch; *Spain*: "Himno de Riego," music by Herta. In the *United States*, the "Star Spangled Banner" (1814; words by F.S. Key, music by J. S. Smith) and "Hail Columbia" (1798; words by Joseph Hopkinson, music by Fyles) share the duties of a national anthem, while the tune of "God save the King" is sung to words beginning "My country, 'tis of thee," by Samuel F. Smith (1808–1895).

The most celebrated of all national anthems is the English "God save the King," which is said to have been first sung as his own composition by Henry Carey in 1740; and a version was assigned by W. Chappell (*Popular Music*) to the *Harmonia Anglicana* of 1742 or 1743, but no copy exists and this is now doubted. Words and music were printed in the *Gentleman's Magazine* for October 1745. There has been much controversy as to the authorship, which is complicated by the fact that earlier forms of the air and the words are recorded. Such are an "Ayre" of 1619, attributed to John Bull, who has long been credited with the origin of the anthem; the Scottish carol, "Remember, O thou man," in Ravenscroft's *Melismata*, 1611; the ballad "Franklin is fled away" (printed 1669; and a piece in Purcell's *Choice Collection for the Harpsichord* (1696). The words or part of them are also found in various forms from the 16th century. The question was discussed in Richard Clarke's *Account of the National Anthem* (1822), and has been reinvestigated by Dr W. H. Cummings in his *God save the King* (1902). Carey and Bull, in the general opinion of musical historians, divide the credit; but in his *Minstrelsy of England* (1901) Frank Kidson introduced a new claimant, James Oswald, a Scotsman who settled in London in 1742, and worked for John Simpson, the publisher of the early copies of *God save the King*, and who became chamber composer to George III. What appears to be certain is that 1745 is the earliest date assignable to the substantial national anthem as we know it, and that both words and music had been evolved out of earlier forms. Bull's is the earliest form of the air; Carey's claim to the remodelling of the anthem rests on an unauthoritative tradition; and, on general probabilities, Oswald is a strong candidate. The tune was adopted by Germany and by Denmark before the end of the 18th century.

NATIONAL DEBT. Details as to the recent figures of the national debts of individual countries are given under the heading of each country, and the reader is also referred to the article Finance. Here the subject is considered in its technical aspects—including the special character of the institution, the different classes of debt, the various methods of raising loans, interest, funding systems, comparative statistics of national debts and other points.

National debt is so universal that it has been described as the first stage of a nation towards civilization. A nation, so far as its finances are concerned, may be regarded as a corporate body or even as an individual. Like the one or the other it may borrow money at rates of interest, and with securities, general or special, proportionate to its resources, credit and stability. But, while in this respect there are certain points of analogy between a state and an individual, there are important points of difference so far as the question of debt is concerned. A state, for example, may be regarded as imperishable, and its debt as a permanent institution which it is not bound to liquidate at any definite period, the interest, unless specially stipulated, being thus of the nature of transferable permanent annuities. While an individual who borrows engages to pay interest to the lender personally, and to reimburse the entire debt by a certain date, a state may have an entirely different set of creditors every six months, and may make no stipulation whatever with regard to the principal. A state, moreover, is the sole judge of its own solvency, and is not only at liberty either to repudiate its debts or compound with its creditors, but even when perfectly solvent may materially alter the conditions on which it originally borrowed. These distinctions explain many of the peculiarities of national debts as contrasted with those of individuals—though a nation, like an individual, may by reckless bad faith utterly destroy its credit and exhaust its borrowing powers.

A well-organized state ought to have within itself the means of meeting all its ordinary expenses; where this is not the case, either through insufficiency of resources or maladministration, and where borrowing is resorted to for what may be regarded as current expenses, a state imperils, not only its credit, but, when any crisis occurs, its very existence; in illustration of this we need only refer to the cases of Turkey in Europe and some of the states of Central and South America. Even for meeting emergencies it is not always inevitable that a state should incur debt; its ordinary resources, from taxation or from state property, may so exceed its ordinary expenses as to enable it to accumulate a fund for extraordinary contingencies. This, it would seem, was a method commonly adopted in ancient states. The Athenians, for example, amassed 10,000 talents in the interval between the Persian and the Peloponnesian wars, and the Lacedaemonians are said to have done the same. At Susa and Ecbatana Alexander found a great treasure which had been accumulated by Cyrus. In the early days of Rome the revenue from certain sources was accumulated as a sacred treasure in the temple of Saturn; and we know that when Pompey left Italy he made the mistake of leaving behind him the public treasury, which fell into the hands of Caesar. In later times, also, the more prudent emperors were in the habit of amassing a hoard. We find that the method of accumulating reserves prevailed among some of the early French kings, even down to the time of Henry IV. This system long prevailed in Prussia. Frederick II., when he ascended the throne, found in the treasury a sum of 8,700,000 thalers, and it is estimated that at his death he left behind him a hoard of from 60 to 70 million thalers. And similarly, in our own time, of the five milliards of indemnity paid by France as a result of the Franco-German War, 150 millions were set apart to reconstitute the traditional war-treasury. The German empire, apart from the individual states which comprise it, had in 1882 a debt of about £24,000,000, while its invested funds amounted to £37,390,000, including a war-treasure of £6,000,000. The majority of economists disapprove of such an accumulation of funds by a state as a bad financial policy, maintaining that the remission of a proportionate amount of taxation would be much more for the real good of the nation. At the same time the possession of a moderate war-fund, it must be admitted, could not but give a state a great advantage in the case of a sudden war. In the case of England, apart from the private hoardings of a few sovereigns, there does not seem to have existed any deliberately accumulated public treasure; before the time of William and Mary English monarchs borrowed money occasionally from Jews and from the city of London, but emergencies were generally met by "benevolences" and increased imposts.

All modern states, it may be said, have been compelled to have recourse to loans, either to meet war expenses, to carry out great public undertakings or to make up the recurrent deficits of a mismanaged revenue. Resources obtained in this way are what constitute national debt proper. Loans have been divided into forced and voluntary. Forced loans can, of course, only be raised within the bounds of the borrowing country; and, apart from the injustice which is sure to attend such an impost, it is always economically mischievous. The loans which the kings of England were wont to exact from the Jews were really of the character of forced loans, though the method has never been used in England in modern times so extensively as on the continent. There the sum sought to be obtained in this way has never been anything like realized. In 1793, for example, a loan of this class was imposed in France, on the basis of income; and of the milliard (francs) which it was sought to raise only 100 millions were realized. In Austria and Spain, also, recourse has been had at various times to forced loans, but invariably with unsatisfactory results. Other methods of a more or less compulsory character have been and are made use of in various states for obtaining money, which, as they involve the payment of interest, may be regarded as of the nature of loans; but the debt incurred by such methods is comparatively insignificant, and some of the methods adopted are peculiarly irritating and mischievous. On the other hand, it has occasionally been attempted to raise voluntary loans by appeals to a nation's patriotism; the method has been confined almost exclusively to France. After the revolutions of 1830 and 1848 appeals were thus made to the patriotism of French capitalists to buy 5% direct from the government at par, at a time when the French 5% were selling at 80; but the results were quite insignificant. In short, the only economically sound method of meeting expenses which the ordinary resources of a state cannot meet is by borrowing in the open market on the most advantageous terms obtainable. On this normal method of borrowing, loans are divided into different categories, though there are really only two main classes, which may be designated perpetual and terminable. Borrowing in quasi-perpetuity has hitherto been the mode adopted by most states in the creation of the bulk of their debt. Not that any state ever borrows with the avowed intention of never paying off debts; but either no definite period for reimbursement is fixed, or the limit has been so extended as to be practically perpetual, or in actual practice the debt has been got rid of by the creation of another of equal amount under similar or slightly differing conditions as to interest. Of course a state is not bound to retain any part of its debt as a perpetual burden; it is at liberty to liquidate whenever it suits its convenience. This quasi-perpetuity of debt in the case of a state in a sound financial condition involves no hardship upon its creditors, who may at any moment realize their invested capital by selling their titles as creditors in the open money market, it may be at the price they paid, or it may be a little below or a little above it, according to the state of the market at the time. Loans, again, contracted on the terminable principle are of various classes; the chief of these are (1) life annuities, (2) terminable annuities, (3) loans repayable by instalments at certain intervals, (4) loans repayable entirely at a fixed date.

From the time of William III. life and terminable annuities have been a favourite mode in England either of borrowing money or of commuting, and thus gradually paying off, the existing funded debt. At first, and indeed until comparatively recent times, the system of life annuities resulted in serious loss to the country, owing to the calculation of the rate of annuity on too high a scale, a result arising from imperfect data on which to base estimates of the average duration of life. The system of life annuities was sometimes combined in England with that of perpetual annuities, or interest on the permanent debt—the life annuity forming a sort of additional inducement to lenders of limited means to invest their money. At one time the form of life annuities known as tontine was much in vogue both in England and France, the principle of the tontine being that the proceeds of the total amount invested by the contributors should be divided among the survivors, the last survivor receiving the whole interest or annuity. The results of this system were not, however, encouraging to the state. In England, at least, the terminable annuity has been a favourite mode of borrowing from the time of William III.; it has been generally conjoined with a low rate of permanent interest on the sum borrowed. Thus in 1700 the interest on the consolidated debt amounted to only £260,000, while the terminable annuities payable amounted to £308,407. In 1780 a loan of 12 millions was raised at 4% at par, with the additional benefit of an annuity of £1, 16s. 3d.% for eighty years. Even so late as the Crimean War in 1855, a loan of 16 millions at 3% at par was contracted, the contributors receiving in addition an annuity of 14s. 6d.% for thirty years.

The third method of contracting terminable loans, that of gradual repayment or amortization within a certain limit of years, has been a favourite one among certain nations, and specially commends itself to those whose credit is at a low ebb. When the final term of repayment is fixed upon, a calculation is easily made as to how much is to be paid half-yearly until the expiry of the term, so that at the end the whole, principal and interest, will have been paid. At first, of course, the amount paid will largely represent interest, but, as at each half-yearly drawing of the numbers of the bonds to be finally paid off the principal will be gradually reduced, there will be more and more money set free from interest for the reduction of the actual debt. This method, as we have said, has its advantages, and when conjoined with stipulations as to liberty of conversion to debt bearing a lower rate of interest than that originally offered, and when the bonds are not issued at a figure much below par, might be the most satisfactory method of raising money for a state under certain emergencies. What is known as the "Morgan loan" of France in 1870 was contracted on such conditions.

The last form of temporary loan, that repayable in bulk at a fixed date, is one which, when the sum is of considerable amount, is apt to be attended with serious disadvantages. The repayment may have to be made at a time when a state may not be in a position to meet it, and so to keep faith with its creditors may have to borrow at a higher rate in order to pay their claims. It has, however, worked well in the United States, most of the debt of which has been contracted on the principle of optional payment at the end of a short period, say five years, and compulsory payment at the end of a longer period, say twenty years. Thus the loan of 515 millions of dollars contracted in 1862 was issued on this principle, at 6%, and so with other loans between that year and 1868. In European states, however, the risks of embarrassment are too great to permit of the application of this method on an extensive scale; and for loans of great amount the methods most likely to yield satisfactory results are loans bearing quasi-perpetual interest, or those repayable by instalments on the basis of half-yearly drawings within a certain period.

What are known as lottery loans are greatly favoured on the continent, either as an independent means of raising money, or as an adjunct to any of the methods referred to above. These must not be confounded with the lottery pure and simple, in which the contributors run the risk of losing the whole of their investment. The lottery loan has been found to work well for small sums, when the interest is but little below what it would have been in an ordinary loan, and when the percentage thus set aside to form prizes of varying amounts forms but a small fraction of the whole interest payable. The principle is that each contributor of such a loan has a greater or less chance of drawing a prize of varying amount, over and above the repayment of his capital with interest.

What are known in England as exchequer bills and treasury bills may be regarded as loans payable at a fixed period of short duration, from three months upwards, and bearing very insignificant interest, even so low as ½%. They are a useful means of raising money for immediate wants and for local loans, and form handy investments for capitalists who are reserving their funds for a special purpose. Exchequer bonds are simply a special form of the funded debt, to be paid off generally within a certain period of years.

There are two principal methods of issuing or effecting a loan. Either the state may appeal directly to capitalists and invite subscriptions, or it may delegate the negotiation to one or more bankers. The former method has been occasionally followed in France and Russia, but in practice it has been found to be attended with so many disadvantages to the borrowing state or city that the best financial authorities consider it unsound. The great banking-houses have such a command over the money-market that it is difficult to keep even a direct loan out of their hands. The majority of loans, therefore, are negotiated by one or more of these houses, and the name of Rothschild is familiar to every one in connexion with such transactions. By this method a borrowing state can assure itself of having the proceeds of the loan with the least possible delay and with the minimum of trouble. A loan may be issued at, above, or below par, though generally it is either at or below par—"par" being the normal or theoretical price of a single share in the loan, the sum which the borrowing government undertakes to pay back for each share on reimbursement, without discount or premium. Very generally, as an inducement to investors, a loan is offered at a greater or less discount, according to the credit of the borrowing government. Sometimes a state may offer a loan to the highest bidders; for example, the city of Auckland in 1875 invited subscriptions through the Bank of New Zealand to a loan of £100,000 at 6%; offers were made of six times the amount, but only those were accepted which were at the rate of 98% or above. The rate of interest offered generally depends on the credit of the state issuing the loan. England, for example, would have no difficulty in raising any amount at 3% or even less, while less stable states may have to pay 8 or 9%. The nominal percentage is by no means, however, always an index of the cost of a loan to a state, as the history of the debt of England disastrously shows. During the 18th century various expedients were employed, besides that of terminable annuities already referred to, to raise money for the great wars of the period, at an apparently low percentage. For example, from 3 to 5% would be offered for a loan, the actual amount of stock per cent. allotted being sometimes 107½ or even 111; so that between 1776 and 1785, for the £91,763,842 actually borrowed by the government, £115,267,993 was to be paid back. In 1797 a loan of £1,620,000 was contracted, for every £100 of which actually subscribed, at 3%, the sum of £219 was allotted to the lender. In 1793 a 3% loan of 4½ millions was offered at the price of £72%, the government thus making itself liable for £6,250,000. Greatly owing to this reckless method the debt of Great Britain in 1815 amounted to over 900 millions. France in this respect has been quite as extravagant as England; many of her loans during the 19th century were issued at from 52½ to 84%, one indeed (1848) so low as 45%—as a rule with 5% interest. The enormous and embarrassing increase of the French debt during the 19th century was doubtless greatly due to this disastrous system. Nearly every European state and most of the Central and South American states have at one time or another aggravated their debts by this method of borrowing, and got themselves into difficulty with their creditors. Financiers almost unanimously maintain that in the long run it is much better for a state to borrow at high interest at or near par, than at an apparently low interest much below par. A state of even the highest rank may find itself in the midst of a crisis that will for a time shake its credit; but when the crisis is past and its credit revives it will be in a much more sound position with a high interest for a debt contracted at par than with a comparatively low interest on a debt much in excess of what it really received. If a state, for example, borrows at par at 6% when its credit is low, it may easily when again in a flourishing condition reduce the interest on its debt to 4 or even 3%. The United States government actually did so with the debt it had to contract at the time of the Civil War. This method of reducing the burden of a debt is evidently no injustice to the creditors of a government, when used in a legitimate way. A state is at liberty at any time to pay off its debts, and, if it can borrow at 3% to pay off a 6% debt, it may with perfect justice offer its creditors the option of payment of the principal or of holding it at a reduced interest. Government debts are, however, sometimes reduced after a fashion by no means so legitimate as this. Other states have been even more unprincipled, and have got rid of their debts at one sweep by the simple method of repudiation.

When a state has a variety of loans at varying rates of interest, it may consolidate them into a single debt at a uniform interest. For example, in 1751 several descriptions of English debt were consolidated into one fund bearing a uniform interest of 3%, an operation which gave origin to the familiar term "consols" ("consolidated annuities"). In the early days of the English national debt, a special tax or fund was appropriated to the payment of the interest on each particular loan. This was the original meaning of "the funds," a term which has now come to signify the national debt generally. So also the origin of the term "funded" as applied to a debt which has been recognized as at least quasi-permanent, and for the payment of the interest on which regular provision is made. Unfunded or floating debt, on the other hand, means strictly loans for which no permanent provision requires to be made, which have been obtained for temporary purposes with the intention of paying them off within a brief period. Exchequer and treasury bills are included in this category, and such other moneys in the hands of a government as it may be required to reimburse at any moment. Where a government is the recipient of savings banks deposits, these may be included in its floating debt, and so also may the paper-money which has been issued so largely by some governments. A state with an excessive floating debt must be regarded as in a very critical financial condition.

National debt, again, is divided into external and internal, according as the loans have been raised within or without the country—

some states, generally the smaller ones, having a considerable amount of exclusively internal debt, though it is obvious that the bulk of national debts are both external and internal.

We referred above to various ways of reducing the burden of a debt, and also to methods of contracting loans by which within a certain period they are amortized or extinguished. Most states, however, are burdened with enormous quasi-permanent debts, the reduction or extinction of which gives ample scope for the financial skill of statesmen. A favourite method of accomplishing this is by the establishment of what is known as a sinking fund, formed by the setting aside of a certain amount of national revenue for the reduction of the principal of the debt. (J. S. K.)

The following table shows the general state of the world's public indebtedness at the beginning of the 20th century, divided according to the more important countries, the bracketed figures in black type indicating the position of the country referred to under each heading in the list. The figures are given by preference for the year 1900, as more representative, in a case like this, than for some later years; for the Boer War, as regards the United Kingdom, and also the Russo-Japanese War, introduced new debt and new considerations, hardly fair to the comparison, while this stands at the end of a long period of peace. The figures in every case are not to be supposed to be absolutely accurate; statistics of national debts differ, often remarkably, and it is practically impossible to give a perfectly satisfactory comparison, owing partly to difficulties of computing the exchange, partly to inaccurate accounts, and partly to the varieties of debt (reproductive or non-reproductive, &c.).

The Principal Public Debts of the World, 1900.

Country.	Population.	Total Debt.		Per Head.		Annual Charge.		Per Head.	
The United Kingdom	40,909,925	(3)	£628,978,782	(11)	£15 7 6	(4)	£23,216,657	(11)	£0 11 4
British Dominions over Sea—									
India	230,000,000	(9)	210,323,937	(24)	0 18 6	(11)	6,595,732	(23)	0 0 6
Australian States	3,707,905	(10)	195,324,717	(2)	52 13 0	(9)	7,595,074	(2)	2 1 0
New Zealand	815,820	(23)	47,874,452	(1)	58 12 0	(22)	1,717,910	(1)	2 2 0
Canada	5,338,883	(21)	53,254,689	(14)	10 0 0	(21)	2,678,496	(13)	0 10 0
Cape Colony	1,527,224	(24)	27,884,078	(8)	18 5 0	(23)	1,331,737	(6)	0 17 5
Natal	902,365	(25)	9,019,143	(15)	10 0 0	(24)	350,204	(16)	0 7 9
France	38,517,975	(1)	1,086,215,525	(4)	28 4 0	(1)	49,844,652	(4)	1 5 11
Russia	129,211,113	(2)	656,000,000	(19)	5 2 0	(2)	29,000,000	(18)	0 4 7
Austria	25,886,000	(6)	358,438,000	(12)	13 16 11	(6)	14,067,000	(10)	0 11 6
Hungary	19,203,531	(11)	184,600,000	(16)	9 14 0	(8)	11,977,640	(9)	0 12 6
Italy	32,449,754	(4)	586,000,000	(9)	18 0 0	(3)	27,000,000	(7)	0 16 7
United States of America	76,303,387	(8)	292,216,265	(21)	3 15 6	(10)	6,709,026	(20)	0 1 9
Spain	18,089,500	(5)	433,283,066	(5)	24 1 5	(5)	16,742,285	(5)	0 18 2
Turkey	23,880,000	(13)	170,000,000	(18)	7 0 0	(13)	5,148,450	(19)	0 4 3
Egypt	9,734,000	(16)	103,372,000	(13)	10 12 4	(15)	4,222,379	(15)	0 8 8
Prussia	34,472,509	(7)	329,584,000	(17)	9 7 6	(7)	13,923,170	(17)	0 7 5
German Empire	56,345,000	(14)	118,554,789	(22)	2 2 1	(16)	3,794,461	(22)	0 1 4¼
Portugal	5,049,729	(12)	177,192,795	(3)	35 0 0	(14)	4,434,243	(8)	0 15 10
Holland	5,104,137	(18)	96,561,287	(7)	18 18 0	(20)	2,926,553	(12)	0 11 1¼
Belgium	6,744,000	(15)	104,551,000	(10)	15 13 6	(17)	3,320,404	(14)	0 9 9
Japan	43,759,577	(22)	52,903,000	(23)	1 4 2	(18)	3,176,759	(21)	0 1 5
China	390,000,000	(20)	55,000,000	(25)	0 3 0	(19)	3,000,000	(24)	0 0 2
Argentina	4,400,000	(17)	103,000,000	(6)	23 12 0	(12)	6,301,419	(3)	1 8 7
Brazil	17,000,000	(19)	81,710,000	(20)	4 16 0		..		..

The total indebtedness of the countries named in the table amounted to £6,311,017,478, and the total indebtedness of the world (*i.e.* including countries not here mentioned) for the year 1898 was computed by Lord Avebury (*Journ. Roy. Stat. Soc.* vol. lxiv. part i.) as £6,432,757,000, as against £5,097,910,000 in 1888. This compares (taking figures compiled by Mr Dudley Baxter in *Journ. Roy. Stat. Soc.*, March 1874) with a total indebtedness of 4680 millions sterling in 1874 and 1700 millions sterling in 1848. The United Kingdom had diminished its total debt since 1883 by 127 millions, the amount per head by £6, the annual charge by 6 millions, and the charge per head by 5s. 8d. The United States debt was lower by nearly a hundred millions. Japan, Egypt and Brazil had sensibly improved their positions. But the following countries had increased their debts: France (by 86 millions), Russia (by some 240 millions), Italy (by 140 millions), Austria-Hungary (by 70 millions), Spain (by 190 millions), Prussia (by 227 millions), Portugal (by 80 millions), Holland (by 18 millions), Belgium (by 32 millions), and Argentina (by 73 millions).

The result is that, whereas in 1883 the total debt of the United Kingdom (756 millions) stood second to that of France (1000 millions), in 1900 it stood third to France and Russia; whereas in 1883 its weight per head of population was third, in 1900 it was eleventh; whereas in 1883 its annual charge stood second, in 1900 it stood fourth; and whereas the weight of the charge per head of population in 1883 was fifth, in 1900 it was eleventh. The indebtedness of the great British dependencies, on the other hand, had increased from 302 millions to 544 millions sterling, or by 242 millions; and the local (municipal) debt of Great Britain had risen from about 100 millions to upwards of 300 millions.

History of British debt.

It is interesting to recall the history of the British national debt during the 19th century. The debt at the close of the Napoleonic war (1816) was nearly 887 millions sterling, and at the beginning of 1900 this debt had been reduced to 621 millions,[1] or a decrease of 266 millions—notwithstanding interim additions of about 367 millions, which made the gross reduction during that period 633 millions sterling, an amount actually larger than the whole (dead-weight[2]) debt at the end of the century. No country (except the United States, to a smaller amount) has ever redeemed its obligations on such a scale, and this was done while all other European countries of similar standing were piling up debt.

This enormous reduction was effected at different rates of speed. Between 1817 and 1830, when what was known as Pitt's sinking fund was in operation (depending upon the devotion of surplus income to the repayment of debt, but much complicated by the raising of fresh loans), a net reduction was made of £29,488,072—an *annual average* of £2,268,313. From 1830 to 1876 the system of using surplus revenue—the so-called old sinking fund—for redeeming debt, was steadily applied, together with the creation of terminable annuities, by which definite blocks of debt were cancelled and the whole amount paid off in a term of years. During this period the debt was reduced by £85,175,782, an *annual average* of £1,851,647. In 1876 Sir Stafford Northcote's (Lord Iddesleigh's) new sinking fund came into operation, in addition to previous methods of redeeming debt. By this system a definite annual sum was set aside for the service of the debt, the difference between it and the amount required for payment of interest forming a (new) sinking fund devoted to repayment of capital. This fixed charge was gradually reduced from about 29 millions to 26 millions in 1888, to 25 millions in 1890, and to 23 millions in 1899. The amount paid off during this period by means of old sinking fund, terminable annuities and new sinking fund, down to March 1900, was £155,238,639, or an *annual average* of £6,468,276.

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[1] Leaving out of account 8 millions of unfunded debt raised for the Boer War.

[2] The "dead-weight" debt, or national debt proper, excludes what are treated in the public accounts as "other capital liabilities," the interest on which is not included in the fixed charge; but it is taken to include the new debt of all sorts raised in 1900, 1901 and 1902 for the Boer War.

It will be observed that the burden of the debt incurred previously to 1817 has thus been borne very unequally by different ages of "posterity." While the generations immediately succeeding the Napoleonic war paid off about £2,000,000 a year, the taxpayers between 1876 and 1900 paid at three times that rate. They did so largely without knowing it, since a large part of the amount was wrapped up in the terminable annuities; but it is very questionable justice that so large a proportion of the burden should have been imposed upon them.

Consols.

The great bulk of the funded national debt consists of what are known as "consols." This name dates from 1751, when nine different government annuities at 3% were consolidated into one, amounting to £9,137,821. These "consolidated annuities" formed the germ of what has since become the type of British government stock. At the same time some of the annuities at a higher rate of interest were combined and the interest reduced to 3%, and this stock was known as "reduced," the two 3% stocks remaining side by side, until in 1854 the $3\frac{1}{4}$% government stock was also converted into 3%, under the style of "new threes." "Consols," "reduced" and "new threes" formed thenceforth a solid body of British 3% stock, until in 1888 the whole amount was converted (see *Conversions* below) by Mr (afterwards Lord) Goschen into $2\frac{3}{4}$%. "Consols" were added to from time to time when fresh loans were needed: from 39 millions in 1771 they rose to 71 millions in 1781, to 101 millions in 1783, 278 millions in 1801, 334 millions in 1811, and 400 millions in 1858; but in 1888 they had decreased, by redemptions, to £322,681,035. "Reduced" were also added to: from 17 millions in 1751 they rose to 164 millions in 1815, and then gradually diminished to 102 millions in 1869, and to £68,912,433 in 1887, when they were converted with "consols" into the new consols (or "Goschens") at $2\frac{3}{4}$%, to be reduced to $2\frac{1}{2}$% in 1903.

The lowest price ever quoted for "consols" was $47\frac{3}{8}$ on 20th September 1797, owing to the mutiny at the Nore; the highest was 114 in 1896 owing to scarcity of stock, the operation of the sinking funds, and the demand for investment of savings bank moneys.

The high premium to which consols rose towards the end of the century may be briefly explained. *Pari passu* with the reduction of the debt went a dwindling of the amount of consols open to investors, and hence occurred a continued normal appreciation of the stock. In 1817 the amount of British government stock per head of the population was £40, 10s.; in 1896 this figure had decreased to £14, 12s. The ordinary law of supply and demand would therefore in any case tend to increase the price of government stock. This has always happened. The amount of 3% diminished from 528 millions in 1817 to 498 in 1827, and to 497 in 1837, and the average prices in these years were 73, 83 and 90; additions were made to the stock, and in 1847 (the amount being 510 millions) the price was $86\frac{3}{8}$; again the amount decreased, and in 1852 (500 millions) the price was 98; then a great conversion raised the amount to 734 millions in 1854, and the price went down to $90\frac{1}{2}$; but by 1887 the amount decreased by about 200 millions, and the price rose well above par; and though the reduction in interest in 1888 set back the price, it rose again as the amount of available stock diminished. Many causes, into which it is not necessary to enter, operated no doubt in keeping up the demand for British government credit. Moreover, apart from the fact that in 1882 there were 689 millions of 3% and in 1900 only 501 millions of $2\frac{3}{4}$% in existence, the amount held by government departments and therefore practically locked up from the market, gradually increased, until from this cause alone the amount of available stock was diminished by upwards of 200 millions; and a large amount more was practically locked up by being held by trustees, or by banks, insurance societies, &c. The savings banks deposits, increasing as they did by about £1,000,000 per month (owing partly to the raising in 1894 of the maximum limit), had to be invested in government securities; and the compulsory activity of the government as a buyer of consols, both on this account and also for sinking fund purposes (in order to obtain stock to redeem debt on the increased scale already indicated) operated as an abnormal cause for sending the price of consols high above par. Even at that figure (the average prices for consols being $101\frac{1}{16}$ in 1894, $106\frac{1}{6}$ in 1895, $110\frac{3}{4}$ in 1896, $112\frac{15}{32}$ in 1897, $110\frac{15}{16}$ in 1898 and $106\frac{7}{8}$—having fallen owing to war prospects—in 1899) it was difficult for the government brokers to obtain consols, and it was principally owing to this state of things that in 1899 Sir Michael Hicks-Beach reduced the fixed annual charge for the debt (and *pro tanto* the new sinking fund) from £25,000,000 to £23,000,000.

It may be useful to give the figures for the British national debt in 1902, after the disturbance due to the South African War. During the years 1900 and 1901 the new sinking fund was suspended, as well as the payments on the terminable annuity debt applicable to repayment of capital (except in so far as annuities to individuals were concerned); so that the debt was not reduced, as it would otherwise have been, by £4,547,000 in 1900 and by £4,681,000 in 1901. On the contrary, it was increased by fresh borrowings. Consols were raised (in 1901 and 1902) to the extent of £92,000,000; a "War Loan" of $2\frac{3}{4}$% stock and bonds, redeemable in 1910, was raised (1900) to the amount of £30,000,000; $2\frac{3}{4}$% exchequer bonds were raised (in 1900) to the amount of £24,000,000, and treasury bills (in 1899 and 1900), £13,000,000. The total war borrowing amounted accordingly to £159,000,000, raised at a discount of (£6,585,000) 4·14%. This includes the whole new borrowing in 1902, a portion of which was intended after the peace to be paid back in the current year; but for this no allowance can here be made. The accompanying table shows the totals for the "dead-weight debt" in 1900, 1901 and 1902, and, for convenience, also the "other capital liabilities."

	"Dead-weight Debt."	Chief Cause of Difference.[1]		"Other Liabilities."
31st March 1900 . .	£628,978,782	+" War Loan,"	£30,000,000	£10,186,482
" 1901 . .	690,992,621	+Exch. Bonds,	24,000,000	
		+Treas. Bills,	5,000,000	14,731,256
" 1902 . .	747,876,000	+Consols,	60,000,000	20,532,000
July 1902 . .	779,876,000	+Consols,	32,000,000	

"Other liabilities" it must be remembered, represent money advanced (generally by terminable annuity) on reproductive objects—telegraphs, barracks, public works, Uganda railway, &c.—and they could not, obviously, be properly included in the national debt unless at the same time a set-off were made for the valuable assets held by the British government, such as the Suez canal shares, which in 1902 were alone worth upwards of £26,000,000. (H. Ch.)

British National Debt Conversions.—The great bulk of the funded debt of the United Kingdom consists of annuities, which are described as perpetual, because the state is under no obligation to pay off at any time the capital debt which they represent. All that the public creditor can claim is to receive payment of the instalments of annuity as they fall due. On the other hand, the government has the right to redeem the annuities ultimately by payment of the capital debt; though it may, and frequently does, bind itself not to exercise that right as regards a particular stock of annuities until after a definite period. So long as a stock is thus guaranteed against redemption, the only way in which the annual charge for that portion of the debt can be reduced is by the government buying back the annuities in the open market at their current price, which may be more or may be less than the nominal debt, according to general financial conditions and to the state of the national credit. The liability of the stock to redemption at par, when the period of guarantee has expired, prevents its market price from rising materially above that level. To enable the right of compulsory redemption to be enforced, it is only necessary that the government should have command of sufficient funds for the purpose of paying off the stockholders, or should be able to raise those funds by borrowing at a rate of interest lower than that borne by the stock. Any circumstances which might tend to raise the price of the stock above par would also assist the government in raising its redemption money on more favourable terms. When the amount of stock to be dealt with is large, the raising by a fresh loan of the amount required for redemption would occasion great disturbance. A more convenient method is the conversion of the existing stock to a lower rate of interest by agreement with the stockholders, whose reluctance to accept a reduction of income is overborne by their knowledge that the power of redemption exists and will be put in force if necessary. The opportunity for conversion may be looked for when the price of a redeemable stock stands steadily at or barely above par. Observation of the movements in the price of other securities will serve to show whether this stationary price represents the real market value of the stock, or whether that value is subject to depression owing to an expectation of the stock being converted or redeemed. Accordingly, the course of prices of other government stocks which are free from the liability to redemption, of the stocks of foreign countries and the colonies, and of the large municipalities, must be watched by government in order to determine, first, whether the conversion of a redeemable stock is feasible, and, secondly, to what extent the reduction of the interest in the stock may be carried.

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[1] Other causes are redemption of land tax, variation in capital value of terminable annuities and minor treasury operations.

The credit for the first measure of conversion belongs to Walpole, though it was carried through by Stanhope, his successor as chan-*1717.* cellor of the exchequer. In 1714 the legal rate of interest for private transactions, which had been fixed at 6% in the year of the Restoration, was reduced to 5% by the act 12 Anne, stat. 2, c. 16. But the bulk of the national debt still bore interest at 6%, the doubtful security of the throne and the too frequent irregularities in public payment having hitherto precluded any considerable borrowing at lower rates. Walpole saw that the first requirement was to give increased confidence to the public creditors. Three acts were passed dealing respectively with debts due to the general public, to the Bank of England and to the South Sea Company. Three separate funds—the general fund, the aggregate fund and the South Sea fund—were assigned to the service of the several classes of debt, each of these funds being credited with the produce of specified taxes, which were made permanent for the purpose; and it was further provided that any surplus of the funds, after payment of the interest of the debts, should be applied in reduction of the principal. Such was the success of this measure that, in spite of the reduction of interest from 6 to 5% which was also enacted, the passing of the acts was followed by a rise in the price of stocks. A curious preliminary to the introduction of these measures was the passing of a resolution by the House of Commons, which invited advances not exceeding £600,000, to be repaid with interest at 4% out of the first supplies of the year. The result showed that the time was not ripe for such a reduction of interest, as only a sum of £45,000 was offered on those terms. A further resolution was then passed, substituting 5% as the rate of interest, and the whole sum was at once subscribed. Besides accepting the reduction of interest on their own debts, the Bank of England and the South Sea Company agreed to assist the government by advancing 4½ millions at the reduced rate, to be employed in paying off any of the general creditors who might refuse assent to the conversion. The assistance was not required, as all the creditors signified assent. The debts thus dealt with amounted altogether to about 25¾ millions, and the annual saving of interest effected (including that upon a large quantity of exchequer bills for which the Bank had been receiving over 7%) was £329,000.

Walpole had a further opportunity of effecting a conversion in 1737. In the meantime much of the 5% debt had been reduced to *1749.* 4% by arrangements with the Bank of England and the South Sea Company, and further borrowings had taken place at that rate and even at 3%. In 1737 the 3% stood above par, and Sir John Barnard proposed to the House of Commons a scheme for the gradual reduction of the 4%. As a financial measure the scheme would doubtless have succeeded; but Walpole, moved apparently by consideration for his capitalist supporters, opposed and for the time defeated it. A scheme on similar lines was carried through by Pelham as chancellor of the exchequer in 1749 and embodied in the act 23 Geo. II. c. 1. By that act holders of the 4% securities, amounting to nearly £58,000,000, were offered a continuance of interest at 4% for one year, followed by 3½% for seven years, during which they were guaranteed against redemption, with a final reduction to 3% thereafter. It was necessary to continue the rate of 4% for the first year, as any objecting stockholders could not be paid off without a year's notice. Three months were allowed for signifying assent to the proposal. At first it was viewed with disfavour, and both the Bank and the East India Company opposed it. But the pens of the government pamphleteers were busily occupied in showing the advantages of the offer, and at the close of the three months acceptances had been received from the holders of nearly £39,000,000 of the stocks, or more than two-thirds of the whole. A further opportunity was afforded to waverers by a second act (23 Geo. II. c. 22), which allowed three months more for consideration; but for holders accepting under this act the intermediate period of 3½% interest was reduced from seven years to five. These terms brought in an additional £15,600,000 of stock; and the balance left outstanding, amounting to less than 3½ millions, was paid off at par by means of a new loan. The annual saving of interest on the stock converted was at first £272,000, increasing to £544,000 after seven years.

For nearly three-quarters of a century no further conversion was attempted. In that period the total debt had been increased tenfold, and the practice of borrowing in times of war by the issue *1822.* of an inflated capital, bearing nominally a low rate of interest, prevented recourse to conversion as a means of reducing the burden after peace was restored. But in 1822 Mr Vansittart—who four years earlier had effected a conversion in the opposite direction, turning £27,000,000 of stock from 3 into 3½%, in order to obtain from the holders an advance of £3,000,000 without adding to the capital of the debt—was able to deal with the 5%. These stocks amounted to £152,000,000 out of a total funded debt of £795,000,000. The prices at which the chief denominations of government stocks stood in the market in the early part of 1822 indicated a normal rate of interest of more than 4 but considerably less than 4½%. In these circumstances, to propose the conversion of the 5% stocks to 4½% would probably have been futile, unless the new stock were guaranteed for a long period, as holders would have stood in fear of a speedy further reduction. Nor could the government hope to succeed in a reduction to 4%. Mr Vansittart's plan was to offer £105 of stock bearing 4% in exchange for £100 of 5% stock, thus adding slightly to the capital of the debt, but effecting a large annual saving in interest. These terms were highly successful. Holders of nearly £150,000,000 accepted, leaving less than £3,000,000 of the stock to be paid off, and the annual saving obtained was £1,197,000. The new 4% stock was made irredeemable for seven years (act 3, Geo. IV c. 9).

There were, however, other 4% stocks, amounting to £76,000,000, which were not secured against redemption. Two years later, the conditions being favourable for their conversion, the act 5 Geo. IV. c. 24 was passed, offering holders in exchange *1824.* a 3½% stock, irredeemable for five years. The offer was accepted as regards £70,000,000, and the remaining £6,000,000 paid off, the annual saving on interest being £381,000.

In 1830 the guarantee given to the 4% stock of 1822 had expired, and the stock stood at a price of 102½. Mr Goulburn decided to attempt its conversion without delay, and accordingly by the act 11 Geo. IV. c. 13 holders were offered in exchange *1830.* for each £100 of the stock, either £100 of a 3½% stock, irredeemable for ten years, or £70 of a 5% stock, irredeemable for forty-two years, these two options being considered of approximately equal value. No difficulty was found in securing assent. Over £150,000,000 of the stock was converted, almost wholly into the 3½% stock; the balance of less than £3,000,000 was paid off, and an annual saving of £754,000 in interest was the result.

It was again Mr Goulburn's fortune to carry out a large and successful conversion in 1844. At that date the funded debt was made up of 3% and 3½% stocks in the proportions of about two to one, the only other denomination being the *1844.* trifling amount of 5% stock created in connexion with the conversion of 1830. The price of 3% consols ranged about 98, and that of the new 3½%, created in 1830, about 102. A reduction straightway from 3½ to 3% was not to be looked for, but it was hoped to ensure that reduction ultimately by offering 3¼% for the first few years and a guarantee against redemption for a long term. Accordingly the holders of the several 3½% stocks were offered an exchange to a new stock bearing interest at 3¼% for ten years and at 3% for the following twenty years. Practically the whole of the stock, amounting to £249,000,000, was converted on these terms, only £103,000 being left to be paid off at par. The immediate saving of interest was £622,000 a year for ten years, and twice that rate in subsequent years (acts 7 & 8 Vict. cc. 4 and 5).

Mr Gladstone's only attempt at the conversion of the debt was made in his first year as chancellor of the exchequer. His primary purpose was to extinguish some small remnants of 3% stocks which stood outside the main stocks of that denomination. *1853.* The act 16 Vict. c. 23 offered to holders of these minor stocks, amounting altogether to about 9½ millions, the option of exchanging every £100 for either £82, 10s. of a 3½% stock guaranteed for 40 years, or £110 of a 2½% stock guaranteed for the same period, or else for exchequer bonds at par. In the result stock to the amount of only about £1,500,000 was converted, and the remaining £8,000,000 had to be paid off at par, with some apparent loss of capital, as the current market price of the 3% was less than par. The failure was largely owing to the fact that, between the initiation and the execution of the scheme, the train of events leading up to the Crimean War had become manifest, with unfavourable results to the public credit. Mr Gladstone had also included, as an optional portion of his plan, liberty to holders of the larger 3% stocks to exchange into the new 3½ and 2½%. Very little advantage was taken of this permission, but the small amount of 2½% stock then created has been largely added to in later years by the conversion of stocks of higher denominations held by the national debt commissioners for the savings banks and other government funds.

1884.

Little better was the result of a more ambitious attempt made by Mr Childers in 1884. His offer (act 47 & 48 Vict. c. 23) extended to the holders of all the 3% stocks, amounting to more than 600 millions, but no attempt was made to compel acceptance. There was offered in exchange for each £100 of 3% stock either £102 of a stock at 2¾% or £108 of a stock at 2½%, both irredeemable for twenty-one years. But the amount exchanged into the new stocks was only 22 millions, of which more than one-half was stock held by government departments.

1888.

The most important of all the conversions of the British debt was effected by Mr Goschen in 1888. It applied to the whole of the 3% stocks, amounting to a total of £558,000,000, made up as follows: £323,000,000 of consols, a stock which dated from 1752, when it was formed by the consolidation of a number of minor stocks; £69,000,000 of reduced 3%, of which the nucleus was the stock reduced from 4 to 3% by Pelham's conversion in 1749; £166,000,000 of new 3% resulting from the conversion of 1844. All the three stocks were, and had been for a considerable time, well over par. But for the past few years they had remained in almost a stationary position, relatively to the upward movement shown in the prices of the government 2½% stock, and of the stocks of foreign governments, of British colonies and of the leading municipalities. It was clear that the anticipation of a conversion or redemption scheme was weighing down consols. Direct evidence of this fact was afforded by the course of a new 3% stock, the local loans stock, which Mr Goschen had created in 1887. Though bearing the same interest and resting upon the same ultimate security as consols, this stock, which had been made irredeemable for twenty-five years, rose at once to a higher level of price. The opportunity for a great scheme of conversion had evidently come. The risk to be incurred by government in undertaking the liability to pay off such an enormous body of stock, though less in comparison with the resources of the nation than that which Mr Goulburn had faced in 1844, was still very great, and it was rendered more formidable by the fact that holders of consols and of reduced 3% were entitled at law to a year's notice before their stocks could be redeemed. If that right of notice were to be enforced as regards any large proportion of the stocks, no precaution could adequately guard against the risk of untoward circumstances arising to affect the operation before the year expired. Mr Goschen proposed to offer to the holders of each of the three stocks an exchange at par into a new stock bearing interest at 3% for the first year, at 2¾% for the next fourteen years and at 2½% for twenty years thereafter, the stock to be irredeemable for the whole of that period, namely till 1923. Acceptance was made compulsory for holders of the new 3%, with the alternative of being paid off at par, as they had no claim to receive notice; but it was made optional for the holders of the other two stocks, and a bonus of 5s. % was offered to them as an inducement to forgo their right of notice. These provisions were duly embodied in the act 51 Vict. c. 2. The terms were accepted by practically all the holders of the new 3% and by the great majority of the holders in consols and reduced 3's, the amount left outstanding being only £42,000,000. To enable that balance to be dealt with, an act was passed providing for the compulsory redemption or conversion of the outstanding stock at the expiry of the statutory notice. The funds required for this further operation were raised by the issue of treasury bills and exchequer bonds, by temporary advances from the bank and from the national debt commissioners, and by the creation of an additional half-million of the new stock. In the result it was only necessary to find cash for paying off dissentients to the amount of £19,000,000. The final outcome of the whole operation was a saving in the annual charge of interest of £1,412,000, increasing to twice that amount after fourteen years.

The conversion of the consols and reduced 3% was greatly facilitated by the exercise of a power, which the act conferred, to pay to recognized agents, such as stockbrokers, bankers and solicitors, a commission of 1s. 6d. % on stocks in respect of which they lodged their clients' assents. These agents were thus afforded an inducement to give their clients explanation and advice, without which many of the fundholders would probably not have moved in the matter. The commissions paid amounted to more than £234,000, representing stocks to the amount of over £312,000,000. The government would not again be confronted with this difficulty of having to give long preliminary notice of the intention to convert or redeem a large portion of the debt, as it was provided by the Conversion Act 1888 that the present consols should be redeemable after 1923 on such notice and in such manner as parliament might direct. (W. Bl.; E. W. H.*)

See Leroy-Beaulieu, *Traité de la Science des Finances*; Rau, *Finanzwissenschaft*; M'Culloch, *On Taxation and the Funding System*; Hamilton, *Inquiry concerning the Rise and Progress of the English Debt*; Taylor, *History of Taxation in England*; Fenn, *Compendium of English and Foreign Funds*; Dudley Baxter, *National Debts*, and his paper in the *Stat. Soc. Jour.* (1874).; Sir E. W. Hamilton, *Conversion and Redemption* (1889). And for statistics of national debts see the *Statesman's Year-Book* and the *Stock Exchange Annual*.

NATIONALITY, a somewhat vague term, used strictly in international law (see INTERNATIONAL LAW, PRIVATE) for the status of membership in a nation or state (for the conditions of which see STATE, ALLEGIANCE, NATURALIZATION, ALIEN), and in a more extended sense in political discussion to denote an aggregation of persons claiming to represent a racial, territorial or some other bond of unity, though not necessarily recognized as an independent political entity. In this latter sense the word has often been applied to such people as the Irish, the Armenians and the Czechs. A "nationality" in this connexion represents a common feeling and an organized claim rather than distinct attributes which can be comprised in a strict definition.

NATIONAL WORKSHOPS (Fr. *Ateliers Nationaux*), the term applied to the workshops established to provide work for the unemployed by the French provisional government after the revolution of 1848.[1] The political crisis which resulted in the abdication of Louis Philippe was naturally followed, in Paris, by an acute industrial crisis, and this, following the general agricultural and commercial distress which had prevailed throughout 1847, rendered the problem of unemployment in Paris very acute. The provisional government under the influence of one of its members, Louis Blanc, and on the demand of a deputation claiming to represent the people passed a decree (Feb. 25, 1848) from which the following is an extract:—

> The provisional government of the French Republic undertakes to guarantee the existence of the workmen by work. It undertakes to guarantee work for every citizen.

For the carrying out of this decree, Louis Blanc wanted the formation of a ministry of labour, but this was shelved by his colleagues, who as a compromise appointed a government labour Commission, under the presidency of Louis Blanc, with power of inquiry and consultation only. The carrying out of the decree of Feb. 25th was entrusted to the minister of public works, M. Marie, and various public works [2] were immediately started. The earlier stages of the national works are sufficiently interesting to justify the following detailed account:—

> "The workman first of all obtained a certificate from the landlord of his house, or furnished apartments, showing his address, whether in Paris or the department of the Seine. This certificate was viséd and stamped by the police commissary of the district. The workman then repaired to the office of the *maire* of his ward, and, on delivering this document, received in exchange a note of admission to the national works, bearing his name, residence and calling, and enabling him to be received by the director of the workplaces in which vacancies existed. All went well while the number of the unemployed was less than 6000, but as soon as that number was exceeded the workmen of each arrondissement, after having visited all the open works in succession without result, returned to their maire's offices tired, starving and discontented. The workmen had been promised bread when work was not to be had, which was reasonable and charitable; the great mistake was, however, then committed of giving them money, and distributing it in public at the offices of the maires instead of distributing assistance in kind, which might have been done so easily through the agency of the bureaux de bienfaisance. Each maire's office was authorized to pay every unemployed workman 1·50 frs. per day on production of a ticket showing that there was no vacancy for him in the national works. The fixed sum of 2 francs was paid to any workman engaged on the public excavation work, without regard to his age, the work done or his calling. . . . The workman made the following simple calculation, and he made it aloud: 'The state gives me 30 sous for doing nothing, it pays me 40 sous when I work, so I need only work to the extent of 10 sous.' This was logical. . . .
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> "The works opened by the minister of public works being far distant from each other, and the workmen not being able to visit them all in turn to make certain that there were no vacancies for them, two central bureaux were established, one at the Halle-aux-Veaux under M. Wissocq, the other near the maire's office in the

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[1] The term is also incorrectly applied to the proposed *ateliers sociaux* of Louis Blanc (*q.v.*), state-supported co-operative productive societies.

[2] Clearing the trench of Clamart and conveying the earth to Paris for the construction of a railway station on the chemin de fer de l'Ouest; construction of the Paris terminus of the Paris-Chartres railway; improvement of the navigation of the Oise· extension of the Sceaux railway to Orsay.

5th arrondissement in the Rue de Bondy, entrusted to M. Higonnet. . . . The workmen went to have their tickets examined at one of these bureaux; and the absence of employment having been proved, they returned to get their 30 sous at their maires' offices."[1]

Owing to the increase in the number of those claiming work or relief, disorganization set in, and both the bureaux and the maires became the centres of disturbances, those in charge of the offices being unable to control the crowds. As a consequence M. Marie commissioned Émile Thomas, a chemist connected with the École Centrale to reorganize the works. When Thomas took the work in hand on the 5th of March, the number of unemployed had increased to 14,000 in addition to some 4000 or 5000 employed on public works, and it was steadily on the increase. On the 16th of March the daily pay of the workmen who were not working was reduced to 1 franc; work was guaranteed for at least every other day, in which case the pay was to be 2 francs for the day. The possible usefulness of this order was stultified by the near approach of the elections, the moderate and extreme sections both trying to exploit the dissatisfied workmen. Private industry, too, was paralysed, the workpeople for the most part preferring 1 franc a day and idleness, with the possibility of future benefits. Thomas, left practically to his own resources, endeavoured to organize some special workshops where artisans could be employed at their own trades; but it was found almost impossible to persuade them to do serious work, as they knew that many of their fellows were being paid for loafing. On the 19th of May the number enrolled had increased to 87,942. The National Assembly had in the meanwhile been elected, and met on the 4th of May. The Executive Commission was elected a few days later; Louis Blanc was excluded, but all the other members of the provisional government were on it. Blanc renewed his motion for a ministry of labour; this was rejected. On the 15th the mob invaded the Assembly, and from that time the government abated their socialist tendencies, and cast about for means to put an end to what had become a serious danger to the state as well as an exhausting drain on the treasury. On the 24th of May Thomas received instructions to dismiss all unmarried men under 25 years of age who would not enlist in the army, all men who could not prove six months' residence in Paris, and all who refused offers of private employment. Piece-work was to be established instead of time-work, and men were to be prepared to be drafted into the provinces. Thomas foretold trouble as a consequence of the order, and it was for a time withdrawn. On the 26th of May Thomas was superseded by M. Lalanne, and on the 30th the National Assembly decreed the substitution of piece-work for time-work. On the 20th of June the remainder of the proposals were approved, and the sequel was the insurrection of the 23rd of June and following days (see FRENCH HISTORY). How far the real socialistic scheme of Louis Blanc would have been successful if it had been put in practice must remain a matter of speculation. It was entered upon hastily, without any organization, was looked upon coldly by those servants of the government who ought to have assisted it, and, in the circumstances, was foredoomed to failure from the start.

AUTHORITIES.—E. Thomas, *Histoire des ateliers nationaux* (1848); L. Blanc, *Histoire de la révolution française de 1848* (1870–1880); *1848 Hist. révelations* (1858); A. de Lamartine, *Hist. de la révolution de 1848* (1849); a useful summary is given in the English Board of Trade *Report on Agencies and Methods for dealing with the Unemployed* (c. 7182, 1893).

NATROLITE, a mineral species belonging to the zeolite group. It is a hydrated sodium and aluminium silicate with the formula $Na_2Al_2Si_3O_{10}\cdot 2H_2O$, and containing sodium (Na_2O, 16·3%), was named natrolite by M. H. Klaproth in 1803. "Needle-stone" or "needle-zeolite" are other names, alluding to the common acicular habit of the crystals, which are often very slender and are aggregated in divergent tufts. Larger crystals have the form of a square prism terminated by a low pyramid: the prism angle being nearly a right angle (88° 45½′), the crystals are tetragonal in appearance, though actually orthorhombic. There are perfect cleavages parallel to the faces of the prism. The mineral also often occurs in compact fibrous aggregates, the fibres having a divergent or radial arrangement (hence the name radiolite for one variety). From other fibrous zeolites natrolite is readily distinguished by its optical characters: between crossed nicols the fibres extinguish parallel to their length, and they do not show an optic figure in convergent polarized light. Natrolite is usually white or colourless, but sometimes reddish or yellowish. The lustre is vitreous, or in finely fibrous specimens sometimes silky. The spec. grav. is 2·2, and the hardness 5½. The mineral is readily fusible, melting in a candle-flame, to which it imparts a yellow colour owing to the presence of sodium. It is decomposed by hydrochloric acid with separation of gelatinous silica.

Natrolite occurs with other zeolites in the amygdaloidal cavities of basic igneous rocks. The best specimens are the diverging groups of white prismatic crystals found in compact basalt at the Puy-de-Marman, Puy-de Dôme, France. The largest crystals are those from Brevig in Norway. The walls of cavities in the basalt of the Giant's Causeway, in Co. Antrim, are frequently encrusted with slender needles of natrolite, and similar material is found abundantly in the volcanic rocks (basalt and phonolite) of Salesel, Aussig and several other places in the north of Bohemia.

Several varieties of natrolite have been distinguished by special names. Fargite is a red natrolite from Glenfarg in Perthshire. Bergmannite or *Spreustein* is an impure variety which has resulted by the alteration of other minerals, chiefly sodalite, in the augite-syenite of southern Norway.

NATTIER, JEAN MARC (1685–1766), French painter, was born in Paris in 1685, the son of Marc Nattier, a portrait painter, and of Marie Courtois, a miniaturist. He received his first instruction from his father, and having applied himself to copying pictures at the Luxembourg Gallery, he refused to proceed to the French Academy in Rome, though he had taken the first prize at the Paris Academy at the age of fifteen. In 1715 he went to Amsterdam, where Peter the Great was then staying, and painted portraits of the tsar and the empress Catherine, but declined an offer to go to Russia. Between 1715 and 1720 he devoted himself to compositions like the "Battle of Pultawa," which he painted for Peter the Great, and the "Petrification of Phineus and of his Companions," which led to his election to the Academy. The financial collapse of 1720 caused by the schemes of Law all but ruined Nattier, who found himself forced to devote his whole energy to portraiture. He became the painter of the artificial ladies of Louis XV.'s court. The most notable examples of his straightforward portraiture are the "Marie Leczinska" at the Dijon Museum, and a group of the artist surrounded by his family, dated 1730. He died in Paris in 1766. Many of his pictures are in the public collections of France. Thus at the Louvre is his "Magdalen"; at Nantes the portrait of "La Camargo" and "A Lady of the Court of Louis XV." At Orléans a "Head of a Young Girl," at Marseilles a portrait of "Mme de Pompadour," at Perpignan a portrait of "Louis XV.," and at Valenciennes a portrait of "Le Duc de Boufflers." The Versailles Museum owns an important group of two ladies, and the Dresden Gallery a portrait of the "Maréchal de Saxe." At the Wallace collection Nattier is represented by "The Comtesse de Dillières," "The Bath (Mdlle de Clermont)," "Portrait of a Lady in Blue," "Marie Leczinska" and "A Prince of the House of France." In the collection of Mr Lionel Phillips are the duchess of Flavacourt as "*Le Silence*," and the duchess of Châteauroux as "*Le Point du jour.*" A portrait of the "Comtesse de Neubourg and her Daughter" formed part of the Vaile Collection, and realized 4500 gs. at the sale of this collection in 1903. Nattier's works have been engraved by Leroy, Tardieu, Lépicié, Audran, Dupin and many other noted craftsmen.

See "J. M. Nattier," by Paul Mantz, in the *Gazette des beaux-arts* (1894); *Life of Nattier*, by his daughter, Madame Tocqué; *Nattier*, by Pierre de Nolhac (1904, revised 1910); and *French Painters of the XVIIIth Century*, by Lady Dilke (London, 1899).

NATURAL BRIDGE, a small village of Rockbridge county, Virginia, in the western part of the state, 179 m. by rail W. of Richmond, and about 16 m. S.E. of Lexington, the county-seat. It is served by the Chesapeake & Ohio and the Norfolk & Western railways. In the vicinity of the village, which is about 1500 ft.

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[1] E. Thomas, *Histoire des ateliers nationaux*, p. 29.

above sea-level, is the great natural curiosity from which it derives its name—a bridge of natural rock 90 ft. long and from 50 to 150 ft. wide, which spans Cedar Creek at a height of 215 ft. above that stream. It consists of horizontal limestone strata, and is the remains of the roof of a cave or underground tunnel through which the creek once flowed. It is crossed by a public road. In the village are magnesia and lithia springs and a saltpetre cave, which was worked during the War of 1812 and the Civil War. A royal grant dated the 5th of July 1774 conveyed to Thomas Jefferson a tract of 157 acres, "including the Natural Bridge on Cedar Creek," and it did not pass from his estate until 1833.

NATURAL GAS, the name given to the inflammable gas occurring in petroliferous formations. It consists mainly of hydrocarbons of the paraffin series, principally marsh gas, which constitutes from 50 to 90 % of the Pennsylvanian gas. Members of the olefine series are also present, especially in the gas of Baku. Varying amounts of carbon dioxide, sometimes as much as 10% or more, and small quantities of carbon monoxide, nitrogen, hydrogen and oxygen are also found. For particulars of the geological occurrence, and the collection and distribution, of natural gas, see PETROLEUM.

NATURALISM. "Nature" is a term of very uncertain extent, and the "natural" has accordingly several antitheses, often more or less conflicting, and only to be learnt from the context in which they occur. Thus, though Man and the World are often opposed as respectively subject and object, yet the word nature is applied to both: hence Naturalism is used in both a subjective and an objective sense. In the subjective sense the natural, as the original or essential, is opposed to what is acquired, artificial, conventional or accidental. On this opposition the casuistry and paradoxes of the Sophists largely turned; it determined also, at least negatively, the conduct of the Cynics in their contempt for the customary duties and decencies; and it led the Stoics to seek positive rules of life in "conformity to nature." This deference for the "natural" generally, and distrust of traditional systems of thought and even of traditional institutions, has played a large part in modern philosophy, especially British philosophy. It was perhaps the inevitable outcome of the reaction, which began with the Renaissance, against the medieval domination of mere authority. "L'homme qui médite est un animal dépravé," said Rousseau; and again, "Tout est bien sortant des mains de l'auteur des choses, tout dégénère entre les mains de l'homme."[1]

In psychology and epistemology, "no one," as Green has said, "is more emphatic than Locke in opposing what is real to what we 'make for ourselves'—the work of nature to the work of the mind. Simple ideas or sensations we certainly do not 'make for ourselves.' They therefore, and matter supposed to cause them, are, according to Locke, real. But relations are neither simple ideas nor their material archetypes. They therefore, as Locke explicitly holds, fall under the head of the work of the mind, which is opposed to the real."[2] This opposition again led Hume, in the first place, to distinguish between natural and philosophical relations—the former determined simply by association, the latter by an abitrary union of two ideas, which we may think proper to compare—and then, in the next, to reduce identity and causality, the two chief "philosophical relations," to fictions resulting from "natural relations," that is to say, from associations of similarity and contiguity. Subjective naturalism thus tended to become, and in the end became, what is more commonly called *Sensationalism* or *Associationism*, thereby approximating towards that objective naturalism which reduces the external world to a mechanism describable in terms of matter and motion—a result already foreshadowed when Hartley connected ideas and their association with brain vibrations and vibratiuncles. In ethics, also, the striving to get back to the natural entailed a similar downward trend. From the Cambridge Platonists, from Locke and Clarke, we hear much of rational principles of conduct, comparable in respect of intelligibility with the truths of mathematics; but already we find that in Shaftesbury the centre of ethical interest is transferred from the Reason, conceived as apprehending either abstract moral distinctions or laws of divine legislation, to the "natural affections" that prompt to social duty;[3] and when we reach Bentham, with pleasure and pain as "sovereign masters," and the Mills, with love of virtue explained by the laws of association, all seems to be non-rational.[4] There is much resemblance, as well as some historical connexion, between the naturalism of moralists such as Shaftesbury and Hutcheson and the Common-Sense metaphysics of Reid and his school.[5] Hence Kant, distinguishing between a "naturalistic" and "scientific" or critical method in metaphysics, styles Reid and his followers "naturalists of pure reason," satirically comparing them to people who think they can settle the size and distance of the moon by direct eyesight better than by the roundabout calculations of mathematics.

So far we have seen the natural approximating to the non-rational. But when used in a subjective sense in opposition to the supernatural, it means the rational as opposed to what is above reason, or even contrary to reason. It is in this sense that the term Naturalism most frequently occurs; and it was so applied specially to the doctrines of the English Deists and the German Illuminati of the 17th and 18th centuries: those of them who held that human reason alone was capable of attaining to the knowledge of God were called theological naturalists or rationalists, while those who denied the possibility of revelation altogether were called philosophical naturalists or naturalists simply.[6] In these controversies the term Naturalist was also sometimes used in an objective sense for those who identified God and Nature, but they were more frequently styled Spinozists, Pantheists or even Atheists. But it is at once obvious that dispute as to what is natural and what supernatural is vain and hopeless till the meanings of reason and nature are clearly defined. "The only distinct meaning of the word" [natural], said Butler, "is *stated*, *fixed* or *settled*; since what is natural as much requires and presupposes an intelligent agent to render it so, *i.e.* to effect it continually, or at stated times, as what is supernatural or miraculous does to effect it for once. And from hence it must follow that persons' notion of what is natural will be enlarged in proportion to their greater knowledge. . . . Nor is there any absurdity in supposing that there may be beings in the universe, whose capacities . . . may be so extensive, as that the whole Christian dispensation may to them appear natural, *i.e.* analogous or conformable to God's dealings with other parts of His creation; as natural as the visible known course of things appears to us."[7]

The antithesis of natural to spiritual (or ideal) has mainly determined the use of the term Naturalism in the present day.[8] But current naturalism is not to be called materialism, though these terms are often used synonymously, as by Hegel, Ueberweg and other historians of philosophy; nor yet pantheism, if by that is meant the immanence of all things in one God. We know only material phenomena, it is said; matter is an abstract conception simply, not a substantial reality. It is therefore meaningless to describe mind as its effect. Moreover, mind also is but an abstract conception; and here again all our knowledge is confined to the phenomenal. To identify the two classes of phenomena is, however, impossible, and indeed absurd; nevertheless we find a constant concomitance of *psychosis* and *neurosis*; and the more sensationalist and associationist our psychology, the easier it becomes to correlate the psychical and the physical as but "two aspects" of one and the same fact. It is therefore simplest and sufficient to assume an underlying, albeit unknown, unity connecting the two. A monism—so far neutral, neither materialistic nor spiritualistic—is thus a characteristic of the prevailing naturalism. But when the question arises, how best to systematize experience as a whole, it is contended that we must begin from the physical side. Here we have precise conceptions, quantitative exactness and thoroughgoing continuity; every thought that has ever stirred the hearts of men, not less than every breeze that has ever rippled the face of the deep, has meant a perfectly definite redistribution of matter and motion. To the mechanical principles of this redistribution an ultimate analysis brings us down; and—beginning from these—the nebular hypothesis and the theory of natural selection will enable us to explain all subsequent synthesis.[1] Life and mind now clearly take a secondary place; the cosmical mechanism determines *them*, while they are powerless to modify it. The spiritual becomes the "epiphenomenal," a merely incidental phosphorescence, so to say, that regularly accompanies physical processes of a certain type and complexity. (See also PSYCHOLOGY.)

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[1] Quoted by Eisler, *Wörterbuch der philosophischen Begriffe* (1899), *s.v.* "Naturalismus."

[2] T. H. Green, *Prolegomena to Ethics* (1883), § 20.

[3] Cf. Sidgwick, *History of Ethics* (1886), p. 181.

[4] Cf. W. R. Sorley, *The Ethics of Naturalism* (1885), pp. 16 sqq.

[5] Cf. W. R. Scott, *Francis Hutcheson; his Life, Teaching and Position in Philosophy* (1900), pp. 121, 265 seq.

[6] See RATIONALISM; Kant, *Religion innerhalb der Grenzen der blossen Vernunft*, Hartenstein's edition, vi. 253; and Lechler, *Geschichte des Englischen Deismus* (1841), pp. 454 sqq.

[7] *Analogy*, part i. chap. i. end. Cf. also J. S. Mill, *Logic*, book iii. chap. xxv. § 2, and *Essays on Religion*.

[8] In aesthetics we find Naturalism used in a cognate sense: the Flemish painters, such writers as Flaubert or Zola, for example, being called naturalistic or realistic, in contrast to the Italian painters or writers like George Sand or the Brontës.

This absolute naturalism, as we may call it, the union, that is, of psychological and cosmological naturalism, is in fact a species of Fatalism, as Kant indeed entitled it.[2] It is the logical outcome of a sensationalist psychology, and of the epistemology which this entails. As long as association of ideas (or sensory residua) is held to explain judgment and conscience, so long may naturalism stand.

The naturalistic work of chief account at the present day is E. Haeckel's *Die Welträtsel, gemeinverständliche Studien über monistische Philosophie* (5th ed., 1900), of which an English translation has appeared. Effective refutations will be found in the works of two of Haeckel's colleagues, O. Liebmann, *Zur Analysis der Wirklichkeit* (3rd ed., 1900); R. Eucken, *Die Einheit des Geisteslebens in Bewusstsein und That der Menschheit* (1888, Eng. trans.); *Der Kampf um einen geistigen Lebensinhalt* (1898). See also A. J. Balfour, *Foundations of Belief* (8th ed., 1901); J. Ward, *Naturalism and Agnosticism* (1899). (J. W.*)

NATURALIZATION, the term given in law to the acquisition by an alien of the national character or citizenship of a certain state, always with the consent of that state and of himself, but not necessarily with the consent of the state to which he previously belonged, which may refuse to its subjects the right of renouncing its nationality, called "expatriation," or may allow the right only on conditions which have not been fulfilled in the particular case. Hence although nationality in strict theory is always single, as liege homage was and allegiance in its proper sense is, it often happens that two states claim the same person as their national or subject. This conflict arises not only from naturalization having been granted without the corresponding expatriation having been permitted, but also from the fact that birth on the soil was the leading determinant of nationality by feudal law, and still is so by the laws of England and the United States (*jus soli*), while the nationality of the father is its leading determinant in those countries which have accepted Roman principles of jurisprudence (*jus sanguinis*). The conflict is usually solved for practical purposes by an understanding which is approximately general, namely that, in cases not provided for by treaty, no state shall protect those whom it claims as its nationals while residing in the territory of another state which claims them as its own nationals by any title, whether *jus soli, jus sanguinis*, naturalization, or the refusal to allow expatriation. On this footing the British foreign office, while it grants passports for travel to naturalized persons, will extend no protection to them against a claim of their former country, if they return to it, to exact military service due to it. The United States, asserting that expatriation is an inalienable right of man, maintains that, to lose his right to American protection, the emigrant who has been naturalized in the United States must have done that for which he might have been tried and punished at the moment of his departure; it claims to protect him against the exaction of what at that moment was merely a future liability to military service, and this doctrine has been practically accepted by France in her dealings with America. Germany also accepted it by the treaty of 1868 between the United States and the North German Confederation, now in force for the German empire, subject to provisions that the emigrant's fixing his domicile in the old country shall be deemed a renunciation of his naturalization in the new, and that his living in the old country for more than two years may be deemed to imply the absence of an intention to return to the new. Between the United States and Great Britain the convention of the 13th of May 1870 provides that naturalization in either is to be valid for all purposes immediately on its completion, but that if the resident shall renew his residence in his old country he may be readmitted to his old nationality, on his application and on such conditions as the readmitting government may impose.

The Naturalization Act 1870, which now governs the matter for England, does not say that the person naturalized becomes thereby a British subject, to which, if it had been said, a proviso might have been added saving the above-mentioned policy of the foreign office as to not protecting him in his old country, although even without such a proviso the foreign office would have been free to follow that policy. The act in question (s. 7) gives him the rights and imposes on him the duties of a natural-born British subject in the United Kingdom, and provides that, when within the limits of his old country, he shall not be deemed a British subject unless he has ceased to be a subject of that country, by its laws or in pursuance of a treaty. On this wording it has been maintained that British naturalization is not really naturalization at all; but leaves the naturalized person as he was with the addition of a certain quality within the United Kingdom; and on that ground it has been considered in France that a Frenchman, obtaining naturalization in England, does not fall within the French law (Code Civil, Art. 17) which pronounces the expatriation of citizens who cause themselves to be naturalized abroad. This is the *Bourgoise Case*, 41 Ch. D. 310, in which, when it came before the English courts, Mr Justice Kay inclined to the same view, but the court of appeal avoided giving an opinion on the point. Professor Dicey leans to the same view (5 *Law Quarterly Review*, 438); but Sir Thomas Barclay (4 *L.Q.R.* 226), Sir Malcolm McIlwraith (6 *L.Q.R.* 379), and Professor Westlake (*International Law—Peace*, 2nd ed. p. 234; *Private International Law*, 4th ed. p. 356) adopt the view that the Naturalization Act 1870 makes the naturalized person a full British subject, only to be treated in his old country in accordance with the international principles recognized by the British executive. And the foreign office, by granting passports to naturalized persons, acts on the same view. The point is important with reference to the question whether the naturalization of the father in the United Kingdom confers the character of British subjects on his children afterwards born abroad. (See ALIEN.)

An analogous question arises on the provision in the Naturalization Act 1870, sec. 16, that the legislature of any British possession may make laws "for imparting to any person the privileges of naturalization, to be enjoyed by such person within the limits of such possession." This, in accordance with the wider view of the effect of naturalization in the United Kingdom, may mean that naturalization in pursuance of a colonial law confers the full character of a British subject, only without removing disabilities, such as that to hold land, under which the naturalized person may have lain as an alien in any other British possession. On that footing the foreign office grants passports to the holders of colonial certificates of naturalization, and protects them in all foreign countries but that of their origin; and the Merchant Shipping Act 1894, sec. 1, allows persons naturalized in British possessions to be owners of British ships. On the other hand, those who maintain the narrower view of the effect of naturalization in the United Kingdom naturally hold that colonial naturalization has no effect at all outside the British possession in which it is granted.

Naturalization in India is regulated by the British Indian Naturalization Act, No. 30 of 1852, under which it may be granted to subjects of the several princes and states in India as well as to those who are entirely aliens to the British empire. The former, however, are treated for several purposes as British subjects even without being so naturalized.

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[1] Cf. Spencer, *First Principles* (1867), p. 398.

[2] Cf. *Prolegomena*, § 60.

In most countries a lengthened sojourn is a condition precedent to naturalization. In Belgium, the United Kingdom, North America and Russia the period of such sojourn is fixed at five years, in France, Greece and Sweden at three, in the Argentine Republic two, while in Portugal a residence of one year is sufficient. In Germany, Austria and Italy no period of residence is prescribed, while in Austria a ten years' residence confers *per se* the rights of citizenship. In the United States an alien desiring to be naturalized must declare on oath his intention to become a citizen of the United States; two years afterwards must declare on oath his intention to support the constitution of the United States and renounce allegiance to every foreign power, including that of which he was before a subject; must prove residence in the United States for five years, and in the state where his application is made for one year, as a good citizen; and must renounce any title of nobility. In France an alien desiring naturalization, if he has not resided continuously in the country for ten years, must obtain permission to establish his domicile in France; three years after (in special cases one year) he is entitled to apply for naturalization, which involves the renunciation of any existing allegiance.

See further, ALLEGIANCE, INTERNATIONAL LAW (Private); also Bar, *Private International Law* (Gillespie's translation); Hansard, *Law relating to Aliens*; Cutler, *Law of Naturalization*; Cockburn, *Nationality*; Cogordan, *Nationalité*; Heffter, *Europäisches Völkerrecht*; Hall, *Foreign Jurisdiction of the British Crown*; Westlake, *International Law—Peace*, and *Private International Law* (4th ed.). (JNO. W.)

NAUARCHIA (Gr. *ναῦς*, ship, *ἀρχή*, command), the supreme command of the Spartan navy. The office was an annual one and could not be held more than once by the same man (Xen. *Hell.* ii. 1, 7). This law might be evaded in special cases; the new admiral might not be sent to take over the command until some time after his election, which took place at midsummer (Beloch in *Philologus*, xliii. p. 272 sqq.), and meanwhile his predecessor remained *de facto* admiral; or the retiring admiral might, after the expiry of his term, hold an appointment as secretary (*ἐπιστολεύς*) to one who, though titular admiral, was really placed under his orders or even kept at Sparta altogether. Being independent of the kings and hampered by no colleague, the nauarch wielded such power that Aristotle is hardly going too far when he says (*Politics*, ii. 9. 22), *ἡ ναυαρχία σχεδὸν ἑτέρα βασιλεία καθέστηκεν.* He was subject only to the ephors, who, if he proved incompetent, could depose him (Thuc. viii. 39), though they usually preferred to send out an advisory committee (*σύμβουλοι*). An admiral might appoint his *ἐπιστολεύς* to command a portion, or even the whole, of the fleet, and if the former died in office the secretary succeeded to his post.

For a detailed discussion see J. Beloch, "Die Nauarchie in Sparta," in the *Rheinisches Museum*, xxxiv. (1879) 117-130, where a complete list of nauarchs known to us will be found; regarding the time of the election this is corrected by a later article of the same writer (*Philologus*, *loc. cit.*). See also A. Solari, *Ricerche Spartane* (Livorno, 1907), 1-58; G. Busolt, "Staats- und Rechtsaltertümer" (Iwan Müller's *Handbuch der klassischen Altertumswissenschaft*, iv.), § 96; G. E. Underhill's edition of Xenophon, *Hellenica*, i., ii., note on i. 5. 1. (M. N. T.)

NAUCK, JOHANN AUGUST (1822–1892), German classical scholar and critic, was born at Auerstädt in Prussian Saxony on the 18th of September 1822. After having studied at Halle and held educational posts in Berlin, he migrated in 1859 to St Petersburg, where he was professor of Greek at the imperial historico-philological institute (1869–1883). He died on the 3rd of August 1892. Nauck was one of the most distinguished textual critics of his day, although, like P. H. Peerlkamp, he was fond of altering a text in accordance with what he thought the author must, or ought to, have written.

The most important of his writings, all of which deal with Greek language and literature (especially the tragedians) are the following: *Euripides, Tragedies and Fragments* (1854, 3rd ed., 1871); *Studia Euripidea* (1859–1862); *Tragicorum Graecorum Fragmenta* (1856, last ed., 1889), his chief work; Index to the Fragments (1892); text of Sophocles (1867); revised edition of Schneidewin's annotated Sophocles (1856, &c.); texts of Homer, *Odyssey* (1874) and *Iliad* (1877–1879); the fragments of Aristophanes of Byzantium (1848), still indispensable; Porphyrius of Tyre (1860, 2nd ed., 1886); Iamblichus, *De Vita Pythagorica* (1884); *Lexikon Vindobonense* (1867), a meagre compilation of the 14th or 15th century. See memoir by T. Zielinski, in Bursian's *Biographisches Jahrbuch* (1894), and J. E. Sandys, *History of Classical Scholarship*, iii. (1908), pp. 149–152.

NAUCRARY, a subdivision of the people of Attica, which was certainly among the most primitive in the Athenian state. The word is derived either (1) from *ναῦς* (a ship) and describes the duty imposed upon each naucrary, of providing one ship and two (or, more probably, ten) horsemen; or (2) from *ναίειν* (to dwell), in which case it has to do with a householder census. The former is generally accepted in view of the fact that the naucraries were certainly the units on which the Athenian fleet was based. The view once held (on the strength of a fragment of Aristotle, quoted carelessly by Photius) that the naucrary was invented by Solon may now be regarded as obsolete (see the Aristotelian *Constitution*, viii. 3). Each of the four Ionian tribes was divided into three *trittyes* ("thirds"), each of which was subdivided into four naucraries; there were thus 48 naucraries. The earliest mention of them is in Herodotus (v. 71), where it is stated that the Cylonian conspiracy was put down by the "Prytaneis (chief men) of the Naucraries." Although it is generally recognized that in this passage we can trace an attempt to shift the responsibility for the murder of the suppliants from the archon Megacles, it is highly improbable that the Prytaneis of the Naucraries did not play a part in the tragedy. Thucydides is probably right, as against Herodotus, in asserting that the nine archons formed the Athenian executive at this period. It may be conjectured, however, that the military forces of Athens were organized on the basis of the naucraries, and that it was the duty of the presidents of these districts to raise the local levies. It is certainly remarkable that the Aristotelian *Constitution of Athens* does not connect the naucrary with the fleet or the army; from chapter viii. it would appear that its importance was chiefly in connexion with finance (*ἀρχὴ τεταγμένη πρός τε τὰς εἰσφορὰς καὶ τὰς δαπάνας*). The naucrary consisted of a number of villages, and was, therefore, a local unit very much in the power of the *naucraros*, who was selected by reason of wealth. The *naucraros* superintended the construction of, and afterwards captained, the ship, and also assessed and administered the taxes in his own area. In the reforms of Cleisthenes, the naucraries gave place to the demes as the political unit. In accordance with the new decimal system, their number was increased to fifty. Whether they continued (and if so, how long) to supply one ship and two[1] (or ten) horsemen each is not certainly known. Cheidemus in Photius asserts that they did, and his statement is to a certain extent corroborated by Herodotus (vi. 89) who records that, in the Aeginetan War before the Persian Invasion, the Athenian fleet numbered only fifty sail.

See Photius (*s.v.*), who is clearly using the *Ath. Pol.* (he quotes from it the last part of his article *totidem verbis*); Schömann, *Antiq.* (p. 326, Eng. trans.)—quoted by J. E. Sandys (*Ath. Pol.* viii., 13)—refutes Gilbert, *Greek Constitutional Antiquities* (Eng. trans., 1895), and in *Jahrb. Class. Phil.* cxi. (1875) pp. 9 seq.; A. H. J. Greenidge, *Handbook of Greek Const. Hist.* p. 134; history of Greece in general; for derivation of name, G. Meyer, *Curtius' Studien* (vii. 175), where Wecklein is refuted. (J. M. M.)

NAUCRATIS, an ancient Greek settlement in Egypt. The site was discovered by Professor W. M. Flinders Petrie in 1884, on the eastern bank of a canal, about 10 m. W. of the present Rosetta branch of the Nile. In ancient times it was approached by the Canopic mouth, which was farther to the west. The identification of the site is placed beyond doubt by the discovery of inscriptions, with the name of the town, and of great masses of early Greek pottery, such as could not have existed anywhere else. The site was excavated in 1884–1886 by the Egypt Exploration Fund, and a supplementary excavation was made by the British School at Athens in 1899. A list of the temples of Naucratis is given by Herodotus (ii. 178); they were the Hellenion, common to all the colonizing cities, and those dedicated by the Aeginetans to Zeus, by the Samians to Hera, and by the Milesians to Apollo. A temple of Aphrodite is also mentioned by Athenaeus. Traces of all these temples, except that of Zeus, or at least dedications coming from them, have been found in the excavations, and another has been added to them, the temple of the Dioscuri. The two chief sites to be cleared were the temples of Apollo and of Aphrodite, in both of which successive buildings of various date were found. Both were remarkable for the great mass of early painted pottery that was found; in the temple of Apollo this had been buried in a trench; in that of Aphrodite it was scattered over the whole surface in two distinct strata. A great deal of it was local ware, but there were also imported vases from various Greek sites. In addition to these temples, there was also found a great fortified enclosure, about 860 ft. by 750, in the south-eastern part of the town; within it was a square tower or fort; a portico of entrance and an avenue of rows of sphinxes was added in Ptolemaic times, as is shown by the foundation deposits found at the corners of the portico; these consisted of models of the tools and materials used in the buildings, models of instruments for sacrifice or ceremonies, and cartouches of King Ptolemy Philadelphus. Professor Petrie naturally supposed this great enclosure to be the Hellenion or common sanctuary of the Greeks, but Mr. Hogarth subsequently found traces of another great walled enclosure to the north-east of the town, together with pottery dedicated τοῖς τῶν Ἑλλήνων θεοῖς, and he claims with reason that this enclosure is more likely than the other to be the Hellenion, since no early Greek antiquities have been found in the southern part of the town, which seems rather to have been a native settlement. The cemetery of the ancient town was found on two low mounds to the north, but was mostly of Ptolemaic date.

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[1] See footnote to CLEISTHENES (1), *ad fin.*

Apart from the historic interest of the site, as the only Greek colony in Egypt in early times, the chief importance of the excavations lies in the rich finds of early pottery and in the inscriptions upon them, which throw light on the early history of the alphabet. The most flourishing period of the town was from the accession of Amasis II. in 570 B.C to the Persian invasion of 520 B.C., when the contents of the temples must have been destroyed. The earlier chronology has been much disputed. There are clear traces of a settlement going back to the 7th century, including a scarab factory, which yielded numerous scarabs, not of native Egyptian manufacture, bearing the names of the kings that preceded Amasis. Among these were fragments of early Greek pottery. It seems a fair inference that the makers of these were Greeks, and that they probably represent the early Milesian colony, settled here in the time of Psammetichus I., before the official assignment of the site by Amasis to the Greek colonists of various cities. The most important of the antiquities found are now in the British Museum.

See W. M. F. Petrie, &c., *Naukratis I.*, third Memoir of the Egypt Exploration Fund (1886); E. A. Gardner, &c., *Naukratis II.*, sixth Memoir of same (1889); D. G. Hogarth, &c., *Annual of the British School at Athens* (1898–1899). (E. Gr.)

NAUDÉ, GABRIEL (1600–1653), French librarian and scholar, was born in Paris on the 2nd of February 1600. He studied medicine at Paris and Padua, and became physician to Louis XIII. In 1629 he became librarian to Cardinal Bagni at Rome, and on Bagni's death in 1641 librarian to Cardinal Barberini. At the desire of Richelieu he began a wearisome controversy with the Benedictines, denying Gerson's authorship of *De Imitatione Christi*. Richelieu intended to make Naudé his librarian, and on his death Naudé accepted a similar offer on the part of Mazarin, and for the next ten years devoted himself to bringing together from all parts of Europe the noble assemblage of books known as the Bibliothèque Mazarine. Mazarin's library was sold by the parlement of Paris during the troubles of the Fronde, and Queen Christina invited Naudé to Stockholm. He was not happy in Sweden, and on Mazarin's appeal that he should re-form his scattered library Naudé returned at once. But his health was broken, and he died on the journey at Abbeville on the 30th of July 1653. The friend of Gui Patin, of Pierre Gassendi and all the liberal thinkers of his time, Naudé was no mere bookworm; his books show traces of the critical spirit which made him a worthy colleague of the humorists and scholars who prepared the way for the better known writers of the "siècle de Louis XIV."

Including works edited by him, a list of ninety-two pieces is given in the *Naudaeana*. The chief are *Le Marfore, ou discours contre les libelles* (Paris, 1620), very rare, reprinted 1868; *Instruction à la France sur la vérité de l'histoire des Frères de la Roze-Croix* (1623, 1624), displaying their impostures; *Apologie pour tous les grands personnages faussement soupçonnez de magie* (1625, 1652, 1669, 1712), Pythagoras, Socrates, Thomas Aquinas and Solomon are among those defended; *Advis pour dresser une bibliothèque* (1627, 1644, 1676; translated by J. Evelyn, 1661), full of sound and liberal views on librarianship; *Addition à l'histoire de Louys XI.* (1630), this includes an account of the origin of printing; *Bibliographia politica* (Venice, 1633, &c.; in French, 1642), a mere essay of no bibliographical value; *De studio liberali syntagma* (1632, 1654), a practical treatise found in most collections of directions for studies; *De studio militari syntagma* (1637), esteemed in its day; *Considérations politiques sur les coups d'état* (Rome [Paris], 1639; first edition rare, augmented by Dumay, 1752), this contains an apology for the massacre of St Bartholomew; *Biblioth. Cordesianae Catalogus* (1643), classified; *Jugement de tout ce qui a été imprimé contre le Card. Mazarin* (1649), Naudé's best work, and one of the ablest defences of Mazarin; it is written in the form of a dialogue between Saint-Ange and Mascurat, and is usually known under the name of the latter.

AUTHORITIES.—L. Jacob, *G. Naudaei tumulus* (1659); P. Hallé, *Elogium Naudaei* (1661); Niceron, *Mémoires*, vol. ix.; L. Jacob, *Traicté des plus belles bibliothèques* (1644); Gui Patin, *Lettres* (1846); *Naudaeana et Patiniana* (1703); Sainte-Beuve, *Portraits Litt.* vol. ii.; A. Franklin, *Histoire de la Bibl. Mazarine* (1860).

NAUGATUCK, a township and borough of New Haven county, Connecticut, U.S.A., on the Naugatuck river, 5 m. S. of Waterbury, with an area of 17 sq. m. in 1906. Pop. (1890) 6218, (1900) 10,541, of whom 3432 were foreign-born, (1910 census) 12,722. It is served by the New York, New Haven & Hartford railroad and by interurban electric railways. Among the principal public buildings are the Whittemore Memorial Public Library (1892), a fine high school and the large Salem school (part of the public school system), all given to the borough by John Howard Whittemore of Naugatuck, who in addition endowed the library and the high school. The river furnishes water-power. Among the manufactures are rubber goods, chemicals, iron castings, woollen goods, cutlery, &c. The value of the factory products increased from $8,886,676 in 1900 to $11,009,573 in 1905, or 23·9%. The prominence of the rubber industry here is due to Charles Goodyear (*q.v.*), who in 1821 entered into partnership with his father Amasa Goodyear for the manufacture of hardware. Vulcanized rubber overshoes were first made in Naugatuck, and in 1843 the Goodyear's Metallic Rubber Shoe Company was established here. The township was formed from parts of Waterbury, Bethany and Oxford, and was incorporated in 1844; the borough was chartered in 1893; and the two were combined in 1895.

NAUHEIM, or BAD-NAUHEIM, a watering-place of Germany, in the grand-duchy of Hesse-Darmstadt, situated on the north-east slope of the Taunus Mountains, 24 m. by rail N. of Frankfort-on-Main on the main line of railway to Cassel. Pop. (1905) 5054. It has three Evangelical, a Roman Catholic and an English church. Its thermal waters (84° to 95° F.), although known for centuries, were, prior to 1835, only employed for the extraction of salt. They now yield about 2000 tons annually. The town has several parks, the largest being the Kurpark, 125 acres in extent, in which are the Kurhaus and the two chief springs. The waters, which are saline, strongly impregnated with carbonic acid, and to a less extent with iron, are principally used for bathing, and are specific in cases of gout and rheumatism, but especially for heart affections. Three smaller springs, situated outside the Kurpark, supply water for drinking. In 1899–1900 a new spring (saline) was tapped at a depth of 682 ft. Another attraction of the place is the Johannisberg, a hill 773 ft. high, immediately overlooking the town.

Nauheim, which was bestowed by Napoleon upon Marshal Davout, became a town in 1854. From 1815 to 1866 it belonged to the electorate of Hesse-Cassel, but in 1866 it was ceded to the grand-duchy of Hesse-Darmstadt. It was the scene of fighting between the French and the Germans in 1762 and again in 1792.

See Grödel, *Bad Nauheim, seine Kurmittel* (9th ed., Friedberg, 1903); Credner, *Die Kurmittel in Bad Nauheim* (Leipzig, 1894); Bode, *Bad Nauheim, seine Kurmittel und Erfolge* (Wiesbaden, 1889); and Weber, *Die Park- und Waldanlagen vom Bad Nauheim* (Nauheim, 1906).

NAULETTE, a large cavern on the left bank of the Lesse, which joins the Meuse above Dinant, Belgium. Here in 1866 Edouard Dupont discovered an imperfect human lower jaw, now in the Brussels Natural History Museum. It is of a very ape-like type in its extreme projection and that of the teeth sockets (teeth themselves lost), with canines very strong and large molars increasing in size backward. It was found associated with the remains of mammoth, rhinoceros and reindeer. The Naulette man is now assigned to the Mousterian Epoch.

See G. de Mortillet, *Le Préhistorique* (1900); E. Dupont, *Étude sur les fouilles scientifiques exécutées pendant l'hiver* (1865–1866), p. 21.

NAUMACHIA, the Greek word denoting a naval battle (ναῦς, ship, and μάχη, battle), used by the Romans as a term for a mimic sea-fight. These entertainments took place in the amphitheatre, which was flooded with water, or in specially constructed basins (also called *naumachiae*). The first on record, representing an engagement between a Tyrian and an Egyptian fleet, was given by Julius Caesar (46 B.C.) on a lake which he constructed in the Campus Martius. In 2 B.C. Augustus, at the dedication of the temple of Mars Ultor, exhibited a naumachia between Athenians and Persians, in a basin probably in the *horti Caesaris*, where subsequently Titus gave a representation of a sea-fight between Corinth and Corcyra. In that given by Claudius (A.D. 52) on the *lacus Fucinus*, 19,000 men dressed as Rhodians and Sicilians manœuvred and fought. The crews consisted of gladiators and condemned criminals; in later times, even of volunteers.

See L. Friedländer in J. Marquardt, *Römische Staatsverwaltung*, iii. (1885) p. 558.

NAUMACHIUS, a Greek gnomic poet. Of his poems 73 hexameters (in three fragments) are preserved by Stobaeus in his *Florilegium*; they deal mainly with the duty of a good wife. From the remarks on celibacy and the allusion to a mystic marriage it has been conjectured that the author was a Christian.

The fragments, translated anonymously into English under the title of *Advice to the Fair Sex* (1736), are in Gaisford's *Poëtae minores Graeci*, iii. (1823).

NAUMANN, GEORG AMADEUS CARL FRIEDRICH (1797–1873), German mineralogist and geologist, was born at Dresden on the 30th of May 1797, the son of a distinguished musician and composer. He received his early education at Pforta, studied at Freiberg under Werner, and afterwards at Leipzig and Jena. He graduated at Jena, and was occupied in 1823 in teaching in that town and in 1824 at Leipzig. In 1826 he succeeded Mohs as professor of crystallography, in 1835 he became professor also of geognosy at Freiberg; and in 1842 he was appointed professor of mineralogy and geognosy in the university of Leipzig. At Freiberg he was charged with the preparation of a geological map of Saxony, which he carried out with the aid of Bernhard von Cotta in 1846. He was a man of encyclopaedic knowledge, lucid and fluent as a teacher. Early in life (1821–1822) he travelled in Norway, and his observations on that country, and his subsequent publications on crystallography, mineralogy and geology established his reputation. He was awarded the Wollaston Medal by the Geological Society of London in 1868. He died at Leipzig on the 26th of November 1873.

He published *Beiträge zur Kenntniss Norwegens* (2 vols., 1824); *Lehrbuch der Mineralogie* (1828); *Lehrbuch der reinen und angewandten Krystallographie* (2 vols. and atlas, 1830); *Elemente der Mineralogie* (1846; ed. 9, 1874; the 10th ed. by F. Zirkel, 1877); *Lehrbuch der Geognosie* (2 vols. and atlas, 1849–1854, ed. 2, 1858–1872).

NAUMBURG, a town of Germany, in the province of Prussian Saxony, the seat of the provincial law courts and court of appeal for the province and the neighbouring districts. It is situated on the Saale, near its junction with the Unstrut, in the centre of an amphitheatre of vine-clad hills, 29 m. S.W. from Halle, on the railway to Weimar and Erfurt. Pop. (1905) 25,137. The cathedral, an imposing building in the Romanesque Transition style (1207–1242), has a Gothic choir at each end, and contains some interesting medieval sculptures. It is remarkable for its large crypt and its towers, a fourth having been added in 1894, the gift of the emperor William II. There are also four other Protestant churches (of which the town church, dedicated to St Wenceslaus and restored in 1892–1894, possesses two pictures by Lucas Cranach the elder), a Roman Catholic church, a gymnasium, a modern school, an orphanage and three hospitals. A curious feature of the town is the custom, which has not yet died out, of labelling the houses with signs, such as the "swan," the "leopard" and the "lion." The industries of the place mainly consist in the manufacture of cotton and woollen fabrics, chemicals, combs, beer, vinegar and leather. On the hills to the north of the town, across the Unstrut, lies Schenkelburg, once the residence of the poet Gellert, and noticeable for the grotesque carvings in the sandstone rocks.

In the 10th century Naumburg was a stronghold of the margraves of Meissen, who in 1029 transferred to it the bishopric of Zeitz. In the history of Saxony it is memorable as the scene of various treaties; and in 1561 an assembly of Protestant princes was held there, which made a futile attempt to cement the doctrinal dissensions of the Protestants. In 1564 the last bishop died, and the bishopric fell to the elector of Saxony. In 1631 the town was taken by Tilly, and in 1632 by Gustavus Adolphus. It became Prussian in 1814. An annual festival, with a procession of children, which is still held, is referred to an apocryphal siege of the town by the Hussites in 1432, but is probably connected with an incident in the brothers' war (1447–51), between the elector Frederick II. of Saxony and his brother Duke William. Karl Peter Lepsius (1775–1853), the antiquary and his more distinguished son Richard the Egyptologist, were born at Naumburg.

See E. Borkowsky, *Die Geschichte der Stadt Naumburg an der Saale* (Stuttgart, 1897); E. Hoffmann, *Naumburg an der Saale im Zeitalter der Reformation* (Leipzig, 1900); S. Braun, *Naumburger Annalen vom Jahre 799 bis 1613* (Naumburg, 1892); Puttrich, *Naumburg an der Saale, sein Dom und andre altertümliche Bauwerke* (Leipzig, 1841–1843); and Wispel, *Entwickelungsgeschichte der Stadt Naumburg an der Saale* (Naumburg, 1903).

NAUNTON, SIR ROBERT (1563–1635), English politician, the son of Henry Naunton of Alderton, Suffolk, was educated at Trinity College, Cambridge, becoming a fellow of his college in 1585 and public orator of the university in 1594. Walter Devereux, earl of Essex, enabled him to spend some time abroad, sending information about European affairs. Having returned to England, he entered parliament in 1606 as member for Helston, and he sat in the five succeeding parliaments; in 1614 he was knighted, in 1616 he became master of requests and later surveyor of the court of wards. In 1618 his friend Buckingham procured for him the position of secretary of state. Naunton's strong Protestant opinions led him to favour more active intervention by England in the interests of Frederick V., and more vigorous application of the laws against Roman Catholics. Gondomar, the Spanish ambassador, complained to James, who censured his secretary. Consequently in 1623 Naunton resigned and was made master of the court of wards. He died at Letheringham, Suffolk, on the 27th of March 1635. Naunton's valuable account of Queen Elizabeth's reign was still in manuscript when he died. As *Fragmenta regalia, written by Sir Robert Naunton*, it was printed in 1641 and again in 1642, a revised edition, *Fragmenta Regalia, or Observations on the late Queen Elizabeth, her Times and Favourites*, being issued in 1653. It was again published in 1824, and an edition edited by A. Arber was brought out in 1870. It has also been printed in several collections and has been translated into French and Italian. There are several manuscript copies extant, and some of Naunton's letters are in the British Museum and in other collections.

See *Memoirs of Sir Robert Naunton* (1814).

NAUPACTUS (Ital. *Lepanto*, mod. Gr. *Epakto*), a town in the nomarchy of Acarnania and Aetolia, Greece, situated on a bay on the north side of the straits of Lepanto. The harbour, once the best on the northern coast of the Corinthian Gulf, is now almost entirely choked up, and is accessible only to the smallest craft. Naupactus is an episcopal see; pop. about 2500. In Greek legend it appears as the place where the Heraclidae built a fleet to invade Peloponnesus. In historical times it belonged to the Ozolian Locrians; but about 455 B.C., in spite of a partial resettlement with Locrians of Opus, it fell to the Athenians, who peopled it with Messenian refugees and made it their chief naval station in western Greece during the Peloponnesian war. In 404 it was restored to the Locrians, who subsequently lost it to the Achaeans, but recovered it through Epaminondas. Philip II. of Macedon gave Naupactus to the Aetolians, who held it till 191, when after an obstinate siege it was surrendered to the Romans. It was still flourishing about A.D. 170, but in Justinian's reign was destroyed by an earthquake. In the middle ages it fell into the hands of the Venetians, who fortified it so strongly that in 1477 it successfully resisted a four months' siege by a Turkish army thirty thousand strong; in 1499, however, it was taken by Bayezid II. The mouth of the Gulf of Lepanto was the scene of the great sea fight in which the naval power of Turkey was for the time being destroyed by the united papal, Spanish and Venetian forces (October 7, 1571). See LEPANTO, BATTLE OF. In 1678 it was recaptured by the Venetians, but was again restored in 1699, by the treaty of Karlowitz to the Turks; in the war of independence it finally became Greek once more (March 1829).

See Strabo ix. pp. 426-427; Pausanias x. 38. 10-13; Thucydides i.-iii. *passim*; Livy. bk. xxxvi. *passim*; E. L. Hicks and G. F. Hill, *Greek Historical Inscriptions* (Oxford, 1901), No. 25.

NAUPLIA, a town in the Peloponnesus, at the head of the Argolic Gulf. In the classical period it was a place of no importance, and when Pausanias lived, about A.D. 150, it was deserted. At a very early time, however, it seems to have been of greater note, being the seaport of the plain in which Argos and Mycenae are situated, and several tombs of the Mycenaean age have been found. A hero Nauplius took part in the Argonautic expedition; another was king of Euboea. The mythic importance of the town revived in the middle ages, when it became one of the chief cities of the Morea. It was captured in 1211 by Godfrey Villehardouin with the help of Venetian ships; a French dynasty ruled in it for some time, and established the feudal system in the country. In 1388 the Venetians bought Argos and Nauplia. In the wars between Venice and the Turks it often changed masters. It was given to the Turks at the peace concluded in 1540; it was recaptured by Venice in 1686, and Palamidhi on the hill overhanging the town was made a great fortress. In 1715 it was taken by the Turks; in 1770 the Russians occupied it for a short time. The Greeks captured it during the War of Independence on the 12th of December 1822, and it was the seat of the Greek administration till 1833, when Athens became the capital of the country. It is the chief town of the department of Argolis (pop. in 1907, 81,943). Pop. about 6000.

NAUSEA (from Gr. *ναῦς*, a ship), sea-sickness, or generally any disposition to vomit; also used figuratively to denote feelings of strong aversion or dislike.

NAUSICAA, in Greek legend, daughter of Alcinous, king of the Phaeacians in the island of Scheria (*Odyssey*, vi. 15-315, viii. 457.) When Odysseus (Ulysses) was swept into the sea from the raft on which he had left the home of Calypso, he swam ashore to Scheria, where he fell asleep on the bank of a river. Here he was found by Nausicaa, who supplied him with clothes and took him to her father's palace, where he was hospitably entertained. She is said to have become the wife of Telemachus. The incident of Odysseus and Nausicaa formed the subject of a lost play by Sophocles and was frequently represented in ancient art.

NAUTCH (Hindostani *nach*), an Indian ballet-dance. The nautch is performed by nautch-girls, who move their feet but little, and the dance consists of swaying the body and posturing with the arms.

NAUTILUS. The term nautilus, meaning simply "the sailor," was applied by the ancient Greeks to the genus of eight-armed cuttlefishes or octopods which is now known as the paper nautilus, and whose scientific name is *Argonauta* (see CEPHALOPODA). This animal is not uncommon in the Mediterranean, and from its habit of floating at the surface attracted the attention of the fishermen and sailors of the Aegean Sea from the earliest times. The popular belief that the expanded arms are raised above the water to act as sails and that the other arms are used as oars was not based on any actual observation of the living animal, and it is now known that although the animal floats at the surface it does not sail, the expanded arms being applied to the exterior surface of the shell, which is secreted by them. The eggs are carried in the shell, and as this structure is entirely absent in the males, there is good reason to conclude that the habit of carrying the eggs and using one pair of arms for that purpose gave rise to the modification of those arms and the secretion of the shell by them. Huxley once expressed the truth of the matter with characteristic felicity in the remark that if the shell of the Argonaut is to be compared to anything of human invention or construction at all, it should be compared, not to a ship or boat, but to a perambulator.

The shell of *Argonauta* (see fig. 1) is spirally coiled and symmetrical, and thus bears a remarkable resemblance to the shell of the pearly nautilus and the extinct ammonites, especially as it is like that of the pearly nautilus coiled towards the dorsal or anterior surface of the animal. It is ornamented by ridges and furrows which pass in transverse curves from the inner to the outer margin of the coils. The outer margin or keel is somewhat flattened and the whole shell is compressed from side to side. It differs entirely from the shell of the pearly nautilus in the absence of internal septa and siphuncle and in the absence of any attachment between it and the body. It is in fact entirely different in origin and relations to the body from the typical molluscan shell secreted by the mantle in other Cephalopods and other types of Mollusca. It is a structure *sui generis*, unique in the whole phylum of Mollusca.

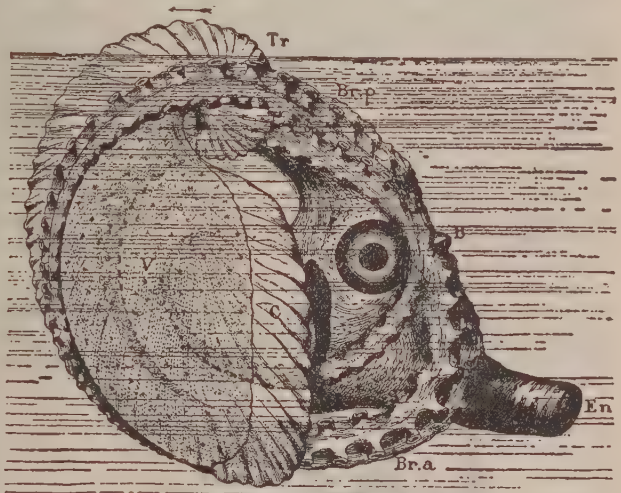

FIG. 1.—The Argonaut in life. (After *Lacaze-Duthiers.*)

Tr, Float; *Br.a*, ventral or posterior arms; *Br.p*, dorsal or anterior arms; *V*, the expanded portion of them, once called the sails; *B*, the beak; *C*, the shell; *En*, the funnel.

The only description of the living animal by a competent observer which we have is that of Lacaze Duthiers, made on a single specimen on the Mediterranean coast of France, and published in 1892, and even this is in some respects incomplete. The specimen after capture was carried in a bucket, and became separated from its shell. When placed with the shell in a large aquarium tank the animal resumed possession of the shell and assumed the attitude shown in fig. 1. The shell floated at the surface, doubtless in consequence of the inclusion of some air in the cavity of the shell. It is not known with certainty that the animal is able in its natural state to descend below the surface; the specimen here considered never did so of its own accord, and when pushed down always rose again.

The siphon or funnel is unusually large and prominent, and is the chief or only organ of locomotion, the water which is expelled from it driving the animal backwards. The arms are usually turned backwards and carried inside the shell, to the inner surface of which the suckers adhere, but one or two arms are from time to time extended in front. This does not apply to the dorsal arms which are applied to the outside of the shell, and the expanded membrane of these arms covers the greater part of its surface. The dorsal arms are turned backwards, and each is twisted so that the oral surfaces face each other and the suckers are in contact with the shell. The membrane or velum is thin, and is really a great expansion of a dorsal membrane similar to that which is found along the median dorsal line of the two posterior arms. The suckers of the originally posterior series of each dorsal arm lie along the external border of the shell, and the arm with its two rows of suckers extends round the whole border of the membrane, the arm being curved into a complete loop, so that its extremity reaches almost to the origin of the membrane near the base of the arm, the extremity being continued on to the internal surface of the membrane. The external row of suckers, originally the posterior row, are united by membrane which is continuous with the velum. The smaller suckers on the more distal part of the arm, which extends along the edge of the shell-aperture, are quite sessile. In the figure of Lacaze-Duthiers (fig. 1) the suckers appear to be turned away from the shell, but this is erroneous. A figure showing the natural position is given in the Monograph of the Cephalopoda in the series of Monographs issued by the Zoological Station of Naples.

The animal described by Lacaze-Duthiers lived a fortnight in captivity, during which time it devoured with avidity small fishes which were presented to it, seizing them, not by throwing out all the ventral arms, but by means of the suckers near the mouth.

Judging from these observations, *Argonauta* is a pelagic animal which lives and feeds near the surface of the ocean. Several species of *Argonauta* are known, distributed in the tropical parts of all the great oceans. The male is much smaller than the female, not exceeding an inch or so in length. It secretes no shell and its dorsal arms are not modified. The third arm on the left side, however, is modified in another way in connexion with reproduction.

Argonauta is one of the Cephalopods in which the process known as hectocotylization of one arm is developed to its extreme degree, the arm affected becoming ultimately detached and left by the male in the mantle cavity of the female where it retains for some time its life and power of movement. The hectocotylus or copulatory arm in the Argonaut is developed at first in a closed cyst (fig. 2), which afterwards bursts, allowing the arm to uncoil; the remains of the cyst form a sac on the back of the arm which serves to contain the spermatophores.

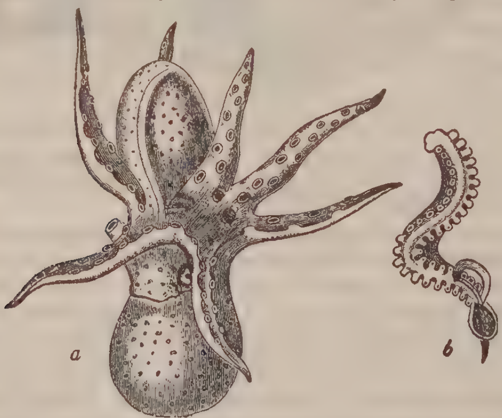

FIG. 2.—*a*, Male of *Argonauta argo*, with the hectocotylized arm still contained in its enveloping cyst, four times enlarged (after H. Müller). *b*, Hectocotylus of *Tremoctopus violaceus* (after Kölliker).

The animal known as the Pearly Nautilus was unknown to the ancient Greeks, since its habitat is the seas of the far East, but in the middle ages, when its shell became known in Europe, it was called, from its superficial similarity to that of the original nautilus, by the same name. It was Linnaeus who, in order to distinguish the two animals, took the name "nautilus" from the animal to which it originally belonged and bestowed it upon the very different East Indian Mollusc, giving to the original nautilus the new name *Argonauta*. Zoological nomenclature dates from Linnaeus, and thus the nautilus is now the name of the only living genus of Tetrabranchiate Cephalopods. A detailed description of this animal is given in the article Cephalopoda (*q.v.*); it is only necessary to add here a brief account of its mode of life and habits.

Four species are known from the Indian and Pacific oceans; they are gregarious and nocturnal animals living at some depth and apparently always on the bottom. The natural attitude of the animal as represented by Dr Willey is with the oral surface downwards, the tentacles spread out, and the shell vertical. The chambers of the shell have no communication with one another nor with the siphuncle, they are air-tight cavities and filled, not with water, but with a nitrogenous gas. This necessarily very much reduces the specific gravity of the animal, but it is still heavier than the water and does not seem capable of rising to the surface any more than an octopus. *Nautilus* is rather abundant at some localities in the East Indian Archipelago, for example at Amboyna in the Moluccas. In 1901–1902 Dr Arthur Willey of Cambridge University spent some time in that region for the purpose of investigating the reproduction and development of the animal. He stationed himself at New Britain, known to the Germans as Neu Pommern, an island of the Bismarck Archipelago off the coast of Papua. The natives of this island use the nautilus for food, capturing them by means of a large fish-trap similar in construction to the cylindrical lobster-traps used by British fishermen. Fish is used for bait. Dr Willey found the males much more numerous than the females; of fifteen specimens captured on one occasion only two were females. He kept specimens alive both in vessels on shore and in large baskets moored at the bottom of the sea. He found that when they were placed in a vessel of sea water numbers of a small parasitic crustacea issued from the mantle cavity. Some of the females laid eggs in captivity, but these were found not to be fertilized; they were about 3·5 centimetres long and attached singly by a broad base to the sides of the cage in which the animals were confined.

LITERATURE.—Lacaze-Duthiers, "Observation d'un argonaute de la Méditerranée," *Arch. zool. expér.* x. (1902), p. 1892. *Cephalopoda*, by Jalta; *Fauna und Flora des Golfes von Neapel*, monographs issued by the Zoological Station of Naples. Bashford Dean, "Notes on Living Nautilus," *Amer. Natur.* xxxv. (1901). A. Willey, *Contribution to the Natural History of the Pearly Nautilus*; A. Willey's *Zoological Results*, pt. vi. (1902). (J. T. C.)

NAUVOO, a city of Hancock county, Illinois, U.S.A., on the Mississippi river at the head of the lower rapids and about 50 m. above Quincy. Pop. (1900) 1321; (1910) 1020. On the opposite bank of the river is Montrose, Iowa (pop. in 1910, 708), served by the Chicago, Burlington & Quincy railway. Nauvoo is the seat of St Mary's Academy and Spalding Institute (1907), two institutions of the Benedictine Sisters. "Commerce City" was laid out here in 1834 by Connecticut speculators; but the first settlement of importance was made by the Mormons (*q.v.*) in 1839-1840; they named it Nauvoo,[1] in obedience to a "revelation" made to Joseph Smith, and secured a city charter in 1840. Four years later its population was about 15,000, and a large Mormon temple had been built, but internal dissensions arose, "gentile" hostility was aroused, the charter of Nauvoo was revoked in 1845, two of the leaders, Joseph Smith and his brother Hyrum, were killed at Carthage, the county-seat, by a mob, and in 1846 the sect was driven from the state. Traces of Mormonism, however, still remain in the ruins of the temple and the names of several of the streets. Three years after the expulsion of the Mormons Nauvoo was occupied by the remnant (some 250) of a colony of French communists, the Icarians, who had come out under the leadership of Étienne Cabet (*q.v.*). For a few years the colony prospered, and by 1855 its membership had doubled. It was governed under a constitution, drafted by Cabet, which vested the legislative authority in a general assembly composed of all the males twenty years of age or over and the administrative authority in a board of six directors, three of whom were elected every six months for a term of one year. Each family occupied its own home, but property was held in common, all ate at the common table, and the children were taught in the community school. In December 1855 Cabet proposed a revision of the constitution to give him greater authority. This resulted in rending the colony into two irreconcilable factions, and in October 1856 Cabet with the minority (172) withdrew to St Louis, Mo., where he died on the 8th of November. In May 1858 the surviving members of his faction together with a few fresh arrivals from France established a new

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[1] The Mormons said the name was of Hebrew origin and meant "beautiful place"; Hebrew "naveh" means "pleasant."

Icarian colony at Cheltenham near St Louis, but this survived only for a brief period. Nauvoo was never intended to be more than a temporary home for the Icarians. Soon after the schism of 1856 those who had rebelled against Cabet began to prepare a permanent home in Adams county, Iowa. There too in 1879 the community split into two factions, the Young Party and the Old Party. Some time before this separation a few members of the colony removed to the vicinity of Cloverdale, Sonoma county, California, and here most of the members of the Young Party joined them early in 1884 in forming the Icaria-Speranza Community. This society tried a government quite different from that first adopted at Nauvoo, but it ceased to exist after about three years. The Old Party also adopted a new constitution, but it too was dissolved in 1895.

See Albert Shaw, *Icaria: A Chapter in the History of Communism* (New York, 1884); Jules Prudhommeaux, *Icaria et son fondateur Étienne Cabet* (Paris, 1907); and H. Lux, *Étienne Cabet und der Ikarische Kommunismus* (Stuttgart, 1894).

NAVAHO, or Navajo, a tribe of North American Indians of Athabascan stock. They inhabit the northern part of Arizona and New Mexico. The majority live by breeding horses, sheep and goats. They are well known for their beautiful blanket weaving. (See Indians, North American.)

NAVAN, a market town of county Meath, Ireland, situated at the confluence of the Blackwater with the Boyne. Pop. (1901) 3839. It is a railway junction of some importance, where the Clonsilla and Kingscourt branch of the Midland Great Western railway crosses the Drogheda and Oldcastle branch of the Great Northern. By the former it is 30 m. N.W of Dublin. Navan is the principal town of county Meath (though Trim is the county town), and has considerable trade in corn and flour, some manufacture of woollens and of agricultural implements, and a tannery. Navan was a barony of the palatinate of Meath, was walled and fortified, and was incorporated by charter of Edward IV. It suffered in the civil wars of 1641, and returned two members to the Irish parliament until the Union in 1800. It is governed by an urban district council, and is a favourite centre for rod-fishing for trout and salmon.

NAVARINO, BATTLE OF, fought on the 20th of October 1827, the decisive event which established the independence of Greece. By the treaty signed in London on the 6th of July 1827 (see Greece, *History*), England, France and Russia agreed to demand an armistice, as preliminary to a settlement. Sir Edward Codrington, then commander-in-chief in the Mediterranean, received the treaty and his instructions on the night of the 10th/11th of August at Smyrna, and proceeded at once to Nauplia to communicate them to the Greeks. His instructions were to demand an armistice, to intercept all supplies coming to the Turkish forces in the Morea from Africa or Turkey in general, and to look for directions to Stratford Canning (Lord Stratford de Redcliffe), the British ambassador at Constantinople. The ambassador's instructions reached Codrington on the 7th of September. He was accompanied to Nauplia by his French colleague, Rear-Admiral de Rigny. The Greek government agreed to accept the armistice. Admiral de Rigny left for a cruise in the Levant, and Sir Edward Codrington, hearing that an Egyptian armament was on its way from Alexandria, and believing that it was bound for Hydra, steered for that island, which he reached on the 3rd of September, but on the 12th of September found the Egyptians at anchor with a Turkish squadron at Navarino. The Turkish government refused to accept the armistice. On the 19th of September, seeing a movement among the Egyptian and Turkish ships in the bay, Codrington informed the Ottoman admiral, Tahir Pasha, that he had orders to prevent hostile movements against the Greeks. Admiral de Rigny joined him immediately afterwards, and a joint note was sent by them on the 22nd of September to Ibrahim Pasha, who held the superior command for the sultan. On the 25th an interview took place, in which Ibrahim gave a verbal engagement not to act against the Greeks, pending orders from the sultan. The allies, who were in want of stores, now separated, Codrington going to Zante and de Rigny to Cervi, where his store ships were. Frigates were left to watch Navarino. The British admiral had barely anchored at Zante before he was informed that the sultan's forces were putting to sea. On the 29th of September a Greek naval force, commanded by an English Philhellene, Captain Frank Abney Hastings, had destroyed some Turkish vessels in Salona Bay, on the north side of the Gulf of Corinth. From the 3rd to the 5th of October Codrington, who had with him only his flagship the "Asia" (84) and some smaller vessels, was engaged in turning back the Egyptian and Turkish vessels, a task in which he was aided by a violent gale. He resumed his watch off Navarino, and on the 13th was joined by de Rigny and the Russian rear-admiral Heiden with his squadron. By general agreement among the powers the command was entrusted to Codrington, and the allied force consisted of three British, four French and four Russian sail of the line, if the French admiral's flagship the "Sirène" (60), which was technically "a double banked frigate," be included. There were four British, one French and four Russian frigates, and six British and French brigs and schooners. The Egyptians and Turks had only three line of battleships and fifteen large frigates, together with a swarm of small craft which raised their total number to eighty and upwards. Ibrahim Pasha, though unable to operate at sea, considered himself at liberty to carry on the war by land. His men were actively employed in burning the Greek villages, and reducing the inhabitants to slavery. The flames and smoke of the destroyed villages were clearly seen from the allied fleet. On the 17th of October, a joint letter of expostulation was sent in to Ibrahim Pasha, but was returned with the manifestly false answer that he had left Navarino, and that his officers did not know where he was. The admirals, therefore, decided to stand into the bay and anchor among the Egyptian and Turkish ships. A French officer in the Egyptian service, of the name of Letellier, had anchored the vessels of Ibrahim and the Turkish admiral in a horseshoe formation, of which the points touched the entrance to the bay, and there were forts on the lands at both sides of the entry. The allies entered in two lines—one formed of the French and British led by Codrington in the "Asia," the other of the Russians,—and began to anchor in the free water in the midst of Ibrahim's fleet. The officer commanding the British frigate "Dartmouth" (42), Captain Fellowes, seeing a Turkish fireship close to windward of him, sent a boat with a demand that she should be removed. The Turks fired, killing Lieutenant G. W. H. Fitzroy, who brought the message, and several of the boat's crew. The "Dartmouth" then opened "a defensive fire," and the action became general at once. The allies, who were all closely engaged, were anchored among their enemies, and the result was obtained by their heavier broadsides and their better gunnery. Three-fourths of the Turkish and Egyptian vessels were sunk by the assailants, or fired by their own crews. On the allied side the British squadron lost 75 killed and 197 wounded; the French 43 killed and 183 wounded; the Russians 59 killed and 139 wounded. In the British squadron Captain Walter Bathurst of the "Genoa" (74) was slain. The loss of the Turks and Egyptians was never accurately reported, but it was certainly very great.

In its effects on the international situation Navarino may be reckoned one of the decisive battles of the world. It not only made the efforts of the Turks to suppress the Greek revolt hopeless, but it made a breach difficult to heal in the traditional friendship between Great Britain and Turkey, which had its effect during the critical period of the struggle between Mehemet Ali and the Porte (1831–1841). It precipitated the Russo-Turkish war of 1828–1829, and, by annihilating the Ottoman navy, weakened the resisting power of Turkey to Russia and later to Mehemet Ali.

See *Memoir of Admiral Sir E. Codrington*, by his daughter Lady Bourchier (London, 1873); *Naval History of Great Britain*, by W. James and Captain Chamier, vol. vi. (London, 1837). (D. H.)

NAVARRE (Span. *Navarra*), an inland province of northern Spain, and formerly a kingdom which included part of France. The province is bounded on the N. by France (Basses Pyrénées) and Guipúzcoa, E. by Huesca and Saragossa, S. by Saragossa and Logroño and W. by Álava. It is traversed from east to west by the Pyrenees and the Cantabrian Mountains, and almost the whole of the province is overrun by the ramifications of these ranges. From Navarre there are only three practicable roads for carriages into France—those by the Puerta de Vera, the Puerta de Maya and Roncesvalles. The highest summit in the province is the Monte Adi (4931 ft.). The chief river flowing towards the Atlantic is the Bidasoa, which rises near the Puerta de Maya, and after flowing southwards through the valley of Baztán takes a north-easterly course, and for a short distance above its outfall at Fuenterrabia constitutes the frontier between France and Spain (Guipúzcoa); by far the larger portion of Navarre is drained to the Mediterranean through the Ebro, which flows along the western frontier and crosses the extreme south of the province. The hilly districts consist almost entirely of forest and pasture, the most common trees being the pine, beech, oak and chestnut. Much of the lower ground is well adapted for agriculture, and yields grain in abundance; the principal fruit grown is the apple, from which cider is made in some districts; hemp, flax and oil are also produced, and mulberries are cultivated for silkworms. The wine trade is active, and the products of the vineyards are in great demand in south-west France and at Passages in Guipúzcoa for mixing with French wines. Navarre is one of the richest provinces of Spain in live stock. Game, both large and small, is plentiful in the mountains, and the streams abound with trout and other fish. Gypsum, limestone, freestone and marble are quarried; there are also mines of copper, lead, iron, zinc and rock salt. Mineral and thermal springs are numerous, but none is of more than local fame. The other industries include manufactures of arms, paper, chocolate, candles, alcohol, leather, coarse linens and cloth. The exports both by rail and by the passes in the Pyrenees consist of live stock, oil, wine, wool, leather and paper.

The Ebro Valley railway, which traverses southern Navarre and skirts the western frontier, sends out a branch line from Castejon to Pamplona and Alsasua junction, where it connects with the Northern railways from Madrid to France. Narrow-gauge railways convey timber and ore from the mountains to these main lines. Pamplona, the capital (pop., 1900, 28,886), and Tudela (9449) are described in separate articles. The only other towns with more than 5000 inhabitants are Baztán (9234), Corella (6793), Estella (5736) and Tafalla (5494).

History.—The kingdom of Navarre was formed out of a part of the territory occupied by the Vascones, *i.e.* the Basques and Gascons, who occupied the southern slope of the western Pyrenees and part of the shore of the Bay of Biscay. In the course of the 6th century there was a considerable emigration of Basques to the north of the Pyrenees. The cause is supposed to have been the pressure put upon them by the attacks of the Visigoth kings in Spain. Yet the Basques maintained their independence. The name of Navarre is derived by etymologists from "nava" a flat valley surrounded by hills (a commonplace name in Spain; cf. Navas de Tolosa to the south of the Sierra Morena) and "erri" a region or country. It began to appear as the name of part of Vasconia towards the end of the Visigoth epoch in Spain in the 7th century. Its early history is more than obscure. In recent times ingenious attempts have been made to trace the descent of the first historic king of Navarre from one Semen Lupus, duke of Aquitaine in the 6th century. The reader may consult *La Vasconie* by Jean de Jaurgain (Paris, 1898) for the latest example of this reconstruction of ancient history from fragmentary and dubious materials. Jaurgain has been subjected to very damaging criticism by L. Barrau-Dihigo (*Revue Hispanique*, t. vii. 141). The first historic king of Navarre was Sancho Garcia, who ruled at Pamplona in the early years of the 10th century. Under him and his immediate successors Navarre reached the height of its power and its extension (see SPAIN: *History*, for the reign of Sancho el Mayor, and the establishment of the Navarrese line as kings of Castile and Leon, and of Aragon). When the kingdom was at its height it included all the modern province of the name; the northern slope of the western Pyrenees called by the Spaniards the "Ultra-puertos" or country beyond the passes, and now known as French Navarre; the Basque provinces; the Bureba, the valley between the Basque Mountains and the Montes de Oca to the north of Burgos; the Rioja and Tarazona in the upper valley of the Ebro. In the 12th century the kings of Castile gradually annexed the Rioja and Álava. While Navarre was reunited to Aragon—1076–1134—(see SPAIN: *History*) it was saved from aggression on the east, but did not recover the territory taken by Castile. About the year 1200 Alfonso VIII. of Castile annexed the other two Basque provinces, Biscay (Vizcaya) and Guipúzcoa. Tarazona remained in possession of Aragon. After 1234 Navarre, though the crown was claimed by the kings of Aragon, passed by marriage to a succession of French rulers. In 1516 Spanish Navarre was finally annexed by Ferdinand the Catholic. French Navarre survived as an independent little kingdom till it was united to the crown of France by Henry IV. founder of the Bourbon dynasty. From 1510 until 1833, when it was fully incorporated with Spain, Navarre was a viceroyalty.

As originally organized, Navarre was divided into Merindades, or districts, governed by a Merino (mayorino) as representative of the king. They were the Ultrapuertos (French Navarre), Pamplona, Estella, Judela, Sanguesa. In 1407 Olite was added. The Cortes of Navarre began with the king's council of churchmen and nobles. But in the course of the 14th century the burgesses were added. Their presence was due to the fact that the king had need of their co-operation to raise money by grants and aids. When fully constituted, the Cortes consisted of the churchmen, the nobles and the representatives of twenty-seven "good towns"—that is to say, towns which had no feudal lord, and, therefore, held directly of the king. In the later stages of its history the Cortes of Navarre included the representatives of thirty-eight towns. The independence of the burgesses was better secured in Navarre than in other parliaments of Spain by the constitutional rule which required the consent of a majority of each order to every act of the Cortes. Thus the burgesses could not be outvoted by the nobles and the Church. Even in the 18th century the Navarrese successfully resisted the attempt of the kings of the Bourbon dynasty to establish custom houses on the French frontier. Yet they were loyal to their Spanish sovereigns, and no part of the country offered a more determined or more skilful resistance to Napoleon. Navarre was much under clerical influence. This, and the resentment felt at the loss of their autonomy when they were incorporated with the rest of Spain in 1833, account for the strong support given by many Navarrese to the Carlist cause.

See *Historia Compendiada de Navarra* by Don J. M. Yanguas, (San Sebastian, 1832).

NAVARRETE, JUAN FERNANDEZ (1526–1579), surnamed El Mudo (The Mute), Spanish painter of the Madrid school, was born at Logroño in 1526. An illness in infancy deprived him of his hearing, but at a very early age he began to express his wants by sketching objects with a piece of charcoal. He received his first instructions in art from Fray Vicente de Santo Domingo, a Hieronymite monk at Estella, and afterwards he visited Naples, Rome, Florence and Milan. According to the ordinary account he was for a considerable time the pupil of Titian at Venice. In 1568 Philip II. summoned him to Madrid with the title of king's painter and a salary, and employed him to execute pictures for the Escorial. The most celebrated of the works he there produced are a "Nativity" (in which, as in the well-known work on the same subject by Correggio, the light emanates from the infant Saviour), a "Baptism of Christ" (now in the Madrid Picture Gallery), and "Abraham Receiving the Three Angels" (one of his last performances, dated 1576). He executed many other altarpieces, all characterized by boldness and freedom in design, and by the rich warm colouring which has acquired for him the surname of "the Spanish Titian." He died at Toledo in February 1579.

NAVARRETE, MARTIN FERNANDEZ DE (1765–1844), Spanish historian, was born at Abalos on the 9th of November 1765, and entered the navy in 1780. He was engaged in the unsuccessful operations against Gibraltar in 1782, and afterwards in the suppression of Algerine pirates. Ill-health compelled him for a time to withdraw from active service, but he devoted this forced leisure to historical research, and in 1789 he was appointed by the crown to examine the national archives relating to the maritime history of Spain. Rejoining the navy in 1793, he was present at the siege of Toulon, and afterwards received command of a frigate. From 1797 to 1808 he held in succession various important posts in the ministry of marine. In 1808 the French invasion led to his withdrawal to Andalusia, and the rest of his life was entirely devoted to literature. In 1819 appeared, as an appendix to the Academy's edition of *Don Quijote*, his *Vida de Cervantes*, and in 1825 the first two volumes of the *Coleccion de los Viajes y Descubrimientos que hicieron por Mar los Españoles desde fines del Siglo XV.* (3rd vol., 1829; 4th vol., 1837). In 1837 he was made a senator and director of the academy of history. At the time of his death, on the 8th of October 1844, he was assisting in the preparation of the *Coleccion de Documentos Ineditos para la Historia de España.* His *Disertacion sobre la Historia de la Nautica* (1846) and *Biblioteca Maritima Española* (1851), were published posthumously.

NAVARRO, PEDRO (*c.* 1460–1528), Spanish military engineer and general, of obscure parentage, was born probably about 1460. He began life as a sailor; and was employed later as *mozo de espuela*, or running footman, by the Cardinal Juan de Aragon; on the death of his employer in 1485 he enlisted as a mercenary in a war between Florence and Genoa; and was subsequently engaged for some years in the warfare between the Genoese corsairs and the Mahommedans of Northern Africa. Navarro was not more scrupulous than others, for in 1499 he was at Civitavecchia, recovering from a gunshot wound in the hip received in a piratical attack on a Portuguese trading ship. When Gonsalvo de Córdoba was sent to Sicily, to take part with the French in the partition of Naples, Navarro enlisted under him; and in the expulsion of the Turkish garrison from Cephalonia in 1500 he helped by laying mines to breach the walls, though not at first with much success. The Spanish commander gave him a captain's commission. During the campaigns of 1502 and 1503 he came to the front among the Spanish officers by the defence of Canosa and of Taranto, by his activity in partisan warfare on the French lines of communication, and by the part he took in winning the battle of Cerinola. But his great reputation among the soldiers of the time was founded on the vigour and success of his mining operations against the castles of Naples, held by French garrisons, in 1503, and he was undoubtedly recognized as the first military engineer of his age. When the French were expelled from Naples he received from Gonsalvo a grant of land and the title of count of Olivetto. In 1506 he was in Spain, and for several years he was employed in wars on the north coast of Africa. In 1508 he took Velez de Gomera, largely by means of a species of floating battery which he invented. In 1509 he accompanied Ximenez in the conquest of Oran, and did excellent service. Till 1511 he continued in service in Africa, and took Bougie and Tripoli in 1510. The disasters at Gerba and Kerkenna did not materially affect his reputation. There was some talk of appointing him to command the army of the league formed against the French in 1512; but his humble birth was thought to disqualify him. He was, however, sent as a subordinate general. At the battle of Ravenna he covered the orderly retreat of the Spanish foot, and was struck from his horse by a shot which failed to pierce his armour. Being taken prisoner by the French, he was sent to the Castle of Loches. Ferdinand, whom the soldiers called an Aragonese skinflint, would not pay his ransom, and after three years of imprisonment he entered the service of Francis I. in a pique. The rest of his life was spent as a French officer. He distinguished himself in the passage of the Alps, at the battle of Marignano, by the taking of the citadel of Milan, and in the long siege of Brescia. He was at the battle of Pavia, and in 1522 was taken prisoner at Genoa by his own countrymen. He was confined at Naples till the peace of 1526, but beyond the confiscation of his estate at Olivetto no punishment was inflicted for his treason. His last service was in the disastrous expedition of Lautrec to Naples in 1527, which was ruined by the plague. He died near the end of 1528.

A life of Navarro by Don Martin de los Heros, is published in the *Documentos inéditos para la Historia de España*, vol. xxv. (Madrid, 1854).

NAVE, ecclesiastically considered, that part of a church appropriated to the laity as distinguished from the chancel, the choir or the presbytery, reserved for the clergy. In a 14th-century letter (quoted in Gasquet's *Parish Life in Medieval England*, 1906, p. 45) from a bishop of Coventry and Lichfield to one of his clergy, the reason for this appropriation is given. "Not only the decrees of the holy fathers but the approved existing customs of the Church order that the place in which the clerks sing and serve God according to their offices be divided by screens from that in which the laity devoutly pray. In this way the nave of the church . . . is alone to be open to lay people, in order that, in the time of divine service, clerics be not mixed up with lay people, and more especially with women, nor have communication with them, for in this way devotion may be easily diminished." The word "nave" has been generally derived from Lat. *navis*, ship. Du Cange (*Glossarium*, *s.v.* "Navis") quotes from the *Chronicon Moriniacense*, of the 12th century, as to the popular origin of the name, *Exterius etiam tabernaculum, quod ecclesiae navis a populo vocatur* . . . . Salmasius in his commentary on Solinus (1629) finds the origin in the resemblance of the vaulted roof to the keel of a ship, and refers to Sallust (*Jugurtha*, 18. 8) where is noticed a similar resemblance in the huts (*mapalia*) of the Numidians. The use of the word *navis* may, however, be due to the early adoption of the "ship" as a symbol of the church (see Skeat's note on *Piers Plowman*, xl. 32). The Greek *ναός*, Attic *νεώς* (*ναίειν*, to dwell), the inner shrine of a Greek temple, the *cella*, has also been suggested as the real origin of the word. This derivative must presume a latinized corruption into *navis*, for the early application of the word for ship to this part of a church building is undoubted.[1]

Architecturally considered the nave is the central and principal part of a church, extending from the main front to the transepts, or to the choir or chancel in the absence of transepts. When the nave is flanked by aisles, light is admitted to the church through clerestory windows, some of the most ancient examples being the basilica at Bethlehem and the church of St Elias, at Thessalonica, both of the 5th century; numerous churches in Rome; and in the 6th century the two great basilicas at Ravenna; in all these cases the sills of the clerestory windows were raised sufficiently to allow of a sloping roof over the side aisles. When, however, a gallery was carried above the side aisles, another division was required, which is known as the triforium, and this subdivision was retained in the nave even when it formed a passage only in the thickness of the wall. In Late Gothic work in England, the triforium was suppressed altogether to give more space for the clerestory windows, and roofs of low pitch were provided over the side aisles.

The longest nave in England is that of St Albans (300 ft.), in which there are thirteen nave arches or bays on each side; in Winchester (264 ft.) there are twelve bays; in Norwich (250 ft.) fourteen; Peterborough (226 ft.) eleven; and Ely (203 ft.) twelve bays. Most of these dimensions are in excess of those of the French cathedrals; Bourges is 300 ft. long, but as there are no transepts this dimension includes nave and choir. Cluny was 230 ft. with eleven bays; Reims is 235 ft. with ten bays; Paris 170 ft. with ten bays; Amiens 160 with ten bays; and St Ouen, Rouen, 200 ft. with ten bays. In Germany the nave of Cologne cathedral is only 190 ft., including the two bays between the towers. The cathedral at Seville in Spain is 200 ft. long, with only five bays. In Italy the cathedral at Milan is 270 ft. long with nine bays; at Florence, 250 ft. long with only four bays; and St Peter's in Rome 300 ft. long with four bays. On the other hand, the vaults in the nave of the continental cathedrals are far higher than those in England, that of Westminster Abbey being only 103 ft. high, whilst the choir of Beauvais is 150 ft. The result is that the naves of the English cathedrals not only are longer in actual dimensions, but appear much longer in consequence of their inferior height.

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[1] Vessels resembling boats or ships are familiar in medieval art and later. Thus "Incense-boats" (*navettes*) somewhat of this shape are found in 12th-century sculptures. By the 16th century they approximated still more closely to a model of a ship. A large vessel, also in the shape of a boat or ship, and known as a *nef*, was used at the table of princes and great personages to contain the knives, spoons, &c. Some very elaborate examples of these survive, such as the 15th-century *nef* of St Ursula in the treasure of the cathedral at Reims, and that of Charles V. of France in the Musée Cluny. A 16th-century *nef*, adapted for use as a cup, is in the Franks Collection at the British Museum. (See DRINKING VESSELS.)

NAVEL (O. Eng. *nafela*, a word common to Teutonic languages; cf. Ger. *Nabel*, Swed. *nafvel*; the Sanskrit is *nābhila*; the English root is also seen in "nave," the hub of a wheel), in anatomy, the umbilicus (Gr. ὀμφαλός), the depression in the abdomen which indicates the point through which the embryo mammal obtained nourishment from its mother (see ANATOMY: section *Superficial and Artistic*).

NAVIGATION (from Lat. *navis*, ship, and *agere*, to move), the science or art of conducting a ship across the seas. The term is also popularly used by analogy of boats on rivers, &c., and of flying-machines or similar methods of locomotion. Navigation, as an art applied properly to ships, is technically used in the restricted sense dealt with below, and has therefore to be distinguished from "seamanship" (*q.v.*), or the general methods of rigging a ship (see RIGGING), or the management of sails, rudder, &c.

History.

The early history of the rise and progress of the art of navigation is very obscure, and it is more easy to trace the gradual advance of geographical knowledge by its means than the growth of the practical methods by which this advance was attained. Among Western nations before the introduction of the mariner's compass the only practical means of navigating ships was to keep in sight of land, or occasionally, for short distances, to direct the ship's course by referring it to the sun or stars; this very rough mode of procedure failed in cloudy weather, and even in short voyages in the Mediterranean in such circumstances the navigator generally became hopelessly bewildered as to his position.

Over the China Sea and Indian Ocean the steadiness in direction of the monsoons was very soon observed, and by running directly before the wind vessels in those localities were able to traverse long distances out of sight of land in opposite directions at different seasons of the year, aided in some cases by a rough compass (*q.v.*). But it is surprising when we read of the progress made among the ancients in fixing positions on shore by practical astronomy that so many years should have passed without its application to solving exactly the same problems at sea, but this is probably to be explained by the difficulty of devising instruments for use on the unsteady platform of a ship, coupled with the lack of scientific education among those who would have to use them.

The association of commercial activity and nautical progress shown by the Portuguese in the early part of the 15th century marked an epoch of distinct progress in the methods of practical navigation, and initiated that steady improvement which in the 20th century has raised the art of navigation almost to the position of an exact science. Up to the time of the Portuguese exploring expeditions, sent out by Prince Henry, generally known as the "Navigator," which led to the discovery of the Azores in 1419, the rediscovery of the Cape Verde Islands in 1447 and of Sierra Leone in 1460, navigation had been conducted in the most rude, uncertain and dangerous manner it is possible to conceive. Many years had passed without the least improvement being introduced, except the application of the magnetic needle about the beginning of the 14th century (see COMPASS and MAGNETISM). Prince Henry did all in his power to bring together and systematize the knowledge then obtainable upon nautical affairs, and also established an observatory at Sagres (near Cape St Vincent) in order to obtain more accurate tables of the declination of the sun. John II., who ascended the throne of Portugal in 1481, followed up the good work. He employed Roderick and Joseph, his physicians, with Martin de Bohemia, from Fayal, to act as a committee on navigation. They calculated tables of the sun's declination, and improved the astrolabe, recommending it as more convenient than the cross-staff. The *Ordenanzas* of the Spanish council of the Indies record the course of instruction prescribed at this time for pilots; it included the *De Sphaera Mundi* of Sacrobosco, the spherical triangles of Regiomontanus, the *Almagest* of Ptolemy, the use of the astrolabe and its mechanism, the adjustments of instruments, cartography and the methods of observing the movements of heavenly bodies.

The then backward state of navigation is best understood from a sketch of the few rude appliances which the mariner had, and even these were only intended for the purpose of ascertaining the latitude. The mystery of finding the longitude proved unfathomable for many years after the time of the Armada, and the very inaccurate knowledge existing of the positions of the heavenly bodies themselves fully justified the quaintly expressed advice given in a nautical work of repute at the time, where the writer observes, "Now there be some that are very inquisitive to have a way to get the longitude, but that is too tedious for seamen, since it requireth the deep knowledge of astronomy, wherefore I would not have any man think that the longitude is to be found at sea by any instrument; so let no seamen trouble themselves with any such rule, but (according to their accustomed manner) let them keep a perfect account and reckoning of the way of their ship." Such record of the "way of the ship" appears to have been then and for many years later recorded in chalk on a wooden board (log board), which folded like a book, and from which each day a position for the ship was deduced, or from which the more careful made abstracts into what was termed the "journal."

A compass, a cross-staff or astrolabe, a fairly good table of the sun's declination, a correction for the altitude of the pole star, and occasionally a very incorrect chart formed all the appliances of a navigator in the time of Columbus. For a knowledge of the speed of the ship one of the earliest methods of actual measurement in use was by what was known as the "Dutchman's log," which consisted in throwing into the water, from the bows of the ship, something which would float, and noting the interval between its apparently drifting past two observers standing on the deck at a known distance apart. No other method is mentioned until 1577, when a line was attached to a small log of wood, which was thrown overboard, and the length measured which was carried over in a certain interval of time; this interval of time was, we read, generally obtained by the repetition of certain sentences, which were repeated twice if the ship were only moving slowly. It is unfortunate that the words of this ancient shibboleth are unknown. This is mentioned by Purchas as being in occasional use in 1607, but the more usual method (as we incidentally see in the voyages of Columbus) was to estimate or guess the rate of progress. It was customary by one or other of these methods to determine the speed of a ship every two hours, "royal" ships and those with very careful captains doing so every hour. When a vessel had been on various courses during the two hours, a record of the duration on each was usually kept by the helmsman on a traverse board, which consisted of a board having 32 radial lines drawn on it representing the points of the compass, with holes at various distances from the centre, into which pegs were inserted, the mean or average course being that entered on the log board.

Some idea of the speed of ordinary ships in those days may be gathered from an observation in 1551 of a "certain shipp which, without ever striking sail, arrived at Naples from Drepana, in Sicily, in 37 hours" (a distance of 200 m.); the writer accounting for "such swift motion, which to the common sort of man seemeth incredible," by the fact of the occurrence of "violent floods and outrageous winds." In 1578 we find in Bourne's *Inventions and Devices* a description of a proposed patent log for recording a vessel's speed, the idea (as far as we can gather from its vague description) being to register the revolutions of a wheel enclosed in a case towed astern of a ship (see LOG).

Whether the property of the lodestone was independently discovered in Europe or introduced from the East, it does not appear to have been generally utilized in Europe earlier than about A.D. 1400 (see COMPASS). In Europe the card or "flie" appears to have been attached to the magnet from the first, and the whole suspended as now in gimbal-rings within the "bittacle," or, as we now spell the word, "binnacle." The direction of a ship's head by compass was termed how she "capes." From the accounts extant of the stores supplied to ships in 1588, they appear to have usually had two compasses, costing 3s. 4d. each, which were kept in charge by the boatswain. The fact that the north point of a compass does not, in most places, point to the true pole but eastward or westward of it, by an amount which is termed by sailors "variation," appears to have been noticed at an early date; but that the amount of variation varied in different localities appears to have been first observed by either Columbus or Cabot about 1490, and we find it used to be the practice to ascertain this error when at sea either from a bearing of the pole star, or by taking a mean of the compass bearings of the sun at both rising and setting, the *deviation* of the compass in the ships of those days being too small a quantity to be generally noticed, though there is a very suggestive remark on the effect of moving the position of any iron placed near a compass, by a Captain Sturmy of Bristol in 1679. In order, partially to obviate the error of the compass (variation), the magnets, which usually consisted of two steel wires joined at both ends and opened out in the middle, were not placed under the north and south line of the compass card, but with the ends about a point eastward of north and westward of south, the variation in London when first observed in 1580 being about 11° E.; the *change* of the variation year by year at the *same* base was first noted by Gellibrand in 1635.

The "cross-staff" appears to have been used by astronomers at a very early period, and subsequently by seamen for measuring altitudes at sea. It was one of the few instruments possessed by Columbus and Vasco da Gama. The old cross-staff, called by the Spaniards "ballestilla," consisted of two light battens. The part we may call the staff was about 1½ in. square and 36 in. long. The cross was made to fit closely and to slide upon the staff at right angles; its length was a little over 26 in., so as to allow the "pinules" or sights to be placed exactly 26 in. apart. A sight was also fixed on the end of the staff for the eye to look through so as to see both those on the cross and the objects whose distance apart was to be measured. It was made by describing the angles on a table, and laying the staff upon it (fig. 1). The scale of degrees was marked on the upper face. Afterwards shorter crosses were introduced, so that smaller angles could be taken by the same instrument. These angles were marked on the sides of the staff.

To observe with this instrument a meridian altitude of the sun the bearing was taken by compass, to ascertain when it was near the meridian; then the end of the long staff was placed close to the observer's eye, and the transversary, or cross, moved until one end exactly touched the horizon, and the other the sun's centre. This was continued until the sun dipped, when the meridian altitude was obtained.

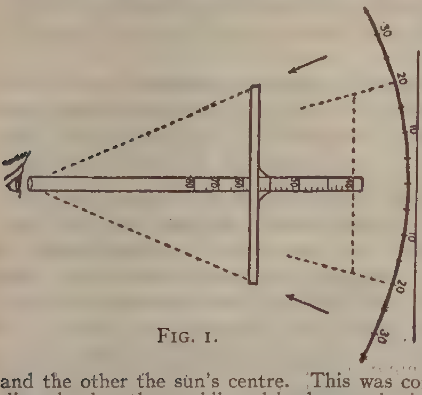

FIG. 1.

Another primitive instrument in common use at the beginning of the 16th century was the astrolabe (*q.v.*), which was more convenient than the cross-staff for taking altitudes. Fig. 2 represents an astrolabe as described by Martin Cortes. It was made of copper or tin, about ¼ in. in thickness and 6 or 7 in. in diameter, and was circular except at one place, where a projection was provided for a hole by which it was suspended. Weight was considered desirable in order to keep it steady when in use. The face of the metal having been well polished, a plumb line from the point of suspension marked the vertical line, from which were derived the horizontal line and centre. The upper left quadrant was divided into degrees. The second part was a pointer *pt* of the same metal and thickness as the circular plate, about 1½ in. wide, and in length equal to the diameter of the circle. The centre was bored, and a line was drawn across it the full length, which was called the line of confidence. On the ends of that line were fixed plates, *s*, *s*, having each a small hole, both exactly over the line of confidence, as sights for the sun or stars. The pointer moved upon a centre the size of a goose quill. When the instrument was suspended the pointer was directed by hand to the object, and the angle read on the one quadrant only. Some years later the opposite quadrant was also graduated, to give the benefit of a second reading. The astrolabe was used by Vasco da Gama on his first voyage round the Cape of Good Hope in 1497; but the movement of a ship rendered accuracy impossible, and the liability to error was increased by the necessity for three observers. One held the instrument by a ring passed over the thumb, the second measured the altitude, and the third read off.

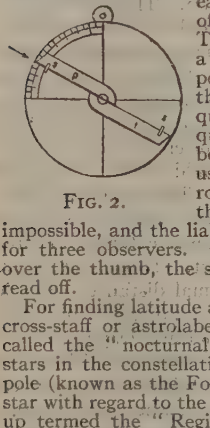

FIG. 2.

For finding latitude at night by altitude of the pole star taken by cross-staff or astrolabe, use was made of an auxiliary instrument called the "nocturnal." From the relative positions of the two stars in the constellation of the "Little Bear" farthest from the pole (known as the Fore and Hind guards) the position of the pole star with regard to the pole could be inferred, and tables were drawn up termed the "Regiment of the Pole Star," showing for eight positions of the guards how much should be added or subtracted from the altitude of the pole star; thus, "when the guards are in the N.W. bearing from each other north and south add half a degree," &c. The bearings of the guards, and also roughly the hour of the night, were found by the nocturnal, first described by M. Coignet in 1581.

The nocturnal (fig. 3) consisted of two concentric circular plates, the outer being about 3 in. in diameter, and divided into twelve equal parts corresponding to the twelve months, each being again subdivided into groups of five days. The inner circle was graduated into twenty-four equal parts, corresponding to the hours of the day, and again subdivided into quarters; the handle was fixed to the outer circle in such a way that the middle of it corresponded with the day of the month on which the guards had the same right ascension as the sun—or, in other words, crossed the meridian at noon. From the common centre of the two circles extended a long index bar, which, together with the inner circle, turned freely and independently about this centre, which was pierced with a round hole. To use the instrument, the projection at twelve hours on the inner plate was turned until it coincided with the day of the month of observation, and the instrument held with its plane roughly parallel to the equinoctial or celestial equator, the observer looking at the pole star through the hole in the centre, and turning the long central index bar until the guards were seen just touching its edge; the hour in line with this edge read off on the inner plate was, roughly, the time. Occasionally the nocturnal was constructed so as to find the time by observations of the pointers in the Great Bear.

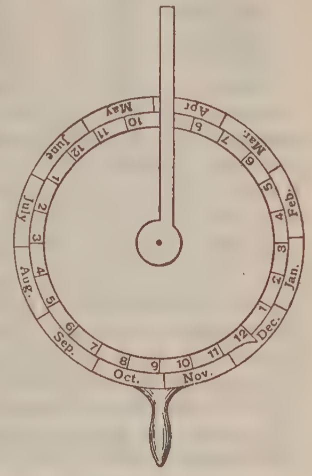

FIG. 3.

The rough charts used by a few of the more expert navigators at the time we refer to will be more fully described later (see also MAP and GEOGRAPHY). Nautical maps or charts first appeared in Italy at the end of the 13th century, but it is said that the first seen in England was brought by Bartholomew Columbus in 1489.

Among the earliest authors who touched upon navigation was John Werner of Nuremberg, who in 1514, in his notes upon Ptolemy's geography, describes the cross-staff as a very ancient instrument, but says that it was only then beginning to be generally introduced among seamen. He recommends measuring the distance between the moon and a star as a means of ascertaining the longitude; but this (though developed many years after into the method technically known as "lunars") was at this time of no practical use owing to the then imperfect knowledge of the true positions of the moon and stars and the non-existence of instrumental means by which such distances could be measured with the necessary accuracy.

Thirty-eight years after the discovery of America, when long voyages had become comparatively common, R. Gemma Frisius wrote upon astronomy and cosmogony, with the use of the globes. His book comprised much valuable information to mariners of that day, and was translated into French fifty years later (1582) by Claude de Bossière. The astronomical system adopted is that of Ptolemy. The following are some of the points of interest relating to navigation. There is a good description of the sphere and its circles; the obliquity of the ecliptic is given as 23° 30′. The distance between the meridians is to be measured on the equator, allowing 15° to an hour of time; longitude is to be found by eclipses of the moon and conjunctions, and reckoned from the Fortunate Islands (Azores). Latitude should be measured from the equator, not from the ecliptic, "as Clarean says." The use of globes is very thoroughly and correctly explained. The scale for measuring distances was placed on the equator, and 15 German leagues, or 60 Italian leagues, were to be considered equal to one degree. The Italian league was 8 stadia, or 1000 paces, therefore the degree is taken much too small. We are told that, on plane charts, mariners drew lines from various centres (*i.e.* compass courses), which were very useful since the virtue of the lodestone had become recognized; it must be remembered that parallel rulers were unknown, being invented by Mordente in 1584. Such a confusion of lines has been continued upon sea charts till comparatively recently. Gemma gives rules for finding the course and distance correctly, except that he treats difference of longitude as departure. For instance, if the difference of latitude and difference of longitude are equal, the course prescribed is between the two principal winds—that is, 45°. He points out that the courses thus followed are not straight lines, but curves, because they do not follow the great circle, and that distances could be more correctly measured on the globe than on charts. The tide is said to rise with the moon, high water being when it is on the meridian and 12 hours later. From a table of latitudes and longitudes a few examples are here selected, by which it appears that even latitude was much in error. The figures in brackets represent the positions according to modern tables, counting the longitude from the western extremity of St Michael. (Flores is 5° 8′ farther west.)

Alexandria	31° 0′ N.	(31° 13′)	60° 30′ E.	(55° 55′)
Athens	37 15	(37 58)	52 45	(49 46)
Babylon	35 0	(32 32)	79 0	(70 25)
Dantzic	54 30	(54 21)	44 15	(44 38)
London	52 3	(51 31)	19 15	(25 54)
Malta	34 0	(35 43)	38 45	(40 31)
Rome	41 50	(41 54)	36 20	(38 30)

The latitude of Cape Clear is given 34′ in error, and the longitude 4½°; the Scilly Islands are given with an error of one degree in latitude and 1° 10′ in longitude; while Madeira is placed 3° 8′ too far south and 4° 20′ too far west, and Cape St Vincent 1° 25′ too far south and 6° too far west.

In 1534 Gemma produced an "astronomical ring," which he dedicated to the secretary of the king of Hungary. He admitted that it was not entirely his own invention, but asserted that it could accomplish all that had been said of quadrants, cylinders and astrolabes—also that it was a pretty ornament, worthy of a prince. As it displayed great ingenuity, and was followed by many similar contrivances during two centuries, a sketch with brief description is here given (fig. 4).

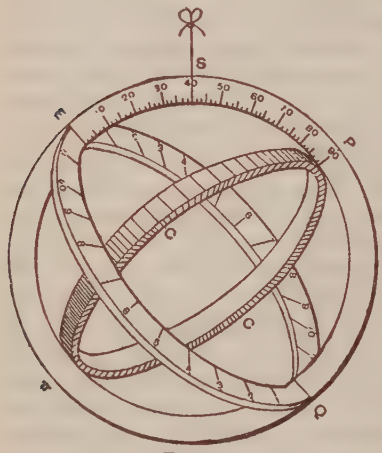

FIG. 4.

The outer and principal sustaining circle EPQ represents the meridian, and is about 6 in. in diameter; Pπ, are the poles. The upper quadrant is divided into degrees. It is suspended by fine cord or wire placed at the supposed latitude. The second circle EQ is fixed at right angles to the first, and represents the equinoctial line. The upper side is divided into twenty-four parts, representing the hours from noon or midnight. On the inner side of that circle are marked the months and weeks. The third ring CC is attached to the first at the poles, and revolves freely within it. On the interior are marked the months, and on another side the corresponding signs of the zodiac; another is graduated in degrees. It is fitted with a groove which carries two movable sights. On the fourth side are twenty-four unequal divisions (tangents) for measuring heights. Its use is illustrated by twenty problems, showing it capable of doing roughly all that any instrument for taking angles can. Thus, to find the latitude, set the sights C, C to the place of the sun in the zodiac, and shut the circle till it corresponds with 12 o'clock. Look through the sights and alter the point of suspension till the greatest elevation is attained; that time will be noon, and the point of suspension will be the latitude. The figure is represented as slung at lat. 40°, either north or south. To find the hour of the day, the latitude and declination being known: the sights C, C being set to the declination as before, and the suspension on the latitude, turn the ring CC freely till it points to the sun, when the index opposite the equinoctial circle will indicate the time, while the meridional circle will coincide with the meridian of the place.

There is in the museum attached to the Royal Naval College at Greenwich an instrument described as Sir Francis Drake's astrolabe. It is not an astrolabe, but may be a combination of astronomical rings as invented by Gemma with additions, probably of a later date. It has the appearance of a large gold watch, about 2½ in. in diameter, and contains several parts which fall back on hinges. One is a sun-dial, the gnomon being in connexion with a graduated quadrant, by which it could be set to the latitude of the place. There are a small compass and an hour circle. It is very neat, but too small for actual use, and may be simply an ornament representing a larger instrument. There is a table of latitudes engraved inside one lid; that given for London is 51° 34′, about 3 m. too much.

Though clocks are mentioned in 1484 as recent inventions, watches were unknown till about 1530, when Gemma seized the idea of utilizing them for the purpose of ascertaining the difference of longitude between two places by a comparison between their local times at the same instant. They were too inaccurate, however, to be of practical use, and their advocate proposed to correct them by water-clocks or sand-clocks. For rough purposes of keeping time on board ship sand glasses were employed, and it is curious to note that hour and half-hour glasses were used for this purpose in the British Navy until 1839. The outer margin of the compass card was early divided into twenty-four equal parts numbered as hours until the error of thus determining time by the bearings of the sun was pointed out by Davis in 1607.

In 1537 Pedro Nunez (Nonius), cosmographer to the king of Portugal, published a work on astronomy, charts and some points of navigation. He recognized the errors in plane charts, and tried to rectify them. Among many astronomical problems given is one for finding the latitude of a place by knowing the sun's declination and altitude when on two bearings, not less than 40° apart. Gemma did a similar thing with two stars; therefore the problem now known as a "double altitude" is a very old one. It could be mechanically solved on a large globe within a degree. To Nunez has been erroneously attributed the present mode of reading the exact angle on a sextant, the scale of a barometer, &c., the credit of which is due, however, to Vernier nearly a hundred years later. The mode of dividing the scale which Nunez published in 1542 was the following. The arc of a large quadrant was furnished with forty-five concentric segments, or scales, the outer graduated to 90°, the others to 89, 88, 87, &c., divisions. As the fine edge of the pointer attached to the sights passed among those numerous divisions it touched one of them, suppose the fifteenth division on the sixth scale, then the angle was $\frac{15}{85}$ of 90°=15° 52′ 56″. This was a laborious method; Tycho Brahe tried it, but abandoned it in favour of the diagonal lines then in common use, and still found on all scales of equal parts.

In 1545 Pedro de Medina published *Arte de navigar* at Valladolid, dedicated to Don Philippo, prince of Spain. This appears to be the first book ever published professedly entirely on navigation. It was soon translated into French and Italian, and many years after into English by John Frampton. Though this pretentious work came out two years after the death of Copernicus, the astronomy is still that of Ptolemy. The general appearance of the chart given of the Mediterranean, Atlantic, and part of the Pacific is in its favour, but examination shows it to be very incorrect. A scale of equal parts, near the centre of the chart, extends from the equator to what is intended to represent 75° of latitude; by this scale London would be in 55° instead of 51½°, Lisbon in 37¼° instead of 38° 42′. The equator is made to pass along the coast of Guinea, instead of being over four degrees farther south. The Gulf of Guinea extends 14° too far east, and Mexico is much too far west. Though there are many vertical lines on the chart at unequal distances they do not represent meridians; and there is no indication of longitude. A scale of 600 leagues is given (German leagues, fifteen to a degree). By this scale the distance between Lisbon and the city of Mexico is 1740 leagues, or 6960 miles; by the vertical scale of degrees it would be about the same; whereas the actual distance is 4820 miles. Here two great wants become apparent—a knowledge of the actual length of any arc, and the means of representing the surface of the globe on flat paper. There is a table of the sun's declination to minutes; on June 12th and December 11th (o.s.) it was given as 23° 33′. The directions for finding the latitude by the pole star and pointers appear good. For general astronomical information the book is inferior to that of Gemma.

In 1556 Martin Cortes published at Seville *Arte de navigar.* He gives a good drawing of the cross-staff and astrolabe, also a table of the sun's declination for four years (the greatest value being 23° 33′), and a calendar of saints' days. The motions of the heavens are described according to the notions then prevalent, the earth being considered as fixed. He recommends the altitude of the pole being found frequently, as the estimated distance run was imperfect. He devised an instrument whereby to tell the hour, the direction of the ship's head, and where the sun would set. A very correct table is given of the distances between the meridians at every degree of latitude, whereby a seaman could easily reduce the difference of longitude to departure. In the rules for finding the latitude by the pole star, that star is supposed to be 3° from the pole. Martin Cortes attributes the tides entirely to the influence of the moon, and gives instructions for finding the time of high water at Cadiz, when by means of a card with the moon's age on it, revolving within a circle showing the hours and minutes, the time of high water at any other place for which it was set would be indicated. Directions are given for making a compass similar to those then in common use, also for ascertaining and allowing for the variation. The east is here spoken of as the principal point, and marked by a cross.

The third part of Martin Cortes's work is upon charts; he laments that wise men do not produce some that are correct, and that pilots and mariners will use plane charts which are not true. In the Mediterranean and "Channel of Flanders" the want of good charts is (he says) less inconvenient, as they do not navigate by the altitude of the pole.

As some subsequent writers have attributed to Cortes the credit of first thinking of the enlargement of the degrees of latitude on Mercator's principle, his precise words may be cited. In making a chart, it is recommended to choose a well-known place near the centre of the intended chart, such as Cape St Vincent, which call 37°, "and from thence towards the Arctic pole the degrees increase; and from thence to the equinoctial line they go on decreasing, and from the line to the Antarctic pole increasing." It would appear at first sight that this implied that the degrees increased in length as well as being called by a higher number, but a specimen chart in the book does not justify that conclusion. It is from 34° to 40°, and the divisions are unequal, but evidently by accident, as the highest and lowest are the longest. He states that the Spanish scale was formed by counting the Great Berling as 3° from Cape St Vincent (it is under $2\frac{1}{2}$°). Twenty English leagues are equal to $17\frac{1}{2}$ Spanish or 25 French, and to 1° of latitude. Cortes was evidently at a loss to know the length of a degree, and consequently the circumference of the globe. The degrees of longitude are not laid down, but for a first meridian we are told to draw a vertical line "through the Azores, or nearer Spain, where the chart is less occupied." It is impossible in such circumstances to understand or check the longitudes assigned to places at that period. Martin Cortes's work was held in high estimation in England for many years, and appeared in several translations. A reprint, with additions, of Richard Eden's (1561), by John Tapp and published in 1609, gives an improved table of the sun's declination from 1609 to 1625—the maximum value being 23° to 30′. The declinations of the principal stars, the times of their passing the meridian, and other improved tables, are given, with a very poor traverse table for eight points. The cross-staff, he said, was in most common use; but he recommends Wright's sea quadrant.

William Cuningham published in 1559 a book called his *Astronomical Glass*, in which he teaches the making of charts by a central meridional line divided into equal parts, with other meridians on each side, distant at top and bottom in proportion to the departure at the highest and lowest latitude, for which purpose a table of departures is given very correctly to the third place of sexagesimals. The chart would be excellent were it not that the parallels are drawn straight instead of being curved. In another example, which shows one-fourth of the sphere, the meridians and parallels are all curved; it would be good were it not that the former are too long. The hemisphere is also shown upon a projection approaching the stereographic; but the eighteen meridians cut the equator at equal distances apart instead of being nearer together towards the primitive. He gives the drawing of an instrument like an astrolabe placed horizontally, divided into 32 points and 360 degrees, and carrying a small magnetic needle to be used as a prismatic compass, or even as a theodolite.

In 1581 Michael Coignet of Antwerp published sea charts, and also a small treatise in French, wherein he exposes the errors of Medina, and was probably the first who said that rhumb lines form spirals round the pole. He published also tables of declination of the sun and observed the gradual decrease in the obliquity of the ecliptic. He described a cross-staff with three transverse pieces, which was then in common use at sea. Coignet died in 1623.

The Dutch published charts made up as atlases as early as 1584, with a treatise on navigation as an introduction.

In 1585 Roderico Zamorano, who was then lecturer at the naval college at Seville, published a concise and clearly-written compendium of navigation; he follows Cortes in the desire to obtain better charts. Andres Garcia de Cespedes, the successor of Zamorano at Seville, published a treatise on navigation at Madrid in 1606. In 1592 Petrus Plancius published his universal map, containing the discoveries in the East and West Indies and towards the north pole. It possessed no particular merit; the degrees of latitude are equal, but the distances between the meridians are varied. He made London appear in 51° 32′ N. and long. 22°, by which his first meridian should have been more than 3° east of St Michael.

For Mercator's great improvements in charts at about this date see MAP; from facsimiles of his early charts in Jomard, *Les Monuments de la géographie*, the following measurements have been made. A general chart in 1569 of North America, from lat. 25° to lat. 79°, is 2 ft. long north and south, and 20 in. wide. Another of the same date, from the equator to 60° south lat. is 15·8 in. long. The charts agree with each other, a slight allowance being made for remeasuring. As compared with J. Inman's table of meridional parts, the spaces between the parallels are all too small. Between 0° and 10° the error is 8′; at 20° it is 5′; at 30°, 16′; at 40°, 39′; at 50°, 61′; at 60°, 104′; at 70°, 158′; and at 79°, 182′—that is, over three degrees upon the whole chart. As the measures are always less than the truth it is possible that Mercator was afraid to give the whole. In a chart of Sicily by Romoldus Mercator in 1589, on which two equal degrees of latitude, 36° to 38°, extend $9\frac{1}{2}$ in., the degree of longitude is quite correct at one-fourth from the top; the lower part is 1 m. too long. One of the north of Scotland, published in 1595, by Romoldus, measures $10\frac{1}{2}$ in. from 58° 20′ to 61°; the divisions are quite equal and the lines parallel; it is correct at the centre only. A map of Norway, 1595, lat. 60° to 70° = $9\frac{1}{4}$ in., has the parallels curved and equidistant, the meridians straight converging lines; the spaces between the meridians at 60° and 70° are quite correct.

In 1594 Blundeville published a description of Mercator's charts and globes; he confesses to not having known upon what rule the meridians were separated by Mercator, unless upon such a table as that given by Wright, whose table of meridional parts is published in the same book, also an excellent table of sines, tangents and secants—the former to seven figures, the latter to eight. These are the tables made originally by Regiomontanus and improved by Clavius.

In 1594 the celebrated navigator John Davis published a pamphlet of eighty pages, in black letter, entitled *The Seaman's Secrets*, in which he proposes to give all that is necessary for sailors—not for scholars on shore. He defines three kinds of sailing: horizontal, paradoxical and great circle. His horizontal sailing consists of short voyages which may be delineated upon a plain sheet of paper. The paradoxical or cosmographical embraces longitude, latitude and distance—the combining many horizontal courses into one "infallible and true," *i.e.* what is now called traverse and Mercator's sailings. His "paradoxical course" he describes correctly as a rhumb line which is straight on the chart and a curve on the globe. He points out the errors of the common or plane chart, and promises if spared to publish a "paradoxall chart." It is not known whether such appeared or not, but he assisted Wright in producing his chart on what is known as Mercator's projection a few years later. Great circle sailing on a globe is clearly described by Davis, and to render it more practicable he divides a long distance into several short rhumb lines quite correctly. From the practice of navigators in using globes the principles of such sailing were not unknown at an earlier date; indeed it is said that S. Cabot projected a voyage across the North Atlantic on the arc of a great circle in 1495.

The list of instruments given by Davis as necessary to a skilful seaman comprises the sea compass, cross-staff, chart, quadrant, astrolabe, an "instrument magnetical" for finding the variation of the compass, a horizontal plane sphere, a globe and a paradoxical compass. The first three are said to be sufficient for use at sea, the astrolabe and quadrant being uncertain for sea observations. The importance of knowing the times of the tides when approaching tidal or barred harbours is clearly pointed out, also the mode of ascertaining them by the moon's age. A table of the sun's declination is given for noon each day during four years 1593–1597, from the ephemerides of J. Stadius. The greatest given value is 23° 28′. Several courses and distances, with the resulting difference of latitude and departure, are correctly worked out. A specimen log-book provides one line only for each day, but the columns are arranged similarly to those of a modern log. Under the head of remarks after leaving Brazil, we read, "the compass varied 9°, the south point westward." He states that the first meridian passed through St Michael, because there was no variation at that place, and therefore that this meridian passed through the magnetic pole as well as the pole of the earth. He makes no mention of Mercator's chart by name nor of Cortes or other writers on navigation. Rules are given for finding the latitude by two altitudes of the sun and intermediate azimuth, also by two fixed stars, using a globe. There is a drawing of a quadrant, with a plumb line, for measuring the zenith distance, and one of a modification of a cross-staff using which the observer stands with his back to the sun, looking at the horizon through a sight on the end of the staff, while the shadow of the top of a movable projection, falls on the sight; this, known as the back-staff, was an improvement on the cross-staff. It was fitted with a reflector, and was thus the first rough idea of the principle of the quadrant and sextant. This remained in common use till superseded in 1731 by Hadley's quadrant. The eighth edition of Davis's work was printed in 1657.

Edward Wright, of Caius College, Cambridge, published in 1599 a valuable work entitled *Certain Errors in Navigation Detected and Corrected*. One part is a translation from Roderico Zamorano; there is a chapter from Cortes and one from Nunez. A year later appeared his chart of the world, upon which both capes and the recent discoveries in the East Indies and America are laid down truthfully and scientifically, as well as his knowledge of their latitudes and longitudes would admit. Just the northern extremity of Australia is shown.

Wright said of himself that he had striven beyond his ability to mend the errors in chart, compass, cross-staff and declination of sun and stars. He considered that the instruments which had then recently come in use "could hardly be amended," as they were growing to "perfection"—especially the sea chart and the compass, though he expresses a hope that the latter may be "freed from that rude and gross manner of handling in the making." He gives a table of magnetic declinations (variation) and explains its geometrical construction. He states that Medina utterly denied the existence of variation, and attributed it to bad construction and bad observations. Wright expresses a hope that a right understanding of the dip of the needle would lead to a knowledge of the latitude, "as the variation did of the longitude." He gives a table of declination of the sun for the use of English mariners during four years—the greatest given value being 23° 31′ 30″. The latitude of London he made 51° 32′. For these determinations a quadrant over 6 ft. in radius was used. He also treats of the "dip" of the sea horizon, refraction, parallax and the sun's motions. With all this knowledge the earth is still considered as stationary—although Wright alludes to Copernicus, and says that he omitted to allow for parallax. Wright ascertained the declinations of thirty-two stars, and made many improvements or additions to the art of navigation, considering that all the problems could be performed trigonometrically, without globe or chart. He devised sea rings for taking observations, and a sea quadrant to be used by two persons, which is in some respects similar to that by Davis. While deploring the neglected state which navigation had been in, he rejoices that the worshipful society at the Trinity House (which had been established in 1514), under the favour of the king (Henry VIII.), had removed "many gross and dangerous enormities." He joins the brethren of the Trinity House in the desire that a lectureship should be established on navigation, as at Seville and Cadiz; also that a grand pilot should be appointed, as Sebastian Cabot had been in Spain, to examine pilots (*i.e.* mates) and navigators. Wright's desire was partially fulfilled in 1845, when an Act of Parliament paved the way for the compulsory qualification of masters and mates of merchant ships; but such was the opposition by shipowners that it was even then left voluntary for a few years. England was in this respect more than a century behind Holland. It has been said that Wright accompanied the earl of Cumberland to the Azores in 1589; and that he was allowed £50 a year by the East India Company as lecturer on navigation at Gresham College, Tower Street.

The great mark which Wright made was the discovery of a correct and uniform method of dividing the meridional line and making charts which are still called after the name of Mercator. He considered such charts as true as the globe itself; and so they were for all practical purposes. He commenced by dividing a meridional line, in the proportion of the secants of the latitude, for every ten minutes of arc, and in the edition of his work published in 1610 his calculations are for every minute. His method was based upon the fact that the radius bears the same proportion to the secant of the latitude as the difference of longitude does to the meridional difference of latitude—a rule strictly correct for small arcs only. One minute is taken as the unit upon the arc and 10,000 as the corresponding secant, 2′ becomes 20,000, 3′=30,000, &c., increasing uniformly till 49′, which is equal to 490,001; 1° is 600,012. The secant of 20° is 12,251,192, and for 20° 1′ it will be 12,251,192+10,642—practically the same as that used in modern tables.

The principle is simply explained by fig. 5, where *b* is the pole and *bf* the meridian. At any point *a* a minute of longitude: a min. of lat.: : *ea* (the semi-diameter of the parallel): *kf* (the radius). Again *ea* : *kf* : : *kf* : *ki* : : radius : sec. *akf* (sec. of lat). To keep this proportion on the chart, the distances between points of latitude must increase in the same proportion as the secants of the arc contained between those points and the equator, which was then to be done by the "canon of triangles."

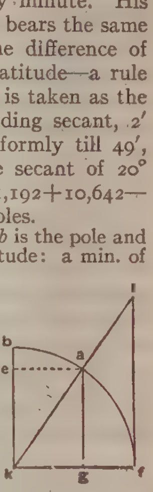

FIG. 5.

Wright gave the following excellent popular description of the principle of Mercator's charts: "Suppose a spherical globe (representing the world) inscribed in a concave cylinder to swell like a bladder equally in every part (that is as much in longitude as in latitude) until it joins itself to the concave surface of the cylinder, each parallel increasing successively from the equator towards either pole until it is of equal diameter to the cylinder, and consequently the meridians widening apart until they are everywhere as distant from each other as they are at the equator. Such a spherical surface is thus by extension made cylindrical, and consequently a plane parallelogram surface, since the surface of a cylinder is nothing else but a plane parallelogram surface wound round it. Such a cylinder on being opened into a flat surface will have upon it a representation of a Mercator's chart of the world."

This great improvement in the principle of constructing charts was adopted slowly by seamen, who, putting it as they supposed to a practical test, found good reason to be disappointed. The positions of most places in the world had been originally laid down erroneously, by very rough courses and estimated distances upon the plane chart, and from this they were transferred to the new projection, so that errors in courses and distances, really due to erroneous positions, were wrongly attributed to the new and accurate form of chart.

When Napier's *Canon Mirificus* appeared in 1614, Wright at once recognized the value of logarithms as an aid to navigation, and undertook a translation of the book, which he did not live to publish (see NAPIER). Gunter's tables (1620) made the application of the new discovery to navigation possible, and this was done by Addison in his *Arithmetical Navigation* (1625), as well as by Gunter in his tables of 1624 and 1636, which gave logarithmic sines and tangents, to a radius of 1,000,000, with directions for their use and application to astronomy and navigation, and also logarithms of numbers from 1 to 10,000. Several editions followed, and the work retained its reputation over a century. Gunter invented the sector, and introduced the meridional line upon it, in the just proportion of Mercator's projection.

The means of taking observations correctly, either at sea or on shore, was about this time greatly assisted by the invention bearing the name of Pierre Vernier, the description of which was published at Brussels in 1631. As Vernier's quadrant was divided into half degrees only, the sector, as he called it, spread over 14½ degrees, and that space carried thirty equal divisions, numbered from 0 to 30. As each division of the sector contained 29 min. of arc, the vernier could be read to minutes. The verniers now commonly adapted to sextants can be read to 10 secs. Shortly after the invention it was recommended for use by P. Bouguer and Jorge Juan, who describe it in a treatise entitled *La Construction, &c., du quadrant nouveau.* About this period Gascoigne applied the telescope to the quadrant as used on shore; and Hevelius invented the tangent screw, to give slow and steady motion when near the desired position. These practical improvements were not applied to the rougher nautical instruments until the invention of Hadley's sextant in 1731.

In 1635 Henry Gellibrand published his discovery of the annual change in variation of the needle, which was effected by comparing the results of his own observations with those of W. Borough and Edmund Gunter. The latter was his predecessor at Gresham College.

In 1637 Richard Norwood, a sailor, and reader in mathematics, published an account of his most laudable exertions to remove one of the greatest stumbling-blocks in the way of correct navigation, that of not knowing the true length of a degree or nautical mile, in a pamphlet styled *The Seaman's Practices.* Norwood ascertained the latitude of a position near the Tower of London in June 1633, and of a place in the centre of York in June 1635, with a sextant of more than 5 ft. radius, and, having carefully corrected the declination of the sun and allowed for refraction and parallax, made the difference of latitude 2° 28′. He then measured the distance with a chain, taking horizontal angles of all windings, and made a special table for correcting elevations and depressions. A few places which he was unable to measure he paced. His conclusion was that a degree contained 367,176 English feet; this gives 2040 yds. to a nautical mile—only about 12 yds. too much. Norwood's work went through numerous editions, and retained its popularity over a hundred years. In a late edition he says that, as there is no means of discovering the longitude, a seaman must trust to his reckoning. He recommends the knots on the log-line to be placed 51 ft. apart, as the just proportion to a mile when used with the half-minute glass. To Norwood is also attributed the discovery of the "dip" of the magnetic needle in 1576.

The progress of the art of navigation was and is still of course inseparably connected with that of map and chart drawing and the correct astronomical determinations of positions on land. While as we have seen at an early period simple practical astronomical means of finding the latitude at sea were known and in use, no mode could be devised of finding longitude except by the rough method of estimating the run of the ship, so that the only mode of arriving at a port of destination was to steer so as to get into the latitude of such a port either to the eastward or westward of its supposed position, and then approach it on the parallel of its latitude. The success of this method would of course greatly depend upon the accuracy with which the longitude of such port was known. Even with the larger and more accurate instruments used in astronomical observatories on shore the means of ascertaining latitude were far in advance of those by which longitude could be obtained, and this equally applied to the various heavenly bodies themselves upon which the terrestrial positions depended, the astronomical element of declination (corresponding to latitude) being far more accurately determined than that of right ascension (corresponding to longitude).

Almanacs were first published on the continent of Europe in 1457, but the earliest printed work of that kind in England is dated 1497. The only portions of their contents of use to seamen were tables of the declination of the sun, rough elements of the positions of a few stars, and tables for finding latitude by the pole star.

No accurate predictions of the positions of the moon, stars and planets could, however, be made until the laws governing their movements were known, such laws of course involving a knowledge of their actual positions at different widely separated epochs.

In 1699 Edmund Halley (subsequently astronomer royal), in command of the "Paramour," undertook a voyage to improve the knowledge of longitude and of the variation of the compass. The results of his voyage were the construction of the first variation chart, and proposals for finding the longitude by occultations of fixed stars.

The necessity for having more correct charts being equalled by the pressing need of obtaining the longitude by some simple and correct means available to seamen, many plans had already been thought of for this purpose. At one time it was hoped that the longitude might be directly discovered by observing the variation of the compass and comparing it with that laid down on charts. In 1674 Charles II. actually appointed a commission to investigate the pretensions of a scheme of this sort devised by Henry Bond, and the same idea appears as late as 1777 in S. Dunn's *Epitome.* But the only accurate method of ascertaining the longitude is by knowing the difference of time at the same instant at the meridian of the observer and that of Greenwich; and till the invention and perfecting of chronometers this could only be done by finding at two such places the apparent time of the same celestial phenomenon.

A class of phenomena whose comparative frequency recommended them for longitude observations, viz. the eclipses of Jupiter's satellites, became known through Galileo's discovery of these bodies (1610). Tables for such eclipses were published by Dominic Cassini at Bologna in 1688, and repeated in a more correct form at Paris in 1693 by his son, who was followed by J. Pound, J. Bradley, P. W. Wargentin, and many other astronomers. But this method, though useful on land, is not suited to mariners; when W. Whiston, for example, in 1737 recommended that the satellites should be observed by a reflecting telescope, he did not sufficiently consider the difficulty of using a telescope at sea.

Another method proposed was that of comparing the local time of the moon's crossing the meridian of the observer with the predicted time of the same event at Greenwich, the difference of the two depending upon the moon's motion during the time represented by the longitude; thus Herne's *Longitude Unveiled* (1678), proposes to find the time of the moon's meridian passage at sea by equal altitudes with the cross-staff, and then compare apparent time at ship with London time. The accuracy of this, as in the case of lunar problems, would obviously depend upon a more perfect knowledge of the laws of the moon's motion than then existed.

The celebrated problem of finding longitude by lunars (or by measurement of "lunar distances") occupied the attention of astronomers and sailors for many years before being superseded by the more simple and accurate modern method by the use of chronometers, and was the principal reason for establishing the Royal Observatory at Greenwich and the subsequent publication of the Nautical Almanac. The principle was simple, depending upon the comparatively rapid movement of the moon with regard to the heavenly bodies lying in her immediate path in the heavens. It is evident that if the theory of this movement were perfectly understood and the positions of such heavenly bodies accurately determined, the distances of the moon from those at any instant of time at Greenwich could be accurately foretold so that if such predictions were published in advance, an observer at any place in the world, by simply measuring such distances, could accurately determine the Greenwich time, a comparison of which with the local time (which in clear weather can be frequently and simply determined) would give the longitude. This, as previously mentioned, was foreseen by J. Werner as early as 1514, but very great difficulties attended its practical application for many years. Until the establishment of national astronomical observatories it was impossible to accumulate the vast number of observations necessary to fulfil the astronomical conditions, and until the invention of the sextant no instrument existed capable of use at sea which would measure the distances required with the necessary accuracy, while even up to the time when the problem had attained its greatest practical accuracy the calculations involved were far too intricate for general use among those for whom it was chiefly intended. The very principles of a theory of the movements of the moon were unknown before Newton's time, when the lunar problem begins to have a chief place in the history of navigation; the places of stars were formerly derived from various and widely discrepant sources.

The study of the lunar problem was stimulated by the reward of 1000 crowns offered by Philip III. of Spain in 1598 for the discovery of a method of finding longitude at sea; the States-general followed with an offer of 10,000 florins. But for a long time nothing practical came of this; a proposal by J. B. Morin, submitted to Richelieu in 1633, was pronounced by commissioners appointed to judge of it to be impracticable through the imperfection of the lunar tables, and the same objection applied when the question was raised in England in 1674 by a proposal of St Pierre to find the longitude by using the altitudes of the moon and two stars to find the time each was from the meridian. When the king was pressed by St Pierre, Sir J. Moore and Sir C. Wren to establish an observatory for the benefit of navigation, and especially that the moon's exact position might be calculated a year in advance, Flamsteed gave his judgment that the lunar tables then in use were quite useless, and the positions of the stars erroneous. The result was that the king decided upon establishing an observatory in Greenwich Park, and Flamsteed was appointed astronomical observer on March 4, 1675, upon a salary of £100 a year, for which also he was to instruct two boys from Christ's Hospital. While the small building in the Park was in course of erection he resided in the Queen's House (now the central part of Greenwich Hospital school), and removed to the house on the hill on the 10th of July 1676, which came to be known as "Flamsteed House." The institution was placed under the surveyor-general of ordnance—perhaps because that office was then held by Sir Jonas Moore, himself an eminent mathematician. Though this was not the first observatory in Europe, it was destined to become the most useful, and has amply fulfilled the important duties for which it was designed. It was established to meet the exigencies of navigation, as was clearly stated on the appointment of Flamsteed, and on several subsequent occasions; we see now what an excellent foster-mother it has been to the higher branches of that science. This has been accomplished by much labour and patience; for, though originally the most suitable man in the kingdom was placed in charge, it was so starved and neglected as to be almost useless during many years. The government did not provide a single instrument. Flamsteed entered upon his important duties with an iron sextant of 7 ft. radius, a quadrant of 3 ft. radius, two telescopes and two clocks, the last given by Sir Jonas Moore. Tycho Brahe's catalogue of 777 stars, formed in about 1590, was his only guide. In 1681 he fitted a mural arc which proved a failure. Seven years after another mural arc was erected at a cost of £120, with which he set to work in earnest to verify the latitude, and to determine the position of the equinoctial point, the obliquity of the ecliptic and the right ascensions and declinations of the stars; he obtained the positions of 2884 which appeared in the "British catalogue" in 1723 (see FLAMSTEED, and ASTRONOMY).

Flamsteed died in 1719, and was succeeded by Halley, who paid particular attention to the motions of the moon with a view to the longitude problem. A paper which he published in the *Phil. Trans.* (1731) shows what had been accomplished up to that date, and proves that it was still impossible to find the longitude correctly by any observation depending upon the predicted position of the moon. He repeats what he had published twenty years before in an appendix to Thomas Street's Caroline tables, which contained observations made by him (Halley) in 1683–1684 for ascertaining the moon's motion, which he thought to be the only practical method of "attaining" the longitude at sea. The Caroline tables of Street, though better than those before his time as well as those of Tycho, Kepler, Bullialdus and Horrox, were uncertain; sometimes the errors would compensate one another; at others when they fell the same way the result might lead to a position being 100 leagues in error. He hopes that the tables will be so amended that an error may scarce ever exceed 3 minutes of arc (equal to 1½° of longitude). Sir Isaac Newton's tables, corrected by himself (Halley) and others up to 1713, would admit of errors of 5 minutes, when the moon was in the third and fourth quarters. He blames Flamsteed for neglecting that portion of astronomical work, as he was at the observatory more than two periods of eighteen years. He himself had at this time seen the whole period of the moon's apogee—less than nine years—during which he observed the right ascensions at her transit, with great exactness, almost fifteen hundred times, or as often as Tycho Brahe, Hevelius and Flamsteed together. He hoped to be able to compute the moon's position within 2 minutes of arc with certainty, which would reduce errors of position to 20 leagues at the equator and 15 in the Channel; he thought Hadley's quadrant might be applied to measure lunar distances at sea with the desired accuracy.[1]

The rise of modern navigation may be fairly dated from the invention of the sextant in 1731 and of the chronometer in 1735; the former a complete nautical observatory in itself, and the latter an instrument which in its modern development has become an almost perfect time-keeper. It was a curious coincidence that these two invaluable instruments were invented at so nearly the same time. Until 1731 all instruments in use at sea for measuring angles either depended on a plumb line or required the observer to look in two directions at once.

Their imperfections are clearly pointed out in a paper by Pierre Bouguer (1729) which received the prize of the Paris Academy of Sciences for the best method of taking the altitude of stars at sea. Bouguer himself proposes a modification of what he calls the English quadrant, probably the one suggested by Wright and improved by Davis. Fig. 6 represents the instrument as proposed, capable of measuring fully 90° from E to N. A fixed pinule was recommended to be placed at E, through which a ray from the sun would pass to the sight C. The sight F was movable. The observer, standing with his back to the sun would look through F and C at the horizon, shifting the sight F up or down till the ray from the sun coincided with the horizon. The space from E to F would represent the altitude, and the remaining part F to N the zenith distance. The English quadrant which this was to supersede differed in having about half the arc from E towards N, and, instead of the pinule being fixed at E, it was on a smaller arc represented by the dotted line *e*B, and movable. It was placed on an even number of degrees, considerably less than the altitude; the remainder was measured on the larger arc, as described.

Hadley's instrument, on the other hand, described to the Royal Society in May 1731 (*Phil. Trans.*), embodies Newton's idea of bringing the reflection of one object to coincide with the direct image of the other. He calls it an octant, as the arc is actually 45°, or the eighth part of a circle; but, in consequence of the angles of incidence and reflection both being changed by a movement of the index, it measures an angle of 90°, and is graduated accordingly; the same instrument has therefore been called a quadrant. It was very slowly adopted, and no doubt there were numerous mechanical difficulties of centring, graduating, &c., to be overcome before it reached perfection. In August 1732, in pursuance of an order from the Admiralty, observations were made with Hadley's quadrant on board the "Chatham" yacht of 60 tons, below Sheerness, in rough weather, by persons—except the master attendant—unaccustomed to the motion; still the results were very satisfactory. A year later Hadley published (*Phil. Trans.*, 1733) the description of an instrument for taking altitudes when the horizon is not visible. The sketch represents a curved tube or spirit-level, attached to the radius of the quadrant, since which time many attempts have been unsuccessfully made to construct some form of artificial horizon adapted to use at sea on board ship, a discovery which would greatly facilitate observations at night and at the many times when the natural or sea horizon is imperfectly visible.

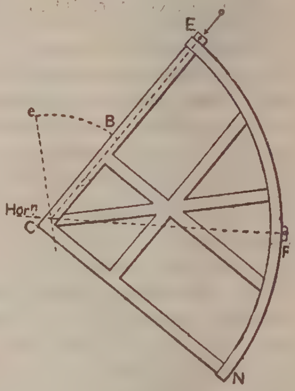

FIG. 6.

From the year 1714 the history of navigation in England is closely associated with that of the "Commissioners for the discovery of longitude at sea," a body constituted in that year with power to grant annually sums not exceeding £2000 to assist experiments and reward minor discoveries, and also to judge on applications for much greater rewards which were from time to time offered to open competition. For a method of determining the longitude within 60 geographical miles, to be tested by a voyage to the West Indies and back, the sum of £10,000 was offered; within 40 m., £15,000; within 30 m., £20,000. £10,000 was also to be given for a method that would determine longitude within 80 m. near the shores of greatest danger. No action seems to have been taken before 1737; the first grant made was in that year, and the last in 1815, but the board continued to exist till 1828, having disbursed in the course of its existence £101,000 in all.[2] In the interval a number of other acts had been passed either dealing with the powers, constitution and funds of the commissioners or encouraging nautical discovery; thus the act 18 George II. (1745) offered £20,000 for the discovery by a British ship of the North-West Passage, and the act 16 George III. (1776) offered the same reward for a passage to the Pacific either north-west or north-east, and £5000 to any one who should approach by sea within one degree of the North Pole. All these acts were swept away in 1828, when the longitude problem had ceased to attract competitors, and voyages of discovery were nearly over.

The suggestions and applications sent in to the commissioners were naturally very numerous and often very trifling; but they sometimes furnish useful illustrations of the state of navigation. Thus, in a memorial by Captain H. Lanoue (1736), he records a number of recent casualties, which shows how carelessly the largest ships were then navigated. Several men-of-war off Plymouth in 1691 were wrecked through mistaking the Deadman for Berry Head. Admiral Wheeler's squadron in 1694, leaving the Mediterranean, ran on Gibraltar when they thought they had passed the Strait. Sir Cloudesley Shovel's squadron, in 1707, was lost on the rocks off Scilly, by erring in their latitude. Several transports, in 1711, were lost near the river St Lawrence, having erred 15 leagues in the reckoning during twenty-four hours. Lord Belhaven was lost on the Lizard on the 17th of November 1721, the same day on which he sailed from Plymouth.

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[1] Halley's observations were published posthumously in 1742, and in 1765 the commissioners of longitude paid his daughter £100 for MSS. supposed to be useful to navigation. As the moon passes the stars lying in her course through the heavens at the mean rate of 33″ in one minute of time, it is obvious that an error to that amount in measuring the distance from a star would produce an error of 15 m. in longitude. As the moon's motion with regard to the sun is nearly one degree a day less, a similar error in the distance would produce still more effect.

[2] This total comprises the large sums awarded to Harrison and to the widow of Mayer, the cost of surveys and expeditions in various parts of the globe, large outlays on the *Nautical Almanac* and on subsidiary calculations and tables, rewards for new methods and solutions of problems, and many minor grants to watchmakers or for improvements in instruments. Thus Jesse Ramsden received in 1775 and later about £1600 for his improvements in graduation (*q.v.*), and E. Massey in 1804 got £200 for his log (see LOG).

Many rewards were paid by the commissioners for methods by which the tedious calculations involved in "clearing the lunar distance" could be abbreviated; thus Israel Lyons (1739–1775) received £10 for his solution of this problem from the commissioners in 1769; and in 1772 he and Richard Dunthorne (1711–1775) each obtained £50. George Whichell, master of the Royal Naval Academy, Portsmouth, conceived a plan whereby the correction could be taken from a table by inspection. In October 1765 the commissioners of longitude awarded him £100 to enable him to complete and print 1000 copies of his table. On the following April they gave him £200 more. The work was continued on the same plan by Antony Shepherd, the Plumian professor of astronomy, Cambridge, with some additions by the astronomer-royal. The total cost of the ponderous 4to volume up to the time of publication in June 1772 was £3100, after which £200 more was paid to the Rev. Thomas Parkinson and Israel Lyons for examining the errata. It was a very large and expensive volume—ill-adapted for ship's use. Considerable sums were paid by the commissioners from time to time for other tables to facilitate navigation—not always very judiciously. It is sufficient to mention here the tables of Michael Taylor and those of Mendoza, published in 1815. The proposals submitted to the board to find the longitude by the time of the moon's meridian passage are very numerous.

One of the first points to which the attention of the commissioners was directed was the survey of the coasts of Great Britain, which was pressed on them by Whiston in 1737. He was appointed surveyor of coasts and headlands, and in 1741 received a grant for instruments. An act passed in 1740 enabled the commissioners to spend money on the survey of the coasts of Great Britain and the "plantations." At a later date they bore part of the expenses of Cook's scientific voyages, and of the publication of their results. Indeed it is to them that we owe all that was done by England for surveys of coasts, both at home and abroad, prior to the establishment of the hydrographic department of the Admiralty in 1795. But their chief work lay in the encouragement they gave on the one hand to the improvement of timepieces, and on the other to the perfecting of astronomical tables and methods, the latter being published from time to time in the *Nautical Almanac*. Before we pass on to these two important topics we may with advantage take a view of the state of practical navigation in the middle of the 18th century as shown in two of the principal treatises then current.

John Robertson's *Elements of Navigation* passed through six editions between 1755 and 1796. It contains good teaching on arithmetic, geometry, spherical trigonometry, astronomy, geography, winds and tides, also a small useful table for correcting the middle time between the equal altitudes of the sun—all good, as is also the remark that "the greater the moon's meridian altitude the greater generally the tides will be." He states that Lacaille recommends equal altitudes being observed and worked separately, in order to find the time from noon, and the mean of the results taken as the truth. There is a sound article on chronology, the ancient and modern modes of reckoning time. A long list of latitudes, longitudes and times of high water finishes vol. i. The second volume is said by the author to treat of navigation mechanical and theoretical; by the former he means seamanship. He gives instructions for all kinds of sailings, for marine surveying and making Mercator's chart. There are two good traverse tables, one to quarter points, the other to every 15 minutes of arc; the distance to each is 120 m. There is a table of meridional parts to minutes, which is more minute than customary. Book ix., upon what is now called "the day's work," or dead-reckoning, appears to embrace all that is necessary. A great many methods, we are told, were then used for measuring a ship's rate of sailing, but among the English the log and line with a half-minute glass were generally used. Bouguer and Lacaille proposed a log with a diver to avoid the drift motion (1753 and 1760). Robertson's rule of computing the equation of equal altitudes is as good as any used at the present day. He gives also a description of an equal-altitude instrument, having three horizontal wires, probably such as was used at Portsmouth for testing Harrison's timekeeper. The mechanical difficulties must have been great in preserving a perpendicular stem and a truly horizontal sweep for the telescope. It gave place to the improved sextant and artificial horizon. The second edition of Robertson's work in 1764 contains an excellent dissertation on the rise and progress of modern navigation by Dr James Wilson, which has been greatly used by all subsequent writers.

Don Jorge Juan's *Compendio de Navegacion*, for the use of midshipmen, was published at Cadiz in 1757. Chapter i. explains what pilotage is, practical and theoretical. He speaks of the change of variation, "which sailors have not believed and do not believe now." He describes the lead, log and sand-glass, the latter corrected by a pendulum, charts plane and spherical. Supposing his readers to be versed in trigonometry, he explains what latitude and longitude are, and shows a method for finding the latter different from what has been taught. He explains the error of middle latitude sailing, and shows that the longitude found by it is always less than the truth. (It is strange that while reckoning was so rough and imperfect in many respects such a trifle as that is in low latitudes should be noticed.) After speaking of meridional parts, he offers to explain the English method, which was discovered by Edmund Halley, but omits the principles upon which Halley founded his theory, as it was "too embarassing." He gives instructions for allowing for currents and leeway, tables of declination, positions of a few stars, meridional parts, &c. It is worthy of remark that, after giving a form for a log-book, he adds that this had not been previously kept by any one, but he thought it should not be trusted to memory. He only requires the knots, fathoms, course, wind and leeway to be marked every two hours. He gives a sketch of Halley's quadrant, but without a clamping screw or tangent screw.

To ascertain *local* time at sea by astronomical observations by the altitude of suitably-situated heavenly bodies was an old, well-known and frequently practised operation, so that a comparison could thus be easily made between such local time and the Greenwich time if known at the same instant. The introduction of timekeepers by which Greenwich time can be carried to any part of the world, and the longitude found with ease, simplicity and certainty is due to the invention of John Harrison.

The idea of keeping time at sea by watches was no novelty, but the practical difficulty arose from their very irregular rates owing to changes of temperature and the motion of the ship. Huygens had applied pendulums to the regulation of clocks on shore in 1656, and in 1675 his application of spiral springs as regulators of watches made them available for use at sea. William Derham published a scientific description of various kinds of timekeepers in *The Artificial Clock-Maker*, in 1700, with a table of equations from Flamsteed to facilitate comparison of mean time with that shown by the sun-dial or apparent time. In 1714 Henry Sully, an Englishman, published a treatise at Vienna, on finding time artificially. He went to France, and spent the rest of his life in trying to make a timekeeper for the discovery of the longitude at sea. In 1716 he presented a watch of his own make to the Academy of Sciences, which was approved; and ten years later he went to Bordeaux to try his marine watches, but died before embarking. Julien le Roy was his scholar, and perfected many of his inventions in watchmaking.

Harrison's great invention was the principle of compensation through the unequal contraction of two metals, which he first applied in the invention in 1726 of the compensation (gridiron) pendulum, still in use, and then modified so as to fit it to a watch, devising at the same time a means by which the watch retains its motion while being wound up. With regard to the success of the trial journey (see Harrison, John) to Jamaica in 1761–1762, it may be noted that by the journal of the House of Commons we find that the error of the watch was ascertained by equal altitudes at Portsmouth and Barbados, the calculations being made by Short; these errors came greatly within the limits of the act. At Jamaica the watch was only in error five seconds (assuming that the longitude previously found by the transit of Mercury could be closely depended on, which as we now know, was not the case, the observations being too few in number, and taken with an untrustworthy instrument). Short at Portsmouth found the whole unallowed-for error from November 6th, 1761, till April 2nd, 1762, to be $1^m54^s.5 = 18$ geographical miles in the latitude of Portsmouth. During the passage home in the "Merlin" sloop-of-war the timekeeper was placed in the after part of the ship, because it was the dryest place, and there it received violent shocks which retarded its motion. It lost on the voyage home $1^m\ 49^s = 16$ geographical miles.

One might have supposed that Harrison had now secured the prize; but there were powerful competitors who hoped to gain it by lunars, and a bill was passed through the House in 1763 which left an open chance for a lunarian during four years. A second West Indies trial of the watch took place between November 1763 and March 1764, in a voyage to Barbados, which occupied four months; during which time it is said, in the preamble to act 5 Geo. III. 1765, not to have erred 10 geographical miles in longitude. We only find in the public records the equal altitudes taken at Portsmouth and at Bridgetown, Barbados. William Harrison assumed an average rate of 1^s a-day gaining, and he anticipated that it would go slower by 1^s for every 10° increase in temperature. The longitude of Bridgetown was determined by N. Maskelyne and C. Green by nine emersions of Jupiter's first satellite, against five of Bradley's and two at Greenwich Observatory, to be $3^h\ 54^m\ 20^s$ west of Greenwich. In February 1765 the commissioners of longitude expressed an opinion that the trial was satisfactory, but required the principles to be disclosed and other watches made. Half the great reward was paid to Harrison under act of parliament in this year, and he and his son gave full descriptions and drawings, upon oath, to seven persons appointed by the commissioners of longitude.[1] The other half of the great reward was promised to Harrison when he had made other timekeepers to the satisfaction of the commissioners, and provided he gave up everything to them within six months. The second half was not paid till 1773, after trials had been made with five watches. These trials were partly made at Greenwich by Maskelyne, who, as we shall see, was a great advocate of lunars, and was not ready to admit more than a subsidiary value to the watch. A bitter controversy arose, and Harrison in 1767 published a book in which he charges Maskelyne with exposing his watch to unfair treatment. The feud between the astronomer-royal and the watchmakers continued long after this date.

Even after Harrison had received his £20,000, doubts were felt as to the certainty of his achievement, and fresh rewards were offered in 1774 both for timekeepers and for improved lunar tables or other methods. But the tests proposed for timekeepers were very discouraging, and the watchmakers complained that this was due to Maskelyne. A fierce attack on the astronomer's treatment of himself and other watchmakers was made by Thomas Mudge in 1792, in *A Narrative of Facts*, addressed to the first lord of the Admiralty, and Maskelyne's reply does not convey the conviction that full justice was done to timekeepers. Maskelyne at this date still says that he would prefer an occultation of a bright star by the moon and a number of correspondent observations of transits of the moon compared with those of fixed stars, made by two astronomers at remote places, to any timekeeper. The details of these controversies, and of subsequent improvements in timekeepers, need not detain us here. In England the names of John Arnold and Thomas Earnshaw as watchmakers are prominent, each of whom received, up to 1805, £3000 reward from the commissioners of longitude. It was Arnold who introduced the name chronometer. The French emulated the English efforts for the production of good timekeepers, and favourable trials were made between 1768 and 1772 with watches by Le Roy and F. Berthoud.

The marvellous accuracy with which the modern chronometer is constructed is doubtless greatly stimulated by the annual competition at Greenwich, from which the Admiralty purchase for the British navy. These chronometers are all fitted with secondary compensation balances, and it is therefore unusual in the navy to apply any temperature correction to the rate. The perfection obtainable in compensation may be illustrated by the performance of a chronometer at the Royal Observatory in 1886, which at a mean temperature of 50° F. had a *weekly* rate of 1·6 secs. losing; and on being further tested at a mean temperature of 92° F., it only changed its *weekly* rate to 2·9 secs. losing. In the mercantile marine cheaper chronometers without secondary compensation are more commonly used, and temperature corrections applied, calculated from a formula originally proposed by Hartnup, formerly of the Liverpool Observatory. Great success attends this mode of procedure, as illustrated by the following facts. From the discussion of the records of performance of the chronometers of the Pacific Steam Navigation Company during twenty-six voyages from London to Valparaiso and back, by giving equal weight to each of the three chronometers carried by each ship, the mean error of longitude for an average voyage of 101 days was less than three minutes of arc. As a single instance, in the s.s. *Orellana*, on applying temperature rates during a voyage of 63 days, the mean accumulated error of the three chronometers was only 2·3 sec. of time.

While chronometers were thus rapidly approaching their present perfection the steady progress of astronomy both by the multiplication and increased accuracy of observations, and by corresponding advances in the theory, had made it possible to construct greatly improved tables. In observations of the moon Greenwich still took the lead; and it was here that Halley's successor Bradley made his two grand discoveries of aberration and nutation which have added so much to the precision of modern astronomy. Kepler's Rudolphine tables of 1627 and Street's tables of 1661, which had held their ground for almost a century, were rendered obsolete by the observations of Halley and his successor. At length, in 1753, in the second volume of the *Commentarii* of the Academy of Göttingen, Tobias Mayer printed his new solar and lunar tables, which were to have so great an influence on the history of navigation. Mayer afterwards constructed and submitted to the English government in 1755 improved MS. tables. Bradley found that the moon's place by these tables was generally correct within 1′, so that the error in a longitude found by lunar would not be much more than half a degree if the necessary observations could be taken accurately at sea. Thus the lunar problem seemed to have at length become a practical one for mariners, and in England it was taken up with great energy by Nevil Maskelyne—"the father," as he has been called, "of lunar observations."

In 1761 Maskelyne was sent to St Helena to observe the transit of Venus. On his voyage out and home he used Mayer's printed tables for lunar determinations of the longitude, and from St Helena he wrote a letter to the Royal Society (*Phil. Trans.*, 1762), in which he described his observations made with Hadley's quadrant of 20 in. radius, constructed by John Bird, and the glasses ground by Dollond. He took the observations both ways to avoid errors. The arc and index were of brass, the frame mahogany; the vernier was subdivided to minutes. The telescope was 6 in. long, magnified four times, and inverted. Very few seamen in that day possessed so good an instrument. He considered that ship's time should be ascertained within twelve hours before or after observing the lunar distance, as a good common watch will scarcely vary above a minute in that time. This shows that he must have intended the altitudes to be calculated—which would lead to new errors. He considered that his observations would give the longitude within 1½ degrees. On the 11th of February he took ten observations; the extremes were a little over one degree apart.

On his return to England Maskelyne prepared the *British Mariner's Guide* (1763), in which he undertakes to furnish complete and easy instructions for finding the longitude at sea or on shore, within a degree, by observing the distance between the moon and sun, or a star, by Hadley's quadrant. How far that promise was fulfilled, and the practicability of the instructions, are points worth consideration, as the book took a prominent place for some years. The errors which he said were inseparable from the dead-reckoning "even in the hands of the ablest and most skilful navigators," amounting at times to 15 degrees, appear to be overestimated. On the other hand, the equations to determine the moon's position at time of observation from Mayer's tables, would, he believed, always determine the longitude within a degree, and generally to half a degree, if applied to careful observations. He recommends the two altitudes and distance being taken simultaneously when practicable. The probable error of observation in a meridian altitude he estimated at one or two minutes, and in a lunar distance at two minutes. He then gave clear rules for finding the moon's position and distance by ten equations, too laborious for seamen to undertake. Admitting the requisite calculations for finding the moon's place to be difficult, he desired to see the moon's longitude and latitude computed for every twelve hours, and hence her distance from the sun and from a proper star on each side of her carefully calculated for every six hours, and published beforehand.

In 1765 Maskelyne became astronomer-royal, and was able to give effect to his own suggestion by organizing the publication of the *Nautical Almanac*. The same act of 1765 which gave Harrison his first £10,000 gave the commissioners authority and funds for this undertaking. Mayer's tables, with his MS. improvements up to his death in 1762, were bought from his widow for £3000; £300 was granted to the mathematician L. Euler, on whose theory of the moon Mayer's later tables were formed; and the first *Nautical Almanac*, that for 1767, was published in the previous year, at the cost and under the authority of the commissioners of longitude. In 1696 the French nautical almanac for the following year appeared, an improvement on what had been before issued by private persons, but it did not attempt to give lunar distances.[1] In the English *Nautical Almanac* for 1767 we find everything necessary to render it worthy of confidence, and to satisfy every requirement at sea. The great achievement was that of giving the distance from the moon's centre to the sun, when suitable, and to about seven fixed stars, every three hours. The mariner has only to find the apparent time at ship, and clear his own measured lunar distance from the effects of parallax and refraction (for which at the end of the book are given the methods of Lyons and Dunthorne), and then by simple proportions, or proportional logarithms, find the time at Greenwich. The calculations respecting the sun and moon were made from Mayer's last manuscript tables under the inspection of Maskelyne, and were so continued till 1804.[2] The calculations respecting the planets are from Halley's tables, and those of Jupiter's satellites from tables made by Wargentin and published by Lalande in 1759 (except those for the fourth satellite). The original *Nautical Almanac* contained all the principal points of information which the seaman required, but the great value of such an authentic publication to the whole astronomical world led soon to a considerable increase to its contents. As much of this was unnecessary for the ordinary requirements of navigation, since 1903 it has been issued in two forms, the larger for observatory purposes, the smaller for the class for whom it was originally intended.

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[1] The explanations and drawings are at the British Museum; and two of his watches, one of which was used by Captain Cook in the "Resolution," are at Greenwich Observatory. In 1767 Harrison estimates that a watch could be made for £100, and ultimately for £70 or £80.

Various useful rules and tables were appended to early volumes of the *Almanac*. Thus that for 1771 contains a method and table for determining the latitude by two altitudes and the elapsed time (first published by Cornelius Downes of Amsterdam in 1740). At the end of the *Almanac* for 1772 Maskelyne and Whichell gave three special tables for clearing the lunar distance; still their rule is neither short nor easily remembered. An improvement of Dunthorne's solution is also given. In the edition for 1773 a new table for equations of equal altitude was given by W. Wales. In those for 1797 and 1800 tables were added by John Brinkley for rendering the calculations for double altitudes easier.

The plan of the *Nautical Almanac* was soon imitated by other nations. In France the Académie Royale de Marine had all the lunar distances translated from the British *Nautical Almanac* for 1773 and following years, retaining Greenwich time for the three-hourly distances. The tables were considered excellent, and national pride was satisfied by their having been formed on the plan proposed by Lacaille. They did not imitate the mode given for clearing the lunar distance, considering their own better.

Though the Spaniards were leaders in the art of navigation during the 16th and 17th centuries, it was not till November 4, 1791, that their first nautical almanac was printed at Madrid, having been previously calculated at Cadiz for the year 1792. They acknowledge borrowing from the English and French. The excellent Berlin *Astronomisches Jahrbuch* began to appear in 1776, the *American Ephemeris* in 1849. These two ephemerides and the French *Connaissance des temps* are independent and valuable works.

A book of *Tables Requisite to be Used with the Nautical Ephemeris* was published by Maskelyne at the same time as the first *Almanac*, and ten thousand copies were quickly sold. A second edition, prepared by Wales, appeared in 1781, an octavo of 237 pages, in the preface of which it is stated that it contains everything necessary for computing the latitude and longitude by observation. There are in all twenty-three tables, the traverse table and table of meridional parts alone being deficient as compared with modern works of the kind; dead-reckoning Maskelyne did not touch. He gave practical methods for working several problems; that for computing the lunar especially is an improvement on those by Lyons and Dunthorne, and a rule given for clearing the distance, called Dunthorne's improved method, is remarkably short. Maskelyne's rule for finding the latitudes by two altitudes and the elapsed time is also good. The third edition of the *Tables* was issued in 1802.

The publication of the *Requisite Tables* met a great want, and the existence of such accurate and conveniently-arranged mathematical tables for the special purposes of nautical calculations led to the more general use of many refinements which had been previously neglected. They formed the original of many subsequent and greatly extended collections, of which those by J. W. Norie are the more generally used in modern times in the mercantile marine, and the very accurate and comprehensive tables by James Inman (originally published in 1823) are constantly used in the British navy.

Until the middle of the 17th century mariners generally employed small collections of Dutch charts, known as "waggoners" from Waghenair, the name of a celebrated Dutch hydrographer in 1584. In 1671 appeared the *English Pilot* by John Sellers, who is styled the "Hydrographer Royal." It forms a collection of rude sketches of the coasts of England, the North Sea, France and Spain, with safling directions, and on its appearance the importation of Dutch charts was prohibited. Private enterprise, for many years after that, supplied both the British navy and the British mercantile marine with constantly improving charts, especially latterly, under the powerful patronage of the East India Company, whose hydrographer (Alexander Dalrymple), in 1795, was selected as the first hydrographer of the Admiralty. This post has since been occupied by a succession of distinguished naval officers under whom have grown up a large school of able nautical surveyors, the results of whose labours are now published in the well-known Admiralty charts.

Prior to the issue of charts by the Admiralty, the instructions to masters of vessels in the British navy enjoined them to "provide such charts and instruments as they considered necessary for the safe navigation of the ship," while on the completion of a voyage of discovery it was customary for the results to be published for the Admiralty by private firms.

The establishment of the Admiralty Hydrographic Office in 1795 marked a great step in the advancement of the art of navigation. On the 12th of August of that year an order in council placed all such nautical documents as were then in the possession of the Admiralty in charge of Dalrymple, whose catalogue, compiled for the use of the East India Company in 1786, contained 347 charts between England, the Cape, India and China; thus the germ of the present hydrographic department was established. The expense was then limited to £650 a year. The first official catalogue of Admiralty charts was issued in 1830, the total number being then 962.

After the close of the long devastating war in 1815 both trade and science revived, and several governments besides that of Great Britain saw the necessity of surveying the coasts in various parts of the globe; the greater portion of the work fell to the English hydrographical department, which took under its charge nearly every place where the inhabitants were not able to do it for themselves. Since that time its career of usefulness has steadily developed, and it not merely undertakes the constant improvement of the charts of the whole world, but periodically issues for the use of the seafaring community a vast amount of most accurate and practical nautical information on the various closely allied subjects of navigation, tides, compass adjustment and ocean meteorology.

A knowledge of the times and heights of high and low water and the directions of the tidal streams due to those phenomena are in many parts of the world (and especially round our own coasts) of vital importance to navigation. The theory of the tides was first laid down by Newton and Laplace, and in *Phil. Trans.*, 1683, there is an account of Flamsteed's tide table for London Bridge, which gave the times of each high tide on every day in the year. For a long subsequent period empirical tide tables for a few places in England were published by private individuals, but in 1832 the researches of Dr W. Whewell and Sir J. W. Lubbock enabled official tide tables to be issued by the Admiralty. These have steadily advanced in detail and accuracy, being now in many cases based on continuous tidal observations for a whole lunar period of 18¼ years, and represent the practical epitome of our knowledge of the tides and tidal currents of the whole world. The formulae and tables on which these predictions are based are given in the introduction to each annual volume (see TIDE).

MODERN NAVIGATION

Having thus sketched the progress of the art of navigation from an early period to the present time, we will now describe the modern methods by which it is brought into practical use referring our readers for more technical information to the professional text-books enumerated at the end of this article. The great development in both size and speed of modern ships enormously increases the responsibilities of those who command and navigate them, and has led to a careful examination of the existing modes of determining a ship's position at all times by day or night, both when in sight of land and on the open ocean. An examination of the present text-books on the subject of navigation shows how problems and methods which were formerly considered chiefly as theoretical exercises have now, from the altered conditions of the navigation of very fast ships, become methods of frequent practice, while corresponding improvements have been made in the instruments, such as compasses, charts and chronometers, by the aid of which more satisfactory results are now attained. Much has also been done to advance the study of this and its numerous allied subjects by the development of the Royal Naval College at Greenwich and the United Service Institution; also by the establishment of shipmasters' societies (of which the well-known society in London is typical), where during the year valuable papers are read and useful discussions take place among those actually carrying out the practice of navigation.

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[1] The French nautical almanac or *Connaissance des temps* appeared under letters patent from the king, dated 24th March 1679—seventeen years before the first issue. The following is a literal translation of its advertisement: "This little book is a collection of holy days and festivals in each month. The rising and setting of the moon when it is visible, and of the sun every day. The aspects of the planets as with respect to each other, the moon and the fixed stars. The lunations and eclipses. The difference of longitude between the meridian of Paris and the principal towns in France. The time of the sun's entrance into the twelve signs of the zodiac. The true place of the planets every fifth day, and of the moon every day of the year, in longitude and latitude. The moon's meridian passage, for finding the time of high water, 'as well as for the use of dials by moonlight.' A table of refraction. The equation of time [this table is strangely arranged, as though the clock were to be reset on the first of every month, and the explanation speaks of the 'premier mobile']. The time of twilight at Paris. The sun's right ascension to hours and minutes. The sun's declination at noon each day to seconds. The whole accompanied by necessary instructions."

[2] Mayer's tables were printed at London under Maskelyne's superintendence in 1770.

In planning out in advance a long ocean voyage the experienced navigator would first, by laying down the track from port to port on a great circle chart, ascertain the shortest route between them, remembering that the greatest saving in distance over other routes is when the ports are far apart in longitude and both in high latitudes of the same name. On examining such a track in conjunction with the wind and current charts it will be seen what modifications the intervention of land, unfavourable currents or winds, ice or unduly high latitude render necessary, and such modified route would be finally adopted subject to possible change as the voyage progressed. The judgment formed on the best route to follow would also be largely influenced by the remarks in the volumes of Sailing directions or "Pilots" relating to the region about to be traversed,while among the many excellent modern publications of the Hydrographic Office of the Admiralty perhaps the *Ocean Passage Book* is one of the most generally useful, since, when used in combination with the admirable charts of suggested full-powered and auxiliary tracks, it very greatly assists all navigators in planning out a successful voyage. Finally the intended route would be transferred from the great circle chart to one on Mercator's projection, which is the more convenient for purposes of navigation since in constructing the former for the sake of simplicity a projection of the coast's surface is adopted on which great circles are correctly shown as straight lines (gnomonic), while for practical purposes in navigation such a representation on which a ship's track when steering a continuous course (technically termed a rhumb line) is truly shown as a straight line (Mercator) is the most convenient, although in high latitudes giving a very distorted representation of the surface depicted. It is well to remember that on great circle charts rhumb lines become curves and great circles straight lines, and, vice versa, on Mercator charts, the rhumb line on each projection being that nearer to the equator, all meridians and the equator on both projections are shown as straight lines.

Ships rarely steer *on* great circles, which would generally theoretically involve continually altering course, but a series of chords of such circles are described of lengths such as involve a practical change of course of one or two degrees on the completion of each.

Great circle charts are very useful for drawing what is known as a composite track where if the great circle route would lead into too high a latitude the shortest route to and from the highest desirable parallel is readily laid down, the intervening track being pursued on that parallel.

A method of drawing approximate great circles directly on Mercator charts was proposed by Airy in 1858, and is sometimes very useful. The excellent idea, originally suggested by M. F. Maury, of establishing steam "lanes" in localities where there is much ocean traffic, so as to minimize the risks of collision between outward and homeward bound ships, has been successfully carried out in the North Atlantic. The leading transatlantic steamship companies now agree to follow great circle routes from the Irish coast to points on the Banks of Newfoundland, which vary somewhat in position with the season of the year, but are published in advance. These "lanes" being avoided by sailing vessels, risks of collision are materially lessened.

Having thus planned the most desirable general track to pursue, three methods are employed to ascertain the position of the ship at any time during such voyage: these are (1) projecting the track on charts; (2) simple trigonometrical calculations where the data are the course steered and distance run; and (3) astronomical observations, which form an entirely independent method.

Of these the first is the least trustworthy, owing to the usual difficulties attending accurate graphic methods and the small scales on which ocean charts are necessarily drawn. When near the land the larger scale coast charts are used, and in the approaches to harbours still larger scale plans give increasing accuracy to this record of a ship's position. Index charts of all parts of the world are provided, by referring to which the navigator ascertains which chart or plan to employ, always preferably using that on the largest scale.

On leaving harbour, and while near the coast, the position is not found by calculation but by frequently observing (when a variety of objects is in sight) (1) simultaneous sextant angles between suitably situated objects subsequently laid down on the chart by a station pointer; (2) simultaneous compass bearings of two or more objects (technically known as cross bearings); or (3) a combination of both methods by employing one bearing and one angle. All such methods are capable of considerable accuracy if the observations are made simultaneously. Should only a small number of objects, or sometimes only one, be visible (as frequently occurs at night) other and rougher methods are practised, depending upon the change of bearing of an object while a certain distance in a certain direction is traversed by the ship, such knowledge being based in many cases on an estimate of the action of the tide. When a ship is steaming at the rate of 20 knots the navigator remembers that a mile is passed over in three minutes, and that if in sight of land and fixing positions by objects on shore, it is essential to adopt some rapid method; otherwise when laid down on the chart the position shows where the ship *was*, and not where she *is*. This difficulty has led to the more general use of methods of obtaining positions by angles instead of bearings, and laying them down on the chart by the aid of the station pointer. Many advantages accrue from this, as the observer is not restricted in position on board, as is the case when using the compass, and especially if a double sextant (having two index glasses and one horizon glass) is employed two angles can be measured simultaneously, the result on the chart being very rapidly arrived at. An ingenious combination of sextant and station pointer in one has been proposed, and most simply carried out by attaching vertical sights to the legs of a station pointer, which is put on a suitable horizontal stand, and the legs moved until the sights are in line with the objects observed. To assist the navigator in the choice of suitable objects between which to measure the angles, a very useful pamphlet is issued by the Admiralty, from the diagrams in which it can be seen at a glance which combination of objects in sight gives the most favourable result, always remembering as a broad principle that nearer objects are more suitable than distant ones, and that the accuracy of position determined depends on the relative *distances* of the objects as well as on the magnitude of the *angles* between them.

In these circumstances, which render these rougher methods those only available, and especially in hazy weather in many known localities (such as the English Channel), a *continuous* line of deep sea soundings at fairly even distances apart affords an additional verification of position, remembering that only an *occasional* sounding might prove very misleading.

The chronicle of progress in the art of navigation would be very incomplete without reference to the extended use of Lord Kelvin's sounding machines, either in the original form, where the increased pressure at different depths is recorded by discoloration of chemical tubes, or in the later form known as the "depth recorder," where similar results are obtained by the automatic record of the position of a piston forced upwards in a tube by this increased pressure. Very satisfactory results can be obtained at speeds of 15 or 16 knots, enabling that great safeguard of navigation in many places, viz. a *continuous* line of soundings, to be accurately and rapidly obtained. In connexion with this should be mentioned a most ingenious invention known as the "submarine sentry," which on being set for any desired depth and towed overboard remains at that depth whatever the speed of the ship may be. On striking bottom it at once floats to the surface and rings a warning bell. Such an instrument is of obvious value in ships where, owing to the small number of available men, it is difficult to maintain a continuous line of soundings. To avoid an unnecessarily wide *détour* in rounding points and shoals, extensive use is now made of both horizontal and vertical danger angles; the former is the angle on the arc of a horizontal circle passing through a point at the required distance from the danger, and through two previously selected, easily recognized, fixed objects. Should circumstances enable the selection to be made of an angle of about 90°, the ship by continually measuring the angle may be steered on the arc of such a circle with great precision, and may even be safely taken through a channel *between* two dangers. The vertical danger angle enables similar results to be attained by measuring the vertical angle subtended by a known height; but except where the selected object is one whose height is *well* determined, such as a lighthouse, this method is not so trustworthy as the former.

Before losing sight of land the latitude and longitude of the last well-determined position found by the methods referred to is taken from the coast chart, transferred to the ocean or small scale chart, and considered to be the "departure" or starting-point of the ocean voyage, and from that point the course and distance run by the ship is laid down, being rectified on every occasion when the position is more accurately determined by astronomical means. To obviate the inevitable inaccuracies attending this graphic method and as a corroboration of the ship's position, the changes of latitude and longitude involved in each alteration of course are daily calculated by plane trigonometry, such calculations being materially abbreviated by the use of the Traverse Table, which is a tabulated expression of the solutions of right-angled plane triangles.

The foregoing modes of keeping account of a ship's position are technically known as "dead reckoning." The general introduction of compasses with short needles and slow periods of vibration has done very much towards improving the accuracy with which a ship's "dead reckoning" is kept. The original model of these was that patented by Lord Kelvin in 1876, and since adopted in the British navy as the standard. In this instrument we have a compass specially designed to enable the principles of compensation or correction proposed by Sir G. B. Airy in 1837 to be accurately carried out, while its slow period of swing renders it in all circumstances extremely steady.

The record of distance run is always obtained from the patent log, usually in the form of the Cherub or Taffrail log introduced in 1878. The common or hand log has ceased to be regarded as anything but the very roughest of guides, and the patent log in its original form, in which it recorded the revolutions of a small screw towed by the ship, does not give satisfactory results at great speeds, nor can anything more favourable be said of those forms where pressure on known areas is employed. The revolutions of the engines, with due allowance made for the condition of the ship's bottom, afford now perhaps the best means of estimating speed (see LOG).

Astronomical observations afford the most accurate means of ascertaining positions at sea, other methods (dead reckoning) being only relied upon when the weather does not admit of the practice of these, though by utilizing twilight and night observations of moon, stars and planets, the navigator in most parts of the world need seldom proceed far without the means of astronomically rectifying his position either in latitude, longitude or both at the same time.

The practical problems involved are precisely those employed at astronomical observatories, but it is not possible to attain similar accuracy of results, for though the sextant (the instrument always employed at sea in making such observations) is capable of marvellous accuracy, yet, as practically all such observations depend directly upon altitudes measured above the sea horizon, the uncertainty and variability of the true position of this, due to the changing effects of refraction, much affect observations made at any one time. This error in practice is greatly reduced by methods of combining several observations made at different times and using their mean or average result.

A notable feature of the progress of the art of modern navigation is the greatly increased practice of star navigation, and many of the supposed difficulties of night observations are found to be removed by experience. Determinations of positions at sea by twilight observations, when the brighter stars become visible while the horizon is still well defined, are probably the most accurate means we possess; and the careful navigator, by combining for latitude stars passing north and south of the zenith, and for longitude those near the prime vertical both east and west, can generally depend upon a good result, especially if suitable stars can be found for each pair at about the same altitudes. For these purposes the armillary sphere is extremely useful: this is a small celestial globe on which are depicted the principal stars visible to the naked eye. On elevating the pole to the approximate latitude of the observer, and turning the sphere until the sidereal time is under the fixed meridian, a correct representation of the heavens at the time of observation is obtained; the stars are then easily identified by their bearings and altitudes. This valuable instrument is not merely useful when at twilight, only a few of the brighter stars being visible, the constellations to which they belong are difficult of recognition, but it enables arrangement to be made in advance for such observations as are desired to be taken during the night. By marking in pencil on the globe the positions of the planets in right ascension and declination, the same sphere is also available for their identification. The heavenly bodies commonly observed at sea are: The Sun, Moon, Venus, Mars, Jupiter, Saturn, the Pole star, and the larger (or first magnitude) fixed stars, the positions of all of which in the heavens are given in the *Nautical Almanac* for fixed epochs at Greenwich, with the requisite data for computing their positions at all other times in all other places.

The chief astronomical observations made at sea are those for ascertaining (1) latitude, (2) time and thence longitude, (3) error of compass, and (4) latitude and longitude simultaneously.

To ascertain latitude by itself altitudes of heavenly bodies are measured above the horizon when they are on or near the meridian and therefore exactly or nearly north or south of the observer; in the case of the sun, of course, this means at or near noon, and in the case of other bodies such local times are previously accurately ascertained by a simple calculation made from the *Nautical Almanac* or more roughly found from an armillary sphere. The principle involved is the simple one that by subtracting the observed altitude when on the meridian from 90° the distance of the zenith or point overhead north or south of the heavenly body is found; then by combining with this the distance, obtained from the *Nautical Almanac*, of the body considered north or south of the celestial equator at the same instant, it is found how far the zenith is north or south of the celestial equator, and this is exactly the same as the latitude of the observer since the celestial equator is merely the imaginary extension of that of the earth. Such observations are not necessarily restricted to that which can be taken at the instant when the body observed is *on* the meridian (meridian altitude); equally accurate and multiplied observations can be made on either or both sides of the meridian if the body is somewhat near it (ex-meridian and circum-meridian altitudes), and a simple calculation or reference to a specially constructed table or graphic curve gives the required result.

Errors arising from uncertainty as to the true position of the horizon are with twilight and night observations largely counteracted by taking the means of results obtained from observations made of heavenly bodies crossing the meridian both north and south of the observer, taken as nearly at the same time as convenient. In northern latitudes the pole star is so near to the pole that observations of it can be taken at any time when it is visible, and from a convenient table given in the *Nautical Almanac* the altitude of the pole itself (which equals the latitude) is readily obtained.

Longitude at sea is in modern navigation always found by comparing local or ship mean time with Greenwich mean time, the latter being accurately known from the chronometers and the former from astronomical observations of suitably placed heavenly bodies. It may be assumed in all well found modern ships that on applying the known errors and accumulated rates to the times shown by the chronometers the Greenwich time at any instant is practically accurately known, and as the distance east or west of any place is merely the difference between the two local times at any instant expressed in degrees, so also is the distance east or west of Greenwich (longitude) the difference between time at place and Greenwich time at any one instant. The connexion between time and degrees depends upon the complete rotation of the earth in twenty-four hours, causing meridians 15° apart to pass under the same fixed point in the heavens at intervals of one hour, those east of Greenwich passing earlier and those west later, resulting in local time being in advance of Greenwich time in east longitude and vice versa in west longitude.

The errors and rates of gaining or losing of the chronometer referred to are known from observations made on shore prior to the beginning of the voyage with a sextant and artificial horizon, and these observations are capable of almost as great accuracy as those taken at fixed astronomical observatories. As this knowledge is absolutely essential every opportunity is taken at each principal port visited of either repeating such observations or obtaining the information from time balls dropped from observatories on shore at the Greenwich times indicated in the Time-ball pamphlet. Local or ship time can only be found with fair accuracy from calculations based on altitudes of heavenly bodies, when they are nearly east or west of the observer or technically on the prime vertical. Such times can be approximately seen from the azimuth diagrams or from tables of true bearings of heavenly bodies, and the error involved by uncertainty as to the position of the horizon can be greatly obviated in twilight or at night by taking the mean of results arising from nearly simultaneous observations of bodies bearing both east and west. In the usual case of determining time by observations of the sun the results arising from morning observations are compared with those similarly obtained in the afternoon. It will of course be remarked that should any unallowed-for error in the chronometer exist it will affect the resulting longitude by its full amount.

In considering the foregoing methods of astronomically fixing a ship's position we notice that always when the two elements of latitude and longitude are determined at different times, and generally, as we shall presently see, when they are determined together (though usually for a shorter time) the navigator has to depend for some time on the accuracy of the course steered and estimated distance run; also when cloudy weather prevails he has to depend entirely on those elements for a knowledge of the ship's position. The frequent astronomical observation of the error of the compass is therefore a most important and fortunately simple duty. In practice the error is found by a comparison between the compass bearing of a heavenly body and its true bearing, obtained either by calculation, or more generally from a graphic diagram (Weir's azimuth diagram) or tables from which at practically any time when above the horizon the true bearings of the principal heavenly bodies are taken by inspection. These important observations are most accurately made when the body observed is bearing nearly east or west true, if not too high, but if clouds prevent observations at such times, fairly good results can be obtained by observing the compass bearing when the object is on the meridian (if not too high) and therefore lying north or south true.

The causes of the changing errors of a compass in an iron ship are described elsewhere (see Compass), but by making comparisons as above the navigator can at once ascertain what is termed the "total" error, and if he takes from that the portion of error due to the earth, or what is termed variation (known from a chart of such elements), the remaining error is that caused by the iron of the ship, technically known as deviation. The latter method of procedure has the great advantage of enabling the navigator to ascertain during a voyage whatever magnetic changes in the ship are taking place other than those he would expect to occur on change of position. The total error is that applied to compass courses.

Deviations greater than a few degrees are not merely inconvenient but in modern compasses produce unsteadiness or oscillation of the compass card, so that, especially in new ships, the skilful navigator reduces such errors by adjusting the compensating magnets when favourable occasions offer. Recognizing the great value of a sound knowledge of compass adjustment, the British Board of Trade have included this among the compulsory subjects of examination for the rank of master, thus following the example of the navy, where all navigating officers have to attend a practical course of study on the subject.

The practical problem of finding both latitude and longitude at the same time is the most important of all in modern navigation, and is rapidly superseding other modes of ascertaining a ship's position. The principle involved depends upon the fact that every heavenly body is at each particular instant of time directly overhead or in the zenith of *some* place on the earth. Thus, if we take the sun as an instance, it is noon at all places on the meridian of 60° W. when it is exactly 4 p.m. at Greenwich, and at the *one* spot on that meridian where the observer is as far north or south of the terrestrial equator as the sun is north or south of the celestial equator (declination) it will not only be noon but the sun will be immediately overhead and will have an altitude of 90°. This, therefore, at any instant defines the position where the sun is vertical; its latitude must equal the sun's declination and its longitude in time equal the time since noon at Greenwich. Now at a distance of 60 m. in every direction on the surface of the earth from the point thus defined the sun will have an altitude of 89° and in all directions at a distance of 1200 m. its altitude will be 70° $(=90°-20°)$, so that on a globe, by marking the position where at a certain instant the sun is vertical and taking that as a centre, a series of concentric circles may be drawn, on all points of each of which the sun's altitude will be the same. When, therefore, at sea we measure with a sextant at any time the altitude of the sun (say 60° 10′) we at once know we are somewhere on the arc of a circle having for its centre the spot where the sun is vertical at that instant, and for radius a distance equal to 1790′ $(=90°-60°\ 10')$. Such information, combined with the best and most recent knowledge we have of the ship's latitude at the time, will of itself afford valuable information as to the position, but by making two such observations, separated by a sufficiently long interval for the position having the sun vertical to have moved considerably (owing to the rotation of the earth), we are able to consider with certainty that we must be at one or other of the widely separated intersections of two such circles, the movement of the ship in the interval between the two observations being duly allowed for. The dead reckoning affords information as to which of these intersections is the true position.

Now even on a large globe it would be practically impossible to obtain very accurate results from this problem by drawing such circles, but on a large scale chart (or ordinary squared paper) much greater accuracy is obtainable. The method commonly used on a Mercator chart involves two suppositions: (1) that the concentric circles we have referred to will be correctly represented as circles on the chart, and (2) that these are of such diameters, that a portion of say 100 m. of arc may be considered to be a straight line coincident with the tangent to the circle and therefore at right angles to the direction of the sun. Except in high latitudes (above 60°) Mercator's projection fulfils the first condition sufficiently well for practical purposes, and, except when the altitude is greater than 70°, the second condition is also approximately true since the radii of such circles will exceed 1200 m.

Premising these conditions, suppose that on a certain day at 9 a.m. when the ship's approximate position, known from previous observations and laid down on the chart, is supposed to be at A (fig. 7), an observation of the sun is made from which the longitude is calculated, the result being that on the supposition that the latitude of A is correct, the ship's position is probably at B. Now by drawing a straight line *ab* through B at right angles to the true bearing of the sun at the time of observation (which is most readily known from the azimuth tables) we are obviously right in assuming the ship's position to be somewhere on that line if we consider it as approximately an arc of a large circle having the place where the sun is then vertical as a centre, the direction of such place being indicated by an arrow.

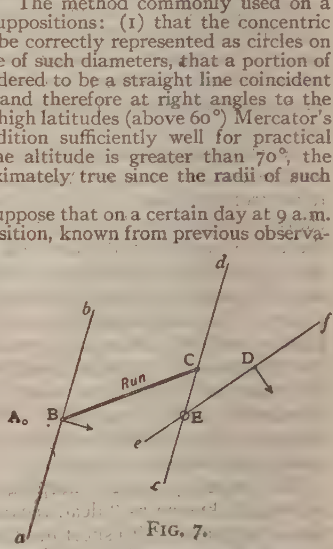

Fig. 7.

If our supposed latitude be right the position will be at B, but if not correct it must still be on the line *ab*, and if near land or any danger the direction of this line, even if no subsequent observation be available, will often give most valuable information. If, while waiting for the sun to change its bearing, the ship runs from B to C, a line *cd* drawn through C parallel to *ab* will represent an arc on which the position lies when she is probably at C, which at this instant (10·30 a. m.) is the most probable position of the ship.

If another observation of the sun for longitude is now made and the resulting position is D (lying of course in the same latitude as C), on drawing through D a line *ef* at right angles to the bearing of the sun (indicated by an arrow) we are right in assuming the position to be somewhere on such an arc as is represented by this line.

Hence E, the intersection of the two arcs on which the position lies at the same instant, must be the true place when the last observation was taken at the supposed position D, the discrepancies being entirely due to the original unknown error in the assumed latitude of A, for had that been accurate the position on the original line *ab* would have been such that on laying off the course and distance from that position C would have coincided with E.

Errors in the assumed latitude of as much in many cases as 30 m. will often be found to produce no practical difference in the resultant position, but of course the accuracy of the longitude found is entirely dependent upon the chronometer, and in such cases as arise when the intersecting arcs make a small angle with each other great accuracy is required in the course and distance run between the times of observation.

This method of finding both latitude and longitude at the same time is commonly known as "Sumner's" method from the publicity given to it in 1847 by the publication of an excellent pamphlet on the subject by a master of that name in the American mercantile marine, although in a modified form it was practised at a much earlier date in the British navy under the name of "cross bearings of the sun." Prior to the publication of azimuth tables in 1866 the calculation was more lengthy and troublesome, the work being practically doubled.

We have taken an illustration from observations of the sun, but the method is obviously applicable to all heavenly bodies provided they are so situated that the arcs drawn will intersect at a good angle; this in twilight or at night-time is readily done by selecting two heavenly bodies whose bearings differ considerably, and in such cases the small complication of allowing for the run of the ship is often obviated by making the observations simultaneously. The armillary sphere or star globe is useful in selecting objects suitably situated.

The principle of Sumner's method has of recent years received a very important and valuable development under the name of the "new navigation." In this method, originally proposed by Marc St Hilaire, a comparison is made between the altitude of a heavenly body as actually *observed* and that *calculated* from the supposed position of the ship. For instance, the position of an observer at the instant of observing a (true) altitude of the sun of 40° 10′ must be somewhere on a portion of the circumference of a circle (usually of such size that the portion considered may be represented on a chart by a straight line) having its centre in latitude equal to the sun's declination, and in longitude equal to the Greenwich apparent time at the instant, the radius of such a circle being equal to the sun's zenith distance of 49° 50′. If at the same time the true altitude of the sun is from the *estimated* position of the ship calculated to be 40° 5′, it is evident that the greater observed altitude must be owing to the ship being nearer to the centre of the circle than was supposed, and a line of position drawn through the estimated position at right angles to the bearing of the sun must be transferred parallel to itself through a distance of 5′ towards the direction of the sun's bearing. The second line of position, obtained when the sun's bearing has altered some 25°, is dealt with in a similar way, and the intersection of the two lines so obtained gives the position of the ship at the time of second observation. This mode of procedure enables all observations, whether near or far from the meridian, to be similarly dealt with; in all cases the altitude the heavenly body *should* have is computed and compared with what it actually *has*. The practice of problems such as the foregoing is greatly facilitated by the extended means of finding at any moment the azimuth or true bearing of a heavenly body. When the azimuth was only required for the determination of compass error, the valuable tables from which the computed results could be obtained by inspection were limited to those cases of most practical importance, but from the ingenious and simple graphical form known as Weir's azimuth diagram azimuths of all heavenly bodies, whose declinations extend from 60° N. to 60° S., can be obtained during the whole time they are above the horizon, thus greatly facilitating the laying down lines of position.

A careful record of everything pertaining to the navigation of the ship, with the results of all observations and calculated positions, is kept in the ship's log, an official book of great importance, a rough original of which is kept on deck with entries made in it of all such events at the time of their occurrence. A copy of the headings of a page of this as transferred into the official log is here given:

Hour.	Knots.	Tenths of Knots.	Course.	Wind.		Weather.	Deviation.	Barometer.	Thermometer.	Temperature of Sea.	Remarks.
				Direction.	Force.						

The course entered here is that which would be indicated by the "standard" compass of the ship (placed in the most favourable magnetic position on board); that actually steered by is the one most conveniently seen by the helmsman. Comparisons between the latter and the "standard" are frequently made, their indications generally varying somewhat owing to the difference of deviation in different positions on the ship. The compass card is usually graduated into points and degrees, but the course is always estimated in degrees. The speed is ascertained from the indication of the patent log, the hand log being generally only used as a rough check on this. Wind direction and force are the result of estimation; as the speed and course of the ship so greatly affect the apparent direction and velocity no practical anemometer for use on board ship exists. Wind force is estimated in terms of what is known as the "Beaufort" scale, based on the supposed amount of sail a vessel could carry at the time. The height of the mercurial barometer is carefully read at the end of each watch, as also is the thermometer; the more sensitive aneroid barometer is kept in a very accessible position and more frequently referred to by the officer of the watch. When navigating in localities and during seasons at which circular storms or hurricanes may be expected (as known from the *Barometer Manual*) the barometer is anxiously and frequently watched, and at all times its indication is compared with that normally experienced in the locality traversed as shown on the barometer charts, due allowance being made in the tropics for the ordinary daily movement. All observations relating to ocean meteorology are of great service in the compilation and improvement of wind and current charts, and in many ships more extensive meteorological journals are voluntarily kept on forms supplied by the Meteorological Office. A knowledge of the temperature of the surface of the sea is often of great practical use in navigation as giving warning of change in direction of the surface ocean current, especially in localities where there exist near to each other warm and cold currents setting in different directions, as, for instance, near the edge of the Gulf Stream. As an indication of the vicinity of ice such observations are usually much less trustworthy.

On the completion of the calculations giving the ship's position at noon each day the results are tabulated in the ship's log on the following form:

Course made good.	Distance.		Latitude.	Longitude.	Variation Allowed.	True Bearings and Distance.
	Made Good.	Through the water.	D.R.	D.R.		
Current.			Obs.	Obs.		

The course and distance made good each day are calculated by trigonometry between the best determined positions at two successive noons, such positions in fine weather being always those determined astronomically, and the current being considered the difference in the positions at noon as determined astronomically and as calculated by dead reckoning since the previous noon; such differences, however, obviously include the errors of *all* kinds. The latitude and longitude found by dead reckoning are entered under that heading (D.R.). The astronomical positions of latitude and longitude (entered as "obs." or "by observation") are very seldom both determined *at* noon, but are carried up or back to that instant by calculation from the intervening dead reckoning. The variation allowed is taken from the published variation chart, on which the latest results of such observations are embodied at intervals of about ten years with the annual changes (as far as known) in different localities, thus enabling the navigator to obtain its value at intermediate dates. Finally the course and distance are calculated from the position of the ship at noon to either the port of destination or some prominent position or danger near to which the vessel must pass. This is entered under the heading "true bearings and distance."

Authorities.—The following list of some writers of navigation whose works have not been already mentioned may be found useful to refer to: Thomas Addison, *Arithmetical Navigation* (1625)—he was the first to apply logarithms; Antonio de Najera (Lisbon, 1628) follows Nuñez and Cespedes, but corrects the declination of sun and stars; Sir R. Dudley, *L'arcano del mare* (1630–1646, 2nd ed., Florence, 1661)—too ponderous for the use of seamen; Sir Jonas Moore (1681)—one of the best books of the period; William Jones (1702)—a useful compendium containing trigonometry applied to the various sailings, the use of the log, and tables of logarithms; Pierre Jean Bouguer, *Traité complet de la navigation* (folio, 1698)—good but too large; Manuel Pimental, *L'Arte de navegar* (Lisbon, 1712); Pierre Bouguer, jun., *Nouveau traité de navigation* (1753)—without tables, published at the request of the minister of marine, improved and shortened in 1769 under the superintendence of the astronomer Lacaille; Nathaniel Colson, *The Mariner's New Calendar* (1735)—a good book; Seller, *Practical Navigation*—a book very popular in its time (there was an edition as late as 1739); Samuel Dunn published good star charts and tables of latitude and longitude (1737), and framed concise rules for many problems on navigation (published by the board of longitude); John H. Moore, *The Practical Navigator and Seaman's New Daily Assistant* (1772)—very popular, and generally used in the British navy—the 18th and 19th editions (1810, 1814) were improved by J. Dessiou; W. Wilson (Edinburgh, 1773)—a treatise of good repute at the time; Samuel Dunn, *New Epitome of Practical Navigation, or Guide to the Indian Seas* (1777)—for the longitude he depends chiefly on a variation chart from observations by East Indiamen, and he still makes no mention of the *Nautical Almanac* or of parallel rulers; Samuel Dunn (probably a son of the last named, 1781) is the last writer who gives instructions for the use of the astrolabe; he also wrote on "lunars" (1783, 1793), a name which was generally adopted about this time, and published an excellent traverse table (1785), and *Daily Uses of the Nautical Sciences*, (1790); Horsburgh, *Directory for East India Voyages* (1805); A Mackay, *The Complete Navigator* (about 1791); 2nd ed. 1810)—there is no instruction for finding longitude by the chronometer. Kelly, *Spherical Trigonometry and Nautical Astronomy* (1796, 4th ed., 1813)—clear and simple; N. Bowditch, *Practical Navigator* (1800)—passed through many editions and is now (in a revised form) the official text-book of the United States navy; J. W. Norie, *Epitome of Navigation* (1803, 21st ed. 1878)—still a favourite in the mercantile marine from its simplicity, and because navigation can be learned from it without a teacher; T. Kerigan, *The Young Navigator's Guide to Nautical Astronomy* (1821); Inman, *Epitome of Navigation* (1821)—with an excellent volume of tables, formerly largely used in the British navy, 9th ed. (1854); E. Riddle, *Navigation and Nautical Astronomy* (3rd ed. 1824, 9th ed., by Escott, 1871), still worthy of its high reputation; J. T. Towson, *Tables for Reduction of Ex-meridian Altitudes* (4th ed. 1854), very useful; H. Raper, *Practice of Navigation* (1840, 10th ed. 1870), an excellent book; H. Evers, *Navigation and Great Circle Sailing* (1850), other works on the same subject by Merrifield and Evers (1868) and Evers (1875); R. M. Inskip, *Navigation and Nautical Astronomy* (1865), a useful book, without tables; T. H. Sumner, *A Method of finding a Ship's Position by two Observations and Greenwich Time by Chronometer*—this is set forth as a novelty, but was published by Captain R. Owen, R.N., early in the century, and practised by many officers; H. W. Jeans, *Navigation and Nautical Astronomy* (1858); Harbord, *Glossary of Navigation* (1863, enlarged ed. 1883), a very excellent book of reference; W. C. Bergen, *Practice and Theory of Navigation* (1872); Sir W. Thomson, *Navigation, a Lecture* (1876), well worth reading; Lecky, *Wrinkles in Navigation* (1880); Martin, *Navigation and Nautical Astronomy*, sanctioned for use in the British navy.

(W. R. M.*)

NAVIGATION LAWS. The laws grouped under this title are a branch rather of municipal law than of the general maritime law. They are based upon the right of a state to regulate the navigation of its own waters and to protect its own commerce. One of the most curious early books on the subject is Captain G. St Lo, *England's Safetie or a Bridle to the French King, proposing a sure Method for encouraging Navigation* (London, 2nd ed. 1693). Navigation laws may be divided into two classes. The first class includes all laws designed to secure a commercial monopoly to the state which enacted them. In Great Britain the object was attained by the Navigation Acts, the earliest of which were those of 1381 and 1390, ordaining that no merchandise should be shipped out of the realm except in British ships on pain of forfeiture. The principal Navigation Act was that of 1660 (Scottish, 1661, c. 45). Up to 1854 coasting trade was wholly restricted to British ships, and a British ship must have been navigated by a master who was a British subject, and by a crew of whom a certain proportion must have been British subjects. After 1854 the only relics of such restrictions were found in the provisions of the Customs Consolidation Act 1853, § 324, by which, in order to secure reciprocity, prohibitions or restrictions may by order in council be imposed upon the ships of any country in which British ships are liable to similar prohibitions or restrictions. Subject to these exceptions, a foreign ship is in the same position as a British ship with regard to British trade. This right of foreign ships is expressly recognized by the Customs Law Consolidation Act 1876; by § 141 of that act foreign ships engaged in the coasting trade are not to be subject to higher rates than British ships. Any advantages which a British ship has, *e.g.* the right of claiming protection for her flag, the non-attachment to her of a maritime lien for necessaries supplied in a British port, are not directly connected with the policy under which the Navigation Acts have become obsolete. These advantages are not secured to a British ship until she is registered. United States law agrees with British in this respect. "The United States have imitated the policy of England and other commercial nations in conferring peculiar privileges upon American-built ships and owned by our own citizens. . . . The object of the Registry Acts is to encourage our own trade, navigation and shipbuilding by granting peculiar or exclusive privileges of trade to the flag of the United States, and by prohibiting the communication of those immunities to the shipping and mariners of other countries" (Kent, *Comm.* iii. 139). It may be noticed that an alien is generally incapable of becoming the owner of a ship. This incapacity was specially preserved in the case of British ships by the Naturalization Act 1870, § 14.

The second class of navigation laws includes those which deal with the navigation of any waters over which a state has any control, and embraces all that is necessary for the due use of such waters, as rules of the road, management of harbours and lighthouses, and licensing and control of pilots. Such laws may deal with (1) the high seas, (2) tidal waters other than the high seas, (3) non-tidal waters.

1. The claims of various nations to dominion over parts of the high seas have now become matters of merely historical interest. Such claims have been at different times advanced by Great Britain, Holland, Spain and Portugal, and were once sufficiently important to evoke the *Mare Liberum of* Grotius and the *Mare Clausum* of John Selden. It may be noted that in 1893 the Court of Arbitration on the Bering Sea Fisheries found that Russia had never claimed or exercised exclusive jurisdiction over the Bering Sea outside territorial waters and that the United States had no further right than had Russia at the time of the cession of Alaska in 1867. Rules for the navigation of the high seas may still be promulgated by any government. In Great Britain such rules, generally known as the "Sailing Rules," have been made by order in council under the powers of the Merchant Shipping Act 1862; the rules at present in force are those contained in the order of the 27th of November 1896, L.G. No. 1082, as amended by subsequent orders in council. The order of 1896 was extended by the order of 1897, L.G. No. 572, to the ships of most foreign countries, with a special provision as to China. In the case of a state which has not assented to them, the only rules enforceable are the general rules of the sea, gradually ascertained by individual cases before courts of admiralty.

2. For the navigation of its tidal waters—as far as they are territorial—a state may legislate without the assent of other states. An example of such legislation is afforded by the Territorial Waters Jurisdiction Act 1878, a measure passed in consequence of the celebrated case of *R. v. Keyn*, L.R. 2 Ex. D., 126 (the "Franconia" case), in 1876. Under the head of territorial waters would fall the "narrow seas" (as the Bristol Channel, Great Belt or Straits of Messina), bays and harbours, estuaries and arms of the sea, navigable tidal rivers, and the sea for the distance of a marine league from the shore. Such waters being *res publicae* though not *res communes*, as are the high seas, are prima facie subject to the jurisdiction of the state. In England the soil under such waters, or at least under all but the last kind, is prima facie vested in the crown, subject to the public rights of fishery and anchorage. For the distance of a marine league from low-water mark the crown has certainly jurisdiction for police and revenue purposes. This is a rule of general international law. It may be noted that the *Institut de Droit International* proposed to double this limit. See Hall, *International Law* (5th ed.), p. 154. In England the navigation of most of the principal tidal waters is governed by rules contained in acts of parliament and orders in council, the latter for the most part promulgated under the authority given by the Merchant Shipping Act 1862. For instance, there are numerous orders relating to the Thames, Mersey, Tees and other important rivers.

3. Non-tidal waters, even though navigable, are in Great Britain prima facie private waters, in which the right of navigation does not exist as a public franchise, but can only be acquired by prescription founded on a presumed grant by an owner. In Roman law and in the Code Napoléon it is otherwise. Navigable rivers in those systems are always *publici juris*, whether tidal or non-tidal. Navigation of non-tidal waters in the United Kingdom, whether natural or artificial, is now almost entirely regulated by various Navigation and Conservancy Acts, *e.g.* the Thames Conservancy Acts, the Shannon, Trent, Lee, &c., Navigation Acts, and the various Canal Acts, especially the Manchester Ship Canal Act 1885. It may be noticed that the crown is empowered by the Merchant Shipping Act 1862 to make rules for the navigation of inland waters, even when artificial, on the application of the proprietors. Examples of such rules are the orders in council regulating the Mersey and Irwell navigation and the Bridgewater navigation, 18th May 1870. Such waters being private property, the application for the rules by the proprietors is recited in the order in council.

The distinction drawn in the United States between navigable and boatable rivers seems to be peculiar to that country, unless indeed it is analogous to the "fleuves et rivières navigables ou flottables" of the Code Napoléon, § 538. It is at least unknown in Great Britain.

Remedies for Obstruction and Pollution.—These may be either criminal or civil—the criminal by indictment or information, the civil by action for damages or for an injunction, in addition to the criminal remedy, where special damage has been sustained. Pollution is expressly provided for by the Rivers Pollution Prevention Act 1876, which gives jurisdiction to county courts in cases within the act.

International Law.—The international law as to the navigation of the high seas has been sketched above. Reference should also be made to what is known as the "Rule of the War of 1756" to the effect that where a colonial or coasting trade is prohibited to other nations in time of peace, a neutral by engaging in this trade by permission of a belligerent in time of war is liable to the other belligerent. The leading case is *The Immanuel* (1799), 2 C. Robinson's Rep. 186. Regulations for the coasting trade may be made by the government of India under the powers of the Customs Consolidation Act 1853, § 329, and by the legislature of a British possession under the Merchant Shipping Act 1894, § 736. As to territorial waters, it is the general though not the universal opinion of jurists that the state to which the territorial waters belong has a right to forbid their navigation by foreigners. The free navigation of rivers has often been the subject of treaties, almost necessarily so where a river is the boundary between two states. In such a case, if a state were to maintain the strict letter of its rights, navigation would be almost impossible, as each state is proprietor down to the middle line of the bed of the river, the *medium filum aquae* or *thalweg*.

By the treaty of Vienna in 1815 it was provided that the navigation of all rivers separating or traversing the states that were parties thereto should be open for commercial purposes to the vessels of all nations, subject to a uniform system of police and tolls. The treaty of Paris, 1856, extended this principle to the Danube. In America the cases of the Mississippi and the St Lawrence are important. By the treaty of Versailles, 1783, it was provided that "the navigation of the Mississippi shall for ever remain free and open to the subjects of Great Britain and the citizens of the United States." But the United States afterwards acquired Louisiana and Florida; and, the stipulation as to British subjects not being renewed in the treaty of Ghent, 1814, the United States maintains that the right of navigating the Mississippi is vested exclusively in its citizens. As to the St Lawrence, after disputes for a long period between Great Britain and the United States, the right of free navigation for purposes of commerce was secured to the United States by the treaty of Washington, 1871. There are some waters, such as the Suez Canal and the Panama Canal, which are subject to peculiar engagements by treaty or convention. The former depends on the Convention of Constantinople, 29th of October 1888, the latter—as far as regards the United Kingdom and the United States—on the Hay-Pauncefote Treaty, 18th of November 1901. But as a rule it may be said that in time of peace the territorial waters of a state are open to foreigners for commercial purposes, subject to observance of any rules as to police, pilotage, &c., imposed by the state. Tolls may be imposed by the state upon foreigners. This right is expressly recognized in most commercial treaties. A notable instance was the claim of Denmark to charge what were called the "Sound dues" from all vessels passing Elsinore, though the Sound was not strictly her territorial water. The right was not universally recognized, though it had prescription in its favour and was invariably paid. In 1857 the dues were abolished, and compensation paid to Denmark for the loss of her alleged right. (J. W.)

NAVIUS, ATTUS, in Roman legendary history, a famous augur during the reign of Tarquinius Priscus. When the latter desired to double the number of the equestrian centuries, Navius opposed him, declaring that it must not be done unless the omens were propitious, and, as a proof of his powers of divination, cut through a whetstone with a razor. Navius's statue with veiled head was afterwards shown in the comitium; the whetstone and razor were buried in the same place, and a puteal placed over them. Hard by was a sacred fig-tree, called after him the Navian fig-tree. It was reported that Navius was subsequently put to death by Tarquinius. According to Schwegler, the puteal originally indicated that the place had been struck by lightning, and the story is a reminiscence of the early struggle between the state and ecclesiasticism.

See Livy i. 36; Dion. Halic. iii. 70; Aurelius Victor, *De viris illustribus*, 6; Schwegler, *Römische Geschichte*, bk. xv. 16.

NAVVY, a labourer employed in the digging and excavating of earth, &c., in the construction of railways, docks, canals or other engineering operations. The word is a shortened form of "navigator," applied during the 18th and early part of the 19th centuries to a labourer at work on canals, to which the name "navigation" is often applied. Power-machines (excavators) for performing such work are consequently known as "steam-navvies."

NAVY and NAVIES. The navy of a country was in its original meaning the total body of its shipping, whether used for war, for oversea and coasting traffic, or for fishing—the total in fact of its ships (Lat. *naves*). By custom, however, the word has come to be used only of that part of the whole which is set aside for purposes of war and police. Every navy consists of a material part (see Ship), *i.e.* the vessels, with their means of propulsion and their armament, and of a human organization, namely the crews of all ranks, by which the vessels are handled. Ships and men are combined in divisions, and are ruled by an organ of the government to which they belong (see Admiralty Administration).

Personnel

The personnel of the British navy is composed of two different bodies of men, the seamen and the marines, each of which has its appropriate officers. The marines are the subject of a separate article.

The officers of the navy are classed as follows in the order of their rank: flag-officers (see Admiral), commodores, captains, staff captains, commanders, staff commanders, lieutenants, navigating lieutenants, sub-lieutenants, chief gunners, chief boatswains, chief carpenters, gunners, boatswains, carpenters, midshipmen, naval cadets.

Flag-officers are divided into three ranks, viz. rear-admiral, vice-admiral, admiral. There is also the rank of "admiral of the fleet": such an officer, if in command, would carry the union flag at the main.

All flag-officers, commanders-in-chief, are considered as responsible for the conduct of the fleet or squadron under their command. They are bound to keep them in perfect condition for service; to exercise them frequently in forming orders of sailing and lines of battle, and in performing all such evolutions as may occur in the presence of an enemy; to direct the commanders of squadrons and divisions to inspect the state of each ship under their command; to see that the established rules for good order, discipline and cleanliness are observed; and occasionally to inquire into these and other matters themselves. They are required to correspond with the secretary of the admiralty, and report to him all their proceedings.

Every flag-officer serving in a fleet, but not commanding it, is required to superintend all the ships of the squadron or division placed under his orders—to see that their crews are properly disciplined, that all orders are punctually attended to, that the stores, provisions and water are kept as complete as circumstances will admit, that the seamen and marines are frequently exercised, and that every precaution is taken for preserving the health of their crews. When at sea, he is to take care that every ship in his division preserves her station in whatever line or order of sailing the fleet may be formed; and in battle he is to observe attentively the conduct of every ship near him, whether of the squadron or division under his immediate command or not; and at the end of the battle he is to report it to the commander-in-chief, in order that commendation or censure may be passed, as the case may appear to merit; and he is empowered to send an officer to supersede any captain who may misbehave in battle, or whose ship is evidently avoiding the engagement. If any flag-officer be killed in battle his flag is to be kept flying, and signals to be repeated, in the same manner as if he were still alive, until the battle shall be ended; but the death of a flag-officer, or his being rendered incapable of attending to his duty, is to be conveyed as expeditiously as possible to the commander-in-chief.

The captain of the fleet is a temporary rank, where a commander-in-chief has ten or more ships of the line under his command; it may be compared with that of adjutant-general in the army. He may either be a flag-officer or one of the senior captains; in the former case, he takes his rank with the flag-officers of the fleet; in the latter, he ranks next to the junior rear-admiral, and is entitled to the pay and allowance of a rear-admiral. All orders of the commander-in-chief are issued through him, all returns of the fleet are made through him to the commander-in-chief, and he keeps a journal of the proceedings of the fleet, which he transmits to the admiralty. He is appointed and can be removed from this situation only by the lords commissioners of the admiralty.

A commodore is a temporary rank, and of two kinds—the one having a captain under him in the same ship, and the other without a captain. The former has the rank, pay and allowances of a rear-admiral, the latter the pay and allowances of a captain and special allowance as the lords of the admiralty may direct. They both carry distinguishing pennants.

When a captain is appointed to command a ship of war he commissions the ship by hoisting his pennant; and if fresh out of the dock, and from the hands of the dockyard officers, he proceeds immediately to prepare her for sea, by demanding her stores, provisions, guns and ammunition from the respective departments, according to her establishment. He enters such petty officers, leading seamen, able seamen, ordinary seamen, artificers, stokers, firemen and boys as may be sent to him from the flag or receiving ship. If he be appointed to succeed the captain of a ship already in commission, he passes a receipt to the said captain for the ship's books, papers and stores, and becomes responsible for the whole of the remaining stores and provisions.

The duty of the captain of a ship, with regard to the several books and accounts, pay-books, entry, musters, discharges, &c., is regulated by various acts of parliament; but the state of the internal discipline, the order, regularity, cleanliness and the health of the crews will depend mainly on himself and his officers. In all these respects the general printed orders for his guidance contained in the King's Regulations and Admiralty Instructions are particularly precise and minute. And, for the information of the ship's company, he is directed to cause the articles of war, and abstracts of all acts of parliament for the encouragement of seamen, and all such orders and regulations for discipline as may be established, to be hung up in some public part of the ship, to which the men may at all times have access. He is also to direct that they be read to the ship's company, all the officers being present, once at least in every month. He is desired to be particularly careful that the chaplain have shown to him the attention and respect due to his sacred office by all the officers and men, and that divine service be performed every Sunday. He is not authorized to inflict summary punishment on any commissioned or warrant-officer, but he may place them under arrest, and suspend any officer who shall misbehave, until an opportunity shall offer of trying such officer by a court-martial. He is enjoined to be very careful not to suffer the inferior officers or men to be treated with cruelty and oppression by their superiors. He is the authority who can order punishment to be inflicted, which he is never to do without sufficient cause, nor ever with greater severity than the offence may really deserve, nor until twenty-four hours after the crime has been committed, which must be specified in the warrant ordering the punishment. He may delegate this authority to a limited extent to certain officers. All the officers and the whole ship's company are to be present at every punishment, which must be inserted in the log-book, and an abstract sent to the admiralty every quarter.

The commander has the chief command in small vessels. In larger vessels he is chief of the staff to the captain and assists him in maintaining discipline, and in sailing and fighting the ship.

The lieutenants take the watch by turns, and are at such times entrusted, in the absence of the captain, with the command of the ship. The one on duty is to inform the captain of all important occurrences which take place during his watch. He is to see that the whole of the duties of the ship are carried on with the same punctuality as if the captain himself were present. In the absence of the captain, the commander or senior executive officer is responsible for everything done on board.

The navigating officer receives his orders from the captain or the senior executive officer. He is entrusted, under the command of the captain, with the charge of navigating the ship, bringing her to anchor, ascertaining the latitude and longitude of her place at sea, surveying harbours, and making such nautical remarks and observations as may be useful to navigation in general.

The warrant-officers of the navy may be compared with the non-commissioned officers of the army. They take rank as follows, viz. gunner, boatswain, carpenter; and, compared with other officers, they take rank after sub-lieutenants and before midshipmen.

The midshipmen are the principal subordinate officers, but have no specific duties assigned to them. In the smaller vessels some of the senior ones are entrusted with the watch; they attend parties of men sent on shore, pass the word of command on board, and see that the orders of their superiors are carried into effect; in short, they are exercised in all the duties of their profession, so as, after five years' service as cadets and midshipmen, to qualify them to become lieutenants, and are then rated sub-lieutenants provided they have passed the requisite examination.

The duties and relative positions of these officers remain practically unaffected by recent changes; but a profound modification was made in the constitution of the corps of officers at the close of 1902. Up to the end of that year, officers who belonged to the "executive" branch, *i.e.* from midshipmen to admiral, to the marines and the engineers, had entered at different ages, had been trained in separate schools, and had formed three co-operating but independent lines. For reasons set forth in a memorandum by Lord Selborne (December 16, 1902)—from the desire to give a more scientific character to naval education, and to achieve complete unity among all classes of officers—it was decided to replace the triple by a single system of entry, and to coalesce all classes of officers, apart from the purely civil lines—surgeons and paymasters (formerly "pursers")—into one. Lads were in future to be entered together, and at one training establishment at Osborne in the Isle of Wight, on the distinct understanding that it was to be at the discretion of the admiralty to assign them to executive, marine or engineer duties at a later period. After two years' training at Osborne, and at the Naval College at Dartmouth, all alike were to go through the rank of midshipman and to pass the same examination for lieutenant. When in the intermediate position of sub-lieutenant, they were to be assigned to their respective branches as executive officer, marine or engineer. The engineers under this new system were to cease to be a civil branch, as they had been before, and become known as lieutenant, commander, captain or rear-admiral E. (Engineer).

The crew of a ship of war consists of leading seamen, able seamen, ordinary seamen, engine-room artificers, other artificers, leading stokers, stokers, coal-trimmers, boys and marines. The artificers and stokers and the marines are always entered voluntarily, the latter in the same manner as soldiers, by enlisting into the corps, the former at some rendezvous or on board particular ships. The supply of boys for the navy, from whom the seamen class of men and petty officers is recruited, is also obtained by voluntary entry.

Merchant seamen are admitted into the royal naval reserve, receive an annual payment by way of retainer, perform drill on board His Majesty's ships, and are engaged to serve in the navy in case of war or emergency.

There are two schemes for forming reserves. The Royal Naval Reserve scheme draws men from the mercantile marine and fishing population of the United Kingdom. The Royal Fleet Reserve scheme, introduced in 1901, while it gave a better system of training to the pensioners, was mainly designed to obtain the services in war of the men who had quitted the navy after the expiration of their twelve years' service.

So far as other countries are concerned, the staff of officers does not differ materially from one navy to another. In all it consists of admirals, captains, lieutenants, midshipmen and cadets receiving their training in special schools. With the exception of the navy of the United States, all the important naval forces of the world are raised by conscription.

The strength and general condition of navies at any given time must be learnt from the official publications of the various powers, and from privately composed books founded on them. The yearly statements of the First Lord of the Admiralty in Great Britain, the Reports of the Secretary of the Navy in the United States, and the Reports of the Budget Committees of the French Chamber contain masses of information. The *Naval Annual*, founded by Lord Brassey in 1886, is the model of publications which appear in nearly every country which possesses a navy. Mr F. T. Jane's *All the World's Fighting Ships* is a survey of the *matériel* of navies since 1898.

History of Navies

Every navy was at its beginning formed of the fighting men of the tribe, or city, serving in the ship or large boat, which was used indifferently for fishing, trade, war or piracy. The development of the warship as a special type, and the formation of organized bodies of men set aside for military service on the sea came later. We can follow the process from its starting-point in the case of the naval powers of the dark and middle ages, the Norsemen, the Venetians, the French, the English fleet and others. But centuries, and indeed millenniums, before the modern world emerged from darkness the nations of antiquity who lived on the shores of the Mediterranean had formed navies and had seen them culminate and decline. The adventures of the Argonauts and of Ulysses give a legendary and poetic picture of an "age of the Vikings" which was coming to an end two thousand years before the Norsemen first vexed the west of Europe. At a period anterior to written history necessity had dictated the formation of vessels adapted to the purposes of the warrior. Long ships built for speed (μακραὶ νῆες, *naves longae*) as distinguished from round ships for burden (στρογγύλαι νῆες, *naves onerariae*) are of extreme antiquity (see Ship). Greek tradition credited the Corinthians with the invention, but it is probable that the Hellenic peoples, in this as in other respects, had a Phoenician model before them. So little is known of the other early navies, whether Hellenic or non-Hellenic, that we must be content to take the Athenian as our example of them all, with a constant recognition of the fact that it was certainly the most highly developed, and that we cannot safely argue from it to the rest.

Athenian.

The Athenian navy began with the provision of warships by the state, because private citizens could not supply them in sufficient numbers. The approach of the Persian attack in 483 B.C. drove Athens to raise its establishment from 50 to 100 long ships, which were paid for out of the profits of the mines of Moroneia (see Themistocles). The Persian danger compelled the Greeks to form a league for their common naval defence. The League had its first headquarters at Delos, where its treasury was guarded and administered by the Ἑλληνοταμίαι (Hellenotamiai), or trustees of the Hellenic fund. Her superiority in maritime strength gave Athens a predominance over the other members of the League like that which Holland enjoyed for the same reason in the Seven United Provinces. The Hellenotamiai were chosen from among her citizens, and Pericles transferred the fund to Athens, which became the mistress of the League. The allies sank in fact to subjects, and their contributions, aided by the produce of the mines, went to the support of the Athenian navy. The hundred long ships of the Persian War grew to three hundred by the end of the 5th century B.C. (see Peloponnesian War), and at a later period (when, however, the quality of ships and men alike had sunk) to three hundred and sixty. The ancient world did not attain to the formation of a civil service—at least until the time of the Roman Empire—and Athens had no admiralty or navy office. In peace the war-vessels were kept on slips under cover in sheds. In war a *strategos* was appointed to the general command, and he chose the trierarchs, whose duty it was to commission them partly at their own expense, under supervision of the state exercised by special inspectors (ἀποστολεῖς). The hulls, oars, rigging and pay of the crews were provided by the state, but it is certain that heavy charges fell upon the trierarchs, who had to fit the ships for sea and return them in good condition. The burden became so heavy that the trierarchies were divided, first between two citizens in the Peloponnesian War, and then among groups (*synteleiai*) consisting of from five to sixteen persons. Individual Athenians who were wealthy and patriotic or ambitious might fit out ships or spend freely on their command. But these voluntary gifts were insufficient to maintain a great navy. The necessity which compelled modern nations to form permanent state navies, instead of relying on a levy of ships from the ports, and such vessels as English nobles and gentlemen sent to fight the Armada, prevailed in Athens also. The organization of the crews bore a close resemblance in the general lines to that of the English navy as it was till the 16th and even the 17th century. The trierarch, either the citizen named to discharge the duty, or some one whom he paid to replace him, answered to the captain. There was a sailing master (κυβερνήτης), a body of petty officers, mariners and oarsmen (ὑπηρεσία), with the soldiers or marines (ἐπιβάται). As the ancient warship was a galley, the number of rowers required was immense. A hundred triremes would require twenty thousand men in all, or more than the total number of crews of the twenty-seven British line of battleships which fought at Trafalgar. And yet this would not have been a great fleet, as compared with the Roman and Carthaginian forces, which contended with hundreds of vessels and multitudes of men, numbering one hundred and fifty thousand or so, on each side, in the first Punic War.

Until the use of broadside artillery and the sail became universal at the end of the 16th century, all navies were forcibly organized on much the same lines as the Athenian, even in the western seas. In the Mediterranean the differences were in names and in details. The war fleets of the successors of Alexander, of Carthage, of Rome, of Byzantium, of the Italian republics, of the Arabs and of Aragon, were galleys relying on their power to ram or board. Therefore they present the same elements—a chief who is a general, captains who were soldiers, or knights, sailing masters and deck hands who navigate and tend the few sails used, marines and rowers. A few words may, however, be said of Rome, which transmitted the tradition of the ancient world to Constantinople, and of the Constantinopolitan or Byzantine navy, which in turn transmitted the tradition to the Italian cities, and had one peculiar point of interest.

Rome.

As a trading city Rome was early concerned in the struggle for predominance in the western Mediterranean between the Etruscans, the Greek colonies and the Carthaginians. Its care of its naval interests was shown by the appointment of navy commissioners as early as 311 B.C. (*Duoviri navales*). In the first Punic War it had to raise great fleets from its own resources, or from the dependent Greek colonies of southern Italy. After the fall of Carthage it had no opponent who was able to force it to the same efforts. The prevalence of piracy in the 1st century B.C. again compelled it to attend to its navy (see POMPEY). The obligation to keep the peace on sea as well as on land required the emperors to maintain a navy for police purposes. The organization was very complete. Two main fleets, called the Praetorian, guarded the coasts of Italy at Ravenna and Misenum (*classes Praetoriae*), other squadrons were stationed at Forum Julii (Fréjus), Seleucia at the mouth of the Orontes (Nahr-el-Asy), called the *classis Syriaca*, at Alexandria (*classis Augusta Alexandriae*), at Carpathos (Scarpanto, between Crete and Rhodes), Aquileia (the *classis Venetum* at the head of the Adriatic), the Black Sea (*classis Pontica*), and Britain (*classis Britannica*). River flotillas were maintained on the Rhine (*classis Germanica*), on the Danube (*classis Pannonica* and *Maesica*) and in later days at least on the Euphrates. All these squadrons did not exist at the same time. The station at Forum Julii was given up soon after the reign of Augustus, and the *classis Venetum* was formed later. But an organized navy always existed. A body of soldiers, the *classici*, was assigned for its service. The commander was the *Praefectus Classis*.

Byzantine.

When Constantine founded his New Rome on the site of Byzantium, the navy of the Eastern Empire may be said to have begun. Its history is obscure and it suffered several eclipses. While the Vandal kingdom of Carthage lasted (428–534), the eastern emperors were compelled to attend to their fleet. After its fall their navy fell into neglect till the rise of the Mahommedan power at the end of the 7th century again compelled them to guard their coasts. The eastern caliphs had fleets for purposes of conquest, and so had the emirs and caliphs of Cordova. The Byzantine navy reached its highest point under the able sovereigns of the Macedonian dynasty (867–1056). It was divided into the imperial fleet, commanded by the Great Drungarios, the first recorded lord high admiral, and the provincial or thematic squadrons, under their *strategoi*. Of these there were three, the Cibyrhaeotic (Cyprus and Rhodes), the Samian and the Aegean. The thematic squadrons were maintained permanently for police purposes. The imperial fleet, which was more powerful when in commission than all three, was kept for war. A peculiar feature of the Byzantine navy was the presence in it of a corps answering to the seaman gunners and gunnery officers of modern navies. These were the *siphonarioi*, who worked the *siphons* (σιφῶνες) used for discharging the "Greek fire." When the Turkish invasions disorganized the Eastern Empire in the 12th century, the Byzantine navy withered, and the emperors were driven to rely on the help of the Venetians.

Medieval.

The Italian republics of the middle ages, and the monarchical states bordering on the Mediterranean, always possessed fleets which did not differ in essential particulars from that of Athens. There is, however, one fact which must not be overlooked. It is that the seamen of some of them, and more especially of Genoa, served the powers of western Europe from a very early date. Diego Gelmirez, the first archbishop of Santiago in Gallicia, employed Genoese to construct a dockyard and build a squadron at Vigo in the 12th century.

Edward III. of England employed Genoese, and others were engaged to create a dockyard for the French kings at Rouen. By them the naval science of the Mediterranean was carried to the nations on the shores of the Atlantic. The Mediterranean navies made their last great appearance in history at the battle of Lepanto (1571). Thenceforth the main scene of naval activity was on the ocean, with very different ships, other armaments and organizations.

The great navies of modern history may best be discussed by taking first certain specially important national navies in their earlier evolution, and then considering those which are of present day interest in their relations to one another.

The British Navy.

The Royal Navy of Great Britain stands at the head of the navies of the modern world, not only by virtue of its strength, but because it has the longest and the most consistent historical development. The Norse invasions of the 9th century forced the English people to provide for their defence against attack from oversea. Though their efforts were but partially successful, and great Norse settlements were made on the eastern side of the island, a national organization was formed. Every shire was called upon to supply ships "in proportion to the number of hundreds and from the produce of what had been the folkland contained in it" (Stubbs, *Const. Hist.* i. 116). Alfred and his successors had also ships of their own, maintained out of the royal revenue of which they had complete control. Before the Conquest the system of contribution by the shires had largely broken down. Yet in its main lines the method of providing a navy adopted by Alfred and his immediate successors remained in existence. There were the people's ships which represented the naval side of the *fyrd*—*i.e.* the general obligation to defend the realm; and there were the king's own vessels which were his property. By the 11th century a third source of supply had been found. This was the feudal array. Towns on the sea coast were endowed with privileges and franchises, and rendered definite services in return.

The Norman Conquest introduced no fundamental difference. In the 12th century the kings of the Angevine dynasty made the military resources of their kingdom available in three ways; the feudal array, the national militia and the mercenaries. Dover, Sandwich, Romney, and the other towns on the south-east coast which formed the Cinque Ports represented the naval part of the feudal array. In the reign of Henry III. (1216–1272) their service was fixed at 57 ships, with 1197 men and boys, for fifteen days in any year, to count from the time when they weighed anchor. During these fifteen days they served at the expense of the towns. Beyond that date they were maintained by the king. The Cinque Ports Squadron has been spoken of as the foundation of the Royal Navy. But a feudal array is wholly alien in character to a national force. The Cinque Ports, after playing a prominent part in the 13th century, sank into insignificance. They were always inclined to piracy at the expense of other English towns. In 1297, during one of the expeditions to Flanders, they attacked and burnt twenty ships belonging to Yarmouth under the eyes of Edward I. (1272–1307). The national militia had a longer life. The obligation of the coast towns and counties to provide ships and men for the defence of the realm was enforced till the 17th century. Nor did the method of enforcing that obligation differ materially. In the reign of King John (1199–1216), when the records began to be regularly kept, but when there was no radical change in system, the reeves and bailiffs of the seaports were bound to ascertain by a jury the number, size and quality of all ships belonging to the port. When the ships were required for the king's service they were embargoed. The local authorities were then bound to see that they were properly equipped and manned. It was the duty of the reeves and bailiffs to arrange that they should reach the place named by the king as rendezvous at the time fixed by him. These embargoes inflicted heavy loss even when they were honestly imposed, and loud complaints were heard in Parliament from the later years of Edward III. (1327–1377) that they afforded the king's officers many openings for oppression and corruption.

The true ancestors of the modern navy must be sought in the third element of the navy of the middle ages—the king's ships and his "mercenaries." Under King John we find the full record of a regular organization of a Royal Navy as apart from the feudal array of the Cinque Ports or the *fyrd*. In 1205 he had in all 50 "galleys"—long ships for war—distributed in various ports. William of Wrotham, archdeacon of Taunton, one of the king's "clerks," or ecclesiastical persons who formed his civil service, is named, sometimes in combination with others, as "keeper of the king's ships," "keeper of the king's galleys" and "keeper of the king's seaports." The royal vessels cannot have differed from the 57 warships of the Cinque Ports, and at first his navy was preferable to the feudal array, or the levy from the counties, mainly because it was more fully under his own control. They were indeed so wholly his that he could hire them out to the counties, and at a much later period the ships of Henry V. (1413–1422) were sold to pay his personal debts after his death. Yet though the process by which the king's ships became the national navy was slow, the affiliation is direct from them to the fleet of to-day, while the permanent officials at Whitehall are no less the direct descendants of William of Wrotham and the king's clerks of the 13th century. When on active service the command was exercised by representatives of the king, who were not required to be bred to the sea or even always to be laymen. In the crusade of 1190 the fleet of Richard the Lion Hearted (1189–1199), drawn partly from England and partly from his continental possessions, was governed by a body of which two of the members were churchmen. They and their lay colleagues were described as the *ductores et gubernatores totius navigii Regis*. The first commanders of squadrons were known as *justiciarii navigii Regis, ductores et constabularii Regis*.

The crusade of 1190 doubtless made Englishmen acquainted with the title of "admiral"; but it was not till much later that the word became, first as "admiral and captain," then as "admiral" alone, the title of an officer commanding a squadron. The first admiral of all England was Sir John Beauchamp, appointed for a year in 1360. The permanent appointment of a lord admiral dates from 1406, when John Beaufort, natural son of John of Gaunt, and marquess of Somerset and Dorset, was named to the post. The crews consisted of the two elements which, in varying proportions and under different names, have been and are common to all navies—the mariners whose business it was to navigate the ship, and the soldiers who were put in to fight. Until the vessel had been developed and the epoch of ocean voyages began, the first were few and subordinate. As the seas of Britain were ill adapted for the use of the galley in the proper sense, though the French employed them, English ships relied mainly on the sail. They used the oar indeed but never as a main resource, and had therefore no use for the "turma" (*ciurma* in Italian, *chiourme* in French, and *chusma* in Spanish) of rowers formed in the Mediterranean craft. Crews were obtained partly by free enlistment, but also to a great extent, by the press (see IMPRESSMENT). The code of naval discipline was the laws of Oleron (see SEA LAWS), which embodied the general "custom of the sea." By the reign of Edward III. (1327–1377) the duties and jurisdiction of the admiral were fixed. He controlled the returns of the ships made by the reeves, selected them for service, and chose his officers, who had their commission from him. A rudimentary code of signals by lights or flags was in use.

The history of the middle ages bears testimony to the general efficiency and energy of the navy. Under weak kings, and at certain periods, for instance in the latter years of Edward III. and the reign of his grandson Richard II. (1377–1399), it fell into decay, and the coast was ravaged by the French and their allies the Basque seamen, who manned the navy of Castile. Henry IV. (1399–1413), though an astute and vigorous ruler, was driven to make a contract with the merchants, mariners and shipowners, to take over the duty of guarding the coast in 1406–1407. Their admirals Richard Clitherow and Nicholas Blackburne were appointed, and exercised their commands. But the experiment was not a success, and was not renewed. Apart from these periods of eclipse, the navy in all its elements, feudal, national and royal, was more than a match for its enemies. The destruction of the fleet prepared by Philip Augustus, the French king, for the invasion of England in 1213 at Damme, the defeat of Eustace the Monk in 1217 off Dover, the victory over the French fleet at Sluys in 1340, and the defeat of the Spaniards off Winchelsea in 1350, were triumphs never quite counterbalanced by any equivalent overthrow. Still better proofs of the ability of any navy to discharge its duties were the long retention of Calais, and the constant success of the rulers of England in their invasions of France. The claim to the sovereignty of the seas has been attributed on insufficient evidence to King John, but it was enforced by Edward III.

Under the sovereigns of the Tudor dynasty (1485–1603) the development of the navy was steady. Though Henry VII. (1485–1509) made little use of his fleet in war, he built ships. His son Henry VIII. (1509–1547) took a keen interest in his navy. Shipbuilding was improved by the importation of Italian workmen. The large resources he obtained by the plunder of the Church enabled Henry VIII. to spend on a scale which had been impossible for his predecessors, and was to be impossible for his successors without the aid of grants from Parliament. But the most vital service which he rendered to the navy was the formation of, or rather the organization of existing officials into, the navy office. This measure was taken at the very end of his reign, when the board was constituted by letters patent dated 24th of April 1546. It consisted of a lieutenant of the admiralty, a treasurer, a comptroller, a surveyor, a clerk of the ships, and two officials without special title. A master of the ordnance for the ships was also appointed. Henry's board, commonly known as the navy board, continued, with some periods of suspension, and with the addition of different departments—the victualling board, the transport board, the pay office, &c., added at various times—to be the administrative machinery of the navy till 1832. They were all theoretically subject to the authority of the lord high admiral, or the commissioners for discharging his office, who had the military and political control of the navy and issued all commissions to its officers. In practice the boards were very independent. The double government of the navy, though it lasted long, was undoubtedly the cause of much waste—partly by the creation of superfluous officials, but more by the opening it provided for corruption.

The 16th century in England as elsewhere saw a great development in the size and capacity of ships, in the length of voyages, and consequently in the sciences of navigation and seamanship, which brought with them the predominance of the seaman element hitherto subordinate. In the reign of Henry VIII., when a squadron was commissioned in 1512, out of a total of 3000 men, 1750 were soldiers. By the end of the reign of his daughter Elizabeth (1558–1603) it was calculated that of the 8346 men required to man her fleet 5534 were seamen, 804 were gunners, and only 2008 were soldiers. In the early years of his reign Henry VIII. equipped his squadrons on a system which bears some resemblance to the Athenian trierarchies. He made a contract with his admiral Sir Edward Howard (1477–1513), by which the king supplied ships, guns and a sum of money. The admiral, who had full power to "press," named the officers and collected the crews. Among them are named contingents from particular towns—the representatives of the *fyrd*. With the exception of the captain, who received eighteen pence a day, all were paid at the same rate, 5s. wages and 5s. for rations per month. Extra sums called "dead shares," the wages of so many imaginary men, and rewards, were provided for the master and warrant officers. Until the regular returns known as the "weekly progress of the dockyards" and the "monthly lists of ships in sea pay" were established in 1773, no constant strict account of the strength of the navy was kept. The figure must therefore be accepted as subject to correction, but King Henry's navy is estimated to have consisted of 53 vessels of 11,268 tons, carrying 237 brass guns and 1848 of iron. It sank somewhat during the agitated reigns of his successors Edward VI. (1547–1553) and Mary (1553–1558). By Elizabeth it was well restored. In mere numbers her navy never equalled her father's. At the end of her reign it was composed of 42 vessels, but they were of 17,055 tons, and therefore on the average much larger. The military services rendered by the great queen's fleet were brilliant. No organic change was introduced, and fleets continued to be made up by including vessels belonging to the different ports.

The two most notable advances in organization were the establishment of a graduated scale of pay by rank in 1582, and the formation of a fund for the relief of sick and wounded seamen. This was not a grant from the state but a species of compulsory insurance. All men employed by the navy, including shipwrights, were subject to a small deduction from their pay. The amount was kept in the chest at Chatham, from which the fund took its name, and was managed by a committee of five, each of whom had a key, and of whom four were elected by the contributors. The commissioner of the dockyard presided.

It was between the accession and the fall of the House of Stuart (1603–1688) that the navy became a truly national force, maintained out of the revenue voted by parliament, and acting without the co-operation of temporary levies of trading ships. The reign of James I. (1603–1625) is a period of great importance in its history. The policy of the king was peaceful, and he only once sent out a strong fleet—in 1620 when an expedition was despatched against the Barbary pirates. He took, however, a lively interest in shipbuilding, and supported his master shipwright Phineas Pett (1507–1647) against the rivals whom he offended by disregarding their rules of thumb. Under the lax administration of the lord high admiral Nottingham, better known as Lord Howard of Effingham, many abuses crept into the navy. Though more money was spent on it than in the reign of the queen, it had sunk to a very low level of effective strength in 1618. In 1619 the old lord admiral was persuaded to retire, and was succeeded by George Villiers, duke of Buckingham, the king's favourite. Nottingham's retirement was made compulsory by the report of a committee appointed to inquire into the condition of the navy in 1618. They reported that while numbers of new offices had been created at a cost treble the whole expense of the permanent staff of Queen Elizabeth's time, the dockyards had become nests of pilfering and corruption. Ships were rotting, and money was yearly drawn for vessels which had ceased to exist. The committee undertook to meet the whole ordinary and extraordinary charges of the navy (upkeep and new building) for £30,000 a year. The ships in commission at that time during peace were confined to the diminutive winter and summer guards, whose duty was to transport ambassadors to and fro across the Channel and to hunt the pirates who still swarmed on the coast. Buckingham left the administration of the navy in the hands of the commissioners, who by dismissing superfluous officers and paying better salaries had by 1624 fulfilled their promise to restore the fleet. The establishment they proposed was only of 30 ships, but they were larger in aggregate tonnage by 3050 tons than Queen Elizabeth's.

Charles I. (1625–1649) carried on the work of his father as far as his limited resources allowed. The pay of the sailors, fixed in 1585 at 10s., was increased to 15s. A captain received from £4, 6s. 8d. a month of 28 days (the standard of the navy) to £14, according to the size of his ship. Lieutenants, who were only carried in the larger ships, received from £2, 16s. to £3, 10s., the sailing-master from £2, 6s. 8d. to £4, 13s. 9d., and the warrant officers from £1, 3s. to £2, 4s. The rating of ships by the number of men carried was introduced in this reign. Vessels of good quality were built for the king, and he showed a real understanding of the necessity for maintaining a strong fleet.

But the time was coming when the hereditary royal revenue was no longer adequate to meet the expense of a navy. By the middle of the 17th century a costly warship, far larger than the trading-ship in size and much more strongly built, had been developed. The extension of British commerce called for protection which an establishment of 40 to 50 vessels could not give. When the Great Rebellion broke out in 1641 the navy of King Charles consisted of only 42 vessels of 22,411 tons. At the Restoration (1660) it had grown to 154 ships for sea service, of 57,463 tons. Such a force could only be maintained out of taxes granted by the parliament. The efforts of King Charles to obtain funds for his navy had a large influence in provoking the rebellion (see SHIP MONEY). The government of the navy during this reign remained in the hands of the committee of 1618, under the lord high admiral Buckingham, till he was murdered in 1628. It was then entrusted to a special commission, who were to have held it till the king's second son James, duke of York, was of age. In 1638 the king restored the office of lord high admiral "during pleasure" in favour of Algernon Percy, 10th earl of Northumberland, by whom the fleet was handed over to the parliament.

During the Great Rebellion and the Protectorate the navy was governed by parliamentary committees, or by a committee named by the Council of State, or by Cromwell. The need, first for cutting the king off from foreign support, and then for conducting successive struggles in Ireland, or with the king's partisans on the sea, with the Dutch and with the Spaniards during the Protectorate, led to a great increase in its size. These, too, were years of much internal development. Blake and the other parliamentary officers found that the pressed or hired merchant ships were untrustworthy in action. The ships were not strong enough, and the officers had no military spirit. Parliament therefore provided its own vessels and its own officers. The staff was strengthened by the appointment of second lieutenants. The Dutch War of 1652–53 may be said to have seen the last of the national militia, *fyrd* or levy of ships from the ports for warlike purposes. After the war a code of "fighting instructions" was issued. During it a code of discipline in 39 articles was established. Both embodied ancient practices rather than new principles, yet it marked a notable advance in the progress of the navy towards complete organization that it should pass from the state of being governed by traditional use and wont, or by the will of the commander for the time being, to the condition of being ruled by fixed and published codes to which all were subject. The high military command during the interregnum 1649–1660 was entrusted to committees of admirals and generals at sea.

With the restoration of Charles II. (1660–1685) the modern period in the history of the navy began. The first steps were taken to form a corps of officers. Lads of gentle birth were sent on board ships in commission with a letter of service—from which came their popular name of "king's letter boys"—to the captain, instructing him to treat them on the footing of gentlemen and train them to become officers. After the Dutch War of 1664–67 a body of flag-officers were retained by fixed allowances from the crown. This was the beginning of the half-pay list, which was extended by successive steps to include select bodies of captains and lieutenants, and then all commissioned officers. The process of forming the corps was not complete till the end of the reign of Queen Anne (1702–1714). Special training and a right to permanent payment are the essentials of a state service. The fleet was, at least in the earlier part of the reign, used for the promotion of British interests and the protection of trade in distant seas. One squadron was sent to take possession of Bombay, which formed part of the dower of Queen Catherine. Tangier, which was acquired in the same way, was occupied as a naval station till the cost of maintaining it proved excessive and it was evacuated in 1685. A series of effective attacks was made on the Barbary pirates, and ships were stationed in the West Indies to check piracy and buccaneering. Until 1673, when he was driven out of office by the Test Act, the king's brother James, duke of York, afterwards James II., held office as lord high admiral. He proved an able administrator. The navy office was thoroughly organized on the lines laid down by the earl of Northumberland, and revised "sailing and fighting instructions," as well as a code of discipline, were issued. During the latter years of the reign of Charles II. the administrative corruption of the time affected the navy severely. The fixed charge for ordinary and extraordinary expenses which had risen to £300,000 a year was mostly wasted, under the lax or dishonest supervision of the commission appointed by the king after his brother left office. James II. (1685–1688), who kept the admiralship in his own hands and governed largely through his able secretary, the diarist Samuel Pepys, did much to restore its efficiency. The navy he left was estimated to consist of 173 ships of 101,892 tons carrying when in commission 42,003 men and armed with 6930 guns.

The evolution of the navy was completed by the Revolution of 1688. It now, though still called royal, became a purely national force, supported by the yearly votes of parliament, and governed by parliamentary committees, known as the commission for discharging the office of lord high admiral. A lord high admiral has occasionally been appointed, as in the case of Prince George of Denmark, husband of Queen Anne, or the duke of Clarence, afterwards King William IV. But these were formal restorations. As no organic change was made till 1832, it will now be enough to describe the organization as it was during this century and a half.

The discipline of the navy was based on the Navy Discipline Act of 1660 (13th of Charles II.). The act was found to require amending acts, and the whole of them were combined, and revised by the 22nd of George II., passed in 1749. Some scandals of the previous years had caused great popular anger, and the alternative to death was taken from the punishment threatened against officers who failed to show sufficient zeal in the presence of the enemy. It was under this severe code that Admiral Byng was executed. In 1780 an amending act was passed which allowed a court martial to assign a lighter penalty.

The government, political and military, was in the hands of the admiralty. The administration was carried on in subordination to the admiralty by the navy board and the other civil departments, the victualling board, the board of transport, the pay office, the sick and hurt office and some others. At the head were the flag-officers, who were divided as follows:—

Admiral of the Fleet.	Vice-Admiral Red.	Rear-Admiral Red.
" " White.	" " White.	" " White.
" " Blue.	" " Blue.	" " Blue.

The Red, White and Blue squadrons had been the divisions of the great fleets of the 17th century, but they became formal terms indicating only the seniority of the flag-officers. It was the intention of parliament to confine the flag list to these nine officers, but as the navy grew this was found to be impossible. The rank of admiral of the fleet remained a solitary distinction. The captains, commanders and lieutenants were the commissioned officers and received their commissions from the admiralty. Promotion from them to flag rank was not at first limited by strict rules, but it tended to be by seniority. During the war of the Austrian Succession, in 1747, a regular system was introduced by which when a captain was promoted for active service—to hoist his flag, as the phrase went—he was made rear-admiral of the Blue squadron. Captains senior to him were promoted rear-admiral in general terms, and were placed on the retired list. They were familiarly called "yellow" admirals, and to be promoted in this way was to be "yellowed." Promotion to a lieutenant's commission could be obtained by any one who had served, or whose name had been on the books of a sea-going ship, for five years. Whether he entered with a king's letter of service or from the naval academy at Portsmouth, as a sailor or as a ship's boy, he was equally qualified to hold a commission if he had fulfilled the necessary conditions and could pass an examining board of captains, a test which in the case of lads who had interest was generally a pure formality. He was supposed to show that he knew some navigation, and was a practical seaman who could hand, reef and steer. As captains were allowed a retinue of servants, a custom arose by which they put the names of absent or imaginary lads on the books as servants and drew the pay allowance for them. It was quite illegal, and constituted the offence known as "false musters," punishable by dismissal from the service. But this regulation was even less punctually observed than the rule which forbade the carrying of women. Till the beginning of the 19th century many distinguished officers were borne on a ship's books for two or three years before they went to sea. The navigation was entrusted to the sailing-master and his mates. He had often been a merchant captain or sailor. The captains and lieutenants were supposed to understand navigation, but it was notorious that many of them had forgotten the little they had learnt in order to pass their qualifying examination. As the navy was cut down to the quick in peace, the supply of officers was insufficient at the beginning of a war, and it was found necessary to give commissions to men who were illiterate but were good practical seamen. Officers who had not begun as gentlemen "on the quarter deck" were said to have come in "through the hawse hole"—the hole by which the cable runs out at the bow. Some among them rose to distinction. The accountant's work was done by the purser, who in bad times was said to be often in league with the captain to defraud both the government and the crew. The medical service in the navy during the 18th century was bad. The position of the surgeons who were appointed by the navy office was not an enviable one, and the medical staff of the navy was much recruited from licentiates of Edinburgh, or Apothecaries Hall. Finally it is to be observed that when a ship was paid off only the commissioned officers, masters and surgeons were entitled to half-pay, or had any further necessary connexion with the navy.

The crews were formed partly by free enlistment and partly by impressment. When these resources failed, prisoners, criminal and political, were allowed to volunteer or were drafted from the jails. The Patriotic Society, formed at the beginning of the Seven Years' War, educated boys for the navy. During the Revolutionary and Napoleonic Wars the counties were called upon to supply quotas, which they commonly secured from the debtors' prison or the workhouse. A ship was supposed to be well manned when she had one-fifth of her crew of marines, and one-third of men bred to the sea. This proportion of seamen was rarely reached. As the navy did not train its men from boyhood in peace, the genuine sailors, known as "prime seamen" and "sailormen," who were the skilled artificers of the time, had to be sought for among those who had served their apprenticeship in the merchant service. They never enlisted voluntarily, for they disliked the discipline of the navy, and the pay was both bad and given in an oppressive way. The pay of a seaman was 22s. 6d. a month for able seamen, the rate fixed in the reign of Charles II., and 19s. for ordinary seamen. This sum was not paid at fixed dates, but at first only at the end of a commission, and after 1758 whenever a ship which had been a year in commission returned home—up to six months before the date of her arrival, the balance being kept as a security against desertion, which was then incessant and enormous. As men were often turned over from ship to ship they had a sheaf of pay notes to present on reaching home. The task of making up accounts was slow, and the men were often driven to sell their pay notes to low class speculators at a heavy discount. Discipline was mainly enforced by the lash, and the abuse of their power by captains was often gross.

These grievances led to a long series of single ship mutinies, which culminated in the great mutiny of 1797. The fleets at Spithead, the Nore, Plymouth, the South of Ireland and Cape of Good Hope mutinied one after another. The government had aggravated the danger by drafting numbers of the United Irish into the fleet, and the quotas from the counties contained many dangerous characters. The crisis which seemed to threaten the country with ruin passed away. Concessions were made to the just claims of the men. When political agitators endeavoured to make use of the discontent of the sailors for treasonable ends, the government stood firm, and the patriotism of the great bulk of the men enabled it to restore discipline. The "breeze at Spithead," as the mutiny was nicknamed in the navy, was the beginning of the reforms which made the service as popular as it was once hateful.

The administration of the navy throughout the 18th century, and in a less degree after 1806 up to 1832, was in many respects slovenly, and was generally corrupt. The different branches, military and civil, were scattered and worked in practical independence, though the board of admiralty was supposed to have absolute authority over all. The admiralty was at Whitehall, the navy office in Seething Lane near the Tower, and after 1780 at Somerset House. The victualling office was on Tower Hill, the pay office in Broad Street, where also was the Sick and Hurt office. In 1749, when the state of the navy excited just discontent, the admiralty first established regular visitations of the dockyards which in a time of general laxity had become nests of corruption. These visitations were, however, not regularly made. By the end of the century, and in spite of sporadic efforts at reform, the evil had become so generally recognized that Earl St Vincent, then first lord, persuaded parliament in 1802 to appoint a parliamentary commission of inquiry. Its reports, thirteen in number, were given between 1804 and 1806. They revealed much waste, bad management and corruption. The tenth report showed that money voted for the navy was used by the then treasurer, Henry Dundas (Lord Melville), for purposes which he refused to reveal. In 1806 another commission was appointed to revise and digest the civil affairs of the navy, and a considerable improvement was effected. Much remained to be done. There was no strict appropriation of money. Accounts were kept in complicated, old-fashioned ways which made it impossible to strike a balance.

In 1832 Sir James Graham, first lord in Earl Grey's administration, obtained the support of parliament for his policy of sweeping away the double administration of the navy, by admiralty and navy office, and combining them into one divided into five departments. With this great organic change the navy entered on its modern stage.

Subject to the warning that for the reason given above, the figures do not deserve absolute confidence, the material strength of the British navy from the death of Queen Anne to the fall of Napoleon was:—

	Ships.	Tons.
At the death of Queen Anne, 1714	247	167,219
" " George I., 1727	233	170,862
" " George II., 1760	412	321,104
In 1783	617	500,781
In 1793	411	402,555
In 1816	776	724,810

The figures for 1783, and for 1816, are swollen by prizes and worn out ships. All the figures include vessels unfit for service, or useful only for harbour work, or ordered to be built, but not actually in existence. The number of men varied enormously from a peace to war establishment. Thus in 1755 on the eve of the Seven Years' War parliament voted 12,000 seamen. In 1762 the vote was for 70,000 men, including 19,061 marines—the corps having been created in the interval. In 1775, on the eve of the American War of Independence, the vote was for 18,000 men for the sea service, including 4354 marines. At the close of the war in 1783 the vote was for 110,000 men, including 25,291 marines, from which it fell in 1784 to 26,000 (marines 4495 included) and in 1786 to 18,000 men, of whom 3860 were marines. In 1812, when the navy was at the highest level of strength it reached, the vote was for 113,000 seamen and 31,400 marines. From this level it fell in 1816 to 24,000 seamen and 9000 marines. These figures represent paper strength. Owing to the prevalence of desertion, and the difficulty of obtaining men, the actual strength was always appreciably lower.

The French Navy.

Before the French monarchy could possess a fleet, its early kings, whose rule was effective only in the centre of the country, had first to conquer their sea coast from their great vassals. Philip Augustus (1180–1223) began by expelling King John of England from Normandy and Poitou. The process was not completed until Louis XII. (1498–1515) united the duchy of Brittany to the crown by his marriage with the duchess Anne. Long before the centralization of authority had been completed the French kings possessed a fleet, or rather two fleets of very distinct character. Her geographical position has always compelled France to draw her navy from two widely different sources—from the Channel and the coast of the Atlantic on the north and west and on the south from the Mediterranean. This separation has imposed on her the difficult task of concentrating her forces at times of crisis, and the concentration has always been hazardous. Like their English rivals, the French kings of the middle ages drew their naval forces from the feudal array, the national levy and their own ships. But the proportion of the elements was not the same. Many of the great vassals owed the service of ships, and their obedience was always less certain than that of the Cinque Ports. The trading towns were less able, and commonly less willing, than the English to supply the king with ships. He was thus driven to trust mainly to his own vessels—and they were drawn at first exclusively, and always to a great extent, from the Mediterranean seaboard. His own territories in the south were insufficiently provided with seamen, and the French king had therefore to seek his captains, his men and his vessels by purchase or by subsidies from Genoa, or in a less degree from Aragon. When Saint Louis (1226–1270) sailed on his first crusade in 1249, he formed the first French royal fleet, and created the first French dockyard at Aigues Mortes. Ships and dockyard were bought from, or were built by, the Genoese at the king's expense. His admirals, the first appointed by the French crown, Ugo Lercari and Jacobo di Levante, were Genoese. Saint Louis created the office of admiral of France. When in later times Aigues Mortes was cut off from the sea by the encroachment of the land, Narbonne and Marseilles were used as ports of war. This fleet was purely Mediterranean in character. It consisted of galleys, and though the sail was used it was dependent on the oar, and therefore on the "turma" (*chiourme*) of rowers, who in earlier times were hired men, but from the middle of the 15th century began to be composed of galley slaves—prisoners of war, slaves purchased in Africa, criminals and vagabonds condemned by the magistrate to the chain and the oar. Philip IV. le Bel (1285–1314) was led by his rivalry with Edward I. of England to create a naval establishment on the Channel. He found his materials in the existing Mediterranean fleet. A dockyard was built for him at Rouen, again by the Genoese Enrico Marchese, Lanfranc Tartaro and Albertino Spinola. It was officially known as the Tersenal or Dorsenal, but was commonly called the *clos des gallées* or galley yard, and it existed from 1294 to 1419. The French navy has always suffered from alternations of attention and neglect. In times of disastrous wars on land it has fallen into confusion and obscurity. Except when Francis I. (1515–1547) made a vigorous attempt to revive it at the very close of his reign, the French navy languished till the 17th century. Its very unity of administration disappeared in the 15th century, when the jurisdiction of the admiral of France was invaded and defied by the admiralties of Guyenne, Brittany and the Levant. These local admiralties were suppressed by Francis I.

Richelieu, the great minister of Louis XIII., found the navy extinct. He was reduced to seeking the help of English ships against the Huguenots. From him dates the creation of the modern French navy. In 1626 he abolished the office of admiral of France, which had long been no more than a lucrative place held by a noble who was too great a man to obey orders. He himself assumed the title of *grand maître et surintendant de la navigation*, and the military command was entrusted to the admirals *du Ponant, i.e.* of the west or Atlantic and Channel, and *du Levant, i. e.* of the Mediterranean. But Richelieu's establishment shrivelled after his death. It was raised from its ruins by the pride and policy of Louis XIV. (1643–1715). Under his direction a numerous and strongly organized navy was created. A very full code of laws—the *ordonnance*—was framed by Colbert and Lyonne with the advice of the ablest officers, and was promulgated on the 5th of April 1689. Though modified by other *ordonnances* in 1765, 1772, 1774, 1776 and 1786, in the main lines it governed the French navy till the Revolution.

By this code the French navy was based on the *Inscription maritime*, a very severe law of compulsory service, affecting the inhabitants of the coast and of the valleys of rivers as far up as they were capable of floating a lighter. The whole body of officials and officers was divided into the civil branch known as *la plume*, and the military branch called *l'épée.* The first had the entire control of the finances, and the dockyards of Toulon, Brest and Rochfort, with an *intendant de la marine* at the head of each. The general chief was the *sous secrétaire au département de la marine*, the title of the French minister of marine till the Revolution. Under Louis XIV. a civil officer, the *intendant des armées navales*, who ranked as an admiral, sat on councils of war and reported on the conduct of the naval officers. He must not be confused with the *intendant de la marine.* The military branch had at its head the admiral of France, the office having been re-created in 1669 by Louis XIV. in favour of his natural son the duc de Vermandois. In theory the admiral was the administrative military and judicial head of the admiralty. In practice the admirals were princes of the blood, who drew pay and fees, but who never went to sea, with the one exception of the count of Toulouse, another natural son of Louis XIV. Two vice-admirals of France *du Ponant* and *du Levant* commanded in the Mediterranean and on the ocean. A third office of vice-admiral of France was created for Suffren. The *lieutenant général* (vice-admiral) came next, and below him the *chef d'escadre* (rear-admiral), *capitaine de vaisseau* (post captain), *capitaine de brûlot* (fireship) or *de frégate* (commander), and the *major*, a chief of the staff on board who commanded all landing parties. There was no permanent body of marines in the French navy, the *infanterie de la marine* being troops for service in the colonies, which were administratively connected with the navy and governed by naval officers. The lieutenant needs no explanation, and the *enseigne* was a sub-lieutenant. The corps of officers was recruited from *les gardes de la marine*, answering more or less to the English midshipmen—who received a careful professional education and were required to be of noble birth. Besides the *grand corps de la marine* there was a fleet of galleys with a general at its head, and a staff of officers also of noble birth. It was suppressed in 1748 as being a useless expense. Officers not belonging to the *grand corps* were sometimes taken in from the merchant service. They were known as *officiers bleus*, because their uniform was all blue, and not, as in the case of the noble corps, blue and red.

On paper the organization of the French royal navy was very thorough. In reality it worked ill; the severity of the *inscription maritime* made it odious, and owing to the prevailing financial embarrassment of the crown after 1692 the sailors were ill-paid, ill-fed and defrauded of the pensions promised them. They fled abroad, or went inland and took up other trades. The military and civil branches were always in a state of hostility to one another, and their pay also was commonly in arrears. The noble corps was tenacious of its privileges, and extremely insolent towards the *officiers bleus.* By Louis XV. (1715–1774) the navy was neglected till the last years of his reign, when it was revived by the duc de Choiseul. Under Louis XVI. (1774–1792) when the Revolution broke out the long accumulated hatred felt for the noble officers had free play. Louis XVI. had indeed relaxed the rule imposing the presentation of proofs of nobility on all naval officers, but the change was made only in 1786 and it came too late. The majority of the noble officers were massacred by the Jacobins or driven into exile.

The Revolution subjected the French navy to a series of disorganizations and reorganizations by which all tradition and discipline were destroyed. Old privileges and the office of Grand Admiral were suppressed. The attempt to revive the navy in the face of the superior power of England was hopeless. Neither the Republic nor the Empire was able to create an effective navy. They had no opportunity to form a new body of officers out of the lads they educated.

The strength of the French Royal Navy is difficult to estimate, since for long periods of the 18th century it was rotting in harbour and its ships were rarely commissioned. Louis XIV. is credited with 95 ships of the line and 29 frigates, together with many smaller vessels, in 1692. At the close of the Seven Years' War it had sunk to 44 ships of the line and 9 frigates. By 1778 the French navy had risen to 78 of the line with frigates and smaller vessels which brought the total to 264. In 1793 on the outbreak of the revolutionary war, it was estimated to consist of 82 ships of the line, mostly fine vessels, and of frigates with lesser craft which brought it to a total of 250. Under Napoleon the mere number was very much more considerable and included ships built in the annexed territories, but they were largely constructed of green timber, were meant merely to force England to maintain blockades, and were never sent to sea.

Spanish Navy.

The administrative history of the Spanish navy is singularly confused and broken. It might almost be said that the country had no navy in the full sense of the word—that is to say, no organized maritime force provided and governed by the state for warlike purposes only—until one was created on the French model by the sovereigns of the Bourbon dynasty *i.e.* after 1700. Yet the kings of the Spanish peninsula, whether they wore the crown of Castile and Leon or of Aragon, had fleets, formed, like all the others of the middle ages, partly of ships supplied by the coast towns and populations, partly of the royal vessels. Aragon was a purely Mediterranean power. Its fleets, which were chiefly supported by Barcelona, a flourishing commercial city, were composed of galleys. With the union of the crown in 1479 Aragon fell into the background, and its navy continued to be represented only by a few galleys, for service in the Mediterranean against the pirates. The dominions of Castile stretched from the Bay of Biscay to the Mediterranean. Its kings, therefore, had need both of ships (*naos*) and galleys. The first beginnings of the Castilian navy were not due to the king, but to the foresight and enterprise of Diego Gelmirez, bishop and afterwards first archbishop of Santiago in Gallicia. In or about 1120 he employed the Genoese Ogerio to form a dockyard at Iria, and to build vessels. The naval activity of the coast of the Bay of Biscay developed so rapidly that in 1147 a squadron from the northern ports took part in the conquest of Almeria by Alfonso VII. (1120–1157) in alliance with the Pisans. A century later (1248) another squadron constructed at the expense of the king Fernando III. El Santo (1217–1252), and commanded by Count Ramon Bonifaz of Burgos, the first admiral of Castile, took a decisive part in the conquest of Seville. The annexation of Andalucia and the necessity for guarding against invasions from Africa called for a great extension of the navy of Castile. Alfonso X. El Sabio (1252–1284) founded the great galley dockyards of Seville—the *arenal*. It was also the work of Genoese builders and administrators. In the course of the 13th century the towns of the northern coast formed one of the associations so common in Spanish history, and known as *hermandades* (brotherhoods). The first meeting of its delegates took place at Castrourdiales near Bilbao in 1296, when the towns of Santander, Laredo, Bermeo, Guetaria, San Sebastian and Vitoria were represented. The *hermandad de la marisma* (of the seafarers) of Castile supplied the squadrons which took an active part in the wars of the 14th and 15th centuries between France and England as allies of the French. Its history is obscure, and it came to an end with the establishment of the full authority of the crown by the Catholic sovereigns Ferdinand and Isabel.

The discovery of America, the acquisition by marriage or conquest of Sicily, Naples and Flanders, gave the kings of Spain a yet stronger motive for maintaining a powerful navy. The maxim that their ships were the bridges which joined their widely scattered dominions was fully accepted by them and their servants. But neither the Catholic sovereigns nor the Habsburgs who held the throne till 1700, made any attempt to organize a common navy. The sources from which the naval armaments of Spain were drawn during the greatness and decline of the country were these. Galleys were maintained in the Mediterranean, but they were mainly found by Sicily and Naples, or by the contracts which the kings of Spain made with the Genoese house of Doria. On the ocean the chief object of the Spanish government was to conduct and protect the severely regulated trade with America. Thus it was mainly concerned for long to obtain the lumbering and roomy vessels called "galleons," first designed by Alvaro de Bazan, marquess of Santa Cruz, which were rather armed traders than real warships. The crown did not build its own ships, but contracted for them with its admirals. The American convoys sailed from and returned to the Bay of Cadiz. One squadron, the *flota*, carried the trade, was navigated by the admiral, with whom was associated a general, who commanded the few warships proper, and was answerable for the protection of the whole. Another squadron, called of Cantabria, was maintained on the north coast, and was employed to see the convoy on its way and meet it on its return home. It had its own admiral and general. The ships were always treated as if they were transports for carrying soldiers. The seamen element was neglected. The command was divided between the *capitan de mar* (sea captain) who was responsible for the navigation and the *capitan de guerra* (soldier captain) who fought the ship. The same division went through all ranks. The soldiers would neither help to work the ship nor fight the guns. They used musketry only, or relied on a chance to board with sword and pike. Properly speaking there was no class of naval officers, and the overworked and depressed seamen could not supply good gunners. No general naval administration existed. The office of admiral of Castile became purely ornamental and hereditary in the family of Henriquez. It was not replaced by a navy office. One of the innumerable *juntas* or boards, through which the Spanish kings governed, looked after the making of contracts, and co-operated with the council of the Indes which was specially concerned with the American convoys. After the disasters of the later years of Philip II. (see ARMADA) some efforts at improvement were made. Better ships were built, and something was done to raise the condition of the seamen. But no thoroughgoing organization was ever created, and in the utter decadence of the 17th century the Spanish navy and seafaring population alike practically disappeared.

Under the Bourbon dynasty which attained the throne in 1700 the Spanish navy was revived, or rather a navy was created on the French model. Don Jose Patiño, a very able man, was named *intendente de la marina* in 1715, and in 1717 he drew up a draft naval organization and code, founded on the French *ordonnance* of 1689. Patiño's draft was the basis of the *ordenanzas generales* (general code) issued in 1748. The Spaniards even set up a squadron of galleys with a separate staff of officers, also on the French model, which was, however, suppressed in the year of the issue of the *ordenanzas generales*. Fine arsenals were organized at Ferrol and Carthagena. The navy thus created produced some distinguished officers, and fought some brilliant single ship actions. But the embarrassments of the treasury, the tendency of several of the kings to sacrifice their navy to political schemes requiring mainly the employment of troops and the ruin of the seafaring population during the 17th century, prevented it from ever attaining to a high level of efficiency. During the Peninsular War the new navy all but disappeared as the old had done. The want of pecuniary resources and internal instability have prevented its revival on any considerable scale.

The navy created by Patiño consisted in 1737 of 56 ships in all, of which 28 were of the line, of from 50 to 80 guns, with one of 114 guns. In 1746 the number of ships of the line had increased to 37. In 1759 the list of line of battle ships was 50—of which the majority, if not all, had been constructed by English shipbuilders, in the service of the Spanish government. In 1778, when at the height of its power, it contained 62 ships of the line.

Dutch Navy.

The Dutch fleet arose out of the great struggle with Spain in the 16th century. The Netherlanders had been a maritime people from the earliest antiquity. Under their medieval rulers, the counts of Holland and of Flanders and the House of Burgundy, they had rendered service at sea. The freemen owed the service known as the *riemtal* (*riem,* an oar). An admiralty office was established in 1397. But during the revolt against Philip II. of Spain, new naval forces were formed which had no connexion with the medieval navy, save in so far as the governments established in the different states which afterwards formed the Seven Provinces took possession of the jurisdiction and the dues of the medieval admiralty. The naval part of the war with Spain was for long conducted by the adventurers known as the "beggars of the sea," and was mainly confined to the coasts and rivers. In 1597, when the Confederation was formed and had provided itself with a common government in the states-general, the need for a regularly organized seagoing fleet was felt. In that year the banner of the states-general, the red lion with the arrows in its paw, was first hoisted during the expedition to Cadiz in alliance with England. On the 13th of August 1597 the states-general issued the decree (*Instructie*) which regulated the naval administration of the Republic until 1795. The attachment of the Netherlanders to their local franchises was too strong to permit of the establishment of a central authority with absolute powers. It was therefore necessary to make a compromise by which some measure of unity was secured while the freedom of the various confederate states was effectually guarded. Five boards of admiralty (*Admiraliteits collegien*) were recognized. They were: South Holland, or the Maas, sitting at Rotterdam; North Holland, or Amsterdam; Westfriesland (the western side of the Zuyder Zee), at Hoorn or Enkhuizen on alternate years; Zealand at Middleburg; and Friesland at Dokhum, or after 1645 at Harlingen. These bodies enjoyed all the rights of the admiralty and collected the port dues, out of which they provided for the current expenses of their respective squadrons. Extraordinary charges for war were met by grants from the province to which each board belonged. Some measure of unity was secured among these five independent authorities by three devices. Each board consisted of seven persons, of whom four were named by the province and required confirmation by the states-general, while three were chosen from other provinces to secure a representation of the commonwealth. The members of the boards took an oath of fealty to the states-general. The stadtholder was admiral-general. He presided at the board, and commanded the squadron. In his absence his place was taken by his lieutenant admiral-general. An oath of fealty was also taken to him, and all armed ships whether men-of-war or privateers sailed with his commission. He chose the captains from two candidates presented to him by the board. Delegates from the boards met twice a year to consult on the general interest. When the stadtholdership was suspended in 1650 the powers of the admiral-general were absorbed by their high mightinesses (*Hunne Hogen Mogen*) of the states-general. The staff of officers began with the lieutenant admiral-general and descended through the vice-admiral, the quaintly named *Schout-bij-nacht*, who was and is the rear-admiral, and whose title means "commander by night." These flag officers were named by the admiral-general or states-general. The captain (*Zeecapitän*) was selected from the provincial list. The lieutenants were appointed by the local boards. No regular method of recruiting the corps of officers existed.

This compromise was in itself a bad system. With the exception of the board of North Holland, which was supported by the wealth of Amsterdam, the admiralties were commonly distressed for money. Unity of action was difficult to obtain. Much of the work of convoy which the state squadrons should have performed was thrown in the 17th century on directorates (*Directiën*) of merchants who fitted out privateers at their own expense. When there was no stadtholder, the local governing bodies trenched on the authority of the states-general, and indulged in a great deal of favouritism. In one respect the navy of the Dutch republic might have been taken as a model by its neighbours. The feeding of the crews was contracted for by the captains, who were required to enter into securities for the execution of the contract, and who had a reputation for probity. The Dutch crews, being better fed and looked after than the English, suffered less from disease. The clumsy organization of the Dutch navy put it at a disadvantage in its wars with England, but the seamanship of the crews, their good gunnery, and the great ability of many of their admirals made them at all times formidable enemies. No organic change was made till 1795, when the victories of the French revolutionary armies led to the formation of the Batavian republic. The five admiralties were then swept away and replaced by a committee for the direction of naval affairs, with a unified administration, organized by Pieter Paulus, a former official of the board of the Maas. As Holland was now swept into the general convulsion of the French Revolution, it followed the fortunes of France. Its navy, after belonging to the Batavian republic, passed to the ephemeral kingdom of Holland, created by Napoleon in favour of his brother Louis in 1806 and annexed to France in 1810. The Dutch navy then became absorbed in the French. After the fall of Napoleon a navy was created for the kingdom of the Netherlands out of the Dutch fragments of the Imperial force.

The United States.

The American navy came into existence shortly after the Declaration of Independence. As early as October 1775 Congress authorized the construction of two national cruisers, and, at the same time, appointed a marine committee to administer naval affairs. The first force, consisting of purchased vessels, badly fitted and built, and insufficiently equipped and manned, embraced two ships of 24 guns each, six brigs carrying from 10 to 12 guns, two schooners each with 8 guns, and four sloops, three of 10 guns and one of 4 guns. On December 22nd a personnel of officers was selected, one of the lieutenants being the well-known Paul Jones. Esek Hopkins was made commander-in-chief, but, having incurred the censure of Congress, he was dismissed early in 1777, and since then the title has never been revived except in the person of the president. In November 1776 the grades of admiral, vice-admiral, rear-admiral and commodore were assimilated in rank and precedence to relative army titles, but they were never created by law until 1862. During the war a number of spirited engagements occurred, but there was a great lack of efficient material at home, and agents abroad were not able to enlist the active sympathies of nations or rulers. Benjamin Franklin did manage to equip one good squadron, but this was rendered almost useless by internal dissensions, and it required the victory of Paul Jones in the "Bon Homme Richard" over the "Serapis" to bring about any tangible result for the risk taken. During the war 800 vessels of all classes were made prizes, but the navy lost by capture 11 vessels of war and a little squadron of gunboats on the lakes, and, with 13 ships destroyed to avoid capture by the British, 5 condemned, and 3 wrecked at sea, the country was practically without a naval force between 1780 and 1785.

Owing to the depredations upon commerce of the Barbary powers, Congress in 1794 ordered the construction of six frigates, prescribing that four of them should be armed with 44 guns and two with 36 guns; but, the Berbers having made peace, the number of vessels was reduced one-half, and no additions were made until 1797, when the "Constitution," "United States" and "Constellation" were built. The navy was at first placed under the war department, but a navy department with a secretary of its own was created in 1798. From 1815 to 1842 the secretary was aided by a board of commissioners chosen from among the naval officers, but in the latter year the department was reorganized into five bureaus, which were increased to eight in 1862. Each has a naval officer at its head. They deal with navigation, ordnance, equipment, navy yards, medicines, provisions, steam engineering and construction. The excellent naval academy at Annapolis was founded in 1845 by the then secretary of the navy, G. Bancroft. The war college for officers at Coasters Harbor, Newport, R.I., dates from 1884.

The Balance of Navies in History.

The five navies above discussed claim special notice on various grounds: the British, Dutch and French because they have been leaders and models; the Spanish because it has been closely associated with the others; the American because it was the first of the extra-European sea forces. But these great examples by no means exhaust the list of navies, old and new, which have played or now play a part. Every state which has a coast has also desired to possess forces on the sea. Even the papacy maintained a fighting force of galleys which took part in the naval transactions of the Mediterranean for centuries. The Turkish sultans have fitted out fleets which once were a menace to southern Europe. But in a survey of general naval history it is not necessary to give all these navies special mention, even though some of them have a certain intrinsic interest. Some, the Scandinavian navies for instance, have been confined to narrow limits, and have had no influence either by their organization, nor, save locally, by action. Others again have been the purely artificial creation of governments. Instances of these on a small scale are the navies of the grand duchy of Tuscany, or of the Bourbon kings of Naples.

Russia.

A much greater instance is the navy of Russia. Founded by Peter the Great (1689–1725), it has been mainly organized and has been most successfully led by foreigners. When the Russian government has desired for political reasons to make a show of naval strength, it has been numerous. In 1770, during the reign of Catherine II. (1762–1796), a Russian fleet, nominally commanded by the empress's favourite Orloff, but in reality directed by two former officers of the British navy, John Elphinston (1722–1785) and Samuel Greig (1735–1788), gained some successes against the Turks in the Levant. But when opposed to formidable enemies, as in the Crimean War, it has either remained in port, or has, as in the case of the war with Japan (1904–1905), proved that its vitality was not in proportion to its size.

The innumerable navies of South American republics are small copies of older forces.

Italy, Germany, Japan, Austria.

The 19th century did indeed see the rise of three navies, which are of a very different character—the Italian, which was the result of the unification of Italy, the German, which followed the creation of the German Empire, and the Japanese. But all three are contemporary in their origin, and have inevitably been modelled on older forces—the British and the French. With them must go the Austrian navy, excellent but unavoidably small.

Influence of sea power.

If we look at the relations which the navies of the modern world have had to one another, it will be seen that the great discoveries of the later 15th century shifted the seat of naval power to the ocean for two reasons. In the first place they imposed on all who wished to sail the wider seas opened to European enterprise by Vasco de Gama and Columbus the obligation to use a vessel which could carry water and provisions sufficient for a large crew during a long voyage. The Mediterranean states and their seamen were not prepared by resources or habit to meet the call. But there was a second and equally effective reason. The powers which had an Atlantic coast were incomparably better placed than the Italian states, or the cities of the Baltic, to take advantage of the maritime discoveries of the great epoch which stretches from 1492 to 1526. In the natural course the leadership fell to Portugal and Spain. Both owed much to Italian science and capital, but the profit fell inevitably to them. The reasons why Spain failed to found a permanent naval power have been given, and they apply equally to Portugal. Neither achieved the formation of a solid navy. The claim of both to retain a monopoly of the right to settle in, or trade with, the New World and Asia was in due course contested by neighbouring nations. France was torn by internal dissensions (the Wars of Religion and the Fronde) and could not compete except through a few private adventurers. England and Holland were able to prove the essential weakness of the Spaniards at sea before the end of the 16th century. In the 17th century the late allies against Spain now fought against one another. Her insular position, her security against having to bear the immense burden of a war on a land frontier, and the superiority of her naval organization over the divided administration of Holland, gave the victory to Great Britain. She was materially helped by the fact that the French monarch attacked Holland on land, and exhausted its resources. Great Britain and France now became the competitors for superiority at sea, and so remained from 1689 till the fall of Napoleon in 1815.

During this period of a century and a quarter Great Britain had again the most material advantage: that her enemy was not only contending with her at sea, but was engaged in endeavouring to establish and maintain a military preponderance over her neighbours on the continent of Europe. Hence the necessity for her to support great and costly armies, which led to the sacrifice of her fleet, and drove Holland into alliance with Great Britain (Wars of the League of Augsburg, of the Spanish Succession, of the Austrian Succession and the Seven Years' War). During the War of American Independence France was in alliance with Spain and Holland, and at peace on land. She and her allies were able to impose terms of peace by which Great Britain surrendered positions gained in former wars. But the strength of the British navy was not broken, and in quality it was shown to be essentially superior.

The French Revolution undid all that the government of France had gained between 1778 and 1783 by attention to its navy and abstinence from wars on land. The result of the upheaval in France was to launch her into schemes of universal conquest. Other nations were driven to fight for existence with the help of Great Britain. In that long struggle all the navies of Europe disappeared except the French, which was broken by defeat and rendered inept by inaction, and the victorious British navy. When Napoleon fell, the navy of Great Britain was not merely the first in the world; it was the only powerful navy in existence.

The pre-eminent position which the disappearance of possible rivals had given to Great Britain lasted for several years unchallenged. But it was too much the consequence of a combination of circumstances which could neither recur nor endure. The French navy was vigorously revived under the Restoration and the government of Louis Philippe (the periods from 1815 to 1830 and 1830 to 1848). The emperor Nicholas I. of Russia (1825–1855) built ships in considerable numbers. As early as 1838 the fear that the naval superiority of Great Britain would be destroyed had already begun to agitate some observers. The "extremely reduced state" of the British navy, and the danger that an overwhelming force would be suddenly thrown on the English coast, were vehemently set forth by Commander W. H. Craufurd, and by an anonymous flag-officer. The peril to be feared, it was argued, was an alliance between France and Russia. In 1838 the British navy contained, built and building, 90 ships of the line, 93 frigates and 12 war steamers; the French, 49 of the line, 60 frigates and 37 war steamers, including armed packets; Russia, 50 of the line, 25 frigates and 8 steamers; the United States, 15 of the line, 35 frigates and 16 war steamers. The agitation of 1838 passed away, and the Crimean War, entailing as it did the destruction of a great part of the Russian fleet at Sebastopol, and proving the weakness of the Baltic fleet, and having, moreover, been conducted by an alliance of France and Great Britain against Russia, would seem to have shown that the anxieties of 1838 were exaggerated. But the rivalry which is inherent in the very position of states possessing sea coasts and maritime interests could not cease. The French imperial government was anxious to develop its navy. By the construction of the armoured floating batteries employed in bombardment of Kinburn in October 1855, and by the launch of the first seagoing ironclad "La Gloire" in 1859, it began a new race for superiority at sea, which has shown no sign of slackening since. The launch of the "Gloire" was followed by political events in Europe which brought forward new competitors, while great navies were developed in America and Asia.

Growth of modern rivalry in armaments.

The year 1871 was the beginning of a vast growth of naval armaments. It saw the completion of the unity of Italy and the formation of the German empire, two powers which could not dispense with strong fleets. But for some years the Italian and German navies, though already in existence, were still in a youthful stage. The rapid growth of the United States navy dates from about 1890, and the Japanese is a few years younger. France, Russia and Great Britain, in answer to them, began the race in which the efforts of each had a stimulating effect on the others. Though the alliance between France and Russia was not formed till later, their common interests had marked them out as allies from the first, and it will be no less convenient than accurate to treat Great Britain and the partners in the Dual Alliance as for some time opposed to one another.

England and the Dual Alliance.

In the general reorganization of her armaments undertaken by France after the war of 1870–71, her navy was not neglected. Large schemes of construction were taken in hand. The instability of French ministries, and the differences of principle which divided the authorities who favoured the construction of battleships from those who were partisans of cruisers and torpedo-vessels, militated against a coherent policy. Yet the French navy grew in strength, and Russia began to build strong vessels. As early as 1874 the approaching launch of a coast-defence ironclad at Kronstadt (the "Peter the Great" designed by the English constructor Sir E. J. Reed) caused one of the successive "naval scares" which recurred frequently in the coming years. It was, however, largely fictitious, and passed away without producing much effect. In 1878 the prospect of a war arising out of the Russian and Turkish conflict of that year, again stirred doubts as to the sufficiency of her naval armaments in England. Yet it was not till about 1885 that an agitation for the increase of the British fleet was begun in a consistent and continuous way. The controversy of the succeeding years was boundless, and was perhaps the more heated because the controversialists were not controlled by the necessity for using terms of definite meaning, and because the lists published for the purpose of making comparisons were inevitably of doubtful value; when ships built, building and ordered to be built, but not begun, were counted together—or as not infrequently happened, were all added on one side, but not on the other. The belief that the British navy was not so strong as it should be, in view of the dependence of the British empire on strength at sea, spread steadily. Measures were first taken to improve the opportunities for practice allowed to the fleet by the establishment of yearly naval manœuvres in 1885, and the lessons they afforded were utilized to enforce the necessity for an increase of the British fleet. In 1888 a committee of three admirals (Sir W. Dowell, Sir Vesey Hamilton and Sir R. Richards), appointed to report on the manœuvres of that year, gave it as their opinion that "no time should be lost in placing the British navy beyond comparison with that of any two powers." This verdict met a ready acceptance by the nation, and in 1889 Lord George Hamilton, then first lord of the admiralty, introduced the Naval Defence Act, which provided for the addition to the navy within four and a half years of 70 vessels of 318,000 tons at a cost of £21,500,000. The object was to obviate the risk of sudden reductions for reasons of economy in the building vote.

Later experience proved that the practice of fixing the amount to be spent for a period of years operated to restrict the freedom of government to make additions, for which the necessity had not been foreseen when the money was voted. But the act of 1889 did effect an immediate addition to the British fleet, while as was inevitable it stimulated other powers to increased efforts.

The rivalry between Great Britain and the states composing the Dual Alliance may be said to have lasted till 1904, when the course of the war in the Far East removed Russia from the field. It must be borne in mind that during the latter part of these twenty years Russia was largely influenced by the desire to arm against the growing navy of Japan. Comparisons between the additions to the fleets made on either side, even when supported by a great display of figures, are of uncertain value. Number is no sufficient test of strength when taken apart from quality, distribution, the command of coaling stations—which are of extreme value to a modern fleet—and other considerations. But the respective lists of battleships supply a rough and ready standard, and when taken with the number of men employed and the size of the budgets (both subject to qualifications to be mentioned) does enable us to see with some approximation to accuracy how far the rivals have attained their desired aims. In 1889, before the passing of the Naval Defence Act, the British navy contained 32 battleships of 262,340 tons. The united French and Russian fleets had 22 of 150,653 tons: of these 17 were French, 7 being vessels of wood plated with iron and therefore of no value when exposed to the fire of modern explosives. This is but one of many examples which might be given of the fallacious character of mere lists of figures. In 1894, when the Naval Defence Act had produced its effect, the comparative figures were: for Great Britain, 46 ironclads (or battleships) of 441,640 tons, and for the Dual Alliance 35 of 270,953—in which, however, the seven wooden vessels were still included. France and Russia had then large schemes of new construction—60,300 tons of ships over 10,000 tons for France, and 78,000 tons for Russia. The British figure was 70,000 tons. But the French and Russian list included mere names of vessels, of which the plans were not then drafted.

The rivalry in building went on as eagerly after 1894 as before. At the beginning of 1904 Great Britain had 67 battleships of 895,370 tons, as against 57 of 635,500 belonging to the powers of the Dual Alliance. The difference in favour of Great Britain was therefore 10 battleships, and 259,870 tons. Vessels not ready for service were included in the list, which therefore includes potential as well as actual strength. The balance in favour of Great Britain was less in 1904 than it had been in 1885 in mere numbers. During this period the naval budget of Great Britain had risen from £12,000,000 in 1885 to £34,457,500 in 1903–1904. The number of men employed had grown from 57,000 to 127,000. The figures for the Dual Alliance cannot be given with equal confidence. France had transferred the *troupes de la marine* or colonial troops from the navy to the army, which introduced a confusing element into the comparison, and the figures for Russian expenditure are very questionable. The total credit demanded for the French navy in 1890, the year after the passing of the British Naval Defence Act, was frs. 217,147,462. By 1903 the sum had risen to frs. 351,471,524. The Russian figures for 1890 are not attainable, but her budget for 1903 was £11,067,889 sterling. A comparison in numbers of men available is wholly misleading, since the British navy contains a large number of voluntarily enlisted men who serve for many years, and a small voluntary reserve, while France and Russia include all who are liable to be called out for compulsory service during a short period. There is no equality between them and the highly trained men of the British navy. The immense increase in its staff represents an addition to real power to which there is nothing to correspond in the case of continental states.

Competition of new navies: Italy.

While this vast growth of naval power was going on in Great Britain, France and Russia, other rivals were entering into the lists with various fortunes. Italy may be said to have been the first comer. Her national navy, formed out of the existing squadrons of Sardinia, Tuscany and Naples, had stood the strain of war in 1866 very ill. The conditions in which the unity of the country had been achieved during the Franco-Prussian War of 1870–71, together with the obvious need for a navy in the case of a nation with a very extended sea coast, animated the Italians to great and even excessive efforts. Their policy was controlled by the knowledge that they could not hope to rival France in numbers, and they therefore aimed at obtaining individual vessels of a high level of strength. Italy may be said to have set the example of building monster ships, armed with monster guns. But she was unable to maintain her position in the race. The too hopeful finance in which she had indulged in the first enthusiasm of complete political unification led to serious embarrassment in 1894. Her naval budget sank from £4,960,000 in 1891 to £3,776,845 in 1897–1898, and only rose slowly to £5,037,642 in 1905–1906. As a candidate in the race for naval strength she necessarily held a subordinate place, though always to be ranked among the important sea powers. In 1903, when the rivalry of Great Britain and the Dual Alliance was at its height, her strength in battleships was 18, of 226,630 tons. In number, therefore, they did more than cover the balance in favour of Great Britain as against the Dual Alliance, but not in tonnage, in which the difference in favour of Great Britain was 259,870.

Germany.

The history of the German navy is one of foresight, calculation, consistency and therefore steady growth. The small naval force maintained by Prussia became the navy of the North German Federation after the war of 1866, and the Imperial navy after 1871. Until 1853 it had been wholly dependent on the war office. In that year an admiralty was created in favour of Prince Albrecht, but this office was abolished in 1861, and the navy was again placed under the war office. The first ministers of the navy under the North German Federation were generals; so was the first imperial minister, General Stosch (1871). Admiral Tirpitz, appointed in 1897, was the first minister who was bred a seaman. His predecessor, General Stosch, had been an excellent organizer and had done much for the efficiency of the service. It has been the rule of the German government, both before and since the foundation of the empire, to advance by carefully framed plans, without adhering to them pedantically when circumstances called for a modification of their lines. As early as 1867 a scheme had been formed for the construction of a navy of 16 ironclads and 50 smaller vessels, at a cost of £5,395,833. It was not sufficiently advanced in execution to allow Germany to make any efforts at sea in the war of 1870–71. In 1872 a supplementary grant of £3,791,666 was made for construction in view of the increased cost of armour and armaments. In 1882 a revised scheme was made which contemplated the construction of 100 vessels, and it was completed in 1888 by another which provided for the construction of 28 vessels, of which 4 should be battleships of the largest size, within the next six years. In 1894 and for some years afterwards the Reichstag showed itself hostile to a heavy expenditure on the navy, and refused many votes asked for by the government. Under the pressure of ambition and of the real needs of a nation with an extensive and growing maritime commerce, the expenditure grew in spite of the opposition of the Reichstag. Between 1874 and 1889 it rose from £1,950,000 to £2,750,000, and was increased in the following year to £3,600,000, from which figure it advanced by 1898 to £5,756,135. Another building scheme was framed in that year, but it was swept aside in 1900, under the combined influence of the exhortations of the emperor William II., and of the anger caused in Germany through the arrest by a British cruiser of a German steamer (the "Bundesrath") on the coast of Africa on a charge of carrying contraband of war to the Boers. The emperor was now able to obtain the consent of the Reichstag to an extended Naval Defence Act. By the terms of this measure it was proposed to spend £74,000,000 on construction, and £20,000,000 on the dockyards. With this money, by the year 1917 Germany was to be provided with a fleet of 38 battleships, together with a proportionate number of cruisers and other smaller vessels. Rapid progress was made not only with the programme itself but with the equipment of German dockyards and other establishments for providing the *matèriel* of a great navy. In the spring of 1909 the serious menace to British supremacy at sea, represented by the growth of the new German fleet of battleships, led in England to a "scare" which recalled that of 1888, and to an energetic campaign for additional expenditure on the British navy.

United States.

During the years following on the American Civil War (1862–66) the United States paid small attention to the navy. In 1881 a board was appointed to advise on the needs of the navy, and in 1890, the board recommended the formation of a fleet of 100 vessels of which 20 should be battleships of the largest class. The reviving interest in the navy was greatly stimulated by the diplomatic difference with Great Britain which arose over the frontier question between her and the republic of Venezuela in 1896. Resolutions were passed in congress approving of an increase of the navy. The war with Spain in 1898 completed the revival of American interest in the navy. The acquisition of Porto Rico, and the protectorate of Cuba in the West Indies, together with the annexation of the Philippines, and the visible approach of the time when the relations of the powers interested in the Pacific would call for regulation, confirmed the conviction that a powerful fleet must be maintained. In 1889 the United States possessed no modern battleship. In 1899 there were 4 built and 8 building. At the close of 1903 there were built and building 27 of 353,260 tons, only two of them being of less than 10,000 tons. From £5,119,850 in 1890 the expenditure grew to £16,355,380 in 1903.

Japan.

The navy of Japan, the last comer among the great naval forces of the world, may be said to date from 1895, from, in fact, the eve of the war with China. As an insular power with a large seafaring population, Japan is called upon to possess a fleet. Even in the days of its voluntary isolation it had a known capacity for maritime warfare. Its capacity for assimilating the ideas and mastering the mechanical skill of Europe have been in no respect better shown than in naval matters. From the moment it was compelled to open its ports it began not only to acquire steamers but to apply itself under European guidance to learning how to make and use them. A navy on the western model was already organized by 1895, but it was still of trifling proportions. In 1896 the Japanese navy had become an object of serious attention to the world. A plan was drafted in that year, and confirmed in the next, by which Japan arranged to supply itself, mainly by purchase in Europe, with a fleet containing 4 of the most powerful battleships. The scheme was modified in detail in 1898, when the decision was taken to increase the tonnage of the vessels. A little later additions were arranged for, and vessels building for South America states in English ports were purchased. The British model was carefully followed in naval organization, the alliance with England giving special facilities for this. And by 1904, when the war with Russia began, the unknown Japanese fleet proved its competence by victories at sea which put the seal on her position as a naval power.

Conclusion.—When we look over the whole period from the end of the Napoleonic wars, one great fact is patent to our view. It is that this was an epoch of revival or development in the naval power of the whole world, in the course of which the position held by Great Britain in 1816 was partially lost simply by the growth of other powers. The situation in that year was by its very nature temporary, and a quotation of the respective numbers of warships then possessed by the world would have no value. An instructive comparison can, however, be made between the year 1838, when Great Britain began to be seriously concerned with the rise of possible enemies at sea, and the eve of the war between Russia and Japan. Battleships may again be taken as the test of strength, since nothing happened in the Russo-Japanese War to show that they do not still form the most vital element of naval power. We may also leave aside the many small fleets which cannot act collectively, and which individually do not weigh in the balance. The figures for 1838 are given above, but may be repeated for comparison. In that year Great Britain possessed, built and building, 90 ships of the line; France 49; Russia 50; the United States 15. In 1903 the number of vessels recognized as battleships, possessed by the great powers, was for Great Britain 67; for France 39; for Russia 18; for the United States 27; for Germany 27; for Italy 18; for Japan 5. At the first date the British fleet was among great powers as 90 to 114. At the latter it was as 67 to 134.

Such comparisons, however, as these become much more complicated in later years, when the importance of the preponderance of "Dreadnoughts"—the new type of battleship—(see SHIP and SHIPBUILDING)—was realized. By the invention of this type Great Britain appeared to obtain a new lead; and in 1907, when it was calculated that by 1910 there would be ten British "Dreadnoughts" actually in commission while neither in Europe nor America would a single similar ship have been completed by any foreign power, the situation seemed to be entirely in favour of complete supremacy at sea for the British fleet. But the progress of German and American construction, and particularly the experience gained of German ability to build and equip much more rapidly than had been supposed, showed by 1909 that, so far as "Dreadnoughts" were concerned at all events, the lead of Great Britain could only be maintained by exceptional effort and exceptional expenditure. It was admitted in parliament by the prime minister, first lord of the admiralty and foreign secretary—themselves Liberals who had flirted with proposals for disarmament, and who depended for office on the support of more extreme "pacifists" who objected on principle to heavy military and naval expenditure—that, while for the moment the British "two-power standard" was still in existence, the revelations as to German shipbuilding showed that it could only be maintained in the future by the creation of a new fleet on a scale previously not contemplated. The supremacy of Great Britain in ships of the older types would be of no avail as years went by and other powers were equalling her in the output of ships of the new type, and a new race thus began, of which it is impossible here to indicate more than the start. It was no longer a question of completed ships, but one still more of programmes for building and of the rate at which these programmes could be accomplished. At the beginning of 1910, while Great Britain had her ten "Dreadnoughts," it was not the case that other powers had none: Germany already had four and the United States two; and a knowledge of the naval programmes of both these countries, to speak of no others, showed that, unless either their policy changed or the British shipbuilding programme was modified so as to keep up with their progress, it would not take many years before the theory of the equality of the British fleet in "capital ships" to those of the next two naval powers would have to be abandoned. In England this situation created a profound sensation in 1909, since it was common ground that her fleet was her all in all, on which her empire depended; and the result was seen, not only in a considerable increase in the Naval Estimates of 1910–1911, but also in the beginning of a serious attempt to organize their fleets on the part of the British colonial dominions, which should co-operate with the mother country.

The British Admiralty figures for the state of the principal fleets as on March 31st, 1910, are summarized below. The letters at the heads of the columns have the following signification: E., England; F., France; R., Russia; G., Germany; I., Italy; U., United States; and J., Japan:—

SHIPS BUILT

	E.	F.	R.	G.	I.	U.	J.
Battleships	56	17	7	33	10	30	14
Armd. C.D. Vessels	..	8	2	7	..	10	..
Armd. Cruisers	38	20	4	9	8	15	12
Protected Cruisers, I.	18	5	7	..	..	3	2
" " II.	35	9	2	23	3	16	11
" " III.	16	8	2	12	11	2	6
Unprotected Cruisers	2	..	..	10	..	5	6
Scouts	8	..	..	..	..	3	..
Torpedo Vessels	23	10	6	1	5	2	2
T.B. Destroyers	150	60	97	85	21	25	57
Torpedo Boats	116	246	63	82	96	30	69
Submarines	63	56	30	8	7	18	9

Ships Building

	E.	F.	R.	G.	I.	U.	J.
Battleships	9	6	8	8	2	4	3
Armd. Cruisers . .	3	2	2	3	2	..	1
Protected Cruisers, II.	9	..	..	5	..	..	3
Unprotected Cruisers	2	..	..	..	..	..	..
T.B. Destroyers . .	37	17	..	12	2	15	2
Submarines . . .	11	23	3	*	..	10	3

* Number uncertain.

Bibliography.—*Ancient and General*:—Accounts of the naval organizations of the ancient world, and of the sea fighting of the time are to be found in the historians of Greece and Rome: Signor G. Corazzini has written a *Storia della marina militare antica* (Livorno, 1882). Valuable details of the Imperial Roman navy and of the Byzantine navy will be found in Professor Bury's appendices to his edition of Gibbon's *Decline and Fall*, vol. i. apx. 5, and vol. vi. apx. 5. General histories of the navies of the world have been written, but they are inevitably apt to be little more than jejune reviews of the dates, and results of battles. This is certainly the case with the great folio of the English writer Josiah Burchett, *A Complete History of the most remarkable transactions at Sea, from the earliest accounts of time to the conclusion of the last war with France, wherein is given an account of the most considerable Naval Expeditions, Sea Fights, Stratagems, Discoveries and other Maritime Occurrences that have happened among all nations that have flourished at Sea; and in a more particular manner of Great Britain from the time of the Revolution in 1688 to the aforesaid period* (1720). The later part is however valuable, for Burchett, who was secretary to the admiralty, had access to good authorities for his own time, and had served at sea as secretary to Russell, Lord Orford. There is an *Histoire de la marine de tous les peuples*, by M. A. du Sein (Paris, 1879) which is of no great value.

Medieval:—As regards the medieval navies the first place may be allowed to the Italians. A general bibliography of Italian nautical literature, *Saggio de una bibliografia marittima italiana*, occupying fifty-eight pages, drawn up by Signor Enrico Celani, will be found in the *Revista marittima*, supplement for 1894 (Rome). The histories of the different Republics of the middle ages record their maritime enterprises. An excellent book, which gives far more than its title promises, is the *Storia della marina pontificia* of A. Guglielmotti, O.P., in 10 volumes published at different times, and in two editions, at Florence 1856, &c. The general maritime history of the Mediterranean in the middle ages is well illustrated in the *Memorias sobre la marina comercio y artes de Barcelona* (1779–1792) by Don A. Capmany. The naval enterprises of the Norsemen are dealt with in a scholarly fashion by M. G. B. Depping, *Histoire des expéditions maritimes des Normands* (1826); and with newer knowledge by Mr C. F. Keary, *The Vikings of Western Christendom* (1891). The medieval periods of Western navies are treated in their respective naval histories.

Great Britain:—*The History of the Royal Navy to the French Revolution*, by Sir N. Harris Nicolas (1847), is unfortunately incomplete. It ends at the year 1422, but is the work of a most laborious and exact antiquary, who had been a naval officer in his youth. The administrative history of the British navy until 1660 is the subject of the *History of the Administration of the Navy and of Merchant Shipping in relation to the Navy* (1896) by Mr M. Oppenheim—a most valuable collection of materials. The campaigns and battles of the navy are told, generally from the public letters of the admirals, and with no great measure of criticism in several compilations. *The Naval History of England* (1735) by Mr T. Lediard, is copious and useful. The *Naval Chronology, or an Historical Summary of Naval and Maritime Events from the Time of the Romans to the Treaty of Peace 1802*, by Captain Isaac Schomberg (1802), contains a mass of valuable information, lists of ships, dates of construction, &c., and some administrative details. Less comprehensive, but still useful, is such a compilation as *The General History of the Late War* (that is, the Seven Years' War), by Dr John Entick "and other gentlemen" (1763). A much better book is *The Naval and Military Memoirs of Great Britain 1727 to 1783* (1804) by Mr R. Beatson, a very careful and well-informed writer who had seen some service as a marine officer. The *Lives of the British Admirals, containing a new and accurate Naval History from the earliest periods*, by Dr J. Campbell (1779), may be profitably consulted, with caution, for it by no means justifies its claim to novelty and accuracy in all parts. The *Naval History of Great Britain*, from 1793 to the accession of George IV., by Mr W. James (1827), republished with a continuation by Captain Chamier in 1837, is a standard authority. A far less useful work, which, however, is in parts written from first-hand knowledge, is *The Naval History of Great Britain* by Captain W. P. Brenton, first published in 1823, and republished in 1836. *The Field of Mars*, a compilation in dictionary form published in 1781, with an enormous title-page, is not without value for some of the naval transactions of the 18th century. The *History of the British Navy from the Earliest Period to the Present Time* (1863) by Dr C. D. Yonge, contains some original matter for the naval transactions of the 19th century. *The Royal Navy*, in 7 large volumes (1897–1903), edited and partly written by Sir W. L. Clowes, is a compilation of unequal value. Some of Sir W. L. Clowes's coadjutors, notably Captain Mahan and Sir C. R. Markham, are of high standing and authority. The book is copiously illustrated. *The Naval Chronicle*, 1799–1818, a magazine, contains masses of useful matter, for the Revolutionary and Napoleonic Wars. *The Royal Naval Biography* of Captain John Marshall, giving the lives of all officers on the list in 1823 or promoted later (1823–1835), with a supplement (1827–1830), may be consulted, but is too uncritical and too uniformly laudatory. *The Naval Biographical Dictionary; life and services of every living officer* (1846), by Lieutenant W. R. O'Bryne, is a solid book of reference. The publications of the Navy Record Society (1894 and subsequent years) contain large and valuable publications of original matter, with some reprints of old authorities, such as Sir W. Monson's *Tracts*, which were difficult of access. See also *A Short History of the Royal Navy*, by David Hannay.

France:—The naval history of France has been much written about since 1840. Not many of the books published have been of considerable value. The *Histoire maritime de la France* of M. Léon Guérin (1844), was meant to meet a popular demand and satisfy national vanity. The *Histoire de la marine française* of M. Eugène Sue (1845–1846) is mainly a romance, but it contains some useful evidence. The *Histoire de la marine française* of Le Comte de Bonfils Lablénie (1845), a naval officer, is of more value, but is somewhat wanting in criticism. The *Précis historique de la marine française* of M. Chasseriau (1845); the *Histoire générale de la marine* (1853); the *Histoire de la marine française* of M. le Saint (1877); and the *Histoire nationale de la marine française depuis Jean Bart* (1878) of M. Trousset are compilations. *La Marine de guerre, ses institutions militaires depuis son origine jusqu'à nos jours*, by Cap^{ne} Gougeard (1877); the *Essai sur l'histoire de l'administration de la marine française* of M. Lambert de Sainte Croix (1892); and the excellent little book of M. Loir on *La Marine royale, 1789* (n.d.), may be consulted with pleasure and profit. The three books of M. Jal, *Archéologie navale* (1840), *Glossaire nautique* (1848) and *Abraham du Quesne et la marine de son temps* (1872) are all of high value. *Les Batailles navales de la France* of Cap^{ne} Troude (1867), is a carefully written account of naval actions. The *Histoire de la marine française, pendant la guerre de l'indépendence américaine* (1877); *Sous la première république* (1886); *Sous le consulat et l'empire* (1886); *De 1815 à 1870* (1900); and *La Marine française et la marine allemande, 1870–1871* (1873) of Cap^{ne} Chevalier, are thorough and critical. M. G. Lacour-Gayet, Professor at L'École supérieure de la Marine, has published two books of serious research, but marked by some national prejudice, *La Marine militaire de la France sous le règne de Louis XV.* (1902), and *La Marine militaire de la France sous le règne de Louis XVI.* (1905). The *Recherches sur l'ancien clos des galées de Rouen* (1864) of M. C. de Robillard de Beaurepaire, and the life of *Jean de Vienne* by the Marquis Terrier de Loray (1878), are valuable monographs on passages of early French naval history. The *Projets et tentatives de débarquement aux Îles britanniques* by Cap^{ne} Desbrière (1900 seq.) is a most valuable authority. A very scholarly *Histoire de la marine française* was begun in 1899 by M. C. de la Roncière.

Miscellaneous:—The standard authorities for Spanish naval history are, *La Marina de Castilla* (1892), and *La Armada Española desde la union de Castilla y Aragon* (1895–1901), of Captain Cesareo Fernandez Duro. The *Geschienes van het Nederlandsche Zeewezen* of Mr J. C. de Jonghe (1858), is an admirable and exhaustive history of the Dutch navy. *The History of the Maritime Wars of the Turks*, by Haji Khalfa (or Hugji Chalifa), translated by Mr J. Mitchell for the Oriental Translation Fund (1831), may be read with curiosity and some profit. There are two general histories of the navy of the United States by Fenimore Cooper (1839), and by Mr E. S. Maclay (1894); the second is the fuller, and the more critical. Captain Mahan's *Influence of Sea Power on History 1660–1783* (1890), and his *Influence of Sea Power upon the French Revolution and Empire 1793–1812* (1892), must be classed apart as studies of the general interaction of navies on one another and on international relations. The long series of readable monographs by Admiral Jurien de la Gravière, covering the whole field of naval warfare from the Peloponnesian War to his own time, contain much information and sound criticism. (D. H.)

Naval Strategy and Tactics

Historical Evolution.—That the methods of conducting war at sea have been conditioned by the capacity of the ships and their armament, and that capacity and armament have interacted upon one another, may appear to be platitudes. But they are none the less truths which must always be borne in mind when we are considering the history of naval strategy, that is, of the large movements by which a commander secures the advantage of fighting at a place convenient to himself, or of tactics—which are the movements he makes in battle. Throughout antiquity and the middle ages till the 16th century, the weapons relied on were—(1) the ship itself, used as a ram, (2) the swords of the crew, (3) such missile weapons as bolts from heavy crossbows

Early history.

fixed on the bulwarks, bows and arrows, weights dropped from a yard or pole rigged out, and the various means of setting an enemy alight; by shooting arrows with burning tow or by Greek fire or wild fire, blown through tubes (*cannae*, whence "cannon"). The nature of the "Greek fire" is still an unsettled question, and it is believed by some authorities that the Byzantines of the middle ages were acquainted with the use of gunpowder. However that may be, it is certain that even after the introduction of artillery in the 14th century, the means of injuring an enemy at a distance were nil, or were very feeble. All actions, therefore, were fought at close quarters, where ramming and boarding were possible. But the use of the ram was only available for a vessel driven by oars. A sailing vessel could not ram unless she were running before a good breeze. In a light wind her charge would be ineffective, and it could not be made at all from leeward. Therefore, while fleets depended on the methods of battle at close quarters, two conditions were imposed on the warship. She must be small and light, so that her crew could row her with effect, and she must carry a numerous crew to work her oars and board or repel boarders. Sails were used by the triremes and other classes of warship, ancient and medieval, when going from point to point—to relieve the rowers from absolutely exhausting toil. They were lowered in action, and when the combatant had a secure port at hand, they were left ashore before battle. These conditions applied alike to Phormio, the Athenian admiral of the 5th century B.C., to the Norse king Olaf Tryggveson of the 10th century A.D., and to the chiefs of the Christian and Turkish fleets which fought the battle of Lepanto in A.D. 1571. There might be, and were, differences of degree in the use made of oar and sail respectively. Outside the Mediterranean, the sea was unfavourable to the long, narrow and light galley of 120 ft. long and 20 ft. of beam. But the Norse ship found at Gokstad, though her beam is a third of her length, and she is well adapted for rough seas, is also a light and shallow craft, to be easily rowed or hauled up on a beach. Some medieval vessels were of considerable size, but these were the exception; they were awkward, and were rather transports than warships.

Given a warship which is of moderate size and crowded with men, it follows that prolonged cruises, and blockade in the full sense of the word, were beyond the power of the sea commanders of antiquity and the middle ages. There were ships used for trade which with a favourable wind could rely on making six knots an hour—that is to say, twice the average speed attained by Captain Cook in his voyages of exploration. But a war fleet could not provide the cover, or carry the water and food, needed to keep the crews efficient during a long cruise. So long as galleys were used, that is to say, till the middle of the 18th century, they were kept in port as much as possible, and a tent was rigged over the deck to house the rowers. The fleet was compelled to hug the shore in order to find supplies. It always endeavoured to secure a basis on shore to store provisions and rest the crews. Therefore the wider operations were slowly made. Therefore too, when the enemy was to be waited for, or a port watched, some point on shore was secured and the ships were drawn up. It was by holding such a point that the Corinthian allies of the Syracusans were able to pin in the Athenians. The Romans watched Lilybeum in the same way, and Hannibal the Rhodian could run the blockade before they were launched and ready to stop him. The Norsemen hauled their ships on shore, stockaded them and marched inland. The Greeks of Homer had done the same and could do nothing else. Roger di Lauria, in A.D. 1285, waited at the Hormigas with his galleys on the beach till the French were seen to be coming past him. Edward III. in A.D. 1350, stayed at Winchelsea till the Spaniards were sighted. The allies at Lepanto remained at anchor near Dragonera till the last moment.

Ancient Greek methods.

Given again that the fighting was at close quarters with ram, stroke of sword, crossbow bolt, arrow, pigs of iron or lead and wild fire blown through tubes, it follows that the formations and tactics were equally imposed on the combatants. The formation was inevitably the *line abreast*—the ships going side by side—for the object was to bring all the rams, or all the boarders into action at once. It was quite as necessary to strike with the prow when boarding as when ramming. If the vessels were laid side by side the oars would have prevented them from touching. It may be added that this rule prevailed equally with the sailing ship of later times, since they were built with what is technically called "a tumble home," that is to say, their sides sloped inwards from the water line, and the space from the top of the bulwarks of one to the other was too great to be jumped. The extent to which ramming or boarding would be used respectively would depend on the skill of the rowers. The highly trained Athenian crews of the early Peloponnesian War relied mainly on the ram. They aimed at dashing through an enemy's line, and shaving off the oars from one side of an opponent. When successfully practised, this manœuvre would be equivalent to the dismasting of a sailing line of battle ship. It was the διέκπλους, and it enabled the assailant to turn, and ram his crippled enemy in the stern (περίπλους). But an attack with the ram might be exceedingly dangerous to the assailant, if he were not very solidly built. His ram might be broken off in the shock. The Athenians found this a very real peril, and were compelled to construct their triremes with stronger bows, to contend with the more heavily built Peloponnesian vessels—whereby they lost much of their mobility. In fact success in ramming depended so much on a combination of skill and good fortune that it played a somewhat subordinate part in most ancient sea fights. The Romans baffled the ramming tactics of the Carthaginians by the invention of the *corva* or crow, which grappled the prow of the rammer, and provided a gangway for boarders. After the introduction of artillery in the 14th century, when guns were carried in the bows of the galley, it was considered bad management to fire them until the prow was actually touching the enemy. If they were discharged before the shock there was always a risk that they would be fired too soon, and the guns of the time could not be rapidly reloaded. The officer-like course was to keep the fire for the last moment, and use it to clear the way for the boarders. As a defence against boarding, the ships of a weaker fleet were sometimes tied side to one another, in the middle ages, and a barrier made with oars and spars. But this defensive arrangement, which was adopted by Olaf Tryggveson of Norway at Swolder (A.D. 1000), and by the French at Sluys (A.D. 1340), could be turned by an enemy who attacked on the flank. To meet the shock of ramming and to ram, medieval ships were sometimes "bearded," *i.e.* fortified with iron bands across the bows.

Sailing ships.

The principles of naval warfare known to the ancient world descended through Byzantium to the Italian Republics and from them to the West. With the growth of ships, the development of artillery, and the beginning of the great sailing fleets capable of keeping the sea for long periods together, came the need for a new adaptation of old principles. A ship which depended on the wind for its motive power could not hope to ram. It could still board, and the Spaniards did for long make it their main object to run their bow over an enemy's sides, and invade his deck. In order to carry out this kind of attack they would naturally try to get to windward and then bear down before the wind in line abreast ship upon ship. But an opponent to leeward could always baffle this attack by edging away, and in the meantime fire with his broadside to cripple his opponent's spars. Experience soon showed the more intelligent sea officers of all nations, that a ship which relied on broadside fire, must present her broadside to the enemy; it was also soon seen that in order to give full play to the guns of the fleet, the ships must follow one another. Thus there arose the practice of arranging ships in the *line ahead*, one behind the other. For a time sea-officers were inclined to doubt whether order could be maintained among vessels subject to the forces of wind and tide. But in the very first years of the 16th century, a Spanish writer of the name of Alonso de Chaves argued with force that even an approach to order is superior to none—and that, given the accidents of

"Line of battle."

wind and tide, the advantage would rest with him who took his precautions. The truth was so obvious that it could not but be universally accepted. The line ahead then became "the line of battle." This term has a double meaning. It may mean the formation, but it may also mean the ships which are fit to form parts of the line in action. The practice of sorting out ships, so as to class those fit to be in a line of battle apart from others, dates from the second half of the 17th century. Its advantages had been seen before, but the classification was not made universal till then. The excessive number of ships collected in those naval wars, their variety in size, and the presence in the fleets of a large proportion of pressed or hired merchant ships had led to much bad execution. But in the final battles of the first war between England and the Dutch Republic (1652–53), the Parliamentary admirals enforced the formation of the line by strong measures. On the conclusion of the war, they drew up the first published code of fighting instructions. These give the basis of the whole tactical system of the 17th and 18th centuries in naval warfare. The treatises of Paul Hoste, Bigot de Morogues and Bourdé de Villehuet, which were the text-books of the time, all French in origin but all translated into other languages, are commentaries upon and developments of this traditional code of practice.

Principles of fighting tactics.

The governing principles were simple and were essentially sound. The ships were arranged in a line, in order that each should have her broadside free to fire into the enemy without running the risk of firing into her own friends. In order to remove the danger that they would touch each other, a competent space, to allow for a change of course in case of need, was left between them. It was fixed at two cables—that is, 200 fathoms, or 400 yds.—though less room was occasionally taken. To reduce the number of men required to handle the sails, and leave them free to fight the guns, the ships fought under reduced canvas. But it was necessary to retain the power to increase the speed of a ship rapidly. This was secured by not sheeting home one of the sails—that is to say, it was left loose, and the wind was "spilt out of it." When the vessel was required to shoot ahead it was easy to sheet the sail home, and "let all draw." The fleets would fight "on the wind"—that is to say, with the wind on the side, because they were then under better control. With the wind blowing from behind they would take the wind out of one another's sails. When the course had to be altered, the ships turned by tacking—that is, head to wind—or by wearing—that is, stern to wind, either together or in succession. To tack or wear a large fleet in succession was a very lengthy operation. The second ship did not tack, or wear, till she had reached the place where the first had turned, and so on, down the whole line. By tacking or wearing together the order of a fleet was reversed, the van becoming the rear, and the rear the van. It must be remembered that a fleet was divided into van, centre and rear, which kept their names even when the order was reversed. Orders were given by signals from the flag-ship, but as they could not be seen by the ships in a line with her, frigates were stationed on the side of the line opposite to that facing the enemy "to repeat signals."

A main object which the admirals who drafted the orders had before them was to obviate the risk that the enemy would double on one end of the line and put it between two fires. It is obvious that if two fleets, A and B, are sailing, both with the wind on the right side, and the leading ship of A comes into action with the seventh or eighth of B, then six or seven leading ships of B's line will be free to turn and surround the head of A's line. This did actually happen at the battle of Beachy Head. Therefore, the orders enjoin on the admiral the strict obligation to come into action in such a way that his leading ship shall steer with the leading ship of the enemy, and his rear with the rear. The familiar expression of the British navy was "to take every man his bird."

The regular method of fighting battles was thus set up. In itself it was founded on sound principles. As it was framed when the enemies kept in view were the Dutch, who in seamanship and gunnery were fully equal to the British, its authors were justified in prescribing the safe course. Unhappily they added the direction that a British admiral was to keep his fleet, throughout the battle, in the order in which it was begun. Therefore he could take no advantage of any disorder which might occur in the enemy's lines. When therefore the conflict came to be between the British and the French in the 18th century, battles between equal or approximately equal forces were for long inconclusive. The French, who had fewer ships than the British, were anxious to fight at the least possible cost, lest their fleet should be worn out by severe action, leaving Great Britain with an untouched balance. Therefore, they preferred to engage to leeward, a position which left them free to retreat before the wind. They allowed the British fleet to get to windward, and, when it was parallel with them and bore up before the wind to attack, they moved onwards. The attacking fleet had then to advance, not directly before the wind with its ships moving along lines perpendicular to the line attacked, but in slanting or curving lines. The assailants would be thrown into "a bow and quarter line"—that is to say, with the bow of the second level with the after part of the first and so on from end to end. In the case of a number of ships of various powers of sailing, it was a difficult formation to maintain. The result was that the ships of the assailing line which were steering to attack the enemy's van came into action first and were liable to be crippled in the rigging. If the same formation was to be maintained, the others were now limited to the speed of the injured vessels, and the enemy to leeward slipped away. At all times a fleet advancing from windward was liable to injury in spars, even if the leeward fleet did not deliberately aim at them. The leeward ships would be leaning away from the wind, and their shot would always have a tendency to fly high. So long as the assailant remained to windward, the ships to leeward could always slip off.

Clerk's theories.

The inconclusive results of so many battles at sea excited the attentions of a Scottish gentleman, Mr Clerk of Eldin (1728–1812), in the middle of the 18th century. He began a series of speculations and calculations, which he embodied in pamphlets and distributed among naval officers. They were finally published in book form in 1790 and 1797. The hypothesis which governs all Clerk's demonstrations is that as the British navy was superior in gunnery and seamanship to their enemy, it was their interest to produce a mêlée. He advanced various ingenious suggestions for concentrating superior forces on parts of the enemy's line—by preference on the rear, since the van must lose time in turning to its support. They are all open to the criticism that an expert opponent could find an answer to each of them. But that must be always the case, and victory is never the fruit of a skilful movement alone, but of that superiority of skill or of moral strength which enables one combatant to forestall or to crush another by more rapid movement or greater force of blow. Clerk's theories had at least this merit that they must infallibly tend to make battles decisive by throwing the combatants into a furious mingled strife.

The unsatisfactory character of the accepted method of fighting battles at sea had begun to be obvious to naval officers, both French and English, who were Clerk's contemporaries. The great French admiral Suffren condemned naval tactics as being little better than so many excuses for avoiding a real fight. He endeavoured to find a better method, by concentrating superior forces on parts of his opponent's line in some of his actions with the British fleet in the East Indies in 1782 and 1783. But his orders were ill obeyed, and the quality of his fleet was not superior to the British. Rodney, in his first battle in the West Indies in 1780, endeavoured to concentrate a superior force on part of his enemy's line by throwing a greater number of British ships on the rear of the French line. But his directions were misunderstood and not properly executed. Moreover he did not then go beyond trying to place a larger number of ships in action to windward against a smaller number to leeward by arranging them at a less distance than two-cables length. But an enemy who took the simple and obvious course of closing his line could baffle the attack, and while the retreat to leeward remained open could still slip away. On the 12th of April 1782 (battle of Dominica) Rodney was induced, by the disorder in the French line, to break his own formation and pass through the enemy. He took the French flag-ship and five other vessels. The favourable result of this departure from the old practice of keeping the formation intact throughout the battle ruined the moral authority of the orthodox system of tactics. In the French war which began in 1793 Lord Howe (battle of 1st of June) ordered his fleet to steer through the enemy, and to put themselves on his line only as a means of bringing his fleet into action, and then played to produce a mêlée in which the individual superiority of his vessels would have free play. Throughout the war, which lasted, with a brief interval of peace, from 1793 to 1815, British admirals grew constantly bolder in the method they adopted for producing the desired mêlée (battles of St Vincent, Camperdown, Trafalgar). It has sometimes been argued that their line of attack was rash and would have proved disastrous if tried against more skilful opponents. But this is one of those criticisms which are of value only against those who think that there can be a magic efficacy in any particular attack, which makes its success infallible. That the tactics of British admirals of the great wars of 1793–1815 had in themselves no such virtue was amply demonstrated at the engagement off Lissa in 1811. They were justified because the reliance of admirals on the quality of their fleets was well founded. It should be borne in mind that a vessel while bearing down on an enemy's line could not be exposed to the fire of three enemies at once when at a less distance than 750 yds., because the guns could not be trained to converge on a nearer point. The whole range of effective fire was only a thousand yards or a very little over. The chance that a ship would be dismasted and stopped before reaching the enemy's line was small.

Influence of improved ship-building.

The improvements in the construction of ships, which had so much influence on the development of tactics, had its effect also on strategy. The great aims of a fleet in war must be to keep the coast of its own country free from attack, to secure the freedom of its trade, and to destroy the enemy's fleet or confine it to port. The first and second of these purposes can be attained by the successful achievement of the third—the destruction or paralysis of the hostile fleet. But till after the end of the 17th century it was thought impossible, or at least very rash, to keep the great ships out of port between September and May or June. Therefore continuous watch on an enemy by blockading his ports was beyond the power of any navy. Therefore too, as the opponent might be at sea before he could be stopped, the movements of fleets were much subordinated to the need for providing convoy to the trade. It was not till the middle of the 18th century that the continuous blockade first carried out by Lord Hawke in 1758–59, and then brought to perfection by Earl St Vincent and other British admirals between 1793 and 1815, became possible.

Modern Times.—The interval of ninety years between 1815 and 1904 (the opening of the Russo-Japanese conflict) was marked by no naval war. There was fighting at sea, and there were prolonged blockades, but there were no encounters between large and well appointed navies. During this period an entire revolution took place in the means of propulsion, armament and material of construction of ships. Steam was applied to war-ships, at first as an auxiliary force, in the second quarter of the 19th century. The Crimean War gave a great stimulus to the development of the guns. It also brought about the application of iron to ships as a cuirass. Very soon metal was adopted as the material out of which ships were made. The extended use of shells, by immensely increasing the danger of fire, rendered so inflammable a substance as wood too dangerous for employment in a war-ship. France has the honour of having set the example of employing iron as a cuirass, while England was the first to take it as the sole material. Changes so sweeping as these could not take place without affecting all the established ideas as to the conduct of war at sea. The time of revolution in means of propulsion, armament and construction was also a time of much speculation. Doubts and obscurities remained unsolved because they had never been brought to the test of actual fighting on an adequate scale. As the 19th century drew to a close, another element of uncertainty was introduced by the development of the torpedo. A weapon which is a floating and moving mine, capable up to a certain point of being directed on its course, invisible or very hard to trace, and able to deliver its blow beneath the water-line, was so complete a novelty that its action was hard indeed to foresee and therefore particularly liable to be exaggerated. From the torpedo sprang too the submarine vessel, which aims at striking below the surface, where it itself is, like its weapon, invisible, or nearly so.

How to solve the problems which science has set has been the task of thoughtful naval officers—and of the governments which the military seaman serves. The questions to be solved may be stated in the following order. What would be the effect: 1st, of the employment of steam, or of any substitute for steam other than the wind or the oar; 2nd, of the development of the gun; 3rd, of the use of metal as a material of construction; 4th, of the use of a weapon and a vessel acting below the surface of the water, and if not wholly invisible at least very much hidden?

The belief that steam had given the lesser fleet an advantage over the greater—that it had, in a phrase once popular among Englishmen, "bridged the Channel,"—need only be touched on for its historical interest. It was an intelligible, perhaps pardonable, example of the confusion produced by a novelty of improved capacity on the minds of those who were not prepared to consider it in all its bearings. A moment's thought ought to have shown that where both sides had the command of steam, the proportion between them would remain what it was before. The only exception would be that the fleet which was steering in a direction already laid down would have a somewhat greater advantage than of old, over another which was endeavouring to detect its presence and course. Its movements would be more rapid, and it could steam through a fog by which it would be hidden in a way impossible for a sailing ship. On the other hand, such a fleet could be much more rapidly pursued and interrupted when once its course was known. The influence which the freedom and certainty of movement conferred by steam would have on the powers of fleets and ships presented a problem less easy to dispose of. Against the advantage they conferred was to be set the limitation they imposed. The necessity for replacing indispensable fuel was a restriction unknown to the sailing ship, which needed only to renew its provisions and water—stores more easily obtained all the world over than coal. Hence doubts naturally arose as to how far a state which did not possess coaling stations in all parts of the world could conduct extensive operations over great distances. The events of the recent Russo-Japanese War lead to the conclusion that the obligation to obtain coal has not materially limited the freedom of movement of fleets. By carrying store vessels with him, by coaling at sea, and taking advantage of the friendly neutrality of certain ports on his route, the Russian admiral, Rojdesvensky, reached the Far East in 1905 in less time and with less difficulty than he could have done in days when he would have been liable to delay by calms, contrary winds and loss of spars in gales. The amount of skill on the part of the crews required to carry a fleet a long distance would even appear to be less than it was of old. From this it would seem to follow that modern fleets possess no less capacity than the old sailing fleets for the great operations of war at a distance, or for maintaining blockades. Advantage and disadvantage counterbalance one another, and the proportion remains the same. Blockade is only another name for the maintenance of a watch on an enemy's squadron in port by a force capable of fighting him if he comes out. Admiral Togo blockaded the Russian squadron at Port Arthur in 1904 as effectually as any admiral has done the work in the past. The mobility given to the blockaded fleet by steam has been exactly counterbalanced by the increased mobility of the watch. The proportions remain the same.

But if the power to undertake far-ranging operations, and to confine an enemy to port by keeping him under observation, and driving him back when he comes out remains the same, the strategy of war at sea cannot have undergone any material alteration. The possession of ports where stores can be accumulated and repairs effected is an advantage as it always was. But a powerful fleet when operating far from its own country can supply itself with a store-house (a base) on the enemy's coast, or can be served at sea by store-ships, as of old. If beaten, it will suffer from the want of places of refuge as it always did.

"Fleet in being."

Among the speculations of recent years, a good deal has been heard of the "fleet in being." If this phrase is only used to mean that, so long as any part of an enemy's navy is capable of acting with effect, its existence cannot be ignored with the certainty of safety, then the words convey a truth which applies to all war whether by land or sea. If it means, as it was at least sometimes clearly intended to mean, that no such operation as the transport of troops oversea can be undertaken with success, so long as the naval forces of an opponent are not wholly destroyed, it is contrary to ancient experience. The Japanese in the beginning of 1904 began transporting troops to Korea before they had beaten the Russians, and they continued to send them in spite of the risk of interruption by the Vladivostok squadron. There was a risk, but risk is inseparable from war. The degree which can be incurred with sanity depends on the stake at issue, the nature of the circumstance and the capacity of the persons, which vary infinitely and must be separately judged.

Ramming.

The war of 1904–05 may also be said to have shown that the vast change in the construction of ships, together with the development of old and the invention of new weapons, has done far less to alter the course of battles at sea than had been thought likely. Two calculations have been successively made and have been supported with plausibility. The first was that steam would enable the ship herself to be used as a projectile and that the use of the ram would again become common. The sinking of the "Re d'Italia" by the Austrian ironclad Ferdinand Max at the battle of Lissa in 1866 seemed to give force to this supposition. Accidental collisions such as those between the British war-ships "Vanguard" and "Iron Duke," "Victoria" and "Camperdown" have also shown how fatal a wound may be given by the ram of a modern ship. But the sinking of the "Re d'Italia" was largely an accident. As between vessels both under full control, a collision is easily avoided where there is space to move. In a mêlée, or pell-mell battle, to employ Nelson's phrase, opportunities would occur for the use of the ram. But the activity of science has developed one weapon to counterbalance another. The torpedo has made it very dangerous for one fleet to rush at another. A vessel cannot fire torpedoes ahead, and when charging home at an opponent presenting his broadside would be liable to be struck by one. The torpedo may be said therefore to have excluded the pell-mell battle and the use of the ram except on rare occasions. But then arose the question whether the torpedo itself would not become the decisive weapon in naval warfare. It is undoubtedly capable of producing a great effect when its power can be fully exerted. A school arose, having its most convinced partisans in France, which argued that, as a small vessel could with a torpedo destroy a great battle-ship, the first would drive the second off the sea. The battle-ship was to give place to the torpedo-boat or torpedo-boat-destroyer which was itself only a torpedo-boat of a larger growth. But the torpedo is subject to close restrictions. It cannot be used with effect at more than two thousand yards. It passes through a resisting medium, which renders its course uncertain and comparatively slow, so that a moving opponent can avoid it. The vessel built to use it can be easily sunk by gun-fire. By night the risk from gun-fire is less, but science has nullified what she had done. The invention of the search-light has made it possible to keep the waters round a ship under observation all night. In the war between Russia and Japan the torpedo was at first used with success, but the injury it produced fell below expectations, even when allowance is made for the fact that the Russian squadron at Port Arthur had the means of repair close at hand. In the sea fights of the war it was of subordinate use, and indeed was not employed except to give the final stroke to, or force the surrender of, an already crippled ship. This war (and as much may be said for the war between the United States and Spain) confirmed an old experience. A resolute attempt was made by the Americans to block or blind (in the modern phrase to "bottle-up") the entrance to Santiago de Cuba by sinking a ship in it. The Japanese renewed the attempt on a great scale, and with the utmost intrepidity, at Port Arthur; but though a steamer can move with a speed and precision impossible to a sailing ship, and can therefore be sunk more surely at a chosen spot, the experiment failed. Neither Americans nor Japanese succeeded in preventing their enemy from coming out when he wished to come.

Torpedoes.

Gun-fire.

Since neither ram nor torpedo has established the claim made for it, the cannon remains "the queen of battles at sea." It can still deliver its blows at the greatest distance, and in the greatest variety of circumstances. The change has been in the method in which its power is applied. Now, as in former times, the aim of a skilful officer is to concentrate a superior force on a part of his opponent's formation. When the range of effective fire was a thousand or twelve hundred yards, and when guns could only be trained over a small segment of a circle because they were fired out of ports, concentration could only be effected by bringing a larger number of ships into close action with a smaller. To-day when gun-fire is effective even at seven thousand yards, and when guns fired from turrets and barbettes have a far wider sweep, concentration can be effected from a distance. The power to effect it must be sought by a judicious choice of position. It is true that greater rapidity and precision of fire produce concentration in one way. If of two forces engaged one can bring forty guns to bear on a chosen point of its opponent's formations, while that opponent can bring fifty guns to bear on a part of it, the superiority would seem to be with the larger number. But this is by no means necessarily the case. The smaller number of guns may give the greater number of blows if fired with greater speed and accuracy. Yet no commander has a right to rely on such a superiority as this till it has been demonstrated, as it had been in the case of the British fleet by the time that Trafalgar was fought. Therefore an able chief will always play for position. He will do so all the more because an advantage of position adds to any other which he may possess. He may dispense with it for a particular reason at a given moment and in reliance on other sources of strength, but he will not throw it away.

Position.

When position is to be secured the first condition to be thought of is the order in which it is to be sought for. The "line ahead" was imposed on the sailing fleets by the peremptory need for bringing, or at least retaining the power to bring, all their broadsides into action. Experiments made during manœuvres by modern navies, together with the experience gained in the war of 1904–05 in the Far East, have combined to show that no material change has taken place in this respect. It is still as necessary as ever that all the guns should be so placed as to be capable of being brought to bear, and it is still a condition imposed by the physical necessities of the case that this freedom can only be obtained when ships follow one another in a line. When in pursuit or flight, or when steaming on the look-out for a still unseen enemy, a fleet may be arranged in the "line abreast." A pursuing fleet would have to run the risk of being struck by torpedoes dropped by a retreating enemy. But it would have the advantage of being able to bring all its guns which can fire ahead to bear on the rear-ship of the enemy. When an opponent is prepared to give battle, and turns his broadside so as to bring the maximum of his gun-fire to bear, he must be answered by a similar display of force—in other words, the line ahead must be formed to meet the line ahead.

Both fleets being in this formation, how is the concentration of a superior force to be effected? If the opponents are equal in number, speed, armament, gunnery and the leadership of the

Speed.

chiefs, accident alone can confer an advantage on either of them. Where equal weights are tried on accurate scales one cannot force up the other, but this evenness of power is rarely met in war by land or sea. The knowledge that it existed would probably prevent an appeal to arms between nations, since no decisive result could be hoped for. It is needless to insist that superior numbers make the task of concentrating comparatively easy, unless counterbalanced by a great inferiority in speed. Speed is the quality which an admiral will wish his fleet to possess, in order that he may have the power to choose his point of attack. The swifter of two forces, otherwise equal, can always get ahead of its opponent, and then by turning inwards bring the leading ship of the force it is attacking into a curve of fire. The leader of the slower fleet can avoid the danger by also turning inwards. By so doing he will keep the assailant on his beam, opposite his side. Then the two fleets will tend to swing round in two circles having a common centre, the swifter going round the outer circumference and the slower round the inner. As the difference in length of these two lines would be always great and perhaps immense, the less speedy fleet could easily avoid the risk of being headed. On the other hand the outer fleet will be in a concave formation, and therefore able to bring all its guns to bear on the same point, while the inner fleet will be in a convex line, so that it will be unable to bring the guns of both van and rear to bear on the same mark. The advantage is obvious, but it may perhaps be easily exaggerated. The swifter fleet on the larger circle can in theory concentrate all its fire on one point, but all its ships will still be under fire, and in practice it is found very difficult to make men neglect the enemy who is actually hitting them, and apply their attention entirely to another. Moreover the ships on the outer circle, having the larger line to cover, cannot allow themselves the same margin of steam-power to make good loss of speed by injury from shot. A fleet would not go at its maximum rate of common speed in action. A blow on the water-line might fill part of the ship's watertight compartments and reduce her speed. She must be able to make good the loss by putting on a greater pressure of steam, which she would not be able to do if already going at her maximum rate. In actual battle very much will depend on the respective skill of the gunnery. The swifter fleet might well find its superiority neutralised by the crippling of two or three of its leading ships. In such an action as this it will be, if not impossible, at least exceedingly difficult to give orders by signal. An admiral will therefore have to direct by example, which he cannot do except by placing his flag-ship at the head of the line. In that place he will be marked out as a target for the enemy's concentrated fire. He may indeed decide to direct the battle by signal from outside the line. Yet the difficulty he will find in seeing what is happening, as well as the difficulty the captains will find in seeing the signals, will always be so great, that in all probability the admirals of the future, will, like Nelson, be content to lay down the general principles on which the battle is to be fought, and trust the captains to apply them as circumstances arise. A large measure of independence must needs be allowed to the captains in the actual stress of battle. Ships must be placed at such a distance apart as will allow them room to manœuvre so as to avoid collision with their own friends. The interval cannot be less than 800 yds. When the length of the vessels themselves is added, it will be seen that a line of twelve vessels will stretch six miles. Modern powder is nominally smokeless, and it certainly does not create the dense bank of smoke produced by the old explosives. Yet it does create a sufficient haze to obscure the view from the van to the rear of an extended line. The movements must be rapid, and there will be little time indeed in which to take decisions. The torpedo may not be used during the actual battle. Its part will be to complete the destruction or enforce the surrender of a beaten enemy, and to cover retreats.

The submarine and submergible vessel were brought into prominence by France in the hope that by diminishing the value of battleships they would reduce the superiority of the British navy. The example of France was followed by other powers, and particularly by Great Britain; but their value as weapons of war is necessarily a matter of speculation.

Bibliography.—Naval strategy can hardly be said to have been dealt with at all till Captain Mahan published his *Influence of Sea Power on History*. The tactics of the ancient world are only very briefly dealt with in the *De re Militari* of Vegetius, in book iv. Vegetius was much copied and read in the middle ages, and was translated in 1284 by Jean de Meung, one of the authors of the *Roman de la Rose*. His translation is printed, together with the verse paraphrase of Priorats, in the *Anciens Textes français*. Naval tactics are dealt with in the treatise of Leo VI. the Tactician, and his son Constantine VII., or perhaps Constantine VIII., printed in Meursius' *Opera Omnia*, vol. vi. They were emperors of the Macedonian dynasty. The tactics of the medieval galleys are described, with references to authorities, both by A. Guglielmotti in *Marine Pontificia*, and by Admiral Jurien de la Gravière in *Les Derniers jours de la marine à rames* (1885). The chief writers on the tactics of the sailing fleets were French. At the head of them, in time and in merit, must be put Paul Hoste, whose folio on *Naval Evolutions* appeared in 1697. Hoste was a Jesuit who was secretary to the Count of Tourville. Hoste's treatise was translated into English and published in Edinburgh in 1834 with numerous and excellent illustrations by Captain J. D. Boswall, *A Treatise on Naval Tactics*. Captain Boswall also made use of the passages relating to naval tactics in the *History of the Art of War* by J. G. Hoyer, an officer in the Prussian army (1797–1800). Another excellent French treatise is *Le Manœuvrier* of Bourde de Villehuet (1765), translated into English in 1788 under the title of *The Manœuvrer, or Skilful Seaman*. Particular attention is due to the *Essay on Naval Tactics* by Mr Clerk of Eldin, first published in a collected form in 1804, but known in parts since 1780. Clerk was original in speculation and lucid in exposition. A French treatise, *L'Art de la guerre sur mer*, by the Vicomte de Grenier (1787), was less famous or influential, but was able and original. An exhaustive collection of "Fighting Instructions" and other material necessary to an intelligent understanding of the naval tactics of sailing fleets is the *Fighting Instructions 1530–1816*, edited by Mr Julian S. Corbett for the Navy Record Society (1905). Admiral Ekin's *Naval Battles* (1824) has some passages of value. It is comparatively easy to give authorities for the warfare of galleys and sailing ships. The case is altered when we have to deal with the tactics of steam fleets. Vast quantities of speculation have been written in every country which possesses a fleet, but, no test having been applied on a sufficient scale till the Russo-Japanese War of 1904, little of it can be said to possess approved authority. The facts of such wars as there have been are collected in Captain Mahan's *Life of Farragut* (1893) and *Lessons of the War with Spain* (1899), and in Mr H. W. Wilson's *Ironclads in Action, 1855–1895*. A standard work on evolutions and formations is *Elementary Naval Tactics*, by Captain Wm. Bainbridge Hoff of the United States navy, first published in 1894, but reprinted since with enlargements. The *Naval Warfare* of Admiral P. H. Colomb is a collection of historical examples meant to illustrate the principles of naval strategy for application in modern conditions. The third edition, revised and corrected, with additions, appeared in 1899. (D. H.)

NAWAB, a Mahommedan title for a native ruler in India, answering to the Hindu raja. Nawab originally means a deputy, being the honorific plural of the Arabic *naib*, and it was applied to a delegate of a supreme chief, the viceroy or governor under the Great Mogul, *e.g.* the nawab of Oudh. From this use it became a title of rank, without office, and is now sometimes conferred by the British government on Mahommedan gentlemen for distinguished service.

NAWABGANJ, the name of three towns of British India. (1) The most important is the headquarters of Bara Banki district in the United Provinces, on the Oudh and Rohilkhand railway, 17 m. E. of Lucknow; pop. (1901) 14,478. It has a considerable trade in sugar and cotton goods. It was the scene of a victory by Sir Hope Grant during the Mutiny. (2) A town in Malda district, Eastern Bengal and Assam, on the Mahananda near its junction with the Ganges, a centre of river trade; pop. (1901) 17,016. (3) A town in Gonda district, United Provinces, on the Bengal and North-Western railway; pop. (1901) 7047.

NAWANAGAR, or Jamnagar, a native state of India, in Kathiawar, within the Gujarat division of Bombay, situated on the south of the Gulf of Cutch. Area, 3791 sq. m. Pop. (1901) 336,779, showing a decrease of 11% in the decade due to famine. Estimated revenue, £170,000; tribute, £8000. The chief, whose title is Jam, is a Jareja Rajput of the same clan as the rao of Cutch. Prince Ranjitsinhji (b. 1872), well known in England as a cricketer, was educated at the Rajkumar College, Rajkot, and Trinity College, Cambridge. He had been adopted by his uncle, the Jam Shri Vibhaji, but the adoption was set aside, with British sanction, in favour of a son by a Mahommedan mother. This son succeeded, but died in 1906 aged twenty-four, and Ranjitsinjhi obtained the throne in March 1907. A branch railway, constructed at the expense of the state, was opened in 1898 from Rajkot to Nawanagar town.

The town of Nawanagar is about 5 m. from the seaport of Bedi. Pop. (1901) 53,844. Founded by Jam Rawal in 1540, it is built of stone, and has manufactures of silk and gold embroidery, and perfumed oils and red powder for ceremonial purposes. Its water is supplied from a reservoir covering 600 acres and an aqueduct 8 m. long.

NAWĀWĪ [Abū Zakarīyya ibn Sharaf un-Nawāwī] (1233–1278), Arabian writer, was born at Nawā near Damascus. In the latter city he studied from his eighteenth year, and there, after making the pilgrimage in 1253, he settled as a private scholar until 1267, when he succeeded Abu Shāma as professor of tradition at the Ashrafīyya school. He died at Nawā from overwork.

His manual of Moslem law according to the Shāfiʽite school has been edited with French translation by van den Bergh, 2 vols., Batavia (1882–1884), and published at Cairo (1888). The *Tahdhīb ul-Asmāʽi* has been edited as the *Biographical Dictionary of Illustrious Men chiefly at the Beginning of Islam* by F. Wüstenfeld (Göttingen, 1842–1847). The *Taqrīb wa Taisīr*, an introduction to the study of tradition, was published at Cairo, 1890, with Suyūṭī's commentary. It has been in part translated into French by M. Marcais in the *Journal asiatique*, series ix., vols. 16-18 (1900–1901). Nawāwī's collection of the forty (actually forty-two) chief traditions has been frequently published with commentaries in Cairo. For other works see C. Brockelmann's *Gesch. der arabischen Litteratur*, vol. i. (Weimar, 1898), pp. 395-397. (G. W. T.)

NAXOS, the largest of the Cyclades (about 22 m. by 16 m.), a fertile island in the Aegean Sea, east of Paros, with which, and adjacent smaller islands, it forms an *eparchia*. In ancient times it was also called Dia or Strongyle. It was rich in vines and famous for its wine, and a centre of the worship of Bacchus. The god found Ariadne asleep on its shore, when she was deserted by Theseus. The sculptors of Naxos formed an important school of early Greek art; several unfinished colossal statues are still to be seen in the quarries, notably one in Apollona Bay, to the N.E. of the island. A tyrant Lygdamis ruled Naxos in alliance with Peisistratus of Athens during the 6th century B.C. In 501 a Persian fleet unsuccessfully attacked it, but in 490 it was captured and treated with great severity. Four Naxian ships took part in the expedition of Xerxes, but deserted and fought on the Greek side at Salamis in 480. Naxos was a member of the Delian League (*q.v.*); it revolted in 471, was captured by Athens, and remained in her possession till her empire was destroyed. In later times the most remarkable event was its capture, in A.D. 1207, by the Venetian Marco Sanudo, who founded the duchy of Naxos, which flourished till the Turks took the island in 1566. Since the War of Independence it has belonged to the Greek kingdom. The only ancient remains of any importance are those of a temple (Palati), supposed to be that of Dionysus, on an island just off the town. Naxos is still rich in fruit trees, and also exports corn, wine and oil, as well as emery, its richest and most important mineral product. Pop. (1907) 25,185 (province), 2064 (commune).

NAXOS, the earliest Greek colony in Sicily, was founded by Theocles from Chalcis in 735 B.C., on the E. coast, S. of Tauromenium (mod. Taormina), in a low-lying situation just N. of the mouth of the river Alcantara, where the castle of Schiso now stands. The adoption of the name of Naxos, the island in the Aegean Sea, seems to indicate that there were Naxians among its founders. Within a few years it became strong enough to found Leontini and Catana. Naxos was the warmest ally of Athens in the Sicilian expedition. In 403 B.C. it was destroyed by Dionysius and handed over to the Sicels, but was never rebuilt. Its place was supplied in 358 by Tauromenium. Scanty traces of its walls are to be seen, of irregular blocks of lava, especially on the south, parallel to the river (E. A. Freeman, *Hist. of Sic.* i. 323). Without the city stood the altar of Apollo Archegetes, at which all sacred embassies that left Sicily sacrificed before their departure (Thuc. vi. 3).

NAY, or Ney, the long flute of the ancient Egyptians, held obliquely and played by directing the breath, as in the pipes of the syrinx, across the open end, which had no embouchure of any kind. Performers on the nay are represented on many of the frescoes which decorated the tombs at Thebes, their flutes reaching nearly to the ground while they are in the familiar half-kneeling posture. The acoustic principles involved in the production of sound are the same as for the flute. The narrowness of the bore in proportion to the length would facilitate the production of harmonics and so give the nay an extended compass. Victor Loret[1] has compiled a list of all the real pipes of ancient Egypt which have survived, having for the most part been preserved in mummy cases. The nay was not restricted to ancient Egypt, but has remained in general use in various parts of the East until the present day. (K. S.)

NAYAGARH, a native state in India, in the Orissa division of Bengal. Area, 588 sq. m.; pop. (1901) 140,779; revenue, £8000. It contains hills rising to 5000 ft.; and exports much agricultural produce. In 1894 a revolt of the hill tribe of Khonds against the raja required the intervention of British military police. Nayagarh village (pop. 3340) is connected by road with Khurda in Puri district.

NAYAR, or Nair, a caste or tribe on the W. coast of S. India, who form the dominant race in Malabar. Traditionally they are soldiers, but many have taken to professions, and one was in 1910 a judge of the high court at Madras. Their total number in all India in 1901 was just over one million. Their most peculiar customs are: (1) *marumakkattayam* = "descent through sister's children," or inheritance in the female line; and (2) *sambandham*, a loose form of union, taking the place of marriage, without any responsibility of the husband towards either wife or children. In 1896 an act of the Madras legislature enabled a *sambandham* to be registered, and have the force of a legal marriage. Little advantage has been taken of this act, while it is alleged that the *sambandham* now usually lasts for a lifetime.

See *Malabar District Gazetteer* (Madras, 1908).

NAYLER (or Naylor), **JAMES** (1618–1660), English Puritan, was born at Andersloe or Ardsley, in Yorkshire, in 1618. In 1642 he joined the parliamentary army, and served as quartermaster in John Lambert's horse. In 1651 he adopted Quakerism, and gradually arrived at the conviction that he was a new incarnation of Christ. He gathered round him a small band of disciples, who followed him from place to place. At Appleby in 1653 and again at Exeter in 1655 he suffered terms of imprisonment. In October 1655, in imitation of Christ's procession into Jerusalem, he entered Bristol on horseback riding single—"a rawboned nude figure, with lank hair reaching below his cheeks"—attended by seven followers, some on horseback, some on foot, he in silence and they singing "Hosanna! Holy, holy! Lord God of Sabaoth!" At the High Cross he and his followers were arrested. His trial occupied the second parliament of Cromwell for several days, and on the 16th of December 1656 he was convicted of blasphemy and sentenced to be whipped from the Palace Yard to the Old Exchange, to be branded in the forehead with "B" (for blasphemer), to have his tongue bored with a red-hot iron, to be whipped through the streets of Bristol, and to suffer imprisonment with hard labour for two years. On his release he was readmitted into the communion of the Quakers, and spent some time in Westmorland with George Whitehead (1636?–1723). In October 1660 Nayler set out to visit his long-forsaken family in Yorkshire, but died on the journey in Huntingdonshire.

A collected edition of the *Tracts* of Nayler appeared in 1716. See *A Relation of the Life, Conversion, Examination, Confession, and Sentence of James Nayler* (1657); a *Memoir of the Life, Ministry, Trial, and Sufferings of James Nayler* (1719); and a *Refutation of some of the more Modern Misrepresentations of the Society of Friends commonly called Quakers, with a Life of James Nayler*, by Joseph Gurney Bevan (1800).

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[1] "Les Flûtes égyptiennes antiques," in *Journal asiatique*, 8ème série, tome xiv. (Paris, 1889).

NAZARENES (Ναζωραῖοι), an obscure Jewish-Christian sect, existing at the time of Epiphanius (fl. A.D. 370) in Coele-Syria, Decapolis (Pella) and Basanitis (Cocabe). According to that authority (*Panarion*, xxix. 7) they dated their settlement in Pella from the time of the flight of the Jewish Christians from Jerusalem, immediately before the siege in A.D. 70; he characterizes them as neither more nor less than Jews pure and simple, but adds that they recognized the new covenant as well as the old, and believed in the resurrection, and in the one God and His Son Jesus Christ. He cannot say whether their christological views were identical with those of Cerinthus and his school, or whether they differed at all from his own. But Jerome (*Ep.* 79, to Augustine) says that they believed in Christ the Son of God, born of the Virgin Mary, who suffered under Pontius Pilate, and rose again, but adds that, "desiring to be both Jews and Christians, they are neither the one nor the other." They used the Aramaic recension of the Gospel according to Matthew, which they called the Gospel to the Hebrews, but, while adhering as far as possible to the Mosaic economy as regarded circumcision, sabbaths, foods and the like, they did not refuse to recognize the apostolicity of Paul or the rights of heathen Christians (Jer., *Comm. in Isa.*, ix. 1). These facts, taken along with the name (cf. Acts xxiv. 5) and geographical position of the sect, lead to the conclusion that the Nazarenes of the 4th century are, in spite of Epiphanius's distinction, to be identified with the Ebionites (*q.v.*).

NAZARETH (mod. *en-Nāṣira*), a town in Galilee, in a hollow of the hills on the southern border of the plain of Esdraelon. It first appears as a village (John i. 46) in which Joseph and Mary lived (Luke i. 26) and to which they returned from Egypt (Matt. ii. 23). Here the unrecorded years of Christ's boyhood were spent. From the name of the town comes *naṣāra* (*i.e.* "Nazarenes"), the ordinary oriental word for "Christians." There was here a synagogue (Matt. xiii. 54) in which Christ preached the sermon that led to his rejection by his fellow townsmen. The growth of legends and traditional identifications can be traced in the writings of the pilgrims who have visited the town from Jerome's time till our own. For none of these can anything be said, save that it is possible that the village spring (called "St Mary's Well") is the same as that used in the time of Christ. A large basilica stood here about A.D. 600: the crusaders transferred here the bishopric of Scythopolis. It was taken by Saladin in 1187. In 1517 it was captured by the Turks. The population is now estimated at about 3500 Moslems and 6500 Christians; there are numerous schools, hospitals, &c., conducted by Greeks, Latins and Protestants. Visitors are shown the "Church of the Annunciation" with caves (including a fragment of a pillar hanging from the ceiling, and said to be miraculously supported) which are described as the scene of the annunciation, the "workshop of Joseph," the "synagogue," and a stone table, said to have been used by Christ.

NAZARITE, or rather Nazirite, the name given by the Hebrews to a peculiar kind of devotee. The characteristic marks of a Nazarite were unshorn locks and abstinence from wine (Judges xiii. 5; 1 Sam. i. 11; Amos ii. 11 seq.); but full regulations for the legal observance of the Nazarite vow are given in Num. vi., where every product of the grape-vine is forbidden, and the Nazarite is enjoined not to approach a dead body, even that of his nearest relative. The law in question is in its present form post-exilic, and is plainly directed to the regulation of a known usage. It contemplates the assumption of the vow for a limited period only, and gives particular details as to the atoning ceremonies at the sanctuary by which the vow must be recommenced if broken by accidental defilement, and the closing sacrifice, at which the Nazarite on the expiry of his vow cuts off his hair and burns it on the altar, thus returning to ordinary life. Among the later Jews the Nazarite vow, of course, corresponded with the legal ordinance, which was further developed by the scribes in their usual manner (Mishna, tractate *Nāzīr*; cf. 1 Macc. iii. 49; Acts xxi. 23 seq.; Joseph. *Ant.* xix. 6. 1, *Wars* ii. 15. 1). On the other hand, in the earliest historical case, that of Samson, and in the similar case of Samuel (who, however, is not called a Nazarite), the head remains unshorn throughout life, and in these times the ceremonial observances as to uncleanness must have been less precise. Samson's mother is forbidden to eat unclean things during pregnancy, but Samson himself touches the carcass of a lion and is often in contact with the slain, nor does he abstain from giving feasts.[1]

In the cases of Samuel and Samson the unshorn locks are a mark of consecration to God (Judges xiii. 5) for a particular service—in the one case the service of the sanctuary, in the other the deliverance of Israel from the Philistines. Since, moreover, the Hebrew root *n-z-r* is only dialectically different from *n-d-r*, "to vow," both corresponding to the same original Semitic root (Arab. *n-dh-r*), it would seem that the peculiar marks of the Nazarite are primarily no more than the usual sign that a man is under a vow of some kind. To leave the locks unshorn during an arduous undertaking in which the divine aid was specially implored, and to consecrate the hair after success, was a practice among various ancient nations, but the closest parallel to the Hebrew custom is found in Arabia.[2] There the vow was generally one of war or revenge, and, till it was accomplished, the man who vowed left his hair unshorn and unkempt, and abstained from wine, women, ointment and perfume. Such is the figure of Shanfara as described in his *Lāmīya*. The observances of the *ihrām* (period of consecration) belong to the same usage (see Mecca), and we find that at Tāif it was customary to shear the hair at the sanctuary after a journey. The consecration of Samuel has also its Arabic parallel in the dedication of an unborn child by its mother to the service of the Kaʿba (Ibn Hishām, p. 76; Azraḳī, p. 128). The spirit of warlike patriotism that characterized the old religion of Israel could scarcely fail to encourage such vows (cf. 2 Sam. xi. 11, and perhaps 1 Sam. xxi. 4 seq.), and from the allusion in Amos we are led to suppose that at one time the Nazarites had an importance—perhaps even an organization—parallel to that of the prophets, but of a very different religious type from the Canaanite nature-worship.

See Rechabites; *Encyc. Bibl.* col. 3362 seq.; G. B. Gray, *Numbers*, pp. 56-61; E. Kautzsch (*l.c.* n. 1 below); W. R. Harper, *Amos and Hosea*, p. li. sq., with references. (W. R. S.; S. A. C.)

NAZARIUS (4th century A.D.), Latin rhetorician and panegyrist, was, according to Ausonius, a professor of rhetoric at Burdigala (Bordeaux). The extant speech of which he is undoubtedly the author (in E. Bährens, *Panegyrici Latini*, No. 10) was delivered in 321 to celebrate the fifteenth anniversary of the accession of Constantine the Great, and the fifth of his son Constantine's admission to the rank of Caesar. The preceding speech (No. 9), celebrating the victory of Constantine over Maxentius, delivered in 313 at Augusta Trevirorum (Trier), has often been attributed to Nazarius, but the difference in style and vocabulary, and the more distinctly Christian colouring of Nazarius's speech, are against this.

See M. Schanz, *Geschichte der römischen Litteratur*, iii. (1896); Teuffel-Schwabe, *Hist. of Roman Literature* (Eng. trans., 1900), 401. 6.

NEAGH, LOUGH, the largest lake (Irish, "lough") in the British Isles, situated in the north-east of Ireland, in the province of Ulster, its waters being divided between counties Antrim (N. and E.), Down (S.E.), Armagh (S.), Tyrone and Londonderry (W.). Its shape is an irregular oblong, its extreme measurements being 18 m. from N.E. to S.W. 16 from N. to S., and 11 from E. to W. Its circumference, without including minor indentations, is about 64 m., and its area 98,255 acres or about 153 sq. m. The shores are generally flat and marshy, or very gently sloping, but flat-topped hills rise near the northern shore, where the lake reaches its extreme depth of 102 ft. The mean height above sea-level is 48 ft. Though the lough receives a large number of streams, the river Bann alone carries off its waters, flowing northward. The principal feeders are the Main on the north, the Crumlin (whose waters have petrifying powers) on the east, the Bann and Blackwater on the south, and the Ballinderry and Moyola on the west. Antrim and Toome, at the N.E. and N.W. respectively, are the only towns immediately on the shores. The islands are few and near the shores; namely, Skady Tower on the north, Ram's Island (with a ruined round tower) on the east, Ready and Coney Islands on the southwest. The lough abounds in fish, including gillaroo trout, char and pullen or fresh-water herring. A tradition that the lough rose suddenly from a fountain, inundating a populous district, and that remains of buildings may be seen below the waters, finds place in Thomas Moore's ballad *Let Erin remember*.

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[1] The prohibition to Samson's mother to abstain from wine does not appear to belong to the original narrative (see E. Kautzsch, Hastings's *D.B.* v. 657 col. *b*, following Böhme). John the Baptist is a later example of lifelong consecration (Luke i. 15); cf. also the tradition as to James the Just (Euseb. *H.E.* ii. 23).

[2] On consecration of the hair, see Spencer, *De Legibus Hebr.* iii. 1. 6; I. Goldziher, *Rev. Hist. Rel.* xiv. 49 sqq. (1886); J. G. Frazer, *Golden Bough*^{2}, i. 368 sqq.; and W. R. Smith, *Rel. Sem.*^{2}, Index *s.v.* "hair."

NEAL, DANIEL (1678–1743), English historian, born in London on the 14th of December 1678, was educated at the Merchant Taylors' School, and at the universities of Utrecht and Leiden. In 1704 he became assistant minister, and in 1706 sole minister, of an independent congregation worshipping in Aldersgate Street, and afterwards in Jewin Street, London, where he remained almost until his death on the 4th of April 1743. He married Elizabeth Lardner (d. 1748), by whom he had one son, Nathanael, and two daughters. In 1720 Neal published his *History of New England*, which obtained for its author the honorary degree of M.A. from Harvard college. He also undertook to assist Dr John Evans in writing a history of Nonconformity. Evans, however, died in 1730, and, making use of his papers for the period before 1640, Neal wrote the whole of the work himself. This *History of the Puritans* deals with the time between the Reformation and 1689; the first volume appearing in 1732, and the fourth and last in 1738. The first volume was attacked in 1733 for unfairness and inaccuracy by Isaac Maddox, afterwards bishop of St Asaph and of Worcester, to whom Neal replied in a pamphlet, *A Review of the principal facts objected to in the first volume of the History of the Puritans*; and the remaining volumes by Zachary Grey (1688–1766), to whom the author made no reply.

The *History of the Puritans* was edited, in five volumes, by Dr Joshua Toulmin (1740–1815), who added a life of Neal in 1797. This was reprinted in 1822, and an edition in two volumes was published in New York in 1844.

NEAL, DAVID DALHOFF (1838–), American artist, was born at Lowell, Massachusetts, on the 20th of October 1838. He was a pupil of the Royal Academy, Munich, under Max. E. Ainmiller, whose daughter he subsequently married. Later he entered the studio of Piloty, with whom he remained from 1869 to 1876. His picture, "The First Meeting of Mary Stuart and Rizzio," won for him the great medal of the Royal Bavarian Academy of Art. Besides portraits his canvases include "James Watt," a large historical composition shown at the Royal Academy, 1874, "Chapel of the Kings at Westminster" (collection of F. Cutting, Boston) and "Cromwell visiting Milton" (Hurlbut collection, Cleveland, Ohio).

NEALE, EDWARD VANSITTART (1810–1892), English co-operator and Christian Socialist, was born at Bath on the 2nd of April 1810, the son of a Buckinghamshire clergyman. After receiving his earlier education at home he went to Oriel College, Oxford. In 1837 he was called to the bar at Lincoln's Inn. He became a member of the Christian Socialists in 1850 and also joined the council of the Society for Promoting Working Men's Associations. His wealth enabled him to carry out experiments in co-operation on a larger scale than had been previously attempted. He founded the first co-operative store in London, and advanced the capital for two builders' associations, both of which failed. In 1851, though strongly opposed by other members of the promoting "Council," he started on his own initiative the Central Co-operative Agency, similar in many respects to the Co-operative Wholesale Society of a later day. The failure of this scheme, together with that of the operatives' cause in the engineering lock-out of 1852 is said to have cost him £40,000. It is certain that until in later life he inherited the estate of Bisham Abbey in Berkshire he was, comparatively speaking, a poor man. He was closely associated with the movement which resulted in the Industrial and Provident Societies Act of 1876, and the passing of the Consolidation Act of 1862 was almost entirely due to his efforts. Besides publishing pamphlets on co-operation he served on the executive committee which afterwards developed into the Central Co-operative Board, and took an active part in the formation of the North of England Co-operative Wholesale Society in 1863. One of the founders of the Cobden mills in 1866, and the Agricultural and Horticultural Association in 1867, he also promoted the annual co-operative congress, afterwards becoming general secretary of the Central Board. He was also a director of the Co-operative Insurance Company and a member of the Co-operative Newspaper Society for many years. He visited America in 1875 with a deputation whose object was to open up a direct trade between the farmers of the western states and the English co-operative stores. After resigning the post of secretary to the congress board in 1891, he became a member of the Oxford University branch of the Christian Social Union. He died on the 16th of September 1892.

NEALE, JOHN MASON (1818–1866), English divine and scholar, was born in London on the 24th of January 1818, and was educated at Trinity College, Cambridge. Here he was affected by the Oxford movement, and helped to found the Camden (afterwards the Ecclesiological) Society. Though he took orders in 1841, ill-health prevented his settling in England till 1846, when he became warden of Sackville College, an almshouse at East Grinstead, an appointment which he held till his death on the 6th of August 1866.

Neale was strongly high-church in his sympathies, and had to endure a good deal of opposition, including a fourteen years' inhibition by his bishop. In 1855 he founded a nursing sisterhood named St Margaret's. He occupies a high place as a hymnologist, but principally as a translator of ancient and medieval hymns, the best known being probably "Brief life is here our portion," "To thee, O dear, dear country," and "Jerusalem, the golden," which are included in the poem of Bernard of Cluny, *De Contemptu Mundi*, translated by him in full. He also published *An Introduction to the History of the Holy Eastern Church* (1850, 2 vols.); *History of the so-called Jansenist Church of Holland* (1858); *Essays on Liturgiology and Church History* (1863); and many other works.

See *Life* by his daughter, Mrs Charles Towle (1907); the *Memoir* by his friend, R. F. Littledale; and the *Letters of John Mason Neale* (1910), selected and edited by his daughter. For a complete list of Neale's works see article in *Dict. of Nat. Biog.* xl. 145.

NEAMTZU (*Neamtu*), a town in Rumania, situated among the lower slopes of the Carpathian Mountains, and on the left bank of the river Neamtzu, an affluent of the Moldova. Pop. (1900) 8578, about half being Jews. Neamtzu gives its name to the Department of which Piatra is the capital. Lying 15 m. S. by E. of Falticheni, the nearest railway station, it has little trade. Near it is the ruined fortress of Neamtzu, constructed early in the 13th century by the Teutonic knights of Andrew II., king of Hungary, in order to repel the incursions of the Cumanians. An hour's drive to the west of the town is the monastery of Neamtzu, founded in the 14th century, and containing two churches and many ancient and interesting relics. Before the secularization of the monastic lands in 1864, it was one of the richest and most important of the Rumanian monasteries. Baltzatesti, 10 m. W. by S. of Neamtzu, is locally famous for its mineral springs and baths.

NEANDER, JOACHIM (1650–1680), German hymnwriter, was born at Bremen. The family name, originally Neumann, had, according to the prevailing fashion a century earlier, been Graecized as Neander. After studying at Heidelberg and Frankfort, where he formed friendships with Friedrich Spanheim (1632–1701) and Philipp Jakob Spener (1635–1705), he settled at Düsseldorf as rector of the Latin school in connexion with the Reformed Church. In 1676 he incurred church censure for abstaining and inducing others to abstain from joining in the celebration of the communion. It was during the term of his suspension from his teaching office that many of his hymns were written. He ultimately renounced his connexion with the separatists, and in 1679 returned to Bremen as one of the preachers of St Martin's church. In the same year he published the *Bundeslieder* and *Dankpsalmen*, a collection of 71 hymns, of which many are still in use. He died on the 31st of May 1680. The Neanderthal, near Düsseldorf, takes its name from him. For his place in hymnology see HYMNS.

See J. F. Iken, *Joachim Neander, sein Leben und seine Lieder* (1880).

NEANDER, JOHANN AUGUST WILHELM (1789–1850), German theologian and church historian, was born at Göttingen on the 17th of January 1789. His father, Emmanuel Mendel, is said to have been a Jewish pedlar, but August adopted the name of Neander on his baptism as a Christian. While still very young, he removed with his mother to Hamburg. There, as throughout life, the simplicity of his personal appearance and the oddity of his manners attracted notice, but still more, his great industry and mental power. From the grammar-school (Johanneum) he passed to the gymnasium, where the study of Plato appears especially to have engrossed him. Considerable interest attaches to his early companionship with Wilhelm Neumann and certain others, among whom were the writer Karl August Varnhagen von Ense and the poet Adelbert von Chamisso.

Baptized on the 25th of February 1806, in the same year Neander went to Halle to study divinity. Here Schleiermacher was then lecturing. Neander found in him the very impulse which he needed, while Schleiermacher found a pupil of thoroughly congenial feeling, and one destined to carry out his views in a higher and more effective Christian form than he himself was capable of imparting to them. But before the year had closed the events of the Franco-Prussian War compelled his removal to Göttingen. There he continued his studies with ardour, made himself yet more master of Plato and Plutarch, and became especially advanced in theology under the venerable G. J. Planck (1751–1833). The impulse communicated by Schleiermacher was confirmed by Planck, and he seems now to have realized that the original investigation of Christian history was to form the great work of his life.

Having finished his university course, he returned to Hamburg, and passed his examination for the Christian ministry. After an interval of about eighteen months, however, he definitively betook himself to an academic career, "habilitating" in Heidelberg, where two vacancies had occurred in the theological faculty of the university. He entered upon his work here as a theological teacher in 1811; and in 1812 he became a professor. In the same year (1812) he first appeared as an author by the publication of his monograph *Über den Kaiser Julianus und sein Zeitalter.* The fresh insight into the history of the church evinced by this work at once drew attention to its author, and even before he had terminated the first year of his academical labours at Heidelberg, he was called to Berlin, where he was appointed professor of theology.

In the year following his appointment he published a second monograph *Der Heilige Bernhard und sein Zeitalter* (Berlin, 1813), and then in 1818 his work on Gnosticism (*Genetische Entwickelung der vornehmsten gnostischen Systeme*). A still more extended an elaborate monograph than either of the preceding followed in 1822, *Der Heilige Johannes Chrysostomus und die Kirche, besonders des Orients in dessen Zeitalter*, and again, in 1824, another on Tertullian (*Antignostikus*). He had in the meantime, however, begun his great work, to which these several efforts were only preparatory studies. The first volume of his *Allgemeine Geschichte der christlichen Religion und Kirche* embracing the history of the first three centuries, made its appearance in 1825. The others followed at intervals—the fifth, which appeared in 1842, bringing down the narrative to the pontificate of Boniface VIII. A posthumous volume, edited by C. F. T. Schneider in 1852, carried it on to the period of the council of Basel. Besides this great work he published in 1832 his *Geschichte der Pflanzung und Leitung der christlichen Kirche*, and in 1837 his *Das Leben Jesu Christi, in seinem geschichtlichen Zusammenhang und seiner geschichtlichen Entwickelung*, called forth by the famous *Life* of David Strauss. In addition to all these he published *Denkwürdigkeiten aus der Geschichte des Christentums* (1823–1824, 2 vols., 1825, 3 vols., 1846); *Das Eine und Mannichfaltige des christlichen Lebens* (1840); papers on Plotinus, Thomas Aquinas, Theobald Thamer, Blaise Pascal, J. H. Newman, Blanco White and T. Arnold, and other occasional pieces (*Kleine Gelegenheitsschriften*, 1829), mainly of a practical, exegetical and historical character. He died on the 14th of July 1850, worn out and nearly blind with incessant study. After his death a succession of volumes, representing his various courses of lectures, appeared (1856–1864), in addition to the *Lectures on the History of Dogma* (*Theologische Vorlesungen*), admirable in spirit and execution, which were edited by J. L. Jacobi in 1857.

Neander's theological position can only be explained in connexion with Schleiermacher, and the manner in which while adopting he modified and carried out the principles of his master. Characteristically meditative, he rested with a secure footing on the great central truths of Christianity, and recognized strongly their essential reasonableness and harmony. Alive to the claims of criticism, he no less strongly asserted the rights of Christian feeling. "Without it," he emphatically says, "there can be no theology; it can only thrive in the calmness of a soul consecrated to God." This explains his favourite motto: "Pectus est quod theologum facit."

His *Church History* (*Allgemeine Geschichte der christlichen Religion und Kirche*) remains the greatest monument of his genius. In this "Neander's chief aim was everywhere to understand what was individual in history. In the principal figures of ecclesiastical history he tried to depict the representative tendencies of each age, and also the types of the essential tendencies of human nature generally. His guiding principle in treating both of the history and of the present condition of the church was—that Christianity has room for the various tendencies of human nature, and aims at permeating and glorifying them all; that according to the divine plan these various tendencies are to occur successively and simultaneously and to counterbalance each other, so that the freedom and variety of the development of the spiritual life ought not to be forced into a single dogmatic form" (Otto Pfleiderer, *Development of Theology*, p. 280). Several of his books have passed into new and revised editions and have been translated into English. Among these English versions may be mentioned *General History of the Christian Religion and Church*, translated by J. Torrey (1850–1858); *History of the Planting and Training of the Church by the Apostle*, by J. E. Ryland (1851); *Julian and his Generation*, by G. V. Cox (1850); *Life of Jesus*, by J. M'Clintock and C. E. Blumenthal (1848); and *Memorials of Christian Life in the Early and Middle Ages*, by J. E. Ryland (1852).

See O. C. Krabbe, *August Neander* (1852), and a paper by C. F. Kling (1800–1861) in the *Stud. u. Krit.* for 1851; J. L. Jacobi, *Erinnerungen an August Neander* (1882); Philipp Schaff, *Erinnerungen an Neander* (1886); Adolph Harnack, *Rede auf August Neander* (1889); A. F. J. Wiegand, *Neanders Leben* (1889); L. T. Schulze, *August Neander* (1890); and K. T. Schneider, *August Neander* (1894). Cf. Herzog-Hauck, *Realencyklopädie*, and P. Schaff, *Germany: its Universities and Theology* (1857).

NEANDERTHAL, a ravine near the village of Hochdal between Düsseldorf and Elberfeld, Rhenish Prussia. Here in 1856 were discovered in a Quaternary bed in the Feldhofen Cave human remains which have been referred to a type commonly called Neanderthal Man. The bones found were a brain-cap, two femora, two humeri and other fragments, now in the Fuhlrott Collection, Elberfeld. The cranium, pronounced by Huxley to be the most ape-like yet discovered, was remarkable for its enormous superciliary ridges. Professor Virchow and others contended that the remarkable shape was pathological or caused by disease during the lifetime of the individual. The subsequent discovery of two other skulls, almost identical in form, at Spy in Belgium, have helped to prove its typical character. The now generally accepted view is that the Neanderthal skull represents the oldest known dolichocephalic race of Europe.

NEAP, a word only used of tides in which the high-water mark is at its lowest, there being the least difference in level between high and low water, opposed to "spring tides" (see TIDE). The word is obscure in origin. It appears in O. Eng. in *nêpflôd*, and only once alone in the expression *forthganges nêp*, "without power of advancing." It may possibly be connected with "nip," in the sense of "pinched," "scanty."

NEARCHUS, one of the officers in the army of Alexander the Great. A native of Crete, he settled at Amphipolis in Macedonia. In 325, when Alexander descended the Indus to the sea, he ordered Nearchus to conduct the fleet to the head of the Persian Gulf. The success with which Nearchus accomplished this arduous enterprise led to his selection by Alexander for the more difficult task of circumnavigating Arabia from the mouth of the Euphrates to the Isthmus of Suez. But this project was cut short by the illness and death of the king (323). In the troubles that followed Nearchus attached himself to Antigonus, under whom he held the government of his old provinces of Lycia and Pamphylia, and probably therefore shared in the downfall (301) of that monarch.

He wrote a detailed narrative of his expedition, of which a full abstract was embodied by Arrian in his *Indica*—one of the most interesting geographical treatises of antiquity.

The text, with copious geographical notes, is published in C. Müller's *Geographi Graeci Minores*, i. (1856); on the topography see W. Tomaschek, "Topographische Erläuterung der Küstenfahrt Nearchs vom Indus bis zum Euphrat" in *Sitzungsberichte der K. K. Acad. der Wissenschaften*, cxxi. (Vienna, 1890). See also E. H. Bunbury, *Ancient Geography*, i. ch. 13; and ALEXANDER THE GREAT. Ancient authorities.—Arrian, *Anab.* vi. 19, 21; vii. 4, 19, 20, 25; Plutarch, *Alexander*, 10, 68, 75; Strabo xv. pp. 721, 725; Diod. Sic. xvii. 104; Justin xiii. 4.

NEATH (Welsh, *Castell-Nêdd*), a municipal and contributory parliamentary borough, seaport and market-town of Glamorganshire, south Wales, prettily situated near the mouth of the Neath or Nêdd, on the Great Western and the Rhondda and Swansea Bay railways, $7\frac{1}{2}$ m. E.N.E. of Swansea and $183\frac{1}{4}$ m. by rail from London, via Badminton. The Neath and Brecon railway has a terminus in the town. Pop. (1901) 13,720. The principal buildings are the parish church of St Thomas (restored 1874), the church of St David (1866), a Roman Catholic church, and Baptist, Calvinistic, Methodist, Congregational and Wesleyan chapels; the intermediate and technical schools (1895), Davies's endowed (elementary) school (1789), the Gwyn Hall (1888), the town hall, with corn exchange in the basement storey, and the market-house. According to tradition Iestyn-ap-Gwrgan, the last prince of Glamorgan, had a residence somewhere near the present town, but Fitzhamon, on his conquest of Glamorgan, gave the district between the Neath and the Tawè to Richard de Granaville (ancestor of the Granvilles, marquesses of Bath), who built on the west banks of the Neath first a castle and then in 1129 a Cistercian abbey, to whose monks he later gave all his possessions in the district. All traces of this castle have disappeared. Another castle, built in the same century, on the east bank, was held direct by the lords of Glamorgan, as the westernmost outpost of their lordship. It was frequently attacked by the Welsh, notably in 1231 when it was taken, and the town demolished by Llewelyn ab Iorwerth. The portcullis gate and a tower are all that remain of it; of the abbey which was at one time the finest in Wales, there still exist the external walls, with parts of the chapel, vaulted chapter-house, refectory and abbot's house. This abbey was the spot where Edward II. found shelter after his escape from Caerphilly. At the dissolution the abbey and the manor of Cadoxton (part of its possessions) were sold to Sir Richard Williams or Cromwell. Its cartulary has been lost. Copper smelting has been carried on in or near the town since 1584 when the Mines Royal Society set up works at Neath Abbey; the industry attained huge proportions a century later under Sir Humphrey Mackworth, who from 1695 carried on copper and lead smelting at Melincrythan. Besides its copper works the town at present possesses extensive tinplate, steel and galvanized sheet works as well as iron and brass foundries, steam-engine factories, brick and tile works, engineering works, flannel factories and chemical works. In the neighbourhood there are numerous large collieries, and coal is shipped from wharves on the riverside, vessels of 300 or 400 tons being able to reach the quays at high tide. The Neath Canal, from the upper part of the Vale of Neath to Briton Ferry (13 m.) passes through the town, which is also connected with Swansea by another canal. There is a large export trade in coal, copper, iron and tin, mostly shipped from nieghbouring ports, while the principal imports are timber and general merchandise. Neath is included in the Swansea parliamentary district of boroughs.

The town perhaps occupies the site of the ancient Nidus or Nidum of the Romans on the Julia Maritima from which a vicinal road branched off here for Brecon. No traces of Roman antiquities, however, have been found. Neath is a borough by prescription and received its first charter about the middle of the 12th century from William, earl of Gloucester, who granted its burgesses the same customs as those of Cardiff. Other charters were granted to it by successive lords of Glamorgan in 1290, 1340, 1359, 1397, 1421 and 1423. By the first of these (1290) the town was granted a fair on St Margaret's Day (July 20) and as the abbey had extensive sheep walks the trade in wool was considerable. In 1685 James II. granted a charter, which, however, was not acted upon except for a short time.

NEBO, or NABU ("the proclaimer"), the name of one of the chief gods of the Babylonian pantheon, the main seat of whose worship was at Borsippa—opposite the city of Babylon. It is due to the close association of Borsippa with Babylon after the period when Babylon became the centre of the Babylonian empire that the cult of Nebo retained a prominence only some degrees less than that of Marduk. The amicable relationship between the two was expressed by making Nebo the son of Marduk. In this case the expression of the relationship in this form was intended to symbolize the superiority of Marduk, different, therefore, from the view involved in making Marduk the son of Ea (*q.v.*), which meant that the prerogatives of Ea were transferred to Marduk by the priests of Babylon.

Borsippa became in the course of time so completely a mere adjunct to Babylon that one might fairly have expected the Nebo cult to have been entirely absorbed by that of Marduk. Since that did not happen, the legitimate inference is that other deterrent factors were at play. One of these factors was the position that Nebo had acquired as the "god of wisdom" to whom more particularly the introduction of writing was ascribed. He takes his place, therefore, by the side of Ea as a cultural deity. The wisdom associated with him had largely to do with the interpretation of the movements in the heavens, and the priests of Nebo at an early age must have acquired widespread fame as astrologers. Assuming now, for which there is a reasonable amount of confirmatory evidence, that the priestly school of Nebo had acquired a commanding position before Babylon rose to political importance we can understand why the worshippers of Marduk persisted in paying homage to Nebo, and found a means of doing so without lowering the dignity and standing of their own god. If Assur-bani-pal, the king of Assyria (668–626 B.C.), in the subscripts to the copies of Babylonian literary tablets invokes as he invariably does Nebo and his consort Tashmit as the gods of writing to whom all wisdom is traced, it is fair to assume that in so doing he was following ancient tradition and that the priests of Marduk likewise were dependent upon the school at Borsippa for their knowledge and wisdom.

Nebo is therefore an older god than Marduk in the sense that his specific prerogative as the god of wisdom was too firmly recognized when Marduk became the head of the Babylonian pantheon to be set aside.

The temple school at Borsippa continued to flourish until the end of the neo-Babylonian empire, and school texts of various contents, dated in the reigns of Artaxerxes, Cambyses and Darius, furnish the evidence that the school survived even the conquest of Babylonia by Cyprus (538 B.C.). The original character of Nebo can no longer be determined with any degree of definiteness. He may have been a solar deity, but there are also decided indications which point to his being a water-deity—like Ea. It may be, therefore, that if he shows the traits of a solar deity, this may be due to the influence of the neighbouring Marduk cult, just as in return Marduk takes on attributes that belong of right to Nebo. Thus, as the god of writing, Nebo has charge of the tables of fate on which he inscribes the names of men and decides what their lot is to be. If in the systematized religious system, Marduk appears as the arbiter of human fates, the conclusion is warranted that Marduk is here imbued with the authority which originally was in the hands of his son. A reconciliation between the rival claims was effected by continuing Nebo in the rôle of scribe, but as writing at the dictation of the gods, thus recording what the divine assembly, gathered in the "chamber of fates" (known as Ubshu Kinakku) within the precincts of E-Saggila—Marduk's temple at Babylon—under the presidency of Marduk, had decided.

Nebo also does homage to his father by paying him an annual visit during the New Year celebration, when the god was solemnly carried across to Babylon, and in return Marduk accompanied his son part way back to his shrine at Borsippa. Within E-Saggila, Nebo had a sanctuary known, as was his chief temple at Borsippa, as E-Zida, "the legitimate (or 'firm') house," and the close bond existing between father and son was emphasized by providing for Marduk within the precinct of E-Zida, a sanctuary which bore the same name, E-Saggila, "the lofty house," as Marduk's temple at Babylon. The kings, and more particularly those of the neo-Babylonian dynasty, devote themselves assiduously to the worship and embellishment of both E-Saggila and E-Zida. In their inscriptions Marduk and Nebo are invoked together and the names of the two temples constantly placed side by side. The symbols of the two gods are similarly combined. On boundary stones and cylinders, when Marduk's symbol—the lance—is depicted, Nebo's symbol—the stylus—is generally found adjacent. The dragon, though of right belonging to Marduk (*q.v.*), as the conqueror of Tiamat, also becomes the symbol of Nebo, and similarly in other respects the two form a close partnership. Such is the relation between the two that occasionally, as in the official reports of astrologers and in official letters, Nebo is even mentioned before Marduk without fear of thereby offending the pride of the priests of Marduk.

In Assyria the Nebo cult likewise enjoyed great popularity, and there is a record of one Assyrian ruler who made Nebo his specific deity and called upon his subjects to put their whole trust in him. One may discern, indeed, a tendency in Assyria to take advantage of the almost equal plane on which Nebo stands with Marduk in Babylonia, to play off Nebo as it were against Marduk. The Assyrian kings in this way, by glorifying at times Nebo at the expense of Marduk, paid their debt of homage to the south without any risk of lowering the grade of their own chief deity Assur. Marduk was in a measure Assur's rival. This was not the case, however, with Nebo, and they accordingly showed a desire to regard Nebo rather than Marduk as the characteristic representative of the southern pantheon. In the astral-theological system Nebo was identified with the planet Mercury. His consort, known as Tashmit, plays no independent part, and is rarely invoked except in connexion with Nebo.

See also BABYLON, BORSIPPA, BABYLONIAN AND ASSYRIAN RELIGION. (M. JA.)

NEBRASKA, a state just N. of the centre of the U.S.A., lying approximately between 40° and 43° N. and between 18° 18′ W., and 27° W. from Washington. It is bounded on the N. by South Dakota, on the E. by Iowa and a corner of Missouri, on the S. by Kansas, on the S. and W. by a corner of Colorado, and on the W. by Wyoming. The Missouri river extends along the eastern and north-eastern border. The extreme length of the state is about 430 m., and extreme breadth about 210 m. The area is 77,520 sq. m., of which 712 are water surface.

Physical Features.—The state lies partly in the physiographic province of the Great Plains (covering more than four-fifths of its area) and partly in that of the Prairie Plains, and slopes gently from the N.W. to the S.E. The altitudes of extreme geographical points are as follows: Rulo, in the S.E. corner of the state, 842 ft.; Dakota city, in the N.E., 1102; Benkelman, in the S.W. in Dundy county, 2968; Kimball, in the S.W. in Kimball county, 4697; Harrison, in the N.W. corner, 4849 ft. There are three physiographic subdivisions; the foot-hills (and Bad Lands), the sand-hills and the prairie—all three being portions of three great corresponding regions of the Great Plains and Prairie Plains provinces.

The western portion of the state lies in the foot-hills of the Rocky Mountain system, and is much rougher than western Kansas. The surface of western Nebraska is characterized by high, barren tablelands, broken by canyons, dotted with buttes, and dominated by some bold and lofty ridges. Pine Ridge, a picturesque escarpment of the Great Plains, cuts across the N.W. corner of Nebraska from Wyoming into South Dakota. A ridge of low hills and bluffs, often precipitous, marked by buttes and deeply cut in places by canyons, it is the most striking surface feature of the state. The altitude in this region varies from 3500 to 5000 ft. In the fork of the North and South Platte are the Wild Cat Mountains with contours rising to 5300 ft., in which Wild Cat Mountain, long reported as the highest point in the state, attains 5038 ft., Hogback Mountain 5082 ft., and various other hills—Gabe Rock (5006), Big Horn Mountain (4718), Coliseum Rock (5050), Scotts Bluff (4662) &c.—rise to heights of 4500 to 5000 ft. In the extreme N.W. the White river and Hat Creek have carved canyons in deep lacustrine deposits, creating fantastic cliffs and buttes, bare of vegetation, gashed with drainage channels, and baked by the sun. The buttes—bare, pyramidal or conical, flat-topped, precipitous hills, and often fantastic, towering pinnacles—are rather widely distributed through the foot-hill region. They are never more than 600 to 1000 ft. above the surrounding country. Nature is not grand in any part of Nebraska, but the Bad Lands are imposing, and in the wooded foot-hills there is an abundance of bold and attractive scenery, particularly in Sioux county, and in Cherry county around Valentine and on the canyon of the Snake river. East of the Bad Lands is the sand-hill region, which includes an area of possibly 20,000 sq. m. The sand-hills proper are scattered over an area of perhaps 15,000 sq. m., between the meridians of 98° and 103° W. long., lying mainly N. of the Platte; though there are some along the Republican river. In places they rise in tiers, one above another, like miniature mountains, and are 200 to 300 ft. high; but in general they are very low (25-50 ft. high) and are scattered over a plain. Their present contours are wholly the result of wind action. Save in rare instances, however, they have long ceased to be shifting dunes; for, with the cessation of prairie fires and the increase of settlement, they have become well grassed over and stable; although sand-draws, and even occasional "blow-outs" scooped by the winds in the summits or sides of the hills are still characteristic landmarks. All about and inter-penetrating the foot-hill and sand-hill regions are the prairies, which include three-fourths of the state. They are sometimes characteristically flat over wide areas, but are usually gently rolling. Stream valleys and bottom lands are the conspicuous modifying feature of the prairie region; but in general, owing to the gentle slope of the streams and the great breadth of the plains, erosion has been slight; and indeed the streams, overloaded in seasonal freshets, are building up their valley floors. The water-partings are characteristically level uplands, often with shallow depressions, once lakes, and some of them still so. The valleys of the greatest streams are huge shallow troughs. The valley floor of the North Platte in the foot-hills, the flood-plain of an older river, is in places 700 ft. or more below the bounding tableland, and 10 to 15 m. wide; the present flood-plain being from 1 to 4 m. in width. Hundreds of small tributaries to the greater streams (especially along the Republican and the Logan) complicate and beautify the landscape. No farming country is richer in quiet and diversified scenic charm than the prairies of the eastern half of the state. The Missouri is noteworthy for high bluffs cut by ravines, which border it almost continuously on at least one side. In the foot-hills there are typical canyons, as along the Platte forks, and in the northern edge of the sand-hills. Those of the upper Republican are the largest, those of the Bad Lands are the most peculiar; and the Niobrara tributary system is the most developed.

Rivers.—The Missouri skirts the eastern border for perhaps 500 m. It is not navigated, and save at Sioux City and Omaha serves practically no economic purposes, irrigation being unnecessary in the counties on which it borders. Its bluffs, cut for the most part in the loess but at places in the rock, are frequently from 100 to 200 ft. high. At Vermilion, South Dakota, its alluvial plain, 1131 ft. above the sea, is 330 ft. above the mouth of the Nemaha. The current is always rapid and heavily loaded with sediment,[1] and its axis is forever shifting. Large areas of soil are thus shifted back and forth between Nebraska and the bordering states, to the encouragement of border lawlessness and uncertainty of titles; some portions E. of the thread and apparently well within Iowa remain under the jurisdiction of Nebraska, or vice versa; and Yankton has been seriously threatened with a sudden transfer from the South Dakota to the Nebraska side. The Platte system is also heavily loaded with sediment in Nebraska. The North and South forks both rise in Colorado; each, especially the latter, has a rapid primary descent, and a very gradual fall down the foot-hills of the Great Plains.[2] Across Nebraska it maintains a remarkably straight course and an extraordinarily even gradient (about 6 ft. per mile). In the spring freshets it is a magnificent stream, but in summer its volume greatly shrinks, and it is normally a broad, shallow, sluggish, stream, flowing through interlacing channels among the sand-bars it heaps athwart its course. The underflow is probably much greater than the summer surface flow in volume. The Loup system is remarkable for the even dip of its parallel feeders, which once joined the Platte separately, until the latter banked up its deposits across the mouths of their more sluggish currents. The Republican and South Platte—the former an intermittent stream—suffer in their flow from the drain made upon their waters in Colorado for irrigation. The upper course of the Niobrara above the Keya Paha is in a narrow gorge. Its immediate bluffs and the shores of some of its tributaries, notably the Snake, are modified by cañons. This system is also notable among Nebraska streams for a number of pretty water-falls. The White river, heading on Pine Ridge, falls 1100 ft. in 20 m. Some streams wholly dry up in the dry seasons, and in the foot-hills and sand-hills there are a few that disappear by sinking or evaporation.

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[1] About 52 grains per gallon at low water, 404 at high.

[2] The North Platte falls 3700 ft. in 510 m., the South, 7200 ft. in 427 m., above their junction; the latter falling 2692 ft. in 308 m. after leaving its canyon in the Rockies.

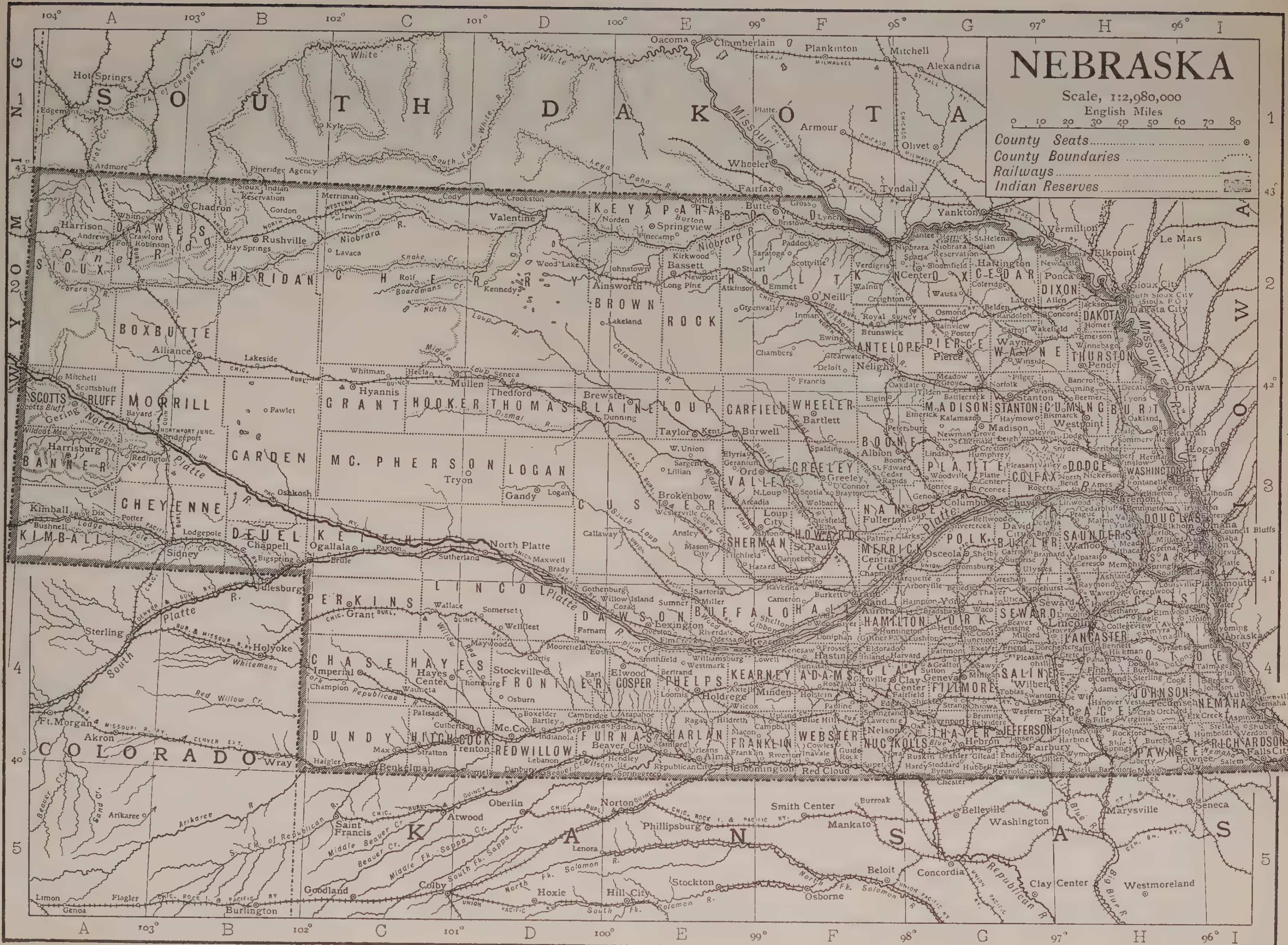
Surface Water.—Swamps and bogs, apart from purely temporary weather ponds, are confined to a few restricted regions of the Missouri river bottoms and the prairies of the S.E. There are some cut-offs or oxbow lakes along the Missouri, and many lakelets originally such are scattered along the Platte, Elkhorn, Big Blue and other rivers. Scores of lakes are scattered about the heads of streams rising in the sand-hills, especially in Cherry county. Some of them are fresh and some alkaline. Springs also are numerous in the sand-hills, where they form considerable streams. They often flow with force and are known locally from this peculiarity as "artesian" springs, or sometimes, from this and their large size, as "mound" springs. The state fish-hatchery is on springs at South Bend; at Long Pine springs of large flow supply the town and railway shops with water, and led to the establishment here of Chautauqua grounds.

Underground Water.—The so-called blowing-wells are peculiar. They occur over much of the state, but most frequently S. of the Platte, and are evidently sensitive to barometric conditions; alternately "blowing" or "sucking" as these vary; so that, in cold weather water-pipes may be frozen 100 or more feet below the surface of the ground. Atmospheric pressure is probably the principal cause of their action; they are therefore termed "weather wells" in some localities. Nearly all counties have a practically inexhaustible supply of ground water. Well-depths vary from 15 to 20 ft. in the stream valleys and from 30 to 35 ft. on the loess prairies to 100-400 ft. in the western foot-hill region and isolated prairie areas. Artesian water is also available in many parts of the state. At Niobrara, in Knox county, a well 656 ft. deep, drilled in 1896, yielded for a time 2500 gallons per minute at 95-℔ pressure (in 1903 1900 gallons at 65-℔ pressure), and furnishes power for a flour-mill and municipal water and electric lighting works; the pressure forces the water about 210 ft. above the mouth of the well, *i.e.* to a height of 1450 ft. Another (1430 ft. deep), in the environs of Omaha, supplies a daily flow of 1,100,000 gallons under a pressure of 15 ℔. In some small and exceptional regions the water is very alkaline, and in the counties of the south-east it is so generally saline that it is difficult, below 150 ft., to avoid an inflow of salt water. Saline wells at Lincoln (2463, 1050 and 570 ft. deep) and at Beatrice (1260 ft.) are notable in this regard.

Geology.—The eastern part of the state is covered with a thick mantle of Quaternary (Pleistocene), and the greatest part of the western portion with very thick deposits of Miocene and Pliocene (Tertiary). To the Pleistocene belong the alluvium, loess and glacial drift, and in part the sand-hills. The drift covers the eastern fifth of the state. In striking contrast to Iowa, the Nebraska deposit is very thin, seldom thicker than 1 or 2 ft. Above the drift there is usually a heavy covering of loess or "bluff deposit" (particularly typical in the neighbourhood of Omaha and Council Bluffs). Though thin and worn out in places, it averages probably 100 ft., and is often as much as 200 ft. in thickness, and runs diagonally across the state from the N.E. to the Colorado inset. The opinion that it is of aqueous origin (and probably dates from the close of the glacial time) has the weight of authority. It was spread by the rivers: some evidences of wind action may be attributed to a later period. The sand-hills, which overlap the loess N. of the Platte, are probably mainly derived from the Arikaree, but probably also in part from the early Pleistocene. West of 102° long. there are beds several hundred feet thick of late Tertiary sands and clays. The Arikaree (Miocene) and Ogallala (Pliocene) formations of the North Loup beds are superficial over much of the western half of the state, the former to the N., the latter to the S. The buttes are characteristically Arikaree or Gering formations topping Brule clay. The same is true of at least considerable parts of Pine Ridge. In the Bad Lands there are scanty outcrops of the Chadron formation (known also as "Titanotherium beds"), the oldest of the Tertiary beds. The thick superficial coverings over the state make difficult the determination of the underlying strata. There are only very scanty outcrops except along the rivers. No Archean rocks are exposed in Nebraska, and the sedimentary formations are undisturbed *in situ.* The Palaeozoic era is represented only by the Pennsylvanian series of the Upper Carboniferous and a scanty strip of Kansas-Nebraska Permian, and is confined to the S.E. counties. But, though small in area, the Carboniferous is by far the most important formation as regards mineral resources within the state. It is buried probably 2000 or 3000 ft. in central Nebraska, outcropping again only in the Rocky Mountains. Upon it, in the trough thus formed, rest conformably the basal strata of the Cretaceous; the Jurassic and Triassic being wholly absent (unless in the extreme north-west). The E. limit of the Cretaceous extends across the state from N. to S. between 98° and 99° W. long. Its groups include the Dakota formation, characterized by a very peculiar rusty sandstone, and the Benton, both of which are rather widely accessible and heavy; the Niobrara; the Pierre shales, which apparently underlie about three-quarters of the state in a deep and heavy bed; and, in the extreme west, the Laramie. There are almost no Cretaceous outcrops except on the streams, especially the Niobrara, Republican and Platte rivers—and in the Bad Lands. The superficial Miocene and Pliocene deposits in the west, above referred to, are underlaid by the White river groups of the Oligocene, whose outcrops of Brule clay and Chadron formation also have been mentioned. The Bad Lands are essentially nothing but fresh-water mud excessively weathered and eroded. They are often intersected by dikes of chalcedony, formerly mistaken for lava. The Bad Lands and the Arikaree are famous fossil fields, the latter being the source of the *Daemonelix,* or "Devil's cork-screw," a large spiral fossil, apparently a lacustrine alga. It was once generally supposed that the Pliocene epoch in Nebraska was distinguished by the activity of geysers; but the so-called "geyserite" now known commonly and correctly as "natural pumice" and "volcanic ash," which is found in the Oligocene and later formations, has no connexion whatever with geysers, but is produced by the shattering of volcanic rock. It occurs widely in Nebraska and adjoining states.

Minerals.—Mineral resources are decidedly limited; the total value of the mineral output (excluding coal) in 1907 was $1,383,916, of which $953,432 was the value of clay products, $324,239 of stone, and $54,227 of sand and gravel. The state, however, is particularly rich in good clays, which are probably its greatest mineral resource. Calcite of excellent quality is the commonest mineral. Gravel is widely obtainable, and sand of the finest quality is available in inexhaustible quantities, and is an important article of export. Flint (valuable for railway ballast) occurs in immense quantities about Wymore and Blue Springs. The underground salt water flow promised once to be a resource of value, especially in the vicinity of Lincoln, but has proved of little or no value in comparison with the great salt-beds of Kansas. A native plaster is yielded by the Arikaree and Ogallala rocks, but though otherwise of excellent qualities it is ruined by slight exposure to the water. A diatomaceous earth in central Nebraska, occurring especially in the region of Loup, is a good polishing powder, and is used for packing steam pipes. Limonite in the form of ochre occurs in considerable quantity. Of building stones limestones are the most abundant and important, the best comes from the Benton beds and when "green" can be sawed into blocks. The Dakota formation, though its sand-stones are in general coarse or otherwise inferior, yields some of splendid quality. Its clays, which are of all colours, are the most valuable of the state. The finest building stone is a beautiful green quartzite rock of dense, fine texture and lasting quality. It is related to the Ogallala beds and occurs only in small areas. The quarries and clay pits of the state are mainly in the Carboniferous region of the S.E. Cretaceous lignite occurs in small quantities in the N.E., and peat more widely. The Carboniferous formations carry only thin seams of coal, never thicker than about 2 ft., and rarely readily accessible, and they can never be of more than small and merely local importance.

Flora.—Nebraska lies partly in the arid, or Upper Sonoran, and partly in the humid, or Carolinian, area of the Upper Austral life-zone; the divisional line being placed by the United States Biological Survey at about 100° W. long. The most marked characteristic of Nebraskan vegetation is its immigrant character, and the state has been called "one of the finest illustrations of the commingling of contiguous species to be found anywhere in America" (C. E. Bessey). Immigrant species have even come from Texas and New Mexico, from the Dakotas and the Rockies. From the last-named various species have crept two-thirds of the way across the state, one (the buffalo berry) wholly covers it, and some have barely crossed into the border foot-hills from Wyoming. A very few trees and shrubs, and some grasses, are strictly endemic to the plains and to Nebraska. Four floral regions lying in north to south belts across the state, and closely corresponding to—though in boundaries by no means coinciding with—its great topographic divisions are distinguished in the regions of the Missouri border, the prairies, sand-hills and foot-hills. In 1896 some 3196, and by 1905 fully 3300 species had been listed, "representing every branch and nearly every class of the vegetable kingdom" (C. E. Bessey). There are at least 64 trees and at least 77 shrubs growing native in the state; but of their joint number a mere half-dozen or so can be classed as strictly endemic. Small woods of broad-leaf trees (and red cedars) grow very generally along all the water-courses of the state; and coniferous species grow along Pine Ridge and the Wild Cat Mountains. In the East, various trees are readily grown on the uplands; in the West the honey-locust, the Osage orange and Russian mulberry for windbreaks; the green ash, and red cedar are perhaps the most valuable drought resisting species. The conifers are spreading naturally. In the sand-hills the sand-bar willow of the rivers and the cottonwood growing naturally, evidence the good conditions of moisture; and the forestation of much of the region is undoubtedly possible. Forest reserves were established on the Dismal river in 1902 and millions of seedlings had been grown by 1906 for transplantation in Nebraska and other states


NEBRASKA
Scale, 1:2,980,000
English Miles
0 10 20 30 40 50 60 70 80
County Seats
County Boundaries
Railways
Indian Reserves
SOUTH DAKOTA
WYOMING
COLORADO
KANSAS
IOWA
Missouri R.
Platte R.
Niobrara R.
Republican R.
SIOUX
DAWES
SHERIDAN
CHERRY
KEYAPAHA
BOYD
HOLT
KNOX
CEDAR
DIXON
DAKOTA
BROWN
ROCK
ANTELOPE
PIERCE
WAYNE
THURSTON
BOXBUTTE
SCOTTS BLUFF
MORRILL
BANNER
KIMBALL
CHEYENNE
DEUEL
KEITH
GARDEN
GRANT
HOOKER
THOMAS
BLAINE
LOUP
GARFIELD
WHEELER
MADISON
STANTON
CUMING
BURT
MC. PHERSON
LOGAN
CUSTER
VALLEY
GREELEY
BOONE
PLATTE
COLFAX
DODGE
WASHINGTON
LINCOLN
PERKINS
DAWSON
BUFFALO
SHERMAN
HOWARD
NANCE
MERRICK
POLK
BUTLER
SAUNDERS
DOUGLAS
SARPY
HALL
HAMILTON
YORK
SEWARD
LANCASTER
CASS
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CHASE
HAYES
FRONTIER
GOSPER
PHELPS
KEARNEY
ADAMS
CLAY
FILLMORE
SALINE
JOHNSON
NEMAHA
GAGE
DUNDY
HITCHCOCK
REDWILLOW
FURNAS
HARLAN
FRANKLIN
WEBSTER
NUCKOLLS
THAYER
JEFFERSON
PAWNEE
RICHARDSON
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North Platte
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Emery Walker sc.

of the Great Plains. Arbor Day (the 10th of April) was instituted by the Nebraska State Board of Agriculture in 1872 at the instance of J. Sterling Morton, later secretary of agriculture of the United States (see ARBOR DAY). It has been yearly observed by the public schools of the state, and no state has done more than Nebraska for the forestation of its waste and prairie lands. In such a purely agricultural state a large wooded area is not desired. Plums, grapes and the dwarf "sand-cherry" (*Prunus demissa*) of the sand-hills are prominent among many wild fruits. The flora is decidedly rich in species as compared with other states, but less so in the number of individuals. Grasses are perhaps the most noteworthy vegetable forms. Nebraska claims a greater variety of native hay and forage species than grow in any other state of the Union. No less than 200 grasses, at least 154 being wild or commonly cultivated, had been listed in 1904. Of the total 200 species 150 (130 indigenous) are valuable for forage, 34 (20 indigenous) are classed economically as weeds, 10 are non-indigenous cereals and 6 are ornamental. The short buffalo-grass was originally everywhere abundant, but it had practically disappeared by 1890 from the eastern half of the state, and since then has steadily become more restricted in habitat. The native prairie grasses have been in considerable part displaced by grasses introduced from more humid regions. Weeds are very numerous (about 125); and some, notably the sand-bur (*Solanum rostratum*) cockle-bur, and tumble-weeds among indigenous, and the Russian thistle (*Salsola tragus*) and purslane among non-indigenous species, are agricultural pests. Nothing can surpass in beauty the rank grasses and bright flowers that grow on the lowlands and rolling uplands of a virgin prairie—now hardly to be found in the state. The common sunflower (the most conspicuous weed of the state) and allied flowers, which spring up in myriads even in the midst of unbroken prairie wherever this is disturbed, line the roads with yellow bands from horizon to horizon, enclose the broken fields and choke waste places.

Fauna.—The fauna of the state is not known with the same thoroughness and detail as the flora, but it too is varied. This is notably true of birds and of insects. Of the latter there are probably 12,000 to 15,000 species, including 140 butterflies, at least 180 grasshoppers, several hundred bees, &c. The so-called "grass hoppers," true locusts, have done great damage at times in Nebraska. About a third of all the species known in the United States are found within the state or close to its borders, and of these, 9 or 10 are so common that their increase under conditions favourable to their development may be a danger Such conditions are found in dry years, unfavourable to their chief parasitic enemies, favourable to their own breeding, and the cause of their migrations. There were locust plagues in 1874, 1876 and 1877. Fungus parasites have been used with some, but on the whole rather slight, success, and mechanical appliances with perhaps greater success, in combating these pests. Birds are more effective. As in the case of plants, western, eastern, northern and southern avian species meet in Nebraska. In 1905 some 415 to 420 species had been found within its borders, and more than half of these were known to nest in the state; 120 had been counted in the winter. The lakes of the sand-hills are the breeding-place—less so as settlement increases—of myriads of water-fowl. Before the advent of the white man Nebraska was full of wild mammals, the buffalo, elk, black and white tailed deer, antelope, bears, timber wolves, panthers (pumas), lynx, otter and mink being common. Almost all that remain are black bears, foxes, coyotes (prairie wolves), mink, musk-rats, raccoons and prairie dogs (or gophers). Antelope were not uncommon in the west and northwest until after 1890. The coyote is still so common even in the east as to be a nuisance to the farmer; in 1907 a bounty law was in force which provided for the payment of a state bounty of $5, on every grey wolf, $1·25 on every coyote and $1 on every lynx (wild cat). A few rodents have increased in numbers; the prairie dog especially is a pest in the alfalfa fields of the arid lands (as are pocket-gophers at places in the east).

Climate.—The climate of Nebraska is typically inland or continental; *i.e.* it is characterized by "winters of considerable severity, summers of unusual warmth, rainfall in limited quantities, marked and sudden changes of temperature, large seasonal and daily temperature ranges, and dry, salubrious atmosphere, with a small percentage of cloudiness, and a large percentage of sunshine."[1] The average wind velocity for the High Plains of Nebraska and adjoining states is about 10 to 12 m.; 25 m. is not uncommon; and a velocity of 40 m. and over is recorded a half-dozen or more times every year. In spring velocities of 15 to 20 m. are common. The average velocity of winds for the entire state for 11 years preceding 1906 was 9·8 m. per hour. The prevailing directions are those common to a large part of the western Mississippi valley. The prevailing wind of the year is N.W.; but in the spring, the summer and much of the autumn its predominance is greatly reduced or overcome by S. and S.W. winds blowing from the Gulf of Mexico (but deflected by the rotation of the earth). Sometimes these winds blow in the winter—causing the curious phenomenon of melting snows on the coldest days of the year; in the summer in seasons of drought, especially in the western part of the state, this wind from the Gulf sometimes reaches Nebraska wrung dry of its moisture and so hot that in a day or two it shrivels and ruins the crops in its path. Such calamities are, however, uncommon, and the belief that Nebraska is often visited by tornadoes is erroneous.

The normal mean-annual temperature of the state is about 48·7° F, and the normals for the six approximately equal weather sections into which the state is divided by the National Weather Service are respectively about 48°, 50·5°, 48·6°, 50·4°, 47·9° and 46·6° F. This illustrates the extraordinary homogeneity of climatic conditions. But there is a considerable difference in the averages for different months—the normal means of January and July through 30 years being 20·9° and 74·6° F., and the means of spring, summer, autumn and winter respectively about 48°, 72°, 53° and 23·5° F. Thus there is for any particular locality a wide range in absolute temperature through the year, which averages for the state probably about 120° (1897–1905). Similarly, the range is large through the day, especially in the higher altitudes, where the nights are almost invariably cool and refreshing after even the hottest day. The number of continuous days with a mean temperature above 50° F., averages probably about 175 for the state. The actual growing-season between frosts is, however, not so great. Temperature is of course lower as one moves to the N. and N.W., the initial planting and harvesting of each crop progressing wave-like across the state in from one to two weeks. Especially in the W. and N.W. there are in some winters occasional anti-cyclonic or high-area storms known as blizzards—wind-storms preceded or accompanied by snow-fall—which are very severe. They continue from one to three days, and are habitually followed by very low temperature. They are the cause of great loss to the cattle owners. Such storms are, however, rare. In the S.E. portion of the state the winters are characteristically mild and open. Temperatures below zero are rare for any locality; and the same may be said of temperatures above 95° in summer.

The normal mean-annual precipitation for the whole state is about 23·84 in. in rain and melted snow, the actual yearly fall varying through 30 years between 13·30 and 31·65 in. Such rainfall might seem inadequate for an agricultural country: moreover, the eastern half of the state is more favoured than the western, which belongs, indeed, to the semi-arid Great Plains on which the Reclamation Service of the United States Government is active. But aridity is a matter of the efficiency rather than of the mere quantity of rainfall, and in this regard Nebraska is very fortunately situated. Rain is most plenteous in the critical months of the year. Seven-tenths of all precipitation falls in the growing season, giving the state, especially in the east, a greater amount at this time than many other states whose aggregate yearly rainfall is greater; so that Nebraska has an abundance for the safest cultivation. Moreover, nine-tenths of the rainfall is absorbed by the loess and sandy soils, only one-tenth being "run-off." It is a widely spread but unfounded belief in Nebraska that the rainfall has been increasing since the settlement of the state. That its storage has very greatly increased as cultivation has been extended (the prairie sod sheds water like a roof) is true; moreover, the spread of scientific principles of farming has increased the advantage derived from the ground-water stored. Efficient rainfall has thus been greatly increased. Intermittent streamlets may well become perennial, and many are probably, as reported, becoming so. It is even conceivable that the settlement of the state may affect the seasonal distribution of precipitation; and that an advantageous alteration has in fact resulted is believed by many.

The climate of Nebraska is exceptionally healthy. Its beneficial qualities must be attributed to the state's inland situation, its dry and pure air, constant winds and splendid drainage, to which its even slope and peculiar soil alike contribute. In some people, however, nervousness is induced; and the winds, in particular, often have this effect. Autumn is perhaps the finest season; the fields are green into the winter, the air is pure and fresh, though dry and warm, and the long season is delightfully mild and beautiful. The arid portion, as compared with the eastern portion, of the state has alike the advantages and disadvantages of a climate more sharply characterized.

Soil.—Geologically Nebraska is one of the most typical agricultural states of the Union; although in the present distribution of industrial interests agriculture is by no means so predominant as in some southern states. The basis of the soils is sands (coarse, fine or silt); clay beds, though economically important, are in quantity relatively scant. In the eastern half silt, and in the western fine sand, form the bulk of the soil. There are five well-defined soil regions corresponding to the geologic-topographic divisions already indicated of drift loess, sand-hills, foot-hills and Bad Lands. The loess is a "salt, fine sandy loam with a large percentage of sand or silt, and considerable calcareous matter, and usually a small amount of clay." It contains considerable humic matter, discolouring rapidly in the air (when exposed it is characteristically a bright buff). It is of extraordinary fertility, and its great depth (in Lincoln and Dawson counties bluffs 200 ft. thick are found) is a guarantee of almost inexhaustible resources. The glacial drift is also a useful deposit, coarse ingredients in it being of small amount (rare boulders, and some gravel). The superficial soil over most of the state, and everywhere in the E. except rarely where the loess or drift is bare, is a rich, black vegetable mould, 1 to 5 ft. thick on the uplands. The sand-hills are not inherently infertile; the soil never bakes, is always receptive of moisture, absorbing water like a sponge and holding it well. There is a great amount of fertile valley land, adequately watered. Alfalfa and other cultivated grasses are encroaching on the whole region, and even the natural arid-land bunch grasses make excellent grazing. The "butte" soil of the W. is a fine sandy soil, characteristically calcareous, derived from the Arikaree. With it also moisture is a great factor in its productivity. The Bad Lands are by no means infertile (their name, it should be noted, was originally *Mauvaises terres à traverser*); but they are almost destitute of ground water, though containing many green "pockets" where surface water can be stored. They contain much clay and marls, non-absorbent and subject to such excessive wash that vegetation cannot gain a foothold. In various parts of the west are small tracts of so-called "gumbo" soil; they are due to the Pierre shale, are poorly drained and characteristically alkaline. Small alkaline areas also occur about lakes in the sand-hills. Where surface water is adequate the regions of the Pierre shale make splendid grazing lands; but in general they are not very useful for agriculture. Salt lands occur about Salt Creek notably around Lincoln. The stream bottoms of alluvium are modified by loess and humic deposits, and are of course very fertile; but hardly more so than the loess of the uplands.

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[1] Senate Executive Document 115 (vol. 10), 51 Congress, 1 Session (1890), *Climate of Nebraska.*

Agriculture.—Agriculture is not only the chief industry but is also the foundation of the commerce and manufactures of the state. In 1900, of the total area 60·8% was reported as included in farms, and 37·5% as actually improved. The rank of the state in the Union was 13th in value of farm property, and 10th in value of farm products. The farm value was $747,950,057, an increase since 1890 of 46·1%; while the total product-value was $162,696,386—an increase (partly factitious) of 143·4% in the same period. A greater part of the state was reported improved in 1890 than in 1900; the change was due to the increase of stock-raising in the West. Similarly, the size of the average farm increased from 156·9 acres in 1880 to 190·1 in 1890, and 246·1 in 1900, although in eastern Nebraska there was a contrary tendency. Under the Kincaid law, which permits entire sections instead of quarter sections (160 acres) to be homesteaded, this movement has been fostered. In the years 1880–1900 the number of farms operated by cash tenants rose from 3·1 to 9·6%; of share tenants from 14·9 to 27·3% of the total. There is no appreciable tendency toward management for absentee owners. The census of 1900 showed that not less than two-fifths of the total net income came from live stock or from hay, grain and forage on farms representing together 96% of the farm-value of the state—live stock being a trifle more important; dairying was similarly predominant for 1·6%, and beet-sugar for 0·1%. Other crops were unimportant sources of revenue. Sugar-beet culture has developed since about 1889; it is localized largely in Lincoln county, near North Platte, though beets are raised over a large part (especially the western part) of the state. In 1907 about 11,000 acres were planted to sugar beets. The principal factory for the slicing of the beets is one built at Grand Island, Hall county, in 1890. The dairy interest is rapidly growing, but is still exceeded in other states. Omaha is a great dairy market. Nebraska ranks very high in the production of cattle and hogs. A fourth of all animal products are represented by milk, butter and cheese, eggs and poultry; the rest by animals killed on the farm or sold for slaughter, most of them going to supply the meat-packing industry of South Omaha. Wild, salt and prairie grasses make up the bulk of the forage acreage, but the cultivated crops—especially millet and Hungarian grasses and alfalfa—are more important. Holt county in the Elkhorn valley, and Sheridan county in the foot-hills, produce more than half the hay-crop of the state. Alfalfa can be grown with more or less success in every county of the state, not excepting areas where clay or sand form the sub-soil; but on the uplands of the central part of the state it is produced with the greatest success and in the greatest quantities. In 1908, according to the reports of the state Board of Agriculture, the crop of Custer, Dawson and Buffalo counties was about 15% of the total crop (1,846,703 tons) of the state. The product was quintupled between 1899 and 1905, and between 1905 and 1908 the increase was about 40%. It has been a great aid to western Nebraska as to other portions of the Great Plains. Sorghum and kafir corn are also excellent, and broom-corn fairly good, as drought-resistant crops; the last, which is of lessening importance, is localized in Cass, Saunders and Polk counties. Cereals are by far the most important crops, representing in 1899 four-fifths of farmed land and crop values. Allowing for variations in "off years," but speaking with as much exactness as is possible, Nebraska has established her position since about 1900 in the third, fourth and fifth rank respectively among the states of the Union, in the production of Indian corn, wheat and oats. Of these, Indian corn is by far the most important, representing normally about two-thirds of the total crop value; while wheat and oats each represented in 1906 about one-seventh of the total crop, and rye, barley, kafir-corn and buckwheat make up the small remainder. Indian corn is grown to some extent all over the state, except in the north-west, but the great bulk of the crop is produced east of the 99th meridian. It is rarely cut, but is left to mature and dry on the stalk in the field. The yearly yield in the decade 1895–1904, according to the most conservative state statistics, varied from 298,599,638 to 72,445,227 bushels, and the average was 178,941,084 bushels, or 190,773,957, omitting the failure of 1901; the yield per acre being similarly 26·35 or 27·9 bushels (12·4 in 1901);[1] in 1906 the crop was 249,782,500 bushels, and the average yield per acre 34·1 bushels; in 1907 the crop was 179,328,000 bushels, and the average yield only 24 bushels per acre. According to the report of the state Board of Agriculture, Custer, Lancaster and Saunders counties produced the largest amounts (each more than 5,000,000 bushels) of Indian corn in 1908. Since 1900 Nebraska has become one of the foremost winter wheat states, second only to Kansas. Little spring wheat is now sown except in the northern counties, the state being on the northern edge of the winter wheat belt. From 1880 to 1890 the acreage devoted to wheat greatly diminished, because the spring variety was not relatively remunerative, but the acreage trebled in the next decade as autumn planting increased. The winter varieties have the advantages of larger yield, earlier ripening and lesser loss from insects, and afford protection to the soil. The growth of durum (macaroni) wheat is also increasing, but is hampered by the uncertainty of market, which is for the most part foreign. The wheat crops of the decade 1895–1904 averaged 33,208,805 bushels a year; or ranged from a minimum of 9·8 to a maximum of 20·9, averaging 15·8 bushels to the acre; in 1906 the crop was 52,288,692 bushels, and the average yield 22 bushels per acre; and in 1907 the crop was 45,911,000 bushels, and the average yield 18·1 bushels per acre. In 1908 Clay, Adams and Hamilton were the principal wheat-growing counties in the state. The corresponding figures for oats were: average yield for the decade, 48,145,185 (range, 28,287,707 in 1901 to 66,810,065 in 1904); range of yield per acre, 17·9 to 34·0, and average 27·6 bushels per acre; in 1906 the crop was 72,275,000 bushels and the average yield per acre 29.5 bushels; in 1907 the crop was 51,490,000 bushels, and the average yield 20·4 bushels per acre. In the decade 1890–1900 the state did not rise above the 10th rank in the Union; after 1900 her rise was rapid. The same is even more markedly true of rye; in 1907 the crop was 1,502,000 bushels (from 88,400 acres), a yield exceeded in only five states in the country. Apples are raised in the N.E. and S.E. sections of the state, and are much the most important fruit grown. Peaches are next in importance, and horticultural enthusiasts believe that the possibilities of this crop are very great. Other fruits are raised with much success, and in 1904 at St Louis the horticultural exhibit of the state led those of all other states in the medals received for excellence; but nevertheless its relative rank in the Union as a fruit-producing state is still low.

In a period of 30 years (1869–1898) there were, according to the state Board of Agriculture, four seasons whose crops could reasonably be classed as failures, three more as "short," one as fair, eighteen as good, and four as great. Compared with adjoining states—Iowa, Minnesota, South Dakota, Kansas, Missouri—none shows a greater, if indeed any shows so great an average value per acre in the yield of Indian corn, wheat, oats, barley and rye; and this despite the assumed handicap of the western half of the state. In fact the yield of this section relatively to cultivated acreage is normally fully equal to that of the eastern section; a result quite consistent with the scientifically proven fertility of semi-arid lands. The real handicap of the western counties would be shown in comparing aggregate yields per given area; for much land is normally inarable. Alfalfa, stock raising and dairying, afforestation, "dry-farming" and irrigation are, however, proving that the West can maintain prosperity by not relying upon ordinary agriculture. Alfalfa is not easily started, however, on the uplands of the extreme western part of the state; and dry-farming (the Campbell dust-mulch system) has the expensiveness in labour of intensive cultivation. The above-mentioned delusion that climate is changing and adapting itself to agriculture, thus relieving the farmer of accommodating his methods to the climate, has considerably handicapped him in progress. Systematic experiments in dry-farming throughout the Great Plains were provided for on a great scale by Congress in 1906. By attention to crop rotation, soil physics and world-wide search for plants adapted to the Great Plains (such as the U.S. Department of Agriculture has long been conducting), a very great deal can be accomplished—no one can say how much; but certainly the Western must long remain at a great disadvantage in comparison with the Eastern portion of the state as regards the growth of cereals.

Irrigation.—Water for the western part of the state is a resource of primary importance, and irrigation therewith a fundamental problem. Very generally, especially in the butte regions, the country lends itself to the impounding of surface water. The lakes are of great importance for the stock ranges of the sand-hills. It is commonly believed that of underground water, and generally of artesian water, even the driest counties have an abundance. This is great exaggeration. Though both in central and western Nebraska there are strata that generally yield a considerable flow, the supply is usually limited and the expense is great. Up to 1906 dependence was mainly upon the streams, which it is estimated might furnish 3 or 4 million acre-feet—enough to irrigate between 10 and 15% of the arid section—were all the water available, and the land irrigable. As compared with the streams of Colorado, where irrigation is much more advanced, the streams of Nebraska have a very constant flow; the relative supply-capacities of the Arkansas and Poudre in Colorado, and the Loup and North Platte in Nebraska being about as 1·000, 1·193, 3·347 and 4·632 respectively, according to the estimates of the state engineer (Nebraska *Public Documents* 1901–1902, vol. iii. p. 144). An irrigation law was first passed by Nebraska in 1895. One of the greatest improvement projects undertaken by the national Reclamation Service is one on the North Platte, begun in 1903, which contemplates a reservoir in Wyoming of sufficient capacity to store all the surplus waters of that stream, about 600 m. of canals, and the reclamation of 107,000 acres in Nebraska; it was 74% completed in 1909. The work of the national service began in Nebraska in 1902. Some farmers on the uplands between the valleys in western Nebraska irrigate by means of wind-mills, and although the underground water is 175 ft. or more below the surface one wind-mill often supplies sufficient water to irrigate ten acres. The extent of irrigated acreage increased about thirteen-fold from 1889 to 1899. In the latter year there were 1701 m. of ditch costing about $751.00 per m., irrigating 148,538 acres, which yielded crops averaging $6.61 per acre in value. The greatest part of the irrigated acreage is in the valley of the North Platte and the Upper Platte—probably nine-tenths in 1906—in Scotts Bluff, Lincoln, Cheyenne, Dawson, Keith and Deuel counties. There is, however, a large ditch in Platte county—the farthest E. of any large ditch in the country; and though agriculture is normally quite "successful" here without irrigation, nevertheless it is more profitable with it. In fact, in 1899 about a quarter of the irrigated acreage lay E. of the section classed as arid.

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[1] Data of the State Bureau of Labor and Industrial Statistics, which are lower than those of the state Board of Agriculture, and (in census years) the Federal Census. The yearly average given by the Board of Agriculture for 1895–1904 is 219,196,000 bushels. The statistics for 1906 and 1907 are taken from the *Year-books* of the Department of Agriculture.

Manufactures.—The rank of Nebraska among the states of the Union in 1900 in population, in value of agricultural products, and in value of manufactured products, was respectively twenty-seventh, tenth and nineteenth. In the decade 1890–1900 the state increased the value of its manufactures somewhat more than half. The *per capita* product-values for agriculture and manufactures in 1900 were $153 and $135 (as compared with $63 and $88 in 1890). Only 2·3% of the population were engaged in manufacturing in 1900. Of the total factory product (in 1900, $130,302,453; in 1905, $154,918,220), 84·7% were urban (*i.e.* were for the three cities which in 1900 had a population of at least 8000) in 1900, and 81·7 in 1905; the percentage for these cities being 53·3 in 1900 and 43·5 in 1905 for South Omaha, 29·2 in 1900 and 34·9 in 1905 for Omaha, and 2·1 in 1900 and 3·4 in 1905 for Lincoln; Nebraska City, Fremont, Grand Island, Beatrice, Hastings, Plattsmouth and Kearney were the only other manufacturing centres of any importance. In 1907 there was a beet-sugar factory at Grand Island; at Nebraska City there are several distinctive industries; at South Omaha very important meat-packing houses; and the other cities have interests rather extensive or varied than distinctive. As yet manufactures are insignificant except in lines immediately dependent upon agriculture, the combined output of the packing, flour and grist mill, dairy and malt-liquor establishments constituting in 1900 nine-tenths of the total state output. Meat-packing is by far the most important single interest, South Omaha being the third greatest packing centre of the country, employing in 1900 and in 1905 a quarter of all wage-earners and yielding nearly one-half the total product-value of the state ($71,018,339 in 1900; $69,243,468 in 1905). The malt-liquor industry is favoured by the great production of barley in Iowa; the value of malt liquors manufactured in 1900 was $1,433,501, and in 1905 $1,663,788. Nebraska wheat, like that of Kansas, combines for milling the splendid qualities of winter wheat with those characteristic of grain grown on the edge of the semi-arid West; flour and grist-mill products were valued at $7,794,130 in 1900 and at $12,190,303 in 1905. The first creamery in Nebraska was established in 1881. A creamery at Lincoln is said to be the largest in the United States. Many co-operative dairies have persisted since the early days of farmers' granges. The value of cheese, butter and other dairy products was $2,253,893 in 1900 and $3,326,110 in 1905. Of manufactures not dependent upon agriculture perhaps the most promising is that of brick and tile products (valued at $839,815 in 1900 and at $1,131,913 in 1905), and the largest in 1905 was the manufacture and repair of steam railway cars (valued at $2,624,461 in 1900 and at $4,394,685 in 1905).

Communications.—There is no longer any river navigation. There were 6,101·5 m. of railway in the state at the end of 1907; the great period of railway building was 1870–1890, the mileage in 1870 being 705, in 1880, 1953, and in 1890, 5407. The eastern half of the state is much better covered by railways than the western. Six great east and west trunk-lines connecting the Rocky Mountain region and Chicago enter the state at Omaha (*q.v.*), and two others, giving rather an outlet southward, enter the same city and serve the eastern part of the state. In 1908 all but 5 counties out of 90 had railway outlets. A marked tendency toward north and south railway lines is of great promise to the state, as outlets towards the Gulf of Mexico are important, especially for local freight. Omaha and Lincoln are Federal ports of entry for customs.

Population.—In 1900 the population of the state was 1,066,300 and in 1910, 1,192,214. In 1900 16·6% were foreign-born, and 43·3% natives of other states than Nebraska. The latter came mainly from the north-central states. Of the foreigners, Germans, Scandinavians and British (including English Canadians) made up four-fifths of the total. The most numerous individual races were Germans (65,506), Swedes (24,693), Bohemians (16,138), Danes (12,531), Irish (11,127), English (9757), Russians (8083) and English Canadians (8010). In 1900 three cities had a population above 25,000—Omaha, 102,555; Lincoln, 40,169; South Omaha, 26,001—and seven others had a population between 5000 and 8000—Beatrice, Grand Island, Nebraska City, Fremont, Hastings, Kearney and York. The population of Nebraska was 28,841 in 1860, 122,993 in 1870, 452,402 in 1880 and 1,062,656 in 1890. The increases of population by decades following 1860 were 326·5, 267·8, 134·1, 0·3, and 11·8%. From 1880–1890 the absolute increase was exceeded in only four states, and was greater than in any state W. of the Mississippi except the enormous state of Texas; from 1890–1900 it was less than in any state of the Union except Nevada (whose population decreased). In this decade 35 counties out of 90 in the state showed a decrease: the shrinkage was mainly in the first half of the decade, and was due to the cumulative effects of national hard times, a reaction from an extraordinarily inflated land "boom" of the late 'eighties, and a remarkable succession of drought years, and consequent crop failure in the West. Between 1885 and 1895 Kansas and Colorado went through much the same experience, due to a too rapid settlement of their arid areas before the conditions of successful agriculture were properly understood. Many homes, and even small settlements in Nebraska—though not to the same extent as in Colorado and Kansas—were abandoned. Urban population (the population in places having 4000 or more inhabitants) also fell, constituting 25·8% in 1890, and in 1900 only 20·8% of the total population of the state. In the case of some cities that showed a great decrease (*e.g.* Lincoln 27·2%, and Omaha 27%) notoriously "padded" censuses in 1890 were in part responsible for the bad showing ten years later.

In 1906 there were in the state 345,803 communicants of various religious denominations; of these 100,763 were Roman Catholics, 64,352 Methodists, 59,485 Lutherans, 23,862 Presbyterians, 19,121 Disciples of Christ, 17,939 Baptists and 15,247 Congregationalists.

In 1890 there were in the state 2893 untaxed and 3538 taxed Indians, the latter being citizens; in 1900 there were 3,322 altogether, all of them taxed; and in 1908 there were 3720, of whom 1270 were Omaha, 1116 Santee Sioux, 1060 Winnebago and 274 Ponca.

Among the Indians who occupied Nebraska immediately before the advent of the whites and thereafter, the only families of much importance in the state's history were the Caddoan and the Siouan. The Caddoan family was represented by the Middle or Pawnee Confederacy; the Siouan family by its Dakota, Thegiha, Chiwere and Winnebago branches. Included in the Dakota branch were the Santee and Teton tribes, the latter comprising the Brulé, Blackfeet and Oglala Indians; in the Thegiha branch were the Omaha and Ponca tribes; and in the Chiwere branch, the Iowa, Oto and the Missouri tribes. Other tribes were of less importance; and tribes of other families—with the exception of the Cheyennes and Arapahoes of the Algonquian family, whose permanent hunting grounds embraced the foot-hill country of the West—were of negligible importance, being only roamers within the borders of the state. The Pawnees contested the plains against the Sioux with undying enmity. Before the Civil War there were no very general troubles between Indians and whites, despite constant frontier difficulties, except the bloodless "Pawnee War" of 1859–60; but in 1863–64 the Indians rose rather generally along the frontier, and many settlers were killed. In 1890–91 there was another war—with the Sioux—marked by the battle of Wounded Knee, just across the line in South Dakota. In dealings with the Indians there have been in Nebraska the usual discreditable features of administration. The maltreatment of the Poncas, a fine and peaceable tribe, was peculiarly and inexcusably harsh. Segregation on reservations was generally accomplished in 1870–1880. There were in 1900 small reservations for Omahas and Winnebagoes in Thurston county and for the Sioux in Sheridan county, and an agency for the Santees and Poncas near the mouth of the Niobrara; and at Genoa, where the Pawnee agency and reservation had been located, there was in 1908 an Indian school maintained by the United States government with 350 boarding pupils. In 1908, however, almost all the tribal lands had been distributed in severalty: the Niobrara Reservation (under the Santee government boarding school for the Santee Sioux and the Ponca) had only 1130·7 acres reserved for agency, school and mission purposes; the Ponca Reservation (under the same school) had only 160 acres reserved for agency and school buildings; the Omaha Reservation (under the Omaha School) had 12,421 acres unallotted; the Sioux Reservation (under the Pine Ridge Agency) for Oglala Sioux had 640 acres; and the Winnebago Reservation (under the Winnebago School) had 1710·8 acres unallotted and 480 reserved for agency, &c.

Government.—The present constitution, adopted in 1875, replaced one adopted in 1866. In 1871 a convention framed a constitution that was rejected by the people. It provided for compulsory education, and for the taxation of church property; prohibited the grant by counties or cities of financial aid to railway or other corporations, and enjoined that railways should have an easement only in their right of way. The last two provisions were mainly responsible for the defeat of the constitution. The instrument of 1875 presents a few variations from the normal type, and under it a few interesting problems have arisen. The constitution provides two methods for amendment. A convention for revising or amending the constitution is to be held in case a recommendation to that effect made by the legislature (a three-fifths vote of all the members of each house being required) is accepted by a majority of the electors voting at the next election for members of the legislature, but no amendment agreed upon by the convention is to take effect until approved by a majority of electors voting on it. Without calling a convention, however, the legislature may, by a three-fifths vote of all the members of each house, adopt an amendment, which is to come into effect only if approved by a majority of electors voting at the next election of senators and representatives—the publication of the proposed amendment in some newspaper in each county once a week for three months before the election being required. This has been interpreted by the courts as requiring a majority of the votes actually cast for senators and representatives. As there is less interest in amendments than in the election of members of the legislature, only two out of a large number of amendments proposed from time to time by three-fifths of the members elected to each house have been adopted. The first of these, increasing the pay per day to the members of the legislature and providing for longer sessions,[1] was declared lost by the official canvassers, but when (1886) the ballots had been recounted by the legislature it was declared adopted. The second (1906), creating a railway commission, was endorsed by a political party in state convention, was printed on the same ballot-paper with the names of the party candidates for office in order to secure for it all "straight" party votes, and by this procedure, which was upheld by the state supreme court in 1907, it was adopted. All male persons who are citizens of the United States or have declared their intention to become such at least thirty days before an election have the right of suffrage provided they have attained the age of twenty-one years, have resided in the state six months, are not of unsound mind, and have not been convicted of treason or felony. Women who have either children or taxable property may vote on questions relating to schools. The general election of state and local officers is held annually on the first Tuesday succeeding the first Monday in November, but municipal and school district elections may be held at other times. The secret ballot was adopted in 1891; the use of the voting machines was authorized in 1899; and the nomination of candidates by primaries was made mandatory in 1907. By a provision unique in 1875, the constitution authorized the legislature to provide that the electors might express their preferences for United States senators; but this was not treated as mandatory on the legislature, and though votes were at times taken (1886, 1894), they were not officially canvassed, nor were any senatorial elections materially affected by them. In 1907, under a direct primary law, the nomination of candidates for United States senator was transferred from the party convention directly to the people; and in 1909 the "Oregon plan" was adopted, whereby each candidate for the legislature must go on record as promising, or not, always to vote for the people's choice for United States senator; on the ballot which bears the name of each candidate for the legislature there appears a statement that he "promises," or that he "will not promise," to vote for the "people's choice." In the same year the state enacted a law providing for the non-partisan nomination of all judges, of all superintendents of public instruction and of regents of the state university; nominations are by petition, and there is a separate "official non-partisan ballot" bearing the names and addresses of the nominees and the titles of the office for which they are nominated. The legislature of 1909 also provided for open election primaries and for the framing of state party platforms by convention before the time of the primary.

The governor is the chief executive officer of the state, but quite independent of him are a lieutenant-governor, a secretary of state, an auditor of public accounts, a treasurer, a superintendent of public instruction, an attorney-general and a commissioner of public lands and buildings, who, as well as the governor, are elected for a term of two years. The governor's appointing power is almost entirely limited to officers of state institutions, and for every appointment he makes the approval of the Senate is required; but he need not ask the consent of that body to remove for incompetency, neglect of duty or malfeasance in office "any officer whom he may appoint." His constitutional power to pardon is regulated by an act of the legislature (1907) which requires that he shall in no instance grant a pardon until the attorney-general shall have investigated the case and conducted a public hearing. His veto power extends to items in appropriation bills, but any bill or item may be passed over his veto by three-fifths of the members elected to each house of the legislature. The most important board of which he is chairman is the state board of equalization. As the present constitution was adopted in the year after a grasshopper plague, which had caused great financial loss, it limited the salary of the governor, auditor of public accounts and treasurer, as well as that of the judges of the supreme and district courts, to $2500 each and that of other important officers (including the secretary of state, the attorney-general and the superintendent of public instruction) to $2000. This economy has somewhat hampered the growing state. Salaries have been too low to attract the ablest men; and as the constitution forbade the creation of new offices, and no amendment of this clause could be secured, resort was had to the creation of additional "secretaries" and of boards constituted of existing state officials or their secretaries.

The legislature consists of a Senate of 33 members and a House of Representatives of 100 members, and meets in regular session on the first Tuesday in January of every odd-numbered year at Lincoln, the capital. Both senators and representatives are apportioned according to population, and are elected by districts in November of each even-numbered year for a term of two years. They are paid at the rate of five dollars a day during 60 days of a regular session and not exceeding 100 days during their entire term. No bill or joint resolution may be introduced at a regular session after its fortieth day except at the request of the governor. Special legislation of various kinds is expressly prohibited, and in the bill of rights it is declared that "all powers not herein delegated remain with the people." This clause would seem to leave the state government with no powers not expressly granted, and to make the rule for interpreting the Nebraska constitution similar to that for interpreting the Federal constitution; but in their practice the Nebraska courts have been little influenced by it, and it is chiefly of historical interest.[2]

The administration of justice is vested in a supreme court, 15 district courts, county courts and courts of justices of the peace and police magistrates. The supreme court consists of three judges elected for a term of six years, one retiring every two years; each district court consists of one to seven judges elected for a term of four years, and each county court consists of one judge elected for a term of two years. The county courts have exclusive original jurisdiction in the probate of wills and the administration of estates, concurrent jurisdiction with the district courts in civil suits for sums not exceeding $1000, and important jurisdiction in criminal cases. Perhaps the most unique provision of the Nebraska constitution is that relating to appeals; it appears in the bill of rights and reads as follows: "The right to be heard in all civil cases in the court of last resort, by appeal, error or otherwise, shall not be denied." Regardless of this provision, however, the civil code denies the right of an appeal from an inferior court in cases that have been tried by a jury, and in which the amount claimed does not exceed $20, and the courts have decided that this denial is not in conflict with the constitution; but in at least one instance an appeal was allowed because of the constitutional guaranty, and that guaranty has doubtless had much influence on judicial legislation.

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[1] The amendment increased the pay of members from three dollars to five dollars a day "during their sitting," and provided that sessions should last at least sixty days, and that members should not receive pay "for more than sixty days at any one sitting"; the original constitution had provided that they should "not receive pay for more than forty days at any one session" and had prescribed no minimum length for a session.

[2] An almost identical clause was inserted in the Ohio constitution of 1802, and one in exactly the same language appears in the present (1851) constitution of that state; it appears also in the Kansas constitutions of 1855, 1858 and 1859 (present), in the Nebraska constitution of 1866, in the North Carolina and South Carolina constitutions of 1868, and was retained in the present constitution of North Carolina as amended in 1876.

County government exists under both the district-commissioner system and the township supervisor system, the latter being rare. Cities are governed in classes according to population.

Except in Omaha there is no great field for social economic legislation; but the record of the state has been normally good in this respect. Railways have given rise to the most notable laws. Regulation has been a burning political question since 1876, the constitution making it the duty of the legislature to "correct abuses and prevent unjust discriminations and extortions in all charges of express, telegraph and railroad companies" within the state. The influence of the railways has been very great, and a constant drag on just taxation and other legislative reforms. In 1885, 1887 and 1897 the legislature created a Board of Transportation consisting of existing state executive officers or their secretaries, but this could do little except gather statistics, investigate alleged abuses, and advise the legislature, upon which the regulation of rates remained mandatory by the constitution. The Board was eventually declared unconstitutional by the state supreme court. In 1893 a maximum freight-rate Act was passed, but the rates thus fixed were declared by the United States Supreme Court to conflict with the Fourteenth Amendment, being "unreasonable." The right of the state to fix "reasonable" rates remained unquestioned, but American experience has not found such laws efficacious. In 1906 all political parties conducted campaigns on promises of radical legislation on railway rates, passenger and freight; and a constitutional amendment creating a railway commission was adopted in the manner above described. A result of this campaign was a remarkable series of enactments in 1907 for the regulation of railways. The legislature framed a stringent anti-pass law, reduced passenger fares and express and freight charges, provided for equitable local taxation of railway terminals, regulated railway labour in the interest of safe travel, fixed upon railways the responsibility for the death or injury of their employés, and gave to the newly-created railway commission complete jurisdiction over all steam-railways in the state, over the street railways of the cities, and over express companies, telegraph companies, telephone companies and all other common carriers. In 1909 provision was made for an annual corporation licence tax and for the physical valuation of railways. In the same year, following the example of Oklahoma, Nebraska passed a law guaranteeing bank deposits from a fund created by an assessment on the basis of total deposits. Useful child-labour and pure-food laws were enacted in 1907. Prohibition of the liquor traffic had been established in the Territory in 1855, but liquor licences were introduced in 1858; in 1909 the licence fee was fixed at $1000. A law enacted in 1907 made it illegal for breweries to own retail liquor houses, and one of 1909 required all saloons to close from 8 P.M. to 7 A.M. A homestead law exempts from judgment liens and forced sale a homestead not exceeding $2000 in value and consisting either of a farm not exceeding 160 acres or of property not exceeding two lots in a city or village; the exemption, however, does not extend to mechanics', labourers' or vendors' liens upon said homestead or to a mortgage upon it that has been signed by both husband and wife or by an unmarried claimant. A woman's rights to her property are not affected by marriage, except that it becomes liable for payment of debts contracted for necessaries to the family when a judgment against the husband for the payment of the same cannot be satisfied. The rights of dower and courtesy have been abolished, and husband and wife have instead equal rights to inherit property from the other; but the portion of the property of a deceased spouse that descends to the survivor varies from one-fourth to all according to whose and how many are the children concerned. The grounds for a divorce are adultery, incompetency at the time of marriage, sentence to imprisonment for a term of three years or more, abandonment without just cause for two years, habitual drunkenness, extreme cruelty, and refusal or neglect of the husband to provide a suitable maintenance for his wife. The period of residence in the state required to secure a divorce was formerly six months, but in 1909 it was made two years.

Finance.—The constitution limited the debt that the state might contract to meet casual deficits to $100,000, unless in time of war, and required taxes to be laid to maintain interest on such debt (bonds). These provisions were construed to mean that not more than $100,000 of debt could be contracted in addition to appropriations made by the legislature. There was from the beginning a constant issue of state "warrants" on the general fund, dependent on taxation. These warrants when issued and presented for payment were paid by the state treasurer, were sold to the permanent school fund, and drew 4% interest until cancelled from the general fund. The floating debt of warrants was practically cancelled in 1909, after a one-mill levy for four years for this purpose. Since 1900 there has been no bonded debt whatever. The constitution also prohibited state aid to railways and other corporations, leaving this to cities and counties under limitations. In 1903 the assessed valuation of property was $188,458,379; in 1905, $304,470,961; in 1906, $313,060,301; in 1907, $328,757,578, and in 1908, $391,529,673. The increase was due largely to a new revenue law of 1903 ordering property to be assessed at one-fifth of its actual value. The average tax-rate in the year 1904 was 6⅔ mills; in 1905, 1906 and 1907, 7 mills; and in 1908, 6¼ mills.

Education.—The public schools have been endowed by the United States, beginning in 1854, and by the state; in 1909 the permanent school funds derived from the sale of educational lands amounted to $8,450,557, invested in state securities, county, school district and municipal bonds. The percentage of illiterate population (*i.e.* population unable to write) above 10 years of age was in 1880 and 1890 smaller than that in any other state in the Union, and in 1900, when it was 2·3% (for native whites, foreign whites and negroes respectively 0·8, 6·8 and 11·8), was smaller than that in any other state except Iowa (whose percentage was also 2·3); the percentage for males of voting age (2·5%) being the least in the Union. There are four state normal schools—one at Peru (opened 1867), one at Kearney (1905), one at Wayne (originally private; purchased by the state in 1909) and one, provided for by the legislature of 1909, situated in the north-western part of the state. The university of Nebraska at Lincoln was established in 1869 by an act of the state legislature, and was opened in 1871. The university is governed by a board of six regents, elected by the electors of the state at large, each for six years, two going out of office each year. The revenue of the university is from the income of Congressional land grants under the Morrill Acts and from a one mill per one dollar tax on the current assessment roll of the state.[1] Connected with it and governed by the same regents are the State College of Agriculture (including the School of Agriculture) and the Agricultural Experiment Station, on the university farm of 320 acres, 2½ m. E. of the university, which receive support from the United States government, and an experimental sub-station at North Platte. The botanical and geological surveys of the state are carried on by the university; the former has been largely under the supervision of Charles Edwin Bessey (b. 1845), professor of botany. The university as reorganized in 1909 embraces a college of arts and sciences, a graduate college, a college of agriculture, a college of engineering, a teachers' college (1908), a college of law (1891), a college of medicine, a school of pharmacy, a school of fine arts, an affiliated school of music and a summer session. The medical school is in Omaha. The university has no preparatory department. Its library in 1909 had about 85,000 volumes. In 1908–1909 the university had an enrolment of 3611 students (2077 men and 1534 women). The granting of university degrees is conditioned by a "credit-hour" system; 125 credit hours are required for a bachelor's degree. Elisha Benjamin Andrews[2] (b. 1844) became chancellor of the university in 1900; in 1909 he was succeeded by Samuel Avery (b. 1865). Most of the educational institutions of the state are coeducational. Among the private educational institutions of the state are: Nebraska Wesleyan University (1888, Methodist Episcopal), at University Place, a suburb of Lincoln; Union College (1891, Adventist), at College View, suburb of Lincoln; Creighton University (1879, Roman Catholic), at Omaha; York College (1890, United Baptist), at York; Cotner University (1889; legally "The Nebraska Christian University"), at Bethany, a suburb of Lincoln; Grand Island College (1892, Baptist), at Grand Island; Doane College (1872, Congregational), at Crete; Hastings College (1882, Presbyterian), at Hastings; and Bellevue College (1883, Presbyterian), at Bellevue. State penal and charitable institutions include soldiers' and sailors' homes at Grand Island and Milford, an Institute for the Blind at Nebraska City (1875), an Institute for the Deaf and Dumb at Omaha (1867), an Institute for Feeble Minded Youth at Beatrice (1885), an Industrial School for Juvenile Delinquents (boys) at Kearney (1879), a Girls' Industrial School at Geneva (1881), an Industrial Home at Milford (1887) for unfortunate and homeless girls guilty of a first offence, asylums or hospitals for the insane at Lincoln (1869), Norfolk (1886) and Hastings (1887), an Orthopedic Hospital (1905) for crippled, ruptured and deformed children and a state penitentiary (1867), both at Lincoln. A Home for the Friendless, at Lincoln, incorporated in 1876, was taken over by the state in 1897; admission was restricted to children, and in 1909 its name was changed to the State Public School.

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[1] In 1909 the state legislature refused to accept for the university the Carnegie education pensions.

[2] He was born in Hinsdale, New Hampshire, on the 10th of January 1844; served in the Union army during the Civil War; graduated at Brown University in 1870 and at Newton Theological Institution in 1874; taught homiletics at Newton in 1879–1882, history and economics at Brown in 1882–1888, and political economy and finance at Cornell in 1888–1889; and was president of Brown University in 1889–1898. He was an ardent bi-metallist, and in 1892 was a member of the International Monetary Conference at Brussels. He wrote on the currency question, and published a *History of the United States in our Own Times* (1904) and other works on American history and economics.

History.—Local pride has prompted some Nebraskans to begin the history of the white race in their state with the march of Coronado, in 1541, across the buffalo plains to "Quivira," N. of the Arkansas river in Kansas; but the claim is not warranted by the evidence. Marquette mapped the Platte from hearsay in 1673; French explorers followed it to the Forks in 1739; and, after Nebraska passed to the United States in 1803 as part of the Louisiana Purchase, successive American exploring expeditions left traces in its history. Major Stephen H. Long, in particular, followed the Platte and South Platte across the state in 1819, and his despairing account of the semi-arid buffalo plains—whence arose the myth of the Great American Desert—finely contrasts with the later history and latter-day optimism of dry-farming and irrigation. Meanwhile, fur traders who drew their goods from the country of the Platte had long been active on the Missouri. Trading posts were probably established in Nebraska in 1795, 1802, 1807 and 1812; the last two near the present towns of Ft. Calhoun (about 20 m. N. by W. from Omaha) and Bellevue. Manuel de Lisa, a noted Cuban trader and plainsman, was probably the first white settler (1807). In 1823 Bellevue became an Indian agency, and in 1849 the first United States post-office in Nebraska. Ft. Atkinson was maintained near the present town of Ft. Calhoun in 1819–1827; in 1825 the government acquired the first Indian lands, and in the 'thirties of the 19th century missionaries began to settle among the tribes; the first Ft. Kearney was maintained where Nebraska City now stands in 1847–1848, and in the latter year was re-established on the Platte, some 175 m. inland from the Missouri. Meanwhile there had begun the passage of the Mormons across the state (1845–1857), marked by important temporary settlements near Omaha (*q.v.*) and elsewhere, the travel to Oregon, and to California, for which depôts of supplies were established at Bellevue, Plattsmouth, Nebraska City and old Ft. Kearney, or Dobey Town.[1] Thus the country was well and favourably known before Congress organized it as a Territory in 1854.

Movements in Congress for the creation of a new Territory on the Platte began in 1844, several attempts at organization failing in the succeeding decade. In 1852–1853 Iowans and Missourians along the border of what are now Kansas and Nebraska held elections W. of the Missouri and sent delegates to Congress. A provisional Territorial government formed by Wyandot Indians and licensed white residents on Indian lands in Kansas (*q.v.*) forced Congress to take action. With what followed, the rivalry of the Platte and Kansas river valleys for the Pacific railway route, and the opposing interests of pro-slavery Missouri and anti-slavery Iowa, and possibly the personal ambitions of Stephen A. Douglas and Thomas H. Benton, had important relations. In the outcome Nebraska was one of the two Territories created by the Kansas-Nebraska Bill of 1854. This creative act bore evident traces of the pro-slavery sentiments of the Congress that passed it in the limitation of the suffrage to whites, and the explicit application of the national fugitive-slave laws for the last time in a federal statute. Under the provision of "popular-sovereignty" it was thought that Nebraska, as the more northerly Territory, would become a "free" state, if not a free Territory. There were slaves within its borders from the beginning, and anti-slavery ideas were embodied in several legislative bills, until a territorial law of 1861 excluded slavery. But the future of slavery was settled in Kansas, and events in Nebraska throw only a small side-light on that struggle. John Brown and James H. Lane spent considerable time in the south-eastern counties, and across these an "underground railroad" ran, by which slaves were conducted from Kansas to Iowa and freedom.

As organized in 1854 Nebraska extended from 40° N. lat. to British America, and from the Missouri and White Earth rivers to the "summit" of the Rockies; but in 1861 and 1863 it was reduced, by the creation of other Territories, to its present boundaries. By 1860 settlement had spread 150 m. W. from the Missouri, following the river valleys and the freighting routes. Many who had migrated to Pike's Peak in 1859, stopped in Nebraska on their return eastward; and settlement was stimulated by the national Homestead Act of 1862 (one of the first patents granted thereunder, on the 1st of January 1863, was for a claim near Beatrice, Nebraska), and by the building and land-sales of the Union Pacific and Burlington railways following 1863. Thus in 1861 there were probably 30,000 inhabitants in the Territory, and 3300 men were sent into the field for the Union army in the Civil War. Until well into the 'sixties freighting across the plains was a great business. The "Oregon Trail," the "Old California Trail," and the "Old Salt Lake Trail"—all nearly identical in Nebraska—ran along the Platte across the entire state with various terminal branches near the eastern border, to the Missouri river towns; while branches from St Joseph, Missouri and Leavenworth, Kansas, ran up the valleys of the Big Blue and Little Blue rivers and joined the Nebraska roads near Ft. Kearney. The Oregon and California migration was of large magnitude by 1846. St Joseph, Leavenworth and Nebraska City (*q.v.*) were the great freighting terminals of the West. Over these roads was run in 1860–1861 the famous "pony express" whose service ended with the completion of the overland telegraph in the latter year; it covered the distance from St Joseph, Missouri, to Sacramento, California, in eight days, and even less. Freighting ended when the Union Pacific was extended across Nebraska between 1863 and 1867.

Political interest in the Territorial period centred mainly in a fight for the capital, waged between the towns of the Missouri river front, Bellevue, Brownville, Nebraska City, Plattsmouth, Omaha and Florence, those of the North Platte interior, and of the South Platte. This struggle engendered extraordinary bitterness, since success might mean continued life, and defeat prompt demise, to competing towns. As population increased the question of the capital was complicated by the question of statehood. Both were involved in the agitation in 1858–1859 for the annexation of the South Platte to Kansas (*q.v.*), which gained considerable strength; annexation promising to the former much earlier statehood than continued union with the backward region of the North Platte, and to northern Kansas also promising earlier statehood, and an advantage in the sectional struggle with southern Kansas. As the expenses of Territorial government were partly borne by the United States, statehood was voted against in 1860, and again (virtually) in 1864 after Congress had passed an Enabling Act; but in 1866 a constitution framed by the legislature was declared carried by the people by a majority of 100 votes in 7776, and Nebraska was admitted as a state (in spite of President Johnson's veto) in 1867, after her legislature had accepted a fundamental condition imposed by Congress removing the limitation of the suffrage to whites by the new constitution. Fraud was charged in the Territorial election. At any rate the Republican party had worked for admission because it needed senators in Congress, and it got them. During part of 1866–1867 there were two *de facto* governments, the Territorial and the state.

The capital of the Territory remained always at Omaha, although in 1858 a majority of the legislature removed to Florence leaving the governor and a legislative rump at Omaha. In 1867 the South Platte region, having obtained a predominance in population capable of overcoming a gerrymander that had favoured the North Platte (and incidentally the Democrats), secured the appointment of a legislative committee to locate the state capital S. of the Platte. Several of the old Missouri river contestants had as representatives of their previous claims young towns located at strategic points in the interior. The committee avoided these and selected the site of Lincoln. Just ten years earlier the legislature had considered removal to another site on the Salt, to be called "Douglas" in honour of Stephen A. Douglas, then still in the heyday of his popularity.

The decade 1870–1880 was marked by the work of the two constitutional conventions described above. The first legislature under the constitution of 1875 met in 1877. The following decade was marked by a tremendous growth in population, by a feverish activity in railway construction (the mileage in the state being increased from 1953 to 5407 m. in the ten years), and by an extraordinary rise in land values, urban and rural. Farm-land prices were raised to a basis of maximum productiveness when the best interests, especially of the western section, demanded steady growth based on average crop results under average conditions. The early 'nineties were marked by an economic collapse of false values, and succeeding years by a painful recovery of stable conditions.

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[1] In 18 months of 1849–1850 it was officially reported that 8000 wagons, with 80,000 draught-animals and 30,000 people, passed Ft. Kearney on the way to Oregon, California or Utah.

The Democratic and Republican parties were first effectively organized in opposition, as parts of national bodies, in the territorial campaigns of 1858. Till then there were practically only Democratic factions; after 1861 the Republicans held the state securely until 1890. After about 1890 the national tendencies towards a re-alignment of political parties on social-economic issues were sharply displayed in Nebraska. This was in the main only an indication of the general Farmers' Movement (*q.v.*),[1] but this found in Nebraska special stimulus in large losses (almost $900,000) suffered by the state from the negligence and defalcation of certain Republican office-holders. Following 1890 the "Fusion" movement—the fusion, that is, of Populists, Democrats and (after 1896) of Silver Republicans—was of great importance. The only year in which these elements carried the state against the Republicans for presidential electors was in 1896, when William J. Bryan of Lincoln was their presidential candidate; although the state delegation of representatives and senators in Congress was for a time divided. The Fusionists practically controlled the state government from 1897–1899; they held the legislature from 1891–1895 and from 1897–1899, the supreme court from 1899–1901, and the governorship and executive departments from 1895–1901; they elected a Democratic governor also for 1891–1893; but he was not of the true Fusion type, and vetoed a maximum railway freight-rate bill, although his Republican successor approved one. The year 1891 was the most feverish political year of this period. Apart from these temporary Fusion successes the Republicans have always controlled the state.

The governors of Nebraska have been as follows:—

	Territorial Period.	
Francis Burt	11 days, Oct. 1854	
Thomas B. Cuming (secretary, acting governor)	Oct. 1854–Feb. 1855	
Mark W. Izard	Feb. 1855–Oct. 1857	
Thomas B. Cuming (secretary, acting governor)	Oct. 1857–Jan. 1858	
William A. Richardson	Jan. 1858–Dec. 1858	
J. Sterling Morton (secretary, acting governor)	Dec. 1858–May 1859	
Samuel W. Black	May 1859–May 1861	
Alvin Saunders	May 1861–Mar. 1867	
Algernon S. Paddock (secretary, several times acting governor, 1861–1867).		
	State.	
David Butler (impeached and removed from office 1871)	1867–1871	Republican
W. H. James (lieut.-governor, succeeding)	1871–1873	,,
Robert W. Furnas	1873–1875	,,
Silas Garber	1875–1879	,,
Albinus Nance	1879–1883	,,
James W. Dawes	1883–1887	,,
John M. Thayer	1887–1891	,,
James E. Boyd[2]		Democrat
John M. Thayer (acting governor)	1891–1892	,,
James E. Boyd	1892–1893	,,
Lorenzo Crounse	1893–1895	Republican
Silas A. Holcombe	1895–1899	Fusion
William A. Poynter	1899–1901	,,
Charles H. Dietrich (elected U.S. Senator)	1901	Republican
Ezra P. Savage (lieut.-governor, succeeding)	1901–1903	,,
John H. Mickey	1903–1907	,,
George L. Sheldon	1907–1909	,,
A. C. Shallenberger	1909–1911	Democrat
Chester H. Aldrich	1911–	Republican

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NEBRASKA CITY, a city and the county-seat of Otoe county, Nebraska, U.S.A., situated on the high W. bank of the Missouri river, about 40 m. below Omaha. Pop. (1880) 4183; (1890) 11,494; (1900) 7380 (882 foreign-born); (1910) 5488. It is served by the Chicago, Burlington & Quincy, and the Missouri Pacific railway systems. A railway and wagon bridge spans the Missouri. The city is the seat of the state Institute for the Blind (1875), and has three public parks and a public library. The city is a distributing centre for a beautiful farming region, the trade in grain being especially large. In 1900 Nebraska City ranked third among the manufacturing cities of the state, the manufactures including canned fruits and vegetables, packed pork, flour, oatmeal, hominy, grits, meal, starch, cider-vinegar, agricultural implements, windmills, paving bricks, concrete, sewer pipe, beer, over-alls and shirts. It is one of the oldest settlements of the state. The first "old Fort Kearney" was established on the site of Nebraska City in 1847, but was abandoned in 1848, and the fort was re-established farther W. on the Platte river (see KEARNEY). Otoe county was organized in 1855, and the original Nebraska City was incorporated and made the county-seat in the same year. This city, together with Kearney City, incorporated in 1855—adjacent to the first "old" Fort Kearney—and South Nebraska City, were consolidated by the legislature into the present Nebraska City in 1858. (Twelve other city "additions" and so-called "towns," all within or closely adjacent to the present city, were in existence in 1857.) Nebraska City was for some years the largest city of the state. In 1858 it became the headquarters of a great freighting-firm that distributed supplies for the United States government among the army posts between the Missouri river and the Rocky Mountains; in seven months in 1859 this one firm employed 602 men, used 517 wagons, 5682 oxen, and 75 mules, and shipped 2,782,258 ℔. of freight. Nebraska City was the initial point of several roads, parts at one time or another of the "Oregon," "Old California," and "Great Salt Lake" trails. (See NEBRASKA (State): *History.*) Nebraska City became a city of the second class in 1871 and a city of the first class in 1901.

NEBUCHADREZZAR, or NEBUCHADNEZZAR, king of Babylon, the Ναβουκοδρόσορος of the Greeks. The first and last are nearer to the original name as it is found on the cuneiform monuments, viz. Nabu-kudurri-uṣur, "Nebo, defend the landmark." Nebuchadrezzar seems to have been of Chaldean origin. He married Amuhia, daughter of the Median king, according to Abydenus, and in 605 B.C. defeated Necho at Carchemish, driving the Egyptians out of Asia and annexing Syria to the Babylonian empire. In the following year he succeeded his father Nabopolassar on the Babylonian throne, and continued the restoration of Babylon, which he made one of the wonders of the world. His "new palace" there was built in fifteen days; temples were erected to the gods, the great walls of the city were constructed with a moat surrounding them, the Euphrates was lined with brick and a strong fortress erected. Canals were dug throughout the country and a great reservoir excavated near the capital. Only a fragment of his annals has been preserved, recording his campaign against Amasis (Aḥmosi) of Egypt in his thirty-seventh year (567 B.C.) when he defeated the soldiers of "Phut of the Ionians." Tyre revolted in the seventh year of his reign, and was besieged for thirteen years; a contract-tablet dated in his fortieth year shows that at that time it was under Babylonian officials. After the investment of Tyre Nebuchadrezzar marched against Jerusalem, put Jehoiakim to death and placed Jehoiachin on the throne. Three months later Jehoiachin was deposed and Zedekiah made king in his place. Zedekiah's revolt in 588 B.C. led to another siege of Jerusalem, which was taken and destroyed in 586 B.C. (see Jews and Jerusalem). To this period probably belong an inscription of Nebuchadrezzar on the north bank of the Nahr el-Kelb near Beirut, and another in the Wadi Brissa in the Lebanon. From his inscriptions we gather that Nebuchadrezzar was a man of peculiarly religious character. A younger brother of his is called Nabo-sum-lisir.

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[1] Nebraska was one of the states in which the collapse of the co-operative enterprises of the Grange was particularly severe. The Farmers' Alliance was organized for the state in 1887, became a secret organization in 1889, and, as in other states, was a power by 1890. The membership of Grange, Alliance and Knights of Labour went over generally speaking into the People's party.

[2] Removed by decision of state supreme court on grounds of non-citizenship, 5th of May 1891; reinstated by decision of U.S. Supreme Court, 1st of February 1892.

See Josephus, *Cont. Apion*, i. 19; Eusebius, *Praep. Evangel.* x.

NEBULA (Lat. for "cloud," connected with the Gr. νεφέλη, mist or cloud), in astronomy, the name given to certain luminous cloudy patches in the heavens. They resemble the stars in that they retain the same relative positions, and thus may be distinguished from the comets which appear to wander across the stars. When examined with sufficient telescopic power, a great many of these luminous patches are perceived to be composed of clusters of little stars, which in a smaller telescope are invisible separately, but whose rays of light blend together so as to produce a confused luminous appearance. Others, however, cannot be resolved into individual stars even with the best telescopes, and in many cases the spectroscope gives direct evidence that the nebula has a constitution altogether different from that of a star-cluster. We thus distinguish between the nebulae proper and the star-clusters; but owing to the difficulty of deciding the nature in any particular case, and especially owing to the fact that some of the earlier observers believed it probable that all nebulae would with sufficient telescopic power become resolvable into stars, the term nebula is often used to cover both star-clusters and the true nebulae.

An enumeration of nebulae was made by Charles Messier in Paris in 1771, who recorded 103; Sir William Herschel increased the number known to over 2500; whilst Sir John Herschel between 1825 and 1847 catalogued and described 3926 nebulae (including 1700 observed at the Cape of Good Hope). About 1848 the earl of Rosse with his famous six-foot reflector at Parsonstown began his examination of the nebulae, which added greatly to our knowledge of their forms and structure. In more modern times the development of photography has enabled the features of the nebulae to be ascertained and recorded with a certainty, which, unfortunately, the older visual observations and drawings cannot claim to possess. In this connexion the photographic work of Isaac Roberts, A. A. Common, E. E. Barnard and J. E. Keeler in particular must be mentioned. The total number of known nebulae has, too, been enormously increased; Perrine estimates that the number within the power of the Crossley reflector at Lick is not less than half a million.

Nebulae may be conveniently classified according to their telescopic appearance; we enumerate below some of the principal forms that have been recognized, but it must be observed that this classification is rather superficial, and that the differentiation is often one of appearance only and not of real structure. The types are: (1) *Irregular nebulae*, examples: the great nebula of Orion (M. 42),[1] the "key-hole" nebula near η Argus, the "Omega" nebula (M. 17); (2) *Annular nebulae*, example: M. 37 in Lyra; (3) *Double nebulae*, example: the dumb-bell nebula (M. 27) in Vulpecula; (4) *Planetary nebulae*, examples: the "owl" nebula (M. 97) in Ursa Major, M. 1 in Taurus; (5) *Elliptical nebulae*, example: the great nebula of Andromeda (M. 31); (6) *Spiral nebulae*, example: M. 51 in Canes Venatici; (7) *Nebulous stars*; (8) *Diffused nebulosities*. Most of these names require little explanation. The first class have ill-defined irregular boundaries; their forms often suggest the appearance of curdled liquid or wreaths of smoke. The annular nebulae have a ringed appearance, the centre being much darker than the outer parts, though it is filled with faintly luminous matter. Double nebulae have two principal centres of condensation. The planetary nebulae are nearly uniformly illuminated compact patches of light generally circular or elliptical in shape; they were so called because they appeared to possess disks like planets. Elliptical nebulae are usually nebulae of some flat type (such as annular or spiral) seen rather edgeways, so that the structure is not readily recognizable. The typical spiral nebulae are in the form of a double spiral, the two branches of which proceed from diametrically opposite points of a bright nucleus and wind round it in the same sense; the whole is generally studded with points of condensation. The great majority of the nebulae, including the abundant small nebulae which shine with a *white* light (in contrast with the blue-green light of the planetary and irregular nebulae—see below *Spectra of nebulae*), are generally classed as spiral nebulae. The spiral structure has been shown to exist in a few of them, but for the remainder it is only inferred. Nebulous stars are true stars surrounded by an atmosphere or aureole of nebulous light. Diffused nebulosities are very faint nebulae of enormous extent, sometimes forming the background of a whole constellation. We proceed to describe some of the more famous nebulae.

One of the most remarkable nebulae is that which is situated in the sword-handle of Orion and about the multiple star θ Orionis; it is faintly visible to the naked eye. It seems to have been first noticed by Huygens in 1656, who described and figured it in his *System Saturnium*. It has now been found that nebulous streamers connected with the bright nucleus wind through the whole constellation of Orion. It is well known that all the brighter stars of the constellation except Betelgeuse appear to be related to one another by their similarity both of spectra and of proper motion; it seems probable that they are actually situated in the nebula and in some way connected with it.

The only other nebula which can be seen with the naked eye is the elliptical nebula in Andromeda. Modern photographs show very clearly that its structure is spiral. The nucleus is large and appears circular, but the spirals proceeding from it lie in a plane inclined at a rather sharp angle to the line of sight, and this gives to the nebula its elliptical appearance. Two small dense nebulae accompany it, and appear to belong to the system.

The finest example of a ring nebula is M. 57 between β and γ Lyrae. The ring is slightly elliptical, its dimensions being 87″ by 64″. At the ends of the major axis the ring becomes very faint, so that the form of the bright part may justly be compared to a pair of marks of parenthesis ( ). The centre is marked by a star which appears to be intimately associated with the ring, for the whole space within the ring is filled with a very faint nebulosity. According to Schaeberle, there is evidence of a spiral structure in this nebula also. It must, however, clearly be of an essentially different character from the structure of an ordinary spiral nebula, and the spectroscope reveals a fundamental difference between the annular and spiral nebulae.

The "dumb-bell" nebula in Vulpecula consists of two almost separated fan-shaped patches of light. It exhibits a close resemblance to the annular nebula; for we have only to assume a continuation of the thinning out along the longest diameter and a slight filling in of the centre of the Lyra nebula to obtain the dumb-bell form.

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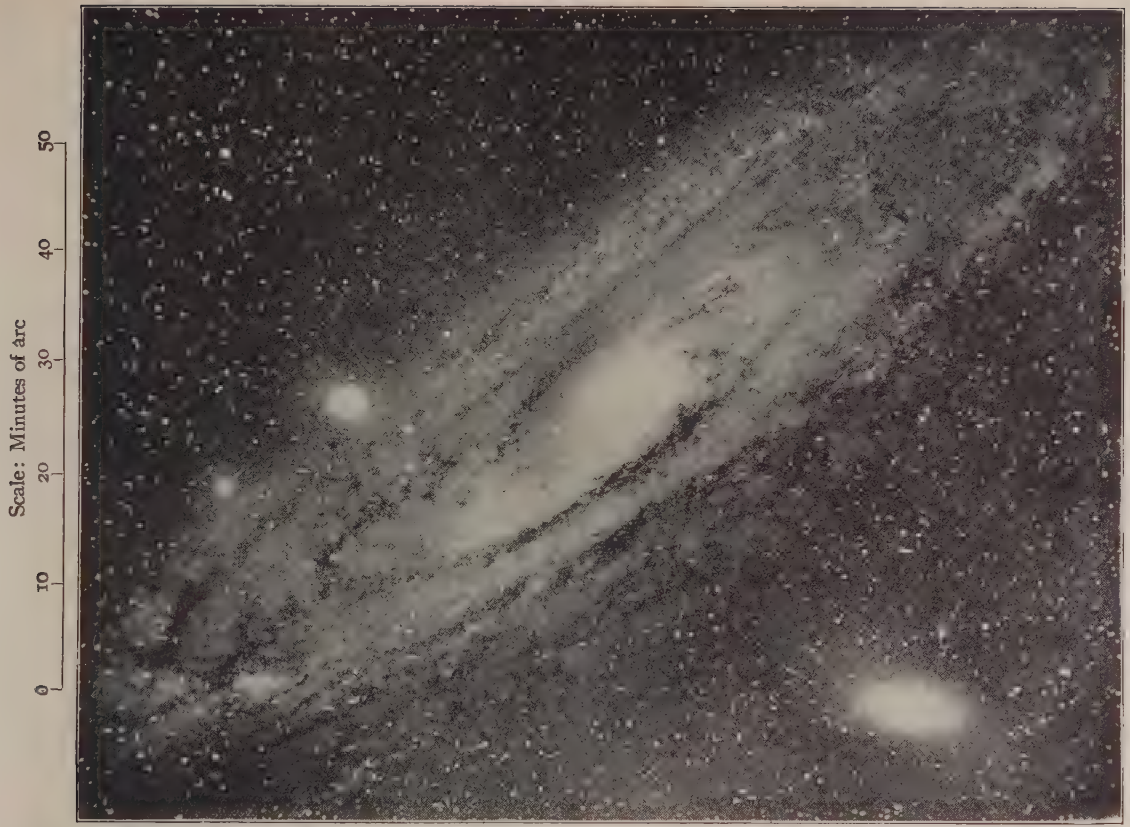
[1] *i.e.* No. 42 in Messier's catalogue. Nebulae not contained in that catalogue are generally known by their number in Dreyer's *New General Catalogue* (N.G.C.).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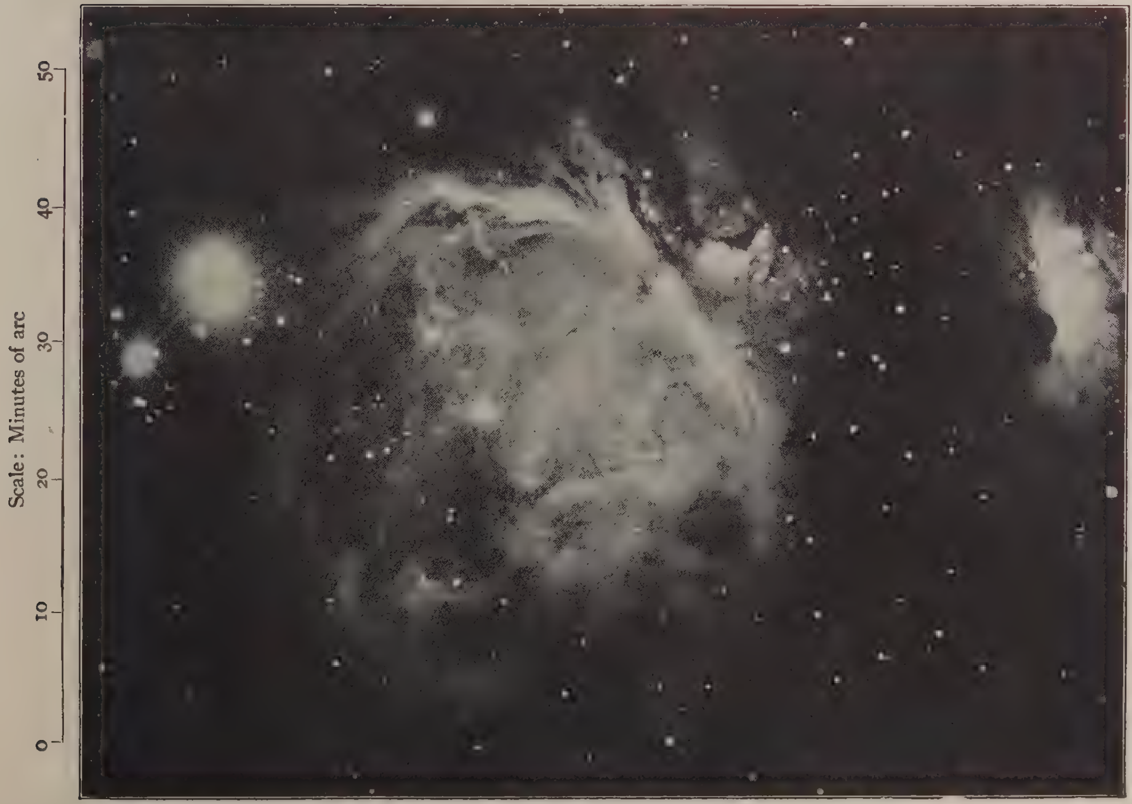
(2) NEBULA IN ANDROMEDA, 1901, SEPTEMBER 18.

By permission of Yerkes Observatory.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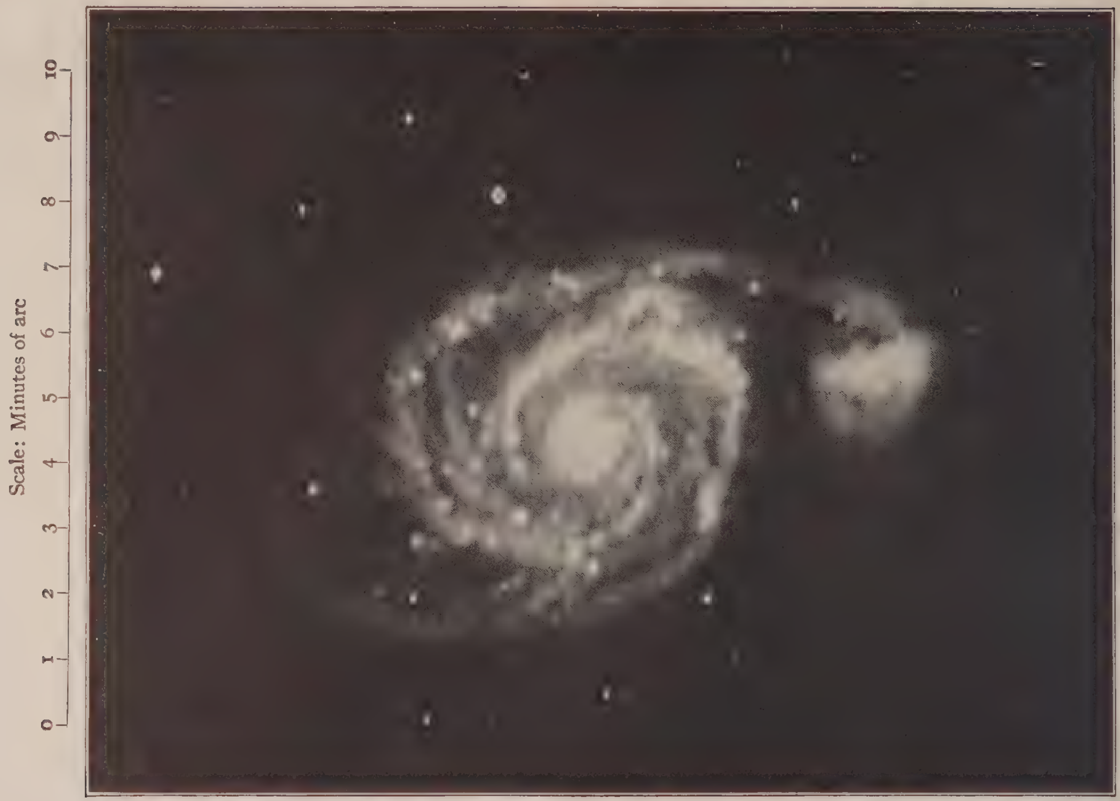
(1) GREAT NEBULA IN ORION, 1901, OCTOBER 19.

By permission of Yerkes Observatory

NEBULA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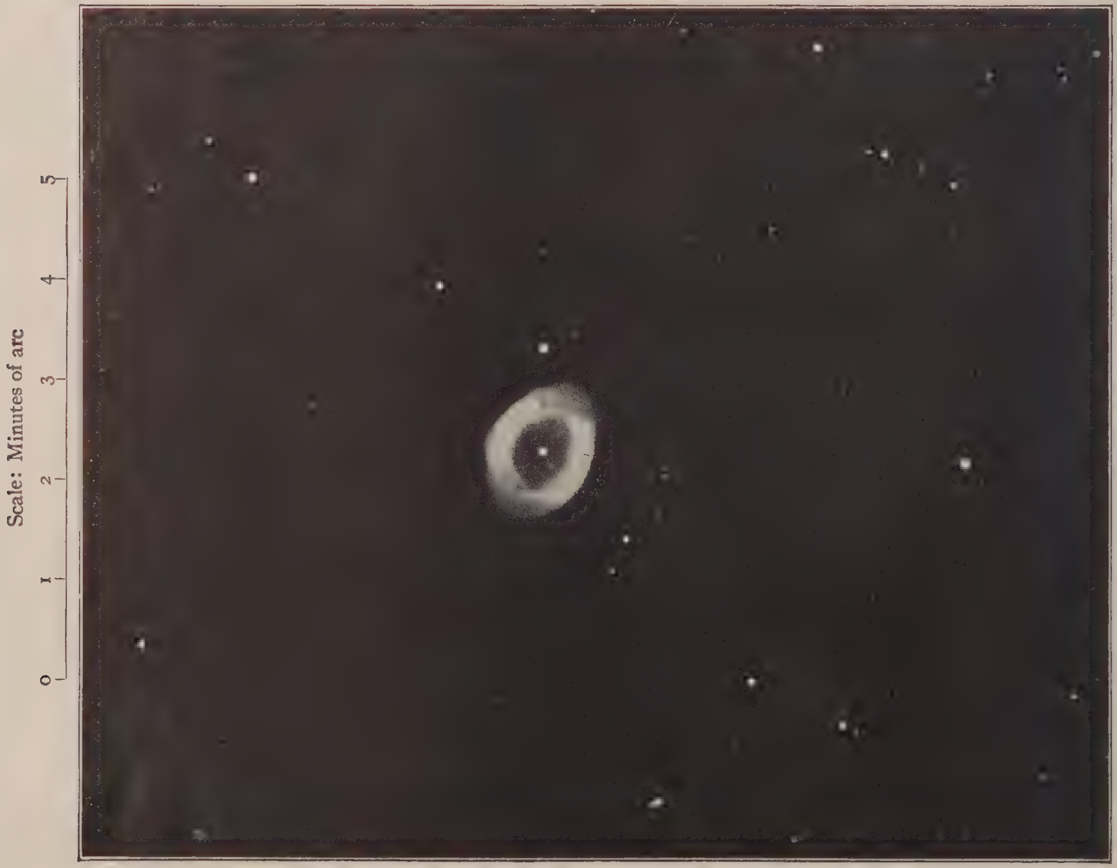
(2) SPIRAL NEBULA, *CANES VENATICI*, 1899, MAY 10.

By permission of Lick Observatory.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(1) ANNULAR NEBULA, *LYRA*, 1899, JULY 14.

By permission of Lick Observatory.

Of planetary nebulae one of the best known is the "owl nebula" in the Great Bear about midway between "the pointers." As seen with Lord Rosse's reflector, it presented a startling appearance, resembling the face of a goblin; two faint stars shone in the centres of the two dark circles which represented the saucer-eyes of the creature. Some change has certainly taken place since then, for the two stars no longer could be supposed to represent the pupils of the eyes; the cause may, however, be merely the proper motion of the stars or of the nebula.

The discovery of great regions having a faint nebulous background is one of the most remarkable results of modern work. Particularly interesting is the fact that, whilst the large telescopes are unable to render them perceptible to the eye or to photograph them, they are revealed by what at first sight seems an absurdly simple apparatus. For the study of the ordinary nebulae large reflecting telescopes (preferably of short focal length) are used, the great light-gathering power being all important; but for photographing these diffused nebulosities portrait lenses of very small aperture and focal length are most successful. Thus the great extension of the Orion nebula was photographed by W. H. Pickering in 1890 with a lens 2·6 in. in aperture and of 8·6 in. focal length; the exposure was rather more than six hours. Other extensive nebulous regions of a similar character have been found by Barnard in the constellations Ophiuchus, Scorpio and Taurus.

Spectra of Nebulae.—Owing to the feebleness of their light the study of the spectra of nebulae is one of particular difficulty. Two varieties of spectra are recognized; the one consists of a few narrow bright lines with sometimes a faint continuous spectrum for a background; the other consists of a continuous spectrum crossed by dark lines and is indistinguishable from that of ordinary stars. The former variety unmistakably shows that the light proceeds from diffuse incandescent vapour; nebulae showing this spectrum are accordingly called "gaseous." Irregular, annular and planetary nebulae are of this nature. The visual spectrum is marked by three bright lines in the blue and green of wave-lengths 5007, 4959 and 4861. Of these the last is the line H β of the hydrogen series; the other two are of unknown origin, and as they are always found together and have always the same relative intensity, they have both been attributed to the same unknown element, which has been named "nebulium." Usually there are no other conspicuous lines in the visual spectrum, but in the ultra-violet region numerous lines can be photographed, including most of the hydrogen series. The yellow line (D_3) of helium can be detected in many nebulae. The great majority of the nebulae, however, show the second variety of spectrum, and are thus indistinguishable spectroscopically from irresolvable star-clusters. The great nebula of Andromeda and the spiral nebulae are of this kind. It is not necessary to conclude that they, therefore, are star-clusters whose components are, owing to their remoteness from us, too faint and close together to be separately distinguishable. A gaseous mass only gives a bright line spectrum when it is so rarefied as to be transparent through and through. If the density and thickness are such that a ray of light cannot pass through it the spectrum will, in general, be continuous like that of a solid body.

The inquiry into the physical state and constitution of the nebulae raises problems of great difficulty. In the case of "gaseous" nebulae it is very hard to understand how such extremely tenuous masses are maintained in a state of incandescence. Only one theory has been put forward which at all accounts for this fact, and unfortunately, it is not altogether satisfactory in other respects. This is Sir Norman Lockyer's "Meteoritic Hypothesis," which attributes the light to collisions between numbers of small discrete solid particles, these being vaporized and made luminous owing to the heat developed by their impacts. Formidable difficulties, however, prevent the entire acceptance of this suggestion.

The spiral nebulae are not distributed at random over the sky, nor are they condensed along the galactic plane like the clusters which they spectroscopically resemble. There is a well-marked centre of aggregation of the northern nebulae near the north galactic pole. In the southern hemisphere they are more evenly distributed, but the avoidance of the galactic plane is marked. The remarkable *Nubeculae* or *Magellanic Clouds* in the southern hemisphere, which look like detached portions of the Milky Way, are found on telescopic examination to consist, not of stars alone, like the Milky Way, but of stars and nebulae clustering together. In the greater cloud Sir John Herschel counted 286 nebulae; in the lesser cloud they are rather less numerous.

References.—The characters of nebulae receive treatment in all text-books on descriptive astronomy; mention may be made of Miss A. M. Clerke, *The System of the Stars* (2nd ed., 1905), which contains a full account of these objects, illustrated by many photographs; the same work is replete with references to original papers. Of recent catalogues of nebula, we notice J. L. E. Dreyer, "A new general catalogue of nebulae and clusters of stars," *Memoirs R.A.S.* (1888), published separately in 1890; and "Index Catalogue of Nebulae (1888–1894)," *Mem. R.A.S.* (1895). Excellent photographs of the more famous nebulae are given in Sir R. Ball's *Popular Guide to the Heavens* (1905); a more comprehensive collection is given in Isaac Roberts, *Photographs of Stars, Star Clusters and Nebulae* (2 vols., 1873–1899). (A. S. E.)

NEBULAR THEORY, a theory advanced to account for the origin of the solar system. It is emphatically a speculation; it cannot be demonstrated by observation or established by mathematical calculation. Yet the boldness and the splendour of the nebular theory have always given it a dignity not usually attached to a doctrine which from the very nature of the case can have but little direct evidence in its favour.

There are very remarkable features in the solar system which point unmistakably to some common origin of many of the different bodies which it contains. We may at once put the comets out of view. It does not appear that they bear any testimony on either side of the question. We do not know whether the comets are really indigenous to the solar system or whether they may not be merely imported into the system from the depths of space. Even if the comets be indigenous to the system, they may, as many suppose, be merely ejections from the sun. In any case the orbits of comets are exposed to such tremendous perturbations from the planets that it is unsafe from the present orbit of a comet to conjecture what that orbit may have been in remote antiquity. On these grounds we discuss the nebular theory without much reference to comets. But even after the omission of all cometary objects we can still count in the solar system upwards of five hundred bodies, almost every one of which pronounces distinctly, though with varying emphasis, in favour of the nebular theory.

The first great fact to be noticed is that the planets revolve around the sun in the same direction. This is true not only of the major planets Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus and Neptune; it is also true of the host of more than five hundred minor planets. It is also remarkable that all the great planets and many of the small ones have their orbits very nearly in the same plane, and nearly circular in form. Viewed as a question in probabilities, we calculate the chance that five hundred bodies revolving round the sun shall all be moving in the same direction. The improbability of such an arrangement is enormously great. It is represented by the ratio of a number containing about a hundred and sixty figures to unity, and so we are at once forced to the conclusion that this remarkable feature of the planetary motions must have some physical explanation. In a minor degree this conclusion is strengthened by observing the satellites. Discarding those of Uranus, in which the orbits of the satellites are highly inclined to the ecliptic, and in which manifestly some exceptional influences have been at work, we find that the satellites revolve around the primaries also in the same direction;[1] while, to make the argument complete, the planets, so far as they can be observed, rotate on their axes in the same manner.

The nebular theory offers an explanation of this most remarkable uniformity. Laplace supposed the existence of a primeval nebula which extended so far out as to fill all the space at present occupied by the planets. This gigantic nebulous mass, of which the sun was only the central and somewhat more condensed portion, is supposed to have a movement of rotation on its axis. There is no difficulty in conceiving how a nebula, quite independently of any internal motion of its parts, shall also have had as a whole a movement of rotation. In fact a little consideration of the theory of probabilities will show it to be infinitely probable that such an object should really have *some* movement of rotation, no matter by what causes the nebula may have originated. As this vast mass cooled it must by the laws of heat have contracted towards the centre, and as it contracted it must, according to a law of dynamics, rotate more rapidly. The time would then come when the centrifugal force on the outer parts of the mass would more than counterbalance the attraction of the centre, and thus we would have the outer parts left as a ring. The inner portion will still continue to contract, the same process will be repeated, and thus a second ring will be formed. We have thus grounds for believing that the original nebula will separate into a series of rings all revolving in the same direction with a central nebulous mass in the interior. The materials of each ring would continue to cool and to contract until they passed from the gaseous to the liquid condition. If the consolidation took place with comparative uniformity we might then anticipate the formation of a vast multitude of small planets such as those we actually do find in the region between the orbit of Mars and that of Jupiter. More usually, however, the ring might be expected not to be uniform, and, therefore, to condense in some parts more rapidly than in others. The effect of such contraction would be to draw the materials of the ring into a single mass, and thus we would have a planet formed, while the satellites of that planet would be developed from the still nascent planet in the same way as the planet itself originated from the sun. In this way we account most simply for the uniformity in the direction in which the planets revolve, and for the mutual proximity of the planes in which their orbits are contained.

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[1] Exceptions are Saturn ix. (Phoebe), Jupiter vii. (?) and viii., and the satellite of Neptune.

Such was the nebular theory as it was originally sketched. At the present day when the nebulae that are spiral in form have been shown to be so numerous, next to the fixed stars themselves, our view of the nebular theory has been somewhat modified. It now seems probable that the spiral nebula is the fittest illustration of the transformation of a diffused nebula into a system of sun and planets.

The rotation of the planets on their axes is also explained as a consequence of the nebular theory, for at the time of the first formation of the planet it must have participated in the rotation of the whole nebula, and by the subsequent contraction of the planet the speed with which the rotation was performed must have been accelerated.

There is quite a different method of considering the nebular origin of our system, which leads in a very striking manner to conclusions practically identical with those we have just sketched. We may commence by dealing with the sun as we find it at the present moment, and thence inferring what must have been the progress of events in the earlier epochs of the history of our system.

The daily outpour of heat from the sun at the present time suggests a profound argument in support of the nebular theory. The amount of the sun's heat has been estimated, but we receive on the earth less than one two-thousand-millionth part of the whole radiation. It would seem that the greater part of the rest flows away to be lost in space. Now what supplies this heat? We might at first suppose that the sun was really an intensely heated body radiating out its heat as does white-hot iron, but this explanation cannot be admitted, for there is no historical evidence that the sun is growing colder. We have not the slightest reason to think that the radiation from the sun is measurably weaker now than it was a couple of thousand years ago, yet it can be shown that, if the sun were merely radiating heat as simply a hot body, then it would cool some degrees every year, and must have cooled many thousands of degrees within the time covered by historical records. We, therefore, conclude that the sun has some other source of heat than that due simply to incandescence. It might, for example, be suggested that the heat of the sun was supplied by chemical combination analogous to combustion. It would take 20 tons of coal a day burned on each square foot of the sun's surface to supply the daily radiation. Even if the sun were made of one mass of fuel as efficient as coal, that mass must be entirely expended in a few thousand years if the present rate of radiation was to be sustained. We cannot, therefore, admit that the source of the heat in the sun is to be found in any chemical combination taking place in its mass. Where then can we find an adequate supply of heat? Only one external source can be named: the falling of meteors into the sun must yield some heat just as a shooting star yields some heat to our atmosphere, but the question is whether the quantity of heat obtainable from the shooting stars is at all adequate for the purpose. It can be shown that unless a quantity of meteors in collective mass equal to our moon were to plunge into the sun every year the supply of heat could not be sustained from this source. Now there is no reason to believe that meteors in anything like this quantity can be supplied to the sun, and, therefore, we must reject this source as also inadequate.

The truth about the sun's heat appears to be that the sun is really an incandescent body losing heat, but that the operation of cooling is immensely retarded owing to a curious circumstance due jointly to the enormous mass of the sun and to a remarkable law of heat. It is well known that if energy disappears in one form it reappears in another, and this principle applied to the sun will explain the famous difficulty.

As the sun loses heat it contracts, and every pair of particles in the sun are nearer to each other after the contraction than they were before. The energy due to their separation is thus less in the contracted state than in the original state, and as that energy cannot be lost it must reappear in heat. The sun is thus slowly contracting; but as it contracts it gains heat by the operation of the law just referred to, and thus the further cooling and further contraction of the sun is protracted until the additional heat obtained is radiated away. In this way we can reconcile the fact that the sun is certainly losing heat with the fact that the change in temperature has not been large enough to be perceived within historic times.

It has been estimated that the sun is at present contracting so that its diameter diminishes 10 m. every century; there is, however, now reason to think that the rate of contraction is by no means so rapid as this would indicate. This is an inappreciable distance when compared with the diameter of the sun, which is nearly a million of miles, but the significance for our present purpose depends upon the fact that this contraction is always taking place. Assuming the accuracy of the estimate just made, we see that a thousand years ago the sun must have had a diameter 100 m. greater than at present, ten thousand years ago that diameter must have been 1000 m. more than it is now, and so on. We cannot perhaps assert that the same rate is to be continued for very many centuries, but it is plain that the further we look back into the past time the greater must the sun have been.

Dealing then simply with the laws of nature as we know them, we can see no limit to the increasing size of the sun as we look back. We must conceive a time when the sun was swollen to such an extent that it filled up the entire space girdled by the orbit of Mercury. Earlier still the sun must have reached to the earth. Earlier still the sun must have reached to where Neptune now revolves on the confines of our system, but the mass of the sun could not undergo an expansion so prodigious without being made vastly more rarefied than at present, and hence we are led by this mode of reasoning to the conception of the primaeval nebula from which our system has originated.

Considering that our sun is but a star, or but one of the millions of stars, it is of interest to see whether any other systems present indication of a nebulous origin analogous to that which Laplace proposed for the solar system. In one of his papers, Sir W. Herschel marshals the evidence which can be collected on this point. He arranges a selection from his observations on the nebulae in such a way as to give great plausibility to his view of the gradual transmutation of nebulae into stars. Herschel begins by showing us that there are regions in the heavens where a faint diffused nebulosity is all that can be detected by the telescope. There are other nebulae in which a nucleus can be just discerned, others again in which the nucleus is easily seen, and still others where the nucleus is a brilliant star-like point. The transition from an object of this kind to a nebulous star is very natural, while the nebulous stars pass into the ordinary stars by a few graduated stages. It is thus possible to exhibit a series of objects beginning at one end with the most diffused nebulosity and ending at the other with an ordinary fixed star or group of stars. Each object in the series differs but slightly from the object just before it and the object just after it. It seemed to Herschel that he was thus able to view the actual changes by which masses of phosphorescent or glowing vapour became actually condensed down into stars. The condensation of a nebula could be followed in the same manner as we can study the growth of the trees in the forest, by comparing the trees of various ages which the forest contains at the same time. In attempting to pronounce on the evidence with regard to Herschel's theory, we must at once admit that the transmutation of a nebula into a star has never been seen. It is indeed very doubtful whether any changes of a nebula have ever been seen which are of the same character as the changes Herschel's theory would require. It seems, however, most likely that the periods of time required for such changes are immense and that the changes accomplished in only a century or two are absolutely inappreciable.

The nebular theory is a noble speculation supported by plausible argument, and the verdict of science on the whole subject cannot be better expressed than in the words of S. Newcomb: "At the present time we can only say that the nebular hypothesis is indicated by the general tendencies of the laws of nature, that it has not been proved to be inconsistent with any fact, that it is almost a necessary consequence of the only theory by which we can account for the origin and conservation of the sun's heat, but that it rests on the assumption that this conservation is to be explained by the laws of nature as we now see them in operation. Should any one be sceptical as to the sufficiency of these laws to account for the present state of things, science can furnish no evidence strong enough to overthrow his doubts until the sun shall be found growing smaller by actual measurement, or the nebulae be actually seen to condense into stars and systems."

BIBLIOGRAPHY.—Laplace, *Système du monde*; Sir William Herschel, *Phil. Trans.* (1814), pp. 248-284; Kant's *Cosmogony*, translated by Professor Hastie; Sir John Herschel, *Outlines of Astronomy*; Professor S. Newcomb, *Popular Astronomy*; Lick Observatory publications, photographs of Nebulae; Sir Robert Ball, *The Earth's Beginning*. (R. S. B.)

NECESSITAS (Gr. 'Ανάγκη), in Orphic theology, the personification of absolute necessity. She appears as the mother of the Moerae (Fates), as the wife of Demiurgus (Fashioner of the World) and mother of Heimarmenē (Destiny). Her power is irresistible, even greater than that of the gods; to her was due the strife (battles with Titans, Giants) that raged amongst them of old, before the rule of love began; the world revolves round the spindle, which she holds in her lap. According to the Egyptian theory, she is one of the four deities present at the birth of every human being, her companions being the Daemon (guardian spirit), Tyche (Fortune) and Eros. On the citadel of Corinth there was a temple sacred to her and Bia (Violence), which none were permitted to enter. The Roman Necessitas is represented in the well-known ode of Horace (i. 35) as the forerunner and companion of Fortuna, holding in her brazen hand huge nails, a clamp and molten lead, symbolical of fixedness and tenacity.

See Plato, *Rep.* 616 C, *Symp.* 195 C, 197 B; Macrobius, *Saturnalia*, i. 19; Pausanias ii. 4. 6.

NECESSITY (Lat. *necessitas*), a term used technically in philosophy for the quality of inevitable happening; for example, hot air *necessarily* tends to rise. Thus it corresponds in the sphere of action to certainty in the sphere of knowledge. That the sun will rise to-morrow is a *necessary* event; and men anticipate the rising with *certainty*. In ordinary language the conception of necessity is rendered meaningless by being referred to the present or even to the past. A current definition of necessity is "the state which cannot be otherwise than it is." Such a definition tells us nothing. How can any state be otherwise than it is? Necessity can have meaning only in reference to the future: it means absence of spontaneous power in that which acts necessarily. For the origin of the conception we must look to our inward personal experience of constraint. When we are acting under physical or mathematical or logical or moral necessity we are so far precluded from spontaneous action—in common phrase, we can do no otherwise—though the causes of constraint may be of very different kinds. In ethics the term necessitarianism is applied to that view of human action which regards all action as dictated by external causes (cf. DETERMINISM). The sense in which, if at all, the human mind can cognize necessity, *i.e.* causal connexion between events or states, has been the subject of vigorous discussion among philosophers. By sceptics and empiricists it is held that a law is merely a crystallized summary of observed phenomena. Thus J. S. Mill denies that a general proposition is more than an enumeration of particulars, and hence that syllogistic reasoning cannot amplify knowledge (see SYLLOGISM). It is clear that the senses cannot apprehend causal connexion, and this impossibility gives rise to a prior conception according to which the conception of necessity is purely intellectual (see METAPHYSICS).

NECK (O. Eng. *hnecca*; the word appears in many Teutonic languages; cf. Dutch *nek*, Ger. *Nacken*; in O. E. the common word was *heals*; cf. Ger. *Hals*), that part of the body which connects the head with the trunk (see ANATOMY: *Superficial* and *Artistic*). The word is transferred to many objects resembling this part of the body in shape or function; it is thus applied to an isthmus, or to the narrowest portion of a promontory, to the narrow part of a musical stringed instrument connecting the head and body, as in the violin, or to a narrow pass between mountains, which in the Dutch form *nek*, appears in place-names in South Africa. In architecture, the "neck" is that part of the capital just above the "astragal," and the term "necking" is applied to the annulet or round, or series of horizontal mouldings, which separates the capital of a column from the plain part or a shaft. In Romanesque work this is sometimes corded.

In Geology, the term "neck" is given to the denuded stump of an extinct volcano. Beneath every volcano there are passages of conduits up which the volcanic materials were forced, and after the mass has been levelled by denudation there is always a more or less circular pipe which marks the site of the crater. This pipe, which is filled with consolidated ashes or with crystalline lava, is the characteristic of a volcanic neck. Active volcanoes often stand on the sea-bottom and when the eruption comes to an end the volcano is slowly buried under layers of sediment. In tropical seas the coral animals cover over the submarine volcanoes which rise nearly to the surface and form great reefs of limestone around them. Should elevation take place after long ages the removal of the overlying strata will bring the volcanic mass to light, and in the normal course of things this will suffer denudation exactly like a recent volcano. Many instances of this are furnished by the geological history of the British Isles. In Carboniferous times, for example, before the Coal-measures were deposited, a shallow sea occupied the southern part of Scotland and the north of England. Volcanic activity broke out on the sea-bottom, and many volcanic cones, both small and large, were produced. These have long since been uplifted and the superjacent strata denuded away over a large part of the area which they occupied. In Derbyshire, Fife, the Lothians and the Glasgow district the remains of Carboniferous volcanoes occur in every state of preservation. Some have the conical hills of lavas and ashes well preserved (*e.g.* Largo Law in Fifeshire); others retain only a small part of the original volcanic pile (*e.g.* Arthur's Seat, Edinburgh; the Binn of Burntisland), and of the larger number nothing remains but the "neck" which shows where once the crater was situated.

In regions of former volcanic activity necks are the most persistent of all volcanic structures, because the active volcanic magma is located deep within the earth's crust, and the pipe by which it rises to the surface is of great length and traverses a great thickness of strata. Many volcanic necks stand on lines of fault. In other cases there are groups of necks lying in a straight or sinuous line, which may indicate the position of a fracture or at least of a line of least resistance. But in Scotland it is often impossible to adduce any evidence of the connexion between faults or fissures and the position of volcanic necks; and it seems likely that the pressure of the gases in the igneous magma increased till an explosion took place which perforated the rocks above with a clean tubular passage often nearly circular in cross section. This pipe was usually vertical, and nearly uniform in diameter for great depths; the material occupying it, when exposed by denudation, has a circular ground plan, or if shown in vertical section (or elevation) in a cliff is a pillar-shaped mass crossing the bedding planes of the strata nearly at right angles. It terminates upwards in the remains of the volcanic cone and communicates below with the reservoir from which the lavas were emitted, represented in most cases, where it has been exposed, by a large irregular mass (a batholith or boss) of coarsely crystalline igneous rock. The site of such a neck is generally indicated by a low conical hill consisting of volcanic rock, surrounded by sedimentary or igneous strata of a different kind. The low cone is due to the greater hardness and strength of the volcanic materials and is not connected with the original shape of the volcano. Such hills are common in some parts of Scotland and well-known examples are Arthur's Seat and the Castle Rock (Edinburgh), North Berwick Law, the Bass Rock; they occur also in the Peak district of Derbyshire, and the Wolf Rock off the coast of Cornwall is probably a neck. Two splendid sugar-loaf cones known as the Pitons of St Lucia in the West Indies, rising from the sea with almost vertical sides to a height of nearly 3000 ft., are old volcanic necks. In Texas, New Mexico, Arizona, California and many of the western states of North America geologists have observed conical volcanic hills having all the features which belong to necks.

Where the volcanic rocks are soft and easily disintegrated they may be reduced more rapidly than the strata around them and the position of a neck may be indicated by a cup-shaped hollow; this is the case with some of the diamond-bearing basic pipes of South Africa. Sometimes necks are encountered in underground mining operations; in the coal-field of Fife, for instance, the coals are sometimes replaced by a circular mass of volcanic rock, a quarter of a mile or more in diameter, which rise vertically to the surface. Better examples are the Kimberley diamond mines. The blue-ground (or serpentine breccia) occupies great pipes or funnels, circular in outline with nearly vertical sides, extending downwards to unknown depths; these are undoubtedly the necks of old volcanoes. If any lavas were poured out from these pipes at the surface they have since been carried away by denudation.

The size of necks varies considerably; the smallest may be only 20 or 30 yds. in diameter, the largest are several miles. In this respect they resemble active craters, but no necks have been met with on the earth's surface with dimensions approaching those of the so-called "craters" of the moon. Small necks are usually simple, *i.e.* they contain only one or two kinds of igneous rock (ashes and dikes) and have been produced, so far as we can judge, by a single eruption. Not infrequently they contain no volcanic rock but are filled with pieces of slate, sandstone or whatever strata the pipe traverses. Such necks must have been produced by a single eruption with an outburst of steam, not followed by lava; the disrupted fragments of the surrounding rocks and the materials tumbling down from the crater's walls ultimately filled up the cavity. Instances occur in Fifeshire and in Shetland, and among the recent volcanoes of the Eiffel there are some which have thrown out more slate and sandstone than lava.

Large necks, on the other hand, are often of complex structure, contain many kinds of rock and seem to have been produced by repeated eruptions, each of which more or less completely cleared out the material obstructing the orifice, and introduced a series of fresh accumulations. The beds of ashes which line the interior of an active crater have in nearly all cases a slope or dip towards a central point where the base of the depression is situated, and in volcanic necks which have been filled with ash (tuffs and agglomerates) this funnel-like inward dip is very constant. If there has been only a single eruption the beds of ashes have a very conformable or uniform arrangement, but if activity has been resumed after a period of quiescence a large part of the old material may have been projected and a new series of beds laid down, transgressing unconformably the edges of the earlier ones. By these structures we can sometimes trace a neck within a neck, or of a lateral crater on the margin of a principal one.

Where the crater has filled up with very coarse ashes, or agglomerate, the bedding is rarely visible. Sometimes large empty craters were occupied temporarily by lakes, and level sheets of mud and silt have gathered on their floors: hence bedded sediments are not infrequently found in volcanic necks. Mixed with the volcanic ashes and bombs there are often large broken pieces of sedimentary rocks which may have been crystallized and hardened by the heat and vapours emitted by the volcano. Sometimes great fragments of the walls have foundered or collapsed into the crater, and masses of non-volcanic rock, an acre or more in extent, may occur in a volcanic neck. In Arran, for example, there is a large neck which contains lumps of Cretaceous rocks nowhere else known to occur on the island; they have fallen down from strata once occupying part of the walls of the crater but now removed by denudation.

The lava which rises and flows out from the crater leaves its trace also in the necks. Sometimes it forms thin beds or flows alternating with the tuffs and having the same basin-shaped dip. More commonly it appears as the material filling fissures and pipes, traversing the ashes irregularly or rising as a central plug in the interior of the neck, and sending out branching veins. Occasionally a whole neck is composed of solid crystalline rock representing the last part of the magma which ascended from the underground focus and congealed within the crater. In Mont Pelée, for instance, the last stage of the eruptions of 1902 to 1905 was the protrusion of a great column of solidified lava which rose at one time to a height of 900 ft. above the lip of the crater, but has since crumbled down. The Castle Rock of Edinburgh is a neck occupied by a plug of crystalline basalt. Necks of this kind weather down very slowly and tend to form prominent hills.

After the eruptions terminate gases or hot solutions given out by deep-lying masses of molten rock may find a passage upward through the materials occupying the crater, greatly modifying their mineral nature and laying down fresh deposits. A good example of secondary deposits within a volcanic neck is provided by the Cripple Creek mining district of Colorado. The ore-bearing veins are connected with volcanic rocks and part of these occupy a vertical circular pipe which is a typical volcanic neck. A phonolitic breccia, greatly altered, is the principal rock, and is cut by dikes of phonolite, dolerite, &c. The country rock is mostly granite and gneiss, and blocks of these are common in the breccia. A large volcano was built up in Tertiary times on the granite plateau, and has since been almost entirely removed by denudation. The gold ores were carried upwards by currents of hot water derived from the volcanic magma and were deposited along cracks and fissures in the materials which occupied the crater, and also in the surrounding rocks (see VOLCANO).

(J. S. F.)

NECKAM, ALEXANDER (1157–1217), English schoolman and man of science, was born at St Albans in September 1157, on the same night as King Richard I. Neckam's mother nursed the prince with her own son, who thus became Richard's foster-brother. He was educated at St Albans Abbey school, and began to teach as schoolmaster of Dunstable, dependent on St Albans Abbey. Later he resided several years in Paris, where by 1180 he had become a distinguished lecturer of the university. By 1186 he was back in England, where he again held the place of schoolmaster at Dunstable. He is said to have visited Italy with the bishop of Worcester, but this statement has been doubted; the assertion that he was ever prior of St Nicolas, Exeter, seems a mistake: on the other hand, he was certainly much at court during some part of his life. Having become an Augustinian canon, he was appointed abbot of Cirencester in 1213. He died at Kempsey in Worcestershire in 1217, and was buried at Worcester. Besides theology he was interested in the study of grammar and natural history, but his name is chiefly associated with nautical science. For in his *De naturis rerum* and *De utensilibus* (the former of which, at any rate, had become well known at the end of the 12th century, and was probably written about 1180) Neckam has preserved to us the earliest European notices of the magnet as a guide to seamen—outside China, indeed, these seem to be the earliest notices of this mystery of nature that have survived in any country or civilization. It was probably in Paris, the chief intellectual centre of his time, that Neckam heard how a ship, among its other stores, must have a needle placed above a magnet (the *De utensilibus* assumes a needle mounted on a pivot), which needle would revolve until its point looked north, and thus guide sailors in murky weather or on starless nights. It is noteworthy that Neckam has no air of imparting a startling novelty: he merely records what had apparently become the regular practice of at least many seamen of the Catholic world.

See Thomas Wright's edition of Neckam's *De naturis rerum* and *De laudibus divinae sapientiae* in the Rolls Series (1863), and of the *De utensilibus* in his *Volume of Vocabularies*. Neckam also wrote *Corrogationes Promethei*, a scriptural commentary prefaced by a treatise on grammatical criticism; a translation of Aesop into Latin elegiacs (six fables from this version, as given in a Paris MS., are printed in Robert's *Fables inédites*); commentaries, still unprinted, on portions of Aristotle, Martianus Capella and Ovid's *Metamorphoses*, and other works. Of all these the *De nat. rer.*, a sort of manual of the scientific knowledge of the 12th century, is much the most important: the magnet passage herein is in book ii. chap. xcviii. (*De vi attractiva*), p. 183 of Wright's edition. The corresponding section in the *De utensil*, is on p. 114 of the *Vol. of Vocabs.*

Roger Bacon's reference to Neckam as a grammatical writer (*in multis vera et utilia scripsit: sed . . . . inter auctores non potest . . . . numerari*) may be found in Brewer's (Rolls Series) edition of Bacon's *Opera inedita*, p. 457. See also Thomas Wright, *Biographia Britannica literaria, Anglo-Norman Period*, pp. 449–459 (1846: some points in this are modified in the 1863 edition of *De nat. rer.*); C. Raymond Beazley, *Dawn of Modern Geography*, iii. 508–509. (C. R. B.)

NECKAR, a river of Germany, and a right-bank tributary of the Rhine, rises between the Black Forest and the Swabian Alb, near Schwenningen, in Württemberg, at an altitude of 2287 ft. As far as Rottweil only a mountain stream, it here attains the volume of a river, flows N. as far as Horb, thence in a north-easterly direction, and with rapid current it passes Rottenburg and the university town of Tübingen, taking then a generally northerly course. From Esslingen the Neckar becomes broader and deeper and its valley very picturesque, and after passing Cannstatt, from which point it is navigable for small craft, it flows through vine-clad hills by the pleasant village of Marbach, Schiller's birthplace, receives at Besigheim the waters of its most considerable tributary, the Enz, swirls down by Lauffen, and enters the beautiful vale of Heilbronn. Hence, between hills crowned by frequent feudal castles, it runs by Wimpfen and by Hornberg, where Götz von Berlichingen lived, to Eberbach, where it enters the sandstone formation of the Odenwald. It now takes a tortuous westerly course, and the scenery on its banks becomes more romantic. Winding down by Neckarsteinach and Neckargemünd between lofty wooded heights, it sweeps beneath the Königsstuhl (1900 ft.), washes the walls of Heidelberg, and now quitting the valley enters the plain of the Rhine and falls into that river from the right at Mannheim. Its length is 247 m., and its drainage area 4790 sq. m. Its more important tributaries are the Enz, Eschach and Glatt (left), and the Fils, Rems, Kocher and Jagst (right). It is navigable for small steamboats up to Heilbronn, for boats up to Cannstatt, and for rafts from Rottweil. It is the principal waterway of Württemberg, and is greatly used for floating down timber. From Rottenburg downwards its banks are almost everywhere planted with vineyards. Up to Frankfort it has been deepened and the channel otherwise improved. A committee, chiefly promoted by the Württemberg government and the Stuttgart chamber of commerce, reported in 1901 that it was both desirable and practicable to dredge the river and to canalize it, from Esslingen down to Mannheim, and that the cost would probably be between 2 and 2½ millions sterling.

See T. Eckart, *Bilder aus dem Neckartal* (1893).

NECKARGEMÜND, a town and climatic health resort of Germany, in the grand duchy of Baden, situated amid densely wooded hills, on the left bank of the Neckar, 6 m. E. from Heidelberg by the railway to Würzburg and at the junction of a line to Jagstfeld. Pop. (1905) 2200. It has an important trade in wine. The other industries are quarrying, tanning and shipbuilding, and there are electrical works. Neckargemünd, one of the favourite tourist resorts in the Neckar valley, was founded in the 10th century and became a free town in 1286. In 1395 it passed to the elector palatine and, together with the surrounding district, was apportioned to Baden in 1814.

NECKER, JACQUES (1732–1804), French statesman, finance minister of Louis XVI., was born at Geneva in Switzerland. His father was a native of Cüstrin in Pomerania, and had, after the publication of some works on international law, been elected as professor of public law at Geneva, of which he became a citizen. Jacques Necker had been sent to Paris in 1747 to become a clerk in the bank of a friend of his father, M. Vernet. He soon afterwards established, with another Genevese, the famous bank of Thellusson & Necker. Thellusson superintended the bank in London (his grandson was made a peer as Lord Rendlesham), while Necker was managing partner in Paris. Both partners became very rich by loans to the treasury and speculations in grain. In 1763 Necker fell in love with Madame de Verménou, the widow of a French officer. But while on a visit to Geneva, Madame de Verménou met Suzanne Curchod, the daughter of a pastor near Lausanne, to whom Gibbon had been engaged, and brought her back as her companion to Paris in 1764. There Necker, transferring his love from the widow to the poor Swiss girl, married Suzanne before the end of the year. She encouraged her husband to try and make himself a public position. He accordingly became a syndic or director of the French East India Company, and, after showing his financial ability in its management, defended it in an able memoir against the attacks of A. Morellet in 1769. Meanwhile he had made interest with the French government by lending it money, and was appointed resident at Paris by the republic of Geneva. Madame Necker entertained the chief leaders of the political, financial and literary worlds of Paris, and her Fridays became as greatly frequented as the Mondays of Madame Geoffrin, or the Tuesdays of Madame Helvetius. In 1773 Necker won the prize of the Académie Française for an *éloge* on Colbert, and in 1775 published his *Essai sur la législation et le commerce des grains*, in which he attacked the free-trade policy of Turgot. His wife now believed he could get into office as a great financier, and made him give up his share in the bank, which he transferred to his brother Louis. In October 1776 Necker was made finance minister of France, though with the title only of director of the treasury, which, however, he changed in 1777 for that of director-general of the finances. He did great good in regulating the finances by attempting to divide the taille or poll tax more equally, by abolishing the "vingtième d'industrie," and establishing *monts de piété* (establishments for loaning money on security). But his greatest financial measures were his attempt to fund the French debt and his establishment of annuities under the guarantee of the state. The operation of funding was too difficult to be suddenly accomplished, and Necker rather pointed out the right line to be followed than completed the operation. In all this he treated French finance rather as a banker than as a profound political economist, and thus fell far short of Turgot, who was the very greatest economist of his day. Politically he did not do much to stave off the coming Revolution, and his establishment of provincial assemblies was only a timid application of Turgot's great scheme for the administrative reorganization of France. In 1781 he published his famous *Compte rendu*, in which he drew the balance sheet of France, and was dismissed from his office. Yet his dismissal was not really due to his book, but to the influence of Marie Antoinette, whose schemes for benefiting the duc de Guines he had thwarted. In retirement he occupied himself with literature, and with his only child, his daughter, who in 1786 married the ambassador of Sweden and became Madame de Staël (*q.v.*). But neither Necker nor his wife cared to remain out of office, and in 1787 Necker was banished by "lettre de cachet" 40 leagues from Paris for attacking Calonne. In 1788 the country, which had at the bidding of the literary guests of Madame Necker come to believe that Necker was the only minister who could "stop the deficit," as they said, demanded Necker's recall, and in September 1788 he became once more director-general of the finances. Throughout the momentous months which followed the biography of Necker is part of the history of the French Revolution (*q.v.*). Necker put a stop to the rebellion in Dauphiné by legalizing its assembly, and then set to work to arrange for the summons of the states general. Throughout the early months of 1789 he was regarded as the saviour of France, but his conduct at the meeting of the states general showed that he regarded it merely as an assembly which should grant money, not organize reforms. But as he had advised the calling of the states general, and the double representation of the third estate, and then permitted the orders to deliberate and vote in common, he was regarded as the cause of the Revolution by the court, and on July 11 was ordered to leave France at once. Necker's dismissal brought about the taking of the Bastille, which induced the king to recall him. He was received with joy in every city he traversed, but at Paris he again proved to be no statesman. Believing that he could save France alone, he refused to act with Mirabeau or La Fayette. He caused the king's acceptance of the suspensive veto, by which he sacrificed his chief prerogative in September, and destroyed all chance of a strong executive by contriving the decree of November 7, by which the ministry might not be chosen from the assembly. Financially he proved equally incapable for a time of crisis, and could not understand the need of such extreme measures as the establishment of assignats in order to keep the country quiet. His popularity vanished when his only idea was to ask the assembly for new loans, and in September 1790 he resigned his office, unregretted by a single Frenchman. Not without difficulty he reached Coppet, near Geneva, an estate he had bought in 1784. Here he occupied himself with literature, but Madame Necker pined for her Paris *salon* and died in 1794. He continued to live on at Coppet, under the care of his daughter, Madame de Staël, and his niece, Madame Necker de Saussure, but his time was past, and his books had no political influence. A momentary excitement was caused by the advance of the French armies in 1798, when he burnt most of his political papers. He died at Coppet in April 1804.

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(H. M. S.; J. T. S.*)

NECROLOGY (from Med. Lat. *necrologium*, Gr. *νεκρός*, corpse, the termination being formed from *λόγιος*, *λέγειν* to read, in the sense of list, register; cf. "martyrology"), a register in a monastery or other ecclesiastical establishment of the names of the deceased members of the society, or of those for whom the prayers of the foundation were offered as benefactors; hence any roll or list of deceased persons or collection of obituaries.

NECROMANCY (Gr. *νεκρομαντεία*, or *νεκυομαντεία*, from *νεκρός* or *νέκυς*, corpse, and *μαντεία*, divination), properly divination by communicating with the dead. The latinized form of the Greek word was corrupted into *nigromantia*, connecting the word with *niger*, black, and so was applied to the "black art," "black magic," in the sense of witchcraft, sorcery. This corrupted form is common in English to the 17th century (see MAGIC and WITCHCRAFT).

NECROPOLIS, a cemetery (*q.v.*) or burying-place, literally a "city of the dead" (Gr. *νεκρός*, corpse, and *πόλις*, city). Apart from the occasional application of the word to modern cemeteries outside large towns, the term is chiefly used of burial-grounds near the sites of the centres of ancient civilizations.

NECROSIS (Gr. *νεκρός*, corpse), a term restricted in surgery to death of bone. A severe inflammation, caused by a violent blow, by cold, or by the absorption of various poisons, as mercury and phosphorus, is the general precursor of necrosis. The dead part, analogous to the slough in the soft tissues, is called a sequestrum or exfoliation. At first it is firmly attached to the living bone around; gradually, however, the dead portion is separated from the living tissue. The process of separation is a slow one. New bone is formed around the sequestrum, which often renders its removal difficult. As a rule the surgeon waits until the dead part is loose, and then cuts down through the new case and removes the sequestrum. The cavity in which it lay gradually closes, and a useful limb is the result.

NECTAR, in ancient mythology generally coupled with ambrosia, the nourishment of the gods in Homer and in Greek literature generally. Probably the two terms were not originally distinguished; but usually both in Homer and in later writers nectar is the drink and ambrosia the food. On the other hand, in Alcman nectar is the food, and in Sappho and Anaxandrides ambrosia the drink. Each is used in Homer as an unguent (*Iliad*, xiv. 170; xix. 38). Both are fragrant, and may be used as perfume. According to W. H. Roscher (*Nektar und Ambrosia*, 1883; see also his article in Roscher's *Lexikon der Mythologie*) nectar and ambrosia were originally only different forms of the same substance—honey, regarded as a dew, like manna, fallen from heaven, which was used both as food and drink. (See also AMBROSIA.)

NEED-FIRE, or WILD-FIRE (Ger. *Notfeuer*, O. Ger. *nodfyr*), a term used in folklore to denote a curious superstition which survived in the Highlands of Scotland until a recent date. Like the fire-churning still customary in India for kindling the sacrificial fire, the need- or wild-fire is made by the friction of one piece of wood on another, or of a rope upon a stake. Need-fire is a practice of shepherd peoples to ward off disease from their herds and flocks. It is kindled on occasions of special distress, particularly at the outbreak of a murrain, and the cattle are driven through it. Its efficacy is believed to depend on all other fires being extinguished. The kindling of the need-fire in a village near Quedlinburg was impeded by a night light burning in the parsonage (Pröhle, *Harz-Bilder*, Leipzig, 1855). According to one account, in the Highlands of Scotland the rule that all common fires must be previously extinguished applied only to the houses situated between the two nearest running streams (Kelly, *Curiosities of Indo-European Tradition and Folklore*, p. 53 seq.). In Bulgaria even smoking during need-fire is forbidden. Two naked men produce the fire by rubbing dry branches together in the forest, and with the flame they light two fires, one on each side of a cross-road haunted by wolves. The cattle are then driven between the two fires, from which glowing embers are taken to rekindle the cold hearths in the houses (A. Strausz, *Die Bulgaren*, p. 198). In Caithness the men who kindled the need-fire had previously to divest themselves of all metal. In some of the Hebrides the men who made the fire had to be eighty-one in number and all married. In the Halberstadt district in Germany, the rope which was wound round the stake, must be pulled by two chaste boys; while at Wolfenbüttel, contrary to usual custom, it is said that the need-fire had to be struck out of the cold anvil by the smith. In England the need-fire is said to have been lit at Birtley within the last half-century. The superstition had its origin in the early ideas of the purifying nature of flame.

See also Grimm, *Deutsche Mythologie*, i. 501 sqq.; Kelly, *Curiosities of Indo-European Tradition and Folklore*, p. 48 sqq.; Elton, *Origins of English History*, p. 293 sqq.; J. G. Frazer, *The Golden Bough*, iii. 301.

NEEDLE (O. Eng. *nædl*; the word appears in various forms in Teutonic languages, Ger. *Nadel*, Dutch *naal*, the root being *ne-*, to sew, cf. Ger. *nähen*, and probably Lat. *nere*, to spin, Gr. *νῆσις*, spinning), an instrument adapted for passing a thread through fabrics in sewing, consisting of a thin rod of steel, having a pointed end and pierced with a hole or "eye" to carry the thread. The term is also applied to various other objects that more or less resemble a sewing needle in form, though differing in function, such as the magnetized piece of steel that points north and south in the mariner's compass, the pointer or indicator of certain forms of electric telegraph instruments, the slender tube by which the contents of a hypodermic syringe are injected beneath the skin, a sharp-pointed mountain peak or isolated mass of rock, &c.

Sewing needles have been in use from prehistoric times. Originally they were made of fishbone, bone or ivory, and their first form was probably a rude bodkin having a hook instead of an eye, though bone needles with an eye, sometimes at the end and sometimes in the middle, have been found in cave deposits in Great Britain and France and in the Swiss lakes. Bone needles continue to be used by uncivilized tribes, but since the discovery of bronze metal needles have been employed in civilized communities. Steel needles were introduced into Europe by the Moors, and it is on record that they were being made at Nuremberg in 1370. In England their manufacture was established about 1650. The centre of the trade in England is Redditch, in Worcestershire, with several other small towns in Warwickshire. Originally the industry was domestic in its character, but it is now carried on in factories where mechanical appliances have to a great extent supplanted handwork. Large quantities of needles are also manufactured on the continent of Europe, Aix-la-Chapelle being an important centre of their production. In the United States ordinary sewing needles are not made, though there is a large output of the special forms used in sewing machines.

The raw material of needle-manufacture consists of Sheffield crucible steel drawn down into wire of suitable gauge. The wire is supplied in coils of definite weight and diameter, and the first operation is to cut the coils into lengths, each sufficient for two needles. These lengths are next straightened. For this purpose a bundle containing several thousand lengths is packed within two strong iron rings, is heated to red heat, and is then pressed on an iron plate having two parallel grooves in which the iron rings run. Over this plate the bundle is worked backward and forward by the pressure of an oblong slightly curved iron tool having two longitudinal slits through which the edges of the rings project. Thus, by combined pressure and rolling the whole of the lengths quickly become perfectly straight and even. The next operation consists in pointing both ends of the wires. This was formerly done by hand by a grinder who, holding several dozen wires against a grindstone with his left hand and slightly revolving them with his right, was able to point about 100,000 needles a day, the number depending, however, to some extent on the size treated. This method, however, is now largely superseded by machinery, which is still more expeditious. The wires are fed out from a hopper to a revolving wheel, on the periphery of which they are held by an india-rubber band. This wheel revolves at right angles to a revolving hollow grindstone, and so each wire is brought up to the stone in rapid succession and pointed at one end, the process being repeated for the other end. The next operations are to stamp the grooves which are to be found at the head of a needle and to punch the oval eyes, both being done by automatic machinery. Each wire now forms two needles attached head to head by a broad thin scarf of steel. The operation of separating them is largely performed by machines which pass the double blanks over the face of an emery wheel, but an older method is to spit them on two flattened wires, clamp them tightly in a frame, file away the scarf and break the blanks in halves, so that two lots of single needles are obtained, each spitted on a wire. The next step, after the heads have been filed smooth, is to harden and temper the needles, which are heated to redness, plunged into cold oil, and then gently heated by being placed on a continuous band passing over a series of gas flames. After the tempering comes the process of scouring, and then the eyes are smoothed and polished so that they will not cut the thread. For this purpose the heads used to be softened by blueing, and the needles strung loosely on wires covered with a paste of emery and oil. These wires were then suspended between uprights on a frame platform to which a jerking motion was communicated; in this way the needles were made to swing on the wires and the gentle friction effected the desired end. Generally, however, the eyes are cleared by the action of a concave wire brush, before the scouring process, and then subsequent burnishing becomes unnecessary. The bodies are next polished by being passed between revolving leather rollers which have also a lateral motion in the direction of their axes. The heads of the finished needles have now to be brought all in one direction. Formerly this was done by a "header," wearing a cloth cap on one of her fingers; this being pressed against a batch of the needles which had previously been arranged parallel to each other, those whose heads were presented to the cloth stuck in it and thus were withdrawn. A more modern device is to roll them down a smooth inclined plane, when the pointed ends, owing to their conical form, travel more slowly than the thicker ends, and thus the needles are all brought round so that they point the same way. They are then sorted according to their lengths, and are done up into packets for the market.

Besides ordinary needles for hand sewing, many varieties are made for use in sewing machines, and in their production automatic machinery is largely utilized. Those used for sewing leather have points of various special forms (twist, chisel, wedge, diamond, &c.) instead of the round point of the ordinary needle, and sometimes have a hook in place of an eye. Knitting needles are long slender rods, usually of steel but sometimes of bone or other material, having neither hooks nor eyes. Crochet needles are provided with a hook. Hooked needles again are employed in knitting and stockinet machines; having to be periodically closed by the operation of the mechanism the hooks in one type are made flexible so that they can be pushed down on the shank, while in another the same end is served by providing them with a minute latch. Another special class is constituted by the numerous varieties of needles used by surgeons for suturing wounds, &c. (see SURGICAL INSTRUMENTS).

NEEDLE-GUN (ZÜNDNADELGEWEHR), a military breech-loading rifle, famous as the arm of the Prussians in 1866 and of the Germans in 1870–1871. It was the invention of the gunsmith Johann Nicholas von Dreyse (1787–1867), who, beginning in 1824, had made many experiments, and in 1836 produced the complete needle-gun. From 1841 onwards the new arm was gradually introduced into the Prussian service, and later into the military forces of many other German states. Dreyse was ennobled in 1864. The principal details of the arm (pattern 1841) are as follows:—

Breech	Bolt system
Calibre	·607 in.
Weight without bayonet	10 lb 4 oz.
Charge (black powder)	74·15 grains
Bullet (lead)	478 grains
Muzzle velocity	1000 f.s.
Sighted to	800 paces (656 yds.)

In practice the needle-gun proved to have numerous defects; its effective range was very short compared to that of the muzzle-loading rifles of the day, and conspicuously so as against the chassepot: the escape of gas at the breech was, moreover, very great. A paper cartridge was used. An improved model, giving greater muzzle velocity and increased speed in loading, was introduced later, but this was soon replaced by the Mauser rifle.

NEEDLEWORK. This subject may be considered under the two headings of (1) Plain Needlework, used for purely utilitarian purposes, and (2) Art Needlework for decorative purposes. Plain needlework requires no such further explanation as may be given in the case of art needlework, under which title are included (*a*) embroidery, and (*b*) other methods of decorative needlework, such as applied or appliqué work, ornamental quilting, patchwork and couching. In these last-mentioned methods the needlework is subservient to the decorative effect, which depends almost wholly upon the materials selected for the purpose; whereas in embroidery the needlework itself constitutes and is the visible decoration. The aim of this article is to indicate briefly different stitches of plain needlework and then to show that these stitches are also used in the domain of art needlework.

The more necessary stitches in plain needlework for making clothes are tacking, running, hemming, feather-stitching or herring-boning (all of which are practically of the same type), and button-holing in which the thread is looped as each stitch is made. Button-holing is allied to another looped stitch, namely chain-stitching, which though frequently used in embroidery is rarely if ever used in plain needlework. For repairs of clothes and household linen, &c., the principal stitch is darning; grafting, however, is a substitute for it, and varies with the character of the stuff to be repaired, *e.g.* knitted stockings, damask linen, cloth, &c. Darning is allied to running, and grafting to patchwork. Patchwork as a form of decorative needlework is exemplified in sumptuous canopies and seat covers made several centuries B.C. by Egyptians, and rich hangings made by Italian and French workers in the 16th century.

Long and short stitches, kindred in principle to the running stitch in plain needlework, are perhaps the more frequent of any stitches used in embroidery, and are especially appropriate when the blending of tints with a flat even surface is the effect to be aimed at. Much medieval work of this character, as well as that done with chain stitch and its allied split stitch, is regarded as typical of *opus anglicanum.* Chain stitch produces a comparatively broken surface in decided contrast with the smooth one of long and short stitch, split stitch and satin stitch embroidery. Satin stitch is well adapted to express, with even flat surface in designs for colour effects, each mass which is to be of one tint. In this respect, therefore, satin stitch serves a purpose in contrast to that of long and short stitch. A characteristic of satin-stitching is the sheeny effect produced, on both sides of the material embroidered, by parallel stitches taken closely together. Buttonhole stitch in relation to art needlework prevails to a great extent in cut linen and drawn-thread work (often called Greek lace), and predominates in the making of needlepoint lace (see LACE). In much of the Persian drawn-thread work, however, it is superseded by whipping or tightly and closely twisting a thread round the undrawn threads of the linen. Whipping has been put to another use in certain 16th-century art needlework for ecclesiastical purposes, where round the gold threads employed as the ground of a design coloured silks are dexterously whipped, closely and openly, producing gradations of tint suffused with a corresponding variation of golden shimmer. Another important branch of art needlework with gold and silver threads is couching. When the metallic threads, arranged so as to lie closely together, are simply stitched flatly to the foundation material, the work is called flat couching or laying, a kind of treatment more frequent in Chinese and Japanese than in European art needlework. Flat couching is also carried out with floss silks. When a design for couching includes effects in relief, stout strings or cords as required by the design are first fastened to the foundation materials, and over them the metallic threads or in some cases coloured gimps are laid, and so stitched as to have an appearance in miniature of varieties of willow-twisting or basket work.

The principle of relief couching is carried much further in certain English art needlework, having cumbersome and grotesque peculiarities, which was done during the reigns of the Stuarts. Crude compositions were wrought in partial relief with padded work, of costumed figures of kings and queens and scriptural persons with a medley of disproportionate animals, insects and trees, &c., in which foliage, wings, &c., were of coloured silk needlepoint lace—the whole being set as often as not in a background of tent or cross-stitch work on canvas. But tent and cross-stitch work (in French *point compté*) was also used by itself for cushion covers and later for upholstery. In its earlier phases it seems to come under the medieval classification of *opus pulvinarum*. The reticulations of the canvas or those apparent in finer material governed the stitching and imparted a stiff formal effect to the designs so carried out, a characteristic equally strong in the *lacis* work, or darning on square mesh net (see LACE).

Appliqué or applied work belongs as much as patchwork to the medieval category of *opus consutum*, or stitching stuffs together according to a decorative design, the greater part of which was cut out of material different in colour, and generally in texture, from that of the ground to which it was applied and stitched. Irish art needlework, called Carrickmacross lace, is for the most part of cambric applied or appliqué to net.

Quilting is also a branch of art needlework rather than embroidery. Indians and Persians using a short running stitch have excelled in it in past times. Some good quilting was done in England in the 18th century with chain-stitching which lay on the inner side of the stuff, the outer displaying the design in short stitches. In the account of his voyage to the East Indies, published in 1655, Edward Terry (1590–1665) writes of the Indians " making excellent quilts of satin lined with taffeta betwixt which they put cotton wool and worked them together with silk." For less bulky quilting, cords have been used; and elaborate designs for quilted linen waistcoats were well done in the 18th century, with fine short stitches that held the cords between the inner and outer materials.

A large number of names have been given to the many modifications of the limited number of essentially different stitches used in plain and art needlework, and on the whole are fanciful rather than really valuable from a technical point of view. Much descriptive information about them, with an abundance of capital illustrations, is given in the *Dictionary of Needlework*, by J. F. Caulfield and Blanche Saward (London, 1903).

NEEMUCH, or NIMACH, a town of Central India, with a British military cantonment, within the state of Gwalior, on the border of Rajputana, with a station on the Rajputana railway, 170 m. N. of Mhow. Pop. (1901) 21,588. In 1857 it was the most southerly place to which the Mutiny extended. The brigade of native troops of the Bengal army, which was stationed there, mutinied and marched to Delhi, the European officers taking refuge in the fort, where they were besieged by a rebel force from Mandasor, and defended themselves gallantly until relieved by the Malwa field force. Since 1895 it has been the headquarters of the political agent in Malwa.

NEENAH, a city of Winnebago county, Wisconsin, U.S.A., on the N.W. shore of Lake Winnebago, 82 m. N. by E. of Milwaukee. Pop. (1890) 5083; (1900) 5954, of whom 1559 were foreign-born; (1905) 6047; (1910) 5734. It is served by the Chicago & North-Western, the Chicago, Milwaukee & St Paul, and the Milwaukee, St Paul & Sault Ste Marie railways, by two interurban electric railways, and by steamboat lines on the lake and on the Fox river, which flows out of Lake Winnebago at this point. Several bridges connect it with Menasha, on the opposite side of the river, and the two cities form one industrial community. Doty Island, at the mouth of the river, belongs partly to Neenah and partly to Menasha. Neenah is a trade centre of the surrounding agricultural region, in which dairying, especially cheese-making, is carried on extensively. The Fox river (with a fall of 12 ft.) furnishes good water-power for the manufactories. There was a trading post at or near the site of Neenah during the French régime in Wisconsin, but there was no actual settlement until well into the 19th century. Neenah was chartered as a city in 1873; its name is derived from an Indian word meaning " running water " or " rapids."

NEER, VAN DER. Aernout and Eglon van der Neer, father and son, were Dutch painters whose lives filled almost the whole of the 17th century.

1. AERNOUT VAN DER NEER (1603–1677), commonly called Aert or Artus, was the contemporary of Albert Cuyp and Hobbema, and so far like the latter that he lived and died in comparative obscurity. Aernout was born at Gorkum and died at Amsterdam. Houbraken's statement that Aernout had been a steward to a Dutch nobleman, and an amateur painter, before he settled in Amsterdam and acquired skill with his brush, would account for the absence of any pictures dating from his early years. He died in abject poverty, and his art was so little esteemed that the pictures left by him were valued at about five shillings apiece. Even as early as 1659 he found it necessary to supplement his income by keeping a wine tavern. The earliest pictures in which Aernout coupled his monogram of A. V. and D. N. interlaced with a date are a winter landscape in the Rijks Museum at Amsterdam (dated 1639), and another in the Martins collection at Kiel (1642)—immature works both, of poor quality. Far better is the " Winter Landscape " (1643) in Lady Wantage's collection, and the " Moonlight Scene " (1644) in the d'Arenberg collection in Brussels. In 1652 Aernout witnessed the fire which consumed the old town-hall of Amsterdam. He made this accident the subject for two or three pictures, now in the galleries of Berlin and Copenhagen. Though Amsterdam appears to have been constantly van der Neer's domicile, his pictures tell that he was well acquainted with the canals and woods about Haarlem and Leiden, and with the reaches of the Maes and Rhine. Dort, the home of Albert Cuyp, is sometimes found in his pictures, and substantial evidence exists that there was friendship between the two men. At some period of their lives they laid their hands to the same canvases, on each of which they left their joint mark. On some it was the signature of the name, on others the more convincing signature of style. There are landscapes in the collections of the dukes of Bedford and Westminster, in which Cuyp has represented either the frozen Maes with fishermen packing herrings, or the moon reflecting its light on the river's placid waters. These are models after which van der Neer appears to have worked. The same feeling and similar subjects are found in Cuyp and van der Neer, before and after their partnership. But Cuyp was the leading genius. Van der Neer got assistance from him; Cuyp expected none from van der Neer. He carefully enlivened his friend's pictures, when asked to do so, with figures and cattle. It is in pictures jointly produced by them that we discover van der Neer's presence at Dort. We are near

Dort in the landscape sunset of the Louvre, in which Cuyp evidently painted the foreground and cows. In the National Gallery picture Cuyp signs his name on the pail of a milkmaid, whose figure and red skirt he has painted with light effectiveness near the edge of van der Neer's landscape. Again, a couple of fishermen with a dog, and a sportsman creeping up to surprise some ducks, are Cuyp's in a capital van der Neer at the Staedel Institute in Frankfort.

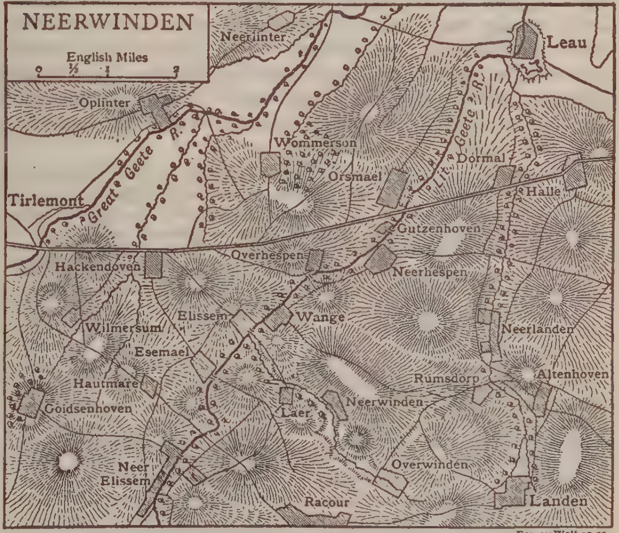
Van der Neer's favourite subjects were the rivers and water-courses of his native country either at sunset or after dark. His peculiar skill is shown in realizing transparence which allows objects—even distant—to appear in the darkness with varieties of warm brown and steel greys. Another of his fancies is to paint frozen water, and his daylight icescapes with golfers, sleighers, and fishermen are as numerous as his moonlights. But he always avoids the impression of frostiness, which is one of his great gifts. His pictures are not scarce. They are less valuable in the market than those of Cuyp or Hobbema; but, possessing a charm peculiarly their own, they are much sought after by collectors. Out of about one hundred and fifty pictures accessible to the public, the choicest selection is in the Hermitage at St Petersburg. In England paintings from his brush are to be found at the National Gallery and Wallace Collection, and, amongst others, in the collections of the marquess of Bute and Colonel Holford.

2. Eglon van der Neer (1643–1703) was born at Amsterdam, and died at Düsseldorf on the 3rd of May 1703. He was first taught by his father, and then took lessons from Jacob van Loo, whose chief business then consisted in painting figures in the landscapes of Wynants and Hobbema. When van Loo went to Paris in 1663 to join the school from which Boucher afterwards emerged, he was accompanied or followed by Eglon. But, leaving Paris about 1666, he settled at Rotterdam, where he dwelt for many years. Later on he took up his residence at Brussels, and finally went to Düsseldorf, where he entered the service of the elector-palatine Johann Wilhelm von der Pfalz. In each of the places where he stopped Eglon married, and having had three wives became the father of twenty-five children. A portrait of the princess of Neuberg led to his appointment as painter to the king of Spain.

Eglon van der Neer has painted landscapes imitating those of his father, of Berchem, and of Adam Elsheimer. He frequently put the figures into the town views of Jan van der Heyden in competition with Berchem and Adrian van der Velde. His best works are portraits, in which he occasionally came near Ter Borch or Metsu in delicacy of touch, de Hooch in effectiveness of lighting, or Mieris in polish of surface. One of his earliest pieces in which the influence of Ter Borch is apparent is the "Lady with the Book," of 1665, which was sold with the Bredel collection in 1875. A young woman in white and red satin at Rotterdam, of 1669, recalls Mieris, whose style also reappears in Eglon's "Cleopatra" at Buckingham Palace. Two landscapes with "Tobit and the Angel," dated 1685 and 1694, in the museums of Berlin and Amsterdam, illustrate his fashion of setting Scripture scenes in Dutch backgrounds. The most important of his sacred compositions is the "Esther and Ahasuerus," of 1696, in the Uffizi at Florence. But Eglon varied his practice also with arrangements of hunting and hawking parties, pastures and fords, and cavalry skirmishes. The latest of his panels is a mountain landscape of 1702 in the gallery of Augsburg. (J. A. C.; P. G. K.)

NEERWINDEN, a village of Belgium in the province of Liége, a few miles E. by S. of Tirlemont, which gives its name to two great battles, the first fought in 1693 between the Anglo-Allied army under William III. of England and the French under the duke of Luxemburg, and the second in 1793 between the Austrians under Prince Josias of Coburg and the French under General Dumouriez.

Battle of Neerwinden or Landen, 1693 (see Grand Alliance, War of the).—Luxemburg, having by feints induced William to detach portions of his army, rapidly drew together superior numbers in face of the Allied camps, which lay in a rough semicircle from Elissem on the right to Neerlanden, and thence along the Landen brook on the left (July 18-28, 1693). William had no mind to retire over the Geete river, and entrenched a strong line from Laer through Neerwinden to Neerlanden. On the right section of this line (Laer to Neerwinden) the ground was much intersected and gave plenty of cover for both sides, and this section, being regarded as the key of the position, was strongly garrisoned; in the centre the open ground between Neerwinden and Neerlanden was solidly entrenched, and in front of it Rumsdorp was held as an advanced post. The left at Neerlanden rested upon the Landen brook and was difficult of access. William's right, as his line of retreat lay over the Geete, was his dangerous flank, and Luxemburg was aware that, the front of the Allies being somewhat long for the numbers defending it, the intervention of troops drawn from one wing to reinforce the other would almost certainly be too late. Under these conditions Luxemburg's general plan was to throw the weight of his attack on the Laer-Neerwinden section, and specially on Neerwinden itself, and to economize his forces—as "economy of force" was understood before Napoleon's time—elsewhere, delivering holding attacks or demonstrations as might be necessary, and thus preventing the Allied centre and left from assisting the right. Luxemburg had about 80,000 men to William's 50,000. Opposite the entrenchments of the centre he drew up nearly the whole of his cavalry in six lines, with two lines of infantry intercalated. A corps of infantry and dragoons was told off for the attack of Neerlanden and Rumsdorp, and the troops destined for the main attack, 28,000 of all arms, formed up in heavy masses opposite Neerwinden. This proportion of about one-third of the whole force to be employed in the decisive attack in the event proved insufficient. The troops opposite the Allied centre and left had to act with the greatest energy to fulfil their containing mission, and at Laer-Neerwinden the eventual success of the attack was bought only at the price of the utter exhaustion of the troops.



Emery Walker sc.

After a long cannonade the French columns moved to the attack, converging on Neerwinden; a smaller force assaulted Laer. The edge of the villages was carried, but in the interior a murderous struggle began, every foot of ground being contested, and after a time William himself, leading a heavy counter-attack, expelled the assailants from both villages. A second attack, pushed with the same energy, was met with the same determination, and meanwhile the French in other parts of the field had pressed their demonstrations home. Even the six lines of cavalry in the centre, after enduring the fire of the Allies for many hours, trotted over the open and up to the entrenchments to meet with certain defeat, and at Neerlanden and Rumsdorp there was severe hand to hand fighting. But, meantime, the two intact lines of infantry in the French centre had been moved to their left and formed the nucleus for the last great assault on Neerwinden, which proved too much for the exhausted defenders. They fell back slowly and steadily, defying pursuit, and the British Coldstream Guards even captured a colour. But at this crisis the initiative of a subordinate general, the famous military writer Feuquières (*q.v.*), converted the hard-won local success into a brilliant victory. William had begun to move troops from his centre and left to the right in order to meet the great assault on Neerwinden, and Feuquières, observing this, led the cavalry of the French centre once again straight at the entrenchments. This time the French squadrons, surprising the Allies in the act of manœuvring, rode over every body of troops they met, and nothing remained for the Allies but a hurried retreat over the Geete. A stubborn rearguard of British troops led by William himself alone saved the Allied army, of which all but the left wing was fought out and in disorder. Luxemburg had won his greatest victory, thanks in a measure to Feuquières' exploit; but had the assaults on Neerwinden been made—as Napoleon would have made them—with one-half or two-thirds of his forces instead of one-third, the victory would have been decisive, and Feuquières would have won his laurels, not in forcing the decision at the cost of using up his cavalry, but in annihilating the remnants of the Allied army in the pursuit. The material results of the battle were twelve thousand Allies (as against eight thousand French) killed, wounded and prisoners, and eighty guns and a great number of standards and colours taken by the French.

The battle of the 18th March 1793 marked the end of Dumouriez's attempt to overrun the Low Countries and the beginning of the Allies' invasion of France. The Austrians under Coburg, advancing from Maestricht in the direction of Brussels, encountered the heads of the hurriedly assembling French army at Tirlemont on the 15th of March, and took up a position between Neerwinden and Neerlanden. On the 18th, however, after a little preliminary fighting Coburg drew back a short distance and rearranged his army on a more extended front between Racour and Dormael, thus parrying the enveloping movement begun by the French from Tirlemont. Dumouriez was consequently compelled to fight after all on parallel fronts, and though in the villages themselves the individuality and enthusiasm of the French soldier compensated for his inadequate training and indiscipline, the greater part of the front of contact was open ground, where the superiority of the veteran Austrian regulars was unchallengeable. In these conditions an attempt to win a second Jemappes with numerical odds of 11 to 10 instead of 2 to 1 in favour of the attack was foredoomed to disaster, and the repulse of the Revolutionary Army was the signal for its almost complete dissolution. Neerwinden was a great disaster, but not a great battle. Its details merely show the impossibility of fighting on the 18th-century system with ill-trained troops. The methods by which such troops could compass victory, the way to fight a "sans culotte" battle, were not evolved until later.

NEES VON ESENBECK, CHRISTIAN GOTTFRIED (1776–1858), German botanist and entomologist, was born at Erbach on the 14th of February 1776, and was educated at Darmstadt and at Jena, where he took the degree of M.D. After spending some time in medical practice he was appointed professor of botany in Erlangen in 1816. Three years later he became professor of natural history in Bonn, and in 1831 he was appointed to the chair of botany in the university of Breslau. In 1848 he entered political life and made himself so obnoxious to the government that in 1851 he was deprived of his professorship, and in consequence the latter years of his life were spent in great poverty. He died in Breslau on the 16th of March 1858.

For about forty years he edited the *Nova acta* of the "Acad. Leopold-Carolina," in which several of his own papers were published. His earliest memoirs dealt with the ichneumons, and he published a *Monographie der Ichneumone* in 2 vols. in 1828, and *Hymenopterorum Ichneumonibus affinium monographiae*, in 2 vols. in 1834. His other separate works include: *Die Algen des süssen Wassers nach ihren Entwickelungsstufen dargestellt* (1814); *Das System der Pilze und Schwämme* (1816); *Naturgeschichte der europäischen Lebermoose*, in 4 vols. (1833–1838); "Agrostologia Brasiliensis," in the *Flora Brasiliensis*; and a *Systema Laurinearum* (1836). He also wrote numerous monographs in *Flora*, in *Linnaea* and in other scientific German magazines, either alone or along with other well-known botanists. His best-known works are those that deal with the *Fungi*, the *Hepaticae* and the *Glumiferae*, in all which groups he made valuable additions to knowledge.

His brother THEODOR FRIEDRICH LUDWIG (1787–1837), inspector of the botanic gardens at Leiden, and afterwards professor of pharmacy at Bonn, also wrote numerous papers on botanical subjects, dealing more particularly with medicinal plants and their products.

NEFF, FELIX (1798–1829), Swiss Protestant divine and philanthropist, was born at Geneva on the 8th of October 1798. Originally a sergeant of artillery, he decided in 1819 to devote himself entirely to evangelistic work. He was ordained to the ministry in 1822, and soon afterwards settled in the valley of Freissinières, where he laboured in the manner of J. F. Oberlin, being at one and the same time pastor, schoolmaster, engineer and agriculturist. He was so successful that he changed the character of the district and its inhabitants. In 1827, worn out by his labours, he was obliged to return to his native place, where he died two years later.

NEGAPATAM, a seaport of British India, in the Tanjore district of Madras, forming one municipality with Nagore, a port 3 m. N. at the mouth of the Vettar river. Pop. (1901) 57,190. It carries on a brisk trade with the Straits Settlements and Ceylon, steamers running once a week to Colombo. The chief export is rice. Negapatam is the terminus of a branch of the South Indian railway, and contains large railway workshops. It is also a depot for coolie emigration. Negapatam was one of the earliest settlements of the Protuguese on the Coromandel coast. It was taken by the Dutch in 1660, becoming their chief possession in India, and by the English in 1781. From 1799 to 1845 it was the headquarters of Tanjore district. There is a large population of Labbais, Mahommedans of mixed Arab descent, who are keen traders. Jesuit and Wesleyan missions are carried on.

NEGAUNEE, a city of Marquette county, Michigan, U.S.A., about 12 m. W. by S. of Marquette and 3 m. E. of Ishpeming, in the N. part of the upper peninsula. Pop. (1904) 6797; (1910) 8460. It is served by the Chicago & North-Western, the Duluth, South Shore & Atlantic, and the Lake Superior & Ishpeming railways. It is built on a ridge called Iron Mountain, 1564 ft. above sea-level, and under and near it are some of the most productive iron-ore deposits in the state, the mining of which is the principal industry of the city. The settlement of Negaunee began about 1870, and the city was chartered in 1873. The name is a Chippewa word meaning "first" or "he goes before," and is said to have been chosen at the request of the Pioneer Iron Company as an equivalent for "Pioneer."

NEGLIGENCE (Lat. *negligentia*, from *negligere*, to neglect, literally "not to pick up"), a ground of civil law liability, and in criminal law an element in several offences, the most conspicuous of which is manslaughter by negligence. In order to establish civil liability on the ground of negligence, three things must be proved—a duty to take care, the absence of due care, and actual damage caused directly by the absence of due care. Mere carelessness gives no right of action unless the person injured can show that there was a legal duty to take care. The duty may be to the public in general, on the ground that any person who does anything which may involve risk to the public is bound to take due care to avoid the risk. For instance, in the words of Lord Blackburn, "those who go personally or bring property where they know that they or it may come into collision with the persons or property of others have by law a duty cast upon them to use reasonable care and skill to avoid such a collision." Where a special duty to an individual is alleged, the duty must rest on a contract or undertaking or some similar specific ground. Thus, where a surveyor has carelessly given incorrect progress certificates, and a mortgagee who has had no contractual relation with the surveyor has advanced money on the faith of the certificate, the surveyor is not liable to the mortgagee in an action of negligence; because he owed no duty to the mortgagee to be careful. When a duty to take care is established, the degree of care required is now determined by a well-ascertained standard. This standard is the amount of care which would be exercised in the circumstances by an "average reasonable man." This objective standard excludes consideration of the capacity or state of mind of the particular individual. It also gets rid of the old distinctions between "gross," "ordinary" and "slight" negligence, though no doubt the degree of care required varies with the circumstances of the case. The application of such a standard is a task for which a jury is a very appropriate tribunal. In fact the decision of the question whether there has been a want of due care is left almost unreservedly to the jury. There is this amount of control, that if the judge is of opinion that the evidence, if believed, cannot possibly be regarded as showing want of due care, or in technical language that there is "no evidence of negligence," it is his duty to withdraw the case from the jury and give judgment for the defendant. Unless the judge decides that there is no duty to take care, or that there is no evidence of want of care, the question of negligence or no negligence is wholly for the jury.

Ordinarily a man is responsible only for his own negligence and for that of his servants and agents acting within the scope of their authority. For the acts or defaults of the servants of an independent contractor he is not liable. But in certain cases a stricter obligation is imposed on him by law. The occupier of premises is under a duty to all persons who go there on business which concerns him to see that the premises are in a reasonably safe condition so far as reasonable care and skill can make them so. Thus he cannot release himself by employing an independent contractor to maintain or repair the premises. The effect of this doctrine is that the occupier may be liable if it can be shown that the independent contractor or his servant has been guilty of a want of due care. A similar obligation has been enforced in the case of a wreck stranded in a navigable river, and the owner was held liable for damage caused by the carelessness of the servant of an independent contractor who had undertaken to light the wreck. So too any person who undertakes a work likely to cause danger if due care is not taken is liable for damage caused by the carelessness of the servant of an independent contractor, so long as the carelessness is not casual or collateral to the servant's employment.

In an action of negligence a familiar defence is "contributory negligence." This is a rather misleading expression. It is not a sufficient defence to show that the plaintiff was negligent, and that his negligence contributed to the harm complained of. The plaintiff's negligence will not disentitle him to recover unless it is such that without it the misfortune would not have happened, nor if the defendant might by the exercise of reasonable care on his part have avoided the consequences of the plaintiff's negligence. The shortest and plainest way of expressing this rule is, that the plaintiff's negligence is no defence unless it was the proximate or decisive cause of the injury. There was an attempt in recent times to extend this doctrine so as to make the contributory negligence of a third person a defence, in cases where the plaintiff, though not negligent himself, was travelling in a vehicle or vessel managed by the negligent third person, or was otherwise under his control. In such circumstances it was said that the plaintiff was "identified" with the third person. (*Waite* v. *North-Eastern Ry. Co.*, 1858, E. B. & E., 719). This case, in the Exchequer Chamber, was an action on behalf of an infant by his next friend. The infant, which was five years of age, was with its grandmother, who took a half-ticket for the child and a ticket for herself to travel by the defendants' line; as they were crossing the railway to be ready for the train the child was injured by a passing train. The jury found that the defendants were guilty of negligence, and that the grandmother was guilty of negligence which contributed to the accident, while there was no negligence of the infant plaintiff. A verdict was entered for the plaintiff, but in the Queen's Bench the verdict was entered for the defendants, without calling on them to argue, on the ground that the infant was identified with its grandmother. But the case of the "Bernina," decided in 1888, where a passenger and an engineer on board the "Bushire" were killed in a collision between the "Bernina" and the "Bushire" caused by fault in both ships, but without fault on the part of the deceased, exploded this supposed doctrine, and made it clear that the defence of contributory negligence holds good only when the defendant contends and proves that the plaintiff was injured by his own carelessness.

The American law of negligence is founded on the English common law; but the decisions in different states have occasionally contradicted English decisions, and also one another.

See T. Beven, *Negligence in Law*, 3rd ed., 1908; Shearman and Redfield, *The Law of Negligence* (New York), Thompson, *Commentaries on Negligence* (Indianapolis). (A. Ll. D.)

NEGOTIABLE INSTRUMENT, in law, a document or other instrument purporting to represent so much money, and the property in which passes, like money, by mere delivery. Negotiable instruments arise in either of two ways: (1) by statute, (2) by custom of merchants. The most commonly recognized negotiable instruments are bills of exchange, promissory notes, bills of lading, foreign bonds and debentures payable to bearer. Negotiable instruments constitute an exception to the general rule that a man cannot give a better title than he has himself (see Bill of Exchange).

NEGRI, ADA (1870–), Italian poet, was born at Lodi, of an artisan family, and became a village school-teacher. Her first book of poems, *Tempeste* (1891), tells the helpless tragedy of the forsaken poor, in words of vehement beauty. Her second volume of lyrics, *Fatalità* (1893), confirmed her reputation as a poet, and led to her appointment to the normal school at Milan; but her later verse, while striking in its sincerity, suffered by a tendency to repetition and consequent mannerism.

NEGRITOS (Span. for "little negroes"), the name originally given by the Spaniards to the aborigines of the Philippine Islands. They are physical weaklings, of low, almost dwarf, stature, with very dark skin, closely curling hair, flat noses, thick lips and large clumsy feet. The term has, however, been more generally applied to one of the great ethnic groups into which the population of the East Indies is divided, and to an apparently kindred race in Africa (see Negro). A. de Quatrefages suggests that from the parent negroid stem were thrown off two negrito branches to the west and east, the Indo-Oceanic and African, and that the Akkas, Wochuas, Batwas and Bushmen of the Dark Continent are kinsmen of the Andaman Islanders, the Sakais of the Malay Peninsula and the Aetas of the Philippines. This view has found much acceptance among ethnologists. The result of Quatrefages's theory would be to place the negrito races closest to the primitive human type, a conclusion apparently justified by their physical characteristics. The true negritos are always of little stature (the majority under 5 ft.), have rounded forms and their skull is brachycephalic or subbrachycephalic, that is to say, it is relatively short and broad and of little height. Their skin is dark brown or black, sometimes somewhat yellowish, their hair woolly (scanty on face and body), and they have the flat nose and thick lips and other physical features of the negro. Among peoples undoubtedly negrito are those of the Andaman Islands (*q.v.*), the Malay Peninsula (*q.v.*) and some of the Philippines (*q.v.*), the best types being the Sakais (*q.v.*), Mincopies and Aetas. The question of the so-called negrito races of India, the Oraons, Gonds, &c., is in much dispute, Quatrefages believing the Indian aborigines to have been negritos, while other ethnologists find the primitive people of Hindustan in the Dravidian races. Some authorities have placed the Veddahs of Ceylon among the negritos, but their straight hair and dolichocephalic skulls are sufficient arguments against their inclusion. The negrito is often confounded with the Papuan; but the latter, though possessing the same woolly hair and being of the same colour, is a large, often muscular man, with a long, high skull.

See A. de Quatrefages, *Les Pygmées* (Paris, 1887; Eng. trans. 1895); E. H. Man, *The Aborigines of the Andaman Islands* (London, 1885); Giglioli, *Nuove notizie sui populi negroidi dell' Asia e specialmente sui Negriti* (Florence, 1879); Meyer, *Album von Philippinen-Typen* (Dresden, 1885); Blumentritt, *Ethnographie der Philippinen* (Gotha, 1892); A. B. Meyer, *Die Negritos* (Dresden, 1899); A. H. Keane, *Ethnology*; A. C. Haddon in *Nature* for September 1899.

NEGRO (from Lat. *niger*, black), in anthropology, the designation of the distinctly dark-skinned, as opposed to the fair, yellow, and brown variations of mankind. In its widest sense it embraces all the dark races, whose original home is the intertropical and sub-tropical regions of the eastern hemisphere, stretching roughly from Senegambia, West Africa, to the Fijian Islands in the Pacific, between the extreme parallels of the Philippines and Tasmania. It is most convenient, however, to refer to the dark-skinned inhabitants of this zone by the collective term of *Negroids*, and to reserve the word *Negro* for the tribes which are considered to exhibit in the highest degree the characteristics taken as typical of the variety.

These tribes are found in Africa; their home being south of the Sahara and north of a not very well-defined line running roughly from the Gulf of Biafra with a south-easterly trend across the equator to the mouth of the Tana. In this tract are found the true negroes; and their nearest relatives, the Bantu-negroids, are found to the south of the last-mentioned line. The relation of the yellowish-brown Bushman and Hottentot peoples of the southern extremity of Africa to the negro is uncertain; they possess certain negroid characters, the tightly curled hair, the broad nose, the tendency towards prognathism; but their colour and a number of psychological and cultural differences would seem to show that the relation is not close. Between the two a certain affinity seems to exist, and the Hottentot is probably the product of an early intermixture of the first Hamito-Bantu immigrants with the Bushman aborigines (see AFRICA: *Ethnology*). The relation of the negroids of Africa to those of Asia (southern India and Malaysia) and Australasia cannot be discussed with profit owing to lack of evidence; still less the theories which have been put forward to account for the wide dispersal from what seems to be a single stock. It will be sufficient to say that the two groups have in common a number of well-defined characteristics of which the following are the chief: A dark skin, varying from dark brown, reddish-brown, or chocolate to nearly black; dark tightly curled hair, flat in transverse section,[1] of the "woolly" or the "frizzly" type; a greater or less tendency to prognathism; eyes dark brown with yellowish cornea; nose more or less broad and flat; and large teeth.

Sharing these characteristics, but distinguished by short stature and brachycephaly, is a group to which the name *Negrito* (*q.v.*) has been given; with this exception the tendency among the negroids appears to be towards tall stature and dolichocephaly in proportion as they approach the pure negro type. As the most typical representatives of the variety are found in Africa, the Asiatic and Australasian negroids may be dismissed with this introduction. The negro and negroid population of America, the descendants of the slaves imported from West Africa, and in a less degree, from the Mozambique coast, before the abolition of the slave-trade, are treated separately below.

In Africa three races have intermingled to a certain extent with the negro; the Libyans (Berbers: *q.v.*) in the Western Sudan; and the Hamitic races (*q.v.*) and Arabs (*q.v.*) in the east. The identity of the people who have amalgamated with the negro to form the Bantu-speaking peoples in the southern portion of the continent is not certain, but as the latter appear to approach the Hamites in those characteristics in which they differ from the true negroes, it seems probable that they are infused with a proportion of Hamitic blood. The true negroes show great similarity of physical characteristics; besides those already mentioned they are distinguished by length of arm, especially of fore arm, length of leg, smallness of calf and projection of heel; characteristics which frequently fail to appear to the same degree among the Bantu, who are also as a rule less tall, less prognathous, less platyrrhine and less dark. A few tribes in the heart of the negro domain (the Welle district of Belgian Congo) show a tendency to round head, shorter stature and fairer complexion; but there seems reason to suppose that they have received an infusion of Libyan (or less probably Hamitic) or Negrito blood.

The colour of the skin, which is also distinguished by a velvety surface and a characteristic odour, is due not to the presence of any special pigment, but to the greater abundance of the colouring matter in the Malpighian mucous membrane between the inner or true skin and the epidermis or scarf skin.[2] This colouring matter is not distributed equally over the body, and does not reach its fullest development until some weeks after birth; so that new-born babies are a reddish chocolate or copper colour. But excess of pigmentation is not confined to the skin; spots of pigment are often found in some of the internal organs, such as the liver, spleen, &c. Other characteristics appear to be a hypertrophy of the organs of excretion, a more developed venous system, and a less voluminous brain, as compared with the white races.

In certain of the characteristics mentioned above the negro would appear to stand on a lower evolutionary plane than the white man, and to be more closely related to the highest anthropoids. The characteristics are length of arm, prognathism, a heavy massive cranium with large zygomatic arches, flat nose depressed at base, &c. But in one important respect, the character of the hair, the white man stands in closer relation to the higher apes than does the Negro.

Mentally the negro is inferior to the white. The remark of F. Manetta, made after a long study of the negro in America, may be taken as generally true of the whole race: "the negro children were sharp, intelligent and full of vivacity, but on approaching the adult period a gradual change set in. The intellect seemed to become clouded, animation giving place to a sort of lethargy, briskness yielding to indolence. We must necessarily suppose that the development of the negro and white proceeds on different lines. While with the latter the volume of the brain grows with the expansion of the brainpan, in the former the growth of the brain is on the contrary arrested by the premature closing of the cranial sutures and lateral pressure of the frontal bone.[3] This explanation is reasonable and even probable as a contributing cause; but evidence is lacking on the subject and the arrest or even deterioration in mental development is no doubt very largely due to the fact that after puberty sexual matters take the first place in the negro's life and thoughts. At the same time his environment has not been such as would tend to produce in him the restless energy which has led to the progress of the white race; and the easy conditions of tropical life and the fertility of the soil have reduced the struggle for existence to a minimum. But though the mental inferiority of the negro to the white or yellow races is a fact, it has often been exaggerated; the negro is largely the creature of his environment, and it is not fair to judge of his mental capacity by tests taken directly from the environment of the white man, as for instance tests in mental arithmetic; skill in reckoning is necessary to the white race, and it has cultivated this faculty; but it is not necessary to the negro.

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[1] This point has been fully determined by P. A. Brown (*Classification of Mankind by the Hair*, &c.), who shows conclusively that, unlike true hair and like true wool, the negro hair is flat, issues from the epidermis at a right angle, is spirally twisted or crisped, has no central duct, the colouring matter being disseminated through the cortex and intermediate fibres, while the cortex itself is covered with numerous rough, pointed filaments adhering loosely to the shaft; lastly, the negro pile will felt, like wool, whereas true hair cannot be felted.

[2] It is also noteworthy that the dark colour seems to depend neither on geographical position, the isothermals of greatest heat, nor even altogether on racial purity. The extremes of the chromatic scale are found in juxtaposition throughout the whole negro domain, in Senegambia, the Gabun, upper Nile basin, lower Congo, Shari valley, Mozambique. In the last region M de Froberville determined the presence of thirty-one different shades from dusky or yellow-brown to sooty black. Some of the sub-negroid and mixed races, such as many Abyssinians, Galla, Jolof and Mandingo, are quite as black as the darkest full-blood negro. A general similarity in the outward conditions of soil, atmosphere, climate, food charged with an excess of carbon, such as the fruit of the butter-tree, and other undetermined causes have tended to develop a tendency towards dark shades everywhere in the negro domain apart from the bias mainly due to an original stain of black blood. Perhaps the most satisfactory theory explains the excessive development of pigment in the dark-skinned races as a natural protection against the ultra-violet rays in which tropical light is so rich and which are destructive of protoplasm (see C. E. Woodruff, *Tropical Light*, London, 1905). The expression "jet black" is applied by Schweinfurth to the upper-Nilotic Shilluk, Nuer and Dinka, while the neighbouring Bongo and Mittu are described as of a "red-brown" colour "like the soil upon which they reside" (*Heart of Africa*, vol. i. ch. iv.).

[3] *La Razza Negra nel suo stato selvaggio*, &c. (Turin, 1864), p. 20.

On the other hand negroes far surpass white men in acuteness of vision, hearing, sense of direction and topography. A native who has once visited a particular locality will rarely fail to recognize it again. For the rest, the mental constitution of the negro is very similar to that of a child, normally good-natured and cheerful, but subject to sudden fits of emotion and passion during which he is capable of performing acts of singular atrocity, impressionable, vain, but often exhibiting in the capacity of servant a dog-like fidelity which has stood the supreme test. Given suitable training, the negro is capable of becoming a craftsman of considerable skill, particularly in metal work, carpentry and carving. The bronze castings by the *cire perdue* process, and the cups and horns of ivory elaborately carved, which were produced by the natives of Guinea after their intercourse with the Portuguese of the 16th century, bear ample witness to this. But the rapid decline and practical evanescence of both industries, when that intercourse was interrupted, shows that the native craftsman was raised for the moment above his normal level by direct foreign inspiration, and was unable to sustain the high quality of his work when that inspiration failed.

In speaking of the form or forms of culture found among negro and negroid tribes, the dependence of the native upon his environment must be kept in mind, particularly in Africa, where interchange of customs is continually taking place among neighbours.

Thus the forest regions are distinguished by a particular form of culture which differs from that prevailing in the more open country (see AFRICA: *Ethnology*). But it may be said generally that the negro is first and foremost an agriculturist. The negritos are on a lower cultural plane; they are nomadic hunters who do no cultivation whatever. Next in importance to agriculture come hunting and fishing and, locally, cattle-keeping. The last is not strictly typical of negro culture at all; nearly all the tribes by whom it is practised are of mixed origin, and their devotion to cattle seems to vary inversely with the purity of race. The most striking exception to this statement is the Dinka of the upper Nile, the whole of whose existence centres round the cattle pen. Of the other tribes where pastoral habits obtain to a greater or less extent, the Masai have a large percentage of Hamitic blood, the eastern and southern Bantu-speaking negroids are also of mixed descent, &c.

The social conditions are usually primitive, especially among the negroes proper, being based on the village community ruled by a chief. Where the country is open, or where the forest is not so thick as to present any great obstacle to communication, it has often happened that a chief has extended his rule over several villages and has ultimately built up a kingdom administered by sub-chiefs of various grades, and has even established a court with a regular hierarchy of officials. Benin and Dahomey are instances of this. But the region where this "empire-building" has reached its greatest proportions lies to the south of the forest belt in the territory of the Bantu negroids, where arose the states of Lunda, Cazembe, &c.

The domestic life of the negro is based upon polygyny, and marriage is almost always by purchase. So vital is polygyny to the native social system that the attempts made by missionaries to abolish plurality of wives would, if successful (a contingency unthinkable under present conditions), result in the most serious social disorder. Not only would an enormous section of the population be deprived of all means of support, but the native wife would be infinitely harder worked; agriculture, the task of the women, would be at a standstill; and infanticide would probably assume dangerous proportions.

Descent in the negro world is on the whole more often reckoned through the female, though many tribes with a patriarchal system are found. Traces of totemism are found sporadically, but are rare.

Of the highest importance socially are the secret societies, which are found in their highest development among the negroes of the west coast, and in a far less significant form among some of the Bantu negroids of the western forest district. In their highest form these societies transcend the tribal divisions, and the tie which binds the individual to the society takes precedence of all others. But the secret society cannot be called a definitely negro institution, since it is found in the west only.

As an agriculturist the negro is principally a vegetarian, but this form of diet is not the result of direct choice; meat is everywhere regarded as a great delicacy, and no opportunity of obtaining it is ever neglected, with one exception—that the cattle-keeping tribes rarely slaughter for food, because cattle are a form of currency. Fish is also an important article of diet in the neighbourhood of large rivers, especially the Nile and Congo. It is worthy of note that the two cultivated plants which form the mainstay of native life, manioc in the west and centre and mealies in the south and east, are neither of African origin.

Cannibalism is found in its simplest form in Africa. In that continent the majority of cannibal tribes eat human flesh because they like it, and not from any magical motive or from lack of other animal food. In fact it is noticeable that the tribes most addicted to this practice inhabit just those districts where game is most plentiful. Among the true negroes it is confined mainly to the Welle and Ubangi districts, though found sporadically (and due to magical motives) on the west coast, and among the Bantu negroids in the south-western part of Belgian Congo and the Gabun.

With regard to crafts the most important and typical is that of iron smelting and working. No negro tribe has been found of which the culture is typical of the Stone age; or, indeed, which makes any use of stone implements except to crush ore and hammer metal. Even these are rough pieces of stone of convenient size, not shaped in any way by chipping or grinding. Doubtless the richness of the African soil in metal ores rendered the Stone age in Africa a period of very short duration (see AFRICA: *Ethnology*). A good deal of aptitude is shown in the forging of iron, considering the primitive nature of the tools. Considerable skill in carving is also found in the west and among the Bantu negroids, especially of Belgian Congo south of the Congo. Weaving is practised to a large extent in the west; the true native material being palm-leaf fibre. The cultivation of cotton, which has become important in West Africa, deals with an exotic material and has been subjected to foreign influences. Among the Bantu of the Kasai district the art of weaving palm-cloth reaches its highest level, and in the east cotton-weaving is again found. Pottery-making is almost universal, though nowhere has it reached a very advanced stage; the wheel is unknown, though an appliance used on the lower Congo displays the principle in very rudimentary form. The production of fire by means of friction was universal, the method known as "twirling" being in vogue, *i.e.* the rapid rotation between the palms of a piece of hard wood upon a piece of soft wood.

Trading is practised either by direct barter or through the medium of rude forms of currency which vary according to locality. Value is reckoned among the tribes with pastoral tendencies in cattle and goats; among the eastern negroes by hoe-and spear-blades and salt blocks; in the west by cowries, brass rods, and bronze armlets (manilas); in Belgian Congo variously by *olivella* shells, brass rods, salt, goats and fowls, copper ingots and iron spear-blades, &c.

As regards religion, the question of environment is again important; in the western forests where communities are small the negro is a fetishist, though his fetishism is often combined more or less with nature worship. Where communication is easier the nature worship becomes more systematic, and definite supernatural agencies are recognized, presiding over definite spheres of human life.[1] Where feudal kingdoms have been formed, ancestor-worship begins to appear and often assumes paramount importance. In fact this form of religion is typical of all the eastern and southern portion of the continent (see AFRICA: *Ethnology*). With the negro, as with most primitive peoples, it is the malignant powers which receive attention from man, with a view to propitiation or coercion. Beneficent agencies require no attention, since, from their very nature, they must continue to do good. The negro attitude towards the supernatural is based frankly on fear; gratitude plays no part in it. A characteristic feature of the western culture area, among both negro and Bantu negroid tribes, is the belief that any form of death except by violence must be due to evil magic exercised by, or through the agency of, some human individual; to discover the guilty party the poison ordeal is freely used. A similar form of ordeal is found in British Central Africa to discover magicians, and the wholesale "smelling-out" of "witches," often practised for political reasons, is a well-known feature of the culture of the Zulu-Xosa tribes. Everywhere magic, both sympathetic and imitative, is practised, both by the ordinary individual and by professional magicians, and most medical treatment is based on this, although the magician is usually a herbalist of some skill. Where the rainfall is uncertain, the production of rain by magical means is one of the chief duties of the magician, a duty which becomes paramount in the eastern plains among negroes and Bantu negroids alike. But the negroes and negroids have been considerably influenced by exotic religions, chiefly by Mahommedanism along the whole extent of country bordering the Sahara and in the east. Christianity has made less progress, and the reason is not far to seek. Islam is simple, categorical and easily comprehended; it tends far less to upset the native social system, especially in the matter of polygyny, and at the same time discourages indulgence in strong drink. Moreover the number of native missionaries is considerable. Christianity has none of these advantages, but possesses two great drawbacks as far as the negro is concerned. It is not sufficiently categorical, but leaves too much to the individual, and it discountenances polygyny. The fact that it is divided into sects, more or less competitive among themselves, is another disadvantage which can hardly be overrated. This division has not, it is true, as yet had much influence upon the evangelization of Africa, since the various missions have mostly restricted themselves each to a particular sphere; still, it is a defect in Christianity, as compared with Islam, which will probably make itself felt in Africa as it has in China.

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[1] The three volumes by Colonel Ellis mentioned in the bibliography form an excellent study of the development of negro religion.

As regards language, the Bantu negroids all speak dialects of one tongue (see BANTU LANGUAGES). Among the negroes the most extraordinary linguistic confusion prevails, half a dozen neighbouring villages in a small area often speaking each a separate language. All are of the agglutinating order. No absolutely indigenous form of script exists; though the Hausa tongue has been reduced to writing without European assistance.[1]

AUTHORITIES.—J. Deniker, *Races of Man* (London, 1900); A. H. Keane, *Ethnology* (London, 1896); *Man Past and Present* (London, 1900); A. B. Ellis, *The Tshi-speaking Peoples* (1887); *The Ewe-speaking Peoples* (1890); *The Yoruba-speaking Peoples* (1894); B. Ankermann, "Kulturkreise in Afrika," *Zeit. f. Eth.* (1905), p. 54. See also AFRICA, § 3, *Ethnology*. (T. A. J.)

Negroes in the United States.

After the migration of the European fair-skinned races in large numbers to other parts of the earth occupied by people of darker colour, the adjustment of relations between the diverse races developed a whole series of problems almost unknown to the ancient world or to the life of modern Europe. The wider the diversity of physique and especially of skin colour, the greater the danger of friction. The more serious the effort to secure industrial and social co-operation under representative institutions, the graver have become the difficulties. They have been and are perhaps more acute in the United States than elsewhere, because there the lightest and the darkest races have commingled, because of the theory on which the government of the country nominally rests, that each freeman should be given an equal chance to improve his industrial position and an equal voice in deciding political questions, and because of the almost irreconcilable differences in the public opinion of the two great sections to only one of which do the problems come home as everyday matters. They were not solved by the Civil War and emancipation, but their nature was radically altered. Neither the earlier system of slavery nor the governmental theory during the radical reconstruction period that race differences should be ignored has proved workable, and the trend is now towards some *modus vivendi* between these extremes.

The only definition of negro having any statutory basis in the United States is that given in the legislation of many Southern states prohibiting intermarriage between a white person and "a person who has one-eighth or more of African blood." Census enumerators in their counts of the American people since 1790 have distinguished the two main races of whites and negroes, but in so doing they have never been given a definition or criterion of race. Consequently they followed the judgment of the community enumerated, which usually classes as negro all persons known or believed to have in their veins any admixture of negro blood. It is probable that this line, the so-called "colour line," which is emphasized in regions where negroes are numerous by many legal, economic and social discriminations between the races, is drawn with substantial accuracy. Far different has been the result of governmental efforts to draw another line within the group of negroes as thus defined, that between the negroes of pure African blood and those of mixed negro and white blood. This distinction has no legal significance, for negroes of pure blood and negroes of mixed blood are subject to the same provisions of law, and at least for the whites it has little social or economic significance. An attempt to draw it was made at each census betweeen 1850 and 1890 inclusive, and the results, so far as they were published, indicate that between one-sixth and one-ninth of the negroes in the United States have some admixture of white blood. The figures were reached through thousands of census enumerators, nearly all of whom were white. Of recent years an effort has been made on the part of negro investigators to get an answer to the same question by the careful study of communities selected as typical. The classification of about 39,000 coloured people, most of them in different parts of Georgia, with a study of the other available data and inferences from a somewhat wide observation, led Dr Dubois to the conclusion that "at least one-third of the negroes of the United States have recognizable traces of white blood."

Perhaps we may believe with some confidence that the information from white sources understates, and that from negro sources overstates, the proportion, and that the true proportion of mulattoes in the United States is between one-sixth and one-third of all negroes. To infer that the true proportion in 1850, 1860, 1870 and 1890, the dates to which the census figures relate, was much less than the true proportion in 1895 to 1900, to which the unofficial figures relate, is contrary to the general trend of the evidence. As the law and the social opinion of the Southern whites make little or nothing of this distinction between negroes of pure blood and mulattoes, it is often regarded as less important than it really is. The recognized leaders of the race are almost invariably persons of mixed blood, and the qualities which have made them leaders are derived certainly in part and perhaps mainly from their white ancestry. Wherever large numbers of full-blooded negroes and of persons of mixed central or north European and negro blood have lived in the same community for some generations, there is a strong and growing tendency to establish a social line between them.

The difficulty of ascertaining the number of mulattoes in the United States and the tendency of the testimony to be modified by the opinion or desire of the race from which it comes are typical. There is hardly any important aspect of the subject upon which the testimony of seemingly competent and impartial witnesses is not materially affected by the influence of the race to which the witnesses belong. Under these circumstances it seems necessary to assume that the testimony of the official documents of the federal government is correct, unless clear evidence, internal or external, refutes it. The following statements of fact rest mainly on those sources.

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[1] The Vai alphabet, "invented" by a native, Doalu Bukere, in the first half of the 19th century, owed its inspiration to European influence, and of the characters "many . . . are clumsy adaptations of Roman letters or of conventional signs used by Europeans" (Sir H. H. Johnston, *Liberia*, p. 1107 foll., London, 1906).

The number of negroes living in the (continental) United States in 1908 was about nine and three-quarter millions, and if those in Porto Rico and Cuba be included it reached ten and two-thirds millions. This number is greater than the total population of the United States was in 1820, and nearly as great as the population of Norway, Sweden and Denmark.

During the colonial period, and down to the changes initiated by the invention of the cotton gin, negroes were distributed with some evenness along the Atlantic coast. Between the date of that invention and the Civil War, and largely as a result of the changes the cotton gin set in motion, the tendency was towards a concentration of the negroes in the great cotton-growing area of the country. In 1700, for example, one-ninth of the population of the colony of New York was negro; in 1900 only one-seventieth of the population of the empire state belonged to that race. The division line between the Northern and Southern states adopted by the Census Office in 1880, and employed since that date in its publications, is Mason and Dixon's line, or the southern boundary of Pennsylvania, the Ohio river from Pennsylvania to its mouth and the southern boundary of Missouri and Kansas. In the states north of that line, the Northern states, in all of which but Missouri negro slavery either never existed or else was abolished before the Civil War, the white population increased tenfold and the negro population only fourfold between 1790 and 1860. In the states south of that line, on the contrary, the Southern states, the negro population in the same period increased sixfold and the white population not so fast. It was a widespread opinion shortly after the Civil War that the emancipated slaves would speedily disperse through the country, and that this process would greatly simplify the problems arising from the contact of the two races. This expectation has not been entirely falsified by the result. Between 1860 and 1900 the negroes in the Northern states increased somewhat more rapidly than the northern whites, and those in the Southern states much less rapidly than the Southern whites. As a result, one-tenth of the American negroes lived in 1908 in the Northern states, a larger proportion than at any time during the 19th century. But this process of dispersion is so slow as not materially to affect the prospects for the immediate future, and it is still almost as true as at any earlier date that the region in which cotton is a staple crop coincides in the main with the region in which negroes are more than one-half of the total population.

This appears if a comparison is made between the northern boundary of the so-called Austroriparian zone of plant and animal life in the United States, that is "the zone of the cotton plant, sugar cane, rice, pecan and peanut," and the northern boundary of the "black belt" or region in which the negroes are a majority of the population. The coincidence of the two is very close, and was much closer in 1900 than in 1860. It appears yet more clearly by a comparison between a map showing the counties in which at least 5% of the area was planted to cotton in 1899 and another map showing the "black belt" counties in 1900. The black belt stretches north through eastern Virginia beyond the cotton belt, and the cotton belt stretches south-west through eastern central Texas beyond the black belt, but between these two extremes there is a close agreement in the boundaries of the two areas.

The question "Have the American negroes progressed, materially and morally, since emancipation?" is generally answered in the affirmative. But even on this question entire unanimity is lacking. A considerable body of men could still be found in 1910, mainly among Southern whites, who held that the condition of the race was worse than it was in the days of slavery. Probably all competent students would admit, however, that the race has differentiated since 1865, that the distance separating the highest tenth from the lowest tenth has become wider, that the highest tenth is far better and far better off than formerly, and the lowest tenth is worse and perhaps also worse off than in slavery. Under such circumstances there are no adequate objective tests of progress. The pessimist points to the alleged increase of idleness and crime, the meliorist to a demonstrated decrease of illiteracy and to considerable accumulations of property. The large majority of competent students believe that the American negroes have progressed, materially and morally, since emancipation, that the central or average point is higher than in 1865, although such persons differ widely among themselves regarding the amount of that progress.

It would be generally but not universally held, also, that the negroes in the United States progressed under slavery, that they were far better qualified for incorporation as a vital and contributing element of the country's civilization at the time of their emancipation than they were on arrival or than an equal number of their African kindred would have been. But probably the rate of progress has been more rapid under freedom than it was under slavery.

The evidence regarding the progress of the American negro may be grouped under the following heads: numbers, birth-rate, health, wealth, education, occupations, morals, citizenship.

Numbers.—The dictum of Adam Smith, "The most decisive mark of the prosperity of any country is the increase of the number of its inhabitants," may be applied, perhaps after changing the word "decisive" to "obvious," to the negro population of the United States. The negro population of Africa is probably not increasing at all. But during the 19th century the negroes in the United States increased nearly ninefold. They are now much the most thriving offshoot of the race and the most civilized and progressive group of negroes in the world. Under a slavery system not permitting the importation of new supplies a high rate of increase by excess of births over deaths is an advantage to the master class. During the slavery period and until about 1880 the increase of southern whites and of southern negroes proceeded at about the same rate. But during the last score of years in the century the increase of negroes was much less rapid, the rate being only about three-fifths of that prevailing among southern whites.

Birth-rate.—As the increase of negro population is slackening, as the immigration and emigration of negroes are insignificant in amount, and as the death-rate is about stationary, it is reasonable to infer that the birth-rate is dwindling. This cannot be stated with certainty, for there are no registration records giving the number of births for any large and representative group of American negroes. A good index to the birth-rate, however, may be derived from the proportion of children under 5 years of age to women 15 to 49 years of age. In the returns negroes are not distinguished from Indians and Mongolians. To minimize this slight source of error and at the same time to secure a more representative and homogeneous population group, the following figures are confined to the Southern or former slave states:—

Date.	Children under 5 Years of Age to 1000 Women 15 to 49 Years of Age in the Southern States.	
	Negroes.	Whites.
1850	705	695
1860	688	682
1870	661	601
1880	737	656
1890	601	580
1900	577	581

These figures indicate that the proportion of children to child-bearing women, and hence probably the birth-rate, changed in the same direction during each decade between 1850 and 1890. Between 1850 and 1870 the proportion of negro children decreased about 6% and that of white children about 14%; between 1870 and 1880 the proportion of negro children increased about 12% and that of white children about 9%; between 1880 and 1890 the proportion of negro children decreased about 18% and that of white children about 12%; between 1890 and 1900 the proportion of negro children decreased about 4% and that of white children remained practically the same. Before the war the proportion of living children to potential mothers was about the same for the two races at the South, for the first three censuses after the war the proportion of negro children was much greater than of white children, but by 1900 that proportion was less, and the movement during the decade suggests that the proportions may have begun to change in opposite directions.

Some light upon the influences at work may be derived from the comparison between city and country at the south.

Date.	Children under 5 Years of Age to 1000 Women 15 to 44 Years of Age in the Southern States.			
	Cities having at least 25,000 Inhabitants.		Smaller Cities and Country Districts.	
	Negroes.	Whites.	Negroes.	Whites.
1890	319	391	688	665
1900	271	374	668	671

The noteworthy inference from these figures is that the proportion of negro children in southern cities was very low and decreasing. In 1890 it was about five-sixths, and in 1900 less than three-fourths of the proportion of children among whites in these cities. The differences in northern cities are equally marked. City life appears to exercise a powerful and increasing influence in reducing the birth-rate among the negroes.

Health.—The prosperity and progress of a population group are indicated, not merely by growth in numbers but also by the longevity of its members. This vitality is roughly measured by the death-rate. Other things being equal, a low and sinking death-rate is evidence of a high and increasing average duration of life. In the United States vital statistics are in charge of the several states and cities, and are often defective or entirely lacking. In 1890 and 1900 the Federal government compiled such as were of importance, and in 1864 an official compilation was made of death-rates of negroes before the war. The results are worth consideration.

Date.	Negro Deaths.	Negro Death-rate.	White Death-rate at same Time and Places.
Mainly between 1818–1863	106,217	35·0	27·0
1890	28,579	29·9	19·1
1900	37,029	29·6	17·3

These figures indicate that the death-rate of each race decreased during a half century, but that the decrease among negroes was much less rapid than among whites. The negro death-rate at the earliest period exceeded that of the whites by 8·0 per thousand, or three-tenths of the smaller rate. At the latest period the difference was 12·3 per thousand, or seven-tenths of the smaller rate. But these figures speak for negroes living mainly in cities where the proportion of children and elderly persons is small and that of negroes at the healthy ages is large. After making a proper allowance for these differences in sex and age composition, it is found that the true death-rate of negroes in the registration area is about twice as high as that of a white population of like sex and age structure. Whether the difference between negro and white residents of the country districts in the south is equally great, we have no means for judging.

The leading causes of death among negroes in the registration area arranged in the order of importance are stated below. The ratio to the corresponding death-rate among whites is added, but the differences are affected partly by the greater proportion of negroes in the southern cities and the different incidence of diseases in the two regions, and partly by probable differences in the accuracy of diagnosis of disease in the two sections and by physicians attending the two races.

Causes of Death.	Negro Death-rate per 1000.	Ratio to White Death-rate = 100.
Consumption	4·85	280
Pneumonia	3·55	192
Diseases of the nervous system	3·08	144
Heart disease and dropsy	2·21	161
Diarrheal diseases	2·14	165
Diseases of the urinary organs	1·57	157
Typhoid fever	·68	204
Old age	·67	125
Malarial fever	·63	969
Cancer and tumour	·48	72
Diphtheria and croup	·32	69
Influenza	·32	136
Whooping cough	·29	239
Diseases of the liver	·21	92
Measles	·15	115
Scarlet fever	·03	25

These figures bring out in a striking way the very high mortality, absolute and relative, of the American negro from consumption. When one considers both the great number of deaths caused by consumption and pneumonia, 28·4% of the deaths from all causes in 1900 and the very high death-rate of negroes from these diseases, it is no exaggeration to say that the main cause that the death-rate of that race is double that of the white race lies in the ravages of these two scourges of mankind. The difference between the two races in this respect has apparently increased since 1890, for at that date the death-rate of negroes in the registration area from consumption was only 2·37 times that of the whites, and its death-rate from pneumonia only 1·53 times that of the whites. Here as elsewhere there has been an improvement as measured by an absolute standard, and at the same time an increased divergence from the conditions prevailing among the more numerous race.

Wealth.—An estimate of the property now held by American negroes made in 1904 by a committee of the American Economic Association indicated about $300,000,000, with a probable error of perhaps $50,000,000. This figure indicates a *per capita* wealth of about $34. We have no means for judging what the possessions of the race were at the time of its emancipation, but in 1860 there were nearly half a million free negroes in the country, many of them holding property and some of them wealthy. The *per capita* wealth of the white population of the United States in 1900 was about $1320 and that of southern whites about $885, indicating that the property of the average negro person or family was about one twenty-fifth that of the average southern white person or family.

Education.—It is often supposed that the American negroes in 1865 were without any accumulated property and without any start in education. Neither assumption is warranted. On the contrary, about two-fifths of the adult free negroes in the country were reported in 1850 and 1860 as able to read and write, and there is some reason to believe that not far from one-twelfth of the adult slaves also had learned to write. In 1900 more than half of the negroes at least ten years of age could write, and the proportion was rising at a rate which, if continued, would almost eliminate illiteracy by the middle of the present century.

The problem of providing adequate educational facilities for negro children is made more difficult by the maintenance in all the former slave states of two sets of schools, one for each race. At the present time those states with one-third of their population negro assign about one-fifth of their public school funds to the support of negro schools. About $155,000,000 or one-sixth of the entire amount spent by southern communities for public schools between 1870 and 1906, has gone to support schools for the negroes. The same cause has been aided by many private gifts from individuals and organizations interested in negro education, among which the Peabody Education Fund of about $2,000,000, now in course of dissolution, and the John F. Slater Fund, now of about $1,500,000, may be mentioned. Wide differences of opinion exist regarding the character of education needed for the race, and the present trend is towards a greater emphasis upon manual and industrial training as of prime importance for the great majority.

Occupations.—The slavery system furnished industrial training to many slaves who seemed likely to turn it to their master's advantage. When this system was abolished the opportunities for such training open to the race were decreased, and it is doubtful whether even yet as large a proportion of skilled negro artizans are being trained in the south as were produced there before the Civil War. The demand for skilled labour in the south is being met more and more by white labour. This derives an advantage from a prejudice in its favour on the part of white employers even when other things are equal, from its greater skill and efficiency in most cases, its better opportunity to accumulate or to borrow the requisite capital, its superior industry, persistence and thrift. In consequence negroes are being more and more excluded from the field of skilled labour in the south.

Morals.—As the death-rate is believed to vary inversely as health and longevity and thus to afford a measure of those characteristics, so the crime-rate is often thought to vary inversely as morality, and thus to measure the self-control, good order and moral health of the community. But the analogy cannot be pushed. The crime-rate is everywhere far more difficult, and in the United States impossible to ascertain. And even if known the connexion between the infrequency of crime or of specific sorts of crime and the prevalence of good order, obedience to law and morality is far more indirect and subject to far more qualifications than the connexion between the death-rate and health. Still the data regarding crime with all their defects are the best available index of moral progress or retrogression. It must be remembered that the comparative infrequency of crime among slaves, even if it existed, is no proof of the absence of criminal tendencies and actions. Offences on the part of slaves, or at least minor offences which are always far more numerous than serious offences, were dealt with in most cases privately and without invoking the machinery of the law. An apparent increase of crime since emancipation might be due merely to the becoming patent of what was before latent. The only statistical measure of crime now possible in the United States is the number of prisoners in confinement at a given date, and these figures are an inadequate and misleading substitute for true judicial statistics. The evidence they afford, however, is far better than any other in existence and deserves careful attention. Enumerations of prisoners affording comparable results were made in 1880, 1890 and 1904.

Date.	Negro Prisoners.	Number per 100,000 Pop.
1880	16,089	244
1890	24,277	324
1904	26,087	278

These figures show a rapid increase between 1880 and 1890 in the number and proportion of negro prisoners, and between 1890 and 1904 a slow increase in the number and a notable decrease in the proportion.

But in order to make the figures for 1890 and 1904 comparable, it is necessary to exclude from those for the earlier date 4473 negro prisoners mainly belonging to two classes, persons in confinement prior to sentence and persons in prison because of their inability to pay a fine, but all belonging to classes which were excluded from the enumeration for 1904. This gives the following result:—

Date.	Negro Prisoners.	Number per 100,000 Pop.	Whites.
1880	16,089	244	96
1890	19,804	264	84
1904	26,087	278	77

The proportion of negro prisoners to population increased rapidly between 1880 and 1890 and slightly between 1890 and 1904, the increase for the first period being most accurately shown by the first set of figures and that for the second period by the second set of figures. It is noteworthy also that the proportion of white prisoners to population decreased during the same period. Perhaps a more significant comparison is that between the proportion of prisoners of each race to the population of that race in the northern states and the southern states respectively, the distribution of population and the systems of penal legislation and administration being widely different in the two sections. It is impossible to make the correction just referred to except for the United States as a whole, but it must be remembered that the figures for 1890 are not comparable with those for 1904, and that the true figures for that year would be decidedly less.

Number of Prisoners to each 100,000 People.

Date.	Southern States.		Northern States.	
	Negroes.	Whites.	Negroes.	Whites.
1880	157	58	495	99
1890	285	62	681	111
1904	221	40	743	83

These figures indicate that in the southern states in 1890 there were about four and a half times as many negro prisoners to population as white prisoners, and in 1904 about five and a half times as many; that in the northern states in 1890 there were about six times as many negro prisoners to population as white prisoners, and in 1904 about nine times as many. They throw no light whatever upon a point they are often quoted as establishing, the comparative criminality of the northern and southern negroes. Those residing in the north include an abnormal number of males, of adults, and of city population, influences all tending to increase the proportion of prisoners. It seems likely that if the figures for the south in 1890 could be made strictly comparable with those for the same region in 1904 the apparent decrease of 22% in the proportion of negro prisoners to population would almost but not quite disappear. The evidence regarding crime indicates a continued but slow and slackening increase in the proportion of negro prisoners to negro population in the country as a whole and in its two main sections, an increase in the proportion of white prisoners to white population during the first interval and a decrease during the second, and a growing difference between the two races in the proportion of prisoners.

Citizenship.—When the Fourteenth and Fifteenth Amendments to the Federal Constitution were adopted, the former conferring United States citizenship on all native negroes and the latter providing that the right of such citizens to vote should not be abridged by any state on account of race, colour or previous condition of servitude, it was not the practice in northern states to allow negroes to vote. Proposals to grant them the suffrage were submitted to the voters in 1865 in Connecticut, Wisconsin, Minnesota and Colorado, and in each state they were rejected. In all states containing a large proportion of negroes the results of the Federal policy of reconstruction were disastrous, and those bitter years probably contributed more than the Civil War itself to estrange the two sections. Since the withdrawal of Federal troops in 1877 the prevailing and persistent judgment of southern whites regarding the laws and the policy to be adopted upon this subject has been accorded more and more weight in determining the action of the states and the Federal government. The number of negroes voting or entitled to vote has been reduced at first by intimidation or fraud, later by legislation or provisions of the state constitutions. If such enactments are nominally directed not against any race but against certain characteristics which may appear mainly in the race, such as illiteracy, inability or unwillingness to pay an annual poll tax or to register each year, they have been and are likely to be held within the constitutional authority of the state. On the part of the overwhelming majority of negroes this practical disfranchisement has aroused no protest, while it has tended to improve the government and to open the way for the gradual development and expression in word and vote of differences within the ranks of white voters regarding questions of public policy.

Along with this decrease of pressure from without the southern states and the development of economic competition between the races within them, there has gone an increased demand on the part of the whites for a complete social separation between the races in school, in church, in public conveyances and hotels, all founded upon a fear that any disregard of such separateness will make intermarriage or fruitful illegal unions between the races more frequent. In short, these developments are towards a more and more rigid caste system.

The negroes in the United States have played and are playing an important and necessary part in the industrial and economic life of the southern states, in which in 1908 they formed about one-third of the population. But that life was changing with marvellous rapidity, becoming less simple, less agricultural and patriarchal, more manufacturing and commercial, more strenuous and complex. It was too early to say whether the negroes would be given an equal or a fair opportunity to show that they could be as serviceable or more serviceable in such a civilization as they had been in that which was passing away, and whether the race would show itself able to accept and improve such chances as were afforded, and to remain in the future under these changing circumstances, as they had been in the past, a vital and essential part of the life of the nation.

Bibliography.—Writings about the American negro fall naturally into classes. The official governmental publications include those of the Census Bureau, notably *Bulletin* 8, "Negroes in the United States," reprinted in 1906 in the volume called *Supplementary Analysis*, those of the Bureau of Labor, especially important articles in the *Bulletin* of the Bureau, and those of the commissioner of education. The information in these is largely statistical, but in the later publications not a little interpretative matter has been introduced. The point of view is usually that of a dispassionate northern man.

Among southern white men who have written wisely on the subject may be mentioned: Dr J. L. M. Curry, for many years general agent of the Peabody and Slater funds; H. A. Herbert, *Why the Solid South? or Reconstruction and its Results* (Baltimore, 1890); T. N. Page, *The Negro—the Southerner's Problem* (New York, 1904); E. G. Murphy, *Problems of the Present South* (New York, 1904); E. R. Corson, *Vital Equation of the Colored Race*; and A. H. Stone, *Studies in the American Race Problem* (New York, 1908). F. L. Hoffman's *Race, Traits and Tendencies of the American Negro* (New York, 1896) contains the most important collection of statistical data in any private publication and interpretations thoroughly congenial to most southern whites.

Among the southern negroes doubtless the most important writers are the two representatives of somewhat antagonistic views, Booker T. Washington, *Up from Slavery* (New York, 1901), *Future of the American Negro* (Boston, 1899), *Tuskegee and its People* (New York, 1905), &c., and W. E. B. Dubois, *The Souls of Black Folk* (Chicago, 1903), *The Philadelphia Negro* (Boston, 1899), *Health and Physique of the Negro American* (1907), &c. With these should be mentioned Atlanta University annual publications, the *Proceedings* of the Hampton Negro Conference and the file of the *Southern Workman*. No northern man since the war has written on the subject with the thoughtfulness and weight of Frederick Law Olmsted, *Journey in the Seaboard Slave States* (New York, 1856). See also Sir H. H. Johnston, *The Negro in the New World* (1910). (W. F. W.)

NEGUS. (1) The title of a king or ruler (Amharic *negūs* or *n'gūs*), in Abyssinia (*q.v.*); the full title of the emperor is *negūs nagasti*, "king of kings." (2) The name of a drink made of wine, most commonly port, mixed with hot water, spiced and sugared. According to Malone (*Life of Dryden, Prose Works*, i. 484) this drink was invented by a Colonel Francis Negus (d. 1732), who was commissioner for executing the office of master of the horse from 1717 to 1727, when he became master of the buckhounds.

NEHAVEND, a small but very fertile and productive province of Persia, situated south-west of Hamadan, west of Malāyir, and north-west of Burujird. Pop. about 15,000. The capital is the ancient city of Nehavend, where Yazdegird, the last monarch of the Sassanian dynasty, was finally defeated by the Arabs. (A.D. 641). It has a population of about 5000, including 700 to 800 Jews; there are fine gardens, and an old citadel on a hill. It is situated at an elevation of 5540 ft., 27 m. from Doletābād (Malāyir), and 25 m. from Burujird.

NEHEMIAH (Heb. for "Yah[weh] comforts"), governor of Judaea under Artaxerxes (apparently A. Longimanus, 465–424 B.C.). The book of Nehemiah is really part of the same work with the book of Ezra, though it embodies certain memoirs of Nehemiah in which he writes in the first person. Apart from what is related in this book we possess little information about Nehemiah. The hymn of praise by Ben Sira (Ecclesiasticus xlix. 13) extols his fame for rebuilding the desolate city of Jerusalem and for raising up fresh homes for the downtrodden people. According to other traditions he restored the temple-service and founded a collection of historical documents (2 Macc. i. 18-36, ii. 13). See further Ezra and Nehemiah (Books), Jews: *History* §§ 21 seq.

NEIGHBOUR (O. Eng. *nêahgebûr*, from *nêah*, "nigh," "near") and *gebûr*, "boor," literally "dweller," "husbandman"; cf. Dan. and Swed. *nabo*, Ger. *Nachbar*), properly one who lives in a house close to one, hence any one of a number of persons living in the same locality. From Biblical associations (Luke x. 27) the word is used widely of one's fellow-men.

NEILE, RICHARD (1562–1640), English divine, was educated at Westminster school and at St John's College, Cambridge. His first important preferment was as dean of Westminster (1605); afterwards he held successively the bishoprics of Rochester (1608), Lichfield (1610), Lincoln (1614), Durham (1617) and Winchester (1628), and the archbishopric of York (1631). When at Rochester he appointed William Laud as his chaplain and gave him several valuable preferments. His political activity while bishop of Durham was rewarded with a privy councillorship in 1627. Neile sat regularly in the courts of star-chamber and high commission. His correspondence with Laud and with Sir Dudley Carleton and Sir Francis Windebank (Charles I.'s secretaries of state) are valuable sources for the history of the time.

NEILL, JAMES GEORGE SMITH (1810–1857), British soldier, was born near Ayr, Scotland, on the 26th of May 1810, and educated at Glasgow University. Entering the service of the East India Company in 1827, he received his lieutenant's commission a year later. From 1828 to 1852 he was mainly employed in duty with his regiment, the 1st Madras Europeans (of which he wrote a *Historical Record*), but gained some experience on the general and the personal staffs as D.A.A.G. and as aide-de-camp. In 1850 he received his majority, and two years later set out for the Burmese War with the regiment. He served throughout the war with distinction, became second-in-command to Cheape, and took part in the minor operations which followed, receiving the brevet of lieutenant-colonel. In June 1854 he was appointed second-in-command to Sir Robert Vivian to organize the Turkish contingent for the Crimean War. Early in 1857 he returned to India. Six weeks after his arrival came the news that all northern India was aflame with revolt. Neill acted promptly; he left Madras with his regiment at a moment's notice, and proceeded to Benares. The day after his arrival he completely and ruthlessly crushed the mutineers (4th June 1857). He next turned his attention to Allahabad, where a handful of Europeans still held out in the fort against the rebels. From the 6th to the 15th of June his men forced their way under conditions of heat and of opposition that would have appalled any but a real leader of men, and the place, "the most precious in India at that moment," as Lord Canning wrote, was saved. Neill received his reward in an army colonelcy and appointment of aide-de-camp to the queen. Allahabad was soon made the concentration of Havelock's column. The two officers, through a misunderstanding in their respective instructions, disagreed, and when Havelock went on from Cawnpore (which Neill had reoccupied shortly before) he left his subordinate there to command the lines of communication. At Cawnpore, while the traces of the massacre were yet fresh, Neill inflicted the death penalty on all his prisoners with the most merciless rigour. Meanwhile, Havelock, in spite of a succession of victories, had been compelled to fall back for lack of men; and Neill criticized his superior's action with a total want of restraint. A second expedition had the same fate, and Neill himself was now attacked, though by his own exertions and Havelock's victory at Bithor (16th August) the tension on the communications was ended. Havelock's men returned to Cawnpore, and cholera broke out there, whereupon Neill again committed himself to criticisms, this time addressed to the commander-in-chief and to Outram, who was on the way with reinforcements. In spite of these very grave acts of insubordination, Havelock gave his rival a brigade command in the final advance. The famous march from Cawnpore to Lucknow began on September 19th; on the 21st there was a sharp fight, on the 22nd incessant rain, on the 23rd intense heat. On the 23rd the fighting opened with the assault on the Alum Bagh, Neill at the head of the leading brigade recklessly exposing himself. Next day he was again heavily engaged, and on the 25th he led the great attack on Lucknow itself. The fury of his assault carried everything before it, and his men were entering the city when a bullet killed their commander. Strict as he was, he was loved not less than feared, and throughout the British dominions he had established a name as a skilful and extraordinarily energetic commander. The rank and precedence of the wife of a K.C.B. was given to his widow, and memorials have been erected in India and at Ayr.

See J. W. Kaye, *Lives of Indian Officers* (1889); and J. C. Marshman, *Life of Havelock* (1867).

NEILSON, ADELAIDE (1846–1880), English actress, whose real name was Elizabeth Ann Brown, was born in Leeds, the daughter of an actress, and her childhood and early youth were passed in poverty and menial work. In 1865 she appeared in Margate as Julia in *The Hunchback*, a character with which her name was long to be associated. For the next few years she played at several London and provincial theatres in various parts, including Rosalind, Amy Robsart and Rebecca (in *Ivanhoe*), Beatrice, Viola and Isabella (in *Measure for Measure*). In 1872 she visited America, where her beauty and talent made her a great favourite, and she returned year after year. She died on the 15th of August 1880. Miss Neilson was married to Philip Henry Lee, but was divorced in 1877.

NEISSE, three rivers of Germany. (1) The Glatzer Neisse rises on the Schneegebirge, at an altitude of 1400 ft., flows north past Glatz, turns east and pierces the Eulengebirge in the Wartha pass, then continues east as far as the town of Neisse, and after that flows north-east until at an altitude of 453 ft. it joins the Oder between Oppeln and Brieg. Owing to its torrential character the greater part of its course is only used for floating down timber. It abounds in fish, and its total length is 121 m. (2) The Lausitzer or Görlitzer Neisse rises near Reichenberg in Bohemia, on the south side of the Riesengebirge, at an altitude of 1130 ft., flows north past Reichenberg, Görlitz, Forst and Guben, and enters the Oder above Fürstenberg at an altitude of 105 ft. Its length is 140 m., of which less than 40 m. are navigable. (3) The Wütende Neisse is a tributary of the Katzbach.

NEISSE, a town and fortress of Germany, in the province of Prussian Silesia, at the junction of the Neisse and the Biela, 32 m. by rail S.W. of Oppeln. Pop. (1905) 25,394 (mostly Roman Catholics) including a garrison of about 5000. It consists of the town proper, on the right bank of the Neisse, and the Friedrichstadt on the left. The Roman Catholic parish church of St James (Jakobikirche) dates mainly from the 13th century, but was finished in 1430. The chief secular buildings are the old episcopal residence, the new town hall, the old Rathaus, with a tower 205 ft. in height (1499), the beautiful Renaissance *Kämmerei* (exchequer) with a high gabled roof ornamented with frescoes, and the theatre. A considerable trade is carried on in agricultural products.

Neisse, one of the oldest towns in Silesia, is said to have been founded in the 10th century, and afterwards became the capital of a principality of its own name, which was incorporated with the bishopric of Breslau about 1200. Its first walls were erected in 1350, and enabled it to repel an attack of the Hussites in 1424. It was thrice besieged during the Thirty Years' War. The end of the first Silesian War left Neisse in the hands of Frederick the Great, who laid the foundations of its modern fortifications.

The town was taken by the French in 1807. Neisse can, at the will of the garrison, be protected by a system of inundation.

See Kastner, *Urkundliche Geschichte der Stadt Neisse* (Neisse and Breslau, 1854–1867, 3 vols.); Schutte, *Beiträge zur Geschichte von Neisse* (Neisse, 1881); and Ruffert, *Aus Neisse's Vergangenheit* (1903).

NEJD, a central province of Arabia, bounded N. by the Nafud desert, E. by El Hasa, S. by the Dahna desert and W. by Asir and Hejāz. It lies between 20° and 28° N. and 41° and 48° E., extends nearly 550 m. from north to south, 450 from east to west, and covers approximately 180,000 sq. m. The name Nejd implies an upland, and this is the distinctive character of the province as compared with the adjoining coastal districts of Hejāz and El Hasa. Its general elevation varies from 5000 ft. on its western border to 2500 in Kasim in the north-east, and somewhat less in Yemāma in the south-east. In the north the double range of Jebel Shammar, and in the east the ranges of J. Tuwēk and J. ʽArid rise about 1500 ft. above the general level, but on the whole it may be described as an open steppe, sloping very gradually from S.W. to N.E. of which the western and southern portion is desert, or at best pasture land only capable of supporting a nomad population; while in the north and east, owing to greater abundance of water, numerous fertile oases are found with a large settled population. The principal physical features are described in the article Arabia.

The main divisions of Nejd are the following: Jebel Shammar, Kasīm, Sudēr, Wushm, ʽArid, Afláj, Harík, Yemāma and Wadi Dawāsir. J. Shammar is the most northerly: its principal settlements are situated in the valley some 70 m. long, between the two ranges of J. Aja and J. Selma, though a few lie on their outer flanks. Jauf, Tēma and Khaibar, though dependencies of the Shammar principality, lie beyond the limits of Nejd. The capital, Hail, has been visited by several Europeans, by W. G. Palgrave in 1862, when Talāl was emir, and by Mr Wilfrid and Lady Anne Blunt, Charles Doughty, C. Huber, T. Euting and Baron E. Nolde during the reign of Mahommed b. Rashid, who from 1892 till his death in 1897 was emir of all Nejd. Its well ordered and thriving appearance is commented on by all these travellers. The town is surrounded by a wall and dominated by the emir's palace, a stately, if somewhat gloomy building, the walls of which are quite 75 ft. high, with six towers, the whole giving the idea of an old French or Spanish donjon.

Hail lies at the northern end of the valley, 2 m. S.E. of J. Aja, at an altitude of about 3000 ft. The highest point of J. Aja, the western and higher of the twin ranges, is according to Huber 4600 ft. above sea-level. The valley is about 20 m. in width and is intersected with dry ravines and dotted with low ridges generally of volcanic origin. Wells and springs are the only source of water supply, both for drinking and for irrigation. The principal crops are dates, wheat and barley and garden produce; forage and firewood are very scarce. The population was estimated by Nolde in 1893 at 10,000 to 12,000.

Among the other settlements of J. Shammar are Jafēfa and Mukāk at the northern foot of J. Aja, Kasr and Kafār at its southern foot, Rauda, Mustajidda and Fēd at the foot of J. Selma, all large villages of 3000 to 5000 inhabitants. ʽAkda is a small valley in the heart of J. Aja, an hour's ride from Hail; it was the oldest possession of the Ibn Rashid, since 1835 the ruling family of J. Shammar, and is a place of great natural strength. Kasim lies E. of J. Shammar in the valley of the W. Rumma the great wadi of northern Nejd; the chief towns Burēda and ʽAnēza are situated about 10 m. apart, on the north and south sides of the wadi respectively. Doughty described ʽAnēza in 1879 as clean and well built with walls of sun-dried brick, with well supplied shops. Many inhabitants live in distant houses in gardens outside the town walls. ʽAnēza and Burēda each contain some 10,000 inhabitants. The dry bed of the Wadi Rumma in lower Kasīm is about 2 m. across, fringed in places with palm plantations; water is found at 6 or 8 ft. in the dry season and in winter the wells overflow. The staple of cultivation is the date-palm, the fruit ripening in August or September. Fruit trees and fields of wheat, maize or millet surround the villages, but the extent of cultivation is limited by the necessity of artificial irrigation. Kahāfa, Kusēba and Kuwāra are the principal villages of upper Kasim; and ʽAnēza and Burēda, Madnab, Ayun and Ras of lower Kasim.

Doughty's and Huber's explorations did not extend east of Kasim, and for all details regarding eastern and southern Nejd Palgrave is the only authority. According to him, a long desert march leads from Madnab to Zulfa the first settlement in Sudēr, where the land rises steadily to the high calcareous tableland of J. Tuwēk. The entire plateau is intersected by a maze of valleys, generally with steep banks, as if artificially cut out of the limestone. In these countless hollows is concentrated the fertility and population of Nejd; gardens and houses, cultivation and villages lie hidden from view among the depths while one journeys over the dry flats, till one comes suddenly on a mass of emerald green beneath.

Sudēr forms the northern end of the plateau, ʽArid the southern, while Wushm appears to lie on its west, and Aflāj and el Harīk below it and to the south and south-west respectively. The principal town is Majma the former capital of Sudēr, a walled town situated on an eminence in a broad shallow valley surrounded by luxuriant gardens and trees. Tuwēm, Jalājil and Hula are also described by Palgrave as considerable towns.

ʽArid is entered at Sedūs, on the W. Hanifa, a broad valley bottom with precipitous sides, here 2 or 3 m. wide, full of trees and brushwood. Along its course lie the villages of Ayāna, and Deraiya the former Wahhābi capital, destroyed by Ibrahim Pasha in 1817; and a few miles farther E. the new capital Riād, built by the emir Fēsal after his restoration and visited by Palgrave in 1863, and by Pelly two years later. It was then, and still is, a large town of perhaps 20,000 inhabitants with thirty or more mosques, well-stocked bazārs, and like the towns of Kasim, surrounded by well-watered gardens and palm groves. To the south the valley opens out into the great plains of Yemāma, dotted with groves and villages, among which Manfuha is scarcely inferior in size to Riād itself. Still farther to the south-east lies the district of Harīk, with its capital Hauta, the last in that direction of the settled districts of Nejd, and on the borders of the southern desert.

Palgrave visited El Kharfa the chief place of the Aflaj district some 80 m. S.W. of Riād. This district seems to be scantily peopled as compared with Sudēr or Yemāma, and a large proportion of the inhabitants are of mixed negro origin. While there, he made inquiries about the adjoining district of W. Dawāsir. Its length was stated to be ten days' journey or 200 m.; scattered villages consisting of palm-leaf huts lie along the way, which leads in a south or south-westerly direction to the highlands of Asir and Yemen.

The Bedouin who occupy the remainder of Nejd consist in the main of the four great tribes of the Shammar, Harb, ʽAteba and Mutēr. The first-named represent that part of the great Shammar tribe which has remained in its ancestral home on the southern edge of the Nafud (the northern branch long ago emigrated to Mesopotamia); many of its members have settled down to town life, but the tribe still retains its Bedouin character, and its late chief, the emir Mahommed Ibn Rashid, the most powerful prince in Nejd, used to live a great part of the year in the desert with his tribesmen. The Harb are probably the largest of the Bedouin tribes in the peninsula; they are divided into a number of sections, several of which have settled in the oases of Hejāz, while others remain nomadic. Their territory is the steppe between Kasim and Medina, and across the pilgrim road between Medina and Mecca, for the protection of which they receive considerable subsidies from the Turks. The ʽAteba circuits extend from the Hejaz border near Mecca along the road leading thence to Kasim. The Mutēr occupy the desert from Kasim northwards towards Kuwēt.

Nejd became nominally a dependency of the Turkish empire in 1871 when Midhat Pasha established a small garrison in El Hasa, and created a new civil district under the government of Basra, under the title of Nejd, with headquarters at Hofuf. Its real independence was not, however, affected, and the emirs, Mahommed Ibn Rashid at Hail, and Abdallah Ibn Sa'ud at Riād, ruled in western and eastern Nejd respectively, until 1892, when the former by his victory at 'Anēza became emir of all Nejd. His successor, Abdul Aziz Ibn Rashid, was, however, unable to maintain his position, and in spite of Turkish support, sustained a severe defeat in 1905 at the hands of Ibn Sa'ud which for the time, at any rate, restored the supremacy to Riād.

No data exist for an accurate estimate of the population; it probably exceeds 1,000,000, of which two-thirds may be settled, and one-third nomad or Bedouin. Palgrave in 1863, perhaps unduly exaggerating the importance of the town population, placed it at nearly double this figure.

The revenue of the emir Mahommed Ibn Rashid of Hail, who died in 1897, was estimated by Blunt in 1879 at £80,000, and his expenditure at little more than half that amount. Nolde who visited Hail in 1893 after the emir's conquest of the Wahhabi state, believed that his surplus income then amounted to £60,000 a year, and his accumulated treasure to £1,500,000.

AUTHORITIES.—W. G. Palgrave, *Central and Eastern Arabia* (London, 1865); Lady Anne Blunt, *Pilgrimage to Nejd* (London, 1881); C. M. Doughty, *Arabia Deserta* (Cambridge, 1885); C. Huber, *Journal d'un voyage en Arabie* (Paris, 1891); J. Euting, *Reise in inner Arabien* (Leyden, 1896); E. Nolde, *Reise nach inner Arabien* (Brunswick, 1895). (R. A. W.)

NEJEF, or MESHED 'ALI, a town of Asiatic Turkey, in the pashalik of Bagdad, 50 m. S. of Kerbela and 5 or 6 m. W. of the ruins of ancient Kufa, out of the bricks of which it is chiefly built. It stands on the eastern edge of the Syrian desert, on the north-eastern shore of a deep depression, formerly a sea, the *Assyrium Stagnum* of the old geographers, but in latter years drained and turned into gardens for the town. It is a fairly prosperous city, supplied with admirable water by an underground aqueduct from the Hindieh canal, a few miles to the north, which also serves to water the gardens in the deep dry bed of the former lake. The town is enclosed by nearly square brick walls, flanked by massive round towers, dating from the time of the caliphs, but now falling into decay. Outside the walls, over the sterile sand plateau, stretch great fields of tombs and graves, for Nejef is so holy that he who is buried here will surely enter paradise. In the centre of the town stands Meshed (strictly Meshhed) 'Ali, the shrine of 'Ali, containing the reputed tomb of that caliph, which is regarded by the Shi'ite Moslems as being no less holy than the Ka'ba itself, although it should be said that it is at least very doubtful whether 'Ali was actually buried there. The dome of the shrine is plated with gold, and within the walls and roof are covered with polished silver, glass and coloured tiles. The resting-place of 'Ali is represented by a silver tomb with windows grated with silver bars and a door with a great silver lock. Inside this is a smaller tomb of damascened ironwork. In the court before the dome rise two minarets, plated, like the dome, with finely beaten gold from the height of a man and upward. While the population of Nejef is estimated at from 20,000 to 30,000, there is in addition a very large floating population of pilgrims, who are constantly arriving, bringing corpses in all stages of decomposition and accompanied at times by sick and aged persons, who have come to Nejef to die. At special seasons the number of pilgrims exceeds many times the population of the town. Nejef is also the point of departure from which Persian pilgrims start on the journey to Mecca. No Jews or Christians are allowed to reside there. The accumulated treasures of Meshed 'Ali were carried off by the Wāhhābites early in the 19th century, and in 1843 the town was deprived of many of its former liberties and compelled to submit to Turkish law; but it is again enormously wealthy, for what is given to the shrine may never be sold or used for any outside purpose, but constantly accumulates. Moreover, the hierarchy derives a vast revenue from the fees for burials in the sacred limits.

See W. K. Loftus, *Chaldaea and Susiana* (1857); J. P. Peters, *Nippur* (1897); B. Meissner, *Hirau Huarnaq* (1901). (J. P. PE.)

NELEUS, in Greek legend, son of Poseidon and Tyro, brother of Pelias. The two children were exposed by their mother, who afterwards married Cretheus, king of Iolcus in Thessaly. After the death of Cretheus, the boys, who had been brought up by herdsmen, quarrelled for the possession of Iolcus. Pelias expelled Neleus, who migrated to Messenia, where he became king of Pylos (Apollodorus i. 9; Diod. Sic. iv. 68) and the ancestor of a royal family called the Neleidae, who are historically traceable as the old ruling family in some of the Ionic states in Asia Minor. Their presence is explained by the legend that, when the Dorians conquered Peloponnesus, the Neleidae were driven out and took refuge in Attica, whence they led colonies to the eastern shores of the Aegean. By Chloris, daughter of Amphion, Neleus was the father of twelve sons (of whom Nestor was the most famous) and a daughter Pero. Through the contest for his daughter's hand (see MELAMPUS) he is connected with the legends of the prophetic race of the Melampodidae, who founded the mysteries and expiatory rites and the orgies of Dionysus in Argolis. According to Pausanias (ii. 2. 2, v. 8. 2) Neleus restored the Olympian games and died at Corinth, where he was buried on the isthmus.

NELLORE, a town and district of India, in the Madras presidency. The town is on the right bank of the Pennar river, and has a station on the East Coast railway, 109 m. N. of Madras city. Pop. (1901) 32,040. There are United Free Church, American Baptist and Catholic missions.

The DISTRICT OF NELLORE has an area of 8761 sq. m. It comprises a tract of low-lying land extending from the base of the Eastern Ghāts to the sea. Its general aspect is forbidding: the coast-line is a fringe of blown sand through which the waves occasionally break, spreading a salt sterility over the fields. Farther inland the country begins to rise, but the soil is not naturally fertile, nor are means of irrigation readily at hand. About one-half of the total area is cultivated; the rest is either rocky waste or is covered with low scrub jungle. The chief rivers are the Pennar, Suvarnamukhi and Gundlakamma. They are not navigable, but are utilized for irrigation purposes, the chief irrigation work being the anicut across the Pennar. Nellore, however, is subject both to droughts and to floods. Copper was discovered in the western hills in 1801, but several attempts by European capitalists to work the ore proved unremunerative, and the enterprise has been abandoned since 1840. Iron ore is smelted by indigenous methods in many places, but the most important mining industry is that of mica. Salt is largely manufactured along the sea-coast. Nellore, with the other districts of the Carnatic, passed under direct British administration in 1801. The population in 1901 was 1,496,987 showing an increase of 2·3% in the decade. In 1904 a portion of the district was transferred to the newly formed district of Guntur, reducing the remaining area to 7965 sq. m., with a population of 1,272,815. The principal crops are millets, rice, other food grains, indigo and oil-seeds. The breed of cattle is celebrated. The East Coast railway, running through the length of the district, was opened throughout for traffic in 1899. The section from Nellore town to Gudur, formerly on the metre gauge, has been converted to the standard gauge. Previously the chief means of communication with Madras was by the Buckingham canal. The sea-borne trade is insignificant.

NELSON, HORATIO NELSON, VISCOUNT (1758–1805), duke of Bronte in Sicily, British naval hero, was born at the parsonage house of Burnham Thorpe, in Norfolk, on the 29th of September 1758. His father, Edmund Nelson (1722–1802), who came of a clerical family, was rector of the parish. His mother, whose maiden name was Catherine Suckling (1725–1767), was a grandniece of Sir Robert Walpole (1st earl of Orford). This connexion proved of little or no value to the future admiral, who, in a letter to his brother, the Rev. William Nelson, written in 1784, speaks of the Walpoles as "the merest set of cyphers that ever existed—in public affairs I mean." His introduction to the navy came from his maternal uncle, Captain Maurice Suckling (1725–1778), an officer of some reputation who at his death held the important post of comptroller of the navy. Horatio, who had received a summary, and broken, education at Norwich, Downham and North Walsham, was entered on the "Raisonable" when Captain Suckling was appointed to her in 1770 on an alarm of war with Spain. The dispute was settled, and Captain Suckling was transferred to the "Triumph," the guardship at Chatham, whither he took his nephew. In order that the lad might have more practice than could be obtained on a harbour ship, his uncle sent him to the West Indies in a merchant vessel, and on his return gave him constant employment in boat work on the river. In a brief sketch of his life, which he drew up in 1799, Nelson says that in this way he became a good pilot for small vessels "from Chatham to the Tower of London, down the Swin, and the North Foreland; and confident of myself among rocks and sands, which has many times since been of great comfort to me." Between April and October of 1772 he served with Captain Lutwidge in the "Carcass," one of the vessels which went on a not otherwise notable voyage to the Arctic seas with Captain Phipps, better known by his Irish title of Baron Mulgrave. On his return from the north he was sent to the East Indies in the "Seahorse," in which vessel he made the acquaintance of his lifelong friend Thomas Troubridge. At the end of two years he was invalided home. In after times he spoke of the depression under which he laboured during the return voyage, till "after a long and gloomy reverie, in which I almost wished myself overboard, a sudden glow of patrotism was kindled within me, and presented my king and my country as my patron. My mind exulted in the idea. 'Well then,' I exclaimed, 'I will be a hero, and, confiding in Providence, I will brave every danger.'" He spoke to friends of the "radiant orb" which from that hour hung ever before him, and "urged him onward to renown." On his return home he served during a short cruise in the "Worcester" frigate, passed his examination as lieutenant on the 9th April 1777, and was confirmed in the rank next day. He went to the West Indies with Captain Locker in the "Lowestoft" frigate, was transferred to the flagship by the admiral commanding on the station, Sir Peter Parker (1721–1811), and was then by him promoted in rapid succession to the command of the "Badger" brig, and the "Hinchinbrook" frigate. By this appointment, which he received in 1779, he was placed in the rank of post captain (from which promotion to flag rank was by seniority), at the very early age of twenty. His connexion with Captain Suckling may, no doubt, have been of use to him, but in the main he owed his rapid rise to his power of winning the affection of all those he met, whether as comrades or superiors. Sir Peter Parker and Lady Parker remained his friends all through his life. In 1780 he saw his first active service in an expedition to San Juan de Nicaragua, which was rendered deadly by the climate. He was brought to death's door by fever, and invalided home once more. In 1781 he was appointed to the "Albemarle" frigate, and after some convoy service in the North Sea and the Sound was sent to Newfoundland and thence to the North American station. "Fair Canada," as he has recorded in one of his letters, gave him the good health he had so far never enjoyed. At Quebec he formed one of those passionate attachments to women which marked his career. He now made the personal acquaintance of Sir Samuel Hood, Lord Hood. In the autobiographical sketch already quoted he mentions the high opinion formed of him by the admiral who presented him to Prince William, duke of Clarence, afterwards King William IV., as an officer well qualified to instruct him in "naval tactics," by which we must perhaps understand seamanship. Prince William has left a brief but singularly vivid account of their first meeting. He appeared, says the Prince, "to be the merest boy of a captain I ever beheld; and his dress was worthy of attention. He had on a full-laced uniform; his lank unpowdered hair was tied in a stiff Hessian tail of an extraordinary length; the old-fashioned flaps of his waistcoat added to the general quaintness of his figure, and produced an appearance which particularly attracted my notice; for I had never seen anything like it before, nor could I imagine who he was or what he came about. My doubts were, however, removed when Lord Hood introduced me to him. There was something irresistibly pleasing in his address and conversation; and an enthusiasm, when speaking on professional subjects, that showed he was no common being." The slight oddity of appearance, the power to arouse affection, and the glow indicating the fire within, are noted by all who ever looked Nelson in the face.

In March 1783, at the very end of the American War, he saw his second piece of active service. He was repulsed in an attempt to retake Turk's Island from the French. The peace gave him leisure to pay a visit to France, for which country and all its ways he entertained a dislike and contempt characteristic of his time. In France he formed another attachment, and went so far as to apply to a maternal uncle for an allowance to eke out his half-pay. It came to nothing, presumably by refusal on the lady's part. And now when the navy was cut down to the quick on the peace establishment, and the vast majority of naval officers were condemned to idleness on shore, he had the extraordinary good fortune to be appointed to the command of the "Boreas" frigate, for service in the West Indies. Nelson found in this commission an opportunity for the display of his readiness to assume responsibility. He signalized his arrival in the West Indies by refusing to obey an order of the admiral which required him to acknowledge a half-pay officer acting as commissioner of the dockyard at Antigua as his superior. He insisted on enforcing the Navigation Laws against the Americans, who by becoming independent had become foreigners. He called the attention of the government to the corruption prevailing in the dockyard of Antigua. His line was in all cases correct, but it impressed the admiralty as somewhat assuming, and his strong measures against the interloping trade brought on him many lawsuits, which, though he was defended at the expense of the government, caused him much trouble for years. In the West Indies on the 12th of March 1787 he married Frances Nisbet (1761–1831), the widow of a doctor in Nevis, whose favour he first gained by being found romping on all fours with her little boy under the drawing-room table. The marriage was one of affection and prudence, rather than of love.

Though Nelson had as yet seen little active service, and that little had not been specially distinguished, he had already gained that reputation within his own service which commonly precedes public recognition. His character had been fully developed, and his capacity proved. His horizon was narrow, being strictly confined to his profession. He had all the convictions of the typical John Bull of his generation. The loyalty of a devoted subject was strong in him. He burned to win affection, admiration, distinction. He was a man to do whatever there was to be done to the utmost. A more magnificent instrument for use in the great Revolutionary struggle now close at hand could not have been forged.

War having broken out, he was appointed captain of the "Agamemnon" (64) on the 30th of November 1793, and joined his ship on the 7th of February. From this date till June 1800, rather more than seven years, he was engaged on continual active service, with the exception of a few months when he was invalided home. This period is the most varied, the busiest, the most glorious and the most debated of a very full career. It subdivides naturally into three sections; (1) From the date of his appointment as captain of the "Agamemnon" till he was disabled by the loss of his arm in the unsuccessful attack on Santa Cruz de Tenerife on the 24th of July 1797 he served as captain, or commodore, under Hood, Hotham and Jervis, successive commanders-in-chief in the Mediterranean. (2) After an interval of nine months spent at home in recovering from his wound, and from the effects of a badly performed operation, he returned to the Mediterranean, and was at once sent in pursuit of the great French armament which sailed from Toulon under the command of Napoleon for the conquest of Egypt. His victory of the Nile on the 1st of August 1798 placed him at once in the foremost rank among the warriors of a warlike time, and made him a national hero. With his return to Naples on the 22nd of September the second period ends. (3) From now till he landed at Leghorn on the 26th of July 1800, on his return home across Europe, he was entangled at Naples in political transactions and intrigues, which he was ill prepared to deal with either by nature or training, and was plunged into the absorbing passion, which did increase his popularity with the mob, but cost him many friends.

The first of these three passages in his life is full of events which must, however, be told briefly. In May he sailed for the Mediterranean with Hood, and was engaged under his orders in the occupation of Toulon by the allied British and Spanish forces. In August 1793 he was despatched to Naples to convoy the troops which the Neapolitan government had undertaken to contribute towards the garrison of Toulon. It was on this occasion that he made the acquaintance of Emma Hamilton (*q.v.*), the wife of Sir William Hamilton, minister at the Court of Naples. References to Lady Hamilton begin to appear in his letters to his wife, but, as might be expected, they indicate little beyond respectful admiration, and he makes a good deal of her kindness to his stepson, Josiah Nisbet, whom he had taken to sea. Young Nisbet was afterwards promoted to post captain, and was put in command of a frigate at an improperly early age by Nelson's interest. He proved quite unworthy, and in the end died mad. After the allies had been driven from Toulon by Napoleon, Nelson was employed throughout 1794 in the operations connected with the occupation of Corsica. In April and May he was engaged in the capture of Bastia, and June and July in the taking of Calvi. Both towns really surrendered from want of stores, but the naval brigades under Nelson's personal direction were conspicuously active, and their energy was favourably contrasted with the alleged formality of the troops. During the operations at Calvi, Nelson's right eye was destroyed by gravel driven into it by a cannon shot which struck the ground close to him. From the date of the occupation of Corsica till the island was evacuated, that is to say, from the end of 1794 till the middle of 1796, he was incessantly active. He served under Hotham, who undertook the command when Hood returned to England, and was engaged in the indecisive actions fought by him in the Gulf of Lyons in March and July 1795. The easy-going ways of the new admiral fretted the eager spirit of Nelson, and Hotham's placid satisfaction with the trifling result of his encounters with the French provoked his subordinate into declaring that, for his part, he would never think that the British fleet had done very well if a single ship of the enemy got off while there was a possibility of taking her. His zeal found more satisfaction when he was detached to the Riviera of Genoa, where, first as captain, and then as commodore, he had an opportunity to prove his qualities for independent command by harassing the communications of the French, and co-operating with the Austrians. In Sir John Jervis, who superseded Hotham, he found a leader after his own heart. When Spain, after first making peace with France at Basel, declared war on England, and the fleet under Jervis withdrew from the Mediterranean, Nelson was despatched to Elba on a hazardous mission to bring off the small garrison and the naval stores. He sailed in the "Minerve" frigate, having another with him. After a smart action with two Spanish frigates which he took off Carthagena on the 20th of December, and a narrow escape from a squadron of Spanish line of battle ships, he fulfilled his mission, and rejoined the flag of Jervis on the eve of the great battle off Cape St Vincent on the 14th of February 1797 (see St Vincent, Battle of). The judgment, independence and promptitude he showed in this famous engagement, were rewarded by the conspicuous part he had in the victory, and revealed him to the nation as one of the heroes of the navy. Nelson receiving the swords of the Spanish officers on the deck of the "San Josef" became at once a popular figure.

A few days after the victory he became rear-admiral by seniority, but continued with Jervis, who was made a peer under the title of Earl St Vincent. Nelson's own services were recognized by the grant of the knighthood of the Bath. During the trying months in which the fleet was menaced by the sedition then rife in the navy, which came to a head in the mutinies at Spithead and the Nore, he remained with the flag, and in the blockade of Cadiz. In July 1797 he was sent on a desperate mission to Santa Cruz de Tenerife. It was believed that a Spanish Manilla ship carrying treasure had anchored at that place, and Lord St Vincent was desirous of depriving the enemy of this resource. The enterprise was, in fact, rash in the last degree, for the soldiers from the garrisons of Elba and Corsica having gone home, no troops were available for the service, and a fortified town was to be taken by man-of-war boats alone. Nelson's well-established character for daring marked him out for a duty which could only succeed by dash and surprise, if it was to succeed at all. But the Spaniards were on the alert, and the attack, made with the utmost daring on the night of the 24th of July, was repulsed with heavy loss. Some of the boats missed the mole in the dark and were stove in by the surf, others which found the mole were shattered by the fire of the Spaniards. Nelson's right elbow was shot through, and he fell back into the boat from which he was directing the attack. The amputation of his arm was badly performed in the hurry and the dark. He was invalided home, and spent months of extreme pain in London and at Bath. On the 10th of April 1798 he came back to the fleet off Cadiz as rear-admiral, with his flag in the "Vanguard" (74).

He was now one of the most distinguished officers in the navy. Within the next six months he was to raise himself far above the heads of all his contemporaries. It was notorious that a great armament was preparing at Toulon for some unknown destination. To discover its purpose, and to defeat it, the British government resolved to send their naval forces again into the Mediterranean, and Nelson was chosen for the command by Jervis, with whom the immediate decision lay, but also by ministers.

Having joined the flag of Lord St Vincent outside of the straits of Gibraltar on the 30th of April, Nelson was detached on the 2nd of May into the Mediterranean, with three line-of-battle ships and five frigates, to discover the aim of the Toulon armament. Napoleon had, however, enforced rigid secrecy, and the British admiral had to confess that the French were better than the British at concealing their plans. Beyond the fact that a powerful combined force was collected in the French port he could learn nothing. On the 20th of May the "Vanguard" was dismasted in a gale. Nelson bore the check in a highly characteristic manner. "I ought not," he wrote, "to call what has happened by the cold name of accident; but I believe firmly that it was the Almighty's goodness to check my consummate vanity." The "Vanguard" was saved from going on shore by the seaman-like skill of Captain Ball of the "Alexander," against whom Nelson had hitherto had a prejudice, but for whom he had henceforth a peculiar regard. The "Vanguard" was refitted by the exertions of her own crew under cover of the little island of San Pietri on the southern coast of Sardinia. In the meantime the frigates attached to his command had returned to Gibraltar, in the erroneous belief that the liners would be taken there to make good the damage suffered in the gale. "I thought Hope would have known me better," said Nelson. On the 30th of April he was off Toulon again, only to find that the French were gone, and that he could not learn whither they were steering. Racked by anxiety and deprived of his best means of obtaining information by the disappearance of his frigates, he remained cruising till he was joined, on the 7th of June, by Troubridge with ten sail of the line. And now he started on his fierce pursuit of the enemy, seeking him in the dark, for there were no scouts at hand; exasperated at being left without the eyes of his fleet; half maddened at the thought he might, by no fault of his own, miss the renown towards which his prophetic imagination had seemed to guide him; knowing that St Vincent would be blamed for choosing so young an admiral; but resolved to follow the enemy to the antipodes if necessary. From the coast of Sardinia to Naples, from Naples to Messina, from Messina to Alexandria, from Alexandria, where he found the roadstead empty, back to Sicily, and then when at last a ray of light came to him, back to Alexandria—he swept the central and eastern Mediterranean. At no time in his life were the noble qualities of his nature displayed more entirely free from all alloy. He was an embodied flame of resolution, and as yet he showed no sign of the vulgar bluster which was to appear later. In the midst of his anxieties his kindness of heart shone forth without a trace of the tendency of sentimental gush so irritatingly obvious in after days. Unlike most admirals of his time, he did not live apart from his captains, but saw much of them, and freely discussed his plans with them. He had his reward in their devotion and perfect comprehension of what he wished them to do. At the same time he acquired an absolute confidence in the efficiency of his squadron, the magnificent force which had been formed by years of successful war, and by the careful training of his predecessors. The captains were the band of brothers he himself had made them.

The great victory of the 1st of August 1798 (see NILE, BATTLE OF) brought Nelson yet another wound. He was struck on the forehead by a langridge shot, and had for a time to go below. It is perhaps to be lamented in the interest of his fame that the wound was not severe enough to compel him to return home. After providing for the blockade of what remained of the French fleet in Alexandria, he sailed for Naples, and arrived there on the 22nd of September. There was no rear-admiral of any standing in the navy who could not have done what remained to be done in the Mediterranean, under the supervision of St Vincent, as well as he. For him Naples was a pitfall. There awaited him there precisely the influences to folly which he was least able to resist. He loved being loved, and was the man to think the gift a debt. He had an insatiable appetite for praise. With those weaknesses of character which caused Lord Minto, who yet never ceased to regard him with sincere friendship, to say that he was in some respects a "baby," he was disarmed in the presence of the two women who now made a determined attempt to capture him. Emma Hamilton, who could not help endeavouring to conquer every man she met, was naturally eager to dominate one who had filled Europe with his fame. Behind Emma was the queen of Naples, Maria Carolina, a woman who had a share of the ability of her mother Maria Theresa without any of her fine moral qualities. Maria Carolina was all her life trying to fight the power of revolutionary France, with no better resources than were afforded her by the insignificant kingdom of Naples, and a husband who was the embodiment of all the faults of the Italian Bourbons. She had made use of the English minister's wife as an instrument of political intrigue, and now she employed her to manage Nelson. We have the repeated assertions of Nelson himself in all his ample correspondence from September 1798 to July of 1800, and indeed later, to prove that he was, in his own tell-tale phrase, persuaded to "Sicilyfy" his conscience—in other words to turn his squadron into an instrument for the ambition, the revenge and the fears of Maria Carolina, the "Dear Queen" of his letters to Emma Hamilton. It is highly probable that he was secretly influenced by annoyance at the pedantry of the British government, which only gave him a barony for the splendid victory of the Nile, on the ridiculous ground that no higher title could be given to an officer who was not a commander-in-chief. All doubt as to the character of his relations with Lady Hamilton has been laid at rest by the Morrison papers. None ought ever to have existed, for, if Nelson did not love this woman in the fullest possible sense of the word, his conduct would be inexplicable on any other hypothesis than that he was an imbecile. He allowed her to waste his money, to lead him about "like a bear," and to drag him into gambling, which he naturally hated. For her sake he offended old friends, and quarrelled with his wife in circumstances of vulgar brutality. That he believed she had borne him a child can no longer be disputed, and he carried on with her a correspondence under the name of Thompson which was apparently meant to deceive her husband, but is varied by grotesque explosions which destroy the illusion, such as it was.

In the hands of these two women, and in the intoxication produced on him by flattery, which could not be too copious or gross for his taste, Nelson speedily became a Neapolitan royalist of far greater sincerity than was to be found among the king's subjects except in the ranks of the Lazzaroni. He gratified the headlong queen by egging her torpid husband into an exceedingly foolish attack on the French garrisons then occupying the so-called Roman republic. The collapse of the Neapolitan forces was instant and ignominious. The court fled to Palermo in December, under the protection of the British squadron. At Palermo Nelson remained directing the operations of the ships engaged in blockading Malta, then held by the garrison placed in it by Napoleon when he took it on his way to Egypt, and sinking continually deeper into his slavery to Lady Hamilton, till the spring of the following year. He was then aroused by a double call. A royalist army led by the king's vicar-general, Fabrizio Ruffo (*q.v.*), had succeeded in recovering the greater part of the kingdom of Naples from the government set up by the French, and called, in the pedantic style of the revolutionary epoch, the Parthenopean republic. A French fleet commanded by Admiral Bruix entered the Mediterranean. News of the appearance of Bruix reached Nelson just as he was about to sail for Naples with the heir apparent to co-operate with Ruffo and his "Christian Army." He immediately took steps to concentrate his ships, which had been reinforced by a small Portuguese squadron, at Marittimo on the western coast of Sicily, where he would be conveniently placed to meet the French, if they came, or to unite with the ships of Lord St Vincent. He was, however, half distraught between his sense of what was required by his duty to his own service and the obligations he had assumed towards the sovereigns of Naples. In the end he resolved to sail for Naples, this time without the crown prince, in order to carry out a mission entrusted to him by the king.

The story of Nelson's visit to Naples in the June of 1799 will probably remain a subject for perpetual discussion. His reputation for humanity and probity is considered to depend on the view we take of his actions there and at this period. It is true that the relative importance of these episodes has been much diminished by the publication of the Morrison Papers, and that it has at all times been exaggerated. From the Morrison Papers we know that, when his passions were concerned, he was not incapable of stratagems to deceive his old friend Sir William Hamilton. It is the less incredible that he should have been willing to use deceit against persons whom he hated so fiercely as he did the Neapolitan Jacobins, in his double quality of English Tory and Neapolitan Royalist. But apart from his laxity in the course of a double adultery, his letters, written to many different people during his stay on the coasts of Naples, contain more than sufficient evidence to show that he was utterly unhinged by excitement, and was unable to estimate the real character of many of his own words and deeds. He considered himself as owing an equal allegiance to Ferdinand of Naples and to his own sovereign. His feelings towards the Jacobin subjects of his Italian king are expressed in terms which bear a remarkable likeness to the rhetoric of the Jacobins of France when they were most vigorously engaged in ridding their country of aristocrats. To Troubridge he writes: "Send me word some proper heads are taken off, this alone will comfort me." To St Vincent he reports that "Our friend Troubridge had a present made him the other day of the head of a Jacobin, and makes an apology to me, the weather being very hot, for not sending it here." Some allowance may be made for a rude taste in jocularity, but it is impossible to mistake the scream of fury in Nelson's letters, imitated from the style of Lady Hamilton, who in these things was the sycophant of the queen. A man who allowed his thoughts to dwell in an atmosphere of hysterical ferocity, and was above all a man of action, was well on the way to interpret his words into deeds. It was while he was in this heated state that he was sent to preside over the fall of the Parthenopean republic at the end of June 1799.

King Ferdinand had not been unwilling to offer terms to those of his subjects who had joined with the French to establish the republic, so long as he was under the influence of fear. But when the French had been defeated in northern Italy and had left the Republicans to their own resources, he became more anxious to make an example. In the early parts of June he heard that Ruffo was inclined to clemency, and grew very eager to prevent any such mistake. No more effectual way of enforcing rigour could be imagined than to put the control of events entirely in the hands of Nelson, whose sentiments were well known, who was notoriously under the influence of Emma Hamilton, that is to say, of the queen, and who, as a stranger, would have no family or social attachments with the republicans, no changes of fortune nor future revenges to fear. That he asked Nelson to go to Naples, giving him large powers, may be considered certain. A commission in the full sense he could not give without the consent of the king of Great Britain, and that was not even asked for. But Nelson had general instructions from home to support the Neapolitan government, and though this only meant, and could only mean, as an ally and against the common enemy, he understood it in a much wider sense, while he considered himself as being bound to Ferdinand in the relation of subject to sovereign by the grant of the duchy of Bronté in Sicily, which he had just received. He therefore sailed to Naples resolved to act in the double capacity of English and Neapolitan admiral, of English opponent of the Jacobins, and of Neapolitan royalist. The general cause of Europe and the particular revenge of the king and queen were of equal importance to him. When he entered the Bay of Naples on the 24th of June he found that a capitulation had been agreed upon some thirty-six hours earlier, between Ruffo, acting as vicar-general, with the consent of Captain Foote (1767–1833) of the "Seahorse," the senior British naval officer present, on the one side, and the Neapolitan republicans on the other. The republicans had been reduced to the possession of the castles of Uovo and Nuovo, and had been glad to secure terms which allowed them to go into exile in France. Nelson denounced an arrangement which would have precluded all cutting off of heads as "infamous." He ordered the white flag to be hauled down on the "Seahorse," and told Ruffo that he would not allow the capitulation to be carried out. The same warning was given to the republicans in the forts. There is a question whether the capitulation had been in part already carried into effect. Sir William Hamilton, who, together with his wife, had accompanied Nelson from Palermo, asserts that it had, in an official despatch to Lord Grenville dated on the 14th July. But this letter, written only a fortnight after the transaction, contains many inaccuracies, and can be held to prove only that Hamilton would have seen nothing discreditable in violating a capitulation, or that he was in his dotage, and did not know what he was doing. Ruffo refused to be a party to a breach of faith. On the afternoon of the 25th he had an interview with Nelson on board the flagship the "Foudroyant," which was conducted through the Hamiltons and was of a very heated character. Next morning, as Ruffo showed a determination to stand aside and throw on Nelson the responsibility of provoking a renewal of hostilities, messages were sent to him both by the admiral and by Hamilton that there would be no interference with the "armistice." This assurance put a stop to the dispute between them. The republicans came out of the forts and were transferred to feluccas under the guard of British marines, where they were kept till the king's pleasure was known. As a matter of course it was that they should be mostly hanged or shot. Whether Nelson meant to deceive Ruffo into thinking that he had accepted the capitulation when he named the armistice,—whether the vicar-general was deceived, and then misled the garrisons in good faith—or whether he knew perfectly well that the capitulation was not included, and took the opportunity afforded him by these two English gentlemen to deceive his own countrymen, are points much discussed. The republicans in the forts did claim that they were covered by the capitulation, and that it had been violated. It is difficult to see in what way the service of King George was forwarded by Nelson's zeal for King Ferdinand. Such discredit as fell on him would have been avoided if he had kept to his duty as British admiral, and had not thought it incumbent on him to prove himself a good Neapolitan royalist. On the 29th of June Francesco Caracciolo (*q.v.*), a Neapolitan naval officer who had joined the republicans, was brought to Nelson as a prisoner. Out of his desire to make an example of a proper head, and in the full knowledge that Caracciolo's death would be pleasing to the queen, Nelson, in virtue, seemingly, of his supposed commission as Neapolitan admiral (which he did not possess), ordered a court martial of Italian officers to sit, on an English ship, to try the prisoner. The court could only find him guilty, and Caracciolo was hanged. The sentence was just, but the procedure was indecent, and Nelson's intervention cannot be justified.

At this period of his life it is indeed difficult to represent Nelson's actions in a favourable light. In July he disobeyed the order of Lord Keith to send some of his ships to Minorca, on the ground that they were needed for the defence of Naples. The influence of the queen, exercised through Emma Hamilton was partly responsible for his wilfulness, but a great deal must be put down to his annoyance at finding that Keith, and not he himself, was to succeed St Vincent as commander-in-chief in the Mediterranean. After the victory of the Nile he became, in fact, incapable of acting as a subordinate. Until he left for home in June 1800, except during the short interval when he acted as commander-in-chief in the absence of Keith, he was captious, querulous and avoided leaving Palermo as much as he could, and far more than he ought. When forced out he made his health an excuse for going back. He began a quarrel with Troubridge which ripened into complete estrangement. He wearied out his friends at the Admiralty, and finally extorted leave to return. As Keith would not allow him to take a line of battleship for his journey home with the Hamiltons, and indeed said plainly that Lady Hamilton had commanded the Mediterranean station long enough, he returned across Europe with his friends. Accounts of the figure they cut, and the sensation they created at Vienna and at Dresden, can be found in the Minto correspondence, and in the reminiscences of Mrs St George, afterwards Mrs Trench (1768–1827). He reached home in November.

In England he was received with the utmost popular enthusiasm, but with coldness by the king, the Admiralty, and by the great official and social world. His erratic and self-willed conduct towards Lord Keith sufficiently explains the distrust shown by My Lords of the Admiralty. Their uneasiness was not diminished by their knowledge that his renown made it quite impossible to lay him aside at a crisis. The king, a man of strict domestic habits and strong religious convictions, was undoubtedly offended by the scandals of Nelson's life at Naples, and he cannot but have been displeased by the admiral's openly avowed readiness to devote himself to King Ferdinand. English society as represented by the First Lord, Lord Spencer, and his wife, may not have shared the moral indignation of the pious king; but their taste was offended, and so was their self-respect, when Nelson insisted on forcing Lady Hamilton on them, and would go nowhere where she was not received. When it was discovered that he insisted on making his wife live in the same house as his mistress, he was considered to have infringed the accepted standard of good manners. After enduring insult at once cruel and cowardly, to the verge of poorness of spirit, Lady Nelson rebelled. A complete separation took place, and husband and wife never met again.

On the 1st of January 1801 Nelson became vice-admiral by seniority. The alliance of the Northern powers of which the Tsar Paul was the inspiring spirit, made it necessary for the British government to take vigorous measures in its own defence. A fleet had to be sent on a very difficult and dangerous mission to the Baltic. The Admiralty would have been unpardonable, and would not have been excused by public opinion if, when it had at its disposal such an admirable weapon as the conqueror of the Nile, it had failed to employ him. Nelson was chosen to go as a matter of course, but unfortunately, it was thought proper to put him under the command of Sir Hyde Parker (*q.v.*) an officer of no experience, and, as the Admiralty ought to have known, of commonplace, not to say indolent, character. Nelson bore the subordination with many bitter complaints, but on the whole with patience and tact. Sir Hyde Parker began by keeping his formidable second in command at arm's length, but Nelson handled him with considerable diplomacy. Knowing his superior to be fond of good living he caused a turbot to be caught for him on the Dogger Bank, and sent it to him with a complimentary message. Sir Hyde was not insensible to the attention, and thawed notably. We have the good fortune to possess the notes taken during the campaign by Colonel Stewart (1774–1827), a military officer who did duty with Nelson as a marine. Colonel Stewart has put on record many stories of Nelson which have a high biographical value. He saw the hero when his character was displayed in all its strength and its weakness. Nelson was at once burning for honour, ardently desirous to serve his country at a great crisis, and yet longing for rest and for the company of Emma Hamilton. His passion had, if possible, been increased by the birth of the child Horatia, whom he believed to be his own, and his jealousy was excited by fears that Emma would become an object of attention to the prince of Wales (afterwards George IV.). His health, as Colonel Stewart justly observed, was always affected by anxiety, and during the Baltic campaign he complained incessantly of his sufferings. Nervous irritation provoked him into odd explosions of excitement, as when, for instance, he suddenly interfered with the working of his flagship while the officer of the watch was tacking her on the south coast of England, and so threw her into disorder. When he saw the consequences of his untimely intrusion he sharply appealed to the officer to tell him what was to be done next, and when the embarrassed lieutenant hesitated to reply, burst out with, "If you do not know, I am sure I don't," and then went into his cabin. His subordinates learnt to take these manifestations as matters of course, knowing that they were wholly without malignity. To them he was always kind, even when they were at fault, taking, as his own phrase has it, a penknife where Lord St Vincent would have taken a hatchet. Colonel Stewart tells how he was wont to invite the midshipmen of the middle watch to breakfast, and romp with them as if he had been the youngest of the party. The playfulness of his nature came out, in combination with his heroism, when he adorned his refusal to obey Sir Hyde's weak signal of recall in the middle of the battle, which would have been disastrous if it had been acted on, by putting his telescope to his blind eye and declaring that he could not see the order to retire. At such moments all could see his agitation; but, as the surgeon of the "Elephant," which bore his flag at Copenhagen, says, they could also see that "it was not the agitation of indecision, but of ardent animated patriotism panting for glory." When Sir Hyde Parker was recalled in May, Nelson assumed the command in the Baltic; but the dissolution of the Northern Confederation left him little to do. His health really suffered in the cold air of high latitudes, and in June he obtained leave to come home. His services were grudgingly recognized by the title of viscount. During the brief interval before the peace he was put in command of a flotilla to combat Napoleon's futile threat of invasion. In the hope of quieting public anxiety rather than in any serious expectation of success, an attack was made on a French flotilla strongly protected by its position, at Boulogne, which was disastrously repulsed. Nelson was not in command on the spot, and if he had been would in all probability have renewed his experience at Santa Cruz. He could not do the impossible more than other men. He was only more ready to try.

While the brief peace made at Amiens lasted, he remained on shore. His home was with the Hamiltons in the strange household in which Sir William showed that his 18th-century training had taught him to accept a domestic division with a good grace, and had not left him too squeamish to profit by the pecuniary advantages which may attend the relation of complacent husband. His death on the 6th of April 1803 made no change in the life of the admiral. He lived almost wholly at Merton, where he had purchased a small house, which Emma filled with memorials of his glory and of her now passing beauty. She fed him profusely with the flattery which he, in Lord Minto's words, swallowed as a child does pap; and she was in turn adored by him, and treated with profound deference by his family, with the exception of his father.

When the ambition of Napoleon made it impossible to keep up the fiction of peace, Nelson was at once called from retirement, and this time there could be no question of putting him under the authority of any other admiral. He was appointed to the Mediterranean command, and hoisted his flag in May 1803. Between this date and his death in the hour of full triumph on the 21st of October 1805, he was in the centre and was one of the controlling spirits of the vast military and naval drama which after filling for more than two years the immense stage bounded by Europe and the West Indies, found its closing scene in Trafalgar Bay (see TRAFALGAR). In spite of the anxieties of an arduous command Nelson was serene and at his best in this last period of his life. Once only did the ill-advised boasting of Latouche Treville provoke him into a scolding mood. The French officer spoke of him as having fled before his French ships, and the vaunt, which had no better foundation than that Nelson had retired before superior numbers when reconnoitring, exasperated him into threatening to make the Frenchman eat his letter if ever they met. Nelson could boast, but his loudest words are not ridiculously out of proportion to his deeds.

The last hours at Trafalgar will never be forgotten by Englishmen. There is no figure in English history at once so magnificent in battle, and so penetrating in its appeal to the emotions, as was Nelson on that last day when under his leadership the fleet annihilated the last lingering fear that Napoleon would ever carry his desolating arms into the British Islands. It matters little that the woman of whom he thought to the last was utterly unworthy of him, had perhaps never rendered the services he supposed her to have done for their country, and was about to dishonour his memory by mercenary immorality. He must be worse than censorious who can think unmoved of Nelson kneeling in prayer by his cabin table as the "Victory" rolled slowly down on the enemy on the 21st of October, appealing to God for help, and writing the codicil in which he left his mistress and his child to the gratitude of his country.

It is said that his famous signal was to have been worded "Nelson confides that every man will do his duty," and that his own name was replaced by that of England on the suggestion of one of his officers. The use of his name as an inspiration and an appeal would have been perfectly consistent with his tone at all times, but he agreed to the alteration with the indifference of a man to whom self and country were one at that hour. "Expects" replaced "confides that" because the signal lieutenant Pascoe pointed out to him that the verb originally chosen must be spelt out letter by letter in a long string of flags. He parted with Captain Blackwood of the "Euryalus" with a prophecy of his approaching fate. The sight of Collingwood, the friend of his youth, leading the lee line into action in the "Royal Sovereign" drew from him a cry of admiration at the noble example his comrade was showing. When the "Victory" had passed astern of the French "Bucentaure," and was engaged with her and the "Redoubtable," he walked up and down the quarter deck of his flagship by the side of his flag-captain, T. M. Hardy, with the brisk short step customary with him. As they turned, a musket shot from the top of the "Redoubtable" struck him on the upper breast, and, plunging down, broke the spine. "They have done for me at last!" were the words in which he acknowledged the fatal stroke. He lingered for a very few hours of anguish in the fetid cockpit of the "Victory," amid the horrors of darkness relieved only by the dim light of lanterns, and surrounded by men groaning, or raving with unbearable pain. The shock of the broadsides made the whole frame of the "Victory" tremble, and extorted a moan from the dying admiral. When Captain Hardy came down to report the progress of the battle, his inherent love for full triumph drew from him the declaration that less than twenty prizes would not satisfy him. He clung to his authority to the end. The suggestion that Collingwood would have to decide on the course to be taken was answered with the eager claim, "Not while I live." But the last recorded words were of affection and of duty. He begged Hardy for a kiss, and he ended with the proud and yet humble claim, "I have done my duty, thank God for that."

His body was brought home in his flagship and laid to rest in St. Paul's. He is commemorated in London by the monument in Trafalgar Square, completed in 1849 with a colossal statue by E. H. Baily, and surrounded by Landseer's bronze lions, added in 1867.

In estimating the character of Nelson, and his achievements, there are some elements which must be allowed for more fully than has always been the case. He was, to begin with, the least English of great Englishmen. He had the excitability, the vanity, the desire for approbation without much delicacy as to the quarter from which it came, which the average Englishman of Nelson's time, his judgment obscured by the effects of centuries of racial rivalry culminating in the Napoleonic wars, was wont to attribute to Frenchmen. Where there is vanity there is the capacity for spite and envy. Nor was Nelson altogether free from these unpleasant faults. But in the main his desire to be liked combined with a natural kindness of disposition to make him appeal frankly to the goodwill of those about him. He won to a very great extent the affection he valued, and that from men so widely different in character as Lord Minto and the simple-hearted seamen among whom he passed the best part of his life. He could be cruel when his emotions were aroused by evil influences, with the downright cruelty he displayed at Naples, or the more subtle form of hardness in his conduct to his wife, when his duty to her stood in the way of his love for Emma Hamilton. But they were few to whom the evil side of his nature was shown, while the captains and seamen for whom he did much to make a hard duty more tolerable were to be counted by the thousand.

As a commander he belonged to the race of Pyrrhus and the prince of Condé—the fighters of battles. His victories were won at the head of a force which had been brought to a high level of efficiency by three generations of predecessors, against enemies who had been, as in the case of the French, disorganized by a social revolution which had ruined their discipline, who were inexperienced as the Danes were, or who, as in the case of the Spaniards, were sunk in a moral and intellectual decadence. But he estimated the vices of his opponents with full insight. Wielding a fine instrument, and confronted by inferior enemies, he was entitled to dare much, and it is a proof of his sagacity that he saw how far he could dare, caring but little for the bulk of the force in front of him, and looking to the spirit. Above all, he had the power to inspire the enthusiasm he felt, and to make men act above themselves because he was there, and because they found a joy in pleasing him. Among all the warriors of his generation Napoleon alone was a greater master of the souls of men, and Blücher alone came near him.

Nelson had no children by his wife. His daughter Horatia, by Lady Hamilton, became the wife of the Rev. Philip Ward, and died in 1881. In November 1805, in recognition of Nelson's great services to his country, his brother William (1757–1835) was created Earl Nelson of Trafalgar, an annuity of £5000 being attached to the title. When William died without sons in February 1835 his only daughter Charlotte Mary (1787–1873), wife of Samuel Hood, 2nd Baron Bridport (1788–1868), became duchess of Bronté, while, according to the remainder, his English titles passed to his nephew Thomas Bolton (1786–1835), who became 2nd Earl Nelson. Bolton, who took the name of Nelson, was succeeded as 3rd Earl Nelson in November 1835 by his son Horatio (b. 1823). The duchy of Bronté was in 1910 held by Baroness Bridport's grandson, Arthur Wellington Nelson Hood, 2nd Viscount Bridport (b. 1839).

AUTHORITIES.—Very much has been written about Nelson. A large part of the total mass consists of hasty work done to meet an immediate demand, or of repetition not justified by the critical faculty or literary skill of the writers. The valuable portion may be divided into original authorities, such as correspondence, and the testimony of eyewitnesses; and the narratives or criticisms of students who tell with original power, and judge with knowledge and insight. Under the heading of original authorities, the first place is taken by *The Dispatches and Letters of Vice-Admiral Lord Viscount Nelson*, with notes by Sir N. H. Nicolas (7 vols., 1844–1846). Nicolas spared no pains to make his collection complete and to illustrate it from all trustworthy sources. Thus he includes Sir Edward Berry's *Account of the Battle of the Nile*, Colonel Stewart's *Notes on the Copenhagen Campaign*, Dr Beatey's *Narrative of Nelson's Last Hours*, and passages from the so-called *Reminiscences of the Captain of the Victory*, Dr Scott. This last authority is of little value, for the book consists of recollections by Dr Scott's daughter and son-in-law of what he said years after the events he was speaking of. The student of Nelson's life should make it a rule to exhaust Nicolas before consulting any other authority. A collection of *Letters from Nelson to Emma Hamilton* was published under her direction in 1814, but it is subject to much suspicion. A great mass of correspondence of the Hamiltons and much MS. relating to Nelson came into the hands of Dr Pettigrew, and passed into the possession of Mr A. Morrison, from whose collection they were transferred to the British Museum. A catalogue, in which the text is given, was privately printed and can be consulted in the museum. Isolated letters have appeared from time to time. Between February and April 1898 some valuable extracts from his correspondence with his wife, previously unknown, and the correct text of parts of his diary, appeared in the extinct weekly, *Literature*. Among the lives of Nelson's contemporaries, J. S. Tucker's *Earl of St Vincent* (1844), Ross's *Saumarez*, Lady Bourchier's *Codrington* and the *Letters of Sir William Hoste* throw light on particular points. The *Nelsonian Reminiscences* of Parsons give an interesting picture of the admiral as he appeared to an observant boy. The observations of older and more intelligent witnesses will be found in *The Diaries and Correspondence of George Rose*, in *The Life and Letters of the First Earl of Minto* and in a *Journal kept during a Visit to Germany*, by Mrs St George, afterwards Mrs Trench. Incidental mentions of Nelson are to be found in the *Paget Papers*, the correspondence of the minister who succeeded Sir W. Hamilton at the court of Naples. Biographies of Nelson are numerous. Emma Hamilton inspired one by a Mr Harrison, an odious book which was in reality an advertisement of herself and which appeared in 1806. The two quartos of Clarke and McArthur (1809), reprinted in three volumes octavo in 1840, were based on papers supplied by the family, but the texts were edited with unpardonable freedom and the originals have in many cases been lost. Southey's classic *Life* was based on Clarke and McArthur. All later biographies have been superseded by Captain Mahan's *Life of Nelson*, first published in two volumes in 1897 and again in one volume, with additions and corrections in 1899. The much-debated Neapolitan episode has given rise to a literature of its own. The controversy began with the appearance of Captain Foote's *Vindication* of his own part in the transaction published in 1810. It drew an immediate *Counter Vindication of Nelson* by Commander Jeaffreson Miles. Italian versions will be found in Sacchinelli's *Fabrizio Ruffo* and in the *Compendio* of Micheroux edited by the Marchese Maresca. The controversy has been revived in England by Mr F. P. Badham with his *Nelson at Naples* (1900), and has provoked the publication of a collection of the documents by the Navy Record Society, in vol. xxv. of their publications, under the title *Nelson and the Neapolitan Jacobins* (1903). Mr C. Jeaffreson's two works, *Lady Hamilton and Lord Nelson* (1888) and the *Queen of Naples and Lord Nelson* (1889), are based on the papers collected by Mr Morrison. See also T. Nelson, *Genealogical History of the Nelson Family* (1908). (D. H.)

NELSON, ROBERT (1656–1715), English philanthropist and religious writer, son of John Nelson, a London merchant, was born on the 22nd of June 1656, and was educated as the private pupil of George Bull, afterwards bishop of St David's. Having inherited a considerable fortune from his father, he followed no profession. About 1680 he went abroad and spent much time on the continent of Europe till 1691, when he settled at Blackheath. For many years he was an intimate friend and correspondent of Archbishop Tillotson, though not in agreement with his views; and he was also on terms of friendship with the astronomer Halley and other men of science. Nelson's sympathies were with the Jacobites; and after his return to England he associated himself with the nonjurors, under whose influence he produced several of his writings on religious subjects. He was an active supporter of the Society for Promoting Christian Knowledge, the Society for the Propagation of the Gospel, and similar associations, and he used his influence largely in the establishment of charity schools and the building of churches in London. In 1687 he had published a controversial work against transubstantiation, and in 1704 appeared his *Companion for the Festivals and Fasts of the Church of England*, which obtained a remarkable popularity lasting till the middle of the 19th century. Within five years of its publication ten thousand copies of the *Companion* were printed, and thirty-six editions appeared in a hundred and twenty years. After the death of Bishop Bull in 1710 Nelson wrote his biography, which was published three years later; and he was also the author of many other devotional and controversial works. He died in January

1715, in which year was published his *Address to Persons of Quality and Estate*, containing suggestions for the establishment of special hospitals, schools and theological colleges, many of his proposals being afterwards carried into effect. Nelson married a Roman Catholic, Lady Theophila Lucy, daughter of the earl of Berkeley, and widow of Sir Kingsmill Lucy of Broxbourne.

See Charles F. Secretan, *Memoirs of the Life and Times of the Pious Robert Nelson* (1860); Thomas Birch, *Life of Tillotson* (2nd ed., 1753); Thomas Lathbury, *History of the Nonjurors* (1845).

NELSON, a river of Keewatin district, Canada, discharging the waters of Lake Winnipeg in a north-easterly direction into Hudson Bay. It drains an area of 360,000 sq. m. and, including its tributary the Saskatchewan, is 1450 m. long. It is navigable for small steamers for a distance of about 80 m., after which it is unnavigable except for canoes. It has a total fall between the lake and sea of 710 ft. Here its chief tributary is the Burntwood. Norway House at its source and York Factory at its mouth are important stations of the Hudson's Bay Company.

NELSON, a town of British Columbia, situated on the west arm of Kootenay lake. Pop. (1906) about 5000. It is the commercial, administrative and railroad centre of the east and west Kootenay districts. It is the northern terminus of a branch of the Great Northern railway and is also connected by rail and steamboat with the main line of the Canadian Pacific railway at Revelstoke and with the Crow's Nest line of the same system at Kootenay landing. It has direct railway communication with Rossland, Grand Forks and Greenwood.

NELSON, a municipal borough in the Clitheroe parliamentary division of Lancashire, England, 32½ m. N. from Manchester by the Lancashire & Yorkshire railway. Pop. (1891) 22,754, (1901) 32,816. It is of modern growth, possessing a town hall, market hall, free library, technical school, pleasant park and recreation grounds, and an extensive system of electric tramways and light railways, connecting with Burnley and Colne. Its chief manufacture is cotton. It was incorporated in 1890, and the corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 3466 acres.

NELSON, a seaport of New Zealand, the seat of a bishop and capital of a provincial district of the same name; at the head of Blind Bay on the northern coast of the South Island. Pop. (1906) 8164. The woods and fields in the neighbourhood abound with English song-birds, and the streams are stocked with trout; while the orchards in the town and suburbs are famous for English kinds of fruit, and hops are extensively cultivated. The town possesses a small museum and art gallery, literary institute, government buildings, and boys' and girls' schools of high repute. The cathedral (Christ Church) is finely placed on a mound which was originally intended as a place of refuge from hostile natives. It is built of wood, the various native timbers being happily combined. Railways connect the harbour with the town, and the town with Motupiko, &c. The harbour, with extensive wharves, is protected by the long and remarkable Boulder Bank, whose southern portion forms the natural breakwater to that anchorage. The settlement was planted by the New Zealand Company in 1842. The borough returns one member to the house of representatives, and its local affairs are administered by a mayor and council.

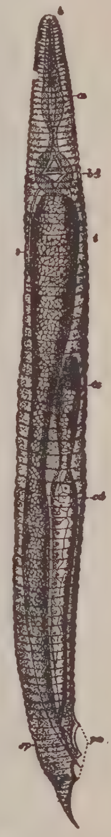
NELSONVILLE, a city of Athens county, Ohio, U.S.A., on the Hocking river, 62 m. S.E. of Columbus. Pop. (1890) 4558, (1900) 5421, including 328 foreign-born and 204 negroes; (1910) 6082. Nelsonville is served by the Hocking Valley railway. The city is in one of the most productive coal sections of the state; there are large quantities of clay in the vicinity; and the principal industries are the mining and shipping of coal and the manufacture of fire-clay products. Nelsonville was settled in 1818 and was incorporated in 1838; it was named in honour of Elisha Nelson, who built the first house here.

NEMATODA, in zoology, a group of worms. The name Nematoda (Gr. νῆμα, thread, and εἶδος, form) was first introduced by Rudolphi, but the group had been previously recognized as distinct by Zeder under the name Ascarides. They are now by many systematists united with the Acanthocephala and the Nematomorpha to form the group Nemathelminthes.

The Nematoda possess an elongated and thread-like form (see fig. 1), varying in length from a few lines up to several feet. The body is covered externally by a chitinous cuticle which is a product of the subjacent epidermic layer in which no cell limits can be detected though nuclei are scattered through it. The cuticle is frequently prolonged into spines and papillae, which are especially developed at the anterior end of the body. The mouth opens at one extremity of the body and the anus at or near the other. Beneath the epidermis is a longitudinal layer of muscle-fibres which are separated into four distinct groups by the dorsal, ventral and lateral areas; these are occupied by a continuation of the epidermic layer; in the lateral areas run two thin-walled tubes with clear contents, which unite in the anterior part of the body and open by a pore situated on the ventral surface usually about a quarter or a third of the body length from the anterior end. These vessels are the nitrogenous excretory organs. The body-cavity is largely occupied by processes from the large muscle cells of the skin. These processes stretch across the body cavity to be inserted in the dorsal and ventral middle lines.

The body-cavity also contains the so-called phagocytic organs. These consist of enormous cells with nuclei so large as to be in some cases just visible to the naked eye. These cells are disposed in pairs, though the members of each pair are not always at the same level. The number of cells is not large (some 2 to 8), and as a rule they lie along the lateral lines. In some species (*Ascaris decipiens*) the giant cell is replaced by an irregular mass of protoplasm containing a number of small nuclei. Such a plasmodium bears, on its periphery, groups of rounded projections of protoplasm termed end-organs. Similarly the giant cells are produced at their periphery into a number of branching processes which bear similar end-organs on their surface and in some cases terminate in them. These end-organs are the active agents in taking up foreign granules, or bacteria, which may have found their way into the fluid of the body-cavity. From the shape and position of the phagocytic organs it is obvious that they form admirable strainers through which the fluid of the body-cavity filters (figs. 2, 3).

The alimentary tract consists of a straight tube running from the mouth to the anus without any convolutions; it is separable into three divisions: (1) a muscular oesophagus, which is often provided with cuticular teeth; (2) a cellular intestine; and (3) a short terminal rectum surrounded by muscular fibres. Neither here nor elsewhere are cilia found at any period of development.



After Galeb, *Arch. de Zool. Exp.*, 1878.

Fig. 1.—*Oxyuris*.

b, Mouth.
oe, Oesophagus.
bd, Enlargement of the oesophagus, armed with chitinous teeth.
i, Intestine.
s, Opening of segmental tubes (placed by mistake on the dorsal instead of the ventral surface).
te, Testes.
cd, Vas deferens.
sp, Cloaca.
pa, Papillae.

A nervous system has been shown to exist in many species, and consists of a perioesophageal ring giving off usually six nerves which run forwards and backwards along the lateral and median lines; these are connected by numerous fine, circular threads in the sub-cuticle. Some of the free-living forms possess eye specks. The sexes are distinct (with the exception of a few forms that are hermaphrodite), and the male is always smaller than the female. The generative organs consist of one or two tubes, in the upper portion of which the ova or spermatozoa are developed, the lower portion serving as an oviduct or vas deferens; the female generative organs open at the middle of the body, the male close to the posterior extremity into the terminal portion of the alimentary canal; from this cloaca a diverticulum is given off in which are developed one to three chitinous spicules that subserve the function of copulation. The spermatozoa differ from those of other animals in having the form of cells which sometimes perform amoeboid movements. Most remarkable sexual conditions are found to occur in the free-living genera *Rhabditis* and *Diplogaster*. While some of the species are bisexual, others are protandrous, self-fertilizing hermaphrodites. In cultures of the latter there occur very rare supplemental males which appear in no sense degenerate but as fit for reproduction as the males of the bisexual species. Though possessing a complete copulatory apparatus and producing large quantities of spermatozoa, they have lost their sexual instinct and play no part in the economy of the species. These "psychically decadent" individuals appear to represent the entire male sex of a bisexual species, and become unnecessary owing to the grafting of hermaphroditism on the female sex.

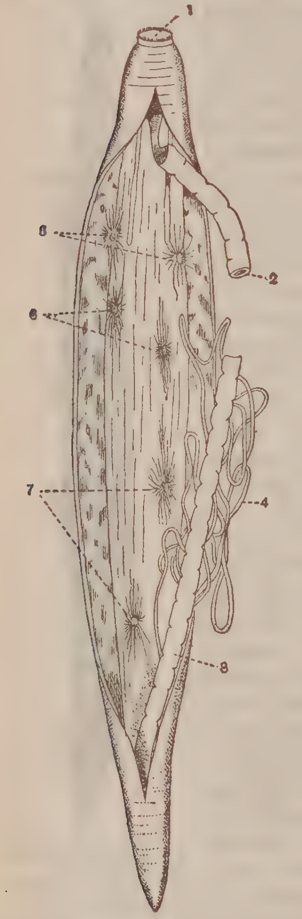


FIG. 2.—*Sclerostomum armatum*, ♀, × about 3½, opened to show the phagocytic organs. (From Nassonov.)

1, Mouth.
2, Anterior end of alimentary canal.
3, Posterior end of alimentary canal.
4, Ovary.
5, 6 and 7, Anterior middle and posterior pairs of phagocytic organs.

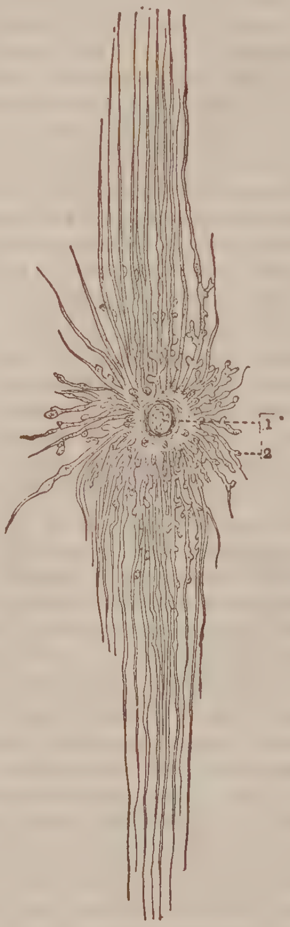


FIG. 3.—One of the phagocytic organs of *Sc. armatum*, highly magnified. (From Nassonov.)

1, Nucleus of giant-cell.
2, One of the processes and end-organs of the same.

Mode of Life and Metamorphoses.—While the majority of the Nematodes are parasites, there are many that are never at any period of their life parasitic. These free-living forms are found everywhere—in salt and fresh water, in damp earth and moss, and among decaying substances; they are always minute in size, and like many other lower forms of life, are capable of retaining their vitality for a long period even when dried, which accounts for their wide distribution; this faculty is also possessed by certain of the parasitic Nematodes, especially by those which lead a free existence during a part of their life-cycle. The free-living differ from the majority of the parasitic forms in undergoing no metamorphosis; they also possess certain structural peculiarities which led Bastian (*Trans. Linn. Soc.*, 1865) to separate them into a distinct family, the *Anguillulidae*. It is impossible, however, to draw a strict line of demarcation between the free and parasitic species, since—(1) many of the so-called free *Nematoda* live in the slime of molluscs (Villot), and are therefore really parasitic; (2) while certain species belonging to the free-living genus *Anguillula* are normally parasitic (*e.g. A. tritici*, which lives encysted in ears of wheat), other species occasionally adopt the parasitic mode of existence, and become encysted in slugs, snails, &c.; (3) it has been experimentally proved that many normally parasitic genera are capable of leading a free existence;[1] (4) transitional forms exist which are free at one period of their life and parasitic at another. The parasitic Nematodes include by far the greatest number of the known genera; they are found in nearly all the orders of the animal kingdom, but more especially among the *Vertebrata*, and of these the *Mammalia* are infested by a greater variety than any of the other groups. Some two dozen distinct species have been described as occurring in man. The Nematode parasites of the *Invertebrata* are usually immature forms which attain their full development in the body of some vertebrate; but there are a number of species which in the sexually adult condition are peculiar to the *Invertebrata*.[2]

The *Nematoda* contain about as many parasitic species as all the other groups of internal parasites taken together; they are found in almost all the organs of the body, and by their presence, especially when encysted in the tissues and during their migration from one part of the body to another, give rise to various pathological conditions. Although some attain their full development in the body of a single host—in this respect differing from all other *Entozoa*—the majority do not become sexually mature until after their transference from an "intermediate" to a "definitive" host. This migration is usually accompanied by a more or less complete metamorphosis, which is, however, not so conspicuous as in most other parasites, *e.g.* the *Trematoda*. In some cases (many species of *Ascaris*) the metamorphosis is reduced to a simple process of growth.

The parasitic and free-living Nematodes are connected by transitional forms which are free at one stage of their existence and parasitic at another; they may be divided into two classes—those that are parasitic in the larval state but free when adult, and those that are free in the larval state but parasitic when adult.

(1) To the first class belong the so-called "hairworm," *Mermis*, not to be confused with the Gordian worms.[3] The adult forms of *M. nigrescens* live in damp earth and may be seen after storms or early in the morning crawling up the stalks of plants, a fact which causes people to talk about showers of worms. The eggs are laid on

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[1] Ercolani successfully cultivated *Oxyuris curvula*, *Strongylus armatus* and other species in damp earth; the free generation was found to differ from the parasitic by its small size, and by the females being ovoviviparous instead of oviparous. To this phenomenon he gave the name of dimorphobiosis.

[2] The genera *Ascaris*, *Filaria*, *Trichosoma* are found throughout the *Vertebrata*; *Cucullanus* (in the adult condition) only in fishes and *Amphibia*; *Ankylostoma*, *Trichocephalus*, *Trichina* and *Pseudalius* live only in the *Mammalia*, the last-mentioned genus being confined to the order *Cetacea*; *Strongylus* and *Physaloptera* are peculiar to mammals, birds and reptiles, while *Dispharagus*, *Syngamus* and *Hystrichis* are confined to birds. *Mermis* (in the larval state) is confined to the *Invertebrata* and *Sphaerularia* to bees. *Oxyuris*, though chiefly parasitic in the *Mammalia*, occurs also in reptiles, *Amphibia* and one or two insects. *Dacnitis* and *Ichthyonema* are only found in fishes.

[3] See NEMATOMORPHA.

the ground and the young larvae make their way into grasshoppers, in whose bodies they pass most of their larval life. (2) To the second class belong *Ankylostoma*, *Strongylus* and many species of *Ascaris*; the embryo on leaving the egg lives free in water or damp earth, and resembles very closely the free-living genus *Rhabditis*. After a longer or shorter period it enters the alimentary canal of its proper host with drinking-water, or it bores through the skin and reaches the blood-vessels, and is so conveyed through the body, in which it becomes sexually mature. *Rhabditis nigrovenosa* has a developmental history which is entirely anomalous, passing through two sexual generations which regularly alternate. The worm inhabits the lung of the frog and toad, and is hermaphrodite (Schneider) or parthenogenetic (Leuckart); the embryos hatched from the eggs find their way through the lungs into the alimentary canal and thence to the exterior; in a few days they develop into a sexual larva, called a *Rhabditiform* larva, in which the sexes are distinct; the eggs remain within the uterus, and the young when hatched break through its walls and live free in the perivisceral cavity of the mother, devouring the organs of the body until only the outer cuticle is left; this eventually breaks and sets free the young, which are without teeth, and have therefore lost the typical *Rhabditis* form. They live for some time in water or mud, occasionally entering the bodies of water snails, but undergo no change until they reach the lung of a frog, when the cycle begins anew. Although several species belonging to the second class occasionally enter the bodies of water snails and other animals before reaching their definitive host, they undergo no alteration of form in this intermediate host; the case is different, however, in *Filaria medinensis* and other forms, in which a free larval is followed by a parasitic existence in two distinct hosts, all the changes being accompanied by a metamorphosis. *Filaria medinensis*—the Guinea worm—is parasitic in the subcutaneous connective tissue of man (occasionally also in the horse). It is chiefly found in the tropical parts of Asia and Africa, but has also been met with in South Carolina and several of the West Indian islands. The adult worm in the female sometimes reaches a length of 6 ft. The males have only recently been discovered. The female is viviparous, and the young, which, unlike the parent, are provided with a long tail, live free in water; it was formerly believed from the frequency with which the legs and feet were attacked by this parasite that the embryo entered the skin directly from the water, but it has been shown by Fedschenko, and confirmed by Manson, Leiper and others, that the larva bores its way into the body of a *Cyclops* and there undergoes further development. It is probable that the parasite is then transferred to the alimentary canal of man by means of drinking-water, and thence makes its way to the subcutaneous connective tissue.

The *Nematoda* which are parasitic during their whole life may similarly be divided into two classes—those which undergo their development in a single host, and those which undergo their development in the bodies of two distinct hosts.

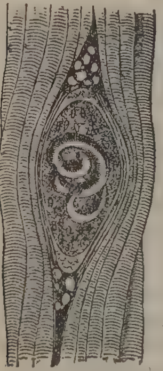


FIG. 4.—*Trichinella* encysted among muscular fibres. (After Leuckart.)

(1) In the former class the eggs are extruded with the faeces, and the young become fully formed within the egg, and when accidentally swallowed by their host are liberated by the solvent action of the gastric juice and complete their development. This simple type of life-history has been experimentally proved by Leuckart to be characteristic of *Trichocephalus affinis*, *Oxyuris ambigua* and other species. (2) The life-history of *Ollulanus tricuspis* is an example of the second class. *Ollulanus tricuspis* is found in the adult state in the alimentary canal of the cat; the young worms are hatched in the alimentary canal, and often wander into the body of their host and become encysted in the lungs, liver and other organs; during the encystment the worm degenerates and loses all trace of structure. This wandering appears to be accidental, and to have nothing to do with the further evolution of the animal which takes place in those embryos which are voided with the excrement. Leuckart proved experimentally that these young forms become encysted in the muscles of mice, and the cycle is completed after the mouse is devoured by a cat. The well-known *Trichinella spiralis* (fig. 4) has a life-history closely resembling that of *Ollulanus*. The adult worm, which is of extremely minute size, the male being only $\frac{1}{18}$th and the female $\frac{1}{8}$ of an inch in length inhabits the alimentary canal of man and many other carnivorous mammalia; the young bore their way into the tissues and become encysted in the muscles—within the muscle-bundles according to Leuckart, but in the connective tissue between them according to Chatin and others. The co-existence of the asexual encysted form and the sexually mature adult in the same host, exceptionally found in *Ollulanus* and other Nematodes, is the rule in *Trichinella*; many of the embryos, however, are extruded with the faeces, and complete the life cycle by reaching the alimentary canal of rats and swine which frequently devour human ordure. Swine become infested with *Trichinella* in this way and also by eating the dead bodies of rats, and the parasite is conveyed to the body of man along with the flesh of "trichinized" swine.

Importance in Pathology.—Among recent advances having medical import in our knowledge of the Nematodes, the chief are those dealing with the parasites of the blood. *F. bancrofti* is known to live in the lymphatic glands, and its embryos *Microfilaria sanguinis hominis nocturna*, passing by the thoracic duct, reach the blood-vessels and circulate in the blood. Manson showed in 1881 that the larvae (*Microfilariae*) were not at all times present in the blood, but that their appearance had a certain periodicity, and the larvae of *F. bancrofti*. *Microfilaria nocturna* swarmed in the blood at night-time and disappeared from the peripheral circulation during the day, hiding away in the large vessels at the base of the lungs and of the heart. Ten years later Manson discovered a second species, *Filaria perstans*, whose larvae live in the blood. They, however, show no periodicity, and are found continuously both by day and by night; and their larval forms are termed *Microfilaria perstans*. The adult stages are found in the sub-peritoneal connective tissue. A third form, *Microfilaria diurna*, is found in the larval stage in blood, but only in the daytime. The adult stage of this form is the *Filaria loa* found in the subcutaneous tissues of the limbs.

The presence of these parasites seems at times to have little effect on the host, and men in whose system it is calculated there are some 40-50 million larvae have shown no signs of disease. In other cases very serious disorders of the lymphatic system are brought about, of which the most marked is perhaps Elephantiasis. Manson and Bancroft suggested that the second host of the parasite is the mosquito or gnat, and for a long time it was thought that they were conveyed to man by the mosquito dying after laying her eggs in water, the larval nematodes escaping from her body and being swallowed by man. It is now held that the parasite enters the blood of man through the piercing mouth-parts at the time of biting. When first sucked up by the insect from an infected man it passes into its stomach, and thence makes its way into the thoracic muscles, and there for some time it grows. Next the larvae make their way into the connective tissue in the pro-thorax, and ultimately bore a channel into the base of the piercing apparatus and come to rest between the hypopharynx and the labium. Usually two are found in this position lying side by side; it would be interesting to know if these are male and female. From their position in the proboscis the larvae can easily enter the blood of man the next time the mosquito bites (Low, *Brit. Med. Journ.*, June 1900; James, *ibid.*, Sept. 1900). Shortly after Low had published his results, Grassi and Noè issued a paper dealing with the larvae of *F. immitis*, which is spread by means of the mosquito *Anopheles* (*Centrbl. Bakter.* I. Abth. xxviii., 1900). The larvae of this parasite develop in the Malpighian tubules of the insect; at a certain stage they cast their cuticle and make their way into the space—part of the haemocoel—found in the labium. During the act of biting the labium is bent back, and as the piercing stylets enter the skin of the sufferer this bending becomes more and more acute. Grassi and Noè think that if the cavity of the labium be full of the larval nematodes this bending will burst the tissue, and through the rent the larvae will escape and make their way into the body of the host. Besides *Anopheles*, two species of *Culex*, *C. penicillaris* and *C. pipiens*, are also accused of transmitting the larvae. A paper by Noè (*Atti Acc. Lincei*, ix., 1900) seems to prove beyond doubt that the larvae of *F. immitis* are transmitted in the manner indicated. The adult worm is chiefly found in the heart of the dog, and usually in the right side, which may be so packed with the worms as seriously to interfere with the circulation (fig. 5). The females produce thousands of larvae, which circulate in the blood, and show a certain periodicity in their appearance, being much more numerous in the blood at night than during the day.

Importance as Pests.—Agriculturists now pay increased attention to the nematodes that destroy their crops. A good example of a fairly typical case is afforded by *Heterodera schachtii*, which attacks beetroot and causes great loss to the Continental sugar manufacturers. The young larvae, nourished by the yolk which remains over from the egg and by the remains of the mother which they have taken into their alimentary canal, make their way through the earth, and ultimately coming across the root of a beet, begin to bore into it. This they do by means of a spine which can be protruded from the mouth. Once within the root, they absorb the cell sap of the parenchyma and begin to swell until their body projects from the surface of the root in the form of a tubercle (fig. 6). The reproductive organs do not begin to appear until the larva has twice cast its skin. After this a marked sexual dimorphism sets in. The female, hitherto indistinguishable from the male, continues to swell until she attains the outlines of a lemon. Doing this she bursts the epidermis of the rootlet, and her body projects into the surrounding earth. The male has a different life-history (fig. 7). After the second larval moult, he passes through a passive stage comparable to the pupa-stadium of an insect, and during this stage, which occurs inside the root, the reproductive organs are perfected. The male next casts his cuticle, and by means of his spine bores through the tissues of the root and escapes into the earth. Here he seeks a female, pairs, and soon afterwards dies. The eggs of the female give rise to embryos within the body of the mother; her other organs undergo a retrogressive change and serve as food for the young, until the body-wall only of the mother remains as a brown capsule. From this the young escape and make their way through the earth to new roots. The whole life-history extends over a period of some 4-5 weeks (fig. 7), so that some 6-7 generations are born during the warmer months. If we assume that each female produces 300 embryos, and that half of these are females, the number of descendants would be, after six generations, some 22,781 milliards (A. Strubell, *Bibl. Zool.*, 1888–1889). Other species which have been recorded in the United Kingdom are *Tylenchus devastatrix* (Kuhn), on oats, rye and clover roots; *T. tritici*, causing the ear-cockle of wheat; *Cephalobus rigidus* (Schn.), on oats; *Heterodera radicicola* (Greef), on the roots of tomatoes, cucumbers, potatoes, turnips, peach-trees, vines and lettuce, and many other plants.

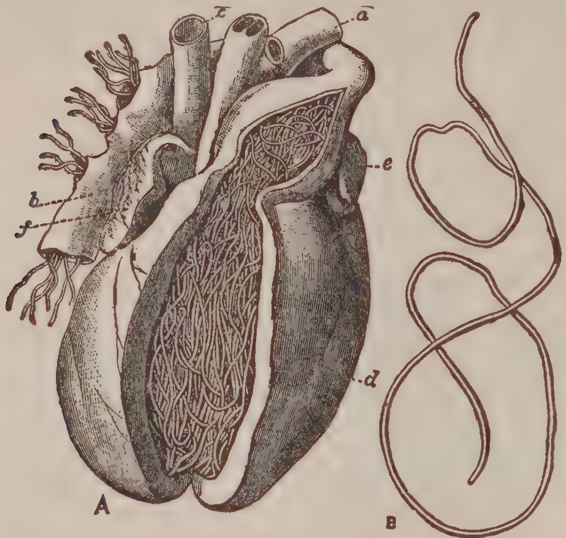


FIG. 5.

A, View of the heart of a dog infested with *Filaria immitis* Leidy; the right ventricle and base of the pulmonary artery have been opened: *a*, aorta; *b*, pulmonary artery; *c*, vena cava; *d*, right ventricle; *e*, appendix of left auricle; *f*, appendix of right auricle.

B, Female *F. immitis*, removed from the heart to show its length.

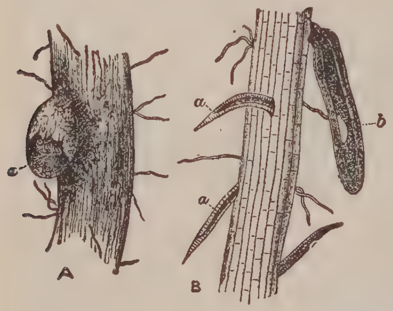


FIG. 6.

A, *a*, Female *Heterodera schachtii* Schmidt, breaking through the epidermis of a root; the head is still embedded in the parenchyma of the root.

B, *a*, larvae boring their way into a root; *b*, larva of the immobile kind surrounded by the old skin, living as an ectoparasite on the outside of the root. (From Strubell.)

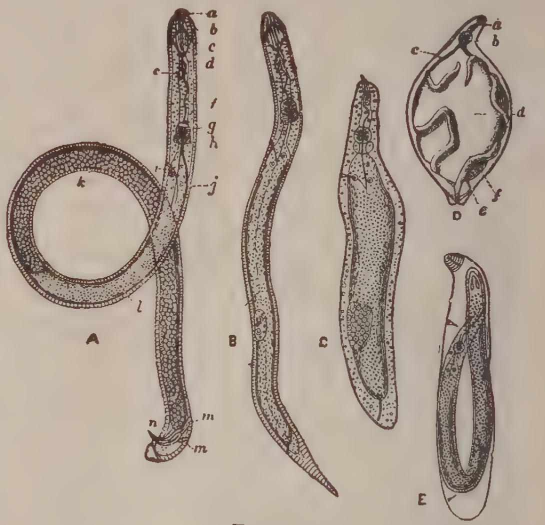


FIG. 7.

A, Male *Heterodera schachtii*, greatly magnified.
a, Head lappets.
b, Mouth cavity.
c, Spine.
d, Muscle of spine.
e, Gland.
f, Oesophagus.
g, Bulb.
h, Nerve-ring.
i, Excretory pore
j, Oesophagus.
k, Testis.
l, Intestine.
m, Muscles moving spicule.
n, Spicule.

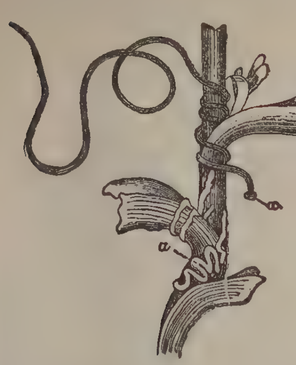
B, First motile larva.
C, Second immovable parasitic larva casting its skin.
D, A female with one half of the body-wall taken away to show the coiling generative organs.
a, Boring apparatus.
b, Oesophageal bulb.
c, Excretory pore.
d, Alimentary canal.
e, Anus.
f, Ovary.
E, A male shortly before casting its larval skin.

See N. Nassonov, *Arch. Mikr. Anat.* (1900); *Arch. parasit.* (1898); Rabot, *Lab. Warsaw* (1898); *Zool. Anz.* (1898); L. Jägerskiold, *Centrbl. Bakter.* (1898); J. Spengel, *Zool. Anz.* (1897); H. Ehlers, *Arch. Naturg.* (1899); O. Hamann, *Die Nemathelminthen* (1895).

(F. E. B.; A. E. S.)

NEMATOMORPHA. This zoological group includes Gordian worms which are found swimming in an undulatory manner or coiling round water-weeds in ponds and puddles, or knotted together in an apparently inextricable coil. They may be several inches in length and are no thicker than a piece of whip-cord.

The male is distinguishable from the female by the presence of a fork at the posterior end of the body. The body is covered by a cuticle which is sculptured and the various markings are of systematic importance: it is secreted by a hypodermis which also includes nerve-cells and some gland-cells. In the adult aquatic stage the alimentary canal shows signs of degeneration, and it seems probable that in this stage Gordian worms take no food. The mouth is terminal or subterminal; there is a weak sucking pharynx situated behind the brain, and a long intestine lying along the medio-ventral body-cavity; it ends in a cloaca which receives the vasa deferentia in the male. There is a single unsegmented nerve-cord which runs along the ventral middle line and enlarges posteriorly into a caudal ganglion and anteriorly in a ganglion, the brain, which is not supra-oesophageal. The peripheral nervous system is minutely described by T. H. Montgomery. There is a median eye on the head.



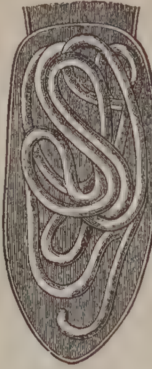


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FIG. 1.—A water plant around which a female Gordius is turning and laying eggs. a, a, clump and string of eggs.

FIG. 2.—Abdomen of *Pterostichus niger* with the terga removed to expose the Gordius larva within. Slightly magnified.

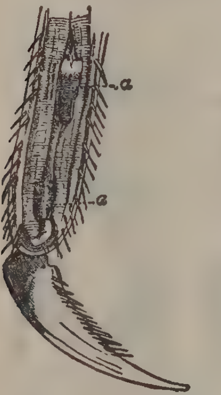

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FIG. 3.—Tarsal joint of an Ephemerid larva into which two Gordius larvae, (a,a) have penetrated. Magnified.

The Nematomorpha are nearly solid,—quite so at each end, and only in the middle region of the body are there any body-cavities, the space within the body being usually filled up with parenchyma. There are four closed spaces of the nature of body-cavities, two lateral and a dorso-median and a ventro-median. Into the former the ovaries project, though the lumen of the lateral body-cavity is quite shut off from the lumina of the ovaries or uteri. In the adult male the lateral body-cavities are absent. A curious duct with lateral branches termed the supra-intestinal organ lies above the intestine in the female. There are two series of ovaries extending through a large part of the body and accompanied by two uteri; the latter open by two oviducts which debouch into an atrium which also receives the intestine and a single receptaculum seminis, and is continued backward as the cloaca; this opens posteriorly. The ovaries are epithelial sacs which open into the uteri. The paired testes extend through the greater part of the body and end in two vasa deferentia which unite with the intestine to form a cloaca.

The eggs are laid in the spring as a rule, and after about a week they give rise to a minute, ringed larva with a protrusible boring apparatus consisting of three chitinous rods. By the aid of this the larva makes its way into the soft body of some insect larva, Ephemerids, Chironomids, or even of Molluscs, and encysts in the muscles or fat body. The insect, which may have become an imago with the Gordian larva still in it, is then eaten by a carnivorous insect or by a fish, and the contained Gordian larva becomes elongate and mature in its second host. After a year or more this larva emerges into the water and commences to reproduce.

The unexpected occurrence of these worms in pools and puddles, often in great numbers, has given rise to myths about showers of worms. They occasionally make their way into the human stomach with the drinking-water and are vomited; but this is a case of pseudo-parasitism—they are no true parasite of man.

There are a considerable number of species divided among the four genera: *Gordius*, *Paragordius*, *Chordodes* and *Parachordodes*; the last, a genus of Camerano's, is looked upon with some doubt by Montgomery. A free swimming marine form with longitudinal rows of bristles, known as *Nectonema* A. E. Verrill, may also come here, but at present its life-history is unknown. The Nematomorpha form an isolated group; at first sight they seem to be connected with the Nematoda, but in reality their only common feature is the tubular genitalia opening into a cloaca, and it seems at present impossible to connect them with the Annelida. Until more is known it seems wisest to look upon them as an isolated assemblage of animals with no near affinities to any of the great phyla.

LITERATURE.—L. Camerano, "Monografia dei Gordii," *Mem. Acc. Torino*, xlvii. (1897), contains literature; O. von Linstow, *Arch. mikr. Anat.*, li. (1898); T. H. Montgomery, *Bull. Mus. Harvard*, xxxii. (1898); *Amer. Natural.*, xxxiii. (1899); *Zool. Jahrb. Anat.*, xviii. (1903) p. 387; F. Vejdovsky, *Zeitschr. wiss. Zool.*, lvii. (1894); A. Villot, *Arch. Zool.* exp. ii. (1887); C. R. Ac. Sci., cviii. (1889); H. B. Ward, *Bull. Mus. Harvard*, xxiii. (1892). (A. E. S.)

NEMERTINA, or NEMERTEANS (*Nemertea*), a subdivision of worms,[1] characterized by the ciliation of the skin, the presence of a retractile proboscis, the simple arrangement of the generative apparatus, and in certain cases by a peculiar pelagic larval stage to which the name "pilidium" has been given. Many of them are long thread-shaped or ribbon-shaped animals, more or less cylindrical in transverse section. Even the comparatively shortest species and genera can always be termed elongate, the broadest and shortest of all being the parasitic *Malacobdella* and the pelagic *Pelagonemertes*. There are no exterior appendages of any kind. The colours are often very bright and varied. Nemertines live in the sea, some being common amongst the corals and algae, others hiding in the muddy or sandy bottom, and secreting gelatinous tubes which ensheath the body along its whole length. Formerly, they were generally arranged amongst the Platyelminthes as a sub-order in the order of the Turbellarians, but with the advance of our knowledge of these lower worms it has been found desirable to separate them from the Turbellarians and to look upon the Nemertina as a separate phylum.

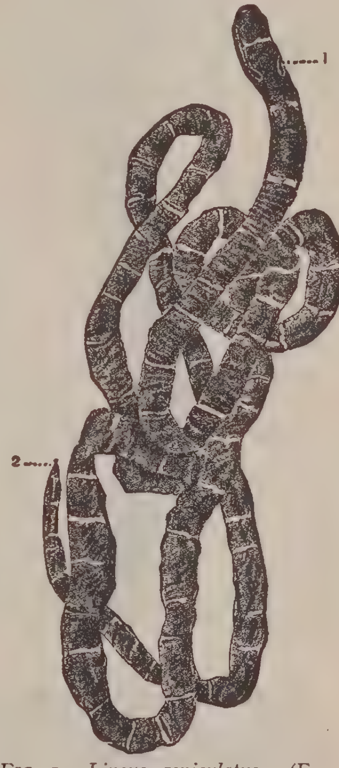

FIG. 1.—*Lineus geniculatus.* (From Bürger.) 1, Lateral slits on head; 2, anus.

O. Bürger classifies Nemertines into four orders:—

I. **Protonemertini,** in which there are two layers of dermal muscles, external circular and internal longitudinal; the nervous system lies external to the circular muscles; the mouth lies behind the level of the brain; the proboscis has no stylet; there is no caecum to the intestine. Families, Carinellidae, Hubrechtiidae.

II. **Mesonemertini,** in which the nervous system has passed into the dermal muscles and lies amongst them; other characters as in Protonemertini. Family, Cephalothricidae.

III. **Metanemertini,** in which the nervous system lies inside the dermal muscles in the parenchyma; the mouth lies in front of the level of the brain; the proboscis as a rule bears stylets; the intestine nearly always has a caecum. Families, Eunemertidae, Ototyphlonemertidae, Prosorhocmidae, Amphiporidae, Tetrastemmatidae, Nectonemertidae, Pelagonemertidae, Malacobdellidae.

This order represents the Hoplonemertini of Hubrecht.

IV. **Heteronemertini,** in which the dermal musculature is in three layers, an external longitudinal, a middle circular, an internal longitudinal; the nervous system lies between the first and second of these layers; the outer layer of longitudinal muscles is a new development; there is no intestinal caecum; no stylets on the proboscis and the mouth is behind the level of the brain. Families, Eupoliidae, Lineidae.

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[1] Nemertes was a sea nymph, daughter of Nereus and Doris. One of the genera was named *Nemertes* by Cuvier.

This order represents the Schizonemertini of Hubrecht and the family Eupolidae.

The first three orders, which have a double muscular layer, external circular and internal longitudinal, are sometimes grouped together as the DIMYARIA; the Heteronemertini, in which a third coat of longitudinal muscles arises outside the circular layer, are then placed in a second branch, the TRIMYARIA

The following families and genera are represented on the British coasts: CARINELLIDAE, *Carinella*; CEPHALOTHRICIDAE, *Cephalothrix*, *Carinoma*; EUNEMERTIDAE, *Eunemertes*; OTOTYPHLONEMERTIDAE, *Ototyphlonemertes*; AMPHIPORIDAE, *Amphiporus*, *Drepanophorus*; TETRASTEMMIDAE, *Tetrastemma*, *Prosorhocmus*; MALACOBDELLIDAE, *Malacobdella*; EUPOLIIDAE, *Eupolia*, *Valencinia*, *Oxypolia*; LINEIDAE, *Lineus*, *Euborlasia*, *Micrura*, *Cerebratulus*, *Micrella*.

ANATOMY.—*Proboscis and Proboscidian Sheath*.—The organ most characteristic of a Nemertine is without doubt the proboscis. With very few exceptions (*Malacobdella*, *Akrostomum*, where it has fused with the mouth into a single exterior opening), there is a terminal opening, the rhynchostome (subterminal in *Valencinia*), at the foremost tip of the body, out of which the proboscis is seen shooting backwards and forwards, sometimes with so much force that both its interior attachments are severed and it is entirely expelled from the body. It then often retains its vitality for a long time, apparently crawling as if it were itself a worm, a phenomenon which is at least partially explained by the extraordinary development of nervous tissue, equally distributed all through the walls of the proboscis, and either united into numerous longitudinal nerve-stems (*Drepanophorus*, *Amphiporus*) or spread out into a uniform and comparatively thick layer (*Cerebratulus*, sp.). This very effective and elaborate innervation, which has been directly traced to the brain, whence strong nerves (generally two) enter the proboscis, renders it exceedingly probable that the most important functions of the proboscis are of a sensiferous, tactile nature. In Nemertines the everted proboscis is retracted in the same way as the tip of a glove finger would be if it were pulled backwards by a thread situated in the axis and attached to the tip. The comparison may be carried still further. The central thread just alluded to is represented in the Nemertean proboscis by that portion which is never everted, and the tip of the glove by the boundary between the evertible and non-evertible portion of the proboscis—a boundary which in the *Metanemertini* is marked by the presence of a pointed or serrated stylet. This stylet is thus situated terminally when the proboscis has reached its maximum eversion. It adds a decisively aggressive character to an organ the original significance of which, as we have seen, was tactile. This aggressive character has a different aspect in several genera which are destitute of a central stylet, but in which the surface that is turned outwards upon eversion of the proboscis is largely provided with nematocysts, sending the urticating rods of different sizes in all directions. In others this surface is beset with thick, glandular, adhesive papillae.

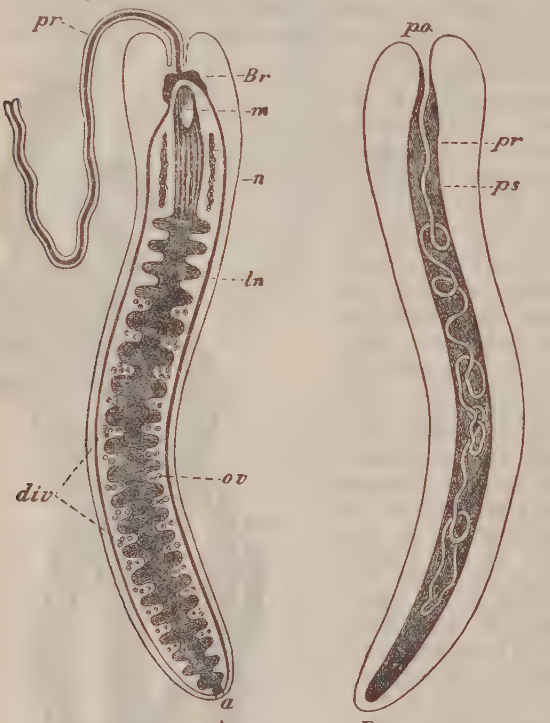

FIG. 2.—Diagrams of the organs of a Nemertine. A, From below; B, from above.

m,	Mouth.	*Br*,	Brain-lobes.
div,	Intestinal diverticula.	*ln*,	Longitudinal nerve stems.
a,	Anus.	*pr*,	Proboscis.
ov,	Ovaries.	*ps*,	Proboscidian sheath.
n,	Nephridia.	*p.o.*,	Opening for proboscis.

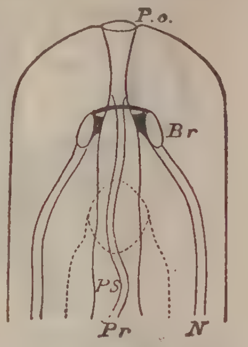

FIG. 3.—Anterior portion of the body of a Nemertine.

Br, Brain-lobes.
N, Lateral nerves.
PS, Proboscidian sheath.
Pr, Proboscis.
P.o., Exterior opening through which the proboscis is everted or rhynchostome. Oesophagus and mouth shown by dotted lines.

The comparison with the glove-finger is in so far insufficient as the greater portion of the non-evertible half of the proboscis is also hollow and clothed by glandular walls. Only at the very hindermost end does it pass into the so-called retractor-muscle (fig. 2), which is attached to the wall of the space, or rhynchocoel, in which the proboscis moves about. This retractor-muscle, indeed, serves to pull back with great rapidity the extruded proboscis, and is aided in its action by the musculature of the head. The extrusion itself depends entirely upon contraction of the muscular walls of the space just mentioned, the rhynchocoel. As it is (1) closed on all sides, and (2) filled with a corpuscular fluid, the contractions alluded to send this fluid to impinge against the anterior portion, where the proboscis, floating in its sheath, is attached with it to the muscular tissue of the head (fig. 3). Partial extrusion lessening the resistance in this region inevitably follows, and when further contractions of the walls of the sheath ensue total extrusion is the consequence. It is worthy of notice that in those Nemertines which make a very free use of their proboscis, and in which it is seen to be continually protruded and retracted, the walls of the proboscidian sheath are enormously muscular. On the other hand, they are much less considerably or even insignificantly so in the genera that are known to make a rather sparing use of their proboscis. The rhynchocoel is formed by a split which appears in the mesoblast surrounding the epiblastic pit which is the forerunner of the proboscis. It does not seem to be coelomic.

The proboscis, which is thus an eminently muscular organ, is composed of two or three, sometimes powerful, layers of muscles—one of longitudinal and one or two of circular fibres. In the posterior retractor the longitudinal fibres become united into one bundle, which, as noticed above, is inserted in the wall of the sheath. At the circular insertion of the proboscis in front of the brain the muscular fibres belonging to the anterior extremity of the body and those connected with the proboscis are very intimately interwoven, forming a strong attachment. The short tube between this circular insertion and the rhynchostome is called the rhynchodaeum.

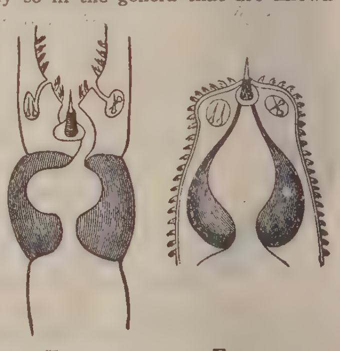

FIG. 4. FIG. 5.

FIGS. 4, 5.—Proboscis with stylet, "reserve" sacs and muscular bulb of a Hoplonemertine. Fig. 4 retracted; fig. 5 everted.

The proboscis broken off and expelled is generally reproduced, the posterior ribbon-like end of this reproduced portion again fusing with the walls of the sheath. There is reason to suppose that, when a wound is inflicted by the central stylet, it is envenomed by the fluid secreted in the posterior proboscidian region being at the same time expelled. A reservoir, a duct and a muscular bulb in the region (fig. 4) where the stylet is attached serve for this purpose. The significance of two or more (in *Drepanophorus* very numerous) small sacs containing so-called "reserve" stylets resembling in shape that of the central dart is insufficiently known.

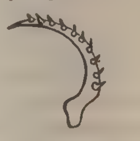

FIG. 6.—The armature from the proboscis of *Drepanophorus*.

The muscular walls of the rhynchocoel, which by their transverse contractions serve to bring about eversion of the proboscis in the way above traced, are attached to the musculature of the head just in front of the ganglionic commissures (fig. 3). In nearly all Nemertines the rhynchocoel extends backwards as far as the posterior extremity, just above the anus; in *Carinella* it is limited to the anterior body-region. The corpuscles floating in the fluid it contains are of definite shape, and in *Cerebratulus urticans* they are deep red, possibly from the presence of haemoglobin. They are usually larger than the blood corpuscles. Internally the muscular layers are lined by an epithelium. In the posterior portion this epithelium in certain *Heteronemertea* has a more glandular appearance, and sometimes the interior cavity is obliterated by cell-proliferation in this region. Superiorly the sheath either closely adheres to the muscular body-wall, with which it may even be partly interwoven, or it hangs freely in the connective tissue which fills the space between the intestine and the muscular body-wall.

Cutaneous System.—Externally in all species a layer of ciliated cells forms the outer investment. In it are, moreover, enclosed unicellular glands pouring their highly refracting contents, of a more or less rod-like shape, directly to the exterior. They appear to be the principal source of the mucus these animals secrete. In most Heteronemertines these elements are separated by a thin homogeneous basement membrane (fig. 8) from the following—that is, from a layer in which longitudinal muscular fibres are largely intermixed with tortuous glands, which by reason of their deeper situation communicate with the exterior by a much longer and generally very narrow duct. The pigment is also principally localized in this layer, although sometimes it is present even deeper down within the musculature. The passage from this tegumentary layer to the subjacent longitudinal muscular one is gradual, no membrane separating them. In *Carinella*, *Cephalothrix*, *Polia* and the Metanemertines the two tegumentary layers with their different glandular elements are fused into one; a thick layer of connective tissue is situated beneath them (instead of between them) and keeps the entire cutaneous system more definitely separate from the muscular (figs. 7, 8).

Musculature and Connective Tissue.—The muscular layers by which the body-wall is constituted have been very differently and to some extent confusingly described by the successive authors on Nemertean anatomy. There is sufficient reason for this confusion. The fact is that not only have the larger subdivisions a different arrangement and even number of the muscular layers, but even within the same genus, nay, in the same species, well-marked differences occur.

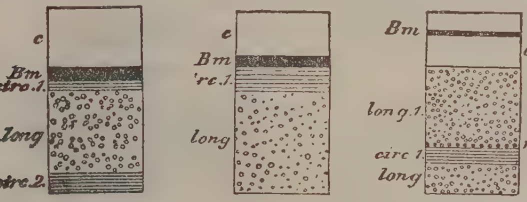

FIG. 7. FIG. 8. FIG. 9.

FIGS. 7–9.—The layers of the body-wall in *Carinella* (fig. 7), the *Metanemertini* (fig. 8) and the *Heteronemertini* (fig. 9). *c*, Cellular tissue of the integument; *Bm*, basement membrane; *circ.* 1, outer circular, and *long.*, longitudinal layer of muscular tissue; *circ.* 2, *long.* 1, additional circular and longitudinal layers of the same; *nl*, nervous layer.

Increase in size appears sometimes to be accompanied by the development of a new layer of fibres, whereas a difference in the method of preparation may give to a layer which appeared homogeneous in one specimen a decidedly fibrous aspect in another. Nevertheless there are three principal types under which the different modifications can be arranged. One of them is found in the two most primitively organized genera, *Carinella* and *Cephalothrix*, *i.e.* an outer circular, a longitudinal and an inner circular layer of muscular fibres (fig. 7). The second is common to all the Heteronemertines, as well as to *Polia* and *Valencinia*, and also comprehends three layers, of which, however, two are longitudinal, viz. the external and the internal one, there being a strong circular layer between them (fig. 9). To the third type all the *Metanemertini* correspond; their muscular layers are only two, an external circular and an internal longitudinal one (fig. 8).

The *Heteronemertini* thus appear to have developed an extra layer of longitudinal fibres internally to those which they inherited from more primitive ancestors, whereas the *Metanemertini* are no longer in possession of the internal circular layer, but have on the contrary largely developed the external circular one, which has dwindled away in the *Heteronemertini*. The situation of the lateral nerve-stems in the different genera with respect to the muscular layers lends definite support to the interpretation of their homologies here given and forms the basis of Bürger's classification.

In *Carinella*, *Cephalothrix* and *Polia*, as well as in all Metanemertines, the basement membrane of the skin already alluded to is particularly strong and immediately applied upon the muscular layers. In the Heteronemertines there is a layer in which the cutaneous elements are largely represented below the thin basement membrane (fig. 8), between it and the bulk of the outer longitudinal muscles. The difference in the appearance of the basement membrane—sometimes wholly homogeneous, sometimes eminently fibrillar—can more especially be observed in differently preserved specimens of the genus *Polia*.

The connective tissue of the integument and basement membrane imperceptibly merges into that which surrounds the muscular bundles as they are united into denser and definite layers, and this is especially marked in those forms (*Akrostomum*) where the density of the muscular body-wall has considerably diminished, and the connective tissue has thus become much more prominent. It can then at the same time be observed, too, that the compact mass of connective tissue ("reticulum," Barrois) which lies between the muscular body-wall and the intestine is directly continuous with that in which the muscular layers are embedded. Nuclei are everywhere present. The omnipresence of this connective tissue tends to exclude the formation of any perivisceral body cavity in Nemertines.

In *Polia* the connective tissue enclosed in the external muscular layer is eminently vacuolar—all the intermediate stages between such cells in which the vacuole predominates and the nucleus is peripheral and those in which the granular protoplasm still entirely fills them being moreover present.

In addition to the musculature of the proboscis and proboscidian sheath, longitudinal muscular fibres are found in the walls of the oesophagus, whilst transverse ones are numerous and united into vertical dissepiments between the successive intestinal caeca, thus bringing about a very regular internal metamerization. The genital products develop in intermediate spaces similarly limited by these dissepiments and alternating with the digestive caeca.

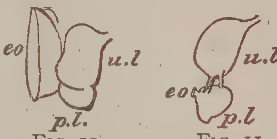

FIG. 10 FIG. 11

FIGS. 10, 11.—Brain and lateral organ of a Schizonemertine (fig. 10) and a Hoplonemertine (fig. 11). *eo*, Exterior opening; *u.l*, superior brain-lobe; *p.l.*, posterior brain-lobe.

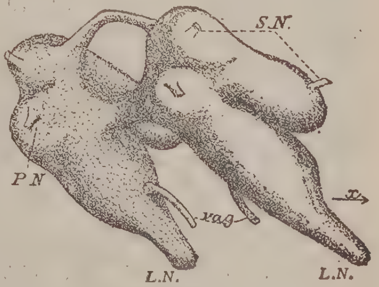

FIG. 12.—The brain of a Nemertine, with its lobes and commissures.
S.N., Nerves to sensory apparatus.
P.N., Nerves for proboscis.
vag, Nerves for oesophagus.
L.N., Lateral nerve-stems.

Nervous System and Sense Organs.—The nervous system of Nemertines presents several interesting peculiarities. As central organs we have to note the brain-lobes and the longitudinal lateral cords which form one continuous unsegmented mass of fibrous and cellular nerve-tissue. The fibrous nerve-tissue is more dense in the higher differentiated, more loose and spongy in the lower organized forms; the cellular nerve-tissue is similarly less compact in the forms that are at the base of the scale. No ganglionic swellings whatever occur in the course of the longitudinal cords. The brain must be looked upon as the anterior thickening of these cords, and at the same time as the spot where the two halves of the central nerve system intercommunicate. This is brought about by a double commissure, of which the ventral portion is considerably thicker than the dorsal, and which, together with the brain-lobes, constitutes a ring through which both proboscis and proboscidian sheath pass. The brain-lobes are generally four in number, a ventral and a dorsal pair, respectively united together by the above-mentioned commissures, and moreover anteriorly interfusing with each other, right and left. In *Carinella* this separation into lobes of the anterior thickenings of the cords has not yet commenced, the ventral commissure at the same time being extremely bulky. There is great probability that the central stems, together with the brain, must be looked upon as local longitudinal accumulations of nervous tissue in what was in more primitive ancestors a less highly differentiated nervous plexus, situated in the body-wall in a similar way to that which still is found in the less highly organized Coelenterates. Such a nervous plexus indeed occurs in the body-wall of all Heteronemertines, sometimes even as a comparatively thick layer, situated, as are the nerve stems, between the external longitudinal and the circular muscles (fig. 9). In *Carinella*, where the longitudinal nerve-stems are situated exteriorly to the muscular layers, this plexus, although present, is much less dense, and can more fitly be compared to a network with wide meshes. In both cases it can be shown to be in immediate continuity with the coating of nerve-cells forming part of the longitudinal cords. It stretches forward as far as the brain, and in *Carinella* is again continued in front of it, whereas in the Heteronemertines the innervation of the anterior extremity of the head, in front of the brain, takes the form of more definite and less numerous branching stems. The presence of this plexus in connexion with the central stems, sending out nervous filaments amongst the muscles, explains the absence, in Pro-, Meso- and Heteronemertines, of separate and distinct peripheral nerve stems springing from the central stems innervating the different organs and body-regions, the only exceptions being the nerves for the proboscis, those for the sense organs in the head and the strong nerve pair (*n. vagus*) for the oesophagus. At the same time it renders more intelligible the extreme sensitiveness of the body-wall of the Nemertines, a local and instantaneous irritation often resulting in spasmodic rupture of the animal at the point touched.

In the *Metanemertini*, where the longitudinal stems lie inside the muscular body-wall, definite and metamerically placed nerve branches spring from them and divide dichotomously in the different tissues they innervate. A definite plexus can here no longer be traced. In certain Metanemertines the lateral stems have been noticed to unite posteriorly by a terminal commissure, situated above the anus, the whole of the central nervous system being in this way virtually situated above the intestine. In others there is an approximation of the lateral stems towards the median ventral line (*Drepanophorus*); in a genus of Heteronemertines (*Langia*), on the other hand, an arrangement occurs by which the longitudinal stems are no longer lateral, but have more or less approached each other dorsally.

In addition to the nerves starting from the brain-lobes just now especially mentioned, there is a double apparatus which can hardly be treated of in conjunction with the sense organs, because its sensory functions have not been sufficiently made out, and which will therefore rather be considered along with the brain and central nervous system. This apparatus is usually known under the name of the lateral organs. To it belong (*a*) superficial grooves or deeper slits situated on the integument near the tip of the head, (*b*) nerve lobes in immediate connexion with the nervous tissue of the brain, and (*c*) ciliated ducts penetrating into the latter and communicating with the former. Embryology shows that originally these different parts are separately started, and only ultimately become united into one. Two lateral outgrowths of the foremost portion of the oesophagus, afterwards becoming constricted off, as well as two ingrowths from the epiblast, contribute towards its formation, at least as far as both Meta- and Heteronemertines are concerned. As to the *Mesonemertini*, in the most primitive genus, *Carinella*, we do not find any lateral organs answering to the description above given. What we do find is a slight transverse furrow on each side of the head, close to the tip, but the most careful examination of sections made through the tissues of the head and brain shows the absence of any further apparatus comparable to that described above. Only in one species, *Carinella inexpectata*, a step in advance has been made, in so far as in connexion with the furrow just mentioned, which is here also somewhat more complicated in its arrangement, a ciliated tube leads into the brain, there to end blindly amidst the nerve-cells. No other intermediate stages have as yet been noticed between this arrangement and that of the *Heteronemertini*, in which a separate posterior brain-lobe receives a similar ciliated canal, and in which the oesophageal outgrowths have made their appearance and are coalesced with the nerve-tissue in the organ of the adult animal. The histological elements of this portion remain distinct both by transmitted light and in actual sections.

These posterior brain-lobes, which in all Heteronemertines are in direct continuity of tissue with the upper pair of principal lobes, cease to have this intimate connexion in the *Metanemertini*; and, although still constituted of (1) a ciliated duct, opening out externally, (2) nervous tissue surrounding it, and (3) histological elements distinctly different from the nervous, and most probably directly derived from the oesophageal outgrowths, they are nevertheless here no longer constantly situated behind the upper brain-lobes and directly connected with them, but are found sometimes behind, sometimes beside and sometimes before the brain-lobes. Furthermore, they are here severed from the principal lobes and connected with them by one or more rather thick strings of nerve-fibres. In some cases, especially when the lobes lie before the brain, their distance from it, as well as the length of these nervous connexions, has considerably increased.

These curious neuro-glandular pits (fig. 1), absent in the Mesonemertine and one or two aberrant species, have been shown to possess large glandular cells at their base which secrete a mucus. The development of these organs, which in the Protonemertine are but grooves in the epidermis, not far removed from the similar cephalic slits of many Turbellaria, reaches its height in *Drepanophorus*. Here the pits split into two, one part ending in a sac lined with sensory epithelium, and embedded in nervous tissue, the other projecting backwards as a long, glandular, blind canal. The exit of these organs takes many shapes, of value in systematic work. Their function is still little understood. Two lateral, shallow pits occur on the side of the body about the level of the hinder end of the proboscis in some species of the genus *Carinella*, which are termed side-organs. These are capable of being everted, and are probably sensory in function (fig. 20, *17*).

For the Heteronemertines arguments have been adduced to prove that here they have the physiological significance of a special respiratory apparatus for the central nervous tissue, which in all these forms is strongly charged with haemoglobin. The haemoglobin would, by its pre-eminent properties of fixing oxygen, serve to furnish the nerve system, which more than any other requires a constant supply, with the necessary oxygen. Such could hardly be obtained in any other way by those worms that have no special respiratory apparatus, and that live in mud and under stones where the natural supply of freshly oxygenated sea-water is practically limited. Whether in the Metanemertines, where the blood fluid is often provided with haemoglobiniferous disks, the chief functions of the side organs may not rather be a sensory one needs further investigation.

The exterior opening of the duct has been several times alluded to. In the Metanemertines it is generally situated towards the middle of a lateral transverse groove on either side of the head, as was noticed for *Carinella*, and as is also present in *Polia*. Generally a row of shorter grooves perpendicular to the first, and similarly provided with strong cilia, enlarges the surface of these furrows (fig. 14). In *Valencinia* there is nothing but a circular opening without furrow. In all Heteronemertines there is on each side of the head a longitudinal slit of varying length but generally considerable depth, in the bottom of which the dark red brain is very plainly visible by transparency. These slits are continued into the ciliated duct, being at the same time themselves very strongly ciliated. In life they are commonly rhythmically opened and shut by a wavy movement. They are the head slits (cephalic fissures, "Kopfspalten") so characteristic of this subdivision (figs. 10 and 13).

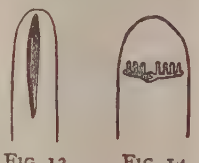
FIG. 13. FIG. 14.

FIGS. 13, 14.—Lateral views of head of a Heteronemertine (fig. 13) with longitudinal slit, and of a Metanemertine (fig 14) with transverse groove and furrows.

With respect to the sense organs of the Nemertines, we find that eyes are of rather constant occurrence, although many Heteronemertines living in the mud appear to be blind. The more highly organized species have often very numerous eyes (*Amphiporus*, *Drepanophorus*), which are provided with a spherical refracting anterior portion, with a cellular "vitreous body," with a layer of delicate radially arranged rods, with an outer sheath of dark pigment, and with a separate nerve-twig each, springing from a common or double pair of branches which leave the brain as *n. optici*, for the innervation of the eyes. Besides these more highly differentiated organs of vision, more primitive eyes are present in others down to simple stellate pigment specks without any refracting apparatus.

Organs of hearing in the form of capsules containing otoliths have only been very rarely observed, apparently only in *Metanemertini*.

As to the organ of touch, the great sensitiveness of the body has already been noticed, as well as the probable primary significance of the proboscis. Small tufts of tactile hairs or papillae are sometimes observed in small number at the tip of the head; sometimes longer hairs, apparently rather stiff, are seen on the surface, very sparingly distributed between the cilia, and hitherto only in a very limited number of small specimens. They may perhaps be considered as sensory.

Digestive System.—The anterior opening, the mouth, is situated ventrally, close to the tip of the head and in front of the brain in the *Metanemertini*, somewhat more backward and behind the brain in the other Nemertines. In most Heteronemertines it is found to be an elongated slit with corrugated borders; in the Metanemertines it is smaller and rounded; in *Malacobdella* and *Akrostomum* it, moreover, serves for the extrusion of the proboscis, which emerges by a separate dorsal opening just inside the mouth. The oesophagus is the anterior portion of the digestive canal; its walls are folded longitudinally, comparatively thick and provided with longitudinal muscular fibres. Two layers are specially obvious in its walls—the inner layer bordering the lumen being composed of smaller ciliated cells, the outer thicker one containing numerous granular cells and having a more glandular character. Outside the wall of the oesophagus a vascular space has been detected which is in direct continuity with the longitudinal blood-vessels. In certain cases, however, the walls of the oesophagus appear to be very closely applied to the muscular body-wall and this vascular space thereby considerably reduced.

The posterior portion of the intestine is specially characterized by the appearance of the intestinal diverticula horizontally and symmetrically placed right and left and opposite to each other.

In the *Metanemertini* there is a curious diverticulum of the intestine which stretches forward in the median line, ventral to the so-called stomach. It is at times sacculated, but its chief interest is that, as Lebedinsky[1] has shown, the tip of the caecum in embryonic life opens to the exterior as the blastopore. This subsequently closes up, and the newly-formed oesophagus and stomach open in the intestine above and behind it. It is a curious feature in Nemertines that the alimentary canal seldom contains traces of food and yet most of these worms are voracious. The food must be digested, absorbed and excreted with great rapidity. There is some evidence that in this group the ectoderm of the oesophagus is chiefly concerned with digestion, whereas the endoderm of the intestine is limited to the absorption of the soluble products.

Cases of asymmetry or irregularity in the arrangement of the intestinal caeca, though sometimes occurring, are not normal. At the tip of the tail, where the growth of the animal takes place, the caeca are always eminently regular. So they are throughout the whole body in most of the Metanemertines. In *Carinella* they are generally deficient and the intestine straight; in young specimens of this species, however, they occur, though less regular and more in the form of incipient foldings by which the digestive surface is, increased. The inner surface of the intestinal caeca is ciliated, the caeca themselves are sometimes—especially in the hindermost portion of the body—of a considerably smaller lumen than the intermediate genital spaces; sometimes, however, the reverse is the case, and in both cases it is the smaller lumen that appears enclosed between and suspended by the transverse fibres constituting the muscular dissepiments above mentioned.

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[1] *Arch. mikr. Anat.* xlix. (1897) p. 503.

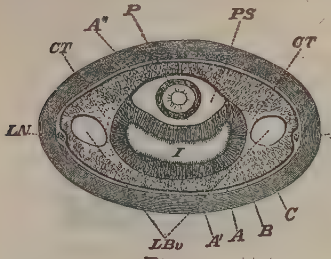

Fig. 15.

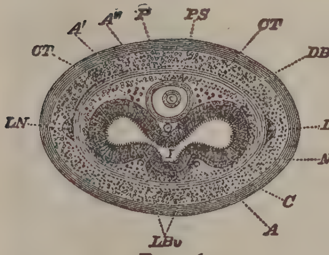

Fig. 16.

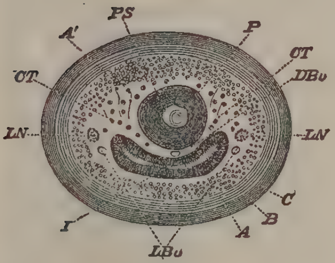

Fig. 17.

Figs. 15–17.—Diagrammatic sections to show disposition of internal organs in *Carinella* (*Protonemertini*), fig. 15, *Heteronemertini*, fig. 16, and *Metanemertini*, fig. 17.

C,	Cellular portion of integument.
B,	Basement membrane.
A,	Circular muscular layer.
A',	Longitudinal muscular layer.
A'',	Second circular (in *Carinella*).
A''',	Second longitudinal (in *Heteronemertini*).
N,	Nervous layer.
LN,	Lateral nerves.
PS,	Cavity of proboscidian sheath (the sheath itself of varying thickness).
P,	Proboscis.
I,	Intestine.
LBv,	Lateral blood-vessel.
DBv,	Dorsal blood-vessel.
CT,	Connective tissue.

The anus is situated terminally, the muscular body-wall through which the intestine must find its way outwards probably acting in this region the part of a sphincter. The lateral nerve stems mostly terminate on both sides in closest proximity to the anus; in certain species, however, they interfuse by a transverse connexion *above* the anus. The longitudinal blood-vessels do the same.

Circulatory Apparatus.—The chief vessels are three longitudinal trunks, a median and two lateral ones. They are in direct connexion with each other both at the posterior and at the anterior end of the body. At the posterior end they communicate together by a T-shaped connexion in a simple and uniform way. Anteriorly there is a certain amount of difference in the arrangement. Whereas in the Metanemertines an arrangement prevails as represented in fig. 18, in the Heteronemertines the lateral stems, while entirely uniform all through the posterior portion of the body, no longer individually exist in the oesophageal region, but here dissolve themselves into a network of vascular spaces surrounding this portion of the digestive tract. The median dorsal vessel, however, remains distinct, but instead of continuing its course beneath the proboscidian sheath it is first enclosed by the ventral musculature of this organ, and still farther forwards it even bulges out longitudinally into the cavity of the sheath. Anteriorly it finally communicates with the lacunae just mentioned, which surround the oesophagus, bathe the posterior lobes of the brain, pass through the nerve ring together with the proboscidian sheath, and are generally continued in front of the brain as a lacunar space in the muscular tissue, one on each side.

Special mention must be made of the delicate transverse vessels regularly connecting the longitudinal and the lateral ones. They are metamerically placed, and belong to the same metamere as the digestive caeca, thus alternating with the generative sacs. The blood fluid does not flow in any definite direction; its movements are largely influenced by those of the muscular body-wall. It is colourless and contains definite corpuscles, which are round or elliptical, and in many Metanemertines are coloured red by haemoglobin, being colourless in other species. The circulatory system of *Carinella* is considerably different, being more lacunar and less restricted to definite vascular channels. Two lateral longitudinal lacunae form, so to say, the forerunners of the lateral vessels. A median longitudinal vessel and transverse connecting trunks have not as yet been detected. There are large lacunae in the head in front of the ganglia.

The vascular system is entirely closed. It contains a colourless fluid, with flat, oval nucleated corpuscles, as a rule colourless, but in some cases tinged with yellow or red haemoglobin. Its presence is one of the most distinctive features which separate the Nemertines from the Platyhelminthes. In origin the vascular system is due to a fusion of spaces which arise in the mesoblast of the larva. The blood is probably circulated by the general contraction of the whole animal, since it is very doubtful if there are any intrinsic muscles in the vessel-walls. Its function is less that of respiration than of conveying the digested food-products all over the body, and the excretory products to the nephridia, and doubtless it serves at times to assist in the extension and retraction of parts of the body. The vessels in the more highly-developed genera seem to be partly lacunae and partly true vessels with definite walls.

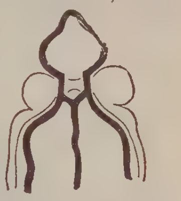
Fig. 18.—Diagram of the circulatory apparatus in the anterior body-region of a Metanemertine.

Nephridia.—Associated with the lateral blood-vessels are the single pair of nephridia. Each consists of a more or less coiled, ciliated, longitudinal canal, which on its external surface gives origin to one or more transverse canals, which pass to the exterior and open a little way behind the mouth on the sides of the body. On its inner surface the longitudinal canal is adpressed to the lateral blood-vessel, and gives off a number of small, blind caeca or tags, each of which ends in a small clump of cells. These tags indent the blood-vessel. From their inner ends, projecting into the lumen of the tag, hangs a bunch of cilia, which forms the flickering "flame" so well known in the excretory apparatus of the Platyhelminthes and larval Annelids (fig. 19). There is no communication between the nephridia on one side and the other, but in *Eupolia* there are ducts opening into the alimentary canal as well as to the exterior, a condition of things which recalls what obtains in certain Oligochaetes. As a rule these organs only extend a short way along the anterior end of the body, a concentration which we may associate with the development of a vascular system to bring the products of excretion to a fixed spot. In *Stichostemma*, however, Montgomery[1] has described a series of nephridia lying all along the body, and each with a varying number of external pores. The excretory system is epiblastic in its origin.

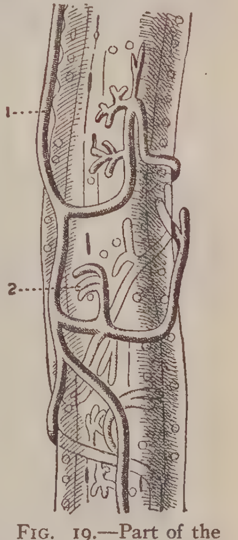

Fig. 19.—Part of the excretory system lying on the lateral vessel of *Drepanophorus spectabilis*. (Magnified about 750.) 1, The longitudinal excretory canal; 2, one of the tags containing the flame-cells.

The two external openings of the nephridia are situated sometimes more towards the ventral, at other times more towards the dorsal side. Even in the larger Heteronemertines these pores are only a few millimetres behind the mouth region. In transverse sections the nephridia can be shown to be generally situated in the region limited by (1) the proboscidian sheath, (2) the upper wall of the intestine, (3) the muscular body-wall. No trace of nephridia is found posterior to the oesophagus.

Generative System.—In the Nemertines the sexes are separate, with only very few exceptions (*Tetrastemma hermaphroditica*, Marion). The reproductive system is of the simplest, strongly contrasting with the complicated arrangements in the Platyhelminthes. A series of sacs lined with an epithelium, the proliferation of which gives rise to the ova or spermatozoa, alternate between the caeca of the intestine. When mature, each sac pushes out a process to the exterior, and this forms the genital duct. The line of the genital openings is usually dorsal to the lateral nerve. The whole sac, with its epithelial wall and its contained genital cells, arises ultimately from some of the parenchymatous cells of the body. The walls and contents in some forms arise simultaneously; in others the walls are first formed and their lining then proliferates. It has been pointed out that the cavity of the sacs corresponds in many particulars with the coelom of higher animals, and in Lebidinsky's observations on the development there is some support to the view that a coelom exists. Montgomery has also described certain spaces which may be coelomic lying between the alimentary canal and the inner longitudinal layer of muscles in the *Heteronemertini*. The ova and spermatozoa, when mature, present no peculiarities. As the ova are in many species deposited in a gelatinous tube secreted by the body-walls, in which they are arranged (three or more together) in flask-shaped cavities, impregnation must probably take place either before or at the very moment of their being deposited. The exact mode has not yet been noticed.

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[1] *Zool. Jahrb. Anat.*, x. (1897) p. 265.

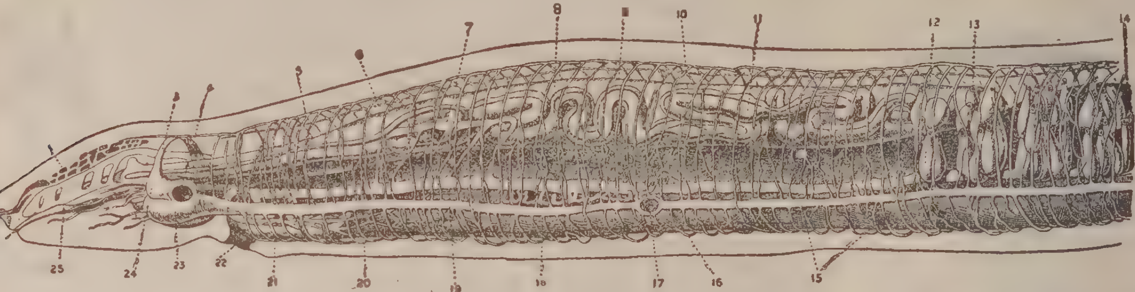

Fig. 20.—Anterior end of a *Carinella*, partly diagrammatic. Magnified. (From Bürger.) 1, Opening of proboscis; 2, cephalic glands running to frontal organ; 3, dorsal commissure of brain; 4, cerebral organ; 5, upper dorsal nerve; 6, under dorsal nerve; 7, rhynchocoelic blood-vessel; 8, fore-gut; 9, rhynchocoel; 10, nerve to proboscis; 11, proboscis; 12, genital sac; 13, genital pore; 14, mid-gut; 15, circular nerves; 16, pore of excretory system; 17, lateral organ; 18, excretory canal; 19, lateral vessel; 20, lateral nerve; 21, oesophageal nerve; 22, mouth; 23, ventral ganglion of brain; 24, dorsal ganglion of brain; 25, rhynchodaeum.

Prosorhocmus claparedii is a viviparous form.

Development.—The embryology of the Nemertines offers some very remarkable peculiarities. Our knowledge of the development of the most primitive forms is scanty. Both *Hetero-* and *Metanemertini* have been more exhaustively studied than the other two groups, the first, as was noticed above, being characterized by peculiar larval forms, the second developing without metamorphosis.

The larva of *Cerebratulus* is called the pilidium. In exterior shape it resembles a helmet with spike and ear-lobes, the spike being a strong and long flagellum or a tuft of long cilia, the ear-lobes lateral ciliated appendages (fig. 21). It encloses the primitive alimentary tract. Two pairs of invaginations of the skin, which originally are called the prostomial and metastomial disks, grow round the intestine, finally fuse together, and form the skin and muscular body-wall of the future Nemertine, which afterwards becomes ciliated, frees itself from the pilidium investment and develops into the adult worm without further metamorphosis.

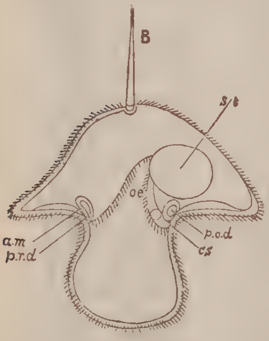

Fig. 21.—Pilidium-larva.
B, Bunch of cilia or flagellum.
oe, Oesophagus.
st, Stomach.
cs, Oesophageal outgrowth for lateral organ.
am, Amnion.
pr.d., Prostomial disk.
po.d., Metastomial disk.

The eggs of these species are not enveloped by such massive gelatinous strings as are those of the genus *Lineus*. In the latter we find the young Nemertines crawling about after a period of from six to eight weeks, and probably feeding upon a portion of this gelatinous substance, which is found to diminish in bulk. In accordance with these more sedentary habits during the first phases of life, the characteristic pilidium larva, which is so eminently adapted for a pelagic existence, appear to have been reduced to a close-fitting exterior layer of cells, which is stripped off after the definite body-wall of the Nemertine has similarly originated out of four ingrowths from the primary epiblast. To this reduced and sedentary pilidium the name of "larva of Desor" has been given.

In the *Metanemertini*, as far as they have been investigated, a direct development without metamorphosis has been observed. It appears probable that this is only a further simplification of the more complicated metamorphosis described above.

As to the development of the different organs, there is still much that remains doubtful. The hypoblast in some forms originates by invagination, in others by delamination. The proboscis is an invagination from the epiblast; the proboscidian sheath appears in the mesoblast, but is perhaps originally derived from the hypoblast. The origin of the lateral organs has already been noticed; that of the nerve system is essentially epiblastic.

Affinities.—The position of the Nemertines in the animal kingdom is now looked upon as more isolated than was formerly thought, and recent writers have been inclined to treat them as a separate phylum. Whether this view be adopted or not, and whether the Turbellaria be regarded as nearly related or only remotely connected, there can be little doubt that the Nemertines resemble the Turbellaria more nearly than they do any other group of animals. Bürger even goes so far as to homologize the proboscis with the Turbellarian pharynx, and he sums up their relationship to the Annelids by the statement that to a certain extent the Nemertines represent Turbellaria which in the course of time have copied certain features of an Annelid character.

Literature.—J. Barrois, "Recherches sur l'embryologie des Némertes," *Annales des Sc. Naturelles*, vi. (1877); O. Bütschli, "Einige Bemerkungen zur Metamorphose des Pilidium," *Archiv für Naturgeschichte* (1873); L. von Graff, *Monographie der Turbellarien* (1882); A. A. W. Hubrecht, "Untersuchungen über Nemertinen a. d. Golf von Neapel," *Niederl. Archiv für Zoologie*, ii.; *Id.*, "The Genera of European Nemerteans critically revised," *Notes from the Leyden Museum* (1879); *Id.*, "Zur Anatomie u. Physiologie d. Nervensystems d. Nemertinen," *Verh. kon. Akad. v. Wetensch.* (Amsterdam, 1880), vol. xx.; *Id.*, "The Peripheral Nervous System of the Palaeo- and Schizonemertini, one of the layers of the Body-wall," *Quart. Journal of Micr. Science*, vol. xx.; *Id.*, "On the Ancestral Forms of the Chordata," *Ib.* (July 1883); W. Keferstein, "Untersuchungen über niedere Seethiere," *Zeitschr. f. wissensch. Zool.* vol. xii. (1863); J. von Kennel, "Beiträge zur Kenntniss der Nemertinen," *Arbeiten a. d. zool.-zoot. Instit.* ii. (Würzburg, 1878); W. C. MacIntosh, *A Monograph of British Annelida: I. Nemerteans* (Ray Society, 1873–1874); A. F. Marion, "Recherches sur les animaux inférieurs du Golfe de Marseille," *Ann. des Sc. Nat.* (1873); E. Metschnikoff, "Studien über die Entwickelung der Echinodermen und Nemertinen," *Mém. de l'Acad. Imp. de St Petersb.* xiv. (1869); Max Schultze, *Beiträge zur Naturgeschichte der Turbellarien* (Greifswald, 1851) and *Zeitschr. für wissensch. Zool.* iv. (1852), p. 178; W. B. Benham, *Quart. Journ. Micr. Sci.* xxxix. (1896), p. 19; A Brown, *Proc. Roy. Soc.* lxi. (1897), p. 28; O. Bürger, *Zeit. f. wiss. Zool.* l. (1890), p. 1; *Id.*, *Mitt. Zool. St Neapel*, x. (1891), p. 206; *Id.*, *Zeit. f. wiss. Zool.* liii. (1892), p. 322; *Id.*, *Verh. Deutsch. zool. Gesellsch.* (1893); *Id.*, *Fauna u. Flora d. Golfe d. Neapel*, Monograph 22 (1895); A. Dendy, *Proc. Roy. Soc. Victoria* (n.s.), iv. (1892), p. 85, v. p. 127 (1891–1892); B. Haller, *Arb. Zool. Inst. Wien*, viii. (1889), p. 276; A. A. W. Hubrecht, "*Challenger*" *Reports*, xix. (1887); L. Joubin, *Arch. Zool. Exper.* (2), viii. (1890), p. 461; *Id.*, "Nemertines," in Blanchard's *Traité de zoologie* (1894); J. N. Lebedinsky, *Arch. Mikr. Anat.* xlix. (1897), p. 503; T. H. Montgomery, *Zool. Anzeig.* xvii. (1894), pp. 298, 301; *Id.*, *Zeit. f. wiss. Zool.* lix. (1895), p. 83; *Id.*, *Zool. Jahrb.* (*Anat.*) x. (1897), p. 1; A. E. Verrill, *Trans. Connecticut Acad. New Haven*, viii. (1892), p. 382; D. Bergendal, *Zool. Anzeiger*, xxiii. (1900), p. 313; W. R. Coe, *Zool. Jahrb.* (*Anat.*) xii. (1899), p. 425; *Id.*, *Trans. Connect. Acad.* ix. (1895), p. 479; *Id.*, *Proc. Wash. Acad.* iii. (1901), p. 1; T. H. Montgomery, *Journ. Morph.*, xiii. (1897) p. 381; *Id.*, *Zool. Jahrb.* (*Anat.*) x. (1897), p. 265; R. C. Punnett, *Quart. Journ. Mic. Sc.* xliv. (1900), p. 111; *Id.*, *Willey's Zool. Results*, pt. v. (1900), p. 569; *Id.*, *Quart. Journ. Mic. Sc.* xliv. (1901), p. 547; Staub, *Semon's Forschungsreisen* (5 Bd., 1900); C. B. Thompson, *Zool. Anzeiger*, xxiii. (1900), pp. 151, 627; C. B. Wilson, *Quart. Journ. Mic. Sc.* xliii. (1900), p. 97.

(A. A. W. H.; A. E. S.)

NEMESIANUS, MARCUS AURELIUS OLYMPIUS, Roman poet, a native of Carthage, flourished about A.D. 283. He was a popular poet at the court of the Roman emperor Carus (Vopiscus, *Carus*, 11). He wrote poems on the arts of fishing (*Halieutica*), aquatics (*Nautica*) and hunting (*Cynegetica*), but only a fragment of the last, 325 hexameter lines, has been preserved. It is neatly expressed in good Latin, and was used as a school text-book in the 9th century. Four eclogues, formerly attributed to Titus Calpurnius (*q.v.*) Siculus, are now generally considered to be by Nemesianus, and the *Praise of Hercules*, generally printed in Claudian's works, may be by him.

Complete edition of the works attributed to him in E. Bährens, *Poetae Latini Minores*, iii. (1881); *Cynegetica*: ed. M. Haupt (with Ovid's *Halieutica* and Grattius Faliscus) 1838, and R. Stern, with Grattius (1832); Italian translation with notes by L. F. Valdrighi (1876). The four eclogues are printed with those of Calpurnius in the editions of H. Schenkl (1885) and E. H. Keene (1887); see L. Cisorio, *Studio sulle Egloghe di N.* (1895) and *Dell' imitazione nelle Egloghe di N.* (1896); and M. Haupt, *De Carminibus Bucolicis Calpurnii et N.* (1853), the chief treatise on the subject.

NEMESIS, the personification of divine justice. This is the only sense in which the word is used in Homer, while Hesiod (*Theog.* 223) makes Nemesis a goddess, the daughter of Night (some, however, regard the passage as an interpolation); she appears in a still more concrete form in a fragment of the *Cypria*. The word Nemesis originally meant the distributor (Gr. *νέμειν*) of fortune, whether good or bad, in due proportion to each man according to his deserts; then, the resentment caused by any disturbance of this proportion, the sense of justice that could not allow it to pass unpunished. Gruppe and others prefer to connect the name with *νεμεσᾶν*, *νεμεσίζεσθαι* ("to feel just resentment"). In the tragedians Nemesis appears chiefly as the avenger of crime and the punisher of arrogance, and as such is akin to Ate and the Erinyes. She was sometimes called Adrasteia, probably meaning "one from whom there is no escape"; the epithet is specially applied to the Phrygian Cybele, with whom, as with Aphrodite and Artemis, her cult shows certain affinities. She was specially honoured in the district of Rhamnus in Attica, where she was perhaps originally an ancient Artemis, partly confused with Aphrodite. A festival called Nemeseia (by some identified with the Genesia) was held at Athens. Its object was to avert the nemesis of the dead, who were supposed to have the power of punishing the living, if their cult had been in any way neglected (Sophocles, *Electra*, 792; E. Rohde, *Psyche*, 1907, i. 236, note 1). At Smyrna there were two divinities of the name, more akin to Aphrodite than to Artemis. The reason for this duality is hard to explain; it is suggested that they represent two aspects of the goddess, the kindly and the malignant, or the goddesses of the old and the new city. Nemesis was also worshipped at Rome by victorious generals, and in imperial times was the patroness of gladiators and *venatores* (fighters with wild beasts) in the arena and one of the tutelary deities of the drilling-ground (*Nemesis campestris*). In the 3rd century A.D. there is evidence of the belief in an all-powerful Nemesis-Fortuna. She was worshipped by a society called Nemesiaci. In early times the representations of Nemesis resembled Aphrodite, who herself sometimes bears the epithet Nemesis. Later, as the goddess of proportion and the avenger of crime, she has as attributes a measuring rod, a bridle, a sword and a scourge, and rides in a chariot drawn by griffins.

See C. Walz, *De Nemesi Graecorum* (Tübingen, 1852); E. Tournier, *Némésis* (1863), and H. Posnansky, "Nemesis und Adrasteia," in *Breslauer philologische Abhandlungen*, v. heft 2 (1890), both exhaustive monographs; an essay, "Nemesis, or the Divine Envy," by P. E. More, in *The New World* (N. Y., Dec. 1899); L. R. Farnell, *Cults of the Greek States*, ii.; and A. Legrand in Daremberg and Saglio's *Dictionnaire des antiquités*. For the Roman Nemesis, see G. Wissowa, *Religion und Kultus der Römer* (Münich, 1902).

NEMESIUS (fl. *c.* A.D. 390), a Christian philosopher, author of a treatise *περὶ φύσεως ἀνθρώπου* (*On Human Nature*), was, according to the title of his book, bishop of Emesa (in Syria); of his life nothing further is known, and even his date is uncertain, but internal evidence points to a date after the Apollinarian controversy and before the strife connected with the names of Eutyches and Nestorius, *i.e.* about the end of the 4th century. His book is an interesting attempt to compile a system of anthropology from the standpoint of the Christian philosophy. Moses and Paul are put side by side with Aristotle and Menander, and there is a clear inclination to Platonic doctrines of pre-existence and metempsychosis. In physiological matters he is in advance of Aristotle and Galen, though we can hardly assert—as has sometimes been thought—that he anticipated Harvey's discovery of the circulation of the blood. The treatise is conclusive evidence as to the mutual influence of Christianity and Hellenism in the 4th century. John of Damascus and the schoolmen, including Albertus Magnus and Thomas Aquinas, held Nemesius in high esteem, believing his book to be the work of Gregory of Nyssa, with whom he has much in common.

Editions: Antwerp, 1575; Oxford, 1671; Halle, 1802; Migne's *Patrol. Gr.* vol. 40. Versions: Latin by Alsanus, ed. Holzinger (1887); by Burgundio, ed. Burkhardt (1891–1896). Literature: Bender, *Untersuch. über Nemesius* (1898). See further Herzog-Hauck's *Realencyklop*, *s.v.*

NEMORENSIS LACUS (mod. *Nemi*), a lake in the Alban Hills, in an extinct subsidiary crater in the outer ring of the ancient Alban crater, E. of the Lake of Albano. It is about 3½ m. in diameter and some 110 ft. deep; the precipitous slopes of its basin are over 300 ft. high, and on the side towards the modern village a good deal more, and are mainly cultivated. It is now remarkable for its picturesque beauty. In ancient times it was included in the territory of Aricia, and bore the name "Mirror of Diana." The worship of Diana here was a very ancient one, and, as among the Scythians, was originally, so it was said, celebrated with human sacrifices; even in imperial times the priest of Diana was a man of low condition, a gladiator or a fugitive slave, who won his position by slaying his predecessor in fight, having first plucked a mistletoe bough from the sacred grove, and who, notwithstanding, bore the title of *rex* (king). It is curious that in none of the inscriptions that have been found is the priest of Diana mentioned; and it has indeed been believed by Morpurgo and Frazer that the *rex* was not the priest of Diana at all, but, according to the former, the priest of Virbius, or, according to the latter, the incarnation of the spirit of the forest. The temple itself was one of the most splendid in Latium; Octavian borrowed money from it in 31 B.C., and it is frequently mentioned by ancient writers. Its remains are situated a little above the level of the lake, and to the N.E. of it. They consist of a large platform, the back of which is formed by a wall of concrete faced with *opus reticulatum*, with niches, resting against the cliffs which form the sides of the crater. Excavations in the 17th and the last quarter of the 19th centuries (now covered in again), and also in 1905, led to the discovery of the temple itself, a rectangular edifice, 98 by 52 ft., and of various inscriptions, a rich frieze in gilt bronze, many statuettes (ex-votos) from the *favissae* of the temple in terra-cotta and bronze, a large number of coins, &c. None of the objects seem to go back beyond the 4th century B.C. A road descended to it from the Via Appia from the S.W., passing through the modern village of Genzano. The lake is drained by a tunnel of about 2 m. long of Roman date. On the W. side of the lake remains of two ships (really floating palaces moored to the shore) have been found, one belonging to the time of Caligula (as is indicated by an inscription on a lead pipe), and measuring 210 ft. long by 66 wide, the other even larger, 233 by 80 ft. The first was decorated with marbles and mosaics, and with some very fine bronze beamheads, with heads of wolves and lions having rings for hawsers in their mouths (and one of a Medusa), now in the Museo delle Terme at Rome, with remains of the woodwork, &c., &c. Various attempts have been made to raise the first ship, from the middle of the 15th century onwards, by which much harm has been done. The neighbourhood of the lake was naturally in favour with the Romans as a residence. Caesar had a villa constructed there, but destroyed again almost at once, because it did not satisfy him.

See F. Barnabei, *Notizie degli scavi* (1895), 361, 461; (1896), 188; V. Malfatti, *Notizie degli scavi* (1895), 471; (1896), 393; *Rivista marittima* (1896), 379; (1897), 293; J. G. Frazer, *The Golden Bough* (London, 1900); L. Morpurgo in *Monumenti dei Lincei*, xiii. (1903), 297 sqq. (T. As.)

NEMOURS, LORDS AND DUKES OF. In the 12th and 13th centuries the lordship of Nemours, in Gâtinais, France, was in possession of the house of Villebeon, a member of which, Gautier, was marshal of France in the middle of the 13th century. The lordship was sold to King Philip III. in 1274 and 1276 by Jean and Philippe de Nemours, and was then made a county and given to Jean de Grailly, captal de Buch in 1364. In 1404 Charles VI. of France gave it to Charles III. of Evreux, king of Navarre, and erected it into a duchy in the peerage of France (*duché-pairie*). Charles III.'s daughter, Beatrix, brought the duchy to her husband Jacques de Bourbon, count of La Marche, and by the marriage of their daughter, Eleanor, to Bernard of Armagnac, count of Pardiac, it passed to the house of Armagnac. After being confiscated and restored several times, the duchy reverted to the French crown in 1505, after the extinction of the house of Armagnac-Pardiac. In 1507 it was given by Louis XII. to his nephew, Gaston de Foix, who was killed at Ravenna in 1512. The duchy then returned to the royal domain, and was detached from it successively for Giuliano de Medici and his wife Philiberta of Savoy in 1515, for Louise of Savoy in 1524, and for Philip of Savoy, count of Genevois, in 1528. The descendants of the last-mentioned duke possessed the duchy until its sale to Louis XIV. In 1572 Louis gave it to his brother Philip, duke of Orleans, whose descendants possessed it until the Revolution. The title of duc de Nemours was afterwards given to Louis Charles, son of King Louis Philippe, who is dealt with separately below.

The following are the most noteworthy of the earlier dukes of Nemours.

James of Armagnac, duke of Nemours (*c.* 1433–1477), was the son of Bernard d'Armagnac, count of Pardiac, and Eleanor of Bourbon-La Marche. As comte de Castres, he served under Charles VII. in Normandy in 1449 and 1450; and afterwards in Guienne. On the accession of Louis XI. the king loaded him with honours, married him to his god-daughter, Louise of Anjou, and recognized his title to the duchy of Nemours in 1462. Sent by Louis to pacify Roussillon, Nemours felt that he had been insufficiently rewarded for the rapid success of this expedition, and joined the League of the Public Weal in 1465. He subsequently became reconciled with Louis, but soon resumed his intrigues. After twice pardoning him, the king's patience became exhausted, and he besieged the duke's château at Carlat and took him prisoner. Nemours was treated with the utmost rigour, being shut up in a cage; and was finally condemned to death by the parlement and beheaded on the 4th of August 1477.

See B. de Mandrot, *Jacques d'Armagnac, duc de Nemours* (Paris, 1890).

Philip of Savoy, duke of Nemours (1490–1533), was a son of Philip, duke of Savoy, and brother of Louise of Savoy, mother of Francis I. of France. Originally destined for the priesthood, he was given the bishopric of Geneva at the age of five, but resigned it in 1510, when he was made count of Genevois. He served under Louis XII., with whom he was present at the battle of Agnadello (1509), under the emperor Charles V. in 1520, and finally under his nephew, Francis I. In 1528 Francis gave him the duchy of Nemours and married him to Charlotte of Orléans-Longueville. He died on the 25th of November 1533.

His son, James (1531–1585), became duke of Nemours in 1533. He distinguished himself at the sieges of Lens and Metz (1552–1553), at the battle of Renty (1554) and in the campaign of Piedmont (1555). He was a supporter of the Guises, and had to retire for some time into Savoy in consequence of a plot. On his return to France he fought the Huguenots, and signalized himself by his successes in Dauphiné and Lyonnais. In 1567 he induced the court to return from Meaux to Paris, took part in the battle of Saint Denis, protested against the peace of Longjumeau, and repulsed the invasion of Wolfgang, count palatine of Zweibrücken. He devoted his last years to letters and art, and died at Annecy on the 15th of June 1585.

By his wife Anne of Este, the widow of Francis, duke of Guise, the duke left a son, Charles Emmanuel (1567–1595), who in his youth was called prince of Genevois. Involved in political intrigues by his relationship with the Guises, he was imprisoned after the assassination of Henry, duke of Guise, and his brother the cardinal of Lorraine, in 1588, but contrived to escape. He fought at Ivry and Arques, and was governor of Paris when it was besieged by Henry IV. After quarrelling with his half-brother Charles of Lorraine, duke of Mayenne, he withdrew to his government of Lyonnais, where he endeavoured to make himself independent. He was imprisoned, however, in the château of Pierre-Encise by the archbishop of Lyons. After his escape he attacked Lyons, but was defeated owing to the intervention of the constable de Montmorency. He died at Annecy in July 1595.

His brother Henry (1572–1632), called originally marquis de Saint-Sorlin, succeeded him as duke. In 1588 he took the marquisate of Saluzzo from the French for his cousin, the duke of Savoy. The princes of Guise, his half-brothers, induced him to join the League, and in 1591 he was made governor of Dauphiné in the name of that faction. He made his submission to Henry IV. in 1596. After quarrelling with the duke of Savoy he withdrew to Burgundy and joined the Spaniards in their war against Savoy. After peace had been proclaimed on the 14th of November 1616, he retired to the French court. He died in 1632, and was succeeded by his eldest son, Louis, and on the death of the latter in 1641 by his second son, Charles Amadeus (1624–1652), who served in the army of Flanders in 1645, and in the following year commanded the light cavalry at the siege of Courtrai. In 1652 he took part in the war of the Fronde, and fought at Bléneau and at the Faubourg St Antoine, where he was wounded. On the 30th of July of the same year he was killed in a duel by his brother-in-law, François de Vendôme, duke of Beaufort. He had two daughters, Marie Jeanne Baptiste (d. 1724), who married Charles Emmanuel of Savoy in 1665; and Marie Françoise Elisabeth, who married Alphonso VI., king of Portugal, in 1666. His brother Henry (1625–1659), who had been archbishop of Reims, but now withdrew from orders, succeeded to the title. In 1657 he married Marie d'Orléans-Longueville (1625–1707), daughter of Henry II. of Orléans, duke of Longueville. This duchess of Nemours is a famous personage. At an early age she was involved in the first Fronde, which was directed by her father and her stepmother. Anne Geneviève de Bourbon-Condé, the celebrated duchesse de Longueville; and when her husband died in 1659, leaving her childless, the rest of her life was mainly spent in contesting her inheritance with her stepmother. She left some interesting *Mémoires*, which are published by C. B. Petitot in the *Collection complète des mémoires* (1819–1829).

NEMOURS, LOUIS CHARLES PHILIPPE RAPHAËL, Duc de (1814–1896), second son of the duke of Orleans, afterwards King Louis Philippe, was born on the 25th of October 1814. At twelve years of age he was nominated colonel of the first regiment of chasseurs, and in 1830 he became a chevalier of the order of the Saint Esprit and entered the chamber of peers. As early as 1825 his name was mentioned as a possible candidate for the throne of Greece, and in 1831 he was elected king of the Belgians, but international considerations deterred Louis Philippe from accepting the honour for his son. In February 1831 he accompanied the French army which entered Belgium to support the new kingdom against Holland, and took part in the siege of Antwerp. He accompanied the Algerian expedition against the town of Constantine in the autumn of 1836, and in a second expedition (1837) he was entrusted with the command of a brigade and with the direction of the siege operations before Constantine. General Damrémont was killed by his side on the 12th of October, and the place was taken by assault on the 13th. He sailed a third time for Algeria in 1841, and served under General Bugeaud, taking part in the expedition to revictual Medea on the 29th of April, and in sharp fighting near Miliana on the 3rd to 5th of May. In the expedition against the fortified town of Takdempt he commanded the 1st infantry division. On his return to France he became commandant of the camp of Compiègne. He had been employed on missions of courtesy to England in 1835, in 1838 and in 1845, and to Berlin and Vienna in 1836. The occasion of his marriage in 1840 with Victoria, daughter of Duke Ferdinand of Saxe-Coburg, was marked by a check to Louis Philippe's government in the form of a refusal to bestow the marriage dowry proposed by Thiers in the chamber of deputies. The death of his elder brother, Ferdinand, duke of Orleans, in 1842 gave him a position of greater importance as the natural regent in the case of the accession of his nephew, the young count of Paris. His reserve and dislike of public functions, with a certain haughtiness of manner, however, made him unpopular. On the outbreak of the revolution of

1848 he held the Tuileries long enough to cover the king's retreat, but refrained from initiating active measures against the mob. He followed his sister-in-law, the duchess of Orléans, and her two sons to the chamber of deputies, but was separated from them by the rioters, and only escaped finally by disguising himself in the uniform of a national guard. He embarked for England, where he settled with his parents at Claremont. His chief aim during his exile, especially after his father's death, was a reconciliation between the two branches of the house of Bourbon, as indispensable to the re-establishment of the French monarchy in any form. These wishes were frustrated on the one hand by the attitude of the comte de Chambord, and on the other by the determination of the duchess of Orléans to maintain the pretensions of the count of Paris. Nemours was prepared to go further than the other princes of his family in accepting the principles of the legitimists, but lengthy negotiations ended in 1857 with a letter, written by Nemours, as he subsequently explained, at the dictation of his brother, François, prince de Joinville, in which he insisted that Chambord should express his adherence to the tricolour flag and to the principles of constitutional government. In 1871 the Orleans princes renewed their professions of allegiance to the senior branch of their house, but they were not consulted when the count of Chambord came to Paris in 1873, and their political differences remained until his death in 1883.

Nemours had lived at Bushey House after the death of Queen Marie Amélie in 1866. In 1871 the exile imposed on the French princes was withdrawn, but he only transferred his establishment to Paris after their disabilities were also removed. In March 1872 he was restored to his rank in the army as general of division, and placed in the first section of the general staff. After his retirement from the active list he continued to act as president of the Red Cross Society until 1881, when new decrees against the princes of the blood led to his withdrawal from Parisian society. During the presidency of Marshal MacMahon, he had appeared from time to time at the Élysée. He died at Versailles on the 26th of June 1896, the duchess having died at Claremont on the 10th of November 1857. Their children were Louis Philippe Marie Ferdinand Gaston, comte d'Eu (b. 1842), who married Isabella, eldest daughter of Don Pedro II. of Brazil; Ferdinand Philippe Marie, duc d'Alençon (b. 1844), who married Sophie of Bavaria (1847–1897), sister of the empress Elizabeth of Austria; Margaret (1846–1893), who married Prince Ladislas Czartoryski; and Blanche (b. 1857).

See R. Bazin, *Le Duc de Nemours* (1907); Paul Thureau-Dangin, *Histoire de la monarchie de juillet* (4 vols., 1884, &c.).

NEMOURS, a town of northern France, in the department of Seine-et-Marne, on the Loing and its canal, 26 m. S. of Melun, on the Paris-Lyon railway. Pop. (1906) 4814. The church, which dates mainly from the 16th century, has a handsome wooden spire, and there is a feudal castle. A statue of the mathematician Bézout (d. 1783), a native of the town, was erected in 1885. In the vicinity is a group of fine sandstone rocks, and sand is extensively quarried. Nemours is supposed to derive its name from the woods (*nemora*) in the midst of which it formerly stood, and discoveries of Gallo-Roman remains indicate its early origin. It was captured by the English in 1420, but derives its historical importance rather from the lordship (afterwards duchy) to which it gave its name. In 1585 a treaty revoking previous concessions to the Protestants was concluded at Nemours between Catherine de Medici and the Guises.

NENADOVICH, MATEYA (1777–1854), Servian patriot, was born in 1777. He is generally called Prota Mateya, since as a boy of sixteen he was made a priest, and a few years later became archpriest (Prota) of Valyevo. His father, Alexa Nenadovich, *Knez* (chief magistrate) of the district of Valyevo, was one of the most popular and respected public men among the Servians at the beginning of the 19th century. When the four leaders of the Janissaries of the Belgrade Pashalic (the so-called Dahis) thought that the only way to prevent a general rising of the Servians was to intimidate them by murdering all their principal men, Alexa Nenadovich was one of the first victims. The policy of the Dahis, instead of preventing, did actually and immediately provoke a general insurrection of the Servians against the Turks. Prota Mateya became the deputy-commander of the insurgents of the Valyevo district (1804), but did not hold the post for long, as Karageorge sent him in 1805 on a secret mission to St Petersburg, and afterwards employed him almost constantly as Servia's diplomatic envoy to Russia, Austria, Bucharest and Constantinople. After the fall of Karageorge (1813), the new leader of the Servians, Milosh Obrenovich, sent Prota Mateya as representative of Servia to the Congress of Vienna (1814–1815), where he pleaded the Servian cause indefatigably. During that mission he often saw Lord Castlereagh, and for the first time the Servian national interests were brought to the knowledge of British statesmen.

Prota Mateya's memoirs are the most valuable authority for the history of the first and second Servian insurrections against the Turks. The best edition of the *Memoari Prote Mateye Nenadovicha* was published by the Servian Literary Association in Belgrade in 1893.

NENAGH, a market town of Co. Tipperary, Ireland, finely situated in a rich though hilly country near the river Nenagh, 96½ m. S.W. from Dublin by the Ballybrophy and Limerick branch of the Great Southern & Western railway. Pop. (1901) 4704. Of the old castle, called Nenagh Round, dating from the time of King John, there still exists the circular donjon or keep. There are no remains of the hospital founded in 1200 for Austin canons, nor of the Franciscan friary, founded in the reign of Henry III. and one of the richest religious houses in Ireland. The town is governed by an urban district council. It was one of the ancient manors of the Butlers, who received for it the grant of a fair from Henry VIII. In 1550 the town and friary were burned by O'Carroll. In 1641 the town was taken by Owen Roe O'Neill, but shortly afterwards it was recaptured by Lord Inchiquin. It surrendered to Ireton in 1651, and was burned by Sarsfield in 1688.

NENNIUS (fl. 796), a Welsh writer to whom we owe the *Historia Britonum*, lived and wrote in Brecknock or Radnor. His work is known to us through thirty manuscripts; but the earliest of these cannot be dated much earlier than the year 1000; and all are defaced by interpolations which give to the work so confused a character that critics were long disposed to treat it as an unskilful forgery. A new turn was given to the controversy by Heinrich Zimmer, who, in his *Nennius vindicatus* (1893), traced the history of the work and, by a comparison of the manuscripts with the 11th-century translation of the Irish scholar, Gilla Coemgim (d. 1072), succeeded in stripping off the later accretions from the original nucleus of the *Historia*. Zimmer follows previous critics in rejecting the *Prologus maior* (§§ 1, 2), the *Capitula*, or table of contents, and part of the *Mirabilia* which form the concluding section. But he proves that Nennius should be regarded as the compiler of the *Historia* proper (§§ 7-65). Zimmer's conclusions are of more interest to literary critics than to historians. The only part of the *Historia* which deserves to be treated as a historical document is the section known as the *Genealogiae Saxonum* (§§ 57-65). This is merely a recension of a work which was composed about 679 by a Briton of Strathclyde. The author's name is unknown; but he is, after Gildas, our earliest authority for the facts of the English conquest of England. Nennius himself gives us the oldest legends relating to the victories of King Arthur; the value of the *Historia* from this point of view is admitted by the severest critics. The chief authorities whom Nennius followed were Gildas' *De excidio Britonum*, Eusebius, the *Vita Patricii* of Murichu Maccu Machtheni, the *Collectanea* of Tirechan, the *Liber occupationis* (an Irish work on the settlement of Ireland), the *Liber de sex aetatibus mundi*, the chronicle of Prosper of Aquitaine, the *Liber beati Germani*. The sources from which he derived his notices of King Arthur (§ 56) have not been determined.

See J. Stevenson's edition of the *Historia Britonum* (English Hist. Soc., 1838), based on a careful study of the MSS.; A. de la Borderie, *L'Historia Britonum* (Paris and London, 1883), which summarizes the older negative criticism; H. Zimmer, *Nennius vindicatus* (Berlin, 1893); T. Mommsen in *Neues Archiv der Gesellschaft für ältere deutsche Geschichtskunde*, xix. 283. (H. W. C. D.)

NEO-CAESAREA, SYNOD OF, a synod held shortly after that of Ancyra, probably about 314 or 315 (although Hefele inclines to put it somewhat later). Its principal work was the adoption of fifteen disciplinary canons, which were subsequently accepted as ecumenical by the Council of Chalcedon, 451, and of which the most important are the following: i. degrading priests who marry after ordination; vii. forbidding a priest to be present at the second marriage of any one; viii. refusing ordination to the husband of an adulteress; xi. fixing thirty years as the age below which one might not be ordained (because Christ began His public ministry at the age of thirty); xiii. according to city priests the precedence over country priests; xiv. permitting *Chorepiscopi* to celebrate the sacraments; xv. requiring that there be seven deacons in every city.

See Mansi ii. pp. 539-551; Hardouin i. pp. 282-286; Hefele (2nd ed.) i. pp. 242-251 (Eng. trans. i. pp. 222-230). (T. F. C.)

NEOCOMIAN, in geology, the name given to the lowest stage of the Cretaceous system. It was introduced by J. Thurmann in 1835 on account of the development of these rocks at Neuchâtel (Neocomum), Switzerland. It has been employed in more than one sense. In the type area the rocks have been divided into two sub-stages, a lower, Valanginian (from Valengin, E. Desor, 1854) and an upper, Hauterivian (from Hauterive, E. Renevier, 1874); there is also another local sub-stage, the infra-Valanginian or Berriasian (from Berrias, H. Coquand, 1876). These three sub-stages constitute the Neocomian in its restricted sense. A. von Koenen and other German geologists extend the use of the term to include the whole of the Lower Cretaceous up to the top of the Gault or Albian. Renevier divided the Lower Cretaceous into the Neocomian division, embracing the three sub-stages mentioned above, and an Urgonian division, including the Barremian, Rhodanian and Aptian sub-stages. Sir A. Geikie (*Text Book of Geology*, 4th ed., 1903) regards "Neocomian" as synonymous with Lower Cretaceous, and he, like Renevier, closes this portion of the system at the top of the Lower Greensand (Aptian). Other British geologists (A. J. Jukes-Browne, &c.) restrict the Neocomian to the marine beds of Speeton and Tealby, and their estuarine equivalents, the Weald Clay and Hastings Sands (Wealden). Much confusion would be avoided by dropping the term Neocomian entirely and employing instead, for the type area, the sub-divisions given above. This becomes the more obvious when it is pointed out that the Berriasian type is limited to Dauphine; the Valanginian has not a much wider range; and the Hauterivian does not extend north of the Paris basin.

Characteristic fossils of the Berriasian are *Hoplites euthymi*, *H. occitanicus*; of the Valanginian, *Natica leviathan*, *Belemnites pistilliformis* and *B. dilatatus*, *Oxynoticeras Gevrili*; of the Hauterivian, *Hoplites radiatus*, *Crioceras capricornu*, *Exogyra Couloni* and *Toxaster complanatus*. The marine equivalents of these rocks in England are the lower Speeton Clays of Yorkshire and the Tealby beds of Lincolnshire. The Wealden beds of southern England represent approximately an estuarine phase of deposit of the same age. The Hils clay of Germany and Wealden of Hanover; the limestones and shales of Teschen; the *Aptychus* and *Pygope diphyoides* marls of Spain, and the Petchorian formation of Russia are equivalents of the Neocomian in its narrower sense.

See Cretaceous, Wealden, Speeton Beds. (J. A. H.)

NEOCORATE, a rank or dignity granted by the Senate under the Roman Empire to certain cities of Asia, which had built temples for the worship of the emperors or had established cults of members of the imperial family. The Greek word *νεωκόρος* meant literally a temple-sweeper (*νεώς*, temple, *κορεῖν*, to sweep), and was thence used both of a temple attendant and of a priestly holder of high rank who was in charge of a temple.

NEOLITHIC, or Later Stone Age (Gr. *νέος*, new, and *λίθος*, stone), a term employed first by Lord Avebury and since generally accepted, for the period of highly finished and polished stone implements, in contrast with the rude workmanship of those of the earlier Stone Age (Palaeolithic). Knowledge of Neolithic times is derived principally from four sources, Tumuli or ancient burial-mounds, the Lake-dwellings of Switzerland, the Kitchen-middens of Denmark and the Bone-Caves. No trace of metal is found, except gold, which seems to have been sometimes used for ornaments. Agriculture, pottery, weaving, the domestication of animals, the burying of the dead in dolmens, and the rearing of megalithic monuments are the typical developments of man during this stage.

See Archaeology; also Lord Avebury, *Prehistoric Times* (1900); Sir John Evans, *Ancient Stone Implements of Great Britain* (1897); Sir J. Prestwich, *Geology* (1886–1888).

NEOPHYTE (Gr. *νεόφυτος*, from *νέος*, new, *φυτόν*, a plant, "newly planted"), a word used in the Eleusinian and other mysteries to designate the newly initiated, and in the early church applied to newly baptized persons. These usually wore the white garments which they received at their admission to the church (see Baptism) for eight days, from Easter eve till the Sunday after Easter (hence called *Dominica in albis*), but they were subject to strict supervision for some time longer and, on the authority of 1 Tim. iii. 6, were generally held ineligible for election as bishops, a rule to which, however, history shows some notable exceptions, as in the cases of St Ambrose at Milan in 374 and Synesius of Cyrene at Ptolemais in 409, who were chosen bishops before they were even baptized. By the council of Nicaea (325) this rule was extended to the priesthood. The ancient discipline is still maintained in the Roman Church, and applies to converts from Christian sects as well as to those from heathenism. The period, however, is determined by circumstances. The term "neophyte" is also sometimes applied in the Roman Church to newly ordained priests, and even—though rarely—to novices of a religious order. In a transferred sense the word is also given to one beginning to learn any new subject.

See Bergier, *Dict. de théologie*, s.v.; Martigny, *Dict. des antiquités*, pp. 433–435; Siegel, *Christliche Alterthümer*, iii. 17 seq.; Riddle, *Christ. Antiquities*, pp. 313, 522; Walcott, *Sacred Archaeology*, s.v.

NEOPLATONISM, the name given specially to the last school of pagan philosophy, which grew up mainly among the Greeks of Alexandria from the 3rd century onwards. The term has also been applied to the Italian humanists of the Renaissance, and in modern times, somewhat vaguely, to thinkers who have based their speculations on the Platonic metaphysics or on Plotinus, and incorporated with it a tendency towards a mystical explanation of ultimate phenomena.

Historical Position and Significance.—The political history of the ancient world ends with the formation, under Diocletian and Constantine, of a universal state bearing the cast of Oriental as well as Graeco-Roman civilization. The history of ancient philosophy ends in like manner with a universal philosophy which assimilated elements of almost all the earlier systems, and worked up the results of Eastern and Western culture. Just as the Later Roman empire was at once the supreme effort of the old world and the outcome of its exhaustion, so Neoplatonism is in one aspect the consummation, in another the collapse, of ancient philosophy. Never before in Greek or in Roman speculation had the consciousness of man's dignity and superiority to nature found such adequate expression; never before had real science and pure knowledge been so undervalued and despised by the leaders of culture as they were by the Neoplatonists. Judged from the standpoint of empirical science, philosophy passed its meridian in Plato and Aristotle, declined in the post-Aristotelian systems, and set in the darkness of Neoplatonism. But, from the religious and moral point of view, it must be admitted that the ethical "mood" which Neoplatonism endeavoured to create and maintain is the highest and purest ever reached by antiquity.

It is a proof of the strength of the moral instincts of mankind that the only phase of culture which we can survey in all its stages from beginning to end culminated not in materialism, but in the boldest idealism. This idealism, however, is also in its way a mark of intellectual bankruptcy. Contempt for reason and science leads in the end to barbarism—its necessary consequence being the rudest superstition. As a matter of fact, barbarism did break out after the flower had fallen from Neoplatonism. The philosophers themselves, no doubt, still lived on the knowledge they repudiated; but the masses were trained to a superstition with which the Christian church, as the executor of Neoplatonism, had to reckon and contend. By a fortunate coincidence, at the very moment when this bankruptcy of the old culture must have become apparent, the stage of history was occupied by barbaric peoples. This has obscured the fact that the inner history of antiquity, ending as it did in despair of this world, must in any event have seen a recurrence of barbarism. The present world was a thing that men would neither enjoy nor master nor study. A new world was discovered, for the sake of which everything else was abandoned; to make sure of that world insight and intelligence were freely sacrificed; and, in the light that streamed from beyond, the absurdities of the present became wisdom, and its wisdom became foolishness.

Such is Neoplatonism. The pre-Socratic philosophy took its stand on natural science, to the exclusion of ethics and religion. The systems of Plato and Aristotle sought to adjust the rival claims of physics and ethics (although the supremacy of the latter was already acknowledged); but the popular religions were thrown overboard. The post-Aristotelian philosophy in all its branches makes withdrawal from the objective world its starting-point. It might seem, indeed, that Stoicism indicates a falling off from Plato and Aristotle towards materialism, but the ethical dualism, which was the ruling tendency of the Stoa, could not long endure its materialistic physics, and took refuge in the metaphysical dualism of the Platonists. But this originated no permanent philosophical creation. From one-sided Platonism issued the various forms of scepticism, the attempt to undermine the trustworthiness of empirical knowledge. Neoplatonism, coming last, borrowed something from all the schools. First, it stands in the line of post-Aristotelian systems; it is, in fact, as a subjective philosophy, their logical completion. Secondly, it is founded on scepticism; for it has neither interest in, nor reliance upon, empirical knowledge. Thirdly, it can justly claim the honour of Plato's name, since it expressly goes back to him for its metaphysics, directly combating those of the Stoa. Yet even on this point it learned something from the Stoics; the Neoplatonic conception of the action of the Deity on the world and of the essence and origin of matter can only be explained by reference to the dynamic pantheism of the Stoa. Fourthly, the study of Aristotle also exercised an influence on Neoplatonism. This appears not only in its philosophical method, but also—though less prominently—in its metaphysic. And, fifthly, Neoplatonism adopted the ethics of Stoicism; although it was found necessary to supplement them by a still higher conception of the functions of the spirit.

Thus, with the exception of Epicureanism—which was always treated by Neoplatonism as its mortal enemy—there is no outstanding earlier system which did not contribute something to the new philosophy. And yet Neoplatonism cannot be described as an eclectic system, in the ordinary sense of the word. For, in the first place, it is dominated by one all-pervading interest—the religious; and in the second place, it introduced a new first principle into philosophy, viz. the supra-rational, that which lies beyond reason and beyond reality. This principle is not to be identified with the "idea" of Plato or with the "form" of Aristotle. Neoplatonism perceived that neither sense perception nor rational cognition is a sufficient basis or justification for religious ethics; consequently it broke away from rationalistic ethics as decidedly as from utilitarian morality. It had therefore to find out a new world and a new spiritual function, in order first to establish the existence of what it desiderated, and then to realize and describe what it had proved to exist. Man, however, cannot transcend his psychological endowment. If he will not allow his thought to be determined by experience, he falls a victim to his imagination. In other words, thought, which will not stop, takes to mythology; and in the place of reason we have superstition. Still, as we cannot allow every fancy of the subjective reason to assert itself, we require some new and potent principle to keep the imagination within bounds. This is found in the authority of a sound tradition. Such authority must be superhuman, otherwise it can have no claim on our respect; it must, therefore, be divine. The highest sphere of knowledge—the supra-rational—as well as the very possibility of knowledge, must depend on divine communications—that is, on revelations. In short, philosophy as represented by Neoplatonism, its sole interest being a religious interest, and its highest object the supra-rational, must be a philosophy of revelation.

This is not a prominent feature in Plotinus or his immediate disciples, who still exhibit full confidence in the subjective presuppositions of their philosophy. But the later adherents of the school did not possess this confidence[1]; they based their philosophy on revelations of the Deity, and they found these in the religious traditions and rites of all nations. The Stoics had taught them to overstep the political boundaries of states and nationalities, and rise from the Hellenic to a universal human consciousness. Through all history the spirit of God has breathed; everywhere we discover the traces of His revelation. The older any religious tradition or mode of worship is, the more venerable is it, the richer in divine ideas. Hence the ancient religions of the East had a peculiar interest for the Neoplatonist. In the interpretation of myths Neoplatonism followed the allegorical method, as practised especially by the Stoa; but the importance it attached to the spiritualized myths was unknown to the Stoic philosophers. The latter interpreted the myths and were done with them; the later Neoplatonists treated them as the proper material and the secure foundation of philosophy. Neoplatonism claimed to be not merely the absolute philosophy, the keystone of all previous systems, but also the absolute religion, reinvigorating and transforming all previous religions. It contemplated a restoration of all the religions of antiquity, by allowing each to retain its traditional forms, and at the same time making each a vehicle for the religious attitude and the religious truth embraced in Neoplatonism; while every form of ritual was to become a stepping-stone to a high morality worthy of mankind. In short, Neoplatonism seizes on the aspiration of the human soul after a higher life, and treats this psychological fact as the key to the interpretation of the universe. Hence the existing religions, after being refined and spiritualized, were made the basis of philosophy.

Neoplatonism thus represents a stage in the history of religion; indeed this is precisely where its historical importance lies. In the progress of science and enlightenment it has no positive significance, except as a necessary transition which the race had to make in order to get rid of nature-religion, and that undervaluing of the spiritual life which formed an insuperable obstacle to the advance of human knowledge. Neoplatonism, however, failed as signally in its religious enterprise as it did in its philosophical. While seeking to perfect ancient philosophy, it really extinguished it; and in like manner its attempted reconstruction of ancient religions only resulted in their destruction. For in requiring these religions to impart certain prescribed religious truths, and to inculcate the highest moral tone, it burdened them with problems to which they were unequal. And further, by inviting them to loosen, though not exactly to dissolve, their political allegiance—the very thing that gave them stability—it removed the foundation on which they rested. But might it not then have placed them on a broader and firmer foundation? Was not the universal empire of Rome ready at hand, and might not the new religion have stood to it in the same relation of dependence which the earlier religions had held to the smaller nations and states? This was no longer possible. It is true that the political and spiritual histories of the peoples on the Mediterranean run in parallel lines, the one leading up to the universal monarchy of Rome, the other leading up to monotheism and universal human morality. But the spiritual development had shot far ahead of the political; even the Stoa occupied a height far beyond the reach of anything in the political sphere. It is also true that Neoplatonism sought to come to an understanding with the Byzantine Roman empire; Julian perished in the pursuit of this project. But even before his day the shrewder Neoplatonists had seen that their lofty religious philosophy could not stoop to an alliance with the despotic world-empire, because it could not come in contact with the world at all. To Neoplatonism political affairs are at bottom as indifferent as all other earthly things. The idealism of the new philosophy was too heavenly to be naturalized in the Byzantine empire, which stood more in need of police officials than of philosophers. Important and instructive, therefore, as are the attempts made from time to time by the state and by individual philosophers to unite Neoplatonism and the universal monarchy, their failure was a foregone conclusion.

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[1] Porphyry wrote a book, *περὶ τῆς ἐκ λογίων φιλοσοφίας*, but this was before he became a pupil of Plotinus; as a philosopher he was independent of the *λόγια*.

There is one other question which we are called upon to raise here. Why did not Neoplatonism set up an independent religious community? Why did it not provide for its mixed multitude of divinities by founding a universal church, in which all the gods of all nations might be worshipped along with the one ineffable Deity? The answer to this question involves the answer to another—Why was Neoplatonism defeated by Christianity? Three essentials of a permanent religious foundation were wanting in Neoplatonism; they are admirably indicated in Augustine's *Confessions* (vii. 18-21). First, and chiefly, it lacked a religious founder; second, it could not tell how the state of inward peace and blessedness could become permanent; third, it had no means to win those who were not endowed with the speculative faculty. The philosophical discipline which it recommended for the attainment of the highest good was beyond the reach of the masses; and the way by which the masses could attain the highest good was a secret unknown to Neoplatonism. Thus it remained a school for the " wise and prudent "; and when Julian tried to enlist the sympathies of the common rude man for the doctrines and worship of this school, he was met with scorn and ridicule.

It is not as a philosophy, then, nor as a new religion, that Neoplatonism became a decisive factor in history, but, if one may use the expression, as a " mood." The instinctive certainty that there is a supreme good, lying beyond empirical experience, and yet not an intellectual good—this feeling, and the accompanying conviction of the utter vanity of all earthly things, were produced and sustained by Neoplatonism. Only it could not describe the nature of this highest good; and therefore it had to abandon itself to imagination and aesthetic impressions. It changed thought into an emotional dream; it plunged into the ocean of sentiment; it treated the old world of fable as the reflection of a higher reality, and transformed reality into poetry; and after all these expedients, to borrow a phrase of Augustine's, it only saw afar off the land of its desire.

Yet the influence of Neoplatonism on the history of our ethical culture is immeasurable, above all because it begot the consciousness that the only blessedness which can satisfy the heart must be sought higher even than the sphere of reason. That man shall not live by bread alone, the world had learned before Neoplatonism; but Neoplatonism enforced the deeper truth—a truth which the older philosophy had missed—that man shall not live by knowledge alone. And, besides the propaedeutic importance which thus belongs to it, another fact has to be taken into account in estimating the influence of Neoplatonism. It is to this day the nursery of that whole type of devotion which affects renunciation of the world, which strives after an ideal, without the strength to rise above aesthetic impressions, and is never able to form a clear conception of the object of its own aspiration.

Origin.—As forerunners of Neoplatonism we may regard, on the one hand, those Stoics who accepted the Platonic distinction between the sensible world and the intelligible, and, on the other hand, the so-called Neopythagoreans and religious philosophers like Plutarch of Chaeronea and especially Numenius of Apamea. But these cannot be considered the actual progenitors of Neoplatonism; their philosophic method is quite elementary as compared with the Neoplatonic, their fundamental principles are uncertain, and unbounded deference is still paid to the authority of Plato. The Jewish and Christian thinkers of the first two centuries approach considerably nearer than Numenius to the later Neoplatonism.[1] Here we have Philo, to begin with. Philo, who translated the Old Testament religion into the terms of Hellenic thought, holds as an inference from his theory of revelation that the divine Supreme Being is " supra-rational," that He can be reached only through " ecstasy ", and that the oracles of God supply the material of moral and religious knowledge. The religious ethics of Philo—a compound of Stoic, Platonic and Neopythagorean elements—already bear the peculiar stamp which we recognize in Neoplatonism. While his system assigns the supremacy to Greek philosophy over the national religion of Israel, it exacts from the former, as a sort of tribute to the latter, the recognition of the elevation of God above the province of reason. The claim of positive religion to be something more than the intellectual apprehension of the reason in the universe is thus acknowledged. Religious syncretism is also a feature of Philo's system, but it differs essentially from what we find in later Neoplatonism. For Philo pays no respect to any cultus except the Jewish; and he believed that all the fragments of truth to be found amongst Greeks and Romans had been borrowed from the books of Moses. The earliest Christian philosophers, particularly Justin and Athenagoras, likewise prepared the way for the speculations of the Neoplatonists—partly by their attempts to connect Christianity with Stoicism and Platonism, partly by their ambition to exhibit Christianity as " hyperplatonic." In the introduction to his *Dialogue with Trypho*, Justin follows a method which bears a striking resemblance to the later method of Neoplatonism: he seeks to base the Christian knowledge of God—that is, the knowledge of the truth—on Platonism, Scepticism and " Revelation." A still more remarkable parallel to the later Neoplatonism is afforded by the Christian Gnostics of Alexandria, especially Valentinus and the followers of Basilides.[2] Like the Neoplatonists, the Basilidians believed, not in an emanation from the Godhead, but in a dynamic manifestation of its activity. The same is true of Valentinus, who also placed an unnameable being at the apex of his system, and regarded matter, not as a second principle, but as a product of the one divine principle. It must be added that the dependence of Basilides and Valentinus on Zeno and Plato is beyond dispute. But the method observed by these Gnostics in thinking out the plan and the history of the universe is by no means thoroughgoing. Ancient myths are admitted without undergoing analysis; the most naïve realism alternates with daring efforts at spiritualizing. Philosophically considered, therefore, the Gnostic systems are very unlike the rigorous self-consistency of Neoplatonism; although they certainly contain almost all the elements which enter into the Neoplatonic theory of the universe.

But were the oldest Neoplatonists really acquainted with the speculations of Philo, or Justin, or Valentinus, or Basilides? Did they know the Oriental religions, Judaism and Christianity in particular? And, if so, did they really derive anything from these sources?

To these questions we cannot give decided, still less definite and precise, answers. Since Neoplatonism originated in Alexandria, where Oriental modes of worship were accessible to every one, and since the Jewish philosophy had also taken its place in the literary circles of Alexandria, we may safely assume that even the earliest of the Neoplatonists possessed an acquaintance with Judaism and Christianity. But if we search Plotinus for evidence of any actual influence of Jewish and Christian philosophy, we search in vain; and the existence of any such influence is all the more unlikely because it is only the later Neoplatonism that offers striking and deep-rooted parallels to Philo and the Gnostics. The Philonic and Gnostic philosophies thus appear to be merely an historical anticipation of the Neoplatonic, without any real connexion. Nor is there anything mysterious in such an anticipation. It simply means that a certain religious and philosophical tendency, which grew up slowly on Greek soil, was already implanted in those who occupied the vantage-ground of a revealed religion of redemption. We have to come down to Iamblichus and his school before we find complete correspondence with the Christian Gnosticism of the 2nd century; that is to say, it is only in the 4th century that Greek philosophy in its proper development reaches the stage at which certain Greek philosophers who had embraced Christianity had arrived in the 2nd century. The influence of Christianity—whether Gnostic or Catholic—on Neoplatonism was at no time very considerable, although individual Neoplatonists, after Amelius, used Christian texts as oracles, and put on record their admiration for Christ.

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[1] The resemblance would probably be still more apparent if we thoroughly understood the development of Christianity at Alexandria in the 2nd century; but unfortunately we have only very meagre fragments to guide us here.

[2] The dogmas of the Basilidians, as given by Hippolytus, read almost like passages from Neoplatonic works: *ἐπεὶ οὐδὲν ἦν, οὐχ ὕλη, οὐκ οὐσία, οὐκ ἀνούσιον, οὐχ ἁπλοῦν, οὐ σύνθετον, οὐκ ἀνόητον, οὐκ ἀναίσθητον, οὐκ ἄνθρωπος. . . . . οὐκ ὢν θεὸς ἀνοήτως, ἀναισθήτως, ἀβούλως, ἀπροαιρέτως, ἀπαθῶς, ἀνεπιθυμήτως κόσμον ἠθέλησε ποιῆσαι. . . . οὕτως οὐκ ὢν θεὸς ἐποίησε κόσμον οὐκ ὄντα ἐξ οὐκ ὄντων, καταβαλόμενος καὶ ὑποστήσας σπέρμα τι ἓν ἔχον πᾶσαν ἐν ἑαυτῷ τὴν τοῦ κόσμου πανσπερμίαν* (*Philos.* vii. 20 seq.). See GNOSTICISM, BASILIDES, &c.

History and Doctrines.—The founder of the Neoplatonic school in Alexandria is supposed to have been Ammonius Saccas (*q.v.*). **Plotinus.** But the *Enneads* of his pupil Plotinus are the primary and classical document of Neoplatonism. The doctrine of Plotinus is mysticism, and like all mysticism it consists of two main divisions. The first or theoretical part deals with the high origin of the human soul, and shows how it has departed from its first estate. In the second or practical part the way is pointed out by which the soul may again return to the Eternal and Supreme. Since the soul in its longings reaches forth beyond all sensible things, beyond the world of ideas even, it follows that the highest being must be something supra-rational. The system thus embraces three heads—(1) the primeval Being, (2) the ideal world and the soul, (3) the phenomenal world. We may also, however, in accordance with the views of Plotinus, divide thus: (A) the invisible world—(1) the primeval Being, (2) the ideal world, (3) the soul; (B) the phenomenal world.

The primeval Being is, as opposed to the many, the One; as opposed to the finite, the Infinite, the unlimited. It is the source of all life, and therefore absolute causality and the only real existence. It is, moreover, the Good, in so far as all finite things have their purpose in it, and ought to flow back to it. But one cannot attach moral attributes to the original Being itself, because these would imply limitation. It has no attributes of any kind; it is being without magnitude, without life, without thought; in strict propriety, indeed, we ought not to speak of it as existing; it is "above existence," "above goodness." It is also active force without a substratum; as active force the primeval Being is perpetually producing something else, without alteration, or motion, or diminution of itself. This production is not a physical process, but an emission of force; and, since the product has real existence only in virtue of the original existence working in it, Neoplatonism may be described as a species of dynamic pantheism. Directly or indirectly, everything is brought forth by the "One." In it all things, so far as they have being, are divine, and God is all in all. Derived existence, however, is not like the original Being itself, but is subject to a law of diminishing completeness. It is indeed an image and reflection of the first Being; but the further the line of successive projections is prolonged the smaller is its share in the true existence. The totality of being may thus be conceived as a series of concentric circles, fading away towards the verge of non-existence, the force of the original Being in the outermost circle being a vanishing quantity. Each lower stage of being is united with the "One" by all the higher stages, and receives its share of reality only by transmission through them. All derived existence, however, has a drift towards, a longing for, the higher, and bends towards it so far as its nature will permit.

The original Being first of all throws out the *nous*, which is a perfect image of the One and the archetype of all existing things. It is at once being and thought, ideal world and idea. As image, the nous corresponds perfectly to the One, but as derived it is entirely different. What Plotinus understands by the nous is the highest sphere accessible to the human mind (*κόσμος νοητός*), and, along with that, pure thought itself.

The image and product of the motionless nous is the soul, which, according to Plotinus is, like the nous, immaterial. Its relation to the nous is the same as that of the nous to the One. It stands between the nous and the phenomenal world, is permeated and illuminated by the former, but is also in contact with the latter. The nous is indivisible; the soul *may* preserve its unity and remain in the nous, but at the same time it has the power of uniting with the corporeal world and thus being disintegrated. It therefore occupies an intermediate position. As a single soul (world-soul) it belongs in essence and destination to the intelligible world; but it also embraces innumerable individual souls; and these can either submit to be ruled by the nous, or turn aside to the sensual and lose themselves in the finite.

Then the soul, a moving essence, generates the corporeal or phenomenal world. This world ought to be so pervaded by the soul that its various parts should remain in perfect harmony. Plotinus is no dualist, like the Christian Gnostics; he admires the beauty and splendour of the world. So long as idea governs matter, or the soul governs the body, the world is fair and good. It is an image—though a shadowy image—of the upper world, and the degrees of better and worse in it are essential to the harmony of the whole. But in the actual phenomenal world unity and harmony are replaced by strife and discord; the result is a conflict, a becoming and vanishing, an illusive existence. And the reason for this state of things is that bodies rest on a substratum of matter. Matter is the basework of each (*τὸ βάθος ἑκάστου ἡ ὕλη*); it is the dark principle, the indeterminate, that which has no qualities, the *μὴ ὄν*. Destitute of form and idea, it is evil; as capable of form it is neutral.

The human souls which have descended into corporeality are those which have allowed themselves to be ensnared by sensuality and overpowered by lust. They now seek to cut themselves loose from their true being; and, striving after independence, they assume a false existence. They must turn back from this; and, since they have not lost their freedom, a conversion is still possible.

Here, then, we enter upon the practical philosophy. Along the same road by which it descended the soul must retrace its steps back to the supreme Good. It must first of all return to itself. This is accomplished by the practice of virtue, which aims at likeness to God, and leads up to God. In the ethics of Plotinus all the older schemes of virtue are taken over and arranged in a graduated series. The lowest stage is that of the civil virtues, then follow the purifying, and last of all the divine virtues. The civil virtues merely adorn the life, without elevating the soul. That is the office of the purifying virtues, by which the soul is freed from sensuality and led back to itself, and thence to the nous. By means of ascetic observances the man becomes once more a spiritual and enduring being, free from all sin. But there is still a higher attainment; it is not enough to be sinless, one must become "God." This is reached through contemplation of the primeval Being, the One—in other words, through an ecstatic approach to it. Thought cannot attain to this, for thought reaches only to the nous, and is itself a kind of motion. It is only in a state of perfect passivity and repose that the soul can recognize and touch the primeval Being. Hence the soul must first pass through a spiritual curriculum. Beginning with the contemplation of corporeal things in their multiplicity and harmony, it then retires upon itself and withdraws into the depths of its own being, rising thence to the nous, the world of ideas. But even there it does not find the Highest, the One; it still hears a voice saying, "not we have made ourselves." The last stage is reached when, in the highest tension and concentration, beholding in silence and utter forgetfulness of all things, it is able as it were to lose itself. Then it may see God, the fountain of life, the source of being, the origin of all good, the root of the soul. In that moment it enjoys the highest indescribable bliss; it is as it were swallowed up of divinity, bathed in the light of eternity.[1]

Such is the religious philosophy of Plotinus, and for himself personally it sufficed, without the aid of the popular religion or worship. Nevertheless he sought for points of support in these. God is certainly in the truest sense nothing but the primeval Being; but He reveals Himself in a variety of emanations and manifestations. The nous is a sort of second god, the *λόγοι* which are wrapped up in it are gods, the stars are gods, and so on. A rigid monotheism appeared to Plotinus a miserable conception. He gave a meaning to the myths of the popular religions, and he had something to say even for magic, soothsaying and prayer. In support of image-worship he advanced arguments which were afterwards adopted by the Christian image-worshippers. Still, as compared with the later Neoplatonists, he is comparatively free from crass superstition and wild fanaticism. He is not to be classed amongst the "deceived deceivers," and the restoration of the worship of the old gods was by no means his chief object.

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[1] Porphyry tells us that on four occasions during the six years of their intercourse Plotinus attained to this ecstatic union with God.

Porphyry.

Amongst his pupils, Amelius and Porphyry are the most eminent. Amelius modified the teaching of Plotinus on certain points; and he also put some value on the prologue to the Gospel of John. To Porphyry (*q.v.*) belongs the credit of having recast and popularized the system of his master Plotinus. He was not an original thinker, but a diligent student, distinguished by great learning, by a turn for historical and philological criticism, and by an earnest purpose to uproot false teaching—especially Christianity, to ennoble men and train them to goodness. The system of Porphyry is more emphatically practical and religious than that of Plotinus. The object of philosophy, according to Porphyry, is the salvation of the soul. The origin and the blame of evil are not in the body, but in the desires of the soul. Hence the strictest asceticism (abstinence from flesh, and wine, and sexual intercourse) is demanded, as well as the knowledge of God. As he advanced in life, Porphyry protested more and more earnestly against the rude faith of the common people and their immoral worships. But, outspoken as he was in his criticism of the popular religions, he had no wish to give them up. He stood up for a pure worship of the many gods, and maintained the cause of every old national religion and the ceremonial duties of its adherents. His work *Against the Christians* was directed, not against Christ, nor even against what he believed to be Christ's teaching, but against the Christians of his own day and their sacred books, which, according to Porphyry, were the work of deceivers and ignorant people. In his trenchant criticism of the origin of what passed for Christianity in his time, he spoke bitter and severe truths, which have gained for him the reputation of the most rabid and wicked of all the enemies of Christianity. His work was destroyed,[1] but the copious extracts which we find in Lactantius, Augustine, Jerome, Macarius Magnus and others show how profoundly he had studied the Christian writings, and how great was his talent for real historical research.

Iamblichus.

Porphyry marks the transition to a new phase of Neoplatonism, in which it becomes completely subservient to polytheism, and seeks before everything else to protect the Greek and Oriental religions from the formidable assault of Christianity. In the hands of Iamblichus (*q.v.*), the pupil of Porphyry, Neoplatonism is changed "from a philosophical theory to a theological doctrine." The distinctive tenets of Iamblichus cannot be accounted for from scientific but only from practical considerations. In order to justify superstition and the ancient forms of worship, philosophy becomes in his hands a theurgy, a knowledge of mysteries, a sort of spiritualism.

To this period also belongs a set of "philosophers," with regard to whom it is impossible to say whether they are dupes or impostors—the "decepti deceptores" of whom Augustine speaks. In this philosophy the mystical properties of numbers are a leading feature; absurd and mechanical notions are glossed over with the sheen of sacramental mystery; myths are explained by pious fancies and fine-sounding pietistic reflections; miracles, even the most ridiculous, are believed in, and miracles are wrought. The "philosopher" has become a priest of magic and philosophy a method of incantation. Moreover, in the unbridled exercise of speculation, the number of divine beings was increased indefinitely; and these fantastic accessions to Olympus in the system of Iamblichus show that Greek philosophy is returning to mythology, and that nature-religion is still a power in the world. And yet it is undeniable that the very noblest and choicest minds of the 4th century are to be found in the ranks of the Neoplatonists. So great was the general decline that this Neoplatonic philosophy offered a welcome shelter to many earnest and influential men, in spite of the charlatans and hypocrites who were gathered under the same roof. On certain points of doctrine, too, the dogmatic of Iamblichus indicates a real advance. Thus his emphatic assertion of the truth that the seat of evil is in the will is noteworthy; and so also is his repudiation of Plotinus's theory of the divinity of the soul.

The numerous followers of Iamblichus—Aedesius, Chrysanthius, Eusebius, Priscus, Sopater, Sallust, and, most famous of all, Maximus (*q.v.*), rendered little service to speculation. Some of them (Themistius in particular) are known as commentators on the older philosophers, and others as the missionaries of mysticism. The work *De mysteriis Aegyptiorum* is the best sample of the views and aims of these philosophers. Their hopes rose high when Julian ascended the imperial throne (361–363). But the emperor himself lived long enough to see that his romantic policy of restoration was to leave no results; and after his early death all hope of extinguishing Christianity was abandoned.

Influence of Christianity.

But undoubtedly the victory of Christianity in the age of Valentinian and Theodosius had a purifying influence on Neoplatonism. During the struggle for supremacy, the philosophers had been driven to make common cause with everything that was hostile to Christianity. But now Neoplatonism was thrust from the great stage of history. The church and church theology, to whose guidance the masses now surrendered themselves, took in along with them their superstition, their polytheism, their magic, their myths, and all the machinery of religious witchcraft. The more all this settled and established itself—certainly not without opposition—in the church the purer did Neoplatonism become. While maintaining intact its religious attitude and its theory of knowledge, it returned with new zest to scientific studies, especially the study of the old philosophers. If Plato still remains the divine philosopher, yet we can perceive that after the year 400 the writings of Aristotle are increasingly read and valued. In the chief cities of the empire Neoplatonic schools flourished till the beginning of the 5th century; during this period, indeed, they were the training-schools of Christian theologians. At Alexandria the noble Hypatia (*q.v.*) taught, to whose memory her impassioned disciple Synesius, afterwards a bishop, reared a splendid monument. But after the beginning of the 5th century the fanaticism of the church could no longer endure the presence of "heathenism." The murder of Hypatia was the death of philosophy in Alexandria, although the school there maintained a lingering existence till the middle of the 6th century. But there was one city of the East which, lying apart from the crowded highways of the world, had sunk to a mere provincial town, and yet possessed associations which the church of the 5th century felt herself powerless to eradicate. In Athens a Neoplatonic school still flourished. There, under the monuments of its glorious past, Hellenism found its last retreat. The school of Athens returned to a stricter philosophical method and the cultivation of scholarship. Still holding by a religious philosophy, it undertook to reduce the whole Greek tradition, as seen in the light of Plotinus, to a comprehensive and closely knit system. Hence the philosophy which arose at Athens was what may fairly be termed scholasticism. For every philosophy is scholastic whose subject-matter is imaginative and mystical, and which handles this subject-matter according to established rules in logical categories and distinctions. Now to these Neoplatonists, the books of Plato, along with certain divine oracles, the Orphic poems, and much more which they assigned to a remote antiquity, were documents of canonical authority; they were inspired divine writings. Out of these they drew the material of their philosophy, which they then proceeded to elaborate with the appliances of dialectic.

Proclus.

The most distinguished teachers at Athens were Plutarch (*q.v.*), his disciple Syrianus (who did important work as a commentator on Plato and Aristotle, and further deserves mention for his vigorous defence of the freedom of the will), but above all Proclus (411–485). Proclus is the great schoolman of Neoplatonism. It was he who, combining religious ardour with formal acuteness, connected the whole mass of traditional lore into a huge system, making good defects, and smoothing away contradictions by means of distinctions and speculations. "It was reserved for Proclus," says Zeller, "to bring the Neoplatonic philosophy to its formal conclusion by the rigorous consistency of his dialectic, and, keeping in view all the modifications which it had undergone in the course of two centuries, to give it that form in which it was transferred to Christianity and Mahommedanism in the middle ages." Forty-four years after the death of Proclus the school of Athens was closed by Justinian (A.D. 529); but it had already fulfilled its mission in the work of Proclus. The works of Proclus, as the last testament of Hellenism to the church and the middle ages, exerted an incalculable influence on the next thousand years. They not only formed one of the bridges by which the medieval thinkers got back to Plato and Aristotle; they determined the scientific method of thirty generations, and they partly created and partly nourished the Christian mysticism of the middle ages.

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[1] It was condemned by an edict of the emperors Theodosius II. and Valentinian in the year 448.

The disciples of Proclus are not eminent (Marinus, Asclepiodotus, Ammonius, Zenodotus, Isidorus, Hegias, Damascius). The last president of the Athenian school was Damascius (*q.v.*). When Justinian issued the edict for the suppression of the school, Damascius along with Simplicius (the painstaking commentator on Aristotle) and five other Neoplatonists set out to make a home in Persia. They found the conditions were unfavourable and were allowed to return (see CHOSROES I.).

At the beginning of the 6th century Neoplatonism had ceased to exist in the East as an independent philosophy. Almost at the same time, however—and the coincidence is not accidental—it made new conquests in the church theology through the writings of the pseudo-Dionysius. It began to bear fruit in Christian mysticism, and to diffuse a new magical leaven through the worship of the church.

In the West, where philosophical efforts of any kind had been very rare since the 2nd century, and where mystical contemplation did not meet with the necessary conditions, Neoplatonism found a congenial soil only in isolated individuals. C. Marius Victorinus (*q.v.*) translated certain works of Plotinus, and thus had a decisive influence on the spiritual history of Augustine (*Confess.* vii. 9, viii. 2). It may be said that Neoplatonism influenced the West only through the medium of the church theology, or, in some instances, under that disguise. Even Boetius (it may now be considered certain) was a catholic Christian, although his whole mode of thought was certainly Neoplatonic (see BOETIUS). His violent death in the year 525 marks the end of independent philosophy in the West. But indeed this last of the Roman philosophers stood quite alone in his century, and the philosophy for which he lived was neither original, nor well-grounded, nor methodically developed.

Neoplatonism and the Theology of the Church.—The question as to the influence of Neoplatonism on the development of Christianity is not easily answered, because it is scarcely possible to get a complete view of their mutual relations. The answer will depend, in the first instance, upon how much is included under the term "Neoplatonism." If Neoplatonism is understood in the widest sense, as the highest and fittest expression of the religious movements at work in the Graeco-Roman empire from the 2nd to the 5th century, then it may be regarded as the twin-sister of the church dogmatic which grew up during the same period; the younger sister was brought up by the elder, then rebelled against her and at last tyrannized over her. The Neoplatonists themselves characterized the theologians of the church as intruders, who had appropriated the Greek philosophy and spoiled it by the admixture of strange fables. Thus Porphyry says of Origen (Euseb. *H.E.* vi. 19), "The outer life of Origen was that of a Christian and contrary to law; but, as far as his views of things and of God are concerned, he thought like the Greeks, whose conceptions he overlaid with foreign myths." This verdict of Porphyry's is at all events more just and apt than that of the theologians on the Greek philosophers, when they accused them of having borrowed all their really valuable doctrines from the ancient Christian books. But the important point is that the relationship was acknowledged on both sides. Now, in so far as both Neoplatonism and the church dogmatic set out from the felt need of redemption, in so far as both sought to deliver the soul from sensuality and recognized man's inability without divine aid—without a revelation—to attain salvation and a sure knowledge of the truth, they are at once most intimately related and at the same time mutually independent. It must be confessed that when Christianity began to project a theology it was already deeply impregnated by Hellenic influences. But the influence is to be traced not so much to philosophy as to the general culture of the time, and the whole set of conditions under which spiritual life was manifested. When Neoplatonism appeared, the Christian church had already laid down the main positions of her theology; or if not, she worked them out alongside of Neoplatonism—*that* is not a mere accident—but still independently. It was only by identifying itself with the whole history of Greek philosophy, or by figuring as pure Platonism restored, that Neoplatonism could stigmatize the church theology of Alexandria as a plagiarism from itself. These assumptions, however, were fanciful. Although our sources are unfortunately very imperfect, the theology of the church does not appear to have learned much from Neoplatonism in the 3rd century—partly because the latter had not yet reached the form in which its doctrines could be accepted by the church dogmatic, and partly because theology was otherwise occupied. Her first business was to plant herself firmly on her own territory, to make good her position and clear away old and objectionable opinions. Origen was quite as independent a thinker as Plotinus; only, they both drew on the same tradition. From the 4th century downwards, however, the influence of Neoplatonism on the Oriental theologians was of the utmost importance. The church gradually expressed her most peculiar convictions in dogmas, which were formulated by philosophical methods, but were irreconcilable with Neoplatonism (the Christological dogmas); and the further this process went the more unrestrainedly did theologians resign themselves to the influence of Neoplatonism on all other questions. The doctrines of the incarnation, the resurrection of the flesh and the creation of the world in time marked the boundary line between the church's dogmatic and Neoplatonism; in every other respect, theologians and Neoplatonists drew so closely together that many of them are completely at one. In fact, there were special cases, like that of Synesius, in which a speculative reconstruction of distinctively Christian doctrines by Christian men was winked at. If a book does not happen to touch on any of the above-mentioned doctrines, it may often be doubtful whether the writer is a Christian or a Neoplatonist. In ethical precepts, in directions for right living (that is, asceticism), the two systems approximate more and more closely. But it was here that Neoplatonism finally celebrated its greatest triumph. It indoctrinated the church with all its mysticism, its mystic exercises and even its magical cultus as taught by Iamblichus. The works of the pseudo-Dionysius contain a gnosis in which, by means of the teaching of Iamblichus and Proclus, the church's theology is turned into a scholastic mysticism with directions on matters of practice and ritual. And as these writings were attributed to Dionysius, the disciple of the apostles, the scholastic mysticism which they unfold was regarded as an apostolic, not to say a divine, science. The influence exercised by these writings, first on the East, and then—after the 9th (or 12th) century—on the West, cannot be overestimated. It is impossible to enlarge upon it here; suffice it to say that the mystical and pietistic devotion of our own day, even in the Protestant churches, is nourished on works whose ancestry can be traced, through a series of intermediate links, to the writings of the pseudo-Areopagite.

In the ancient world there was only one Western theologian who came directly under the influence of Neoplatonism; but that one is Augustine, the most important of them all. It was through Neoplatonism that Augustine got rid of scepticism and the last dregs of Manichaeism. In the seventh book of his *Confessions* he has recorded how much he owed to the perusal of Neoplatonic works. On all the cardinal doctrines—God, matter, the relation of God to the world, freedom and evil—Augustine retained the impress of Neoplatonism; at the same time he is the theologian of antiquity who most clearly perceived and most fully stated wherein Neoplatonism and Christianity differ. The best ever written by any church father on this subject is to be found in chaps. ix.-xxi. of the seventh book of the *Confessions.*

Why Neoplatonism succumbed in the conflict with Christianity is a question which the historians have never satisfactorily answered. As a rule, the problem is not even stated correctly. We have nothing to do here with our own private ideal of Christianity, but solely with catholic Christianity and catholic theology. These are the forces that conquered Neoplatonism, after assimilating nearly everything that it contained. Further, we must consider the arena in which the victory was won. The battlefield was the empire of Constantine and Theodosius. It is only when these and all other circumstances of the case are duly realized that we have a right to inquire how much the essential doctrines of Christianity contributed to the victory, and what share must be assigned to the organization of the church.

In medieval theology and philosophy mysticism appears as the powerful opponent of rationalistic dogmatism. The empirical science of the Renaissance and the two following centuries was itself a new development of Platonism and Neoplatonism, as opposed to rationalistic dogmatism, with its contempt for experience. Magic, astrology and alchemy—all the outgrowth of Neoplatonism—gave the first effectual stimulus to the observation of nature, and consequently to natural science, and in this way finally extinguished barren rationalism. Thus in the history of science Neoplatonism has played a part and rendered services of which Plotinus or Iamblichus or Proclus never dreamt. So true is it that sober history is often stranger and more capricious than all the marvels of legend and romance.

Authorities.—On the relation of Neoplatonism to Christianity, and the historical importance of Neoplatonism generally, see the leading church histories, and the *Histories of Dogma* by Baur, Nitzsch, Harnack, &c. Compare also Löffler, *Der Platonismus der Kirchenväter* (1782); Huber, *Die Philosophie der Kirchenväter* (1859); Tzchirner, *Fall des Heidenthums* (1829), pp. 574-618; Burckhardt, *Die Zeit Constantin's des Grossen* (1853); Chastel, *Hist. de la destruction du Paganisme dans l'empire d'Orient* (1850); Beugnot, *Hist. de la destruction du Paganisme en Occident* (1835); E. von Lasaulx, *Der Untergang des Hellenismus* (1854); Vogt, *Neuplatonismus und Christenthum* (1836); Ullmann, "Einfluss des Christenthums auf Porphyrius," in the *Stud. u. Kritiken* (1832); Jean Réville, *La Religion à Rome sous les Sévères* (1886); C. Bigg, *The Christian Platonists of Alexandria* (1886) and *Neoplatonism* (1895); Rufus M. Jones, *Studies in Mystical Religion* (1909), pp. 70 foll. See further, C. Schmidt, *Gnostische Schriften in Koptischer Sprache* (1892); K. P. Hasse, *Von Plotin zu Goethe* (1909); Thomas Whittaker, The Neo-Platonists (1901); Petrie, *Personal Religion in Egypt before Christ* (1909); M. Heinze, "Neuplatonismus," in Herzog-Hauck, *Realencyk.* vol. xiii. (1903). On the after-effects of Neoplatonism on the church's dogmatic, see Ritschl, *Theologie und Metaphysik* (1881). On the relation of Neoplatonism to Monachism, compare Keim, *Aus dem Urchristenthum* (1878). On the history of Neoplatonism with special reference to the decline of Roman polytheism, see, *e.g.*, Samuel Dill, *Roman Society in the Last Century of the Western Empire* (1898), pp. 82 foll. On Plotinus, Porphyry, &c., see separate articles. (A. Ha.; J. M. M.)

NEOPTOLEMUS (also called Pyrrhus), in Greek legend, the son of Achilles and Deïdameia. He was brought up by his grandfather Lycomedes in the island of Scyros, and taken to Troy in the last year of the war by Odysseus, since Helenus had declared that the city could not be captured without the aid of a descendant of Aeacus. Neoptolemus was famed for his beauty, eloquence and bravery. He was one of the warriors in the wooden horse and slew Priam at the sack of Troy (*Odyssey*, xi. 508-526; *Aeneid*, ii. 527). Apart from these Trojan tales, Neoptolemus is a prominent figure in the legends of Epirus and of Delphi. He was the ancestor of the Molossian kings, who therefore claimed to be of pure Hellenic stock. He was murdered at Delphi, where he was buried, and a festival was held in his honour every eighth year.

NEOPYTHAGOREANISM, a Graeco-Alexandrian school of philosophy, which became prominent in the 1st century A.D. Very little is known about the members of this school, and there has been much discussion as to whether the Pythagorean literature which was widely published at the time in Alexandria was the original work of 1st-century writers or merely reproductions of and commentaries on the older Pythagorean writings. The only well-known members of the school were Apollonius of Tyana and Moderatus of Gades. In the previous century Cicero's learned friend P. Nigidius Figulus (d. 45 B.C.) had made an attempt to revive Pythagorean doctrines, but he cannot be described as a member of the school. Further, it is necessary to distinguish from the Neopythagoreans a number of Eclectic Platonists, who, during the 1st century of our era, maintained views which had a similar tendency (*e.g.* Apuleius of Madaura, Plutarch of Chaeronea and, later, Numenius of Apamea).

Neopythagoreanism was the first product of an age in which abstract philosophy had begun to pall. The Stoics discovered that their "perfect man" was not to be found in the luxurious, often morbid society of the Graeco-Roman world; that something more than dialectic ethics was needed to reawaken a sense of responsibility. A degenerate society cared nothing for syllogisms grown threadbare by repetition. Neopythagoreanism was an attempt to introduce a religious element into pagan philosophy in place of what had come to be regarded as an arid formalism. The founders of the school sought to invest their doctrines with the halo of tradition by ascribing them to Pythagoras and Plato, and there is no reason to accuse them of insincerity. They went back to the later period of Plato's thought, the period when Plato endeavoured to combine his doctrine of Ideas with the Pythagorean number-theory, and identified the *Good* with the *One*, the source of the duality of the Infinite and the Measured (τὸ ἄπειρον and πέρας) with the resultant *scale of realities* from the *One* down to the objects of the material world. They emphasized the fundamental distinction between the Soul and the Body. God must be worshipped spiritually by prayer and the will to be good, not in outward action. The soul must be freed from its material surrounding, the "muddy vesture of decay," by an ascetic habit of life. Bodily pleasures and all sensuous impulses must be abandoned as detrimental to the spiritual purity of the soul. God is the principle of good; Matter (ὕλη) the groundwork of Evil. In this system we distinguish not only the asceticism of Pythagoras and the later mysticism of Plato, but also the influence of the Orphic mysteries and of Oriental philosophy. The Ideas of Plato are no longer self-subsistent entities; they are the elements which constitute the content of spiritual activity. The Soul is no longer an appanage of *οὐσία*, it is *οὐσία* itself: the non-material universe is regarded as the sphere of mind or spirit.

Thus Neopythagoreanism is a link in the chain between the old and the new in pagan philosophy. It connects the teaching of Plato with the doctrines of Neoplatonism and brings it into line with the later Stoicism and with the ascetic system of the Essenes. A comparison between the Essenes and the Neopythagoreans shows a parallel so striking as to warrant the theory that the Essenes were profoundly influenced by Neopythagoreanism. Lastly Neopythagoreanism furnished Neoplatonism with the weapons with which pagan philosophy made its last stand against Christianity.

See Pythagoras, Neoplatonism, Essenes; and Zeller's *Philosophie d. Griechen*. For members of the school see Apollonius of Tyana and Moderatus of Gades.

NEPAL, Nepaul or Nipal, an independent state, situated on the north-eastern frontier of India, lying between 80° 15′ and 88° 10′ E., and 26° 20′ and 30° 10′ N.; area, 54,000 sq. m. Its extreme length is about 525 m., and its breadth varies from 90 to 140 m. It is bounded on the N. by Tibet; on the E. by Sikkim; on the S. by Bengal and the United Provinces; and on the W. by Kumaon, from which it is separated by the Kali river. Its population is estimated by the natives at about 5,200,000, the common phrase used by the rulers in speaking of popular opinion being, "but what will the Bāwan (*i.e.* fifty-two) Lākh say to this."

Nepal consists physically of two distinct territories: (1) the *tarai*, or strip of level, cultivated and forest land lying along the southern border; and (2) the great mountainous tract stretching northwards to Tibet. Along the northern frontier stand many of the highest peaks of the Himalayan range, such as Dhaulagiri (26,837 ft.), Mutsiputra, Gaurishankar and Yasa (24,000), Gosaïn Than (26,313), Mount Everest (29,002 according to the survey value), Kinchinjunga (28,146), and numerous peaks varying from 20,000 to 24,000 ft. In clear weather this magnificent snowy range may be seen in an almost continuous line from the top of some of the lower ranges near Katmandu. South of these are numerous parallel lower ranges, varying from 16,000 to 6000 ft. in height, which are broken up at intervals by cross ranges, thus forming a series of glens with a few hill-girt valleys interspersed.

These mountain ranges determine the course of the rivers, which are divided by the cross ranges into four groups. The first of these extends from Kumaon eastward as far as Dhaulagiri, and consists of the affluents of the Kali (Sarda), Sarju, Kurnali, Eastern Sarju, and Rapti, all of which ultimately form the Gogra or Gogari, and flow into the Ganges. The second group, known to the Nepalese as the Sapt Gandaki, rises from the peaks between Dhaulagiri and Gosaïn Than, and unite at Trebeni Ghat to form the Gandak. The third is a group of smaller rivers draining the great valley of Nepal, the valleys of Chitlong, Benepa, and Panouti, and portions of the tarai around the Churiaghati range of hills. These are the various branches of the Bara Gandak, the lesser Rapti, the Bagmati and Kumla. East of this again is the fourth group, known to the Nepalese as the Sapt Kosi, rising from the peaks between Gosaïn Than and Kinchinjunga, and uniting to form the Soon Kosi, which falls into the Ganges.

There is thus a natural division of the country into four portions. The most western is the country of the Baisi (or twenty-two) rajas, and contains the towns of Jumla, Doti and Sulliana. The second is the country of the Chaubisi (or twenty-four) rajas, and contains the towns of Malebum, Palpa, Gurkha and Noakote. The third is the district containing Nepal proper, with the capital and many large towns to be mentioned afterwards. The fourth is the eastern portion of Nepal, comprising the country of the Kiratis, and many small towns, such as Dhankota, Ilam and Bijapur.

Route into Nepal—The portion of Nepal, exclusive of the tarai, which is open to Europeans is the "valley of Nepal," containing the capital of the country, and a few adjacent smaller valleys. There is only one means of access open to Europeans, and this indeed is in general resorted to by the natives, as the other routes to the capital are longer and far more difficult. The road runs nearly north from Segauli, passing through the tarai and sal forests, to Bhichhkhori; then through the beds of mountain streams, through a pass in the Churiyaghati range, and through another sal forest, to Hetoura; thence by a wide and good road to Bhimphedi at the foot of the Sisaghari range of hills. So far the route is practicable for carts and baggage animals, but from this point the road is a mere rugged footpath over the Sisaghari Pass, through the Chitlong valley and over the Chandragiri range. The distance from Segauli to Katmandu is 90 m.

The valley in extreme length from east to west is about 26 m., and in breadth from north to south about 15. The surrounding hills vary in height from 6000 to 9720 ft., the level of the valley itself being about 4500 ft. above the sea. Tradition has it that Nepal was once a lake, and appearances are in favour of this view. It is crossed from east to west by a low limestone range, through which the waters have gradually forced a passage, and in like manner the collected rivers have escaped at the south-east corner of the valley.

There are three principal streams, the Bagmati, Vishnumati, and Manohora, besides many small tributaries of these. All the rivers rise within the valley, except the Bagmati, which springs from the northern side of the Shiupuri peak, and enters the valley through a ravine at the north-east corner. They all unite and pass through a long narrow gorge in the limestone range, already mentioned, at Chobhar, and ultimately escape from the valley at Kotwaldar.

Climate.—In and around the Nepal valley, as in India, the year may be divided into the rainy, cold and hot seasons. The rains begin in June and last till October, but the fall is not so heavy or continuous as in the plains of Hindustan. The cold season extends from the middle of October to the middle of April. During these months the climate is delicious. Hoar-frost and thin ice are common in the mornings, and the thermometer sometimes falls as low as 25° Fahr., but the days are bright and warm. From Christmas to the end of February there are occasional showers of rain; and snow falls on the surrounding low ranges, but is very rarely seen in the valley itself. From April to the beginning of the rains is the hot season, but the thermometer seldom reaches 85° in the shade. The result of observations extending over many years gives an average mean temperature of 60° Fahr., and an annual rainfall of about 60 in. Violent thunderstorms are not uncommon, and occasionally severe earthquakes occur, as in 1833 and 1866.

Flora and Fauna.—In a country possessing such a range of altitudes the flora and fauna are of course very varied. For descriptive purposes, Nepal may again be divided into three zones. These are—(1) the tarai and lower ranges of hills up to 4000 ft. in height; (2) the central ranges and high-lying valleys, up to 10,000 ft.; and (3) the alpine region, from 10,000 to 29,000 ft. in height. These zones are not, however, sharply defined, as the climate varies according to the latitude, the height of intermediate ranges, and the depth of the valleys; so that tropical plants and animals are sometimes found far in the interior, and the more northern species descend along the loftier spurs into the southern zones.

The low alluvial land of the tarai is well adapted for cultivation, and is, so to speak, the granary of Nepal; but owing to scantiness of population and other causes the greater portion of it consists of swamps, jungles and forests. Considerable stretches of land are, however, being reclaimed from year to year. The productions here are those of British India—cotton, rice, wheat, pulse, sugar-cane, tobacco, opium, indigo, and the fruits and vegetables familiar in the plains of India. The forests yield a magnificent supply of sal, sisū, and other valuable forest trees; and the jungles abound with acacias, mimosas, cotton tree (*Bombax*), dak (*Butea frondosa*), large bamboos, rattans, palms, and numerous ferns and orchids. On the Churiaghati range the common *Pinus longifolia* grows freely. Tea can be grown at a height of from 2000 to 4000 ft. The middle zone supplies rice, wheat, maize, barley, oats, ginger, turmeric, chillies, potatoes, Cucurbitaceae, pineapples, and many varieties of European fruits, vegetables and flowers. The forests contain tree rhododendrons, *Pinus longifolia*, oaks, horse-chestnuts, walnuts, maples, hill bamboos, wild cherry, pear, allies of the tea plant, paper plants (*Daphne*), roses, and many other inhabitants of temperate climes, with various orchids, ferns and wild flowers. In the alpine zone exist Coniferae of many kinds, junipers, yew, box, hollies, birch, dwarf rhododendrons and the usual alpine flora.

The wild animals follow a similar distribution, and the following typical species may be mentioned. In the lowest zone are found the tiger, leopard, wolf, hyena and jackal, the elephant and rhinoceros, the gaur (*Gavaeus gaurus*), gayal (*Gavaeus frontalis*), wild buffalo or arna, many species of deer, and the black bear (*Ursus labiatus*). Among the birds are found the pea-fowl, francolins, wild jungle fowl, and the smaller vultures, &c. In the middle zone there are the leopard, the Himalayan black bear (*Ursus tibetanus*), the wild dog, cats of many sorts, squirrels, hares, porcupines, the pangolin, and some species of deer and antelope. Among the birds are the larger vultures and eagles, pheasants (*Gallophasis*), chukor, hill partridges, &c. In the alpine zone are found the true bear (*Ursus isabellinus*, or brown bear), the yak, musk deer, wild goats and sheep, marmots, &c. Among the birds are the eagle-vulture (*Gypaetus*), the blood pheasant (*Ithaginis cruentus*), snow pheasant (*Tetraogallus himalayensis*), snow partridge (*Lerwa nivicola*), the horned pheasant (*Ceriornis saiyra*), crested pheasant (*Catrens wallichi*). &c. Geese, ducks, waders of all sorts, and other migratory birds are found in abundance in the two lower zones.

Minerals.—The lowest zone in some directions abounds in fossils; and deposits of lignite, and even of true coal, are met with, the latter notably at a spot south of Palpa. The middle zone is rich in limestone and marbles, and abounds with minerals, such as iron, copper, zinc, lead and sulphur. Copper is found near the surface in many places, and there are remains of mines both at Markhu and in the great valley of Nepal. Mineral springs, both hot and cold, are numerous. Traces of silver, and also of gold, have been found in the alpine zone.

People.—The races occupying Nepal are of mixed Mongol origin. To the north, inhabiting the higher mountains and valleys, dwell the Bhutias or Tibetans. To the west lie the Gurungs and Magars. The Murmis, Gurkhalis and Newars occupy the central parts; and the Kiratis, Limbus and Lepchas occupy the eastern districts. There are also Brahmans and Chhatris in the hills. Besides these there are many small tribes residing in the tarai and some other malarious districts, known as Kumhas, Tharus, Manjis, &c., but generally classed together by the Nepalese as Aoulias, or dwellers in the malarious or *aoul* districts. These are probable descendants of immigrants from the lower castes of Hindus, occupying the borderlands of the tarai. Among the forests of the lower eastern region are also to be found some small savage tribes, known as Chepangs and Kusundas.

All the races except the Aoulias are of a decidedly Mongolian appearance, being generally short and robust, and having flat faces, oblique eyes, yellow complexions, straight black hair, and comparatively hairless faces. The Newars, according to the *Vamçavalī* or native history, trace their descent from the races of southern India, but this is rendered more than doubtful by both their appearance and language. The Gurkhalis (Gurkhas or Ghurkhas) are descendants of the Brahmans and Rajputs who were driven out of Hindostan by the Moslems, and took refuge in the western hilly lands, where they ultimately became dominant, and where they have become much mixed with the other races by intermarriage.

Religions.—The Bhutias, Newars, Limbus, Keratis, and Lepchas are all Buddhists, but their religion has become so mixed up with Hinduism that it is now hardly recognizable. The Newars have entirely abandoned the monastic institutions of Buddhism, and have in great measure adopted the rules of caste, though even these sit but lightly upon them. They burn their dead, eat the flesh of buffaloes, goats, sheep, ducks, and fowls, and drink beer and spirits. The Gurkhalis, Magars, and Gurungs are Hindus, but the last two are by no means strict in the observance of their religion, though there are some peculiarities which they carefully preserve. Thus, for instance, the Magars will eat pork but not buffalo's flesh, whereas the Gurungs eat the buffalo but not the hog.

Priests.—Where temples are so numerous (there are 2733 shrines in the valley) priests naturally abound, both of the Hindu and Buddhist religions. The festivals too are many in number, and in consequence holidays are incessant. The rāj gurū, or high priest, is an influential person in the state, a member of council, and has a large income from government lands as well as from the fines for offences against caste, &c. Many other priests, gurūs and purohits, have lands assigned to them, and most of the temples have been richly endowed by their founders. Every family of rank has a special priest, whose office is hereditary.

Astrologers are also numerous, and their services are in constant request. One cannot build a house, set out on a journey, commence a war, or even take a dose of physic, without having an auspicious moment selected for him.

Languages.—The various races have all separate languages, or at least dialects. The Gurkhalis and western tribes use Khas (see PAHARI), which, unlike the other dialects, is of Sanskrit origin. The Newars have a distinct language and alphabets, for there are three known to their pandits, though only one is in use now. Their language, called Gubhajius, greatly resembles Tibetan, but is now interspersed with many Sanskrit words. The Bhutias use the Tibetan language and alphabet.

Education.—There is a central educational institution at Katmandu with sixteen branches, or schools, over the valley of Nepal. This central institution has three departments, English, Sanskrit and Persian—or more correctly perhaps Urdu. Education is provided free by the state, and is encouraged by grants of scholarships and prizes. Boys passing out well are sent at government expense to the various universities of northern India to complete their education, and some have lately been sent to Japan. The evil effects of higher education, as taught in the Indian colleges, on the youth of Bengal, &c., has, however, given the Gurkha durbar a distinct shock, and it seems not unlikely that education in Nepal may receive a set-back in consequence. Some of the upper classes speak English fluently, but the bulk of the labouring classes is quite illiterate.

Katmandu is a perfect storehouse of ancient Sanskrit literature, and some of the oldest MSS. in that language as yet known to scholars have been found there. There is also a fair English library. Both are lodged in a good building.

Calendar.—There are three principal eras in use in Nepal. The Samvat of Vikramaditya begins fifty-seven years before the Christian era, the Saka era of Sālivanhn begins seventy-eight years after the Christian era, and the Nepalese Samvat dates from October A.D. 880. The Sri-Harsha and Kaligat eras are also sometimes used. Day is considered to begin when the tiles on a house can be counted, or when the hairs on the back of a man's hand can be discerned against the sky. Sixty bipalas = 1 pala; 60 palas = 1 ghari or 24 minutes; 60 gharis = 1 day of 24 hours.

Health.—All families of good position have at least one *baid*, or medical man, in constant attendance, and there are also many general practitioners. There is a large central hospital at Katmandu, and some thirteen other smaller hospitals are distributed over the country, with free beds, and provision for outdoor treatment. There is also a small hospital attached to the British Residency. The diseases most prevalent in the country are rheumatism, chronic dyspepsia, skin diseases, syphilis, goître, smallpox, cholera and leprosy. In the rains a number of cases of mild intermittent fever, diarrhoea, and dysentery are met with. Fever of a severe typhoid type is common in the crowded lanes and dirty villages. Vaccination is being gradually introduced into the country, and the general health of the inhabitants of the principal cities in the valley has greatly improved since the introduction of fresh water, which has been brought in by pipes from mountain springs.

Towns.—There are three large towns in the Nepal valley, Katmandu, the capital, said to contain approximately 50,000 inhabitants, Patan and Bhatgaon about 30,000 each. The houses are from two to four storeys in height, built of brick and tiled. The windows and balconies are of wood, and some are elaborately carved. There are numerous handsome temples in all the towns, the majority of which are pagoda-shaped and built of brick, with roofs of copper, which is sometimes gilt. The streets are narrow, and they, as well as the squares, are all paved with brick or stone. In front of the temples generally stand monoliths surmounted by figures of Garuda, or of the founder, made of brass gilt, or sometimes of black stone. Besides these three large towns, there are at least twenty smaller towns and numerous villages in the valley, all of which possess many temples. Some of these, as for instance those of Pashupati, Bodhnatha and Symbhunatha, are considered of great sanctity. Many thousands of pilgrims come at one festival to worship at Pashupati, and it is there that the dying are brought to be immersed in the Bagmati, and the dead are burned on its banks.

Agriculture.—While the Gurkhalis are occupied in military affairs, the agriculture of the valley is carried on by the Newars. The soil is varied in character, from light micaceous sand to dense ferruginous clay. The whole valley is cultivated and irrigated where practicable, and the slopes of the hills are carefully terraced, so that there is little grazing ground, and few sheep or cattle are kept There are some milch cows and buffaloes, which are either stall-fed or grazed in the jungles at the foot of the hills. Animals for consumption and sacrifice are all imported, and are consumed as fast as they are brought in. In the cold season the Bhutias bring large flocks of sheep and goats laden with bags of borax, salt and saltpetre. These are sold for consumption, except a few that are retained to carry back the bags. These droves are generally accompanied by ponies and some of the large Tibetan dogs; the latter are powerful, fierce, shaggy animals, about the size of a small Newfoundland dog. Poultry are kept and used by the Newars, especially ducks, the eggs of which are in great demand even among the orthodox Hindus. The crops grown in the valley consist of rice, both the transplanted and the dry-sown or ghaiya varieties, wheat, pulse, murwah, maize, buckwheat, chillies, radishes, mustard, garlic, onions, ginger, turmeric, sugar-cane, potatoes, ground nuts, many species of cucumbers and pumpkins, &c. Nothing but articles of food are allowed to be grown in the valley; hence its capabilities for producing tea, cotton and tobacco are unknown. All of these, however, are grown in other parts of the country, both in the hills and the tarai. Large cardamoms are extensively grown in the eastern hills, and form an important article of export. The hemp plant (*Cannabis indica*) grows wild, and is used both for manufacturing purposes and for producing the resinous extract and other intoxicating products which are exported. Plants producing dyes, such as madder or manjit, are grown in some places; and drugs, such as chirata, are collected and exported. The better class of soils yields a return of about Rs. 180 per khait, and the poorest about Rs. 90 per khait. From some of the finer soils as many as three crops of various sorts are obtained annually. The land-measures in use are different in different parts of the country. Thus, in the eastern tarai a *bigha* measures 90×90 yds. English, while in the western tarai it is only 15×15 yds. In the hills the unit of land measurement is called *ropni*, which is about twice the size of a western tarai bigha,—and twenty-five ropnis make one khait. This measurement applies only to rice lands. Other land measurements for the valley are as follows: One Nepali bigha is 90 yds. × 90 yds. British. (A British Indian bigha is 40 yds. × 40 yds. and 3 Nepali bighas equal about 5 acres.) Sixteen ropnis equal 1 Nepali bigha.

Land Taxes.—The tarai lands pay from two to nine rupees (British) per Nepali bigha according to quality of land. In the hills taxes are charged on the plough, thus: one plough pays 13 annas; one bullock without plough about 10 annas; one spade 6½ annas. These taxes are termed *Hal*, *Patay* and *Kodaley*.

Horticulture.—The Newars are also fond of horticulture. Many European fruits, flowers and vegetables have been introduced and grow freely. The country is famous for its oranges and pineapples. Flowers are grown and sold for religious purposes, and even wild flowers are brought into the market and much used by the Newar women in adorning their hair, as well as for offerings at the shrines. Many wild fruits are collected and sold in the markets. Apples and pears, of English stock, thrive well; apricots and plums are good; peaches and grapes grow freely and are of large size, but they seldom ripen before the rains begin, when they rot.

Trade.—All the trade and manufactures of the country are in the hands of the Newars, and a few Kashmiris and natives of Hindustan. The trade in European goods is chiefly carried on by the latter, whilst the Newars deal in corn, oil, salt, tobacco and articles of domestic manufacture. The trade with India is carried on at numerous marts along the frontier, at each of which a customs station is established, and the taxes are collected by a *thikadar* or farmer. The Newars also carry on the trade with Tibet, through a colony which has been for many years established at Lhasa, but this trade has been a shrinking item since the opening of the Lhasa-Darjeeling route. There are two principal routes to Tibet. One of these runs north-east from Katmandu to the frontier-station of Kuti or Nilam, crossing the Himalayan range at a height of 14,000 ft.; the other passes out of the valley at the north-west corner, and runs at first upwards along the main branch of the Gandak, crossing the Himalayas, near Kerung, at a height of 9000 ft. All goods on these routes are carried on men's backs, except the salt, &c., carried in bags by the Bhutia sheep and goats. The principal imports from Hindustan are raw cotton, cotton goods, woollen goods, silks and velvets, hardware, cutlery, beads, jewels, coral, saddlery, shoes, guns, gunpowder, glassware, vermilion, indigo, lac, tea, betel-nut, spices, paper, sugar, tobacco, oils, sheet copper, goats, cattle, buffaloes; and from Tibet, musk, medicines, yaks' tails, tea, woollen cloth, blankets, borax, salt, saltpetre, paper-plant, honey, wax, sheep, goats, yaks, ponies, silver, gold. The exports to Hindustan include wax, paper-plant, musk, yaks' tails, medicines, cardamoms, borax, sulphate of copper, brass pots, iron pots, ponies, elephants, hawks, hides and horns (buffalo), rice, ghee, oil seeds, red chillies, madder, cobalt, potatoes, oranges; and to Tibet, broad cloth, raw cotton, cotton goods, tobacco, sugar, opium, coral, jewels, pearls, spices, betel-nut, copper pots, iron pots and hardware. The Nepalese are utterly regardless of statistics, but recent estimates value the exports and imports to and from the British provinces at 3 million sterling annually. Duties are levied on exports and imports, which will be noticed under the head of revenue.

Manufactures.—The Newars are skilful workmen. Their bricks are excellent, and so also is their pottery, for which certain towns are famous, such as Themi and Noakote. As carpenters they excel, though the use of the large saw is still unknown, and planks are cut with chisel and mallet. Some of the wood carvings on the temples and large houses are most artistic in design and bold in execution, though unfortunately they are sometimes of a most obscene character. The manufactures are few, consisting chiefly of coarse cotton cloths, paper made of the inner bark of the paper-plants (*Daphne*), bells, brass and iron utensils, weapons, and ornaments of gold and silver.

Coinage.—At one time Nepal supplied Tibet with its silver coinage, but this was abandoned on account of the adulterations introduced by the Nepalese. The ancient coins, specimens of which are still to be met with, were made by hand. The modern coinage is struck by machinery, a regular mint having been established by Sir Jung Bahadur at Katmandu, and since improved by his successors.

Government.—The Nepalese have relations with China, and occasionally send an embassy with presents to Peking. The British too have considerable influence with the government in regard to their foreign relations, and a British resident is stationed at Katmandu. But in all matters of domestic policy the Nepalese brook no interference, and they are most jealous of anything that has a tendency to encroach on their independence. Theoretically the government of Nepal is a pure despotism, and the maharajah is paramount. Practically, all real power has long been in the hands of the prime minister, and much of the modern history of the country consists of accounts of the struggles of the various factions for power. Under the prime minister there is a council, consisting of the relations of the king, the raj guru, the generals, and a few other officials known as kajis and sirdars and bhardars, which is consulted on all important business, and which forms a court of appeal for disputed cases from the courts of law. There are separate civil and criminal courts, but the distinction is not always observed, as difficult cases are often transferred from one to the other.

Law and Justice.—The old savage legal code with its ordeals by fire and water, and its punishments by mutilation and torture was abolished by Sir Jung Bahadur after his return from England in 1851. Treason, rebellion and desertion in war-time are punished by death. Bribery and peculation by public servants are punished by dismissal from office, and a fine and imprisonment, the latter of which can be commuted by payments at various rates, according to the nature of the offence. Murder and the killing of cows are capital offences. Manslaughter and maiming cows are punished by imprisonment for life, and other offences against the person or property by imprisonment or fine. Brahmans and women are exempted from capital punishment. Offences against caste are heavily punished by fine and imprisonment. In some cases indeed all the offender's property is confiscated, and he and his family may be sold as slaves. Bankruptcy laws have been recently introduced. The marriage laws are somewhat peculiar. Among the Gurkhas the laws resemble those of other Hindus as regards the marriage of widows, polygamy, &c., but among the Newars every girl while still an infant is married with much ceremony to a bel fruit, which is then thrown into some sacred stream. As the fate of the fruit is unknown, a Newari is supposed never to become a widow. At the age of puberty a husband is selected, but the woman can at any moment divorce herself by placing a betel-nut under her husband's pillow and taking her departure. Adultery is punished by the imprisonment and fine of both the adulteress and her paramour. Sati has been abolished in Nepal by law.

Gaols.—There are three large prisons in the Nepal valley, one for males and two for females; there are also a considerable number of gaols throughout the country. The prisoners are kept in irons, and employed in public works of various sorts. They are allowed six pice a day for subsistence at the capital, and five pice in other places. Their relatives are allowed to minister to their creature comforts.

Slavery is an institution of the country, and all families of rank possess many slaves, who are employed in domestic and field work. They are generally treated well, and are carefully protected by law. The price of slaves ranges from Rs. 100 to Rs. 200.

Revenue.—The revenue of Nepal is about one hundred and fifty lakhs of rupees, *i.e.* £10,000,000. The chief sources of it are the land-tax, customs, mines, forests and monopolies. About 10% of the tarai lands, and 20% of the hill lands, are private property. Some lands were assigned by the Gurkhali rajas to Brahmans, soldiers and others, and these are untaxed. Others, which were the gifts of the old Newar kings, pay from 4 to 8 annas per bigha. All such grants of land, however, are subject to a heavy fine on the coronation of a new raja. Land which does not produce rice is lightly taxed, but in the valley of Nepal, and wherever rice is grown, the government tax or rent is one half of the produce of the land. Waste lands, when brought into cultivation, are rent free for ten years, after which for five years the tax is only 4 annas per bigha, and the cultivator receives one-tenth of the cleared land rent free for his life. A considerable revenue in the shape of royalty is obtained from mines of copper, iron, &c. The taxes on merchandise amount to from 12 to 14% on the value of the goods carried to and from British India, and from 5 to 6% is charged on goods exported to Tibet.

Army.—Much attention is devoted by the Gurkhalis to military matters, and the bulk of that race may be said to be soldiers. The standing army consists of about 50,000 men, in a fair state of efficiency. Besides this force there is a reserve, consisting of men who have served for a few years and taken their discharge, but in case of necessity can be called on again to enter the ranks. These would probably raise the strength to between 70,000 and 80,000 men. The regiments are formed on the European system, and similarly drilled and officered. Each man carries in addition to a bayonet a *kukri* or native knife. There is practically no cavalry, as the country is not suited for horses. The artillery, however, is on a larger scale, and consists nearly entirely of batteries of mountain artillery. There is a large arsenal well provided with supplies of gunpowder and military stores. There are workshops where cannon are cast, and rifles, and ammunition of all sorts turned out in large quantities, but of an indifferent quality.

In addition to its own army, Nepal supplies to the British army in India a large force of splendid soldiers, who were raised under the following circumstances. In 1815 the British enlisted three battalions of Gurkhas from amongst the soldiers of that race who were thrown out of employment, owing to the termination of the first phase of the war with Nepal. These regiments were styled the 1st, 2nd and 3rd Gurkhas, and were soon employed on active service. The 1st and 2nd behaved with much gallantry at the siege and storming of Bharatpur, and in the First Sikh War, while the 2nd and 3rd won a great name for loyalty and courage during the Mutiny of 1857–58, especially at the siege of Delhi. This induced the British to raise, in 1858, two more battalions, which they numbered the 4th and 5th, and the whole Gurkha force has since proved its usefulness and loyalty on many occasions, particularly during the Afghan War of 1878–80, and on many frontier expeditions. Battalions have also been sent on service to Burma, Egypt, China and Tibet. The Gurkhas in the British service now consist of ten regiments of riflemen of two battalions each, and number about 20,000 men.

History.—Nepal and the somewhat similar country of Kashmir are peculiar among the Hindu states of India in possessing an historical literature. The Nepalese *Vamçāvalī* professes to start from a very early period in the Satya Yuga, when the present valley was still a lake. The earlier portion of it is devoted to the Satya and Treta Yugas, and contains mythological tales and traditions having reference to various sacred localities in the country. During these two Yugas, and also the Dwapur Yuga, the *Vamçāvalī* deals in round numbers of thousands of years.

In the beginning of the Kali Yuga, the Gupta dynasty is said to have been founded by Ne-Muni, from whom the country takes its name of Nepal. Lists are then given of the various dynasties, with the lengths of the reigns of the rajas. The dynasties mentioned are the Gupta, Ahir, Kirāti, Somavanshi, Suryavanshi, Thakuri or first Rajput, Vaishya Thakurī, second Rajput and Karnataki dynasties. The country was then invaded by Mukundasena, and after his expulsion various Vaishya Thakuri dynasties are said to have held the throne for a period of 225 years. The chronology of the *Vamçāvalī* up to this period is very confused and inaccurate; and, though the accounts of the various invasions and internal struggles, mixed up as they are with grotesque legends and tales, may be interesting and amusing, they can hardly be considered authentic. Some of the names of the rajas, and the dates of their reigns, have been determined by coins, the colophons of old MSS., and certain inscriptions on the temples and ancient buildings. For instance, Ançuvarma, of the Thakuri dynasty, reigned about A.D. 633, as he is mentioned by the Chinese traveller Hsuan Tsang, who visited Nepal. His name too is found in an inscription still extant. In like manner it is ascertained from MSS. that Rudra-deva-Varma was reigning in 1008; Lakshmikama-deva from 1015 to 1040; Padma-deva, of the Vaishya Thakuri dynasty, in 1065; Mana-deva, of the second Rajput dynasty, in 1139; Ananta-Malla, 1286–1302; Harisinha-deva, 1324; Jayastithi-Malla, 1385–1391. Much information as to the chronology of the various dynasties can be obtained from the catalogue of the Cambridge MSS. compiled by Cecil Bendall, and also from his papers on the ancient coins of the country. Inscriptions too have been edited by Professor Bühler in the *Indian Antiquary*, vol. ix. Detailed lists of the rajas are to be found in Kirkpatrick's *Account of Nepāl*, in Hodgson's *Essays*, Prinsep's papers in the *Asiatic Society's Journal* and Wright's *History of Nepāl*.

The records begin to be more accurate from the time of the invasion and conquest of the country by Harisinha-deva, the raja of Simraun, 1324. This raja was driven from Simraun by Tughlak Shah of Delhi, but seems to have found little difficulty in the conquest of Nepal. There were only four rajas of this Ayodhya dynasty, and then the throne was occupied by Jayabhadra-Malla, a descendant of Abhaya-Malla, one of the Rajput dynasty, who reigned in the 13th century. There were eight rajas of this dynasty. The seventh, Jayastithi-Malla, who reigned for forty-three years (1386–1429), appears to have done much in forming codes of laws, and introducing caste and its rules among the Newars. In the reign of the eighth raja, Yaksha-Malla, the kingdom was divided into four separate states—namely, Banepa, Bhatgaon or Bhaktapur, Kantipur or Katmandu, and Lalitapur or Patan. There was only one raja of Banepa, who died without issue. The Malla dynasty in the other three branches continued in power up to the conquest of the country by the Gurkhas in 1768.

The Gurkhas claim descent from the Rajputs of Chitor, in Rajputana. They were driven out of their own country by the victorious Moslems, and took refuge in the hilly districts about Kumaon, whence they gradually pushed their way eastwards to Lamjung, Gurkha, Noakote and ultimately to the valley of Nepal, which under Raja Prithwi Narayana they finally captured. In the struggle which took place at Bhatgaon, Jayaprakasa (the raja of Katmandu) was wounded, and shortly afterwards he died at Pashupati. Ranjit-Malla, the aged raja of Bhatgaon, was allowed to retire to Benares, where he ended his days. Tej Narsinha, the raja of Patan, was kept in confinement till his death. During the latter years of the war Jayaprakasa applied to the British for assistance, and a small force, under Captain Kinloch, was sent into the tarai in 1765, but it was repulsed by the Gurkhas.

Prithwi Narayana died in 1774. He left two sons, Pratapasinha Sah and Bahadur Sah. The former succeeded his father, but died in 1777, leaving an infant son, Rana Bahadur Sah. On the death of Pratapa-sinha, his brother, who had been in exile, returned to Nepal and became regent. The mother of the infant king, however, was opposed to him, and he had again to flee to Bettia, in British territory, where he remained till the death of the rani, when he again became regent, and continued so till 1795. During this time the Gurkhas were busily annexing all the neighbouring petty states, so that in 1790 their territories extended from Bhutan to the Sutlej river, and from Tibet to the British provinces. At length, in 1790, they invaded Tibet, and were at first successful; but they were thus brought into contact with the Chinese, who in 1791 sent a large force to invade Nepal. In 1792 the Chinese advanced as far as Noakote, and there dictated terms to the Nepalese.

In 1791 the Gurkhas had entered into a commercial treaty with the British and hence, when hard pressed, they applied for assistance against the Chinese to Lord Cornwallis. In consequence of this Kirkpatrick was despatched to Nepal, and reached Noakote in the spring of 1792, but not till after peace had been concluded. One result of this embassy was the ratification of another commercial treaty on the 1st of March 1792.

In 1795 Rana Bahadur removed his uncle, Bahadur Sah, from the regency, and two years subsequently put him to death. From this time up to 1799 the king, who seems to have been insane, perpetrated the most barbarous outrages, till at length his conduct became so intolerable that he was forced to abdicate in favour of his son, Girvan-yuddha Vikrama Sah, who was still an infant. Rana Bahadur once again recovered the throne in 1804, but was assassinated in 1805.

In October 1801 another treaty was signed by the British and Nepalese authorities, and a British resident was sent to the Nepalese court, but was withdrawn in 1803, owing to the conduct of the Nepalese. From this time the Nepalese carried on a system of encroachment and outrage on the frontier, which led to a declaration of war by the British in November 1814. At first the British attacks were directed against the western portion of the Nepalese territory, and under Generals Marly, Wood and Gillespie several disasters were met with. General Gillespie himself was killed while leading an assault on a small fort called Kalunga. General Ochterlony was more successful, and the Gurkhas were driven eastward beyond the Kali river, and began to negotiate for peace. Arms, however, were soon taken up again, and Ochterlony, who was put in command, in January 1816, advanced directly on the capital in the line of the route that is now in use. He soon fought his way as far as Mukwanpur, and the Nepalese sued for peace. A treaty was concluded in March, by which the Nepalese relinquished much of their newly acquired territory, and agreed to allow a British residency to be established at Katmandu. In November the raja died, and was succeeded by his infant son, Surendra Bikran Sah, the reins of government being held by General Bhimsena Thapa.

From this time the records for many years furnish little of interest except a history of struggles for office between the Thapa and Pandry factions, and futile attempts at forming combinations with other states in Hindustan against the British.

In 1839 Bhimsena's enemies succeeded in driving him from power, and he committed suicide, or was murdered, in prison. The Kala Pandry faction then came into power, and there were frequent grave disputes with the British. War, however, was averted by the exertions of the resident, Mr Brian Hodgson.

In 1843 Matabar Singh, the nephew of Bhimsena, returned from exile, soon got into favour at court, and speedily effected the destruction of his old enemies the Kala Pandrys, who were seized and executed in May 1843. At this time mention begins to be made of a nephew of Matabar Singh, Jung Bahadur, the eldest of a band of seven brothers, sons of a kaji or state official. He rose rapidly in the army and in favour at the court, especially with one of the ranis, who was of a most intriguing disposition. In 1844 he was a colonel, and on the 18th of May 1845 killed his uncle, and immediately, with the aid of the rani, took a prominent part in the government. After a short but turbulent interval of intrigue, he got rid of his enemies at one fell swoop, by what is known as the Kot massacre, on the 15th of September 1846. From that time till the day of his death Jung Bahadur was in reality the ruler of Nepal. His old friend, the rani, was banished, and all posts of any consequence in the state were filled by Jung, his brothers and other relatives. In 1850, finding himself securely seated in power, Jung Bahadur paid a visit to England, which made a great impression on his acute intellect, and ever after he professed and proved himself to be a stanch friend of the British. On his return in 1851 he at once devoted himself to reforming the administration of the country, and, whatever may have been the means by which he gained power, it must be allowed that he exercised it so as to prove himself the greatest benefactor his country has ever possessed. In 1853 a treaty for the extradition of criminals was proposed, but it was not ratified till February 1855. In 1854 the Nepalese entered into a war with Tibet, which lasted with varying success till March 1856, when peace was concluded on terms very favourable to Nepal.

In June 1857 intelligence of the mutiny of the native troops in Hindustan reached Nepal, and produced much excitement. Jung Bahadur, in spite of great opposition, stood firm as a friend of the British. On the 26th June 4000 troops were sent off to assist, and these rendered good service in the campaign against the mutineers. Jung himself followed on the 10th of December, with a force of 8000 men, 500 artillerymen and 24 guns, but too late to be of much use. Many of the mutineers and rebels, including the infamous Nana Sahib, took refuge in the Nepalese tarai, and it was not till the end of 1859 that they were finally swept out of the country. The Nana was said to have died of fever in the tarai, and it is probable that this was the case. His wives and a few attendants resided for many years near Katmandu.

In return for the aid afforded to the British, Jung Bahadur was well rewarded. He was created a G.C.B., and in 1873 a G.C.S.I., honours of which he was not a little proud. The troops employed received food and pay from the day of leaving Katmandu; handsome donations were given to those severely wounded, and to the relatives of the killed; great quantities of muskets and rifles were presented to the Nepalese government; and, to crown all, a large portion of the tarai was restored to Nepal. This ground contains most valuable sal and sisu forests, and yields a revenue of several lākhs of rupees yearly.

From the termination of the mutiny Nepalese history has been uneventful. The country has been prosperous, and the relations with the British have continued to be most friendly. Nevertheless the restrictions on commerce, and the prohibitions against Europeans entering the country, or travelling beyond certain narrow limits, are as rigidly enforced as they were a hundred years ago. Sir Jung Bahadur died suddenly in the tarai in 1877. In spite of all the exertions he had made to bring about a better state of things, three of his wives were allowed to immolate themselves on his funeral pyre. His brother, Sir Ranadip Singh Bahadur, G.C.S.I., succeeded him as prime minister. Shortly after his accession to power a plot was formed against him, but nearly forty of the conspirators were seized and executed, while others escaped into exile. He was, however, murdered in 1885 and was succeeded by his nephew Sir Shamsher Jung, G.C.S.I., who died in 1901 and was succeeded by his brother Deb Shamsher Jung. But in June of that year a palace revolution placed another brother, Chandra Shamsher Jung, in power, whilst Deb Shamsher fled to India. Maharajah Chandra Shamsher has ruled Nepal with much ability. He gave effective aid to the British during the Tibet war of 1904, and the relations with the government of India became more cordial after his accession to power. In 1906 Chandra Shamsher was created a G.C.S.I., and in 1908 he visited England as a guest of the government, when he was invested with the G.C.B. by King Edward VII. He was also made a major-general in the British army, and honorary colonel of the 4th Gurkha Rifles.

For authorities see Dr Daniel Wright, *History of Nepal* (1877); Colonel Kirkpatrick, *Account of Nepal*; Brian Houghton Hodgson's essays; Dr H. A. Oldfield's sketches; Sir C. M. Aitchison, *Treaties and Engagements*; Sir Joseph Hooker's writings; and Sir Richard Temple, *Hyderabad and Nepal* (1887). (D. Wr.; H. Wy.)

NEPENTHES (Gr. νηπενθές, *sc.* φάρμακον, a drug that takes away grief, from νη- privative, and πένθος, "grief"), an Egyptian drug spoken of by Homer in the *Odyssey* (iv. 221). Generally in the form "nepenthe" the name is given to any drug having a like property, and also occasionally to the herb or plant from which such a drug is produced. It is also applied to a special genus of plants, chiefly East Indian, known as the "pitcher-plants," on account of the formation of the leaves.

NEPHELINE, a rock-forming mineral consisting of sodium, potassium and aluminium silicate, $Na_6K_2Al_8Si_9O_{34}$. Its crystals belong to the hexagonal system, and usually have the form of a short six-sided prism terminated by the basal plane. The unsymmetrical etched figures produced artificially on the prism faces indicate, however, that the crystals are hemimorphic and tetartohedral, the only element of symmetry being a polar hexad axis. The hardness is $5\frac{1}{2}$. The specific gravity (2·6), the low index of refraction and the feeble double refraction are nearly the same as in quartz; but since in nepheline the sign of the double refraction is negative, whilst in quartz it is positive, the two minerals are readily distinguished under the microscope. An important determinative character of nepheline is the ease with which it is decomposed by hydrochloric acid, with separation of gelatinous silica (which may be readily stained by colouring matters) and cubes of salt. A clear crystal of nepheline when immersed in acid becomes for this reason cloudy; hence the name nepheline, proposed by R. J. Haüy in 1801, from Gr. νεφέλη, a cloud.

Although in naturally occurring nepheline sodium and potassium are always present in approximately the atomic ratio 3 : 1, artificially prepared crystals have the composition $NaAlSiO_4$; the corresponding potassium compound, $KAlSiO_4$, which is the mineral kaliophilite, has also been prepared artificially. It has therefore been suggested that the orthosilicate formula, $(NaK)AlSiO_4$, represents the true composition of nepheline.

The mineral is one specially liable to alteration, and in the laboratory various substitution products of nepheline have been prepared. In nature it is frequently altered to zeolites (especially natrolite), sodalite, kaolin, or compact muscovite. Gieseckite and liebenerite are pseudomorphs.

Two varieties of nepheline are distinguished, differing in their external appearance and in their mode of occurrence, being analogous in these respects to sanidine or glassy orthoclase and common orthoclase respectively. "Glassy nepheline" has the form of small, colourless, transparent crystals and grains with a vitreous lustre. It is characteristic of the later volcanic rocks rich in alkalis, such as phonolite, nepheline-basalt, leucite-basalt, &c., and also of certain dike-rocks, such as tinguaite. The best crystals are those which occur with mica, sanidine, garnet, &c., in the crystal-lined cavities of the ejected blocks of Monte Somma, Vesuvius. The other variety, known as elaeolite, occurs as large, rough crystals, or more often as irregular masses, which have a greasy lustre and are opaque, or at most translucent, with a reddish, greenish, brownish or grey colour. It forms an essential constituent of certain alkaline plutonic rocks of the nepheline-syenite series, which are typically developed in southern Norway.

The colour and greasy lustre of elaeolite (a name given by M. H. Klaproth in 1809, from Gr. ἔλαιον, oil, and λίθος, stone; Ger. *Fettstein*) are due to the presence of numerous microscopic enclosures of other minerals, possibly augite or hornblende. These enclosures sometimes give rise to a chatoyant effect like that of cat's-eye and cymophane; and elaeolite when of a good green or red colour and showing a distinct band of light is sometimes cut as a gem-stone with a convex surface.

Closely allied to nepheline, and occurring with it in some nepheline-syenites, is the species cancrinite, which has the composition $H_6Na_6Ca(NaCO_3)_2Al_8(SiO_4)_9$. It is frequently of a bright yellow colour, and has sometimes been cut as a gem-stone. (L. J. S.)

NEPHELINE-SYENITE, or Elaeolite-syenite, a holocrystalline plutonic rock which consists largely of nepheline and alkali felspar. The rocks are mostly pale coloured, grey or pink, and in general appearance they are not unlike granites, but dark green varieties are also known. They do not contain quartz, as that mineral and nepheline are mutually exclusive. From ordinary syenites they are distinguished not only by the presence of nepheline but also by the occurrence of many other minerals rich in alkalis or in rare earths. Orthoclase and albite are the principal felspars; usually they are intergrown to form perthite. In some rocks the potash felspar, in others the soda felspar predominates. Soda-lime felspars such as oligoclase and andesine are rare or entirely absent. Fresh clear microcline is very characteristic of some types of nepheline-syenite. Sodalite, colourless and transparent in the slides, but frequently pale blue in the hand specimens, is the principal felspathoid mineral in addition to nepheline. As a rule these two crystallize before felspar, but they may occur in perthitic intergrowth with it. The commonest ferro-magnesian mineral is pale green augite, which may be surrounded by rims of dark-green, pleochroic soda-augite (aegirine). The latter forms long flat prisms or bundles of radiating needles. A dark reddish-brown biotite is very common in some of these rocks and a white mica, probably not muscovite but lepidolite, is occasionally present. The hornblende may be brown, brownish-green, blue or blue-black, belonging as a rule to the varieties which contain soda; it is often intergrown with the pyroxene or enclosed in it. The dark-brown triclinic hornblende aenigmatite occurs also in these rocks. Olivine is rare, but may be found in some basic forms of nepheline-syenite.

The commonest accessories are sphene, zircon, iron ores and apatite. Cancrinite occurs in several nepheline-syenites; in others there is fluor-spar or melanite garnet. A great number of interesting and rare minerals have been recorded from nepheline-syenites and the pegmatite veins which intersect them. Among these we may mention eudialyte, eukolite, mosandrite, rinkite, johnstrupite, lavenite, hiortdahlite, perofskite and lamprophyllite. Many of these contain fluorine and the rare earths.

Nepheline-syenites are rare rocks; there is only one occurrence in Great Britain and one in France and Portugal. They are known also in Bohemia and in several places in Norway, Sweden and Finland. In America these rocks have been found in Texas, Arkansas and Massachussetts, also in Ontario, British Columbia and Brazil. South Africa, Madagascar, India, Tasmania, Timor and Turkestan are other localities for the rocks of this series. They exhibit also a remarkable individuality as each occurrence has its own special features; moreover a variety of types characterizes each occurrence, as these rocks are very variable. For these reasons, together with the numerous rare minerals they contain, they have attracted a great deal of attention from petrographers.

Many types of nepheline-syenite have received designations derived from the localities in which they were discovered. The laurdalites (from Laurdal in Norway) are grey or pinkish, and in many ways closely resemble the laurvikites of southern Norway, with which they occur. They contain anorthoclase felspars of lozenge-shaped forms, biotite or greenish augite, much apatite and sometimes olivine. Some of these rocks are porphyritic. The foyaites include the greater number of known nepheline-syenites and are called after Foya in the Serra de Monchique (southern Portugal), from which they were first described. They are grey, green or reddish, and mostly of massive structure with preponderating potash felspar, some nepheline, and a variable (often small) amount of femic minerals. Pyroxene-, hornblende- and biotite-foyaites have been recognized according to their mineral composition. Examples of the first-named occur in southern Norway with the laurdalites; they contain aegirine and black mica. At Alnö Island in the Gulf of Bothnia (Sweden) similar rocks are found bearing enclosures or altered limestone with wollastonite and scapolite. In Siebenburgen (Hungary) there is a well-known rock of this group, very rich in microcline, blue sodalite and cancrinite. It contains also orthoclase, nepheline, biotite, aegirine, acmite, &c. To this type the name ditroite has been given from the place where it occurs (Ditro). Pyroxene-foyaite has been described also from Pouzac in the Pyrenees (S. France). Mica-foyaite is not very common, but is known at Miask in the Ural Mountains (miaskite), where it is coarse-grained, and contains black mica, sodalite and cancrinite. The hornblende-foyaites are usually brown or blue, and intensely dichroic, but may contain also biotite or augite. Rocks of this class occur in Brazil (Serra de Tingua) containing sodalite and often much augite, in the western Sahara and Cape Verde Islands; also at Zwarte Koppies in the Transvaal, Madagascar, São Paulo (in Brazil), Paisano Pass (West Texas) and Montreal, Canada. The rock of Salem, Mass., U.S.A., is a mica-foyaite rich in albite and aegirine; it accompanies granite and essexite.

Litchfieldite is another well-marked type of nepheline-syenite, in which albite is the dominant felspar. It is named after Litchfield, Maine, U.S.A., where it occurs in scattered blocks. Biotite, cancrinite and sodalite are characteristic of this rock. A similar nepheline-syenite is known from Hastings Co., Ontario, and contains hardly any orthoclase, but only albite felspar. Nepheline is very abundant and there is also cancrinite, sodalite, scapolite, calcite, biotite and hornblende. The lujaurites are distinguished from the rocks above described by their dark colour, which is due to the abundance of minerals such as augite, aegirine, arfvedsonite and other kinds of amphibole. Typical examples are known near Lujaur on the White Sea, where they occur with umptekites and other very peculiar rocks. Other localities for this group are at Julianehaab in Greenland (with sodalite-syenite); at their margins they contain pseudomorphs after leucite. The lujaurites frequently have a parallel-banding or gneissose structure.

Sodalite-syenites in which sodalite very largely or completely takes the place of nepheline occur in Greenland, where they contain also microcline-perthite, aegirine, arfvedsonite and eudialyte. Cancrinite-syenite, with a large percentage of cancrinite, has been described from Dalekarlia (Sweden) and from Finland. We may also mention urtite from Lujaur Urt on the White Sea, which consists very largely of nepheline, with aegirine and apatite, but no felspar. Jacupirangite (from Jacupiranga in Brazil) is a blackish rock composed of titaniferous augite, magnetite, ilmenite, perofskite and nepheline, with secondary biotite.

The chemical peculiarities of the nepheline-syenites are well marked, as will be seen from the following analyses. They are exceedingly rich in alkalis and in alumina (hence the abundance of felspathoids and alkali felspars) with silica varying from 50 to 56%, while lime, magnesia and iron are never present in great quantity, though somewhat more variable than the other components. As a group, also, these rocks have a low specific gravity.

	SiO_2.	Al_2O_3.	FeO.	Fe_2O_3.	CaO.	MgO.	K_2O.	Na_2O.
Laurdalite .	54·55	19·07	3·12	2·41	3·15	1·98	4·84	7·67
Ditroite .	56·30	24·14	. .	1·99	0·69	0·13	6·79	9·28
Litchfieldite	60·39	22·57	2·26	0·42	0·32	0·13	4·77	8·44
Lujaurite .	54·14	20·61	2·08	3·28	1·85	0·83	5·25	9·87

(J. S. F.)

NEPHELINITES. The group of effusive rocks which contains nepheline with plagioclase felspar is subdivided into nepheline-tephrites and nepheline-basanites, while those which contain nepheline but not felspar are nephelinites and nepheline-basalts. The tephrites differ from the basanites in the absence of olivine, and the same distinction subsists between the nephelinites and nepheline-basalts.

Lavas with nepheline, plagioclase and augite = nepheline-tephrites.
Lavas with nepheline, plagioclase, augite and olivine = nepheline-basanites.
Lavas with nepheline and augite = nephelinites.
Lavas with nepheline, augite and olivine = nepheline-basalts.

In their essential and accessory minerals, appearance and structure, these rocks have much in common, and they tend to occur in a natural association as basic rocks comparatively rich in alkalis and alumina. The nephelinites and tephrites are rather closely linked to the phonolites and pass into them by various gradations. They are usually richer in alkalis and silica and contain less iron, lime and magnesia than the basanites and nepheline-basalts, a difference which finds expression in the presence of olivine and the smaller amount of felspars and felspathoids in the latter.

The nepheline is colourless and transparent when fresh, often in six-sided prisms, but also as irregular interstitial masses filling the spaces between the other minerals, and hard to identify owing to its low double refraction and frequent decomposition. Leucite appears in some tephrites; haüyne is more frequent as small dodecahedra often filled with black inclusions. The augite varies a good deal, being bright green or dark green (aegirine) and rich in soda in some tephrites and nephelinites, while in basanites and basalts it is often brown "basaltic" augite or purple "titaniferous" augite. It has often good crystalline form, and occurs as eight-sided monoclinic prisms, but the soda augites may be of late crystallization and form mossy or irregular growths in the matrix. Brown hornblende is much less common, and a red biotite is very characteristic of certain nephelinites. Of the felspars, labradorite is probably the most common, with more acid varieties of plagioclase. Sanidine is by no means absent, but may be considered as an accessory. The olivine presents no peculiarities. Melilite, perofskite, pseudobrookite, melanite garnet, iron oxides, apatite and chromite are occasionally met with.

All these rocks are practically confined to lavas of Tertiary and recent age, though some occur as dikes or small intrusive masses. The plutonic facies of these rocks are found among the theralites, shonkinites, essexites and ijolites. In the British Isles they are exceedingly scarce, though nepheline-basanite occurs in a dike which is presumably Tertiary, cutting the Triassic rocks at Butterton in Staffordshire, and nepheline-basalt has been found in a single neck at John o' Groat's in Caithness and at one or two places near North Berwick in Haddingtonshire. They attain a great development in the Canary Islands (Teneriffe, Grand Canary, &c.) and in the Azores, Cape Verde Islands and Fernando Noronha. In Germany they are represented among the Tertiary eruptive rocks of the Rhine district and Thuringia, at the extinct craters of the Eiffel and at the Kaiserstuhl. In central Bohemia there are many occurrences of nepheline-tephrites, basanites and basalts which though fine grained contain all their minerals in excellent preservation. The nephelinite of Katzenbuckel in the Odenwald is well known. Contrasted with the phonolites and leucitophyres these rocks are scarce in Italy and the Mediterranean province, but leucite-bearing nepheline-tephrites occur at Monte Vulture and nepheline-basalts in Tripoli. In America these rocks occur in Texas, in the Bearpaw Mountains of Montana and at Cripple Creek, Colorado. From Argentina some members have been described: thay have a great extension in East Africa (Somaliland and Masai-land) and occur also in North Nigeria. A few also have been described from New South Wales, New Zealand (Dunedin) and Tasmania. (J. S. F.)

NEPHEW, the son of a brother or sister. The word is adapted from Fr. *neveu*, Lat. *nepos* (originally "grandson" or "descendant"). The O. Eng. *nefa* survived in the form *neve* till the 15th century; this represents the Teutonic branch, cf. Ger. *Neffe*, Dutch *neef*; the ultimate root is seen in the cognate Gr. *νέποδες*, "descendants," *ἀνεψιός*, "kinsman," and Sans. *napāt*, *napt*, "descendants" or "descendant." The correlative "niece," the daughter of a brother or sister, is from Fr. *nièce*, Lat. *neptis*, the feminine form of *nepos*; the O. Eng. word was *nift*, cf. Ger. *Nichte*. A euphemistic use of "nephew" is that of the natural son of a pope, cardinal or other ecclesiastic; and from the practice of granting preferments to such children the word "nepotism" is used of any favouritism shown in finding positions for a man's family.

NEPI (anc. *Nepet* or *Nepete*), a town and episcopal see of Italy, in the province of Rome, 7½ m. S.W. of the town of Civita Castellana, 738 ft. above sea-level. Pop. (1901) 2973. The site, surrounded by ravines and accessible only on the W., is naturally strong and characteristic of an Etruscan town; on this side there is a considerable fragment of the ancient Etruscan wall, built of rectangular blocks of tufa (whether the rest of the site was protected by walls is uncertain), and a ruined castle, erected by Antonio da Sangallo the elder in 1499, for Pope Alexander VI., and restored by Pope Paul III. The municipio (town hall) is from the designs of Vignola, and contains some ancient inscriptions. The cathedral was burnt down by the French in 1789 and restored in 1831. A mile and a half E.N.E. is the Romanesque church of S Elia, founded about A.D. 1000, with frescoes of the period. It contains a pulpit of the time of Pope Gregory IV. (827–844), the sculptures of which are scattered about the church (F. Mazzanti in *Nuovo Bollettino d' Archaeologia Cristiana*, 1896, 34).

Nepet had become Roman before 386 B.C., when Livy speaks of it and Sutrium as the keys of Etruria. In that year it was surrendered to the Etruscans and recovered by the Romans, who beheaded the authors of its surrender. It became a colony in 383 B.C. It was among the twelve Latin colonies that refused further help to Rome in 209 B.C. After the Social War it became a *municipium.* It is hardly mentioned in imperial times, except as a station on the road (Via Amerina) which diverged from the Via Cassia near the modern Settevene and ran to Ameria and Tuder. In the 8th century A.D. it was for a short while the seat of a dukedom.

See G. Dennis, *Cities and Cemeteries of Etruria* (London, 1883, i. 82). (T. As.)

NEPOMUK (or Pomuk), **JOHN OF,** the national saint of Bohemia. It is necessary to distinguish between the John of Nepomuk of history and the legendary one. In 1393 a dispute arose between King Wenceslaus IV. of Bohemia and the archbishop of Prague, John of Jenzenstein. Wenceslaus, wishing to found a new bishopric in south-western Bohemia, determined to seize the revenues of the abbey of Kladrub as soon as the aged abbot Raček should die. The archbishop opposed this plan, and by his orders his vicar-general, John of Pomuk—son of a German named Wölfel, a citizen of Pomuk—advised the monks to elect a new abbot immediately after Raček's death. This greatly incensed the king, who summoned the archbishop and some of his clergy—among whom was Pomuk—to appear before him. He ordered them to be immediately arrested, and though the archbishop escaped his four companions—among them Pomuk—were seized and subjected to cruel torture. They were ordered to abandon the archbishop. Three of them consented, but Pomuk, who refused to submit and was already on the point of death, was carried to the bridge of Prague and thrown into the Vltava. It is difficult to connect this historical event with the legend of St John of Nepomuk, who was canonized by the church of Rome in 1729, mainly by the influence of the Jesuits, who hoped that this new cult would obliterate the memory of Hus. The Austrian chronicler Thomas Ebendorffer of Haselbach, who lived two generations later, first states that it was reported that King Wenceslaus had ordered that the confessor of his queen—an office that John of Pomuk never held—should be thrown into the Vltava because he would not reveal the secret of confession. The story is afterwards told in greater detail by the untrustworthy Bohemian historian Wenceslaus Hajek. It appears certain that the person canonized in 1729 was not the historical John of Pomuk or Nepomuk.

See A. H. Wratislaw, *Life, Legend and Canonization of St John Nepomuk* (1873), a valuable work founded on the best Bohemian authorities; also A. Frind, *Der geschichtliche Heilige Johann von Nepomuk* (1861); O. Abel, *Die Legende vom heiligen Johann von Nepomuk* (1855); and particularly vol. iii. of W. W. Tomek's *History of the Town of Prague* (Czech) (12 vols., Prague, 1855–1901).

NEPOS, CORNELIUS (*c.* 99–24 B.C.), Roman historian, friend of Catullus, Cicero and Atticus, was born in Upper Italy (perhaps at Verona or Ticinum). He wrote: *Chronica*, an epitome of universal history; *Exempla*, a collection of anecdotes after the style of Valerius Maximus; letters to Cicero; lives of Cato the elder and Cicero; and *De viris illustribus*, parallel lives of distinguished Romans and foreigners, in sixteen books. One section of this voluminous work (*De excellentibus ducibus exterarum gentium*, more commonly known as *Vitae excellentium imperatorum*) and the biographies of Cato and Atticus from another (*De Latinis historicis*) have been preserved. Erotic poems and a geographical treatise are also attributed to him. Nepos is not altogether happy in the subjects of his biographies, and he writes rather as a panegyrist than as a biographer, although he can rebuke his own countrymen on occasion. The *Lives* contain many errors (especially in chronology), but supply information not found elsewhere. The language is as a rule simple and correct. The *Lives* were formerly attributed to Aemilius Probus of the 4th century A.D.; but the view maintained by Lambinus (in his famous edition, 1569)—that they are all the work of Nepos—is now generally accepted. A dedicatory epigram written by Probus to the emperor Theodosius and inserted after the life of Hannibal, was the origin of the mistake. This dedication, if genuine, would only prove that Probus copied (and perhaps modified and abridged) the work. In modern times G. F. Unger (*Der sogenannte C. N.*, 1881) has attempted to prove that the author was Hyginus, but his theory has not been favourably received.

Editions of the *Lives* (especially selections) are extremely numerous; text by E. O. Winstedt (Oxford, 1904), C. L. Roth (1881), C. G. Cobet (1881), C. Halm and A. Fleckeisen (1889), with lexicon for school use; with notes, O. Browning and W. R. Inge (1888), J. C. Rolfe (U.S. 1894), A. Weidner and J. Schmidt (1902), C. Erbe (1892), C. Nipperdey and B. Lupus (ed. maj., 1879, school ed., 1895), J. Siebelis and O. Stange (1897).

NEPOS, JULIUS, the last but one of the Roman emperors of the West (474–475). He was a nephew of Marcellinus, prince of Dalmatia, whom he succeeded in his principality. After the death of Olybrius the throne of the West remained vacant for some months, during which Italy was abandoned to barbarians. Being connected by marriage with Leo I., emperor of the East, he was selected by him to succeed Olybrius on the Western throne, and proclaimed at Ravenna. After capturing his rival Glycerius, who had been nominated by the army in 473, at the mouth of the Tiber, he was recognized as emperor in Rome, Italy and Gaul. The only event of the reign of Nepos was the inglorious cession to the Visigoths of the province of Auvergne. In 475 Orestes, father of Augustulus, afterwards the last emperor of the West, raised the standard of revolt and marched against Nepos at Ravenna. The emperor fled into Dalmatia, and continued to reside at Salona until his assassination by two of his own officers in 480, possibly at the instigation of Glycerius, who had been compelled to enter the church and had been appointed bishop of Salona.

See Tillemont, *Hist. des empereurs*, vi.; Gibbon, *Decline and Fall*, ch. 36.

NEPTUNE (Lat. Neptunus), an Italian god, of unknown origin and meaning, paired with Salacia, possibly the goddess of the salt water. At an early date (399 B.C.) he was identified with the Greek Poseidon (*q.v.*), when the Sibylline books ordered a lectisternium in his honour (Livy v. 13). His festival, Neptunalia, at which tents were made from the branches of trees, was celebrated on the 23rd of July, and his temple, containing a famous marine group by Scopas, stood near the Circus Flaminius. In earlier times it was the god Fortunus who was thanked for naval victories; but Sextus Pompeius called himself son of Neptune, and Agrippa dedicated to Neptune a temple (Basilica Neptuni) in the Campus Martius in honour of the naval victory of Actium.

NEPTUNE, in astronomy, the outermost known planet of our solar system; its symbol is ♆. Its distance from the sun is a little more than 30 astronomical units, *i.e.* 30 times the mean distance of the earth from the sun, or about 2,796,000,000 m. It deviates greatly from Bode's law, which would give a distance of nearly 39. Its orbit is more nearly circular than that of any other major planet, Venus excepted. Its time of revolution is 165 years. Being of the 8th stellar magnitude it is invisible to the naked eye. In a small telescope it cannot be distinguished from a fixed star, but in a large one it is seen to have a disk about 2·3″ in diameter, of a pale bluish hue. No features and no change of appearance can be detected upon it, so that observation can give no indication of its rotation. Both its optical aspect and the study of its spectrum seem to show that it resembles Uranus. Its spectrum shows marked absorption-bands in the red and yellow, indicating an atmosphere of great depth of which hydrogen would seem to be a constituent. (See Planet.)

Only a single satellite of Neptune is yet known. This was discovered by William Lassell soon after the discovery of the planet. Its period of revolution is 5*d.* 21 *h.* Its motion is retrograde, in a plane making an angle of about 35° with the orbit of the planet. This was the first case of retrograde motion found in any of the planets or satellites of the solar system. The most noteworthy feature connected with the satellite is a secular change which is going on in the position of its orbital plane. Were the planet spherical in form, no such change could occur, except an extremely slow one produced by the action of the sun. The change is therefore attributed to a considerable ellipticity of the planet, which is thus inferred to be in rapid rotation. It will ultimately be possible to determine from this motion the position of the axis of rotation of Neptune with much greater precision than it could possibly be directly observed.

The following elements of the satellite were determined by H. Struve from all the observations available up to 1892:

Varying Elements of Neptune's Satellite.

Inclination to earth's equator . .	119·35° − 0·165° (t−1890)
R.A. of node on earth's equator .	185·15° + 0·148 (t−1890)
Distance from node at epoch .	234·42
Mean daily motion	61·25748°
Mean distance at log Δ = 1·47814	16·271″
Epoch, 1890, Jan. 0, Greenwich mean noon	

The eccentricity, if any, is too small to be certainly determined. From the above mean distance is derived as the mass of Neptune $\frac{1}{19\,400}$. The motion of Uranus gives a mass $\frac{1}{19,314}$.

Discovery of Neptune.—The detection of Neptune through its action upon Uranus before its existence had been made known by observation is a striking example of the precision reached by the theory of the celestial motions. So many agencies were concerned in the final discovery that the whole forms one of the most interesting chapters in the history of astronomy. The planet Uranus, before its actual discovery by Sir William Herschel in 1781, had been observed as a fixed star on at least 17 other occasions, beginning with Flamsteed in 1690. In 1820 Alexis Bouvard of Paris constructed tables of the motion of Jupiter, Saturn and Uranus, based upon a discussion of observations up to that year. Using the mutual perturbations of these planets as developed by Laplace in the *Mécanique Céleste,* he was enabled satisfactorily to represent the observed positions of Jupiter and Saturn; but the case was entirely different with Uranus. It was found impossible to represent all the observations within admissible limits of error, the outstanding differences between theory and observation exceeding 1′. In these circumstances one of two courses had to be adopted, either to obtain the best general representation of all the observations, which would result in the tables being certainly erroneous, or to reject the older observations which might be affected with errors, and base the tables only on those made since the discovery by Herschel. A few years of observation showed that Uranus was deviating from the new tables to an extent greater than could be attributed to legitimate errors of theory of observation, and the question of the cause thus became of growing interest. Among the investigators of the question was F. W. Bessel,[1] who tried to reconcile the difficulty by an increase of the mass of Saturn, but found that he could do so only by assigning a mass not otherwise admissible. Although the idea that the deviations were probably due to the action of an ultra-Uranian planet was entertained by Bouvard, Bessel and doubtless others, it would seem that the first clear statement of a conviction that such was the case, and that it was advisable to reach some conclusion as to the position of the disturbing body, was expressed by the Rev. T. J. Hussey, an English amateur astronomer. In a letter to Sir George B. Airy in 1834 he inquired Airy's views of the subject, and offered to search for the planet with his own equatorial if the required estimate of its position could be supplied. Airy expressed himself as not fully satisfied that the deviation might not arise from errors in the perturbations. He therefore was not certain of any extraneous action; but even if there was, he doubted the possibility of determining the place of a planet which might produce it. In 1837 Bouvard, in conjunction with his nephew Eugène, was again working on the problem; but it does not seem that they went farther than to collect observations and to compare the results with Bouvard's tables.

In 1835 F. B. G. Nicolai, director of the observatory at Mannheim, in discussing the motion of Halley's comet, considered the possibility that it was acted upon by an ultra-Uranian planet, the existence of which was made probable by the disagreement between the older and more recent observations.[2]

In 1838 Airy showed in a letter to the *Astronomische Nachrichten* that not only the heliocentric longitude, but the tabulated radius vector of Uranus was largely in error, but made no suggestions as to the cause.[3]

In 1843 the Royal Society of Sciences of Göttingen offered a prize of 50 ducats for a satisfactory working up of the whole theory of the motions of Uranus, assigning September 1846 as the time within which competing papers should be presented.

It is also recorded that Bessel, during a visit to England in 1842, in a conversation with Sir John Herschel, expressed the conviction that Uranus was disturbed by an unknown planet, and announced his intention of taking up the subject.[4] He went so far as to set his assistant Fleming at the work of reducing the observations, but died before more was done.

The question had now reached a stage when it needed only a vigorous effort by an able mathematician to solve the problem. Such a man was found in John Couch Adams, then a student of St John's College, Cambridge, who seriously attacked the problem in 1843, the year in which he took his bachelor's degree. He soon found that the observations of Uranus could be fairly well represented by the action of a planet moving in a radius of twice the mean distance of Uranus, which would closely correspond to Bode's law. During the two following years he investigated the possible eccentricity of the orbit, and in September 1845 communicated his results to Professor James Challis. In 1845, about the 1st of November, Adams also sent his completed elements to Airy, stating that according to his calculations the observed irregularities in the motion of Uranus could be accounted for by the action of an exterior planet, of which the motions and orbital elements, were given. It is worthy of note that the heliocentric longitude of the unknown body as derived from these elements is only between one and two degrees in error, while the planet was within half a degree of the ecliptic. Two or three evenings assiduously devoted to the search could not therefore have failed to make the planet known. Adams's paper was accompanied by a comparison of his theory with the observations of Uranus from 1780, showing an excellent agreement. Airy in replying to this letter inquired whether the assumed perturbation would also explain the error of the radius-vector of Uranus, which he seemed to consider the crucial test of correctness. It does not seem that any categorical reply to this question was made by Adams.

Meanwhile, at the suggestion of Arago, the investigation had been taken up by U. J. J. Leverrier, who had published some excellent work in theoretical astronomy. Leverrier's first published communication on the subject was made to the French Academy on the 10th of November 1845, a few days after Adams's results were in the hands of Airy and Challis. A second memoir was presented by Leverrier in 1846 (June 1). His investigation was more thorough than that of Adams. He first showed that the observations of Uranus could not be accounted for by the attraction of known bodies. Considering in succession various explanations, he found none admissible except that of a planet exterior to Uranus. Considering the distances to be double that of Uranus he then investigated the other elements of the orbit. He also attempted, but by a faulty method, to determine the limits within which the elements must be contained.

The following are the elements found by Adams and Leverrier:

	Leverrier.	Adams.	
		Hypothesis I.	Hypothesis II.
Semi-major axis .	36·154	38·38	37·27
Eccentricity . .	0·1076	0·16103	0·12062
Long. of perihelion	284° 45′	315° 57′	299° 11′
Mean longitude .	318° 47′	325° 8′	323° 2′
Epoch . . .	1847, Jan. 1	1846, Oct. 1	1846, Oct. 1
True longitude .	326° 32′	328°	329°

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[1] *Briefwechsel zwischen Olbers u. Bessel,* ii. 250 (Oct. 9, 1823).

[2] *Astron. Nach.* xiii. § 94.

[3] *Ibid.* xv. § 217.

[4] See *Astron. Nach.*, Ergänzungsheft, p. 6.

The longitude of the actual planet was 327° 57′ on the 1st of October 1846.

The close agreement of these elements led Airy to suggest to Challis, on the 9th of July 1846, a search for the planet with the Northumberland telescope. He proposed an examination of a part of the heavens 30° long in the direction of the ecliptic and 10° broad, and estimated the number of hours' work likely to be employed in this sweep. The proposed sweeps were commenced by Challis on the 29th of July. The plan required each region to be swept through twice, and the positions of all the known stars found to be compared, in order that the position of the planet might be detected by its motion. On the 31st of August Leverrier's concluding paper was presented to the French Academy, and on the 18th of September he wrote to John G. Galle (1812–1910), then chief assistant at the Berlin observatory, suggesting that he should search for the computed planet, with the hope of detecting it by its disk, which was probably more than 3″ in diameter. This letter, probably received on the 23rd of September, was communicated to J. F. Encke, the director of the observatory, who approved of the search. H. L. d'Arrest, a student living at the observatory, expressed a wish to assist. In the evening the search was commenced, but it was not found possible to detect any planet by its disk. Star charts were at the time being prepared at the observatory under the auspices of the Berlin Academy of Sciences. It was suggested by d'Arrest that this region might be covered by one of the charts. Referring to the chart, which was lying in a drawer, it was found that such was the case. Comparing the stars on the chart one by one with the heavens it was found that an eighth magnitude star now visible was not on the chart. This object was observed until after midnight, but no certain motion was detected. On the following evening the object was again looked for, and found to have actually moved. The existence of the planet was thus established. It was afterwards found that Challis in his sweeps had observed the planet on the 4th of August, but, not having compared his observations with those made subsequently, had failed to detect it.

The question whether Leverrier should receive the sole credit of the discovery was warmly discussed. Arago took the extreme ground that actual publication alone should be considered, rejecting Adams's communications to Airy and Challis as quite unworthy of consideration. He also suggested that the name of Leverrier should be given to the planet, but this proposal was received with so little favour outside of France that he speedily withdrew it, proposing that of Neptune instead.

The observations at the first opposition showed that the planet was moving in a nearly circular orbit, and was at a mean distance from the sun much less than that set by Leverrier as the smallest possible. The latter had in fact committed the error of determining the limits by considering the variations of the elements one at a time, assuming in the case of each that while it varied the others remained constant. But a simultaneous variation of all the elements would have shown that the representation of the observations of Uranus would be improved by a simultaneous diminution of both the eccentricity and the mean distance, the orbit becoming more nearly circular and the planet being brought nearer to the sun. But this was not at first clearly seen, and Benjamin Peirce of Harvard University went so far as to maintain that there was a discontinuity between the solution of Adams and Leverrier and the solution offered by the planet itself, and that the coincidence in direction of the actual and computed planet was an accident. But this view was not well founded, and the only explanation needed was to be found in Leverrier's faulty method of determining the limits within which the planet must be situated. As a matter of fact the actual motion of the planet during the century preceding, as derived from Leverrier's elements, was much nearer the truth than the elements themselves were. This arose from the fact that his very elliptic orbit, by its large eccentricity, brought the planet near to the sun, and therefore near to its true position, during the period from 1780 to 1845, when the action on Uranus was at its greatest.

The observations of the first opposition enabled Sears Cook Walker of the National Observatory, Washington, in February 1847 to compute the past positions of the planet, and identify it with a star observed by Lalande at Paris in May 1795. This being communicated to the Paris observatory, an examination of Lalande's manuscript showed that he had made two observations of the planet, on the 8th and 10th of May, and finding them discordant had rejected one as probably in error, and marked the other as questionable. A mere re-examination of the region to see which observation was in error would have led him to the discovery of the planet more than half a century before it was actually recognized. The identity of Lalande's star with Neptune was also independently shown by Petersen of Altona, before any word of Walker's work had reached him.

Bibliography.—The principal sources for the history of the discovery of Neptune are the *Astronomische Nachrichten*, vols. xxv., xxvi., xxviii., and Lindenau's paper in the *Ergänzungsheft* to this publication, pp. 1-31 (Altona, 1849). In the *Memoirs of the Royal Astronomical Society*, vol. xvi., Airy gave a detailed history of the circumstances connected with the discovery, so far as he was cognizant of them. Documents pertaining to the subject are found in the *Monthly Notices of the Royal Astron. Society*. B. A. Gould, *Report to the Smithsonian Institution on the History of the Discovery of Neptune*, published by the Smithsonian Institution (Washington, 1850), is the most complete and detailed history of all the circumstances connected with the discovery, and with the early investigations on the orbit of the planet, that has been published. Leverrier's investigation was published *in extenso* as an addition to the *Connaissance des temps*, and Adams's as an appendix to the *Nautical Almanac* for 1851. Peirce's discussions, so far as published at all, are found in the *Proceedings of the American Academy of Arts and Sciences*. The first computations of the orbit after the discovery were made by Sears Cook Walker, and published by the Smithsonian Institution (1848–1850). General tables of the motion of Neptune are in Kowalski's *Tables du mouvement de la planète Neptune*; Newcomb's *Investigation of the Orbit of Neptune*, Washington, Smithsonian Institution (1866); Leverrier's *Annales de l'Observatoire de Paris*; *Memoirs*, vol. xiv. (1877), and lastly Newcomb's "Tables" in *Astron. Papers of the American Ephemeris*, vol. vii., part iv. Tables of the satellite are found in Newcomb, *The Uranian and Neptunian Systems*; appendix to the Washington observations for 1873. (S. N.)

NÉRAC, a town of south-western France, capital of an arrondissement in the department of Lot-et-Garonne, 16 m. W.S.W. of Agen by road. Pop. (1906) town, 4018; commune, 6318. The town, once the capital of the dukes of Albret, is divided by the Baise into two parts, Grand-Nérac on the left bank and Petit-Nérac on the right bank. The river is spanned by a bridge of the 16th century, called the Pont Vieux, and by the Pont Neuf, of modern construction. Narrow winding streets often bordered by old houses ascend from the narrow quays on both banks. From the left bank a staircase leads to the Rue Henri Quatre, where stands a wing of the castle in which Henry IV. lived. A statue of the king stands in one of the squares. The former palace of the Chambre des Comptes is now occupied by the tribunal of commerce, the library and the museum. The church of Grand-Nérac of the 18th century and the church of Petit-Nérac of the 19th century offer no remarkable features. On the left bank of the Baise, above Grand-Nérac, market gardens have taken the place of the old gardens of the Sires d'Albret, but remains of the Palais des Mariannes and of the Pavillon des Bains du Roi de Navarre, both of Renaissance architecture, are left. The famous promenade of La Garenne laid out by Antoine de Bourbon, king of Navarre, stretches for more than a mile along the opposite bank of the river. The remains of a Roman villa, including a fragment of mosaic, have been found there. A road leads from the south end of La Garenne to the ruins of the feudal castle of Nazareth. The Château du Tasta of the 15th century is within a short distance of Nérac. The town has a sub-prefecture, and the industries include brewing and cork-working.

Nérac appears at the beginning of the 11th century as a possession of the monks of St Pierre de Condom. The lords of Albret gradually deprived them of their authority over the town, and at the beginning of the 14th century founded a castle on the left bank of the Baise. In the 16th century the castle was the residence of Henry IV. during much of his youth and of

Marguerite de Valois, sister of Francis I.; of Jeanne d'Albret, and of the second Marguerite de Valois, wife of Henry IV., who held a brilliant court there. Nérac, the inhabitants of which had adopted the Reformed religion, was seized by the Catholics in 1562. The conferences, held there at the end of 1578 between the Catholics and Protestants, ended in February 1579 in the peace of Nérac. In 1580 the town was used by Henry IV. as a base for attacks on the Agenais, Armagnac and Guienne. A Chambre de l'Edit for Guienne and a Chambre des Comptes were established there by Henry IV. In 1621, however, the town took part in the Protestant rising, was taken by the troops of Louis XIII. and its fortifications dismantled. Soon after it was deprived both of the Chambre de l'Edit and of the Chambre des Comptes, and its ruin was completed by the revocation of the Edict of Nantes in 1685.

NERBUDDA, or Narbada, a river of India. It is traditionally regarded as the boundary between Hindustan proper and the Deccan. It rises on the summit of Amarkantak hill in Rewa state, and for the first 200 m. of its course winds among the Mandla hills, which form the head of the Satpura range; then at Jubbulpore, passing through the "Marble Rocks," it enters its proper valley between the Vindhyan and Satpura ranges, and pursues a direct westerly course to the Gulf of Cambay. Its total course through the Central Provinces and Gujarat amounts to about 800 m., and it falls into the sea in the Bombay district of Broach. It receives the drainage of the northern slopes of the Satpuras, but not that of the Vindhyan tableland, the streams from which flow into the Ganges and Jumna. After leaving the Central Provinces, the river widens out in the fertile district of Broach, with an average breadth of ½ m. to 1 m. Below Broach city it forms an estuary which is 13 m. broad where it enters the Gulf of Cambay. The Nerbudda is nowhere utilized for irrigation, and navigation is confined to the lower section. In the rainy season boats of considerable size sail about 60 m. above Broach city. Sea-going vessels of about 70 tons frequent the port of Broach, but they are entirely dependent on the tide. In sanctity the Nerbudda ranks only second to the Ganges among the rivers of India, and along its whole course are special places of pilgrimage. The most meritorious act that a pilgrim can perform is to walk from the sea to the source of the river and back along the opposite bank. This pilgrimage takes from one to two years to accomplish.

The Nerbudda has given its name to a division of the Central Provinces, comprising the five districts of Narsinghpur, Hoshangabad, Nimar, Betul and Chhindwara. Area, 18,382 sq. m.; pop. (1901) 1,785,008.

NERCHINSK, a town of Eastern Siberia, in the government of Transbaikalia, 183 m. by rail E. of Chita, on the left bank of the Nercha, 2½ m. above its confluence with the Shilka. Pop. (1897) 6713. It is badly built of wood, and its lower parts frequently suffer from inundations. It has a small museum. The inhabitants support themselves mainly by agriculture, tobacco-growing and cattle-breeding; a few merchants trade in furs and cattle, in brick-tea from China, and manufactured wares from Russia.

The fort of Nerchinsk dates from 1654, and the town was founded in 1658 by Pashkov, who in that year opened direct communication between the Russian settlements in Transbaikalia and those on the Amur which had been founded by Cossacks and fur-traders coming from the Yakutsk region. In 1689 was signed between Russia and China the treaty of Nerchinsk, which stopped for two centuries the farther advance of the Russians into the basin of the Amur. After that Nerchinsk became the chief centre for the trade with China. The opening of the western route through Mongolia, by Urga, and the establishment of a custom-house at Kiakhta in 1728 diverted this trade into a new channel. But Nerchinsk acquired fresh importance from the influx of immigrants, mostly exiles, into eastern Transbaikalia, the discovery of rich mines and the arrival of great numbers of convicts, and ultimately it became the chief town of Transbaikalia. In 1812 it was transferred from the banks of the Shilka to its present site, on account of the floods. Since the foundation, in 1851, of Chita, the present capital of Transbaikalia, Nerchinsk has been falling into decay.

NERCHINSK (in full Nerchinskiy Zavod), a town and silver-mine of East Siberia, in the government of Transbaikalia, 150 m. E.S.E. of another Nerchinsk (*q.v.*) (with which it is often confused), on a small affluent of the Argun. Pop. (1897) 3000. It lies in a narrow valley between barren mountains, and is much better built than any of the district towns of East Siberia. It has a chemical laboratory for mining purposes, and a meteorological observatory (51° 18′ N., 119° 37′ E., 2200 ft. above sea-level), where meteorological and magnetical observations have been made every hour since 1842. The average yearly temperature is 25·3° F., with extremes of 97·7° and −52·6°.

Nerchinsk Mining District extends over an area of 29,450 sq. m., and includes all the silver-mines and gold-fields between the Shilka and the Argun, together with a few on the left bank of the Shilka. It is traversed by several parallel chains of mountains which rise to 4500 ft., and are intersected by a complicated system of deep, narrow valleys, densely wooded, with a few expansions along the larger rivers, where the inhabitants with difficulty raise some rye and wheat. The population (75,625 in 1897) consists of Russians, Buryats and Tunguses. Included in this number were some 2300 convicts. The mountains, so far as they have been geologically explored, consist of crystalline slates and limestones—probably Upper Silurian and Devonian—interspersed with granite, syenite and diorite; they contain rich ores of silver, lead, tin and iron, while the diluvial and alluvial valley formations contain productive auriferous sands.

The Nerchinsk silver mines began to be worked in 1704, but during the first half of the 18th century their yearly production did not exceed 8400 oz., and the total amount for the first 150 years (1704–1854) amounted to 11,540,000 oz. The lead was mostly neglected on account of the difficulties of transport, but its production is at present on the increase. Gold was first discovered in 1830, and between 1833 and 1855 260,000 oz. of gold dust were obtained. In 1864 a large number of auriferous deposits were discovered. Until 1863 all the labour was performed by serfs, the property of the emperor, and by convicts, numbering usually nearly four thousand.

NEREUS, in Greek mythology, the eldest son of Pontus and Gaea, and father of the fifty Nereïds. He is a beneficent and venerable old man of the sea, full of wisdom and skilled in prophecy, but, like Proteus, he will only reveal what he knows under compulsion. Thus Heracles seized him when asleep, and, although he attempted to escape by assuming various forms, compelled him to reveal the whereabouts of the apples of the Hesperides (Apollodorus ii. 5). His favourite dwelling-place is a cavern in the depths of the Aegean. The fifty daughters of Nereus, the Nereïds, are personifications of the smiling, quiet sea. Of these, Thetis and Amphitrite rule the sea according to the legend of different localities; Galatea is a Sicilian figure, who plays with and deludes her rustic lover of the shore, Polyphemus. Nereus is represented with the sceptre and trident; the Nereïds are depicted as graceful maidens, lightly clad or naked, riding on tritons and dolphins. The name has nothing to do with the modern Greek *νερό* (really *νεαρόν*, "fresh" [water]): it is probably a short form of *Νήριτος*.

NERGAL, the name of a solar deity in Babylonia, the main seat of whose cult was at Kutha or Cuthah, represented by the mound of Tell-Ibrahim. The importance of Kutha as a religious and at one time also as a political centre led to his surviving the tendency to concentrate the various sun-cults of Babylonia in Shamash (*q.v.*). He becomes, however, the representative of a certain phase only of the sun and not of the sun as a whole. Portrayed in hymns and myths as a god of war and pestilence, there can be little doubt that Nergal represents the sun of noontime and of the summer solstice which brings destruction to mankind. It is a logical consequence that Nergal is pictured also as the deity who presides over the nether-world, and stands at the head of the special pantheon assigned to the government of the dead, who are supposed to be gathered in a large subterranean cave known as Arâlu or Irkalla. In this capacity there is associated with him a goddess Allatu, though there are indications that at one time Allatu was regarded as the sole mistress of Arâlu, ruling in her own person. Ordinarily the consort of Nergal is Laz. Nergal was pictured as a lion and on boundary-stone monuments his symbol is a mace surmounted by the head of a lion.

As in the case of Ninib, Nergal appears to have absorbed a number of minor solar deities, which accounts for the various names or designations under which he appears, such as Lugalgira, Sharrapu (" the burner," perhaps a mere epithet), Ira, Gibil (though this name more properly belongs to Nusku, *q.v.*) and Sibitti. A certain confusion exists in cuneiform literature between Ninib and Nergal, perhaps due to the traces of two different conceptions regarding these two solar deities. Nergal is called the " raging king," the " furious one," and the like, and by a play upon his name—separated into three elements Ne-uru-gal " lord of the great dwelling "—his position at the head of the nether-world pantheon is indicated. In the astral-theological system he is the planet Mars, while in ecclesiastical art the great lion-headed colossi serving as guardians to the temples and palaces seem to be a symbol of Nergal, just as the bull-headed colossi are probably intended to typify Ninib.

The name of his chief temple at Kutha was E-shid-lam, from which the god receives the designation of Shidlamtäea, " the one that rises up from Shidlam." The cult of Nergal does not appear to have been as widespread as that of Ninib. He is frequently invoked in hymns and in votive and other inscriptions of Babylonian and Assyrian rulers, but we do not learn of many temples to him outside of Kutha. Sennacherib speaks of one at Tarbisu to the north of Nineveh, but it is significant that although Nebuchadrezzar II. (606–586 B.C.), the great temple-builder of the neo-Babylonian monarchy, alludes to his operations at E-shid-lam in Kutha, he makes no mention of a sanctuary to Nergal in Babylon. Local associations with his original seat—Kutha—and the conception formed of him as a god of the dead acted in making him feared rather than actively worshipped. (M. JA.)

NERI, PHILIP (FILIPPO DE) (1515–1595), Italian churchman, was born at Florence on the 21st of July 1515. He was the youngest child of Francesco Neri, a lawyer of that city, and his wife Lucrezia Soldi, a woman of noble birth, whose family had long served the state. He was carefully brought up, and received his early teaching from the friars at San Marco, the famous Dominican monastery in Florence. He was accustomed in after life to ascribe most of his progress to the teaching of two amongst them, Zenobio de' Medici and Servanzio Mini. When he was about sixteen years old, a fire destroyed nearly all his father's property. Philip was sent to his father's childless brother Romolo, a merchant at San Germano, a Neapolitan town near the base of Monte Cassino, to assist him in his business, and with the hope that he might inherit his possessions. So far as gaining Romolo's confidence and affection, the plan was entirely successful, but it was thwarted by Philip's own resolve to take holy orders. In 1533 he left San Germano, and went to Rome, where he became tutor in the house of a Florentine gentleman named Galeotto Caccia. Here he was able to pursue his own studies under the guidance of the Augustinians, and to begin those labours amongst the sick and poor which gained him in later life the title of "Apostle of Rome," besides paying nightly visits for prayer and meditations to the churches of the city and to the catacombs. In 1538 he entered on that course of home mission work which was the distinguishing characteristic of his life; somewhat in the manner of Socrates he traversed the city, seizing opportunities of entering into conversation with persons of all ranks, and of leading them on, with playful irony, with searching questions, with words of wise and kindly counsel, to consider the topics he desired to set before them.

In 1548 he founded the celebrated confraternity of the Santissima Trinità de' Pellegrini e de' Convalescente, whose primary object is to minister to the needs of the thousands of poor pilgrims who flock to Rome, especially in years of jubilee, and also to relieve the patients discharged from hospitals, but still too weak for labour. In 1551 he passed through all the minor orders, and was ordained deacon, and finally priest on the 23rd of May. He had some thought of going to India as a missionary, but was dissuaded by his friends who saw that there was abundant work to be done in Rome, and that he was the man to do it. Accordingly he settled down, with some companions, at the hospital of San Girolamo della Carità, and while there tentatively began, in 1556, the institute with which his name is more especially connected, that of the Oratory. The scheme at first was no more than a series of evening meetings in a hall (the Oratory), at which there were prayers, hymns, readings from Scripture, from the fathers, and from the *Martyrology*, followed by a lecture, or by discussion of some religious question proposed for consideration. The musical selections (settings of scenes from sacred history) were called *oratorios*. The scheme was developed, and the members of the society undertook various kinds of mission work throughout Rome, notably the preaching of sermons in different churches every evening, a wholly novel agency at that time. In 1564 the Florentines requested him to leave San Girolamo, and to take the oversight of their church in Rome, San Giovanni dei Fiorentini, then newly built. He was at first reluctant, but by consent of Pius IV. he accepted, while retaining the charge of San Girolamo, where the exercises of the Oratory were kept up. At this time the new society included amongst its members Caesar Baronius, the ecclesiastical historian, Francesco Maria Tarugi, afterwards archbishop of Avignon, and Paravicini, all three subsequently cardinals, and also Gallonius, author of a well-known work on the *Sufferings of the Martyrs*, Ancina, Bordoni, and other men of ability and distinction.

The Florentines, however, built in 1574 a large oratory or mission-room for the society contiguous to San Giovanni, in order to save them the fatigue of the daily journey to and from San Girolamo, and to provide a more convenient place of assembly, and the headquarters were transferred thither. As the community grew, and its mission work extended, the need of having a church entirely its own, and not subject to other claims, as were San Girolamo and San Giovanni, made itself felt, and the offer of the small parish church of Santa Maria in Vallicella, conveniently situated in the middle of Rome, was made and accepted. The building, however, as not large enough for their purpose, was pulled down, and a splendid church erected on the site. It was immediately after taking possession of their new quarters that Neri formally organized, under permission of a bull dated July 15, 1575, a community of secular priests, entitled the Congregation of the Oratory. The new church was consecrated early in 1577, and the clergy of the new society at once resigned the charge of San Giovanni dei Fiorentini, but Neri himself did not migrate from San Girolamo till 1583, and then only in virtue of an injunction of the pope that he, as the superior, should reside at the chief house of his congregation. He was at first elected for a term of three years (as is usual in modern societies), but in 1587 was nominated superior for life. He was, however, entirely free from personal ambition, and had no desire to be general over a number of dependent houses, so that he desired that all congregations formed on his model outside Rome should be autonomous, governing themselves, and without endeavouring to retain control over any new colonies they might themselves send out—a regulation afterwards formally confirmed by a brief of Gregory XV. in 1622. Much as he mingled with society, and with persons of importance in church and state, his single interference in political matters was in 1593, when his persuasions induced the pope, Clement VIII., to withdraw the excommunication and anathema of Henry IV. of France, and the refusal to receive his ambassador, even though the king had formally abjured Calvinism. Neri saw that the pope's attitude was more than likely to drive Henry to a relapse, and probably to rekindle the civil war in France, and directed Baronius, then the pope's confessor, to refuse him absolution, and to resign his office of confessor, unless he would withdraw the anathema. Clement yielded at once, though the whole college of cardinals had supported his policy; and Henry, who did not learn the facts till several years afterwards, testified lively gratitude for the timely and politic intervention. Neri continued in the government of the Oratory until his death, which took place on the 26th of May 1595 at Rome. He was succeeded by Baronius. There are many anecdotes told of him which attest his possession of a playful humour, united with shrewd mother-wit. He considered a cheerful temper to be more Christian than a melancholy one, and carried this spirit into his whole life. This is the true secret of his popularity and of his place in the folk-lore of the Roman poor. Many miracles were attributed to him alive and dead, and it is said that when his body was dissected it was found that two of his ribs had been broken, an event attributed to the expansion of his heart while fervently praying in the catacombs about the year 1545. This phenomenon is in the same category as the stigmata of St Francis of Assisi. Neri was beatified by Paul V. in 1600, and canonized by Gregory XV. in 1622.

"Practical commonplaceness," says Frederick William Faber in his panegyric of Neri, was the special mark which distinguishes his form of ascetic piety from the types accredited before his day. "He looked like other men . . . he was emphatically a modern gentleman, of scrupulous courtesy, sportive gaiety, acquainted with what was going on in the world, taking a real interest in it, giving and getting information, very neatly dressed, with a shrewd common sense always alive about him, in a modern room with modern furniture, plain, it is true, but with no marks of poverty about it—in a word, with all the ease, the gracefulness, the polish of a modern gentleman of good birth, considerable accomplishments, and a very various information." Accordingly, he was ready to meet the needs of his day to an extent and in a manner which even the versatile Jesuits, who much desired to enlist him in their company, did not rival; and, though an Italian priest and head of a new religious order, his genius was entirely unmonastic and unmedieval; he was the active promoter of vernacular services, frequent and popular preaching, unconventional prayer, and unsystematized, albeit fervent, private devotion.

Neri was not a reformer, save in the sense that in the active discharge of pastoral work he laboured to reform individuals. He had no difficulties in respect of the teaching and practice of his church, being in truth an ardent Ultramontane in doctrine, as was all but inevitable in his time and circumstances, and his great merit was the instinctive tact which showed him that the system of monasticism could never be the leaven of secular life, but that something more homely, simple, and everyday in character was needed for the new time.

Accordingly, the congregation he founded is of the least conventional nature, rather resembling a residential clerical club than a monastery of the older type, and its rules (never written by Neri, but approved by Paul V. in 1612) would have appeared incredibly lax, nay, its religious character almost doubtful, to Bruno, Stephen Harding, Francis or Dominic. It admits only priests aged at least thirty-six, or ecclesiastics who have completed their studies and are ready for ordination. The members live in community, and each pays his own expenses, having the usufruct of his private means—a startling innovation on the monastic vow of poverty. They have indeed a common table, but it is kept up precisely as a regimental mess, by monthly payments from each member. Nothing is provided by the society except the bare lodging, and the fees of a visiting physician. Everything else—clothing, books, furniture, medicines—must be defrayed at the private charges of each member. There are no vows, and every member of the society is at liberty to withdraw when he pleases, and to take his property with him. The government, strikingly unlike the Jesuit autocracy, is of a republican form; and the superior, though first in honour, has to take his turn in discharging all the duties which come to each priest of the society in the order of his seniority, including that of waiting at table, which is not entrusted in the Oratory to lay brothers, according to the practice in most other communities. Four deputies assist the superior in the government, and all public acts are decided by a majority of votes of the whole congregation, in which the superior has no casting voice. To be chosen superior, fifteen years of membership are requisite as a qualification, and the office is tenable, as all the others, for but three years at a time. No one can vote till he has been three years in the society; the deliberative voice is not obtained before the eleventh year. There are thus three classes of members—novices, triennials and decennials. Each house can call its superior to account, can depose, and can restore him, without appeal to any external authority, although the bishop of the diocese in which any house of the Oratory is established is its ordinary and immediate superior, though without power to interfere with the rule. Their churches are non-parochial, and they can perform such rites as baptisms, marriages, &c., only by permission of the parish priest, who is entitled to receive all fees due in respect of these ministrations. The Oratory chiefly spread in Italy and in France, where in 1760 there were 58 houses all under the government of a superior-general. Malebranche, Thomassin, Mascaron and Massillon were members of the famous branch established in Paris in 1611 by Bérulle (after cardinal), which had a great success and a distinguished history. It fell in the crash of the Revolution, but was revived by Père Pététot, curé of St Roch, in 1852, as the "Oratory of Jesus and the Immaculate Mary"; the Church of the Oratory near the Louvre belongs to the Reformed Church. An English house, founded in 1847 at Birmingham, is celebrated as the place at which Cardinal Newman fixed his abode after his submission to the Roman Catholic Church. In 1849 a second congregation was founded in King William Street, Strand, London, with F. W. Faber as superior; in 1854 it was transferred to Brompton. The society has never thriven in Germany, though a few houses have been founded there, in Munich and Vienna.

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NERO (37–68), Roman emperor 54–68, was born at Antium on the 15th of December 37. He was the son of Gnaeus Domitius Ahenobarbus and Agrippina the younger, and his name was originally L. Domitius Ahenobarbus. His father died when Nero was scarcely three years old. In the previous year (39) his mother had been banished by order of her brother Caligula (Gaius) on a charge of treasonable conspiracy, and Nero, thus early deprived of both parents, found shelter in the house of his aunt Domitia, where two slaves, a barber and a dancer, began his training. The emperor Claudius recalled Agrippina, who spent the next thirteen years in the determined struggle to win for Nero the throne which had been predicted for him. Her first decisive success was gained in 48 by the disgrace and execution of Messallina (*q.v.*), wife of Claudius. In 49 followed her own marriage with Claudius, and her recognition as his consort in the government.[1] The Roman populace already looked with favour on Nero, as the grandson of Germanicus, but in 50 his claims obtained formal recognition from Claudius himself, who adopted him under the title of Nero Claudius Caesar Drusus Germanicus.[2] Agrippina's next step was to provide a suitable training for her son. The scholar L. Annaeus Seneca was recalled from exile and appointed his tutor. On the 15th of December 51 Nero completed his fourteenth year, and Agrippina, in view of Claudius's failing health, determined to delay no longer his adoption of the *toga virilis*. The occasion was celebrated in a manner which seemed to place Nero's prospects of succession beyond doubt. He was introduced to the senate by Claudius himself. The proconsular *imperium* and the title of *princeps juventutis* were conferred upon him.[3] He was specially admitted as an extraordinary member of the great priestly colleges; his name was included by the Arval Brethren in their prayers for the safety of the emperor and his house; at the games in the circus his appearance in triumphal dress contrasted significantly with the simple *toga praetexta* worn by Britannicus. During the next two years Agrippina followed this up with energy. Britannicus's leading partisans were banished or put to death, and the all-important command of the praetorian guard was transferred to Afranius Burrus, a Gaul by birth, who had been the trusted agent first of Livia and then of Tiberius and Claudius. Nero himself was put prominently forward. The petitions addressed to the senate by the town of Bononia and by the communities of Rhodes and Ilium were gracefully supported by him in Latin and Greek speeches, and during Claudius's absence in 52 at the Latin festival it was Nero who, as praefect of the city, administered justice in the forum. Early in 53 his marriage with

[1] Tac. *Ann.* xii. 26, 36; see also Schiller, *Nero*, 67.

[2] Tac. *Ann.* xii. 26; Zonaras xi. 10.

[3] Tac. *Ann.* xii. 41.

Claudius's daughter Octavia drew still closer the ties which connected him with the imperial house. Agrippina determined to hasten the death of Claudius, and the absence, through illness, of the emperor's trusted freedman Narcissus, favoured her schemes. On the 13th of October 54 Claudius died, poisoned, as all our authorities declare, by her orders, and Nero was presented to the soldiers on guard as their new sovereign. From the steps of the palace he proceeded to the praetorian camp to receive the salutations of the troops, and thence to the senate-house, where he was promptly invested with all the honours, titles and powers of emperor.[1]

Agrippina's bold stroke had been completely successful. Only a few voices were raised for Britannicus; nor is there any doubt that Rome was prepared to welcome the new emperor with genuine enthusiasm. His prestige and his good qualities, carefully fostered by Seneca, made him popular, while his childish vanity, ungovernable selfishness and savage temper were as yet unsuspected. His first acts confirmed this favourable impression. He modestly declined the title of *pater patriae*; the memory of Claudius, and that of his own father Domitius were duly honoured. The senate listened with delight to his promises to rule according to the maxims of Augustus, and to avoid the errors which had rendered unpopular the rule of his predecessor, while his unfailing clemency, liberality and affability were the talk of Rome. Much no doubt of the credit of all this is due to Seneca and Burrus. Seneca had seen from the first that the real danger with Nero lay in the savage vehemence of his passions, and he made it his chief aim to stave off by every means in his power the dreaded outbreak. The policy of indulging his tastes and helping him to enjoy the sweets of popularity without the actual burdens of government succeeded for the time. During the first five years of his reign, the golden *quinquennium Neronis*, little occurred to damp the popular enthusiasm. Nero's promises of constitutional moderation were amply fulfilled, and the senate found itself free to discuss and even to decide important administrative questions. Abuses were remedied, the provincials protected from oppression, and the burdens of taxation lightened. On the frontiers, thanks chiefly to Corbulo's energy and skill, no disaster occurred serious enough to shake the general confidence, and even the murder of Britannicus seems to have been accepted as a necessary measure of self-defence. But Seneca's fear lest Nero's sleeping passions should once be roused were fully verified, and he seems to have seen all along where the danger lay, namely in Agrippina's imperious temper and insatiable love of power. The success of Seneca's own management of Nero largely depended on his being able gradually to emancipate the emperor from his mother's control. During the first few months of Nero's reign the chances of such an emancipation seemed remote, for he treated his mother with elaborate respect and consulted her on all affairs of state. In 55, however, Seneca found a powerful ally in Nero's passion for the beautiful freedwoman Acte, a passion which he deliberately encouraged. Agrippina's angry remonstrances served only to irritate Nero, and caresses equally failed. She then rashly tried intimidation and threatened to espouse the cause of Britannicus. Nero retaliated by poisoning Britannicus. Agrippina then tried to win over Nero's neglected wife Octavia, and to form a party of her own. Nero dismissed her guards, and placed her in a sort of honourable confinement (Tac. *Ann.* xiii. 12-20). During nearly three years she disappears from the history, and with her retirement things again for the time went smoothly. In 58, however, fresh cause for anxiety appeared, when Nero was enslaved by Poppaea Sabina, a woman of a very different stamp from her predecessor. High-born, wealthy and accomplished, she was resolved to be Nero's wife, and set herself to remove the obstacles which stood in her way. Her first object was the final ruin of Agrippina, and by rousing Nero's jealousy and fear she induced him to seek her death, with the aid of a freedman Anicetus, praefect of the fleet of Misenum. Agrippina was invited to Baiae, and after an affectionate reception, was conducted on board a vessel so constructed as, at a given signal, to fall to pieces. But Agrippina saved herself by swimming, and wrote to her son, announcing her escape, and affecting entire ignorance of the plot. A body of soldiers under Anicetus then surrounded her villa, and murdered her in her own chamber. Nero was horrorstruck at the enormity of the crime and terrified at its possible consequences. But a six months' residence in Campania, and the congratulations which poured in upon him from the neighbouring towns, where the report had been officially spread that Agrippina had fallen a victim to her treacherous designs upon the emperor, gradually restored his courage. In September 59 he re-entered Rome amid universal rejoicing. A prolonged carnival followed. Chariot races, musical and dramatic exhibitions, games in the Greek fashion rapidly succeeded each other. In all the emperor was a prominent figure, but these revels at least involved no bloodshed, and were civilized compared with the gladiatorial shows.

A far more serious result of the death of Agrippina was the growing influence over Nero of Poppaea and her friends. In 62 Burrus died, it was said by poison, and Seneca retired from the unequal contest. Their place was filled by Poppaea, and the infamous Tigellinus, whose sympathy with Nero's sensual tastes had gained him the command of the praetorian guards in succession to Burrus. The haunting fear of conspiracy was skilfully used by them to direct Nero's suspicions against possible opponents. Cornelius Sulla, who had been banished to Massilia in 58, was put to death on the ground that his residence in Gaul was likely to arouse disaffection in that province, and a similar charge proved fatal to Rubellius Plautus, who had for two years been living in retirement in Asia.[2] Nero's taste for blood thus whetted, Octavia was divorced, banished to the island of Pandateria and barbarously murdered. Poppaea's triumph was now complete. She was formally married to Nero; her head appeared on the coins side by side with his; and her statues were erected in the public places of Rome.

In the course of the year 61 Rome was startled by the news of a disaster in Britain. At the time of the Claudian invasion of Britain in A.D. 43 Prasutagus, the king of the Iceni, had concluded a treaty with Claudius, by which no doubt he recognized the suzerainty of Rome and was himself enrolled among "the allies and friends of the Roman people." The alliance was of value to Claudius, for the territory of the Iceni (Norfolk, Suffolk, and Cambridgeshire) lay immediately north of the new province and its capital town Colchester, and Prasutagus had loyally kept faith with Rome. But in A.D. 61 he died, leaving no male heir. His kingdom therefore lapsed to Rome, and Prasutagus, anxious that the transfer should be effected in an orderly way, divided his accumulated wealth between his two daughters and the emperor. His plan failed, for the local Roman officials acted as though the kingdom had been conquered in war; they seized on the property of the late king and his chiefs and insulted his family. Fearing that worse might follow when the kingdom should be annexed, and encouraged by the absence of the legate and his legions, the Iceni, led by Prasutagus's daughter Boudicca (Boadicea) rose in revolt and were joined by the Trinobantes in Essex, who had been long subject to Rome and had their own grievances to redress. Colchester, since A.D. 50 a Roman colony, was sacked. The ninth legion which had hurried from Lincoln was cut to pieces, and the insurgents prepared to march on London. The news of the outbreak found the legate Suetonius Paulinus engaged in attacking Anglesey. His resolution was at once taken. At the head of such light troops as he could collect, he marched in haste along the Watling Street, leaving orders for the legions to follow. Though the tribes along the road were rising, Suetonius succeeded in reaching London, only however to find himself too weak to hold it. He was obliged to fall back along the road by which he had come. London first, and then Verulam, were abandoned to the Britons. At last at some undefined point on the Watling Street his legions joined him. Thus reinforced he turned to face the enemy. The engagement was severe but the Roman victory was decisive, and Roman authority was restored throughout central and southern Britain.

The profound impression produced in Rome by the "British disaster" was confirmed two years later in A.D. 63 by the partial destruction of Pompeii by an earthquake, and the news of the evacuation of Armenia by the Roman legions. A far deeper and more lasting impression was produced by the great fire in Rome. The fire broke out on the night of the 18th of July, 64, among the wooden booths at the south-east end of the Circus Maximus. Thence in one direction it rapidly spread over the Palatine and

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[1] Tac. *Ann.* xii. 96; Suet. *Nero*, 8.

[2] Tac. *Ann.* xiv. 59.

Velia up to the low cliffs of the Esquiline, and in another it laid waste the Aventine, the Forum Boarium and Velabrum till it reached the Tiber and the solid barrier of the Servian wall. After burning fiercely for six days it suddenly started afresh in the northern quarter of the city and desolated the regions of the Circus Flaminius and the Via Lata, and by the time that it was finally quenched only four of the fourteen regiones remained untouched; three had been utterly destroyed and seven reduced to ruins. The conflagration is said by all authorities later than Tacitus to have been deliberately caused by Nero himself.[1] But Tacitus, though he mentions the rumours, declares that its origin was uncertain, and in spite of such works as Profumo's *Le fonti ed i tempi dello incendio Neroniano* (1905), there is no proof of his guilt.[2] By Nero's orders, the open spaces in the Campus Martius were utilized to give shelter to the homeless crowds, provisions were brought from Ostia and the price of corn lowered. In rebuilding the city every precaution was taken against the recurrence of such a calamity. Broad regular streets replaced the narrow winding alleys. The new houses were limited in height, built partly of hard stone and protected by open spaces and colonnades. The water-supply, lastly, was carefully regulated.

There is, however, no doubt that this great disaster told against Nero in the popular mind. It was regarded as a direct manifestation of the wrath of the gods, even by those who did not suspect the emperor. This impression no religious ceremonies, nor even the execution of a number of Christians, as convenient scapegoats, could altogether dispel. But Nero proceeded with the congenial work of repairing the damage. In addition to the rebuilding of the streets, he erected a splendid palace, the "golden house," for himself. The wonders of his *Domus aurea* were remembered and talked of long after its partial demolition by Vespasian. It stretched from the Palatine across the low ground, afterwards occupied by the Colosseum, to the Esquiline. Gold, precious stones and Greek masterpieces adorned its walls. Most marvellous of all were the grounds in which it stood, with their meadows and lakes, their shady woods and their distant views. To defray the enormous cost, Italy and the provinces, says Tacitus, were ransacked, and in Asia and Achaia especially the rapacity of the imperial commissioners recalled the days of Mummius and of Sulla.[3] It was the first occasion on which the provincials had suffered from Nero's rule, and the discontent it caused helped to weaken his hold over them at the very moment when the growing dissatisfaction in Rome was gathering to a head. Early in 65 Nero was panic-stricken by the discovery of a formidable conspiracy involving such men as Faenius Rufus, Tigellinus's colleague in the prefecture of the praetorian guards, Plautius Lateranus, one of the consuls elect, the poet Lucan, and, lastly, not a few of the tribunes and centurions of the praetorian guard itself. Their chosen leader, whom they destined to succeed Nero, was C. Calpurnius Piso (*q.v.*), a handsome, wealthy and popular noble, and a boon companion of Nero himself. The plan to murder Nero was frustrated by a freedman Milichus, who, in the hope of a large reward, disclosed the whole plot. Piso, Faenius Rufus, Lucan and many of their less prominent accomplices, and even Seneca himself (though there seems to have been no evidence of his complicity) were executed.

But, though largesses and thanksgivings celebrated the suppression of the conspiracy, and the round of games and shows was renewed with even increased splendour, the effects of the shock were visible in the long list of victims who during the next few months were sacrificed to his restless fears and resentment. Conspicuous among them was Paetus Thrasea, whose unbending virtue had long made him distasteful to Nero, and who was now suspected, possibly with reason, of sympathy with the conspirators. The death of Poppaea in the autumn of 65 was probably not lamented by any one but her husband, but the general gloom was deepened by a pestilence, caused, it seems, by the overcrowding at the time of the fire.

Early, however, in the summer of 66, the Parthian prince Tiridates visited Italy. This event was a conspicuous tribute to the ability both as soldier and statesman of Cn. Domitius Corbulo. As long ago as 54 the news reached Rome that the Parthian king Vologaeses had expelled the king recognized by Rome from Armenia and installed in his place his own brother Tiridates. Orders were at once issued to concentrate all available forces on the Cappadocian frontier under Corbulo, the first soldier of his day. After some time spent in making his army efficient, Corbulo invaded Armenia and swept victoriously through the country. Armenia was rescued and Corbulo proposed that Tiridates should become king of Armenia on condition of his receiving his crown as a gift from Nero. But the government in Rome had a plan of its own, and a certain Tigranes, long resident in Rome, but a stranger to the Armenians, was sent out, and Corbulo was obliged reluctantly to seat him on the Armenian throne. Tigranes's position, always insecure, soon became untenable, and it became necessary for Rome to intervene once more. A Roman force under Caesennius Paetus was sent to restore Tigranes and re-establish Roman predominance. Paetus, however, was no Corbulo. He was defeated, and Corbulo, now legate of Syria, was obliged to come to his rescue. The result was the final triumph of Corbulo's policy. Tiridates agreed to accept the crown of Armenia from the hands of Nero. In royal state he travelled to Italy, and the ceremony of investiture was performed at Rome with the utmost splendour. Delighted with this tribute to his greatness, Nero for a moment dreamt of rivalling Alexander. Expeditions were talked of to the Caspian Sea and Ethiopia, but Nero was no soldier and quickly turned to a more congenial field. He had already, in 64, appeared on the stage before the half-Greek public of Naples. But his mind was now set on challenging the applause of the Greeks themselves in the ancient home of art. Towards the end of 66 he arrived in Greece with a retinue of soldiers, courtiers, musicians and dancers. The spectacle presented by Nero's visit was unique.[4] He went professedly as an enthusiastic worshipper of Greek art and a humble candidate for the suffrages of Greek judges. At each of the great festivals, which to please him were for once crowded into a single year, he entered in regular form for the various competitions, scrupulously conformed to the tradition and rules of the arena, and awaited in nervous suspense the verdict of the umpires. The dexterous Greeks humoured him to the top of his bent. Everywhere the imperial competitor was victorious, and crowded audiences importuned him to display his talents. The emperor protested that only the Greeks were fit to hear him, and rewarded them when he left by the bestowal of immunity from the land tax on the whole province, and by the gift of the Roman franchise; he also planned and actually commenced the cutting of a canal through the Isthmus of Corinth. If we may believe report, Nero found time in the intervals of his artistic triumphs for more vicious excesses. The stories of his mock marriage with Sporus, his execution of wealthy Greeks for the sake of their money, and his wholesale plundering of the temples were evidently part of the accepted tradition about him in the time of Suetonius, and are at least credible. Far more certainly true is his ungrateful treatment of Domitius Corbulo, who, when he landed at Cenchreae, fresh from his successes in Armenia, was met by an order for his instant execution and at once put an end to his life.

Meanwhile the general dissatisfaction was coming to a head, as we may infer from the urgency with which the imperial freedman Helius insisted upon Nero's return to Italy. Far more serious was the disaffection which now showed itself in the rich and warlike provinces of the west. In northern Gaul, early in 68, the standard of revolt was raised by Julius Vindex, governor of Gallia Lugdunensis, and himself the head of an ancient and noble Celtic family. South of the Pyrenees, P. Sulpicius Galba, governor of Hispania Tarraconensis, and Poppaea's former husband, Marcus Salvius Otho, governor of Lusitania, followed Vindex's example. At first, however, fortune seemed to favour Nero. It is very probable that Vindex had other aims in view than the deposition of Nero and the substitution of a fresh emperor in his place, and that the liberation of northern Gaul from Roman rule was part of his plan.[1] If this was so, it is easy to understand both the enthusiasm with which the chiefs of northern Gaul rallied to the standard of a leader belonging to their own race, and the opposition which Vindex encountered from the Roman colony of Lugdunum and the legions on the Rhine. For it is certain that the latter at any rate were not animated by loyalty to Nero. Though they defeated Vindex and his Celtic levies at Vesontio (Besançon), their next step was to break the statues of Nero and offer the imperial purple to their own commander Virginius Rufus. He declined their offer, but appealed to them to declare for the senate and people of Rome. Meanwhile in Spain Galba had been saluted imperator by his legions, had accepted the title, and was already on his march towards Italy. On the road the news met him that Vindex had been crushed by the army of the Rhine, and for the moment he resolved to abandon his attempt. Meanwhile, Nero had reluctantly left Greece, but returned to Italy only to renew his revels. When on the 19th of March the news reached him at Naples of the rising in Gaul, he allowed a week to elapse before he could tear himself away from his pleasures, and then contented himself with proscribing Vindex, and setting a price on his head. The revolts in Spain and Germany terrified him too late into something like energy. The senate almost openly intrigued against him, and the populace were silent or hostile. The fidelity of the praetorian sentinels even was more than doubtful. When finally the palace guards forsook their posts, Nero despairingly stole out of Rome to seek shelter in a freedman's villa some four miles off. There he heard of the senate's proclamation of Galba as emperor, and of the sentence of death passed on himself. On the approach of the horsemen sent to drag him to execution, he collected sufficient courage to save himself by suicide. Nero died on the 9th of June 68, in the thirty-first year of his age and the fourteenth of his reign, and his remains were deposited by the faithful hands of Acte in the family tomb of the Domitii on the Pincian Hill. With his death ended the line of the Caesars, and Roman imperialism entered upon a new phase. His statues were broken, his name everywhere erased, and his golden house demolished; yet, in spite of all, no Roman emperor has left a deeper mark upon subsequent tradition. The Roman populace for a long time reverenced his memory as that of an open-handed patron, and in Greece the recollections of his magnificence, and his enthusiasm for art, were still fresh when the traveller Pausanias visited the country a century later. The belief that he had not really died, but would return again to confound his foes, was long prevalent, not only in the remoter provinces, but even in Rome itself; and more than one pretender was able to collect a following by assuming the name of the last of the race of Augustus. More lasting still was the implacable hatred of those who had suffered from his cruelties. Roman literature, faithfully reflecting the sentiments of the aristocratic salons of the capital, while it almost canonized those who had been his victims, fully avenged their wrongs by painting Nero as a monster of wickedness. In Christian tradition he even appears as the mystic Antichrist, who was destined to come once again to trouble the saints. Even in the middle ages, Nero was still the very incarnation of splendid iniquity, while the belief lingered obstinately that he had only disappeared for a time, and as late as the 11th century his restless spirit was supposed to haunt the slopes of the Pincian Hill.

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[1] Tac. *Ann.* xv. 38; Suet. *Nero,* 38; Dio Cass. lxii. 16; Pliny, *N.H.* xvii. 5.

[2] This work is a reply to C. Pascal's *L'Incendio di Roma e i primi Cristiani* (Milan, 1900), which throws the guilt on the Christians.

[3] Tac. *Ann.* xv. 42; Suet. *Nero,* 31; cf. Friedländer, *Sittengeschichte,* iii. 67-69.

[4] Suet. *Nero,* 19-24; Dio Cass. *Epit.* lxiii. 8-16.

The chief ancient authorities for Nero's life and reign are Tacitus (*Annals*, xiii.-xvi., ed. Furneaux), Suetonius, Dio Cassius (*Epit.* lxi., lxii., lxiii.), and Zonaras (*Ann.* xi.). The most important modern work is that of B. W. Henderson, *The Life and Principate of the Emperor Nero* (London, 1903; see an important notice in *Class. Rev.* vol. xviii. p. 57), which contains complete bibliography of ancient and modern writers; see also H. Schiller's *Nero*, and *Geschichte d. Kaiserzeit*; Lehmann, *Claudius und Nero*; histories of Rome in general. (H. F. P.)

NERVA, MARCUS COCCEIUS, Roman emperor from the 18th of September 96 to the 25th of January 98, was born at Narnia in Umbria on the 8th of November, probably in the year 35. He belonged to a senatorial family, which had attained considerable distinction under the emperors, his father and grandfather having been well-known jurists. A single inscription (*C.I.L.* vi. 31,297) gives the name of his mother as Sergia Plautilla, daughter of Laenas. In his early manhood he had been on friendly terms with Nero, by whom he was decorated in 65 (Tacitus, *Annals*, xv. 72) with the triumphal insignia after the suppression of the Pisonian conspiracy (further valuable information as to his career is given in an inscription from Sassoferrato, (*C.I.L.* xi. 5743).

He was praetor (66) and twice consul, in 71 with the emperor Vespasian for colleague, and again in 90 with Domitian. Towards the close of the latter's reign (93) he is said to have excited suspicion and to have been banished to Tarentum on a charge of conspiracy (Dio Cass. lxvii. 15; Philostr. *Apoll. Tyan.* vii. 8). On the murder of Domitian in September 96 Nerva was declared emperor by the people and the soldiers. He is described as a quiet, kindly, dignified man, honest of purpose, but unfitted by his advanced age and temperament, as well as by feeble health, to bear the weight of empire. Nevertheless, his selection, in spite of occasional exhibitions of weakness, justified the choice. His accession brought a welcome relief from the terrible strain of the last few years. The new emperor recalled those who had been exiled by Domitian; what remained of their confiscated property was restored to them, and a stop was put to the vexatious prosecutions which Domitian had encouraged. But the popular feeling demanded more than this. The countless informers of all classes who had thriven under the previous régime now found themselves swept away, to borrow Pliny's metaphor (Pliny, *Paneg.* 35), by a hurricane of revengeful fury, which threatened to become as dangerous in its indiscriminate ravages as the system it attacked. It was finally checked by Nerva, who was stung into action by the sarcastic remark of the consul Titus Catius Caesius Fronto that, "bad as it was to have an emperor who allowed no one to do anything, it was worse to have one who allowed every one to do everything" (Dio Cass. lxviii. 1).

Nerva seems to have followed the custom of announcing the general lines of his future policy. Domitian had been arbitrary and high-handed, and had heaped favours on the soldiery while humiliating the senate; Nerva showed himself anxious to respect the traditional privileges of the senate, and such maxims of constitutional government as still survived. He pledged himself to put no senator to death. His chosen councillors in all affairs of state were senators, and the hearing of claims against the *fiscus* was taken from the imperial *procuratores* and entrusted to the more impartial jurisdiction of a praetor and a court of *judices* (Dio Cass. lxviii. 2; *Digest*, i. 2, 2; Pliny, *Paneg.* 36).

No one probably expected from Nerva a vigorous administration either at home or abroad, although during his reign a successful campaign was carried on in Pannonia against the Germans (Suebi), for which he assumed the name Germanicus. He appears, however, to have set himself honestly to carry out reforms. The economical condition of Italy evidently excited his alarm and sympathy. The last mention of a *lex agraria* in Roman history is connected with his name, though how far the measure was strictly speaking a law is uncertain. Under the provisions of this *lex*, large tracts of land were bought up and allotted to poor citizens. The cost was defrayed partly from the imperial treasury, but partly also from Nerva's private resources, and the execution of the scheme was entrusted to commissioners (*Dig.* xlvii. 21, 3; Dio Cass. lxviii. 2; Pliny, *Ep.* vii. 31; *Corp. Inscr. Lat.* vi. 1548). He also founded or restored colonies at Verulae, Scyllacium and Sitifis in Mauretania. The agrarian law was probably as short-lived in its effects as preceding ones had been, but a more lasting reform was the maintenance at the public cost of the children of poor parents in the towns of Italy (Aur. Vict. *Ep.* 24), the provision being presumably secured by a yearly charge on state and municipal lands. Private individuals were also encouraged to follow the imperial example. In the hands of Trajan, Hadrian and the Antonines, Nerva's example bore fruit in the institution of the *alimentationes*, the most genuinely charitable institution of the pagan world. These measures Nerva supplemented by others which aimed at lightening the financial burdens on the declining industry of Italy. The cost of maintaining the imperial postal system (*vehiculatio*) was transferred to the *fiscus*; from the same source apparently money was found for repairing the public roads and aqueducts; and lastly, the lucrative but unpopular tax of 5% on all legacies or inheritances (*vicesima hereditatum*), was so readjusted as to remove the grosser abuses connected with it (Pliny, *Paneg.* 37). At the same time Nerva did his best to reduce the overgrown expenditure of the state (Pliny, *Ep.* ii. 1). A commission was appointed to consider the best modes of retrenchment, and the outlay on shows and games was cut down to the lowest possible point. Nerva seems nevertheless to have soon wearied of the uncongenial task of governing, and his anxiety to be rid of it was quickened by the discovery that not even his blameless life and mild rule protected him against intrigue and disaffection. Early, apparently, in 97 he detected a conspiracy against his life headed by L. (or C.) Calpurnius Crassus, but he contented himself with a hint to the conspirators that their designs were known, and with banishing Crassus to Tarentum. This ill-judged lenity provoked a few months later an intolerable insult to his dignity. The praetorian guards had keenly resented the murder of their patron Domitian, and now, at the instigation of one of their two prefects, Casperius Aelianus, whom Nerva had retained in office, they imperiously demanded the execution of Domitian's murderers, the chamberlain Parthenius and Petronius Secundus, Aelianus's colleague. Nerva vainly strove to save, even at the risk of his own life, the men who had raised him to power, but the soldiers brutally murdered the unfortunate men, and forced him to propose a vote of thanks for the deed (Dio Cass. *Epit.* lxviii. 4; Aur. Vict. *Ep.* 24). This humiliation convinced Nerva of the necessity of placing the government in stronger hands than his own. Following the precedent set by Augustus, Galba and Vespasian, he resolved to adopt as his colleague and destined successor, M. Ulpius Trajanus, a distinguished soldier, at the time in command of the legions on the Rhine. In October 97, in the temple of Jupiter on the Capitol, Trajan was formally adopted as his son and declared his colleague in the government of the empire (Pliny, *Paneg.* 8). For three months Nerva ruled jointly with Trajan (Aur. Vict. *Ep.* 24); but on the 25th (according to others, the 27th) of January 98 he died somewhat suddenly. He was buried in the sepulchre of Augustus, and divine honours were paid him by his successor. The verdict of history upon his reign is best expressed in his own words— "I have done nothing which should prevent me from laying down my power, and living in safety as a private man." The memory of Nerva is still preserved by the ruined temple in the Via Alessandrina (il Colonacce) which marks the site of the Forum begun by Domitian, but which Nerva completed and dedicated (Suet. *Dom.* 5; Aur. Vict. 12).

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[1] Suet. *Nero*, 40; Dio Cass. *Epit.* lxiii. 22; Plut. *Galba*, 4; cf. also Schiller's *Nero*, pp. 261 seq.; Mommsen in *Hermes*, xiii. 90.

AUTHORITIES.—Dio Cass. lxviii. 1-4; Aurelius Victor 12, and *Epit.* 24; Zonaras xi. 20; compare also Pliny, *Epistolae* and *Panegyricus*; Tillemont, *Histoire des empereurs romains*, ii.; C. Merivale, *History of the Romans under the Empire*, ch. 63; H. Schiller, *Geschichte der römischen Kaiserzeit*, i. pt. 2 (1883), p. 538; J. Asbach, *Römisches Kaiserthum und Verfassung bis auf Trajan* (Cologne, 1896); A. Stein in Pauly-Wissowa's *Realencyclopädie* (*s.v.* Cocceius, 16); J. B. Bury, *The Student's Roman Empire*, ch. 23 (1893). (H. F. P.)

NERVAL, GÉRARD DE (1808–1855), the adopted name of Gérard Labrunie, French man of letters, born in Paris on the 22nd of May 1808. His father was an army doctor, and the child was left with an uncle in the country, while Mme Labrunie accompanied her husband in his campaigns. She died in Silesia. In 1811 his father returned, and beside Greek and Latin taught the boy modern languages and the elements of Arabic and Persian. Gérard found his favourite reading in old books on mysticism and the occult sciences. He distinguished himself by his successes at the Collège Charlemagne, however, and his first work, *La France guerrière, élégies nationales*, was published while he was still a student. In 1828 he published a translation of Goethe's *Faust*, the choruses of which were afterwards used by Berlioz for his legend-symphony, *The Damnation of Faust.* A number of poetical pieces and three comedies combined to acquire for him, at the age of twenty-one, a considerable literary reputation, and led to his being associated with Théophile Gautier in the preparation of the dramatic *feuilleton* for the *Presse.* He conceived a violent passion for the actress Jennie Colon, in whom he thought he recognized a certain Adrienne, who had fired his childish imagination. Her marriage and her death in 1842 were blows from which his nervous temperament never really recovered. He travelled in Germany with Alexandre Dumas, and alone in various parts of Europe, leading a very irregular and eccentric life. In 1843 he visited Constantinople and Syria, where, among other adventures, he nearly married the daughter of a Druse sheikh. He contributed accounts of his travels to the *Revue des Deux Mondes* and other periodicals. After his return to Paris in 1844 he resumed for a short time his *feuilleton* for the *Presse*, but his eccentricities increased and he committed suicide by hanging, on the 25th of January 1855. The literary style of Gérard is simple and unaffected, and he has a peculiar faculty of giving to his imaginative creations an air of naturalness and reality. In a series of novelettes, afterwards published under the name of *Les Illuminés, ou les précurseurs du socialisme* (1852), containing studies on Rétif de la Bretonne, Cagliostro and others, he gave a sort of analysis of the feelings which followed his third attack of insanity. Among his other works the principal are *Les Filles du feu* (1854), which contains his masterpiece, the semi-autobiographical romance of *Sylvie*, *Scènes de la vie orientale* (1848–1850); *Contes et facéties* (1852); *La Bohême galante* (1856); and *L'Alchimiste*, a drama in five acts, the joint composition of Gérard and Alexandre Dumas. His *Poésies complètes* were published in 1877.

There are many accounts of Gérard de Nerval's unhappy life. Among them may be mentioned notices by his friend Théophile Gautier and by Arsène Houssaye, prefixed to the posthumous *Le Rêve et la vie* (1855); Maurice Tourneux's sketch in his *Âge du romantisme* (1887); and a sympathetic study of temperament in the *Névrosés* (1898) of Mme Arvède Barine. See also G. Ferrières, *Gérard de Nerval* (1906).

NERVE (Lat. *nervus*, Gr. *νεῦρον*, a bowstring), originally a sinew or tendon (and still so used in the phrase "to strain every nerve"), but now a term practically confined to the fibres of the *nervous system* in anatomy, though consequentially employed as a general psychical term in the sense of courage or firmness, and sometimes (but more usually "nervousness") in the opposite sense. In the present article the anatomy of the nerves is dealt with; see also NERVOUS SYSTEM, MUSCLE AND NERVE, NEUROPATHOLOGY, &c.

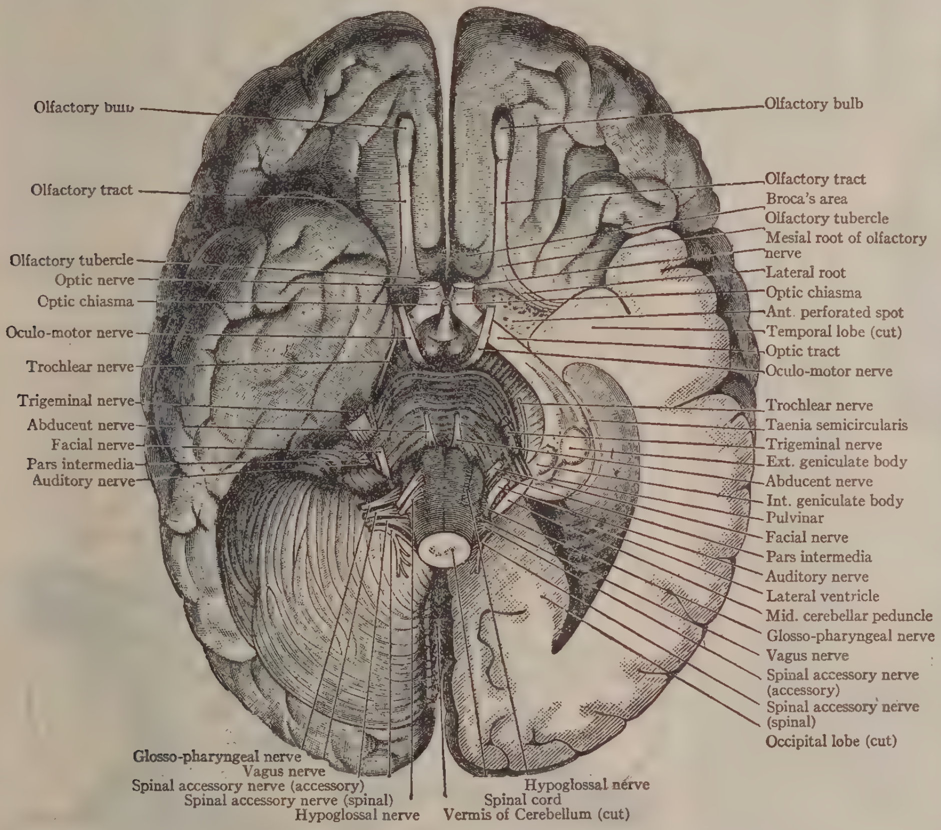
I. Cranial

The cranial nerves are those which rise directly from the brain, and for the most part are concerned with the supply of the head. With one exception they all contain medullated fibres (see NERVOUS SYSTEM). Twelve pairs of these nerves are recognized, and they are spoken of as often by their numbers as by their names. The following is a list:—

(1) Olfactory; (2) Optic; (3) Oculo-motor or Motor oculi; (4) Trochlearis or Patheticus; (5) Trigeminal or Trifacial; (6) Abducens; (7) Facial; (8) Auditory; (9) Glosso-pharyngeal; (10) Vagus or Pneumogastric; (11) Spinal accessory; (12) Hypoglossal.

The *first*, or *olfactory nerve*, consists of the *olfactory bulb* and *tract*, which are a modified lobe of the brain and lie beneath the sulcus rectus on the frontal lobe of the brain (see fig. 1). At its posterior end the tract divides to become continuous with the two extremities of the limbic lobe (see BRAIN), while at its anterior end is the bulb from which some twenty small non-medullated nerves pass through the cribriform plate of the ethmoid to supply the sensory organs in the olfactory mucous membrane (see OLFACTORY ORGAN).

The *second* or *optic nerve* consists of the *optic tract*, the optic *commissure* or *chiasma*, and the *optic nerve* proper. The optic tract begins at the lower visual centres or internal and external geniculate bodies, the superior quadrigeminal body and the pulvinar (see fig. 1), but these again are connected with the higher visual centre in the occipital lobe by the optic radiations (see fig. 2). In the chiasma some of the fibres cross and some do not, so that the right optic tract forms the right half of both the right and left optic nerves. In addition to this the fibres coming from the internal geniculate body of one side cross in the chiasma to the same body of the opposite side, forming *Gudden's commissure*. The optic nerve passes through the optic foramen in the skull into the orbit, where it is penetrated by the central artery of the retina, and eventually pierces the scelerotic just internal to the posterior pole of the eyeball. Its final distribution is treated in the article EYE.


Olfactory bulb
Olfactory tract
Olfactory tubercle
Optic nerve
Optic chiasma
Oculo-motor nerve
Trochlear nerve
Trigeminal nerve
Abducent nerve
Facial nerve
Pars intermedia
Auditory nerve
Olfactory bulb
Olfactory tract
Broca's area
Olfactory tubercle
Mesial root of olfactory nerve
Lateral root
Optic chiasma
Ant. perforated spot
Temporal lobe (cut)
Optic tract
Oculo-motor nerve
Trochlear nerve
Taenia semicircularis
Trigeminal nerve
Ext. geniculate body
Abducent nerve
Int. geniculate body
Pulvinar
Facial nerve
Pars intermedia
Auditory nerve
Lateral ventricle
Mid. cerebellar peduncle
Glosso-pharyngeal nerve
Vagus nerve
Spinal accessory nerve (accessory)
Spinal accessory nerve (spinal)
Occipital lobe (cut)
Glosso-pharyngeal nerve
Vagus nerve
Spinal accessory nerve (accessory)
Spinal accessory nerve (spinal)
Hypoglossal nerve
Hypoglossal nerve
Spinal cord
Vermis of Cerebellum (cut)

From D. J. Cunningham, in Cunningham's *Text-book of Anatomy*.

FIG. 1.—View of the Under Surface of the Brain, with the lower portion of the temporal and occipital lobes, and the cerebellum on the left side removed, to show the origins of the cranial nerves.

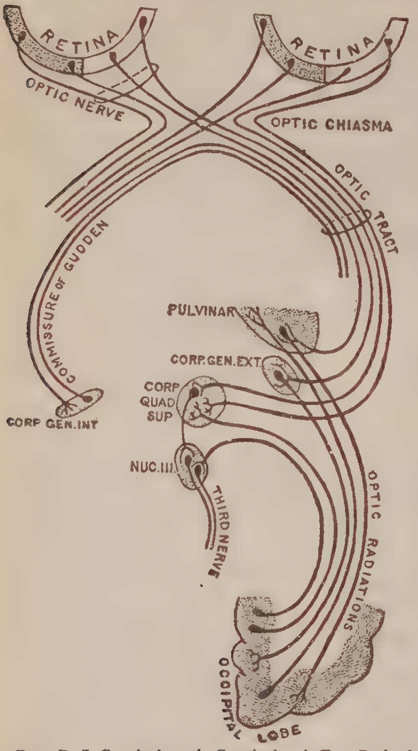
The *third* or *oculomotor nerve* rises from a nucleus in the floor of the aqueduct of Sylvius (see BRAIN, fig. 8), and comes to the surface in a groove on the inner side of the crus cerebri (fig. 1); it soon pierces the dura mater, and lies in the outer wall of the cavernous sinus, where it divides into an upper and lower branch. Both these enter the orbit through the sphenoidal fissure, the upper branch supplying the superior rectus and levator palpebrae superioris muscles, the lower the inferior and internal rectus and the inferior oblique, so that it supplies five of the seven orbital muscles.

The *fourth* or *trochlear nerve* is very small, and comes from a nucleus a little lower than that of the third nerve. It is specially remarkable in that it crosses to the opposite side in the substance of the valve of Vieussens of the fourth ventricle, after which it winds round the outer side of the crus cerebri (fig. 1) and enters the outer wall of the cavernous sinus to reach the orbit through the sphenoidal fissure. Here it enters the superior oblique muscle on its orbital surface.

The *fifth* or *trigeminal nerve* consists of motor and sensory roots. The motor root rises from a nucleus in the upper lateral part of the floor of the fourth ventricle, as well as by a descending (mesencephalic) tract from the neighbourhood of the Sylvian aqueduct (see fig. 3). The large sensory root goes to a sensory nucleus a little external to the motor one, and also, by a spinal or descending root, to the substantia gelatinosa Rolandi as low as the second spinal nerve (see fig. 3). The superficial origin of the fifth nerve is from the side of the pons (see fig. 1), and the two roots at once pass into a small compartment of the dura mater, in front of the apex of the petrous bone, known as *Meckel's cave*; here the large crescentic *Gasserian ganglion* is formed upon the sensory root, and from this the three branches come off, earning the nerve its name of trigeminal. The first of these divisions is the ophthalmic, the second the maxillary, and the third the mandibular, while the motor root only joins the last of these. The *first* or *ophthalmic division of the fifth* runs in the outer wall of the cavernous sinus, where it divides into frontal, lachrymal and nasal branches. They all enter the orbit through the sphenoidal fissure. The *frontal nerve* divides into *supraorbital* and *supratrochlear*, which pass out of the upper part of the anterior opening of the orbit and supply the skin of the forehead and upper part of the scalp as well as the inner part of the eyelids. The *lachrymal nerve* supplies that gland and the outer part of the upper eyelid. The *nasal nerve* gives off a branch to the *ciliary* or *lenticular ganglion*, which lies in the outer part of the orbit, and through which, as well as through its own *long ciliary branches*, it supplies the eyeball with sensation. It leaves the orbit through the anterior ethmoidal canal, and lies for a short distance on the cribriform plate of the ethmoid; it then enters the nasal cavity through the nasal slit and supplies this cavity, as well as the surface of the nose as far as the tip, with ordinary sensation. The *second* or *maxillary division of the fifth nerve* leaves the skull through the foramen rotundum, and then runs across the roof of the spheno-maxillary fossa; here the *spheno-maxillary* or *Meckel's ganglion* hangs from it by two roots. The nerve then runs in the floor of the orbit, giving off *superior dental* branches, until it emerges on to the face at the infraorbital foramen, where it divides into *palpebral*, *nasal* and *labial branches*, the names of which indicate their distribution. The *third* or *mandibular division of the fifth* leaves the skull through the foramen ovale, and at once gives off a set of motor branches for the muscles of mastication; these are derived from the motor root of the fifth, except that for the buccinator, which really supplies only the skin and mucous membrane in contact with the muscle. After the motor branch is given off, the third division of the fifth divides into *lingual*, *inferior dental* and *auriculo-temporal*. The *lingual* is joined by the *chorda tympani* branch of the facial nerve, and then passes to the anterior two-thirds of the tongue. In its course it passes deep to the submaxillary gland, and here the small *submaxillary ganglion* is connected with it by two roots. The *inferior dental nerve* gives off a small motor branch to the mylohyoid and posterior belly of the digastric muscles, and then enters a canal in the lower jaw, where it gives off twigs to all the lower teeth. A *mental branch* comes out through the mental foramen to supply the skin of the chin. The *auriculo temporal nerve* rises by two roots, which embrace the middle meningeal artery, and runs backward and then upward close to the lower jaw joint to supply the parotid gland, the skin on the outer side of the ear, and the side of the scalp. At its beginning it communicates with the *otic ganglion*, which lies just internal to it below the foramen ovale, and also receives a communication from the nerve to the internal pterygoid muscle.

The *sixth* or *abducent nerve* rises from a nucleus in the floor of the fourth ventricle deep to the eminentia teres (see fig. 3). It appears on the surface of the brain just below the pons and close to the middle line (see fig. 1), soon after which it pierces the dura mater and runs in the floor of the cavernous sinus to the sphenoidal fissure. Entering the orbit through this, it quickly supplies the external rectus muscle.

The *seventh* or *facial nerve* begins in a nucleus which is about the same level as that for the sixth, but much deeper from the floor of the fourth ventricle as well as farther from the middle line (see fig. 3). The fibres of the facial loop round the nucleus of the sixth, and then emerge in the triangular interval between the medulla, pons and cerebellum, close to the eighth nerve, and having the pars intermedia between (see fig. 1). Entering the internal auditory meatus with these structures the facial nerve soon passes into a canal in the petrous bone known as the *aqueductus Fallopii*, and in this it makes a sudden bend and forms the *geniculate ganglion*, from which the *great superficial petrosal* branch to Meckel's ganglion is given off. The canal ends at the stylo-mastoid foramen on the base of the skull, and here the nerve enters the parotid gland, in which it forms a plexus called the *pes anserinus*. From this, branches pass to all the muscles of the face except those of mastication. In the aqueduct the pars intermedia joins the seventh, and, beyond the geniculate ganglion, leaves it as the *chorda tympani*, which runs through the tympanum (see EAR) to join the lingual branch of the fifth. It is probable that the pars intermedia, geniculate ganglion and chorda tympani, represent the sensory root of the facial nerve. Just outside the stylo-mastoid foramen the facial gives off the *posterior auricular branch* to the occipitalis and posterior auricular muscles, as well as a branch of supply to the stylohyoid and posterior belly of the digastric muscles.



From D. J. Cunningham, in Cunningham's *Text-Book of Anatomy*.

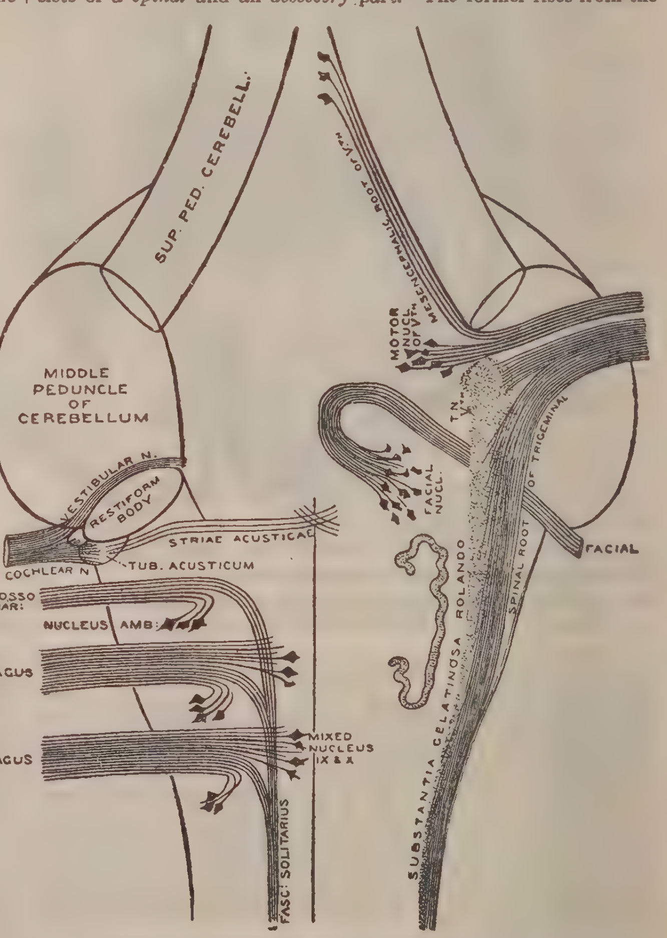
FIG. 2.—Diagram of the Central Connexions of the Optic Nerve and Optic Tract.

The *eighth* or *auditory nerve* is in two bundles, *cochlear* and *vestibular*. The former comes from the cochlear nuclei which lie deep to the acoustic tubercle in the floor of the fourth ventricle (see fig. 3), while the latter rises from the dorsal nucleus, nucleus of Deiters and the nucleus of the descending root, which are more deeply placed. The *nucleus of Deiters* is connected with the cerebellum, and is concerned in maintaining the equilibrium (*q.v.*) of the body, while, as is pointed out in the article BRAIN, the cochlear nuclei are connected with the inferior quadrigeminal body by the lateral fillet as well as with the internal geniculate body, while this body again is connected with the higher auditory centre in the grey cortex of the temporosphenoidal lobe by the auditory radiations. The vestibular root passes in front of the restiform body (see fig. 3), and the cochlear behind that body. Together they enter the internal auditory meatus, and, at the end of it, pierce the lamina cribrosa, the vestibular nerve supplying the utricle and superior and external semicircular canals, the cochlear nerve the posterior canal, the saccule and the cochlea (see EAR).

The *ninth* or *glossopharyngeal nerve* is chiefly, if not entirely, sensory, and its deep termination in the brain is the solitary bundle (see fig. 3; and BRAIN, fig. 4). It appears on the surface between the olive and restiform body (see fig. 1), and leaves the skull through the posterior lacerated foramen; as it does so two ganglia, the *jugular* and *petrous*, are formed on it, after which it runs downward and forward, between the internal and external carotid arteries, and eventually reaches the back of the tongue (see TONGUE). On its way it supplies the tympanum, the stylopharyngeus muscle, though there is grave doubt as to whether these fibres are not really derived from the facial nerve, contributions to the pharyngeal plexus, the tonsil and part of the epiglottis.

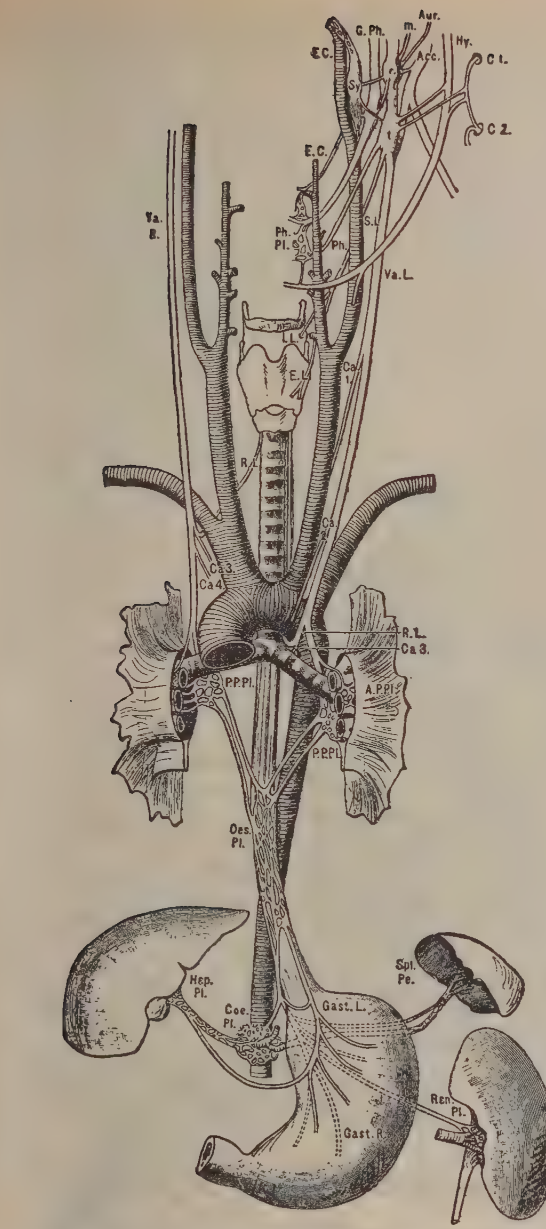
The *tenth nerve* or *vagus* has sensory and motor fibres; the former go to the solitary bundle mentioned in the description of the last nerve (see fig. 3), while the latter come from the dorsal nucleus and nucleus ambiguus, both of which are found deep to the lower half of the fourth ventricle. The nerve appears on the surface between the olive and restiform body and just below the ninth (see fig. 1). It leaves the skull through the posterior lacerated foramen, and, like the glossopharyngeal, has two ganglia developed on it; the upper of these is the *ganglion of the root*, and the lower the *ganglion of the trunk* (see fig. 4). From the former the *auricular branch* or *Arnold's nerve* (see EAR) comes off, while from the latter are given off the *pharyngeal branches* to the pharyngeal plexus (fig. 4; Ph.) and the *superior laryngeal branch* which is the sensory nerve of the larynx (fig. 4, S.L.). Between the two ganglia the accessory part of the eleventh nerve joins the tenth, and it is from this communication that the motor twigs to the pharynx, larynx, alimentary and respiratory tracts are derived, as well as the inhibitory fibres of the heart. In the neck the vagus accompanies the carotid artery and internal jugular vein, and here it gives off superior and inferior cardiac branches. The left inferior cardiac branch passes to the superficial, while the three others go to the deep cardiac plexus. The nerve now enters the thorax, passing between the subclavian artery and vein. On the right side its recurrent laryngeal branch loops under the subclavian artery (fig. 4, R.), and runs up to supply all the muscles of the larynx except one (see RESPIRATORY SYSTEM). In the thorax the left vagus passes in front of the arch of the aorta, under which the left recurrent laryngeal loops, and on both sides a thoracic cardiac branch is given to the deep cardiac plexus. Both vagi pass behind the root of their own lung, and break up to form the *posterior pulmonary plexus* after giving off some branches for the much smaller *anterior pulmonary plexus*; they then reach the oesophagus, where they again break up into an *oesophageal plexus* or *plexus gulae*. As the diaphragm is approached the two nerves become distinct again, but the left one now lies in front and the right behind the food tube, so that, when the stomach is reached, the left vagus supplies the front of the organ and communicates with the *hepatic plexus*, while the right goes to the back and communicates with the *coeliac*, *splenic* and *renal plexuses*.

The *eleventh* or *spinal accessory nerve* is entirely motor, and consists of a *spinal* and an *accessory* part. The former rises from the anterior horn of the grey matter of the spinal cord as low as the fifth cervical nerve. Its fibres come to the surface mid-way between the anterior and posterior nerve-roots, and run up through the foramen magnum to join the accessory part, the deep origin of which is the lower part of the nucleus ambiguus. The accessory part, as has been noticed, joins the vagus, while the spinal part pierces the sterno-mastoid muscle and runs obliquely downward



From D. J. Cunningham, in Cunningham's *Text-Book of Anatomy*.

FIG. 3.—Deep Origins of Cranial Nerves from the Fourth Ventricle.



From A. M. Paterson, in Cunningham's *Text-Book of Anatomy*.

Fig. 4.—The Distribution of the Pneumogastric Nerve.

Va.R,	Right vagi.
Va.L,	Left vagi.
r,	Ganglion of the root and connexions with
Sy,	Sympathetic, superior cervical ganglion.
G.Ph,	Glosso-pharyngeal.
Acc,	Spinal accessory nerve.
m,	Meningeal branch.
Aur,	Auricular branch.
t,	Ganglion of the trunk and connexions with
Hy,	Hypoglossal nerve.
C1, C2	Loop between the first two cervical nerves.
Sy,	Sympathetic.
Acc,	Spinal accessory nerve.
Ph,	Pharyngeal branch.
Ph.Pl,	Pharyngeal plexus.
S.L,	Superior laryngeal nerve.
I.L,	Internal laryngeal branch.
E.L,	External laryngeal branch.
I.C,	Internal, and
E.C,	External carotid arteries.
Ca1,	Superior cervical cardiac branch. [branch.
Ca2,	Inferior cervical cardiac
R.L,	Recurrent laryngeal nerve.
Ca3,	Cardiac branches from recurrent laryngeal nerves.
Ca4,	Thoracic cardiac branch (right vagus).
A.P.Pl,	Anterior, and
P.P.Pl,	Posterior pulmonary plexuses.
Oes.Pl,	Oesophageal plexus.
Gast.R,	and *Gast.L*, Gastric branches of vagus (right and left).
Coe.Pl,	Coeliac plexus.
Hep.Pl,	Hepatic plexus.
Spl.Pl,	Splenic plexus.
Ren.Pl,	Renal plexus.

and backward across the posterior triangle of the neck to enter the trapezius; both these muscles are in part supplied by the nerve.

The *twelfth* or *hypoglossal nerve* is motor, and rises from a nucleus in the floor of the fourth ventricle deep to the trigonum hypoglossi (see Brain, fig. 3). It emerges from the brain between the anterior pyramid and the olive (see fig. 1), and leaves the skull in two bundles through the anterior condylar foramen. Soon after this it is closely bound to the vagus, and, in front of the atlas, receives an important contribution from the loop between the first and second cervical nerves. The nerve then passes downward until it reaches the origin of the occipital artery, round which it loops, and then runs forward on the surface of the hyo-glossus to the muscles of the tongue. As it bends round the occipital artery it gives off its *descendens hypoglossi branch*, which derives its fibres from the communication with the first cervical already mentioned. This branch runs down and forms a loop with the *communicans cervicis* branch from the second and third cervical nerves, and from this loop (*ansa hypoglossi*) many of the depressor muscles of the hyoid bone and larynx are supplied. Farther forward special branches are given off to the thyro-hyoid and genio-hyoid muscles, and these, like the descendens hypoglossi, are derived from the first and second cervical loop, thus leaving all the true muscles of the tongue to be supplied by the medullary part of the nerve.

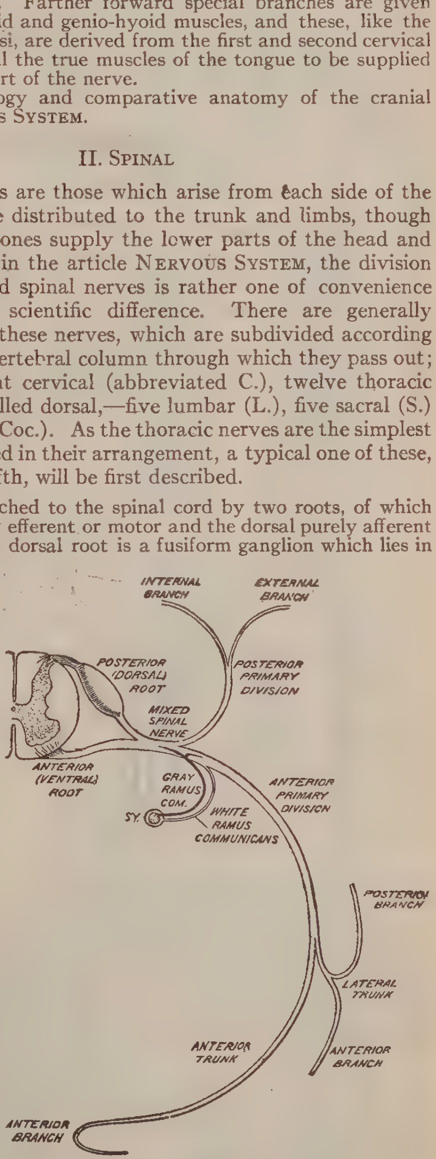
For the embryology and comparative anatomy of the cranial nerves, see Nervous System.

II. Spinal

The spinal nerves are those which arise from each side of the spinal cord and are distributed to the trunk and limbs, though some of the upper ones supply the lower parts of the head and face. As is shown in the article Nervous System, the division between cranial and spinal nerves is rather one of convenience than of any real scientific difference. There are generally thirty-one pairs of these nerves, which are subdivided according to the part of the vertebral column through which they pass out; thus there are eight cervical (abbreviated C.), twelve thoracic (Th.)—formerly called dorsal,—five lumbar (L.), five sacral (S.) and one coccygeal (Coc.). As the thoracic nerves are the simplest and most generalized in their arrangement, a typical one of these, say the fourth or fifth, will be first described.

The nerve is attached to the spinal cord by two roots, of which the ventral is purely efferent or motor and the dorsal purely afferent or sensory. On the dorsal root is a fusiform ganglion which lies in the foramen between the vertebrae through which the nerve passes. The two roots then join together to form a mixed nerve (see fig. 5), but very soon divide once more into anterior (ventral) and posterior (dorsal) primary divisions. These, however, each contain sensory and motor fibres. Just before it divides in this way the mixed nerve gives and receives its rami communicantes with the sympathetic (see Nervous System).

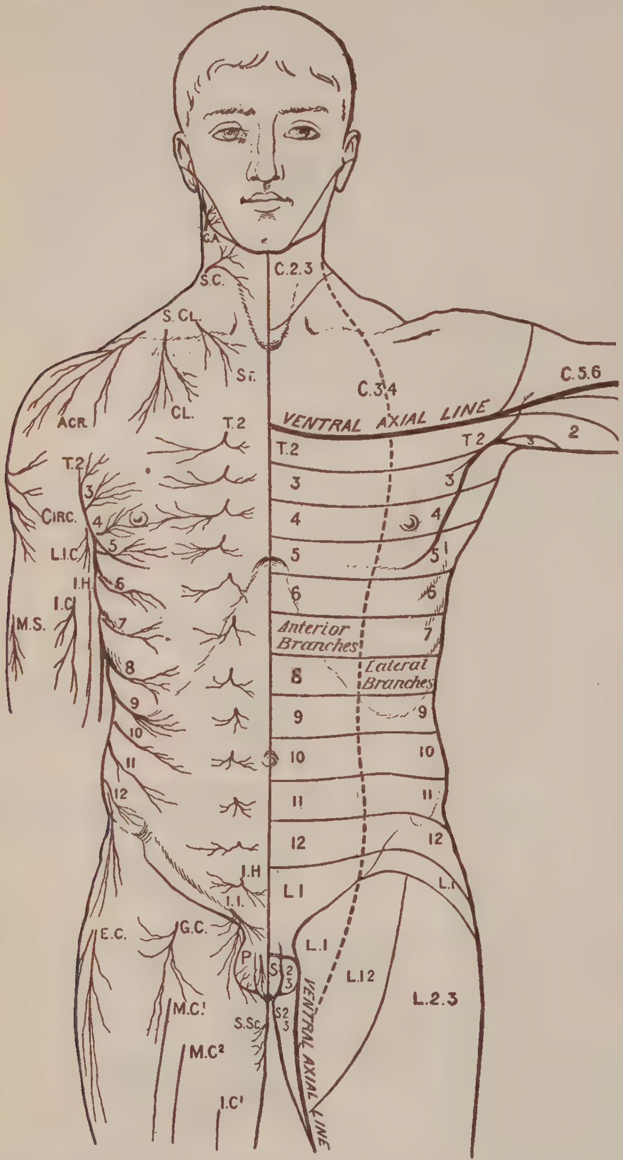
The anterior primary division runs round the trunk, between the ribs, forming an intercostal nerve and giving off a lateral cutaneous branch, when the side of the body is reached, which divides into anterior and posterior secondary branches. The rest of the division runs forward, supplying the intercostal muscles, as far as the edge of the sternum, when it ends in an anterior cutaneous branch to the front of the chest. The dorsal primary division divides into an external (lateral) and internal



From A. M. Paterson, in Cunningham's *Text-Book of Anatomy*.

Fig. 5.—Scheme of the Distribution of a Typical Spinal Nerve.

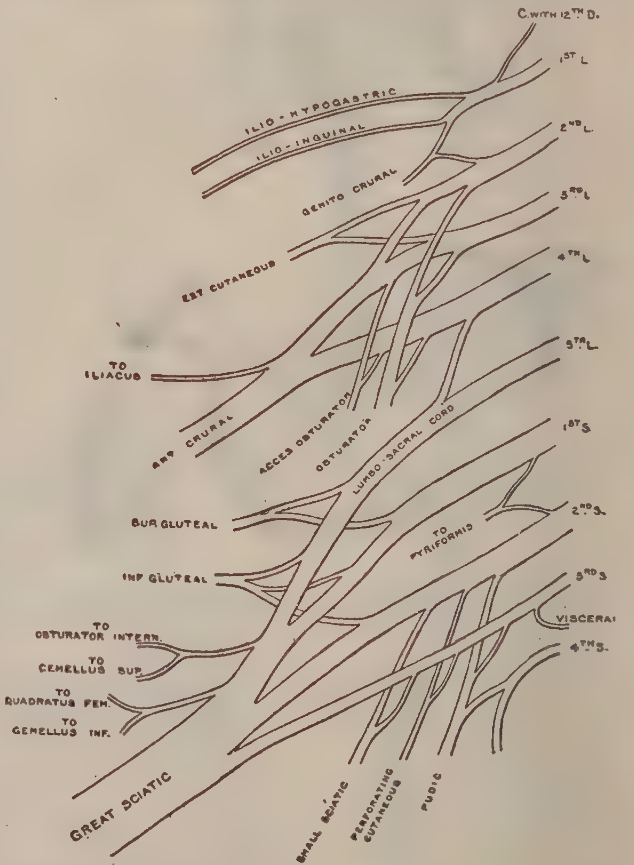
(mesial) branch through which the skin and muscles of the back are supplied.


G.A.
S.C.
C.2.3
S.Cl.
St.
C.3.4
C.5.6
VENTRAL AXIAL LINE
ACR.
CL.
T.2
2
3
4
5
6
7
CIRC.
L.I.C.
I.H.
I.C.
M.S.
Anterior Branches
Lateral Branches
8
9
10
11
12
I.H
I.I.
L.I
E.C.
G.C.
P
S 2 3
L.12
L.2.3
M.C1
S.Sc.
S2 3
M.C2
I.C1
VENTRAL AXIAL LINE

From A. M. Paterson, in Cunningham's *Text-Book of Anatomy.*

FIG. 6.—The Distribution of Cutaneous Nerves on the front of the Trunk. On one side the distribution of the several nerves is represented, the letters indicating their nomenclature:

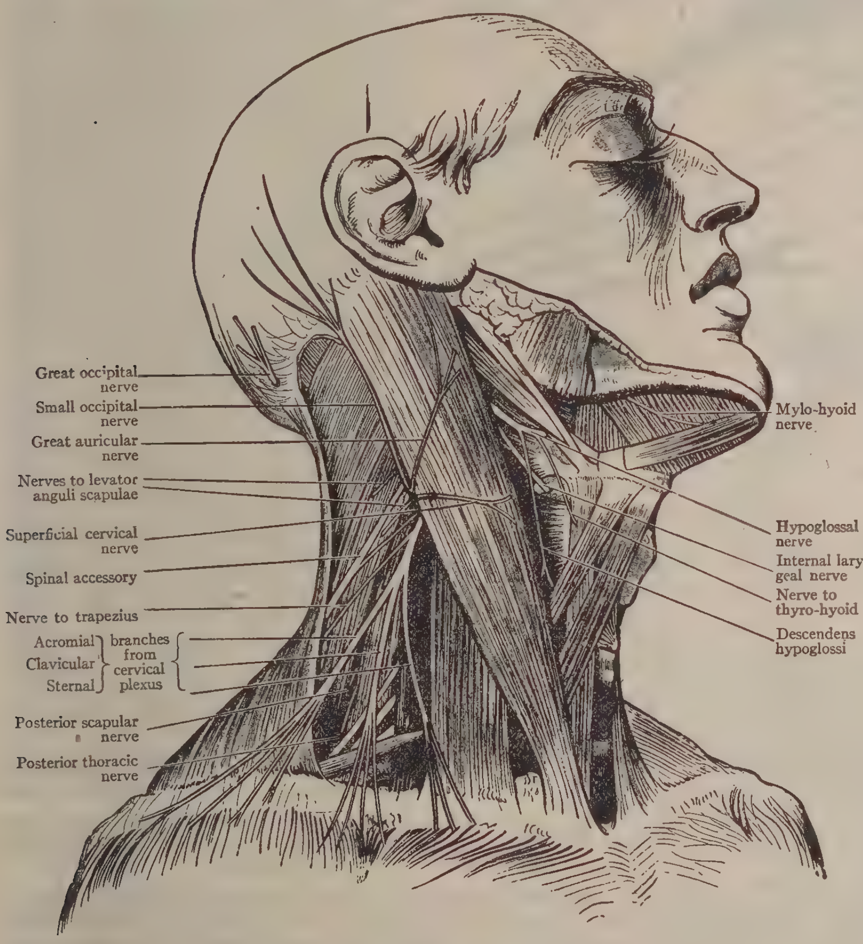
G.A.,	Great auricular nerve.
S.C,	Superficial cervical nerve.
S.Cl,	Supraclavicular nerves.
Acr,	Acromial.
Cl,	Clavicular.
St,	Sternal.
T. 2-12,	Lateral and anterior branches of thoracic nerves.
I.H,	Ilio-hypogastric nerve.
I.I,	Ilio-inguinal nerve.
Circ,	Cutaneous branch of circumflex nerve.
L.I.C,	Lesser internal cutaneous nerve.
I.H,	Intercostohumeral.
I.C,	Internal cutaneous.
M.S,	Cutaneous branch of musculo-spiral nerve.
E.C,	External cutaneous nerve.
G.C,	Genito-crural nerve.
M.C^{1,2},	Middle cutaneous nerve.
I.C^{1},	Branch of internal cutaneous nerve.
P,	Branches of pudic nerve.
S.Sc,	Branches of small sciatic nerve.


C. WITH 12TH D.
1ST L
ILIO-HYPOGASTRIC
ILIO-INGUINAL
2ND L.
GENITO CRURAL
3RD L
EXT CUTANEOUS
4TH L
5TH L.
TO ILIACUS
ANT CRURAL
ACCES OBTURATOR
OBTURATOR
LUMBO-SACRAL CORD
1ST S
SUP GLUTEAL
2ND S.
TO PYRIFORMIS
INF GLUTEAL
3RD S
VISCERAL
TO OBTURATOR INTERN.
TO GEMELLUS SUP
4TH S.
TO QUADRATUS FEM.
TO GEMELLUS INF.
GREAT SCIATIC
SMALL SCIATIC
PERFORATING CUTANEOUS
PUDIC

From Gray's *Anatomy, Descriptive and Surgical.*

FIG. 9.—Plan of the Lumbar and Sacral Plexuses.

It will be seen from the foregoing that the thoracic nerves are almost completely segmental in their distribution, in other words, each supplies a slice of the body, but in the other regions this segmental character is masked by the development of the branchial skeleton and the limbs. In the cervical region the first cervical or *suboccipital nerve* comes out between the occiput and atlas and does not always have a posterior root. When it has not, it obviously can supply no skin. Its anterior primary division joins those of the second, third and fourth cervical nerves to form the *cervical plexus*, from which the skin of the side of the neck and lower part of the head and face are supplied by means of the *small occipital*, *great auricular*, *superficial cervical*, *suprasternal*, *supraclavicular* and *supra-acromial* nerves (see fig. 7), as well as those muscles of the neck which are not supplied by the cranial nerves. The *phrenic nerve*, which comes chiefly from the fourth cervical, deserves special notice because it runs down, through the thorax, to supply the greater part of the diaphragm. The explanation of this long course (see DIAPHRAGM) is that the diaphragm is formed in the neck region of the embryo. The posterior primary division of the second cervical nerve is very large, and its inner (mesial) branch is called the *great occipital* and supplies most of the back of the scalp (fig. 7). The fifth, sixth, seventh and eighth anterior primary divisions of the cervical nerves as well as a large part of that of the first thoracic are prolonged into the arm, and in the lower part of the neck and armpit communicate with one another to form the *brachial plexus.* As a general law underlies the composition of the limb plexuses it will be worth while to study the structure and distribution of this one with some little care. It will be seen from the accompanying diagram (fig. 8) that each component nerve with the exception of the first thoracic divides into an anterior (ventral) and a posterior (dorsal) division which are best spoken of as secondary divisions in order to prevent any confusion with the anterior and posterior primary divisions which all the spinal nerves undergo. In the diagram the anterior secondary divisions are white, while the posterior are shaded. It has been suggested by A. M. Paterson that the posterior secondary branches correspond with the lateral branches of the thoracic nerves already mentioned, but there are still certain difficulties to be explained before altogether accepting this. Later on in the plexus three cords are formed of which the posterior is altogether made up of the posterior secondary divisions, while the anterior secondary divisions of the fifth, sixth and seventh cervical nerves form the external cord, and those of the eighth cervical and first thoracic the inner. As a general rule the nerves which rise from the ventral secondary divisions of the limb plexuses run only to that surface of the limb which was ventral in the embryo, while the dorsal secondary divisions are confined to the original dorsal area, but, in order to apply this to the human adult, it must be realized that the limbs are at one time flattened buds coming off at right angles from the side of the body and having dorsal and ventral surfaces, one (preaxial) border toward the head of the embryo, and one (postaxial) toward the tail. If a person lies prone upon the floor with the arms outstretched and the palms downward the embryological position of the forelimb is to some extent restored, and it will now be easily understood that the more preaxial part of the limb will be supplied by those nerves which enter it from nearer the head, while the postaxial part draws its nerve supply from lower down the spinal cord. To use Herringham's words: " (A) Of two spots on the skin, that nearer the preaxial border tends to be supplied by the higher nerve. (B) Of two spots in the preaxial area the lower tends to be supplied by the lower nerve, and of two spots in the postaxial area the lower tends to be supplied by the higher nerve." Other points of general importance in regard to cutaneous nerve supply are, firstly, that the area of skin supplied by one spinal nerve is not sharply marked off from that of the next, but the two are separated by an overlapping region; and, secondly, that the area supplied by any one spinal nerve is liable to variation in different individuals within moderate limits. This variation may affect the whole plexus, and the term " prefixed plexus " has been devised by C. S. Sherrington to indicate one in which the spinal nerves entering into its formation are rather higher than usual, while, when the opposite is the case, the plexus is spoken of as " postfixed."



From A. M. Paterson, in Cunningham's *Text-book of Anatomy*.

FIG. 7.—The Triangles of the Neck (Nerves).

With regard to the muscular supply of a limb the general rule is that each muscle is supplied by fibres derived from more than one spinal nerve; this, of course, is made possible by the redistribution of fibres in the plexuses. Moreover, the muscular supply does not necessarily correspond to that of the overlying skin, because (see MUSCULAR SYSTEM) some of the primitive muscles have been suppressed, others have fused together, while others have shifted their position to a considerable distance. Bearing the foregoing facts in mind, the main distribution of the nerves of the brachial plexus may be surveyed, though the exact details must be sought in the human anatomy text-books. The outer cord of the plexus gives off the *external anterior thoracic nerve* (C. 5, 6, 7) to the pectoralis major, the *musculo-cutaneous* nerve (C. 5, 6) to the muscles on the front of the arm, and to the skin of the outer side of the forearm and the outer head of the *median nerve* (C. 5?, 6, 7), which joins the inner head (C. 8, Th. 1) and supplies most of the flexor muscles of the front of the forearm as well as those of the ball of the thumb, the outer two lumbricals and also the skin of the outer part of the palm including the outer three digits and half the fourth.

From the inner cord come the inner head of the median just mentioned, the *ulnar nerve* (C. 8, Th. 1), which passes down behind the internal condyle of the humerus, where it is popularly known as the " funny bone " and supplies the flexor carpi ulnaris, half the flexor profundus digitorum, and most of the muscles of the hand as well as the inner digit and a half on the palmar and dorsal aspects. Other branches of the inner cord are the *internal cutaneous* (C. 8, Th. 1) supplying the inner side of the forearm, the *lesser internal cutaneous* (Th. 1) which often joins the *intercosto-humeral* or lateral cutaneous branch of the second intercostal nerve to supply the skin on the inner side of the upper arm, and the *internal anterior thoracic nerve* (C. 8, Th. 1) to the pectoralis minor and major.

From the posterior cord are derived the three *subscapular nerves* (C. 5, 6, 7, 8) which supply the subscapularis, teres major and latissimus dorsi muscles, the *circumflex nerve* (C. 5, 6) supplying the deltoid and teres minor muscles, and the skin over the lower part of the deltoid, and the *musculo-spiral nerve* (C. 5, 6, 7, 8) which is the largest branch of the brachial plexus and gives off cutaneous twigs to the outer side and back of the arm and to the back of the forearm, as well as muscular twigs to the triceps and adjacent muscles. At the elbow this nerve divides into the *radial* and *posterior* interosseous. The radial is entirely sensory and supplies the skin of the outer side of the back of the hand, including three digits and a half, while the posterior interosseous is wholly muscular, supplying the muscles on the back of the forearm. It will be seen that the posterior cord is derived altogether from posterior secondary divisions of the plexus, but there are three other nerves derived from these which should be mentioned.

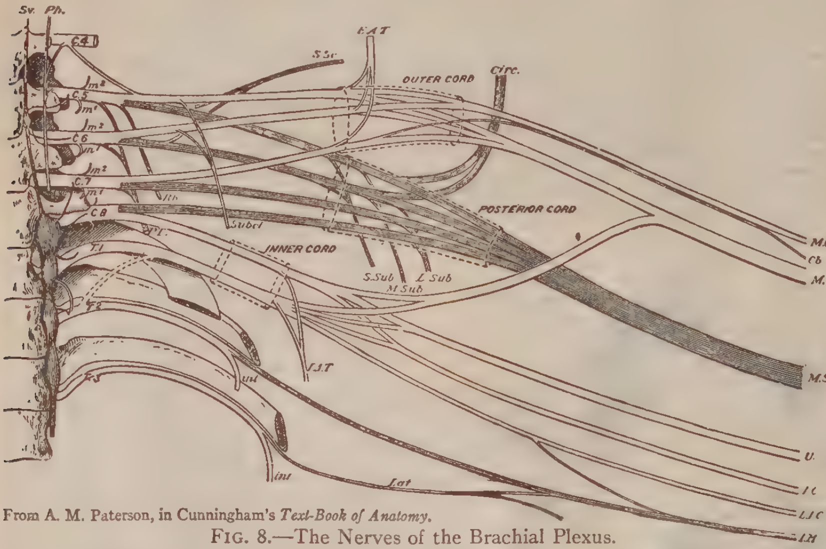
The *posterior thoracic* or respiratory nerve of Bell comes off the back of the fifth, sixth and seventh cervical nerves before the anterior and posterior secondary divisions separate, and runs down to supply the serratus magnus muscle.

The *posterior scapular* or nerve to the rhomboid muscles runs to those muscles from the fifth cervical.

The *suprascapular nerve* (C, 5, 6) passes through the suprascapular notch to supply the supraspinatus and infraspinatus muscles.

The spinal nerves which are distributed to the lower limbs first intercommunicate in the *lumbar* and *sacral* plexuses, which, with the perineal nerves, are sometimes spoken of together as the *lumbo sacral plexus*. The *lumbar plexus* (see fig. 9) is formed as a rule of the first four lumbar nerves, though the greater part of the first number is segmental in its distribution and resembles one of the thoracic nerves. It early divides into an *ilio-hypogastric* and *ilio-inguinal* branch, which run round the abdominal wall in the substance of the muscles, and of which the former gives off an iliac branch, which is in series with the lateral cutaneous branches of the intercostal nerves and passes over the crest of the ilium to the gluteal region, while the hypogastric branch runs round to the skin of the pubic region. The ilio-inguinal, on the other hand, gives off no lateral cutaneous or iliac branch, but is prolonged down the inguinal canal to supply the skin ot the scrotum as well as that of the thigh which touches it. In all probability the hypogastric branch of the ilio-hypogastric and the whole of the ilio-inguinal represent the anterior secondary division of the first lumbar nerve, while the posterior secondary division is the iliac branch of the ilio-hypogastric.

The other anterior secondary divisions of the lumbar plexus is the obturator (see fig. 8). The *obturator nerve* (L. 2, 3, 4) supplies the adductor group of muscles on the inner side of the thigh as well as the hip and knee joints; it occasionally has a cutaneous branch on the inner side of the thigh. The posterior secondary branches of the plexus are the genito-crural, the external cutaneous and the anterior crural. The genito-crural nerve (L. 1, 2) is partly anterior (ventral) and partly posterior (dorsal). It sends one anterior branch through the inguinal canal to supply the cremaster muscle, and another (posterior) to the skin of the thigh just below the groin.



From A. M. Paterson, in Cunningham's *Text-Book of Anatomy.*

FIG. 8.—The Nerves of the Brachial Plexus.

Sy, Sympathetic gangliated cord.
Phr, Phrenic nerve.
C.4, 5, 6, 7, 8, *T*.1, 2, 3, Anterior primary divisions of the lower cervical and upper thoracic nerves.
*m*¹, *m*², Muscular branches to axial muscles.
P.T, Long thoracic nerve.
Rh, Nerve to rhomboids (posterior scapular).
Subcl, Nerve to subclavius muscle.
Int, Intercostal nerves.
S.Sc, Supra-scapular nerve. The intercostal part of the first thoracic nerve is omitted.

Outer Cord.

E.A.T, External anterior thoracic nerve.
M.C, Muscular-cutaneous nerve.
Cb, Nerve to coraco-brachialis.
M, Median nerve.

Inner Cord.

I.A.T, Internal anterior thoracic nerve.
U, Ulnar nerve.
I.C, Internal cutaneous nerve.
L.I.C, Lesser internal cutaneous nerve.

Posterior Cord.

Circ, Circumflex nerve.
M.S, Musculo-spiral nerve.
S.Sub, Short subscapular nerve.
M.Sub, Lower subscapular nerve.
L.Sub, Long subscapular nerve.
I.H, Intercosto-humeral nerve.
Lat, Lateral branch of third intercostal nerve.

The *external cutaneous nerve* (L.2, 3) supplies the skin of the outer side of the thigh, while the *anterior crural* (L.2, 3, 4) innervates the muscles on the front of the thigh, the skin on the front and inner side of the thigh, through its *middle* and *internal cutaneous* branches, and the skin of the inner side of the leg and foot through the *internal saphenous* branch. At first sight it is difficult to understand how the anterior crural nerve, which supplies the skin of the front of the thigh, is a posterior secondary division of the lumbar plexus, but the explanation is that the front of the human thigh was originally the dorsal surface of the limb bud, and the distribution of the nerve is quite easily understood if the position of the hind limb of a lizard or crocodile is glanced at. The fourth lumbar nerve is sometimes called the *nervus furcalis*, because, dividing, it partly goes to the lumbar, and partly to the sacral plexus (fig. 8), though, when the plexus is prefixed, the third lumbar may be the nervus furcalis, or, when it is postfixed, the fifth lumbar. Under ordinary conditions the descending branch of the fourth lumbar nerve joins the fifth, and together they make the *lumbo-sacral cord*, which, with the first three sacral nerves, forms the *sacral plexus*. This plexus, like the others, contains anterior and posterior secondary divisions of its spinal nerves, and it resembles the brachial plexus in that the lowest nerve to enter it contributes no dorsal secondary division.

All the constituent nerves of the plexus run into one huge nerve, the *great sciatic*, which runs down the back of the thigh and, before reaching the knee, divides into *external* and *internal popliteal nerves*. These two nerves are sometimes separate from their first formation in the plexus, and may always be separated easily by the handle of a scalpel, since they are only bound together by loose connective tissue to form the great sciatic nerve. When they are separated in this way it is seen that the external popliteal is made up entirely of posterior (dorsal) secondary divisions (see fig. 9), and is derived from the fourth and fifth lumbar and first and second sacral nerves, while the internal popliteal is formed by the anterior (ventral) secondary divisions of the fourth and fifth lumbar and first, second and third sacral nerves. The *external popliteal nerve* supplies the short head of the biceps femoris (see MUSCULAR SYSTEM), and, just below the knee, divides into anterior tibial and musculo-cutaneous branches, which both supply the dorsal surface of the leg and foot. The *anterior tibial nerve* is chiefly muscular, innervating the muscles in front of the tibia and fibula as well as the extensor brevis digitorum pedis on the dorsum of the foot, though it gives one small cutaneous branch to the cleft between the first and second toes. The *musculo-cutaneous nerve* supplies the peroneus longus and brevis muscles, and the rest of the skin of the dorsum, of the foot, and lower part of the leg, while the skin of the upper part of the dorsum of the leg, below the knee, is supplied by the external popliteal before its division. The *internal popliteal nerve*, after supplying the hamstrings, is continued into the calf of the leg as the *posterior tibial* and innervates all the muscles on this, the ventral, surface. Behind the inner ankle it divides into the *external* and *internal plantar nerves*, from which the muscles and skin of the sole are supplied. A little above the knee each popliteal nerve gives off a contribution to help form the *external* or *short saphenous nerve.* That from the internal popliteal is called the *communicans tibialis*, while that from the external popliteal is the *communicans fibularis.* These join about the middle of the back of the calf, and the, now formed, *short saphenous nerve* runs down behind the outer ankle to supply the outer side of the foot. Sometimes it encroaches on the dorsum of the foot, replacing part of the musculo-cutaneous, though, when this is the case, its dorsal contribution from the external popliteal (communicans fibularis) is always larger than usual. To return to the sacral plexus: branches are given off from the anterior secondary divisions to the short external rotator muscles of the hip (pyriformis, quadratus femoris, &c.), while from the posterior secondary divisions come the superior gluteal (L. I.S. 4, 5) and the inferior gluteal (L.5, S. 1, 2) to the muscles of the buttocks.

In modern descriptions the lower branches of the lumbo-sacral plexus are grouped into a *pudendal plexus*, and the plan, though open to criticism on morphological grounds, has such descriptive advantages that it is followed here. Contributions from the first, second, third and fourth sacral, and the coccygeal nerve, form it, and these contributions are almost all anterior (ventral) secondary divisions. The branches of this plexus are the small sciatic, pudic, visceral, perforating cutaneous, muscular and sacro-coccygeal nerves. The *small sciatic* (S.1, 2, 3) is partly dorsal and partly ventral in its origin and distribution; it supplies the skin of the perineum, buttock and the back of the thigh. The *pudic nerve* (S.2, 3, 4) helps to supply the skin and muscles of the perineum and genital organs. The *visceral branches* form the pelvic stream of white rami communicantes (see NERVOUS SYSTEM); they run from the second and third or third and fourth sacral nerves to the pelvic plexuses of the sympathetic system. The *perforating cutaneous nerve* (S.2, 3) pierces the great sacro-sciatic ligament and supplies the skin over the lower internal part of the buttock. The *muscular branches* (S.3, 4) supply the external sphincter, levator ani and coccygeus.

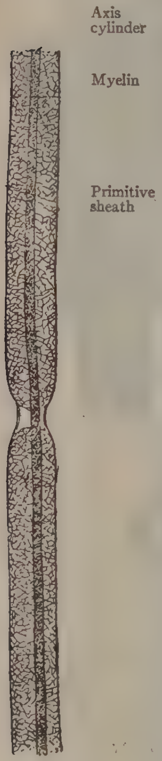
The *sacro-coccygeal nerve* (S.4, 5, Coc.1) runs down on each side of the coccyx to supply the adjacent skin, and represents the ventro-lateral nerve of the tail of lower mammals. (F. G. P.)

NERVI, a coast town of Liguria, Italy, in the province of Genoa, from which it is 7½ m. S.E. by rail (also electric tramway), 82 ft. above sea-level. Pop. (1901) 3480 (town); 6317 (commune). It is much frequented as a winter resort. It is surrounded with groves of olives, oranges and lemons, and its villas have beautiful gardens. It is moister and less dusty than the western Riviera, and is especially in favour with those who suffer from lung complaints. At Quarto, 2½ m. N.W., 1000 Garibaldians (1 mille) embarked for Marsala in 1860.

NERVOUS SYSTEM. The nervous system forms an extremely complicated set of links between different parts of the body, and is divided into (A) the central nervous system, composed of (1) the brain, and (2) spinal cord; (B) the peripheral nervous system, consisting of (1) the cranial nerves, (2) the spinal nerves, (3) the various sense organs, such as the eye, ear, olfactory organ, taste organ and tactile organs, and (4) the motor end plates; (C) the sympathetic system. The anatomy and physiology of many of these parts are treated in separate articles (see BRAIN, SPINAL CORD, NERVE, EYE, EAR, OLFACTORY ORGAN, TASTE, TOUCH, MUSCLE AND NERVE, SYMPATHETIC NERVOUS SYSTEM). The object here is to deal with anatomical points which are common to the whole system, or for which a place does not conveniently occur elsewhere.

HISTOLOGY OF THE NERVOUS SYSTEM.

Three kinds of tissue are found in the nervous system, *nerve fibres, nerve cells*, and a supporting tissue called *neuroglia*. NERVE FIBRES may be medullated or non-medullated, but, whichever they are, they consist of the long process or *axon* of a nerve cell; in a non-medullated nerve this process is either naked or enclosed in a delicate membrane called the *primitive sheath* or *neurilemma*, but in a medullated nerve the process or *axis cylinder* is encased by a white fatty substance called myelin, and so the term "myelinated" is often used instead of "medullated" for these nerves (see fig. 1). Outside this white sheath the neurilemma is present in most nerves, but is lost when they are massed to form the white matter of the central nervous system and in the optic nerve. At regular intervals the myelin is interrupted by some substance which stains deeply with silver nitrate, and these breaks are known as *nodes of Ranvier*. They do not, however, affect the axis cylinder. In a large nerve, such as the median, the nerve fibres are collected into small bundles called *funiculi*, enclosed in a connective tissue sheath, the *perineurium*, and separated from it by a lymph space. From this sheath delicate processes penetrate among the fibres, and these are known as the *endoneurium*. The funiculi are collected into bundles called *fasciculi*, and the whole nerve consists of a variable number of fasciculi surrounded by a dense fibrous sheath, the *epineurium*. The various bundles do not remain distinct, but break up and rearrange themselves, so that following them up with the scalpel is a difficult and tedious work. The nerve fibres, however, never join one another and are often several feet in length.



Cunningham's *Text-Book of Anatomy*.

FIG. 1.—Nerve-fibre from a Frog. (After v. Kölliker.)

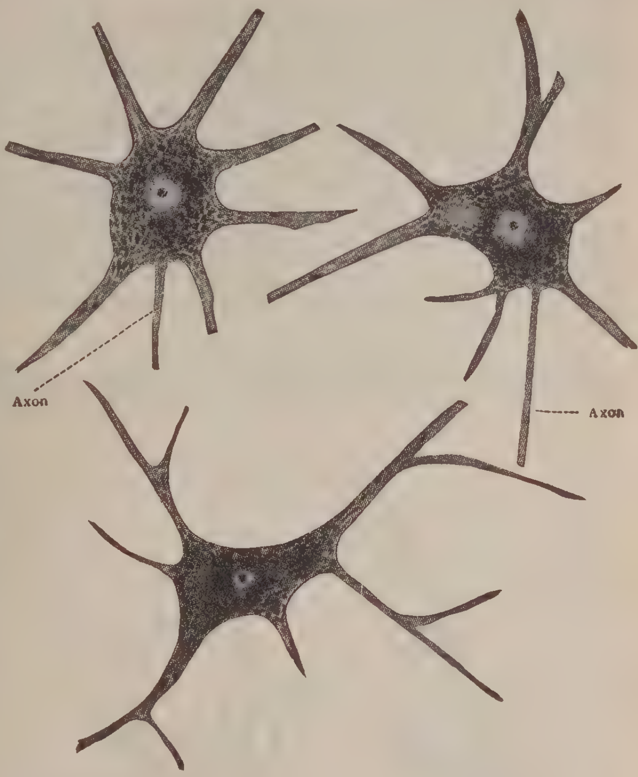
NERVE CELLS are unipolar, bipolar or multipolar. *Unipolar cells* are found in the ganglia on the posterior roots of the spinal nerves, and only give off an axon or axis cylinder process; this, however, soon divides in a T-shaped manner, and all these cells were originally bipolar, though the cell has grown away from its two axons (or, as they are often regarded, axon and dendrite), leaving a stalk joining it to them at right angles. *Bipolar cells* are found as an embryonic stage of unipolar, though in fish they persist in the spinal ganglia throughout life. They are also sometimes found in the sympathetic ganglia. *Multipolar cells* are found in the brain and cord, and are best studied in the anterior horns of the grey matter of the latter, where they are nearly visible to the naked eye (see fig. 2). Of their many processes only one is an axon, and it becomes the axial cylinder of a motor spinal nerve. The other fibres are called dendrites, and break up into delicate branches some of which surround, but, it is generally believed, are not actually continuous with, neighbouring cells or their processes. It is known that the axons are made up of delicate fibrils, and it is thought by some observers that there is actual continuity between some of these and those of an adjacent *neuron*, as the combination of a nerve cell, its axon and dendrites, is called. The cells of Purkinje in the cerebellum show a particularly rich arborization of dendrites (see BRAIN, fig. 7). Nerve cells have generally a large clear nucleus.

THE NEUROGLIA is the delicate connective tissue which supports and binds together the nervous elements of the central nervous system. One part of it, which lines the central canal of the cord and ventricles of the brain, is formed of columnar cells, and is called *ependyma*, while the rest consists of small cells with numerous processes which sometimes branch and sometimes do not. These fibres interlace with one another to form a delicate felt-work which is unmixed with nervous elements on the surface of the grey matter of the brain (see BRAIN, figs. 7 and 15), though elsewhere it is interwoven with them.

NERVE ENDINGS.—Sensory nerves end by breaking up into fibrillae or by various tactile organs. In the former case the minute fibrils, of which it has been shown that the axons or nerve fibres consist, separate and end among epithelial cells of the mucous membrane or skin. In the latter case the nerve fibres lose their coating of myelin and end in one of the seven following organs:—

1. *End bulbs of Krause* (fig. 3, A), oval bulbs composed of elongated cells among which the nerve fibrils end in knobs or coils; each is surrounded by a sheath of neurilemma, and the organs are found in the lips, tongue, conjunctiva, epineurium of nerves, synovial membranes of joints, and in the glans penis et clitoridis, where they have a mulberry-like appearance.

2. *Pacinian corpuscles* (fig. 3, B) are large enough to be seen by the naked eye, and are oval bodies made up of a series of concentric capsules of connective tissue rather resembling the structure of an onion; in the centre of this is a structureless core, at the distal extremity of which the nerve fibre ends in one or more knobs. These bodies are found in the palm and sole, in the mesentery, the genital organs and in joints.

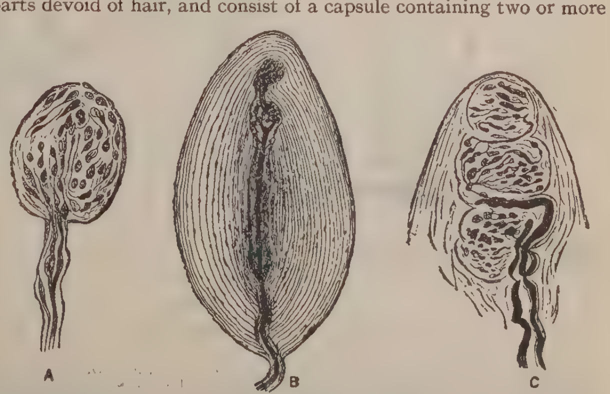


Cunningham's *Text-Book of Anatomy*.

FIG. 2.—Three Nerve-Cells from the Anterior Horn of Gray Matter of the Human Spinal Cord.

3. *Tactile corpuscles of Meissner and Wagner* (fig. 3, C) are oval bodies found in certain of the skin papillae and mucous membrane, especially of very sensitive parts like the hand and foot, lips, tongue and nipple. They are oval and made of a connective tissue capsule from which septa enter the interior. The nerve fibre generally takes a spiral course through them, loses its myelin sheath, and ends by breaking up into its fibrils, which eventually become bulbous.

4. *Tactile corpuscles of Grandry* are found in the skin of those parts devoid of hair, and consist of a capsule containing two or more largish cells, between which the nerve fibre ends in the so-called tactile discs.



From Robert Howden, in Cunningham's *Text-Book of Anatomy*.

FIG. 3.—Tactile Corpuscles. A, End bulb (Krause); B, Corpuscle of Pacini; C, Corpuscle of Meissner. (B, C, after Ranvier.)

5. *Ruffini's endings* are flattened oval bodies with a thick connective tissue capsule, in which the nerve fibre divides into many

branches which have a varicose appearance, form a rich plexus, and end in knobs. These organs are found between the true skin and subcutaneous tissue of the fingers.

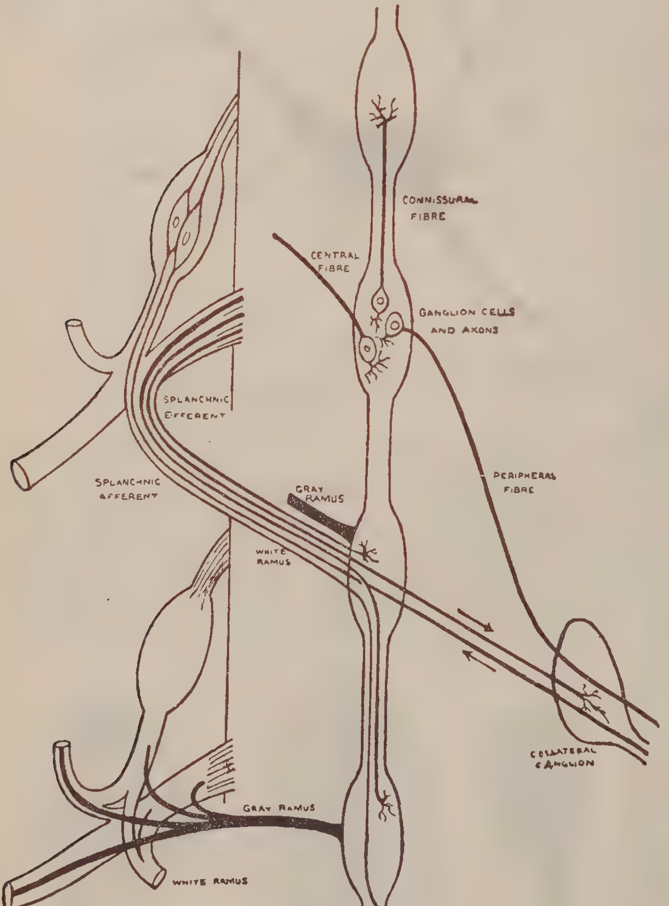
6. *Organs of Golgi* are found in tendons. Nerve fibres penetrate the tendon bundles and divide in a tree-like manner to end in little disks and varicosities.

7. *Neuro-muscular spindles* are small fusiform bundles of embryonic muscle fibres among which the nerve fibres end by encircling them and forming flattened disks. These are sensory endings, and must not be confused with the motor end plates. They are found in most of the striped muscles of the body.

Motor nerves end in striped muscle by *motor end plates.* These are formed by a nerve fibre approaching a muscle fibre and suddenly losing its myelin sheath while its neurilemma becomes continuous with the sarcolemma of the muscle fibre. The axis cylinder divides, and its ramifications are surrounded by a disk of granular matter containing many clear nuclei. In very long muscle fibres more than one of these end plates are sometimes found. *Involuntary motor endings* are usually found in sympathetic nerves going to unstriped muscle. The fibres form minute plexuses, at the points of union of which small triangular ganglion cells are found. After this the separate fibrils of the nerve divide, and each ends opposite the nucleus of an unstriped muscle cell.

THE SYMPATHETIC SYSTEM

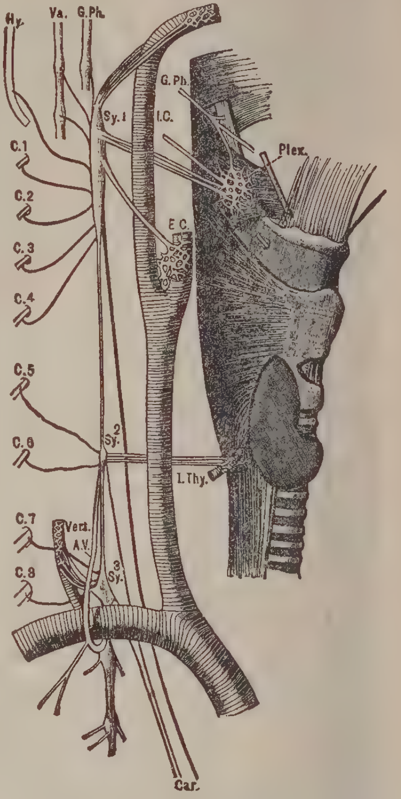
This system is made up of two gangliated cords running down one on each side of the vertebral column and ending below in the median coccygeal ganglion (*g. impar*). In the neck the cords lie in front of the anterior tubercles of the transverse processes of the cervical vertebrae, in the thorax, in front of the heads of the ribs, while in the abdomen they lie in front of the sides of the bodies of the vertebrae. In addition to these cords there are numerous ganglia and plexuses through which the sympathetic nerves pass on their way to or from the viscera and blood-vessels.



From A. M. Paterson, in Cunningham's *Text-Book of Anatomy.*

FIG. 4.—Scheme of the Constitution and Connexions of the Gangliated Cord of the Sympathetic. The gangliated cord is indicated on the right, with the arrangement of the fibres arising from the ganglion cells. On the left the roots and trunks of spinal nerves are shown, with the arrangement of the white ramus communicans above and of the gray ramus below.

A typical ganglion of the sympathetic chain is connected with its corresponding spinal nerve by two branches called *rami communicantes*, one of which is grey and the other white (see fig. 4). The white consists of medullated fibres belonging to the central nervous system, and these are splanchnic afferent or centripetal, and efferent or centrifugal. The efferent fibres lie in the anterior roots of the spinal nerves, and, like all the fibres there, are either motor or secretory. They are the motor paths for the unstriped muscle of the vessels and viscera, and the secretory paths for the cells of the viscera. In the course of each fibre from the nerve cell in the spinal cord, of which it is an axon, to the vessel or viscus it supplies, there is always a break where it arborizes round a ganglion cell, and this may be in its own ganglion of the sympathetic chain, in a neighbouring ganglion above or below, or in one of the so-called collateral ganglia interposed between the sympathetic chain and the viscera. In addition to these there are a certain number of vaso-dilator and viscero-inhibitory fibres, which run without any cell connexions from the spinal or cranial nerve to the viscera. The splanchnic afferent or centripetal fibres are the sensory nerves from the viscera, and have no cell connexions until they reach the spinal ganglia on the posterior roots of the spinal nerves, which they do by traversing the gangliated cord of the sympathetic. The fibres of the white rami communicantes are remarkable for their small diameter, and the efferent fibres, at all events, are only found in two regions, one of which is called the thoracico-lumbar stream and extends from the first or second thoracic to the second or third lumbar nerve, while the pelvic stream is found from the second to the fourth sacral nerves.



From A. M. Paterson, in Cunningham's *Text-Book of Anatomy.*

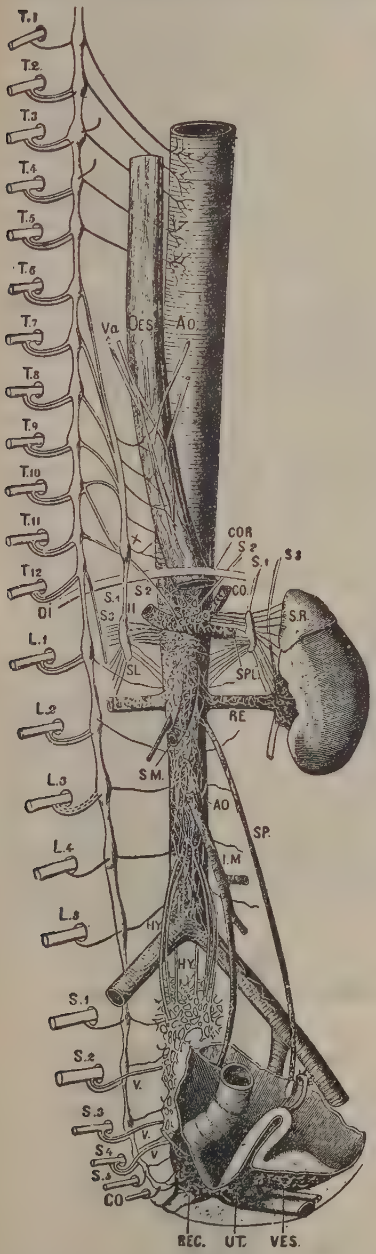
FIG. 5.—The Distribution of the Sympathetic Gangliated Cord in the Neck.

*Sy.*1,	Superior cervical ganglion, and connexions and branches.
I.C,	Internal carotid artery.
G.Ph,	Glosso-pharyngeal.
Va,	Vagus.
Hy,	Hypoglossal.
*C.*1, 2, 3, 4,	First four cervical nerves.
Plex,	Pharyngeal plexus.
G.Ph,	Glosso-pharyngeal nerve.
E.C,	To external carotid artery.
*Sy.*2,	Middle cervical ganglion, connexions and branches.
*C.*5, 6,	Fifth and sixth cervical nerves.
I.Thy,	Inferior thyroid artery.
A.V,	Ansa Vieussenii.
*Sy.*3,	Inferior cervical ganglion, connexions and branches.
*C.*7, 8,	Seventh and eighth cervical nerves.
Vert,	Vertebral plexus.
Car,	Cardiac branches.

The grey rami communicantes are found in connexion with all the spinal nerves, though they are irregular in the paths by which they reach the sympathetic ganglia from the cells of which they spring; their fibres are mainly non-medullated, and pass into both roots of the spinal nerves and also into the anterior and posterior primary divisions of those nerves. In this way they reach the body wall and limbs, and are somatic vaso-motor, secretory and pilo-motor fibres, supplying the vessels, glands and hair muscles of the skin and its glands. The sympathetic ganglia, from which these nerves come, contain multipolar nerve cells with one axon and several dendrites as well as a number of medullated fibres passing through, and much connective tissue.

Some of the axons of these cells pass in the connectives to ganglia above and below, while others pass with the splanchnic efferent nerves to the viscera.

The above sketch will give the general scheme of the sympathetic system, but its exact topographical details in man must be sought in the modern text-books such as those of Gray, Quain or Cunningham. Here only the larger and more important details can be given. In the gangliated chain there is a ganglion corresponding to nearly each spinal nerve, except in the neck, where only three are found; of these the superior cervical ganglion is more than an inch long, and is connected with the first four spinal nerves as well as with the ninth, tenth and twelfth cranial nerves (see fig. 5, *Sy.*1). Branches of distribution pass from it to the pharyngeal plexus, the heart and the two carotid arteries. Of these the branch accompanying the internal carotid artery passes to the carotid and cavernous plexuses, and through these communicates with the sphenomaxillary, otic and ciliary ganglia, while the branch to the external carotid communicates with the submaxillary ganglion. The middle cervical ganglion (fig. 5, *Sy.*2), when it is present, gives rami communicantes to the fifth and sixth cervical nerves, as well as branches of distribution to the thyroid body and heart.



From A. M. Paterson, in Cunningham's *Text-Book of Anatomy.*

FIG. 6.—The Arrangement of the Sympathetic System in the Thorax, Abdomen and Pelvis.

*T.*1-12, *L.*1-5, *S.*1-5, *Co*,	Anterior primary divisions of spinal nerves, connected to the gangliated cord of the sympathetic by rami communicantes, white (double lines) and gray (single lines).
Oes,	Oesophagus and oesophageal plexus.
Ao,	Aorta and aorta plexus.
Va,	Vagus nerve joining oesophageal plexus.
*S.*1,	Great splanchnic nerve.
X,	Great splanchnic ganglion.
*S.*2,	Small splanchnic nerve.
*S.*3,	Least splanchnic nerve.
Co,	Coronary artery and plexus.
Spl,	Splenic artery and plexus.
H,	Hepatic artery and plexus.
SL,	Semilunar ganglion.
Di,	Diaphragm.
S.R,	Suprarenal capsule.
Re,	Renal artery and plexus.
S.M,	Superior mesenteric artery and plexus.
Sp,	Spermatic artery and plexus.
I.M,	Inferior mesenteric artery and plexus.
Hy,	Hypogastric nerves and plexus.
Rec,	Rectal plexus.
Ut,	Uterine plexus.
Ves,	Vesical plexus.
V.V.V,	Visceral branches from sacral nerves.

The inferior cervical ganglion (fig. 5, *Sy.*3) lies behind the subclavian artery, and, besides the main connective cord, has a loop (ansa Vieussenii) joining it to the middle cervical ganglion in front of that vessel. It communicates with the seventh and eighth spinal nerves, and gives branches of distribution to the heart and to the subclavian artery and its branches, especially the vertebral. The thoracic part of the sympathetic cord has usually eleven ganglia, which receive both white and grey rami communicantes from the spinal nerves (fig. 6); of the former the upper ones run up in the chain and come off from the cervical ganglia as already described, while the lower ones form the three abdominal splanchnics which pass through the diaphragm (*q.v.*) and join the abdominal plexuses.

The *great splanchnic* (fig. 6, *S.*1) comes from the sixth to the ninth ganglia, and ends in the semi-lunar ganglion of the solar plexus (fig. 6, *SL*). The small splanchnic (fig. 6, *S.*2) comes from the ninth and tenth, or tenth and eleventh ganglia, and ends in the aortico-renal ganglion of the solar plexus, while the smallest splanchnic (fig. 6, *S.*3) comes from the last thoracic ganglion, whether it be the tenth or eleventh, and ends in the renal plexus.

In the lumbar region the gangliated cord is very irregular; there may be four or more ganglia, and these are often fused. Grey rami communicantes are given to all the lumbar spinal nerves, and white ones are received from the first two. Most of the branches of distribution pass to the aortic plexus. The sacral gangliated cord runs down just internal to the anterior sacral foramina; it usually has four small ganglia, and the two cords end by joining the *coccygeal ganglion* or *ganglion impar*, though the two-fourth sacral ganglia are united by transverse interfunicular commissures. The white rami communicantes, already mentioned as the pelvic stream, from the second to the fourth sacral spinal nerves, do not enter the ganglia but pass directly to the pelvic plexuses (fig. 6, *V*).

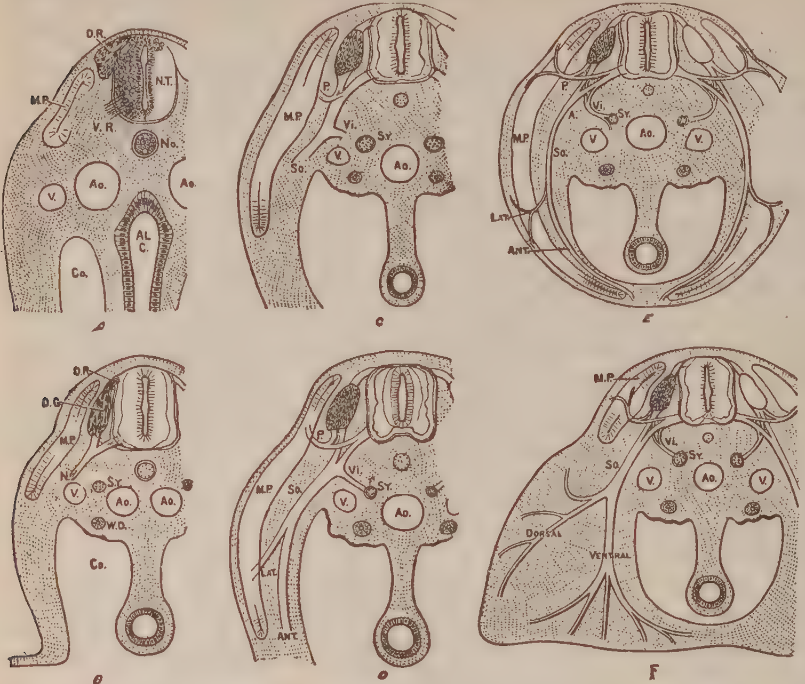
Sympathetic Plexuses.—In the thorax are the *superficial* and *deep cardiac plexuses* and the *coronary plexuses*; the former receives the left superior cervical cardiac of the vagus, and lies in the concavity of the arch of the aorta. The deep cardiac plexus is larger, and lies in front of the bifurcation of the trachea; it receives all the other cardiac nerves, and communicates with the anterior pulmonary plexuses of the vagus (see NERVES: *Cranial*). The right and left coronary plexuses accompany the coronary arteries; the former communicates with both the cardiac plexuses, the latter only with the deep cardiac plexus.

In the abdomen the solar plexus is by far the most important. It lies behind the stomach and surrounds the coeliac axis; in it are situated the semilunar, aortico-renal and superior mesenteric ganglia, and from it are prolonged subsidiary plexuses along the main arteries, so that *diaphragmatic*, *suprarenal*, *renal*, *spermatic*, *coeliac*, *superior mesenteric*, *aortic* and *inferior mesenteric plexuses*, are recognized. The *hypogastric plexus* is the continuation downward of the aortic, and lies just below the bifurcation of the aorta (see fig. 6, *Hy*); it divides into two branches, which accompany the internal iliac arteries and are joined by the pelvic stream of white rami communicantes from the sacral spinal nerves and some twigs from the ganglia of the sacral sympathetic to form the pelvic plexuses. These are prolonged to the viscera along the branches of the internal iliac artery, so that *haemorrhoidal*, *vesical*, *prostatic*, *vaginal* and *uterine plexuses* are found. By the side of the neck of the uterus in the last-named plexus several small ganglia are seen. (For the literature of the sympathetic system, see Quain's *Anatomy*, London, 1895.)

EMBRYOLOGY OF NERVOUS SYSTEM

The development of the brain, spinal cord and organs of special sense (eye, ear, tongue), will be found in separate articles. Here that of the cranial and spinal nerves and the sympathetic system is dealt with. The thoracic spinal nerves are the most typical, and one of them is the best to begin with. In fig. 7, A the ganglion on the dorsal root (*DR*) is seen growing out from the neural crest, and the cells or neuroblasts of which it is composed become fusiform and grow in two directions as the ganglion recedes from the cord. Those which run toward the spinal cord are the axons, while those growing into the mesoderm are probably enlarged dendrites. The ventral roots (*VR*) rise as the axons of the large cells in the ventral horn of the grey matter, and meet the fibres of the dorsal root on the distal side of the ganglion (fig. 7, B). As the two roots join each divides into an anterior (ventral) and a posterior (dorsal) primary division (fig. 7, D), the latter growing into the dorsal segment of its muscle plate and the skin of the back. The anterior primary division grows till it reaches the cardinal vein and dorsal limit of the coelom, and there forks into a somatic branch to the body wall (fig. 7, C, *So*), and a splanchnic or visceral branch (fig. 7, C, *Vi*) which joins the sympathetic and forms the white ramus communicans. The somatic branch grows round the body wall and gives off lateral and anterior branches (fig. 7, E). In the limb regions the anterior primary divisions of the nerves divide into anterior and posterior secondary divisions, which probably correspond to the anterior and lateral branches of the thoracic nerves (fig. 7, *E* and F). These unite with neighbouring nerves to form plexuses, and divide again, but the anterior nerves keep to the ventral side of the limb and the posterior to the dorsal.

The cranial nerves are developed in the same way as the spinal, so far as concerns the facts that the motor fibres are the axons of cells situated in the basal lamina of the mesencephalon and rhombencephalon (see BRAIN), and the sensory are the axons and dendrites of cells situated in ganglia which have budded off from the brain. The evidence of comparative anatomy, however, shows that the cranial nerves cannot be directly homologized with the spinal, nor can the fact of there being twelve of them justify us in assuming that the head contains the rudiments of twelve fused or unsegmented somites. To this we will return later. The case of the optic nerve is different to that of any of the others. A. Robinson (*Journ. Anat. and Phys.*, vol. 30, p. 319) has shown that most of its fibres are the axons of ganglion cells in the retina, and, as the retina is part of the optic vesicle and an outgrowth from the brain, the so-called optic nerve is only comparable to a tract of fibres within the brain.



From A. M. Paterson, in Cunningham's *Text-book of Anatomy*.

FIG. 7.—Development of the Spinal Nerves.

A, Formation of nerve roots.
D.R, Dorsal root.
V.R, Ventral root.
N.T, Neural tube.
No, Notochord.
Al.C, Alimentary canal.
Ao, Aorta.
V, Cardinal vein.
M.P, Muscle plate.

B, Formation of nerve trunk (N)
D.G, Dorsal ganglion.
Sy, Sympathetic cord.
W.D, Wolffian duct.
Co, Coelom.

C, Formation of nerves.
So, Somatic division.
Vi, Visceral branch.
P, Posterior primary division.

D, E, Formation of subordinate branches.
Lat, Lateral, and
Ant, Anterior, branches.

F, Formation of nerve trunks in relation to the limb; dorsal and ventral trunks corresponding to lateral and anterior trunks in D and E.

The twelfth or hypoglossal nerve is regarded as a fusion of the motor roots of three spinal nerves, and embryology bears this out, for Froriep has described a small and transitory ganglion corresponding to the posterior root ganglion of this nerve. Another link in the chain of reasoning is that the first spinal or sub-occipital nerve often has its posterior root suppressed.

The sympathetic system is developed from the posterior root ganglia of the spinal nerves, by cells which in man migrate a few at a time. A. M. Paterson, however, believes that the sympathetic is developed, independently of the cerebro-spinal system, in the mesoderm (*Phil. Trans.* clxxxi. pt. B. p. 159). In embryos of 14·5 m.m. there are found masses of cells on each side of the abdominal aorta, permeated with blood vessels, and having the same structure as the carotid and coccygeal bodies. They are known as the organs of Zuckerkandl, and disappear soon after birth.

COMPARATIVE ANATOMY

The comparative anatomy of the brain and spinal cord is dealt with in the separate articles devoted to them.

Spinal Nerves.—In *Amphioxus* the dorsal and ventral roots do not unite with one another but alternate, a dorsal root on one side being opposite a ventral on the other. The dorsal roots are both sensory and motor, the ventral only motor. In the Cyclostomata (*Petromyzon*) the arrangement is nearly the same, but in some regions there are two ventral roots to one dorsal. In the fishes and higher vertebrates the dorsal and ventral roots unite, though in selachian (shark) embryos F. M. Balfour says that the dorsal and ventral roots alternate (*The Development of Elasmobranch Fishes*, London, 1878). When limbs are developed, beginning with fishes, limb plexuses are formed. Where the limbs are suppressed rudimentary plexuses may persist, as in the snake, though usually they disappear.

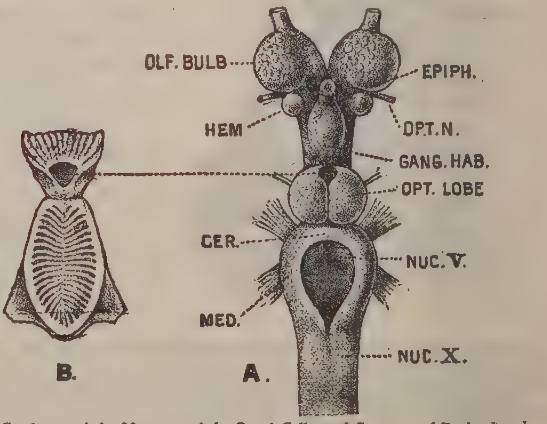
The cranial nerves are only represented by two pairs in *Amphioxus*. In the Cyclostomata, fishes and Amphibia, ten pairs of nerves are found, which in their distribution do not always agree with those of man. In the Amniota or reptiles, birds and mammals, the eleventh and twelfth nerves have been added. The researches of W. H. Gaskell ("On the structure, distribution and functions of the nerves which innervate the visceral and vascular systems," *J. of Phys.* vii. 1, 1886), O. S. Strong ("The cranial nerves of Amphibia," *J. Morph.* x. 101), J. B. Johnston (*J. Comp. Neurol.* xii. 2 and 87), and others, show that the cranial nerves are formed of at least five components: (1) Ventral motor, (2) Lateral motor, (3) Somatic sensory, (4) Visceral sensory, (5) Lateral line nerves.

The *ventral motor components* are those which rise from cells situated close to the mid line, and probably correspond to the ventral roots of the spinal nerves. The nerves to the eye muscles (motor oculi, trochlearis and abducens) have this origin (see NERVE: *Cranial*), as also has the hypoglossal, which doubtless is a cephalized spinal nerve.

The *lateral motor components* rise from cells situated more laterally, and comprise the motor roots of the fifth (trigeminal), seventh (facial), and ninth, tenth and eleventh (glossopharyngeal, vagus and spinal accessory). These nerves supply muscles belonging to the branchial skeleton, instead of the muscles of the primitive cranium, of which the eye muscles are the remnants.

The *somatic sensory components* supply the skin, and end in cells which, among the cyclostomes and fishes, form a considerable elevation in the rhombencephalon, known as the lobus trigemini (fig. 8, *Nuc. V.*). These components, in the lower forms, are found in the fifth, seventh and tenth nerves, but in mammals practically only the fifth contains them. They correspond to the dorsal roots of the spinal nerves.

The *splanchnic sensory* or *viscero sensory components* end in the brain in the medullary cells known as the *fasciculus communis* in fishes, and *fasciculus solitarius* in mammals (see BRAIN, fig. 4), as well as in the lobus trigemini and lobus vagi (fig. 8, *Nuc. X.*). They are found in the fifth, seventh, ninth, tenth and eleventh nerves, and supply visceral surfaces. In mammals the lingual and palatine branches of the fifth, the chorda tympani and great superficial petrosal (?) of the seventh, and all the sensory fibres of the ninth and tenth except Arnold's nerve, represent these. In fishes and Amphibians the palate is supplied by the seventh nerve instead of



From *Catalogue of the Museum of the Royal College of Surgeons of England*, vol. 2 2nd ed.

FIG. 8.—Brain (A) and Choroid Plexuses (B) of Lamprey.

the fifth, but the explanation given for this difference is that in these lower forms the Gasserian and geniculate ganglia are not distinct, and so fibres from the compound ganglion may pass into either nerve. These splanchnic sensory components of the cranial nerves evidently correspond to the branches which have already been mentioned as the splanchnic afferent fibres of the sympathetic.

The system of the *lateral line* or *acustico-lateralis component* is sometimes regarded merely as a subdivision of the somatic sensory. It is best developed in the fish, and may be divided into pre- and post-auditory, and auditory. The pre-auditory part comprises the pit and canal end organs supplied by the seventh, and also probable the olfactory organ supplied by the first nerve. The auditory apparatus, supplied by the eighth nerve, is, according to modern opinion, undoubtedly a part of this system, while the tenth nerve sends a large branch along the lateral line supplying the special end organs of the post-auditory part. All these components of the lateral line pass to the tuberculum acusticum in the fourth ventricle, as well as to the cerebellum, which J. B. Johnston (*Zool. Bull.* 1, 5, p. 221, Boston) regards as a derivative of the rostral (anterior) end of the acusticum. In mammals no doubt the olfactory and auditory apparatus and nerves have the same morphological significance as in fishes, but the seventh does not supply any cutaneous sense organs on the head or face, and the only vestige of the post-auditory supply of the tenth nerve to the lateral line is the small auricular branch of the vagus, often called Arnold's nerve.

The following table, slightly modified from the one drawn up by J. McMurrich, gives a fair idea of the present state of our knowledge of the nerve components in the Mammalia.

Nerve.	Ventral Motor.	Lateral Motor.	Somatic Sensory.	Splanchnic Sensory.	Lateral Line.
I.					+(?)
II.[1]					
III.	+				
IV.	+				
V.		+	+	+	
VI.	+				
VII.		+		+	
VIII.					+
IX. }					
X. }		+	+	+	+
XI. }					
XII.	+				
Spinal	+	(?)	+	+	

[1] A tract of the brain.

For further details and literature of the nervous system see Quain's *Anatomy* (latest edition); R. Wiedersheim's *Comp. Anat. of Vertebrates* (Lond. 1907); Bronn's *Classen und Ordnungen des Thierreichs*; C. S. Minot's *Human Embryology* (1892); McMurrich's *Development of the Human Body* (London, 1906). For the theory of nerve components see Onèra Merritt, *Journ. Anat. and Phys.*, vol. 39, p. 199. A general discussion on the comparative anatomy and morphology of limb plexuses will be found in Miss C. W. Saberton's paper on the "Nerve Plexuses of Troglodytes Niger" *Studies in Anatomy*, University of Manchester, vol. iii. (1906), p. 165. She refers to most of the literature on the subject, but the papers of H. Braus, *Jena Zeitschr.* v. 31 (1898), p. 239 on fish, of M. Davidoff, *Morph. Jahrb.* v. 5 (1879), p. 450 on the pelvic plexuses of fish, and of M. Fürbringer, *Gegenb. Festschr.* v. 3 (1897), on the spino-occipital nerves and brachial plexus of fish, are also very important. (F. G. P.)

NESFIELD, WILLIAM EDEN (1835–1888), British architect, one of the leaders of the Gothic revival in England, was born in Bath on the 2nd of April 1835. His father, Major William Andrew Nesfield, a well-known landscape gardener, laid out Regent's Park and St James's Park, and remodelled Kew. Educated at Eton, Nesfield was articled first to Mr Burn, a classicist, and then to his uncle, Anthony Salvin, who took the Gothic side in the "battle of the styles." Nesfield travelled for study in France, Italy and Greece, afterwards publishing a volume, *Sketches from France and Italy* (London, 1862), which became one of the text-books of the Gothic revival. In 1859 Nesfield settled down in London. His first important commission was to build a new wing to Combe Abbey for Lord Craven. In 1862 began a nominal partnership with Norman Shaw, the fruits of which have been exaggerated; they shared rooms in Argyle Street for some years, but never collaborated. It was in Argyle Street that the principal work of Nesfield's life was conceived—Combe Abbey, Cloverly Hall and Kinmel Park. Here he showed a mastery of planning and construction, a conscientious regard for detail, an eye for the picturesque, an unfailing regard for dignity, which make his achievements landmarks in the history of his art. He built the lodge in Regent's Park (1864) and that in Kew Gardens (1866). Combe Abbey and Cloverly are somewhat "early French" in style, but as Nesfield developed he adopted a purely English manner, and presented his newer ideas in Loughton Hall and Kinmel Park. The gate lodge at Kinmel Park, Abergele, is entirely "English Renaissance"; Cloverly Hall (1864), planned when he was twenty-nine, with its great hall, fine approaches to the staircase, and the staircase itself, is already half English, and Eastlake, in his *History of Gothic Revival*, praises it on that very ground. The full development of the revived classic taste in Nesfield came with his addition to Kinmel Park—red brick, stone dressings, grey-green slated roofs—which elevated that originally unpretentious 18th-century building into a small Renaissance palace. For contrast in style, harmonious as they are in artistic expression, Cloverly and Kinmel are the typical examples of the artist's style. Other works are Farnham Royal House near Slough, Lea Wood, Loughton Hall and Westcombe Park. His more notable urban works are the bank at Saffron Walden (1873), and the Rose and Crown Hotel; they stand next door to each other and exhibit another contrast, the former being medieval and the latter what is called "Queen Anne." Though he built no new important church, Nesfield rebuilt the Early Decorated St Mary's, Farnham Royal, near Slough, mainly on the old lines. He restored King's Walden church, Herts (1868), and Radwinter church, Essex (1871), and Cora church near Whitchurch, Salop; but no great public building came from him. Nesfield's career was a comparatively short one. On the 3rd of September 1885 he married Mary Annetta, eldest daughter of John Sebastian Guilt and granddaughter of Joseph Guilt, and he retired from practice some years before his death at Brighton on the 25th of March 1888. He left behind him a valuable series of sketches and measured drawings, most of which are now in the library of the Royal Institute of British Architects. (J. M. By.)

NESLE, the name of a place in France (dep. of Somme), which gave its name to an old feudal family. This family became extinct at the beginning of the 13th century, and the heiress brought the lordship to the family of Clermont in Beauvaisis. Simon de Clermont, seigneur de Nesle, was regent of the kingdom of France during the second crusade of St Louis. Raoul de Clermont, constable of France, and Guy I. (d. 1302) and Guy II. (d. 1352) de Clermont, both marshals of France, were members of the family. The lordship of Nesle was erected into a countship for Charles de Sainte-Maure in 1467 and into a marquisate for Louis de Sainte-Maure in 1546. It was acquired in 1666 by Louis Charles de Mailly. His grandson, Louis de Mailly, had five daughters, of whom four (the countess of Mailly, the duchess of Lauragais, the countess of Vintimille, and the marquise de la Tournelle, afterwards duchess of Châteauroux) were successively, or simultaneously, mistresses of Louis XV.

NESSELRODE, KARL ROBERT, Count (1780–1862), Russian diplomatist and statesman, was born on the 14th of December 1780 at Lisbon, where his father (d. 1810) was Russian ambassador. In deference to his mother's Protestantism he was baptized in the chapel of the British embassy, thus becoming a member of the Church of England. The Nesselrodes were of Westphalian origin, but had long been settled in Livonia. Nesselrode's German origin was emphasized by his education in a Berlin gymnasium, his father having been appointed ambassador to the Prussian court about 1787. When he was sixteen he entered the Russian navy, and his father's influence procured for him the position of naval aide-de-camp to the emperor Paul. He presently exchanged into the army, obtained a further court appointment, and entered the diplomatic service. Nesselrode was attached to the Russian embassy at Berlin, and transferred thence to the Hague. In August 1806 he received a commission to travel in South Germany to report on the French troops; he was then attached as diplomatic secretary to Generals Kamenski, Buxhoewden and Bennigsen in succession. He was present at the battle of Eylau in January 1807, and assisted at the negotiation of the peace of Tilsit. Immediately afterwards he was sent to Paris to join the embassy of Count Peter Tolstoy, whom he accompanied in the spring of the next year to the meeting of the two emperors at Erfurt. After his return to Paris he strengthened the understanding between Alexander I. and Talleyrand consequent on the Erfurt meeting, and acted as intermediary between the two. On the appointment of a successor to Count Tolstoy he retired to St Petersburg, but returned to Paris early in 1810 charged with a commission from Speranski to Talleyrand and the marquis de Caulaincourt, formerly ambassador in St Petersburg, both of whom were hostile to Napoleon's policy of aggression. After the breach of diplomatic relations with Russia in 1811, Nesselrode returned to St Petersburg by way of Vienna in order to exchange views with Metternich. He sought to persuade Alexander to open negotiations with Napoleon, if only to throw the onus of breaking the peace entirely on the French side. He joined the tsar's headquarters at Vilna in March 1812 and, though Rumiantzov was still foreign minister, it was Nesselrode who directed the foreign policy of Russia from this time forward. He was present at the battle of Leipzig, and accompanied the invading army to Paris; he negotiated the capitulation of Marmont and Mortier at Clichy, and signed the treaty of Chaumont on the 1st of March 1814. His former relations with Talleyrand facilitated negotiations in Paris, and his great influence with the emperor was used in favour of the restoration of the Bourbons, and, after Waterloo, against the imposition of a ruinous war indemnity on France. At the congress of Vienna he was associated with Count Capo d'Istria, and when, in August 1816, Alexander made him secretary of state for foreign affairs in succession to Rumiantzov, it was again in conjunction with the Greek statesman, from whom he differed widely in temperament and ideas. The emperor Alexander I., however, was apt to keep the direction of affairs in his own hands and so long as Alexander inclined to Liberalism Capo d'Istria was the interpreter of his will, but as the emperor veered towards Metternich's system Nesselrode became his mouthpiece. After Alexander's final "conversion" to reactionary principles, Capo d'Istria was dismissed (1822) and Nesselrode definitely took his place. He had consistently advocated Alexander's project of a "universal union," symbolized by the Holy Alliance, in contradistinction to the narrower system of the alliance of the great powers; and, when the Greek insurrection broke out, he did much to determine the tsar to sacrifice his sympathy with the Orthodox Greeks to his dream of the European confederation (see ALEXANDER I., emperor of Russia).

After Alexander's death in 1825 Nesselrode retained office under Nicholas I. He was responsible for the change of policy of Russia towards the Ottoman empire after 1829, viz. that of abandoning the traditional idea of conquering Constantinople in favour of keeping the Ottoman power weak and dependent on the tsar. This was his policy during the revolt of Mehemet Ali (*q.v.*), and it was Nesselrode who inspired the terms of the famous treaty of Unkiar Skelessi (1833). Nicholas I. was, however, even less inclined than his brother to place himself in the hands of a minister; and Nesselrode showed himself amenable, though when his views differed from those of the emperor he stated them with great frankness. He conducted the negotiations which led to the shelving of the treaty of Unkiar Skelessi and to the alliance between Russia and Great Britain which, issuing ultimately in the Straits Convention of 1841—to which France also was a party—healed the breach which had so long divided the powers of eastern and western Europe.

In 1849 it was Nesselrode who suggested the intervention of Russia in Hungary in favour of the Austrian government, although he restrained the tsar from active intervention in France then as in 1830. During the crisis of 1853 he prolonged negotiation in the hope of averting war. The last of his important political acts, the signing of the treaty of Paris in 1856, undid the results of his patient efforts to establish Russian preponderance in the Balkan peninsula. He then retired from the foreign office, retaining the chancellorship, which he had held since 1844. He died at St Petersburg on the 23rd of March 1862.

See *Lettres et papiers du chancelier comte de Nesselrode 1760–1850*, the first volume of which was issued by his grandson Count Anatole Nesselrode at Paris in 1904. This work includes letters of the chancellor's father, Count William, Nesselrode's correspondence, and important state papers. In vol. ii. is a fragment of an autobiography (to 1814), which Count Nesselrode did not live to complete. See also *Correspondance diplomatique du comte Pozzo di Borgo et du comte de Nesselrode*, edited by Charles Pozzo di Borgo (Paris, 2 vols., 1890–1897).

NEST, the place where a bird lays its eggs, hatches them out, and shelters them until they are fledged. The word is used by analogy of other animals than birds, insects, &c. It appears in much the same form in Teutonic languages; related to it are Irish *nead*, and Lat. *nidus*, whence Fr. *nid*. It has been referred to the Gr. *νόστος*, return home, but it is now established that it represents a form *nizdo-* for *nisido-*, from *ni-*, down; cf. "nether," and *sed-*, to sit. Sanskrit has *nīda*. The Lat. *nidus* has given the scientific term for nest-building, *nidification* (*q.v.*).

NESTOR, in Greek legend, son of Neleus and Chloris, king of Pylos in Messenia. When all his brothers were slain by Heracles, in consequence of the refusal of Neleus to purify him for the murder of Iphitus, Nestor alone escaped, being absent at Gerenia—hence his epithet Gerenios in Homer (Apollodorus i. 9). He is the old warrior of the *Iliad* and the wise counsellor of the Greeks before Troy. After the fall of the city he returned to Pylos, where Telemachus visited him to obtain news of his father. In his earlier years he took part in the battle of the Centaurs and Lapithae, the Calydonian boar hunt, and the Argonautic expedition. The name is used in modern times for any old man of ripe experience, or the oldest member of a class or corporation.

NESTOR (*c.* 1056–*c.* 1114), the reputed author of the earliest Russian chronicle, was a monk of the Pecherskiy cloister of Kiev from 1073. The only other fact of his life is that he was commissioned with two other monks to find the relics of St Theodosius, a mission which he succeeded in fulfilling. The chronicle begins with the deluge, as those of most chroniclers of the time did. The compiler appears to have been acquainted with the Byzantine historians; he makes use especially of John Malalas and George Hamartolus. He also had in all probability other Slavonic chronicles to compile from, which are now lost. Many legends are mixed up with Nestor's *Chronicle*; the style is occasionally so poetical that perhaps he incorporated *bīlini* which are now lost. The early part is rich in these stories, among which are the arrival of the three Varangian brothers, the founding of Kiev, the murder of Askold and Dir, the death of Oleg, who was killed by a serpent concealed in the skeleton of his horse, and the vengeance taken by Olga, the wife of Igor, on the Drevlians, who had murdered her husband. The account of the labours of Cyril and Methodius among the Slavs is also very interesting, and to Nestor we owe the tale of the summary way in which Vladimir suppressed the worship of Perun and other idols at Kiev. As an eyewitness he could only describe the reigns of Vsevolod and Sviatopolk (1078–1112), but he gathered many interesting details from the lips of old men, two of whom were Giurata Rogovich of Novgorod, who gave him information concerning the north of Russia, Petchora, and other places, and Jan, a man ninety years of age, who died in 1106, and was son of Vishata the voivode of Yaroslavl and grandson of Ostromir the Posadnik, for whom the *Codex* was written. Many of the ethnological details given by Nestor of the various races of the Slavs are of the highest value.

The latest theory about Nestor is that the *Chronicle* is a patchwork of many fragments of chronicles, and that the name of Nestor was attached to it because he wrote the greater part or perhaps because he put the fragments together. The name of a certain Sylvester, an Igumen, is affixed to several of the manuscripts as the author.

The *Chronicle* has come down to us in several manuscripts, but unfortunately no contemporary ones, the oldest being the so-called Lavrientski of the 14th century (1377). It was named after the monk Lavrentii, who copied it out for Dimitri Constantinovich, the prince of Souzdal. The work, as contained in this manuscript, has had many additions made to it from previous and contemporary chronicles, such as those of Volinia and Novgorod. Soloviev, the Russian historian, remarks that Nestor cannot be called the earliest Russian chronicler, but he is the first writer who took a national point of view in his history, the others being merely local writers. The language of his work, as shown in the earliest manuscripts just mentioned, is Palaeo-Slavonic with many Russisms. It has formed the subject of a valuable monograph by Professor Miklosich.

The *Chronicle* has been translated into Polish, Bohemian, German and French. The compiler cannot very well be the author of the lives of Boris and Gleb, the martyrs, and of the life of St Theodosius, because they contradict many passages in the *Chronicle*. The work is of primary importance for early Russian history, and, although devoid of literary merit, is not without its amusing episodes of an Herodotean character. The reputed body of the ancient chronicler may be seen among the relics preserved in the Pecherskiy monastery at Kiev.

See Louis Leger's *Chronique dite de Nestor* (Paris, 1884); Bestuzhev Riumin, *On the Composition of the Russian Chronicles till the end of the 14th century* (in Russian), (St Petersburg, 1869). (W. R. M.)

NESTOR, the name of a small but remarkable group of parrots peculiar to the New Zealand sub-region, of which the type is the *Psittacus meridionalis* of Gmelin, founded on a species described by J. Latham (*Gen. Synopsis* i. 264), and subsequently termed by him *P. nestor*, in allusion to its hoary head, but now usually known as *Nestor meridionalis*, the "*Kaka*" of the Maories and English settlers in New Zealand, in some parts of which it was very abundant, though its numbers are fast decreasing. Forster, who accompanied Cook in his second voyage, described it in his MSS. in 1773, naming it *P. hypopolius*, and found it in both the principal islands. The general colour of the kaka is olive-brown, nearly all the feathers being tipped with a darker shade, so as to give a scaly appearance to the body. The crown is light grey, the ear-coverts and nape purplish-bronze, and the rump and abdomen of a more or less deep crimson-red; but much variation is presented in the extent and tinge of the last colour, which often becomes orange and sometimes bright yellow. The kaka is about the size of a crow; but a larger species, generally resembling it, though with plumage mostly dull olive-green, the *Nestor notabilis* of J. Gould, was discovered in 1856 by Walter Mantell, in the higher mountain ranges of the Middle Island. This is the "*Kea*" of the Maories, and incurred the enmity of colonists by developing an extraordinary habit of assaulting sheep, picking holes with its powerful beak in their side, wounding the intestines, and so causing death. The bird is admittedly an eater of carrion in addition to its ordinary food, which, like that of the kaka, consists of fruits, seeds and the grubs of wood-destroying insects, the last being obtained by stripping the bark from trees infested by them. The amount of injury the kea inflicts on flock-masters has doubtless been much exaggerated, for Dr Menzies states that on one "run," where the loss was unusually large, the proportion of sheep attacked was about one in three hundred, and that those pasturing below the elevation of 2000 ft. are seldom disturbed.

On the discovery of Norfolk Island (October 10 1774) a parrot, thought by Forster to be specifically identical with the kaghāá (as he wrote the name) of New Zealand—though his son (*Voyage*, ii. 446) remarked that it was "infinitely brighter coloured"—was found in its hitherto untrodden woods. Among the drawings of Bauer, the artist who accompanied Robert Brown and Flinders, is one of a *Nestor* marked "Norfolk Isl. 19 Jan. 1805," on which Herr von Pelzeln in 1860 founded his *N. norfolcensis*. Meanwhile Latham, in 1822, had described, as distinct species, two specimens evidently of the genus *Nestor*, one said, but doubtless erroneously, to inhabit New South Wales, and the other from Norfolk Island. In 1836 Gould described an example, without any locality, in the museum of the Zoological Society, as *Plyctolophus productus*, and when some time after he was in Australia, he found that the home of this species, which he then recognized as a *Nestor*, was Phillip Island, a very small adjunct of Norfolk Island, and not more than 5 m. distant from it. Whether the birds of the two islands were specifically distinct or not we shall perhaps never know, since they are all extinct, and no specimen undoubtedly from Norfolk Island seems to have been preserved. The Phillip-Island *Nestor* may be distinguished from both of the New-Zealand species by its somewhat smaller size, orange throat, straw-coloured breast, and the generally lighter shade of its tints.

The position of the genus *Nestor* in the order *Psittaci* must be regarded as uncertain, but it is now usually placed in the sub-family *Nestorinae* of the *Trichoglossidae* (see PARROT).

Further knowledge of this very interesting form may be facilitated by the following references to the *Transactions and Proceedings of the New Zealand Institute*, ii. 64, 65, 387, iii. 45-52, 81-90, v. 207, vi. 114, 128, ix. 340, x. 192, xi. 377; and to Sir W. Buller's *Birds of New Zealand.* (A. N.)

NESTORIANS. §1. *The Early Nestorians.*—Among those who had been present at Ephesus in support of Nestorius (*q.v.*) was Ibas, presbyter and head of the theological school of Edessa. In 435 he became bishop of Edessa and under his influence the Nestorian teaching made considerable progress. On the accusation of the orthodox he was deposed by the "Robber Synod" of Ephesus, but at Chalcedon in 451 was pardoned on condition of anathematizing both Nestorius and Eutyches and accepting the Tome of Leo. He had not, however, changed his views, and this was generally recognized. Meanwhile one of his pupils, Barsumas, had settled at Nisibis in Persian territory where he became bishop in 435 and established a Nestorian school. And when the emperor suppressed the school of Edessa ("the Athens of Syria") in 489, and expelled its members, they travelled far afield as eager and successful missionaries of the Gospel. In Persia their numbers and their zeal stimulated the old churches into vigour and led to the founding of new ones. And as they were under ban from Rome and out of communion with the Byzantine Church the Persian government welcomed them as a political ally, though the religious opposition of the Magi was still largely retained. In their new environment the Nestorians abandoned some of the rigour of Catholic asceticism, and at a synod held in 499 abolished clerical celibacy even for bishops and went so far as to permit repeated marriages, in striking contrast not only to orthodox custom but to the practice of Aphraates at Edessa who had advocated celibacy as a condition of baptism. The liberty here granted to bishops was enjoyed as late as the 12th century, but since then the Nestorian Church has assimilated its custom to that of the Greek Church. That the ascetic ideal was by no means wholly extinct is evident from the *Book of Governors* written by Thomas, bishop of Marga, in 840 which bears witness to a Syrian monasticism founded by one Awgin of Egyptian descent, who settled in Nisibis about 350, and lasting uninterruptedly until the time of Thomas, though it had long been absorbed in the great Nestorian movement that had annexed the church in Mesopotamia.

The Nestorian Church in Eastern Syria and Persia was under the jurisdiction of an archbishop (*catholikos*), who in 498 assumed the title "Patriarch of the East" and had his seat at Seleucia-Ctesiphon on the Tigris, a busy trading city and a fitting centre for the great area over which the evangelizing activity of the Nestorians now extended. The church traced its doctrines to Theodore of Mopsuestia rather than to Nestorius, whose name at first they repudiated, not regarding themselves as having been proselytized to any new teaching.

§ 2. *The Later Nestorians.*—In 608 Magian influence was so strong in Persia that the Christians were persecuted and the office of catholicus was vacant for 20 years, being filled again by Jesu-Jabus, during whose patriarchate the Mahommedan invasion overran Persia. The patriarch was able to secure from the caliph permission for the Christians to practice their religion in return for tribute money and this was afterwards remitted. Ibn Ali Talib, anxious to perpetuate their severance from the orthodox church and the Byzantine empire, confirmed these privileges by charter and in 762 the patriarchate was removed to Bagdad. For five centuries the Nestorians were a recognized institution within the territory of Islam, though their treatment varied from kindly to harsh. Bīrūnī, a Mahommedan writer, who lived at Khiva *c.* A.D. 1000, speaks of them as comprising the bulk of the population of Syria, Irak and Khorasan, and as superior to the orthodox in intellectual ability.

They agreed with Byzantines in observing Lent, Christmas and Epiphany, but differed from them in the observance of all other feasts and fasts. The Latin church tried in vain during the Crusades to secure their adhesion to Rome. The barbaric invasions of the 13th and 14th centuries fell with crushing force on the Nestorians. In 1258 Hulagu Khan took Bagdad, and about 1400 Timur again seized and sacked the city. Though the Nestorians were numerous, their moral influence and their church life had greatly deteriorated. Those who escaped capture by Timur fled to the mountains of Kurdistan, and the community that had played so large a part in Mesopotamian history for a thousand years was thus shattered. In 1552 they were further weakened by a large secession known as "the Chaldeans" arising out of a dispute about the succession to the patriarchate. The discontented appealed to Rome, and the pope (Julius III.) consecrated the Chaldean catholikos. The Chaldeans are now chiefly found in rural districts east of the Tigris. They have a see at Bagdad, a monastery (Rabban Hormuz) at Elkoösh, and are called by those Syrian Christians who have resisted the papal overtures, *Maghlabin* ("the conquered"). Other attempts during the 16th century to promote union between the Nestorians and Rome proved fruitless, but the Roman Church has never ceased in its efforts to absorb this ancient community. The history of the Jacobites or Syrian Monophysites who, like the Nestorians, diverged from the Byzantine Church, but in an exactly opposite direction, is told elsewhere (see JACOBITE CHURCH, &c.). Like the Nestorians they were great missionaries, and up to the 7th century, and again in the 12th and 13th, produced the bulk of Syriac literature (*q.v.*). The chief Nestorian authors were (*a*) in the 7th, 8th and 9th centuries, Babbai the elder and Isho-yabh of Gedhala, commentators; Sahdona, who wrote on the monastic life; Abraham the Lame, a devotional and penitential writer; Dionysius of Tell Mahre (see DIONYSIUS TELMAHARENSIS), whose *Annals* are important; and Thomas (*q.v.*) of Marga; (*b*) in the 14th century, Abdh-isho bar Berikha (d. 1318) the author of a theological treatise *Marganitha* ("the Pearl"), 1298, and the *Paradise of Eden*, a collection of 50 theological poems.

§ 3. *The Nestorian Missionary Enterprise.*—The combined hostility of the orthodox church and the Byzantine empire drove the Nestorians into exile, but they went much further than was needed simply to secure immunity from persecution. They showed a zeal for evangelization which resulted in the establishment of their influence throughout Asia, as is seen from the bishoprics founded not only in Syria, Armenia, Arabia and Persia, but at Halavan in Media, Merv in Khorasan, Herat, Tashkent, Samarkand, Baluk, Kashgar, and even at Kambaluk (Pekin) and Singan fu Hsi'en fu in China, and Kaljana and Kranganore in India. In 1265 they numbered 25 Asiatic provinces and over 70 dioceses. Mongolian invasions and Mahommedan tyranny have, of course, long since swept away all traces of many of these. The 400,000 Syrian Christians ("Christians of St Thomas," see THOMAS, ST) who live in Malabar no doubt owe their origin to Nestorian missionaries, the stories of the evangelization of India by the Apostles Thomas and Bartholomew having no real historical foundation, and the Indian activity of Pantaenus of Alexandria having proved fruitless, in whatever part of India it may have been exercised. The theology of the Indian Syrian Christians is of a Nestorian type, and Cosmas Indicopleustes (6th century) puts us on the right track when he says that the Christians whom he found in Ceylon and Malabar had come from Persia (probably as refugees from persecution, like the Huguenots in England and the Pilgrim Fathers in America). Pahlavi inscriptions[1] found on crosses at St Thomas's Mount near Madras and at Kottayam in Travancore, are evidence both of the antiquity of Christianity in these places (7th or 8th century), and for the semi-patripassianism (the apparent identification of all three persons of the Trinity in the sufferer on the cross) which marked the Nestorian teaching. In 745 Thomas of Kana brought a new band of emigrants from Bagdad and Nineveh, and possibly the name "Christians of St Thomas" arose from confusion between this man and the apostle. Other reinforcements came from Persia in 822, but the Malabar church never developed any intellectual vigour or missionary zeal. They had their own kings, lived as a close caste, and even imitated the Hindus in caste regulations of food and avoidance of pollution. In 1330 Pope John XXII. issued a bull appointing Jordanus, a French Dominican, bishop of Quilon, and inviting the Nestorians to enter "the Christian Church." The invitation was declined, but in the 16th century the Syrian Christians sought the help of the Portuguese settlers against Mussulman oppression, only to find that before long they were subjected to the fiercer perils of Jesuit antagonism and the Inquisition. The Syrians submitted to Rome at the synod of Dampier in 1599, but it was a forced submission, and in 1653 when the Portuguese arrested the Syrian bishop just sent out by the catholicus of Babylon, the rebellion broke out. The renunciation was not quite thorough, one party adhering to the Roman Church as Romo-Syrians, the others reverting wholly to Syrian usages and forming to-day about three-fourths of the whole community. In 1665 a curious thing happened. Gregory, the Jacobite metropolitan of Jerusalem, visited Malabar, and, as the people had no consecrated bishop at the time, he consecrated Mar Thomas, who had been filling the office at the people's request, and remained in the country jointly administering the affairs of the Church with Thomas. Thus the Nestorian Church in India, voluntarily and with perfect indifference to theological dogmas, passed under Jacobite rule, and when early in the 18th century, Mar Gabriel, a Nestorian bishop, came to Malabar, he had a cool reception, and could only detach a small following of Syrians whom he brought back to the old Nestorianism. The approaches of the Anglican Church through the Church Missionary Society in the first part of the 19th century were politely repelled. On the death of the bishop Mar Athanasius Matthew in 1877, litigation began as to his successor; it lasted ten years, and the decision (since reversed) was given against the party that held by the Nestorian connexion and the habitual autonomy of the Malabar church in favour of the supremacy of the Jacobite patriarch of Antioch. The great need of the Indian Syrian church to-day is an educated ministry.

Early evidence of Nestorian missions in China is extant in the tablet found in 1625 at Chang'an in the district of Hsi'en-fu, province of Shensi. It commemorates "the introduction and propagation of the noble law of Ta t'sin in the Middle Kingdom," and beneath an incised cross sets out in Chinese and Syriac an abstract of Christian doctrine and the course of a Syrian mission in China beginning with the favourable reception of Olopan, who came from Judaea in 636. For two generations the little cause prospered, and again after persecutions in 699 and 813. Later on a second mission arrived, many churches were built and several emperors patronized the faith. This evidence is confirmed by (*a*) the canon of Theodore of Edessa (800) allowing metropolitans of China, India and other distant lands to send their reports to the catholikos every six years; (*b*) the edict of Wu Tsung destroying Buddhist monasteries and ordering 300 foreign priests to return to the secular life that the customs of the empire might be uniform; (*c*) two 9th-century Arab travellers, one of whom, Ibn Wahhab, discussed the contents of the Bible with the emperor; (*d*) the discovery in 1725 of a Syrian MS. containing hymns and a portion of the Old Testament.

In the 10th century the Nestorians introduced Christianity into Tartary proper; in 1274 Marco Polo saw two of their churches. The legend of Prester John is based on the idea of the conversion of a Mongol tribe, the Karith, whose chieftain Ung Khan at baptism received the title Malek Juchana (King John). And there has lately come to light a MS. of the 9th or 10th century in Sogdianese, an Indo-Iranian language spoken in the north-east of Asia, which shows that the Nestorians had translated the New Testament into that tongue and had taught the natives the alphabet and the doctrine. Their activity may well be said to have covered the continent. Their campaign was one of deliberate conquest, one of the greatest ever planned by

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[1] "In punishment by the cross (was) the suffering of this One; He who is the true Christ, and God alone, and Guide ever pure."

Christian missionaries. Marco Polo is witness that there were Nestorian churches all along the trade routes from Bagdad to Pekin. (A. J. G.)

§ 4. *The Modern Nestorians.*—The Nestorians or East Syrians (*Surayi*) of Turkey and Persia now inhabit a district bounded by Lake Urmia, or Urumia, on the east, stretching westwards into Kurdistan, to Mosul on the south, and nearly as far as Van on the north. They are divided into the Persian Nestorians of the plain of Azerbaijan, and the Turkish Nestorians, inhabiting chiefly the sanjak of Hakkiari in the vilayet of Van, who are subdivided into the *Rayat* or subject, and the *Ashiret* or tribal, the latter being semi-independent in their mountain fastnesses. Forming at once a church and a nation, they own allegiance to their hereditary patriarch, Mar Shimun, Catholicus of the East, who resides at Qudshanis, a village about 7000 ft. above the sea-level, near the Kurdish town of Julamerk. It is only of late years, under the influence of the different missions, that education, ruined by centuries of persecution, has revived amongst the Nestorians; and even now the mountaineers, cut off from the outer world, are as a rule destitute of learning, and greatly resemble their neighbours, the wild and uncivilized Kurds. They are, however, extraordinarily tenacious of their ancient customs, and, almost totally isolated from the rest of Christendom since the 5th century, they afford an interesting study to the eccesiastical student. Their churches are rude buildings, dimly lighted and destitute of pictures or images, save that of the Cross, which is treated with the deepest veneration. The *qanki*, or sanctuary, is divided from the nave, by a solid wall, pierced by a single doorway; it contains the altar, or *madhb'kha* (literary, *the sacrificing place*), and may be entered only by persons in holy orders who are fasting. Here is celebrated the Eucharist (*Qurbana*, or the *offering*; cf. "Corban"), by the priest (*qasha*), attended by his deacon (*shamasha*). Vestments are worn only at the ministration of the sacraments; incense is used invariably at the Eucharist and frequently at other services. There are three liturgies—of the Holy Apostles, of Theodore and of Nestorius. The first is quite free from Nestorian influence, dates from some remote period, perhaps prior to 431, and is certainly the most ancient of those now in use in Christendom; the other two, though early, are undoubtedly of later date. The Nestorian canon of Scripture seems never to have been fully determined, nor is the sacramental system rigidly defined. Nestorian writers, however, generally reckon the mysteries as seven, *i.e.* Priesthood, Oil of Unction, the Offering of the Body and Blood of Christ, Absolution, The Holy Leaven, the Signation of the life-giving Cross. The "Holy Leaven" is reputed to be a part of the original bread of the first Eucharist, brought by Addai and Mari[1] and maintained ever since in the Church; it is used in the confection of the Eucharistic wafers, which are rather thicker than those used in the Western Church. Communion is given in both kinds, as throughout the East; likewise, confirmation is administered directly after baptism. Sacramental confession is enjoined, but has recently become obsolete; prayers for the departed and invocation of saints form part of the services. The bishops are always celibates and are chosen from episcopal families. The service-books were wholly in MS. until the press of the archbishop of Canterbury's mission at Urmia issued the *Takhsa* (containing the liturgies, baptismal office, &c.) and several other liturgical texts.

The Nestorians commemorate Nestorius as a saint, and invoke his aid and that of his companions. They reject the Third Oecumenical Council, and though showing the greatest devotion to the Blessed Virgin, deny her the title of *Theotokos*, *i.e.* the mother or bearer of God. Their theological teaching is misty and perplexing; their earliest writings contain no error, and the hymns of their great St Ephrem, still sung in their services, are positively antagonistic to "Nestorianism"; their theology dating from the schism is not so satisfactory. They attribute two *Kiani*, two *Qnumi* and one *Parsopa* in Christ (see J. F. Bethune-Baker's *Nestorius and his Teaching*). To say that the modern Nestorians are not definitely and firmly orthodox is perhaps fairer than to charge them with being distinctly heretical.

§ 5. *Missions amongst the Nestorians.*—The peculiar circumstances, both ecclesiastical and temporal, of the Nestorians have attracted much attention in western Christendom, and various missionary enterprises amongst them have resulted.

1. *The Roman Catholic Missions.*—In Turkey these consist of the Dominican mission, established at Mosul during the 18th century, and in Persia of the French Lazarist mission, which sprang out of some schools established by a French layman and scientific traveller, Eugène Boré, in 1838. At M. Boré's entreaty the Propaganda sent the first Lazarist father to Persia in 1840. The chief stations of the Lazarists are at Khosrova and Urmia. At the latter place there is an orphanage under the superintendence of the Sisters of St Vincent de Paul. The work of these missions is to extend and consolidate that Catholicized and partly Latinized offshoot of the Nestorians known as the *Uniat-Chaldean Church* (see *ante*).

2. The *American Presbyterian Mission*, established in Persia in 1834–1835 by the Rev. Justin Perkins and Dr A. Grant, comprises large buildings near Urmia, a college and a hospital. The influence of this mission does not extend much beyond the Turkish frontier, but it is strong in the Persian plains. The original aim was to influence the old Nestorian Church rather than to set up a new religious body, but the wide difference between Presbyterians and an Oriental Church rendered the attempt abortive, and the result of the labours of the Americans has been the establishment since 1862 of a Syrian Protestant community in Persia, with some adherents in Turkey.

3. *The Archbishop of Canterbury's Mission to the Assyrian Christians.*—This Anglican mission was promoted by Archbishop Tait, and finally established by Archbishop Benson in 1886. Its aim is thus officially defined: "To aid an existing Church, . . . not to Anglicanize, . . . not to change any doctrines held by them which are not contrary to that faith which the Holy Spirit, speaking through the Oecumenical Councils of the Undivided Church of Christ, has taught us as necessary to be believed by all Christians, but . . . to strengthen an ancient Church, at the earnest request of the Catholicos, and with the knowledge and blessing of the Catholic patriarch of Antioch, one of the four patriarchs of the Holy Orthodox Eastern Church, and occupant of the Apostolic See from which the Church of the East revolted at the time of Nestorius." This mission has its headquarters at Urmia, with a college for candidates for holy orders and a printing-press. Two mission-priests reside in Turkey, one at Qudshanis with Mar Shimun, the Nestorian Catholicus and Patriarch. The Anglican Church in America co-operates with the mission.

4. *The Russian Mission.*—One of the Nestorian bishops joined the Russian Orthodox Church in 1898, and returned the same year with a small band of missionaries sent by the Holy Synod of Russia. This mission enrolled a very large number of adherents drawn from the old Church, the Protestant Nestorians, and the Uniat-Chaldeans, but it can hardly be said to have commenced any active work, although the Anglican mission withdrew from competition by closing its schools in the dioceses occupied by the Russians.

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NESTORIUS (d. *c.* 451), Syrian ecclesiastic, patriarch of Constantinople from 428 to 431, was a native of Germanicia at the foot of Mount Taurus, in Syria. The year of his birth is unknown. He received his education at Antioch, probably under Theodore of Mopsuestia. As monk in the neighbouring monastery of Euprepius, and afterwards as presbyter, he became celebrated in the diocese for his asceticism, his orthodoxy and his eloquence; hostile critics, such as the church historian Socrates, allege that his arrogance and vanity were hardly less conspicuous. On the death of Sisinnius, patriarch of Constantinople (December 427), Theodosius II., perplexed by the various claims of the local clergy, appointed the disinguished preacher of Antioch to the vacant see. The consecration took place on the 10th of April 428, and then, almost immediately afterwards, in what is said to have been his first patriarchal sermon, Nestorius exhorted the emperor in the famous words—"Purge me, O Caesar, the earth of heretics, and I in return will give thee heaven. Stand by me in putting down the heretics and I will stand by thee in putting down the Persians." In the spirit of this utterance, steps were taken within a few days by the new prelate to suppress the assemblies of the Arians; these, by a bold stroke of policy, anticipated his action by themselves setting fire to their meeting-house, Nestorius being forthwith nicknamed "the incendiary." The Novatians and the Quartodecimans were the next objects of his orthodox zeal—a zeal which in the case of the former at least was reinforced, according to Socrates, by his envy of their bishop; and it led to serious and fatal disturbances at Sardis and Miletus. The toleration the followers of Macedonius had long enjoyed was also rudely broken, the recently settled Pelagians alone finding any respite. While these repressive measures were being carried on outside the pale of the catholic church, equal care was taken to instruct the faithful in such points of orthodoxy as their spiritual head conceived to be the most important or the most in danger. One of these was that involved in the practice, now grown almost universal, of bestowing the epithet Θεοτόκος, "Mother of God," upon Mary the mother of Jesus. In the school of Antioch the impropriety of the expression had long before been pointed out, by Theodore of Mopsuestia, among others, in terms precisely similar to those afterwards attributed to Nestorius. From Antioch Nestorius had brought along with him to Constantinople a co-presbyter named Anastasius, who enjoyed his confidence and is called by Theophanes his "syncellus." This Anastasius, in a pulpit oration which the patriarch himself is said to have prepared for him, caused great scandal to the partisans of the Marian cultus then beginning by saying, "Let no one call Mary the mother of God, for Mary was a human being; and that God should be born of a human being is impossible." The opposition, which was led by one Eusebius, a "scholasticus" or pleader who afterwards became bishop of Dorylaeum, chose to construe this utterance as a denial of the divinity of Christ, and so violent did the dispute upon it become that Nestorius judged it necessary to silence the remonstrants by force. The situation went from bad to worse, and the dispute not only grew in intensity but reached the outer world.

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[1] The legendary founders of the Syrian Church. Addai was supposed to be one of the Seventy of Luke x. 1, and Mari his disciple.

Matters were soon ripe for foreign intervention, and the notorious Cyril (*q.v.*) of Alexandria, in whom the antagonism between the Alexandrian and Antiochene schools of theology,[1] as well as the jealousy between the patriarchate of St Mark and that of Constantinople, found a determined and unscrupulous exponent, did not fail to make use of the opportunity. He stirred up his own clergy, he wrote to encourage the dissidents at Constantinople, he addressed himself to the sister and wife of the emperor (Theodosius himself being known to be still favourable to Nestorius), and he beggared the clergy of his own diocese to find bribes for the officials of the court.[2] He also sent to Rome a careful selection of Nestorius's sayings and sermons. Nestorius himself, on the other hand, having occasion to write to Pope Celestine I. about the Pelagians (whom he was not inclined to regard as heretical), gave from his own point of view an account of the disputes which had recently arisen within his patriarchate.[3] While ordinarily Rome might have been expected to hold the balance between the contrasted schools of thought, as Leo was able later to do, it is not surprising that this implied appeal proved unsuccessful, for Celestine naturally resented any questioning of the Roman decision concerning the Pelagians and was jealous of the growing power of the upstart see of the *Nova Roma* of the East. He was not slow to use the opportunity of gaining what was at once an official triumph and a personal satisfaction. In a synod which met in 430, he decided in favour of the epithet Θεοτόκος, and bade Nestorius retract his erroneous teaching, on pain of instant excommunication, at the same time entrusting the execution of this decision to the patriarch of Alexandria. On hearing from Rome, Cyril at once held a synod and drew up a doctrinal formula for Nestorius to sign, and also twelve anathemas covering the various points of the Nestorian dogmatic. Nestorius, instead of yielding to the combined pressure of his two great rivals, merely replied by a counter excommunication.

In this situation of affairs the demand for a general council became irresistible, and accordingly Theodosius and Valentinian III. issued letters summoning the metropolitans of the catholic church to meet at Ephesus at Whitsuntide 431, each bringing with him some able suffragans. Nestorius, with sixteen bishops and a large following of armed men, was among the first to arrive; soon afterwards came Cyril with fifty bishops. Juvenal of Jerusalem and Flavian of Thessalonica were some days late. It was then announced that John of Antioch had been delayed on his journey and could not appear for some days; he, however, is stated to have written politely requesting that the opening of the synod should not be delayed on his account. Cyril and his friends accordingly assembled in the church of the Theotokos on the 22nd of June, and summoned Nestorius before them to give an account of his doctrines. The reply they received was that he would appear as soon as all the bishops were assembled; and at the same time the imperial commissioner, Candidian, presented himself in person and formally protested against the opening of the synod. Notwithstanding these circumstances, Cyril and the one hundred and fifty-nine bishops who were with him proceeded to read the imperial letter of convocation, and afterwards the letters which had passed between Nestorius and his adversary. Almost immediately the entire assembly with one voice cried out anathema on the impious Nestorius and his impious doctrines, and after various extracts from the writings of church fathers had been read the decree of his exclusion from the episcopate and from all priestly communion was solemnly read and signed by all present, whose numbers had by this time swelled to one hundred and ninety-eight. The accused and his friends never had a hearing. As Nestorius himself said, "the Council was Cyril"; it simply registered the Alexandrian patriarch's views.

When the decision was known the populace, who had been eagerly waiting from early morning till night to hear the result, accompanied the members with torches and censers to their lodgings, and there was a general illumination of the city. A few days afterwards (June 26th or 27th) John of Antioch arrived, and efforts were made by both parties to gain his ear; whether inclined or not to the cause of his former co-presbyter, he was naturally excited by the precipitancy with which Cyril had acted, and at a *conciliabulum* of forty-three bishops held in his lodgings shortly after his arrival he was induced by Candidian, the friend of Nestorius, to depose the bishops of Alexandria and Ephesus on the spot. The efforts, however, to give effect to this act on the following Sunday were frustrated by the zeal of the Ephesian mob. Meanwhile a letter was received from the emperor declaring invalid the session at which Nestorius had been deposed unheard; numerous sessions and counter-sessions were afterwards held, the conflicting parties at the same time exerting themselves to the utmost to secure an effective superiority at court. In the end Theodosius decided to confirm the depositions which had been pronounced on both sides, and Cyril and Memnon as well as Nestorius were by his orders laid under arrest. Representatives from each side were now summoned before him to Chalcedon, and at last, yielding to the sense of the evident majority, he gave a decision in favour of the "orthodox," and the council of Ephesus was dissolved. Maximian, one of the Constantinopolitan clergy, a native of Rome, was promoted to the vacant see, and Nestorius was henceforward represented in the city of his former patriarchate only by one small congregation, which also a short time afterwards became extinct. The commotion which had been thus raised did not so easily subside in the more eastern section of the church; the Antiochenes continued to maintain for a considerable time an attitude of antagonism towards Cyril and his creed, and were not pacified until an understanding was reached in 433 on the basis of a new formula involving some material concessions by him. The union even then met with resistance from a number of bishops, who, rather than accede to it, submitted to deposition and expulsion from their sees; and it was not until these had all died out that, as the result of stringent imperial edicts, Nestorianism may be said to have become extinct throughout the Roman empire. Their school at Edessa was closed by Zeno in 489. As for Nestorius himself, immediately after his deposition he withdrew into private life in his old monastery of Euprepius, Antioch, until 435, when the emperor ordered his banishment to Petra in Arabia. A second decree, it would seem, sent him to Oasis, probably the city of the Great Oasis, in Upper Egypt, where he was still living in 439, at the time when Socrates wrote his *Church History*. He was taken prisoner by the Blemmyes, a nomad tribe that gave much trouble to the empire in Africa, and when they set him free in the Thebaid near Panopolis (Akhmim) *c.* 450, they exposed him to further persecution from Schenute the great hero of the Egyptian monks. There is some evidence that he was summoned to the Council of Chalcedon,[1] though he could not attend it, and the concluding portion of his book known as *The Bazaar of Heraclides* not only gives a full account of the "Robber Synod" of Ephesus 449, but knows that Theodosius is dead (July 450) and seems aware of the proceedings of Chalcedon and the flight of Dioscurus the unscrupulous successor of Cyril at Alexandria. Nestorius was already old and ailing and must have died very soon after.

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[1] At Alexandria the mystic and allegorical tendency prevailed, at Antioch the practical and historical, and these tendencies showed themselves in different methods of study, exegesis and presentation of doctrine.

[2] Letters of the archdeacon Epiphanius to the patriarch Maximianus (Migne, *Patr. Gr.* lxxxiv. 826).

[3] The letter is given in F. Loofs, *Nestoriana* 166-168, partly translated in J. F. Bethune-Baker, *Nestorius and his Teaching*, p. 16 seq.

The Nestorian Heresy.—What is technically and conventionally meant in dogmatic theology by "the Nestorian heresy" must now be noticed. As Eutychianism is the doctrine that the God-man has only one nature, so Nestorianism is the doctrine that He has two complete persons. So far as Nestorius himself is concerned, however, it is certain that he never formulated any such doctrine;[2] nor does any recorded utterance of his, however casual, come so near the heresy called by his name as Cyril's deliberately framed third anathema (that regarding the "physical union" of the two hypostases or natures) approaches Eutychianism. It must be remembered that Nestorius was as orthodox at all events as Athanasius on the subject of the incarnation, and sincerely, even fanatically, held every article of the Nicene creed. Hefele himself, one of the most learned and acute of Cyril's partisans, is compelled to admit that Nestorius accurately held the duality of the two natures and the integrity of each, was equally explicitly opposed to Arianism and Apollinarianism, and was perfectly correct in his assertion that the Godhead can neither be born nor suffer; all that he can allege against him is that "the fear of the *communicatio idiomatum* pursued him like a spectre." But in reality the question raised by Nestorius was not one as to the *communicatio idiomatum*, but simply as to the proprieties of language. "I cannot speak of God," he said, "as being two or three months old," a remark which was twisted to his disadvantage. He did not refuse to speak of Mary as being the mother of Christ or as being the mother of Emmanuel, but he thought it improper to speak of her as the mother of God, and Leo in the Letter to Flavian which was endorsed at Chalcedon uses the term "Mother of the Lord" which was exactly what Nestorius wished. And there is at least this to be said for him that even the most zealous desire to frustrate the Arian had never made it a part of orthodoxy to speak of David as θεοπάτωρ or of James as ἀδελφόθεος. The secret of the enthusiasm of the masses for the analogous expression Theotokos is to be sought not so much in the Nicene doctrine of the incarnation as in the recent growth in the popular mind of notions as to the dignity of the Virgin Mary, which were entirely unheard of (except in heretical circles) for nearly three centuries of the Christian era. That the Virgin should be given a title that was quasi-divine mattered little. The danger was that under cover of such a title an unhistorical conception of the facts of the Gospel should grow up, and a false doctrine of the relations between the human and the Divine be encouraged, and this was to Nestorius a double danger that needed to be exposed. He was thus forced into the position of one who brings technical objections against a popular term.

The fact that Nestorius was trained at Antioch and inherited the Antiochene zeal for exact biblical exegesis and insistence upon the recognition of the full manhood of Christ, is of the first importance in understanding his position. From the days of Ignatius, down through Paul of Samosata and Lucian to the great controversies of the 5th century which began with the theories of Apollinarius, the theologians of Antioch started from the one sure fact, that Christ lived on earth the life of man, and without questioning the equally genuine Divine element laid stress on this genuine human consciousness. There is no reason to suppose that Nestorius intended to introduce any innovations in doctrine, and in any estimate of him his strong religious interest and his fervent pastoral spirit must have due weight. He was a great extempore preacher and exposed to the peril of the unconsidered "telling" phrase. That a man of such conspicuous ability, who impressed himself at the outset on the people of Constantinople as an uncompromising opponent of heresy should within a few short years be an excommunicated fugitive, sacrificed to save the face of Cyril and the Alexandrians, is indeed, as Duchesne says, a tragedy. No successor of Chrysostom was likely to receive much good-will from the nephew and successor of Theophilus of Alexandria.

It is only within recent years that an attempt has been made to judge Nestorius from some other evidence than that afforded by the accusations of Cyril and the inferences drawn therefrom. This other evidence consists partly of letters from Nestorius, preserved among the works of those to whom they were written, some sermons collected in a Latin translation by Marius Mercator, an African merchant who was doing business in Constantinople at the time of the dispute, and other material gathered from Syriac manuscripts. Since the helpful collection of *Nestoriana* published by Dr F. Loofs in 1905 there has also come to our knowledge the most valuable evidence of all, Nestorius's own account of the whole difficulty, viz. *The Bazaar*[3] *of Heraclides of Damascus*. This pseudonym served to protect the book against the fate that overtook the writings of heretics, and in a Syriac version it was preserved in the Euphrates valley where the followers of Nestorius settled. Ebed Jesu in the 14th century mentions it together with *Letters* and *Homilies*, as well as the *Tragedy*, or a *Letters to Cosmas*, the *Theopaschites* (of which some fragments are still extant) and the *Liturgy*, which is still used by the Nestorian Church. The discovery of *The Bazaar*, which is the *Apologia* of Nestorius, was made public by Dr H. Goussen (though members of the Archbishop of Canterbury's Mission to the Assyrian Christians had previously been acquainted with the book). The text has been edited by P. Paul Bedjan (Leipzig, 1910) and a French translation has been made by M. l'abbé F. Nau. A representative selection of extracts has been given to English readers in J. F. Bethune-Baker's *Nestorius and his Teaching* (Cambridge, 1908), chapter ii. of which describes the MS. and its accounts. Much of the argument is thrown into the form of a dialogue between (1) Nestorius and an imaginary opponent Superianus, (2) Nestorius and Cyril. The book reveals a strong personality and helps us to know the man and his teaching, even though we have to gather his own views largely from his criticism of his antagonists. He is throughout more concerned for the wrong done to the faith at Ephesus than to himself, saying that if he held the views attributed to him by Cyril he would be the first to condemn himself without mercy. All through the years of conflict he had "but one end in view, that no one should call the Word of God a creature, or the Manhood which was assumed incomplete." In his letters to Celestine he had laid stress on the point that the teaching he attacked was derogatory to the Godhead and so he called its champions Arians. "If the Godhead of the Son had its origin in the womb of the Virgin it was not Godhead as the Father's, and He who was born could not be *homoousios* with God, and that was what the Arians denied Him to be." It is thus increasingly difficult to believe that Nestorius was a "Nestorian." Père J. Mahé has shown (*Revue d'Inst. ecclés.* July, 1906) that in spite of notable differences of terminology and form the chronologies of Antioch and Alexandria were in essence the same. Personal rather than doctrinal reasons had by far the larger part in determining the fate of Nestorius, who was sacrificed to the agreement between the two great schools. This view is confirmed by the evidence of the *Synodicon Orientale* (the collection of the canons of Nestorian Councils and Synods), which shows that the Great Syriac Church built up by the adherents of Nestorius and ever memorable for its zeal in carrying the Gospel into Central Asia, China and India cannot, from its inception, be rightly described as other than orthodox. The "attenuated" (*i.e.* un-"Nestorian") form which some historians have noted in the early centuries of Persian Nestorianism was really there from the beginning. The Nestorian Church, following its leader, formally recognizes the Letter of Leo to Flavian and the decrees of the Council of Chalcedon. "When I came," said Nestorius (*Baz. Herac.*), "upon that exposition and read it, I gave thanks to God that the Church of Rome was rightly and blamelessly making confession, even though they happened to be against me personally." His aim, he tells us, had been to maintain the distinct continuance of the two natures of Christ when united through the Incarnation into one Person. "In the Person the natures use their properties mutually. . . . The manhood is the person of the Godhead and the Godhead is the person of the manhood." The ultimate union of these two natures appears to lie in the will—"For there was one and the same will and mind in the union of the natures, so that both should will or not will exactly the same things. The natures have, moreover, a mutual will, since the person of this is the person of that, and the person of that the person of this." The manner in which this union is realized is thus stated by Nestorius: "The Word also passed through Blessed Mary inasmuch as He did not receive a beginning by birth from her, as is the case with the body which was born of her. For this reason I said that God the Word passed and not was born, because He did not receive a beginning from her. But the two natures being united are one Christ. And He who was born of the Father as to the Divinity, and from the Holy Virgin as to the humanity is and is styled one; for of the two natures there was a union." It may truly be said that the ideas for which Nestorius and the Antiochene school strove "won the day as regards the doctrinal definitions of the church. The manhood of Christ was safeguarded, as distinct from the Godhead: the union was left an ineffable mystery."

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[1] Coptic Life of Dioscurus (*Rev. Égyptologique*, 1880–1883).

[2] J. F. Bethune-Baker, *Nestorius and his Teaching*, ch. vi.

[3] Syriac, *tĕgūrtā*, lit. "merchandise." The Greek word may have been ἐμπόριον. Nothing is certainly known of any such Heraclides.

AUTHORITIES.—On Nestorius, in addition to the modern literature cited in the article, and the standard histories of dogma (A. Harnack, F. Loofs, R. L. Ottley's *Doctrine of the Incarnation*, &c.) see R. Seeberg, *Lehrbuch der Dogmengeschichte*, Bd. ii. § 27 (Leipzig, 1910), L. Duchesne, *Histoire ancienne de l'église*, vol. iii. chs. x. xi. (Paris, 1910). (J. S. BL.; A. J. G.)

NESZLER, VICTOR (1841–1890), German musical composer, was born on the 28th of January 1841 at Baldenheim, near Schlettstadt. At Strassburg he began his university career with the study of theology, but he concluded it with the production of a light opera entitled *Fleurette* (1864). To complete his knowledge of music Neszler went to Leipzig to study under Hauptmann. His opera *Der Trompeter von Säckingen*, based on Scheffel's poem, was composed and performed in 1884. Besides a number of other operas, Neszler wrote many songs and choral works; but it is with the *Trompeter von Säckingen* that his name is associated. He died at Strassburg on the 28th of May 1890. In 1895 a monument to him by Marzolff was erected there.

NET,[1] a fabric of thread, cord or wire, the intersections of which are knotted so as to form a mesh. The art of netting is intimately related to weaving, knitting, plaiting and lace-making, from all of which, however, it is distinguished by the knotting of the intersections of the cord. It is one of the most ancient and universal of arts, having been practised among the most primitive tribes, to whom the net is of great importance in hunting and fishing.

Net-making, as a modern industry, is principally concerned with the manufacture of the numerous forms of net used in fisheries, but netting is also largely employed for many other purposes, as for catching birds, for the temporary division of fields, for protecting fruit in gardens, for screens and other furniture purposes, for ladies' hair, bags, appliances used in various games, &c. Since the early part of the 19th century numerous machines have been invented for netting, and several of these have attained commercial success. Fishing nets were formerly made principally from hemp fibre—technically called "twine"; but since the adaptation of machinery to net-making cotton has been increasingly used, such nets being more flexible and lighter, and more easily handled and stowed.

The forms of fishing nets vary according to the manner in which they are intended to act. This is either by entangling the fish in their complicated folds, as in the trammel; receiving them into pockets, as in the trawl; suspending them by the body in the meshes, as in the mackerel-net; imprisoning them within their labyrinth-like chambers, as in the stake-net; or drawing them to shore, as in the seine. The parts of a net are the head or upper margin, along which the corks are strung upon a rope called the head-rope; the foot is the opposite or lower margin, which carries the foot-rope, on which in many cases leaden plummets are made fast. The meshes are the squares composing the net. The width of a net is expressed by the term "over"; *e.g.* a day-net is three fathoms long and one over or wide. The lever is the first row of a net. There are also accrues, false meshes or quarterings, which are loops inserted in any given row, by which the number of meshes is increased. To bread or breathe a net is to make a net. Dead netting is a piece without either accrues or stole (stolen) meshes, which last means that a mesh is taken away by netting into two meshes of the preceding row at once.

Hand-Netting.—The tools used in hand-netting are the needle, an instrument for holding and netting the material; it is made with an eye E, a tongue T, and a fork F (fig. 1). The twine is wound on it by being passed alternately between the fork and round the tongue, so that the turns of the string lie parallel to the length of the needle, and are kept on by the tongue and fork. A spool or mesh-pin is a piece of round or flat wood on which the loops are formed, the perimeter of the spool determining the size of the loops. Each loop contains two sides of the square mesh; therefore, supposing that it be required to make a mesh 1 in. square—that is, measuring 1 in. from knot to knot, —a spool 2 in. in circumference must be used. Large meshes may be formed by giving the twine two or more turns round the spool, as occasion may require; or the spool may be made flat, and of a sufficient width. The method of making the hand-knot in nets known as the fisherman's knot is more easily acquired by example than described in writing. Fig. 2 shows the course of the twine in forming a single knot. From the last-formed knot the twine passes over the front of the mesh-pin *h*, and is caught behind by the little finger of the left hand, forming the loop *s*, thence it passes to the front and is caught at *d* by the left thumb, then through the loops *s* and *m* as indicated, after which the twine is released by the thumb and the knot is drawn "taut" or tight. Fig. 3 is a bend knot used for uniting two ends of twine.

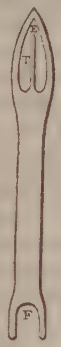

FIG. 1.

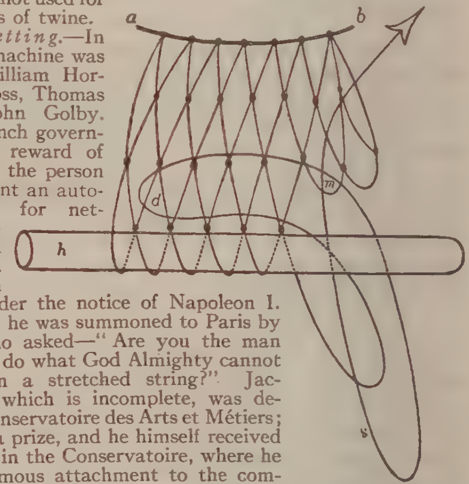

FIG. 2.

Machine-Netting.—In 1778 a netting-machine was patented by William Horton, William Ross, Thomas Davies and John Golby. In 1802 the French government offered a reward of 10,000 francs to the person who should invent an automatic machine for net-making. Jacquard submitted a model of a machine which was brought under the notice of Napoleon I. and Carnot, and he was summoned to Paris by the emperor who asked—"Are you the man who pretends to do what God Almighty cannot —tie a knot in a stretched string?" Jacquard's model, which is incomplete, was deposited in the Conservatoire des Arts et Métiers; it was awarded a prize, and he himself received an appointment in the Conservatoire, where he perfected his famous attachment to the common loom. In the United Kingdom, the first to succeed in inventing an efficient machine and in establishing the industry of machine net-making was James Paterson of Musselburgh. Paterson, originally a cooper, served in the army through the Peninsular War, and was discharged after the battle of Waterloo. He established a net factory in Musselburgh about 1820; but the early form of machine was imperfect, the knots it formed slipped readily, and, there being much prejudice against machine nets, the demand was small. Walter Ritchie, native of Musselburgh, devised a method for forming the ordinary hand-knot on the machine nets, and the machine, patented in July 1835, became the foundation of an extensive and flourishing industry.

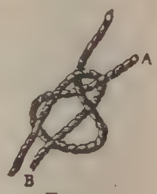

FIG. 3.

The Paterson machine is very complex. It consists of an arrangement of hooks, needles and sinkers, one of each being required for every mesh in the breadth being made. The needles hold the meshes, while the hooks seize the lower part of each and twist it into a loop. Through the series of loops so formed a steel wire is shot, carrying with it twine for the next range of loops. This twine the sinkers successively catch and depress sufficiently to form the two sides and loop of the next mesh to be formed. The knot formed by threading the loops is now tightened up, the last formed mesh is freed from the sinkers and transferred to the hooks, and the process of looping, threading and knotting thus continues.

Another form of net-loom, working on a principle distinct from that of Paterson, was invented and patented in France by Onésiphore Pecqueur in 1840, and again in France and in the United Kingdom in 1849. This machine was improved by many subsequent inventors; especially by Baudouin and Jouannin, patented in the United Kingdom in 1861. In this machine separate threads or cords running longitudinally for each division of the mesh are employed (fig. 4). It will be observed that the alternate threads *a* and *b* are differently disposed—the *a* series being drawn into simple loops over and through which the threads of the *b* series have to pass. On the machine the *a* series of threads are arranged vertically, while the *b* series are placed horizontally in thin lenticular spools. Over the horizontal *b* series is a range of hooks equal in number with the threads, and set so that they seize the *b* threads, raise them, and give them a double twist, thus forming a row of open loops. The loops are then depressed, and, seizing the vertical *a* threads, draw them crotchet-like through the *b* loops into loops sufficiently long and open to pass right over the spools containing the *b* threads (fig. 5), after which it only remains to tighten the threads and the mesh is complete.

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[1] This is a common Teut. word, of which the origin is unknown; it is not to be connected with "knit" or "knot." The term "net," *i.e.* remaining after all deductions, charges, &c., have been made, as in "net profit," is a variant of "neat," tidy, clean, Lat. *nitidus*, shining.

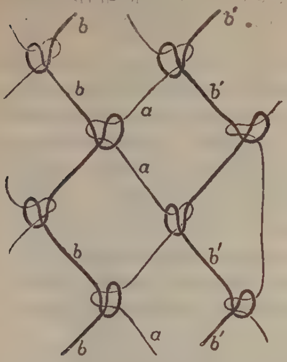

FIG. 4.

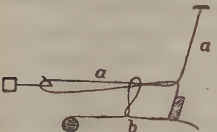

FIG. 5.

Wire-netting, which is in extensive demand for garden use, poultry coops, and numerous like purposes, is also a twisted structure made principally by machine power. The industry was mainly founded by Charles Barnard in 1844, the first netting being made by hand on wooden rollers. The first machine appeared in 1855, and, since that time many devices, generally of extremely complex construction, have come into use. The wire chiefly used is common annealed Bessemer or mild steel (see B. Smith, *Wire, Its Manufacture and Uses*, New York, 1891).

NETHERLANDS. The geographical features of the countries formerly known collectively as the Netherlands or Low Countries are dealt with under the modern English names of HOLLAND and BELGIUM. Here we are concerned only with their earlier history, which is put for convenience under this heading in order to separate the account of the period when they formed practically a single area for historical purposes from that of the time when Holland and Belgium became distinct administrative units.

Early inhabitants.

The sources of our knowledge of the country down to the 8th century are Caesar's *De Bello Gallico*, iv., the history of Velleius Paterculus, ii. 105, the works of Tacitus, the *Historia Francorum* (i.-iii.) of Gregory of Tours, the Fredegar's *Chronica* (for the last two of which see D. Bouquet's *Recueil de historiens des Gaules et de la France, 1738–1876*). The Netherlands first became known to the Romans through the campaigns of Julius Caesar. He found the country peopled partly by tribes of Gallo-Celtic, partly by tribes of Germanic stock, the river Rhine forming roughly the line of demarcation between the races. Several of the tribes along the borderland, however, were undoubtedly of mixed blood. The Gallo-Celtic tribes bore the general appellation of Belgae, and among these the Nervii, inhabiting the district between the Scheldt and the Sambre were at the date of Caesar's invasion, 57 B.C., the most warlike and important. To the north of the Meuse, and more especially in the low-lying ground enclosed between the Waal and the Rhine (*insula Batavorum*) lived the Batavi, a clan of the great Germanic tribe, the Chatti. Beyond these were found the Frisians (*q.v.*), a people of German origin, who gave their name to the territory between the Rhine and the Ems. Of the other tribes the best known are the Caninefates, Chauci, Usipetes, Sicambri, Eburones, Menapii, Morini and Aduatici.

Their relations with the Romans.

Julius Caesar, after a severe struggle with the Nervii and their confederates, was successful in bringing the Belgic tribes into subjection to Rome. Under Augustus, 15 B.C., the conquered territory was formed into an imperial province, *Gallia Belgica*, and the frontier line, the Rhine, was strongly held by a series of fortified camps. With regard to the region north of the Rhine we first obtain information from the accounts of the campaigns of Nero, Claudius, Drusus and Tiberius. The Batavians were first brought under Roman rule in the governorship of Drusus, A.D. 13. They were not incorporated in the empire, but were ranked as allies, *socii* or *auxilia*. Their land became a recruiting ground for the Roman armies, and a base for expeditions across the Rhine. The Batavians served with fidelity and distinction in all parts of the empire, and from the days of Augustus onwards formed a considerable part of the Praetorian guard. The Frisians struggled against Roman over-lordship somewhat longer, and it was not until A.D. 47 that they finally submitted to the victorious arms of Domitius Corbulo. The Frisian auxiliaries were likewise regarded as excellent troops.

The revolt of Civilis.

In the confusion of the disputed succession to the imperial throne after the death of Nero, the Batavians (A.D. 69–70) under the influence of a great leader, known only by his Roman name, Claudius Civilis, rose in revolt. Civilis had seen much service in the Roman armies, and was a man of statesmanlike ability. In revenge for his own imprisonment, and the death of his brother by order of Nero, he took advantage of the disorder in the empire not only to stir up his fellow-countrymen to take up arms for independence, but to persuade a large number of German and Belgic tribes to join forces with them. A narrative of the revolt is given in detail by Tacitus. At first success attended Civilis and the Romans were driven out of the greater part of the Belgic province. Even the great fortress of Castra Vetera (Xanten) was starved into submission and the garrison massacred. But dissensions arose between the German and Celtic elements of Civilis's following. The Romans, under an able general, Cerealis, took advantage of this, and Civilis, beaten in fight, retired to the island of the Batavians. But both sides were exhausted, and it was arranged that Cerealis and Civilis should meet on a broken bridge over the Nabalia (Yssel) to discuss terms of peace. At this point the narrative of Tacitus breaks off, but it would appear that easy conditions were offered, for the Batavians returned to their position of *socii*, and were henceforth faithful in their steady allegiance to Rome. The *insula Batavorum*, lined with forts, became for a long period the bulwark of the empire against the inroads of the Germans from the north.

The Franks.

Of this period scarcely any record remains, but when at the end of the 3rd century the Franks (*q.v.*) began to swarm over the Rhine into the Roman lands, the names of the old tribes had disappeared. The peoples within the frontier had been transformed into Romanized provincials; outside, the various tribes had become merged in the common appellation of Frisians. The branch of the Franks—who were a confederacy, not a people—which gradually overspread Gallia Belgica, bore the name of the Salian Franks. Nominally they were taken under the protection of the empire, in reality they were its masters and defenders. In the days of their great king Hlodwig or Clovis (481–511) they were in possession of the whole of the southern and central Netherlands. The strip of coast from the mouth of the Scheldt to that of the Ems remained, however, in the hands of the free Frisians (*q.v.*), in alliance with whom against the Franks were the Saxons (*q.v.*), who, pressing forward from the east, had occupied a portion of the districts known later as Gelderland, Overyssel and Drente. Saxon was at this period the common title of all the north German tribes; there was but little difference between Frisians and Saxons either in race or language, and they were closely united for some four centuries in common resistance to the encroachments of the Frankish power.

Spread of Christianity.

The conversion of Clovis and his rude followers to Christianity tended gradually to civilize the Franks, and to facilitate the fusion which soon took place between them and the Gallo-Roman population. It tended also to accentuate the enmity to the Franks of the heathen Frisians and Saxons. In the south (of the Netherlands) Christianity was spread by the labours of devoted missionaries, foremost amongst whom were St Amandus, St Bavon and St Eligius, and bishoprics were set up at Cambrai, Tournai, Arras, Thérouanne and Liége. In the north progress was much slower, and though a church was erected at Utrecht by Dagobert I. about A.D. 630, it was destroyed by the Frisians, who remained obstinately heathen. The first successful attempt to convert them was made, under the powerful protection of Pippin of Heristal, by Willebrord, a Northumbrian monk, who became, A.D. 695, the first bishop of Utrecht (see UTRECHT). His labours were continued with even more striking results by another Englishman, Winfred, better known as St Boniface, the Apostle of the Germans, who suffered martyrdom at Dokkum in A.D. 754 at the hands of some heathen Frisians. The complete conversion was, however, in the end due rather to the arms of the Carolingian kings than to the unaided efforts of the missionaries. Towards the end of the century, Charlemagne, himself a Netherlander by descent and ancestral possessions, after a severe struggle, thoroughly subdued the Frisians and Saxons, and compelled them to embrace Christianity.

The duchy of Lower Lorraine.

In the triple partition of the Carolingian empire at Verdun in 843, the central portion was assigned to the emperor Lothaire, separating the kingdoms of East Francia (the later Germany) from West Francia (the later France). This middle kingdom formed a long strip stretching across Europe from the North Sea to Naples, and embraced the whole of the later Netherlands with the exception of the portion on the left bank of the Scheldt, which river was made the boundary of West Francia. On the death of the emperor, his son Lothaire II. received the northern part of his father's domain, known as Lotharii or Hlutharii Regnum, corrupted later into Lotharingia or Lorraine. Lothaire had no heir, and in 870 by the treaty of Meerssen his territory was divided between the kings of East and West Francia. In 879 East Francia acquired the whole; from 912 to 924 it formed part of West Francia. Finally in 924 Lorraine passed in the reign of Henry the Fowler under German (East Frankish) overlordship. Henry's son, Otto the Great, owing to the disordered state of the country, placed it in 953 in the hands of his able brother, Bruno, archbishop of Cologne, for pacification. Bruno, who kept for himself the title of archduke, divided the territory into the two duchies of Upper and Lower Lorraine. Godfrey of Verdun was invested by him with the government of Lower Lorraine (Nieder-Löthringen). The history of the Netherlands from this time forward—with the exception of Flanders, which continued to be a fief of the French kings—is the history of the various feudal states into which the duchy of Lower Lorraine was gradually broken up.

Growth of the feudal states.

It is a melancholy history, telling of the invasion of the Northmen, and of the dynastic struggles between the petty feudal sovereigns who carved out counties and lordships for themselves during the dark centuries which followed the fall of the Carolingian empire. It was a time of oppression and cruelty, and of war and devastation, during which the country remained chiefly swamp and tangled woodland, with little communication save up and down the rivers and along the old Roman roads. Its remoteness from the control of the authority of the German and French kings, together with its inaccessibility, gave special facilities in Lower Lorraine to the growth of a number of practically independent feudal states forming a group or system apart. Chief among these states were the duchy of Brabant, the counties of Flanders, Hainault, Holland, Gelderland, Limburg and Luxemburg, and the bishoprics of Utrecht and Liége. For their separate local histories and their dynasties, their wars and political relations with one another and with neighbouring countries, reference must be made to the separate articles FLANDERS, HOLLAND, BRABANT, GELDERLAND, LIMBURG, LUXEMBURG, UTRECHT, LIÉGE.

The invasions of the Northmen.

During the 9th and 10th centuries the Netherlands suffered cruelly from the attacks of the Northmen, who ravaged the shores and at times penetrated far inland. In 834 Utrecht and Dorestad were sacked, and a few years later all Holland and Friesland was in their hands. Year after year the raids went on under a succession of leaders—Heriold, Roruk, Rolf, Godfrey—and far and wide there was pillaging, burning, murder and slavery. In 873 Rolf seized Walcheren, and became the scourge of the surrounding districts. In 880 the invaders took Nijmwegen, erected a permanent camp at Elsloo and pushed on to the Rhine. Liège, Aix-la-Chapelle, Cologne and Bonn fell into their hands. The emperor, Charles the Fat, was roused to collect a large army, with which he surrounded the main body of the Northmen under their leader Godfrey in the camp at Elsloo. But Charles preferred negotiation and bribery to fighting. Godfrey received a large sum of money, was confirmed in the possession of Friesland, and on being converted to Christianity in 882, received in marriage Gisela, daughter of Lothaire II. Three years later, however, Godfrey was murdered, and although the raids of the Northmen did not entirely cease for upwards of another century, no further attempt was made to establish a permanent dynasty in the land.

The Crusades.

At the close of the 11th century the system of feudal states had been firmly established in the Netherlands under stable dynasties hereditary or episcopal, and, despite the continual wars between them, civilization had begun to develop, orderly government to be carried on, and the general condition of the people to be less hopeless and miserable. It was at this time that the voice of Peter the Hermit roused the whole of western Europe to enthusiasm by his preaching of the first crusade. Nowhere was the call responded to with greater zeal than in the Netherlands, and nowhere had the spirit of adventure and the stimulus to enterprise, which was one of the chief fruits of the crusades, more permanent effects for good. The foremost heroes of the first crusade were Netherlanders. Godfrey of Bouillon, the leader of the expedition and the first king of Jerusalem, was duke of Lower Lorraine, and the names of his brothers Baldwin of Edessa and Eustace of Boulogne, and of Count Robert II. of Flanders are only less famous. The third crusade numbered among its chiefs Floris III. of Holland, Philip of Flanders, Otto I. of Gelderland and Henry I. of Brabant. The so-called Latin crusade of 1203 placed the imperial crown of Constantinople on the head of Baldwin of Flanders. At the siege and capture of Damietta (1218) it was the contingent of North-Netherlanders (Hollanders and Frisians under Count William I. of Holland) who bore the brunt of the fighting and specially distinguished themselves. To the Netherlands, as to the rest of western Europe, the result of the crusades was in the main advantageous. They broke down the intense narrowness of the life of those feudal times, enlarged men's conceptions and introduced new ideas into their minds. They first brought the products and arts of the Orient into western Europe; and in the Netherlands, by the impulse that they gave to commerce, they were one of the primary causes of the rise of the chartered towns.

Rise of the cities in the Netherlands.

Little is known about the Netherland towns before the 12th century. The earliest charters date from that period. No place was reckoned to be a town unless it had received a charter from its sovereign or its local lord. The charters were of the nature of a treaty between the city and its feudal lord, and they differed much in character according to the importance of the place and the pressure it was able to put upon its sovereign. The extent of the rights which the charter conceded determined whether the town was a free town (*vrije stadt—villa franca*) or a commune (*gemeente—communia*). In the case of a commune the concessions included generally the right of inheritance, justice, taxation, use of wood, water, &c. The lord's representative, entitled "justiciary" (*schout*) of "bailiff" (*baljuw*), presided over the administration of justice and took the command of the town levies in war. The *gemeente*—consisting only of those bound by the communal oath for mutual help and defence—elected their own magistrates. These electors were often a small proportion of the whole body of inhabitants: sometimes a few influential families alone had the right, and it became hereditary. This governing oligarchy was known as "the patricians." The magistrates bore the name of *scabini* (*schepenen* or *échevins*), and at their head was the seigneurial official—the *schout* or *baljuw*. These *schepenen* appointed in their turn from the citizens to assist them a body of sworn councillors (*gezworenen* or *jurés*), whose presidents, styled "burgomasters," had the supervision of the communal finances. Thus grew up a number of municipalities—practically self-governing republics—semi-independent feudatories in the feudal state.

The Flemish communes.

The most powerful and flourishing of all were those of Flanders—Ghent, Bruges and Yprès. In the 13th century these towns had become the seat of large industrial populations (varying according to different estimates from 100,000 to 200,000 inhabitants), employed upon the weaving of cloth with its dependent industries, and closely bound up by trade interests with England, from whence they obtained the wool for their looms. Bruges, at that time connected with the sea by the river Zwijn and with Sluis as its port, was the central mart and exchange of the world's commerce. In these Flemish cities the early oligarchic form of municipal government speedily gave way to a democratic. The great mass of the townsmen organized in trade gilds—weavers, fullers, dyers, smiths, leather-workers, brewers, butchers, bakers and others, of which by far the most powerful was that of the weavers—as soon as they became conscious of their strength rebelled against the exclusive privileges of the patricians and succeeded in ousting them from power. The patricians (hence called *leliaerts*) relied upon the support of the French crown, but the fatal battle of Courtrai (1302), in which the handicraftsmen (*clauwaerts*) laid low the chivalry of France, secured the triumph of the democracy. The power of the Flemish cities rose to its height during the ascendancy of Jacques van Artevelde (1285–1345), the famous citizen-statesman of Ghent, but after his downfall the mutual jealousies of the cities undermined their strength, and with the crushing defeat of Roosebeke (1382) in which Philip van Artevelde perished, the political greatness of the municipalities had entered upon its decline.

Other Netherland municipalities.

In Brabant—Antwerp, Louvain, Brussels, Malines (Mechlin)—and in the episcopal territory of Liège—Liège, Huy, Dinant—there was a feebler repetition of the Flemish conditions. Flourishing communities were likewise to be found in Hainault, Namur, Cambrai and the other southern districts of the Netherlands, but nowhere else the vigorous independence of Ghent, Bruges and Yprès, nor the splendour of their civic life. In the north also the 13th century was rich in municipal charters. Dordrecht, Leiden, Haarlem, Delft, Vlaardigen, Rotterdam in Holland, and Middleburg and Zierikzee in Zeeland, repeated with modifications the characteristics of the communes of Flanders and Brabant. But the growth and development of the northern communal movement, though strong and instinct with life, was slower and less tempestuous than the Flemish. In the bishopric of Utrecht, in Gelderland and Friesland, the privileges accorded to Utrecht, Groningen, Zutphen, Stavoren, Leeuwarden followed rather on the model of those of the Rhenish "free cities" than of the Franco-Flemish commune. In the northern Netherlands generally up to the end of the 14th century the towns had no great political weight; their importance depended upon their river commerce and their markets. Thus at the close of the 14th century, despite the constant wars between the feudal sovereigns who held sway in the Netherlands, the vigorous municipal life had fostered industry and commerce, and had caused Flanders in particular to become the richest possession in the world.

The Burgundian dominion.

It was precisely at this time that Flanders, and gradually the other feudal states of the Netherlands, by marriage, purchase, treachery or force, fell under the dominion of the house of Burgundy. The foundation of the Burgundian rule in the Netherlands was laid by the succession of Philip the Bold to the counties of Flanders and Artois in 1384 in right of his wife Margaret de Mâle. In 1404 Antony, Philip's second son (killed at Agincourt 1415), became duke of Brabant by bequest of his great-aunt Joan. The consolidation of the Burgundian power was effected by Philip the Good, grandson of Philip the Bold, in his long and successful reign of 48 years, 1419–1467. He inherited Flanders and Artois, purchased the county of Namur (1427) and compelled his cousin Jacqueline, the heiress of Holland, Zeeland, Hainault and Friesland, to surrender her possessions to him, 1428. On the death in 1430 of his cousin Philip, duke of Brabant, he took possession of Brabant and Limburg; the duchy of Luxemburg he acquired by purchase, 1443. He made his bastard son David bishop of Utrecht, and from 1456 onwards that see continued under Burgundian influence. Two other bastards were placed on the episcopal throne of Liège, an illegitimate brother on that of Cambrai. Philip did not live to see Gelderland and Liège pass definitively under his rule; it was reserved for his son, Charles the Bold, to crush the independence of Liège (1468) and to incorporate Gelderland in his dominions (1473).

Philip the Good.

This extension of dominion on the part of the dukes of Burgundy implied the establishment of a strong monarchical authority. They had united under their sway a number of provinces with different histories and institutions and speaking different languages, and their aim was to centralize the government. The nobility and clergy were on the side of the ducal authority; its opponents were the municipalities, especially those of Flanders. Their strength had been seriously weakened by the overthrow of Roosebeke, but Philip on his accession found them once more advancing rapidly in power and prosperity. He was quite aware that the industrial wealth of the great Flemish communes was financially the mainstay of his power, but their very prosperity made them the chief obstacle to his schemes of unifying into a solid dominion the loose aggregate of states over which he was the ruler. On this matter Philip would brook no opposition. Bruges was forced after strenuous resistance to submit to the loss of its most cherished privileges in 1438, and the revolt of Ghent was quenched in the "red sea" (as it was styled) of Gavre in 1453. The splendour and luxury of the court of Philip surpassed that of any contemporary sovereign. A permanent memorial of it remains in the famous Order of the Golden Fleece, which was instituted by the duke at Bruges in 1430 on the occasion of his marriage with Isabel of Portugal, a descendant of John of Gaunt, and was so named from the English wool, the raw material used in the Flemish looms, for which Bruges was the chief mart. The reign of Philip, though marred by many acts of tyranny and harshness, was politically great. Had his successor been as prudent and able, he might have made a unified Netherlands the nucleus of a mighty middle kingdom, interposing between France and Germany, and a revival of that of the Carolingian Lothaire.

Charles the Bold.

Before the accession of Charles, the only son of Philip, two steps had been taken of great importance in the direction of unification. The first was the appointment of a grand council with supreme judicial and financial functions, whose seat was finally fixed at Malines (Mechlin) in 1473; the other the summoning of deputies of all the provincial "states" of the Netherlands to a states-general at Brussels in 1465. But Charles, rightly surnamed the Bold or Headstrong, did not possess the qualities of a builder of states. Impatient of control and hasty in action, he was no match for his crafty and plotting adversary, Louis XI. of France. His ambition, however, was boundless, and he set himself to realize the dream of his father—a Burgundian kingdom stretching from the North Sea to the Mediterranean. At first all went well with him. By his ruthless suppression of revolts at Dinant and Liège he made his authority undisputed throughout the Netherlands. His campaigns against the French king were conducted with success. His creation of a formidable standing army, the first of its kind in that age of transition from feudal conditions, gave to the Burgundian power all the outward semblance of stability and permanence. But Charles, though a brave soldier and good military organizer, was neither a capable statesman nor a skilful general. He squandered the resources left to him by his father, and made himself hateful to all classes of his subjects by his exactions and tyranny. When at the very height of power, all his schemes of aggrandisement came to sudden ruin through a succession of disastrous defeats at the hands of the Swiss at Grandson (March 2, 1476),* at Morat (June 22, 1476) and at Nancy (January 5, 1477). At Nancy Charles was himself among the slain, leaving his only daughter Mary of Burgundy, then in her twentieth year, sole heiress to his possessions.

Mary of Burgundy and Maximilian of Austria.

Philip and Joanna.

The catastrophe of Nancy threatened the loosely-knit Burgundian dominion with dissolution. Louis XI. claimed the reversion of the French fiefs, and seized Burgundy, Franche Comté and Artois. But the Netherland provinces, though not loving the Burgundian dynasty, had no desire to have a French master. Deputies representing Flanders, Brabant, Hainault and Holland met at Ghent, where Mary was detained almost as a prisoner, and compelled her (February 10, 1477) to sign the "Great Privilege." This charter provided that no war could be declared nor marriage concluded by the sovereign, nor taxes raised without the assent of the states, that natives were alone eligible for high office, and that the national language should be used in public documents. The central court of justice at Malines was abolished, but the Grand Council was reorganized and made thoroughly representative. The Great Privilege was supplemented by provincial charters, the Flemish Privilege granted (February 10), the Great Privilege of Holland and Zeeland (February 17), the Great Privilege of Namur and the *Joyeuse Entrée* of Brabant, both in May, thus largely curtailing the sovereign's power of interference with local liberties. On these conditions Mary obtained the hearty support of the states against France, but her humiliations were not yet at an end; two of her privy councillors, accused of traitorous intercourse with the enemy, were, despite her entreaties, seized, tried and beheaded (April 3). Her marriage four months later to Maximilian of Austria was the beginning of the long domination of the house of Habsburg. The next fifteen years were for Maximilian a stormy and difficult period. The duchess Mary died from the effects of a fall from her horse (March 1482), and Maximilian became regent (*mambourg*) for his son. The peace of Arras with France (March 1483) freed him to deal with the discords in the Netherland provinces, and more especially with the turbulent opposition in the Flemish cities. With the submission of Ghent (June 1485) the contest was decided in favour of the archduke, who in 1494, on his election as emperor, was able to hand over the country to his son Philip in a comparatively tranquil and secure state. Philip, surnamed the Fair, was fifteen years of age, and his accession was welcomed by the Netherlanders with whom Maximilian had never been popular. Gelderland, however, which had revolted after Nancy, had Charles of Egmont for its duke, and the two bishoprics of Liége and Utrecht were no longer subject to Burgundian authority. In 1496 Philip married Joanna of Aragon, who in 1500 became heiress apparent to Castile and Aragon. That same year she gave birth at Ghent to a son, afterwards the emperor Charles V. Philip's reign in the Netherlands was chiefly noteworthy for his efforts for the revival of trade with England. On the death of Queen Isabel, Philip and Joanna succeeded to the crown of Castile and took up their residence in their new kingdom (January 1506). A few months later Philip unexpectedly died at Burgos (September 25th). His Burgundian lands passed without opposition to his son Charles, then six years of age.

Margaret of Austria.

Charles V.

The claim of the emperor Maximilian to be regent during the minority of his grandson was recognized by the states-general. Maximilian nominated his daughter Margaret, widow of Philibert, duke of Savoy, to act as governor-general, and she filled the difficult post for eight years with great ability, courage and tact; and when Charles at the age of fifteen assumed the government he found the Netherlands thriving and prosperous. In the following year, by the death of Ferdinand of Aragon, his maternal grandfather, and the incapacity of his mother Joanna, who had become hopelessly insane, he succeeded to the crowns of Castile and Aragon, which carried with them large possessions in Italy and the dominion of the New World of America. In 1519 Maximilian died, and the following year his grandson, now the head of the house of Austria, was elected emperor. Charles V. had been born and brought up in the Netherlands, and retained a strong predilection for his native country, but necessarily he had to pass the larger part of his life, at that great crisis of the world's history, in other lands. During his frequent absences he entrusted the government of the Netherlands to the tried hands of his aunt, Margaret, who retained his confidence until her death (November 1530), and secured the affection of all Netherlanders. Margaret was assisted by a permanent council of regency, and there was a special minister charged with the administration of the finances, sometimes under the name of superintendent of the finances, sometimes under the title of treasurer-general and controller-general. The duties of this minister were of special importance, for it was to the Netherlands that Charles looked for much of the resources wherewith to carry on his many wars. During this time Charles consolidated his dominion over the Netherlands. In 1524 he became lord of Friesland by purchase, and in 1528 he acquired the temporalities of Utrecht. He now ruled over seventeen provinces—*i.e.* four duchies, Brabant, Gelderland, Limburg and Luxemburg; seven counties, Flanders, Artois, Hainault, Holland, Zeeland, Namur and Zutphen; the margraviate of Antwerp; and five lordships—Friesland, Mechlin, Utrecht, Overyssel, and Groningen with its dependent districts.

Mary of Hungary.

After the death of Margaret, Charles appointed his sister Mary, the widowed queen of Hungary, to the regency, and for twenty years she retained her post, until the abdication in fact of Charles V. in 1555. She too governed ably, though in entire subservience to her nephew, but was not in such intimate touch with the national peculiarities of the Netherlanders as her predecessor. At the time of her accession to office Charles changed the form of administration by the creation of three separate councils, those of State, of Finance, and the Privy Council. The regent was president of the council of state, of which the knights of the Golden Fleece were members. The policy of Charles towards the Netherlands was for many years one of studied moderation. He redressed many grievances, regulated the administration of justice, encouraged commerce, reformed the coinage, but as time went on he was compelled to demand larger subsidies and to take severer measures against heretical opinions. Mary was forced to impose taxation which met with violent resistance, especially in 1539 from the stiff-necked town of Ghent. The emperor himself was obliged to intervene. On the 14th of February 1540 he entered Ghent at the head of a large army and visited the city with severe punishment. All its charters were annulled, its privileges and those of its gilds swept away, and a heavy fine imposed. It was a lesson intended to teach the Netherlanders the utter futility of opposition to the will of their lord. The struggle, however, with the Protestant princes of Germany not only led to continual demands of Charles for men and money from his Netherland dominions, but to his determination to prevent the spread of Protestant opinions; and a series of edicts was passed, the most severe of which (that of 1550) was carried out with extreme rigour. Its preamble stated that its object was "to exterminate the root and ground of this pest." By its enactments, men holding heretical opinions were condemned to the stake, women to be buried alive. Yet despite the efforts of the government the Reformation made progress in the land. In 1548 Charles laid before the states a scheme for making the Netherlands an integral part of the empire under the name of the Circle of Burgundy; but the refusal of the German Electors to make his only son Philip king of the Romans led him to abandon the project, which was never renewed. Already the emperor was beginning to feel weary of the heavy burdens which the government of so many realms had imposed upon him, and in 1549 he presented Philip to the states of the Netherlands, that they might take the oath of allegiance to him, and Philip swore to maintain all ancient rights, privileges and customs.

The abdication of Charles V. took place on the 25th of October 1555 in the great hall of the palace at Brussels, and Philip II. entered upon his long and eventful reign. His external policy

Philip II.

was at first successful. Chiefly through the valour of Lamoral, count of Egmont, two great victories were won over the French at St Quentin (August 10, 1557) and at Gravelines (July 13, 1558). The terms of the treaty of Cateau-Cambrésis (February 1559) were entirely favourable to Philip. Internal difficulties, however, confronted him. His proposal to impose a tax of 1% on real property and of 2% on movable property was rejected by all the larger provinces. As a thorough Spaniard who did not even understand the language of his Netherland subjects Philip was from the first distrusted and his acts regarded with suspicion. He himself never felt at home at Brussels, and in August 1559 he set sail for Spain, never again to revisit the Netherlands.

Margaret of Parma.

He appointed as regent, Margaret, duchess of Parma, a natural daughter of Charles V. by a Flemish mother, and like the other women of the House a strong and capable ruler. She was nominally assisted by the members of the three councils—the Council of State, the Privy Council and the Council of Finance, but in reality all power had been placed by Philip in the hands of three confidential councillors styled the *Consulta*—Barlaymont, president of the Council of Finance, Viglius, president of the Privy Council, and Antony Perrenot, bishop of Arras, better known by his later title as Cardinal Granvelle. This extremely able man, a Burgundian by birth, was the son of one of Charles V.'s most trusted councillors, and it was largely to him that the government of the Netherlands was confided. Two burning questions at the outset confronted Margaret and Granvelle—the question of the new bishoprics and the question of the presence in the Netherlands of a number of Spanish troops. The proposal to reorganize the bishoprics of the Netherlands was not a new one, but was the carrying out of a long-planned project of Charles V. In 1555 there were but three dioceses in the Netherlands—those of Tournay, Arras and Utrecht,—all of unwieldy size and under the jurisdiction of foreign metropolitans. It was proposed now to establish a more numerous hierarchy, self-contained within the limits of Burgundian rule, with three archbishops and fifteen diocesans. The primatial see was placed at Malines (Mechlin), having under it Antwerp, Hertogenbosch, Roermond, Ghent, Bruges, and Yprès constituting the Flemish province; the second archbishopric was at Cambray, with Tournay, Arras, St Omer, and Namur,—the Walloon province; the third at Utrecht, with Haarlem, Middleburg, Leeuwarden, Groningen and Deventer,—the northern (Dutch) province. All these with the exception of Cambray and St Omer were within the boundaries of the Netherlands. The scheme aroused almost universal distrust and opposition. It was believed that its object was the introduction of the dreaded form of the Inquisition established in Spain, and in any case more systematic and stringent measures for the stamping out of heresy. It excited also the animosity of the nobles jealous of their privileges, and of the monasteries, which were called upon to furnish the revenues for the new sees.

Granvelle was made first archbishop of Malines, and all the odium attaching to the increase of the episcopate was laid at his door, though he was in reality opposed to it. The continued presence of the Spanish troops caused also great dissatisfaction. The Netherlanders detested the Spaniards and everything Spanish, and this foreign mercenary force, together with the new bishops, was looked upon as part of a general plan for the gradual overthrow of their rights and liberties. So loud was the outcry that Margaret and Granvelle on their own responsibility sent away the Spanish regiments from the country (January 1561). The most serious difficulty with which Margaret had to deal arose from the attitude of the great nobles, and among these especially of William (the "Silent") of Nassau, prince of Orange, Lamoral, count of Egmont, and Philip de Montmorency, count of Hoorn. These great magnates, all of them Knights of the Fleece and men of peculiar weight and authority in the country, were disgusted to find that, though nominally councillors of state, their advice was never asked, and that all power was placed in the hands of the *Consulta*. They began to be alarmed by the severity with which the edicts against heresy were being carried out, and by the rising indignation among the populace. William, Egmont, and Hoorn therefore placed themselves at the head of a league of nobles against Granvelle (who had become cardinal in 1561) with the object of undermining his influence and driving him from power. They resigned their positions as councillors of state, and expressed their grievances personally to Margaret and by letter to the king in Madrid, asking for the dismissal of Granvelle. The duchess, herself aggrieved by the dictatorial manners of the cardinal, likewise urged upon her brother the necessity of the retirement of the unpopular minister. At last Philip unwillingly gave way, and he secretly suggested to the cardinal that he should ask permission from the regent to visit his mother at Besançon. Granvelle left Brussels on the 13th of March 1564, never to return. But the king was only temporizing; he had no intention of changing his policy. He did but bide his time.

The Tridentine decrees.

The Council of Trent had recently brought its long labours to a close (December 4, 1563), and Philip resolved to enforce its decrees throughout his dominions. He issued an order to that effect (August 18, 1564), and it was sent to the duchess of Parma for publication. The nobles protested, and Egmont was deputed to go to Madrid and try to obtain from the king a mitigation of the edicts and redress of grievances. Philip was inexorable. The activity of the Inquisition was redoubled, and persecution raged throughout the Netherlands. Everywhere intense indignation was aroused by the cruel tortures and executions. In the presence of the rising storm the duchess was bewildered, seeing clearly the folly of the policy she was obliged to carry out no less than its difficulty. Following the example of William of Orange, Hoorn, Berghen and other governors, the magistrates generally declined to enforce the edicts, and offered to resign rather than be the instruments for burning and maltreating their fellow-countrymen. It was at this time that the lesser nobility, foremost among whom were Louis of Nassau (brother of William), Philip de Marnix, lord of Sainte Aldegonde, and Henry, count of Brederode, began to organize resistance, and in 1566 a confederacy was formed, all the members of which signed a document called "The Compromise," by which they bound themselves to help and protect one another against persecution, and to extirpate the Inquisition from the land. The signatories drew up a petition, known as the "Request," which was presented by the confederates to the regent (April 5, 1566) in the council chamber at Brussels. As they approached, Barlaymont had been heard to say to Margaret, "What, Madam, is your Highness afraid of these beggars (*gueux*)?" The phrase was seized upon and made a party name, and it became the fashion for patriots to wear beggar's garb and a medal round the neck, bearing Philip's image on one side and a wallet on the other, with two hands crossed, and the legend *Fidèles au roi jusqu'à la besace.*

The Compromise.

The Beggars.

The Iconoclasts.

William of Orange, Egmont, and Hoorn were alarmed at the violent passions that had been aroused, and held aloof at first from Brederode and his companions. At their instance, and carrying with them instructions from the regent and the council, the marquis of Berghen and Hoorn's brother (the lord of Montigny) were persuaded to go to Spain and lay before Philip the serious character of the crisis. Philip received them courteously, but took care that neither of them should return home. Meanwhile in the Netherlands the sectaries had been making rapid headway in spite of the persecution. Open-air conventicles were held in all parts of the provinces, and the fierce Calvinist preachers raised the religious excitement of their hearers to such a pitch that it found vent in a furious outburst of iconoclasm. During the month of August bands of fanatical rioters in various parts of the country made havoc in the churches and religious houses, wrecking the altars, smashing the images and pictures, and carrying off the sacred vessels and other treasures on which they could lay their hands. These acts of wild and sacrilegious destruction reached their climax at Antwerp (August 16 and 17), where a small body of rioters forced their way into the cathedral and were permitted without any interference on the part of the magistracy to wreak their will upon its spendid and priceless contents.

The effect of the outbreak was in every way disastrous. The regent was alienated from the popular leaders, and was no longer disposed to help William of Orange, Egmont, and Hoorn to secure a mitigation of religious persecution; and the heart of Philip was hardened in its resolve to exterminate heresy in the Netherlands. He dissembled until such time as he could despatch his greatest general, the duke of Alva, to Brussels at the head of a picked force to crush all opposition.

Flight of Orange.

William of Orange was not deceived by the specious temporizing of the king. He foresaw the coming storm, and he did his utmost to induce Egmont, Hoorn and other prominent members of the patriotic party to unite with him in taking measures for meeting the approaching danger. Egmont and Hoorn refused to do anything that might be construed into disloyalty; in these circumstances William felt that the time had come to provide for his personal safety. He withdrew (April 1567) first to his residence at Breda, and then to the ancestral seat of his family at Dillenburg in Nassau.

Punishment of the sectaries.

Margaret of Parma meanwhile, with the aid of a considerable body of German mercenaries, had inflicted exemplary punishment upon the iconoclasts and Calvinist sectaries. A body of some 2000 men drawn principally from Antwerp were cut to pieces at Austruweel (March 13, 1567), and their leader John de Marnix, lord of Thouseule, slain. Valenciennes, the chief centre of disturbance in the south, was besieged and taken by Philip de Noircarmes, governor of Hainault, who inflicted a savage vengeance (April 1567). The regent therefore represented to her brother that the disorders were entirely put down and that the time had come to show mercy. But Philip's preparations were now complete, and Alva set out from Italy at the head of a force of some 10,000 veteran troops, Spaniards and Italians, afterwards increased by a body of Germans, with which, after marching through Burgundy, Lorraine and Luxemburg, he reached the Netherlands (August 8), and made his entry into Brussels a fortnight later.

The Council of Blood.

Orange outlawed.

Execution of Egmont and Hoorn.

The powers conferred on Alva were those of military dictator. The title of regent was left to the duchess Margaret, but she speedily sent in her resignation, which was accepted (October 6). Before this took place events had been moving fast. On the 9th of September Egmont and Hoorn were arrested as they left a council at the duke's residence and were confined in the castle of Ghent. At the same time Orange's friend, the powerful burgomaster of Antwerp, Anthony van Stralen, was seized. The next step of Alva was to create a special tribunal which was officially known as the "Council of Troubles," but was popularly branded with the name of the "Council of Blood," and as such it has passed down to history. As a tribunal it had no legal status. The duke himself was president and all sentences were submitted to him. Two members only, Vargas and del Rio, both Spaniards, had votes. A swarm of commissioners ransacked the provinces in search of delinquents, and the council sat daily for hours, condemning the accused, almost without a hearing, in batches together. The executioners were ceaselessly at work with stake, sword and gibbet. Crowds of fugitives crossed the frontier to seek refuge in Germany and England. The prince of Orange was publicly declared an outlaw and his property confiscated (January 24, 1568). A few weeks later his eldest son, Philip William, count of Buren, a student at the university of Louvain, was kidnapped and carried off to Madrid. William had meanwhile succeeded in raising a force in Germany with which his brother Louis invaded Friesland. He gained a victory at Heiligerlee (May 23) over a Spanish force under Count Aremberg. Aremberg himself was killed, as was Adolphus of Nassau, a younger brother of William and Louis. But Alva himself took the field, and at Jemmingen (July 21) completely annihilated the force of Louis, who himself narrowly escaped with his life. One result of the victory of Heiligerlee was the determination of Alva that Egmont and Hoorn should die before he left Brussels for the campaign in Friesland. They were pronounced by the Council of Blood to be guilty of high treason (June 2, 1568). On the 6th of June they were beheaded before the Broodhuis at Brussels.

Alva triumphant.

A few months after the disaster of Jemmingen, Orange, who had now become a Lutheran, himself led a large army into Brabant. He was met by Alva with cautious tactics. The Spaniards skilfully avoided a battle, and in November the invaders were compelled to withdraw across the French frontier through lack of resources, and were disbanded. Alva was triumphant; but though Alva's master had supplied him with an invincible army, he was unable to furnish him with the funds to pay for it. Money had to be raised by taxation, and at a meeting of the states-general (March 20, 1569) the governor-general proposed (1) an immediate tax of 1% on all property, (2) a tax of 5% on all transfers of real estate, (3) a tax of 10% on the sale of all articles of commerce, the last two taxes to be granted in perpetuity. Everywhere the proposal met with uncompromising resistance. After a prolonged struggle, Alva succeeded in obtaining a subsidy of 2,000,000 fl. for two years only. All this time the brutal work of the Blood Council went on, as did the exodus of thousands upon thousands of industrious and well-to-do citizens, and with each year the detestation felt for Alva and his rule steadily increased.

The Sea-Beggars.

Capture of Brill and Flushing.

Revolt in the northern provinces.

All this time William and Louis were indefatigably making preparations for a new campaign, and striving by their agents to rouse the people to active resistance. The first successes were however to be not on land, but on the sea. In 1569 William in his capacity as sovereign prince of Orange issued letters-of-marque to a number of vessels to prey upon the Spanish commerce in the narrow seas. These corsairs, for such they were, were known by the name of Sea-Beggars (*Gueux-de-Mer*). Under the command of the lord of Lumbres, the lord of Treslong, and William de la Marck (lord of Lumey) they spread terror and alarm along the coast, seized much plunder, and in revenge for Alva's cruelty committed acts of terrible barbarity upon the priests and monks and catholic officials, as well as upon the crews of the vessels that fell into their hands. Their difficulty lay in the lack of ports in which to take refuge. At last by a sudden assault the Sea-Beggars seized the town of Brill at the mouth of the Maas (April 1, 1572). Encouraged by this success they next attacked and took Flushing, the port of Zeeland, which commanded the approach to Antwerp; and the inhabitants were compelled to take the oath to the prince of Orange, as stadtholder of the king. They next mastered Delfshaven and Schiedam. These striking successes caused a wave of revolt to spread through Holland, Zeeland, Gelderland, Utrecht and Friesland. The principal towns gave in their submission to the prince of Orange, and acknowledged him as their lawful stadtholder. Within three months of the capture of Brill, Amsterdam was the only town in Holland in the hands of the Spaniards.

The campaign of Mons.

This revolt of the northern provinces was facilitated by the fact that Alva had withdrawn many of the garrisons, and was moving to oppose an invasion from the south. Louis of Nassau, with a small force raised in France with the connivance of Charles IX., made a sudden dash into Hainault (May 1572) and captured Valenciennes and Mons. Here he was shut in by a superior force of Spaniards, and made preparations to defend himself until relieved by the army which Orange was collecting on the eastern frontier. On the 9th of July William crossed the Rhine, and captured Malines, Termonde and Oudenarde, and was advancing southwards when the news reached him of the massacre of St Bartholomew, which deprived him of the promised aid of Coligny and his army of 12,000 men. He made an attempt, however, to relieve Mons, but his camp at Harmignies was surprised by a night attack, and William himself narrowly escaped capture. The next morning he retreated, and six days later Mons surrendered.

Orange takes up his residence at Delft.

Orange however did not despair, and resolved to throw in his lot for good and all with the rebel province of the north. Already at his summons the states of Holland had met at Dort (July 15) under the presidency of Philip de Marnix, lord of Sainte Aldegonde, and they had unanimously recognized William as their lawful stadtholder and had voted a large grant of supplies. The prince now took up his permanent residence at Delft, and a regular government was established, in which he exercised almost dictatorial authority.

Alva was now free to deal with rebellion in the north. Malines, which had surrendered to William, was given over for three days to the mercy of a brutal soldiery. Then the army under Alva's son, Don Frederick of Toledo, marched northwards, and the sack of Zutphen and the inhuman butchery of Naarden are among the blackest records of history. But the very horrors of Don Frederick's advance roused a spirit of indomitable resistance in Holland.

Siege of Haarlem and Alkmaar.

Alva withdraws from the Netherlands.

The famous defence of Haarlem, lasting through the winter of 1572 to July 1573, cost the besiegers 12,000 lives, and gave the insurgent provinces time to breathe. The example of Haarlem was followed by Alkmaar, and with better success. The assault of the Spaniards was repulsed, the dykes were cut, and Don Frederick, fearing for his communications, beat a hasty retreat (August). A few weeks later (Oct. 11) the fleet of Alva on the Zuyder Zee was completely defeated by the Sea-Beggars and its admiral taken prisoner. Disgusted by these reverses, in bad odour with the king, and with his soldiers mutinying for lack of pay, the governor-general resigned. On the 18th of December 1573 Alva, who to the end had persisted in his policy of pitiless severity, left Brussels, carrying with him the curses of the people over whom he had tyrannized for six terrible years of misery and oppression.

Don Luis Requesens, governor-general.

The siege and relief of Leiden.

Philip sent the grand commander, Don Luis Requesens, as governor-general in his place, and after some futile attempts at negotiation the war went on. The prince of Orange, who had now formally entered the Calvinist communion, was inexorable in laying down three conditions as indispensable: (1) Freedom of worship and liberty to preach the gospel according to the Word of God; (2) the restoration and maintenance of all the ancient charters, privileges, and liberties of the land; (3) the removal of all Spaniards and other foreigners from all posts and employments civil and military. In February 1574 the Spaniards by the fall of Middleburg lost their last hold upon Walcheren and Zeeland. This triumph was however far more than counterbalanced by the complete defeat of the army, led by Count Louis of Nassau, at Mookerheide near Nijmwegen (14th March). The gallant Louis and his younger brother Henry both lost their lives. This was a grievous blow to William, but his courage did not fail. The Spaniards laid siege to Leiden, and though stricken down by a fever at Delft the prince spared no exertion to save the town. The dykes were cut, the land flooded, but again and again a relieving force was baulked in its attempts to reach the place, which for more than four months bravely defended itself. But when at the very last extremity through famine, a tempestuous flood enabled the vessels of Orange to reach Leiden, and the investing force was driven to retreat (October 3, 1574). This was the turning-point of the first stage in the struggle for Dutch independence. In honour of this great deliverance, the state of Holland founded the university, which was speedily to make the name of Leiden illustrious throughout Europe.

Death of Requesens.

Act of Federation between Holland and Zeeland.

In the spring of 1575 conferences with a view to peace were held at Breda, and on their failure Orange, in the face of Spanish successes in Zeeland, was forced to seek foreign succour. He sought at first in vain. The sovereignty of Holland and Zeeland was offered to the queen of England, but she, though promising secret support, declined. The situation was, however, relieved through the sudden death of Requesens (March 1576). The stadtholder summoned a meeting of the states of Holland and Zeeland to Delft, and on the 25th of April an act of federation between the two provinces was executed. By this compact the prince was invested with all the prerogatives belonging to the sovereign. He was made commander-in-chief of both the military and naval forces with supreme authority, and in his hands was placed the final appointment to all political and judicial posts and to vacant city magistracies. He was required to maintain the Protestant reformed religion and to suppress "all religion at variance with the gospel." He also had authority to confer the protectorate of the federated provinces upon a foreign prince.

The great Spanish Mutiny.

"The Spanish Fury."

The Pacification of Ghent.

In June 1576 the long siege of Zierikzee, the capital of Schouwen, ended in its surrender to the Spanish general Mondragon, after the failure of a gallant attempt by Admiral Boisot to break the leaguer, in which he lost his life. Things looked ill for the patriots, and Zeeland would have been at the mercy of the conqueror had not the success been followed by a great mutiny of the Spanish and Walloon troops, to whom long arrears of pay were due. They chose their leader (*eletto*), marched into Brabant, and established themselves at Alost, where they were joined by other bands of mutineers. The principal fortresses of the country were in the hands of Spanish garrisons, who refused obedience to the council. William seized his opportunity, and with a body of picked troops advanced into Flanders, occupied Ghent, and entered into negotiations with the leader of the states-general at Brussels, for a union of all the provinces on the basis of exclusion of foreigners and non-interference with religious belief. The overtures were favourably received, the council at Brussels was forcibly dissolved, and a congress met at Ghent on the 19th of October to consider what measures must be taken for the pacification of the country. In the midst of their deliberations the news arrived that the mutineers had marched from Alost on Antwerp, overpowered the troops of Champagney, and sacked the town with terrible barbarities (Nov. 3). This tragedy, known as "the Spanish Fury," silenced all disputes and differences among the representatives of the provinces. A treaty establishing a firm alliance between the provinces, represented by the states-general, assembled at Brussels on the one part, and on the other by the prince of Orange, and the states of Holland and Zeeland, was agreed upon and ratified under the title of the "Pacification of Ghent." It was received with great enthusiasm. The provinces agreed first to eject the foreigner, then to meet in states-general and regulate all matters of religion and defence. It was stipulated that there was to be toleration for both Catholics and Protestants; that the Spanish king should be recognized as *de jure* sovereign, and the prince of Orange as governor with full powers in Holland and Zeeland.

Don John of Austria becomes Governor-General.

"Union of Brussels."

Meanwhile Philip had appointed his natural brother, Don John of Austria, to be governor-general in the place of Requesens. After many delays he reached Luxemburg on the 4th of November (the date of the Spanish Fury at Antwerp) and notified his arrival to the council of state. His letter met with a cold reception. On the advice of the prince of Orange the states-general refused to receive him as governor-general unless he accepted the "Pacification of Ghent." Negotiations were entered into, but a deadlock ensued. At this crisis the hands of Orange and the patriotic party were greatly strengthened by a new compact entitled "The Union of Brussels," which was extensively signed, especially in the southern Netherlands. This document (Jan. 1577) engaged all its signatories to help in ejecting the foreign soldiery, in carrying out the "Pacification," in recognizing Philip's sovereignty, and at the same time in maintaining the charters and constitutions which that king on his accession had sworn to observe. The popular support given to the Union of Brussels forced Don John to yield.

"Perpetual Edict."

He promised to accept the "Pacification of Ghent," and finally an agreement was drawn up, styled the "Perpetual Edict," which was signed by Don John (February 12th) and ratified by Philip a few weeks later. The states-general undertook to accept Don John as governor-general and to uphold the Catholic religion, while Don John, in the name of the king, agreed to carry out the provisions of the "Pacification." The authority conferred upon Orange as stadtholder by the provinces of Holland and Zeeland was thus ratified, but that astute statesman had no confidence that Philip intended to observe the treaty any longer than it suited his convenience. He therefore refused, with the approval of the representatives of these provinces, to allow the publication of the "Perpetual Edict" in Holland and Zeeland. As events were to prove, he was in the right.

Orange at Brussels.

Don John made his state entry into Brussels on the 1st of May, but only to find that he had no real authority. "The prince of Orange," he informed the king, "has bewitched the minds of all men. They keep him informed of everything, and take no resolution without consulting him." In vain the fiery young soldier strove to break loose from the shackles which hampered him. He was, to quote the words of a contemporary, "like an apprentice defying his master." Irritated and alarmed, the governor suddenly left Brussels in the month of July with some Walloon troops and went to Namur. It was a virtual act of abdication. The eyes of all men turned to the prince of Orange. Through his exertions the Spanish troops had not only been expelled from Holland and Zeeland, but also from the citadels of Antwerp and Ghent, which were now in the hands of the patriots. He was invited to come to Brussels, and after some hesitation, and not without having first obtained the approval of the states of Holland and Zeeland, he assented. William made his triumphal entry into the capital (September 23), which he had quitted as an outlawed fugitive ten years before. In a brief period he was the acclaimed leader of the entire Netherland people.

Archduke Matthias.

But it was not to last. The jealousy of Catholic against Protestant, of south against north, was too deeply rooted. Two distinctive nationalities, Belgian and Dutch, were already in course of formation, and not even the tactful and conciliatory policy of the most consummate statesman of his time could unite those whom the whole trend of events was year by year putting farther asunder. On the 6th of October, at the secret invitation of the Catholic nobles headed by the duke of Aerschot, the archduke Matthias, brother of the emperor, arrived in Brussels to assume the sovereignty of the Netherlands. He was but twenty years of age, and his sudden intrusion was as embarrassing to the prince of Orange as to Don John. William, however, whose position had been strengthened by his nomination to the post of ruwaard of Brabant, determined to welcome Matthias and use him for his own purposes. Matthias was to be the nominal ruler, he himself with the title of lieutenant-general to hold the reins of power.

The Duke of Anjou and John Casimir.

But Philip had now become thoroughly alarmed, and he despatched Alexander Farnese, son of the duchess of Parma, to join his uncle Don John with a veteran force of 20,000 troops. Strengthened by this powerful reinforcement, Don John fell upon the patriot army at Gemblours near Namur on the 31st of January 1578, and with scarcely any loss completely routed the Netherlanders. All was now terror and confusion. The "malcontent" Catholics now turned for help from Matthias to the duke of Anjou, who had invaded the Netherlands with a French army and seized Mons. At the same time John Casimir, brother of the elector palatine, at the invitation of the Calvinist party and with the secret financial aid of Queen Elizabeth, entered the country at the head of a body of German mercenaries from the east. Never did the diplomatic talents of the prince of Orange shine brighter than at this difficult crisis. The duke of Anjou at his earnest instigation accepted the title of "Defender of the liberties of the Netherlands," and promised, if the provinces would raise an army of 10,000 foot and 2000 horse, to come to their assistance with a like force. At the same time negotiations were successfully carried on with John Casimir, with Elizabeth and with Henry of Navarre, and their help secured for the national cause. Meanwhile Don John had aroused the mistrust of his brother, who met his urgent appeal for funds with cold silence. Deeply hurt at this treatment and disappointed at his failure, the governor-general fell ill and died on the 1st of October. Philip immediately appointed Alexander Farnese to the vacant post. In him Orange was to find an adversary who was not only a great general but a statesman of insight and ability equal to his own.

Death of Don John.

Alexander Farnese governor-general.

Farnese at once set to work with subtle skill to win over to the royalist cause the Catholic nobles of the south. The moment was propitious, and his efforts met with success. Ghent had fallen into the hands of John Casimir, and under his armed protection a fierce and intolerant Calvinism reigned supreme in that important city. To the "Malcontents" (as the Catholic party was styled) the domination of heretical sectaries appeared less tolerable than the evils attendant upon alien rule. This feeling was widespread throughout the Walloon provinces, and found expression in the League of Arras (5th of January 1579). By this instrument the deputies of Hainault, Artois and Douay formed themselves into a league for the defence of the Catholic religion, and, subject to his observance of the political stipulations of the Union of Brussels, professed loyal allegiance to the king. The Protestant response was not long in coming. The Union of Utrecht was signed on the 29th of January by the representatives of Holland, Zeeland, Utrecht, Gelderland and Zutphen. By it the northern provinces bound themselves together "as if they were one province" to maintain their rights and liberties "with life-blood and goods" against foreign tyranny, and to grant complete freedom of worship and of religious opinion throughout the confederacy. This famous compact was the work of John of Nassau, at that time governor of Gelderland, and did not at first commend itself to his brother. William was still struggling to carry out that larger scheme of a union of all the seventeen provinces, which at the time of the "Pacification of Ghent" had seemed a possibility. But his efforts were already doomed to certain failure. The die was cast, which decreed that from 1579 onwards the northern and southern Netherlands were to pursue separate destinies. For their later history see HOLLAND and BELGIUM.

League of Arras.

Union of Utrecht.

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NETHERSOLE, OLGA (1863–), English actress, of Spanish descent, was born in London, and made her stage début at Brighton in 1887. From 1888 she played important parts in London, at first under John Hare at the Garrick, and in 1894 took the Court Theatre on her own account. She also toured in Australia and America, playing leading parts in modern plays, notably Clyde Fitch's *Sapho* (produced in London in 1902), which was strongly objected to in New York. Her powerful emotional acting, however, made a great effect in some other plays, such as *Carmen*, in which she again appeared in America in 1906.

NETHINIM, the name given to the Temple assistants in ancient Jerusalem. They are mentioned at the return from the Exile and particularly enumerated in Ezra ii. and Neh. vii. The original form of the name was *Nethunim*, as in the *Khetib* (consonantal reading) of Ezra viii. 17 (cf. Numbers iii. 9), and means "given" or "dedicated," *i.e.* to the temple. The Talmud has also the singular form—*Nathin*. In all, 612 Nethinim came back from the Exile and were lodged near the "House of the Nethinim" at Ophel, towards the east wall of Jerusalem so as to be near the Temple, where they served under the Levites and were free of all tolls, from which they must have been supported. It is mentioned that they had been ordered by David and the princes to serve the Levites (Ezra viii. 20).

Notwithstanding their sacred service, the Nethinim were regarded by later Jewish tradition as especially degraded, being placed in tables of precedence below bastards (Talm. *Jer. Hor.* iii. 5, *Jeb.* vii. 5) and in the Mishna (*Jeb.* viii. 3) it is stated that the prohibition against intermarriage with the Moabites, Ammonites, Egyptians and Edomites, though given in the Bible, only applied for a certain number of generations and did not apply at all to their daughters, but, it is added, "Bastards and Nethinim are prohibited (to marry Israelites), and this prohibition is perpetual and applies both to males and females."

To explain this combination of sacred service and exceptional degradation, it has been suggested by Joseph Jacobs that the Nethinim were the descendants of the *Kedishoth*, *i.e.* women dedicated to the worship of Astarte and attached to the Temple before the Exile. There is evidence of these practices from the time of Solomon (1 Kings xi. 5) down to Josiah (2 Kings xiii. 4-6), and even as late as Ezekiel (Ezek. xxiii. 36-48), giving rise to the command of Deuteronomy xxiii. 17.

An examination of the name lists given in duplicate in Ezra ii. 43-58, Neh. vii. 46-59, together with the additional names in the Greek Esdras (v. 29-35), shows that the Nethinim were in charge of the rings and hooks connected with the temple service; they sheared the sheep offered for sacrifice in the temple and poured the libations. Some of them were derived from the wars with the Meunim; others from the campaign with Rezin of Damascus. One of the names given in 1 Esdras v. 34, *υἱοὶ Σουβὰ*, ed. Fritzsche, *Σουβάς*, ed. Swete, would seem to throw light on the puzzling reading סובאים (A.V. "Sabeans," R.V. "Drunkards") of Ezek. xxiii. 42, and if so would directly connect the list of the Nethinim with the degraded worship of Astarte in the Temple.

A large majority of the names of the parents mentioned seem to be feminine in form or meaning, and suggest that the Nethinim could not trace back to any definite paternity; and this is confirmed by the fact that the lists are followed by the enumeration of those who could not "show their father's house" (Ezra ii. 60; Neh. vii. 62). The Greek versions, as well as Josephus, refer to them as ἱερόδουλοι, which can mean one thing only.

The Talmudic authorities have an abstract term, *Nethinuth*, indicating the status of a *Nathin* (*Tos. Kidd.* v. 1) ed. Zuckermandel, p. 341), and corresponding to the abstract *Mamziruth*, "bastardy." The existence of this degraded class up to the Exile throws considerable light upon the phraseology of the prophets in referring to idolatry as adultery and the scenes connected with it as prostitution. Their continued existence as a pariah class after the Exile would be a perpetual reminder of the dangers and degradation of the most popular Syrian creed.

These unfortunate creatures had no alternative but to accept the provisions made for them out of the Temple treasury, but after the fall of the Temple they would naturally disappear by intermarriage with similar degraded classes (*Mishna Kidd.* viii. 3). In the Code of Khammurabi §§ 191, 192, they could be adopted by outsiders.

The above explanation of the special degradation of the Nethinim, though they were connected with the Temple service, seems to be the only way of explaining the Talmudic reference to their tabooed position, and is an interesting example of the light that can be reflected on Biblical research by the Talmud.

See Joseph Jacobs, *Studies in Biblical Archaeology* (1894), 104-122; W. Baudissin, *Geschichte des Alttestamentlichen Priesterthums*, 142 seq. This view, however, is not accepted by Cheyne, *Encyclopaedia Biblica*, s.v. (J. Ja.)

NETLEY, a village in the Fareham parliamentary division of Hampshire, England, 3 m. S.E. of Southampton on the east shore of Southampton Water, and on a branch of the London & South Western railway. Here a Cistercian abbey was founded in 1237 by Henry III., and its ruins are extensive, including a great part of the cruciform church, abbot's house, chapter house and domestic buildings. The style is Early English and Decorated, and many beautiful details are preserved. The gatehouse was transformed into a fort in the time of Henry VIII. Netley Hospital for wounded soldiers (1 m. S.E. of the abbey), was built in 1856 after the Crimean War. It is a vast pile giving accommodation for upwards of a thousand patients, and is the principal military hospital in Great Britain.

NETSCHER, GASPAR (1639–1684), German portrait and genre painter, was born at Heidelberg in 1639. His father died when he was two years of age, and his mother, fleeing from the dangers of a civil war, carried him to Arnheim, where he was adopted by a physician named Tullekens. At first he was destined for the profession of his patron, but owing to his great aptitude for painting he was placed under an artist named de Koster, and, having also studied under Ter Borch, he set out for Italy to complete his education there. Marrying, however, at Liége, he settled at Bordeaux, and toiled hard to earn a livelihood by painting those small cabinet pictures which are now so highly valued on account of their exquisite finish. After removing to The Hague, he turned his attention to portrait-painting, and in this branch of his art was more successful. He was patronized by William III., and his earnings soon enabled him to gratify his own taste by depicting musical and conversational pieces. It was in these that Netscher's genius was fully displayed. The choice of these subjects, and the habit of introducing female figures, dressed in glossy satins, were imitated from Ter Borch; they possess easy yet delicate pencilling, brilliant and correct colouring, and pleasing light and shade; but frequently their refinement passes into weakness. The painter was gaining both fame and wealth when he died prematurely in 1684. His sons Constantyn (1668–1722), and Theodorus (1661–1732), were also painters after their father's style, but inferior in merit.

NETTLE (O. Eng. *netele*, cf. Ger. *Nessel*), the English equivalent of Lat. *Urtica*, a genus of plants which gives its name to the natural order Urticaceae. It contains about thirty species in the temperate parts of both east and west hemispheres. They are herbs covered with stinging hairs, and with unisexual flowers on the same or on different plants. The male flowers consist of a perianth of four greenish segments enclosing as many stamens, which latter, when freed from the restraint exercised upon them by the perianth-segments while still in the bud, suddenly uncoil themselves, and in so doing liberate the pollen. The female perianth is similar, but encloses only a single seed-vessel with a solitary seed. The stinging hairs consist of a bulbous reservoir filled with acrid fluid, prolonged into a long slender tube, the extremity of which is finely pointed. By this point the hair penetrates the skin and discharges its irritant contents beneath the surface. Nettle tops, or the very young shoots of the nettle, may be used as a vegetable like spinach; but from the abundance of crystals (*cystoliths*) they contain they are apt to be gritty, though esteemed for their antiscorbutic properties, which they do not possess in any exceptional degree. The fibre furnished by the stems of several species is used for cordage or paper-making. Three species of nettle are wild in the British Isles: *Urtica dioica*, the common stinging nettle, which is a hairy perennial with staminate and pistillate flowers in distinct plants; *U. urens*, which is annual and, except for the stinging hairs, glabrous, and has staminate and pistillate flowers in the same panicle; and *U. pilulifera* (Roman nettle), an annual with the pistillate flowers in rounded heads, which occurs in waste places in the east of England, chiefly near the sea—the more virulent of the British species. From their general presence in the neighbourhood of houses, or in spots where house refuse is deposited, it has been suggested that the nettles are not really natives, a supposition that to some extent receives countenance from the circumstance that the young shoots are very sensitive to frost. In any case they follow man in his migrations, and by their presence usually indicate a soil rich in nitrogen. The trailing subterranean root-stock renders the common nettle somewhat difficult of extirpation.

NETTLERASH, or Urticaria, a disorder of the skin characterized by an eruption resembling the effect produced by the sting of a nettle, namely, raised red or red and white patches occurring in parts or over the whole of the surface of the body and attended with great irritation. It may be acute or chronic. In the former variety the attack often comes on after indulgence in certain articles of diet, particularly various kinds of fruit, shell-fish, cheese, pastry, &c., also occasionally from the use of certain drugs, such as henbane, copaiba, cubebs, turpentine, &c. There is at first considerable feverishness and constitutional disturbance, together with sickness and faintness, which either precede or accompany the appearance of the rash. The eruption may appear on any part of the body, but is most common on the face and trunk. The attack may pass off in a few hours, or may last for several days, the eruption continuing to come out in successive patches. The chronic variety lasts with interruptions for a length of time often extending to months or years. This form of the disease occurs independently of errors in diet, and is not attended with the feverish symptoms characterizing the acute attack. As regards treatment, the acute variety generally yields quickly to a purgative and the use of some antacid, such as magnesia or liquor potassae. The local irritation is allayed by sponging with a warm alkaline solution (soda, potash or ammonia), or a solution of acetate of lead, and a lotion of ichthyol has been found useful. Chronic cases have been known to benefit from the administration of creosote or salol.

NETTLESHIP, HENRY (1839–1893), English classical scholar, was born at Kettering on the 5th of May 1839. He was educated at Lancing, Durham and Charterhouse schools, and Corpus Christi College, Oxford. In 1861 he was elected to a fellowship at Lincoln, which he vacated on his marriage in 1870. In 1868 he became an assistant master at Harrow, but in 1873 he returned to Oxford, and was elected to a fellowship at Corpus. In 1878 he was appointed to succeed Edwin Palmer in the professorship of Latin, which post he held till his death at Oxford on the 10th of July 1893. Nettleship had been from the first attracted to the study of Virgil, and a good deal of his time was devoted to his favourite poet. After Conington's death in 1869, he saw his edition of Virgil through the press, and revised and corrected subsequent editions of the work. In 1875 he had undertaken to compile a new Latin lexicon for the Clarendon Press, but the work proved more than he could accomplish, and in 1887 he published some of the results of twelve years' labour in a volume entitled *Contributions to Latin Lexicography*, a genuine piece of original work. In conjunction with J. E. Sandys, Nettleship revised and edited Seyffert's *Dictionary of Classical Antiquities*, and he contributed to a volume entitled *Essays on the Endowment of Research* an article on "The Present Relations between Classical Research and Classical Education in England," in which he pointed out the great value of the professorial lecture in Germany. In his views on the research question he was a follower of Mark Pattison, whose essays he edited in 1889 for the Clarendon Press. In *Lectures and Essays on Subjects connected with Latin Literature and Scholarship*, Nettleship revised and republished some of his previous publications. A second series of these, published in 1895, and edited by F. Haverfield, contains a memoir by Mrs M. Nettleship, with full bibliography.

See obituary notices in *The Times* (11th of July, 1893); *Classical Review* (October, 1893); *Oxford Magazine* (18th of October, 1893).

NETTLESHIP, RICHARD LEWIS (1846–1892), English philosopher, youngest brother of Henry Nettleship, was born on the 17th of December 1846, and educated at Uppingham and Balliol College, Oxford, where he held a scholarship. He won the Hertford scholarship, the Ireland, the Gaisford Greek verse prize, a Craven scholarship and the Arnold prize, but took only a second class in Litterae Humaniores. He became fellow and tutor of his college and succeeded to the work of T. H. Green, whose writings he edited with a memoir (London, 1880). He left an unfinished work on Plato, part of which was published after his death, together with his lectures on logic and some essays. His thought was idealistic and Hegelian. His literary style was excellent; but, though he had considerable personal influence on his generation at Oxford, a certain nebulousness of view prevented his making any permanent contribution to philosophy. He was fond of music and outdoor sports, and rowed in his college boat. He died on the 25th of August 1892, from the effects of exposure on Mont Blanc, and was buried at Chamounix.

NETTLE TREE, the name applied to certain trees of the genus *Celtis*, belonging to the family or natural order Ulmaceae. The best-known species have usually obliquely ovate, or lanceolate leaves, serrate at the edge, and marked by three prominent nerves. The flowers are inconspicuous, usually hermaphrodite, with a 4- or 5-parted perianth, as many stamens, a hairy disk and a 1-celled ovary with a 2-parted style. The fruit is succulent like a little drupe, a character which serves to separate the genus alike from the nettles and the elms, to both of which it is allied. *Celtis australis* is a common tree, both wild and planted, throughout the Mediterranean region extending to Afghanistan and the Himalayas; it is also cultivated in Great Britain. It is a rapidly growing tree, from 30 to 40 ft. high, with a remarkably sweet fruit, recalling a small black cherry, and was one of the plants to which the term "lotus" was applied by Dioscorides and the older authors. The wood, which is compact and hard and takes a high polish, is used for a variety of purposes. *C. occidentalis*, a North American species, is the hackberry (*q.v.*).

NETTUNO, a fishing village of the province of Rome, Italy, 2 m. E.N.E. of Anzio by rail, and 39 m. S.S.E. of Rome, 36 ft. above sea-level. Pop. (1901) 3406 (town), 5072 (commune). It has a picturesque castle built by Alexander VI. from the designs of Antonio da Sangallo the elder in 1496. It is said to have been a Saracen settlement. The picturesque costume of the women is now worn only at festivals. To the E. on the sandy coast on the way to Astura is a military camp and a range for the trial of field artillery.

NETZE, a river of Germany, having a small portion of its upper course in Poland. It is a right-bank tributary of the Warthe, and rises in the low-lying lake district, through which the Russo-German frontier runs, to the south of Inowrazlaw. The frontier crosses Lake Goplo, which is not far from the source of the Netze, which on leaving it (in Prussian territory), flows north-west to the Trlonger lake, and continues thereafter in the same general direction, but with wide fluctuations, to Nakel. Here it joins the Bromberg canal, which gives access to the river Brahe and so to the Vistula. The Netze then turns west-south-west and waters the moorland (much of which, however, has been brought under cultivation) known as the Netzebruch. It joins the Warthe at Zantoch, after a course of 273 m. It is navigable for 130 m. up to the Bromberg canal and thereafter for smaller boats for 40 m. up to Pakosch on the Trlonger lake. Its drainage area is 5400 sq. m. From 1772 to 1807 that part of Poland which was given to Prussia at the first partition was known as the Netze District, as it extended along the Netze. It was almost all given back to Russia at the peace of Tilsit, but was restored to Prussia in 1815 under the treaty of Vienna.

NEU-BRANDENBURG, a town of Germany, in the grand duchy of Mecklenburg-Strelitz, is situated on a small lake called the Tollense See, 58 m. N.W. of Stettin by rail. Pop. (1905) 11,443. It is still partly surrounded with walls, and possesses four interesting old Gothic gates, dating from about 1300. The principal buildings are the Marienkirche, a Gothic building of the 13th century, the Johanniskirche, the town-hall and the grand ducal palace. It possesses a bronze statue of Fritz Reuter (1893); a monument to Bismarck (1895); another commemorating the war of 1870–71 (1895); a small museum of antiquities; and an art collection. On the other side of the lake is the grand-ducal palace, Belvedere. Iron-founding, machine-making, wool-spinning and the making of paper, tobacco and musical instruments are carried on here, and the trade in wool and agricultural products is considerable. The horse fair is also important. Neu-Brandenburg was founded in 1248, and has belonged to Mecklenburg since 1292.

See Boll, *Chronik der Vorderstadt Neubrandenburg* (1875).

NEUBREISACH, a town and fortress of Germany in the imperial province of Alsace-Lorraine, situated on the Rhine-Rhone canal, 12 m. E. from Colmar by the railway to Freiburg-im-Breisgau. Pop. (1905—including a garrison of 2300 men) 3520. It is built in the form of a hectagon, and together with Fort Mortier, which lies on an arm of the Rhine opposite, forms a place of great strategic strength. It contains an Evangelical (garrison) church, a Roman Catholic church and a non-commissioned officers' school. There are electrical works in the town.

Neubreisach was founded by Louis XIV. in 1699 and fortified by Vauban, the Neubreisacher canal being constructed to transport the necessary materials. In the Franco-German War, it was bombarded by the Germans from the 2nd to the 10th of November 1870, when it capitulated.

See Wolff, *Geschichte des Bombardements von Schlettstadt und Neubreisach* (Berlin, 1874); and von Neumann, *Die Eroberung von Schlettstadt und Neubreisach im Jahre 1870* (Berlin, 1876).

NEUBURG, a town of Germany, in the kingdom of Bavaria, is pleasantly situated on the Danube, 12 m. W. of Ingolstadt, on the railway to Neuoffingen. Pop. (1905) 8532. It is a place of ancient origin, but is chiefly noteworthy because formerly for two centuries it was the capital of the principality of Pfalz-Neuburg. Its most important building is the old residence of its princes, the handsomest part of which is in the Renaissance style of the 16th century. The town also contains an Evangelical and seven Roman Catholic churches, a town hall, several schools and convents, a theatre, and an historical museum with a valuable library. It has electrical works and breweries, while fruit and vegetables are cultivated in the neighbourhood, a considerable trade in these products being carried on by the Danube.

Neuburg was originally an episcopal see. In the 10th century it passed to the counts of Scheyern, and through them to Bavaria, being ceded to the Rhenish Palatinate at the close of a war in 1507. From 1557 to 1742 it was the capital of a small principality ruled by a cadet branch of the family of the elector palatine of the Rhine. This principality of Pfalz-Neuburg had an area of about 1000 sq. m. and about 100,000 inhabitants. In 1742 it was united again with the Rhenish Palatinate, with which it passed in 1777 to Bavaria.

See Gremmel, *Geschichte des Herzogtums Neuburg* (Neuburg, 1872); and *Führer durch die Stadt Neuburg und deren Umgebung* (Neuburg, 1904).

NEUCHÂTEL (Ger. *Neuenburg*), one of the cantons of western Switzerland, on the frontier towards France. It is the only Swiss canton that is situated entirely in the Jura, of which it occupies the central portion (its loftiest summit is the Mont Racine, 4731 ft. in the Tête de Rang range). The canton has a total area of 311·8 sq. m., of which 267·1 sq. m. are reckoned "productive" (forests occupying 88·6 sq. m. and vineyards 4·4 sq. m.). It consists, for the most part, of the longitudinal ridges and valleys characteristic of the Jura range, while its drainage is very unequally divided between the Thièle or Zihl, and the Doubs, which forms part of the north-west boundary of the canton, and receives only the streams flowing from the Le Locle and La Chaux de Fonds valley. Three regions make up the territory. That stretching along the shore of the lake is called *Le Vignoble* (from its vineyards) and extends from about 1500 ft. to 2300 ft. above the sea-level. An intermediate region is named *Les Vallées*, for it consists of the two principal valleys of the canton(the Val de Ruz, watered by the Seyon, and the Val de Travers, watered by the Areuse) which lie to a height of about 2300 ft. to 3000 ft. above the sea-level. The highest region is known as *Les Montagnes*, and is mainly composed of the long valley in which stand the industrial centres of La Chaux de Fonds (*q.v.*), and Le Locle (*q.v.*) to which must be added those of La Sagne, Les Ponts and Les Verrières, the elevation of these upland valleys varying from 3000 ft. to 3445 ft. The canton is well supplied with railways, the direct line from Bern past Kerzers (Chiètres), Neuchâtel, the Val de Travers and Les Verrières to Pontarlier for Paris passing right through it, while La Chaux de Fonds is connected by a line past Le Locle with Morteau in France. Other lines join the capital, Neuchâtel, to La Chaux de Fonds, as well as to Yverdon at the south-west extremity of the lake, and to St Blaise at its north-east end, not very far from Bienne.

In 1900 the population numbered 126,279 souls according to the federal census (a cantonal census of 1906 makes the figure at that date 134,014), of whom 104,551 were French-speaking, 17,629 German-speaking and 3664 Italian-speaking, while 107,291 were Protestants, 17,731 Romanists or Old Catholics, and 1020 Jews. There are three "established and state-endowed" churches, the National Evangelical (in 1907 a proposal to disestablish it was rejected by a huge majority), the Roman Catholic, and the Old Catholic (this sect in La Chaux de Fonds only), while the pastors of the Free Evangelical church and of the Jews (mostly in La Chaux de Fonds) are so far recognized as such by the state as to be exempt from military service.

Besides the capital, Neuchâtel (*q.v.*), the chief towns are La Chaux de Fonds (the most populous of all), Le Locle and Fleurier (3746), the principal village in the Val de Travers.

The most valuable mineral product is asphalt, of which there is a large and rich deposit in the Val de Travers, belonging to the state but worked by an English company. The wine of the Vignoble region (both sparkling and still) is plentiful and has a good reputation, the red wines of Neuchâtel, Boudry and Cortaillod being largely exported, though the *petit vin blanc* of Neuchâtel is all but wholly consumed within the canton. Absinthe is largely manufactured in the Val de Travers, but lace is no longer made there as of old. The well-known manufactory of Suchard's chocolate is at Serrières, practically a suburb of the town of Neuchâtel, while in the canton there are also cement factories and stone quarries. But the most characteristic industry is that of watch-making and the making of gold watch cases, which is chiefly carried on (since the early 18th century) in the highland valleys of La Chaux de Fonds and of Le Locle, as well as at Fleurier in the Val de Travers. At Couvet, also in the Val de Travers, there is a large factory of screws and knitting machines.

The canton is divided into 6 administrative districts, which comprise 63 communes. The cantonal constitution dates in its main features from 1858, but has been modified in several important respects. The legislature or *Grand Conseil* consists of members elected (since 1903) in the proportion of one to every 1200 (or fraction over 600) of the population, and holds office for three years, while since 1906 the principles of proportional representation and minority representation obtain in these elections. Since 1906 the executive of 5 members (since 1882) or *Conseil d'État* is elected by a popular vote. The 2 members of the federal *Conseil des États* are named by the Grand Conseil, but the 6 members of the federal *Conseil National* are chosen by a popular vote. Since 1879, 3000 citizens have the right of "facultative referendum" as to all laws and important decrees, while since 1882 the same number have the right of initiative as to all legislative projects, this right as to the *partial* revision of the cantonal constitution dating as far back as 1848, the number in the case of a *total* revision having been raised in 1906 to 5000.

We first hear of the *novum castellum, regalissimam sedem* in the will (1011) of Rudolf III., the last king of Burgundy, on whose death (1032) that kingdom reverted to the empire. About 1034 the emperor Conrad II. gave this castle to the lord of several neighbouring fiefs, his successors establishing themselves permanently there in the 12th century and then taking the title of "count." In 1288 the reigning count resigned his domains to the emperor Rudolf, who gave them to the lord of Châlon-sur-Saône, by whom they were restored to the count of Neuchâtel on his doing homage for them. This act decided the future history of Neuchâtel, for in 1393 the house of Châlon succeeded to the principality of Orange by virtue of a marriage contracted in 1388. The counts gradually increased their dominions, so that by 1373 they held practically all of the present canton, with the exception of the lordship of Valangin (the Val de Ruz and Les Montagnes, this last region only colonized in the early 14th century), which was held by a cadet line of the house till bought in 1592. In 1395 the first house ended in an heiress, who brought Neuchâtel to the count of Freiburg im Breisgau. As early as 1290 the reigning count had made an alliance with the Swiss Fribourg, in 1308 with Bern, and about 1324 with Soleure, but it was not till 1406 that an "everlasting alliance" was made with Bern (later in 1495 with Fribourg, and in 1501 with Lucerne). This alliance resulted in bringing the county into the Swiss confederation four centuries later, while it also led to contingents from Neuchâtel helping the Confederates from the battle of St Jakob (1444) onwards right down into the early 18th century. In 1457, through another heiress, the county passed to the house of the marquises of Baden-Hochberg, and in 1504 similarly to that of Orléans-Longueville (a bastard line of the royal house of France). From 1512 to 1529 the Swiss occupied it as the count was fighting for France and so against them. In 1532 the title of "prince" was taken, while by the treaty of Westphalia (1648) the principality became sovereign and independent of the empire. In 1530 (the very year Farel introduced the Reformation at Neuchâtel) the overlordship enjoyed by the house of Châlon-Orange passed, by virtue of a marriage contracted in 1515, to that of Nassau-Orange, the direct line of which ended in 1702 in the person of William III., king of England. In 1707 the Longueville house of Neuchâtel also became extinct, and a great struggle arose as to the succession. Finally the parliament (states) of Neuchâtel decided in favour of Frederic I., the first king of Prussia, whose mother was the elder paternal aunt of William III., and so heiress of the rights (given in 1288) of the house of Châlon, to which the fief had reverted on the extinction of the line of the counts of Neuchâtel. Thus the act of 1288 determined the fate of the principality, partly because Frederic I. was a Protestant, while the other claimants were Romanists. The nominal rule of the Prussian king (for the country enjoyed practical independence) lasted till 1857, with a brief interval from 1806 to 1814, when the principality was held by Marshal Berthier, by virtue of a grant from Napoleon. In 1814 its admission into the Swiss confederation was proposed and was effected in 1815, the new canton being the only non-republican member, just as the hereditary rulers of Neuchâtel were the last to maintain their position in Switzerland. This anomaly led in 1848 to the establishment (attempted in 1831) of a republican form of government, brought about by a peaceful revolution led by A. M. Piaget. A royalist attempt to regain power in 1856 was defeated, and finally, after long negotiations, the king of Prussia renounced his claims to sovereignty, though retaining the right (no longer exercised) to bear the title of "prince of Neuchâtel." Thus in 1857 Neuchâtel became a full republican member of the Swiss confederation.

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NEUCHÂTEL, capital of the above Swiss canton, situated near the north-east corner of the lake of Neuchâtel. It is the meeting-point of several important railway lines, from Bern past Kerzers (27 m.), from Bienne (19 m.), from La Chaux de Fonds (19 m.), from Pontarlier (in France), by the Val de Travers, (33½ m.), and from Yverdon (23 m.). The railway station (1575 ft.) at the top of the town is connected by an electric tramway with the shore of the lake some 150 ft. lower. The older portion of the town is built on the steep slope of the Chaumont, and originally the waters of the lake bathed the foot of the hill on which it stood. But the gradual growth of alluvial deposits, and more recently the artificial embankment of the shore of the lake, have added much dry ground, and on this site the finest modern buildings have been erected. The 16th-century castle and the 13th-century collegiate church of Notre Dame (now Protestant) stand close together and were founded in the 12th century when the counts took up their permanent residence in the town, to which they granted a charter of liberties in 1214. Among the buildings on the quays are the Musée des Beaux Arts (modern Swiss paintings and also various historical collections, including that of Desor relating to the Lake Dwellings), the Gymnase or Collège Latin (in which is also the museum of natural history and the town library), the university (refounded in 1866 and raised from the rank of an academy to that of a university in 1909), the École de Commerce and the post office. The town owes much to the gifts of citizens. Thus David de Purry (1709–1786) founded the town hospital and built the town hall, while James de Purry bequeathed to the town the villa in which the ethnographical museum has been installed (1904). In 1811 J. L. de Pourtalès (1722–1814) founded the hospital which bears his name, while in 1844 A. de Meuron (1789–1852) constructed the lunatic asylum at Préfargier, a few miles from the town. Among natives of the town are the theologians J. F. Ostervald (1663–1747) and Frédéric Godet (1812–1900), the geologist E. Desor (1811–1882), the local historian G. A. Matile (1807–1881) and the politicians A. M. Piaget (1802–1870) and Numa Droz (1844–1899). Neuchâtel (partly because very good French is spoken there) attracts many foreign students, while the town is a literary centre. In 1900 Neuchâtel numbered 20,843 inhabitants (in 1850 only 7727 and in 1870, 12,683), 15,277 being French-speaking and 4553 German-speaking; there were 17,237 Protestants, 3459 Romanists and 80 Jews. (W. A. B. C.)

NEUCHÂTEL, LAKE OF. This lake, in W. Switzerland, is with the neighbouring lakes of Bienne and Morat (both connected with it by canals), the modern representative of the large body of water which at one time seems to have filled the whole of the lower valley of the Aar. It is now the most considerable sheet of water which is *wholly* within Switzerland (since parts of those of Geneva and Constance belong to foreign countries), though it does not belong entirely to any one Canton—of its total area of 92½ sq. m., 36½ sq. m. are in the Canton of Neuchâtel and rather over 33 sq. m. in that of Vaud, while Fribourg claims 20¾ sq. m. and Berne 2 sq. m. It is about 23½ m. in length, varies from 3½ to 5 m. in width, and has a maximum depth of 502 ft., while its surface is 1427 ft. above sea-level. It is mainly formed by the Thièle or Zihl river, which enters it at its south-western end and issues from it at its north-eastern extremity, but it also receives, near its north-west end, the Areuse (flowing through the Val de Travers) and the Seyon (which traverses the Val de Ruz), as well as, near its north-east end, the Broye (that flows through a canal from the Lake of Morat). Successive drainages have brought to light the remains of many lake dwellings, of which there is a good collection in the natural history museum at Neuchâtel. The scenery of the lake, though pleasing, cannot compare with that of the other Swiss lakes, despite the fact that from it the giants of both the Mont Blanc and Bernese Oberland ranges are clearly seen. The first steamer was placed on the lake in 1827. On the south-eastern shore the picturesque and historical little town of Estavayer is the chief place. At the south-western extremity of the lake is Yverdon (the *Eburodunum* of the Romans and the residence of the educationalist Pestalozzi, 1806–1825). Far more populated is the north-western shore, where, from S.W. to N.E., we find Grandson (famous for the battle of 1476 wherein Charles the Bold, duke of Burgundy, was defeated by the Swiss), Cortaillod (producing excellent sparkling wine), Serrières (with the famous manufactories of Suchard chocolate) and Neuchâtel itself. On the north shore is La Tène, famous for the remarkable relics of the Iron Age that have been discovered there. (W. A. B. C.)

NEUENAHR, a spa of Germany, in the Prussian Rhine province, situated at the foot of a basalt peak, in the pleasant valley of the Ahr, 10 m. N.W. of Remagen on the Rhine by the railway to Adenau. Pop. (1905) 3388. It is well laid out, has an Evangelical and two Roman Catholic churches, and carries on a considerable trade in the red wines of the district. There are five alkaline springs with temperatures from 69° to 102° F., the waters of which are specific in chronic catarrh of the respiratory organs, gout, rheumatism and diabetes. In the immediate vicinity lies the Apollinaris spring.

See Schmitz, *Erfahrungen über Bad Neuenahr* (5th ed., Ahrweiler, 1887); and Schwenke, *Die Kurmittel des Bades Neuenahr* (Halle, 1900).

NEUENDORF, a village of Germany, in the province of Brandenburg, 2 m. E. from Potsdam, on the Nuthe, with a station on the railway from Berlin to Potsdam. Pop. (1905) 6877. The place has considerable industries, chief among which are carpet-weaving, jute-spinning and the manufacture of railway plant. Within its area lies the colony of Nowawes laid out by Frederick the Great in 1754.

NEUFCHÂTEAU, a town of eastern France, in the department of Vosges at the confluence of the Meuse and the Mouzon, 49 m. W.N.W. of Épinal by rail. Pop. (1906) 3924. The churches of St Christopher (13th and 15th centuries) and St Nicholas, the latter combining the Romanesque and Gothic styles and built above a Romanesque crypt, are of interest. A sub-prefecture, a tribunal of first instance and communal colleges are among the public institutions. Neufchâteau carries on wool-spinning and the manufacture of embroidery, nails and chains. The town, which is said to occupy the site of the Roman *Neomagus*, belonged in the middle ages to the dukes of Lorraine, ruins of whose château are still to be seen. In 1641 it passed to France.

NEUHALDENSLEBEN, a town of Germany, in the province of Prussian Saxony on the Ohre, situated 18 m. N.W. from Magdeburg by the railway to Öbisfelde and at the junction of a line to Eisleben. Pop. (1905) 10,421. It has an Evangelical church, an old equestrian statue of Henry the Lion and a gymnasium. There are several active industries, notably the manufacture of majolica and terra-cotta wares, machinery, gloves, beer, malt, cheese and sugar, while large pig markets are held here.

See Behrends, *Chronik der Stadt Neuhaldensleben* (new ed., 1903).

NEUHOF, THEODORE STEPHEN, Baron von (*c.* 1690–1756), German adventurer and for a short time nominal king of Corsica, was a son of a Westphalian nobleman and was born at Metz. Educated at the court of France, he served first in the French army and then in that of Sweden. Baron de Goertz, minister to Charles XII., realizing Neuhof's capacity for intrigue, sent him to England and Spain to negotiate with Cardinal Alberoni. Having failed in this mission he returned to Sweden and then went to Spain, where he was made colonel and married one of the queen's ladies-in-waiting. Deserting his wife soon afterwards he repaired to France and became mixed up in Law's financial affairs; then he wandered about Portugal, Holland and Italy, and at Genoa he made the acquaintance of some Corsican prisoners and exiles, whom he persuaded that he could free their country from Genoese tyranny if they made him king of the island. With their help and that of the bey of Tunis he landed in Corsica in March 1736, where the islanders, believing his statement that he had the support of several of the great powers, proclaimed him king. He assumed the style of Theodore I., issued edicts, instituted an order of knighthood, and waged war on the Genoese, at first with some success. But he was eventually defeated, and civil broils soon broke out in the island; the Genoese having put a price on his head and published an account of his antecedents, he left Corsica in November 1736, ostensibly to seek foreign assistance. After trying in vain to induce the grand duke of Tuscany to recognize him, he started off on his wanderings once more until he was arrested for debt in Amsterdam. On regaining his freedom he sent his nephew to Corsica with a supply of arms; he himself returned to the island in 1738, 1739 and 1743, but the combined Genoese and French forces and the growing strength of the party opposed to him again drove him to wandering about Europe. Arrested for debt in London he regained his freedom by mortgaging his "kingdom" of Corsica, and subsisted on the charity of Horace Walpole and some other friends until his death in London on the 11th of December 1756. His only son, Frederick (*c.* 1725–1797), served in the army of Frederick the Great and afterwards acted as agent in London for the grand-duke of Württemberg.

Frederick wrote an account of his father's life, *Mémoires pour servir à l'histoire de la Corse*, and also an English translation, both published in London in 1768. In 1795 he published a new edition of *Description of Corsica with an account of its union to the crown of Great Britain*. See also Fitzgerald, *King Theodore of Corsica* (London, 1890).

NEUILLY-SUR-SEINE, a town of northern France, in the department of Seine, 3½ m. N.W. of the centre of Paris, of which it is a suburb, between the fortifications and the Seine. Pop. (1906) 39,222. A castle at Neuilly, built by the count of Argenson in the 18th century, ultimately became the property and favourite residence of the duke of Orleans (Louis Philippe), the birthplace of nearly all his children, and the scene of the offer of the crown in 1830. The buildings were pillaged and burned by the mob in 1848. The park, which extended from the fortifications to the river, as well as the neighbouring park of Villiers (also belonging to the princes of Orleans), was broken up into building lots, and is occupied by many small middle-class houses and a few fine villas. Within the line of the fortifications, but on Neuilly soil, stands the chapel of St Ferdinand, on the spot where the duke of Orleans died in 1842 from the results of a carriage accident. The stained-glass windows were made at Sèvres after designs by Ingres; the ducal cenotaph, designed by Ary Scheffer, was sculptured by de Triqueti; and the chapel also contains a "Descent from the Cross," by the last-named artist, and an angel executed in Carrara marble by the princess Marie d'Orleans, sister of the duke. The fine bridge, designed in the 18th century by Perronet, is noteworthy as the first level bridge constructed in France. The Galignani Institution, founded by the brothers Galignani for aged booksellers, printers and others, has accommodation for 100 residents. The manufactures include perfumery, chocolate, colours, varnish, automobiles, carpets, &c.

NEUMANN, FRANZ ERNST (1798–1895), German mineralogist, physicist and mathematician, was born at Joachimstal on the 11th of September 1798. In 1815 he interrupted his studies at Berlin to serve as a volunteer in the campaign against Napoleon, and was wounded in the battle of Ligny. Subsequently he entered Berlin University as a student of theology, but soon turned to scientific subjects. His earlier papers were mostly concerned with crystallography, and the reputation they gained him led to his appointment as Privatdozent at Königsberg, where in 1828 he became extraordinary, and in 1829 ordinary, professor of mineralogy and physics. In 1831, from a study of the specific heats of compounds, he formulated "Neumann's law," which expressed in modern language runs: "The molecular heat of a compound is equal to the sum of the atomic heats of its constituents." Devoting himself next to optics, he produced memoirs which entitle him to a high place among the early searchers after a true dynamical theory of light. In 1832, by the aid of a particular hypothesis as to the constitution of the ether, he reached by a rigorous dynamical calculation results agreeing with those obtained by A. L. Cauchy, and succeeded in deducing laws of double refraction closely resembling those of A. J. Fresnel; and in subsequent years he attacked the problem of giving mathematical expression to the conditions holding for a surface separating two crystalline media, and worked out from theory the laws of double refraction in strained crystalline bodies. He also made important contributions to the mathematical theory of electrodynamics, and in papers published in 1845 and 1847 established mathematically the laws of the induction of electric currents. His last publication, which appeared in 1878, was on spherical harmonics (*Beiträge zur Theorie der Kugelfunctionen*). He took part in founding the Mathematisch-Physikalisches Seminar, to give students a practical acquaintance with the methods of original research. He retired from his professorship in 1876, and died at Königsberg on the 23rd of May 1895. His son, CARL GOTTFRIED NEUMANN (b. 1832), became in 1858 Privatdozent, and in 1863 extraordinary professor of mathematics at Halle. He was then appointed to the ordinary chair of mathematics successively at Basel (1863), Tübingen (1865) and Leipzig (1868).

NEUMANN, KARL FRIEDRICH (1793–1870), German orientalist, was born, under the name of Bamberger, at Reichsmannsdorf, near Bamberg, on the 28th of December 1793. He studied philosophy and philology at Heidelberg, Munich and Göttingen, became a convert to Protestantism and took the name of Neumann. From 1822 to 1825 he was a teacher at Spires; then he learned Armenian in Venice and visited Paris and London. In 1829 he went to China, where he studied the language and amassed a large library of valuable books and manuscripts. These, about 12,000 in number, he presented to the royal library at Munich. Returning to Germany in 1831 Neumann was made professor of Armenian and Chinese in the university of Munich. He held this position until 1852, when, owing to his pronounced revolutionary opinions, he was removed from his chair. Ten years later he settled in Berlin, where he died on the 17th of March 1870.

Neumann's leisure time after his enforced retirement was occupied in historical studies, and besides his *Geschichte des englischen Reichs in Asien* (Leipzig, 1851), he wrote a history of the United States of America, *Geschichte der Vereinigten Staaten von Amerika* (Berlin, 1863–1866). His other works include *Versuch einer Geschichte der armenischen Literatur* (Leipzig, 1836); *Die Völker des südlichen Russland* (1846, and again 1855); and *Geschichte des englisch-chinesischen Kriegs* (1846, and again 1855). He also issued some translations from Chinese and Armenian: *Catechism of the Shamans* (1831); *Vahram's Chronicle of the Armenian Kingdom in Cilicia* (1831) and *History of the Pirates in the China Sea* (1831). The journal of the Royal Asiatic Society (London, 1871) contains a full list of his works.

NEUMAYR, MELCHIOR (1845–1890), German palaeontologist, was born at Munich on the 24th of October 1845, the son of Max von Neumayr, a Bavarian Minister of State. He was educated in the university of Munich, and completed his studies at Heidelberg, where he graduated Ph.D. After some experience in field-geology under C. W. von Gümbel he joined the Austrian geological survey in 1868. Four years later he returned to Heidelberg, but in 1873 he was appointed professor of palaeontology in Vienna, and occupied this post until his death on the 29th of January 1890. His more detailed researches related to the Jurassic and Cretaceous Ammonites and to the Tertiary freshwater mollusca; and in these studies he sought to trace the descent of the species. He dealt also with the zones of climate during the Jurassic and Cretaceous periods, and endeavoured to show that the equatorial marine fauna differed from that of the two temperate zones, and the latter from that of the arctic zone, much as the faunas of similar zones differ from each other in the present day; see his "Über klimatische Zonen während der Jura und Kreidezeit" (*Denkschr. K. Akad. Wiss. Wien*, 1883); he was author also of *Erdgeschichte* (2 vols., 1887); and *Die Stämme des Thierreiches* (vol. 1 only, 1889).

Obituary by Dr W. T. Blanford in *Quart. Journ. Geol. Soc.* (1890).

NEUMÜNSTER, a town of Germany, in the Prussian province of Schleswig-Holstein, lies on both banks of the small river Schwale, in the basin of the Stör, 40 m. N. of Altona-Hamburg by rail, and at the junction of lines to Kiel, Vamdrup (Denmark) and Tönning. Pop. (1905) 31,347. It has an Evangelical and a Roman Catholic church and several schools. It is, after Altona, the most important industrial town in the province, and contains extensive cloth-factories, besides manufactories of leather, cotton, wadding, carpets, paper, machinery, beer and sweetmeats. Its trade is also brisk. The name, which was originally Wipendorp, is derived from an Augustine monastery, founded in 1130 by Vicelin, the apostle of Holstein, and is mentioned as "novum monasterium" in a document of 1136. Its industrial importance began in the 17th century, when the cloth-workers of Segeberg, a town to the south-east, migrated to it. It became a town in 1870.

See Kirmis, *Geschichte der Stadt Neumünster* (1900); and Dittmann, *Aus dem alten Neumünster* (1879).

NEUNKIRCHEN, or OBER-NEUNKIRCHEN, a town of Germany, in the Prussian Rhine province, on the Blies, 12 m. N.W. of Saarbrücken by rail. Pop. (1905) 32,358, consisting almost equally of Protestants and Roman Catholics. It contains two Gothic Evangelical and a Romanesque Roman Catholic church, several schools, and a monument to Freiherr von Stumm (d. 1901), a former owner of the iron-works here. The principal industrial establishment is a huge iron-foundry, employing upwards of 4800 hands, and producing about 320,000 tons of pig-iron per annum; and there are also boiler-works, saw-mills, soap manufactories and a brewery. Around the town are important coal mines from which about 2½ million tons of coal are raised annually. The castle built in 1570 was destroyed in 1797, and is now a ruin. The town is first mentioned in 1280, and became important industrially during the 18th century.

NEUQUEN, an inland territory of Argentina on the Chilean frontier, between the Colorado and Limay rivers, with the province of Mendoza on the N. and the territory of Rio Negro on the E. and S. Area, 42,345 sq. m. Pop. (1895) 14,517; (1904, estimate) 18,022. The greater part of the territory is mountainous, with fertile, well-watered valleys and valuable forests. The eastern part, however, contains large barren plains, showing some stunted vegetation, and having numerous saline deposits. Long drouths prevail in this region and there is no inducement for settlement, the nomadic Indians visiting it only on their hunting expeditions. Guanacos and Argentine hares are found in abundance in Neuquen, and to a lesser degree the South American ostrich. The Neuquen, which unites with the Limay near the 68th meridian to form the Rio Negro, is the principal river of the territory. The largest of a group of beautiful lakes in the higher Andean valleys is the celebrated Nahuel-Huapi (Lion Grass), which is nearly 50 m. long from E. to W. and about 20 m. from N. to S. at its widest part, and which lies partly in the S.W. angle of the territory, partly in Rio Negro, and partly in the republic of Chile. It is the source of the Rio

Limay and receives the overflow from two smaller neighbouring lakes. The temperature of the Andean region is cold even in summer, but on the lower plains it is hot in summer, and only moderately cold in winter. The principal industry is the raising of stock for the Chilean markets, as there is little cultivation. Cereals, forage crops, vegetables and fruits of the cold temperate zone can be produced easily, but distance from markets and lack of transport have restricted their production to local needs. The territory is reached by a light-draft river steamer which ascends the Rio Negro to Fort Roca at the confluence of the Limay and Neuquen, and by a branch of the Great Southern railway from Bahia Blanca to the same point. The population is concentrated in a few small towns on the rivers and in some colonies, established by the national government to check Chilean invasions, in the fertile districts of the Andes. A majority of the population, however, is of Chilean origin. The capital is Chos Malal, a small town on the upper Neuquen, in the mountainous district in the northern part of the territory.

NEURALGIA (Gr. νεῦρον, nerve, and ἄλγος, pain), a term denoting strictly the existence of pain in some portion or throughout the whole of the distribution of a nerve without any distinctly recognizable structural change in the nerve or nerve centres. This strict definition, if adhered to, however, would not be applicable to a large number of cases of neuralgia; for in not a few instances the pain is connected with some source of irritation, by pressure or otherwise, in the course of the affected nerve; and hence the word is generally used to indicate pain affecting a particular nerve or its branches from any cause. There are few ailments which give rise to greater human suffering. The existence of neuralgia usually betokens a depressed or enfeebled state of health. It is often found to affect the hereditarily rheumatic or gouty. In weakened conditions of the system from improper or insufficient food, or as a result of any drain upon the body, or in anaemia from any cause, and in such diseases as syphilis or malaria, neuralgia is a frequent concomitant. Any strain upon the nervous system, such as mental overwork or anxiety, is a potent cause; or exposure to cold and damp, which seems to excite irritation in a nerve already predisposed to suffer. But irritation may be produced by numerous other causes besides this—such as a decayed tooth, diseased bone, local inflammations in which nerves are implicated, by some source of pressure upon a nerve trunk, or by swelling of its sheath in its passage through a bony canal or at its exit upon the surface.

The pain is generally localized, but may come to extend beyond the immediate area of its first occurrence. It is usually of paroxysmal character, and not unfrequently periodic, occurring at a certain time of the day or night. It varies in intensity, being often of the most agonizing character, or less severe and more of a tingling kind. Various forms of perverted nerve function may be found co-existing with or following neuralgia. Thus there may be hyperaesthesia, anaesthesia, paralysis, or alterations of nutrition, such as wasting of muscles, whitening of the hair, &c.

The forms in which neuralgia most commonly shows itself are facial neuralgia or tic douloureux, migraine (hemicrania or brow ague), intercostal neuralgia and sciatica.

Facial neuralgia, or *tic douloureux*, affects the great nerve of sensation of the face (fifth nerve), and may occur in one or more of the three divisions in which the nerve is distributed. It is usually confined to one side. When the first or upper division of the nerve is involved the pain is mostly felt in the forehead and side of the head. It is usually of an intensely sharp, cutting or burning character, either constant or with exacerbations, and often periodic, returning at a certain hour each day while the attack continues. The skin over the affected part is often red and swollen, and, even after the attack has abated, feels stiff and tender to the touch. In this, as in all forms of neuralgia, there are certain localities where the pain is more intense, these "painful points," as they are called, being for the most part in those places where the branches of the nerves emerge from bony canals or pierce the fascia to ramify in the skin. Hence, in this form, the greater severity of the pain above the eyebrow and along the side of the nose. There is also pain in the eyelid, redness of the eye, and flow of tears. When the second division of the nerve is affected the pain is chiefly in the cheek and upper jaw, the painful points being immediately below the lower eyelid, over the cheek bone, and about the upper lip. When the third division of the nerve suffers the pain affects the lower jaw, and the chief painful points are in front of the ear and about the chin.

Hemicrania, migraine, brow-ague and *sick headache* are various terms employed to describe what by some is considered to be another form of neuralgia. An attack may come on suddenly, but, in general, begins by a dull aching pain in the brow or temple, which steadily increases in severity and extent, but remains usually limited to one side of the head. It attains at times an extreme degree of violence, and is apt to be aggravated by movement, loud noises or bright light. Accompanying the pain there is more or less of nausea, and when the attack reaches its height vomiting may occur, after which relief comes, especially if sleep supervene. An attack of this kind may last for a few hours or for a whole day, and after it is over the patient feels comparatively well. It may recur periodically, or, as is more common, at irregular intervals. During the paroxysms, or even preceding them, certain sensory disturbances may be experienced, more especially affections of vision, such as ocular spectra, hemiopia, diplopia, &c. Gout, eyestrain and intestinal toxaemia have been put forward as causes of migraine, and Sir W. Gowers regards it as the equivalent of a true epileptic attack.

Intercostal neuralgia is pain affecting the nerves which emerge from the spinal cord and run along the spaces between the ribs to the front of the body. This form of neuralgia affects the left side more than the right, is much more common in women than in men, and occurs generally in enfeebled states of health. It might be mistaken for pleurisy or some inflammatory affection of the lungs; but the absence of any chest symptoms, its occurrence independently of the acts of respiration, and other considerations well establish the distinction. The specially painful points are chiefly at the commencement of the nerve as it issues from the spinal canal, and at the extremities towards the front of the body, where it breaks up into filaments which ramify in the skin. This form of neuralgia is occasionally the precursor of an attack of shingles (*Herpes zoster*) as well as a result of it.

Sciatica is another of the more common forms of neuralgia. It affects the great sciatic nerve which emerges from the pelvis and runs down the leg to the foot. It is in most instances traceable to exposure to cold or damp, to overuse of the limbs in walking, &c. Any source of pressure upon the nerve within the pelvis, such as may be produced by a tumour or even by constipation of the bowels, may excite an attack of sciatica. It is often connected with a rheumatic or gouty constitution. In general the nerve of one side only is affected. The pain which is felt at first a little behind the hip-joint steadily increases in severity and extends along the course of the nerve and its branches in many instances as far as the toes. The specially painful points are about the knee and ankle joints; besides which a feeling of numbness is experienced throughout the whole limb. In severe cases all movement of the limb aggravates the pain, and the patient is obliged to remain in bed. In prolonged attacks the limb may waste and be drawn up and fixed in one position. Attacks of sciatica are often attended with great suffering, and are apt to be very intractable to treatment.

In the treatment of all forms of neuralgia it is of first importance to ascertain if possible whether any constitutional morbid condition is associated with the malady. When the attack is periodic the administration of a large dose of quinine two or three hours previous to the usual time of the seizure will often mitigate, and may even prevent the paroxysm. Many topical applications are of great efficacy. Liniments containing opium, belladonna or aconite rubbed into the affected part will often soothe the most severe local pain. And antipyrin, phenacetin, aspirin and similar analgetics are commonly taken. The plan at one time resorted to of dividing or excising a portion of the affected nerve is now seldom employed, but the operation of nerve-stretching in some forms of neuralgia, notably sciatica, is sometimes successful. It consists in cutting down upon and exposing the nerve, and in seizing hold and drawing upon it so as to stretch it. Such an operation is obviously justifiable only in cases where other less severe measures have failed to give relief. The employment of electricity, in long continued and intractable forms of neuralgia, proves in many instances eminently serviceable. In the severest forms of tic doloureux complete relief has followed the extirpation of the Gasserian ganglion. (F. W. Mo.)

NEURASTHENIA (Gr. *νεῦρον*, nerve, and *ἀσθένεια*, weakness), the general medical term for a condition of weakness of the nervous system. The symptoms may present themselves as follows: (1) general feeling of malaise, combined with a mixed state of excitement and depression; (2) headache, sometimes with the addition of vertigo, deafness and a transitory clouding of consciousness simulating *petit mal* or *migraine*; (3) disturbed and restless, unrefreshing sleep, often troubled with dreams; (4) weakness of memory, especially for recent events; (5) blurring of sight, noises or ringing in the ears; (6) variable disturbances of sensibility, especially scattered analgesia (partial and symmetrical) affecting the backs of the hands especially, and in women the breasts; (7) various troubles of sympathetic origin, notably localized coldness, particularly in the extremities, morbid heats, flushings and sweats; (8) various phenomena of nervous depression associated with functional disturbances of organs, *e.g.* muscular weakness, lack of tone, and sense of fatigue upon effort, dyspepsia and gastric atony with dilatation of the stomach and gastralgia; pseudo-anginal attacks and palpitation of the heart; loss of sexual power with nocturnal pollutions and premature ejaculations leading to apprehension of oncoming impotence. Objective signs met with in organic disease are absent, but the knee-jerks are usually exaggerated.

According to the complexity of symptoms, the neurasthenia is more particularly defined as cerebral, spinal, gastric and sexual. The cerebral form is sometimes termed *psychasthenia*, and is liable to present morbid fears or phobias, *e.g.* agoraphobia (fright in crowds), monophobia (fright of being alone), claustrophobia (fright of being in a confined place), anthropophobia (fright of society), batophobia (fright of things falling), siderodromophobia (fright of railway travelling). There may also be mental ruminations, in which there is a continuous flow of connected ideas from which there is no breaking away, often most insistent at night and leading to insomnia. Sometimes there is arithmomania (an imperative idea to count). Such cases often exhibit a marked emotionalism and readily manifest joy or sorrow; they may be cynical, pessimistic, introspective and self-centred, only able to talk about themselves or matters of personal interest, yet they frequently possess great intellectual ability, and although there may be mental depression, there is an absence of the insane ideas characteristic of melancholia.

Traumatic neurasthenia is the neurasthenia following shock from injury; it is sometimes termed "railway spine," "railway brain," from the frequency with which it occurs after railway accidents, especially in people of a nervous temperament. The physical injury at the time may be slight, so that the patient is able to resume work, but symptoms develop later which may simulate serious organic disease. As in all forms of neurasthenia, the subjective symptoms may be numerous and varied, whereas the objective signs are but few and slight. Many difficulties, therefore, present themselves in arriving at a sound opinion as to the future in such cases. It is desirable not only to study the case carefully, but to obtain some knowledge of the previous history of an individual who is claiming damages on account of traumatic neurasthenia. (F. W. Mo.)

NEURI, an ancient tribe placed by Herodotus (iv. 105) to the north-east of Scythia. He says of it that it is not Scythian, but has Scythian customs. Every member of it, being a wizard, becomes a wolf once a year. The position assigned to their district appears to be about the head waters of the Dniester and Bug (Bugh) and the central course of the Dnieper just the region which, on general grounds, place-names, recorded migrations and modern distribution, appears to be the original location of the Slavs (*q.v.*). The wolf story again recalls the tales of werewolves so common among Slavonic peoples, and there is much probability in Schafarik's conjecture that the Neuri are nothing but the ancestors of the Slavs. (E. H. M.)

NEURITIS (Gr. *νεῦρον*, nerve), a term applied to the inflammation of one or more bundles of nerve fibres. Two varieties are known, the localized and the multiple. The localized form frequently follows on exposure to cold and may attack a single nerve. Facial paralysis (Bell's palsy) is commonly seen following a neuritis of the facial nerve. Neuritis may follow blows and wounds of a nerve, injuries involving stretching of a nerve or long continued pressure such as may occur in a dislocation of the elbow joint, or the nerve may share in the extension of a neighbouring inflammation. The first symptom of a localized neuritis is pain of a boring character along the course of a nerve and its distribution, the part being sensitive to pressure. There may be slight redness and oedema along the course of the nerve, movement becomes painful in the muscles to which the nerve is distributed, numbness may follow and the tactile sense be impaired, finally the muscles atrophy, and degenerative changes may take place in the nerve or nerve sheath. Slight cases following cold or injury may pass off in a few days, while severe cases such as those following the pressure of an unreduced dislocation may last for months.

Multiple neuritis or polyneuritis is a disease which may affect many of the peripheral nerves symmetrically and at the same time. For the pathological changes see NEUROPATHOLOGY. The difference in these changes is due mostly to the difference in the aetiology of the neuritis. The causes may be divided as follows: (1) The toxins of acute infective diseases, such as diphtheria, influenza, typhoid fever, malaria, scarlet fever and septicaemia. (2) Acute or chronic poisoning by lead, arsenic, mercury, copper and phosphorus. (3) General disorders: gout, rheumatism, tubercle, carcinoma. (4) The local action of leprosy and syphilis. (5) Endemic disease: beri-beri. (6) Alcohol, the most common.

Alcoholic neuritis occurs as a result of constant steady drinking, particularly in those who drink beer rather than spirit. The earliest symptom is numbness of the feet and later of the hands, then painful cramps in the legs appear and there is pain on moving the limbs, or the patient complains of deadness, tingling and burning in the hands and feet, and superficial tenderness is occasionally present. In other varieties of the disease the earliest symptoms are weakness of the legs and extreme fatigue, leading to a characteristic "steppage gait," or marked inco-ordination of movement may occur and the gait become ataxic. Trophic changes soon appear, in some cases early and rapid muscular wasting occurs, the skin becomes dry and glossy, the nails brittle and the hair thin. In time actual contractures takes place, the hip and knee-joints become flexed and the foot dropped at the ankle. In cases that recover there may be permanent deformity. Should the case progress the patient may become bedridden and powerless, and degenerative mental changes may take place, loss of memory, irritability of temper and emotional instability. Various complications such as bronchitis, fatty changes in the heart, albuminuria and a liability to pulmonary tuberculosis, tend to carry off the victim of chronic alcoholic neuritis. Cases seen early in the progress of the disease, who can be placed under supervision, may recover under treatment, but those in whom the attacks have recurred several times and in whom there is much mental impairment rarely make a complete recovery. The treatment consists in putting the patient to bed, with the administration of strychnine hypodermically, and attention should be paid to the position of the limbs so as to avoid the development of contractures, cradles being used, the limbs kept in the correct positions by sandbags, and gentle massage being employed as soon as possible. Should contractures have already formed some mechanical device adapted to stretch the contracted muscle must be resorted to. Biers' hyperaemic suction apparatus is very useful in the painless stretching of contracted joints, or old-standing adhesions may have to be broken down under an anaesthetic, extension apparatus being afterwards worn. In the later treatment the galvanic and faradaic currents combined with massage are useful in helping to restore the wasted muscles, and hot-air baths and warm applications are appreciated.

Arsenical neuritis mostly affects the lower extremities, as contrasted with lead, which mainly paralyses the fingers and wrists; recovery is even slower than in alcoholic neuritis, the treatment being on the same lines, with the removal of the cause of the disease. In the neuritis of chronic lead poisoning a fine tremor of the hands is an early symptom and sensory symptoms are usually absent; the muscles affected are the extensors of the wrists, thumb and fingers (see Lead Poisoning). The course of the disease is long, and an attempt should be made to eliminate the lead from the system by purgatives and the administration of potassium iodide.

The diabetic neuritis paraesthesia is slight, and the legs are chiefly affected; weakness and ataxia may be present. Trophic sores on the feet are of frequent occurrence in this variety. The treatment is that of the disease.

Post-diphtheritic neuritis occurs in about 10% of all cases of diphtheria. In this form paralysis of the soft palate is the earliest symptom, and this may be the only one, or the pharynx may be affected. The limbs are affected much later, usually about the 5th or 6th week. Atrophy of the muscles is frequently rapid. If the respiratory muscles are unaffected the prognosis is good, but the paralysis of the limbs may last for several months. The treatment is complete rest, good food and the administration of strychnine.

Acute polyneuritis with numbness and motor weakness has been noted after influenza, together with slight muscular wasting and electrical degeneration. Later, loss of sensation in the peripheral portion of the limbs is complained of, and the motor weakness may affect the muscles of the trunk and face. Such cases tend towards complete recovery.

NEUROPATHOLOGY, the general name for the science concerned with diseases of the nervous system. As regards the anatomy and physiology, see the articles Nerve, Nervous System, Brain, Spinal Cord, and Sympathetic System. The morbid processes affecting the nervous system are numerous and varied, but usually they are clinically divided into two great groups of (1) organic disease, (2) functional disturbance. Such a classification depends upon whether or not symptoms observed during life can be associated with recognizable changes of the nervous system, gross or microscopical, after death. Sometimes this is the morbid process itself, sometimes only the ultimate result of the process. It must be remarked, however, that many diseases which we now look upon as functional may be found due to recognizable changes when suitable methods of investigation shall have been discovered. The paroxysmal neuroses and psychoses may be considered a priori to be due to temporary morbid functional conditions. Our knowledge of the first group is naturally much more advanced than of the latter, for, given certain symptoms during life, we are able, as a rule, to predict not only the nature of the morbid process, but its particular locality.

The histological elements which make up the nervous system may also be divided into two groups: (1) the nervous units or neurones, (2) the supporting, protecting and nutrient tissues. Organic diseases may start primarily in the nervous units or neurones and cause their degeneration; such are true diseases of the nervous system. But the nervous units may be affected secondarily by diseases starting in the supporting, protecting and nutrient tissues of the nervous system; such are essentially diseases *within* the nervous system, and include diseases of the blood-vessels, lymphatics, membranes and the special nervous connective tissue, neuroglia (a residue of the embryonal structure from which the nervous system was developed). Tumours and new growths must also be included.

The modern conception of the "neurone" as an independent complex cell with branching processes, in physiological rather than anatomical association with other neurones, has modified our ideas of the morbid processes affecting the nervous system, especially as regards degenerations of systems, communities or collections of neurones subserving special functions. It was formerly believed, and generally taught, that the primary systemic degenerations were due to a sclerosis; thus locomotor ataxy was believed to be caused by an overgrowth of the supporting glia tissue of the posterior columns of the spinal cord, which caused a secondary atrophy of the nervous tissue. We now know that this overgrowth of glia tissue is secondary to the atrophy of the nervous elements, and the only true primary overgrowth of glia tissue is really of the nature of the new growth (gliosis). But even in this case it is doubtful if the mere proliferation of the glia tissue elements could destroy the nervous elements, if it were not for the fact that it leads to changes in the vessel walls and to haemorrhages.

The symptoms manifested during life depend upon the nature of the morbid process and the portion of the nervous system affected. A correct understanding of neuropathology involves the study of (1) the causes which give rise to morbid conditions, which are often complex and due to various combinations of factors arising from without and within the body, and (2) the changes in the structure and functions of the nervous system brought about by intrinsic and extrinsic causes.

The causes of pathological processes occurring in the nervous units (neurones) may be divided into internal and external, and it may be remarked that in all cases except direct injury the two groups are generally more or less combined.

A. *Internal Causes.*—Of all the causes of nervous disease *hereditary predisposition* stands pre-eminently first; it may be convergent, paternal, maternal; from grandparents or even more remote ancestors. Moreover, no study of heredity is complete that does not take into consideration collaterals. Especially does this statement apply to functional neuroses, *e.g.* epilepsy, migraine, hysteria and neurasthenia; and to psychoses, *e.g.* delusional insanity, mania and melancholia, manic-depressive, recurrent or periodic insanity and dementia-praecox or adolescent insanity.

In 70% of 150 cases of idiocy or imbecility in the London county asylums, Dr Tredgold found a family history of insanity in some form or another. Strictly speaking, it is the tendency to nervous disease rather than the disease itself that is inherited, and this is frequently spoken of as a neuropathic or psychopathic taint. There are, besides, a number of inherited diseases, which, although somewhat rare, are of interest inasmuch as they affect members of a family, the same disease frequently commencing in each individual at about the same age. These are termed *family diseases*, and include hereditary ataxia (Friedreich's disease), myotonia (Thomsen's disease), hereditary (Huntingdon's) chorea, amaurotic idiocy and various forms of idiopathic muscular atrophy. Alcoholism, tuberculosis and syphilis in the parents, especially if one or both come from a neuropathic or psychopathic stock, frequently engender idiocy, imbecility, epilepsy and general paralysis in the offspring, by the production of defects in the vitality of the germinal plasm, causing arrest, imperfect development or premature decay of groups, communities or systems of neurones, especially those which are latest developed—the symptoms manifested depending upon the portions of the nervous system affected. To explain the hereditary neuropathic tendency morphologically, we may suppose that there is an inherited defect in the germinal plasm which is concerned in the formation of the neurones. We may regard the neurone as a complex cell, and the nervous system as a community of neurones arranged in systems and groups having special functions. Like all cells, the neurone nourishes itself and is not nourished; certainly it depends for its development, life and functional activity upon a suitable environment, but it must also possess an inherent vital energy by which it can assimilate and store up nutrient material which may be regarded as *potential* (latent nerve energy), to be converted into nerve force as required. A constant constructive and destructive bio-chemical process occurs in the neurones of a healthy nervous system, latent nervous energy is high and the sense of fatigue is the natural indication for sleep and repose, whereby it is constantly recuperated. In the neuropathic or psychopathic individual it may be conceived that in some portion of the nervous system, especially the brain, there may exist communities, systems or groups of neurones with inherited low potential, readily becoming exhausted, and, under the influence of altered blood states or stress, especially liable to functional depression, from which arise function-paralysis and melancholia. Again, the bio-chemical substance which represents potential in the nervous system may be in a chemically unstable condition, so as readily to fulminate when excited by abnormal conditions (*e.g.* toxic conditions of the blood), thus acting as a centre of discharge of nervous energy, which may be manifested by mental or bodily symptoms. We know that in strychnia and tetanus poisoning the most localized peripheral excitation will cause general muscular spasm; in both toxic conditions the spread is probably due to a bio-chemical change in the protoplasm of the spinal neurones, whereby the excitability is greatly increased and a slight stimulus is sufficient to fulminate the whole system of motor neurones. In epilepsy and other paroxysmal neuroses and psychoses it is possible that some altered condition of the blood, when associated with an inherited bio-chemical instability of certain groups, systems or communities of neurones, may act as a *fulminating agent.* In neuralgia and local hyperaesthesia the slightest general or distant local irritation suffices to produce pain; thus coughing, the vibration of a passing train or the slamming of a door may produce pain by the stimulation of the hyper-excitable neurones. Moreover, it must be borne in mind that the symptoms of nervous disease are due as much to normal physiological functional activity improperly applied, as to actual loss of function occasioned by disease. Thus squint, caused by paralysis of one of the muscles of the eyeball, causes less trouble to the patient than the double vision occasioned by the physiological activity of the two retinae, upon the corresponding points of which the images are prevented by the paralysis from falling.

B. The *external causes* producing morbid changes in the nervous elements are: I. Abnormal conditions of the blood and lymph, by which the neurones are poisoned and their metabolism morbidly affected. II. Excess or deficiency of normal stimulation, or existence of abnormal stimulation. III. Injury or diseases of supporting, enclosing or vascular tissues.

I. *Abnormal Conditions of the Blood and Lymph.*—The immediate environment of all the cellular elements of the body is lymph, and in the central nervous system there is a special form of lymph, the cerebro-spinal fluid, which is secreted by the choroid plexus in the venticles of the brain. The neurones, like other cellular elements, are bathed in the lymph, and extract from it the materials necessary for their growth and vital activities, casting out the waste products incidental to the bio-chemical changes which are continually taking place. The lymph, therefore, serves as a medium of exchange between the blood and the tissues, consequently the essential causes of change in environment of the nervous elements (neurones) are: (1) Deficiency or absence of blood-supply to the nervous system in general (as after severe haemorrhage), or to some particular portion, owing to local vascular disturbance or occlusion. (2) Alterations in the normal condition of the blood, due to (*a*) deficiency or absence of certain essential constituents, (*b*) excess of certain normal constituents, (*c*) the presence of certain abnormal constituents produced within the body, or entering it from without.

(1) *Quantity of Blood Supply.*—Syncope or fainting occurs when the blood supply suddenly fails to reach the higher centres of the brain; this usually arises from sudden reflex arrest of the heart's action. If a portion of the central nervous system is cut off from its arterial blood supply by embolic plugging or by clotting of the blood in a vessel with diseased walls, the portion of the brain substance thus deprived of blood undergoes softening, the nervous elements are destroyed, and the systems of nerve fibres, which have had their trophic and genetic centres in the area destroyed, undergo *secondary degeneration.* Clotting of the blood in the veins may also give rise to destructive softening of the brain, and similar secondary degeneration.

(2) *Quality of Blood Supply.*—(*a*) *Insufficiency of oxygen*, due to poverty of the colouring matter or of the number of the red corpuscles, which constitutes the various forms of anaemia, leads to functional depression, lassitude and mental fatigue. Impoverishment of the blood in women by frequent pregnancies and excessive lactation causes neuralgia, nervous exhaustion and, in the neuropath, hysteria, neurasthenia, melancholia and mania. The mental depression, and the tendency that the various neuroses and psychoses have to occur and recur at the time of the menstrual and climacteric periods in women, suggests the possibility of an alteration in the composition of the blood, either in the nature of an auto-intoxication or "sub-minimal deficiency," as the probable contributory factor of the mental disturbance. It may be remarked that eclampsia, puerperal and lactational mania are relatively common forms of insanity in women; although sometimes of septic origin, they more frequently are occasioned by some morbid metabolism as yet little understood. The most striking examples we have, however, of the effect of absence or "sub-minimal" deficiency of a normal constituent of the blood upon the development and functions of the nervous system are afforded by cretinous idiots, who are born without thyroid glands, and whose brains never develop in consequence; and by those people who suffer from the disease known as *myxoedema*, occasioned by the absence of iodothyrin, a product of the internal secretion of the thyroid gland. The proof of this is shown by the disappearance of the nervous phenomena, slowness of thought, slowness of speech, &c., after a preparation of the gland has been continuously administered by the mouth. Even cretinous idiots when subjected in early life to thyroid treatment improve considerably. The removal of the testicles in the male may produce a profound effect upon the nervous temperament; for probably there is an internal secretion of this gland in the male, as of the ovary in the female, which has some subtle influence upon the functional activity of the nervous system. The seminal fluid contains a large amount of complex phosphorus-containing substances, which, lost to the body by sexual excess or onanism, have to be replaced by the blood; the nervous system, which also needs these complex organic phosphorus compounds, is thereby robbed, and neurasthenia ensues. Brown-Séquard's testicular injection treatment for many nervous complaints, based upon this idea, has not, however, met with much success.

(*b*) *Excess of certain Normal Constituents in the Blood.*—Excess of carbonic acid causes drowsiness, and probably in asphyxia is one of the causes of the convulsions. All the series of the nitrogenous waste products—the most highly oxidized, most soluble and least harmful of which is urea—are normal constituents of the blood; but should the oxidation process be incomplete, owing to functional or organic disease of the liver, or should these substances accumulate in the blood, owing to inadequate function of the kidneys, a toxic condition, called uraemia, may supervene, the nervous manifestations of which are headache, drowsiness, unconsciousness or coma, epileptiform convulsions and sometimes symptoms of polyneuritis. Again, in Graves's disease, nervous phenomena, in the form of exophthalmos, fine tremors, palpitation and mental excitement, have by some authorities been explained by the excess of thyroid internal secretion, due to the enlargement and increased functional activity of the gland. The successful treatment of Graves's disease by the administration of the blood serum and milk of animals (goats), which had the thyroid glands removed, supports this theory.

(*c*) The presence of *abnormal constituents in the blood* is a most important cause of disease of the nervous elements. We may consider the subject under the following headings: Poisons produced within the body (*α*) by perverted function of organs or tissues, auto-intoxication; (*β*) by the action of micro-organisms, protozoa and bacteria, upon the living fluids and tissues of the body; (*γ*) poisons introduced into the body from without, in the food and drink, or by inhalation.

(*α*) *Poisons resulting from perverted Function of the Organs.*—In the process of digestion a number of poisonous substances, *e.g.* albumoses, &c., are produced, which, although absorbed in the alimentary canal, are prevented by the living epithelium, and possibly by the liver, from entering the systemic circulation. Fatigue products, *e.g.* sarcolactic acid in prolonged muscular spasms, may lead to auto-intoxication. Excess of uric acid in the blood is associated with high arterial pressure, deposits of lithates in the urine, headache and nervous irritability; it is an indication of imperfect metabolism and auto-intoxication, as shown by the fact that marked improvement occurs by suitable diet and treatment. Phosphoruria, oxaluria and glycosuria, tokens of deranged metabolism, may be associated with various nervous phenomena. Bile in the blood, cholaemia, resulting from obstructive jaundice, may be attended by stupor and psychical depression; and the term melancholia, signifying "black bile," indicates the importance which has long been attached to the liver as an organ the derangement of which causes nervous depression. The rapidly fatal results attending acute yellow atrophy of the liver, namely, the profound changes in the urine, the jaundice and the nervous phenomena of delirium, motor irritation, delusions, stupor and coma, demonstrate the important part this organ plays in preserving the normal quality of the blood. The delirium and coma which sometimes supervene in diabetes, heralded by acetonaemia, is another instance of auto-intoxication. The coma is very possibly due to the saturation of the sodium salts of the blood by aceto-acetic and oxybutyric acids, products of imperfect proteid metabolism. The effect of this would be an interference with the elimination of carbonic acid in the processes of tissue and pulmonary respiration. Again, in pernicious and certain grave anaemias, the degenerative changes in the spinal cord found in some cases is due, not so much to the defect in the red corpuscles, as to some neuro-toxin, which probably arises from imperfect metabolism or absorption from the alimentary canal. In this question of auto-intoxication, it must be remarked that all the tissues of the body are mutually interdependent. If one suffers, all suffer, and a disease of one organ or tissue is thereby apt to establish a vicious circle which is constantly enlarging; therefore nervous symptoms manifesting themselves in the course of a disease add much to the gravity of the complaint.

(*β*) *Poisons produced by Infective Micro-organisms.*—Some of these poisons have a general devitalizing influence, by an alteration of the blood and the production of fever. In the course of the acute infectious diseases, typhoid, typhus, smallpox, scarlet fever, measles, influenza, also tuberculosis and septicaemia, delirium is a frequent complication; it may be the result of high fever or prolonged fever, or directly due to the poison, or the two combined. In severe cases stupor and coma may occur, and it has been shown that in this extreme stage the nerve cells undergo an acute morbid bio-chemical change. These particular poisons have no selective toxic action upon a particular part of the nervous system, and symptoms not only during, but after, the acute illness are liable to supervene, especially in a neuropathic individual. Thus many cases of neurasthenia, insanity, neurosis, also neuritis, date their origin from an acute specific fever. In cerebro-spinal meningitis, tubercular meningitis, acute delirious mania and leprous neuritis, the inflammation of the membranes of the brain and spinal cord is due to the growth of the specific organism in the lymph and interstitial tissue elements.

Poisons may have a *selective influence* upon some part of the nervous system. The syphilitic poison is the most important factor in the production of two progressive degenerations of the nervous system—one affecting especially the afferent conducting tracts of the spinal cord, namely, locomotor ataxy, and the other affecting especially the frontal and central convolutions of the cerebral hemispheres, namely, general paralysis of the insane. A striking instance of the selective action of the syphilitic poison is shown in the fact that only in persons affected with acquired or inherited syphilis is a symptom known as Argyll-Robertson pupil found; this is the absence of the pupil reflex contraction to light, while that for accommodation persists. Seeing that this is the most common objective phenomenon in the two diseases mentioned, it strengthens the presumption,

NEUROPATHOLOGY

PLATE I.

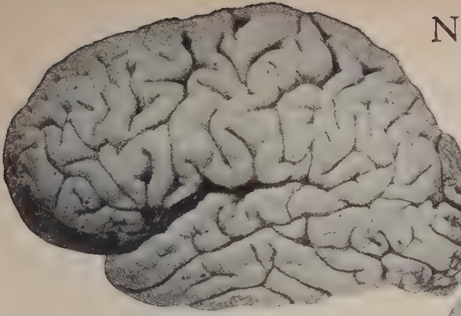


FIG. 1. Left hemisphere, case of delusional insanity; this in all respects might pass for a normal brain.

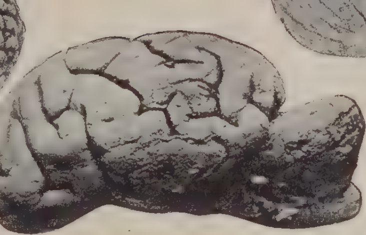


FIG. 2. Brain of a micro-cephalic idiot, which weighed only eight ounces although its possessor was an adult woman. The striking lack of development of the hemispheres is shown in their small size, whereby the cerebellum is almost entirely uncovered; moreover the convolutional pattern is simpler than that of an anthropoid ape's brain.

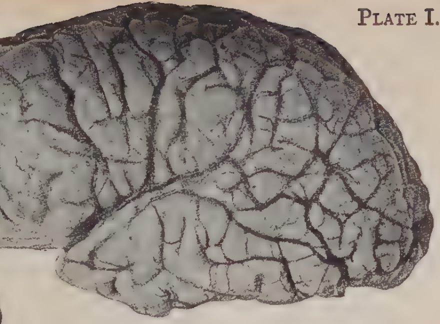


FIG. 3. Left hemisphere, case of abscess of the frontal lobe: the convolutions and sulci are obliterated and the membranes thickened, so that the fore part of the brain presents the appearance of a membranous bag; this contained a large amount of pus.

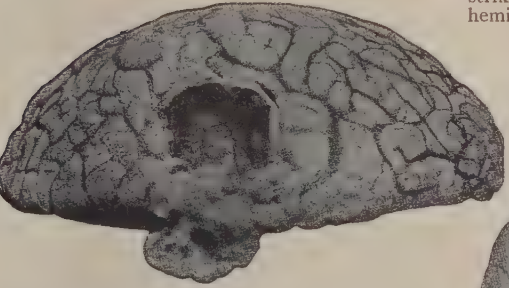


FIG. 4. Right hemisphere seen from above instead of laterally: a hole corresponding to the middle of the central convolutions is seen, out of which a tumour is displaced towards the middle line.

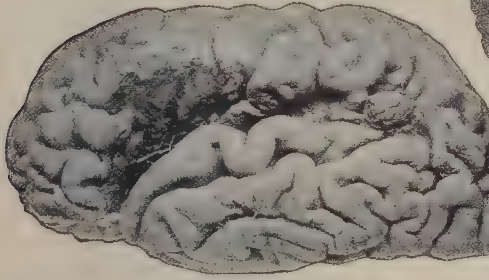


FIG. 5. Left hemisphere of a woman who for 11 years suffered with *Motor aphasia* paralysis of the lower half of the right side of the face, deviation of the tongue to the right and some weakness in the right leg and arm.

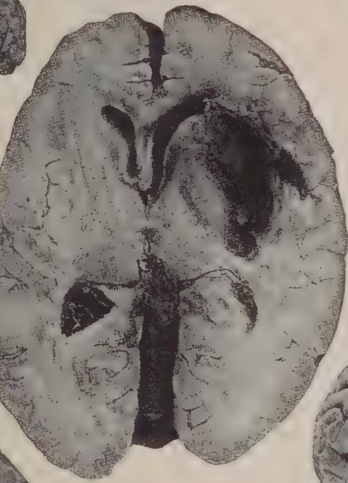


FIG. 6. Brain from a case of apoplexy: the tops of the hemispheres have been sliced off to show the haemorrhage (dark patch) in the right centrum ovale, which has ruptured the fibres proceeding from the motor area of the brain, situated between the basal ganglia.

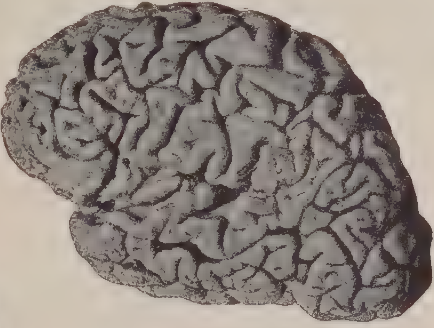


FIG. 7. Left hemisphere: a case of advanced dementia, showing atrophy of the convolutions, with deep and wide sulci intervening.

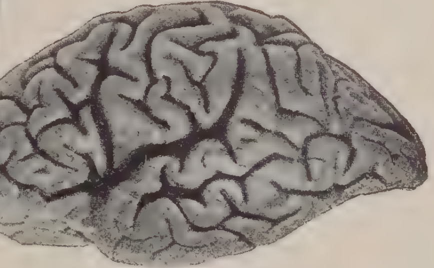


FIG. 8. The brain of an adult congenital imbecile. There is a very simple convolutional pattern in comparison with the other brains, shown in the figures. The convolutions are small, the secondary gyri are deficient in numbers. The sylvian fissure turns obliquely upwards and there is an obvious deficiency in the superior and inferior parietal lobes.

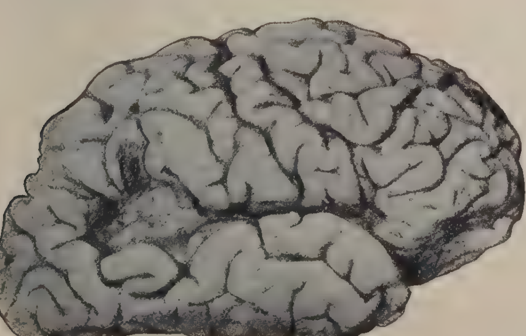


FIG. 9. Right hemisphere of a woman who for many years was the subject of *sensory aphasia*. The left hemisphere showed a similar lesion to the right but rather more extensive.

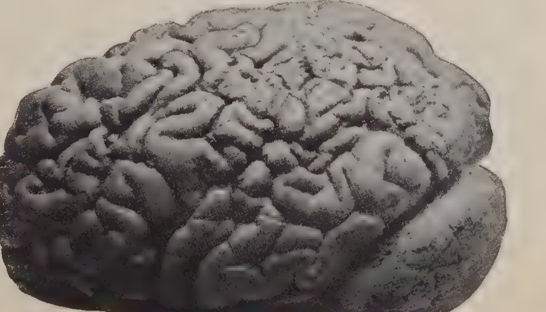


FIG. 10. Left hemisphere and cerebellum of a case of porencephaly. A local atrophy of the convolutions, owing to a vascular lesion before birth, is seen in the parietal lobe.

PHOTOGRAPHS OF THE BRAIN (ABOUT $\frac{1}{3}$ THEIR NATURAL SIZE) ILLUSTRATING VARIOUS PATHOLOGICAL CONDITIONS.

NEUROPATHOLOGY

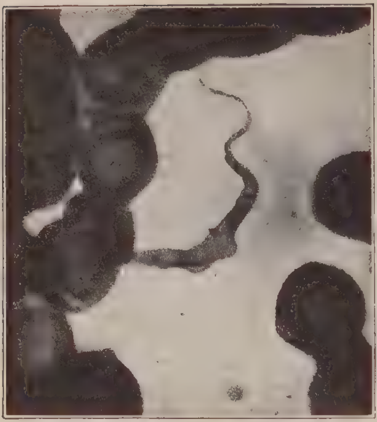


FIG. 1.—Trypanosoma gambiense in the blood from a case of sleeping sickness in a European. The undulatory membrane is clearly seen; the head of the organism with its micronucleus is in contact with a red blood corpuscle. Magnification 2000 diameters.

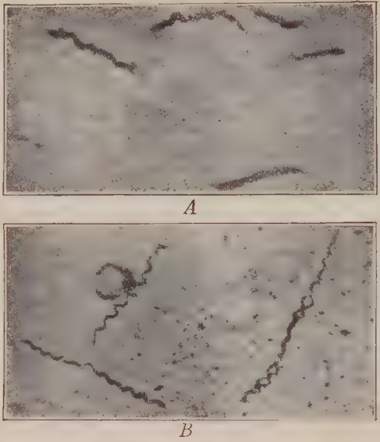


FIG. 2.—*A*. and *B*. The spirochaete pallidum. *A* shows the organisms seen in a section of mucous tubercle stained by Levaditi's silver method; the lowest with 8 equal spirals and a pointed end is the most typical. Magnification 1200. *B*. Spirochetes in a smear preparation stained by Leishman. Magnification 2260.

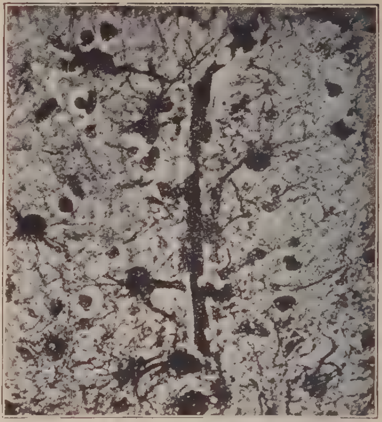


FIG. 3.—Section of the brain of a European who died of sleeping sickness, showing an enormous increase of large branching neuroglia cells around a small vessel of the cortex. Magnification 450.

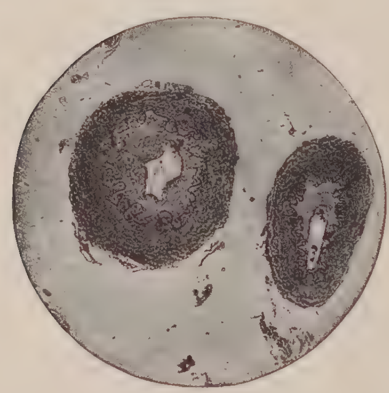


FIG. 4.—Very marked syphilitic arteritis, showing great diminution of the lumen, mainly caused by an inflammatory thickening of the inner coat. Magnification 5.

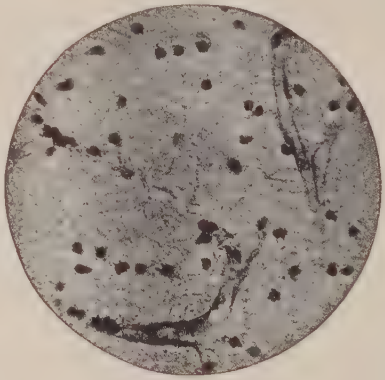


FIG. 5.—Section of the base of the brain of a monkey that died of experimental sleeping sickness caused by inoculation of the Trypanosoma gambiense. Magnification 250.

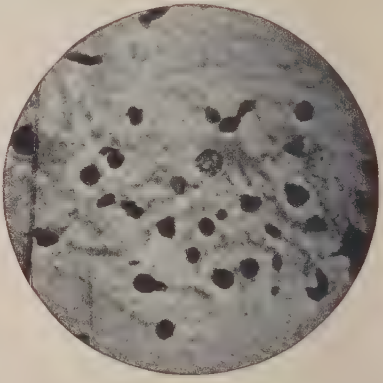


FIG. 6.—Longitudinal section of a perivascular sheath of the cortex of a monkey that died of experimental sleeping sickness. The large branching neuroglia cells are seen undergoing proliferation. Magnification 600.

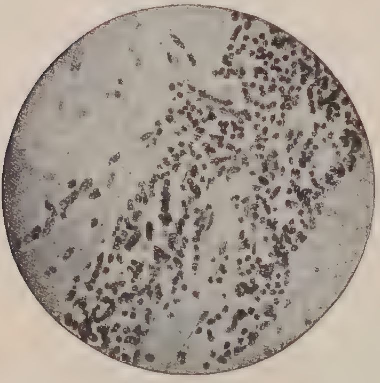


FIG. 7.—Longitudinal section of a small vessel of the cortex from a case of well-marked general paralysis of the insane. Magnification 250.

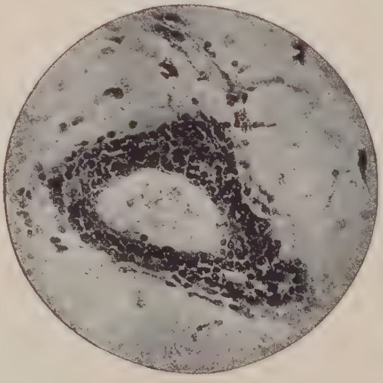


FIG. 8.—Transverse section of a small vessel of the cortex from a case of sleeping sickness, showing the perivascular cell infiltration of lymphocytes and plasma cells. Magnification 250.

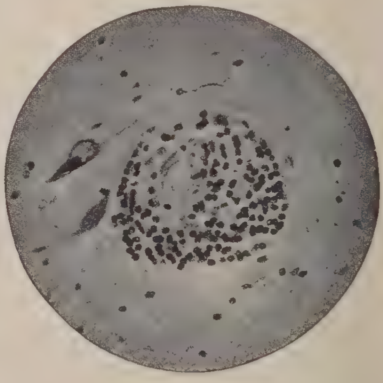


FIG. 9.—Transverse section of a small vessel of the cerebral cortex from a case of syphilitic gummatous meningitis, showing the same perivascular cell infiltration of lymphocytes and plasma cells as seen in figs. 7 and 8. Magnification 250.

based on experience, that the syphilitic poison is the cause of these diseases in the majority of instances. Again, syphilis, when it attacks the supporting, enclosing and nutrient vascular tissues, shows a predilection to affect structures about the base of the brain, and paralyses of the third nerve are almost pathognomonic of this disease. In rabies, although the whole nervous system is charged with the poison, the medulla oblongata (as shown by the symptoms) is especially affected. Again, in tetanus the bacilli are only found in the wound; they must therefore be comparatively few in number, but they elaborate a virulent poison, which affects particular groups of neurones. The fact that lockjaw nearly always occurs first, shows that the poison selects the motor nucleus of the fifth nerve; but it is remarkable that experiment has shown that the tetanus toxin, if mixed with an emulsion of nervous matter before injection into an animal, loses its toxicity. This fact indicates its affinity for nervous matter, and also a power of absorption of the poison by some chemical substance in the nervous matter. Another example is offered by diphtheria. A neuro-toxin is produced by the local action of the bacilli, for they do not become freely generalized in the blood and tissues. Whether the poison is a direct production of the bacilli themselves, or is an auto-toxin created in the body itself, by an influence exerted on the living fluids and tissues by a ferment-like product of the bacilli, is not determined. But whatever may be the source of the toxin, its effects upon the neurones are constant, as shown by the sufferings of the patients—paralysis of the soft palate, with nasal speech and regurgitation of fluids through the nose when swallowing is attempted; inability to read, owing to the paralysis of the muscle of accommodation; weakness and inco-ordination of the limbs, which may amount to paralysis; absence of the knee-jerks; and often skin anaesthesia

Protozoa and diseases of the nervous system.

The relation of protozoa to the existence of widespread diseases affecting men and animals is becoming yearly of greater importance and interest. Certain hitherto obscure diseases in which the nervous system is profoundly affected are now explained by the invasion of the tissues of the body by these lowly organisms, for example, Sleeping Sickness, the cause of which has been definitely proved to be the Trypanosoma gambiense (see Plate II. fig. 1).

The discovery by Schaudinn of the presence of the Spirochaete Pallida (see Plate II. fig. 2) in the primary and secondary lesions of seventy successive cases of syphilis, and the general acceptance of this organism as the cause of the disease, taken together with the fact that in many respects it simulates the trypanosome in its mode of division and other characters, tend to prove that syphilis is also a protozoal disease.

The bacterial invasion of tissues is generally characterized by a migration of polymorpho-nuclear leucocytes, but protozoal invasion is characterized by a formative hyperplasia of the fixed cell tissues, endothelial, epithelial and conjunctival, and there is a close similarity in the defensive reaction of the tissues to all forms of protozoal invasion (see Plate II. with explanatory text).

If the cause of rabies be regarded as proved since the discovery of Negri bodies, we may assume that just as in malaria the *Haematozoon malariae* undergoes its endocellular development in the red blood corpuscle, the protozoon of rabies undergoes its endocellular development in the nerve cell.

Only a short time has elapsed since Negri showed that in cases of rabies, whether experimental or otherwise, curious bodies measuring from 1 μ to 20 μ could be constantly found in the nerve cells, and that these bodies are not found in the nerve cells in any other disease; so that even if the theory advanced that they are endocellular forms of protozoa prove not true, yet the discovery affords a valuable and expeditious means of determining whether a suspected animal suffered with rabies or not. It is known that the salivary glands and saliva contain the virus, even before the animal shows symptoms. It is known too that the central nervous system contains the virus and that it multiplies there. Experimental inoculation can be made either from the saliva or an emulsion of the central nervous system of an animal suffering with rabies. Moreover, the virus can pass through a Berkfeldt filter; and if the filtrable product be injected into an animal, the animal thus inoculated will die of rabies and exhibit the Negri bodies. There are only two conclusions to be drawn from these observations: (1) If it be a protozoal disease, the organism at one period of its developmental cycle must be so small as to be able to pass through the pores of the Berkfeldt filter. (2) Negri bodies are the result of intra-cellular degenerative changes caused by an elective affinity of the virus for the protoplasm of the nerve cell. The virus, whatever it may be, does not exist in the blood and other organs and tissues. Seeing that the Negri bodies cannot be found in the saliva, although the saliva contains the virus, nor can they be found in the peripheral nerves, although the virus passes by the lymphatics of the nerves to the nerve cells of the spinal ganglia and central nervous system, it must be concluded that the filtrable virus travels to the central nervous system and there increases.

It is a remarkable fact that before the discovery of the Negri bodies, the diagnosis of rabies was made by microscopic examination of the spinal and sympathetic ganglia, particularly the ganglia of the vagus and fifth nerves. Changes were found similar to those met with in other protozoal diseases, namely, sleeping sickness, dourine and syphilis. These changes were proliferation of the interstitial connective tissue cells forming the supporting structure of the ganglion and hyperplasia of the lymphatic endothelial cells forming the capsule containing the nerve cells.

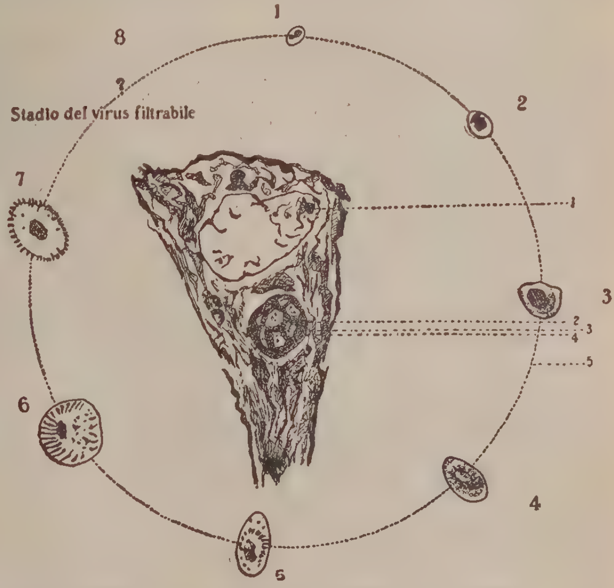
The diagram here given (fig. 1) after Volpino explains the supposed developmental cycle of the protozoon which is presumed to be the cause of rabies. The weak link in the chain is the assumed sporozoit which is so small as to be capable of passing through a Berkfeldt filter. It has taken twenty years to lead to the complete knowledge of the life history of the malarial parasite and its relation to the disease, and all we can say is that there is now a certain amount of evidence forthcoming which tends to show that rabies is due to a protozoon, which Calkins, who discovered a similar body in the epithelial cells of variola, places among the rhizopods.

Trypanosome diseases and affections of the nervous system.

There are certain chronic trypanosome infections in which the nervous symptoms form a special feature of the disease, notably *sleeping sickness* (see Plate II. fig. 1) and a disease affecting horses, termed mal de coit or dourine.

The chronic trypanosome affections resemble in many respects syphilis; they are characterized by local infection, enlargement of the nearest lymphatic glands, a general polyadenitis and successive eruptions, accompanied by fever. The tissue changes are the same whether we examine the primary seat of infection, papular eruptions on the mucous membrane or the skin, or the lymphatic glands.

When the nervous system is affected a local or general chronic meningo-encephalitis is set up, characterized by a meningeal and perivascular infiltration with lymphocytes and plasma cells, occasioned by a chronic irritative process, presumably caused in the case of sleeping sickness by the presence of trypanosomes in the cerebro-spinal fluid (see fig. 8, Plate II.). The same perivascular and meningeal infiltration with plasma cells and lymphocytes is found in syphilitic and parasyphilitic diseases of the nervous system (see Plate II., figs. 7 and 9).



From a coloured plate in *Centralblatt für Bakteriologie*, by permission of Gustav Fischer.

FIG. 1.

Pathology of the cerebro-spinal fluid.

The significance of pathological changes in the cerebro-spinal fluid has recently become of great importance in the diagnosis of nervous diseases, and a short account of the subject in this article will therefore not be out of place. The cerebro-spinal fluid is clear like water; it has a specific gravity of 1006 and resembles in its composition the blood *minus* its corpuscular and albuminous constituents. It is secreted by the choroid plexus, and if any cause, such as tumour or meningitis, should interfere with its escape from the ventricles it gives rise by pressure to *internal hydrocephalus* and cerebral anaemia which may occasion epileptic convulsions and various degrees of drowsy stupor, lethargy, unconsciousness and even coma. Withdrawal of the fluid by lumbar puncture and by tapping the ventricles of the brain has been employed in treatment, but without very satisfactory results. If, however, lumbar puncture has proved of but little use in treatment, it has proved of inestimable service in the diagnosis of various diseases of the central nervous system. The fluid withdrawn may be examined in various ways which are complementary to one another.

It should be centrifuged and the deposit examined microscopically if necessary after staining by suitable methods; the existence of cells in a fluid which normally contains no cellular elements indicates disease of the central nervous system. In general paralysis, syphilis of the nervous system and tabes dorsalis even in early stages of these diseases, the deposit is seen to consist almost entirely of lymphocytes. Some evidence of the progress of the disease and the effect of treatment may be obtained by counting the number of cells at different periods. In tubercular meningitis there are also lymphocytes in abundance although usually tubercle bacilli cannot readily be found, yet bacilli are present, for injection of the fluid into a guinea pig is a certain means of determining whether it is tubercular meningitis or not; for if it is, the animal is sure to develop tubercle. In epidemic cerebro-spinal meningitis the cells in the deposit are polymorphonuclear leucocytes, and in the leucocytes can be seen the specific organism *Diplococcus intracellularis* with its characteristic staining and cultural characters. Septic, pneumonic and pyogenic organisms may also invade the central nervous system giving rise to meningitis, and in these cases the deposit will be polymorpho-nuclear leucocytes, and perhaps the specific organisms may be seen in stained preparations; but if not, they can be obtained by cultural methods. In all operations of this kind antiseptic precautions must be adopted both for the safety of the patient and the reliability of the findings, otherwise organisms in the skin may contaminate the fluid withdrawn.

Other formed elements which may be found are large cells, macrophages containing blood pigment; these cells indicate that some haemorrhage has occurred. One of the most important uses of lumbar puncture has been the discovery of the cause of sleeping sickness. The fluid withdrawn and centrifuged contains, as one would expect from the lesions in the brain and spinal cord, large numbers of lymphocytes and plasma cells (see Plate II. fig. 10), but besides, the actively moving organisms (*Trypanosoma gambiense*) (see Plate II. fig. 1) which are the essential cause of the disease. It has been remarked that the normal cerebro-spinal fluid is devoid of proteins, but in the various forms of disease above described as containing cells in the centrifuged deposit, there is also in the fluid an appreciable amount of proteins. If pathological cerebro-spinal fluid be added to an equal quantity of saturated solution of sodium sulphate there will be a distinct turbidity indicating the presence of proteins in appreciable quantity. This appreciable quantity of proteins is especially significant in the case of fluid withdrawn from cases of general paralysis or tabes, for it goes *pari passu* in amount with a reaction which is known as the Wassermann *sero-diagnostic reaction for syphilis*; a reaction, however, which is too complicated to explain here, but which is of the greatest importance for the diagnosis of general paralysis and tabes dorsalis. The finding of the *Trypanosoma gambiense* in the cerebro-spinal fluid in sleeping sickness led to the belief that the specific organism of syphilis, Spirochoete pallidum might be found in the cerebro-spinal fluid in syphilitic diseases of the nervous system, but although in a few instances successful inoculation of animals with syphilis by injection of the cerebro-spinal fluid has been effected, yet the organism has only once been found in the fluid withdrawn by lumbar puncture. It has long been a puzzle why only certain individuals, about 5%-8% of those infected with syphilis, should subsequently suffer with diseases of the nervous system. The skin and mucous orifices are the most common sites of secondary and tertiary lesions and after this the nervous system, but no tissue or structure in the body is exempt. It is probable that the virus attacks tissues when in a low state of resistance in a random metastatic manner. It is necessary to distinguish between these true syphilitic lesions which are the result of the reaction of the tissues to the living virus and the parasyphilitic affections, which own a different cause. The former may be most successfully treated with mercury, which has the power of devitalizing the specific virus and preventing its multiplication, the same as atoxyl prevents the multiplication of the trypanosomes. Iodide of potassium favours the absorption of the degenerative products of the cells, and syphilitic tumours may rapidly resolve and disappear under the influence of these drugs. Nervous symptoms even so severe as to threaten a rapidly fatal termination may disappear with energetic treatment when they are due to the syphilitic virus producing an inflammatory reaction of the tissues; not so, however, when the symptoms are slow, insidious and progressive, due to a primary decay of the neurones, *e.g.* the parasyphilitic affections tabes dorsalis and general paralysis of the insane, which are really one and the same disease owning the same cause. We can understand that it may be a chance whether a man suffers with true brain or spinal cord syphilis, because it may be a chance whether the virus is carried there by the blood-vessels and lymphatics, and if carried there finds a suitable nidus to develop. But the parasyphilitic affections appear to be due to a premature primary decay of the neural elements owing to bio-chemical changes in the body induced by reaction to the syphilitic virus. There are a good many facts now forthcoming which show that the subjects of parasyphilis present mild symptoms of syphilis, and upon an average it is not until ten years later that they develop nervous symptoms, which are aggravated rather than benefited by mercury. Such subjects are immune to a second attack of syphilis, and the examination of the blood and cerebro-spinal fluid by the Wassermann reaction of the deviation of the Complement reveals the fact that there is a bio-chemical change; the presence of this reaction may be correlated with the fact that these fluids contain lipoid substances and a globulin in excess. The cerebro-spinal fluid contains these lipoid substances and globulin in proportion to the degree of decay of the neural structure; they arise from the destructive metabolism of the neural elements. But the same lipoid substances and globulin are found only in the blood of syphilitic individuals, consequently it must be supposed that in general paralysis and tabes certain groups and systems of neurones undergo decay from excessive metabolic activity which is brought about by two factors (1) a bio-chemical stimulus, the syphilitic poison, (2) excessive physiological stress, which in *non*-syphilitic individuals would only lead to cerebral or spinal neurasthenia.

Sleeping Sickness is characterized by a progressive *lethargy*, paresis, tremors and the signs and symptoms of neural exhaustion without neural destruction; it comes on slowly and insidiously often years after infection and eventually terminates fatally by intercurrent disease or paralysis of the bulbar centres. Examination of the central nervous system explains the fatal lethargy; the perivascular and meningeal lymphatics are filled with lymphocytes and plasma cells (Plate II. fig. 6.); moreover, the neuroglia supporting cells have undergone a rapid formative proliferation (Plate II. figs. 3 and 5). The effect of this morbid process is to deprive the neural elements of oxygen and nutrition; the neurones in consequence, although not destroyed, are nevertheless unable to function for more than a brief period.

(γ) *Poisons introduced into the Body.*—The most widespread and potent cause of nervous and mental disease is the abuse of alcoholic stimulants. At least 20% of the inmates of the asylums of London are admitted with a history of alcoholism. In not more than 10% is alcohol the efficient cause of the mental disease; in many it is only a contributory factor, and in not a few the lapse from moderation to intemperance is the first sign of the mental breakdown. Most of the patients admitted inherit the neuropathic tendency, and it is a rare thing, among such, to find cirrhosis of the liver with ascites, a condition which indicates long persistent spirit-drinking. The writer, from a very large experience as pathologist to the asylums of London, only remembers one such case, and that was in a notorious woman who was convicted nearly four hundred times for drunkenness before she could be certified as of unsound mind, a fact which indicates that she inherited a very stable nervous constitution. To people with unstable nervous systems a relatively small quantity of alcohol may act as a poison. Thus epileptics, imbeciles, criminals, potential lunatics, hysterics, neurasthenics and the subjects of head injury are liable to become anti-social and dangerous to themselves and others by indulgence in quantities of alcohol which would have no harmful effect upon the mentally stable and sound individual. Alcohol may produce acute delirium, with fine tremors, and, generally, visual hallucinations of a horrible nature, indicating acute toxic influence upon the brain. This apparently acute form of alcohol poisoning is met with in chronic inebriates especially; it is much commoner in men than in women, and it is remarkable how a severe injury or illness, such as pneumonia, will bring out *delirium tremens* in a drunkard. Chronic alcoholism manifests itself in a variety of ways according to the inborn temperament of the individual. The well-fed man with an inborn stable well-balanced mental organization is able to consume daily large quantities of alcohol with no other obvious effect than the lowered moral sense of indulgence in a vicious habit. However, chronic alcoholics form a large proportion of those convicted for crimes of violence, homicide, suicide and sexual offences. Alcohol acts especially upon the higher centres of the brain, and a drunken man may exhibit "the abstract and brief chronicle of insanity, going through its successive phases in a short period of time" (Maudsley). The effect on the nervous system of chronic tippling may be dementia, a very characteristic manifestation of the mental degradation being absence of knowledge of time and place, personal illusions and loss of memory of recent events, indicating a failure of receptivity and of the formation of memory-pictures in the higher centres, mental confusion, delusions of persecution, and especially a morbid jealousy with suspicions of fidelity of the husband by the wife or of the wife by the husband. A certain amount of improvement may occur when total abstinence is enforced, which shows the poison has damaged but not destroyed the nervous elements. There is also a form of mental disease characterized especially by hallucinations of hearing and vision, associated with delusions usually of a persecuting nature, unaccompanied by other marked mental disorder. Abstinence and proper control generally ends in recovery, but such cases so frequently relapse that it is fairly certain that alcohol is an exciting factor to a morbid or insane temperament. Besides mental symptoms of chronic alcoholic poisoning, there is frequently paralysis, affecting especially the lower limbs (structures suffer most where vitality is least), although the upper limbs, and even the respiratory muscles, may be affected in severe cases. The patient, usually of the female sex, becomes helpless and bedridden, and death frequently occurs from heart failure. Characteristic features of this affection are great tenderness on pressure of the muscles, especially of the calves, absence of reflexes, a variable degree of skin anaesthesia, wasting of muscles and alteration of the normal electrical reactions, and frequently pyrexia. There is no loss of control over the bladder and bowels, unless there is very marked dementia. This "complex of symptoms" points to a *peripheral polyneuritis*, although frequently changes occur also in the ganglion cells, from which the axis cylinders of the nerves have their origin (*vide* figs. 2, 3, 4, and 5). Alcoholic polyneuritic psychosis affecting women in many ways resembles delirium tremens; the fact that neuritis occurs much more frequently in women is probably associated with a greater liability to the influence of microbial toxins by absorption from the organs of reproduction. Many other poisons, notably lead and arsenic, the specific fevers before mentioned, syphilis and alterations of the blood due to imperfect metabolism, such as occur in diabetes and gout, may produce, or become important factors in producing, peripheral neuritis. The outbreak of arsenical neuritis from beer containing this poison in Manchester in 1900 is of interest, from the fact that the symptoms closely resembled acute alcoholic neuritis. A distinctive feature, however, was the pigmentation of the skin and the severity of the nervous symptoms. A disease which is common in the East, termed *Beri-beri*, is a form of neuritis, the cause of which is not exactly known (see BERI-BERI). Anaesthetic leprosy is an interstitial inflammation of the nerves due to the *Lepra bacillus*. Among the nervous diseases due to occupation may be cited lead-poisoning. This is peculiar in selecting the nerve which supplies the extensor muscles of the wrist and fingers, so that dropped wrist is almost characteristic of this form of toxic neuritis. Lead also produces a chronic inflammation of the cerebral cortex, *Encephalitis saturnina*, causing a complex of symptoms, namely, dementia, loss of memory, weakened intellect, paresis and epileptiform seizures, hallucinations of sight and hearing, and mental exaltation or depression. Mirror-makers suffer with characteristic fine tremors, from the slow absorption of mercury into the system. Workmen at indiarubber factories may suffer from severe mental symptoms, owing to the inhalation of the fumes of bisulphide of carbon. Serious nervous symptoms have followed carbon monoxide poisoning. Cases which have recovered from the immediate effects have suffered with dementia and symptoms of disseminated sclerosis, the result of multiple haemorrhagic softenings.

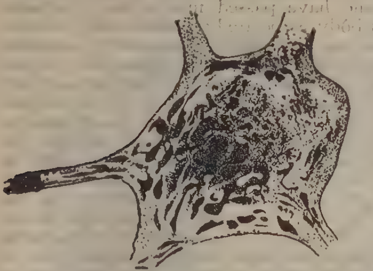


FIG. 2.

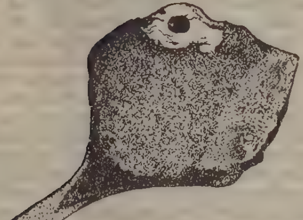


FIG. 3.

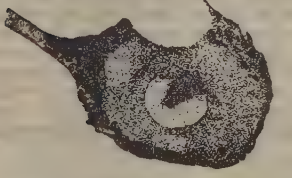


FIG. 4.

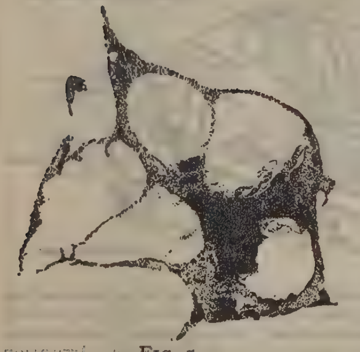


FIG. 5.

FIGS. 2, 3, 4 and 5.—Spinal motor cells in various stages of destruction, from a case of acute alcoholic poly-vacuolation. Compare with the appearances of a normal cell, fig. 12.

There are a certain number of poisons, besides alcohol, which act upon the nervous system when continually entering the body as the result of a *habit*, namely, absinthe, ether, cocaine, opium, morphia, hashish and tobacco. Each of these poisons produces a train of symptoms denoting a selective influence upon certain parts of the nervous system. In illustration thereof may be mentioned impairment of central vision in tobacco amblyopia.

The disease *pellagra*, an affection of the skin associated with degenerative changes in the brain and spinal cord and characterized by melancholy with suicidal impulses, sometimes mania associated with paresis, was long considered to be due to the eating of bad maize. But in 1910 the recent research on this disease, still in progress, seemed to negative this theory (see PELLAGRA). Another disease, *ergotism*, in an epidemic form, has affected poor people in Russia and North Germany when obliged to subsist upon bread made of rye which has been attacked by the ergot fungus. The poison thus introduced into the system produces progressive degenerative changes in the brain and spinal cord, which are manifested by psychical disturbances, such as slowness of thought, weakness of memory, dulness of perception, sometimes delirium and incoherence; other symptoms are blunted sensibility, dilated pupils, muscular spasms, perhaps even epileptiform seizures and ataxy, and, lastly, stupor deepening into coma. Sausage disease, due to eating decayed meat and fish infected with *Bacillus botulinus*, is associated with symptoms which frequently terminate fatally, and it has been shown that the symptoms are due to a poison which has a very destructive effect upon the nerve cells (fig. 6).

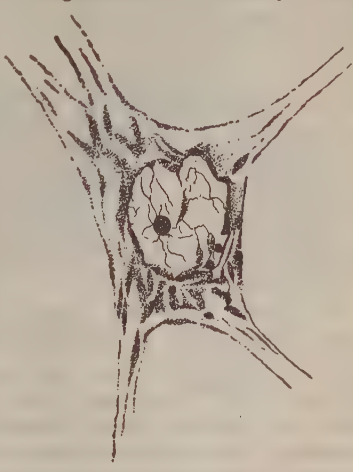


FIG. 6.—Cell illustrating swelling of nucleus and chromatolysis in acute toxaemia produced by poison of bacillus botulinus. Compare with the appearances presented by a normal cell, fig. 12.

II. *Normal and Abnormal Stimulation.*—The nervous system, in order to develop and manifest functional activity, requires suitable stimulation from without. Structure and function are mutually reciprocal and interdependent; for a structure which is not used will gradually lose its function, while its nutrition will also suffer, and in time atrophy may occur. Consciously and unconsciously, a continuous stream of impulses is pouring into the nervous system from without by the sensory channels, which are the avenues of experience and intelligence, and our somatic and psychical life depends upon the existence of such stimuli. The nervous system in the form of systems, groups and communities of neurones, each with special functions, yet all woven together in one harmonious whole, develops in a particular way in consequence of the awakening influence of these stimuli from without. Consequently nervous structures which are not used are liable to undergo regressive metamorphosis and atrophy; thus amputation of a limb in early life causes atrophy of the nervous structures which presided over the sensation and movement of the part. This is seen both in the grey and white matter of the spinal cord; there is also an atrophy of the psycho-motor neurones of the brain presiding over the movements of the limb.

A healthy physical, intellectual and moral environment of the individual is an essential factor in the prevention and cure of psychoses and neuroses, because it tends to develop and strengthen body and mind, deliberation, judgment and the higher controlling functions of the brain. A function not used will gradually disappear, and become more and more difficult to evoke. This fact is of importance in functional neuroses and psychoses, *e.g.* hysterical paralysis, melancholia and delusional insanity, because the longer mental or bodily function is left in abeyance, the more likely is the defect to become permanently installed. The converse is also true; the longer a perverted function exists, the more unlikely it is to disappear. Thus auditory hallucinations, a very important and frequent symptom in the insane, commence with indistinct noises: these are followed by "voices," which eventually become so distinct and real that the greater part of the patient's psychical existence is concentrated upon, and determined by, this abnormal stimulus from within, indicating progressive strengthening and fixation of the perverted functions of the mind, and progressive weakening and dissolution of the normal functions.

Mental pain in the form of grief, worry, anxiety, fright, shock, violent emotions (pleasurable or painful), disappointed love, sexual excesses or perversions, and excessive brain work, frequently precede and determine, in persons with the insane or neuropathic taint, various forms (*a*) of psychoses, *e.g.* mania, melancholia, delusional insanity; (*b*) of neuroses, *e.g.* chorea, hysteria, epilepsy, hystero-epilepsy; (*c*) or organic brain disease, *e.g.* apoplexy, thrombosis, general paralysis.

Visceral reflex irritation affords many examples of neuroses and psychoses, the symptoms of which are set up by irritation of the viscera, *e.g.* intestinal worms. Teething and indigestible food are often the exciting cause in infants and young children of convulsions, spasms of the glottis and tetany. Various functional and organic diseases of the female reproductive organs act as exciting causes in the production of hysteria, hystero-epilepsy, melancholia and mania; moreover, paroxysmal attacks in these diseases are more liable to occur at the menstrual period or menopause. The irritation of a carious tooth may produce spasmodic tic and trigeminal neuralgia. Wax in the ear may occasion vertigo and tinnitus; and errors of refraction in the eyes may be the cause of attacks of migraine, and even tend to excite epileptic fits in a person suffering from epilepsy. Numerous other examples of peripheral disturbance could be mentioned as exciting causes of nervous affection in neurotic individuals. Irritation of the terminals of the vagus in almost any part of its widespread visceral distribution may lead to vomiting. The characteristic pain of angina pectoris, which radiates down the inner side of the left arm, is explained by the fact that the cardiac branches of the sympathetic arise from the same segments of the spinal cord as the sensory branches of the ulnar nerve; consequently the pain is referred to the corresponding skin area supplied by this nerve. This is one example of a great number of *referred pains.*

III. *Injury or disease of enclosing or supporting structures* may lead to paralytic or irritative lesions of the nervous system, or the two may be combined. Blows or wounds of the head and spine may damage or destroy the nervous structures by shock or direct injury. Concussion of the brain or spinal cord may occur, as a result of injury, without any recognizable serious damage of the enclosing structures or even the central nervous system. Shock, due to concussion, can only be explained by a molecular or bio-chemical change in the nervous structures.

Direct injury or a fall fracturing the skull, driving the fragments into the brain, will cause direct destruction of the nervous tissue; but wounds and diseases of the enclosing and supporting structures, if producing simple non-infective inflammation, give rise only to such symptoms as accord with the nerve structure irritated or destroyed. Should, however, the wound or diseased structure become infected with micro-organisms, the disease spreads and becomes generalized likewise the symptoms. Of all the causes of infective inflammation, middle-ear disease, on account of its frequency and insidious onset, is the most important. It is very liable, when neglected, to be followed by a septic meningitis, encephalitis and brain abscess, the most frequent seat of which is in the adjacent temporal lobe, but it may be in other parts of the brain, *e.g.* the cerebellum and frontal lobe (Plate I. fig. 3). The peripheral nerves may be destroyed or irritated by direct injury, disease or new growth in adjacent tissues, or they may be involved in the callus thrown out round the seat of a fracture.

Diseases of the blood-vessels are among the most frequent causes of organic brain disease. Arteries or veins—more frequently the former—may become blocked or ruptured from various causes. The immediate effect is a disturbance or loss of consciousness, and the individual may be "struck down" (see APOPLEXY) and never regain consciousness (see COMA). Should the individual recover consciousness more or less permanent loss or disturbance of function will be the result. Paralysis of some form, especially hemiplegia, is the commonest result, but the loss or disturbance of function will depend upon the seat of the injury.

The cerebral arteries may be occluded by embolism; a portion of a clot or vegetation from a diseased valve of the left side of the heart may be detached, and escape into the circulation; and this is carried into one of the arteries of the brain, usually the middle cerebral, more often of the left side than the right. The area of brain tissue supplied by that artery is deprived of blood, and undergoes softening in consequence, resulting in paralysis of the opposite half of the body (hemiplegia) associated with aphasia when the paralysis affects the right side in a right-handed person (Plate I. figs. 5 and 9). When the embolus is infective, as it frequently is in ulcerative endocarditis, its lodgment in an artery of the brain, not only blocks the vessel but leads to an infective inflammation and softening of its coats, with the formation of an aneurism. The aneurism may suddenly rupture into the substance of the brain and produce apoplexy. In fact the majority of cases of apoplexy from cerebral haemorrhage recurring in young people are due to this cause. Softening may also arise from coagulation of the blood (thrombosis) in the arteries or veins. There are many causes which generally combine or conspire together to produce thrombosis, viz. a weak acting heart and altered conditions of the blood, and sometimes independently of vascular disease spontaneous coagulation in a vessel of the brain may occur. It is sometimes met with in the cachexia of certain grave diseases, viz. in phthisis and cancer, in typhus and pneumonia, after parturition and in marasmus at all periods of life, but especially in the very young and very old. But thickening, roughening and a degenerated condition of the cerebral arteries known as atheroma when associated with a weak acting heart is especially liable to give rise to thrombosis and softening, and this is a very common cause of apoplexy, paralysis and dementia in people who have passed middle life. General disease of the arteries of the body, associated especially with chronic Bright's disease and high arterial pressure, is frequently attended with the formation of minute miliary aneurisms upon the cerebral arteries, which may rupture and cause apoplexy. Haemorrhage into the brain from this cause is especially liable to occur in certain situations; one vessel in particular, supplying the basal ganglia, most frequently gives way, the effused blood tearing through the motor efferent fibres, which, proceeding from the cerebral cortex in the shape of a funnel, become aggregated together to form the neck between the two masses of grey matter—the optic thalamus and the corpus striatum (Plate II. fig. 6). The result is hemiplegia of the opposite side of the body. Disease of the arteries of the central nervous system, occurring in a person under forty, is generally due to syphilis, the virus of which produces an inflammation of the coats of the vessel, especially the inner (see Plate II. figs. 4, 9, 10). The thickening and narrowing of the lumen with loss of elasticity of the arteries of the brain generally, may suddenly or gradually set up conditions of cerebral anaemia and give rise to semi-comatose and comatose or even apoplectic states. Occlusion by the inflammatory proliferation or by the sudden clotting of blood in the diseased vessel may occur, the immediate effect of which may be an epileptic or apoplectic fit; the result is softening; and seeing that any or all the arteries of the brain may be affected successively, simultaneously, or at random, the symptoms may be manifold. They may be general or local, and not uncommonly are associated with inflammation of the membranes. The disease, under treatment, may abate, and the paralytic or mental phenomena partially or completely disappear, indicating the restoration, or partial restoration, of the circulation in the diseased arteries; sometimes with the lapse of treatment and sometimes without, new symptoms, such as paralysis of a fresh group of muscles or of the opposite side of the body, may manifest themselves, showing that the disease has attacked a fresh set of arteries. *Disseminated sclerosis* (*insular*) is another random morbid process, affecting especially the white matter, with certain characteristic symptoms of a progressive character, the pathology of which is not understood fully, but is probably due to some toxic cause. Islands of nervous tissue undergo a morbid change, commencing in

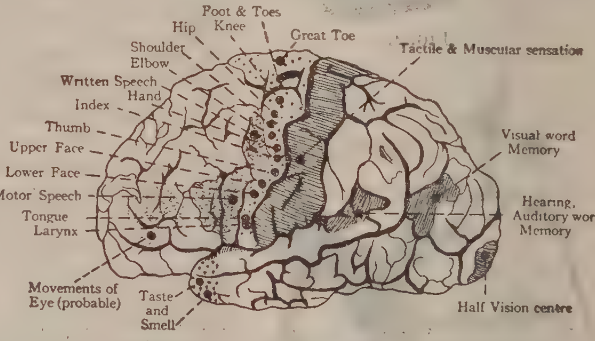


FIG. 7.—Diagram of left cerebral hemisphere, showing localization of function. The motor region is situated in front of the central sulcus, and is arranged in a series from "toe to larynx" downwards, corresponding in an inverse manner to the spinal series. Irritation of any part of this area will cause localized convulsive spasms, which may spread in a definite march to the whole motor area, as in Jacksonian epilepsy. Destructive lesions will cause paralysis. The centre for "taste and smell" is represented at the tip of the uncinate convolution. The centre for "half-vision" is only in small part represented, for the larger part is on the mesial surface. "Hearing" is represented occupying the posterior half of the first temporal convolution, but only a small part of the centre is seen, for the greater part lies above within the fissure of Sylvius. Included in this area, but in the *left* hemisphere only, is the centre for "auditory word memory"; destruction of this causes inability to understand the meaning of words uttered, although the patient is able to read aloud. Behind this, in the angular gyrus, is the centre for "visual word memory"; destruction of this causes loss of power of understanding of written or printed words—therefore inability to read. In front of the motor area is Broca's convolution, the centre of "motor speech"; destruction of this produces motor aphasia, or inability to articulate words. Above this is a centre which is connected with written speech. These four centres concerned with verbal and written language are connected by commissural fibres, and destruction of these connexions leads to various defects in verbal and written language. It will be understood from this diagram that diseases of the left hemisphere in right-handed persons are associated with results of more significance than similar affections of the right hemisphere.

the myelin sheath and ending in an increase of the supporting neuroglia tissue at the expense of the true nervous tissue.

Tumours and new growths in the central and peripheral nervous systems may be primary or secondary: the former arise in the supporting, enclosing or nutrient tissue elements; the latter are metastatic deposits from tumours originating elsewhere. Tumours may be single or multiple, the special symptoms occasioned depending upon the seat of the tumour and whether it destroys or only irritates the adjacent nervous tissue. Tumours situated within the cranial cavity cause general symptoms, namely, optic neuritis, severe headache and vomiting; these symptoms, which are caused by increased intracranial pressure, are more severe in rapidly-growing vascular tumours, even though small, than in large slow-growing tumours.

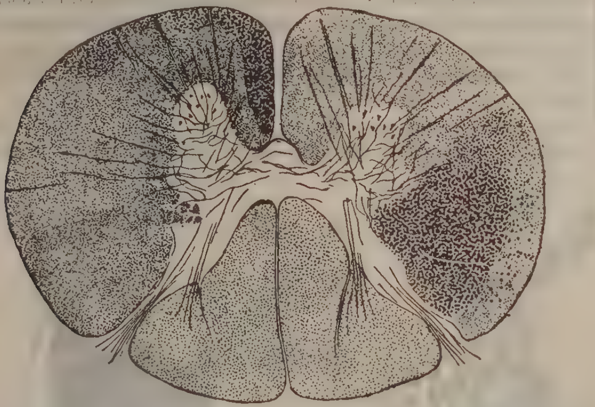


FIG. 8.—Diagram of section of the spinal cord in the upper cervical region, showing recent degeneration of the crossed pyramidal tract of the right side and direct pyramidal tract of the left side. The black dots indicate the degenerated fibres stained by the Marchi method. This degeneration is secondary to haemorrhage into the internal capsule of the left hemisphere, and it will be observed by the number of degenerated fibres that the greater bulk have crossed over to the right side of the spinal cord, thus agreeing with the fact that the paralysis is of the right half of the body.

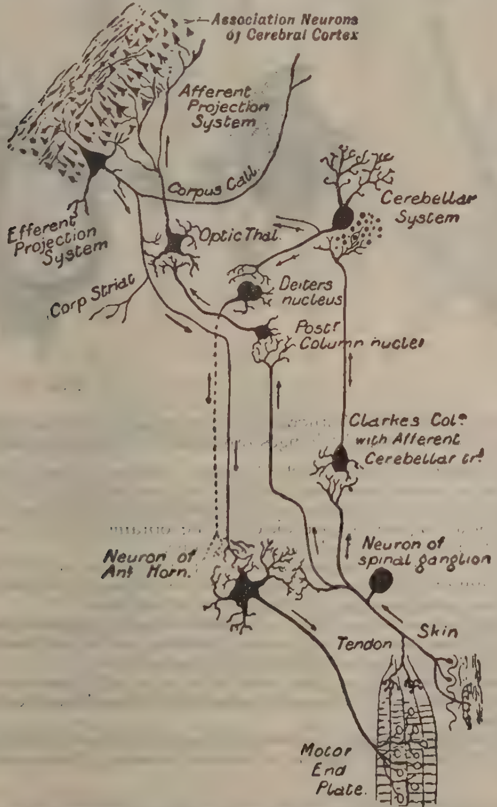

Association Neurons of Cerebral Cortex
Afferent Projection System
Corpus Call.
Cerebellar System
Efferent Projection System
Optic Thal.
Corp Striat
Deiters nucleus
Post' Column nuclei
Clarkes Col. with Afferent Cerebellar tr.
Neuron of spinal ganglion
Neuron of Ant Horn.
Tendon
Skin
Motor End Plate.

FIG. 9.—A diagram to indicate afferent, efferent and association systems of neurones. It will be observed that there are three nervous circles indicated by the arrows—spinal, cerebellar and cerebral. In every perfect co-ordinate movement impulses properly adjusted are flowing along these three systems of neurones. In systemic degenerations one or more of these systems may be affected, and the symptoms will depend partly upon the function which is lost or disturbed, and partly upon the disturbance of equilibrium of the three co-ordinated systems.

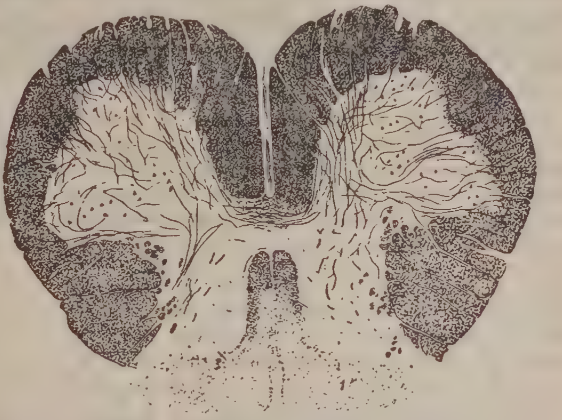


FIG. 10.—Diagram of spinal cord, fifth lumbar segment, from a case of advanced *tabes dorsalis*. The posterior column is shrunken, and but faintly stained, except in the anterior part; the shrinkage and the loss of stainability are due to the absence of fibres of the posterior roots, which normally form the greater part of this region of the cord. The fibres which are seen in the anterior part of the posterior column are derived from cells within the spinal cord, and belong to spinal association neurones.

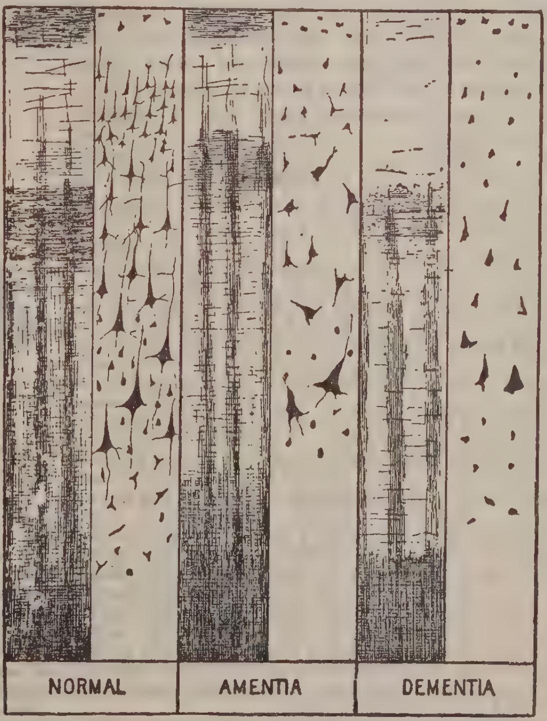


FIG. 11.—Diagram illustrating the relative number and wealth of cells and fibres in the cerebral cortex in the normal brain, in amentia and dementia. The horizontal systems of fibres are association systems, and it will be observed that these are especially diminished in amentia, and still more in dementia, whereas the radial fibres are less affected. In the normal, there are five layers of cells arranged in columns (Meynert's); in the pathological conditions it will be observed that the pyramidal-shaped cells no longer have their apical processes pointing vertically upwards. The processes are broken off, the cells are distorted in shape and diminished in numbers, and the degree of dementia in a wasted brain is proportional to the atrophy and destruction of the small and medium-sized pyramids of the whole cerebral cortex, and the disappearance of the superficial layers of fibres. This is specially manifested in paralytic dementia and the dementia of chronic insanity.

Some tumours are highly vascular and a large thin-walled vessel may suddenly rupture and cause an apoplectic fit. If the growth is situated in a portion of the cortex having some special localizing function, *e.g.* the motor area (*vide* fig. 7), it may give rise to epileptiform convulsions, starting in a limb or definite group of muscles; but the irritation usually spreads to the whole motor area of the same side, and even extends to the opposite hemisphere, by an overflow of the discharge through the corpus callosum. In such case there is loss of consciousness. If, however, the tumour destroys the cerebral cortex of a particular region, it may give rise to a paralytic lesion, *e.g.* paralysis of the arm (*vide* Plate I., fig. 4).

Organic diseases of the blood-vessels, or of supporting and enclosing tissues, produce secondary degenerations of the nervous system. The symptoms, like the lesion, are obvious, coarse and obtrusive; frequently arising suddenly, they may in a short time terminate fatally, or tend towards partial or complete recovery. Various forms of motor and sensory loss and disturbance of function may arise, indicating destruction or disturbance of particular regions of the central nervous system; and degenerations in certain tracts and systems of fibres arise, corresponding in histological character with those observed when a nerve fibre is separated from its cell of origin by section (secondary degeneration of Waller and Türck) (*vide* fig. 8, with explanation). This form of degeneration must be distinguished from primary degeneration, which is due to an inherent nutritional defect of the nerve cell and all its processes (the neurone), in which a regressive metamorphosis occurs; it starts in the structures of the neurones latest developed (namely, the myelin sheath and the fine terminal twigs of the axis cylinder and dendrons), and proceeds back to the main branches and trunk, eventually destroying the trophic and genetic centre itself, the nerve cell. These *primary* degeneration processes are insidious in origin, progressive in character, and nearly always fatal in termination; they affect definite systems, groups and communities of neurones in a progressive manner, and, therefore, are associated with a progressive evolution of symptoms, related to the structures affected (*vide* figs. 9 and 10).

To cite some examples: (1) *Locomotor ataxy*, on the one hand, is a primary degeneration affecting the *afferent* system of neurones; it is characterized by muscular incoordination without wasting, inability to stand with the eyes shut, lightning pains in the limbs, absent knee-jerks, Argyll-Robertson pupils, and other symptoms pointing to a morbid process affecting especially the afferent sensory system of neurones. (2) *Progressive muscular atrophy*, on the other hand, is a disease of the *efferent* motor system of neurones of the brain and spinal cord, characterized by progressive wasting of groups of muscles innervated by groups of neurones which are undergoing degeneration. A fatal termination to this disease frequently arises from affection of the medulla oblongata, causing what is known as bulbar paralysis. Infantile paralysis is an acute inflammation of the anterior horns of the spinal cord, causing destruction of the spinal motor neurones of the anterior horn. It differs from the above chronic disease in its sudden onset and non-progressive character; it resembles it in producing paralysis of muscles without sensory disturbance. (3) *General paralysis of the insane* is a degeneration which begins in the association system of neurones of the cerebral cortex, but which may be, and frequently is, associated with degeneration of the afferent or efferent systems (fig. 9).

Neuroses and psychoses have not hitherto been satisfactorily explained by definite morphological changes in the brain (Plate I., fig. 1). We know little or nothing accurately about the morbid histology of insanity, except as regards the morphological changes met with in cases of amentia and dementia. The conditions of amentia, namely, idiocy and imbecility, are associated with arrest of development of the brain, as a whole or in part, the naked-eye evidence of which may be afforded by small size and simplicity of convolutions of the brain as a whole or in part (Plate I., figs. 2, 8 and 10); and the microscopical evidence by arrest of development, or imperfect development, of structures connected with the higher functions of the mind, namely, the association neurones in the superficial layers of the cerebral cortex (fig. 11). Conditions of dementia, primary or secondary, are associated with progressive decay and atrophy of the superficial layers of the grey matter of the cortex, and naked-eye evidence thereof is afforded by partial or general wasting of the cerebral hemispheres, accompanied with thickening of the pia-arachnoid membrane, atrophy of the convolutions, and with deepening and widening of the intervening sulci (Plate I., fig. 7).

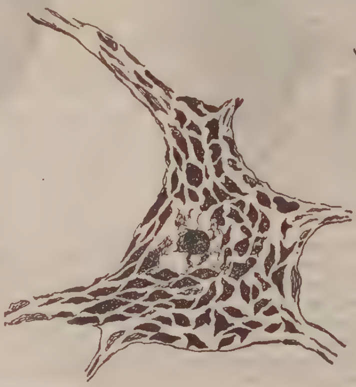


FIG. 12.

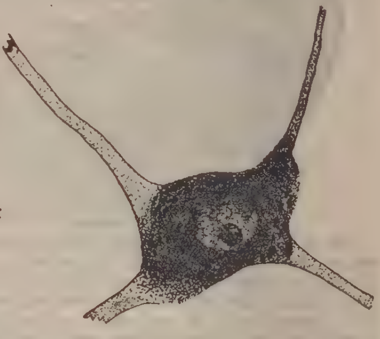


FIG. 13.

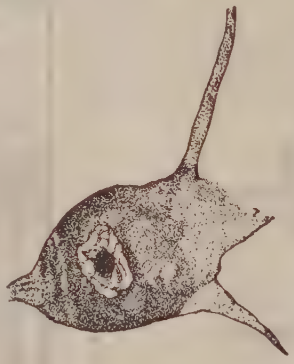


FIG. 14.

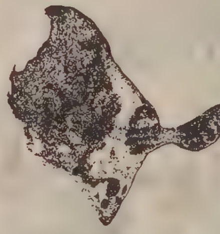


FIG. 15.

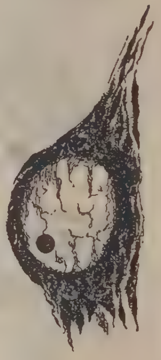


FIG. 16.

Motor Cells, drawn from Microphotographs of Preparations stained by Nissl method to show Microchemical Changes produced by various diseases.

FIG. 12.—Normal motor cell from cerebral cortex, showing a mosaic pattern of the cytoplasm due to a substance stainable by basic aniline dyes; this stainable substance exists also on the dendrons. By comparing the appearances of this cell with the other figures a just idea can be obtained of the morbid changes which result in various pathological conditions.

FIG. 13.—Cell from a case of hyper-pyrexia—disappearance of the mosaic pattern, substance uniformly stained; absence of the chromatic elements on the dendrons, due to a precipitation of cell-globulin by the heat.

FIG. 14.—Cell in an advanced stage of coagulation necrosis, complete absence of mosaic pattern; diffuse fine dust-like stain; breaking off of the processes; all caused by softening of the brain from vascular obstruction.

FIG. 15.—Another specimen from the same brain in a still more advanced stage of destruction, and showing a phagocyte attached to the cell and devouring the decayed structure.

FIG. 16.—A cell with enormously swollen nucleus, the result of hydration due to absorption of fluid after ligature of cerebral vessels. Such a cell will probably recover.

The cerebro-spinal fluid fills up the space in the cranial cavity caused by the atrophy of the brain; consequently there is a great excess of this fluid. Before general paralysis was recognized as a disease some of the cases which died suddenly in a fit were doubtless termed serous apoplexy. This wasting so characteristic of general paralysis is especially due to atrophy of the cells and fibres of the superficial grey matter of the cortex, sections of which, examined microscopically, after suitable methods of staining have been employed, show great poverty, or complete loss, of three sets of delicate myelinated fibres, namely, tangential, super-radial and the inter-radial corresponding to the line of Baillarger. This degeneration of the superficial association fibres of the cerebral cortex affects especially the frontal and central convolutions, and is the earliest and most constant microscopical change in progressive paralytic dementia; it is accompanied usually by meningeal and vascular changes, atrophy of the nerve cells, and proliferation of the neuroglia (fig. 11); especially characteristic is the perivascular infiltration with lymphocytes and plasma cells (see Plate II., fig. 7). It was indeed thought that this condition of the vessels was pathognomonic of general paralysis; it certainly is not, for it is found throughout the central nervous system in sleeping sickness and cerebro-spinal syphilis (Plate II., figs. 8 and 9). It sometimes occurs in the neighbourhood of cerebral tumours but it is not found in uraemia or lead encephalitis. Possibly new methods may enable us to show changes of structure in diseases such as epilepsy and delusional insanity, in which hitherto no naked eye or microscopical structural defects accounting for the symptoms have been certainly demonstrated.

In conditions of acute mania there is usually considerable vascular engorgement. We should, however, probably be more correct in assuming that insanity (especially those forms in which there is neither amentia or dementia) is due to alterations in the quality rather than the quantity of blood in the brain. The primary dementia of adolescence, which in 80% of the cases occurs before the age of 25, in which hereditary taint is most common, and which frequently is accompanied by, or terminates in, tuberculosis, can be explained by the effect of toxaemic conditions of the blood on cerebral neurones with an inborn low specific energy and metabolic activity. The histological changes found in the brain do not serve to explain the symptoms, and we must look to bio-chemical changes in the body acting upon an innately unstable brain to explain the problems of the disordered mind in this disease.

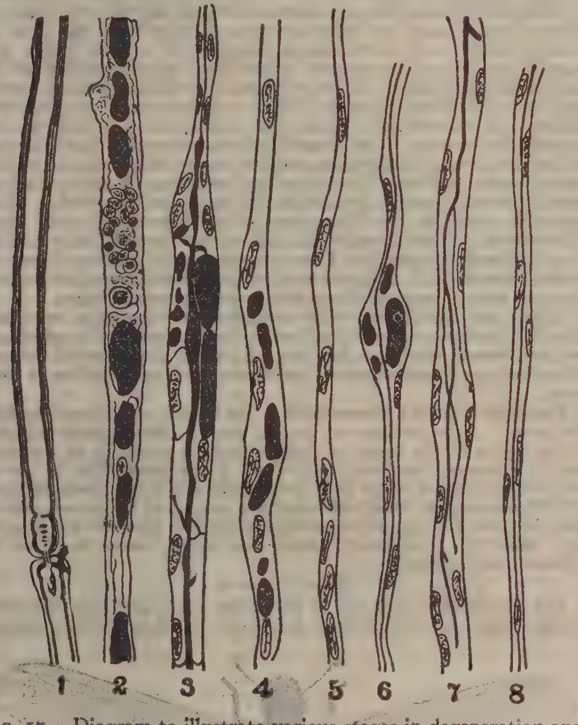


Fig. 17.—Diagram to illustrate various stages in degeneration and regeneration of medullated nerve fibres.

1, Normal medullated nerve with node of Ranvier.

2, Degenerated nerve, ten days after section, showing degenerated myelin stained black; disappearance of axis-cylinder.

3, Central end of cut nerve, showing at the top an axis-cylinder budding out, proliferated neurilemmal cells, and still some degenerated myelin in sheath.

4, Peripheral cut end of same, showing proliferated neurilemmal cells, still some degenerated myelin.

5, Complete absorption of degenerated myelin, proto-plasmic basis of new fibre formed out of neurilemmal cells.

6, A new fibre, with axis-cylinder.

7, Central end of cut nerve at junction, showing an axis-cylinder sprouting and forming a number of axis-cylinder processes, which grow into the peripheral end to form new channels of conduction.

8, Is a new regenerated fibre resembling a sympathetic fibre in having as yet no myelin sheath; as the nerve becomes excitable and stimulus passes, a myelin sheath is formed.

Microscopical Changes in Degeneration of the Neurone.—About 1850, Waller demonstrated that a nerve fibre underwent degeneration to its termination when separated from its cell of origin; hence the term "Wallerian degeneration." Embryological researches by Professor His showed that the axis-cylinder process (the essential conducting portion of the nerve fibre) is an outgrowth of the nerve cell. The cell, therefore, is the trophic and genetic centre of the nerve fibre. Acute alterations and death of the nerve cells may occur from toxic conditions of the blood; from high fever (107°-110° F.); arrest of the blood supply, as in thrombosis and embolism; or actual destruction by injury, haemorrhage or inflammation. These morbid processes produce, as a rule, bio-chemical as well as morphological changes in the nerve cell and its processes. Space will not allow of a full description, but some of these changes are indicated in figs. 18-22, with explanatory text. When a nerve cell dies, the nerve fibre undergoes secondary degeneration and death; that is to say, the whole neurone dies, and regeneration, at any rate in the higher vertebrates, does not take place. Restoration, or partial restoration, of function is due to other structures taking on the function, and the more specialized that function is, the less likely is restoration to take place. If, however, a peripheral nerve is divided, its component fibres are merely severed from their cells of origin. All that portion of the nerve which is in connexion with the nerve cells of origin practically undergoes no change. The peripheral portion undergoes degeneration, but from the central end of the nerve new axis cylinders again grow out and a new nerve is formed. With this regeneration comes restoration of function, which may be hastened by suturing the ends of the cut nerve. A similar regeneration, however, does not occur after section of fibres of the white matter of the central nervous system, and this may be due to the fact that the nerve fibres of the white matter of the cerebro-spinal axis possess no nucleated sheath of Schwann, which, by the light of recent investigations, is shown to play an important part in regeneration; in the writer's opinion, the neurilemmal sheath of the old fibre forms a new protoplasmic basis, into which the axis-cylinder from above grows, the passage of stimulus determining its function. Fig. 17, Nos. 1-8, with explanatory text, shows the changes which occur in degeneration and regeneration of a peripheral nerve after section, with loss of function; and subsequent union, with restoration of function. The writer, in conjunction with Professor Halliburton, has shown that the characteristic microscopical changes in the myelin sheath which occur in the process of degeneration are due to a splitting up of the complex phosphoretted substance "protagon" into glycero-phosphoric acid, choline and oleic acid by a process of hydration. The Marchi reaction, which has been found so useful for demonstrating degeneration of the central and peripheral nervous systems, is dependent upon the fact that the myelin sheath, after hardening in a solution of bichromate of potash, does not turn black when acted upon by osmic acid, whereas the simpler non-phosphoretted fatty product of degeneration is stained black. When the Marchi reaction of degeneration is fully developed, it has been ascertained that the nerve yields no phosphorus. The degeneration resulting from section of a nerve is termed *secondary*, to distinguish it from another, *primary*, due to slow

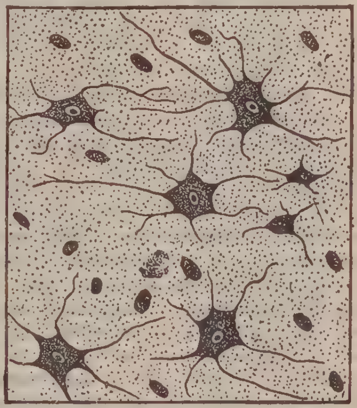


Fig. 18.—Diagram drawn from photomicrograph to show different forms of neuroglia cells in a patch of sclerosis secondary to degeneration and disappearance of the neurones. Observe the large branched cells of Deiters.

and progressive decay of the whole neurone, beginning usually at the terminal twigs and proceeding back towards the cell body with its contained nucleus. These primary degenerations involve systems of neurones, correlated by function rather than by anatomical situation. Examples are afforded by locomotor ataxy and progressive muscular atrophy, the former being a degeneration of the afferent sensory system of neurones, the latter of the motor efferent system. The cause of primary degenerations is probably a defect inherited or acquired in the "vita propria" of the neurones affected. They slowly atrophy and disappear, and their place is filled up by an overgrowth of the supporting neuroglia tissue (figs. 10 and 18). This overgrowth of dense tissue is termed sclerosis, and was erroneously considered to be the cause, instead of the effect, of the atrophy of the nervous tissue.

For further information the reader may consult the Croonian Lectures on the Degeneration of the Neurone, by F. W. Mott, published in the *Lancet* (1900); and the same writer's "Introduction to Neuropathology," in *Albutt's System of Medicine*. Also Gower's *Handbook of the Nervous System*, von Monakow's *Gehirn Pathologie*, Ford-Robertson's *Pathology of Mental Diseases* and Mott's *Archives of Neurology*, vols. 1, 2, 3 and 4. (F. W. Mo.)

NEUROPTERA (Gr. νεῦρον, a nerve, and πτερόν, a wing), a term used in zoological classification for an order of the class *Hexapoda* (*q.v.*). No ordinal name used in the class has had so many varying meanings given to it by different authors. As first used by Linnaeus (1735) it included all insects with mandibulate jaws and two pairs of net-veined wings—dragon-flies, May-flies, stone-flies, lacewing-flies and caddis-flies—and it has been employed in the same wide sense by D. Sharp (*Cambridge Nat. Hist.* vol. v., 1895). But detailed study of these various groups of insects shows that beneath their common superficial resemblances lie important distinctions in structure, and essential differences in the course of the life-history. Some of the families—the stone-flies, for example—have the young insect much like the adult, growing its wings visibly outside the thoracic segments, and active at all stages of its life. The dragon-flies and May-flies are also active throughout their lives and possess external wing-rudiments, though the young insects differ rather strikingly from their parents. All such families—falling into the group Exopterygota as defined in the classification of the Hexapoda—were separated from the Neuroptera by W. E. Erichson (1839) and united with the Orthoptera, with which order some entomologists still associate them under the name of "Pseudo-neuroptera." The other groups of the old Linnean order (such as lacewing-flies and caddis-flies)—which are hatched as larvae markedly unlike the parent, develop wing-rudiments hidden under the larval cuticle, and only show the wings externally in a resting pupal stage, passing thus through a "complete" metamorphosis and falling into the sub-class Endopterygota—were retained in the order Neuroptera, which thus became much restricted in its extent. More recently the subdivision of the Linnean Neuroptera has been carried still further by the separation of the caddis-flies and scorpion-flies as distinct orders (Trichoptera and Mecaptera respectively), and by the withdrawal of the "Pseudo-neuroptera" from the Orthoptera—with whose typical families they have little in common—and their division into a number of small orders. Altogether, eight orders are recognized in the classification adopted here, the first five of these belonging to the sub-class Exopterygota and the last three to the Endopterygota (see Hexapoda).

The multiplication of orders is attended with practical difficulties, and the distinctions between the various groups of the Linnean Neuroptera are without doubt less obvious than those between the Coleoptera (beetles) and the Diptera (two-winged flies) for example. But if classification is to express relationship, it is impossible to associate in the same order families whose kinship to insects of other orders is nearer than their kinship to each other. And no student can doubt that the stone-flies are akin to Orthoptera and the caddis-flies to the Lepidoptera, while dragon-flies and May-flies stand in an isolated position with regard to all other insects. In the present article, for the sake of convenience, all the insects which have been regarded by Linnaeus and others as "Neuroptera" are included, but they are distributed into the orders agreed upon by the majority of modern observers, and short characters of these orders and their principal families are given. For further details the reader should consult the special articles on these groups, to which cross-references will be found.

Sub-class Exopterygota

Order *Plecoptera.*

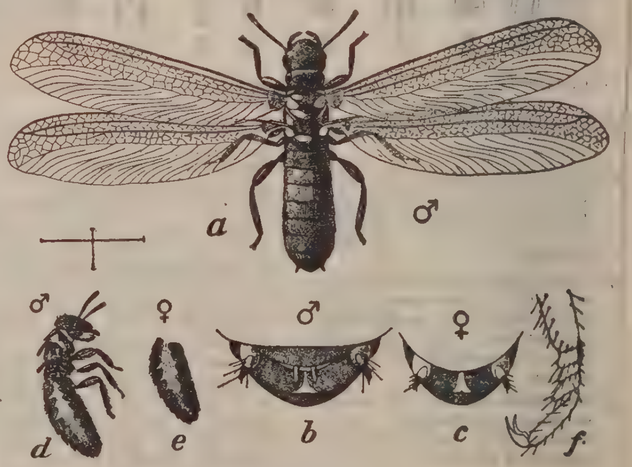
This order was founded (1869) by F. Brauer—the name having been long previously suggested by H. Burmeister (1832)—to include the single family of the Perlidae or stone-flies. They resemble the Orthoptera more nearly than do any other group of the Linnean Neuroptera, having the anal area of the hind-wings folding fanwise beneath the costal area and the whole hind-wing covered by the forewing when the insect is at rest, though the forewing is not firmer in texture than the hind-wing, as is the case in the Orthoptera. In the opinion of J. H. Comstock and J. G. Needham the wing-neuration in this order is the most primitive to be found in the Hexapoda. The tenth abdominal segment carries a pair of jointed cerci which are often elongate, and the feelers are always long, while the jaws are usually feeble and membraneus, though the typical parts of a mandibulate mouth are present—mandibles, maxillae with inner and outer lobes and palps, and second maxillae (labium) whose lacinae are not fused to form a ligula. Both head and trunk are somewhat flattened dorso-ventrally, giving the insects a very distinct and characteristic aspect. The stone-flies further resemble the Orthoptera in their numerous Malpighian excretory tubes, which vary in number from twenty to sixty. The reproductive organs, both ovaries and testes, become fused together in the middle of the body. A remarkable point in the Plecoptera is the presence in some forms (*Pteronarcys*) of small branching gills on the three thoracic and the front abdominal segments. These organs appear, however, from the observations of H. A. Hagen not to be functional in the adult insect—they are merely survivals from the aquatic nymphal stage.

Life-history and Habits.—The nymphs of the Perlidae are closely like their parents and breathe dissolved air by means of tracheal gills on the thoracic segments, for they all live in the water of streams. They feed upon weaker aquatic creatures, such as the larvae of May-flies.

The perfect insects, whose flight is feeble, are never found far from the water. A curious feature among them is the frequent reduction of the wings in the males of certain species, contrary to the usual condition among the Hexapoda, where if the sexes differ in the development of their wings it is the female which has them reduced. The Plecoptera are world-wide in their range and fossils referable to them have been described from rocks of Eocene, Miocene and Jurassic age, while C. Brongniart states that allied forms lived in the Carboniferous Period.

Order *Isoptera.*

The two families included in this order agree with the Plecoptera in the young insect resembling the parent, but they are all terrestrial throughout life. The hind-wings have no folding anal area and the wings of both pairs, when present, are closely alike (see fig. 1) whence the name Isoptera (=equal winged) lately applied to the group by



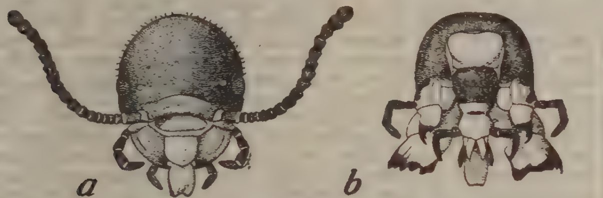
After C. L. Marlatt, *Ent. Bull.* 4 (*N.S.*), *U.S. Dept. Agric.*

Fig. 1.—*Termes flavipes*, N. America.

a, Male from above.
b and *c*, Hind segments of male and female abdomens, showing short cerci.
d, Male from side.
e, Abdomen of female from side.
f, End of shin and foot-segments.

G. Enderlein. The eleventh abdominal segment which carries the short jointed cerci (fig. 1, *b*, *c*) may remain in a reduced condition distinct from the tenth. There are only six or eight Malpighian tubes—contrasting with the large number of these excretory organs found in the Orthoptera and Plecoptera.

The *Embiidae* are feeble, somewhat soft-skinned insects with the prothorax small and the mesothorax and metathorax elongate. The feelers are long and simple, and the wings are very narrow, each with a sub-costal, a radial, a median and a cubital nervure; the branches of the median and the cubital, however, as well as the anal nervures, are vestigial, and there are a few short cross-bars between the radial and the median. Some Embiidae are entirely wingless in the adult state, and it has been suggested that this is always the condition in the female sex. According to the recent investigations of K. W. Verhoeff, the family contains only thirteen known species.



After Marlatt, *Ent. Bull.* 4 (*N.S.*), *U.S. Dept. Agric.*

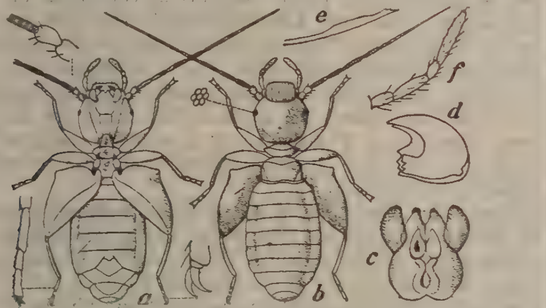
FIG. 2.—Head of termite. *a*, Front view. *b*, Hind view, showing jaws (note the distinct inner and outer lobes of the second maxillae). Magnified.

The Embiidae live in warm countries, and are very retiring in their habits, hiding under stones where they spin webs formed of silk produced by glands in the basal segments of the fore-feet.

The *Termitidae* (so-called "white ants") are the other family of Isoptera. They are relatively shorter and broader insects than the Embiidae with large prothorax and long wings, which have a transverse line of weakness at the base and are usually shed after the nuptial flight. The Termitidae are numerous in species in warm countries. The vast majority of individuals in a community consist of wingless forms—"workers" and "soldiers," which are undeveloped members of either sex. Their economy is fully described in a special article on TERMITES.

Order *Corrodentia*.

The insects included in this order differ from those of the two preceding orders in their more condensed abdomens which bear no cerci, while the number of Malpighian tubes is reduced to four. In the absence of cerci the Corrodentia are more specialized than the Isoptera and Plecoptera, but some of them show a more primitive character in the retention of vestigial maxillulae—the minute pair of jaws that are found behind the mandibles in the Aptera (*q.v.*). A large proportion of the Corrodentia are wingless. When wings are present the front pair are much larger than the hind pair, and the neuration is remarkable for the concresence of the median with the cubital trunk, and the zigzag course of many of the branches. All the insects of this order are of small size and the cuticle is imperfectly chitinized, so that the body as a whole is soft. The name Corrodentia was first used by H. Burmeister (1832) and has reference to the biting habits of the insects. Originally, however, the Corrodentia included the order which Enderlein has recently separated as Isoptera (see above). As at present restricted, the Corrodentia include two distinct sub-orders.



After Marlatt, *Bull.* 4 (*N.S.*), *Div. Ent. U.S. Dept. Agric.*

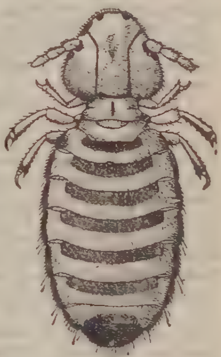
FIG. 3.—Book-louse (*Atropos divinatoria*, Fab.), Europe.

a, From below.
b, From above, (eyes, feeler, feet and claws more highly magnified).
c, Second maxillae.
d, Mandible.
e, Lacinia or "pick" of first maxilla.
f, Its palp. Highly magnified.

Copeognatha.—This sub-ordinal name has been applied by Enderlein to the "book-lice." These frail insects, the majority of which have wings of the type described above, are further characterized by the presence of minute but distinct maxillulae, while the inner lobe (lacinia) of the first maxilla is an elongate, hard structure (the "pick," fig. 3, *e*) and the outer lobe is convex and soft. The labial (second maxillary) palps are reduced to small, rounded prominences external to the still smaller prominences that represent the lobes (fig. 3, *c*). The feelers of these insects are elongate and thread-like, consisting of from a dozen to nearly thirty segments. The prothorax is very small.

The book-lice are familiar wingless insects, often found in houses running about among old papers and neglected biological collections. They belong to the family *Psocidae* which has a few score species—most of them winged—living out of doors on the bark of trees and among vegetable refuse. In some Psocidae the wings are in a vestigial state, and the fully winged species rarely if ever fly. H. A. Hagen observed that some genera possess wing-like outgrowths on the prothorax, comparable to those seen in certain insects of the Carboniferous Period. The Psocidae themselves have not been traced back beyond the Oligocene, in the amber of which period their remains are fairly numerous.

Mallophaga.—This term was first applied by C. L. Nitzsch (1818) to the degraded wingless parasites (fig. 4) commonly known as bird-lice or biting-lice, differing from the true lice (see HEMIPTERA, LOUSE) by their jaws adapted for biting (not for piercing or sucking). By their structure they are evidently allied to the Copeognatha. They are abundantly distinct, however, through the short feelers with only three to five segments and the conspicuous prothorax. The head is relatively very large, but the eyes are degraded and often absent. A remarkable feature is the frequent concrescence of mesothorax and metathorax and in some cases, even, their fusion with the anterior abdominal segments. The legs are stout and spiny, and well adapted for clinging to the hair or feathers of the host animal. It is usual to divide the Mallophaga into two families—the *Liotheidae*, possessing labial palps and two foot-claws, being fairly active insects, which are capable, on the death of their host, of seeking another, and the *Philopteridae*, without labial palps and with a single foot-claw modified for clasping (fig. 4) which never leave the host and perish themselves soon after its death.



After Osborn, *Ent. Bull.* 7 (*O.S.*), *U.S. Dept. Agric.*

FIG. 4.—Biting-louse (*Trichodectes scalaris*) of cattle.

Order *Ephemeroptera*.

This order includes the single family of the *Ephemeridae* or May-flies. The name, although quite recently proposed by A. E. Shipley, should be used rather than A. S. Packard's older term Plectoptera on account of the great liability of confusion between the latter and Plecoptera. The May-flies are remarkably primitive in certain of their characters, notably the elongate cerci, the paired, entirely mesodermal genital ducts, and the occurrence of an ecdysis after the acquisition of functional wings. On the other hand, the reduced feelers, the numerous Malpighian tubes (40), the large complex eyes, the vestigial condition of the jaws, the excessive size of the fore-wings as compared with the hind-wings and their complex neuration with an enormous number of cross-nervules are all specializations. So in some respects is the life-history, with a true larval preparatory stage, unlike the parent form, and living an aquatic life, breathing dissolved air by means of a paired series of abdominal tracheal gills. Except for its aquatic adaptations, however, the ephemerid larva is wonderfully thysanuran in character, and possesses conspicuous and distinct maxillulae. See special article on MAY-FLIES.

Order *Odonata*.

The distinctness of the dragon-flies from other insects included in Linnaeus's Neuroptera was long ago recognized by J. C. Fabricius, who proposed for them the ordinal name of Odonata (1775). They resemble the May-flies in their "hemimetabolous" life-history; the young insects are markedly unlike their parents, inhabiting fresh water and breathing dissolved air, either through tracheal gills at the tip of the abdomen, or by a branching system of air-tubes on the walls of the rectum into which water is periodically admitted. The winged insects resemble the May-flies in their short feelers and in the large number (50 to 60) of their Malpighian tubes, but differ most strikingly from those insects in their strong well-armoured bodies, their powerful jaws adapted for a predaceous manner of life, and the close similarity of the hind-wings to the fore-wings. All the wings are of firm, glassy texture, and very complex in their neuration; a remarkable and unique feature is that a branch of the radius (the radial sector) crosses the median nervure, while, by the development of multitudinous cross-nervules, the wing-area becomes divided into an immense number of small areolets. The tenth abdominal segment carries strong, unjointed cerci, while the presence of reproductive armature on the second abdominal segment of the male is a character found in no other order of the Hexapoda. See special DRAGON-FLY.

Sub-class ENDOPTERYGOTA

Order *Neuroptera.*

The insects retained in the order Neuroptera as restricted by modern systematists are distinguished from the preceding orders by the presence of a resting pupal stage in the life-history, so that a "complete metamorphosis" is undergone. Structurally the Neuroptera are distinguished by elongate feelers, a large, free prothorax, a labium with the inner lobes of the second maxillae fused together to form a median ligula, membranous, net-veined wings without hairy covering, those of the two pairs being usually alike, the absence of abdominal cerci, and the presence of six or eight Malpighian tubes. The larvae are active and well-armoured, upon the whole of the "campodeiform" type, but destitute of cerci; they are predaceous in habit, usually with slender, sickle-shaped mandibles, wherewith they pierce various insects so as to suck their juices. The order contains nine families, most of which are wide in their geographical distribution. Fossil Neuroptera occur in the Lias and even in the Trias if the relationships of certain larvae have been correctly surmised.

The *Sialidae* or alder-flies (*q.v.*) differ from other Neuroptera in the jaws of the larva—which is aquatic, breathing by paired, jointed abdominal gills—resembling those of the imago, and being adapted for the mastication of solid food. Some American genera (Corydalis) which belong to this family are gigantic among insects and their males possess enormous mandibles. The *Raphidiidae* or snake-flies (*q.v.*) are remarkable for the long, narrow, tapering prothorax which gives the appearance of a constricted neck, while the female has a long ovipositor. Both these families are very sparingly represented in our fauna.

The *Myrmeleonidae* are large insects with short clubbed feelers on their prominent heads, and two pairs of closely similar net-veined wings, with regular oblong areolets at the tips. Their predaceous, suctorial larvae are the well-known ant-lions (*q.v.*). No members of this family inhabit our islands, though a few species occur in neighbouring parts of the continent. The same is the case with the allied *Ascalaphidae*, which are distinguished from the *Myrmeleonidae* by their elongate feelers—as long as the body—and by the irregular apical areolets of the wings. The curious *Nemopteridae* have slender feelers and very long strap-shaped hind-wings. The *Mantispidae* are remarkable among the Neuroptera for their elongate prothorax, raptorial fore-legs and hypermetamorphic life-history, the young campodeiform larva becoming transformed into a fat eruciform grub parasitic on young spiders or wasp-larvae (see MANTIS-FLY). The last-named two families are confined to warm regions of the earth. The lacewing-flies (*q.v.*), however, of which there are two families, the *Hemerobiidae* and *Chrysopidae*, whose larvae feed on Aphids, sucking their juices, are represented in our fauna. So are the tiny *Coniopterygidae*, which are covered with a white powdery secretion, and have very small hind-wings. Their larvae resemble those of the lacewings, attacking scale-insects and sucking their juices.

Order *Mecaptera.*

This small order was founded (1869) by F. Brauer—under the name of Panorpata—for the small family of the Panorpidae or scorpion-flies (*q.v.*). The name Mecaptera is due to Packard. They may be distinguished from the Neuroptera by the elongation of the head into a beak, the small prothorax, the narrow, elongate wings with predominantly longitudinal neuration, the presence of abdominal cerci and the eruciform larva. They are generally but sparingly distributed over the earth's surface and can be traced back in time to the early Jurassic epoch.

Order *Trichoptera.*

The caddis-flies (*q.v.*) constitute this order, the name of which (suggested by H. Burmeister) indicates the hairy covering of the wings. They are abundantly distinct from the Neuroptera and Mecaptera, through the absence of mandibles in the imago, the maxillae—both pairs of which possess the typical inner and outer lobes and jointed palps—forming a suctorial apparatus. The feelers are long, slender and many-jointed. While the fore-wings are elongate and narrow, the hind-wings are broad, with a folding anal area. At the base of each wing projects a dorsal lobe—the jugum—and the neuration is predominantly longitudinal, resembling so closely that of the lower Lepidoptera (*q.v.*) that a nearer relationship of the Trichoptera to that order than to any group of the old Linnean Neuroptera is certain. Fossil Trichoptera occur in rocks of Liassic age.

Frequently the whole of the Trichoptera are included in a single family, but most special students of the order recognize seven families. In all Trichoptera the maxillary palps of the female are five-segmented. The family *Phryganeidae* have males with four-segmented hairy palps; the larvae inhabit stagnant water and make cases of vegetable fragments. In the *Limnephilidae* the maxillary palp is three-segmented in the male, the larvae are variable in habit, many forming cases of snail-shells. The males of the *Sericostomatidae* have two or three segmented palps; their larvae inhabit running water and make cases of grains of sand, or of small stones. In the *Leptoceridae*, *Hydropsychidae*, *Rhyacophilidae* and *Hydroptilidae* the palps of the males have five segments like those of the females. The stone-built cases of the carnivorous Hydropsychid larvae are familiar objects in the water of swift streams.

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NEUSALZ, a town of Germany, in the Prussian province of Silesia, on the Oder, 20 m. by rail N.W. of Glogau. Pop. (1905) 13,002. It has three Evangelical churches, one of which belongs to the Herrnhut brotherhood, a Roman Catholic church and an orphanage. Its largest industry is, perhaps, the manufacture of thread; there are also in the town ironworks, breweries, shipbuilding yards and electrical works. Neusalz became a town in 1743.

See Bronisch, *Geschichte von Neusalz an der Oder* (Neusalz, 1893).

NEUSS, a town of Germany, in the Prussian Rhine province, lies 4 m. to the W. of Düsseldorf and 1½ m. from the W. bank of the Rhine, with which it is connected by the Erft canal. It lies at the junction of lines to Cologne, Viersen, Zevenaar (Holland), Düsseldorf, Düren and Rheydt. Pop. (1905) 30,494, of whom 95% were Catholics. The chief building in the town is the church of St Quirinus, a remarkably fine example of the transition from the Round to the Pointed style; and there are six other Roman Catholic churches, two Protestant churches and a gymnasium, which contains a collection of Roman antiquities. The town hall was built in the 17th and altered in the 18th century. The old fortifications are now laid out as a promenade encircling the town. Neuss produces oil and meal, and also manufactures woollen stuffs, chemicals and paper, bricks and iron-ware. Its markets for cereals are among the most important in Prussia, and it is also the centre of a brisk trade in cattle, coals, building materials and the products of its various manufactories.

Neuss, the *Novaesium* of the Romans, frequently mentioned by Tacitus, formerly lay close to the Rhine, and was the natural centre of the district of which Düsseldorf has become the chief town. Drusus, brother of the emperor Tiberius, threw a bridge across the Rhine here, and his name is preserved in the Drusustor, the lower half of which is of Roman masonry. In 1474–1475 Charles the Bold of Burgundy besieged the town in vain for eleven months, during which he lost 10,000 men; but it was taken and sacked by Alexander Farnese in 1586. Since 1887 extensive excavations have been made of the foundations of a huge Roman camp, and many valuable Roman treasures have been unearthed.

See C. Tücking, *Geschichte der Stadt Neuss* (Düsseldorf, 1891); F. Schmitz, *Der Neusser Krieg, 1474–1475* (Bonn, 1896); W. Effmann, *Die St Quirinus Kirche zu Neuss* (Düsseldorf, 1890); and Band xx. of the *Chroniken der deutschen Städte.*

NEUSTADT (Polish, *Prudnik*), a town of Germany, in the Prussian province of Silesia, on the river Prudnik, 60 m. by rail S.E. of Breslau. It has four Roman Catholic churches and one Evangelical. Pop. (1905) 20,187, the greater part of whom are

Roman Catholics. The chief industries are tanning, dyeing and the manufacture of damask, linen, woollen stuffs, leather and beer.

In 1745, 1760 and 1779 engagements between the Austrians and Prussians took place near Neustadt, which on the last occasion was bombarded and set on fire.

See Weltzel, *Geschichte der Stadt Neustadt* (Neustadt, 1870).

NEUSTADT-AN-DER-HAARDT, a town of Germany, in the Bavarian Palatinate, picturesquely situated under the eastern slope of the Haardt Mountains and at the mouth of the valley of the Speyerbach, 14 m. W. of Spires, and at the junction of railway lines to Worms, Weissenburg and Monsheim. Pop. (1905) 18,576. It has four churches, two Evangelical and two Roman Catholic. The Protestant abbey church, a fine Gothic edifice dating from the 14th century, contains the tombs of several of the counts palatine of the Rhine. The Roman Catholic Ludwigskirche is a modern Gothic structure. The chief industries of the town are cloth, paper, furniture, soap, starch and hats. It has also breweries and distilleries. A brisk trade is carried on in wood, grain, fruit and wine, all of which are extensively produced in the vicinity. Neustadt, which became a town in 1275, is one of the centres of the Rhenish "grape-cure," and thus attracts numerous visitors.

NEU-STETTIN, a town of Germany, in the Prussian province of Pomerania, on the small Streitzig lake, 90 m. by rail N.E. of Stettin, at the junction of railways to Belgard, Posen and Stolpmünde. Pop. (1905) 10,785. Its industries are iron-founding, dyeing, brewing and the manufacture of machinery, soap and matches. There is a considerable trade in cattle, grain and other agricultural produce, and in timber and spirits. Neu-Stettin was founded in 1313 by Wratislaus, duke of Pomerania, on the model of Stettin.

See Wilcke, *Chronik der Stadt Neu-Stettin* (Neu-Stettin, 1862); and F. W. Kasiski, *Beschreibung der vaterländischen Alterthümer in Neu-Stettin* (Danzig, 1881).

NEU-STRELITZ, a town of Germany, capital of the grand-duchy of Mecklenburg-Strelitz, situated between two small lakes, the Zierker See and the Glambecker See, 60 m. N. of Berlin, on the railway to Stralsund, at the junction of lines to Warnemünde and Buschhof. Pop. (1905) 11,656. It is built in the form of a star, the eight rays converging on a market-place adorned with a statue of the grand-duke George (d. 1860). The ducal residence is a handsome edifice in a pseudo-classical style, with a library of 75,000 volumes, and collections of coins and antiquities. Other buildings are the churches (two Evangelical and one Roman Catholic), the Carolinum (a large hospital), the town hall, the barracks, the gymnasium and the theatre. Its manufactures are iron-ware, machinery, pottery, beer and mineral waters. Its trade, chiefly in corn, meal and timber, is facilitated by the Zierker See and by a canal connecting the town with the Havel and the Elde.

About 1½ m. to the south lies Alt-Strelitz, the former capital of the duchy, a small town the inhabitants of which are employed in the manufacture of tobacco, leather and wax candles. Neu-Strelitz was not founded till 1726. In the vicinity is the château of Hohen-Zieritz, where Queen Louise of Prussia died in 1810.

NEUSTRIA, the old name given to the western kingdom of the Franks, as opposed to the eastern kingdom, Austrasia (*q.v.*). The most ancient form of the word is *Niuster*, from *niust*, which would make the word signify the "most recent" conquests of the Franks. The word Neustria does not appear as early as the *Historia Francorum* of Gregory of Tours, but is found for the first time in Fredegarius. The kingdom of Chilperic was retrospectively given this name, and in contemporary usage it was given to the kingdom of Clovis II., as opposed to that of Sigebert III., the two sons of Dagobert; and after that, the princes reigning in the West were called kings of Neustria, and those reigning in the East, kings of Austrasia. Under the new Carolingian dynasty, Pippin and Charlemagne restored the unity of the Frankish realm, and then the word Neustria was restricted to the district between the Loire and the Seine, together with part of the diocese of Rouen north of the Seine; while Austrasia comprised only the Frankish dominions beyond the Rhine, perhaps with the addition of the three cities of Mainz, Worms and Spires on the left bank. The districts between Neustria and Austrasia were called *Media Francia* or simply *Francia*. In 843 Brittany took from Neustria the countships of Rennes and Nantes; and gradually the term Neustria came to be restricted to the district which was later called Normandy. Dudo of Saint Quentin, who flourished about the year 1000, gives the name Neustria to the lands ceded to Rollo and his followers during the 10th century. In the year 1663, the Père de Moustier gave to his work on the churches and abbeys of Normandy the title of *Neustria pia*.

At the time of Charlemagne, Lombardy was divided into five provinces: Neustria, Austrasia, Aemilia, Littoraria maris and Tuscia. Austrasia was the name given to eastern Lombardy, and Neustria that given to western Lombardy, the part last occupied by the Lombards.

See F. Bourquelet, "Sens des mots France et Neustrie sous le régime mérovingien," in the *Bibliothèque de l'école des chartes*, xxvi. 566-574; Longnon, *Atlas historique de la France*, both atlas and text. (C. Pf.)

NEUTITSCHEIN (Czech *Nový Jičin*), a town of Austria, in Moravia, 75 m. N.E. of Brünn by rail. Pop. (1900) 11,891, chiefly German. It is situated on a spur of the Carpathians, and on the banks of the Titsch, an affluent of the Oder. It is the chief place in the Kuhländchen, a fertile valley peopled by German settlers, who rear cattle and cultivate flax. At Neutitschein manufactures of woollen cloth, flannel, hats, carriages and tobacco are carried on; and it is also the centre of a brisk trade. The town was founded in 1311. Neutitschein was in 1790 the headquarters of the Austrian field-marshal Loudon, who died here in the same year and is buried in the parish church.

NEUTRALITY, the state or condition of being neutral (Lat. *neuter*, neither of two), of not being on or inclined to one side or another, particularly, in international law, the condition of a state which abstains from taking part in a dispute between other states. Neutrality is the most progressive branch of modern International Law. It is also that branch of International Law in which the practice of self-restraint takes the place of the direct sanctions of domestic law most effectively. The rapid changes it is undergoing are in fact bringing the state-system of the modern world nearer to the realization of the dream of many great writers and thinkers, of a community of nations just as much governed by legal methods as any community of civilized men. While the right of war was simply the right of the stronger, there was no room for neutral rights, for, without going back to the time of the ancients, the so-called rights of war and conquest are nothing but survivals of the right of brute strength. No nation or community down to comparatively recent times was treated as having a right to what it could not keep. It is the growth of a law of neutrality, through the modern possibility of concerted action among neutral states, which is bringing about improvement, and, though the signs of our times are not always reassuring, we have taken a long stride forward since Molloy, in his *De Jure maritimo et navali* (1680), wrote: "As a neuter neither purchases friends nor frees himself from enemies, so commonly he proves a prey to the victor; hence it is held more advantage to hazard in a conquest with a companion than to remain in a state wherein he is in all probability of being ruined by the one or the other."

It was the great commercial communities, the Hansa in the north and Venice and the Mediterranean maritime republics in the south, which were first able to insist on some sort of regulation of the usages of war for their own protection. With the growth of intercourse among nations a further advance was made, by treaty stipulations entered into in time of peace, to provide rules for their guidance in the event of war, but it is only in our own time that the idea of a substantive neutral right has obtained recognition. To our own time belongs the final acceptance of the principle that the neutral flag protects an enemy's goods except contraband, the conception of neutralization of territory, the abolition of fictitious blockades, the practice of declarations of neutrality, the detachment from the high sea and neutralization of the zone called territorial waters, and the Areopagus of nations called the European Concert, in which the right of neutrals is asserted as a brake upon the operation of the still venerated right of conquest. The rights of neutrals have received their most recent affirmation in several of the decisions of the Hague Peace Conferences.

International trade and intercourse have become so intricate that war can no longer be waged without causing the most serious loss to neutral nations, which, moreover, suffer from it without any of the possible contingent benefits it may procure for the immediate parties. So much is it so, that most great powers have found it necessary for their self-protection to enter into defensive alliances with others, the direct object of which is the preservation of European peace by the threat of making war so gigantic a venture that no state will again embark on it "with a light heart." The next step will probably be alliances between states which, by their nature or by their having reached the limit of their expansion, have nothing further to gain by war with each other, for the purpose of securing perpetual peace as between themselves.

Definition and scope.

Different attempts have been made to define neutrality, but the word defines itself, so far as a succinct definition serves any purpose. The subject covers too wide and varied an area of matter to be condensed into a short statement of any kind. Neutrality entails rights and duties on both the belligerent and the neutral sides. Theoretically, neutrality, to be complete, would require the neutral to abstain from everything which could even remotely be of assistance to either belligerent. To this obligation would theoretically correspond that the belligerent should carry on the war without doing anything which could even remotely disturb or interfere with the neutral state or the free activity of its citizens. Neither the one nor the other is found to be practicable. It is not even easy for the belligerent to observe absolutely the duty of doing no direct injury to neutral territory. A battle may be fought to the very edge of the neutral frontier, and shells may explode in any neutral town within the firing range of modern artillery. The present respect paid by belligerents to territorial waters is a palliative in the case of a seaboard frontier; but even the three-mile limit acknowledged by most countries would permit belligerent vessels with present range of artillery to fire landwards far into neutral territory. Compensation—it is true, would be due for any damage done, but this does not alter the fact that acts of war can produce direct consequences on neutral territory which have the character of carrying war into a neutral state. The neutral state, moreover, is obliged to incur heavy expenditure to protect its frontier from being traversed by either belligerent, and thus avoid itself being exposed to claims for compensation for an act which it would otherwise be powerless to prevent. In the case of a maritime war, the neutral state is also bound to exercise strict supervision to prevent its ports from being used by either belligerent for the purpose of increasing its military strength. In short, war cannot be carried on without heavy expense and inconvenience to neighbouring neutral states. The inconvenience to the intercourse of neutral citizens is still greater. Their ships are liable to be taken out of their course, and their cargoes to be discharged to the bottom of the hold in search of articles which are contraband according to circumstances over which they have no control, and they may be confiscated without recourse by judges appointed by one of the interested parties. Even their whole trade with specific ports of the one belligerent may be stopped by the ships of the other belligerent without indemnity. On the other hand, a great deal of vital assistance can be given by neutral citizens to the one or the other belligerent in money, or by supplies of arms, ammunition, food and other commodities, which it is not at present the duty of neutral states to interfere with.

The respective rights and duties of belligerents and neutrals in current practice may be subdivided as follows:—

1. Belligerent duty to respect neutral territory and neutral territorial waters.

2. Neutral right of official representation and mediation; of intercourse of neutral citizens with citizens of either belligerent; of convoy, &c.

3. Belligerent right of blockade, angary, visit and search, capture and confiscation of contraband of war.

4. Neutral duties: (*absolute*) of abstention from any direct corporate assistance to either belligerent, of enforcement of respect by both belligerents for neutral territory; (*relative*) of prevention of any recruiting for either belligerent, or arming or equipping of vessels for their service; and (*contingent*) of allowing commercial access to the one or other belligerent without distinction, and of granting impartially to one or the other belligerent any rights, advantages or privileges, which, according to the usages recognized among nations, are not considered as an intervention in the struggle.

This subdivision, we believe, covers the whole ground of neutrality. We shall follow it in this article.

Duty to respect neutral territory.

Belligerent Duty.—It is now universally recognized among European states that a belligerent army must make no use of its strength in the field to carry its operations into neutral territory or into neutral waters. Belligerent forces entering neutral territory are by the practice of nations bound to surrender their arms to the neutral state, and remain *hors de combat* till the close of the war. (Compare arts. 11 and 12 of the Hague Convention relating to the "Rights and Duties of Neutral Powers and persons in case of war on land" 18th of October 1907.)

Access to and duty to respect territorial waters and ports.

Through territorial waters belligerent vessels are allowed to pass freely as in time of peace. Nor does the usage of nations forbid a belligerent vessel from entering a neutral port. Motives of humanity have sanctioned this distinction between territorial and maritime warfare. The Admiralty Instructions (1893) set out the rights of belligerents as Great Britain views them as follows: "Subject to any limit which the neutral authorities may place upon the number of belligerent cruisers to be admitted into any one of their ports at the same time, the captain, by the comity of nations, may enter a neutral port with his ship for the purpose of taking shelter from the enemy or from the weather, or of obtaining provisions or repairs that may be pressingly necessary (I. section 592). He is bound to submit to any regulations which the local authorities may make respecting the place of anchorage, the limitation of the length of stay in the port, the interval to elapse after a hostile cruiser has left the port before his ship may leave in pursuit, &c. (I. section 593). He must abstain from any acts of hostility towards the subjects, cruisers, vessels or other property of the enemy which he may find in the neutral port (section 594). He must also abstain from increasing the number of his guns, from procuring military stores, and from augmenting his crew even by the enrolment of British subjects" (section 595).

Nor may the commander of a British warship take a capture into a neutral port against the will of the local authorities (Holland, *Manual of Naval Prize Law*, 1888, section 299). This subject was one of those dealt with at the Hague Conference of 1907. (See art. 18 of the "Convention relating to the rights and duties of neutral powers in naval war.")

Right of legation.

Neutral Rights.—Neutral powers have the right to remain, as far as possible, unaffected by the war operations, and, therefore, continue their diplomatic relations with the belligerent states. The immunities and exterritoriality of their diplomatic agents attach to them as in time of peace, subject only to necessity of war, which may entitle a belligerent to place restrictions on this intercourse. Thus, during the Franco-German War, on the surrounding of Paris, foreign diplomatists in the besieged city were refused by the German authorities all possibility of corresponding with their governments, except by letters left open for their inspection. Neutral legations may also undertake the representation of private interests of subjects of the one belligerent on the territory of the other. Thus in the Franco-German War of 1871 the Germans in France were placed under the protection of the United States legation, and the French in

Germany under that of the British legation; in the war of 1898, between the United States and Spain, American interests in Spain were committed to the care of the British legation, and those of Spaniards in the United States to that of the Austro-Hungarian legation. By legations are understood both diplomatic and consular authorities. The protection granted is in the nature of mere mediation. It confers no rights on the belligerent subjects in question, nor does it give the neutral legation any right to protect a belligerent subject or his property against any ordinary rights of war.

Right of offering good offices and mediation.

Good offices, properly speaking, are a mild form of mediation or tentative mediation, *i.e.* mediation before it has been accepted by the parties. Article 3 of the Hague Convention for the pacific settlement of international disputes of October 18, 1907, however, provides that "powers, strangers to the dispute, have *the right* to offer good offices or mediation, even during the course of hostilities," and that "the exercise of this right can never be regarded by one or other of the parties in conflict as an unfriendly act." The Hague Convention puts an end to the doubt whether a neutral power can mediate without involving itself in some way with the one or the other side in the dispute. Mediation had already been provided for in several existing treaties, such as the Treaty of Paris (30th March 1856), which provides that "if any dissension should arise between the Sublime Porte and one or more of the other signatory powers and threaten the maintenance of their good relations, the Sublime Porte and each of these powers before resorting to force shall give an opportunity to the other contracting parties in order to prevent such extreme measures" (article 8); the Treaty of Yedo between the United States and Japan (29th July 1858) stipulating that in the case of difference between Japan or any other state, "the president of the United States, at the request of the Japanese government, will act as a friendly mediator in such matters of difference as may arise between the government of Japan and any other European power" (article 2); and the General Act of Berlin relating to West Africa (1885), which provides that "in the case of a serious dissension having arisen on the subject of, or within the territories" in question, between the signatory powers, they undertake, before taking up arms, to have recourse to the mediation of one or more of the friendly powers (article 12).

In the Venezuela-Guiana boundary question, the mediation of the United States government was declined by Great Britain, but its good offices were accepted. In the difficulty which arose between Germany and Spain in connexion with the hoisting of the German flag on one of the Caroline Islands, Spain did not consider arbitration consistent with the sovereign power she claimed to exercise over the island in question, but she accepted the mediation of the pope, and the matter was settled by protocols, signed at Rome (17th December 1885). These incidents show the uses of variety and gradation in the methods of diplomacy.

Rights of neutral subjects on belligerent soil.

Neutral subjects have the right to carry on trade and intercourse with belligerent subjects in so far as they do not interfere with the operations or necessities of war, and it is no violation of the neutral character that this trade or intercourse is of benefit to either side. This is subject always to the belligerent right to capture and confiscate contraband of war (see below). On the other hand, the property of subjects and citizens of neutral states follows the fortune of the belligerent state within whose territorial jurisdiction it is situated. It is liable to the same charges as that of native subjects and citizens, and in case of military contributions neutral subjects on belligerent soil can claim no protection or exemption (see below, *Angary*). They have also the same rights to all indemnities for loss as are granted to native subjects and citizens.

The rights of neutral public ships and mail steamers.

The position of neutral public ships and the relative assimilation to them of mail steamers has been the subject of some controversy. A public ship is a ship having an official character. It includes not only warships, but also any ships affected to any specific and *exclusive* government purpose. Public ships in this sense are invested with an extra-territorial character, and the state to which they belong is directly responsible for their acts. They are therefore not liable to visit and search for contraband of war, and are exempt from territorial jurisdiction even in belligerent waters. As regards vessels which are engaged partly in private traffic and partly on public service, such as mail steamers and government packets, the position is necessarily different. Under the Japanese Prize Law, adopted in view of the Chino-Japanese campaign, any vessel carrying contraband of war, whose destination is hostile, may be detained, without exception being made for mail steamers. The United States proclamation of April 1898 in connexion with the Spanish War stated that mail steamers would only be stopped in case of grave suspicion of their carrying contraband or of their violating a blockade.

On the arrest of the German mail steamers "Bundesrath" and "General" during the South African War, the German government represented to the British government that "it was highly desirable" that steamers flying the German mail-flag should not be stopped, and the British government thereupon issued orders not to stop them on suspicion only (*Parliamentary Papers*, Africa, No. 1, 1900). This was a precedent of the greatest importance. It would have practically assimilated mail steamers to public ships. Yet the mere circumstance of carrying the mails does not manifestly *per se* change the character of the ship. Both this subject and the position of packets under state ownership, which may carry on trade and may consequently transport contraband, require deliberate adjustment by treaty. The convention between Great Britain and France respecting postal communications (30th August 1890) provides that "in the case of war between the two nations the packets of the two administrations shall continue their navigation, without impediment or molestation until a notification is made on the part of either of the two governments of the discontinuance of postal communications, in which case they shall be permitted to return freely to their respective ports" (article 9). The position of either as neutral is not dealt with. The tendency seems to be towards exemption, but in this case there should be official certification that the ships in question carry nothing in the nature of contraband.

Convoy.

Meanwhile the Hague Conference of 1907 has adopted rules under which postal correspondence of neutrals or belligerents is inviolable, whether it be official or private, or the carrying vessel be neutral or an enemy vessel, but in so far as mail ships are concerned they are not otherwise exempt from the application of the rules of war affecting merchant ships generally (see Convention on restrictions on the exercise of the right of capture in maritime war, October, 1907). Connected with the position of public ships is the question of the right of convoy. Neutral merchant ships travelling under the escort of a warship or warships of their own flag are held by some authorities to be exempt from visit and search. The Japanese Prize Law, which is largely based on English practice, following on this point the recommendations of the Institute of International Law (see *Règlement des prises maritimes*, Annuaire 1888, p. 221), provides that "when the commander of a neutral convoy declares that there is no contraband of war on board the vessels under convoy, and that all the papers are in order in these vessels, the vessels shall not be visited" (article 23).[1] The United States, in treaties with Mexico (5th April 1831), Venezuela (20th January 1836), Peru (6th Sept. 1870), Salvador (6th December 1870) and Italy (26th February 1871), have agreed to accept the commander's declaration as provided in the Japanese Prize Law. Wharton quotes in his *International Law Digest* a passage from a despatch of Mr Secretary Forsyth (18th May 1837) in which he states that "it is an ordinary duty of the naval force of a neutral during either civil or foreign wars to convoy merchant vessels of the nation to which it belongs to the ports of the belligerents. This, however, should not be done in contravention of belligerent rights as defined by the law of nations or by treaty." The Spanish Naval Instructions (24th April 1898) in the war with the United States granted unconditional exemption to convoyed neutral ships (article 11). The subject has now been dealt with by the Declaration of London (1908–1909), which requires the commander of a convoy to give a statement in writing as to the character of the vessels and cargoes (see CONVOY). A neutral merchant ship, travelling under *enemy's* convoy, places itself, with the assistance of the belligerent force, beyond the application of the belligerent right of visit and search, and thus commits a breach of neutrality.

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[1] At the outset of the Chino-Japanese War, Vice-Admiral Sir E. R. Fremantle sent a note to the Japanese admiral requesting him to "give orders to the ships under his command not to board, visit or interfere in any way with British merchant vessels, observing that the British admiral had directed all British ships under his orders to afford protection to such merchant vessels, and not to allow them to be molested in any way." Professor Takahashi, in his *International Law of the Chino-Japanese War*, relates that the Japanese admiral replied that "as the matters demanded by the British admiral belonged to the sphere of international diplomacy, and consequently were outside his official responsibility, they should be communicated directly to the Japanese Department of Foreign Affairs." "The idea of the British admiral," observes Professor Takahashi, "seemed to be not only to claim a right of convoy, which has never been recognized

Blockade.

Belligerent Rights.—Since the declaration of Paris providing that blockades in order to be binding must be effective, that is to say, must be maintained by a force sufficient really to prevent access to the enemy's coast, the tendency has been to give a precise form to all the obligations of the blockading belligerent. Thus it is now generally agreed that notification to the neutral should be sufficiently detailed to enable neutral vessels to estimate, with practical accuracy, the extent of their risks. French writers consider a general notification, though desirable, as insufficient, and hold an individual notification to each neutral ship which presents itself at the line of blockade as requisite. This theory was applied by France in the Franco-German War, and earlier by the Northern States in the American Civil War. The new Japanese Prize Law (1894) does not attempt to prescribe any such notification to each ship, but sets out that notice of blockade to each ship is either actual or constructive. "Actual" it describes as being when the master is shown to have had knowledge of the blockade, in whatever way he may have acquired such knowledge, whether by direct warning from a Japanese warship or from any other source; "constructive," when a notification of its existence has been made to the proper authorities of the state to which the vessel belongs, and sufficient time has elapsed for such authorities to communicate the notification to the subjects of that nation, whether or not they have in fact communicated it. No blockade, however, was attempted by the Japanese government, and the application of the rules was not put to the test.

In the war with Spain the United States proclamation of the investment of Cuba stated that an efficient force would be posted, so as to prevent the entrance and exit of vessels from the blockaded ports, and that any neutral vessel approaching or attempting to leave any of them, "without notice or knowledge" of the establishment of the blockade, would be duly warned by the commander of the blockading forces, who would endorse on her register the fact and date of such warning, and where such endorsement was made. The words "without notice or knowledge" were explained fully in the instructions to blockading vessels (20th June 1898). "Neutral vessels," said these instructions, "are entitled to notification of a blockade before they can be made prize for its attempted violation." "The character of this notification is not material. It may be actual, as by a vessel of the blockading force, or constructive, as by a proclamation of the government maintaining the blockade, or by common notoriety. If a neutral vessel can be shown to have notice of the blockade in any way, she is good prize and should be sent in for adjudication; but should the formal notice not have been given, the rule of constructive knowledge arising from notoriety should be construed in a manner liberal to the neutral." Thus the United States government abandoned the system of individual notification inserted in the proclamation of 19th April 1861, which was only found practicable in the case of vessels which had presumably sailed without knowledge. In such cases it was provided by the more recent instructions that they should be boarded by an officer, who should enter the notice in the ship's log, such entry to include the name of the blockading vessel giving notice, the extent of the blockade, and the date and place, verified by his official signature. The vessel was then to be set free, with a warning that, should she again attempt to enter the same or any other blockaded port, she would be good prize. The Declaration of London (1908–1909) exhaustively treats of this subject and has regulated it with a leaning towards continental views (see BLOCKADE).

Angary.

Angary, or *Droit d'Angarie*, is a contingent belligerent right, arising out of necessity of war, to dispose over, use and destroy, if need be, property belonging to neutral states.[1] During the Franco-German War imminent necessity was pleaded by the German government, as the justification of using force to seize and sink six British coal-ships in the Seine to prevent French gun-boats from running up the river and interfering with the tactics of the German army operating on its banks. The captains of the vessels refused to enter into any agreement with the commanding German general, and the vessels were then sunk by being fired upon. The British government raised no objection to the exercise of the right, and confined itself to demanding compensation for the owners, which the German government declared itself ready to pay. Count Bismarck evidently felt the use which might be made against Germany, as a neutral power, of such an extreme measure, and took care in the correspondence with the British government to emphasize the pressing character of the danger, which could not be otherwise parried.

A case given in the text-books as another one of angary during the same war was the temporary seizure and conversion to war purposes of Swiss and Austrian rolling-stock in Alsace, without any apparent military necessity. Ordinary private neutral property on belligerent soil, it must be remembered, follows the fate of private property generally. The only distinction between the right of angary and the right of assimilating private neutral property to private property generally on belligerent soil which seems based on reason is that, whereas private property of neutrals generally which has remained on belligerent soil is sedentary, or, so to speak, domiciled there, neutral vessels are mere visitors with a distinct external domicile. The writer thinks the assimilation of neutral railway carriages to neutral vessels in this respect not unreasonable.[2]

Contraband.

A neutral state in its corporate capacity, we have seen, must abstain from acts which can be of assistance to either belligerent, and it is bound to exercise reasonable diligence to prevent its territory being used as a base for belligerent operations. The duties of a neutral state as a state go no further. Commercial acts of its citizens, even the export of arms and munitions of war to a belligerent country, do not, in the present state of international usage, so long as both belligerents are free to profit by such acts alike, involve liability on the part of the neutral state. But relief from the obligation of repressing breaches of neutrality by contraband traffic of subjects has its counterpart in the right granted to belligerent warships of visit and search of neutral merchant vessels, and in the possible condemnation, according to circumstances, of the ship and confiscation of goods held to be contraband.

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by British prize courts, but also to extend it over all waters of the Far East, where British warships were not actually engaging in convoy. Soon afterwards the matter was settled without any difficulty. On 11th August the under-Secretary of the Japanese Foreign Office received a letter from the British Minister in Tôkyô stating that there must be some misunderstanding, and that the British government would never try to interfere with belligerent right."

[1] Angaria (from ἄγγαρος, a messenger), a post station. The French word *hangar* or shed is probably of the same origin.

[2] Treaties between the Zollverein and Spain (30th March 1868) and between Germany and Portugal (2nd March 1872) contain special provisions for the fixing of indemnities in case of any forced utilization by either state of private property of the citizens of the other.

Contraband is of two kinds—*absolute* contraband, such as arms of all kinds, machinery for manufacturing arms, ammunition, and any materials which are of direct application in naval or military armaments; and *conditional* contraband, consisting of articles which *are fit* for, but not necessarily of direct, application to hostile uses. The British Admiralty *Manual of Prize Law* (1888), following this distinction, enumerates as *absolutely contraband*: arms of all kinds and machinery for manufacturing arms; ammunition and materials for ammunition, including lead, sulphate of potash, muriate of potash, chlorate of potash and nitrate of soda; gunpowder and its materials, saltpetre and brimstone; also guncotton; military equipments and clothing; military stores, naval stores, such as masts, spars, rudders, and ship-timber, hemp and cordage, sailcloth, pitch and tar, copper fit for sheathing vessels, marine engines and the component parts thereof, including screw propellers, paddle wheels, cylinders, cranks, shafts, boilers, tubes for boilers, boiler plates and fire-bars, marine-cement and the material used in the manufacture thereof, blue lias and Portland cements; iron in any of the following forms—anchors, rivet iron, angle iron, round bars of iron of from ¾ to ⅝ of an inch diameter, rivets, strips of iron, sheets, plate iron exceeding ¼ of an inch, and Low Moor and Bowling plates;—and as *conditionally contraband:* provisions and liquors fit for the consumption of army or navy, money, telegraphic materials, such as wire, porous cups, platina, sulphuric acid, materials for the construction of a railway, such as iron bars, sleepers and so forth, coal, hay, horses, rosin, tallow, timber.[1]

Coal.

The classing of coal as conditional contraband has given rise to much controversy. Great Britain has consistently held it to be so. During the war of 1870 the French and German warships were only allowed to take at English ports enough to return to a French or German port respectively. In 1885, during the Franco-Chinese campaign, after protest by the Chinese government, Great Britain applied the same rule at Hong-Kong and Singapore. During the Spanish-American War neither belligerent seems to have treated coal as contraband. In the case of the coal-ships which were prevented from landing their cargoes at Cuba, the prevention seems to have been connected with the blockade only. At the West African conference of 1884 Russia declared that she would "categorically refuse her consent to any articles in any treaty, convention or instrument whatever which would imply the recognition of coal as contraband of war (*Parliamentary Papers*, Africa, No. 4, 1885). Coal, however, is so essential to the prosecution of war that it is impossible to avoid classing it as conditional contraband, so long as such contraband is recognized. The alternative, of course, would be to allow both belligerents freely to supply themselves at neutral ports, and neutral vessels freely to supply belligerent coaling stations.

Food-stuffs.

During the Franco-Chinese campaign of 1885 and the South African War there was controversy as to the legality of treating food-stuffs as conditional contraband. During the former the subject-matter was rice, and the circumstances were exceptional. The hostilities being at the outset reprisals, and not actual war, France at first exercised no right of search over British merchant ships. Great Britain, on her side, for the same reason did not object to French war vessels coaling, victualling and repairing at British ports. On China protesting against this indulgence to France, Great Britain, as above stated, put in force her practice of treating coal as contraband, and thereupon France exercised her corresponding belligerent right of searching British vessels. The closing of British coaling stations to French warships was a serious inconvenience to France, and she proclaimed "that in the circumstances in which war was being carried on" the cargoes of rice which were being shipped to the northern Chinese ports were contraband. By depriving the Chinese government of part of the annual tribute sent from the southern provinces in the form of rice she hoped to bring pressure on the Peking government. This was a manifest stretching of the sense of conditional contraband. Besides, no distinction was made as to destination. The British government protested, but no cases were brought into the French prize courts, and the legality of the measure has never been judicially examined.

The controversy during the South African War was confined to theory. In practice no stoppage of food-stuffs seems to have taken place, though the fact that the whole able-bodied population of the enemy states formed the fighting force opposed to Great Britain made it clear that the free import of food supplies from abroad helped the farmer-soldiers to carry on warfare without the immediate care of raising food crops.

The two cases cited show the great difficulty of fixing the character of conditional contraband in a way to prevent arbitrary seizures. During the Russo-Japanese War (1904–1905) there was a warm controversy between the British and Russian governments on the scope of the belligerent right to declare certain articles contraband. The Conference of London (1908–9), by enumerating the articles which are absolute contraband, limiting those which may be declared contraband, and fixing certain articles which can in no case be declared contraband, has endeavoured to meet the difficulties which arise in practice (see CONTRABAND).

Continuous voyages.

Trade between neutrals has a prima facie right to go on, in spite of war, without molestation. But if the ultimate destination of goods, though shipped first to a neutral port, is enemy's territory, then, according to the "doctrine of continuous voyages," the goods may be treated as if they had been shipped to the enemy's territory direct. This doctrine, though Anglo-Saxon in its origin and development, has been put in force by an Italian court in the case of the *Doelwijk*, a Dutch vessel which was adjudged good prize on the ground that, although bound for Jibouti, a French colonial port, it was laden with a provision of arms of a model which had gone out of use, and which could only be intended for use by the Abyssinians, with whom Italy was at war. The subject has been fully discussed by the Institute of International Law, by whom the following rule has been adopted: "Destination to the enemy is presumed where the shipment is to one of the enemy's ports, or to a neutral port, if it is unquestionably proved by the facts that the neutral port was only a stage (*étape*) towards the enemy as the final destination of a single commercial operation."[2]

The question of the legality of the doctrine was raised by Chancellor von Bülow during the South African War in connexion with the stopping of German ships bound for Delagoa Bay, a neutral port. He contended that such vessels were quite, at all times, outside belligerent jurisdiction, and that only the authorities of the neutral port were entitled to stop contraband on its way to a belligerent force. He did not, however, press the point, and only reserved the right of raising it at a future date.[1] It was fully discussed at the London Conference of 1908–1909. In order to effect a compromise between conflicting theories and practice, a distinction was made in the declaration between absolute and conditional contraband, the doctrine of continuous voyages not being applicable to conditional contraband when documented to be discharged at a neutral port, except where the enemy country has no seaboard (Declaration of London, arts. 30 to 36).

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[1] The Japanese Prize Law (21st August 1894) makes the following distinction: (1) Arms of all kinds, brimstone, dynamite, nitrate of potash, and all goods fit for the purpose of war exclusively: the above-mentioned goods are contraband when they are on board a vessel which either has a hostile destination or calls at any port of the enemy. (2) Provisions and liquors, money, telegraphic materials, such as wire, platinum, sulphuric acid and zinc, porous cups, materials for the construction of a railway, as iron bars, sleepers, &c., coal, timber and so forth; the above-mentioned goods are contraband goods when the destination of the vessel is either the enemy's fleet at sea or a hostile port, used exclusively or mainly for naval or military equipment. When it is clearly known that, though goods detailed in the above sections 1 and 2 are found on board a vessel, they are merely for her own use, they cannot be deemed contraband goods.

[2] The only person in that eminent assemblage who raised an objection to the principle of the doctrine was the distinguished French writer on maritime law, M. Desjardins, who declined to acknowledge that any theory of continuous voyages was, or could be, consistently with the existing law of neutrality, juridically known to International Law. He admitted, at the same time, that penalties of contraband would be incurred if the shipping to a neutral port were effected merely in order "to deceive the belligerent as to the real destination of the cargo." This was the French ruling in the *Frau Houwina* case (26th May 1855). He proposed to restrict the operation of the doctrine to this condition, but was opposed by three Italian professors of international law, Professors Fusinato, Catellani and Buzzati, on the ground that it would exclude, as it obviously would do, the contingency of goods shipped to a neutral port, not for the purpose of defrauding the belligerent, but for that of being ultimately delivered to a belligerent not in possession of a seaport. The article as quoted in the text was also supported by the greatest German authority on International Maritime Law, Director Perels of the German admiralty.

Unneutral Service.—Under this heading the London Conference of 1908–1909, concerning the laws of naval war, dealt with analogues of contraband, and neutral vessels assisting or in the service of the enemy. The articles adopted are as follows:—

> A neutral vessel will be condemned and will, in a general way, receive the same treatment as a neutral vessel liable to condemnation for carriage of contraband: (1) If she is on a voyage specially undertaken with a view to the transport of individual passengers who are embodied in the armed forces of the enemy, or with a view to the transmission of intelligence in the interest of the enemy. (2) If, to the knowledge of either the owner, the charterer, or the master, she is transporting a military detachment of the enemy, or one or more persons who, in the course of the voyage, directly assist the operations of the enemy.
>
> In the cases specified under the above heads, goods belonging to the owner of the vessel are likewise liable to condemnation.
>
> The provisions of the present article do not apply if the vessel is encountered at sea while unaware of the outbreak of hostilities, or if the master, after becoming aware of the outbreak of hostilities, has had no opportunity of disembarking the passengers. The vessel is deemed to be aware of the existence of a state of war if she left an enemy port subsequently to the outbreak of hostilities, or a neutral port subsequently to the notification of the outbreak of hostilities to the power to which such port belongs, provided that such notification was made in sufficient time. (Art. 45.)
>
> A neutral vessel will be condemned and, in a general way, receive the same treatment as would be applicable to her if she were an enemy merchant vessel: (1) If she takes a direct part in the hostilities; (2) If she is under the orders or control of an agent placed on board by the enemy government; (3) If she is in the exclusive employment of the enemy government; (4) If she is exclusively engaged at the time either in the transport of enemy troops or in the transmission of intelligence in the interest of the enemy.
>
> In the cases covered by the present article, goods belonging to the owner of the vessel are likewise liable to condemnation. (Art. 46.)
>
> Any individual embodied in the armed forces of the enemy who is found on board a neutral merchant vessel may be made a prisoner of war, even though there be no ground for the capture of the vessel. (Art. 47.)

Visit and search.

The procedure employed to ascertain whether a neutral vessel carries contraband or not is called *Visit and Search* (see SEARCH), a belligerent right universally recognized and justified by the considerations that merchant ships of the enemy might evade capture by hoisting a neutral flag, if the belligerent had not the right of ascertaining the real character of the ship, and that private neutral vessels might carry contraband goods and generally help the enemy, if the belligerent had not the right of examining their cargo. All neutral private vessels in time of war are liable to visit by belligerent warships on the high seas and in the territorial waters of the belligerents, but not in the territorial waters of neutral states. Neutral public ships are not liable to visit (see above as to neutral public ships, mail ships, and convoy). Visit and search must be effected at every stage with "as much consideration as possible" (Herr von Bülow, in Reichstag, 19th January 1900). The visiting officer first examines the ship's papers. If satisfied that the vessel is not liable to detention, he immediately quits her. If not so satisfied, he proceeds to search her. If in the course of the search he is satisfied that the vessel is not liable to detention, the search is immediately discontinued. The visiting officer has the right to inspect any lockers, stores or boxes, and in case of refusal to open them he is justified in using such coercive measure as the case warrants. If after the visit and search the commander has reason to entertain suspicion he gives the master an opportunity of explanation, and if the explanation is unsatisfactory he detains the vessel. If the seizure turns out after all not to have been justified, the ship and cargo are immediately released and compensation is due for the loss through the detention. In the case of the stoppage and search of German vessels during the South African War, the German government proposed the appointment of arbitrators to decide upon the claims for compensation but this was an innovation to which the British government did not assent.

Resistance to search entails consequences which Art. 63 of the Declaration of London (1908–1909) has expressed as follows:—

> Forcible resistance to the legitimate exercise of the right of stoppage, search and capture involves in all cases the condemnation of the vessel. The cargo is liable to the same treatment as the cargo of an enemy vessel. Goods belonging to the master or owner of the vessel are treated as enemy goods.

Capture, pre-emption, prize.

The consequence of carrying contraband are capture, trial by a belligerent prize court, and possible confiscation of the ship and cargo, or of the cargo alone or of a part of the cargo, according to the facts of the case. All are agreed as to articles which are absolute contraband being liable to capture. As regards conditional contraband, British law,[2] in so far, at least, as concerns "naval and victualling stores," is less severe, the Lords of the Admiralty being entitled to purchase such stores without condemnation in a prize court. In practice such purchases are made at the market value of the goods, with an additional 10% for loss of profit. This proceeding is known in International Law as the right of pre-emption. It is not, however, as yet officially recognized on the continent of Europe, though the need of some palliative for confiscation, in certain cases, is felt, and some continental jurists, moved by the same desire to distinguish unmistakable from so to speak constructive contraband, and protect trade against the vexation of uncertainty, have tried to argue conditional contraband away altogether.

The tendency, however, among the majority of continental authorities is seen in the rule drawn up in 1895, after several years of discussion, by the Institute of International Law, a body composed exclusively of international jurists of acknowledged standing. The majority which adopted it represents authoritative opinion in Germany, Denmark, Italy, Holland and France, showing that the old antagonism between the British and continental views on conditional contraband has ceased to exist. To prevent confusion the Institute declares conditional *contraband* abolished, and then adds that "nevertheless, the belligerent has, at his option and on condition of paying an equitable indemnity, *a right of sequestration or pre-emption* as to articles (*objets*) which, on their way to a port of the enemy, may serve equally for use in war or in peace." The proposed rule goes beyond the directions of the British Prize Act, and it could only come into operation under a verbal alteration of the Declaration of Paris, under which "contraband" alone is excepted from the protection of the neutral flag, a fact which seems to have escaped the notice of the Institute. British prize law is at present governed by the Prize Act of 1864. This act must be overhauled to meet the requirements of the new international law of the subject; the creation of an International Court of Appeal and the new rules adopted by the conferences of the Hague and London will make many changes necessary.

Enforcement of respect for neutral territory.

Absolute Duties of Neutrals.—The very sense of neutrality obviously implies abstention from direct corporate assistance. The duty of neutral states to enforce respect for their territory has become a very serious one. A belligerent cannot be allowed to cross the neutral frontier or carry on war operations in neutral waters, without the same right being granted to the other belligerent. Pursuit of one force by the other would amount to waging war on the neutral territory. It is agreed among nations that the avoidance of such a contingency is in the interest of them all. During the Franco-German War both France and Germany, as belligerents, and Belgium and England, as neutrals, rigorously observed their duties and enforced their rights, and no difficulty occurred. It is, nevertheless, conceivable that, under pressure of military necessity, or on account of an overwhelming interest, a powerful belligerent state would cross the territory of a weak neutral state and leave the consequences to diplomacy. The South African War was exceptional, in that the Portuguese government exposed itself to no international difficulty through allowing a belligerent, whose final victory was certain, and of necessity entailed total suppression of the conquered belligerent, to cross its colonial territory. At the same time it is an unfortunate precedent of taking advantage of the practical powerlessness of neighbouring neutral states to commit a violation of the law of nations, respect for which it is a primary duty of every self-respecting state to encourage.[1]

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[1] *Parl. Papers*, Africa, No. 1 (1900), pp. 14, 23.

[2] The Naval Prize Act 1864, sect. 38.

Refugees.

If, by inadvertence or otherwise, belligerent soldiers pass the frontier, they have to be turned back. If they claim the *droit d'asile*, they are arrested, disarmed, and kept in such a manner as to render it impossible for them to take any further part in the hostilities. In the case of territorial waters, as has already been pointed out, the neutral state is not in the same position as on land, all ships without distinction having a right of innocent passage through them. Belligerent ships also have the right to enter neutral ports, but the neutral authority is bound to take precautions to prevent any favour being shown to the one party or the other.[2]

Foreign enlistment, &c.

Relative Duties of Neutrals.—Relative duties embrace those duties which citizens are bound to observe and for which states incur a relative responsibility. It was the non-observance of these relative duties that led to difficulties between Great Britain and the United States at the close of the American Civil War and which brought the two countries themselves to the verge of conflict. The Treaty of Washington (8th May 1871) referring these difficulties to arbitration defined the scope of the duties in question for all future purposes between the two peoples (see below, "Proclamations of Neutrality"). Under this treaty the parties bind themselves to use "due diligence," where they have "reasonable ground" to believe that any acts have a belligerent character, in "preventing" them. They are bound to prevent—

(1) Fitting out, arming, or equipping any vessel;

(2) The departure from their jurisdiction of any vessel, having been specially adapted in whole or in part within such jurisdiction to warlike uses;

(3) The making use by a belligerent of their ports or waters as a base of naval operations against the other;

(4) The making use thereof for the purpose of the renewal or augmenting of military supplies or arms;

(5) The making use thereof for the recruitment of men.

The contracting states undertook to bring the rules they adopted on this subject to the knowledge of other maritime powers, and to invite them to adopt them also, but nothing was ever done to get them accepted among other states. Provision had already been made to enable the government to carry them out in the Foreign Enlistment Act (9th August 1870). This act, which repealed the previous one of 1819 on the same subject, is minute in its provisions to prevent enlisting or recruiting men, or the building or the equipping of vessels, for the military service "of a foreign state at war with a friendly state." Other states, except the United States (which adopted a similar act), have not followed the example of Great Britain, but leave it to their governments to deal with the cases, when they may arise, as matters of public safety.[3]

There was evident reluctance among foreign states to commit themselves to the obligation of exercising "due diligence." It is clear that the duty of a state to forbear from committing any act which may be of assistance to either belligerent can never be formulated as an absolute one in regard to the acts of private persons, merely within the neutral jurisdiction. In recent times it has certainly become possible for states to exercise a more effective control than formerly over these acts; but at the present moment, though a much greater latitude is left to neutral subjects and citizens than is consistent with the idea of strict neutrality, there is no movement to alter the usages to the disadvantage of neutral interests. That the Geneva Arbitral Tribunal found in favour of the United States in the "Alabama" case in no way implied that International Law had undergone any change. The tribunal was bound by the antecedent fixation of the Washington rules, and laid down no new principle. On the other hand, the magnitude of the Geneva award was not likely to promote change in the direction of increasing neutral duties, except as part of a general regulation of neutral and belligerent rights. The whole subject was laid before the Hague Conference of 1907, which adopted the main principles of the rules enunciated in the Treaty of Washington (see Art. 8 of the Convention relating to the rights and duties of neutral states in maritime war).

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[1] The right of way claimed and acceded to under the Anglo-Portuguese Treaty of 11th June 1891 was a mere right of transit for merchandise, and could not in any way be construed as diminishing the neutral obligation to a belligerent who was no party to the treaty.

[2] The rules laid down on this subject by the British authorities during the Spanish-American War were as follows:—

Rule 1.—During the continuance of the present state of war all ships of war of either belligerent are prohibited from making use of any port or roadstead in the United Kingdom, the Isle of Man or the Channel Islands, or of any of Her Majesty's colonies or foreign possessions or dependencies, or of any waters subject to the territorial jurisdiction of the British crown, as a station or place of resort for any warlike purpose, or for the purpose of obtaining any facilities for warlike equipment; and no ship of war of either belligerent shall hereafter be permitted to leave such port, roadstead or waters from which any vessel of the other belligerent (whether the same shall be a ship of war or a merchant ship) shall have previously departed until after the expiration of at least twenty-four hours from the departure of such last-mentioned vessel beyond the territorial jurisdiction of Her Majesty.

Rule 2.—If there is now in any such port, roadstead or waters subject to the territorial jurisdiction of the British crown any ship of war of either belligerent, such ship shall leave such port, roadstead, or waters within such time, not less than twenty-four hours, as shall be reasonable, having regard to all the circumstances and the condition of such ship as to repairs, provisions or things necessary for the subsistence of her crew; and if after the date hereof any ship of war of either belligerent shall enter any such port, roadstead or waters subject to the territorial jurisdiction of the British crown, such ship shall depart and put to sea within twenty-four hours after her entrance into any such port, roadstead or waters, except in case of stress of weather, or of her requiring provisions or things necessary for the subsistence of her crew, or repairs; in either of such cases the authorities of the port, or the nearest port (as the case may be), shall require her to put to sea as soon as possible after the expiration of such period of twenty-four hours, without permitting her to take in any supplies beyond what may be necessary for her immediate use; and no such vessel which may have been allowed to remain within British waters for the purpose of repair shall continue in any such port, roadstead or waters for a longer period than twenty-four hours after her necessary repairs shall have been completed. Provided, nevertheless, that in all cases in which there shall be any vessels (whether ships of war or merchant ships) of both the said belligerent parties in the same port, roadstead or waters within the territorial jurisdiction of Her Majesty, there shall be an interval of not less than twenty-four hours between the departure therefrom of any such vessel (whether a ship of war or merchant ship) of the one belligerent and the subsequent departure therefrom of any ship of war of the other belligerent; and the time hereby limited for the departure of such ships of war respectively shall always, in case of necessity, be extended so far as may be requisite for giving effect to this proviso, but no further or otherwise.

Rule 3.—No ship of war of either belligerent shall hereafter be permitted, while in any such port, roadstead or waters subject to the territorial jurisdiction of Her Majesty, to take in any supplies, except provisions and such other things as may be requisite for the subsistence of her crew, and except so much coal only as may be sufficient to carry such vessel to the nearest port of her own country or to some nearer destination; and no coal shall again be supplied to any such ship of war in the same or any other port, roadstead or waters subject to the territorial jurisdiction of Her Majesty, without special permission, until after the expiration of three months from the time when such coal may have been last supplied to her within British waters as aforesaid.

Rule 4.—Armed ships of either belligerent are interdicted from carrying prizes made by them into the ports, harbours, roadsteads or waters of the United Kingdom, the Isle of Man, the Channel Islands, or any of Her Majesty's colonies or possessions abroad.

[3] The French Penal Code, however, contains the following clauses covering the government's powers in this respect:—

Art. 84.—Whoever shall by hostile acts, not approved by the Government, expose the State to a declaration of war, shall be punished by banishment, and should war follow, by deportation.

Art. 85.—Whoever shall, by acts not approved by the Government, expose Frenchmen to the risk of reprisals, shall be punished by banishment.

Proclamations of neutrality.

To some extent the difficulty of determining the extent of relative neutral duty is overcome by the issue of proclamations of neutrality; but neutrality and its rights and duties are in no respect dependent on their being proclaimed by the neutral power. Germany issues no proclamation; at least the German empire has issued none in connexion with the different wars which have taken place since 1870. The Austro-Hungarian government during the same period only in the case of the war of 1870 itself, and in 1877, issued proclamations, and these probably had objects outside the ordinary purposes of proclamations of neutrality, and its usual practice is the same as that of Germany. France usually issues a short general proclamation, and Great Britain a more detailed one, which must be as old as the "ancient custom" of its being publicly read from the steps of the Royal Exchange by the sergeant-at-arms and common crier of the City of London.[1] The British proclamation practically recites the Foreign Enlistment Act 1870 (an act to regulate the conduct of His Majesty's subjects during the existence of hostilities between foreign states with which His Majesty is at peace), admonishes all persons entitled to British protection to observe and respect the exercise of those belligerent rights which "We and Our Royal Predecessors have always claimed to exercise," and warns them that any such persons "breaking, or endeavouring to break, any blockade lawfully and actually established" by either belligerent, "or carrying officers, soldiers, despatches, arms, ammunition, military stores, or materials, or article or articles, considered and deemed to be contraband of war, according to the law or modern usages of nations, for the use or service" of either belligerent, "rightfully incur, and are justly liable to, hostile capture and to the penalties denounced by the law of nations in that behalf." During the South African War no proclamation of neutrality was issued by any country.

Proclamations of neutrality may be made to serve the twofold purpose of warning the belligerent of the length to which the neutral government considers neutral duty to extend, and neutral subjects of the exceptional measures to which a foreign war exposes them. They may also be used to give effect to any modification of neutral right or duty which the neutral state may consider warranted by special or altered circumstances.

Sale of arms and ammunition by neutrals.

No purely mercantile transactions are considered a violation of neutrality. Six years before the American Civil War, President Pierce, in his message to the Thirty-fourth Congress, first session, made the following statement:—"The laws of the United States do not forbid their citizens to sell to either of the belligerent powers articles of contraband of war, or to take munitions of war or soldiers on board their private ships for transportation; and although in so doing the individual exposes his person or property to some of the hazards of war, his acts do not involve a breach of the national neutrality, nor of themselves implicate the government." This statement of international practice has been confirmed by art. 7 of the Hague Convention of October 18, 1907, on the Rights and Duties of Neutral States and Persons on Land (see below).

During the Franco-German War there was correspondence between the Prussian diplomatic representatives in London and at Washington and the British and United States foreign secretaries concerning shipments of arms and ammunition to the French armies, in which the Prussian government contended that it was incompatible with strict neutrality that French agents should be permitted to buy up in the neutral country, under the eyes and with the cognizance of the neutral government, "many thousands of breech-loaders, revolvers, and pistols, with the requisite ammunition, in order to arm therewith the French people, and make the formation of fresh army corps possible after the regular armies of France had been defeated and surrounded." Nothing, however, was done to prevent the departure of these supplies. Both the British and United States governments claimed entire liberty for the traffic in question.

Raising of loans on neutral territory.

In the case of loans publicly issued or raised on neutral territory the position is a little different, inasmuch as the neutral state is necessarily cognizant of the fact. No restriction, however, is imposed by international usage, and provided the same rights are granted to both belligerents, either or both can raise money *ad libitum* in neutral countries. Thus neutral states did not prevent the issue on their territory of the Russian war loan of 1876–1877. Nor in the war of 1894 between China and Japan was any opposition made by Japan to the raising of the Chinese loan in London. Art. 18 of the Hague Convention on the Rights and Duties of Neutral States and Persons on Land (see below) confirms the existing practice.

General neutrality convention of 1907.

Neutrality Reforms.—At the Hague Peace Conference 1899 a suggestion was agreed to, without discussion, that a further state conference should be held for the purpose of dealing specially with neutrality. At the Conference of 1907 this was done, with the result that two fairly exhaustive conventions were adopted. The general provisions relating to neutrality are as follow:—

ART. 1.—Neutral territory is inviolable.

ART. 2.—Belligerents are forbidden to send troops or convoys either of munitions of war or of provisions through the territory of a neutral state.

ART. 3.—Belligerents are also forbidden:—

(*a*) To instal, on the territory of a neutral state, a radio-telegraphic station or any apparatus intended to serve as a means of communication with the belligerent forces on land or sea;

(*b*) To make use of any installation of like nature, erected by them before the war, on the territory of the neutral state, for an exclusively military purpose, and which has not been opened to the service of public correspondence.

ART. 4.—Bodies of combatants shall not be formed or recruiting offices opened on territory of a neutral power for the benefit of the belligerents.

ART. 5.—A neutral state shall not allow on its territory any of the acts mentioned in arts. 2 to 4. It is only bound to repress acts contrary to neutrality in case they have been committed on its own territory.

ART. 6.—A neutral state is not responsible where individuals separately pass the frontier to place themselves at the disposal of either belligerent.

ART. 7.—A neutral state is not bound to prevent exportation or transit for the account of either belligerent, of arms, munitions of war, and, in general, of anything which may be useful for an army or a fleet.

ART. 8.—A neutral state is not bound to prohibit or restrict the use, for belligerents, of telegraphic or telephonic cables, or of wireless telegraphy apparatus, which are its property or that of companies or private individuals.

ART. 9.—Any prohibitive or restrictive measures adopted by a neutral state relative to the matters mentioned in arts. 7 and 8 shall be applied uniformly by it to both belligerents. The neutral state shall see that this obligation is observed by companies or private individuals owning telegraphic or telephonic cables or wireless telegraphic apparatus.

ART. 10.—The act by a neutral state of resisting any violation of its neutrality, even by force of arms, cannot be regarded as an act of hostility.

ART. 11.—A neutral state receiving, on its territory, troops belonging to the belligerent armies, shall, as far as possible, keep them distant from the area of hostilities.

It may keep them in camps, and even shut them up in fortified places, or in places suitable for this purpose. It shall decide whether officers may be left at liberty or parole not to leave the neutral territory without authorization.

ART. 12.—When there is no special convention a neutral state shall supply internal prisoners with food, clothing, and the aid which humanity calls for. When peace is established, the cost of keeping the prisoners shall be reimbursed.

ART. 13.—A neutral state receiving escaped prisoners of war shall leave them at liberty. If it allows them to stay on its territory, it may appoint a place of residence for them. The same rule is applicable to prisoners of war brought by troops taking refuge on neutral territory.

ART. 14.—A neutral state may authorize the passage on its territory of wounded or sick belonging to the belligerent armies, on condition that the trains which carry them shall transport none of the fighting force and no materials of war. In such a case, the neutral state is bound to take the necessary steps to ensure safety and control.

The wounded or sick brought in these circumstances into neutral territory by one of the belligerents, and belonging to the enemy, shall be detained by the neutral state in such a way that they cannot again take part in the hostilities. This neutral state shall discharge the same duties if it be entrusted with the wounded or sick of the other army.

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[1] *The Times*, 28th April 1898.

ART. 15.—The Geneva Convention applies to sick and wounded interned on neutral territory (see GENEVA CONVENTION).

ART. 16.—The natives of a state not taking part in the hostilities are considered as neutrals.

ART. 17.—A neutral person cannot take advantage of his neutrality:—

(*a*) If he commits hostile acts against a belligerent;

(*b*) If he commits acts in favour of a belligerent, for instance, if he voluntarily takes service in the ranks of the army of one of the parties.

In such a case the neutral shall not be treated with more severity by the belligerent against whom he has acted in contravention of his neutrality than a native of the other belligerent state would be for the same act.

ART. 18.—The following shall not be considered as acts committed in favour of one of the belligerents, in the sense of Art. 17 (*b*):—

(*a*) Supplies or loans made to one of the belligerents provided the purveyor or the lender inhabits neither the territory of the other party nor territory occupied by it, and provided the supplies do not come from these territories;

(*b*) Services rendered in matters of police or civil administration.

ART. 19.—Railway property coming from the territory of neutral states, whether it belongs to these states or to companies or to private persons, and recognizable as such, cannot be requisitioned or utilized by a belligerent, except in such cases and in such a manner as dictated by absolute necessity. Such property shall be returned to its country of origin as soon as possible.

The neutral state can even, in case of necessity, keep and utilize to that extent property coming from the territory of a belligerent state.

An indemnity shall be paid, proportionate to the amount of the property utilized and the duration of utilization.

The clauses of the Convention relating exclusively to neutrality in naval war, which are still fuller, are:—

Convention of 1907 on neutrality in naval war.

ART. 1.—Belligerents are bound to respect the sovereign rights of neutral powers and to abstain, either on the territory or in neutral waters, from all acts which might constitute in the part of the powers permitting them a non-observance of their neutrality.

ART. 2.—All acts of hostility, including capture and the exercise of the right of *visit and search*, by belligerent ships of war in the territorial waters of a neutral power, constitute a breach of neutrality and are strictly forbidden.

ART. 3.—When a vessel has been captured in the territorial waters of a neutral power, this power shall, if the prize is still within its jurisdiction, use all means in its power to effect the release of the prize and its officers and crew, and that the crew placed on board by the captor shall be interned. If the prize is out of the jurisdiction of the neutral power, the capturing government shall, on the request of the former, release the prize with its officers and crew.

ART. 4.—No prize court can be constituted by a belligerent on neutral territory or on a vessel in neutral waters.

ART. 5.—Belligerents are forbidden to make neutral ports and waters the base of naval operations against their adversaries, especially by installing radio-telegraphic stations or any apparatus which may serve as means of communication with belligerent forces on sea or on land.

ART. 6.—The supply, under any ground whatever, either directly or indirectly, by a neutral power to a belligerent power, of ships of war, or of munitions or of material of war of any kind, is forbidden.

ART. 7.—A neutral power is not bound to prevent the exportation or transit, for the account of either belligerent, of arms, munitions of war, or, in general, of anything which may be useful to an army or a fleet.

ART. 8.—A neutral government is bound to use the means at its disposal to prevent, within its jurisdiction, the equipping or arming of any vessel, which it has any reasonable suspicion of being destined to act as a cruiser or to join in hostile operations against a power with which it is at peace.

It is also bound to exercise the same surveillance to prevent the departure out of its jurisdiction of any vessel intending to act as a cruiser or take part in hostile operations, and which, within the said jurisdiction, may have been adapted either wholly or in part for warlike purposes.

ART. 9.—A neutral power must apply equally to the two belligerents the restrictions, conditions and interdictions specified by it relating to admission to its ports, roadsteads, or territorial waters, with respect to ships of war or their prizes.

A neutral power may, however, forbid access to its ports and roadsteads, to any belligerent vessel which may have neglected to comply with the orders and directions issued by it or may have committed a breach of neutrality.

ART. 10.—The neutrality of a power is not compromised by the simple passage through its territorial waters of belligerent ships of war and of their prizes.

ART. 11.—A neutral power may allow ships of war of belligerents to make use of its licensed pilots.

ART. 12.—In default of other special provisions in the laws of a neutral power, ships of war of belligerents are forbidden to remain in the ports or roadsteads or in the territorial waters of the said power for more than twenty-four hours, except in the cases provided for by the present Convention.

ART. 13.—If a power which has received notice of the commencement of hostilities learns that a ship of war of a belligerent is in one of its ports and roadsteads or in its territorial waters, it shall notify the said ship that it must leave within twenty-four hours or within the time prescribed by the local law.

ART. 14.—A belligerent ship of war may not prolong its stay in a neutral port beyond the legal period, except for the purpose of repairing damage or by reason of the state of the sea. It must leave as soon as the cause of the delay has ceased.

The rules relating to the limitation of stay in ports, roadsteads, and neutral waters do not apply to ships of war exclusively employed on religious, scientific or philanthropic missions.

ART. 15.—In default of other special provisions in the laws of the neutral power, the maximum number of ships of war of a belligerent which may be at the same time in one of its ports or roadsteads shall be three.

ART. 16.—When ships of war of two belligerents are at the same time in a neutral port or roadstead, twenty-four hours at least must elapse between the departure of the ship of either belligerent before that of the other.

The order of departure shall be regulated by the order of arrival, unless the vessel arriving first is entitled to a prolongation of the legal period of its stay.

A belligerent ship of war may not leave a neutral port or roadstead until at least twenty-four hours after the departure of a merchant vessel carrying the flag of its adversary.

ART. 17.—In neutral ports and roadsteads, belligerent ships of war may only repair damage to the extent indispensable for their seaworthiness, and may not, in any way, increase their military strength. The neutral authority will ascertain the nature of the repairs to be executed, which shall be carried out as rapidly as possible.

ART. 18.—Belligerent ships of war may not make use of neutral ports, roadsteads and territorial waters for the purpose of renewing or increasing their military equipment or armament or for completing their crews.

ART. 19.—Belligerent ships may not revictual in neutral ports or roadsteads, except to complete their normal supplies as in time of peace. These ships may also only take on board the fuel necessary for the purpose of reaching the nearest port of their own country. They may also take in fuel sufficient to fill up their bunkers properly so called if they are in a neutral country which has adopted this method of fixing the amount of fuel to be supplied.

If, according to the law of the neutral power, ships may only receive coal twenty-four hours after their arrival, the legal period of their stay is prolonged for twenty-four hours.

ART. 20.—Belligerent ships of war which have taken in fuel in the port of a neutral power cannot renew their supply in a port of the same power within three months.

ART. 21.—A prize may not be brought into a neutral port except by reason of its unseaworthiness, or of the stress of weather or of insufficiency of fuel or provisions. It must leave again as soon as the cause of its entry has ceased. If it does not do so, the neutral power shall give it notice to leave immediately, and in the event of its not complying therewith, the neutral power shall use the means at its disposal to release it with its officers and crew and intern the crew placed on board by the captor.

ART. 22.—The neutral power shall also release any prize which has been brought in not in accordance with the conditions laid down in Art. 21.

ART. 23.—A neutral power may allow access to its ports and roadsteads to prizes, whether escorted or not, when they have been brought there to be left in sequestration pending the decision of a prize court. It may have the prize conducted to any other of its ports.

If the prize is escorted by a ship of war, the officers and men placed on board by the captor are allowed to go on board the escorting ship.

If the prize is navigating alone, the *personnel* placed on board is set at liberty.

ART. 24.—If, in spite of notice from the neutral authority, a belligerent ship of war does not leave a port in which it has no right to remain, the neutral power has the right to take such steps as it may think proper to render the ship incapable of going to sea during the continuance of the war, and the commander of the ship must facilitate the taking of such steps. When a belligerent ship is detained by a neutral power, the officers and crew are also detained.

The officers and crew thus detained may be left on board the ship or lodged on board another vessel or on shore, and they may be subjected to such restrictive measures as may be considered necessary to be imposed on them. In any event, sufficient men must be left on board the ship to keep it in order.

The officers may be released on giving their parole not to leave the neutral territory without permission.

ART. 25.—A neutral power is bound to exercise the surveillance of which the means in its power admit, to prevent within its ports or roadsteads and in its waters any violation of the preceding provisions.

Art. 26.—The exercise by a neutral power of the rights defined by the present Convention can never be considered as an unfriendly act by either belligerent who has accepted the articles relating thereto.

Art. 27.—The contracting powers will communicate to each other, as soon as feasible, all the laws, ordinances and other provisions which within their jurisdiction govern belligerent ships of war in their ports and waters, by means of a notification addressed to the government of the Netherlands and immediately transmitted by the latter to the other contracting powers.

Art. 28.—The provisions of the present Convention are only applicable as between contracting powers, and only if the belligerents are all parties thereto.

Other reforms may be expected from the Conference of 1915. Germany in the course of the South African War and Great Britain in that of the Russo-Japanese War showed great irritation at the stoppage of certain of their merchant vessels, and Great Britain in the one case had to consent to and in the other to demand a modification of belligerent right under International Law—a modification which, be it said, is a perfectly justifiable one, viz. that the right of search for contraband of war be restricted to a specified area. It is probable that, in future wars, powerful neutral states will show, in similar cases, quite as much irritation as did Germany and Great Britain. (T. Ba.)

NEUVILLE, ALPHONSE MARIE DE (1836–1885), French painter, was born, the son of wealthy parents, at Saint-Omer, France, on the 31st of May 1836. From school he went to college, where he took his degree of *bachelier ès lettres*. In spite of the opposition of his family he entered the naval school at Lorient, and it was here, in 1856, that his artistic instincts first declared themselves. After being discouraged by several painters of repute, he was admitted to work in Picot's studio. He did not remain there long, and he was painting by himself when he produced his first picture, "The Fifth Battalion of Chasseurs at the Gervais Battery (Malakoff)." In 1860 de Neuville painted an "Episode of the taking of Naples by Garibaldi" for the Artists' Club in the Rue de Provence, and sent to the Salon in 1861 "The Light Horse Guards in the Trenches of the Mamelon Vert." He also illustrated *Le Tour du monde* and Guizot's *History of France*. At the same time he painted a number of remarkable pictures: "The Attack in the Streets of Magenta by Zouaves and the Light Horse" (1864), "A Zouave Sentinel" (1865), "The Battle of San Lorenzo" (1867), and "Dismounted Cavalry crossing the Tchernaia" (1869). In these he showed peculiar insight into military life, but his full power was not reached till after the war of 1870. He then aimed at depicting in his works the episodes of that war, and began by representing the "Bivouac before Le Bourget" (1872). His fame spread rapidly, and was increased by "The Last Cartridges" (1873), in which it is easy to discern the vast difference between the conventional treatment of military subjects, as practised by Horace Vernet, and that of a man who had lived through the life he painted. In 1874 the "Fight on a Railroad" was not less successful, and was followed by the "Attack on a House at Villersexel" (1875) and the "Railway Bridge at Styring" (1877). In 1878 the painter exhibited (not at the Great Exhibition) "Le Bourget," the "Surprise at Daybreak," "The Intercepted Despatch-bearer," and a considerable number of drawings. He also exhibited in London some episodes of the Zulu War. In 1881 he was made an officer of the Legion of Honour for "The Cemetery of Saint-Privat" and "The Despatch-bearer." During these years de Neuville was at work with Detaille on an important though less artistic work, "The Panorama of Rézonville." De Neuville died in Paris on the 18th of May 1885. At the sale of his works the state purchased for the Luxembourg the "Bourget" and the "Attack on a Barricaded House," with a water-colour "The Parley," and a drawing of a "Turco in Fighting Trim."

See Montrosier, *Les Peintres militaires* (Paris, 1881), "De Neuville," in *Gazette des beaux arts* (Paris, 1885).

NEUWEILER, a town of Germany, in the imperial province of Alsace-Lorraine, situated under the Vosges Mountains, 6 m. N. from Zabern by the railway to Rastatt. Pop. (1905) 1906. It is an interesting medieval town, still surrounded by walls. The Romanesque Evangelical church dates from the 12th century; there are also a Romanesque Roman Catholic church, which was restored in 1852, a synagogue, and an old town-hall. The town has a considerable trade in hops and wine. Above it rise the ruins of the fortress of Herrenstein, and of the castle of Hüneburg.

See Fischer, *Geschichte der Abtei und Stadt Neuweiler* (Zabern, 1876).

NEUWIED, a town of Germany, in the Prussian Rhine province, the capital of the mediatized countship of Wied, is situated on the right bank of the Rhine, 8 m. below Coblenz, on the railway from Frankfort-on-Main to Cologne. Pop. (1905) 18,177. The principal edifice is the château of the princes of Wied. This is situated in a fine park, and contains a collection of Roman antiquities. The town has an Evangelical and a Roman Catholic church. Its chief products are starch, sugar, tobacco, cigars, chicory, buttons and enamelled goods. There are large rolling-mills, and in the vicinity are several large iron-foundries. The schools of Neuwied enjoy a high reputation.

Neuwied was founded by Count Frederick of Wied in 1662, on the site of the village of Langendorf, which was destroyed during the Thirty Years' War, and it rapidly increased owing to the toleration accorded to all religious sects. Among those who sought refuge here was a colony of Moravian Brethren; they still occupy a separate quarter of the town, where they carry on manufactures of porcelain stoves and deerskin gloves. Near Neuwied one of the largest Roman *castra* on the Rhine has been excavated. In April 1797 the French, under General Hoche, defeated the Austrians near Neuwied, this being their first decisive success in the revolutionary wars. Legenhaus, in the neighbourhood, is one of the residences of the princes of Weid.

See Wirtgen and Blenke, *Neuwied und seine Umgebung* (Neuwied, 1901).

NEVA, a river of Russia, which carries off into the Gulf of Finland the waters of Lakes Ladoga, Onega, Ilmen and many smaller basins. It issues from the south-west corner of Lake Ladoga in two channels, which are obstructed by sandstone reefs, so that the better of the two has a depth of only 7 to 16 ft. A little farther down it becomes completely navigable, and attains a breadth of 4200 ft.; but between the village of Ostrovki and that of Ust-Tosna it passes over a limestone bed, which produces a series of rapids, and reduces the width of the river from 1050 to 840 and that of the navigable passage from 350 to 175 ft. Nine or ten miles before reaching its outfall the river enters St Petersburg, and 5 or 6 m. lower down breaks up into the Great Neva (850 to 1700 ft. wide), the Little Neva (945 to 1365), and the Great Nevka (280 to 1205), this last, 2 m. farther on, sending off the Little Nevka (370 to 1130 ft.). Its total length is only 40 m. In front of the delta are sandbanks and rocks which prevent the passage of vessels except by a canal, 18 m. long, 124 to 226 ft. wide, and admitting vessels with a draught of $18\frac{1}{2}$ ft., from Kronstadt to St Petersburg. Most of its alluvial burden being deposited in the lakes, the Neva takes a long time to alter its channels or extend its delta. The ordinary rise and fall of the river is comparatively slight, but when the west wind blows steadily for a long time, or when Lake Ladoga sends down its vast accumulations of block-ice, inundations of a dangerous kind occur, as in 1777, 1824, 1879 and 1903.

According to observations extending from 1706 to 1899, the mean day of the freezing of the Neva is November 25th, the earliest October 28th, the latest January 9th, and the next latest December 26th. The mean day of opening is April 21st, the earliest March 18th, and the latest May 12th. The mean number of days open is 218, the least 172, the greatest 279.

NEVADA (a Spanish word meaning "snow-clad" or "snowy land," originally applied to a snow-capped mountain range on the Pacific slope), one of the far western states of the American Union, lying between 35° and 42° N. and 114° 1′ 34″ and 120° 1′ 34″ W. (37° and 43° W. of Washington). It is bounded N. by Oregon and Idaho, E. by Utah and Arizona, the Colorado River separating it in part from the latter state, and S. and W. by California. Nevada ranks sixth in size among the states of the Union. Of its total area of 110,690 sq. m., 869 sq. m. are water surface. Its extreme length, N. and S., is 484 m., and its extreme width, E. and W., is 321 m. (For map, see CALIFORNIA.)

Physiography.—With the exception of its N.E. and S.E. corners, the state lies wholly within the Great Basin, the floor of which is really a vast table-land between 4000 and 5000 ft. above the sea. This plateau, however, is not a plain, but contains many buttes and mesas and isolated mountain ranges rising from 1000 to 8000 ft. above its surface. In the N.E. an unnamed range of highlands, with an E. and W. trend, forms the water-parting between the streams tributary to the Humboldt river in Nevada and those that flow into the Snake river through Idaho and Oregon and thence to the Pacific Ocean. This range is very broken and ill-defined, with peaks often reaching altitudes of from 9000 to 12,000 ft., and with numerous spurs diverging N. and S. from the main divide. Between this ridge and the valley of the Colorado river lies all that portion of the Great Basin included within the state. The surface of this table-land is very rugged, and frequently broken by mountain ranges running N. and S. and from 5 to 20 m. wide at their bases. Intersecting the mountains are numerous ravines and passes. Between the ranges lie valleys of about the same width as the bases of the mountains. These valleys are generally level-floored, but at their borders gradually slope upward, and are filled, often to a depth of several thousand feet, with the detritus of gravel, sand and silt from the neighbouring hills. This is a region of innumerable faulted crust blocks, the elevated ones creating the N. and S. mountain ranges, and the depressed ones the valleys that lie between. It is for this reason that the mountain slopes are generally more abrupt on one side than on the other. Several valleys often unite into a large elevated plain, broken only by scattered buttes and spurs. The combined areas of the valleys and the area occupied by the mountains are about equal.

The mean elevation of the state is 5500 ft. There are 5400 sq. m. between 2000 and 3000 ft. above the sea; 11,100 sq. m. between 3000 and 4000 ft.; 23,700 sq. m. between 4000 and 5000 ft.; 29,800 sq. m. between 5000 and 6000 ft.; 30,100 sq. m. between 6000 and 7000 ft.; 7800 sq. m. between 7000 and 8000 ft.; and 2800 sq. m. between 8000 and 9000 ft. The highest point within the state is Wheeler Peak, near the centre of the eastern boundary, with an elevation of 13,058 ft.; the lowest points are along the Colorado river, where the altitudes range from 700 to 800 ft. With the exception of this dip in the S.E. corner, the entire state lies above the 2000 ft. line.

The Sierra Nevada range, which forms the western rim of the Basin, sends into the state a single lofty spur, the Washoe Mountains. At the foot of this range there is, relatively speaking, a depression, with an altitude of about 3850 ft. above the sea, which receives the drainage of the eastern slopes of the Sierra and what little drainage there is in the northern half of Nevada. From this depression eastward the general level of the plateau gradually rises to an elevation of 6000 ft. near the eastern borders of the state. The mountains also increase in height and importance as far as the East Humboldt range, a lofty mass about 60 m. W. of the Utah boundary. This range is the water-parting for nearly all the westward-flowing streams of the state, and is by far the steepest and most rugged within Nevada, a number of its peaks attaining a height of 11,000 or 12,000 ft. On its eastern slope the waters soon disappear within the bed of narrow canyons, but break out again at the foot in ice-cold springs that form the source of the Ruby and Franklin lakes; on its western side the descent is more gentle, and the waters form the South Fork of the Humboldt river. Somewhat S. of the centre of the state lie the Toyabe Mountains, with several peaks from 10,000 to 12,000 ft. in height. The waters on the eastern slopes flow into the Smoky Valley; those on the other side assist the neighbouring Shoshone Mountains in feeding the Reese river, which flows N. toward the Humboldt, but seldom has sufficient volume to enable it to reach that stream. About 100 m. E. of the California boundary lies a third important range, the Humboldt Mountains, whose highest point (Star Peak) is 9925 ft. above the sea. Owing to their great height these three ranges receive heavier rainfall than the surrounding country and are feeders to the northern valleys, which constitute the chief agricultural region of the state. Many of the block mountains of the Great Basin are of complicated internal structure, showing rocks of all ages—slate, limestone, quartzites, granite, multi-coloured volcanic rocks, and large areas of lava overflow.

From the valley of the Humboldt river southward the plateau gradually rises until the divide between this stream and the Colorado river, in the vicinity of the White Pine Mountains, is reached. From this point there is a fall, which is gradual as far S. as the 38th parallel, and then more abrupt. Thus at Pioche the altitude is 6100 ft., at Hiko 3881 ft., at St Thomas 1600 ft., and at the Eldorado Canyon 828 ft. The region of the Colorado river is largely desert, with occasional buttes and spurs.

Rivers and Lakes.—There are three drainage systems within the state. North of the Humboldt Valley an area of about 5000 sq. m. is drained by the Owyhee, the Little Owyhee, the Salmon and Bruneau rivers, whose waters eventually reach the Pacific Ocean. Below this region flow the streams of the Great Basin, none of which reach the sea, but either terminate in lakes having no outlet or else vanish in sloughs or "sinks." Small streams often sink from sight in their beds of gravel, and after flowing some distance underground, reappear farther on. Of the basin streams the Humboldt is the most important. Rising in the N.E., it flows in a tortuous channel in a general S.W. direction for 300 m. and drains 7000 or 8000 sq. m. This stream empties into the Humboldt lake, the overflow from which goes into the so-called Carson Sink. At no part of its course is it a large river, and near its mouth its waters are sub-alkaline. The Truckee river flows with more vigour, having its source in Lake Tahoe, in California, at an altitude of 6225 ft., and entering the Carson river through an irrigation canal completed in 1905; before this date it flowed into Pyramid Lake and Lake Winnemucca in the depression at the foot of the Sierra Nevada. A short distance to the S. two other streams, the Carson and the Walker rivers, receive their waters from the eastern slope of this range and empty into lakes bearing their names. Of this group of lakes in the western depression, Pyramid Lake is the largest, being 33 m. long and 14 m. wide. Fed by the same stream is its western neighbour, Lake Winnemucca, a much smaller body. The waters of these two lakes are only moderately saline and may be used for live-stock but not for human beings. Next in importance is Walker lake, 33 m. long and 6 or 7 m. wide, whose waters are strongly saline. On the western boundary, and partly included within the limits of Nevada, is Lake Tahoe, 20 m. long and 10 m. wide, which is 1645 ft. deep at its centre and whose waters have never been known to freeze, notwithstanding the lake's elevation. The topography and the climate of Nevada have led to the formation of two kinds of lakes, the ephemeral and the perennial. The perennial lakes, such as those just described, hold their waters for years and perhaps centuries; but the ephemeral lakes usually evaporate in the course of the summer. The latter class is formed by waters that fall on the barren mountain-sides and rush down in torrents, forming in the valleys shallow bodies of water yellow with the mud held in suspension. The largest of these occurs in the Black Rock Desert, in the N.W., and at times is from 450 to 500 m. in length and only a few inches deep. Such bodies often become nothing but vast sheets of liquid mud, and are called "mud lakes," a term most frequently applied to the sloughs fed by Quinn's river. When the waters evaporate in the summer they leave a clay bed of remarkable hardness, which is sometimes encrusted with saline matter of a snowy whiteness and dazzles the eyes of the traveller. When such is the case the beds are called "alkali flats." During the glacial period many of the Nevada lakes attained a great size, several of them uniting to form the ancient "Lake Lahontan," in north-western Nevada. As these lakes shrank after the return of an arid climate, they left elevated beaches and deposits of various minerals, which mark their former extent. Both hot and cold springs are numerous, with temperatures ranging from 50° to 204° F.

In the S.E. corner of the state is the third drainage system. Here the Virgin river enters the state after crossing the N.W. corner of Arizona and flows S.W. for 60 m. until it joins the Colorado river. The latter stream flows for 150 m. along the S.E. boundary towards the Gulf of California.

Fauna and Flora.—Of native animals the varieties are few and the numbers of individuals small. In the arid valleys coyotes (prairie wolves), rabbits and badgers are found. Large animals, such as the black and the grizzly bear, and deer are found on the slopes of the Sierra Mountains, and antelope, deer and elk visit the northernmost valleys in the winter. At rare intervals antelope appear in the southern deserts. Here also are found the sage thrasher, Le Conte's thrasher, the Texas nighthawk, Baird's woodpecker, and the mourning dove. Certain species of grouse are common high in the timbered mountains. Several varieties of water-fowl, especially curlews, pelicans, gulls, ducks, terns, geese and snipe, are found in the vicinity of the lakes. The Truckee river and the western lakes abound in trout and black bass. Of the reptiles the leopard lizard and gridiron-tailed lizard, the "chuck-walla" (*Sauromalus ater*), the rattle-snake, and the horned toad are the most numerous. The "black mouse" or Carson field mouse (*Microtus montanus*) is found throughout Nevada, as well as in Utah, north-eastern California, and eastern Oregon; it multiplies rapidly under favourable conditions, and at times causes serious injury to crops.

The flora of Nevada, although scanty, varies greatly according to its location. With the exception of the alkali flats, no portion of the desert is devoid of vegetation, even in the driest seasons. In the Washoe Mountains, as in the rest of the Sierra Nevada range, there is a heavy growth of conifers, extending down to the very valleys; but in many places these mountains have been almost deforested to provide timbers for the mines. In very limited spaces on other mountains there are scattered trees—the piñon (nut pine) and the juniper at an altitude between 5000 and 7000 ft. on all but the lowest ranges, the trees rarely reaching a height of over 15 ft.; and the stunted mountain mahogany on the principal ranges at an altitude of 6800 ft. Several varieties of poplar are found in the upper canyons, and trees of the willow-leaved species in the Humboldt Mountains often attain a height of 60 ft. But except for these infrequent wooded strips, the mountains are even more bare than the valleys, because their shrubs are dwarfed from exposure. The trees, except in the Washoe Mountains, are of very slow growth and therefore knotty and ill-adapted for timber. As a rule, the elevation of the timber line on the mountains increases as the latitude decreases. On the foothills are found phlox and lupine, and in the N. much bunch grass, which is valuable for grazing purposes. The valleys are covered with typical desert shrubs; greasewood (*sarcobatus vermiculatus*), creosote bushes (*larrea tridentata*), and sage-brush (*artemisia tridentata*); the first-named plant is abundant, chiefly in the N. This vegetation, covering plains, mesas, and even extending up the sides of the mountains, gives the entire landscape the greyish or dull olive colour characteristic of the Great Basin. To the southward, as the valleys become increasingly sandy and saline, even the sage-brush disappears, and little vegetation besides the cactus and the yucca is to be seen. The valleys are treeless, except in the vicinity of the Truckee river, where considerable quantities of the cotton wood and a small amount of willow, birch, and wild cherry are found. The mesquite grows some distance from water, and is especially common near the Colorado river. In January 1910 there were seven national forests in the state, created since July 1908 and chiefly in 1909, containing 7983·76 sq. m.

Climate.—As the lofty range of mountains on the W. deprives the winds from the Pacific of nearly all their moisture before they reach the Great Basin, the climate of Nevada is characterized by an excessive dryness. The skies are clear nearly every day in the year. The mean annual precipitation varies from 3 in. in the S.W. (Esmeralda county) to 12 in. in the E. (White Pine county). In the central, north-eastern and north-western sections, embracing the counties of Nye, Elko and Humboldt, the average annual rainfall varies from 7 to 8 in.; in the west-central section, at the foot of the Sierra, the average is about 10 in. A so-called "rainy season" lasts from October to April, but the precipitation is chiefly in the form of snow on the mountains. Except at great altitudes snow lies on the ground only a few days each year. The melting of the mountain snow-caps in the spring causes severe freshets, which in turn are followed by long seasons of drought at a time when water is most needed for agricultural purposes. Fogs and hail are rare, but, as in all treeless countries, the rain comes in unequal quantities, and cloudbursts are not unknown. The mean annual temperature for the state is 49° F., but varies from 54° in the S.W. to 46° in the N. The daily and annual variation is very great, and is intensified toward the E., where the altitudes are greater. At Elko, Elko county, in the N.E., the mean temperature for the year is 46° F.; for the winter (December, January and February) it is 26°, with extremes reported of 73° and –42°; the mean temperature for the summer (June, July and August) is 69°, with extremes of 108° and 20°. At Hawthorne, Esmeralda county, in the S.W., the mean temperature for the year is 54°; for the winter it is 36°, with extremes of 69° and –6°; the mean temperature for the summer is 72°, with extremes of 102° and 32°. At the head of the Humboldt river frosts are of almost nightly occurrence, and in the Carson Valley damaging frosts often occur in June. In the extreme S. the isothermal lines run almost due E. and W.; but farther northward they take a N.W. and S.E. direction. The annual range of temperature is about 124°; the highest temperature ever recorded being 119°, and the lowest –42°. In spite of the high temperatures of summer, however, the low humidity prevents the heat from being oppressive, and cases of sunstroke are unknown. While the western mountains keep out the moisture, they do not ward off the winds which pour down the steep slopes in the winter and spring and raise clouds of dust. Early-sown grain is often injured by flying sand and gravel. In the summer and autumn the winds are light.

Agriculture.—Because of this extreme aridity, agriculture in Nevada is dependent on irrigation. The three principal areas in which irrigation is practicable are along the Humboldt river, in the plains watered by the Carson, Truckee and Walker rivers, and at the foot of the mountains along the western edge of the state. There are various places also near the mouths of desert canyons, where small amounts of water are obtainable for irrigation purposes from intermittent streams. The total number of acres irrigated in 1899 was 504,168, an increase of 124·7% in the decade. In 1902 the total irrigated acreage was 570,001, an increase of 13·1% in three years. In 1902 Congress provided for the beginning of extensive irrigation works in the arid West, and Nevada (where preliminary reconnaissances had been made in 1889–1890) was the first state to profit from this undertaking. The survey for the Truckee-Carson system was begun in 1902, with the object of utilizing the waters flowing to waste in western Nevada for the irrigation and reclamation of the adjacent arid regions in Churchill, Lyon and Storey counties. A canal 31 m. long, diverting the waters of the Truckee river into the Carson river, was completed in 1905 at a cost of $1,250,000. A system of reservoirs (the main reservoir is Lake Tahoe with an area of 193 sq. m.), distributing canals, and drain ditches was also projected, making it possible to reclaim 231,300 acres of the desert. It was estimated that the works would require nine years for their completion, at a total cost of $9,000,000, although the first 200,000 acres could be reclaimed at a cost of $2,700,000. The works were to be operated by the government for ten years, and the cost assessed against the holders of the land.[1] At the conclusion of this period the system was to pass into the control of the landholders, with no further charge by the government.

The soil when reclaimed is well adapted for forage crops, cereals, vegetables and deciduous fruits. Nevada is a great ranching state, and stock-raising has shown a rapid extension. In 1900, 88·9% of its farm acreage was devoted to hay and forage crops, being more than doubled in the decade. Fifty-one per cent. of the improved lands in 1899 were devoted to the cultivation of these crops. With the growing of grasses as the chief agricultural product, farming in Nevada is necessarily extensive rather than intensive. In 1899 the average size of the farms was 1174 acres.[2] The value of the different kinds of agricultural products for 1899 was as follows: live stock, $4,373,973; hay and grain, $1,535,914; dairy produce, $385,220; vegetables, $216,600; fruits, $20,900. It thus appears that the live stock industry is one of the most important in the state; the value of its product in 1899 exceeded its output of gold and silver, which had then reached its lowest point, by over one million dollars.[3] About 64% of the value of the live stock was represented by neat cattle; 19% by sheep; 10% by horses, and the remainder by mules, swine, asses, burros and goats.

In spite of the predominating interest in stock-raising, intensive cultivation of the soil is practicable where the water supply is sufficient. Nevada, for example, ranked third in 1909 in the amount of wheat produced to the acre (28·7 bushels),[4] but in the total amount produced (1,033,000 bushels) ranked only thirty-eighth, and furnished only 0·145% of the crop of the United States. In 1909 in the amount of barley per acre (38 bushels) Nevada ranked third, and in the average farm price per bushel ($0·75) ranked first among the barley-producing states of the country, but in the total amount produced (304,000 bushels) held only the twenty-second place; and in the same year the average yield of potatoes per acre in Nevada was 180 bushels, exceeded in two states—the average for the entire country was 106·8 bushels per acre—but the total crop in Nevada (540,000 bushels) was smaller than in any state or Territory of the Union, except New Mexico.

The prevailing soils are sand and gravel loams, but other varieties are numerous, ranging from rich alluvial beds of extinct lakes, as in parts of Lyon and Esmeralda counties, to the strongly alkaline plains of the southern deserts. The most productive part of the state is the Humboldt Valley and the region near Pyramid Lake, including the counties of Humboldt, Elko and Washoe.

A singular menace to agriculture in Nevada was the plague in 1907–1908 of Carson field mice. These first appeared in large numbers in the lower part of the Humboldt Valley in the summer of 1906, and in October and November 1907 it was estimated that they numbered on certain ranches from 8000 to 12,000 on every acre. The alfalfa crop suffered particularly, the total loss being about $300,000. After unsuccessful attempts to rid themselves of the mice, the farmers appealed to the United States Biological Survey, and alfalfa hay poisoned with strychnia sulphate was used successfully in the Humboldt Valley in January 1908 and in the Carson Valley, where a similar plague threatened, in April 1908.[5]

Minerals.—To its mineral wealth Nevada owes its existence as a state; but for the richness of its veins of gold and silver ore it would be still little more than an arid waste. Extending from central California S.E. along the dividing line between that state and

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[1] The public lands are open to entry free of charge, but the government withholds the title until all the payments for water have been made. The yearly payments amount to $2·60 per acre under the present system; this amount covers the cost of maintenance and operation and also of a thorough drainage system, which is as important to the settler as irrigation. Lands already held in private ownership are supplied with water at the same price as public lands.

[2] Compare this figure with that for the neighbouring state of California, where the average size of the farms was 397·4 acres.

[3] That conditions are favourable to the animal industry is shown by the fact that in 1897 the valleys of northern Nevada were so overrun with wild horses, to the detriment of the grazing grounds for cattle, that the legislature authorized the killing of such animals. For a time this was a profitable pursuit, as the horse hides brought good prices.

[4] This is the yield reported by the United States Department of Agriculture. Between its reports and those of the Census Bureau in census years there are sometimes great discrepancies. According to the *Year Book* of the Department of Agriculture in 1909 a crop of 165,000 bushels of oats was grown in Nevada on 7000 acres; there was no crop reported of Indian corn or of rye.

[5] See Stanley E. Piper, *The Nevada Mouse Plague of 1907–1908* (Washington, 1909), Farmers' Bulletin 352, U.S. Department of Agriculture.

Nevada, and thence past the Colorado river into Arizona, is one of the richest mineral belts in the world. Gold was found in Gold Canyon near Dayton, Nevada, as early as July 1849. In 1859 the discovery of the famous Comstock Lode in Western Nevada led to the building of Virginia City, a prosperous community on the side of a mountain where human beings under ordinary conditions would not have lived, and eventually brought a new state into existence. The mines of this one district had produced, up to 1902, $371,248,288, of which $148,145,385 was in gold, $204,653,040 in silver, and the remainder in unclassified tailings. For the years 1862–1868 inclusive, the average annual production was over $11,000,000; in the second period of great productivity (1873–1878), after the opening (by John W. Mackay and his partners, Flood, Fair and O'Brien) in the Comstock Lode of the Great Bonanza mine, the average annual yield was over $26,000,000. In 1877 the maximum annual output for the mines was attained, being $36,301,537. For the three years 1875–1877 the production of gold and silver in Nevada was more than the combined product of all the other American states and Territories. After this last year the output of the Comstock mines declined on account of the exhaustion of the ore supply, the increased expense of mining at great depths, and the decrease in the price of silver. The yield reached its lowest point in 1899, but subsequently increased through the application of improved machinery, while the tailings of the old diggings were treated by the cyanide process with profitable results. In 1859 the mines were worked only for their gold; the ignorant miners threw away the "black stuff" which was really valuable silver ore with an assay value four times as great as that of their ores of gold; and when this was discovered there came a period of unprecedented silver production. But the fall in the price of silver led to a reaction, and from 1893 the gold output predominated. The gold production of 1907 was valued at $12,099,455; the silver production at $4,675,178.

In connexion with the operation of the Comstock mines was built (in 1869–1879) the Sutro Tunnel, named in honour of its engineer, Adolph Sutro (1830–1898), piercing the mountain horizontally far below the mouth of the mines, and at a distance of nearly 4 m. striking the shafts of the Comstock Lode, securing ventilation and cool air for the miners, draining the mines above its level, and obviating much pumping and hoisting.[1] Two lateral tunnels were also constructed, making the total length 6⅓ m.

Another mining region that attained importance in the early period was the Eureka District, in Eureka county, about 90 m. S. of the Southern Pacific railway. Ore was first discovered here in 1864, but it was five years before the mines became productive. By 1882 they had produced $60,000,000 of precious metals.

With the working out of the deposits in the Comstock region, the mining industry declined, and between 1877 and 1900 there was a period of great depression, in which Nevada fell from first to sixth place among the silver-producing states and Territories. In May 1900, however, very rich deposits of gold and silver were discovered in Nye county, near the summit of the San Antonio Mountains, and a new era began in Nevada's mining industry. The village of Tonopah sprang into existence as soon as the rush of newcomers to this region began, and in 1903 it contained 4000 inhabitants. In two years $7,000,000 worth of gold and silver had been taken from the Tonopah mines and it was asserted that they would prove as rich as the mines of the Comstock Lode. The Tonopah ores were richer in silver than in gold, the respective values in 1904 and 1905 being approximately in the proportion of three to one. This discovery gave a new impetus to prospecting in south-western Nevada, and it was soon discovered that the district was not an isolated mining region but was in the heart of a great mineral belt. Tonopah is at the outcropping of a number of ledges which continue for several hundred feet below the surface for an unknown distance. In 1902, in Esmeralda county, 24 m. S. of Tonopah, rich ores were found in the Goldfield District, and within three years there were 8000 people in this region. During 1905 the town of Goldfield had a period of mushroom growth, then quieted, and finally revived to a healthy development. The value of the production of the Goldfield District in 1904 amounted to $2,341,979. This discovery was followed in 1904 by that of the Bullfrog District, in Nye county, 60 m. S.E. of Goldfield, and within ninety days after its birth the village of Bullfrog, although 100 m. from a railway, had an electric-lighting plant, an ice plant and a hotel. In 1905 gold was discovered in Nye county, 29 m. N.E. of Tonopah, in what became known as the Manhattan District, and by March 1906 the village of Manhattan was a mile in length and contained 3000 inhabitants.

After 1902 the production of gold and silver steadily increased, being $4,980,786 in that year, $9,184,996 in 1905, and $16,774,633 in 1907. By far the greater portion of these metals came from the southern part of the state. In production of gold in 1907 Esmeralda county ranked first with $8,533,617 (nearly 70% of the total); Nye county's output was $1,547,408, Lincoln county's $929,775, and Storey county's a little more than $250,000. In the production of silver Nye county ranked first in 1907 ($3,667,973, of which $3,544,788 was from Tonopah), Churchill county second ($432,617, from Fairview, Wonder and Stillwater), and Eureka county (with lead silver ores) and Storey county were third and fourth respectively. Copper, lead and zinc are produced in small quantities, being found in fissure veins with gold and silver. In 1907 the production of copper was 1,782,571 lb, valued at $356,514. The output of lead in 1907 was 6,271,341 lb (valued at $322,381). The output of zinc was 2,168,783 lb (valued at $127,958).

Other minerals exist in great variety. Salt deposits are extensive and commercially important in Washoe and Churchill counties. After 1900 the production of salt rapidly increased up to 1906, when it was 11,249 bbls.; in 1907 it was only 6457 bbls., all graded as "common coarse" and all obtained by solar evaporation from brine. Borax marshes are numerous in the west and south-west, but they are no longer commercially productive. Large beds of mica are found in the east. Gypsum occurs in a number of places, the best known being in the north-west. Veins of antimony are worked in the Battle Mountain District and in Bullion Canyon, 15 m. south of Mill City. There are veins of bismuth near Sodaville. A little graphite is produced in Humboldt county. A sub-bituminous lignite is mined in Esmeralda county (800 tons in 1906; 330 tons in 1907). Considerable quantities of the following minerals have been found: barytes (heavy spar), magnetite (magnetic iron ore), and pyrolusite (manganese dioxide) in Humboldt county; roofing slate in Esmeralda county; cinnabar (ore containing quicksilver) in Washoe county; haematite in Elko and Churchill counties; cerussite and galena (lead ores) in Eureka county; and wolframite (a source of tungsten) at Round Mountain, White Pine county. In 1903 and 1907 Nevada ranked second among the American states in the production of sulphur, but its output is very small in comparison with that of Louisiana.

Manufactures.—The manufacturing interests of Nevada are unimportant. Of the manufacturing establishments in the state in 1900, 109, or 47·8%, were situated in Reno, Carson City and Virginia City, named in the order of their importance. These places employed 35·9% of the labour engaged in manufacturing, and the value of their products was 38·8% of the total for the state. Manufactures based on the products of mines and quarries (chemicals, glass, clay, stone and metal works) constituted about one-fifth of the whole product. Car construction and general shop work of steam railways was the leading manufacturing industry in 1905; next in importance were the flour and grist milling industry and the printing and publishing of newspapers and periodicals. Such statistics of the special census of manufactures (under the factory system) of 1905 as are comparable with those of 1900 show 99 factories in 1900 and 115 in 1905, an increase of 16·2%. Their capital in 1900 was $1,251,208 and in 1905 $2,891,997, an increase of 131·1%. The value of their products in 1900 was $1,261,005, and in 1905, $3,096,274, an increase of 145·5%.

Transportation.—In its industrial development Nevada has always been hampered by lack of transportation facilities. There are no navigable waterways, and the railway mileage is small. Until the completion of the trans-continental railway in 1869, wagon trains were the only means of transporting the products of the mines across the desert. An unsuccessful attempt was made, beginning in 1861, to domesticate the camel for this purpose.[2] The railway mileage in 1880 was 739 m.; in 1890, 923 m.; in the following decade railway building was at a standstill. Since 1900, however, there has been considerable development, and the total mileage on the 1st of January 1909, was 1,866·92 m. The state is crossed from east and west by three main lines of railway, parts of the great transcontinental systems, the Southern Pacific and the Western Pacific in the northern part of the state and the San Pedro, Los Angeles & Salt Lake in the southern. The oldest of these trunk lines, the Southern Pacific (formerly the Central Pacific), follows the course of the Humboldt and Truckee rivers. It is met at several points by lines which serve the rich mining districts to the south; at Cobre by the Nevada Northern from Ely in White Pine county in the Robinson copper mining district; at Palisade by the Eureka & Palisade, a narrow-gauge railway, connecting with the lead and silver mines of the Eureka District; at Battle Mountain by the Nevada Central, also of narrow gauge, from Austin; at Hazen by the Nevada & California (controlled by the Southern Pacific) which runs to the California line, connecting in that state with other parts of the Southern Pacific system, and at Mina, Nevada, with the Tonopah & Goldfield, which runs to Tonopah and thence to Goldfield, thus giving these mining regions access to the Southern Pacific's transcontinental service; and at Reno, close to the western boundary, by the Virginia & Truckee, connecting with Carson City, Minden, in the Carson Valley, and Virginia City, in the Comstock District, and by the Nevada-California-Oregon, projected to run through north-eastern California into Oregon, in 1910, in operation to Alturas, California. The Western Pacific railway, completed in 1910, extending from Salt Lake City to San Francisco, and running entirely across the state of Nevada, is parallel with the Southern Pacific for some distance in the eastern part of the state, and crosses the mountains at Beckwith Pass 20 m. north of Reno. The San Pedro, Los Angeles & Salt Lake railway, also an important factor in east and west transcontinental traffic, opened in May 1905, has been of special value in the development of the southern part of the state. It crosses a section that is mostly desert, but is connected with the Bullfrog District by the Las Vegas & Tonopah, which runs from Goldfield through Beatty and Rhyolite, and meets the San Pedro, Los Angeles & Salt Lake at Las Vegas. The Goldfield and Bullfrog districts have a further outlet to the south through a second railway, the Nevada Short Line (Bullfrog-Goldfield and Tonopah & Tidewater railways) which connects with the Atchison, Topeka & Santa Fé at Ludlow in California.

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[1] Apart from their commercial uses, the Sutro Tunnel and the shafts of the Comstock Lode have been employed for scientific investigations, with the object of classifying igneous rocks, determining the variations of temperature, and the character of electrical manifestations beneath the earth's surface, and the relation between the structure of rocks and their rate of cooling.

[2] It is interesting to note that in 1875 the Nevada legislature passed an act forbidding camels or dromedaries to run at large. This law remained on the statute books until 1898, when it was formally repealed.

Population.—Nevada is the most sparsely settled state of the Union. Its population in 1860 was 6857; in 1870, 42,491; in 1880, 62,266; in 1890, 45,761; in 1900, 42,335; and in 1910, 81,875 (0·7 per sq. m.). In 1900 10,093 were foreign-born (mostly English, Irish, Germans, Italians and Chinese in almost equal proportions); and there were 35,405 white persons, 5216 Indians, 1352 Chinese, 228 Japanese and 134 negroes. There were then only three towns of importance: Reno, Virginia City and Carson City, the capital.

The Indian population consists of Paiute, Shoshoni and the remnants of a few other tribes of Shoshonean stock. On the Duck Valley reservation (488 sq. m.), established in 1877, in Elko county, between the forks of the Owyhee river and lying partly in Nevada and partly in Idaho, and under the western Shoshoni (boarding) school (55 pupils in 1908), there were 252 Paiute, 238 Shoshoni and 1 Hopi in 1908; on the Pyramid Lake reservation (503 sq. m.), established in 1874, in Washoe county, on the borders of the lake from which it is named, 486 Paiute; on the Walker river reservation (79·37 sq. m.), established in 1874 (partly opened to settlement in 1906) along Walker river and Walker Lake, 466 Paiute; on the Moapa river reserve (15·6 sq. m.), in the south-eastern part of the state, 117 Paiute.

In 1906, of the 14,944 members of religious denominations 9,970 were Roman Catholics, 1,210 Protestant Episcopalians, 1,105 Latter-Day Saints (Mormons), 618 Methodists and 520 Presbyterians.

Administration.—Nevada is governed under the original constitution of 1864, with the amendments adopted in 1880, 1889, 1904 and 1906. The constitution as adopted limited the suffrage to adult white males, but this provision was annulled by the fifteenth amendment to the Federal constitution; and in 1880 amendments to the state constitution were adopted striking out the word "white" from the suffrage clause and adding a new article granting rights of suffrage and office holding without regard to race, colour or previous condition of servitude. A residence in the state of six months and in the district or county of thirty days preceding the election is required of all voters. Persons guilty of treason or felony in any state or Territory and not restored to civil rights, idiots and insane persons, are excluded from the suffrage. An unusual provision in the constitution, a result of its adoption in the midst of the Civil War, gives soldiers and sailors in the service of the United States the right to vote; their votes to be applied to the township and county in which they were bona fide residents at the time of enlistment.[1] The legislature has the right to make the payment of the poll tax a requirement for voting, but no such provision is in force.[2] A law passed in 1887, requiring all voters to take an oath against polygamy, with the object of disfranchising Mormons, was declared unconstitutional by the State Supreme Court.

A governor, lieutenant-governor, secretary of state, attorney-general, controller, treasurer, superintendent of public instruction and surveyor-general are chosen by popular vote every four years. Their functions are similar to those of the administrative officials in other states, with the exception that the governor does not possess the usual pardoning power but is *ex officio* a member of the pardoning board. The governor and lieutenant-governor must each be at least twenty-five years old at the time of election to office. The legislative department consists of a Senate, with members chosen every four years, about half of whom retire every two years; and an Assembly, whose members are chosen biennially. The constitution requires that the number of senators shall be not less than one-third nor more than one-half the number of members of the Assembly, and that the total membership of both houses shall not exceed seventy-five. Bills of any character may originate in either house. The legislative sessions are biennial and are limited to fifty days; special sessions are limited to twenty days. The judicial department consists of a supreme court with a chief justice and two associate justices, chosen for six years, and district courts, with judges chosen for four years.

The state is divided into fifteen counties, each of which is governed in local matters by a board of county commissioners, and is divided for administrative purposes into townships. The constitution requires that township and county governments shall be uniform throughout the state. For each township there is a justice of the peace, chosen biennially by its voters. The homestead exemption extends to a dwelling-house, with its land and appurtenances, with a value not exceeding $5000; but no exemption is granted against a process to enforce the payment of purchase-money, or for improvements, or for legal taxes, or of a mortgage to which both the husband and wife have consented. The exemption can be claimed by the husband, wife, or other head of the family, by a written declaration duly acknowledged and recorded in the manner prescribed for conveyances; and the homestead can then be mortgaged or alienated by a husband only with the wife's consent, if the wife is at the time a resident of the state. The exemption is not affected by the death of the husband or wife, but inures to the benefit of the surviving members of the family. For divorce a residence in the state of six months is necessary; the grounds for divorce are desertion or neglect to provide for one year, conviction of felony, habitual drunkenness, cruelty or physical incapacity.

There are a number of unusual provisions in the constitution of Nevada. The assertion in the "Declaration of Rights" that "no power exists in the people of this or any other state of the Federal Union to dissolve their connexion therewith or perform any act tending to impair, subvert, or resist the supreme authority of the government of the United States," is a result of the drafting of the instrument during the Civil War. There is also a provision that only three-fourths of the jurors may be required to agree to a verdict in civil cases, although the legislature has the power to require by statute a unanimous agreement. Amendments to the constitution must be passed by a majority of each house of the legislature at two consecutive sessions and submitted to a vote of the people at the next regular election. Under this provision an amendment cannot be adopted until nearly four years after it is first proposed. At the election of 1904 an amendment was adopted which provides that whenever 10% of the voters of the state, as shown by the votes of the last preceding election, express a wish that any law or resolution of the legislature shall be submitted to the people, the Act or Resolve shall be voted on at the next election of the state or county officers, and if a majority of the voters approve the measure it shall stand; otherwise, it shall become void. Nevada thus became the fourth American state to adopt the referendum.

Institutions.—The state maintains a penitentiary at Carson City and an insane asylum at Reno. The deaf, dumb and blind are cared for at its expense in the California institution for these defectives. The State University, established at Elko in 1874 and removed to Reno in 1887, is supported by the income from a Federal grant of two townships (72 sq. m.) of public land and an additional grant, under the Morrill Act of 1862, of 90,000 acres for the support of a college for agriculture and mechanic arts. An agricultural experiment station and a normal school are conducted in connexion with the university. The control of this institution is vested in a board of regents, chosen by popular vote. At Virginia City is a school of mines, established by the state in 1903. The Federal government maintains three boarding schools for Indians in the state.

The public schools are supported by the income from a Federal grant of 2,000,000 acres of public land (given in lieu of the usual sixteenth and thirty-sixth sections) supplemented by state and local taxation. The constitution provides that a special state tax, at a rate of not over two mills on the dollar, may be levied for school purposes. All fines collected under the penal laws, all escheats and 2% of the receipts of toll roads and bridges go into the school fund, which is invested in state and Federal securities and the interest apportioned among the counties according to their school population. The administration of the school system is in the hands of a superintendent of public instruction.

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[1] An interesting application of this provision was made in 1898, when Nevada soldiers on their way to Manila were allowed to vote at sea. It was discovered, however, that no statute had ever been passed to carry this provision into effect, and the votes were rejected.

[2] In 1897 a law was passed making the right of suffrage dependent on the payment of poll taxes for the preceding two years; but in the following year the State Supreme Court declared this act unconstitutional because the title was not descriptive of the matter.

Finance.—The bonded debt of the state on the 31st of December 1908 amounted to $550,000, of which the state held an irredeemable bond for $380,000; the actual redeemable bonded debt of $170,000 was due to the investment of the school and university funds in the bonds of the state. The actual borrowing capacity of the state is limited by its constitution to $300,000, except for the extraordinary purpose of repelling invasion or suppressing insurrection. Practically all the revenue is derived from the taxation of real and personal property. Mines and mining claims are exempt from taxation, but a quarterly tax is levied on the net proceeds of mines, and is not to be paid a second time so long as the products remain in the hands of the original producer. The rate of taxation for state purposes is fixed by the legislature, and for county purposes by the board of county commissioners. A poll tax is required of all males between the ages of 21 and 60 years, one half of which goes to the county in which it is collected and the rest to the state. At the close of 1908 the state receipts for the year amounted to $1,004,041, and expenditures to $875,941.

History.—The first recorded person of European descent to enter the limits of Nevada was Francisco Garcés (1738–1781), of the Order of St Francis, who set out from Sonora in 1775 and passed through what is now the extreme southern corner of the state on his way to California. Half a century later a party of trappers of the Hudson's Bay Company entered Nevada and plied their trade along the Humboldt river. American trappers came about the same time. Emigrants to California followed the trappers, and many crossed Nevada in the early 'forties of the 19th century. During 1843–1845 John C. Frémont made a series of explorations in this region. By the treaty of Guadalupe Hidalgo, negotiated in 1848, at the close of the war with Mexico, Nevada became United States territory. It was then a part of California known as the Washoe Country, and remained so until the 9th of September 1850, when most of the present state was included in the newly organized Territory of Utah. In the meantime the discovery of gold in California had swelled the stream of westward migration across the Washoe Country, and had resulted in the settlement of traders, mostly Mormons, along the routes to the gold fields. The first settlement in what is now the state of Nevada was planted in the valley of the Carson river in 1849. The earliest recorded public meeting was held at Mormon Station (now Genoa) on the 12th of November 1851. The object of this gathering was to frame a government for the settlers, as the seat of the Territorial government of Utah was too remote to afford protection for life and property. Congress was petitioned to organize a separate Territory. An independent local government was formed a week later, and this lasted for several months, until the Utah authorities intervened. In 1854 the Utah legislature created the county of Carson, which included all the settlements in western Utah; but the inhabitants sought to rid themselves of all connexion with the people of the Salt Lake region, and petitioned Congress to annex them to California. In 1858 Carson City was laid out, and in the following year the people of Carson county held a mass meeting and chose delegates to a constitutional convention, which met at Genoa on the 18th of July 1859, and in ten days drafted a constitution. The instrument was submitted to a vote of the people and was adopted, and a full set of state officers was chosen. This attempt to create a new state proved abortive, however, and it was not till the mineral wealth of the Washoe Country became generally known that Congress took any action. On the 2nd of March 1861 the Territory of Utah was divided at 39° W. (of Washington) and the western portion was called Nevada. As then constituted, the northern boundary of Nevada was the 42nd parallel, its southern the 37th, and its western boundary was made to conform to the eastern limits of the state of California. James W. Nye (1814–1876) of New York was appointed Territorial governor. In December 1862 the Territorial legislature passed an act "to frame a constitution and state government for the state of Washoe." This was submitted to the people and adopted at the polls. Delegates to a constitutional convention accordingly drafted a frame of government, which on the 19th of January 1864 was submitted to a popular vote and overwhelmingly defeated. The instrument contained a very unpopular clause taxing all mining property, unproductive as well as productive. Moreover, as state officers were to be chosen at the same time that the constitution was voted on, disappointed candidates for party nominations fought against ratification. As a result, the constitution was rejected while officers to act under it were at the same time duly elected.

Early in 1864, when it became evident that two more Republican votes might be needed in the United States Senate for reconstruction purposes, party leaders at Washington urged the people of Nevada to adopt a constitution and enter the Union as a patriotic duty, and on the 21st of March 1864 Congress passed an act to enable the people of the Territory to form a state government. The third constitutional convention in its history now met at Carson City and drew up a constitution which was duly ratified. On the 31st of October President Lincoln issued a proclamation declaring Nevada a state. By the Enabling Act Congress had extended the eastern boundary to the 38th meridian (W. of Washington), and in 1866 still farther extended it to the 37th and fixed the southern boundary as it exists at present. The additions eastward were made from Utah and those to the south from Arizona.

Being "battle-born," Nevada was loyal to the Union throughout the Civil War, and in spite of its scanty population furnished a company of troops in 1861, which were joined to a California regiment. In 1863 the Territory raised six companies of infantry and six of cavalry (about 1000 men), which saw no actual service against the Confederates but were useful in subduing hostile Indians.

The history of the state since its organization has been largely a history of its mines. The period from 1860 to 1864 was one of rapid development accompanied by the wildest speculation. This was followed by a reaction and a general collapse of inflated values until 1873, when the discovery of the Great Bonanza mine brought about a revival of industry and of speculation. A second period of decline followed the working out of this mine and lasted until 1900, when the discovery of a new mineral belt in southern Nevada brought renewed prosperity. Until 1870 the state was regularly Republican, but in this year the Democrats gained most of the offices, including the seat in the national House of Representatives. The Republicans, however, secured the electoral votes of Nevada in 1872 and in 1876, and in 1878 were again in full control, only to suffer defeat in 1880. Not until the silver currency question became a political issue did Nevada take a prominent part in national politics. In 1885 the Nevada Silver Association was formed for the purpose of advocating the free and unlimited coinage of silver. Both parties in the state in 1888 declared in favour of free coinage, and in 1892 instructed their delegates to the national conventions to oppose any candidate who did not favour this policy. As a means of asserting their views effectively, the citizens, irrespective of party, organized local silver clubs, and these eventually led to the formation of the Silver party of Nevada, which drafted a "platform" and nominated a state ticket and presidential electors who were instructed to support the Populist national ticket. The Republicans in the state divided, and the majority of them went over to the Silver party. At the national election in this year the Silver ticket received in Nevada 7264 votes; the Republican 2811; the Democrat 714; and the Prohibitionist 86. In the state election of 1894 the Silver party was again victorious, and not a Democrat was returned to the legislature. In the election of 1896 all the parties in the state declared in favour of the free and unlimited coinage of silver at the ratio of 16 to 1. The Democratic and Silver parties united, with the result that the state's electoral vote went to Bryan and Sewall, the Democratic nominees, while the Silver party retained most of the state offices. In the presidential election of 1900 the Nevada Republicans pursued a non-committal policy with regard to the silver question, declaring in favour of "the largest use of silver as a money metal in all matters compatible with the best interests of our government." The Democratic and the Silver parties again united, and subsequently dominated the politics of the state.

Territorial Governor.—James W. Nye, 1861–1864.

State Governors.

H. G. Blasdel, Rep., 1865–1870.
L. R. Bradley, Dem., 1871–1878.
J. H. Kinkhead, Rep., 1879–1882.
Jewett W. Adams, Dem., 1883–1886.
Christopher C. Stephenson, Rep., 1887–1889.[1]
Frank Bell, Rep., 1890.
R. K. Colcord, Rep., 1891–1894.
John E. Jones, Silver, 1895.[2]
Reinhold Sadler, Silver, 1895–1902.
John Sparks, Dem. (Silver), 1903–1906.
D. S. Dickerson, Dem., 1907–1910.
T. L. Oddie, Rep., 1911–

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NEVADA, a city and the county-seat of Vernon county, Missouri, U.S.A., in the south-western part of the state, about 90 m. S. by E. of Kansas City. Pop. (1900) 7461, of whom 235 were foreign-born and 168 negroes; (1910) 7176. It is served by the Missouri Pacific and the Missouri, Kansas & Texas railway systems. The principal public buildings are the county court house, the federal building and the high school. Nevada is the seat of Cottey College for girls (Methodist-Episcopal, South, 1884) and of a state hospital for the insane, and there is a state camp ground for the National Guard of Missouri. There are three parks, one of which, Lake Park, is a pleasure and health resort, with a lake and chalybeate and sulphur springs. The smelting of lead and zinc and the manufacture of paper, lumber, sheet metal and bricks are among the city's industries. Nevada is a trading centre for the surrounding country, and a fine farming and stock-raising region, in which Indian corn, oats, wheat, clover, timothy and blue-grass are grown; coal is mined in the vicinity. The city's water-supply is drawn from artesian wells. Nevada ("Nevada City" until 1869) was platted in 1855, was burned down in 1863 during the occupancy by the state militia in war time, was incorporated as a town in 1869, was entered by the first railway in 1870, and was chartered as a city in 1880.

NEVADA CITY, a township and the county-seat of Nevada county, California, U.S.A., about 130 m. N.E. of San Francisco. Pop. (1890) 2524; (1900) 3250 (764 foreign-born); (1910) 2689. It is the terminus of the Nevada County Narrow Gauge railway, which connects with the Southern Pacific railway at Colfax, 23 m. S. An electric line extends to Grass Valley (pop. in 1900, 4719), 4 m. S.W. Situated in a hilly and picturesque region, 2580 ft. above the sea, Nevada City is frequented as a health and summer resort (annual mean temperature, about 53·5° F.; mean summer temperature, about 66°). Gold-mining and quartz-mining are its principal industries, and in 1907 Nevada county's output of gold (104,590·76 oz., worth $2,162,083) was second only to that of Butte county (134,813·39 oz., worth $2,786,840) in California; the county is the leading producer from quartz mines. Among the manufactures of the township are carriages and products of planing mills, foundries and machine shops; and grapes and fruits are raised in the surrounding country. Gold was first discovered within what is now Nevada City, on Deer Creek, in the summer of 1848, by James W. Marshall, who, in January of the same year, had found the metal near what is now Coloma, Eldorado county. The first settlement was made here in 1849; rich deposits of gold were soon afterwards found on or near the surface, and the settlement had the characteristic growth of a western mining town; its output of gold reached its maximum in 1850–1851. Nevada City was first incorporated in 1851 under a special act of the legislature (repealed in 1852); it was reincorporated in 1856 and again in 1878.

NÉVÉ, or FIRN, the name given to the partly consolidated masses of snow and ice which form in the hollows on the sides of mountains below the belt of freshly fallen snow and just above the compact glacier-ice. The névé, which generally consists of broad sheets of great beauty, is formed from the freshly fallen snow during a series of alternate thaws and frosts. These processes are accompanied by a gradual descent down the mountain side, during which the névé suffers consolidation, until it becomes compact glacier-ice. The névé is thus the feeding ground of the glacier (*q.v.*). The word *névé* (Lat. *nix, nivis*, snow) is adopted from the French dialect of the French Alps; *firn* is German, meaning "last year's (snow)."

NEVERS, a town of central France, capital of the department of Nièvre, 159 m. S.S.E. of Paris by the Paris-Lyons-Méditerranée railway to Nîmes. Pop. (1906) 23,561. Nevers is situated on the slope of a hill on the right bank of the Loire at its confluence with the Nièvre. Narrow winding streets lead from the quay through the town where there are numerous old houses of the 14th to the 17th centuries. Among the ecclesiastical buildings the most important is the cathedral of St Cyr, which is a combination of two buildings, and possesses two apses. The apse and transept at the west end are the remains of a Romanesque church, while the nave and eastern apse are in the Gothic style and belong to the 14th century. There is no transept at the eastern end. The lateral portal on the south side belongs to the late 15th century; the massive and elaborately decorated tower which rises beside it to the early 16th century. The church of St Étienne is a specimen of the Romanesque style of Auvergne of which the disposition of the apse with its three radiating chapels is characteristic. It was consecrated at the close of the 11th century, and belonged to a priory affiliated to Cluny. The ducal palace at Nevers (now occupied by the courts of justice and an important ceramic museum) was built in the 15th and 16th centuries and is one of the principal feudal edifices in central France. The façade is flanked at each end by a turret and a round tower. A middle tower containing the great staircase has its windows adorned by sculptures relating to the history of the house of Clèves by the members of which the greater part of the palace was built. In front of the palace lies a wide open space with a fine view over the valley of the Loire. The Porte du Croux, a square tower, with corner turrets, dating from the end of the 14th century, is among the remnants of the old fortifications; it now contains a collection of sculptures and Roman antiquities. A triumphal arch of the 18th century, commemorating the victory of Fontenoy and the hôtel de ville, a modern building which contains the library, are of some interest. The Loire is crossed by a modern stone bridge, and by an iron railway bridge. Nevers is the seat of a bishopric, of tribunals of first instance and of commerce and of a court of assizes and has a chamber of commerce and a branch of the Bank of France. Its educational institutions include a *lycée*, a training college for female teachers, ecclesiastical seminaries and a school of art. The town manufactures porcelain, agricultural implements, chemical manures, glue, boilers and iron goods, boots and shoes and fur garments; and has distilleries, tanneries and dye-works. Its trade is in iron and steel, wood, wine, grain, live-stock, &c. Hydraulic lime, kaolin and clay for the manufacture of faience are worked in the vicinity.

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[1] Died the 21st of September, 1890, and Frank Bell became governor by virtue of his office as lieutenant-governor.

[2] Died the 10th of April 1895, and R. Sadler became governor by virtue of his office as lieutenant-governor.

Noviodunum, the early name of Nevers was in later times altered to *Nebirnum*. The quantities of medals and other Roman antiquities found on the site indicate the importance of the place at the time when Caesar chose it as a military depôt for corn, money and hostages. In 52 B.C. it was the first place seized by the revolting Aedui. It became the seat of a bishopric at the end of the 5th century. The countship (see below) dates at least from the beginning of the 10th century. The citizens of Nevers obtained charters in 1194 and in 1231. For a short time in the 14th century the town was the seat of a university, transferred from Orleans, to which it was restored.

Counts and Dukes of Nevers. Having formed part of the duchy of Burgundy, the county of Nevers (Nivernais) was given by Duke Henry I. in 987 to his stepson, Otto William, afterwards count of Mâcon, who five years later handed it over to his son-in-law Landri. The first house of the hereditary counts of Nevers originated in this Landri, and was brought to an end in 1192 by the death of Agnes, countess of Nevers, wife of Pierre de Courtenay (d. 1217). The county subsequently passed by successive marriages into the houses of Donzy, Châtillon and Bourbon. Mahaut de Bourbon brought the county of Nevers, together with those of Auxerre and Tonnerre, to her husband Odo (Eudes), son of Hugh IV., duke of Burgundy, in 1248. Her eldest daughter, Yoland, received the county of Nevers as her dowry when in 1265 she married Jean Tristan, son of King Louis IX. She became a widow in 1270, and in 1272 married Robert de Dampierre, who became count of Flanders. Her descendant by her second marriage, Marguerite, daughter and heiress of Louis II. de Male, count of Flanders, married successively two dukes of Burgundy, Philip I. de Rouvre and Philip II. the Bold. Philip (d. 1415), the third son of Philip the Bold, received the counties of Nevers and of Rethel and the barony of Donzy; his last male descendant, John, died in 1491. The house of Cleves then inherited the Nivernais, which was erected into a duchy by King Francis I. for Francis of Cleves in 1539. In 1565 Louis de Gonzaga (d. 1595), son of Frederick II., duke of Mantua, married Henrietta of Cleves, duchess of Nevers, and one of his descendants, Charles (d. 1665), sold the Nivernais to Cardinal Mazarin in 1659. The cardinal devised it to his nephew Philippe Jules Mancini, whose descendants possessed it until the French Revolution. The last duke of Nivernais, Louis Jules Barbon Mancini Mazarini, died in 1798.

NEVILLE, or Nevill, the family name of a famous English noble house, descended from Dolfin son of Uchtred, who had a grant from the prior of Durham in 1131 of "Staindropshire," co. Durham, a territory which remained in the hands of his descendants for over four centuries, and in which stood Raby castle, their chief seat. His grandson, Robert, son of Meldred, married the heiress of Geoffrey de Neville (d. 1192–1193), who inherited from her mother the Bulmer lordship of Brancepeth near Durham. Henceforth Brancepeth castle became the other seat of the house, of which the bull's head crest commemorates the Bulmers; but it adopted the Norman surname of Neville (*Neuville*). Robert's grandson, another Robert, (d. 1282) held high position in Northumbria, and sided with Henry III. in the Barons' War, as did his younger brother Geoffrey (d. 1285), ancestor of the Nevills of Hornby. This Robert's son Robert (d. 1271) extended the great possessions of the family into Yorkshire by his marriage with the heiress of Middleham, of which the powerful Norman castle still stands. The summons of their son Ranulf (d. 1331) to parliament as a baron (1294) did but recognize the position of the Nevills as mighty in the north country. Ralph (d. 1367) the second baron—whose elder brother "the Peacock of the North" was slain by the Douglas in 1318—was employed by Edward III. as a commander against the Scots and had a leading part in the victory of Nevill's Cross (1346), where David Bruce was captured, and by which Durham was saved. His active career as head of his house (1331–1367) did much to advance its fortunes and to make the name of Nevill a power on the Scottish march. Of his younger sons, Alexander became archbishop of York (1374–1388) and was a prominent supporter of Richard II., attending him closely and encouraging his absolutist policy; in consequence of which he was one of those "appealed of treason" by the opposition in 1388 and being found guilty was outlawed, and died abroad in 1392. His younger brother William, a naval commander, took the opposite side, was a leading Lollard and a friend of Wiclif, and in 1388–1389 acted with the lords appellant.

John, the 3rd baron (d. 1388), a warden of the Scottish marches and lieutenant of Aquitaine, a follower of John of Gaunt and a famous soldier in the French wars of Edward III., continued the policy of strengthening the family's position by marriage; his sisters and daughters became the wives of great northern lords; his first wife was a Percy, and his second Lord Latimer's heiress; and his younger son, Thomas, became Lord Furnival in right of his wife, while his son by his second wife became Lord Latimer. His eldest son Ralph (1364–1425), 1st earl of Westmorland (see Westmorland, earls of), carried the policy further, marrying for his second wife a daughter of John of Gaunt and securing heiresses for five of his sons, four of the younger ones becoming peers, while a fifth, Robert, was made bishop of Durham (1438–1457). Among his daughters were the duchesses of Norfolk, Buckingham and York (mother of Edward IV. and Richard III.) and an abbess of Barking. The Nevills were thus closely connected with the houses of Lancaster and York, and had themselves become the most important family in the realm. Of the earl's sons by his second marriage, Richard, earl of Salisbury (and three of his sons) and William, earl of Kent, are the subjects of separate notices.

The greatness of the Nevills centred in the "kingmaker" (Richard's son) and the heads of his house, after the 1st earl, were of small account in history, till Charles, the 6th earl, at the instigation of his wife, Surrey's daughter, joined Northumberland in the fatal northern rising of 1569 to the ruin of his house. His estates, with the noble castles of Brancepeth and Raby, were forfeited; Middleham, with the Yorkshire lands, had been settled by the 1st earl on the heirs of his second marriage.

Although the senior line became extinct on the earl's death abroad (1601), there were male descendants of the 1st earl remaining, sprung from George and Edward, sons of his second marriage. George, who was Lord Latimer, was father of Sir Henry, slain at Edgcote fight, and grandfather of Richard, 2nd lord (1469–1530), a soldier who distinguished himself in the north, especially at Flodden Field. His grandson (d. 1577) was the last lord, but there were male descendants of his younger sons, one of whom, Edmund, claimed the barony, and after 1601 the earldom of Westmorland, but vainly, owing to its attainder. In this line may still exist a male heir of this mighty house.

The heirs male of Edward, Lord "Bergavenny" (now "Abergavenny" co. Monmouth), who died in 1476, have retained their place in the peerage under that style to the present day by a special and anomalous devolution. His wife, the only child of Richard (Beauchamp), earl of Worcester (d. 1422), brought him the great estates which had come to her line with Fitz Alan and Despencer heiresses, and in 1450 he was summoned as Lord Bergavenny, though not seized of that castle. Their grandson, George (*c.* 1471–1535) the 3rd lord, was in favour with Henry VII. and Henry VIII., and recovered from the latter in 1512 the castle and lands of Abergavenny. He was prominent in the French campaigns of 1513–14 and 1523. On the death of his son, Henry, the 4th lord, in 1587, a long-famous contest ensued between his daughter, Lady Fane, and his heir-male, Edward Nevill, which was eventually ended by James I., in 1604, assigning the barony of Abergavenny to Edward's son and that of Despencer to Lady Fane. The former subsequently descended (on uncertain grounds) to the heirs-male with the old Beauchamp estates under special entails. In 1784 the then Lord Abergavenny received an earldom, and the next lord erected at Eridge, Sussex, the present seat of the family, on which the marquisate of Abergavenny and earldom of Lewes were conferred in 1876. Its Sussex estates are mainly derived through the Beauchamps, from the Fitz Alans, heirs of the Warennes.

The Nevills of Billingbear, Berks, were a junior line, of whom was Sir Henry Nevill (d. 1615), courtier and diplomatist, who became a leading figure in parliament under James I. His grandson, another Sir Henry (d. 1694), was an author of some note and a Republican opponent of Cromwell, by whom he was banished from London in 1654. The family became extinct in 1740, and in 1762 Richard Aldworth (1717–1793), on inheriting Billingbear, took the name of Nevill. From him descend the Lords Braybrooke.

Neuville is a common French name, and it is not clear whether all the Nevills who occur in the 12th and 13th centuries were of the same stock as the lords of Raby. The baronial line of Nevill of "Essex" was founded by the marriage, *temp.* Richard I., of a Hugh de Nevill to the heiress of Henry de Cornhill, a wealthy Londoner. He went on crusade with Richard I. and was afterwards an active supporter of John, who names him in the Great Charter (1215). His descendant, Hugh de Nevill, was summoned as a baron in 1311, as was his son John, who served in the French and Flemish campaigns, and died, the last of his line, in 1358.

See Rowland's *Historical and Genealogical Account of the Family of Nevill* (1830); Drummond's *Noble British Families* (1846); Swallow's *De Nova Villa* (1885); and Barron's sketch in *The Ancestor*, No. 6 (1903). Also Dugdale's *Baronage*; G. E. C[okayne]'s *Complete Peerage*; J. H. Round's *Feudal England*; and for the Nevill castles Mackenzie's *Castles of England*. For the Kingmaker, see Oman's monograph (1891). (J. H. R.)

NEVILLE, GEORGE (*c.* 1432–1476), archbishop of York and chancellor of England, was the youngest son of Richard Neville, earl of Salisbury, and brother of Richard Neville, earl of Warwick, known as the "Kingmaker." He was educated at Balliol College, Oxford, and was from his childhood destined for the clerical profession, in which through the great influence of his family he obtained rapid advancement, becoming bishop of Exeter in 1458. From this time forward Neville took a prominent part in the troubled politics of the period. He was present with his brother Warwick at the battle of Northampton in July 1460, immediately after which the great seal was committed to his keeping. He took part in the proclamation of Edward of York as king, who confirmed his appointment as chancellor. In 1463 he was employed on a diplomatic mission in France; and in 1464, after taking part in negotiation with the Scots, Neville became archbishop of York. During the next few years he as well as his brothers fell into disfavour with Edward IV.; and in 1469, after a successful rising in Yorkshire secretly fermented by Warwick, the king fell into the hands of the archbishop, by whom, after a short imprisonment, he was permitted to escape. When Warwick was in turn defeated by the king's forces at Stamford in 1470, Archbishop Neville took the oath of allegiance to Edward, but during the short Lancastrian restoration which compelled Edward to cross to Holland, Neville acted as chancellor to Henry VI.; and when the tide once more turned he again trimmed his sails to the favouring breeze, making his peace with Edward, now again triumphant, by surrendering Henry into his hands. The archbishop for a short time shared Henry's captivity in the Tower. Having been pardoned in April 1471, he was re-arrested a year later on a charge of treason and secretly conveyed to France, where he remained a prisoner till 1475, when he returned to England; he died in the following year, on the 8th of June 1476. Archbishop Neville was a respectable scholar; and he was a considerable benefactor of the university of Oxford and especially of Balliol College.

See Thomas Rymer, *Foedera, &c.* (London, 1704); John Warkworth, *Chronicle of the first Thirteen Years of the Reign of Edward IV.*, ed. J. O. Halliwell (Camden Soc., London, 1839); *Paston Letters*, ed. J. Gairdner (London, 1872–1875); *The Historical Collections of a Citizen of London in the 15th century*, ed. J. Gairdner (Camden Soc., London, 1876); Sir James H. Ramsay, *Lancaster and York 1399–1485* (Oxford, 1892).

NEVILLE, RALPH (d. 1244), bishop of Chichester and chancellor of England, was a member of the great Neville family, but of illegitimate birth. In 1214 he became dean of Lichfield, and obtained several rich livings; and in 1224 he was consecrated bishop of Chichester. In 1226 he was appointed chancellor by the council governing during the minority of Henry III.; and when the king in 1236 demanded the return of the great seal, Neville refused to surrender it, on the ground that only the authority that had appointed him to the office had power to deprive him of it. In 1231 he was chosen archbishop by the monks of Canterbury, but the election was not ratified by the pope. He died in 1244.

Neville's residence in London was a palace in the street opposite the Temple, which from this association obtained the name of Chancery Lane, by which it is still known; while the palace itself, after passing into the hands of Henry de Lacy, earl of Lincoln, was called Lincoln's Inn after that nobleman when it became the abode of students of law. Neville bequeathed this property to the see of Chichester, and the memory of his connexion with the locality is further preserved in the name of a passage leading from Chancery Lane to Lincoln's Inn which still bears the name of Chichester Rents.

NEVIN, JOHN WILLIAMSON (1803–1886), American theologian and educationalist, was born on Herron's Branch, near Shippensburg, Franklin county, Pennsylvania, on the 20th of February 1803. He was a descendant of Hugh Williamson of North Carolina, and was of Scotch blood and Presbyterian training. He graduated at Union College in 1821; studied theology at Princeton Theological Seminary in 1823–1828, being in 1826–1828 in charge of the classes of Charles Hodge; was licensed to preach by the Carlisle Presbytery in 1828; and in 1830–1840 was professor of Biblical literature in the newly founded Western Theological Seminary of Allegheny, Pennsylvania. But under the influence of Neander he was gradually breaking away from "Puritanic Presbyterianism," and in 1840, having resigned his chair in Allegheny, he was appointed professor of theology in the (German Reformed) Theological Seminary at Mercersburg, Pa., and thus passed from the Presbyterian Church into the German Reformed. He soon became prominent; first by his contributions to its organ the *Messenger*; then by *The Anxious Bench—A Tract for the Times* (1843), attacking the vicious excesses of revivalistic methods; and by his defence of the inauguration address, *The Principle of Protestantism*, delivered by his colleague Philip Schaff, which aroused a storm of protest by its suggestion that Pauline Protestantism was not the last word in the development of the church but that a Johannean Christianity was to be its outgrowth, and by its recognition of Petrine Romanism as a stage in ecclesiastical development. To Dr Schaff's 122 theses of *The Principle of Protestantism* Nevin added his own theory of the mystical union between Christ and believers, and both Schaff and Nevin were accused of a "Romanizing tendency." Nevin characterized his critics as pseudo-Protestants, urged (with Dr Charles Hodge, and against the Presbyterian General Assembly) the validity of Roman Catholic baptism, and defended the doctrine of the "spiritual real presence" of Christ in the Lord's Supper, notably in *The Mystical Presence: a Vindication of the Reformed or Calvanistic Doctrine of the Holy Eucharist* (1846); to this the reply from the point of view of rationalistic puritanism was made by Charles Hodge in the *Princeton Review* of 1848. In 1849 the *Mercersburg Review* was founded as the organ of Nevin and the "Mercersburg Theology"; and to it he contributed from 1849 to 1883. In 1851 he resigned from the Mercersburg Seminary in order that its running expenses might be lightened; and from 1841 to 1853 he was president of Marshall College at Mercersburg. With Dr Schaff and others he was on the committee which prepared the liturgy of the German Reformed Church, which appeared in provisional form in 1857 and as *An Order of Worship* in 1866. In 1861–1866 he was instructor of history at Franklin and Marshall College (in which Marshall College had been merged), of which he was president in 1866–1876. He died at Lancaster, Penn., on the 6th of June 1886.

See Theodore Appel, *The Life and Work of John Williamson Nevin* (Philadelphia, 1889), containing Nevin's more important articles.

NEVIS, an island in the British West Indies, forming with St Kitts one of the five presidencies in the colony of the Leeward Islands. Pop. (1901) 12,774. It lies in 17° 14′ N. and 62° 33′ W., and is separated from St Kitts by a shallow channel 2 m. wide at its narrowest point. In form it is almost round, and from the sea has the appearance of a perfect cone, rising gradually to the height of 3200 ft. Its total area is 50 sq. m. Although the island is subject to severe storms, the climate is healthy, the average temperature being 82° F. Sugar, rum and molasses are exported, and corn, yams, coffee and fruit are grown. There are medicinal springs and large deposits of sulphur. The chief town, Charlestown, lies on a wide bay on the S.W. The legislative council of St Kitts-Nevis meets at Basseterre, the capital of St Kitts. Nevis was discovered by Columbus in 1498 and first colonized in 1628 by the English from St Kitts. During the period of the slave trade it was a leading mart for slaves in the West Indies.

NEVYANSK, Nevyanskiy or Neyvinskiy Zavod, a town of Russia, in the government of Perm, 57 m. by rail N.N.W. of Ekaterinburg, on the eastern slope of the Ural mountians, in the populous mountain valley of the Neyva, in a district very rich in iron and auriferous sands. Pop. (1881) 13,980; (1897) about 16,000, all Great-Russians and mostly Nonconformists, who are employed, partly at the iron-works, partly in various small industries, such as the manufacture of boxes, widely sold in Siberia, iron wares and boots, and partly in agriculture. The iron-works at Nevyansk are the oldest in the Urals, having been founded in 1699. In 1702 Peter the Great presented them to Demidov, with 3,900,000 acres of land. Several other iron-works are situated within a short distance, the chief being Verkhne-Neyvinsk, 18 m. S.; Neyvo-Rudyansk, 8 m. S.; Petrokamensk, 32 m. N.E.; Neyvo-Shaitansk, 20 m. lower down the Neyva; and Neyvo-Alapayevsk, 64 m. N.E. of Nevyansk.

NEW ABBEY, a parish and village of Kirkcudbrightshire, Scotland. Pop. of parish (1901) 957. The hill of Criffel and Loch Kinder are situated within the parish boundaries. The lake contains two islets, of which one was a crannog and the other the site of an ancient kirk. The village, which lies 6½ m. S. of Maxwelltown, is famous for the ruin of Sweetheart Abbey, a Cistercian house built in 1275 by Devorguila in memory of her husband John de Baliol, who had died at Barnard Castle in 1269. His heart, embalmed and enshrined in a coffin of ebony and silver, which she always kept beside her, was, at her death in 1290, buried with her in the precincts of the abbey, which thus acquired its name (*Abbacia Dulcis Cordis*, or Douxquer). The building afterwards became known as the New Abbey, to distinguish it from the older foundation at Dundrennan, which had been erected in 1142 by Fergus of Galloway. The remains of the abbey chiefly consist of the shell of the beautiful Cruciform church, with a central saddleback tower rising from the transepts to a height of over 90 ft., and a graceful rose window at the west end of the nave. Most of the work is Early English with Decorated additions. The abbot's tower, a stately relic, stands about ½ m. N.E. of the abbey.

NEW ALBANY, a city and the county-seat of Floyd county, Indiana, U.S.A., on the N. bank of the Ohio river, at the head of low water navigation, nearly opposite Louisville, Kentucky, with which it is connected by three railway bridges, and 156 m. below Cincinnati, Ohio. Pop. (1890) 21,059; (1900) 20,628, of whom 1363 were foreign-born and 1905 negroes; (1910) 20,629. It is served by the Baltimore & Ohio South-western, the Chicago, Indianapolis & Louisville, the Pittsburg, Cincinnati, Chicago & St Louis and the Southern railways, by electric railways to Louisville, Indianapolis, &c., and by steamboats on the Ohio; it is connected by a belt line with the Louisville & Nashville, the Chesapeake & Ohio, the Illinois Central and other railways. The city is situated on an elevated plateau above the river, in an amphitheatre of wooded hills. It has a good public library, a well organized public school system and several private schools and academies. Within the city limits is a national cemetery. The manufactures include leather, iron, foundry and machine shop products, furniture and veneer, lumber, cotton goods and hosiery, distilled liquors and stoves. The value of the factory products in 1905 was $4,110,769, 13% more than in 1900. Originally settled about the beginning of the 19th century, New Albany was platted in 1813 and was chartered as a city in 1839. The city owed much of its early industrial importance to the plate-glass works successfully established here by Washington Charles de Pauw (1822–1887), who endowed the De Pauw College for Young Women (opened as the Indiana Asbury Female College in 1852). The glass works left the city because of the superior and cheaper fuel supplied by natural gas in central Indiana. The De Pauw College for Young Women was relatively unimportant after the endowment of Indiana Asbury University (now De Pauw University) by W. C. de Pauw in 1883, but it continued to give instruction until 1903.

NEW AMSTERDAM, a town of British Guiana, situated in 6° 20′ N. and 59° 15′ W. on the east bank of the Berbice river, about 4 m. from the mouth. Formerly the capital of the colony of Berbice, it is now the capital of the county of that name. It is a picturesque little town composed almost entirely of wooden houses, having a population estimated in 1904 at 7459. The Colony House, standing in handsome grounds beside the small but pretty botanical gardens, was formerly the residence of the governor and the seat of the legislature, and now contains the treasury and supreme courts. The town is lighted by municipally owned electric works, and contains various government institutions, a town hall and market. The local government is vested in a mayor and town council, the revenue (a little over £12,000 annually) being mainly raised by a direct rate on house property. The expenditure is principally on streets, street lighting, fire brigade, water supply and drainage. New Amsterdam is connected by ferry and rail with Georgetown, to which there is also a bi-weekly steamer service.

NEWARK, DAVID LESLIE, Lord (1601–1682), Scottish general, was born in 1601, the fifth son of Sir Patrick Leslie of Pitcairly, Fifeshire, commendator of Lindores, and Lady Jean Stuart, daughter of the 1st earl of Orkney. In his early life he served in the army of Gustavus Adolphus, where he rose to the rank of colonel of cavalry. In 1640 he returned to his native country to take part in the impending war for the Covenant. In 1643, when a Scottish army was formed to intervene in the English Civil War (see Great Rebellion) and placed under the command of Alexander Leslie, earl of Leven, the foremost living Scottish soldier, Leslie was selected as Leven's major-general. This army engaged the Royalists under Prince Rupert at Marston Moor, and Leslie bore a particularly distinguished part in the battle. He was then sent into the north-western counties, and besieged and took Carlisle. When, after the battle of Kilsyth, Scotland was at the mercy of Montrose and his army, Leslie was recalled from England in 1645, and made lieutenant-general of horse. In September he surprised and routed Montrose at Philiphaugh near Selkirk, and was rewarded by the committee of estates with a present of 50,000 merks and a gold chain; but his victory was marred by the butchery of the captured Irish—men, women and children—to whom quarter had been given. He was then declared lieutenant-general of the forces, and, in addition to his pay as colonel, had a pension settled on him. Leslie returned to England and was present at the siege of Newark. On his return to Scotland he reduced several of the Highland clans that supported the cause of the king. In 1648 he refused to take part in the English expedition of the "engagers," the enterprise not having the sanction of the Kirk. In 1649 he purchased the lands of Abercrombie and St Monance, Fifeshire. In 1650 he was sent against Montrose, who was defeated and captured by Major Strachan, Leslie's advanced guard commander; and later in the year, all parties having for the moment combined to support Charles II., Leslie was appointed to the chief command of the new army levied for the purpose on behalf of Charles II. The result, though disastrous, abundantly demonstrated Leslie's capacity as a soldier, and it might be claimed for him that Cromwell and the English regulars proved no match for him until his movements were interfered with and his army reduced to indiscipline by the representatives of the Kirk party that accompanied his headquarters. After Dunbar Leslie fought a stubborn defensive campaign up to the crossing of the Forth by Cromwell, and then accompanied Charles to Worcester, where he was lieutenant-general under the king, who commanded in person. On the defeat of the royal army Leslie, intercepted in his retreat through Yorkshire, was committed to the Tower, where he remained till the Restoration in 1660. He was fined £4000 by Cromwell's "Act of Grace" in 1654. In 1661 he was created Lord Newark, and received a pension of £500 per annum. He died in 1682. The title became extinct in 1790.

NEWARK (Newark-upon-Trent), a market town and municipal borough in the Newark parliamentary division of Nottinghamshire, England. Pop. (1901) 14,992. It lies in a flat, fertile lowland near the junction of the river Devon with the Trent, but actually on the Devon. By means of a canal 1½ m. in length it is connected with the Trent navigation. It is 120 m. N.N.W. from London by the Great Northern railway, and is on the Melton Mowbray joint branch of that company and the London & North-Western, and on the Nottingham & Lincoln branch of the Midland railway. The church of St Mary Magdalene, one of the largest and finest parish churches of England, is specially notable for the beauty of the tower and of the octagonal spire (223 ft. high) by which it is surmounted. The central piers of the old church, dating from the 11th or 12th century, remain, and the lower part of the tower is a fine example of Early English when at its best. The upper parts of the tower and spire are Decorated, completed about 1350; the nave dates from between 1384 and 1393, and the chancel from 1489. The sanctuary is bounded on the south and north by two chantry chapels, the former of which has on one of its panels a remarkable painting from the "Dance of Death." There are a few old monuments, and an exceedingly fine brass of the 14th century. The castle, supposed to have been founded by Egbert, king of the West Saxons, was partly rebuilt and greatly extended by Alexander, consecrated bishop of Lincoln in 1123, who established at it a mint. It rises picturesquely from the river, and from its position and great strength was for a long time known as the "key of the North." Of the original Norman stronghold the most important remains are the gate-house, a crypt and the lofty rectangular tower at the south-west angle. The building seems to have been reconstructed in the early part of the 13th century. In the reign of Edward III. it was used as a state prison. During the Great Rebellion it was garrisoned for Charles I., and endured three sieges. Its dismantling was begun in 1646, immediately after the surrender of the king. There is a very beautiful and interesting cross (the "Beaumond" cross) of the latter part of the 15th century in good preservation in the town. A grammar and song school was founded in the reign of Henry VIII., and endowed by Archdeacon Magnus, and there are other considerable charities. The other principal public buildings are the town-hall in the Grecian style (erected in 1774), the corn exchange (1848), the Stock library and Middleton newsroom (1828), the mechanics' institution (1836), a free library and a fine hospital (1881). There is a large trade in malt, coal, corn and cattle. There are iron and brass foundries, boiler-works, agricultural implement manufactories and breweries. Gypsum and limestone are obtained in the neighbourhood, and plaster of Paris is extensively manufactured. The town is governed by a mayor, 6 aldermen and 18 councillors. Area 1931 acres.

Newark (*Newerca, Nouwerk*) owed its origin, possibly in Roman times, to its position on the great road called the Fosse Way, in the valley of the Trent. In a document which purports to be a charter of 664 Newark is mentioned as having been granted to the abbey of Peterborough by Wulfhere. In the reign of Edward the Confessor it belonged to Godiva, who granted it to the monastery of Stow, and it remained in the hands of the bishops of Lincoln until the reign of Edward VI. The castle was erected by Bishop Alexander in 1123, and the bridge about the same time. Under Stephen a mint was established. There were burgesses in Newark at the time of the Domesday Survey, and in the reign of Edward III. there is evidence that it had long been a borough by prescription. It was incorporated under an alderman and twelve assistants in 1549, and the charter was confirmed and extended by Elizabeth. Charles I., owing to the increasing commercial prosperity of the town, reincorporated it under a mayor and aldermen, and this charter, except for a temporary surrender under James II., has continued the governing charter of the corporation. Newark returned two representatives to parliament from 1673 until 1885. A weekly market on Wednesdays, and a fair on the eve, day and morrow of the Invention of the Holy Cross, granted to the bishop of Lincoln by John, are still held; another fair at St Mary Magdalene and the four preceding days was granted by Henry III., and is probably represented by the fair now held on the 14th of May. A market for corn and cattle is still held on Wednesdays, and another on Tuesdays for fat stock has been added.

NEWARK, the largest city of New Jersey, U.S.A., a port of entry, and the county-seat of Essex county, on the Passaic river and Newark Bay, about 8 m. W. of New York City. Pop. (1890) 181,830; (1900) 246,070, of whom 71,363 were foreign-born, and 6694 were negroes; (1910 census), 347,469. Of the total foreign-born population in 1900 (48,329 of whom had been in the United States at least ten years), 25,139 were from Germany, 12,792 from Ireland, 8537 from Italy, 5874 from England, 5511 from Russia and 4074 from Austria. Of the total population, 143,306 were of foreign parentage on both sides, 56,404 German, 30,261 Irish, 13,068 Italian, 8951 English and 8531 Russian. Newark is served by the Pennsylvania, the Lehigh Valley, the Erie, the Delaware, Lackawanna & Western and the Central of New Jersey railways, and by steamboats engaged in coastwise and river commerce. By electric lines it is connected with most of the cities and towns within a radius of 20 m., including Jersey City, Paterson and the residential suburbs, among which are the Oranges, Montclair, Bloomfield, Glen Ridge, Belleville and Nutley. It has a frontage on the river and bay[1] of 10½ m., and a total area of 23·4 sq. m. The site is generally level, but the ground rises toward the western part. Broad Street, 120 ft., and Market Street, 90 ft. wide, the principal thoroughfares, intersect. The most prominent public buildings are the City Hall, completed in 1906; County Court-House, designed by Cass Gilbert (b. 1859), with sculpture by Andrew O'Connor and decorations by Howard Pyle, Will H. Low, Kenyon Cox, H. O. Walker, C. Y. Turner, F. D. Millet, George W. Maynard and Edwin H. Blashfield; United States Government Building; Public Library, finished in 1901, and City Hospital. There is a Roman Catholic Cathedral, and the city is the see of a Roman Catholic and of a Protestant Episcopal bishop. The Prudential Life Insurance Company and the Mutual Benefit Life Insurance Company have fine office buildings. Many of the older buildings are of a brown sandstone, quarried in or near the city. In Military Park is a monument to Major-General Philip Kearny (1815–1862), and in Washington Park is a monument to Seth Boyden (1785–1870), a Newark inventor of malleable iron, of machinery for making nails, and of improvements in the steam-locomotive. Newark has also a monument to Frederick Theodore Frelinghuysen (1817–1885), secretary of state in the cabinet of President Chester A. Arthur, and to Abraham Coles (1813–1891), a poet and physician, both of whom lived here. On the banks of the Passaic is a house having as a part of its walls the old walls of Cockloft Hall, in which Washington Irving frequently sojourned, and of which he gave a charming description in *Salmagundi*. In the vicinity are the remains of Peterborough, the home of Colonel Peter Schuyler (1710–1762), who served against the French in 1746–48 and in the French and Indian War. At the corner of Broad and William streets stood until 1835 the parsonage in which Aaron Burr was born.

In 1910 Newark had 658 acres in public parks, of which 637 acres were under the administration of the Essex County Park Commission. To Washington, Military and Lincoln parks, the older ones near the heart of the city, there have been added Branch Brook (277 acres), Weequahic (265·8 acres), West Side (23 acres), and East Side (12·5 acres) parks. The principal cemeteries are Mount Pleasant, overlooking the Passaic in the northern part of the city, and Fairmount in the western part; about 1894 the remains of the early settlers were removed from the Old

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[1] The river channel before improvement had a navigable depth of 7 ft. at mean low water; the depth was increased to about 10 ft. by the Federal government before 1902; in 1907 further improvement was authorized by Congress, the channel to be made 300 ft. wide and 16 ft. deep.

Burying Ground to Fairmount Cemetery and placed in a large vault marked by a monument.

As parts of its public school system the city maintains twelve summer or vacation schools, evening schools, a normal and training school for the education of teachers, a school of drawing, and a technical school, the last for evening classes. The Newark Academy, founded in 1792, is the leading private school; and there are various Roman Catholic academies. In the township of Verona (pop. in 1905, 2576), about 7 m. N. by W. of Newark, is the City Home for boys, in which farming, printing and other trades are taught. The Public Library (opened in 1889) contained about 160,000 volumes in 1910, and the library of the New Jersey Historical Society about 26,000 books, about 27,000 pamphlets and many manuscripts; the Prudential Insurance Company has a law library of about 20,000 volumes; and the Essex County Lawyers' Club has one of 5000 volumes or more. Among the charitable institutions are the City Hospital, Saint Michael's Hospital, Saint Barnabas Hospital, Saint James Hospital, the German Hospital, a Babies' Hospital, an Eye and Ear Infirmary, a City Dispensary, the Newark Orphan Asylum, a Home for Crippled Children, a Home for Aged Women and three day nurseries. The municipality owns and operates the water-works, and the water is brought from reservoirs in the Pequanac Valley 20-30 m. N.W. of the city.

The city charter (1857) provides for government by a mayor, elected biennially, and a unicameral council, elected by popular vote. By popular vote, also, the board of street and water commissioners is chosen. The council chooses the city clerk, treasurer and tax receiver, and the mayor appoints the city attorney, police justices, the board of education, the trustees of the public library, and the excise and assessment commissioners, and, subject to the ratification of his choice by the council, the comptroller, auditor and the tax, police, health and fire commissioners.

Newark has long been one of the leading manufacturing cities of the country. The manufacture of shoes and other leather products, particularly patent leather, became an important industry early in the 19th century; in 1770 there was one tannery here; in 1792 there were three; a large one, still in operation, was built in 1827; in 1837 there were 155 curriers and patent leather makers in the city, which then had an annual product of leather valued at $899,200; in 1905 the value of the leather, tanned, curried and finished was $13,577,719. The manufacture of felt hats (product, 1905, $4,586,040, Newark ranking third in this industry among the cities of the United States), carriages, chairs and jewelry (an industry established about 1830; product, 1905, $9,258,095), developed rapidly early in the 19th century, and there are extensive manufactories of malt liquors (product, 1905, $10,917,003), and of clothing (product, 1905, $3,937,138), foundries and machine shops (product, 1905, $6,254,153), and large establishments for smelting and refining lead and copper, the product of the lead smelters and refining establishments being in 1905 the most valuable in the city. Among the other important manufactures in 1905 were: chemicals, valued at $3,964,726; slaughtering and meat packing, $2,933,877; varnish, $2,893,305; stamped ware, $2,689,766; enamelled goods, $2,361,350; boots and shoes, $2,382,051; reduction of gold and silver, not from ore, $2,361,350; corsets, $2,081,761; paints, $1,812,463; silverware and silver-smithing, $1,780,906; tobacco, cigars and cigarettes, $1,742,862; hardware, $1,616,755; buttons, $1,281,528, and saddlery hardware, $1,151,789. In 1905 an art pottery was established for making "crystal patina" and "robin's egg blue" wares, in imitation, to a certain extent, of old oriental pottery, and Clifton India ware, in imitation of pottery made by the American Indians. The total value of Newark's factory products increased from $112,728,045 in 1900 to $150,055,227 in 1905, or 33·1%. In 1905 the value of the city's factory product was almost one-fifth of that for the whole state, and Newark ranked tenth among the manufacturing cities of the entire country. In the same year Newark manufactured more than one-half (by value) of all the jewelry, leather and malt liquors produced in the state.

Insurance is another important business, for here are the headquarters of the Prudential, the Mutual Benefit Life and the American Fire, the Firemen's and the Newark Fire Insurance companies. The city's foreign trade is light (the value of its imports was $859,442 in 1907; of its exports $664,525), but its river traffic is heavy, amounting to about 3,000,000 tons annually, and being chiefly in general merchandise (including food-stuffs, machinery and manufactured products), ores and metals, chemicals and colours, stone and sand and brick.

Newark was settled in 1666 by about thirty Puritans from Milford, Connecticut, who were followed in the next year by about the same number of their sect from Branford and Guilford. Because of the union of the towns of the New Haven Jurisdiction with Connecticut, in 1664, and the consequent admission of others than church members to civil rights, these Puritans resolved to remove and found a new town, in which, as originally in the New Haven towns, only church members should have a voice in the government. They bought practically all of what is now Essex county from the Indians for "fifty double hands of powder, one hundred bars of lead, twenty axes, twenty coats, ten guns, twenty pistols, ten kettles, ten swords, four blankets, four barrels of beer, ten pairs of breeches, fifty knives, twenty horses, eighteen hundred and fifty fathoms of wampum, six ankers of liquor (or something equivalent), and three troopers' coats." Their first church was in Broad Street, nearly opposite the present First Presbyterian Church, with cupola and flankers from which "watchers" and "wards" might discover the approach of hostile Indians, and as an honour to their pastor, Rev. Abraham Pierson (1608–1678), who came from Newark-on-Trent, they gave the town its present name, having called it Milford upon their first settlement. The town was governed largely after the Mosaic law and continued essentially Puritan for fifty years or more; about 1730 Presbyterianism superseded Congregationalism, and in 1734 Colonel Josiah Ogden, having caused a schism in the preceding year, by saving his wheat one dry Sunday in a wet season, founded with several followers the first Episcopal or Church of England Society in Newark—Trinity Church. Partly because of its Puritanic genesis and partly because of its independent manufacturing interests, Newark has kept, in spite of its nearness to New York City, a distinct character of its own. The College of New Jersey, now Princeton University, was situated here from 1747 to 1756, for all but the first few months under the presidency of the Rev. Aaron Burr, who published in 1752 the well-known *Newark Grammar*, long used in Princeton and originally prepared for Burr's very successful boys' school in Newark. The city received large additions to its foreign-born population immediately after the revolution of 1848, when many Germans settled here—a German daily newspaper was established in 1857. Newark was incorporated as a township in 1693, was chartered as a city in 1836 and received another charter in 1857; from it the township of Orange was formed in 1806 and the township of Bloomfield in 1812.

See H. L. Thowless, *Historical Sketch of the City of Newark, New Jersey* (Newark, 1902); F. J. Urquhart, *Newark, The Story of its Early Days* (Newark, 1904); and J. Atkinson, *The History of Newark, New Jersey* (Newark, 1878).

NEWARK, a city and the county-seat of Licking county, Ohio, U.S.A., at the confluence of three forks of the Licking river, on the Ohio Canal, and 33 m. E. by N. of Columbus. Pop. (1890) 14,270; (1900) 18,157, of whom 1342 were foreign-born and 300 were negroes; (1910 census) 25,404. Newark is served by the Baltimore & Ohio, and the Pittsburg, Cincinnati, Chicago & St Louis railways, and by inter-urban electric lines. It lies on a level plain, but is surrounded by hills. Along two of the forks of the Licking are some of the most extensive earthworks of the "mound builders"; they occupy about 3 sq. m., and have a great variety of forms: parallel walls, circles, semicircles, a parallelogram, an octagon, &c. About 10 m. S.W. and connected with Newark by electric line is Buckeye Lake, an artificial body of water about 8 m. long and 1 m. wide, frequented as a summer resort. Among the city's attractive features are Idlewilde Park and a beautiful auditorium, built as a memorial to the soldiers and sailors of the Civil War. Newark is the trade centre of an agricultural region, which also abounds in natural gas and coal; natural gas is piped as far as Cincinnati. The city has electric car and steam car shops and various manufactures, including stoves and furnaces (the most important), bottles, table glass-ware, cigars, rope halters, machine furniture and bent wood. The total factory product in 1905 was valued at $5,612,587, an increase of 94·9% over that in 1900. Newark was laid out about 1801 and was incorporated in 1813.

For an account of the earthworks see Gerard Fowke, *Archaeological History of Ohio* (Columbus, 1902).

NEW BEDFORD, a city and port of entry, and one of the county-seats of Bristol county, Massachusetts, U.S.A., 56 m. S. of Boston, at the mouth of the Acushnet river, and at the head of New Bedford Harbor, an arm of Buzzard's Bay. Pop. (1890) 40,733; (1900) 62,442, of whom 25,529 were foreign-born, including 8559 French Canadians, 5389 English, 4802 Portuguese and 3020 Irish; (1910 census) 96,652. New Bedford is the terminus of two divisions of the New York, New Haven & Hartford railroad, and is connected with Taunton (the other county-seat), Fall River, Brockton and other cities by interurban electric railways. Passenger steamboat lines connect with Martha's Vineyard, Nantucket and Buzzard's Bay points; a freight line and, in summer, daily passenger service to New York are maintained; the Insular Navigation Co. (Empreza Insulana de Navegação) runs passenger and freight steamers from New Bedford to Lisbon, and to the Azores; and there is a regular sailing packet service between New Bedford and the Cape Verde Islands. Two bridges connect New Bedford with the township of Fairhaven, on the E. side of the harbour; one, a steel bridge, is almost 1 m. in length and cost $1,500,000. New Bedford is attractively situated, and, commercially, occupies a particularly favourable position. It covers about 20 sq. m., and extends along the W. side of the river and harbour for several miles. Unusual dockage facilities are thus provided. The harbour was improved by the Federal government, between 1840 and 1906, the channel from Buzzard's Bay through the harbour being 18 ft. deep and 200 ft. wide; under a project of 1907 it was contemplated to increase the depth of the channel to 25 ft. and the width to 300 ft. There is a broad driveway along the shore of the harbour to Clark's Point at the entrance, where during the Civil War the United States government erected a stone fort, Fort Rodman, in which a garrison of artillery is still maintained; New Bedford was one of the 26 places reported by the U.S. Chief of Engineers in 1909 as having "permanent seacoast defences." Among the principal buildings and institutions are the post office and custom house, the city hall, the county court house, the registry of deeds building, the masonic building, the merchants' national bank, the institution for savings, St Joseph's and St Luke's hospitals, the Swain free school, St Mary's (Roman Catholic) school, the Friends' academy, a state textile school, a state armory and St Mary's home. The public library, established as a private society library in 1802, taken over by the city in 1853, and housed in the refitted old city hall building, was one of the first free public libraries in the United States; it contains about 100,000 volumes, and has notable collections relating to the whaling industry and to the Quakers. The Sailors' Bethel, built in 1831, and containing memorial tablets reminiscent of the whaling days, is of interest. The Old Dartmouth Historical Society was organized in 1903. A fine park system, aggregating 255 acres, includes the Common, and Brooklawn, Buttonwood, Hazelwood, Grove and Triangle Parks. The city owns and operates a fine water-supply system.

When whale-oil was a widely used illuminant, New Bedford was long the principal port of the world's whaling industry; and in point of tonnage owned it is perhaps still so, as many New Bedford vessels now sail from San Francisco. As early as the middle of the 18th century, vessels sailed on whaling voyages from the mouth of the Acushnet river, but it was not until 1765, when Joseph Rotch, a Nantucket merchant, bought a tract of land on the W. side of the river and constructed wharves and warehouses, that the industry became established here. At first the whales were obtained principally off the Virginia and Carolina coasts, but by the outbreak of the War of Independence, the New Bedford whalers sought their prey as far as West Indian and even South American waters. The War of Independence temporarily ruined the industry, but it was soon re-established, and the field of operations was much extended, after 1791 many ships regularly rounding Cape Horn into the Pacific Ocean. By 1804 there were 59 whaling vessels registered from New Bedford. The unsettled commercial conditions of the early years of the 19th century and the Embargo combined to ruin the business once more, but the close of the War of 1812 ushered in the greatest era of prosperity for the industry. By 1845 only New York, Boston and New Orleans of American ports exceeded New Bedford in tonnage. The production was greatest in that year, New Bedford whalers importing 158,000 bbls. of sperm oil, 272,000 bbls. of whale oil and 3,000,000 ℔ of whalebone. The beginning of Arctic whaling in 1848 marked a new step in the industry, and the tonnage was much increased. The highest point in capital, tonnage and vessels was reached in 1857, when New Bedford possessed 329 registered whaling ships, representing an investment of $12,000,000 and employing afloat and ashore 10,000 hands. From a succession of causes, of which the introduction of petroleum into general use as an illuminant was the chief, the industry began to decline from this time. The Civil War was a great blow to the whalers; 25 vessels were sunk by Confederate cruisers, entailing a loss of $1,650,000, and many more were bought by the government to be sunk at the entrances of southern harbours, or to be used as colliers or store ships.[1] In 1871 and 1876 many vessels were lost in the Arctic ice, involving losses of several millions. Still the industry survives on a comparatively small scale; in January 1909 there were 13 steamers and barks, 1 brig and 4 schooners, with an aggregate tonnage of 4710, employed, chiefly in sperm whaling, and the oil and whalebone product of 1908 was valued at about $350,000.

The prosperity that New Bedford lost with the decline of the whaling industry has been more than made up by the growth of the cotton spinning industry. In 1905 New Bedford ranked second among the cities of the United States in the manufacture of cotton goods (including cotton small wares), producing 5% of the total for the country; the speciality of the mills is the finer cotton goods. The first cotton mill, a five-storey stone structure, was built by Joseph Grinnell (1789–1885) and his associates in 1847, and began operations in the following year with 15,000 spindles and 200 looms. This was the beginning of the Wamsutta Mills, in 1907 comprising 8 buildings, 228,000 spindles and 4300 looms. In 1909 the city had some 50 mills, with a total of over 2,137,000 spindles. The value of cotton goods manufactured in 1905 was $22,411,936, or 76·1% of all manufactured products of New Bedford (in 1890 the product was $8,185,286; in 1900 $16,748,783). Among the city's other manufactures are tools, cordage and twine, boots and shoes, glass, oils, lubricants (notably black-fish oil, a lubricant for watches and clocks, of which almost the entire supply is manufactured here), mechanical toys, beer, ale, woollen and silk goods, and paints. The total value of all factory products was $23,397,491 in 1900 and $29,469,349 in 1905. There is an extensive commerce in coal, raw cotton, lumber and fish; the direct foreign trade is comparatively small—in 1909 the imports were valued at $542,995, and the exports at $34,473.

The site of New Bedford was visited in 1602 by the English navigator, Bartholomew Gosnold, who traded with the Indians at the mouth of the Acushnet or Acoosnet. It was originally part of the town of Dartmouth, which was occupied by settlers from Plymouth, who in 1652 purchased the land from Massasoit, Sachem of the Narragansets, and his son Wamsutta (called Alexander by the whites). About 1665 there was a considerable influx of Quakers, and members of this sect have always formed an important and influential element in the population. There were few settlers on the site of New Bedford until the middle of the 18th century, and there was no village, properly speaking, until 1760. The town was first called Bedford after Joseph Russell, one of the founders, whose family name was the same as that of the dukes of Bedford; and it was later called New Bedford to distinguish it from Bedford in Middlesex county. During the War of Independence the harbour became a rendezvous for American privateers; this led to an attack, on the 5th of September 1778, by a fleet and armed force under Earl Grey, which burned seventy ships and almost destroyed the town. In 1787 New Bedford was set off from Dartmouth and separately incorporated as a township; in 1812 the township of Fairhaven was separated from it. New Bedford was chartered as a city in 1847. Its first newspaper, the *Marine Journal*, was established in 1792. The *Mercury*, founded in 1807, now one of the oldest newspapers in continuous publication in the country, was for some time edited by William Ellery Channing (1818–1901). There are Portuguese and French weekly newspapers.

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[1] From New Bedford in November and December 1861 sailed the "Stone Fleet," a flotilla of 45 whaling vessels collected by the Federal government and loaded with stone, most of which were sunk off Charleston and other harbours on the South Atlantic coast for the purpose of stopping blockade running.

See Daniel Ricketson, *History of New Bedford* (New Bedford, 1858); Z. W. Pease and G. W. Hough, *New Bedford* (New Bedford, 1889); D. H. Hurd, *History of Bristol County* (Philadelphia, 1883); L. B. Ellis, *History of New Bedford and its Vicinity 1602–1892* (Syracuse, N.Y., 1892); W. S. Tower, *A History of the American Whale Fishery* (Philadelphia, 1907); and *The Old Dartmouth Historical Sketches* (1903 seq.), published by the Old Dartmouth Historical Society.

NEWBERN, a city, port of entry and the county-seat of Craven county, North Carolina, U.S.A., near the head of the estuary of the Neuse river and at the mouth of the Trent river, about 90 m. N.E. of Wilmington. Pop. (1890) 7843; (1900) 9090, of whom 5878 were negroes; (1910 census) 9961. Newbern is served by the Atlantic Coast Line and the Norfolk & Southern railways. The Federal government has improved both the Neuse and the Trent rivers for navigation; the Neuse has a channel of 8 ft. at low water to Newbern and one of 4 ft. from Newbern to Kinston, and the Trent a channel of 3 ft. from Newbern to Trenton. The Trent and the Neuse are both spanned here by railway and county bridges. The "Waterway between Newbern and Beaufort," projected in 1884, had in 1908 a controlling depth at mean low water of only 2 to 2½ ft.; it was decided to abandon this waterway on the completion of an inland waterway about 18 m. long with a channel 10 ft. deep at low water and 90-250 ft. wide, projected in 1907, which would give Newbern an outlet to the ocean at Beaufort. The remains of Tryon Palace, the residence of the royal governor and the meeting-place of the legislature, which was built by William Tryon (*q.v.*) in 1765–1770, and was said to be the finest building of its time in the colonies, are of historic interest, and among the principal buildings are the United States government building, the county court house, the county jail and the county home. At Newbern is one of the national cemeteries of the Federal government, containing many fine monuments. The most important industries are the manufacture of lumber (especially pine) and trucking. The total value of factory products in 1905 was $1,343,384. In 1907 about 1000 men, mostly negroes, were employed in the saw-mills, whose annual product averages about 170,000,000 ft. Among the manufactures are fertilizers, cotton seed oil and carriages; repair shops of the Norfolk & Southern railway are here; the fisheries are of considerable importance; and the city ships quantities of fish, cotton and market-garden produce—much of the last being forced under canvas with steam heat. It is the port of entry of the Pamlico customs district; in 1908 its imports were valued at $71,421. Newbern was settled in 1710 by a company of Swiss and Germans under the leadership of Baron Emanuel de Graffenried (d. 1735) and was named for Bern, Switzerland. It was incorporated as a city in 1723, but its present charter dates from 1899 with amendments adopted in 1907. For several years it was the capital of the province and for a long time was the chief seaport of the state. Although strongly fortified early in the Civil War, Newbern was captured by a Union force under General A. E. Burnside on the 14th of March 1862 after an engagement near the city in which the loss to the Confederates, who were under the command of General Lawrence O'Brien Branch, was about 578 in killed, wounded, captured and missing, and the loss of the Union force was 90 killed and 380 wounded. Unsuccessful attempts to recapture the city were made by the Confederates on the 14th of March 1863, and on the 1st of February and the 5th of May 1864.

NEWBERRY, JOHN STRONG (1822–1892), American geologist, was born at Windsor, Connecticut, on the 22nd of December 1822, and received a medical education at Cleveland, Ohio, taking the degree of M.D. in 1848. He completed his medical studies in Paris. His attention was early attracted to geology by collecting coal-measure plants from mines that had been opened by his father, and an acquaintance with Professor James Hall established his interest in the science. Hence while in Paris he studied botany under A. T. Brongniart. In 1851 he settled in practice at Cleveland, but in 1855 he was appointed surgeon and geologist to an exploring party in northern California and Oregon, and in 1857 his reports on the geology, botany and zoology were published. Between then and 1861 he was employed on similar work in the region of the Colorado river under Lieutenant J. C. Ives, and his researches were extended over a large area of previously unknown country in Utah, Arizona and New Mexico, the further results being published in 1876. During the Civil War he did important work as a member of the U.S. Sanitary Commission, his organizing capacity being specially marked during the operations in the Mississippi Valley. In 1866 he was appointed professor of geology and palaeontology at the Columbia School of Mines, New York, where he commenced the formation of a magnificent collection of specimens; in 1869 he was made state geologist of Ohio and director of the (second) Geological Survey there, and in 1884 palaeontologist to the U.S. Geological Survey. Four volumes on the geology of Ohio were published while he was director of the survey, his own reports being confined to the surface geology and to the coal-measures and their fossil plants. He devoted much labour to the study of Triassic, Cretaceous and Tertiary plants, and in particular to those of the Laramie stage. He also carried on researches among the Palaeozoic and Triassic fishes of North America. Among his other publications may be mentioned *The Origin and Classification of Ore Deposits* (1880). His work throughout was characterized by great care and conscientious study, and it was recognized by his inclusion in most of the learned societies of America and the Old World. He received the Murchison medal of the Geological Society of London in 1888, and was president of the American Association for the Advancement of Science (1867), of the New York Academy of Sciences (1867–1891), and of the International Congress of Geologists (1891). He died at New Haven, Conn., on the 7th of December 1892.

Memoir (with portrait) by J. J. Stevenson, *American Geologist* (July 1893).

NEWBOLT, HENRY JOHN (1862–), English author, was born on the 6th of June 1862, the son of H. F. Newbolt, vicar of St Mary's, Bilston. He was educated at Clifton College, where he was head of the school in 1881 and edited the school magazine, and at Corpus Christi College, Oxford. He was called to the bar at Lincoln's Inn in 1887 and practised until 1899. His first book was a story, *Taken from the Enemy* (1892), and in 1895 he published a tragedy, *Mordred*; but it was the publication of his ballads, *Admirals All* (1897), that created his literary reputation. These were followed by other volumes of stirring verse, *The Island Race* (1898), *The Sailing of the Long-ships* (1902), *Songs of the Sea* (1904). From 1900 to 1905 he was the editor of the *Monthly Review*. Among his later books his novels *The Old Country* (1906) and *The New June* (1909) attracted considerable attention.

NEW BRIGHTON, formerly a village (coextensive with the town of Castleton) of Richmond county, New York, U.S.A., but since the 1st of January 1898 the first ward of the borough of Richmond, New York City. It is at the north-eastern end of Staten Island, about 6 m. S.W. of the borough of Manhattan, with which it is connected by ferry. Pop. (1890) 16,423; (1900)

21,441, of whom 6575 were foreign-born and 259 negroes; (1905 state census) 23,659. At New Brighton is the Sailors' Snug Harbor, founded under the will of Robert Richard Randall (*c.* 1740–1801), who in 1771 became a member of the Marine Society of New York (an organization for the relief of indigent masters of vessels and their families), and in 1790 bought from Baron Poelnitz the "Minto farm," about 21 acres of land in what is now the Fifteenth Ward of the Borough of Manhattan. This tract, with four lots in what is now the First Ward of Manhattan, and cash and stocks to the value of about $10,000 Randall (who himself seems to have followed the sea for a time, and was called "Captain") bequeathed to a board of trustees, directing that the income should be used "for the purpose of maintaining and supporting aged, decrepit and worn-out sailors," who had served at least five years under the American flag, and that the institution established for this purpose should be called "the Sailors' Snug Harbor." The will was bitterly contested by relatives, but finally was fully upheld in 1830 by the United States Supreme Court. The Sailors' Snug Harbor was incorporated in 1806, and its charter was amended in 1828 to permit the building of the institution on Staten Island rather than on the Randall estate, which had already greatly increased in value. In 1833 the institution, with lands covering 160 acres, was opened in New Brighton with about 50 inmates. Randall's body was removed to the grounds in 1834, and buried under a marble monument, and in 1884 a life-size bronze statue of him, by Augustus Saint Gaudens, was placed in front of the main building. In 1909 the institution comprised the main building, a hospital, a chapel, a parsonage, residences for the officials, and several other buildings. The inmates (about 1000 in 1909) employ themselves at simple trades, or at work about the grounds; the use of intoxicating liquors is strictly prohibited, but the men are furnished with plenty of tobacco, and are well cared for. The present immense value of the land bequeathed by Randall makes Snug Harbor one of the most liberally endowed charitable institutions in New York City. At New Brighton are also a Home for Destitute Children of Seamen, founded in 1846 at Stapleton, Staten Island, removed to a new building on the Snug Harbor property in 1852, and maintained by contributions and gifts; and the Samuel R. Smith Infirmary, founded in 1861 by the Medical Society of Richmond county, and named in honour of a Staten Island physician. At New Brighton there are dry docks, paper and plaster mills, and silk-dyeing and printing works. The village as incorporated in 1866 included the northern half of the township of Castleton, and as reincorporated in 1872 included all of that township.

NEW BRIGHTON, a borough of Beaver county, Pennsylvania, U.S.A., on Beaver river, 2 m. from its confluence with the Ohio and 28 m. N.W. of Pittsburg. Pop. (1890) 5616, (1900) 6820 (487 foreign-born and 179 negroes); (1910) 8329. It is served by the Pennsylvania railway, and is connected by bridge with Beaver Falls. The borough has a public art gallery, a public park and a general hospital. Coal and fireclay abound in the vicinity, the Beaver river furnishes good water power, and the borough has various manufactures. New Brighton was laid out as a town in 1815 and was incorporated as a borough in 1838.

NEW BRITAIN, a city of Hartford county, Connecticut, U.S.A., near the centre of the state, about 9 m. S.W. of the city of Hartford; land area 13·09 sq. m. in 1906. Pop. (1890) of the township, including the city, 19,007; of the city, 16,519; (1900) of the township, including the city, 28,202; of the city, 25,998, of whom 9293 were foreign-born, including 1869 Irish and 1811 Swedes, who have a weekly published here; (1910 census) 43,916. It is served by the New York, New Haven & Hartford railway, and by several inter-urban electric railways. The city is the seat of a state normal school, and has a free public library, formerly the New Britain Institute, and a public park of about 100 acres. New Britain is an important manufacturing centre; its principal products are hardware, cutlery and edge tools, hosiery, and foundry and machine shop products. In 1905 the capital invested in manufacturing was $19,979,712 (an increase of 45·1% since 1900) and the value of the factory products was $14,959,543 (an increase of 34·8%). More than one-half of the product-value was in hardware ($7,537,625).

New Britain, which was settled in 1687, was originally a part of the township of Farmington. On account of ecclesiastical difficulties the "New Britain Society"—a parish—was organized in 1754. New Britain became a part of Berlin when that township was established in 1785. In 1850 the township of New Britain was incorporated, and in 1871 the city was chartered. By act of the state legislature in 1905 the township of New Britain and the city of New Britain were consolidated; the first election under the new charter was in April 1906. The city was one of the first in the country to build a municipal subway for electric light, telephone and telegraph wires.

See D. N. Camp's *History of New Britain* (New Britain, 1889).

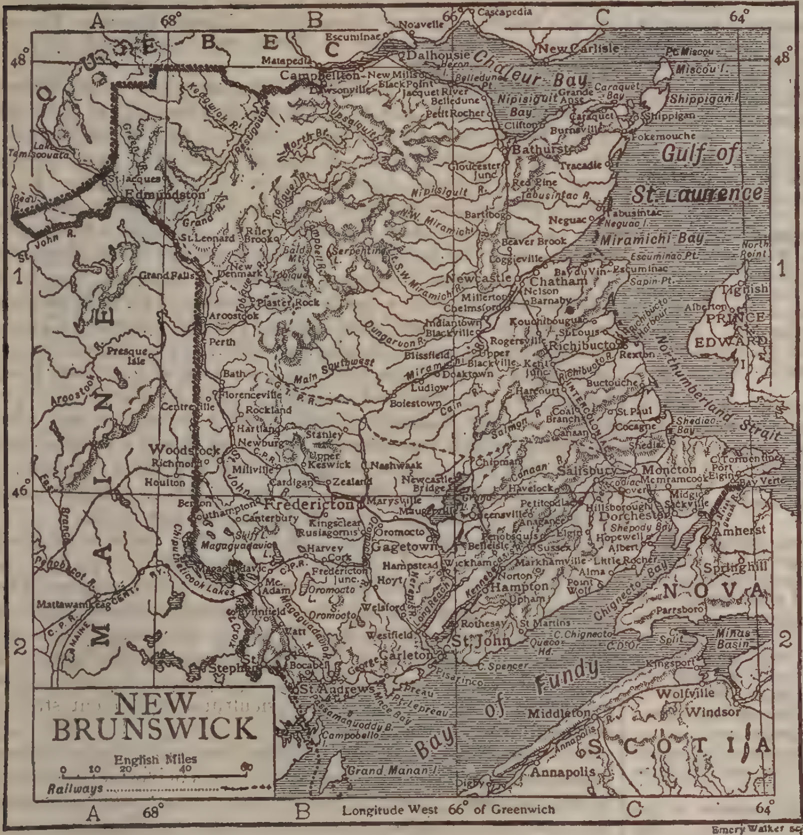
NEW BRUNSWICK, a province of the Dominion of Canada, lying between 45° 2′ and 48° 3′ N. and 63° 46′ and 69° 3′ W. Its length from N. to S. is 230 m., its greatest breadth 190 m., and it has a seaboard of about 550 m.

Physical Features.—The surface is generally undulating, but in the north and north-west of the province are many ranges of hills from 1000 to 2000 ft. in height, rising in Bald Mountain to 2400 ft. These elevations are an extension of the Appalachian Mountains and traverse the province from the state of Maine. This whole section of the province is densely wooded. The southern region embraces the district along the Bay of Fundy. Its coast is rocky and bold and interrupted by ravines. Inland the numerous rivers, flowing through the soft sandstone and conglomerate rocks, have cut broad valleys, the soil of which is extremely rich and fertile. Along the shores on the east coast, and for some miles inland, the country is flat and composed of mosses and marshes, but beyond that distance it rises into gently sloping hills, which extend as far as St John.

New Brunswick is a network of rivers, bays and lakes, several of which are navigable for vessels of large tonnage. The principal rivers are the St John, Miramichi, Restigouche, Saint Croix, Petitcodiac, Richibucto and Nipisiguit. The St John, which is famous for its scenery, rises in the state of Maine and is over 450 m. in length. It is navigable for vessels of moderate tonnage from St John on the Bay of Fundy to Fredericton, a distance of about 88 m., but steamers of light draught ply as far as Woodstock, 65 m. farther, and during the rainy season boats go as far as Grand Falls, a cataract 70 or 80 ft. high, 225 m. from the sea. Among the many lakes which it drains is Grand Lake, 20 m. long, and varying from 3 to 9 m. in breadth. The Miramichi flows N.E. into a bay of the same name. It is 225 m. long, 7 m. wide at its mouth, and navigable as far as Nelson (46 m.). In the spring and autumn small steamers and barges go much farther up. With its branches it drains a fourth of the province. A large lumber trade is done in this district, and many saw-mills are driven by the river. The Restigouche forms the north-east boundary of the province, is 100 m. in length and flows into the Bay of Chaleur. It is composed of five main branches, its name signifying in Indian "the river which divides like the hand." Large vessels may safely navigate it 18 m. from the bay. With its tributaries it drains over 4000 sq. m. of fertile and well-wooded country. The St Croix separates New Brunswick from the state of Maine at its south-west angle. Its source is a chain of lakes called the Chiputneticook. The Petitcodiac is navigable for 25 m. for ships, and schooners of 80 tons burden may proceed to the head of the tide, 12 m. farther; it empties into Shepody Bay. The Richibucto discharges into the Gulf of St Lawrence. The Nipisiguit and Tobique (a tributary of the St John) in the N. are in much repute among anglers.

The coast-line of New Brunswick is indented with numerous fine bays and harbours. The Bay of Fundy is an arm of the sea separating New Brunswick from Nova Scotia and terminating in two smaller bays, Chignecto Bay and the Basin of Minas. Its length up to Chignecto Bay is 140 m. and its extreme breadth 45 m. It is noted for its high tides, which rise about 30 ft. at St John and over 50 ft. at the head of Chignecto Bay. At Bay Verte, 14 m. distant, on the opposite side of the Isthmus of Chignecto, the tide rises little more than 4 or 5 ft. The Bay of

Chaleur, which has several excellent harbours, is over 90 m. in length and from 20 to 25 m. in breadth. The other inlets of consequence on the east coast are Miramichi, Richibucto, Buctouche, Cocagne and Shediac Bays; on the south coast are Passamaquoddy Bay, St John Harbour and Chignecto Bay. At the mouths of the rivers are in nearly every case excellent harbours. To the province belong the islands of Campobello and Grand Manan, at the entrance of the Bay of Fundy, from both of which important fisheries are carried on.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MAINE
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PRINCE EDWARD I.
Gulf of St Laurence
Chaleur Bay
Miramichi Bay
Northumberland Strait
Bay of Fundy
Chignecto Bay
Minas Basin
Nipisiguit Bay
Shediac Bay
Passamaquoddy B.
Grand Manan I.
Campobello
Miscou I.
Shippigan I.
Cascapedia
Noavelle
Escuminac
Matapedia
Dalhousie
New Carlisle
Campbellton
New Mills
Bathurst
Tracadie
Caraquet
Shippigan
Newcastle
Chatham
Richibucto
Buctouche
Moncton
Dorchester
Sackville
Amherst
Springhill
Parrsboro
Edmundston
Grand Falls
Perth
Woodstock
Houlton
Presque Isle
Fredericton
Gagetown
Oromocto
Sussex
Hampton
St John
Carleton
St Martins
St Andrews
St Stephen
Kingsport
Wolfville
Windsor
Middleton
Annapolis
Digby
Mattawamkeag
St Leonard
Plaster Rock
Aroostook
Boiestown
Doaktown
Blackville
Salisbury
Petitcodiac
Hillsborough
Memramcook
Westfield
Welsford
Harvey
McAdam
Millville
Nashwaak
Keswick
Chipman
Canaan
C. Chignecto
C. Spencer
Point Lepreau
Tignish
Alberton
Escuminac Pt.
North Point
Sapin Pt.
Pt. Miscou

Geology.—Along the Bay of Fundy, for about 30 m. inland, is a band of hard Cambrian and Cambro-Silurian rocks, with smaller areas of Devonian, Huronian and Laurentian. The city of St John is built upon very hard Cambrian slates, in which interesting fossils are found. North of this belt grey sandstones and conglomerates of Carboniferous age occupy a triangular area, the apex of which is near Oromocto Lake, the south side extending to Nova Scotia and the north-west side to Bathurst. Along the western border this area is 400 to 600 ft. high, but near the coast it is low and flat. "The Carboniferous area of New Brunswick is continuous across the isthmus [of Chignecto] with that of Nova Scotia, so that from Miscou on the Bay of Chaleur to Sydney on the Atlantic coast of Cape Breton, the whole coast of the Gulf of St Lawrence is bordered by coal-bearing rocks" (S. E. Dawson, *North America*, London, 1897). North-west of the Carboniferous a belt of 40 to 50 m. wide is occupied by Ordovician and pre-Cambrian formations, with large masses of intrusive granite. The Ordovician is composed of schistose, micaceous, and foliated slates and quartzites, in places highly altered and disturbed. The pre-Cambrian rocks consist of very hard crystalline reddish felsite, chloritic quartzites, and felspathic and micaceous schists. The whole of this region is rugged and broken into numerous ranges of hills. The remainder of the province to the north-western boundary is occupied by Silurian rocks, mostly calcareous slates and shales associated with beds of limestone. The whole province has been mantled with ice in the Pleistocene period, and boulder-clay and later modified deposits occupy the surface. Marine clay and sand containing fossil shells are found along the coast.

Climate.—The climate, though subject to extremes, is healthy. The average mean temperature in summer is 60° F., and in winter 19° F. The average rainfall for thirty years (1875 to 1905 inclusive) was 32·6 in., whereas in the neighbouring province of Nova Scotia, with its larger coast-line, it was 39·6. The winters are severe, and snow falls to a great depth, but the harbour of St John is open throughout the year. During the period 1875–1905 the average yearly snowfall was 97·5 in., 20 in. more than in Nova Scotia. The autumn is delightful, especially during the "Indian summer," after the first frost, but before the weather has broken.

Area and Population.—Not including the territorial sea, the area of the province is 27,985 sq. m., of which 74 are water. It thus occupies an area rather larger than that of the mainland of Scotland. The population in 1901 was 331,120, and is practically stationary, there being little or no immigration, and a steady exodus to the United States and to the western provinces of the Dominion. The number of males slightly exceeds that of females. The bulk of the people are of English descent, the remainder Irish and French. The Scots, so prominent in nearly all the other provinces of the Dominion, are here less conspicuous. Of the original Indian inhabitants of the province, who were of Algonquian stock and divided into two tribes, the Micmacs and the Malicites, about 1700 remain, many of whom have a greater or less proportion of white blood.

The capital is Fredericton, on the St John (pop. in 1901, 7117). The chief shipping and commercial centre is St John (pop. in 1901, 40,711). Moncton is a large railway centre (pop. in 1901, 9026). None of the other towns exceeds 5000 inhabitants. Owing to the large Irish and French element over one-third of the population belongs to the Roman Catholic Church. Campbellton (pop. 5000), a northern port on Chaleur Bay, with an important lumber trade, was destroyed by fire in July, 1910.

Administration.—The province sends ten senators and fourteen members of the House of Commons to the federal parliament. Since the abolition of the legislative council in 1892 the provincial legislature has consisted of a lieutenant-governor and a legislative assembly. Though in this the members are nominally divided on party lines, the smallness of the population renders the division rather one of persons than of principles. Both city and county districts have an elective municipal system.

Education.—There is a good system of primary and secondary schools under provincial control. When in 1871 the system of free undenominational primary schools supported by the province was introduced, feeling rose so high among the Roman Catholics that rioting broke out and life was lost. In view of the provisions in the British North America Act for protecting the rights of religious minorities, the Roman Catholics sought to have the new system declared unconstitutional, but the case, after being carried to the judicial committee of the imperial privy council, was decided against them. In 1875 a compromise was arranged, by which practical though not theoretic satisfaction is given to that church. Renewed rioting broke out among the French Roman Catholics in 1890, but after some years the compromise of 1875 was confirmed. At Fredericton an efficient normal school for the training of teachers is maintained, and a school for the deaf and dumb. The lazaretto for lepers at Tracadie and the marine hospital at St John are supported by the Dominion. At Fredericton is a small provincial university, founded in 1800 and re-established in 1859; at Sackville is the university of Mount Allison College under Methodist control, and at Memramcook one, working chiefly among the French, is owned by the Roman Catholics. In all these an adequate training is given in law, theology and the literary subjects, but for science, whether pure or applied, most of the provincial students go either to the United States or to the universities of Upper Canada.

Either owing to the beauty of its scenery or to the excellence of its education New Brunswick has produced a school of poetry, headed by Charles Roberts, which is unique in the Dominion.

Agriculture.—The great predominance of the lumber industry has tended to keep agriculture in the background. There is also a steady flow of the most active young men to the greater opportunities offered by the Canadian and American west. Thus the area under crop tends slowly to decrease. Rather more than 6000 sq. m. is now occupied, of which about 1500 is under crop and about 700 used for pasture, the rest being for the most part still covered with forest. In all the river valleys, and especially on the fertile diked lands along the head of the Bay of Fundy, many rich and prosperous farms are found varying in size from 100 to 240 acres, and good crops of wheat, oats, buckwheat and all the staple grains and roots are grown. The raising of sheep and cattle, and the production of cheese and butter, are becoming industries of importance. A dairy school is maintained by the provincial government at Sussex (King's county). Though no great development of agriculture is possible, a quiet, equable prosperity is attained by hundreds of farmers. Much crown land still remains unoccupied, and is sold by the provincial government on easy terms to bona fide settlers.

Forests.—Its great forests, through which flow numerous rivers with excellent harbours at or near their mouths, have long made New Brunswick a centre of lumbering. This industry has affected the whole development of the province, and the wilder and more unsettled life of its woodsmen contrasts with that of the farmer of Ontario or of the west. The most valuable and most widely-spread tree is the black spruce (*Abies nigra*), from which is made a yearly increasing quantity of wood-pulp for paper-making. The hemlock (*Abies Canadensis*), the cedar, birch, beech, oak, ash and many other valuable trees, are also widely spread. The chief ports for shipping are St John, at the mouth of the St John river, and Chatham, at the mouth of the Miramichi.

Though much remains, much has been destroyed by forest fires. To this day traces may be seen of the fire which in 1825 utterly destroyed hundreds of square miles of timber along the river Miramichi.

The same forests are also a paradise for sportsmen. The game laws are being made increasingly strict, and the province draws a large revenue from the sale of licences, extra fees being imposed on sportsmen from other countries. Moose (*Cervus alces*), caribou and deer may only be shot during about two months in the autumn, and the number allowed to each gun is strictly limited. In 1902 the provincial government set aside a large area of the highlands at the sources of the Tobique, Nipisiquit and Miramichi rivers for a national park and game preserve.

Mines and Fisheries.—The mineral wealth of the province is small, though gold, iron, copper, lead, zinc and plumbago have been worked on a small scale at various times. Coal seams are numerous, but are worked solely for local consumption. Albertite, a species of coal found in Albert county and giving a very hot flame, is now exhausted. Limestone and gypsum are extensively quarried near St John and in Albert county.

The fisheries, on the other hand, are extensive, though less so than those of Nova Scotia. This industry centres in the counties of Charlotte and Gloucester, herring, salmon, lobsters, sardines and cod forming the chief catch. The Restigouche and other rivers near the northern border are much frequented by anglers in search of trout and salmon.

Manufactures.—The chief manufactures, apart from the shipping of St John, are connected with lumbering and with agriculture. The making of paper pulp and of furniture is growing steadily in importance. Co-operation in the manufacture of butter and cheese has produced excellent results, and numerous cheese and butter factories are scattered through the province. In no sense, however, does New Brunswick play an important part in the manufactures of the Dominion.

Communications.—The rivers are still the main arteries of the province. The roads, though improving, are as a rule bad. The main railway system has since 1876 been that of the Intercolonial, owned and operated by the federal government, by which the province is linked to Nova Scotia on the E. and to the rest of Canada on the W. The Canadian Pacific and the Grand Trunk Pacific also run through the province, and by the Canadian Pacific and the Maine Central it has communication with the United States. Various lines of steamers run, chiefly from St John, to American and other Canadian ports.

History.—Until 1784 New Brunswick formed part, first of the French province of Acadia, later of the British province of Nova Scotia. The first settlement within its borders was made in 1604 by Pierre de Guast, sieur de Monts, with whom was Samuel de Champlain. Their colony at the mouth of the St Croix river was soon abandoned, but throughout the French régime the district was frequented by bands of fur-traders. In 1762 the first English settlement was made at Maugerville on the St John river, and in 1764 a body of Scottish farmers and labourers took up land along the Miramichi. On the 18th of May 1783 a band of American loyalists settled at the mouth of the St John. Thousands more followed, and in 1784 New Brunswick was declared a separate province. At first governed by a representative assembly and an irresponsible council, it obtained responsible government in 1847–1848, after a constitutional struggle in which no little ability was shown. In 1867 it entered without reluctance but without enthusiasm into the Canadian Federation. Its economic and educational history, both more important than its political, have been indicated in earlier parts of this article. (For the boundary dispute, see MAINE.)

BIBLIOGRAPHY.—Sir J. W. Dawson, *Acadian Geology* (edition of 1891), is the most easily accessible work on the geology of the province. Numerous studies have been published, chiefly by the Geological Survey of Canada, by L. W. Bailey, R. W. Ells, A. P. Low, and G. F. Matthew. Valuable papers on various provincial subjects have been published in the *Transactions* of the Royal Society of Canada by W. F. Ganong. The provincial government issues a yearly volume of sessional papers; *Acadiensis*, a magazine published in St John, should also be consulted. The earliest account of New Brunswick is given by Nicholas Denys, *Description géographique* (published Paris, 1672; republished by W. F. Ganong with notes and introduction, 1908); there is no good modern history; R. Montgomery Martin, *History of New Brunswick* (1837); G. E. Fenety, *Political Notes* (1867); James Hannay, *History of Acadia* (1879), and *Lives of Wilmot and Tilley* (1907) may be consulted. (W. L. G.)

NEW BRUNSWICK, a city and the county-seat of Middlesex county, New Jersey, U.S.A., on the Raritan river, at the terminus of the Delaware & Raritan canal, about 23 m. S.W. of Newark. Pop. (1890) 18,603, (1900), 20,006, of whom 3526 were foreign-born and 755 were negroes; (1910 census) 23,388. It is served by the Pennsylvania and the Raritan River railways, and by daily steamboats to New York. There is a fine stone bridge across the Raritan. In the city are the Wells Memorial Hospital, St Peter's General Hospital, a Carnegie library, a Federal building and a Soldiers' Monument. New Brunswick is the seat of the Theological Seminary of the Reformed Church in America, the oldest theological school in the United States, founded in 1784 in New York City, situated at Flatbush, Long Island, in 1796–1810, and removed to New Brunswick in 1810, and of Rutgers College (originally Dutch Reformed, now non-sectarian), which was founded in 1766 as Queen's College, was rechartered in 1770 as a college for "the education of youth in the learned languages, liberal and useful arts and sciences and especially in divinity," was first opened for instruction in 1770, was closed during 1795–1807 and 1816–1825, and was renamed in 1825 in honour of Colonel Henry Rutgers (1745–1830), of New York City, a liberal benefactor. The college embraces two schools: the classical school and the scientific school, which in 1864, in pursuance of the Morrill Act of 1862, was constituted by the state legislature as the state college for the benefit of agriculture and the mechanic arts; a preparatory school is also controlled by its trustees. An agricultural experiment station is maintained in connexion with the college. In 1908–1909 there were 306 students. In 1908 the library of Rutgers College contained 57,000 volumes, and that of the Theological Seminary 48,000 volumes. The city has a variety of manufactures, and the total value of factory products in 1905 was $8,916,983, 54% more than in 1900.

A settlement was made here in 1681, and for a time the place was known as Prigmore's Swamp; later, after John Inian had established a ferry across the river, it was called Inian's Ferry; the present name was adopted in honour of the house of Brunswick. New Brunswick received a city charter from the royal governor in 1730, and was chartered as a city by the state legislature in 1784. During the War of Independence, General Washington and his army entered New Brunswick on the 28th of November 1776, but on the approach of the enemy evacuated it, and from the 3rd of December 1776 to the 13th of April 1777 it was occupied by the British under Lord Howe. Cornelius Vanderbilt was for several years the proprietor of the Bellona Hotel of New Brunswick, now a tenement house.

NEWBURGH, or NEWBURG, a city of Orange county, New York, U.S.A., on the W. bank of the Hudson river, about 57 m. N. of New York City. Pop. (1890) 23,087, (1900) 24,943, of whom 4346 were foreign-born and 558 negroes; (1910, census) 27,805. It is served by the Erie, the West Shore, and—by ferries across the Hudson—the Central New England and the New York Central & Hudson River railways. Across Newburgh Bay, as the expansion of the Hudson at this point is called, is the village of Fishkill, and an electric line connects with the village of Walden (pop. in 1910, 4004), about 12 m. N.W., which has various manufactures, the most important being pocket-knives. The city occupies a commanding position on terraces rising abruptly from the river, and on the flat plateau above, whence a view may be obtained of the Catskill Mountains to the N.W., of the Highlands of the Hudson to the S. and of the Hudson river for many miles in both directions. Orange Lake, between Newburgh and Walden, is known for its ice yachting and skating races. Washington Park is in the central part of the city. Downing Park, named in honour of the horticulturist and landscape gardener Andrew Jackson Downing, (1815–1852), a native of Newburgh, lies on a high plateau overlooking the city and the surrounding country. Among Newburgh's institutions are a public library, St Luke's Hospital, a Children's Home, Mount St Mary's Academy (Roman Catholic) and a business college. In Colden Square there is a statue of Governor George Clinton. Cotton, woollen and silk goods, laces, paper, plaster, plush, felt and felt hats, carpets, engines and boilers, and mill and farm machinery are manufactured, and there are ship and brick yards. In 1905 factory products were valued at $7,142,327, an increase of 33·3% over their value for 1900. Newburgh was first settled in 1709 by a colony of Germans from the Rhenish Palatinate under their minister, Joshua Kockethal (d. 1719), and was known as "the Palatine Parish of Quassaic." Toward the middle of the century many of the Germans removed to Pennsylvania, and Scottish and English settlers took up their abandoned lands. In 1752 the place was renamed Newburgh, after the town of that name in Scotland, whence many of the new settlers had come. From the spring of 1782 until August 1783 Washington made his headquarters here, occupying the Hasbrouck House (built by Jonathan Hasbrouck between 1750 and 1770), which is still standing in Washington Park, and was bought by the state in 1849. It long contained a collection of historical relics, for which the state has erected a brick building in Washington Park. It was here on the 27th of May 1782 that he wrote his famous letter of rebuke to Colonel Lewis Nicola (1717–*c.* 1807), who had written to him on behalf of a coterie of army officers, it is said, suggesting that he assume the title of king. Here, also, Washington made his reply to the so-called "Newburgh Addresses," written by John Armstrong, and calling for action on the part of the army to force Congress to redress its grievances. Here the arrangements were completed for the disbandment of the Continental Army, and the centenary of the disbandment was celebrated here on the 18th of October 1883. In commemoration of the disbandment also a monument, known as the "Tower of Victory" (53 ft. high, with a life-sized statue of Washington), was erected in Washington Park by Federal and state authorities. Newburgh was incorporated as a village in 1800 and chartered as a city in 1865. The U.S. Geographic Board spells the name Newburg, but the spelling Newburgh is adopted locally and by the U.S. Post Office.

See E. M. Ruttenber, *History of the Town of Newburgh* (Newburgh, 1859) and *History of Orange County* (Newburgh, 1872).

NEWBURGH, a royal and police burgh of Fifeshire, Scotland. Pop. (1901) 1904. It is situated on the Firth of Tay, 7 m. N.W. of Ladybank Junction by the North British Railway. Its industries chiefly consist of the making of linen and floorcloth, malting and quarrying, and there are fisheries, especially of salmon. The harbour is used for the transhipment of the cargoes of Perth-bound vessels of over 200 tons. On high ground, about 1 m. S.W., stand the remains (only the pedestal) of Macduff's Cross, which marks the spot where the clan Macduff—in return for the chief's services against Macbeth—was granted rights of sanctuary and composition for murder done in hot blood. Denmyln castle, about 1½ m. S.E. of Newburgh, was the home for more than 250 years of the Balfour family, of which the two brothers, Sir James (1600–1657), the annalist and Lyon King, and Sir Andrew (1630–1694), founder of the Botanic Garden in Edinburgh, were the most distinguished members. Lindores abbey, the gem of the district, is situated on the Tay, close to Newburgh, and 1½ m. N. of the village of Lindores. Of the Benedictine abbey, founded in 1178 by David, earl of Huntingdon, brother of William the Lion, there only remain the groined arch of the principal entrance, a portion of the west tower and other Early English fragments, but the ground plan of the whole structure can still be traced. The monks were noted agriculturists and their orchards famous. At Blackearnside, a forest of alders, to the east of the village, Wallace defeated the earl of Pembroke in 1298.

NEWBURN, an urban district in the Tyneside parliamentary division of Northumberland, England, on the Tyne, 5½ m. W. of Newcastle by a branch of the North Eastern railway. Pop. (1901) 12,500. It has collieries, and iron, steel, engineering, tool and fire-clay works, and there is a large industrial population. Newburn is of considerable antiquity. Roman remains have been discovered in proximity to Hadrian's Wall. A church here was destroyed by fire in 1072 in the course of a dispute between two claimants of the earldom of Northumberland. Here in 1640 the Scottish Covenanters planted guns to protect them while fording the river, after which they defeated the English on the Durham side at Stellaheugh, and subsequently occupied Newcastle. The name of Scotswood, one of the manufacturing villages between Newburn and the city, commemorates one of their positions. The district has many associations with the famous engineer George Stephenson, born at Wylam, 3 m. W.

NEWBURY, a market town and municipal borough in the Newbury parliamentary division of Berkshire, England, 53 m. W. by S. of Reading by the Great Western railway. Pop. (1901) 11,061. It is beautifully situated in the narrow well-wooded valley of the Kennet, which is followed by the Kennet and Avon canal. The town has north and south communications by the Didcot, Newbury & Southampton railway (worked by the Great Western company), and is the terminus of the Lambourn Valley light railway. The church of St. Nicholas is a large Perpendicular building of the beginning of the 16th century. It is said to have been built mainly at the charge of John Winchcombe or Smalwoode (Jack of Newbury), an eminent clothier, who, according to the brass to his memory, died in February 1519. A few picturesque old buildings remain in the town, including part of Winchcombe's house and the Jacobean cloth hall, now a public museum. The almshouses called King John's Court are supported by a foundation known as St Bartholomew's Hospital, to which in 1215 King John granted by charter (renewed in 1596 to the corporation) the profits of a fair on St Bartholomew's day (24th of August). Shaw House, on the outskirts of the town to the north-east, is an Elizabethan mansion of brick, dating from 1581; to the north is Donnington castle, retaining a Perpendicular gateway and other fragments. The suburb of Speenhamland was formerly an important posting station on the Bath road. At Sandleford Priory, to the south of Newbury, the site and part of the buildings of an Augustinian priory (*c.* 1200) were utilized in the erection of a mansion, in 1781, for Mrs Elizabeth Montague. The householders of Newbury have the right to elect boys and girls to the educational foundation of Christ's Hospital. The cloth industry is long extinct in Newbury, but large wool fairs are held annually; there is considerable agricultural trade, and there are breweries and flour mills. A racecourse was opened in the vicinity of the town in 1905, and six meetings are held annually. The borough is under a mayor, 6 aldermen and 18 councillors. Area, 1828 acres.

Newbury (Neubiri, Neubiry) possibly owes its origin to the village of Speen on the other side of the Kennet, which probably marks the site of the Roman station Spinae. The name Newbury (new town or borough) is first mentioned by Odericus Vitalis; it is probable, however, that the manor of Uluritone, entered in Domesday as held by Ernulph de Hesdain and containing fifty-one houses, covered a large part of the site of the town. The manor was subsequently held by the Marshalls, and later by the Mortimers, through whom it passed to the house of York and the crown. It formed part of the dowry of several queens-consort, and was held by Elizabeth before her accession. In 1627 it was granted by Charles I. at a fee-farm to the corporation. Newbury was a borough by prescription; in 1187 its inhabitants are called "burgesses" and a document of the time of Edward I. speaks of it as "*burgus.*" It was incorporated by a charter of Elizabeth (1596) which was confirmed by Charles I. and Charles II.; a doubtfully valid charter of James II. (1685). Newbury sent two representatives to the parliament of 1302 and delegates to a council held in the reign of Edward III.

Newbury early became a centre of the woollen industry, but at the beginning of the 17th century this was declining. John Kendrick (d. 1624) left a sum of money to benefit the clothing trade and to "set the poor on work," but the result was not what was expected. Elias Ashmole (d. 1629) says: "Newbury had lost most of its clothing trade, which the navigation of the river Kennet hither, now begun, will probably recover"; the trade, however, was already irrevocably lost. The Weavers' Company, which still exists, was incorporated in 1601. In the 18th century a considerable trade was done in corn and malt. Newbury castle, of which traces remained until the 17th century, is said to have been besieged by Stephen in 1152. Newbury was the scene of two battles during the Civil War, in the first of which (1643) Lord Falkland was killed. An important woollen market, established in 1862, is held annually on the first Wednesday in July.

See W. Money, *History of Newbury* (1887); *Victoria County History, Berks.*

NEWBURYPORT, a city and port of entry and one of the county-seats of Essex county, Massachusetts, U.S.A., on the S. bank of the Merrimac river, about 3 m. above its mouth, and about 38 m. N.N.E. of Boston. Pop. (1890) 13,947; (1900) 14,478, of whom 2863 were foreign-born; (1910 census) 14,949. Area, about 12·85 sq. m. The city is served by two divisions of the Boston & Maine railroad, and by coast and river freight steamers. There are many houses dating back to the 17th century; of these the stone "garrison" house (in Newbury), with walls 4 ft. thick and built in the form of a cross, is an interesting example. Other private houses worthy of mention are the former homes of "Lord" Timothy Dexter and Caleb Cushing, the birthplace of William Lloyd Garrison, and (3½ m. from Newburyport in the township of West Newbury) Indian Hill Farm, the birthplace of the journalist Ben Perley Poore (1820–1887), author of *Perley's Reminiscences of Sixty Years in the National Metropolis* (1886). Among the public buildings and institutions are the Marine Museum, the Public Library (founded in 1854 by Josiah Little and containing about 45,000 volumes), the old Tracy mansion (built in 1771 or 1772), which forms part of the Public Library building, the Anna Jacques and Homoeopathic hospitals, homes for aged women and men, a Home for Destitute Children, Old South Church, in which is the tomb of George Whitefield, and the Young Men's Christian Association building, which is a memorial to George Henry Corliss (1817–1888), the inventor, erected by his widow, a native of Newburyport. The General Charity Society is a benevolent association. The city has a good public school system. The Female High School was opened in 1843 and is said to be the first high school for girls to be established in the United States. The Putnam Free School, now part of the public school system, was endowed early in the 19th century by Oliver Putnam of Newburyport and afterwards of Hampstead, New Hampshire. Three parks, Washington, Cushing and Atkinson, are maintained by the city; and there are a statue of George Washington (1879), by J. Q. A. Ward, one of William Lloyd Garrison by D. C. French, and a memorial to the soldiers and sailors of the Civil War—a bronze statue, "The Volunteer"—by Mrs Theo (Ruggles) Kitson. A curious chain suspension bridge across the Merrimac, connecting Newburyport with Amesbury, was built in 1827, replacing a similar bridge built in 1810, which was one of the first suspension bridges in America.

Newburyport in the early part of the 18th century was one of the most prosperous commercial centres in New England. At that time fishing, whaling and shipbuilding were its principal industries, the clipper ships built here being among the fastest and best known on the seas. After the Civil War manufacturing became Newburyport's chief interest. In 1905 its factory product was valued at $6,809,979, an increase of 32·5% since 1900; 57·6% was in boots and shoes, and the manufactures of combs and silverware, silversmithing products, cotton goods and electrical supplies are also important.

Newbury, including the site of the present Newburyport, was settled in 1635 by a company under the leadership of the Rev. Thomas Parker (1595–1677), who had taught in Newbury, England, in his youth. In 1639 a portion of the territory was set off to form the town of Rowley, and in 1764 about 647 acres were set off and incorporated as the town of Newburyport. In 1819 the town of Parsons (now West Newbury) was formed from Newbury. Newburyport, with its area considerably enlarged, became a city in 1851. During the War of Independence and the War of 1812 it sent out many privateers. In 1811 a fire destroyed 250 buildings, including the greater part of the business portion of the town.

See Caleb Cushing, *History and Present State of the Town of Newburyport* (Newburyport, 1826); Joshua Coffin, *History of Newbury, Newburyport, and West Newbury, 1635–1845* (Boston, 1845); Mrs E. V. Smith, *History of Newburyport* (Boston, 1854); D. H. Hurd, *History of Essex County* (Philadelphia, 1888); J. J. Currier, *History of Newbury from the First Settlement of the Town to the Beginning of the Twentieth Century* (Boston, 1902), *History of Newburyport, 1764–1905* (Newburyport, 1906), and *Ould Newbury, Historical and Biographical Sketches* (Boston, 1898).

NEW CALEDONIA (Fr. *Nouvelle-Calédonie*), an island in the western Pacific Ocean, belonging to France. (For map, see PACIFIC OCEAN.) It is about 250 m. long, and has an extreme breadth of 35 m. and an area including adjacent islets of 6450 sq. m.; is situated at the southern extremity of Melanesia, between 20° 5′ and 22° 16′ S., and between 164° and 167° 30′ E., and, like all the chief islands of that chain and the chain itself, lies north-west and south-east. An almost unbroken barrier reef skirts the west shore at about 5 m. distance, enclosing a navigable channel; on the east, which is more abrupt and precipitous, it is much interrupted. To the north the reefs continue, marking the former extension of the land, for about 160 m., ending with the Huon Islands. The Isle of Pines, so called from its araucarias (its native name is *Kunie*), geologically a continuation of New Caledonia, lies 30 m. from its south-east extremity. It formerly abounded in sandalwood, and consists of a central plateau surrounded by a belt of cultivation. At the two extremities of New Caledonia, parallel longitudinal ranges of mountains enclose valleys; for the rest the island consists essentially of confused masses and ranges of mountains, rising to an extreme elevation of 5387 ft., the plains being chiefly the deltas of rivers. The landscape is rich and beautiful, varied with grand rock scenery, the coast-line being broken by numerous small bays, into which flow streams rarely navigable even for short distances, but often skilfully utilized by the natives for irrigation; and sometimes flowing in subterranean channels. The larger rivers in the wet season form impassable morasses, especially in the S.E., where the mountains rise in isolated masses from flat plains.

Geology.[1]—Speaking generally, New Caledonia may be described as a band of Palaeozoic and probably Lower Palaeozoic rocks, associated doubtless with some Archean beds; this band runs from north-west to south-east, through the whole length of the island. The second element in the composition of the island consists of Mesozoic beds, which occur in a broken band along most of the south-western coast. Most of the island is occupied by the band of the old rocks, which include mica, glaucophane and sericite-schists and slates; there are small intrusions of granite, and numerous dikes and masses of basic eruptive rocks. The slates are interbedded with limestones containing fossil brachiopods, which have led to their determination as Silurian or Devonian; but L. Peletan classes all these limestones as Triassic. Triassic beds of the Pacific coastal type occur in a band along the south-western coast. They are covered by marine Jurassic beds and they in turn by Cretaceous coal-bearing, terrestrial deposits, resembling those of New Zealand. According to E. Glasser, the basic igneous rocks which are associated with the mineral deposits of New Caledonia were intrusive in Cainozoic times, at the severing of the connexion between New Caledonia and New Zealand. New Caledonia is part of the Australasian Festoon, and in its general characters resembles the geology of New Zealand. The main mineral deposits are the nickel ores, occurring as veins of garnierite, associated with peridotite dikes, in the ancient rocks of the eastern slope of the island.

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[1] The basis of knowledge of the geology of New Caledonia was laid by Garnier, *Ann. des Mines*, ser. 6, vol. xii. (1867). Later accounts are by E. Glasser, "Les Richesses minérales de la Nouvelle Calédonie," *Ann. des Mines*, ser. 10, vol. iv. mem. pp. 299-392, pl. xi., and vol. v. mem. pp. 29-54, 503-701, pl. ii. and xii. (1904); and by L. Peletan, *Les Richesses minerales des colonies françaises* (Paris, 1902).

Climate, Flora, Fauna.—The hottest and wettest months are from December to March, but there is usually a fresh trade-wind blowing and the climate is healthy. There is much less moisture, and the flora is of a less tropical character than farther north; it has some Polynesian and New Zealand affinities, and on the west coast a partially Australian character; on the higher hills it is stunted; on the lower, however, there are fine grass lands, and a scattered growth of niaulis (*Melaleuca viridiflora*), useful for its timber, bark and cajeput oil. There is a great variety of fine timber trees. The bread-fruit, sago, banana, vanilla, ginger, arrowroot and curcuma grow wild. The cocoa nut, maize, sugar-cane, coffee, cotton, rice and tobacco (which last does not suffer like other crops from the locusts) do well. The orange, indigo, lucerne and European vegetables are grown. Mammals are very few; they include the rat and *Pteropus* and other bats. The commonest birds are pigeons (the large notou and other varieties), doves, parrots, kingfishers and ducks. The kagu (*Rhinochetus jubatus*), a peculiar "wingless" bird, is found here only. Turtle abound on the coast, and fish, of which some kinds, as the tetrodons (globe-fish), are poisonous, especially at certain seasons. Land and marine molluscs are numerous, and include various edible kinds.

Population.—At the census of 1901 the population of New Caledonia numbered 51,415, consisting of 12,253 free Europeans (colonists, soldiers, officials), 29,106 natives, 10,056 convicts. In 1898, however, the introduction of convicts into the island ceased. The centres of population are Nouméa (Numea), the capital, on a fine harbour of the west coast near the southern extremity of the island, with 7000 inhabitants; Bourail, an agricultural penitentiary (1800); La Foa, in the centre of the coffee plantations; Moindu, St Louis and St Vincent.

The natives, whom the French call Kanakas (*Canaques*, a word meaning "man," applied indiscriminately to many Pacific peoples), live on reservations. They are Melanesians of mixed blood, of two fairly distinct types, one sub-Papuan and the other Polynesian. Of the first the physical characteristics are a small, thin-limbed body, hair black, short and woolly, projecting jaws, rounded, narrow, retreating forehead, long and narrow head, enormous eyebrow ridges, flat nose and dark skin. The second type is characterized by a lighter skin, sometimes of a reddish-yellow, longer, less woolly hair, body taller with better-proportioned limbs, and head broader. This is the prevailing type in the east and south of the island. There is nowhere a real defining line between the two (many New Caledonians having black skins and woolly hair with Polynesian superiority of limb), but the Polynesian type is generally found among the chiefs and their kindred.

Both sexes among the natives pierce the lobes of the ear for ornaments. Tattooing is almost entirely confined to the women. Both sexes go naked, or with the scantiest loin-cloth. Their huts are usually beehive-shaped, with a single apartment, low narrow door, and no chimney. There are various degrees of hereditary chiefships, and a supreme chief recognized by all. As in some other Pacific islands, when a son is born the chiefship passes to him, but the father continues to govern as regent. All property descends to the eldest son by birth or adoption, though custom demands that the younger members of the family should have a share. The people have to work on the chief's plantations and fisheries, and also work in parties for each other, breaking up new land, &c. This often ends in feasting and in dances (*pilu pilu*), which include allegorical representations of events or ideas. The supreme chief's authority is limited by the advice of a council of elders, whom he is obliged to summon in certain emergencies. The standard of morality is low; women are practically slaves, and infanticide was formerly common.

The Kanakas are excellent agriculturists, being accounted superior in this matter to every other race of the Pacific. About the middle of the 19th century the indigenous population was 60,000. Returns for 1904 showed that this had fallen to rather less than half.

The languages of the different tribes are mutually unintelligible. They express abstract ideas imperfectly. Thus there are several words for eating, each applied to a particular article of food. Their reckoning shows the same peculiarity. The numbers go up to five, and for living objects the word *bird* is added, for inanimate *yam*, for large objects *ship*.[1] There are other terms for bundles of sugar-canes, rows (planted) of yams, &c.; and sometimes things are counted by threes. Ten is two fives, 15 three fives, 20 is a "man" (ten fingers and ten toes), 100 is "five men," and so on.

Administration and Industries.—The colony is administered by a governor, who exercises military power through a marine infantry colonel, and civil power with the assistance of a privy council, a director of the interior, a judicial head, and a director of the penitentiary administration. There is also an elective general council. Nouméa is the seat of a superior tribunal, a tribunal of first instance, and a tribunal of commerce. The island and its dependencies are divided into five arrondissements. Nouméa alone has (since 1879) a municipality, other localities being administered by commissions. There are about 1600 sq. m. of cultivable lands in the alluvial valleys, where coffee, maize, tobacco, sugar-cane, the vine, vegetables, potatoes, and some of the cereals are grown with success. Coffee was introduced about 1870, and has prospered well. Cheap agricultural labour is supplied by the convicts, by the liberated convicts, the Kanakas, and (to some extent) labourers from the New Hebrides. The soil is in three domains: that of the state, for the working of which concessions may be granted; that of the penitentiary administration; and that of the native reserve. Many horses, cattle and sheep have been imported, and the meat-preserving industry is prosecuted. Gold is found in the valley of the Diahot, as well as lead and copper at Balade. Iron is found everywhere. The yearly output of nickel and chrome is considerable, and these minerals, with cobalt, constitute the characteristic wealth of the island. Coal has been worked near Nouméa, and kaolin is found in places. Gypsum and marble also deserve mention. The chief industrial establishments are smelting furnaces for cobalt, meat-preserving works at Ouaco, sugar-works and distilleries at Nouméa and La Foa, tobacco, oil and soap factories at Nouméa. The commerce in 1888 amounted to £480,000, of which £200,000 represented the trade with France. In 1900 the total had risen to £820,000, of which £480,000 was for imports and £340,000 for exports, the share of France in that year having been 45% of imports and 47% of exports. The island imports wines, spirits, tissues, clothing and ironmongery; and exports ores, nickel, cobalt and chrome (which represent over three-quarters of the total exports in value), preserved meats and hides, coffee, copra and other colonial produce. There are about 150 m. of carriage roads, and in the mountainous regions there are many footpaths. A railway running north-westward from Nouméa to Dumbéa, &c., is designed to connect the capital with Bourail. The islands annexed to the colony of New Caledonia are the Isle of Pines, used as a place of detention for habitual criminals; the Loyalty Islands (*q.v.*), E. of New Caledonia; the Huon Islands, a practically barren group; the Wallis Archipelago (*q.v.*); and Futuna and Alofa, S. of the Wallis group.

History.—New Caledonia was discovered by Captain Cook in 1774. He touched at the haven of Balade (the original name of the island) near the north-western extremity, as did d'Entrecasteaux in 1793, who closely explored the coast and surrounding seas. They subsequently became known to sealers and traders in sandalwood, who, however, established no friendly relations with the natives. In 1843 French missionaries arrived at the island, and it was claimed for France, but on British representations the claim was renounced. In 1851 a landing party from a French vessel lying at Balade was attacked by the natives, and massacred with the exception of a single member. France was now determined on the annexation, and the flag was raised at the same spot in 1853, but simultaneously the commander of a British vessel was in negotiation with the native chief of the Isle of Pines, and the British flag was hoisted there. The chief, however, subsequently sided with the French, and the British claim was finally withdrawn. The capital, Nouméa, was founded in 1854 (it was then called Port de France); in 1860 New Caledonia became a colony distinct from the French possessions in the Pacific at large; in 1864 the first penal settlement was made on Nou Island, off Nouméa. In 1878 there was a serious native insurrection, and another in 1881 was only put down after much bloodshed.

See H. Rivière, *Souvenirs de la Nouvelle-Calédonie: l'insurrection canaque* (Paris, 1881); Gallet, *La Nouvelle-Calédonie* (Nouméa, 1884); Cordeil, *Origines et progrès de la Nouvelle-Calédonie* (Nouméa, 1885); C. Lemire, *La Colonisation . . . en Nouvelle-Calédonie* (Paris, 1878); *Ibid.* (Nouméa, 1893); *Voyage à pied en Nouvelle-Calédonie* (Paris, 1884); M. A. Legrand, *Au pays des Canaques*

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[1] A similar usage exists in Malay; see paper by Yule in *Jour. Anthrop. Inst.* ix. 290.

(Paris, 1893); Moncelon, *Le Bagne et la colonisation pénale à la Nouvelle-Calédonie* (Paris, 1886); A. Bernard, *L'Archipel de la Nouvelle-Calédonie* (Paris, 1895); *Nouvelle-Calédonie, ses richesses, son avenir* (Paris Exhibition, 1900); G. Griffith, *In an unknown Prison Land* (London, 1901); Carol, *La Nouvelle-Calédonie minière et agricole* (Paris, 1900); Vallet, *La Colonisation française en Nouvelle-Calédonie* (Paris, 1905).

NEWCASTLE, DUKES OF. Within the space of a century there were no less than four successive creations of dukes of Newcastle in the British peerage. William Cavendish (see below), nephew of the 1st earl of Devonshire, was raised to the dignity of duke of Newcastle-upon-Tyne in 1665. His son and successor Henry (1630–1691) died leaving daughters only, and one of these married John Holles (1662–1711), earl of Clare, who was created duke in 1694. This duke died also without male issue, leaving his estates to his sister's son, Thomas Pelham (see below), who, with other dignities, had the title of duke of Newcastle-upon-Tyne conferred on him in 1715, and a second and similar ducal title (that of Newcastle-under-Lyme) in 1756. The first dukedom became extinct at his death, but the second title was granted him with remainder to Henry Fiennes Clinton, earl of Lincoln, at once his nephew and nephew-in-law. From his heir, who ranks as the 2nd duke, Henry Fiennes Clinton (1720–1794), the dukedom passed through father and son from Thomas Pelham Clinton (d. 1795), Henry Pelham Fiennes Pelham Clinton (1785–1851), Henry Pelham Fiennes Pelham Clinton (1811–1864), Henry Pelham Alexander (1834–1879), to the 7th duke, Henry Pelham Archibald Douglas Pelham Clinton (b. 1864). The three principal dukes are more fully noticed below.

1. WILLIAM CAVENDISH, duke of Newcastle (1592–1676), eldest surviving son of Sir Charles Cavendish and of Catherine, daughter of Cuthbert, Lord Ogle, and grandson of Sir William Cavendish and "Bess of Hardwick," was born in 1592 and educated at St John's College, Cambridge. On the occasion of the creation of Prince Henry as prince of Wales in 1610 he was made a knight of the Bath, subsequently travelled with Sir Henry Wotton, then ambassador to the duke of Savoy, and on his return married his first wife, Elizabeth, daughter of William Basset of Blore, Staffordshire, and widow of Henry Howard, 3rd son of the earl of Suffolk. His fortune was immense, and he several times entertained James I. and Charles I. with great magnificence at Welbeck and Bolsover. On the 3rd of November 1620 he was created Viscount Mansfield, on the 7th of March 1628 earl of Newcastle, and in 1629 the barony of Ogle was restored to his mother, this title, together with an estate of £3000 per annum, descending to him. In 1638 he was made governor of the prince of Wales, and in 1639 a privy councillor. When the Scottish war broke out he assisted the king with a loan of £10,000 and a troop of volunteer horse, consisting of 120 knights and gentlemen. In 1641 he was implicated in the Army Plot, and in consequence withdrew for a time from the court. He was sent by Charles on the 11th of January 1642 to seize Hull, but was refused admittance. When the king declared open war, Newcastle was given the command of the four northern counties, and had the power conferred on him of making knights. He maintained troops at his own expense, and having occupied Newcastle kept open communications with the queen, and despatched to the king his foreign supplies. In November 1642 he advanced into Yorkshire, raised the siege of York, and compelled Fairfax to retire after attacking him at Tadcaster. Subsequently his plans were checked by the latter's recapture of Leeds in January 1643, and he retired to York. He escorted the queen, who returned from abroad in February, to York, and subsequently captured Wakefield, Rotherham and Sheffield, though failing at Leeds, but his successes were once more ravished from him by Fairfax. In June he advanced again, defeated the Fairfaxes to Adwalton Moor on the 30th of June, and obtained possession of all Yorkshire except Hull and Wressel Castle. He might now have joined the king against Essex, but continued his campaign in the north, advancing into Lincolnshire to attack the eastern association, and taking Gainsborough and Lincoln. Thence he returned to besiege Hull, and in his absence the force which he had left in Lincolnshire was defeated at Winceby by Cromwell on the 11th of October 1643, which caused the loss of the whole county. On the 27th of October 1643 he was created a marquis. Next year his position was further threatened by the advance of the Scots. Against prevailing numbers he could do little but harass and cut off supplies. He retreated to York, where the three armies of the Scots, Fairfax and Manchester surrounded him. On the 1st of July Rupert raised the siege, but on the next day threw away his success by engaging the three armies in battle, contrary to Newcastle's desire, at Marston Moor. After this disaster, notwithstanding the entreaties of the king and the remonstrances of Rupert, Newcastle immediately announced his intention of abandoning the cause and of quitting England. He sailed from Scarborough accompanied by a considerable following, including his two sons and his brother, resided at Hamburg from July 1644 to February 1645, and removed in April to Paris, where he lived for three years. There he married as his second wife Margaret (see below), daughter of Sir Thomas Lucas of St John's, Colchester. He left in 1648 for Rotterdam with the intention of joining the prince of Wales in command of the revolted navy, and finally took up his abode at Antwerp, where he remained till the Restoration. In April 1650 he was appointed a member of Charles II.'s privy council, and in opposition to Hyde advocated the agreement with the Scots. In Antwerp he established his famous riding-school, exercised "the art of manage," and published his first work on horsemanship, *Méthode et invention nouvelle de dresser les chevaux* (1658, 2nd ed., 1747; translated as *A General System of Horsemanship*, 1743).

At the Restoration Newcastle returned to England, and succeeded in regaining the greater part of his estates, though burdened with debts, his wife estimating his total losses in the war at the enormous sum of £941,303. He was reinstated in the offices he had filled under Charles I.; was invested in 1661 with the Garter which had been bestowed upon him in 1650, and was advanced to a dukedom on the 16th of March 1665. He retired, however, from public life and occupied himself with his estate and with his favourite pursuit of training horses. He established a racecourse near Welbeck, and published another work on horsemanship, *A New Method and Extraordinary Invention to Dress Horses and Work them according to Nature . . .* (1667). He wrote also several comedies, *The Country Captain and The Varietie* (1649), *The Humorous Lovers* and *The Triumphant Widow* (1677). With Dryden's assistance he translated Molière's *L'Étourdi* as *Sir Martin Mar-All* (1688). He contributed scenes to his wife's plays, and poems of his composition are to be found among her works; and he was the patron of Jonson, Shirley, Davenant, Dryden, Shadwell and Flecknoe, and of Hobbes, Gassendi and Descartes. He died on the 25th of December 1676, and was buried in Westminster Abbey. By his first wife he had ten children, of whom one son, Henry, survived him and became 2nd duke of Newcastle, dying in 1691 without male issue; the title then became extinct and the estates passed to his third daughter Margaret, wife of John Holles, earl of Clare, created duke of Newcastle in 1694.

As a commander in the field Clarendon spoke contemptuously of Newcastle as "a very lamentable man, and as fit to be a general as a bishop."[1] It can hardly be denied, however, that his achievements in the north were of great military value to the king's cause. For politics he had no taste, and adhered to the king's cause merely from motives of personal loyalty, from hatred of "whatsoever was like to disturb the public peace," and because the monarchy "was the foundation and support of his own greatness." Even Clarendon concedes that he was "a very fine gentleman," which is perhaps the best summary of his character.

His second wife, Margaret, duchess of Newcastle (*c.* 1625–1673), had been maid of honour to Henrietta Maria, and after she married the duke in 1645 they continued to cherish a mutual admiration of a very exaggerated character, each regarding the other as endowed with transcendent merits both of person and mind. The duchess cultivated literary composition with exuberant fervour, and kept a bevy of maids of honour obliged to be ready at all hours "to register her Grace's conceptions." Walpole speaks of her as a "fertile pedant" with an "unbounded passion for scribbling"; and, although giving evidence of learning, ingenuity and imagination, her writings are fatally marred by a deficiency in judgment and self-restraint. She is best known by the *Life* she wrote of her husband, originally printed by A. Maxwell at London in 1667. She also published *Philosophical Fancies* (1653); *Poems and Fancies* (1653); *The World's Olio* (1655); *Nature's Picture drawn by Fancie's Pencil to the Life*, which includes an autobiography (1656); *Philosophical and Physical Opinions* (1655); *Orations* (1662); *Plays* (1662); *Sociable Letters* (1664); *Observations upon Experimental Philosophy* (1666); *Letters and Poems* (1676).

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[1] *Calendar of Clarendon Papers*, ii. 63.

The Life of William Cavendish, Duke of Newcastle, by Margaret, duchess of Newcastle, has been edited by C. H. Firth (1886); it was criticized by Pepys as "the ridiculous history of my Lord Newcastle writ by his wife, which shows her to be a mad, conceited, ridiculous woman, and he an ass to suffer her to write what she writes to him and of him," but on the other hand eulogized by Charles Lamb as a work for which "no casket is rich enough, no case sufficiently durable to honour and keep soft such a jewel." See also *La Duchesse et le Duc de Newcastle*, by Émile Montégut (1895). The duchess's *Select Poems* were edited by Brydges in 1813, and her *Autobiography* in 1814. The latter, edited by Lower, was published along with her *Life of the Duke of Newcastle* in 1872.

2. THOMAS PELHAM HOLLES, duke of Newcastle (1693–1768), whose official life extended throughout the Whig supremacy of the 18th century, was the elder son of Thomas, first Lord Pelham, by his second wife Lady Grace Holles, younger sister of John Holles, duke of Newcastle-on-Tyne, who died in 1711, and left the whole of his vast estates to him. In 1712 he also succeeded his father in his peerage and estates, and in 1714, when he came of age, was one of the greatest landowners in the kingdom. He vigorously sustained the Whig party at Queen Anne's death, and had much influence in making the Londoners accept King George. His services were too great to be neglected, and in 1714 he was created earl of Clare, and in 1715 duke of Newcastle-on-Tyne. He also became lord-lieutenant of the counties of Middlesex and Nottingham and a knight of the Garter in 1718, in which year he increased his Whig connexion by marrying Lady Henrietta Godolphin, granddaughter of the great duke of Marlborough. In 1717 he first held political office as lord chamberlain of the household, and in 1724 was chosen by Sir Robert Walpole to be secretary of state in place of Lord Carteret. This office he held continuously for thirty years (1724–1754), and only changed it for the premiership on his brother's death. His long tenure of office has been attributed to his great Whig connexions and his wealth, but some praise must be given to his inexhaustible activity and great powers of debate. He was a peculiarly muddle-headed man, and unhappy if he had not more to do than he could possibly manage, but at the same time he was a consummate master of parliamentary tactics, and knew how to manage the Houses of Lords and Commons alike. Lord Hervey (*Memoirs*) compares him with Walpole in 1735, and says: "We have one minister that does everything with the same seeming ease and tranquillity as if he were doing nothing; we have another that does nothing in the same hurry and agitation as if he did everything." He continued in office on Walpole's fall in 1742, and became more powerful on his younger brother Henry becoming prime minister in 1743. On Henry Pelham's death in March 1754, Newcastle succeeded him as premier; but people who had been accustomed to him as secretary of state would not stand him as premier, and in November 1756 he gave place to the duke of Devonshire. For his long services he was created duke of Newcastle-under-Lyme, with remainder to Henry Fiennes Clinton, 9th earl of Lincoln, who had married his niece Catherine Pelham. In July 1757 he again became prime minister—for Pitt, though a great statesman, was a bad party leader—on the understanding, according to Horace Walpole, that "Mr Pitt does everything, the duke gives everything." Under this ministry England became famous abroad, but it gradually fell before the young king's affection for Lord Bute, who, after supplanting Pitt, became prime minister in the room of Newcastle in May 1762. The duke went into strong opposition, and lost his two lord-lieutenancies for opposing the peace of 1763. In 1765 he became lord privy seal for a few months, but his health was fast giving way, and he died in November 1768. The duke was certainly not a great man, but he was industrious and energetic, and to his credit be it said that the statesman who almost monopolized the patronage of office for half a century twice refused a pension, and finally left office £300,000 poorer than he entered it.

See *Memoirs of the Administration of the Right Hon. H. Pelham*, by W. Coxe (1829).

3. HENRY PELHAM FIENNES PELHAM CLINTON, 5th duke of Newcastle (1811–1864), the eldest son of Henry, the 4th duke, was educated at Eton and at Christ Church, Oxford, where he graduated in 1832. He was member of parliament for South Nottinghamshire from 1832 to 1846, when he became member for the Falkirk Burghs, retaining this seat until he became duke of Newcastle in January 1851. As earl of Lincoln he was first commissioner of woods and forests from 1841 to February 1846, when he was appointed chief secretary to the lord-lieutenant of Ireland, but the ministry fell in June of the same year. In 1852 Newcastle became secretary for war and the colonies under the earl of Aberdeen, and when, after the outbreak of the Crimean War, a separate war department was constituted, he was placed in charge of it. As secretary for war he was regarded as being largely responsible for the terrible hardships which befell the British troops in the Crimea in the winter of 1854, and as the result of a vote of censure he left office with his colleagues in January 1855. He was secretary for the colonies from 1859 to 1864, and died on the 18th of October 1864, being succeeded as 6th duke by his eldest son, Henry Pelham Alexander.

See J. Martineau, *The Life of Henry Pelham, 5th Duke of Newcastle* (1908).

NEWCASTLE, a seaport of Northumberland county, New South Wales, Australia, at the mouth of the Hunter river, 102 m. by rail and 62 m. by sea N. by E. of Sydney, in 32° 55′ S., 151° 49′ E. Newcastle is the second city in New South Wales, the fourth port of Australia, and the seat of an Anglican bishop. The city rises steeply from the sea, and possesses numerous fine buildings, among which may be mentioned the railway station, post office, custom-house, the cathedral of Christ Church, the school of art with its large library, and the Victoria Theatre. There are also two state-subsidized hospitals, a college, a school of mines, a technological museum, several large and handsome churches, and numerous subsidized charitable institutions. Communication between the different parts is maintained by tramways, and steam ferry-boats ply between the city and its suburbs on the shores of the harbour. The industries include brewing, shipbuilding, copper and iron-founding, carriage-building and fellmongery; there are boot factories, engineering works, biscuit factories and smelting works at Cockle Creek. There is also a large trade in frozen meat. There are numerous coal mines in the vicinity, yielding coal of the finest quality. Newcastle has a fine harbour, with an area of 540 acres, protected by two breakwaters; the breadth of the channel at its entrance is 1200 ft., and the depth at the bar is 25½ ft. Vessels of the largest tonnage can enter and lie alongside of the wharves, which are 5 m. in extent, equipped with travelling cranes, hydraulic and steam cranes, lighted by electric light and connected with the Great Northern railway by a branch line. There is a floating dock to lift 2000 tons, and at Stockton there is a patent slip to take large vessels for repair. The facilities for the shipment of coal are excellent, and Newcastle is the chief coaling port in the southern hemisphere. The harbour is protected by two forts, Fort Scratchley, the strongest in Australia, and Shepherd's Hill Fort. The city exports coal, wool, coke, horses, cattle, frozen meat, silver, lead, copper, tallow, hides and country produce. Newcastle returns three members to the legislative council and six members to the legislative assembly. Most of the suburbs are separate municipalities, namely, Stockton, Carrington, Wickham, Hamilton, Merewether, Adamstown, Waratah, New

Lambton, Lambton, Wallsend and Plattsburg. The population of the municipality of Newcastle is 14,250; of the town and suburbs about 70,000.

The mouth of the Hunter river (named after Governor John Hunter), now known as Newcastle Harbour, was discovered in 1797 by Lieutenant John Shortland, who accompanied Hunter to New South Wales. For many years after its discovery it was used as a convict station. It became a free settlement in 1821, and in 1859 was erected into a municipality. The centenary of the landing of Shortland was celebrated in 1897, when a monument commemorating the event was erected.

NEW CASTLE, a city of New Castle county, Delaware, U.S.A., in the northern part of the state, at the head of Delaware Bay, on a high point of land extending into the Delaware river, 6 m. south of Wilmington. Pop. (1890) 4010; (1900) 3380 (315 foreign-born); (1910) 3351. It is served by the Philadelphia, Baltimore & Washington (Pennsylvania System), and (*viâ* Wilmington) the Baltimore & Ohio railways, and by steamship lines connecting with Baltimore, Philadelphia and river ports. The "old" county court house, possibly built by the Swedes, is in New Castle; and there are a public library, the Immanuel Protestant Episcopal Church (partly built in 1689), and several residences of Dutch and colonial types. The city has a good harbour and an excellent river front for manufacturing sites and for shipping; it is included in the customs district of Wilmington. Its industrial establishments include shipyards, rolling mills and steel works, flour-mills, and manufactories of cotton and woollen goods. The shad fisheries are of some importance. In 1651 Governor Peter Stuyvesant of New Netherland established near the place Fort Casimir, as the first determined move in his aggressive policy against the Swedes, who had settled in this vicinity about 1640. The Swedes captured the fort in 1654, but this precipitated the crisis in which New Sweden (Delaware) was lost to the Dutch in 1655. Fort Casimir (renamed Fort Amstel) was made the seat of government of the local Dutch possessions, and in 1657 was placed under the jurisdiction of the City of Amsterdam, under which it remained, though prospering little—disease, famine and fears of English attack causing most of the inhabitants to leave in 1658 and 1659—until just before the English seized the settlements in Delaware in 1664. Under the English the name was changed to New Castle, and trade and commerce prospered; and an arc with a radius of 12 m., having the New Castle court house as a centre, became the northern boundary of the "counties on the Delaware." New Castle was frequently the meeting place of the colonial legislature, and after the legislative separation of Delaware from Pennsylvania in 1704 it was the seat of administration of the colony until 1777. It was chartered as a city in 1875.

NEWCASTLE, a seaside resort of Co. Down, Ireland, finely situated on the western shore of Dundrum Bay, at the foot of Slieve Donard, the highest eminence of the Mourne Mountains. Pop. (1901) 1553. It is the terminus of the Belfast and County Down railway, being 36 m. S. of Belfast; and is also served by a branch of the Great Northern railway. A fort guarded the passage of the river Shimna here in early times, but the town is entirely modern. The sandy shore affords good bathing, there is a small spa, and the scenery of the Mournes is fine. The demesnes of Donard Lodge and Bryansford are of great beauty. The golf links of the County Down Club here are well known.

NEWCASTLE, a city and the county-seat of Lawrence county, Pennsylvania, U.S.A., on the Shenango river, at the mouth of Neshannock Creek, about 50 m. N.N.W. of Pittsburg. Pop. (1890) 11,600; (1900) 28,339, 5324 being foreign-born and 463 negroes; (1910) 36,280. It is served by the Pennsylvania, the Erie, the Baltimore & Ohio, the Buffalo, Rochester & Pittsburgh, and the Pittsburgh & Lake Erie railways. Cascade Park, in the neighbourhood, is a pleasure resort. The surrounding country, with which the city has an extensive trade, is well adapted to agriculture, and abounds in bituminous coal, iron ore, limestone, sandstone and fire-clay. In 1905 the city ranked fifth among the cities of the state in the value of its factory product, and of its products (valued at $29,433,635, an increase of 47·1% since 1900) iron and steel, and tin and terne-plates were the most important. Newcastle was founded in 1802, became a borough in 1869, and was first chartered as a city in 1875, its charter being revised in 1887.

NEWCASTLE-UNDER-LYME, a market town and municipal and parliamentary borough of Staffordshire, England, 2 m. W. of Stoke-upon-Trent by the North Staffordshire railway. Pop. (1901) 19,914. The parish church of St Giles was rebuilt in 1873–1876 by Sir Gilbert Scott, with the exception of the tower, which dates from the 12th century. The free grammar school, originally founded in 1602, possesses large endowments, increased by the amalgamation of various subsequent bequests for educational purposes, and now consists of high and middle schools for boys and Orme's school for girls. There is also a school of art included with a free library in handsome municipal buildings. The manufacture of hats was once the staple trade, but it has declined. There are cotton and paper mills; and tanning, brewing, malting and the manufacture of army clothing are carried on. In the neighbourhood there are large collieries, as at Silverdale and elsewhere. Partly included in the parliamentary borough is the populous parish of Wolstanton, of which the fine church, well placed on high ground, has good details of the 13th century, with a massive tower and spire. The mining town of Audley lies 4. m. N.W.; with a fine early Decorated church. Newcastle-under-Lyme is governed by a mayor, 6 aldermen and 18 councillors. Area, 671 acres.

Newcastle-under-Lyme (Neofchastell-sur-Lyme, Newcastle-under-Lyme) is not mentioned in Domesday, but it must early have become a place of importance, for a charter, known only through a reference in a charter to Preston, was given to the town by Henry II. The town owes its name to a castle built here in the 12th century to supersede an older fortress at Chesterton about 2 m. to the north, of which the ruins were to be seen in the 16th century, and to the fact that it was situated under the forest of Lyme. Henry III. (1235) constituted it a free borough, granting a gild merchant and other privileges; in 1251 he leased it at fee-farm to the burgesses; the governing charter in 1835 was that of 1590 enlarged by that of 1664, under which the title of the corporation was the "mayor, bailiffs and burgesses of Newcastle-under-Lyme." Newcastle, which was originally held by the crown, was granted (1265) to Simon de Montfort, and subsequently to Edmund Crouchback, through whom it passed to Henry IV. In Leland's time the castle had disappeared "save one great Toure"; in the 17th and 18th centuries the town was flourishing and had a manufacture of hats. The market was originally held on Sunday; in the reign of John it was changed to Saturday; by the charter of Elizabeth it was fixed on Monday. Markets are now held on Monday, Wednesday and Saturday. Grants of fairs were given by Edward I., Edward III. and Henry VI. Up to the time of the passing of the Municipal Reform Act the farce of electing a mock mayor was gone through annually after the election of the real mayor. Newcastle sent two members to parliament from 1355 to 1885, when it lost one representative.

See *Victoria County History, Stafford*; T. Ingamells, *Historical Records and Directory of Newcastle-under-Lyme.*

NEWCASTLE-UPON-TYNE, a city and county of a city, municipal, county and parliamentary borough, and port of Northumberland, England, 272 m. N. by W. of London, on the North-Eastern railway. Pop. (1891) 186,300; (1901) 215,328. It stands on the N. bank of the Tyne, which is here high and steeply inclined above the river. The mouth of the river into the North Sea is 8 m. below Newcastle and its banks are lined with docks and industrial towns, while its narrow waters are crowded with traffic.

Though Newcastle owes its origin to a Roman station at a bridge over the river, its modern growth has largely destroyed traces of antiquity. Of the old walls which, according to Leland, "for strength and magnificence far surpassed all the walls of the cities of England and of most of the towns of Europe," and the circuit of which was 2 m. 239 yds., there are slight remains, although the fortifications were allowed to go into disrepair after the union of Scotland and England. The castle, from which the town takes its name, stood on a slight elevation rising abruptly from the river, and was erected by Henry II. between 1172 and 1177 on the site of an older structure built in 1080 by Robert, eldest son of the Conqueror. It was originally the strongest fortress in the north of England, and its keep is now one of the finest specimens of the Norman stronghold remaining in the country. While it was still incomplete, William the Lion was led within its walls after his capture at Alnwick; and within its great hall Baliol, on the 26th of December 1292, did homage for the crown of Scotland to Edward I. The area of the castle within its outer walls and fosse was 3 acres. Fragments of these walls, with the principal entrance or Black Gate (portions of which are, however, of later construction) and the Watergate or southern postern remain, but the inner wall surrounding the keep has been entirely removed. The massive keep, with walls 14 ft. thick, is in a state of good preservation, as is also the chapel, a beautiful specimen of late Norman style. The castle was purchased by the corporation in 1809, and is under the charge of the Newcastle Society of Antiquaries, which uses a portion of it as an antiquarian museum. Near the castle is St Nicholas church, forming the cathedral of the diocese of Newcastle, instituted in 1882. The diocese covers practically the whole of Northumberland, with a very small portion of Cumberland. The church, which is principally Decorated, consists of nave, aisles, chancel and transepts, the total length of the interior from east to west being 245 ft., and the width at the transepts 128 ft. The principal feature of the church is the lantern tower, a later addition and a very fine specimen of early Perpendicular. Among other interesting old churches is St Andrew's church, erected in the 11th century, and retaining Norman characteristics, with a low square tower and a peal of six bells. During the siege by the Parliamentary army in 1644 it was greatly damaged. St John's church is a building of the 14th century with an ancient front. Of the nine conventual buildings at one time existing in Newcastle or its immediate neighbourhood, a few fragments of the monastery of the Black Friars remain, and the chapel of the hospital of St Mary at Jesmond forms a picturesque ruin. There are a number of quaint Elizabethan houses in the steep street called the Side, and in the Sandhill at its foot.

Some of the modern streets of Newcastle are spacious and handsome. The most noteworthy are Grey Street, in which a complete scheme of Grecian architecture is followed, and Grainger Street. This thoroughfare is named after Richard Grainger (1798–1861), a wealthy local architect who devoted himself to the beautifying of his city with remarkable energy. Of numerous modern churches may be noted that of St George, Jesmond, a landmark for a great distance and finely decorated within, and the Roman Catholic cathedral of the diocese of Hexham and Newcastle. The most important public buildings are the corporation buildings, including a large public hall, and a corn exchange; the guildhall, originally a hospital called the Maison de Dieu, and afterwards used as "the stately court of merchant adventurers," re-erected in 1658; the moot-hall (1810) for the meetings of assizes and sessions and the transaction of county business; the exchange (1860); the central newsroom and art gallery (1838); the Wood memorial hall (1870), used for the meetings of the North of England Institute of Engineers; and the custom-house. The Grey monument in Grey Street, an Ionic column surmounted by a statue of Earl Grey, was erected in 1836 to commemorate the passing of the Reform Bill; the Stephenson monument near the railway station was erected in 1862; a marble statue of Queen Victoria in front of the Royal Victoria Infirmary was unveiled in 1906, and a bronze statue of the queen in 1903 in the cathedral square.

Among educational establishments the chief are the colleges of medicine and of physical science of the university of Durham; the first granting degrees in medicine and surgery; the second, with which the school of art is incorporated, degrees in science and literature. The college of science, or Armstrong College as it is called in commemoration of the first Lord Armstrong, was founded in 1871; the north-east wing was opened in 1888; further parts of the building in 1894, and the west wing by King Edward in 1906. The royal free grammar school, founded in 1525, occupies modern buildings in Jesmond. There should be mentioned also Allan's endowed schools, founded in 1705, and reorganized by the charity commissioners in 1877; and Rutherford College and the Commercial Institute, providing technical and commercial education. The Laing Art Gallery was erected and presented to the city by Alexander Laing, and opened in 1904. Among clubs and similar institutions are the Literary and Philosophical Society, founded in 1793, the Society of Antiquaries, founded in 1813, with a museum in the castle; the Natural History Society and museum; the Tyneside Geographical Society; the Tyneside Naturalists' Club, established in 1846; the Mechanics' Institution, 1824; the North of England Institute of Mining Engineers, 1852; the Fine Arts Society; the Farmers' Club; the Northern Counties' Club; the Union Club; and the University Club. Several clubs for working men form a noteworthy social feature. There is a public library and newsroom. The Royal Victoria Infirmary on the Castle Leazes is a memorial of the Diamond Jubilee of Queen Victoria, and was opened in 1906. The benevolent institutions also include the dispensary (1777), fever house (1803), lying-in hospital (1760), eye infirmary (1822), children's hospital, Trinity almshouses (1492), hospital of the Holy Jesus (1682), hospital (1701) for keelmen, *i.e.* coal-bargemen; and institutions for the blind, dumb and orphans.

Newcastle is well supplied with public parks and recreation grounds. To the N. of the city is the Castle Leazes ornamental park of 35 acres, and beyond this the Town Moor and racecourse, an extensive common, the survival of the pasture land of the township. Eastward from Town Moor is Brandling Park, and westward Nun's Moor. The picturesque grounds of Armstrong Park N.E. of the city extend to about 50 acres, the larger half of which was presented by Sir W. G. Armstrong, who also presented the beautifully wooded grounds of Jesmond Dene. Elswick Park in the south-west of the city, extending to 8¾ acres, includes Elswick Hall. There are several others. Jesmond, N.E. of the city, is the chief residential suburb. It takes name from "Jesus Mount," and was formerly a place of pilgrimage, possessing a hospital dedicated to St Mary the Virgin.

Both the Northumberland and Durham banks of the river are lined with manufacturing towns or suburbs. Of these the most important is Gateshead (*q.v.*) immediately opposite Newcastle; while those adjacent to Newcastle on the same bank are Benwell and Fenham (pop. in 1901, 18,316) on the west, and Walker (13,336) on the east. The last-named two (formerly urban districts), together with part of Kenton, were incorporated with Newcastle in 1904. Newcastle is connected with the south bank of the Tyne by four bridges—two high-level bridges, an hydraulic swing bridge and a suspension bridge. The old high-level bridge carries the North-Eastern railway, with a road and footway beneath it. It was opened by Queen Victoria in 1849. The new high-level bridge, carrying the railway only, was opened by King Edward VII. in 1906; it consists of four steel spans on granite piers. The hydraulic swing bridge, on the low level, was built to replace a stone structure erected in 1781 on the site of a bridge dating from 1250, and destroyed by a flood in 1771. The Roman bridge, the Pons Aelii, is said to have spanned the river at the same point. The hydraulic bridge (1876) consists of one large centre pier, two midstream piers and two abutments; and its foundations are iron cylinders resting on the solid rock, 60 ft. below the bed of the river. Two spans, which open simultaneously by machines impelled by steam, allow 103 ft. of waterway for vessels going up and down the river. About half a mile farther up the stream is the Redheugh bridge (1871). The central station of the North-Eastern railway is an extensive and handsome structure built on a sharp curve. An underground line connects it with the Blyth and Tyne station. The suburban line of the North-Eastern company from the central station to Jesmond, Gosforth and Benton was the first standard line to carry passengers by electric traction (1904).

Newcastle owes its prosperity to its convenient situation on a tidal river, and to the immense stores of coal in the neighbourhood, which, besides being largely exported, stimulate a great variety of industries which are dependent on their use. It began to export coal about the end of the 13th century, but the trade received a severe check by the act of Edward I. which made the burning of coal in London a capital offence. In the reign of Edward III. licence was granted to the inhabitants "to dig coals and stones in the common soil of the town without the walls thereof in the place called the Castle Field and the Forth." The quay in front of the town, extending from the hydraulic bridge to the Ouseburn, forms a fine thoroughfare of about a mile in length; and by means of dredging a depth of water has been obtained at the shore permitting vessels of large tonnage to approach, although the berths of the ocean steamers are a little farther down the river. The quay is supplied with the most improved mechanical appliances, and has direct communication with the North-Eastern railway. There is a large grain warehouse at the E. end of the quay. Exports include coal, chemicals, pig-iron, iron-work, steel, iron bars, plates and castings, machinery, fire-clay goods and copper. The chief imports are fruits, wheat, maize, oats, barley, iron and steel, petroleum, sulphur ore, timber and wood hoops, iron ore and potatoes. Steamers carrying passengers serve the principal English ports, Cardiff, Leith, &c.; also Baltic ports and New York; while Newcastle is one of the chief ports for the extensive Norwegian tourist traffic, the ships of the combined Bergenske and Nordenfjeldske companies regularly serving Stavanger, Bergen, Trondhjem and intermediate ports. To the industries of Newcastle indicated by the exports may be added glass, lead and shot, brick and tile, earthenware, tool, rope and ships'-fitting manufactures, and most important of all, shipbuilding. The celebrated Elswick works, founded by Messrs Armstrong in 1847, and amalgamated with those of Mitchell & Co., are among the most important in the world. The construction of ships of all sorts, including the largest ironclads with all their armour and guns, is carried on. Elswick is the name of the western part of the borough of Newcastle. The borough returns two members to parliament. It is the largest undivided parliamentary constituency in the United Kingdom. The city is governed by a lord mayor (the title was conferred in 1906), 19 aldermen and 57 councillors. Area, 8453 acres.

History.—Newcastle owes its origin to its position on the great Roman wall and on the estuary of the river Tyne. Its Roman occupation is proved by existing remains, most important among which are the foundations of a bridge, attributed to the emperor Hadrian. Before the Conquest little is known of the town except that it was called Monkchester, and that it was destroyed in the 9th century by the Danes. After the defeat of Edgar Ætheling and Earl Waltheof on Gateshead Fell, it was again destroyed by William the Conqueror, but Robert of Normandy is said to have raised a castle there in 1080 on his return from an expedition against Malcolm, king of Scotland, and from that time the town was called Newcastle. Shortly afterwards it was fortified by Robert de Mowbray in his rebellion against William Rufus, but it was taken by the king in 1095. In the reign of Stephen it was seized by David, king of Scotland, and after its restoration to the English in 1157 Henry II. rebuilt the castle and established a mint. The walls surrounding the town are attributed to Edward I. During the 14th century Newcastle was three times defended successfully against the Scots, but in 1640 it was occupied for a year by the Scottish Covenanters under Leslie. It was then garrisoned by royalists, but again surrendered to the Scots in 1644 after a siege of about six weeks, and Charles I. was taken there in 1646 when he had yielded himself to the Scottish army. The burgesses are said to have held the borough at a fee-farm rent under a grant from William Rufus. The title of mayor was conferred by Henry III., while Henry IV. in 1400 made the town a county of itself with a sheriff, and granted the burgesses power to elect 6 aldermen. Queen Elizabeth incorporated the town in 1589 under the title of mayor and burgesses, and Philip and Mary in 1556 granted 4 additional aldermen, while the charter of James I. in 1604 appointed 24 common councilmen. Newcastle has been represented in parliament by two members since 1295. The coal trade, to which the town owes its prosperity, began in the 13th century, but, partly owing to the act of parliament passed in the reign of Edward I. forbidding the use of coal in London, did not become important until the 17th century. Glassmaking was a considerable trade in the 17th century, and in 1823 George Stephenson established iron works at Newcastle, where the first engines used on the Stockton and Darlington, and Manchester and Liverpool lines were made.

See *Victoria County History, Northumberland*; John Brand, *The History and Antiquities of the Town and County of the Town of Newcastle-upon-Tyne* (1789); *Chirographia, or a Survey of Newcastle-upon-Tyne* (1818).

NEWCOMB, SIMON (1835–1909), American astronomer, was born in Wallace, Nova Scotia, on the 12th of March 1835. He became a resident of the United States in 1853, and graduated at the Lawrence Scientific School of Harvard University in 1858, having paid special attention to mathematics and astronomy. He assisted in the preparation of the American *Nautical Almanac* for 1857. In 1861 he became professor of mathematics in the United States navy, and was put in charge of the great 26-in. equatorial erected at Washington Observatory in 1873. In 1877 he was appointed director of the American *Nautical Almanac* office, a post which he held until March 1897. In 1884 he became professor of mathematics and astronomy at the Johns Hopkins University, continuing, however, to reside at Washington. He was also editor of the *American Journal of Mathematics* for many years. In view of the wide extent and importance of his labours, the variety of subjects of which he treats, and the unity of purpose which guided him throughout, Simon Newcomb must be considered as one of the most distinguished astronomers of his time. A study of his works reveals an unusual combination of skill and originality in the mathematical treatment of many of the most difficult problems of astronomy, an unfailing patience and sagacity in dealing with immense masses of numerical results, and a talent for observation of the highest order. On assuming the directorship of the *Nautical Almanac* he became very strongly impressed with the diversity existing in the values of the elements and constants of astronomy adopted by different astronomers, and the injurious effect which it exercised on the precision and symmetry of much astronomical work. Accordingly he resolved to "devote all the force which he could spare to the work of deriving improved values of the fundamental elements and embodying them in new tables of the celestial motions." The formation of the tables of a planet has been described by Cayley as "the culminating achievement of astronomy." but the gigantic task which Newcomb laid out for himself, and which he carried on for more than twenty years, was the building up, on an absolutely homogeneous basis, of the theory and tables of the whole planetary system. The results of these investigations have, for the most part, appeared in the *Astronomical Papers of the American Ephemeris*, and have been more or less completely adopted for use in the nautical almanacs of all countries. A valuable summary of a considerable part of this work, containing an account of the methods adopted, the materials employed, and the resulting values of the various quantities involved, was published in 1895, as a supplement to the *American Ephemeris* for 1897, entitled *The Elements of the Four Inner Planets and the Fundamental Constants of Astronomy*. In 1866 Newcomb had published[1] an important memoir on the orbit of Neptune, which was followed in 1873 by a similar investigation of the orbit of Uranus.[2] About twenty-five years later the tables of these planets were revised by him in view of all the observations which had accumulated in the meanwhile at Washington, Greenwich, Paris and Cambridge. In the meantime the theory of Jupiter and Saturn had been thoroughly worked out by G. W. Hill, Newcomb's distinguished collaborator in the *Nautical Almanac* office, and thus was completed one important section of the work projected by Newcomb in 1877.

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[1] *Smithsonian Contributions to Knowledge*, vol. xv.

[2] *Ibid.* vol. xix.

Among Newcomb's most notable achievements are his researches in connexion with the theory of the moon's motion. His first work on this abstruse subject, entitled *Théorie des perturbations de la lune, qui sont dues à l'action des planètes*,[1] is remarkable for the boldness of its conception, and constitutes an important addition to celestial dynamics. For some years after the publication of Hansen's tables of the moon in 1857 it was generally believed that the theory of that body was at last complete, and that its motion could be predicted as accurately as that of the other heavenly bodies. Newcomb showed that this belief was unfounded, and that as a matter of fact the moon was falling rapidly behind the tabular positions. With the view of examining this question, he undertook the reduction of every observation made before 1750 which appeared to be worthy of confidence. In an elaborate memoir[2] he showed that the ancient solar eclipses described by Herodotus, Thucydides, and others, which seemed to require an increased value of the secular acceleration of the moon's mean motion to bring them into line with modern results, might safely be neglected, the ambiguity of the accounts in each case rendering uncertain either the totality of the eclipse or the place from which it was visible. In his investigation he employed the eclipses of the moon recorded in the Almagest, the Arabian eclipses between A.D. 800 and 1004, extracted from Caussin's translation of Ibn Junis, the eclipses and occultations of Bullialdus, Gassendi, and Hevelius, of the French astronomers at Paris and St Petersburg, and of Flamsteed at Greenwich, and deduced a secular acceleration of 8·8″, agreeing well with the theoretical value.

On taking charge of the 26-in. equatorial at the United States Naval Observatory, Newcomb devoted it almost exclusively for the first two years to observations of the satellites of Uranus and Neptune, being of opinion that it was better to do one thing well than many things indifferently. The results of these skilfully conducted observations were published in a memoir on *The Uranian and Neptunian Systems*.[3] From this research it appears that the orbits of all four satellites of Uranus are sensibly circular, and although no special search was made, he concludes that none of Sir William Herschel's supposed outer satellites can have any real existence. From the motion of the satellites he finds that the mass of Uranus is $\frac{1}{22600}$th of that of the sun, while for the planet Neptune he finds a mass equal to $\frac{1}{19380}$th of the sun, agreeing with the value previously found by him from the perturbations of Uranus within $\frac{1}{60}$th of its amount. As early as 1860 Newcomb communicated an important memoir to the American Academy,[4] *On the Secular Variations and Mutual Relation of the Orbits of the Asteroids*, in which he discussed the two principal hypotheses to account for the origin of these bodies—one, that they are the shattered fragments of a single planet (Olbers' hypothesis), the other, that they have been formed by the breaking up of a revolving ring of nebulous matter.

In the *Astronomical Papers of the American Ephemeris* will be found a large number of contributions from Newcomb's pen on some fundamental and most important questions of astronomy. Among these are papers on *The Recurrence of Solar Eclipses*, *A Transformation of Hansen's Lunar Theory*, *Development of the Perturbative Function and its Derivatives*. His memoir *On the Motion of Hyperion, a New Case in Celestial Mechanics*, is in some respects one of his most original researches. He discussed the transits of Venus of 1761 and 1769, and those of Mercury from 1677 to 1881. At the international conference, which met at Paris in 1896 for the purpose of elaborating a common system of constants and fundamental stars to be employed in the various national ephemerides, Newcomb took a leading part, and at its suggestion undertook the task of determining a definite value of the constant of precession, and of compiling a new catalogue of standard stars. The results of these investigations were published in 1899,[5] and have been in use since the beginning of 1901. In the intervals of these immense labours, on which his reputation as an astronomer rests, he found leisure for works of a lighter character, *e.g.* his *Popular Astronomy* (1878) which has been translated into German, Russian, Norwegian, Czech, Dutch and Japanese, his *Astronomy for Schools and Colleges* (1880), written in conjunction with Professor E. S. Holden, and *Astronomy for Everybody* (1903). After his retirement from official life he published an excellent popular treatise on *The Stars* (1901). A more recondite work is his *Compendium of Spherical Astronomy* (1906). He also wrote on questions of finance and economics.

He received the honorary degrees of D.C.L. Oxford, and Sc. D. Cambridge and Dublin. In 1872 he was elected an associate of the Royal Astronomical Society, receiving its gold medal in 1874. In 1877 he was elected a foreign member of the Royal Society, which in 1890 awarded him the Copley medal. He also received the first Bruce medal of the Astronomical Society of the Pacific, awarded by the directors of the Berlin, Greenwich, Harvard, Lick, Paris and Yerkes observatories. Except Benjamin Franklin he was the only American to become an Associate of the French Institute. He died at Washington on the 11th of July 1909, and was given a military funeral, having been made a rear-admiral by Act of Congress in 1906.

An autobiography, *Reminiscences of an Astronomer*, appeared in 1903; and a bibliography of his writings is given by Mr Archibald in the *Trans. Roy. Soc. Canada*, XI. iii. 79. See also the obituary notice by H. H. Turner in the *Mon. Not. R.A.S.* (Feb. 1910), p. 305.

NEWCOMEN, MATTHEW (*c.* 1610–1669), English nonconformist divine, was born about 1610 and educated at St John's College, Cambridge (M.A. 1633). In 1636 he became lecturer at Dedham in Essex, and was the leader of the church reform party in that county. He assisted the elder Calamy in writing *Smectymnuus* (1641), and preached before parliament in 1643. He was a man of many gifts, excelling alike in preaching, in debate and in friendship, and declined many offers of more remunerative service. He protested against the extreme democratic proposals called "The Agreement of the People" (1647), and was one of the commissioners at the Savoy Synod of 1658. On the passing of the Act of Uniformity in 1662, Newcomen lost his living, but was soon invited to the pastorate at Leiden, where he was held in high esteem not only by his own people but by the university professors. He died of the plague in 1669.

NEWCOMEN, THOMAS (1663–1729), English engineer, one of the inventors of the steam-engine, was born at Dartmouth in 1663. While employed as an ironmonger in his native town, he corresponded with Robert Hooke about the previous investigations of Denis Papin and the marquis of Worcester as to the applicability of steam-power for the purpose of driving machinery, and in conjunction with John Calley (or Cawley), said to have been a grazier or glazier in Dartmouth, and Captain Thomas Savery (1650?–1715), a military engineer, he constructed in 1705 a "fire-engine," now known as the "atmospheric steam-engine." He died in 1729, probably in London. (See STEAM-ENGINE.)

NEWDIGATE, SIR ROGER (1719–1806), English antiquary, was born on the 30th of May 1719. He was the 5th baronet of Harefield (in Middlesex) and Arbury (in Warwickshire), and grandson of Sir Richard Newdigate, an English chief justice during the time of Richard Cromwell's protectorate. He was educated at University College, Oxford. From 1741 to 1747 he was M.P. for Middlesex, and from 1750 to 1780 M.P. for the university of Oxford. In 1753 he spoke in parliament on behalf of the repeal of the Plantation Act, and during the debates on the land tax in 1767 he opposed the duke of Grafton's administration and the proposed grant to the royal princes. Being the owner of extensive collieries near Bedworth in Warwickshire, he actively promoted the Coventry, Oxford and Grand Junction canal, cutting also a canal from his collieries to Coventry, and interesting himself in the construction of the turnpike road from

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[1] *Liouville*, t. xvi. (1871), pp. 1-45.

[2] *Washington Observations*, 1875, Appendix II.

[3] *Ibid.*, 1873, Appendix I.

[4] *Memoirs Amer. Acad. of Arts and Sciences*, v. 124-152.

[5] *Astronomical Papers of the American Ephemeris*, vol. viii. pts. i. and ii.

Coventry to Leicester. But it is as an antiquary and the founder of a prize at the Oxford university that he is chiefly remembered. His interest in old architecture dated from a tour in France and Italy which was undertaken while he was a young man. He filled two folio volumes with sketches of ancient buildings. His collection of antiquities included marbles, casts of statues and vases. Two marble candelabra found in Hadrian's villa at Rome he purchased for £1800 and presented them to the Radcliffe Library at Oxford. Among his other generosities to the university were a chimney piece, for the hall of University College, and the sum of £2000 for the removal by Flaxman of the Arundel collection of marbles to the Radcliffe Library. The "Newdigate" prize of twenty-one guineas for English verse, which is open for competition each year to the undergraduates of Oxford University, was founded by him and was first awarded in the year of his death. He died at Arbury on the 23rd of November 1806. His portrait was painted by Kirkby for University College, Oxford, and at the age of sixty-three he also sat to Romney.

NEWEL (O. Fr. *nouel* or *noel*, modern *noyau*, properly a kernel, from Lat. *nux*, nut; other foreign equivalents are Ital. *albero*, Ger. *Spindel*), the term given in architecture to the central shaft of a semicircular or winding staircase, which is built up or consists of the narrow ends of the steps standing one over the other. When in stone, both newel and steps are cut out of the same block; when in wood, the newel becomes a vertical post into which the steps are housed. The term is also given to the vertical post at the foot or the angles of a square staircase, into which the carriage or beam carrying the steps is tenoned.

NEW ENGLAND, a general name for the north-east section of the United States of America, embracing the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. It has an area of 66,424 sq. m. (4448 sq. m. being water); and in 1910 its population was 6,552,681, more than one-half of which was in Massachusetts, although that state contains less than one-eighth of the total area. The region is traversed by the broken mountain ranges which form the N.E. continuation of the Appalachian system; the soil is rather sterile, except in the river valleys; and the climate of the long winters is often severe. But the picturesque scenery and delightful summer climate have made New England a favourite resort. When the commerce of New England was interrupted as a consequence of the Napoleonic wars, the abundance of water power afforded by the rivers encouraged manufacturing, and the region rapidly acquired prominence in this industry, especially in the manufacture of textiles, of boots and shoes, and of paper and wood pulp; in 1905 the value of the textile products of New England (excluding flax, hemp and jute) alone was $522,821,440 (more than 45% of that of the entire country), the value of boots and shoes was $181,023,946 (more than 55% of the total for the entire country), the value of paper and wood pulp was $49,813,133 (more than one-quarter of that of the entire country), and the value of all factory products amounted to $2,025,998,437 (nearly one-seventh of the total for the entire country).

Northmen very probably visited this region at the beginning of the 11th century. (See VINLAND). To Europeans who visited it in the 16th century it was included in "Norumbega," and some of the early explorers searched here for the mythical city of that name. Title to the territory was claimed by the English on the basis of its alleged exploration by the Cabots in 1498, and by the French on the basis of its exploration by Giovanni da Verrazano in 1524. It was made favourably known to the English by the explorations of Bartholomew Gosnold in 1602, of Martin Pring in 1603 and of George Weymouth in 1605, and was at this time called North Virginia. In 1606 King James I. granted it to the Plymouth Company with a view to encouraging settlement, and in the next year a colony was planted at the mouth of the Sagadahoc (now Kennebec) river, but this was abandoned in 1608; the efforts of the French to establish settlements along the Maine coast were likewise unsuccessful. In 1614–1616 Captain John Smith traversed the coast as far east as the mouth of the Penobscot river and as far south as Cape Cod, gathered much information from the Indians, wrote an attractive description of the country, prepared a map of it, suggested its present name, New England, and made another unsuccessful attempt to found a settlement. A new charter of 1620 conveyed to the New England Council, the successor of the Plymouth Company, all the territory in North America between latitudes 40° and 48° N. under the name of New England, and in the same year a permanent settlement was established at Plymouth by a band of Separatists, who, although they had expected to settle in Virginia, were prevailed upon by the captain of their vessel to land in New England. During its existence of fifteen years the New England Council made numerous grants of territory, and from three of these grew three of the present states: Massachusetts, from a grant to the Massachusetts Bay Company in 1628; Maine, from the grant to Sir Ferdinando Gorges and John Mason (the two most influential members of the council) in 1622; and New Hampshire, from the grant to John Mason in 1629. The Council attempted to establish a general government over its entire domain, but the scheme of some of its members for supporting such a government with contributions from each member in return for an allotment of land was a failure, and although Robert Gorges, the second son of Sir Ferdinando Gorges, was sent over as governor-general in 1623, he accomplished nothing and returned in the next year in disgust. In 1635, when the Dutch were hemming in its domain on the west and the French on the north, the Council made a final allotment of its remaining territory among its members and surrendered its charter. Connecticut was founded in the same year by emigrants from Massachusetts without any other authority than that given by the mother colony. A separate colony was founded at New Haven in 1638 by emigrants from England who had stayed for a time in Boston and other Massachusetts towns, but this was annexed to Connecticut in 1664 under the Connecticut charter of 1662. Rhode Island was founded in 1636 by exiles from Massachusetts who had no authority whatever from a superior government. Plymouth was a separate colony until its union with Massachusetts under the charter of 1691. New Hampshire was a part of Massachusetts from 1641–1643 to 1679. Maine, having passed under the jurisdiction of Massachusetts in 1652, did not regain its independence until 1820. Vermont was settled largely by emigrants from New Hampshire, but New York claimed the territory and the dispute was not settled until the new state was erected in 1791.

Massachusetts, Plymouth, Connecticut and New Haven constituted in their early years a group of neighbouring colonies, substantially independent of the mother country, and possessing a unity of purpose and similar institutions but in need of mutual protection from the Indians, the Dutch and the French, and also needing an arbiter to whom they might refer their own disputes, especially those relating to boundaries and trade. To meet these needs they organized, under Articles of Confederation signed in 1643, the first form of colonial union in America; they called it The United Colonies of New England, but it is more commonly known as the New England Confederacy. The confederate authority was vested in a board of eight commissioners, two from each colony chosen annually by its General Court.

This board was to meet annually in September, two years of every five at Boston, one year of every five at Hartford, one at New Haven, and one at Plymouth; special meetings also might be called by three magistrates of any of the four colonies. The commissioners chose their president at each meeting, but this officer had only the powers of a moderator. An agreement of six commissioners was necessary to pass any measure, but if there was an agreement of less than six the measure might be referred to the General Courts and become a law of the Confederacy if all of those courts approved. The most important powers of the Confederacy were those relating to defence, and in case of an invasion its entire force, consisting of 100 men from Massachusetts and 45 men from each of the other colonies (or some other proportion which the commissioners might name), was to march out if so requested by three magistrates of any of the contracting colonies. The expenses of every defensive war which the commissioners declared to be just were to be defrayed by the several colonies in proportion to their number of men and boys between the ages of sixteen and sixty. Other matters within the jurisdiction of the commissioners were such as related to disputes between two or more colonies and the return of escaped servants, prisoners and fugitives from justice. As the commissioners had no means of enforcing their orders, their function was chiefly advisory, but it was nevertheless of considerable importance on several occasions. Although the number of commissioners from each of the colonies was the same, those from Massachusetts exerted the dominant influence.

The commissioners met regularly until 1684—annually until New Haven submitted to Connecticut in 1664, and triennially from 1664 to 1684, when Massachusetts lost its first charter. Upon the downfall of the Puritan Commonwealth in the mother country (1660) numerous grievances were presented to King Charles II. against the Puritan governments of New England, among them Massachusetts' extension of its jurisdiction over the towns of Maine and New Hampshire, the persecution of the Quakers, and the denial of the right of appeal to the crown, and in 1664 a royal commission, consisting of Richard Nicolls, Samuel Maverick, Robert Carr and George Cartwright, was sent over to settle disputes and secure some measure of imperial control, but Massachusetts, the chief offender, successfully baffled all attempts at interference, and the mission was almost a complete failure. The grievances of English merchants arising from the violation of the navigation laws by the colonies continued, however, to receive the attention of the home government.

In 1676 the Lords of Trade and Plantations sent over Edward Randolph to investigate and gather information which would show the justice and expediency of imposing imperial control, and two years later Randolph was appointed Collector and Surveyor of Customs in New England. Randolph sent back many charges, especially against Massachusetts, with the effect that, in 1684, the charter of that colony was annulled by a decree in Chancery on a writ of *quo warranto*. This done, the home government set to work to organize the royal domain which should be known as New England, or the Dominion of New England, and its plan for this provided for the annulment of the charters of Rhode Island and Connecticut, and the inclusion in the Dominion of these colonies, and New Hampshire, Maine, New York and the Jerseys, thereby restoring to New England all the territory, with the exception of Pennsylvania, that was included in the grant to the New England Council in 1620. A temporary government was established at Boston in May 1686, with Joseph Dudley as president, and in December of the same year Edmund Andros arrived with a commission and instructions which were a copy of those to the governor of New York and made him governor of all New England except Rhode Island and Connecticut. Rhode Island offered no resistance to the writ against its charter and Andros extended his authority over it immediately after his arrival. Connecticut successfully baffled the royal servants for a time, but when threatened with a division of its territory agreed not to resist the royal purpose, and on the last day of October 1687 it passed under the general government of New England. Finally, a new commission to Andros, issued in April 1688, extended his jurisdiction over New York and the Jerseys, and the whole region over which he was made governor by this instrument was named "Our Territory and Dominion of New England in America." But the English Revolution of 1688 inspired a revolt in New England by which Andros was deposed in April 1689. Under William and Mary no attempt was made to preserve the Dominion of New England, but Rhode Island and Connecticut were permitted to resume government under their old charters, Massachusetts received a new one, and New Hampshire again became a separate royal province.

New England is prominent in American colonial history as the "Land of the Puritans" and the home of the corporate colony. The chief motive of its founders in coming to the New World was the establishment of a new Christian commonwealth, but subordinate to this there was from the first an economic motive. So long as the religious motive remained dominant, "blue laws" were a prominent feature of the administration, but by a slow transition the economic motive became the dominant one, and, as a consequence of this transition and of the corporate form of government, European institutions were transformed into American institutions and new political ideas were generated more rapidly in New England than in either the Middle or the Southern colonies. Owing to its geographical position, nearer to Canada than any other group of colonies, New England had to stand the brunt of the fighting during the wars between the English and the French (aided by their Indian allies) in America, terminating with the conquest of Canada by the English in 1759–1760, and a sense of common danger helped to create a certain solidarity, which made easier the union of the colonies for common action against the mother country at the time of the War of American Independence. After that war, New England was long the most essentially commercial and industrial group of states, and was a stronghold of Federalism; and in the period immediately before and during the War of 1812, when its commercial interests suffered terribly, first from the restrictive measures of the general government and then from warfare, New England was a centre of that opposition to the policy of the National Administration (then Democratic), which culminated in the famous Hartford Convention of 1814–1815 (see HARTFORD).

See the articles on the separate New England states and the authorities there given; among good general works are J. G. Palfrey, *History of New England* (5 vols., Boston, 1858–1890); J. A. Doyle, *The Puritan Colonies* (2 vols., New York, 1889); B. B. James, *The Colonization of New England* (Philadelphia, 1904); H. L. Osgood, *The American Colonies in the Seventeenth Century* (3 vols., New York, 1904–1907); John Fiske, *The Beginnings of New England, or the Puritan Theocracy in its Relation to Civil and Religious Liberty* (Boston, 1896); S. A. Drake, *The Making of New England* (New York, 1896); W. B. Weeden, *Economic and Social History of New England* (2 vols., Boston, 1890); and Edward Channing, *History of the United States*, vols. i. and ii. (New York, 1905, 1908).

NEW FOREST, one of the few woodland regions left in England covering about 93,000 acres in the south-west of Hampshire, between the Solent, Southampton Water and the river Avon. About two-thirds of it is crown property, and is preserved more or less in its natural condition as open woodland interspersed with bogs and heaths. The trees principally represented are oak and beech, with some newer plantations of Scotch fir. The trees were formerly felled for building the ships of the navy and for feeding the iron furnaces of Sussex and Hampshire. Pigs and a hardy breed of ponies find a good living in the forest; and in spite of an act in 1851 providing for their extermination or removal, a few red deer still survive. Foxes, squirrels, otters, snakes (smooth snake, grass snake and adder), butterflies (some of them peculiar to the district), and an occasional badger range the forest freely. The tract derives its name from the extensive afforestation carried through in this region by William the Conqueror in 1079; and the deaths of two of his sons within its confines—Richard killed by a stag, and William Rufus by an arrow—were regarded in their generation as a judgment of Heaven for the cruelty and injustice perpetrated by their father when appropriating the forest. Rufus's stone, near Lyndhurst, marks the supposed spot where that monarch fell. About one-fourth of the area is under cultivation by private owners and tenants. The principal village within the forest is Lyndhurst (pop. 2167 in 1901); its church contains a fresco by Lord Leighton, and here is held the verderers' court, which since 1887 has had charge of the crown portion of the forest. On the western outskirts lies the town of Ringwood (*q.v.*). Brockenhurst and Beaulieu are the villages next in importance. Beaulieu, at the head of the picturesque estuary of the Beaulieu river, which debouches into the Solent, is famous for the ruins of Beaulieu Abbey, founded by King John for Cistercians. The gatehouse is restored as a residence, and the Early English refectory as a church. There are considerable remains of the cloisters, chapter house and domestic buildings. The New Forest gives name to a parliamentary division of the county.

The New Forest is one of the five forests mentioned in Domesday. It was a hunting-ground of the West Saxon kings, but, as already stated, was afforested by the Conqueror, whose cruelty in the matter is probably exaggerated by the traditional account. One of the chief sources of the wealth of the forest in early times was the herds of pigs fed there. The New Forest being under the forest laws, was affected by the forest clauses of Magna Carta and by the Forest Charter (1217), which mitigated their severity. The chief officer of this, as of other forests, was the justice in eyre who held the justice seat, the highest forest court and the only court of record capable of entering and executing judgments on offenders; the lower courts were the Swainmote and Wodemote, the former of which is still held, in a modified form, in the Verderers' Hall of the King's House at Lyndhurst. The circuit of the justices in eyre, or their deputies, continued down to 1635; they were virtually ended by the Act for the Limitation of Forests (1640), though Charles II. attempted to revive them, and they were not legally abolished until 1817. The lower officers of the forest, who held merely local appointments, were the verderers, the regarders (one of whose duties was that of seeing to the expeditation of "great dogs"), the foresters, the woodwards and the agisters. There was also a lord warden, who was usually a nobleman and performed no judicial functions. The Deer Removal Act (1851) resulted in the almost total extinction of the forest deer. Under the act of 1877 the forest is administered rather as a national park than for the growing of timber on commercial principles.

See J. R. Wise, *The New Forest* (4th ed., 1883), with over sixty engravings by W. J. Linton and a dozen etchings by H. Sumner; and R. D. Blackmore, *Cradock Nowell* (1866).

NEWFOUNDLAND, a large island, forming a British colony, and occupying an important and commanding position off the eastern coast of the North American continent, not dissimilar to that occupied by Great Britain towards Europe. It stretches directly across the entrance of the Gulf of St Lawrence, to which access is afforded at both the northern and the southern extremities of the island. In the south-west its distance from Cape Breton is less than 60 m., while only 1640 m. separate its most easterly point from the coast of Ireland. It is situated between 46° 36′ 50″ and 51° 39′ N., and between 52° 37′ and 59° 24′ 50″ W. The total area of the island is about 40,200 sq. m, or one-sixth larger than Ireland: its maximum length from Cape Ray to Cape Norman is 317 m., its maximum breadth from Cape Spear to Cape Anguille, 316 m. In shape it is roughly triangular, three extensive peninsulas, which project from the north (Petit Nord) and south-east (Avalon), assisting the conformation, although the latter, the most populous region of the island, is joined by a very slender isthmus, at one place only 3 m. wide. A further division of the Avalon peninsula is wrought by the two bays of St Mary's and Conception. St John's, the capital, is situated on the eastern side of Avalon.

Physical Features.—Viewed from the ocean the coasts of Newfoundland appear bleak, rocky and barren. The brown wall of rock, 200 to 300 ft. in height, is, however, broken at frequent intervals by deep fjords and large bays running in some instances 80 to 90 m. inland, and throwing out smaller arms in all directions. For this reason the circumference of the island, which, measured from headland to headland, is about 1000 m., is actually doubled. The fjords resemble those of Norway; islands are numerous, some of them clad with vegetation; and picturesque scenery is not uncommon.

Near the coasts the surface of the country is of a hilly, rugged character. In the interior the elevated undulating plateau is diversified by ranges of low hills, valleys, woods, lakes, ponds and marshes. Much of this is a savanna country, giving sustenance to large herds of caribou. All the principal hill ranges have a N.N.E. and S.S.W. trend, as have also all the other great physical features of the island, such as the bays, larger lakes, rivers and valleys, a conformation doubtless shaped by glacial action during the Ice period. The most important range of mountains is the Long Range, beginning at Cape Ray and extending along the western side of the island for some 200 m., and having peaks more than 2000 ft. high. Parallel to this but nearer the west coast is the Anguille Range, running from Cape Anguille to the highlands of Bay St George. Some of the summits of the Blomidon Range, extending along the south shore of the Humber and Bay of Islands, attain a height of 2084 ft., being the highest on the island. Avalon peninsula is also very hilly, but the greatest altitude is only 1200 ft.—North-East Mountain, from which sixty-seven lakes are visible on a clear day. Over the interior are spread a number of detached sharply-pointed summits, springing abruptly from the great central plateau, bearing the local name of "tolts," and serviceable as landmarks.

In comparison with the island's size large rivers are few, owing to the broken, uneven character of most of the country, and the fact that the ponds and lakes find a convenient vent in the numerous lengthy inlets and arms of the sea. There are, however, three considerable streams, the Exploits, the Humber and the Gander. The first-named rises in the extreme S.W. angle of the island, close to the southern extremity of the Long Range, and after a course of 200 m. falls into the Bay of Exploits, Notre Dame Bay. It is a mile wide at its mouth; its channel is studded with islands, the largest being Thwart Island, 9 m. in length. Fourteen miles from the mouth is a succession of cascades known as Bishop's Falls, and farther inland are the picturesque Grand Falls. The Exploits drains an area of between 3000 and 4000 m., much of it fertile land, and densely wooded with pine, spruce, birch and poplar. The width of this fertile belt varies at different parts of the river, but it is estimated that some 200,000 acres might be available for agriculture. The Humber rises 20 m. inland from Bonne Bay, and, after emptying itself by a circuitous course into Deer Lake, falls into the Bay of Islands. It drains an area of 2000 sq. m. Rising near the southern coast, the Gander flows through Gander Lake into Hamilton Sound, draining an area of nearly 4000 sq. m. Besides these three there is the Codroy, rising in the Long Range and emptying into the Gulf of St Lawrence.

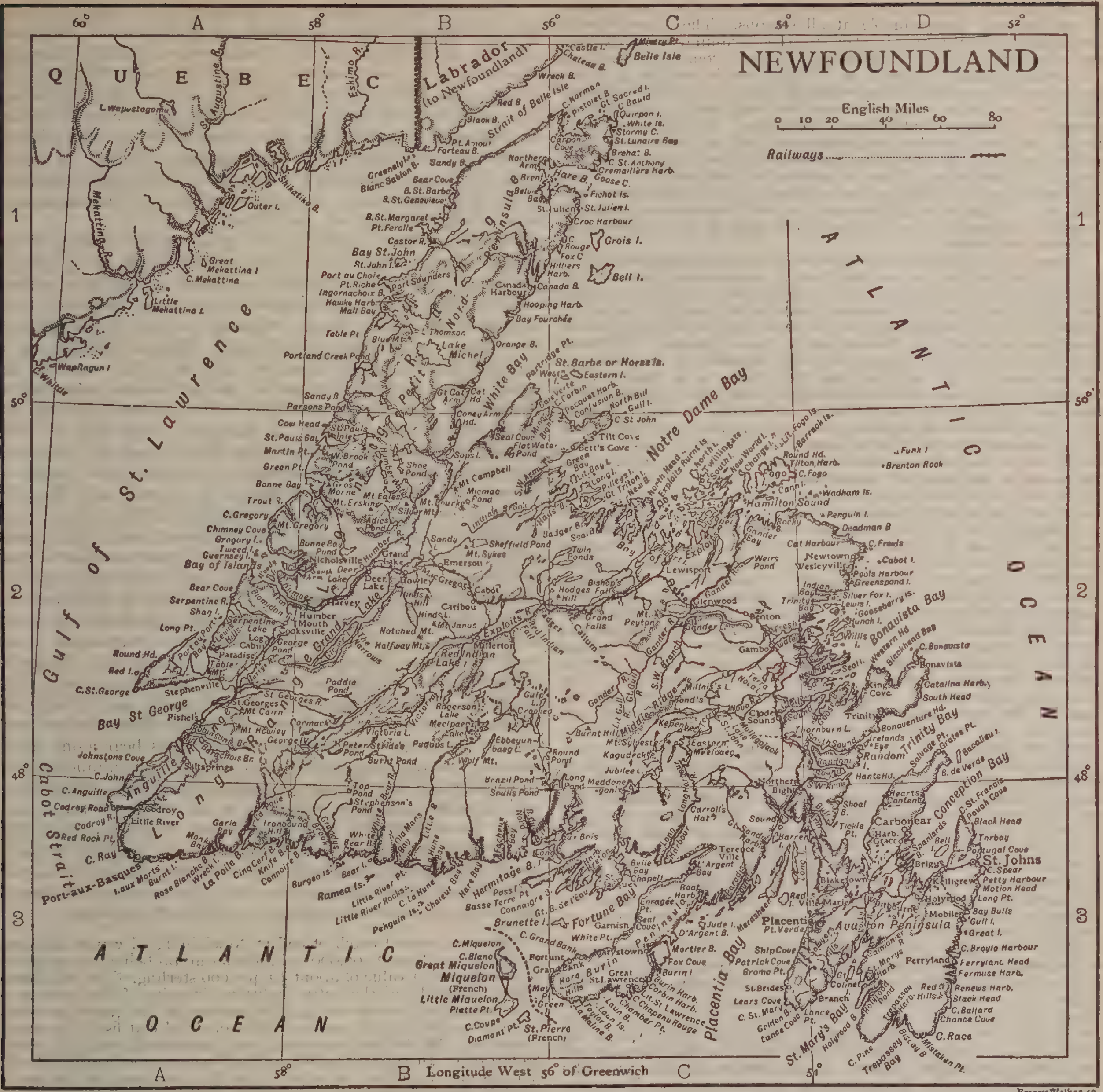
The immense number of lakes and ponds constitutes perhaps the most striking physical feature of the island. More than a third of the whole area is occupied by water. These bodies of water, large and small, are found in the most various positions: in the mountain gorges; in the depressions between the low hills; in the valleys and even in the hollows on the tops of the highest eminences. The largest is Grand Lake, 56 m. long, 5 in breadth, with an area of 192 sq. m. Its surface is but 50 ft. above sea-level, the bottom at its deepest portion being 300 ft. below sea-level. It contains an island 22 m. long. The next, Red Indian Lake, is 37 m. long, with an area of 64 sq. m. Gander Lake is 33 m. in length, and Deer Lake, through which the Humber flows, is 15 m. After these Michel Sandy Lake, Victoria, Hind's, Terra Nova and George IV. lakes rank next in size. Save where the railway and lumbering camps have invaded them the shores of these lakes are still primitive wilderness.

The coasts of the island, intersected by many great bays, have been familiar to fishermen from an early period, but the interior remained almost completely unknown until the geological survey, still in process, was begun in 1864. Chief amongst the inlets are Placentia Bay, 55 m. in width at its mouth and 90 m. long; Notre Dame Bay, 50 m. wide and 70 m. long; Fortune Bay, 25 m. wide and 70 long; and St Mary's Bay, 25 m. wide by 35 m. in length. Opposite Fortune Bay, which has several important arms, are the two islands of St Pierre and Miquelon, ceded by treaty in 1713 to France, as shelter for her fishermen, and now all that remains of French sovereignty in North America. In the neighbourhood of Bay St George, on the west coast (40 m. wide at the mouth and boasting a good harbour) are situated some of the most fertile lands in the island, well-timbered and containing large deposits of coal and other minerals. Three extensive arms run 20 m. inland from Bay of Islands, the seat of a profitable herring fishery. Conception Bay is one of the largest and most important in the island, having in 1901 a population scattered through the settlements on its shores of over 40,000 inhabitants. Another principal inlet is Bonavista Bay, which contains numerous groups of islands.

Geology.—All the great ancient rock systems, between the Lower Laurentian and the Coal-measures, are more or less represented at one part or another of Newfoundland.

The Laurentian system has an immense spread in the island. It constitutes the principal mountain ranges, coming to the surface through the more recent deposits, on the axes of anticlinal lines, or brought up by great dislocations, most of which trend nearly parallel with each other in a general bearing of about north-north-east and south-south-west. The Laurentian gneiss of the Long Range, on the western side, extends in a nearly straight course from Cape Ray to the headwaters of the Castor in the great northern peninsula. On the south-western extremity of the island these rocks occupy the coast from Cape Ray to La Poile. They are largely exhibited on Grand Lake, running in a spur from the Long Range between it and Red Indian Lake, and bearing for the south-eastern shores of Hall's Bay. The central portion of the northern peninsula is Laurentian, which also spreads over a wide expanse of country between Grand Lake and the Humber and Exploits rivers, and shows itself on the coast between Canada Bay and White Bay. Another range of Laurentian comes up in the district of Ferryland, and shows itself occasionally on the coast of Conception Bay. Thus more than half the island is Laurentian.

Three-fourths of the peninsula of Avalon are Huronian, a formation which does not extend west of Fortune Bay. The town of St John's and, in fact, nearly all the settlements between Fortune Bay and Bonavista Bay are built upon it. Signal Hill, overlooking the harbour of St John's, is capped with the sandstone of this formation. The whole Huronian system is not less than 10,000 ft. thick, and has been cut through by denudation to the Laurentian floor. The rocks of the Primordial Silurian age are spread unconformably over the area thus ground down. These evidences of denudation and reconstruction are very clear in Conception Bay, where the rocks


NEWFOUNDLAND
English Miles
0 10 20 40 60 80
Railways
60° A 58° B 56° C 54° D 52°
1
2
3
50°
48°
Longitude West 56° of Greenwich
QUEBEC
Labrador (to Newfoundland)
Strait of Belle Isle
Belle Isle
Gulf of St. Lawrence
ATLANTIC OCEAN
Notre Dame Bay
White Bay
Bay of Islands
Bay St George
Cabot Strait
Port-aux-Basques
C. Ray
Grand Lake
Red Indian Lake
Gander Lake
Hamilton Sound
Bonavista Bay
Trinity Bay
Conception Bay
St. Johns
Avalon Peninsula
Placentia Bay
St. Mary's Bay
Fortune Bay
Hermitage B.
Burin Peninsula
Miquelon (French)
St. Pierre (French)
C. Race
C. Bonavista
Twillingate
Fogo
Funk I.
Brenton Rock
Bell I.
Grois I.
Ramea Is.
Burgeo Is.
C. St. George
C. Anguille
Long Range
Exploits R.
Gander R.
Humber R.
Grand Falls
Lewisport
Carbonear
Placentia
Ferryland
Trepassey Bay

Emery Walker sc.

of the intermediary system have been ground down to the Laurentian gneiss, and, subsequently, the submarine valley thus formed has been filled up with a new set of sediments, the remains of which are still to be found skirting the shores of the bay and forming the islands in it.

Rocks of the Silurian age are most extensive on the peninsula of Cape St Mary, and around the head of Trinity Bay. These belong to the Primordial Silurian group. The Lower Silurian rocks have a large development, and in them the metallic ores occur which seem destined to render the island a great mining centre. The Lauzon division of the Quebec group, which is the true metalliferous zone of North America, has an immense spread in the island. It consists of serpentine rocks associated with dolomites, diorites, &c., and is well known throughout North America to be usually more or less metalliferous. The Newfoundland rocks are no exception, but give evidence of being rich in metallic ores. The Middle Silurian division of rocks is also widely spread; and the most fertile belts of land and the most valuable forests are nearly all situated on the country occupied by this formation. The great valley of the Exploits and Victoria rivers, the valley of the Gander and several smaller tracts belong to it.

The Carboniferous series occupies a large area on the western side of the island, in the neighbourhood of Bay St George and Grand Lake. There is also a wider spread of the same series along the valley of the Humber and round the shores of Deer Lake and the eastern half of Grand Lake, and as far as Sandy Lake. "Coal," says Mr J. P. Howley, F.R.G.S., head of the survey, "is known to exist at several places in this series; and seams, apparently of workable thickness, judging from their out-crops, occur on the Middle Barachois and Robinson's Brook, in St George's Bay."

It will thus be seen that the Carboniferous series is confined to the western side, while the middle, eastern and southern portions are occupied by Silurian, Huronian and Laurentian formations. From the extent to which the Lauzon division of the Quebec group, the true metalliferous zone of North America, prevails in the island, its yet undeveloped mineral wealth must be very great.

Climate.—The climate is more temperate than that of most portions of the neighbouring continent. It is but rarely, and then only for a few hours, that the thermometer sinks below zero in winter, while the summer range rarely exceeds 80° F., and for the most part does not rise above 70°. The Arctic current exerts a chilling influence along the eastern coast, but as a compensation it brings with it the enormous wealth of commercial fishes and seals which has rendered the fisheries the most productive in the world. The Gulf Stream, while it creates fogs, modifies the cold. The salubrity of the climate is evidenced by the robust healthy appearance of the inhabitants.

Open fireplaces are sufficient to warm the houses, and free exercise in the open air is attainable at all seasons. The average mean temperature at St John's is 41·2° F., the maximum being 83° and the minimum 7°; the average height of the barometer is 29·37 in. The average rainfall is 58·30 in. Winter sets in, as a rule, in the beginning of December and lasts until the middle of April. Generally the snow lies during this period, and the frost rarely penetrates the ground to a greater depth than a few inches. Spring is sometimes late in arriving, but once vegetation sets in it advances with marvellous rapidity. The autumn is usually very fine, and is often prolonged till November. There is nothing in the climate to interfere with agriculture. Tornadoes are unknown, and thunderstorms are very rare. Fogs, of which so much is said in connexion with the country, are confined to the shores and bays of the south-eastern and southern coasts.

Fauna.—Among the well-known wild animals indigenous to the country the caribou or reindeer hold a conspicuous place. They migrate regularly between the south-eastern and north-western portions of the island. The winter months are passed in the south, where "browse" is plentiful, and the snow is not too deep to prevent them from reaching the lichens on the lower grounds. In March they begin their spring migration to the barrens and mountains of the north-west. In May or June they bring forth their young. As soon as the frosts of October begin to nip the vegetation they turn south. September and October are the best months for stalking. In addition to the caribou, the wolf and black bear are found in the interior; the fox (black, silver, grey and red), beaver, otter, arctic hare, North-American hare, weasel, bat, rat, mouse and musquash or musk-rat are numerous. The famous Newfoundland dog is still to be met with, but good specimens are rare, and he appears to thrive better elsewhere. The common dogs are a degenerate mongrel race. It is estimated that there are three hundred species of birds in the island, most of them being migratory. Among them may be enumerated the eagle, hawk, owl, woodpecker, swallow, kingfisher, six species of fly-catchers and the same number of thrushes, warblers and swallows in great variety, finches, ravens, jays. The ptarmigan or willow grouse is very abundant, and is the finest game-bird in the island. The rock ptarmigan is found in the highest and barest mountain ridges. The American golden plover, various species of sandpipers and curlews, the brent goose, ducks, petrels, gulls and the great northern diver are met with everywhere. The great auk, now extinct, was once found in myriads around the island. The little auk, guillemot and the razor-billed auk are abundant. No venomous reptiles occur. Frogs have been introduced and thrive well. Of molluscous animals the common squid, a cephalopod about 6 or 7 in. in length, visits the coasts in immense shoals in August and September, and supplies a valuable bait. A gigantic species of cephalopod was discovered in 1873, which excited much interest among naturalists: the body varies from 7 to 15 ft. in length, with a circumference of 5 or 6 ft.; from the head ten arms radiate, the two longest (tentacles) being from 24 to 40 ft. in length, and covered with suckers at their extremities; the other eight arms vary from 6 to 11 ft., and on one side are entirely covered with suckers. Professor Verrill, of Yale College, distinguished two species—one he named *Architeuthis Harveyi*, after the discoverer, and the other *Architeuthis monachus*.

Flora.—The pine, spruce, birch, juniper and larch of the forests of the interior furnish ample materials for a large timber trade as well as for shipbuilding purposes. The white pine grows to the height of 70 or 80 ft. in some places, and is 3 or 4 ft. in diameter. There is an abundance of wood suitable for making pulp for paper; and in 1906–1907 a London company, with Lord Northcliffe (of the *Daily Mail*) at its head, acquired large tracts for this purpose, and operations were begun in 1910. The mountain ash, balsam poplar and aspen thrive well. Evergreens are in great variety. The berry-bearing plants cover large areas of the island. The maidenhair or capillaire yields a saccharine matter which is lusciously sweet. Flowering plants and ferns are in vast varieties, and wild grasses and clover grow luxuriantly. Garden vegetables of all kinds, and strawberries, raspberries, gooseberries, currants, &c., thrive well.

Population.—By the earliest computation made in 1654 the number of permanent inhabitants in the island was 1750. Twenty-six years later the resident population was stated to be 2280; in 1763, 7000; in 1804, 20,000. In 1832 the population had risen to 60,000; in 1836 to 75,094; in 1857, 124,288; and in 1874, 161,374. By the census of 1901 the total population of Newfoundland was 217,037, that of Labrador being 3947. The capital, St John's, which contained a population of 15,000 in 1835, had in 1901 29,594 souls. The rate of increase for the island for the ten years ending in 1901 was 9·37% as compared with the rate of increase 1874–1884, which was 22·30%. Certain districts such as Carbonear, Harbour Grace and Ferryland, as well as Labrador, showed a steady decline, the largest increase being in St George's district and on the west coast, where it is not less than 40%.

Of the various religious denominations the strength in 1901 was as follows: Roman Catholics, 75,989; Chuch of England, 73,008; Methodists, 61,388; Presbyterians, 1168; Congregationalists, 954; Salvationists, 6594; Moravians, Baptists and others, 1554. The system of public education is denominational, each religious body receiving grants from the revenue according to numerical strength. The total sum allotted to education in 1904–1905 was $196,192. The aggregate number of pupils under fifteen attending the 783 elementary schools and academies in the island was 35,204. It is estimated that 25% of the population, chiefly the older folk, are illiterate.

Fisheries.—These constitute the great staple industry of the island. On the export of its products the trade of the colony still mainly depends. The most important fish in these waters, commercially, is the cod, which is here more abundant than anywhere else in the world. Although subject to considerable fluctuation the average annual export of dried cod-fish over a term of years is about 1,200,000 quintals. The value of the export varies between five and six million dollars, according to the market price of the dried fish. The cod are taken on the shores of the island, along the Labrador coast and on "the Banks." These Banks, which have played such an important part in the history of the colony, and are the chief source of its wealth, stretch for about 300 m. in a south-east direction towards the centre of the North Atlantic, and probably at one time formed a part of the North American continent. The depths range from 15 to 80 or 90 fathoms. The deposits consist of sand and gravel composed of ancient rocks, and fragments of quartz, mica, hornblende, felspars and magnetite; along with these are many calcareous fragments of echinoderms, polyzoa and many foraminifera. In the deeper parts there is sometimes a fine mud containing the above-mentioned minerals and calcareous fragments, and in addition numerous frustules of diatoms. The Banks are swept by the cold Labrador current, and icebergs are frequently stranded upon them. The Gulf Stream passes over their southern portions. These two currents bear along many species of pelagic algae and animals, which supply abundant food to the myriads of echinoderms, molluscs, annelids, coelenterates and other invertebrates which live at all depths on the Banks. These invertebrates in turn supply food to the cod and other fishes which are sought for by the fishermen. Sea birds frequent the Banks in great numbers; and, as diving birds are not met with at any great distance from them, the presence of these in the sea gives seamen an indication of the shallower water.

The total annual catch of cod in Newfoundland waters has been estimated at about 2,500,000 quintals (a quintal being one-twentieth of a ton), with a value of about £1,400,000 sterling. The cod fishery forms four-fifths of the entire industry, in spite of the increase in the herring and lobster catch. No increase in the quantities taken is to be noted, but the market value of dried cod fish is generally enhanced. In 1885 an export of 1,284,710 quintals was only worth $4,061,600. In 1905 1,196,814 quintals were valued at $6,108,614. To this may be added the value of the fish consumed by the people of the colony, estimated at $450,000. According to the census of 1901 there were 41,231 males and 21,443 females engaged in the catching and curing of fish.

The figures have greatly varied in past years: as for instance in 1857, 31% of the total population were engaged in catching and curing fish: in 1869, 25·4%, in 1884, 30·6%, and in 1901, 28·4%. Small voyages and low prices have tended to limit fishery operations; and the opening up of other industries has diverted labour from the fisheries. The total number of vessels engaged is about 1550, with a tonnage of 54,500; over 11,000 fishing rooms are in actual use. The use of traps has followed the decrease in number of nets and seines, but the continued increase of fishing rooms shows that there is no falling off in the Newfoundland cod fishery, which has now been prosecuted for fully four centuries. Notwithstanding the enormous drafts every year, to all appearance the cod are as abundant as ever. They begin to appear on the coasts of the island about the first of June, at which time they move from the deep waters of the coast to the shallower and warmer waters near the shore, for spawning purposes. Their approach is heralded by the caplin, a beautiful little fish about 7 in. in length, vast shoals of which arrive, filling every bay and harbour. The cod follow in their wake, feasting greedily upon the caplin, which supply the best bait. In six weeks the caplin disappear, and their place is taken by the squid about the 1st of August. These also supply a valuable bait, and are followed by the herring, which continue till the middle or end of

October, when the cod fishery closes. The cod are taken by the hook-and-line, the seine, the cod-net or gill-net, the cod-trap and the bultow. Newfoundland exports cod to Brazil, Spain, Portugal, Italy, Great Britain, Greece, the West Indies and the United States. Brazil and Spain are the largest consumers.

After the cod the seal fishery is of next importance. The industry was begun about 1740, when the value of the seal oil exports was £1000. In 1904–1905 sealskins and seal oil to the value of $370,261 and $374,974 were exported, the price of a skin varying between $·90 to $1·25. This shows a considerable falling off. The number of men employed is about 4000. Steamers were first used in 1863. They are from 350 to 500 tons burden, most of them carrying from 200 to 300 men. The larger class can bring in from 30,000 to 40,000 seals. In one instance 41,900 seals were brought in by a single steamer, the "Neptune," the weight being 874 tons and the value $103,750. In bad years the catch may not exceed 200,000—in 1893 it fell to 129,061. By law no steamer may leave port on a sealing voyage until the 12th of March, and no seal may be killed before the 14th of March. The young seals are born on the ice between the 15th and 25th of February, and mature so rapidly that they are in excellent condition in four weeks.

Of more recent origin is the lobster fishery, their packing for export having begun in 1873. By 1888 the value of the lobster export had risen to $385,077. In 1904–1905, while the catch had somewhat diminished as compared with 1895, the value had increased to $512,662.

A vigorous effort has been made to establish the herring fishery on a scale commensurate with the abundance of the fish in these waters. In 1855 the total quantity exported was 32,042 barrels, with a value of $91,357. In 1905 there were 176,633 barrels, valued at $379,938. The principal seats of the herring fishery are Fortune Bay, Placentia, Bay St George and Bay of Islands, and the whole coast of Labrador, which furnishes the finest kind of herring. Besides the herring exported, at least $150,000 worth is sold to the French and Americans as bait.

The export of preserved salmon, of which the island has an abundant supply, does not form a large or important item, seldom reaching in value $100,000. Salmon is taken for the most part in nets in the coves and bays and at the mouths of rivers. The season for taking it is brief, six or seven weeks, beginning at the end of May. The proper preservation of the salmon waters has been for generations neglected, and reckless practices bade fair wholly to exterminate the fish. In 1888, however, a fisheries commission was appointed, and river warders were charged with the stringent enforcement of the new laws. The best salmon fisheries are in Bonavista Bay, Gander and Exploits bays, and on the west coast.

Mackerel formerly frequented the Newfoundland coasts, but disappeared about the middle of the 19th century; and few halibut or haddock are caught. Sea trout and brook trout, however, abound, and latterly Loch Leven and Californian rainbow trout have been introduced with success.

The most extraordinary increase concerns the whaling industry. Before 1850 a very successful whale fishery was carried on, but it then suddenly ceased and has only recently been revived. The revival is due to the invention of a harpoon-gun which kills the whale effectually and with despatch. There are now fourteen whale factories in operation for the production of bone and oil. While in 1895 the value of the oil reached only $7300 and the bone $1000, a decade later the values were $384,062 and $34,833 respectively; no fewer than 1275 whales being caught. A patent process manufactures the carcases into a fine guano, and utilizes the by-products, thus adding $100,000 to the industry.

On the whole the aggregate value of the Newfoundland fisheries for 1906–1907 was nearly £2,000,000 sterling, including the fish consumed in the colony.

Agriculture.—Until recent years little attention has been paid to agriculture, the belief being current that the interior of the island was a desert. The reports of the geological survey dispelled this fiction, it being conclusively shown that out of the 28,000 sq. m. of dry land over one-sixth or 7000 sq. m. is available under suitable conditions for arable and for grazing purposes. The best land is situated in the Codroy valley, which is rich in alluvial soil. That in the Bay St George district is very fertile, and in the Humber valley, Exploits valley and elsewhere many thousands of farmers could work to advantage. In 1874 only 36,339 acres were under cultivation. In 1901, 215,579 acres were occupied, of which 85,533 acres were actually under cultivation, producing chiefly hay, oats, potatoes, turnips and cabbages. In the numbers of live stock there has been a notable increase, especially in sheep. Newfoundland seems especially adapted for a sheep-grazing country.

Mining.—Not until a comparatively recent date was Newfoundland known to contain mineral deposits of great value. The first discovery of copper ore took place at a small fishing hamlet called Tilt Cove in 1857. Seven years later the mine was opened, and during the following fifteen years Tilt Cove mine yielded about 50,000 tons of copper ore valued at $1,572,154, besides nickel worth $32,740. In 1875 another mine at Bett's Cove was opened. There are three principal mines, all in Notre Dame Bay, the copper exports in 1905 being 81,491 tons, with a value of $448,400. The copper-bearing deposits are widely distributed. According to the geological survey reports, copper-bearing rocks have a development of over 5000 sq. m. throughout the island. Iron-mining, however, has far surpassed copper-mining, the chief centre being at Bell Island in Conception Bay. Hematite iron has been found at Exploits river, Fortune Harbour, New Bay and other parts in Notre Dame Bay. The iron exported in 1905 amounted to 635,350 tons with a value of $635,350. In 1895 the value of iron exports was nil. Of iron pyrites 68,970 tons were exported in 1905 valued at $410,514. Similarly in 1895 no slate was exported. It has since been worked at Trinity Bay, Bonavista Bay and Bay of Islands, the latter deposit being declared equal to the best Carnarvon slate. In 1905 14,750 tons were shipped. The existence of coal in the island has been known since Captain Cook first reported its discovery in 1763, but until lately little has been done to exploit it. The most important carboniferous region is at Grand Lake, St George's and the Codroy region directly opposite the Cape Breton coal-fields.

Zinc has been found in many localities, as also antimony, silver and gold. Asbestos is frequently found, and mica of good size has been discovered in the Laurentian rocks in the Long Range Mountains and in Labrador. At the mouth of the Humber are large deposits of marble. The valuable non-metallic materials include talc, gypsum, graphite, lithographic stone and manganese.

Shipping.—The total number of vessels sailing under Newfoundland registry on the 31st of December 1905 was 3049, with a net tonnage of 129,617 tons. Of these 66 were steamers. The statistics of foreign-going tonnage show a remarkable growth in trade. The bounty granted by the legislature has given a considerable impetus to local shipbuilding. Between 1900 and 1905 the average of vessels annually built in the colony was 105, with a total tonnage for the five years of 17,698. In 1904–1905 the total value of exports was $10,669,342, of imports $10,279,293. For the period of seven years preceding the exports exceeded the imports by $7,174,676 or a balance of trade in favour of the colony of over one million dollars annually.

Manufactures.—In 1874 there were only five saw-mills in the colony, producing 2111 ft. of timber. The census returns of 1901 showed 195 saw-mills valued at $292,790, employing 2408 persons and producing 43,648 ft. of timber, 16,197 of shingle and 2020 of laths, of a total value of $480,555. Paper-making from wood-pulp has been mentioned in connexion with *Flora*, above. Six tanneries in 1901 produced goods to the value of $98,200. There are boot and shoe, tobacco, nail, soap, furniture and carriage manufactories. The rope-walk in St John's produces rope and line valued at $300,000 annually.

Government.—Newfoundland is a British colony, directly dependent on the crown. Representative government and a constitution were granted to it in 1832, and "responsible government" in 1855. Two legislative chambers were appointed—the house of assembly, to be elected, and the legislative council, to be nominated by the governor in council. This form of government has worked satisfactorily. It consists of a governor who is appointed by the crown, and whose term of office is usually about six years; an executive council chosen by the party commanding a majority in the house of assembly, and consisting of seven members; a legislative council or upper house, of fifteen members nominated by the governor in council and holding office for life; and a house of assembly elected every four years by the votes of the people on a household suffrage basis. There are seventeen electoral districts sending thirty-six members to the house of assembly, all of whom are paid. The sessional allowances range from $194 to $291. The supreme court, instituted in 1826, is composed of a chief justice and two assistant judges. They are appointed by the crown, and hold their office for life. The jurisdiction of Newfoundland extends over the whole of the Atlantic coast of Labrador.

Finance.—Duties levied on imports form the basis of the revenue. The tariff being intended for the cost of government and not for industrial protection, the duties are not as a rule differential, being partly *ad valorem*, partly specific.

There is no direct taxation, and there are no city or town corporations. The customs revenue grew from $840,936 in 1885 to $2,295,959 in 1905. The public debt increased from $2,149,597 in 1885 to $22,043,338 in 1905, against which there was a sinking fund of $300,244. The debt of St John's municipal council, $1,187,221, on which full interest is paid to the government, must be credited to the gross public debt. In December 1905 a new loan of $636,903 was floated in England. Based on the value of the exports the earning capacity of the population increased from $29 per head in 1885 to $47 per head in 1905. The postal and telegraph revenue amounted in 1905 to $125,000, having more than doubled in a decade. The crown lands revenue, which in 1895 was $5500, stood in 1905 at $41,357. With the United Kingdom, trade, which in 1888 was 38 % of the whole, steadily diminished in volume, until it was in 1905 only 22 % of the whole. Trade with

America in this period showed an increase of 128·5% and that with Canada 76·1%.

The Reid contract.

Roads and Railways.—Railways play a unique part in the modern history of the island. Not until 1825 was the first road made; it was 9 m. in length, from St John's to Portugal Cove. When representative government was established in 1832 an annual grant was voted for roads and bridges, and of late years not less than $100,000 per annum has been expended on this head. There are now over 1000 m. of postal roads, and over 2000 of district roads. In 1880 after much agitation the legislature finally agreed to raise a loan of £1,000,000 for the construction of a railway from St John's to Hall's Bay, with branches to Brigus and Harbour Grace, the distance being estimated at 340 m. In November 1884 the line was completed for traffic as far as Harbour Grace. In the following year the construction of a line, 27 m. in length, from Whitbourne to Placentia, the old French capital, was begun and finished in 1888. Shortly afterwards it was decided to resume the line northwards from St John's to Hall's Bay (which, owing to the failure of the contractors, had been discontinued) with a view ultimately to a transinsular railway. The tender of a well-known contractor, Mr R. G. Reid of Montreal, was accepted, and the work was begun in October 1890. But before the contractor had proceeded far with the Hall's Bay line a new survey was made and another route determined for the proposed transinsular railway, westwards from the valley of the Exploits, which was regarded as much more favourable than the one originally contemplated. It traversed the Exploits and Humber valleys, passing through the most fertile territory in the island, to the Bay of Islands on the west coast; hence it skirted Bay St George and the Codroy valley and terminated at Port-aux-Basques, a commodious harbour 93 m. distant from Sydney, Cape Breton. The new route was chosen, and a contract signed on the 16th of May 1893, whereby the contractor was to be paid $15,600 per mile in Newfoundland bonds, the whole line to be completed in three years. At the same time, in order to provide for the working of the line, it was agreed between the colonial government and Mr Reid that the latter should maintain and work it, as well as construct a system of telegraphs, for a period of ten years from the 1st of September 1893 at his own expense, in consideration of a "grant in fee simple to the contractor of 5000 acres of land for each one mile of mail line or branch railway to be operated." Should the line, therefore, be 500 m. in length the land grant would be 2,500,000 acres, to be situated on each side of the railway in alternate sections of 1 or 2 m. in length with the railway, and 8 m. in depth, the colony also retaining an equal amount of land with the contractor along the route. Much hostile criticism was subsequently directed towards this arrangement. In 1898 a new proposal was made by Mr Reid, under the terms of which he undertook to work all the railways in the island for a period of fifty years, free of cost to the government, provided that, at the termination of the said period, the railways should become his own property. He was also to receive a further concession of land to the extent of 2,500,000 acres on terms similar to those contained in the former contract. Mr Reid agreed to build and run seven steamers, one in each of the large bays, and one to ply in Labrador in summer, to provide an electric street railway for St John's, and also to pave a certain portion of the capital. The colony was to part with the telegraph system to the contractor, who was to acquire at a fixed price the government dry-dock at St John's. On the other hand, to complete the bargain, $1,000,000 in cash was to be paid by the contractor to the government within a year after the signing of the contract. This remarkable covenant, which was afterwards characterized by Mr Chamberlain, secretary of state for the colonies, as a transaction "without parallel in the history of any country," was nevertheless ratified by the legislature, and submitted to the governor, Sir Herbert Murray, for his approval. The governor declined to append his signature to the instrument, but upon its being referred to the imperial secretary of state, it was decided that the arrangement was one relating exclusively to the colony, and this being the case, that it would be "an unwarrantable interference with the rights of a self-governing colony" to disallow the measure. The Reid contract was therefore signed by Sir Herbert Murray before relinquishing his post early in 1898. Meanwhile considerable feeling had been manifested in the colony; numerous public meetings in support of the governor's action were held; and several petitions were despatched to England; but it was not until the spring of 1900 that Sir James Winter and his colleagues were forced to resign on account of the opposition which had been engendered. The general election brought a Liberal, Mr (afterwards Sir) Robert Bond, into power; and he had hardly assumed office when the contractor approached the ministry with further proposals to convert his property into a limited liability company with a capital of £5,000,000 sterling, for which proceeding the consent of the legislature was necessary, under the terms of 1898. Mr Bond refused unless a modification of the contract was agreed to. The modifications demanded were—that the telegraphs should revert at once to the government; that the land grants, which included a large amount of private property, should be readjusted so as to conserve the rights of those whose holdings had been confiscated; also, that it should be optional for the colony to take over the railways at the end of fifty years by paying back the sum of $1,000,000 with interest, the amount paid by Mr Reid to the colony; and a sum to be arrived at by arbitration for all improvements that may have been made on the property within the fifty years. After considerable dispute these terms were substantially agreed to, and the conversion into a company took place.

Discovery.

Early colonizing.

History.—Newfoundland, commonly termed the "senior colony" of Great Britain, antedates in discovery (though not in continuous settlement) any other British over-sea dominion. John Cabot, sailing from Bristol in 1497, appears to have made landfall at Bonavista and claimed the whole country for Henry VII. Three years later Gaspar Corte-Real, ranging the North American coasts, discovered and named Conception Bay and Portugal Cove, and was appointed Portuguese governor of Terra Nova. The long series of annual trans-Atlantic expeditions followed upon the voyages of Cabot and Corte-Real, and their reports in England, Portugal and France concerning the multitude of fish in Newfoundland. For a long time it was supposed that the English fishermen did not avail themselves to any extent of these advantages until the middle of the 16th century, but this is now shown to be erroneous. Mr Prowse states that the trade during the first half of the century was both "extensive and lucrative." In 1527 the little Devonshire fishing ships were unable to carry home their large catch, so "sack ships" (large merchant vessels) were employed to carry the salt cod to Spain and Portugal. An act of 1541 classes the Newfoundland trade with the Irish, Shetland and Iceland fisheries. Hakluyt, writing in 1578, mentions that the number of vessels employed in the fishery was 400, of which only one-quarter were English, the rest being French and Spanish Basque. But in the same year, according to Anthony Parkhurst, "the English are commonly lords of the harbours where they fish and use all help in fishing if need require." Shortly thereafter England awoke to the importance of Cabot's great discovery, and an attempt was made to plant a colony on the shores of the island. Sir Humphry Gilbert, provided with letters patent from Queen Elizabeth, landed in St John's in August 1583, and formally took possession of the country in the queen's name. The first attempt at colonizing was frustrated by the loss of Gilbert soon afterwards at sea. In 1610 James I. granted a patent to John Guy, an enterprising Bristol merchant, for a "plantation" in Newfoundland; but no marked success attended his efforts to found settlements. In 1615 Captain Richard Whitbourne of Exmouth in Devonshire was despatched to Newfoundland by the British admiralty to establish order and correct abuses which had grown up among the fishermen. On his return in 1622 he wrote a "Discourse and Discovery of Newfoundland Trade" which King James, by an order in council, caused to be distributed among the parishes of the kingdom "for the encouragement of adventures unto plantation there." A year after the departure of Whitbourne, Sir George Calvert, afterwards the first Lord Baltimore, obtained a patent conveying to him the lordship of the whole southern peninsula of Newfoundland, and the right of fishing in the surrounding waters. He planted a colony at Ferryland, 40 m. north of Cape Race, where he built a handsome mansion and resided with his family for many years. The French so harassed his settlement by incessant attacks that he at length abandoned it.

Fishery policy.

In 1650, or about a century and a half after its discovery, Newfoundland contained only 350 families, or less than 2000 individuals, distributed in fifteen small settlements, chiefly along the eastern shore. These constituted the resident population; but in addition there was a floating population of several thousands who frequented the shores during the summer for the sake of the fisheries, which had now attained very large dimensions. So early as 1626, 150 vessels were annually despatched from Devonshire alone; and the shipowners and traders residing in the west of England sent out their ships and fishing crews early in summer to prosecute these lucrative fisheries. The fish caught were salted and dried on the shore; and on the approach of winter the fishermen re-embarked for England, carrying with them the products of their labour. Hence it became the interest of these traders and shipowners to discourage the settlement of the country, in order to retain the exclusive use of the harbours and fishing coves for their servants, and also a monopoly of the fisheries. They were able to enlist the British government of the day in their project, and stringent laws were passed prohibiting settlement within 6 m. of the shore, forbidding fishermen to remain behind at the close of the fishing season, and rendering it illegal to build or repair a house without a special licence. The object of this short-sighted policy, which was persisted in for more than a century, was to preserve the island as a fishing station and the fisheries as nurseries for British seamen.

Treaty of Utrecht.

There was, however, another element which retarded the prosperity of the country. The French had early realized the immense value of the fisheries, and strove long and desperately to obtain possession of the island. Their constant attacks and encroachments harassed the few settlers, and rendered life and property insecure during the long wars between England and France. When at length, in 1713, the treaty of Utrecht ended hostilities, it did not deliver Newfoundland from the grasp of France, as it yielded to her the right of catching and drying fish on the western and northern sides of the island. Though no territorial rights were conferred on the French, and the sovereignty was secured to England, the practical effect was to exclude the inhabitants from the fairest half of the island.

First governor.

In spite of the restrictive regulations, the number of the resident population continued to increase. The sturdy settlers clung to the soil, and combated the "adventurers" as the merchants were called, and after a lengthened conflict obtained freedom of settlement and relief from oppression. But the contest was severe and prolonged. The merchant-adventurers strenuously opposed the appointment of a governor; but at length, in 1728, the British government appointed Captain Henry Osborne first governor of Newfoundland, with a commission to establish a form of civil government. This constituted a new era in the history of the colony. In 1763 the fixed inhabitants had increased to 8000, while 5000 more were summer residents who returned home each winter. In 1763 the coast of Labrador, from Hudson's Strait to the river St John opposite the west end of the island of Anticosti, was attached to the governorship of Newfoundland. The population in 1785 had increased to 10,000. During the wars between England and France which followed the French Revolution, Newfoundland attained great prosperity, as all competitors in the fisheries were swept from the seas, and the markets of Europe were exclusively in the hands of the merchants of the country. The value of fish trebled, wages rose to a high figure, and in 1814 no less than 7000 emigrants arrived. The population now numbered 80,000. In 1832 representative government was granted to the colony, and provision was made for education. In 1846 a terrible fire destroyed three-fourths of St John's and with it an enormous amount of property; but the city rose from its ashes improved and beautified. In 1855 the system of responsible government was inaugurated. In 1858 the first Atlantic cable was landed at Bull Arm, Trinity Bay.

Recent history.

Unproductive fisheries, causing a widespread destitution among the working classes, marked the first eight years of the decade between 1860 and 1870. A system of able-bodied pauper relief was initiated to meet the necessities of the case but was attended with the usual demoralizing results. The necessity of extending the cultivation of the soil in order to meet the wants of the growing population was felt more and more as the pressure arising from the failure of the fisheries showed their precarious nature more sensibly. In 1864 copper ore was discovered in the north, and mining operations were successfully initiated. In 1869 a series of successful fisheries began which enabled the government to terminate the injurious system of able-bodied pauper relief. In 1871 the revenue rose to $831,160. In 1873 direct steam communication with England and America was established.

French claims.

By the treaty of Utrecht of 1713 a right was reserved to French subjects to catch fish and to dry them on that part of Newfoundland which stretches from Cape Bonavista to the northern part of the island and from thence coming down by the western side reaches as far as Pt. Riche. By the treaty of Versailles of 1783 France renounced the fishery from Bonavista to Cape St John on the east coast, receiving in return extended rights upon the west coast as far as Cape Ray. Neither treaty purported to grant exclusive right, but there was annexed to the treaty of Versailles a declaration to the effect that "His Britannic Majesty will take the most positive measures for preventing his subjects from interrupting in any manner by their competition the fishery of the French during the temporary exercise of it which is granted to them upon the coasts of the island of Newfoundland, and he will for this purpose cause the fixed settlements which shall be formed there to be removed." Upon this declaration the French founded a claim to exclusive fishing rights within the limits named. A convention was entered into with a view to defining these rights in 1854, but it remained inoperative, the consent of the Newfoundland legislature, to which it was made subject, having been refused. Meanwhile the French government granted a bounty to the French fishermen which enabled them to undersell the colonists.

Bait Act.

In 1884 a convention which had been arranged between the British and French governments was submitted to the colonial administration by its promoters Sir Clare Ford and Mr E. B. Pennell, C.M.G., but without commanding the support of the Newfoundland government. In the year following, on a change of ministry in the colony, the Ford-Pennell convention was again offered to the Newfoundland legislature in a slightly amended form, but the joint committee of the colonial house of assembly and the council absolutely refused to ratify the arrangement unless the French government would consent either to annul or to amend the system of bounties paid upon French-caught fish in Newfoundland waters. At the same time, to counteract the effect of these bounties, which pressed very hardly upon the British competition, a Bait Act was framed and carried in 1886, empowering the executive to prohibit the capture in Newfoundland waters for exportation or sale of bait fishes, except under special licence to be issued by the colonial government. The consequence of this measure, were its provisions properly enforced, would be to place an embargo upon the local supply of bait requisite to the French fishermen—the so-called "metropolitan fleet"—on the Grand Banks. Upon being apprised of this enactment, the French government immediately demanded that Great Britain should deny its sanction to this Newfoundland Bait Act, and pressed their objections with such persistence as to induce Lord Salisbury to disallow the measure. Nevertheless, the despatch of the governor, Sir William des Voeux, to the colonial secretary, Sir H. Holland, was so entirely in favour of the principle of the bill that the Newfoundland authorities became imbued with a fixed determination to urge forward the measure for imperial acceptance. In 1887, therefore, a delegation, consisting of Sir Robert Thorburn, the premier, and Sir Ambrose Shea, visited England at a moment most propitious for obtaining the sympathy and support of the imperial government and the press and people of the mother country, it being the jubilee year of Queen Victoria's accession to the throne. A conference of colonial premiers was one of the notable events distinguishing that happy period, and the subject was argued before the conference at considerable length. The claim set up by the senior colony "to control and legislate for her own fisheries" met with general approval, the single dissentient being the representative of Canada, who feared that Canadian fishermen would suffer under the bill. When an assurance was tendered that Canada's fishermen would be placed upon the same footing with those of Newfoundland, the British government somewhat reluctantly sanctioned the Bait Act. The stipulation was made, however, that it should not be enforced until the spring following (1888). In the meantime the chagrin of the French Foreign Office at the failure of the Ford-Pennell negotiations, and the hostile attitude taken up by the Newfoundlanders in what they deemed to be the conservation of their interests, induced M. de Freycinet to devise retaliatory measures. Instructions were issued "to seize and confiscate all instruments of fishing belonging to foreigners resident or otherwise, who shall fish on that part of the coast which is reserved to our use." Lord Rosebery, then foreign secretary, protested to the French ambassador against the spirit of these instructions, which he insisted were in direct contravention of the treaty, inasmuch as they ignored the concurrent as well as those sovereign rights of Great Britain which France solemnly undertook by the treaties never to question or dispute. Nor were other opportunities soon wanting to the French to retort severely upon the Newfoundland authorities for their passage of the Bait Act, as well as to repair in large measure the injury which that act promised to inflict upon the French industry. About 1874 a Nova Scotian named Rumkey had established the first factory for the canning of lobsters on the west coast. This concern proved profitable, and others sprang up, until, at the close of the season of 1887, Captain Campbell, R.N., reported that twenty-six factories were at work, employing about 1100 hands. It was at that time understood that this was an industry which, by the very nature of the process and the permanent shore structure it involved, the French were disqualified from pursuing. So clearly was this recognized that in 1886, when Commander Browne of H.M.S. "Mallard" reported the existence of a French lobster factory at Port-aux-Choix, a substantially-built structure, roofed with corrugated iron, the French authorities conceded that the establishment was in violation of the treaties, and issued orders for its removal. But this conciliatory policy was of brief duration. The year of the Bait Act's first successful application was marked by the stoppage, by order of the French government, of Messrs Murphy and Andrew's lobster factory, and by their contention that the lobster-canning industry formed a part of the privileges conceded under the treaties to the French, whose participation by the British fishermen would be forcibly resisted.

An exchange of notes took place between Lord Salisbury and M. Waddington, the French ambassador, in which the latter expressed an opinion which evoked a spirited protest on the part of the British Foreign Office. "France," it was then declared, "preserved the exclusive right of fishing she always possessed. This right of France to the coast of Newfoundland reserved to her fishermen is only a part of her ancient sovereignty over the island which she retained in ceding the soil to England, and which she has never weakened or alienated." This claim of the French to an exclusive fishery was held to be wholly untenable, and their classification of the lobster catching and canning industry as amongst the "fishing" privileges granted them by the treaty was denounced as contrary to both letter and spirit of that instrument. Notwithstanding this, the French agents on the treaty shore clamoured for the removal of several of the British factories, which (it was declared) interfered with the exclusive fishing rights of the French. The French government also voted (1888) a special bounty for the establishment of lobster factories by their subjects on the treaty coast. Pending a settlement, the British foreign office deemed it expedient, in order not to give offence to France, to invest the French claims with a semblance of right by issuing instructions to British naval officers on the North American station to continue to interpret and enforce the treaties with regard to the Newfoundland lobster-canning industry on the same terms as they had done hitherto with regard to the cod-fishery. Acting under a statute passed in the reign of George III., empowering British naval officers to interpret and enforce the treaties, Sir Baldwin Walker and others proceeded to destroy or remove a number of British factories at the request of the French agents. In 1890 the unexpected discovery was made that the act empowering British naval officers to enforce the provisions of the treaties with France had expired in 1832 and had never been renewed. Consequently all the proceedings of which the colonists had been the victims were illegal. One of them, Mr James Baird, immediately took proceedings against Sir Baldwin Walker in the supreme court, which decided in his favour, mulcting the admiral in £1000.

***Modus vivendi* 1890.**

On an appeal to the privy council the decision was upheld. But before this incident had taken place, the controversy between London and Paris culminated in the *modus vivendi* of 1890, by which the lobster factories, both British and French, which were in existence on the 1st of July 1889, were to continue for the present. Instantly the colony took alarm, and a deputation consisting of the island's leading men was sent to England to protest against both the principle and practice of such an arrangement. On their return they learnt that it was the intention of the imperial government to re-enact *verbatim et literatim* the act for the enforcement of the treaties which had expired fifty-nine years previously. To prevent such an occurrence, delegates from both parties in Newfoundland visited London in April 1891, and, appearing at the bar of the House of Lords, promised that if the measure which was then on the eve of being introduced into that body were withdrawn, a temporary measure would be passed by the Newfoundland legislature which would answer the same purpose of enabling Great Britain to carry out her treaty obligations with France. The hope then generally entertained was that the whole question of French rights in the colony would soon be the subject of definite negotiations looking to their total extinguishment. That hope was, however, not speedily realized. For a number of years the Modus Vivendi Act was annually passed by the legislature, each year under protest, the conviction gaining strength in the colony that the imperial government was averse from renewing negotiations with France.

In 1898 the secretary of state, Mr Chamberlain, yielding to the urgent request of the senior colony, despatched a commission consisting of Sir J. Bramston and Sir James Erskine, with Lord Westmeath as secretary, on a tour of investigation along the treaty shore; and the report which the royal commissioners made (though not published) touched all points of the unhappy dispute. Again, in 1901, on a suggestion put forward by the colony, Mr Chamberlain summoned Sir Robert Bond, the Newfoundland premier, and a colleague, Sir E. P. Morris, to London, for a new conference on the French shore question, in which Lord Lansdowne, the foreign secretary, participated. Nothing coming of this, the Modus Vivendi Act continued to be passed annually. In 1901 a fresh attempt was made to effect a settlement, but the negotiations were again unsuccessful, as the colony declined to make concessions in regard to the sale of bait unless the French system of bounties on the sale of fish by their citizens were abandoned or at least modified in important particulars. Later in the same year negotiations were begun between the British and French governments for a general treaty, in which all outstanding matters of dispute between the two countries should be for ever settled. As regards Newfoundland, the discussion of the French fishery question on the basis of arrangement in the matter of bait and bounties having proved unavailing, it was proposed not to persist further in it, but to put before the French government an arrangement which would terminate the rights of French fishermen to land and dry their fish on the shores of the island, but leave a concurrent right of fishery, the regulation and policing of which would be in the manner provided in the North Sea Fishery Convention of 1881 and the convention of 1887.

Convention of 1904.

On the 8th of April 1904 the Lansdowne-Cambon Convention was signed, which effected a final settlement of the French shore question. For the total abandonment of the French rights compensation was clearly not only due to the individuals actually engaged in the fishing industry, but to the French nation at large. Territorial concessions were therefore made consisting of a modification of the Anglo-French boundary line in the Niger and Lake Chad district, and a re-arrangement of the Gambia-Senegambia frontier, giving Yarbatenda to Senegambia. The Los Islands opposite Konakry Island were likewise ceded to France. Provision was made for the reciprocal recognition, on the convention coming into force, of a British consul at St Pierre and a French consul at St John's. Claims for indemnity were duly submitted to an arbitral tribunal, composed of an officer of each nation; and at length what is known as the Lyttelton Award, was made as follows:—

General award for French rights	$255,750
Loss of occupation	226,813
Effects left by the French on treaty coast	28,936

So far as concerned the French, an end was thus put to a situation on the treaty shore, which for nearly two hundred years had given rise to difficulties and anxieties.

American fishing rights.

Scarcely, however, had a year elapsed from the signing of the convention, when another international disagreement connected with the fisheries assumed grave importance. There had long been intense dissatisfaction in the colony over the attitude of the American government and American fishermen towards the colony. The action of the American Senate in rejecting the Bond-Hay treaty negotiated in 1902 stirred the colonial government to retaliatory measures. By virtue of the treaty of 1818 American fishermen enjoyed the following rights: (1) to take fish of every kind on that part of the southern coast of Newfoundland which extends from Cape Ray to Ramea Islands; (2) to take fish of every kind on the western and northern coasts of Newfoundland from the said Cape Ray to the Quirpon Islands; and (3) to take fish of every kind on the coasts, bays, harbours and creeks from Mount Joly to the southern coast of Labrador, to and through the straits of Belle Isle, and thence northward indefinitely along the coast. Subject to these limitations American fishermen have a right in common with British fishermen to prosecute their industry within those areas.

The foregoing embraces the whole of their fishing privileges. Every other right that they ever possessed they renounced under the treaty in the following language: "The United States hereby renounce for ever any liberty heretofore enjoyed or claimed by the inhabitants thereof, to take, dry or cure fish on or within three marine miles of any of the coasts, bays, creeks or harbours of His Britannic Majesty's dominions in America not included in the above limits." This renunciation contained but one qualification: "that American fishermen shall be permitted to enter such bays or harbours for the purpose of shelter and of repairing damages therein, of purchasing wood, and of obtaining water and for no other purpose whatever."

Modus vivendi, 1906.

Under the Newfoundland Foreign Fishing Vessels Act of 1893 the governor in council was authorized to issue licences to foreign fishing vessels, enabling them to enter any port on the coasts of the island to purchase bait, ice, supplies and outfits for the fishery, and to ship crews. In 1905 this act was repealed and another passed by the colonial legislature imposing certain restrictions on American vessels, and a further more stringent act in 1906, preventing Newfoundlanders from joining American vessels. These acts were resented by the American government, which, through Mr Secretary Root, called upon the British government to disallow such interferences on the part of the Newfoundland legislature. Lord Elgin's reply was to suggest a *modus vivendi* pending further discussion of the questions at issue. In spite of the colony's energetic protest, a *modus vivendi* was agreed to in October 1906, whereby the Foreign Fishing Vessels Act of 1906 was held in abeyance, and the act of 1905 was held not to apply to American fishing vessels, and light dues were waived, while on the other hand American vessels were to report at the custom house on entry for clearance, and their fishermen were to comply with colonial fishery regulations. As regards Sunday fishing by the Americans, which was an important colonial grievance, the American government consented to waive it, if the use of purse seines by American fishermen were allowed. Lord Elgin's action was considered to be an interference with the internal affairs of the colony and great public indignation was aroused. Retaliatory measures were resolved upon, Newfoundland fishermen being declared liable to fine and imprisonment for selling bait to the Americans or for joining American vessels. The legislature voted an address to the imperial government, protesting against the *modus vivendi*, and this was carried to England in 1907 by Sir Robert Bond, the premier of the colony, but without avail. The matter was referred to the Hague tribunal for arbitration, and pending this the *modus vivendi* (agreed to in 1908) continued in force. The tribunal gave its award in September 1910, the two main points at issue being decided as follows: (*a*) Great Britain had the right to make regulations as to the fisheries without the consent of the United States, subject to the provisions of the treaty of 1818. (*b*) The "three-mile limit" in bays (subject to special judgment in individual cases) was to be taken from a line across the bay at the point, nearest the entrance, where a width of ten miles is not exceeded. Among other provisions it was decided that American vessels might employ foreign hands (but these received no benefit under the treaty); also that they might be required to report to customs houses if facilities to do so existed.

Commerce received a shock, but derived a salutary lesson from bank failures which occurred in December 1894. The Union and Commercial banks suspended payment, followed by the suspension of the savings bank, a government institution. This at once lowered the credit of the colony abroad, and caused the utmost misfortune amongst all classes. There is little doubt but that a principal cause of the disaster was the vicious and dangerous system of credit which had been followed by the merchants in their dealings with the "planters" and commission merchants. The insolvent institutions were speedily replaced by branches of three prominent Canadian banks, and a loan of $1,000,000 procured in London by Mr Bond soon after the debacle served to tide the senior colony over its financial difficulties. A new era of prosperity has since set in.

In politics, apart from the matters already alluded to, there occurred in 1893 the filing of petitions under the Corrupt Practices Act to unseat Sir William Whiteway and his colleagues, who had been successful at the general election of that year. The charges created no little interest in England, and the new government was subjected to much unfair criticism, arising largely from a misapprehension of the political and administrative conditions in the colony. They were examined in detail by the supreme court, which finally pronounced them unsustained, and the Whiteway government resumed office after a brief period of abdication. On the whole, it may be said that Newfoundland has passed the critical stage in her history. Between 1863 and 1900 it has been estimated that $12,000,000 worth of copper ore has been exported, and since 1898, when a discovery of iron ore made at Bell Island, Conception Bay, led to important results, the belief in the island's mineral resources, long entertained by geologists, received practical corroboration.

In 1900 the British admiralty, acting upon the repeated suggestions of Sir Charles Dilke and others interested in the manning of the navy, decided to initiate a branch of the imperial naval reserve in the colony. In 1901 a difficulty arose as to paying the men, owing to the lack of any provision for that purpose in the Imperial Reserves Act under which they were enlisted. The colony was asked to bear the cost; its refusal was followed (1902) by the enactment of special legislation rendering the enrolment and maintenance of the reserves in Newfoundland a special imperial undertaking. Several efforts had been and continued to be made to induce Newfoundland to confederate with the Dominion of Canada, but the project never met with any degree of favour with the electorate. Much of the disfavour with which confederation was regarded in the colony was said to be due to Sir John Macdonald's opposition on behalf of Canada to the Bond-Blaine commercial treaty, which was negotiated between an emissary from the government of Newfoundland and Mr Blaine, then secretary of state of the United States of America, in 1890, but was subsequently disallowed at his request by the imperial government. It is, however, probable that the treaty would never have received the sanction of the American Senate. After the insolvency of the colony in 1894–1895, a delegation was sent to Ottawa to ascertain if it were possible to arrange terms of confederation; but Sir Mackenzie Bowell's government objected to the assumption by the Dominion of the entire amount of Newfoundland's debt ($16,000,000), and the negotiations were abandoned.

Projects for union with Canada.

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NEW GLARUS, a town and a village of Green county, Wisconsin, U.S.A., about 22 m. S.W. of Madison, on the Little Sugar river, a branch of the Rock river. Pop. of the town (1890) 1180; (1900) 1245; (1905) 685; (1910) 627; of the village, which was separated from the town in 1901 (1905) 665; (1910) 708. New Glarus is served by a branch of the Chicago, Milwaukee & St Paul railway. It has agricultural and dairying industries, but little or no manufacturing interests. It had its origin in a colonizing experiment made by the canton of Glarus, Switzerland in 1845. Agents sent by the canton chose the site of New Glarus largely because the rocky slopes of the valley suggested their Alpine home. The advance party then set about constructing houses and sent for the colonists; and some two hundred men, women and children started from Glarus in April 1845 under two leaders chosen by popular vote; misreading their directions the party got by mistake to St Louis, whence they proceeded up the Mississippi to Galena and thence overland to their new home. To all intents and purposes they were an independent people. They expected to be and were self-sustaining, and for a generation or more retained their exclusiveness to a remarkable degree. They brought with them a "form of government" drawn up by the Cantonal Council of Glarus and providing in great detail for a system of schools, for what was practically a state church (Reformed Lutheran) supported by tithes, for a system of poor relief, for a system of courts, and for a set of town officers elected on a limited property franchise. This "form" was to be amended and new laws were to be added, as circumstances should require, in a town-meeting in which the essential features of the referendum were observed. The original plan provided also for an equitable distribution of land so as to give to each head of a family pasture, timber and farm lands. With such adjustments as were found necessary for co-ordination with the town and county governments of Wisconsin, it remains practically the same to this day. The village and town still have an Old World aspect, and the architecture, customs, style of dress and language of the pioneers still persist to a great degree. A famous organization is the New Glarus William Tell Club of sharpshooters. The village owns its waterworks and its electric lighting plant.

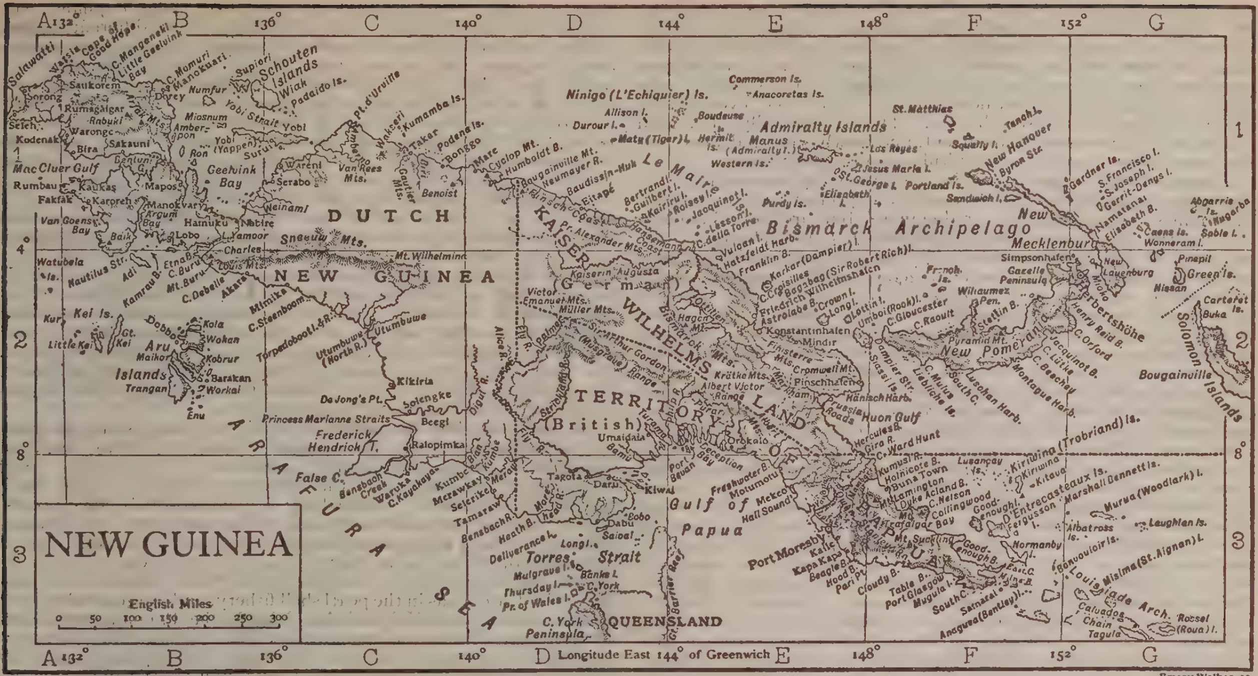
NEW GLASGOW, a manufacturing and mining town of Pictou county, Nova Scotia, Canada, on the East river, near its entrance into Pictou Harbour, and the Intercolonial railway, 104 m. N.E. of Halifax. Pop. (1901) 4447. Extensive coal mines are in the vicinity, and there are manufactures of iron and steel, mill machinery, door and sash factories, &c., as well as several shipbuilding yards.

NEW GRANADA (Span. *Nueva Granada*), the title under Spanish colonial administration of that part of South America now known as the republic of Colombia, which at one time was extended to include Venezuela and Ecuador. It also was for a time the title of the united territories of Panama and Colombia under republican auspices. The Bogotá plateau, then inhabited by a partly civilized Indian nation known to the Spaniards as Chibchas, or Muyscas (the second name seems to have been applied to them through a misunderstanding, the word meaning "men"), was invaded from the Caribbean coast and conquered in 1537 by Gonzalo Jiménez de Quesada, who, in honour of his native province, called it the "Nuevo Reino de Granada." The title at first applied only to the plateau regions of Colombia, as the coast provinces had been previously occupied and named. In 1550 an *audiencia real* under the viceroyalty of Peru was established at Santa Fé (Bogotá), but in 1564 this isolated group of Spanish settlements was transformed into a presidency. In 1718, owing to the unmanageable size of the viceroyalty of Peru, it was divided and a new viceroyalty was created from the various provinces lying in the north-western angle of the continent, extending from Tumbez northward to the northern limits of Panama, and eastward to the Orinoco, to which the name of Nueva Granada was given. The first viceroy was Pedroza y Guerrero, but his successor, Jorge Villalonga, resumed the title of president, and it was not until 1739 that the title of viceroy was definitely established. The new viceroyalty included the provinces of Tierra Firma (now the republic of Panama); Maracaibo, Caracas, Cumana and Guyana (now included in Venezuela); Cartagena, Santa Marta, Rio Hacha, Antioquia, Pamplona, Socorro, Tunja, Santa Fé, Neiva, Mariquita, Popayan and Pasto (now included in Colombia); and Quito, Cuenca and Guayaquil (now included in Ecuador). In 1777 the provinces of Maracaibo, Caracas, Cumana and Guyana were detached from the viceroyalty to form the captaincy-general of Caracas; otherwise it remained as above until the termination of Spanish rule in South America.

For the republic of Colombia (1819–1830), the republic of New Granada (1831–1861), the United States of Colombia (1861–1886), and the republic of Colombia (1886 to date), see Colombia.

NEW GUINEA, the largest island (excluding Australia) in the world, lying between the equator and 12° S. and 130° 50′ and 151° 30′ E., separated from Australia by Torres Strait and having the Arafura Sea on the south-west. It is divided politically between Britain (south-east), Germany (north-east) and Holland (west), the Dutch territory occupying about 48·6% of the whole area, the German 28·3% and the British Territory of Papua 23·1%. The total area is estimated to be 312,329 sq. m.

New Guinea was probably in Miocene times, if not later, united to the northern part of Queensland. The deeply indented shore of the Gulf of Papua forms the boundary of the subsided area between the two countries, and from it the land stretches out for 200 to 300 m. north and west on both sides of the Fly river in vast plains, little elevated above sea-level. From Cape Buru westwards precipitous limestone cliffs, several hundred feet high, face the sea and rise into forest-clad mountains behind. The northern extremity of New Guinea is all but severed from the mainland by the deep MacCluer Inlet, running eastwards towards Geelvink Bay which deeply indents the northern coast. Southwards from Geelvink Bay the north-east coast is more regular than the south-western. Off its coast-line, on the parallel of 6° S., lies the vast Bismarck Archipelago, of which New Pomerania (Neu Pommern) is the most important member; and, on the parallel of 10°, the d'Entrecasteaux Islands, with the Marshall Bennett group to their north-east; while stretching out from the south-east promontory of the mainland is the Louisiade Archipelago. The Great Barrier Reef of Australia can be traced more or less continuously round the Gulf of Papua and along the south-east coast to the extremity of the Louisiades. In a general way it may be said that on the west coast of New Guinea, from Cape Buru to the Louisiades, the sea is shallow, while on its steeper eastern side the water close in-shore is often too deep


NEW GUINEA
English Miles
0 50 100 150 200 250 300
Longitude East 144° of Greenwich
132° 136° 140° 144° 148° 152°
4° 8°
DUTCH NEW GUINEA
KAISER WILHELMS LAND
TERRITORY (British)
Bismarck Archipelago
Admiralty Islands
Schouten Islands
Geelvink Bay
MacCluer Gulf
Aru Islands
Kei Is.
ARAFURA SEA
Gulf of Papua
Torres Strait
QUEENSLAND
C. York Peninsula
Port Moresby
Huon Gulf
New Pomerania
New Mecklenburg
New Hanover
Bougainville
Solomon Islands
d'Entrecasteaux Is.
Louisiade Arch.
Kiriwina (Trobriand) Is.
Murua (Woodlark) I.
Misima (St Aignan) I.
Rossel (Roua) I.
Tagula
Sneeuw Mts.
Mt. Wilhelmina
Charles Louis Mts.
Victor Emanuel Mts.
Finisterre Mts.
Albert Victor Range
Frederick Hendrick I.
Princess Marianne Straits
False C.
Fly R.
Kaiserin Augusta R.
Thursday I.
Pr. of Wales I.
Hatzfeldt Harb.
Friedrich Wilhelmshafen
Astrolabe B.
Finschhafen
Milne B.
Collingwood B.
Dampier Str.
Vitiaz Str.

Emery Walker sc

for safe anchorage. The islands on the southern margin of the Louisiade Archipelago are raised coral reefs, but the majority are mountainous, rarely, however, exceeding 3000 ft.; all of them are richly forested, but of little agricultural value. The volcanic d'Entrecasteaux Islands are mostly larger, more elevated (the highest being 8000 ft.), and stand in deeper water than the Louisiade group. To the east of Kiriwina (Trobriand) lies a small group of uniquely formed islets, each of which is completely surrounded by a steep forest-clad marginal rampart of coral 300 to 400 ft. high, concealing a depressed inhabited central plateau.

Starting in the southern extremity of New Guinea from an abrupt face some 3000 ft. high, and traversing its centre nearly parallel to both coasts, run high ranges of mountains, which, if not continuous, merge into each other in the same general direction. The Owen Stanley range-its highest summit, named by Huxley in 1850 Mount Owen Stanley, 13,120 ft.—the Albert Victor Mountains, the Sir Arthur Gordon range, and the Bismarck Mountains form a backbone united probably with the Sneeuw (Snowy) Mts., where perpetual snow was found by Dr. Lorentz in 1909 at 14,635 ft., and the height of Mt. Wilhelmina was fixed at 15,580 ft. This height may be exceeded by Mt. Carstensz. Other ranges, mostly of lower altitude, run parallel mainly to the east and west coasts. The most important and best-known rivers are the Amberno, in the north, discharging by a wide delta at Point d'Urville; the Kaiserin Augusta, which, rising in the Charles Louis range, and entering the Pacific near Cape della Torre, is navigable by ocean steamers for 180 m.; the Ottilien, a river of great length, which discharges into the sea a short distance south of the last named; and the Mambare, navigable by steam-launch for 50 m. which drains the eastern aspect of Wasigororo Mountains and enters the sea near the Anglo-German boundary. Below 8° S. the narrowness of the country precludes the existence of any very important rivers on either coast. The Purari, however, whose delta is 20 m. long by 20 broad, is navigable for 120 m. by steam-launch, while the Fly has been traversed by the same means for 500 and by a whale-boat for over 600 m. The latter drains an enormous tract of country, which is so little elevated above the sea-level that it can never be of any agricultural or commercial value. West of 141° E. the geographical features of the coast, except in the region of MacCluer Inlet and Geelvink Bay, are very little known, and those of the interior even less.

Geology.—The geology of British New Guinea is best known from the report of A. Gibb Maitland (*Ann. Rep.*, British New Guinea, 1891–1892; *Parl. Papers*, Queensland, 1893, C.A. 1. 53-85, with 3 maps and 3 plates; bibliography, p. 85), which shows that the axis of the territory is a high range, composed of slates and schists of undetermined age, with intrusive plutonic rocks. In the district around Port Glasgow, on the south coast of the eastern peninsula, are the Boioro limestones, also of unknown age; they are lead-coloured, brecciated limestones with interbedded dolerites. Some Cretaceous or Upper Jurassic rocks occur in the basin of the Fly river. The Port Moresby beds are Cainozoic. They are highly inclined, and occupy a large range of country along the south coast, and include the Macgillivray Range, to the north-east of Beagle Bay. They are marine and probably Miocene; and range up to the height of 800 ft. above the sea, approximately the same limit as in Victoria. The Kevori grits, and the raised coral reefs are upper Cainozoic, and perhaps Pleistocene; but the reefs occur inland up to a height of 2000 ft. and their range back in time has not been fixed. The volcanic series include the rhyolite of Nell Island, some obsidian, and the sheets of basalts which form the Cloudy Mountains, Mount Dayman and Mount Trafalgar (an active volcano), and also cover wide areas to the south and west of the Owen Stanley Range. Most of western British New Guinea consists of recent superficial deposits, in the basin of the Fly river. The Louisiade and the d'Entrecasteaux Islands consist of the same slates and schists as form the main axis of the eastern peninsula, and they are auriferous. The geology of the rest of New Guinea is imperfectly known. It appears to consist in the main of a continuation of an axis of old schists and slates, with granite intrusions, and flanked by coastal plains with Cretaceous or Jurassic, and Miocene beds, with Pleistocene sands and reefs and volcanic rocks. In the north-west coal deposits occur. Fergusson Island clearly shows remains of extinct craters, and possesses numerous hot springs, saline lakes and solfataras depositing sulphur and alum. In Murua (Woodlark I.) are quarries of the banded quartzite from which the best stone adzes found throughout south-east New Guinea are made. In Rossel Island (Roua or Arova) occur crystalline schistose and volcanic rocks, and in Misima (St Aignan) limestones and lavas in addition. Nearly all the rivers in New Guinea yield "colours" of gold, but only in the Louisiade Archipelago has enough been discovered to constitute the district a goldfield. No auriferous reefs have been found. Black magnetic iron sand covers the shore in Milne Bay. Coal has been observed in the Purari sandstones. In the Gira river the valuable alloy osmiridium has been discovered. Earthquakes are rare on the mainland, but not infrequent in Bismarck and d'Entrecasteaux archipelagos.

Climate.—Since the mountains as a rule traverse the island parallel to its coasts, the eastern shores have far less rain than the western. The amount which falls, chiefly at night, varies from 30 in. on some parts of the coast to 130 at others, and to a far greater but unknown amount in the mountains. Throughout the dry or cool season the wind blows steadily and almost uninterruptedly (except for an hour or so forenoon and afternoon) from the south-east. The temperature has an extreme range of from 72° to 95° F., with a mean of about 80°. At an elevation of 3000 ft. the climate is pleasantly cool; at 13,000 ft. ice forms in the night, but disappears with the heat of the sun. No snow is known certainly to fall, though it is alleged to have been seen from the sea lying on the summits of the Charles Louis range. Fever is very prevalent on the coasts, and even in the interior at 2000 ft. above the sea. Though generally of a mild character, it is persistently recurrent, and slowly saps and wears out the constitution; too often it is virulent and rapidly fatal.

Fauna.—New Guinea shares in the poverty in mammals of the Australian sub-region. Monotremes (2 species) and marsupials (4 families and 44 species) predominate, but are not abundant. Among the latter two genera, *Distaechurus* and *Dorcopsis*, are peculiar. A pig (*Sus papuensis*), a dingo, several species of mice (of which *Chiruromys* is a peculiar genus), a few squirrels, and a considerable number of *Chiroptera* (bats) inhabit the country. The island is specially remarkable for the number and beauty of its birds. The most recent lists record over 500 species as found in the Papuan area, and of these between 50 and 60 genera are peculiar to it. The birds of paradise, which are confined to the sub-region, give special celebrity to its fauna. Between 70 and 80 species have already been described, many of them the most gorgeously adorned, and others, such as the *Pteridophora albertisi*, the most wonderful of feathered creatures. They are absent from the Louisiades, but species occur in the d'Entrecasteaux Islands which have not been seen on the mainland opposite. The zoology of the Bismarck Archipelago is little known. The species of birds so far described from it number 178 (referable to 38 families), of which 74 are peculiar to it, though closely allied to Papuan forms. It contains, however, no *Paradiseidae*. The *Amphibia*, to which the sea is a barrier, are almost exclusively of Australian affinities. Turtles and tortoises are plentiful on the coast. *Ceratochelys insculpta* of the Fly river, a chelonian peculiar to New Guinea, is remarkable in having its nearest affinities (as have the Papuan tortoises) with South American species. Of the lizards, 3 of the 6 species of *Varanidae*, 16 of the 30 *Scincidae*, 8 *Geckonidae*, and 8 out of the 11 *Agamidae* are peculiar. Salamanders, toads and frogs are numerous, and crocodiles abound. Only 4 genera and 5 species of snakes are peculiar to New Guinea, many of them poisonous. Butterflies, moths and bees are very abundant, the former being remarkable for their size and splendid coloration; but these groups have not been investigated exhaustively enough to afford a correct idea of their number or their true affinities. Although the list of *Coleoptera* already known is long, it represents only a fraction of the species remaining to be discovered. The land molluscs show relationship with the Indian and the Malayan sub-regions; but many forms have here their centre, and have spread hence into Australia and the Pacific islands.

Flora.—Most of the foreshores of New Guinea are eucalyptus-dotted grass lands; in the interior dense forests prevail to a height of many thousand feet. Vast tracts of the country have been, however, deforested by fire, and these are covered by the tall ineradicable grass, *Imperata arundinacea*. So far the highest altitudes yet botanically investigated are those of the Owen Stanley range and the mountains in Kaiser Wilhelms Land, but of the flora of the highest range of all—the Charles Louis mountains—nothing is known. The vascular plants already described number about 1500 species. In the low and sub-mountainous lands the flora is a mixture of Malayan, Australian and Polynesian forms. There are, according to Müller, twice as many palms known from New Guinea as from Australia. The alpine flora, beginning at 6000 ft., is specially characterized by its rhododendrons, pines (*Araucaria* and *Libocedrus*), and palms, by numerous superb species of *Agapetes* (*Ericaceae*), and on the summits by an extraordinary association of species characteristically European (*Rubus*, *Ranunculus*, *Leontodon*, *Aspidium*), Himalayan, New Zealandian (*Veronica*), Antarctic and South American (*Drymus*, *Libocedrus*). Good pasture grasses are numerous, but pasture lands are limited. The usual tropical food-plants are cultivated. Tobacco has been found growing in the interior, and may be indigenous, as is in some districts the Kava pepper (*Piper methysticum*). At Dorey a cotton plant (*G. vitifolium*) grows wild, and is also cultivated.

Natives.—So large an area of New Guinea remains unexplored that it is impossible, except approximately, to state the number of its inhabitants, but probably 600,000 is under rather than over the mark. The people are broken up into numerous isolated tribes differing greatly in feature, colour and language. Ethnically they belong as a whole to the Melanesian division of the Indo-Pacific races. The predominant tribe are the Papuans (*q.v.*), who are found here in their greatest racial purity and occupy practically the whole island except its eastern extremity. The New Guinea native is usually of a negroid type with fine physique, but in the Arfak mountains in the north-west, and at points on the west and north coasts and adjacent islands, the very degraded and stunted Karons are found, with hardly the elements of social organization (possibly the aboriginal race unmixed with foreign elements), and resembling the Aetas or Negritos of the Philippines, and other kindred tribes in the Malay Archipelago. On the banks of the Fly river d'Albertis observed at least two widely differing types, those on its upper course bearing some resemblance to the tribes of the eastern coast. Here, wedged in among the ruder Papuans, who reappear at the extremity of the peninsula, a very different-looking people are found, whom competent observers, arguing from appearance, language and customs, assert to be a branch of the fair Polynesian race. But they are obviously of mixed blood. On the west coasts there is a semi-civilization, due to intercourse with Malays and Bugis, who have settled at various points, and carry on the trade with the neighbouring islands, in some of which, while the coast population is Malay or mixed, that of the interior is identical with the people of the mainland of New Guinea. On the west coasts Mahommedan teaching has also some civilizing effect. Many of the tribes at the west end of New Guinea are, at all events in war time, head-hunters, and in the mountains cannibals. Cannibalism, in fact, is practised here and there throughout New Guinea. The frequent hostility and mistrust of strangers are partly due to slave-hunting raids and ill-treatment by traders, but the different tribes vary much in character. Thus in the mountains of the north-west the Karons live by plunder, or by disposal of slaves or bird skins; while their neighbours the Kebars are a peaceful agricultural people. The mountain tribes are usually despised by their coast neighbours, but in the south of west New Guinea the coast people live in perpetual terror of their inland neighbours.

At Humboldt Bay the people are ready to trade, as are the tribes at Astrolabe Bay; here the Russian Miklucho Maclay lived for some time, and was favourably impressed by the natives. Still farther east, the plateaus of the Finisterre ranges are highly cultivated and artificially irrigated by a comparatively fair people. Many tribes in the south-west seem to be migratory. At Princess Marianne Straits tribes much wilder than those farther west, naked and painted, swarm like monkeys in the trees, the stems of which are submerged at high tide. But the Torres Straits islanders are employed by Europeans in the pearl shell fishery, and are good labourers; and in some of the Kei and Aru Islands the Papuan inhabitants form orderly Christian communities. The people of the south-east peninsula are generally far from ferocious. Englishmen, wandering inland and losing their way, have been found and brought back by them. Their manners are more courteous, their women better treated, than is usual with Papuans, but they show perhaps less ingenuity and artistic taste. Their children, in the mission schools, show much intelligence.

Exploration and Annexation.—Though probably sighted by Antonio d'Abreu, 1511, New Guinea was apparently first visited either by the Portuguese Don Jorge de Meneses, driven on his way from Goa to Ternate in 1526 to take shelter at "Isla Versija" (which has been identified with Warsia, a place on the N.W. coast, but may possibly be the island of Waigeu), or by the Spaniard Alvaro de Saavedra two years later. The name of "New Guinea" was probably given by Ortiz de Retez, or Roda, who in 1546 first laid down several points along the north coast. In the same and the two following centuries, though the coasts were visited by many illustrious navigators, as Willem Schouten and Jacob Lemaire, Abel Tasman, William Dampier, L. V. de Torres, L. A. de Bougainville and James Cook, little additional knowledge was gained. This was due first to the difficulties of the navigation, next to the exclusiveness of the Dutch, who, holding the Spice Islands, prevented all access to places east of them, and lastly to the stream of enterprise being latterly diverted to the more temperate regions farther south. The Dutch barrier was broken down by the arrival of Dampier and other "interlopers" from the east, and of emissaries from the (English) East India Company in search of spice-bearing lands. The voyage of Thomas Forrest (1774) in the "Tartar galley" of 10 tons, and his account of New Guinea (*Voyage to New Guinea and the Moluccas*, London, 1780), are still full of interest. New Guinea was actually annexed in 1793 by two commanders in the East India Company's service, and the island of Manasvari in Geelvink Bay was held for some months by their troops. After the peace of 1815 Dutch surveying expeditions to the west coasts became numerous, and in later times scientific explorers penetrated many of the unknown parts of Dutch New Guinea, such as A. R. Wallace (1856–1863), Odoardo Beccari (1871, 1875 and 1876), and Maria d'Albertis (1871–1878). Important expeditions were those of P. van der Crab, J. E. Teysmann, J. G. Coorengel, A. J. Langeveldt van Hemert and P. Swaan, undertaken for the Netherlands Indian government 1871–1872, 1875–1876 (reports published at The Hague in 1879); and of C. B. H. von Rosenberg in the Geelvink Bay districts in 1869–1870 (report published at The Hague in 1875). Subsequently to the visits of J. A. d'Entrecasteaux (1793) and Dumont d'Urville (1827–1840), the eastern coasts were surveyed by Captains F.P. Blackwood (1835), Owen Stanley (1848), Charles B. Yule (1864), and other British officers, including J. Moresby (1874). Among other explorers in this period the following may be mentioned: Nicholas von Miklucho Maclay in 1870, 1877 and 1879–1881, in the Astrolabe Bay district, &c.; the missionary, Rev. S. Macfarlane (1875, Fly river, &c.); about 1876–1880 the north-east coasts and adjacent islands were explored by the Rev. G. Brown and by Wilfred Powell, and in 1882 Dr Otto Finsch, whose name is well known in connexion with scientific work in New Guinea, made valuable explorations in the neighbourhood of Port Moresby and the Loluki river.

The surveys and reports of Captain Moresby in 1874 brought home to Queensland (and Australia generally) the dangers possible to her commerce were the coasts opposite to Torres Strait and the entrance to the splendid waterway inside the Barrier Reef to fall into the possession of a foreign power. By authority, therefore, of Queensland, the mainland of New Guinea, opposite her shores east of the 141st meridian, was annexed to that colony in 1883. But this action was disallowed by the British government as Yule's and Moresby's had been. Finally, however, in 1884 a British protectorate was authoritatively proclaimed by Commodore Erskine over the region "lying between the 141st meridian eastward as far as East Cape, with the adjacent islands as far as Kosman Island." German New Guinea was annexed on the 16th of November 1884, when the German flag was raised in Friedrich Wilhelmshafen and a trading company was established on the north-east coast, and in 1885 the two countries agreed to fix their boundaries through the then neutral areas of the country. The result of this was the assignation to Great Britain of the portion now known as the Territory of Papua (British New Guinea), lying between the extreme limits of 5° and 12° S. and 141° and 155° E. To Germany were assigned all the territory and islands to the north of the British boundary under the name of Kaiser Wilhelms Land, while all to the west of the 141st meridian remained under its old flag as Dutch New Guinea.

Since this period explorers and investigators have been almost constantly at work. There may be mentioned the work of the Rev. J. Chalmers on the coast of the Gulf of Papua (1893), and of officers of the German New Guinea Company in the ship "Ysabel" on the coasts and among the islands of the German territory; the expedition which crossed the south-eastern peninsula from Huon Gulf of which both the leaders, O. Ehlers and M. Piering, lost their lives (1895), the important German expedition under C. Lauterbach (1896), and the various explorations carried out by or at the instigation of Sir William MacGregor, including a crossing of the island from the mouth of the Mambare river to that of the Vanapa, and a second crossing in the reverse direction (1897). Ethnographical researches have been prosecuted by Messrs C. G. Seligmann and W. Mersh Strong, and others. The reports of travellers and of various missionary societies have thrown a great deal of light on the natural history of the island, on its resources, and the islanders.

British New Guinea

The British Territory of Papua has an area of about 90,540 sq. m. and a population estimated at 400,000, of whom about 600 are Europeans. The Protectorate, as declared in 1884, with its seat of government at Port Moresby, was subsidized by the three Australian colonies of Queensland, New South Wales and Victoria, and lasted, under the administration of two successive special commissioners (Major-General Sir Peter Scratchley and the Hon. John Douglas), till the 4th of September 1888, when it was proclaimed, by the first Administrator—afterwards Lieutenant-Governor—Sir William MacGregor, a possession of Queen Victoria. Its constitution was that of a crown colony in association with Queensland; but in 1901 the federal government took control of the territory and in 1906 a proclamation by the governor-general of the commonwealth gave it the name of the Territory of Papua. The lieutenant-governor is aided by an executive and a legislative council, and advised by a native regulation board. Justice is administered by petty sessions in the six magisterial districts into which the possession is divided, with a central court at Port Moresby (which, however, sits elsewhere as necessary) having the jurisdiction of a supreme court, from which in certain cases an appeal lies to the supreme court of Queensland. Order is maintained by an armed constabulary force, under a European officer, of about 180, almost all natives from different districts, whose members are found to be very efficient and trustworthy. The expenditure is about £38,000 annually, and the revenue, mainly derived from customs duties, is rapidly increasing. Only £5110 in 1895, it was £11,683 in 1899 and £19,197 in 1905.

Commerce and Trade.—The making of mats, fishing-nets, shell ornaments, decorated gourds, and stone implements, and the manufacture of pottery, canoes and sago, constitute the chief native industries, which are the subject of barter between different regions. European industries include gold mining, in which 500 miners, besides natives, are engaged (chiefly in the Louisiade Archipelago), and the bêche de mer and pearl-shell fisheries, which were formerly more productive than at present. Copra is naturally largely prepared, as coco-nut palms are very numerous, and are extensively planted every year. A small amount of tortoise-shell is collected. The rubber industry is, according to Sir W. MacGregor, "important and promising." Species of *Palaquium*, the genus from which, in the Indian Archipelago, the best gutta-percha is obtained, occur on the hills, and from their cultivation there might in time be obtained a large revenue independently of European labour. Timber of economic value is scarce. Red cedar (*Cedrilia*) abounds in the riverine flats, but the quality is poor and commercially valueless; and oaks are plentiful, but the wood is coarse. Small quantities of ebony and sandal-wood are exported. "There can be no reasonable doubt that the sugar-cane, which is native and present in a great many varieties, sago, cotton, probably also indigenous and of exceptionally fine quality, will eventually be valuable" (MacGregor). The trade of British New Guinea is exclusively with the Australian colonies. Imports were valued at £72,286 in 1899–1900 (an increase of over £20,110 in the year), and exports (including the gold mines) at £56,167, while in 1905 the figures were £67,188 for imports and £73,669 for exports, and in 1906 £79,671 and £80,290 respectively.

German New Guinea

The German protectorate of New Guinea, so called after the island which contributes the greatest area, comprehends, besides Kaiser Wilhelms Land, the islands which are now commonly called the Bismarck Archipelago—viz. New Pomerania, New Mecklenburg, with New Hanover and the Admiralty Islands and the Solomon Islands (Bougainville and Buka). There are besides nearly 200 smaller islands and islets scattered among their greater neighbours. In 1884 New Guinea was absolutely wild, not a single white man living on what is now the German part. On the islands New Pomerania and Mioko only two trading firms had their establishments; and on New Lauenburg the Wesleyans had a mission station. After the annexation commercial enterprise set in at once, hand in hand with political administration. Now on the mainland and in the islands plantations have been established and tobacco and cotton have been successfully grown. Three German mission societies formed settlements on New Guinea, with a branch one on the Gazelle peninsula. The protectorate is included in the Universal Postal Union; each harbour has its post office, also a leading official with a number of assistants to control the natives and the revenue. It is divided into two districts with separate administrations, New Guinea and the Bismarck Archipelago; over both presides an imperial governor, the seat of government being Herbertshöhe in New Pomerania. A small police force of natives has been formed. In each district there is a registry of deeds and a court of law, and in New Guinea a court of appeal, of which the governor is president. A line of steamers plies between New Guinea, the Bismarck Archipelago and Singapore. A special silver coin of rupee value has been introduced. The area of Kaiser Wilhelms Land is approximately 70,000 sq. m. It is impossible to speak with any precision of the number of the native population, but the white population in 1906 was 149.

The revenue of German New Guinea is derived from taxes, dues and licences, and amounted on the 31st of March 1892 to about £3000; on the same rate, 1901, to £3750. The annual revenue is averaged at £5000, and the expenditure at £4200. The New Guinea Company was to receive £20,000 for transferring proprietorship to government, which took over the administration in 1899. In 1905 imports into Kaiser Wilhelms Land were valued at £33,316, and exports at £7702, and the estimated expenditure for 1907–1908 of £76,000 included an imperial subvention of £57,696. The chief harbours are Friedrich Wilhelmshafen and Konstantinhafen.

Dutch New Guinea

Dutch New Guinea comprises all the western portion of the island. The boundary on the east, separating it from British New Guinea and German New Guinea, was finally settled in 1895. Starting from the south coast, it follows 141° 1′ 48″ E. up to the Fly river, which is mounts until 141° 1′ is reached, when it once more follows the meridian up to the north coast. The area of the territory is 151,789 sq. m., and the inhabitants have been conjectured to number some 200,000. A few missionaries have established themselves, but otherwise the Dutch have scarcely occupied their possession, which at present merely forms part of the residency of Ternate in the Moluccas. Dutch New Guinea, however, has better natural advantages than either the British or German possessions in the island, and should eventually prove of real value to the Netherlands. The claims to superiority over New Guinea on the part of the rulers of some of the small neighbouring islands date at least from the spread of Islam to the Moluccas at the beginning of the 15th century, and were maintained by the Malay rulers both of Bachian and of Gebeh and afterwards by the sultan of Tidore. When the Dutch first came to these seas it was their policy to ally themselves with certain chiefs, and support their claims over various islands, so as to extend their own commercial monopoly; and they therefore supported the claims (admitted by Great Britain in 1814) of the sultan of Tidore over both the Raja Ampat (*i.e.* the four Papuan kingships, Waigeu, Salawatti, Misol and Waigamma on Misol Island) and certain islands or points on the north-west coast of New Guinea. Nominally the sultan of Tidore is still the suzerain of western New Guinea, but his authority is scarcely recognized, except on some few shores and adjacent islands; and practically Dutch New Guinea used to be administered partly from Ternate and partly from Timor, upon more peaceful lines than was the case when the rule of the Dutch in New Guinea largely consisted of the sending of a warship now and again to some distant island or bay to burn a *kampong*, to punish rebellious villagers, and thus assert or reassert Dutch authority, or that of the sultan, who is their vassal. In 1901, however, a more serious effort was made to establish some kind of government in the southern province of Dutch New Guinea, at Merawkay, where a small Dutch-Indian garrison was stationed with the professed object of preventing raids by bands of savages into the British territory near by. Such raids had been rather frequent, the invaders attacking the natives who live under British protection, burning their huts, murdering the men, carrying off the women and children as slaves, and returning to their own haunts laden with booty. There is an assistant Resident at Merawkay, whose immediate chief is the Dutch Resident at Ternate, and who is the civil administrator of the province of southern Dutch New Guinea. Assistant Residencies have also been established at Manokvary in northern Dutch New Guinea, which has been formed into a province, under Ternate, and at Fakfak, in western Dutch New Guinea, likewise erected into a province, also under Ternate. By 1902, therefore, Dutch New Guinea formed a government, with its headquarters at Ternate, divided into the three provinces named. At regular intervals the steamers of the Dutch Royal Steam Packet Company call at Dorey and other points, while administrative posts have been established elsewhere in lieu of others previously attempted but abandoned.

A curious discussion arose in the Dutch states-general when the government was seeking legislative sanction for the above measures, with a provisional credit to cover the first establishment expenses. It was seriously contended in one part of the house that, as eminent men of geographical and ethnographical science had settled the question whether New Guinea belongs to Asia or Polynesia in favour of the latter, a New Guinea colonization scheme could not properly be proposed and decided upon in a section of the Dutch-Indian budget. This budget concerned only the Asiatic possessions of Holland, not the Polynesian ones, and Dutch New Guinea must, consequently, have its own budget. Finally, the majority of the states-general, backed by government, decided that New Guinea must still be reckoned to belong to Asia.

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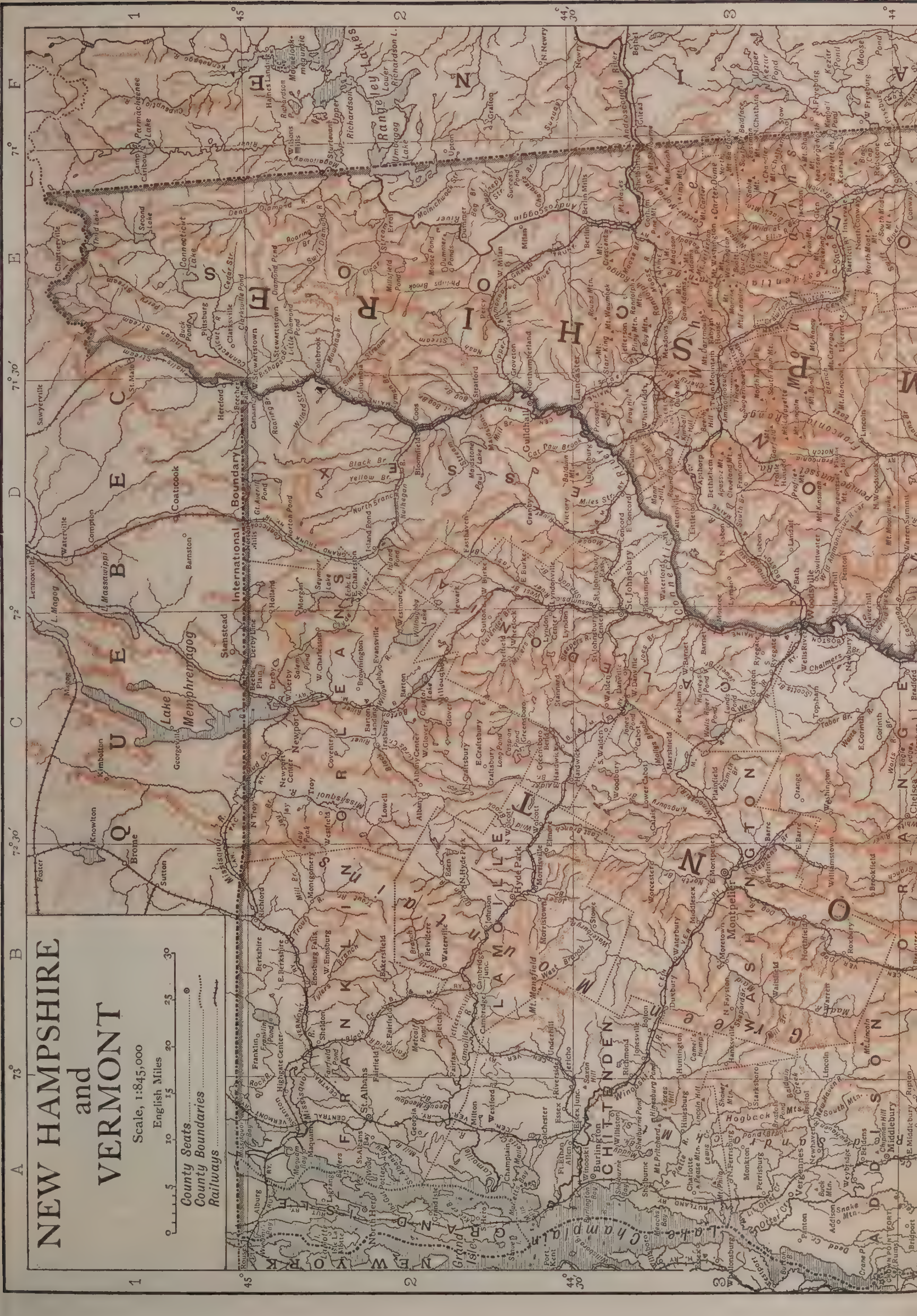
NEW HAMPSHIRE, a North Atlantic state of the United States, one of the New England group, and one of the Original Thirteen, lying between latitudes 42° 40′ and 45° 18′ 23″ N., and between longitudes 70° 37′ and 72° 37′ W. It is bounded N. by the Canadian province of Quebec; E. by Maine, by the Salmon Falls river, which separates it in part from Maine, and by the Atlantic Ocean; S.E. and S. by Massachusetts; W. and N.W. by Vermont (from which it is separated by the Connecticut river—low water mark on the W. bank of the Connecticut is New Hampshire's W. boundary), and by Halls Stream which separates it from Quebec. The state has an area of 9341 sq. m., of which 310 sq. m. are water surface.

Physical Features.—The delightful scenery of mountains, lakes, streams and woodlands gives to the greater part of New Hampshire, which is in the New England physiographic province, the appearance of a vast and beautiful park; and the state is a favourite summer resort. In the N. central portion, the White Mountains, a continuation of the Appalachian system, rise very abruptly in several short ranges and in outlying mountain masses from a base level of 700–1500 ft. to generally rounded summits, the heights of several of which are nowhere exceeded in the eastern part of the United States except in the Black and the Unaka mountains of North Carolina; seventy-four rise more than 3000 ft. above the sea, twelve more than 5000 ft., and the highest, Mount Washington, attains an elevation of 6293 ft.

The principal ranges, the Presidential, the Franconia and the Carter-Moriah, have a north-eastern and south-western trend. The Presidential, in the north-eastern part of the region, is separated from the Franconia on the south-west by the Crawford, or White Mountain Notch, about 2000 ft. in depth, in which the Ammonoosuc and Saco rivers find a passage, and from the Carter-Moriah, parallel to it on the east, by the Glen-Ellis and Peabody rivers, the former noted for its beautiful falls. On the Presidential range, which is about 20 m. in length, are Mount Washington and nine other peaks exceeding 5000 ft. in height: Mount Adams, 5805 ft.; Mount Jefferson, 5725 ft.; Mount Sam Adams, 5585 ft.; Mount Clay, 5554 ft.; Boot Spur, 5520 ft.; Mount Monroe, 5390 ft.; J. Q. Adams Peak, 5384 ft.; Mount Madison, 5380 ft.; and Mount Franklin, 5028 ft. On the Franconia, a much shorter range, are Mount Lafayette, 5269 ft.; Mount Lincoln, 5098 ft.; and four others exceeding 4000 ft. The highest peak on the Carter-Moriah range is Carter Dome, 4860 ft., but seven others exceed 4000 ft. Loftiest of the isolated mountains is Moosilanke noted for its magnificent view-point 4810 ft. above the sea. Separating Franconia and Pemigewasset ranges is the romantic Franconia Notch, overlooking

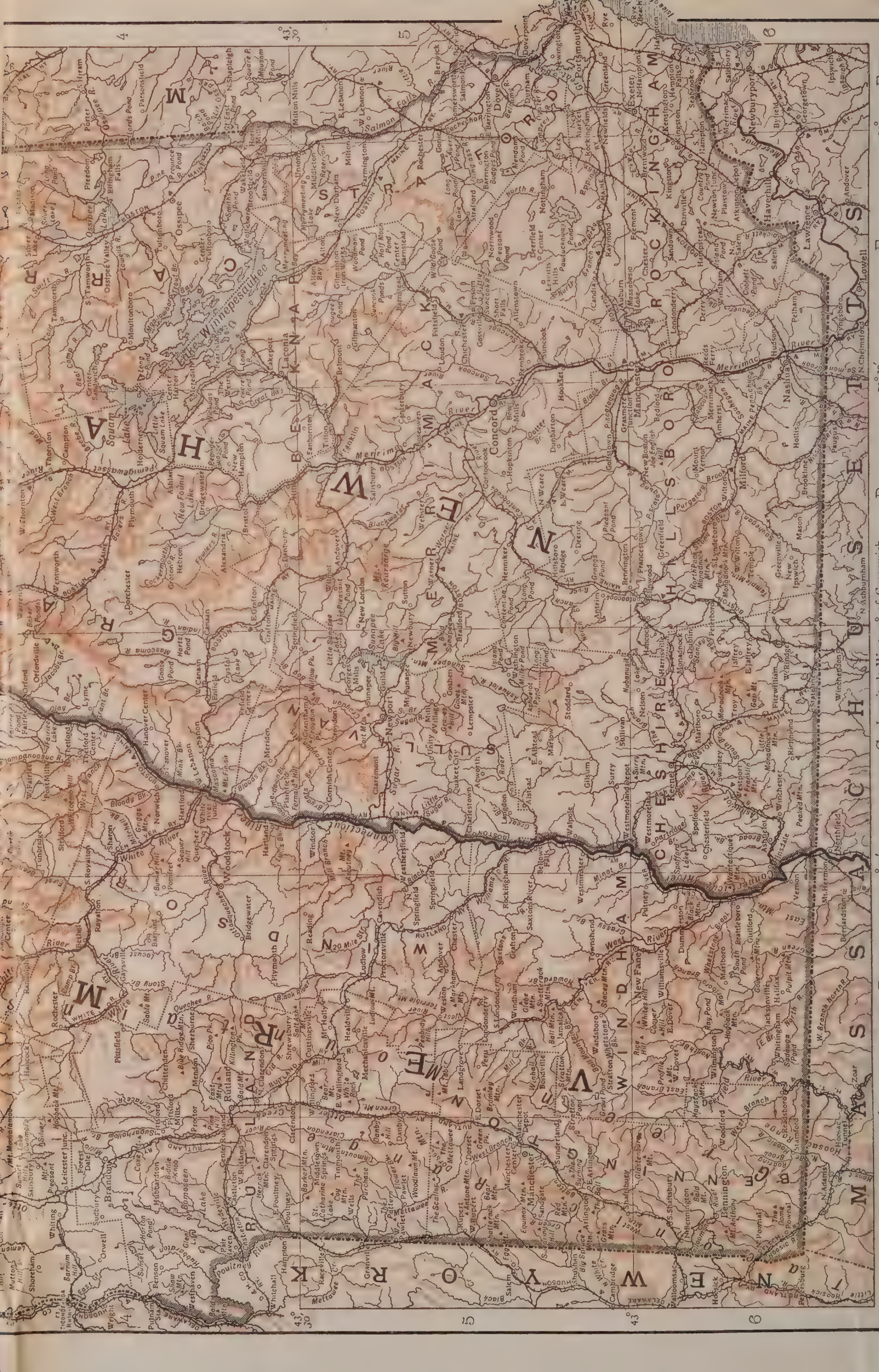


NEW HAMPSHIRE and VERMONT

Scale, 1:845,000

English Miles

0 5 10 15 20 25 30
County Seats ⊙
County Boundaries ....
Railways
QUEBEC
NEW YORK
International Boundary
Lake Memphremagog
Lake Champlain
Rangeley Lakes
Umbagog Lake
Connecticut Lake
Connecticut River
Androscoggin River
ESSEX
COOS
ORLEANS
FRANKLIN
GRAND ISLE
LAMOILLE
CALEDONIA
CHITTENDEN
WASHINGTON
ADDISON
ORANGE
GRAFTON
NEW HAMPSHIRE
VERMONT
MAINE
Montpelier
Burlington
St. Albans
St. Johnsbury
Newport
Lancaster
Hyde Park
Middlebury
Vergennes
Barre
Guildhall
Chelsea
Woodsville
Littleton
Berlin
Colebrook
Lennoxville
Coaticook
Stanstead
Magog
Sherbrooke
Mt. Mansfield
Mt. Washington
Presidential Range
Franconia Notch
Crawford Notch
Green Mts.
45°
44° 30'
44°
73°
72° 30'
72°
71° 30'
71°
A B C D E F
1 2 3


NEW HAMPSHIRE
VERMONT
MASSACHUSETTS
NEW YORK
CARROLL
GRAFTON
BELKNAP
STRAFFORD
MERRIMACK
ROCKINGHAM
HILLSBORO
CHESHIRE
SULLIVAN
WINDSOR
WINDHAM
BENNINGTON
RUTLAND
ORANGE
Concord
Manchester
Nashua
Portsmouth
Dover
Laconia
Keene
Rutland
Bennington
Brattleboro
Lake Winnepesaukee
Merrimac River
Connecticut River
White River
Mt. Monadnock
Mt. Kearsarge
Longitude West 72° of Greenwich
73°
72° 30'
71° 30'
71°
43°
43° 30'
A
B
C
D
E
F
4
5
6
Emery Walker sc.

which from the upper cliffs of Profile Mountain is a remarkable human profile, *The Great Stone Face*, immortalized by Nathaniel Hawthorne; here, too, is the Franconia Flume, a narrow upright fissure, 60 ft. in height, with beautiful waterfalls.

The whole White Mountain region abounds in deep narrow valleys, romantic glens, ravines, flumes, waterfalls, brooks and lakes. The part of the state which lies N. of the White Mountains is occupied by ridges and wide rolling valleys, the ridges rising occasionally to heights of 2000 ft. or more. South of the mountains a plateau-like surface—a part of the New England Uplands—broken by residual mountains, or "monadnocks" (a term derived from Mount Monadnock, 3186 ft. high, near the S.W. corner of the state) and lenticular hills, or drumlins, but having a general S.E. slope toward the sea, extends from the intervales of the Connecticut river to the E. border of the Merrimac Valley. Between the Merrimac Valley and the sea is the only low surface in the state; a considerable portion of this region is less than 500 ft. above the sea, but even here are numerous ridges 1000 ft. in height or more, and small drumlins. The seashore, about 18 m. in length, is for the most part a low sandy beach; here and there, however, especially to the northward, it is somewhat rocky, and to the southward are two bluffs. The only harbour is at Portsmouth near the mouth of the Piscataqua. About 9 m. from the shore are the bleak and nearly barren Isles of Shoals, nine in number, a part of which belong to New Hampshire and a part to Maine.

Extending from Mount Monadnock in Cheshire, the S.W. corner county, to the headwaters of the Connecticut river in the N.E. corner is a water-parting, W. of which the state is drained southward into Long Island Sound by the Connecticut and its tributaries and E. of which it is drained south-eastward into the Atlantic Ocean principally by the Merrimac in the S., the Saco and the headwaters of the Merrimac in the White Mountain region, and the Androscoggin in the N. The Piscataqua is a tidal estuary fed chiefly by the Salmon Falls, Lamprey and Exeter rivers. The headwaters of the rivers are for the most part mountain streams or elevated lakes; farther on their swift and winding currents—flowing sometimes between wide intervales, sometimes between rocky banks—are marked by numerous falls and fed by lakes.

The lakes and ponds, numbering several hundred, were formed by glacial action and the scenery of many of them is scarcely less attractive than that of the mountains. The largest and most widely known is Lake Winnepesaukee on the S. border of the White Mountain region; this is about 20 m. long and from 1 to 8 m. wide, is dotted by 274 islands, mostly verdant, and has clear water and a rather level shore, back of which hills or mountains rise on all sides. Among the more prominent of many others that are admired for their beauty are Squam, New Found, Sunapee and Ossipee, all within a radius of a few miles from Winnepesaukee; Massabesic farther S.; and Diamond Ponds, Umbagog and Connecticut lakes, N. of the White Mountains. The rivers with their numerous falls and the lakes with their high altitudes furnish a vast amount of water power for manufacturing, the Merrimac, in particular, into which many of the larger lakes, including Winnepesaukee, find an outlet, is one of the greatest power-yielding streams of the world.

Flora.—Except on the summits of the higher mountains New Hampshire was originally an unbroken forest of which the principal trees were the white pine, hemlock, sugar maple, yellow birch, beech, red oak, and white oak in the S., red spruce, balsam, and white birch on the upper mountain slopes, and red spruce, white pine, sugar maple, white spruce and white cedar in the other parts of the N. The primeval forests have nearly disappeared, but much of the N. third of the state and many abandoned farms in the S. have become reforested with much the same trees, except that on the lower levels in the N. yellow birch, sugar maple and beech have to a considerable extent supplanted spruce, white pine and hemlock, and that wherever forest fires have occurred there is much bird cherry, yellow birch and aspen. The butternut, hickory and chestnut are common nut-bearing trees in the S. Among indigenous fruit-bearing trees, shrubs and vines the state has the bird cherry, black cherry, blueberry, cranberry, raspberry, blackberry, gooseberry, strawberry, grape and black currant; and conspicuous among a very great variety of shrubs and flowering plants are the rose, dogwood, laurel, sumac, holly, winterberry, trilliums, anemones, arbutuses, violets, azaleas, eglantine, clematis, blue gentians, orange lilies, orchids, asters and golden rod. The summits of some of the mountains are too high for trees and above belts of dwarf spruce, balsam and birch they are clothed chiefly with sandworts, diapensia, cassiope, rushes, sedges and lichens.

Fauna.—The N. section of the state was originally a favourite hunting-ground of the Indians, for here in abundance were the moose, caribou, deer, wolf, bear, lynx, otter, beaver, fox, sable, mink, musk-rat, porcupine, wood-chuck, ruffed grouse and pigeon. These were rapidly reduced in number by the white man, the wild pigeons are extinct, and the moose, caribou, bear, wolf, lynx and beaver have become rare, but, under the protection of laws enacted during the latter part of the 19th century, deer and ruffed grouse are again quite plentiful. Rabbits, squirrels, raccoons, woodcock and quail are also common game. Many of the lakes and rivers have been stocked with trout and salmon or bass; some, with smelt; the fresh waters of the state also contain pickerel, perch, pouts, eels, suckers, dace, sunfish and shiners. In the S. half of New Hampshire are many song birds belonging to the Alleghany faunal area; in the N. part many others belonging to the Canadian faunal area. The hermit thrush, veery, song sparrow, red-eyed vireo, bunting, warbler and wren are among the song birds of the forests.

Climate.—The winters are usually long and severe, and the summers cool and salubrious, but the diversity of surface together with unequal distances from the sea cause marked variations for the different regions. The mean annual temperature ranges from about 42° F. at only moderate elevations in the White Mountain region and farther N. to 47° F. at low altitudes in the S.E. The greatest extremes of temperature occur in the deep mountain valleys where it sometimes rises to 102° F. or above, in summer, and falls to −38° F. or below in winter; higher up on the mountains it is never so warm and along the sea-coast both extremes are considerably less. The highest recorded winter mean is 25° F., at Nashua in the lower valley of the Merrimac, and at Durham near the sea-coast; the lowest recorded winter mean is 18° F., at Bethlehem 1470 ft. above the sea in the White Mountain region; the highest recorded summer mean is 69° F. at Nashua, and the lowest recorded summer mean is 64° F. at Bethlehem. The mean annual precipitation for the entire state is about 40 in.; it is 43 in. at Nashua, 45·3 in. at Durham, and perhaps still more on the E. slopes of the mountain ranges, but it is only 37·7 in. at Bethlehem in the N.W. part of the mountain region and only 35·5 in. at Stratford in the upper valley of the Connecticut. The distribution is quite even throughout the year, but summer and autumn are slightly more wet than winter and spring. Among the mountains and in the N. part of the state the annual fall of snow is from 7 to 8 ft., but in the S.E. corner it is little more than one-half that amount. The prevailing winds are generally N.W., but in the vicinity of the sea they are S.E. during summer.

Agriculture.—Fertile soil in New Hampshire is confined largely to the bottom-lands of the Merrimac and Connecticut rivers, where on deposits of glacial drift, which are generally quite deep in the southern half of the state, there is considerable alluvium. In the south-eastern section is also a moderately productive soil derived largely from the disintegration of slate. Elsewhere south of the mountains the surface soil is mostly *hard pan* or *till*, this being deepest on the drumlins. In the mountain region the soil is mostly a sandy loam composed of disintegrated granitic gneiss and organic matter; on the lower and more gentle slopes as well as in the valleys this is generally deep enough for a luxuriant vegetable growth but on the upper and more precipitous slopes it is thin, or the rocks are entirely bare.

Farms in the more sterile parts of New Hampshire were abandoned when the depleted soil and the old methods of agriculture made it impossible for owners or tenants to compete with western farmers. This abandonment led in 1889 to the adoption by the state Board of Agriculture of measures which promoted the development of the state, especially the central and northern parts, as a summer resort. Abandoned farms were advertised as suitable for country homes, and within fifteen years about two thousand were bought; and the carriage roads were improved, game preserved and the interests of visitors studied. Agriculture on the farms still operated was now greatly modified, and the production of vegetables, fruits, dairy products, poultry and eggs was largely substituted for the production of cereals. The total acreage of all land included in farms increased from 3,459,018 acres in 1890 to 3,609,784 acres in 1900, or from 60% to 62·6% of the total land area of the state, but the improved portion of this decreased during the decade from 1,727,387 acres to 1,076,879 acres, or from 49·9% to 29·8%; in no other state east of the Mississippi river was so small a proportion of the farm land improved at the close of the decade, although in Florida it was only a trifle larger. The total number of farms increased from 29,151 in 1890 to 29,324 in 1900, and the average size increased from 119 acres to 123·1 acres, but as a result of the more intensive form of agriculture, farms containing less than 50 acres increased from 8188 in 1890 to 8764 in 1900, and those containing 50 acres or more decreased during this decade from 20,963 to 20,560. Of the total number of farms in 1900, 26,344, or 89·8%, were operated by owners or part owners, 1639 by cash tenants and 546 by share tenants.

Hay is the principal crop; in 1909 the acreage was 640,000 acres and the yield was 621,000 tons. The total acreage of cereals decreased from 88,559 acres in 1879 to 61,498 acres in 1889, and to 42,335 acres in 1899; during the latter decade that of Indian corn increased from 23,746 acres to 25,694 acres (30,000 acres in 1909), but that of oats decreased from 26,618 acres to 12,589 acres (14,000 acres in 1909), that of wheat decreased from 2027 acres to 271 acres (none reported in 1909), that of barley decreased from 4934 acres to 1596 acres (2000 acres in 1909), that of buckwheat decreased from 3117 acres to 1835 acres (2000 acres in 1909), and that of rye decreased from 1056 acres to 350 acres (none reported in 1909). With the exception of dairy cows and horses there was likewise a corresponding decrease in the number of livestock during these years: the number of hogs decreased from 58,585 in 1890 to 56,970 in 1900 (51,000 in 1910); of sheep, from 211,825 in 1880 to 105,702 in 1900 (74,000 in 1910); and of neat cattle other than dairy cows, from 141,841 in 1880 to 116,835 in 1900 (93,000 in 1910); but the number of horses increased from 52,458 in 1890 to 77,233 in 1900 (59,000 in 1910), and the number of dairy cows from 90,564 in 1890 to 115,036 in 1900 (122,000 in 1910). The value of the poultry and egg product of 1899 was $1,824,399, which was more than twice that of the cereals and nearly one-third of that of the hay and forage. The potato crop of the same year was grown on 19,422 acres and amounted to 2,420,668 bushels valued at $1,090,495; in 1909 the acreage was 21,000, and the crop was 2,730,000 bushels, valued at $1,747,000. The acreage of other vegetables in 1899 was 26,780 and the value of the market garden produce, including small fruits, which was sold, increased from $187,049 in 1889 to $394,283 in 1899 or 110·8%. Although the crop of orchard fruits was no greater in 1899 than in 1889 the number of apple trees increased during the decade from 1,744,779 to 2,034,398, the number of peach trees from 19,057 to 48,819 and the number of plum trees from 10,151 to 18,137; in the number of pear trees and of cherry trees there was a slight decrease. The fruit crop of 1899 included 1,978,797 bushels of apples, 19,341 bushels of pears, 6054 bushels of peaches, 4942 bushels of plums, 1183 bushels of cherries, 487,500 lb of grapes, 568,640 qts. of strawberries, 124,760 qts. of raspberries and 105,290 qts. of blackberries and dewberries. The valley of the Merrimac is the leading section for the production of hay, small fruits and dairy products. In the bottom lands of the Merrimac and of the Connecticut, south of the White Mountains, a large part of the Indian corn and vegetables is grown. Potatoes, however, are grown in large quantities north and west of the White Mountains; and this district leads in the number of cattle and sheep, and in the production of all the cereals except Indian corn. Apples, pears and grapes are successfully grown throughout the central and southern sections, but peaches and cherries chiefly south of Lake Winnepesaukee, Hillsboro and Rockingham counties, in the south-east, lead in the production of poultry and eggs.

Forests.—The White Mountain region and Coos county to the north of it, embracing in all nearly one-third of the total area of the state, is essentially a forest country. In 1903, however, only about 12% of this was still occupied by a virgin merchantable forest and 69·8% was cut-over or culled land. In the southern part of the state there is in the aggregate nearly as large an area of young forests on lands, most of which were until about 1850 used for agricultural purposes. The principal merchantable timber of the state is red spruce, and this is found chiefly in the virgin forests which remain in the north, especially in those on the steep mountain slopes between elevations of 1800 ft. and 3500 ft. All except a few scattered trees of the white pine, which was once abundant in all parts of the state below 1500 ft. in elevation, has been cut; but some of the second growth in the south is already merchantable. The most common hardwood trees are sugar maple, yellow birch, white birch and beech; these are widely distributed throughout the state, but are for the most part too young to be cut for lumber. White cedar is almost wholly confined to the swamps of the north, and white oak is found chiefly on the more fertile lands of the south. Most of the virgin forests of the northern section were cut in the latter half of the 19th century, while abandoned farms in the south were becoming reforested, and the value of the state's lumber and timber products increased from $1,099,492 in 1850 to $4,286,142 in 1870, and to $9,218,310 in 1900 and then decreased to $7,519,431 in 1905; since 1890 large quantities of wood, chiefly spruce, have also been used in the manufacture of paper and wood pulp. In 1909 a forestry commission was established.

Fisheries.—Although the trout and salmon of the fresh waters in the interior are a great attraction to sportsmen, the commercial fisheries, which are confined to Rockingham county, on the coast, are of small and declining importance. The take of 1898 consisted chiefly of cod, haddock, lobsters, mackerel, alewives, pollock and hake, but was valued at only $48,987, which was a decrease of 67% from that of 1889; in 1905 the total take was valued at $51,944, of which $32,575 was the value of lobsters and $8166 was the value of fresh cod—the only other items valued at more than $1000 were soft clams ($2770), Irish moss ($2400), alewives, fresh and salted ($1220), and haddock ($1048).

Minerals.—The most important of the mineral products of New Hampshire, which has long been known as "the Granite State," is granite, which is quarried in the southern part of the state in the area of "Lake Winnepesaukee gneiss," near Concord, Merrimack county, near Milford, Hillsboro county, and E. of Manchester in Rockingham county; in Sullivan county, near Sunapee; and in the east central part of the state in Carroll county, near Conway and Madison. In 1908 there were 8 quarries at Concord, all on Rattlesnake Hill, and all within 2 m. of the state house in Concord. The Concord granite is a medium bluish-grey coloured muscovite-biotite granite, with mica plates so abundant as to effect the durability of the polish of the stone; it is used for building—the outer walls of the Library of Congress at Washington, D.C., are made of this stone—to a less degree for monuments, for which the output of one quarry is used exclusively, and for paving blocks. The output of the Milford quarries, which numbered in 1908 fifteen—twelve south and south-west and three north-west of Milford—consists of fine and mostly even-grained, quartz monzonites (*i.e.* granites with an unusually large proportion of soda-lime feldspar), of various grey shades, sometimes tinged with blue, pink or buff, and always marked with black mica; the finer varieties take a high polish and are used for monuments, and the coarser grades are used for construction, especially of railway bridges, and for paving and curbing. The output of the Auburn quarry, 7 m. E. of Manchester, is a deep pink quartz monzonite, marked with fine black dots, which has a fine texture, takes a good polish and is used for monuments. The Conway quarries, four in number in 1908, are on either side of the Saco river, south-east and south-west of North Conway; their output is coarse constructional stones, all biotite or biotite-hornblende, but varying in colour, pinkish ("red") and dark-yellow greenish-grey ("green") varieties being found remarkably near each other at Redstone, on the east side of the Saco valley. About 2½ m. E. of Sunapee are quarried two kinds of monumental stone: the "light Sunapee," a light bluish-grey biotite-muscovite, finer than the Concord granite, and capable of a good polish and of fine carving; and the "black pearl" or "dark Sunapee," a dark bluish-grey quartz-diorite, which seems black mottled with white when polished, and which is coarser than the "light Sunapee." New Hampshire granites were used for building as early as 1623. The value of granite quarried in the state increased from $195,000 in 1887 to $1,147,097 in 1902, when building stone was valued at $619,916, monumental stone at $346,735 and paving stone at $101,548. In that year New Hampshire ranked fourth among the states in output of granite, with 6·3% of the total value of granite quarried in the entire country; in 1908 the value of granite ($867,028) was exceeded by that of each of seven other states but was more than one-half of the total value of all mineral products of the state. Of this total the only other large items were clay and clay products (valued at $371,640), and mineral waters ($259,520; of which $150,512 was the value of table waters) from nine springs, four in Rockingham, three in Hillsboro county and one each in Coos and Carrol counties—and other mineral waters were used in the manufacture of soft drinks. Mica, first mined at Grafton, Grafton county, in 1803, found also in the northern part of Merrimack county and in the north-western corner of Cheshire county in such quantities that for sixty years New Hampshire was the largest producer of mica in the United States, is no longer an important product: in 1907 its value ($7227) was less than that of the mica produced in South Dakota, Alabama, North Carolina or Colorado. A quartz schist, suitable for making whetstones and oilstones, was discovered in 1823 by Isaac Pike at Pike Station, Grafton county, and the Pike Manufacturing Company now owns and operates quarries outside this state also; in 1907 New Hampshire was the principal producer of scythe-stones in the United States, and the total value of whetstones made in 1907 (including the value of precious stones[1]) was $59,870.

Manufactures.—The heavy precipitation on the elevated central and northern parts, and the hundreds of lakes and ponds which serve as reservoirs, give to the lower southern part of the state on the Merrimac and other rivers such an abundant and constant water-power that southern New Hampshire has become an important manufacturing district, and manufacturing has become the leading industry of the state. During the last two decades of the 19th century the number of inhabitants engaged in agricultural pursuits decreased from 45,122 to 38,782; and the number engaged in manufacturing and mechanical pursuits increased from 57,283 to 75,945. Many farmers abandoned their sterile farms and made new homes in the West, where soil yielded larger returns for labour, and a foreign-born population, consisting largely of French Canadians, came to the cities in response to the demand for labour in the mills and factories.

From 1850 to 1860 the value of the manufactured products increased 62·3%; in the decade of the Civil War they further increased in value 89%; from 1890 to 1900 the increase was from $85,770,549 to $118,709,308, or 38·4%; and from 1900 to 1905 the value of the factory products increased from $107,590,803 to $123,610,904, or 14·9%. Textiles, and boots and shoes represented in 1905 more than one-half the total value. Cotton goods, the manufacture of which was introduced in 1804, increased in value only slightly during the last decade of the 19th century, from $21,958,002 to $22,998,249, but from 1900 to 1905 their value increased 28·4%, or to $29,540,770; except in 1900 the manufacture of cotton goods had long ranked first, measured by the value of the product, among the state's manufacturing industries. Factory-made boots and shoes increased in value from $11,986,003 in 1890 to $23,405,558 in 1900, or 95·3%, the industry ranking first in 1900; but in 1905 there was a decrease to $22,425,700, the industry then ranking second; in 1900 the value of boots and shoes was 21·8% and in 1905 it was 18·1% of the total value of all factory products, and in no other state was the degree of specialization in this industry so great as in New Hampshire. Woollen goods, third in rank, decreased in value from $10,963,250 in 1890 to $10,381,056 in 1900, but the factory product increased in value from $7,624,062 in 1900 to $11,013,982, in 1905, or 44·5%. Paper and wood pulp, for the manufacture of which the spruce forests of the state are so largely used, increased in value from $1,282,022 in 1890 to $7,244,733 in 1900, or 465·1%, and to $8,930,291 in 1905; and this industry rose from ninth in rank in 1890 to fifth in 1900 and to fourth in 1905. The manufacture of lumber and timber products, one of the oldest industries of the state, ranked fifth in 1905; these products had increased in value from $5,641,445 in 1890 to $9,218,310 in 1900, or 63·4%, but decreased to $7,519,431 in 1905, the decrease being in large measure due to the great demand for spruce at the paper and pulp mills. Foundry and machine shop products, hosiery and knit goods, wooden boxes, flour and grist mill products, and malt liquors are other important manufactures; the value of wooden boxes increased from $979,758 in 1900 to $2,565,612 in 1905, or 161·9%, and the value of hosiery and knit goods increased during the same period from $2,592,829 to $3,974,290, or 53·3%. As compared with other states of the Union, New Hampshire in 1905 ranked fifth in the manufacture of factory-made boots and shoes, and in woollen goods, sixth in cotton goods, and seventh in paper and wood pulp, in hosiery and knit goods, and in the dyeing and finishing of textiles. In 1905 the value of the products in the eight cities of Manchester, Nashua, Concord, Dover, Rochester, Laconia, Keene, and Portsmouth, all of which are south of Lake Winnepesaukee, was 59·5% of that for the entire state. Nearly one-half the cotton goods were manufactured in Manchester. Boots and shoes were manufactured chiefly in cities near the southern border. Dover led in the manufacture of woollens; Laconia in the manufacture of hosiery and knit goods; and Berlin, the chief manufacturing centre north of the White Mountains, in the manufacture of paper and wood pulp.

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[1] Gems are not sought for systematically in New Hampshire. Topaz occurs on Baldface Mountain, near North Chatham;

Transportation.—With the exception of a Grand Trunk line in the northern part of the state the several steam railways are owned or leased by the Boston & Maine. Up the steep slope of Mount Washington runs a cog railway. The first steps in railway building were taken in 1835, when the Boston & Maine, the Concord, and the Nashua & Lowell railways were incorporated. The Boston & Maine was opened from Boston, Mass., to Dover, N.H., in 1842. In 1850 there were in operation 467 m.; this mileage had increased to 1015 in 1880 and to 1167·14 on the 1st of January 1909. Portsmouth, the only port of entry, has a very small foreign trade, but there is a considerable traffic in coal and building materials here and on the Cocheco, which is navigable to Dover.

Population.—The population of the state was 141,885 in 1790; 183,858 in 1800; 214,460 in 1810; 244,161 in 1820; 269,328 in 1830; 284,574 in 1840; 317,976 in 1850; 326,073 in 1860; 318,300 in 1870; 346,991 in 1880; 376,530 in 1890; 411,588 in 1900; and 430,572 in 1910; the per cent of increase was 9·3 from 1890 to 1900 and 4·6 from 1900 to 1910. Of the total in 1900, 88,107 were foreign-born; 58,967, or 66·9%, were natives of Canada (44,420 French and 14,547 English), 13,547 of Ireland, 5100 of England, 2019 of Scotland, 2006 of Germany, and 2032 of Sweden. Of the 323,481 native-born, 80,435, or 24·8%, were natives of other states than New Hampshire; 56,210 of these were natives of other New England states, however, and 7502 were natives of New York. At the same time there were 124,561 natives of New Hampshire numbered among the inhabitants of other states, principally Massachusetts, Vermont, Maine, New York, Illinois, California, Connecticut, Rhode Island, Minnesota, Iowa, Wisconsin, Michigan, Pennsylvania, Ohio, New Jersey, Kansas and Nebraska, and to induce these to return for a holiday season to their native state the "Old Home Week" festival, now held throughout New England, was planned in 1899 by Frank West Rollins (b. 1860), who was then governor of New Hampshire. The Roman Catholic Church in 1906 had more members than any other religious denomination (119,863 out of 190,298 communicants of all denominations); in the same year there were 19,070 Congregationalists, 15,974 Baptists, 12,529 Methodist Episcopalians (North) and 4892 Protestant Episcopalians. Of the total population in 1890 the rural constituted 67·4% and the urban 37·6%, but in 1900 the rural constituted only 53·3% of the total and the urban 46·7%. The eleven cities having a population in 1900 of 5000 or more were: Manchester (56,987); Nashua (23,898); Concord (19,632); Dover (13,207); Portsmouth (10,637); Keene (9165); Berlin (8886); Rochester (8466); Laconia (8042); Somersworth (7023), and Franklin (5846).

Administration.—New Hampshire was the first of the original thirteen states to establish a government wholly independent of Great Britain. This was designed to be only temporary,[1] but was in operation from the 5th of January 1776 to the 2nd of June 1784. The constitution which then went into effect provided for a General Court consisting of a Senate and a House of Representatives and made the Council a body advisory to the state president; the 1784 instrument was much amended in 1792, when the title of president was changed to governor, but with the amendments adopted in that year it is in large measure the constitution of to-day. For sixty years there was no change whatever, and only three amendments, those of 1852 (removing the property qualifications of representatives, senators and the governor), were adopted until 1877, when twelve amendments were adopted,—the most important being those providing for biennial (instead of annual) state elections in November (instead of March), and those doing away with the previous requirement that representatives, senators and the governor "be of the Protestant religion." Five amendments were ratified in 1889 and four in 1902. New Hampshire is the only state in the Union in which amendments to the constitution may be proposed only by a constitutional convention, and once in seven years at the general election a popular vote is taken on the necessity of a revision of the constitution. A radical revision of the constitution is rendered especially difficult by a provision that no amendment proposed by a convention shall be adopted without the approval of two-thirds of the electors who vote on the subject when it is referred to them. Prior to 1902 every male inhabitant of a town who was twenty-one years of age or over, a citizen of the United States, and not a pauper or excused from paying taxes at his own request, had a right to vote, but an amendment adopted in this year made ability to read English and to write additional qualifications, except in the case of those physically unable to read or to write, of those then having the franchise, and of persons 60 years of age or more on the 1st of January 1904. Various other amendments have been proposed from time to time, but have been defeated at the polls. By an act approved on the 9th of April 1909 provision was made for direct nominations of candidates at primaries conducted by regular election officers.

There is a governor's council of five members, one from each councillor district, which has advisory duties and shares with the governor most of his powers. There is no lieutenant-governor. The governor and the councillors are elected for a term of two years, and a majority of the votes cast is necessary to a choice. Where no candidate receives such a majority the Senate and the House of Representatives by joint ballot choose one of the two having the greatest number. No person is eligible for either office who shall not at the time of his election be at least thirty years of age and have been an inhabitant of the state for the seven years next preceding; a councillor must be an inhabitant of the district from which he is chosen. The governor and council appoint all judicial officers, the attorney-general, auditor, important administrative boards, coroners and certain naval and military officers; they have power to pardon offences; and they may exercise some control over expenditure through the constitutional requirement of the governor's warrant for drawing money from the treasury. The governor may veto within five days, besides Sunday, after it has been presented to him, any bill or resolution of which he disapproves, and a two-thirds vote of the members of both houses is required to pass over his veto.

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[1] The constitution of 1776 provided that the Congress which framed it "assume the name, power and authority of a House of Representatives"; that said house choose twelve persons to be "a distinct and separate branch of the legislature by the name of a Council"; that the Council appoint a president; that civil officers for the colony and for each county (except clerks of court, county treasurers and recorders) should be appointed by the two houses; and that "if the present unhappy dispute with Great Britain should continue longer than this present year, and the Continental Congress give no instruction or direction to the contrary, the Council be chosen by the people of each respective county in such manner as the Council and House of Representatives shall order." A constitution framed by a Convention which met in Concord on the 10th of June 1778 was rejected by the people in 1779.

A Senate and a House of Representatives, which together constitute the General Court, meet at Concord on the first Wednesday in January of every odd-numbered year, and at such other times as the governor may appoint for a special session, principally for the making of laws and for the election of the secretary of state, the state treasurer, and the commissary-general. The Senate is composed of 24 members, one from each senatorial district, and these districts are formed so as to be approximately equal with respect to the amount of direct taxes paid in each; representation in this body is therefore apportioned on the basis of property. In the House of Representatives, which has the large membership of 390, representation is on the basis of population, but is so arranged as to favour the rural districts; thus every town or ward of a city having 600 inhabitants is allowed one representative, but, although for every additional representative 1200 additional inhabitants are required, any town having less than 600 inhabitants is allowed a representative for such proportionate part of the time the legislature is in session as the number of its inhabitants bears to 600. Senators and representatives are elected for a term of two years. A representative must have been an inhabitant of the state for at least two years next preceding his election, and must be an inhabitant of the town, parish or ward he is chosen to represent; a senator must be at least thirty years of age, must have been an inhabitant of the state for at least seven years next preceding his election, and must be an inhabitant of the district by which he is chosen. The constitution of New Hampshire places scarcely any restrictions on the powers of the legislature. By an amendment of 1877, however, it is forbidden to authorize any town to lend money or give credit for the benefit of any corporation whose object is profit. Although money bills may originate only in the House of Representatives the Senate may propose amendments. In 1909 the office of state auditor was created.

For the administration of justice the state has a supreme court and a superior court, each county has a probate court, and some towns as well as the cities have a police court. The supreme court and the superior court consist each of one justice and four associate justices. The supreme court holds one general term each year at Concord and on the first Tuesday of every month except July and August sits to hear arguments, make orders and render decisions; the superior court holds one or two sessions a year in every county. Both of these courts have extensive jurisdiction. Each probate court, consisting of a single judge, has jurisdiction within its county of the probate of wills, of the granting of administration, in insolvency proceedings, and in relation to the adoption of children; it may appoint and remove guardians of minors, insane persons and spendthrifts, and, upon application, may change a person's name. The court of a justice of the peace has jurisdiction in criminal cases only where the punishment is by fine not exceeding twenty dollars, or by imprisonment not exceeding six months, or by both, and in civil cases only where the title to real estate is not involved and the damage demanded does not exceed thirteen dollars and thirty-three cents. A police court has the same jurisdiction as that of a justice of the peace, and, in addition, concurrent jurisdiction with the superior court in certain cases where the title to real estate is not involved and the damage demanded does not exceed one hundred dollars. Judges and justices are appointed by the governor and council, and with the exception of justices of the peace they hold office during good behaviour or until they have attained the age of seventy years; justices of the peace are appointed for a term of five years only, but they may be reappointed.

Local affairs are administered by counties, towns (townships), village districts and cities. In each county a convention, composed of representatives from the towns, meets every two years to levy taxes and to authorize expenditures for grounds and buildings whenever more than one thousand dollars are required. For the discharge of other county functions the qualified electors of each county elect every two years three commissioners, a sheriff, a solicitor, a treasurer, a register of deeds and a register of probate; two auditors also are appointed annually by the supreme court. The county commissioners have the care of county buildings, consisting chiefly of a court house, gaol and house of correction, but are not allowed to expend more than one thousand dollars for repairs, new buildings or grounds, without authority from the county convention; the commissioners have the care also of all other county property, as well as of county paupers; and once every four years they are required to visit each town of their county, inspect the taxable property therein, determine whether it is incorrectly assessed and report to the state board of equalization. In each town a regular annual meeting of the qualified electors is called on the second Tuesday in March for the transaction of miscellaneous business and the election of town officers. These officers always include three selectmen, a clerk, a treasurer and one or more auditors, and they may include any or all of the following: assessors, who together with the selectmen constitute a board for the assessment of taxes, one or more collectors of taxes, overseers of the poor, constables, surveyors of highways, fence-viewers, sealers of weights and measures, measurers of wood and bark, surveyors of lumber, cullers of staves, a chief fireward or engineer and one or more assistants, a clerk of the market and a pound keeper. The moderator of the town meeting is elected at the general election in November for a term of two years, and a board of health, consisting of three members, is appointed by the selectmen, one member each year. The general business of the town, other than that which comes before the town meeting, is managed by the selectmen, and they are specially intrusted with the regulation of the highways, sidewalks and commons. A village district is a portion of a town, including a village, which is set apart and organized for protection from fire, for lighting or sprinkling the streets, for providing a water-supply, for the construction and maintenance of sewers, and for police protection; to serve these interests three commissioners, a moderator, a clerk, a treasurer and such other officers as the voters of the district may deem necessary are chosen, each for a term of one year. The government of cities is in part determined by general laws and in part by individual charters. In accordance with the general laws each city elects a mayor, a board of aldermen, and a common council in whom is vested the administration of its "fiscal, prudential and municipal affairs"; the mayor presides at the meetings of the board of aldermen, and has a veto on any measure of this body, and no measure can be passed over his veto except by an affirmative vote of at least two-thirds of all the aldermen; each ward elects three selectmen, a moderator and a clerk in whom is vested the charge of elections; the city marshal and assistant marshals are appointed by the mayor and aldermen, but the city clerk and city treasurer are elected by the aldermen and common council in joint session.

Under the laws of New Hampshire the property rights of husband and wife are nearly equal. The wife may hold, acquire and manage property the same as if she were single; she is also subject to the same liabilities in relation to her property as a single woman except that no contract or conveyance by her as surety or guarantor for her husband is binding. Rights of dower and courtesy both obtain. Where there is no will or its provisions are waived, the right of a widow, in addition to her dower and homestead rights, in the personal estate of a deceased husband is the same as that of a widower, in addition to his estate by courtesy and homestead right, in the personal estate of a deceased wife, *i.e.* one-half if there is no surviving issue and one-third if there is such issue. By releasing his or her right of dower or courtesy together with the homestead right, if any, the surviving widower or widow is also entitled, in fee, to one-half the real estate, if said deceased leaves no issue surviving; if the husband leaves issue by the widow surviving, she is entitled in fee to one-third of his real estate; if the wife leaves issue by him surviving, the husband also is entitled in fee to one-third of her estate; but if the wife leaves issue not by him, he is entitled only to a life interest in one-third of her real estate. Among the grounds for a divorce are adultery, impotency, extreme cruelty, conviction of a crime punishable in the state with imprisonment for more than a year and actual imprisonment under such conviction, treatment seriously injuring the health or endangering the reason, wilful desertion for three years, or joining a religious sect or society which professes to believe the relation of husband and wife unlawful, and conduct in accordance therewith for six months.

The homestead law of New Hampshire exempts from seizure for debt five hundred dollars' worth of any person's homestead except for the enforcement of a mortgage upon it, for the collection of debts incurred in making repairs or improvements, or for the collection of taxes. The law also provides that except where a mortgage is given to secure payment of the purchase money, the homestead right of a married person shall not be encumbered without the consent of both husband and wife. The surviving wife or husband and the minor children, if any, may occupy the homestead right during the minority of the children, and the surviving wife or husband is entitled to the right during the remainder of her or his lifetime.

From 1855 to 1903 the liquor law was essentially prohibitory, but in the latter year an act licensing the traffic was passed. However, some option still remains with each town and city. Once every four years in cities and once in two years in towns the question of licence or no-licence must be submitted to a vote of the electorate, and in a no-licence town or city no bar-room or saloon is to be permitted; in such a town or city, however, malt liquor, cider and light wines may be sold at a railway restaurant and an inn-keeper may serve liquors to his bona-fide registered guests.

Capital punishment for murder in the first degree is inflicted only upon the request of a jury.

The general supervision of railways is vested in a board of three commissioners appointed by the governor and council for a term of three years, one each year. The board is specially directed to prescribe the manner in which the railway corporations shall keep their accounts, to examine these accounts from time to time, to examine the railways at least once a year, to investigate the cause of all accidents and upon the petition of an interested party to fix rates for the transportation of persons and freight. In 1909 an anti-pass law was enacted.

Education.—New Hampshire formed a part of Massachusetts when, in 1647, the General Court of that province passed the famous act requiring every town in which there were fifty householders to maintain a school for teaching reading and writing, and every town in which there were one hundred householders to maintain a grammar school with an instructor capable of preparing young men for college. Although not much enforced, this, with some slight changes, continued to be the school law until the close of the colonial era. The beginning of the new era was marked by the founding of Phillips Exeter Academy (1781), and later several other similar schools were opened. Their excellence aroused a much greater interest in the common school system, and throughout the 19th century various experiments for improving it were tried; among them were the division of towns into districts, the appointment of county school commissioners, and the establishment of a state board of education. These, however, have been abandoned, and the system is now administered chiefly by towns and a few special districts under the general supervision of a state superintendent.

Each town is constituted a school district, and some special districts are organized under special acts of the legislature. Some of the business relating to the schools is transacted at the annual district school meeting in which women as well as men have a vote, but the schools of each district are managed very largely by a school board elected at this meeting, one-third each year; in districts without a high school the board has only three members, but in districts having a high school the board may have three, six or nine members. The superintendent of public instruction is appointed by the governor and council for a term of two years, and it is his duty to prescribe the form of register to be kept in the schools, to investigate the condition of the schools, to make suggestions and recommendations for improving them, to lecture upon educational subjects in the towns and cities, to hold at least one teachers' institute each year in each of the counties, and to designate the times and places for holding examinations of those who wish to teach. The free school system now provides free high schools for all children within the state; for an act of 1903 requires any town not maintaining a high school, or school of corresponding grade, or not uniting with adjoining towns in maintaining one, to pay the tuition of any of its children who attend a high school or academy within the state. Evening schools for the instruction of persons over fourteen years of age must be established in any city or town of more than 5000 inhabitants if 5% of its legal voters petition for them. Any town upon application, and by contracting to appropriate annually a certain fixed sum for its maintenance, may receive state aid for establishing a library, and in 1904 libraries had been established by this means in 146 towns. Every district is required to keep its schools open at least twenty weeks each year.

All children between the ages of eight and fourteen, and those between the ages of fourteen and sixteen who cannot read and write English are required to attend either a public or an approved private school for the full term unless excused by the school board on account of physical or mental infirmity. The schools are maintained chiefly out of the proceeds of a district school tax, which must not be less in any district than seven hundred and fifty dollars for every dollar of public taxes apportioned to the town or district, a proportion which has gradually increased from five to one in 1789 and from ninety to one in 1817. To this is added a "Literary Fund" (designed originally for founding a college) which is derived from the proceeds of a state tax on the deposits, stock, &c. of savings banks, trust companies, loan and trust companies, building and loan associations and other similar corporations not residing in the state, and a portion of the proceeds of a dog tax, both of which are distributed among the several districts in proportion to the number of pupils not less than five years of age who have attended school at least two weeks. The state also makes appropriations for the payment of a portion of the tuition in high schools and academies distributing it among the districts in proportion to the rate of school tax in each, appropriations for paying a portion of the salary of school superintendents where two or more districts unite to form a supervising district, and appropriations for general school purposes to be distributed among the districts according to the number of teachers trained in normal schools and to average school attendance.

The plan of 1821 to use the Literary Fund for founding and maintaining a state college for instruction in the higher branches of science and literature was abandoned in 1828 and the only state institutions of learning are the Plymouth Normal School (1870) at Plymouth, the Keene Normal School (1909) at Keene, and the New Hampshire College of Agriculture and Mechanic Arts, organized as a department of Dartmouth College in 1866, but removed to Durham, Strafford county, as a separate institution in 1891. The normal schools are managed by a board of trustees consisting of the governor, the superintendent of public instruction and five other members appointed by the governor and council for a term of five years, one each year, and they are maintained out of annual state appropriations. The College of Agriculture and Mechanic Arts is managed by a board of trustees consisting of the governor, the president of the college, one member chosen by the alumni, and ten members appointed by the governor with the advice and consent of the council for a term of four years, and it is maintained out of the proceeds of grants by the United States government, annual state appropriations and a private endowment. The principal institutions of higher learning in the state are Dartmouth College (non-sectarian, opened in 1769), at Hanover, and Saint Anselm's College (Roman Catholic, opened in 1893), at Manchester. Dartmouth College receives some aid from the state.

The state charitable and correctional institutions consist of the New Hampshire School for Feeble-minded Children, at Laconia; the New Hampshire Soldiers' Home, at Tilton; the New Hampshire Industrial School, at Manchester; the New Hampshire Hospital for the Insane, and the State Prison, at Concord; and the New Hampshire Sanatorium for consumptives (1909) near Warren Summit, about 75 m. north of Concord. The state also makes annual appropriations for the care and education of blind and deaf and dumb persons in institutions outside of the state. Each county has an almshouse and house of correction. Here, too, many of the insane of the state were formerly confined; but by an act of 1903 the counties were entirely relieved of this care, and the insane were removed to the state hospital. Within the state are also sixteen orphan asylums, and though these are private institutions, in all but one of them children are boarded at county or city expense. Each of the state institutions is under the management of an officer or board of trustees appointed by the governor and council. In 1895 the legislature established a State Board of Charities and Correction. This consists of five members appointed by the governor and council for a term of five years, one each year, and its duties are chiefly advisory and supervisory. It is required to inspect both state and county charitable and correctional institutions, except the state prison and the state hospital, to recommend such changes to the state government as may seem desirable, and to have a special care for dependent children whether in institutions or placed in permanent homes.

Finance.—The income of the state, counties and towns is derived mainly from taxes levied on real estate, on male polls between the ages of twenty-one and seventy, on stock in public funds, on stock in corporations that pay a dividend and are not subject to some special form of tax, on surplus capital in banks, on stock in trade, on live-stock, on railways, on telegraph and telephone lines, on savings banks and on the stock of fire insurance companies. Except in the case of railways, telegraph and telephone lines, savings banks, building and loan associations and fire insurance companies, the taxes are assessed and collected by town officers, but every fourth year the county commissioners are required to inspect the taxable property in the towns and report any misappraisal to the state board of equalization whose duty it is to equalize the valuation of property in the several towns. This board, which is composed of five members appointed by the supreme court for a term of two years, also assesses the taxes on the railways, and on telegraph and telephone lines; for railways the average rate of taxation is assessed on the estimated actual value of the road beds, rolling stock and equipment, and for the telegraph and telephone lines this rate is assessed on the estimated actual value of the poles, wires, instruments, apparatus, office furniture and fixtures. Savings banks pay to the state treasurer a tax of three-fourths of 1% upon the amount of deposits on which they pay interest; building and loan associations pay to him a tax of three-fourths of 1% upon the whole amount of their capital stock paid in or shares in force, less the value of their real estate and loans secured by mortgages on real estate situated within the state and bearing interest not exceeding 5%; and fire insurance companies pay to the same officer a tax of 1% upon the amount of their paid-up capital. The railway tax is distributed as follows: one fourth is paid to the towns through which the railways pass; such a portion of the remainder is paid to any town as is equal to the portion of stock owned in that town; and what is left is reserved as a part of the state tax. Such a portion of 75% of the tax on fire insurance companies is distributed among the several towns, in proportion to the amount of stock owned in each, as the amount of stock owned within the state bears to the whole amount of stock, and the remainder is reserved as a part of the state tax. All taxes on savings banks are distributed to the towns in which the depositors reside, the tax on non-resident depositors constituting a Literary Fund which is distributed to the towns on the basis of the number of pupils in each. The whole tax received by the state treasurer from each building and loan association is paid by him to the treasurer of the town in which it is located. The state also derives an income from fees charged for chartering banks, railways, insurance companies and other corporations. The financial condition at the close of the War of Independence was alarming, and in September 1785 a mob at Exeter demanded relief through the issue of more paper currency. This was refused them however, and by the beginning of the Civil War the state was almost free of debt. During that war the state incurred an indebtedness of about $4,236,000; this it reduced to $2,205,695 in 1872, and then assumed the war debt of the towns and cities, making its total indebtedness again $4,138,124. On the 1st of September 1908 the funded debt of the state was $706,700.

History.—Martin Pring was at the mouth of the Piscataqua in 1603 and, returning to England in the same year, gave an account of the New England coast from Casco Bay to Cape Cod Bay. Samuel de Champlain discovered the Isles of Shoals and sailed along the New Hampshire coast in 1605, and much more information concerning this part of the New World was gathered in 1614 by Captain John Smith, who in his *Description of New England* refers to the convenient harbour at the mouth of the Piscataqua and praises the country back from the rocky shore. Under the leadership of Sir Ferdinando Gorges there was formed in 1620 the Council for New England, which procured from King James I. a grant of all the country from sea to sea between 40° and 48° N. latitude, and which made the following grants bearing upon the history of New Hampshire by their inducement to settlement, by determining the boundaries or by causing strife through their conflicts with one another: to John Mason, who has been called "the founder of New Hampshire," on the 9th of March 1622, a grant of the region between the Salem and Merrimac rivers, under the name of Mariana; to John Mason and Sir Ferdinando Gorges jointly, on the 10th of August 1622, a grant of the region between the Merrimac and Kennebec rivers for 60 m. inland, under the name of the Province of Maine; to David Thomson and associates, in 1622, a grant of six thousand acres near the mouth of the Piscataqua; to Sir Henry Roswell and associates, on the 19th of March 1628, a grant of the region from 3 m. south of the Charles river, "or to the southward of any and every part thereof" to 3 m. N. of the Merrimac river, "or to the northward of any and every part thereof," and extending west to the South Sea or Pacific Ocean, under the name of Massachusetts; to John Mason alone, on the 7th of November 1629, a grant of that portion of the "Province of Maine" which lay between the Merrimac and the Piscataqua, under the name of New Hampshire; to the Laconia Company, consisting of Gorges, Mason and associates, on the 17th of November 1629, a grant of an extensive territory (which was called Laconia) around the Lake of the Iroquois (Lake Champlain) together with one thousand acres at some place to be selected along the sea coast; to Edward Hilton, on the 12th of March 1630, the grant of a tract on and about the lower part of Dover Neck; to the Laconia Company, in November 1631, a grant of a tract on both sides of the Piscataqua river near its mouth, known as the Pescataway grant; and finally to John Mason, on the 22nd of April 1635, a short time before the Council surrendered its charter, a grant of the region between the Salem river on the south and the Piscataqua and Salmon Falls rivers on the north-east and extending 60 m. inland, under the name of New Hampshire. Mason died in December of this year, and New Hampshire, unlike the other colonies from which the United States originated, New Jersey and Delaware excepted, never received a royal charter.

The first settlement of which there is indisputable evidence was established in 1623 by David Thomson at Little Harbor, now in the town of Rye. Thomson was the head of a company which was organized for fishing and trading and whose entire stock was to be held jointly for five years. He built a house on Odiorne's Point overlooking Little Harbor, and, although he removed to an island in Boston Harbor in 1626, he may have continued to superintend the business of the company until the expiration of the five-year term. At least there was a settlement here which was assessed in 1628, and it may not have been completely abandoned when colonists sent over by the Laconia Company arrived in 1630. The Laconia Company received its first grant under the erroneous impression that the Piscataqua river had its source in or near Lake Champlain, and its principal object was to establish an extensive fur trade with the Iroquois Indians. Although Lake Champlain could not be reached by boat up the Piscataqua, and although the enterprise was ultimately a failure, the company sent over colonists who occupied the house left standing by Thomson, and, not far away, built "Mason Hall" or the "Great House" in what is now Portsmouth, a name (for the entire settlement) that replaced "Strawberry Banke" in 1653. Edward Hilton with a few associates appears to have established a settlement on Dover Point about the time of Thomson's arrival at Little Harbor, and in the Hilton grant of 1630 it is stated that he had already built houses and planted there; as early as 1639 this settlement was named Dover. In 1638 the Rev. John Wheelwright, an Antinomian leader who had been banished from Massachusetts, founded Exeter on land claimed to have been bought by him from the Indians. In the same year Massachusetts encouraged friendly Puritans to settle Hampton on the same purchase, and about a year later this colony organized Hampton as a town with the right to send a deputy to the General Court. Serious dissensions had already arisen between Puritan and Anglican factions in Dover, and Captain John Underhill, another Antinomian, became for a time a leader of the Puritan faction. Puritan Massachusetts was naturally hostile to the Antinomians at Exeter as well as to the Anglicans at Strawberry Banke. Although Exeter, in 1639, Dover, in 1640, and Strawberry Banke, not later than 1640, adopted a plantation covenant, these settlements were especially weak from lack of a superior tribunal, and appeals had been made to Massachusetts as early as 1633. Moreover, the grants of Massachusetts and Mariana were clearly in conflict. Under these conditions Massachusetts discovered a new claim for its northern boundary. The charter of that colony was drafted under the impression that the Merrimac flowed east for its entire course, but now an investigation was in progress which was to show that its source in Lake Winnepesaukee was several miles north of any of the four settlements in New Hampshire. Accordingly, Massachusetts resolved to make the most of the clause in the charter which described the northern boundary as three English miles north of the Merrimac river, "or to the northward of any and every part thereof," to ignore the conflicting grants to Mason and to extend its jurisdiction over the offending settlements. Dover submitted in 1641, Strawberry Banke (Portsmouth) soon afterwards and Exeter in 1643.

The heirs of Mason protested, but little was done about the matter during the period of Puritan ascendancy in the mother country. Immediately after the resignation of Richard Cromwell, however, Robert Tufton Mason (a grandson of the original proprietor), who had become sole heir in 1655, began petitioning first parliament and later the king, for relief. The attorney-general, to whom the petition to the king was referred, reported that the petitioner had a "good and legal right and title to the lands." The commission appointed by the king in 1664 to hear and determine complaints in New England decided that Mason's lands were not within the jurisdiction of Massachusetts, and made an attempt to set up a government under which his claims could be tried, but this was a failure. In 1674 Mason offered to surrender his rights to the Crown in return for one-third of the customs, rents, fines, and other profits derived therefrom, but although the offer was at first favourably considered it was finally declined. Mason then petitioned again, and this time Massachusetts was requested to send agents to England to answer his complaints. They arrived in December 1676, and the case was tried before the Lords Chief Justices of the King's Bench and Common Pleas in April 1677. Mason presented no claim to the right of government, and as to the title to the lands claimed by him the court decided that this was a question between him and the several tenants to be determined by the local court having jurisdiction in such matters. Thereupon Mason, in January 1679, petitioned the king to appoint a governor who should have jurisdiction over all the lands which he claimed, and on the 18th of September of this year New Hampshire was constituted a separate province with a government vested in a president and council appointed by the king and an assembly chosen by the people. This was the principal outcome of Mason's persistent efforts to establish his rights to the land; for although he succeeded in procuring the appointment of officers who supported his claims, and although decrees were issued in his favour, the tenants, who contended that they had profited nothing from what his grandfather had done or that they were on lands which Wheelwright had bought from the Indians, resisted the enforcement of those decrees. The contest, however, especially for the waste lands, was continued by Mason, his heirs and assigns until near the close of the 18th century.

From 1686 to 1689 New Hampshire formed a part of the Dominion of New England, which, after the first few months, was under Sir Edmund Andros as governor-general. There being no provincial authority in New Hampshire at the close of this period, a convention of the leading citizens of its four towns attempted to establish one. Upon the failure of this attempt, a temporary nominal union with Massachusetts was formed, but in 1692 Samuel Allen, the assign of Mason, caused a royal government to be established with his son-in-law, John Usher, as lieutenant-governor, and during the remainder of the colonial era New Hampshire was separate from Massachusetts except that from 1699 to 1741 the two had the same governor. The boundary between the two provinces was yet to be determined. Massachusetts proposed to confine New Hampshire to less than one-fourth its present area; that is, on the west to a line drawn 3 m. east of the south course of the Merrimac and on the north-east to a line drawn north-west from the source of the Salmon Falls river. New Hampshire claimed for its southern boundary a line drawn west from a point 3 m. north of the mouth of the Merrimac and for its upper eastern boundary a line running north by slightly west from the source of the Salmon Falls river. Both provinces granted townships within the disputed territory; Massachusetts arrested men there who refused to pay taxes to its officers, and sought to defer the settlement of the dispute. New Hampshire, being on the more friendly terms with the home government, finally petitioned the king to decide the matter, and in 1737 a royal order referred it to a commission to be composed of councillors from New York, Nova Scotia and Rhode Island. This body agreed upon the present eastern boundary but evaded deciding the southern one. Both parties then appealed to the king, and in 1741 the king in council confirmed the decision of the commission in regard to the eastern boundary and decided that the southern boundary should be a line corresponding to the course of the Merrimac from 3 m. north of its mouth to 3 m. north of Pawtucket Falls, at its most southerly bend, and thence due west to the next English province. This gave New Hampshire much more territory on the south than it had claimed. But the western boundary was not yet defined, and as early as 1749 a controversy over that arose with New York. New Hampshire asked for the territory west to within 20 m. of the Hudson river, or as far as the western boundaries of Massachusetts and Connecticut, while New York claimed east to the Connecticut river. Within a few years the governor of New Hampshire granted in the disputed territory 138 townships which were rapidly settled by those whom it was the duty of the province to protect. But there was a reluctance to incur the expense of a contest with so powerful a neighbour as New York, and in 1764 that province procured from the king in council a royal order declaring the western boundary of New Hampshire to be the western bank of the Connecticut river. The controversy, however, continued for some years thereafter (see VERMONT).

From 1676 to 1759 New Hampshire suffered greatly from the Indians, and the fear of them, together with the boundary disputes and Mason's claims, retarded settlement. But where these troubles were removed the population increased rapidly, and at the outbreak of the War of Independence the province had about 80,000 inhabitants, the great majority of whom were with the patriot or Whig party during that struggle. By June 1775 the once popular governor, Sir John Wentworth, was a refugee; on the 5th of January 1776 the fifth Provincial Congress established a provisional government; on the 15th of the following June the first Assembly elected under that government declared for independence; and on the 16th of August 1777 the important victory at Bennington was won by New Hampshire and Vermont troops under the command of General John Stark, who had a commission from New Hampshire. Six states had ratified the Federal constitution when the New Hampshire convention met at Exeter on the 13th of February 1788, to accept or reject that instrument, and so great was the opposition to it among the delegates from the central part of the state that after a discussion of ten days the leaders in favour of ratification dared not risk a decisive vote, but procured an adjournment in order that certain delegates who had been instructed to vote against it might consult their constituents. Eight states had ratified when the convention reassembled at Concord on the 17th of June, and four days later, when a motion to ratify was carried by a vote of 57 to 47, adoption by the necessary nine states was assured. The War of Independence left the state heavily burdened with debt and many of its citizens threatened with a debtor's prison. As a means of relief a number of citizens demanded of the legislature the issue of paper money equal in amount to the state's debt, and as this was refused, an armed mob numbering about 200 surrounded the meeting-house in Exeter in which the legislature was in session, towards evening on the 20th of September 1786. But General John Sullivan (1740–1795) was at that time president of the state, and on the next day he, with 2000 or more militia and volunteers, captured 39 of the leaders and suppressed the revolt without bloodshed.

National elections in New Hampshire were carried by the Federalists until 1816, except in 1804 when President Thomas Jefferson won by a small majority; but within this period of Federalist supremacy in national politics the Democrat-Republicans elected the governor from 1805 to 1812 inclusive except in 1809. In 1816 the Democrats won both state and national elections; and out of the transition from Federalist to Democratic control, which was effected under the leadership of William Plumer (1759–1850), a prominent politician in New Hampshire for half a century, a United States senator from 1802 to 1807 and governor of the state in 1812–1813 and 1816–1819, arose the famous Dartmouth College Case. As the trustees of this institution were Federalists with the right to fill vacancies in their number, the Democrats attempted to gain control by converting it into a state university and increasing the number of trustees, but when the case reached the Supreme Court of the United States that body pronounced (1819) the charter a contract which the Federal constitution forbade the state to violate. Heretofore the Federalist régime had taxed the people to support the Congregational Church, but now the Baptists, Methodists and Universalists joined the Democrats, and in 1819 this state support was abolished by the "Toleration Act." Because of Daniel Webster's arguments in the Dartmouth College Case, and because his party had favoured the support of the Congregational Church by public taxation, he became very unpopular in this his native state. Accordingly, his denunciation of President Andrew Jackson's bank policy added strength to the Jacksonian Democracy, and, later, his Whig connexions were the greatest source of the Whig party's weakness in New Hampshire. John Quincy Adams was an intimate friend of William Plumer, the Democratic leader, and carried the state both in 1824 and 1828, but a Jackson man was elected governor in 1827, 1829, 1830 and 1831. The Whigs never won a national or state election, and often their vote was only about one-half that of the Democrats. But the Democrats broke into two factions in 1846 over the question of slavery (see HALE, JOHN PARKER); the American or "Know-Nothing" party elected a governor in 1855 and 1856; and then control of the state passed to the Republican party which has held it to the present. After 1890 the railway corporations were charged with a corrupt domination of the legislature and the courts, and in 1906 a "Lincoln Republican" movement was organized under the leadership of the well-known novelist Winston Churchill (b. 1871), with the object of freeing the state from this influence.

The governors or presidents of the province and state have been:

Province.

John Cutt, president	1679–1681
Richard Waldron, president	1681–1682
Edward Cranfield, lieutenant-governor	1682–1685
Walter Barefoot, deputy-governor	1685–1686
Joseph Dudley, president of Council for New England	1686–1687
Edmund Andros, governor-general of New England	1687–1689
Without a government	1689–1690
Nominally united with Massachusetts	1690–1692
Samuel Allen, governor	1692–1698
Richard Coote, earl of Bellamont, governor	1699–1701
Joseph Dudley, governor	1702–1715
Samuel Shute, governor	1716–1723
John Wentworth, lieutenant-governor	1723–1728
William Burnett, governor	1729–1730
Jonathan Belcher, governor	1730–1741
Benning Wentworth, governor	1741–1767
John Wentworth, governor	1767–1775

Transition from Province to State.

Matthew Thornton, president of the Provincial Convention	1775

State Presidents.

Mesheck Weare	1776–1785
John Langdon	1785–1786
John Sullivan	1786–1787
John Langdon	1788–1789
John Sullivan	1789–1790
Josiah Bartlett	1790–1792

State Governors.

Josiah Bartlett	1792–1794	Federalist
John Taylor Gilman	1794–1805	,,
John Langdon	1805–1809	Dem.-Repub.
Jeremiah Smith	1809–1810	Federalist
John Langdon	1810–1812	Dem.-Repub.
William Plumer	1812–1813	,,
John Taylor Gilman	1813–1816	Federalist
William Plumer	1816–1819	Dem.-Repub.
Samuel Bell	1819–1823	,,
Levi Woodbury	1823–1824	,,
David Lawrence Morril	1824–1827	"Adams Man"
Benjamin Pierce	1827–1828	"Jackson Man"
John Bell	1828–1829	"Adams Man"
Benjamin Pierce	1829–1830	"Jackson Man"
Matthew Harvey	1830–1831	,,
Joseph Morrill Harper (acting)	1831	,,
Samuel Dinsmoor	1831–1834	,,
William Badger	1834–1836	Democrat
Isaac Hill	1836–1839	,,
John Page	1839–1842	,,
Henry Hubbard	1842–1844	,,
John Hardy Steele	1844–1846	,,
Anthony Colby	1846–1847	,,
Jared Warner Williams	1847–1849	,,
Samuel Dinsmoor	1849–1852	,,
Noah Martin	1852–1854	,,
Nathaniel Bradley Baker	1854–1855	,,
Ralph Metcalf	1855–1857	Know-Nothing
William Haile	1857–1859	Republican
Ichabod Goodwin	1859–1861	,,
Nathaniel Springer Berry	1861–1863	,,
Joseph Albree Gilmore	1863–1865	,,
Frederick Smyth	1865–1867	,,
Walter Harriman	1867–1869	,,
Onslow Stearns	1869–1871	,,
James Adams Weston	1871–1872	Democrat
Ezekiel Albert Straw	1872–1874	Republican
James Adams Weston	1874–1875	Democrat
Person Colby Cheney	1875–1877	Republican
Benjamin Franklin Prescott	1877–1879	,,
Natt Head	1879–1881	,,
Charles Henry Bell	1881–1883	,,
Samuel Whitney Hale	1883–1885	,,
Moody Currier	1885–1887	,,
Charles Henry Sawyer	1887–1889	,,
David Harvey Goodell	1889–1891	,,
Hiram Americus Tuttle	1891–1893	,,
John Butler Smith	1893–1895	,,
Charles Albert Busiel	1895–1897	,,
George Allen Ramsdell	1897–1899	,,
Frank West Rollins	1899–1901	,,
Chester Bradley Jordan	1901–1903	,,
Nahum Josiah Bachelder	1903–1905	,,
John McLane	1905–1907	,,
Charles M. Floyd	1907–1909	,,
Henry B. Quinby	1909–1911	,,
Robert P. Bass	1911–	,,

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NEW HARMONY, a village in Posey county, Indiana, U.S.A., on the Wabash river, about 22 m. N.W. of Evansville. Pop. (1900) 1341; (1910) 1229. It is served by the Illinois Central railway, and has regular steamboat connexion with the river cities. New Harmony had its beginning in 1814–1815, when it became the home of a communistic religious sect known variously as the Harmonists, Harmonites and Rappites, founded in Germany towards the end of the 18th century by George Rapp (1757–1847), a native of Iptingen in Württemberg. Rapp and his followers, who sought to form a community after the manner of the primitive Christian Church, were persecuted in Germany, and in 1803-1804 emigrated to Butler county, Pennsylvania. There they established in 1805 a community known as Harmony, consisting of some 600 persons, who held their property in common and in 1807 adopted celibacy. In 1814 Rapp sold most of his Pennsylvania land and bought about 24,735 acres (in the next ten years more than 14,000 acres in addition) on the Wabash river in Indiana Territory. In 1814–1815 Rapp and a thousand of his followers settled on the Indiana tract, their headquarters being established at New Harmony, or Harmonie as they called it. The settlers, mostly Germans, devoted themselves to agriculture, weaving and leather-working so industriously that they prospered from the start. Rapp, however, in 1825 disposed of his lands and property to Robert Owen, having returned with part of his followers to Pennsylvania and founded a new community known as Economy (*q.v.*), in Beaver county, where he died in 1847. Intent on founding a socialistic community, Owen went to the United States in 1824, and purchased Rapp's lands and live stock for $182,000. He interested several well-known scientists in his settlement, and with them came to New Harmony in the spring of 1826. Within six months the community numbered over 1000. Among its most notable members were Robert Owen's sons, Robert Dale Owen (1801–1877), a political leader and diplomat; David Dale Owen (1807–1860) and Richard Owen (1810–1890), both geologists of note; William MaClure (1763–1840), the founder of the Academy of Natural Sciences at Philadelphia; Thomas Say (1787–1834), "the father of American Zoology"; Charles Lesueur, a scientist and antiquarian; and Gerard Troost (1776–1850), a well-known geologist. The greater part of the settlers, however, were impractical theorists or adventurers. Constitution after constitution was adopted, and with the adoption of each new constitution and with each new religious discussion a group would secede and form a separate community—in 1828 there were ten—the best known and most successful being Macluria (like the others, occupying a part of Owen's land), named after William MaClure, who became its directing power. The whole organization broke up in 1827, and Owen left New Harmony in 1828. New Harmony has a Working Men's Institute Public Library, founded in 1838 by William MaClure, and having in 1907 18,000 volumes; the collection is rich in works dealing with socialism.

See "The Harmony Society" in *German-American Annals* (Philadelphia), vol. 2 (new series), for January 1904; G. B. Lockwood and C. A. Prosser, *The New Harmony Movement* (New York, 1907); Meredith Nicholson, *The Hoosiers* (New York, 1901); Morris Hillquit, *History of Socialism in the United States* (New York, 1903); and Frank Podmore, *Robert Owen* (London, 1906).

NEW HAVEN, the largest city of Connecticut, U.S.A., the county-seat of New Haven and the seat of Yale University. It is co-extensive with the township of New Haven (though there is both a township and a city government), and lies in the south-western part of the state, about 4 m. from Long Island Sound, at the head of New Haven Bay, into which empty three small streams, the Quinnipiac, the Mill and the West rivers. Pop. (1890) 81,298; (1900) 108,027, of whom 30,802 were foreign-born, including 10,491 Irish, 5262 Italians, 4743 Germans, 3193 Russians and 1376 Swedes; (1910 census) 133,605. Land area (1906) 17·91 sq. m., of which more than one-half was annexed since 1900. New Haven is served by the main line and five branches of the New York, New Haven & Hartford railway, by three inter-urban electric lines and by two steamship lines connecting with New York. The city is built on a level, sandy plain, in the rear of which is a line of hills terminating in two spurs, East Rock and West Rock, respectively 360 and 400 ft. high and 2 m. and 2¼ m. distant from the Green. On East Rock is a monument to the Connecticut soldiers who fell in the War of Independence, the War of 1812, the Mexican War and the Civil War; on the West Rock is a cave, "Judges' Cave," in which the regicides William Goffe and Edward Whalley are said to have concealed themselves when sought for by royal officers in 1661. The central and older portion of the city is laid out in squares surrounding a public Green of 16 acres, which was in former days the centre of religious and social life. New Haven is popularly known as the "City of Elms," because of the number of these trees. Besides the Green there are 12 other parks, ranging from 6 to 300 acres in area, four of them being on the water front, along the harbour. On the west side of the city is Edgewood Park (120 acres); on the north is Beaver Pond Park (100 acres); and East and West Rocks, mentioned above, have been made into suburban parks.

Among the public buildings and places of interest are the three churches on the Green, built in 1814; Center Church (Congregational), in the rear of which is the grave of John Dixwell (1608–1689), one of the regicides; United (formerly known as North) Church (Congregational), and Trinity Church, which belongs to one of the oldest Protestant Episcopal congregations in Connecticut. On the north-western side of the Green are the buildings of Yale University (*q.v.*); the "college" campus is the square enclosed by College, Chapel, High and Elm streets, with Battell Chapel at its eastern corner, Farnam, Lawrence, Phelps, Welch and Osborn halls on its south-eastern side, Vanderbilt Hall, Connecticut (or South Middle) Hall, the oldest of the Yale buildings (1750), and the Art School on the southern side, the Library, Dwight Hall and Alumni Hall on the north-western and Durfee Hall on the northern side; farther north of the Green are the Divinity School, the University Campus, on which are the Bicentennial Buildings and Memorial Hall, and, lying between Grove Street and Trumbull Street and Prospect Street and Hillhouse Avenue, the buildings of the Sheffield Scientific School. In the vicinity is the Grove Street Cemetery, in which are the graves of many famous Americans. Besides the University Library, there are a Public Library (1887), containing about 80,000 vols., the library of the Young Men's Institute (1826) and the collection of the New Haven Colony Historical Society. The city contains a State Normal School and a number of hospitals and charitable institutions.

Among the newspapers of New Haven are the *Morning Journal and Courier* (1832, Republican), whose weekly edition, the *Connecticut Herald and Weekly Journal*, was established as the *New Haven Journal* in 1766; the *Palladium* (Republican; daily, 1840; weekly, 1828); the *Evening Register* (Independent; daily, 1840; weekly, 1812); and the *Union* (1873), a Democratic evening paper. At New Haven also are published several weekly English, German and Italian papers, and a number of periodicals, including the *American Journal of Science* (1818), the *Yale Law Journal* (1890) and the *Yale Review* (1892), a quarterly.

In 1900 New Haven was the most important manufacturing centre in Connecticut, and in 1905 it was second only to Bridgeport in the value of its factory product. In 1905 its establishments numbered 490. The principal manufactures are hardware, foundry and machine shop products, ammunition and fire-arms (the Winchester Company), carriages and wagons, malt liquors, paper boxes and corsets. Meat packing is also an important industry. In 1905 the total capital invested in manufacturing was $31,412,715 and the total product $39,666,118 (a gain of 13·7% since 1900). Commercially, New Haven is primarily a distributing point for the Atlantic seaboard, but the city is a port of entry, and foreign commerce (almost exclusively importing) is carried on to some extent, the imports in 1909 being valued at $404,805. In 1908 the assessed valuation of real and personal property was $119,592,508, the net debt was $3,854,498 and the rate of taxation was 14·75 mills on the dollar.

Under a charter of 1899, as amended afterwards, the city government, which has almost entirely superseded the town government, is in the hands of a mayor, who holds office for two years and appoints most of the administrative officers, except a board of aldermen (of whom each has a two-year term, six are chosen from the city at large and the others one each from each ward, the even-numbered wards electing their representatives one year and the odd-numbered the next), a city clerk, controller, sheriff, treasurer and tax collector, all chosen by popular vote, and an assistant clerk, appointed by the board of aldermen.

The first settlement in New Haven (called Quinnipiac, its Indian name, until 1640) was made in the autumn of 1637 by a party of explorers in search of a site for colonization for a band of Puritans, led by Theophilus Eaton and the Rev. John Davenport, who had arrived at Boston, Massachusetts, from England in July 1637. In the following spring a permanent settlement was made. It was governed under a "plantation covenant" until the 4th of June 1639, when, at a general meeting, the "free planters" adopted the fundamental principles of a new government. They agreed that the Scriptures should be their guide in civil affairs, and that only approved church members should be admitted to the body politic; twelve men were appointed to choose seven men ("seven pillars") who should found the church and admit to its original membership such planters as they thought properly qualified. This having been done, the first General Court of which there is record met on the 25th of October. At this court the members of the new church, together with six members of other approved churches, were admitted to citizenship; a magistrate, four assistants, a secretary and a constable were chosen as the civil officers; annual elections and an annual session of the General Court in the last week of October were agreed upon; English statute and common law were expressly excluded; and the "worde of God was adopted as the onely rule to be attended unto in ordering the affayres of government in this plantation." As thus founded, New Haven was town and colony combined. In 1643–1644 the colony was expanded into the New Haven Jurisdiction, embracing the towns of New Haven, Guilford, Milford, Stamford and Branford in Connecticut, and, on Long Island, Southold; but this "Jurisdiction" was dissolved in 1664, and all these towns (except Southold) passed under the jurisdiction of Connecticut, according to the Connecticut charter of 1662. The government of the Jurisdiction was of the strictest Puritan type, and although the forty-five "blue laws" which the Rev. Samuel Peters, in his *General History of Connecticut*, ascribed to New Haven were much confused with the laws of the other New England colonies and some were mere inventions, yet many of them, and others equally "blue," were actually in operation as enactments or as court decisions in New Haven.

Among those in the Peters's list which are wholly or substantially true are the following: "The judges shall determine controversies without a jury"; "Married persons must live together or be imprisoned"; "A wife shall be good evidence against her husband"; "No minister shall keep school"; "The selectmen, on finding children ignorant, may take them away from their parents and put them into better hands, at the expense of their parents." Among those in the same list which are wholly or in part spurious are: "No woman shall kiss her child on the Sabbath or fasting day," and "No one shall travel, cook victuals, make beds, sweep house, cut hair or shave on the Sabbath day."

One of the most important events in the history of New Haven was the removal hither in October 1716 from Saybrook of the Collegiate School of Connecticut, which developed into Yale University. The period of greatest material prosperity of New Haven in the colonial period began about 1750, when a thriving commerce with other American ports and the West Indies developed. As a port it was notorious for its smuggling and illicit trade. New Haven also had extensive shipbuilding interests. All attempts to enforce the British commercial regulations were ineffectual. On the 22nd of February 1763 a town meeting resolved to encourage colonial manufactures and to refrain from importing from England hats, clothing, leather, gold and silver lace, buttons, cheese, liquors, &c. Two years later Jared Ingersoll (1722–1781), who had been sent to England to protest against the Stamp Act, but had accepted the office of Stamp Distributor on the advice of Benjamin Franklin, was forced to resign his office. In 1770 most of the merchants agreed not to import goods from England and transferred their trade with New York City, where Loyalist influence was strong, to Boston and Philadelphia. When news of the embargo of the port at Boston arrived at New Haven, a Committee of Correspondence was at once formed; and in the War of Independence the people enthusiastically supported the American cause. On the 5th of July 1779 the place was invaded by a British force under General William Tryon, who intended to burn the town, but met so strong a resistance that he withdrew before the next day. New Haven's commerce suffered severely during the war, but by the close of the first decade of the 19th century it had regained its former importance. When the War of 1812 opened there were fully 600 seamen in the city, practically all of whom were engaged in privateering or in the regular naval service of the United States. Among them was Captain Isaac Hull. In 1815 the *Fulton*, the first steamboat on Long Island Sound, made its first trip from New York to New Haven. The second quarter of the 19th century was the period of development of railways and manufactures. The period since the Civil War has been marked by a diversification of industries. To that conflict New Haven contributed approximately $30,000,000, and 3000 men, 500 of whom were killed. From 1701 until 1873 New Haven was the joint capital (with Hartford) of Connecticut. New Haven was incorporated as a city in 1784; new charters were secured from the General Assembly of the state in 1869, 1881 and 1899. Fair Haven was annexed to New Haven in 1897.

See Leonard Bacon, *Thirteen Historical Discourses* (New Haven, 1839); J. W. Barber, *History and Antiquities of New Haven* (3rd ed., New Haven, 1870); C. H. Levermore, *Town and City Government of New Haven*, and *The Republic of New Haven* (Baltimore, 1886); E. S. Bartlett, *Historical Sketches of New Haven* (New Haven, 1897); Edward E. Atwater, *History of the Colony of New Haven to its Absorption into Connecticut* (New Haven, 1881); H. T. Blake, *Chronicles of New Haven Green* (New Haven, 1898); *Records of the Colony of New Haven 1638–1665* (2 vols., Hartford, 1857–1858), edited by C. H. Hoadly; and the *Papers* and other publications (1865 sqq.) of New Haven Colony Historical Society.

NEWHAVEN, a seaport in the Eastbourne parliamentary division of Sussex, England, 56 m. S. from London by the London, Brighton & South Coast railway, on the English Channel at the mouth of the Ouse. Pop. of urban district (1901) 6772. The church of St Michael has a Norman square embattled tower surmounted by a spire, and an apsidal chancel. The port is protected by fortifications. A harbour was first granted to Newhaven in 1713, and during the early part of the 18th century it possessed a large shipping trade. This afterwards declined, but it is now one of the principal points of communication between England and France, the railway company maintaining a daily service of fast steamers to Dieppe in connexion with the Chemin de fer de l'Ouest. The tidal harbour, which is owned by a company, is enclosed by two piers and a breakwater, the area being about 30 acres, and the quayage 1400 yds. The roadstead is one of the finest on the coast of England. With France there is a large traffic in wines, spirits, silk, fruit, vegetables and general provisions. The coasting trade consists chiefly of imports of coal and provisions, the exports being principally timber for shipbuilding and flint for the Staffordshire potteries. Some shipbuilding is carried on.

NEW HEBRIDES, a chain of islands in the western Pacific Ocean, between 166° and 171° E., and 13° and 21° S., included in Melanesia, and under the joint influence of Great Britain and France. (For map, see Pacific Ocean.) From New Caledonia to the S.W. they are separated by a deep channel; but a comparatively shallow sea indicates their physical connexion with the Santa Cruz group (*q.v.*) to the N. The chain lies S.E. and N.W., but the main islands are arranged somewhat in the form of the letter Y. The south-easternmost island is Aneiteum; N.W. from this the main islands are Tanna or Aipere, Eromanga, Efaté,[1] the Shepherd Islands and Api or Epi. At this point the arms of the Y divide, the western comprising the large islands of Malekula or Mallicollo and Espiritu Santo,[2] the eastern consisting of Ambrym, Arag and Maiwo or Aurora, with Aoba or Leper Island between the two arms. Espiritu Santo, the largest island, has an area of 875 sq. m. Irregularly disposed to the N. of the Y are the lesser islands composing the Banks group—Gaua, Vanua Lava, Mota, Valua, &c., and the Torres Islands.

With their rugged outline and rich vegetation, the islands as seen from the sea are very beautiful. Excepting the small Torres group, which are low-lying and perched on reefs, but without lagoons, all the islands are of volcanic, not coral, formation, the larger ones lying on both sides of the line of volcanic activity. The coasts are almost free from reefs and the shores rise abruptly from deep water. Old coral is sometimes found elevated to a considerable height. The islands are formed chiefly of basalt and recent eruptive material; earthquakes and submarine eruptions are not infrequent; and some of the islands themselves have active craters. All have considerable elevations, the loftiest being the isolated cone of Lopevi, near the junction of the arms of the Y; its height is 4714 ft. The volcanic soil is very rich. Numerous clear streams water the islands, but some debouch upon flat ground towards the sea, and form unhealthy marshes there. Copper, iron and nickel are the most important minerals known in the group, and sulphur is of some commercial importance.

The climate is generally hot and damp, but there is a season (November to April) which is specially distinguished, as such, and is somewhat unhealthy. The trees—*Casuarina*, candle nut (*Aleurites triloba*), kauri pine (or Tanna), various species of *Ficus*, *Myrtaceae* and many others—are magnificent; the coco-nut is not confined to the coast, but grows high up the valleys on the hill-sides. Sandal-wood is also found. Besides the breadfruit, sago-palm, banana, sugar, yam, taro, arrowroot and several forest fruits, the orange, pine-apple and other imported species flourish; and European vegetables are exported to Sydney. Land mammals are scarce; they include bats, rats and pigs which have run wild. There are some lizards and turtles; birds include pigeons, parrots, ducks and swallows; locusts, grasshoppers, butterflies and hornets are numerous, and the sea abounds in fish, which, however, are generally inferior as food, and in some cases poisonous.

The native population is estimated at 50,000; in 1904 the British population was 212, the French 401. The island of Efaté contains the seat of the joint government, Vila or Port Vila (formerly Franceville), and the majority of the French population. There are several British and French trading companies, and a considerable area is cleared and worked by settlers. The chief exports are copra, coffee, maize, bananas, timber, &c.

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[1] Efaté, Vaté, Faté, Efat or Sandwich island.

[2] Abbreviated to Santo; native Marina.

The natives of the New Hebrides are Melanesians of mixed blood, and vary much in different islands. On Efaté and some others Polynesian immigration has produced a taller, fairer and less savage people. In some parts, as on Aoba, isolated Polynesian communities exist. But the general type is Melanesian: black skin, woolly hair, low, receding forehead, broad face, flat nose and thick lips. The natives decorate themselves with nose-rings and ear-rings and bracelets of shells. The men are constantly fighting; their weapons are bows and poisoned arrows, often beautifully designed, clubs of elaborate patterns and spears. Their houses are either round huts, or rectangular with pitched roofs resting on three parallel rows of posts. The villages are scrupulously clean and neat, ornamented with flowering shrubs, crotons and dracaenas, and are often fortified with stone walls. In character the New Hebrideans are ferocious and treacherous, though most of their unhospitality and savagery is to be traced to the misconduct and cruelty of traders and labour agents. The women occupy a degraded position, and in some islands widows are buried alive with the bodies of their husbands. There is a great belief in sorceries and omens; but prayer and offerings (usually of shell money) are addressed mainly to the spirits of the (recently) dead, and there is another class of spirits, called Vui, who are appealed to when incorporate in certain stones or animals; of one of two such the divinity is recognized generally. By the villages a space shadowed by a great banyan tree is often set apart for dances and public meetings. A certain sanctity attaches also sometimes to the *Casuarina* and the *Cycas*. An important institution is the club-house, in which there are various grades, whereon a man's rank and influence mainly depend, his grade being recognized even if he goes to another island where his language is unintelligible. In like manner a division into two great exogamous groups prevails, at all events throughout the northern islands. It would therefore seem that the present diversity of languages in the group must be of relatively recent origin. These languages or dialects are numerous, and mutually unintelligible, but alike as to grammatical construction, and belonging to the Melanesian class.

History.—The Portuguese Pedro Fernandez de Quiros, sighting Espiritu Santo in 1606, thought he had discovered the great southern continent then believed to exist, and named it Australia del Espiritu Santo. Louis de Bougainville visited the islands in 1768, and Captain Cook, who gave them the name they bear, in 1774. The subsequent visits of several explorers, the exploitation of the sandal-wood and other products by traders and the arrival of missionaries helped to open up the islands and to give them a certain commercial importance by the middle of the 19th century. Trade was mainly with New Caledonia, and France was thus indicated as the dominant power in the New Hebrides; even British planters pressed France to annex the islands in 1876, but in the following year some of the missionaries urged the same course on England. In 1878 the islands were declared neutral by Great Britain and France. The presence of British and French settlers under independent authority led to unsatisfactory administration, especially in regard to the settlement of civil actions and jurisdiction over the native population. As to the establishment of commercial supremacy, French interests clashed with Australian, and in 1882 M. John Higginson of New Caledonia (d. 1904) consolidated the former by founding the trading society which afterwards became the *Société française des Nouvelles-Hébrides.* In 1886 one of the most serious of many native outbreaks occurred, necessitating a French demonstration of force from New Caledonia. An Anglo-French convention of the 16th of November 1887 provided for the surveillance of the islands (protection of life and property) by a mixed commission of naval officers. The Anglo-French agreement of 1904 had a clause providing for an arrangement as to proper jurisdiction over the natives and for the appointment of a commission to settle disputes between British and French landed proprietors. In this and the following year there was much unrest among the natives, and a joint punitive expedition was necessary.

Strong feeling was aroused meanwhile in Australia owing to the disabilities suffered by British settlers in the islands. British annexation, or at least a division of the group into British and French spheres, was urged. But on the 20th of October 1906 a convention was signed in London, confirming a protocol of the preceding 27th of February, and providing that "the group of the New Hebrides, including the Banks and Torres Islands," should form "a region of joint influence," in which British and French subjects should have equal rights in all respects, and each power should retain jurisdiction over its own subjects or citizens. The claim of other powers to share the joint influence was excluded by the provision that their subjects resident on the islands must be under either British or French jurisdiction. A British and a French high commissioner were appointed, each assisted by a resident commissioner; provision was made for two police forces of equal strength, and the joint naval commission of 1887 was retained for the purpose of keeping order. The high commissioners were given authority over the native chiefs. A joint court was established, consisting of two judges, appointed respectively by Great Britain and France, and a third, to be president, and not a British subject or French citizen, appointed by the king of Spain. Its jurisdiction covers civil cases (including commercial suits and those respecting landed property), native offences or crimes against non-natives, and all offences against the provisions of the convention. The sale of arms and intoxicants to natives is forbidden; and the convention regulates the recruitment of native labour. Provision was made for community of interests in regard to public works, finance and the official use of the English and French languages. The creation of municipalities on the application of groups of not less than thirty non-native residents was provided for, municipal votes being given to both sexes. The convention provided against the establishment of a penal settlement and the erection of fortifications.

This convention was bitterly criticized in Australia on the ground that many of the provisions which nominally established equality between British and French would operate in practice to the advantage of the French; and there was no little dissatisfaction on the ground that the Australian government was neither represented at the preliminary conference, nor fully consulted during the negotiations.

See *Parliamentary Papers*, France, No. 1 (1888 and 1906); and "Correspondence relating to the Convention . . ." (Cd. 3288), (1907).

NEW IBERIA, a city of Louisiana, U.S.A., capital of Iberia parish, on the Bayou Teche, in the southern part of the state, about 125 m. W. of New Orleans. Pop. (1890) 3447; (1900) 6815 (3309 negroes); (1910) 7499. It is served by the Southern Pacific, the Franklin and Abbeville, and the New Iberia & Northern railways. Lumber, sugar, cotton and rice are produced in the neighbourhood. At the village of Avery Island, about 10 m. S.E., there are deposits of rock salt. The municipality owns and operates the waterworks and the electric lighting plant. New Iberia was laid out in 1835 and was chartered as a city in 1839.

NEW JERSEY, one of the Middle Atlantic states of the American Union, lying between 41° 21′ 22·6″ and 38° 55′ 40″ N. lat., and 75° 35′ and 73° 53′ 39″ W. long. It is bounded, N., by the state of New York; E., by the Hudson river, which separates the state from New York, and by the Atlantic Ocean; and S. and W. by the Delaware Bay and river, which separate New Jersey from Delaware and Pennsylvania. All the boundaries except the northern are natural. New Jersey has an extreme length, N. and S., of 166 m., an extreme width, E. and W., of 57 m., and a total area of 8224 sq. m., of which 710 sq. m. are water-surface.

Physiography.—There are within the state four distinct topographic belts—the Appalachian, the Highlands, the Triassic Lowland and the Coastal Plain. The folded Appalachian belt crosses the N.W. corner of the state, and includes the Kittatinny Mountain and Valley. The mountain has a north-east-south-west trend, crossing the Delaware river at the Delaware Water Gap and continuing S.W. into Pennsylvania. In width the range varies from 4 or 5 m. in the N. to about 2 m. in the S. Its western foot lies along the Delaware river, which for some distance flows parallel with the range, and has an altitude of about 400 ft. above the sea at Port Jervis, where it enters the state, and of about 300 ft. at the Water Gap, where it leaves it. Where the crest of the ridge enters the state its elevation is 1539 ft.; at High Point, 1¼ m. S.W. the ridge attains a height of 1803 ft., the highest point within the state. A short distance S.W. of this point, in a depression in the mountain crest, is Lake Marcia, at an elevation of 1570 ft. Beyond Culver's Gap the mountain again narrows to a ridge, and for a portion of its length it is double-crested. On the eastern side the slope is so abrupt as to make ascent difficult and at places impossible, but the western slope, on account of a dip of the rock to the N.W., is more gradual. The eastern foot has a very uniform altitude of from 900 to 1000 ft. above the sea. The crest of the ridge is from 600 to 1200 ft. W. of the foot, and from 450 to 600 ft. above it. At the Water Gap the ridge is cut through to its base, and the Delaware river flows through the opening. This gap, 900 ft. wide at the base and 4500 ft. wide at the top, with sides rising very abruptly to a height of 1200 ft. and more, is an impressive sight. The Kittatinny Valley, S.E. of and parallel to the Kittatinny Range, is about 40 m. long and 12 m. wide and has an average elevation of 700 ft. Its western margin is from 900 to 1000 ft. above the sea, and its eastern border is from 400 to 500 ft. lower. The floor of the valley is very undulating, and contains numerous small streams, whose divides are from 700 to 900 ft. above the sea. South-east of the Kittatinny Valley, and parallel with it, lies the second topographic belt, the Highlands. This region embraces an area of 900 sq. m., having a length, N.E. and S.W., of 60 m., and a width varying from 9 to 18 m. It consists of an upland plateau now dissected by streams into a series of hills and ridges, and corresponds to the Piedmont Belt farther to the S.W. and to the upland region of southern New England. The average elevation of the Highlands is about 1000 ft.; the highest point, between Canisteer and Vernon, in Sussex county, being 1496 ft. The third belt, called the Triassic Lowland, occupies about one-fifth of the surface of the state. Its N.W. border is marked by a line drawn S.W. across the state through Pompton, Morristown, Lebanon and Highbridge to the Delaware; its S.E. border by a line drawn from Woodbridge to Trenton. The surface is irregular, with altitudes ranging from about sea-level to 900 ft. A noteworthy feature of this area is the series of trap rock ridges, between which the Passaic river makes its irregular way through a region of flat bottom lands. On the N. E. border of the Lowland, one of these trap ridges lines the western bank of the Hudson river for about 25 m., and is known as the Palisade Ridge, or simply the Palisades, because of the scenic effect produced by the columnar jointing and steep eastern wall of the trap sheet. To the W. the slope of the ridge is very gentle. The Palisades extend from a point N. of the New York boundary as far S. as Weehawken, their height gradually decreasing southward. A slope of débris occurs at the E. base of the Palisade Ridge, but the summit is covered with trees. The trap formation extends to the Kill van Kull Channel, and includes, among other ridges, the so-called First and Second Watchung (or Orange) Mountains W. of the group of suburbs known as the "Oranges," but S. of Weehawken it has no scenic attractiveness. With the exception of the ridges, the Triassic Lowland N. of the Raritan river is usually below 200 ft. in altitude; S. of the Raritan the topography of this belt is similar to the northern portion, but much of the area is over 200 ft. above the sea. South-east of the Triassic Lowland lies the fourth topographic belt, the Coastal Plain, containing an area of 4400 sq. m., or slightly more than one-half the entire surface of the state. This belt, bordered on the E., S. and W. by water, is highest near its centre and lowest along its margins. It is free from mountainous ridges, but there are a number of isolated hills, such as the Navesink Highlands (259 ft.) in Monmouth county. One-third of the Coastal Plain is below 50 ft. in altitude; two-fifths are between 50 and 100 ft.; and somewhat more than a fourth of the area is over 100 ft. above sea-level. The total area of the belt as high as 200 ft. above the sea does not exceed 15 sq. m. About one-eighth of the area consists of tidal marsh, lying chiefly between the long sandy ridges or barrier beaches of the Atlantic coast and the mainland. The width of the marsh varies from 1 to 6 m., being least in the extreme N. and S. and greatest near the mouths of streams. There is also a marsh along Delaware Bay, unprotected by a beach. The waters between these beaches and the mainland are gradually filling with sediment and changing into tidal marsh. In addition to the stretches of marsh along the coast, the eastward-flowing rivers of the Coastal Plain are fringed with large areas of swamp land, some of which is well forested.

For the entire state the average elevation is 250 ft., with 4100 sq. m. below 100 ft.; 2100 sq. m. between 100 and 500 ft.; 1400 sq. m. between 500 and 1000 ft.; and 215 sq. m. between 1000 and 1500 ft. The four topographic belts of the state correspond very closely to the outcrops of its geological formations; the rocks of the Appalachian belt being of Palaeozoic age; the formation of the Highlands, Archaean; that of the Triassic Lowland, Triassic; that of the irregular hills of the Coastal Plain, Cretaceous and Tertiary.

The great terminal moraine of the glacial epoch crosses the N.E.-S.W. topographic belts of the state, in an irregular line running W. and N.W., from Staten Island, N.Y. North of the morainic belt the effect of the glaciation is seen in the irregular courses of the streams, the numerous lakes and freshwater marshes and the falls and rapids along those streams displaced by the glaciers from their former courses. The effect of glaciation on the soil is noted in a later paragraph.

The Delaware river, from its junction with the Neversink Creek to the capes, flows along the western and southern borders of the state for a distance of 245 m., and has a total drainage area in New Jersey of 2345 sq. m. Of equal importance is the Hudson, whose lower waters, forming the north-eastern boundary of New Jersey for a distance of 22 m., drain a very small part of the state, but have contributed materially to the state's commercial development. The streams lying wholly within the state are relatively unimportant. Of the tributaries to the Delaware river the northernmost is Flat Brook, 25 m. long, draining an area of 65 sq. m. W. of the Kittatinny Mountain. The Kittatinny Valley is drained by Paulins Kill and the Pequest river in the E. and S.E., and by the Walkill river in the N.E. Of the streams of the Highlands and the Triassic Lowland, the Passaic river is the most important. Rising in the N.E.—in the southern part of Morris county—it pursues a winding north-easterly course, passing through a gap in the trap rock at Little Falls, and by means of a cascade and a mile of rapids descends 40 ft. At Paterson, 3 m. farther, the stream passes through a crevasse in the trap rock and has a sheer fall of 70 ft. (the Great Falls of the Passaic).[1] The stream then makes a sharp bend southward and empties into Newark Bay.[2] The Passaic and its small tributaries—the Whippany, Rockaway, Pequanac, Wanaque, Saddle and Ramapo—drain an area of about 950 sq. m. On account of the rapid fall of its tributaries, the union of so many of them with the main stream near its middle course and the obstructions to the flow of the water in the lower course, the Passaic is subject to disastrous floods. In 1903 a heavy rainfall caused a flood which continued from the 8th to the 19th of October and destroyed not less than $7,000,000 worth of property. Another, which continued from the 25th of February to the 9th of March 1902, destroyed property valued at $1,000,000 or more, and there were less disastrous floods in 1882 and 1896.[3] The Hackensack river enters the state about 5 m. W. of the Hudson river, flows almost parallel with that stream, and empties into Newark Bay, having a length of 34 m. and a drainage area of 201 sq. m. The Raritan river, flowing eastwardly through the centre of the state, is the largest stream lying wholly within New Jersey, and drains 1105 sq. m. Commercially, however, this stream is less important than the Passaic. In the southern half of the state the drainage is simple, and the streams are unimportant, flowing straight to the Delaware or the Atlantic. The westward streams are only small creeks; the eastward and southward streams, however, on account of the wider slope, have greater length. Among the latter are the Maurice river, 33 m. long, emptying into Delaware Bay; and the Great Egg Harbor river, 38 m. long, and the Mullica, 32 m. long, emptying into the Atlantic. In the northern part of the state, and especially among the Highlands, are numerous lakes, which are popular places of resort during the summer months. Of these the largest and the most frequented are Lake Hopatcong, an irregular body of water in Morris and Sussex counties, and Greenwood Lake, lying partly in New York and partly in New Jersey.

Fauna and Flora.—The fauna of New Jersey does not differ materially from that of the other Middle Atlantic states. Large game has almost disappeared. The red, or Virginia, deer and the grey fox are still found in circumscribed localities; and of the smaller mammals, the squirrel, chipmunk, rabbit, raccoon and opossum are still numerous. Among game birds are various species of ducks, the quail, or "Bob White," and the woodcock. The waters of the coast and bays abound in shad, menhaden, bluefish, weak-fish (squeteague), clams and oysters. The interior streams are stocked with trout, black bass and perch.

The conditions of plant growth are varied. In the northern and north central parts of the state, where the soil consists partly of glacial drift, the species have a wider range than is the case farther S., where the soil is more uniform. New Jersey is a meeting ground for many species which have their principal habitat farther N. or farther S., and its flora therefore may be divided into a northern and a southern. Still another class, and the most clearly marked of all, is the flora of the beaches, salt marshes and meadows. The total woodland area of the state is about 3234 sq. m. Two distinct types of forest are recognized, with the usual transition zone between them. South and east of a line drawn approximately from Seabright to Glassboro, and thence southward to Delaware Bay, is a nearly level, sandy region known as "The Pines." This is the great forest area of the state; it contains about 1,200,000 acres of woodland, practically continuous, and portions of it still but sparsely inhabited. The original forest has been entirely removed, but a young growth of the same tree species, chiefly pitch pine with a variety of oaks, replaces it. Within "The Pines," immediately north of the Mullica river, lies an area of about 20,000 acres called "The Plains." These are sparsely clothed with prostrate pitch pine, scrub oak and laurel. Tree forms are entirely absent. The cause of this condition is still undetermined. Along the streams in this section are many swamps, valuable for the white cedar that they produce, or when cleared, for cranberry bogs. The northern part of the state is much more rugged,

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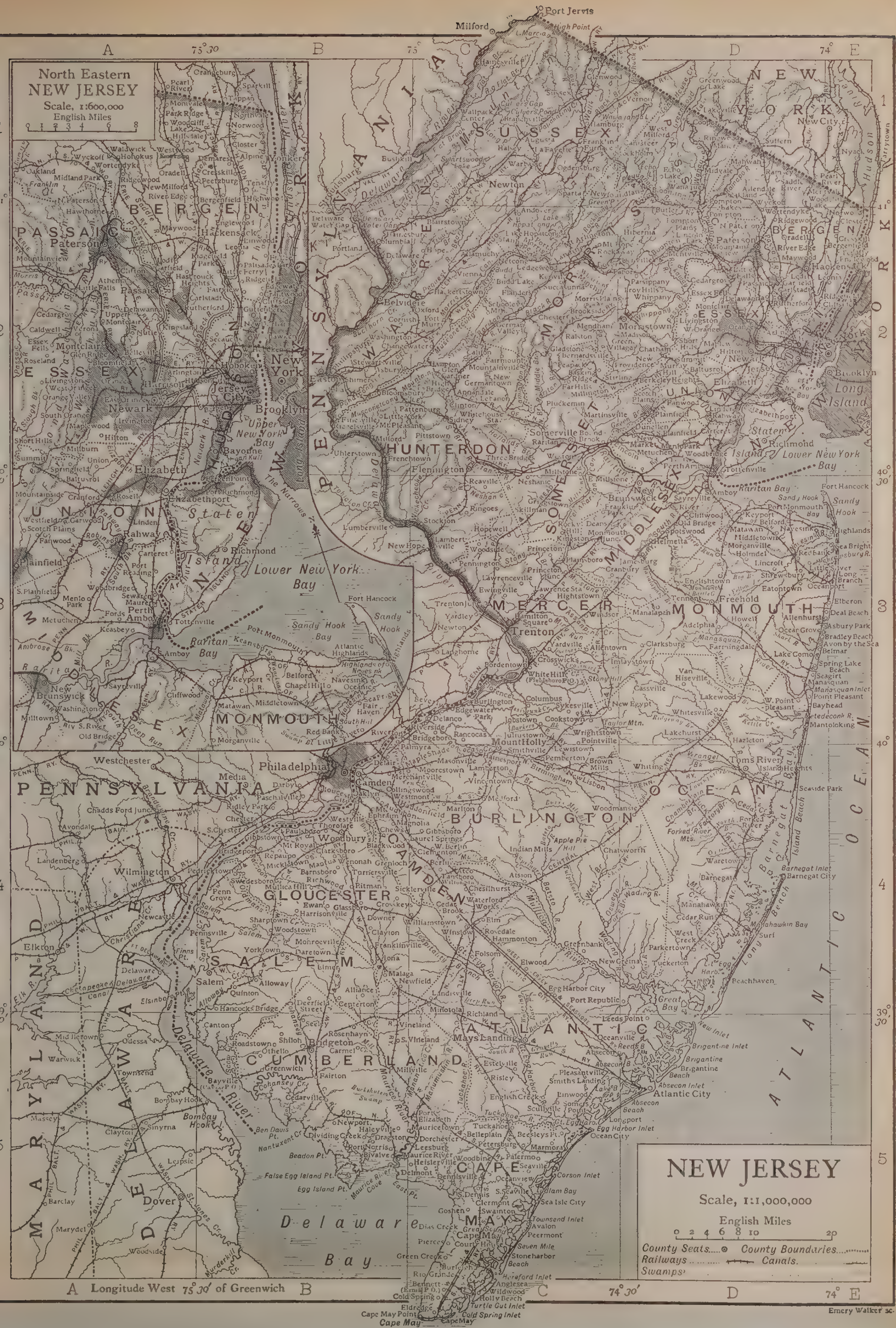
[1] As the waters of the stream have been diverted into mill races, the river very seldom makes this leap in its natural channel. The power thus generated has been largely instrumental in creating the city of Paterson (*q.v.*).

[2] The total length of the Passaic is about 100 m., but its course is so irregular that the distance in a straight line from its source to its mouth is only about 15 m.

[3] See G. B. Hollister and M. O. Leighton, *The Passaic Flood of 1902* (Washington, 1903), and M. O. Leighton, *The Passaic Flood of 1903* (Washington, 1904), being numbers 88 and 92 of the Water Supply and Irrigation Papers of the U.S. Geological Survey.


NEW JERSEY
Scale, 1:1,000,000
English Miles
0 2 4 6 8 10 20
County Seats ◎
County Boundaries
Railways
Canals
Swamps
North Eastern NEW JERSEY
Scale, 1:600,000
English Miles
0 1 2 3 4 6 8
Longitude West 75° 30′ of Greenwich
75° 30′
75°
74° 30′
74°
40°
40° 30′
39° 30′
A
B
C
D
E
1
2
3
4
5
SUSSEX
PASSAIC
BERGEN
ESSEX
MORRIS
WARREN
HUNTERDON
SOMERSET
UNION
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
CUMBERLAND
ATLANTIC
CAPE MAY
HUDSON
PENNSYLVANIA
NEW YORK
DELAWARE
MARYLAND
ATLANTIC OCEAN
Delaware Bay
Lower New York Bay
Raritan Bay
Long Island
Staten Island
Trenton
Newark
Jersey City
Paterson
Camden
Philadelphia
Atlantic City
Cape May
Port Jervis
Milford

Emery Walker sc.

and the forests are chiefly of chestnut and various species of oak. Though much broken by farms and other elements of culture they aggregate about 740,000 acres. New Jersey's forests have suffered much from fire, but with the exception of "The Plains" the soil everywhere is well adapted to tree growth. A comparatively mild climate and good market facilities increase the potential value of the whole woodland area. The state maintains a Forest Commission whose chief concern is to control the fires and thereby give value to private holdings. In this effort it is meeting with considerable success. The state is also acquiring, and maintaining as demonstration acres and public parks, forest reserves in various parts of the state. The five reserves now held are in Atlantic, Burlington and Sussex counties and aggregate 9899 acres.[1]

Climate.—Between the extreme northern and southern sections of the state there is a greater variation in climate than would naturally result from their difference in latitude. This is due to the proximity of the ocean in the S. and to the relatively high altitudes in the N. Near Cape May fruit trees bloom two or three weeks earlier than in the Highlands. The mean annual temperature ranges from 49·2° F. at Dover, in the N., to 55·4° at Bridgeton, in the S. The average date of the first killing frost at Dover is the 4th of October, and of the last, the 10th of May; at Atlantic City, on the sea-coast, these dates are respectively the 4th of November and the 11th of April. At Dover the mean annual temperature is 49°; the mean for the winter is 28°, with an extreme minimum recorded of –13°; and the mean for the summer is 70°, with an extreme maximum recorded of 102°. At Atlantic City the mean annual temperature is 52°; for the winter it is 34°, with an extreme of –7°; and for the summer, 70°, with an extreme of 99°. At Vineland, a southern interior town, the mean annual temperature is 53°; for the winter it is 33°, with an extreme of –13°; and for the summer, 74°, with an extreme of 105°. These records of temperature afford a striking illustration of the moderating influence of the ocean upon the extremes of summer and winter. On account of the proximity to the sea, New Jersey has a more equable climate than have some of the states in the same latitude farther west. During the summer months the general course of the wind along the sea-coast is interrupted about midday by an incoming current of air, the "sea breeze," which gradually increases until about three o'clock in the afternoon, and then gradually lessens until the offshore wind takes its place. As the heat is thus made less oppressive along the coast, the beaches of New Jersey have rapidly built up with towns and cities that have become popular summer resorts—among the best known of these are Long Branch, Asbury Park, Ocean Grove, Atlantic City (also a winter resort) and Cape May. Among the interior resorts are Lakewood, a fashionable winter resort, and Lake Hopatcong, and Greenwood Lake and surrounding regions, much frequented in the summer. In the summer the prevailing winds throughout the state are from the S.W.; in the winter, from the N.W. The normal annual precipitation is 47·7 in., varying from 46·6 in. on the sea-coast to 49·1 in. in the Highlands and the Kittatinny Valley. Precipitation is from 1 to 3 in. greater in the summer than in the other seasons, which differ among themselves very little in the average amount of rainfall. From December to March, inclusively, part of the precipitation is in the form of snow. In the extreme S. there is more rain than snow in the winter; but no part of the state is free from snow storms. In the summer thunder storms are frequent, but are generally local in extent, and are much more common in the afternoon and early evening than in the morning.

Soils.—The soils of the state exhibit great variety. Those of the northern and central sections are made up in part of glacial drift; those of the S. are sandy or loamy, and are locally enriched by deposits of marl. The most fertile soils of the state lie in the clay and marl region, a belt from 10 to 20 m. wide extending across the state in a general south-westerly direction from Long Branch to Salem. South of this belt the soils are generally sandy and are not very fertile except at altitudes of less than 50 ft., where they are loamy and of alluvial origin.

Agriculture.—In 1900 very little more land was under cultivation than in 1850, the total acreage for these years being respectively 2,840,966 and 2,752,946. The number of farms, however, increased from 23,905 to 34,294, and the average size of the farms decreased from 115·2 acres to 82 acres, an indication that agriculture gradually became more intensive. In 1900, 22 % of the farms contained from 20 to 50 acres, 48·3 %, 50-175 acres and only 7·8 % contained over 175 acres. Farms were smallest in Hudson county, where the average size was 7·9 acres, and largest in Sussex county, where the average size was 143·4 acres. The counties with the largest total acreage were Burlington (343,096), Sussex (256,896) and Hunterdon (248,733). Between 1880 and 1900 the percentage of farms operated by owners decreased from 75·4 to 70·1; the percentage of cash tenants increased from 10·5 to 15·3; and that of share tenants remained about stationary, being 14·1 in 1880 and 14·6 in 1900. In this last year 27·5 % of the farms derived their principal income from live stock, 20·3 % from vegetables, 17·2 % from dairy produce, 7·8 % from fruits and 7·8 % from hay and grain.

In 1907, according to the *Year Book* of the United States Department of Agriculture, the principal crops were: hay, 634,000 tons ($10,778,000); potatoes, 8,400,000 bushels ($6,216,000); Indian corn, 8,757,000 bushels ($5,517,000); wheat, 1,998,000 bushels ($1,958,000); rye, 1,372,000 bushels ($1,043,000); oats, 1,770,000 bushels ($991,000). The number and value of each of the various classes of live stock in the state on the 1st of January 1908 were as follows: horses, 102,000 ($11,526,000); mules, 5000 ($675,000); milch cows, 190,000 ($8,170,000); other neat cattle, 82,000 ($1,722,000); sheep, 44,000 ($220,000); swine, 155,000 ($1,555,000). In 1899, 5959 farms were classified as dairy farms, *i.e.* they derived at least 40 % of their income from dairy products; and the total value of dairy products was $8,436,869, the larger items being $6,318,568 for milk sold and $818,624 for butter sold. Poultry raising also is an important agricultural industry: poultry in the state was valued at $1,300,853 on the 1st of June 1900; and for the year 1899 the value of all poultry raised was $2,265,816, and the value of eggs was $1,938,304. In the production of cereals the state has not taken high rank since the development of the wheat fields of the western states; but in 1899 the acreage in cereals was 45·4 % of the acreage in all crops, and the value of the yield was 25·3 % of that of all crops. Of the total acreage in cereals in 1907, 278,000 acres were in Indian corn; 108,000 in wheat; 78,000 in rye; and 60,000 in oats. The chief cereal-producing counties in 1899 were Burlington, Hunterdon, Monmouth and Salem. The most valuable field crop in 1907 was hay and forage, consisting mostly of clover and cultivated grasses; in 1899 the value of this crop was 20·2 % of that of all crops.

Since 1830 market gardening in New Jersey has become increasingly important, especially in the vicinity of large cities, and has proved more profitable than the growing of cereals. In the total acreage devoted to the raising of vegetables in marketable quantities New Jersey in 1900 was surpassed by only two other states. The value of the marketable vegetables in 1899 was $4,630,658, and the value of the total vegetable crop, $8,425,596, or 30·7 % of that of all crops. Among the vegetables grown the potato is the most important; in 1907 there were 70,000 acres in potatoes, yielding 8,400,000 bushels, valued at $6,216,000. Between 1899 and 1907 the value of the potato crop more than doubled. In 1899 the state also produced 5,304,503 bushels of tomatoes; 2,418,641 bushels of sweet potatoes; 2,052,200 bunches of asparagus; 17,890,980 heads of cabbage; 21,495,940 musk melons; 3,300,330 water melons; and 1,015,111 bushels of sweet corn. Fruit-growing has also attained considerable importance. In 1899 the total value of the crop was $4,082,788; the value of the orchard fruit was $2,594,981; of small fruits, $1,406,049; and of grapes, $81,758. Peaches grow in all parts of the state, but most of the crop comes from Hunterdon, Sussex and Somerset counties. Apples are grown there and also in the western part of Burlington county. In the decade 1889–1899 the apple crop increased from 603,890 to 4,640,896 bushels. In Monmouth, Camden and parts of Burlington and Gloucester counties great quantities of pears are grown. Atlantic, Burlington, Camden and Salem counties are the great centres for strawberries; Atlantic, Cumberland and Salem counties lead in grape-growing; and a large huckleberry crop is yearly gathered in "the Pines." In 1899 New Jersey produced nearly a fourth of the cranberry crop of the United States, the chief centre of production being the bogs of Burlington and Ocean counties. Other fruits grown in considerable quantities are cherries, plums, blackberries and raspberries.

Minerals and Mining.—In 1907 the total value of the state's mineral products was $32,800,299. Clays of different degrees of value are found in nearly every section, but the principal clay mining areas are: the Middlesex county area, where the best clays are found along the Raritan river and the coast; the Trenton area, in which clay is mined chiefly at Dogtown, E. of Trenton; the Delaware river area, in the vicinity of Palmyra; and the Woodmansie area, in Ocean county. As the clay pits contain only small amounts of any one kind of clay, it has proved more profitable for manufacturers to buy their raw materials from a number of miners than for them to operate the mines themselves, and consequently clay mining and the manufacture of clay products are largely distinct industries. In New Jersey the mining of clays is more important than in any other state, the amount mined and sold in 1902 being a third of the entire output of the United States, and the amount in 1907 (440,138 tons) being more than one-fifth of all clay mined and sold in the United States; and in 1907 in the value of clay products ($16,005,460; brick and tile, $9,019, 834, and pottery, $6,985,626) New Jersey was outranked only by Ohio and Pennsylvania. In Warren and Sussex counties are abundant materials for the manufacture of Portland cement, an industry that has attained importance since 1892; in the value of its product in 1907 ($4,738,516) New Jersey was surpassed only by Pennsylvania. Granite is found in Morris and Sussex counties, but is not extensively quarried; there are extensive quarries of sandstone in the Piedmont section; and limestone and trap rock are important mineral resources. In 1907 the total value of stone quarried in the state was $1,523,312, of which $995,436 was the value of trap rock, $274,452 of limestone, $177,667 of sandstone and $75,757 of granite. Some roofing slate is produced in Sussex county; in 1907 the output was valued at $8000. The mining of natural fertilizers—white and greensand marls—is a long established industry; the output in 1907 was 14,091 tons, valued at $8429.

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[1] The amount of timber cut within the state is very small. Before the introduction of coal and coke as fuel in the forges and furnaces the cutting of young trees for the manufacture of charcoal was a profitable industry, and the process of deforestation reached its maximum. Since 1860 the forest area has only slightly diminished, and the condition of the timber has improved, but large trees are still scarce.

Of mineral ores the most important are iron, zinc and copper. The manufacture of iron in New Jersey dates from 1674, when the metal was reduced from its ores near Shrewsbury, Monmouth county. Magnetic ores, found chiefly in Morris, Passaic and Warren counties, form the basis of the present industry. Bog ores were mined until about 1840; since that date they have had no market. The product of the iron mines has fluctuated greatly in quantity, being nearly 1,000,000 tons of ore in 1892, 257,235 tons in 1897, and 549,760 tons in 1907, when the output was valued at $1,815,586, and was about nine-tenths magnetite and one-tenth brown ore. The chief places of production are Hibernia (Morris county) and Mt Pleasant (Hunterdon county); in 1907 four mines in the state produced 316,236 tons. In the production of zinc New Jersey once took a prominent part; in 1907 the only producer was The New Jersey Zinc Company's mine at Franklin Furnace, Sussex county, with an output of 13,573 short tons, valued at $1,601,614. The chief deposits consist of red oxide, silicate and franklinite, and the average zinc content is 23 %. The copper deposits of the state were worked to a small extent in colonial days. One of the brass cannon used at Yorktown was made of copper taken from the Watchung Mountains during the War for Independence. These mountains are still the chief source of copper, but the ores, chiefly cuprite, malachite and chrysocolla, are also found in various parts of the Piedmont region. In the years following 1900 there was renewed interest in copper mining. There are many valuable mineral springs in the state: for 1907 eleven springs (three in Bergen and two each in Morris, Camden and Somerset counties) reported to the U.S. Geological Survey the sale of 982,445 gallons (mostly table water), valued at $103,082. Other minerals, which are not found in commercial quantities, are lead in the form of galena, in Sussex county; graphite, in the crystalline schistose rocks of the Highlands; molybdenum, in the form of a sulphide, in Sussex county; and barytes in Mercer and Sussex counties. In Bergen, Warren, Sussex and Morris counties are numerous bogs containing peat of a good quality.

Manufactures.—After 1850 New Jersey made rapid progress in manufacturing, which soon became its leading industry. In 1850 7·7 % of the population were employed as wage-earners in manufacturing establishments; in 1900, 12·8 %. The value of the products in 1850 was $39,851,256; in 1890, $354,573,571; in 1900, $611,748,933. Such figures of the census of 1900 as are comparable with those of the special census of 1905, when only the establishments under the factory system were enumerated, show that between 1900 and 1905 the number of factories increased 9·3 %; the capital, 49·8 %; and the value of the products,[1] 40 % (from $353,005,684 to $774,369,025). This rapid development is due to the excellent transportation facilities, and to the proximity of large markets and of great natural resources, such as the clays of New Jersey and the coal and iron of Pennsylvania. The chief manufacturing centres in 1905, as judged by the value of their products, were Newark ($150,055,277), Jersey City ($75,740,934), Bayonne ($60,633,761), Paterson ($54,673,083), Perth Amboy ($34,800,402), Camden ($33,587,273), and Trenton ($32,719,945). In 1905, 67·1 % of the factories were in municipalities having a population of at least 8000 in 1900, and their product was 74·1 % (in value) of the total. There are indications, however, that industries are slowly shifting to the smaller towns.

The textile industries taken together are the most important of the manufacturing industries, having a greater output (in 1900, $81,910,850; in 1905, $96,060,407), employing more labourers and capital, and paying more wages than any other group. Among the various textiles silk takes the first place, the value of the factory product in 1900 being $39,966,662, and in 1905, $42,862,907. In 1900 the value of the silk output was 48·8 % of the total value of the textiles, and silk manufacturing was more important than any other industry (textile or not); in 1905, however, owing to the great progress in other industries, silk had dropped to fourth place, but still contributed 44·6 % of the value of the textiles. In 1900 New Jersey furnished 37·3 %, and in 1905, 32·2 %, of the silk products of the United States, and was surpassed by no other state. The silk industry is centred at Paterson, the chief silk manufacturing city of the United States. West Hoboken and Jersey City are also important producers. A second textile industry in which New Jersey in 1900 and in 1905 took first rank was the manufacture of felt hats; the total value of the product in 1905 was $9,540,433, a gain of 32·3 % since 1900, and constituting 26 % of the value of the product of the entire United States. Most of the product comes from the cities of Newark and Orange. From 1900 to 1905 the value of the worsted goods increased from $6,823,721 to $11,925,126, or 74·8 %, the greatest gain made by any of the textiles. In this industry New Jersey was surpassed only by Massachusetts, Rhode Island and Pennsylvania. During this five-year period there was an increase of 31·2 % (from $6,540,289 to $8,518,527) in the value of the cotton goods manufactured in New Jersey; of 12·6 % (from $2,168,570 to $2,441,516) in that of linen goods; of 45·3 % (from $1,748,148 to $2,539,178) in that of hosiery and knit goods, and of 14·8 % (from $1,522,827 to $1,748,831) in that of carpets and rugs. In dyeing and finishing textiles New Jersey was first among the states of the Union in 1900 (value, $10,488,963, being 23·3 % of the total for the country) and in 1905 (value, $11,979,947, being 23·6 % of the total for the country); Paterson is the centre of this industry in New Jersey.

In the manufacture of clay products, including brick, tiling, terra cotta and pottery, the state takes high rank: the total value of pottery, terra cotta and fire-clay products increased from $8,940,723 in 1900 to $11,717,103 in 1905; in 1905 the most valuable pottery product was sanitary ware, valued at $3,006,406; and in that year New Jersey furnished 18·2 % of the total pottery product of the United States, and was surpassed in this industry only by Ohio. The city of Trenton is one of the two great centres of the American pottery industry, and in 1905 it manufactured more than one-half of the state's output of pottery, terra cotta and fire-clay products. The pottery products include china, c.c. ware, white granite ware, sanitary ware, belleek and porcelain. Much of the raw material for this industry, such as ball, flint, and spar clays and kaolin, is imported from other states. In 1905 the value of brick and tile manufactured in the state was $1,830,080. Glass is also an important product of New Jersey; the output being valued at $5,093,822 in 1900 and at $6,450,195 in 1905. Since 1880, however, the state had fallen from second to fourth place (in 1905) in this industry.

The leading single industry in the state in 1905, as determined by the value of its products, was the smelting and refining of copper. In 1900 the output was valued at $38,365,131; in 1905, at $62,795,713, an increase of 63·7 %; and in 1905 21·6 % of the product of the United States came from New Jersey. The raw materials for this industry, however, are imported into New Jersey from other states. In the smelting and refining of platinum, nickel, gold and silver (not from the ore) there was a striking development between 1900 and 1905, the value of the product increasing from $469,224 to $7,034,139. The value in 1905 of gold and silver reduced and refined (not from the ore) was $5,281,805. The values of the other leading manufactures in 1905 were as follows: products of foundry and machine shops, $49,425,385; iron and steel[2] (including products of blast furnaces and rolling mills), $23,667,483; wire (exclusive of copper wire), $11,103,959; petroleum refining, $46,608,984; tanned, curried and finished leather, $21,495,329 (5th in the United States in 1900 and 1905); malt liquors, $17,446,447; slaughter-house products and packed meats, $17,238,076; electrical machinery, supplies and apparatus, $13,803,476 (5th in the United States in 1900 and in 1905); chemicals, $13,023,629; rubber belting and hose, $9,915,742; jewelry, $9,303,646 (4th in the United States in 1900 and in 1905); tobacco, cigars and cigarettes, $8,331,611. Other manufactures valued in 1905 at more than $5,000,000 were: boots and shoes, cars and general railway shop work, illuminating and heating gas, lumber and planing mill products, phonographs, fertilizers, flour and grist mill products, iron and steel ships, refined lard and paper and wood pulp.

Fisheries.—The fisheries of the state are of great commercial value. In 1904 the fisheries and the wholesale fish trade gave employment to 9094 persons. Until 1901 New Jersey's fisheries were more important than those of any other state in the Middle or South Atlantic groups; but after that date, owing to a decrease in the catch of bluefish, shad, clams and oysters, the annual catch of New York and Virginia became more valuable. The great length of river and sea front, and the easy communication from all parts of the state with the leading urban markets, have brought about the development of this industry. The total catch in 1904 was 90,108,068 ℔, valued at $3,385,415, a decline of 28 % in value since 1901. The chief varieties of the product in 1904, with their value, were as follows: oysters, $1,691,953; clams, $430,766; shad, $238,517; squeteague (weak-fish), $253,200; bluefish, $120,085; menhaden, $109,090; sea bass, $97,903; cod, $53,789. Fishing, as a commercial pursuit, is carried on in seventeen counties, and attains its greatest importance in Cumberland county, where the catch in 1904 was valued at $1,090,157, and the oyster catch alone at $1,046,147. In the other counties along the Delaware shad is the chief product, and these counties furnish nearly nine-tenths of the catch. A small amount of shad is taken also in the Hudson river. The value of the shad fisheries has greatly declined since 1901. Along the coast squeteague is the most abundant edible variety taken. Bluefish are very plentiful from 4 to 10 m. off Seabright. The shell fisheries (oysters particularly) are centred in Delaware Bay and at Maurice River Cove, in Cumberland county, but are important also in Cape May, Atlantic, Ocean and Monmouth counties on the Atlantic seaboard. This industry declined for a time, partly on account of the pollution of the streams by sewage and the refuse of manufacturing establishments, but laws have been enacted for its protection and development. Clams are gathered from Perth Amboy to the upper Delaware Bay; the most important fisheries being at Keyport, Port Monmouth and Belford. In 1909 the State Bureau of Shell Fisheries estimated the annual value of shell fisheries in the state at nearly $6,000,000, of which $500,000 was the value of clams. Monmouth, Ocean and Cape May counties furnish large quantities of menhaden, which are utilized for oil and fertilizer. This industry in 1904 yielded fertilizer valued at $154,360 and oil valued at $33,110.

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[1] The following statistics of the products for 1900 and for 1905 are for factory products, those for 1900 differing, therefore, from the statistics which appear in the reports of the census of 1900.

[2] This is one of the oldest of the important industries in New Jersey: at Old Boonton, about 1770, was established a rolling and slitting mill, probably the first in the country.

Transportation.—In 1905, with a total railway mileage of 2274·40, New Jersey possessed an average of 30·22 m. of railway for each 100 sq. m. of territory, an average higher than that of any other American state; in 1909, according to the State Railroad Commissioners, the mileage was 2354·63 (including additional tracks, sidings, &c., 5471·38 m.). Owing to its geographical position the state is crossed by all roads reaching New York City from the S. and W., and all those reaching Philadelphia from the N. and E. The eastern terminals of the southern and western lines running from New York City are situated on the western shore of the Hudson river, in Weehawken, Hoboken or Jersey City; whence passengers and freight are carried by ferry to New York. Jersey City and Hoboken are also connected with New York by tunnels under the Hudson river. Among these lines are the Erie system, extending W. from Jersey City via Buffalo; the New York, Susquehanna & Western (subsidiary to the Erie), from Jersey City to Wilkes-Barré, Pennsylvania; the Delaware, Lackawanna & Western, from Hoboken to Buffalo; the Lehigh Valley, from Jersey City to Buffalo; the Pennsylvania, from Jersey City to the S. and W.[1]; the New York, Ontario & Western (controlled by the New York, New Haven & Hartford), from Weehawken to Oswego; the West Shore (leased by the New York Central), from Weehawken to Buffalo; and the Central railway of New Jersey (controlled by the Philadelphia & Reading), with numerous short lines from Jersey City to the S. and W. These roads also operate numerous branch lines and control other short lines built independently. Among the latter class are the Atlantic City railway (controlled by the Philadelphia & Reading) from Philadelphia to various coast resorts in southern New Jersey; and the West Jersey & Seashore (controlled by the Pennsylvania), from Philadelphia to Atlantic City and Cape May. The railways operating independently of the great "trunk" systems are few and unimportant. The excellence of the waggon roads of the state is largely due to the plentiful supply of trap rock in New Jersey.

Of New Jersey's 487 m. of boundary, 319 m. are touched by waters navigable for boats of varying draft. There is tidal water on the E. and S., and also on the W. as far N. as Trenton. The lower Hudson is navigable for the largest ocean-going steamers. From Bergen Point to Perth Amboy, W. of Staten Island, lie the narrow channels of the Kill van Kull and Arthur Kill, with a minimum depth of 9 or 10 ft. at low water. Raritan Bay, to the S., is navigable only for small vessels. There are no good harbours on the Atlantic coast. The lower Delaware is navigable for ocean steamships as far N. as Camden (opposite Philadelphia), and for small vessels as far as Trenton, which is the head of navigation. The only deep water terminals of the state are Jersey City and Hoboken. Among the rivers the Raritan is navigable to New Brunswick, the Hackensack for small boats for 20 m. above its mouth, the Rahway as far as Rahway, the Great Egg Harbor river as far as May's Landing, the Mullica for 20 m. above its mouth, and the Elizabeth river as far as Elizabeth. In 1907 an inland waterway from Cape May to Bay Head was planned: the length of this channel, through and between coastal sounds from the southernmost part of the state to the northern end of Barnegat Bay in the N.E. part of Ocean county, was to be about 116·6 m., and the channel was to be 6 ft. deep and 100 ft. wide. The Delaware and Raritan canal[2] was long a very important artificial waterway. Its main channel (opened for traffic in 1838) extends from Bordentown, Burlington county, on the Delaware to New Brunswick, on the Raritan, 44 m. by the canal route, and thus carries the waters of the Delaware river entirely across the state, discharging them into the Raritan at New Brunswick. It is 40 ft. wide at the bottom, 80 ft. at the top and 9 ft. deep; it has a navigable feeder (30 ft. wide at the bottom and 60 ft. wide at the top, with a depth of 9 ft.), which is 22 m. long, extending from the Delaware at Bull's Head to Trenton. The canal passes through Trenton (the highest point—56·3 ft. above mean tide), Kingston, Griggston, Weston and Bound Brook, and has one lock (or more) at each of these places. It is used chiefly for the transportation of Pennsylvania coal to New York, and is controlled by the Pennsylvania railway. The total cost up to 1906 was $5,113,749. The Morris Canal,[3] opened in 1836, is 50 ft. wide at the surface, 30 ft. wide at the bottom and 5 ft. deep, and (excluding 4·1 m. of feeders) 102·38 m. long, beginning at Jersey City and passing through Newark, Bloomfield, Paterson, Little Falls, Boonton, Rockaway, Dover, Port Oram, Lake Hopatcong, Hackettstown and Washington to Phillipsburg on the Delaware; it is practically in two sections, one east and the other west of Lake Hopatcong (Sussex and Morris counties; about 928 ft. above sea-level; 9 m. long from N.E. to S.W.; maximum width, 1 m.), which is a reservoir and feeder for the canal's eastern and western branches, and which was enlarged considerably when the canal was built. There is another feeder, the Pompton, 3·6 m. long, in Passaic county. The canal crosses the Passaic and Pompton rivers on aqueducts. The Canal (the Morris Canal Banking Company) was leased in April 1871 to the Lehigh Valley Railroad Company for 999 years. It is no longer of commercial importance as a waterway. At Phillipsburg it connects with an important coal carrying canal (lying almost entirely in Pennsylvania), the property of the Lehigh Coal and Navigation Co. (leased to the Central Railroad of New Jersey), which follows the Lehigh river to Coalport (Carbon county, Pennsylvania), penetrating the coal regions of Pennsylvania.

Population.—The population of the state in 1880 was 1,131,116; in 1890, 1,444,933; in 1900, 1,883,669 (431,884 foreign-born, and 69,844 negroes); in 1905 (state census) 2,144,134; in 1910, 2,537,167. Of the native-born white population in 1900, 556,294 were of foreign parentage, and 825,973 were of native parentage. Among the various elements comprising the foreign-born population were 119,598 Germans; 94,844 Irish; 45,428 English; 41,865 Italians; 19,745 Russians; 14,913 Hungarians; 14,728 Austrians; 14,357 Poles; 14,211 Scotch; and 10,261 Dutch. In 1800 barely 2% of the population was urban; in 1900 80% of the inhabitants either lived in cities or were in daily communication with Philadelphia or New York. The rural population is practically stationary. The chief cities in 1910 were Newark (pop. 347,469), Jersey City (267,779), Paterson (125,600), Trenton (96,815), Camden (94,538) and Hoboken (70,324). Owing to its milder climate and its larger number of cities New Jersey has a negro population somewhat larger than that of the states of the same latitude farther west. The rate of increase of this element, which is greatest in the cities, is about the same as that for the white inhabitants. Since 1881 colonies of Hebrews have been established in the southern part of the state, among them being Alliance (1881), Rosenhayn (1882), Carmel (1883), and, most noted of all, Woodbine, which owes its origin to the liberality of Baron de Hirsch, and contains the Baron de Hirsch Agricultural and Industrial School. As regards church affiliation, in 1906 Roman Catholics were the most numerous, with 441,432 members out of a total of 857,548 communicants of all denominations; there were 122,511 Methodists, 79,912 Presbyterians, 65,248 Baptists, 53,921 Protestant Episcopalians, 32,290 members of the Reformed (Dutch) Church in America, and 24,147 Lutherans.

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[1] The Pennsylvania railway has constructed tunnels under the Hudson river, and has erected a large terminal station on Manhattan Island.

[2] In William Winterbotham's *An Historical, Geographical, Commercial and Philosophical View of the American United States*, &c. (London, 1795) there was a discussion of the feasibility of a canal between the Delaware and the Raritan. In 1804 a company was chartered to build such a canal; in 1816 a route was surveyed; in 1823 a commission was appointed which recommended a route and suggested that the state take part in building the canal; in December 1826 a canal company was incorporated with a monopoly of canal and railway privileges within 10 m. of any part of the canal authorized, but Pennsylvania refused permission to use the waters of the Delaware, and the charter lapsed; in 1830 the Delaware and Raritan Canal Company was incorporated by an act which forbade the construction of any other canal within 5 m. of the proposed route of the Delaware and Raritan, and which reserved to the state the right to buy the waterway 30 years (changed in 1831 to 50 years) after its completion. Lieutenant (afterwards Commodore) Robert F. Stockton (1795–1866), president of the Company, contributed greatly to its financial success. In 1831 it was combined with the Camden & Amboy railway.

[3] The Morris Canal & Banking Company was chartered in 1824 to build the Morris Canal, which never proved a financial success, partly because of the competition of the Delaware Raritan which soon commanded the coal trade, and partly because of physical and mechanical defects. It was exempted from all taxation by the state, which reserved the right to buy it, at a fair price, in 1923 or, without making any payment, to succeed to the actual ownership in 1973 upon the expiration of the charter. The idea of utilizing the waters of Lake Hopatcong was that of George P. MacCulloch of Morristown. A peculiar feature of the canal was a system of inclined planes or railways on which there were cradles, carrying the canal boat up (or down) the incline; these were devised by Professor James Renwick (1818–1895) of Columbia College; 12 of them in the eastern division raised boats altogether about 720 ft., and 11 of them in the western division lowered the boats about 690 ft.—the remainder of the grade was overcome by locks.

Administration.—The state is governed under the constitution of 1844, with subsequent amendments of 1875 and of 1897. The only other constitution under which the state has been governed was that of 1776 (see *History* below). The right of suffrage is conferred upon all males, twenty-one years of age and over, who have resided in the state for one year and in the county for five months preceding the election.[1] Paupers, idiots, insane persons and persons who are convicted of crimes which exclude them from being witnesses and who have not been pardoned and restored to civil rights are disfranchised. The executive power is vested in a governor, who is elected for a term of three years and may not serve two successive terms, though he may be re-elected after he has been out of office for a full term. He must be at least thirty years of age, and must have been a citizen of the United States for a least twenty years, and a resident of the state seven years next preceding his election. He may not be elected by the legislature, during the term for which he is elected as governor, to any office under the state or the United States governments. He receives a salary of $10,000 a year. If the governor die, resign or be removed from office, or if his office be otherwise vacant, he is succeeded by the president of the Senate, who serves until another governor is elected and qualified. The governor's powers under the constitution of 1776 were greatly limited by the constitution of 1844. His appointive power is unusually large. With the advice and consent of the state Senate he selects the secretary of state, attorney-general, superintendent of public instruction, chancellor, chief justice, judges of the supreme, circuit, inferior and district courts, and the so-called "lay" judges of the court of errors and appeals, in addition to the minor administrative officers who are usually appointive in all American states. The governor may make no appointments in the last week of his term. The state treasurer, comptroller and the commissioners of deeds are appointed by the two houses of the legislature in joint session. The governor is *ex officio* a member of the court of pardons, and his affirmative vote is necessary in all cases of pardon or commutation of sentence (see below).

The legislative department consists of a Senate and a General Assembly. In the Senate each of the 21 counties has one representative, chosen for a term of three years, and about one-third of the membership is chosen each year. The members of the General Assembly are elected annually, are limited to sixty (the actual number in 1909), and are apportioned among the counties according to population, with the important proviso, however, that every county shall have at least one member.

The arrangement of senatorial representation is very unequal; and the densely populated counties are under-represented. A senator must at the time of his election be at least thirty years old, and must have been a citizen and inhabitant of the state for four years and of his county for one year immediately preceding his election; and an assemblyman must at the time of his election be at least twenty-one years old, and must have been a citizen and inhabitant of the state for two years, and of his county for one year, immediately preceding his election. The annual salary of each senator and of each member of the General Assembly is $500. Money bills originate in the lower house, but the Senate may propose amendments. The legislature may not create any debt or liability "which shall, single or in the aggregate with any previous debts or liabilities, at any time exceed $100,000," except for purposes of war, to repel invasion or to suppress insurrection, without specifying distinctly the purpose or object, providing for the payment of interest, and limiting the liability to thirty-five years; and the measure as thus passed must be ratified by popular vote. The constitution as amended in 1875 forbids the legislature to pass any private or special laws regulating the affairs of towns or counties, or to vote state grants to any municipal or industrial corporations or societies, and prescribes that in imposing taxes the assessment of taxable property shall be according to general laws and by uniform rules; and anti-race-track agitation in 1891–1897 led to a further amendment prohibiting the legalizing of lotteries, of pool-selling or of other forms of gambling. The governor may (since 1875) veto any item in any appropriation bill, but any bill (or item) may be passed over his veto by bare majorities (of all members elected) in both houses. Bills not returned to the legislature in five days become law, unless the legislature adjourns in the meantime. Amendments to the constitution must first be passed by the legislature at two consecutive sessions (receiving a majority vote of all members elected to each house), and then be ratified by the voters at a special election, and no amendment or amendments may be submitted by the legislature to the people oftener than once in five years.

The judicial system is complex and is an interesting development from the English system of the 18th century. At its head is a court of errors and appeals composed of the chancellor, the justices of the supreme court and six additional "lay" judges. The supreme court consists of a chief justice and eight associate justices, but it may be held by the chief justice alone or by any one of the associate justices. The state is divided into nine judicial districts, and each supreme court justice holds circuit courts within each county of a judicial district, besides being associated with the "president" judge of the court of common pleas of each county in holding the court of common pleas, the court of quarter sessions, the court of oyer and terminer and the orphans' court. One of five additional judges may hold a circuit court in the absence of a justice of the supreme court, or the "president" judge of a court of common pleas may do so if the supreme court justice requests it. In each township there are from two to five justices of the peace, any one of whom may preside over the "small cause court," which has jurisdiction of cases in which the matter in dispute does not exceed $200 and is not an action of replevin, one in which the charge is slander, trespass or assault, battery or imprisonment, or in which the title to real estate is in question.

The court of common pleas, which may be held either by the "president" judge or by a justice of the supreme court, may hear appeals from the "small cause court," and has original jurisdiction in all civil matters except those in which the title to real estate is in question. The court of quarter sessions, which may likewise be held by either the judge of the court of common pleas or by a justice of the supreme court, has jurisdiction over all criminal cases except those of treason or murder. The court of oyer and terminer is a higher criminal court, and has cognizance of all crimes and offences whatever. Except in counties having a population of 300,000 or more, a justice of the supreme court must preside over it, and the judge of the court of common pleas may or may not sit with him; in a county having a population of 300,000 or more the judge of the court of common pleas may sit alone. Writs of error in cases punishable with death are returnable only to the court of errors and appeals. No appeals are permitted in criminal cases. The orphans' court may be held either by the judge of the court of common pleas or by a justice of the supreme court; and it has jurisdiction over controversies respecting the existence of wills, the fairness of inventories, the right of administration and guardianship, the allowance of accounts to executors, administrators, guardians or trustees, and over suits for the recovery of legacies and distributive shares, but it may refer any matter coming before it to a master in chancery. The prerogative court, which is presided over by the chancellor as ordinary and surrogate-general, or by a vice-ordinary and vice-surrogate-general, may hear appeals from the orphans' court, and has the authority to grant probate of wills and letters of administration and guardianship, and to hear and determine disputes arising therein. The court of chancery is administered by a chancellor, seven vice-chancellors and numerous masters in chancery. Besides the ordinary chancery jurisdiction it hears all applications for divorce or nullity of marriage. Appeals from the court of chancery as well as writs of error from the supreme court are heard by the court of errors and appeals. New Jersey has a court of pardons composed of the governor, chancellor and the six "lay" judges of the court of errors and appeals, and the concurrence of a majority of its members, of whom the governor shall be one, is necessary to grant a pardon, commute a sentence or remit a fine. This court has, also, the authority to grant to a convict a licence to be at large upon such security, terms, conditions and limitations as it may require. The judges of the several New Jersey courts are appointed by the governor with the consent of the Senate for a term of years, usually five to seven.

For the purposes of local government the state is divided into counties, cities, townships, towns and boroughs. The government of the towns is administered through a council, clerk, collector, assessor, treasurer, &c., chosen by popular vote; that of the townships is vested in the annual town meeting, at which administrative officers are elected. Any township with more than 5000 inhabitants may be incorporated as a town, with its government vested in a mayor and council. Any township or part thereof with less than 4 sq. m. of territory, and less than 5000 inhabitants, may be incorporated as a borough, with its government vested in a mayor and council.

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[1] The constitution of 1844 limited the suffrage to white males, and although this limitation was annulled by the fifteenth amendment to the Federal Constitution, it was not until 1875 that the state by an amendment (adopted on the 7th of September) struck the word "white" from its suffrage clause. At the same time another amendment was adopted providing that sailors and soldiers in the service of the United States in time of war might vote although absent from their election districts.

In 1903 a law (revised in 1908) was passed providing for the conduct at public cost of primary elections for the nomination of nearly all elective officers, and for the nomination of delegates to party nominating conventions; nominations for primary elections are made by petitions signed by at least ten voters (except in very small election districts) who make affidavit as to their party affiliations; the nominee thus indorsed must file a letter of acceptance. Under this act a "political party" is one which polled at least one-twentieth of the total number of votes cast in the next preceding election in the area for which the nomination is made; and in party conventions there must be one delegate from each election district, and one delegate for each 200 votes cast by the party in the next preceding gubernatorial election.

An act approved on the 10th of April 1908 authorized a Civil Service Commission of four members appointed by the governor, who choose a chief examiner and a secretary of the commission. Civil service rules adopted by this commission went into effect in the same year for certain state employes. In 1910 that part of the law permitting municipalities to adopt these rules through their governing bodies was declared unconstitutional; but municipalities may adopt them by popular vote.

A state Board of Railroad Commissioners (three appointed by the governor), created in 1907, became in 1910 a Board of Public Utility Commissioners with jurisdiction over all public utilities (including telephones and telegraphs); its approval is necessary for the issue of stock or bonds, but it has no power to fix rates.

The state acts concurrently with New York in preserving the natural beauties of the Palisades of the Hudson river; and in 1909 the Palisades Interstate Park, with a front of 13 m. on the Hudson, from Fort Lee to Piermont, was dedicated.

The homestead exempt from sale under seizure is limited to the house and lot, not exceeding $1000 in value, of a debtor having a family. To entitle the property to exemption, it must be registered as a homestead in the office of the county clerk, and it may be sold, then, only with the consent of the husband and wife, and the proceeds of the sale, to the amount of $1000, must be applied to the purchase of another homestead. The exemption does not extend to a sale for unpaid taxes, for labour done on the homestead, materials furnished to it, or for a debt contracted in the purchase thereof, or prior to the recording of the notice. The exemption inures to the benefit of the widow and family of the householder until the youngest child becomes twenty-one years of age.

Capital punishment is by electrocution. A law of 1902 provides the death penalty for any murderous assault on the president of the United States, the chief executive of any state, or the heir to any foreign throne.

The grounds for an absolute divorce are only two: adultery and "wilful, continued and obstinate" desertion for two years; but a decree of limited or permanent separation may be obtained in case of extreme cruelty. Unless the cause of action is adultery or at least one of the parties was a resident of the state at the time the cause of action arose and has continued to reside there, no suit for a divorce can be begun until one of the parties shall have resided in the state for the two years next preceding. Furthermore, the cause of action must have been recognized in the jurisdiction in which the petitioner resided at the time it arose.

No child less than fourteen years old is permitted to work in any factory, workshop or mill; and the penalty for each offence is $50. The employment of children under sixteen years of age in any mercantile establishment for more than 10 hours a day, or 55 hours a week, or between 6 o'clock in the evening and 6 o'clock in the morning is prohibited, except one evening each week when they may be permitted to work until 9 o'clock, and except in the evenings from the 15th to the 25th of December when they may be permitted to work until 10 o'clock. There are strict provisions for the protection and for the sanitary housing of factory employees, and prohibiting sweat-shops. A state law (1899) requires the payment of wages in lawful money at least every two weeks to its employees on the part of every firm, association or partnership doing business in the state.

Education.—During the colonial period there were schools maintained by churches, a few town schools of the New England type, and, in the latter part of the era, a number of private schools. But the schools of colonial New Jersey, especially the private schools, were usually taught by incompetent masters, and many children were permitted to grow up without any schooling whatever. Public interest in education, however, began to awaken soon after the close of the War of Independence. Under the encouragement of an act of the legislature passed in 1794 several academies were established. A public school fund was established in 1817. Three years later townships were authorized to levy taxes for maintaining schools for poor children. The division of townships into school districts and the election of three trustees were provided for in 1829. In 1846 each township was required to raise as much money for school purposes as the state contributed. In 1855 a normal school for training teachers was established at Trenton. And in 1867 a school law was passed which established the main features of the present school system, although it was four years later before a state school tax was imposed and schools were made free to all children in the state. The public school system is administered under the direction of a superintendent of public instruction and a state board of education. The former decides all controversies arising under the school law, and exercises a general supervision over the public schools; the latter has the control of a number of special state educational institutions, appoints the county superintendents and supervises the execution of the school laws of the state. In general each city, town and township in the state constitutes a separate school district, although two or more of these may unite to form a single district. Each district is required to furnish free textbooks. All children between the ages of 7 and 15 are required to attend school for the full school year, and those who at 15 years of age have not completed the grammar school course must continue to attend until they either complete it or arrive at the age of 17. Furthermore, children past 15 years of age who have completed the grammar school course but are not regularly and lawfully employed at some useful occupation must attend a high school or a manual training school until 17 years of age.

Funds for the support of the public schools are derived from various sources: (1) the interest on the "surplus revenue" ($760,670), deposited with New Jersey by the Federal government in 1836; (2) the income from the state school fund, consisting largely of receipts from the sale and rental of riparian lands[1]; (3) a state school tax; (4) a direct appropriation by the legislature to supplement the school tax, so that the two combined will form a sum equal to a tax of two and three-fourths mills on each dollar of taxable property; and (5) local taxes. At the close of the fiscal year 1908 the school fund of the state was $4,850,602·41; the income for the year was $224,233·56 and the disbursements were $373,095·76. The income from the state school fund is divided among the counties on the basis of the total number of days of attendance of the public school pupils; the legislative appropriation, however, is apportioned among the counties according to their assessed property values. Each county also received 90% of the state school tax it has paid, the remainder forming a reserve fund to be distributed among the counties at the discretion of the state board. The state will duplicate any yearly sum between $250 and $5000 which a school district may raise to maintain a school or courses of manual training. In like manner, any school that raises $20 for a library will receive the same amount from the state, which will also contribute $10 each year thereafter for maintenance, if the school raises a similar sum. The total number of teachers in the public schools in 1908 was 10,279; the total school enrollment was 402,866, with an average daily attendance of 289,167; and the average length of the school term was nine months and two days. For the benefit of veteran and invalid public school teachers there is a "retirement fund," which owes its origin to voluntary contributions by teachers in active service. The state has taken official recognition of this fund and administers it on behalf of the contributors through a board of trustees appointed by the governor.

In addition to the regular public schools, the state maintains a normal and a model school at Trenton, a normal school at Montclair (opened 1908), the Farnum Preparatory School at Beverly, a Manual Training and Industrial School for Colored Youth at Bordentown, and an agricultural college and experiment station, maintained in connexion with Rutgers College, at New Brunswick. There are industrial schools in Newark, Hoboken and Trenton, for which the state made an appropriation of $20,000 in 1908. Among the prominent institutions not receiving state aid are Princeton University, at Princeton; Rutgers College (excluding its agricultural school), at New Brunswick; and the Stevens Institute of Technology, at Hoboken. Among the denominational institutions are the Theological Seminary (Presbyterian) at Princeton; the Drew Theological Seminary (Methodist Episcopal) at Madison; Seton Hall College (Roman Catholic), at South Orange; St Peter's College (Roman Catholic) at Jersey City; St Benedict's College (Roman Catholic) at Newark; the German Theological School of Newark

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[1] The state's title to its riparian lands was established, after a long controversy, in 1870 in the case of *Stevens* v. *the Paterson & Newark R.R. Co.* (5 *Vroom's Reports* 532). Since that date, with the exception of the period of Governor Abbett's second administration (1890–1893), the proceeds from the sale and rental of these lands have been regularly applied to the school fund.

(Presbyterian) at Bloomfield; and the Theological Seminary of the (Dutch) Reformed Church in America, at New Brunswick. There are many private academies and secondary schools, sectarian and non-sectarian.

The state supports the following charitable and correctional institutions all under the inspection of a State Department of Charities and Correction (1905); hospitals for the insane at Trenton and Morris Plains; a training-school for feeble-minded children (partly supported by the state) and a home for feeble-minded women at Vineland; a sanatorium for tuberculous diseases at Glen Gardner; a village for epileptics, with a farm of 700 acres, near Skillman, Somerset county; a state home (reform school) for boys near Jamesburg, Middlesex county, and for girls in Ewing township, near Trenton; a state reformatory for criminals sixteen to thirty years of age, near Rahway; a state prison at Trenton; a home for disabled soldiers at Kearney,[1] Hudson county; a home for disabled soldiers, sailors and their wives at Vineland[2]; and a school for the deaf at Trenton. There is no institution for the blind, but the state pays the expenses of blind children who are sent from New Jersey to the New York State School for the Blind. A State Board of Children's Guardians, with an office in Jersey City, cares for destitute children. A convict parole law went into operation in 1891.

Finance.—The revenues for state and for local purposes are derived from separate sources. The expenses of the state government are met chiefly by special taxes on railway and canal corporations, a franchise tax on the capital stock of other corporations, a collateral inheritance tax and leases of riparian lands. The counties and municipalities derive their revenues chiefly from taxes on real and personal property. Real and personal property is free from a state tax, except for school purposes. The school tax is apportioned among the counties in proportion to their taxable property.

A large part of the state's revenue comes from the tax on railways and canals, which is levied on the property actually employed in their operation. Any property of railways other than the "main stem" (*i.e.* the road-bed with the rails and sleepers not over 100 ft. in width),[3] that is employed in operating the road or canal is taxed by the state for local purposes. Counties and municipalities may tax property within their jurisdiction belonging to railways but not actually used for railway purposes. Domestic telegraph, telephone, express, cable, parlour- and sleeping-car, gas- and electric-lighting, oil and pipe line companies, and several classes of insurance companies, are taxed on the amount of their gross receipts. Other domestic corporations are taxed on the amount of their capital stock. The rate of this tax decreases as the amount of capital stock increases, thus favouring large corporations. On all capital stock up to $3,000,000, the rate is one-tenth of 1%; on all amounts between three and five million dollars, the rate is one-twentieth of 1%; and on all above five million dollars, thirty dollars per million, or 3/1000 of 1%. An inheritance tax is levied on all bequests in excess of $500 to persons other than specially excepted classes; and in 1907 the receipts from the "collateral inheritance tax" were $241,480. County and municipal revenue are derived from the tax on general property. The poll tax is restricted almost entirely to municipalities, which devote the proceeds to roads and schools. The fees received for issuing charters to corporations are another source of revenue to the state. Toward corporations the policy of New Jersey has always been liberal; there is no limit fixed either to capitalization or to bonded indebtedness; the tax rate, as already indicated, is lower for large than for small corporations; and so many large combinations of capital have been incorporated under the laws of the state that it is sometimes called "the home of the trusts." For the fiscal year 1907 the fees collected from corporations by the secretary of state amounted to $204,454, the receipts from the tax on corporations other than railways amounted to $2,584,363·60, and the receipts from the tax on railway corporations were $807,780.[4] It is the revenue from these sources that has enabled New Jersey to dispense almost entirely with the general property tax for state purposes. The legal requirement that every corporation chartered by the state must maintain its principal office there has given rise to the peculiar institution called the "corporation agency," a single office which serves as the "principal office" of numbers of corporations. At the close of the fiscal year 1907 the state was free from bonded indebtedness,[5] and had a balance on hand of $1,320,038 (much less than in 1906, because of the non-payment of railway taxes, pending litigation). In the state fund, the total receipts for the year were $4,602,100, and the total disbursements, $5,366,813.

History.—Bones and implements have been found in the Quaternary gravels at Trenton, which have been held by some authorities to prove the presence of Palaeolithic man; but the earliest inhabitants of New Jersey of whom there is any certain record were the Lenni-Lennapé or Delaware Indians, a branch of the Algonquian family. They were most numerous in the southern and central portions of the state, preferring the river valleys; but their total number, perhaps, never exceeded a thousand. Between them and the European settlers there were seldom any manifestations of acute hostility, though each race feared and distrusted the other. Many Indians were enslaved, and intermarriage between them and negro slaves became common. During the 18th century the Indian title to the soil was rapidly extinguished, and at the same time the vices and diseases of the stronger race were gradually reducing their numbers. In 1758 an Indian reservation, said to have been the first established within the present limits of the United States, was established at Edgepelick, or Brotherton (now called Indian Mills) in Burlington county. The surviving aborigines remained there until 1802, when they joined the Mohegans in New York and migrated to Wisconsin and later to Indian Territory, now part of the state of Oklahoma. For the extinction of all Indian titles the legislature of New Jersey in 1832 appropriated $2000, and since that date almost every vestige of Indian occupation has disappeared.

The first authenticated visit of a European to what is now New Jersey was made under French authority by Giovanni da Verrazano, a Florentine navigator, who in the spring of 1524 sailed within Sandy Hook and dropped anchor in the waters of upper New York Bay. In the following year Estevan Gomez, a Portuguese sailor in the service of the emperor Charles V., in his reputed voyage southward from Labrador, is said to have made note of the Hudson and Delaware rivers. It is very probable, also, that French traders soon afterward penetrated the region along the lower Hudson. Voyages to this region for exploration, trade and settlement, however, may be said to have really begun with the year 1609, when Henry Hudson explored the region between Sandy Hook and Raritan Bay and sailed up the river which now bears his name. After this voyage came Dutch traders, who established themselves on Manhattan Island and soon spread across the Hudson river into what are now Hudson and Bergen counties. In 1614 Cornelis Jacobsen Mey explored the lower Delaware, and two years later Cornelis Hendricksen more thoroughly explored this stream. In 1623 the first party of permanent homeseekers arrived at New Amsterdam, and a portion of these formed a settlement on the eastern bank of the Delaware and built Fort Nassau near the site of the present Gloucester City. In 1631 Samuel Godyn and Samuel Blommaert secured a patent from Peter Minuit, the director of New Netherland, authorizing them to plant a settlement near Cape May, but the effort was soon abandoned. A trading hut built at Paulus Hook in 1633 was the beginning of the present Jersey City. On the western bank of the Hudson the trading post of Hobocanhackingh, on the site of the present city of Hoboken, was established at an early date. From these places and from New Amsterdam the Dutch spread into the Raritan Valley. During the rule of Governor William Kieft, the Indians, disturbed by the encroachments of the settlers, assumed a hostile attitude. The actual occasion of the Indian outbreak was the massacre of a number of Tappan Indians in 1643 by soldiers acting under Kieft's orders. From the Connecticut to the Raritan the savages rose in arms, laid waste the farms, massacred the settlers and compelled those who escaped to take refuge on Manhattan Island. The Dutch engaged the services of about fifty Englishmen under Captain John Underhill, a hero of the Pequot War, and in 1644 the Indians were defeated in several engagements, but a general peace with them was not established until the 30th of August 1645.

In the meantime colonists of another nationality had set foot on the shores of the lower Delaware. To found a colony in the new world was long the desire of Gustavus Adolphus of Sweden, but incessant European wars prevented the establishment of any settlement until after his death. In 1638 fifty colonists landed on the western bank of the Delaware and built Fort Christina on the site of the modern Wilmington. Five years later, on the eastern bank a triangular fort, called Elfsborg, was constructed near the present Salem. But the Swedish rule was short-lived, as in 1655 the settlements surrendered to Peter Stuyvesant and passed under the control of the Dutch. Upon the subsequent history of New Jersey the attempts of Holland and Sweden at colonization had very little influence. The Dutch and Swedes between the Delaware and the Hudson were mostly traders, and therefore did not make many permanent settlements or establish forms of government.

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[1] Also receives Federal aid.

[2] *Idem.*

[3] Passenger stations and depot buildings were included as part of the "main stem" until 1906, when their exclusion gave considerable added revenue to the municipalities.

[4] The tax on railway corporations collected by the state for local purposes and paid over to the local governments in 1907 amounted to $581,794.

[5] The only state debt is state certificates for $116,000 issued to the commissioners of the Agricultural College.

By the English of New England and Virginia the Dutch and Swedes were regarded as intruders, and were repeatedly warned against trespassing on English soil.[1] As early as 1634 a patent had been issued to Sir Edmund Plowden, appointing him governor over New Albion, a tract of land including the present states of New Jersey, Delaware, Maryland and Pennsylvania. In spite of great efforts, however, Sir Edmund failed to plant a colony.[2] In 1634 a party of English from Virginia, having ascended the Delaware and occupied Fort Nassau, which the Dutch had abandoned, were promptly captured by the Dutch, taken to New Amsterdam, and thence sent home, arriving just in time to prevent the departure of a second English expedition up the Delaware. In 1641 English colonists from New Haven migrated southward and planted a settlement on the eastern bank of the Delaware river, declaring it to be a part of the New Haven jurisdiction. In the following year Governor Kieft, with the assistance of the Swedes, arrested the English and sent them back to New Haven.

Many years elapsed before an English sovereign made any effort to oust the Dutch from the dominions he claimed by virtue of the discovery of the Cabots. On the 12th of March 1664 Charles II. bestowed upon his brother James, duke of York, all the lands between the Connecticut river and the eastern side of Delaware Bay, as well as all the islands between Cape Cod and the Hudson river. An expedition was sent from England in May, under the command of Richard Nicolls, and in the following August the English flag floated over New Amsterdam. In October Sir Robert Carr took possession of the settlements on the Delaware, and terminated the rule of the Dutch. The few inhabitants of what is now New Jersey acquiesced in the new order. While the expedition commanded by Nicolls was still at sea, the duke of York, by deeds of lease and release, transferred to Lord John Berkeley, baron of Stratton, and Sir George Carteret (*q.v.*), all that part of his new possessions extending eastward from the Delaware Bay and river to the Atlantic Ocean and the Hudson river, and northward from Cape May to a line drawn from the northernmost branch of the Delaware, "which is 41° 40′ lat.," to the Hudson river in 41° N. lat. To this tract the name of *Nova Caesarea*, or New Jersey, was given, as the same name had been given in a patent to Carteret issued in 1650, to "a certain island and adjacent islets" near Virginia, in America, which were never settled—in honour of Carteret, who governed the isle of Jersey in 1643–1651 and there entertained Prince Charles during his exile from England. The grant conferred upon Berkeley and Carteret all the territorial rights which the royal charter had conferred upon the duke of York; but whether or not the rights of government went with these soon became a vexed question. In order to attract immigrants, the proprietors in February 1665 published their "Concession and Agreement," by which they made provision for a governor, a governor's council, and an assembly chosen by the freemen and having the power to levy taxes. Special inducements in the way of land grants were offered to persons embarking with the first governor. In the meantime Governor Nicolls of New York, ignorant of the grant to Berkeley and Carteret, had approved certain Indian sales of land to settlers within New Jersey, and had confirmed their titles to tracts in what later became Elizabethtown, Middletown and Shrewsbury. In this way he unconsciously opened the way for future trouble. Moreover, when he had learned that the duke had parted with New Jersey he convinced him that it was a great loss, and in the effort to save what was possible, Staten Island was taken from the proprietors on the plea that one arm of the Hudson flowed along its western border.

In August 1665 Philip Carteret, a relative of Sir George, arrived in the province as its first governor. In May 1668 he convoked the first assembly at Elizabethtown. At the next session, in the following November, the towns of Shrewsbury and Middletown declared that they held their grants from Governor Nicolls, and that they were consequently exempt from any quit-rents the proprietors might claim. They refused to pay their share of the public expenses; and their deputies, on refusing to take the oath of allegiance and fidelity, were expelled from the assembly. The disaffection soon spread and led to the so-called "disorganizing" assembly in 1672, which went so far as to choose James Carteret, a landgrave of Carolina and presumably a natural son of Sir George, as "President." Philip Carteret returned to England and laid the case before the proprietors; they ordered President Carteret to continue on his way to Carolina and confirmed as governor John Berry, whom Governor Carteret had left behind as deputy. The duke of York declared that the grants made by Nicolls were null and void; the king enjoined obedience to the proprietors, and quiet was restored. Another change was impending, however, and in August 1673, when a Dutch fleet appeared off Staten Island, New Jersey for a second time became a part of New Netherland. The settled region was called "Achter Koll," or "Back Bay," after Newark Bay, whose waters, lying behind the bay of New York, had to be crossed in order to reach Elizabethtown. The period of Dutch rule was short, and by the treaty of Westminster, of the 9th of February 1674, the territory was restored to England. The crown lawyers decided that the rights of the proprietors of New York and New Jersey had been extinguished by the conquest, and that by treaty the lands had been reconveyed, not to the proprietors, but to the king. On the 13th of June 1674 Charles II. accordingly wrote a letter confirming the title and power of Carteret in the eastern half of New Jersey. No similar grant was made to Berkeley, as on the 18th of March he had sold his interest in the province to John Fenwicke, sometime major in the Parliamentary army and later a member of the Society of Friends, and Edward Byllynge (d. 1687), a Quaker merchant.[3] On the 29th of June the duke of York received a new patent similar to that of 1664, and he at once (on the 28th and 29th of July) confirmed Carteret in all his rights in that portion of New Jersey N. of a line drawn from Barnegat Creek to "Rankokus Kill"—a stream a little S. of the site of Burlington—which was considerably more than one-half of the province. The duke of York commissioned Sir Edmund Andros as governor of his dominions, including "all ye land from ye West side of Connecticut River to ye East side of Delaware Bay." Sir George Carteret again sent over his kinsman Philip Carteret to be governor of the eastern part of New Jersey, and the two governors arrived in October 1674 in the same ship. A disagreement arose as to the respective interests of Fenwicke and Byllynge in the western portion of the province, and they chose William Penn, a new member of the Society of Friends, as arbitrator. To Byllynge Penn awarded nine-tenths of the territory and to Fenwicke one-tenth. Financial embarrassments a short time afterward caused Byllynge to assign his shares in trust for his creditors to three Quakers, William Penn, Gawen Lawrie and Nicholas Lucas. Later they acquired control of Fenwicke's share also. In 1675 Fenwicke with his family and a company of settlers reached the Delaware in the ship "Griffith" from London, and on the eastern shore they formed a settlement to which they gave the name of Salem. This was the first permanent English settlement in this part of New Jersey. Refusing to recognize Fenwicke's jurisdiction, Governor Andros of New York attempted to secure his peaceful recognition of the duke's authority, and, failing in this, he sent a military force into this district in December 1676 and made Fenwicke a prisoner. In January, however, he was released on his promise not to act in a public capacity until he should receive further authority. Meanwhile the trustees of Byllynge were seeking a division of the province more to their advantage and, Sir George Carteret having been persuaded by the duke of York to surrender his grant of July 1674, the so-called "quintipartite deed" was executed on the 1st of July 1676. This instrument defined the interests of Carteret, Penn, Lawrie, Lucas and Byllynge, by fixing a line of partition from Little Egg Harbor to a point on the Delaware river, in 41° 40′ N. lat., and by assigning the province east of this line (East Jersey) to Carteret and the province west of this line (West Jersey), about five-eighths of the whole, to the Quaker associates. The Quakers' title to West Jersey, however, still bore the cloud resulting from the Dutch conquest, and the duke of York had desired to recover all of his original grant to Berkeley and Carteret ever since Governor Nicolls had protested against it. But at this time his own right to the crown of England was threatened with the Exclusion Bill, and under these conditions instead of pressing his case against the Quakers he not only permitted it to be decided against him but in August 1680 confirmed their title by a new deed.

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[1] As early as 1613, Captain Samuel Argall, on his way to Virginia, after breaking up some Jesuit settlements at Port Royal, and Mount Desert, passed through the Narrows near the mouth of the Hudson, and finding a group of Dutch traders, made them haul down their flag and replace it with that of England. In the spring of 1620 Thomas Dermer, an English ship captain, on his way from Monhegan to Virginia, visited Manhattan Island and told the Dutch traders that they would not be allowed to remain. In 1627 Governor William Bradford of Plymouth protested by letter to the Dutch against their occupancy, and this warning from the Pilgrims was repeated at least twice.

[2] As late as 1784, Charles Varlo, an Englishman who had purchased one-third of the grant from the heirs of Sir Edmund Plowden, came to New Jersey and sought to substantiate his claim. Failing in a suit in chancery to obtain redress, he returned to England, and nothing further was heard of the claimants to New Albion.

[3] It has been supposed that Fenwicke and Byllynge intended to establish in America a retreat for those who desired religious and political freedom.

A very liberal frame of government for West Jersey, drafted presumably by William Penn, and entitled "the Concessions and Agreements of the Proprietors, Freeholders and Inhabitants of West Jersey in America," was adopted in March 1677. This vested the principal powers of government in an assembly of one hundred members, who were to be chosen annually and to be subject to instructions from their constituents. In the intervals between sessions of the assembly, affairs were to be managed by ten commissioners chosen by that body. Religious toleration was assured. In August 1677 the ship "Kent" arrived in the Delaware, with 230 Quakers from London and Yorkshire. These founded a settlement, which became the modern Burlington, and in the next few months several hundred more colonists arrived. But the new colony was never actually governed under "the Concessions and Agreements"; for from the beginning until the first assembly was called in November 1681 its affairs were managed by commissioners named by the proprietors and when in 1680 the duke of York confirmed the title to the land to Byllynge and his associates he conveyed the right to govern to Byllynge alone. Although he was one of the signers of "the Concessions and Agreements" Byllynge now commissioned Samuel Jennings as governor of the province, and the other proprietors acquiesced, appointing Byllynge governor and permitting Jennings to serve as his deputy. Jennings immediately called the first assembly, and this body passed a number of fundamental laws which provided for a governor and council, but were in other respects much like the clauses relating to government in "the Concessions and Agreements." When, as if to test his authority, Byllynge, in 1682–1683, removed Jennings who had been a popular governor, the assembly, by the advice of William Penn, passed a series of resolutions in the form of a protest, and in 1684 two agents were sent to England to negotiate with Byllynge. There the dispute was finally submitted for arbitration to George Fox and other Quakers, and they decided that, as the government of the province was legally vested in Byllynge by the duke's conveyance to him, he had the right to name the deputy governor. Fenwicke, after his release by Andros, endeavoured to re-establish a government at Salem with himself as "Lord and Chief Proprietor" of West Jersey, but the duke's officers further contested his claims and in 1682 Penn effected a peaceful settlement with him.

In East Jersey, after the return of Governor Carteret, there was a period of quiet, until the death of Sir George Carteret in 1680 gave the zealous Andros another chance to further the supposed interests of his ducal master. Claiming jurisdiction over New Jersey by the terms of his commission, he issued a proclamation in March 1680 ordering Philip Carteret and his "pretended" officers to cease exercising jurisdiction within the duke's dominions unless he could show warrant. To this Carteret made a spirited reply, and on the 30th of April a detachment of soldiers dragged the governor of East Jersey from his bed and carried him prisoner to New York. Here he was confined for four weeks, and was released only on his promise not to exercise any authority until the matter could be referred to England for adjudication. When the assembly of East Jersey met in June, Andros appeared before it as governor and recommended such measures as he deemed advisable, but the deputies refused to pass them. In England, too, his conduct was disavowed, and he was called home to answer charges that had been preferred against him. Philip Carteret reassumed the duties of his office, but his administration, now that Andros was no longer feared, was again marked by much friction with the assembly. Sir George Carteret had bequeathed his province to eight trustees, who were to administer it for the benefit of his creditors, and for the next two years the government was conducted in the name of his widow and executrix, Lady Elizabeth. Early in 1682, after several unsuccessful attempts to effect a sale by other means, the province was offered for sale at public auction, and was purchased by William Penn and eleven associates for £3400. Later each of these twelve sold one-half of his share to another associate, thus making twenty-four proprietors; and on the 14th of March the duke of York confirmed the sale, and gave them all the powers necessary for governing the province. Robert Barclay, one of the proprietors, was chosen governor for life, with the privilege of performing his duties by deputy, and as his deputy he sent over Thomas Rudyard. In 1683 Rudyard was succeeded by Gawen Lawrie, who brought over with him a curious frame of government entitled "the Fundamental Constitutions." This instrument, which was designed to replace the Concessions, provided for the government of the province by a governor chosen by the proprietors, a common council consisting of the proprietors or their proxies together with 12 freemen, and a great council consisting of the proprietors or their proxies together with 144 freemen chosen by a mixed system of elections and the casting of lots. But the new system was to apply only to those who, in return for the greater privileges which it was alleged to ensure, would agree to a resurvey of their lands, arrange to pay quit-rents and provide for the permanent support of the government, and as Governor Lawrie found the colonists generally unwilling to make the exchange on the proposed terms, he discreetly refrained from any attempt to put the Fundamental Constitutions in operation and thereby avoided the confusion which must have resulted from two sets of laws. The government of the twenty-four proprietors, however, was liberal. Recognizing the necessity of some one in the province with full power "to do all things that may contribute to the good and advancement of the same," they directed the appointment of the American Board of Proprietors—a body of men identified with the province, who with the deputy-governor were to look after the proprietary interests in such matters as the approval of legislation and the granting of lands, and thereby prevent the delay caused by the transmission of such matters to England for approval. In 1686 another effort was made to put the Fundamental Constitutions in force, but when the deputies and the council rejected the instrument, the proprietors did not force the matter. In 1686 Perth Amboy, the newly created port of East Jersey, became its seat of government.

After his accession to the throne in 1685, James II. showed an unyielding determination to annul the privileges of the colonies, and to unite New York, New Jersey and the New England colonies under a single government. In order, therefore, to save their rights in the soil, the proprietors of East and West Jersey offered to surrender their claims to jurisdiction, and to this arrangement the king consented. Andros, previously appointed viceroy of New England, thereupon received a new commission extending his authority over New York and the Jerseys, and in August 1688 he formally annexed these provinces to the Dominion of New England. The seizure of Andros by the people of Boston in April 1689, following the news of the revolt in England against James II., gave the Jersey proprietors an opportunity to resume their rights, but the proprietary governments regained their former footing very slowly. The proprietors were widely separated—some being in America, some in England and others in Scotland—and unity of action was impracticable. For three years there was little or no government in the Jerseys, beyond the measures taken by local officers for preserving the peace.

In 1692 an important change occurred in the administrative system through the appointment of Andrew Hamilton (d. 1703) as governor of both East and West Jersey. In 1697 a faction opposed to Hamilton secured his removal and the appointment of their partisan, Jeremiah Basse. The opposition in the two colonies to Basse became so formidable that he was removed in 1699 and Hamilton was reappointed. Certain disaffected elements thereupon refused to recognize his authority, on the ground that his appointment had not received the required approval of the crown, and for a time the condition of the provinces bordered on anarchy. These disorders, and especially complaints against the Jerseys as centres of illegal trade, were brought to the attention of King William and his lawyers contended that as only the king could convey powers of government those exercised by the Jersey proprietors, derived as they were from the duke of York, were without sufficient warrant. Moreover, the inhabitants sent petitions to England, praying that they might be placed under the direct control of the crown. The proprietors of East Jersey had already offered to surrender their jurisdiction, in return for certain concessions by the royal government, but no action had been taken. In 1701 the proprietors of both provinces made another proposal, which was accepted, and in April 1702 all rights of jurisdiction were transferred to the crown, while the rights to the soil remained in the proprietors. The provinces of East and West Jersey were then united under a government similar to that of the other royal provinces. Until 1738 the governor of New York was also governor of New Jersey; after that date each colony had its own governor. The legislature met alternately at Burlington and Perth Amboy, until 1790, when Trenton was selected as the capital of the state.

The next four decades were years of development disturbed, however, by friction between the assembly and the royal governors, and by bitter disputes, accompanied by much rioting, with the proprietors concerning land-titles (1744–1749). Independence of the absentee landlords was again claimed by virtue of the grants made by Nicolls nearly a century before. Agriculture at this time was the main pursuit. The climate was more temperate and the soil more fertile than that of New England; but there were similar small farms and no marked tendencies towards the plantation system of the southern colonies. Slavery had been introduced by the Dutch and Swedes, and from the time of the earliest English occupation had been legally recognized. East Jersey had a fugitive slave law as early as 1675. With the exception of laying an import duty no legislative effort was made—nor is it likely that any would have been allowed by the crown—to restrict the importation of slaves during the colonial period. In addition to African and Indian slaves there was the class known as "redemptioners," or term slaves, consisting of indented servants, who bound themselves to their masters before leaving the mother country, and "free willers," who allowed themselves to be sold after reaching America, in order to reimburse the ship captain for the cost of their passage. Between East and West Jersey certain political and religious differences developed. The former, settled largely by people from New England and Long Island, was dominated by Puritans; the latter by Quakers. In East Jersey, as in New England, the township became a vigorous element of local government; in West Jersey the county became the unit. Important events in the period of royal government were the preaching of George Whitefield in 1739 and the following years, and the chartering of the College of New Jersey (now Princeton University) in 1746, and of Queen's (now Rutgers) College in 1766. The colony gave many proofs of its loyalty to the mother country: it furnished three companies of troops for Admiral Vernon's unfortunate expedition against Cartagena in 1741; in King George's War it raised £2000 for supplies, furnished troops for the capture of Louisburg and sent over six hundred men to Albany; and in the French and Indian (or Seven Years') War its militia participated in the capture of both Quebec and Havana. Against England the colony had fewer grievances than did some of its more commercial neighbours, but the Stamp Act and the subsequent efforts to tax tea aroused great opposition. In 1774 occurred the "Greenwich Tea Party."[1]

The last colonial assembly of New Jersey met in November 1775. From the 26th of May to the 2nd of July 1776 the second provincial congress met at Burlington, Trenton and New Brunswick and for a time became the supreme governing power. By its orders the royal governor, William Franklin (the natural son of Benjamin Franklin) was arrested and deported to Connecticut, where he remained a prisoner for two years, until exchanged and taken to New York under British protection. Following the recommendation of the Continental Congress, that the colonies should create independent governments, the provincial congress also drafted a provincial constitution, which, without being submitted to the people, was published on the 3rd of July 1776; it contained the stipulation that "if a reconciliation between Great Britain and these colonies should take place, and the latter be taken again under the protection of the crown of Britain, this charter shall be null and void—otherwise to remain firm and inviolable." On the 20th of September 1777 it was amended by the New Jersey legislature, the words "state" and "states" being substituted for the words "colony" (or "province") and "colonies." The state furnished a full quota for the Continental army, but the divided sentiment of the people is shown by the fact that six battalions of loyalists were also organized. Tories were active in New Jersey throughout the struggle; among them were bands known as "Pine Robbers," who hid in the pines or along the dunes by day and made their raids at night. In the state were fought some of the most important engagements of the war. When Washington, in the autumn of 1776, was no longer able to hold the lower Hudson he retreated across New Jersey to the Delaware near Trenton and seizing every boat for miles up the river he placed his dispirited troops on the opposite side and left the pursuing army no means of crossing. With about 2500 men he recrossed the Delaware on the night of the 25th of December, surprised three regiments of Hessians at Trenton the next morning, and took 1000 prisoners and 1000 stands of arms. In a series of movements following up this success he outgeneraled the British commander, Lord Cornwallis, and on the 3rd of January 1776, defeated a detachment of his army at Princeton (*q.v.*). The American army then went into winter quarters at Morristown, while a part of the British army wintered at New Brunswick. To protect the inhabitants of the Raritan Valley from British foraging parties General Benjamin Lincoln with 500 men was by Washington's orders stationed at Bound Brook, but on the 13th of April 1777 Lincoln was surprised by a force of about 4000 men under Cornwallis, and although he escaped with small loss it was only by remarkably rapid movements. When the British had gained possession of Philadelphia, in September 1777, their communication between that city and the ocean through the Lower Delaware was obstructed on the New Jersey side by Fort Mercer, commanded by Colonel Christopher Greene, at Red Bank; three battalions of Hessians under Colonel Karl Emil Kurt von Donop attacked the fort on the 22nd of October, but they were repulsed with heavy loss. The fort was abandoned later, however. As the British army under General Clinton was retreating, in June 1778, from Philadelphia to New York, the American army engaged it in the battle of Monmouth (June 28, 1778); the result was indecisive, but that the British were not badly defeated was ascribed to the conduct of General Charles Lee. Before daylight on the 19th of August 1779 was approaching, Major Henry Lee with a force of about 400 men surprised the British garrison at Paulus Hook, where Jersey City now stands, and, although sustaining a loss of 20 men, killed 50 of the garrison and took about 160 prisoners. In 1779–1780 Morristown was again Washington's headquarters. The Congress of the Confederation met in Princeton, in Nassau Hall, which still stands, from June to November 1783.

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[1] Greenwich then had some importance as a port on Cohansey Creek on the lower Delaware. In the summer of 1774 the captain of the ship "Greyhound," bound for Philadelphia with a cargo of tea, on account of the state of opinion in that city, put in at Greenwich and stored his tea there in a cellar. It remained undisturbed till the night of the 22nd of November, when a band of about 40 men dressed as Indians, in imitation of the Boston party, broke into the cellar and made a bonfire of the tea. All attempts to punish the offenders were futile.

After the war New Jersey found its commercial existence threatened by New York and Philadelphia, and it was a feeling of weakness from this cause rather than any lack of state pride that caused the state to join in the movements for a closer Federal Union. In 1786 New Jersey sent delegates to the Annapolis Convention, which was the forerunner of the Federal Convention at Philadelphia in the following year. In the latter body, on the 15th of June, one of the New Jersey delegates, William Paterson (1745–1806), presented what was called the "New Jersey plan" of union, representing the wishes of the smaller states, which objected to representation in a national Congress being based on wealth or on population. This merely federal plan, reported from a Conference attended by the delegates from Connecticut, New York and Delaware, as well as those from New Jersey (and by Luther Martin of Maryland), consisted of nine resolutions; the first was that "the Articles of Confederation ought to be so revised, corrected and enlarged as to render the federal Constitution adequate to the exigencies of government and the preservation of the Union"; and the actual "plan" was for a single legislative body, in which each state should be represented by one member, and which should elect the supreme court and have power to remove the executive (a Council), to lay taxes and import duties, to control commerce, and even, if necessary, to make requisitions for funds from the states. Madison opposed the plan, on the ground that it would not prevent violations by the states of treaties and of laws of nations. On the first resolution only there was a definite vote; on the 19th of June it was voted to postpone the consideration of this resolution and to report the resolutions (the Virginia plan) formerly agreed upon by the committee of the whole. The New Jersey plan left its impress in the provision of the Constitution (approved in the Convention on the 7th of July) for equal representation in the national Senate. The Federal Constitution was ratified by a unanimous vote in the state convention which met at Trenton on the 18th of December 1787.

The state's own constitution, which had been adopted in 1776 and amended in 1777, retained, like other state constitutions framed during the War of Independence, many features of colonial government ill-adapted to a state increasingly democratic. The basis of representation, each county electing three members to the assembly and one member to the legislative council, soon became antiquated. The property qualifications were, for members of the council, "one thousand pounds proclamation money, of real and personal estate, in the same county," and, for members of the assembly, "five hundred pounds proclamation money, in real and personal estate, in the same county." These and the property qualifications for suffrage, which was granted to "all inhabitants of this state, of full age, who are worth fifty pounds proclamation money, clear estate in the same," &c., were soon considered undemocratic; and the democratic tendency of certain election officers may be seen from their construing the words "all inhabitants of full age" to include women, and from their permitting women to vote. The governor was chosen by the joint vote of the council and assembly; he was president of the council, with a casting vote; he was chancellor, captain-general and commander-in-chief of the militia; he had three members of the legislature to act as a privy-council; and he, with the council (of which seven formed a quorum), constituted "the Court of Appeals in the last resort in all causes of law, as heretofore," which, in addition, had "the power of granting pardons to criminals, after condemnation, in all cases of treason, felony or other offences."

In 1838 the opposition to the governor's extensive powers under the constitution was greatly increased in the "Broad Seal" or "Great Seal" War. After a closely contested election in which six members of Congress were chosen on a general ticket, although there was an apparent Democratic majority of about one hundred votes (in a total of 57,000), two county clerks rejected as irregular sufficient returns from townships to elect five Whig candidates to whom the state board of canvassers (mostly Whigs and headed by the Whig governor, William Pennington) gave commissions under the broad seal of the state. Excluding these five members from New Jersey the House of Representatives contained 119 Democrats and 118 Whigs, so that the choice of a Whig speaker could be secured only by the seating of the five Whigs from New Jersey rather than their Democratic rivals. It was decided that only members whose seats were not contested should vote for speaker, and Robert M. T. Hunter, of Virginia, a Democrat and a compromise candidate, was elected to the position; and on the 28th of February 1839 the Democratic candidates were admitted to their seats, to which a congressional committee, reporting afterwards, declared them entitled.[1]

Agitation for constitutional reform resulted in a constitutional convention, which met at Trenton from the 14th of May to the 29th of June 1844 and drafted a new frame of government, introducing a number of radical changes. This instrument was ratified at the polls on the 13th of August. The election of the governor was taken from the legislature and given to the people; the powers of government were distributed among legislative, executive and judicial departments; representation in the assembly was based on population; and the property qualification for membership in the legislature and for the suffrage was abolished.

The constitution of 1844 declared that "All men are by nature free and independent, and have certain unalienable rights, among which are those of enjoying and defending life and liberty . . . and of pursuing and obtaining safety and happiness." A similar clause in the constitution of Massachusetts had been interpreted by the courts as an abolition of slavery, and an effort was made to have the same ruling applied in New Jersey, where the institution of slavery still existed. The courts, however, declared that the clause in the constitution of New Jersey was a "general proposition," not applying "to man in his private, industrial or domestic capacity." An attempt at abolition had previously been made in 1804 by an act declaring that every child born of a slave should be free, but should remain the servant of its mother's owner until twenty-five years of age if a male or twenty-one years of age if a female. The owner of the mother, however, might abandon the child after a year, and it then became a public charge. This last provision produced such a heavy drain on the treasury for the support of abandoned negro children that in 1811 the statute was repealed. In 1846 an act was passed designating slaves as apprentices bound to service until discharged by their owners, and providing that children of such apprentices should be free at birth, but were to be supported by the masters of their parents for six years. There were consequently a few vestiges of the slavery system in New Jersey until the adoption of the Thirteenth Amendment to the Federal Constitution.

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[1] The election to the U.S. Senate in 1865 of John Potter Stockton (1826–1900), a great-grandson of Richard Stockton, a signer of the Declaration of Independence, created hardly less excitement than the Broad Seal War. The state legislature which elected him senator did so by a plurality vote, having previously passed a resolution changing the vote requisite to choose a senator from a majority to a plurality vote. He took his seat in the Senate and his election was upheld by the Senate committee on the judiciary, whose report was adopted (26 March 1866) by a vote of 22 to 21, his own vote carrying the motion; but, because of the objection of Charles Sumner, he withdrew his vote on the 27th of March, and was thereupon unseated by a vote of 23 to 21.

Toward the political questions that disturbed the American people immediately before the Civil War the attitude of the state was conservative. In 1852 the Free-soil candidate for the presidency received only 350 votes in New Jersey; and in 1856 the Democratic candidate received a plurality of 18,605 votes, even though William L. Dayton, a citizen of the state, was the Republican nominee for the vice-presidency. In 1860 three of the state's electoral votes were given to Douglas and four to Lincoln. During the Civil War New Jersey furnished 89,305 men for the Union cause and incurred extraordinary expenditures to the amount of $2,894,385. The state readily consented to the Thirteenth and Fourteenth Amendments to the Federal Constitution, but in 1868 withdrew its consent to the latter. The Fifteenth Amendment was rejected by one legislature, but was accepted by its successor, in which the Republican party had obtained a majority.

Industrially the early part of the 19th century was marked in New Jersey by the construction of bridges and turnpikes, the utilization of water power for manufactures, and the introduction of steam motive power upon the navigable waters. The second war with England interrupted this material progress, and at its beginning was so unpopular, especially with the Quakers, that the Federalists carried the elections in the autumn of 1812. But the attempt of this party to retain control by a "gerrymandering" process was unsuccessful. The Democrats were triumphant in 1813, and the Federalist as well as the Democratic administration responded with aid for the defence of New York and Philadelphia. The state also contributed several hundred men to the service of the United States. Material progress in New Jersey after the war is indicated by the construction of the Morris (1824–1836) and the Delaware & Raritan (1826–1838) canals, and the completion of its first railway, the Camden & Amboy, in 1834.

The years following the Civil War were marked by great industrial development. The numerous projects, good and bad, that were inaugurated in 1866–1875, and the various kinds of laws and charters conferring special privileges that were secured, led to the constitutional prohibition of special legislation already mentioned. In this same period there was a bitter railway war. The Delaware & Raritan Canal Company and the Camden & Amboy Railroad Company, both chartered in 1830 and both monopolies,[1] had been practically consolidated in 1831; in 1836 these joint companies gained control of the Philadelphia & Trenton railway; in 1867 these "United New Jersey Railroad & Canal Companies" consolidated with the New Jersey Railroad & Transportation Company (which was opened in 1836 and controlled the important railway link between New Brunswick and Jersey City), and profits were to be divided equally between the four companies; and in 1871 these entire properties were leased for 999 years to the Pennsylvania Railroad Company. This combination threatened to monopolize traffic, and it was opposed by the Central Railroad of New Jersey, the Delaware, Lackawanna & Western, and a branch of the North Pennsylvania (from Jenkintown to Yardley; sometimes called the "national" or "air-line"), and by the general public; and in 1873 the state passed a general railway law giving other railways than the United New Jersey holdings of the Pennsylvania the right to connect New York and Philadelphia. In 1876 the "national" line was extended to Bound Brook (as the Delaware & Bound Brook) and this road, the North Pennsylvania & Central Railroad of New Jersey, were operated under a tripartite agreement as a through line between New York and Philadelphia; but in 1879 these three lines were leased for 990 years to the Philadelphia & Reading railway. The state itself then became engaged in a struggle with the railways in order to secure from them their full portion of taxes, as the property of individuals was then taxed many times as heavily as that of railways. In 1884 the state gained the victory by securing the passage of a law taxing the franchises of railway corporations.

A reform movement in politics, called the "New Idea," and led by Everett Colby (b. 1874), then a Republican member of the Assembly and in 1906–1908 a state senator, began in 1904; it did much to secure the passage of acts limiting public service franchises to 20 years (unless extended to 40 years by the voters of the municipality concerned), the increase of taxes on railways, the increase of franchise tax rates by 1½% each year up to 5%, the adoption of direct primary elections, and the modification of the existing promoters' liability law.

Before 1800 the state was dominated by the Federalist party; from that date until 1896 it was generally controlled by the Democrats, and from 1896 to 1911 by the Republicans.

The governors of New Jersey have been as follows:—

GOVERNORS: UNDER THE PROPRIETORS

Philip Carteret		1665–1672
John Berry		1672–1673
Anthony Colve[2]		1673–1674

Governors of East Jersey and their Deputies.

Philip Carteret		1674–1682
Robert Barclay		1682–1688
Thomas Rudyard	Deputy	1682–1683
Gawen Lawrie	Deputy	1683–1686
Lord Neill Campbell	Deputy	1686
Andrew Hamilton	Deputy	1686–1688
Edmund Andros		1688–1689
Andrew Hamilton		1692–1697
Jeremiah Basse		1697–1699
Andrew Hamilton		1699–1702

Governors of West Jersey and their Deputies.

Edward Byllynge		1680–1687
Samuel Jennings	Deputy	1681–1684
Thomas Olive	Deputy	1684–1685
John Skene	Deputy	1685–1687
Daniel Coxe		1687–1688
Edward Hunloke	Deputy	1687
Edmund Andros		1688–1689
Andrew Hamilton		1692–1697
Jeremiah Basse		1697–1699
Andrew Hamilton		1699–1702

UNDER THE ROYAL GOVERNMENT

Governors of New York and New Jersey.

Edward Hyde, Lord Cornbury	1703–1708
John, Lord Lovelace	1708–1709
Richard Ingoldsby, Lieut.-Governor	1709–1710
Robert Hunter	1710–1719
William Burnet	1720–1728
John Montgomerie	1728–1731
Lewis Morris,[3] Pres. Council	1731–1732
William Cosby	1732–1736
John Anderson,[3] Pres. Council	1736
John Hamilton,[3] Pres. Council	1736–1738

Governors of New Jersey only.

Lewis Morris	1738–1746
John Hamilton, Pres. Council	1746–1747
John Reading, Pres. Council	1747
Jonathan Belcher	1747–1757
Thomas Pownall, Lieut.-Governor	1757
John Reading, Pres. Council	1757–1758
Francis Bernard	1758–1760
Thomas Boone	1760–1761
Josiah Hardy	1761–1762
William Franklin	1762–1776

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[1] In 1864 a bill was introduced in the Federal House of Representatives making the Camden & Atlantic (now the Atlantic City) railway and the Raritan & Delaware Bay (now a part of the Central of New Jersey) a post route between New York and Philadelphia and authorizing these railways to carry passengers and freight between New York and Philadelphia. Thereupon the governor and legislature of New Jersey protested that such a measure was an infringement of the reserved rights of the state, since the state had contracted with the Camden & Amboy not to construct nor to authorize others to construct within a specified time any other railway across the state to be used for carrying passengers or freight between New York and Philadelphia.

[2] Governor-general of New Netherland.

[3] Jurisdiction only over New Jersey.

Governors of the State

William Livingston	1776–1790	Federalist
William Paterson	1790–1793	„
Richard Howell	1793–1801	„
Joseph Bloomfield	1801–1802	Dem.-Repub.
John Lambert (Acting)	1802–1803	„
Joseph Bloomfield	1803–1812	„
Aaron Ogden	1812–1813	Federalist
William Sandford Pennington	1813–1815	Dem.-Repub.
Mahlon Dickerson	1815–1817	„
Isaac Halsted Williamson	1817–1829	„
Garret Dorset Wall (Declined)	1829	„
Peter Dumont Vroom	1829–1832	Democrat
Samuel Lewis Southard	1832–1833	Whig
Elias P. Seeley	1833	„
Peter Dumont Vroom	1833–1836	Democrat
Philemon Dickinson	1836–1837	„
William Pennington	1837–1843	Whig
Daniel Haines	1843–1844	Democrat
Charles C. Stratton	1845–1848	Whig
Daniel Haines	1848–1851	Democrat
George Franklin Fort	1851–1854	„
Rodman McCauley Price	1854–1857	„
William Augustus Newell	1857–1860	Republican
Charles Smith Olden	1860–1863	„
Joel Parker	1863–1866	Democrat
Marcus Lawrence Ward	1866–1869	Republican
Theodore Frelinghuysen Randolph	1869–1872	Democrat
Joel Parker	1872–1875	„
Joseph Dorsett Bedle	1875–1878	„
George Brinton McClellan	1878–1881	„
George Craig Ludlow	1881–1884	„
Leon Abbett	1884–1887	„
Robert Stockton Green	1887–1890	„
Leon Abbett	1890–1893	„
George Theodore Werts	1893–1896	„
John William Griggs	1896–1898	Republican
Foster MacGowan Voorhees (Acting)	1898	„
David O. Watkins	1898–1899	„
Foster MacGowan Voorhees	1899–1902	„
Franklin Murphy	1902–1905	„
Edward Casper Stokes	1905–1908	„
John Franklin Fort	1908–1911	„
Woodrow Wilson	1911–	Democrat

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History.—The most important sources are: *Documents Relating to the Colonial History of the State of New Jersey* (Archives of the State of New Jersey, 1st series), edited by W. A. Whitehead, F. W. Ricardo and W. Nelson (26 vols., Newark, 1880–1903); *Documents Relating to the Revolutionary History of the State of New Jersey* (Archives of the State of New Jersey, 2nd series; 2 vols., Trenton, 1901–1903); and *Acts of the General Assembly of New Jersey from 1703–1761*, reprinted by A. Leaming and J. Spicer (Somerville, New Jersey, 1881).

For the period of the Dutch rule, see E. B. O'Callaghan's *History of New Netherland* (New York, 1846); and John Romeyn Brodhead's *History of the State of New York* (2nd vol., New York, 1853, 1871); E. P. Tanner, *The Province of New Jersey* (New York, 1908), the most thorough study of the period from 1664 to 1738; Samuel Smith's *History of the Colony of Nova Caesarea, or New Jersey* (Burlington, 1765; 2nd ed., Trenton, 1877), still one of the best accounts of the colonial period, and particularly valuable on account of its copious extracts from the sources, many of which are no longer accessible; see, also, William A. Whitehead's "The English in East and West Jersey, 1664–1689" (in vol. iii. of Justin Winsor's *Narrative and Critical History of America*). Among the monographic contributions are Austin Scott's *Influence of the Proprietors in Founding the State of New Jersey* (Baltimore, 1885) and H. S. Cooley's *Study of Slavery in New Jersey* (Baltimore, 1896). Other useful contributions are A. D. Mellick, *Story of an Old Farm; or, Life in New Jersey in the 18th Century* (Somerville, New Jersey, 1889), full of interesting details; F. B. Lee and others, *New Jersey as a Colony and as a State* (4 vols., with an additional biographical volume, New York, 1902, rather unevenly proportioned, and inaccurate as to details; W. J. Mills, *Historic Houses of New Jersey* (Philadelphia, 1902); William Nelson, *The New Jersey Coast in Three Centuries* (2 vols., New York, 1902); Isaac S. Mulford, *Civil and Political History of New Jersey* (Philadelphia, 1851); W. A. Whitehead, *East Jersey under the Proprietary Governments* (New Jersey Historical Society *Collections*, vol. i., Newark, 1875); W. S. Stryker, *Official Register of the Officers and Men of New Jersey in the Revolutionary War* (Trenton, 1872); W. E. Sackett, *Modern Battles of Trenton* (Trenton, 1895), a political history of New Jersey from 1868 to 1894, dealing especially with the railway controversies; John E. Stillwell, *Historical and Genealogical Miscellany* (2 vols., New York, 1903–1906), containing data relating to the settlement and settlers of New York and New Jersey; R. S. Field, *The Provincial Courts of New Jersey*; L. Q. C. Elmer, *The Constitution and Government of New Jersey* (vols. iii. and vii. of New Jersey Historical Society *Collections*, Newark, 1849, 1872); and David Murray, *History of Education in New Jersey* (No. 23 of Circulars of Information issued by the United States Bureau of Education, Washington, 1899).

NEW JERUSALEM CHURCH, or NEW CHURCH, the community founded by the followers of Emmanuel Swedenborg (*q.v.*). Swedenborg himself took no steps to found a church, but having given a new interpretation of Scripture, it was inevitable that those who accepted his doctrine should separate themselves and organize a society in accordance therewith. Those who received them fully during Swedenborg's lifetime were few and scattered, but courageously undertook the task of dissemination, and gave themselves to translating and distributing their master's writings. Two Anglican clergymen were conspicuous in this work: Thomas Hartley (d. 1784), rector of Winwick, and John Clowes (1743–1831), vicar of St John's, Manchester. Hartley translated *Heaven and Hell* (1778) and *True Christian Religion* (1781); Clowes, who taught New Church doctrine in the existing churches and was opposed to the forming of new organizations, translated 17 volumes, including the *Arcana Coelestia*, and published over 50 volumes of exposition and defence. Through his influence Lancashire became the stronghold of the Swedenborgians, and to-day includes a third of the congregations and more than half the members of the New Church in the United Kingdom.

In 1782 a society for publishing Swedenborg's writings was formed in Manchester, and in December 1783 a little company of sympathizers with similar aims met in London and founded "The Theosophical Society," among the members of which were John Flaxman the sculptor, William Sharpe the engraver, and F. H. Barthélemon the composer. In the early days most of them worshipped at the Female Orphan Asylum, St George's, whose chaplain, Rev. Jacob Duche, like Clowes at Manchester, preached the doctrines from his own pulpit. In 1785 and 1787 J. W. Salmon and R. Mather conducted an open-air missionary tour in the Midlands and the North with some success. Five prominent Wesleyan preachers adopted the new teaching and were cut off from their connexion, a step which led, in spite of remonstrance from Clowes and others, to the formal organization of the New Jerusalem Church on the 7th of May 1787. For some months the members met in private houses, but in January 1788 began worship in a church in Great Eastcheap with a liturgy specially prepared by the Rev. James Hindmarsh and Isaac Hawkins. "The Theosophical Society" was now dissolved. In April 1789 a General Conference of British Swedenborgians was held in Great Eastcheap Church, followed by another and by the publication of a journal, the *New Jerusalem Magazine*, in 1790. Since 1815 conferences have been held every year. A weekly paper, the *Morning Light*, is published, as well as monthly magazines for adults (the *New Church Magazine*) and young folk. The liturgy (containing five services for Morning and Evening, together with the order of Baptism, Holy Supper, Marriage, &c.) was prepared in 1828, revised and extended in 1875; the hymn book of 1823 was revised and enlarged in 1880.

In the provinces the first church was at Birmingham (1791), followed by one at Manchester and another at Liverpool (1793). The Accrington church, the largest in Great Britain, was founded in 1802. Many of the early converts to the New Church were among the most fervent advocates of the abolition of slavery, one was the medical officer of the first batch of convicts sent to Botany Bay; from the house of another, William Cookworthy of Plymouth, Captain Cook sailed on his last voyage. Others were pioneers of elementary education, establishing free day schools long before they were thought of by the state.

In 1815 the conference took up the question of home missionary work, and its agents were able to found many branches of the church. In 1813 the Manchester and Salford (now the North of

England) Missionary Society was founded, chiefly to provide preachers for the smaller churches in its area; in 1857 a National Missionary Institution was founded and endowed, to which most of the local ones have been affiliated. Other denominational agencies have been concerned with the printing and circulation of Swedenborgian literature, a training college for the ministry (founded in 1852), and a Ministers' Aid Fund (1854), and an Orphanage (1881). The centenary of the New Church as a spiritual system was celebrated in 1857, as an external organization in 1883. A few Swedenborgians still hold to the non-separating policy, but more from force of circumstances than from deliberate principle. The constitution of the New Church is of the Independent Congregational type; the conference may advise and counsel, but cannot compel the obedience of the societies. The returns for 1909 showed 45 ministers, 8 recognized leaders, 10 recognized missionaries, 70 societies, 6665 registered members, 7907 Sunday scholars. There are also five or six small societies not connected with the conference.

The New Church in Europe.—In Sweden the Philanthropic Exegetic Society was formed by C. F. Nordenskiold in 1786 to collect documents about Swedenborg and to publish his writings. The introduction of alchemy and mesmerism led to its dissolution in 1789, but its work was continued by the society "Pro fide et charitate," which existed from 1796 to 1820. For many years the works of Swedenborg and his followers were proscribed, and receivers of his writings fined or deprived of office, but in 1866, when religious liberty had made progress, the cause was again taken up; in 1875 the society of "Confessors of the New Church" was formed in Stockholm, and since 1877 services have been regularly held. There is also a church in Gothenburg, and lectures are given from time to time in most of the towns of Sweden. In Norway there is no New Church organization; in Denmark a church was founded in Copenhagen in 1871. In Germany Prelate Oetinger of Württemberg translated many of Swedenborg's writings between 1765 and 1786, but the great name is that of Immanuel Tafel (d. 1863), librarian of Tübingen, who not only edited, translated and published, but in 1848 founded a "Union of the New Church in Germany and Switzerland" which held quarterly meetings. There is a church in Berlin, but otherwise activity in Germany has taken shape in the German Swedenborg Society with headquarters at Stuttgart. In Switzerland, on the contrary, there is an organized body of the New Church; divine service being held in the Society at Zürich and by circles at Berne, Herisau and Nesslau. The Zürich pastor is a member of the American Convention, and has oversight also of the Austrian societies at Vienna and Trieste. In Hungary there are societies at Buda Pesth and Gyorkony. In France there were early Swedenborgians of rank and learning, and much translation was accomplished before 1800. About 1838 J. F. E. Le Boys de Guays began his masterly translation of all Swedenborg's theological works and instituted public New Church worship, which was carried on at his house for thirty years. Sunday worship is now held in the New Church Temple on the Rue Thouin. In Italy (Rome), Holland (The Hague), Belgium (Antwerp and Bruges), there are small societies, and nearly every European country has some known adherents.

In America.—About 1784 James Glen, a London Scot, delivered lectures "For the Sentimentalists" on the new doctrine in Philadelphia and Boston and circulated some of Swedenborg's works. Francis Bailey, state printer of Pennsylvania, was attracted by them and became active in their promulgation. During the next ten years a number of prominent men gave their support to the teaching, which gradually spread inland and southward. The first society for worship was formed in Baltimore in 1792 (reorganized 1798), though a short-lived one had preceded it at Halifax, N.S., in 1791. Other churches grew up in Philadelphia, Cincinnati, Boston and New York, and the General Convention, which meets annually, was formed at Philadelphia in 1817. In 1907 there were 102 ministers and 103 societies with a membership of 6560. Of these, 4 societies and 140 members are in Canada, while the German Synod counts for 11 societies and 325 members.

In Australia, &c.—The formation of societies in Australia began at Adelaide in 1844. Melbourne and Sydney followed in 1854, Brisbane in 1865, Rodborough, Vict., in 1878. There is a circle at Perth. New Zealand has a church at Auckland (1883) and scattered members in the south island. An Australasian conference met at Melbourne in 1881 and has continued to meet in alternate years. There is a society at Mauritius, and correspondents in various parts of South and West Africa, India, Japan, the West Indies and South America.

See L. P. Mercer, *The New Jerusalem in the World's Religious Congresses of 1893*; *Minutes of the General Conference of the New Church* (annual); *Journal of the Annual Session of the General Convention of the New Jerusalem in the United States of America.*

(A. J. G.)

NEW KENSINGTON, a borough of Westmoreland county, Pennsylvania, U.S.A., on the Allegheny river, 18 m. N.E. of Pittsburg. Pop. (1900) 4665 (1042 foreign-born and 86 negroes); (1910) 7707. It is served by the Pennsylvania railroad and by electric railways to neighbouring towns. There are a variety of manufactures. The borough was founded in 1891 and was incorporated in the following year.

NEWLANDS, JOHN ALEXANDER REINA (1838–1898), English chemist, was born in 1838. He was one of the first, if not quite the first, to propound the conception of periodicity among the chemical elements. His earliest contribution to the question took the form of a letter published in the *Chemical News* in February 1863. In the succeeding year he showed, in the same journal, that if the elements be arranged in the order of their atomic weights, those having consecutive numbers frequently either belong to the same group or occupy similar positions in different groups, and he pointed out that each eighth element starting from a given one is in this arrangement a kind of repetition of the first, like the eighth note of an octave in music. The Law of Octaves thus enunciated was at first ignored or treated with ridicule as a fantastic notion unworthy of serious consideration, but the idea, subsequently elaborated by D. I. Mendeléeff and other workers into the Periodic Law, has taken its place as one of the most important generalizations in modern chemical theory. Newlands, who was of Italian extraction on his mother's side, and fought as a volunteer in the cause of Italian freedom under Garibaldi in 1860, died in London on the 29th of July 1898. He collected his various papers on the atomicity of the elements in a little volume on the *Discovery of the Periodic Law* published in London in 1884.

NEW LONDON, a city, port of entry, and one of the county-seats of New London county, Connecticut, U.S.A., coextensive with the township of New London, in the S.E. part of the state, on the Thames river, about 3 m. from its entrance into Long Island Sound. Pop. (1890) 13,757; (1900) 17,548, of whom 3743 were foreign-born; (1910 census) 19,659. It is served by the New York, New Haven & Hartford, and the New London Northern (leased by the Central Vermont) railways, by electric railway to Norwich, Westerly, Groton, Stonington and East Lyme, by a daily line of passenger steamboats to New York City, and by two lines of freight steamers, and in the summer months by daily steamboats to Sag Harbor and Greenport, Long Island, and Watch Hill and Block Island, Rhode Island. New London's harbour is the best on the Sound. The city is the headquarters of a United States artillery district, embracing Fort H. G. Wright on Fisher's Island, New York, Fort Michie on Gull Island, New York, Fort Terry on Plum Island, New York, and Fort Mansfield on Napatree Point, Rhode Island—fortifications which command the eastern entrance to Long Island Sound; and it is the headquarters of the Third District of the U.S. Engineers and of the Third District of the Lighthouse Department. The harbour was formerly defended by two forts, both now obsolete—Fort Trumbull on the right bank of the Thames, and Fort Griswold on the left bank, in the township of Groton (pop. 1900, 5962). The city is built on a declivity facing the south-east; from the higher points there are excellent views of Long Island Sound and the surrounding country. New London is a summer resort, and is a station of the New York Yacht Club; the boat races between Harvard and Yale universities are annually rowed on the river near the city. Among the places of interest are the Town Mill, built in 1650 by John Winthrop, Jr., in co-operation with the town; the Hempstead Mansion, built by John Hempstead about 1678; the old cemetery, north-east of the city, laid out in 1653; a school house in which Nathan Hale taught; and a court house built in 1785. There is a public library (about 30,000 volumes), and the New London County Historical Society (incorporated 1870) has an historical library. There are two endowed high schools, the Bulkeley School for boys and the Williams Memorial Institute (1891) for girls, and an endowed Manual Training and Industrial School (1872), all offering free instruction. In the 18th century New London had a large trade in lumber, flour and food supplies with the West Indies, Gibraltar and the Barbary States; but this trade declined after the War of 1812, and the whaling and sealing industries, once very lucrative, have also declined in value. The imports in 1906 were valued at $54,873 and the exports at $60,522; in 1909 their respective values were $10,870 and $10,295. Manufacturing is the principal industry; among the products are silk goods, cotton gins, printing presses and foundry and machine shop products. The total value of factory products was $4,709,628 in 1905, an increase of 11·6% since 1900.

New London was founded in 1646 by John Winthrop, the younger. It was known by its Indian name "Nameaug" until 1658, when the General Court of Connecticut approved the wish of the settlers to adopt its present name from London, England, the river Monhegin at the same time becoming the Thames. During the War of Independence it was a rendezvous for American privateers. In 1776 the first naval expedition authorized by Congress was organized in its harbour, and there in the next three years twenty privateers were fitted out. On the 6th of September 1781, 800 British troops and Loyalists under General Benedict Arnold (who was born in New London county) raided New London, destroyed much private property, and at Fort Griswold killed 84 American soldiers, many of them after their surrender. The massacre is commemorated by an obelisk, 134 ft. high, on Groton Heights. The city was incorporated in 1784. In 1798 there was an epidemic of yellow fever. From the 7th of November 1812 until the close of the second war with Great Britain the harbour was blockaded by a British fleet.

See F. M. Caulkins's *History of New London* (new ed., New London, 1900); and the publications of the New London County Historical Society (New London).

NEWLYN, a village in the St Ives parliamentary division of Cornwall, England, on the shore of Mount's Bay, 1 m. S.W. of Penzance. It is a small fishing port, with narrow paved lanes and old-fashioned cottages. Near the parish church of St Peter stands an ancient cross of granite, discovered in a field close by. The harbour, one of the safest for small craft in the west country, is sheltered by two long and massive stone piers. A more ancient pier, originally constructed in the reign of Henry VI., was renewed in that of James I. Tin mining and smelting have been largely carried on in the neighbourhood, and several galleries were worked far under the sea. The principal modern industry, however, is fishing, especially for pilchard. The picturesque appearance of the village, with its quays and little harbour, and the grandeur of the cliffs and moorland scenery towards Land's End, make Newlyn an attractive spot. Between 1880 and 1890 an artistic coterie grew up here, the leaders of which were Edwin Harris, Walter Langley, Fred Hall, Frank Bramley, T. C. Gotch, Mr and Mrs Stanhope Forbes, Chevalier Taylor and H. S. Tuke. The earlier artists at Newlyn were said to have selected it as their centre, because a greyness in the atmosphere helped their depiction of subtleties in tone, part of their creed being subordination of colour to tone-gradation. In later times, the element of a common ideal tended to disappear, but the interest of the "Newlyn school" attracted a regular art-colony, who in various ways assimilated and expressed the picturesque influences of the place (see PAINTING: *Recent British*). There is a permanent Art Gallery, containing examples of the work of the Newlyn artists. Newlyn ward in the urban district of PAUL (pop. 6332) had in 1901 a population of 3749.

NEW MADRID, a city and the county-seat of New Madrid county, Missouri, U.S.A., on the right bank of the Mississippi river, about 35 m. S. by W. of Cairo, Ill. Pop. (1900) 1489; (1910) 1882. It is served by the St Louis South-western railway and by river packets. The city is a shipping point for a rich grain, cotton, livestock and lumber region. Among its manufactures are lumber, staves, and hoops. The municipality owns its water-works. Owing to the encroachments of the Mississippi river, the site of the first permanent settlement of New Madrid is said to lie now about 1½ m. from the E. bank of the river, in Kentucky. This settlement was made in 1788, on an elaborately laid out town site, and was named New Madrid by its founder, Colonel George Morgan (1742–1810),[1] who, late in 1787, had received a grant of a large tract of land on the right bank of the Mississippi river, below the mouth of the Ohio, from Don Diego de Gardoqui, Spanish minister to the United States. The tract lay within the province of "Louisiana," and the grant to Morgan was a part of Gardoqui's plan to annex to that province the western American settlements, Morgan being required to establish thereon a large number of emigrants, whom he secured from New Jersey, Canada and elsewhere. Governor Estevan Miro of Louisiana, however, disapproved of the grant, on the ground that it would cause the province to be overrun by Americans; the settlers became restive under the restraints imposed upon them; Morgan himself left; and in December 1811 and January 1812 a series of severe earthquake shocks caused a general emigration. New Madrid was occupied by Confederate troops under General Gideon J. Pillow, on the 28th of July 1861, and after the surrender of Fort Donelson (February 16, 1862) the troops previously at Columbus, forming the Confederate left flank, were withdrawn to New Madrid and Island No. 10 (in the Mississippi about 10 m. S.). There were Confederate batteries on the left bank of the Mississippi opposite Island No. 10, and along the same bank from a point opposite New Madrid to Tiptonville, Tennessee. Behind these batteries were Reelfoot Lake and overflowed lands. Retreat by land was thus virtually impossible. Early in March, Major-General John Pope and Commodore A.H. Foote proceeded against these positions; New Madrid, then in command of General John P. McGown, was evacuated on the 14th; (Admiral) Henry Walke (1808–1896), commanding the "Carondelet," ran past the batteries of Island No. 10 and the shore batteries on the 4th of April, and Lieut.-Commander Egbert Thompson, commanding the "Pittsburgh," on the 7th; meanwhile the Federals under the direction of Colonel Josiah W. Bissell (b. 1818), of the engineer corps, had, with great difficulty, constructed an artificial channel to New Madrid across the peninsula (swamp land) formed by a great loop of the Mississippi; troops were conveyed by transports through this channel below the island, Federal batteries having been established on the right bank of the river; the retreat of the Confederates down stream was effectually blocked; they evacuated the island on April 7th, and on the 8th the garrison and the forces stationed in the shore batteries, a total of about 7000, under General W. W. Mackall (who had succeeded General McGown on the 31st of March) was surrendered at Tiptonville. The island was subsequently washed away, a new one being formed in the vicinity.

NEWMAN, FRANCIS WILLIAM (1805–1897), English scholar and miscellaneous writer, younger brother of Cardinal Newman, was born in London on the 27th of June 1805. Like his brother, he was educated at Ealing, and subsequently at Oxford, where he had a brilliant career, obtaining a double first class in 1826. He was elected fellow of Balliol in the same year. Conscientious scruples respecting the ceremony of infant baptism led him to resign his fellowship in 1830, and he went to Baghdad as assistant in the mission of the Rev. A. N. Groves. In 1833 he returned to England to procure additional support for the mission, but rumours of unsoundness in his views on the doctrine of eternal punishment had preceded him, and finding himself generally looked upon with suspicion, he gave up the vocation of missionary to become classical tutor in an unsectarian college at Bristol. His letters written home during the period of his mission were collected and published in 1856, and form an interesting little volume. Newman's views matured rapidly, and in 1840 he became professor of Latin in Manchester New College, the celebrated Unitarian seminary long established at York, and the parent of Manchester College, Oxford. In 1846 he quitted this appointment to become professor in University College, London, where he remained until 1869. During all this period he was assiduously carrying on his studies in mathematics and oriental languages, but wrote little until 1847, when he published anonymously a *History of the Hebrew Monarchy*, intended to introduce the results of German investigation in this department of Biblical criticism. In 1849 appeared *The Soul, her Sorrows and Aspirations*, and in 1850, *Phases of Faith, or Passages from the History of my Creed*—the former a tender but searching analysis of the relations of the spirit of man with the Creator; the latter a religious autobiography detailing the author's passage from Calvinism to pure theism. It is on these two books that Professor Newman's celebrity will principally rest; having in both to describe his personal experience, his intense earnestness has kept him free from the eccentricity which marred most of his other writings, excepting his contributions to mathematical research and oriental philology. There was, indeed, scarcely a crotchet, except "spiritualism," of which he was not at one time or another the advocate. His versatility was amazing: he wrote on logic, political economy, English reforms, Austrian politics, Roman history, diet, grammar, the most abstruse departments of mathematics, Arabic, the emendation of Greek texts, and languages as out of the way as the Berber and as obsolete as the dialect of the Iguvine inscriptions. In treating all these subjects he showed signal ability, but, wherever the theme allowed, an incurable crotchetiness; and in his numerous metrical translations from the classics, especially his version of the *Iliad*, he betrayed an insensibility to the ridiculous which would almost have justified the irreverent criticism of Matthew Arnold, had this been conveyed in more seemly fashion. His miscellaneous essays, some of much value, were collected in several volumes before his death: his last publication, *Contributions chiefly to the Early History of Cardinal Newman* (1891), was generally condemned as deficient in fraternal feeling. He was far from possessing his brother's subtlety of reasoning, but he impresses by a transparent sincerity and singleness of mind not always displayed by the more celebrated writer; his style is too individual to be taken as a model, but is admirable for its simplicity and clearness. His character is vividly drawn by Carlyle in his life of Sterling, of whose son Newman was guardian: "a man of fine attainments, of the sharpest-cutting and most restlessly advancing intellect and of the mildest pious enthusiasm." It was his great misfortune that this enthusiasm should have been correlated, as is not unfrequently the case, with an entire insensibility to the humorous side of things. After his retirement from University College, Professor Newman continued to live for some years in London, subsequently removing to Clifton, and eventually to Weston-super-Mare, where he died on the 7th of October 1897. He had been blind for five years before his death, but retained his faculties to the last. He was twice married.

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[1] Morgan had been made Indian agent at Fort Pitt (Pittsburg) in 1776, and was commissioned a colonel in the Continental Army in 1777. In 1806 he was visited at his home, near Pittsburg, by Aaron Burr, who told him something about his famous "conspiracy" scheme in the West, which Morgan reported to Jefferson—"the very first intimation I had of the plot," Jefferson afterward wrote to Morgan.

See T. G. Sieveking, *Memoir and Letters of Francis W. Newman* (1909). (R. G.)

NEWMAN, JOHN HENRY (1801–1890), English Cardinal, was born in London on the 21st of February 1801, the eldest son of John Newman, banker, of the firm of Ramsbottom, Newman and Co. The family was understood to be of Dutch extraction, and the name itself, spelt "Newmann" in an earlier generation, further suggests Hebrew origin. His mother, Jemima Fourdrinier, was of a Huguenot family, long established in London as engravers and paper manufacturers. John Henry was the eldest of six children. The second son, Charles Robert, a man of ability but of impracticable temper, a professed atheist and a recluse, died in 1884. The youngest son, Francis William (*q.v.*), was for many years professor of Latin in University College, London. Two of the three daughters, Harriett Elizabeth and Jemima Charlotte, married brothers, Thomas and John Mozley; and Anne Mozley, a daughter of the latter, edited in 1892 Newman's Anglican *Life and Correspondence*, having been entrusted by him in 1885 with an autobiography written in the third person to form the basis of a narrative of the first thirty years of his life. The third daughter, Mary Sophia, died unmarried in 1828.

At the age of seven Newman was sent to a private school conducted by Dr Nicholas at Ealing, where he was distinguished by diligence and good conduct, as also by a certain shyness and aloofness, taking no part in the school games. He speaks of himself as having been "very superstitious" in these early years. He took great delight in reading the Bible, and also the novels of Scott, then in course of publication. At the age of fifteen, during his last year at school, he was "converted," an incident that throughout life remained to him "more certain than that he had hands or feet." It was in the autumn of 1816 that he thus fell under the influence of a definite creed, and received into his intellect impressions of dogma never afterwards effaced. The tone of his mind was at this date evangelical and Calvinistic, and he held that the pope was anti-Christ. Matriculating at Trinity College, Oxford, 14th December 1816, he went into residence there in June the following year, and in 1818 he gained a scholarship of £60, tenable for nine years. But for this he would have been unable to remain at the university, as in 1819 his father's bank suspended payment. In that year his name was entered at Lincoln's Inn. Anxiety to do well in the final schools produced the opposite result; he broke down in the examination, and so graduated with third-class honours in 1821. Desiring to remain in Oxford, he took private pupils and read for a fellowship at Oriel, then "the acknowledged centre of Oxford intellectualism." To his intense relief and delight he was elected on the 12th of April 1822. E. B. Pusey was elected a fellow of the same society in 1823.

On Trinity Sunday, 13th June 1824, Newman was ordained, and became, at Pusey's suggestion, curate of St Clement's, Oxford. Here for two years he was busily engaged in parochial work, but he found time to write articles on "Apollonius of Tyana," on "Cicero" and on "Miracles" for the *Encyclopaedia Metropolitana*. In 1825, at Whately's request, he became vice-principal of St Alban's Hall, but this post he held for one year only. To his association with Whately at this time he attributed much of his "mental improvement" and a partial conquest of his shyness. He assisted Whately in his popular work on logic, and from him he gained his first definite idea of the Christian Church. He broke with him in 1827 on the occasion of the re-election of Peel for the University, Newman opposing this on personal grounds. In 1826 he became tutor of Oriel, and the same year R. H. Froude, described by Newman as "one of the acutest, cleverest and deepest men" he ever met, was elected fellow. The two formed a high ideal of the tutorial office as clerical and pastoral rather than secular. In 1827 he was a preacher at Whitehall. The year following Newman supported and secured the election of Hawkins as provost of Oriel in preference to Keble, a choice which he later defended or apologized for as having in effect produced the Oxford Movement with all its consequences. In the same year he was appointed vicar of St Mary's, to which the chapelry of Littlemore was attached, and Pusey was made regius professor of Hebrew. At this date, though still nominally associated with the Evangelicals, Newman's views were gradually assuming a higher ecclesiastical tone, and while local secretary of the Church Missionary Society he circulated an anonymous letter suggesting a method by which Churchmen might practically oust Nonconformists from all control of the society. This resulted in his being dismissed from the post, 8th March 1830; and three months later he withdrew from the Bible Society, thus completing his severance from the Low Church party. In 1831–1832 he was select preacher before the University. In 1832, his difference with Hawkins as to the "substantially religious nature" of a college tutorship becoming acute, he resigned that post, and in December went with R. H. Froude, on account of the latter's health, for a tour in South Europe. On board the mail steamship "Hermes" they visited Gibraltar, Malta and the Ionian Islands, and subsequently Sicily, Naples and Rome, where Newman made the acquaintance of Dr Wiseman. In a letter home he described Rome as "the most wonderful place on earth," but the Roman Catholic religion as "polytheistic, degrading and idolatrous." It was during the course of this tour that he wrote most of the short poems which a year later were printed in the *Lyra Apostolica*. From Rome Newman returned to Sicily alone, and was dangerously ill with fever at Leonforte, recovering from it with the conviction that he had a work to do in England.

In June 1833 he left Palermo for Marseilles in an orange boat, which was becalmed in the Strait of Bonifacio, and here he wrote the verses, "Lead, kindly Light," which later became popular as a hymn. He was at home again in Oxford on the 9th of July, and on the 14th Keble preached at St Mary's an assize sermon on "National Apostasy," which Newman afterwards regarded as the inauguration of the Oxford Movement. In the words of Dean Church, it was "Keble who inspired, Froude who gave the impetus and Newman who took up the work"; but the first organization of it was due to H. J. Rose, editor of the *British Magazine*, who has been styled "the Cambridge originator of the Oxford Movement." It was in his rectory house at Hadleigh, Suffolk, that a meeting of High Church clergymen was held, 25th to 29th of July (Newman was not present), at which it was resolved to fight for "the apostolical succession and the integrity of the Prayer-Book." A few weeks later Newman started, apparently on his own initiative, the *Tracts for the Times*, from which the movement was subsequently named "Tractarian." Its aim was to secure for the Church of England a definite basis of doctrine and discipline, in case either of disestablishment or of a determination of High Churchmen to quit the establishment, an eventuality that was thought not impossible in view of the States' recent high-handed dealings with the sister established Church of Ireland. The teaching of the tracts was supplemented by Newman's Sunday afternoon sermons at St Mary's, the influence of which, especially over the junior members of the university, was increasingly marked during a period of eight years. In 1835 Pusey joined the movement, which, so far as concerned ritual observances, was later called "Puseyite"; and in 1836 its supporters secured further coherence by their united opposition to the appointment of Hampden as regius professor of divinity. His Bampton Lectures (in the preparation of which Blanco White had assisted him) were suspected of heresy, and this suspicion was accentuated by a pamphlet put forth by Newman, *Elucidations of Dr Hampden's Theological Statements*. At this date Newman became editor of the *British Critic*, and he also gave courses of lectures in a side-chapel of St Mary's in defence of the *via media* of the Anglican Church as between Romanism and popular Protestantism. His influence in Oxford was supreme about the year 1839, when, however, his study of the monophysite heresy first raised in his mind a doubt as to whether the Anglican position was really tenable on those principles of ecclesiastical authority which he had accepted; and this doubt returned when he read, in Wiseman's article in the *Dublin Review* on "The Anglican Claim," the words of St Augustine against the Donatists, "*securus judicat orbis terrarum*," words which suggested a simpler authoritative rule than that of the teaching of antiquity. He continued his work, however, as a High Anglican controversialist until he had published, in 1841, *Tract 90*, the last of the series, in which he put forth, as a kind of proof charge, to test the tenability of all Catholic doctrine within the Church of England, a detailed examination of the XXXIX. Articles, suggesting that their negations were not directed against the authorized creed of Roman Catholics, but only against popular errors and exaggerations. This theory, though not altogether new, aroused much indignation in Oxford, and A. C. Tait, afterwards archbishop of Canterbury), with three other senior tutors, denounced it as "suggesting and opening a way by which men might violate their solemn engagements to the university." The alarm was shared by the heads of houses and by others in authority; and, at the request of the bishop of Oxford, the publication of the Tracts came to an end. At this date Newman also resigned the editorship of the *British Critic*, and was thenceforth, as he himself later described it, "on his deathbed as regards membership with the Anglican Church." He now recognized that the position of Anglicans was similar to that of the semi-Arians in the Arian controversy; and the arrangement made at this time that an Anglican bishopric should be established in Jerusalem, the appointment to lie alternately with the British and Prussian governments, was to him further evidence of the non-apostolical character of the Church of England. In 1842 he withdrew to Littlemore, and lived there under monastic conditions with a small band of followers, their life being one of great physical austerity as well as of anxiety and suspense. To his disciples there he assigned the task of writing lives of the English saints, while his own time was largely devoted to the completion of an essay on the development of Christian doctrine, by which principle he sought to reconcile himself to the elaborated creed and the practical system of the Roman Church. In February 1843 he published, as an advertisement in the *Oxford Conservative Journal*, an anonymous but otherwise formal retractation of all the hard things he had said against Rome; and in September, after the secession of one of the inmates of the house, he preached his last Anglican sermon at Littlemore and resigned the living of St Mary's. But still an interval of two years elapsed before he was formally received into the Roman Catholic Church (9th October 1845) by Father Dominic, an Italian Passionist. In February 1846 he left Oxford for Oscott, where Bishop Wiseman, then vicar-apostolic of the Midland district, resided; and in October he proceeded to Rome, where he was ordained priest and was given the degree of D.D. by the pope. At the close of 1847 he returned to England as an Oratorian, and resided first at Maryvale (near Oscott); then at St Wilfrid's College, Cheadle; then at St Ann's, Alcester Street, Birmingham; and finally at Edgbaston, where spacious premises were built for the community, and where (except for four years in Ireland) he lived a secluded life for nearly forty years. Before the house at Edgbaston was occupied he had established the London Oratory, with Father Faber as its superior, and there (in King William Street, Strand) he delivered a course of lectures on "The Present Position of Catholics in England," in the fifth of which he protested against the anti-Catholic utterances of Dr Achilli, an ex-Dominican friar, whom he accused in detail of numerous acts of immorality. Popular Protestant feeling ran very high at the time, partly in consequence of the recent establishment of a Roman Catholic diocesan hierarchy by Pius IX., and criminal proceedings against Newman for libel resulted in an acknowledged gross miscarriage of justice. He was found guilty, and was sentenced to pay a fine of £100, while his expenses as defendant amounted to about £14,000, a sum that was at once raised by public subscription, a surplus being spent on the purchase of Rednall, a small property picturesquely situated on the Lickey Hills, with a chapel and cemetery, where Newman now lies buried. In 1854, at the request of the Irish bishops, Newman went to Dublin as rector of the newly-established Catholic university there. But practical organization was not among his gifts, and the bishops became jealous of his influence, so that after four years he retired, the best outcome of his stay there being a volume of lectures entitled *Idea of a University*, containing some of his most effective writing. In 1858 he projected a branch house of the Oratory at Oxford; but this was opposed by Manning and others, as likely to induce Catholics to send their sons to that university, and the scheme was abandoned. In 1859 he established, in connexion with the Birmingham Oratory, a school for the education of the sons of gentlemen on lines similar to those of the English public schools, an important work in which he never ceased to take the greatest interest. But all this time (since 1841) Newman had been under a cloud, so far as concerned the great mass of cultivated Englishmen, and he was now awaiting an opportunity to vindicate his career; and in 1862 he began to prepare autobiographical and other memoranda for the purpose. The occasion came when, in January 1864, Charles Kingsley, reviewing Froude's *History of England* in *Macmillan's Magazine*, incidentally asserted that "Father Newman informs us that truth for its own sake need not be, and on the whole ought not to be, a virtue of the Roman clergy." After some preliminary sparring between the two—Newman's pamphlet, "Mr Kingsley and Dr Newman: a Correspondence on the Question whether Dr Newman teaches that Truth is no Virtue," published in 1864 and not reprinted, is unsurpassed in the English language for the vigour of its satire; the anger displayed was later, in a letter to Sir William Cope, admitted to have been largely feigned—Newman published in bi-monthly parts his *Apologia pro vita sua*, a religious autobiography of unsurpassed interest, the simple confidential tone of which "revolutionized the popular estimate of its author," establishing the strength and sincerity of the convictions which had led him into the Roman Catholic Church. Kingsley's accusation indeed, in so far as it concerned the Roman clergy generally, was not precisely dealt with; only a passing sentence, in an appendix on lying and equivocation, maintained that English Catholic priests are as truthful as English Catholic laymen; but of the author's own personal rectitude no room for doubt was left.

In 1870 he put forth his *Grammar of Assent*, the most closely reasoned of his works, in which the case for religious belief is maintained by arguments differing somewhat from those commonly used by Roman Catholic theologians; and in 1877, in the republication of his Anglican works, he added to the two volumes containing his defence of the *via media* a long preface and numerous notes in which he criticized and replied to sundry anti-Catholic arguments of his own in the original issues. At the time of the Vatican Council (1869–1870) he was known to be opposed to the definition of Papal infallibility, and in a private letter to his bishop (Ullathorne), surreptitiously published, he denounced the "insolent and aggressive faction" that had pushed the matter forward. But he made no sign of disapproval when the doctrine was defined, and subsequently, in a letter nominally addressed to the duke of Norfolk on the occasion of Mr Gladstone's accusing the Roman Church of having "equally repudiated modern thought and ancient history," Newman affirmed that he had always believed the doctrine, and had only feared the deterrent effect of its definition on conversions on account of acknowledged historical difficulties. In this letter, and especially in the postscript to the second edition of it, Newman finally silenced all cavillers as to his not being really at ease within the Roman Church. In 1878 his old college (Trinity), to his great delight, elected him an honorary fellow, and he revisited Oxford after an interval of thirty-two years. At the same date died Pope Pius IX., who had long mistrusted him; and Leo XIII. was encouraged by the duke of Norfolk and other distinguished Roman Catholic laymen to make Newman a cardinal, the distinction being a marked one, because he was a simple priest and not resident in Rome. The offer was made in February 1879, and the announcement of it was received with universal applause throughout the English-speaking world. The "creation" took place on 12th May, with the title of St George in Velabro, Newman taking occasion while in Rome to insist on the lifelong consistency of his opposition to "liberalism in religion." After an illness that excited apprehension he returned to England, and thenceforward resided at the Oratory until his death, 11th August 1890, making occasional visits to London, and chiefly to his old friend, R. W. Church, dean of St Paul's, who as proctor had vetoed the condemnation of *Tract 90* in 1841. As cardinal Newman published nothing beyond a preface to a work by A. W. Hutton on the *Anglican Ministry* (1879) and an article on Biblical criticism in the *Nineteenth Century* (February 1884).

Newman's influence as controversialist and preacher (*i.e.* as reader of his written sermons, for he was never a speaker) was very great. For the Roman Church his conversion secured great prestige and the dissipation of many prejudices. Within it his influence was mainly in the direction of a broader spirit and of a recognition of the important part played by development both in doctrine and in Church government. And although he never called himself a mystic, he showed that in his judgment spiritual truth is apprehended by direct intuition, as an antecedent necessity to the professedly purely rational basis of the Roman Catholic creed. Within the Anglican Church, and even within the more strictly Protestant Churches, his influence was greater, but in a different direction, viz. in showing the necessity of dogma and the indispensableness of the austere, ascetic, chastened and graver side of the Christian religion. If his teaching as to the Church was less widely followed, it was because of doubts as to the thoroughness of his knowledge of history and as to his freedom from bias as a critic. Some hundreds of clergymen, influenced by the movement of which for ten or twelve years he was the acknowledged leader, made their submission to the Church of Rome; but a very much larger number, who also came under its influence, failed to learn from him that belief in the Church involves belief in the pope. The natural tendency of his mind is often (and correctly) spoken of as sceptical. He held that, apart from an interior and unreasoned conviction, there is no cogent proof of the existence of God; and in *Tract 85* he dealt with the difficulties of the Creed and of the canon of Scripture, with the apparent implication that they are insurmountable unless overridden by the authority of an infallible Church. In his own case these views did not lead to scepticism, because he had always possessed the necessary interior conviction; and in writing *Tract 85* his only doubt would have been where the true Church is to be found. But, so far as the rest of the world is concerned, his teaching amounts to this: that the man who has not this interior conviction has no choice but to remain an agnostic, while the man who has it is bound sooner or later to become a Roman Catholic.

He was a man of magnetic personality, with an intense belief in the significance of his own career; and his character may be described as feminine, both in its strength and in its weakness. As a poet he had inspiration and genuine power. Some of his short and earlier poems, in spite of a characteristic element of fierceness and intolerance in one or two cases, are described by R. H. Hutton as "unequalled for grandeur of outline, purity of taste and radiance of total effect"; while his latest and longest, "The Dream of Gerontius," is generally recognized as the happiest effort to represent the unseen world that has been made since the time of Dante. His prose style, especially in his Catholic days, is fresh and vigorous, and is attractive to many who do not sympathize with his conclusions, from the apparent candour with which difficulties are admitted and grappled with, while in his private correspondence there is a charm that places it at the head of that branch of English literature. He was too sensitive and self-conscious to be altogether successful as a leader of men, and too impetuous to take part in public affairs; but he had many of the gifts that go to make a first-rate journalist, for, "with all his love for and his profound study of antiquity, there was something about him that was conspicuously modern." Nevertheless, with the scientific and critical literature of the years 1850–1890 he was barely acquainted, and he knew no German. There are a few passages in his writings in which he seems to show some sympathy with a broader theology. Thus he admitted that there was "something true and divinely revealed in every religion." He held that "freedom from symbols and articles is abstractedly the highest state of Christian communion," but was "the peculiar privilege of the primitive Church." And even in 1877 he allowed that "in a religion that embraces large and separate classes of adherents there always is of necessity to a certain extent an exoteric and an esoteric doctrine." These admissions, together with his elucidation of the idea of doctrinal development and his eloquent assertion of the supremacy of conscience, have led some critics to hold that, in spite of all his protests to the contrary, he was himself somewhat of a Liberal. But it is certain that he explained to his own satisfaction and accepted every item of the Roman Catholic creed, even going beyond it, as in holding the pope to be infallible in canonization; and while expressing his preference for English as compared with Italian devotional forms, he was himself one of the first to introduce such into England, together with the ritual peculiarities of the local Roman Church. The motto that he adopted for use with the arms emblazoned for him as cardinal—*Cor ad cor loquitur*, and that which he directed to be engraved on his memorial tablet at Edgbaston—*Ex umbris et imaginibus in veritatem*—together seem to disclose as much as can be disclosed of the secret of a life which, both to contemporaries and to later students, has been one of almost fascinating interest, at once devout and inquiring, affectionate and yet sternly self-restrained.

There is at Oxford a bust of Newman by Woolner. His portrait by Ouless is at the Birmingham Oratory, and his portrait by Millais is in the possession of the duke of Norfolk, a replica being at the London Oratory. Outside the latter building, and facing the Brompton Road, there is a marble statue of Newman as cardinal. (A. W. Hu.)

The chief authorities for Newman's life are his *Apologia* and the *Letters and Correspondence*, edited by Miss Mozley, above referred to. The letters and memoranda dealing with the years 1845–1890 were entrusted by Newman to the Rev. W. Neville as literary executor. Works by R. W. Church, J. B. Mozley, T. Mozley and Wilfrid Ward should also be consulted, as well as an appreciation by R. H. Hutton. Adverse criticism will be found in the writings of Dr E. A. Abbott (*e.g. The Anglican Career of Cardinal Newman*, 2 vols. London, 1892), while some minor traits and foibles were noted by A. W. Hutton in the *Expositor* (September, October and November 1890). See also P. Thureau-Dangin, *La Renaissance catholique: Newman et le mouvement d'Oxford* (Paris, 1899); Lucie Félix-Faure, *Newman, sa vie et ses œuvres* (*ib.* 1901); MacRae, *Die religiöse Gewissheit bei John Henry Newman* (Jena, 1898); Grappe, *John Henry Newman. Essai de psychologie religieuse* (Paris, 1902); William Barry, *Newman* (London, 1903); Lady Blennerhassett, *J. H. Kardinal Newman* (Berlin, 1904); Brémond, *Newman. Le développement du dogme chrétien* (Paris, 1905; 4th ed., 1906), *Psychologie de la foi* (*ib.* 1906), and *Essai de biographie psychologique* (*ib.* 1906).

NEWMARCH, WILLIAM (1820–1882), English economist and statistician, was born at Thirsk, Yorkshire, on the 28th of January 1820. He settled in London in 1846 as an official of the Agra Bank, but resigned in 1851 on his appointment as secretary of the Globe Insurance Company. This post he held till 1862, when he became chief officer in the banking-house of Glyn, Mills & Co., in whose employ he remained until 1881. Notwithstanding the continuous pressure of an active business life he found time to contribute largely many valuable articles to the magazines and newspapers, and took an active part in the proceedings of the Royal Statistical Society (of which he was one of the honorary secretaries, editor of its journal, and in 1869–1871 president) and the Political Economy Club. He was also elected a fellow of the Royal Society. His extensive knowledge of banking was displayed in the evidence which he gave before the select committee on the Bank Acts in 1857. He collaborated with Thomas Tooke in the two final volumes of his *History of Prices* and was responsible for the greater part of the work in those volumes. For nineteen years he wrote an admirable survey of the commercial history of the year in the *Economist*. He died at Torquay on the 23rd of March 1882. After his death his friends founded, in perpetuation of his memory, a Newmarch Lectureship in economic science and statistics at University College, London.

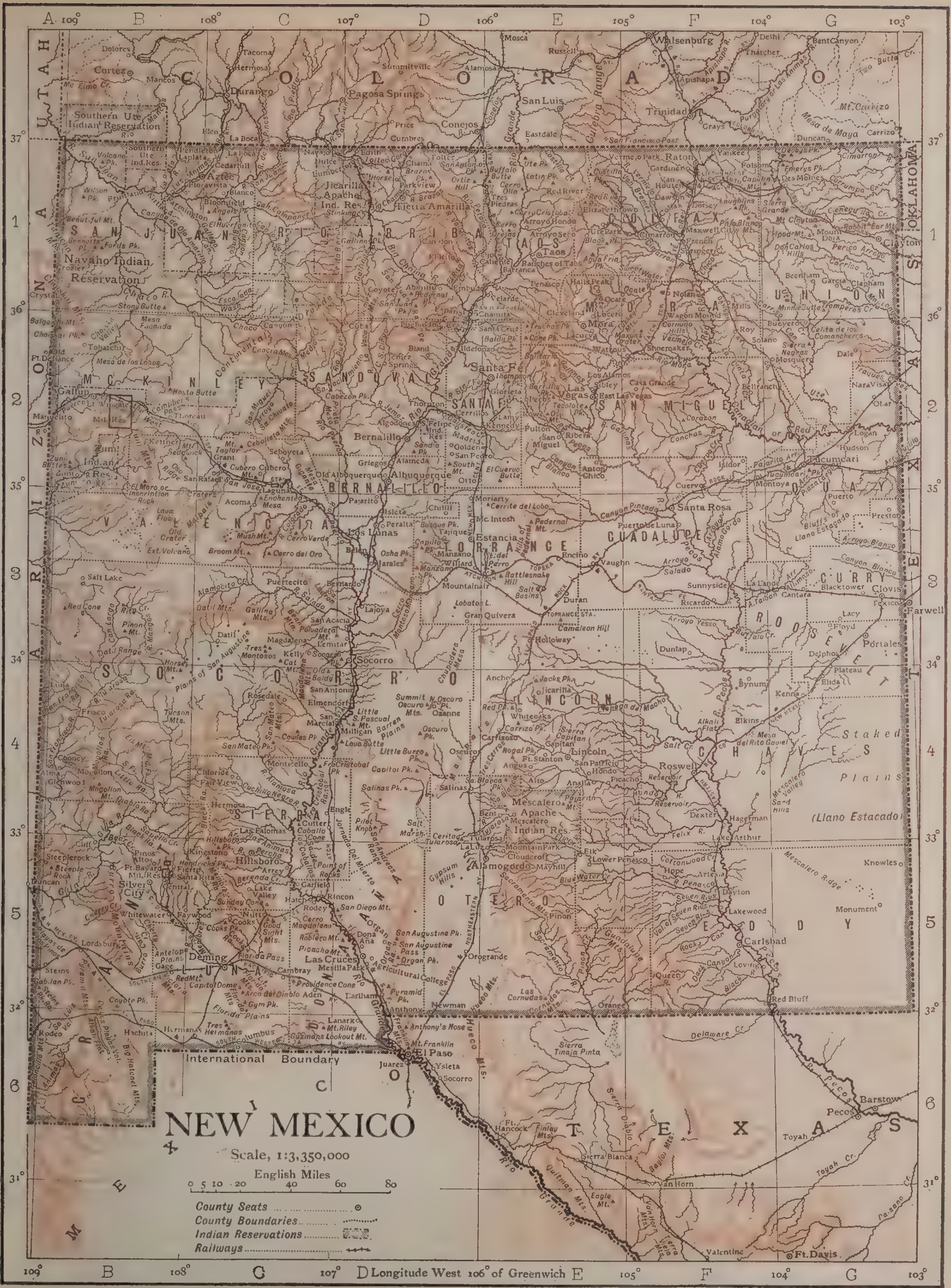
NEWMARKET, a market town in the Newmarket parliamentary division of Cambridgeshire, England, 13½ m. E. by N. of Cambridge on the Bury branch of the Great Eastern railway. Pop. (1901) 10,688. A part of the town is in Suffolk, and the urban district is in the administrative county of West Suffolk. Newmarket has been celebrated for its horse-races from the time of James I., though at that time there was more of coursing and hawking than horse-racing. Charles I. instituted the first cup-race here. For the use of Charles II., during his visits to the races, a palace, no longer extant, was built on the site of the lodge of James I. There are numerous residences belonging to patrons of the turf, together with stables, and racing and training establishments. The racecourse, which lies south-west of the town, has a full extent of 4 m., but is divided into various lengths to suit the different races. The course intersects the so-called Devil's Ditch or Dyke (sometimes also known as St Edmund's Dyke), an earthwork consisting of a ditch and mound stretching almost straight for 5 m. from Reach to Wood Ditton. It is 12 ft. wide at the top, 18 ft. above the level of the country, and 30 ft. above the bottom of the ditch, with a slope of 50 ft. on the south-west side and 26 ft. on the north-east. It formed part of the boundary between the kingdoms of East Anglia and Mercia, but is doubtless of much earlier origin. Roman remains have been found in the neighbourhood.

NEW MECKLENBURG (Ger. *Neu-Mecklenburg*, formerly *New Ireland*, native *Tombara*), an island of the Bismarck Archipelago, N.E. of New Guinea in the Pacific Ocean, about 3° S., 152° E., in the administration of German New Guinea. It is about 240 m. long but seldom over 15 wide. From St George's Channel at the south, separating it from New Pomerania, it sweeps north and then north-west, being divided from New Hanover at the other extremity by Byron Strait. It is mountainous throughout, having an extreme elevation of about 6500 ft. in the north, where the prevalent formations are sandstone and limestone, whereas in the south they are granite, porphyry and basalt. There is a white population of about forty; the natives are Papuans of a less fine type than the natives of New Pomerania, and rather resemble the Solomon islanders. Jacob Lemaire and Willem Cornelis Schouten sighted New Mecklenburg in 1616, but it was only recognized as part of an island separate from New Guinea by William Dampier in 1700, and as separate from New Pomerania in 1767 by Philip Carteret.

NEW MEXICO, a south-western state of the United States, lying between 31° 20′ and 37° N. lat., and 103° and 109° 2′ W. long. It is bounded N. by Colorado; E. by Oklahoma and Texas; S. by Texas and Mexico; and W. by Arizona. It has an extreme length N. and S. of 400 m., an extreme width E. and W. of 358 m., and a total area of 122,634 sq. m., of which 131 sq. m. are water-surface.

Physiography.—New Mexico is a region of mountains and high plateaus. Broadly speaking, its surface is a vast tableland tilted toward the S. and E., and broken by parallel ranges of mountains whose trend is most frequently N. and S. About midway between the western boundary and the Rio Grande passes the Continental Divide, which separates the waters entering the Gulf of Mexico from those that flow into the Gulf of California. In the region E. of the Continental Divide, which embraces about three-fourths of the surface of the state, the general south-eastern slope is very marked. Thus, at Santa Fé, in the north central part of the state, the elevation is 7013 ft.; at Raton, in the N.E., 6400 ft.; at Las Cruces, in the extreme S., 3570 ft.; and at Red Bluff, in the extreme S.E., 2876 ft.

The Rocky Mountain system enters New Mexico near the centre of the northern boundary; its main ridge, lying E. of the Rio Grande, extends as far S. as the city of Santa Fé. It forms the water-parting between the upper waters of the Canadian river and the Rio Grande, and contains many of the loftiest peaks in New Mexico, among them being Truchas (13,275 ft.), Costilla (12,634 ft.) and Baldy (12,623 ft.). On the E. this ridge is bounded by the region of the Great Plains, the dissected topography of which is characterized by many broad valleys intervening. W. of the Rio Grande lies a series of lower ranges, also a part of the Rocky Mountain system, whose western slopes merge almost imperceptibly with the Plateau Region. The San Juan, Gallinas and Nacimiento ranges are among the most notable in this group. South of the Rocky Mountains lies the so-called Basin Region, in which isolated, but sometimes lofty and massive, mountains, the result in many instances of a series of numerous parallel faults, rise from level plains like islands from the sea and enclose the valleys with bare walls of grey and brown rock. These valley plains, from 10 m. to 20 m. wide and sometimes 100 m. long, sloping gradually toward their centres, are usually covered with detritus from the neighbouring mountains, and seldom have a distinct drainage outlet. The Spaniards called them "bolsons" (purses), a term that geologists have retained. In many of these bolsons are ephemeral lakes, in which the waters collect during the rainy season and stand for several months. These waters are frequently impregnated with alkali or salt, and on evaporating leave upon the bed of the lake a thin encrustation of snowy whiteness. Such beds, locally known as "alkali flats," are especially numerous in Valencia, Socorro, Dona Ana and Otero counties, and a number of them furnish all the salt needed by the cattle ranges in their vicinity. East of the San Andreas Range, in the south central part of New Mexico, lies the basin of the extinct Lake Otero, in which are found the remarkable "white sands," consisting of dunes of almost pure granular gypsum and covering the area of 300 sq. m. In this region many species of reptiles and insects are almost perfectly white—an interesting example of protective coloration. Both E. and W. of the central portion of the Basin Region the bolson plains soon lose their distinctive character, the valleys become wider and broader and the mountains less lofty and more isolated. East of the Pecos and S. of the Canadian rivers lies the great arid tableland known as the Staked Plains (Llano Estacado), a vast stretch of barren wastes, with almost nothing to break the monotony of its landscape. This is a part of the Great Plains and a continuation of the high plains region of Texas. The Plateau Region includes most of the area N.



NEW MEXICO

Scale, 1:3,350,000

English Miles

0 5 10 20 40 60 80
County Seats
County Boundaries
Indian Reservations
Railways
A 109° B 108° C 107° D 106° E 105° F 104° G 103°
109° B 108° C 107° D Longitude West 106° of Greenwich E 105° F 104° G 103°
37° 36° 35° 34° 33° 32° 31°
1 2 3 4 5 6
COLORADO
UTAH
ARIZONA
OKLAHOMA
TEXAS
MEXICO
International Boundary
SAN JUAN
RIO ARRIBA
TAOS
COLFAX
UNION
MORA
McKINLEY
SANDOVAL
SANTA FE
SAN MIGUEL
BERNALILLO
VALENCIA
TORRANCE
GUADALUPE
QUAY
CURRY
ROOSEVELT
SOCORRO
LINCOLN
CHAVES
SIERRA
OTERO
EDDY
GRANT
LUNA
DONA ANA
Navaho Indian Reservation
Jicarilla Apache Ind. Res.
Southern Ute Indian Reservation
Zuni Indian Res.
Mescalero Apache Indian Res.
Staked Plains (Llano Estacado)
Santa Fe
Albuquerque
Las Vegas
Raton
Gallup
Socorro
Roswell
Las Cruces
El Paso
Silver City
Deming
Carlsbad
Alamogordo
Tucumcari
Clovis
Trinidad
Durango
Rio Grande
Pecos

Emery Walker sc.

of the Gila river and W. of the Rio Grande. Here volcanic activity and powerful erosion have combined to produce a series of remarkable scenic effects. The eastern border of this area is formed by the valley of the Rio Grande and the western foot-hills of the Rocky Mountains; the southern boundary overlooks the Gila river; and on the N. and W. the plateau continues into Colorado, Utah and Arizona. Near its southern and eastern borders are many lava flows and extinct volcanic mountains, one of the most imposing of those in New Mexico being the Mt. Taylor volcano (11,389 ft.), which is surrounded by lava tables and some of the most wonderful volcanic buttes in the world. In other portions of New Mexico there is also much evidence of former volcanic activity. A conspicuous feature of the New Mexican landscape is the *mesa*, a flat-topped hill created by differential erosion and projecting above the surrounding country like a table. A notable example is the mesa of Acoma, in Valencia county, capped with volcanic rocks; upon its summit, about 350 ft. above the plain, is the Indian pueblo of Acoma.

The average elevation of New Mexico is 5700 ft., with 40,200 sq. m. between 3000 and 5000 ft.; 56,680 sq. m. between 5000 and 7000 ft.; 22,500 sq. m. between 7000 and 9000 ft.; and 2000 sq. m. above 9000 ft.

For a region with such a small amount of rainfall the rivers are numerous, but none of the streams is navigable, and in many of them during the dry season (and in some of them because of broken stratification) the water in places disappears entirely beneath the sandy bed, and after flowing underground for some distance, breaks out afresh farther on as a river, rivulet or spring. The most important stream is the Rio Grande, which, rising in southern Colorado, enters New Mexico through deep canyons near the centre of the northern boundary and continues southward across the entire state. During its course it changes from a mountain stream in the N. to a sluggish river turgid with sand in the S. In the lowlands it loses much of its volume through evaporation and absorption by the sands, and through irrigation, and in its lower course in New Mexico its bed is frequently dry. In the flood season it usually leaves its banks and inundates the lowlands, spreading over the sands a rich deposit of silt; and on account of this characteristic it is sometimes called "the Nile of New Mexico." The stream next in importance is the Pecos river, which rises in Mora county and flows southward into Texas, where it joins the Rio Grande. It has the same general characteristics as the latter river, being a mountain stream near its source, and after leaving the highlands becoming sluggish and losing much of its water. Along the lower course many underground streams from the mountains break out as springs and empty into the Pecos. The Canadian river drains the eastern slope of the Rocky Mountains and flows in a general south-easterly direction through Texas into Oklahoma, where it empties into the Arkansas. Most of its course in New Mexico lies through a canyon. The westward-flowing streams—the San Juan, Rio Puerco of the West, Zuñi, Rio San Francisco and Gila—are of only slight importance, though their flow is perennial. In the valleys there are many small streams whose waters never reach the ocean, but disappear by seepage or evaporation.

Fauna and Flora.—Of native animals the species are numerous, but their numbers are small. Bison no longer roam the plains, and the elk has been driven out; but among the larger mammals still to be found in certain districts are the deer, prong-horn (in small numbers), puma, coyote, timber wolf, lynx (*Lynx rufus* and *Lynx Canadensis*) and the black and grizzly bear. Badgers, hares and rabbits are found everywhere, and prairie-dogs are so numerous in some places as to be considered a nuisance. There are numerous species of aquatic birds. From time to time upon the Rio Grande may be seen ducks, wild geese, swans, cranes, herons and gulls. Eagles are often seen, and in the arid and elevated regions crows and ravens are numerous. Gamble's quail, bob-white, grouse, English pheasants and wild turkeys are the most important game birds, and the mocking-bird is common throughout south-western New Mexico. Among the venomous reptiles and insects are the rattlesnake, the Gila monster (*Heloderma suspectum*), a poisonous lizard, and the tarantula (*Mygale Heintzii*), which, however, are common only in certain places and at certain seasons.

New Mexico has such a great range of elevations that all four of the zones of vegetation into which the South-West has been divided according to altitude are found within its limits; namely, the zone of cactus, yucca and agave (3000–3500 ft.), where grass is scanty; the zone of greasewood and sage-brush (3500–4900 ft.), where there is little grass, and the cactus species are less numerous; the zone of the cedar (4900–6800 ft.); and the zone of the pine and fir (6800–10,800 ft.), in which grass is more abundant. The total woodland area has been estimated at 23,700 sq. m., or a little more than 19% of the land area. Only the higher ranges and plateaus are timbered, and even there the forests are not dense. The lower slopes are usually covered with the scrub oak, juniper and piñon; but some mountains, especially those along the eastern border of the Rio Grande Valley, are absolutely treeless. The principal forest areas are upon the southern end of the San Juan Range, upon the Sangre de Cristo Range and in Socorro county, W. of the Rio Grande. The chief varieties of timber are the red fir, Engelmann's spruce and yellow pine. Up to 1910 the Federal government had created eleven forest reservations in New Mexico, embracing an area of 10,971,711 acres. In the valleys the only trees native to the soil are the willow and cottonwood, found along the water courses, and beyond the range of irrigation vegetation is limited to scanty grass, with sage-brush and greasewood in the N. and cactus and yucca in the S.

Climate.—As the winds that reach New Mexico have been desiccated while crossing the plains of Texas or the mountains of the N.W., the climate is characterized by a lack of humidity. The sandy soil quickly absorbs the sun's heat and also quickly radiates it, so that there is great daily variation in the temperature. The low humidity, high altitudes and southern latitude all combine to make the climate salubrious and especially beneficial to persons suffering with pulmonary disorders. The highest temperature ever recorded was 110° F. at Roswell; the lowest, −23° at Aztec. At Santa Fé, where mountain and plain meet, the mean annual temperature is 49°; the mean for the winter is 31° and for the summer 67°; and the highest and lowest temperatures ever recorded were respectively 97° and −13°. At Fort Bayard, in the S.W., the mean temperature for the year is 55°; the mean for the winter is 39°, with an extreme recorded of −1°; the mean for the summer is 72°, with a maximum recorded of 103°. At Mesilla Park, in the lower Rio Grande Valley, the mean annual temperature is 60°; for the winter it is 43°, with a minimum of 1°, and for the summer 77°, with a maximum of 106°. In all parts of New Mexico except the N.W. there is a so-called wet season, which begins early in July and lasts for a month or six weeks, the rain coming in the form of short afternoon thunderstorms. About a third of the precipitation occurs during July and August, but after August the monthly precipitation is steadily less until March, in which month only about 3% of the annual rainfall occurs. For all of New Mexico the mean precipitation is about 13 in., ranging from 9 in. in the lower Rio Grande Valley to 25 in. on the mountain ranges at elevations of 10,000 ft. and over. In the valleys there are usually about two snows a year and these quickly disappear; but on the mountain peaks and in the canyons the snow accumulates to great depths and forms a steady source of water-supply for the rivers. It is the melting of the snows on the Rocky Mountains, and not the rainy season, that produces the floods of the Rio Grande.

Soils.—The prevailing type of soil on the higher lands is a sandy loam, underlaid with clay or clay loam, which stores water and is the typical soil of the basins. Along the river valleys there are limited areas of fine sediment, and here with irrigation good crops can be grown without the use of fertilizers. In the plains where drainage is poor, especially in the S., the soils contain too much alkali; but in the highlands most of this has been dissolved and carried away by the rains, and the soils are well adapted for grazing grounds.

Agriculture.—Because of the small amount of rainfall, agriculture is confined chiefly to the river valleys. In 1900 only 4·2% of the land surface was included in farms, and less than ·27 of 1% was classed as improved farm land. The total acreage, however, rose from 787,882 in 1890 to 5,130,878 in 1900, an increase of 551·2%. Between 1850 and 1880 there was very little increase in farm area. The amount of improved land, though showing an absolute increase between 1880 and 1900, declined relatively to the total area in farms from 37·6% in 1880 to 6·4% in 1900. At the same time the average size of farms (not including farms with an area of less than 3 acres, which reported an annual income of less than $500) increased from 124·9 acres in 1880 to 433·6 acres in 1900. This decrease in the proportion of improved acreage and increase in the average size of the farms is due to the increased use of lands for grazing purposes. As regards tenure, 90·6% of the farms in 1900 were operated by owners, 2·2% by cash tenants, and 7·2% by share tenants. In this year 39·6% of the farms derived their principal income from hay and grain, 33·2% from live stock, 5·5% from dairy produce, 3·5% from vegetables, 2·8% from fruits. The most important crop, as a result of irrigation, is alfalfa, which is grown for forage, requires little attention, and improves the soil. Wheat, Indian corn and oats are the leading cereal crops; and S. of the latitude of Santa Fé vegetables and deciduous fruits flourish where the water-supply is ample. A little cotton has been grown near Carlsbad in the Pecos Valley, and in 1909 sugar beets were introduced south of Albuquerque and cantaloupes in the southern Rio Grande Valley. Fruit, especially the Bartlett pear, is very successful. The total value of farm property in 1900 was $53,767,824, and the value of the live stock, $31,727,400. The value of the farm products in 1879 was $1,897,974, in 1889 $1,784,824, and in 1899 $10,155,215. In 1909 the values of the principal farm products (according to the *Year Book of the U.S. Department of Agriculture*) were as follows: hay, $5,339,000; wheat, $1,175,000; Indian corn, $1,915,000; oats, $634,000; and potatoes, $86,000. The values of the various classes of live stock on the 1st of January 1910 were as follows: sheep, $13,714,000; milch cows, $1,125,000; other neat cattle, $15,677,000; horses, $6,251,000; mules, $632,000; swine, $272,000. Stock-raising is the most important industry, and the growing of sheep for wool takes a leading place. The hills and mesas covered with the nutritious grama grass form excellent grazing grounds, which are most extensive in Bernalillo, Guadalupe, Rio Arriba, San Miguel, Union and Valencia counties. In April 1907 (according to an estimate of the National Association of Wool Manufacturers) New Mexico contained 2,600,000 sheep, the largest number in any state or Territory except Montana and Wyoming; and in April 1909 there were 3,200,000 sheep of shearing age in New Mexico, but this number was less than that in Montana or Wyoming at that time.

Except in a few mountain valleys in the N., agriculture was long entirely dependent upon irrigation, which has been practised in New Mexico by the Pueblo Indians since prehistoric times. In 1899 the total irrigated area outside of Indian reservations amounted to 203,893 acres (67·2% of all improved land)—an increase of 122·2% in the preceding decade. Of the total land in crops in that year 89·2% was irrigated. After the passage of the Federal Reclamation Act in 1902, a number of extensive irrigation works in New Mexico were undertaken by the Federal government. The Carlsbad reservoir and diverting dam in Eddy county and the Rio Hondo canals and reservoir in Chaves county were completed in 1907 and are capable of supplying water to tracts of 20,000 and 10,000 acres respectively. In 1908 an irrigation reservoir in McKinley county for the use of the Zuñi Indians and the Leasburg project (Dona Ana county; 20,000 acres) were completed. The Rio Grande project was planned in 1907 for the storage of the flood waters of the Rio Grande near Engle, New Mexico, in order to reclaim about 155,000 acres of land in New Mexico and Texas, and to deliver to Mexico above the city of Juarez 60,000 acre-feet of water per year, as provided by a treaty (proclaimed on the 16th of January 1907) between that republic and the United States. Other systems contemplated by the government were the Las Vegas project for reclaiming 10,000 acres near Las Vegas, the Urton Lake project for reclaiming 60,000 acres in the Pecos Valley, and the La Plata Valley project for irrigating about 40,000 acres in the north-western part of New Mexico, 35 m. S.W. of Durango, Colorado. A special irrigation commission was appointed in 1897, and in 1905 the legislature created the office of Territorial irrigation engineer. Irrigation by private companies is of some importance, especially in the San Juan Valley, the Rio Grande Valley and the Pecos Valley. In 1909 it was estimated that about 500,000 acres were irrigated. Dry farming has proved a great success in New Mexico, as elsewhere in the South-West, especially since 1900; and in 1907 it was estimated that 2,000,000 acres were cultivated without irrigation.

Manufactures.—As New Mexico is primarily a mining and stock-raising region, its manufacturing industries are of comparatively small importance. The value of the manufactured products in 1880 was $1,284,846; in 1890 $1,516,195; and in 1900 $5,605,795, an increase in the latter decade of 269·7%. In 1905 there were 199 establishments under the factory system (an increase of 14·4% over the number in 1900); the amount of capital invested was $4,638,248, and the value of "factory" products was $5,705,880 (an increase of 40·5% over the value of the "factory" products in 1900). The leading industries in 1905 were the construction of cars and general railway shop and repair work by steam railway companies (value of product, $2,509,845), the manufacture of lumber and timber products (value $1,315,364) and of flour and grist mill products (value $388,124), and the printing and publishing of newspapers and periodicals (value $279,858). In 1900 the manufactures of Albuquerque, Santa Fé and Socorro were valued at 39·4% of the total value of New Mexico's products.

Minerals.—The existence of valuable mineral deposits was early known to the Spaniards. There was some production of gold by the Mexicans, but the silver mining was unimportant until 1881, when the Lake Valley silver mines in Sierra county began to yield. Between that year and 1884 the coining value of the silver product increased from $275,000 to $3,000,000. After 1885 there was a gradual decline in the output, whose bullion value in 1908 was $250,986. The production of gold has shown a somewhat similar movement; the output in 1881 was valued at $185,000; in 1889, at $1,000,000, and in 1908 at $298,757. The leading gold- and silver-producing counties are Socorro, Grant, Sierra and Dona Ana. Only silver is mined in the last-named county. Copper has been mined for many years, and in 1906 and 1908 constituted New Mexico's most valuable metallic product, the value of the yield in these years being $1,356,533 and $658,858 respectively. Nearly all the product comes from Grant county, and in 1908 nearly 98% of the output was from Grant and Otero counties. In 1905–1908 the decrease in output was large. In the same years there was an increase in the output of zinc, which in 1906 was valued at $67,710 and in 1908 at $168,096. Most of the zinc comes from Socorro county, where the mines of the Magdalena District in 1908 yielded 93% of the entire product. A small amount of lead is produced incidentally to the mining of zinc, being derived from mixed lead and zinc ores. Far the most important mineral product, however, is coal, which is found in all forms—lignite to anthracite—and in widely distributed areas. The chief centres of production are the Raton field, in Colfax county; the Durango-Gallup field, in McKinley and Rio Arriba counties; the Whiteoaks field, in Lincoln county; and the Los Cerillos and Tejon areas, in Santa Fé county. Much of the coal is suitable for coke, of which a considerable amount is manufactured. The value of the coal product in 1902 was $1,500,230; in 1904, $1,904,499; and in 1908, $3,368,753. Iron ores are widely distributed, but have not been developed; graphite is mined in Colfax county; mica in Taos county, and to a small extent in Rio Arriba county; marble is quarried in Otero county and sandstone in Bernalillo, Colfax and San Miguel counties. Gypsum beds are widely distributed, and the supply is inexhaustible, but their great distance from centres of consumption has prevented their profitable working. In New Mexico are found turquoises and a few garnets; it seems probable that turquoises were mined by the Aztecs. The largest of the old Spanish turquoise mines in the Cerillos District, 18 m. S. of Santa Fé, furnished a turquoise product between 1890 and 1900 valued at more than $2,000,000. Other mines are in Grant and Otero counties. The New Mexican garnets are found in McKinley county. The output of precious stones in 1902 was valued at $51,100, in 1908 at $72,100.

Transportation.—The total railway mileage on the 31st of December 1908 was 2,918·02, more than twice as much as that of 1890. The length of railway per inhabitant in New Mexico in 1907 was about five times as great as that for the whole country, but the amount of line per square mile of territory was only about one-third as great as the average for the United States. New Mexico is traversed by two transcontinental lines, the Atchison, Topeka & Santa Fé, from Chicago to San Francisco and the Southern Pacific, from New Orleans to San Francisco. The main line of the former enters New Mexico near Raton, extends S.W. to Albuquerque and thence westward into Arizona. A southward extension taps the Southern Pacific at El Paso, Texas, and Deming, New Mexico, and there are numerous shorter branches. This system also controls the Pecos Valley & North-Eastern railway, which serves the south-western part of New Mexico. The Southern Pacific crosses New Mexico westward from El Paso, Texas. The western division of the El Paso & South-Western system, connecting El Paso and Benson, Arizona, crosses New Mexico just N. of the Mexican boundary. Its eastern division (including the El Paso & North-Eastern, the El Paso & Rock Island, the Alamogordo & Sacramento Mountain and the Dawson railways) connects with the Chicago, Rock Island & Pacific at Tucumcari; thus forming a connecting link between that system and the Southern Pacific. The Santa Fé Central, extending southward from Santa Fé to Torrance, is a connecting link between the Atchison, Topeka & Santa Fé and the El Paso & South-Western systems. Branches of the Denver & Rio Grande serve the northern parts of New Mexico.

Population.—The population of New Mexico consists of three distinct classes—Indians; Spanish-Americans, locally known as "Mexicans"; and the English-speaking class called, in distinction from the others, "Americans." Of the Indians there are two types, both of the Athapascan family; in one are the Pueblos, and in the other the Navahos, in the N.W. part of the state, and their near kinsmen, the Apaches, to the south. The Pueblo Indians live in adobe houses, are quiet and usually self-sustaining, and have been converted to the forms of Christianity. They had irrigated farms and dwelt in six-storey communal houses long before the advent of the white man. By the treaty of Guadalupe-Hidalgo, in 1848, the United States government recognized them as citizens. They lived in 19 villages of pueblos, the largest of which, Zuñi, is more properly called a reservation, as it has been enlarged from time to time by grants from the Federal government. The 18 pueblos and the Zuñi reservation contained in 1900 a population of 8127, and a total area of 1417 sq. m. The pueblos are held under Spanish grants which were confirmed by the United States. The terraced architecture of the villages is very remarkable. Originally the Pueblo Indians lived in many-storeyed communal houses, built sometimes of stone, sometimes of adobe, and occasionally chiselled into the sides of a stone cliff, as best suited the convenience of the builders. At present there is a tendency among them to copy the one-storey huts of the Mexicans. Taos (pop. in 1900, 419) is one of the most imposing of the pueblos, consisting of two six-storeyed pyramidal tenements, separated by a brook. Zuñi (pop. 1525) has a five-storeyed dwelling surrounded by detached huts; Acoma (pop. 492 in 1900; 566 in 1902), standing on a cliff 357 ft. high (Acoma means "people of the white rock" and Aco, the Indian name for the pueblo, means "white rock"), contains three blocks of three-storeyed terraced buildings,[1] and Laguna also contains some three-storeyed dwellings, but the Laguna tribe, numbering, 1077 in 1900 and 1384 in 1905, now live mostly in their former summer villages on the plain. The other Indians live on reservations, of which there are three: the Mescalero Apache reservation, in Otero county, containing 554 Indians in 1900; the Jicarilla Apache reservation, in Rio Arriba county, with a population of 829; and the Navaho reservation, in Utah, Arizona and New Mexico, which contains in that part of it situated in New Mexico a population of 2480.

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[1] About 3 m. N.E. of Acoma stands the Enchanted Mesa (Mesa Encantada; Katzimo in Keresan), rising 430 ft. above the plain, and being 2050 ft. long and 100 to 350 ft. wide. Upon its summit, according to Indian tradition, once stood the village of Acoma, but while the inhabitants were tending their crops in the plains a powerful earth movement threw down the rocky ladder by which alone the summit could be reached. According to the story, three women had been left in the village and these perished. The Mesa was first climbed by white men in 1896 by Prof. William Libbey (b. 1855), of Princeton University; it was climbed again in 1897 by a party led by F. W. Hodge; and pottery and stone implements were found here.

The inhabitants of Spanish descent have been only slightly assimilated and cling tenaciously to their racial peculiarities. As a rule, they live in low adobe houses built around a court, and are poor and ignorant, but hospitable. They are more Americanized in the Rio Grande Valley than among the mountains, where English is rarely spoken. Many of them have intermarried with the Indians, creating the class of half-breeds known as "Mestizos." Although the proportion of Spanish-American and Indian inhabitants is steadily decreasing with the arrival of immigrants from other parts of the United States, it was nevertheless computed by the New Mexican authorities to be about 63% in 1904. About one-tenth of the Spanish-American and Indian population habitually use the English language.

The total population of New Mexico in 1870 was 91,874; in 1880, 119,565; in 1890, 153,593; in 1900, 195,310, and in 1910, according to the U.S. census, the figure was 327,301. Of the native white population in 1900, 17,917 were of foreign parentage. Of the foreign-born element 6649, or about one-half, were Mexicans, 1360 were Germans and the rest chiefly English, Irish, Canadians, Italians, Scotch and Austrians. The chief cities were Albuquerque (6238), Santa Fé (5603), Las Vegas (3552) and Raton (3540). Far the greater portion of the population (in 1906, 56·2% of the estimated population) are communicants of the Roman Catholic Church, which had in 1906 121,558 members, the total communicants of all denominations in that year numbering 137,009. Among Protestants there were 6560 Methodists, 2935 Presbyterians and 2331 Baptists.

Administration.—The executive officers until 1911 were a governor and a Territorial secretary appointed by the President of the United States, and a treasurer, auditor, superintendent of public instruction, adjutant-general, commissioner of public lands and other administrative officials appointed by the governor. The legislative department included a council of 12 members and a House of Representatives of 24 members, chosen by popular vote. The sessions were biennial and limited to 60 days. All laws passed by the Assembly and approved by the governor had to be submitted to the Federal Congress for its approval. The Territory was represented in Congress by a delegate, chosen by popular vote, with the right to speak in the national legislature but not to vote. The judicial department included a supreme court, district courts, probate courts and local justices of the peace. The supreme court consisted of a chief justice and six associate justices appointed by the President. There were seven judicial districts, each with a court presided over by a justice of the supreme court. Each county had a probate court, and each precinct a justice of the peace.

For the purposes of local government New Mexico is divided into 26 counties, each being governed by a board of county commissioners, chosen by the people. Each county is divided by the commissioners into precincts. Municipal corporations with a population of 3000 and over are cities, and are governed through a mayor and board of aldermen; those with a population of between 1500 and 3000 are towns, and are governed through a mayor and trustees.

A rather unusual institution within New Mexico is the mounted police, who numbered 11 in 1907, whose work was almost entirely in the cattle country, and who had authority to patrol the entire Territory and to make arrests or to preserve order wherever their presence was needed, unhampered by the restrictions limiting the jurisdiction of local police.

A homestead not exceeding $1000 in value, and held by a husband and wife or by a widow or widower with an unmarried daughter or an unmarried minor son, may be held exempt from seizure and sale by legal process. The exemption may be claimed by either the husband or the wife, but may not be granted if each owns a homestead; and it does not extend to judgments rendered against the debtor on account of a mortgage, non-payment of the purchase money or supplies and labour for building and repairs.

In 1907 the legislature passed a radical measure, making the penalty for operating games of chance six months' imprisonment in the county-jail, and, at the discretion of the court, a fine of not less than $100 and not more than $500; this law went into effect on the 1st of January 1908. Gambling had formerly been licensed—the gambling-house keeper paying $200 per annum for each gaming table or apparatus, this sum going to the district and county school funds.

Revenues for the support of the government are derived chiefly from the general property tax. There are also special corporation taxes on car companies, express companies and foreign corporations producing, refining or selling petroleum or coal oil: and a system of licence-charges or business taxes. A poll tax is levied by the state for school purposes and may also be levied by municipalities. The county and the municipal tax rates are limited respectively to 5 and 10 mills on the dollar. A special tax not exceeding 3 mills on the dollar may be levied on all taxable property for school purposes, and the proceeds apportioned among the school districts according to the number of school children. The proceeds of the poll tax are distributed in the counties in which the tax is collected. Each school district may supplement the aid from the state by laying special taxes, and the Federal government has granted to each township 4 sq. m. of public land to aid in the support of the schools. Land-grants amounting in 1907 to 1,343,080 acres had also been made for the benefit of various educational, charitable and correctional institutions, and for irrigation purposes. At the close of the fiscal year ending on the 31st of May 1908, New Mexico showed expenditures of $721,272·81, receipts of $754,080·94 and a balance in the treasury of $378,653·63. The bonded debt, amounting on the 31st of May 1908 to $788,000, was incurred partly in meeting temporary deficits in the treasury and partly in the construction of public buildings.

Education.—At the head of the public school system is a Board of Education of seven members, including the governor and the superintendent of public instruction; this Board apportions the school fund among the counties, selects the text-books and prepares the examinations for teachers. The superintendent of public instruction exercises a general supervision over the schools of New Mexico. There is also a superintendent of schools for each county, and the counties are divided into school districts, each having three directors, who disburse the school funds and have the care of the school property. In incorporated cities and towns these functions are discharged by local boards of education. The school age is from five to twenty-one years, and for children between the ages of seven and fourteen school attendance for three months in each year is compulsory. The total enrollment for the year ending the 1st of August 1906 was 39,377, with an average daily attendance of 25,174; the average length of the school year was 5 months and 19 days. The use of English in the schoolroom is required by law; New Mexico has adopted a uniform system of text-books.

The state supports the University of New Mexico at Albuquerque; a College of Agriculture and Mechanic Arts[1] (established 1889, opened 1890) at Mesilla Park, 40 m. from El Paso; a Normal School at Silver City (pop. 1900, 2735; county-seat of Grant county); a Normal University at Las Vegas; a School of Mines (at Socorro; pop. 1900, 1512; county-seat of Socorro county), which was founded in 1889, was organized and opened in 1895 when it received from Congress 50,000 acres of land, has in its library the private library of John W. Powell, formerly director of the U.S. Geological Survey, and owns the Torrance Mine at the foot of Socorro Mountain, 2 m. from the college campus; and a Military Institute at Roswell (pop. 1900, 2006; county-seat of Chaves county). Indian day schools are maintained by the Federal government at Albuquerque, Jicarilla, Santa Fé and Zuñi.

The state maintains an insane asylum at Las Vegas, a deaf and dumb asylum and penitentiary at Santa Fé, an institute for the blind at Almagordo, a reform school at El Rito and a miners' hospital at Raton. For many years the legislature has also contributed to the support of a number of private hospitals and charitable institutions.

History.—To the existence of an Old-World myth New Mexico owes its early exploration by the Spaniards. Early in the 16th century it was believed that in the New World would be found the fabled cities and creatures of which Europeans had heard for centuries. There was a story that in the 8th century a bishop of Lisbon, to escape from the Arabs, had fled to islands in the West, where he and his followers had founded seven cities; and when the Indians in Mexico related to the Spanish explorers a bit of their folk-lore, to the effect that they had issued from seven caves, the imaginative white men soon identified these caves with the famous Seven Cities. In 1536 came Cabeza de Vaca into Mexico after eight years of wandering across the continent and related to his countrymen the stories he had heard of wonderful cities of stone in the north. He had not seen the cities himself, nor had he, as is frequently asserted, gone as far north as the present New Mexico, but his reports tended to confirm previous rumours and led the viceroy, Don Antonio de Mendoza, to send Fray Marcos de Niza, a Franciscan friar, on a small and inexpensive expedition of discovery.

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[1] This college also receives Federal aid: 100,000 acres of public land were voted to it in 1898.

Fray Marcos (*q.v.*) was the first European to enter the limits of what is now New Mexico. A glimpse of the terraced houses of an Indian village—now identified as Zuñi—convinced him that he had seen one of the Seven Cities, and he hastened back with the good news. The stories that he told grew in their passage from mouth to mouth until the Spaniards believed that in the north were cities "very rich, having silversmiths, and that the women wore strings of gold beads and the men girdles of gold." Full of missionary zeal, and desirous that settlements should be planted in the new region in order that the heathen might be converted, Fray Marcos did little to refute these exaggerations. The conquest of the Seven Cities was determined upon, and a band of adventurers, led by Francisco Vasquez de Coronado (*q.v.*), set out in 1539. Following the route of Fray Marcos de Niza, Coronado reached the first of the alleged cities, and to his great disappointment found only an Indian pueblo. An exploring party sent eastward reached Acoma, and then proceeded to Tiguex on the Rio Grande, and finally to the Pecos river. The main body of Coronado's expedition remained in New Mexico on the Rio Grande while he pushed on to the fabled land of Quivíra,[1] only to meet with another disappointment.

Forty years elapsed before the Spaniards again entered New Mexico. In 1581 Fray Augustin Rodriguez, another Franciscan, explored the valley of the Rio Grande, and in 1582–1583 Antonio Espejo made extended explorations to the E. and W. of this stream. It was about this time, apparently, that the Spaniards in Mexico adopted the term New Mexico to designate the land to the north; Rodriguez had called the country San Felipe, and Espejo had named it Nueva Andalucia. Between 1583 and 1595 several attempts at the conquest and occupation of New Mexico were made, but for various reasons they were unsuccessful. In the spring of 1598 Don Juan de Oñate entered New Mexico with about 400 colonists, and choosing the pueblo of San Juan (30 m. N.W. of the modern Santa Fé) as a temporary dwelling-place, made preparations for building a town at the junction of the Rio Chama and the Rio Grande, to be known as San Francisco. In the following year the new settlement was renamed San Gabriel. Some years later a second settlement was made at Santa Fé, which has ever since been the seat of government of New Mexico. Although the Franciscan missionaries by 1617 had built seven churches and had baptized 14,000 Indians, there were in this year only 48 soldiers and settlers in the province. The zeal of the friars in stamping out the religious rites of the natives, the severe penalties inflicted for non-observance of the rules of the Church, and the heavy tribute in kind demanded by the Spanish authorities, aroused feelings of resentment in the Pueblo Indians and led in 1680 to a general revolt, headed by a native named Popé. Over 400 Spaniards were massacred, and the remnant, after enduring a siege in Santa Fé, fled southward to a mission near the present El Paso. For a decade the natives enjoyed their independence, destroying nearly all vestiges of Spanish occupation, and venting their wrath particularly upon the churches. After several attempts at reconquest had failed, Don Diego de Vargas marched up the Rio Grande in 1692, and largely by moral suasion secured the surrender of Santa Fé, then held by the Indians. During the next four years the submission of all the pueblos was secured, and the permanency of European occupation was assured. The history of New Mexico in the 18th century was uneventful, being chiefly a story of petty disagreements among the pueblos, and occasional forays of the more warlike tribes, the Navahos, Apaches and Comanches. During the Mexican War of Independence (1811–21) New Mexico was tranquil and little disturbed by events farther south; but when, near the close of the year 1821, the news of independence arrived it was received with enthusiasm. Under the Mexican republic New Mexico was called a province till 1824, when it was united with Chihuahua and Durango to form the Estado Interno del Norte. Several months later, however, it was separated from these two provinces and became a Territory; in 1836 it was officially designated as a department, and remained as such until ceded to the United States by the treaty of Guadalupe-Hidalgo, in 1848. Its government during this period was only slightly changed from what it had been under Spain.

Of great importance to New Mexico during the first half of the 19th century was the development of its trade with the United States. American traders had occasionally ventured as far as Santa Fé before the independence of Mexico, but they were frequently expelled and their goods confiscated by the Spanish authorities. After 1822 trading expeditions became larger and more numerous. From Missouri caravans of pack animals, and later wagon trains, set out in May of each year on the 800 m. journey to Santa Fé, along the route later followed in its general lines by the Atchison, Topeka & Santa Fé railway. The value of the products carried by these trains increased from $15,000 in 1822 to $450,000 in 1843. On their return trip the wagons often brought loads of wool, fur and blankets.

In 1841 the republic of Texas, claiming that its western boundary was the Rio Grande, sent a force of 300 men to New Mexico to enforce these claims. The Texans reached the frontier in a starved and exhausted condition, were made prisoners by the New Mexican militia, and were sent to Mexico, where after a short term of confinement they were released.

In 1846 the Congress of the United States declared that war existed with Mexico, and on the 3rd of June Brigadier-General Stephen W. Kearny was ordered to undertake the conquest of New Mexico and California and to "establish temporary civil governments therein." Kearny reached Las Vegas on the 15th of August, assured the people of protection if they remained peaceable, and three days later entered Santa Fé without opposition. Here he organized a civil government and compiled a code of laws, some of which are still in force, thus exceeding his instructions and ignoring the territorial claims of Texas, out of which had grown the war. After Kearny's departure for California and Col. Alexander William Doniphan's (1808–1887) setting out (Dec. 1846) on his heroic expedition to join Gen. Wool at Chihuahua, some of the inhabitants revolted, and in January 1847 assassinated the governor, Charles Bent, and a number of Americans and Mexicans who had taken office under the new regime. The insurrection was quickly suppressed, but the citizens soon grew tired of a military government, and in 1848 and again in 1849 petitioned Congress for a government "purely civil in character." In 1850 a convention met in Santa Fé and drafted a state constitution prohibiting slavery; this constitution was ratified, and state officials were chosen to act under it. The governor by military appointment, Colonel John Munroe (1796–1861), refused to surrender his jurisdiction in favour of the state officials until authorized to do so by Congress, and for a time there was much writing of pronunciamentos by the military and the quasi-state officials. But finally a regular Territorial form of government, provided by Congress by an act of the 13th of December 1850 (a part of the Compromise of 1850), was formally inaugurated on the 3rd of March 1851.

As originally constituted, the Territory included, besides most of its present area, nearly all of what is now Arizona, and a small portion of the present Colorado. By the terms of the Compromise Measures of 1850 Texas surrendered all claims to the portion of New Mexico E. of the Rio Grande, and was reimbursed for this loss of territory by the Federal Government. The Gadsden Purchase (see Gadsden, James), concluded on the 30th of

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[1] Although the Quivíra story was fabricated by an Indian captive and its fraudulent character was fully exposed by Coronado in 1541, ignorant American treasure-seekers still search for this mythical region. By a strange perversion of names the deserted stone pueblo of Tabirá, S. of Albuquerque in the vicinity of the Manzano Mountains, has received the appellation of "Gran Quivíra," thereby causing many deluded persons to make a vain search among its ruins for treasure.

December 1853, and proclaimed by President Pierce on the 30th of June 1854, added to the Territory an area of 45,535 sq. m., and changed the southern boundary W. of the Rio Grande so that from the Rio Grande the new boundary ran due W. on the parallel of 31° 47′ N. lat. for 100 m., then due S. to the parallel of 31° 20′ N. lat., then due W. on that parallel to its intersection with the 111th meridian of longitude west of Greenwich, from that point of intersection in a straight line to the Colorado river, 20 m. below its junction with the Gila, and thence up the middle of the Colorado river to the boundary line between Mexico and California. In 1861 a portion of north-eastern New Mexico was taken to form part of Colorado; and in 1863 all of the area W. of the 109th meridian was organized as the separate Territory of Arizona.

By the Compromise of 1850 the question whether New Mexico should have slavery was left to the decision of the inhabitants. Only a few African slaves were ever brought into the Territory, and these were usually the property of civil and military officers. There were two classes of the population, however, whose status was practically that of slaves; namely, Indian captives and *peons*. Before slavery was prohibited in the Territory by Act of Congress in 1862, Indian captives were regularly bought and sold, a traffic sanctioned by custom and not prohibited by law. *Peons* were persons held in servitude on account of debt, and the peonage system was sanctioned both by the custom of the Mexican provinces and by the laws of the Territory. An act of 1851 forbade servants from leaving masters to whom they were indebted, and in 1853 sheriffs were authorized in some instances to dispose of the debtor's labour to the highest bidder. Peonage remained a legalized institution until 1867, when it was prohibited by an act of Congress.

At the outbreak of the Civil War the inhabitants were generally apathetic; but when the Confederates invaded New Mexico they proved loyal to the Union.[1] In February 1862 General H. H. Sibley, commanding a force of about 3800 Texans, marched into New Mexico, fought a successful engagement at Valverde, on the Rio Grande, against Union forces under Colonel, later General, Edward R. S. Canby, and occupied Albuquerque and Santa Fé. The Union troops were reinforced from Colorado, however, and after a series of skirmishes the Confederates were compelled to retreat to Texas, leaving behind about half their original number in killed, wounded and missing. New Mexico furnished to the Union army between 5000 and 6000 men.

The period following the American occupation of New Mexico was marked by constant depredations of the Indians, chiefly the Navahos, Apaches and a few Utes, their main object being plunder. While the troops were occupied with the Confederate invaders the Indians had a free hand, but in 1863 an energetic campaign was begun by General James H. Carleton against the Navahos, who were subdued and placed on a reservation on the Pecos river, and later removed to the north-western part of the Territory. There they grew peaceful and prosperous, acquiring large flocks of sheep and gaining a reputation as makers of blankets. The Apache Indians, the most savage of all, were placed on reservations somewhat later, but for many years bands of their warriors would escape and make raids into New Mexico, Arizona and Mexico. The most notable of the later outbreaks were those in 1879–1880 and in 1885–1886 respectively of the Apache chiefs Victorio and Geronimo (*c.* 1834–1909).

When the United States acquired possession of New Mexico, the best portions of the Territory were held in private ownership under Spanish and Mexican grants, which were confirmed by the treaty of Guadalupe-Hidalgo. To determine the validity of these claims, which had been complicated by transfers and subdivisions, and to fix their boundaries, which were often very vaguely described, proved a very formidable undertaking; and the slow process of confirmation greatly retarded the development of the Territory. There was but little material progress before the advent of the railway. The Atchison, Topeka & Santa Fé railway reached Albuquerque in 1880, and the Southern Pacific railway effected a junction with it at Deming in 1881, thus connecting the Territory with the eastern and western coasts of the United States. With the railway came capital and the development of mines, great cattle ranges and modern towns. Immigrants from the states, however, rarely settled beyond the zone of the railway, and in the remote rural regions the process of Americanization was slow.

After the Civil War numerous attempts were made to secure the admission of New Mexico into the Union as a state. In 1872 a state constitution was drafted, and it was proposed for a time to call the new state Lincoln, but the movement came to nothing. In 1889 another constitution was drafted, but it was rejected when submitted to a popular vote. On the 6th of November 1906 the question of the joint admission of New Mexico and Arizona as a single state bearing the name of the latter Territory was submitted to a vote of their citizens. The vote of New Mexico was favourable (26,195 to 14,735), but the measure was defeated in Arizona. In June 1910 the President approved an enabling act providing for the admission of Arizona and New Mexico as separate states.

The governors of New Mexico since its independence from Spain have been as follows:

UNDER THE MEXICAN REPUBLIC[2]

Francisco Javier Chavez	1822
Antonio Vizcarra	1822–1823
Francisco Javier Chavez (acting)	1823
Bartolomé Vaca	1823–1825
Antonio Narbona	1825–1827
Manuel Armijo	1827–1828
Antonio Vizcarra (acting)	1828
José Antonio Chavez	1828–1831
Santiago Abreu	1831–1833
Francisco Sarracino	1833–1835
Juan Rafael Ortiz (acting)	1834
Mariano Chavez (acting)	1835
Albino Perez	1835–1837
José Gonzalez, revolutionary governor or pretendant	1837–1838
Manuel Armijo	1838–1846
Antonio Sandoval (acting)	1841
Mariano Martinez de Lejanza (acting)	1844–1845
José Chavez (acting)	1845
Juan Bautista Vigil y Alarid (acting)	1846

UNDER THE UNITED STATES

Governors by Military Appointment.

Charles Bent	1846–1847[3]
Donaciano Vigil	1847–1848
John Marshall Washington	1848–1849[4]
John Munroe	1849–1851[4]

Governors by Presidential Appointment.

James S. Calhoun	1851–1852
E. V. Sumner (Military Commander, acting)	1852
John Greiner (Secretary, acting)	1852
William Carr Lane	1852–1853
David Merriwether	1853–1857
Abraham Rencher	1857–1861
Henry Connelly	1861–1865
W. E. M. Arny (Secretary, acting)	1865–1866
Robert B. Mitchell	1866–1869
William A. Pile	1869–1871
Marsh Gidding	1871–1875
William G. Ritch (Secretary, acting)	1875
Samuel B. Axtell	1875–1878
Lewis Wallace	1878–1881
Lionel A. Sheldon	1881–1885
Edmund G. Ross	1885–1889
L. Bradford Prince	1889–1893
William T. Thornton	1893–1897
Miguel A. Otero	1897–1906
Herbert J. Hagerman	1906–1907
J. W. Raynolds (Secretary, acting as governor)	1907
George Curry	1907–1909
William J. Mills	1909–

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[1] According to the historian H. H. Bancroft, the loyalty to the Union cause resulted "largely from the fact that the Confederate invasion came from Texas, the old hatred of the Texans being the strongest popular feeling of the natives, far outweighing their devotion to either the North or the South."

[2] Under the republic until 1837 the governor was officially designated as *jefe político*; after that date as *gobernador*.

[3] Assassinated during the Mexican revolt on the 19th of January 1847.

[4] Governor as Commander of the Department.

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NEW MILLS, an urban district in the High Peak parliamentary division of Derbyshire, England, at the confluence of the rivers Goyt and Kinder, on the border of Cheshire, 13 m. S.E. of Manchester, on the Midland and the London & North-Western railways. Pop. (1901) 7773. Its ancient name was Bowden Middle Cale. The name of New Mills was given to it from a corn-mill erected on the Kinder in the hamlet of Ollersett, and is specially applied to the group of factories which have grown up round it. Formerly paper and cloth were the staple industries of the district, but the inhabitants of the various hamlets are now occupied chiefly in iron and brass foundries, cotton mills and print-works. A short branch of the Midland railway leads to the town of Hayfield (pop. 2614).

NEWMILNS, a manufacturing town and police burgh of Ayrshire, Scotland. Pop. (1901) 4467. It is situated 7½ m. E. of Kilmarnock by the Glasgow and South-Western railway. It was made a burgh of barony in 1490 by James IV., the charter being confirmed in 1566 by Sir Matthew Campbell, the laird of Loudoun, in which parish the town is situated. Muslin- and lace-curtain making and the manufacture of mosquito-nets are the chief industries. Nearly 2 m. E. lies Darvel (pop. 3070), a police burgh and manufacturing town, with a station on the Glasgow and South-Western railway; its chief manufactures are those of lace curtains, muslins and carpets. Two miles E. rises Loudoun Hill (1036 ft.) where Robert Bruce defeated the English in 1307, and about a mile farther E. is the cairn raised to commemorate one of Wallace's victories.

NEW ORLEANS, a city of Louisiana, U.S.A., situated almost wholly on the left bank of the Mississippi, 107 m. from its mouth, in that portion of the state which constitutes the river's larger delta, and lying between Lake Pontchartrain (to the north and west) and Lake Borgne (to the east and south); its latitude is about 30°, nearly the same as that of Cairo, Egypt. Pop. (1910) 339,075. The city lay originally at the angle of a deep three-sided bend in the river. Into this hollow it gradually spread, the curving river front, some 9 m. long, serving as its harbour; and hence its old appellation, the Crescent City. Long ago, however, the city filled the pocket of the bend, and spreading farther along the river, now has the form of an "S." Directly north, and still about 3 m. distant from the parts of the city proper that have advanced farthest toward it, lies Lake Pontchartrain (about 40 m. long and 20 m. wide). Lake and river are parallel to one another for many miles; the city lies on the narrow alluvial strip between. The total area included within the municipal limits is 196·25 sq. m., but the city proper covers about 40 sq. m. The larger limits are coextensive with those of the parish of Orleans, and include the district of Algiers, on the right bank of the Mississippi.

The river at New Orleans varies from 1500 to 3000 ft. in width, and its broad channel often stretches almost from shore to shore, with a depth varying frequently at short intervals from 40 ft. to more than 200 ft. Around the margins a line of wharves and shipping extends for miles on each shore. Including the suburbs of Westwego, Gretna, &c., on the right bank of the stream, there is a river frontage of more than 20 m. Gretna, the seat of Jefferson parish, McDonoghville, in Jefferson parish, and Algiers, or West New Orleans, a part of the city, are industrial suburbs on the west bank of the Mississippi, connected with the east bank by a steam ferry and with one another by electric railway. At Algiers are railway terminals and repair shops of the Southern Pacific and the Texas & Pacific; and the United States Naval Station here, which was built in 1894 (though land was bought for it in 1849), and has a large steel floating dry dock, is the only fresh-water station south of Portsmouth, Virginia, and is equipped to make all repairs.

The city site is almost perfectly level; there is an exceedingly slight slope from the river toward the tidal morasses that border Lake Pontchartrain. The elevation of the city plain is only 10 ft. above the sea, and its lower parts are as much as 10-12 ft. below the Mississippi at high flood water. About 6 m. of heavy "levees" or dykes—in some parts rising clear above the city plain, but backed by filled-in areas graded down from the shores where the traffic of the water-front is concentrated—protect it from the waters. The speed of the current reaches, in times of high water, a rate of 5 m. an hour. Along the immediate front of the principal commercial quarter, this current, losing some of its force by change of direction, deposits its alluvium in such quantities as to produce a constant encroachment of the shore upon the harbour. At its widest part this new land or batture, with wharves, streets and warehouses following eagerly after it, has advanced some 1500 ft. beyond the water-line of the middle of the 18th century.

The climate is not marked by extremes of absolute heat or cold. Only once in thirty-seven years (1871–1907) did the thermometer register as high as 102° F., and on only a few days did it register above 96°; in February 1899 the temperature was 7°, but it rarely falls below 22°. The average annual rainfall is about 58 in.

Canal Street, the centre of retail trade and street life, bounds on the south-west near the river the *Vieux Carré*—the old rectangle within the walls of the original city, bounded by the river, Canal, Rampart and Esplanade streets—and separates the picturesque, peaceful French (or Latin) Quarter of the north-east from the bustling business and dignified residence districts of the American Quarter, or New City, on the south-west. In the latter St Charles Avenue and Prytania Street have the finest residences, and in the former Esplanade Avenue. Just below Canal Street, in the oldest part of the American Quarter, are many of the most important or imposing buildings of the city, and some of the places most intimately associated with its history. Here are the St Charles Hotel (1894), the third of that name on the present site, all famous hostelries, and the first (1838–1851) one of the earliest of the great hotels of the country; and Lafayette Square, surrounded by the City Hall (built in 1850 in the style of an Ionic temple), the new Post Office, two handsome churches, St Patrick's and the First Presbyterian, Odd Fellows' Hall and other buildings. In the square are statues of Henry Clay (by Joel T. Hart) and Franklin (by Hiram Powers), and a monument to John McDonogh (1898); and in the vicinity are the Howard Memorial Library (1887; a memorial to Charles T. Howard), which was the last work of H. H. Richardson, a native of Louisiana, and the Confederate Memorial Hall (presented to the city by F. T. Howard) with Confederate relics. Two blocks away in Marguerite Place is a statue erected (1884) by the women of the city to Margaret Haughery (d. 1882), the "Orphan's Friend," a noble woman of humble birth and circumstances, who devoted a toilful but successful life to charities. In Lee Circle is a monument to Robert E. Lee, and facing it is the New Orleans Public Library building (1908). Just off Canal Street, at Carondelet and Gravier Street, is the Cotton Exchange (1882–1883), and in Magazine Street the Produce Exchange. The large office buildings are on Canal, Carondelet, Common and Gravier streets; among them may be mentioned the Maison Blanche, the Hennen Building, the Tulane Newcomb Building and the Canal Louisiana Bank and Trust Company Building. On Camp Street, between Gravier and Poydras, are the office buildings of the *Picayune* and the *Times-Democrat*; on Carondelet and Gravier are the wholesale cotton houses; on Poydras and Tchoupitoulas are the wholesale grocery houses; and on North Peters and Custom House streets the sugar and rice industries are concentrated. Little of history or tradition is associated with the American Quarter, with the exception of the former site (before 1900) of the Clay statue in Canal Street where Royal Street and St Charles Avenue begin, which was the scene of popular meetings in the Italian troubles of 1891; here, in Liberty Place, a triangle at the intersection of Canal, North Peters and Tchoupitoulas streets, on the scene of the fight of the 14th of September 1874 between conservative citizens and the radical authorities of the state, is a granite memorial called the Liberty Monument. The Customs House, long renowned for its "marble room," is in the old city, just off Canal Street. The corner-stone was laid by Henry Clay in 1847. The Boston (1845) and Pickwick (1857) are the best known of the general social clubs, and the Harmony (1862) of the Jewish clubs.

It is the French Quarter in which the history, poetry and romance of New Orleans are indissolubly united. The memory of French dominion is retained in the titles, and in the foreign aspect as well, of Toulouse, Orleans, Du Maine, Conti, Bourbon, Dauphiné and Chartres streets; while even more distinctly the Spaniard has superimposed his impress on stuccoed wall and iron lattice, huge locks and hinges, arches and gratings, balconies, jalousies, inner courts with parterres, urns and basins with fountains, and statues half hid in roses and vines. There are streets named from its Spanish governors: Unzaga, Galvez, Miro, Salcedo, Casa Calvo, Carondelet and the baron Carondelet's Baronne. The moated and palisaded boundaries of early days are indicated by the wide, tree-planted and grassy avenues named respectively from the Canal, the Rampart and the Esplanade that once lay along their course; the original "commons" outside the walls are commemorated in Common Street; and the old parade ground in the midst of the early town's river front, now laid off in flower-beds, white-shelled walks and shaven shrubbery, and known as Jackson Square, still retains its older name of the Place d'Armes. With this quaint, sunny and dusty old square is associated nearly every important event in Louisiana's colonial history. This was the *place publique*, associated with traffic, gossip, military muster and official acts of state. On one side is the cathedral of St Louis, first built in 1718, burned in 1788, rebuilt in 1792–1794, and largely rebuilt again in 1850. Flanking the cathedral on one side stands the calaboose (*Calaboza*, 1810), and on the other the *Cabildo*—so named from the municipal council that sat here under Spanish rule, when it was the government house and palace of justice. Both buildings are to-day used as law courts. The Cabildo is a dignified two-storey structure of adobe and shell-lime, built in 1795; an incongruous mansard roof was added in 1850. On the 30th of November 1803, in the council hall, the city keys were handed back to the representatives of the French government and the people of Louisiana were absolved from their allegiance to the Spanish king; and here, only twenty days afterward, with similar ceremonies, the keys of the city passed from the hands of the French colonial prefect to those of the commissioners for the United States. In the old Place d'Armes a bronze equestrian statue (1846) of Andrew Jackson by Clark Mills is a remembrance of the ceremonies attending Jackson's triumphal entry into the city after the battle of New Orleans in 1815. In 1825 Lafayette was lodged in the Cabildo as the city's guest.

The appearance of the square was greatly changed in 1849, when the Baroness de Pontalba, in whose estate it was then comprised, cut down the ancient elms that shaded it and laid it out in its present style of a French garden. She also is responsible for the low brick "Pontalba Mansions" on the north and south sides of the square. The Babel of Tongues in the French Market (1813), on the site of an older market, immediately below Jackson Square, and at the "Picayune Tier" just adjacent, is an interesting feature of the city. Near the Cathedral, in Orleans Street, is the convent of the Holy Family, a brick building housing a negro sisterhood founded in 1835, and formerly the scene of New Orleans's famous "quadroon balls." The archiepiscopal palace (1730), said to be the oldest building of the Mississippi Valley, is part of the unchanged original Ursuline convent; it was used as the State Capitol in 1831, and then it was the residence, and since 1899 has been the administrative office of the archbishop, and houses a colonial museum with the ecclesiastical records. The French Opera House (1860) was the successor of various French theatres built after 1808. The carnival balls are given here. New Orleans was by far the earliest of American cities to have an annual opera season.

The 18th-century fortifications about the old city were destroyed about 1804. The United States Branch Mint (1838) occupies the site of Fort St Charles (destroyed 1826), where Jackson reviewed his troops as they marched to Chalmette. Just outside the *Vieux Carré* is Beauregard Square, formerly known as Congo Square, because in early days the slaves were wont to gather here for their barbaric dances. The Hotel St Louis (1836), rebuilt in 1884 as the Hotel Royal, was the seat of the Republican reconstruction governments of governors Kellogg and Packard, and the prison fortress of both, respectively in 1874 and 1877, when the whites rose against Republican rule; its rotunda was also once a famous slave mart. Many other spots in the Latin Quarter are of scarcely less interest than those mentioned, not excluding those which were made famous by the romances of G. W. Cable, and whose only title to historic consideration is that which his imagination has given them.

City Park (216·6 acres, partly water), lying between the city and the lake, is notable in the local duelling annals of earlier days. Audubon Park (249 acres) was once the sugar plantation of Étienne de Boré, who first successfully made granulated sugar in 1795–1796; earlier experiments had been made in 1791 by Antonio Mendes, from whom de Boré, who established the sugar industry, bought a plantation in St Bernard Parish. The park was bought by the city for $180,000 in 1871, but was little improved until 1884, when the Cotton Centennial Exposition was held here. It contains to-day a state Sugar Experiment Station, in which a part of their work in course is done by the students in the Audubon Sugar School of the State University at Baton Rouge, and Horticultural Hall, the only one of the Exposition buildings now standing, with a display of tropical trees and plants; opposite Audubon Park is the campus of Tulane University. West End is a suburban resort and residential district on Lake Pontchartrain.

A noted feature of New Orleans is its cemeteries. Owing to the undrained condition of the subsoil, burials are made entirely above ground, in tombs of stuccoed brick and of granite and marble. Some of these are very elegant and costly, and many of the burial-grounds, with their long alleys of these tombs of diverse designs, deeply shaded by avenues of cedars and magnolias, possess a severe but emphatic beauty. Jews and the poor bury their dead underground in shallow graves. The oldest cemetery, St Louis No. 1, contains the graves of many persons notable in history. St Roch's Campo Santo has a wonder-working shrine, and is the most picturesque of the old burying-grounds. Metairie, on the site of an old race track, is the finest of the new. It contains a monument[1] to the Army of the Tennessee and its commander, Albert Sidney Johnston, with an equestrian statue of Johnston by Alexander Doyle, and a monument to the Army of Northern Virginia surmounted by a statue of General T. J. Jackson. In Greenwood Cemetery is the first monument erected to Confederate dead, given by the women of New Orleans. At Chalmette (on the Mississippi, about 5 m. E. of Canal Street), where the battle of New Orleans was fought in 1815, there is a National Cemetery, in which some 12,000 Union soldiers in the Civil War are buried.

Population.—The population in 1900[2] was 287,104, New

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[1] In the burial vault of this tomb, with the bodies of many other soldiers, are the remains of General P. G. T. Beauregard, who was born near New Orleans.

[2] At the earlier censuses the population of the city was as follows: 17,242 in 1810 (when it was the sixth city in population in the United States); 27,176 in 1820 (when, as in 1830 and 1850, it was the fifth city); 46,082 in 1830; not reported separately in 1840; 116,375 in 1850; 168,675 in 1860; 191,418 in 1870; 216,090 in 1880; and 242,039 in 1890.

Orleans ranking twelfth among the cities of the United States; in 1910 it was 339,075. Of the 1900 total, 256,779 were native-born, and 30,325 were foreign-born, including 8733 Germans, 5866 Italians, 5398 Irish, 4428 French and 1262 English; and there were 77,714 negroes. In 1900 the population of foreign parentage was 108,010, of whom 78,269 had foreign fathers and foreign mothers, 27,259 being of German, 15,465 of Irish, 10,694 of Italian, 9317 of French and 1882 of English parentage. The Latin element that came in colonial times included Frenchmen, French-Canadians, colonists from the French and Spanish West Indies, Canary Islanders (whose descendants are still known as *Isleños*), and French refugees from Acadia in 1765 and the years following, and from Santo Domingo at the end of the 18th century. The earliest French immigrants were largely Bretons and Normans, and various creole words in common use (such as *banquette* for "side-walk") still recall these racial beginnings. The creoles of New Orleans and the surrounding delta are a handsome, graceful, intelligent race, of a decidedly Gallic type, though softened in features, speech and carriage. Their dialect has been formed from the French entirely by sound, has no established orthography, and is of much philological interest. Until very recent years the Latin races, though fusing somewhat among themselves, mixed little in blood with the Anglo-American. The Spaniards when in power at the end of the 18th century were notably different from the French in their liberalism in this respect. In social life and standards the French creoles were very conservative; the old styles of dress, *e.g.* of the late 18th century—wigs, silk stockings and knee-breeches—lingered later among them, probably, than in any other part of the country. But before the pressure of Anglo-American immigration, capital, enterprise and education, this creole civilization has slowly yielded ground, at last fairly beginning to amalgamate with the social system of the American nation. But the creole has stamped his influence upon wellnigh every aspect in the life of the city that has broadened out so widely on every side of his antique town. Its cuisine, its speech, its "continental" Latin Sundays, its opera, its carnival, its general fashions and manners, its intolerance of all sorts of rigour, its whole outward tone and bearing, testify to this patent Latin impress. A comparatively recent addition to the Latin element in the city has been through Italian immigration.

The coloured population, notwithstanding the presence among it of that noted quadroon class which enjoyed a certain legal freedom for generations before the Civil War, has not greatly improved since the date of emancipation. Catholicism is naturally extremely strong in New Orleans. So also are the Baptist and Methodist churches.

Carnivals.—The famous carnival displays of New Orleans are participated in very largely by the "Americain," *i.e.* the Anglo-American; but they mark one of the victories of the Latin-American over North-American tastes, and probably owe mainly to the "Americain" their pretentious dignity and to the creole their more legitimate harlequin frivolity. Out of the simple idea of masked revelry in the open streets, as borrowed from Italian cities, the American bent for organization appears to have developed, by a natural growth, the costly fashion of gorgeous torch-lighted processions of elaborately equipped masques in tableaux drawn on immense cars by teams of caparisoned mules, and combining to illustrate in a symmetrical whole some theme chosen from the great faiths or literatures or from history. Legends, fairy-tales, mythologies and theologies, literature from Homer to Shakespeare, science and pure fantasy are drawn upon for these ornate representations, which are accompanied by all the picturesque licence of street life characteristic of carnival times in other cities. They have no rival in America, and for glitter, colour and elaborateness are by many esteemed the most splendid carnival celebrations of the world. The first carnival parade (as distinguished from the Mardi Gras celebration) was held in 1827 by masked students recently returned from Paris. In 1837 and 1839 the first processions with "floats" were held in New Orleans. The regular annual pageants, almost uninterrupted save during the Civil War, date from 1857, when the "Mystic Krewe of Comus," the oldest of the carnival organizations, was formed; similar organizations, secret societies or clubs are the "Twelfth Knight Revelers" (1870), "Rex" and "Knights of Momus" (both 1872, when the carnival was reviewed by the Grand Duke Alexis of Russia), the "Krewe of Proteus" (1882), and the "Krewe of Nereus" (1895). Balls, processions and other festivities are now spread over a considerable period, culminating in those of Shrove Tuesday (*Mardi Gras*). During this time the festivities quite engross public attention, and many thousands of visitors from all parts of America are yearly attracted to the city.

Charitable Institutions.—The large Charity Hospital (1786) and the Richard Milliken Memorial Hospital for Children are supported by the state. The Touro Infirmary (1854; controlled by the Hebrew Benevolent Association; founded by Judah Touro (1775–1854; a Jew of Dutch descent, son of Isaac Touro of Newport, Rhode Island), includes a free clinic open to the needy of all faiths. Other hospitals are: the U.S. Marine Hospital (1885); the Hôtel Dieu (1859) and the St Joseph's Maternity Hospital (1863), both under the Sisters of Charity; the Sarah Goodrich Hospital (1896; Methodist Episcopal); and the Eye, Ear, Nose and Throat Hospital (1889; private). The Poydras Asylum, on Magazine Street, was founded in 1817 by Julien Poydras (1746–1824), a successful trader and delegate from Orleans Territory to the Federal Congress in 1809–1811; the present building was erected in 1836; the asylum, which is for orphans, is controlled by Presbyterian trustees, although it was, during Poydras's life, under the charge of Sisters of Charity. St Vincent's Infant Asylum (1858), or "Margaret's Baby House," is in charge of Sisters of Charity. Other orphanages and children's homes are: the New Orleans Female Orphan Asylum (1849) and St Elizabeth's Industrial School (1845), under the Sisters of Charity; an Ursuline Orphanage (1729); the Immaculate Conception Girls' Asylum (1851) and St Mary's Catholic Orphan Boys' Asylum (1835, under the Sisters Marianites of the Holy Cross); the St Alphonsus Orphan Asylum (1878) and St Vincent's Home for Newsboys (1878), under the Sisters of Mercy; the Mount Carmel Orphan Asylum (1869), under the Sisters of Mount Carmel; the Sacred Heart Orphan Asylum (1894) for girls, under the Missionary Sisters of the Sacred Heart; St Joseph's Orphan Asylum (1863), under the Sisters of Notre Dame; a Protestant Orphans' Home (1853); a Jewish Orphans' Home (1855); the Children's Home of the Protestant Episcopal Church (1859); the Evangelical Lutheran Bethlehem Orphan Asylum (1881); the German Protestant Orphan Asylum (1866); the Freedmen's Orphan Asylum (Baptist); and, under private and non-sectarian control, the Asylum for Destitute Orphan Boys (1824) and the Colored Industrial Home and School (1902). The J. D. Fink Fund and the Fink Home (1874) or Asylum (for Protestant widows and their children) are the gift of an eccentric, whose offer of marriage had been refused by one preferring not to marry at all, and who forbade that any old maid should enter the asylum. Other homes for adults are: the Soldiers' Home of Louisiana for Confederate Veterans; two Homes for the Aged (1869 and 1882), both under the Little Sisters of the Poor; the Faith Home (1888; Baptist) for old coloured women; the German Protestant Bethany Home (1889) and the German Protestant Home for the Aged and Infirm (1887); the Julius Weis Home for Aged and Infirm (1899), under the Hebrew Benevolent Association; and, all under private corporations, the Maison Hospitalière (1893) for aged women, the New Orleans Home for Incurables (1893) and St Anna's Asylum (1850) for destitute women and their children. Temporary homes are: the Convent of the Good Shepherd (1859), under the Sisters of the Good Shepherd, and a Memorial Home (1886; both for wayward women); a Home for Homeless Women (1888), and the New Orleans Convalescent Home (1885). Kingsley House is modelled after Hull House in Chicago. The Louisiana Retreat, a private asylum for the insane, is in New Orleans, and there also is a state House of Detention.

Education.—The public schools give equal opportunities to whites and blacks, but the whites take decidedly greater advantage of them; a large number even of the whites still make practically no use of either public or parochial schools. The races are kept separate: the attempt was made to mix attendance in 1870, but the whites compelled its abandonment. To a bequest of John McDonogh (1778–1850), whose life is one of the romances and the lessons of New Orleans,[1] the city owes already some thirty school buildings. The Home Institute (1883) provides free night schooling for hundreds of students, and similar work is done on a larger scale by public night schools. Of the adult male population in 1900 13·4 % were illiterate (could not write), seven-tenths of the illiterates being negroes, of whom the illiterates constituted 36 %.

There are various higher institutions of learning in the city. Tulane University of Louisiana was named after its benefactor Paul Tulane (1801–1887), a merchant of New Orleans, who gave $1,050,000 in 1882–1887 to a Board of Trustees for the education of "the white young persons in the city." The university was established, under its present name, in 1884, the former university of Louisiana (1834) being merged in it; it gives free tuition in the academic department to one student from each senatorial and each representative district or parish in the state, and its income-producing property, up to $5,000,000, is exempted from taxation by the state. In 1908–1909 Tulane University had 192 instructors and 2236 students; and it included a Graduate Department, a College of Arts and Sciences (1884), a College of Technology with 157 students, Extension Courses with 148 students, the H. Sophie Newcomb Memorial College for Girls (1886; endowed in memory of her only daughter by Josephine Louise, wife of Warren Newcomb, a sugar merchant of the city), with 288 students in the college and 102 in Newcomb High School, a Teachers' College, a Law Department (1847), a Medical Department (1834) with 648 students, a Department of Pharmacy and a Summer School with 860 students. The College of the Immaculate Conception (Jesuit, 1847) is an important school. Higher schools for the negroes include Leland University (1870; Baptist), with college courses, preparatory courses (there are several Baptist secondary schools affiliated with the university), normal and manual training departments, a school of music, a theological school, a woman's Christian Workers' Class and a night school; Straight University (1870; Congregational), with kindergarten, primary, high school and industrial departments; New Orleans University (1873; Methodist) and Southern University (1883). The last is supported by the state.

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[1] See William Allan's *Life and Work of John McDonogh* (Baltimore, 1886).

Libraries.—The public, society and school libraries in the city in 1909, many being very small, aggregated 301,000 volumes, 227,000 being in five collections. A central library building and three branch buildings, costing $275,000, were presented to the city by Andrew Carnegie. The Howard Memorial Library (1887) is an important reference library, peculiarly rich in books on the history of Louisiana. The Louisiana Historical Society (1836) and the Athenée Louisiannaise (1876) may also be mentioned; the latter has for its purpose the conservation and cultivation of the French language. The Union Franchaise (1872) supplements with educational and charitable activities the general bond of fraternity offered by it to the French population. In New Orleans there is a State Museum, devoted to the history, institutions and resources of the state.

Newspapers.—Among the older newspapers are *L'Abeille* (1827) and the *Picayune* (1837), which is one of the most famous and influential papers of the South, and was founded by George Wilkins Kendall (1809–1867), a native of New Hampshire, who organized a special military correspondence for his paper during the Mexican War, probably the earliest instance of such service in the United States. The *Times-Democrat* (1863) is counted among the ablest and most energetic papers of the South. *De Bow's Commercial Review* (published in New Orleans 1846–1864), founded and edited by James D. B. De Bow (1820–1867), was in its day one of the most important periodicals of the country, and remains a valuable repository of information on conditions in the South before the war.

Commerce.—It was its potential commercial value, as indicated by its geographical position, that in 1803, when New Orleans was only a small, poor and remote Franco-Spanish-American port, led to its purchase by the United States. But various causes operated to impede the city's growth: the invention of railway transit, the development of the carrying trade on the Great Lakes, the bars at the mouth of the Mississippi, over which few large ships could pass, the scourge of yellow fever, the provincialism and the lethargy of an isolated and indolent civilization. Slavery kept away free labour, and the plantation system fostered that "improvidence and that feudal self-complacency which looked with indolent contempt upon public co-operative measures" (G. W. Cable). However, in 1860 the exports, imports and domestic receipts of New Orleans aggregated $324,000,000. As a result of the Civil War the commerce of New Orleans experienced an early paralysis; the port was soon blockaded by the United States navy; the city fell into the hands of the Federal forces (1st May 1862); its commerce with the interior was practically annihilated until after 1865, and from the depression of the years following the war the city did not fully recover for a quarter of a century. Only after 1880 did its total commerce again equal that of 1860. It was almost solely as the dispenser of the products of the greatest agricultural valley in the world that New Orleans grew from a little frontier town to the dimensions of a great city. This trade is still dominant in the city's commerce. In the season that follows the harvest of the South and West, the levee, the wharves and the contiguous streets are gorged with the raw staples of the regions that lie about the Mississippi and its greater and lesser tributaries—sugar, molasses, rice, tobacco, Indian corn, pork, staves, wheat, oats, flour and, above all else, from one-fourth to one-third the country's entire supply of cotton. All other movement is subsidiary or insignificant.

By 1900 the drawbacks which have been enumerated had been practically eliminated, and uncertainty as to the investment of capital had been removed. The southward tendency in railway traffic favours the city. Deep water to the ocean was secured by a system of jetties at the South Pass mouth of the Mississippi, built by James B. Eads in 1875–1879; but in time this ceased to maintain an adequate depth of water, and (after the report in 1900 of a board of engineers) in 1902 Congress began appropriations for an improvement of the South-west Pass[1] by opening a channel 1000 ft. wide and at least 35 ft. deep. Many lines of steamers give direct connexion with the West Indies, Central America, Europe, New York and also with Japan (for the shipment of raw cotton via Suez). Ocean steamers, loaded in large part by elevators, now bear away the exports for which a swarm of sailing-ships of much lighter draft and average freight-room once made long stays at the city's wharves. Passenger traffic on the rivers has practically vanished, and the shrunken fleet of river steamers (only 15 in 1907) are devoted to the carrying of slow freights and the towing of barges on the rivers and bayous of the lower Mississippi Valley.[2]

The total value of all merchandise exported in the six customs years 1902–1903 to 1907–1908 averaged $154,757,110 yearly, and the imports $37,319,254. For the ten years 1890–1899 the corresponding averages were $95,956,618 and $15,924,594. Bank clearings increased in the ten customs years preceding 1906–1907 from $447,673,946 to $1,027,798,476 (bank clearings were $956,154,504 and $786,067,353 respectively for the calendar years 1907 and 1908). There has been an extraordinary increase of exports since 1900, and imports from Central America have similarly increased. Cotton represents roughly two-thirds of the value of all exports. As a cotton port New Orleans in 1908 was second only to Galveston, which had only recently surpassed it; and more than half of the raw cotton exports of the country passed through these two ports. The Board of Trade has maintained a cotton-inspection department since 1884, and its statistics are standard on the cotton crop. Cotton exports in the four seasons 1903–1904 to 1906–1907 averaged 1,001,199,468 ℔, valued at $104,108,824. Wheat and flour, Indian corn, lumber and tobacco are especially noteworthy articles of the export, and bananas and coffee of the import, trade. Importations of coffee have more than quintupled since 1900; the coffee comes for the most part from Brazil and grain wholly from American fields. The imports of bananas, for which New Orleans is the leading port of the country, more than doubled in the same period, and increased more than eight-fold in the twenty-five years following 1882 (1,200,000 to 10,200,000 bunches).

Railway traffic has grown immensely, and port facilities have been vastly improved in recent years. A belt railway owned by the city (built 1905–1907) connects all railway terminals, public wharves and many manufactories and warehouses. Public ownership protects the city's interest in the harbour front, while at the same time all railways are equally and cheaply served; and new railways, which could not enter the city or have access to the water front because of the impossibility of securing individual trackage, can now enter on the municipal belt. Of privately owned railway terminals in 1908 those of the Illinois Central system had nearly 200 m. of track; the Stuyvesant Docks of the railway have 15 m. of track, a wharf almost 1 m. long, immense warehouses and grain elevators. The New Orleans Terminal Company constructed at Chalmette

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[1] The South-west Pass, originally the usual entrance, could not be entered by vessels drawing more than 16 ft.; the Eads jetties, aided by dredging, provided through the South Pass (500 ft. broad) a channel 180 ft. wide and 25 to 28 ft. deep. South-west Pass has always been the primary outlet of the river, venting half or more of its volume. Active work on its improvement was begun in 1903 and practically completed in 1909. Including the jetties, this Pass is nearly 20 m. long and has an average width of about 2150 ft.; the deep channel through it is more than 1000 ft. wide. The jetties, 4 m. long on one side and 3 m. on the other, are 6000 ft. apart at their head and 3600 ft. at the sea line. They are built on willow mats (foundation mats 200×150×2 ft.) in wooden frames, sunk with stone and surmounted above the water by a concrete wall.

[2] The value of the river commerce was about $8,000,000 in 1816 and $82,000,000 in 1849. The first steamboat descended the Mississippi to New Orleans (from Pittsburg) in 1811, and the first steamboat trip up the river was made in 1817. The halcyon period of river steamer traffic was from 1840 to 1860. The luxury of the passenger boats then on the Mississippi and the immense volume of the freighting traffic are things of the past since the advent of the railway era. The best time ever made (1870) from New Orleans to St Louis (1278 m.) was 3 days, 21 hours and 25 minutes. The races of these river boats were prominent news items in the papers of America and even in those of Europe, and they have been recorded in more than one page of literature. Steam packets replaced sailing vessels in the ocean trade about 1845.

(1908) splendid terminals, including an immense slip in the river (1590×300 ft., excavated to give 30 ft. of water below zero gauge) capable of accommodating nine vessels at dock simultaneously, and arranged with remarkable conveniences for the loading of grain. Steel-concrete warehouses and elevators surround the slip. The greater industrial establishments of the city cluster about the terminals. New Orleans is served by eleven railways, including the Illinois Central, Southern Pacific, Texas & Pacific and Louisville & Nashville systems. The New Orleans & North-eastern crosses Lake Pontchartrain over a trestle bridge 7 m. long (originally 25 m. before end filling).

Within the city are two canals, now of little importance, because too shallow except for local trade: the Carondelet or Old Basin canal, built in 1798, is 2·5 m. long, 55–65 ft. wide and 7 ft. deep, and goes via Bayou St John to Lake Pontchartrain; and the New Basin Canal, built in 1837 by the New Orleans Canal & Banking Company, and state property since 1866, is 6·7 m. long, 100 ft. wide and 8 ft. deep, and also connects with Lake Pontchartrain. Neither of these canals connects with the Mississippi river as do the following privately owned canals: the Lake Borgne Canal, from a point 10 m. below the city to Lake Borgne, 7 m. long, 80 ft. wide, 7 ft. deep, shortening the water distance between Mobile and New Orleans by 60 m.; and the Barataria & Lafourche Company Canal (7 m. long, 45 ft. wide and 6 ft. deep) and Harvey's Canal (5·35 m. long, 70 ft. wide and 6 ft. deep), both connecting with the Bayou Teche region.

Manufactures.—Manufacturing has greatly developed since 1890. The value of products increased 146·7% from 1880 to 1890, and in the following decade the increase of wages paid, cost of materials used and value of product were respectively 7·6, 53·3 and 31·5%. In 1905 the value of the factory product was $84,604,006, 45·4% of the value of the total factory product of the state, and an increase of 47·3% since 1900; during this same period capital increased 36·6%, the average number of wage-earners 8·9%, the amount of wages 20·5% and the cost of materials used 53·3%. The sugar and molasses industry is the most important, with a product value of $34,908,614 in 1905; New Orleans ranked second to Philadelphia among the cities of the country in the value of this product, that of New Orleans being 12·6% of the total value of the country's product. At New Orleans is a sugar refinery said to be the largest in the world. Of the manufactures from products of the state the most noteworthy are rice (value of product cleaned and polished in 1905, $4,881,954), bags other than paper ($4,076,226), cotton-seed oil and cake ($3,698,509), malt liquors ($2,170,714), tobacco ($1,408,883), lumber and timber products ($1,644,329) and planing mill products ($1,105,497) and cotton goods ($1,081,951). Other important manufactures are foundry and machine-shop products ($2,085,327), men's clothing ($1,979,308), coffee and spice roasted and ground ($1,638,263) and steam railway cars constructed and repaired ($1,627,435). New Orleans is the chief centre of the country for the manufacture of cotton-seed products and for rice milling. Oyster canning is a recent and rapidly growing industry. There are also furniture establishments, paper mills and cotton cloth mills.

Government.—Municipal government is organized under a charter framed by the state legislature in 1896, and amended by acts of 1898 and 1900. The seven municipal districts correspond to seven independent faubourgs successively annexed. A mayor and various other executive officers and a legislative unicameral council are elected for four years. The mayor and the heads of departments consult as a "cabinet." Various boards—of civil service, public debt, education, health, police, fire, drainage, water and sewerage and state commissioners of the port—control many of the most important interests of the city. The mayor, through his office and his appointive powers, exercises great influence in a number of these. In 1896 New Orleans followed the example of New York and Chicago in subjecting its civil service to a competitive merit system and to rules of a civil service board. The police board is non-partisan. The board of education is composed of seventeen members, each elected by one of the seventeen wards of the city. In addition to the city board of health, a state board acts with municipal authority, and (since April 1907) the United States government maintains the maritime quarantine of the Mississippi. The commissioners of the port are officials of the state. Owing to the complete dominance of the Democratic party, all reform movements in politics must come from within that organization. Reform organizations have been intermittently powerful since 1888, and among their achievements for good were the beginning of the great drainage and sewerage improvements and the adoption of the charter of 1896. The present government of the city compares very favourably with systems tried in the past.[1] In 1909 the total assessed valuation of property was $221,373,362, of which $154,604,325 was realty and the remainder personalty. The bonded debt on the 30th of June 1909 was $32,521,040 and the floating debt at the end of 1908 was $1,264,030.

From 1890 to 1900 the expenditures for permanent works (including sewerage, lighting, paving, levees, improvements in connexion with street and steam railways, docks, &c.) aggregated $30,000,000. Almost all the public services, nevertheless, were in 1909 in private hands. Electric traction was introduced in 1891–1895, and the street railways were consolidated in 1902 under one management. In 1869 the city bought, and nine years later sold again, the waterworks; municipal ownership and control, under a sewerage and water board, was again undertaken in 1900. In 1900 arrangements were made to transfer the extensive markets from private lessees to direct municipal control, and in May 1901 the wharves of the city passed from private to municipal control.[2] The municipal belt railway was constructed in 1905–1907.

Until 1900 there were no sewers, open gutters serving their purpose. It is remarkable that the city twice granted franchises to private parties for the construction of a sewerage system, but without result. The low and extremely level character of the city site, of which nearly one-third is at or below the level of the Gulf, the recurrence of back-water floods from Lake Pontchartrain and the tremendous rains of the region have made the engineering problems involved very difficult. In 1896 a Drainage Commission (merged in 1900 in a Sewerage and Water Board) devised a plan involving the sale of street railway franchises to pay for the installation of drainage canals and pumps, and in 1899 the people voted a 2-mill tax over 42 years assuring a bond issue of $12,000,000 to pay for sewerage, drainage and water works to be owned by the municipality and to be controlled by a Sewerage and Water Board. Work was begun on the sewerage system in 1903 and on the water works in 1905. In 1906 the legislature authorized the issue of municipal bonds for $8,000,000 to be expended on this work. Up to 1909 the drainage system had cost about $6,000,000 and the sewerage system about $5,000,000; and 310 m. of sewers and nine sewerage pumping stations discharged sewage into the Mississippi below the centre of the city. Garbage is used to fill in swamps and abandoned canals. The new water-supply is secured from the river and is filtered by mechanical precipitation and other means. By 1909 about 500 m. of water-mains had been laid, $7,000,000 had been expended for the water-system, and filtering plants had been established with a capacity of 50,000,000 gallons a day. In August 1905 a city ordinance required the screening of aerial cisterns, formerly characteristic of the city, which were breeding-places of the yellow fever *Stegomyia*, and soon afterwards the state legislature authorized the Sewerage and Water Board to require the removal of all such cisterns. About two-thirds of the street surface in 1899 was still unpaved; the first improvements in paving began in 1890.

As regards hygienic conditions much too has been done in recent years. New Orleans was long notorious for unhealthiness. Yellow fever first appeared in 1769, and there were about thirty epidemics from 1769 to 1878. Though the first board of health and first quarantine system date back to 1821, from 1787 to 1853 the average death-rate was 59·63 per 1000; never did it fall below 25·00, which was the rate in 1827. In 1832, a cholera year, it rose to 148; in 1853–1854–1855, the great yellow-fever years, complicated in 1854–1855 by cholera, it was 102, 72 and 73. During these three years there were more than 25,000 deaths. The millesimal mortality in 1851–1855 and succeeding quinquennial periods to 1880 was as follows: 70, 45, 40, 39, 34·5 and 33·5. The rate reported by the national census of 1900 was 28·9, the highest of any of the large cities of the United States.[1] This high death-rate is often attributed in great part to the large negro population, among whom the mortality in 1900 was 42·1 per 1000; but the negro population largely comprises that labouring element whose faulty provision for health and sickness in every large city swells the death-rate. A light yellow-fever epidemic occurred in 1897–1898–1899, after nineteen years of immunity, and a more serious one in 1905, when the United States Marine Hospital Service for a time took control of the city's sanitation and attempted to exterminate the *Stegomyia* mosquito. The city Board of Health has done much to secure pure food for the people, and has exercised efficient oversight of communicable diseases, including yellow fever. In movements for the betterment of the city—in commerce, sanitation, public works and general enterprise—a leading part has been taken by an organization of citizens known as the New Orleans Progressive Union, whose charter and by-laws prohibit its participation in political and religious issues.

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[1] The charter of 1805 organized the old *cité* (the *Vieux Carré*) and the faubourgs as distinct municipalities with almost wholly separate governments: they issued paper money independently, for example. The charter of 1836 was also an extreme statement of local self-government; the municipalities were practically independent, although there was a common mayor and a general council of the entire city meeting once annually. This organization was in large part due to the hostility of the creoles to the Americans. The charter of 1852 formed a consolidated city. That of 1856 added to and amended its predecessor. That of 1870 was very notable as an attempt to secure a business-like and simplified administration. A mayor and seven "administrators," elected on a general ticket and constituting individually the different administrative departments, formed collectively a council with legislative powers. All sessions of the council were public, and liberties of suggestion were freely accorded to the citizens. Tried in better times, and as a movement for reform sprung from the people and not due primarily to an external impulse, this system might have been permanent and might have exercised great influence on other cities. The early 'seventies were marked by a great widening of the city's corporate limits. In 1882 another charter went back to the ordinary American plan of elective district councillors chosen for the legislative branch, and executive officers chosen on a general ticket. The latter held seats in the council and could debate but not vote. This is the present system.

[2] They were leased to a private company in 1891–1901, but the lease was unprofitable and was disadvantageous to trade. From 1901 to 1908 wharfage and harbour dues were reduced 25 to 85%.

History.—New Orleans was founded in 1718 by Jean Baptiste Lemoyne, Sieur de Bienville, and was named in honour of the then Regent of France.[2] The priest-chronicler Charlevoix described it in 1721 as a place of a hundred wretched hovels in a malarious wet thicket of willows and dwarf palmettos, infested by serpents and alligators; he seems to have been the first, however, to predict for it an imperial future. In 1722 New Orleans was made the capital of the vast province of Louisiana (*q.v.*). Much of the population in early days was of the wildest and, in part, of the most undesirable character—deported galley-slaves, trappers, gold-hunters and city scourings; and the governors' letters are full of complaints regarding the riff-raff sent as soldiers as late as Kerlerec's administration (1753–1763). In 1788 a fire destroyed a large part of the city. In 1795–1796 the sugar industry was first put upon a firm basis. The last twenty years of the 18th century were especially characterized by the growth of commerce on the Mississippi, and the development of those international interests, commercial and political, of which New Orleans was the centre. The year 1803 is memorable for the actual transfer (at New Orleans) of Louisiana to France, and the establishment of American dominion. At this time the city had about 10,000 inhabitants, mostly French creoles and their slaves. The next dozen years were marked by the beginnings of self-government in city and state; by the excitement attending the Aaron Burr conspiracy (in the course of which, in 1806–1807, General James Wilkinson practically put New Orleans under martial law); by the immigration from Cuba of French planters; and by the American War of 1812.

In 1815 New Orleans was attacked by a conjunct expedition of British naval and military forces from Halifax, N.S., and other points. The American government managed to obtain early information of the enterprise and prepared to meet it with forces (regular and militia) under Maj.-Gen. Andrew Jackson. The British advance was made by way of Lake Borgne, and the troops landed at a fisherman's village on the 23rd of December 1814, Major-General Sir E. Pakenham taking command there on the 25th. An immediate advance on the still insufficiently prepared defences of the Americans might have led to the capture of the city, but this was not attempted, and both sides remained inactive for some time awaiting reinforcements. At last in the early morning of the 8th of January 1815 (after the Treaty of Ghent had been signed) a direct attack was made on the now strongly entrenched line of the defenders at Chalmette, near the Mississippi river. It failed disastrously with a loss of 2000 out of 9000 British troops engaged, among the dead being Pakenham and Major-General Gibbs. The expedition was soon afterwards abandoned and the troops embarked for England.

From this time to the outbreak of the American Civil War the city annals are almost wholly commercial. Hopeful activity and great development characterized especially the decade 1830–1840. The introduction of gas (about 1830); the building of the New Orleans and Pontchartrain railway (1820–1830), one of the earliest in the United States; the introduction of the first steam cotton press (1832), and the beginning of the public school system (1840) marked these years; foreign exports more than doubled in the period 1831–1833. Travellers in this decade have left pictures of the animation of the river trade—more congested in those days of river boats and steamers and ocean-sailing craft than to-day; of the institution of slavery, the quadroon balls, the medley of Latin tongues, the disorder and carousals of the river-men and adventurers that filled the city. Altogether there was much of the wildness of a frontier town, and a seemingly boundless promise of prosperity. The crisis of 1837, indeed, was severely felt, but did not greatly retard the city's advancement, which continued unchecked until the Civil War. In 1849 Baton Rouge replaced New Orleans as the capital of the state. In 1850 telegraphic communication was established with St Louis and New York; in 1851 the New Orleans & Jackson railway, the first railway outlet northward, now part of the Illinois Central, and in 1854 the western outlet, now the Southern Pacific, were begun.

The political and commercial importance of New Orleans, as well as its strategic position, marked it out as the objective of a Union expedition soon after the opening of the Civil War. Captain D. G. Farragut (*q.v.*) was selected by the Union government for the command of the Western Gulf squadron in January 1862. The four heavy ships of the squadron (none of them armoured) were with many difficulties brought up to the head of the passes, and around them assembled nineteen smaller vessels (mostly gunboats) and a flotilla of twenty mortar-boats under Commander D. D. Porter (*q.v.*). The main defences of the Mississippi consisted of the two permanent forts Jackson and St Philip. These were of masonry and brick construction, armed with heavy rifled guns as well as smooth-bores, and placed on either bank so as to command long reaches of the river and the surrounding flats. In addition, the Confederates had some improvised ironclads and gunboats, large and small. On the 16th of April, after elaborate reconnaissances, the Union fleet steamed up into position below the forts, and on the 18th the mortar-boats opened fire. Their shells fell with great accuracy, and although one of the boats was sunk and two disabled, fort Jackson was seriously damaged. But the defences were by no means crippled even after a second bombardment on the 19th, and a formidable obstacle to the advance of the Union main fleet was a boom between the forts designed to detain the ships under close fire should they attempt to run past. At that time the eternal duel of ship *versus* fort seemed to have been settled in favour of the latter, and it was well for the Union government that it had placed its ablest and most resolute officer at the head of the squadron. Gunboats were repeatedly sent up at night to endeavour to destroy the boom, and the bombardment went on, disabling only a few guns but keeping the gunners of fort Jackson under cover. At last the gunboats "Pinola" and "Itasca" ran in and broke a gap in the boom, and at 2 A.M. on the 24th the fleet weighed, Farragut in the corvette "Hartford" leading. After a severe conflict at close quarters, with the forts and with the ironclads and fire rafts of the defence, almost all the Union fleet (except the mortar-boats) forced its way past. At noon on the 25th Farragut anchored in front of New Orleans; forts Jackson and St Philip, isolated and continuously bombarded by the mortar-boats, surrendered on the 28th; and soon afterwards the military portion of the expedition occupied the city. The commander, General B. F. Butler, subjected New Orleans to a rigorous martial law so tactlessly administered as greatly to intensify the hostility of South and North, but his administration was in many respects beneficial to the city, which was kept both orderly and healthy. Towards the end of the war General N.P. Banks held the command at New Orleans.

Throughout the years of the Civil War and the Reconstruction period the history of the city is inseparable from that of the state. All the constitutional conventions were held here, the seat of government again was here (in 1864–1882) and New Orleans was the centre of dispute and organization in the struggle between the races for the control of government. Notable events of that struggle in city history were: the street riot of the 30th of July 1866, at the time of the meeting of the radical constitutional convention; and the "revolution" of the 14th of September 1874, when the White League worsted the Republican metropolitan police in pitched battle and forced the temporary flight of the Kellogg government. The latter was reinstated in power by the United States troops, and by the same power the Democrats were frustrated in January 1875, after they had wrested from the Republicans the organization of the state legislature. Nevertheless, the "revolution" of 1874 is generally regarded as the independence day of Reconstruction, although not until President Hayes withdrew the troops in 1877 and the Packard government fell did the Democrats actually hold control of the state and city. The financial condition of the city when the whites gained control was very bad. The tax-rate had risen in 1873 to 3%. The city defaulted in 1874 on the interest of its bonded debt, later refunding this ($22,000,000 in 1875) at a lower rate, so as to decrease the annual charge from $1,416,000 to $307,500. Among events in the decade 1880–1890 were the World's Industrial and Cotton Centennial Exposition of 1884–1885 (celebrating the centennial of the cotton industry of the country), and the introduction of electric lighting (1886); in the decade 1890–1900 the introduction of electric transit, the latest charter and the improvements in public works already detailed. The lynching of Italian subjects by a mob in 1891[1] caused serious international complications.

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[1] But the death-rate of New Orleans was not so high as that of some smaller Southern cities, Richmond (29·7), Savannah (34·3) or Charleston (37·5), for example. According to *Mortality Statistics, 1905* (Washington, 1907), the death-rate in New Orleans in 1905 was 23·7, and the annual average between 1900 and 1904 was 23·1.

[2] Two of the lakes in the vicinity commemorate respectively Louis Phelypeaux, Count Pontchartrain, minister and chancellor of France, and Jean Frederic Phelypeaux, Count Maurepas, minister and secretary of state; a third is really a landlocked inlet of the sea, and its name (Lake Borgne) has reference to its "incomplete" or "defective" character.

Among the many floods from which the city has suffered those of 1849 and 1882 were the most destructive.

Bibliography.—For description see the *Historical Sketch Book and Guide to New Orleans . . . compiled by several leading writers of the New Orleans Press* (New York, 1885); B. M. Norman, *New Orleans and Environs* (New Orleans, 1845); Grace King, *New Orleans, the Place and the People* (New York, 1895); and the novels and magazine writings of G. W. Cable. The *Picayune* publishes a guide, frequently revised. For administration, *Manual of the City of New Orleans* (periodical); W. W. Howe, "Municipal History of New Orleans," in Johns Hopkins University *Studies*, series vii., No. 4 (Baltimore, 1889); for accounts of the worst of the yellow-fever epidemics, W. L. Robison's *Diary of a Samaritan, by a member of the Howard Association of New Orleans* (New York, 1860); *Report of the Sanitary Commission of New Orleans on the Epidemic Yellow Fever of 1853* (New Orleans, 1854); and for much miscellaneous information, 10th Census of the United States (1880), *Social Statistics of Cities. History and Present Condition of New Orleans . . . by G. E. Waring and G. W. Cable* (Washington, 1881).

NEW PHILADELPHIA, a city and the county-seat of Tuscarawas county, Ohio, U.S.A., on the Tuscarawas River and near the Ohio canal, about 75 m. S. by E. of Cleveland. Pop. (1890) 4456; (1900) 6213 (554 foreign-born); (1910) 8542. It is served by the Baltimore & Ohio (the Cleveland, Lorain & Wheeling Division), and the Pennsylvania (Cleveland & Pittsburgh Division) railways, and by an inter-urban electric system. The city has a level site in the midst of a good agricultural country, which abounds in coal and fire-clay. In the public square is a soldiers' monument, and the city has a public library and a park. Its principal manufactures are steel, enamelled ware, clay goods, brooms, flour and carriages. The first settlement in the vicinity was made in May 1772, when Moravian Indian converts migrated from Pennsylvania (Friedenshütten, Bradford county, and Friedenstadt, Lawrence county) to Schoenbrunn, called by the Indians Welhik-Tuppeek, a spring (now dry) a little south of the present New Philadelphia. Under David Zeisberger (1721–1808) and Johann Gottlieb Ernestus Heckewelder (1743–1823) other missionary villages were planted at Gnadenhütten (October 1772), Lichtenau (1776) and Salem (1780), all in the present county of Tuscarawas. After the massacre of Christian Indians at Gnadenhütten in 1782 the Indians removed to Michigan and in 1791 to Fairfield, Ontario; in 1798 some of them returned to Tuscarawas county and settled Goshen, where Zeisberger is buried. New Philadelphia was laid out in 1804 and was named by its founder, John Knisely, after Philadelphia in Pennsylvania; it was incorporated as a village in 1815, and was first chartered as a city in 1896.

See *Ohio Archaeological and Historical Quarterly* for April 1909 (Columbus, Ohio) for several articles on the early settlement by Moravian Indians.

NEW PLYMOUTH, a municipality and seaport on the west coast of North Island, New Zealand, capital of the provincial district of Taranaki, 258 m. N.N.W. of Wellington by rail. Pop. (1906) 5141. The town slopes to the ocean, with a background of forest surmounted by the snow-clad volcanic cone of Mount Egmont (8270 ft.). The district is not unjustly termed "the garden of New Zealand." It is highly fertile, cereals and fruits growing well; and dairy products are extensively exported. In the town are leather-works, timber-works and flour-mills, with freezing-works for export dairy produce. The settlement was founded in 1841 by the Plymouth Company under the auspices of the New Zealand Company, and chiefly consisted of emigrants from Devonshire and Cornwall. On the seashore in the neighbourhood are extensive deposits of ironsand.

NEW POMERANIA (Ger. *Neu-Pommern*, formerly *New Britain*, native *Birara*), an island of the Bismarck Archipelago, N.E. of New Guinea in the Pacific Ocean, about 6° S., 150° E., in the administration of German New Guinea. It is crescent-shaped, about 330 m. long, and, except where the Willaumez Peninsula projects northward, nowhere more than 60 m. wide. The north-eastern extremity consists of the broad, irregular Gazelle Peninsula, joined to the main mass by a narrow neck. The total area is about 9500 sq. m. The island is in great part unexplored. The coasts are in some parts precipitous; in others the mountains recede inland, and the coast is flat and bordered by coral reefs. The formation appears otherwise to be volcanic, and there are some active craters. The greatest elevation occurs towards the west—about 6500 ft. There is a rich tropical vegetation, and a number of considerable streams water the island. The chief centre is Herbertshöhe at the north of the Gazelle Peninsula; it is the seat of the governor of German New Guinea (see New Guinea).

The natives are Melanesians, resembling their Papuan kinsmen of eastern New Guinea, and are a powerful well-formed race. Their villages are clean and well kept. Unlike their Papuan relatives, the islanders are unskilled in carving and pottery, but are clever farmers and fishermen, constructing ingenious fishing weirs. They have a fixed monetary system consisting of strings of cowries. They perform complicated surgical operations with an obsidian knife or a shark's tooth. The common dead are buried or exposed to sharks on the reefs; bodies of chiefs are exposed in the fork of a tree. Justice is executed, and taboos, feasts, taxes, &c., arranged by a mysterious disguised figure, the *duk-duk*. The population is divided into two exogamous classes. The children belong to the class of the mother, and when the father dies go to her village for support, the land and fruit trees in each district being divided between the two classes. There are several dialects, the construction resembling Fijian, as in the pronominal suffixes in singular, triad and plural; the numerals, however, are Polynesian in character.

NEWPORT, a market town and municipal borough, the chief town of the Isle of Wight, England. Pop. (1901) 10,911. It is situated near the centre of the island, at the head of the navigation of the Medina River, 5 m. S. from its mouth at Cowes. It is the chief centre of the railway system of the island. The church of St Thomas of Canterbury, rebuilt in 1854 in the Decorated style, contains many interesting old monuments, and one by Marochetti to the princess Elizabeth, daughter of Charles I., erected by Queen Victoria. The guildhall, erected in 1816 from the designs of Nash, includes the town-hall in the upper story with the market-place below. There are a corn exchange and museum. The grammar school (the scene of negotiations between Charles I. and the parliament) was founded in 1612, and there is a blue-coat school for girls founded in 1761. The Albany barracks and Parkhurst prison lie north of the town. A considerable trade is carried on in timber, malt, wheat and flour. The town is governed by a mayor, 6 aldermen and 18 councillors. Area 504 acres.

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[1] In October 1890 the chief of police was assassinated, and before he died charged the crime to Italians. He had been active in proceedings against certain Italians accused of crime, and his death was popularly attributed to the Mafia. Nineteen Sicilians were indicted, and of nine put on trial six were acquitted and three escaped conviction on the ground of a mis-trial. On the 14th of March 1891 a mob broke into the jail and lynched eleven of the accused. The Italian government demanded that the lynchers should be punished, entered claims for indemnity in the case of the three Sicilians who had been Italian subjects, and, failing to secure as prompt an answer as it desired, withdrew its ambassador from Washington. In 1892 the United States paid an indemnity of $25,000 to Italy.

It is supposed that Newport (*Neuport*) was a Roman settlement, then known as *Medina*. There are no traces of Saxon occupation, and no evidence that Newport became a borough before the reign of Henry II., though it was probably used before that time as a port of entrance for the ancient capital of Carisbrooke. The first charter was granted by Richard de Redvers between 1177 and 1184, freeing the burgesses from tolls throughout the island, from hundred suits, and from being impleaded without the walls, and giving them permission to choose their own reeve—privileges for which they paid 18 marks yearly. These grants, repeated and extended by the countess Isabel de Fortibus, were confirmed in 1349 by Edward III. and afterwards by successive kings, Henry VII. in 1489 granting in addition the petty customs within all ports and creeks of the island. The borough was incorporated by James I. in 1607, and a second charter of incorporation granted by Charles I. in 1637 is that by which Newport was governed until 1835. It was represented in parliament in 1295, but no return was made from that time until 1584, from which date it regularly sent two members. In 1867 the number was reduced to one, and in 1885 its representation was merged in that of the island. A fair was formerly held on Whit-Monday and the two following days, and on the three Saturdays nearest Whitsuntide, known as "Bargain Saturdays," there was a hiring fair for servants. There is now no fair. The Saturday market dates from 1184, and there is a Wednesday cattle market. Owing to its facilities for trade, Newport early superseded Carisbrooke as the capital of the island. Its prosperity in medieval times depended upon its harbour dues and its oyster beds in the river Medina.

NEWPORT, a municipal and county borough, contributory parliamentary borough, seaport and market town in the Monmouth parliamentary division of boroughs, Monmouthshire, England, on the Usk, 5 m. from its confluence with the Severn, and 133½ m. W. of London by the Great Western railway. Pop. (1891) 54,707; (1901) 67,270. It lies chiefly on the right (west) bank of the river, and on the E., N. and W. it is sheltered by a line of lofty hills. The old parish church of St Woollos stands finely on Stow Hill. Originally it consisted only of the present nave, a fine specimen of grand though unadorned Norman architecture; but a massive square tower (of the time of Henry III.) and a chancel were subsequently added; a large western Early English lady-chapel is interposed between the nave and the tower. The old castle, built about 1130 by Robert, earl of Gloucester, was greatly altered in the late Perpendicular period. The remains include two towers and the river frontage. The old Dominican monastery is entirely rebuilt and occupied as a private residence; but there are a few fragments of a house of White Friars. The principal public buildings are the spacious Victoria Hall, the Albert Hall, the town-hall, county council offices, market-house, custom-house, and museum and art gallery. Newport owes a rapid increase in importance to its situation on a deep and spacious tidal river, which renders it a convenient outlet for the trade of a rich mineral district. It has extensive docks and wharves, to which large steamers have access at all tides. Three docks, the Alexandra, South and Old Docks, had together a water area of about 60 acres, besides the Alexandra graving dock and dry docks. But additional accommodation was found necessary. In 1905 the Alexandra Docks and Railway company let the contract for the extension of the docks by 50 acres of water area, and the scheme was enlarged later so as to afford an additional area of 86 acres in all. The new works, added to the old Alexandra Dock, give a total deep-water area of over 130 acres. The first part to be completed (48 acres) was filled in the autumn of 1907. The river is crossed by a transporter bridge, opened in 1906, and having a span of 645 ft. and a clear headway from high water of 177 ft., with a travelling truck worked by electricity. Iron ore, pig iron, timber and grain are among the chief imports, while coal and iron goods are exported. Besides the Great Western railway, Newport is served by the London and North-Western, the Rhymney, and the Brecon & Merthyr systems. The town possesses large iron foundries and engineering works, and among other industries are the manufacture of wagons and wheels, nails, bolts and wire, shipbuilding and the making of railway plant, chemical manures and agricultural implements. There are also large breweries, glass and pottery works, and an extensive cattle market. Newport gives name to a Roman Catholic bishopric, but the cathedral church is at Belmont near Hereford. With Monmouth and Usk, Newport returns one member to parliament. In 1889 Maindee, a populous suburb on the left bank of the Usk, was incorporated with Newport, and constitutes one of its five wards. The town is governed by a mayor, 10 aldermen and 30 councillors. Area 4431 acres.

Newport, an ancient mesne borough and castle, occupied an important position on the Welsh marches. The town, which is not mentioned in Domesday, grew up round the castle built early in the 12th century. Giraldus Cambrensis, writing in 1187, calls it *Novus Burgus*, probably to distinguish it from Caerleon, whose prosperity declined as that of Newport increased. The first lord was Robert Fitz Hamon, who died in 1107, and from him the lordship passed to the earls of Gloucester and Stafford and the dukes of Buckingham. Hugh le Despenser, who held the lordship for a short time, obtained in 1323 a charter of liberties for the burgesses, granting them freedom from toll throughout England, Ireland and Aquitaine. The earl of Stafford granted a further charter in 1385, confirmed by his grandson in 1427, which gave the burgesses the right of self-government and of a merchant gild. On the attainder of the duke of Buckingham in 1483 the lordship lapsed to the crown, of whom it was held in the 16th and 17th centuries by the Pembrokes, and in the 19th by the Beauforts. The town was incorporated by charter of James I. in 1624 under the title of "Mayor and Bailiffs." This charter was confirmed by Charles II. in 1685 and holds force at the present day. By the act of 1535–1536 Newport is entitled as an ancient borough to take part in the election of a member for Monmouth town. The commercial importance of the town dates only from the second half of the 19th century, the Old Dock being partially formed in 1842, while the Alexandra was opened in 1875. In 1801 the population of the town was only 1135. In 1385 the borough obtained a market lasting fifteen days from the vigil of St Lawrence (August 10). The charter of 1624 granted two fairs, one on the feast of the Ascension, and a second (still held) on St Leonard's day (November 6). Newport was the scene of a serious Chartist riot in 1839.

NEWPORT, a market town in the Newport parliamentary division of Shropshire, England, 145 m. N.W. from London on the Stafford-Shrewsbury joint line of the London & North-Western and Great Western railways, and on the Shrewsbury canal. Pop. of urban district (1901) 3241. The church of St Nicholas is Early English and Perpendicular. There is an ancient market cross, greatly decayed. Newport possesses a literary institute, and a free grammar school founded in 1665. Four miles S. are the beautiful ruins of Lilleshall abbey, including a fine Norman west door and part of the front, considerable remains of the church besides, and traces of domestic buildings. The abbey was founded in 1145, under charter from King Stephen, by Richard de Baumes or Belmeis, dean of St Alkmund, Shrewsbury, for Augustinian canons, who were brought from Dorchester Abbey, Oxfordshire. Ironstone, coal and limestone are worked in the parish.

Newport is not mentioned in the Domesday Survey, but at the time of the Conquest formed part of the manor of Edgmond, which William I. gave with the rest of the county of Shropshire to Roger, earl of Shrewsbury. Henry I. is supposed to have founded the borough, at first called New Borough, after the manor had come into his hands through the forfeiture of Robert de Belesme. The site was probably chosen partly on account of the fisheries, which are mentioned in the Domesday Survey, one of the chief services of the burgesses being that of taking fish to the king's court wherever it might be. This custom was continued after Henry III. had granted the borough with the manor of Edgmond, to Henry de Audley, but in the middle of the 13th century James, son of Henry de Audley, granted that the burgesses need not take the fish anywhere except within the county of Shropshire. The burgesses must have received certain privileges from Henry I., since Henry II. in an undated charter granted them all the liberties, rights and customs which they had in the time of Henry I. This probably included a gild merchant which is mentioned in the *Quo Warranto* Rolls as one of the privileges claimed by the burgesses. Confirmation charters were granted by Edward I. in 1287 and Edward II. in 1311, while the town was incorporated in 1551 by Edward VI. whose charter was confirmed by James I. in 1604. The governing body consisted of a high steward, deputy steward, two water-bailiffs and 28 burgesses, but the corporation was abolished by the Municipal Corporation Act of 1883, and a Local Board was formed, which, under the Local Government Act, gave place in 1894 to an urban district council.

See Edward Jones, *Historical Records of Newport, co. Salop*; *Shropshire Archaeol. and Natural History Society*, vols. viii. and ix. (1885–1886); *Victoria County History, Shropshire.*

NEWPORT, a city of Campbell county, Kentucky, U.S.A., on the Ohio River opposite Cincinnati, Ohio, and at the mouth of the Licking River opposite Covington, Ky. Pop. (1900) 28,301, of whom 4081 were foreign-born and 424 were negroes; (1910 census) 30,309. It is served by the Louisville & Nashville, and the Chesapeake & Ohio railways, and by electric lines to Covington, Cincinnati, Bellevue, Fort Thomas and Dayton. With Cincinnati and Covington it is connected by bridges. In the highlands, about 3 m. back of the city, is Fort Thomas, a United States military post, established in 1888 to supersede Newport Barracks (1804), in the city, which were abandoned in 1894. Newport is essentially a residential suburb of Cincinnati, but it is also industrially important. In 1905 the value of the factory product was $5,231,084, Newport ranking third among the manufacturing centres of the state. Newport was settled late in the 18th century, was laid out in 1791, was incorporated as a town in 1795, and was chartered as a city in 1834.

NEWPORT, a city, a port of entry and the county-seat of Newport county, Rhode Island, U.S.A., occupying the southern portion of the island of Rhode Island at the entrance to Narragansett Bay, about 30 m. S. by E. of Providence, about 71 m. S. by W. of Boston and about 165 m. E.N.E. of New York. Pop. (1905 state census) 25,039, of whom 6111 were foreign-born, 2590 being born in Ireland; (1910 U.S. census) 27,149. It is served by the Newport & Wickford Railroad and Steamboat Line, which connects with the New York, New Haven & Hartford railway at Wickford Junction; by ferry to Bristol, and by steamboats to Providence, Fall River and New York.

The broken water-front of the island, about 17 m. long, is partly rocky and partly made up of sandy beaches. From the harbour on the south-west the land rises to a gently rolling plateau with maximum elevations of about 250 ft. The climate is notably mild and equable throughout the greater part of the year. In the newer parts of the city there are many magnificent estates of summer residents; and in the "Old Town," the greater part of which is close to the harbour, and extending up the hillside, are many 18th-century houses and Thames Street, its principal business thoroughfare, only 20 ft. wide. Near the northern end of Thames Street, Washington Square or the Parade, connects with Broadway, which extends northward and is the principal thoroughfare through a large residential district of the permanent inhabitants. From the Parade, also, Touro Street extends eastward to the upper end of Bellevue Avenue, the principal street, which extends southward to the ocean. There Bellevue Avenue connects with the southern end of the Cliff Walk, which for about 3 m. winds along the cliffs on the eastern coast of the island. North of the walk is the smooth, hard Easton's Beach, frequented for sea-bathing. South of the Cliff Walk is Bailey's Beach, a private bathing-beach; at its western end is the Spouting Rock, through an opening in which the water, during violent south-east gales, has been thrown to a height of about 50 ft. Ocean Drive, about 9 m. long, encircles the south-western peninsula. Beyond Easton's Beach, in the town of Middletown, is Sachuest, or Second, Beach, with a heavier surf, and here is a fissure in the rocks, 150 ft. long and 50 ft. deep, and 8-14 ft. wide, known as Purgatory. North of Sachuest Beach are the picturesque Paradise Rocks and the Hanging Rocks.

At the head of the Parade stands the old State House (used when Newport was one of the capitals of Rhode Island); it was completed about 1743, was used as a hospital during the War of Independence, and is now the seat of the county court. In the vicinity are the City Hall and a monument to Oliver Hazard Perry. Fronting on Touro Street is a synagogue, erected in 1762–1763, and said to be the oldest in the United States; one of the early rabbis was Isaac Touro, a Jew of Dutch birth, whose name is borne by a street and a park in Newport. Near the corner of Touro Street and Bellevue Avenue is the Hebrew cemetery. Of chief historic interest along Bellevue Avenue are Touro Park and Redwood Library. In the park is the historic old Stone Mill or "Round Tower," which Longfellow, in accordance with the contention of certain members of the Society of Danish Antiquarians, ascribes, in his *Skeleton in Armour*, to the Norsemen, but which Benedict Arnold (1615–1678), governor of Rhode Island, repeatedly mentions in his will as "my Stone-built Wind-Mill." Opposite the park stands the William Ellery Channing Memorial Church; and in the park are monuments to Channing and to Matthew Calbraith Perry. The Channing House on Mary Street, built in 1751, is now used for a Children's Home. The Redwood Library grew out of the Philosophical Society, established in 1730, which Bishop (then Dean) Berkeley possibly helped to found during his residence here in 1729–1731; the Library was incorporated in 1747, being named in honour of Abraham Redwood (*c.* 1709–1788), a wealthy Friend who early contributed £500 toward supplying it with books; the building was completed in 1750. In Berkeley Avenue, north of Paradise Road, is Whitehall, which Berkeley built for his home in 1729 and which was restored in 1900. The first newspaper of Newport was published in 1732 by James Franklin, a brother of Benjamin Franklin, and in 1758 James Franklin's son, also named James, founded the present Newport *Mercury*.

Newport is best known as a fashionable resort during the summer and autumn; there are annual horse and dog shows, and fox-hunting is one of the amusements. The harbour is a rendezvous for racing- and pleasure-yachts. On Bellevue Avenue is the country club, the Casino. Among the great estates with magnificent "cottages" here are those of Mrs Cornelius Vanderbilt, Wm. B. Leeds, Mrs O. H. P. Belmont (the "Marble Palace," built for W. K. Vanderbilt), Mrs Ogden Goelet, Mrs Robert Goelet, Perry Belmont, and J. J. Astor—all on the Cliff Walk.

Newport has an inner and an outer harbour; the inner is landlocked, 1 m. long and ½ m. wide, but is not deep enough to admit vessels drawing more than 15 ft. of water; the outer admits the largest vessels and is a refuge for foreign and coastwise commerce. The whole harbour is protected at its entrance by Fort Adams, at the mouth of the inner harbour, Fort Wetherill on Conanicut Island, and Fort Greble on Dutch Island. The Lime Rock Lighthouse was for many years in charge of Mrs Ida Lewis Wilson (b. 1841), famous for the many lives she saved. On Goat Island, which partly encloses the inner harbour, is Fort Walcott, with a United States torpedo station and torpedo factory, and on Coasters Harbor Island, farther north, are a United States Naval Training Station and a War College. Along the western border of the outer harbour is Conanicut Island, on which is the town of Jamestown (pop. in 1905, 1337), with the Conanicut Yacht Club and other attractions for summer visitors. Newport has little foreign trade. There is, however, considerable coastwise trade in fish, coal and general merchandise, and in 1905 the total tonnage of the port amounted to 1,770,816 tons.

Fishing is an industry of some importance. The value of the city's factory products decreased from $1,575,192 in 1900 to $1,347,104 in 1905.

Newport is governed under a charter of 1906, which is unique as an instrument for the government of a city, and aims to restore in a measure the salient features of township government. Most of the powers usually vested in a town meeting are here vested in a representative council of 195 members—39 from each of 5 wards. A candidate for councilman must secure the signature of at least 30 electors in his ward before his name can be placed on the ballot. A mayor, one alderman from each ward, and a school committee are elected in much the same manner: a candidate for mayor must have his election paper signed by at least 250 qualified electors, and an alderman or member of the school committee by at least 100. All other important officers are appointed by the council. The mayor and aldermen are for the most part executive officials corresponding to the selectmen of a town.

Newport was founded by Nicholas Easton (1593–1675), William Coddington (1601–1678), John Coggeshall, John Clarke (1609–1676), William Brenton (d. 1674), William Dyer, Thomas Hazard, Henry Bull (1609–1693) and Jeremy Clerke (d. 1652), who, as Antinomians, were driven from Massachusetts Bay, and in 1638 settled at Pocasset (later Portsmouth, in the northern part of the island of Rhode Island; pop. in 1905, 2371). As radical tendencies prevailed in Pocasset they removed, and in 1639 settled Newport at the southern end of the island (called Aquidneck until 1644), which they had bought from the Indians. Most of the founders are commemorated by place-names in the city; in the Coddington Burying-Ground are the tombs of Governor William Coddington, Governor Henry Bull, and Governor Nicholas Easton; and in the Coggeshall Burying-Ground John Coggeshall was buried. At the beginning an independent government by judge and elders was established (Newport and Portsmouth being united in 1640), but in 1647 the town was united with Providence, Portsmouth and Warwick in the formation of Rhode Island according to the Williams (or, as it is commonly called, the Warwick) charter of 1644. During 1651–1654 Newport and Portsmouth were temporarily separated from the other two towns. About 1640 a Baptist Church was founded, which is probably the oldest in the United States except the Baptist congregation in Providence; here, too, at nearly the same time, one of the first free schools in America was opened. In 1656 English Friends settled here. Between 1739 and 1760 great fortunes were amassed by the "Triangular Trade," which consisted in the exchange in Africa of rum for slaves, the exchange in the Barbadoes of slaves for sugar and molasses, and the exchange in Newport of sugar and molasses for rum. The destruction here on the 17th of May 1769 of the British revenue sloop "Liberty," formerly the property of John Hancock, was one of the first acts of violence leading up to the War of American Independence. The foreign trade of Newport, which in 1770 was greater than that of New York, was destroyed by the War of Independence. During the war the town was in the possession of the British from December 1776 to the 25th of October 1779; a plan to recover it in 1778 by a land force under General John Sullivan, co-operating with the French fleet under Count d'Estaing, came to nothing. Soon after the evacuation of the British, French troops, under Comte de Rochambeau, arrived and remained until near the end of the war, and Newport was a station of the French fleet in 1780–1781. The Sayer house, which was the headquarters of Richard Prescott (1725–1788), the British general; the Vernon house, which was the headquarters of Rochambeau, and the Gibbs house, which was for a short time occupied by Major-General Nathanael Greene, are still standing.

Newport was chartered as a city in 1784, but in 1787 it surrendered its charter and returned to government by town meeting. It was rechartered as a city in 1853; the charter of this year was much amended in 1875 and in 1906 was superseded by another. Until 1900, when Providence became the sole capital, Newport was one of the seats of government of Rhode Island.

See Mrs J. K. Van Rensselaer, *Newport, Our Social Capital* (Philadelphia, 1905); Susan C. Woolsey, "Newport, the Isle of Peace," in L. P. Powell's *Historic Towns of New England* (New York, 1898); G. C. Mason, *Reminiscences of Newport* (Newport, 1884); W. A. Greene and others, *The Providence Plantations for Two Hundred and Fifty Years* (Providence, 1886); C. T. Brooks, *Controversy touching the Old Stone Mill* (Newport, 1851); R. M. Bayles (ed.), *History of Newport County* (New York, 1888); E. Peterson, *History of Rhode Island* (*i.e.* Aquidneck) (New York, 1853).

NEWPORT NEWS, a city and port of entry of Warwick county, Virginia, U.S.A., on the James River and Hampton Roads, 14 m. N. by W. of Norfolk and 75 m. S.E. of Richmond; it is situated on what is known as the Virginia Peninsula. Pop. (1890) 4449; (1900) 19,635, of whom 1614 were foreign-born and 6798 were negroes; (1910 census) 20,205. Newport News is served by the Chesapeake & Ohio railway, of which it is a terminus; by river boats to Richmond and Petersburg, Va.; by coastwise steamship lines to Washington, D.C., Baltimore, Philadelphia, New York, Boston and Providence; by foreign steamship lines to London, Glasgow, Liverpool, Dublin, Belfast, Rotterdam, Hamburg and other ports; and by electric lines to Old Point Comfort, Norfolk and Portsmouth. A public park extending from the James to the heart of the city, a deep, spacious and well-protected harbour, a large shipbuilding yard with three immense dry docks, and two large grain elevators of 2,000,000 bushels capacity, are among the most prominent features; at the shipbuilding yard various United States battleships, including the "Kearsarge," "Kentucky," "Illinois," "Missouri," "Louisiana," "Minnesota," "Virginia" and "West Virginia," were constructed, as well as cruisers, gun-boats, merchant vessels, ferry-boats and submarines. The city's export of grain and its coastwise trade in coal are especially large. Among the manufactures are shoes, tobacco, medicines and knit goods. The value of the factory products in 1905 was $9,053,906, being 52·5% more than in 1900. Both in 1900 and in 1905 Newport News ranked second to Richmond among the cities of the state in the value of factory products. The first settlement on the site of Newport News was made in 1621 by planters brought from Ireland by Daniel Gookin, the father of Daniel Gookin (1612–1687) of Massachusetts, who selected the site on the advice of Sir William Newce and his brother Captain Newce. The present city dates only from 1882, when it was laid out in consequence of the extension of the Chesapeake & Ohio railway to the coast here; it was incorporated in 1896. The name is said to be in honour of Christopher Newport and Sir William Newce.

NEWPORT PAGNELL, a market town in the Buckingham parliamentary division of Buckinghamshire, England, 56 m. N.W. by N. of London, on a branch of the London & North-Western railway, and at the junction of the river Ouzel with the Ouse. Pop. of urban district (1901) 4028. The church of St Paul and St Peter has Early English portions, including fine north and south porches. An inscription on the tomb of Thomas Abbott Hamilton in the churchyard is by the poet Cowper, who lived in the neighbouring town of Olney (*q.v.*). The almshouse called Queen Anne's Hospital is named from Anne of Denmark, queen of James I., who reconstituted a foundation of the time of Edward I., dedicated to St John the Baptist and St John the Evangelist.

NEWQUAY, a seaport and watering-place, in the St Austell parliamentary division of Cornwall, England, 14 m. N. of Truro, on a branch of the Great Western railway. Pop. of urban district (1901) 2935. It is finely situated on the north coast, on Newquay Bay, which is sheltered to the west by Towan Head. The cliff scenery is grand, and there is a fine sandy beach along the northward sweep of the coast in Watergate Bay. The harbour, artificially constructed, and equipped with a jetty and piers, admits vessels of 250 tons. The chief exports are iron and other ores, china clay, granite, fish and grain. The imports are coal, salt and manures.

NEW ROCHELLE, a city of Westchester county, in southern New York, U.S.A., on Long Island Sound, 16½ m. from the Grand Central Station, New York City. Pop. (1890) 9057, (1900) 14,720, of whom 4425 were foreign-born and 777 negroes; (1910 census) 28,867. It is served by the New York, New Haven & Hartford Railroad, and by electric railways to New York City and neighbouring places. The city is primarily a residential suburb of New York City, and has some fine colonial residences, and several beautiful residential parks, notably Rochelle, Neptune, and Beechmont Parks. Its large foreign-born population is comparatively recent and comparatively isolated. Among the prominent buildings of the city are a public library, the high school, a theatre (owned by the Knights of Columbus), a Masonic Temple, the City Bank and several churches, of which the most notable, perhaps, are the Baptist, Methodist, and St Gabriel's (Roman Catholic), which is the gift of members of the Iselin family, to whose interest in yachting is due in part the prominence of the New Rochelle and Larchmont Yacht Clubs. The Ursuline College of St Angela (1904) and the Merrill School (1906), both for girls, are in New Rochelle. The principal building of the first is Leland Castle, built in 1858–1860 by Simon Leland and finely decorated with frescoes and coloured marbles. A People's Forum, growing out of the work of the People's Institute of New York City, was established here in 1903–1904. In the road between New Rochelle and White Plains is the monument to Thomas Paine, provided for in his will, on the farm which was confiscated from a Tory by the state and was given to him at the end of the American War of Independence. On the Sound, in Hudson Park, is a monument commemorating the landing-place of the first Huguenot settlers. Immediately S. of New Rochelle, in the Sound, is Glen Island, an amusement resort; belonging to the Glen Island group, E. of Pelham Manor, is Travers Island, with the out-of-town clubhouse and grounds of the New York Athletic Club. On David's Island, 1½ m. S.W. of New Rochelle, is Fort Slocum, a United States Army post. The suburban villages of Larchmont and Pelham (and Pelham Manor) lie respectively N.E. and W. of New Rochelle. The important industries are the manufacture of scales and of other instruments of precision, and printing and publishing—the Knickerbocker Press of G. P. Putnam's Sons, New York, is here. The site of New Rochelle is part of a purchase by Thomas Pell in 1654 and of a grant to him by Richard Nicolls in 1666; it was sold in 1689 to Jacob Leisler. The first settlement of importance was made in 1688 by Huguenots, some of whom were natives of La Rochelle. New Rochelle was incorporated as a village in 1847, and as a city in 1899.

See R. and C. W. Bolton, *History of the Several Towns, Manors and Patents of Westchester County* (New York, 1881), and J. Thomas Scharf's *History of Westchester County* (2 vols., Philadelphia, 1886).

NEW ROSS, a market-town of Co. Wexford, Ireland, on the acclivity of a hill on the E. bank of the Barrow, 2 m. below its junction with the Nore, 102 m. S.S.W. of Dublin by the Dublin & South-Eastern railway. Pop. (1901) 5847. The Barrow is crossed by an iron bridge with a swivel pillar in the centre on which a portion of the bridge is turned to admit the passage of vessels. Vessels of 600 tons can lie alongside the quays. The inland water communications reach to Dublin by means of the Barrow and the Grand Canal. The Nore is navigable to Inistioge. New Ross has breweries and tan-yards, a salmon fishery, and a brisk export trade in agricultural produce. The urban district of New Ross includes Rosbercon, on the opposite side of the Barrow.

It is stated that St Alban built the abbey of Rossmactreoin, which gave rise to an ancient city formerly called Rossglas. A Dominican foundation of the 13th century has left some remains in Rosbercon. According to Camden, New Ross was founded by Isabella, daughter of Strongbow and wife of William Marshal, afterwards earl of Pembroke. A charter was granted to it by Roger Bigod in the reign of Edward I., which was extended by James I. and James II. From 1374 it returned two members to parliament, but at the Union in 1800 the number was reduced to one, and the town ceased to be a parliamentary borough in 1885. In 1269 it was surrounded by walls. The fortresses were dismantled by Cromwell, but some remains are extant.

NEWRY, a seaport, market town and parliamentary borough (returning one member) of Co. Down, Ireland, on the Newry water and Newry canal at the extreme head of Carlingford Lough. Pop. (1901) 12,405. It is 73 m. N. of Dublin by the Great Northern railway. A railway owned by the London & North-Western company connects Newry with the deep-water harbour at Greenore; and there is an electric railway to Bessbrook in Co. Armagh. The western part, called Ballybot, is connected with the eastern part, or old town, by four bridges over the canal and four over the tidal water. The situation of the town is striking, the Newry Mountains and Slieve Gullion on the west, and the Mourne Mountains on the east, enclosing the narrow valley in which it lies. Newry is one of the most important ports of the province of Ulster, and in connexion with several sub-ports farther down the river is the outlet for the trade of a very extensive district. The port admits vessels of 2000 tons to Victoria Docks, 3 m. from the town, but vessels drawing 15 ft. can go up the ship canal to the Albert Basin, 3 m. from the sea. The principal exports are grain, eggs, cattle, linen cloth and flax, and the imports include timber, groceries and coal. In the neighbourhood granite of a fine quality is quarried, and the town possesses rope and sail works, breweries, distilleries, flour-mills and tanneries. It is governed by an urban district council. In 1175 an abbey was founded here by Maurice M'Loughlin, king of Ireland. The abbey was converted in 1543 into a collegiate church for secular priests, and was dissolved by Edward VI., who granted it to Sir Nicholas Bagenal, marshal of Ireland. Bagenal made it his private residence, and laid the foundations of its prosperity. In 1689 Newry was set on fire by the duke of Berwick when in retreat before Schomberg. Charters were granted to the town by James I. and James II. By the charter of James I. it sent two members to parliament, but at the Union in 1800 it was restricted to one member. Until 1898 a portion of Newry was situated in Co. Armagh. A mile N.E. of the town is a notable rath or enclosure, taking its name of Crown rath from traditional single encounters between native princes in contention for the sovereignty.

NEW SIBERIA ARCHIPELAGO, a group of islands situated off the Arctic coast of Siberia, from 73° to 76° 6′ N., and 135° 20′ to 148° E. The name is loosely applied, covering either the northern group only of these islands, for which the name of New Siberia Archipelago, or of Anjou Islands, ought properly to be reserved, or the southern group as well, which ought to maintain its name of Lyakhov Islands. Some confusion prevails also as to whether the islands Bennett, Henrietta and Jeannette, discovered by the "Jeannette" expedition, ought to be included in the same archipelago, or described separately as the Jeannette Islands. The first of these three belongs geographically, and probably geologically, to New Siberia Archipelago, from which it is only 97 m. distant. As to Henrietta and Jeannette Islands, situated 200 m. N.E. of New Siberia Island, in 157° to 159° E., they can hardly be included in the New Siberia Archipelago. There seems, moreover, to be land due north of Kotelnyi Island in 78° N., first sighted by Sannikov and described as Sannikov Land. It was also seen by Baron Toll.

The *New Siberia* or *Anjou Islands* consist, beginning from the west, of Kotelnyi, the largest (116 m. long, 100 m. wide), having the small island Byelkovskiy near its western shore; Thaddeus (Faddéevskiy), in the middle; and New Siberia (Novaya Sibir), in the east (90 m. long, 40 m. wide). Kotelnyi is the highest and most massive of the four, reaching a maximum altitude of 1200 ft. in the Malakatyn-tras mountain. Its north-east portion consists of Upper Silurian coral limestones (Llandovery division), containing a rich fossil fauna and representing a series of folds running north-north-west. The same Silurian deposits are widely spread on the mainland as far as Olenek. The western portion of Kotelnyi is built up of Middle Devonian limestones and slates, folded the same way, of which the fossil fauna is similar to that of the Urals. Triassic slates appear in the south-east. Diabases pierce to Devonian rocks, and olivine rocks appear as dykes amidst the Triassic deposits. The Malakatyn-tras is also made up of volcanic rocks. The eastern portion of the island, named Bunge's Land, is thickly covered with Post-Tertiary deposits. Thaddeus Island has a long promontory, Anjou, protruding north-westwards. New Siberia Island attains altitudes of 200 to 300 ft. in its western portion. A range of hills, composed of Tertiary deposits, and named Hedenström's Mountains, runs along its south-western coast, and the same rocks form a promontory protruding northwards. The so-called Wood Mountains, which were supposed to be accumulations of floating wood, are denudations of Miocene deposits containing layers of brown coal with full stems of trees. These Tertiary deposits are characterized by a rich fauna; fully developed leaves of poplars, numerous fruits of the mammoth tree, needles of several conifers, &c., being found in them, thus testifying to a climate once very much warmer. The only representative of tree vegetation now is a dwarf willow 1 in. high.

The *Lyakhov Islands* consist of the Bolshoy (Large), or Blizhniy (Nearest), which is separated by Laptev Strait, 27 m. wide, from Svyatoy Nos of Siberia; Malyi (Small), or Dalniy (Farthest), to the north-west of Blizhniy; and three smaller islands—Stolbovyi (Pillars), Semenovskiy and Vasilevskiy—to the west of Malyi. Dr Bunge found Bolshoy to consist of granite protruding from beneath non-fossiliferous deposits; while the promontory of Svyatoy Nos consists of basalt hills, 1400 ft. high. Along the southern coast of Bolshoy Baron Toll found immense layers of fossil ice, 70 ft. thick, evidently relics from the Ice Age, covered by an upper layer of Post-Tertiary deposits containing numbers of perfectly well-preserved mammoth remains, rhinoceros, *Ovibos*, and bones of the horse, reindeer, American stag, antelope, *saiga* and even the tiger. The proof that these animals lived and fed in this latitude (73° 20′ N)., at a time when the islands were not yet separated from the continent, is given by the relics of forest vegetation which are found in the same deposits. A stem of *Alnus fruticosa*, 90 ft. high, was found with all its roots and even fruits.

Basalts and Tertiary brown coal deposits enter into the composition of the southern extremity of Bennett Island, and the mountains of Sannikov Land, seen by Toll, have the aspect of basaltic "table mountains."

The climate of these islands is very severe. In 1886 the winter ended only in June, to begin anew in August (21st May, −5·8° F.; 16th October, −34·6°). The highest summer temperature was 50°. Flocks of geese and other birds come to the islands from the north (Bunge and Toll), as also the gull *Lestris pomarina*, which feeds chiefly on the lemming. The lemmings are very numerous, and in certain years undertake migrations to the mainland and back. Reindeer, followed by wolves, come also every year to the islands; the polar fox and polar bear, both feeding on the lemmings, are numerous. Hunters come in numbers to the Lyakhovs, which must have been long known to Arctic hunters.

A Yakutsk Cossack, named Vaghin, wintered on Bolshoy in 1712, but it was a merchant, Lyakhov, who first described the two greater islands of this group in 1770, and three years later reached on sledges the largest island of the New Siberia group, which he named Kotelnyi. The Lyakhovs were mapped in 1777. J. Sannikov, with a party of hunters, discovered in 1805–1808 Stolbovyi, Thaddeus and New Siberia Islands, and a merchant, Byelkov, the Byelkovskyi Islands. He sighted the land to the north of Kotelnyi and the land to the north of New Siberia (now Bennett Island). A Russian officer named Hedenström, accompanied by Sannikov, explored the archipelago and published a map of it in 1811. Lieutenant Anjou visited it in 1821–1823. A scientific expedition under Dr Alexander Bunge (including Baron Eduard Toll) explored it in 1885–1886. Baron Toll revisited it in 1893 with Lieutenant Shileiko, and again in 1900 with F. G. Seeberg. Papers were found on Bennett Island showing that he left it for the south in November 1902, but he never returned home, and two relief parties in 1903 failed to find traces of him.

Authorities.—The works of Hedenström, Ferdinand von Wrangell, and Anjou, Bunge and Toll in *Beiträge zur Kenntniss des russischen Reichs*, 3te Folge, Bd. iii. (1887). Baron Toll in *Memoirs (Zapiski) of the St Petersburg Academy of Sciences*, 7th series, vol. xxxvii. (1889), xliii. (1895), and 8th series, vol. ix. (1899), with maps. J. Schmalhausen, "Tertiäre Pflanzen," in same *Memoirs*, 7th series, vol. xxxvii. (1890); *Geographical Journal, passim.* (P. A. K.)

NEW SOUTH WALES, a state of the Australian Commonwealth. The name was given by Captain Cook, in his exploratory voyage in 1770, to the southern portion of the eastern coast of Australia, from some imagined resemblance of its coast-line to that of South Wales. The name was afterwards extended to the eastern half of Australia, but now designates a much more restricted area. New South Wales is bounded by the Pacific Ocean on the E., by Queensland on the N., by South Australia on the W. and by Victoria on the S. It lies between 28° and 38° S. lat., and 141° and 154° E. long. The coast-line, which is about 700 m. in length, extends from Cape Howe (37° 30′) at the south-eastern corner of Australia to Point Danger in 28° 7′ S. The colony is approximately rectangular in form, with an average depth from the coast of 650 m. and an average width from north to south of 500 m. The superficial area is estimated at 310,700 sq. m., or about one-tenth of the whole of Australia.

Physical Configuration.—The surface of the state is divided naturally into three distinct zones, each widely differing in general character and physical aspect, and clearly defined by the Great Dividing Range running from north to south. The tableland, which forms the summit of the range, comprises one of the three zones and separates the other zones, viz. the coastal region, and the great plain district of the interior. The main range follows the line of the coast, varying from 30 to 140 m. distant, being nearest at the south and receding the farthest at the sources of the Goulburn river, the main tributary of the Hunter. The crest of this range is, in some places, narrow; in others it spreads out into a wide tableland. The eastern slopes are, as a rule, rugged and precipitous, but the western versant falls gently to plains. The highest part of the Dividing Range is in the south-eastern portions of the state, on the borders of Victoria. Here some of the peaks rise to a height of over 7000 ft.; one of these, Mount Kosciusco, the highest peak in Australia, attains an elevation of 7328 ft. The tableland varies greatly in elevation, but nowhere does it fall below 1500 ft., and in places it reaches an average of 5000 ft. The great plain district, lying west of the tableland, is part of a vast basin which comprises portions of Queensland, South Australia and Victoria, as well as of New South Wales. The great plains are traversed by a few rivers, whose long and uncertain courses carry their waters to the river Murray, which empties itself into the Southern Ocean through the state of South Australia, and during 1250 m. of its course forms the boundary between the states of New South Wales and Victoria. The Murray has a very tortuous course, as may be judged from the fact that the measurement along the joint boundary of New South Wales and Victoria is only 460 m. in a straight line, the river course being 1250. The chief tributaries of the Murray are the Darling and the Murrumbidgee, which is joined by the Lachlan. The Murray and the Murrumbidgee are permanent streams, but the Darling occasionally ceases to run in part of its course, and for a thousand miles above its junction with the Murray it receives no tributary. In its upper course the Darling receives numerous tributaries. Those on the right bank all come from Queensland and bring down enormous volumes of water in flood time; on the left bank the most important tributaries are the Gwydir, Namoi, Castlereagh, Bogan and Macquarie. Here and there along the course of the western rivers are found lagoons, sometimes of considerable dimensions. These are commonly called lakes, but are in reality shallow depressions receiving water from the overflow of the rivers in times of flood, and in return feeding them when the floods have subsided.

The coastal belt differs greatly from the other divisions of the state. The main range gives rise to numerous rivers flowing eastward to the South Pacific. Almost everywhere between the main range and the sea the country is hilly and serrated, more particularly in the southern portions of the state. In the Illawarra district, 50 m. south of Sydney, the mountains skirt the very edge of the coast, but farther north there is a wider coastland, with greater stretches of country available for tillage and pasture.

Along the sea-board are twenty-two well-defined headlands or capes and about a score of bays or inlets, to mark which for navigators there are thirty-four lighthouses. There are four very fine natural harbours, viz. Jervis Bay, Port Jackson, Broken Bay and Port Stephens, and several others of minor importance. Port Jackson, on which is situated the city of Sydney, is one of the six greatest ports of the British empire. The port second of commercial importance to Sydney is Newcastle, at the mouth of the Hunter river, which is the great coal-shipping port of the colony. Secondary harbours, available for coasting steamers, south of Sydney are at Port Hacking, Wollongong, Kiama, Shoalhaven, Bateman's Bay, Ulladulla, Merimbula, and Twofold Bay. North of Sydney the secondary ports are at the mouths of the Hawkesbury, Manning, Hastings, Macleay, Nambucca, Bellingen, Clarence, Richmond and Tweed rivers. The rivers of the sea-board are as just enumerated, the only other of importance being the Hunter. The Richmond drains an area of 2400 sq. m. and is navigable for 60 m. The Clarence is a fine stream draining an area of 8000 sq. m.; it has a course of 240 m. navigable for 67 m. The Macleay drains an area of 4800 sq. m., and empties at Trial Bay after a course of 200 m., of which 20 m. are navigable. The Hastings and Manning are both important rivers. The Hunter is one of the chief rivers of the state and embouches at Port Hunter or Newcastle Harbour after a course of 200 m. It drains an area of 11,000 sq. m., more than twice the area of the Thames basin. Less commercially important than the Hunter, the Hawkesbury is nevertheless a fine stream; it has a course of 330 m., of which 70 m. are navigable. South of Sydney the rivers are of less importance; the principal is the Shoalhaven, 260 m. long, draining an area of 3300 sq. m.

Climate.—The three geographical regions above described constitute three distinct climatic divisions. The coastal region, 28° to 37° S. lat., shows a difference between the average summer and winter temperatures of only 24° Fahrenheit. Sydney, which is situated midway between the extreme points of the state (33° 51′ S.), has a mean temperature of 63°, the mean summer temperature being 71° and that of winter 54°, showing a mean range of 17°; the highest temperature in the shade experienced at Sydney in 1896 was 108·5°, and the lowest 35·9. The coastal district has an area of 38,000 sq. m., over which there is an average rainfall of 42 in. The rainfall is greatest at the sea-board, diminishing inland; the fall also diminishes from north to south. Sydney has an average fall of 50 in., while the Clarence Heads, in the north, has 58 in., and Eden, in the south, 35·5 in. The tableland is a distinct climatic region. On the high southern plateau, at an elevation of 4640 ft., stands the town of Kiandra, with a mean summer temperature of 56·4° and winter of 32·5°. Cooma, in the centre of the Monaro plains, at an elevation of 2637 ft., has a mean summer temperature of 65·9° and winter, 41·7°; its summers are therefore as mild as those of London or Paris, while its winters are much less severe. On the New England tableland, under latitude 30° S., the yearly average temperature is 56·5°, the mean summer 67·7° and the mean winter 44·3°. The tablelands cover an area of 85,000 sq. m. and have an average rainfall of 32·6 in.; there is, however, a small area in the southern portion where an average fall of 64 in. is experienced. In the western division, or great plains, severe heat is experienced throughout the summer, and on occasional days the thermometer in the shade ranges above 100° Fahrenheit, but it is a dry heat and more easily borne than a much less degree of temperature at the sea-board. The mean summer temperature ranges between 75° at Deniliquin in the south and 84° at Bourke. The mean range in winter is between 48° and 54·5°, and, accompanied as this is with clear skies, the season is very refreshing. West of the tableland the amount of rainfall decreases as the distance from the Pacific increases, and in a large area west of the Darling the average annual rainfall does not exceed 10 in. For the whole western division, embracing an area of 188,000 sq. m., the average rainfall is 19·8 in. (T. A. C.)

Geology.—New South Wales consists geologically as well as geographically of three main divisions which traverse the state from north to south. The highlands of eastern Australia form the middle belt of the state, to the east of which are the low coastal districts and to the west the wide western plains. The highlands of New South Wales consist, geographically, of a series of tablelands, now in the condition of dissected peneplains; geologically, they are built of a foundation of Archean and folded Lower Palaeozoic rocks, covered in places by sheets of more horizontal Upper Palaeozoic and Mesozoic rocks; these deposits occur along the edge of the highlands, and are widely distributed on the floor of the coastal districts. They have been lowered to this level by a monoclinal fold, which has brought down the Mesozoic rocks, so that they extend eastward to the coast, where they dip beneath the sea. The western plains contain isolated ridges of the old Archean and Lower Palaeozoic rocks; but in the main, they consist of plains of Cretaceous beds covered by Cainozoic drifts. The stratified rocks in the highlands strike north and south, as if they had been crumpled into folds, in Upper Palaeozoic times, by pressure from east to west. The weak areas in the crust caused by the earth movements were invaded by great masses of Devonian granites. They altered the Lower Palaeozoic rocks on their edges, and were once thought to have converted wide areas of Lower Palaeozoic rocks into schists and gneisses. Most of these foliated rocks, however, are doubtless of Archean age. The highland rocks no doubt once extended along the whole length of the state from north to south; but they are now crossed by a band of Upper Palaeozoic sediments, which extend up to the valley of the Hunter river and separate the Blue Mountains and the Southern Highlands of New South Wales from the New England tableland to the north.

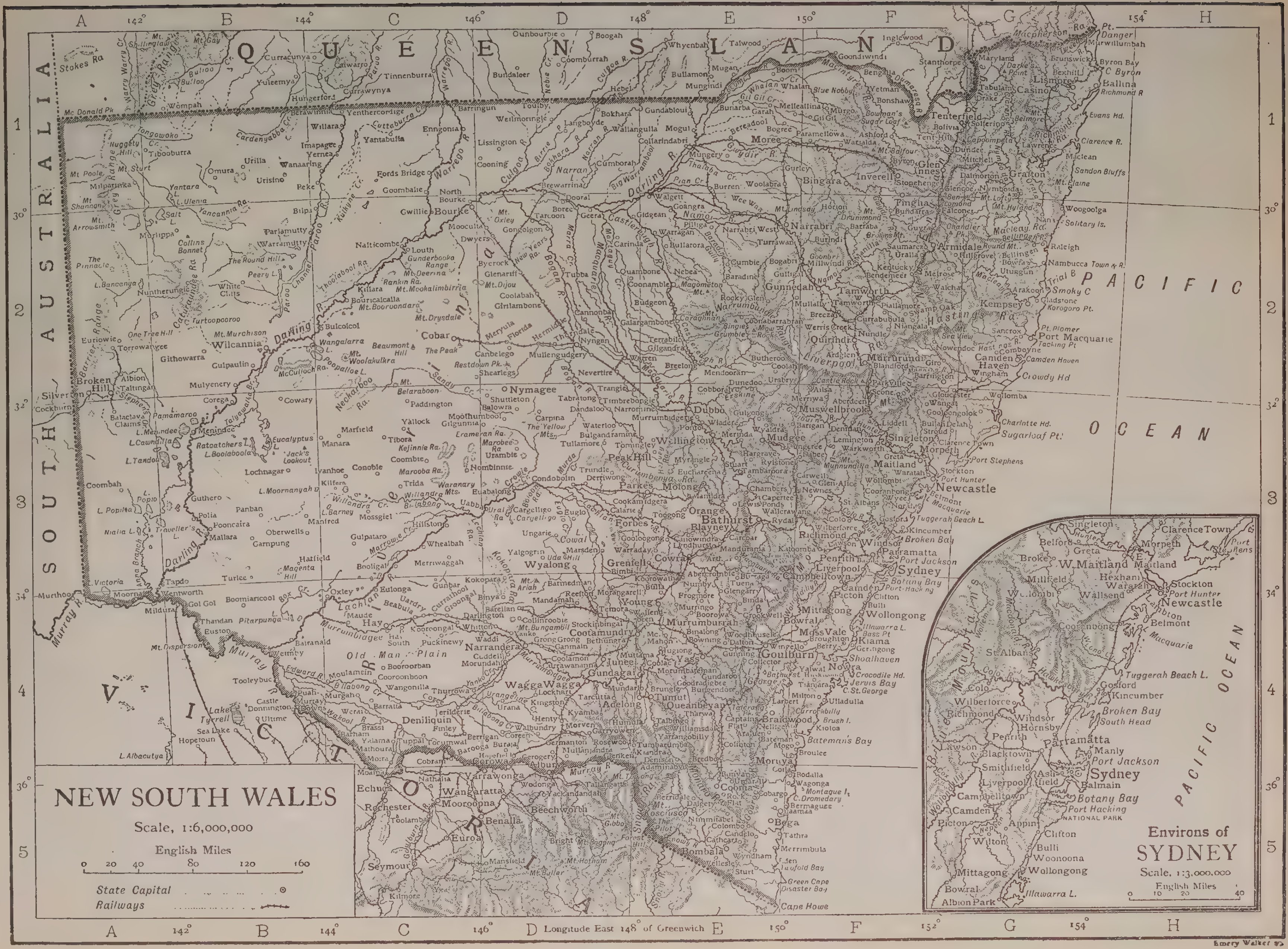
The oldest rocks in New South Wales are referrable to the Archean system, and consist of gneisses and schists, including the glaucophane-schists in the New England tableland, and hornblende-schists of Berthong. The Archean rocks are comparatively sparsely exposed in New South Wales. They enter the state from the south, being continuous with the Archean block of north-eastern Victoria. They occupy a large area in the western districts of New South Wales, where a projection from the Archean plateau of central Australia crosses into the state from South Australia; it is best exposed in the Barrier Ranges around Broken Hill. Cambrian rocks have not yet been discovered in New South Wales; but Pittman has recorded an *Agnostus* from Mandurama, near Orange. The rocks of the Ordovician system, though widely distributed, have not always been separated from the Silurian rocks, which they often closely resemble lithologically. The occurrence of Ordovician rocks was first established by Dun at Tomingley, 33 m. S.W. of Dubbo, where he discovered graptolites that he identified as *Climacograptus* and *Dicellograptus*. Other graptolites have been found near Orange, and at Lyndhurst, near Carcoar. The fossiliferous horizon is of Upper Ordovician age. The extent of the Ordovician will probably be increased by addition of areas, which cannot yet be separated from the Silurian. The Silurian system is the best-known constituent of the Lower Palaeozoic foundation of New South Wales. The rocks consist of sandstones, quartzites, slates and shales, associated with lenticular masses of limestone. The typical Silurian rocks are richly fossiliferous, the shales containing trilobites, the sandstones many brachiopods, and the limestones a rich coral and bryozoan fauna. There are also beds of chert, which are largely composed of radiolaria. Caves have been dissolved in the limestones by underground streams; the Jenolan caves in the Blue Mountains and those of Yarrangobilly and the Goulburn district are the most famous. The slates of the Silurian have been bent into folds, and saddle reefs occur along the axis of the folds, as at Hargraves. Numerous quartz reefs occur both in the Silurian and Ordovician rocks. In these reefs the chief mineral is gold. Some schists, attributed to the Silurian, but possibly older, contain platinum; and associated with the limestones are beds of copper.

The rocks of the Devonian system rest unconformably upon the Silurian; but some beds of which the age is still uncertain are called Devono-Silurian. The Devonian beds are well developed in the Blue Mountains, where the lower Devonian sediments at Mount Lambie are estimated to be 10,000 ft. in thickness. They are extensively developed along the Cox river and along the slopes of Mount Canoblas. They are also developed in the New South Wales highlands, to the south-east of Goulburn. Some of the best-known exposures are in the ranges which rise above the western plains, such as the Rankin Range on the Darling and the Kokopara Range to the north of the Murrumbidgee. The Devonian rocks at Yalwal are sharply folded and are associated with a series of rhyolites and basic lavas. The lower part of this series is probably Lower Devonian; and it is covered by shales and volcanic rocks belonging to the Upper Devonian. In the extreme south-east of New South Wales, at the head of the Genoa river, are sandstones with *Archaeopteris howitti*, which are an extension of the Lower Devonian beds of Victoria; while farther to the east, at Eden and Twofold Bay, are Upper Devonian sandstones.

The Devonian system is separated from the Carboniferous by an interval, during which there were powerful earth movements; they produced a lofty mountain chain, running north and south across New South Wales. The highlands are the worn down stumps of this mountain line. In Lower Carboniferous times these mountains were snow-capped, and the valleys on their flanks were occupied by glaciers.

The Lower Carboniferous beds are represented by conglomerates and sandstones with some shales and limestones. The sandstones are characterized by *Lepidodendron* (*Bergeria*) *australe.* It is associated with beds of lava and volcanic ash, some of which contain copper ores. Granites and granodiorites were intruded at this period into the older rocks, and altered the adjacent Devonian beds into slates and quartzites, and formed gold-quartz veins, which have been worked in the Devonian rocks at Yalwal. The Lower Carboniferous rocks also occur in the Blue Mountains, along the Cox river and Capertee river; and a northern continuation occurs along the western slope of the New England tableland, from the Macintyre river to the Queensland border.

The Upper Carboniferous rocks are most important from their rich seams of coal. They occupy from 24,000 to 28,000 sq. m., which are best exposed in the Hunter river and around Newcastle.


NEW SOUTH WALES

Scale, 1:6,000,000

English Miles
0 20 40 80 120 160
State Capital
Railways
Environs of SYDNEY
Scale, 1:3,000,000
English Miles
0 10 20 40
Longitude East 148° of Greenwich
QUEENSLAND
SOUTH AUSTRALIA
VICTORIA
PACIFIC OCEAN
Sydney
Newcastle
Bathurst
Broken Hill
Bourke
Goulburn
Emery Walker sc.

Farther south they disappear beneath the Mesozoic sandstones, from which they again rise along the coast around Lake Illawarra and near the mouth of the Shoalhaven river. The Coal Measures have been reached under Sydney, by a deep bore at Balmain, which pierced a seam of coal 10 ft. thick, at the depth of 2917 ft. The Coal Measures are classified by Professor T. W. David as follows:—

	Ft.
1. Upper or Newcastle Coal Measures, containing an aggregate of about 100 ft. of coal	1,150
2. Dempsey Series; freshwater beds, containing no productive coal. This series thins out completely in certain directions	2,000
3. Middle, or Tomago, or East Maitland Coal Measures, containing an aggregate of about 40 ft. of coal	570
4. Upper Marine Series; specially characterized by the predominance of *Productus brachythaerus*	5,000
5. Lower or Greta Coal Measures, containing an aggregate of about 20 ft. of coal	130
6. Lower Marine Series; specially characterized by the predominance of *Eurydesma cordata*	4,800
	13,650

Geologically, perhaps, the most interesting rocks in the Carboniferous are the glacial conglomerates, containing ice-scratched, erratic blocks. Some of the boulders are encrusted by marine organisms and must have been dropped by icebergs in the sea. The northern limit of the glacial beds is in dispute; they have been described as far north as Ashford. The Carboniferous beds contain numerous sheets and flows of basalt and andesite. A syenite *massif* of this age occurs at Mittagong; and leucite has been discovered in Carboniferous basalts by David.

The Mesozoic rocks of New South Wales begin with the Narrabeen Shales; they are covered by the Hawkesbury Sandstones, which are well exposed around Sydney; and they in turn are covered by the Wianamatta Shales. The Triassic age of the Hawkesbury Sandstone is supported by the evidence of the fossil fish; though, according to Dr Smith Woodward, they may perhaps be Rhaetic. But the fossil plants of which the chief are *Taeniopteris daintreei* and *Thinnfeldia odontopteroides* are regarded by Seward as Lower Jurassic. At Talbragar there is a bed containing Jurassic fish, which rests in an erosion hollow in the Hawkesbury Sandstone. The Talbragar beds, then, may be representative of the Jurassic; and the underlying Hawkesbury Sandstone may be Upper Triassic. The Cretaceous system is widely developed in the western part of the state, where it is represented by two divisions. The Rolling Downs formation is regarded as Lower Cretaceous. It consists of a thick series of shales containing marine fossils. It is covered in places by tablelands and ridges of the Desert Sandstone, the remnants of a sheet which doubtless once covered the whole of the Western Plains. The chief economic product of the Desert Sandstone is opal, which occurs in it at White Cliffs and Wilcannia. The opal beds contain Cretaceous fossils such as *Cimoliosaurus*. An occurrence of Upper Cretaceous beds occurs in the coastal district at Nimbin on the Richmond river. The Cainozoic rocks are best developed in the western districts, as the silts of the Darling and Murray plains. They include some Miocene, or perhaps Oligocene marine sands, formed in the northern part of an inland sea, which occupied the basin of the Lower Murray. The most significant point in the distribution of the marine Cainozoic rocks in New South Wales is their complete absence from the coastal districts; this fact indicates that while the Middle Cainozoic marine beds of Victoria and New Guinea were being deposited, Australia extended far eastward into the Tasman Sea. The Cainozoic series of New South Wales contains many interesting volcanic rocks, including leucite-basalts, nepheline-basalts and sodalite-basalts. In a basic neck of this period at Inverell, there are eclogite boulders, containing diamonds *in situ*; and it is doubtless from these basic volcanic necks that the diamonds of the New England tableland have been derived. The volcanic rocks occur on the tableland of New South Wales, and contribute much to the fertility of their soils.

The most important mineral in New South Wales is coal, of which the state has probably a larger available supply than any other country in the southern hemisphere. The coal-fields occupy 24,000 sq. m. The coal is present in such vast amount as to offer the possibility of very economical working of the abundant iron ores of Australia. Kerosene shale occurs in the Blue Mountains to the west of Sydney, in the Upper Carboniferous rocks. Gold is widely distributed through the highlands. It was first recorded by James McBrien in 1823, as occurring in grains in the sands of the Fish river, between Rydal and Bathurst; and though further discoveries were made, they were kept secret as far as possible. The first discovery of gold in mining quantities was made by Hargraves in 1851, at the junction of Lewis Ponds and Summerhill Creek, in what was called the Ophir Diggings, near Bathurst. The gold mines are very numerous and widely scattered, but individually they are mostly small and of no great depth. The total value of the gold raised since 1850 is over £50,000,000. The output of alluvial gold is now increased by the employment of dredges. The gold-quartz veins are mainly in the Ordovician and Silurian rocks; but some also occur in the Devonian, and there are impregnations of gold in tufas of Devonian age. Deep leads beneath the basalts occur at Kiandra.

The silver-lead mines of New South Wales are famous owing to the importance of Broken Hill. The mines there occur in gneiss and schists, which are probably of Archean age; the lode has in places been worked for a width of over 200 ft. The zinc ores associated with the silver-lead long lay unutilized, as the problem of their separation from the associated rhodonite has only recently been overcome. Tin is worked in the rivers of the New England tableland as at Vegetable Creek. The chief copper field is at Cobar in the north-western plains. Bismuth, platinum, molybdenum and antimony are obtained in small quantities.

The geology of New South Wales has been described in the Monographs, Memoirs and Records of the Geological Survey, which in the fullness and high scientific character form the most valuable contribution to Australasian geology. Pittman's map of the state in two sheets, on the scale of 16 m. to the inch, was issued by the Survey in 1893. The economic geology has been admirably summarized in a work by E. F. Pittman, *The Mineral Resources of New South Wales* (1901). Numerous geological memoirs have appeared in the *Rep. Austral. Assoc. for the Advancement of Science*, the *Journ. R. Soc. N.S. Wales* and the *Proc. of the Linnaean Soc. N.S. Wales*. A systematic account of the minerals has been published by A. Liversidge, *The Minerals of New South Wales* (1888), and to him is due a valuable chemical study of the meteorites and gold nuggets. Contributions on the palaeontology of New South Wales are contained in the Rec. Austral. Museum, Sydney. A bibliography of the economic geography has been issued by W. S. Dun, *Rec. Geol. Surv. N.S. Wales*, vol. vi., 1899, and of the Cretaceous geology, also by W. S. Dun, in *Journ. of Proc. Royal Soc. N.S. Wales*, 1903, vol. xxxvii. pp. 140–153. (J. W. G.)

Artesian Water.—Before actual boring proved that the belief was well founded, it had long been scientifically demonstrated that water would probably be obtained in the Cretaceous formation which underlies the whole of the north-west of New South Wales; and it is probable that the artesian water-bearing basin extends much farther south than was previously supposed. It may, indeed, be yet found to extend approximately along the course of the Lower Darling. Artesian water is also obtainable in other than Cretaceous rocks. This is shown by palaeontological evidence; and some of the most successful bores, such as those at Coonamble, Moree, Gil Gil and Euroka, have pierced rocks of Triassic age, corresponding with the Ipswich Coal Measures.

Population.—The population on the 1st of July 1906 was 1,504,700, viz. 799,260 males and 705,440 females. The total includes 105,000 Chinese and 7500 aborigines and half-castes. Since 1860 New South Wales had added more largely to its population than any of the other Australian states. In 1860 the population was 348,546; in 1890 the number was 1,121,860. From 1890 to 1901 the population increased 238,083, or at the rate of 21·2%. By far the largest part of the increase is due to excess of births over deaths, for out of the increase of over 1,000,000 since 1860, only 350,000 was due to immigration. In 1905 there were 39,572 births and 14,980 deaths; these figures are equal to 26·78 and 10·13 per thousand respectively. The birth-rate has fallen very much, especially since 1899. In 1861–1865 it was 42·71 per 1000; in 1896–1899 it was 27·92, and in 1906 it had fallen still further to 26·78. The marriage rate for 1905 was 7·40 per thousand, and the persons married 14·80 per thousand. The mean for 20 years was 7·39. The chief cities are Sydney and suburbs, population in 1906, 535,000; Newcastle and suburbs, 56,000; Broken Hill, 30,000; in 1901, Parramatta, 12,568; Goulburn, 10,610; and Maitland (East and West), 10,085. There are nine other towns with between 5000 and 10,000 inhabitants each.

Religion.—The proportions of the leading denominations in 1901 were:—Church of England, 46·6%; Roman Catholic, 26·0; Presbyterian, 9·9; Wesleyan and other Methodists, 10·3; Congregationalist, 1·9; Baptist, 1·2; Jews, 0·5; others, 3·6. Sydney is the seat of Anglican and Roman Catholic archbishoprics; the Anglican archbishop is also primate of Australia and Tasmania.

Education.—The state has in its employ 3135 male and 2424 female teachers, and maintains 2901 schools. The law requires that all children over six years and under fourteen years shall attend school, and in 1904, 220,000 children of these ages, as well as 39,000 others below or beyond the school ages, were receiving instruction, making a total of 259,000. Of this number 211,000 were in state schools and 48,000 in private schools. The majority of the private schools are controlled by one or other of the religious bodies. The Roman Catholic Church has 361 schools, with 1835 teachers and an attendance of 33,000 pupils. The total expenditure of the state on public instruction, science and art during the year ended 30th June 1906 was £911,000. During the calendar year 1906 a sum of £840,000 was expended on primary instruction. The fees from pupils amounted to £82,000, making the actual cost of primary instruction £758,000. There are a university and a technical college in Sydney.

Finance.—The revenue of the state is derived from four main sources, viz. taxation; sale and lease of lands; earnings of railways, tramways and other services; and share of surplus revenue returned by the commonwealth. During 1906 the income derived under each of these heads was: from taxation £1,297,776; from lands £1,729,887; from railways and other services £5,856,826; from commonwealth £2,742,770; these with miscellaneous collections to the amount of £655,823 made up a total revenue of £12,283,082. The direct taxation is represented by a tax of one penny in the pound on the unimproved value of land, sixpence in the pound on the annual income derived in the state from all sources, except the use and occupation of land and improvements thereon. There are also various stamp duties. The land revenue is derived partly from the alienation of the public estate, either absolutely or under conditions, but mainly from the occupation of the public lands. There is also a small revenue from mining lands, timber licences, &c. The state still holds 146 million acres out of a total of 196 million acres, having alienated about 50 million acres. The principal heads of expenditure were: interest and charges on public debt, £3,291,059; public instruction, £911,177; working expenses of railways and tramways, £2,954,777; other services working expenses, £208,242; other services, £3,900,726. The public debt in 1906 was £85,641,734, equal to £56, 11s. per inhabitant; the great proportion of this debt has been incurred for works that are revenue producing, only about £11,000,000 was not so expended. Of the total debt in 1903 about £66,000,000 was held in London. The net return from public works in excess of expenditure in 1906 amounted to nearly 3¼% on the whole public debt, and the interest paid averages 3·6%.

Administration.—The political constitution of New South Wales is that of a self-governing British colony, and rests on the provisions of the Constitution Act. The governor is appointed by the crown, the term of office being generally for five years, and the salary £5000. The governor is the official medium of communication between the colonial government and the secretary for the colonies, but at the same time the colony maintains its own agent-general in London, who not only sees to all its commercial business but communicates with the colonial office. The powers of the state parliament have been since 1901 restricted by the transfer of certain powers to the commonwealth of Australia. In the legislative assembly there are 90 members. The principle adopted in distributing the representation is that of equal electoral districts, modified in practice by a preference given to the distant and rural constituencies at the cost of the metropolitan electorates. The suffrage qualification is a residence of twelve months and the attainment of the age of 21 years. Women are entitled to the franchise: there are the usual restrictions in regard to the pauper and criminal classes. An elector has only one vote, which is attached to the district in which he resides. Members of the Legislative Assembly are allowed a salary of £300 a year. There were in 1906 about 700,000 electors. Each electoral district returns one member. The Legislative Council consists of persons nominated for life by the governor, acting on the advice of the Executive Council; the number of members is not fixed by law but in 1906 it was 55. Parliaments are triennial. Local government was extended in 1905 and 1906 to the whole state, excepting the sparsely populated western division; formerly it was confined to an area of about 2800 sq. m. There are altogether about 55,000 m. of road communications, but not more than 15,000 m. are properly formed. The various local bodies are municipalities or shires, the former is the term applied to closely peopled areas of small extent endowed with complete local government, and the latter is the designation of the more extensive districts, thinly peopled, to which a less complete system of local government has been granted.

Federal Capital.—In 1908 the Seat of Government Act provided that the federal territory and capital of Australia should be in the Yass-Canberra district of New South Wales, and that the territory should have an area of not less than 900 sq. m. and easy access to the sea. In 1909 a Board appointed to consider the several possible sites within this district reported in favour of Canberra, on the Molonglo river, near Queanbeyan, as the site for the new city, and the basins of the Molonglo, Queanbeyan and Cotter rivers were indicated as suitable to form the federal territory. Jervis Bay was recommended as offering a site for a port for the territory. Bills were passed in 1909 by the legislative assembly of New South Wales and by the federal parliament, transferring this territory to the federation.

Agriculture.—New South Wales might be described as essentially a pastoral country, and the cultivation of the soil has always been secondary to stock-raising. But the predominance of the pastoral industry is not by any means so marked as it was even as late as the last decade of the 19th century. The want of progress in agriculture was not to be ascribed to defects of climate or soil, but chiefly to the great distance of Australia from the markets of the world. This difficulty has, for the most part, been removed by the establishment of numerous important lines of steamers trading between Australia and Europe, and recent years have therefore seen considerable expansion in all forms of agriculture.

In 1882 the area of land under cultivation was 733,582 acres, which is slightly less than 1 acre per inhabitant. In 1900 the total area under cultivation was 2,439,639 acres, and in 1906 it had risen to 2,838,081 acres, which is a little short of 2 acres per inhabitant.

The area devoted to each of the principal crops was as follows:—

	Acres.
Wheat	1,939,400
Maize	189,000
Oats	38,500
Sugar Cane	21,500
Hay	438,000
Vines	8,100

The average yield per acre of crops may be set down as follows:—

	Bushels.
Wheat	10·5
Maize	30
Oats	23
Sugar Cane	20 tons, cane
Hay	1 ton
Wine	185 gallons

The total value of production in the year 1906 may be set down at £6,543,000, which works out at £2, 6s. 1d. per acre.

Although the coastal districts are still important, as the crops yielding the largest returns per acre are grown there, as regards the total area under crop these districts are of much less importance compared with the whole state than formerly.

The area under crop on the coast districts is about 320,000 acres; on the tablelands 375,000 acres; on the western slopes, 1,100,000 acres; the Riverina district, 750,000 acres; the western plains, chiefly in the central portion, 270,000 acres; and less than 20,000 acres in the western division, which comprises nearly half the total area of the state. The soil in that part of the country is, for the most part, suitable for cultivation, and there are large areas of rich land, but the rainfall is too light and irregular for the purpose of agriculture.

There were 76,000 occupiers of rural holdings in 1905, and the area occupied by them, exclusive of lands leased from the state, is 48,081,000 acres. The great majority, 80% in 1905, of occupiers are freeholders; the practice of renting farm lands is not followed to any considerable extent, except in the dairying lands on the coast district. New South Wales took up its position amongst wheat-exporting countries in 1900; the bulk of the grain exported goes to the United Kingdom. Hay crops and maize rank next in importance to wheat. The cultivation of fruit is receiving increased attention, but the growing of sugar cane and tobacco and the production of wine, until recently so promising, are, if not declining, at least stationary, in spite of the suitability of the soil of many districts for these crops.

Grazing and Dairying.—The grazing industry still holds a chief place amongst the productive industries of the state. In 1906 the number of horses was 507,000; of sheep, 40,000,000; of cattle, 2,340,000; and swine, 311,000. There were considerable losses of sheep in 1902 owing to the drought of that year, but the flocks in 1906 were of better quality than at any previous period and little short of the number of 1898. The vast majority of the sheep are of the merino breed, but there are about a million long-woolled sheep and between two and three million cross-bred. Dairying made very great strides in the ten years preceding 1906, and ranks as one of the great industries of the state. There were 644,000 dairy cows in 1906, and the numbers are increasing year by year. The production of wool was 300,000,000 ℔, as in the grease; tallow, 493,000 cwt.; butter, 500,000 cwt.; cheese, 42,000 cwt.; and bacon and hams, 110,000 cwt.

Mining.—The mining industry has made great strides. In 1905 there were about 38,000 men engaged in the various mines, besides 3300 employed in smelting. Of these, 10,700 were employed in gold-mining; in coal-mining there were 14,100; silver, 7100; tin, 2750, and copper, 1850. The value of mining machinery may be approximately set down at £2,900,000. The following summary shows the value of the various minerals won in 1905. It is impossible to separate the values of silver and lead contained in the ore obtained at Broken Hill; the two metals are therefore shown together.

Minerals.		Quantity.	Value.
Metallic—			
Gold	oz. fine	274,267	£1,165,013
Silver	,,	417,520	52,196
Silver, lead and ore	ton	441,447	2,441,856
Lead, pig, &c.	,,	210	2,657
Zinc spelter and concentrates	,,	103,532	221,155
Tin ingots and ore	,,	1,957	226,110
Copper ingots and ore	,,	8,592	527,403
Antimony and ore	,,	388	5,221
Bismuth	,,	55	20,763
Wolfram	,,	86	7,361
Scheelite	,,	138	10,122
Molybdenite	,,	19	2,507
Platinum	oz.	398	825
Non-metallic—			
Coal	ton	6,632,138	2,003,461
Coke	,,	162,961	100,306
Kerosene shale	,,	38,226	21,247
Alunite	,,	2,702	6,750
Limestone flux	,,	14,941	9,519
Ironstone flux	,,	6,801	4,525
Marble		. .	2,420
Diamonds	carat	6,354	3,745
Opal		. .	59,000
Sundry minerals		. .	2,919
Total			£6,897,081

The value of gold won varies from year to year, but from 1894 to 1906 in only two years did it fall below £1,000,000. About one-fourth of the gold won is alluvial. The yield of gold from quartz mines was in 1904 11 dwt. 14 grs. per ton, which was somewhat below the average for the previous ten years. The Broken Hill silver lode is the largest as yet discovered; it varies in width from 10 ft. to 200 ft., and may be traced for several miles. The Broken Hill Proprietary Company owns the principal mine, and at Port Pirie in the neighbouring colony of South Australia erected a complete smelting plant; the problem of the recovery of the zinc contents of the ore having been satisfactorily solved, the company made extensive additions to the plant already erected, and in 1906 the manufacture of spelter was undertaken. From the commencement of mining operations on a large scale in 1885 to the end of 1905 the value of silver and lead ore won was £40,000,000. The production of tin rapidly declined after 1881, when the value of ore raised was £569,000: the production varies both with the price and the occurrence of rain, but the principal cause of the decreased production was the exhaustion of the shallow deposits of stream tin, from which most of the ore was obtained. The principal deposits of copper are in the central parts between the Macquarie, Bogan and Darling rivers. The copper lodes of New South Wales contain ores of a much higher grade than those of many well-known mines worked at a profit in other parts of the world, and, with a fair price for copper, the production largely increases. Iron is widely diffused, principally in the form of magnetite, brown haematite, limonite and bog iron. Coal mining is carried on in three districts. In the northern or Hunter river district there were 63 collieries, employing 10,500 men, and the quantity of coal raised was in 1904 about 4,100,000 tons; in the southern district there were fifteen collieries, employing 3100 men and raising 1,600,000 tons of coal. The western or mountain collieries were seventeen in number, employing 540 men and raising about 418,000 tons. About 52 % of the coal obtained is exported. Kerosene shale (torbanite) is abundant and is systematically worked.

Manufacturing.—There are a large and rapidly increasing number of manufactories, but in 1905 only about 250 employed more than 50 hands. The following gives a statement of factory employment for eleven years:—

Year.	No. of Establishments.	Hands Employed.	Value of Plant and Machinery.
1895	2723	48,030	£5,255,000
1900	3077	60,779	5,708,000
1905	3700	72,175	7,920,000

About 5·3 % of the males and 10·6 % of the females employed are under sixteen years; the total number of male employees in 1905 was 56,117, and of females, 16,058. About two-thirds of the hands are employed in Sydney and the adjacent district. The total value of the articles produced in manufactories, and the increased value of materials after undergoing treatment, was £30,028,000 in 1905, of which £17,500,000 represented value of materials used and £600,000 the value of fuel: the total wages paid was £5,200,000.

Commerce.—During 1905, 2725 vessels entered New South Wales ports from places outside the state; their tonnage was 4,697,500; the value of goods imported was £29,424,008; and the value of exports was £36,757,002. The average value of imports per inhabitant was £20 and of exports £24, 17s. The bulk of the trade is carried on with the other Australian states; in 1905 the value of such trade was, imports, £14,938,885, and exports, £12,263,472; the British trade is also considerable, the imports direct from Great Britain being valued at £8,602,288 and the exports £10,222,422. With all British countries the trade was, imports, £25,989,399, and exports, £25,994,563. New South Wales maintains a large trade with foreign countries aggregating £3,434,609 imports and £10,762,439 exports. France, Germany, Belgium and the United States are the principal foreign countries with which the state trades.

Wool is the staple export, and represents, in most years, one-third the value of the exports. Gold coin and bullion form one of the principal items in the export list, but only a small portion of the export is of local production, the balance being Queensland and New Zealand gold sent to Sydney for coinage. The course of trade from 1880 to 1905 was as follows:—

Year.	Imports.	Exports.
1880	£14,176,063	£15,682,802
1885	23,737,461	16,750,107
1890	22,615,004	22,045,937
1895	15,992,415	21,934,785
1900	27,561,071	28,164,516
1905	29,424,008	36,757,002

The principal articles of export in 1905 were: Wool, £13,446,260; gold, £3,053,331; silver and concentrates, £2,407,142; lead, £1,072,858; butter, £817,820; coal, £1,565,602; copper, £1,280,599; breadstuffs, £1,345,589; leather and skins, £1,559,033; meats, £761,235; tallow, £464,330; timber, £353,265; tin, £466,049.

Banking.—The banks of issue number thirteen; their paid-up capital amounts to £13,918,000 and the capital and reserves to £19,319,000, but of this sum only about £9,000,000 is used in the state. On the 30th of June 1906 the coin and bullion in reserve amounted to £8,192,000 and the note circulation to £1,462,000. The banks had on deposit £23,325,730 bearing interest and £15,773,883 not bearing interest, representing a total of £39,100,000. The savings banks had on their books at the close of 1905 about 355,714 depositors, with £13,500,000 to their credit. This represents £9, 1s. 6d. per inhabitant. The total deposits in all banks therefore amounted to £52,600,000. The progress from 1860 to 1905 was as follows:—

Year.	Amount on Deposit.	Average per Inhabitant.		
		£.	s.	d.
1860	£5,721,208	16	8	3
1870	7,044,464	14	2	6
1880	19,958,880	26	13	8
1890	43,390,141	38	13	6
1900	43,135,000	31	17	0
1905	52,600,000	34	17	6

Postal and Telegraph Service.—The postal business of 1905 was represented by the carriage of 102,292,888 letters and postcards, 44,599,104 newspapers and 23,077,094 parcels and books; the telegrams despatched numbered 3,837,962. To transact the postal business of the country, mail conveyances travelled 12,000,000 m. The income of the postal and telegraph department in 1905 was £1,065,618 and the expenditure £933,121, but there were some items of expenditure not included in the sum named, such as interest charges, &c., and cost of new buildings. The administration of the post office is under the commonwealth government

Railways.—The railways are almost entirely in the hands of the state, for out of 3471 m. open in 1906 the state owned 3390 m. The capital expended on the state lines open for traffic was £43,626,000, of which sum £7,400,000 was expended on rolling stock and equipment and £36,226,000 on construction of roads, stations and permanent ways. The net earnings amounted in 1906 to £1,926,407, which represents a return of 4·41 % upon the capital invested. The state pays, on an average, 3·69 % for the money borrowed to construct the lines, and there is therefore a considerable surplus to the advantage of the revenue. The year 1906 was, however, a very excellent one as regards railway working, the operations of the ten previous years showing an average loss of about a quarter of 1 %. (T. A. C.)

History

Early history.

New South Wales was discovered by Captain Cook on board the "Endeavour," on 20th April 1770. After he had observed the transit of Venus at Tahiti, he circumnavigated New Zealand and went in search of the eastern coast of the great continent whose western shores had long been known to the Dutch. He sighted the Australian coast at

Gippsland, Victoria, near Cape Everard, which he named Point Hicks, and sailed along the east coast of Australia as far north as Botany Bay, where he landed, and claimed possession of the continent on behalf of King George III. He then continued his voyage along the east coast of Australia, and returned to England by way of Torres Strait and the Indian Ocean. The favourable reports made by Captain Cook of the country around Botany Bay induced the British government to found a penal settlement on the south-eastern part of what was then known as New Holland. An expedition, consisting of H.M.S. "Sirius" of 20 guns, the armed trader "Supply," three store-ships and six transports, left England on 17th May 1787, and after touching at Tenerife, Rio de Janeiro, and the Cape of Good Hope, arrived at Botany Bay on the 20th of January 1788, under the command of Captain Arthur Phillip, R.N., with Captain John Hunter, R.N., as second. The persons on board the fleet included 564 male and 192 female convicts, and a detachment of marines, consisting of Major Ross, commandant, 16 officers, 24 non-commissioned officers, an adjutant and quartermaster, 160 privates and 40 women. There were in addition five medical men and a few mechanics. The live stock consisted of one bull and four cows, a stallion and three mares, some sheep, goats, pigs and a large number of fowls. The expedition was well provided with seeds of all descriptions.

Penal settlement regime.

The shores of Botany Bay were found to be unsuitable for residence or cultivation, and Captain Phillip transferred the people under his command to Port Jackson, half a dozen miles away, near the site of the present city of Sydney. For some years the history of the infant settlement was that of a large gaol; the attempts made to till the soil at Farm Cove near Sydney and near Parramatta were only partially successful, and upon several occasions the residents of the encampment suffered much privation. But by degrees the difficulties inseparable from the foundation of a remote colony were surmounted, several additional convict-ships landed their living freight on the shores of Port Jackson, and in 1793 an emigrant-ship arrived with free settlers, who were furnished with provisions and presented with free grants of land. By the end of the 18th century the inhabitants of Sydney and its neighbourhood numbered 5000. Immediately after the arrival of the first fleet, surveys of the adjacent coast were made; the existence of a strait between Australia and Tasmania was discovered by Surgeon Bass; and before the retirement of Governor King in 1806 Australia had been circumnavigated and the principal features of its coast-line accurately surveyed by Captain Flinders, R.N. The explorations landward were, however, not so successful, and for many years the Blue Mountains, which rise a few miles back from Sydney, formed an impenetrable barrier to the progress of colonization. Penal establishments were formed at Newcastle in New South Wales, at Hobart and Launceston in Tasmania, and an unsuccessful attempt was made to colonize Port Phillip. The most noteworthy incident in the first decade of the 19th century was the forcible deportation by the officers of the New South Wales Corps, a regiment raised in England for service in the colony, of the governor, Captain Bligh, R.N., the naval officer identified with the mutiny of the "Bounty." For some time the government was administered by the senior officer of the New South Wales Corps, but in 1809 he was succeeded by Captain Macquarie, who retained the governorship for eleven years.

Captain Macquarie's governorship.

During the régime of this able administrator New South Wales was transformed from a penal settlement to a colony. Before the arrival of Macquarie schools and churches had been erected, a newspaper, the *Sydney Gazette and New South Wales Advertiser*, had been started, and attempts had been made to acclimatize the drama. But he was the first governor to open up the country. He constructed permanent buildings at Sydney and Parramatta, formed roads and built bridges in the districts along the coast, and commenced a track across the Blue Mountains, which had been crossed in 1813 by Wentworth and others, thus opening up the rich interior to the inhabitants of Sydney. It was during Captain Macquarie's administration that the first banking institution, the Bank of New South Wales, was founded. The final fall of Napoleon in 1815 gave the people of the United Kingdom leisure to think about their possessions at the Antipodes; and in 1817 free settlers commenced to arrive in considerable numbers, attracted by the success of Captain John M'Arthur, an officer in the New South Wales Regiment, who had demonstrated that the soil, grass and climate were well adapted for the growth of merino wool. But although the free settlers prospered, and were enabled to purchase land on very easy terms, they were dissatisfied with the administration of justice, which was in the hands of a judge-advocate assisted by military officers, and with the absence of a free press and representative institutions. They also demanded permission to occupy the vast plains of the interior, without having to obtain by purchase or by grant the fee-simple of the lands upon which their sheep and cattle grazed. These demands were urged during the governorships of Sir Thomas Brisbane and General Darling; but they were not finally conceded, together with perfect religious equality, until the regime of Sir Richard Bourke, which lasted from 1831 to 1837. At the latter date the population had increased to 76,793, of whom 25,254 males and 2557 females were or had been convicts. Settlement had progressed at a rapid rate. Parramatta, Richmond and Windsor had indeed been founded within the first decade of the colony's existence; Newcastle, Maitland and Morpeth, near the coast to the north of Sydney, had been begun during the earlier years of the 19th century; but the towns of the interior, Goulburn, Bathurst and others, were not commenced till about 1835, in which year the site of Melbourne was first occupied by Batman and Fawkner. The explorations which followed the passage of the Blue Mountains opened up a large portion of south-eastern Australia. Van Diemen's Land was declared a separate colony in 1825, West Australia in 1829, South Australia in 1836 and New Zealand in 1839; so that before 1840 the original area of New South Wales, which at first included the mainland of Australia and the islands in the South Pacific, had been greatly reduced. In 1840 the press was free in every part of Australia, trial by jury had been introduced, and every colony possessed a legislature, although in none of them except New South Wales had the principle of representation been introduced, and in that colony only to a very limited extent. The policy of granting land without payment, originally in force in New South Wales, had been abandoned in favour of sales of the public lands by auction at the upset price of twenty shillings per acre; and the system of squatting licences, under which colonists were allowed to occupy the waste lands on payment of a small annual licence, had been conceded. In 1851, when separate autonomy was granted to Victoria, New South Wales had a population of 187,243, the annual imports were £2,078,338, the exports £2,399,580, the revenue was £575,794, and the colony contained 132,437 horses, 1,738,965 cattle and 13,059,324 sheep.

1831 to 1851.

Responsible government, 1856.

Gold was discovered at Summerhill Creek, near Bathurst, in February 1851, by Edward Hammond Hargraves; and at the end of June the first shipment, valued at £3500, left Sydney. This discovery made an important change in the position of the colony, and transportation, which had been discontinued during the previous year, was finally abolished. The first mail steamer arrived in August 1852, and in 1853 a branch of the Royal Mint was established at Sydney. The New Constitution Bill, passed during the same year by the local legislature, provided for two deliberative chambers, the assembly to be elected and the council nominated, and for the responsibility of the executive to the legislature. The Sydney University, founded in 1850, was enlarged in 1854, and the first railway in New South Wales, from Sydney to Parramatta, commenced in 1850, was opened in 1855. In the same year the Imperial parliament passed the New Constitution Act; and in June 1856 the first responsible government in Australia was formed, during the governorship of Sir William Denison, by Mr Stuart Alexander Donaldson.

The first administration lasted only for a few weeks, and it was some years before constitutional government worked smoothly. The powers of the new parliament were utilized for extending representative institutions. Vote by ballot was introduced; the number of members in the assembly was increased to 80, and the franchise was granted to every adult male after six months' residence in any electoral area. Meanwhile the material progress of the colony was unchecked. A census taken at the end of 1857 showed that the population of Sydney was, including the suburbs, 81,327. Telegraphic communication was established between Sydney, Melbourne, Adelaide and Tasmania in 1859; and during the same year the Moreton Bay district was separated from New South Wales and was constituted the colony of Queensland.

Sir John Young's governorship.

During the regime of Sir John Young, afterwards Lord Lisgar, who succeeded Sir William Denison in 1861, several important events occurred. The land policy of previous governments was entirely revised, and the Land Bill, framed by Sir John Robertson, introduced the principle of deferred payments for the purchase of crown lands, and made residence and cultivation, rather than a sufficient price, the object to be sought by the crown in alienating the public estate. This measure, passed with great difficulty and by bringing considerable pressure to bear upon the nominated council, was the outcome of a lengthened agitation throughout the Australian colonies, and was followed by similar legislation in all of them. It was during the governorship of Sir John Young that the distinction between the descendants of convicts and the descendants of free settlers, hitherto maintained with great strictness, was finally abandoned. In 1862 the agitation against the Chinese assumed importance, and the attitude of the miners at Lambing Flat was so threatening that a large force, military and police, was despatched to that goldfield in order to protect the Chinamen from ill-treatment by the miners. At this time, the only drawback to the general progress and prosperity of the country was the recrudescence of bushranging, or robbery under arms, in the country districts. This crime, originally confined to runaway convicts, was now committed by young men born in the colony, familiar with its mountains and forests, who were good horsemen and excellent shots. It was not until a large number of lives had been sacrificed, and many bushrangers brought to the scaffold, that the offence was thoroughly stamped out in New South Wales, only to reappear some years afterwards in Victoria under somewhat similar conditions.

The earl of Belmore became governor in 1868, and it was during his first year of office that H.R.H. the duke of Edinburgh visited the colony in command of the "Galatea." An attempt made upon his life, during a picnic at Clontarf, caused great excitement throughout Australia, and his assailant, a man named O'Farrell, was hanged. A measure which virtually made primary education free, compulsory and unsectarian came into operation. A census taken in 1871 showed that the population was 503,981; the revenue, £2,908,155; the expenditure, £3,006,576; the imports, £9,609,508; and the exports, £11,245,032. Sir Hercules Robinson, afterwards Lord Rosmead, was sworn in as governor in 1872. During his rule, which lasted till 1879, the Fiji Islands were annexed; telegraphic communication with England and mail communication with the United States were established; and the long series of political struggles, which prevented any administration from remaining in office long enough to develop its policy, was brought to an end by a coalition between Sir Henry Parkes and Sir John Robertson. Lord Augustus Loftus became governor in 1879, in time to inaugurate the first International Exhibition ever held in Australia. The census taken during the following year gave the population of the colony as 751,468, of whom 411,149 were males and 340,319 females. The railway to Melbourne was completed in 1880; and in 1883 valuable deposits of silver were discovered at Broken Hill. In 1885 the Hon. W. B. Dalley, who was acting Premier during the absence through ill-health of Sir Alexander Stuart, made to the British government the offer of a contingent of the armed forces of New South Wales to aid the Imperial troops in the Sudan. The offer was accepted; the contingent left Sydney in March 1885, on board the "Iberia" and "Australasian," and for the first time a British colony sent its armed forces outside its own boundaries to fight on behalf of the mother-country. In July of the same year Dr Moran, the Roman Catholic archbishop of Sydney, became the first Australasian cardinal. Lord Carrington, who was appointed governor in 1888, opened the railway to Queensland, and during the same year the centenary of the colony was celebrated. The agitation against the Chinese, always more or less existent, became intense, and the government forcibly prevented the Chinese passengers of four ships from landing, and passed laws which practically prohibit the immigration of Chinese.

Sudan contingent 1885.

Attitude towards federation.

In 1889 the premier, Sir Henry Parkes, gave in his adhesion to the movement for Australasian federation, and New South Wales was represented at the first conference held at Melbourne in the beginning of 1890. Lord Jersey assumed office on the 15th of January 1891, and a few weeks afterwards the conference to consider the question of federating the Australian colonies was held at Sydney, and the great strike, which at one time had threatened to paralyse the trade of the colony, came to an end. A board of arbitration and conciliation to hear and determine labour questions and disputes was formed, and by later legislation its powers have been strengthened. (For the labour legislation of the state, see Australia.) A census taken on the 5th of April 1891 showed that the population was 1,134,207, of whom the aborigines numbered 7705 and the Chinese 12,781. In 1893 a financial crisis resulted in the suspension of ten banks; but with two exceptions they were reconstructed, and by the following year the effects of the depression had passed away. Federation was not so popular in New South Wales as in the neighbouring colonies, and no progress was made between 1891 and 1894, although Sir Henry Parkes, who was at that time in opposition, brought the question before the legislature. The Rt. Hon. Sir William Duff, who followed Lord Jersey as governor, died at Sydney in 1895, and was succeeded by Lord Hampden. In 1896 a conference of Australian premiers was held at Sydney to consider the question of federation. The then Premier, Mr Reid, was rather lukewarm, as he considered that the free-trade policy of New South Wales would be overridden by its protectionist neighbours and its metropolitan position interfered with. But his hand was to a great extent forced by a People's Federation Convention held at Bathurst, and in the early portion of 1897 delegates from New South Wales met those from all the other colonies, except Queensland, at Adelaide, and drafted the constitution, which with some few modifications eventually became law. The visit of the Australian premiers to England on the occasion of Queen Victoria's Diamond Jubilee gave an additional impetus to federation, and in September 1897 the convention reassembled in Sydney and discussed the modifications in the constitution which had been suggested in the local parliaments. In January 1898 the bill was finally agreed to and submitted to a popular referendum of the inhabitants of each colony. Those of Victoria, South Australia and Tasmania agreed to the measure; but the majority in New South Wales, 5458, was not sufficient to carry the bill. The local parliament subsequently suggested certain amendments, one of them being that Sydney should be the federal capital. The general election returned a majority pledged to federation, and after some opposition to the federal Bill by the legislative council it was again referred to the electors of the colony and agreed to by them, 107,420 votes being recorded in its favour, and 82,741 against it. One of the provisions of the bill as finally carried was that the federal metropolis, although in New South Wales, should be more than 100 m. from Sydney. The Enabling Bill passed through all its stages in the British parliament during the summer of 1900, all the Australian colonies assenting to its provisions; and on the 1st of January 1901 Lord Hopetoun, the governor-general of Australia, and the federal ministry, of which the premier, Mr Barton, and Sir

William Lyne, Home Secretary, represented New South Wales, were sworn in at Sydney amidst great rejoicings. Large contingents of troops from New South Wales were sent to South Africa during 1899 and 1900. (G. C. L.)

NEWSPAPERS. The word "newspaper," as now employed, covers so wide a field that it is difficult, if not impossible, to give it a precise definition. By the English "Newspaper Libel and Registration Act" of 1881 it is defined as "any paper containing public news, intelligence or occurrences, or any remarks or observations therein printed for sale, and published periodically or in parts or numbers at intervals not exceeding twenty-six days"; and the British Post Office defines a newspaper as "any publication"—to summarize the wording—"printed and published in numbers at intervals of not more than seven days, consisting wholly or in part of political or other news, or of articles relating thereto or to other current topics, with or without advertisements." In ordinary practice, the "newspapers," as distinguished from other periodicals (*q.v.*), mean the daily or (at most) weekly publications which are principally concerned with reporting and commenting upon general current events.

For the laws regulating the conduct and contents of newspapers see PRESS LAWS and allied articles. The two real essentials of a "newspaper" are that it contains "news," and is issued at regular intervals. But the course of history has involved considerable changes both in the mode of issue and in the conception of what "news" is. For purposes of modern usage we have to distinguish historically between the product of a printing-press which is manifolded by that means, and a mere manuscript sheet which is only capable of being copied by hand. "News" again varies both according to the appetite and according to its method of collection and presentation. A distinction ought perhaps to be made between literary and pictorial news, but this is almost impossible in practice.

1. GENERAL CONSIDERATIONS

So far as very early forms of what we now recognize as corresponding to a "newspaper" are concerned, involving public reports of news, the Roman *Acta Diurna* and the Chinese *Peking Gazette* may be mentioned here, if only on account of their historical interest. The *Acta Diurna* ("Daily Events") in ancient Rome (lasting to the fall of the Western Empire), were short announcements containing official intelligence of battles, elections, games, fires, religious rites, &c., and were compiled by the *actuarii* officers appointed for the purpose; they were kept as public records, and were also posted up in the forum or other places in Rome, and were sometimes copied for despatch to the provinces. Juvenal speaks of a Roman lady passing her morning in reading the paper, so that it appears that private copies were in vogue. In China the *Peking Gazette*, as foreigners call it, containing imperial rescripts and official news, has appeared regularly ever since the days of the Tang dynasty (A.D. 618–905). Even older than it, as is alleged, is the monthly *Peking News* (*Tsing-Pao*)—now in appearance an octavo book of 24 pages in a yellow cover—which, according to M. Huart, French Consul at Canton, was founded early in the 6th century. But it is not of any real moment to do more than refer to such publications as these, which have little in common with the ideas of Western civilization. The "newspaper" in its modern acceptation can only be properly dated from the time when in Western Europe the invention of printing made a multiplication of copies a commercial possibility in any satisfactory sense.

On the point of terminology, Mr J. B. W. Williams, in his *History of English Journalism to the Foundation of the Gazette* (1908), the first scholarly account of the early evolution of the Press in England, describes the *Oxford Gazette* of 1665 (the original of the *London Gazette*) as the first English "newspaper" in the precise sense, *i.e.* a "paper" of news;[1] for it was a half-sheet in folio, two pages, and not a "pamphlet" as previous periodicals of news had been. A pamphlet (*q.v.*) was one or more unbound sheets of paper folded in quarto, and these earlier periodicals were called "news *books*." The term "news *sheet*," again, had implied, up to that time, a written letter of news—a "newsletter" as it came afterwards to be called. But it is hardly necessary to insist here on the distinction between a "news book" and a "newspaper," interesting as it is to note that the English inclusion of newspapers among "books" for the purpose of the law of copyright is strictly justified by the original nomenclature. The "newsbook" made what is for modern purposes the essential advance upon either the written "newsletter" or the isolated printed announcement of some event, in being both printed and also issued in a series at regular and continuous intervals. Yet both these forms of publication were in the direct ancestry of the newspaper. The writing of "letters of news" or "letters of intelligence" was a regular profession before the printed newspaper was introduced, and lasted as such for some time afterwards, having indeed the advantage of being outside the necessity of obtaining a licence, which hampered the printed publication; and the profession of "scrivener" naturally suggested that of the later type of journalist. Of what used, again, to be called a "relation," *i.e.* a statement of an isolated piece of news, there are various printed examples as early as during the latter part of the 15th century. For instance, an official manifesto of Archbishop Dietrich of Cologne was printed at Mainz in 1462. A French pamphlet giving an account of the surrender of Granada to Ferdinand and Isabella—"le premier jour de janvier dernièrement passé"—appeared in 1492.

Precisely at what point, and in what instance, it can be said that a continuous series of news-pamphlets started, which can therefore be called the earliest newspaper, is hard to decide, upon the materials now available. But it was on the continent of Europe, and not in England; and probably in the Netherlands. We have, for instance, pamphlets in the British Museum, which contain news-items and suggest periodical publication, though they are not actually known to form copies of a regular series. A *Newe Zeytung; Die Schlact des turkischen Keysers, &c.*, dates from 1526; another *Newe Zeytung*, still more varied in its contents, contains a letter from Winchester dated July 24, 1554. In Germany alone about 800 examples of such news-pamphlets dating earlier than 1610 are known. The effect of the Cologne *Mercurius Gallobelgicus* (1594) on English purveyors of "relations" is dealt with below (under *United Kingdom*); but this was rather a book than a newspaper. The earliest plainly periodical publication containing "news of the day" was, however, the German *Frankfurter Journal*, a weekly started by Egenolph Emmel in 1615. The Antwerp *Nieuwe Tijdinghen* followed in 1616; and in 1622 the history of English newspapers begins with the *Weekly Newes* published in London by Archer and Bourne. From this point we are on firmer ground, and the evolution of the modern Press in the different countries, as traced below, can be continuously followed. It is worth noting that a link in the history of journalism with the Roman *Acta Diurna* is provided by the Venetian government written *gazetti* (from which comes our "gazette") of the 16th century, official bulletins or leaflets dealing with public affairs, which were avowedly based on the ancient Roman model. Italy indeed originated not only the title "gazette" (probably derived from the Gr. γάζα, *i.e.* treasury of news), but also that of "coranto" (Fr. *courant*; also early anglicized as "current," *i.e.* a "running" relation), both of which are familiar in the history of the English and foreign Press.

Journalism.

The art and business of journalism, as now understood—taking "journalism" here in the sense of the production of the literary contents of a newspaper, and not the production and distribution of the printed sheet itself—is a combination of the mere recording or reporting of news and of its presentation in such a way, and with such comment, as to influence the minds of readers in some particular direction. The history of the "leading article" as a great factor in the shaping of public opinion begins with Swift, Defoe, Bolingbroke and Pulteney, in the many English newspapers, from the *Review* and the *Examiner* to the *Craftsman*, by which was waged the keen political strife of the years 1704–1740. There is no counterpart to it in France until the Revolution of 1789, nor in Germany until 1796 or 1798. It was a Frenchman who wrote—"Suffer yourself to be blamed, imprisoned, condemned; suffer yourself even to be hanged; but publish your opinions. It is not a right; it is a duty." It was in England that the course so pithily described was actually taken, in the face of fine, imprisonment and pillory, at a time when in France the public had to depend upon foreign journals illicitly circulated, when its own chief writers resorted to clandestine presses, to paltry disguises, and to very poor subterfuges to escape the responsibilities of avowed authorship, and when in Germany there was no political publicity worthy to be named. When the *Mercure de France* (1672), after a long period of mediocrity, came into the hands of men of large intellectual faculty, they had the most cogent reasons for exerting their powers upon topics of literature rather than upon themes of politics. True political journalism dates in France only from the French Revolution (see, for instance, MALLET DU PAN), and it then had a very brief existence. It occupied a cluster of writers, some of whom left an enduring mark upon French literature. A term of high aspiration was followed quickly by a much longer term of frantic licence and of literary infamy. Then came the long rule of a despotic censorship; and cycles of licence followed by cycles of repression. In 1870 indeed the democratic government at Bordeaux issued against journals of high aims and of unspotted integrity, but opposed to its pretensions, edicts as arbitrary as the worst acts in that kind of Napoleon I., and unparalleled in the whole course of the government of Napoleon III.

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[1] For the earliest known use of the term "newspaper" he cites a letter in 1670 to Charles Perrot, second editor of the *Gazette*: "I wanted your newes paper Monday last past."

In all the other countries of Europe political journalism, in any characteristic sense, was the creation of the 19th century—somewhat earlier in the century in northern Europe, somewhat later in southern. The *Ordinarie Post-Tidende* of Stockholm dates indeed from 1643, but until recent times it was a mere news-letter. Denmark had no sort of journal worth remark until the foundation in 1749 of the *Berlingske Tidende*, and that too attained to no political rank. The *Gazette* (*Viedomosti*) of St Petersburg—the patriarch of Russian newspapers—dating from the 16th of December 1702, is a government organ, and nearly synchronizes with the *Boston News-Letter* (1704), the first successful attempt at a newspaper in the British colonies in America. Journalism in Italy begins with the *Diario di Roma* in 1716, but in politics the Italian press remained a nullity for all practical purposes until nearly the middle of the 19th century, when the newspapers of Sardinia, at the impulse of Cavour, began to foreshadow the approach of the influential Italian press of a later day. In Spain no rudiments of a newspaper press can be found until the 18th century; the *Gaceta de Madrid* started about 1726. As late as in 1826 an inquisitive American traveller recorded his inability to lay his hands, during his Peninsular tour, upon more than two Spanish newspapers.

While originally the newspaper depended entirely on its own reporters and correspondents for news, and still largely does so, the widening of the field of modern journalism is largely due to collective enterprise, by which outside organizations known as "news agencies" send a common service of news to all papers which arrange to take it. The first of the great collecting and distributing news agencies, Reuter's Agency, was founded by Julius Reuter, a Prussian government-messenger, who was impressed by the common interest roused by the revolutionary movements of 1848. In 1849 he established a news-transmitting agency in Paris, with all the appliances that were then available. Between Brussels and Aix-la-Chapelle he formed a pigeon-service, connecting it with Paris and with Berlin by telegraph. As the wires extended, he quickly followed them with agency-offices in many parts of the continent. He then went to London, where his progress was for a moment held in check. Mr Walter of *The Times* listened very courteously to his proposals, but (on that first occasion) ended their interview by saying, "We generally find that we can do our own business better than anybody else can." He went to the office of the *Morning Advertiser*, which had then the next largest circulation to that of *The Times*, and had better success. He entered into an agreement with that and afterwards with other London journals, including *The Times*, and also with many commercial corporations and firms. The newspapers, of course, continued to employ their own organizations and to extend them, but they found great advantage in the use of Reuter's telegrams as supplementary. Within a few years the business is said to have yielded the founder some £25,000 a year, and in 1865 it was transferred to a limited company. In later years this type of news-agency operating all over the world was repeated by others, and also by agencies operating mainly or exclusively only in one country.

It is no longer possible nowadays to confine the meaning of "journalism" merely to the work of those who write for the Press. Properly it may be said to include the whole intellectual work comprised in the production of a newspaper; and although the designation of "journalist" is generally applied only to editors and to writers, and would not be extended at all to the purely mechanical staff—the compositors, foundry-men and machinists—nor even to the proof-readers, whose sphere is analogous rather to the sub-editorial than to the mechanical departments, the modern tendency has nevertheless been, not only to install mere reporting (*q.v.*) in a place of high importance, but to give increased weight in journalism to those who occupy what may be called the "managerial" offices, the business side of making a paper pay having itself developed into an art on its own account. To be a great "journalist" was once, but is hardly now, the same as being a great "publicist." The publicist proper is he who delivers his views on public affairs in the Press; but the excellence of his articles may nevertheless be consistent with the journal being a disastrous failure, and his reputation as a journalist is then but poor. The great journalist is he who makes the paper with which he is connected a success; and in days of competition the elements necessary for obtaining and keeping a hold on the public are so diverse, and the factors bearing on the financial success, the business side, of the paper are so many, that the organization of victory frequently depends on other considerations than those of its intrinsic literary excellence or sagacity of opinion, even if it cannot be wholly independent of these. The modern newspaper, moreover, depends for its financial success no longer primarily on its receipts from circulation, but on its receipts from advertisements; and though these can only ultimately be secured on the basis of circulation (the number of people who buy and read the paper), the establishment of the paper as the organ of a large body of readers for whose custom it is desirable to advertise often involves other capacities than those of the great publicist; and even in so far as the circulation depends on the attractiveness of its "news," the direction given to the supply of news may be managerial rather than editorial. Thus, in the division of labour, the editorial functions, formerly supreme and all-embracing, because the excellence of the contents of the paper made its success, have gradually, by a fissiparous process, yielded some of their authority to the managerial functions, and these have grown into an independence which—since editorial possibilities ultimately depend on financial resources—has given increased importance in journalism to the business side.

It must suffice here to say therefore that the work of journalism may be broadly divided into its editorial and managerial sides. And apart from exceptional cases of a working proprietor who is both editor and manager, or of a managing-editor, or of a great manager who exercises editorial functions, or a great editor who exercises managerial functions, the ordinary course is to keep them fairly distinct. The managerial side involves the business work of a paper, including the obtaining of advertisements and all the operations directly connected with producing it and making it pay as a commercial enterprise. The editorial side is engaged—however much managerial exigencies may dictate its policy—in providing the "reading matter" which forms its contents, other than such as is of the nature of advertising. The editorial staff includes editors and assistant-editors, sub-editors (in Great Britain a term usually restricted in daily journalism to those engaged in the "news" departments), leader-writers, critics, reporters (more narrowly considered part of the "sub-editorial" staff), &c. The actual owner of the paper, the proprietor, may or may not take part in either side, but in law his authority is delegated to those who produce it. The older ideas of journalistic management survive in making the editor, publisher and printer, but curiously not the "manager," liable in a writ for libel, contempt of court, &c., together with the proprietor in English law. But no satisfactory legal definition of "editor," still less of "manager," is possible, since their positions and powers vary according to circumstances.

So far as the general relations of the staff of a paper with its proprietor are concerned, we may briefly note that engagements are contracts for personal service; they will not therefore be specifically enforced, and the remedy for injury is dismissal or action for damages; and they must be in writing and stamped, to be evidence in law, if for a year or longer. The editor is the agent of the proprietor, and binds him for acts within the scope of editorial authority (which includes the insertion of any matter in the paper). Being an agent he can have no power as against the proprietor, but unreasonable interference on the latter's part may entitle an editor to an action for breach of contract or for damage to his professional reputation: while gross misconduct on the part of an editor might similarly entitle the proprietor to damages. Letters, manuscripts, &c., come into the editor's hands as agent for his proprietor, and are the latter's property. Uninvited contributors send him articles at their own risk, but the sending to them of a type-set proof has been held to be evidence of acceptance. Apart from special terms, the editor is entitled to "edit" such articles, *i.e.* use them wholly or in part, or alter them; he has a free hand to do so in the case of anonymous articles; in the case of signed articles it is clearly his duty to keep them free from libel or illegality, but the right to edit is limited in so far as his alterations might attribute to the writer anything which would give the latter a claim for damages. Though the highest function of an editor is embodied in the etymology of the word (a "bringer forth" or producer), as one who acts as the literary midwife in the literary setting forth of ideas, it is probably his use of the proverbial blue-pencil, altering or deleting, which is generally associated with the word "to edit." Each aspect, however, of editorial work has its own importance—the organization and inspiration on the one hand, the moulding into shape on the other. And "good" editing is necessarily relative, depending to a certain extent on the character of the paper which it is intended to produce.

See PRESS LAWS, LIBEL, COPYRIGHT, &c.; and generally, for law, Fisher and Strachan, *Law of the Press* (2nd ed., 1898).

The history of the Newspaper Press is told for various countries of importance under their respective sections below. The practical development of the modern newspaper is indeed due to a union of causes, largely mechanical, that may well be termed marvellous. A machine (see PRINTING) that, from a web of paper 3 or 4 m. long, can, in one hour, print, fold, cut and deliver many thousand perfected broadsheets, is, however, not so great a marvel as is the organizing skill which collects information by conversation, post or telegraph, from all over the world, and then distributes these communications in cheap printed copies regularly every day to an enormous public, sifted, arranged and commented upon, in the course of a few hours. But for a high ideal of public responsibility and duty, conjoined with high culture and with great "staying-power," in the editorial rooms, all these marvels of ingenuity—which now combine to develop public opinion on great public interests, and to guide it—would be nothing better than a vast mechanism for making money out of man's natural aptitude to spend his time either in telling or in hearing some new thing. A newspaper, after all, is essentially a business, conducted by its proprietors for gain. That the commercial motive is a danger to honest journals is obvious, were it not indeed that here as elsewhere honesty is in the long run the best commercial policy.

The influence of American journalism.

The example of American journalism has so greatly affected the developments in England and other countries since about 1890, that it is important to realize the conditions under which, in the United States, the newer type of journalism arose.[1] In substance very much the same causes produced very much the same effects, though at a slower rate, in England; but British conservatism operated here as elsewhere. Several circumstances combined in the last quarter of the 19th century to promote great changes in the condition and character of American newspapers. (1) Paper was enormously cheapened. Before and during the Civil War it cost large New York newspapers at times 22 cents per lb for even a poor quality. In 1864 it cost 16 cents in February, and ran up a cent every month till in midsummer it touched 21 and 22 cents. As late as 1873 it was still sold at from 12 to 13 cents. As new materials were found and machinery was improved, the price slowly declined. When the manufacture from wood-pulp was made commercially successful, the profits tempted great investments of new capital; bigger mills were built, competition became keen, and new inventions cheapened the various processes. Thus in New York in 1875 the average price for the year for fair "news" paper was 8·53 cents per lb; in 1880, 6·92; in 1885, 5·16; and in 1890, 3·38. At last, about 1897, large contracts for a good average quality, delivered at the press-room, were made in New York at as low a figure as 1·5 cents per lb. Subsequently advances in raw materials, one or two dry seasons which curtailed the water-power, and combinations resulting from over-competition, caused some reaction. Yet it could still be said in 1900 that prudent publishers could buy for $1 as much paper as would have cost them $3 twenty years earlier, or $10 about 1875. (2) Printing machinery for great newspaper offices was transformed. Instead of the old cylinder presses fed by hand, with the product then folded and counted by hand, machines came into common use to print, fold, cut, paste and count and deliver in bundles, ready either for the carrier or the mail, at rates of speed formerly not dreamed of. The size of the paper could be increased or diminished at will, as late news might require, within an hour of the time when it must be in the hands of its readers. Instead of cutting down other news to make room for something late and important, more pages were added, and this steadily increased the tendency to larger papers. Devices were also found for printing the same sheet in different colours at the same rate of speed; and in this way startling headlines were made more startling in red ink, or a piece of news for which special attention was desired was made so glaring that no one could help seeing it. (3) Hand-setting (for great newspapers) was practically abolished. Instead of the slow gathering of single types by hand separate lines were now produced and cast by machines, capable when pushed to their utmost capacity of doing each the work of five average compositors. Thus between 1880 and 1900 there were reductions in the cost—(1) of the raw material for the manufacture of newspapers from two-thirds to three-fourths; (2) of printing, at least as much; and (3) of composition, at least one-half, while the facilities in each department for a greater product within a given time were enormously increased. The obvious business tendency of these changes was either a reduction in price or an increase of size, or both.

Electricity became the only news-carrier. New ocean cables broke down the high rates charged at the outset. The American news appetite, growing by what it fed on, soon demanded far fuller cablegrams of European news; and the wars in which Great Britain and the United States were involved accelerated the movement. The establishment of a strong telegraph company, capable of efficient competition with the one which practically controlled the inland service in 1880, likewise cheapened domestic news by telegraph and increased its volume. The companies presently recognized their interest in encouraging rival news associations, and so getting double work for the wires, while promoting the establishment of new papers. Wild competition between news agencies was thus encouraged (even in the cases of some already known to be bankrupt) to the extent of credits of a quarter or half a million dollars on telegraphic tolls. The rapid spread of long-distance telephone lines further contributed to this tendency to make the whole continent a whispering gallery for the press. Every great paper had both telegraph and telephone wires run directly into its newsroom.

Photography and etching were added to the office equipment. Various "process" methods were found, by which the popular desire for a picture to make the news clearer could be gratified. Drawings were reproduced successfully in stereotype plates for the fastest rotary presses. The field of political caricature had heretofore belonged exclusively to the weekly papers, but the great dailies now seized upon it, and commanded the service of the cleverest caricaturists. Newspapers found a way to put the "half-tone" etching of a photograph, such as had heretofore been printed only on slow flat presses, bodily into the stereotype plate for the great quadruple and octuple presses; and thereafter portraits and photographs of important groups on notable occasions began to appear, embodied in the text describing the occurrences, a few hours after the camera had been turned on them, in papers printed at the rate of thirty and forty thousand an hour. In this development of illustrated daily journalism America rapidly went far beyond other countries.

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[1] The account which follows is reproduced from Mr Whitelaw Reid's article in the 10th edition of the *Ency. Brit.*

News agencies multiplied and gave cheaper service. The New York Associated Press had been the chief agency for the whole country. It admitted new customers with great caution, and its refusal to admit was almost prohibitory, while its withdrawal of news from established papers was practically fatal. It was owned by the leading New York journals. Their disagreements led to the success of a rival, the United Press. The New York Associated Press finally dissolved, most of the New York members became connected with the United Press, and many of their Western and Southern clients organized the Associated Press of Illinois, more nearly on a mutual plan. The United Press finally failed, and most of its New York members went into the Associated Press of Illinois, which in turn was forced into plans for reorganization by decisions of Illinois courts against its rules for confining its services to its own members. One result of these successive changes was to encourage new papers by making it easy for them to secure a comprehensive news service, and thus to threaten the value of the old papers. Another was the struggle to increase the volume of the service, leading to reports of multitudes of occurrences formerly left without notice in the great news centres, and extension of agencies into the remotest hamlets, and less scrupulous care in the consideration and preparation of the reports filed at many points for transmission. News syndicates for special purposes also developed, as well as small news associations, sometimes with a service sufficient for the wants of many papers. The almost official authenticity which the public formerly attributed to an Associated Press despatch measurably declined; and the dailies found more difficulty in sifting and deciding upon the news that came to them, and incurred more individual responsibility for what they printed.

The great accumulation of private fortunes also changed the newspapers. Millionaires came to think it advantageous to own newspapers, openly or secretly, which could be conducted without reference to direct profits, for the sake primarily of political, social or business considerations. To secure large circulations for such enterprises they were willing to sell the paper for long periods at much below the cost of manufacture, and to spend money for news and writers more lavishly than the legitimate business of established journals would allow. Great business corporations seeking for favourable or fearing adverse legislation sometimes made secret newspaper investments for the same purpose.

These various new conditions, affecting the newspaper press of the United States with ever-increasing force, gradually changed the average character of the papers and their effect upon their readers. A large circulation became the only evidence of success and the only way to make the sale of a newspaper below cost ultimately a source of profit. A disposition to lower the character in order to catch the largest audience naturally followed. Criminal news was reported more fully than formerly, with more piquant details. Competitors outdid each other in the effort to treat all news with unprecedented sensationalism. The lowest possible price was regarded as essential to the largest possible circulation, and so a favourite price even for large newspapers became one cent to the public, and consequently only half a cent to the publishers, whose business was practically all at wholesale with dealers and news companies. The feeling that the most must be given for the money prompted also the great increase in size, only made possible by the reductions in paper, composition, presswork, &c., already noted. Yet mere quantity and mere sensation after a time palled on the jaded appetite, and the spice of intense personality became necessary. As most people like to see their names in print, and can bear criticism of their neighbours with composure, these two chords of human nature were incessantly played upon.

Characteristics of modern newspapers.

The principal feature in the development of modern newspapers is the importance attached to obtaining, and prominently displaying, "news" of all sorts, and incidentally there has been a considerable change of view as to what sort of news should be given prominence. Sport and finance are treated at greater length and more popularly; and, partly owing to the largely increased number of papers and consequent greater competition, partly to a desire to appeal to the larger public, which is now able to read and ready to buy reading-matter, there has been a tendency to follow the tastes of the vast number of people who can read at all rather than of those to whom reading means a very high standard of literary and intellectual enjoyment. This has involved a more popular form of presenting news, not only in a less literary style and by the presentation of "tit-bits" of information with an appeal to cruder sentiments, but also in a more liberal use of headlines and of similar devices for catching the eye of the reader. "Personal journalism," *i.e.* paragraphs about the private life or personal appearance of individuals—either men or women—of note or notoriety in society or public affairs, has become far more marked; and in this respect, as in many others, encouragement has been given to a spirit of inquisitiveness, and also to a widespread inclination either to flatter or be oneself flattered, the latter desire being indeed conspicuously prevalent in these "democratic days" even among the classes which once affected to despise such publicity.

The modern impulse, culminating in England in the last decade of the 19th century in what was then called the "New Journalism," was a direct product of American conditions and ways of life, but in Great Britain it was also the result of the democratic movement produced by the Education Act of 1870 and the Reform Act of 1885; and it affected more or less all countries which came within the influence of free institutions. The most generally adopted American innovation (for, though not known before even in England, it was practically a new thing as carried out in American newspapers) was the "interview" (the report in dialogue form of a conversation with some prominent person, whose views were thus elicited by a reporter), which during the early 'nineties was taken up in varying degrees by English newspapers; it was "cheap copy"—the word "copy" covering in journalistic slang any matter in the shape of an article—and could easily be made both informing and interesting; and "interviewing" caused a large increase in the journalistic profession, notably among women. The rage for the "interview" again declined in vogue outside American journalism in proportion as people of importance became less ready to talk for publication—or for nothing.

From the highest class of paper downwards, however, real news—and especially early news—has been more and more sought after, and all the force of organization both within individual newspaper offices and outside them in the shape of news agencies, has been applied to the purpose of obtaining early news and publishing it as quickly as possible. In this matter the Press has certainly been helped most materially not only by the advance in telegraphic facilities (see REPORTING) but by all the other new rapid methods of production in Typesetting (see TYPOGRAPHY) and Press-work (see PRINTING) which have been the feature of the modern period. The vastly increased amount of telegraphic work now done has perhaps not been all pure gain to the best sort of journalism. It has to some extent weakened the effect of the considered article, and led to hasty conclusions and precipitate publication, with results that sometimes cannot be compensated for by any later contradiction or modification. In some cases a reaction ensued. Take for instance the case of war correspondence. The prestige of the "war correspondent" became at one time enormous, and his evolution from the days of H. Crabb Robinson, who wrote to *The Times* from Spain in 1807–1809, has been traced by busy pens with all the precision of a special interest in history. Certainly nothing finer in active English journalism was ever done than in W. H. Russell's letters to *The Times* from the Crimea, or the work of Archibald Forbes and others in the Franco-Prussian War; but more recently, although first-rate abilities have been forthcoming, the news agencies, often favoured by the military Press censor, have generally been ahead of the "specials," and the individual work that might have been done for isolated papers has been much hampered by restrictions. This is due partly to the increased competition, partly to military jealousy and officialism, partly to the vital importance of secrecy in modern warfare: but the result has been to a considerable extent to reduce the value of the "war correspondent" as compared with what was done in the Press in the days of Russell and Forbes. A letter arriving weeks after the telegraphic account, however meagre, is largely shorn of its interest. Given a brilliant foreign correspondent, the form of letters sent home from abroad on general subjects is still, no doubt, very effective. But the telegram is necessarily the backbone of the news service of the daily paper. The Press, be it added, is frequently able to acquaint the public with what is going on while a government itself is still uninformed. The work of officials and statesmen is admittedly increased and sometimes embarrassed by the new strain imposed upon them in consequence, but the public are on the whole well served by their emancipation from the obscurity of purely official intelligence and by the obligation of straightforward dealing imposed upon governments, which in their nature are apt to be secretive.

Connected with the increased attention given to news is the greater vogue of the newspaper "poster" or contents-bill, which is exhibited in the streets. The poster has acquired commercial importance for indicating the possession of some special news without revealing its whole nature, and the tendency has been to have fewer lines and fewer words in larger type, in order to catch the eye more impressively. Rotary machines for printing these posters enable them to be turned out with greater rapidity; and in the case especially of evening papers it is possible at any time during the afternoon, should important news arrive, to issue a new poster and thus secure a large street sale by the insertion of a few words only in the "stop press" or "fudge" without the necessity of changes in the plates. The catch-penny style of the poster has transferred itself also to the newspaper itself, in the shape of the "scare" headlines. And there has been a tendency for the news to be so "displayed" in the headlines as to make any further reading unnecessary.

Apart from the publication of "news" and reports, and occasional original articles of a descriptive and miscellaneous character, the chief function of a newspaper is criticism, whether of politics or other topics of the moment, or of the drama, art, music, books, sport or finance. As regards sport, the comments of the various newspapers are mainly descriptive; but a prominent feature in the United Kingdom has been the attention paid to "tipping" probable winners on the Turf, and the insertion of betting news. The publication of the "odds" some time before a race, and of starting-prices, undoubtedly helped to foster the increase of this form of gambling, as was pointed out in the report of the Select Committee on Gambling in England in 1902, but the efforts to induce the English newspapers to keep such matter out of their columns have not had much success. The *Daily News* (London) in 1902 started on a new proprietorship under Mr Cadbury with a declared policy of not referring to horse-racing or betting; but when its principal proprietors in 1909 became largely concerned also in the *Star* and *Morning Leader*, they were apparently content to retain the "tipster" elements which bulked large in them, and this inconsistency aroused considerable comment. The sporting interest (*i.e.* the desire to know results of racing and cricket, &c.) largely inflates the circulation of most of the London and provincial halfpenny evening papers.

Between about 1870 and 1880 the English newspapers began to pay increased attention to literary and artistic criticism; and gradually the daily Press, which formerly applied itself mainly to recording news, and to political, social and financial subjects, became a formidable rival in this sphere to the weekly reviews and the monthly and quarterly magazines. Books are "reviewed" in the Press partly for literary reasons, partly as a *quid pro quo* for publishers' advertisements; and the desire for "something to quote," irrespectively of the responsible nature of the criticism, became in the early 'nineties a mania with publishers, who in general appear to have considered that their sales depended upon their catching a public which would be satisfied by seeing in the advertisement that such and such a book was pronounced by such and such a paper to be "indispensable to any gentleman's library." Unfortunately the enormous output of books made it impossible for editors to have them all reviewed, and equally impossible for them to be certain of discriminating properly between those which were really worth reviewing or not. The result has been that the work of book-reviewing in the newspapers is often hastily and poorly or very spasmodically done. But there have been some honourable exceptions. The "Literary Supplement" (since 1901) to *The Times* is the most ambitious attempt made by any daily paper to deal seriously with literature. The *Daily Chronicle* started a "literary page" in 1891, and it was imitated in varying degrees by other English papers. The *Scotsman* and some other provincial papers have also for some time devoted much space to excellent literary criticism. The "literary supplement" has also been developed to excellent effect in some journals in the United States, such as the New York *Times*, where this feature was indeed originally started. As a form of serious criticism, however, the review has, in the general newspapers of later years, taken a lower place than must be desirable, partly owing to the cause named, partly to a tendency among reviewers either to indiscriminate praise or to irresponsible irrelevance, partly to a suspicion of "log-rolling"; and to a large extent it has become the practice merely to treat the appearance of new books as so much news, to be chronicled, with or without extracts, according as the subject makes good "copy," like any other event of the day.

The modern tendency, resulting from the enormous amount of newspaper production, has been to make journalism less literary and at the same time literature more journalistic. Either as reviewers, leader-writers or editors, many of the principal "men of letters" have worked for longer or shorter periods as writers for some newspaper or other, and much of the published literature of the time has appeared originally in the columns of the newspapers, in the form of essays, poems, short stories or novels (in serial form). Publication in this shape has many advantages for an author besides that of additional remuneration; it offers an opportunity for a new writer to try his wings, and it helps to introduce him at once to a large public. Moreover, the newspapers read by the educated classes profit by the superior class of journalist represented by writers of a literary turn. But the increased popularity of the newspaper, and the close tie between it and the literary world, have on the whole impressed a journalistic stamp upon much of the literature of the day. However popular at the moment a writer may be, the infection with journalistic methods—while rightly employed by journalists, as such, in dealing with contemporary events and for strictly contemporary purposes—is apt to be responsible for something wanting in his work, the loss of which deprives him of the permanent literary or scientific rank to which he might otherwise aspire.

The new point of departure for the more popular style of English journalism (apart from the influence of American models) is really to be found in the publication of Sir George (then Mr) Newnes's *Tit-Bits* in 1881. This penny weekly paper, with its appeal to the masses, who liked to read snippets of information brightly put together, showed what enormous profits were to be made by this style of enterprise; and the multiplication of journals of this description—notably Mr

Alfred Harmsworth's (Lord Northcliffe's) *Answers* (1888) and Mr C. Arthur Pearson's *Pearson's Weekly* (1890)—had a further influence on public taste, so that even the classes above that which primarily enjoyed these publications were affected in the same direction. A new note was thus introduced into English daily journalism in England. Whereas before 1885 the chief feature in London journalism, outside *The Times* and other great morning papers, had been the literary brilliance of the *Saturday Review* and its evening paper analogues, the *Pall Mall* and *St James's Gazettes*, in the early 'nineties came a craze for "actuality." Mr T. P. O'Connor, with his vivid pen (first in the *Star*, then in the *Sunday Sun* and elsewhere), set the pace for a crowd of imitators; the successful establishment of the *Daily Mail* in 1896, with its system of compressing the news of the day briefly and pointedly into short paragraphs, while at the same time catering for all tastes and employing first-rate correspondents and reporters to supply it with special information, gave a distinct shake-up to the older traditions of daily journalism. The old tendency had been to rely for success either on writers of exceptional knowledge or capacity, men who were essentially amateurs, or on a class of professional journalists who at all events had a literary tradition behind them. A different sort of amateur now arose, and a different sort of professional. Even when an attempt was made to provide for a literary public, success came to be generally sought by popular rather than by literary methods. The literary public in the proper sense of the word is inevitably a small one, and the greater part of the Press deals with literature on lines more suited to a larger and less refined *clientèle*. It may be claimed, no doubt, that the best sort of journalism shows a high, and sometimes the highest, literary standard, but the fact remains that for the bulk of modern journalism its conductors realize only too well that their business is to appeal to the masses, and to a standard of education and taste which falls far short of anything that can be called intellectual.

It is often said that the leading articles or "editorials," expressing the attitude of the paper towards important subjects of the day, have lost their importance, but this is only a half-truth. Allowance being made for changes in literary style, the actual amount of good writing in this department in the great organs of opinion—well-informed, scholarly and incisive—may justly be considered equal to anything done in what are sometimes considered its palmy days.[1] On the other hand, it is undoubtedly the case that in the newer type of newspaper, which appeals rather on the score of its tit-bits of news and rapid readableness to a more casual and less serious public, the whole *raison d'être* of the old-fashioned leading article has disappeared, and its place is taken by a few brief notes, merely indicating the attitude of the paper, and not seeking to discuss any subject comprehensively at all. The "leader" is to some extent a form of newspaper routine, but on the whole it is a routine which has proved its value by experience. The continuous high standard of tone, maintained by so many great journals, depends more largely than is sometimes realized on the regular industry and skill of those whose business it is to discuss the latest developments of affairs every day or every week in a manner which gives reasonable men something fresh to think about, or interprets for them the thoughts which are only vaguely floating in their minds. The liberty of the Press enables every sort of view, right or wrong, to be discussed in this prominent form; and thus every aspect of a question is brought out in public, to be accepted or rejected according to the weight of evidence and of argument.

The same end is assisted by the devotion of so much space to "letters to the editor." It is sometimes said that in England the London *Times* owes its position largely to the fact that if any individual grievance is felt it is generally ventilated by a letter to *The Times*. Whatever may be the organization of the Press for reporting the news of the day, the resources of no newspaper staff are great enough to cover an area of information as large as that represented by its readers; and the value of the outlet for opinion and information afforded by the correspondence columns cannot be overstated.

Most people probably read more papers than is compatible with a healthy mental digestion, but the Press, as such, has to-day an enormous—and none the less real because subtle—influence; and this is largely due to the reputation maintained by its higher representatives. While, individually, the great papers wield considerable influence, due partly to real sagacity and authority, partly to the psychological effect produced by mere print or by reiterated statement, collectively the Press now represents the Public, and expresses popular opinion more directly than any representative assembly. The multiplication of "Press-cutting agencies," and of such essentially "newsy" publications as *Who's Who* (the English form of which originated with Mr Douglas Sladen in 1897) and similar biographical reference books—all tending to increase the publicity of modern life—has contributed materially to the pervading influence of journalism in everyday life and the constant dependence of society in most of its manifestations on the activity of the "Fourth Estate." (H. Ch.)

Price of newspapers.

From the introduction of low rates for telegraphy and from the increase of mechanical methods of production, and of the desire to read and the growth of advertising (see Advertisement), the modern low-priced newspaper has resulted. But it is by no means a recent development merely. In France, Theophrastus Renaudot's *Gazette de Paris* (1631) was started at the price of six centimes. In England we find the first mention of inexpensive news-sheets towards the close of the 17th century, when a number of halfpenny and farthing *Posts* sprang into existence, and appeared at more or less irregular intervals. These consisted of small leaflets, containing a few items of news—sometimes accompanied by advertisements—and were commonly sold in the streets by hawkers. The rise in cost was really due to artificial causes. The increase of these newspapers, and especially the growing practice of inserting advertisements, led the legislature to contemplate a stamp tax of a penny per sheet on all news publications. As a protest, a curious pamphlet—of which a copy is preserved in the British Museum—was issued in 1701, and it sheds an interesting light upon this early phase of cheap journalism. The pamphlet is entitled *Reasons humbly offered to the Parliament on behalf of several persons concerned in the paper-making, printing and publishing of the halfpenny newspapers.* It states that five master printers were engaged in the trade, which used 20,000 reams of paper per annum. The journals are described in the following terms: "The said newspapers have been always a whole sheet and a half, and sold for one halfpenny to the poorer sort of people, who are purchasers of it by reason of its cheapness, to divert themselves, and also to allure herewith their young children and entice them to reading; and should a duty of three halfpence be laid on these mean newspapers (which, by reason of the coarseness of the paper, the generality of gentlemen are above conversing with), it would utterly extinguish and suppress the same." The pamphlet goes on to say that hundreds of families, including a considerable number of blind people, were supported by selling the halfpenny journals in the streets.

In 1712 a tax of a halfpenny per sheet was imposed, and the cheap newspapers at once ceased to exist. This tax on the press was increased from time to time, till in 1815 it stood at fourpence per sheet. The usual price of newspapers was then sevenpence a copy. From these facts it seems highly probable that, had not the stamp tax been imposed, the halfpenny paper would soon have become the normal type, and would have continued so to this day. In 1724 a committee of the House of Commons sat to consider the action of certain printers who were evading the stamp tax by publishing cheap newspapers under the guise of pamphlets. They found that there were then two *Halfpenny Posts* published in London, one by Read of Whitefriars, and the other by Parker of Salisbury Street. There were also three weekly papers issued at a halfpenny a copy. The tax, after several reductions, was finally repealed on 15th June 1855, and a rush of cheap papers immediately followed. A penny became the usual price for London daily papers, with the exception of *The Times*, and halfpenny papers soon became common.

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[1] It must be remembered that the style of public speeches has also altered. Nobody thinks of quoting the classics nowadays in the House of Commons. A more business-like form of speech is adopted in public life, and the Press reflects this change.

The growth of the cheap newspaper has since been practically a simultaneous one throughout the civilized world. This has been notably the case in the United States, France and Great Britain. The general tendency in newspaper production, as in all other branches of industry, has in recent times been towards the lowering of prices while maintaining excellence of quality, experience having proved the advantage of large sales with a small margin of profit over a limited circulation with a higher rate of profit. The development—and indeed the possibility—of the cheap daily paper was due to a number of causes operating together during the latter half of the 19th century. Among these, the first place must undoubtedly be given to the cheapening of paper, through the introduction of wood pulp and the perfecting of the machinery used in the manufacture. From 1875 to 1885 paper cheapened rapidly, and it has been estimated that the introduction of wood pulp trebled the circulation of newspapers in England. Keen competition in the paper trade also did much to lower prices. At the same time the prime cost of newspaper production was increased by the introduction of improved machinery into the printing office. The growth of advertisements must also be taken into account in considering the evolution of the halfpenny journal. The income from this source alone made it possible to embark upon journalistic enterprises which would otherwise have been simply to court disaster. The popular journal of the present day does not, however, owe its existence and success merely to questions of diminished cost and improved methods of production. A change has come over the public mind. The modern reader likes his news in a brief, handy form, so that he can see at a glance the main facts without the task of reading through wordy articles. This is especially the case with the man of business, who desires to master the news of the past twenty-four hours as he travels to his office in the morning. It is to economize time rather than money that the modern reader would often prefer a halfpenny paper; while the man of leisure, who likes to peruse leading articles and full descriptive accounts, finds what he needs in the more highly priced journals. The halfpenny paper in England has not had to contend with the opposition that the penny newspaper met from its threepenny contemporaries in the 'fifties and 'sixties. This is largely due to the fact that in most cases the contributors, paper, printing and general arrangement of the cheaper journal do not leave much room for criticism. Mr G. A. Sala once complained that the reporters of the older papers objected to work side by side with him when he represented the first penny London daily (the *Daily Telegraph*), through fear of losing caste, but this does not now apply, for in the United Kingdom, France and the United States the cheap journals, owing to their vast circulation, are able to offer the best rates of remuneration, and can thus command the services of some of the best men in all the various departments of journalism. (N.)

Illustrated papers.

Another aspect of the newspaper which may here be considered is the introduction of pictorial illustrations (see also ILLUSTRATION). The earliest attempts at popular illustration of news events took the form in England of "broadsides." One broadside dated 1587 recounted the *Valiant Exploits of Sir Francis Drake*; another dated 1607 gave an account of *A wonderful flood in Somersetshire and Norfolk*. The series of murder broadsides which lasted almost to our own time commenced in 1613 with one that gave an account of the murder of Mr William Storre, a clergyman of Market Rasen, in Lincolnshire, by Francis Cartwright. Early in the reign of Charles I. there appeared a broadside which described a fall of meteors in Berkshire. A little later—in 1683—the *Weekly News* came out with the picture of an island which was supposed to have risen from the sea on the French coast. The execution of Strafford in 1641 was made the subject of a picture pamphlet that is to be seen in the British Museum, and in 1642 the first attempt to portray the House of Commons appeared in *A Perfect Diurnall of the Passages in Parliament*. In 1643 a pamphlet was published, called *The Bloody Prince; or a Declaration of the Most Cruel Practices of Prince Rupert and the rest of the Cavaliers in fighting against God and the True Ministers of His Church*. This contains a woodcut representation of Prince Rupert on his charger, one of the first attempts at providing the public with a portrait of a contemporary celebrity.

Soon after this there appeared a journal, entitled *Mercurius Civicus*, which frequently gave illustrations, and, allowing for the *Weekly News* with its one attempt at an illustration above mentioned, must be counted the first illustrated paper. *Mercurius Civicus*, however, only gave portraits; it published Charles I. and his queen, Prince Rupert, Sir Thomas Fairfax and all the leading men on both sides in the Civil War. Perhaps the most interesting illustration of the next four years was that contained in a tract intended to evoke sympathy for the conquered and captured king. It represented Charles in Carisbrooke Castle in 1648. There were many later attempts to depict the tragedy of Charles I.'s execution, and several woodcuts present to us also the execution of the regicides after Charles II. came to the throne. A broadside of the reign of the second Charles shows the Frost Fair on the Thames in 1683, and with a broadside describing *Great Britain's Lamentations, or the Funeral Obsequies of that most incomparable Protestant Princess*—Queen Mary, the wife of William III., in 1695—we close the illustrated journalism of the 17th century.

Curiously enough, the 18th century, so rich in journalistic enterprise and initiative so far as the printed page was concerned, did less than the previous century to illustrate news. In 1731, however, in the *Grub Street Journal*, there appeared the first illustration of the Lord Mayor's procession. In 1740 another journal, the *Daily Post*, gave an illustration of Admiral Vernon's attack on Porto Bello. The narrative was introduced by the editor with the information that the letter that he is printing is from a friend who witnessed the conflict between the English and the Spaniards. The writer of the letter, who must be put on record as the father of war correspondents, signed himself "William Richardson."

There were some interesting efforts to illustrate magazines about this time. In the *Gentleman's Magazine* for 1746 there was a lengthy account of the famous rising of 1745, and a map was given of the country round Carlisle, showing the route of the Scottish rebels; and in the same volume there was a portrait of the duke of Cumberland. In 1747 the *Gentleman's* gave a bird's-eye view of the city of Genoa, illustrating the account of the insurrection there, and so on year by year there were further pictures. In 1751 an obituary notice was illustrated by a portrait of a certain Edward Bright of Maldon, Essex. Mr Bright died at the age of thirty, and his interest to the public was that he weighed 42½ stones. There were a number of magazines besides the *Gentleman's* that came out about this time and continued well into the next century. In the *Thespian Magazine* for 1793, for example, there is an illustration of a new theatre at Birmingham. Then there were the *English Magazine*, the *Macaroni Magazine*, the *Monstrous Magazine*. Every one of these contained illustrations on copper, more or less topical.

William Clement, the proprietor of the *Observer*, the first number of which was published in 1791, was the first real pioneer of illustrated journalism, although his ideals fell short in this particular, that he was never prepared to face the illustration of news systematically; he only attempted to illustrate events when there was a great crisis in public affairs. In 1818 Abraham Thornton, who was tried for murder, appealed to the wager of battle, which after long arguments before judges was proved to be still in accordance with statute law, and he escaped hanging in consequence. Thornton's portrait appeared in the *Observer*. Clement owned for some time *Bell's Life* and the *Morning Chronicle*. All his journals contained occasional topical illustrations. The *Observer's* illustration of the house where the Cato Street conspirators met is really sufficiently elaborate for a journal of to-day, and in 1820 it gave its readers "A Faithful Reproduction of the Interior of the House of Lords as prepared for the Trial of Her Most Gracious Majesty Queen Caroline." In 1821 it published an interior of the House of Commons with the members in their places. The *Observer* of 22nd July 1821—the Coronation number—contained four engravings. Of the George IV. Coronation number Mr Clement sold 60,000 copies, but even that was nothing to the popularity that this journal secured by its illustrations of the once famous murder of Mr Weare and the trial of the murderer Thurtell. The *Observer* in 1838 gave a picture of the Coronation of Queen Victoria. In 1841 there was a fire at the Tower of London, when the armoury was destroyed. The *Observer* published three illustrations of the fire; it further published an emblematic engraving on the birth of the prince of Wales, and issued a large page engraving of the christening ceremony in the following January. Thus it had in it all the elements of pictorial journalism as we know it to-day.

The weekly *Illustrated London News* was, however, the first illustrated newspaper by virtue of its regularity. It was the first illustrated paper, because all the illustrations to which we have referred as appearing in the *Observer* and other publications were irregular. They came at intervals; they were quite subordinate to the letterpress of the paper; they were given only occasionally in times of excitement, with a view to promoting some little extra sale. That they did not really achieve the result hoped for to any great extent may be gauged by the fact that from 1842 to 1847 the *Observer* published scarcely any illustrations at all, and in the meantime the *Illustrated London News* had taken an assured place as a journal devoted mainly to the illustration of news week by week. That is why its first publication marked an epoch in journalism. The casual illustration of other journals still went on: the *Weekly Chronicle*, for example, still published a number of pictures; the *Sunday Times*, also a very old paper, illustrated in these early days many topical subjects. In 1834, indeed, it pictured the ruins of the House of Commons, when that building was burned down. A paper started in 1837 called the *Magnet* gave illustrations, one of them of the removal from St Helena and delivery of the remains of the emperor Napoleon to the prince de Joinville in 1840.

The first number of the *Illustrated London News* appeared on 14th May 1842. Its founder was Herbert Ingram (1811–1860), who was born in Boston, Lincolnshire, and started life amid the most humble surroundings, what education he ever received having been secured at the free school of his native town. Apprenticed at fourteen to a printer in Hull, he later settled in Nottingham as a printer and newsagent in a small way. It was during his career as a newsvendor at Nottingham that he was seized with the belief that it was possible to produce a paper entirely devoted to illustration of news. In the first number of the *Illustrated London News*, however, there was not a single picture that was drawn from actual sight, the factor which is the most essential element of the illustrated journalism of to-day. Sir John Gilbert (1817–1897), the artist, has stated that not one of the events depicted by him—a state ball at which the queen and the prince consort appeared, the queen with the young prince of Wales in her arms, and other incidental illustrations—was taken from life.

The *Illustrated London News* had not been long in existence before there were many imitators, in America *Harper's Weekly*, in France *L'Illustration* and in Germany *Über Land und Meer*, and from that day there has been constant development, the *Illustrated Zeitung* of Leipzig being perhaps the most striking. In America the use of illustrations in the daily papers has become a regular feature, culminating in the bulky Sunday editions of the principal journals; and the practice of presenting the news in pictorial form has increased continuously even in England. In 1910 three London daily newspapers were principally devoted to illustration—the *Daily Graphic*, the *Daily Mirror* and the *Daily Sketch*, while most of the penny and halfpenny journals included some form of pictorial matter. This change was due to the ever-increasing cheapening and ever-growing celerity of manufacture of what are known as half-tone blocks. It was in 1890 that the application of photography to illustrated journalism began in England, and by 1910 it had grown to enormous dimensions, but the first newspaper photographs (mainly portraits) had to be engraved on wood, although the use of half-tone came in well-nigh simultaneously. Up to 1890 illustrated journalism was in the hands of the artists, and the artists were in the hands of the wood engravers, who reproduced their work sometimes effectively—often inefficiently. But in the course of twenty years the wood engraver had been utterly superseded so far as illustrated journalism was concerned. The further developments of journalism seemed likely to be entirely in the direction of coloured reproductions, block-making and machinery for facilitating their production having made particularly rapid strides.

(C. K. S.)

Comparative statistics.

It is almost impossible by any statistical detail to give an idea of the advances made by the newspaper press as a whole; but an outline of the general results for 1828, 1866 and 1882, together with a fourth, as given in the 10th edition of this encyclopaedia for 1900, may have its utility.

The earliest summary is that of Adrien Balbi. It was published in the *Revue encyclopédique* for 1828 (vol. i. pp. 593–603), along with much matter of more than merely statistical interest. The numbers of newspapers published in different countries at that date are given as follows: France, 490; United Kingdom, 483; Austria, about 80; Prussia, 288; rest of the Germanic Confederation, 305; Netherlands, 150; Spain, 16; Portugal and the Azores, 17; Denmark, Sweden and Norway, 161; Russia and Poland, 84. The respective proportions of journals to populations were—for Prussia 1 to 41,500, German states 1 to 45,300, United Kingdom 1 to 46,000, France 1 to 64,000, Switzerland 1 to 66,000, Austria 1 to 400,000, Russia 1 to 565,000. Europe had in all 2142 newspapers, America 978, Asia 27, Africa 12 and Oceania 9; total 3168. Of these, 1378 were published in English-speaking countries (800 of them in the United States), having a population of 154 millions, and 1790 in other countries, with a population of 583 millions..

The second summary (1886) is that given by Eugène Hatin in an appendix to his valuable *Bibliothèque de la presse périodique.* His enumeration of newspapers is as follows: France, 1640; United Kingdom, 1260; Prussia, 700; Italy, 500; Austria-Hungary, 365; Switzerland, 300; Belgium, 275; Holland, 225; Russia, 200; Spain, 200; Sweden and Norway, 150; Denmark, 100; United States, 4000. Here the proportions of papers to population are—Switzerland and United States 1 to 7000, Belgium 1 to 17,000, France and the United Kingdom 1 to 20,000, Prussia 1 to 30,000, Spain 1 to 75,000, Austria 1 to 100,000, Russia 1 to 300,000. Hatin assigns to Europe a total of 7000, to America 5000 and to the rest of the world 250, making in all 12,500.

The third summary is taken from that of Henry Hubbard, published in his *Newspaper Directory of the World* (New Haven, Connecticut, 1882). Its scope embraces a considerable number of serial publications which cannot be classed as newspapers. Still Hubbard's figures, which were collected (chiefly by the American consuls and consular agents in all parts of the world) about 1880, cannot be disregarded. The following are his general results:—

	Daily Newspapers.	Other Publications.
Europe	2403	10,730
Asia	154	337
Africa	25	125
N. America	1136	9,656
S. America	208	427
Australasia	94	471
Total	4020	21,746

The following summary for 1900, given in the 10th edition of the *Ency. Brit.*, and compiled by G. F. Barwick and Dorset Eccles, of the British Museum, included everything in the nature of a newspaper, as distinct from periodicals.

Totals of Newspapers, 1900.

Great Britain and Ireland	2,902
United States	15,904
France	2,400
Germany	3,278
Austria	393
Hungary	171
Sweden	213
Denmark	145
Iceland and Faroe Islands	3
Norway	132
Belgium	290
Holland	312
Luxemburg	12
Russia	280
Italy	251
Spain	338
Portugal	79
Switzerland	600
Greece	47
Rumania	47
Servia	24

Bulgaria	15
Montenegro	2
Turkey	22
Persia	3
Syria	6
India	600
Ceylon	10
China	40
Siam	5
Straits Settlements	12
Cochin China	4
Japan	150
East Indies	39
South Africa	109
West Africa	10
Central Africa, &c.	76
Egypt	21
Canada	742
Central and West Indies	129
South American Republics	340
Australasia—	
New South Wales	227
Queensland	109
South Australia	44
Victoria	310
West Australia	18
Tasmania	18
New Zealand—	
Otago	28
Wellington	29
Auckland	17
Hawkes Bay	11
Canterbury	23
Sundry	36
Total	31,026

2. British Newspapers

United Kingdom.[1]

The first regular English journalists may be identified with the writers of manuscript "news-letters," originally the dependants of great men, each employed in keeping his own master or patron well-informed, during his absence from court, of all that happened there. The duty grew at length into a calling. The writer had his periodical subscription list, and instead of writing a single letter wrote as many letters as he had customers. Then one more enterprising than the rest established an "intelligence office," with a staff of clerks, such as Ben Jonson's Cymbal depicts from the life in *The Staple of News*, acted in 1625, which is the best-known dramatic notice of the news-sheets.

> "This is the outer room where my clerks sit,
> And keep their sides, the register in the midst;
> The examiner, he sits private there within;
> And here I have my several rolls and files
> Of news by the alphabet, and all put up
> Under their heads."

Early news-letters.

Of the earlier news-letters good examples may be seen in the *Paston Letters*, and in the *Sydney Papers*. Of those of later date specimens will be found in Knowler's *Letters and Despatches of Strafford*, and other well-known books. Still later examples may be seen amongst the papers collected by the historian Thomas Carte, preserved in the Bodleian Library at Oxford. Of these, several series were addressed to the first duke of Ormond, partly by correspondents in England and Ireland, partly by correspondents in Paris; others were addressed to successive earls of Huntingdon; others, again, to various members of the Wharton family. And similar valuable collections are to be seen in the library of the British Museum, and in the Record Office in London. In Edinburgh the Advocates' Library possesses a series of the 16th century, written by Richard Scudamore to Sir Philip Hoby during his embassy to Vienna. The MS. news-letters—some of them proceeding from writers of marked ability who had access to official information, and were able to write with greater freedom and independence of tone than the compilers of the printed news—held their ground, although within narrowing limits, until nearly the middle of the 18th century. The distinction between the news-letter and the newspaper is pointed out in the preceding section.

Early newspapers.

It was at one time believed that the earliest regular English newspaper was an *English Mercurie* of 1588, to which George Chalmers, the political writer and antiquarian, referred in his *Life of Ruddiman* (1794) as being (with others of the same date) in the British Museum. The falsehood of this supposition, which was long accepted on Chalmers's authority, was, however, pointed out by Thomas Watts, of the British Museum, in 1839, in a volume with the title *Letter to Antonio Panizzi on the Reputed earliest printed Newspaper*, and again in 1850, in an article in the *Gentleman's Magazine* (n.s. xxxiii. 485-491). The documents in question are (1) a MS. unnumbered issue of the *English Mercurie*, dated "Whitehall, July 26th, 1588"; (2) a printed copy, No. 50, of July 23, 1588; (3) a printed copy of No. 51; (4) a printed copy of No. 54, of November 24, 1588; (5) and three other MS. copies. These were included in a collection bequeathed to the Museum of Dr Birch (1766), and are incontestably 18th-century forgeries. The handwriting of the spurious MSS. was identified by a letter among Dr Birch's correspondence as that of Philip Yorke, afterwards 2nd Lord Hardwicke, and there were trifling corrections in Dr Birch's handwriting, showing that he was a party with Yorke, the author, to the mystification. No information is forthcoming as to the object of it, but it is worth mentioning that Yorke and his brother also published a clever *jeu d'esprit* called *The Athenian Letters*, purporting to be a transcript from a Spanish translation of letters written by a Persian agent during the Peloponnesian War; so that it may be inferred that this sort of thing recommended itself to Yorke, and not necessarily for any deception.

Various English pamphlets, as well as French, Italian and German, occur in the 16th century with such titles as *Newes from Spaine*, and the like. In the early years of the 17th century they became very numerous; the Charles Burney collection in the British Museum is particularly valuable for this early period, the newsbooks and newspapers in it commencing with a "relation" of 1603. In 1614 we find Burton (the author of the *Anatomy of Melancholy*) pointing a sarcasm against the non-reading habits of "the major part" by adding, "if they read a book at any time . . . 'tis an English chronicle, Sir Huon of Bordeaux, Amadis de Gaul, &c., a play-book, or *some pamphlet of news*." But up to 1641, owing to the fact that to print domestic news was barred by the royal prerogative, the English periodicals which are to be considered as strictly the forerunners of the regular newspaper were only translations or adaptations of foreign periodicals containing news of what was going on abroad.

There is in the British Museum a *Mercurius Gallobelgicus; Sive rerum in Gallia et Belgio potissimum, Hispania quoque, Italia, Anglia, Germania, Polonia, Vicinisque Locis ab anno 1588 usque ad Martium anni praesentis 1594 gestarum, nuncius. Opusculum in Sex libris qui totidem annos complectuntur, divisum auctore D. M. Jansonio Doccomensi Frisio. Editio altera. Coloniae Agrippinae. Apud Godefridum Kempensem. Anno MDXCIV*. This production of Janson's at Cologne is a fairly thick octavo book, giving a Latin chronicle of events from 1587 to 1594, and is really a sort of annual register. It was continued down to 1635. The *Mercurius Gallobelgicus* is chiefly interesting because, by circulating in England, it started the idea of a periodical supplying foreign news, and apparently became to English contemporaries a type of the newfangled news-summaries.[1] In 1614 there was published in London a little square book (45 pp.), by Robert Booth, *A Relation of all matters passed . . . since March last to the present 1614, translated according to the originall of Mercurius Gallobelgicus*, which has the running title *Mercurius Gallobelgicus his relation since March last*. From a repetition of such "relations" at irregular intervals, to the periodical publication of news-books with a common title in a numbered series, was a natural development. Thus on the 1st of June 1619 Ralph Rounthwaite entered at Stationers' Hall *A Relation of all matters done in Bohemia, Austria, Poland, Sletia, France, &c., that is worthy of relating, since the 2nd of March 1618* (1619 N.S.) *until the 4th of May*.[2] Again at the beginning of November 1621 Bartholomew Downes and another entered in like manner *The certaine and true newes from all parts of Germany and Poland, to this present 20 of October 1621*.[3] No copy of either of these papers is now known to exist. Nor is any copy known of the *Courant or Weekly Newes from foreign parts* of October 9, 1621—"taken out of the High Dutch,"—mentioned by John Nichols.[4] But in May 1622 we arrive at a regular weekly newspaper which may still be seen in the British Museum.

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[1] In the following account of early British newspapers certain portions of the article by E. Edwards in the 9th ed. of the *Ency. Brit.* have been incorporated.

[1] The title *Mercurius* or Mercury—as representing the messenger of the gods—thus became a common one for English periodicals.

[2] Registers of the Stationers' Company, as printed by Edward Arber, iii. 302.

[3] *Ibid.* iv. 23.

[4] *Literary Anecdotes*, iv. 38.

The Stationers' Registers contain an entry on May 18th of *A Currant of generall newes. Dated in 14th May last*; no copy of this issue is preserved, but what is presumably the next number is to be found in the Burney collection. It is entitled "The 23rd of May—*The Weekely Newes from Italy, Germany, &c.*, London, printed by J. D. for Nicholas Bourne and Thomas Archer." On many subsequent numbers the name of Nathaniel Butter appears in connexion sometimes with Bourne and sometimes with Archer; so that there was probably an eventual partnership in the new undertaking. Archer is known as a publisher of "relations" since 1603; he died in 1634. Butter had published *Newes from Spaine* in 1611, and he continued to be a publisher of news until 1641, if not later,[1] and died in 1664.

For details of the history of the development of the news-book down to 1641, and thence to the starting of the *London Gazette* in 1665, reference should be made to Mr J. B. Williams's *History of English Journalism* (1908), already referred to. Mr Williams, by his study of the materials preserved in the British Museum in the Burney and Thomason[2] collections, has considerably modified many of the previously accepted views as to the affiliation and authorship of these early English periodicals. The leading facts can only be summarized here.

The *Weekely Newes* (1622), though the first English "Coranto," had no regular title connecting one number with the rest; it was simply the news of the week, and so described. The first periodical with a title was a *Mercurius Britannicus* published by Archer (1625; the earliest copy in existence being No. 16, April 7th), which probably lasted till the end of 1627. But the activity of the Coranto-makers was checked by the Star Chamber edict in 1632 against the printing of news from foreign parts. The next step in the evolution of the newspaper was due to the abolition of the Star Chamber in 1641, and the consequent freeing of the Press; and at last we come to the English periodical with domestic news. In November 1641 begins *The Head of severall proceedings in the present parliament* (outside title) or *Diurnal Occurrences* (inside title), the latter being the title under which it was soon known as a weekly; and on Jan. 31st 1642 appeared *A Perfect Diurnal of the Passages in Parliament*. These were printed for William Cooke, and were written apparently by Samuel Pecke, "the first of the patriarchs of English domestic journalism" (Williams). It is unnecessary here to mention every domestic journal which played its part in the verbal warfare in the Great Rebellion. The weekly *Diurnals* were soon copied by other booksellers. At first they were naturally on the side of the parliament. In January 1643, however, appeared at Oxford the first Royalist diurnal, named *Mercurius Aulicus* (continued till September 1645, and soon succeeded by *Mercurius Academicus*), which struck a higher literary note; its chief writer was Sir John Birkenhead. *Mercurius Civicus*, the first regularly illustrated periodical in London, was started by the parliamentarian Richard Collings on May 11th, 1643 (continued to December 1646); Collings had also started earlier in the year the *Kingdome's Weekly Intelligencer*, which lasted till October 1649. In September 1643 appeared another Puritan opponent of *M. Aulicus* in the *Mercurius Britanicus* (*sic*) of Captain Thomas Audley, which temporarily ceased publication on September 9th, 1644, only to be revived on September 30th by Marchamont (or Marchmont) Nedham, a writer who plays a prominent part in the journalism of this period, and to be continued till May 18th 1646.

In January 1647 was started the *Perfect Occurrences* by Henry Walker ("Luke Harruney"), who was not only a great journalist on the parliamentary side but is important as having originated the introduction of advertisements into the news-books. Later in the year a number of new Royalist Mercuries came into the field from which *Aulicus* and *Academicus* had now withdrawn: the first was *Mercuricus Melancholicus* (until 1649), and the most important were *Mercurius Pragmaticus* (Sept. 1647 to May 1650) and *Mercuricus Elencticus* (Nov. 1647 to Nov. 1649). *M. Pragmaticus* was not, as has been stated, originated by Marchamont Nedham (who about this time turned his coat and became Royalist), but in 1648–1649 he was its writer until he again turned parliamentarian; "history," says Mr Williams, "has no personage so shamelessly cynical as Marchamont Nedham, with his powerful pen and his political convictions ever ready to be enlisted on the side of the highest bidder; he even wrote for Charles II. in later years." Against the unlicensed Royalist Mercuries in London, where the people were on the king's side, the parliament waged active war, but some of them managed to come out, although writer after writer was imprisoned, until the middle of 1650. Meanwhile from October 1649 to June 1650, by a new act of parliament, the licensed press itself was entirely suppressed, and in 1649 two official journals were issued, *A Brief Relation* (up to October 1650) and *Severall Proceedings in Parliament* (till September 1655); a third licensed periodical, *A Perfect Diurnall* (till September 1655), being added later in the year, and a fourth, *Mercurius Politicus* (of which Milton was the editor for a year or so and Marchamont Nedham one of the principal writers), starting on June 13th, 1650 (continuing till April 12th, 1660). After the middle of 1650 there was a revival of some of the older licensed news-books; but the *Weekly Intelligence of the Commonwealth* (July 1650 to September 1655), by R. Collings, was the only important newcomer up to September 1655, when Cromwell suppressed all such publications with the exception of *Mercurius Politicus* and the *Publick Intelligencer* (October 1655 to April 1660), both being official and conducted by Marchamont Nedham.

Till Cromwell's death (Sept. 3rd. 1658) Nedham reigned alone in the press, but with the Rump he fell into disgrace, and in 1659 a rival appeared in Henry Muddiman (a great writer also of "news-letters"), whose *Parliamentary Intelligencer*, renamed the *Kingdom's Intelligencer* (till August 1663), was supported by General Monck. Nedham's journalistic career came finally to an end (he died in 1678) at the hand of Monck's council of state in April 1660. The following announcement was published in the *Parliamentary Intelligencer*: "Whereas Marchmont Nedham, the author of the weekly news-books called *Mercurius Politicus* and the *Publique Intelligencer* is, by order of the council of state, discharged from writing or publishing any publique intelligence; the reader is desired to take notice that, by order of the said council, Giles Dury and Henry Muddiman are authorized henceforth to write and publish the said intelligence, the one upon the Thursday and the other upon the Monday, which they do intend to set out under the titles of the *Parliamentary Intelligencer* and of *Mercurius Publicus*." This arrangement with Muddiman lasted till 1663, when he was supplanted by Sir Roger L'Estrange, who was appointed "surveyor of the Press." On him was conferred by royal grant—and, as it proved, for only a short period—"all the sole privilege of writing, printing, and publishing all narratives, advertisements, mercuries, intelligencers, diurnals and other books of public intelligence; . . . with power to search for and seize the unlicensed and treasonable schismatical and scandalous books and papers." L'Estrange discontinued *Mercurius Politicus* and *Kingdom's Intelligencer* and substituted two papers, the *Intelligencer* (Aug. 1st) and the *Newes* (Sept. 3rd) at a halfpenny, the former on Mondays and the latter on Thursdays; they were continued till January 29th, 1666, but from the beginning of 1664 the *Intelligencer* was made consecutive with the *Newes*, numbered and paged as one.

We come now to the origin of the famous *London Gazette*. Muddiman, obliged to devote himself solely to his news-letters, was associated with Joseph Williamson (under-secretary and afterwards secretary of state), who was for a time L'Estrange's

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[1] It is to him that a passage in *Fletcher's Fair Maid of the Inn* (Act iv. Sc. 2) obviously refers (written in 1625): "It shall be the ghost of some lying stationer. A spirit shall look as if *butter* would not melt in his mouth; a new *Mercurius Gallo-Belgicus*." The quotation also illustrates the contemporary regard paid to the *Mercurius Gallobelgicus*.

[2] George Thomason (d. 1666) was a London bookseller who in 1641 began collecting contemporary pamphlets, &c. His collection was ultimately bought by George III. and presented to the British Museum in 1762. A catalogue was completed in 1908, with introduction by Dr G. K. Fortescue. There is also a catalogue of early English newspapers in the *Bibliotheca Lindesiana, Collections and Notes No. 5*, of Lord Crawford (1901).

The London Gazette.

assistant in the compilation of the *Intelligencer*.[1] Muddiman organized for himself a far-spread foreign correspondence, and carried on the business of a news-letter writer on a larger scale than had till then been known. Presently L'Estrange, whose monopoly of printing was highly unpopular, found his own sources of information much abridged, while Williamson, for his own ambitious purposes, entered into a complicated intrigue (analysed in detail by Williams, *op. cit.* pp. 190 seq.) for getting the whole business into his hands, with Muddiman as his tool and with Muddiman's clients as his customers. To L'Estrange's application for renewed assistance Williamson replied that he could not give it, but would procure for him a salary of £100 a year if he would give up his right in the news-book.[2] The *Intelligencer* appealed (Oct. 1665) to Lord Arlington, and pathetically assured him that the charge for "entertaining spies for information was £500 in the first year."[3] But L'Estrange boasted that he had "doubled" the size and price of the book,[4] and had brought the profit from £200 to £400 or £500 a year.[5] The appeal was in vain. At that time the great plague had driven the court to Oxford. The first number of the bi-weekly *Oxford Gazette*, licensed by Arlington and written by Muddiman, was published on the 16th November 1665. It was a "paper" of news, of the same size and shape as Muddiman's news-letters. With the publication of the 24th number (Monday, February 5th, 1665–1666 O.S.) the *Oxford Gazette* became the *London Gazette*. After the 25th number Muddiman, who saw that he was not safe in Williamson's hands, seceded. Williamson had the general control of the *Gazette*, and for a considerable time Charles Perrot, a member of Oriel College, was the acting editor.[6] L'Estrange was soon driven out of the field, being solaced, on his personal appeal to the king, with a charge of £100 a year on the news-books (henceforth "taken into the secretaries' office") and a further £200 out of secret service money for his place as surveyor of the press. Muddiman, meanwhile, attached himself to the other secretary of state, Sir W. Morice, and he was authorized to issue an opposition official paper, which appeared as *Current Intelligence* (June 4–Aug. 20, 1666); and though the Great Fire, which burnt out all the London printers, resulted in the reappearance, after a week's interval, of the *Gazette* alone, Muddiman's unrivalled organization of news-letters remained; and they continued, till his death in 1692, to be the more popular source of information. The *Gazette*, however, now remained for some time the only "newspaper" in the strict sense already mentioned. For several years it was regularly translated into French by one Moranville. During the Stuart reigns generally its contents were very meagre, although in the reign of Anne some improvement is already visible. More than a century after the establishment of the *Gazette*, we find Secretary Lord Weymouth addressing a circular[7] to the several secretaries of legation and the British consuls abroad, in which he says, "The writer of the *Gazette* has represented that the reputation of that paper is greatly lessened, and the sale diminished, from the small portion of foreign news with which it is supplied." He desires that each of them will send regularly all such articles of foreign intelligence as may appear proper for that paper, "taking particular care—as the *Gazette* is the only paper of authority printed in this country—never to send anything concerning the authenticity of which there is the smallest doubt." From such humble beginnings has arisen the great repertory of State Papers, now so valuable to the writers and to the students of English history. The *London Gazette* has appeared twice a week (on Tuesday and Friday) in a continuous series ever since.[8] The editorship is a government appointment.

We come now to the Revolution. The very day after the departure of James II. was marked by the appearance of three newspapers—The *Universal Intelligence*, the *English Courant* and the *London Courant*. Within a few days more these were followed by the *London Mercury*, the *Orange Gazette*, the *London Intelligence*, the *Harlem Currant* and others. The Licensing Act, which was in force at the date of the Revolution, expired in 1692, but was continued for a year, after which it finally ceased. On the appearance of a paragraph in the *Flying Post* of 1st April 1697, which appeared to the House of Commons to attack the credit of the Exchequer Bills, leave was given to bring in a bill "to prevent writing, printing or publishing of any news without licence"; but the bill was thrown out in an early stage of its progress. That *Flying Post* which gave occasion to this attempt was also noticeable for a new method of printing, which it thus announced to its customers—"If any gentleman has a mind to oblige his country friend or correspondent with this account of public affairs, he can have it for twopence . . . on a sheet of fine paper, half of which being left blank, he may thereon write his own affairs, *or the material news of the day*."

In 1696 Edward Lloyd—the virtual founder of the famous "Lloyd's" of commerce—started a thrice-a-week paper, *Lloyd's News*, which had but a brief existence in its first shape, but was the precursor of the *Lloyd's List* of the present day. No. 76 of the original paper contained a paragraph referring to the House of Lords, for the appearance of which a public apology must, the publisher was told, be made. He preferred to discontinue his publication (February 1697). Nearly thirty years afterwards he in part revived it, under the title of *Lloyd's List*—published at first weekly, afterwards twice a week.[9] This dates from 1726. It is now published daily.

First London daily.

It was in the reign of Queen Anne that the English newspaper press first became really eminent for the amount of intellectual power and of versatile talent which was employed upon it. It was also in that reign that the press was first fettered by the newspaper stamp. The accession of Anne was quickly followed by the appearance of the first successful London daily newspaper, the *Daily Courant* (11th of March 1702–1703). Seven years earlier, in 1695, the *Postboy* had been started as a daily paper (actually the first in London), but only four numbers appeared. The *Courant* was published and edited by the learned printer Samuel Buckley, who explained to the public that "the author has taken care to be duly furnished with all that comes from abroad, in any language. . . . At the beginning of each article he will quote the foreign paper from which it is taken, that the public, seeing from what country a piece of news comes, with the allowance of that government, may be better able to judge of the credibility and fairness of the relation. Nor will he take upon himself to give any comments, . . . supposing other people to have sense enough to make reflexions for themselves." Then came, in rapid succession, a crowd of new competitors for public favour, of less frequent publication. The first number of one of these, the *Country Gentleman's Courant* (1706), was given away gratuitously, and made a special claim to public favour on the ground that "here the reader is not only diverted with a faithful register of the most remarkable and momentary [*i.e.* momentous] transactions at home and abroad, . . . but also with a geographical description of the most material places mentioned in every article of news, whereby he is freed the trouble of looking into maps."

Defoe's Review.

On the 19th of February 1704, whilst still imprisoned in Newgate for a political offence, Defoe (*q.v.*) began his famous paper, the *Review*. At the outset it was published weekly, afterwards twice, and at length three times a week. It continued substantially in its first form until July 29, 1712; and a complete set is of extreme rarity. From the first page to the last it is characterized by the manly boldness and persistent tenacity with which the almost unaided author utters and defends his opinions on public affairs against a host of able and bitter assailants. Some of the numbers were written during travel, some in Edinburgh. But the *Review* appeared regularly. When interrupted by the pressure of the Stamp Act (which came into force on the 1st of August 1712), the writer modified the form of his paper, and began a new series (August 2, 1712, to June 11, 1713). In those early and monthly supplements of his paper which he entitled "Advice from the Scandalous Club," and set apart for the discussion of questions of literature and manners, and sometimes of topics of a graver kind, Defoe to some extent anticipated Richard Steele's *Tatler* (1709) and Steele and Addison's *Spectator* (1711). In 1705 he severed those supplements from his chief newspaper, and published them twice a week as the *Little Review*. But they soon ceased to appear. It may here be added that in May 1716 Defoe began a new monthly paper under an old title, *Mercurius Politicus*, . . . "by a lover of old England." This journal continued to appear until September 1720. The year 1710 was marked by the appearance of the *Examiner, or Remarks upon Papers and Occurrences* (No. 1, August 3), of which thirteen numbers appeared by the co-operation of Bolingbroke, Prior, Freind and King before it was placed under the sole control of Swift. The *Whig Examiner*, avowedly intended "to censure the writings of others, and to give all persons a rehearing who had suffered under any unjust sentence of the *Examiner*," followed on the 1st September, and the *Medley* three weeks afterwards.

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[1] This help seems to have been given at the request of the secretary of state, Lord Arlington (then Sir H. Bennet), in 1663; *State Papers, Domestic, Charles II.*, lxxix. 112, 113.

[2] *State Papers, Domestic, Charles II.*, cxxxiv. 103 (Rolls House).

[3] *Ibid.* 117.

[4] In 1664 he had halved them, so that this really only means he had now restored the original size.

[5] *State Papers, Domestic, Charles II.*, cxxxv. 24.

[6] Anthony Wood, *Athenae Oxonienses*, "Perrot."

[7] *Calendar of Home-Office Papers, 1766–1769*, p. 483 (1879).

[8] A complete set is now of extreme rarity.

[9] Frederick Martin, *History of Lloyd's*, 66-77 and 107-120. The great collection of newspapers in the British Museum contains only one number of *Lloyd's News*; but sixty-nine numbers may be seen in the Bodleian Library. Of the *List*, also, no complete series is known to exist; that in the library of Lloyd's begins with 1740.

Stamp tax of 1712.

This increasing popularity and influence of the newspaper press could not fail to be distasteful to the government of the day. Prosecutions were multiplied, but with small success. At length some busy projector hit upon the expedient of a newspaper tax. The paper which seems to contain the first germ of the plan is still preserved amongst the treasury papers. It is anonymous and undated, but probably belongs to the year 1711. "There are published weekly," says the writer, "about 44,000 newspapers, viz. *Daily Courant*, *London Post*, *English Post*, *London Gazette*, *Postman*, *Postboy*, *Flying Post*, *Review* and *Observator*."[1] The duty eventually imposed (1712) was a halfpenny on papers of half a sheet or less, and a penny on such as ranged from half a sheet to a single sheet (10 Anne, c. xix. § 101). The first results of the tax cannot be more succinctly or more vividly described than in the following characteristic passage of Swift's *Journal to Stella* (August 7, 1712): "Do you know that Grub Street is dead and gone last week? No more ghosts or murders now for love or money. I plied it close the last fortnight, and published at least seven papers of my own, besides some of other people's; but now every single half-sheet pays a halfpenny to the queen. The *Observator* is fallen; the *Medleys* are jumbled together with the *Flying Post*; the *Examiner* is deadly sick; the *Spectator* keeps up, and doubles its price—I know not how long it will hold. Have you seen the *red stamp* the papers are marked with? *Methinks the stamping is worth a halfpenny.*"

Swift's doubt as to the ability of the *Spectator* to hold out against the tax was justified by its discontinuance in December 1712, Steele starting the *Guardian* in 1713, which only ran for six months. But the impost which was thus fruitful in mischief, by suppressing much good literature, wholly failed in keeping out bad. Some of the worst journals that were already in existence kept their ground, and the number of such ere long increased.[2] An enumeration of the London papers of 1714 comprises the *Daily Courant*, the *Examiner*, the *British Merchant*, the *Lover*, the *Patriot*, the *Monitor*, the *Flying Post*, the *Postboy*, *Mercator*, the *Weekly Pacquet* and *Dunton's Ghost*. Another enumeration in 1733 includes the *Daily Courant*, the *Craftsman*, *Fog's Journal*, *Mist's Journal*, the *London Journal*, the *Free Briton*, the *Grub Street Journal*, the *Weekly Register*, the *Universal Spectator*, the *Auditor*, the *Weekly Miscellany*, the *London Crier*, *Read's Journal*, *Oedipus or the Postman Remounted*, the *St James's Post*, the *London Evening Post* and the *London Daily Post*, which afterwards became better known as the *Public Advertiser*. Part of this increase may fairly be ascribed to political corruption. In 1742 the committee of the House of Commons appointed to inquire into the political conduct of the earl of Orford reported to the House that during the last ten years of the Walpole ministry there was paid, out of public money, no "less a sum than £50,077, 18s. to authors and printers of newspapers, such as the *Free Briton*, *Daily Courant*, *Gazetteer* and other political papers."[3] But some part of the payment may well have been made for advertisements. Towards the middle of the century the provisions and the penalties of the Stamp Act were made more stringent. Yet the number of newspapers continued to rise. Dr Johnson, who in 1750 started his twopenny bi-weekly *Rambler*, and in 1758 his weekly *Idler*, writing in the latter bears testimony to the still growing thirst for news: "Journals are daily multiplied, without increase of knowledge. The tale of the morning paper is told in the evening, and the narratives of the evening are bought again in the morning. These repetitions, indeed, waste time, but they do not shorten it. The most eager peruser of news is tired before he has completed his labour; and many a man who enters the coffee-house in his nightgown and slippers is called away to his shop or his dinner before he has well considered the state of Europe." Five years before (*i.e.* in 1753) the aggregate number of copies of newspapers annually sold in England, on an average of three years, amounted to 7,411,757. In 1760 it had risen to 9,464,790, and in 1767 to 11,300,980. In 1776 the number of newspapers published in London alone had increased to fifty-three.

Dr Johnson's time.

When Johnson wrote his sarcastic strictures on the newspapers that were the contemporaries and, in a sense, the rivals of the *Idler*, the newswriters had fallen below the standard of an earlier day. A generation before the newspaper was often much more of a political organ than of an industrial venture. All of the many enterprises of Defoe in this field of journalism united indeed both characteristics. But if he was a keen tradesman, he was also a passionate politician. And not a few of his fellow-workers in that field were conspicuous as statesmen no less than as journalists. Even less than twenty years before the appearance of Johnson's remarks, men of the mental calibre of Henry Fielding were still to be found amongst the editors and writers of newspapers. The task had fallen to a different class of men in 1750.

Press prosecutions.

The history of newspapers during the long reign of George III. is a history of the struggle for freedom of speech in the face of repeated criminal prosecutions, in which individual writers and editors were defeated and severely punished, while the Press itself derived new strength from the protracted conflict, and turned ignominious penalties into signal triumphs. From the days of Wilkes's *North Briton* onwards (see WILKES, JOHN: it was started in 1761), every conspicuous newspaper prosecution gave tenfold currency to the doctrines that were assailed. In the earlier part of this period men who were mere traders in politics—whose motives were obviously base and their lives contemptible—became for a time powers in the state, able to brave king, legislature and law courts, by virtue of the simple truth that a free people must have a free press. One of the minor incidents of the *North Briton* excitement (Wilkes's prosecution in 1763) led indirectly to valuable results with reference to the much-vexed question of parliamentary reporting. During the discussions respecting the Middlesex election, Almon, a bookseller, collected from members of the House of Commons some particulars of the debates, and published them in the *London Evening Post*. The success which attended these reports induced the proprietors of the *St James's Chronicle* to employ a reporter to collect notes in the lobby and at the coffee-houses. This repeated infraction of the privilege of secret legislation led to the memorable proceedings of the House of Commons in 1771, with their fierce debates, angry resolutions and arbitrary imprisonments—all resulting, at length, in that tacit concession of publicity of discussion which in the main, with brief occasional exceptions, has ever since prevailed.

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[1] "A Proposition to Increase the Revenue of the Stamp-Office," Redington, *Calendar of Treasury Papers, 1708–1714*, p. 235. The stamp-office dated from 1694, when the earliest duties on paper and parchment were enacted.

[2] See the Burney collection of newspapers in the British Museum; and Nichols, *Literary Anecdotes of the Eighteenth Century*, iv. 33–97.

[3] "Fourth Report of the Committee of Secrecy," &c., in Hansard's *Parliamentary History*, xii. 814.

London evening press.

Evening journalism in England started originally with supplemental editions of the morning papers, giving the latest foreign war news. In July 1695, when William III. was fighting France in the Netherlands, a "Postscript to the Pacquet-boat from Holland to Flanders" was published with special advices from the seat of war; and from that time there were frequent afternoon issues of morning journals, giving war news. In August 1706 a "Six at Night" evening paper was started in London. The first London evening paper of any importance, however, was the *Courier* (1792), which during the latter part of the Napoleonic War, with Mackintosh, Coleridge and Wordsworth among its contributors, became one of the chief papers of the day. It was edited successively by Daniel Stuart, William Mudford, Eugenius Roche, John Galt, James Stuart and Laman Blanchard. In 1827 a twenty-fourth share in the paper sold for 5000 guineas, but it gradually declined and came to an end in 1842, when it was incorporated by the *Globe* (still existing).

London press in George III.'s reign.

The principal metropolitan newspapers at different periods of George III.'s reign were the *Public Advertiser*, the *Morning Post*, the *Morning Chronicle*, the *Morning Herald* and finally *The Times*. Of these the *Morning Post* and *The Times*, still existing, are dealt with later. Of the three which eventually ceased to exist, the first was known in 1726 as the *London Daily Post and General Advertiser*. In 1738 the first part of this title was dropped, and in 1752 *General Advertiser* was altered into *Public Advertiser*, a name which the letters of Junius made so famous. Many of these had appeared before the smallest perceptible effect was produced on the circulation of the paper; but when the "Letter to the King" came out (19th December 1769, almost a year from the beginning of the series) it caused an addition of 1750 copies to the ordinary impression. The effect of subsequent letters was variable; but when Junius ceased to write the monthly sale of the paper had risen to 83,950. This was in December 1771. Seven years earlier the monthly sale had been but 47,515. It now became so valuable a property that shares in it were sold, according to John Nichols, "as regularly as those of the New River Company." But the fortunes of the *Advertiser* declined almost as rapidly as they had risen. It continued to appear until 1798, and then expired, being amalgamated with the commercial paper called the *Public Ledger* (dating from 1759). Actions for libel were brought against the paper by Edmund Burke in 1784, and by William Pitt in 1785, and in both suits damages were given.

The *Morning Chronicle* was begun in 1769. William Woodfall was its printer, reporter and editor, and continued to conduct it until 1789. James Perry succeeded him as editor, and so continued, with an interval during which the editorship was in the hands of Mr Sergeant Spankie, until his death in 1821. Perry's editorial functions were occasionally discharged in Newgate in consequence of repeated prosecutions for political libel. In 1819 the daily sale reached nearly 4000. It was sold in 1823 to Mr Clement, the purchase-money amounting to £42,000. Mr Clement held it for about eleven years, and then sold it to Sir John Easthope for £16,000. It was then, and until 1843, edited by John Black, who numbered amongst his staff Albany Fonblanque, Charles Dickens and John Payne Collier, the circulation being about 6000. The paper continued to be distinguished by much literary ability, but not by commercial prosperity. In 1849 (the circulation having fallen to 3000) it became the joint property of the duke of Newcastle, Mr W. E. Gladstone and some of their political friends; and by them, in 1854, it was sold to Mr Sergeant Glover. From 1848 to 1854 Douglas Cook (afterwards of the *Saturday Review*) was editor. At length the *Morning Chronicle* ended in the Bankruptcy Court, after an existence of more than ninety years. The *Morning Herald* was founded and first edited by Henry Bate (Sir Henry Bate Dudley) in 1781, and came to an end at the close of 1869; for some time it was a popular Tory paper, and from 1835 to 1845 had a circulation of about 6000.

Abolition of taxes on knowledge.

The development of the Press was enormously assisted by the gradual abolition of the "taxes on knowledge," and also by the introduction of a cheap postal system. In 1756 an additional halfpenny was added to the tax of 1712. In 1765 and in 1773 various restrictive regulations were imposed. In 1789 the three-halfpence was increased to twopence, in 1798 to twopence-halfpenny, in 1804 to threepence-halfpenny, and in 1815 to fourpence, less a discount of 20%. Penalties of all kinds were also increased, and obstructive regulations were multiplied. In the course of the struggle between this constantly enhanced taxation and the irrepressible desire for cheap newspapers, more than seven hundred prosecutions for publishing unstamped journals were instituted, and more than five hundred were imprisoned, sometimes for considerable periods. As the prosecutions multiplied, and the penalties became more serious, *Poor Man's Guardians*, *Democrats*, *Destructives* and their congeners multiplied also, and their revolutionary tendencies increased in a still greater ratio. Blasphemy was added to sedition. Penny and halfpenny journals were established which dealt exclusively with narratives of gross vice and crime, and which vied with each other in every kind of artifice to make vice and crime attractive. Between the years 1831 and 1835 many scores of unstamped newspapers made their appearance. The political tone of most of them was fiercely revolutionary. Prosecution followed prosecution; but all failed to suppress the obnoxious publications.

To Bulwer Lytton, the novelist and politician (Baron Lytton), and subsequently to Milner Gibson and Richard Cobden, is chiefly due the credit of grappling with this question in the House of Commons in a manner which secured first the reduction of the tax to a penny on the 15th of September 1836, and then its total abolition at last in 1855. The measure for the final abolition of the stamp tax was substantially prepared by W. E. Gladstone during his chancellorship of the exchequer in 1854, but was carried by his successor in 1855. The number of newspapers established from the early part of 1855, when the repeal of the duty had become a certainty, and continuing in existence at the beginning of 1857, amounted to 107; 26 were metropolitan and 81 provincial. Of the latter, the majority belonged to towns which possessed no newspaper whatever under the Stamp Acts, and the price of nearly one-third of them was but a penny. In some cases, however, a portion of these new cheap papers of 1857 was printed in London, usually with pictorial illustrations, and to this was added a local supplement containing the news of the district.

Amongst the earliest results of the change in newspaper law made in 1855 was the establishment in quick succession of a series of penny metropolitan local papers, chiefly suburban, of a kind very different from their unstamped forerunners. They spread rapidly, and attained considerable success, chiefly as advertising sheets, and as sometimes the organs, more often the critics, of the local vestries and other administrations. One of them, the *Clerkenwell News and Daily Chronicle*, so prospered in the commercial sense, being crowded with advertisements, that it sold for £30,000, and was then transformed into the London *Daily Chronicle* (28th May 1877). Another conspicuous result of the legislation of 1855 was an enormous increase in the number and influence of what are known as "class papers" and professional and trade papers. The duties on paper itself were finally abolished in 1861.

"Taxes on knowledge" having thus been abolished, the later developments in newspaper history are mainly connected with the increase in number, due largely to the spread of education, the improvements in machinery and distribution and in collection of news, the constant adaptation to the new demands of a wider public, and the progress in the art of advertising as applied to the Press. The following sections on the more important newspapers in London and the Provinces fill in the remaining details of the history of the British Press, so far as they are substantially important or interesting. Much that is in its nature ephemeral or trivial is necessarily passed over.

Modern London Newspapers.

"Morning Post."

The *Morning Post* (oldest of existing London daily papers) dates from 1772. For some years it was in the hands of Henry Bate (Sir Henry Bate Dudley), and it attained some degree of temporary popularity, though of no very enviable sort. In 1795 the entire copyright, with house and printing materials, was sold for £600 to Peter and Daniel Stuart, who quickly raised the position of the *Post* by enlisting Sir James Mackintosh and the poet Coleridge in its service, and also by giving unremitting attention to advertisements and to the copious supply of incidental news and amusing paragraphs. There has been much controversy about the share which Coleridge had in elevating the *Post* from obscurity to eminence. That he greatly promoted this result there can be no doubt. His famous "Character of Pitt," published in 1800, was especially successful, and created a demand for the particular number in which it appeared that lasted for weeks, a thing almost without precedent. Coleridge wrote for this paper from 1795 until 1802, and during that period its circulation in ordinary rose from 350 copies, on the average, to 4500. Whatever the amount of rhetorical hyperbole in Fox's saying—recorded as spoken in the House of Commons—"Mr Coleridge's essays in the *Morning Post* led to the rupture of the treaty of Amiens," it is none the less a striking testimony, not only to Coleridge's powers as a publicist, but to the position which the newspaper press had won, in spite of innumerable obstacles at that time. The list of his fellow-workers in the *Post* is a most brilliant and varied one. Besides Mackintosh, Southey and Arthur Young, it included a galaxy of poets. Many of the lyrics of Moore, many of the social verses of Mackworth Praed, some of the noblest sonnets of Wordsworth, were first published in the columns of the *Post*. And the story of the paper, in its early days, had tragic as well as poetic episodes. In consequence of offence taken at some of its articles, the editor and proprietor, Nicholas Byrne (who succeeded Daniel Stuart), was assaulted and murdered whilst sitting in his office.

Up to about 1850 the history of the *Morning Post* offers little to record; with the *Morning Chronicle* and *Morning Herald*, and having a smaller circulation than either of them, it was being rapidly eclipsed in London journalism by *The Times* (see below), and in 1847 only sold some three thousand copies. Heavily in debt to Messrs J. and T. B. Crompton, the paper manufacturers, it had been taken over by them; and in that year the management was entrusted to Peter Borthwick (1804–1852), a Scotsman who, after graduation both at Edinburgh and Cambridge, had taken to politics in the Conservative interest and had sat in parliament for Evesham from 1835 to 1838 and from 1841 to 1847, when he was almost ruined by fighting an election petition in which he was unseated. Peter Borthwick took the task of reviving the paper seriously in hand, and in a few years was already improving its position when he fell ill and died; and he was succeeded in 1852 by his son Algernon Borthwick, afterwards Lord Glenesk (1830–1908). The later history of the paper is primarily connected with its practical re-establishment and successful conduct under the latter. Algernon Borthwick had been its Paris correspondent from 1850, and had shown social gifts and journalistic acumen of great promise. When he became managing editor in 1852 he devoted himself with such energy to the work that in seven years the debt on the business had been paid off. He gave the paper a strong political colour, Conservative, Imperialist and Protectionist; and in the 'fifties and 'sixties Borthwick was a keen supporter of Lord Palmerston. After the death of Mr Crompton, his nephew, Mr Rideout, the principal surviving partner in the paper manufacturing firm, was so impressed with Borthwick's success that he vested the entire control of the paper in him for life; and on Mr Rideout's death in 1877, Borthwick was enabled, by the help of his friend Andrew Montague, to buy the property and become sole proprietor. The *Morning Post* had now become, largely through Borthwick's own social qualities, the principal organ of the fashionable world; but in 1881 he took what was then considered the hazardous step of reducing its price from threepence to a penny, and appealing no longer to the "threepenny public" with *The Times* but to a wider clientèle with the *Daily Telegraph* and *Standard*. The result was a ten-fold increase in circulation and a financial success exceeding all anticipations. Borthwick himself, who was knighted in 1880, and was created a baronet in 1887, had entered parliament in 1880 for Evesham, and from 1885 to 1895 sat for South Kensington, being finally raised to the peerage in 1895. His political gifts naturally increased the influence of the paper; he supported the "Tory democracy" and was an active worker for the Primrose League, of which he was three times chancellor; and the *Morning Post*, under his control, became one of the great organs of opinion on the Conservative side. From 1880 onwards he devolved the editorial duties on others, at first Sir William Hardman, and then successively Mr A. K. Moore, Mr Algernon Locker, Mr James Nicol Dunn (from 1897 to 1905; afterwards editor of the *Manchester Courier*) and Mr Fabian Ware; under them the literary standard of the paper was kept at a high level, and constant improvements were introduced; and the staff included a number of well-known writers, notably Mr Spencer Wilkinson (b. 1853), who in 1909 was appointed professor of military history at Oxford. From 1897 till his death in 1905, at the age of thirty-two, Lord Glenesk's son, Oliver Borthwick, had much to do with the managerial side. On Lord Glenesk's own death on the 24th November 1908, the proprietorship passed to the trustees of his only surviving child, a daughter, who in 1893 had married the 7th Earl Bathurst.

"The Times."

The Times[1] is usually dated from the 1st of January 1788, but was really started by John Walter on the 1st of January 1785, under the title of *The London Daily Universal Register, printed logographically*. On its reaching its 940th issue its name was changed. The logographic or "word-printing" process had been invented by a printer named Henry Johnson several years before, and found a warm advocate in John Walter, who expounded its peculiarities at great length in No. 510 of his *Daily Universal Register*. In a later number he stated, very amusingly, his reasons for adopting the altered title, which the enterprise and ability of his successors (see WALTER, JOHN) made world-famous. Within two years John Walter had his share in the Georgian persecutions of the press, by successive sentences to three fines and to three several imprisonments in Newgate, chiefly for having stated that the prince of Wales and the dukes of York and Clarence had so misconducted themselves "as to incur the just disapprobation of his Majesty." In 1803 the management was transferred (together with the joint proprietorship of the journal) to his son, John Walter (2), by whom it was carried on with extraordinary energy and consummate ability, and at the same time with marked independence. To Lord Sidmouth's government he gave a general but independent support. That of Pitt he opposed, especially on the questions of the Catamaran expedition and the malversations of Lord Melville. This opposition was resented by depriving the elder Walter of the printing for the customs department, by the withdrawal of government advertisements from *The Times*, and also, it is said, by the systematic detention at the outports of the foreign intelligence addressed to its editor. John Walter the Second, however, was strong and resolute enough to brave the government. He organized a better system of news transmission than had ever before existed. He introduced steam-printing (1814) and repeatedly improved its mechanism (see PRINTING); and although modern machines may now seem to thrust into insignificance a press of which it was at first announced as a notable triumph that "no less than 1100 sheets are impressed in one hour," yet the assertion was none the less true that *The Times* of 29th November 1814 "presented to the public the practical result of the greatest improvement connected with printing since the discovery of the art itself." The effort to secure for *The Times* the best attainable literary talent in all departments kept at least an equal pace with those which were directed towards the improvement of its mechanical resources. And thus it came to pass that a circulation which did not, even in 1815, exceed on the average 5000 copies became, in 1834, 10,000; in 1840, 18,500; in 1844, 23,000; in 1851, 40,000; and in 1854, 51,648. In the year last named the average circulation of the other London dailies was—*Morning Advertiser*, 7644; *Daily News*, 4160; *Morning Herald*, 3712; *Morning Chronicle*, 2800; *Morning Post*, 2667; so that the supremacy of *The Times* can readily be understood.

Sir John Stoddart, afterwards governor of Malta, edited *The Times* for several years prior to 1816. He was succeeded by Thomas Barnes, who for many years wrote largely in the paper. When his health began to fail the largest share of the editorial work came into the hands of Captain Edward Sterling—the contributor about a quarter of a century earlier of a noteworthy series of political letters signed "Vetus," the Paris correspondent of *The Times* in 1814 and subsequent eventful years, and afterwards for many years the most conspicuous among its leader-writers.[2] From 1841 to 1877 the chief editor was John Thadeus Delane, who had his brother-in-law G. W. Dasent for assistant-editor, and another brother-in-law, Mowbray Morris, as business manager. By the time of the second John Walter's death (1847) the substantial monopoly of *The Times* in London journalism had been established; and under the proprietorship of the third John Walter the result of the labour of Delane as editor, and of the brilliant staff of contributors whom he directed, among whom Henry Reeve was conspicuous as regards foreign affairs, was to turn the "favourite broadsheet" of the English public into the "leading journal of the world." When Delane retired, he was succeeded as editor by Thomas Chenery, and on his death in 1884 by George Earle Buckle (b. 1854). At the beginning of 1908 considerable changes took place in the proprietorial side of *The Times*, which was converted into a company, with Mr A. F. Walter (chief proprietor since 1891) as chairman and Mr C. Moberly Bell (b. 1847; manager since 1890) as managing director; the financial control passing into the hands of Lord Northcliffe.

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[1] See the centenary number of January 2, 1888; the pamphlet by S. V. Makower, issued by *The Times* in 1904, "The History of *The Times*"; and the article by Hugh Chisholm on "*The Times*, 1785–1908" in the *National Review* (May 1908).

[2] See *Life of John Sterling*, by Carlyle, who says of him at this time: "The emphatic, big-voiced, always influential and often strongly unreasonable *Times* newspaper was the express emblem of Edward Sterling. He, more than any other man, . . . was *The Times*, and thundered through it, to the shaking of the spheres." The nickname of "The Thunderer," for *The Times*, came in vogue in his day.

In the history of *The Times* its influence on the mechanical side of newspaper work was very great. The increasing circulation of *The Times* between the years 1840 and 1850 made an improvement in the printing-presses necessary, as sometimes the publication could not be completed before the afternoon. To meet this want the Applegath vertical press was introduced in 1848 and the American Hoe ten-feeder press in 1858. Meanwhile the idea of stereotyping from the movable types had been making steady progress. About the year 1856, however, a Swiss named Dellagana introduced to *The Times* Kroning's idea of casting from papier-mâché instead of plaster, and was allowed to experiment in *The Times* office. After a time the invention was so much improved that matrices of pages could be taken and the stereotype plates fixed bodily on the printing machine in place of the movable type. This cleared the way for the introduction of the famous Walter press. Hitherto only one set of "formes" could be used, as the type was set up once only—one side of the paper being worked on one machine and the sheets then taken to another machine to be "perfected." Stereotyping enabled the formes to be multiplied to any extent, as several plates could be cast from one matrix. Mr MacDonald, the manager of *The Times*, had devoted himself for several years to the production of a press which could print papers on both sides in one operation from a large reel of paper, the web of paper being cut into the required size after printing, instead of each sheet being "laid on" by a man and then printed. After years of experiment the Walter press was introduced into the *Times* machine-room in 1869, and the question of printing great numbers in a short time was solved. Each press turned out 12,000 sheets per hour, and it was therefore only a question of multiplying the stereo plates and presses to obtain any number of printed papers by a certain time. Meanwhile Messrs Hoe had set about producing something even quicker and better than the Walter press. They succeeded in accomplishing this by multiplying the reels of paper on each press, and also adding folders and stitchers. The result was the production of over 36,000 sheets per hour from each machine. These presses were adopted by *The Times* in 1895.

In 1868 the question of composing machines for the quicker setting-up of type was taken up by *The Times*. A German named Kastenbein had an invention which he brought to the notice of *The Times*, and arrangements were made for him to continue his experiments in *The Times* office. In a couple of years a machine was made, which was worked and improved until in 1874 several machines were ready to set up a portion of the paper; but it was not until 1879 that the arrangements were sufficiently advanced to make certain that they could do all that was wanted from them. The introduction of composing machines, and the necessary alterations in the office arrangements which followed, led to some trouble among the compositors, which in 1880 culminated in a partial strike; but a part of the staff remaining loyal the printer was able by extra effort to produce the paper at the proper time on the morning following the strike. Various improvements were made, until one machine was able to set up as many as 298 lines of *The Times* in one hour, equal to 16,688 separate types. A system of telephoning the parliamentary report from the House of Commons direct to the compositor was begun in 1885, and was continued until the House decided to rise at midnight, which enabled the more economical method of composing direct from the "copy" to be resumed.

Ever since the introduction of the composing machines the business had been much hampered by the question of "distribution"—that is, the breaking-up and sorting of the types after use. Kastenbein had invented a distributing machine to accompany his composing machine, but it proved to be unsatisfactory. Various systems were tried at *The Times* office, but for many years the work of the composing machines was to some extent crippled by the distribution difficulty. This had been recognized by Mr Frederick Wicks (d. 1910), the inventor of the Wicks Rotary Type-casting Machine, who for many years had been working at a machine which would cast new type so quickly and so cheaply as to do away with the old system of distribution and substitute new type every day. In 1899 his machine was practically perfect, and *The Times* entered into a contract with him to supply any quantity of new type every day. The difficult question of distribution was thus surmounted, and composition by machines placed on a satisfactory basis.

Thus during the last half of the 19th century *The Times* continued to take the lead in new inventions relating to the printing of a newspaper, just as it had in the fifty years preceding. The three most important advances during the later period were practically worked out at *The Times* office—namely, fast-printing presses, stereotyping and machine composing, and without these it is safe to say that the cheap newspaper of the present day could not exist. Further indications of the enterprise of *The Times* in taking up journalistic novelties may also be seen in its organizing a wireless telegraphy service, with a special steamer, in the Far East, at the opening of the Russo-Japanese War.

The price at which *The Times* has been sold has been changed at various dates: in 1796 to 4½d., 1799 to 6d., 1809 to 6½d., 1815 to 7d., 1836 to 5d., 1855 to 4d., 1861 (Oct. 1) to 3d., and in 1904 (still remaining at 3d.) it started a method of payment by subscription which gave subscribers an advantage in one form or another and thus in reality reduced the price further. In 1905 this advantage took the form of the price (3d.) covering a subscription to *The Times* Book Club, a circulating library and book-shop on novel lines (see BOOKSELLING and PUBLISHING).

The first number of the paper contained 57 brief advertisements, but as it grew in repute and in size its advertising revenue became very large, and with the growth of this revenue came *pari passu* the means of spending more money on the contents. As far back as 1861 a single issue had contained 105 columns of advertisements, and another 98. Prior to 1884 the paper had only on two occasions consisted of 24 pages in a single issue. Between that year and 1902 more than 80 separate issues of this size were published, many of them containing over 80 columns of advertisements. Of two issues, one containing the news of the death and the other the account of the funeral of Queen Victoria, 140,000 copies were printed. From that time issues of 20 pages and over became an ordinary matter: and on May 24, 1909 (Empire Day), *The Times* signalized the occasion by bringing out a huge supplement of 72 pages full of articles on Imperial topics.

The Times has long stood in a class by itself among newspapers, owing to its abundance of trustworthy news, its high literary standard and its command of the ablest writers, who, however, are generally anonymous in its columns. It has always claimed to be a national rather than a party organ. It was Liberal in its politics in the Reform days, but became more and more Conservative and Imperialist when the Unionist and anti-Home Rule era set in. On the conversion of Mr Gladstone to Home Rule, *The Times* was, indeed, largely instrumental in forming the Liberal-Unionist party. In the course of its vigorous campaign against Irish Nationalism it published as part of its case a series of articles on "Parnellism and Crime," including what were alleged to be *facsimile* reproductions of letters from Mr Parnell showing his complicity with the Phoenix Park murders. The history of this episode, and of the appointment of the Special Commission of investigation by the government, is told under PARNELL. One of the strongest features of *The Times* has been always its foreign correspondence.

Among leading incidents in the history of *The Times* a few may be more particularly mentioned. In 1840 the Paris correspondent of the paper (Mr O'Reilly) obtained information respecting a gigantic scheme of forgery which had been planned in France, together with particulars of the examination at Antwerp of a minor agent in the conspiracy, who had been there, almost by chance, arrested. All that he could collect on the subject, including the names of the chief conspirators, was published by *The Times* on the 26th of May in that year, under the heading "Extraordinary and Extensive Forgery and Swindling Conspiracy on the Continent (Private Correspondence)." The project contemplated the almost simultaneous presentation at the chief banking-houses throughout the Continent of forged letters of credit, purporting to be those of Glyn & Company, to a very large amount; and its failure appears to have been in a great degree owing to the exertions made, and the responsibility assumed, by *The Times*. One of the persons implicated brought an action for libel against the paper, which was tried at Croydon in August 1841, with a verdict for the plaintiff, *one farthing damages*. A subscription towards defraying the heavy expenses (amounting to more than £5000) which *The Times* had incurred was speedily opened, but the proprietors declined to profit by it; and the sum which had been raised was devoted to the foundation of two "*Times* scholarships," in connexion with Christ's Hospital and the City of London School. Three years afterwards *The Times* rendered noble public service in a different direction. It used its vast power with vigour—at the expense of materially checking the growth of its own advertisement fund—by denouncing the fraudulent schemes which underlay the "railway mania" of 1845. The Parnell affair has already been mentioned. And more recently the "book war," arising out of the attack by the combined publishers on *The Times* Book Club in 1906, was prosecuted by *The Times* with great vigour, until in 1908 it came quietly to an end.

Various adjuncts to *The Times*, issued by its proprietors, have still to be mentioned. *The Mail*, published three times a week at the price of 2d. per number, gives a summary of two days' issue of *The Times*. *The Times Weekly Edition* (begun in 1877) is published every Friday at 2d., and gives an epitome of *The Times* for the six days. The *Law Reports* (begun in 1884) are conducted by a special staff of *Times* law reporters. *Commercial Cases* deals with cases of a commercial nature. *Issues* is a useful half-yearly compilation of all the company announcements and demands for new capital, taken from the advertisement columns of *The Times*.

In 1897 *The Times* started a weekly literary organ under the title of *Literature*. In 1901, however, a weekly literary supplement to *The Times* was issued instead, and *Literature* passed into the hands of the proprietor of the *Academy*, with which paper it was incorporated. The "Literary Supplement," which appears each Thursday (at first on Fridays), is printed in a different form, and separately paged. In 1904 a "Financial and Commercial Supplement" (at first on Mondays, and later on Fridays) was added; in 1905 an "Engineering Supplement" (Wednesdays), and in 1910 a "Woman's Supplement."

The publishing department of *The Times* also invaded several new fields of enterprise. *The Times Atlas* was first published in 1895, and this publication was supplemented by that of *The Times* (previously Longmans') *Gazetteer*. A much larger amd more important venture was the issue in 1898 of a reprint of the ninth edition of the *Encyclopaedia Britannica* at less than half the original price, on a new system of terms (known as *The Times* system) that enabled the purchaser to receive the whole work at once and to pay for it by a series of equal monthly payments. This was followed by a similar sale of the *Century Dictionary* and of a reprint of the first fifty years of *Punch*; and eleven new volumes of the *Encyclopaedia Britannica*, supplementing the ninth edition, and forming with it the tenth edition, were issued by *The Times* in 1902 on similar terms (see ENCYCLOPAEDIA).

In 1895 *The Times*, through its Vienna correspondent, purchased from Dr Moritz Busch the MS. and entire copyright of his journals, containing a very minute record of his intimate relations with Bismarck. It was stipulated in the contract that these were not to be published until after the death of the prince. That event occurred on the 30th July 1898, and on the 12th September of the same year *The Times* published through Messrs Macmillan (in 3 vols.) *Bismarck: Some Secret Pages of his History*, by Dr Moritz Busch.

The Times History of the War in South Africa arose out of a desire to preserve in a more readable form the excellent work done by the numerous *Times* correspondents in South Africa. When originally projected in the early days of 1900 it was hoped that the war would be of short duration, and that the history of it could be rapidly completed. The length of the war naturally upset all these calculations, and eventually the sixth and last volume was only issued in 1909.

For a long period after the establishment of *The Times*, no effort to found a new daily London morning newspaper was ever conspicuously successful. Among unfruitful attempts were—(1) the *New Times*, started by Dr (afterwards Sir John) Stoddart, upon his departure from Printing-House Square; (2) the *Representative* (1824), established by John Murray, under circumstances which seemed at the outset exceptionally promising; (3) the *Constitutional*, begun in 1836 and carried on for eight months by a joint-stock company, exceptionally favoured in having for editor and sub-editor Laman Blanchard and Thornton Hunt, with a staff of contributors which included Thackeray, Douglas Jerrold and Bulwer; (4) the *Morning Star*, founded in 1856, and kept afloat until 1870, when it was merged in the *Daily News*; (5) in 1867, the *Day*, for six weeks only; (6) in 1873 the *Hour*, for three years; (7) in 1878, the *Daily Express*, which soon failed.

"Morning Advertiser."

A measure of greater success followed the establishment (1794) of the *Morning Advertiser*, under special circumstances. It was the joint-stock venture of a large society of licensed victuallers, amongst whom subscription to the paper was the condition of membership. For nearly sixty years its circulation lay almost entirely in public-houses and coffee-houses, but amongst them it sold nearly 5000 copies daily, and it yielded a steady profit of about £6000 a year. Then, by the ability and enterprise of an experienced editor, James Grant (1802–1879), it was within four years raised to a circulation of nearly 8000, and to an aggregate profit of £12,000 a year. In 1891 its price was reduced from threepence to a penny.

"Daily News."

The history of the *Daily News*, founded in 1846, has been told by Mr Justin McCarthy and Sir John R. Robinson in a volume of "political and social retrospect" published in 1896 on the occasion of its jubilee. It could boast of having continuously been the champion of Liberal ideas and principles—of what (so long as Mr Gladstone lived) might be called official Liberalism at home and of liberty abroad. It became a penny paper in 1868. Its only rival in the history of Liberal journalism in London for many years was the *Morning Star*, which in 1870 it absorbed. Notably, it led British public opinion in foreign affairs as champion of the North in the American Civil War, of the cause of Italy, of the emancipation of Bulgaria from the Turk and of Armenia. Its early editors were Charles Dickens (21st January–March 1846), John Forster (March–October 1846), E. E. Crowe (1847–1851), F. K. Hunt (1851–1854), W. Weir (1854–1858), T. Walker (1858–1869). In 1868 the price was reduced to a penny, and it came under the management of Mr (afterwards Sir) John R. Robinson (1828–1903), who only retired in 1901. Its later editors included (1868–1886) Mr F. H. Hill (the brilliant author of *Political Portraits*), and subsequently Sir John Robinson, as managing editor, in conjunction with Mr P. W. Clayden (1827–1902), the author of *Life of Samuel Rogers*, *England under the Coalition* and other able works, as political and literary editor, down to 1896, and Mr E. T. Cook from 1896 to 1901. Mr Cook, during the negotiations with the Boer government in 1899, strongly supported Sir Alfred Milner; and under him the *Daily News*, as an exponent of Lord Rosebery's Liberal Imperialism, gave no countenance to the pro-Boer views of some of the more active members of the Liberal party. In 1901, however, the proprietary changed, and Mr George Cadbury became chief owner of the paper. Mr E. T. Cook, who had shown brilliant ability as a publicist, but whose views on the Boer War were not shared by the new proprietor, retired, subsequently joining the staff of the *Daily Chronicle*; the journal then became an organ of the anti-imperialist section of the Liberal party. Mr A. G. Gardiner became editor in 1902; and in 1904 considerable changes were made in the style of the paper, which was reduced in price to a halfpenny. The influence of Mr Cadbury, and of the group of Quaker families—largely associated with the manufacture of cocoa—who followed his example in promoting the publication of Liberal and Free Trade newspapers, led in later years to somewhat violent attacks from political opponents on the so-called "Cocoa Press," with the *Daily News* at its head.

"Daily Telegraph."

The first number of the *Daily Telegraph* was published on 29th June 1855, as a twopenny newspaper. Its proprietor was Colonel Sleigh. This gentleman soon found himself in pecuniary straits, and in satisfaction of the debt for the printing of the paper it was transferred to Mr Joseph Moses Levy in the following September. On 17th September Mr Levy published it as a four-paged penny journal, the first penny newspaper produced in London. His son, afterwards Sir Edward Lawson (b. 1833), who was created Baron Burnham in 1904, immediately entered the office, and after a short time became editor, a post which he only abandoned in 1885, when he became managing proprietor and sole director. From the outset Mr Levy gathered round him a staff of high literary skill and reputation. Among the first were Thornton Hunt, Geoffrey Prowse, George Hooper and Sir Edwin Arnold. E. L. Blanchard was among the earliest of the dramatic critics, and Alexander Harper the City editor. Later there came George Augustus Sala (q.v.), then one of Charles Dickens's young men; Clement Scott (1841–1904), at one time a clerk in the War Office; and Edward Dicey (b. 1832), then fresh from Cambridge. The Hon. Frank Lawley turned to journalism from official life; and among the most remarkable of the early contributors to the paper was J. P. Benjamin, the great Anglo-American lawyer. H. D. Traill was a leader-writer for well-nigh a quarter of a century. J. M. Le Sage (b. 1837), for many years the managing editor, began his connexion with the paper under Mr Levy. Others prominently associated with the paper have been W. L. Courtney (b. 1850), a distinguished man of letters who, after several years of work as tutor at New College, Oxford, joined the staff in 1890, and in 1894 also became editor of the *Fortnightly Review*; E. B. Iwan-Müller (d. 1910) and J. L. Garvin (from 1899), afterwards (1904) editor of the *Observer*. After 1890 Mr H. W. L. Lawson, Lord Burnham's eldest son and heir, assisted his father in the general control of the paper.

The *Daily Telegraph* may be said to have led the way in London journalism in capturing a large and important reading-public from the monopoly of *The Times*. It became the great organ of the middle classes, and was distinguished for its enterprise in many fields. In June 1873 the *Telegraph* despatched George Smith to carry out a series of archaeological researches in Nineveh, which resulted in the discovery of the missing fragments of the cuneiform account of the Deluge, and many other inscriptions. In co-operation with the *New York Herald* it equipped H. M. Stanley's second great expedition to Central Africa (1875–1877). Another geographical feat with which the name of the *Daily Telegraph* is associated was the exploration of Kilimanjaro (1884–1885) by Mr (afterwards Sir) Harry Johnston, whose account of his work appeared in the *Daily Telegraph* during 1885. And Mr Lionel Decle's march from the Cape to Cairo, in 1899 and 1900, was also undertaken under the auspices of the paper. The *Telegraph* raised many large funds for public purposes. Almost the first was the subscription for the relief of the sufferers by the cotton famine in Lancashire, in the winter of 1862–1863; the fund in aid of the starving and impoverished people of Paris at the close of the siege in 1871; the prince of Wales's Hospital Fund in commemoration of the Jubilee of 1897; and the Shilling Fund for the soldiers' widows and orphans in connexion with the Boer War. An undertaking of a more festive kind was the fête given to 30,000 London school children in Hyde Park on the occasion of Queen Victoria's Jubilee in 1887.

In politics the *Daily Telegraph* was consistently Liberal up to 1878, when it opposed Mr Gladstone's foreign policy as explained in his Midlothian speeches. After 1886 it represented Unionist opinions. Among special feats of which it can boast was the first news brought to England of the conclusion of peace after the Franco-German War.

Prior to 1874 the *Daily Telegraph* was printed by eight- and ten-feeder machines, through which every sheet had to be passed twice to complete the impression. Under these conditions it was necessary to start printing one side of the paper as early as ten or eleven o'clock. The handicap which this imposed on the satisfactory production of a newspaper was removed by the introduction of Hoe's web machines at the end of 1874. No further change took place until 1891, when they were superseded by others built by the same makers capable of printing a 12-page paper at the rate of about 24,000 an hour, cut, folded, delivered and counted in quires. In 1896 they were modified so as to be suitable for turning out an 8-, 10-, 12-, 14- or 16-page paper. Up to 1894 the setting of type had been done entirely by hand, but in that year the linotype, after an experimental trial, was introduced on a large scale.

The Standard. The *Standard* was established as an evening paper in the Tory interest (as the express organ of the opponents of the measure for removing Roman Catholic disabilities) in 1827, its first editor being Stanley Lees Giffard, father of the first earl of Halsbury, who had Alaric Watts and Dr William Maginn, famous as one of the originators of *Fraser's Magazine*, as his chief helpers. In the course of two or three years it became a pecuniary, as it had from the first been a political, success, and gradually ousted the *Courier*, which was for a time conducted by William Mudford, whose son half a century later became the most distinguished editor of the *Standard*. In course of time the latter became the property of Mr Charles Baldwin, whose father was proprietor of the *Morning Herald*, and when the father died the son found himself in possession of both a morning and an evening journal. In his hands neither of them prospered, although the *Standard* retained a large circulation and constantly printed early and accurate political information. At length, midway in the 'fifties, both papers were purchased by Mr James Johnstone, Mr John Maxwell, the publisher, being for a time associated with him in the ownership. Mr Johnstone realized that he had before him a great opportunity, and at once set to work to grasp it. He brought out the *Standard* as a morning paper (29th June 1857), increased its size from four to eight pages, and reduced the price from fourpence to twopence. One of the most curious features of the early numbers was a novel by William Howard Russell. The evening edition was continued. In February 1858 Mr Johnstone again reduced the price, this time to a penny. When that step was taken the *Standard* announced that its politics were "enlightened amelioration and progress," but that it was "bound to no party"; and to those independent lines it in the main adhered. In the course of four or five years it became a financial success, and then began to attract to itself many brilliant pens, one of its contributors in the 'sixties, Lord Robert Cecil, being destined to become illustrious as marquess of Salisbury. Lord Robert was an occasional leader-writer, whose contributions were confined almost entirely to political subjects. It was at this time that the *Standard* laid the foundation of the great reputation for early and detailed foreign news which it has ever since enjoyed. During the American Civil War it obtained the services of a representative signing himself "Manhattan," whose vivid and forcible letters from the battlefield arrested attention from the beginning. As the campaign progressed, these full, picturesque and accurate accounts of the most terrible struggle of modern times were looked for with eager interest. There were no "special cables" to discount the poignant curiosity of the reader, and the paper reached a circulation far beyond anything hitherto known. The distinction thus acquired was maintained during the Prussian-Austrian War of 1866, and greatly increased by the letters and telegrams describing the triumphs and disasters of the campaign of 1870. In the early 'sixties the staff had been reinforced by the engagement of Mr William Heseltine Mudford. In the midst of his work as a parliamentary reporter, he was sent as special correspondent to Jamaica in 1865 to report upon the troubles which involved the recall of Governor Eyre; a further period in the gallery of the House of Commons followed, and in 1873 Mr Mudford became business manager. Mr Johnstone's first editor was Captain Hamber, who afterwards seceded to the short-lived *Hour*, with whom had been associated Mr David Morier Evans as manager. He was succeeded by the owner's eldest son, to whom Mr (afterwards Sir) John Gorst was joined in a consultative capacity. In 1876 Mr Mudford became editor, still, however, retaining managerial control. Mr Johnstone, the proprietor to whose energy and perspicacity the paper owed so much, died in 1878, and under his will Mr Mudford was appointed editor and manager for life, or until resignation. Already a great property, the *Standard* in Mr Mudford's hands entered upon a very successful period. He had for his first assistant-editor Mr Gilbert Venables, who was succeeded after a short term by Mr George Byron Curtis, previously one of the leader-writers, who thus held the position through nearly the whole of Mr Mudford's long editorship. The staff at this time comprised many men, and some women, whose names are distinguished in letters as well as in journalism. Mr Alfred Austin, Mr T. H. S. Escott, Miss Frances Power Cobbe and Professor Palmer were all writing for the paper at the same time. To them must be added, among others, Mr E. D. J. Wilson, the brilliant political leader-writer (afterwards of *The Times*), Mr Percy Greg, son of "Cassandra" Greg, Mr T. E. Kebbel and Dr Robert Brown, who wrote copiously upon scientific and miscellaneous subjects. Foremost among the war correspondents were Mr G. A. Henty, who represented the paper on many a stricken field; Mr John A. Cameron, who was killed at Abu Klea; and Mr William Maxwell. In January 1900 Mr Mudford retired, and was succeeded in the editorship by Mr G. Byron Curtis (d. 1907), Mr S. H. Jeyes, whose connexion with the paper had begun in 1891, becoming assistant-editor. In November 1904 the *Standard*, which had at that time taken rather a strong line in deprecating the tariff reform movement within the Unionist party, was sold to Mr C. Arthur Pearson (proprietor of the *Daily Express*, see below), who was chairman of the Tariff Reform League, and considerable changes were made in the paper, Mr H. A. Gwynne becoming editor. In 1910 Mr Pearson, owing to ill-health, transferred his interests in the proprietary company he had formed in 1904 to Mr Davison Dalziel.

Daily Chronicle. The *Daily Chronicle* arose, as already mentioned, out of the local *Clerkenwell News*, the latter paper having been purchased by Mr Edward Lloyd in 1877, and converted into "an Imperial morning paper" on independent Liberal lines. Under the editorship of Mr R. Whelan Boyle the *Daily Chronicle* soon took rank among the other London daily journals, the only traces of its original character being shown in the attention paid to metropolitan affairs and the appearance of numerous small advertisements. The independent tone of the journal was conspicuous in its treatment of the Home Rule question. At first deprecating the system of combined agitation and outrage with which the term was synonymous, the *Daily Chronicle*, under the editorship of Mr A. E. Fletcher (1890–1895), ceased to be a Unionist journal, and supported Mr Gladstone's Bill of 1893. Another instance was afforded in the course of the Boer War. During the negotiations and the early stages of the campaign, the *Daily Chronicle*, which was then edited by Mr H. W. Massingham (b. 1860), strove for peace by supporting the Boer side against the diplomacy of Mr Chamberlain. Mr Massingham's policy was, however, not to the liking of the proprietors, and he retired from the editorship towards the end of 1899, Mr W. J. Fisher succeeding him as editor. In 1904 Mr Robert Donald became editor, and the price was reduced to a halfpenny. Mr Massingham during his editorship, ably seconded by Mr (afterwards Sir) Henry Norman (b. 1858), had largely increased the interest of the paper, particularly on its literary side. A new impetus had been given in this direction in 1891, when a "literary page" was started, conducted at first by Mr J. A. Manson, and after 1892 by Mr Massingham, when he became assistant-editor under Mr Fletcher. The *Chronicle* had taken a leading part in many public movements since 1877. It was conspicuous in its advocacy of the cause of the men in the London dock strike of 1889; and in the great mining dispute for a "living wage," which was brought to a close by Lord Rosebery in November 1893, raised over £13,000 for the relief committees. Much attention was given to the theosophical discussion of 1891 and to the exposure of the adventurer "De Rougemont" after he had appeared before the British Association at Bristol in 1898. The *Chronicle* took an active part in the negotiations which led to the Venezuelan Arbitration Treaty of 1897; it energetically pleaded the cause of the Armenians and Cretans during the massacres of 1896, and it encouraged the Greeks in the war with Turkey in 1897. Its foreign policy was, however, more distinguished by goodwill than by discretion—and notably in the latter instance. The *Chronicle* also worked strenuously for the Progressive cause in London in regard to the County Council, Borough Councils and the School Board. Its new successes included the first announcement of the revolution in eastern Rumelia (1885); the first circumstantial account of the death of Prince Rudolph (1889); Nansen's own narrative of his expedition towards the North Pole; Sir Martin Conway's journey across Spitzbergen in 1896; and the first ascent of Aconcagua in 1897.

Daily Graphic. In 1890 the illustrated morning daily paper, the *Daily Graphic*, was founded by W. L. Thomas (1830–1901) as an offshoot from the weekly illustrated *Graphic*, and soon came into favour.

Tribune. In 1906 a new Liberal morning daily was started by Mr Franklin Thomason in the shape of the *Tribune*, edited by Mr W. Hill, who retired after a few months, with Mr L. T. Hobhouse as political editor. Later Mr Pryor became managing editor, but at the beginning of 1908, after heavy losses, the publication was stopped.

Morning Leader. Two morning papers, at the popular price of halfpenny, appeared in the spring of 1892, the *Morning* and the *Morning Leader*. They raced for priority of publication, the former winning by a day. The *Morning Leader*, under the same management as the (evening) *Star*, continued to flourish, but the *Morning* had but a brief career.

Daily Mail. The halfpenny *Daily Mail* was originated by Mr Alfred Charles Harmsworth (b. 1865), who was subsequently created a baronet (1904) and in 1905 a peer as Baron Northcliffe; it appeared in 1896, on the same day as Sir G. Newnes's penny *Courier* (which only lasted a few weeks). In the evolution of English journalism the foundation of the *Daily Mail* carried still farther the work begun by the *Daily Telegraph* in earlier days. It was the first halfpenny morning newspaper to place at the disposal of its readers a news service competing with that of any of the higher-priced newspapers, and soon took an increasingly important place in the Press. At the opening of the 20th century it claimed a regular circulation of about a million copies daily (and had occasionally sold as many as 1,500,000 copies of a single issue), and it was produced simultaneously in London and Manchester, the whole of the contents being telegraphed nightly. In May 1904 it began publishing a continental edition in Paris. The sensational success of the *Daily Mail*, which first made Lord Northcliffe one of the dominant personalities in English journalism, was due, not to individual writers, but to a consistent policy of catering for a modern public and serving them with lively news and articles, and constant change of interest. Its large circulation, and resulting advertising revenue, gave it an influence which in politics was used on the Unionist side; but the readers of the *Daily Mail* went to it, not for politics, but for news, brightly and briefly displayed. Its triumph represented the success of a business organization, in which individual views on affairs played a comparatively minor part.

Daily Express.

The halfpenny *Daily Express*, founded by Mr Cyril Arthur Pearson (b. 1866) on the lines of the *Daily Mail*, first appeared in 1900, and soon won a large clientèle. With R. D. Blumenfeld as editor (from 1904) it worked strenuously for Tariff Reform.

Daily Mirror.

The *Daily Mirror*, started by Mr Harmsworth as a women's penny daily in 1904, failed to attract in its original form and was quickly changed into a halfpenny general daily, relying as a novelty on the presentation of news by photographic pictures of current events. This new feature soon obtained for it a large circulation under the enterprising management of Mr Kennedy Jones (b. 1865), who was already known for his successful conduct of the *Evening News* and his share in the business of the *Daily Mail*.

Globe.

The *Globe* (founded Jan. 1st., 1803), the oldest of existing London evening papers, owed its origin to the desire of the booksellers or publishers of the day for an advertising medium, at a moment when the *Morning Post* gave them the cold shoulder. A syndicate of publishers started a morning paper, the *British Press* (which had only a short career), to combat the *Post*, and the *Globe* as a rival to the *Courier* (see above), which, like the *Post*, was under Daniel Stuart's control. George Lane, previously Stuart's chief assistant, was the editor. From 1815 a prominent member of the staff was Mr (afterwards vice-chancellor Sir James) Bacon. After swallowing up some other journals, in 1823 it absorbed the property and title of the *Traveller*, controlled by Colonel Torrens, who in the reorganization became principal proprietor and brought over Walter Coulson as the editor. John Wilson succeeded as editor in 1834, efficiently seconded by Mr Moran; Thomas Love Peacock and R. H. Barham ("Ingoldsby") being famous contributors during his regime. For some time the *Globe* was the principal Whig organ, and Mr (afterwards Deputy Judge Advocate Sir James) O'Dowd its political inspirer. Mahony ("Father Prout") was its Paris correspondent. In 1842 the *Courier* was incorporated, but a gradual decline in the fortunes of the paper, and Colonel Torrens's death in 1864, brought about a reorganization in 1866, when a small Conservative syndicate, including Sir Stafford Northcote, bought it and converted the *Globe* into a Conservative organ. In 1868 the pink colour since associated with the paper was started. In 1869 its price (originally sixpence) was lowered to a penny. Mr W. T. Madge (b. 1845), whose vigorous management was afterwards so valuable, and who in 1881 started with Captain Armstrong the *People*, a popular Sunday journal for the masses, joined the paper in 1866; and after brief periods of editorship by Messrs Westcomb, R. H. Patterson, H. N. Barnett and Marwood Tucker (1868), in 1871 Captain George C. H. Armstrong (1836–1907), who in 1892 was created a baronet, was put in control; he edited the paper for some years, and then it became his property. The editorial chair was filled in succession by Mr Ponsonby Ogle, Mr Algernon Locker (1891), and the proprietor's son and heir Lieut. G. E. Armstrong, R.N. (1895), until in June 1907, after Sir G. Armstrong's death, the paper was sold to Mr Hildebrand Harmsworth. The *Globe* "Turnovers" (miscellaneous articles, turning over from the first to the second page) began in 1871, and became famous for variety and humour. The jocular "By the Way" column, another characteristic feature, was started in 1881, and owed much to Mr Kay Robinson and Mr C. L. Graves. In the history of the *Globe* one of the best-known incidents is its publication of the Salisbury-Schuvaloff treaty of 1878. It was the first London daily to use the linotype composing-machine (1892).

Pall Mall Gazette.

A new period of evening journalism, characteristic of the later 19th century, opened with the founding of the *Pall Mall Gazette*. The first number (at twopence) was issued on 7th February 1865 from Salisbury Street, Strand. Mr George Smith, of the publishing firm of Smith and Elder, was its first proprietor; Mr Frederick Greenwood (*q.v.*), its first editor, took the *Anti-Jacobin* for his model; the paper was intended to realize Thackeray's picture (in *Pendennis*) of one "written by gentlemen for gentlemen." Its political attitude was to be independent, and much space was to be given to literature and non-political matter. It had brilliant supporters, such as Sir J. Fitzjames Stephen as writer of leading articles (replaced to a certain extent, after 1869, by Sir Henry Maine), R. H. Hutton, Matthew James Higgins ("Jacob Omnium"), James Hannay, and George Henry Lewes, with George Eliot, Anthony Trollope, Charles Reade, and Thomas Hughes as occasional contributors; but the paper failed to attract the general public until, in the following year, Mr Greenwood's brother, James, furnished it with three articles on "A Night in a Workhouse: by an Amateur Casual." A morning edition had already been tried and dropped, and so was a distinct morning paper attempted in 1870. In 1867 new premises were taken in Northumberland Street, Strand. Three years later the *Pall Mall Gazette* was the first to announce the surrender of Napoleon III. at Sedan. Matthew Arnold contributed his famous "Arminius" letters ("Friendship's Garland") in 1871, and Richard Jefferies contributed "The Gamekeeper at Home" in 1876 and onwards. Mr Greenwood made the paper unflinchingly Conservative and strongly adherent to Lord Beaconsfield's foreign policy. In 1880, however, Mr Smith handed over the *Pall Mall Gazette* to his son-in-law, Mr Henry Yates Thompson, who turned it into a Liberal journal. Mr Greenwood then retired from the editorship and shortly afterwards started the *St James's Gazette*; Mr John (afterwards Viscount) Morley became editor of the *Pall Mall*, with Mr W. T. Stead (b. 1849) as assistant-editor. The price was reduced in 1882 to one penny. Many of the old contributors remained, and they were reinforced by Robert Louis Stevenson, who wrote some "Letters from Davos," Professor Tyndall, Professor Freeman, James Payn and Mrs Humphry Ward. When Mr Morley exchanged journalism for politics in 1883, he was succeeded by Mr W. T. Stead (*q.v.*), with Mr Alfred Milner, afterwards Lord Milner, as his assistant. Adopting an adventurous policy, Mr Stead imported the "interview" from America, and a report of General Gordon's opinion was believed to have been the cause of his ill-fated mission to Khartum. A series of articles called "The Truth about the Navy" (1884) had considerable influence in causing the Admiralty to lay down more ships next year. But Mr Stead's career as the editor came to an end in 1889, in consequence of his publishing a series of articles called "The Maiden Tribute of Modern Babylon," purporting to further the Criminal Law Amendment Bill. Mr Stead had made a feature of reprints called "extras"; and, edited by Mr Charles Morley, the *Pall Mall Budget* became an illustrated weekly. Mr Stead was replaced in 1889 by E. T. Cook, who had become assistant-editor in succession to Milner. The *Pall Mall Gazette* was now steadily Liberal and a strong advocate of Irish Home Rule. On its staff were Edmund Garrett (a gifted writer who became editor of the *Cape Times* in South Africa, and died prematurely in 1907), F. C. Gould the caricaturist, and J. Alfred Spender (b. 1862). Mr Cook resigned in 1892, on the sale of the paper to Mr William Waldorf Astor, the American millionaire, who turned it again into a Conservative organ, and also changed its shape, abandoning the old small pages for a larger sheet; and he and his assistant Mr Spender continued the Liberalism of the *Pall Mall* in the *Westminster Gazette* (see below). Mr Henry Cust, M.P., was appointed editor, with Mr E. B. Iwan-Müller as assistant-editor. Mr Cust (b. 1861), who was Lord Brownlow's heir, and came fresh to editorship with enthusiasms acquired from his experiences in parliament and in society, made the columns of the *Pall Mall* very lively for the next couple of years. It became well known for its "booms," and its "smartness" generally. Some papers contributed to it by Sir Charles Dilke and Mr Spenser Wilkinson resulted in the establishment of the Navy League in 1894. The paper had, too, the first news of Mr Gladstone's resignation and the appointment of Lord Rosebery to succeed him. But though the *Pall Mall* under Mr Cust had outshone all its competitors, its independence of those business considerations which ultimately appeal to most proprietors hardly represented a durable state of affairs; and eventually the relations between proprietor and editor became strained. In February 1896 Mr Cust and Mr Iwan-Müller were succeeded respectively by Sir Douglas Straight and Mr Lloyd Sanders, the latter of whom retired in 1902. Sir Douglas Straight (b. 1844) had been in early days a well-known London barrister, and from 1879 to 1892 was a judge in India. Sir Douglas Straight remained editor till the end of 1908, when he was succeeded by Mr Higginbottom.

The St James's Gazette.

Founded in 1880 by Mr H. Hucks Gibbs (afterwards Lord Aldenham), for Mr Frederick Greenwood to edit when he had left the *Pall Mall*, the *St James's Gazette* represented the more intellectual and literary side of Tory journalism in opposition to the new Liberalism of Mr Greenwood's former organ; it was in fact meant to carry on the idea of the original *Pall Mall* as Mr Greenwood had conceived it, and was (like it) more of a daily review than a chronicle of news. In 1888 the paper having then been sold to Mr E. Steinkopff, Mr Greenwood retired and was succeeded as editor (1888–1897) by Mr Sidney Low, subsequently author of *The Governance of England* and other able works, who had as his chief assistant-editors Mr S. H. Jeyes (till 1891), and Mr Hugh Chisholm (1892–1897), the latter succeeding him as editor (1897–1900). In those days mere news was not considered the important feature; or rather, original and sagacious views were identified with a sort of novelty such a paper could best promulgate. The *St James's* was for many years conspicuous for its literary character, and for the number of distinguished literary men who wrote for it, some of whom first became known to the public by means of its columns. Its interest in newspaper history is really that of a paper which appealed to and influenced a comparatively small circle of cultured readers, a "superior" function more and more difficult to reconcile with business considerations. It was one of the earliest supporters of the Imperialist movement, and between 1895 and 1899 was the chief advocate in the Press of resistance to the foreign bounties on sugar which were ruining the West Indies, thus giving an early impetus to the movement for Tariff Reform and Colonial Preference. During the years immediately following 1892, when the *Pall Mall Gazette* again became Conservative, the competition between Conservative evening papers became acute, because the *Globe* and *Evening Standard* were also penny Conservative journals; and it was increasingly difficult to carry on the *St James's* on its old lines so as to secure a profit to the proprietor; by degrees modifications were made in the general character of the paper, with a view to its containing more news and less purely literary matter. But it retained its original shape; with sixteen (after 1897, twenty) small pages, a form which the

Pall Mall abandoned in 1892. Gradually these changes took effect. In 1900 Mr Theodore Andrea Cook, who had been assistant-editor since 1898, became editor for a brief period, and subsequently Mr Ronald MacNeill (till 1903) acted in this capacity, with Mr W. D. Ross as manager. Meanwhile the *St James's Budget*, which up to 1893 had been a weekly edition of the *Gazette*, was turned into an independent illustrated weekly, edited from the same office by Mr J. Penderel-Brodhurst (afterwards editor of the *Guardian*), who had been on the editorial staff since 1888; and it continued to be published till 1899. In 1903 the *St James's* was sold to Mr C. Arthur Pearson, who in 1905, having bought the morning *Standard*, amalgamated the *St James's* with the *Evening Standard*.

Evening Standard.

The *Evening Standard* had been founded in 1827 (see under the *Standard* above), and when it was amalgamated with the *St James's Gazette* in 1905, the two titles covered a new paper, in a new form, as the penny *Evening Standard and St James's Gazette*.

The Westminster Gazette.

When the *Pall Mall Gazette* was sold to Mr Astor in 1892 and converted into a Conservative organ, Mr E. T. Cook, the editor, and most of his staff, resigned, and in 1893 they came together again on the *Westminster Gazette*, newly started for the purpose by Sir G. Newnes (who had made a fortune out of *Tit-bits* and other popular papers) as a penny Liberal evening paper. It was printed on green paper, but the novelty of this soon wore off. The paper was conducted on the lines of the old *Pall Mall*, and it had the advantage of a brilliant political cartoonist in F. Carruthers Gould. In 1895 Mr Cook was appointed editor of the *Daily News*, and his place was ably filled by Mr J. Alfred Spender, who had been his assistant-editor, Mr Gould (who was knighted in 1906) being his chief assistant. Apart from Sir F. C. Gould's cartoons, the *Westminster* became conspicuous in London evening journalism for its high standard of judicious political and literary criticism. It gradually became the chief organ of Liberal thought in London. One of its early literary successes was the original publication of Mr Anthony Hope's *Dolly Dialogues*, and it continued to maintain, more than any other evening paper, the older literary and political tradition of the "gentlemanly journalism" out of which it had sprung. In 1908 a change of proprietorship took place, the paper being sold by Sir G. Newnes (d. 1910) to Mr (afterwards Sir) Alfred Mond, but without affecting the *personnel* or policy of the paper.

Halfpenny Evening Papers.

The first modern English evening newspaper to be issued at a halfpenny was the *London Evening News*—afterwards known as the *Day*. It was started in 1855, but soon failed to meet expenses and disappeared from the scene. In 1868 appeared the London *Echo*, published by Henry Cassell. It had for its first editor, until 1875, Mr (afterwards Sir) Arthur Arnold (1833–1902), afterwards M.P. for Salford (1880–1886) and chairman of the London County Council (1895–1896), who was well known both as a writer and traveller and as founder of the Free Land League (1885). Baron Albert Grant (1830–1899), the pioneer of modern mammoth company-promoting,[1] afterwards took the *Echo* in hand and wasted a fortune over it; and eventually it was owned for some years by Mr Passmore Edwards, coming to an end in 1905. The *Evening News* was begun at a halfpenny in 1881 as a Liberal organ, but was shortly afterwards bought by a Conservative syndicate. It saw stormy times, and at the end of thirteen years it had absorbed £298,000 and was heavily in debt. Its shares could then be purchased for threepence or fourpence each. In August 1894 it was purchased by Messrs Harmsworth for £25,000, and under Mr Kennedy Jones's management developed into a highly successful property. On 17th January 1888 the first number of the *Star* appeared, under the editorship of Mr T. P. O'Connor (b. 1848), as a half penny evening newspaper in support of Mr. Gladstone's policy. When Mr O'Connor left the paper, Mr H. W. Massingham became its editor, and subsequently Mr Ernest Parke. In 1909 the *Star* was acquired by a new proprietorship in which Messrs Cadbury and the *Daily News* had an important share. From the first it was conspicuous for its advanced attitude in politics, and also for excellent literary criticism. In 1893 Mr T. P. O'Connor founded the *Sun*, which eventually passed into the hands of a succession of proprietors and came to an end in October 1906.

Sporting and financial dailies.

As regards the purely sporting press in London, *Sporting Life*, started in 1859, became a daily in 1883, and in 1886 incorporated the old *Bell's Life*. The daily *Sportsman*, the leading paper, was founded in 1865. The financial daily press is a modern creation and has taken many shapes; the *Financier* was the first regular daily, but in 1884 the *Financial News*, under Mr H. H. Marks, made its appearance, and in 1888 the *Financial Times*; and these became the leading papers of their class.

London weekly newspapers.

The London weekly press (see also under Periodicals) has always worn a motley garb. Weekly publication facilitates the individuality of a journal, both as respects its editorship and as respects the class of readers to which it more especially addresses itself. From the days of Daniel Defoe there have always been newspapers bearing the unmistakable impress of an individual and powerful mind. Cobbett's *Weekly Register* affords perhaps as striking an illustration of journalism in its greatness and in its meanness as could be found throughout its entire annals. And Cobbett's paper has had many successors, some of which, profiting by the marvellous mechanical appliances of the present day, have attained a far wider popular influence than was possessed by the *Weekly Register* in its most prosperous days.

The history of the weekly reviews practically begins with the *Examiner*, which was founded in 1808 and had a long career as one of the most prominent organs of the Liberals, ending in 1881. That its literary reputation was great resulted naturally from a succession of such editors as Leigh Hunt, Albany Fonblanque, John Forster and Henry Morley. This was succeeded in January 1817 by the foundation of the *Literary Gazette*, the proprietor of which was Henry Colburn and the first editor William Jerdan. Jerdan succeeded in inducing Crabbe and Campbell to contribute to it, and among those who assisted him were Bulwer Lytton, Barry Cornwall and Mrs Hemans. The *Literary Gazette* came to an end in 1862. At the end of 1820 Theodore Hook founded *John Bull*, which for a time had extraordinary popularity; to it he contributed the most brilliant of his *jeux d'esprit*.

Epochs in the development of this form of literature were marked by the foundation of the *Athenaeum* by James Silk Buckingham in January 1828 and by that of the *Spectator* by Robert Stephen Rintoul later in the same year.

Spectator and Saturday Review.

The *Spectator* was edited for thirty years by Robert Rintoul. In 1858 the latter sold the paper to Mr Scott, who retired, however, from the editorship after a few months; and for a time the *Spectator* was in low water. In 1861 it passed into the hands of R. H. Hutton (*q.v.*) and Meredith Townsend, and under them became a successful exponent of moderate Liberalism and thoughtful criticism, particularly in the discussion of religious problems, such as were uppermost in the days of the Metaphysical Society. The high character and literary reputation of the *Spectator* were already established when, in 1897, it passed into the hands of Mr J. St Loe Strachey (b. 1860), but under him it became a more powerful organ, if only because it more than maintained its position while the other weekly papers declined. Unionist in politics since 1886, the *Spectator* after 1903 was the leading organ of Free Trade Unionists who opposed tariff reform, until the progress of socialism and the extravagance of Mr Lloyd-George's budget in 1909 caused it to accept the full policy of the Unionist party in preference to the dangers of socialistic radicalism. No paper in London, it may well be said, has earned higher respect than the *Spectator*, or carried more weight in its criticisms, both on politics and on literature. This has not been on account of any special brilliance of the pyrotechnic order, but because of continuous sobriety and good sense and unimpeachable good faith.

The *Saturday Review*, on the other hand, is important historically rather for the brilliance of its "palmy days." First published on the 3rd of November 1855, it was founded by A. J. B. Beresford Hope (1820–1887), a brother-in-law of Lord Salisbury, M.P. for Maidstone and for Cambridge University, and a prominent churchman and art patron; with John Douglas Cook (1808–1868) as editor. Mr Hope was the son of James Hope (1770–1831), author of *Anastatius*; and it was reputed that Douglas Cook was "Anastatius" Hope's natural son. For several years the *Saturday* maintained an exceptional position in London journalism. On the political side it was at first Peelite, but the strong churchmanship of Mr Beresford Hope and antagonism to Mr Gladstone did much to bring it round to a pronounced Conservative view. Most, though not all, of its early staff had already worked under Mr Cook, when he was editor of the *Morning Chronicle* (from 1848 to 1854). In its literary comment it gave much space to articles of pure criticism and scholarship, and almost every writer of contemporary note on the Tory side contributed to its columns. But the matter which did most to give it its peculiar character was found in its outspoken or even sensational "middles"—"The Frisky Matron," "The Girl of the Period" (by Mrs Lynn Linton), "The Birch in the Boudoir," &c. The editorship remained in the hands of Mr Cook till his death in 1868. In 1861 a secession from the *Saturday* lasting till 1863, led to the temporary brilliance of the *London Review* (1860–1868), started by Charles Mackay. Douglas Cook was succeeded by Philip Harwood (1809–1887), who had followed him from the *Morning Chronicle* and under whom Mr Andrew Lang became a contributor, with others of note. Mr Harwood retired in 1883, and was succeeded by his former assistant Mr Walter Herries Pollock, under whom the paper underwent some modifications in form to meet changes in the public taste; Mr G. Saintsbury and Mr H. D. Traill were then prominent members of the staff, and Mr Frederick Greenwood wrote for the paper till he started the *Anti-Jacobin*. In 1894 the *Saturday Review* was sold by the heirs of Mr Beresford Hope to Mr Lewis Edmunds, from whose hands it soon passed to Mr Frank Harris. In 1899 the paper was sold to Lord Hardwicke and came under the editorship of Mr Harold Hodge, who remained in this position when, after Lord Hardwicke's death in 1905, it passed into the hands of Mr Gervase Becket.

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[1] Albert Grant, who took that name though his father's was Gottheimer, was given the title of baron by King Victor Emmanuel of Italy in 1868 for his services in connexion with the Milan picture gallery. He made a large fortune by company-promoting, and in 1865 became M.P. for Kidderminster. He became a prominent public character in London. In 1873 he built Kensington House, a vast mansion close to Kensington Palace, which in 1883 was demolished and the site seized by his creditors. In 1874 he bought up Leicester Square, converted it into a public garden, and presented it to the Metropolitan Board of Works. But soon afterwards he failed, and from 1876 to his death he constantly figured in the law-courts at the suit of his creditors.

The *Saturday Review* and *Spectator*, as the exponents of brilliant Toryism and serious Liberalism, had the field practically to themselves for some years; but when in 1886 the *Spectator* followed the Liberal Unionists in opposing Home Rule for Ireland, and ceased to support Mr Gladstone, the result was the addition to London journalism of the Radical *Speaker* (1898); and in 1898 the threepenny *Outlook* (altered in price in 1905 to sixpence) was started, to present more particularly the growing interests of the Colonies and the Empire, a side further developed in 1905 and 1906 under the editorship of Mr J. L. Garvin (b. 1868) in its advocacy of Mr Chamberlain's policy of a preferential tariff, when the *Spectator* became aggressively Free Trade. In December 1906 the *Outlook* was sold by its proprietor, Mr C. S. Goldman, to Lord Iveagh, and Mr Garvin resigned the editorship. In 1907 the *Speaker* was incorporated with the *Nation*, a new Radical weekly, edited by H. W. Massingham. Several ambitious new weeklies meanwhile started, and some passed away before the end of the century, such as the *Realm*, the *British Review* and the *Review of the Week*. The most brilliant of all these, which also lasted the longest, was the *Scots* (soon renamed the *National*) *Observer* (1888–1897), edited at first by W. E. Henley (*q.v.*), and subsequently by J. E. Vincent (d. 1909). Mr Henley, assisted by Mr Charles Whibley, collected a band of clever young writers, who formed almost a "school" of literary journalism, and many of whom won their spurs in literature by their contributions to this paper. The *Pilot* (1900) under Mr D. C. Lathbury was another brilliant attempt, but it failed to pay its way and hardly lasted for three years.

Among purely literary weeklies the *Athenaeum* found a rival in the *Academy*, founded in October 1869 by Dr Appleton and edited by him. Later, under the editorship of J. S. Cotton, it was famous for its signed reviews and scholarly character; but the small circle to whom pure literature appealed made financial success difficult. In 1896 the *Academy* was bought by Mr Morgan Richards, and for some years was edited by Mr Lewis Hind, amalgamating *Literature* (a weekly which had been started by *The Times*) in 1901; and subsequently under changed proprietors it was successively edited by Mr Teignmouth Shore and Mr Anderson Graham. In April 1907 it was bought from Sir G. Newnes by Sir Edward Tennant, and subsequently passed under the control of Lord Alfred Douglas, who in 1910 parted with it to a new proprietary.

Sunday papers.

The publication of Sunday editions of the daily papers has not found the same favour in England as in the United States. In 1899 a Sunday *Daily Mail* and a Sunday *Daily Telegraph* appeared simultaneously; but public opinion was so violent against seven-day journalism that both were withdrawn. The oldest of the Sunday papers, the *Observer* (1791), was conducted by one editor, Mr Doxat, for more than fifty years. It was one of the first papers to contain illustrations. In later years Mr Edward Dicey was a notable editor. In 1905 the *Observer* passed into the hands of Lord Northcliffe, his first editor being Mr Austin Harrison, a son of Frederic Harrison. In 1907 Mr J. L. Garvin became editor, and under him the old influence of the *Observer* revived.

Lloyd's Weekly Newspaper started as an unstamped illustrated journal at a penny in September 1842. In 1843 it was enlarged in size, and the price raised to threepence. Curious ingenuity was shown in advertising it by all sorts of expedients. Amongst others, all the pennies its proprietor could lay his hands on were embossed, by a cleverly constructed machine, with the title and price of the new journal. *The Times* drew attention to this defacement of the coin of the realm, and so gave it a better advertisement still. From a weekly sale of 33,000 in 1848 it rose to 170,000 in 1861. In anticipation of the abolition of the paper duty, the price was then reduced to a penny, and its circulation continued to increase. In later years it had an able editor in Mr T. Catling. *Reynolds's Weekly Newspaper*, an extreme Radical paper with a large circulation, dates from May 1850. Other Sunday papers came later into existence—the *People* (1881), the *Sunday* (afterwards *Weekly*) *Sun* (1891), the *Sunday Special* (1897)—with which in 1904 was amalgamated the *Sunday Times* (1822). The *Referee* (1877), a paper with a strong sporting and theatrical interest, is famous for the humorous contributions by "Dagonet" (G. R. Sims) and the pungency of its miscellaneous articles.

Illustrated weekly papers.

Of the London illustrated weekly papers the oldest, the *Illustrated London News*, was founded in 1842; the *Graphic* in 1869; while the *Pictorial World*, which lasted for some years, began in 1874. In 1891 *Black and White* was started; and in 1892 the *Sketch*, edited by Mr Clement Shorter (also then editor of the *Illustrated London News*), introduced a lighter vein. Mr Shorter gave up the editorship of these two weeklies in 1901, and became editor of a new illustrated weekly, the *Sphere*, with the proprietorship of which came also to be associated the *Tatler*. Another new illustrated weekly of a high class, *Country Life Illustrated*, began in 1897.

"Society" and other weeklies.

The "Society" weeklies, *Truth* (1877), *Vanity Fair* (1868)—with a separate cartoon as a special feature, famous for the artistic work of Pellegrini, Leslie Ward and others—and the *World* (1874), brought a new "note" into regular journalism, Mr Edmund Yates's success with the *World* largely contributing to the increase of the personal style which he did so much to introduce; and *Truth* made its proprietor, the politician Mr Henry Labouchere, one of the most prominent men of the day, not so much for its aggressive Radicalism as for its vigorous exposures of all sorts of public charlatanry.

Among other weeklies, important ones are such ecclesiastical papers as the *Guardian* (1846), the *Record* (1828), the *Church Times* (1863), the *Tablet* (1840), *Christian World* (1857), *Methodist Times* (1885); the medical papers, the *Lancet* (1823) and *British Medical Journal*; the financial papers, the *Economist* (1843) and *Statist* (1878); and the great sporting and country-house paper, the *Field* (1853).

Humorous papers.

Among humorous papers *Punch* (1840) stands first (see CARICATURE,) of which (1895) Mr M. H. Spielmann published a *History*; *Fun* (1860–1901), Mr Harry Furniss's *Lika Joko* (1894, only for a few months), *Judy* (1867), *Moonshine* (1879) and *Pick-me-up* (1888), have also catered for popular gaiety.

Women journalists.

The introduction of women into English journalism in any large degree was one of the new departures of the last quarter of the 19th century. It was indeed no new thing for women to write for the Press. Harriet Martineau was, in her day, one of the principal members of the *Daily News* staff, and Miss Frances Power Cobbe (1822–1905)the advocate of anti-vivisectionism, was an active journalist. Miss Flora Shaw (Lady Lugard), as writer of colonial topics for *The Times*, or Mrs Crawford, as Paris correspondent of the *Daily News*, are other notable instances of the prominence of women's work in the same spheres with the ablest men. But such cases as these were exceptional, in which something in the nature of a personal mission and a peculiar aptitude gave the impulse. Journalism as a profession for women came, however, to be widely resorted to, partly through its obvious recommendation in a day when women's education required an alternative outlet, for those who had to earn their living, to that of the teaching profession; partly, and *pari passu*, through the immense increase in women readers and the immensely increased publicity given in newspapers to matters of primarily feminine interest. In 1880 the only "ladies' paper" of any importance was the *Queen*, a weekly which dates from 1861. But subsequently a considerable number of new weeklies entered the field: notably the *Lady's Pictorial* (1880); the *Lady* (1885); *Woman* (1889); the *Gentlewoman* (1890), which owed its success to the vigorous management of Mr J. S. Wood; *Madame* (1895); and the *Ladies' Field* (1898). New monthlies also appeared, in the *Englishwoman*, the *Ladies' Realm* and the *Woman at Home*. The sphere of action of the lady journalist was soon by no means confined to the "ladies' papers," or to the writing of columns on dress or cookery for such general journals as found it useful to cultivate feminine readers; women invaded every other field of journalism, especially the large new field of "interviewing" and fashionable gossip. The increase in women-writers generally, novelists, dramatists, poets, reacted on their connexion with journalism; the increased "respectability" of journalism made it easier for them to work side by side with men; and gradually nobody thought the introduction of women into this sphere anything out of the common; a lady journalist, in fact, was much less remarkable than a lady doctor.

British Provincial Press.

England and Wales.—Though the real development of English provincial journalism, as a power co-ordinate with that of London, only dates from the abolition of the stamp duty in 1855, many country newspapers before that time had been marked by literary ability and originality of character. The history of the provincial press of England begins in 1690 with the weekly *Worcester Postman* (now *Berrow's Worcester Journal*). The *Stamford Mercury* (1695; earliest known 1712; long known as *Lincoln, Rutland and Stamford Mercury*); *Norwich Postman*[1] (1706); *Nottingham Courant* (1710), afterwards renamed *Journal*; *Newcastle Courant* (1711); *Liverpool Courant* (1712; shortlived); *Hereford Journal* (1713); *Salisbury Postman* (1715); *Bristol Felix Farley's Journal* (1715; merged into the *Bristol Times* in 1735[2]); the *Canterbury Kentish Post* (1717; afterwards *Kentish Gazette*); *Leeds Mercury* (1717); *Exeter Mercury*, *Protestant Mercury*, and *Postmaster or Loyal Mercury* (all 1718[3]); *York Mercury* (1718), and *Manchester Weekly Journal* (1719), came quickly afterwards; and other early papers worth mentioning were the *Salisbury Journal* (1729); *Manchester Gazette* (1730–1760); *Manchester Mercury* (1762–1830); the earliest Birmingham paper, *Aris's Gazette* (1741); the *Cambridge Chronicle* (1744); and the *Oxford Journal* (1753). Liverpool also boasted of the *Liverpool Advertiser* (1756) and *Gore's General Advertiser* (1765–1870). Of the above the *Leeds Mercury* (1717) became an increasingly important provincial organ. It was originally published weekly, and its price was three-halfpence. In 1729 it was reduced to four pages of larger size, and sold, with a stamp, at twopence. From 1755 to 1766 its publication was suspended, but was resumed in January 1767, under the management of James Bowley, who continued to conduct it for twenty-seven years, and raised it to a circulation of 3000. Its price at this time was fourpence. The increase of the stamp duty in 1797 altered its price to sixpence, and the circulation sank from 3000 to 800. It was purchased in 1801 by Edward Baines, who first began the insertion of "leaders," and whose family left an impress not only on journalism but on literature in the North of England. It took him three years to obtain a circulation of 1500; but the *Mercury* afterwards made rapid progress. When the Stamp Tax was removed, its price was reduced to a penny, and in 1901 to a halfpenny. For many years it admitted neither racing nor theatrical new to its columns, and it had a powerful moral and political influence in Lancashire and Yorkshire.

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[1] The *Norwich Postman*, a small quarto of meagre contents, was published at a penny, but its proprietor notified that "a halfpenny is not refused"! Within a few years Norwich also had its *Courant* (1712) and *Weekly Mercury or Protestant's Packet* (1720).

[2] Amalgamated with the *Bristol Mirror* (1773) in 1865 to form the *Daily Bristol Times and Mirror*.

[3] Exeter was then fiercely political. These three newspapers commented so freely on proceedings in parliament that their editors were summoned to appear at bar (*Journal of the House of Commons*, xix. 30, 43, 1718). The incident is curious as showing that each represented a rival MS. news-letter writer in London.

The abolition of the duty on advertisements in 1853, of the stamp duty in 1855, and of the paper duty in 1861, opened the way for a cheap press, and within ten years of the abolition of the paper duty penny morning newspapers had taken up commanding positions in Edinburgh, Glasgow, Dundee and Aberdeen; in Liverpool, Manchester, Leeds, Bradford, Newcastle and Sheffield; in Birmingham and Nottingham; in Bristol, Cardiff and Plymouth; and across St George's Channel in Dublin, Cork, Belfast and Waterford. As time went on, and increasingly after the 'seventies, provincial evening papers began to multiply. But any real importance as organs of opinion was still confined to only a few of the great penny provincial dailies, notably the *Yorkshire Post*, *Manchester Guardian*, *Birmingham Post* (1857), *Sheffield Telegraph* (associated with Sir W. Leng), *Liverpool Daily Post*, *Leeds Mercury* and *Western Morning News*; others too numerous to mention here were at the same time cradling journalists who were to become famous in a larger sphere, such as the *Darlington Northern Echo*, on which Mr W. T. Stead made his début, while Mr Joseph Cowen for some years made the Newcastle *Daily Chronicle* a powerful force.

The provincial journals began as strictly local organs. But even in 1870 it was beginning to be universally perceived that, though the influence of a newspaper depends upon the sagacity, sound judgment and courage of the editor, its success as a business enterprise rests mainly with the business manager. Managers demanded less localism, a wider range of news, prompter and fuller reports of all important events, longer parliamentary reports, parliamentary sketches, verbatim reports of speeches by statesmen of the first rank. In the early 'seventies such a thing as a full telegraphic report in a provincial morning newspaper of parliamentary proceedings, or of a speech by a leading statesman, was almost unheard of. The Press Association had been in existence a short time, but had not then covered the country with its organization. Reuter's foreign news service very briefly reported important events. Leading articles were written during the day. Between 1870 and 1880 a complete revolution was effected, as the result of the social and educational changes. Leader-writers began to discuss the latest topics. Newspapers that had been content to fill their columns with local news and clippings from London and distant provincial papers put such matter aside. Telegraphic news crushed it out. In February 1870 the government took over the telegraph system. The advantage of the change was immediately felt by newspapers and their readers. Leading English and Irish newspapers, following Scotland's lead, began to open offices in London, where Fleet Street soon began to be an open directory to the provincial press—English, Scottish and Irish. The Scottish and the leading Irish newspapers of necessity, the wealthiest and most enterprising English papers for convenience and advantage, engaged special wires. Others that were near enough to London to do so secured London news and advertisements by railway, and completed their news supply by a liberal use of the telegraph. Commercial news, both home and foreign, especially American, was expanded. The Press Association spread its news-collecting organization over the whole country, and was stimulated to activity by the rising opposition of the Central News. All this energy had its counterpart in the business side of the press. Rapid "perfecting" printing machines were introduced, and newspaper managers found themselves in possession of newspapers full of the latest news, and procurable in practically unlimited quantities. By the use of special trains and other organizations, circulation increased apace. The development of news agencies, and their universal employment, tended to produce sameness in the provincial press. From this fate the more enterprising journals saved themselves by special London letters, parliamentary sketches and other special contributions. In 1881 the reporters' gallery in the House of Commons was opened to some provincial newspapers, and these accordingly enjoyed new facilities for special effort and distinction. A more important matter, however, was the bombardment of Alexandria and the subsequent Egyptian War. The leading provincial newspapers had already emancipated themselves from localism, and in general news and criticism had risen almost, if not quite, to the average level of the first-class London journals. Now they were to step abroad into the field of war. Singly or in syndicates, or by arrangement with London journals, the leading provincial newspapers sent out war correspondents, and were able to record the history of events as promptly and fully as the metropolitan press. The first syndicate to send out war correspondents was formed by the *Glasgow News*, the *Liverpool Daily Post*, *Manchester Courier*, *Birmingham Gazette* and *Western Morning News*, who despatched two correspondents to Egypt, and the new departure was attended with complete success. The Central News also sent out war correspondents to Egypt and the Sudan. During the South African War (1899–1902) the Press Association, in conjunction with Reuter's Agency, employed correspondents, as well as the Central News. The leading provincial newspapers, however, all formed syndicates amongst themselves to secure war telegrams, and in many cases made arrangements for the simultaneous publication of the letters and telegrams of leading London journals. This system of securing simultaneous publication, in provincial newspapers, of special contributions to London morning newspapers was afterwards still further extended, and articles of exceptional interest that have been specially prepared for London journals may now be found on the same day in some of the leading provincial newspapers.

By the beginning of 1880 the country had fallen upon a period of low prices, and extra expenditure upon war telegrams and on an improved supply of general news was to a considerable extent balanced by the reduced cost of paper. A list compiled at the commencement of 1902 gave the names of eighty-seven halfpenny daily newspapers published in English provincial towns, a considerable number of these being morning journals. Of these, sixty-two had been issued since 1870, those bearing earlier dates of origin being in most cases sheets which formerly were issued at a penny or more, but had subsequently reduced their prices. Of the sixty-two that were issued since 1870, twenty-seven appeared between 1871 and 1882, nineteen between 1882 and 1892 and sixteen between 1892 and 1902. Under the stimulus of cheapness the news-sheet was enlarged. More advertisements, more news, more varied contributions, filled up the additional space. The cost of composition increased, and, though circulation and revenue increased also, there was some danger to the margin of profit. Again invention came to the rescue. In the 'eighties some of the leading provincial newspapers began to use type-setting machines. In this forward step the provinces were far ahead of the London papers, excepting *The Times*. The *Southport Daily News*—since dead—led the way by introducing six Hattersley machines, and soon afterwards type-setting machinery became the rule in the provincial press. In the development of provincial papers, one factor of special importance must be noted, the desire for news about all branches of sport. In 1870 sporting meant horse-racing and little more. By degrees it embraced athleticism in all its branches, and progressive newspapers were looked to for information on football, hockey, golf, cricket, lawn-tennis, yachting, boating, cycling, wrestling, coursing, hunting, polo, running, bowls, billiards, chess, &c., quite as much as for notices of musical and dramatic performances, and of other forms of recreation and amusement. The ordinary provincial press, and its halfpenny evening representatives, largely depend on the attraction of the sporting news; and a number of special local papers have also been started to cater for this public.

Scotland.—The first newspaper purporting by its title to be Scottish (the *Scotch Intelligencer*,[1] 7th September 1643) and the first newspapers actually printed in Scotland (*Mercurius Criticus* and *Mercurius Politicus*, published at Leith in 1651 and 1653) were of English manufacture—the first being intended to communicate more particularly the affairs of Scotland to the Londoners, the others to keep Cromwell's army well acquainted with the London news. The reprinting of the *Politicus* was transferred to Edinburgh in November 1654, and it continued to appear (under the altered title *Mercurius Publicus* subsequently to April 1660) until the beginning of 1663. Meanwhile an attempt by Thomas Sydserfe to establish a really Scottish newspaper, *Mercurius Caledonius*, had failed after the appearance of ten numbers, the first of which had been published at Edinburgh on the 8th of January 1660. It was not until March 1699 that a Scottish newspaper was firmly established, under the title of the *Edinburgh Gazette*, by James Watson, a printer of eminent skill in his art.[2] Before the close of the year the *Gazette* was transferred to John Reid, by whose family it long continued to be printed. In February 1705 Watson started the *Edinburgh Courant*, of which he only published fifty-five numbers. He states it to be his plan to give " most of the remarkable foreign news from their prints, and also the home news from the ports of this kingdom . . . now altogether neglected." The *Courant* appeared thrice a week. Upon complaint being made to the privy council concerning an advertisement inserted after the transfer of the paper to Adam Boig, the new printer presented a supplication to the council in which he expressed his willingness "that in all time coming no inland news or advertisements shall be put into the *Courant*, but at the sight and allowance of the clerks of council." In 1710 the town council authorized Mr Daniel Defoe to print the *Edinburgh Courant* in the place of the deceased Adam Boig. Four years earlier (1706) the indefatigable pioneer of the Scottish press, James Watson, had begun the *Scots Courant*, which he continued to print until after the year 1718. To these papers were added in October 1708 the *Edinburgh Flying Post* and in August 1709 the *Scots Postman*. Five years later this paper appears to have been incorporated with the *Edinburgh Gazette*. The *Caledonian Mercury* began April 28, 1720. At one period it was published thrice and afterwards twice a week. Its first proprietor was William Rolland, an advocate, and its first editor Thomas Ruddiman. The property passed to Ruddiman on Rolland's death in 1729, and remained in his family until 1772. It is curious to notice that in his initiatory number of April 1720, Rolland claimed a right to identify his *Mercury* with that of 1660. This journal, he said in his preface to the public, " is the oldest [existing] in Great Britain." And his successor of the year 1860 followed suit by celebrating the " second centenary " of the *Caledonian Mercury*. He brought out a facsimile of No. 1 of *Mercurius Caledonius* (January 1660), in its eight pages of small quarto, curiously contrasting with the great double sheet of the day. But sixty years is a long period of suspended animation, and the connexion of the two newspapers cannot be proved to be more than nominal. The *Caledonian Mercury* was the first of Scottish journals to give conspicuous place to literature—foreign as well as Scottish. In " the '45 " one of its editors, Thomas Ruddiman, junior, virtually sacrificed his life,[1] and the other, James Grant, went into exile, for the expression of conscientious political opinion. Its publication ceased after an existence of more than one hundred and forty years.

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[1] This was followed by the *Scotch Dove*, the first number of which is dated "September 30 to October 20, 1643," and by the *Scottish Mercury* (No. 1, October 5, 1643). In 1648 a *Mercurius Scoticus* and a *Mercurius Caledonius* were published in London. The *Scotch Dove* was the only one of these which attained a lengthened existence.

[2] Watson was the printer and editor, but the person licensed was James Donaldson, merchant in Edinburgh ("Act in favors of James Donaldson for printing the *Gazette*," March 10, 1699, published in *Miscellany of the Maitland Club*, ii. 232 sq.). Arnot, in his *History of Edinburgh*, mentions as the second of Edinburgh newspapers—intervening between *Mercurius Caledonius* and the *Gazette*—a

Notwithstanding the positive assertion[2] that the *Edinburgh Courant* and the *Edinburgh Evening Courant* " were entirely different journals, and never had any connexion whatever with each other," a substantial identity may be asserted upon better grounds than those for which identity used to be claimed for the *Caledonian Mercury* with *Mercurius Caledonius*. The grant by the town council of Edinburgh in December 1718 of a licence to James M'Ewan to print an *Evening Courant* three times a week appears to have been really a revival, in altered form, of the original *Courant*, repeatedly referred to in earlier, but not much earlier, records of the same corporation. So revived, the *Evening Courant* was the first Scottish paper to give foreign intelligence from original sources, instead of repeating the advices sent to London. In 1780 David Ramsay became its proprietor. Under his management it is said to have attained the largest Scottish circulation of its day. It was then of neutral politics. Subsequently, returning to its original title, and appearing as a daily morning paper, it ranked for long as the senior organ of the Conservative party in Scotland, but at last the competition of the *Scotsman* caused its disappearance, and after amalgamating with the *Glasgow News* or the *Scottish News* in 1886, it expired in 1888.

The *Edinburgh Weekly Journal* began in 1744, but it only attained celebrity when, almost seventy years afterwards, it became the joint property of Sir Walter Scott and of James Ballantyne. Scott wrote in its columns many characteristic articles. Ballantyne edited it until his death in 1833, and was succeeded in the editorship by Thomas Moir. The paper was discontinued about 1840. The *Edinburgh Evening News* started in 1873.

The *Scotsman*, the leading Scottish newspaper, was established as a twice-a-week paper in January 1817 and became a daily in June 1855. It ranked as the chief organ of the Liberal party in Scotland, until the Home Rule split in 1886, when it became Unionist. It was founded by William Ritchie, in conjunction with Charles Maclaren. For a short period it was edited by J. R. M'Culloch, the eminent political economist. He was succeeded by Maclaren, who edited the paper until 1845, and he in turn in 1848 by Alexander Russel (1814–1876), who (with Mr Law as manager) continued to conduct it with great ability until 1876. In 1859 the first of Hoe's rotary machines brought into Scotland was erected for the *Scotsman*. The *Scotsman* soon developed into a great newspaper, strong both on its literary side and also in gathering news; and it was circulated all over Scotland, its publishing offices being opened in Glasgow, which was a better centre for distributing in the west, and in Perth for the north. At last under Charles A. Cooper it succeeded in killing all its rivals in Edinburgh. In 1885 the *Scotsman* issued an evening paper.

The *North British Advertiser* was founded in 1826. The *Witness* began in 1840 as the avowed organ of what speedily became the Free Church party in Scotland. In its first prospectus it calls itself the *Old Whig*. The paper appeared twice a week, and its editor, Hugh Miller, very soon made it famous. In the course of less than sixteen years he wrote about a thousand articles and papers, conspicuous for literary ability, still more so for a wide range of acquirement and of original thought, most of all for deep conscientiousness. It survived its first editor's death (1855) only a few years.

In Glasgow the *Glasgow Herald* was founded in 1782. When the *Scotsman* extended its activities to Glasgow, the *Herald* opened an office in Edinburgh; and it took an active part in breaking down the old localism of Scottish papers. In later years it became a powerful organ. The *North British Daily Mail* was established in April 1847. George Troup, its first editor, made it specially famous for the organizing skill with which he brought his intelligence at an unprecedented rate of speed from Carlisle, the nearest point then connected with London by railway.[3] The *Glasgow Evening News* was started in 1870.

The *Aberdeen Journal* was founded as a weekly paper in 1748 and became a daily in 1876. In 1879 it issued an evening edition. The *Aberdeen Daily Free Press*, originally a weekly, dates from 1853. In 1881 it issued an evening paper in connexion with itself. The *Dundee Advertiser*, established in 1801, towards the latter part of the century extended its sphere of influence much on the lines of the *Scotsman* and *Glasgow Herald*. It issued the *Evening Telegraph* in 1877. In 1859 the *Dundee Courier*, a halfpenny paper, had begun.

It may be added that a very large number of the men who have distinguished themselves by their labours on the great newspapers of London, and several who rank as founders of these, began their career and have left their mark on the newspapers of Scotland.

Ireland.—In 1641 appeared a sheet called *Warranted Tidings from Ireland*, but this, with *Ireland's True Diurnal* (1642), *Mercurius Hibernicus* (1644), the *Irish Courant* (1690), were all of them London newspapers containing Irish news. The real newspaper press of Ireland began with the *Dublin News-Letter* of 1685. Five years later appeared the *Dublin Intelligencer* (No. 1, September 30, 1690). Both of these were shortlived. *Pue's Occurrences* followed in 1700 and lasted for more than fifty years, as the pioneer of the daily press of Ireland. In 1710 or in 1711 (there is some doubt as to the date of the earliest number) the *Dublin Gazette* began to appear, the official organ of the vice-regal government. *Falkener's Journal* was established in 1728. *Esdaile's News-Letter* began in 1744, took the title of *Saunders's News-Letter* in 1754 (when it appeared three times a week), and became a daily newspaper in 1777.

In the Nationalist press the famous *Freeman's Journal* has long been prominent amongst the Dublin papers. It was established as a daily paper by a committee of the first society of "United Irishmen" in 1763, and its first editor was Dr Lucas. Flood and Grattan were at one time numbered amongst its contributors, although the latter, at a subsequent period, is reported to have exclaimed in his place in the Irish parliament, "The *Freeman's Journal* is a liar . . . a public, pitiful liar." In 1870 it brought out the *Evening Telegraph*. In 1891 the dissensions among the Irish Nationalists led to the establishment of the Parnellite *Dublin Daily Independent* and *Evening Herald*. In 1897 the *Nation*, formerly a weekly, was brought out as a daily. On the Unionist side the principal Irish paper is the Dublin *Irish Times* (1859).

Waterford possessed a newspaper as early as 1729, entitled the *Waterford Flying Post*. It professed to contain " the most material news both foreign and domestic," was printed on common writing paper and published twice a week at the price of a halfpenny. The *Waterford Chronicle* was started in 1766.

The *Belfast News-Letter* was started in 1737; the *Belfast Evening Telegraph* in 1870; the *Belfast Northern Whig* in 1824.

British Dominions beyond the Sea.

It is unnecessary here to give all the statistics for the British Colonial press, which has enormously developed in modern times. So far as its early history is concerned, it may be noted that *Keimer's Gazette* was started in Barbadoes in 1731 and Granada followed with a newspaper of its own in 1742. In Canada the *Halifax Gazette* was established in 1751 and the *Montreal Gazette* in 1765. The first Australasian paper was the *Sydney Gazette and New South Wales Advertiser* (1803–1843), the *Derwent Star*, in Van Dieman's Land (Tasmania), starting in 1810. In modern days all the British dominions beyond the sea have produced important and well-conducted papers. The Canadian press has naturally had certain marked affinities with the American; but the *Globe* in Toronto, as

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Kingdom's Intelligencer. But this was a London newspaper, dating from 1662, which may occasionally have been reprinted in Scotland; no such copies, however, are now known to exist. In like manner the *Scottish Mercury*, No. 1, May 8, 1692, appears to have been a London newspaper based upon Scottish news-letters, although in an article written in 1848, in the *Scottish Journal of Topography*, vol. ii. p. 303, it is mentioned as an Edinburgh newspaper.

[1] During an imprisonment of six weeks in the Tolbooth of Edinburgh his health suffered so severely that he died very shortly after his release.

[2] Grant, *History of the Newspaper Press* (1873), iii. 412.

[3] See *Notes and Queries*, 5th series, vii. 45, viii. 205.

the organ of the Liberal party, has played a leading part in Canadian history. In Australia the *Sydney Bulletin*, the *Sydney Morning Herald* (1831—daily since 1840), *Sydney Daily Telegraph*, *Melbourne Argus* (1846) and *Melbourne Age* (1854), with the evening *Melbourne Herald*, have been the most important. In South Africa the *Cape Times* (1876) has been the principal paper, but some of the Transvaal English papers have exercised great influence in the disturbed political conditions since about 1895.

India.—For a considerable period under the rule of the East India Company the Indian press was very unimportant both in character and influence. It was permitted to shape its course and to gain a position as it could, under the potent checks of the deportation power and the libel law, without any direct censorship. Nor was it found difficult to inflict exemplary punishment on the writers of "offensive paragraphs."

Prior to Lord Wellesley's administration the most considerable newspapers published at Calcutta were the *World*, the *Bengal Journal*, the *Hurkaru*, the *Calcutta Gazette* (the organ of the Bengal government), the *Telegraph*, the *Calcutta Courier*, the *Asiatic Mirror* and the *Indian Gazette*. Mr Duane, the editor of the *World*, was sent to Europe in 1794 for "an inflammatory address to the army," as was Mr Charles Maclean, four years afterwards for animadverting in the *Telegraph* on the official conduct of a local magistrate.

The *Calcutta Englishman* dates from 1821. Lord Wellesley was the first governor-general who created a censorship (April 1799). His press-code was abolished by the marquis of Hastings in 1818. The power of transporting obnoxious editors to Europe of course remained. Perhaps the most conspicuous instance of its exercise was the removal of the editor of the *Calcutta Journal* (Silk Buckingham), which occurred immediately after Lord Hastings's departure from India and during the government of his temporary successor, Mr John Adan. Buckingham's departure was followed closely (14th March 1823) by a new licensing act, far exceeding in stringency that of Lord Wellesley, and (5th April 1823) by an elaborate "Regulation for preventing the Establishment of Printing-Presses without Licence, and for restraining under certain circumstances the Circulation of Printed Books and Papers." The first application of it was to suppress the *Calcutta Journal*.

In the course of the elaborate inquiry into the administration of India which occupied both Houses of Parliament in 1832, prior to the renewal of the Company's charter, it was stated that there were, besides 5 native journals, 6 European newspapers: three daily, the *Bengal Hurkaru*, *John Bull* and the *Indian Gazette*; one published twice a week, the *Government Gazette*; and two weekly the *Bengal Herald* and the *Oriental Observer*. At this period every paper was published under a licence, revocable at pleasure, with or without previous inquiry or notice. At Madras, on the other hand, the press remained under rigid restriction. The Madras censorship was removed whilst the parliamentary inquiry of 1832 was still pending.

One question only, and that but for a brief interval, disturbed Lord William Bentinck's love of free discussion. The too famous "Half-Batta" measure led him to think that a resolute persistence in an unwise policy by the home government against the known convictions of the men actually at the helm in India and an unfettered press were two things that could scarcely co-exist. It was on this occasion that Sir Charles Metcalfe recorded his minute of September 1830, the reasoning of which fully justifies the assertion —"I have, for my own part, always advocated the liberty of the press, believing its benefits to outweigh its mischiefs; and I continue of the same opinion." This opinion was amply carried out in the memorable law (drafted by Macaulay and enacted by Metcalfe as governor-general in 1835), which totally abrogated the licensing system. It left all men at liberty to express their sentiments on public affairs, under the legal and moral responsibilities of ordinary life, and remained in force until the outbreak of the mutiny of 1857.

In 1853 Garcin de Tassy, when opening at Paris his annual course of lectures on the Hindustani language, enumerated and gave some interesting details concerning twenty-seven journals (of all sorts) in Hindustani. In 1860 he made mention of seventeen additional ones. Of course the circulation and the literary merits of all of them were relatively small. One, however, he said, had reached a sale of 4000 copies.[1]

In 1857 Lord Canning's law, like that of 1823, on which it was closely modelled, absolutely prohibited the keeping or using of printing-presses, types or other materials for printing, in any part of the territories in the possession and under the government of the East Indian Company, except with the previous sanction and licence of government, and also gave full powers for the seizure and prohibition from circulation of all books and papers, whether printed within the Indian territories or elsewhere.

In 1878 an act was passed, which long remained in force, regulating the vernacular press of India: "Printers or publishers of journals in Oriental languages must, upon demand by the due officer, give bond not to print or publish in such newspapers anything likely to excite feelings of disaffection to the government or antipathy between persons of different castes or religions, or for purposes of extortion. Notification of warning is to be made in the official gazette if these regulations be infringed (whether there be bond or not); on repetition, a warrant is to issue for seizure of plant, &c.; if a deposit have been made, forfeiture is to ensue. Provision is made not to exact a deposit if there be an agreement to submit to a government officer proofs before publication." After the disturbances of 1908–1909 further and more stringent regulations were made.

The *Indian Daily Mirror* (1863) was the first Indian daily in English edited by natives. The total number of journals of all kinds published within all the territories of British India was reported by the American consular staff in 1882 as 373, with an estimated average aggregate circulation per issue of 288,300 copies. Of these, 43, with an aggregate circulation of 56,650 copies, were published in Calcutta; 60, with an aggregate circulation of 51,776 copies, at Bombay. In 1900 it appeared from the official tables that there were about 600 newspapers, so called, published in the Indian empire, of which about one-third, mostly dailies, were in the Indian vernaculars. Calcutta had 15 dailies (*Calcutta Englishman*, &c.); Bombay 2 (*Bombay Gazette*); Madras 4 (*Madras Mail*); Rangoon 3 (*Rangoon Times*); Allahabad 2 (*Pioneer*); Lahore 2 (*Civil and Military Gazette*).

AUTHORITIES.—For late developments, see Mitchell's, Sell's and Willing's *Press Directories*. For historical information: J. B. W. Williams, *Hist. of British Journalism to the Foundation of the Gazette* (1908); H. R. Fox-Bourne, *English Newspapers* (1877); "The Newspaper Press," *Quarterly Review*, cl. 498-537 (October, 1880); Hatton, *Journalistic London* (1882); Pebody's *English Journalism* (1882); *Progress of British Newspapers in the 19th Century* (1901; published by Simpkin, Marshall & Co.); Andrews, *History of British Journalism* (2 vols., 1860); Hunt, *The Fourth Estate*; Grant, *The Newspaper Press* (3 vols., 1871–1873); Plummer, "The British Newspaper Press," *Companion to the Almanac* (1876); Nichols, *Literary Anecdotes of the Eighteenth Century*, iv. 33-97. (H. CH.)

3. NEWSPAPERS OF THE UNITED STATES[2]

Massachusetts.—Boston was the first city of America that possessed a local newspaper; but the earliest attempt in that direction, made in 1689, and a second attempt, under the title *Publick Occurrences*, which followed in September 1690, were both suppressed by the government of Massachusetts. Nearly fourteen years afterwards (April 24, 1704), the first number of the *Boston News-Letter* was "printed by B. Green, and sold by Nicholas Boone." Its proprietor and editor—so far as it can be said to have had an editor, for extracts from the London papers were its staple contents—was John Campbell, postmaster of the town. In 1719 he enlarged his paper, in order, as he told his readers, "to make the news newer and more acceptable; . . . whereby that which seem'd old in the former half-sheets becomes new now by the sheet. . . . This time twelvemonth we were thirteen months behind with the foreign news beyond Great Britain,[3] and now less than five months; so that . . . we have retrieved about eight months since January last"; and he encourages his subscribers with the assurance that if they will continue steady "until January next, life permitted, they will be accommodated with all the news of Europe . . . that are needful to be known in these parts." But Campbell's new plans were soon disturbed by the loss of his office, and the commencement of a new journal by his successor in the postmastership, William Brooker, entitled the *Boston Gazette* "published by authority" (No. 1, 21st December 1719). The old journalist had a bitter controversy with his rival, but at the end of the year 1722 relinquished his concern in the paper to Benjamin Green, who carried it on, with higher aims and greater success, until his death, at the close of 1733, being then succeeded by his son-in-law, John Draper, who published it until December 1762. By Richard Draper, who followed his father, the title was altered to *Massachusetts Gazette and Boston News-Letter*; and the maintenance of the British rule against the rising spirit of independence uniformly characterized his editorship and that of his widow (to whom, at a subsequent period, a pension was granted by the British government). It was the only paper printed in Boston during the siege, and ceased to appear when the British troops were compelled to evacuate the city.

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[1] The *Hurkaru* and the *Indian Gazette* were long afterwards combined under the new leading title, *Indian Daily News* (with the old name appended).

[2] For the general conditions producing the modern type of American newspaper, see the first section of this article. In the following account of American and foreign newspapers, the historical material in the 9th and 10th editions of the *Ency. Brit.* has been utilized and in parts repeated.

[3] In other words, the attention of the Bostonian politicians was engrossed on the siege of Belgrade, when their contemporaries in the mother country were intent on the destruction of the Spanish fleet on the coast of Sicily.

The *Boston Gazette*, founded in 1719, had James Franklin, elder brother of the celebrated Benjamin Franklin, as its first printer. It lasted until the end of 1754, its editorship usually changing with the change of the postmasters. On the 17th August 1721 James Franklin started the *New England Courant*, the publication of which ceased in 1727; and two years later Benjamin Franklin purchased the *Pennsylvania Gazette*, which he continued weekly until 1765.

To the *Boston Gazette* and the *Courant* succeeded the *New England Weekly Journal* (20th March 1727; incorporated with the *Boston Gazette* in 1741), and the *Weekly Rehearsal* (27th September 1731), which became the *Boston Evening Post* (August 1735), and under that title was for a time the most popular of the Boston newspapers. It aimed at neutrality in politics, and therefore did not survive the exciting events of the spring of 1775. Several minor papers followed, which may be passed over without notice. A new *Boston Gazette*, which began in April 1755 (merged in 1836 in the *Centinel*), is of more interest. For a long time it was the main organ of the popular party against England, and expounded their policy with great ability, and in a dignified temper. Otis, John Adams, Samuel Adams and Joseph Warren were amongst its writers. It was strongly Republican after the adoption of the constitution, especially opposing its old contributor John Adams.

The *Massachusetts Spy* (1770), under the indefatigable editorship of the American historian of printing, Isaiah Thomas, did yeoman's service in this struggle, although of a different kind from that of the *Boston Gazette.* The latter spoke chiefly to the thinkers and natural leaders of the people. The *Spy* was a light and active skirmisher who engaged his antagonists wherever he met them, and frequently carried the war into the enemy's country. In July 1774, during the operation of the Boston Port Act, and soon after the landing of four British regiments, it adopted Franklin's odd device, representing Great Britain as a dragon, and the colonies as a snake divided into nine parts with the motto, "join or die." But Boston grew too hot for the patriotic printer, and he had to remove to Worcester on the day of the battle of Lexington. Here the paper continued to be published (as the *Worcester Spy*) until 1786,—the lack of the stirring revolutionary matter being occasionally supplied by the republication in its columns of entire books, such as Robertson's *America* and Gordon's *History of the Revolution.* This journal, like so many more, was for a time killed by a tax. The stamp duty imposed in March 1786, though amounting to but two-thirds of a penny, and very speedily repealed, led to its suspension until April 1788, when the weekly *Massachusetts Spy* was revived, lasting till 1848. A morning edition, the *Worcester Spy*, was started in 1845 and continued to be published till May 1904.

The Boston *Centinel* was another memorable newspaper. It was founded in 1784 as the *Massachusetts Centinel and the Republican Journal*, a semi-weekly; in 1790 becoming the *Columbian Centinel.* For many years it was edited by Major B. Russell (1761–1845), a man who combined real ability with moderation of temper and singular modesty and disinterestedness. He printed the Acts of Congress for a very long time without charge, but the government eventually gave him £1400 in recognition of his work. The *Centinel* had good foreign news, and Russell was intimate with Louis Philippe and Talleyrand when they were in Boston. In 1830 it absorbed the *Palladium* (founded in 1793 as the *Massachusetts Mercury*, and renamed in 1801 the *Massachusetts Mercury and New England Palladium*), and in 1836 the *Boston Gazette*, but in 1840 was merged in the *Boston Advertiser.* The *Boston Daily Advertiser* was founded in 1813, and in 1832 absorbed the *Patriot*, which in 1819 was started out of a nucleus chiefly composed of the *New England Chronicle* (1776).

William Lloyd Garrison's once well-known *Liberator* was founded at Boston on New Year's Day 1831. For a time its editor was also writer, compositor and pressman. In December of that year the legislature of Georgia offered a reward of 5000 dollars to any one who would cause him to be apprehended and brought to trial. He continued the paper till 1865 and lived to witness the abolition of negro slavery. In 1827 Garrison also edited in Boston the *National Philanthropist*, the first American total abstinence paper.

Among modern Boston papers the most important are the *Evening Transcript* (1830), *Herald* (1836), *Daily Advertiser* (1813), *Globe* (1872), *Boston American* (1904) and *Post* (1831).

Of Massachusetts papers outside Boston the most important still in existence in 1910 was the morning *Springfield Republican* (weekly, 1824; daily, 1844), established by Samuel Bowles, father of Samuel Bowles (1826–1878), its most famous editor.

The *Evening Salem Gazette*, originally a weekly (1768), was a famous paper during the War of Independence and in the period immediately after. The *Hampshire Gazette* of Northampton, Massachusetts, founded in September 1786 in the interests of the Administration at the time of Shays's Rebellion, started its daily edition in 1890. The weekly *Gazette and Courier* (1841), was a consolidation of the *Greenfield Gazette* (1792) and the *Courier* (1838). The Salem *Register and Mercury* continues the *Salem Register* (1800) and the *Mercury*, which was published in Salem as early as 1768, but not continuously. The Haverhill *Evening Gazette* dates from 1798. In Pittsfield is published the *Berkshire County Eagle*, a weekly established in 1789, with an evening edition, the *Berkshire Evening Eagle* (1892). The Newburyport *Herald* (evening 1880; morning 1892) continues the title of an earlier paper (1797) owned by Ephraim W. Allen and William S. Allen.

At the commencement of the struggle for independence in 1775 Massachusetts possessed 7 newspapers, New Hampshire 1 (the *New Hampshire Gazette*), Rhode Island 2, and Connecticut 3,—making 13 in all for the New England colonies. Pennsylvania had 8, of which the earliest in date was the *American Weekly Mercury* (No. 1, 22nd December 1719); and New York but 3, the oldest of them being the *New York Gazette* (1725). Up to that period (1725) Boston and Philadelphia were the only towns possessing a newspaper throughout America. In the middle and southern colonies there were, in 1775, in the aggregate, 10 journals, of which Maryland, Virginia and North Carolina possessed each 2, South Carolina 3 and Georgia 1. The total number of the Anglo-American papers was 34, and all of them were of weekly publication.

New Hampshire.—The *New Hampshire Gazette* (1756; daily edition since 1852), published at Portsmouth, was the "father" of the New England press. The *Cheshire Republican* (1793) and *New Hampshire Sentinel* (1799; evening edition since 1890) are still published at Keene.

Vermont.—The earliest paper established in Vermont was the *Green Mountain Postboy*, first published in April 1781. The oldest important paper in Vermont is the *Rutland Herald* (established in 1794 as a weekly; daily edition since 1861). The *Vermont Journal* of Windsor, Vermont, was established in 1783.

Maine.—The first papers of any importance published in Maine were the Portland *Advertiser* (evening, 1785), of which James G. Blaine was editor in 1857–1860; and the *Eastern Argus* of Portland (September 1803). The latter was established by Nathaniel Willis (1780–1870), the father of N. P. Willis. Willis was converted in Portland by Edward Payson and about 1808 he left the paper. In 1816–1826 he established in Boston the *Recorder*, which is supposed to have been the first American religious paper. In 1827 Willis established the *Youth's Companion*, the most popular American juvenile paper. The *Eastern Argus* was edited in 1820–1824 by Seba Smith (1818–1868), who established in 1829 the *Portland Courier*, which he edited until 1837 and to which he contributed the sketches republished in 1833 as *Life and Letters of Major Jack Downing.*

Connecticut.—The *Connecticut Courant* of Hartford was established in October 1764 as a weekly; in 1893 there appeared a semi-weekly issue, and its daily issue, the *Hartford Courant*, first appeared in 1837. The paper was a strong supporter of the administrations of Washington and Adams. Probably the best known of its editors is Joseph R. Hawley. Charles Dudley Warner was long a member of the staff. The *Hartford Times* (semi-weekly 1817; daily, 1841) has always been a prominent paper. Its principal early editors were Gideon Wells in 1826–1836 (in 1861–1869 he was United States secretary of the navy), and John Milton Niles (1787–1856), who was United States senator in 1835–1839 and 1843–1849 and was postmaster-general of the United States in 1840–1841.

Next to the *Courant*, the oldest paper still published in Connecticut is the *New Haven Journal*, established as a weekly in 1766 (the weekly edition is now styled the *Connecticut Herald*), which first appeared as a daily in 1834 as the *Morning Journal and Courier*. The *New London Gazette* (1763), which in 1773 became the *Connecticut Gazette*, ceased publication in 1844. Another *Gazette* was established in New London for a time, but is no longer published and was in no way connected with the earlier paper. The *Danbury News* (weekly, 1870, when *The Times* and *Jeffersonian* were consolidated; daily, 1883) is known for the humorous sketches contributed by its proprietor James Montgomery Bailey (1841–1894). The *Republican Farmer* (weekly) was established in 1790 in Danbury and in 1810 removed to Bridgeport; the *Evening Farmer* was first published in 1855. The Norwich *Courier* (weekly, 1796) has a daily edition, the *Bulletin* (1858).

Rhode Island.—The oldest paper now published in Rhode Island is the *Newport Mercury* (weekly; 1758), which, like most of the other New England patriot sheets, was suppressed in 1765; it was established by James Franklin, a nephew of Benjamin Franklin.

Pennsylvania.—The *Aurora* (1790) was the most notable of the early Philadelphia papers, next to Franklin's *Gazette*. It was founded by Franklin's grandson, Benjamin Franklin Bache, who in 1784 had started the *American Daily Advertiser*, the first American daily. Bache and his successor William Duane (who edited the paper till 1822) bitterly attacked Washington, Adams and Hamilton; and the *Aurora* after 1793 was practically the organ of Jefferson, but ceased to be of importance after the national capital was removed from Philadelphia. From 1791 to 1793 the principal Anti-Federalist paper was the *National Gazette*, edited by Philip Freneau, whom Jefferson brought to Philadelphia. As opposed to these there was the *United States Gazette*, founded in New York in 1789, but removed to Philadelphia in 1790, which represented Alexander Hamilton. This journal afterwards (1826–1847) was an important Whig organ, under the editorship of Joseph Ripley Chandler (1792–1880). In 1847 it was consolidated with the *North American* (1830), which still survives in Philadelphia, having in its progress also absorbed the *Pennsylvania Gazette* (1729–1845), for a time owned by Benjamin Franklin, the *Pennsylvania Packet* (founded 1771) and other papers.

Other important Philadelphia papers still in existence are, the *Public Ledger* (1836), founded as a one-cent paper, purchased in 1864 by George W. Childs, who increased the price from 6¼ to 10 cents a week; the *Philadelphia Evening Bulletin*, which consolidated the *American Sentinel* (1815) and the *Evening Bulletin* (1847); and the *Press* (1857), edited from 1880 to 1908 by Charles Emory Smith (1842–1908), United States Minister to Russia in 1890–1892, and postmaster-general of the United States in 1898–1902.

Benjamin Lundy edited in Philadelphia in 1836–1838 the *National Enquirer* (anti-slavery), which became the *Pennsylvania Freeman* and in 1838–1840 was edited by John G. Whittier.

Outside of Philadelphia the oldest papers of importance in Pennsylvania are the *Pittsburgh Gazette*, first published in 1786 and probably the first newspaper published west of the Alleghanies, which in 1906 was consolidated with the *Times* (1879) to form the *Gazette Times*; and the *Pittsburgh Post* (1792; daily, 1842), one of the few influential Democratic papers published in Pennsylvania; the *Pittsburgh Dispatch* (1846) is a morning paper. Other papers founded before 1801 (and still published) in Pennsylvania are: the *Franklin Repository* of Chambersburg (weekly, 1790; daily, 1883), of which A. K. McClure was proprietor and editor in 1850–1856; the Reading *Adler* (weekly, 1796), the oldest existing German newspaper in the country; the *Intelligencer* of Lancaster (1799), with which the *Journal* (1794) was combined in 1839; the *Westmoreland Democrat* of Greensburg (weekly, 1799); the *Herald* of Norristown (weekly, 1799; daily, 1848).

Maryland.—The earliest journal of Maryland was William Parks's *Maryland Gazette*, of Annapolis, begun in 1727, when in all America it had but six existing predecessors. Discontinued in 1736, it was revived in 1739 by Jonas Green and lasted till 1839. The oldest paper now published in Baltimore is the *American*, the successor of the *Maryland Journal and Baltimore Advertiser* founded in August 1773; on the 21st September 1814 it published "The Star Spangled Banner." The *Baltimore Sun* was started in 1837.

New Jersey.—New Jersey had no really established newspaper before the Revolution, although the first number of an intended journal was published in 1765, under the title of the *Constitutional Gazette, containing matters interesting to Liberty, but no wise repugnant to Royalty*. The earliest regular paper was the *New Jersey Gazette*, which began in December 1777 at Burlington (soon removing to Trenton), and ceased publication in 1786. A *State Gazette* (weekly), now published in Trenton, dates from 1792 (daily, 1846); Trenton's largest paper is the *Times* (evening; 1882). The *Sentinel of Freedom*, a Newark weekly, was first published in 1796; its daily edition, the *Star*, dates from 1832. Newark's largest paper is the *Evening News* (1883). The *New Brunswick Times* was first published as a weekly in 1792; a daily edition was added in 1849.

Virginia.—Virginia, notwithstanding its illustrious precedency—the province of Raleigh, the cradle of Washington—possessed neither newspaper nor printing office until 1736, so that (as respects one-half at least of the wish) there was once a prospect that the devout aspiration of Sir William Berkeley might be realized. "Thank God," said this Virginian governor in 1671, "we have neither free school nor printing press, and I hope may not have for a hundred years to come." The earliest journal established in the state was the *Virginia Gazette*, commenced in 1736. It was still published at Williamsburg in 1766, when a second paper of the same name was established there. This second paper, backed by Thomas Jefferson, was afterwards called the *American Advertiser* and then the *Commercial Advertiser*, and stopped in 1822. The *Richmond Enquirer*, which started in 1808, succeeding the *Examiner*, early attained a leading position as a Democratic organ; it was discontinued in 1880. The *Alexandria Gazette* (1816) is still published.

Washington, D.C.—The first "administration organ" (*i.e.* expressing the political views of the administration, but not officially a government paper), was the *National Intelligencer* (1800); this position it held until 1829, when it became an opposition paper. In Jackson's administration the *United States Telegraph*, which had been purchased in 1826 by Duff Green, became the "administration organ"; but in 1830 it was supplanted by the *Globe*. The *United States Telegraph*, which had supported Calhoun, remained his organ until 1835, strongly favouring slavery and opposing the abolition press. The *Globe* after December 1830 was conducted by Francis Preston Blair the elder and John C. Rives (1795–1864); it opposed Nullification, Secession, and the Southern wing of the Democratic party. In 1841 the *National Intelligencer* became the administration organ; it was succeeded in the same year by a new paper, the *Daily Madisonian*, President Tyler's organ, and in 1845 the *Union* became the organ of President Polk. To the *Union* in 1845 the *Globe* sold out, but only as a party organ. In 1846 to 1871 the *Globe* was the publisher of the Congressional debates. President Taylor's organ during his administration was the newly established *Republican*. During President Fillmore's presidency the *National Intelligencer*, which was a Webster-Whig organ, returned to power, and during Pierce's administration the *Union* was again the administration organ, with the *Evening Star* (1852) a close second. In Buchanan's administration the influence of the *Union* continued. During the Civil War most of these papers died off, except the *Star* and the *National Intelligencer*, which in 1870 removed to New York, where it stayed as a semi-weekly for some time. The *Washington Post*, now the leading paper, was founded in 1877. The *National Era*, the organ of the American and Foreign Anti-Slavery Society, first published in Washington in 1844 (the Cincinnati *Philanthropist* was merged with it in 1847) by Gamaliel Bailey, is known principally because *Uncle Tom's Cabin* ran in its columns as a serial in 1851–1852. A *New*

National Era (1870), was conducted in Washington by Frederick Douglass and his sons.

New York.—The *New York Gazette* (which started in New York City on the 16th of October 1725) was followed by the *Weekly Journal* (No. 1, 5th November 1733), still memorable for the prosecution for sedition which it entailed on its printer, John Peter Zenger, and for the masterly defence of the accused by Andrew Hamilton. "The trial of Zenger," said Gouverneur Morris, "was the germ of American freedom.". Gaines's *New York Mercury* was published from 1752 to 1783. James Rivington (1724–1802) in 1773 published the *New York Gazetteer* as a loyalist sheet, but his press was destroyed in 1775 and he went to England; in 1777 he returned and published *Rivington's New York Loyal Gazette* (semi-weekly), renamed first the *Royal Gazette* and then *Rivington's New York Gazette* and *Universal Advertiser*, which came to an end in 1783. The semi-weekly *Independent Journal* was one of the papers of New York City in which, between October 27th, 1787, and April 2nd, 1788, the *Federalist* essays were published; in 1788 it became part of the *New York Gazette*, and then in 1840 was consolidated with the *Journal of Commerce*. The first daily newspaper published in the city or state of New York was the *New York Journal and Register*, commenced in 1788. In 1802 the *Morning Chronicle*, edited by Peter Irving (1771–1838), a brother of Washington Irving, was established as Aaron Burr's organ; in 1805 it was merged in the *Poughkeepsie Journal*. Another political paper was the *Minerva* (1793), under Noah Webster, which had a semi-weekly edition, the *Herald*. These in 1797 became the *Commercial Advertiser* and *New York Spectator* respectively. The former (surviving as the *Globe and Commerical Advertiser*) was edited in 1820–1844 by W. L. Stone and in 1867 by Thurlow Weed.

In 1810 the aggregate number of papers published within the state was 66, of which 14 belonged to New York City. Ten years later the city press included 8 daily journals, with an aggregate daily circulation of 10,800 copies. No one paper circulated more than 2000, and but two—the *Evening Post* (1801) and the *Commercial Advertiser* (1797)—attained that number.

The New York *Evening Post* was at first strongly Federalist and practically an organ of Alexander Hamilton, who with John Jay assisted in founding it. Its first editor was William Coleman (1766–1829). In the years immediately following 1819 John Rodman Drake contributed to the *Post* the "Croaker" pieces, in which FitzGreene Halleck joined. William Cullen Bryant began to write for the *Post* in 1826, and became its editor-in-chief in 1828. John Bigelow, Parke Godwin, Carl Schurz, Horace White, E. L. Godkin, editor from 1881 to 1901, and Henry Villard, are the important names in its history. Rollo Ogden became editor in 1903. Closely connected with the *Post* is the weekly *Nation*, long edited by E. L. Godkin (*q.v.*). The *Post* was strongly Federalist until the War of 1812; it opposed the Hartford Convention; until 1860 it was consistently Democratic; it supported Lincoln in 1860 and in 1864 and Grant in 1868; in later years it was an advocate of free trade and of civil service reform. There were earlier *Evening Posts* in 1746–1747 and in 1794.

The cheap (two-cent) press of America (the previous price having usually been six cents) began in New York in the shape of the *Morning Post* (1st January 1833), which only lasted a few weeks; the real pioneer was the *Daily Sun* (No. 1, 23rd September 1833), written, edited, set up, and worked off by Benjamin Henry Day, a journeyman printer. It sold at one cent till the Civil War, when it charged two cents, the price remaining at that figure. The New York *Sun* was acquired in 1868 by Charles Anderson Dana (*q.v.*), who made it a powerful organ, and under his successor William M. Laffan (1848–1909) it remained one of the great dailies.

The *New York Herald* followed in May 1835, founded and edited by James Gordon Bennett (*q.v.*), and his efforts and those of his son gave it an enormous commercial success.

The *New York Tribune* was established in 1841 by Horace Greeley (*q.v.*), who remained its editor and one of its proprietors until his death, shortly after his defeat for the presidency in 1872. He was succeeded as editor and proprietor by Whitelaw Reid (b. 1837), who had joined the staff in 1868 and afterwards became U.S. Ambassador in London. Directed by two such men the *Tribune* became a powerful organ.

The *New York Times*, which was to rank with the *Tribune* and *Sun* among the best modern American daily papers, was established by Henry J. Raymond (*q.v.*) in September 1851; and, though absent at times in the discharge of his duties as lieut.-governor of New York and member of Congress, he continued its editor and chief proprietor until his death in June 1869. At the end of the century, under the control of Mr Adolph S. Ochs (b. 1858), it was prominent in American journalism for the excellence of its news service and literary character.

The New York *World* was founded in 1860 as a highly moral and religious sheet, which immediately failed and had to be reorganized. In 1861 the *Morning Courier* and the *Enquirer* were merged into it. In 1864 it and the *Journal of Commerce* were suppressed for several days by the Federal authorities because each had been tricked into publishing a forged presidential proclamation of a draft and of a general fast day. In 1869 it became the sole property of Manton Marble (b. 1834), who retired from its editorship in 1875; in 1876 it was sold to a syndicate and came under the control of Jay Gould; in 1883 it was purchased by Joseph Pulitzer (b. 1847), and its modern activity began. It worked hard for Grover Cleveland, especially in his first campaign, and opposed W. J. Bryan and his policies.

The journals owned by W. R. Hearst (b. 1863) all over America represent perhaps more conspicuously than any others the popular developments which at the end of the 19th century were associated with the nickname of the "Yellow Press." His papers in New York in 1910 were the *American* (originally *Journal*; morning except Sunday); the *Evening Journal*, the *American and Journal* (Sunday) and *Das Morgen Journal*. Starting in the 'nineties as proprietor of the San Francisco *Examiner*, Mr Hearst had a large fortune to enable him to carry out his ideas of a thoroughgoing democratic journalism, appealing particularly to the less literate masses and supplying all sorts of sensational news. The class prejudice often underlying the policy of his papers was bitterly criticized and resented by sober American opinion, but their passionate appeal to the masses, combined with their audacious and lively presentation of news, gave Mr Hearst nevertheless a position of considerable power; and no secret was made of his ambition to reach the highest political positions, both in New York itself and in the Republic. Dangerous as his social influence was considered by important sections of the community, and unsuccessful as he remained up to 1910 in obtaining municipal office or presidential nomination, it remained the fact that, in the type of journalism so indefatigably conducted under him, he represented a serious force in American social and political life, and his journalistic methods were a remarkable outcome of the conditions of a modern free press in a democratic country, where a large public exists for the consumption of the sort of newspaper fare which he was ready to provide.

The *New York Press* (1887) is a morning Republican paper of the strictest party type.

An important commercial paper of long standing in New York is the *Journal of Commerce and Commercial Bulletin*, founded in 1827 as the *Journal of Commerce* by Arthur Tappan (1786–1865) and his brother Lewis Tappan (1788–1873), and in 1893 consolidated with the *Commercial Bulletin* (1865). The *Journal of Commerce* in 1829–1830 was the first American paper to send out news schooners which intercepted packet ships which brought news especially of the French Revolution of 1830. Arthur Tappan, who was one of the founders of Oberlin College, established in 1833 the *Emancipator*, an abolitionist paper, of which in 1833–1837 Elizur Wright (1804–1885), and in 1837–1840 Joshua Leavitt (1794–1873), were editors. Leavitt took the paper to Boston. It was the weekly organ of the American Anti-Slavery Society.

The New York *Evening Mail* (1833), for a time the *Mail* *and Express*, was bought in 1888 and reorganized by Elliott Fitch Shepard (1833–1893). The *Express* was established in 1836 with the help of Willis Hall (1801–1868), a prominent Whig lawyer and politician, by James Brooks (1810–1873), who had formerly been on the Portland *Advertiser* and in 1832 had written (for the *Advertiser*) the first regular Washington correspondence. His brother Erastus (1815–1886) was joint owner of the *Express* in 1836–1877. James Brooks wrote several books of travel and was involved in the scandal of the Crédit Mobilier.

Of the New York newspapers not in English the most important are the following. The *Staats-Zeitung* (evening, 1834) is published by a company of which in 1909 Herman Ridder (b. 1851) was president, having since 1890 been treasurer and manager. Ridder, a prominent German Democrat and Roman Catholic, established in 1886 the *Catholic News*, a weekly with a large circulation, edited by his son Henry Ridder. The *Zeitung* (morning, 1845), *Herald* (evening, 1879), and *Revue* (Sundays) are other German papers published by one company. Mr Hearst's *Das Morgen Journal* dates from 1890. A Socialist Labour paper—daily *Volks Zeitung* and weekly *Vorwaerts*—was established in 1878. The *Jewish Daily News* and (weekly) *Jewish Gazette* (1874) in Yiddish and English have large circulations; so have the *Jewish Morning Journal* (1901; *Abend Post*, 1899, and weekly, *Jewish Journal*, 1899); the *Jewish Herald* (evening) and *Volksadvocat* (weekly), both editions, 1887; and *Forward* (evening, 1897). The *Courrier des États-Unis* (1828) publishes small daily, Sunday and weekly editions. There are four Italian dailies, the more important being *L'Araldo Italiano* (1894) and *Il Progresso Italo-Americano* (1879). The *Atlantis* (evening, 1894) is a Greek daily. The *Listy* (1875) and *Hlas Lidu* (1886) are Bohemian dailies; the *Narodni List* (1898) is a Croatian daily; the *Gaelic American* (1903), *Irish Nationalist* (1888), *Irish-American* (1849) and *Irish World* are Irish weeklies printed in English; the *Amerikai Magyar Nepsava* (1897) is a Hungarian daily, also published in Cleveland, Ohio; the *Glas Naroda* (1893) is a small Slavonic daily.

Among the New York weekly publications must be mentioned *Harper's Weekly*, founded in 1856; George William Curtis was first connected with it in 1857, and after 1864 was its political editor. Under Curtis it was a powerful advocate of civil service reform, and its campaigns against Tammany were made famous by the cartoons of Thomas Nast. During the Civil War *Harper's Weekly* published Nast's sketches in the field. *Frank Leslie's Illustrated Newspaper* (now *Leslie's Weekly*) was founded in 1855 by Frank Leslie (1821–1880), whose ability as a wood-engraver was the basis of its success. Nast was employed by Leslie in 1854 and subsequent years, and was sent to England to sketch the Heenan-Sayers fight. With Harper's and Leslie's *Weeklies* ranks *Collier's Weekly*, established in 1888 by Peter Fenelon Collier (d. 1909).

The following are newspapers of Brooklyn. The *Eagle* (evening, 1841), of which Walt Whitman was editor in 1846–1847, came in 1885 under the editorship of St Clair McKelway (b. 1845), editor in 1878–1885 of the Albany *Argus*. The *Times* (evening, 1848), like the *Eagle*, makes a specialty of the news of Long Island. *Brooklyner Freie Presse* (evening, 1864). The *Standard Union* (evening, 1864). The *Citizen* (evening, 1886).

Outside of New York City the most important papers in the political history of the state have been those of Albany. The Albany *Argus*, established in 1813 (daily, 1824), was the organ of the famous Albany Regency. The *Evening Journal* of Albany was established in 1830 by Thurlow Weed, who controlled it for 35 years. After 1865 it became the property of Samuel Wilkeson (1817–1889), and in 1889 William Barnes, Jr., became its editor. The *Argus* and the *Journal* held alternately the valuable state printing. A factional fight in the Democratic party over the printing resulted in the establishment of the *Atlas* in 1843; in 1858 this was consolidated with the *Argus*.

In Buffalo the oldest paper is the *Commercial*, the successor of the Buffalo *Gazette* (1811, weekly), which in 1818 became the *Niagara Patriot* and in 1820 the *Buffalo Patriot*, and in 1834 the *Buffalo Patriot and Commercial Advertiser*. The daily issue began in 1835 as the *Commercial Advertiser*; the weekly was still called by the earlier name. The weekly ceased publication in 1909. In 1890 the daily became the *Commercial*. The first daily in Buffalo was the *Courier* (1828), controlled in 1909 by W. J. Conners. The *Evening Times* (1885) was in 1909 edited by Norman Mack, who was in 1908 treasurer of the Democratic National Committee.

In Rochester are the *Democrat and Chronicle* (morning and weekly; *Democrat*, 1826; *Chronicle*, 1868); *Post-Express* (evening, 1858); *Herald* (morning, 1879); and *Union and Advertiser* (evening, 1826). It was in Rochester that Myron Holly (1779–1841), who had formerly edited the Lyons (N.Y.) *Countryman* (anti-masonic), edited the *Freeman*, an anti-slavery paper; and here in 1847–1860 Frederick Douglass edited the *North Star*, called *Frederick Douglass's Paper* after 1855.

In Syracuse are the *Evening Herald* (1877) and the *Post-Standard* (morning, *Standard*, 1829, and *Post*, 1894, consolidated in 1899).

In Troy are the *Record* (morning and evening, successor to the *Post*, 1812), the *Times* (daily, 1851; weekly, 1856), the *Evening Standard* (1877), and the *Northern Budget* (weekly only, 1797).

The Utica *Herald-Despatch and Daily Gazette* is the successor of the Whitestown *Gazette* (1793); the *Daily Gazette* first appeared in 1842; the *Morning Herald* (1847) was consolidated with it in 1867; and in 1900 it was purchased by the owners of the *Evening Despatch* (1898).

In Catskill, Greene county, New York, was established in August 1792 by Mackay Croswell the *Packet*, which in May 1804 was succeeded by the *Recorder*, which in 1909 was still published as a weekly, the largest in the county. Mackay Croswell's son Edwin Croswell (1797–1871) left the *Recorder* in 1823 and in 1824 became editor of the Albany *Argus*; Croswell was state printer in 1824–1840 and 1844–1847.

Other papers (mostly with small circulations) in New York state founded before 1801 are: the *Gazette* of Hudson (weekly, 1785; daily, *Evening Register*, 1866); the *Register* of Newburgh (1796; now a daily only); the *Washington County Post* of Cambridge (weekly only, 1798); the *Journal* of Ballston Spa (weekly, 1798; *Ballston Daily Journal*, 1894; Republican); and the *Gazette* of Owego (weekly only, 1800).

Ohio.—The *Repository* (weekly, 1815; daily, 1878), formerly the *Ohio Repository*, of Canton, is one of the oldest papers in Ohio. The *Western Hemisphere* of Columbus was purchased in 1836 by Samuel Medary (1801–1864), who changed its name to the *Ohio Statesman*; Medary—the "old wheel horse of Democracy," who is said to have originated the cry of "Fifty-four, forty, or fight!"—was a friend of Stephen A. Douglas and governor of Minnesota in 1857–1858 and of Kansas in 1858–1860; S. S. Cox was editor of the *Statesman* in 1853–1854.

The *Weekly Gazette* of Cincinnati (founded in 1793 as the *Centinel*; in 1804–1815 called the *Liberty Hall*; in 1815–1883 the *Cincinnati Gazette*), and the *Commercial Tribune* (morning; formed in 1896 by the consolidation of the *Commercial Gazette* and *Tribune*), are published by the same firm. In 1825–1840 Charles Hammond (1779–1841), an anti-slavery leader, was editor of the *Gazette*. The *Commercial* was made by Murat Halstead (1829–1908), a prominent Republican politician, and writer of several "campaign lives" of Republican presidential candidates, who was the first editor in the Middle West to get news freely by telegraph. The *Cincinnati Enquirer* (morning, 1842) became a great power in Ohio politics under the ownership (after 1852) of Washington McLean and his son John R. McLean. The *Post* (1880), the *Times-Star* (*Times* 1836), the *Volksblatt* (1836), the *Volksfreund* (daily 1850; weekly 1852), and the *Freie Presse* (1874) are the other large dailies of Cincinnati. In Cincinnati James G. Birney established in 1835 the *Philanthropist*, an anti-slavery paper, which Gamaliel Bailey edited in 1837–1847.

The *Cleveland Leader* (Republican, 1847) was bought in 1853 by Edwin Cowles (1825–1890) and Joseph Medill (after 1855 of the Chicago *Tribune*). Cowles became sole owner in 1854; he was an anti-slavery Whig and one of the founders of the Republican party in the state. The *Leader* of 1853 was a consolidation of the *Cleveland Forest City*, a Whig paper founded in 1849 by Joseph Medill and united in 1852 with the *Free Democrat*. Like the Chicago *Tribune* it was in 1909 controlled by Medill's grandson, Medill McCormick (b. 1877), a son-in-law of M. A. Hanna. The *Press* of Cleveland (evening, independent) was established in 1878 by James Edmund Scripps (1835–1906); with Milton A. McRae (b. 1858) he formed the Scripps-McRae Press Association of Cleveland and the Scripps-McRae League, which included the Cincinnati *Post*, the St Louis *Star-Chronicle*, the Cleveland *Press*, the Kentucky *Post* of Covington, the Columbus *Citizen*, and the *Times*, the *News-Bee* and *Times-Bee* of Toledo. Scripps and McRae organized the Publishers' Press Association of New York, a rival of the Associated Press. Scripps in his later years was a benefactor of the city of Detroit, where he had established (1873) the *Evening News*. The Cleveland *Plain-Dealer* (morning, 1841) is a well-known paper; in its columns appeared the first "Artemus Ward" sketches, contributed by Charles Farrar Browne (1834–1867), who in 1861 went to New York to edit the short-lived humorous *Vanity Fair*. The *Waechter und Anzeiger* (*Waechter* 1852; *Anzeiger* 1872) is published in Cleveland.

The larger papers of Columbus are the *Ohio State Journal* (morning, 1811), the *Press-Post* (evening, 1827), the *Citizen* (evening, 1899), and the *Express und Westbote* (weekly, 1880; Sunday, 1878; daily, 1890—the different editions being under different names). The *News* of Springfield has a weekly edition, the *Weekly Republic*, which was founded in 1817. The *Toledo Blade* (daily, 1848; weekly, 1835) before and during the Civil War contained the attacks on slavery and on political abuses written by "Petroleum V. Nasby," *i.e.* David Ross Locke (1833–1888). The first of these letters (signed "Rev. Petroleum Vesuvious Nasby") appeared in the *Jeffersonian* of Findlay, Ohio, in 1860, when he was its editor. He had edited small papers in Plymouth and Mansfield (O.) before his connexion with the *Blade*; in 1871 he became managing editor of the *Evening Mail* of New York City. Will Carleton (b. 1845) was a member of the *Blade's* staff, and contributed to the *Blade* his first "ballads." The *News-Bee* (evening) of Toledo was formed by the consolidation in 1903 of the *Times* (1846), *News* (1888) and *Bee* (1894), and has a morning edition called the *Times* and a Sunday edition called the *Times-Bee*. The Zanesville *Courier* (Republican; daily, 1846) has a weekly edition dating from 1809 (originally the *Muskingum Messenger*).

Among the smaller newspapers of Ohio the following are more than 100 years old: the *Western Star* of Lebanon (weekly, 1806); the *Ohio Patriot* of Lisbon (weekly, 1808; daily and semi-weekly, 1898); and the *Journal* of Dayton (morning, 1808).

Illinois.—The first newspaper in Illinois was the *Illinois Herald* (1814; succeeded in 1815 by the *Illinois Intelligencer*) of Kaskaskia (then the seat of government); it removed to Vandalia, which then became the capital, in 1820; it became the *Vandalia Whig and Illinois Intelligencer* in 1832; and it ceased publication about 1839, when Springfield became the capital.

The principal papers in Illinois are naturally those of Chicago. The *Chicago Tribune* (morning; 1847) succeeded *The Gem of the Prairie* (1844), and a weekly edition was for a time continued under that name. In August 1848 John Locke Scripps (1818–1866) bought a third interest in the *Tribune* and became its managing editor. In 1852 he sold it to a syndicate of Whig politicians. A part (in 1855) and eventually the whole (in 1874) was bought by Joseph Medill (1823–1899). Horace White (b. 1834) was a reporter on the *Tribune* in 1856, and was its editor and one of its proprietors in 1864–1874; from 1883 to 1903 he was editor-in-chief of the New York *Evening Post*. In 1858 the *Daily Democratic Press*, which J. L. Scripps had established in 1852 with William Bross, was consolidated with the *Tribune* as the *Press and Tribune*; in 1860 the name became the *Tribune* again; the Tribune Company was incorporated in 1861, with J. L. Scripps as its president. The first newspaper published in Chicago, the *Democrat* (November 1833), was merged with the *Daily Tribune* in 1861. The *Inter-Ocean* (morning; 1872), under the editorship (from 1897) of George Wheeler Hinman (b. 1863), has made a specialty of foreign affairs. The *News* (evening; 1875) was founded and developed by Melville E. Stone (b. 1848) as a one-cent evening paper. After 1883 Eugene Field contributed to this paper his column "Sharps and Flats," including much verse. In 1888 Victor Fremont Lawson (b. 1850), who had been associated with Stone, acquired the paper. The *Record* (morning; 1881), started by Lawson, was consolidated in 1901 with the *Herald* (1881) as the *Record-Herald*. The *Evening Post* dates from 1889. In 1900 W. R. Hearst established in Chicago two papers, *Hearst's Evening American* and the *Examiner* (the name assumed in 1902 for his morning *American*). The Chicago German papers include the *Freie Presse* (evening and weekly; 1871), the *Staats-Zeitung* (daily, 1847, weekly—*Westen und Daheim*—1845; evening edition, the *Abend Presse*) and *Abendpost* (1899). The *Skandinaven* (semi-weekly, 1866; daily, 1871) is an important Norwegian-Danish paper; and there are large Bohemian and Polish dailies.

In Springfield, the state capital, there are two party journals, the *Illinois State Journal* (Republican; semi-weekly, 1831; daily, 1848) and the *Illinois State Register* (Democratic; weekly, 1836; daily, 1848).

Michigan.—The *Detroit Free Press* (morning, 1835; with a weekly agricultural edition, *Farm and Live Stock Journal*, 1831) was particularly known in 1869–1891 for the humorous sketches of Charles Bertrand Lewis (b. 1842), who wrote under the pseudonym "M. Quad." The *News* (morning, 1873) was established by J. E. Scripps (1835–1906).

Missouri.—The oldest paper is the *Republic* of St Louis, formerly the *Republican*, founded as a weekly in July 1808, by Joseph Charless, an Irishman who had worked on the *Kentucky Gazette* in Lexington; it was called first the *Missouri Gazette*, then (1809) the *Louisiana Gazette*, then (1812) the *Missouri Gazette* again, and then (1822) the *Missouri Republican*, and in 1886–1888 the *St Louis Republican*; the present name was adopted in 1888. Its first daily issue was in September 1836 and the first Sunday issue in 1848. The *Republican* was originally a Jeffersonian Democratic paper; it opposed Thos. H. Benton; it supported Wm. Henry Harrison in 1840, and became a Whig organ; and from 1856 was a Democratic paper. A *cause celèbre* was the trial in 1830 for the impeachment of Judge James H. Peck of the U.S. District Court for Missouri, who had suspended from practice for 18 months and had imprisoned for 24 hours an attorney, Luke Edward Lawless, who had criticized in the *Republican* Judge Peck's decision in a Spanish land grant case, which was adverse to Lawless, attorney for the plaintiff. William Wirt appeared for Peck, and he was acquitted. Since 1837 the paper has been almost continuously the property of the Knapp and Paschall families. In 1871 the *Republican* purchased a Walter press from *The Times* of London; it introduced stereotyping in 1860, probably before any other newspaper. The *Globe-Democrat* (morning; Republican, 1852) of St Louis early became a valuable property: in 1872 it was sold for $456,100. In St Louis in 1833–1836 Elijah P. Lovejoy published the *Observer*, primarily a religious paper, which because of local opposition to its attacks on slavery he removed in July 1836 to Alton, Ill., where he was killed by a mob.

The *Post-Dispatch* (evening, 1851) is a consolidation made in 1878 by its proprietor Joseph Pulitzer. Pulitzer's first newspaper experience was in 1868 as a reporter on the *Westliche Post* (morning, 1857) of St Louis, which has an evening edition, the *Anzeiger*, a Sunday edition, Mississippi *Blaetter*, and a semi-weekly and weekly edition, *Anzeiger des Westens*. Carl Schurz was editor of the *Westliche Post* in 1867. Another German newspaper in St Louis is *Amerika* (morning; 1872).

The two principal dailies of Kansas City are the *Star* (evening, 1880–1881; with a morning edition, the *Times*, 1838, and a *Weekly Star*, 1890), founded by William R. Nelson (b. 1841); and the *Journal* (morning, 1854; with a weekly edition). The *News-Press* (*News*, 1878; *Press*, 1902; evening) is the principal paper of St Joseph.

North Carolina.—The *Observer* (weekly, 1817; daily, 1896) of Fayetteville. The *News and Observer* (daily; *News*, 1872; *Observer*, 1876) and *North Carolinian* (weekly, 1892) of Raleigh.

South Carolina.—The *News and Courier* of Charleston (*Courier*, established 1803 by Loring Andrews, d. 1805, of Hingham, Mass.; *News*, 1865; consolidated, 1873). The *City Gazette* of Charleston (founded in 1783 as the *South Carolina Weekly Gazette*) was edited by W. G. Simms in 1828–1833, but then failed, after bravely attempting to oppose Nullification, and was finally purchased by the *Courier*. The *State* of Columbia (1891) is one of the most influential papers in the South.

Alabama.—The *News* (evening, 1887) and *Age-Herald* (morning, 1887) of Birmingham. The *Mercury* of Huntsville (weekly, 1816; daily, 1885). The *Register* of Mobile (weekly, 1821). The *Advertiser* of Montgomery (1828). The *Morning Times* of Selma (weekly edition, 1825).

Georgia.—The *Constitution* of Atlanta (daily, 1868; weekly, 1870): Henry W. Grady (1851–1889), the orator, was its editor and proprietor-in-part from 1880 until his death; Joel Chandler Harris was an editor (1890–1901) and contributed the *Uncle Remus* sketches; Frank Lebby Stanton (b. 1857) is well known as a contributor of humorous paragraphs and excellent verse. The *Journal* of Atlanta (1883; semi-weekly, 1885); its proprietor in 1887–1898 was Hoke Smith (b. 1855), U.S. Secretary of the Interior in 1893–1896, and governor of Georgia in 1907–1909. The *Chronicle* of Augusta (1785, semi-weekly; now semi-weekly and, since 1837, daily); originally the *Augusta Chronicle and Gazette of the State*, in 1821 it became the *Augusta Chronicle and Georgia Gazette* (then *Advertiser*); in 1835, the *Augusta Chronicle*; in 1837, when it incorporated the *State's Rights Sentinel*—edited for about a dozen years by Judge Augustus Baldwin Longstreet (1790–1870), son of the inventor William Longstreet, and author of *Georgia Scenes* (1840)—the *Daily Chronicle and Sentinel*; in 1877, after merging with the *Constitutionalist* (founded before 1800), the *Chronicle and Constitutionalist*; James R. Randall (1839–1908), author of "Maryland, my Maryland," was senior editor of the *Chronicle* for some time, having been connected with the *Constitutionalist* after 1866. The *Enquirer-Sun* of Columbus (weekly, 1828; daily, 1858). The *Telegraph* of Macon (semi-weekly, 1826; now daily also). The *Union-Recorder* of Milledgeville (the *Federal Union*, 1829, and the *Southern Recorder*, 1819, united in 1872). The *Tribune* of Rome (1843). The *Morning News* of Savannah (1850).

Louisiana.—The *Picayune* of New Orleans (daily, 1837; weekly, 1841). The *Item* (evening, 1877) of New Orleans. The *Times-Democrat* (daily, 1863; semi-weekly, 1895) of New Orleans. *L'Abeille de la Nouvelle-Orleans* (1827). The *States* (1880) of New Orleans. On all these see New Orleans. *De Bow's Commercial Review* appeared in New Orleans in 1846–1861, in Charleston and Washington in 1861–1864, and in New York in 1866–1870; it was edited by James Dunwoody Brownson De Bow (1820–1867), formerly (1844–1845) of the *Southern Quarterly Review*, professor (1848–1850) of political economy in the University of Louisiana, director of the state census in 1850–1853, and of the Federal census in 1853–1855. The *Review* was intensely Southern in tone and is a most important "source" for the economic history of the South; from it De Bow extracted *Industrial Resources of the Southern and Western States* (3 vols. New Orleans, 1852–1853).

Florida.—The *Florida Times Union and Citizen* (1865), with daily and semi-weekly editions; and the *Metropolis* (1887), both of Jacksonville. The *Morning Tribune* (weekly, 1870; daily, 1891) of Tampa.

Texas.—The *Statesman* of Austin (1871). The *Morning News* of Dallas, established in 1885 by Alfred H. Belo (1839–1901), who in 1875 bought the *Galveston News* (established 1842) and built up these two papers. The *Post* (1880) and the *Chronicle and Herald* (1901) of Houston.

Tennessee.—The *Journal and Tribune* (*Journal*, 1839, and *Tribune*, 1816, consolidated in 1898) of Knoxville. The *Commercial Appeal* (*Appeal*, 1840; *Avalanche*, 1857; *Commercial*, 1889; consolidated in 1894); and the *News Scimitar* (*Evening Scimitar*, 1880, and *News*, 1902, consolidated in 1904), both of Memphis. The *Banner* (1875), and the *American* (1830), both of Nashville. The first paper published in the state was the *Gazette* (1791) of Rogersville, which removed in 1818 to Knoxville, where it was published for a few years.

Kentucky.—The Louisville *Courier-Journal* (*Journal*, 1830; *Courier*, 1843; *Democrat*, 1844; consolidated 1868), edited by Henry Watterson, who began his connexion with the *Journal* in 1867. The *Herald* (1869) of Louisville. In Frankfort, the *Argus of Western America* was established in 1806; in 1816 Amos Kendall (1789–1869) became part owner and co-editor, and under him the *Argus* was a political power; it was succeeded in 1840 by the *Yeoman*.

Indiana.—The first paper in Indianapolis was the *Gazette* (January 1822), which in 1830 was consolidated with (and took the name of) the *Indiana Democrat*; in 1840 it was reorganized as the *Indiana Sentinel*; in 1851 it was first published as a daily; in 1865 its name was changed to the *Herald*, and in 1868 again to the *Indianapolis Sentinel*; in February 1905 it was bought by the *News* (*v. infra*). The Indianapolis *Journal* (1823) ceased publication in 1904, but was an important Republican sheet especially after 1878, when John Chalfant New (1831-1906) became its editor and proprietor; New was a wealthy banker who was U.S. treasurer in 1875–1876, assistant secretary of the treasury in 1882–1884, and for many years a member (part of the time, treasurer) of the Republican National Committee. The paper was also owned and edited by his son, Harry Stewart New (b. 1858), who was a member of the executive committee of the Republican National Committee. The Indianapolis *News* (evening, 1869) and the *Star* (morning, 1903) are the principal papers in the city. The first paper published in the state was at Vincennes in July 1804 and called the *Western Sun*; it is still published (daily edition since 1879).

Wisconsin.—The principal papers are those of Milwaukee· the *Evening Wisconsin* (1847); the *Sentinel* (morning, 1837), edited in 1845–1861 by Rufus King (1814–1876), who was U.S. minister to the Pontifical States in 1863–1867, and a brigadier of volunteers in the Civil War; the *News* (evening, 1866); the *Free Press* (morning, 1901); the *Germania-Abend-Post* (1872, with a large weekly edition), and the *Kuryer Polski* (evening, 1888).

Minnesota.—The *Journal* (evening, 1878); the *Tribune* (morning, evening and weekly, 1867); and the *Tidende* (daily, 1887; weekly, 1851; Norwegian-Danish) are the principal papers of Minneapolis. In St Paul the best-known paper is the *Pioneer Press* (founded in 1849; daily since 1854); the *Minnesota Pioneer* was the first paper printed in the state, and in 1855 it was consolidated with the *Minnesota Democrat* under the name of *Pioneer and Democrat*; in 1862 it became the *St Paul Pioneer*; and in 1875 after the St Paul *Press* united with it it took the name of the *Pioneer Press*. The other dailies are the *Dispatch* (evening, 1868); the *News* (evening, 1900) and the *Volks Zeitung* (weekly, 1857; daily, 1877).

Kansas.—The Emporia *Gazette* (evening, 1890) is one of the notable smaller city papers of the country; its reputation being due to its editor and proprietor William Allen White (b. 1868). Other papers of interest are the Leavenworth *Times* (morning and weekly, 1857); in Topeka, the *Capital* (daily and semi-weekly, 1879); the *State Journal* (evening and weekly, 1872), and the *Herald* (evening, 1901); and in Wichita, the *Eagle* (morning, 1884, and weekly, 1872).

Nebraska.—The *News* (evening, 1899), the *World-Herald* (morning and evening, weekly and semi-weekly, 1865), and the *Omaha Bee* (morning and evening, 1871) are all of Omaha. The *Bee* was established by Edward Rosewater (1841–1906); his son Victor (b. 1871) succeeding him in 1895 as managing editor. The Rosewaters were prominent in the Republican party and headed the opposition in the state to William Jennings Bryan, who was in 1894–1896 editor of the *World-Herald*. Bryan also founded at Lincoln the *Commoner*, a weekly used by him in spreading his political views and in advancing his candidacy for the presidency. The Lincoln dailies are the *Nebraska State Journal* (morning, 1870; *Evening News*, 1880; *Weekly State Journal*, 1868), the *Star* (evening, 1902); and the evening *Post* (1896).

Iowa.—The Des Moines papers are the *Capital* (evening, 1883), the *News* (evening, 1881), and the *Register and Leader* (morning, *Leader*, 1849, and *Register*, 1856, consolidated in 1902). At Burlington is the *Hawk Eye* (morning, 1839), to which Robert Jones Burdette (b. 1844), associate editor in the 'seventies, contributed humorous squibs. The Burlington *Evening Gazette*, originally the *Wisconsin Territorial Gazette* (1837), is one of the oldest papers in the state.

Arkansas.—The *Arkansas Gazette* (Democratic; morning and weekly) was first published at Arkansas Post in 1819, then removed to Little Rock.

Colorado.—At Denver are the *Republican* (morning and weekly, 1866); the *Post* (evening, 1893; weekly, 1901); and the *Rocky Mountain News* (morning, 1859; evening, *The Times*, 1872; and a weekly edition).

Arizona.—At Tombstone, the county-seat of Cochise county, is the well-known *Epitaph* (1882), a Sunday edition of the *Prospector* (daily, 1886).

Utah.—At Salt Lake City are the *Deseret Evening News* (daily and semi-weekly, 1850), controlled by the Mormons; the *Salt Lake Tribune* (daily, 1870; semi-weekly, 1894), founded by Godbe and Harrison, opponents of Brigham Young, and always anti-Mormon; and the *Salt Lake Herald* (daily and semi-weekly, 1870). The last named was the principal—and for a time the only—Democratic paper in Utah; in 1901 it was purchased by Senator W. A. Clark, who sold it in August 1909 to Republican politicians.

California.—At San Francisco are the *Call* (morning, 1856), owned by John D. Spreckels (b. 1853), principal owner of the Oceanic Steamship Company, and son of Claus Spreckels the "sugar-king"; the *Examiner* (morning, 1865), founded by Senator George Hearst (1820–1891), the inheritance of which started his son, William Randolph Hearst, in the newspaper business; the *Bulletin* (morning, 1855); the *Chronicle* (morning, 1865; weekly, 1874); the *Evening Post* (1871; weekly edition, 1875), and the *California Demokrat* (morning, 1853; consolidated in 1902 with the *Abend Post*; weekly edition, *California Staats-Zeitung*, 1854). The *Argonaut* (1877) is an able literary weekly.

In Los Angeles the large dailies are the *Times* (morning, 1881; weekly edition, *Saturday Times and Weekly Mirror*, 1873); the *Herald* (morning, 1873); the *Express* (evening, 1871); the *Record* (evening, 1895); and W. R. Hearst's *Examiner* (morning, 1903).

Oregon.—At Portland are the *Morning Oregonian* (1861; weekly edition, 1850) which has a great reputation on the Pacific Coast; the *Oregon Daily Journal* (evening and semi-weekly; 1902); and the *Evening Telegram* (1868).

Washington.—At Seattle are the *Post Intelligencer* (morning, 1867), and the *Times* (evening and weekly, 1861).

4. Newspapers of France

Gazette de France.

The annals of French journalism begin with the *Gazette* (afterwards called *Gazette de France*), established by Théophraste Renaudot in 1631, under the patronage of Richelieu, and with his active co-operation. Its price was six centimes. Much of its earliest foreign news came direct from the minister, and not seldom in his own hand. Louis XIII. took a keen, perhaps a somewhat childish, interest in the progress of the infant *Gazette*, and was a frequent contributor, now and then taking his little paragraphs to the printing office himself, and seeing them put into type. Renaudot was born at Loudun in 1584, studied medicine in Paris and at Montpellier, established himself in the capital in 1612, and soon became conspicuous both within and beyond the limits of his profession. Endowed by nature with great energy and versatility, he seems at an early period of his career to have attracted the attention of the great cardinal, and to have obtained permission to establish a sort of general agency office, under the designation of "Bureau d'Adresses et de Rencontre." An enterprise like this would, perhaps, naturally suggest to such a mind as Renaudot's the advantage of following it up by the foundation of a newspaper. According to some French writers, however, the project was formed by Pierre d'Hozier, the genealogist, who carried on an extensive correspondence both at home and abroad, and was thus in a position to give valuable help; according to others by Richelieu himself. Be this as it may, Renaudot put his hand zealously to the work, and brought out his first weekly number in May 1631. So much, at least, may be inferred from the date (4th July 1631) of the sixth number, which was the first *dated* publication, the five preceding numbers being marked by "signatures" only—A to E. Each number consists of a single sheet (eight pages) in small quarto, and is divided into two parts—the first simply entitled *Gazette*, the second *Nouvelles ordinaires de divers endroits.* For this division the author assigns two reasons—(1) that two persons may thus read his journal at the same time, and (2) that it facilitates a division of the subject-matter, the *Nouvelles* containing usually intelligence from the northern and western countries, the *Gazette* from the southern and eastern. He commonly begins with foreign and ends with home news, a method which was long and generally followed, and which still obtains. Once a month he published a supplement, under the title of *Relation des nouvelles du monde, reçues dans tout le mois.* In October 1631 Renaudot obtained letters patent to himself and his heirs, conferring the exclusive privilege of printing and selling, where and how they might please, "the gazettes, news and narratives of all that has passed or may pass within and without the kingdom." His assailants were numerous, but he steadily pursued his course, and at his death in October 1653 left the *Gazette* to his sons in flourishing circumstances. In 1752 the title *Gazette de France* was first used. Under this designation it continued to appear until the 24th August 1848. During the five days which followed that date it was suspended; on the 30th it was resumed as *Le Peuple français, journal de l'appel à la nation*, and again modified on the 14th September to *L'Étoile de la France, journal des droits de tous.* On the 25th October it became *Gazette de France, journal de l'appel à la nation*; and under this title it continued.

Jean Loret's rhymed *Gazette* (1650 to March 1665) will always have interest in the eyes of students who care less for the "dignity" of history than for the fidelity of its local colouring and the animation of its backgrounds. It were vain to look there for any deep appreciation of the events of those stormy times; but it abounds in vivid portraits of the men and manners of the day. It paints rudely, yet to the life, the Paris of the Fronde, with all its effervescence and depression, its versatility and fickleness, its cowardice and its courage.

Mercure de France.

Of the *Mercure galant*, established by Donneau de Vizé in 1672, with Thomas Corneille for its sub-editor, it may be said that it sought to combine the qualities of the *Gazettes*, both grave and gay. Like the *Gazette de France*, it contained the permitted state news and court circulars of the day. Like Loret's *Gazette*, it amused its readers with satirical verses, and with sketches of men and manners, which, if not always true, were at least well invented. Reviews and sermons, law pleas and street airs, the last reception at the Academy and the last new fashion of the milliners, all found their place. De Vizé carried on his enterprise for more than thirty years, and at his death (1710) it was continued by Rivière du Fresny. The next editor, Lefèvre de Fontenay, altered the title to *Nouveau Mercure*, which in 1728 was altered to *Mercure de France*, a designation retained, with slight modification, until 1853. The *Mercure* passed through many hands before it came into those of Panckoucke, at the eve of the Revolution. Amongst its more conspicuous writers, immediately before this change, had been Raynal and Marmontel. The latter, indeed, had for many years been its principal editor, and in his *Mémoires* has left us a very interesting record of the views and aims which governed him in the performance of an arduous task. He there narrates the curious fact that it was Madame de Pompadour who contrived the plan of giving pensions to eminent men of letters out of the profits of the *Mercure.* To one of Marmontel's predecessors the "privilege," or patent, had been worth more than £1000 sterling annually. This revenue was now to be shared amongst several, and to become a means of extending royal "patronage" of literature at a cheap rate. It is to this pension scheme, too, that we owe the *Contes Moraux.* Marmontel, who had long before lost his "patent" by an act of high-minded generosity, continued to share in the composition of the literary articles with Chamfort and La Harpe, whilst Mallet du Pan, a far abler writer than either, became the most prominent of the political writers in the *Mercure.* In 1789 he contributed a series of remarkable articles on the well-known book of de Lolme; and in the same year he penned some comments on the "Declaration of the Rights of Man," very distasteful to violent men of all parties, but which forcibly illustrate the pregnant truth they begin with: "The gospel has given the simplest, the shortest and the most comprehensive 'Declaration of the Rights of Man,' in saying, 'Do unto others as you would that they should do unto you.' All politics hinge upon this."

In 1790 the sale of the *Mercure* rose very rapidly. It attained for a time a circulation of 13,000 copies. Mirabeau styled it in debate "the most able of the newspapers." Great pains were taken in the collection of statistics and state papers, the absence of which from the French newspaper press had helped to depress its credit as compared with the political journalism of England and to some extent of Germany. But, as the Revolution marched on towards a destructive democracy, Mallet du Pan evinced more and more unmistakably his rooted attachment to a constitutional monarchy. And, like so many of his compatriots, he soon found the tide too strong for him. The political part of the *Mercure* (in 1791 its title was altered to *Mercure français*) changed hands, and after the 10th August 1792 its publication was suspended.

Moniteur universel.

All this time the *Moniteur* (*Gazette nationale, ou le moniteur universel*), founded in 1789, was under the same general management. The first idea, indeed, of this famous official journal appears to have been Panckoucke's, but it did not firmly establish itself until he had purchased the *Journal de l'assemblée nationale*, and so secured the best report of the debates. The *Moniteur*, however, kept step with the majority of the assembly, the *Mercure* with the minority. So marked a contrast between two journals, with one proprietor, gave too favourable a leverage to the republican wits not to be turned to good account. Camille Desmoulins depicted him as Janus—one face radiant at the blessings of coming liberty, the other plunged in grief for the epoch that was rapidly disappearing.

When resumed, after a very brief interval, the *Mercure français* became again *Mercure de France*—its political importance diminished, whilst its literary worth was enhanced. During the later days of the Revolution, and under the imperial rule, its roll of contributors included the names of Geoffroy, Ginguené, Morellet, Lacretelle, Fontanes and Chateaubriand. The statesman last named brought upon the *Mercure* another temporary suppression in June 1807 (at which date he was its sole proprietor), by words in true unison with the noblest deed of his chequered career—his retirement, namely, from the imperial service on the day that the news of the execution of the duke of Enghien reached him, being the day after he had been appointed by Napoleon a minister plenipotentiary.

Thus it chanced that alike under the brilliant despotism of Napoleon and under the crapulous malversation of Louis XV. the management of the *Mercure* was revolutionized for protests which conferred honour upon the journal no less than upon the individual writers who made them. Resumed by other hands, the *Mercure* continued to appear until January 1820, when it was again suspended. In the following year it reappeared as *Le Mercure de France, au dix-neuvième siècle*, and in February 1853 it finally ceased.

Journal de Paris.

The only other newspaper of a date anterior to the Revolution which needs to be noticed here is the first French daily, the *Journal de Paris*, which was started on New Year's Day of 1777. It had but a feeble infancy, yet lived till 1819. Its tameness, however, did not save it from sharing in the "suspensions" of its predecessors. After the Revolution such men as Garat, Condorcet and Regnaud de St Jean d'Angély appear amongst its contributors, but those of earlier date were obscure. Its period of highest prosperity may be dated about 1792, when its circulation is said to have exceeded 20,000.

The police adventures of the writers of the MS. news-letters, or *Nouvelles à la main*, were still more numerous, and, if we

Nouvelles à la main.

may judge from the copious specimens of these epistles which yet survive, must also not unfrequently have arisen from lack of official employment, rather than from substantial provocation. Madame Doublet de Persan, the widow of a member of the French board of trade, was a conspicuous purveyor of news of this sort. For nearly forty years daily meetings were held in her house at which the gossip and table-talk of the town were systematically (and literally) *registered*; and weekly abstracts or epitomes were sent into the country by post. Piron, Mirabaud, Falconet, D'Argental and, above all, Bachaumont, were prominent members of the "society," and each of them is said to have had his assigned seat beneath his own portrait. The lady's valet-de-chambre appears to have been editor *ex officio*; and as he occasionally suffered imprisonment, when offensive news-letters had been seized by the police, so responsible a duty was doubtless "considered in the wages." News and anecdotes of all kinds—political and literary, grave, gay or merely scandalous—were all admitted into the *Nouvelles à la main*; and their contents, during a long series of years, form the staple of those *Mémoires secrets pour servir à l'histoire de la rêpublique des lettres* which extend to thirty-six volumes, have been frequently printed (at first with the false imprint "Londres: John Adamson, 1777–89"), and are usually referred to by French writers as the *Mémoires de Bachaumont*.

Newspapers of the Revolution.

Journal des débats and Moniteur.

The journalism of the first Revolution has been the theme of many bulky volumes, and only a very casual glance at this part of our subject can be given to it here. When at least one half of the French people was in a ferment of hope or of fear at the approaching convocation of the states-general, most of the existing newspapers were still in a state of torpor. Long paragraphs, for example, about a terrible "wild beast of the Gevaudan"—whether wolf or bear, or as yet nondescript, was uncertain—were still current in the Paris journals at this momentous juncture. Mirabeau was among the foremost to supply the popular want. His *Lettres à ses commettants* began on the 2nd May 1789, and with the twenty-first number became the *Courrier de Provence*. Within a week Maret (afterwards duke of Bassano) followed with the *Bulletin des séances de l'assemblée nationale*, and Lehodey with the *Journal des états généraux*. In June Brissot de Warville began his *Patriote français*. Gorsas published the first number of his *Courrier de Versailles* in the following month, from which also dates the famous periodical of Prudhomme, Loustalot and Tournon, entitled *Révolutions de Paris*, with its characteristic motto—"Les grands ne nous paraissent grands que parce que nous sommes à genoux; levons nous!" In August 1789 Baudouin began the *Journal des débats* (edited in 1792 by Louvet) and Marat the *Ami du Peuple* (which at first was called *Le Publiciste parisien*). The *Moniteur universel* (of which we have spoken already) was first published on the 24th November, although numbers were afterwards printed bearing date from the 5th May, the day on which the states-general first assembled. Camille Desmoulins also commenced his *Révolutions de France et de Brabant* in November 1789. The *Ami du roi* was first published in June 1790, *La Quotidienne* in September 1792.

The *Moniteur* and *Débats* survived, but most of these papers expired either in the autumn of 1792 or with the fall of the party of the Gironde in September 1793. In some of them the energy for good and for evil of a whole lifetime seems to be compressed into the fugitive writings of a few months. Even the satirical journals which combated the Revolution with shafts of ridicule and wit, keen enough after their kind, but too light to do much damage to men terribly in earnest, abound with matter well deserving the attention of all students desirous of a thorough knowledge of the period.

The consular government began its dealings with the press by reducing the number of political papers to thirteen. At this period the number of daily journals had been nineteen, and their aggregate provincial circulation, apart from the Paris sale, 49,313, an average of 2600 each.

Under Napoleon the *Moniteur* was the only political paper that was really regarded with an eye of favour. Even as respects the nation at large, the monstrous excesses into which the Revolutionary press had plunged left an enduring stigma on the class. When Bertin acquired the *Journal des débats* from Baudouin, the printer, for 20,000 francs, he had to vanquish popular indifference on the one hand, as well as imperial mistrust on the other. The men he called to his aid were Geoffroy and Fievée; and by the brilliancy of their talents and the keenness of his own judgment he converted the *Débats* into a paper having 32,000 subscribers, and producing a profit of 200,000 francs a year. When the imposition of a special censorship was threatened in 1805, at the instance of Fouché, a remarkable correspondence took place between Fievée and Napoleon himself, in the course of which the emperor wrote that the only means of preserving a newspaper from suspension was "to avoid the publication of any news unfavourable to the government, until the truth of it is so well established that the publication becomes needless." The censorship was avoided, but Fievée had to become the responsible editor, and the title was altered to *Journal de l'empire*—the imperial critic taking exception to the word *Débats* as "inconvenient." The old title was resumed in August 1815. The revolution of July did but enhance the power and the profit of the paper. It has held its course since with uniform dignity, as well as with splendid ability, and may still be said, in the words which Lamartine applied to it in an earlier day, to have "made itself part of French history."

Shortly before the *Journal de l'empire* became again the *Journal des débats* (in 1815), a severance occurred amidst both the writers and subscribers. It led to the foundation of the *Constitutionnel*, which at first and for a short time bore the title of *L'Indépendant*. The former became, for a time, the organ of the royalists *par excellence*, the latter the leader of the opposition. In 1824, however, both were in conflict with the government of the day. At that date, in a secret report addressed to the ministry, the aggregate circulation of the opposition press of Paris was stated at 41,330,[1] while that of the government press amounted only to 14,344.[2]

Constitutionnel.

The rapid rise of the *Constitutionnel* was due partly to the great ability and influence of Jay, of Étienne, of Béranger and of Saint Albin (who had been secretary to Carnot in his ministry of 1815), all of whom co-operated in its early editorship, and partly to its sympathy with the popular reverence for the memory of Napoleon, as well as to the vigorous share it took in the literary quarrel between the classicists and romanticists. Its part in bringing about the revolution of 1830 raised it to the zenith of its fortunes. For a brief period it could boast of 23,000 subscribers at 80 francs a year. But the invasion of cheap newspapers, and that temporary lack of enterprise which so often follows a brilliant success, lowered it with still greater rapidity. When the author of the *Mémoires d'un bourgeois*, Dr Véron, purchased it, the sale had sunk to 3000. Véron gave 100,000 francs for the *Juif errant* of Sue, and the Sue fever rewarded him for a while with more than the old circulation. Afterwards the paper passed under the editorship of Césena, Granier de Cassagnac, and La Guéronnière.

La Presse and Le Siècle.

The cheap journalism of Paris began in 1836 (1st July) with the journal of Girardin, *La Presse*, followed instantly by *Le Siècle*, under the management of Dutacq, to whom, it is said—not incredibly—the original idea was really due. The first-named journal attained a circulation of 10,000 copies within three months of its commencement of and soon doubled that number. The *Siècle* prospered even more strikingly, and in a few years had reached a circulation (then without precedent in France) of 38,000 copies.

The rapid growth of the newspaper press of Paris under

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[1] *Le Constitutionnel*, 16,250; *Journal des débats*, 13,000; *La Quotidienne*, 5800; *Le Courrier français*, 2975; *Journal de commerce*, 2380; *L'Aristarque*, 925.

[2] *Journal de Paris*, 4175; *L'Étoile*, 2749; *Gazette de France*, 2370; *Le Moniteur*, 2250; *Le Drapeau blanc*, 1900; *Le Pilote*, 900.

Louis-Philippe will be best appreciated from the fact that, while in 1828 the number of stamps issued was 28 millions, in 1836, 1843, 1845 and 1846 the figures were 42, 61, 65 and 79 millions respectively. At the last-mentioned date the papers with a circulation of upwards of 10,000 were (besides the *Moniteur*, of which the circulation was chiefly official and gratuitous) as follows: *Le Siècle*, 31,000; *La Presse* and *Le Constitutionnel*, between 20,000 and 25,000; *Journal des Débats* and *L'Époque*, between 10,000 and 15,000.

If we cast a retrospective glance at the general characteristics (1) of the newspaper press of France, and (2) of the legislation concerning it, between the respective periods of the devastating revolution of 1793–1794 and the scarcely less destructive revolution of 1848, it will be found that the years 1819, 1828, 1830 (July), and 1835 (September) mark epochs full of pregnant teaching upon our subject. We pass over, as already sufficiently indicated, the newspaper licence of the first-named years (1793–1794), carried to a pitch which became a disgrace to civilization, and the stern Napoleonic censorship which followed it—also carried to an excess, disgraceful, not, indeed, to civilization, but to the splendid intellect which had once given utterance to the words, "Physical discovery is a grand faculty of the human mind, but literature is the mind itself."

The year 1819 is marked by a virtual cessation of the arbitrary power of suppression lodged till then in the government, and by the substitution of a graduated system of preliminary bonds and suretyships ("cautionnements") on the one hand, and of strict penalties for convicted press-offences on the other. This initiatory amelioration of 1819 became, in 1828, a measure of substantial yet regulated freedom, which for two years worked, in the main, alike with equity towards the just claims of journalism as a profession and with steady development towards the public of its capabilities as a great factor in the growth of civilization. Those two years were followed by a widely contrasted period of five years. That was a term of entire liberty often grossly abused, and fitly ending with the just and necessary restrictions of September 1835. But that period of 1830–1835 was also signalized by some noble attempts to use the powers of the newspaper press for promoting the highest and the enduring interests of France. Not least memorable amongst these was the joint enterprise of Montalembert and Lamennais—soon to be aided by Lacordaire,—when, by the establishment (October 1830) of the newspaper *L'Avenir*, they claimed for the church of France "her just part in the liberties acquired by the country," and asserted for the sacred symbols of Christianity their lawful place, alike above the tricolor and above the lilies. "Dieu et la liberté" was the motto which Montalembert chose for his newspaper, as he had chosen it long before for the guiding star of his youthful aspirations. *L'Avenir* existed only for one year and one month. It came to its early end from no lack of energy and patience in its writers, but in part from that mission of the editors to Rome (November 1831) which, at least for a time, necessitated the discontinuance of their newspaper. Human regrets had higher than human consolations. "Our labours" on *L'Avenir*, wrote Montalembert, with simple truth, "decided the attitude of Catholics in France and elsewhere, from the time of the July revolution to the time of the second empire."

There were many other papers, at this time and afterwards, which, like *L'Avenir*, were, in their degree, organs of ideas, not speculations of trade. But they cannot be even enumerated here. No very notable specially religious paper succeeded *L'Avenir* until the foundation in 1843—under widely different auspices, although twice at the outset the editorship was offered to Lacordaire—of *L'Univers Religieux*. That journal was edited, at first, by De Coux, then by Louis Veuillot; it underwent innumerable lawsuits, "warnings," suppressions and interdicts, for causes very diverse. Several prelates suppressed *L'Univers Religieux* in their respective dioceses, amongst them the great bishop Dupanloup in that of Orleans (1853). Napoleon III. suppressed it in 1861, permitted it to reappear as *Le Monde*, and suspended it many times afterwards; but it survived all its misfortunes for a good many years. *Le Monde* had the curious fate, at one time, of being conducted jointly by the first editor of *L'Avenir*, Lamennais, and by George Sand, who had previously figured in the newspaper annals of France as co-foundress of *L'Éclaireur de l'Indre*, a journal published at Orleans. The account given by that brilliant writer of her adventures in what was then to her a new department of activity is an instructive one. With that breadth of sympathy which was so characteristic of her, she strove to interest all her friends (however varied in character, as in rank) in the enterprise. There is, perhaps, scarcely anything more amusing in French journalistic annals than is her (contemporary) account of the first meeting of the shareholders—at which, she tells us, about five hundred resolutions were moved for the guidance of the editor at his desk.

The impulse given to the growth of advertisements in the days which followed July 1830, became, as the years rolled on, sufficiently developed to induce the formation of a company—in which one of the Laffittes took part—to farm them,[1] at a yearly rent of £12,000 sterling (300,000 francs), so far (at first) as regarded the four leading journals (*Débats*, *Constitutionnel*, *Siècle*, *Presse*), to which were afterwards added two others (*Le Pays* and *La Patrie*). The combination greatly embarrassed advertisers, first, since its great aim was to force them either to advertise in all, whether addressing the classes intended to be canvassed or not, or else to pay for each advertisement in a selected newspaper the price of many proffered advertisements in all the papers collectively, and, secondly, because by many repetitions in certain newspapers no additional publicity was really gained, two or three of the favoured journals circulating for the main amongst the same class of buyers. *La France* was then the newspaper of the Conservative aristocracy of the nation; *Le Monde* and the *Union* more especially addressed the clergy; the *Débats* and the *Temps* were the journals of the upper mercantile class, the *Siècle* and *L'Opinion* of the lower or shopkeeping class. A man who asked to advertise briefly, in the *Siècle*, for example, alone, was charged 2 francs for each several insertion. If he went the round of the six, his advertisement cost him only 75 centimes per journal, for ten successive insertions in each of them, all round.

Loi Tinguy.

To a great extent, the inundation of newspapers which followed the revolution of February 1848 was but a parody on the revolutionary press of 1793. Most of them, of course, had very short lives. When Cavaignac took the helm he suppressed eleven journals, including *La Presse* and *L'Assemblée Nationale*. The former had at this period a circulation of nearly 70,000, and its proprietor, in a petition to the National Assembly, declared that it gave subsistence to more than one thousand persons, and was worth in the market at least 1,500,000 francs. In August the system of sureties was restored. On the 13th June 1849 the president of the republic suspended *Le Peuple*, *La Révolution Démocratique et Sociale*, *La Vraie République*, *La Démocratie Pacifique*, *La Réforme* and *La Tribune des Peuples*. On July 16, 1850, the assembly passed what is called the "Loi Tinguy" (from the name of the otherwise obscure deputy who proposed it), by which the author of every newspaper article on any subject, political, philosophical or religious, was bound to affix his name to it, on penalty of a fine of 500 francs for the first offence, and of 1000 francs for its repetition. Every false or feigned signature was to be punished by a fine of 1000 francs, "together with six months' imprisonment, both for the author and the editor." The practical working of this law lay in the creation of a new functionary in the more important newspaper offices, who was called "secrétaire de la rédaction," and was, in fact, the scapegoat *ex officio*. The "Loi Tinguy," though now long repealed, has had a permanent influence on French journalism in the continued prevalence of signed articles, and the consequent prominence of individual writers as compared with the same class of work in other countries. In February 1852 all the press laws were incorporated, with increased stringency, into a "Décret organique sur la presse." The stamp duty for each sheet was fixed at 6 centimes, within certain dimensions, and a proportional increase in case of excess.

In 1858 the order of the six leading Parisian papers in point of circulation was—(1) *Siècle*, (2) *Presse*, (3) *Constitutionnel*, (4) *Patrie*, (5) *Débats*, (6) *Assemblée Nationale*. The number of provincial papers exceeded five hundred. "Newspapers, nowadays," wrote a keenly observant publicist in that year, "are almanacs, bulletins, advertising mediums, rather than the guides and the centres of opinion." In 1866 the change had become more marked still. The monetary success of Girardin's many commercial speculations in this branch of commerce greatly increased the number of Parisian journals, whilst lowering the status of those of established rank. The aggregate daily issue of the Parisian "dailies" had increased to about 350,000 copies, but the evening paper, *Le Petit Moniteur*, alone issued nearly 130,000 of these. The average circulation of *Le Siècle* had fallen from 55,000 to 45,000 copies; that of *La Patrie* was reduced by one-half (32,000 to 16,000); that of *Le Constitutionnel* from 24,000 to 13,000; of *L'Opinion Nationale* from 18,000 to 15,000; whilst the chief journal of all—with grand antecedents and with a brilliant history of public service rendered—had for a time descended, it is said, from 12,000 copies to 9000. And yet almost over the whole of this very period the brilliant "Lundis" of Sainte-Beuve were making their punctual appearance in *Le Constitutionnel*, to be presently continued in *Le Moniteur* and in *Le Temps*; and writers like St Marc Girardin, Cuvillier-Fleury, and Prévost-Paradol were constantly writing in the *Journal des Débats*. Meanwhile, Villemessant and his colleagues were making their fortunes out of *Le Figaro* (begun 1854, but a daily from 1866), and helping to make frivolous petty "paragraphs" on matters of literature almost everywhere take the place of able and well-elaborated articles. Well might Albert Sorel say,[2] "Our trumpery newspapers are the newspapers that pay." In 1872 the circulation of *Le Petit Journal* (founded 1863), the pioneer of the French halfpenny press, was 212,500, and it went on rapidly increasing.

No incident in the newspaper history of this period made more temporary noise than did the strange charges brought in 1867 against the *Débats*, the *Siècle* and *L'Opinion Nationale*, by M. Kerveguen, member for Toulon, in the French assembly. He charged them collectively with receiving bribes, both from the government of Prussia and from that of Italy—upon the faith, as it afterwards appeared, of statements made by another newspaper, not of France but of Belgium, *La Finance*. An elaborate inquiry, presided over by M Berryer, pronounced the accusation to be absolutely groundless. Yet it was soon revived by *Le Pays*, in the shape of a specific charge against an individual editor of *Le Siècle*—La Varenne. All that was eventually proved, in due course of law, was merely the agency in Paris of La Varenne for the Italian government, at a time prior to the events of 1866.

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[1] Or, to speak more precisely, to farm a certain conspicuous page of each newspaper, in perpetuity.

[2] When comparing the French newspaper press as it stood in 1873 with that of Germany, in the *Revue des deux Mondes*, article "La Presse Allemande," vol. ii. of 1873, p. 715.

In 1874 an elaborate return showed that in thirty-five principal towns of France, comprising a population of 2,566,000, their respective journals had an aggregate weekly issue of 2,800,000 copies.

In 1878 the total number of journals of all kinds published in France was 2200. Of these 150 were political, strictly speaking, of which Paris published 49. Of Parisian journals other than political there were 1141 (including 71 religious, 104 legal, 153 commercial, 134 technological, 98 scientific and medical, 59 artistic). At that date *Le Figaro* had a circulation of about 70,000, *Le Petit Journal* (at a halfpenny) one of about 650,000.

The principal Parisian newspapers in 1883 may be classified thus—

(*a*) Organs of the Legitimists and of the Church of France: *Gazette de France*, *Le Monde*, *L'Union*, *La Défense*, *La Civilisation*, *L'Univers*.

(*b*) Orleanist organs: *Le Moniteur Universel*, *Le Constitutionnel*, *Le Français* (under the auspices of the Duc de Broglie), *Le Soleil*.

(*c*) Bonapartist organ: *Le Pays* (edited at one time by Lamartine).

(*d*) Republican organs: *Journal des Débats*, *Le Temps* (founded 1861, with the title of the earlier *Temps* of 1829–1842), *Le Siècle*, *Le XIX. Siècle*, *Le Paix*, *La Justice*, *Paris*, *La République Française* (founded in 1871 by Gambetta), *Le Parlement* (founded by Dufaure), the Socialist *La Petite République* (1875).

The law concerning the liberty of the press, of July 29, 1881, abolished suretyship for newspapers, and transferred their registration from the ministry of justice at Paris to the local representative of the attorney-general (*le parquet*) in each town respectively. It made the establishment of a newspaper virtually free, upon legal deposit of two copies, and upon due registration of each newspaper under the simple guarantee of a registered director, French by birth, responsible in case of libel. And it took away the former discretionary power, lodged in the home office, of interdicting the circulation in France of foreign journals. The home minister might still prohibit a single number of a newspaper; only the whole council of ministers, duly convened, could prohibit the circulation of a foreign newspaper absolutely.[1]

Later developments.

The newspapers of Paris, and similarly of France, practically doubled in number between 1880 and 1900. In 1880 there were about 120 Paris newspapers, in 1890 about 160, and in 1900 about 240. The total number of newspapers, as distinguished from periodicals, published in France during 1900 was in round numbers 2400. Of these, about 2160 appeared in 540 provincial towns.

The history of the French press during the last twenty years of the 19th century followed very closely that of the country itself, Boulangist and anti-Boulangist, Dreyfusist or anti-Dreyfusist, Republican or Nationalist; finally it became either Moderate Republican or Radical-Socialist with a sprinkling of Nationalist organs and a small minority of Royalist and Bonapartist sheets.

At the head of the Moderate Republican organs were *Le Temps* and *Le Journal des Débats* among the evening papers, and *Le Figaro*, *Le Journal*, *Le Siècle*, *Le Petit Parisien* and *Le Petit Journal* among the morning dailies. *Le Figaro* was until 1901 under the editorship of M. F. de Rodays, and the brilliant articles of M. J. Cornély were one of the features of the paper; but a dispute among the proprietors in 1901 resulted in the dismissal of M. Cornély and the retirement of M. de Rodays. M. Jean Dupuy (a member of the Waldeck-Rousseau government) was the proprietor and editor of *Le Petit Parisien*, a popular organ almost rivalling *Le Petit Journal*; the circulation of the latter had, however, reached over one million and a quarter copies daily.

Le Matin and *L'Éclair*, among the Moderate Republican organs, gave less attention to the discussion of political questions from the party point of view than to the collection of news, and they were followed by the *Écho de Paris* (1884). *Le Matin*, which also dates from 1884, was from its origin essentially what is called in France a *journal d'informations*, publishing every morning a mass of telegraphic news from all countries. By an arrangement with the London *Times*, it gave every day a translation of most of the telegrams published in that newspaper.

In April 1901 the proprietorship of *Le Siècle* was changed, in consequence of the lack of support given by Parisian readers to that journal as edited by M. Yves Guyot (formerly minister of public works). The latter was a staunch free-trader, a courageous defender of Captain Dreyfus, and an eloquent advocate of a good understanding between France and England; he emphatically endorsed the British policy in South Africa, and tried to explain it to his countrymen. The paper was, however, bought in by a number of friends of M. Yves Guyot, who remained as editor. The greatest opponent of Yves Guyot from the economic point of view was Jules Méline, also a former minister, whose paper, *La République*, was the recognized organ of Protectionism.

The Radical and Socialist ideas which in latter years made such progress in France were very ably advocated by several newspapers whose influence steadily grew, such as *L'Aurore*, *La Lanterne* and *L'Humanité* (the organ of Jean Jaurès). Such individual organs of opinion must also be mentioned as *L'Intransigéant*, the organ of Henri Rochefort, and M. Clemenceau's organ, *Le Bloc*, in which he advocated the practical application of all of the revolutionary republican principles, pure and unadulterated, forming a whole (*bloc*), no part of which could or ought to be sacrificed to temporary political necessities.

As an intermediate link between the Republican organs of all shades and the various Monarchist newspapers, came the so-called Nationalist press, an offshoot of or successor to the Boulangist press of the preceding decade. As were the Boulangists, so were the Nationalists, a sort of *syndicat des mécontents*, their chief organs being *La Patrie*, edited by M. Millevoye, and *La Cocarde*; these papers represented the views of those who had vague hankerings after a different *régime* and a decided hostility towards the republican form of government.

There was a considerable diminution of influence in the Monarchist press. *Le Soleil*, however, had a large circle of readers among the Conservative *bourgeoisie* with Orleanist leanings. *Le Gaulois* remained a Royalist paper of somewhat doubtful tendencies, the editor, M. Arthur Meyer, having incurred the displeasure of the Pretender whose cause he defended. Of the old Legitimist press there remained the old *Gazette de France*, which was founded in 1631 and had still a diminishing band of faithful readers. The organ of the religious (Roman Catholic) associations in France, *La Croix*, founded in 1880, represented the views of the French religious associations, and discussed all questions from the point of view of Catholic interests. *La Croix* was published in Paris, but had in the provinces one hundred and four local weekly supplements to the Paris edition, each one taking its name from the parent journal and adding to it the name of the department or locality in which it was printed, such as *La Croix de l'Allier*, *La Croix de Lyon*.

The French papers, of whatever party, took an increased interest during this period in foreign matters, and much improved their organization for collecting news. Some of them, in fact, were almost exclusively news-sheets, and the *journal d'informations—Le Matin* or *L'Éclair*, for instance—took its place beside the *journal* properly so called, more perhaps as a rival than as a complement. The natural result followed, and the more old-type newspapers took steps to provide their readers with news as well as with leading articles, current and literary topics, society gossip, dramatic criticism and law reports. The most remarkable as well as perhaps the earliest attempt to enlarge the scope of Parisian newspapers was made in 1893 by Georges Patinot, editor of the *Journal des Débats*. Instead of one edition, that newspaper published two entirely distinct editions, a morning one and an evening one. After some time the plucky attempt had to be given up, and the *Journal des Débats* became an evening paper. The bold experiment made by the *Journal des Débats* (which celebrated its centenary in 1889) led the other newspapers to find a happy mean between a four-page paper published twice a day and an eight-page paper on the pattern of English newspapers, and the result was that now most great daily papers in Paris came out with six pages, the *Figaro* giving the lead. As French newspapers increased in size they reduced their price. Most six-page newspapers, with the exception of *Le Figaro*, were by 1902 sold at 5 centimes, and the price of 15 centimes, which used to be the rule, became the exception. In 1902 60 Paris papers (daily and weekly) were sold at 5 centimes and 51 at 10 centimes, whilst only 11 cost 15 centimes. In 1880 only 23 were 5-centime papers and 24 were 10-centime papers.

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[1] The history of French journals published abroad is interesting. The *Annales politiques* of Linguet—for a time of Linguet and Mallet du Pan jointly—was, from about 1770 to about 1785, almost a power in Europe, in its way. Mallet du Pan's own *Mercure Britannique*, during the eventful years 1798–1800, was brilliant, sagacious and honest. When the pen literally fell from his dying hand—a hand that had kept its integrity under the pains of exile and of bitter poverty—that pen was taken up (for a short interval) by Malouet. When Napoleon forcibly suppressed, a little later, the *Courrier de l'Europe* of the count of Montlosier, he offered the deprived editor a pension, which was refused, until accompanied by the offer of a post in which the able minister of Louis XVI. could still work for his country.

English journalism in France was for long associated with *Galignani's Messenger*, started by Giovanni Antonio Galignani (1757–1822) in 1814, and turned into a daily just before his death. Its palmy days were between 1814 and 1848. In 1895 it was turned into the *Daily Messenger*, but proved a failure and was dropped in 1904; it was really killed by the competition of the Paris edition of the *New York Herald*. It had been preceded by Sampson Perry's *Argus* (1809), a Napoleonic organ. In May 1905 a new era of English journalism on the continent began by the institution of the Paris edition of the London *Daily Mail*.

The American style of journalism came into vogue in Paris in the 'eighties, and "interviews" were frequent; but the general tendency of Parisian editors was to adopt the English compromise, and to eschew any extreme sensational methods. Most of the important Parisian newspapers had their special correspondents in the great capitals of Europe, London, Berlin, St Petersburg, Vienna and Rome. Nothing perhaps was so striking after 1890 as the demand of the French public for foreign and colonial news, or the readiness of the papers to supply it by means of special representatives independent of the news agencies.

In home matters the French press made greater progress still in the rapid and accurate collection of news, and in this respect the provincial press showed more enterprise and more ability than that of Paris. Its development was remarkable, for whereas in 1880 the inhabitants of the departments had to await the arrival of the Parisian papers for their news, they now had the advantage of being supplied every morning with local newspapers inferior to none of the best organs of Paris. Among the best provincial papers may be mentioned *La Gironde* and *La Petite Gironde* of Bordeaux, *La Dépêche* of Toulouse, *Le Lyon Républicain*, *L'Écho du Nord* of Lille, *Le Journal de Rouen*, all having a staff in Paris engaged in collecting news, reporting parliamentary proceedings and law cases, telegraphed or telephoned during the night and published early the next morning in their respective localities. Being perfectly independent of purely Parisian opinion or even bias, the decentralization of the French provincial press became complete. The newspapers of the large towns circulated not only in the city in which they were printed but throughout the region of which it was the centre. Thus the *Dépêche* of Toulouse, with its twelve editions daily, was read in the whole of the departments extending from the Lot to the Pyrenees, whilst the *Petite Gironde* was found in all south-western France. The influence of the provincial, as of the Paris, press became so great that, as M. Avenel says in his book on the French press, there came a tendency to resent its omnipotence. The power of the newspaper in France differs from that of the English newspaper, in that it seems to act more on the government and the parliament than on public opinion. The French newspapers have taken upon themselves, in many cases, functions which belong more properly to the legislative or to the judicial power than to the press, and the result has not always been successful. The cause of this is that too many men of talent with political ambition look upon journalism as "leading to everything, provided one gets out of it." and use it alternately as an antechamber of parliament or of the cabinet, and a lounge during their parliamentary or ministerial eclipses.

See generally Hatin, *Histoire de la Presse en France* (8 vols., 1860–1861); Gallois, *Histoire des Journaux et Journalistes de la Révolution* (2 vols.); "Journalism in France," *Quarterly Review*, lxv. 422-468 (March, 1840); Henri Avenel, *La Presse française au vingtième siècle* (Paris, 1901).

5. NEWSPAPERS OF GERMANY

Printed newspapers in Germany begin with the *Frankfurter Journal*, established in 1615 by Egenolph Emmel, a bookseller of Frankfort-on-Main. The following year saw the foundation of the *Frankfurter Oberpostamtszeitung*—continued until the year 1866 as *Frankfurter Postzeitung*. Fulda appears to have been the next German town to possess a newspaper, then Hildesheim (1619) and Herford (1630). In the course of the century almost all German cities of the first rank possessed their respective journals. The earliest in Leipzig bears the date 1660. The *Rostocker Zeitung* was founded in 1710. The *Hamburgischer Correspondent* (1714) was originally published under the name of *Holsteinische Zeitungs-Correspondenz*, two years earlier, and was almost the only German newspaper which really drew its foreign news from "our own correspondent." Berlin had in the 18th century two papers, those of Voss (the *Vossische Zeitung*, 1722) and of J. K. P. Spener (1749–1827; the *Spener'sche Zeitung*, or *Berlinische Nachrichten*, 1772). Some half-dozen papers which glimmered in the surrounding darkness were the reservoirs whence the rest replenished their little lamps. On the whole, it may be said that the German newspapers were of very small account until after the outbreak of the French Revolution. Meanwhile the MS. news-letters, as in earlier days, continued to enjoy a large circulation in Germany. Many came from London. The correspondence, for instance, known under the name of "Mary Pinearis"—that, apparently, of a French refugee settled in London—had a great German circulation between 1725 and 1735. Another series was edited by the Cologne gazetteer, Jean Ignace de Rodérique, also a French refugee, and remembered as the subject of a characteristic despatch from Frederick II. of Prussia to his envoy in that city, enclosing 100 ducats to be expended in hiring a stout fellow with a cudgel to give a beating to the gazetteer as the punishment of an offensive paragraph.[1] The money, it seems, was earned, for Rodérique was well-nigh killed. At Berlin itself, Franz Hermann Ortgies carried on a brisk trade in these news-letters (1728–1735), until he too came under displeasure on account of them, was kept in prison several months, and then exiled for life.[2] Nor, indeed, can any journal of a high order be mentioned of prior appearance to the *Allgemeine Zeitung*, founded at Leipzig by the bookseller Cotta (at first under the title of *Neueste Weltkunde*) in 1798. Posselt was its first editor, but his want of nerve—and perhaps his weak health—hindered the application of his high powers to political journalism. His articles, too, gave offence to the Austrian court, and the paper had to change both its title and its place of publication. It had been commenced at Tübingen, and removed to Stuttgart; it was now transferred to Ulm, and again to Augsburg. It was Cotta's aim to make this the organ of statesmen and publicists, to reach the public through the thinkers, to hold an even balance between the rival parties of the day, and to provide a trustworthy magazine of materials for the historians to come; and, in the course of time, his plan was so worked out as to raise the *Allgemeine Zeitung* into European fame. Cotta was also the founder, at various periods, of the *Morgenblatt*, which became famous for its critical ability and tact, of *Vesperus*, of *Das Inland*, of *Nemesis*, of the *Oppositionsblatt* of Weimar (for a time edited by Bertuch), and even of the *Archives Parisiennes*.

Whilst French influence was dominant in Germany, the German papers were naturally little more than echoes of the Parisian press. But amidst the excitements of the "war of liberation" a crowd of new journals appeared. Niebuhr started a *Preussischer Correspondent*; Görres—who in 1798 had founded at Coblentz *Das rothe Blatt*, soon suppressed by the invading French—undertook the *Rheinischer Mercur* (January 1814 to January 1816), which was suppressed by the Prussian government, under Von Hardenberg. This journal, during its initiatory year, had the honour of being termed by Napoleon—perhaps satirically—"the fifth power of Europe." Wetzel, somewhat later, founded the *Fränkischer Mercur*, published at Bamberg, and Friedrich Seybold the *Neckarzeitung*. Some of these journals lasted but two or three years. Most of the survivors fell victims to that resolution of the diet (20th September 1819) which subjected the newspaper press, even of countries where the censorship had been formally abolished, to police superintendence of a very stringent kind.

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[1] Fr. Kapp, "Berliner geschriebene Zeitungen," in *Deutsche Rundschau*, xxi. 107-122 (1879), citing Droysen, *Zeitschr. f. preuss. Gesch.* xiii. 11. The story, as told by Droysen, is an instructive commentary on Carlyle's praise of Frederick's "love of the liberty of the press."

[2] Kapp, *ut supra*.

The aspirations for some measure of freedom which burst forth again under the influences of 1830 led to the establishment of such papers as Siebenpfeiffer's *Westbote*, Lohbauer's *Hochwächter*, Wirth's *Deutsche Tribune*, Eisenmann's *Baierisches Volksblatt*, *Der Freisinnige* of Rotteck and Welcker, and many more of much freer utterance than had been heard before in Germany. This led, in the ordinary course, to new declarations in the diet against the licence and revolutionary tendencies of the press, and to "regulations" of a kind which will be sufficiently indicated by the mention of one, in virtue whereof no editor of a suppressed journal could undertake another journal, during the space of five years, within any part of Germany. It need hardly be added that few of the newspapers of 1830 saw the Christmas of 1832. Very gradually some of the older journals—and amongst the number the patriarch of all, the *Frankfurter Oberpostamtszeitung*—plucked up courage enough to speak out a little; and some additional newspapers were again attempted. Amongst those which acquired deserved influence were Brockhaus's *Deutsche Allgemeine Zeitung*, the advocate of free trade and of a moderate liberalism, possessing a large circulation in northern Germany (1837); the *Deutsche Zeitung*, edited by Gervinus, at Heidelberg (July 1847); and the *Dorfzeitung*, published at Hildburghausen. The stirring events of 1848 called forth in Germany, as in so many other countries, a plentiful crop of political instructors of the people, many of whom manifestly lacked even the capacity to learn, and vanished almost as suddenly as they had appeared. But it is undeniable that a marked improvement in the ability and energy of the German political press may be dated from this period.

At the beginning of the 20th century the position and influence of the German press were passing through a period of change. The Germans had become a newspaper-reading people. Indeed, with the remarkable growth of the commercial spirit in Germany there had simultaneously been a change in the intellectual attitude and habits of the mass of the nation. The German of "the great period" of 1866 and 1870 derived his knowledge of his own and other countries to a very great extent from the more or less intelligent study of books, pamphlets and magazines. The busy German of the opening years of the 20th century had become almost as much the slave of his newspaper as the average American. Berlin in 1900 had 45 dailies, Leipzig 8, Munich 12, Hamburg 11, Stuttgart 8, Strassburg 6. In the domains both of home and of foreign politics the result was often a chaos of crude opinions and impulses, the strata of which were only differentiated by certain permanent tendencies of German political thought based upon tradition, class feeling, material interests, or distinctions of religious creed. In these circumstances it was still possible for the government, as in the days of Prince Bismarck and Dr Moritz Busch, to bring its superior knowledge to bear upon the anarchy of public sentiment through the medium of the inspired (or as it used to be called, the "reptile") press, but this operation had now to be performed with greater delicacy and skill. The press had begun to feel its power. It was at least able to drive a bargain with those who would officially control it, and it was conscious in its relations with the authorities that the advantage no longer rested exclusively on the side of the latter. It would be instructive to compare, with the aid of Dr Busch's "Secret Pages" of the history of Prince Bismarck, the methods by which the first Chancellor used to create and control a movement of public opinion with the devices by which, for instance, count von Bülow and his subordinates endeavoured to manage the press of a later day. The journalists who placed themselves at the disposal of Prince Bismarck were mostly treated as his menials; as he himself said, "Decent people do not write for me." Count von Bülow's methods, and to a certain extent those of his predecessor, Prince Hohenlohe, moved on somewhat different lines. These methods might be characterized as the psychological treatment of the individual journalist, the endeavour to appeal to his personal vanity or to his legitimate ambition, and only in a minor degree to his fear of the *dossier*, the public prosecutor, and the official boycott. There was also a further development of Prince Bismarck's system of acknowledging the existence of political and social movements the origin of which was wholly or partially independent. As in Bismarck's time, the tendencies of these movements were carefully observed, and they were turned to account where they seemed capable of subserving the main objects of state policy. Thus at the opening of the century the pro-Boer and agrarian movements were both employed in support of German foreign and colonial policy, and of an elaborate scheme of naval construction; while the growth of the commercial spirit on the one hand and the awakening of the lower middle classes on the other, were pressed into the service of *Welt-politik* and of its auxiliary—a system of protective tariffs. It required no small skill to bring into line and to hold together the various classes and interests from time to time arrayed in the press in support of German foreign policy. The organs of the government in the press were the sheep-dogs which held the flock together.

The German journals of which foreigners hear most belong with few exceptions to the daily press of Berlin. There are, however, one or two provincial or non-Prussian newspapers which from time to time enjoy more careful inspiration from the government offices than any of their Berlin contemporaries. There is, for example, the *Cologne Gazette* (*Kölnische Zeitung*, 1848), of which Prince Bismarck once said that it was "worth an army corps on the Rhine." It is difficult to trace all the channels by which information is conveyed to an organ of this kind, but there have undoubtedly been times when leading articles and *entre-filets* in the Rhenish organ were virtually or actually written in the German Foreign Office. Indeed, the methods of the institution which has been called the "Press Bureau," but which in the realm of foreign policy at least represented no concrete organization, have been so numerous and varied that it would be hopeless for any one except the most practised observer to trace their manifestations. The advantage of a semi-official press, if it could be manipulated with unvarying success, is that it can easily be disavowed when the suggestions, overtures or menaces of which it has been the exponent have served their turn or have become inexpedient. Thus during the blockade of Manila in 1898 the *Cologne Gazette* gave all the prominence of its first column and of leaded type to an article taken from the *Marine Politische Korrespondenz*, which practically warned the United States of the intention of Germany to have a share in the Pacific possessions of Spain if these should eventually change hands. Some ten days later the authority of this menace was explicitly disavowed by the *North German Gazette*, which announced that the *Marine Politische Korrespondenz* had never possessed a semi-official character. The *Cologne Gazette* continued in the west of Germany to serve the German government much as it did in the time of Prince Bismarck, although for prudential reasons its inspiration became on the whole more intermittent than it was in the days of the first Chancellor. The *Hamburgischer Correspondent*, the leading Hamburg journal, played a minor rôle of the same nature in the chief Hanseatic port, while the *Hamburger Nachrichten*, celebrated especially during the exile of Prince Bismarck and the closing years of his life at Friedrichsruh as the receptacle of indiscreet revelations and violent attacks upon his successors, almost lost all significance except as a local organ of violent Anglophobia. The *Allgemeine Zeitung* of Munich, once famous throughout Europe as the *Augsburger Allgemeine Zeitung* before its transference to the Bavarian capital, became in the hands of new proprietors practically an organ of the imperial Chancellor. In Prince Bismarck's days the press bureau of the Prussian Ministry of the Interior, and a similar organization in the Imperial Home Office, used to furnish hundreds of petty local newspapers known as *Kreis-blätter* with whole articles gratis, so that the policy of the government might be advocated in every nook and corner of the country. The numerous journals in which these communications used to appear simultaneously and in an identical form were the government organs to which the Radical and Socialist opposition more particularly applied the term "Reptile Press." Later this practice of wholesale inspiration was abandoned, but there remained many channels, public and private, through which almost every department of the government could communicate information and guidance to newspapers in all parts of Germany. The Prussian Ministry of the Interior distributed to all and sundry a news-letter known as the *Berliner Korrespondenz*, professing only to give statistics and information, and to correct erroneous statements, but also frequently containing articles advocating some proposal of the government or combating the arguments of its opponents. The *Süd-Deutsche Reichs-Korrespondenz* had a similar character, and in 1902 served as an exponent of the policy and tactics of the imperial Chancellor, count von Bülow. Almost every one of the political parties has its *Korrespondenz* (or news-letter) supplying views rather than news. These circular letters deal, in fact, with the policy of the party with which they are associated, although they occasionally also embody information which the party leaders in the Reichstag or in the Prussian Diet have received from representatives of the government for their own guidance. They form the means of holding the parties together, and of inspiring them with common aims, as they are reproduced throughout the country by all the party organs.

It was in the press of Berlin that the greatest changes took place towards the end of the 19th century. During the regime of Prince Bismarck the *North German Gazette*, and occasionally the *Post*, used to keep Europe in a state of nervous tension by fulminant *communiqués* which the great Chancellor himself often dictated, or by what he used to call "jets of cold water" (*Kaltwasserstrahl*), which were mostly directed against France or Russia. So far as France and Russia are concerned, a much more pacific tone prevailed in Berlin after the conclusion of the Dual Alliance, and it was upon England that the press mainly concentrated its attacks. The *North German Gazette*, which was originally established by a private individual, in order "to place a blank sheet of paper at the disposal of Prince Bismarck," became on the whole, a mere record of home news and a summary of foreign intelligence bearing the semi-official stamp of Wolff's Telegraph Agency. It had doubtless been found that the constant employment of an organ so distinctly official as the *Norddeutsche Allgemeine* as a medium of expression for the views of the government was apt to lead to indiscretions which committed the authorities too deeply. Indeed, immediately before Prince Bismarck's fall he had actually employed this journal in order to attack the labour policy of the emperor. Official communications still continued to appear in the *North German Gazette*, but mostly characterized by a vagueness and awkwardness of style in striking contrast to the force and point of Prince Bismarck's polemics. The *Imperial Gazette* (*Reichsanzeiger*), corresponding to the *London Gazette*, is purely a record of official intelligence, though on rare occasions it publishes in the section marked *Nicht Amtlich* (non-official), some *démenti*, some statement of policy or some official document—a proceeding which always requires the express sanction of the emperor.

The journals which in 1880 were most widely read in Berlin, and which were best known abroad as the exponents of Berlin opinion, were the Liberal or Radical *Vossische Zeitung* and *Berliner Tageblatt*, and the National Liberal *National Zeitung*. The *Vossische Zeitung*, the oldest of all the Berlin newspapers, written with a degree of literary ability which justified its real title, *Königlich priviligierte Berlinische Zeitung für Staats- und Gelehrtensachen*, held its place. The *National Zeitung*, however (founded in 1848 by Bernhard Wolff, the originator of Wolff's news agency), which represented as long as it could those vestiges of old German Liberalism which survived in the National Liberal party, was compelled to come to an end on January 1st, 1905. The *Kreuz Zeitung* represented the "small but mighty party" of the reactionary Conservatives and Agrarians in the state, and of the orthodox (Lutheran) Protestants in the Church. It was the favourite journal of officers in the army, of the Conservative gentry (*Junker*), as well as the medium through which people of social standing preferred to announce births, marriages and deaths. The *Post* continued to be subsidized by a small number of industrial and rural magnates in the interests of the *Reichspartei*, or Free Conservative party, which for the most part subordinated its views to those of the government. The *Berliner Neueste Nachrichten*, like the *Post*, was a consistent advocate of the development of the German navy and of a vigorous *Welt-politik*. The *Boersen Zeitung* and the *Boersen-Courier* were organs of the Berlin Stock Exchange; the first of a National Liberal colour, and the other expressing the views of the Moderate Radicals (*Freisinnige Vereinigung*) and of opponents of extreme protection. The *Vörwarts* was the central organ of the German Social-Democrats, who had established a considerable number of other journals throughout Germany. The clericals or Centre party were represented by the *Germania*, less influential than the other leading organ of the Roman Catholic "governing party," the *Kölnische Volks-zeitung*. The *Deutsche Tageszeitung* made itself a name by its advocacy of the agrarian movement, while the *Freisinnige Zeitung* (founded, and to a great extent edited, by the Radical leader Eugen Richter) represented the Radical point of view. Among the provincial papers the *Frankfurter Zeitung* (Radical) was distinguished by the excellence of its news, especially on commercial subjects. The *Schlesische Zeitung* (1752) a leading Conservative organ, had continued to appear in Breslau since the days of Frederick the Great. The *Magdeburger Zeitung* and the *Hannoversche Courier* gave an independent or National Liberal support to the government. The *Weser Zeitung*, published at Bremen, was an exponent of the Liberalism of the commercial classes, while the *Strassburger Post* was one of the journals which enjoyed government inspiration, and helped to maintain *die Wacht am Rhein*. A considerable number of journals, published in the Polish language, advocated the Polish cause in the eastern provinces of Prussia.

Great success attended a new departure in German journalism, represented by newspapers like the Berlin *Lokal-Anzeiger*, describing themselves as non-political. The *Lokal-Anzeiger*, founded by August Scherl, who had gained his journalistic experience in America, had a circulation in Germany comparable with that of the *Petit Journal* in France, and it exercised a very marked influence upon public opinion in Berlin.

The external form and arrangement of German newspapers is often puzzling at first sight to an English reader. There is an absence of the striking headlines, which in English journals direct attention to news of importance, and which in America almost swamp the text. The outside page generally contains the editorial articles and the news of most importance, while the intelligence received immediately before going to press is placed in the last column of the last sheet. The bulk of the paper can apparently be increased indefinitely in accordance with the supply of news or literary matter, or with the number of advertisements. The *Vossische Zeitung* on a Sunday morning assumes, with its numerous supplementary sheets, the dimensions of a thick Blue-book. The quantity of extraneous matter, such as articles on literary, social and technical subjects, is enormous, and even the most serious political journals invariably publish a novel in serial form, as well as numerous novelettes and sketches. The local news in Berlin and other large cities is written with the minuteness and the familiarity of style of a village chronicle, and gives the impression that every one is occupied in observing the doings of his neighbour. The signed article is very much in vogue, and most writers and salaried correspondents have at least a cypher or initial by which they are distinguished. The greatest licence prevails in reporting and discussing the affairs of other countries, combined with the keenest sensitiveness to foreign criticism of anything that concerns Germany. The example of the government is followed in advertising the products of German industry, while those of foreigners are studiously depreciated.

6. Other European Countries

Austria-Hungary.—At the beginning of 1840 the whole number of Austro-German and Hungarian periodicals, of all sorts, was less than 100, only 22 being (after a fashion) political newspapers; and of these nearly all drew their materials and their inspiration from the official papers of Vienna (*Wiener Zeitung* and *Oesterreichischer Beobachter*). These two were all that appeared in the capital. Agram, Pesth, Pressburg, Lemberg and Prague had also two each; but no other city had more than a single journal. In 1846 the aggregate number of periodicals had grown to 155, of which 46 were political, but political only in the character of mere conduit-pipes for intelligence "approved of" by the government. In 1855 the number of political papers published throughout the entire territory under Austrian government, the Italian provinces excepted, was 60. The *Neue Freie Presse*, the chief Vienna daily, was founded in 1864. In 1873, ten years after the virtual cessation of a very strict censorship, the number of political journals, including all the specifically administrative organs, as well local as general, was 267, and that of mere advertising papers 42; in 1883 the former number had increased to about 280, the latter to about 60. Vienna had in 1883 in all 18 daily newspapers, ten of which ranged in average circulation from 14,000 to 54,000 copies.

In the period from 1880 to 1888 the only notable paper founded in Austria, was the *Wiener Allgemeine Zeitung* (1880). It appeared three times daily, but in spite of the impetus communicated to its start by the well-known "Freilands" Apostle Theodor Hertzka, it soon fell away, and eventually became simply a late evening paper, known as the *6 Uhr Abendblatt*. It was with the rise of the anti-Semitic and Socialistic movements of 1888 onwards that the Vienna daily press first began a fresh increase. The *Deutsche Volksblatt* (anti-Semitic) was founded in 1888, the *Ostdeutsche Rundschau* (Radical) in 1893, and the *Reichspost* (the organ of the Catholic section of the Christian Socialist party) in 1894. The Labour movement led to the development of the *Arbeiterzeitung* from a weekly, when it succeeded the *Gleichheit* in 1889, to a daily in 1895. It was therefore the first Social Democratic daily of Austria. In 1893 the *Neues Wiener Journal* was founded as a political neutral, and the old *Presse* disappeared in 1894, its place being filled by the weekly *Reichswehr* (military), established in 1888. The French daily paper, *Le Petit Journal de Vienne*, was founded in May 1899. In 1902 nineteen political dailies were published in Vienna.

In 1883 the Hungarian journals numbered 170; in 1899 they were returned as 764. Budapest, which in 1890 had 14 dailies and 10 weeklies, in 1900 had 21 and 3 respectively. The leading papers are the *Budapest Kögtöng*, the *Pester Lloyd* and the *Budapeste Hirlap*. Of the German provincial press the most highly developed is in the German towns of Bohemia and in Prague, and the foundation of the *Deutsche Volkszeitung* at Reichenberg in 1885 marks the date of separation of the *Deutschfortschrittliche* and *Deutschvolkliche* parties, while the Radical party, which greatly increased in Bohemia, was first represented by the weekly *Deutscher Volksbote* at Prague, and also in 1897 by the *Unverfälschte deutsche Worte*, edited by Iro at Eger. A peculiar feature in Austrian journalism is the existence of German organs of the Czech national movement, of which the representative is the Prague daily *Politik*, founded in 1862. In Silesia the anti-Semitic *Freie Schlesische Presse* was founded in 1881 at Troppau, and when it changed sides in 1889 it was speedily replaced, 1891, by the *Deutsche Wehr*. In Moravia the representative papers of the Czech Conservatives and Radicals were the *Mir* and the *Pozar* respectively. The newspapers in Galicia, which increased steadily after 1870, are both numerous and important. The leading ones are the *Slovo Polskie* in Lemberg and the *Glos Naroda* in Cracow. In 1900 there were 161 newspapers in Polish, as against 10 in 1848 and 50 in 1873. Of the lesser Slavic nations, the Slovenians advanced the most, the *Slovenski List* having started at the end of 1896. In Illyrian journalism the chief newspapers founded after 1880 were the *Crvena Hrvatska* (1891), and the *Hrvatska Kruna* (1893). An attempt at unity amongst the Ruthenian factions in 1885 to 1887 produced the *Mir*, while the *Ruslan*, a daily founded at Lemberg in 1896, advocated joint action by Poles and Ruthenians. The *Bukowyna*, established in 1885, developed into the organ of "Young Ruthenia," and the *Bukowinska Widomosty*, established in 1895, represented the Old Ruthenians.

The Italian press in Austria was represented in 1900 chiefly by the very popular daily *Piccolo*, published at Trieste; it had a formidable rival in the *Mattino*, from 1885 to 1898. The *Fede e Lavoro*, published at Roveredo, was the organ of the Catholic Labour party, and *L'Avvenire del Lavoro*, at Bozen, that of the Socialists. In Dalmatia the *Corriere Nazionale*, founded in 1896 at Zara and afterwards published at Trieste, was the organ of the autonomist Italians, while *Il Dalmata* continued to represent the National Liberals.

Belgium.—The *Nieuwe Tijdinghen* of Antwerp, published by Abraham Verhoeven, has been said to date virtually from 1605, in which year a "licence for the exclusive retailing of news" was accorded to him by the archduke Albert and the archduchess Isabella. But the claim is conjectural. No copy of any number anterior to 1616 is now known to exist. It seems probable that the *Gazette Extraordinaris Posttijdinghen*, published by Wilhelm Verdussen between 1637 and 1644, is a continuation of Verhoeven's paper. But, be this as it may, that of Verdussen was certainly the foundation of the well-known *Gazette van Antwerpen*, which continued to appear until 1827.

Bruges had its *Nieuwe Tijdinghen uyt verscheyden Quartieren*, published (in black letter) by Nicholaes Breyghel. When this paper was commenced is uncertain, but various numbers of it exist with dates between 1637 and 1645. In one of these (26th July 1644) a *Brusselsche Gazette* of the 24th of that month is quoted, apart from which citation no Brussels paper is known of earlier date than 1649. When the first number of *Le Courier véritable des Pays-Bas* made its appearance, the publisher (Jean Mommaert) prefaced the first number by an address to the reader, in which he says: "I have long endeavoured to meet with somebody who would give employment to my presses in defending truth against the falsehoods which malignity and ignorance *send daily abroad*. I have at length found what I sought, and shall now be able to tell you, weekly, the most important things that are going on in the world." This paper became afterwards the *Gazette de Bruxelles*, then *Gazette des Pays-Bas*; and, under the last-named title, it continued to appear until 1791. The *Annales Politiques* of Linguet was one of the most remarkable of the political journals of Brussels in the 18th century. For a time the editor won the favour of the emperor Joseph II. by praising his reforms, and the Government subscribed for 1200 copies of his paper at two louis d'ors each a year; but here, as in almost every other place of residence during his chequered career, Linguet at length incurred fine and imprisonment. His journal was repeatedly suppressed, and as often resumed under many modifications of title. It was continued in France, in Switzerland (at Lausanne), and in England. At one time it was so popular that a printer in Brussels regularly and rapidly published a pirated edition of it. For a brief period the publication was resumed at Brussels. Mallet DuPan was, for a time, a collaborator in the editorship. Linguet died by the guillotine in 1794. *Le National* was a famous paper for a short period prior to the revolution of 1830. Soon after its cessation—its presses were destroyed by the populace on the 26th August —the official journal, *Le Moniteur Belge*, was established,—"the ministry deeming it indispensable to the success of its great political enterprise that a journal should be created which might expound its views, and act daily upon public opinion"; and, on decree of the regency, it was published accordingly.

The first newspaper published at Ghent, *Gazette van Gent*, appeared in 1667. *Den Vaderlander*, begun in October 1829, was, for a long period, one of the most widely circulated of the Flemish journals.

In 1890 Brussels published 34 papers of various periodicity, among which the *Moniteur Belge* held the lead with a circulation of 90,000, while *Le National* (revived in 1885) and *L'Étoile* (1869) circulated 21,000 and 5000 respectively. In 1900 there were 18 dailies and 14 weeklies, &c. Antwerp had 7 dailies in 1890 and 1900; Ghent 7 dailies in 1890 and 6 in 1900; Liége 6 in 1890 and 5 in 1900. The halfpenny paper is well established.

Holland.—The kingdom of the Netherlands has always been rich in newspapers, but they have usually had more weight commercially than politically. Amsterdam in 1890 had 10 dailies, and in 1900 had 12 dailies (*Algemeen Handelsblad*, *Nieuws van den Dag*, &c.). In 1900 the Hague had 6 dailies (*Dagblad*, *Vaderland*, &c.); and Rotterdam had 5 dailies (*Nieuwe Rotterdammer Courant*, &c.). The oldest Dutch paper, the *Haarlemsche Courant*, founded in 1656, is still one of the leading journals.

Italy.—The *Diario di Roma*, although dating only from 1716, may claim to have been the patriarch of the Italian press. It lasted for nearly a century and a half. During its later years it was a daily paper, with a weekly supplement having the somewhat whimsical title *Notizie del Giorno*. Next to this came the *Gazzetta Uffiziale di Napoli*. These and their congeners were published under a rigid censorship until far into the 19th century, and exercised little influence of any kind. The first tentative movement towards a free press may, perhaps, be dated from the effort to establish at Milan, in 1818, under the editorship of Silvio Pellico, the *Conciliatore*, in which Simonde de Sismondi, Gonfalonieri and Romagnosi were fellow-writers. But the new journal was suppressed in 1820. The first really effectual effort had to wait for the lapse of nearly thirty years. *L'Opinione* was first published in Turin (26th December 1847) afterwards in Rome. It had, amongst its many editors, Giacomo Durando (a soldier of mark, and twice minister of foreign affairs), Montezenolo, Giovini Bianchi and Giacomo Dina. The Florence *Diritto*, originally founded at Turin, in 1851, by Lorenzo Valerio, was edited successively by Macchi, Bargini and Civinini, and as a radical organ attained great influence. Counting journals of all kinds, there were published in Italy in 1836 185 newspapers; in 1845, 200; in 1856, 311; in 1864, 450; in 1875, 479. In 1882 the "periodicals" of all kinds numbered 1454, and total number of political dailies was 149. In 1890 Rome published 13 dailies, and in 1900, 10 dailies. The leading Roman papers were the *Fanfulla*, representing the court and government; the *Tribuna* (5 centimes), a Liberal paper founded in 1883; the organ of the Vatican, *L'Osservatore Romano*; and the popular *Messaggiero*. *Il Secolo* (1866) and the *Corriere della Sera* (1876) are issued from Milan.

Russia, Poland and Finland.—The earliest gazette of Moscow (*Moskovskya Viedomosti*) was issued by order of Peter the Great on the 16th December 1702, but no copy is known now to exist of earlier date than the 2nd January following. The whole gazette of the year 1703 was reproduced in facsimile by order of Baron de Korff (the imperial librarian at St Petersburg) in 1855, on occasion of the festival for the 3rd century of Moscow university. The existing *Viedomosti* dates only from 1766. That of St Petersburg dates from 1718. The historian Karamzin established a short-lived Moscow journal (*Moskovski Listok*), and afterwards at St Petersburg the once widely-known Russian *Courrier de l'Europe* (1802). The profits of the successful *Invalide Russe* (*Russki Invalid*), established in 1815 by Persorovius, were devoted to the sufferers by the war with France. Adding to the distinctively political journals those of miscellaneous character, the whole number of newspapers published within the Russian states—Poland and Finland excepted—in the year 1835 was 136; in 1858 that number had grown to 179, of which 82 were published in St Petersburg and 15 in Moscow; 132 were printed in Russian, 3 in Russian and in German, 1 in Russian and in Polish, 28 in German, 8 in French, 3 in English, 1 in Polish, 1 in Lithuanian, 1 in Italian. In 1879, under the more liberal rule of Alexander II., the number of political and miscellaneous journals had grown to 293, and of these 105 were under the direct influence of the Government. But, in truth, the period of relaxation of censorship, if strictly examined, will be found to have lasted only from 1855 to 1864, when repressive measures were again and frequently resorted to. Poland in 1830 had 49 newspapers. Fifty years later the number was still less than 70, of which 54 were in Polish, these numbers including journals of all kinds. Finland in 1860 had 24 newspapers, half in Swedish, half in Finnish. In 1863 the number had increased to 32, in spite of the zealous opposition of Count de Berg, the governor-general, to all discussion of political events and "subjects which do not concern the people." He was very friendly to journals of gardening and cottage economy, and to magazines of light literature, and did not regard comic papers with anger provided they kept quite clear of politics. The paper which was long the chief Finnish organ, *Suometar* (founded at Helsingfors in 1847), owed much of its popularity to the pains its editors took with their correspondence. The *Oulun Wukko-Samomat* ("Uleaborg Daily News") was for a considerable period the most northerly newspaper of the world, with the one exception of the little journal published at Tromsö, in Norway.

In 1880 the whole number of newspapers printed within the government of Finland was 46, while the total number of newspapers and journals of all kinds published within the whole Russian empire during the same year was 608. Of these, 417 were printed in the Russian language, 155 of them being official or administrative organs; 54 were printed in Polish, 40 in German, 11 in Lettish, 10 in French, 7 in Esthonian, 3 in Lithuanian.

In 1890 St Petersburg had 6 dailies; and in 1900 there were 16 dailies (the *St Petersburgskya Viedomosti*, the *Novoya Vremja*, the *Journal de St Pétersbourg*, &c.). Moscow increased from 5 to 8 dailies (the *Moskovskya Viedomosti*, &c.). The rest of Russia proper produced about 100 newspapers, of which one-third were dailies.

In Russian Poland about 11 papers, one-half being dailies, were published at Warsaw in 1900 (*Kurier Warsawski*, *Gazeta Polska*, &c.).

Spain and Portugal.—In Spain no newspaper of any kind existed earlier than the 18th century, a *Gaceta de Madrid* starting about 1726 (an alleged *gaceta* in 1626 is a myth). Even during the early years of the 19th century the capital contented itself with a single journal, the *Diario de Madrid*. The Peninsular War and the establishment of the Cortes gave the first impulse towards something which might be called political journalism, but the change from total repression to absolute freedom was too sudden not to be grossly abused. The *Diario de las Cortes*, the *Semanario Patriotico* (published at Cadiz from 1808 to 1811,) and the *Aurora Mallorquina* (published at Palma in 1812–1813) were the first of the new papers that attained importance. In 1814 the circulation or receipt in Spain of English newspapers was prohibited under penalty of ten years' imprisonment. Most of the native journals fell with the Cortes in 1823. In the following year Ferdinand decreed the suppression of all the journals except the then *Diario* and *Gaceta* of Madrid, the *Gaceta de Bayona*, and certain provincial papers which dealt exclusively with commercial or scientific subjects. At the close of his reign only three or four papers were published in Madrid. Ten years afterwards there were 40; but the number was far more noticeable than the value. Spanish newspapers have been too often the mere stepping-stones of political adventurers, and not unfrequently the worst of them appear to have served the turn more completely than the best. Gonzales Bravo attained office mainly by the help of a paper of notorious scurrility,—*El Guirigay*. His press-law of 1867 introduced a sort of indirect censorship, and a system of "warnings," rather clandestine than avowed; and his former rivals met craft with craft. The *Universal* and the *Correo* were successively the organs of José Salamanca. At the end of 1854 the political journals published in Madrid numbered about 40, the most conspicuous being the now defunct *España* and *El Clamor Publico*. In 1890 Madrid published 38 papers, of which 15 were dailies; but by 1900 they declined to 28, of which 19 were dailies. The leading Spanish papers in 1900 were—*El Correo* (1879), Monarchico-Liberal; *La Epoca*, Conservative; *El Imparcial*, Independent Liberal; *La Justicia*, an evening Republican paper; *El Liberal*, numbering among its contributors the best writers without distinction of party; and *El Pais*, the organ of the Progressives.

Portugal in 1882 was credited with 179 journals of all kinds and of various periodicity. Of this number 68 appeared in Lisbon. The strictly political daily papers of Lisbon were 6 in number; those of Oporto 3. In 1890 Lisbon published 11 dailies; and in 1900, 19 dailies.

Sweden.—In Sweden the earliest regular newspaper appears to have been the *Ordinarie Post-Tidende* of Stockholm, first published in 1645, and continued until 1680, then, after long suspension, revived under the title *Post- och Inrikes-Tidning*. Stockholm has also its *Aftonbladet*. The *Post-Tidende* was followed by the *Svensk Mercurius* (1675–1683) and the Latin *Relationes Curiosae* (1682–1701). In 1742 a Swedish newspaper in French (*Gazette Française de Stockholm*) was commenced, and was followed in 1772 by the *Mercure de Suède*. But the press in Sweden had small political influence until 1820, when the *Argus* was established by Johannsen. The strife between "classicists" and "romanticists" spread itself in Sweden, as in France, from the field of literature into that of politics. Crusenstolpe's *Fäderneslandbladet* and Hjerta's *Aftonbladet*, founded in 1830, were long the most conspicuous of the Swedish journals,—the former on the side of the royalists, the latter on that of the reformers. Hjerta's paper, in its best days, could boast of a circulation of 5000 copies; but on the accession of King Oscar it ceased to appear as an opposition organ. Almost every town in the provinces now has its paper. In 1890 Stockholm had 5 dailies and 12 weeklies, &c.; in 1900 it had 11 dailies and 4 weeklies, &c., while 93 provincial towns published 197 papers, mostly weeklies, &c. In the period 1890–1894 a large number of newspapers appeared at Stockholm, but their duration was in general very short, often only a few months (Lundstadt, *Sveriges Periodiska Literatur*, ii. 1896). A newspaper in Finnish is published at Haparanda.

Denmark.—While Denmark published an *Europäische Zeitung* as early as 1663 and the *Danske Mercurius* in 1666, the political influence of the press is a newer thing in that country than even in Sweden. Until 1830 Copenhagen had but two papers, and they filled their columns with mild extracts from foreign journals. Real activity in this direction dates from the establishment of the provincial states in 1834. The *Berlingske Tidende* dates from 1749, and was at first published in German. The *Fädrelandet* in 1848–1849 was in a glow of zeal for Scandinavianism and "Young Denmark." In 1890 Copenhagen produced 8 dailies and 6 weeklies, &c. In 1900 it had 12 dailies and 2 weeklies, while 121 papers appeared in sixty-eight provincial towns.

Reykjavik (*Iceland*) published two weekly papers in 1890, and the same number in 1900 (*Thiódólfr* and *Isafold*).

Norway.—The earliest Norwegian paper was the Christiania *Intelligentssedler*, founded in 1763. Next to this came the *Adresse-contors Efterretninger* (1765), published at Bergen. *Den Constitutionelle* absorbed an older paper, called *Norske Rigstidende*. The *Morgenblad* was founded in 1819. In 1890 Christiania published 12 papers, of which only three appeared daily; in 1900 only 10 papers were produced, but 8 of them were dailies. The *Morgenbladet* still held its rank, and the *Aftenposten* had a large circulation.

Switzerland.—In 1873 the total number of political and general newspapers in Switzerland was 230. In 1881 they numbered 342; 53 were of daily issue, 166 appeared twice or thrice a week, and 7 only were of weekly issue. A monthly compendium of the news of the day appeared at Rorschach, in the canton of St Gall, as early as January 1597. The editor was a German, one Samuel Dilbaum, of Augsburg. He varied his titles, so that his monthly newsbooks, although really consecutive, do not wear the appearance of serial publications. Sometimes he called his issue *Historische Relatio*, sometimes *Beschreibung*, sometimes *Historische Erzählung*. Switzerland has since become remarkable for the number of its newspapers in proportion to its size. Among the more important may be mentioned the *Journal de Genève* and the *Gazette de Lausanne*, both Moderate Liberal, and the Catholic *Courrier de Genève*. *La Tribune de Genève* (1878) is a leading five-centime paper.

Greece.—The few newspapers that made their sudden appearance in Greece during the war of liberation departed as hastily when King Otho brought with him a press-law, one of the provisos of which demanded caution-money by actual deposit. The journal *Saviour* was established, in 1834, as a Government organ, and was soon followed by *Athena* as the journal of the opposition. Ten years later 7 distinctively political papers had been established, along with 13 journals of miscellaneous nature. In 1877 there were, of all sorts, 81 journals, of which 77 appeared in Greek, 2 in Greek and French, 2 in French only; 37 of these were printed in Athens, 17 in the Ionian Islands. In 1890 Athens published 9 dailies and 4 weeklies, &c., and in 1900, 10 dailies and 2 weeklies. The chief papers, the *Asty* and the *Acropolis*, were mainly political and on the Liberal side, as indeed were nearly all the Athenian papers.

Turkey.—During the embassy (1795) of Verninac Saint-Maur, envoy of the French republic, a French journal was established at Pera. This, possibly, is the pioneer of all Turkish newspapers. Thirty years later (1825) the *Spectateur de l'Orient* was founded at Smyrna, also by a Frenchman (Alexander Blacquet?). It was afterwards published under the titles *Courrier* and *Journal de Smyrne*. In like manner, the *Moniteur Ottoman*, first of strictly Constantinopolitan journals, was founded by the above-named Blacquet in 1831. It soon changed its language to Turkish, and was edited by Franceschi. The second Smyrna newspaper, *Echo de l'Orient*, established in 1838, was transferred to Constantinople in 1846. But not one of these papers has survived. In 1876 the total number of journals of all kinds published in the capital was 72 (namely, 20 in French, 16 in Turkish, 13 in Armenian, 12 in Greek, 11 in as many other tongues). In 1890 there were 19 papers, in various languages, published at Constantinople, most of them dailies; and in 1900 the number of papers decreased to 18. They appeared in the following languages: the *Stamboul* and 4 others in French, 3 in Turkish, 1 in Turkish and Greek, 3 in Greek, 2 in Armenian, 1 in English and French, and 1 each in Arabic, English, Italian and Persian. Smyrna published 8 papers, mostly weeklies, in 1890, and the same number in 1900. Owing to the number of Mahommedan fasts and feasts Turkish newspapers are somewhat irregular in their appearance.

For the newspapers of other countries (*e.g.* Japan) or of important towns, see under the separate topographical headings. (H. Ch.)

NEWT (a corrupted form from "an evet" or "an effet," a term of Anglo-Saxon origin, still used in many parts of England), the name usually applied to the aquatic members of the family *Salamandridae* which constitute the genus *Molge*, formerly known as *Triton*. But the name *Triton*, applied to these Batrachians by N. Laurenti (1768), has already been used by Linnaeus (*Systema Naturae*) for parts of the barnacle (*Lepas anatifera*). B. Merem (1820) proposed to substitute for it the name *Molge*, said to be derived from the Gr. Μόλγης or Μόλγος, "slow," in allusion to the movements of these animals on land. The similar name *Molch* designates these Batrachians in German.

The newts are very closely related to the true Salamanders, Salamandra, from which they differ principally in the shape of the tail, which is compressed, in relation to their aquatic habits during a considerable part of the active period. Their aquatic progression is effected principally by means of the tail, and during the act of swimming the legs are turned backwards and folded against the body and tail, so as to admit of the smallest possible degree of resistance.

A very marked sexual dimorphism prevails in most species of this genus, the males being more brilliantly coloured than the females and provided with a dorsal crest which attains its greatest development during the breeding season, lasting through the spring and the early summer. Later in the season the males more or less completely lose their crests and other nuptial ornaments, and the two sexes are more alike; they then retire on land, concealing themselves under stones, logs of wood, or in holes in damp earth, but leaving their retreat at night or in wet weather to search for earth-worms and slugs which constitute their principal food. In the water they are very destructive of tadpoles, insect larvae and crustaceans.

A remarkable feature of the newts, which they share with the other tailed Batrachians and the larvae of the frogs and toads, is the great facility with which they regenerate lost parts, such as the tail, limbs, and even the eye, a faculty which has given rise to a great variety of experiments, from the days of Charles Bonnet and Spallanzani to those of the present school of *Entwickelungsmechanik*.

Extraordinary as it may appear, considering the abundance of these creatures and the attention they have received from naturalists, it was only in 1880 that their mode of fecundation was correctly ascertained, from observation of the common newt by the Italian zoologist F. Gasco. The amorous games of the newts, so graphically represented by M. Rusconi, had been repeatedly described, and Abbé Spallanzani, as early as 1766, had ascertained the impregnation to be internal. The then current belief that the water served as a vehicle to convey the spermatozoa to the female organs had received a blow on Karl Theodor von Siebold's discovery of a *receptaculum seminis* in the female, but no satisfactory explanation had been given of the manner in which the spermatozoa reach these pouches. This mystery Gasco succeeded in elucidating in his masterly paper published in 1880, which has since been supplemented by his own investigations on the axolotl, and those of E. Zeller, E. O. Jordan and others on the European and American newts.

All who have kept newts in an aquarium have witnessed the curious antics of the male placing himself before the female and rapidly vibrating his folded tail, or bending his body in a semicircle, as if to prevent her from passing ahead of him. The male then emits, at short intervals, in front of the female, several conical or bell-shaped spermatophores (a gelatinous secretion from the cloaca), adhering to the ground and crowned by a spherical mass of spermatozoa, which the female afterwards gathers in the lips of her cloaca either by mere application or by holding the spermatophore between her hind legs and pressing the mass of spermatozoa into the cloaca, whence they ultimately find their way into the lower part of the oviducts, where the eggs are fecundated as they descend.

The larvae are provided with three pairs of long, fringed, plume-like external gills, which are not lost until the very last stages of the metamorphosis, and, in exceptional cases are even retained throughout life, the newt breeding in the branchiate condition, as often happens in the axolotl. The fore limbs are developed before the hind limbs.

The genus *Molge* has a wide distribution, extending over Europe, north-west Africa, south-western Asia, eastern temperate Asia (China and Japan) and North America as far south as southern California and the Rio Grande del Norte. Twenty species are distinguished. The British species are the crested newt (*M. cristata*), the common newt (*M. vulgaris*) and the palmated newt (*M. palmata*). The first is the largest, and measures 4 to 6 in. The skin is more or less rugose, with granular warts, a strong fold extends across the throat, and the male is provided with a very high dentate dorsal crest which is interrupted over the sacral region; the upper parts are dark, with more or less distinct black spots; the sides are speckled with white, and the lower parts are yellow or orange, spotted or marbled with black; a silvery stripe adorns the side of the tail in the male. The common and the palmated newts are smaller, 2½ to 4 in. in length, and have a smooth skin. The dorsal crest of the male is high and festooned in the former, low and straight-edged in the latter; during the breeding season the feet of the common newt are lobate like a grebe's, whilst they are webbed like a duck's in the palmated newt, which is further distinguished in having the tail truncate and terminating in a filament.

It is a remarkable fact that, although related so closely and occurring so frequently together in pools of small extent, the common and palmated newts are not known ever to produce hybrids, whilst the crested newt, when coexisting (in some parts of France) with a south-western ally, the beautiful *Molge marmorata*, to which it is by no means more nearly akin than are the two above-named species to each other, regularly gives rise to the form known as *M. blasii*, which has been proved to be a cross between *M. cristata* and *M. marmorata*.

Principal references: G. A. Boulenger, *Catalogue of Batrachia Gradientia s. Caudata* (1882); J. de Bedriaga, *Lurchfauna Europas*, II. *Urodela* (1897); F. Gasco, "Sviluppo del Tritone alpestre," *Ann. Mus. Geneva*, xvi. (1880); E. Zeller, "Befruchtung bei den Urodelen," *Z. Wiss. Zool.* xlix. (1890) and li. (1891); M. Rusconi, *Amours des Salamandres aquatiques* (1821); W. Wolterstorff, "Über Triton blasii," *Zool. Jahrb., Syst.*, xix. p. 647 (1904).

NEWTON, ALFRED (1829–1907), English zoologist, was born at Geneva on the 11th of June 1829. In 1854 he was elected travelling fellow of Magdalene College, Cambridge, of which he had been an undergraduate, and subsequently visited many parts of the world, including Lapland, Iceland, Spitsbergen, the West Indies and North America. In 1866 he became the first professor of zoology and comparative anatomy at Cambridge, a position which he retained till his death. His services to ornithology and zoogeography were recognized by the Royal Society in 1900, when it awarded him a Royal medal. He wrote many books, including *Zoology of Ancient Europe* (1862), *Ootheca Wolleyana* (begun in 1864), *Zoology* (1872), and a *Dictionary of Birds* (1893–1896). The last, still a standard work, was an amplification of the numerous articles on birds which he contributed to the 9th edition of the *Encyclopaedia Britannica*, and which with comparatively slight revision are retained in the present edition. He contributed many memoirs to scientific societies, and edited *The Ibis* (1865–1870), the *Zoological Record* (1870–1872), and *Yarrell's British Birds* (1871–1882). He died at Cambridge on the 7th of June 1907.

NEWTON, SIR CHARLES THOMAS (1816–1894), British archaeologist, was born on the 16th of September 1816, at Bredwardine in Herefordshire, and educated at Shrewsbury School and Christ Church, Oxford. He entered the British Museum in 1840 as an assistant in the Antiquities Department. Antiquities, classical, Oriental and medieval, as well as ethnographical objects, were at the time included in one department, which had no classical archaeologist among its officers. In 1852 Newton quitted the Museum to become vice-consul at Mitylene, with the object of exploring the coasts and islands of Asia Minor. Aided by funds supplied by Lord Stratford de Redcliffe, then British ambassador at Constantinople, he made in 1852 and 1855 important discoveries of inscriptions at the island of Calymnos, off the coast of Caria; and in 1856–1857 achieved the great archaeological exploit of his life by the discovery of the remains of the mausoleum of Halicarnassus, one of the "seven wonders" of the ancient world. He was greatly assisted by Murdoch Smith, afterwards celebrated in connexion with Persian telegraphs. The results were described by Newton in his *History of Discoveries at Halicarnassus* (1862–1863), written in conjunction with R. P. Pullan, and in his *Travels and Discoveries in the Levant* (1865). These works included particulars of other important discoveries, especially at Branchidae, where he disinterred the statues which had anciently lined the Sacred Way, and at Cnidos, where R. P. Pullan, acting under his direction, found the colossal lion now in the British Museum.

In 1855 Newton declined the regius professorship of Greek at Oxford. In 1860 he was made British consul at Rome, but had scarcely entered upon the post when an opportunity presented itself of reorganizing the amorphous department of antiquities at the British Museum, which was divided into three and ultimately four branches. The Greek and Roman section naturally fell to Newton, who returned as Keeper, and held the office until 1885, declining the offer of the principal librarianship made to him in 1878. The Mausoleum Room, to accommodate the treasures he had found in Asia Minor, was built under his supervision, but the most brilliant episode of his administration was the acquisition of the Blacas and Castellani gems and sculptures. The Farnese and Pourtalès collections were also acquired by him. He took a leading part in the foundation of the Society for the Promotion of Hellenic Studies, the British School at Athens, and the Egypt Exploration Fund. He was Yates professor of classical archaeology at University College, London, from 1880 to 1888. His collected *Essays on Art and Archaeology* were published in 1886. When, on his retirement from the Museum, his bust by Boehm, now placed in one of the sculpture galleries, was presented to him as a testimonial, he desired the unexpended balance to be given to the school at Athens. After his retirement he was much occupied with the publication of the Greek inscriptions in the British Museum, but his health failed greatly in the latter years of his life. He died at Margate on the 28th of November 1894. He married in 1861 the daughter of his successor in the consulate at Rome, the painter Severn, herself a distinguished artist. She died in 1866. (R. G.)

NEWTON, SIR ISAAC (1642–1727), English natural philosopher, was born on the 25th of December 1642 (O.S.), at Woolsthorpe, a hamlet in the parish of Colsterworth, Lincolnshire, about 6 m. from Grantham. His father (also Isaac Newton) who farmed a small freehold property of his own, died before his son's birth, a few months after his marriage to Hannah Ayscough, a daughter of James Ayscough of Market-Overton. When Newton was little more than two years old his mother married Barnabas Smith, rector of North Witham. Of this marriage there was issue, Benjamin, Mary and Hannah Smith, and to their children Sir Isaac Newton subsequently left the greater part of his property. After having acquired the rudiments of education at two small schools in hamlets close to Woolsthorpe, Newton was sent at the age of twelve to the grammar school of Grantham. While attending Grantham school Newton lived in the house of Mr Clark, an apothecary of that town. According to his own confession he was far from industrious, and stood very low in his class. An unprovoked attack from the boy next above him led to a fight, in which Newton's pluck gave him the victory. This success seems to have led him to greater exertions, and he rose to be the head boy of the school. He displayed very early a taste and an aptitude for mechanical contrivances. He made windmills, water-clocks, kites and dials, and he is said to have invented a four-wheeled carriage which was to be moved by the rider. In 1656 Mr Smith died, and Newton's mother came back with her three children to Woolsthorpe. Newton was then in his fifteenth year, and, as his mother in all probability intended him to be a farmer, he was taken away from school. He was frequently sent on market days to Grantham with an old and trusty servant, who made all the purchases, while Newton spent his time among the books in Mr Clark's house. It soon became apparent to Newton's relatives that they were making a great mistake in attempting to turn him into a farmer, and he was therefore sent back again to school at Grantham. His mother's brother, William Ayscough, the rector of Burton Coggles, the next parish, was a graduate of Trinity College, Cambridge, and when he found that Newton's mind was wholly devoted to mechanical and mathematical problems, he urged upon Mrs Smith the desirability of sending her son to his own college. He was accordingly admitted a member of Trinity College on the 5th of June 1661, as a subsizar, and was matriculated on the 8th of July. We have scarcely any information as to his attainments when he commenced residence, and very little as to his studies as an undergraduate. It is known that while still at Woolsthorpe Sanderson's *Logic* had been read by him to such purpose that his tutor at Trinity College excused his attendance at a course of lectures on that subject. Newton tells us himself that, when he had purchased a book on astrology at Stourbridge fair, a fair held close to Cambridge, he was unable, on account of his ignorance of trigonometry, to understand a figure of the heavens which was drawn in this book. He therefore bought an English edition of Euclid with an index of propositions at the end of it, and, having turned to two or three which he thought likely to remove his difficulties, he found them so self-evident that he put aside Euclid "as a trifling book," and applied himself to the study of Descartes's *Geometry*. It is reported that in his examination for a scholarship at Trinity, to which he was elected on the 28th of April 1664, he was examined in Euclid by Dr Isaac Barrow, who formed a poor opinion of his knowledge, and that in consequence Newton was led to read the *Elements* again with care, and thereby to form a more favourable estimate of Euclid's merits.

The study of Descartes's *Geometry* seems to have inspired Newton with a love of the subject, and to have introduced him to the higher mathematics. In a small commonplace book, bearing on the seventh page the date of January 1663/1664, there are several articles on angular sections, and the squaring of curves and "crooked lines that may be squared," several calculations about musical notes, geometrical propositions from Francis Vieta and Frans van Schooten, annotations out of Wallis's *Arithmetic of Infinities*, together with observations on refraction, on the grinding of "spherical optic glasses," on the errors of lenses and the method of rectifying them, and on the extraction of all kinds of roots, particularly those "in affected powers." And in this same commonplace book the following entry made by Newton himself, many years afterwards, gives a further account of the nature of his work during the period when he was an undergraduate:—

> "July 4, 1699.—By consulting an account of my expenses at Cambridge, in the years 1663 and 1664, I find that in the year 1664 a little before Christmas, I, being then Senior Sophister, bought Schooten's *Miscellanies* and Cartes' *Geometry* (having read this *Geometry* and Oughtred's *Clavis* clean over half a year before), and borrowed Wallis's works, and by consequence made these annotations out of Schooten and Wallis, in winter between the years 1664 and 1665. At such time I found the method of Infinite Series; and in summer 1665, being forced from Cambridge by the plague, I computed the area of the Hyperbola at Boothby, in Lincolnshire, to two and fifty figures by the same method."

That Newton must have begun early to make careful observations of natural phenomena is sufficiently testified by the following remarks about halos, which appear in his *Optics*, book ii. part iv. obs. 13:—

> "The like Crowns appear sometimes about the moon; for in the beginning of the Year 1664, February 19th, at night, I saw two such Crowns about her. The Diameter of the first or innermost was about three Degrees, and that of the second about five Degrees and an half. Next about the moon was a Circle of white, and next about that the inner Crown, which was of a bluish green within next the white, and of a yellow and red without, and next about these Colours were blue and green on the inside of the Outward Crown, and red on the outside of it. At the same time there appear'd a Halo about 22 Degrees 35′ distant from the center of the moon. It was elliptical, and its long Diameter was perpendicular to the Horizon, verging below farthest from the moon."

In January 1665 Newton took the degree of B.A. The persons appointed (in conjunction with the proctors, John Slade of Catharine Hall, and Benjamin Pulleyn of Trinity College, Newton's tutor) to examine the questionists were John Eachard of Catharine Hall and Thomas Gipps of Trinity College. It is a curious accident that we have no information about the respective merits of the candidates for a degree in this year, as the "ordo senioritatis" of the bachelors of arts for the year is omitted in the "Grace Book."

It is supposed that it was in 1665 that the method of fluxions first occurred to Newton's mind. There are several papers still existing in Newton's handwriting bearing dates 1665 and 1666 in which the method is described, in some of which dotted or dashed letters are used to represent fluxions, and in some of which the method is explained without the use of dotted letters.

Both in 1665 and in 1666 Trinity College was dismissed on account of the plague. On each occasion it was agreed, as appears by entries in the "Conclusion Book" of the college, bearing dates August 7th, 1665, and June 22nd, 1666, and signed by the master of the college, Dr Pearson, that all fellows and scholars who were dismissed on account of the pestilence be allowed one month's commons. Newton must have left college before August 1665, as his name does not appear in the list of those who received extra commons on that occasion, and he tells us himself in the extract from his commonplace book already quoted that he was "forced from Cambridge by the plague" in the summer of that year. He was elected a fellow of his college on the 1st of October 1667. There were nine vacancies, one of which was caused by the death of Abraham Cowley in the previous summer, and the nine successful candidates were all of the same academical standing. A few weeks after his election to a fellowship Newton went to Lincolnshire, and did not return to Cambridge till the February following. On the 16th of March 1668 he took his degree of M.A.

During the years 1666 to 1669 Newton's studies were of a very varied kind. It is known that he purchased prisms and lenses on two or three several occasions, and also chemicals and a furnace, apparently for chemical experiments; but he also employed part of his time on the theory of fluxions and other branches of pure mathematics. He wrote a paper *Analysis per Equationes Numero Terminorum Infinitas*, which he put, probably in June 1669, into the hands of Isaac Barrow (then Lucasian professor of mathematics), at the same time giving him permission to communicate the contents to their common friend John Collins (1624–1683), a mathematician of no mean order. Barrow did this on the 31st of July 1669, but kept the name of the author a secret, and merely told Collins that he was a friend staying at Cambridge, who had a powerful genius for such matters. In a subsequent letter on the 20th of August, Barrow expressed his pleasure at hearing the favourable opinion which Collins had formed of the paper, and added, "the name of the author is Newton, a fellow of our college, and a young man, who is only in his second year since he took the degree of master of arts, and who, with an unparalleled genius (*eximio quo est acumine*), has made very great progress in this branch of mathematics." Shortly afterwards Barrow resigned his chair, and was instrumental in securing Newton's election as his successor. Newton was elected Lucasian professor on the 29th of October 1669. It was his duty as professor to lecture at least once a week in term time on some portion of geometry, arithmetic, astronomy, geography, optics, statics, or some other mathematical subject, and also for two hours in the week to allow an audience to any student who might come to consult with the professor on any difficulties he had met with. The subject which Newton chose for his lectures was optics. The success which attended his researches in optics must have been great, although the results were known only through his own oral lectures, until he presented an account of them to the Royal Society in the spring of 1672. On the 21st of December 1671 he was proposed as a candidate for admission into the Royal Society by Dr Seth Ward, bishop of Salisbury, and on the 11th of January 1672 he was elected a fellow of the Society. At the meeting at which Newton was elected a description of a reflecting telescope which he had invented was read, and "it was ordered that a letter should be written by the secretary to Mr Newton to acquaint him of his election into the Society, and to thank him for the communication of his telescope, and to assure him that the Society would take care that all right should be done him with respect to this invention."

In his reply to the secretary on the 18th of January 1672, Newton writes:—

> "I desire that in your next letter you would inform me for what time the society continue their weekly meetings; because, if they continue them for any time, I am purposing them to be considered of and examined an account of a philosophical discovery, which induced me to the making of the said telescope, and which I doubt not but will prove much more grateful than the communication of that instrument being in my judgment the oddest if not the most considerable detection which hath hitherto been made into the operations of nature."

The promise here made was fulfilled in a communication which Newton addressed to Henry Oldenburg, the secretary of the Royal Society, on the 6th of February 1672, and which was read before the society two days afterwards. The whole is printed in No. 80 of the *Philosophical Transactions*.

After explaining his discovery of the composition of white light, he proceeds:—

> "When I understood this, I left off my aforesaid Glass works; for I saw, that the perfection of Telescopes was hitherto limited, not so much for want of glasses truly figured according to the prescriptions of Optick Authors (which all men have hitherto imagined), as because that Light itself is a *Heterogeneous mixture of differently refrangible Rays*. So that, were a glass so exactly figured as to collect any one sort of rays into one point, it could not collect those also into the same point, which having the same Incidence upon the same Medium are apt to suffer a different refraction. Nay, I wondered, that seeing the difference of refrangibility was so great, as I found it, Telescopes should arrive to that perfection they are now at."

He then points out why "the object-glass of any Telescope cannot collect all the rays which come from one point of an object, so as to make them convene at its *focus* in less room than in a circular space, whose diameter is the 50th part of the Diameter of its Aperture: which is an irregularity some hundreds of times greater, than a circularly figured *Lens*, of so small a section as the Object-glasses of long Telescopes are, would cause by the unfitness of its figure, were Light *uniform*." He adds: "This made me take reflections into consideration, and finding them regular, so that the Angle of *Reflection* of all sorts of Rays was equal to their Angle of Incidence; I understood, that by their mediation Optick instruments might be brought to any degree of perfection imaginable, provided a Reflecting substance could be found, which would polish as finely as Glass, and *reflect* as much light, as glass *transmits*, and the art of communicating to it a *Parabolick* figure be also attained. But these seemed very great difficulties, and I have almost thought them insuperable, when I further considered, that every irregularity in a reflecting superficies makes the rays stray 5 or 6 times more out of their due course, than the like irregularities in a refracting one; so that a much greater curiosity would be here requisite, than in figuring glasses for Refraction.

> "Amidst these thoughts I was forced from *Cambridge* by the Intervening Plague, and it was more than two years before I proceeded further. But then having thought on a tender way of polishing, proper for metall, whereby, as I imagined, the figure also would be corrected to the last; I began to try, what might be effected in this kind, and by degrees so far perfected an Instrument (in the essential parts of it like that I sent to *London*), by which I could discern Jupiters 4 Concomitants, and shewed them divers times to two others of my acquaintance. I could also discern the Moon-like phase of *Venus*, but not very distinctly, nor without some niceness in disposing the Instrument.

> "From that time I was interrupted till this last Autumn, when I made the other. And as that was sensibly better than the first (especially for Day-Objects), so I doubt not, but they will be still brought to a much greater perfection by their endeavours, who, as you inform me, are taking care about it at *London*."

After a remark that microscopes seem as capable of improvement as telescopes, he adds: "I shall now proceed to acquaint you with another more notable difformity in its Rays, wherein the *Origin of Colour* is unfolded: Concerning which I shall lay down the *Doctrine* first, and then, for its examination, give you an instance or two of the *Experiments*, as a specimen of the rest. The Doctrine you will find comprehended and illustrated in the following propositions:

> "1. As the Rays of light differ in degrees of Refrangibility, so they also differ in their disposition to exhibit this or that particular colour. Colours are not *Qualifications of Light*, derived from Refractions, or Reflections of natural Bodies (as 'tis generally believed), but *original and connate properties*, which in divers Rays are divers. Some Rays are disposed to exhibit a red colour and no other; some a yellow and no other, some a green and no other, and so of the rest. Nor are there only Rays proper and particular to the more eminent colours, but even to all their intermediate gradations.

> "2. To the same degree of Refrangibility ever belongs the same colour, and to the same colour ever belongs the same degree of Refrangibility. The *least Refrangible* Rays are all disposed to exhibit a *Red* colour, and contrarily those Rays, which are disposed to exhibit a *Red* colour, are all the least Refrangible: So the *most refrangible* Rays are all disposed to exhibit a deep *Violet Colour*, and contrarily those which are apt to exhibit such a violet colour are all the most Refrangible.

> "And so to all the intermediate colours in a continued series belong intermediate degrees of refrangibility. And this Analogy 'twixt colours, and refrangibility is very precise and strict; the Rays always either exactly agreeing in both, or proportionally disagreeing in both.

> "3. The species of colour, and degree of Refrangibility proper to any particular sort of Rays, is not mutable by Refraction, nor by Reflection from natural bodies, nor by any other cause, that I could yet observe. When any one sort of Rays hath been well parted from those of other kinds, it hath afterwards obstinately retained its colour, notwithstanding my utmost endeavours to change it. I have refracted it with Prismes, and reflected it with Bodies, which in Day-light were of other colours; I have intercepted it with the coloured film of Air interceding two compressed plates of glass, transmitted it through coloured Mediums, and through Mediums irradiated with other sorts of Rays, and diversly terminated it; and yet could never produce any new colour out of it. It would by contracting or dilating become more brisk, or faint, and by the loss of many Rays, in some cases very obscure and dark; but I could never see it changed *in specie*.

> "Yet seeming transmutations of Colours may be made, where there is any mixture of divers sorts of Rays. For in such mixtures, the component colours appear not, but, by their mutual allaying each other constitute a midling colour."

Further on, after some remarks on the subject of compound colours, he says: "I might add more instances of this nature, but I shall conclude with this general one, that the Colours of all natural Bodies have no other origin than this, that they are variously qualified to reflect one sort of light in greater plenty then another. And this I have experimented in a dark Room by illuminating those bodies with uncompounded light of divers colours. For by that means any body may be made to appear of any colour. They have there no appropriate colour, but ever appear of the colour of the light cast upon them, but yet with this difference, that they are most brisk and vivid in the light of their own day-light colour. *Minium* appeareth there of any colour indifferently, with which 'tis illustrated, but yet most luminous in red, and so *Bise* appeareth indifferently of any colour with which 'tis illustrated, but yet most luminous in blew. And therefore *minium* reflecteth Rays of any colour, but most copiously those indued with red; and consequently when illustrated with day-light, that is with all sorts of Rays promiscuously

> blended, those qualified with red shall abound most in the reflected light, and by their prevalence cause it to appear of that colour. And for the same reason *Bise*, reflecting blew most copiously, shall appear blew by the excess of those Rays in its reflected light; and the like of other bodies. And that this is the intire and adequate cause of their colours, is manifest, because they have no power to change or alter the colours of any sort of Rays incident apart, but put on all colours indifferently, with which they are inlightened.
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> “ Reviewing what I have written, I see the discourse it self will lead to divers Experiments sufficient for its examination: And therefore I shall not trouble you further, than to describe one of those, which I have already insinuated.
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> “ In a darkened Room make a hole in the shut of a window whose diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Suns light: And there place a clear and colourless Prisme, to refract the entring light towards the further part of the Room, which, as I said, will thereby be diffused into an oblong coloured Image. Then place a Lens of about three foot radius (suppose a broad Object-glass of a three foot Telescope), at the distance of about four or five foot from thence, through which all those colours may at once be transmitted, and made by its Refraction to convene at a further distance of about ten or twelve feet. If at that distance you intercept this light with a sheet of white paper, you will see the colours converted into whiteness again by being mingled.
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> “ But it is requisite, that the *Prisme* and *Lens* be placed steddy, and that the paper, on which the colours are cast be moved to and fro; for, by such motion, you will not only find, at what distance the whiteness is most perfect but also see, how the colours gradually convene, and vanish into whiteness, and afterwards having crossed one another in that place where they compound Whiteness, are again dissipated and severed, and in an inverted order retain the same colours, which they had before they entered the composition. You may also see, that, if any of the Colours at the *Lens* be intercepted, the Whiteness will be changed into the other colours. And therefore, that the composition of whiteness be perfect, care must be taken, that none of the colours fall besides the *Lens*.”

He concludes his communication with the words: “ This, I conceive, is enough for an Introduction to Experiments of this kind: which if any of the *R. Society* shall be so curious as to prosecute, I should be very glad to be informed with what success: That, if any thing seem to be defective, or to thwart this relation, I may have an opportunity of giving further direction about it, or of acknowledging my errors, if I have committed any.”

The publication of these discoveries led to a series of controversies which lasted for several years, in which Newton had to contend with the eminent English natural philosopher Robert Hooke; Lucas, mathematical professor at Liége; Linus, a physician in Liége, and many others. Some of his opponents denied the truth of his experiments, refusing to believe in the existence of the spectrum. Others criticized the experiments, saying that the length of the spectrum was never more than three and a half times the breadth, whereas Newton found it to be five times the breadth. It appears that Newton made the mistake of supposing that all prisms would give a spectrum of exactly the same length; the objections of his opponents led him to measure carefully the lengths of spectra formed by prisms of different angles and of different refractive indices; and it seems strange that he was not led thereby to the discovery of the different dispersive powers of different refractive substances.

Newton carried on the discussion with the objectors with great courtesy and patience, but the amount of pain which these perpetual discussions gave to his sensitive mind may be estimated from the fact of his writing on the 18th of November 1676 to Oldenburg:—

> “ I promised to send you an answer to Mr Lucas this next Tuesday, but I find I shall scarce finish what I have designed, so as to get a copy taken of it by that time, and therefore I beg your patience a week longer. I see I have made myself a slave to philosophy, but if I get free of Mr Lucas's business, I will resolutely bid adieu to it eternally, excepting what I do for my private satisfaction, or leave to come out after me; for I see a man must either resolve to put out nothing new, or to become a slave to defend it.”

It was a fortunate circumstance that these disputes did not so thoroughly damp Newton's ardour as he at the time felt they would. He subsequently published many papers in the *Philosophical Transactions* on various parts of the science of optics, and, although some of his views have been found to be erroneous, and are now almost universally rejected, his investigations led to discoveries which are of permanent value. He succeeded in explaining the colour of thin and of thick plates, and the inflexion of light, and he wrote on double refraction, polarization and binocular vision. He also invented a reflecting sextant for observing the distance between the moon and the fixed stars,—the same in every essential as the instrument which is still in everyday use at sea under the name of Hadley's quadrant. This discovery was communicated by him to Edmund Halley in 1700, but was not published, or communicated to the Royal Society, till after Newton's death, when a description of it was found among his papers.

In March 1673 Newton took a prominent part in a dispute in the university. The public oratorship fell vacant, and a contest arose between the heads of the colleges and the members of the senate as to the mode of electing to the office. The heads claimed the right of nominating two persons, one of whom was to be elected by the senate. The senate insisted that the proper mode was by an open election. The duke of Buckingham, who was the chancellor of the university, endeavoured to effect a compromise which, he says, “ I hope may for the present satisfy both sides. I propose that the heads may for this time nominate and the body comply, yet interposing (if they think fit) a protestation concerning their plea that this election may not hereafter pass for a decisive precedent in prejudice of their claim,” and, “ whereas I understand that the whole university has chiefly consideration for Dr Henry Paman of St John's and Mr Craven of Trinity College, I do recommend them both to be nominated.” The heads, however, nominated Dr Paman and Ralph Sanderson of St John's, and the next day one hundred and twenty-one members of the senate recorded their votes for Craven and ninety-eight for Paman. On the morning of the election a protest in which Newton's name appeared was read, and entered in the Regent House. But the vice-chancellor admitted Paman the same morning, and so ended the first contest of a non-scientific character in which Newton took part.

On the 8th of March 1673 Newton wrote to Oldenburg, the secretary of the Royal Society:

> “ Sir, I desire that you will procure that I may be put out from being any longer Fellow of the Royal Society: for though I honour that body, yet since I see I shall neither profit them, nor (by reason of this distance) can partake of the advantage of their assemblies, I desire to withdraw.”

Oldenburg must have replied to this by an offer to apply to the Society to excuse Newton the weekly payments, as in a letter of Newton's to Oldenburg, dated the 23rd of June 1673, he says, “ For your proffer about my quarterly payments, I thank you, but I would not have you trouble yourself to get them excused, if you have not done it already.” Nothing further seems to have been done in the matter until the 28th of January 1675, when Oldenburg informed “ the Society that Mr Newton is now in such circumstances that he desires to be excused from the weekly payments.” Upon this “ it was agreed to by the council that he be dispensed with, as several others are.” On the 18th of February 1675 Newton was formally admitted into the Society. The most probable explanation of the cause why Newton wished to be excused from these payments is to be found in the fact that, as he was not in holy orders, his fellowship at Trinity College would lapse in the autumn of 1675. It is true that the loss to his income which this would have caused was obviated by a patent from the crown in April 1675, allowing him as Lucasian professor to retain his fellowship without the obligation of taking holy orders. This must have relieved Newton's mind from a great deal of anxiety about pecuniary matters, as we find him in November 1676 subscribing £40 towards the building of the new library of Trinity College.

It is supposed that it was at Woolsthorpe in the summer of 1666 that Newton's thoughts were directed to the subject of gravity. Voltaire is the authority for the well-known anecdote about the apple. He had his information from Newton's favourite niece Catharine Barton, who married Conduitt, a fellow of the Royal Society, and one of Newton's intimate friends. How much truth there is in what is a plausible and a favourite story can never be known, but it is certain that tradition marked a tree as that from which the apple fell, till 1820, when, owing to decay, the tree was cut down and its wood carefully preserved.

Johann Kepler had proved by an elaborate series of measurements that each planet revolves in an elliptical orbit round the sun, whose centre occupies one of the foci of the orbit, that the radius vector of each planet drawn from the sun describes equal areas in equal times, and that the squares of the periodic times of the planets are in the same proportion as the cubes of their mean distances from the sun. The fact that heavy bodies have always a tendency to fall to the earth, no matter at what height they are placed above the earth's surface, seems to have led Newton to conjecture that it was possible that the same tendency to fall to the earth was the cause by which the moon was retained in its orbit round the earth. Newton, by calculating from Kepler's laws, and supposing the orbits of the planets to be circles round the sun in the centre, had already proved that the force of the sun acting upon the different planets must vary as the inverse square of the distances of the planets from the sun. He therefore was led to inquire whether, if the earth's attraction extended to the moon, the force at that distance would be of the exact magnitude necessary to retain the moon in its orbit. He found that the moon by her motion in her orbit was deflected from the tangent in every minute of time through a space of thirteen feet. But by observing the distance through which a body would fall in one second of time at the earth's surface, and by calculating from that on the supposition of the force diminishing in the ratio of the inverse square of the distance, he found that the earth's attraction at the distance of the moon would draw a body through 15 ft. in 1 min. Newton regarded the discrepancy between the results as a proof of the inaccuracy of his conjecture, and "laid aside at that time any further thoughts of this matter." But in 1679 a controversy between Hooke and Newton, about the form of the path of a body falling from a height, taking the motion of the earth round its axis into consideration, led Newton again to revert to his former conjectures on the moon. The measure of the earth, which had hitherto been accepted by geographers and navigators, was based on the very rough estimate that the length of a degree of latitude of the earth's surface measured along a meridian was 60 m. More accurate estimates had been made by R. Norwood and W. Snell, and more recently by P. Picard. At a meeting of the Royal Society on the 11th of January 1672, Oldenburg the secretary read a letter from Paris describing the method followed by Picard in measuring a degree, and specifically stating the precise length that he calculated it to be. It is probable that Newton had become acquainted with this measurement of Picard's, and that he was therefore led to make use of it when his thoughts were redirected to the subject. This estimate of the earth's magnitude, giving 69·1 m. to 1°, made the two results, the discrepancy between which Newton had regarded as a disproof of his conjecture, to agree so exactly that he now regarded his conjecture as fully established.

In January 1684 Sir Christopher Wren, Halley and Hooke were led to discuss the law of gravity, and, although probably they all agreed in the truth of the law of the inverse square, yet this truth was not looked upon as established. It appears that Hooke professed to have a solution of the problem of the path of a body moving round a centre of force attracting as the inverse square of the distance; but Halley, finding, after a delay of some months, that Hooke "had not been so good as his word" in showing his solution to Wren, started in the month of August 1684 for Cambridge to consult Newton on the subject. Without mentioning the speculations which had been made, he asked Newton what would be the curve described by a planet round the sun on the assumption that the sun's force diminished as the square of the distance. Newton replied promptly, "an ellipse," and on being questioned by Halley as to the reason for his answer he replied, "Why, I have calculated it." He could not, however, put his hand upon his calculation, but he promised to send it to Halley. After the latter had left Cambridge, Newton set to work to reproduce the calculation. After making a mistake and producing a different result he corrected his work and obtained his former result.

In the following November Newton redeemed his promise to Halley by sending him, by the hand of Mr Paget, one of the fellows of his own college, and at that time mathematical master of Christ's Hospital, a copy of his demonstration; and very soon afterwards Halley paid another visit to Cambridge to confer with Newton about the problem; and on his return to London on the 10th of December 1684, he informed the Royal Society "that he had lately seen Mr Newton at Cambridge, who had showed him a curious treatise *De Motu*," which at Halley's desire he promised to send to the Society to be entered upon their register. "Mr Halley was desired to put Mr Newton in mind of his promise for the securing this invention to himself, till such time as he could be at leisure to publish it," and Paget was desired to join with Halley in urging Newton to do so. By the middle of February Newton had sent his paper to Aston, one of the secretaries of the Society, and in a letter to Aston dated the 23rd of February 1685, we find Newton thanking him for "having entered on the register his notions about motion." This treatise *De Motu* was the germ of the *Principia*, and was obviously meant to be a short account of what that work was intended to embrace. It occupies twenty-four octavo pages, and consists of four theorems and seven problems, some of which are identical with some of the most important propositions of the second and third sections of the first book of the *Principia*.

The years 1685 and 1686 will ever be memorable in the history of science. It was in them that Newton composed almost the whole of his great work. During this period Newton had a very extensive correspondence with John Flamsteed, who was then the astronomer-royal. Many of the letters are lost, but it is clear from one of Newton's, dated the 19th of September 1685, that he had received many useful communications from Flamsteed, and especially regarding Saturn, "whose orbit, as defined by Kepler," Newton "found too little for the sesquialterate proportions." In the other letters written in 1685 and 1686 he applies to Flamsteed for information respecting the orbits of the satellites of Jupiter and Saturn, respecting the rise and fall of the spring and neap tides at the solstices and the equinoxes, respecting the flattening of Jupiter at the poles (which, if certain, he says, would conduce much to the stating the reasons of the precession of the equinoxes), and respecting the difference between the observed places of Saturn and those computed from Kepler's tables about the time of his conjunction with Jupiter. On this last point the information supplied by Flamsteed was peculiarly gratifying to Newton; and it is obvious from the language of this part of his letter that he had still doubts of the universal application of the sesquialteral proportion. "Your information," he says, "about the errors of Kepler's tables for Jupiter and Saturn has eased me of several scruples. I was apt to suspect there might be some cause or other unknown to me which might disturb the sesquialteral proportions, for the influences of the planets one upon another seemed not great enough, though I imagined Jupiter's influence greater than your numbers determine it. It would add to my satisfaction if you would be pleased to let me know the long diameters of the orbits of Jupiter and Saturn, assigned by yourself and Mr Halley in your new tables, that I may see how the sesquialteral proportion fills the heavens, together with another small proportion which must be allowed for."

Upon Newton's return from Lincolnshire in the beginning of April 1685, he seems to have devoted himself to the preparation of his work. In the spring he had determined the attractions of masses, and thus completed the law of universal gravitation. In the summer he had finished the second book of the *Principia*, the first book being the treatise *De Motu*, which he had enlarged and completed. Excepting in the correspondence with Flamsteed we hear nothing more of the preparation of the *Principia* until the 21st of April 1686, when Halley read to the Royal Society his *Discourse concerning Gravity and its Properties*, in which he states "that his worthy countryman Mr Isaac Newton has an incomparable treatise of motion almost ready for the press," and that the law of the inverse square "is the principle on which Mr Newton has made out all the phenomena of the celestial motions so easily and naturally, that its truth is past dispute." At the next meeting of the Society, on the 28th of April, "Dr Vincent presented to the Society a manuscript treatise entitled *Philosophiae Naturalis Principia Mathematica*, and dedicated to the Society by Mr Isaac Newton." Although this manuscript contained only the first book, yet such was the confidence the Society placed in the author that an order was given "that a letter of thanks be written to Mr Newton; and that the printing of his book be referred to the consideration of the council; and that in the meantime the book be put into the hands of Mr Halley, to make a report thereof to the council." Although there could be no doubt as to the intention of this report, yet no step was taken towards the publication of the work. At the next meeting of the Society, on the 19th of May, some dissatisfaction seems to have been expressed at the delay, as it was ordered "that Mr Newton's work should be printed forthwith in quarto, and that a letter should be written to him to signify the Society's resolutions, and to desire his opinion as to the print, volume, cuts and so forth." Three days afterwards Halley communicated the resolution to Newton, and stated to him that the printing was to be at the charge of the Society. At the next meeting of the council, on the 2nd of June, it was again ordered "that Mr Newton's book be printed," but, instead of sanctioning the resolution of the general meeting to print it at their charge, they added "that Mr Halley undertake the business of looking after it, and printing it at his own charge, which he engaged to do."

In order to explain to Newton the cause of the delay, Halley in his letter of the 22nd of May alleges that it arose from "the president's attendance on the king, and the absence of the vice-presidents, whom the good weather had drawn out of town"; but there is reason to believe that this was not the true cause, and that the unwillingness of the council to undertake the publication arose from the state of the finances of the Society. Halley certainly deserves the gratitude of posterity for undertaking the publication of the work at a very considerable pecuniary risk to himself. In the same letter Halley found it necessary to inform Newton of Hooke's conduct when the manuscript of the *Principia* was presented to the Society. Sir John Hoskyns was in the chair when Dr Vincent presented the manuscript, and passed a high encomium on the novelty and dignity of the subject. Hooke was offended because Sir John did not mention what he had told him of his own discovery. Halley only communicated to Newton the fact "that Hooke had some pretensions to the invention of the rule for the decrease of gravity being reciprocally as the squares of the distances from the centre," acknowledging at the same time that, though Newton had the notion from him, "yet the demonstration of the curves generated thereby belonged wholly to Newton." "How much of this," Halley adds, "is so, you know best, so likewise what you have to do in this matter; only Mr Hooke seems to expect you should make some mention of him in the preface, which 'tis possible you may see reason to prefix. I must beg your pardon that 'tis I that send you this ungrateful account; but I thought it my duty to let you know it, so that you might act accordingly, being in myself fully satisfied that nothing but the greatest candour imaginable is to be expected from a person who has of all men the least need to borrow reputation."

In thus appealing to Newton's candour, Halley obviously wished that some acknowledgment of Hooke should be made. He knew indeed that before Newton had announced the inverse law Hooke and Wren and himself had spoken of it and discussed it, and therefore justice demanded that, though none of them had given a demonstration of the law, Hooke especially should receive credit for having maintained it as a truth of which he was seeking the demonstration. On the 20th of June 1686 Newton wrote to Halley the following letter:—

"Sir,—In order to let you know the case between Mr Hooke and me, I give you an account of what passed between us in our letters, so far as I could remember; for 'tis long since they were writ, and I do not know that I have seen them since. I am almost confident by circumstances, that Sir Chr. Wren knew the duplicate proportion when I gave him a visit; and then Mr Hooke (by his book *Cometa* written afterwards) will prove the last of us three that knew it. I intended in this letter to let you understand the case fully; but it being a frivolous business, I shall content myself to give you the heads of it in short, viz. that I never extended the duplicate proportion lower than to the superficies of the earth, and before a certain demonstration I found the last year, have suspected it did not reach accurately enough down so low; and therefore in the doctrine of projectiles never used it nor considered the motions of the heavens; and consequently Mr Hooke could not from my letters, which were about projectiles and the regions descending hence to the centre, conclude me ignorant of the theory of the heavens. That what he told me of the duplicate proportion was erroneous, namely, that it reached down from hence to the centre of the earth.

"That it is not candid to require me now to confess myself, in print, then ignorant of the duplicate proportion in the heavens; for no other reason, but because he had told it me in the case of projectiles, and so upon mistaken grounds accused me of that ignorance. That in my answer to his first letter I refused his correspondence, told him I had laid philosophy aside, sent him only the experiment of projectiles (rather shortly hinted than carefully described), in compliment to sweeten my answer, expected to hear no further from him; could scarce persuade myself to answer his second letter; did not answer his third, was upon other things; thought no further of philosophical matters than his letters put me upon it, and therefore may be allowed not to have had my thoughts of that kind about me so well at that time. That by the same reason he concludes me then ignorant of the rest of the duplicate proportion, he may as well conclude me ignorant of the rest of that theory I had read before in his books. That in one of my papers writ (I cannot say in what year, but I am sure some time before I had any correspondence with Mr Oldenburg, and that's above fifteen years ago), the proportion of the forces of the planets from the sun, reciprocally duplicate of their distances from him, is expressed, and the proportion of our gravity to the moon's *conatus recedendi a centro terrae* is calculated, though not accurately enough. That when Hugenius put out his *Horol. Oscil.*, a copy being presented to me, in my letter of thanks to him I gave those rules in the end thereof a particular commendation for their usefulness in Philosophy, and added out of my aforesaid paper an instance of their usefulness, in comparing the forces of the moon from the earth, and earth from the sun; in determining a problem about the moon's phase, and putting a limit to the sun's parallax, which shews that I had then my eye upon comparing the forces of the planets arising from their circular motion, and understood it; so that a while after, when Mr Hooke propounded the problem solemnly, in the end of his attempt to prove the motion of the earth, if I had not known the duplicate proportion before, I could not but have found it now. Between ten and eleven years ago there was an hypothesis of mine registered in your books, wherein I hinted a cause of gravity towards the earth, sun and planets, with the dependence of the celestial motions thereon; in which the proportion of the decrease of gravity from the superficies of the planet (though for brevity's sake not there expressed) can be no other than reciprocally duplicate of the distance from the centre. And I hope I shall not be urged to declare, in print, that I understood not the obvious mathematical condition of my own hypothesis. But, grant I received it afterwards from Mr Hooke, yet have I as great a right to it as to the ellipsis. For as Kepler knew the orb to be not circular but oval, and guessed it to be elliptical, so Mr Hooke, without knowing what I have found out since his letters to me, can know no more, but that the proportion was duplicate *quam proximè* at great distances from the centre, and only guessed it to be so accurately, and guessed amiss in extending that proportion down to the very centre, whereas Kepler guessed right at the ellipsis. And so Mr Hooke found less of the proportion than Kepler of the ellipsis.

"There is so strong an objection against the accurateness of this proportion, that without my demonstrations, to which Mr Hooke is yet a stranger, it cannot be believed by a judicious philosopher to be any where accurate. And so, in stating this business, I do pretend to have done as much for the proportion as for the ellipsis, and to have as much right to the one from Mr Hooke and all men, as to the other from Kepler; and therefore on this account also he must at least moderate his pretences.

"The proof you sent me I like very well. I designed the whole to consist of three books; the second was finished last summer being short, and only wants transcribing, and drawing the cuts fairly. Some new propositions I have since thought on, which I can as well let alone. The third wants the theory of comets. In autumn last I spent two months in calculations to no purpose for want of a good method, which made me afterwards return to the first book, and enlarge it with divers propositions, some relating to comets, others to other things, found out last winter. The third I now design to suppress. Philosophy is such an impertinently litigious lady, that a man has as good be engaged in lawsuits, as have to do with her. I found it so formerly, and now I am no sooner come near her again, but she gives me warning. The two first books, without the third, will not so well bear the title of *Philosophiae Naturalis Principia Mathematica*; and therefore I had altered it to this, *De Motu Corporum libri duo.*

> "But, upon second thoughts, I retain the former title. 'Twill help the saie of the book, which I ought not to diminish now 'tis yours. The articles are, with the largest, to be called by that name; if you please you may change the word to sections, though it be not material. In the first page, I have struck out the words '*uti posthac docebitur*,' as referring to the third book; which is all at present, from your affectionate friend, and humble servant,
>
> "IS. NEWTON."

On the 29th of June 1686 Halley wrote to Newton:—"I am heartily sorry that in this matter, wherein all mankind ought to acknowledge their obligations to you, you should meet with anything that should give you unquiet"; and then, after an account of Hooke's claim to the discovery as made at a meeting of the Royal Society, he concludes:—

> "But I found that they were all of opinion that nothing thereof appearing in print, nor on the books of the Society, you ought to be considered as the inventor. And if in truth he knew it before you, he ought not to blame any but himself for having taken no more care to secure a discovery, which he puts so much value on. What application he has made in private, I know not; but I am sure that the Society have a very great satisfaction, in the honour you do them, by the dedication of so worthy a treatise. Sir, I must now again beg you, not to let your resentments run so high, as to deprive us of your third book, wherein the application of your mathematical doctrine to the theory of comets and several curious experiments, which, as I guess by what you write, ought to compose it, will undoubtedly render it acceptable to those, who will call themselves Philosophers without Mathematics, which are much the greater number. Now you approve of the character and paper, I will push on the edition vigorously. I have sometimes had thoughts of having the cuts neatly done in wood, so as to stand in the page with the demonstrations. It will be more convenient, and not much more charge. If it please you to have it so, I will try how well it can be done; otherwise I will have them in somewhat a larger size than those you have sent up.—I am, Sir, your most affectionate humble servant, E. HALLEY."

On the 30th of June 1686 the president was desired by the council to license Newton's book, entitled *Philosophiae Naturalis Principia Mathematica*.

On the 14th of July 1686 Newton wrote to Halley approving of his proposal to introduce woodcuts among the letterpress, stating clearly the different things which he had from Hooke, and adding, "And now having sincerely told you the case between Mr Hooke and me, I hope I shall be free for the future from the prejudice of his letters. I have considered how best to compose the present dispute, and I think it may be done by the inclosed scholium to the fourth proposition." This scholium was—"The inverse law of gravity holds in all the celestial motions, as was discovered also independently by my countrymen Wren, Hooke and Halley." After this letter of Newton's the printing of the *Principia* was begun. The second book, though ready for the press in the autumn of 1686, was not sent to the printers until March 1687. The third book was presented to the Society on the 6th of April 1687, and the whole work published about midsummer in that year. It was dedicated to the Royal Society, and to it was prefixed a set of Latin hexameters addressed by Halley to the author. The work, as might have been expected, caused a great deal of excitement throughout Europe, and the whole of the impression was very soon sold. In 1691 a copy of the *Principia* was hardly to be procured.

While Newton was writing the second and third books of the *Principia*, a very important event occurred at Cambridge which had the effect of bringing him before the public in a new light. James II. had already, in 1686, in open violation of the law, conferred the deanery of Christ Church at Oxford on John Massey, a person whose sole qualification was that he was a member of the Church of Rome; and the king had boasted to the pope's legate that "what he had done at Oxford would very soon be done at Cambridge." In accordance with this boast, in February 1687 he issued a mandate directing that Father Alban Francis, a Benedictine monk, should be admitted a master of arts of the university of Cambridge, without taking the oaths of allegiance and supremacy. Upon receiving the mandamus Dr Pechell, the master of Magdalene College, who was vice-chancellor, sent a messenger to the duke of Albemarle, the chancellor, to request him to get the mandamus recalled; and the registrary and the bedells waited upon Francis to offer him instant admission to the degree if only he would take the necessary oaths. Both the king and the monk were inexorable. The court and the university were thus placed in open collision. A menacing letter was despatched by Sunderland to shake the firmness of the university; but, though humble and respectful explanations were returned, the university showed no sign of compliance, nor even of a desire to suggest a compromise. In consequence the vice-chancellor and deputies from the senate were summoned to appear before the High Commission Court at Westminster. Newton was one of the eight deputies appointed by the senate for this purpose. The deputies, before starting for London, held a meeting to prepare their case for the court. A compromise which was put forward by one of them was stoutly and successfully resisted by Newton, and on the 21st of April the deputation, with their case carefully prepared, appeared before the court. Lord Jeffreys presided at the board. The deputation appeared as a matter of course before the commissioners, and were dismissed. On the 27th of April they gave in their plea. On the 7th of May it was discussed, and feebly defended by the vice-chancellor. The deputies maintained that in the late reign several royal mandates had been withdrawn, and that no degree had ever been conferred without the oaths having been previously taken. Jeffreys spoke with his accustomed insolence to the vice-chancellor, silenced the other deputies when they offered to speak, and ordered them out of court. When recalled the deputies were reprimanded, and Pechell was deprived of his office as vice-chancellor, and of his emoluments as master of Magdalene. Newton returned to Trinity College to complete the *Principia*. While thus occupied he had an extensive correspondence with Halley, a very great part of which is extant. The following letter from Halley, dated London, July 5th, 1687, announcing the completion of the *Principia*, is of peculiar interest:—

> "I have at length brought your book to an end, and hope it will please you. The last errata came just in time to be inserted. I will present from you the book you desire to the Royal Society, Mr Boyle, Mr Paget, Mr Flamsteed, and if there be any else in town that you design to gratify that way; and I have sent you to bestow on your friends in the University 20 copies, which I entreat you to accept. In the same parcel you will receive 40 more, which having no acquaintance in Cambridge, I must entreat you to put into the hands of one or more of your ablest booksellers to dispose of them. I intend the price of them, bound in calves' leather, and lettered, to be 9 shillings here. Those I send you I value in quires at 6 shillings, to take my money as they are sold, or at 5$^{\text{sh.}}$ for ready, or else at some short time; for I am satisfied there is no dealing in books without interesting the booksellers; and I am contented to let them go halves with me, rather than have your excellent work smothered by their combinations. I hope you will not repent you of the pains you have taken in so laudable a piece, so much to your own and the nation's credit, but rather, after you shall have a little diverted yourself with other studies, that you will resume those contemplations wherein you had so great success, and attempt the perfection of the lunar theory, which will be of prodigious use in navigation, as well as of profound and public speculation. . . . You will receive a box from me on Thursday next by the waggon, that starts from town to-morrow."

In 1692 and 1693 Newton seems to have had a serious illness, the nature of which has given rise to very considerable dispute. In a letter dated the 13th of September 1693, addressed to Samuel Pepys, he writes:—

> "Some time after Mr Millington had delivered your message, he pressed me to see you the next time I went to London. I was averse, but upon his pressing consented, before I considered what I did, for I am extremely troubled at the embroilment I am in, and have neither ate nor slept well this twelvemonth, nor have my former consistency of mind. I never designed to get any thing by your interest, nor by King James's favour, but am now sensible that I must withdraw from your acquaintance, and see neither you nor the rest of my friends any more, if I may but have them quietly. I beg your pardon for saying I would see you again, and rest your most humble and obedient servant."

And in a letter written to John Locke in reply to one of his about the second edition of his book, and dated the 15th of October 1693, Newton wrote:—

> "The last winter, by sleeping too often by my fire, I got an ill habit of sleeping; and a distemper, which this summer has been epidemical, put me farther out of order, so that when I wrote to you, I had not slept an hour a night for a fortnight together, and for five days together not a wink. I remember I wrote to you, but

what I said of your book I remember not. If you please to send me a transcript of that passage, I will give you an account of it if I can."

The loss of sleep to a person of Newton's temperament, whose mind was never at rest, and at times so wholly engrossed in his scientific pursuits that he even neglected to take food, must necessarily have led to a very great deal of nervous excitability. It is not astonishing that rumours got abroad that there was a danger of his mind giving way, or, according to a report which was believed at the time, that it had actually done so. Pepys must have heard such rumours, as in a letter to his friend Millington, the tutor of Magdalene College at Cambridge, dated the 26th of September 1693, he wrote:—

> "I must acknowledge myself not at the ease I would be glad to be at in reference to excellent Mr Newton; concerning whom (methinks) your answer labours under the same kind of restraint which (to tell you the truth) my asking did. For I was loth at first dash to tell you that I had lately received a letter from him so surprising to me for the inconsistency of every part of it, as to be put into great disorder by it, from the concernment I have for him, lest it should arise from that which of all mankind I should least dread from him and most lament for—I mean a discomposure in head, or mind, or both. Let me, therefore, beg you, Sir, having now told you the true ground of the trouble I lately gave you, to let me know the very truth of the matter, as far at least as comes within your knowledge."

On the 30th of September 1693 Millington wrote to Pepys that he had been to look for Newton some time before, but that "he was out of town, and since," he says,

> "I have not seen him, till upon the 28th I met him at Huntingdon, where, upon his own accord, and before I had time to ask him any question, he told me that he had writt to you a very odd letter, at which he was much concerned; added, that it was in a distemper that much seized his head, and that kept him awake for above five nights together, which upon occasion he desired I would represent to you, and beg your pardon, he being very much ashamed he should be so rude to a person for whom he hath so great an honour. He is now very well, and though I fear he is under some small degree of melancholy, yet I think there is no reason to suspect it hath at all touched his understanding, and I hope never will; and so I am sure all ought to wish that love learning or the honour of our nation, which it is a sign how much it is looked after, when such a person as Mr Newton lyes so neglected by those in power."

The illness of Newton was very much exaggerated by foreign contemporary writers. In a manuscript journal of Huygens is to be found an entry:—

> "29 Maj. 1694.—Narravit mihi D. Colm Scotus virum celeberrimum ac summum geometram Is. Neutonum in phrenesin incidisse abhinc anno et sex mensibus. An ex nimia studii assiduitate, an dolore infortunii, quod incendio laboratorium chymicum et scripta quaedam amiserat? Cum ad Archiepiscopum Cantabrigiensem venisset, ea locutum, quae alienationem mentis indicarent. Deinde ab amicis curam ejus susceptam, domoque clauso remedia volenti nolenti adhibita, quibus jam sanitatem recuperavit ut jam rursus librum suum Principiorum Philosophiae Mathematicorum intelligere incipiat."

Huygens, in a letter dated the 8th of June 1694, wrote to Leibnitz, "I do not know if you are acquainted with the accident which has happened to the good Mr Newton, namely, that he has had an attack of phrenitis, which lasted eighteen months, and of which they say his friends have cured him by means of remedies, and keeping him shut up." To which Leibnitz, in a letter dated the 22nd of June, replied, "I am very glad that I received information of the cure of Mr Newton at the same time that I first heard of his illness, which doubtless must have been very alarming."

The active part which Newton had taken in defending the legal privileges of the university against the encroachments of the crown had probably at least equal weight with his scientific reputation when his friends chose him as a candidate for a seat in parliament as one of the representatives of the university. The other candidates were Sir Robert Sawyer and Mr Finch. Sir Robert stood at the head of the poll with 125 votes, Newton next with 122 and Mr Finch was last with 117 votes. Newton retained his seat only about a year, from January 1689 till the dissolution of the Convention Parliament in February 1690. During this time Newton does not appear to have taken part in any of the debates in the House; but he was not neglectful of his duties as a member. On the 30th of April 1689 he moved for leave to bring in a bill to settle the charters and privileges of the university of Cambridge, just as Sir Thomas Clarges did for Oxford at the same time, and he wrote a series of letters to Dr Lovel, the vice-chancellor of the university, on points which affected the interests of the university and its members.

Some of the members of the university who had lately sworn allegiance to James had some difficulty in swearing allegiance to his successor. On the 12th of February 1689, the day of the coronation of William and Mary, Newton intimated to the vice-chancellor that he would soon receive an order to proclaim them at Cambridge. He enclosed a form of the proclamation, and expressed a hearty "wish that the university would so compose themselves as to perform the solemnity with a reasonable decorum."

During his residence in London Newton had made the acquaintance of John Locke. Locke had taken a very great interest in the new theories of the *Principia*. He was one of a number of Newton's friends who began to be uneasy and dissatisfied at seeing the most eminent scientific man of his age left to depend upon the meagre emoluments of a college fellowship and a professorship.

At one time Newton's friends had nearly succeeded in getting him appointed provost of King's College, Cambridge, but the college offered a successful resistance on the ground that the appointment would be illegal, as the statutes required that the provost should be in priest's orders. Charles Montague, who was afterwards earl of Halifax, was a fellow of Trinity College, and was a very intimate friend of Newton; and it was on his influence that Newton relied in the main for promotion to some post of honour and emolument. His hopes, however, were blighted by long delay. In one of his letters to Locke at the beginning of 1692, when Montague, Lord Monmouth and Locke were exerting themselves to obtain some appointment for him, Newton wrote that he was "fully convinced that Mr Montague, upon an old grudge which he thought had been worn out, was false to him." Newton was now in his fifty-fifth year, and whilst those of his own standing at the university had been appointed to high posts in church or state, he still remained without any mark of national gratitude. But this blot upon the English name was at last removed by Montague in 1694, when he was appointed chancellor of the exchequer. He had previously consulted Newton upon the subject of the recoinage, and on the opportunity occurring he appointed Newton to the post of warden of the mint. In a letter to Newton announcing the news, Montague writes:—

> "I am very glad that at last I can give you a good proof of my friendship, and the esteem the king has of your merits. Mr Overton, the warden of the mint, is made one of the Commissioners of Customs, and the king has promised me to make Mr Newton warden of the mint. The office is the most proper for you. 'Tis the chief office in the mint: 'tis worth five or six hundred pounds per annum, and has not too much business to require more attendance than you can spare."

This letter must have convinced Newton of the sincerity of Montague's good intentions towards him; we find them living as friends on the most intimate terms until Halifax's death in 1715.

Newton's chemical and mathematical knowledge proved of great use in carrying out the recoinage. This was completed in about two years. In 1697 Newton was appointed to the mastership of the mint, a post worth between £1200 and £1500 per annum. While he held this office, Newton drew up a very extensive table of assays of foreign coins, and composed an official report on the coinage.

Up to the time of the publication of the *Principia* in 1687 the method of fluxions which had been invented by Newton, and had been of great assistance to him in his mathematical investigations, was still, except to Newton and his friends, a secret. One of the most important rules of the method forms the second lemma of the second book of the *Principia*. Though this new and powerful method was of great help to Newton in his work, he did not exhibit it in the results. He was aware that the well-known geometrical methods of the ancients would clothe his new creations in a garb which would appear less strange and uncouth to those not familiar with the new method. The *Principia* gives no information on the subject of the notation adopted in the new calculus, and it was not until 1693 that it was communicated to the scientific world in the second volume of Dr Wallis's works.

Newton's admirers in Holland had informed Dr Wallis that Newton's method of fluxions passed there under the name of Leibnitz's *Calculus Differentialis*. It was therefore thought necessary that an early opportunity should be taken of asserting Newton's claim to be the inventor of the method of fluxions, and this was the reason for this method first appearing in Wallis's works. A further account of the method was given in the first edition of Newton's *Optics*, which appeared in 1704. To this work were added two treatises, entitled *Tractatus duo de speciebus et magnitudine figurarum curvilinearum*, the one bearing the title *Tractatus de Quadratura Curvarum*, and the other *Enumeratio linearum tertii ordinis*. The first contains an explanation of the doctrine of fluxions, and of its application to the quadrature of curves; the second, a classification of seventy-two curves of the third order, with an account of their properties. The reason for publishing these two tracts in his *Optics*, from the subsequent editions of which they were omitted, is thus stated in the advertisement:—

> "In a letter written to M Leibnitz in the year 1679, and published by Dr Wallis, I mentioned a method by which I had found some general theorems about squaring curvilinear figures on comparing them with the conic sections, or other the simplest figures with which they might be compared. And some years ago I lent out a manuscript containing such theorems; and having since met with some things copied out of it, I have on this occasion made it public, prefixing to it an introduction, and joining a Scholium concerning that method. And I have joined with it another small tract concerning the curvilineal figures of the second kind, which was also written many years ago, and made known to some friends, who have solicited the making it public."

In 1707 William Whiston published the algebraical lectures which Newton had delivered at Cambridge, under the title of *Arithmetica Universalis, sive de Compositione et Resolutione Arithmetica Liber*. We are not accurately informed how Whiston obtained possession of this work; but it is stated by one of the editors of the English edition "that Mr Whiston, thinking it a pity that so noble and useful a work should be doomed to a college confinement, obtained leave to make it public." It was soon afterwards translated into English by Raphson; and a second edition of it, with improvements by the author, was published at London in 1712, by Dr Machin, secretary to the Royal Society. With the view of stimulating mathematicians to write annotations on this admirable work, the celebrated 's Gravesande published a tract, entitled *Specimen Commentarii in Arithmeticam Universalem*; and Maclaurin's *Algebra* seems to have been drawn up in consequence of this appeal.

Newton's solution of the celebrated problems proposed by John Bernoulli and Leibnitz deserves mention among his mathematical works. In June 1696 Bernoulli addressed a letter to the mathematicians of Europe challenging them to solve two problems—(1) to determine the brachistochrone between two given points not in the same vertical line, (2) to determine a curve such that, if a straight line drawn through a fixed point A meet it in two points P_1, P_2, then $AP_1^m + AP_2^m$ will be constant. This challenge was first made in the *Acta Lipsiensia* for June 1696. Six months were allowed by Bernoulli for the solution of the problem, and in the event of none being sent to him he promised to publish his own. The six months elapsed without any solution being produced; but he received a letter from Leibnitz, stating that he had "cut the knot of the most beautiful of these problems," and requesting that the period for their solution should be extended to Christmas next, that the French and Italian mathematicians might have no reason to complain of the shortness of the period. Bernoulli adopted the suggestion, and publicly announced the prorogation for the information of those who might not see the *Acta Lipsiensia*.

On the 29th of January 1696/7 Newton received from France two copies of the printed paper containing the problems, and on the following day he transmitted a solution of them to Montague, then president of the Royal Society. He announced that the curve required in the first problem must be a cycloid, and he gave a method of determining it. He solved also the second problem, and he showed that by the same method other curves might be found which shall cut off three or more segments having the like properties. Solutions were also obtained from Leibnitz and the Marquis de L'Hôpital; and, although that of Newton was anonymous, yet Bernoulli recognized the author in his disguise; "tanquam," says he, "ex ungue leonem."

In 1699 Newton's position as a mathematician and natural philosopher was recognized by the French Academy of Sciences. In that year the Academy was remodelled, and eight foreign associates were created. Leibnitz, Domenico Guglielmini (1655–1710), Hartsoeker, and E. W. Tschirnhausen were appointed on the 4th of February, James Bernoulli and John Bernoulli on the 14th of February, and Newton and Olaus Roemer on the 21st of February.

While Newton held the office of warden of the mint, he retained his chair of mathematics at Cambridge, and discharged the duties of the post, but shortly after he was promoted to be master of the mint he appointed Whiston his deputy with "the full profits of the place." Whiston began his astronomical lectures as Newton's deputy in January 1701. On the 10th of December 1701 Newton resigned his professorship, thereby at the same time resigning his fellowship at Trinity, which he had held with the Lucasian professorship since 1675 by virtue of the royal mandate. Whiston's claims to succeed Newton in the Lucasian chair were successfully supported by Newton himself.

On the 26th of November 1701 Newton was again elected one of the representatives of the university in parliament, but he retained his seat only until the dissolution in the following July. Newton does not seem to have been a candidate at this election, but at the next dissolution in 1705 he was again a candidate for the representation of the university. He was warmly supported by the residents, but being a Whig in politics he was opposed by the non-residents, and beaten by a large majority.

In the autumn of 1703 Lord Somers retired from the presidency of the Royal Society, and Newton on the 30th of November 1703 was elected to succeed him. Newton was annually re-elected to this honourable post during the remainder of his life. He held the office in all twenty-five years, a period in which he has been exceeded by but one other president of the Royal Society, Sir Joseph Banks. As president Newton was brought into close connexion with Prince George of Denmark, the queen's husband, who had been elected a fellow of the Royal Society. The prince had offered, on Newton's recommendation, to be at the expense of printing Flamsteed's observations, and especially his catalogue of the stars. It was natural that the queen should form a high opinion of one whose merits had made such a deep impression on her husband. In April 1705, when the queen, the prince and the court were staying at the royal residence at Newmarket, they paid a visit to Cambridge, where they were the guests of Dr Bentley, the master of Trinity. Her Majesty went in state to the Regent House, where a congregation of the senate was held, and a number of honorary degrees conferred. Afterwards the queen held a court at Trinity Lodge, where (16th of April 1705) she conferred the order of knighthood upon Sir Isaac Newton.

As soon as the first edition of the *Principia* was published Newton began to prepare for a second edition. He was anxious to improve the work by additions to the theory of the motion of the moon and the planets. Dr Edleston, in his preface to Newton's correspondence with Cotes, justly remarks:—

> "If Flamsteed the Astronomer-Royal had cordially co-operated with him in the humble capacity of an observer in the way that Newton pointed out and requested of him . . . the lunar theory would, if its creator did not overrate his own powers, have been completely investigated, so far as he could do it, in the first few months of 1695, and a second edition of the *Principia* would probably have followed the execution of the task at no long interval."

Newton, however, could not get the information he wanted from Flamsteed, and after the spring of 1696 his time was much occupied by his duties at the mint. Rumours, however, of his work, and of a new edition, were heard from time to time. In February 1700 Leibnitz writes of Newton, "J'ai appris aussi (je ne sçai où) qu'il donnera encore quelque chose sur le mouvement de la lune: et on m'a dit aussi qu'il y aura une nouvelle édition de ses principes de la nature."

Dr Bentley, the master of Trinity College, had for a long time urged Newton to give his consent to the republication of the *Principia*. In the middle of 1708 Newton's consent was obtained, but it was not till the spring of 1709 that he was prevailed upon to entrust the superintendence of it to a young mathematician of great promise, Roger Cotes, fellow of Trinity College, who had been recently appointed the first Plumian professor of astronomy and experimental philosophy. On the 21st of May 1709, after having been that day with Newton, Bentley announced this arrangement to Cotes:—"Sir Isaac Newton," he said, "will be glad to see you in June, and then put into your hands one part of his book corrected for the press." About the middle of July Cotes went to London, in the expectation doubtless to bring down with him to Cambridge the corrected portion of the *Principia*. Although Cotes was impatient to begin his work, it was nearly the end of September before the corrected copy was put into his hands.

During the printing of this edition a correspondence went on continuously between Newton and Cotes. On the 31st of March 1713, when the edition was nearly ready for publication, Newton wrote to Cotes:—

> "I heare that Mr Bernoulli has sent a Paper of 40 pages to be published in the *Acta Leipsica* relating to what I have written upon the curve Lines described by Projectiles in resisting Mediums. And therein he partly makes Observations upon what I have written & partly improves it. To prevent being blamed by him or others for any disingenuity in not acknowledging my oversights or slips in the first edition, I believe it will not be amiss to print next after the old *Praefatio ad Lectorem*, the following account of this new Edition.
>
> "'In hac secunda Principiorum Editione, multa sparsim emendantur & nonnulla adjiciuntur. In Libri primi Sect. ii. Inventio virium quibus corpora in Orbibus datis revolvi possint, facilior redditur et amplior. In Libri secundi Sect. vii. Theoria resistentiae fluidorum accuratius investigatur & novis experimentis confirmatur. In Libro tertio Theoria Lunae & Praecessio Aequinoctiorum ex Principiis suis plenius deducuntur, et Theoria Cometarum pluribus et accuratius computatis Orbium exemplis confirmatur.
>
> "'28 Mar. 1713. I. N.'
>
> "If you write any further Preface, I must not see it, for I find that I shall be examined about it. The cuts for y^{e} Comet of 1680 & 1681 are printed off and will be sent to Dr Bently this week by the Carrier."

Newton's desire to have no hand in writing the preface seems to have proceeded from a knowledge that Cotes was proposing to allude to the dispute about the invention of fluxions. At last, about midsummer 1713, was published the long and impatiently expected second edition of the *Principia*, and, on the 27th of July, Newton waited on the queen to present her with a copy of the new edition.

In 1714 the question of finding the longitude at sea, which had been looked upon as an important one for several years, was brought into prominence by a petition presented to the House of Commons by a number of captains of Her Majesty's ships and merchant ships and of London merchants. The petition was referred to a committee of the House, who called witnesses. Newton appeared before them and gave evidence. He stated that for determining the longitude at sea there had been several projects, true in theory but difficult to execute. He mentioned four: (1) by a watch to keep time exactly, (2) by the eclipses of Jupiter's satellites, (3) by the place of the moon, (4) by a new method proposed by Mr Ditton. Newton criticized all the methods, pointing out their weak points, and it is due mainly to his evidence that the committee brought in the report which was accepted by the House, and shortly afterwards was converted into a Bill, passed both Houses, and received the royal assent. The report ran "that it is the opinion of this committee that a reward be settled by parliament upon such person or persons as shall discover a more certain and practicable method of ascertaining the longitude than any yet in practice; and the said reward be proportioned to the degree of exactness to which the said method shall reach."

Sir Isaac Newton was a very popular visitor at the court of George I. The princess of Wales, afterwards Queen Caroline, wife of George II., took every opportunity of conversing with him. Having one day been told by Sir Isaac that he had composed a new system of chronology while he was still resident at Cambridge, she requested him to give her a copy. He accordingly drew up an abstract of the system from his papers, and sent it to the princess for her own private use; but he afterwards allowed a copy to be made for the Abbé Conti on the express understanding that it should not be communicated to any other person. The abbé, however, lent his copy to M Fréret, an antiquary at Paris, who translated it, and endeavoured to refute it. The translation was printed under the title *Abrégé de chronologie de M le Chevallier Newton, fait par lui-même et traduit sur le manuscrit anglais*. Upon receiving a copy of this work, Sir Isaac Newton printed, in the *Philosophical Transactions* for 1725, a paper entitled "Remarks on the observations made on a Chronological Index of Sir Isaac Newton, translated into French by the observator, and published at Paris." In these remarks Sir Isaac charged the abbé with a breach of promise, and gave a triumphant answer to the objections which Fréret had urged against his system. Father Souciet entered the field in defence of Fréret; and in consequence of this controversy Sir Isaac was induced to prepare his larger work, which was published in 1728, after his death, and entitled *The Chronology of Ancient Kingdoms amended, to which is prefixed a short Chronicle from the First Memory of Kings in Europe to the Conquest of Persia by Alexander the Great.*

From an early period of his life Newton had paid great attention to theological studies, and it is well known that he had begun to study the subject of the prophecies before the year 1690. M Biot, with a view of showing that his theological writings were the productions of his dotage, has fixed their date between 1712 and 1719. That Newton's mind was even then quite clear and powerful is sufficiently proved by his ability to attack the most difficult mathematical problems with success. For it was in 1716 that Leibnitz, in a letter to the Abbé Conti, proposed a problem for solution "for the purpose of feeling the pulse of the English analysts." The problem was to find the orthogonal trajectories of a series of curves represented by a single equation. Newton received this problem about 5 o'clock in the afternoon as he was returning from the mint, but, though he was fatigued with business, he solved the problem the same evening.

One of the most remarkable of Sir Isaac's theological productions is his *Historical Account of Two Notable Corruptions of the Scripture*, in a letter to a friend. This friend was Locke, who received the letter in November 1690. Sir Isaac seems to have been then anxious for its publication; but, as the effect of his argument was to deprive the Trinitarians of two passages in favour of the Trinity, he became alarmed at the probable consequences of such a step. He therefore requested Locke, who was then going to Holland, to get it translated into French, and published on the continent. Being prevented from going to Holland, Locke copied the manuscript, and sent it, without Newton's name, to Le Clerc, who received it before the 11th of April 1691. On the 20th of January 1692 Le Clerc announced to Locke his intention to publish the pamphlet in Latin; and, upon the intimation of this to Sir Isaac, he entreated him "to stop the translation and impression as soon as he could, for he designed to suppress them." This was accordingly done; but Le Clerc sent the manuscript to the library of the Remonstrants, and it was afterwards published at London in 1754, under the title of *Two Letters from Sir Isaac Newton to M le Clerc*. This edition is imperfect, and in many places erroneous. Dr Horsley therefore published a genuine one, which is in the form of a single letter to a friend, and was taken from a manuscript in Sir Isaac's own hand.

Sir Isaac Newton left behind him in manuscript a work entitled *Observations on the Prophecies of Daniel and the Apocalypse of St John*, which was published in London in 1733, in one volume 4to; another work, entitled *Lexicon Propheticum*, with a dissertation on the sacred cubit of the Jews, which was printed in 1737; and four letters addressed to Bentley, containing some arguments in proof of a Deity, which were published by Cumberland, a nephew of Bentley, in 1756. Sir Isaac also left a *Church History* complete, a *History of the Creation*, *Paradoxical Questions regarding Athanasius*, and many divinity tracts.

Newton devoted much of his time to the study of chemistry; but the greater number of his experiments still remain in manuscript. His *Tabula Quantitatum et Graduum Caloris* contains a comparative scale of temperature from that of melting ice to that of a small kitchen fire. He wrote also another chemical paper *De Natura Acidorum*, which has been published by Dr Horsley. Sir Isaac spent much time in the study of the works of the alchemists. He had diligently studied the works of Jacob Boehme, and there were found amongst his manuscripts copious abstracts from them in his own handwriting. In the earlier part of his life he and his relation Dr Newton of Grantham had put up furnaces, and had wrought for several months in quest of the philosopher's tincture. Among the manuscripts in the possession of the earl of Portsmouth there are many sheets in Sir Isaac's hand of Flamsteed's *Explication of Hieroglyphic Figures*, and in another hand many sheets of William Yworth's *Processus Mysterii Magni Philosophicus*.

In the last few years of his life Newton was troubled with incontinence of urine, which was supposed to be due to stone; but with care he kept the disease under control. In January 1725 he was seized with a violent cough and inflammation of the lungs, which induced him to reside at Kensington; and in the following month he had a severe attack of gout, which produced a decided improvement in his general health. His duties at the mint were discharged by John Conduitt, and he therefore seldom went from home. On the 28th of February 1727, feeling well, he went to London to preside at a meeting of the Royal Society; but the fatigue which attended this duty brought on a violent return of his former complaint, and he returned to Kensington on the 4th of March, when Dr Mead and Dr Chesselden pronounced his disease to be stone. He endured the sufferings of this complaint with wonderful patience. He seemed a little better on the 15th of March, and on the 18th he read the newspapers and conversed with Dr Mead; but at 6 o'clock in the evening he became insensible, and continued in that state till Monday the 20th of March 1727, when he expired without pain between one and two o'clock in the morning. His body was removed to London, and on Tuesday the 28th of March it lay in state in the Jerusalem Chamber, and was thence conveyed to Westminster Abbey, where it was buried.

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NEWTON, JOHN (1725–1807), English divine, was born in London on the 24th of July 1725 (O.S.). His father, who for a long time was master of a ship in the Mediterranean trade, became in 1748 governor of York Fort, Hudson Bay, where he died in 1751. The lad had little education and served on his father's ship from 1737 to 1742; shortly afterwards he was impressed on board a man-of-war, the "Harwich," where he was made a midshipman. For an attempt to escape while his ship lay off Plymouth he was degraded, and treated with so much severity that he gladly exchanged into an African trader. He made many voyages as mate and then as master on slave-trading ships, devoting his leisure to the improvement of his education. The state of his health and perhaps a growing distaste for the slave trade led him to quit the sea in 1755, when he was appointed tide-surveyor at Liverpool. He began to study Greek and Hebrew, and in 1758 applied to the archbishop of York for ordination. This was refused him, but, having had the curacy of Olney offered to him in April 1764 he was ordained by the bishop of Lincoln. In October 1767 William Cowper settled in the parish. An intimate friendship sprang up between the two men, and they published together the *Olney Hymns* (1779). In 1779 Newton left Olney to become rector of St Mary Woolnoth, London, where he laboured with unceasing diligence and great popularity till his death on the 31st of December 1807.

Like Cowper, Newton held Calvinistic views, although his evangelical fervour allied him closely with the sentiments of Wesley and the Methodists. His fame rests on certain of the *Olney Hymns* (*e.g.* "Glorious things of Thee are spoken," "How sweet the name of Jesus sounds," "One there is above all others,") remarkable for vigour, simplicity and directness of devotional utterance.

His prose works include an *Authentic Narrative of some Interesting and Remarkable Particulars in the Life of John Newton* (1764), a volume of *Sermons* (1767), *Omicron* (a series of letters on religion, 1774), *Review of Ecclesiastical History* (1769) and *Cardiphonia* (1781). This last was a further selection of religious correspondence, which did much to help the Evangelical revival. Thomas Scott, William Wilberforce, Charles Simeon, William Jay and Hannah More all came under his direct influence. His *Letters to a Wife* (1793) and *Letters to Rev. W. Bull* (posthumous, 1847) illustrate the frankness with which he exposed his most intimate personal experiences. A *Life* of Newton by Richard Cecil was prefixed to a collected edition of his works (6 vols., 1808; 1 vol. 1827). See also T. Wright, *The Town of Cowper*.

NEWTON, JOHN (1823–1895), American general and engineer, was born in Norfolk, Virginia, on the 24th of August 1823, and graduated second in his class at the U.S. Military Academy in 1842. From 1842 to 1861 he was engaged in the construction of coast defences and the improvement of waterways; he was assistant professor of engineering in the Military Academy from 1843 to 1846, became a captain in 1856, and took part as chief engineer in the Utah expedition of 1857–1858. He served as an engineer in the Virginian campaign of 1861, and was promoted brigadier-general, U.S.V., in September. He especially distinguished himself in the Seven Days' battle and at Antietam, and after the battle of Fredericksburg was made major-general, U.S.V. In the Chancellorsville campaign Newton took part in the storming of Marye's Heights at Fredericksburg, on the 3rd of May 1863, and at the battle of Gettysburg he was for a time in command of the I. corps. He had already received the brevet of lieutenant-colonel for his services at Antietam, and he now became brevet colonel for his services at Gettysburg. Later he was transferred to Sherman's army, and as a division commander under General Oliver O. Howard took part in the Atlanta campaign. For gallant conduct at Peach Tree Creek he was made brevet brigadier-general, and at the close of the war was made brevet major-general, U.S.A. Returning to regular engineering duty after the war, he was stationed at New York from 1866 to 1884. His most important work there was the improvement of the Hudson river, and especially the removal of the obstructions to shipping in the dangerous entrance to the East river from Long Island Sound, known as Hell Gate. Under two of the largest obstructions—Hallet's Point and Flood Rock, with a surface of three acres and nine acres respectively—shafts were sunk from the shore, and tunnels were bored in every direction. In these tunnels thousands of pounds of explosives were placed, and the rocks were blown into fragments. In March 1884 he became Chief of Engineers, with the rank of brigadier-general, and held this position until his retirement from the army, at his own request, in August 1886. In 1887–1888 he was commissioner of public works in New York City, and from 1888 until his death, on the 1st of May 1895, he was president of the Panama railway.

NEWTON, a city and the county-seat of Harvey county, Kansas, U.S.A., about 27 m. N. of Wichita. Pop. (1905) 6601; (1910) 7862. It is served by the Atchison, Topeka & Santa Fé (of which it is a division point and which has shops here), and the Missouri Pacific railways. Newton is the centre of the settlements of the German-Russian Mennonites, a thrifty people, who immigrated in 1873 and subsequently; Bethel College (opened 1893) is a Mennonite secondary school, and there is a Mennonite hospital. Newton is a supply and distributing point for the surrounding agricultural and stock-raising region, and has various manufactures. The municipality has natural gas for heating, lighting and manufacturing. Newton was first settled in 1871, was chartered as a city in 1872, and in 1910 adopted a commission form of government.

NEWTON, a city of Middlesex county, Massachusetts, U.S.A., 10 m. W. of Boston, on the S. bank of the Charles river, which borders it for 16 m. Pop. (1880) 16,995; (1890) 24,379; (1900) 33,587, of whom 10,068 were foreign-born, 19,006 of foreign parentage and 505 were negroes; (1910, census) 39,806. Newton is served by the Boston & Albany railway. The city, with an area of 17·98 sq. m., contains 15 villages. In Newton, the most prominent of these villages, is a stone terrace monument to John Eliot, erected on the site of Waban's wigwam near Nonantum Hill, where Eliot founded the first Indian Church on the 28th of October 1646—the Nonantum Indians, under their chief Waban, removed to Natick in 1651. On Institution Hill, Newton Centre, is the first Baptist theological seminary in America, Newton Theological Institution, founded in 1825. Here also is the residence of Samuel Francis Smith (1808–1895), author of " America " and several missionary hymns, and pastor here in 1842–1854. In Newton Upper Falls, Echo Bridge (of the Boston Aqueduct) crosses the Charles near the falls in Hemlock Gorge Reservation of the Metropolitan Park system. Auburndale is the seat of Lasell Seminary for Young Women, founded in 1851 by Edward Lasell (1809–1852). Other of the villages are Newtonville, West Newton and Newton Highlands. The city of Newton is primarily a residential suburb of Boston; along the Charles is a part (191·12 acres) of the Charles River Reservation of the Metropolitan Park system, and the city has several attractive public parks, including Norumbega Park, on the banks of the river, with a large open-air theatre; boating, especially canoeing, on the river is very popular. The city has a public library, a high school and a technical high school. Among its manufactures are foundry and machine shop products, worsted goods and electrical apparatus; the factories utilize the water power of the falls. The value of the manufactured product in 1905 was $4,140,996. The region was settled as a part of Cambridge in 1630 and was called South Side (*i.e.* of the Charles), Nonantum (the Indian name), Cambridge Village, Little Cambridge or New Cambridge; in 1688 it was incorporated as a separate town and in 1691 received its present name; it annexed an island in the Charles in 1803; parts of it were annexed to Roxbury (1838) and Waltham (1849); it became a city in 1873; and in 1875 it annexed a part of Boston, with which there have been several more recent boundary adjustments.

NEWTON ABBOT, a market town and seaport in the Ashburton parliamentary division of Devonshire, England, 20 m. S. by W. of Exeter by the Great Western railway. Pop. of urban district (1901) 12,517. Beautifully situated at the head of the Teign estuary, the town grew rapidly in the 19th century. The two parish churches, St Mary's in Wolborough, and All Saints' in Highweek, are Perpendicular in style. St Mary's contains a Norman font, an ancient brass lectern, buried during the Civil Wars, and some interesting heraldic ornaments which date from the 15th century. Of the 14th century chapel of St Leonard, only a tower survives. A large nunnery, called St Augustine's Priory, was erected near the town in 1861; while eastward is the Jacobean Forde House, belonging to the earl of Devon, and visited by Charles I. and William of Orange, who first read his declaration to the people of England at Newton Abbot market-cross. The establishment of large engine works by the Great Western railway has aided the development of local industries, and there is a considerable shipping trade, fine china clay and pipeclay being worked near the towns and exported to the Potteries. Large fairs are held for the sale of agricultural produce and livestock. The portion of Newton Abbot in the parish of Highweek was formerly a separate town, known as Newton Bushel.

Probably both Newton Abbot and Newton Bushel were originally included under the name of Newton. Newton Abbot was given to the abbot of Tor by William Lord Brewer, founder of the monastery (1196). Newton Bushel was so called from Robert Bussell or Bushel, foster-child and kinsman of Theobald de Englishville, who was made lord of the manor by Henry III. in 1246.

NEWTON-IN-MAKERFIELD, or NEWTON-LE-WILLOWS, an urban district in the Newton parliamentary division of Lancashire, England, 15½ m. W. of Manchester by the London & North-Western railway. Pop. (1891) 12,861; (1901) 16,699. At a short distance from the town is a moated Elizabethan half-timbered house, and also an ancient barrow of great extent. The Liverpool farm reformatory school is in the neighbourhood. The industrial establishments include foundries, printing and stationery works, paper mills, glass works and sugar refineries. Coal abounds in the neighbourhood.

The township of Newton-in-Makerfield, gave its name in Saxon times and in the reign of William the Conqueror to one of the hundreds of Lancashire. The barony was held by the Banastres from the conquest to 1286 and passed successively to the Langtons, Fleetwoods and Leghs. It does not seem that the barons were ever summoned to parliament, and the title, like all parliamentary titles, has fallen into disuse since the abolition of feudal tenures. The courts-baron and courts-leet are held twice annually. The township returned two members to parliament from 1559 to 1831, but was disfranchised by the Reform Act of 1832. There was a market here at least as early as 1558 which is now discontinued. Near the town a party of Highlanders were taken prisoners in 1648 by Cromwell's troops, and hanged in an adjoining wood, still called Gallow's Cross.

NEWTOWN, a municipality of Cumberland county, New South Wales, Australia, 3½ m. S.W. of Sydney. It consists chiefly of the residences of the wealthier citizens of Sydney and is connected with the city by rail and tram. As a municipality it dates from 1862. Pop (1901) 22,598.

NEWTOWN (Welsh *Drefnewydd*, with the same meaning, formerly *Llanfair Cedewain*), a market town and contributory parliamentary borough of Montgomeryshire, situated on both sides of the Severn, and on the Cambrian railway, 195 m. from London. Pop. of urban district of Newtown and Llanllwchhaiarn (1901) 6500. It is connected with Shrewsbury (*Amwythig*) by the Montgomeryshire canal. The old Anglican church, partly Decorated and partly Perpendicular, has been superseded by the modern St Mary's, which contains the font and rood-screen of the old building. In the old churchyard lies Robert Owen, born in 1771 at Newtown, where he died in 1858, known as "the patriarch of reason," author of *New Views of Society*, &c., and one of the fathers of communism. Newtown, rather than Welshpool, is the chief seat of Welsh flannel manufacture, together with that of tweeds and shawls. It joins with Welshpool, Llanfyllin, Montgomery (*Trefaldwyn*), Llanidloes and Machynlleth, in returning a member to parliament.

NEWTOWNARDS (pron. *Newtonárds*), a market town of Co. Down, Ireland, beautifully situated near the northern extremity of Strangford Lough, on a branch of the Belfast and Co. Down railway, 9½ m. E. of Belfast. Pop. (1901) 9110. The town is sheltered by the Scrabo Hills on the west and north, and possesses a fine square, in which the pedestal of an ancient cross was erected in 1636. Muslin embroidery is the principal industry. There are also mills for flax and hemp yarns, a weaving factory and a hosiery factory. The remains of the old church, originally erected in 1244, contain good Perpendicular work, and the family vault of the Londonderrys; there are also the parish church and Presbyterian church, with lofty spires, and a Roman Catholic chapel. In the neighbourhood there are freestone quarries.

The town owes its origin to a Dominican monastery founded in 1244 by Walter de Burgh. It was forfeited by the O'Neills, and given to the Hamiltons and Montgomeries, from whom it passed to the marquess of Londonderry. It received a charter from James I., and until the Union in 1800 returned two members to parliament. The ruined abbey of Moville, 1½ m. N.E., is the most notable of the many ecclesiastical remains in the neighbourhood. It is attributed to St Finian (*c.* 550).

NEW ULM, a city and the county seat of Brown county, Minnesota, U.S.A., on the S. bank of the Minnesota river, 88 m. (by rail) S.W. of Minneapolis, in the south central part of the state. Pop. (1905, state census) 5720 (1287 of German birth); (1910) 5648. New Ulm is served by the Minneapolis & St Louis, and the Chicago & North Western railways. In the south-western part of the city, on a wooded hill called Hermann Heights, there is a statue of Arminius erected by the Grand Lodge of Hermann's Sons of the United States. New Ulm is an important livestock market. The city is the seat of the Dr Martin Luther College (Lutheran, 1884), a secondary school, with a normal and a collegiate department. St Michael's Academy and St Alexander Hospital are under the charge of Roman Catholic sisters. New Ulm was settled about 1853, and was twice attacked and almost destroyed by the Indians during the Sioux uprising of 1862. There is a monument to those who lost their lives in the Sioux massacres.

NEW WASHINGTON, a town of the province of Capiz, island of Panay, Philippine Islands, on the N. coast about 17 m. W. of Capiz, the capital of the province. The town was formed in 1903 by uniting the towns of Batan, Jimeno, Balete and the village or barrio of Lagatic in the town of Calibo; the total population at that time was 24,480. There are about sixty-six barrios, but all of these except Lagatic, the seat of the municipal government, had in 1903 less than 1000 inhabitants. The language is Visayan. The cultivation of rice, sugar cane, hemp, and Indian corn and the raising of cattle and horses are the principal industries.

NEW WESTMINSTER, a city on the north bank of the Fraser river, British Columbia, 15 m. from the mouth. Pop. (1906 estimate) 7900. Founded in 1859 it was the capital of British Columbia when the British possessions on the Pacific coast formed two colonies—*i.e.* British Columbia (the mainland portion) and Vancouver Island. The city is accessible to ocean-going ships of 16 ft. draught. It is the chief centre of the farming country of the lower Fraser and has a small export lumber trade. In 1898 the greater portion of the business part of the city was destroyed by fire, and though much of it was rebuilt, the establishment of the city of Vancouver, only 12 m. distant, seriously affected its growth. It is connected with Vancouver by an electric railway. The Great Northern railway, connecting with Seattle and other points in the state of Washington, here crosses the Fraser river by a fine bridge.

NEW YEAR'S DAY, the first day of the year. In the Gregorian calendar this date occurs twelve days earlier than in the Julian; thus in Russia, Greece, &c., where the latter is still employed, New Year's Day is celebrated on the English 13th of January.

The ancient Egyptians, Phoenicians and Persians began their year at the autumnal equinox (Sept. 21) and the Greeks until the 5th century B.C. at the winter solstice (Dec. 21). In 432 B.C. the latter altered their New Year's Day to the 21st of June. The ancient Romans celebrated the beginning of the year on the 21st of December, but Caesar by the adoption of the Julian calendar postponed it to the 1st of January. The Jews have always reckoned their civil year from the first day of the month of Tishri (Sept. 6-Oct. 5), but their ecclesiastical year begins at the spring equinox (March 21). The 25th of March was the usual date among most Christian peoples in early medieval days. In Anglo-Saxon England, however, the 25th of December was New Year's Day. At the Norman Conquest owing, it is believed, to the coincidence of his coronation being arranged for that date, William the Conqueror ordered that the year should start on the 1st of January. But later England began her year with the rest of Christendom on the 25th of March. The Gregorian calendar (1582), which restored the 1st of January to its position as New Year's Day, was accepted by all Catholic countries at once; by Germany, Denmark and Sweden about 1700, but not until 1751 by England.

The Romans, after the adoption of the Julian calendar, kept the 1st of January as a general holiday. Sacrifices were made to Janus; gifts and visits were exchanged, and masquerading and feasting were general. Congratulatory presents were made to the magistrates who entered upon office on this day. The emperors at the new year exacted from their subjects tribute of a pound of gold. This quasi-present was called *strena*, a term (extended to all New Year's gifts in Rome) traditionally derived from a custom initiated by the legendary King Tatius, to whom branches of vervain gathered in the sacred Grove of Strenua, the goddess of strength, were presented as a good omen on the first day of the year 747 B.C. The imperial *strenae* later became so excessive that Claudius found it necessary to limit the amount by formal decree.

Participation in the ordinary New Year's Day observances as well as in the Saturnalia of December was from the first discouraged by the Church. Christians were expected to spend the day in quiet meditation, reading of scripture and acts of charity. When about the 5th century the 25th of December had become a fixed festival commemorative of the Nativity, the 1st of January assumed a specially sacred character as the octave of Christmas Day and as the anniversary of the Circumcision. As such it still figures in the calendars of the various branches of the Eastern and Western Church, though only as a feast of subordinate importance. The first mention of it in Christian literature as a feast occurs in Canon 17 of a council which met at Tours in 567.

The custom of giving and receiving *strenae* for luck at the New Year survives in France (where New Year's Day is known as *le jour d'étrennes*) and the Continent generally. In England its place has been taken by the Christmas-gift. In Scotland, where New Year's Day is more generally observed than Christmas, the custom is still universal. The Persians celebrated the beginning of the year by exchanging presents of eggs. The Druids distributed as New Year's gifts branches of the sacred mistletoe. In Anglo-Saxon and Norman England New Year's gifts were common. According to Matthew Paris, Henry III. followed the Roman precedent by extorting New Year's gifts from his subjects. These in later reigns became voluntary but none the less obligatory on those who wished to stand well with the throne. The custom reached its climax in Tudor times. Wolsey one New Year gave Henry VIII. a gold cup valued at £117, 17s. 6d. in the coinage of that time. An MS. account is preserved of money gifts given to King Henry by all classes of his subjects on New Year's Day 1533. The total reached many thousands. Bishop Latimer, however, handed Henry instead of a purse a New Testament with a leaf doubled down at Hebrews xiii. 4, as apposite to the king's then impending marriage with Anne Boleyn. In Edward VI.'s time, if not earlier, it was usual for the sovereign to give "rewards" to those who presented New Year's gifts. Elizabeth is related to have been most conscientious in this regard. The custom of offering New Year's gifts to the sovereign became obsolete during the Commonwealth and was not revived at the Restoration.

NEW YORK, one of the original thirteen United States of America, situated between 40° 29′ 40″ and 45° 0′ 2″ N., and between 71° 51′ and 79° 45′ 54·4″ W. Its northern boundary is, for the most part, formed by Lake Ontario and the St Lawrence river, which separate it from the province of Ontario, Canada; but north of the Adirondacks the boundary line leaves the St Lawrence, extending in a due east direction to the lower end of Lake Champlain. Thus the boundary between New York and the province of Quebec, Canada, is wholly artificial. Vermont, Massachusetts and Connecticut bound New York on the E.; the Atlantic Ocean, New Jersey and Pennsylvania, on the S.; and Pennsylvania, Lake Erie and the Niagara river on the W.

The state has a triangular outline, with a breadth from E. to W. of 326·46 m. and from N. to S., on the line of the Hudson, of 300 m. In addition, it includes Long Island and Staten Island on the Atlantic Coast. Its land area is 47,654 sq. m. and the area of the inland waters is 1550 sq. m., giving a total area of 49,204 sq. m. In addition to this, New York includes 3140 sq. m. of water in Lakes Ontario and Erie.

Topography.—The most notable topographic feature is the roughly circular mountain area of north-eastern New York known as the Adirondack mountains (*q.v.*). This is a very ancient mountain mass of crystalline rocks resembling more the Laurentian mountains of Canada than the Appalachians. Indeed, it is commonly considered to be an extension of the Canadian mountains. Parts of the crystalline area are worn down to a condition of low relief, but in the main mountain mass, although greatly worn, there are still elevations of truly mountainous proportions. The highest peak is Mount Marcy (5344 ft.), though associated with it are several other peaks with an elevation from 4000 to 5000 ft. Even the higher summits are worn to a rounded condition, and are therefore for the most part forest covered up to the timber line which, on Mount Marcy, is at an elevation of about 4900 ft. From the crest of the dome of the Adirondacks proper the surface slopes in all directions to surrounding lowlands: to the St Lawrence valley on the N.; the Champlain-Hudson lowland on the E.; the Mohawk valley on the S.; and Lake Ontario on the W. While igneous and metamorphic crystalline rocks form the bulk of the Adirondack area, it is surrounded by a ring of ancient Palaeozoic sediments in which these peripheral lowlands have been developed. The Adirondack area proper, and much of the surrounding ring of more recent rocks, is either too rugged, or has a soil too thin and rocky for extensive agriculture. It is therefore a sparsely settled region with lumbering for one of the leading industries, though there is some mining, as of iron. Owing to the varied and beautiful scenery, this is a favourite summer resort; the game of the forests and the fishing in the streams and in the multitude of lakes serve as further attractions. In the peripheral ring farming increases, especially dairying; and manufacturing industries connected with the products of forests, farms and mines are developed. These and other manufacturing industries are greatly aided by the extensive water power furnished by the mountain streams which flow out radially from the central area.

South of the Adirondack region, and S. of the Mohawk Valley, rises a high-level plateau which extends westward to the Pennsylvania boundary. Here the rocks are all essentially horizontal and of Palaeozoic age, mainly Devonian. This plateau province, which includes more than half the state, differs greatly from place to place. Its elevation decreases toward the N. by a series of steps, having its lowest elevation on the Ontario plain which skirts the southern shore of Lake Ontario. Similar to this is a narrow plain along the southern shore of Lake Erie, which, in fact, lies in a shallow depression in this Erie plain. Both of these plains are so level, and have so fertile a soil that they are the seats of extensive agriculture, especially fruit raising, which is further encouraged by the influence of the large bodies of lake water that moderate the heat of summer and the cold of winter, and tend to check the late frosts of spring and the early frosts of autumn.

Elsewhere in the plateau province the land is higher and the surface far more irregular, increasing in ruggedness toward both the S. and the E. Elevations of between 1500 and 2000 ft. are common in this region all the way from Chautauqua county in the extreme W. to the Catskill mountains in the E.; and in places the surface becomes so rugged as to simulate the features of mountains and locally to win the name mountain. Valleys are deeply sunk in the plateau, the largest with bottom lands of sufficient width to give rise to strips of fertile farm land. The valley walls rise to undulating, and often fairly level uplands, which are, in large part, cleared of forest; but the uplands are remote from markets, and the soil is thin. In the main they are grazing lands—the seat of important dairy and sheep-raising industries. This is the region of abandoned farm houses. Thousands have been deserted and they may be found along all the upland roads.

Since this plateau region is a northward extension of the Alleghany plateau, which skirts the western base of the Appalachian mountains, it rises as the mountains are approached. Thus, in S.E. New York, where the Appalachians enter the state, the plateau becomes much higher than in the W., reaching its culmination in the Catskills. Here, partly because of elevation, and partly because of the resistant nature of the Catskill sandstones, dissection has so sculptured the plateau as to carve it into a mountainous mass which is generally known as the Catskill mountains. In this part of the plateau, summit elevations of from 3000 to 4000 ft. are common, the highest point being Slide Mountain (4205 ft.). Like the Adirondacks, this region is largely forest covered, and is a favourite summer resort; but it is far less a wilderness than the Adirondacks, and in places is cleared for farming, especially for pasturage.

In the plateau province there are other areas known as mountains, of which the Helderberg mountains are the most conspicuous. This formation is really an escarpment facing the lower Mohawk and the Hudson river S. of Albany, where there is a downward step in the plateau. The steeply rising face of the plateau here is due to the resistance of a durable layer of limestone, known as the Helderberg limestone. There are other lower escarpments in the plateau province, similar in form and cause to the Helderberg escarpment. Of these the most notable is the Niagara escarpment which extends eastward from Canada, past Lewiston and Lockport,—a downward step from the Erie to the Ontario plain, where the Niagara limestone outcrops, and its resistance to denudation accounts for the steeply rising face at the boundary between the two plains.

South and S.E. of the Catskills, although including only a small portion of the state, there are a number of different topographic features, due to the belts of different rock structure which cross the state from S.W. to N.E. First come the low folds of the western Appalachians, which, though well developed in Pennsylvania, die out near the New York boundary. The most pronounced of these upfolded strata in New York form the low Shawangunk mountains, which descend, toward the S.E., to a lowland region of folded strata of limestone, slate and other rocks in Orange and Dutchess counties. This lowland area, due to the non-resistant character of the strata, is a continuation of the Great Valley of the Appalachians, and extends N.E. into Vermont and S.W. across New Jersey, Pennsylvania, Maryland and Virginia. It is bounded on its S.E. side by the Highlands, a belt of ancient crystalline rocks which extends N.E. into Connecticut and Massachusetts, and S.W. into the Highlands of New Jersey and thence to the Blue Ridge. South of the Highlands, in New Jersey, but extending to the very banks of the Hudson, is a belt of Triassic sandstone with intrusions of trap rock, which, on account of its peculiar columnar jointing, has developed a palisade structure—the famous Palisades of the lower Hudson. On the New York side of the Hudson the rocks are crystalline, the surface a region of low hills, a continuation of the crystalline area of Connecticut, and comparable with the Piedmont plateau of the Southern states. Long Island, though modified by extensive glacial deposits, may be considered a N.E. extension of the coastal plains which attain a much more perfect development in New Jersey and the states farther S.

The entire surface of New York, with the exception of a very small area in the extreme W., in Chautauqua and Cattaraugus counties, was covered by the continental glacier. With its source in Canada, it overrode even the highest mountains and spread beyond the boundary of New York into Pennsylvania and New Jersey; but farther E. its front rested on Staten Island and Long Island, whose surface features, and a part of whose area, are due to the deposits along the ice front, including terminal moraines and outwash gravel plains. Elsewhere in the state, also, the work of the glacier is very evident. It broadened and deepened many of the valleys; rounded the hills; turned aside many streams, causing changes in drainage and giving rise to innumerable waterfalls and rapids; and it formed the thousands of lakes, large and small, which dot the surface. As the ice receded, it halted at various points, forming moraines and other glacial deposits. Thus the soil of almost the entire state has been derived by glacial action. After the continental ice sheet entirely disappeared from the state, local valley glaciers lingered in the Adirondacks and the Catskills.

Drainage.—The drainage of New York finds its way to the sea in various directions. The St Lawrence system receives the most, mainly from short streams from the plateau province and from the Adirondacks. A small part of the state, in the W., drains to the Ohio, and thence, by way of the Mississippi, to the Gulf of Mexico; and a much larger area drains into the Susquehanna, entering the head of Chesapeake Bay. A part of the Catskills, and the region farther S., drains into Delaware Bay through the Delaware river. Thus New York is pre-eminently a divide region, sending its drainage, by various courses, into widely separated parts of the ocean. Only the Hudson and a few streams in the extreme S. have independent courses to the sea within the state itself.

The Hudson (*q.v.*) is essentially a New York stream, though it receives some drainage from the New England States through its small eastern tributaries. Its entire course is within New York, from which it receives most of its water supply. It is by far the most important river in the state, for, owing to the sinking of the land, which has admitted the tide as far as Troy, it is navigable for 151 m. from the sea. Thence westward the Mohawk Valley furnishes a highway which is followed by canal, railway and waggon road. Thus there is here a gap, easily traversed, across the Appalachian mountains and plateaus to the more level and fertile plains beyond. A low gap also leads northward from the Hudson to the Champlain Valley across a pass only 147 ft. above sea-level. This was of much importance in early wars; but it is of only minor importance as a commercial highway since it leads to Canada through a region of little economic importance.

The lower Hudson, below Troy, is really a fiord, the stream valley being drowned by the sea through subsidence of the land. It is noted for its remarkable scenery, especially where it crosses the Highlands. The other large river valleys are far less useful as highways, though each is paralleled by one or more railways. The action of the continental glacier in scouring down the passes between the St Lawrence and southern drainage, and in turning streams southward, has facilitated the building of railways across the divides.

There are thousands of lakes and ponds in the state, most of them very small and all, even including Lakes Erie and Ontario, the result of glacial action. The largest lake apart from Erie and Ontario is the beautiful Lake Champlain, which lies on the eastern boundary, partly in Vermont, and with the N. end in Canada. It occupies the lower portion of the trough between the Adirondacks and the Green Mountains. The largest lake entirely within the state is Lake George, famous for its beautiful scenery. In the central part of the state are a series of peculiar elongated lakes, extending in a nearly N.S. direction, known as the Finger Lakes. The largest of these are Cayuga, Seneca, Keuka, Canandaigua, Owasco and Skaneateles. In the extreme western part of the state is Chautauqua Lake, beautifully situated in the plateau of western New York.

New York is noted for its many falls and rapids, some of them of great beauty. Of these the largest is the cataract of Niagara, about 1 m. wide and 160 ft. high. The American Fall is entirely within the state; but the Canadian boundary-line passes down the centre of the Horseshoe or Canadian Fall. Other notable falls are those of the Genesee at Portage and at Rochester, Trenton Falls, the Falls of Ticonderoga, and a multitude of falls and rapids in the Adirondack region and along the shores of the upper portions of the Finger Lakes. Here the tributary streams tumble down the sides of the lake valleys, whose bottoms have been deepened by glacial erosion, leaving the tributary valleys hanging. There are scores of picturesque glens here, and hundreds of waterfalls, among the most beautiful being in the Cayuga valley—notably Enfield Falls, a few miles S. of Ithaca, Ithaca Falls in the city, and Taughannock, a few miles N. of Ithaca. The last, the highest waterfall in the state, has a vertical fall of 215 ft. Similar glens and falls are found in the Seneca Valley, the best known being the widely renowned Watkins Glen, now reserved as a state park (see WATKINS). Many of the waterfalls of New York, but notably Niagara, are used as a source of power.

The Coast-line.—New York has extensive coast-line along the Great Lakes, 75 m. on Lake Erie and over 200 m. on Lake Ontario. Where the lake waters flood the stream mouths, there are excellent harbours, and lake navigation is therefore of high importance. The largest of the lake ports is at Buffalo at the head of Niagara river, where, owing to the Niagara cataract, lake boats from the W. must transfer their goods to rail or canal. Buffalo lies at the lower end of natural lake navigation, though by the building of a ship canal in Canada, lake steamers can proceed into Lake Ontario and thence to the St Lawrence.

The ocean coast-line, though of limited extent, is by far the most important in the United States. The greater part of the sea coast is on Long Island—a low, sandy coast, the seat of numerous summer resorts and of some fishing. The mainland, opposite the western end of Long Island, is traversed by the lower Hudson and other channels —submerged valleys—which form a branching bay with several islands, the largest of which are Staten and Manhattan Islands. The western bank of the lower Hudson is in New Jersey. This branching bay makes an excellent protected harbour, with an immense water front, at the outlet of the chief natural highway from the E. to the interior of the country. Naturally, therefore, a dense population, engaged mainly in manufacturing and commerce, has gathered around the shores of this harbour, the greatest number on Manhattan Island and the contiguous mainland in New York City, but large numbers also on western Long Island, in Brooklyn, on the smaller islands, and on the New Jersey side. The harbour entrance is somewhat obstructed by sand bars, so that extensive government work has been necessary to open and maintain a channel for large draft ocean vessels. This sand has not been brought by the Hudson itself, for that river drops most of its sediment load far up stream, in its long tidal channel. It is supplied by the tidal- and wind-formed currents, which are drifting sand from the Long Island and New Jersey coasts, extending the barrier beaches, such as Sandy Hook, out across the entrance to New York Bay.

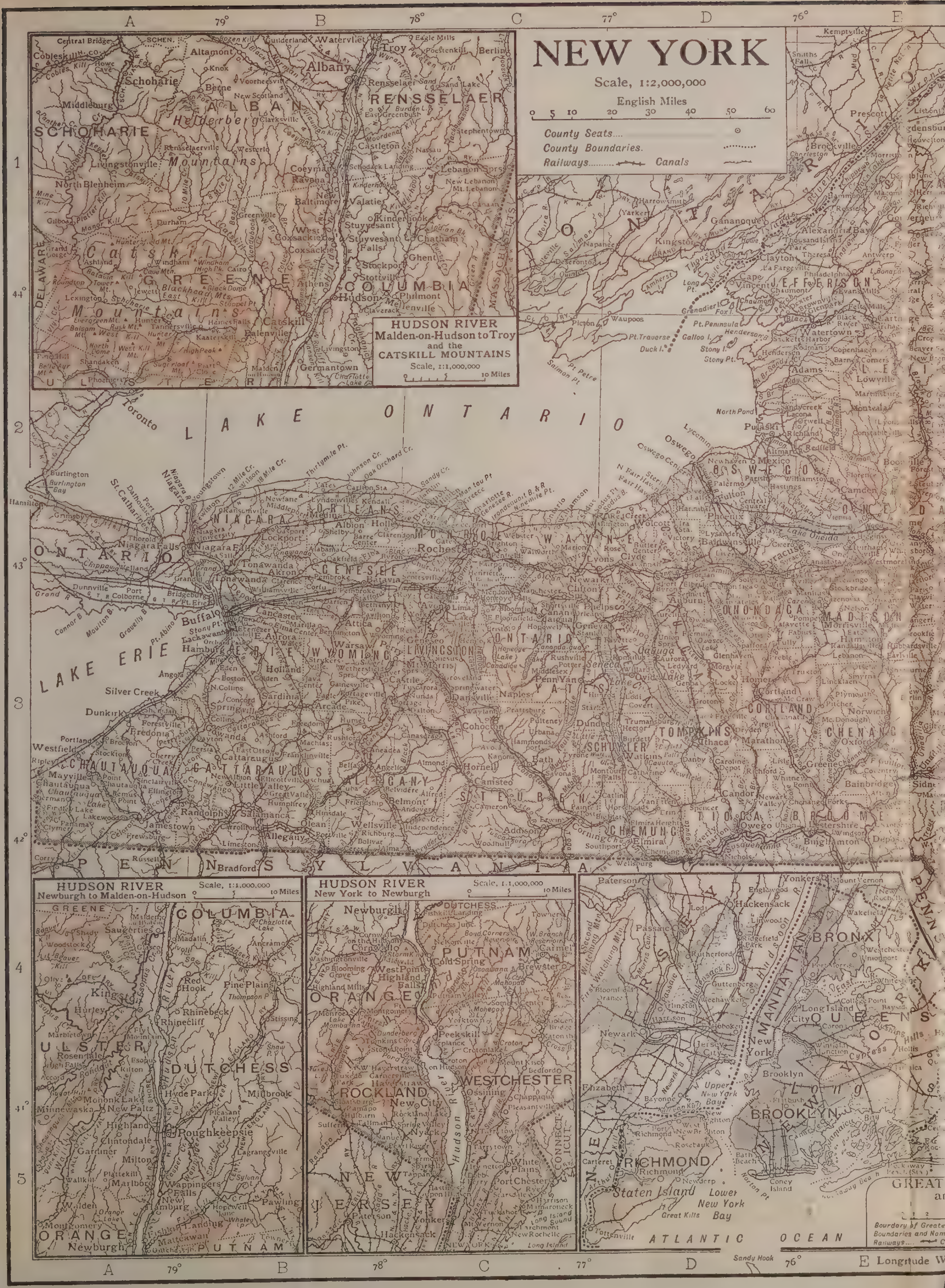
Climate.—In general the climate of New York is typical of that of northern United States, a climate of extremes, hot in summer, and cold in winter, and yet healthful, stimulating, and, on the whole, not disagreeable. In the absence of extensive alluvial plains and marshes, there is little malaria. The average mean annual temperature is not far from 45° F., though it varies from over 50° near New York City, and 48° near the Lake Erie shore, to less than 40° in the high Adirondacks. The average maximum summer heat is about 93°, temperature of 100° being rarely reached. In the winter the temperature descends below zero during exceptionally cold spells. A temperature of –20° or lower is never attained in the southern portion, seldom in the central, but is often passed, by 5 or 10 degrees, in the Adirondacks and in the higher parts of the plateau. The rivers and smaller lakes freeze in winter and navigation on the St Lawrence river is closed by ice on the average from about the middle of December until early in April. The average rainfall is between 40 and 45 in., but it is less than 30 in. in the Lake Champlain Valley and over 55 in. N. of New York City. In most of the state frosts begin from September 1st to October 1st, and end from April 1st to May 1st. In the Adirondack region the snowfall is heavy, the winter long and severe. In central New York it is not uncommon for snow to accumulate to the depth of 3 or 4 ft., and yet this is not persistent. About New York City, and on Long Island, the snow rarely exceeds 1 ft. in depth. The climate is very variable, owing to the frequent passage of cyclonic storms from the W. and S.W., bringing warmer weather with rain and snow in winter, and causing days of great heat and humidity, with thunderstorms, in summer. Between these cyclonic storms come areas of high pressure, or anticyclones, with dry cool air in summer, and dry cold air in winter, sometimes with such decided changes in temperature as to merit the name cold wave. About New York City, and on Long Island, the ocean softens the rigours of winter, and through the influence of cold surface waters off the coast, tempers the heat of summer. The temperature of the larger valleys is notably higher than that of the uplands; and the temperature along the lake shores is decidedly influenced by the large bodies of water. Lakes Ontario and Erie never freeze completely over in winter.

Although one of the smaller states in the Union, being 30th in area, New York ranks first in population and in wealth, and has won for itself the name Empire State. The physiography has enabled the state to become a great highway of commerce between the central part of the United States and the sea-coast, by rail and by water, along the Mohawk Gap and by other routes. The Great Lakes waterway naturally finds an outlet in New York City. This has made it easy for the states to the west to contribute raw materials, notably coal and iron, adding these to the natural raw products of New York. Thus it happens that from Buffalo to New York City there is a chain of busy manufacturing centres along the natural highway followed by the Erie Canal and the Hudson river. Other parts of the state, where connected with the main highway, are influenced by it to some extent; but away from the great natural route of commerce New York is not especially noteworthy either for its density of population or for extensive manufacturing and commerce. (R. S. T.)

Flora.—When first settled by Europeans New York was a woodland region containing nearly all the varieties of trees, shrubs and plants which were common to the territory lying E. of the Mississippi river, N. of the Ohio, and S. of the St Lawrence. In the Adirondack region the trees were principally white pine, spruce, hemlock and balsam, but mixed with these were some birch, maple, beech and basswood, and smaller numbers of ash and elm; in the swamps of this region were also larch and cedar. The forests of the W. half of the state contained pine, but here such hardwood trees as oak, chestnut, hickory, maple and beech were more common. The tulip tree was common both in the S.W. and N.; and the walnut, butternut, poplar, sycamore and locust were widely distributed. The original varieties of trees still abound, though in less numbers, on lands ill-adapted to agriculture, and in the Adirondack and Catskill Mountains, where the state has established forest preserves, and the Forest, Fish and Game Commissioner began reforesting in 1901, principally with pine, spruce and larch. On the summits of the Adirondacks are a few alpine species, such as reindeer moss and other lichens; on the shores of Long Island, Staten Island and Westchester county are a number of maritime species; and on Long Island are several species especially characteristic of the pine barrens of New Jersey. Laurel, rhododendron, and whortleberry are common shrubs in the mountain districts, and sumac, hazel, sassafras and elder are quite widely distributed elsewhere. Among indigenous fruit-bearing plants the state has the black cherry, red cherry, red plum, yellow plum, grape, black currant, blackberry, dewberry, strawberry and cranberry. Blue flag, snake root, ginseng, lobelia, tansy, wormwood, wintergreen, pleurisy root, plantain, burdock, sarsaparilla and horehound are among its medicinal plants. Cowslips, violets, anemones, buttercups and blood-roots are conspicuous in early spring, the white pond lily and the yellow pond lily in summer, asters and golden-rod in autumn, and besides these there are about 1500 other flowering plants in the state and more than 50 species of ferns.

Fauna.—Of the fur and game animals which were inhabitants of the primeval forests few of the larger species remain except in the Adirondack region. Here the puma ("panther") has become extinct and the Canada lynx is rare. The moose, the elk and the beaver have been placed under the protection of the Forest, Fish and Game Commissioner. There are many deer in the Adirondacks. The porcupine is common, but the Canada pine marten or American sable, fisher, and red fox are rare, and the black bear and grey wolf are found only in small numbers. Rabbits and squirrels are numerous in nearly all parts of the state; skunks, weasels, muskrats and woodchucks are common; there are some racoons; mink are frequently taken in the Adirondacks; and a few otter remain. In the lower counties are some "Virginia" opossums.

Among birds of prey a bald eagle and a golden eagle are occasionally seen in secluded places. Game birds include ducks, geese, plovers, snipe, loons, grebes, terns, rails, the woodcock and the ruffed grouse; quails are scarce except on Long Island, where a number of young birds are liberated each year, and by the same means a supply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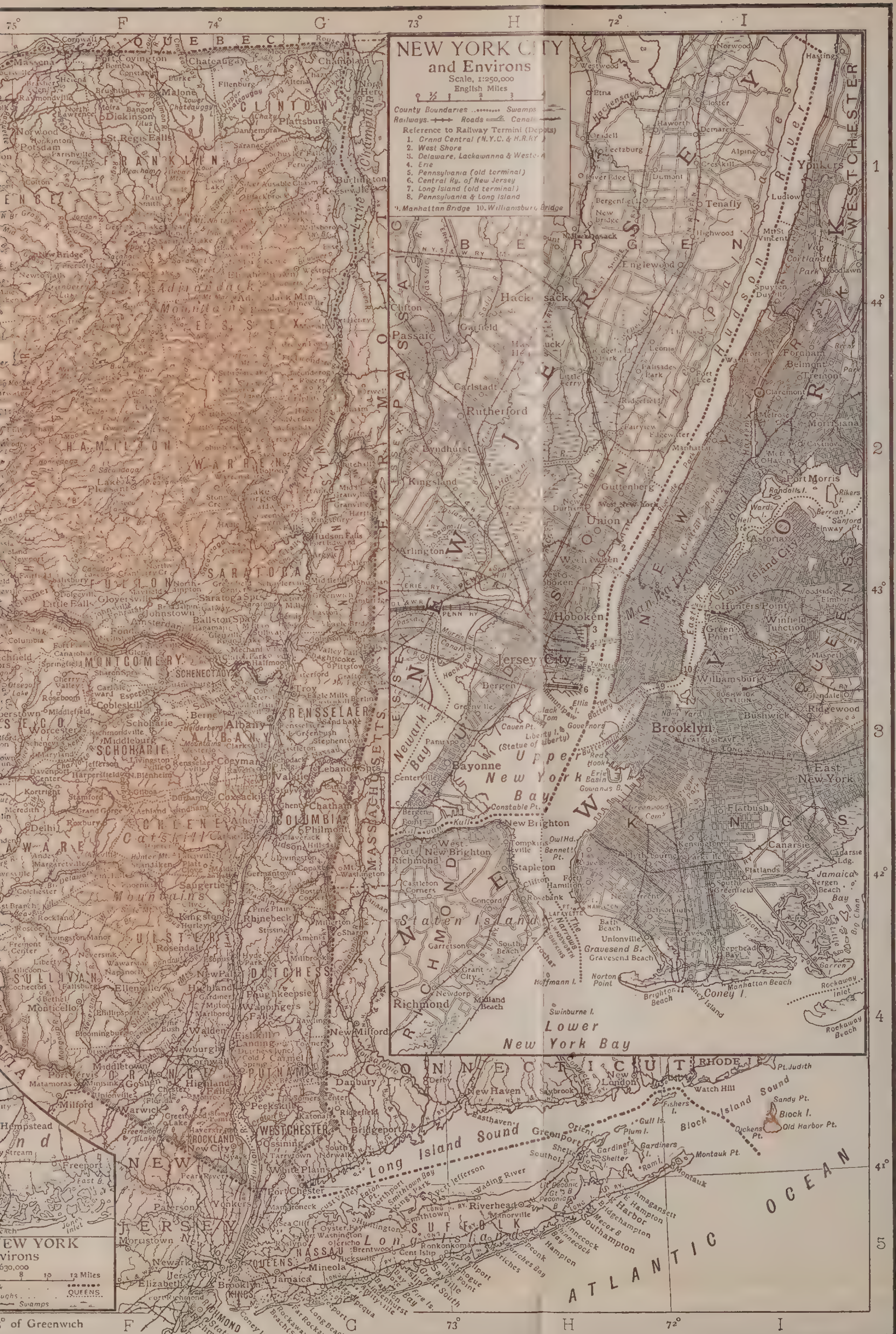
Malden-on-Hudson to Troy
and the
CATSKILL MOUNTAINS
Scale, 1:1,000,000
10 Miles
HUDSON RIVER
Newburgh to Malden-on-Hudson
Scale, 1:1,000,000
10 Miles
HUDSON RIVER
New York to Newburgh
Scale, 1:1,000,000
10 Miles
LAKE ONTARIO
LAKE ERIE
ATLANTIC OCEAN
PENNSYLVANIA
ONTARIO
NIAGARA
ORLEANS
MONROE
WAYNE
OSWEGO
JEFFERSON
ONONDAGA
MADISON
CAYUGA
SENECA
ONTARIO
LIVINGSTON
GENESEE
WYOMING
ERIE
CHAUTAUQUA
CATTARAUGUS
ALLEGANY
STEUBEN
SCHUYLER
YATES
CHEMUNG
TOMPKINS
CORTLAND
TIOGA
BROOME
CHENANGO
ALBANY
RENSSELAER
SCHOHARIE
GREENE
COLUMBIA
ULSTER
DUTCHESS
ORANGE
PUTNAM
ROCKLAND
WESTCHESTER
BRONX
MANHATTAN
QUEENS
BROOKLYN
RICHMOND
NEW JERSEY
A
B
C
D
E
79°
78°
77°
76°
44°
43°
42°
41°
1
2
3
4
5
E Longitude W


NEW YORK CITY
and Environs
Scale, 1:250,000
English Miles
County Boundaries
Swamps
Railways
Roads
Canals
Reference to Railway Termini (Depots)
1. Grand Central (N.Y.C. & H.R.RY.)
2. West Shore
3. Delaware, Lackawanna & Western
4. Erie
5. Pennsylvania (old terminal)
6. Central Ry. of New Jersey
7. Long Island (old terminal)
8. Pennsylvania & Long Island
9. Manhattan Bridge
10. Williamsburg Bridge
Upper New York Bay
Lower New York Bay
Staten Island
Brooklyn
Jersey City
Hoboken
QUEBEC
CLINTON
FRANKLIN
ESSEX
HAMILTON
WARREN
SARATOGA
FULTON
MONTGOMERY
SCHENECTADY
ALBANY
SCHOHARIE
RENSSELAER
GREENE
COLUMBIA
ULSTER
DUTCHESS
SULLIVAN
ORANGE
PUTNAM
ROCKLAND
WESTCHESTER
NASSAU
SUFFOLK
QUEENS
KINGS
RICHMOND
MASSACHUSETTS
CONNECTICUT
RHODE I.
NEW JERSEY
Adirondack Mountains
Catskill Mountains
Lake Champlain
Long Island Sound
Block Island Sound
ATLANTIC OCEAN
...EW YORK
...virons
...630,000
12 Miles
QUEENS
Swamps
° of Greenwich
F
G
H
I
75°
74°
73°
72°
44°
43°
42°
41°
1
2
3
4
5

Emery Walker sc.

of pheasants is maintained in some parts of the state. There is a state game bird farm (1909) near Sherburne in Chenango county. Herons, the brown pelican, bittern, and mud hen frequent the marshes. The robin, song sparrow, chickadee, thrushes, warblers, vireos, orioles, wrens, blue-bird, cat-bird and phoebe are favourite song birds.

There are about 375 species of fish in New York waters (see below under FISHERIES).

Soil.—The soil is mostly glacial drift, but its depth and composition often vary greatly even within small areas. The most widely distributed soil, especially in the W. half of the state, is mainly a clay which was formed by the glacial pulverizing of limestone and shale and is still forming from the decomposition of fragments of these substances. In the larger valleys and along the shores of lakes considerable alluvium is mixed with this clay. In the E. there is some clay formed mainly by the decomposition of slate. A sandy loam is quite characteristic of some of the N. counties, and gravelly loams containing limestone are not uncommon.

Agriculture and Stock-Raising.—Although New York has lost in the competition with the Western States in the production of most of the grains, especially wheat and barley, and in the production of wool, mutton and pork, it has made steady progress in the dairy business and continues to produce great crops of hay. The state has made great advances, too, in the production of flowers, ornamental plants, nursery products, fruits, vegetables, poultry and eggs. In 1900 a little less than three-fourths of the state's total land area was included in farms and a little more than two-thirds of this was improved. The number of farms gradually increased from 170,621 in 1850 to 226,720 in 1900, and the average size decreased from 112·1 acres in 1850 to 97·1 acres in 1890, but increased to 99·9 acres in 1900. More than two-thirds of the farms (152,956) were operated by owners or part owners, 29,900 were operated by share tenants, and 24,303 by cash tenants. Of the total acreage of all crops, 5,154,965 acres (54·1 %) were of hay and 3,125,077 acres (32·8 %) were of cereals. In 1909 the amount of the hay crop (5,002,000 tons) was greater than that of any other state except Iowa, and its value ($71,028,000) was greater than in any other state. The oat crop in 1909 was 37,365,000 bushels; the Indian corn crop, 1,910,000 bushels; the wheat crop, 24,120,000 bushels; the barley crop, 8,820,000 bushels; the rye crop, 2,720,000 bushels; buckwheat, 7,512,000 bushels.

There were less than one-third as many sheep in 1910 (1,177,000) as in 1850; but in the same period the number of dairy cows (1,771,000 in 1910) steadily increased. The number of cattle other than dairy cows was 946,315 in 1850 and 889,000 in 1910. Horses increased from 447,014 in 1850 to 717,000 in 1910.

New York has a larger acreage of vegetables than any other state. Its crop of potatoes in 1909 was 52,560,000 bushels and that of Maine, the next largest, 29,250,000 bushels; and the state is a large producer of onions, turnips, cabbages, cauliflower, sweet Indian corn, cucumbers, rhubarb, parsnips, carrots, green peas and green beans. During the years 1850–1889 New York produced about 70 % of the hop crop of the entire country, but since 1890 hop culture has been rapidly extended in the Pacific Coast states and suffered to decline in New York, and the crop from 1899 to 1907 averaged only about one-half that of 1889 (20,063,029 ℔). Tobacco culture was introduced in 1845, and in 1860 the crop was 5,764,582 ℔. During 1860–1880 the increase was slight, but in 1899 the crop was 13,958,370 ℔; in 1909 the crop was only 7,050,000 ℔. The value of the fruit crop in 1899 ($15,844,346) was second only to that of California; and the most productive agricultural lands are those devoted to floriculture and nurseries.

The dairy business and the production of hay are especially prominent in the rugged region W. of the Adirondack Mountains and in the rugged portions of the counties in the S. half of the state. A large portion of the Indian corn, wheat and barley is produced on the Ontario plain. There are large crops of oats here, too, but the culture of this cereal is quite extensive in most of the counties W. of the Adirondacks. The lower valley of the Hudson is noted for its crops of rye. The buckwheat belt extends S.W. across the state from Albany and Saratoga counties. The principal hop-producing counties are Otsego, Schoharie and Madison, all of which are between Albany and Syracuse. Those producing most tobacco are in a district extending from the S.E. shore of Lake Ontario southward across the state. The great orchards are in the tier of counties bordering the S. shore of Lake Ontario and in Dutchess and Ulster counties in the Hudson Valley. Chautauqua county alone produced more than one-half of the state's crop of grapes in 1899, but this fruit is grown extensively also in the region W. of Seneca Lake in the vicinity of Lake Keuka, and in parts of the lower valley of the Hudson. The culture of small fruits and vegetables is widely distributed throughout the W. half of the state and in the valley of the Hudson, and the greater part of Long Island under cultivation is devoted to market gardening, floriculture and nurseries. The largest nurseries, however, are in the vicinity of Rochester.

Forest Products.—The principal forest area is in the Adirondack region where the state has a forest preserve (in Clinton, Essex, Franklin, Fulton, Hamilton, Herkimer, Lewis, Oneida, St Lawrence, Saratoga, Warren and Washington counties) containing (1909) 1,530,559 acres, and there is as much or more in private preserves and in tracts owned by lumbermen. The state has a forest preserve also in the Catskill region (in Delaware, Greene, Sullivan and Ulster counties) of 110,964 acres, and there are wood-lots on many farms throughout the state that produce commercial timber. Originally white pine was the principal timber of the Adirondacks, but most of the merchantable portion has been cut, and in 1905 nearly one-half of the lumber product of this section was spruce, the other half mainly hemlock, pine and hardwoods (yellow birch, maple, beech and basswood, and smaller amounts of elm, cherry and ash). The state is reforesting portions of its preserve chiefly with pine, spruce and larch. In the Catskills and in the farming regions the lumber product consists largely of hardwoods (mostly oak, chestnut and hickory), smaller amounts of hemlock and pine, and a very little spruce. The state's entire timber product in 1905 was 1,212,070,168 ft. (board measure); of this about five-eighths was from the Adirondack region, a little more than one-fourth was from the farming regions, and a little less than one-eighth was from the Catskill region. Maple sugar is an important by-product of the forests, and in the production of this commodity New York ranks second only to Vermont; 3,623,540 ℔ were made in 1900.

Fisheries.—New York was in 1904 more extensively engaged in oyster culture than any other state, and was making more rapid progress in the cultivation of hard clams. In 1909 there were distributed from state fish hatcheries[1] 531,293,721 fishes (mostly smelt, pike-perch, and winter flatfish); a large number of fish and eggs were also placed in New York waters by the United States Bureau of Fisheries. The products of the marine fisheries decreased nearly 30 % in value from 1891 to 1897, but from 1897 to 1904 they increased from $3,391,595 to $6,230,558, or 80·3 %, and a large part of this increase was due to the extension of the successful oyster culture at the E. end of Long Island; the value of oysters alone rising from $2,050,058 to $3,780,352. The value of hard clams rose during the same period from $198,930 to $303,599. Peconic Bay, at the E. end of Long Island, yields more scallops than all the other waters of the United States. Soft clams, lobsters, hard crabs and soft crabs are other shell-fish obtained in small quantities. Menhaden are caught in much larger quantities in New York than any other fish, but being too bony for food they are used only in the manufacture of oil and fertilizer. The most valuable catches of food fish in 1904 were those of bluefish ($556,527), squeteague ($212,623), flounders ($67,159), eels ($53,832), cod ($52,710), scup ($48,068) and shad ($36,826). The shad fishery is mainly in the lower waters of the Hudson river, and the catch diminished so rapidly from 1901 that in 1904 it was only about one-eighth of the average for the decade from 1890 to 1900. The New York fisheries of Lakes Erie and Ontario and the Niagara and St Lawrence rivers yielded products in 1903 valued at $187,798 and consisting largely of pike-perch, herring, catfish, bullheads and sturgeon, and in 1902 there were commercial fisheries in sixteen interior lakes and rivers which yielded muscallonge, smelt, bullheads, pickerel, pike-perch and several other varieties having a total value of $87,897.

Minerals.—More than thirty mineral substances are obtained in commercial quantities from the mines, quarries and wells of New York, but of the total value of the mineral products in 1908 ($45,660,861), nearly six-sevenths was represented by clay products ($8,929,224), pig iron ($15,879,000), stone ($6,157,279), cement ($2,254,759), salt ($2,136,738), petroleum ($2,071,533), and sand and gravel ($1,349,163). The extensive deposits of clay in the Hudson Valley together with the easy water communications with New York City have made this valley the greatest brick-making region in the world; in 1906 the common bricks made here numbered 1,230,692,000. There are also deposits of clay suitable for making bricks, terra-cotta and tiles in nearly every county outside of this valley, and there are some pottery clays in Albany and Onondaga counties. The common bricks made in New York in 1908 were valued at $5,066,084, an amount in excess of that in any other state; and the total value of brick and tile products was $7,270,981, being less than that of Ohio, Pennsylvania or Illinois. In 1750 the mining of iron ore was begun near Monroe, Orange county. Ore has since been found in most of the eastern counties and as far W. as Wayne county, but the mines in Essex, Clinton and Franklin counties of the Adirondack region are by far the most productive. The ores are principally magnetites (New York is the largest producer of magnetite ore among the states, producing about 45 % of the total for the United States in 1907 and 1908), but red haematites occur in the N. and W. section of the Adirondacks and in the central part of the state, and brown haematites and carbonate ore in the S.E. counties. The total output of the state increased from 651,228 long tons in 1884 to 1,253,393 long tons in 1890, decreased to 179,951 long tons in 1898, again increased to 1,375,020 long tons in 1907, when only three states produced more, and was only 697,473 long tons in 1908 when the state held the same rank as in 1907. Limestone is widely distributed throughout the state, and great quantities of it are crushed for road-making, railway ballasts, and concrete, but as the prevailing colours are greyish or drab it is little used in the walls of buildings. In 1908 the total value of the output of this stone was $2,584,559. Three distinct varieties of sandstone are quarried extensively. Those popularly known as "bluestones" belong to the Hamilton period of the Devonian formation and occur mainly between the Hudson and Delaware rivers. They are dark blue-grey, fine grained and durable, and are much used for flagging and kerbing and for sills, caps and steps. Medina sandstones occur throughout a belt averaging about 10 m. wide along the S. shore of Lake Ontario and are either red or grey; the red are used for building, the grey for street paving. A more durable and more beautiful stone for building is the reddish or reddish-brown Potsdam sandstone of which there are extensive formations on the N.W. border of the Adirondacks. The value of all sandstones quarried in 1908 was $1,774,843, an amount exceeded by no other state. Several choice marbles are obtained in the eastern counties. From Tuckahoe, Westchester county, has been taken white marble, used in some of the finest buildings in New York City, and a similar marble is obtained in Putnam and Dutchess counties. Near Gouverneur, St Lawrence county, is a large quarry of coarsely crystalline magnesian limestone, used as monumental marble. In the Lower Silurian formation at Plattsburg and Chazy, in Clinton county, are two beautiful grey or grey and pink marbles, one of which is a favourite among domestic marbles for mantels, table tops and other interior decorations. From an extensive deposit of blue-black magnesian limestone at Glens Falls are taken the choicest varieties of black marble quarried in the United States. At Moriah and Port Henry, in Essex county, is a stone known as ophite marble, a mixture of serpentine, dolomite and calcite interspersed with small flecks of phlogopite. Larger deposits of serpentine occur at several places in St Lawrence county; and at Warwick, in Orange county, is some beautiful marble of a carmine-red colour occasionally mottled with white or showing white veins. The marble quarried in 1908 was valued at $706,858. There are extensive formations of granitic rocks in the Adirondacks, in the lower Hudson Valley, and in the adjacent highlands, but they are not extensively quarried. Rockland county quarries considerable trap rock, used mostly for road-making and concrete, and Ulster county has for more than a century produced most of the domestic millstones used in the United States. Extending from Madison county to the W. border of the state in Erie county is a narrow belt containing large deposits of gypsum, and in 1908 the value of the state's output ($760,759) was greater than that of any other state, although Michigan produced a larger quantity. At or near Chittenango, in Madison county, natural-cement rock was first discovered in the United States, and the first use made of it was in the construction of the Erie Canal. The rock was found in much greater quantities at Rosendale, in Ulster county, in 1823, and the amount of this cement produced by New York rose to 4,689,167 barrels in 1899; the state is still the chief producer but only 947,929 barrels were made in 1908. Limestone and clay suitable for making Portland cement are also found in Ulster county and elsewhere, and the production of this increased from 65,000 barrels in 1890 to 2,290,955 barrels in 1908. Near Talcville, in St Lawrence county, is a large deposit of fibrous talc. In 1908 the total value of the state's talc product was $697,390, almost one-half the total for the entire country.

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[1] These include: the Adirondack Hatchery at Upper Saranac, Franklin county; the Caledonia Hatchery at Mumford, Monroe county; the Cold Spring Harbor Hatchery, at Cold Spring Harbor, Suffolk county; the Delaware Hatchery, at Margaretville, Delaware county; the Fulton Chain Hatchery, at Old Forge, Herkimer county; the Linlithgo Hatchery, at Linlithgo, Columbia county; the Oneida Hatchery, at Constantia, Oswego county; and the Pleasant Valley Hatchery, at Taggart, Steuben county.

New York and Michigan are the two principal salt-producing states in the Union. Salt was discovered by the Jesuits in Western New York about the middle of the 17th century, and was manufactured by the Indians in the Onondaga region. The state bought the salt reservation in 1788, and soon afterward the manufacture of salt was begun by the whites. From 1880 to 1885 the first brines were obtained in Wyoming and Genesee counties by boring deep wells into beds of rock salt, and in 1885 the mining of the extensive deposits of rock salt in Livingston county was begun. Salt is also produced in Tompkins and Schuyler counties. In 1908 the total production of the state, 9,076,743 barrels valued at $2,136,738, was exceeded in quantity and (for the first time) in value by that of Michigan.

The Appalachian oil field extends northward from West Virginia and Pennsylvania into Cattaraugus, Allegany and Steuben counties. The first oil well in the state was drilled at Limestone in Cattaraugus county in 1865, and the state's output of oil was 1,160,128 barrels, valued at $2,071,533 in 1908. At Olean it is pumped into pipes which extend as far north as Buffalo and as far east as Long Island City. The village of Fredonia, in Chautauqua county, was illuminated by natural gas as early as 1825, and gas has since been discovered in several of the western counties. The value of the flow in 1908 was $959,280.

There are more than forty mineral springs in New York whose waters are of commercial importance, and in 1908 the waters sold from them amounted to 8,007,092 gals., valued at $877,648; several of the springs, especially those in Saratoga county, attract a large number of summer visitors. Graphite is widely distributed in the Adirondack region, but the mining of it is confined for the most part to Essex and Warren counties; in 1908 the output was 1,932,000 lb. valued at $116,100. Other mineral substances obtained in small quantities are: pyrite, in St Lawrence county; arsenical ore, in Putnam county; red, green and purple slate, in Washington county; garnet in Warren, Essex and St Lawrence counties; emery and felspar, in Westchester county; and infusorial earth in Herkimer county.

Manufactures.—The establishment of a great highway of commerce through the state from New York City to Buffalo by the construction of the Erie Canal, opened in 1825, and later by the building of railways along the line of the water route, made the state's manufactures quite independent of its own natural resources. The factory manufacture of clothing was begun in New York City about 1835, and received a great impetus from the invention of the sewing-machine, the demands created by the Civil War, and the immigration of vast numbers of foreign labourers. It is now the leading manufacturing industry of the state. The value of the clothing was $340,715,921 in 1905. New York City ranks first among American cities in printing and publishing, the products being valued at $137,985,751 in 1905. Knitting by machinery was introduced into America in 1831 at Cohoes Falls, on the Mohawk river; the products, consisting largely of underwear, were valued at $46,108,600 in 1905. Of the other textile industries none except the manufacture of carpets and rugs and silk and silk goods has become very prominent, and yet the total value of all textile products in 1905 was $123,668,177. The refining of sugar was begun in New York City late in the 18th century, but the growth of the industry to its present magnitude has been comparatively recent; the value of the sugar and molasses refined in 1905 was $116,438,838. Foundry and machine-shop products were valued at $115,876,193 in 1905, and electrical machinery, apparatus, and supplies at $35,348,276. The manufacture of paper and wood-pulp products ($37,750,605 in 1905) is an industry for which the state still furnishes much of the raw material, and other large industries of which the same is true are the manufacture of flour and grist-mill products, dairy products, canned fruits and vegetables, wines, clay products, and salt. New York state has ranked first in the Union in the value of its manufactures since 1830, and their value rose to $2,488,345,579 in 1905. More than three-fifths of that of 1905 was represented by the manufactures of New York City alone. Buffalo, the second city in manufactures, shares largely with New York City the business of slaughtering and meat packing, the refining and smelting of copper, and the manufacture of foundry and machine-shop products, and with New York City and Rochester the manufacture of flour and grist-mill products. Rochester ranks first among the cities of the United States in the manufacture of photographic materials and apparatus and optical instruments. Niagara Falls and New York City manufacture a large part of the chemicals, and the value of the state's output rose to $29,090,484 in 1905. Gloversville and Johnstown are noted for leather gloves and mittens.

Transportation and Commerce.—From the very beginning of the occupation of New York by Europeans, commerce was much encouraged by the natural water-courses. The Western Inland Lock Navigation Company, chartered by the state in 1792, completed three canals within about four years and thereby permitted the continuous passage from Schenectady to Lake Ontario of boats of about 17 tons. The Erie Canal was begun by the state in 1817 and opened to boats of about 75 tons burden in 1825. The Champlain Canal, connecting the Erie with Lake Champlain, was also begun in 1817 and completed in 1823. The Oswego Canal, connecting the Erie with Lake Ontario, was begun in 1825 and completed in 1828. Several other tributary canals were constructed during this period, and between 1836 and 1862 the Erie was sufficiently enlarged to accommodate boats of 240 tons burden.

The first railway in the state and the second in operation in the United States was the Mohawk & Hudson, opened from Albany to Schenectady in 1831. The railway mileage in the state increased to 1361 m. in 1850, to 3928 m. in 1870, to 7684·41 m. in 1890, and to 8422·14 m. in January 1909. The first great trunk line in the country was that of the Erie railway, opened from Piermont, on the Hudson river, to Dunkirk, on Lake Erie, in 1853. The New York Central & Hudson River railway, nearly parallel with the water route from New York City to Buffalo, was formed by the union, in 1869, of the New York Central with the Hudson River railway. The West Shore railway, which follows closely the route of the New York Central & Hudson River, was also the result of a consolidation, completed in 1881, of several shorter lines. In 1886 the New York Central & Hudson River Railroad Company leased the West Shore for a term of 475 years, and this company operates another parallel line from Syracuse to Buffalo, a line following closely the entire N. border of the state (the Rome, Watertown & Ogdensburg), and several cross lines. Other important railways are the Lehigh Valley, the Delaware, Lackawanna & Western, and the Pennsylvania in the central and W. sections, the Delaware & Hudson, the Rutland, and the New York Ontario & Western in the E., and the Long Island on Long Island. In competition with the railways, traffic on the existing canals suffered a marked decline. As, however, this decline was accompanied with a considerable decrease in the proportion of the country's exports which passed through the port of New York, interest in the canals revived, and in 1903 the electorate of the state authorized the issue of bonds to the amount of $101,000,000 for the purpose of increasing the capacity of the Erie, the Champlain and the Oswego canals, to make each navigable by barges of 1000 tons burden. A project adopted by the state for the enlargement of the Erie provides for a new route up the Hudson from Troy to Waterford and thence to the Mohawk river above Cohoes Falls. Up the Mohawk to Rome the old route is for the most part to be retained; but from Rome to Clyde there is to be a diversion so as to utilize Oneida Lake and Oneida and Seneca rivers. Westward from Clyde the new channel, like the old but larger, will pass through Rochester and Lockport to the Niagara river at Tonawanda. Each of the three canals is to have a minimum depth of 12 ft., a minimum bottom width in rivers and lakes of 200 ft., and in other sections a bottom width generally of 75 ft. Their locks are to be 328 ft. in length and 45 ft. in width.

The imports to the port of New York increased in value from $466,527,631 in 1897 to $891,614,678 in 1909, while the exports increased in value from $404,750,496 to $627,782,767. Other ports of entry are Buffalo and Dunkirk, on Lake Erie, Niagara Falls, on the Niagara river, Ogdensburg and Cape Vincent, on the St Lawrence river, Plattsburg, on Lake Champlain, Oswego, on Lake Ontario, Rochester, on the Genesee river, Albany and Syracuse in the interior, and Sag Harbor at the E. end of Long Island.

Population.—New York outstripped Pennsylvania in population in the first decade of the 19th century, and Virginia in the second decade, and since 1820 it has been the most populous state in the Union. In 1880[1] the population was 5,082,871; in 1890, 5,997,853; in 1900, 7,268,894; in 1905, according to the state census, 8,067,308; and in 1910, 9,113,614. The foreign-born population in 1900 was 1,900,425, including 480,026 natives of Germany, 425,553 of Ireland, 182,248 of Italy, 165,610 of Russia, 135,685 of England, 117,535 of Canada, 78,491 of Austria, 69,755 of Poland and 64,055 of Scandinavia. More than two-thirds of the foreign-born were in New York City. The coloured population constituted only 1·5% of the total, and was composed of 99,232 negroes, 7170 Chinese, 5257 Indians and 354 Japanese.

Most of the Indians were on eight reservations: the Allegany Reservation (30,469 acres) in Cattaraugus county; the Cattaraugus Reservation (21,680 acres) in Erie, Cattaraugus and Chautauqua counties; the St Regis Reservation (14,030 acres) in Franklin county; the Tonawanda Reservation (7548 acres) in Erie and Genesee counties; the Onondaga Reservation (7300 acres) in Onondaga county; the Tuscarora Reservation (624 acres) in Niagara county; the Oneida Reservation (400 acres) in Madison county; and the Shinnecock Reservation (400 acres) near Southampton, on Long Island.

Of 3,591,974 members of all religious denominations in 1906, 2,285,768 were Roman Catholics, 313,689 Methodist Episcopalians, 199,923 Presbyterians, 193,890 Protestant Episcopalians, 176,981 Baptists, 124,644 Lutherans, 57,351 Congregationalists, 35,342 Jews (heads of families only), 26,183 members of the German Evangelical Synod, 19,302 members of Eastern Orthodox churches and 10,761 Universalists. The urban population (*i.e.* population of places having 4000 inhabitants or more) increased from 3,805,477 in 1890 to 5,176,414 in 1900, or 36%, while the rural population (*i.e.* population outside of incorporated places) decreased during this decade from 1,834,119 to 1,625,859 or 5·9%.

The cities having a population of 15,000 or more in 1905 were: New York City, 4,013,781; Buffalo, 376,587; Rochester, 181,666; Syracuse, 117,503; Albany, 98,374; Troy, 76,910; Utica, 62,934; Yonkers, 61,716; Schenectady, 58,387; Binghamton, 42,036; Elmira, 34,687; Auburn, 31,422; Niagara Falls, 26,560; Newburgh, 26,498; Jamestown, 26,160; Kingston, 25,556; Watertown, 25,447; Poughkeepsie, 25,379; Mt. Vernon, 25,996; Cohoes, 24,183; Amsterdam, 23,943; Oswego, 22,572; New Rochelle, 20,479; Gloversville, 18,672; Lockport, 17,552; Rome, 16,562; and Dunkirk, 15,250.

Government.—Since becoming a state, New York has been governed under four constitutions, adopted in 1777, 1821, 1846 and 1894 respectively. The first state constitution, adopted by a convention at Kingston, made few changes in the provincial system other than those necessary to establish it on a popular basis, but the powers of the governor were curtailed, especially his powers of appointment and veto. These limitations worked unsatisfactorily, and their removal or modification and the extension of the franchise were the principal changes effected in 1821. Under the first constitution the decentralization of administration, which began early in the colonial era, continued without interruption, and under the second it was checked by a few measures only. The third constitution, besides reorganizing the judiciary, transferred to the people the choice of many officers, state and local, who had been appointed by the governor or the legislature; and placed numerous restrictions on the law-making power of the legislature. Under this constitution the theory of local self-government was more fully realized in New York than at any other time.

Since the middle of the 19th century an attempt has been made to meet the problems arising from a rapid industrial and social development by creating bureaus or commissions to exercise a central control over local officials, corporations and even private individuals, and as most of the heads of these bureaus and the commissions are appointed by the governor the importance of that officer has increased. The constitutional changes since 1846 affect principally the judiciary and cities. A constitutional convention met and proposed a new constitution in 1867, but every article was rejected by the people save one relating to the judiciary, which was adopted separately as an amendment in 1869. The constitution of 1894 made further important changes in the judiciary and in the government of cities. The first constitution made no provision for its amendment or revision. The second provided that whenever a majority of the members elected to each house of the legislature voted for an amendment and two-thirds of those elected to the next legislature approved, it should be submitted to the people for their adoption or rejection. The third modified this provision by requiring the approval of only a majority of the members elected to each house of the second legislature, and directed that the legislature should call a convention to revise the constitution at least once in twenty years if the people requested it. The present constitution contains the same clause as the third for the proposal of amendments by the legislature, and makes the unique provision that if the people vote for a convention when the question is submitted to them—this must be as often as once in twenty years—the delegates shall be elected and shall assemble at an appointed time and place without the call of the legislature, this being the result of the governor's veto, in 1887, of a bill for calling a convention in response to an overwhelming vote of the people in favour of it. Under the first constitution there were property qualifications for voting which amounted in the election of the governor and senators to a freehold estate worth £100 ($500) and in the election of assemblymen to a freehold estate worth £20. ($100) or the payment of an annual rent of 40s. ($10). But under the second constitution the most that was required of any white voter was the payment to the state or county of taxes on either personal or real property, and by an amendment of 1826 this requirement was abolished. The second constitution, however, imposed a property qualification on coloured voters amounting to a freehold estate worth $250, and this restriction was not removed until 1874. Since 1874 the aim has been to bestow suffrage on all male citizens who shall have attained the age of twenty-one years and shall have been inhabitants of the state for one year, but for the protection of the ballot citizenship for ninety days,[2] residence in the county for four months, and in the election district for thirty days next preceding the election are required. Conviction for bribery or of an infamous crime disqualifies, and personal identification of voters is required in New York City. A statement of receipts and expenditures of an election campaign, showing the amount received from each contributor and the name of every person or committee to whom more than $5 was paid, must be filed by the treasurer of every political committee within twenty days after the election; each candidate also must file a statement of his contributions. By an Act of 1910 women may vote on financial questions affecting a village in which they hold property.

Executive.—When the state government was first established, the governor and lieutenant-governor were the only state officers elected by the people. The state treasurer was chosen by the legislature, and for the appointment of other state officers as well as county officers and mayors of cities the Assembly chose four senators to constitute a council of appointment, a body in which the governor had only a casting vote. But the constitution of 1821 abolished the council of appointment and gave the choice of the principal state departmental officers to the legislature, and the constitution of 1846 transferred the choice of these officers from the legislature to the people, where it has since remained. Under the constitution of 1821 a great number of local officers were appointed by the governor with the advice and consent of the Senate. The choice of most of these was given to the people in 1846, but since then many new state departments have been created, the heads of which are usually appointed by the governor, subject to the approval of the Senate. Under the present system, therefore, there is a biennial election (in even-numbered years) of a governor, a lieutenant-governor, a secretary of state, a state comptroller, a state treasurer, an attorney-general and a state engineer and surveyor; and the governor appoints, subject to the approval of the Senate, a superintendent of public works, a superintendent of state prisons, a superintendent of insurance, a superintendent of banks, a commissioner of excise, a commissioner of agriculture, a forest, fish and game commissioner, a commissioner of health, a commissioner of labour, a state architect, a state historian, a state librarian, two public service commissions, a civil service commission, a board of charities, a commission of prisons, a commission in lunacy, three tax commissioners and several other boards and commissions. The governor has the power, also, of filling vacancies in certain state offices and on the benches of the supreme court and county courts, and he may remove or suspend certain county and municipal officers on charges.

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[1] The population at preceding census years was: (1790) 340,120; (1800) 589,051; (1810) 959,049; (1820) 1,372,812; (1830) 1,918,608; (1840) 2,428,921; (1850) 3,097,394; (1860) 3,880,735; (1870) 4,382,759.

[2] Increased from ten days in 1894.

The first state constitution gave the veto power to a council of revision composed of the governor, the chancellor and the judges of the supreme court, but since 1821 this power has been exercised by the governor alone; and in 1874 it was extended to separate items in appropriation bills. A bill or item of an appropriation bill that has been vetoed by the governor can become a law only with the approval of two-thirds of the members elected to each house of the legislature. So long as the legislature is in session the governor is allowed ten days, besides Sundays, to consider a bill, and if he does not veto it within that time it becomes a law, but no bill becomes a law after the final adjournment of the legislature unless it is actually approved by the governor within thirty days after the adjournment. The governor's power to grant reprieves, commutations or pardons is unrestricted by any board of pardons, but he is required to report to the legislature each case in which he exercises such power. A candidate for the office of governor or lieutenant-governor must be at least thirty years of age and must have resided within the state for five years next preceding his election. The governor's salary is $10,000 a year, and the lieutenant-governor's is $5000.

Legislature.—The legislative power is vested in a Senate of 50 members elected biennially and an Assembly of 150 members elected annually. Since 1846 both senators and assemblymen have been elected by single districts, and ever since the state government was established they have been apportioned according to population, but the present constitution limits the representation of New York City in the Senate by declaring that no county shall have more than one-third of all the senators nor any two adjoining counties more than one-half of them. The first and second state constitutions required that every senator should be a freeholder, but since 1846 no property qualifications have been prescribed for membership in either house; the only persons disqualified are those who at the time of the election or within one hundred days before the election were members of Congress, civil or military officers under the United States, or officers under any city government. The constitution of 1846 limited the pay of members of both houses to three dollars a day and to three hundred dollars for any one session (except in impeachment proceedings) besides an allowance for travelling expenses, but since an amendment of 1874 they have been paid $1500 a year and ten cents a mile for travelling expenses.

The legislature meets in annual sessions, beginning in January. Money bills may originate in either house, but at the final vote on such a bill in either house three-fifths of the members elected to that house must be present and the yeas and nays must be recorded; bills entailing appropriations for local or private purposes must receive a two-thirds majority to pass. The legislature appoints the board of regents of the University of the State of New York. To decrease the evil of lobbying a law was enacted in 1906 which requires that every person employed to promote or oppose the passage of any bill shall file in the office of the secretary of state a written statement showing who has employed him and describing the legislation in respect of which his services are to be rendered; the law also requires the employers of lobbyists to file in the same office within two months after the adjournment of the legislature an itemized statement of all their lobbying expenses, and forbids the employment of a lobbyist for a contingent fee.

Judiciary.— At the close of the colonial era there were a court of chancery, a supreme court, circuit courts and courts of oyer and terminer which were held in the several counties by the justices of the supreme court, a court of common pleas and a court of sessions in each county, and courts held by justices of the peace in the several towns. This system, with the addition of the Senate, the chancellor and the justices of the supreme court occasionally sitting as a court for the correction of errors, was retained with only slight changes until 1846. But the new constitution of that year substituted a court of appeals for the court of errors, merged the court of chancery into the supreme court, established in each county a new county court composed of a single judge, and, taking the appointment of judges from the governor, gave the election of them to the people. Some further alterations in the constitution affecting the courts were made in 1869, 1879, 1888, 1894, 1899 and 1909, and the system as at present constituted comprises a supreme court of ninety-seven justices, an appellate division of the same, a court of appeals, a court of claims and local courts. The highest judicial court in the state is not, as in most states of the Union, the supreme court, but the court of appeals. This court consists of a chief judge and six associate judges elected from the state at large for a term of fourteen years. Its jurisdiction is limited, except where judgment is of death, to a review of questions of law. Vacancies are temporarily filled from among the justices of the supreme court by the governor. To expedite business, at the request of the court, the governor may designate not more than four justices of the supreme court to act temporarily as additional associate judges of the court of appeals. The salary of the chief judge is $14,200, of the associate judges $13,700 a year.

The ninety-seven justices of the supreme court are elected for fourteen years from the nine districts into which the state is divided. Of these thirty are chosen in the first district (New York county) and seventeen in the second district (Long Island and Staten Island). The jurisdiction of each justice extends over the entire state. Vacancies are temporarily filled by the governor. The supreme court has general jurisdiction in law and equity, including all actions both civil and criminal. The salary of the justices in the first district and in Kings county of the second district is $17,500 a year; in the remainder of the second district it is $16,300 a year; in the other districts it is $10,000 a year. The state is divided into four departments for each of which there is an Appellate Division consisting of seven justices in the first department (county of New York) and five in each of the others. The justices and presiding justice are designated from among the justices of the supreme court by the governor; the presiding justice and a majority of the other justices of each department must be residents of the department.

The court of claims consists of three judges, one presiding, appointed by the governor for a term of six years. It has jurisdiction to hear and determine private claims against the state.

The local judiciary includes the usual county and city judges, county surrogates and justices of the peace. New York City (*q.v.*) has an extensive judiciary system of its own.

Local Government.—The state is divided into sixty-one counties, each (unless wholly included in a city) having a county board of supervisors elected for two years, one from every town or city ward. This board has certain administrative and legislative powers, such as the care of county property, the borrowing of money for the erection of county buildings, the fixing of the salary of the county treasurer and of other county officers, the levying of county taxes and the division of the county into assembly districts and school commissioners' districts. Other county officers are a county judge and a county surrogate elected for a term of six years, a treasurer, a clerk, a district attorney, a sheriff and from one to four coroners elected for a term of three years. Cities are of three classes: (1) those having a population of 175,000 or more; (2) those having a population between 50,000 and 175,000; and (3) those whose population is less than 50,000; the classification is according to the latest state enumeration.

Bills for "special" city laws, as opposed to "general," must be approved (within fifteen days after their passage by both houses of the legislature) by the mayor of the city in first-class cities (in which, however, the state legislature may provide for the concurrence of the municipal legislative body), and in other cities by the mayor and council, before it is laid before the governor: if it is passed by the state legislature over the mayor's veto it goes direct to the governor. All city elections are held in odd numbered years. The organization of cities and villages is provided by the legislature, which may restrict their powers of taxation and of contracting debts and may fix salaries. Town (or township) government in New York somewhat resembles that of New England; the chief executive officer of the town is a supervisor, who represents his town in the county "board of supervisors."

National Guard.—The national guard of the state is commanded under the governor by a major-general. It consists of four brigades each commanded by a brigadier-general. The establishments in 1910 consisted of thirteen regiments and fifty separate companies of infantry, two squadrons and two troops of cavalry, four light batteries, one regiment of engineers, a signal corps of two companies and a naval militia, commanded by a captain and consisting of two battalions and two separate divisions.

Laws.—A married woman has full control of her property whether acquired before or after marriage, and she may carry on any business, trade or occupation in her own right. A husband or a wife may convey real property directly to the other. A widow has a dower right in one-third of the real property to which her husband had absolute title, but a wife may convey or devise her real property free from her husband's right of tenancy by courtesy. The only ground for divorce is adultery. As soon as a divorce has been granted the plaintiff may marry again, but the defendant is not permitted to marry within the state any one except the plaintiff until five years have elapsed, and then only in case the court permits it because of the petitioner's uniformly good conduct in the meantime. Since the 1st of January 1908 a marriage licence has been required for every lawful marriage.

A homestead consisting of a lot of land with one or more buildings, and properly designated as such in the office of the county clerk, but not exceeding $1000 in value, is exempt from forced sale so long as it is owned and occupied as a residence by a householder having a family or by a married woman, except to recover the purchase money, to satisfy a judgment obtained before it was designated as a homestead, or to collect taxes upon it. Personal property consisting of necessary household furniture, working tools and team of horses, professional instruments and a library, not exceeding $250 in value, besides the necessary food for the team for ninety days, provisions for the family, wearing apparel, wages or other income not exceeding $12 a week, and several other things, when owned by a householder or person providing for a family, are also exempt from seizure for debt, unless the debt be for purchase money or for services performed in the family by a domestic.

Eight hours constitute a legal day's work for all employees except those engaged in farm labour or domestic service. The employment of children under fourteen years of age in any factory is forbidden. Until sixteen years of age no child is to be so employed without an employment certificate issued by a commissioner of health, and showing that the child has completed an eight years' course of study in a public school of the state or has had an equivalent schooling elsewhere. For children under sixteen years of age who are so employed the hours of labour are limited to eight a day and the days to six a week, and such children must not begin work before eight o'clock in the morning or continue after five o'clock in the evening. For children between sixteen and eighteen years of age and for women the hours of labour in a factory are limited to ten a day, unless to prepare for a short day or a holiday, and the days to six a week. The employment of children under fourteen years of age in any mercantile establishment, business office, hotel, restaurant or apartment house is also forbidden, except that in villages and in cities of the second or third class children upwards of twelve years of age may be so employed during the summer vacation of the public schools. For both boys and girls sixteen years of age or upward the restrictions are removed for two weeks at Christmas time.[1] The Employers' Liability Act of 1902 (amended and broadened in 1910) holds an employer liable for damages in any case in which one of his employees sustains a personal injury by reason of the negligence of the employer, of a sub-contractor, of a superintendent, or any other person in the employer's service whose duty it was to see that "the ways, works or machinery connected with or used in the business," were in proper condition, or whose duty it was to "direct . . . any employee," if it is not proved that the employee failed in due care and diligence; by another law of 1910 in certain dangerous employments the employer is liable unless the injured employee was negligent.

Although the constitution of 1894 expressly declares that "any lottery or the sale of lottery tickets, pool-selling, book-making, or any other kind of gambling" shall not "hereafter be authorized or allowed within the state" and directs the legislature to pass appropriate laws prohibiting the same, the legislature passed an act in 1895, which in practice permitted pool-selling and book-making at race-tracks, but in 1908 and 1910 bills were enacted prohibiting gambling at race-tracks. License to sell intoxicating liquors is subject to a graduated tax. The sale of liquor on Sunday or between one o'clock and five o'clock in the morning of any other day is unlawful. Any town (but not any city) may at its option wholly forbid the sale of intoxicating liquors, may allow it to be sold only on condition that it be not drunk on the vendor's premises, or may allow it to be sold only by hotel-keepers and pharmacists, or by pharmacists alone.

Administrative Commissions.—The regulation and control of such public service corporations as own or operate steam, electric or street railways, gas or electric plants, and express companies were, in 1907, vested in two public service commissions (the first for New York City and the second for all other parts of the state), each of five members appointed by the governor with the approval of the Senate; in 1910 the regulation of telephone and telegraph companies throughout the state was vested in the second commission.

A state civil service commission (1883) consists of three members (not more than two of the same political party) appointed by the governor with the approval of the Senate. For the classified service of the state and of the minor civil divisions, except cities, the commission makes rules (subject to the governor's approval and to statutory and constitutional provisions) governing the classification of offices, the examination of candidates for office, and the appointment and promotion of employees. In cities the mayor is required to appoint a municipal civil service commission, with similar duties; not more than two-thirds of the members may be of the same political party.

Prisons, Poor Law, Charities, &c.—Penal institutions for sane adults, except reformatories for women, are under the general supervision of a state commission of prisons; hospitals for the insane are under the general supervision of a state commission in lunacy; and all other charitable and penal institutions, maintained wholly or in part by the state, or by any county, city or town within the state, are under the general supervision of a state board of charities. This board of charities consists of one member from each of the nine judicial districts and three additional members from the City of New York, all appointed by the governor with the consent of the Senate for a term of eight years. Its existence dates from 1867, but its authority was very limited, chiefly advisory, until 1895. Since then, however, its powers have been greatly increased. In 1910 the state charitable institutions were as follows: State Soldiers' and Sailors' Home, Bath; State School for the Blind, Batavia; the Thomas Indian School, Iroquois; State Woman's Relief Corps Home, Oxford; State Hospital for the care of Crippled and Deformed Children, West Haverstraw; Syracuse State Institution for Feeble-Minded Children, Syracuse; State Hospital for the treatment of Incipient Pulmonary Tuberculosis, Ray Brook; Craig Colony for Epileptics, Sonyea; State Custodial Asylum for Feeble-Minded Women, Newark; Rome State Custodial Asylum for Unteachable Idiots, Rome; State Agricultural and Industrial School, Industry; State Training School for Girls, Hudson; Western House of Refuge, Albion; New York State Reformatory for Women, Bedford; the State Training School for Boys; and Letchworth Village, a custodial asylum for epileptics and feeble-minded. Eight private institutions for the care or the care and instruction of deaf mutes and one for the care of the blind are supported mainly by the state. Many other charitable institutions receive public money, mostly from counties, cities and towns.

The poor law of the state defines the town poor as those who have gained a settlement in some town or city, by residing there for one year prior to their application for public relief and who are unable to maintain themselves; the county poor as the poor who have not resided in any one town or city for one year before their application for public relief, but have been in some one county for sixty days; and the state poor as all other poor persons within the state. Wherever cared for, each town, city, county and the state must pay the cost of maintaining its own poor. In some counties there is no distinction between town and county poor, but in 1910 only one county had not a county superintendent for the general supervision and care of the poor; towns and cities not subject to special provisions intrusted public relief to one or more overseers of the poor or to commissioners of charities. In counties lacking adequate hospital accommodation a poor person requiring medical or surgical treatment may be sent to the nearest hospital approved by the state board of charities. An Act of 1910 provides that indigent soldiers, sailors or marines of the U.S. and their families be cared for in their homes and not in almshouses.

The first state insane asylum, designed chiefly for recent and curable cases, was opened at Utica in 1843. Since 1896 every public institution for the insane has been maintained and administered as a part of the state system. A state commissioner in lunacy was first appointed in 1874; this officer was replaced in 1889 by a commission in lunacy, which in 1894 was placed at the head of the administration of the state's insanity law. This commission consists of three members appointed by the governor with the consent of the Senate. Its president must be a physician and alienist, and another member must be a lawyer. The commission appoints a board of experts to examine all immigrants suspected of insanity or allied mental disorders in order to prevent the admission of the insane into the country. In 1910 there were fourteen state hospitals (corresponding to fourteen state hospital districts) for the poor and indigent insane; these were at Utica, Willard, Poughkeepsie, Buffalo, Middletown (homoeopathic), Binghamton, Rochester, Ogdensburg, Gowanda (homoeopathic), Flatbush, Ward's Island, King's Park, Central Islip and Yorktown. There were also in 1910 two hospitals for the criminal insane, at Matteawan and Dannemora. Each of these is under the immediate control of a superintendent appointed by the superintendent of state prisons.

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[1] For further regulations relating to the employment of women and children see the Labour Law enacted in 1909 and the subsequent amendments.

The state commission of prisons consists of seven members appointed by the governor with the consent of the Senate for a term of four years, and the institutions under its supervision in 1910 were the Sing Sing State Prison,[1] at Ossining, the Auburn State Prison at Auburn, the Clinton State Prison at Dannemora, the New York State Reformatory at Elmira, the Eastern New York Reformatory at Napanoch, five county penitentiaries, and all other institutions for the detention of sane adults charged with or convicted of crime, or retained as witnesses or debtors. The state prisons are under a superintendent of state prisons, appointed by the governor, with the consent of the Senate, for five years; and the state reformatories are managed by a board of seven managers similarly appointed for seven years. In the state reformatory at Elmira (which, like that at Napanoch, is for men between sixteen and thirty years of age who have been convicted of a state prison offence for the first time only), the plan of committing adult felons on an indeterminate sentence to be determined by their behaviour was first tested in America in 1877, and it has proved so satisfactory that it has been in part adopted for the state prisons. In order to minimize competition between prison labour and free labour, articles manufactured in the state prisons, the reformatories and the penitentiaries, are sold only to the institutions and departments of the state and its political divisions.

Education.—The first school was established by the Dutch at New Amsterdam (now New York City) as early as 1633, and at the close of the Dutch period there was a free elementary school in nearly every settlement. But from the English conquest to the close of the colonial era the chief purpose of the government with respect to education was to prepare leaders for the state church; to this end King's College was founded in 1754, and from 1704 to 1776 the other schools were principally those maintained by the Society for the Propagation of the Gospel in Foreign Parts. Hardly any schools remained in operation throughout the War of Independence. In January 1784 Governor George Clinton recommended legislation for the "revival and encouragement of seminaries of learning," with the result that the legislature passed an act establishing a state university of which Columbia College, formerly King's, was the "mother" portion. In 1787 a second university act was passed which restored to Columbia College the substance of its original charter and made the University of the State of New York an exclusively executive body with authority to incorporate new colleges and academies and to exercise over them the right of visitation. In 1795 an act was passed which formed the basis of the present elementary-school system. This act appropriated £20,000 annually for five years for the establishment and maintenance of elementary schools, required each city and town to raise by taxation a sum for the same purpose equal to one-half of its share from the proceeds of the state fund, and provided for the election of school commissioners in each town and of trustees of each school. The state appropriation was discontinued in 1800; but in 1805 the proceeds of the sale of 500,000 acres of land were set apart for a permanent school fund, and in 1812, when the interest on this fund had become nearly $50,000 a year, the amount required before any of it could be distributed for school purposes, the common-school system was permanently established by an act which restored the main features of that of 1795, except that a superintendent of schools chosen by the council of appointment was now placed at its head. Although the interest on the state fund had risen to $70,000 in 1819, this together with an equal sum raised by the cities and towns was insufficient, and to meet the deficiency the patrons in each district were required by a "rate bill" to contribute in proportion to the attendance of their children. The schools were made free only after a memorable contest against the "rate bill." The framers of the constitution of 1846 were nearly equally divided on this question. In 1849 the legislature passed a free-school bill subject to the approval of the people. The people approved by a vote of nearly three to one, but the court of appeals declared the act unconstitutional because of the referendum. In 1851 a compromise measure was substituted, increasing the state appropriation to $800,000 and exempting indigent parents from the "rate bill," which was finally abolished in 1867. The administration of the common school system was in the hands of a state superintendent of schools from 1813 to 1821, of the secretary of state from 1821 to 1854, and of a superintendent of public instruction from 1854 to 1904. In the meantime the functions of the university had been extended to include an oversight of the professional, scientific and technical schools, the administration of laws relating to admission to the professions, the charge of the State Library at Albany, the supervision of local libraries, the custody of the State Museum and the direction of all scientific work prosecuted by the state. This dual system was consolidated by the Educational Unification Act of 1904, in conformity with which the university regents have become a legislative body, subordinate to the state legislature, for determining the general educational policy of the state, and a commissioner of education acts as the chief executive, advisory and supervisory, officer of the whole educational system.

The regents of the University are chosen by the legislature, one retiring each year; and an act of 1909 requires that their number shall at all times be three more than the number of judicial districts. The first commissioner of education was chosen by the legislature for a term of six years, but it was arranged that his successor should be chosen by the regents and continue in office during their pleasure. The commissioner (subject to approval of the regents) appoints three assistant commissioners, for higher, secondary and elementary education respectively. The elementary school is administered by a school commissioner in each of the school commissioner's districts into which a county may be divided, by one trustee or three trustees in each separate school district, and by a board of education in each city, village or union free school district having more than three hundred children. Any two or more adjoining school districts may unite to form a union free school district, and in any village or union free school district having a population of 5000 or more the board of education may appoint a superintendent of schools.

The compulsory education law as amended in 1907 and 1909 requires the full attendance at a public school, or at a school which is an approximate equivalent, of all children who are between seven and fourteen years of age, are in the proper physical and mental condition, and reside in a city or school district having a population of 5000 or more and employing a superintendent of schools; in such a city or district children between fourteen and sixteen years must attend school unless they obtain an employment certificate and are regularly engaged in some useful employment or service; and outside of such a city or district all children between the ages of eight and fourteen years and those between fourteen and sixteen years who are not regularly employed must attend school on all school days from October to June. In a city of the first or second class every boy between fourteen and sixteen years of age who has an employment certificate, but has not completed the course of study prescribed for the elementary public schools or the equivalent, must attend an evening school not less than six hours each week for a period of not less than sixteen weeks each year, or a trade school not less than eight hours a week for sixteen weeks a year. By a law of 1908 the board of education of any city is authorized to establish industrial schools for children who have completed the elementary school course or have attained the age of fourteen years, and trade schools for children who are more than sixteen years old and have completed the elementary school course or a course offered by any of the industrial schools. For the training of teachers for the elementary schools the state maintains ten normal schools at Oswego (1863), Cortland (1866), Fredonia (1866), Potsdam (1866), Geneseo (1867), Brockport (1867), Buffalo (1867), New Paltz (1885), Oneonta (1887) and Plattsburg (1890); it also appropriates $700 annually for each teachers' training class in about one hundred of the secondary schools. The State Normal College at Albany, founded in 1844 as the first state normal school, is designed principally for the training of teachers for the secondary schools, about 800 high schools and academies, supported wholly or in part by the state.

The state controls professional and technical schools through the regents' examinations of candidates for admission to such schools and to the professions, determines the minimum requirements for admission to college by the regents' academic examinations, maintains the large State Library and the valuable State Museum, and occasionally makes a gift to a college or a university for the support of courses in practical industries; but it maintains no college or university that is composed of a teaching body. To Cornell University (*q.v.*), a non-sectarian institution opened at Ithaca in 1868, the state turned over the proceeds from the National land-grant act of 1862 on condition that it should admit free one student annually from each Assembly district, and in 1909 a still closer relation between this institution and the state was established by an act which makes the governor, lieutenant-governor, speaker of the Assembly and commissioner of education *ex-officio* members of its board of trustees, and authorizes the governor with the approval of the Senate to appoint five other members, one each year.

Among the institutions of higher learning in the state, besides Columbia University (*q.v.*) and Cornell University (*q.v.*), are: Union University (1795, non-sectarian), at Schenectady; Hamilton College (1812, non-sectarian), at Clinton; Colgate University (1819, non-sectarian), at Hamilton; Hobart College (1822, non-sectarian), at Geneva; Rensselaer Polytechnic Institute (1824, non-sectarian), at Troy; New York University (1832, non-sectarian), in New York City; Alfred University (1836, non-sectarian), at Alfred; Fordham University (1841, Roman Catholic), in New York City; College of

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[1] In 1906 a law was enacted for the establishment of a new state prison in the eastern part of the state to take the place of Sing Sing Prison.

St Francis Xavier (1847, Roman Catholic), in New York City; College of the City of New York (1849, city); University of Rochester (1850, Baptist), at Rochester; Polytechnic Institute of Brooklyn (1854, non-sectarian), at Brooklyn; Niagara University (1856, Roman Catholic), at Niagara Falls; St Lawrence University (1858, non-sectarian), at Canton; St Bonaventure's College (1859, Roman Catholic), at St Bonaventure; St Stephen's College (1860, Protestant Episcopal), at Annandale; Manhattan College (1863, Roman Catholic), at New York City; St John's College (1870, Roman Catholic), at Brooklyn; Canisius College (1870, Roman Catholic), at Buffalo; Syracuse University (1871, Methodist Episcopal), at Syracuse; Adelphi College (1896, non-sectarian), at Brooklyn; and Clarkson School of Technology (1896, non-sectarian), at Potsdam. The United States Military Academy (1802) is at West Point.

Finance.—In New York the direct property tax is levied by and for the benefit of localities. Revenues for state purposes are derived from special taxes collected from the liquor traffic, corporations, transfers of decedents' estates, transfers of shares of stock, recording tax on mortgages, sales of products of state institutions, fees of public officers including fines and penalties, interest on deposits of state funds, refunds from department examinations and revenue from investments of trust funds, the most important of which are the common school fund and the United States deposit fund. A board of three tax commissioners has supervision of methods of assessment within the state, and with the commissioners of the land office constitutes the state board of equalization. The county supervisors, with or without the aid of three commissioners whom they are authorized to appoint for the purpose, constitute a county board of equalization. The recording tax on mortgages, amounting to one-half of 1% of the principal sums secured, is collected by the recording officers under the supervision of the state board of tax commissioners. The administration of the liquor tax law is under the supervision of the state commissioner of excise and his deputies. The tax on corporations, originating as a capital stock tax in 1880 and extended through succeeding years, is administered by the state comptroller. The comptroller also has charge of the enforcement of the stock transfer tax act and of the laws imposing taxes upon the transfer of decedents' estates. The aggregate of taxes received by the state treasury through the comptroller's department for the fiscal year ending September 30, 1909, was $23,000,000.

On the 30th of September 1909 the state debt, most of which was created since 1895 for the purpose of canal improvements, amounted to $41,230,660. The surplus in the treasury was $8,435,848, the total amount in trust and sinking funds was $31,301,501. The constitution prohibits the legislature from lending the state's credit or incurring an indebtedness for current expenses in excess of $1,000,000 or incurring any indebtedness whatever, other than for war purposes, unless such indebtedness be authorized by law for "some single work or object," the law to be approved by the people at a general election and providing for a direct annual tax sufficient to pay the interest and to liquidate the debt within eighteen years. That instrument further prohibits each county, city, town and village from lending its credit and from creating an indebtedness in excess of 10% of the assessed valuation of its real estate.

The first state institution to receive a bank charter was the bank of New York, incorporated in 1791. In 1804 free banking was restricted to such an extent as to give practically a monopoly of the business to associations receiving special charters, and as these charters were generally awarded as favours to politicians the system was a formidable agency of corruption. Chiefly because of these evils the constitution of 1821 required the assent of two-thirds of the members elected to each house of the legislature to pass an act creating a corporation. In 1829 the Safety-Fund Act was passed, which required each bank thereafter chartered or rechartered to pay into the state treasury 3% of its capital stock other than that owned by the state, and from this fund the debts of insolvent banks were to be paid. The fund became exhausted by many failures, and a free banking law was enacted in 1838. The constitution of 1846 prohibited the legislature from granting any special charters for banking purposes, and consequently no more safety-fund banks were established. At the same time the free-banking system has been greatly improved. The state banks still have the right to issue currency, but the heavy tax on currency issue imposed by Congress in 1866 (after the introduction of the National banking system in 1863) put a stop to the practice. In 1851 a state banking department was created, and at the head of this is a superintendent of banks appointed by the governor, with the consent of the Senate, for a term of three years. The superintendent—or examiners appointed by him (from a civil service list)—is required to examine every bank and every trust company at least twice each year, each building and loan association at least once a year, and every savings bank at least once in two years. The law provides specifically as to the investment of deposits made in savings banks with the evident purpose of providing the greatest possible security to depositors. State banks must carry from 15% to 25% reserve and trust companies from 10% to 15% reserve, depending upon location.

The introduction of the National banking system caused a decrease in the number of state banks from 309 in 1863 to 45 in 1868, but their number has increased steadily since 1880 and in 1909 there were 202. In the same year there were 140 savings-banks, 85 trust companies, 46 safe deposit companies, 255 building and loan associations and other miscellaneous corporations, with total resources of $3,833,500,000 under the supervision of the banking department of the state. This is over 21% of the entire banking power of the United States.

To correct abuses in the life insurance business which were discovered in 1905 by a committee of the state legislature, laws were passed in the next year regulating the election of the directors of the insurance companies, and the investments of the companies and the distribution of dividends, limiting the amount of business of the larger companies and prohibiting rebates on insurance premiums. A state superintendent of insurance, (since 1860) appointed by the governor, holds office for three years.

History.—The aboriginal inhabitants of New York had an important influence on its colonial history. Within its limits from the upper Hudson westward to the Genesee river was the home of that powerful confederacy of Indian tribes, the Mohawks, Oneidas, Onondagas, Cayugas and Senecas, known to the French as the Iroquois and to the English as the Five (later Six) Nations. When supplied with firearms by Europeans they reduced a number of other tribes to subjection and extended their dominion over most of the territory from the St Lawrence to the Tennessee and from the Atlantic to the Mississippi. They were at the height of their power about 1700. Of much less influence in New York were several Algonquian tribes in the lower valley of the Hudson and along the sea coast.

New York Bay and the Hudson river were discovered by Giovanni da Verrazano in 1524, and were probably seen by Estevan Gomez in 1525; for many years following French vessels occasionally ascended the Hudson to trade with the Indians. The history of New York really begins, however, in 1609. In July of that year Samuel de Champlain discovered the lake which bears his name and on its shores led his Algonquian Indian allies against the Iroquois, thus provoking against his countrymen the hostility of a people who for years were to hold the balance of power between the English and the French in America. On the 3rd of September Henry Hudson, in the employ of the Dutch East India Company, entered New York Bay in the "Half Moon" in search of the "northwest passage." He conceived that a vast trade with the Iroquois for furs might be established; his report aroused great interest in Holland; and the United Netherlands, whose independence had been acknowledged in the spring, claimed the newly discovered country. In 1610 a vessel was despatched with merchandise suitable for traffic with the Indians, the voyage resulted in profit, and a lucrative trade in peltry sprang up. Early in 1614 Adriaen Block explored Long Island Sound and discovered Block Island. The merchants of Amsterdam and Hoorn soon formed themselves into the New Netherland Company, and on the 11th of October 1614 received from the States-General a three years' monopoly of the Dutch fur trade in New Netherland, *i.e.* that part of America between New France and Virginia, or between latitudes 40° and 45° N. Late in the same year or early in 1615 a stockaded trading post called Fort Nassau was erected on Castle Island, now within the limits of Albany, and a few huts were erected about this time or earlier on the southern extremity of Manhattan Island; but no effort at colonization was as yet made. In 1617 the Dutch negotiated with the Iroquois a treaty of peace and alliance. Fort Nassau was soon removed to the mouth of Tawasentha Creek. On the expiration of the charter of the New Netherland Company (1618) the States-General refused to grant a renewal, and only private ventures were authorized until 1621, when the West India Company (*q.v.*) was chartered for a term of twenty-four years; to this company was given a monopoly of Dutch trade with the whole American coast from Newfoundland to the Straits of Magellan. It was authorized to plant colonies and to govern them under a very limited supervision of the States-General, such as the approval of its appointment of a governor and of its instructions to him; and its own government was vested in five chambers of directors and an executive board or college of nineteen delegates from those chambers, eight of the nineteen representing the Chamber of Amsterdam. New Netherland became one of the more important interests of the Company. In June 1623, however, New Netherland was formally erected into a province and the management of its affairs assigned to the Chamber of

Amsterdam, which in March 1624 despatched the "New Netherland," with the first permanent colonists (thirty families mostly Walloon), under Cornelis Jacobsen Mey, the first governor or director of the colony. Arriving at Manhattan early in May, a few of the men remained there, another small party established a temporary post (Fort Nassau) on the Delaware river, and still another began a fortified settlement on the site of the present Hartford, Connecticut. But more than one-half of the families proceeded up the Hudson to Fort Orange, the successor of Fort Nassau, at the mouth of Tawasentha Creek, and there founded what is now Albany. Three more vessels arrived in 1625, and when in that year Mey was succeeded as director by William Verhulst the colony had a population of 200 or more. The government of the province was fully established in 1626 and was vested mainly in a director-general and council. The director-general was formally appointed by the Company subject to the approval of the States-General, but the Amsterdam Chamber and the College of Nineteen supervised his administration. The members of the council were formally appointed by the Company, but the director-general actually determined who they should be, and as he was not bound by their advice they were no check to an autocratic rule. Peter Minuit, the first director-general, arrived with more colonists in May 1626, and soon afterwards Manhattan Island was bought from the Indians, Fort Amsterdam was erected at its lower end, and the settlement here was made the seat of government.

In 1629, chiefly to encourage agriculture, the Company issued its famous Charter of Privileges and Exemptions, which provided that any member might have anywhere in New Netherland except on Manhattan Island his choice of a tract of unoccupied land extending 16 m. along the seacoast or one side of a navigable river, or 8 m. along the river on both sides "and so far into the country as the situation of the occupyers will permit" by purchasing the same from the Indians and planting upon it a colony of fifty persons, upwards of 15 years old, within four years from the beginning of the undertaking, one-fourth part within one year; and that any private person might with the approval of the director-general and council take up as much land as he should be able to improve. The founder of a colony was styled a *patroon*, and, although the colonists were bound to him only by a voluntary contract for specified terms, the relations between them and the patroon during the continuance of the contract were in several important respects similar to those under the feudal system between the lord of a manor and his serfs. The patroon received his estate in perpetual inheritance and had the exclusive right of hunting and fishing upon it. Each colonist not only paid him a fixed rent, usually in kind, but had to share with him the increase of the stock and to have the grain ground at his mill. The patroon was the legal heir of all his colonists who died intestate. He had civil and criminal jurisdiction within the boundaries of his estate; he could create offices, found cities, and appoint officers and magistrates, and, although the charter permitted an appeal from his court to the director-general and council in any case in which the amount in dispute exceeded fifty guilders ($20), some of the patroons exacted from their colonists a promise not to avail themselves of the privilege. The Company promised to permit the patroons to engage in the fur trade, wherever it had no commissary of its own, subject to a tax of one guilder (40 cents) on each skin, and to engage in other trade along the coast from Newfoundland to Florida subject to a tax of 5% on goods shipped to Europe. The colonists of the patroons were exempted from all taxes for a period of ten years, but were forbidden to manufacture any cloth whatever. The charter did not give the encouragement to agriculture that was expected of it because the status created for colonists of a patroon was no attraction to a successful farmer in the Netherlands. Immediately after the issue of the charter a few of the more adroit directors of the Amsterdam Chamber hastened to acquire for themselves, as patroons, the tracts of land most favourably situated for trade. On both sides of the entrance to Delaware Bay Samuel Godyn, Samuel Blomaert and five other directors who were admitted to partnership in the second year (1630) established the manor and colony of Swaanendael; on a tract opposite the lower end of Manhattan Island and including Staten Island, Michael Pauw established the manor and colony of Pavonia; on both sides of the Hudson and extending in all directions from Fort Orange (Albany) Kilian van Rensselaer established the manor and colony of Rensselaerwyck. The colony of Swaanendael was destroyed by the Indians in 1632. Pauw maintained his colony of Pavonia for about seven years and then sold out to the Company. The colony of Rensselaerwyck was the only one that prospered under the patroon system. In the meantime the patroons had claimed unrestricted rights of trade within the boundaries of their estates. These were stoutly denied by the Company. Director-General Minuit was recalled in 1632 on the ground that he had been partial to the patroons; and Wouter van Twiller, who arrived in 1633, endeavoured to promote only the selfish commercial policy of the Company; at the close of his administration (1637) the affairs of the province were in a ruinous condition.

William Kieft was appointed director-general late in 1637, and in 1638 the Company abandoned its monopoly of trade in New Netherland and gave notice that all inhabitants of the United Provinces, and of friendly countries, might trade there subject to an import duty of 10%, an export duty of 15%, and to the requirement that the goods should be carried in the Company's ships. At the same time the director-general was instructed to issue to any immigrant applying for land a patent for as large a farm as he required for cultivation and pasturage, to be free of all charges for ten years and thereafter subject only to a quit-rent of one-tenth of the produce. Two years later, by a revision of the Charter of Privileges and Exemptions, the prohibition on manufactures was abolished, the privileges of the original charter with respect to patroons were extended to "all good inhabitants of the Netherlands," and the estate of a patroon was limited to 4 m. along the coast or a navigable river and 8 m. back into the country. The revised charter also provided that any one who brought over five colonists and established them in a new settlement should receive 200 acres, and if such a settlement grew to be a town or village it should receive a grant of municipal government. These inducements encouraged immigration not only from the Fatherland but from New England and Virginia. But the freedom of trade promoted dangerous relations with the Indians, and an attempt of Kieft to collect a tribute from the Algonquian tribes in the vicinity of Manhattan Island and other indiscretions of this officer provoked Indian hostilities (1641–1645), during which most of the outlying settlements were laid waste.

Out of this warfare arose an organized movement for a government in which the colonists should have a voice. In August 1641 Kieft called an assembly of the heads of families in the neighbourhood of Fort Amsterdam to consider the question of peace or war. The assembly chose a board of Twelve Men to represent it, and a few months later this board demanded certain reforms, especially that the membership of the director-general's council should be increased from one to five by the popular election of four members. Kieft promised the concessions to gain the board's consent to waging war, but later denied its authority to exact promises from him and dissolved it. At another crisis, in 1643, he was obliged to call a second assembly of the people. This time a board of Eight Men was chosen to confer with him. It denied his right to levy certain war taxes, and when it had in vain protested to him against his arbitrary measures it sent a petition, in 1644, to the States-General for his recall, and this was granted. Peter Stuyvesant (*q.v.*), his successor, arrived at Fort Amsterdam in May 1647. Under his rule there was a return of prosperity; from 1653 to 1664 the population of the province increased from 2000 to 10,000. Stuyvesant was, however, extremely arbitrary. Although he permitted the existence of a board of Nine Men to act as "tribunes" for the people it was originally composed of his selections from eighteen persons chosen at a popular election, and annually thereafter the places of six retiring members were filled by his selections from twelve persons nominated by the board. He treated it with increasing contempt, and the most that it could do was to remonstrate to the States-General. That body suggested a representative government, but this the Company refused to grant.

Stuyvesant conducted a successful expedition against the Swedes on the southern border of New Netherland in 1655; but he was powerless against the English. The Dutch had long claimed the whole coast from Delaware Bay to Cape Cod, but by the treaty of Hartford (1650), negotiated between himself and the commissioners of the United Colonies of New England, Stuyvesant agreed to a boundary which on the mainland roughly determined the existing boundary between New York and Connecticut and on Long Island extended southward from the west side of Oyster Bay to the Atlantic Ocean. Notwithstanding the good claim to their province which the Dutch had established by discovery and occupancy, the government of Great Britain, basing its claim to the same territory on Cabot's discovery (1498), the patent to the London and Plymouth companies (1606), and the patent to the Council for New England (1620), contended that the Dutch were intruders. In 1653, during the war between England and Holland, the Dutch, fearing an English attack, built a wall, from which the present Wall Street was named, across Manhattan Island at what was then the northern limits of New Amsterdam. In the following year Cromwell actually sent out an expedition which, with the aid of New England, was to attempt the conquest, but before an attack was made peace was announced. The Connecticut Charter of 1662 included in that colony some settlements acknowledged by the treaty of Hartford to belong to New Netherland, and strife was renewed. Finally, in March 1664, Charles II. formally erected into a province the whole territory from the west side of the Connecticut river to the east side of Delaware Bay together with all of Long Island and a few other dependencies of minor importance, and granted it to his brother James, the duke of York and Albany, as its lord proprietor. The duke appointed Colonel Richard Nicolls governor and placed him in command of an expedition to effect its conquest. Nicolls won over the burgomaster of New Amsterdam and other prominent citizens by the favourable terms which he offered, and Stuyvesant was forced, without fighting, into a formal surrender on the 8th of September. The duke's authority was proclaimed and New Netherland became New York. The separation from it of what is now New Jersey (*q.v.*) was begun by the duke's conveyance, in the preceding June, of that portion of his province to Berkeley and Carteret, and among numerous changes from Dutch to English names was that from Fort Orange to Fort Albany. A treaty of alliance with the Mohawks and Senecas procured for the English the same friendly relations with the Iroquois that the Dutch had enjoyed. The transition from Dutch to English institutions was effected gradually and the private rights of the Dutch were carefully preserved. The English executive, consisting of a governor and council, was much like the Dutch, but Nicolls, by his conciliatory spirit, made his administration more agreeable than Stuyvesant's. In the administration of local affairs some of the Dutch settlements were little disturbed until ten years or more after the conquest, but the introduction of English institutions into settlements wholly or largely English was begun in 1665 by the erection of Long Island, Staten Island and Westchester into an English county under the name of Yorkshire, and by putting into operation in that county a code of laws known as the "Duke's Laws." This code was based largely on the laws of New England, and, although a source of popular discontent, it gave to the freeholders of each town a voice in the government of their town by permitting them to elect a board of eight overseers which chose a constable and sat as a court for the trial of small causes. Nicolls resigned the governorship in 1668, but his successor, Francis Lovelace, continued his policy—autocratic government, arbitrary in form but mild in practice, and progressive in the matter of religious toleration. In August 1673, Holland and England being at war, a Dutch fleet surprised New York, captured the city, and restored Dutch authority and the names of New Netherland and New Amsterdam. But by the treaty of Westminster, February 1674, the Dutch title to the province was finally extinguished, and in November the English again took possession. A new charter was issued to the duke to perfect his title and Edmund (later Sir Edmund) Andros, the new governor, was instructed to establish English institutions and enforce English law in all sections. In 1675 Andros established at Albany a commission for Indian affairs which long rendered important service in preserving the English-Iroquois alliance. The imperious manner of Andros made him many enemies. Some of them preferred charges against him relating to his administration of the revenue. He was called to England in 1681 to answer these, and during his absence the demand for a representative assembly was accompanied with a refusal to pay the customs duties and so much other insubordination that the duke appointed Colonel Thomas Dongan to succeed Andros, and instructed him to call the desired assembly. It met at Fort James in the City of New York on the 17th of October 1683, was in session for about three weeks, and passed fifteen acts. The first, styled a charter of liberties and privileges, required that an assembly elected by the freeholders and freemen should be called at least once every three years; vested all legislative authority in the governor, council and assembly; forbade the imposition of any taxes without the consent of the assembly; and provided for religious liberty and trial by jury. Other acts divided the province into counties, established courts of justice, and provided for a revenue. In August 1684 when, by its charter, the western boundary of the province was not definitely extended beyond the Hudson, Dongan laid the basis of New York's claim to the western lands of the Iroquois by a new covenant with them in which they recognized the English as their protectors, and throughout his administration he was busy neutralizing French influence among the Iroquois and in diverting the fur trade of the north-west from the St Lawrence to Albany. The charter of liberties and privileges was approved by the duke, but before the news of this reached its authors the duke became King James II., and in 1686, when a frame of government for New York as a royal province was provided, the assembly was dispensed with. About the same time the new king adopted a policy for strengthening the imperial control over New England as well as for the erection of a stronger barrier against the French, and in 1688 New York and New Jersey were consolidated with the New England colonies into the Dominion of New England and placed under the viceregal authority of Sir Edmund Andros as governor-general. The news of the English revolution of 1688, however, caused an uprising in Boston, and in April 1689 Andros was seized and imprisoned. Francis Nicholson as lieutenant-governor was still in quiet possession of the government of New York, and a majority of the population of the province were satisfied to await the outcome of the revolution in the mother country, but in the southern portion of the province, especially in the City of New York and on Long Island, were a number of restless spirits who were encouraged by the fall of Andros to take matters into their own hands. They found a leader in a German merchant, Jacob Leisler (*q.v.*). Leisler refused to pay duties on a cargo of wine on the ground that the collector was a "papist," and on the 31st of May 1689, during a mutiny of the militia, he and other militia captains seized Fort James. In the following month Nicholson deserted his post and sailed for England, and Leisler easily gained possession of the city. To strengthen his position he called an assembly which conferred upon him the powers of a dictator. Some time after a copy of the order of the new monarchs (William and Mary) to continue all Protestants in their offices in the colonies had been received, Leisler falsely announced that he had received a commission as lieutenant-governor. He then attempted to revive the act of 1683 for raising revenue, but met with so much opposition that he issued writs for the election of another assembly. This, however, brought him chiefly petitions for the redress of grievances. Albany successfully defied his usurped authority until his recognition was necessary to a united front against the French and their Indian allies, who, in February 1690, had surprised and burned Schenectady. Two other French attacks had at the same time been directed against New England, and to meet the dangerous situation Leisler performed the one statesmanlike act of his public career, notable in American history as the first step toward the union of the colonies. At his call, delegates from Massachusetts, Plymouth, Connecticut and Maryland met in New York City with delegates from New York on the 1st of May 1690 to consider concerted action against the enemy, and although the expedition which they sent out was a failure it numbered 855 men, New York furnishing about one-half the men, Massachusetts one of the two commanders and Connecticut the other. Leisler had proclaimed the new monarchs of Great Britain and had declared that it was his purpose only to protect the province and the Protestant religion until the arrival of a governor appointed by them; but he was enraged when he learned that he had been ignored and that under the new governor, Colonel Henry Sloughter, his enemies, van Cortlandt and Bayard, had again been appointed to the council. When Major Richard Ingoldsby arrived with two companies of the king's soldiers and demanded possession of the fort, Leisler refused although he still professed his willingness to deliver it to Sloughter. On the 17th of March 1691 Leisler's force fired on the king's soldiers, killing two and wounding several. Governor Sloughter arrived two days later, and the revolt terminated in the arrest of Leisler and his chief followers. Leisler and Jacob Milborne, his son-in-law, were pronounced guilty of treason, and were executed on the 16th of May. The execution was regarded even by many who had been indifferent to Leisler's cause, as an act of revenge. The case was carried to England, where in 1695 parliament reversed the attainders of the victims, and for many years the province was rent by the Leislerian and anti-Leislerian factions.

Governor Sloughter, as his commission directed, re-established in 1691 the assembly which James II. had abolished in 1686, and throughout the remainder of the colonial era the history of the province relates chiefly to the rise of popular government and the defence of the northern frontier. At its first session the assembly passed an act declaratory of the rights and privileges of the people, and much like the charter of liberties and privileges enacted in 1683, except that annual instead of triennial sessions of the assembly were now requested and, as was also provided in Sloughter's commission and instructions, religious liberty was denied to Roman Catholics. This act was disallowed by the crown in 1697, and until Governor Cornbury's administration (1702–1708) both the Leislerians and the anti-Leislerians repeatedly bid for the governor's favour by supporting his measures instead of contending for popular rights. But Cornbury's embezzlement of £1500, appropriated for fortifying the Narrows connecting Upper and Lower New York Bay, united the factions against him and started the assembly in the important contest which ended in the establishment of its control over the public purse. In 1706 it won the right to appoint its own treasurer to care for money appropriated for extraordinary purposes, and eight years later the governor assented to an act which gave to this officer the custody of practically all public money. Until 1737 it had been the custom to continue the revenue acts from three to five years, but thereafter the assembly insisted on annual appropriations.

The first newspaper of New York, the *New York Gazette*, was established in 1725 by William Bradford as a semi-official organ of the administration. In 1733 a popular organ, the *New York Weekly Journal*, was established under John Peter Zenger (1697–1746), and in 1735 both the freedom of the press and a great advance toward the independence of the judiciary were the outcome of a famous libel suit against Zenger.

Between the administration of Governor Montgomerie (1728–1731) and Governor Cosby (1732–1736) there was an interregnum of thirteen months during which Rip van Dam, president of the council, was acting-governor, and upon Cosby's arrival a dispute arose between him and van Dam over the division of the salary and fees. Both appealed to the law, and when the chief-justice, Lewis Morris, refused Cosby's request to have the court proceed in equity jurisdiction, and denied the right of the governor to establish courts of equity, he was removed from office. Not long afterwards there appeared in the *Weekly Journal* some severe criticisms of the administration. For printing these Zenger was arrested for libel in November 1734. The case was not brought to trial until August 1735, and in the meantime Zenger was kept in jail. Originally he had for counsel two of the most able lawyers in the province, James Alexander (1690–1756) and William Smith (1697–1769), but when they excepted to the commissions of the chief-justice, James de Lancey (1703–1760) and one of his associates, because by these commissions the justices had been appointed "during pleasure" instead of "during good behaviour," the chief justice disbarred them. Their places, however, were taken by Andrew Hamilton, speaker of the Assembly of Pennsylvania and a lawyer of great reputation in the English colonies. The jury quickly agreed on a verdict of not guilty, and the acquittal was greeted by the populace with shouts of triumph. The further independence of judges became a leading issue in 1761 when the assembly insisted that they should be appointed during good behaviour, and refused to pay the salaries of those appointed during pleasure; but the home government met this refusal by ordering that they be paid out of the quit-rents.

The defence of the northern frontier was a heavy burden to New York, but by its problems the growth of the union of the colonies was promoted. From the destruction of Schenectady to the Peace of Ryswick (1697) hostilities between the French and the English in the New World took the form of occasional raids across the frontier, chiefly by the Indian allies. The main effort of the French, however, was, by diplomacy, to destroy the English-Iroquois alliance. This rested on the fear of the Iroquois for the French and their hope of protection from the English. Therefore, in response to their repeated complaints of the weakness of the English arising from disunion, Governor Fletcher, in 1694, called another intercolonial conference consisting of delegates from New York, Massachusetts, Connecticut and New Jersey, and urged the necessity of more united feelings. Open hostilities were interrupted for a few years by the Peace of Ryswick and for a longer period by the Peace of Utrecht (1713), but French priests continued to dwell among the Iroquois, teaching them and distributing presents, and of the success of this diplomacy the English were ever in danger. To counteract it they, in 1701, prevailed upon the chiefs to deed their territory, said to be 800 m. in length and 400 m. in breadth, to the king of England. The English, also, frequently distributed presents. But the success of the French at the close of the 17th century and the early portion of the 18th was prevented only by the ceaseless efforts of Peter Schuyler (1657–1724) whose personal influence was for years dominant among all the Iroquois except the Senecas. When they had assumed a neutral attitude, he persuaded a number of them to join troops from New York, New Jersey and Connecticut in the unsuccessful expeditions of 1709 and 1711 against the French at Montreal. The English had a decided advantage over the French in that they could furnish goods for the Indian trade much cheaper than their rivals, and when Governor Burnet saw that this advantage was being lost by a trade between Albany and Montreal he persuaded the assembly to pass an act (1720) prohibiting it. Pursuing the same wise policy he established a trading post at Oswego in 1722 and fortified it in 1727, and thereby placed the Iroquois in the desirable position of middlemen in a profitable fur trade with the "Far Indians." London merchants, in their greed, brought about the repeal of the prohibitory act in 1729, but its effects were only in part destroyed. At another intercolonial conference at Albany, called by Burnet, a line of trading posts along the northern and western frontiers was strongly recommended. But neither the other colonies nor the home government would co-operate, and the French were the first to accomplish it. In King George's War the co-operation of all the northern colonies was sought, and New York contributed £3000 and some cannon toward New England's successful expedition against Louisburg. But it was left alone to protect its own frontier against the French, and while the assembly was wrangling with Governor Clinton for the control of expenditures the French and their Indians were burning farm houses, attacking Saratoga (November 16, 1745), and greatly endangering the English-Iroquois alliance. Even after the Peace of Aix-la-Chapelle (1748) the Iroquois complained bitterly of the fraudulent land speculators, and in 1753 the chiefs of the Mohawks threatened to declare the covenant chain broken. A reconciliation was effected, however, by Colonel William Johnson (1715–1774), who had long been superintendent of Indian affairs. Largely to secure the co-operation of the Iroquois the home government itself now called to meet at Albany (*q.v.*) the most important assembly of colonial deputies that had yet gathered. This body, consisting of twenty-five members and representing seven colonies, met in June 1754, and, besides negotiating successfully with the Iroquois, it adopted, with some modifications, a plan of colonial union prepared by Benjamin Franklin; the plan was not approved, however, either by the home government or by any of the colonies. In the first year of the war (1755) expeditions set out against Fort Duquesne (on the site of Pittsburg) and Fort Niagara and Crown Point, on the New York frontier. None of these was taken but on the 8th of September Major-General William Johnson, in command of the expedition against Crown Point, defeated a French and Indian force under Baron Dieskau in the battle of Lake George. As Johnson thought it unsafe to pursue the routed army his victory had no other effect than the erection here of the useless defences of Fort William Henry, but as it was the only success in a year of gloom parliament rewarded him with a grant of £5000 and the title of a baronet. In August 1756 Montcalm took Oswego from the English and destroyed it, and in 1757 he captured Fort William Henry; but in the latter year the elder Pitt assumed control of affairs in England, and his aggressive, clear-sighted policy turned the tide of war in England's favour. Victory followed victory, Ticonderoga, Crown Point and Niagara were wrested from the French and New York was freed of its foes.

England's attempt to make the colonies pay the expenses of the war by means of the stamp tax thoroughly aroused the opposition of commercial New York, already chafing under the hardships imposed by the Navigation Acts and burdened with a war debt of its own exceeding £300,000. The assembly was almost unanimous in voicing its protest to the governor. It authorized its committee, which had been appointed to correspond with the New York agent in London, to correspond also with the committees in the other colonies and this committee represented New York in the Stamp Act Congress, a body which was called at the suggestion of Massachusetts, met in New York City in October 1765, was composed of twenty-seven members representing nine colonies, and drew up a declaration of rights, an address to the king, and a petition to each house of parliament. When the Sons of Liberty, a society composed largely of unfranchised mechanics and artisans of New York City, which began to dominate the movement immediately after the Congress adjourned, resorted to mob violence—destroying property and burning in effigy the governor and other officers—the propertied classes drew back, and a few years later the popular or patriot party lost its control of the assembly. Since the Zenger trial there had been a court party and a popular party: the former included many wealthy Anglicans and was under the leadership of the De Lanceys, the latter included many wealthy and influential dissenters and was under the leadership of the Livingstons. During the administration of Governor Clinton (1743–1753) a quarrel between the governor and James De Lancey, the chief-justice, had greatly weakened the court party, and nearly all its members supported their rivals in opposition to the Stamp Act. In the series of events which followed the first violence of the Sons of Liberty important changes were made in party lines. Personal rivalry and creed became subordinate to political principles. The court party became the Loyalist party, standing for law as against rebellion, monarchy and the union of the empire as against republicanism; the popular party became the patriot party, determined to stand on its rights at any cost. The Stamp Act was repealed in March 1766, but the Townshend Acts, imposing duties on glass, paper, lead, painters' colours and tea, followed closely. They were met in New York by fresh outbursts of the Sons of Liberty and, as in the other colonies, by an association of nearly all the merchants, the members pledging themselves not to import anything from England until the duties were repealed. New York had also been requested to provide certain supplies for the British troops quartered in the city. This the assembly refused to do but parliament answered (1767) by forbidding it to do any other business until it complied. It was under these conditions that the Loyalists, in the elections of 1768 and 1769, gained control of the assembly and in the latter year passed an act granting the soldiers' supplies. When, in 1770, all the duties except those on tea were repealed, the conservative merchants wished to permit the importation of all goods from England except tea. The Sons of Liberty strongly opposed this, but the conservatives won and went over to the Loyalists. The moderate Loyalists joined in the election of delegates to the first Continental Congress; but the great body of Loyalists in New York strongly disapproved of the "dangerous and extravagant" measures adopted by that body, and the assembly, in January 1775, refused to approve its acts or choose delegates to the second Continental Congress. The patriots met this refusal by calling a provincial convention to choose the delegates. Scarcely had they done this when news of the encounter at Lexington produced a strong reaction in their favour, and in May 1775 they called a Provincial Congress which usurped the powers of the Assembly. Still, conditions were such in New York that a fight for independence was not to be lightly considered. The failure of Montgomery's expedition against Canada at the close of 1775 left the colony exposed to British attacks from the north. In the south the chief city was exposed to the British fleet. Sir William Johnson died in 1774, but under his influence and that of his son, Sir John Johnson, and his nephew Guy Johnson, the Mohawks and other Iroquois Indians had become firmly attached to the British side and threatened the western frontier. In various sections, too, considerable numbers of Loyalists were determined to aid the British. When, in June 1776, a vote on the Declaration of Independence was pending in the Continental Congress, the New York Provincial Congress refused to instruct its delegates in the matter; but a newly elected Provincial Congress, influenced by a Loyalist plot against the life of Washington, adopted the Declaration when it met, on the 9th of July.

The position of New York made it naturally one of the principal theatres of military operations during the War of Independence. It was a settled point of British military policy throughout the war to hold New York City, and from it, as a base, to establish a line of fortified posts along the Hudson by means of which communication might be maintained with another base on Lake Champlain. Such a scheme, if successfully carried out, would have driven a wedge into the line of colonial defence and cut off communication between New England and the southern colonies. A few days after the fight at Lexington and Concord, Connecticut authorized an expedition under Ethan Allen which surprised and captured Ticonderoga and Crown Point. In the following year (1776) the British began their offensive operations for the control of the Hudson; an army under Sir William Howe was to capture New York City and get control of the lower Hudson, while another army under Sir Guy Carleton was to retake Crown Point and Ticonderoga and get control of the upper Hudson. Howe, with a force of British and Loyalists vastly superior in equipment and numbers to Washington's untrained militia, landed in July on Staten Island and late in August defeated Washington at the battle of Long Island within the present limits of Brooklyn borough. In the following month Washington withdrew from New York City which the British entered and held until the close of the war. Washington prepared to withstand the British behind fortifications on Harlem Heights, but discovering that Howe was attempting to outflank him by landing troops in the rear he retreated to the mainland, leaving only a garrison at Fort Washington, and established a line of fortified camps on the hills overlooking the Bronx river as far as White Plains. This brought on the battle of White Plains late in October, in which Howe gained no advantage; and from here both armies withdrew into New Jersey, the British capturing Fort Washington on the way, the Americans leaving behind garrisons to guard the Highlands of the Hudson. In 1777 General John Burgoyne succeeded in taking Ticonderoga, but in the swampy forests southward from Lake Champlain he fought his way against heavy odds, and in the middle of October his campaign culminated disastrously in his surrender at Saratoga. Colonel Barry St Leger led an auxiliary expedition from Oswego against Fort Stanwix on the upper Mohawk, and on the 6th of August he fought at Oriskany one of the most bloody battles of the war, but a few days later, deserted by his terror-stricken Indian allies, he hastened back to Montreal. The British government intended that Howe should co-operate with Burgoyne by fighting his way up the Hudson, but as the secretary of state for the colonies neglected to send him such instructions this was not undertaken until early in October, and then an expedition for the purpose was placed under the command of Sir Henry Clinton. Clinton met with little difficulty from the principal American defences of the Highlands, consisting of Forts Montgomery and Clinton on the western bank, together with a huge chain and boom stretched across the river to a precipitous mountain (Anthony's Nose) on the opposite bank, and ascended as far as Esopus (now Kingston) which he burned, but he was too late to aid Burgoyne. The year 1778 saw the bloody operations of the Tory Butlers and their Loyalist and Indian allies in the Mohawk and Schoharie valleys and notably the massacre at Cherry Valley. In retaliation a punitive expedition under Generals John Sullivan and James Clinton in 1779 destroyed the Iroquois towns, and dealt the Indian confederacy a blow from which it never recovered. The American cause was strengthened this year also by several victories along the lower Hudson of which General Anthony Wayne's storming of the British fort at Stony Point was the most important. The closing episode of the war as far as New York was concerned was the discovery of Benedict Arnold's attempt in 1780 to betray West Point and other colonial posts on the Hudson to the British. On the 25th of November 1783 the British forces finally evacuated New York City, but the British posts on Lakes Erie and Ontario were not evacuated until some years later.

New York ratified the Articles of Confederation in 1778, and when Maryland refused to ratify unless those states asserting claims to territory west to the Mississippi agreed to surrender them, New York was the first to do so. But under the leadership of George Clinton, governor in 1777–1795, the state jealously guarded its commercial interests. The Confederation Congress appealed to it in vain for the right to collect duties at its port; and there was determined opposition to the new Federal constitution. In support of the constitution, however, there arose the Federalist party under the able leadership of Alexander Hamilton. When a majority of the constitutional convention of 1787 had approved of the new constitution Hamilton alone of the three New York delegates remained to sign it; and when, after its ratification by eight states, the New York convention met at Poughkeepsie (June 17, 1788) to consider ratification, two-thirds of the members were opposed to it. But others were won over by the news that it had been ratified by New Hampshire and Virginia or by the telling arguments of Hamilton, and on the 26th of July the motion to ratify was carried by a vote of 30 to 27.

The constitution having been ratified, personal rivalry among the great families—the Clintons, the Livingstons and the Schuylers—again became dominant in political affairs. The Clintons were most popular among the independent freeholders; the Livingstons had increased their influence by numerous marriage alliances with landed families; and the Schuylers had General Philip Schuyler and Alexander Hamilton, his son-in-law. Originally, the Livingstons, with whom John Jay was connected by marriage, were united with the Schuylers, and yet both together were unable to defeat the Clintons in an election for governor. Later, the Livingstons, piqued at Washington's neglect to give them the offices they thought their due, joined the Clintons, but the Federal patronage was used against the anti-Federalists or Republicans with such effect that in 1792 John Jay received more votes for governor than George Clinton, although the latter was counted in on a technicality. Jay was elected in 1795 and re-elected in 1798, but in 1801 the brief Federalist regime in the state came to an end with the election of George Clinton for a seventh term. The Republican leaders straightway quarrelled among themselves, thus starting the long series of factional strifes which have characterized the party politics of New York state; the bitterness of the factions and the irresponsible council of appointment are also responsible for the firm establishment early in the Republican regime of the "spoils system." The leaders of the several Republican groups were Chancellor Robert R. Livingston, Aaron Burr, then vice-president, Governor George Clinton and his nephew, De Witt Clinton, who in 1802 was elected United States senator. The first break came in the spring of 1804 when Burr, who had incurred the enmity of his Republican colleagues in 1800 by seeking Federalist votes in the electoral college at Jefferson's expense, became an independent candidate for governor against Morgan Lewis. Hamilton's action in counselling Federalists not to vote for Burr for governor just as he had counselled them not to support Burr against Jefferson in 1800, was one of the contributary causes of Burr's hostility to Hamilton which ended in the duel (July 1804) in which Burr killed Hamilton. Hamilton's death marked the end of the Federalists as a power in New York. The election as governor in 1804 of Lewis, a relative of the Livingstons, was followed by a bitter quarrel with the Clintons over patronage, and resulted at the state election of 1807 in the choice of a Clintonian, Daniel D. Tompkins, for governor and the virtual elimination of the Livingstons from New York state politics. Tompkins served as governor by successive re-elections until 1817, his term covering the trying period of the second war with Great Britain. New York, whose growing shipping interests had suffered by the Embargo of 1807, was as a commercial state opposed to the war. Politically this opposition had the effect of temporarily reviving the Federalist party, which secured control of the legislature, and gave the electoral vote of the state in 1812 to De Witt Clinton, whom the Federalists had accepted as a candidate to oppose Madison for re-election on the war issue. During the war New Yorkers served with the regular troops at Niagara, Plattsburg and other places on the western and northern frontiers of the state. For some years after the war political contests in New York state as in the rest of the country were not on party lines. The opposing groups were known as "Bucktails," whose leaders were Governor Tompkins and Martin Van Buren, and "Clintonians" or supporters of De Witt Clinton. In 1817 an act was passed which ten years later ended for ever slavery in New York state; in the same year De Witt Clinton was elected governor and, largely through his efforts, the Erie Canal was begun.

The election of Martin Van Buren as governor in 1828 marked the beginning of the long ascendancy in the state of the "Albany Regency," a political coterie in which Van Buren, W. L. Marcy, Benjamin Franklin Butler (1795–1858) and Silas Wright were among the leaders; Thurlow Weed, their bitterest opponent and the man who gave them their name, declared of them that he "had never known a body of men who possessed so much power and used it so well." Thurlow Weed owed his early political advancement to the introduction into state politics of the anti-Masonic issue (see ANTI-MASONIC PARTY), which also brought into prominence his co-worker W. H. Seward. In 1826 in Genesee county the disappearance of a printer named William Morgan was attributed to Free-Masons and aroused a strong antipathy to that order; and the anti-Masonic movement, through the fostering care of Weed, Francis Granger (1792–1868) and others, spread to other states and led eventually to the establishment of a political organization that by uniting various anti-Jacksonian elements, polled in the New York state election of 1832 more than 156,000 votes for Francis Granger, their candidate for governor against Marcy, who was chosen by about 10,000 plurality. As the anti-Masonic wave subsided its leaders and most of its adherents found a place in the newly organized Whig party, which was powerful enough in New York to elect William H. Seward governor in 1838, and to re-elect him and to carry the state for W. H. Harrison against Van Buren in 1840. It was during the first administration of Governor Seward that the anti-rent agitation in the Hudson river counties began. The greater part of the land in this section was comprised in vast estates such as Rensselaerwyck, Livingston, Scarsdale, Phillipse, Pelham and Van Cortlandt manors, and on these the leasehold system with perpetual leases, leases for 99 years or leases for one to three lives had become general. Besides rent, many of the tenants were required to render certain services to the proprietor, and in case a tenant sold his interest in a farm to another he was required to pay the proprietor one-tenth to one-third of the amount received as an alienation fine. Stephen van Rensselaer, the proprietor of Rensselaerwyck, had suffered the rents, especially those of his poorer tenants, to fall much in arrears, and when after his death (1839) the agents of his heirs attempted to collect them they encountered violent opposition. Governor Seward called out the militia to preserve order but asked the legislature to consider the tenants' grievances. The legislature appointed an arbitration commission, but this was unsuccessful, and the trouble, spreading to other counties, culminated (1845) in the murder of the deputy-sheriff of Delaware county. Politically, the anti-rent associations which were formed often held the balance of power between the Whigs and the Democrats, and in this position they secured the election of Governor John Young (Whig) as well as of several members of the legislature favourable to their cause, and promoted the passage of the bill calling the constitutional convention of 1846. In the new constitution clauses were inserted abolishing feudal tenures and limiting future leases of agricultural land to a period of twelve years. The courts pronounced the alienation fines illegal. The legislature passed several measures for the destruction of the leasehold system, and under the pressure of public opinion the great landlords rapidly sold their farms.[1] Up to the election of Seward as governor, New York had usually been Democratic, largely through the predominating influence of Van Buren and the "Albany Regency." After the defeat of Governor Silas Wright in 1846, however, the Democratic party split into two hostile factions known as the "Hunkers," or conservatives, and the "Barnburners," or radicals. The factions had their origin in canal politics, the conservatives advocating the use of canal revenues to complete the canals, the radicals insisting that they should be used to pay the state debt. Later when the conservatives accepted the annexation of Texas and the radicals supported the Wilmot Proviso the split became irrevocable. The split broke up the rule of the "regency," Marcy accepting the "Hunker" support and a seat in Polk's cabinet, while Wright, Butler and Van Buren joined the "Barnburners," a step preliminary to Van Buren's acceptance of the "Free Soil" nomination for president in the campaign of 1848. Only once between 1846 and the Civil War did the Democratic party regain control of the state—in 1853–1855 Horatio Seymour was governor for a single term. In 1854 the newly organized Republican party, formed largely from the remnants of the Whig party and including most of the Free Soil Democrats, with the aid of the temperance issue elected Myron Holley Clark (1806–1892) governor. Two years later the Republicans carried the state for Frémont for president, and a succession of Republican governors held office until 1862 when the discouragement in the North with respect to the Civil War brought a reaction which elected Seymour governor.

With the exception of New York City the state was loyal to the Union cause during the war and furnished over a half million troops to the Federal armies. Certain commercial interests of New York City favoured the Confederate cause, but Mayor Wood's suggestion that the city (with Long Island and Staten Island) secede and form a free-city received scant support, and after the sanguinary draft riots of July 1863 (see NEW YORK CITY) no further difficulty was experienced. After the Civil War the state began to reassume the pivotal position in national politics which has always made its elections second only in interest and importance to those of the nation, and the high political tension emphasized the evils of the "spoils system." In 1868 Tammany Hall (*q.v.*), then under the rule of William M. Tweed, forced the Democratic state convention to nominate its henchman, John T. Hoffman, for governor, and by the issue of false naturalization papers and fraudulent voting in New York City on a gigantic scale Hoffman was chosen governor and the electoral vote was cast for Seymour. Tammany and Hoffman were again victorious in 1870; but in 1871 the New York *Times* disclosed the magnitude of Tammany's thefts, amounting in the erection of the New York county court house alone to almost $8,000,000, and Tweed and his "Ring" were crushed in consequence. The Republicans carried the state in 1872, but in 1874 Samuel J. Tilden, a Democrat and the leading prosecutor of Tweed, was elected governor. The Republican legislature had in 1867 appointed a committee to investigate the management of the canal system, but the abuses were allowed to continue until in 1875 Governor Tilden disclosed many frauds of the "Canal Ring," and punished the guilty. In 1876, Tilden having been nominated for the presidency, New York cast its electoral vote for him. In 1880 it was cast for Garfield, the Republican nominee. Two years later the Republicans, having split over a struggle for patronage into the two factions known as "Halfbreeds," or administration party, and "Stalwarts" of whom the leader was Roscoe Conkling, were defeated, Grover Cleveland being chosen governor. In 1884 Cleveland as the Democratic presidential nominee received the electoral vote of his state. Cleveland likewise carried the state in 1892, but in 1888 Benjamin Harrison, the Republican candidate, the factional quarrels being settled, carried the state. Hostility to free silver and "Bryanism" in the large financial and industrial centres put the state strongly in the Republican column in the elections of 1896, 1900, 1904 and 1908. It was carried by the Democrats in the gubernatorial campaign of 1910.

GOVERNORS OF NEW YORK

Colonial.

Cornelis Jacobsen Mey	1624–1625
William Verhulst	1625–1626
Peter Minuit	1626–1632
Bastiaen Janssen Crol	1632–1633
Wouter Van Twiller	1633–1637
William Kieft	1637–1647
Peter Stuyvesant	1647–1664
Richard Nicolls	1664–1668
Francis Lovelace	1668–1673
Anthony Colve	1673–1674
Edmund Andros	1674–1683
Thomas Dongan	1683–1688
Francis Nicholson, Lieutenant-Governor	1688–1689
Jacob Leisler (de facto)	1689–1691
Henry Sloughter	1691
Richard Ingoldsby (Acting)	1691–1692
Benjamin Fletcher	1692–1698
Richard Coote, earl of Bellomont	1698–1701
John Nanfan (Acting)	1701–1702
Edward Hyde, Lord Cornbury	1702–1708
John, Lord Lovelace	1708–1709
Richard Ingoldsby (Acting)	1709–1710
Gerardus Beekman (Acting)	1710
Robert Hunter	1710–1719
Peter Schuyler (Acting)	1719–1720
William Burnet	1720–1728
John Montgomerie	1728–1731
Rip van Dam (Acting)	1731–1732
William Cosby	1732–1736
George Clarke (Acting)	1736–1743
George Clinton	1743–1753
Sir Danvers Osborne	1753
James de Lancey (Acting)	1753–1755
Sir Charles Hardy	1755–1757
James de Lancey (Acting)	1757–1760
Cadwallader Colden (Acting)	1760–1761
Robert Monckton	1761
Cadwallader Colden (Acting)	1761–1762
Robert Monckton	1762–1763

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[1] James Fenimore Cooper's novels *Satanstoe* (1845), *The Chainbearer* (1845) and *The Redskins* (1846) preach the anti-rent doctrine.

Cadwallader Colden (Acting)	1763–1765	
Sir Henry Moore	1765–1769	
Cadwallader Colden (Acting)	1769–1770	
John Murray, earl of Dunmore	1770–1771	
William Tryon	1771–1776	
Transition.		
Provincial Congress	1776–1777	
State.		
George Clinton	1777–1795	Anti-Federalist
John Jay	1795–1801	Federalist
George Clinton	1801–1804	Dem.-Repub.
Morgan Lewis	1804–1807	,,
Daniel D. Tompkins	1807–1817	,,
John Taylor (Acting)	1817	,,
De Witt Clinton	1817–1823	,,
Joseph Christopher Yates	1823–1825	,,
De Witt Clinton	1825–1828	,,
Nathaniel Pitcher (Acting)	1828–1829	,,
Martin Van Buren	1829	Democrat
Enos Thompson Throop (Acting)	1829–1831	,,
Enos Thompson Throop	1831–1833	,,
William Learned Marcy	1833–1839	,,
William Henry Seward	1839–1843	Whig
William C. Bouck	1843–1845	Democrat
Silas Wright	1845–1847	,,
John Young	1847–1849	Whig
Hamilton Fish	1849–1851	,,
Washington Hunt	1851–1853	,,
Horatio Seymour	1853–1855	Democrat
Myron Holley Clark	1855–1857	Whig-Repub.
John Alsop King	1857–1859	Republican
Edwin Dennison Morgan	1859–1863	,,
Horatio Seymour	1863–1865	Democrat
Reuben Eaton Fenton	1865–1869	Republican
John Thompson Hoffman	1869–1873	Democrat
John Adams Dix	1873–1875	Republican
Samuel Jones Tilden	1875–1877	Democrat
Lucius Robinson	1877–1880	,,
Alonzo Barton Cornell	1880–1883	Republican
Grover Cleveland	1883–1885	Democrat
David Bennett Hill (Acting)	1885–1886	,,
David Bennett Hill	1886–1892	,,
Roswell Pettibone Flower	1892–1895	,,
Levi Parsons Morton	1895–1897	Republican
Frank Swett Black	1897–1899	,,
Theodore Roosevelt	1899–1901	,,
Benjamin Barker Odell	1901–1905	,,
Frank Wayland Higgins	1905–1907	,,
Charles Evans Hughes	1907–1910	,,
Horace White	1910	,,
John A. Dix	1911–	Democrat

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NEW YORK (CITY), the largest city of New York state, U.S.A., situated at the junction of the Hudson river, here called the North river, with the narrow East river (actually a strait connecting Long Island Sound with the Upper Bay), and between Long Island Sound and the Atlantic Ocean. It is composed of five boroughs: the Borough of the Bronx on the south-easternmost part of the mainland of New York state; the Borough of Manhattan on Manhattan Island (including also other small islands[1]) immediately S. and S.W. of the Bronx, and bounded on the W. by the North river, on the E. by the East river, and on the S. by New York Bay; the Borough of Richmond (Staten Island, *q.v.*), the southernmost and westernmost part of the city; and on the western end of Long Island, the Borough of Brooklyn (*q.v.*), and, N. of it, the Borough of Queens. The city hall, in the southern part of Manhattan Island, is in lat. 40° 42′ 43″ N. and long. 74° 0′ 3″ W. The greatest width of the city E. and W. is 16 m., and the greatest length N. and S. is 32 m.; its area is about 326·97 sq. m. (285·72 sq. m. more than in 1890), of which Manhattan Borough constitutes nearly 21·93 sq. m., the Borough of the Bronx about 41·7 sq. m., the Borough of Queens about 129·5 sq. m., the Borough of Brooklyn 77·6 sq. m., and the Borough of Richmond 55·2 sq. m.[2] The total waterfront of the city is 341·22 m., and much of it, especially on the lower part of Manhattan, is made ground.

New York harbour is one of the most beautiful, largest and best of the world's great ports. Over the bar (Sandy Hook), about 20 m. S. of the S. end of Manhattan Island, is the "Main Ship Bayside-Gedney channel," 1000 ft. wide and 30 ft. deep. By 1909 the Federal government had completed 7½ m. of the Ambrose channel farther to the E. and 40 ft. deep, and 950–1600 ft. wide (2200 ft. is the projected width).[3] A third

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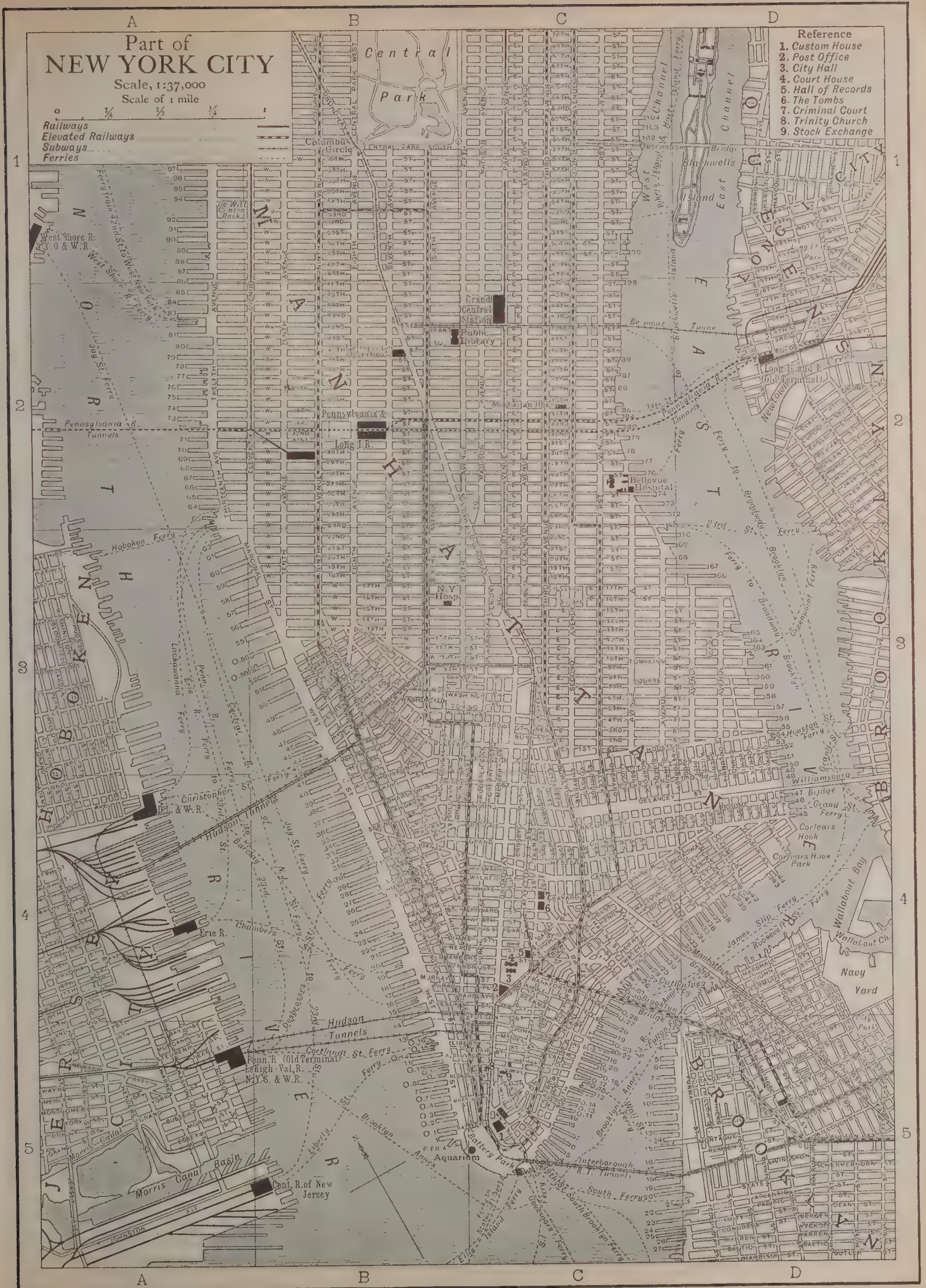
[1] The more important of these small islands are: Blackwell's (about 120 acres) in the East river, Ward's N. of Blackwell's, and Randall's N. of Ward's, separated from it by Little Hell Gate, and in the mouth of the Harlem river; in the Upper Bay, Governor's Island (originally 65 acres; enlarged by the addition of 101 acres to the southwest), a U.S. military reservation, about 1000 yds. S. of the Battery, the southernmost point of Manhattan Island; Bedloe's Island (sometimes called Liberty Island from the Bartholdi statue on it of "Liberty Enlightening the World"), with an area of 13½ acres, lying 2 m. S.W. of the Battery; and Ellis Island, 1½ m. W.S.W. of the Battery, occupied by the Federal government as a landing-place for immigrants. In the Lower Bay, and a part of the Borough of Richmond, are the artificial islands, Swinburne (1866–1870; 8 m. S. of the Battery) and Hoffman (1868–1873; 7 m. S. of the Battery), constructed for quarantine stations.

[2] Manhattan and Bronx boroughs compose New York county; the counties of Queens and Richmond are coterminous respectively with the boroughs of those names; Brooklyn Borough is coextensive with Kings county.

[3] The narrowness of the channel makes the tidal scour more effective, and it was little filled in even when sewage and garbage was dumped in the Bay itself. The river carries little silt and leaves most of it well above the harbour. The natural excellence of the harbour may be inferred from the following figures: in 1895–1903 the Federal



Part of NEW YORK CITY

Scale, 1:37,000

Scale of 1 mile
0
¼
½
¾
1
Railways
Elevated Railways
Subways
Ferries
Reference
1. Custom House
2. Post Office
3. City Hall
4. Court House
5. Hall of Records
6. The Tombs
7. Criminal Court
8. Trinity Church
9. Stock Exchange
A
B
C
D
1
2
3
4
5
Central Park
Columbus Circle
Central Park South
De Witt Clinton Park
MANHATTAN
Grand Central Station
Public Library
Pennsylvania & Long I.R.
Pennsylvania R. Tunnels
Bellevue Hospital
N.Y. Hosp.
Tompkins Square
Washington Sq.
Belmont Tunnel
Queensboro Bridge
Blackwell's Island
West Channel
East Channel
EAST RIVER
QUEENS
LONG ISLAND CITY
Long Island R. (Old Terminal)
Newtown Creek
BROOKLYN
Williamsburg Bridge
Manhattan Bridge
Brooklyn Bridge
Corlears Hook Park
Wallabout Bay
Navy Yard
City Park
HUDSON RIVER
HOBOKEN
JERSEY CITY
West Shore R. N.Y.O. & W.R.
Hoboken Ferry
D.L. & W.R.
Erie R.
Christopher St. Ferry
Hudson Tunnels
Penn. R. (Old Terminal) Lehigh Val. R. N.Y.S. & W.R.
Cent. R. of New Jersey
Morris Canal
Morris Canal Basin
Cortlandt St. Ferry
Liberty St. Ferry
Chambers St. Ferry
Barclay St. Ferry
Desbrosses St. Ferry
23rd St. Ferry
Ferry from 42nd St. to West New York
Battery Park
Aquarium
Interborough R.T. Tunnel
South Ferry
Ellis Island Ferry
Governors Island Ferry
South Brooklyn Ferry
Hamilton Av. Ferry
Wall St. Ferry
Fulton Fy.
Catharine Fy.
James Slip Ferry
Roosevelt St. Ferry
Grand St. Ferry
Houston St. Ferry
23rd St. Ferry
Greenpoint Ferry
34th St. Ferry

channel, the South and Swash, is used by coasting vessels drawing about 20 ft. The harbour is divided into three parts: the Lower Bay, the Upper Bay and the North and East rivers. The Lower Bay (about 88 sq. m.) of which Raritan Bay on the S.W., Sandy Hook Bay on the S.E., and Gravesend Bay on the N.E. form parts, and to which the channels mentioned afford entrance from the ocean, has Staten Island to the W. and N., Brooklyn to the N. and E., and the New Jersey shore to the S. and W. The Upper Bay has an area of 14 sq. m., is the immediate embouchure of the North and the East river, is connected with the Lower Bay by the Narrows (minimum width 1 m.) and with Newark Bay to the W. by Kill Van Kull, immediately N. of Staten Island, and, except for these four narrow water-ways, is enclosed by land. The North river (maximum depth, 60 ft.) is here about 1 m. wide and the East river (maximum depth more than 100 ft.; in Hell Gate channel about 200 ft.) is about ¾ m. wide and, from the Battery to Throg's Neck and Willett's Point, where Long Island Sound proper begins, about 20 m. long. The north-east entrance to the harbour, from Long Island Sound by the East river, used principally by New England coasting vessels (especially coal barges), was made navigable for vessels of 25–27 ft. draft by the Federal government, which in 1870–1876 and in 1885 widened and deepened the formerly dangerous narrows and removed the reefs of Hell Gate, between Manhattan Island (E. 88th Street), Blackwell's Island, Astoria (on the Long Island shore), and Ward's Island. The third great entry and commercial feeder to the harbour is the North river, by which the great inland water-borne traffic of the Hudson river and the Erie Canal is brought to the port of New York. On the North river are the piers of the transatlantic steamship companies, part of them on the New Jersey side at Hoboken (*q.v.*). The coastwise trade with New England, especially through Long Island Sound, is largely from the East river, to which a part of the Hudson river traffic makes its way by the Harlem river. The Harlem is a place of anchorage for small craft.

The narrow approaches to the harbour from the ocean and from Long Island Sound make its fortification easy. On Sandy Hook, less than 8 m. from the nearest points of Rockaway Beach and Coney Island on the other side of the entrance, is Fort Hancock, established as a military reservation (1366 acres) in 1892; it received its present name in 1895, and has an artillery garrison. Between the lower and upper bays, on the Narrows, are Fort Wadsworth (1827; named in honour of General James S. Wadsworth (1807–1864), killed in the battle of the Wilderness), on the Staten Island side, a reservation of 230 acres, including Fort Tompkins, on higher ground than Fort Wadsworth proper, and, across the Narrows, on the Long Island shore, Fort Hamilton (1831), with a reservation of 167 acres. Older fortifications are Fort Lafayette (1807; called Fort Diamond until 1823), between Forts Hamilton and Wadsworth on an artificial island, now used to store ordnance and supplies, and Fort Columbus (1806), South Battery (1812) and Castle Williams (built in 1811 by Jonathan Williams (1750–1815), who planned all the earlier fortifications of New York harbour; it is now a military prison), all on Governor's Island, where are important barracks and the New York arsenal of the Ordnance Department. The north-eastern approach to the harbour, at the entrance to Long Island Sound, is protected by fortifications, Fort Totten, at Willett's Point (1862), and directly across from this battery by Fort Schuyler (1826; post established 1856) with a reservation of 52 acres on Throg's Neck.

Geology.—Manhattan Island[1] (13½ m. long; maximum width—at 14th Street—2¼ m.; average width about 2 m.) is a "group of gneissoid islands separated . . . by low levels slightly elevated above tide and filled with drift and alluvium" (L. D. Gale in W. W. Mather's *Geology of New York*, 1843), with a steep west wall from Manhattanville (125th Street W. of 8th Avenue) S. beyond 81st Street, and a much steeper east wall. Upon its first occupation by the Dutch the island was rough and rocky with brooks, ponds, marshes and several swamps.[2] Superficially the island may be divided into: an area of drift, S. of 21st Street on the East river, of 13th street on Broadway and of 31st Street on the North river; a second, narrow area of drift running from Hell Gate N.W. to Manhattanville in a line parallel to the Harlem; a limestone (Inwood limestone) area on the Harlem from its mouth to the sharp turn in its course; a second and smaller limestone area on the Spuyten Duyvil in the north-westernmost part of the island; and the remainder areas of gneiss, the larger part being in two great "islands," one between the line of E. 21st Street, 13th Street and W. 31st Street, already mentioned, and a line from Hell Gate to Manhattanville, and the other nearly joining the first at Manhattanville and covering all the narrow N.W. part of Manhattan Island except the second limestone area on the Spuyten Duyvil. These two gneiss areas have a southerly tilt; they are named respectively Washington and Morningside Heights. In all these areas, except the limestone, the underlying rock is what is styled Manhattan schist (see *U.S. Geologic Atlas, N.Y. City*, folio No. 83). The waterfront of Manhattan does not correspond in direction with limestone belts, but is probably due to lines of fracture (see W. H. Hobbs, in *Bulletin*, Geological Society of America, xvi. 151-182).

The Borough of the Bronx is made of high N.E. and S.W. ridges, sloping E. to the lower shores of Long Island Sound; and the Boroughs of Brooklyn and Queens form part of the great terminal moraine. Low serpentine hills (300-380 ft.), with a N.E. and S.W. trend, occupy the central part of the northern end of Staten Island; W. of this is Jura-Trias formation, crossed in its centre by a narrow strip of igneous dike rock; the E. and S. part of the island is Cretaceous. Yellow gravel is one of the many evidences of glacial drift; but the S.E. part of the island was not encroached upon by the moraine.

Climate.—A combination of marine and continental influences produces a humid climate subject to sudden changes of temperature. The temperature, however, rises above 90° F. only six days in a year on the average; it rarely falls below zero; and in a period of thirty-eight years, from 1871 to 1908, extremes ranged between 100°, in September 1881, and −6°, in February 1899. The mean winter temperature (December, January and February) is 32°; the mean summer temperature (June, July and August) is 72°; and the mean annual temperature is 52°. The average monthly rainfall ranges from 3·2 in. in May to 4·5 in. in July and in August, and the mean annual precipitation is 44·8 in. The average annual fall of snow amounts to 37 in., of which 11·5 in. falls in February, 8·7 in. in January and 8·2 in. in March. The average number of hours of sunshine ranges from 150 in November to 271 in June. The prevailing winds are N.W., except in June when they are S.W.

Streets.—In the downtown portion of Manhattan Island, a strip about 2 m. long, some streets follow the irregular water-fronts and others cross these; and on the west side this irregularity extends farther N., in the former Greenwich village (W. and N.W. of Washington Square), where West 4th Street, running N.W., crosses West 12th Street, running S.W. north of Houston Street, then North Street, the northernmost limit of the occupied city; in 1807 a commission laid out the island into streets, which were numbered from S. to N. and were called East and West, as they were E. or W. of Broadway, below 8th Street, and of Fifth Avenue, above 8th, and into avenues, which were numbered[3] from E. to W., Twelfth Avenue being on the North river waterfront. East of First Avenue in a bulge of the Island S. of 23rd Street four additional avenues were named A, B, C, and D, Avenue A being one block E. of First Avenue. Afterwards Madison Avenue was laid out midway between Fourth and Fifth Avenues, N. from 23rd Street, and Lexington Avenue, midway between Third and Fourth Avenues, N. from 21st Street. The most important of the avenues is Broadway, an unfortunately narrow street in the busy downtown part of its course. From Bowling Green, immediately N. of the Battery, it goes in a straight line (E. of N.) for about 2½ m. to 10th Street; then bears off to the W. It is called the Boulevard from 78th Street to 162nd Street in its course between Amsterdam Avenue and West End (or Eleventh) Avenue (to 104th Street), and then as a continuation of West End Avenue; and thence to the Yonkers city line is called Kingsbridge Road. The monotonous regularity of the rectangular street plan of Manhattan above 14th Street is partly redeemed by this westward trend of Broadway, the only

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expenses for important harbour improvements, principally dredging, were $1,035,300 for New York, $2,710,000 (exclusive of $1,185,000 for the Delaware Breakwater) for Philadelphia, $1,501,169 for Boston, $1,404,845 for New Orleans, and $470,000 for Baltimore.

[1] See Wm. H. Hobbs, *Configuration of the Rock Floor of Greater New York* (Washington, 1905), Bulletin 270 of the U.S. Geological Survey, with an excellent summary of the earlier literature. The study of the underlying rock of Manhattan Island and its vicinity has been stimulated by the great engineering and building enterprises in the city limits.

[2] See a paper, "Old Wells and Water-Courses on the Island of Manhattan," by George Everett Hill and George E. Waring, Jr., in *Historic New York: the First Series of the Half Moon Papers* (New York, 1899).

[3] In the Borough of the Bronx the system of numbered avenues no longer holds, but the cross streets are numbered consecutively, W. 262nd Street being immediately S. of the Yonkers line and E. 242nd and 243rd immediately S. of the Mt. Vernon boundary.

old street in this part of the city. The Bowery, extending N. from Chatham Square to East 4th St. (practically continued by Fourth Avenue), is not now a street of commercial importance, being largely taken up with Yiddish tenements. Broadway, in its southernmost part, is a financial and business street; the financial interests centre particularly about Wall Street,[1] which is about one-third of a mile above the Battery, runs E. from Broadway, and was named from a redoubt built here by the Dutch in 1653 on news of a threatened attack by the English. The wholesale dry goods district is on Broadway and the side streets between Reade and Prince Streets and the wholesale grocery district immediately W. of this. In Maiden Lane is the wholesale jewelry trade. The leather and hide trade is centred immediately S. of the approaches to the Brooklyn Bridge. A little farther up-town on the East Side is the tenement district, one of the most crowded in the world. The principal shopping districts are on Broadway from 17th Street to 34th Street; on Sixth Avenue from 14th Street to 34th Street; and to an increasing degree on Fifth Avenue from 23rd Street to 42nd Street, and on the cross-streets in this area, especially 23rd, 34th and 42nd Streets. Next to Broadway the best known of the avenues is Fifth Avenue, which extends from Washington Square to the Harlem river (143rd Street) in a straight line. On Fifth Avenue there are a few residences in its lower part and between 34th and 45th Streets; but N. of 50th and on the E. side of Central Park are many fine residences. The cross streets within one block to the W. and two blocks to the E. of Fifth Avenue, Central Park West, and in general the upper West Side and in particular Riverside Drive, high above the North river, are the newer residential parts of the city.

Parks.—The park system in 1908 included property valued at $501,604,188. The principal parks are: Central Park in Manhattan; Prospect Park in Brooklyn (*q.v.*); and Bronx Park, Van Cortlandt Park and Pelham Bay Park in the Bronx. The first park (as distinguished from "square") of any size in Manhattan was Central Park (840 acres; between 59th and 110th Streets and between 5th and 8th Avenues; about 2½ m. long and ½ m. wide), which was laid out (beginning in 1857) by F. L. Olmsted and Calvert Vaux. Nearly one-half is wooded, with a variety of native and foreign trees and shrubs. The park contains a large pond, the Mere, in the N.E. corner; the Croton retaining reservoir and the receiving reservoir, and other sheets of water. Near the 65th Street entrance from 5th Avenue is the Arsenal, the executive quarters of the Department of Parks, with a meteorological observatory (1869).

Pelham Bay Park (1756 acres), in the north-easternmost corner of the city, lies on Long Island Sound, includes Hunter's Island and Twin Islands, and has a total shore front of about 9 m. Bordering on the city of Yonkers, S. (from 262nd Street) to 242nd Street, is Van Cortlandt Park (1132 acres), in which are the Van Cortlandt Mansion (1748), for a time Washington's headquarters and now a Revolutionary Museum under the Colonial Dames, a parade-ground (75 acres), and Van Cortlandt Lake, a skating pond. East of Van Cortlandt Park is Woodlawn Cemetery. Mosholu Parkway (600 ft. wide and about 6000 ft. long) leads from Van Cortlandt Park to the S.E., and Bronx and Pelham Parkway (400 ft. wide and 12,000 ft. long) from Pelham Bay Park to the S.W. connecting these parks with Bronx Park (719 acres) on either side of the Bronx river, a small stream which here broadens into lakes and ponds and has a fall at the lower end of the park. Bronx Park reaches from 180th Street to 205th Street. The northern part is occupied by the New York Botanical Gardens and the southern part by the Zoological Park.

Battery Park is at the southern end of Manhattan; here are the New York Aquarium (in what was until 1896 Castle Garden, on the site of Fort Clinton) and a children's playground (1903). In City Hall Park are the public buildings mentioned below.

The other down-town open spaces are small; many of them are recreation grounds, some, such as Mulberry Bend Park and Hamilton Fish Park, being on the site of former slums, condemned by the city at great expense. Especially in this part of the city municipal recreation piers and free baths have been constructed. Washington Square (1827), between Waverley Place, Wooster and Macdougal Streets, at the foot of 5th Avenue, became a pauper burial-ground about 1797, and was laid out as a park in 1827; on the N. side of the square there are still a few fine old residences. Union Square, between Broadway and 4th Avenue, is a favourite place for workmen's mass meetings. Madison Square is reclaimed swampy ground on which there was an arsenal in 1806–1815, then a parade-ground, and in 1825–1839 a municipal House of Refuge in the old barracks, and which was then laid out as a park and was a fashionable centre in 1850–1875. Bryant Park on Sixth Avenue, between 40th and 42nd Streets, was a Potter's Field in 1813–1823, and in 1853 was the site of a world's fair with Crystal Palace, which was destroyed in 1858. In De Witt Clinton Park between 52nd and 54th Streets on the North river, there was the first children's farm school[2] in New York. Riverside Park (140 acres; 1872), between 72nd and 129th Streets, on the North river front, is a finely wooded natural terrace with winding paths. Morningside Park (31⅕ acres), between W. 110th and 123rd Streets, beautifully wooded, and Mount Morris Park (20⅙ acres) from 120th to 124th Streets, interrupting Fifth Avenue, are high rough ground, Mount Morris being the highest point on Manhattan Island.

Among the other parks in the north part of Manhattan Island are: Roger Morris Park, between 160th and 162nd Streets, containing the Roger Morris or Jumel Mansion (1763), Washington's headquarters for five weeks in 1776, then the headquarters of Sir Henry Clinton, and after 1777 of the Hessian officers; High Bridge Park (73¼ acres) at the Manhattan end of High Bridge, between W. 170th and 175th Streets; Audubon Park between 155th and 158th Streets, from Broadway to the North river, the home in 1840–1851 of John James Audubon; and Ft. Washington (40⅘ acres) from 171st to 183rd Streets on the North river, the site of Ft. Washington in the War of Independence. Along the W. bank of the Harlem river for about 3 m. N. and N.W. is the Harlem River Driveway (or speedway), about 95 ft. wide. Besides the large parks in the Bronx the more important are Crotona (154·6 acres), and Poe Park (2⅓ acres) on E. 192nd Street, the site of E. A. Poe's Fordham cottage. The great baseball grounds of the National and American leagues furnish amusement to the crowds interested in professional baseball. Coney Island (*q.v.*), similar resorts on Staten Island, on the shores of the North river and on Long Island on the Sound, and on the Hudson river are popular amusement places.

Buildings.—The city's sky-line is broken by the tall business buildings, known as "sky-scrapers,"[3] the construction of which was made necessary by the narrowness of the down-town portion of the island in which the increasing business population had to be accommodated. The ten-storey Tower Building (1889; 21 ft. wide; first 9 then 11 storeys; replaced in 1908–1910 by a taller and wider building) was the first of these, and was soon followed by much taller ones.

The prominent business buildings include the Singer Sewing-Machine Company's Building[4] (612 ft. high, built in 1905–1908 by Ernest Flagg); the Metropolitan Life Insurance Company's Building (693 ft.; completed in 1909); the Produce Exchange (with a 225-ft. tower); the Manhattan Life Building (with a 360-ft. tower); the Empire Building (20 storeys); on Wall Street, the Drexel Building, the Trust Company of America (23 storeys), and the National City Bank; on Broad Street, the white marble Stock Exchange (1903), the Broad Exchange Building (276 ft. high), and the Commercial Cable Building (317 ft. high); in Cedar Street, the New York Clearing House; in Liberty Street, the New York Chamber of Commerce (1903), built of white marble and granite, with Ionic columns, the Trinity Building (with a Gothic façade) and the United States Realty Building (both by F. H. Kimball), the City Investing Building (32 storeys; 486 ft. high); in Church Street, the Hudson Terminal Buildings (1909, Clinton & Russell), 22 storeys high, with four storeys below ground (including the terminal of the down-town Hudson tunnels), office buildings with a tenant population of 10,000; in Park Row, the Park Row Building (30 storeys; 390 ft. high), and the office building of the *World* (the Pulitzer Building, with a dome 310 ft. high); the white marble Home Life Insurance Building with its sloping red tiled roof; the Fuller (or "Flatiron") Building (290 ft. high); and the New York *Times* Building (363 ft. high) at 42nd Street and Broadway.

The principal public buildings are: the Custom House (1902–1907; by Cass Gilbert), on the site of Fort Amsterdam, built of granite in the French Renaissance style; in Wall Street, the United States Sub-Treasury, on the site of Federal Hall, in which George Washington was inaugurated first president of the United States; and in and about City Hall Park, the Post

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[1] See F. T. Hill, *Story of a Street* (New York, 1908).

[2] See Jacob A. Riis, "City Farms and Harvest Dances," in the *Century Magazine* for September 1909.

[3] On the mechanical equipment of the New York "skyscraper" see R. P. Bolton, "High Office Buildings of New York," vol. 143 of Minutes of *Proceedings of the Institution of Civil Engineers* (1901). See also Frank W. Skinner, "The Foundation of Lofty Buildings," in the *Century Magazine* for March 1909.

[4] See *A History of the Singer Building Construction* (New York, 1908), edited by O. F. Semsch. The building's steel columns are carried on pneumatic caisson piers which reach bed rock 90 ft. below the street-level.

Office, the Italian Renaissance City Hall by John McComb, Jr., 1803–1812 (architecturally the best of the public buildings); the Court House, the Hall of Records (French Renaissance), and a new Municipal Building with a lantern 559 ft. high, the main building of 23 storeys being pierced by an arcade through which Chambers Street runs; a little farther N. and E. of Broadway, the Tombs (1898–1899), the city prison, connected by a flying bridge called "the Bridge of Sighs" with the Criminal Courts; at Madison Avenue and 25th Street, the elaborate Appellate Court House (J. B. Lord); and on Fifth Avenue (40th–42nd Sts.) the new Public Library (1911). There are several large armouries of the state militia in the city, the best known being those of the 7th, 69th and 71st regiments.

Churches.—Historically the foremost religious denomination in New York City is the Dutch Reformed. The consistory of the Collegiate Church, controlling several churches, is the oldest ecclesiastical organization in the city, dating from 1628, when there was a Dutch church "in the Fort." After the city passed into the hands of the English the Protestant Episcopal Church rapidly increased in power, and in 1705 received the grant of the "Queen's Farm" between Christopher and Vesey streets. This immense wealth is held by the corporation of Trinity Church. Its present building (1839–1846; by R. M. Upjohn) is on the site of a church built in 1696, at the head of Wall Street on Broadway. The bronze doors are a memorial to J. J. Astor, and the altar and reredos, to W. B. Astor. In the churchyard are the graves of Alexander Hamilton, Robert Fulton, Captain James Lawrence, Albert Gallatin, William Bradford, the colonial printer, and General Phil Kearny. Many of the largest Episcopalian churches in the city were founded as its chapels, including St Paul's (1766), the oldest church building in the city. Trinity has several important chapels dependent on it. The Presbyterian Church is relatively stronger in New York than in any other city in the country with the possible exceptions of Philadelphia and Pittsburg. The first Methodist Episcopal society in the United States was formed in New York in 1766 and still exists as the John Street Church. The varied immigration to the city had brought in the other Protestant sects; the large Irish immigration of the first two-thirds of the 19th century, and the great Hebrew migration of the last part of the same century, made the Roman Catholic and the Jewish denominations strong. The city became the see of a Roman Catholic bishop in 1808 and of an archbishop in 1850. The Roman Catholic Cathedral, St Patrick's (50th–51st Streets; Fifth-Madison Avenues), is the head of the archdiocese of New York; it is the largest and one of the most elaborately decorated churches in the country, designed by James Renwick and erected in 1850–1879, with a Lady Chapel added in 1903. It is in Decorated style and is built principally of white marble. Behind the Cathedral on Madison Avenue is the archiepiscopal residence. The Protestant Episcopal Cathedral of St John the Divine, on 112th Street near Morningside Park, was begun in 1892; the crypt and St Saviour's Chapel were completed in 1910. Other prominent Episcopalian churches are: Christ Church, organized in 1794, the second parish in age to Trinity; St Mark's, an old parish with a colonial church (1829); Grace Church (organized in 1808), since 1844 in a commanding position at Broadway and 10th Street, at the first turn in Broadway, with a building of white limestone in Decorated style with a graceful stone spire; the Church of the Ascension (1840) with John La Farge's mural painting of the Ascension, a chancel by Stanford White, and Sienese marble walls and pulpit; and the Church of the Transfiguration (1849), nicknamed "The Little Church around the Corner," and famous under the charge of Dr George H. Houghton (1820–1897) as the church attended by many actors. It has a memorial window to Edwin Booth by John La Farge. Of Presbyterian churches the First (organized in 1719) long occupied a brick church on Wall Street, near the old City Hall, and since 1845 has been on Fifth Avenue between 11th and 12th Streets; and the Madison Square Church was organized in 1853, and after 1907 occupied one of the most striking ecclesiastical buildings in the city, in a quasi-Byzantine style, with a golden dome and a façade of six pale green granite Corinthian columns. The First Baptist Church (organized 1762; present building on Broadway and 79th Street) is the oldest and the Fifth Avenue Baptist Church (1841) is the richest society of that denomination in the city; the Memorial Church (1838) is a memorial to Adoniram Judson. The first Congregational Church was built in 1809, but it was soon sold and the congregation disbanded; the Broadway Tabernacle on Broadway, near Worth Street, was a famous church in 1840–1857; the present church is at Broadway and 56th Street. St Peter's (Roman Catholic; 1785) is the oldest Catholic organization in the city; St Patrick's (1815) was formerly the cathedral church, and St Paul the Apostle (Paulist; 1859; rebuilt 1876–1885, with decorations by John La Farge) was established by Isaac Hecker. There are many Jewish synagogues and temples.

Hotels.—The principal hotels, clubs and theatres of New York City have steadily been making their way up-town. Both hotels and clubs had their origin in the taverns of the 17th and 18th centuries, such as Fraunces's Tavern, on the corner of Pearl and Broad Streets, built in 1719, used as a residence of the De Lancey family, sold in 1762 to Samuel Fraunces (Washington's steward after 1789), who opened it as the Queen's Head or Queen Charlotte, used for a time (1768) as the meeting-place of the Chamber of Commerce, and the scene, in its assembly room, of Washington's farewell to his officers in 1783; it was restored in 1907 by the New York State Society of The Sons of the Revolution, which owns the building. There are now few first-class hotels in the down-town district, the Astor House being the principal exception to the rule that the hotel district is bounded by 23rd and 59th Streets, and by Fourth and Seventh Avenues. With the rapid increase in the value of New York City real estate many apartment-hotels have been built, especially on the upper west side. The most widely-known restaurants are Delmonico's and Sherry's, both at Fifth Avenue and 44th Street.

Clubs.—The clubs of New York are even more important to the social life than those of London, and most of them are splendidly housed and appointed. The oldest of the social clubs is the Union Club, organized in 1836. The Union League Club (organized 1863, incorporated 1865) was formed by members of the U.S. Sanitary Commission, and is the club of the leaders of the Republican party in the city. The Democratic organizations corresponding to it are the Manhattan Club (organized 1865, reorganized in 1877), and the Democratic Club, more closely allied with the local organization of Tammany Hall. The Metropolitan Club was formed in 1891 by members of the Union Club, with which the Calumet Club (1879) also is closely connected. The Knickerbocker Club was founded in 1871 by descendants of early settlers; and the St Nicholas Club by descendants of residents of the city or state before 1785. The University Club (1865, for college graduates only) has one of the handsomest club-houses in the world. Among the special clubs chiefly for writers, artists, actors and musicians, are the Century Association (1847, membership originally limited to 100, devoted to the advancement of art and literature); the Lotos Club (1870, composed of journalists, artists, musicians, actors and "amateurs" of literature, science and fine arts); the Salmagundi Club (1871, artists); the Lambs' Club (1874, "for the social intercourse of members of the dramatic and musical professions with men of the world"); the Players' (1887, actors and authors, artists and musicians), whose building was the gift of Edwin Booth, its founder and first president; the Grolier Club (1884, bibliophiles); the Cosmos Club (1885, members must have read von Humboldt's *Cosmos*); and the New York Press Club (1872, journalists). The Sorosis (1868) is a women's club, largely professional. Other clubs are the New York Bar Association (1870), the Engineers' Club (1888), the New York Athletic Club (1868), the Racquet and Tennis Club, the New York Yacht Club (1844, incorporated 1865, the custodian of the "America's" cup); and the Riding Club (1883); the Freundschaft Society (1879) and the Deutscher Verein (1874) for Germans; the Army and Navy Club (1889); several Hebrew clubs, notably the Harmonie and the Progress (1864); the Catholic Club of New York, and the clubs of Harvard (1865), Yale, the University of Pennsylvania, Cornell University and Princeton.

Theatres, &c.—The first dramatic performances[1] in New York City were given in September and December 1732 by a company from London which played at Pearl Street and Maiden Lane; the first playhouse was opened on the 5th of March 1750, but in 1758 became a German Reformed Church; and the second was opened with Rowe's *Jane Shore* on the 28th of December 1758, but remained a theatre only a little more than six years. What has been called the first New York theatre, opened on the 7th of December 1767 in John Street near Broadway, was the Royal Theatre during the British occupation in the War of Independence, and was destroyed in 1798. In that year was built on Park Row the Park Theatre (burnt 1820; rebuilt 1821; burnt 1848) in which George Frederick Cooke (1810), James W. Wallack (1818) and Junius Brutus Booth (1821) made their American débuts, in which Edmund Kean, Charles Kean, Fanny Kemble and Edwin Forrest played, and in which *Il Barbiere di Siviglia*, the first Italian opera given in the United States, was rendered in 1825, and the first ballet was danced by Fanny Ellsler in 1840. Rivals of the Park Theatre were: the Chatham Garden and Theatre in 1823–1831, and later the Bowery Theatre (opened in 1826; burnt in 1828, 1836, 1838 and 1845; named the Thalia in 1879, when it became a German theatre; and since 1892 Yiddish). Among famous theatres of the 19th century the following may be mentioned: Niblo's Garden (built in 1829; burned in 1846; rebuilt in 1849; destroyed in 1895) was long owned by A. T. Stewart, and after 1866 was the scene of many spectacular shows. Palmo's Opera House (1844–1857) was the home first of Italian opera and after 1848, under the management of William E. Burton (1802–1860), of comedy. In Mechanics' Hall (1847–1868) E. P. Christy's minstrels, George Christy's minstrels and the Bryant Brothers appeared. The Astor Place Opera House (on the present site of the Mercantile Library; 1847–1854) is best known because of the riot at Macready's appearance on the 19th of May 1849, in which many were killed by the police and militia. Tripler Hall (1850–1867) was built for Jenny Lind's début but not completed in time. Here Rachel played in

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[1] See T. Allston Brown, *A History of the New York Stage* (3 vols., New York, 1903).

1855, and Patti made her début in 1859. The hall was managed in 1855 by Laura Keene and in 1856–1858 by William E. Burton, and in it in 1864 the three Booths played *Julius Caesar*, and Edwin Booth played Hamlet for one hundred nights. It was burned in March 1867. In Booth's Theatre (1869–1882; managed and afterwards leased by Edwin Booth), Sarah Bernhardt made her American début (November 1880); and in the Park Theatre (Broadway and 21st Street; 1875–1882) Stuart Robson and William H. Crane first played together. Light opera was first introduced in 1864, opera bouffe in 1867, and Gilbert and Sullivan light opera in 1879; and *The Pirates of Penzance* was produced in New York before it was seen in London. Most of the older theatres still in existence have become houses of vaudeville, melodrama or moving pictures, as, for example, the Academy of Music (14th Street and Irving Place; opened in 1854), until about 1883 the home of the best opera, in which Christine Nilsson, Parepa-Rosa, Salvini and Emma Nevada made their American débuts. The Broadway (1888) was the scene of Edwin Booth's last performance, as Hamlet, in March 1891. In connexion with the Empire Theatre (1893) is the Empire Dramatic School. The two largest places of amusement are the Madison Square Garden (opened in 1890) and the Hippodrome (Sixth Avenue and 43rd–44th Streets). The principal concert halls are Carnegie Music Hall (1891; built by Andrew Carnegie for the Symphony and Oratorio Societies) and Mendelssohn Hall. The Metropolitan Opera House (1882; burnt 1892; immediately rebuilt) gave in 1884 the first season of German opera in America, under the direction of Leopold Damrosch. The Manhattan Opera House (built in 1903 by Oscar Hammerstein as the Drury Lane) was opened as an opera-house in December 1906. In 1910 grand opera ceased to be given except in the Metropolitan. Grand opera in New York has always been dependent for financial success on season subscriptions, and (like the great museums and the zoological and botanical gardens) has been supported by millionaires. The New Theatre (1909) is practically an endowed house.

Music.—Musical societies were formed in the 18th century, an Apollo Society as early as 1750, a St Cecilia Society, which lasted less than ten years, in 1791, and the Euterpean Society, which lived a half century, in 1799. A New York Choral Society was established in 1823, a Sacred Music Society in the same year and a Philharmonic Society in 1824, succeeded in 1828 by the Musical Fund Society. The present Philharmonic Society, composed of professional players, was organized in 1842 by a New York violinist, Uriah C. Hill (d. 1875). In 1847 was formed the Deutscher Liederkranz, which has given much classical German music; a secession from the Liederkranz in 1854 formed the Arion Society, which has been more modern than the Liederkranz, furnished in 1859 the choruses for Tannhäuser, the first Wagner opera performed in America, and brought from Breslau in 1871 Leopold Damrosch (1832–1885) as its conductor. He founded the Oratorio Society in 1873 and the Symphony Society in 1877, and was succeeded as conductor of each of these societies by his son Walter (b. 1862). Musical instruction in the public schools has been under the supervision of Frank Damrosch (b. 1859), another son of Leopold, who formed in 1892 the People's Singing Classes, picked voices from which form the People's Choral Union.

Art.—Many private collections have been given or lent to the public galleries of the city, in which are held from time to time excellent loan collections. The largest public art gallery is the Metropolitan Museum of Art, for which a committee, including art patrons and members of the National Academy of Design, drew up a plan in 1869, and which was chartered in April 1870. General Luigi Palma di Cesnola (*q.v.*) became its director in 1879 and was succeeded (1905–1910) by Sir Caspar Purdon Clarke, director of the South Kensington Museum, and in 1910 by Edward Robinson (b. 1858). In April 1871 the legislature appropriated $500,000 for a building for the Museum in Central Park: in 1878 the trustees took possession of the building in a tract of 18½ acres in Central Park on Fifth Avenue between 80th and 85th Streets; and in March 1880 this building was opened. Additions were made to the south (1888) and the north (1894). In 1902 the central part of the E. front of a new building was opened, and under an appropriation of $1,250,000 in 1904 the building was again enlarged in 1908. Among the benefactors of the Museum have been: its presidents, John Taylor Johnston (1820–1893), Henry G. Marquand (*q.v.*), who gave it his collection (old masters and English school), and J. Pierpont Morgan, and Miss Catharine Lorillard Wolfe, who gave the Museum $200,000 and her collection of paintings, Jacob S. Rogers (1823–1901) who left the Museum about $5,000,000, Frederick T. Hewitt, who gave more than $1,600,000, and John S. Kennedy (1830–1909), who left it $2,500,000. Besides paintings and statuary the Museum has collections of glass, Egyptian antiques, Babylonian and Assyrian seals and cylinders, tapestries, ancient gems, porcelain and pottery, armour, musical instruments, laces and architectural casts. The New York Historical Society since 1858 has had the collection of the New York Gallery of the Fine Arts; in its art gallery are several examples of Van Dyck and Velazquez, the best collection in the United States (except the Jarves collection at Yale) of the primitives and the early Renaissance of Italy and the Low Countries, and a good American collection, rich in portraits and in the work of Thomas Cole. There is a small collection of paintings with some statuary in the Lenox Library and there are many private collections of note. The National Academy of Design (organized in 1826; incorporated in 1828) has an art library, and students' classes. The Society of American Artists (1877) was a secession from the Academy which it rejoined in 1906. This Society with the Art Students' League (1875), and the Architectural League of New York (1881) formed in 1889 the American Fine Arts Society. In its building on W. 57th Street there are good galleries, it is the headquarters of the American Water Color Society (1866), the New York Water Color Club, the National Sculpture Society (1893), the National Society of Mural Painters and the New York Chapter of the American Institute of Architects; and the exhibitions of the National Academy of Design and of the Society of American Artists are held here. The National Arts Club and the Municipal Art Society (1893) have club houses in Gramercy Park. The Decorative Art Association (1878) has classes and sales-rooms for women artists. There are art classes at Cooper Union (*q.v.*). Columbia University has a School of Architecture (1881).

Municipal Art, Monuments, Statuary, &c.—The city charter of 1897 established an art commission consisting of the mayor, the president of the Metropolitan Museum of Art, the president of the New York Public Library, the president of the Brooklyn Institute of Arts and Sciences, one painter, one sculptor, one architect and three lay members, the last six to be appointed by the mayor from a list presented by the Fine Arts Federation of New York. Without the approval of this commission no work of art can become the property of the city either by purchase or by gift. Whenever requested by the mayor and board of aldermen it must act in a similar capacity with respect to the design of any municipal building, bridge or other structure, and no municipal structure that is to cost more than one million dollars can be erected until it has approved the design. The City Hall contains a valuable collection of portraits. In front of the Custom House are groups symbolical of the continents by D. C. French. The Hall of Records has historic and allegorical statues by Philip Martiny, H. K. Bush-Brown and Albert Weinert. In the Criminal Courts Building are mural decorations by Edward Simmons. The statuary of the Appellate Court House is by T. S. Clarke, K. F. T. Bitter, M. M. Schwartzott, D. C. French, F. W. Ruckstuhl, C. H. Niehaus and others; and it has excellent mural paintings by E. H. Blashfield, Kenyon Cox, C. Y. Turner, H. S. Mowbray and others. Of the city's great monuments the greatest is the tomb (1897; designed by John H. Duncan) of General U. S. Grant (*q.v.*); this mausoleum is in Riverside Park, commanding the North river, at 122nd Street. In the same park at 90th Street is the Soldiers' and Sailors' Monument (1900; C. W. Stoughton, A. A. Stoughton and P. E. Duboy), a memorial to those who fought in the Union army during the Civil War; it has marble and granite stairways leading up to a pedestal on which are twelve fluted Corinthian pillars arranged in a circle and covered with a white marble canopy. On Bedloe's Island in the harbour is the colossal bronze "Liberty Enlightening the World" (F. Bartholdi; dedicated 1886; presented to the people of the United States by the people of France), which is 151 ft. 5 in. from its base to the top of the torch held in the uplifted hand of the female figure. On the N. side of Washington Square at the foot of Fifth Avenue is the granite Washington Arch (1889; by Stanford White) commemorating the hundredth anniversary of the inauguration in New York City of George Washington as first president of the United States. Among other public statues and monuments are: Augustus St Gaudens's W. T. Sherman (1903), an equestrian statue in gilt bronze on a polished granite pedestal in Fifth Avenue at the S.E. entrance to Central Park, his D. G. Farragut (1880; with a granite exedra for pedestal, designed by Stanford White) in Madison Square, and his Peter Cooper (1894), a seated figure on a marble pedestal and beneath a marble canopy (designed by Stanford White) immediately below Cooper Union on the Bowery; F. W. MacMonnies's Nathan Hale (1893) in City Hall Park; J. Q. A. Ward's William Shakespeare (1870), Seventh Regiment Memorial (1873), "Indian Hunter" (1868), and "Pilgrim" (1885) in Central Park, his George Washington (1882) on the steps of the sub-treasury, his Greeley in front of the *Tribune* building, and his William Earl Dodge (1885) at Broadway and 34th Street; E. Plassmann's Benjamin Franklin (1872) in Printing House Square; Alexander Doyle's Horace Greeley (1890) in Greeley Square; K. F. T. Bitter's Franz Sigel (1907) in Riverside Park at 106th Street, D. C. French's Memorial to R. M. Hunt (1900), a bust with a semicircular granite entablature at Fifth Avenue and 70th Street; and a Columbus Memorial (1894; by Gaetano Russo; erected by the Italian residents), a tall shaft with a statue of Columbus, at 59th Street and Seventh Avenue. There are many other statues in the city, especially in Brooklyn (*q.v.*) and in Central Park. In Central Park on a knoll S.W. of the Metropolitan Museum stands the Egyptian obelisk, of rose-red Syene granite, the companion of that on the Thames embankment, London, and like it popularly called "Cleopatra's Needle," but actually erected by Thothmes III.; it was presented to the city by Ismail Pasha, Khedive of Egypt, in 1877, was brought to New York at the expense of W. H. Vanderbilt in 1880, and was erected in the park in 1881.

Scientific Collections and Learned Societies.—The New York Aquarium in Battery Park has excellent exhibits of marine life; since 1902 it has been under the direction of the New York Zoological Society (organized 1895), a private corporation which has relations with the Park Department and the city like those of the corporations in control of the Botanical Gardens, the Natural History Museum and the Metropolitan Museum of Art. Its Zoological Park (opened 1899) forms the southern part of Bronx Park, in which the animals (5528 individuals, 1146 species—246 mammals, 644 birds and 256 reptiles in 1910) are almost perfectly housed—in large houses, flying cages, pools, dens and ranges. The Botanical Gardens (incorporated in 1891 and 1894), occupying the N. part of Bronx Park, contains two large conservatories (the largest in America), the largest botanical museum in the world (1900), with lecture hall and museum of fossil botany in the basement, a collection of economic plants on the main floor, and a library, herbarium, laboratories, type exhibits of vegetation on the upper floors, and a natural hemlock grove and bog garden, pinetum, herbaceous grounds, flower garden, fruticetum and deciduous arboretum. The American Museum of Natural History was incorporated in 1869, and is governed by a board of trustees. On the ground floor of its building (77th–81st Streets; Eighth–Ninth Avenues) are a lecture hall, meteorites, the Jesup collections of the woods of North America and of building stones, and anthropological and ethnological collections, particularly rich in specimens from the North Pacific region, collected by an expedition sent out by Morris K. Jesup (*q.v.*). On the main floor are the mammals, insects and butterflies; on the second floor the palaeontological collections, the Cope collection of fossils and (presented by J. P. Morgan) the Bement collection of minerals and the Tiffany collection of gems; and on the top floor are a collection of shells and the library, including that of the New York Academy of Sciences, which was founded in 1817 and incorporated in 1818 as the Lyceum of Natural History, received its present name in 1876, and publishes *Annals* (1824 sqq.) and *Transactions* (1881 sqq.). Other learned societies are: the New York Historical Society (founded in 1804 and incorporated in 1809), which has a library rich in Americana, the Lenox collection of Assyrian marbles, and the Abbott collection of Egyptian antiquities; the American Geographical Society (founded in 1852; incorporated in 1854), which issues a *Bulletin* (1859 sqq.); the American Numismatic Society (1858), with an excellent numismatic library and collection; the American Society of Civil Engineers (1852; with a club house and library); the American Society of Mechanical Engineers (1880), which occupies with the American Institute of Electrical Engineers and the American Institute of Mining Engineers (1871) a building given by Andrew Carnegie; and the New York Academy of Medicine (1847), with a technical library.

Literature.—In literature[1] New York's position in America is largely due to the city's being the home of the principal publishing houses and, as the American metropolis, the home of many authors. Charles Brockden Brown, the first American professional "man-of-letters," although a Philadelphian by birth, was connected with New York City throughout his literary career; after him came the brilliant Knickerbocker school, including Irving, Cooper, Bryant, James Rodman Drake, Fitz Greene Halleck, Charles Fenno Hoffman (who in 1833 established the *Knickerbocker Magazine*), N. P. Willis, Edgar Allan Poe, J. K. Paulding, George P. Morris and Gulian C. Verplanck. In this early period New York literature centred largely about the *Knickerbocker* and the *Mirror*; and in the later period the monthlies *Harper's* (1850), the *Century* (founded in 1870 as *Scribner's*; present name 1881), and *Scribner's* (1887) were great literary influences under the editorship of such men as George William Curtis, Josiah Gilbert Holland, William Dean Howells, Henry Mills Alden (b. 1836) and Richard Watson Gilder. Richard Henry Stoddard, Richard Grant White, Bayard Taylor, Edmund Clarence Stedman, H. C. Bunner and John Bigelow are other literary names connected with New York City and with its periodical press. The success of the older magazines has brought into the field lower-priced monthlies. The oldest religious weekly still published is the *New York Observer* (1823; Presbyterian); its great editors were Samuel Irenaeus Prime from 1840 to 1885 and afterwards his son-in-law Charles Augustus Stoddard. Others are the *Churchman* (1844; Protestant Episcopal), the *Christian Advocate* (1826; Methodist Episcopal), the *Examiner* (1823; Baptist), the *Christian Herald* (1878) famous for its various charities under the control (1892–1910) of Dr Louis Klopsch (1852–1910), the *Outlook* (founded in 1870 as the *Christian Union* by Henry Ward Beecher and carried on as a household magazine by Lyman Abbott), and the *Independent* (1846) after 1870 edited by William Hayes Ward.

The city's cosmopolitan character is suggested by the great number of its newspapers published in other languages than English: in 1905 of all the periodical publications in New York City almost one-seventh (127 out of 893) were printed in languages other than English, 20 languages or dialects being represented. German, Yiddish and Italian newspapers have large circulations, and there are Bohemian, Greek, French, Croatian, Hungarian and Slavonic dailies. To a degree the New York press is metropolitan, also; but the American press is not dominated by the newspapers of New York as the English press is by that of London (see NEWSPAPERS: *United States*).

Education.[2]—The Dutch West India Company was bound by its charter to provide schoolmasters. Its first schoolmaster emigrated in 1633 and his school still exists in the Collegiate School, the property of the Collegiate (Dutch) Reformed Church. Down to the middle of the 17th century the support and control of the schools remained with the Dutch Church. Later the desire of the English to hasten the substitution of the English for the Dutch language in the colony led to an unsuccessful attempt by the colonial government to reserve to itself the appointment of the schoolmasters. An English public school was established in 1705 under an Act of 1702, and in 1710 was first opened in connexion with the Anglican Church. It still exists as the Trinity School. In 1754 King's College, now Columbia University (*q.v.*), was established; the Dutch Reformed Church made a vain effort to secure control of it, but it became Anglican in its sympathies and its teachers were mostly Loyalists. Before the War of Independence the English language had practically carried the day, and taken possession of the schools and churches.

In 1787 the Manumission Society established a free school for negroes, which was incorporated in 1794. A Quaker society (1798), the "Association of Female Friends for the Relief of the Poor," opened a school in 1801, which soon became a school for white girls only; until 1824 it shared in the school fund and it carried on an infant school only from 1824 to 1846. An association known in 1805–1808 as the Society for Establishing a Free School in the City of New York (afterwards the "Free School Society," and after 1826 the "Public School Society") opened its first school in May 1806; got an appropriation from the state legislature in 1807; in 1819 brought from England a Lancasterian teacher—for the sake of economy the society's schools had always been conducted under the Lancasterian system with student "monitors" or assistant teachers; until 1826 was largely under the control of the Friends, giving religious instruction; and was supported in part by voluntary contributions, in part by subscriptions from those who desired to share in its management, and in a small degree after 1815 by a contribution from the school fund of the state. For fifty years it did virtually all that was done for popular education in New York City, and for nearly thirty years caused the exemption of the city from the operation of the common-school system of the state; and about 600,000 children passed through its schools.

The Roman Catholic parochial schools opposed the Protestant character of the text-books used in these public schools, and in 1840, followed by Hebrew and Presbyterian schools, attempted in vain to secure a part of the common-school fund. In 1842, as a result of this controversy, the city was brought under the general state system, but the Public School Society retained control of its own schools. The Board of Education opened its first schools in 1843. The right of the Public School Society to put up new buildings was definitely withdrawn in 1848; and in 1853 the Society was voluntarily dissolved, and its seventeen schools and property (valued at $454,422) were handed over to the city authorities; from its trustees fifteen commissioners were appointed to hold office through 1854, and in each ward where there had been a school of the Society three trustees were chosen. After 1856 the control of the schools was entirely in the hands of the Board of Education. A compulsory education law came into effect in 1875. Since 1874 the Board has controlled a Nautical School, a training ship being lent to the city by the Federal Navy Department. The separate schools for negroes were abolished in 1884; free lecture courses were established in 1888; in 1893 seven kindergarten classes were established, and after 1896 a supervisor of kindergartens was appointed by the Board; and in 1894 a teachers' retirement fund was established, the first in any American city.

In Brooklyn also the early Dutch schools were under the clergy. In 1815 the schools first received a part of the state common-school fund. There were separate district schools until 1843 when a Board of Education was organized.

By the consolidation of 1898 the Boroughs of Manhattan and the Bronx became a unit for school purposes, the former city Board of Education becoming the School Board for these two boroughs; the former Brooklyn Board remained in control in that borough; and there was a Central Board of Education for the entire city consisting of eleven delegates from the Manhattan and Bronx Board, six delegates from the Brooklyn Board, and one each (the president) from the Richmond Board and the Queens Board. The revised charter of 1901 abolished the borough school boards and established a single board with 46 members (22 from Manhattan, 14 from Brooklyn, 4 from the Bronx, 4 from Queens and 2 from Richmond), and 46 local school boards (distributed as above) of seven members each, who took the place of the former inspectors in Manhattan and the Bronx. In the City Board there is an executive committee of 15 members. The borough superintendents were done away with in 1901; the powers of the city superintendent were increased, and a board of superintendents (the city superintendent and eight associate superintendents) was created. A board of examiners, nominated by the city superintendent and appointed by the Board of Education, supervises examinations taken by candidates for teaching positions, appointments to which are governed by rigid civil service rules. The development of public high schools has been rapid since the consolidation. In 1909–1910 trade schools and schools for the anaemic were established. There is an excellent system of evening and vacation schools.

A Free Academy founded in 1848 for advanced pupils who had left the common schools was empowered to grant degrees in 1854, and in 1866 became the College of the City of New York, with the Board of Education as its Board of Trustees. In 1900 a separate Board of Trustees (nine members appointed by the mayor) was created. Before 1882 no one was eligible for entrance unless he had attended the city's public schools for one year. In 1907 the College removed to new buildings on St Nicholas Heights between 138th and 140th Streets, the old buildings at Lexington Avenue and 23rd Street being used for some of the lower classes of the seven years' course. The retention of the secondary school in connexion with college, although there are now well-equipped public high schools, is one of the anomalies of the New York educational system. In 1871 a Normal School for Girls, since 1910 the Woman's College of the City of New York, was established as a part of the public system. Since 1888 public lectures for adults have been given under the auspices of the Board of Education, usually in school-houses; and in 1899 the Board opened evening recreation centres in school-houses, in which literary, debating and athletic clubs meet. For the charitable schools see § *Charities*.

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[1] See Charles Hemstreet, *Literary New York, Its Landmarks and Associations* (New York, 1903).

[2] See A. Emerson Palmer, *The New York Public School* (New York, 1905).

The oldest institution of higher education is Columbia University (*q.v.*). New York University was chartered in 1831 as the University of the City of New York, and in 1896 received its present name. The University Council is the corporation; it consists of 32 members, eight going out of office annually. The University Senate has immediate control; it is composed of the chancellor,[1] two professors of the University College, and the dean and a professor from each of the following schools—law, medicine, pedagogy, graduate and applied science. The work of the collegiate department was begun in 1832; a university building at Washington Square was erected in 1832–1835; a law school, on a plan submitted by B. F. Butler of New York, was established in 1835, a medical school in 1841, the School of Applied Science in 1862, a graduate school in 1886, a school of pedagogy in 1890, a veterinary college (formed by the union of two previously existing schools) in 1899, and a School of Commerce, Accounts and Finance in 1900. In 1894 the College of Arts and Pure Science and the School of Applied Science were removed to a commanding and beautiful site on Washington Heights (about E. 181st Street) above the Harlem river, the schools of law and pedagogy remaining at Washington Square where a Collegiate Division was opened in 1903; in 1895 the Metropolis Law School was consolidated with the University; in 1898 the Bellevue Hospital Medical College became a part of the University school of medicine. On the Washington Heights Campus the principal buildings are the library (1900), around a part of which extends an open colonnade, 500 ft. long, which is known as the Hall of Fame for Great Americans, and in which the names of great Americans (chosen at intervals by the ballots of 100 prominent educators, historians, &c.) are inscribed on memorial tablets; and Gould Hall, a dormitory, which like the library and the Hall of Fame was the gift of Miss Helen Miller Gould. In 1909–1910 the University library contained about 65,000 vols. and the law library 22,000, and there were 254 instructors and 4036 students (966 in the School of Commerce and 739 in the Law School).

For Fordham University see FORDHAM. Other Roman Catholic colleges are: the College of St Francis Xavier (Society of Jesus; opened 1847; chartered 1861); and Manhattan College (Brothers of the Christian Schools; opened 1853; chartered 1863) at Broadway and 131st Street, in the district formerly known as Manhattanville.

Among the technical and professional schools, excluding those of Columbia University and New York University, are: the General Theological Seminary of the Protestant Episcopal Church (opened 1819; in 1820–1822 in New Haven; then re-established in New York City), beautifully situated in "Chelsea Village" on a block (Ninth-Tenth Avenues and 20th-21st Streets) given for the purpose by Clement Clarke Moore (1779–1863)[2] in buildings largely the gift of Eugene Augustus Hoffman (1829–1902), dean of the Seminary in 1879–1902, and of his family, who put it on a sound financial basis; the Union Theological Seminary (1836; Presbyterian), which is representative of the most liberal tendencies in American Presbyterianism (*q.v.*), especially in regard to text-criticism; the Jewish Theological Seminary of America (1886), chiefly supported by the synagogues of New York, Philadelphia and Baltimore; the College of Physicians and Surgeons in the City of New York (1892; see COLUMBIA UNIVERSITY); the Cornell University Medical College (1897; see CORNELL UNIVERSITY); the Eclectic Medical College (1865); the New York Post-Graduate Medical School and Hospital (1882); the New York Polyclinic Medical School and Hospital (1882); the New York Medical College and Hospital for Women (1863); the New York College of Dentistry (1865); and the College of Dental and Oral Surgery of New York (1892). Among the normal schools are: the Teachers' College of Columbia University (*q.v.*); the School of Pedagogy and the kindergarten training school of New York University; the kindergarten training school of Pratt Institute in Brooklyn (*q.v.*); the Kraus Seminary for Kindergarteners; and the Kindergarten Normal Department of the Ethical Culture School under the Ethical Culture Society. Of the many private secondary schools in New York the oldest are the Collegiate School and Trinity School (see above). The Columbia Grammar School (1764) was originally a preparatory department of Columbia College.

Other educational institutions of a popular character are Cooper Union (*q.v.*) and the People's Institute[3] (incorporated in 1897), which holds its meetings and lectures in the Cooper Union Building. Its most active promoter and long its managing director was Charles Sprague Smith (1853–1910), who was professor of modern languages at Columbia University in 1880–1891, and in 1896 organized the Comparative Literature Society; he was especially assisted by Richard Heber Newton (b. 1840), a Protestant Episcopal clergyman of broad and radical religious and social views, and by Samuel Gompers. The aim was to supply a "continuous and ordered education in social science, history, literature and such other subjects as time and demand shall determine" and "to afford opportunities for the interchange of thought upon topics of general interest . . . to assist in the solution of present problems." The Institute is primarily a free evening school of social science and a forum for the discussion of questions of the day. There are, besides, Sunday evening ethical services, "a people's church," which has attracted much attention, and several "Institute Clubs" of a social nature, some of them for children. The People's Institute organized a censorship of "moving pictures" to which most American manufacturers of these films voluntarily submit. Cheap concerts are given in Cooper Union by the People's Symphony Concert Association in conjunction with the People's Institute.

For the Brooklyn Institute see BROOKLYN. The Young Men's and Young Women's Christian Associations have classes, especially for working people.

Libraries.—"The New York Public Library, Astor, Lenox and Tilden Foundations," was the result of the consolidation in May 1895 of the Astor Library (founded by the bequest of $400,000 by John Jacob Astor; incorporated in 1849; opened in 1854; further endowed by William B. Astor, who gave it about $550,000 and by John Jacob Astor, the younger, who gave it about $800,000 and built the hall in Lafayette Street in which the library, for general reference, was housed until 1911), the Lenox Library (originally the private collection, particularly rich in incunabula, Americana, genealogy and music, of James Lenox (1800–1880), a bibliophile and art amateur, given by him to the city in 1870 and until 1911 housed as a special reference library, in a building, designed by R. M. Hunt, on Fifth Avenue, between 70th and 71st streets), and the Tilden Trust (to which Samuel J. Tilden left his private library and about $4,000,000 (most of his estate) for the establishment of a public library, but which, owing to a contest by the heirs, was unable to secure the entire bequest and received only about $2,000,000 from one of the heirs). In 1902–1911 a new building was erected to house these collections. With the Public Library the New York Free Circulating Library (incorporated in 1880; re-incorporated in 1884) was consolidated in 1901; and in the next two years several other free libraries, including one for the blind. In 1901 Andrew Carnegie gave more than $5,000,000 for about 65 branch libraries, the city to furnish sites for them and maintain them. The largest and best equipped of the college libraries is that of Columbia University. The library of Cooper Union has a complete set of patent office reports and files of newspapers. The Mercantile Library (1820; established by an association of merchants' clerks) is a subscription library at Astor Place; the New York Society Library[4] (on University Place) is a subscription library, the oldest in the city, being the outgrowth of a reading room established in the City Hall in 1700 by the earl of Bellomont; it was incorporated in 1754 as the City Library and in 1772 under its present name. The General Society of Mechanics and Tradesmen (founded in 1785) since 1820 has had a circulating library; which with the DeMilt (reference) and the Slade (architectural collections), contains about 99,000 volumes.

Charities.—The city has a commissioner and two deputy commissioners of public charities, but this municipal department works largely through private organizations, the municipal appropriations to which exceed the amount actually expended through institutions controlled by the city.[5] Municipal institutions include: Bellevue Hospital (opened 1816), which in 1869 established the first hospital ambulance service in the world, near which there is an Emergency Hospital (1878) for maternity cases, and in connexion with which are the Gouverneur Reception Hospital (1885), the Harlem Reception Hospital and Dispensary (1887); and the Fordham Reception Hospital and Dispensary (1892); the City Hospital (1853) and the Metropolitan Hospital (1875), both on Blackwell's Island; for contagious diseases Willard Parker Hospital (1866) and Riverside Hospital (1885; on North Brother Island in the East river); and for the sick, crippled and idiotic destitute children, the New York City Children's Hospitals and Schools (1837; on Randall's Island). The Manhattan State Hospital on Ward's Island (1871; now used for patients from New York and Richmond counties only) Central Islip State Hospital, on Long Island, in Suffolk county (for Queens county and outside of New York City, Suffolk county) and the Long Island State Hospital (for the county of Kings) are the state insane asylums for the population of New York City.

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[1] The chancellors have been: in 1831–1839 James H. Mathews (d. 1870); in 1839–1850, Theodore Frelinghuysen (d. 1862); in 1852–1870, Isaac Ferris (1798–1873); in 1870–1880, Howard Crosby; in 1881–1891, John Hall; and in 1891–1910, Henry Mitchell MacCracken (b. 1840). Dr Ferris was a minister of the (Dutch) Reformed Church and the three chancellors since his time have been Presbyterian clergymen; but the University is not sectarian.

[2] C. C. Moore (1779–1863), son of Benjamin Moore (1748–1816), who was Protestant Episcopal bishop of New York and president of Columbia College in 1801–1811, was professor of Biblical learning in the Seminary in 1821–1850, compiled a *Hebrew and English Lexicon* (1809) and wrote some poetry including the popular juvenile verses beginning "'Twas the night before Christmas."

[3] See C. S. Smith, *Working with the People* (New York, 1904), and the *Annual Reports* of the Managing Director of the People's Institute.

[4] See A. B. Keep, *History of the New York Society Library* (New York, 1909).

[5] See H. R. Hurd (ed.) *New York Charities Directory* (19th ed., 1910), published annually by the Charity Organization Society; and W. H. Tolman and Charles Hemstreet, *The Better New York* (1904), published by the American Institute of Social Service.

The Charity Organization Society (organized and incorporated in 1882) investigates claims for charities and secures employment for applicants, has a bureau of information and a sociological library, has done much effective work through its Tenement House Committee and its Committee on Prevention of Tuberculosis, has a school of philanthropy begun as a summer school in 1898 but with a two-year course since 1904, and publishes a weekly journal, the *Survey*. In the United Charities Building (1891–1893; in E. 22nd Street), a gift of John S. Kennedy, there is housed, besides the Charity Organization Society, the Children's Aid Society (1853), which was founded by Charles Loring Brace (1826–1890), its first secretary, has established industrial schools and lodging houses (the earliest 1854, being a Newsboys' Lodging House in New Chambers Street), vacation schools, kindergartens, evening classes, summer houses at Bath Beach (for crippled girls) and West Coney Island, and a farm school at Kensico, and finds homes for orphans and homeless children. In the same building are the New York City Mission and Tract Society (1822, incorporated in 1867; undenominational), the first American organization to introduce district nursing, whose work is all done below 14th street, and the Association for Improving the Condition of the Poor (1843; incorporated in 1848), which has a department of relief, does fresh-air work at West Coney Island, supports people's baths, and has founded the Hartley House (a memorial to Robert M. Hartley, who established the Association), a neighbourhood settlement. The Society of St Vincent de Paul in the City of New York (organized 1835; chartered 1872) is the local Roman Catholic charitable organization. The United Hebrew Charities was formed in 1874 by the union of four Hebrew societies. The Russell Sage Foundation (1907) has headquarters in New York, but is not merely local in its work; it has a charity organization department, a child helping department, and a school hygiene department. "Institutional work" by the churches is well developed.

Trade and domestic schools include the Hebrew Technical Institute and the Hebrew Technical School for Girls; the New York Trade School; Grace Institute, endowed by W. R. Grace (twice Mayor of New York City) for the instruction of women in trades; the Manhattan Trade School for Girls; the American Female Guardian Society and Home for the Friendless; the Baron de Hirsch Trade Schools, in connexion with which there are day and evening schools for the instruction of immigrants (Russian, Galician and Rumanian) in the English language, and a colony with an agricultural and industrial school at Woodbine, N.J.; the Clara de Hirsch Home and Trade Training School for Working Girls; the New York Cooking School; and the Association of Practical Home Making Centres. The New York Diet Kitchen Association (1873) has established diet kitchens in connexion with many dispensaries. The City and Suburban Home Company (1896) provides good apartments at cheap rentals; the Society for Ethical Culture has promoted the same work; and the Mills Hotels, erected by D. O. Mills (1825–1910), are low-priced but self-supporting lodging houses.

There are many orphanages and day nurseries and there are about thirty permanent homes for adults in the boroughs of Manhattan and the Bronx. The New York Society for the Prevention of Cruelty to Children was incorporated in 1875, and the children's court movement in the city has been connected with this society; in its work and in that of the Society for the Prevention of Cruelty to Animals Henry Bergh (1820–1888) was the American pioneer. The Society for the Reformation of Juvenile Delinquents (1824) maintains a House of Refuge on Randall's Island; and the New York Catholic Protectory (1862), under the Brothers of the Christian Schools and the Sisters of Charity, is of a similar character. An important work has been done by the Society for the Suppression of Vice (1873), and by the Society for the Prevention of Crime, organized in 1877 and re-organized in 1891 by its president Charles Henry Parkhurst (b. 1842), a Presbyterian clergyman.

The New York Institution for the Blind was incorporated in 1831 and originated the New York point system of tangible writing and printing for the blind; the Society for the Relief of the Destitute Blind (1869) and the New York Association for the Blind (1906) are noteworthy. The New York Institute for the Instruction of the Deaf and Dumb (1817), of which Harvey Prindle Peet (1794–1873) was principal in 1831–1867, is a free state school and the first oral school for the deaf in America; the Institution for the Improved Instruction of Deaf Mutes (1867) is a free city school; St Joseph's Institute for the Improved Instruction of Deaf Mutes (Roman Catholic; 1869) has a school for boys and one for girls.

Among special hospitals the foremost are: the New York Eye and Ear Infirmary (1820), the New York Ophthalmic Hospital (1852), the Manhattan Eye and Ear and Throat Hospital (1869), the New York Orthopaedic Dispensary and Hospital (1866), the New York Skin and Cancer Hospital (1882), the General Memorial Hospital for the Treatment of Cancer (1884), the New York Bacteriological Institute (1890; maintaining the New York Pasteur Institute), and the Neurological Institute (1909). Important research is undertaken by the richly endowed Rockefeller Institute for Medical Research. The St John's Guild (1866, non-sectarian) maintains floating hospitals for tuberculosis patients and a sea-side hospital at New Dorp, Staten Island. There is a roof camp for tuberculous patients on the Vanderbilt Clinic (1886), a free dispensary, connected with the College of Physicians and Surgeons.

Many of the general hospitals have already been mentioned in the list of medical schools; others are: the New York Hospital (1771), St Luke's (1850), Mt. Sinai (1852), the Roosevelt (opened 1871), the Presbyterian (opened 1872; undenominational), the J. Hood Wright Memorial (1862; called the Manhattan Dispensary until 1895), the Hahnemann (1875), and the Flower (1890; homoeopathic; surgical).

Population.—New York is by far the largest city in the United States in population, the census of 1910 returning its numbers as 4,766,883, and in the whole world is second to London only. Seven-eighths of the present area was annexed in the decade 1890–1900; and in those years the population increased from 1,515,301 (for an area of which the population in 1900 was 2,050,600) to 3,437,202. In 1905 the population by the state census was 4,000,403; of the separate boroughs: Manhattan, 2,102,928 (in 1900, 1,850,093; in 1890, 1,441,216); Bronx, 271,592 (in 1900, 200,507; in 1890, 88,908); Brooklyn, 1,355,106 (in 1900, 1,166,582; in 1890, 838,547); Queens, 197,838 (in 1900, 152,999; in 1890, 87,050); Richmond, 72,939 (in 1900, 67,021; in 1890, 51,693). In 1900 there was a slight preponderance of females (1,731,497 females; 1,705,705 males); the ratio of native born to foreign born was about as 176 to 100 (2,167,122 native born; 1,270,808 foreign born); less than 1·8% (60,666) were negroes; and less than 0·19% (6321) were Chinese. Of the native population seven-eighths (1,892,719 out of 2,167,122) were natives of New York state. Of the foreign-born population (1,270,080) in 1900, more than one-fourth (322,343) were Germans; more than one-fifth (275,102) were Irish, nearly one-eighth (155,201) were Russians, principally Jews; more than one-ninth (145,433) were Italians; and the next largest numbers were: 71,427 from Austria, 68,836 from England, 31,516 from Hungary, 28,320 from Sweden, 25,230 from Russian Poland,[1] 19,836 from Scotland, 19,399 English Canadians, 15,055 from Bohemia, 11,387 from Norway, 10,499 from Rumania, 8371 from Switzerland and 5621 from Denmark. In 1900 more than two-thirds of the entire population was of foreign parentage, 2,643,957 being the number of all the persons of foreign parentage and 2,339,895 the number of persons having both parents foreign-born; of this latter number 658,912 were German, 595,267 were Irish, 237,875 were Russians, 214,799 were Italians and 103,497 were Austrians—these numbers as compared with the figures just given for the foreign-born furnish a hint as to priority of the Irish and German immigration to that of the Russian Jews, who like the southern Europeans and the Slavs came to New York in comparatively few numbers more than a generation before 1900. There are in New York City more Germans than in any city of Germany, save Berlin, and more Irish than in Dublin. There are many well-defined foreign communities in the city, such as "Little Italy" about Mulberry Street, "Chinatown" on Mott, Pell and Doyers Streets, the Hebrew quarter on the Upper Bowery and east of it, a "German Colony" east of Second Avenue below 14th Street, French quarters south of Washington Square about Bleecker Street and on the west side between 20th and 34th Streets; a Russian quarter near East Broadway, a "Greek Colony" about Sixth Avenue in the 40's, and negro quarters on Thompson Street and on the west side in the 50's; and there are equally well-defined Armenian and Arab quarters. In 1900 35% of the total working population were employed in trade and transportation (in Boston 34%, in Chicago 32%, in Philadelphia 24%) and 37% in manufacturing and mechanical arts (in Philadelphia 41%; in Chicago 35%; in Boston 32%). In 1661 the population of Manhattan Island was about 1000. In 1700 it was probably about 5000, the Dutch and English being about equally divided, and there being a few French, Swedes and Jews. In 1732 the population was 8624. During the War of Independence the city lost heavily; but the recovery at the close of the war was rapid, and although the population probably fell during the war from 20,000 to 10,000, in 1790 it was 33,131, then first being greater than that of Boston. From 60,515 in 1800 the population increased to 123,706 in 1820; to 312,710 in 1840; to 813,669 in 1860 and to 1,206,299 in 1880. This rapid growth, the large part which immigration plays in the growth, the marked falling-off in the character of the immigrants, and the fact that it is usually the weaker and less enterprising immigrant who stays in New York while the more capable go West—all these circumstances combine to make a serious social problem. The low scale of living of this poorer class operates with the peculiar physical character of the city, especially on the lower East Side, where so many of the more recent immigrants live, to make the question of housing difficult. In Manhattan and the Bronx 66·7% of the population in 1890 and 72·6% in 1900 lived in dwellings in which the minimum number of dwellers was 21; for the whole city in 1900 the percentage was 54·4, the corresponding percentage for Chicago in 1900 was 17·9. For the entire Borough of Manhattan the average density was 149·0 inhabitants per acre; but in the Eighth Assembly District (98 acres; on the lower East Side, bounded S.E. by Henry Street, E. by Clinton Street, N. by Stanton Street, and W. by Chrystie Street), in which more than two-thirds of the population is foreign-born, the density in 1900 was 735·9 per acre, and in 1905 727·9 per acre. In twelve tenement blocks in Manhattan in 1905 the density was over 1000 per acre, the maximum being 1458 per acre in a block bounded by Cherry, Jefferson, Monroe and Rutgers Streets. A Citizens' Association with a "council of hygiene and public health" in 1865 employed sanitary experts to investigate the city's tenements. In 1879 a prize offered for the best plans for tenements was unfortunately awarded to the so-called "dumb bell" tenement, in which the court for air-space gives little air or light, and many of these tenements, which, however, were a great improvement on the older types, were built. In 1902 the further building of "dumb bell" tenements was forbidden and a new Tenement House Commission was appointed. Model apartments have been built: in 1855 by the Workmen's Home Association, organized by the Association for Improving the Condition of the Poor; by the Improved Dwellings Company of Brooklyn and the Improved Dwellings Association of Manhattan (1879); by the City and Suburban Homes Company (1896); and by some individuals. The city is comparatively healthy; for the five years 1901–1905 the average death rate was 18·99 per thousand for the entire city, 20·96 for the Borough of the Bronx, 18·64 for the Borough of Brooklyn, 19·49 for the Borough of Manhattan, 16·12 for the Borough of Queens and 18·98 for the Borough of Richmond.

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[1] The immigrants from Russian Poland, from Austria Hungary, from Russia and Rumania are largely Jews, and it is estimated that one-fourth of the inhabitants of Manhattan are Jews.

Communications.—The physical limitations of Manhattan Island and particularly the circumstance that the business area of the city is small and that the movement of passengers is almost entirely in one direction at any one time, have hindered the development of a simple and adequate system of local communications. Between Manhattan and Long Island there were in 1910 four bridges, three of them completed in the decade immediately before 1910, three of them to Brooklyn (*q.v.*) and one to Long Island City; the New York and Brooklyn Bridge (1872–1883), with a Manhattan terminus at Park Row, and the Williamsburg Bridge (1897–1903) from Clinton and Delancey Streets, Manhattan, to South 5th and 6th Streets, Brooklyn, are suspension bridges; for a technical description of them see BRIDGES, vol. iv. pp. 537-538. The Manhattan Bridge (1901–1909) is a wire cable suspension bridge situated between the two just mentioned; its Manhattan terminal is at Canal Street and the Bowery, and its Brooklyn terminal is at Nassau Street. It is the largest of all suspension bridges with a total roadway length of 6855 ft. (Manhattan approach 2067 ft.; Brooklyn approach 1868 ft.; two land spans of 725 ft.; river span 1470 ft.) and a width of 122·5 ft. It has a double deck, the lower for two surface car tracks and a wagon way, and the upper for footways and four elevated railway tracks. The Queensboro Bridge (1901–1909) is a cantilever from Second Avenue, between 59th and 60th Streets, Manhattan, to Long Island City, with sustaining towers on Blackwell's Island. Its total length, including a plaza in Queens 1152 ft. long, is 8601 ft. (Manhattan approach 1052 ft.; Queens approach 2672·5 ft.; west channel span 1182 ft.; island span 630 ft.; east channel span 984 ft.) and its width is 89·5 ft. over all, the roadway being 53 ft. and the two sidewalks each 16 ft. All of these bridges are crossed by electric cars, and on the bridges to Brooklyn there run surface cars and elevated trains. In 1909 an average of 4249 trolley cars and 3988 elevated cars crossed the Brooklyn Bridge every week day; for the Williamsburg Bridge the corresponding averages were 4473 trolley cars and 918 elevated train cars. The Harlem river is crossed by about a dozen bridges, including High Bridge, which carries the city aqueduct. The ferries to Brooklyn are less important than in the days when there was only one bridge and no subway connexion between Manhattan and Brooklyn; the opening of the Pennsylvania-Long Island railway tube in 1910 in the same way made the ferry from 34th Street, Manhattan, to Long Island City comparatively unimportant; and the Pennsylvania and the Hudson river subways have to some degree taken the place of ferryboats on the North river for passenger traffic between Manhattan and railways in New Jersey. Between Manhattan and the various islands (to North Brother Island from E. 16th; to Ward's Island from E. 116th; to Randall's Island from E. 125th and E. 120th) of the river and bay including Staten Island the only means of transportation is still by ferryboats; the ferry line to Staten Island is owned and operated by the municipality. In Manhattan the first advance made on the horse car—which was still used to some extent in 1910, especially on streets along the water front—was the elevated railway; on great iron trestles of varying heights the first of these railways was built in 1867–1872 on New Church Street, West Broadway and Ninth Avenue, from the Battery to 59th Street; in 1878 a line was built on Sixth Avenue, branching off on 53rd Street to Ninth Avenue, and on 110th Street to Eighth Avenue and running on Eighth Avenue to the Harlem river (155th Street), a distance of 10¾ m.; soon afterwards the Second and Third Avenue lines were built from the Brooklyn Bridge to the Harlem river, and the line now extends to Fordham (190th Street), a distance of 13 m. In 1902 the motive power of these elevated trains was changed from steam to electricity. In 1886 a cable car line was opened, the cars being operated by a clutch (or "grip") seizing a moving endless cable in a slot beneath the road bed; but in 1898 the "underground trolley" system began to be substituted. Outside Manhattan the overhead trolley is prevalent. In 1900–1904 another era in "rapid transit" in New York was begun: in the latter year was opened the Broadway subway with electric trains from the City Hall, along Broadway (above 42nd Street) to Kingsbridge (230th Street) and by a branch line, turning to the E. from 104th street and running, above 110th Street, on Lenox Avenue to the Harlem river and then through the Bronx to West Farms (180th Street) at the S.E. entrance to Bronx Park. In 1901–1906 the subway was continued to South Ferry and was carried under the East river to the junction of Atlantic and Flatbush Avenues in Brooklyn. The construction company received a fifty years' franchise for the operation of this subway. In 1908–1909 two more underground lines were opened connecting Manhattan with Hoboken (the terminus of the Delaware, Lackawanna & Western) and Jersey City (the terminus of the Erie, the Pennsylvania and the Central of New Jersey railways) by tubes under the North river; one of these extends up Sixth Avenue to 33rd Street, near the new terminal of the Pennsylvania railway, from which by 1910 tubes had been carried immediately E. and under the East river to Long Island and immediately W. to the New Jersey side. The municipality in 1910 contracted for the construction in Manhattan of lines on Broadway and Lexington Avenue and on Canal Street across town and for the continuation in Brooklyn of the subway to Coney Island and Fort Hamilton.

The opening of the Erie Canal made the city the gateway for communication by water from the Atlantic Ocean to the interior of the continent,[1] and when the great railway lines were built westward it became the chief railway terminal on the Atlantic coast. Water communication up the Hudson river and through the canal is still of great importance. The New York Central & Hudson river and West Shore railways follow closely this water route to Buffalo. The Erie, the Lehigh Valley, the Pennsylvania and the Delaware, Lackawanna & Western railways reach Buffalo by routes across New Jersey, Pennsylvania and western New York. The New York, New Haven & Hartford railway affords communication with New England; and the Pennsylvania and the Baltimore & Ohio railways, with the middle western and south-eastern parts of the country. The Central Railroad of New Jersey and the Long Island railway (belonging to the Pennsylvania) are more local. The New York Central & Hudson river and the New York, New Haven & Hartford railways have a terminal in the borough of Manhattan, and the Pennsylvania has a terminal there also, since 1910, with tunnels to Long Island and New

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[1] Between 1840 and 1858 the tonnage cleared at New York nearly quadrupled, the increase being from 408,768 to 1,460,998; at the close of the period of the predominance of the canal as a freight carrier, in the decade 1850–1860, New York City had, thanks to the Erie Canal and the canals of Ohio, a monopoly of the trade of the upper Mississippi basin.

Jersey; but the other railways have their terminals on the New Jersey bank of the Hudson and are reached either by ferries or by subways under the river. The New York Central tracks are sunken from the Grand Central Station for about 50 blocks and then run on a trestle (like the "elevated" railways) for the rest of their course in Manhattan. Ten steamboat lines afford communication with the cities and towns on the Hudson. The Old Dominion, the Clyde and the Savannah are among the more important coastwise lines connecting the city with ports on the South Atlantic coast. The Metropolitan line connects it with Boston, and the Portland line with Portland; and there are several lines to ports on Long Island Sound. Among great trans-Atlantic lines which serve the city are the Cunard and the White Star lines to English, French and Mediterranean ports; the North German Lloyd, and the Hamburg-American lines to English, French and German ports; the Compagnie Générale Transatlantique to French ports; and the Holland-American line to the Dutch port of Rotterdam; the docks of some of these lines are on the New Jersey side of the North river, in Hoboken. There are also lines to the West Indies, Central and South America.

Commerce.—The lack of railway lines direct to wharfs and piers in Manhattan is one of the commercial disadvantages of the city. The value of the imports received at the port of New York, which comprises New York Harbor and the Hudson river, increased from $518,796,561 in 1899 to $891,614,678 (or 60·4% of those of the entire country) in 1909; the value of the exports from $476,609,251 in 1899 to $627,782,767 (or 36·3% of those of the entire country) in 1909. The importations of works of art, furs, laces, diamonds, sugar, coffee, spices, cocoa, india-rubber, cigar wrappers, tin, cheese, hemp, hides of cattle and gloves of kid or other leather at New York are especially large as compared with the other ports of the country; and so are the exportations of chemicals and medicines, copper, machinery, illuminating oil and hardware.

The city is the principal centre of the New World for the wholesale grocery and dry-goods businesses. Here are the country's most important "exchanges," including the Stock Exchange (1792), the Produce Exchange (the New York Commercial Association in 1862–1868), the Cotton Exchange (1871) and the Consolidated Stock Exchange (1885); and here are the richest and most powerful banks and trust companies in the New World and the great New York Clearing House. The Chamber of Commerce of the city was first organized and was chartered in 1768, and was reorganized in 1784.

Manufactures.—Many of the manufacturing industries, notably the manufacture of clothing, are favoured by the abundance of immigrant labour. Others, such as the refining of sugar and molasses, derive an advantage from their position with respect to imported raw materials. Still others, *e.g.* the refining of petroleum, derive an advantage from their position with respect to the exportation of the finished products. The growth of manufactures was promoted by the rapid growth in commerce after the opening of the Erie Canal (1825) and by a great stream of immigration, and New York became the foremost manufacturing city in the United States about the middle of the 19th century. The value of its manufactured products increased from $1,084,850,236 in 1890 to $1,371,358,468 in 1900, and the total value of factory products[1] from $1,172,870,261 in 1900 to $1,526,523,006 in 1905 (an increase of 30·2%). Clothing ranked first in value in 1905, and its value ($305,523,795) was greater than the total value of all factory products in any other city in the United States except Chicago and Philadelphia. Printing and publishing, with products valued at $116,877,594, ranked second. In 1905 the highest degree of localization of any industry in the country was in lapidary work, of which 96·5% of the entire output of the country was produced in New York City, more than 60% of the total for the city being produced in Brooklyn. The boroughs of Manhattan and the Bronx produced in that year goods valued at $1,043,251,923, or a little more than two-thirds of that for the entire city; and in this part of the city is made more than 95% of the clothing manufactured in all the city. The Borough of Brooklyn produced nearly three-fourths of the remainder.

Water Supply.—The water supply[2] of the colonial city was derived from wells and from the many fresh-water streams and ponds which have now almost without exception been filled in. A system, drawing water from Collect Pond, was installed in 1774–1776 by Christopher Colles (1738–1821), but this never was in actual operation. In 1799 the Manhattan Company was incorporated ostensibly to supply the city with water, but under an omnibus clause in its charter it devoted itself to the banking business. In 1829 the city built a reservoir on 13th Street. In 1830 De Witt Clinton suggested the Croton river as a source of supply. Between 1837 and 1893 were constructed the first Croton Aqueduct, the Bronx river Conduit and the New Croton Aqueduct (see AQUEDUCT), with maximum discharges respectively of 95,000,000 gals., 28,000,000 gals. and 302,000,000 gals. a day. In 1905 a new Water Supply Commission was created and immediately afterwards work was begun on a new aqueduct[3] to bring water from the Catskills; a great reservoir (the Ashokan) was built more than 85 m. N. of New York, W. of Kingston (on the W. side of the Hudson); thence an aqueduct was constructed which crossed under the Hudson river between Storm King and Bear Mountain to the Kensico storage reservoir at White Plains, to a filtration plant near Scarsdale and to the Hill View distributing reservoir in Yonkers, and from this reservoir to the five boroughs of Greater New York (Queens and Richmond boroughs both being supplied from Brooklyn) by tunnels, the supply for Staten Island only being pumped through pipes. One of the largest of the new reservoirs within the city limits is the Jerome Park. The water supply for the typical New York City "sky-scraper" cannot be forced to the higher storeys of these buildings by the pumps of the municipal service, and such buildings must have each its own installation of engines for this purpose. In 1908 a high pressure water supply system was installed for fire-protection of a part of the city below 23rd Street; induction motors driving multi-stage centrifugal pumps give sufficient power to force the water to a fire in the top of the highest buildings. (See FIRES AND FIRE EXTINCTION.)

Administration.—By the close of the Dutch period the city had become practically self-governing. But in the permanent form of English government that was established by the Dongan charter, granted in 1686 when the English crown was attacking the privileges of municipalities in the mother country, the mayor and sheriff were appointed by the governor and council; the recorder, town clerk and clerk of the market were appointed either by the king or by the governor; and although the aldermen and assistants were elected by the people no ordinances of the common council could remain in force more than three months unless they were confirmed by the governor and council. The Montgomerie charter of 1730 was mainly an enlargement of the Dongan charter. From 1777 to 1821 the mayor was chosen by the state council of appointment, consisting of the governor and four senators; from 1821 to 1834 he was elected by the common council; since 1834 he has been elected by the people. In 1730 the common council was divided into two chambers: the board of aldermen and the board of assistants; and the mayor and recorder were excluded from membership. In 1853 a board of sixty councilmen, in which was vested the sole right to originate acts appropriating money, was substituted for the board of assistants. The latter was restored in 1868, but was abolished in 1873 when the board of estimate and apportionment was created. Until 1849 the common council was an executive as well as a legislative body, and for many years the government was administered chiefly by its committees and by the heads of departments which it created and appointed; and the mayor's veto could be overcome by a bare majority vote of the members elected to each chamber. In 1849 the choice of the heads of departments was given to the people, and in 1853 a two-thirds vote of the members elected to each chamber was required to pass an act over the mayor's veto. In 1857 the state legislature began the appointment of boards and commissions for the performance of various functions, and from this state interference and the popular election of the heads of departments resulted a divided responsibility in the city government. The present state constitution (1894) affords some protection against state interference, and under the Consolidation Act of 1882 and under the present charter of "Greater New York," granted in 1897 and revised in 1901, responsibility centres in the mayor.

The mayor is elected for a term of four years. With the exception of that of finance he appoints the heads of all departments: law, water supply, gas and electricity, fire, street cleaning, bridges, docks and ferries, parks, public charities, tenement house, health, correction, police, education, taxes and assessments. Even in the department of finance he appoints the chamberlain and two commissioners of accounts, who examine the receipts and disbursements in the office of the comptroller and chamberlain and may examine the affairs of such other offices or departments as the mayor may direct. All officers appointed by the mayor may be removed by him, except certain judicial officers and the members of the board of education.

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[1] The census of 1905 was confined to establishments under the factory system; the total for all manufactured products in 1900 (the figure given in the 1900 census) is greater than the value of factory products only (the figure given for 1900 in the 1905 census, so that figures for 1900 and 1905 may be comparable).

[2] See Edward Wegmann, *The Water Supply of the City of New York* (New York, 1896).

[3] See A. D. Flinn, "The World's Greatest Aqueduct" in the *Century Magazine* for September 1909.

The aqueduct commissioners, the trustees of the College of the City of New York, and the trustees of Bellevue and allied hospitals, however, are removable only for cause and after a hearing. The mayor's veto of a franchise passed by the board of aldermen is final; his veto of an ordinance or resolution of the board which involves the expenditure of money, the creation of a debt or the laying of an assessment can be overcome only by a three-fourths vote; and his veto of any other measure of the board can be overcome only by a two-thirds vote. Special city legislation passed by the state legislature is referred to the mayor for his acceptance; if he does not accept it, it may be repassed by both branches of the legislature but must then be marked, when referred to the governor, "passed without the acceptance of the city."

The department of finance is administered under the direction of the comptroller, who, like the mayor, is elected for a term of four years. He prescribes the manner in which the accounts in the other departments shall be kept and rendered, and all such accounts are subject to his inspection. His warrant, drawn on the chamberlain and countersigned by the mayor, is required in making a payment on behalf of the city. He settles claims in favour of or against the city. No real estate can be purchased or leased by the city without his consent. No contract, the expense for the execution of which is not in part covered by assessments on the property benefited, is valid without his signature. Legislation affecting the city's finances is determined mainly by the board of estimate and apportionment consisting of the mayor, comptroller, president of the board of aldermen, with three votes each; the presidents of the boroughs of Manhattan and Brooklyn, with two votes each; and the presidents of the boroughs of Queens, the Bronx and Richmond, with one vote each. Every October this board prepares the budget for the ensuing year. It is required to submit the same to the aldermen for approval, but the aldermen are not permitted to increase an appropriation, to insert any new appropriation or to reduce that for the payment of state taxes, that for the payment of the interest on the city debt or any of those the amounts of which are fixed by law; and in case they reduce others their action is subject to the mayor's veto which they can overcome only by a three-fourths vote.

The city's budget grew from $90,778,972 in 1900 $156,545,148 in 1909; the assessed value of its taxable property, real and personal, from $3,654,122,193 in 1900 to $7,250,500,559 ($5,423,312,599 for Manhattan and the Bronx) in 1909, when the real estate was valued at $6,807,179,704. The net funded debt in December 1909 was $653,270,379, the gross bonded debt being $946,005,728; the floating debt was $60,367,290, and the sinking fund was $232,368,060. Among the large items of the 1909 budget were: $27,470,737 for education; $47,225,078 for redemption and interest of the city debt; $20,235,115 for miscellaneous city and county expenses; $14,160,202 for police; $8,428,596 for borough governments; $8,039,565 for fire protection; $7,418,299 for street cleaning; $6,511,143 for water supply and public lighting; $4,760,651 for charitable institutions; $3,319,065 for parks; $2,512,606 for public charities; and $2,484,859 for health. The state constitution of 1894 fixed the debt limit of all municipalities at 10% of the assessed valuation of their real estate. An amendment of 1899 (in effect 1900) excepted from the debt limit of New York City the previous debt of the counties now wholly included in the city; another amendment adopted in 1905 excepted from this limit debts incurred by the City of New York after the 1st of January 1904 to provide for the supply of water; and an amendment, adopted in 1909, excepted from the debt limit bonds issued after December 31st 1909 for such public improvements owned or to be owned by the city as yield a revenue in excess of what is required to meet the interest and principal of such bonds; also indebtedness incurred prior to January 1st 1910 for rapid transit or dock properties in proportion to the extent to which the revenue meets the interest and the instalments to be paid for the redemption of the bonds, such increase of the debt limit to be used, however, only for rapid transit or dock improvements. The same amendment (1909) also authorizes the city to issue, during any one year, in excess of its former debt limit, bonds to be redeemed out of the tax levy for the ensuing year to the extent of one-tenth of 1% of the assessed value of the real estate of the city subject to taxation.

The board of aldermen, whose power is less than formerly, is composed of a president, elected on the city ticket for a term of four years; the five borough presidents, each elected by his borough for a term of four years; and 73 aldermen, elected by districts for a term of two years. Each head of an administrative department is entitled to a seat in the board but no vote; he is required to attend the board's meeting whenever it requests him to do so and must answer questions relating to his department. The board is required to meet once each month except in August and September. Each administrative department has a single head with the exception of the department of parks, the department of health and the department of education; and each head of a department has full power of appointing and removing subordinates except that a person holding a position in the classified civil service subject to competitive examination can be removed only for cause. The head of the department of parks is a board of three park commissioners: one for the boroughs of Manhattan and Richmond, one for the boroughs of Brooklyn and Queens and one for the Borough of the Bronx; one of the three is designated by the mayor as president of the board. The head of the department of health is also a board of three members; the commissioner of health, who is president of the board, the police commissioner and the health officer of the port. The department of education is described in the paragraph on education. Railway, gas and electric companies doing business within the city are subject to the extensive control of a public service commission of five members who are appointed by the governor of the state (see NEW YORK).

In New York county, which comprises the boroughs of Manhattan and the Bronx, there is no county court, but in its place are a city court and a court of general sessions. The city court is a civil court, having jurisdiction over cases in which the amount involved does not exceed $2000, and is composed of seven justices elected for a term of ten years. The court of general session is a criminal court, having jurisdiction of all crimes including murder, and is composed of the city judge, the recorder and three justices of the sessions, each elected for a term of fourteen years. New York county elects a surrogate for a term of fourteen years, and Kings has two county judges; but in Queens and Richmond the county and surrogate courts are the same as in other counties of the state. In each of twenty-eight districts into which the city is divided a municipal-court justice is elected for a term of ten years and sessions of the municipal court, which has jurisdiction of civil cases in which the amount involved does not exceed $500, are held. For the administration of criminal justice by magistrates (justices of the peace) the boroughs of Manhattan and the Bronx constitute the first division and the other three boroughs constitute the second division. In each division there is a board of magistrates appointed by the mayor for a term of ten years, and the magistrates hold the several courts of their division in rotation according to such rules as they themselves establish. There is also in each division a court of special sessions consisting of six justices appointed by the mayor for a term of ten years; it has jurisdiction in all misdemeanour cases except libel and must be held by three justices. In the first division both the magistrates and the justices of the court of special sessions are required to hold a separate court for hearing charges against children under sixteen years of age.

Each borough has a president with extensive power, and the city is divided into twenty-five local improvement districts, each having a board composed of the president of the borough and the alderman representing the district. The president appoints and removes at pleasure a commissioner of public works, who, subject to his control, directs his administration relating to streets, sewers, public buildings and supplies. The borough president prepares all contracts relating to his borough. In Queens and Richmond he directs the cleaning of the streets. In Manhattan, Brooklyn and the Bronx he is directed by the charter to appoint a superintendent of buildings, who, subject to him and with the aid of inspectors, enforces the ordinances of the aldermen relating to the construction, alteration and removal of buildings; in Queens and Richmond the borough president may appoint such an officer only when authorized to do so by the board of aldermen upon the recommendation of the board of estimate and apportionment. A borough president is chairman of each of the local improvement boards.

History.—The discovery of New York Bay and the Hudson river by Verrazano in 1524 was followed only by occasional visits of trading or exploring vessels until the arrival of Henry Hudson in 1609. Beginning with 1610, Dutch merchants despatched several vessels to engage in the fur trade with the Indians, and in 1614 a ship commander, Adriaen Block, having lost his vessel, built the "Onrust" or "Restless" on the shore of Upper New York Bay. About the same time a few huts were built at the south end of Manhattan Island. When New Netherland had been erected (1623) into a province of the West India Company (see NEW YORK), that body chose the south end of Manhattan Island for a trans-Atlantic shipping station and for the seat of government. In 1626 Peter Minuit, the director-general of the province, bought the entire island from the Indians for goods valued at 60 guilders (about $24) and at what was then its southern extremity began the erection of Fort Amsterdam; and at the close of the year the settlement, New Amsterdam, comprised thirty bark-covered dwellings. For several years it was maintained wholly in the interest of the Company, and to none of the inhabitants, all of whom were its agents or employees, were given any political rights, title to land or right to European trade on his own account. The company divided a large portion of the island into six farms of its own, and when by its Charter of Privileges and Exemption

(1629) it attempted to encourage agriculture in other parts of the province (see New York State) it reserved to itself the whole island. In 1633 New Amsterdam received a grant of "staple right" by which it could compel any vessel passing the port either to offer its cargo for sale or pay a duty; in 1638 the Company extended to all friendly European countries the privilege of trading with the province, and about this time it opened town lots for sale. The town rapidly assumed the cosmopolitan character for which it has ever since been noted, there being, according to a contemporary report, eighteen languages spoken by its 400 or 500 inhabitants in 1643. In 1641, to gain the necessary support to fight the Indians, Kieft had to yield to the demand for a popular voice in the government, and permitted the heads of families to choose a board of Twelve Men to confer with him. In 1643 he permitted the choice of a board of Eight Men, and when he refused its demands it was largely instrumental in effecting his recall. Under his successor, Peter Stuyvesant, a board of Nine Men was chosen, and this body, objecting to the customs duties which he imposed, sent three of its number with a petition to the States-General with the result that in 1653 New Amsterdam was made a city with a government administered by a schout, two burgomasters and five schepens.

Chiefly with a view to protection from roving traders the great burgher-right and the small burgher-right were established in 1657; the great burgher-right being conferred on all who had been magistrates as well as on those then in office, on clergymen, on militia officers and on the male descendants of all such persons; and the small burgher-right being conferred on all native-born citizens, on the husbands of native-born women and on all who had been residents of the city for a year and six weeks. Other persons approved by the magistrates were allowed to buy the great burgher-right for 50 guilders ($20) or the small burgher-right for 20 guilders ($8). Only burghers and employees of the West India Company could engage in commerce, work at a trade or practise a profession, and only great burghers could hold the more important offices. Originally Stuyvesant appointed the city officers, but in 1658 he permitted them to nominate their own successors. Besides engaging in the fur trade, the city was now exporting considerable timber and food-stuffs; in the coast trade it was beginning to reap the advantages of its situation on the coast route through Long Island Sound; and its trade with the Dutch West Indies was of some importance. But the city and the Company were always at odds. The duties exacted by the Company were a heavy burden and yet the Company did not keep the fort in good repair. Stuyvesant's arbitrary rule primarily in the interests of the Company was another grievance, and when in August 1664 there appeared in the harbour an English fleet sent by the duke of York for the conquest of the province, the city was in a defenceless condition. Richard Nicolls, the representative of the duke, easily won over the burgomasters and other prominent citizens; Stuyvesant, practically deserted, was driven to a formal surrender on the 8th of September; and New Amsterdam became New York.

In June 1665 Nicolls reorganized the government, vesting it in a mayor, aldermen and sheriff, to be appointed by the governor of the province for a term of one year; and extended the city's limits to include the whole of Manhattan Island. In 1666 he granted to New Harlem, founded in 1658, a charter which gave to it the status of a town within the city. Nicolls' successor, Governor Francis Lovelace, established a post-route from New York to Boston in 1673. On the 30th of July 1673 the city was surprised and captured by a Dutch fleet under Cornelis Evertsen and Jacob Binckes. The captors renamed the city New Amsterdam and in January 1674 Anthony Colve, the newly appointed governor of the province, re-established the Dutch city government, but under the treaty of Westminster the English again took possession in November. In 1678 Governor Edmund Andros gave the city practically a monopoly within the province of commerce "over seas" and ordered that flour should be inspected nowhere else; two years later he required that all flour for export should be bolted and packed within the city. The duties established by order of the duke of York were still a grievance, and when, in 1681, Governor Andros had sailed for England without renewing the ordinance imposing them, the merchants refused payment and demanded that they should thereafter be imposed by a representative assembly. The duke yielded and the first New York Assembly, called by Governor Thomas Dongan, met in the city on the 17th of October 1683. Less than three years later, on the 20th of April 1686, Dongan gave the city its first real charter, which is a historic instrument in the city government; it was superseded only to a very small extent as late as 1830 (when there was a revision of the charter) and on it as a basis the later charters have been framed.

New York City with its numerous artisans, small traders, sailors and common labourers, such as usually compose the party of discontent, was the centre of the Leisler uprising (see New York State) incited by the English Revolution of 1688, and it was here that Leisler in the spring of 1690 called the first intercolonial assembly to plan an expedition against Canada. During Leisler's rule, too, the freeholders of the city were for the first time permitted to elect their own mayor, a privilege not subsequently granted until 1834. Before the close of the 17th century New York had become a favourite haunt of pirates; leading merchants assisted pirates as well as privateersmen in fitting out their vessels and shared in their plunder or at least welcomed them with their rich cargoes, and public officials, including one or more governors, were also implicated. The home government finally appointed Richard Coote, earl of Bellomont (1636–1701), governor with explicit instructions to suppress the evil. Before he received his commission he and Robert Livingston sent out William Kidd (d. 1701) with a frigate to capture the pirates. Kidd himself turned pirate, but was arrested in Boston in July 1699, was sent to England for trial and was hanged in May 1701. Bellomont met determined opposition among New York officers and merchants; but by the close of his brief administration (1698–1701) he had caught a number of the pirates and broken up the corrupt system by which they had been protected. The importation of negro slaves was begun in 1725 or 1726 and was somewhat encouraged by the States-General. Becoming prized as household servants they so increased in number in the city that during the first half of the 18th century they were not greatly outnumbered by the whites; the whites early began to fear a slave insurrection, and ordinances were passed forbidding negroes to gather on the Sabbath in groups of more than four, or to carry guns, swords or clubs; but one night in April 1712 some slaves met in an orchard near Maiden Lane, set fire to a building and killed nine men besides wounding several others who came to put out the fire. Soldiers then captured all the insurgents except six, who committed suicide, and after trial twenty-one were executed. When early in 1741 nine fires broke out within a few weeks and a negro was seen running from the last, the belief became general that the negroes had formed a plot to burn the town. A reward of £100 was offered for information exposing the plot, and the testimony of an indentured servant-girl, Mary Burton, that her master, mistress, a few other whites and a number of negroes were implicated in such a plot threw the city into a panic. Other confessions were extorted by threats, and on such worthless testimony four whites were executed, fourteen negroes were burned at the stake, twenty were hanged and seventy-one were transported. The frenzy was checked when Mary Burton began to accuse persons of consequence and above suspicion. The *New York Gazette*, the first newspaper of New York, established by William Bradford in 1725, was a semi-official organ. For criticizing the government in the *New York Weekly Journal*, which he established in 1733, John Peter Zenger was charged with libel in 1734, and by securing his acquittal in the following year the popular party established the freedom of the press (see New York). At the beginning of the Stamp-Act controversy John Holt's *New York Gazette and Weekly Post-Boy*, the successor of Bradford's *Gazette*, was the medium through which the popular leaders stirred the people to resistance. The Stamp-Act Congress, called at the suggestion of Massachusetts, sat in the city from the 7th to the 28th of October 1765, and on the 31st of October the New York merchants started the non-importation movement which spread to the other colonies. Lieut.-Governor Cadwallader Colden prepared for the enforcement of the Act by strengthening Fort George (a later name for Fort Amsterdam) and increasing its garrison. The ship with the stamps arrived in the evening of the 23rd of October and on the following night threatening notices were posted on the doors of every public office and at the corners of streets. When the day (1st of November) came for the Act to go into effect Governor Colden had retired within the fort. Major James, the commander of the garrison, had threatened to enforce the Act; but the Sons of Liberty gathered a mob, broke into the governor's coach-house, burned his coach and burned him in effigy, destroyed the furniture and other property of Major James and threatened to storm the fort. On the 5th, the governor delivered the stamps to the mayor and aldermen. No serious attempt was subsequently made to enforce the Act, and its repeal (18th of March 1766) was celebrated on the city common with noisy demonstrations and the erection of a liberty pole. The Assembly also made appropriations for the erection of statues of the king and William Pitt. The Sons of Liberty opposed the passage by the Assembly of appropriations for the maintenance of the soldiers, and the latter retaliated by repeatedly cutting down liberty poles erected by the Sons of Liberty. Finally in a skirmish on the 18th of January 1770 the soldiers killed one man and severely wounded several others, and this bloodshed is memorable as the first in the struggle which culminated in the independence of the colonies. The tea shipped to New York for testing the right of parliament to tax the colonies did not arrive until four months after that shipped to Boston had been thrown overboard, but when it did arrive (April 1774) the chests in one vessel were destroyed in the same manner as were those in Boston and the other vessel was forced to carry its cargo back to London. The Port Act for punishing Boston stirred the New York merchants as well as the Sons of Liberty (chiefly mechanics and artisans), and when the latter again threatened violence the merchants resolved to guide the movement, and called a mass meeting and named a committee of correspondence of fifty-one members. This committee, on the 23rd of May 1774, proposed a Continental Congress chiefly with a view to obtaining an effective regulation of non-importation from England; it also named the New York delegates to that body.

During the greater part of the War of Independence the city was occupied by the British. Its capture was a part of the British plan to get control of the Hudson and separate New England from the southern colonies. Early in 1776 the Americans began to throw up fortifications at several points on both banks of the East river in the hope of closing the east water front to the enemy. Other fortifications were erected on Governor's Island and at some points along the west water front to the upper end of Manhattan Island, where an attempt was made to close the passage of the Hudson by building Fort Washington on the New York bank and Fort Lee on the New Jersey bank and connecting them with a line of sunken ships fastened together with chains. To the north of the city proper, also, defences were constructed along the line of the present Grand Street, and to prepare for a retreat from the north end of the island a redoubt, which the British later called Fort George, was built on the prominence overlooking Kingsbridge from the south, and Fort Independence, in what is now Bronx Borough, was built to command the approach from the mainland. After the battle of Long Island, fought within the present limits of Brooklyn Borough, Washington, on the night of the 29th of August 1776, crossed to Manhattan Island. As the city was no longer tenable, some of the generals proposed burning it, but Congress would not give its consent and Washington, although withdrawing the greater part of his army behind fortifications on Harlem (now Washington) Heights, continued to occupy it with about 5000 men under General Israel Putnam until the British general, Sir William Howe, began to show signs of attack. Troops also remained behind the batteries along the east water front, and it was on this occasion that Nathan Hale went on his fatal errand to ascertain Howe's intentions, was discovered within the British lines and was hanged as a spy. On the 15th of September several British ships which had some days before passed the American batteries, as far as Montressor's (now Randall's) Island, entered Kipp's Bay, at the foot of the present 34th Street, routed the militia posted behind the low breastworks there, and after landing narrowly missed cutting off the rear of Putnam's retreating army. One portion of Howe's army took possession of the city and another marched toward Harlem Heights along the east side of what is now Central Park while Putnam's men were marching in nearly parallel columns on the west side of the park. On the 16th, in the battle of Harlem Heights (on what is now Morningside Heights), about 1800 Americans drove a somewhat smaller number of British troops from the field. In October Howe sailed up the East river, and Washington, to avoid being outflanked, retreated to the mainland, leaving only a garrison at Fort Washington. Howe landed at Pell's Point (now within Pelham Bay Park), and on the 28th, a few miles north of the present city limits, was fought the battle of White Plains. Howe then turned westward and southward and on the 16th of November captured Fort Washington. What is now Bronx Borough was within the "Neutral Grounds" which suffered greatly from the foraging parties of both armies. Six days after the British entered the city proper about one-fourth of it was destroyed by fire, and the desolation was extended by another large fire on the 3rd of August 1778. The British crowded their prisoners (who suffered terrible hardships) into several of the churches, the City Hall, the new gaol (later the Hall of Records), King's College, the Livingston sugar house, and a number of ships moored in the harbour. The city was a refuge for Loyalists, but even they were treated with contempt by the British. The homes of Loyalists and Whigs alike were plundered, and when the British finally evacuated (25th of November 1783) they had robbed the city of its wealth and had destroyed its business.

For the first three or four years after the return of peace recovery in some directions was very slow; but only a few months after the British had gone an American merchantman sailed from the port bound for China and opened trade with that country. Trade was speedily resumed with European ports, and by 1788 it was not uncommon to see 100 or more vessels in the port either loading or unloading. On the question of enlarging the powers of the Federal government in 1787–1788, the city strongly supported Alexander Hamilton and John Jay against a determined opposition in other parts of the state, and the ratification of the Federal constitution in the state convention at Poughkeepsie was a triumph for New York City. The city was the Federal capital in 1789–1790 and under its strong Federalist influence the new government of the nation was organized. During the colonial era New York was always the seat of the provincial government and for twenty years it was at times the seat of the state government, but in 1797 Albany was made the permanent capital. In 1807 the success of steam navigation was assured by the trial trip of Robert Fulton's "Clermont" from New York to Albany and return; but the city did not benefit immediately from this invention. On the contrary, the Embargo Act (1807–1809) threatened its commerce with ruin. It revived under the Non-Intercourse Act, but suffered again from the second war with Great Britain. In the first and second years of this war some merchants reaped profits from privateering against the enemy, but in December 1813 the British stopped privateering by a closer blockade of the harbour and in 1814 they threatened to attack the city. In preparing to resist, the city erected or assisted in erecting elaborate fortifications, and Robert Fulton was busy in New York building a steam frigate with cannon-proof sides and heavy guns, but the war closed without a test of the fortifications and before the frigate was ready for action.

In 1817 the Erie Canal was begun and the first line of trans-Atlantic packet-ships was established. The canal, opened in

1825, insured the commercial supremacy of New York among American cities. The years immediately following the close of the second war with Great Britain also mark the beginning of a rapid increase in the number of European immigrants, and this stream of immigration, rising to a flood in the fourth decade and continuing high throughout the century, has been a dominant force in determining the city's social and political conditions. Although the city was a stronghold of the Federalists at the time the National government was organized, the Democrats, owing to the dexterous management of Aaron Burr, were victorious in the elections of 1800 and 1801, and the city has continued to be normally Democratic owing largely to the activities of the Tammany Society or Tammany Hall (*q.v.*). This organization, founded in 1789, early espoused the cause of the unfranchised inhabitants, attended to the wants of the immigrants in various ways, led the movement for universal manhood suffrage and the election of city officers, and, after the office of mayor became elective (1834) and the last property qualifications for city voters were removed (1842), continued strong by reason of the support of the great mass of foreign-born citizens. Fraud and corruption were resorted to by Tammany, and offices were used for the good of the organization rather than for the good of the city. Socially, the immigrants deluged the city with vice, crime, misery and pauperism. The unsanitary conditions had already caused epidemics of yellow fever in 1795, 1798, 1822 and 1823, and the city was visited in 1832, 1834 and 1849 with epidemics of cholera in which several thousand lives were lost. These scourges together with a fire in 1835, which destroyed the East Side below Wall Street, hastened the construction of works for getting a supply of water from the Croton river. The immigrants represented various nationalities and religious sects, and from 1830 to 1871 the city was frequently disturbed by riots arising usually from national or religious antipathy. During the first mayoralty election (1834) there was rioting; and there were an abolitionist riot in the same year, a flour riot during the financial panic of 1837, and labour riots from time to time which were suppressed by the police. In 1857 the state legislature established a state or "metropolitan" police for the better protection of the city. The mayor, Fernando Wood, contending that the act was unconstitutional, resisted with the old municipal police, and another serious riot had begun when the Seventh Regiment of state troops compelled obedience; later, too, the court of appeals decided against the mayor.

Wood was still mayor at the outbreak of the Civil War, and in January 1861 he proposed to the Common Council that Manhattan Island, Long Island and Staten Island should secede and constitute a free city, to be named Tri-Insula. The Council approved. But when, in April, the city had been aroused by the bombardment of Fort Sumter the majority of the Democrats joined with the Republicans in discarding the proposal and in support of the Union. The native-born and loyal citizens joined the Union army in such large numbers that the city was left with inadequate protection from such of its inhabitants as had often constituted the mob. In this state of affairs the drafting of men for the army was begun in July 1863 in conformity with an act of Congress which exempted from its operation all who should make a money payment of $300. The New York proletariat and unscrupulous politicians complained that the measure was peculiarly oppressive to the poor, and the rioting with which it was resisted was protracted and bloody. The rioting began the 13th of July and continued for nearly five days. More than fifty buildings were burned. The mob was especially furious against negroes, a number of whom were hanged or beaten to death. The police fought bravely but were unequal to the emergency, and order was restored only after several regiments had returned to the city and had killed at least 500 of the rioters. In 1871 Irish Catholics threatened to prevent the Orangemen from parading the streets on the anniversary of the Battle of Boyne (12th of July). The superintendent of police also issued an order on the preceding day prohibiting the parade. Public opinion, however, was so strong in favour of the Orangemen that the order was revoked, and five regiments of militia were called out to protect the parade before it started; at the first assault the mob was scattered by a volley which killed 51 persons. The militia suffered a loss of three killed and several wounded.

The character of the population did not improve speedily, for while immigrants were coming in great numbers a large portion of the saving middle class was removing to the suburbs; and although Tammany Hall was discredited during the Civil War, it gained control of the state as well as the city government soon after the war. William M. Tweed, its ruler, organized the "Tweed Ring" which was plundering the city on a gigantic scale, when in 1871 its operations were exposed by the New York *Times*. The thefts of the "Ring" amounted to many millions of dollars, those in the erection of the county court house alone to $8,000,000. Several of the malefactors were sent to prison and Tweed himself died there. Tammany, however, was victorious again in the second election (1874) after Tweed's fall, and in 1884, when rival companies were seeking to obtain a franchise for working a street railway on Broadway, this privilege, so valuable that the city could have sold it for millions of dollars, was given away by the aldermen; and it was afterwards proved that a number of them had shared a cash bribe of $500,000. Some of them were subsequently punished, but Tammany's power was not seriously impaired. In 1874 the city's corporate limits were extended to include about 13,000 acres across the Harlem river; in 1895 there was a further extension in the same county to the southern borders of Yonkers and Mt. Vernon; and in 1898 all of Kings county, all of Richmond county (Staten Island) and a portion of Queens county were consolidated with it. As Tammany's stronghold was in Manhattan, the annexation of these districts diminished the difficulty of holding Tammany in check, or of defeating it at the polls whenever the anti-Tammany forces united as a consequence of a notoriously corrupt administration. In 1894 an investigation of the state Senate brought to light some of the facts respecting an elaborate system of blackmail which had grown up under the joint protection of Tammany Hall and the city government. Under this system large sums were paid for appointments to office and promotions, and money was collected regularly from the keepers of gambling houses, houses of ill-fame and other disorderly resorts, and from liquor sellers for permission to violate certain details of the excise laws, such as midnight and Sunday closing. There followed a great outcry against Tammany and it was driven from power for three years. During the reform administration, Colonel George Edward Waring (1833–1898), as head of the street cleaning department, quite revolutionized New York as respects cleanliness. The police service and the school system were also much improved. Tammany was successful in the election of 1897 when the opposition was divided. It again abused its power and was defeated in 1901. In 1903 and 1905 the Tammany ticket was elected, but the mayor, George Brinton McClellan, administered the government, especially during his second term (1906–1910), independently of Tammany Hall. With the exception of the mayor the Tammany ticket was defeated in 1909, and the mayor, William Jay Gaynor (b. 1851), was little in sympathy with Tammany Hall, having been nominated apparently for the purpose of insuring the election of loyal Tammany men on the county ticket.

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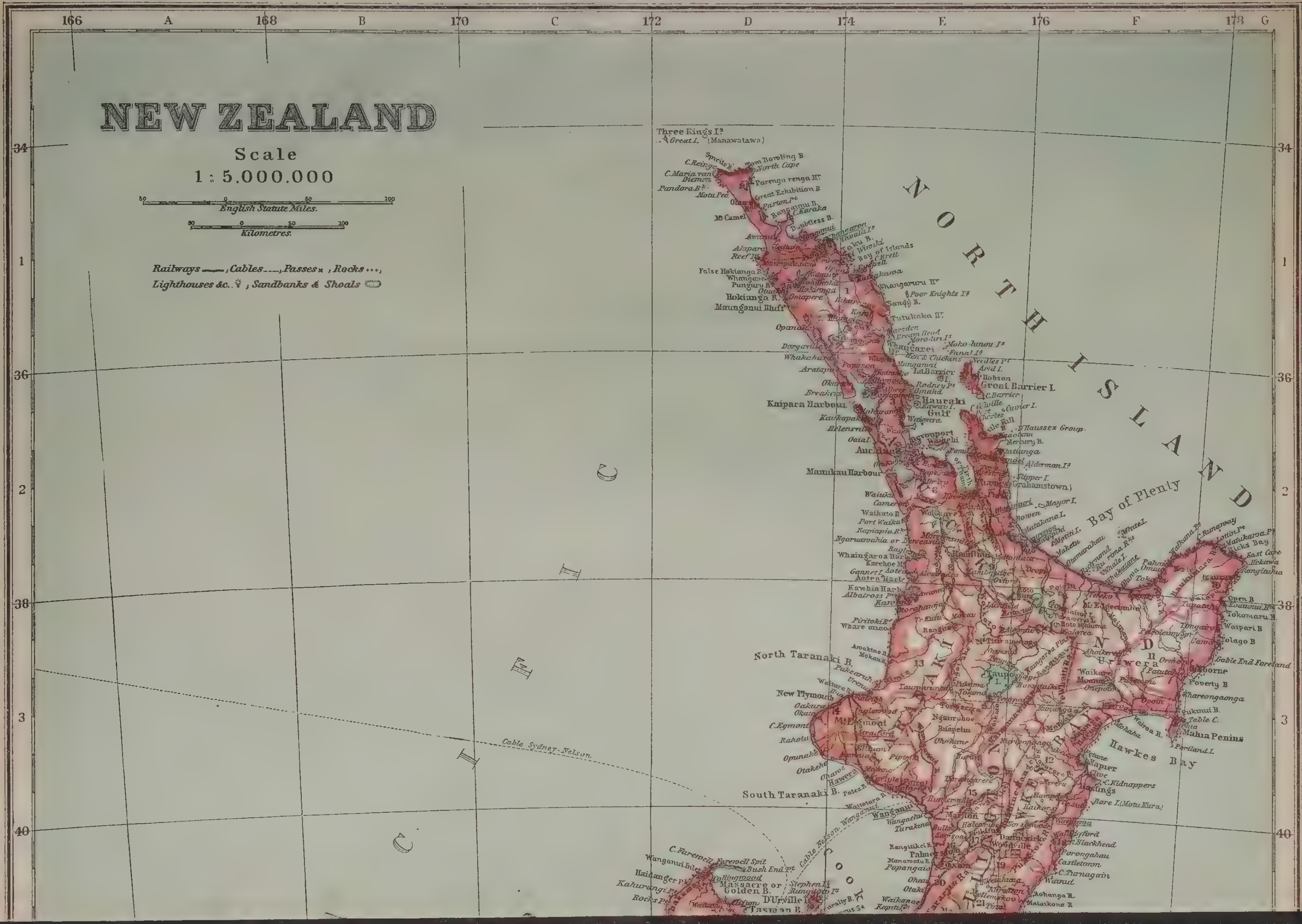
NEW ZEALAND, a British colonial Dominion (so named in 1907), consisting mainly of a group of islands lying in the south Pacific between 34° 25′ and 47° 17′ S., and between 166° 26′ and 178° 36′ E. The group is situated eastward of Tasmania and Victoria, and Wellington, its capital and central seaport, is 1204 m. distant from Sydney. Of certain outlying clusters of small islands belonging to the colony, the Chathams (356 m. E. of Cook Strait), Aucklands and Campbell Island are alone of any value. All these are grassy and the Chathams are inhabited by sheep-farming colonists. The Aucklands contain two of the finest harbours in the Pacific. Six hundred miles north of Auckland, the volcanic Kermadecs, covering 8208 acres, are picturesquely clothed with vegetation. In Polynesia a number of inhabited islands were brought under New Zealand control in 1893. Rarotonga and Mangaia, in the Cook group, and Niué or Savage Island are the largest of these; Penrhyn and Suwarrow, though but small coral atolls, contain excellent harbours. Rarotonga is hilly, well watered, and very beautiful. Apart from these little tropical dependencies New Zealand has an area of 104,471 sq. m., of which its two important islands, called North and South, contain 44,468 and 58,525 respectively, while, divided from South Island by Foveaux Strait, Rakiura or Stewart Island, mountainous and forest-clad, contains 621 sq. m. These three form a broken chain, North and South Islands being cut asunder by Cook Strait, a channel varying in width from 16 to 90 m.

North Island is 515 m. long and varies in breadth from 6 to 200 m. It is almost cleft in twain where the Hauraki Gulf penetrates to within 6 m. of Manukau Harbour. From the isthmus thus formed a narrow, very irregular peninsula reaches out northward for some 200 m., moist and semi-tropical, and beautiful rather than uniformly fertile. Rich strips of alluvial soil, however, seam a cold clay-marl, needing intensive cultivation to become highly productive. Buried in this clay-marl are found large deposits of the fossil resin which becomes the kauri gum of commerce; and on the surface extensive forests are still a great though diminishing source of wealth. Though a species of mangrove fringes much of this peninsula, its presence does not denote malaria, from which the islands are entirely free.

South of the isthmus aforesaid, North Island rapidly broadens out. Its central physical feature is the unbroken mountain chains running N.E. from Cook Strait to East Cape on the Bay of Plenty, ranges seldom under 3000 ft., but never attaining 6000 ft. in height. Ikurangi, their highest summit, though a fine mass, does not compare with the isolated volcanic cones which, rising W. of the main mountain system and quite detached from it, are among the most striking sights in the island. Ruapehu (9100 ft.) is intermittently active, and Ngauruhoe (7515 ft.) emits vapour and steam incessantly. Egmont (8340 ft.) is quiescent, but its symmetrical form and dense clothing of forest make it the most beautiful of the three. North of the two first-mentioned volcanoes Lake Taupo spreads over 238 sq. m. in the centre of a pumice-covered plateau from 1000 to 2000 ft. above the sea; and round and beyond the great lake the region of the thermal springs covers 5000 sq. m. and stretches from Mount Ruapehu to White Island, an ever-active volcanic cone in the Bay of Plenty. The most uncommon natural feature of the district, the Pink and White Terraces, was blown up in the eruption of Mount Tarawera in 1886, when for great distances the country was buried beneath mud and dust, and a chasm 9 m. long was opened in the earth. Fine lakes and waterfalls, innumerable pools, in temperature from boiling-point to cold, geysers, solfataras, fumaroles and mud volcanoes still attract tourists in large numbers. The healing virtue of many of the springs is widely known. The government maintains a sanatorium at Lake Rotorua, and there are private bathing establishments in other places, notably near Lake Taupo. In South Island there are hot pools and a state sanatorium at Hanmer Plains. Experience shows that the most remarkable cures effected by the hot waters are in cases of gout, rheumatism, diseases of the larynx and in skin disorders. Though, thanks to the overlaying porous pumice, the Taupo plateau is not fertile, it has a good rainfall and is drained by unfailing rivers running through deep terraced ravines. The Waikato and Waihou flow N., the Rangitaiki N.E., and Mokau, Wanganui and Rangitikei W. or S.W. The first named, the longest river in the colony, though obstructed by a bar like all western,—and most eastern,—New Zealand rivers, is navigable for some 70 m. The Mokau and Wanganui run between ferny and forest-clad hills and precipices, often of almost incomparable beauty.

East of the Taupo plateau and south of Opotiki on the Bay of Plenty the steep thickly-timbered ranges held by the Uriwera tribe still show scenery quite unspoiled by white intrusion. On the southern frontier of this mountainous tract Waikaré Moana extends its arms, the deepest and most beautiful of the larger lakes of the island.

From the mouth of the Waikato southward to about 25 m. from Cape Terawhiti on Cook Strait, and for a distance of from 20 to 40 m. inland, the western coast skirts fertile country well fitted for grazing and dairy-farming, to which it is being rapidly turned as the timber and fern are cleared away from its low hills, downs and rich valleys. On the east coast the same fertility is seen with less forest, and, round Hawkes Bay, a hotter and drier summer. In the south centre, the upland plain of the Wairarapa, ending in a large but commonplace lake, has a climate adapted for both grazing and cereals. The butt-end of the island, of poor, rough, wind-beaten hills, is redeemed by the fine harbour of Port Nicholson, which vies with the Waitemata in utility to New Zealand commerce. Broken as is the surface, poor as is the soil of certain tracts, there is but little of the island which will not ultimately be cultivated with profit as pumice and clay-marl yield to labour. Everywhere the settler may count on a sufficient rainfall, and—except on the plateau and the mountain highlands—mild winters and genial summers. The pleasant climate has certain drawbacks; the coastal farmer finds that blights and insect pests thrive in the comparative absence of hard frosts. Fortunately mosquitoes are not a serious plague outside a few marshy localities. To pass Cook Strait and land in the middle province of South Island is to pass from Portugal to Switzerland, a Switzerland, however, with a sea-coast that in the east centre is a dull fringe of monotonous sand dunes or low cliffs. As a rule, nevertheless, the shores of South Island are high and bold enough. They are not too well served with harbours, except along Cook Strait, in Banks Peninsula, and by the grand but commercially useless fjords of the south-west. In the last-named region some fifteen salt-water gulfs penetrate into the very heart of the mountains, winding amid steep, cloud-capped ranges, and tall, richly-clothed cliffs overhanging their calm waters. The dominating features of south New Zealand are not ferny plateaus or volcanic cones, but stern chains of mountains. There the Southern Alps rise range upon range, filling the whole centre, almost or quite touching the western shore, and stretching from end to end of the island. West of the dividing crest they are forest clad; east thereof their stony grimness is but slightly softened by growths of scrub and tussock grass. Nineteen-twentieths of the colonists, however, live east of the dividing range, for to that side settlement was attracted by the open, grassy character of the country. The rivers are many, even on the drier eastern coast. But, as must be expected in an island but 180 m. across at the widest point and yet showing ridges capped with perpetual snows, the rivers, large or small, are mountain torrents, now swollen floods, anon half dry. Almost useless for communication or transport, they can be easily drawn upon for irrigation where, as in the east centre, water-races are useful. The largest river, the Clutha, though but 80 m. long in its course to the south-east coast, discharges a volume of water



NEW ZEALAND

Scale

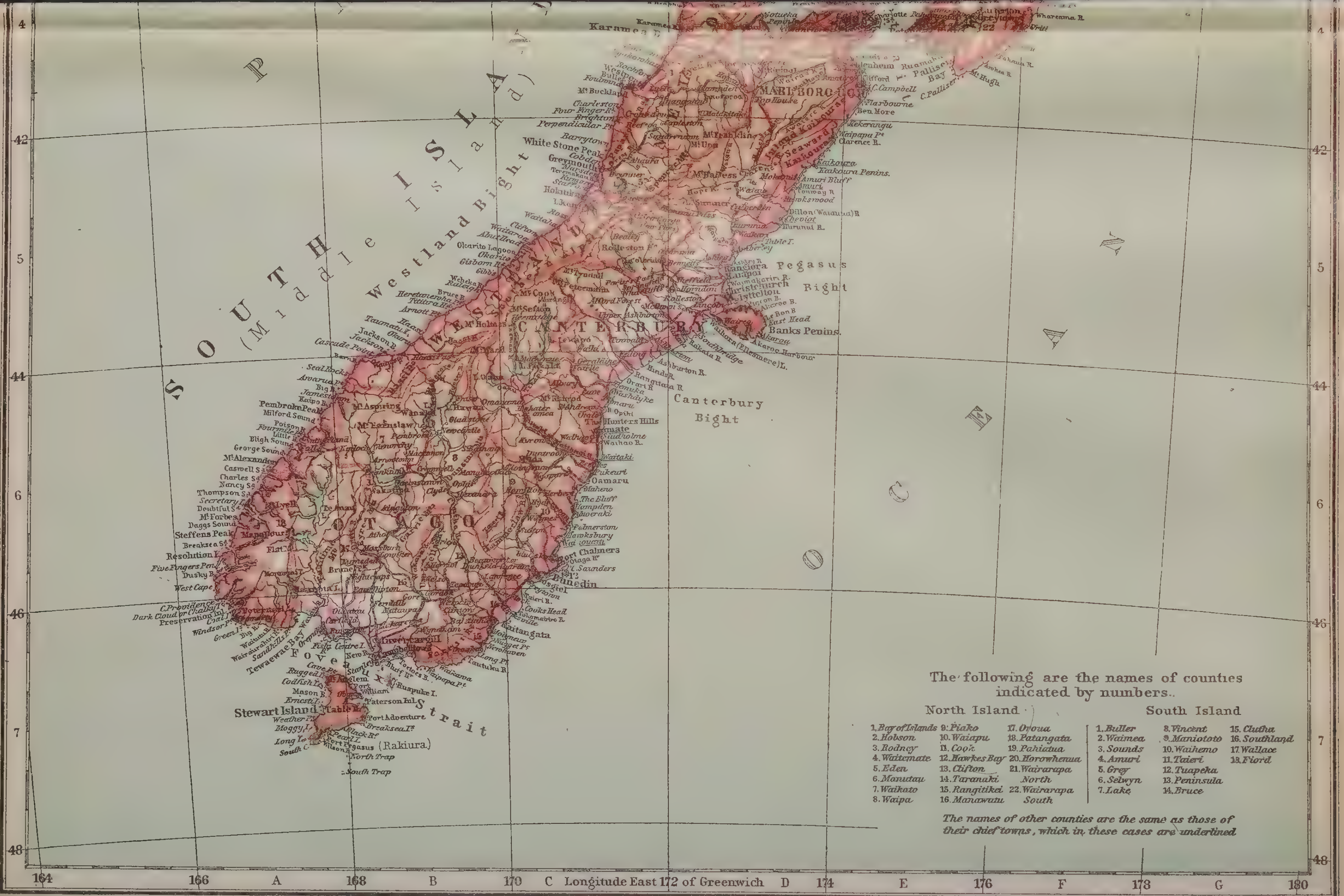
1 : 5,000,000

English Statute Miles.

Kilometres.

Railways ——, Cables ----, Passes ×, Rocks +++, Lighthouses &c. ☼, Sandbanks & Shoals ⬭

166
A
168
B
170
C
172
D
174
E
176
F
178
G
34
1
36
2
38
3
40
NORTH ISLAND
Bay of Plenty
Hawkes Bay
Three Kings Is
Great I. (Manawatawa)
C. Reinga
C. Maria van Diemen
Spirits B.
Tom Bowling B.
North Cape
Parenga renga Hr
Great Exhibition B.
Pandora Bk
Motu Pea
Doubtless B.
Bay of Islands
Whangaruru Hr
Poor Knights Is
Tutukaka Hr
False Hokianga R.
Hokianga R.
Omapere
Maunganui Bluff
Whangarei
Hen & Chickens
Moko-hinou Is
Great Barrier I.
Lit. Barrier
Hauraki Gulf
Kaipara Harbour
Helensville
Auckland
Devonport
Manukau Harbour
D'Haussez Group
Mercury B.
Alderman Is
Slipper I.
Shortland (Grahamstown)
Mayor I.
Motiti I.
Maketu
White I.
Port Waikato
Waikato R.
Raglan
Whaingaroa Harb.
Kawhia Harb.
Albatross Pt
Aotea Harb.
Hamilton
Oxford
Rotorua
Tarawera L.
Taupo L.
Mt Tongariro
Ruapehu
Ngauruhoe
Mt Edgecumbe
Opotiki
Urewera
East Cape
Hicks Bay
Tokomaru B.
Tolago B.
Gable End Foreland
Gisborne
Poverty B.
Mahia Penins
Table C.
Portland I.
Wairoa R.
Napier
Hastings
C. Kidnappers
Bare I. (Motu Kura)
North Taranaki B.
New Plymouth
Mt Egmont
C. Egmont
Stratford
Hawera
South Taranaki B.
Wanganui
Wangaehu
Turakina
Marton
Palmerston
Rangitikei R.
Foxton
Otaki
Waikanae
Kapiti I.
Dannevirke
Woodville
Castlepoint
Porangahau
C. Turnagain
Cable Sydney–Nelson
Cable Nelson Wanganui
C. Farewell
Farewell Spit
Bush End Pt
Wanganui Inlet
Kahurangi Pt
Rocks Pt
Collingwood
Massacre or Golden B.
Stephens I.
D'Urville I.
Tasman B.


SOUTH ISLAND
(Middle Island)
PACIFIC OCEAN
Westland Bight
Pegasus Bight
Canterbury Bight
Foveaux Strait
Stewart Island
(Rakiura)
MARLBOROUGH
WESTLAND
CANTERBURY
OTAGO
Banks Penins.
Christchurch
Lyttelton
Dunedin
Port Chalmers
Oamaru
Invercargill
Greymouth
Hokitika
Westport
Kaikoura
Blenheim
Palliser Bay
C. Palliser
White Stone Peak
Mt. Cook
Mt. Aspiring
Pembroke Peak
Milford Sound
West Cape
Resolution I.
Dusky B.
Cooks Head
Kaitangata
North Trap
South Trap
Longitude East 172 of Greenwich
164
166
168
170
172
174
176
178
180
A
B
C
D
E
F
G
4
5
6
7
42
44
46
48
The following are the names of counties indicated by numbers.
North Island
1. Bay of Islands
2. Hobson
3. Rodney
4. Waitemate
5. Eden
6. Manukau
7. Waikato
8. Waipa
9. Piako
10. Waiapu
11. Cook
12. Hawkes Bay
13. Clifton
14. Taranaki
15. Rangitikei
16. Manawatu
17. Oroua
18. Patangata
19. Pahiatua
20. Horowhenua
21. Wairarapa North
22. Wairarapa South
South Island
1. Buller
2. Waimea
3. Sounds
4. Amuri
5. Grey
6. Selwyn
7. Lake
8. Vincent
9. Maniototo
10. Waihemo
11. Taieri
12. Tuapeka
13. Peninsula
14. Bruce
15. Clutha
16. Southland
17. Wallace
18. Fiord
The names of other counties are the same as those of their chief towns, which in these cases are underlined

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estimated at nearly 1,100,000 cubic ft. a minute. On the west the only two rivers of importance are the Buller and the Grey, the former justly famous for the grandeur of its gorges. Large and deep lakes fill many of the mountain valleys. Te Anau and Wakatipu (54 m. long) are the chief, though Manapouri is the most romantic. Aorangi (Mt. Cook) is easily first among the mountain peaks. Its height, 12,349 ft., is especially impressive when viewed from the sea off the west coast. On the north-east a double range, the Kaikouras, scarcely fall short of the Southern Alps in height and beauty. Apart from the fjords and lakes the chief beauties of the Alps are glaciers and waterfalls. The Tasman glacier is 18 m. long and has an average width of 1 m. 15 chains; the Murchison glacier is 10 m. in length. To the west of Aorangi glaciers crawl into the forest as low as 400 ft. above sea-level. Among waterfalls the Sutherland is 1904 ft. high, but has less volume than the Bowen and others. The finest mountain gorge, the Otira, is also the chief route from the east to the west coast. It begins on the western side of Arthur's Pass, a gap the floor of which is 3100 ft. above the sea. Generally the open and readily available region of South Island extends from the Kaikouras along the east and south-east coast to the river Waiau in Southland. It has a mean breadth of some 30 m. In compensation the coal and gold, which form the chief mineral wealth, are found in the broken and less practicable west and centre, and these portions also furnish the water-power which may in days to come make the island a manufacturing country. (W. P. R.)

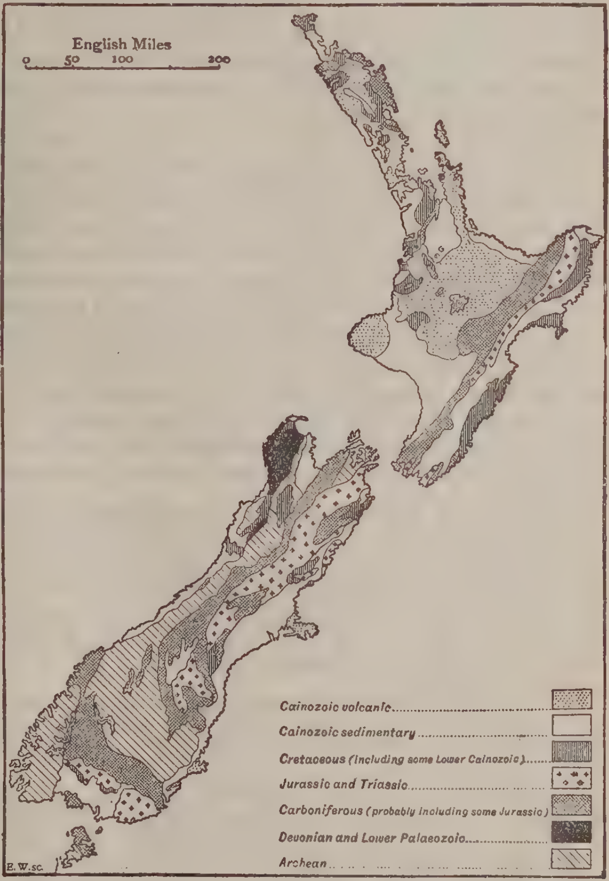
Geology.—New Zealand is part of the Australasian festoon, on the Pacific edge of the Australasian area. Unlike Australia, its geological structure is unusually varied, and owing to its instability, it includes, for its size, an unusually complete series of marine sedimentary rocks. It has, moreover, been a volcanic area of long-continued activity. The physical geography of New Zealand is closely connected with its geological structure, and is dominated by two intersecting lines of mountains and earth movements. The Southern Alps, the backbone of the South Island, rest on a foundation of coarse gneisses and schists, that are quite unrepresented in the North Island. The continuation of this line of old rocks is occupied by the basins of the Wanganui river and Taupo. E. Suess therefore suggested that the northern continuation of the Alps had foundered, and its summits been buried beneath the Pliocene marine rocks of the Wanganui basin and the volcanic rocks of the Taupo area.

The oldest rocks are Archean, represented by the band of gneisses and schists exposed along the western foot of the Southern Alps. To the south of the district in southern Westland, where the Alps have passed out to sea, the Archeans become more extensive; for they spread eastward and underlie the whole of the dissected tableland of Otago. It has been suggested that the jasperoids and diabases of the Tarawera Mountains on the North Island may be of Upper Archean age, from their resemblance to the Heathcotian rocks of Australia. No Cambrian rocks have as yet been discovered, but the Ordovician system is represented by the Aorere beds in the north-western part of the South Island. Here they contain numerous graptolites, including *Tetragraptus*, *Dichograptus* and *Didymograptus*. The Silurian system is represented by the Baton river beds to the west of the Aorere beds, occurring in the basin of the Motueka river, which flows into Tasman Bay. The Devonian system is well exposed in the Reefton mining field. The Carboniferous system includes either the whole or a large part of the Maitai beds. The Maitai beds include a thick mass of slates and sandstones, which form the bulk of the Southern Alps, whence branches extend south-eastward to the coast. The beds take their name from the Maitai river near Nelson; they are largely developed in the mountains of the Tararua-Ruahine-Raukumara chain, on the eastern side of the North Island; they occur in the Kaikoura Mountains, and an outlier forms Mount Torlesse, near the eastern edge of the Southern Alps, west of Christchurch. The Maitai beds have generally been considered to be Carboniferous from the presence of species of *Productus* found in the Permo-Carboniferous of New South Wales. But Professor Park has obtained Jurassic fossils in the Maitai series; so that it will probably be ultimately divided between the Carboniferous and Jurassic. The two systems should, however, be separable by an unconformity, unless the Maitai series also includes representatives of the Kaihiku series (the New Zealand Permian), and of the Wairoa series, which is Triassic.

New Zealand includes representatives of all the three Mesozoic systems. The Hokanui group comprises the Triassic Wairoa and Otapira beds, and the Jurassic Mataura beds. The Wairoa series includes marine limestones characterized by *Monotis salinaria*, and the Otapira series is characterized by *Spiriferina spatulata*. The Mataura beds are largely of estuarine formation; they contain oil shales and gas springs.

The Cretaceous system includes the Waipara series, a belt of chalky limestones with some phosphate beds at Clarendon in eastern Otago. Their fossils include belemnites, ammonites, scaphites and marine saurians, such as *Cimoliosaurus*. These Cretaceous limestones are interbedded with glauconitic greensands, as at Moeraki Point in eastern Otago. The second type of Cretaceous is a terrestrial formation, and is important as it contains the rich coal seams of Greymouth, Westport and Seddonville, which yield a high quality of steam coal. Cretaceous coals have long been worked in the North Island, north of Auckland, on the shores of the Bay of Islands, where the age of the coal is shown by its occurrence under the Whangarei or Waimio limestone.

The Cainozoic system is represented by Oligocene, Miocene, Pliocene and Pleistocene beds. The best-known Oligocene rocks are the limestones of Oamaru and the brown-coal measures of Waikato. The Oamaru limestones have been largely used for building stones; they are a pure white limestone, largely made up of foraminifera, bryozoa and shell fragments, and contain the teeth of sharks (*e.g. Carcharodon*) and of toothed whales such as *Squalodon serratus*. In southern Otago the Oligocene beds are brown coals and lignites with oil shales, which, at Orepuki, contain 47% of oil and gas, with 8% of water. The Miocene Pareora beds occur to the height of 3000 or 4000 ft. above sea-level, in both the North and South Islands. Some of its fossils also occur in the Oamaru series, but the two series are unconformable. In Westland the Miocene includes the Moutere gravels, which rest on the summit of Mount Greenland, 4900 ft. above sea-level.


English Miles
0 50 100 200
Cainozoic volcanic
Cainozoic sedimentary
Cretaceous (including some Lower Cainozoic)
Jurassic and Triassic
Carboniferous (probably including some Jurassic)
Devonian and Lower Palaeozoic
Archean
E.W.sc.

Marine beds of the Pliocene are best developed in the Wanganui basin. They consist of fine clays with nodular calcareous concretions rich in fossils. The Pleistocene system in the South Island includes glacial deposits, which prove a great extension of the New Zealand glaciers, especially along the western coast. The glaciers must have reached the sea at Cascade Point in southern Westland. On the eastern side of the Alps the glaciers appear to have been confined to the mountain valleys. The Pleistocene swamp deposits are rich in the bones of the moa and other gigantic extinct birds, which lived on until they were exterminated by the Maori. The Cainozoic volcanic history of New Zealand begins in the Oligocene, when the high volcanic domes of Dunedin and Banks Peninsula were built up. The Dunedin lavas including tephrites and kenytes correspond to the dacite eruptions in the volcanic history of Victoria. The building up of these domes of lavas of intermediate chemical type was followed by the eruption of sheets of andesites and rhyolites in the Thames

Goldfield and the Taupo volcanic district. The volcanic activity of the Taupo district lasted into the Pleistocene, and the last eruptions contributed many of its chief geographical features.[1] (J. W. G.)

Climate.—Diversity of level and latitude cause many varieties of climate in the South Island provinces. The height and regularity of the mountain backbone increase the diversity. Only one pass, the Haast (1716 ft.), crosses from E. to W. at a less height than 3000 ft. Along the whole west coast the climate resembles nothing in the British Islands so much as Cork and Kerry, for there are the same wet gales from a western ocean, the same clouds gathering on the dripping sides of wild mountains, an equal absence of severe frosts and hot sunshine, and a rich and evergreen vegetation. Elsewhere, sheltered Nelson has a more genial air than the Wellington side of Cook Strait. Foveaux Strait is as cold and windy as the Strait of Dover. The Canterbury plain has but 26 ins. of annual rainfall, less than a fourth of that along the western littoral. Very seldom indeed is moisture excessive in the eastern half; there is even a deficiency in unfavourable years, and dry, warm winds do damage to crops. Insect life is relatively not abundant; the air is brisk and bright with ample sunshine. The snow-line, which is at 3000 ft. on the eastern flank of the Alps, is 3700 ft. on the western.

The healthiness of the New Zealand climate in all parts is attested by the death-rate, which, varying (1896–1906) from 9 to 10·50 per 1000, is the lightest in the world. In 1896 it was as low as 9·10. In 1907, however, it was 10·91, the highest figure since the year 1883. Even in the boroughs the average is below 13. The rainfall in most of the settled districts ranges from 30 to 50 ins. a year. Meteorological statistics are collected at Auckland, Wellington, Christchurch, and Dunedin and eight other stations; and observations of rainfall, temperature, and wind-directions are received from eighteen stations of the second class. From the data thus obtained an isobaric map and a report are prepared for each day; and weather warnings are telegraphed to any part of the coast when necessary. A system of inter-colonial weather exchanges has been agreed upon, and telegrams are daily exchanged between Sydney and Wellington.

Flora.—There are about one thousand species of flowering plants, of which about three-fourths are endemic. Most of those not peculiar to the country are Australian; others are South American, European, Antarctic; and some have Polynesian affinities. Ferns and other cryptogamic plants are in great variety and abundance. The New Zealand flora, like the fauna, has been cited in support of the theory of the remote continental period. In appearance the more conspicuous flora differs very greatly from that of Australia, Polynesia, and temperate South America, and helps to give to the scenery a character of its own.

The early colonists found quite half the surface of the archipelago covered with dense, evergreen forest, a luxuriant growth of pines and beeches, tangled and intertwined with palms, ferns of all sizes, wild vines and other parasites, and a rank, bushy, mossed undergrowth. Though much of the timber is of commercial value—notably the kauri, totara, puriri, rimu, matai and kahikatea—this has not saved the forests from wholesale, often reckless, destruction. Two-fifths perhaps have already disappeared, and it is probable that in fifty years the only large tracts still standing will be sub-alpine woods and in state reserves. Meanwhile charred and rotting stumps give a melancholy and untidy air to valleys and denuded hillsides, for hard-wood stumps—and most New Zealand trees are hard-wood—take more than a generation to decay utterly. Compelled by the windy climate the colonists are doing something to repair these ravages by planting European, Californian and Australian shelter-trees; but it is only in the naturally open and grassy regions of the east and south-east that settlement as yet improves the landscape. There, before the colonists came, wide sweeps of dull green bracken or wiry yellow-green tussocks seemed bleak and monotonous enough. The swamps covered with flax and giant bulrushes were often redeemed to the eye by sheets of golden-plumed toé-toé, a kind of pampas grass.

Fauna.—The destruction of the forest is telling fatally on the native avifauna. In their natural state the islands were without land mammals, and the Polynesian immigrants brought but two in their canoes—a dog, now extinct, and a black rat, now rarely seen. Until recent years the forest birds did much to atone for this deficiency, for among them the tui and makomako rank high as songsters, while the apteryxes, kakapo, weka and stitch-bird are of peculiar interest to science. The importation of stoats and weasels, ferrets and cats has resulted in a process of extermination which has already made it necessary to set aside the islets Resolution, Kapiti and Little Barrier as sanctuaries. The place of the vanishing native species is being taken by such European arrivals as sky-larks, finches, blackbirds, sparrows and rooks. Outside the forest country the weka, an almost wingless bird, is numerous, and in the Alps a hawk-like green parrot, the kea, has learned to kill sheep and holds its ground. The pukeko, a handsome rail, abounds in swamps. The native wild ducks are carefully preserved for sportsmen, in whose interests pheasants, red and fallow deer, and brown and rainbow trout have been very successfully acclimatized. Acclimatization, indeed, had played a chief part in the settlement of New Zealand. Coming to a country without useful animals, cereals, rich grasses or fruit trees, the colonists had to bring all these necessaries with them. So far acclimatizers note but few failures; the chief case is that of the salmon. Again and again salmon have been successfully hatched out into rivers, but the young fish hastening down stream to the sea never return thence. This is all the more unfortunate as eels were the only large edible creatures found in the fresh-water lakes and rivers. Tidal waters furnish minute whitebait, and the mud-flats of salt or brackish lagoons and estuaries flounders—both very delicate eating. Oysters, both mud and rock, are good and plentiful. A strange visitor, the frost-fish, never seen at sea, is picked up stranded on sandy beaches in cold weather, and is prized by epicures. The snapper is at once the handsomest and most palatable of a good variety of sea fish. Sharks are found everywhere and are common round the north, though they rarely attack man. The albatross is of course the most conspicuous sea bird. Penguins are found, confined to the islets of the far south. As some compensation for its paucity of useful animals and food plants, New Zealand was, of course, free from wild carnivora, has no snakes, and only one poisonous insect, the katipo, a timid little spider found on certain sea-beaches. Of poisonous plants only the berries of the tutu and the karaka are worth notice. The wild dogs and pigs which now sometimes prey on the sheep-farmers' lambs in outlying districts are the descendants of domestic animals which have escaped into the "bush." Among imported pests the rabbit and sparrow, and a numerous company of European and American thistles and other weeds, have to be systematically contended with. The formidable increase of the rabbit has been arrested, mainly by poison and wire-netting fences.

Population.—In January 1840 there may have been 2000 whites in New Zealand. By 1861 the number was still slightly under 100,000. During the next twenty years the gold discoveries, the public works expenditure, and the development of agriculture, multiplied the number of colonists five times to 498,000 in April 1881. Then increase slackened for many years, and was slowest between 1886 and 1891, when the addition was but 48,000 in five years. In 1901 the whites numbered 773,000; and between that year and the census computation in April 1906 the increase, 115,859, was the largest yet recorded in any quinquennium. In the middle of 1908 the official estimate of white inhabitants was 950,000.

The white population, about nine to the square mile, is very unevenly distributed. In the South Island nine-tenths of the colonists live within 40 m. of the east and south-east coasts; in the North Island the eastern and northern parts of Wellington province, and the southern and broadest part of Auckland province are still very scantily peopled. For all that, Auckland and Wellington are the most populous of the larger districts, while Nelson, Westland and Marlborough have for a long time shown the slowest increase.

Males still exceed females in the proportion of nine to eight. About 70% of the population is New Zealand born. The white foreign element is small; what there is is chiefly Scandinavian, German and Dalmatian. Among the foreigners males greatly outnumber females; even in the case of the German settlers the proportion is two to one.

Between 1880 and 1892 the birth-rate fell by no less than 12·95 points—rather more than 1 a year. It continued to fall for seven years more, though at a much reduced rate, and finally reached 25·12 in the year 1899. In the next eight years there was a slow recovery to 27·30 in 1907. Thanks, however, to the low death-rate, elsewhere referred to, the margin of increase in New Zealand is over 17. To that, and to the annual gain by immigration, the fairly rapid rate of increase is due. Between 1885 and 1891 the colony lost more than it gained oversea; but from 1892 to 1908 the gain by immigration was 90,000. Probably, at least half of these represent Australians, impelled to emigrate by years of drought. England and Scotland supply the bulk of the remainder. The government has aided immigrant farmers and farm labourers having a certain sum of money, also female domestics, by paying part of their passage money.

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[1] See the geological map of New Zealand by Sir James Hector (1884). A brief sketch of its geological history is given by Hutton, *Trans. New Zealand Inst.* (1899), xxxii. pp. 159-183. Fullest information about the geology of New Zealand is given in the *Reports of Geological Explorations* issued by the Geological Survey of New Zealand, and the *Annual Reports* of the mines department. A bibliography of the chief literature has been compiled by A. Hamilton, *Trans. New Zealand Inst.* (1903), xxxv. 489-546.

The people of colour in 1906 numbered 53,000, including 2300 Chinese and 6500 Maori half-castes. An apparent increase of 7000 in the Maori and half-castes between 1891 and 1906 is, perhaps, partly due to more accurate computation. It seems probable that the number of Maori and half-castes taken together is about the same as it was thirty years ago, though the infusion of white blood is larger. The Public Health Department has exerted itself to improve the sanitation of native villages and combat the mischievous trickery of Maori wizards and "doctors."

Wealth.—The increase of wealth went on after 1879 in spite of dull times, and was only checked by the especially severe financial depression of 1893 and 1894, caused by low prices and the Australian bank panic. The estimated private wealth of colonists fell from £236 per head in 1890 to £219 in 1895. It was computed in 1905 to have reached £292. After deducting debts owing abroad the public and private wealth of the colony is calculated to be about £270,000,000.

Of the five banks of issue doing business in the dominion three are Australian and New Zealand institutions. Their deposits exceeded £21,000,000 in 1907, as against £12,250,000 in 1890. At the same date more than £10,000,000 stood to the credit of small depositors in post office and private savings banks, nine-tenths in the former. The gross amount insured by policies in life insurance offices (ordinary and industrial) was over £29,000,000, of which the state office claimed two-fifths.

Trade.—The growth of sea-trade in recent years is shown by the larger size of the ocean-going vessels trading with the colony. The number of these only advanced from 589 to 629 between 1896 and 1906. But the increase of tonnage in the eleven years was from 614,000 tons to 1,243,000; while the crews rose from 20,000 to 32,500. The coasting trade and trade with Australia are carried in New Zealand-owned vessels.

External trade has risen from £13,111,000 in 1887 to £37,371,000 in 1907. Before 1886 exports exceeded imports; but in the twenty subsequent years there was an invariable excess of exports, valued in all at £52,000,000.

The re-export trade is stationary and extremely small. Trade with the United States grew from £877,000 in 1891 to £2,140,000 in 1907. Thanks to the tariff of the United States the balance of trade with North America is heavily against New Zealand. The same disparity is shown in her trade with Germany, which is, however, much smaller—less than half a million. Trade with India and Ceylon reached £557,000 in 1906; that with Fiji and other Pacific islands was £622,000 in 1900. With these exceptions New Zealand trade is almost all done with Australia (£5,348,000 in 1907) and the United Kingdom; the latter's share in 1906 was £26,811,000 of the whole.

Production.—Wool (£4,250,000 to £7,657,000 according to prices) remains at the head of the list of exports. The quantity grown increased by 70% in the twenty years 1887–1906. Moreover the export of sheep skins and pelts was valued at £680,000 in the last-mentioned year. But the description changes; there is much less merino, and more of the coarser and longer cross-bred. The number of sheep has increased from 16,564,000 in 1886 to 22,000,000 in 1908, though the increase has been almost all in North Island. The number of the flocks grows, and the average size diminishes even more rapidly. There were 9149 flocks in 1886; in 1906 the number had risen to 18,500—average size of each flock about 1050. The smaller size of the flocks and the breeding of sheep for meat rather than for wool, the cultivation of English grasses and of extensive crops of turnips and other roots on which to fatten sheep and lambs, all tend to change sheep-farming from the mere grazing of huge mobs on wide, unimproved runs held by pastoral licences. The "squatters" still occupy eleven million acres, but even these are more closely subdivided than in former days. How much more extensive is grazing—of the more scientific order—than agriculture, is seen at once from the figures of the amount of land broken up, for crops or other purposes, and the amount under sown grasses. There were about 1,600,000 acres under crop in 1899. This is exclusive of the vast area of native-grass land. The area now occupied and utilized by whites is about 38,000,000 acres.

The character of the soil and the moist cool climate enable English grasses to be sown almost everywhere, and 13,000,000 acres are now laid down with these. The result is seen in the price obtained for New Zealand sheep in Smithfield Market, which is from ½d. to 1d. per ℔ higher than that given for frozen mutton from other countries. The figures below show the growth of the trade:

Export of Frozen Meat.

Year.	℔.	Year.	℔.
1882	1,707,328	1901	208,045,000
1891	110,199,082	1907	263,738,496

In the market for frozen lambs the colony remains at present without a rival. Frozen beef is also sent to England. In 1907 the export of frozen meat was valued at £3,420,000. The export of butter and cheese has risen in value from £207,687 in 1890, till in 1907 that of butter amounted to £1,615,000. In London, New Zealand cheese fetches as high a price as Canadian; the value of the cheese exported was £662,000 in 1907. Though not yet quite equal in importance to wool or frozen meat, dairy-farming is almost entirely carried on by small farmers and their families, who supply milk to factories. Most of these are co-operative, their shareholders being the farmers themselves. The profits of the industry are thus widely distributed among the producers. The development of dairy-farming has led to the spread of settlement, especially in the west of North Island, where large tracts of fertile soil formerly covered with forest have now been cleared and converted into dairy-farms. Of 1,850,000 cattle in the colony, two-sevenths are dairy cows.

The importance of hemp as an export—increasing from £26,000 in 1898 to £832,000 in 1907—has led to improvements in cleaning and grading it. In consequence its price in London nearly approaches that paid for manila.

Mining.—The export of gold, which was £1,220,000 in 1880, did not exceed that figure until 1898, and, indeed, fell below three-quarters of a million in 1887. Then gold-mining, after being long at a standstill, began again to make headway. For many years the surface alluvial mining in South Island became less and less profitable. As in other countries, however, the working of quartz reefs gradually compensated for this. The cyanide process of gold extraction, and the returns obtained by its means from the great Waihi mine in the Upper Thames, caused an outbreak of gold fever, which led to the opening up of a few good and a great many worthless quartz-mines in the Auckland fields. In South Island the river-beds of Otago province have been successfully worked by means of dredges, and good returns secured. In 1907 the gold exported was valued at £2,027,000. The total value of the gold exported from New Zealand from the discovery of the metal in 1857 to 1907 was, roundly, £70,000,000. Kauri gum still holds its place as an export, over £500,000 worth being dug up annually. The number of Istrians and Dalmatians who came from the Adriatic to dig for kauri gum led to the passing of restrictive laws.

The progressive output of coal from 1880 to 1900 is shown below.

Year.	Raised in the Colony.	Imported.	Exported.[1]
	Tons.	Tons.	Tons.
1880	299,923	123,298	7,021
1890	637,397	110,939	33,404
1900	1,093,990	124,033	36,699
1907	1,831,009		

Four-sevenths of the coal is bituminous.

[1] Excluding Coal for Fuel by Ocean Steamers.

Excellent as the quality of the best New Zealand coal is, the cost of mining and shipping it prevents the growth of any considerable export trade. Silver is chiefly extracted in the Thames district, but other mines containing silver ores have been found. There are many other valuable ores—copper, iron, lead, zinc, antimony, chrome and manganese. Petroleum springs have been tapped near New Plymouth. Building stones of various kinds and of excellent quality abound. Marble and cement stones occur in many places. There are extensive deposits of iron-sand on the west coast of the North Island, and of iron ore at Parapara in Nelson.

Manufactures.—Protected by a tariff wall which was repeatedly heightened between 1879 and 1907, manufactures made considerable progress. At the end of 1885 about 22,000 work-people were being employed in 1946 workshops, and the aggregate output was valued at six millions and three-quarters. Twenty years later the number of establishments was 4186; the number of hands 56,000; and the output twenty-three millions and a half. A small deduction should be made from this apparent increase to allow for a changed system of classification. Male factory hands greatly outnumbered female, standing in the ratio of four to one. Between 1879 and 1895 wages fell. Between 1895 and 1906 they rose 15% on the average among males of all ages, and as much as 30% among women and girl workers. The disproportionate rise in the case of females is probably due to the policy of the industrial arbitration court. The chief factory industries come under the following heads: meat-freezing and tallow; tanning and wool-scouring; flax mills, saw-mills and grain-mills; boots and shoes; woollen and clothing; butter and cheese; breweries; printing houses; foundries; agricultural implement and machine shops; soap and candle works; coach-building and furniture; gas-works. Except in meat-freezing, wool-scouring, butter- and cheese-making, flax-milling and timber-sawing, manufacturing is almost entirely for consumption within the colony.

Government.—New Zealand was not colonized in the ordinary manner around one centre. There were in its early years six distinct settlements—Auckland, Wellington, Nelson, New Plymouth, Canterbury and Otago—between which communication was for several years irregular and infrequent. To meet their political wants the Constitution Act of 1852 created them into provinces, with elective councils and superintendents respectively, subordinated to one colonial legislature. In 1876 the provincial system was abolished. The general assembly, as it is called, is composed of the governor, the legislative council, and the House of Representatives. The governor is appointed by the crown, but his salary, £7500, is paid by the colony. The legislative council consists of members appointed for seven years by the governor in council; the number of legislative councillors stays at or near forty-five. The House of Representatives consists of eighty members chosen by the electors. The members of both houses are paid. The franchise is adult suffrage, conditional on a previous residence in the colony for a year, including six months in the electoral district for which a claim to vote is registered. Every elector is qualified for election. Four members of the house must be Maori elected by their own race. The duration of the house is for three years, but it is subject to re-election whenever the governor dissolves the general assembly. Legislation is subject to disallowance by the crown, but that power is seldom exercised. Executive administration is conducted on the principle of English responsible or parliamentary government. The government is represented in England by a high commissioner. Local administration is vested in local elective bodies, such as municipal councils, county councils, road boards, harbour boards, charitable aid boards, and others, with power to levy rates. The colonial revenue is chiefly derived from customs, stamp duties, land tax, income tax, beer excise, postal and telegraphic services, railways, and crown land sales and rents. The proceeds of land sales are applied to surveys and public works. Customs duties, railways and stamps are by far the most important sources of revenue. They yielded £3,103,000, £2,765,000 and £1,550,000 respectively out of a total revenue of £9,056,000 in the financial year 1907–1908. The gross public debt had reached £66,500,000 in 1908. The money has chiefly been spent on railways, telegraphs, roads, bridges, land purchase from the native tribes and private estate owners, on loans to settlers and on native wars. The state railways (2500 m.) return about £800,000 after paying working expenses. This does not quite defray the interest on the cost of their construction and equipment, inasmuch as it barely comes to 3½% thereon, but rates and fares are deliberately kept low to encourage settlement and communication. The debts of the local bodies amount to about nine millions. They raise rather more than a million a year by rates, licence fees and dues.

Education.—Under the Education Act of 1877 state schools are established, in which teaching is free, secular and compulsory, with certain exceptions, for children between the ages of seven and thirteen. A capitation grant is given for every child in average daily attendance at the schools. Grants are also made for scholarships from primary to secondary schools, for training institutions for teachers and for school buildings. Large reserves of public lands have been made for primary, secondary and university education. All primary and some secondary public schools are controlled by provincial education boards elected by school committees of the parents of pupils. The percentage of attendance has rivalled that in the primary schools of Scotland, and in 1905 attained to 86·9%. Native village schools are also provided by the state in native districts. There are, moreover, industrial schools, orphanages and institutions for the deaf and dumb and blind. There are about ninety secondary schools, state-supported or aided by public endowments. The university of New Zealand is an examining body, and grants honours, degrees and scholarships. It is empowered by royal charter to confer degrees entitled to rank and consideration throughout the British dominions, as fully as if they were granted by any university in the United Kingdom. Colleges in the four chief towns and in Nelson are affiliated to the New Zealand University, which has about fifteen hundred undergraduates keeping terms. The state in no way controls or interferes with religious administration. Each denomination attends to the religious instruction of its own adherents, chiefly by means of Sunday schools, which count 108,000 pupils. Roman Catholics support about 150 clerical day schools attended by about 11,500 scholars. State school buildings can be, and sometimes are, used for religious instruction on days and at hours other than those fixed by law for ordinary school work; but no child can be required to attend, except at the wish of its parent or guardian. The government spends £35,000 a year on manual and technical instruction, a branch of teaching which includes about two hundred cookery classes. A school of engineering and an agricultural college are attached to the university college in the province of Canterbury, and there are several schools of mines elsewhere.

About 157,000 white children and 6500 Maori children attend schools of one degree or another. Private schools claim about 10% of these. The annual parliamentary expenditure on education exceeds £700,000. In this connexion it may be claimed that the proportion of policemen to population (1 to 1375) is lower in New Zealand than in any other colony. The fixing of the legal minimum "factory age" for children at fourteen undoubtedly favours school attendance.

Land.—Apart from gold-mining, coal-mining and gum-digging, the industries are still mainly the growing of food and raw material; and the occupation of the land is easily the chief of all economic questions. Sixteen million acres were in 1907 already held in freehold, as against about six million acres rented from the state on permanent leasehold. Crown lands are still alienated, though but little is now sold for cash outright. The number of holdings of one acre and upwards in size rose from 33,332 in 1886 to 58,904 in 1896, and 72,338 in 1906; but the area held in estates of 5000 acres and upwards remains very large and has diminished but slowly despite the severity of the graduated land-tax. Many interesting experiments in settling lands have been tried. The best known of these, perhaps, is the repurchase of large pastoral estates for subdivision and lease in perpetuity. In the fourteen years 1893–1907 about a million and a quarter acres were thus acquired at a cost of somewhat under five millions and a half. Over 13,000 souls had been settled in this area, and the yearly rent received from them, about £220,000, left a substantial balance to the credit of the enterprise in the books of the treasury. The tenants (who had been favoured with good years) were with very few exceptions prospering.

Old Age Pensions.—The Old Age Pensions law, enacted in 1898, provided for the free grant of pensions, not exceeding £18 a year, to persons of sixty-five years and upwards who had lived for twenty-five years in the colony. Pensioners must be British subjects, poor, and not ex-criminals or of notoriously bad character. In 1905 the maximum pension was raised to £26 a year. Official figures show that the total number of applications for pensions up to that date had been 31,271, of which 23,877 had been granted. The number of pensioners then on the books of the Pensions Office was 13,257. In the first three years after enactment of the law the growth of the number of pensioners was very rapid; in the next five it was remarkably slow—only 481 altogether. The proportion of whites qualified by age and residence who were actually drawing pensions was rather less than one-third (it had been 9% more in 1902). The reduction was due to stricter administration. The total sum paid out in eight and a quarter years had been a million and three quarters. The amount paid in pensions in the financial year 1906–1907 was £325,000. The money is found by the central government. The administration of the system, which is in the hands of a special department, costs a little over £5000. Frauds and evasions by applicants and pensioners, though they exist, are not believed to be numerous. Public thrift does not, so far, seem to have been diminished. Since the coming of the system the amount spent on outdoor relief in the colony had by 1906 diminished from £51,000 to £36,500, in face of an increase of nearly 23% in the population.

History.—The date, even the approximate date, of man's arrival in New Zealand is uncertain. All that can be safely asserted is that by the 14th century A.D. Polynesian canoe-men had reached its northern shores in successive voyages. By 1642 they had spread to South Island, for there Abel Jansen Tasman found them when, in the course of his circuitous voyage from Java in the "Heemskirk," he chanced upon the archipelago, coasted along much of its western side, though without venturing to land, and gave it the name it still bears. One hundred and thirty-seven years later, Cook, in the barque "Endeavour," gained a much fuller knowledge of the coasts, which he circumnavigated, visited again and again, and mapped out with fair accuracy. He annexed the country, but the British government disavowed the act. After him came other navigators, French, Spanish, Russian and American; and, as the 18th century neared its end, came sealers, whalers and trading-schooners in quest of flax and timber. English missionaries, headed by Samuel Marsden, landed in 1814, to make for many years but slow progress. They were hindered by murderous tribal wars in which imported muskets more than decimated the Maori. Still, cruel experience and the persevering preaching of the missionaries gradually checked the fighting, and by the year 1839 it could be claimed that peace and Christianity were in the ascendant. So far the British government had resisted the considerable pressure brought to bear in Downing Street in favour of annexation. In vain Edward Gibbon Wakefield, organizer of colonizing associations, prayed and intrigued for permission to repeat in New Zealand the experiment tried by him in South Australia. Lord Glenelg, the colonial minister, had the support of the missionaries in withstanding Wakefield's New Zealand Company, which at length resolved in desperation to send an agent to buy land wholesale in New Zealand and despatch a shipload of settlers thither without official permission. Before, however, the "Tory" had thus sailed for Cook Strait, it had become known to the English government that a French colonizing company—*La Compagnie Nanto-Bordelaise*—was forming, under the auspices of Louis Philippe, to anticipate or oust Wakefield. Further obstruction was manifestly futile, and the British authorities reluctantly instructed Captain Hobson, R.N., to make his way to northern New Zealand with a dormant commission of lieutenant-governor in his pocket and authority to annex the country to Australia by peaceful arrangement with the natives. Hobson landed in the Bay of Islands on the 22nd of January 1840, hoisted the Union Jack, and had little difficulty in inducing most of the native chiefs to accept the queen's sovereignty at the price of guaranteeing to the tribes by the treaty of Waitangi possession of their lands, forests and fisheries. Some French settlers, convoyed by a man-of-war, reached Akaroa in South Island in the May following. But Hobson had forestalled them, and those who remained in the country became British subjects. Meanwhile, a week after Hobson's arrival, Wakefield's colonists had sailed into Port Nicholson, and proposed to take possession of immense tracts which the New Zealand Company claimed to have bought from the natives, and for which colonists had in good faith paid the company. Other bands of company's settlers in like manner landed at Nelson, Wanganui and New Plymouth, to be met with the news that the British government would not recognize the company's purchases. Then followed weary years of ruinous delay and official inquiry, during which Hobson died after founding Auckland. His successor, Fitzroy, drifted into an unsuccessful native war. A strong man, Captain Grey, was at last sent over from Australia to restore peace and rescue the unhappy colony from bankruptcy and despair. Grey, much the best of the absolute governors, held the balance fairly between the white and brown races, and bought large tracts of land for colonization, including the whole South Island, where the Presbyterian settlement of Otago and the Anglican settlement of Canterbury were established by the persevering Wakefield.

In 1852 the mother-country granted self-government, and, after much wrangling and hesitation, a full parliamentary system and a responsible ministry were set going in 1856. For twenty years thereafter the political history of the colony consisted of two long, intermittent struggles—one constitutional between the central government (first seated in Auckland, but after 1864 in Wellington) and the powerful provincial councils, of which there were nine charged with important functions and endowed with the land revenues and certain rating powers. The other prolonged contest was racial—the conflict between settler and Maori. The native tribes, brave, intelligent and fairly well armed, tried, by means of a league against land-selling and the election of a king, to retain their hold over at least the central North Island. But their kings were incompetent, their chiefs jealous and their tribes divided. Their style of warfare, too, caused them to throw away the immense advantages which the broken bush-clad island offered to clever guerrilla partisans. They were poor marksmen, and had but little skill in laying ambuscades. During ten years of intermittent marching and fighting between 1861 and 1871 the Maori did no more than prove that they had in them the stuff to stand up against fearful odds and not always to be worsted. Round Mount Egmont, at Orakau, at Tauranga and in the Wanganui jungles, they more than once held their own against British regiments and colonial riflemen. The storming of their favourite positions—stockades strengthened with rifle-pits—was often costly; and a strange anti-Christian fanaticism, the Hau-Hau cult, encouraged them to face the white men's bullets and bayonets. But even their fiercest fighting leaders, Rewi and Te Kooti, scarcely deserved the name of generals. Some of the best Maori fighters, such as the chiefs Ropata and Kemp, were enlisted on the white side, and with their tribesmen did much to make unequal odds still more unequal. Had General Pratt or General Cameron, who commanded the imperial forces from 1860 to 1865, had the rough vigour of their successor, General Chute, or the cleverness of Sir George Grey, the war might have ended in 1864. Even as it was the resistance of the Maori was utterly worn out at last. After 1871 they fought no more. The colonists too, taught by the sickening delay and the ruinous cost of the war to revert to conciliatory methods, had by this time granted the natives special representation in parliament. A tactful native minister, Sir Donald McLean, did the rest. Disarmament, roads and land-purchasing enabled settlement to make headway again in the North Island after twelve years of stagnation. Grey quarrelled with his masters in Downing Street, and his career in the imperial service came to an end in 1868. His successors, Sir George Bowen, Sir James Ferguson, the marquess of Normanby and Sir Hercules Robinson, were content to be constitutional governors and to respect strictly the behests of the colonial office. Meanwhile the industrial story of New Zealand may be summed up in the words wool and gold. Extremely well suited for sheep-farming, the natural pastures of the country were quickly parcelled out into huge pastoral crown leases, held by prosperous licensees, the squatters, who in many cases aspired to become a country gentry by turning their leases into freeholds. So profitable was sheep-farming seen to be that energetic settlers began to burn off the bracken and cut and burn the forest in the North Island and sow English grasses on the cleared land. In the South artificial grassing went on for a time hand in hand with cereal-growing, which by 1876 seemed likely to develop on a considerable scale, thanks to the importation of American agricultural machinery, which the settlers were quick to utilize. Even more promising appeared the gold-fields. Gold had been discovered in 1853. Not, however, until 1861 was a permanent field found—that lighted upon by Gabriel Read at Tuapeka in Otago. Thereafter large deposits were profitably exploited in the south and west of South Island and in the Thames and Coromandel districts of the Auckland province. Gold-mining went through the usual stages of alluvial washing, deep sinking and quartz-reef working. Perhaps its chief value was that it brought many thousand diggers to the colony, most of whom stayed there. Pastoral and mining enterprise, however, could not save the settlers from severe depression in the years 1867 to 1871. War had brought progress in the north to a standstill; in the south wool-growing and gold-mining showed their customary fluctuations. For a moment it seemed as though the manufacture of hemp from the native *Phormium tenax* would become a great industry. But that suddenly collapsed, to the ruin of many, and did not revive for a number of years.

In 1870 peace had not yet been quite won; industry was depressed; and the scattered and scanty colonists already owed seven millions sterling. Yet it was at this moment that a political financier, Sir Julius Vogel, at that moment colonial treasurer in the ministry of Sir William Fox, audaciously proposed that the central government should borrow ten millions, make roads and railways, buy land from the natives and import British immigrants. The House of Representatives, at first aghast, presently voted four millions as a beginning. Coinciding as the carrying out of Vogel's policy did with a rising wool market, it for a time helped to bring great prosperity, an influx of people and much genuine settlement. Fourteen millions of borrowed money, spent in ten years, were on the whole well laid out. But prosperity brought on a feverish land speculation; prices of wool and wheat fell in 1879 and went on falling. Faulty banking ended in a crisis, and 1879 proved to be the first of sixteen years of almost unbroken depression. Still, eight prosperous years had radically changed the colony. Peace, railways, telegraphs (including cable connexion with Europe), agricultural machinery and a larger population had carried New Zealand beyond the primitive stage. The provincial councils had been swept away in 1876, and their functions divided between the central authority and small powerless local bodies. Politics, cleared of the cross-issues of provincialism and Maori warfare, took the usual shape of a struggle between wealth and radicalism. Sir George Grey, entering colonial politics as a Radical leader, had appealed eloquently to the work-people as well as to the Radical "intellectuals," and though unable to retain office for very long he had compelled his opponents to pass manhood suffrage and a triennial parliaments act. A national education system, free, non-religious and compulsory, was established in 1877. The socialistic bent of New Zealand was already discernible in a public trustee law and a state life insurance office. But the socialistic labour wave of later years had not yet gathered strength. Grey proved himself a poor financier and a tactless party leader. A land-tax imposed by his government helped to alarm the farmers. The financial collapse of 1879 left the treasury empty. Grey was manœuvred out of office, and Sir John Hall and Sir Harry Atkinson, able opponents, took the reins with a mission to reinstate the finances and restore confidence.

Roughly speaking, both the political and the industrial history of the colony from 1879 to 1908 may be divided into two periods. The dividing line, however, has to be drawn in different years. Sixteen years of depression were followed, from 1895 to 1908, by thirteen years of great prosperity. In politics nearly twelve years of Conservative government, or at least capitalistic predominance in public affairs, were succeeded by more than seventeen years of Radicalism. Up to January 1891 the Conservative forces which overthrew Sir George Grey in 1879 controlled the country in effect though not always in name, and for ten years progressive legislation was confined to a mild experiment in offering crown lands on perpetual lease, with a right of purchase (1882), a still milder instalment of local option (1881) and an inoffensive Factories Act (1886). In September 1889, however, Sir George Grey succeeded in getting parliament to abolish the last remnant of plural voting. Finance otherwise absorbed attention; by 1880 the public debt had reached £25,000,000, against which the chief new asset was 1300 m. of railway, and though the population had increased to nearly half a million, the revenue was stagnant. A severe property-tax and an increase of customs duties in 1879 only for a moment achieved financial equilibrium. Although taxation was seconded by a drastic, indeed harsh, reduction of public salaries and wages (which were cut down by one-tenth all round) yet the years 1884, 1887 and 1888 were notable for heavy deficits in the treasury. Taxation, direct and indirect, had to be further increased, and as a means of gaining support for this in 1888 Sir Harry Atkinson, who was responsible for the budget, gave the customs tariff a distinctly protectionist complexion.

During the years 1879–1890 the leading political personage was Sir Harry Atkinson. He, however, withdrew from party politics when, in December 1890, he was overthrown by the Progressives under John Ballance. Atkinson's party never rallied from this defeat, and a striking change came over public life, though Ballance, until his death in April 1893, continued the prudent financial policy of his predecessor. The change was emphasized by the active intervention in politics of the trade unions. These bodies decided in 1889 and 1890 to exert their influence in returning workmen to parliament, and where this was impossible, to secure pledges from middle-class candidates. This plan was first put into execution at the general election of 1890, which was held during the industrial excitement aroused by the Australasian maritime strike of that year. It had, however, been fully arranged before the conflict broke out. The number of labour members thus elected to the general assembly was small, never more than six, and no independent labour party of any size was formed. But the influence of labour in the Progressive or, as it preferred to be called, Liberal party, was considerable, and the legislative results noteworthy. Ballance at once raised the pay of members from £150 to £240 a year, but otherwise directed his energies to constitutional reforms and social experiments. These did not interfere with the general lines of Atkinson's strong and cautious finance, though the first of them was the abolition of his direct tax upon all property, personal as well as real, and the substitution therefor of a land-tax of 1d. in the £ on capital value, and also of a graduated tax upon unimproved land values, and an income-tax also graduated, though less elaborately. The graduated land-tax, which has since been stiffened, rises from nothing at all upon the smaller holdings to 3d. in the £ upon the capital value of the largest estates—those worth £210,000 and upwards. Buildings, improvements, and live stock are exempted. In the case of mortgaged estates the mortgagor is exempted from ordinary land-tax in proportion to the amount of his mortgage. On that the mortgagee pays at the rate of ¾d. in the £. In 1896 municipal and rural local bodies were allowed to levy rates upon unimproved land values if authorized to do so by a vote of their electors, and by the end of 1901 some sixty bodies, amongst them the city of Wellington, had made use of this permission. The income-tax is not levied on incomes drawn from land. In 1891 the tenure of members of the legislative council or nominated Upper House, which had hitherto been for life, was altered to seven years. In 1892 a new form of land tenure was introduced, under which large areas of crown lands were leased for 999 years, at an unchanging rent of 4% on the prairie value. Crown tenants under this system had no right of purchase. In the same year a law was also passed authorizing government to repurchase private land for closer settlement.

On Ballance's sudden death in April 1893 his place was taken by Richard Seddon, minister of mines in the Ballance cabinet, whose first task was to pass the electoral bill of his predecessor, which granted the franchise to all adult women. This was adopted in September 1893, though the majority for it in the Upper House was but two votes. In 1893 was enacted the Alcoholic Liquor Control Act, greatly extending local option. In 1894 was passed the Advances to Settlers Act, under which state money-lending to farmers on mortgage of freehold or leasehold land was at once begun. The money is lent by an official board, which deals with applications and manages the finance of the system. In thirteen years the board lent out over five millions and a half, and received repayment of nearly two millions of principal as well as over one million in interest at 5%. Borrowers must repay ½% of their principal half-yearly, and may repay as much more as they choose. Profits are paid over to an assurance fund. No losses were incurred during the thirteen years above mentioned. The net profit made by the board in 1906 was £45,000. The same year also saw the climax of a series of laws passed by the Progressives affecting the relations of employers and workmen. These laws deal with truck, employers' liability, contractors' workmen, the recovery of workmen's wages, the hours of closing in shops and merchants' offices, conspiracy amongst trade unionists, and with factories, mines, shipping and seamen. In 1895 a law controlling servants' registry offices was added. In 1897 all shipowners engaging in the coasting trade of the colony were compelled to pay the colonial rate of wages.

Meanwhile the keystone of the regulative system had been laid by the passing of the Industrial Conciliation and Arbitration Act, under which disputes between employers and unions of workers are compulsorily settled by state tribunals; strikes and lock-outs are virtually prohibited in the case of organized work-people, and the conditions of employment in industries may be, and in many cases are, regulated by public boards and courts. The years 1896,1897 and 1898 were marked by struggles over the Old Age Pensions Bill, which became law in November 1898. In 1898 the divorce law was amended on the lines of the Stephen Act of New South Wales, a change which helped to treble the number of petitions for divorce in the next seven years. In 1898 also the municipal franchise, hitherto confined to ratepayers, was greatly widened; in 1900 the English system of compensation to workmen for accidents suffered in their trade was adopted with some changes, one of the chief being that contested claims are adjudicated upon cheaply and expeditiously by the same arbitration court that decides industrial disputes. In 1895 borrowing on a larger scale was begun, and in twelve years twice as many millions were added to the public debt. Before this the Ballance ministry had organized two new departments, those of labour and agriculture. The former supervises the labour laws and endeavours to deal with unemployment; the latter has done much practical teaching, inspection, &c. Butter, cheese and New Zealand hemp are by law graded and branded by departmental inspectors before export. For some years the government has worked two coal-mines profitably, chiefly to supply its railways. In 1907 the net profit on these was over £8000. The continued success of the government life insurance office led in 1899 to the setting up of an accidents insurance office, and, in 1903, of a state fire insurance office.

The outbreak of the Boer War in October 1899 was followed in New Zealand by a prompt display of general and persistent warlike enthusiasm: politics ceased to be the chief topic of interest; the general election of 1899 was the most languid held for fifteen years. The desire of New Zealanders to strike a blow for the mother-country took the practical shape of despatching to South Africa ten successive contingents.

After gaining office at the beginning of 1891 the Ballance-Seddon party had to struggle with the last four years of the period of depression. In 1895 began a marked commercial revival, mainly due to the steady conversion of the colony's waste lands into pasture; the development of frozen meat and dairy exports; the continuous increase of the output of coal; the invention of gold-dredging; the revival and improvement of hemp manufacture; the exploiting of the deposits of kauri gum; the reduction in the rates of interest on mortgage money; a general rise in wages, obtained without strikes, and partially secured by law, which has increased the spending power of the working classes. Undoubtedly also commercial confidence was restored by the reconstruction in 1895 of the Bank of New Zealand, and activity has been stimulated by large public loans, while more cautious banking and the systems of taxation and rating on land values, adopted in 1891 and 1896, have done something to check land speculation.

Between 1879 and 1908 seven governors represented the crown in New Zealand. Of these Sir Hercules Robinson and Sir Arthur Gordon had but brief reigns; Sir Arthur Gordon quitted the colony in June 1882. His successor, Sir William Drummond Jervois, arrived in January 1883, and held office until March 1889. The earl of Onslow, who followed, landed in June 1889, and resigned in February 1892. The next governor, the earl of Glasgow, remained in the colony from June 1892 to February 1897, and was succeeded in August of the last-mentioned year by the earl of Ranfurly, who did not retire until 1904. His place was then taken by Lord Plunket. The cabinets which administered the affairs of the colony during these years were those of Sir Frederick Whitaker, Sir Harry Atkinson (3), Sir Robert Stout (2), Mr Ballance, Mr Seddon, Mr Hall-Jones and Sir Joseph Ward. Mr Hall-Jones's short premiership was an interregnum made necessary by the absence of Sir Joseph Ward in England at the moment of Mr Seddon's death. Except in one disturbed month, August 1884, when there were three changes of ministry in eighteen days, executives were more stable than in the colony's earlier years. The party headed by Ballance, Seddon and Ward held office without a break for more than seventeen years, a result mainly due to the general support given to its agrarian and labour policy by the smaller farmers and the working classes. Sir Arthur Gordon differed from his ministers—Hall and Atkinson—on their native policy. Lords Onslow and Glasgow came into collision with Ballance over a proposal to nominate a large batch of Liberals to the then Conservative legislative council. The dispute was by consent referred to the secretary for the colonies, and the decision from Downing Street was in Ballance's favour. The governor's salary, reduced in 1887, was restored to £7500 a year in 1900. An Immigrants Exclusion Act voted by the general assembly in 1896 did not receive the royal assent; but, by arrangement with the colonial office, another measure, giving power to impose a reading test on aliens landing in the colony, became law in 1899.

The presence of New Zealand premiers at the imperial conferences in London in 1897, 1903 and 1907 helped to bring the colony into conscious touch with imperial public questions. Among the results were the increase of the naval contribution (first to £40,000 and then, in 1908, to £100,000), and the imposition in 1903 and again in 1907 of severe discriminating duties against imports from foreign countries.

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(W. P. R.)

NEXT FRIEND, in law, the phrase used for a person who represents in an action another person who is under disability to maintain a suit on his own behalf. This disability arises from infancy or mental incapacity, consequently every application to the court on behalf of an infant or a lunatic must be made through a next friend (*prochein amy, proximus amicus*). Previous to the Married Women's Property Act 1882 it was also usual for a married woman to sue by a next friend, but that act, allowing a married woman to sue in all respects as a *feme sole*, has rendered a next friend unnecessary in her case. In the case of an infant the father is prima facie the proper person to act as next friend; in the father's absence the testamentary guardian if any; but any person not under disability may act as next friend so long as he has no interest in the action adverse to that of the infant. A married woman cannot, however, act as next friend. An infant defends a suit, not by a next friend, but by a guardian *ad litem*. In the case of a lunatic, he sues by his committee, but if he has no committee, or if the committee has some interest adverse to the lunatic, he sues by his next friend. A next friend has full power over the proceedings in the action as if he were an ordinary plaintiff, but he is not entitled to be heard in person.

NEY, MICHEL, duke of Elchingen, prince of the Moskowa (1769–1815), marshal of France, was born at Saarlouis on the 10th of January 1769. His father was a cooper, and he received only a rudimentary education. In 1788 he went to Metz and enlisted in a regiment of hussars; in 1792 he was elected lieutenant; and in 1794 he became captain and was placed by Kléber at the head of a special corps of light troops. He was soon promoted *chef de brigade*, and in 1796, after repeatedly distinguishing himself in action, general of brigade. He then commanded the right wing of Hoche's army up to the peace of Campo Formio. On the resumption of hostilities he again took the field, and for his surprise of Mannheim in 1799 received the grade of general of division. He distinguished himself and received three wounds in the Swiss campaign of Masséna, and when Masséna turned against the Russians, who were approaching from Italy, Ney was left in command of the holding detachment opposite the Austrians. He displayed great vigour and skill in this work, and was completely successful, although his opponent was the famous Archduke Charles. In 1800 he was present at Hohenlinden. In May 1802 he married Mademoiselle Auguié, whom Josephine had chosen for him at Bonaparte's request. This event marks a change in Ney's political opinions which can only be explained by reference to Napoleon's power of captivating men. He was henceforward as ardent and sincere an admirer of Napoleon as hitherto he had been of revolutionary principles, and was one of the very few officers of the Army of the Rhine who became a trusted lieutenant of the emperor. He soon afterwards carried out an important diplomatic mission in Switzerland, and in 1803 he was placed in command of the camp of Montreuil. It was while there that, in the name of the army, he begged Napoleon to declare himself emperor, and on the establishment of the empire he was made marshal of France, and received the grand eagle of the Legion of Honour. In 1805 he commanded the VI. corps of the Grand Army, and his great victory at Elchingen (for which in 1808 he was made duke of Elchingen) practically secured the surrender of the Austrians at Ulm. He was then ordered to the upper Adige, and missed the battle of Austerlitz, but was present at Jena and Eylau and led the decisive attack at Friedland. His reputation for personal heroism was by now at its height, and after Friedland Napoleon gave him the title by which he is still known, "the bravest of the brave."

In 1808, after the first disaster to the French arms in Spain, Ney accompanied Napoleon thither as commander of the VI. corps. He took part in the Peninsular War from 1808 to 1811, commanding his corps in Napoleon's own operations of 1808–09, in the irregular operations in Galicia 1809–10, and under Masséna in the invasion of Portugal in 1810–11. In the last, however, he quarrelled bitterly with his former chief, and although he distinguished himself very greatly in command of the rearguard during the retreat from Torres Vedras—notably at Redinha—he was recalled to France by Napoleon and censured for his indiscipline. Almost immediately, however, he was re-employed with the *Grande Armée* in central Europe under Napoleon himself. In the 1812 expedition to Russia Ney commanded the centre at Borodino, and was created prince of the Moskowa on the evening of the victory. In the retreat he was a tower of strength, animating the rearguard with his own sublime courage, keeping the harassed and famished soldiers together under the colours and personally standing in the ranks with musket and bayonet. He himself was the last to recross the frontier, and threw the remaining muskets into the Niemen. In 1813 he commanded a corps in the German campaign, fought at Lützen, Bautzen, Dennewitz and Leipzig, and in 1814 he shared in the victories and defeats of the campaign in France. At the fall of the Empire Ney was neither the first nor the last of the marshals to give up the struggle, but that he acted in the negotiations in concert with Macdonald and Caulaincourt is sufficient proof of his desire to avert the unreserved abdication that was forced upon Napoleon by other circumstances. Less satisfactory than his conduct at this crisis was his loud protestation of devotion to the Bourbons, when the Restoration was a *fait accompli*. But he was soon mortified by the disdain of the returned *émigrés*, and retired to his country seat. While on his way thence to take up a command at Besançon, he learned of the return of Napoleon. He hurried at once to pay his respects to Louis XVIII. and to assure him of his fidelity. With the famous remark that the usurper ought to be brought to Paris in an iron cage, he proceeded to Lons-le-Saulnier to bar Napoleon's progress. But instead of doing so, he deserted with his troops, and Napoleon's march became a triumphal progress. Ney's act was undeniably treason to his sovereign, but it was hardly the calculated treason that his *émigré* detractors saw fit to imagine. The first violence of his language, his ineffective efforts to make constitutional guarantees the price of his adhesion to Napoleon, and his final surrender to the dominant personality of his old leader, all show him to have been "out of his depth" in this political crisis. Napoleon received him kindly, but did not give him a command at first. But when the Waterloo campaign was about to begin he summoned Ney to the northern frontier. The marshal gladly obeyed and took up the command of the left wing on June 13. The next day the army moved into Belgium. Ney took part in the campaign successively in the rôles of strategist, tactician and soldier (see WATERLOO CAMPAIGN). Much controversy has raged over his actions of the 15th and 16th of June. At Waterloo he was of course subordinated to the personal command of Napoleon, but his advice as to the conduct of the battle was often offered and sometimes accepted, and he personally led several charges of the French up to the British squares. But when all was lost, his courage, instead of burning brightly as in the Moscow retreat, was extinguished. He made no attempt to second Davout and Grouchy in the last days of Napoleon's reign, and in despair advocated the restoration of the Bourbons. Finding that Louis XVIII. and his allies ignored his advances, he resolved to escape from France, but afterwards, believing himself protected by the terms of the convention concluded on the 3rd of June, he gave up the idea. Soon a fresh order was issued denouncing him by name, and after a half-hearted attempt to conceal himself he was arrested on the 5th of August. King Louis and his minister Decazes realized to the full the lasting unpopularity that would fall on the monarchy in consequence; they had done their best to facilitate the escape of the "traitors"; and when Louis heard of Ney's arrest he exclaimed, "By letting himself be caught he has done us more harm than he did on the 13th of March!" But neither king nor ministers were in a position to resist the clamour of the ultra-royalists for blood. Every fresh delay in the process of Ney's trial raised a new outcry at the court, in the salons and in the Chamber of Deputies; and fiercest of all in demanding immediate execution was the king's niece, the unhappy duchess of Angoulême, who lived to confess that had she known the record of Ney's services to France she would never have consented to his death. The king was powerless against this all but unanimous voice of royalist opinion, backed as it was by that of the powers to whom he owed his crown. Ney was placed on trial before a court-martial composed chiefly of his former brothers-in-arms, whose participation in the tragedy, slight as it was, was probably never forgiven them by their countrymen. Others of the marshal's old comrades refused to serve, and were disgraced in consequence, until public opinion forced their reinstatement. The court, once assembled, was only too glad to take advantage of the plea of Ney's counsel that he was entitled to be tried by his equals in the Chamber of Peers. In spite of the courageous and eloquent appeal of the young duc de Broglie, the result of the trial before the latter body was a foregone conclusion; as to Ney's treason there could be no doubt, and de Broglie was alone in voting for his acquittal. In the early morning of the 7th of December 1815 Ney was shot in the Luxembourg gardens, near the Observatory. He met his death quietly and with a perfect soldierly dignity that effaced the memory of his political extravagances, and made him, next to Napoleon himself, the most heroic figure of the time. Much has been said as to the share of the duke of Wellington in the trial and execution, and, rightly or wrongly, he has been blamed for allowing the Bourbons, when restored by the foreign bayonets that he controlled, to proscribe the soldiers who as soldiers had been included in the military capitulation to the Allies.

Ney left materials for memoirs, but in an incomplete state. The *Mémoires du maréchal Ney*, published in 1833, were collected from these papers by his brother-in-law Gamot and by General Foy. They cover only the earlier part of his career, and end with the battle of Elchingen (October 1805). An edition in English was published the same year.

See Rouval, *Vie du maréchal Ney* (Paris, 1833); Dumoulin, *Histoire du procès du maréchal Ney* (Paris, 1815, Eng. trans. 1816); Nollet-Fabert, *Éloge du maréchal Ney* (Nancy, 1852); Welschinger, *Le maréchal Ney, 1815* (Paris, 1893); A. Delmas, *Mémoire sur la révision du procès du maréchal Ney* (1832); and *Military Studies by Marshal Ney* (Eng. trans. London, 1833); Vol. I. of General Bonnal's *Life of Ney* appeared in 1910.

NEZ PERCÉS (in allusion to their custom of wearing nose-rings, &c.), a tribe of North American Indians of Sahaptian stock. They call themselves Shaptin (whence the stock name) but to other tribes were known as Chopunnish. Their former range was a large tract in eastern Washington and Oregon and central Idaho. Until 1877 they had been at peace with the whites. In 1875 a portion of their reservation having been taken from them, owing to the allegation that they had not carried out the treaty stipulations, difficulties arose which, two years later, caused the Nez Percés War. The disaffected portion of the tribe, numbering some 400 or 500, held out for several months against all the forces the government could bring up, but were finally captured on the Sweet Grass Hills, northern Montana. They were placed in Indian Territory, but in 1884 transferred, owing to their decrease through disease, to a healthier locality in northern Washington. The main tribe are on a reservation in northern Idaho.

NGAMI, the central point of an inland water system of South Africa, once forming a lake 20 m. long and 10 wide, but now little more than an expanse of reeds growing in a soft treacherous soil, below which brackish water is found. It is cut by 20½° S. and 23° E. Ngami is the lowest point of a large depression in the plateau which comprises nine-tenths of Africa south of the Zambezi. The area which drains to it is bounded S. by the basin of the Orange, E. by the Matabele hills, N. by the western affluents of the Zambezi. The greater part of the Ngami water-system lies, however, N.W. of the lake (which for convenience it may still be called) in the tableland of Angola and German South West Africa. On the high plateau of Bihe, in the hinterland of Benguella, rise two large rivers, the Okavango and the Kwito, which uniting discharged their waters into Ngami. From the N.E. end of Ngami issued the Botletle or Zuga, a stream which runs S.E. and drains towards the Makarikari marsh, from which there is no outlet.

Although Ngami has dried up since 1890 the Okavango and its tributary the Kwito remain large rivers. The Okavango is known in its upper course as the Kubango. Its most remote source lies in about 12½° S. and 16½° E. and its length is over 900 m. It flows first S. then S.E. and E. In about 18° S. and 20½° E. it is joined on the north bank by the Kwito, a large navigable stream rising almost as far north as the Okavango. Its general course is S.E., but between 15° and 17° S. it flows S. and even S.W. Below the Kwito confluence the Okavango, which is also joined by various streams from the S.W. (German territory), is a rapid stream with an average breadth of over 100 yds., and generally navigable as far as the Popa falls, in 21° 50′ E. In the dry season, the water-level is from 4 to 20 ft. below the banks, but these are overflowed during the rains. At this period, April–June, some of the surplus water finds its way (in about 19° S.) by the Magwekwana to the Kwando or Linyanti (Zambezi system), to which, it is conjectured, the whole body of water may have once flowed. Below the Magwekwana outlet the Okavango, now called the Taukhe or Tioghe, turns almost due S., enters a swampy reed-covered plain and is broken into several branches. In this region the effects of desiccation are marked. Through the swamps the river formerly entered Ngami. The last 20 m. of the old channel are now dry and devoted to grain crops. Above this point the waters of the Okavango are diverted eastward through a channel called Tamalakane to the Botletle, the river which, as stated above, formerly flowed out of Ngami. The point of confluence is in about 20° S. 23½° E., the Botletle above this point being merely a succession of pools. Below the junction the river bed is 150 to 200 yds. wide. The banks are 25 to 30 ft. high, and form steep white walls of sand compacted with lime, behind which the dark green forest rises. The stream is fringed with reeds harbouring countless water-fowl. The Botletle, whose bed is about 100 m. in length, loses itself in a system of salt-pans—round or oval basins of varying size sunk to a depth of 30 to 45 ft. in the sandstone, and often bounded by steep banks. The outer pans are dry for a large part of the year, the whole system being filled only at the height of the flood-season in August. The Botletle, which receives in addition the scanty waters of the northern Kalahari, at this season reaches the Makarikari marsh. This marsh, occupying the N.E. corner of Bechuanaland, has also feeders from the Matabele hills in the direction of Bulawayo. During the rains the marsh is converted into a large lake. Much of the water is lost by evaporation; much of it sinks into some subterranean reservoir.

The evidence of travellers is conclusive that the country around Ngami is drying up. The desiccation appears to be rapid. In 1849 when David Livingstone visited Ngami the lake though shallow was of considerable extent. Later travellers reported progressive decrease in the size of the lake and in 1896 Sir F. D. Lugard and Dr Siegfried Passarge found it dry. Dr Passarge was told by the natives that the cessation of the river's flow was caused, about 1890, by a blocking of the channel by thousands of rafts.

Although the river system below the Magwekwana outlet of the Okavango is drying up, above that point there are long stretches of navigable water both on the Okavango and the Kwito, in all considerably over 1000 m. The Popa falls are the last of a series of six in a distance of 40 m., but none present serious engineering difficulties. The Magwekwana connexion with the Zambezi is a little over 100 m. long, and for more than half its course flows through a deep well-defined bed with a minimum width of 100 yards. The fall to the Linyanti affluent of the Zambezi is only a few feet and the country presents no obstacles to the construction of artificial channels.

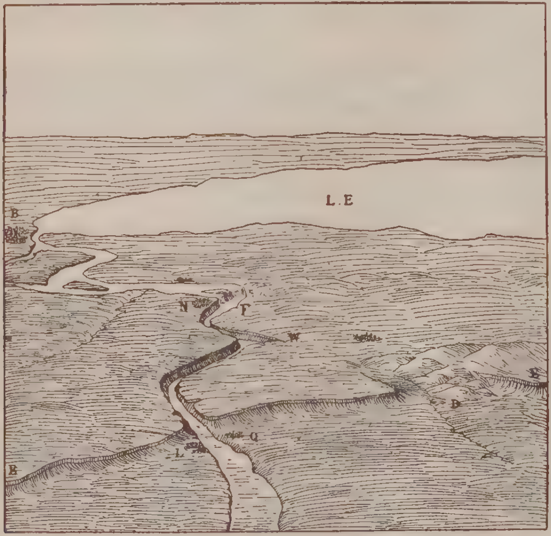
Ngami is within the (British) Bechuanaland protectorate, about 50 m. E. of the frontier of German South-West Africa. The district is the home of the Batawana tribe of Bechuana, with whom is stationed a European magistrate. The tribes living along the lower Okavango are tributary to the Bechuana, and the blocking of the channel referred to was occasioned by their bringing to Ngami their annual tribute of corn.

See BECHUANALAND and KALAHARI. An account of the Ngami district is given in *Die Kalahari* by Dr Siegfried Passarge (Berlin, 1904). Of early books of travel consult C. J. Andersson's *Lake Ngami* (London, 1856) and *The Okavango River* (London, 1861).

NGAN-HUI (AN-HWEI or GAN-HWUY), an eastern province of China, which, together with Kiang-su and Kiang-si, forms the vice-royalty of Kiang-nan. It is bounded N. by Ho-nan, E. by Kiang-su and Cheh-kiang, S. by Kiang-si and W. by Hu-peh and Ho-nan. It covers an area of 48,461 sq. m., and contains a population of 23,600,000. Its principal city is Ngan-k'ing on the Yangtsze Kiang, besides which it numbers seven prefectural cities. One district city, Ho-fei, is noted as having been the birthplace of Li Hungchang (1822–1901). The southern half of the province, that portion south of the Yangtsze Kiang, forms part of the Nan-shan, or hilly belt of the south-eastern provinces, and produces, besides cotton, coal and iron ore, large quantities of green tea. There are also considerable forest areas. Ngan-hui is one of the most productive provinces of China. Over the whole of its southern portion tea is largely grown, notably in the districts of Hui-chow Fu, Tung-liu, Ta-tung and Wu-hu. The Yangtsze Kiang is the principal river of the province, and is of great importance for foreign commerce, supplying direct water communication between some of the principal tea-growing districts and the neighbourhood of Hang-chow. The only other river of importance is the Hwai-ho (see CHINA: *The Country*). Wu-hu on the Yangtsze Kiang is the only open port in this province. From this port a railway runs S.E. to Wen-chow—an open seaport in Cheh-kiang province.

NIAGARA, a river of North America, running northward from Lake Erie to Lake Ontario, and carrying the discharge of all the Laurentian or Great Lakes, except Lake Ontario (see St Lawrence River). It constitutes part of the boundary between the United States and Canada, separating the state of New York from the province of Ontario. It is navigable from its head to Chippawa, 16 m., and from Queenston to its mouth, 6 m. The intervening 9 m. include a series of rapids and the Falls of Niagara. On the right bank are Buffalo, Tonawanda, Niagara Falls, Lewiston and Youngstown, of New York; on the left bank, Chippawa, Niagara Falls, Queenston and Niagara-on-the-Lake, of Ontario.

The Falls of Niagara are justly celebrated for their grandeur and beauty, and are viewed every year by from 800,000 to 1,200,000 visitors. They are in two principal parts, separated by an island. The greater division, adjoining the left bank, is called the Horseshoe Fall; its height is 155 ft., and the length of its curving crest line is about 2600 ft. The American Fall, adjoining the right bank, is 162 ft. high and about 1400 ft. broad. The water, being supplied by a lake, is free from sediment, and its clearness contributes to the beauty of the cataract. In recognition of the importance of the waterfall as a great natural spectacle, the province of Ontario and the state of New York have retained or acquired title to the adjacent lands and converted them into parks, which are maintained at public expense for the convenience and pleasure of visitors. The cataract is thus a great aesthetic asset of the people of the world; but its perpetuity has been threatened because it is also a great economic asset of the bordering nations. The flow of water in the river at mean stage is 222,000 cub. ft. per second, at low stage 176,000 cub. ft. The descent of this stream at the Falls, and in the rapids just above them, affords a theoretic water power equal to nearly four million horse power, and it is estimated that three-fourths of this is practically available. The annual value of the power must be reckoned in millions of pounds sterling, at least, and possibly in tens of millions. In the utilization of this natural power a beginning has been made; about 15,000 cub. ft. of water per second are now used for the development of electric power, and much larger appropriations have been authorized. As the full development of the economic value involves the diversion of the river from its channel and the destruction of the cataract as a scenic feature, the economic and aesthetic interests are antagonistic. An agitation started by the champions of scenic beauty led to negotiations looking to the regulation of economic exploitation by international agreement.



Bird's-eye sketch of Niagara river and gorge, from the north.

L.E., Lake Erie.
B, Buffalo.
N, Niagara Falls, N.Y.
F, Niagara Falls, Ont.
W, Whirlpool.
EE, Escarpment.
L, Lewiston.
Q, Queenston.
D, St Davids.

The river has no valley. The belt of land it crosses consists of two plains separated by a high cliff or escarpment facing towards Lake Ontario. The stream runs half its length on the upper plain, drops at the falls into a narrow gorge through which it courses 7 m. to the escarpment, and then traverses the lower plain in a deep channel. Under the lower plain are soft shales. The crest of the escarpment is a bed of limestone, nearly level, and this bed is visible in both walls of the gorge to the falls, where it is 60 ft. thick. From this firm brink the cataract plunges down into a deep pool or basin hollowed from the soft shale, and the resulting agitation causes further wear of the shale and the continual undermining of the limestone, which breaks away in blocks. Thus the site of the cataract retreats up stream and the gorge is lengthened; the average rate, measured from 1842 to 1905 being about 5 ft. a year. It is evident that the whole gorge has been dug out by the river, and many attempts have been made to determine the time consumed in the work.

The problem of the river's age is of much interest to geologists, because its solution would aid in establishing a relation between the periods and ages of geologic time and the centuries of human chronology. The great Canadian glacier, which in the Glacial period alternately crowded forward over the Great Lakes region and melted back again, so modified the face of the land by erosion and by the deposit of drift that the waters afterwards had to find new courses. The Niagara river came into existence when the waning of the glacier laid bare the western part of the Ontario basin, and the making of the gorge was then begun. If it were supposable that the lengthening of the gorge proceeded at a uniform rate, the computation of the time would be easy, but there are various modifying conditions. (1) The limestone is not equally thick all along the gorge; in one place it is 90 ft., and in several places as little as 35 ft. (2) The height of the cataract has varied from 155 ft. to more than 300 ft. (3) For a short distance at the whirlpool the limestone and shale were replaced by softer material, sand and clay. The river here touched a more ancient gorge, which had previously been concealed by drift except at the escarpment. The diagram shows the breach in the escarpment at St Davids directed towards the sharp turn of the river gorge at the whirlpool. (4) The size of the river has varied. While the glacier was gradually melting the lakes underwent a complicated series of metamorphoses, and there were two separate epochs when the discharge from all the basins beyond Lake Erie followed other routes, and during these epochs the Niagara drained only one-eighth of its present territory. The variation in the size of the river is the most important of the modifying conditions, and at the same time least amenable to computation.

The parts of the gorge eroded by the full river are now marked by deep pools, the powerful cataract having dug far down into the shale. The parts eroded by the depleted river are comparatively narrow and shallow, the weaker cataract having been unable to clear away the fallen blocks of limestone. The work of the full river is illustrated by the main division of the present cataract, called the Horseshoe Fall, which wore its cliff back 335 ft. in 63 years. The work of the depleted river is less adequately represented by the narrower and shallower American Fall, where the present rate of recession is about one-twenty-fifth as fast. In making two-thirds of the gorge the full river probably consumed between 5000 and 15,000 years. If the depleted river worked one-tenth as fast, the period required for the remaining third was five times as long; but the relative rate is wholly conjectural. A weighing of the evidence now available indicates 25,000 years as a lower limit for plausible estimates of the age of the river, but yields no suggestion of an upper limit.

Authorities.—James Hall, *Natural History of New York: Geology*, Part IV. (Albany, 1843); Sir Charles Lyell, *Travels in North America* (London, 1845); John Tyndall, "Some Observations on Niagara," *Pop. Sci. Mo.* (1873); J. Pohlman, "The Life-History of Niagara," *Trans. Amer. Inst. Mining Engineers* (1888); G. K. Gilbert, "The History of the Niagara River," *Sixth Ann. Rep. Com. State Reservation at Niagara* (Albany, 1890), and *Rate of Recession of Niagara Falls* (Washington, 1907), being Bulletin 307 of the United States Geological Survey; A. S. Kibbe, "Report of the Survey to determine the Crest Lines of the Falls of Niagara in 1890," *Seventh Ann. Rep. Com. State Reservation at Niagara* (Albany, 1891); G. K. Gilbert, "Niagara Falls and their History," *National Geographic Monographs* (New York, 1895); "Niagara Number," *Cassier's Magazine* (July, 1895); J. W. Spencer, "Niagara as a Timepiece," *Pop. Sci. Mo.* (May 1896); F. B. Taylor, "A Short History of the Great Lakes," *Studies in Indiana Geography* (Terre Haute, 1897); and "Origin of the Gorge of the Whirlpool Rapids at Niagara," *Bull. Geol. Soc. Amer.* (1898). (G. K. G.)

NIAGARA, FORT, an American fortification, on the E. side and at the mouth of Niagara river, opposite the Canadian village of Niagara, or Niagara-on-the-Lake. Fort Niagara has a reservation of 288 acres, with fairly modern equipments, several historic buildings of the time of French and of British possession, in one of which, the old magazine (1757), William Morgan was imprisoned in 1826. Fort Niagara was long, especially during the French occupation of Canada, one of the most important forts in North America, being the key to the Great Lakes, beyond Lake Ontario. "This immense extent of inland navigation," says Parkman, "was safe in the hands of France so long as she held Niagara. Niagara lost not only the lakes but also the valley of the Ohio was lost with it." René Robert Cavelier, Sieur de La Salle, wintered here in 1678–9, built his ship the "Griffon," and established a trading post and Fort Conti, destroyed not long afterwards. Fort Denonville, built in 1687 by Jacques René de Brésay, marquis de Denonville, governor-general of Canada, in his cruel campaign against the Iroquois, was abandoned in 1688, after the garrison, commanded by Pierre de Troyes (d. 1687), had been wiped out by an epidemic. The first Fort Niagara, to be so named, was built in 1725–1727 at the instance of Charles le Moyne, 1st baron of Longueil (1656–1729), and became a very important military and trading post; the fort was rebuilt by François Pouchot (1712–1769) in 1756, but in July 1759, after a siege of about sixteen days, it was surrendered to Sir William Johnson by Pouchot, who wrote a *Memoir upon the Late War* (translated and edited by F. B. Hough; 2 vols., 1866). On the 14th of September 1763 a British force marching from Fort Schlosser (about 2 m. above the Falls; built 1750) to Fort Niagara was ambushed by Indians, who threw most of their captives into Devil's Hole, along the Niagara river. In July 1764 a treaty with the Indians was signed here, which detached some of them from Pontiac's conspiracy. Joseph Brant, John Butler, and, in general, the Indians of north-western New York favouring the British during the American War of Independence, made Fort Niagara their headquarters, whence they ravaged the frontier, and many loyalists and Indians took refuge here at the time of General Sullivan's expedition into western New York in 1779. The fort was not surrendered to the United States until August 1796. In the War of 1812 it was bombarded by the guns of Fort George (immediately across the river in the town now called Niagara, then Newark[1]) on the 13th and 14th of October 1812; was the starting-point of the American expedition which took Fort George on the 27th of May 1813; and on the 19th of December 1813 was surprised and taken by assault—most of the garrison being killed or taken prisoners—by British troops under John Murray (1774–1862), who had previously retaken Fort George. After the close of the war, on the 27th of March 1815, Fort Niagara was restored to the United States, and a garrison was kept there until 1826. The fort was regarrisoned about 1836.

See F. H. Severance, *Old Trails on the Niagara Frontier* (Buffalo, 1903), Parkman's works, especially *Montcalm and Wolfe* (2 vols., Boston, 1884), and *The Conspiracy of Pontiac* (2 vols., Boston, 1851), and a pamphlet by Peter A. Porter, *A Brief History of Old Fort Niagara* (Niagara Falls, 1896).

NIAGARA FALLS (formerly Clifton or Suspension Bridge), a town and port of entry of Welland county, Ontario, Canada, 40 m. S.S.E. of Toronto, on the west bank of the Niagara river and opposite the Falls. Pop. (1901) 4244. It is a station on the Grand Trunk, Michigan Central and St Catharines & Niagara Central railways, and has electric railway communication with the chief towns in the neighbourhood. Three large steel bridges connect it with the American town of Niagara Falls on the opposite bank. Its importance is chiefly due to the tourist traffic, but the unrivalled water power is being more and more employed. Factories have sprung up, and power is transmitted to Toronto and other cities. A beautiful park, named after Queen Victoria, extends along the bank of the river for 2½ m. above the Falls.

NIAGARA FALLS, a city of Niagara county, New York, U.S.A., on the E. side of the Niagara river, at the Falls, 22 m. N.N.W. of Buffalo. Pop. (1900) 19,457, of whom 7326 were foreign-born, (1910 census) 30,445. The city is served by the New York Central & Hudson River, the Wabash, the Erie, the Lehigh Valley, the West Shore and the Michigan Central railways, and by the International Electric railway and the Niagara, St Catharines & Toronto (electric) railway. The city extends along the level summit of the cliffs from above the Falls to some 3 m. below. The river is here crossed by three bridges; the (upper) steel arch bridge, built (1895) on the site of the former suspension bridge (built in 1869; blown down in 1889; rebuilt as a suspension bridge) near the Falls, is crossed by double carriage-ways and footpaths and by an electric railway, and is probably the longest bridge of the kind in the world, being 1240 ft. long with an arch span of 840 ft.; and 1½ m. farther down the river are two railway bridges, the Michigan Central's cantilever bridge, completed in 1883, and the (lower) single steel arch bridge (completed in 1897, on the site of John A. Roebling's suspension bridge built in 1851–1856) of the Grand Trunk railway, which has a terminus at Niagara Falls (Clifton), Ontario, and connects here with the New York Central & Hudson River and the Lehigh Valley railways.

The principal buildings of the city are the Niagara Falls Memorial Hospital, the Federal Building and the Niagara Falls Power Co. Building. The city has a Carnegie library, De Veaux College (Protestant Episcopal, chartered in 1853), and Niagara University, a Roman Catholic institution, founded in 1856 by the priests of the Congregation of the Mission and incorporated in 1863 as the Seminary of Our Lady of Angels, a name still used for the theological department, but displaced, since the charter of the university in 1883, by the present name. In the extreme S.W. part of the city is Prospect Park, which with Goat Island immediately S., and several smaller islands, has been, since 1885, the "New York State Reservation at Niagara Falls." From the Falls, which gave the city its first importance as a stopping place for tourists, valuable electric and hydraulic power is derived (by a tunnel 29 ft. deep and 18 ft. wide, passing about 200 ft. under the surface of the city, from the upper steel arch bridge to a point 1¼ m. above the Falls, and by the canal of the Niagara Falls Hydraulic Power and Manufacturing Company). Niagara Falls is an important manufacturing city; the value of the factory products increased from $8,540,184 in 1900 to $16,915,786 in 1905, or 98·1%. The city is the shipping centre for the W. part of Niagara county. The village of Niagara Falls was for a time called Manchester. In 1892 the village of Suspension Bridge (formerly Niagara City) was joined with it under a city charter, which has been frequently amended.

NIAM-NIAM (*Zandeh, A-Zandeh*), a people of Central Africa, of mixed Negroid descent. With kindred tribes, they stretch from the While Nile above the Sobat confluence to the Shari affluent of Lake Chad, and from the Bahr-el-Arab, about 10° N., nearly to the equator. Their political ascendancy, weakened by the incessant attacks of the Arab-Nubian slave-raiders before the rise of the Sudanese mahdi in 1882, was afterwards broken by the forces of the Congo Free State and the Anglo-Egyptian Sudan.

The term Niam-Niam appears to be of Dinka origin, meaning in that language "great eaters," with reference, as is supposed, to their cannibalistic propensities. They are called Babungera by the Mangbettu (Monbuttu), A-Madyaka by the Diur, Mundo or Manyanya by the Bongo, Makaraka or Kakaraka by the Mittu. But Niam-Niam has been adopted and generalized by the Sudan and Nubian Mahommedans. Their native name is Zandeh (pl. A-Zandeh), which is current throughout the eastern Niam-Niam domain, a region estimated by Georg Schweinfurth, who visited the country in 1870, at about 48,000 sq. m., with a population of at least two millions. But these by no means constitute a uniform ethnical group, for within this area is the large Madi nation, differing altogether in speech and even in some respects physically from the ordinary Niam-Niam type. Apart also from numerous tribal divisions, the eastern Niam-Niam proper form three very distinct branches. The bleak northern highlands bordering east on the Bongo and north on Dar-Fertit are occupied by the Banda Niam-Niam. To the southwards are the more civilized Belanda Niam-Niam, who hold the fertile hilly territory of the Nile-Congo watershed. Very different from either are the so-called "White" Niam-Niam, neighbours of the Madi of the Makua-Welle river basin. Their complexion is of a lighter bronze tint, and they are distinguished from the other branches of the family by their tall stature, symmetrical figure, long kinky hair and beard and higher social culture. They wear cotton garments, obtained by barter for ivory, copper and iron, and have a tendency to political unity under one chief.[1]

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[1] On the night of the 10th of December 1813 the American general George McClure (1771–1851), upon abandoning Fort George, set fire to Newark, almost destroying the town and causing great suffering among the inhabitants. McClure attempted to justify this act by a strained construction of a letter to him from the secretary of war, but it was promptly disavowed by the United States government. The burning of Newark led to severe reprisals on the part of the British.

There is, however, a very distinct Niam-Niam type, one of the most marked in the whole of Africa. "These beings," remarks Schweinfurth, on his first introduction to them, "stood out like creatures of another world . . . a people of a marked and most distinct nationality, and that in Africa and amongst Africans is saying much." They are of medium height and powerful build. The great space between the eyes, which are almond-shaped and slightly slanting, gives them a peculiar expression. They have a very short nose, with correspondingly long upper lip; woolly hair; a very round head, agreeing in this respect with the Bongo of the Bahr-el-Ghazal but differing from the great majority of the other African dark races; features generally round, with less jaw-projection and altogether more regular than the typical Negro; of a ruddy brown or chocolate colour, scarcely ever black, but occasionally bronze and even olive.

The average Niam-Niam is distinguished by some excellent qualities, such as frankness, courage, an instinctive love of art, and above all a genuine and lasting affection for his women, such as is betrayed by no other African race. By tribal custom the men are all hunters, armed with long knives and spears and carrying oblong shields of wicker-work; the women all tillers of the soil, which with little toil yields abundant crops of cereals, yams, manioc, colocasia and Virginian tobacco. Both sexes wear large pins of ivory, iron, monkey or human bone stuck in their hair, and stain their skin with red camwood and the oil of a wild berry. The Niam-Niam are intelligent, skilful builders, and proficient in many native industries. Prominent among these are their earthenware vessels, which display considerable symmetry; iron smelting and metal work, such as swords, knives and spears; wood carvings, such as stools, benches, bowls and tobacco pipes, of varied and intricate design and often admirable works of art. They are great smokers, and very fond of music. Of the ox, horse, ass or camel they have no knowledge; the only domestic animals are poultry, and a breed of dogs, like small wolf-hounds, with smooth red hair, twisted tail like a porker's, large ears, pointed nose and four-clawed hind feet. These curious little "greyhounds" join in the chase with small wooden bells round the neck, and are thus soon found when lost in the woods.

The Niam-Niam are distinguished by their elaborate head-dresses (they formerly wore a sort of big full-buttomed wig, and Dr W. Junker actually saw elderly people in these), and peculiar tattoo markings—square patterns on forehead, temples or cheeks, an X-shaped figure in a cartouche below the chest, and various zigzag, straight or dotted lines on the upper arm and breast. Most of them file the incisors. From the malted grain of a species of eleusine they brew good beer, of a sparkling brown or reddish colour and pleasant bitter taste, derived from the stalk of the same cereal.

In this widespread Negroid family are now provisionally grouped the *Makaraka*, intermingled with the *Mundu*, and the *Babukur* in the north-east (Bahr-el-Ghazal); the *Krej*, *Banda* and *N'Sakkara* in the north-west (Dar-Fertit, and thence to the upper Shari); the *Banziri*, *Ndris*, *Togbo*, *Languassi*, *Dakoa*, *Ngapu*, *Wia-Wia*, *Manja*, *Awaka*, *Akunga* and others about both slopes of the Congo-Chad water-parting. These last, who give such an enormous westward extension to the family, present much the same physical characters as the Zandeh proper, and speak dialects of the widely diffused Ndris language, which is not Bantu, but appears to show affinities with Zandeh.

This great division ethnologists are even disposed to connect with the Fula of west and central Sudan, and to substitute for the now exploded "Nuba-Fula" a "Zandeh-Fula" family, resulting from various secular interminglings between the true negroes and the Berbers of North Africa. Such crossings have undoubtedly been in progress since prehistoric times over an enormous area south of the Sahara (AFRICA: *Ethnology*), and are almost everywhere marked by certain constant characters, such as long ringlety or kinky black hair, coppery, reddish or bronze shades of complexion, brachycephalic (round) head, often highly pronounced, and indicated outwardly by an unusually wide space between the orbits, and generally by somewhat softened negro features. But, owing to the different environments and to the different initial ratios of intermixture, the transitional forms are almost endless, so that it becomes difficult to constitute distinct ethnical groups without calling in the aid of language. Where type and speech correspond, as to a large extent is the case with most of the above-mentioned tribes, even strict systematists will be disposed to constitute separate ethnical groups, at least as working hypotheses, always allowing for the somewhat untrustworthy nature of the linguistic factor. In the case under consideration Fula has no kind of connexion with Zandeh speech, but this by no means precludes the possibility of racial connexion.

Beyond a few meagre vocabularies no materials have yet been collected for the study of the Zandeh language, which, except in the Madi country, appears to be everywhere spoken with considerable uniformity in the eastern Niam-Niam lands. Its phonetic system, such as initial *mb* and vowel *auslaut*, affiliates it, not to the Libyan, as has been asserted, but to the Negro linguistic type. Within this order of speech its pronominal prefix inflection points to affinity rather with the southern Bantu than with the Sudan group of languages. Thus the personal plural *a-*, as in A-Zandeh, A-Madi, A-Banga, &c., would appear to be identical in origin and meaning with the Bantu *wa-*, as in Wa-Ganda, Wa-Swaheli, Wa-Sambara, &c. There is also the same dearth of abstract terms, which renders the translation of Scripture into the Negro tongues such a difficult task. Compare *gumbah*, an expression for the Deity, really meaning "lightning," with the Chinyanja *chuuta = thunder = God* (?) and the Zulu *Unkulunkulu = great-grandfather*, also adopted by the missionaries as the nearest equivalent for the Deity in that language.

Politically the dismembered Zandeh empire and dependent principalities are divided up between France, which claims the "sultanates" of Rafai, Dinda, Zemio and Tambura in the Mbomu valley, with all the peoples in Fertit and the Shari basin; Belgium, which administers the eastern section between the Mbomu and the upper Welle; and Great Britain, to whose share have fallen the Makaraka and other Niam-Niam groups of the Bahr-el-Ghazal region.

See John Petherick, *Egypt, the Soudan and Central Africa* (1861); Carlo Piaggia's "Account of the Niam-Niam," communicated by the Marchese O. Antinori to the *Bolletino* of the Italian Geographical Society (1868), pp. 91-168; G. A. Schweinfurth, *Heart of Africa* (English edition, 1873); G. Casati, "Journey to the Niam-Niam Country," in *Esploratore* for August 1883, and *Ten Years in Equatoria* (1891); F. R. Bohndorff, *Reisen in Central Africa* (1885); Dr W. Junker, "Rundreise in dem südlichen Niamniam-Lande," in *Petermann's Mittheilungen* for May 1883, English edition, *Travels in Africa* (1890).

NIAS, the largest island in the chain off the west coast of Sumatra, Dutch East Indies, lying about 1° N., 97° 30′ E. It is roughly oblong in form, measuring about 80 m. by 28, and appears to be partly of volcanic origin and to consist partly of older rocks corresponding with those of Sumatra. Its extreme elevation is about 2300 ft. A number of islets (Nako, Bunga, &c.) lie off the west and north coasts. The island is thickly populated by a pagan people, who by some authorities, including F. Junghuhn, have been associated with the Battas, but are probably a distinct branch of the pre-Malayan or Indonesian race. Slavery and head-hunting are universal, despite the efforts of Dutch and German missionary societies. The natives are skilled in such crafts as weaving and metal-work, as well as in agriculture and road-making. Coco-nut oil is produced on Nias and also more especially on the Nako group. A Dutch commissioner is established at Gunong Sitoli on the east coast, a settlement of Malay and Chinese traders.

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[1] About the middle of the 19th century, most of the eastern Niam-Niam lands appear to have been subject to Yapaty, son of Mabengeh. But after his death they were distributed amongst his seven sons, Renjy, Balia, Perkye, Tombo, Bazimbey, Manuba; and in 1870 there were already fourteen reigning princes of this dynasty, besides several of doubtful relationship with the line of Mabengeh. In the Niam-Niam districts visited by the traders from the Egyptian Sudan there were at that time altogether as many as thirty-five independent chiefs. But reports were current of a very powerful "sultan" named Mofio, whose empire lay some 300 m. farther west. Another large state, founded in the Welle region by Kipa (Kifa), brother of Yapaty, also fell to pieces after his death in 1868. The powerful chiefs Bakangoi and Kanna, visited in 1883 by G. Casati, were sons of this Kipa, whose grave near Kanna's village was still watched by twenty-five "vestals," bound, under penalty of death, to keep a fire constantly burning, and to preserve their chastity inviolate (*Esploratore*, August 1883).

NIBELUNGENLIED, or DER NIBELUNGE NÔT, an heroic epic written in a Middle High German dialect. The story on which the poem is based belongs to the general stock of Teutonic saga and was very widespread under various forms, some of which are preserved. Thus it is touched upon in *Beowulf*, and fragments of it form the most important part of the northern *Eddas*, the poets of which evidently assumed that the tale as a whole was well known and that their hearers would be able to put each piece in its proper place. In the prose *Edda*, or *Volsungasaga*, which, though largely primitive in spirit, dates from the 13th century, it is set forth in full. The substance of this Norse version is as follows:—

The three Anses—Odin, Loki and Hörnir—saw an otter devouring a salmon beside a waterfall. They killed and skinned the otter and, taking the skin with them, sought shelter for the night with Rodmar the giant. But Rodmar recognized the skin as that of his son, and demanded as *weregild* gold enough to cover it completely. Loki thereupon went back to the stream, where Andvari in the form of a pike was guarding a great treasure, caught him in a net, and forced him to surrender his hoard. But the piled-up gold left one hair exposed; in order to cover it Loki returned to Andvari and forced him to surrender a magic ring which had the virtue of breeding gold. Thereupon Andvari, enraged, laid upon the hoard and all who should possess it a curse. This curse, the *Leitmotif* of the whole story, began to operate at once. Rodmar, for the sake of the treasure, was slain by his sons Fafnir and Regin; and Fafnir, seizing the whole, retired to a desolate heath and, in the form of a snake or dragon, brooded over the hoard. Regin, cheated of his share, plotted vengeance and the conquest of the treasure.

To Regin, a notable smith, was sent Sigurd—son of the slain hero Sigmundr the Volsung and his wife Hiortis, now wife of the Danish king Alf—to be trained in his craft. To him Regin told of Fafnir and the hoard, and the young hero offered to go out against the dragon if Regin would weld him a sword. But every brand forged by the smith broke under Sigurd's stroke; till at last he fetched the fragments of the sword Gram, Odin's gift to his father, which Hiortis had carefully treasured. These Sigurd forged into a new sword, so hard that with it he could cleave the anvil and so sharp that it would sever a flock of wool floating against it down stream; and, so armed, he sought and slew the dragon. But while roasting Fafnir's heart, which Regin had cut out, Sigurd burned his finger with the boiling fat and, placing it to his lips, found that he could understand the language of birds, and so learned from the chattering of the woodpeckers that Regin was planning treachery. Thereupon he slew the smith and loading the treasure on the magic steed Grani, given to him by Odin, set out upon his travels.

On the summit of a fire-girt hill Sigurd found the Valkyrie Brunhild in an enchanted sleep, and ravished by her beauty awakened her; they plighted their troth to each other and, next morning, Sigurd left her to set out once more on his journey. Coming to the court of Giuki, a king in the Rhine country, Sigurd formed a friendship with his three sons, Gunnar, Hogni and Guthorm; and, in order to retain so valuable an ally, it was determined to arrange a match between him and their sister Gudrun. Queen Grimhild, skilled in magic, therefore gave him an enchanted drink, which caused him to forget Brunhild. Gunnar, on the other hand, wished to make Brunhild his wife, and asked Sigurd to ride with him on this quest, which he consented to do on condition of receiving Gudrun to wife. They set out; but Gunnar was unable to pass the circle of fire round Brunhild's abode, the achievement that was the condition of winning her hand. So Sigurd, assuming Gunnar's shape, rode through the flames on his magic horse, and in sign of troth exchanged rings with the Valkyrie, giving her the ring of Andvari. So Gunnar and Brunhild were wedded, and Sigurd, resuming his own form, rode back with them to Giuki's court where the double marriage was celebrated. But Brunhild was moody and suspicious, remembering her troth with Sigurd and believing that he alone could have accomplished the quest.

One day the two queens, while bathing in the river, fell to quarrelling as to which of their husbands was the greater. Brunhild taunted Gudrun with the fact that Sigurd was Gunnar's vassal, whereupon Gudrun retorted by telling her that it was not Gunnar but Sigurd who rode through the flames, and in proof of this held up Brunhild's ring, which Sigurd had given to her. Then Brunhild "waxed as wan as a dead woman, and spoke no word the day long." Maddened by jealousy and wounded pride, she now incited the three kings to murder Sigurd by exciting their jealousy of his power. The two elder, as bound to him by blood-brotherhood, refused; but the youngest, Guthorm, who had sworn no oaths, consented to do the deed. Twice he crept into Sigurd's chamber, but fled when he found the hero awake and gazing at him with flashing eyes. The third time, finding him asleep, he stabbed him; but Sigurd, before he died, had just strength enough to hurl his sword at the murderer, whom it cut in two. Brunhild, when she heard Gudrun wailing, laughed aloud. But her love for Sigurd was great as ever, and she determined not to survive him; distributing her wealth to her hand-maidens, she mounted Sigurd's funeral pyre, slew herself with his sword, and was burnt with him.

In course of time Gudrun married Atli (Attila), king of the Huns, Brunhild's brother. Atli, intent on getting hold of the hoard, which Gudrun's brothers had seized, invited them to come to his court. In spite of their sister's warnings they came, after sinking the treasure in the Rhine. On their refusal to surrender the hoard, or to say where it was concealed, a fierce fight broke out, in which all the followers of Gunnar and Hogni fell. Atli then once more offered to spare Gunnar's life if he would reveal his secret; but Gunnar refused to do so till he should see the heart of Hogni. The heart of a slave was laid before him, but he declared that that could not be Hogni's, since it quaked. Hogni's heart was then cut out, the victim laughing the while; but when Gunnar saw it he cried out that now he alone knew where the hoard was and that he would never reveal the secret. His hands were then bound, and he was cast into a den of venomous serpents; but he played so sweetly on the harp with his toes that he charmed the reptiles, except one adder, by which he was stung to death. Gudrun, however, avenged the death of her brothers by slaying the sons she had borne to Atli and causing him unwittingly to drink their blood and eat their hearts. Finally, in the night, she killed Atli himself and burned his hall; then, leaping into the sea, she was carried by the waves to new scenes, where she had adventures not connected with those recorded in the *Nibelungenlied*.

This story, in spite of the late date of the *Volsungasaga* and of added elements due to the imagination of its author, evidently represents a very primitive version. In the *Nibelungen* story, on the other hand, though its extant versions are of much earlier date, and though it contains elements equally primitive not found in the other, the spirit and the motives of the earlier story have to a large extent been transmuted by later influences, the setting of the story being—though by no means consistently—medieval rather than primitive. Thus the mysterious hoard is all but lost sight of; no mention is made of the curse attached to it; and it is only as an afterthought that Siegfried (Sîfrit) is described as its master. Everywhere the supernatural elements are eliminated or subordinated, and the story becomes a drama of human motives, depending for its development on the interplay of human passions and activities.

To us in ancient story   wonders great are told
Of heroes rich in glory   and of adventures bold,
Of feast and joyous living,   of wailing and of woe,
Of gallant warriors striving   may ye now many marvels know.[1]

That is all he gives by way of preface. The gods have vanished from the scene; there is nothing of Loki and his theft of Andvari's hoard, nothing of Odin and his gifts of the sword Gram and the magic horse Grani; and not till the third *Aventiure*, when Siegfried comes to Worms, are we given even a hint that such things as the sword and treasure exist. On the other hand, in the very next stanza we are introduced to what is to be the leading motive of the plot: Kriemhild, the Burgundian princess, on whose account "many a noble knight was doomed to perish." For, as in the legend of Sigurd the Volsung, the plot had turned upon the love and vengeance of Brunhild, so in the song of the Nibelungs it is the love and vengeance of Kriemhild, the Gudrun of the northern saga, that forms the backbone of the story and gives it from first to last an artistic unity which the *Volsungasaga* lacks. Of the story itself it is impossible here to give anything but the barest outline, sufficient to show its contrast with the northern version. We may note at the outset the spirit of pessimism which, like the curse on the hoard, pervades the whole. It appears in the very first *Aventiure*, when Kriemhild, in answer to her mother's interpretation of her dream, declares that she will never marry, since "it has been proved by the experience of many women that joy is in the end rewarded by sorrow"; it is repeated in the last stanza but one of the long poem: "As ever joy in sorrow ends and must end alway." This tragic contrast is emphasized by the pomp and circumstance that surround the ill-fated hero of the story at the beginning.

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[1] Uns ist in alten maeren   wunders vil geseit
Von heleden lobebaeren   von grôzer arebeit
Von freude unt hôchgezîten   von weinen unde klagen
Von küener recken strîten   muget ir nun wunder hoeren sagen.

The primitive setting of the northern version has vanished utterly. Sigmund is king of the Netherlands; the boy Siegfried is brought up by "wise men that are his tutors" (*Avent.* ii.); and when, attracted by the fame of Kriemhild's beauty, he rides to Worms to woo her, it is as the typical handsome, accomplished and chivalrous king's son of medieval romance.

It is at this point (*Avent.* iv.) that some of the primitive elements of the story are suddenly and awkwardly introduced. As Siegfried approaches Worms, Kriemhild's brothers, the Burgundian kings Gunther, Giselhêr and Gêrnot watch his coming, and to them their faithful retainer, "the grim Hagen," explains who he is. This, he exclaims, can be no other than the hero who slew the two kings of the Nibelungs, Schilbunc and Nibelunc, and seized their treasure, together with the sword Balmunc and the *tarnkappe*, or cape of darkness, which has the virtue of making him who wears it invisible. Another adventure, too, he can tell of him, namely, how he slew a dragon and how by bathing in its blood his skin became horny, so that no weapon could wound him, save in one place, where a linden leaf had fallen upon him as he stooped, so that the blood did not touch this spot.[1] In spite of Hagen's distrust and misgivings, Siegfried now fights as the ally of the Burgundians against the Saxons (*Avent.* iv.), and undertakes, on condition of receiving Kriemhild to wife, to help Gunther to woo Queen Brunhild, who can only be won by the man who can overcome her in three trials of strength (*Avent.* vi.). Siegfried and Gunther accordingly go together to Brunhild's castle of Isenstein in Iceland, and there the hero, invisible in his *tarnkappe*, stands beside Gunther, hurling the spear and putting the weight for him, and even leaping, with Gunther in his arms, far beyond the utmost limit that Brunhild can reach (*Avent.* vii.). Brunhild confesses herself beaten and returns with the others to Worms, where the double marriage is celebrated with great pomp (*Avent.* x.). But Brunhild is ill content; though she saw Siegfried do homage to Gunther at Isenstein she is not convinced, and believes that Siegfried should have been her husband; and on the bridal night she vents her ill humour on the hapless Gunther by tying him up in a knot and hanging him on the wall. "I have brought the evil devil to my house!" he complains to Siegfried next morning; and once more the hero has to intervene; invisible in his *tarnkappe* he wrestles with Brunhild, and, after a desperate struggle, takes from her her girdle and ring before yielding place to Gunther. The girdle and ring he gives to his wife Kriemhild (*Avent.* x.).

One day, while Siegfried and his wife were on a visit to the Burgundian court, the two queens fell to quarrelling on the question of precedence, not in a river but on the steps of the cathedral (*Avent.* xiv.). Kriemhild was taunted with being the wife of Gunther's vassal; whereupon, in wrath, she showed Brunhild the ring and the golden girdle taken by Siegfried, proof that Siegfried, not Gunther, had won Brunhild. So far the story is essentially the same as that in the *Volsungasaga*; but now the plot changes. Brunhild drops out, becoming a figure altogether subordinate and shadowy. The death of Siegfried is compassed, not by her, but by the "grim" Hagen, Gunther's faithful henchman, who thinks the glory of his master unduly overshadowed by that of his vassal. Hagen easily persuades the weak Gunther that the supposed insult to his honour can only be wiped out in Siegfried's blood; he worms the secret of the hero's vulnerable spot out of Kriemhild, on pretence of shielding him from harm (*Avent.* xv.), and then arranges a great hunt in the forest, so that he may slay him when off his guard.

The 16th *Aventiure*, describing this hunt and the murder of Siegfried, is perhaps the most powerful scene in all medieval epic. To heighten the effect of the tragic climax the poet begins with a description of the hunting, and describes the high spirits of Siegfried, who captures a wild boar, rides back with it to camp, and there lets it loose to the great discomfiture of the cooks.

When the hunters sat down to feast, it was found that the wine had been forgotten. Hagen thereupon proposed that they should race to a spring of which he knew some way off in the forest. Siegfried readily agreed, and though handicapped by carrying shield, sword and spear, easily reached the goal first, but waited, with his customary courtesy, until the king had arrived and drunk before slaking his own thirst. Then, laying aside his arms, he stooped and drank. Hagen, seizing the spear, thrust it through the spot marked by Kriemhild on Siegfried's surcoat. The hero sprang up and, finding that his sword had been removed, attacked Hagen with his shield.

> Though to death he was wounded   he struck so strong a stroke
> That from the shattered shield-rim   forthwith out there broke
> Showers of flashing jewels;   the shield in fragments lay.[2]

Then reproaching them for their cowardice and treachery, Siegfried fell dying "amid the flowers," while the knights gathered round lamenting. At this point two stanzas may be quoted as well illustrating the poet's power of dramatic characterization:—

> The king of the Burgundians   he too bewailed his death:
> Then spake the dying hero: "Nay, now you waste your breath!
> You weep for an ill fortune   that you yourself have wrought:
> That is a shameful sorrow: it were better you said nought!"
> Then out spake the grim Hagen: "I know not why ye plain:
> This is for us the ending   of sorrow and of pain.
> Full few are left of foemen   that dare withstand us now.
> Glad am I that the hero   was by this hand of mine laid low!"

This account of the death of Siegfried, which embodies the ancient German tradition, is far finer than the northern version, according to which Hogni murders the hero in his bed. The whole spirit of this *Aventiure*, too, is primitive Teutonic rather than medieval. The same is true, indeed, of the whole of the rest of the poem. Siegfried, to be sure, is buried with all the pomp of medieval Catholic rites; but Kriemhild, while praying for his soul like a good Christian, plots horrible vengeance like her pagan prototype. With this significant difference, however: Gudrun revenged upon her husband the death of her brothers; Kriemhild seeks to revenge upon her brothers the death of her husband. The Catholic bond of marriage has become stronger than the primitive Teutonic bond of kinship. Mistress now of the inexhaustible hoard of the Nibelungs, Kriemhild sought to win a following by lavish largesses; but this Hagen frustrated by seizing the treasure, with the consent of the kings, and sinking it in the Rhine, all taking an oath never to reveal its hiding-place, without the consent of the others, so long as they should live (*Avent.* xix.). At last, however, after thirteen years, Kriemhild's chance came, with a proposal of marriage from Etzel (Attila) king of the Huns, whom she consented to marry on condition that he would help her to vengeance (*Avent.* xx.). Then more years passed; old feuds seemed to be forgotten; and the Burgundian kings, in spite of Hagen's warnings, thought it safe to accept their sister's invitation to visit her court (*Avent.* xxiii. xxiv.).

The journey of the Burgundians into Hunland is described by the poet at great length (*Avent.* xxv.-xxvii.). The story is full of picturesque detail and stirring incident, full also of interesting problems in folk-lore and mythology; and throughout it is dominated by the figure of the grim Hagen, who, twitted with cowardice and his advice spurned, is determined that there shall be no turning back and that they shall go through with it to the bitter end. With his own hands he ferries the host over the Danube and then, when the last detachment has crossed, destroys the boat, so that there may be no return. At Attila's court (*Avent.* xxviii.) it is again Hagen who provokes the catastrophe by taunting Kriemhild when she asks him if he has brought with him the hoard of the Nibelungs:

> "The devil's what I bring you!"   Hagen then replied,
> "What with this heavy harness   and my shield beside,
> I had enough to carry: this helmet bright I brought;
> My sword is in my right hand,   and that, be sure, I bring you not!"

The sword was Siegfried's. It is Hagen, too, who after the first onslaught of the Huns strikes off the head of Ortlieb, the son of Etzel and Kriemhild, and who, amid the smoke and carnage of the burning hall, bids the Burgundians drink blood if they are thirsty.

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[1] Compare the heel of Achilles.

[2] This last fight with the shield seems to have belonged to the common stock of heroic story. Cf. the account of the death of Hereward "the Wake" given by Geoffrey Gaimar in the *Chronicon Anglo-Norm.* and adopted by Freeman in his *Norman Conquest* (1871), iv. 486.

Besides Hagen, during the ride into Hunland and in the final fight, another figure comes to the front, that of Volkêr the Fiddler, so far only mentioned as a hero of the Saxon war in *Avent.* ii. He rides fiddling at the head of the host; he plays to the weary warriors in the intervals of the battle in the court of Etzel's palace; but he is also expert at performing other music, with "a strong fiddle-bow, mighty and long, like to a sword, exceeding sharp and broad." He is the type of the medieval knightly minstrel of the age of the Minnesang.

But for all their prowess, after a prolonged struggle (*Avent.* xxix.-xxxvii.), the Burgundians were at last overwhelmed. Most of the chief figures of heroic saga had come up against them: Attila, Hildebrand, the Ostrogoth Theodoric (Dietrich von Bern). To the last-named even Hagen armed with Siegfried's sword had to yield (*Avent.* xxxviii.). Kriemhild came to him as he lay in bonds and demanded the Nibelung treasure. He refused to reveal its hiding-place so long as Gunther, also a prisoner, should live. Gunther was accordingly slain by the queen's orders and his head was brought to Hagen, who cried out when he saw it that all had been accomplished as he had foretold:

"Now none knows where the hoard is save God and I alone:
That to thee, devil-woman, shall nevermore be known!"

Whereupon Kriemhild slew him with Siegfried's sword. But Kriemhild was not destined, like Gudrun, to set out on further adventures. Hildebrand, horrified at her deed, sprang forward and cut her to pieces with his sword.

In sorrow now was ended the king's high holiday,
As ever joy in sorrow ends and must end alway.

To some MSS. of the *Nibelungenlied* is added a supplementary poem called the *Klage* or *Lament*, a sequel of 2160 short-line couplets, describing the lament of the survivors—notably Etzel—over the slain, the burying of the dead, and the carrying of the news to the countries of the Burgundians and others. At the end it is stated that the story was written down, at the command of Bishop Pilgrim of Passau, by a writer named Konrad (Kuonrât) in Latin, and that it had since been sung (*getichtet*) often in the German tongue.

Sources of the Story.—The origin and nature of the various elements that go to make up the story of the *Nibelungenlied* have been, and continue to be, the subject of very lively debate. The view at one time most generally accepted was that first propounded by Karl Lachmann in his "Kritik der Sage von den Nibelungen" (*Rheinisches Museum für Philologie*, Num. 249, 250, 1829, republished in his *Zu den Nibelungen . . . Anmerkungen* in 1836), namely, that the story was originally a myth of the northern gods, modified into a heroic saga after the introduction of Christianity, and intermingled with historical elements. This view is maintained by Richard von Muth in his *Einleitung in das Nibelungenlied* (Paderborn, 1877), who thus sums up the result of his critical researches: "The basis of all is an old myth of a beneficent divine being (Siegfried), who conquers daemonic powers (the Nibelungen), but is slain by them (the Burgundians turned Nibelungen); with this myth was connected the destruction of the Burgundian kingdom, ascribed to Attila, between 437 and 453, and later the legend of Attila's murder by his wife; in this form, after Attila and Theodoric had been associated in it, the legend penetrated, between 555 and 583, to the North, where its second part was developed in detail on the analogy of older sagas, while in Germany a complete change of the old *motif* took place." To this theory the objection is raised that it is but a theory; that it is unsupported by any convincing evidence; and that the process which it postulates, that, namely, of the transformation of the gods into heroes by the popular imagination, is contrary to all that we know of the fate of dethroned deities, who are apt to live on in fairy stories in very unheroic guise. So early as 1783 Johannes von Müller of Göttingen had called attention to the historical figures appearing in the *Nibelungenlied*, identifying Etzel as Attila, Dietrich of Bern as Theodoric of Verona, and the Burgundian kings Gunther, Giselhêr and Gêrnot as the Gundaharius, Gislaharius and Godomar of the *Lex Burgundiorum*; in 1820 Julius Leichtlen (*Neuaufgefundenes Bruchstück des Nibelungenliedes*, Freiburg-im-Breisgau) roundly declared that "the *Nibelungenlied* rests entirely on a historical foundation, and that any other attempt to explain it must fail." This view was, however, overborne by the great authority of Lachmann, whose theory, in complete harmony with the principles popularized by the brothers Grimm, was accepted and elaborated by a long series of critics. It is only of late years that criticism has tended to revert to the standpoint of Müller and Leichtlen and to recognize in the story of the Nibelungen as a whole a misty and confused tradition of real events and people. Mythical elements it certainly contains; and to those figures which—like Siegfried, Brunhild, Hagen and the "good margrave" Ruedegêr of Bechlâren—cannot be traced definitively to historical originals, a mythical origin is still provisionally ascribed. But criticism is still busy attempting to trace these also to historical originals, and Theodor Abeling (*Das Nibelungenlied*, 1907) makes out a very plausible case for identifying Siegfried with Segeric, son of the Burgundian king Sigimund, Brunhild with the historical Brunichildis, and Hagen with a certain Hagnericus, who, according to the *Life of St Columban*, guided the saint (the chaplain of the *Nibelungenlied*), who had incurred the enmity of Brunichildis, safe to the court of her grandson Theuderich, king of the West Franks.

Herr Abeling's theory of the sources of the *Nibelungen* story is one among many; but, as it is one of the latest and not the least ingenious, it deserves mention. That the Icelandic *Eddas* contain the oldest versions of the legend, though divided and incomplete, is universally admitted. It is equally well established, however, that Iceland could not have been its original home. This Herr Abeling locates among the Franks of what is now southern France, whence the stories spread, from the 6th century onwards, on the one hand across the Rhine into Franconia, on the other hand westwards and northwards, by way of Ireland—at that time in close intercourse with continental Europe—and the northern islands, to Iceland. Hence the two traditions, the German and the Icelandic, of which the latter alone is preserved in something of its primitive form,[1] though primitive elements survive in the *Nibelungenlied*.

The basis of the story is then, according to this view, historical, not mythical: a medley of Franco-Burgundian historical traditions, overlaid with mythical fancies.[2] The historical nucleus is the overthrow of the Burgundian kingdom of Gundahar by the Huns in 436; and round this there gathered an accretion of other episodes, equally historical in their origin, however distorted, with a naïve disregard of chronological possibility: the murder of Segeric (*c.* 525), the murder of Sigimund by the sons of Chrothildis, wife of Clovis (identified by Abeling with Kriemhild), the murder of Attila by his Burgundian wife Ildico (see KRIEMHILD). In the *Eddas* the identity of the original Franco-Burgundian sagas is fairly preserved. In the *Nibelungenlied*, on the other hand, the influence of other wholly unconnected stories is felt: thus Hildebrand appears during the final fight at Etzel's court, and Theodoric the Great (Dietrich von Bern; see THEODORIC), for no better reason than that the Dietrich legend had sent him into exile there, and that he must have been there when the Burgundians arrived.

Origin of the Poem.—The controversy as to the underlying elements of the Nibelung legend extends to the question of the authorship and construction of the poem itself. Was it from the first—whatever additions and interpolations may have followed—conceived as a single, coherent story, or is it based on a number of separate stories, popular ballads akin to the *Eddas*, which the original author of the *Nibelungenlied* merely collected and strung together? The answer to these questions has been sought by a succession of scholars in a critical comparison of the medieval MSS. of the poem still surviving. Of these 33 are now known, of which 10 are complete, the rest being more or less fragmentary. The most important are those first discovered, viz. the MSS. lettered C (Hohenems, 1755), B (Schloss Werdenberg, 1769), A (Hohenems, 1779); and round these the others more or less group themselves. They exhibit many differences: put briefly, C is the most perfectly finished in language and rhythm; A is rough, in places barbarous; B stands half-way between the two. Which is nearest to the original? Karl Lachmann (*Zu den Nibelungen und zur Klage, Anmerkungen*, 1836) decided in favour of A. He applied to the *Nibelungenlied* the method which Friedrich August Wolf had used to resolve the *Iliad* and *Odyssey* into their elements. The poem, according to Lachmann, was based on some twenty popular ballads, originally handed down orally, but written down about 1190 or 1200. This original is lost, and A—as its roughness of form shows—is nearest to it; all other MSS., including B and C, are expansions of A. The great authority of Lachmann made this opinion the prevalent one, and it still has its champions. It was first seriously assailed by Adolf Holtzmann (*Untersuchungen über das Nib.*, Stuttgart, 1854), who argued that the original could not have been strophic in form—the fourth lines of the strophes are certainly often of the nature of "padding"—that it was written by Konrad (Kuonrât of the *Klage*), writer to Bishop Pilgrim of Passau about 970–984, and that of existing MSS. C is nearest to this original, B the copy of a MS. closely akin to C, and A an abbreviated, corrupt copy of B. This view was adopted by Friedrich Zarncke, who made C the basis of his edition of the *Nibelungenlied* (Leipzig, 1856). A new hypothesis was developed by Karl Bartsch in his *Untersuchungen über das Nibelungenlied* (Leipzig, 1865). According to this the original was an assonance poem of the 12th century, which was changed between 1190 and 1200 by two separate poets into two versions, in which pure rhymes were substituted for the earlier assonances: the originals of the *Nibelungenlied* and *Der Nibelunge Nôt* respectively. Bartsch's subsequent edition of the *Nibelunge Nôt* (1st ed., Leipzig, 1870) was founded on B, as the nearest to the original. To this view Zarncke was so far converted that in the 1887 edition of his *Nibelungenlied* he admitted that C shows signs of recension and that the B group is purer in certain details.

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[1] The *Eddas* were first written down, as is commonly assumed, by Bishop Saemund Sigfusson (1056–1133).

[2] The process of this overlaying is easy to realize if we remember how usual it was to transfer characteristics and episodes drawn from immemorial folk-lore to successive historical personages. A good example is the "Swan-maiden" myth connected with the house of Bouillon (see LOHENGRIN). See also other interesting cases cited in the chapter on the "Geste of John de Courci" in Mr J. H. Round's *Peerage and Pedigree* (London, 1910).

As a result of all this critical study Herr Abeling comes to the following conclusions. The poem was first written down by a wandering minstrel about 971 to 991, was remodelled about 1140 by Konrad,[1] who introduced interpolations in the spirit of chivalry and was perhaps responsible for the metre; during the wars and miseries of the next fifty years manners and taste became barbarized and the fine traditions of the old popular poetry were obscured, and it was under this influence that, about 1190, a jongleur (*Spielmann*) revised the poem, this recension being represented by group B. After 1190, during the Golden Age of the art poetry (*Kunstdichtung*) of the Minnesingers (*q.v.*), a professional poet (Rudolf von Ems?) again remodelled the poem, introducing further interpolations, and changing the title from *Der Nibelunge Nôt* into *Das Nibelungenliet*, this version being the basis of the group C. The MS. A, as proved by its partial excellence, is based directly on Konrad's work, with additions borrowed from B.

Theodor Abeling (*Das Nibelungenlied und seine Literatur* (Leipzig, 1907) gives a full bibliography, embracing 1272 references from 1756 to 1905. There are English translations of the poem by A. G. Foster-Barham (1887), Margaret Armour (prose, 1897) and Alice Horton (1898). (W. A. P.)

NICAEA, or NICE [mod. *Isnik, i.e.* εἰς Νικαίαν] an ancient town of Asia Minor, in Bithynia, on the Lake Ascania. Antigonus built the city (316 B.C.?) on an old deserted site, and soon afterwards Lysimachus changed its name from Antigonia to Nicaea, calling it after his wife. Under the Roman empire Nicaea and Nicomedia disputed the title of metropolis of Bithynia. Strabo describes the ancient Nicaea as built regularly, in the form of a square, with a gate in the middle of each side. From a monument in the centre of the city all the four gates were visible at the extremities of great cross-streets. After Constantinople became the capital of the empire Nicaea grew in importance, and after the conquest of Constantinople by the Crusaders became the temporary seat of the Byzantine emperor; the double line of walls with the Roman gates is still well preserved. The possession of the city was long disputed between the Greeks and the Turks. It remained an important city for some time after its final incorporation in the Ottoman empire; but became subsequently an insignificant village.

NICAEA, COUNCIL OF. The Council of Nicaea (A.D. 325) is an event of the highest importance in the history of Christianity. Its convocation and its course illustrate the radical revolution which the position of this religion, within the confines of the Roman empire, had undergone in consequence of the Edict of Milan. Further, it was the first oecumenical council, and this fact invested it with a peculiar halo in the eyes of subsequent ages; while among its resolutions may be found a series of decisions which acquired a lasting significance for the Christian Church. This applies more especially to the reception of the doctrine of the Trinity; for though, immediately after the close of the synod, it was exposed to a powerful opposition, it gained the day, and, in the form which it received at Nicaea and at the council of Constantinople (381), still enjoys official validity in the principal churches of Christendom. Finally, the council marks an epoch in the history of the conception of the Christian religion, in that it was the first attempt to fix the criteria of Christian orthodoxy by means of definitely formulated pronouncements on the content of Christian belief—the acceptance of these criteria being made a *sine qua non* of membership of the Church. Moreover, it admitted the principle that the state might employ the secular arm to bring the Christian subjects of the Roman world-empire under the newly codified faith. Thus the Nicene Council is an important stage in the development of the state-church, though the completion of that edifice was delayed till the reign of Theodosius the Great. The relation of the emperor Constantine to the assembly was in itself a step in the direction of that independent treatment of ecclesiastical affairs, which, in the following centuries, created the peculiar type of the Byzantine state-church.

From his accession Constantine had shown himself the friend of the Christians; and, when his victory over Licinius (A.D. 323) gave him undisputed possession of the crown, he adhered to this religious policy, distinguishing and fortifying the Christian cause by gratuities and grants of privilege. This propitiatory attitude originated in the fact that he recognized Christianity—which had successfully braved so many persecutions—as the most vital and vigorous of religions, and as the power of the future. Consequently he directed his energies toward the establishment of a positive relationship between it and the Roman state. But the Church could only maintain its great value for the politician by remaining the same compact organism which it had proved itself to be under the stormy reign of Diocletian. Scarcely, however, did it find itself in the enjoyment of external peace, when violent feuds broke out in its midst, whose extent, and the virulence with which they were waged, threatened to dismember the whole religious body. Donatism in the West was followed by the Arian struggle in the East. The former movement had been successfully arrested, though it survived in North Africa till the 5th century. The conflict kindled by the

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[1] Bartsch and others ascribe its authorship, with much plausibility, to an Austrian knight of the race of Kürenberg, the earliest of the courtly lyric poets, whose lyrics are written in the Nibelung strophe. Thus compare Kürenberg's lyric (Lachmann and Haupt, *Des Minnesangs Frühling*, 4th ed., F. Vogt, Leipzig, 1888)—

> "Ich zôch mir einen valken mêre danne ein jâr"

with the *Nibelungen Nôt* (Bartsch) *Av.* i. 13—

> "troumte Kriemhilde.
> Wie sie züge einen valken, starc scoen' und wilde."

Alexandrian presbyter Arius (*q.v.*) assumed greater dimensions and a more formidable character. Constantine at first attempted to restore quiet in Alexandria by transmission of an epistle by Bishop Hosius of Cordova, but his admonitions were fruitless. Accordingly, since other debatable points were at issue, he had recourse to an institution previously evolved by the Christian Church—the convocation of a synod to pronounce on burning questions—qualifying it, however, to correspond with the altered circumstances. He convened a council, designed to represent the whole Church of the empire, at Nicaea in Bithynia, a town situated no great way from the imperial summer-residence of Nicomedia and within easy reach by sea of the Oriental bishops. Among the various estimates of the number of delegates, the statement of Athanasius, who speaks of 318 members, has dominated the tradition. In consequence of the vast distances, the West was but weakly represented. From Spain, Hosius—the above-mentioned bishop of Cordova—made his appearance; from Gaul, Nicasius of Dijon; from Dalmatia, Domnus of Stridon; from Italy, Marcus of Calabria with two presbyters as deputies of the Roman bishop Silvester; and from North Africa, Caecilian of Carthage. Thus an immense majority of the synod hailed from the East. The bishops of the three most important metropolises were present—Alexander of Alexandria, Eustathius of Antioch and Macarius of Jerusalem—while a prominent rôle was also played by Eusebius, bishop of the imperial city Nicomedia, and his erudite namesake, Eusebius of Caesarea. Of the other prelates not a few had distinguished themselves as confessors in the later persecution, and still bore the honourable traces of their sufferings. Since the bishops were accompanied by priests, Nicaea witnessed an array of clerics such as had never before been mustered in a single place. Among the attendant clergy, the still youthful deacon Athanasius, destined to succeed Alexander in the see of Alexandria, was prominent as the most powerful antagonist of Arianism (see ATHANASIUS). The synod met in the imperial palace from the 20th of May to the 25th of July. What order of procedure obtained, and in whom the presidency was vested, are problems which admit of no certain solution: the one indisputable fact is that Constantine—who, at his appearance, was accorded a ceremonious reception, and himself delivered an address on the occasion—exercised a decided influence on the discussions.

The deliberations on the Arian question passed through several distinct stages before the final condemnation of Arius and his doctrines was reached. A clearly defined standpoint with regard to this problem—the relationship of Christ to God—was held only by the attenuated group of Arians and a far from numerous section of delegates, who adhered with unshaken conviction to the Alexandrian view. The bulk of the members occupied a position between these two extremes. They rejected the formulae of Arius, and declined to accept those of his opponents; that is to say, they were merely competent to establish negations, but lacked the capacity, as yet, to give their attitude of compromise a positive expression. In the main they perpetuated the line of Origen. That the majority of the council should have adopted this neutral tendency is easily intelligible when we consider the state of theology at that period. True, at Nicaea this majority eventually acquiesced in the ruling of the Alexandrians; yet this result was due, not to internal conviction, but partly to indifference, partly to the pressure of the imperial will—a fact which is mainly demonstrated by the subsequent history of the Arian conflicts. For if the Nicaean synod had arrived at its final decision by the conscientious agreement of all non-Arians, then the confession of faith there formulated might indeed have evoked the continued antagonism of the Arians, but must necessarily have been championed by all else. This, however, was not the case; in fact, the creed was assailed by those very bodies which had composed the *laissez-faire* centre at Nicaea; and we are compelled to the conclusion that, in this point, the voting was no criterion of the inward convictions of the council.

In the synod, an Arian confession of faith was first brought forward and read; but it aroused such a storm of indignation that obviously, in the interests of a restoration of ecclesiastical peace, there could be no question of its acceptance. On this, Eusebius of Caesarea submitted the baptismal creed of his community; and this met with the imperial approval. Since the creed dated from a period anterior to the outbreak of the Arian struggle, its reception would have been equivalent to a declaration on the part of the council that it declined to define its position with reference to the controversy of the hour. That the greater number of delegates were not disinclined to adopt this subterfuge, so congenial to their standpoint, and to shelve the actual solution of the whole problems by recognition of this or some similar neutral formula, is extremely probable. But the emperor manifestly saw that, if the difficulties were eluded in any such mode, it was inevitable from the very nature of the case, that they should rise again in an accentuated form, and that consequently no pacification could be expected from this policy. Since the Eastern Church subscribed to the Alexandrian solution of the question, he drew the natural deduction and concluded that he had here a genuine presentment of the feeling of the Church, which, if it received official sanction, might be justly expected to restore peace to the Christian community. But, in pronouncing for this view, he was careful to dissociate himself from the formulation of a new confession: for it was imperative to avoid even an apparent innovation in the articles of faith. Accordingly he proposed that the Caesarean creed should be modified by the insertion of the Alexandrian passwords—as if for the purpose of more accurate definition—and by the deletion of certain portions. That he appreciated the import of these alterations, or realized that this revision was virtually the proclamation of a new doctrine, is scarcely probable. The creed thus evolved—the expression ὁμοούσιος is of Western origin—was finally signed by all the deputies with the exception of the bishops Theonas of Marmarica and Secundus of Ptolemais: even the Arians had submitted. The two recalcitrant prelates, with the presbyter Arius, were banished to Illyria; Eusebius of Nicomedia and Theognis of Nicaea were also driven into exile, and at the same time the works of Arius were condemned to be burned under pain of death.

But this artificial unity was no ratification of peace: in fact, it paved the way for a struggle which convulsed the whole empire. For it was the proclamation of the Nicene Creed that first opened the eyes of many bishops to the significance of the problem there treated; and its explanation led the Church to force herself, by the arduous path of theological work, into compliance with those principles, enunciated at Nicaea, to which, in the year 325, she had pledged herself without genuine assent.

In addition to the Arian *impasse*, there was the schism of Bishop Meletius of Lycopolis in the Thebaid, whose settlement Constantine had added to the programme of the council. He and Peter, bishop of Alexandria, had come into conflict over the treatment of the " backsliders " (*lapsi*) in the Diocletian persecution; and their strife acquired additional bitterness from the fact that it was extended to cover the prerogatives of the Alexandrian bishopric. Peter had composed a treatise advocating moderate principles and censuring the courtship of martyrdom for its own sake, then gone so far as to save himself by flight. Meletius, on the other hand, represented the most rigorous school, and allowed himself high-handed infringements of the law. When this had resulted in his deposition by a synod, a faction still adhered to him, and the Meletians became a schismatic community; and such they remained even after the death of Peter (311), who demonstrated by his martyrdom that his counsels of moderation were not prompted by cowardice. This Meletian schism made for disorder in the ecclesiastical life of Egypt all the more because its followers sided with Arius. The Nicene Council broke the strength of the movement by great concessions to the Meletian bishops, and, at the same time, expressly recognized the supreme rights of the Alexandrian see over Egypt, Libya and the Pentapolis. Since, in the resolution dealing with this point (canon vi.), reference was made to the analogous and undisputed suzerainty of the Roman see—over the ten suburbican provinces, attached to the diocese of Rome and including middle and lower Italy, with the islands of Sicily, Corsica and Sardinia—this decision enshrines an important piece of evidence for the history of the papacy. On this opportunity, his ancient privileges were restored to the bishop of Jerusalem, who, in consequence of the political history of the Holy Land, had been subordinated to the metropolitan of Caesarea (canon vii.). The path was smoothed for the readmittance of the Novatians (*Cathari*) into the church, by recognizing, in this case, their clergy, with the bare stipulation that the laying-on of hands should follow their written promise to be faithful to the doctrine of the Catholic Church (canon viii.).

With regard to the much-debated question as to the termination of the Easter festival, the synod committed itself so far as to pronounce in favour of the Alexandrian cycle—a settlement which entailed such important results in practical life that it was communicated to the Christian churches by Constantine in a circular letter. The problem, whether a baptism, performed by heretics in the name of Christ or the Trinity, should rank as a baptism or not, had given rise to an animated controversy between the Roman bishop Stephen, who answered in the affirmative, and Cyprian of Carthage, who gave an equally decided negative. The council followed the Roman practice, merely declaring the nullity of baptisms imparted by the adherents of Paul of Samosata (canon xix.). An important provision, in point of ecclesiastical law, was that the chirotony of a bishop required the presence of at least three other bishops of his province, while the confirmation of the choice remained at the disposal of the metropolitan (canon iv.). A further regulation was that two provincial synods should be held annually (canon v.); but a law enacting the celibacy of the clergy was rejected at Nicaea, since Paphnutius, an aged bishop of Egypt who had been tested in persecution, warned his colleagues against the danger of imposing too arduous a yoke upon the priesthood, and defended the sanctity of marriage.

As Constantine had convened the synod, so he determined its conclusion. A brilliant banquet in the imperial palace—of which Eusebius of Caesarea gives an enthusiastic account—marked its close, after which the bishops were granted their return. The admonitions to peace with which he dismissed them proved unavailing for the reasons indicated above: but the reputation of the first oecumenical council suffered no abatement in consequence.

See F. v. Hefele, *Conciliengeschichte*, i. (ed. 2, Freiburg, 1873), pp. 282-443. A catalogue of the special literature will be found in Loofs's article "Arianismus" in Herzog-Hauck, *Realencyklopädie f. protestantische Theologie*, i. (ed. 3, Leipzig, 1897): also Bernoulli, "Nicaenisches Konzil," *ib.*, vol. xiv. (1904), pp. 9 sqq. (C. M.)

NICANDER (2nd cent. B.C.), Greek poet, physician and grammarian, was born at Claros, near Colophon, where his family held the hereditary priesthood of Apollo. He flourished under Attalus III. of Pergamum. He wrote a number of works both in prose and verse, of which two are preserved. The longest, *Theriaca*, is an hexameter poem (958 lines) on the nature of venomous animals and the wounds which they inflict. The other, *Alexipharmaca*, consists of 630 hexameters treating of poisons and their antidotes. In his facts Nicander followed the physician Apollodorus. Among his lost works may be mentioned: *Aetolica*, a prose history of Aetolia; *Heteroeumena*, a mythological epic, used by Ovid in the *Metamorphoses* and epitomized by Antoninus Liberalis; *Georgica* and *Melissourgica*, of which considerable fragments are preserved, said to have been imitated by Virgil (Quintilian x. 1. 56). The works of Nicander were praised by Cicero (*De oratore*, i. 16), imitated by Ovid, and frequently quoted by Pliny and other writers. His reputation does not seem justified; his works, as Plutarch says (*De audiendis poetis*, 16), have nothing poetical about them except the metre, and the style is bombastic and obscure; but they contain some interesting information as to ancient belief on the subjects treated.

Editions.—J. G. Schneider (1792, 1816); O. Schneider (1856) (with the Scholia); H. Klauser, "De Dicendi Genere . . . Nicandri" (*Dissertationes Philologicae Vindobonenses*, vi. 1898). The Scholia (from the Göttingen MS.) have been edited by G. Wentzel in *Abhandlungen der k. Gesellschaft der Wiss. zu Göttingen*, xxxviii. (1892). See also W. Vollgraff, *Nikander und Ovid* (Groningen, 1909 foll.).

NICANOR, Greek grammarian, son of Hermeias of Alexandria (or Hierapolis), lived during the reign of Hadrian. He chiefly devoted himself to the study of punctuation and the difference of meaning caused by it. Hence he was nicknamed "the Punctuator" (ὁ στιγματίας). He is known to have written on the punctuation of Homer and Callimachus. He was possibly the author of a work Περὶ Μετονομασιῶν (*On the Change of Names of Places*), of which some fragments are preserved in C. W. Müller, *Fragmenta Historicorum Graecorum*, iii. 632.

Edition of the *Iliad* and *Odyssey* fragments by L. Friedländer (1850) and O. Carnuth (1875) respectively.

NICARAGUA, a republic of Central America, bounded on the N. by Honduras, E. by the Caribbean Sea, S. by Costa Rica, and W. by the Pacific Ocean (for map, see CENTRAL AMERICA). Pop. (1905), about 550,000; area, 49,200 sq. m. Nicaragua forms an irregular equilateral triangle with its base stretching for 280 m. along the Caribbean Sea from Cape Gracias à Dios southwards to the San Juan delta, and its apex at the Coseguina volcano, on the Bay of Fonseca, which separates Nicaragua on the Pacific side from Salvador. The frontier which separates the republic from Honduras extends across the continent from east-north-east to west-south-west. It is defined by the river Segovia for about one-third of the distance, or from Cape Gracias à Dios to 86° W.; it then deflects across the watershed on the east and south of the Hondurian river Choluteca, crosses the main Nicaraguan cordillera (mountain chain), and follows the river Negro to the Bay of Fonseca. In accordance with the treaty of 1858, which was confirmed in 1888 by the United States president, acting as arbitrator, and more fully defined in 1896, the boundary towards Costa Rica is drawn 2 m. S. of the San Juan river and Lake Nicaragua, as far as a point parallel to the centre of the western shore of the lake. It is then continued south-westward for the short distance which intervenes between this point and the northernmost headland of Salinas Bay, on the Pacific.

Physical Features.—The coasts of Nicaragua are strikingly different in configuration. The low, swampy and monotonous shore of the Caribbean, with its numerous lagoons and estuaries, and its fringe of reefs and islets, contains only three harbours: Gracias à Dios, Bluefields or Blewfields, and Greytown (San Juan del Norte). Its length, from Cape Gracias à Dios to the San Juan delta, is nearly 300 m. The Pacific coast, measuring some 200 m. from the Bay of Fonseca to Salinas Bay, is bold, rocky and unbroken by any great indentation; here, however, are the best harbours of the republic—the southern arm of the Bay of Fonseca (*q.v.*), Corinto, Brito and San Juan del Sur.

The surface of the country is naturally divided into five clearly distinct zones: (1) the series of volcanic peaks which extend parallel to the Pacific at a little distance inland; (2) the plains and lakes of the great depression which lies to the east of these mountains and stretches from sea to sea, between the Bay of Fonseca and the mouths of the San Juan; (3) the main cordillera, which skirts the depression on the east, and trends north-west from Monkey Point or Punta Mico on the Caribbean Sea, until it is merged in the ramifications of the Hondurian and Salvadorian highlands; (4) the plateaus which slope gradually away from the main cordillera towards the Caribbean; (5) the east or Mosquito coast, with its low-lying hinterland. The last-named region has to a great extent had a separate history; and it was only in 1894 that the Mosquito Reserve, a central enclave which includes more than half of the littoral and hinterland, was incorporated in the republic and renamed the department of Zelaya. (See MOSQUITO COAST.)

Though situated almost on the western edge of the country, and greatly inferior, both in continuity and in mean altitude, to the main cordillera, the chain of volcanic cones constitutes a watershed quite equal in importance to the cordillera itself. It consists for the most part of isolated igneous peaks, sometimes connected by low intervening ridges. It terminates in the extreme north-west with Coseguina (2831 ft.), and in the extreme south-east with the low wooded archipelagos of Solentiname and Chichicaste near the head of the San Juan river. Between these two extremes the chief cones, proceeding southwards, are: the Maribios chain, comprising El Viejo (5840 ft.), Santa Clara, Telica, Orota, Las Pilas, Axosco, Momotombo (4127 ft.), all crowded close together between the Bay of Fonesca and Lake

Managua; Masaya or Popocatepac (which was active in 1670, 1782, 1857 and 1902, and attains a height of 2972 ft.), and Mombacho (4593 ft.), near Granada; lastly, in Lake Nicaragua the two islands of Zapatera and Ometepe or Omotepec with its twin peaks Ometepe (5643 ft.) and Madera. On the 20th of January 1835 Coseguina was the scene of one of the most tremendous eruptions on record. The outbreak lasted four days and the volcanic dust and ashes erupted fell over a vast area, which comprised Jamaica, southern Mexico and Bogotá. After a long repose Ometepe also burst into renewed activity on the 19th of June 1883, when the lavas from a new crater began to overflow and continued for seven days to spread in various directions over the whole island. In the Maribios district occur several volcanic lakelets, such as that of Masaya, besides numerous *infernillos*, low craters or peaks still emitting sulphurous vapour and smoke, and at night often lighting up the whole land with bluish flames.

In the great lacustrine depression of Nicaragua is collected all the drainage from the eastern versant of the volcanic mountains, from the sheer western escarpment of the main cordillera, and from a large area of northern Costa Rica. The only river which flows out of the depression on the north enters the Bay of Fonseca at Tempisque. The accumulated waters which pour down into the depression are gathered into the two basins of Lake Managua and Lake Nicaragua. Both basins have a maximum depth of some 260 ft. Lake Managua, the more northerly, has a length of 30 m. and varies in breadth from 8 to 16 m. Its area is about 575 sq. m. After the rains a portion of its overflow escapes southwards into the lower and larger Lake Nicaragua, through the Panaloya channel. Steamers ply on both lakes, but the channel is rendered impassable by a rapid near the town of Tipitapa, at its northern extremity. Here there is a waterfall of 13 ft. The existence of ancient lacustrine beaches, upheaved between the two basins by volcanic agencies or left dry by some enlargement of the San Juan outfall, and a consequent subsidence of the water-level, seems to indicate that the lakes were formerly united. Now, however, Lake Managua is almost a closed basin in the dry season, when the stream in parts of the Panaloya channel sinks to a mere rivulet. The surface of Lake Nicaragua after the rains is 110 ft. above sea-level. The lake is 100 m. long, and has a maximum breadth of 45 m. and an area of 2970 sq. m. It is thus the largest sheet of fresh water between Lake Michigan and Lake Titicaca on the borders of Bolivia and Peru. Towards the San Juan outlet its depth decreases to 6 or 8 ft., owing to the vast accumulation of the silt washed down into the lake by its principal Costa Rican affluent, the Rio Frio. Much of this silt is again carried away by the San Juan. Under the influence of the intermittent trade-winds Lake Nicaragua rises and falls regularly, whence the popular notion that it was a tidal lake. It is also exposed to the dangerous Papagayos tornadoes, caused by the prevailing north-easterly winds meeting opposite currents from the Pacific. It is drained on the south by the San Juan river, which flows generally east by south to the Caribbean Sea. The distance from the lake to the principal or Colorado mouth of the river is 95 m., and the average width of the channel 1500 ft. Near its mouth the main stream branches out into a wide delta. Navigation is greatly impeded by shifting banks of silt, and especially by five rapids which can only be traversed when the river is in full flood. It is often asserted that these rapids were artificially formed by the Spaniards themselves to prevent the buccaneers from penetrating to Lake Nicaragua. But Herrera (*Dec.* iii. book 2, chap. 3) speaks of the "great rocks and falls" which prevented Cordova, the first circumnavigator of the lake, from descending the San Juan in 1522; and although the English traveller Gage states that in his time (17th century) vessels reached Granada direct from Spain, there can be little doubt that the rapids are natural obstructions. The various schemes which have been put forward for the conversion of the San Juan and the lacustrine depression into an interoceanic waterway are fully discussed under Panama Canal.

The main Nicaraguan cordillera, which flanks the depression on the east, has often been called the Cordillera de los Andes, from its supposed continuity with the mountain-chains of Panama and the west coast of South America. There is in fact no such continuity, for the San Juan valley completely separates the mountains of Panama from the main Nicaraguan system. This severance, it is true, may be geologically recent, and some geologists see, in the five rapids of the San Juan, remnants of a connecting ridge which the river has swept away. But the evidence for past continuity is inconclusive, while there can be no doubt about the present severance of the two mountain systems. The main cordillera bears different names in different parts of Nicaragua. Thus the important section which terminates at Monkey Point is commonly called the Cordillera de Yolaina. The summits of the main cordillera seem nowhere to exceed 7000 ft. in altitude; the mean elevation is probably less than 2000 ft.; the declivity is sheer towards the lakes, and gradual towards the Caribbean. Along the shores of the lakes the cordillera may be described as a double range, consisting of two series of ridges divided by a great longitudinal valley. The lower series, which adjoins the lakes, rises near Lake Managua, and marches parallel to the main crest of the cordillera as far as the northern base of the Yolaina section; it then diverges, trending south-east nearly as far as Greytown, while the axis of the Yolaina section has a more easterly direction.

On the east, the main cordillera abuts upon the region of plateaus and savannas, which occupies nearly half of the area of Nicaragua. It is likely that this region was once a single uniform tableland, sloping by degrees to the flat Mosquito Coast, in which direction its level still sinks. But the relief of the tableland has been wholly changed by fluvial action. The great rivers which flow eastward to the sea have fissured and moulded the surface into deep ravines alternating with high plateaus, ridges and isolated hills. Large tracts of these uplands have never been adequately explored, and consist of virgin forest and prairie. The principal river is the Segovia, which rises in the main cordillera due north of Lake Managua, winds E.N.E. as far as 85° W., and constitutes the frontier until it reaches the sea at Cape Gracias à Dios, after a course of more than 450 m., during which it receives many tributaries. Its basin is narrow and its volume not remarkable, but in length it surpasses all other Central American rivers. Its nomenclature, like that of many lesser streams in the plateau region, is somewhat confusing; for while the Spanish colonists were settling beside its headwaters the mid-stream was hardly known except to the native Indians, and the lower reaches were frequented by buccaneers, often of British or Dutch origin. In addition to the three names of Segovia, Coco or Cocos, and Wanks, which are applicable to the whole river, different parts have from time to time received the names of Cabullal, Cabrugal, Cape River, Encuentro, Gracias, Herbias, Oro, Pantasma, Portillo Liso, Tapacac, Telpaneca, Somoro, Yankes, Yare and Yoro. Other important streams, all flowing to the Caribbean in a direction E. by S., are the Hueso, Wawa, Cuculaia, Prinzapolca, Rio Grande, Bluefields and Rama. The Rio Grande or Amaltara, which receives one large tributary, the Tuma, is navigable for about 100 m. The Bluefields, Blewfields, Escondida, or Rio del Desastre, which derives its best-known name from that of Blieveldt, a Dutch corsair, is navigable for 65 m. The hydrography of Nicaragua is curious in two respects: as in the Amazonian region all the large rivers flow east, none escaping to the Pacific; and the main watershed does not correspond with the main cordillera, which is inferior in this particular both to the volcanic mountains and to the plateau region.

The geology, fauna and flora of Nicaragua may be studied in connexion with those of the neighbouring countries (see Central America).

Climate.—The climate is mild and healthy for Europeans on the uplands, such as those of Segovia and Chontales, which have a mean elevation of 2000 to 3000 ft. above sea-level. But elsewhere it is distinctly tropical, with two seasons—wet from May to November on the Pacific slope, and from June to December on the Caribbean, and dry throughout the winter months. The mean annual temperature is about 80° Fahr., falling to 70° at night and rising to 90° at noon in summer. Nicaragua comes within the zone of the wet north-east trade-winds, which sweep inland from the Atlantic. The rainfall is heavy along the west side of the lacustrine basin, with an annual mean at Rivas of 102 in., but this figure is sometimes greatly exceeded on the east coast, where rain is common even in the dry season. Observations made at Greytown in 1890 showed the extremes of temperature to be 89° Fahr. in September for the maximum and 70° Fahr. in January for the minimum; the rainfall for the whole year amounted to 297 in., the rainiest month having been July (52·5 in.) and the driest, May (4·9 in.). Earthquakes are felt at times on the Pacific slope, but in Nicaragua they are less violent than in the neighbouring countries.

Inhabitants.—Accurate statistics as to the growth and distribution of the population cannot be obtained, and the figures given below are based on estimates which can only be approximately correct. The census of 1882 gave the total as 275,816; this appears to have risen in 1890 to 375,000, in 1900 to 500,000, and in 1905 to 550,000, or 11 inhabitants per sq. m. There can thus be no doubt that the population is increasing with extraordinary rapidity, although there is hardly any immigration. The number of Europeans and their pure-blooded descendants is about 1200, and tends to increase. Spanish and German elements preponderate in the foreign colonies. The most densely peopled region and the focus of civilization is the lacustrine depression and the surrounding uplands. Here are all the large towns, and hither European settlers were attracted from the first by the temperate climate, rich soil, and natural waterways. The development of Nicaragua, unlike that of most American countries (notably Brazil and the United States), has been from west to east. The great mass of the population is a composite race, descended chiefly from the native "Indians," their Spanish conquerors, many of whom were Galicians, and the negro slaves introduced during the colonial period. Intermarriage with British, Dutch, and French with Caribs and Creoles has further complicated the ethnology of the country, producing "Indians" with fair hair and blue eyes, and half-castes with European features and Indian or negroid coloration, or with European coloration and Indian or negroid features. The prevailing language is a degenerate form of Spanish, nearer to Galician than to Castilian. Most of the native dialects have ceased to exist, but a corrupt form of English is spoken on parts of the east coast. All who speak Spanish are classed as Ladinos; the half-castes generally are termed Mestizos; and the name of Sambos or Zambos is confined to the descendants of Indian and negro parents; these are also incorrectly called Caribs. The number of the uncivilized Indians, whose camps or villages are situated in open glades among the forests of the plateau region, is usually estimated at 30,000; but this would seem to be an exaggeration. Pure-blooded Indians are not numerous, as whole districts were depopulated and whole tribes exterminated by the Spanish colonists and the buccaneers. A few may be descendants of the Aztecs and Mayas, whose temples, sculptures, burial-grounds, &c., have not yet been fully explored. For a general account of this ancient civilization and of the Indian tribes see Central America and Mexico: *Archaeology*. A collection of Nicaraguan antiquities is preserved in the National Museum at Washington, U.S.A.; and the archaeological collection brought to Europe by Dr W. Lehmann in 1910 was exhibited in the Berlin Museum of Fine Arts.

Chief Towns and Communications.—The capital is Managua (pop. 1905, about 30,000); other important towns are Leon (45,000), Granada (25,000), Masaya (20,000), Chinandega (12,000), and the seaports of Corinto (3000) and Greytown (2500). These are described in separate articles. At the beginning of the 20th century, Nicaragua had few good roads, and none at all east of the main cordillera. Transport in the plateau region was mainly effected by means of pack mules, over the roughest of tracks. But between 1900 and 1905 contracts were signed for the construction of three highways, leading respectively from Matagalpa, from Nueva Segovia and from the Pis Pis mining district to the head of steam navigation on the Segovia, about 160 m. above Cape Gracias. These highways were to be linked to the western system by 79 m. of road connecting Matagalpa with Momotombo. For the construction and upkeep of roads a tax varying from one to ten pesos is levied on all males over eighteen years old. There are 160 m. of state railways, running from Corinto to Leon, Managua, Granada and Diriamba, with branches to El Viejo and Momotombo. Contracts for additional lines were signed between 1900 and 1905. The steamers which ply on the great lakes and the San Juan, besides other vessels which visit the principal Caribbean and Pacific ports, are national property; but from the 1st of January 1905 all the state railways were leased to a syndicate for fifteen years and the steamers for twenty-five years. There are also 20 m. of private railway near the mouth of the Rio Grande, and private steam tramways on the western shore of Lake Nicaragua. Corinto is the headquarters of shipping; it is visited by two-thirds of the 2100 vessels of 550,000 tons (including coasters) which annually enter the ports of the republic. The coasting trade is restricted to vessels under the Nicaraguan flag. At the beginning of the 20th century most of the ocean-going steamers were owned in Germany or the United States; British enterprise being chiefly represented by schooners trading from Jamaica to Bluefields and Greytown. Nicaragua joined the postal union in 1882, and the western provinces have a fairly complete telegraphic and telephonic system.

Industries and Commerce.—The principal agricultural product is coffee, the yield of which increased from 4,528,300 ℔ in 1880 to 11,382,000 ℔ in 1890, and 26,400,000 ℔ in 1900. Coffee is grown principally in the Matagalpa region, on the uplands of the interior. The plantations are chiefly owned and managed by Germans, and the product is of good quality; but coffee-planting, like most Nicaraguan industries, suffers from the scarcity of labour. On the Caribbean coast bananas are cultivated and largely exported to the United States. In 1903 more than 2,000,000 bunches were consigned to New Orleans. The cultivation of cotton has been often attempted, but with little success. Sugar is grown and there are many small sugar factories, but little of the output is exported. The cocoa export is also small; tobacco, rice, beans and other crops are grown for local use. Rubber is collected in the forests, and plantations have been formed. Dye-woods and indigo are exported, but the demand for vegetable dyes has decreased. Cattle-rearing is successfully pursued, live cattle and hides being important articles of export. Cheese and butter are manufactured in large quantities for home consumption. Horses and pigs are also reared, but not sheep. In 1899 the government sold about 52,000 acres of public land lying about 18 m. E. of Lake Nicaragua for the purpose of colonization. The purchaser undertook to introduce settlers from northern Europe, to import cattle for the improvement of the Nicaraguan breed, to plant rubber and vanilla, and to provide schools for agricultural instruction. The sale of Nicaraguan spirits is a state monopoly. From the 1st of January 1904 it was leased to a syndicate of distillers for six years. Gold-mining is carried on along the Caribbean littoral. In 1898 the gold dust and bar exports from Bluefields were of the value of £25,760; in 1900, £62,000; and in 1907, £65,000. Copper, coal, petroleum, silver and precious stones are also found, and there seems little reason to doubt that the mineral resources of Nicaragua, though undeveloped, are nearly as rich as those of Honduras. Other industries include manufactures of leather, boots and shoes, furniture, bricks and pottery, cigars and cigarettes, beer, wine and spirits, candles and soap. The largest and most numerous commercial firms are German, but there are also French, British, and even Chinese establishments, although the immigration of Chinese is prohibited by law. The principal exports are (in order of value) coffee, bananas, gold, rubber, cattle and hides, dye-woods and cabinet woods. The principal imports are cotton and woollen goods, machinery and hardware, flour, beer, wine, spirits and drugs. The United States and Great Britain send respectively 60% and 20% of the imports, receiving 60% and 8% of the exports. The average yearly value of the foreign trade is about £1,200,000—exports, £700,000; imports, £500,000.

Money, Weights and Measures.—There is one bank of issue, the Bank of London and Central America, which has a capital of £260,000 (£130,300 paid). The monetary unit is the silver peso or dollar of 100 cents, which weighs 25 grammes, ·900 fine. The current coin consists largely of Mexican and Central and South American dollars; but little coin is in circulation. The currency is mostly paper, notes being issued directly by the treasury and by the bank. The notes issued by the bank must be covered to the extent of 40% by gold and silver; the actual bank reserve is stated to be from 65 to 100% of the notes issued. The value of the paper peso fluctuates; in 1904 the premium on gold stood at 640%. The value of the silver peso in fractional silver money is about nineteen pence; in a single coin about twenty pence. The exportation of silver pesos is prohibited. In 1899 a nickel coinage was introduced. The metric system of weights and measures was legalized in January 1893.

Finance.—The revenue of the republic is derived mainly from customs duties, liquor, tobacco and slaughter taxes, railways and steamers, the postal and telegraph services, and the gunpowder monopoly. The principal spending departments are those of war and marine, internal development, and finance. The published accounts, however, present no continuous or clear view of the national receipts and disbursements. Revenue and expenditure vary considerably, but neither often falls below £300,000 or rises above £500,000. In 1886 the republic contracted a railway loan in London to the amount of £285,000 at 6% interest, and in July 1894 the interest fell into default. In 1895 an arrangement was made for the reduction of interest to 4%, the beginning of amortization, and the creation of "coffee warrants" to be used in the payment of export duties on coffee assigned for the service of the debt. In the four years 1897–1900 the sales of these warrants amounted to 1,028,990 gold pesos or (at 23d., the average rate for this period) £98,610. In July 1905 the outstanding amount of the debt was £253,600. In 1905 a further loan of 12,500,000 francs (£500,000) was raised in Paris at 5%. The internal debt amounts to about £400,000.

Constitution and Administration.—The former constitution, proclaimed on the 4th of July 1894 and amended on the 10th of December 1896, was superseded on the 30th of March 1905, when a new constitution was promulgated. By this instrument the legislative power is vested in a single chamber of 36 members (instead of 40, as under the old constitution), elected by universal male suffrage for six years (instead of two). The executive is entrusted to a president similarly chosen for six years (instead of four) and aided by a cabinet representing the five ministries of foreign affairs and education, finance, internal administration and justice, war and marine, and public works. For administrative purposes the republic is divided into 13 departments and 2 comarcas, each under a political head who acts as military commandant and controls education, finance, &c. The administration of justice is entrusted to numerous courts of first instance, three courts of appeal, and a supreme court. The active army of 4000 men can be increased to 40,000 in war. All able-bodied citizens between the ages of seventeen and fifty-five are compelled to serve one year with the colours and are then enrolled in the reserve. Roman Catholicism is the prevailing creed, but all religions are tolerated, and none receives any endowment or other special privilege from the state. The bishop of Leon, whose diocese is included in the archiepiscopal province of Guatemala, is the spiritual head of the Roman Catholics. There are numerous elementary schools, at which the teaching is free and compulsory, besides ten colleges for secondary or technical education, and two universities.

History.—For a general account of the Spanish administration during the colonial period, *i.e.* up to 1821, and of the subsequent attempts to unite all the Central American republics in a single federal state, see CENTRAL AMERICA. The history of the Mosquito Reserve and of the relations between Nicaragua and Great Britain is told in full under MOSQUITO COAST.

First discovered by Columbus in 1502, Nicaragua was not regularly explored till 1522, when Gil Gonzalez Davila penetrated from the Gulf of Nicoya to the western provinces and sent his lieutenant Cordova to circumnavigate the great lake. The country is said to take its name from Nicaras or Nicaragua (also written Micaragua), a powerful Cholutec chief, ruling over most of the land between the lakes and the Pacific, who received Davila in a friendly spirit and accepted baptism at his hands. Nicaragua's capital seems to have occupied the site of the present town of Rivas. The Spaniards overran the country with great rapidity, both from this centre northwards, and southwards from the Honduras coast. The occupation began with sanguinary conflicts between the two contending waves of intrusion. Granada was founded in 1524 on the isthmus between the two lakes as the capital of a separate government, which, however, was soon attached as a special province to the captaincy general of Guatemala, which comprised the whole of Central America and the present Mexican state of Chiapas. Hence, during the Spanish tenure, the history of Nicaragua is merged in that of the surrounding region. Of its five earliest rulers "the first had been a murderer, the second a murderer and rebel, the third murdered the second, the fourth was a forger, the fifth a murderer and rebel" (Boyle). Then came the hopeless revolts of the Indians against intolerable oppression, the abortive rebellions of Hernandez de Contreras and John Bermejo (Bermudez) against the mother country (1550), the foundation of Leon, future rival of Granada, in 1610, its sack by the buccaneers under William Dampier in 1685, and, lastly, the declaration of independence (1821), not definitively acknowledged by Spain till 1850.

In 1823 Nicaragua joined the Federal Union of the five Central American states, which was dissolved in 1839. While it lasted Nicaragua was the scene of continual bloodshed, caused partly by its attempts to secede from the confederacy, partly by its wars with Costa Rica for the possession of the disputed territory of Guanacaste between the great lake and the Gulf of Nicoya, partly also by the bitter rivalries of the cities of Leon and Granada, respective headquarters of the Liberal and Conservative parties. During the brief existence of the Federal Union no fewer than three hundred and ninety-six persons exercised the supreme power of the republic and the different states. The independent government of Nicaragua was afterwards distinguished almost beyond all other Spanish-American states by an uninterrupted series of military or popular revolts, by which the whole people was impoverished and debased. One outstanding incident was the filibustering expedition of William Walker (*q.v.*), who was at first invited by the Liberals of Leon to assist them against the Conservatives of Granada, and who, after seizing the supreme power in 1856, was expelled by the combined forces of the neighbouring states, and on venturing to return was shot at Trujillo in Honduras on the 12th of September 1860.

Under the administration of Chamorro, who became president in 1875, a difficulty with Germany occurred. The German government asserted that one of its consuls had been insulted, and demanded an indemnity of $30,000 (about £2800), a demand to which Nicaragua only submitted after all her principal ports had been blockaded. The successor of President Chamorro was General Zavala, whose administration brought Nicaragua to a higher degree of prosperity than she had ever known. He was succeeded in 1883 by Dr Cárdenas, during whose presidency the attempt of General Barrios to unite the five Central American states was a cause of war between Guatemala and Honduras on one side, and Salvador, Nicaragua, and Costa Rica on the other. Cárdenas had taken command of the united Nicaraguan and Costa Rican army when Barrios died, and on the 11th of April 1885 a treaty of peace was signed. Don Evaristo Carazo succeeded Dr Cárdenas as president of the republic in 1887, but died when he had served a little over two years, and was succeeded by Dr Roberto Sacasa. Under Carazo's administration the boundary question between Nicaragua and Costa Rica had been settled by arbitration, the president of the United States acting as arbitrator. While Dr Sacasa was president of Honduras, Salvador and Guatemala signed a treaty, under which the United States of Central America were to be formed. The president of Nicaragua adhered to this treaty, but the National Congress refused to ratify it. Sacasa was overthrown by a revolution in 1893, and was succeeded by a provisional government, which in its turn was deposed soon after by another uprising, at the head of which was General José Santos Zelaya. His position was regularized by the constitution of 1894, and he was re-elected president in 1898 for another term of four years. Under his government the incorporation of the Mosquito Reserve into the territory of Nicaragua took place. In 1895 occurred the Hatch incident, which led to the occupation of the port of Corinto by a British fleet. Mr Hatch, British pro-vice-consul at Bluefields, being accused of conspiracy against the Nicaraguan government, was arrested, along with other British subjects, and expelled. For this action Nicaragua was required to pay an indemnity of $15,000. An attempt to overthrow Zelaya was made in February 1896, but it was crushed after several months of severe fighting. There were occasional disturbances subsequently, but none sufficient to overturn President Zelaya, who was again re-elected in 1902 and 1906. In 1907 he carried to a successful issue the war which broke out in that year between Nicaragua and Honduras (*q.v.*). But he was believed to be planning the conquest of other Central American states, and his policy of granting monopolies and commercial concessions to his own supporters aroused widespread discontent. In October 1909 an insurrection broke out in the Atlantic departments. The execution (after alleged torture) of two citizens of the United States named Grace and Cannon, who were said to have fought in the revolutionary army under General Estrada, led to the despatch of United States warships to Nicaragua; but in the absence of full evidence President Zelaya's responsibility for the execution could not be proved.[1] On the 1st of December the United States broke off diplomatic relations with Nicaragua, and in an official note Secretary Knox described the Zelayan administration as a "blot on the history" of the republic. Fighting at Bluefields was prevented by the U.S. cruiser "Des Moines" (18th December), an example followed at Greytown by the British cruiser "Scylla"; but elsewhere along the Atlantic coast the insurgents gained many victories. In the battle of Rama (23rd December) they captured the greater part of the government troops. On the following day Zelaya took refuge on board a Mexican gunboat, and sailed for Mexico. Dr Madriz, one of his supporters, had already succeeded him as president.

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NICASTRO, a town and episcopal see of Calabria, Italy, in the province of Catanzaro, 17 m. W.N.W. of Catanzaro by rail, and 5½ m. E. of S. Eufemia, a station on the line along the west coast from Naples to Reggio di Calabria. Pop. (1901) 13,671 (town), 18,150 (commune). It is situated on the isthmus between the gulfs of S Eufemia and of Squillace, the narrowest part of Calabria, 970 ft. above sea-level, and commands a fine view. The ruined castle served as the place of imprisonment of Frederick II.'s son Henry. The place suffered greatly from the earthquake of 1638, which also destroyed the Benedictine abbey of S Eufemia, founded by Robert Guiscard.

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[1] General Medina and other officers were tried by a Nicaraguan court-martial for the murder of Grace and Cannon, but were acquitted on the 28th of January 1910.

NICCOLI, NICCOLO DE' (1363–1437), Italian humanist, was born and died at Florence. He was one of the chief figures in the company of learned men which gathered round Cosimo de' Medici, who played the part of Augustus to Niccoli's Maecenas. Niccoli's chief services to classical literature consisted in his work as a copyist and collator of ancient MSS.; he corrected the text, introduced divisions into chapters, and made tables of contents. His lack of critical faculty was compensated by his excellent taste; in Greek (of which he knew very little) he had the assistance of Ambrogio Traversari. Many of the most valuable MSS. in the Laurentian library are by his hand, amongst them those of Lucretius and of twelve comedies of Plautus. Niccoli's private library was the largest and best in Florence; he also possessed a small but valuable collection of ancient works of art, coins and medals. He regarded himself as an infallible critic, and could not bear the slightest contradiction; his quarrels with Filelfo, Guarino and especially with Traversari created a great sensation in the learned world at the time. His hypercritical spirit (according to his enemies, his ignorance of the language) prevented him from writing or speaking in Latin; his sole literary work was a short tract in Italian on Latin Orthography, which he withdrew from circulation after it had been violently attacked by Guarino.

See the *Life* in *Traversarii Epistolae* (ed. L. Mehus, 1759); G. Voigt, *Die Wiederbelebung des klassischen Altertums* (1893); G. Zippel, *Nicolò Niccoli* (Florence, 1890).

NICCOLITE, a mineral consisting of nickel arsenide, NiAs, containing 43·9% nickel and 56·1% arsenic. Crystals are hexagonal, but are rare and indistinct. It usually occurs as compact masses. A characteristic feature is the pale copper-red colour, with metallic lustre, on the uneven fractured surfaces. It is opaque and brittle, and the streak is brownish-black. The specific gravity is 7·5, and the hardness 5½. Small quantities of sulphur, iron and cobalt are usually present, and sometimes the arsenic is largely replaced by antimony. Antimonial varieties are known as arite, and form a passage to the isomorphous species breithauptite (nickel antimonide). Niccolite occurs with ores of cobalt, silver and copper at Annaberg and Schneeberg in Saxony, at Sangerhausen and Mansfeld in Prussian Saxony and other localities; it has occasionally been found in Cornwall and Scotland. The original arite (aarite) is from Mount Ar (Aar) near Pic du Midi d'Ossau in the Pyrenees.

The names niccolite (J. D. Dana, 1868) and nickeline (F. S. Beudant, 1832) refer to the presence of nickel (Lat. *niccolum*). Owing to its copper-red colour the mineral is commonly called "copper-nickel," the German equivalent of which, *Kupfernickel*, was used as early as 1694. (L. J. S.)

NICE, a city of France, the chief town of the department of the Alpes Maritimes, and previous to 1860 the capital of the county of Nice (Nizza) in the kingdom of Sardinia, 739 m. by rail from Paris. Pop. (1901) 127,027, of whom 105,109 were permanent residents; in winter-time there is a large influx of visitors. It occupies a fine position at the mouth of the Paillon (Paglione), a stream (often dried up in summer) which, after a course of 20 m., enters the northern end of the Baie des Anges. A steep isolated limestone hill, 308 ft. in height, running back for some distance from the shore, forms the historical nucleus of the town. Formerly crowned by a castle, which, previous to its destruction by the duke of Berwick in 1706, was one of the strongest fortresses on the coast, it is now laid out as a public pleasure-ground, and planted with aloe, cactus, agave and palm. Towards its south-west corner stands a tower (Tour Bellanda or Clérissy) dating, it is said, from the 5th century. The old town stretches along the western base of the hill; the "town of the 18th century" occupies the ground farther west, which slopes gently towards the Paillon; and away to the north-east and north and west beyond the stream lie the ever-growing quarters of the modern city. To the east of the hill, and thus out of sight of the more fashionable districts, the commercial quarter surrounds the port. The whole frontage of Nice is composed of fine embankments: the Quai des Ponchettes, constructed in 1770 round the base of the castle hill, is continued westward by the Quai du Midi to the public gardens and the municipal casino, whence the Promenade des Anglais (so called because it was begun in 1822–1824 at the cost of the English colony), a boulevard 85 ft. wide, extends for more than a mile to the mouth of the Magnan, and in 1904 was prolonged to the Var. A pier projecting into the sea from the promenade contains a "crystal palace." The course of the Paillon also is embanked on both sides, and at one part the Place Masséna, one of the largest public squares in the city, and the principal resort of foreign visitors, and the Avenue Masséna (leading thence to the Promenade des Anglais) have been laid out across the stream. Besides a Roman Catholic cathedral—Ste Réparate, dating from 1650—Nice possesses two Russian churches, two synagogues and an Anglican chapel. Architecturally the most remarkable church is Notre Dame du Voeu, a modern Gothic building with two towers 213 ft. high, erected by the town in 1835 to commemorate its preservation from cholera. The secular buildings include the town hall, the prefecture, the theatres, the hospitals, the lycée (founded by the Jesuits in the 17th century), the natural history museum, the library (especially rich in theology), and, at some distance from the town, the astronomical and meteorological observatory on Mont Gros (1220 ft.). The industrial establishments comprise perfumery factories, distilleries, oil-works, furniture and wood-work factories, confectionery works, soap-works, tanneries and a national tobacco factory employing several hundred persons. Besides the vine, the trees principally cultivated in the neighbourhood are the olive, the orange, the mulberry and the carob; and the staple exports are oil, agricultural produce, fruits and flowers.

Nice now joins on the north-east the ancient episcopal town of Cimiez, in which are situated the largest and most elegantly appointed hotels. Reckoning from east to west the town is surrounded by a girdle of beautiful towns—Carabacel, St Etienne, St Philippe and Les Beaumettes. On the east of the port lie Montboron, Riquier and St Roch, the last partly occupied by barracks. The entrances to the port of Nice and the outer pier have been improved; that of the outer port is 300 ft. wide, and that of the inner 220 ft. The area of the port is about 15 acres, the length of quayage available 3380 ft., the depth of water 20 ft., its trade, mostly coastal, being shared principally between French and Italian vessels, the arrivals being about 1235 vessels of some 300,000 tons annually. Nice is an episcopal see (first mentioned at the end of the 4th century) which since 1860 is in the ecclesiastical province of Aix en Provence. It is the headquarters of a military division forming part of the corps d'armée of Marseilles. Protected towards the north by hills which rise stage behind stage to the main ridge of the Alps, Nice is celebrated for the mildness of its climate. The mean temperature is 60° Fahr., that of winter being 49°, of spring 56°, of summer 72° and of autumn 63°. For a few nights in winter the mercury sinks below freezing point, but snow is practically unknown, falling, on an average, only half a day in the year. The highest reading of the thermometer is rarely above 90°. There are sixty-seven days with rain in the course of the year; but it usually falls in heavy showers which soon leave the sky clear again, though the whole annual amount exceeds 32 in. Fine days and rainy days are almost equally distributed throughout the different seasons. The winds are very variable, sometimes changing several times a day. Apart from the ordinary land and sea breezes, the most frequent is the east wind, which is especially formidable during autumn. The south-west wind (called *Libeccio*, or wind of Lybia) is moist and warm; the north-east (or *Gregaou*, Greek), which is happily rare, brings storms of hail and even snow in winter. The mistral (from the north-west) and the tramontane (from the north) are generally stopped by the mountains; but when they do reach the city they raise intolerable dust-storms. For two thousand years the climate of Nice has been considered favourable in chest complaints. Those who are requiring rest, and those suffering from gout, asthma, catarrhs, rachitic affections, scrofula, stone, also experience benefit; but the reverse is the case when heart disease, nervous disorders or ophthalmia are concerned. Autumn is the best season; in spring the sudden changes of temperature demand great care. Means of passing the time pleasantly are fairly abundant. The city is at its liveliest during the carnival festivities, in which, as at Rome, battles are waged with sweetmeats and flowers.

History.—Nice (*Nicaea*) was founded about two thousand years ago by the Phocaeans of Marseilles, and received its name in honour of a victory (*νίκη*) over the neighbouring Ligurians. It soon became one of the busiest trading stations on the Ligurian coast; but as a city it had an important rival in the town of Cemenelum, which continued to exist till the time of the Lombard invasions, and has left its ruins at Cimiez, 2½ m. to the north. In the 7th century Nice joined the Genoese league formed by the towns of Liguria. In 729 it repulsed the Saracens; but in 859 and 880 they pillaged and burned it, and for the most of the 10th century remained masters of the surrounding country. During the middle ages Nice had its share in the wars and disasters of Italy. As an ally of Pisa it was the enemy of Genoa, and both the king of France and the emperor endeavoured to subjugate it; but in spite of all it maintained its municipal liberties. In the course of the 13th and 14th centuries it fell more than once into the hands of the counts of Provence; and at length in 1388 it placed itself under the protection of the counts of Savoy. The maritime strength of Nice now rapidly increased till it was able to cope with the Barbary pirates; the fortifications were largely extended and the roads to the city improved. During the struggle between Francis I. and Charles V. great damage was caused by the passage of the armies invading Provence; pestilence and famine raged in the city for several years. It was in Nice that the two monarchs in 1538 concluded, through the mediation of Paul III., a truce of ten years; and a marble cross set up to commemorate the arrival of the pope still gives its name, Croix de Marbre, to part of the town. In 1543 Nice was attacked by the united forces of Francis I. and Barbarossa; and, though the inhabitants, with admirable courage, repulsed the assault which succeeded the terrible bombardment, they were ultimately compelled to surrender, and Barbarossa was allowed to pillage the city and to carry off 2500 captives. Pestilence appeared again in 1550 and 1580. In 1600 Nice was taken by the duke of Guise. By opening the ports of the countship to all nations, and proclaiming full freedom of trade, Charles Emmanuel in 1626 gave a great stimulus to the commerce of the city, whose noble families took part in its mercantile enterprises. Captured by Catinat in 1691, Nice was restored to Savoy in 1696; but it was again besieged by the French in 1705, and in the following year its citadel and ramparts were demolished. The treaty of Utrecht in 1713 once more gave the city back to Savoy; and in the peaceful years which followed the "new town" was built. From 1744 till the peace of Aix-la-Chapelle (1748) the French and Spaniards were again in possession. In 1775 the king of Sardinia destroyed all that remained of the ancient liberties of the commune. Conquered in 1792 by the armies of the French Republic, the county of Nice continued to be part of France till 1814; but after that date it reverted to Sardinia. By a treaty concluded in 1860 between the Sardinian king and Napoleon III. it was again transferred to France, and the cession was ratified by over 25,000 electors out of a total of 30,700.

See L. Durante, *Histoire de Nice* (3 vols., Turin, 1823–1824); J. N. Fervel, *Histoire de Nice et des Alpes Maritimes depuis 21 siècles* (Paris, 1862); E. Tisserand, *Histoire civile et religieuse de la cité de Nice* (2 vols., Nice, 1862); *Cartulaire de l'ancienne cathédrale de Nice* (Turin, 1888).

NICE, an adjective which in present usage has two main meanings: (1) fastidious, particular, precise or scrupulous, and (2) pleasant, kind or agreeable. The first meaning has been common since the 16th century, the second only since the end of the 18th. In O. Fr., from which the English form was adapted, the word is *niche* or *nice*, which are derivatives of Lat. *nescius*, not knowing, ignorant. The development in meaning is doubtful; some authorities take it as (1) foolish, (2) foolishly precise, (3) delicate, (4) pleasant. Skeat suggests an early confusion with the word "nesh," soft, delicate, still surviving dialectically.

NICEPHORUS, the name of three emperors of the East.

Nicephorus I., emperor 802–811, was a native of Seleucia in Pisidia, who was raised by the empress Irene to the office of *logothetes* or lord high treasurer. With the help of the patricians and eunuchs he contrived to dethrone and exile Irene, and to be elected emperor in her stead. His sovereignty was endangered by Bardanes, one of his ablest generals, who revolted and received support from other commanders, notably the later emperors Leo the Armenian and Michael the Amorian. But Nicephorus gained over the latter two, and by inducing the rebel army to disperse achieved the submission of Bardanes, who was relegated to a monastery. A conspiracy headed by the patrician Arsaber had a similar issue. Nicephorus, who needed large sums to strengthen his military force, set himself with great energy to increase the empire's revenue. By his rigorous imposts he alienated the favour of his subjects, and especially of the clergy, whom he otherwise sought to control firmly. In 803 and 810 he made a treaty with Charlemagne, by which the limits of the two empires were amicably fixed. Venice, Istria, the Dalmatian coast and South Italy were assigned to the East, while Rome, Ravenna and the Pentapolis were included in the Western realm. By withholding the tribute which Irene had agreed to pay to Harun al-Rashid, Nicephorus committed himself to a war with the Saracens. Compelled by Bardanes's disloyalty to take the field himself, he sustained a severe defeat at Crasus in Phrygia (805), and the subsequent inroads of the enemy into Asia Minor induced him to make peace on condition of paying a yearly contribution of 30,000 gold pieces. By the death of Harun in 809, Nicephorus was left free to deal with the Bulgarian king, Krum, who was harassing his northern frontiers. In 811 Nicephorus invaded Bulgaria and drove Krum to ask for terms, but in a night attack he allowed himself to be surprised and was slain along with a large portion of his army. Krum is said to have made a drinking-cup of Nicephorus's skull.

Nicephorus II. (Phocas), emperor 963–969, belonged to a Cappadocian family which had produced several distinguished generals. He was born about 912, joined the army at an early age, and, under Constantine VII., became commander on the eastern frontier. In the war with the Saracens he began with a severe defeat (956), which he retrieved in the years following by victories in Syria. In 960 he led an expedition to Crete, stormed Candia after a ten months' siege, and wrested the whole island from the Saracens. After receiving the unusual honours of a triumph, he returned to the east with a large and well-equipped army. In the campaigns of 962–63 by brilliant strategy he forced his way through Cilicia into Syria and captured Aleppo, but made no permanent conquests. Upon the death of Romanus II. he returned to Constantinople to defend himself against the intrigues of the minister Bringas. With the help of the regent Theophano and the patriarch, he received supreme command of the eastern forces, and being proclaimed emperor by these marched upon the capital, where meanwhile his partisans had overthrown his enemy Bringas. Thanks to his popularity with the army, Nicephorus was crowned emperor by the side of Romanus's infant sons, and in spite of the patriarch's opposition married their mother Theophano. During his reign he continued to wage numerous wars. In 964–966 he definitely conquered Cilicia and again overran Mesopotamia and Syria, while the patrician Nicetas recovered Cyprus. In 968 he reduced most of the fortresses in Syria, and after the fall of Antioch and Aleppo (969), which were recaptured by his lieutenants, secured his conquests by a peace. On his northern frontier he began a war against the Bulgarians, to whom the Byzantines had of late been paying tribute (967), and by instigating an attack from the

Russians distracted their attention effectively. Nicephorus was less successful in his western wars. After renouncing his tribute to the Fatimite caliphs, he sent an expedition to Sicily under Nicetas (964–65), but was forced by defeats on land and sea to evacuate that island completely. In 967 he made peace with the Saracens of Kairawan and turned to defend himself against their common enemy, Otto I. of Germany, who had attacked the Byzantine possessions in Italy; but after some initial successes his generals were defeated and driven back upon the southern coast. Owing to the care which he lavished upon the proper maintenance of the army, Nicephorus was compelled to exercise rigid economy in other departments. He retrenched the court largesses and curtailed the immunities of the clergy, and although himself of an ascetic disposition forbade the foundation of new monasteries. By his heavy imposts and the debasement of the coinage he forfeited his popularity with the rest of the community, and gave rise to riots. Last of all, he was forsaken by his wife, and, in consequence of a conspiracy which she headed with his nephew John Zimisces, was assassinated in his sleeping apartment. Nicephorus was the author of an extant treatise on military tactics which contains valuable information concerning the art of war in his time.

NICEPHORUS III. (Botaniates), emperor 1078–1081, belonged to a family which claimed descent from the Roman Fabii and rose to be commander of the troops in Asia. He revolted in 1078 from Michael VII., and with the connivance of the Turks marched upon Nicaea, where he assumed the purple. In face of another rebellious general, Nicephorus Bryennius, his election was ratified by the aristocracy and clergy. With the help of Alexius Comnenus he drove out of the field Bryennius and other rivals, but failed to clear the invading Turks out of Asia Minor. Nicephorus ultimately quarrelled with Alexius, who used his influence with the army to depose the emperor and banish him to a monastery. In the years of his reign he had entirely given himself over to debauchery.

See Gibbon, *Decline and Fall* (ed. Bury, 1896); Finlay, *Hist. of Greece*; G. Schlumberger, *Nicéphore Phocas* (Paris, 1890); K. Leonardt, *Kaiser Nicephorus II.* (Halle, 1887).

NICEPHORUS CALLISTUS XANTHOPOULOS, of Constantinople, the last of the Greek ecclesiastical historians, flourished 1320–1330. His *Historia Ecclesiastica*, in eighteen books, brings the narrative down to 610; for the first four centuries the author is largely dependent on his predecessors, Eusebius, Socrates, Sozomen, Theodoret and Evagrius, his additions showing very little critical faculty; for the later period his labours, based on documents now no longer extant, to which he had free access, though he used them also with small discrimination, are much more valuable. A table of contents of other five books, continuing the history to the death of Leo the Philosopher in 911, also exists, but whether the books were ever actually written is doubtful. Some modern scholars are of opinion that Nicephorus appropriated and passed off as his own the work of an unknown author of the 10th century. The plan of the work is good and, in spite of its fables and superstitious absurdities, contains important facts which would otherwise have been unknown. The history of the Latin Church receives little attention. Only one MS. of the history is known; it was stolen by a Turkish soldier from the library at Buda during the reign of Matthias Corvinus of Hungary and taken to Constantinople, where it was bought by a Christian and eventually reached the imperial library at Vienna. Nicephorus was also the author of lists of the emperors and patriarchs of Constantinople, of a poem on the capture of Jerusalem, and of a synopsis of the Scriptures, all in iambics; and of commentaries on liturgical poems.

Works in J. P. Migne, *Patrologia Graeca*, cxlv.-cxlvii.; see also F. C. Baur, *Die Epochen der kirchlichen Geschichtsschreibung* (1852); C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897); Wetzer and Welte's *Kirchenlexikon*, ix. (Freiburg im Breisgau, 1895).

NICEPHORUS PATRIARCHA (*c.* 758–829), Byzantine historian and patriarch of Constantinople (806–815). His father Theodorus, one of the secretaries of the emperor Constantine Copronymus, had been scourged and banished for his zealous support of image-worship, and the son inherited the religious convictions of the father. He was secretary to the imperial commissaries at the council of Nicaea in 787, which witnessed the triumph of his opinions; but, feeling dissatisfied with court life, he retired into a convent. In 806 he was suddenly raised by the emperor Nicephorus I. to the patriarchate of Constantinople, and this office he held until 815, when he accepted deposition rather than assent to the iconoclastic edict promulgated by Leo the Armenian in the previous year. He retired to the cloister of St Theodore, which he himself had founded, and died there in 829. After his death he was included among the saints of the orthodox church.

Nicephorus is the author of a valuable compendium (*Breviarium historicum*) of Byzantine history from 602 to 770, of a meagre *Chronologia compendiaria* from Adam to the year of his own death. The former contains an interesting account of the origin and migrations of the Bulgarians. Both will be found, together with some controversial writings and his biography by his pupil Ignatius, also patriarch of Constantinople, in J. P. Migne, *Patrologia Graeca*, c.; edition of the compendia and life by C. de Boor (1880, Teubner series); see also F. Hirsch, *Byzantinische Studien* (1876); J. Hergenröther, *Photius* (1867); C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897); Wetzer and Welte's *Kirchenlexikon*, ix. (Freiburg im Breisgau, 1895).

NICHE (through Fr. *niche* from Ital. *nicchia*, *nicchio*, shell; possibly from Lat. *mitulus*, a sea-mussel; cf. "napkin" from *mappa*), in architecture a recess sunk in a wall, generally for the reception of a statue. The niche is sometimes terminated by a simple label, but more commonly by a canopy, and with a bracket or corbel for the figure, in which case it is often called a "tabernacle."

NICHOL, JOHN (1833–1894), Scottish man of letters, son of the astronomer J. P. Nichol (1804–1859), was born on the 8th of September 1833, and educated at Glasgow and Balliol College, Oxford, where he had a brilliant career. After taking his first-class in classics, he remained at Oxford as a coach. With Albert Venn Dicey, Thomas Hill Green, Swinburne and others, he formed the Old Mortality Society for discussions on literary matters. In 1862 he was made professor of English literature at Glasgow. He had already made a reputation as an acute critic and a successful lecturer, and his influence at Glasgow was very marked. He visited the United States in 1865, and in 1882 he wrote the article on American literature for the ninth edition of the *Encyclopædia Britannica*—an article which is a good example of his pungent (sometimes unduly pungent) style. He left Glasgow for London in 1889, and died on the 11th of October 1894. Among his best works were his drama *Hannibal* (1873), *The Death of Themistocles, and other Poems* (1881), his *Byron* in the "English Men of Letters" series (1880), his *Robert Burns* (1882) and *Carlyle* (1892).

A *Memoir* by Professor Knight was published in 1896.

NICHOLAS, ST, bishop of Myra, in Lycia, a saint honoured by the Greeks and the Latins on the 6th of December. His cult is as celebrated as his history is obscure. All the accounts that have come down to us are of a purely legendary character, and it is impossible to find any single incident confirmed historically. The main facts of his life are usually given as follows. He was bishop of Myra in the time of the emperor Diocletian, was persecuted, tortured for the faith, and kept in prison until the more tolerant reign of Constantine, and was present at the council of Nicaea. It should be observed that this last circumstance is ignored by all the historians, and that St Athanasius, who knew all the notable bishops of the period, never mentions Nicholas, bishop of Myra. The oldest known monument of the cult of St Nicholas seems to be the church of SS Priscus and Nicholas built at Constantinople by the emperor Justinian (see Procopius, *De aedif.* i. 6). In the West, the name of St Nicholas appears in the 9th century martyrologies, and churches dedicated to him are to be found at the beginning of the 11th century. It is more especially, however, from the time of the removal of his body to Bari, in Apulia, that his cult became popular. The inhabitants of Bari organized an expedition, seized his remains by means of a ruse, and transported them to Bari, where they were received in triumph on the 9th of May

1087, and where the foundations were laid of a new basilica in his honour. This was the origin of a famous and still popular pilgrimage. There are nearly 400 churches in England dedicated to St Nicholas. He is the patron saint of Russia; the special protector of children, scholars, merchants and sailors; and is invoked by travellers against robbers. In art St Nicholas is represented with various attributes, being most commonly depicted with three children standing in a tub by his side. Of the various interpretations of this, none is absolutely certain. One explanation has been sought in the legend of St Nicholas miraculously restoring to life three rich youths, who had been murdered, cut up and concealed in a salting tub by a thievish innkeeper or butcher, in whose house they had taken lodging.

A legend of his surreptitious bestowal of dowries upon the three daughters of an impoverished citizen, who, unable to procure fit marriages for them, was on the point of giving them up to a life of shame, is said to have originated the old custom of giving presents in secret on the Eve of St Nicholas, subsequently transferred to Christmas Day. Hence the association of Christmas with "Santa Claus," an American corruption of the Dutch form "San Nicolaas," the custom being brought to America by the early Dutch colonists. (For the ceremony of the boy-bishop elected on St Nicholas's Day see Boy-Bishop.)

See N. C. Falconius, *Sancti Nicolai acta primigenia* (Naples, 1751); *Bibliotheca hagiographica Graeca* (Brussels, 1895), p. 96; *Bibl. hagiogr. Latina* (Brussels, 1899), n. 6104-6221; F. Nitti di Vito, *Le Pergamene di S. Nicola di Bari* (Bari, 1901); Charles Cahier, *Caractéristiques des saints* (Paris, 1867), p. 354; Frances Arnold-Forster, *Studies in Church Dedications* (London, 1899), i. 495-501 and iii. 21.

NICHOLAS, the name of five popes, and one anti-pope.

Nicholas I., sometimes called The Great, and certainly the most commanding figure in the series of popes between Gregory I. and Gregory VII., succeeded Benedict III. in April 858. According to the annalist Prudentius of Troyes, "he owed his election less to the choice of the clergy than to the presence and favour of the emperor Louis II. and his nobles"—who can hardly have foreseen with what ability and persistency the rights of the Holy See as supreme arbiter of Christendom were to be asserted even against themselves by the man of their choice. Of the previous history of Nicholas nothing is recorded. His pontificate of nine years and a half was marked by at least three memorable contests which have left their mark in history. The first was that in which he supported the claims of the unjustly degraded patriarch of Constantinople, Ignatius; the history of the conflict cannot be related here, but two of its incidents, the excommunication of Photius, the rival of Ignatius, by the pope in 863, and the counter-deposition of Nicholas by Photius in 867, were steps of serious moment towards the permanent separation between the Eastern and the Western Church. The second great struggle was that with Lothair, the king of Lorraine (second son of the emperor Lothair I., and brother of the emperor Louis II.), about the divorce of his wife Theutberga or Thietberga. The king, who desired to marry his mistress Waldrada, had brought a grave charge against the life of his queen before her marriage; with the help of Archbishops Gunther of Cologne and Thietgaud of Treves, a confession of guilt had been extorted from Thietberga, and, after the matter had been discussed at more than one synod, that of Aix-la-Chapelle finally authorized Lothair, on the strength of this confession, to marry again. Nicholas ordered a fresh synod to try the cause over again at Metz in 863; but Lothair, who was present with his nobles, anew secured a judgment favourable to himself, whereupon the pope not only quashed the whole proceedings, but excommunicated and deposed Gunther and Thietgaud, who had been audacious enough to bring to Rome in person the "libellus" of the synod. The archbishops appealed to Louis II., then at Benevento, to obtain the withdrawal of their sentence by force; but, although he actually occupied the Leonine city (864), he was unsuccessful in obtaining any concession, and had to withdraw to Ravenna. Thietberga herself was now induced to write to the pope a letter in which she declared the invalidity of her own marriage, and urged the cause of Lothair, but Nicholas, not without reason, refused to accept statements which had too plainly been extorted, and wrote urging her to maintain the truth steadfastly, even to the death if need were, "for, since Christ is the truth, whosoever dies for the truth assuredly dies for Christ." The imminent humiliation of Lothair was prevented only by the death of Nicholas. The third great ecclesiastical cause which marks this pontificate was that in which the indefeasible right of bishops to appeal to Rome against their metropolitans was successfully maintained in the case of Rothad of Soissons, who had been deposed by Hincmar of Reims. It was in the course of the controversy with the great and powerful Neustrian archbishop that papal recognition was first given (in 865) to the False Decretals, which had probably been brought by Rothad to Rome in the preceding year (see Decretals). At an early period in his reign it also became necessary for Nicholas to administer discipline to John of Ravenna, who seems to have relied not only on the prestige of his famous see but also on the support of Louis II. After lying under excommunication for some time he made a full submission. Nicholas was the pope to whom Boris, the newly converted king of Bulgaria, addressed himself for practical instruction in some of the difficult moral and social problems which naturally arise during a transition from heathenism to Christianity. The pope's letter in reply to the hundred and six questions and petitions of the barbarian king is perhaps the most interesting literary relic of Nicholas I. now extant. He died on the 13th of November 867, and was succeeded by Adrian II.

The *epistolae* of Nicholas I. are printed in Migne, *Patrologia Lat.* vol. 119, p. 769 seq. See F. Gregorovius, *Rome in the Middle Ages*, vol. iii. (Eng. trans., London, 1900–1902); H. Lämmer, *Nikolaus I. und die byzantinische Staatskirche seiner Zeit* (Berlin, 1857); J. Roy, *Saint-Nicolas I.* (Paris, 1900); J. Richterich, *Papst Nikolaus I.* (Bern, 1903); A. Greinacher, *Die Anschauungen des Papstes Nikolaus I. über das Verhältnis von Staat und Kirche* (1909). (X.)

Nicholas II., pope from December 1058 to July 1061, was a Burgundian named Gerard, who at the time of his election was bishop of Florence. He was set up by Hildebrand, with the support of the empress-regent Agnes and of the powerful Duke Godfrey of Lorraine, against Benedict X., the nominee of the Roman nobles, and was crowned at Rome, after the expulsion of Benedict, on the 24th of January 1059. His pontificate was signalized by the continuance of the policy of ecclesiastical reform associated with the name of Hildebrand (afterwards Gregory VII.). To secure his position he at once entered into relation with the Normans, now firmly established in southern Italy, and later in the year the new alliance was cemented at Melfi, where Nicholas II., accompanied by Hildebrand, Cardinal Humbert and the abbot Desiderius of Monte Cassino, solemnly invested Robert Guiscard with the duchies of Apulia, Calabria and Sicily, and Richard of Aversa with the principality of Capua, in return for oaths of fealty and the promise of assistance in guarding the rights of the Church. The first fruits of this arrangement, which was based on no firmer foundation than the forged "Donation of Constantine" (*q.v.*), but destined to give to the papacy a position of independence towards both the Eastern and Western Empires, was the reduction in the autumn, with Norman aid, of Galera, where the anti-pope had taken refuge, and the end of the subordination of the papacy to the Roman nobles.

Meanwhile, Peter Damian and Bishop Anselm of Lucca had been sent by Pope Nicholas to Milan to adjust the difference between the Patarenes and the archbishop and clergy. The result was a fresh triumph for the papacy, Archbishop Wido, in face of the ruinous conflict in the Church of Milan, being forced to submit to the terms proposed by the legates, which involved the principle of the subordination of Milan to Rome; the new relation was advertized by the unwilling attendance of Wido and the other Milanese bishops at the council summoned to the Lateran palace in April 1059. This council not only continued the Hildebrandine reforms by sharpening the discipline of the clergy, but marks an epoch in the history of the papacy by its famous regulation of future elections to the Holy See (see

Lateran Councils, and Conclave). Its most important immediate result was the revival of strained relations with the empire, due to the fact that the emperor's traditional rights in the matter of papal elections had been completely ignored. Stephen, cardinal priest of S. Chrysogonus, was sent to the German court to attempt to allay the consequent ill-feeling, but was not received. Pope Nicholas, moreover, had offended the German bishops by what they regarded as arbitrary interference with their rights: he had refused to send the pallium of Archbishop Siegfried of Mainz; he had sent a sharp letter of admonition to Archbishop Anno of Cologne. The resulting opposition culminated in a synod of German bishops, perhaps early in 1061 (its date and place of meeting are unknown), at which the decrees of the pope, including the new electoral law, were annulled, while he himself was deposed and his name ordered to be expunged from the canon of the Mass. That these resolutions were not followed by any further action was due to the war of parties in Germany, which enabled the papacy to ignore a demonstration of opinion to which no effect could be given.

Nicholas II. died at Florence in July 1061. Personally he was one of the least important of the popes, and the great importance of the events of his pontificate is due to the fact that, as Peter Damian wrote (*Epist.* i. 7), he possessed in Hildebrand, Cardinal Humbert and Bishop Boniface of Albano *acutissimi et perspicacis oculi.*

His *Diplomata, epistolae, decreta* are in Migne, *Patrolog. Lat.* 143, pp. 1301-1366. See the article "Nikolaus II." by C. Mirbt in Herzog-Hauck, *Realencyklopädie* (3rd ed., Leipzig, 1904), with bibliography. Other lists of authorities are in Potthast, *Biblioth. Hist. Med. Aev.* (2nd ed., Berlin, 1896), p. 854; and Ulysse Chevalier, *Répertoire des sources hist. biobibliogr.* (Paris, 1905), vol. 3347, *s.v.* "Nicolas II." (X.)

Nicholas III. (Giovanni Gaetano Orsini), pope from the 25th of November 1277 to the 22nd of August 1280, was a Roman nobleman who had served under eight popes, been made cardinal-deacon of St Nicola in carcere Tulliano by Innocent IV., protector of the Franciscans by Alexander IV., inquisitor-general by Urban IV., and succeeded John XXI., largely through family influence, after a six-months' vacancy in the Holy See. His brief pontificate was marked by several important events. A born politician, he greatly strengthened the papal position in Italy. He concluded a concordat with Rudolph of Habsburg in May 1278, by which the Romagna and the exarchate of Ravenna were guaranteed to the pope; and in July he issued an epoch-making constitution for the government of Rome, which forbade foreigners taking civil office. Nicholas issued the bull *Exiit* on the 14th of August 1279 to settle the strife within the Franciscan order between the parties of strict and loose observance. He repaired the Lateran and the Vatican at enormous cost, and erected a beautiful country house at Soriano near Viterbo. Nicholas, though a man of learning and strength of character, brought just reproach on himself for his efforts to found principalities for his nephews and other relations. He died from a stroke of apoplexy and was succeeded by Martin IV.

See "Les Registres de Nicolas III.," published by Jules Gay in *Bibliothèque des écoles françaises d'Athènes et de Rome* (Paris, 1898–1905); A. Potthast, *Regesta pontif. Roman.* vol. 2 (Berlin, 1875); A. Demski, "Papst Nikolaus III." in *Kirchengeschichtliche Studien* (Münster, 1903); F. Gregorovius, *Rome in the Middle Ages*, vol. 5, trans. by Mrs G. W. Hamilton (London, 1900–1902); Fr. Wertsch, *Die Beziehungen Rudolfs von Habsburg zur röm. Kurie bis zum Tode Nikolaus III.* (Bochum, 1880); G. Palmieri, *Introiti ed esiti di Papa Niccolò III.* (Rome, 1889). (C. H. Ha.)

Nicholas IV. (Girolamo Masci), pope from the 22nd of February 1288 to the 4th of April 1292, a native of Ascoli and a Franciscan monk, had been legate to the Greeks under Gregory X. in 1272, succeeded St Bonaventura as general of his order in 1274, was made cardinal-priest of Sta Prassede and Latin patriarch of Constantinople by Nicholas III., cardinal-bishop of Palestrina by Martin IV., and succeeded Honorius IV. after a ten-months' vacancy in the papacy. He was a pious, peace-loving monk with no ambition save for the church, the crusades and the extirpation of heresy. He steered a middle course between the factions at Rome, and sought a settlement of the Sicilian question. In May 1289 he crowned Charles II. king of Naples and Sicily after the latter had expressly recognized papal suzerainty, and in February 1291 concluded a treaty with Alphonso III. of Aragon and Philip IV. of France looking toward the expulsion of James of Aragon from Sicily. The loss of Ptolemais in 1291 stirred the pope to renewed enthusiasm for a crusade. He sent the celebrated Franciscan missionary, John of Monte Corvino, with some companions to labour among the Tatars and Chinese. He issued an important constitution on the 18th of July 1289, which granted to the cardinals one-half of all income accruing to the Roman see and a share in the financial management, and thereby paved the way for that independence of the college of cardinals which, in the following century, was to be of detriment to the papacy. Nicholas died in the palace which he had built beside Sta Maria Maggiore, and was succeeded by Celestine V.

See "Les Registres de Nicolas IV.," ed. by Ernest Langlois in *Bibliothèque des écoles françaises d'Athènes et de Rome* (Paris, 1886–1893); A. Potthast, *Regesta pontif. Roman.* vol. 2 (Berlin, 1875); F. Gregorovius, *Rome in the Middle Ages*, vol. 5, trans. by Mrs G. W. Hamilton (London, 1900–1902); O. Schiff, "Studien zur Geschichte Papst Nikolaus IV." in *Historische Studien* (1897); W. Norden, *Das Papsttum u. Byzanz* (Berlin, 1903); R. Röhricht, *Geschichte des Königreichs Jerusalem* (Innsbruck, 1898); J. B. Sägmüller, *Die Thätigkeit u. Stellung der Kardinäle bis Papst Bonifaz VIII.* (Freiburg-i.-B., 1896); J. P. Kirsch, "Die Finanzverwaltung des Kardinalkollegiums im 13. u. 14. Jahrhunderte" in *Kirchengeschichtliche Studien* (1895). (C. H. Ha.)

Nicholas V. (Tomaso Parentucelli or Tomaso da Sarzana), pope from the 6th of March 1447 to the 24th of March 1455, was born at Sarzana, where his father was a physician, in 1398. He early studied at Bologna, where the bishop, Nicholas Albergati, was so much struck with his ardour for learning that he gave him the chance to pursue his studies further, by sending him on a tour through Germany, France and England. He distinguished himself at the council of Ferrara-Florence, and in 1444 was made bishop of Bologna by Pope Eugenius IV., who soon afterwards named him as one of the legates charged to negotiate at the convention of Frankfort an understanding between the Holy See and the Empire with regard to the reforming decrees of the council of Basel. His successful diplomacy was rewarded, on his return to Rome, with the title of cardinal priest of Sta Susanna (December 1446). He was elected pope in succession to Eugenius IV. on the 6th of March of the following year, taking the name of Nicholas in honour of his early benefactor.

The eight years of his pontificate were important in the political, scientific and literary history of the world. With the German king, Frederick III., he made the Concordat of Vienna, or Aschaffenburg (February 17, 1448), by which the decrees of the council of Basel against papal annates and reservations were abrogated so far as Germany was concerned; and in the following year he secured a still greater triumph when the resignation of the anti-pope Felix V. (April 7), and his own recognition by the rump of the council of Basel, assembled at Lausanne, put an end to the papal schism. The next year, 1450, Nicholas held a jubilee at Rome; and the offerings of the numerous pilgrims who thronged to Rome gave him the means of furthering the cause of culture in Italy, which he had so much at heart. In March 1452 he crowned Frederick III. as emperor in St Peter's, the last occasion of the coronation of an emperor at Rome.

Under the generous patronage of Nicholas humanism made rapid strides. He employed hundreds of copyists and scholars, giving as much as ten thousand *gulden* for a metrical translation of Homer, and founded a library of nine thousand volumes. Nicholas himself was a man of vast erudition, and his friend Aeneas Silvius (later Pope Pius II.) said of him that "what he does not know is outside the range of human knowledge." He was compelled, however, to add that the lustre of his pontificate would be for ever dulled by the tragic fall of Constantinople, which the Turks took in 1453. The pope bitterly felt this catastrophe as a double blow to Christendom and to Greek letters. "It is a second death," wrote Aeneas Silvius, "to Homer and Plato." Nicholas preached a crusade, and endeavoured to reconcile the mutual animosities of the Italian states, but without much success.

Nicholas conceived great plans for beautifying and developing Rome. He restored the walls and numerous churches, and began the rebuilding of the Vatican and St Peter's. In undertaking these works Nicholas was moved by no vulgar motives, his idea being "to strengthen the weak faith of the people by the greatness of that which it sees." The Romans, however, appreciated neither his motives nor their results, and in 1452 a formidable conspiracy for the overthrow of the papal government, under the leadership of Stefano Porcaro, was discovered and crushed. This revelation of disaffection, together with the fall of Constantinople, darkened the last years of Nicholas; "As Thomas of Sarzana," he said, "I had more happiness in a day than now in a whole year." He died on the 24th of March 1455.

See Herzog-Hauck, *Realencyklopädie für protestantische Theologie und Kirche*, vol. xiv. (1904), with full references; *Cambridge Modern History*, i. 76-78; and M. Creighton, *History of the Papacy* (London, 1882), vol. ii.

Nicholas V. (Pietro Rainalducci), antipope in Italy from 1328 to 1330 during the pontificate of John XXII. at Avignon, was a native of Corbara in the Abruzzi. He joined the Franciscan order after separating from his wife in 1310, and became famous as a preacher. He was elected through the influence of the excommunicated emperor, Louis the Bavarian, by an assembly of priests and laymen, and consecrated at St Peter's on the 12th of May 1328 by the bishop of Venice. After spending four months in Rome, he withdrew with Louis to Viterbo and thence to Pisa, where he was guarded by the imperial vicar. He was excommunicated by John XXII. in April 1329, and sought refuge with Count Boniface of Donoratico near Piombino. Having obtained assurance of pardon, he presented a confession of his sins first to the archbishop of Pisa, and then (25th of August 1330) to the pope at Avignon. He remained in honourable imprisonment in the papal palace until his death in October 1333.

See F. Gregorovius, *Rome in the Middle Ages*, vol. 6, trans. by Mrs G. W. Hamilton (London, 1900–1902); Baluzius, *Vitae paparum Avenionensium*, vol. 1 (Paris, 1693); J. B. Christophe, *Histoire de la papauté pendant le XIV^{ième} siècle*, vol. 1 (Paris, 1853); E. Marcour, *Anteil der Minoriten am Kampfe zwischen König Ludwig IV. von Bayern und Papst Johann XXII.* (Emmerich, 1874); Eubel, "Der Gegenpapst Nicolaus V. u. seine Hierarchie," in *Hist. Jahrbuch*, vol. 12 (1891). (C. H. Ha.)

NICHOLAS (1841–), King of Montenegro and the Berda, was born at the village of Niegush, the ancient home of the reigning family of Petrovitch-Niegush, on the 25th of September 1841. His father, Mirko Petrovitch, a celebrated Montenegrin warrior, was elder brother to Danilo II., who left no male offspring. After 1696, when the dignity of *vladika*, or prince-bishop, became hereditary in the Petrovitch family, the sovereign power had descended from uncle to nephew, the vladikas belonging to the order of the "black clergy" who are forbidden to marry. A change was introduced by Danilo II., who declined the episcopal office, married and declared the principality hereditary in the direct male line. Mirko Petrovitch having resigned his claim to the throne, his son was nominated heir, and the old system of succession was thus accidentally continued. Prince Nicholas, who had been trained from infancy in martial and athletic exercises, spent a portion of his early boyhood at Trieste in the household of the Kuetitch family, to which his aunt, the princess Darinka, wife of Danilo II., belonged. The princess was an ardent advocate of French culture, and at her suggestion the young heir of the vladikas was sent to the academy of Louis le Grand in Paris. Unlike his contemporary, King Milan of Servia, Prince Nicholas was little influenced in his tastes and habits by his Parisian education; the young mountaineer, whose keen patriotism, capability for leadership and poetic talents early displayed themselves, showed no inclination for the pleasures of the French capital, and eagerly looked forward to returning to his native land. He was still in Paris when, in consequence of the assassination of his uncle, he succeeded as prince (August 13, 1860). In 1862 Montenegro was engaged in an unfortunate struggle with Turkey; the prince distinguished himself during the campaign, and on one occasion narrowly escaped with his life. In the period of peace which followed he carried out a series of military, administrative and educational reforms. In 1867 he met the emperor Napoleon III. at Paris, and in 1868 he undertook a journey to Russia, where he received an affectionate welcome from the tsar, Alexander II. He afterwards visited the courts of Berlin and Vienna. His efforts to enlist the sympathies of the Russian imperial family were productive of important results for Montenegro; considerable subventions were granted by the tsar and tsaritsa for educational and other purposes, and supplies of arms and ammunition were sent to Cettigne. In 1871 Prince Dolgorouki arrived at Montenegro on a special mission from the tsar, and distributed large sums of money among the people. In 1869 Prince Nicholas, whose authority was now firmly established, succeeded in preventing the impetuous mountaineers from aiding the Krivoshians in their revolt against the Austrian government (see Cattaro); similarly in 1897 he checked the martial excitement caused by the outbreak of the Greco-Turkish War. In 1876 he declared war against Turkey; his military reputation was enhanced by the ensuing campaign, and still more by that of 1877–78, during which he captured Nikshitch, Antivari and Dulcigno. The war resulted in a considerable extension of the Montenegrin frontier and the acquisition of a seaboard on the Adriatic. In 1883 Prince Nicholas visited the sultan, with whom he subsequently maintained the most cordial relations; in 1896 he celebrated the bicentenary of the Petrovitch dynasty, and in the same year he attended the coronation of the tsar Nicholas II.; in May 1898 he visited Queen Victoria at Windsor. In 1900 he assumed the title of "Royal Highness." On the 28th of August 1910, during the celebration of his jubilee, he assumed the title of king, in accordance with a petition from the *Skupshtina*. He was at the same time gazetted field-marshal in the Russian army, an honour never previously conferred on any foreigner except the great duke of Wellington. The descendant of a long line of warriors, gifted with a fine physique and a commanding presence, a successful military leader and a graceful poet, King Nicholas possessed many characteristics which awoke the enthusiasm of the impressionable Servian race, while his merits as a statesman received general recognition. His system of government, which may be described as a benevolent despotism, was perhaps that best suited to the character of his subjects. His historical dramas, poems and ballads hold a recognized place in contemporary Slavonic literature; among them are—*Balkanska Tzaritza* and *Kniaz Arvaniti* (dramas); *Haïdana*, *Potini Abenserage* and *Pesnik i Vila* (poems); *Skupliene Pesme* and *Nova Kola* (miscellaneous songs). In November 1860 Prince Nicholas married Milena, daughter of the *voievode* Petar Vukotitch. Of his three sons, the eldest, Prince Danilo, married (July 27, 1899) Duchess Jutta (Militza) of Mecklenburg-Strelitz; of his six daughters, Princess Militza married the Grand Duke Peter Nikolaievitch, Princess Stana, Duke George of Leuchtenberg, Princess Helena, King Victor Emmanuel III. of Italy, and Princess Anka, Prince Francis Joseph of Battenberg. (J. D. B.)

NICHOLAS I. [Nikolai Pavlovich], emperor of Russia (1796–1855), eighth child of the emperor Paul I. and his wife Maria Feodorovna, was born at Tsarskoe-Selo on the 25th of June (July 6, N.S.) 1796. He was only five years old when his father's murder brought his brother Alexander I. to the throne (1801). In the following year his education was entrusted to M. von Lambsdorff, director of the 1st cadet corps and ex-governor of Courland, a man of character and wide knowledge, who superintended it for the next fifteen years. But Nicholas had as little taste for learning as his brother Constantine. The royal pupils spent their lesson hours, as Nicholas afterwards confessed, "partly in dreaming, partly in drawing all sorts of nonsense," in the end "cramming" just enough to scrape through their examinations without discredit. Their chief bent was in the direction of everything connected with military matters. Religious training was confined to instruction in the forms of the Orthodox Church and the repetition of prayers by rote; dogmatic questions Nicholas neither understood nor cared about; and, in spite of his reverence for his brother Alexander, the latter's mysticism had not the faintest influence upon him.

Though a colonel in his cradle and a general since 1808, the grand-duke Nicholas did not see any active service until 1814, when he was allowed to join the Russian head-quarters in France but not to take part in any fighting. It is characteristic of him that from this time onwards he never wore civilian dress. In 1815 he was with the Allies in Paris, and in the following year set out on the *grand tour*, visiting Moscow and the western provinces of Russia, Berlin (where his engagement to Princess Charlotte Louise, daughter of Frederick William III., was arranged) and England, where his handsome presence and charming address created a profound impression.[1] On the 1/13th of July 1817 took place at St Petersburg his marriage to Princess Charlotte (Alexandra Feodorovna), the beginning of those intimate relations between the courts of Berlin and St Petersburg which were later to become of great international importance. On the 17/29th of April 1818 their first child, the future emperor Alexander II., was born. In the autumn Nicholas was placed in command of the 2nd brigade of the 1st division of the Guard. In 1819 the emperor Alexander first mentioned his intention to abdicate in favour of Nicholas, Constantine consenting to stand aside; but he took no steps to initiate his prospective heir in affairs of state, and the grand-duke continued to be confined to his military duties. In 1820 a further important step in the matter of the succession was taken in the divorce of Constantine from the grand-duchess Anne and his re-marriage to Johanna Grudzinska (see CONSTANTINE PAVLOVICH). In January 1822 it was decided in a family council, with the knowledge though not in the presence of Nicholas, that Constantine's petition to be relieved of the burden of the crown, for which he felt himself unfitted, should be granted. It was not, however, until August 1823 that the emperor drew up the necessary papers, in the presence of the metropolitan Philaret and other witnesses, and deposited them in sealed packets, to be opened at his death, with the council of state, the senate and the holy synod. For some reason, which can only be conjectured, Constantine was not made a party to this proceeding.

Alexander I. died at Taganrog on the 1st of December 1825. When, some days later, the news reached St Petersburg, all was confusion and uncertainty. Constantine was at Warsaw; Nicholas, who on the 3rd of May of the same year had become chief of the 2nd division of the infantry of the Guard, was too conscious of his unpopularity in the army—the fruit of his drastic discipline—to dare to assume the crown without a public abdication on the part of the legitimate heir. No steps were taken to open the sealed packets, and he himself took the oath to Constantine, and, with characteristic contempt for constitutional forms, usurped the functions of the senate and council of state by himself ordering its imposition on the regiments stationed in St Petersburg. But Constantine refused to come to St Petersburg, or to do more than himself take the oath to Nicholas as emperor, and write assuring him of his loyalty. The result was a three weeks' interregnum, of which the discontented spirits in the army took advantage to bring to a head a plot that had long been hatching in favour of constitutional reform. When on the 14th of December the troops who had already taken the oath to Constantine were ordered to take another to Nicholas, it was easy to persuade them that this was a treasonable plot against the true emperor. The Moscow regiment refused to take the oath, and part of it marched, shouting for Constantine and "Constitution,"[2] to the square before the Senate House, where they were joined by a company of the Guard and the sailors from the warships. In this crisis Nicholas showed high personal courage, if little decision and initiative. It was entirely uncertain how many, and which, regiments could be trusted. For hours he stood, or sat on horseback, amid the surging crowd, facing the mutinous soldiers—who had loaded their muskets and formed square—while effort after effort was made to bring them to reason, sometimes at the cost of life—as in the case of Count Miloradovich, military governor of St Petersburg, who was mortally wounded by a pistol shot while arguing with the mutineers. Nicholas was saved by the very belief of the conspirators in the universal sympathy of the army with their aims. Had the mutinous troops early in the day received the order to attack, they would have carried the waverers with them; but they hesitated to fire on comrades whom they expected to see march over to their side; and when at last the emperor had steeled his heart to use force, a few rounds of grape-shot sufficed to quell the mutiny. The chief conspirators—Prince Shchepin-Rostovski, Suthoff, Ryleyev, Prince Sergius Trubetskoi, Prince Obolenski and others—were arrested the same night and interrogated by the emperor in person. A special commission, consisting entirely of officers, was then set up; and before this, for five months, the prisoners were subjected to a rigorous inquisition.[3] It was soon clear that the Decabrist[4] rising was but one manifestation of a vast conspiracy permeating the whole army. A military rising on a large scale in the south was only averted by the news of the failure of the mutiny at St Petersburg; and at Moscow there were many arrests, including that of Colonel Paul Pestel, the chief of the revolutionary southern league. The prisoners were finally brought to trial before a supreme criminal court established by imperial *ukaz* on the 1st of June 1826; there were 121 of them and their trial had concluded by the 12th of June. Some were condemned to death, others to solitary confinement in fortresses, others to the Siberian mines and colonies. Of the latter many were accompanied by their wives, though the Russian law allows divorce in the case of such sentences; the emperor unwillingly allowed the devoted women to go, but decreed that any children born to them in Siberia would be illegitimate.

Firmly seated on his throne, Nicholas proceeded to fill up the gaps in his education by studying the condition of his empire. In spite of his reverence for his brother's memory, he made a clean sweep of "the angel's" Bible Society,[5] and other paraphernalia of official hypocrisy; as for Alexander's projects of reform, the pitiful legacy of a life of unfulfilled purposes, these were reported upon by committees, considered and shelved. Nicholas too saw the need for reform; the Decabrist conspiracy had burnt that into his soul; but he had his own views as to the reform needed. The state was corrupt, disorganized; what was wanted was not more liberty but more discipline. So he put civil servants, professors and students into uniform, and for little offences had them marched to the guard-house; thought was disciplined by the censorship, the army by an unceasing round of parades and inspections. The one great gift of Nicholas I. to Russia, a gift which he really believed would be welcome because it would bring every subject into immediate contact with the throne, was—the secret police, the dreaded Third Section.[6]

The crowning fault of Nicholas was, however, that he would not delegate his authority; whom could he trust but himself? In this he resembled his contemporary the emperor Francis I. But Francis would "sleep upon" a difficult problem; Nicholas never slept. His constitution was of iron, his capacity for work prodigious; reviews and parades, receptions of deputations, visits to public institutions, then eight or nine hours in his cabinet reading and deciding on reports and despatches—such was his ordinary day's work. Yet, in spite of all this, his activity could not but prove the narrow limits of autocratic power. Under the "Iron Tsar" the outward semblance of authority was perfectly maintained; but behind this imposing façade the whole structure of the Russian administrative system continued to rot and crumble. The process was even hastened; for the emperor's stern discipline crushed out all independence of initiative and silenced all honest criticism. The secret police provided but a poor substitute for the assistance which an argus-eyed and articulate public opinion gives to the efficient working of a constitutional system; for the greatest of autocrats has but two eyes, and it is no difficult task to deceive him. Thus it came about that, as Professor Schiemann puts it, "Potemkin's scenery was brought out again," and Nicholas walked with conscious self-approval through a Russia seemingly well ordered, but in fact merely temporarily prepared for each stage of his progress.

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[1] See Stockmar, *Denkwürdigkeiten* (Brunswick, 1872), p. 98 seq.; and, for a later impression, Queen Victoria to the king of the Belgians, 4th of June 1844, in *Queen Victoria's Letters*.

[2] They had been told that this was the name of Constantine's wife.

[3] The prisoners were kept in solitary confinement in the casemates of the inner fortress of St Peter and St Paul. They were brought blindfolded before the commission, and then suddenly confronted with their interrogators. Many went mad under the ordeal, one died, and one starved himself to death (Schiemann, ii. 73).

[4] From Russ. *Dekabr*, December.

[5] "The Holy Scriptures distributed with an absurd profusion in a country where the clergy itself is hardly able to understand and explain them" had been the "prime source of all the secret societies established in the empire." *Pièce remise par S.M. l'Empereur Nicolas*, in Nesselrode vi. 275.

[6] *I.e.* of the Private Chancery of the emperor.

War is the ultimate and sharpest test of the soundness of a state, and to this test Russia was submitted soon after the accession of Nicholas, who could not be blind to the revelations that resulted, though he drew the wrong moral. These revelations had, indeed, begun before the outbreak of the war with Turkey in 1828. The new tsar had devoted especial attention to the reform and reconstruction of the navy, which under Alexander I. had been suffered to decay. Yet the newly organized squadron which in 1827 set out on the cruise which ended at Navarino only reached Plymouth with difficulty, and there had to be completely refitted. The disastrous Balkan campaign of 1828 was an even more astounding revelation of corruption, disorganization and folly in high places; and the presence of the emperor did nothing to mitigate the attendant evils. He was indefatigable, in war as in peace, in parading and inspecting; the weary and starving soldiers were forced to turn out amid the marshes of the Dobrudscha as spick and span as on the parade grounds of St Petersburg; but he could do nothing to set order in the confusion of the commissariat, which caused the troops to die like flies of dysentery and scurvy; or to remedy the scandals of the hospitals, which inflicted on the wounded unspeakable sufferings. On the other hand, his presence was sufficient to hamper the initiative of Prince Wittgenstein, the nominal commander-in-chief; for Nicholas was constitutionally incapable of leaving him a free hand. This was one reason for the failure of the opening campaign.[1] Another was more creditable to the tsar's heart than to his head; he turned from the sight of wounds and blood, and would not make up his mind to sanction operations which, at the cost of a few hundred lives, would have saved thousands who perished miserably of disease.[2]

These then were the leading principles which underlay Nicholas's domestic and foreign policy from first to last: to discipline Russia, and by means of a disciplined Russia to discipline the world. So far as the latter task was concerned, he again sharply divided the issues which Alexander had confused. The mission of Russia in the West was, in accordance with the principles of the Holy Alliance as Nicholas interpreted them, to uphold the cause of legitimacy and autocracy against the Revolution; her mission in the East was, with or without the co-operation of "Europe," to advance the cause of Orthodox Christianity, of which she was the natural protector, at the expense of the decaying Ottoman empire. The sympathy of Europe with the insurgent Greeks gave the tsar his opportunity. The duke of Wellington was sent to St Petersburg in 1826 to congratulate the new tsar on his accession and arrange a concert in the Eastern Question. The upshot proved the diplomatic value of Nicholas's apparent sincerity of purpose and charm of manner; the "Iron Duke" was to the "Iron Tsar" as soft iron to steel; Great Britain, without efficient guarantees for the future, stood committed to the policy which ended in the destruction of the Ottoman sea-power at Navarino and the march of the Russians on Constantinople. By the treaty of Adrianople in 1829 Turkey seemed to become little better than a vassal state of the tsar, a relation intensified, after the first revolt of Mehemet Ali, by the treaty of Unkiar-Skelessi in 1833 (see MEHEMET ALI). In the West, meanwhile, the revolutions of 1830 had modified the balance of forces. Nicholas himself proposed an armed intervention of the Alliance in order "to restore order" in Belgium and France;[3] and when his allies held back even proposed to intervene alone, a project rendered impossible by the outbreak of the great insurrection in Poland, which tied the hands of all three powers (see POLAND: *History*). In the circumstances, Nicholas was forced to give a grudging recognition to the title of Louis Philippe as king of the French; his recognition of that of Leopold, king of the Belgians, was postponed until King William of the Netherlands had finally resigned his rights. Then, the insurrection in Poland once crushed, and Poland itself scarce surviving even as a geographical expression,[4] he drew the three eastern autocratic powers together in a new "Holy Alliance" by the secret convention of Berlin (3rd Oct. 1833) reaffirming the right and duty of intervention at the request of a legitimate sovereign. The cordial understanding with Austria, cemented at Münchengrätz and Berlin, was renewed, after the accession of the emperor Ferdinand, at Prague and Töplitz (1835); on the latter occasion it was decided "without difficulty" to suppress the republic of Cracow, as a centre of revolutionary agitation.[5] The Triple Alliance was now, in the tsar's opinion, "the last anchor of safety for the monarchical cause." To its maintenance he had sacrificed "his religious convictions" and "the traditions of Russian policy" in consenting to uphold the integrity of Turkey; a sacrifice perhaps the less hard to make since, as he added, the Ottoman empire no longer existed.[6] He allowed himself to be persuaded by Metternich to support the cause of Don Carlos in Spain,[7] and so early as May 1837, in view of the agitation in Hungary, he announced that "in every case" Austria might count on Russia.

These cordial ties were loosened, however, by the fresh crisis in the Eastern Question after 1838. Metternich was anxious to summon a European conference to Vienna, with a view to placing Turkey under a collective guarantee. To Nicholas this seemed to be a blow aimed at Russia, and he refused to be a party to it.[8] Moreover, in view of the tendency of Austria to forget the conventions of Münchengrätz and Töplitz, and to approach the maritime powers, he determined to checkmate her by himself coming to an agreement with Great Britain, in order to settle the Eastern Question according to his own views: a double gain, if by this means Queen Victoria (a "legitimate" sovereign) could be drawn away from her unholy alliance with the Jacobin Louis Philippe. This is the explanation of those concessions in the Eastern Question which ended in the Quadruple Alliance of 1840 and the humiliation of Louis Philippe's government (see MEHEMET ALI).

The new Anglo-Russian *entente* led in 1844 to a visit of the tsar to the English court. This visit, in spite of the favourable personal impression made by the emperor, was the starting-point of a fresh and fateful divergence; for it was now that the tsar first openly raised the question of the eventual partition of the inheritance of the "Sick Man," as he called Turkey. The whole question, however, was indefinitely postponed by the events culminating in the revolutions of 1848. Nicholas foresaw the troubles brewing, and warned Frederick William IV. of Prussia, in a tone of lofty and paternal remonstrance, of the inevitable results of his constitutional experiments. When the storm burst, he remained entrenched behind the barriers of his own disciplined empire; sovereigns truckling in a panic to insurgent democracies he would not lift a finger to help;[1] it was not till Francis Joseph of Austria in 1849 appealed to him in the name of autocracy, reasserting its rights, that he consented to intervene, and, true to the promise made at Münchengrätz in 1833, crushed the insurgent Hungarians and handed back their country as a free gift to the Habsburg king. Scarcely less valuable to Austria was the tsar's intervention in the quarrel between Austria and Prussia arising out of the Hesse incident and the general question of the hegemony of Germany. In October 1850 he had a meeting with Francis Joseph at Warsaw, at which Count Brandenburg and Prince Schwarzenberg were present. Prussia, he declared, must in the German question return to the basis of the treaties of 1815 and renew her *entente* with Austria; this was the only way of preserving the old friendship of Prussia and Russia. In face of the threat conveyed in this, the Prussian government decided to maintain peace (Nov. 2), Radowitz resigning as a protest. Thus Nicholas, who refused to believe in the perfidy ascribed by Frederick William to Austria,[2] was the immediate cause of Prussia's humiliation at Olmütz.

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[1] Nicholas remained in Russia in 1829, and Diabitsch had a free hand.

[2] He once sentenced an unhappy Jew to run the gauntlet of 10,000 strokes, exclaiming as he signed the warrant, "Thank God, we have no capital punishment in Russia!" Yet his nature had its kindly side: "He *feels* kindness deeply—and his love for his wife and children, and for all children, is *very* great" (Queen Victoria, *loc. cit*). He also spent much personal effort in organizing the charitable institutions of the dowager empress Maria, and founded a great number of institutions for technical education.

[3] Martens, *Recueil*, viii. 164, &c., especially the autograph mem. of the tsar on the situation (p. 168): "But apart from *honour*, is it to our interest to consent to this fresh iniquity? . . . . Even if France invade Austria, Prussia says she will give her *moral* support! Is that—Great God!—the alliance created by the immortal emperor? . . . . Let us preserve the sacred fire for the moment of the struggle with the infernal powers!"

[4] Nicholas himself ascribed his hatred of Poles and Jews to the stories told him by his English nurse, Miss Lyon, of her sufferings during the siege of Warsaw in 1794.—Schiemann, i. 181.

[5] This convention was not acted upon till 1846.

[6] Conversation with Count Ficquelmont (Feb. 13, 1833) in Martens *Recueil*, iv. pt. i. p. 443.

[7] *Ib.* p. 475.

[8] *Ib* p. 481.

Nicholas was soon to have personal experience of the perfidy of Austria. It was a small matter that Count Prokesch-Osten, the Austrian ambassador, was discovered to be supplying a "foul Jew" editor with copy; more serious was Austria's attitude in the troubles that led up to the Crimean War. Gratitude, in the tsar's opinion, should have made her neutral if not friendly; the revelation of her ingratitude came upon him with the shock of a painful surprise. The first cause of all the evils that followed was his attitude towards Napoleon III. He was forced to recognize the new French empire, but he would recognize no more than the fact of its existence (*du fait en lui-même*); he refused to address the emperor of the French as a brother sovereign. He attempted, moreover, to revive the function of the triple alliance as guardian of Europe against French aggression. The resentment of Napoleon awakened the slumbering Eastern Question by reviving the obsolescent claims of France to the guardianship of the Holy Places, and this aroused the pride of the Orthodox tsar, their guardian by right of faith and in virtue of a clause of the treaty of Kuchuk Kainardji (1774), as interpreted in the light of subsequent events. Nicholas could not believe that Christian powers would resent his claim to protect the Christian subjects of the sultan; he believed he could count on the friendship of Austria and Prussia; as for Great Britain, he would try to come to a frank understanding with her (hence the famous conversations with Sir Hamilton Seymour on the 9th and 14th of January 1853, reviving the "Sick Man" arguments of 1844), but in any case he had the assurance of Baron Brunnow, his ambassador in London, that the influence of Cobden and Bright, the eloquent apostles of peace, was enough to prevent her from appealing to arms against him.

The disillusionment that followed was profound. In October 1853 Nicholas met his brother monarchs of the triple alliance at Warsaw for the last time. In December, at the conference of Vienna, Austria had already passed over to the enemy. Prussia was wavering, neutral indeed, but joining the other powers in a guarantee of the integrity of Turkey (9th April 1854), urging the tsar to accept the decisions of the Vienna conference, and on his refusal signing a defensive alliance with Austria (April 20, 1854), which included among the *casus belli* the incorporation in Russia of the banks of the Danube and a Russian march on Constantinople. Thus Nicholas, the pillar of the European alliance, found himself isolated and at war, or potentially at war, with all Europe. The invasion of the Crimea followed, and with it a fresh revelation of the corruption and demoralization of the Russian system. At the outset Nicholas had grimly remarked that "Generals January and February" would prove his best allies. These acted, however, impartially; and if thousands of British and French soldiers perished of cold and disease in the trenches before Sevastopol, the tracks leading from the centre of Russia into the Crimea were marked by the bones of Russian dead. The revelation of his failure broke the spirit of the Iron Tsar, and on the 2nd of March 1855 he threw away the life which a little ordinary care would have saved.

The character of the emperor Nicholas was summed up with great insight by Queen Victoria in a letter to the king of the Belgians, written during the tsar's visit to England (June 11, 1844). "He is stern and severe—with fixed principles of *duty* which *nothing* on earth will make him change; very *clever* I do *not* think him, and his mind is an uncivilized one; his education has been neglected; politics and military concerns are the only things he takes great interest in; the arts and all softer occupations he is insensible to, but he is sincere, I am certain, *sincere* even in his most despotic acts, from a sense that that *is* the *only* way to govern; he is not, I am sure, aware of the dreadful cases of individual misery which he so often causes, for I can see by various instances that he is kept in utter ignorance of *many* things, which his people carry out in most corrupt ways, while he thinks that he is extremely just . . . and I am sure *much* never reaches his ears, and (as you observed) how can it? He is, I should say, too frank, for he talks so openly before people, which he should not do, and with difficulty restrains himself. His anxiety *to be believed* is very great, and I must say his personal promises I *am inclined* to believe; then his feelings are very strong; he *feels* kindness deeply. . . . He is *not* happy, and that melancholy which is visible in the countenance made me sad at times; the sternness of the eyes goes very much off when you know him, and changes according to his being put out or not. . . . He is bald now, but in his chevalier Garde uniform he is *magnificent* still, and very *striking*."

The emperor was a kind husband and father, and his domestic life was very happy. He had seven children: (1) the emperor Alexander II. (*q.v.*); (2) the grand-duchess Maria (1819–1876), duchess of Leuchtenberg; (3) the grand-duchess Olga (1822–1892), consort of King Charles of Württemberg; (4) the grand-duchess Alexandra (1825–1844), married to Prince Frederick of Hesse-Cassel; (5) the grand-duke Constantine Nikolayevich (1827–1892); (6) the grand-duke Nicholas Nikolayevich (1831–1891); (7) the grand-duke Michael Nikolayevich (b. 1832). The second son of the latter, the grand-duke Michael Mikhaïlovich (b. 1861), who was morganatically married, his wife bearing the title of Countess Torby, took up his residence in England.

AUTHORITIES.—All other works on Nicholas I. have been more or less superseded by Professor Theodor Schiemann's *Geschichte Russlands unter Kaiser Nikolaus I.*, of which the 1st vol., *Kaiser Alexander I. und die Ergebnisse seiner Lebensarbeit*, was published at Berlin in 1904; the 2nd, carrying the history of Nicholas's reign down to the revolutions of 1830, in 1908. It is based on a large mass of unpublished material, and considerably modifies, *e.g.* the account of the accession of Nicholas and of the Decabrist conspiracy given in chapter xiii. of vol. x. of the *Cambridge Modern History*, and tells for the first time the secret history of the Russo-Turkish War of 1828–29. The great *Recueil des traités conclus par la Russie* of T. T. de Martens (St Petersburg, 1874–1909) contains admirable introductory essays, based on the unpublished Russian archives, and giving much material for the study of Nicholas's character and policy. Many documents are published for the first time in Schiemann's work; some, from the archives of Count Nesselrode, are published in the *Lettres et papiers du Chancelier Comte de Nesselrode*, t. vi. seq. For other works see bibliographies attached to the chapters on Russia in vol. x. and xi. of the *Cambridge Modern History*. (W. A. P.)

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[1] "Russia cannot aid a power which has abjured its traditions and is under the empire of revolutionary institutions."—Nicholas to Frederick William IV., Sept. 26, 1848. Martens, *Recueil*, viii. 376.

[2] See Frederick William's letter to the tsar (Nov. 4) and the latter's reply. Martens, viii. 384, 386.

NICHOLAS II. (1868–), emperor of Russia, eldest son and successor of Alexander III., was born at St Petersburg on the 18th of May 1868. He received the ordinary education of Russian grand-dukes, under the direction of General Danilovitch, assisted by M. Pobêdonostsev and other eminent professors. Among these was an Englishman, Mr Charles Heath, for whom he had great respect and affection. By the death of his grandfather, Alexander II., in 1881, he became heir-apparent (cesarevich). Though he received, like all the heirs-apparent to the Russian throne, a certain amount of military training, his personal tastes did not lie in that direction, nor did he show any inclination for the boisterous amusements of the *jeunesse dorée* of St Petersburg. Like his father, he was nowhere happier than in the family circle, and he was particularly attached to his sister, the grand-duchess Xenia, who was seven years younger than himself. In 1890–1891 he made a tour in Greece, Egypt, India, Ceylon and Japan, where he narrowly escaped assassination at the hands of a Japanese fanatic. On the return journey by Siberia, at Vladivostok, he turned the first sod of the eastern section of the Siberian railway, and two years afterwards (1893) he was appointed president of the imperial committee for that great undertaking. By the death of his father on the 1st of November 1894 he became emperor, and on the 26th of that month he married Princess Alix of Hesse (a grand-daughter of Queen Victoria), to whom he had been betrothed in the presence of his father during the latter's last illness. Eighteen months later the coronation took place at Moscow with great pomp, but a gloom was thrown over the festivities by the unfortunate incident of the Khodinskoe Polye, a great open space near the city, where a popular fête had been prepared and where, from defective police arrangements, a large number of men, women and children, roughly estimated at 2000, were crushed and trampled to death. Nicholas II. followed in the footsteps of his father, seeking to preserve peace in foreign relations, and continuing in home affairs, though in a much milder form, the policy of centralization and Russification which had characterized the previous reign. His pacific tendencies were shown by his systematic opposition to all bellicose excitement, by his maintaining M. de Giers in the post of minister of foreign affairs, by his offering the post, on the death of that statesman, to M. de Staal, by his restraining France from dangerous adventures, and by initiating the Peace Conference at the Hague. To these ought perhaps to be added the transformation of the Franco-Russian *entente cordiale* into a formal alliance, since the alliance in question might be regarded as favourable to the preservation of the *status quo* in Europe. In the internal administration during the first years of his reign he introduced by his personal influence, and without any great change in the laws, a more humane spirit towards those of his subjects who did not belong by language and tradition to the dominant nationality, and who were not members of the Eastern Orthodox Church; but he disappointed the men of liberal views by giving it to be clearly understood soon after his accession that he had no intention of circumscribing and weakening the autocratic power by constitutional guarantees or parliamentary institutions. In spite, however, of his desire for peace he let his country drift into the disastrous war with Japan; and notwithstanding his sincere attachment to the principles of bureaucratic autocracy, it was he who granted the constitutional reforms which altered the whole political outlook in Russia (see RUSSIA).

NICHOLAS OF BASEL (d. 1397), a prominent member of the Beghard community, who travelled widely as a missionary and propagated the teachings of his sect. Though vigorously sought after by the Inquisition he eluded its agents for many years until in 1397 he was seized in Vienna, and burned at the stake as a heretic, together with two of his followers, John and James. A considerable legend has attached itself to Nicholas through the persistent but mistaken identification of him with the mysterious "Friend of God from the Oberland," the "double" of Rulman Merswin, the Strassburg banker who was one of the leaders of the 14th-century German mystics known as the Friends of God. In Merswin's *Story of the First Four Years of a New Life*, he writes: "Of all the wonderful works which God had wrought in me I was not allowed to tell a single word to anybody until the time when it should please God to reveal to a man in the Oberland to come to me. When he came to me God gave me the power to tell him everything." The identity and personality of this "Friend of God," who bulks so largely in the great collection of mystical literature, and is everywhere treated as a half supernatural character, is one of the most difficult problems in the history of mysticism. The tradition, dating from the 15th century and supported by the weighty authority of the Strassburg historian Karl Schmidt (*Nicolaus von Basel*, Vienna, 1866), identified him with Nicholas, but is now discredited by all scholars. A. Jundt (*Les Amis de Dieu*, 1879) shared Preger's view that the Friend was a great unknown who lived in or near Chur (Coire) in Switzerland. But since Denifle's researches (see especially *Der Gottesfreund im Oberlande und Nikolaus von Basel*, 1870) the belief has gained ground that the "Friend" is not a historical personage at all. Apart from the collection of literature ascribed to him and Merswin there is no historical evidence of his existence. The accounts of his life say that about 1343 he was forbidden to reveal his identity to anyone save Rulman Merswin. And as all the writings bear the marks of a single authorship it has been assumed, especially by Denifle, that "the Friend of God" is a literary creation of Merswin and that the whole collection of literature is the work of Merswin (and his school), tendency-literature designed to set forth the ideals of the movement to which he had given his life. Thus "the great unknown" from the Oberland is the ideal character, "who illustrates how God does his work for the world and for the church through a divinely trained and spiritually illuminated layman," just as William Langland in England about the same time drew the figure of Piers Plowman.

To rescue Merswin from the charge of deceit involved in this theory, Jundt puts forward the suggestion, more ingenious than convincing, that Merswin was a "double personality," who in his primary state wrote the books ascribed to him, and in his secondary state became "the Friend of God from the Oberland," writing the other treatises. A third hypothesis is that advanced by Karl Rieder (*Der Gottesfreund von Oberland*, Innsbruck, 1905), who thinks that not even Merswin himself wrote any of the literature, but that his secretary and associate Nicholas of Löwen, head of the House of St John at Grünenwörth, the retreat founded by Merswin for the circle, worked over all the writings which emanated from different members of the group but bore no author's names, and to glorify the founder of the house attached Merswin's name to some of them and out of his imagination created "the Friend of God from the Oberland," whom he named as the writer of the others. As his design took shape he expanded the supernatural element and made the narratives autobiographical. There is much in this contention that is sound, but Rieder seems to go unnecessarily far in denying altogether that Merswin wrote any of the mystical books. The conclusion remains that the literature must be treated as tendency-writing and not as genuine biography and history.

See besides the works cited, Rufus M. Jones, *Studies in Mystical Religion*, ch. xiii. (London, 1909). (A J. G.)

NICHOLAS OF GUILDFORD (fl. 1250), English poet, the supposed author of *The Owl and the Nightingale*, an English poem of the 13th century. This work, which displays genuine poetical and imaginative qualities, is written in the south-western dialect, and is one of the few 13th-century English poems not devoted entirely to religious topics. The nightingale sitting on a branch covered with blossom sees the owl perched on a bough overgrown with ivy, and proceeds to abuse him for his general habits and appearance. The birds decide to refer the consequent dispute to Master Nicholas de Guildford, who is skilled in such questions, but they first of all engage in a regular *débat* in the French fashion. The owl is the best logician, but the nightingale has a fund of abuse that equalizes matters. Finally, when the argument threatens to become a fight, the wren interferes, and the two go to the house of Master Nicholas at Portisham in Dorset. He judges, they say, many right judgments, and composes and writes much wisdom, and it is lamentable that so learned and worthy a man should gain no preferment from his bishop. The poet, whoever he was, wrote the octosyllabic couplet with ease and smoothness. He borrows something from Alexander of Neckham's *De naturis rerum*, and was certainly familiar with contemporary French poetry. The piece is a general allegory of the contest between asceticism and a more cheerful view of religion, and is capable of a particular application to the differences between the regular orders and the secular clergy. The nightingale defends her singing on the ground that heaven is a place of song and mirth, while the owl maintains that much weeping for his many sins is man's best preparation for the future.

There are two MSS. of the *Hule amd the Nightingale*, MS. Cotton Caligula A ix. (British Museum), dating from the first half of the 13th century, and MS. Arch. I. 29, Jesus College, Oxford, written about half a century later. In the Jesus College MS. the poem is immediately preceded by a religious poem entitled *La Passyun Jhu Christ*, which, according to a note on it, once possessed an additional quatrain implying that it was written by John of Guildford, perhaps a relation of Nicholas.

The Owl and the Nightingale has been edited from the Cotton MS. chiefly for the Roxburghe Club (1838) by Joseph Stevenson, and for the Percy Society (1843) by T. Wright; the best edition is by F. H. Stratmann (Krefeld, 1868), who collated the two MSS. See also B. Ten Brink, *Early English Literature* (trans. H. M. Kennedy, pp. 214-218); Courthope, *History of English Poetry*; and J. W. H. Atkins in the *Cambridge History of Literature*, vol. i. For some textual criticism see A.E. Egge in *Modern Language Notes* (Baltimore, January, 1887).

NICHOLAS, SIR EDWARD (1593–1669), English statesman, eldest son of John Nicholas, a member of an old Wiltshire family, was born on the 4th of April 1593. He was educated at Salisbury grammar school, Winchester College and Queen's College, Oxford. After studying law at the Middle Temple, Nicholas became secretary to Lord Zouch, warden and admiral of the Cinque ports, in 1618, and continued in a similar employment under the duke of Buckingham. In 1625 he became secretary to the admiralty; shortly afterwards he was appointed an extra clerk of the privy council with duties relating to admiralty business, and from 1635 to 1641 he was one of the clerks in ordinary to the council. In this situation Nicholas had much business to transact in connexion with the levy of ship-money; and in 1641, when Charles I. went to Scotland, a heavy responsibility rested on the secretary who remained in London to keep the king informed of the proceedings of the parliament. On the return of Charles to the capital Nicholas was knighted, and appointed a privy councillor and a secretary of state, in which capacity he attended the king while the court was at Oxford, and carried out the business of the treaty of Uxbridge. Throughout this troubled period he was one of Charles's wisest and most loyal advisers; he it was who arranged the details of the king's surrender to the Scots, though he does not appear to have advised or even to have approved of the step; and to him also fell the duty of treating for the capitulation of Oxford, which included permission for Nicholas himself to retire abroad with his family. He went to France, being recommended by the king to the confidence of the prince of Wales. After the king's death Nicholas remained on the continent concerting measures on behalf of the exiled Charles II. with Hyde and other royalists, but the hostility of Queen Henrietta Maria deprived him of any real influence in the counsels of the young sovereign. He lived at the Hague and elsewhere in a state of poverty which hampered his power to serve Charles, but which the latter did nothing to relieve. He returned to England at the Restoration; but although Charles had formally appointed him secretary of state in 1654, this office was now conferred on another, and Nicholas had to content himself with a grant of money and the offer of a peerage, which his poverty compelled him to decline. He retired to a country seat in Surrey which he purchased from a son of Sir Walter Raleigh, and here he lived till his death in 1669. By his wife Jane, a daughter of Henry Jay, an alderman of London, he had several sons and daughters; his younger brother MATTHEW NICHOLAS (1594–1661) was successively dean of Bristol, canon of Westminster and dean of St Paul's.

See *The Nicholas Papers*, edited by G. F. Warner (Camden Society, London, 1886–1897), containing Nicholas's correspondence and some autobiographical memoranda. Private correspondence between Nicholas and Charles I. will be found in the *Memoirs of John Evelyn*, edited by W. Bray (London, 1827); *The Edgerton MSS.* and the *Ormonde Papers* contain many references to Nicholas.

NICHOLAS (or NICLAES), **HENRY** (or HENDRIK) (*c.* 1501–*c.* 1580), founder of the sect called "the Family of Love," was born in 1501 or 1502, at Münster, where he was married and carried on the business of a mercer. As a boy he was subject to visions, and at the age of twenty-seven charges of heresy led to his imprisonment. About 1530 he removed with his family to Amsterdam, where he was again imprisoned on a charge of complicity in the Münster revolution of 1534–1535. About 1539 he experienced a call to found his "Familia Caritatis." Removing to Embden, he lived there and prospered in business for twenty years, though he travelled with commercial as well as missionary objects into the Netherlands, England and elsewhere. The date of his sojourn in England has been placed as early as 1552 and as late as 1569. In 1579 he was living at Cologne, where probably he died a year or two later. His doctrines seem to have been derived largely from the Dutch Anabaptist David Jöris or George, who died in 1556; but they have mainly to be inferred from the jaundiced accounts of hostile writers. The outward trappings of his system were merely Anabaptist; but he anticipated a good many later speculations, and his followers were accused of asserting that all things were ruled by nature and not directly by God, of denying the dogma of the Trinity, and repudiating infant baptism. They held that no man should be put to death for his opinions, and apparently, like the later Quakers, they objected to the carrying of arms and to anything like an oath; and they were quite impartial in their repudiation of all other churches and sects, including Brownists and Barrowists.

Nicholas's principal disciple in England was one Christopher Vitel, and towards 1579 the progress of the sect especially in the eastern counties provoked literary attacks, proclamations and parliamentary bills. But Nicholas's followers escaped the gallows and the stake, for they combined with some success the wisdom of the serpent and the harmlessness of the dove. They would only discuss their doctrines with sympathizers; they showed every respect for authority, and considered outward conformity a duty. This quietist attitude, while it saved them from molestation, hampered propaganda; and though the "Family" existed until the middle of the 17th century, it was then swallowed up by the Quakers, Baptists and Unitarians, all of which denominations may have derived some of their ideas through the "Family" from the Anabaptists.

The list of Nicholas's works occupies nearly six columns in the *Dict. Nat. Biogr.* See also Belfort Bax, *Rise and Fall of the Anabaptists*, pp. 327-380 (1903); and Strype's Works, General Index. (A. F. P.)

NICHOLS, JOHN (1745–1826), English printer and author, was born at Islington on the 2nd of February 1745. He edited the *Gentleman's Magazine* from 1788 till his death, and in the pages of that periodical, and in his numerous volumes of *Anecdotes and Illustrations*, he made invaluable contributions to the personal history of English men of letters in the 18th century. He was apprenticed in 1757 to "the learned printer," William Bowyer, whom he eventually succeeded. On the death of his friend and master in 1777 he published a brief memoir, which afterwards grew into the *Anecdotes of William Bowyer and his Literary Friends* (1782). As his materials accumulated he compiled a sort of anecdotical literary history of the century, based on a large collection of important letters. *The Literary Anecdotes of the 18th Century* (1812–1815), into which the original work was expanded, forms only a small part of Nichols's production. It was followed by the *Illustrations of the Literary History of the 18th Century, consisting of Authentic Memoirs and Original Letters of Eminent Persons*, which was begun in 1817 and completed by his son John Bowyer Nichols (1779–1863) in 1858.

The *Anecdotes* and the *Illustrations* are mines of valuable information on the authors, printers and booksellers of the time. Nichols's other works include: *A Collection of Royal and Noble Wills* (1780); *Select Collection of Miscellaneous Poems* (1782), with subsequent additions, in which he was helped by Joseph Warton and by Bishops Percy and Lowth; *Bibliotheca Topographica Britannica* (1780–1790); with Richard Gough, *The Progresses and Public Processions of Queen Elizabeth* (1788); and the important *History and Antiquities of the Town and County of Leicester* (1795–1815). Nichols was a fellow of the Society of Antiquaries, a trustee of many city institutions, and in 1804 he was master of the Stationers' Company. He died on the 26th of November 1826. JOHN BOWYER NICHOLS continued his father's various undertakings, and wrote, with other works, *A Brief Account of the Guildhall of the City of London* (1819). His eldest son, JOHN GOUGH NICHOLS (1806–1873), was also a printer and a distinguished antiquary, who edited the *Gentleman's Magazine* from 1851 to 1856, and the *Herald and Genealogist* from 1863 to 1874, and was one of the founders of the Camden Society.

A full *Memoir* of John Nichols by Alexander Chalmers is contained in the *Illustrations*, and a bibliography in the *Anecdotes* (vol. vi.) is supplemented in the later work. See also R. C. Nichols, *Memoirs of J. G. Nichols* (1874).

NICHOLSON, HENRY ALLEYNE (1844–1899), British palaeontologist and zoologist, son of Dr John Nicholson, a biblical scholar, was born at Penrith on the 11th of September 1844. He was educated at Appleby Grammar School and at the universities of Göttingen (Ph.D., 1866) and Edinburgh (D.Sc., 1867; M.D., 1869). Geology had early attracted his attention, and his first publication was a thesis for his D.Sc. degree *On the Geology of Cumberland and Westmoreland* (1868). In 1871 he was appointed professor of natural history in the university of Toronto, in 1874 professor of biology in the Durham College of Science and in 1875 professor of natural history in the university of St Andrews. This last post he held until 1882, when he became regius professor of natural history in the university of Aberdeen. He was elected F.R.S. in 1897. His original work was mainly on fossil invertebrata (graptolites, stromatoporoids and corals); but he did much field work, especially in the Lake district, where he laboured in company with Professor R. Harkness and afterwards with Dr J. E. Marr. He was awarded the Lyell Medal by the Geological Society in 1888. He died at Aberdeen on the 19th of January 1899.

PUBLICATIONS.—*Ancient Life-History of the Earth* (1877); *Manual of Zoology* (of which there were 7 editions) and other text-books of Zoology; *Manual of Palaeontology* (1872, 3rd ed., 2 vols., with R. Lydekker, 1889); *Monograph of the Silurian Fossils of the Girvan District in Ayrshire* (with R. Etheridge, jun.) (1878–1880); *Monograph of the British Stromatoporoids* in Palaeontograph. Soc. (1886–1892).

Obituary, with portrait, by Dr G. J. Hinde, in *Geol. Mag.* (March 1899).

NICHOLSON, JOHN (1822–1857), Anglo-Indian soldier and administrator, son of Alexander Nicholson, a north of Ireland physician, was born on the 11th of December 1822 and educated at Dungannon College. He was presented with a cadetship in the Bengal infantry in 1839 by his uncle Sir James Hogg, and served in the first Afghan War of 1839–42; he distinguished himself in the defence of Ghazni, and was one of the prisoners who were carried to Bamian and escaped by bribing the guard upon General Pollock's successful advance. It was in Afghanistan that Nicholson first met Sir Henry Lawrence, who got him the appointment of political officer in Kashmir and subsequently on the Punjab frontier. In 1847 he was given charge of the Sind Sagar district, and did much to pacify the country after the first Sikh War. On the seizure of Multan by Mulraj, he rendered great service in securing the country from Attock, and was wounded in an attack upon a tower in the Margalla Pass, where a monument was subsequently erected to his memory. On the outbreak of the second Sikh War he was appointed political officer to Lord Gough's force, when he rendered great service in the collection of intelligence and in furnishing supplies and boats.

On the annexation of the Punjab he was appointed deputy commissioner of Bannu. There he became a kind of legendary hero, and many tales are told of his stern justice, his tireless activity and his commanding personality. In the course of five years he reduced the most turbulent district on the frontier to such a state of quietude that no crime was committed or even attempted during his last year of office, a condition of things never known before or since. On one occasion, being attacked by a *ghazi*, he snatched the musket from the hand of a sentry and shot the man dead; on another occasion he put a price on the head of a notorious outlaw, and finding every one afraid to earn it, rode single-handed to the man's village, met him in the street and cut him down. But besides being a severe ruler, Nicholson was eminently just. A criminal had no chance of escaping him, so able and determined was his investigation; and a corrupt official could not long evade his vigilance; but he was deliberate in his punishments, and gave offenders a chance to redeem their character. He would go personally to the scene of a crime or a legal dispute and decide the question on the spot. Every man in his district, whether mountain tribesman or policeman, felt that he was controlled by a master hand, and the natives said of him that "the tramp of his war-horse could be heard from Attock to the Khyber." Lord Roberts says of him in *Forty-One Years in India*: "Nicholson impressed me more profoundly than any man I had ever met before, or have ever met since. I have never seen any one like him. He was the *beau idéal* of a soldier and a gentleman." It is little wonder that the natives worshipped him as a god under the title of Nikalsain. Nicholson, however, had a fiery temper and a contempt for red tape, which made him a somewhat intractable subordinate. He had a serious quarrel with Sir Neville Chamberlain, and was continually falling out with Sir John Lawrence, who succeeded his brother Henry as ruler of the Punjab.

It was when the Mutiny broke out in May 1857 that Nicholson was able to show the metal that was in him, and he did more than any other single man to keep the Punjab loyal and to bring about the fall of Delhi. When the news of the rising at Meerut arrived, Nicholson was with Edwardes at Peshawar, and they took immediate steps to disarm the doubtful regiments in that cantonment. Together they opposed Sir John Lawrence's proposal to abandon Peshawar, in order to concentrate all their strength on the siege of Delhi. In June Nicholson was appointed to the command of a movable column, with which he again disarmed two doubtful regiments at Phillaur. In July he made a forced march of 41 m. in a single day in the terrific heat of the Punjab summer, in order to intercept the mutineers from Sialkot, who were marching upon Delhi. He caught them on the banks of the Ravi near Gurdaspur, and utterly destroyed them, thus successfully achieving what hardly any other man would have attempted. In August he had pacified the Punjab and was free to reinforce General Wilson on the Ridge before Delhi. An officer who served in the siege gives the following word picture of him as he appeared at this time:—

> "He was a man cast in a giant mould, with massive chest and powerful limbs, and an expression ardent and commanding, with a dash of roughness; features of stern beauty, a long black beard, and a deep sonorous voice. There was something of immense strength, talent and resolution in his whole frame and manner, and a power of ruling men on high occasions which no one could escape noticing. His imperial air, which never left him, and which would have been thought arrogant in one of less imposing mien, sometimes gave offence to the more unbending of his countrymen, but made him almost worshipped by the pliant Asiatics."

Before Nicholson's arrival the counsels of the commanders before Delhi, like those at Meerut, suffered from irresolution and timidity. As General Wilson's health declined, his caution became excessive, and Nicholson was specially sent by Sir John Lawrence to put more spirit into the attack. His first exploit after his arrival was the victory of Najafgarh, which he won over the rebels who were attempting to intercept the British siege train from Ferozepore. After marching through a flooded country scarcely practicable for his guns, Nicholson, with a force of 2500 troops, defeated 6000 disciplined sepoys after an hour's fighting, and thenceforth put an end to all attempts of the enemy to get in the rear of the British position on the Ridge. Nicholson grew fiercely impatient of General Wilson's procrastination, and at one time was thinking of appealing to the army to set Wilson aside and elect a successor; but at last, on the 13th of September, he forced Wilson to make up his mind to the assault, and he himself was chosen to lead the attacking column. On the morning of the 14th he led his column, 1000 strong, in the attack on the Kashmir gate, and successfully entered the streets of Delhi. But in trying to clear the ramparts as far as the Lahore Gate, he undertook a task beyond the powers of his wearied troops. In encouraging them as they hesitated, he turned his back on the enemy and was shot in the back. The wound was mortal, but his magnificent physique allowed him to linger for nine days before finally succumbing on the 23rd of September.

His best epitaph is found in the words of Sir John Lawrence's Mutiny Report:—

"Brigadier-General John Nicholson is now beyond human praise and human reward. But so long as British rule shall endure in India, his fame can never perish. He seems especially to have been raised up for this juncture. He crowned a bright, though brief, career by dying of the wound he received in the moment of victory at Delhi. The Chief Commissioner does not hesitate to affirm that without John Nicholson Delhi could not have fallen."

See J. L. Trotter, *Life of John Nicholson* (1904); Sir John Kaye, *Lives of Indian Officers* (1889); Bosworth Smith, *Life of Lord Lawrence* (1883); Lady Edwardes, *Memorials of Sir Herbert Edwardes* (1886); and S. S. Thorburn, *Bannu* (1876).

NICHOLSON, WILLIAM (1753–1815), English writer on natural philosophy, was born in London in 1753, and after leaving school made two voyages as midshipman in the East India service. He subsequently entered an attorney's office, but, having become acquainted, in 1775, with Josiah Wedgwood, he lived for some years at Amsterdam as agent for the sale of pottery. On his return to England he was induced by Thomas Holcroft to devote himself to the composition of light literature for periodicals, assisting that writer also with some of his plays and novels. Meanwhile he employed himself on the preparation of *An Introduction to Natural Philosophy*, which was published in 1781 and was at once successful. A translation of Voltaire's *Elements of the Newtonian Philosophy* soon followed, and he now entirely devoted himself to scientific pursuits and philosophical journalism. In 1784 he was appointed secretary to the General Chamber of Manufacturers of Great Britain, and he was also connected with the Society for the Encouragement of Naval Architecture, established in 1791. He bestowed much attention upon the construction of various machines for comb-cutting, file-making, cylinder printing, &c.; he also invented an areometer. In 1800 he began in London a course of public lectures on natural philosophy and chemistry, and about this period he made the discovery of the decomposition of water by the voltaic current. In 1797 the *Journal of Natural Philosophy, Chemistry and the Arts*, generally known as *Nicholson's Journal*, the earliest work of the kind in Great Britain, was begun; it was carried on till 1814. During the later years of his life Nicholson's attention was chiefly directed to waterworks engineering at Portsmouth, at Gosport and in Southwark. He died in London on the 21st of May 1815.

Besides considerable contributions to the *Philosophical Transactions*, Nicholson wrote translations of Fourcroy's *Chemistry* (1787) and Chaptal's *Chemistry* (1788), *First Principles of Chemistry* (1788) and a *Chemical Dictionary* (1795); he also edited the *British Encyclopaedia, or Dictionary of Arts and Sciences* (6 vols., 8vo, London, 1809).

NICHOLSON, WILLIAM (1784–1844), Scottish painter, was born at Newcastle-on-Tyne. Having settled in Edinburgh, he painted portraits both in oil and water-colour; and along with Thomas Hamilton the architect he was one of the founders and most vigorous promoters of the Scottish Academy, of which he became the first secretary (1826–1833). In 1818 he published a series of etchings entitled *Portraits of Distinguished Living Characters of Scotland*, including Sir Walter Scott, Lord Jeffrey, Robert Burns and Professor Wilson.

NICIAS (d. 414 B.C.), a soldier and statesman in ancient Athens, inherited from his father Niceratus a considerable fortune invested mainly in the silver mines of Laurium. Evidence of his wealth is found in the fact that he had no less than 1000 slaves whom he hired out. He gravitated naturally to the aristocratic party, and was several times colleague with Pericles in the strategia. On the death of Pericles he was left leader of the aristocrats against the advanced party of Cleon (*q.v.*). He made use of his wealth both to buy off enemies (especially informers) and to acquire popularity by the magnificent way in which he discharged various public services, especially those connected with the state religion, of which he was a strong supporter. In the field he displayed extreme caution, and prior to the great Sicilian expedition achieved a number of minor military successes. In 421 he took a prominent part in the arrangement of the "Peace of Nicias," which terminated the first decade of the Peloponnesian War (*q.v.*). He now entered with varying success upon a period of rivalry with Alcibiades, the details of which are largely matters of conjecture. So bitter was the strife that the ostracism of one seemed inevitable, but by a temporary coalition they secured instead the banishment of the demagogue Hyperbolus (417). In 415 he was appointed with Alcibiades and Lamachus to command the Sicilian expedition, and, after the flight of Alcibiades (*q.v.*) and the death of Lamachus, was practically the sole commander, the much more capable Demosthenes, who was sent to his aid, being apparently of comparatively little weight. How far it is just to attribute to his excessive caution and his blind faith in omens the disastrous failure it is difficult to say. At all events it is clear that the management of so great an enterprise was a task far beyond his powers. He was a man of conventional respectability and mechanical piety, without the originality which was required to meet the crisis which faced him. His popularity with the aristocratic party in Athens is, however, strikingly shown by the lament of Thucydides over his death: "He assuredly, among all Greeks of my time, least deserved to come to so extreme a pitch of ill-fortune, considering his exact performance of established duties to the divinity" (vii. 86, Grote's version).

Besides Thucydides see Plutarch's *Nicias* and Diod. xii. 83; also the general authorities on the history of Greece, and the article PELOPONNESIAN WAR.

NICIAS, son of Nicomedes, an Attic painter of the 4th century B.C. Pliny (xxxv. 131) gives a list of his works. He was associated with Praxiteles, whose statues he coloured, thus adding to their value.

NICKEL (symbol Ni, atomic weight 58·68 (O=16)), a metallic element. It has been known from the earliest times, being employed by the Chinese in the form of an alloy called pakfong. It was first isolated in an impure condition in 1751 by A. F. Cronstedt from niccolite, and his results were afterwards confirmed by T. O. Bergman in 1775 (*De niccolo, opusc.* 2, p. 231; 3, p. 459; 4, p. 374). It occurs in the uncombined condition and alloyed with iron in meteorites; as sulphide in millerite and nickel blende, as arsenide in niccolite and cloanthite, and frequently in combination with arsenic and antimony in the form of complex sulphides. In recent years it has been found in considerable quantities in New Caledonia in the form of a hydrated silicate of nickel and magnesia approximating to the constitution $(NiO, MgO)SiO_2 \cdot nH_2O$ (J. Garnier, 1865), and in Canada in the form of nickeliferous pyrrhotines, which consist of sulphides of iron associated with sulphides of nickel and copper, embedded in a matrix of gneiss. At the present time nickel is obtained practically entirely from garnierite and the nickeliferous pyrrhotines. When the former is used it is roasted with calcium sulphate or alkali waste to form a matte which is then blown in a Bessemer converter or heated in a reverberatory furnace with a siliceous flux with the object of forming a rich nickel sulphide. This sulphide is then by further heating converted into the oxide and finally reduced to the state of metal by ignition with carbon in clay crucibles. The process adopted for the Canadian ores, which are poor in copper and nickel, consists in a preliminary roasting in heaps and smelting in a blast furnace in order to obtain a matte, which is then further smelted with a siliceous flux for a rich matte. This rich matte is then mixed with coke and salt-cake and melted down in an open hearth furnace. The nickel sulphide so obtained is then roasted to oxide and reduced to metal. For a wet method of extraction of the matte see Christofle and Bouilhet, *French Patent* 111591 (1876). L. Mond (*Jour. Soc. Chem. Ind.* 1895, p. 945) has obtained metallic nickel from the Canadian mattes by first roasting them and then eliminating copper by the action of sulphuric acid, the product so obtained being then exposed to the reducing action of producer gas at about 350° C. The reduced metal is then passed into a "volatilizer" and exposed to the action of carbon monoxide at about 80° C., the nickel carbonyl so formed being received in a chamber heated to 180–200° C., where it decomposes, the nickel being deposited and the carbon monoxide returned to the volatilizer. For an electrolytic method of treating mattes, see T. Ulke, *Moniteur scient.*, 1897, 49, p. 450. The metal as obtained by industrial methods rarely contains more than about 99–99·5% of nickel, the chief impurities being copper, iron, cobalt, silicon and carbon.

The following tables show the output of nickel from Canada and the shipments of nickel ore from New Caledonia in recent years:—

CANADA

	Production (℔).	Export (℔).		Production (℔).	Export (℔).
1900	7,080,227	13,493,239	1905	18,876,315	11,970,557
1901	9,189,047	9,537,558	1906	21,490,955	20,653,845
1902	10,693.410	3,883,264	1907	21,189,793	19,376,335
1903	12,505,510	9,032,554	1908	19,143,111	19,419,893
1904	10,547,883	14,229,973			

NEW CALEDONIA

	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Metric tons .	100,319	133,676	129,653	77,360	98,665	125,289	130,688	101,708	120,028

(See Rothwell's *Mineral Industry* (1908), pp. 666, 670).

The metal may also be obtained on the small scale by the reduction of the oxide by hydrogen or by carbon, by ignition of the oxalate or of nickel ammonium oxalate (J. J. Berzelius), by reduction of the chloride in a current of hydrogen (E. Péligot), by electrolysis of nickel ammonium sulphate (Winkler, *Zeit. anorg. Chem.* 1894, 8, p. 1), and by reduction of the chloride with calcium carbide.

It is a greyish white metal, and is very malleable and ductile. Its specific gravity varies according to the method employed for its preparation, the extreme values being 8·279 and 9·25. It melts between 1400–1600° C. Its specific heat increases with rise of temperature, the mean value from 15° to 100° C. being 0·1084 (A. Naccari, *Gazz.*, 1888, 18, p. 13). It is magnetic, but loses its magnetism when heated, the loss being complete at about 340-350° C. On the physical constants see H. Copaux, *Comptes rendus*, 1905, 140, p. 651. Nickel occludes hydrogen readily, is attacked by the halogen elements, and oxidizes easily when heated in air. In the massive state it is unacted upon by dry air, but if moistened with acidified water, oxidation takes place slowly. When obtained by reduction processes at as low a temperature as possible the finely divided metal so formed is pyrophoric, and according to P. Schutzenberger (*Comptes rendus*, 1891, 113, p. 177) dry hydrochloric acid gas converts this form into nickel chloride and a volatile compound of composition NiHCl. It decomposes water at a red heat. According to E. St Edme (*Comptes rendus*, 1886, 106, p. 1079) sheet nickel is passive to nitric acid, and the metal remains passive even when heated to redness in a current of hydrogen. On the reduction of organic compounds by hydrogen in the presence of metallic nickel see P. Sabatier and J. B. Senderens, *Ann. Chim. Phys.*, 1905 [8], 4, pp. 319, 433.

It rapidly oxidizes when fused with caustic soda, but is scarcely acted upon by caustic potash (W. Dittmar, *Jour. Soc. Chem. Ind.*, 1884, 3, p. 103). Hydrochloric and sulphuric acids are almost without action on the metal, but it dissolves readily in dilute nitric acid. Nickel salts are antiseptic; they arrest fermentation and stop the growth of plants. Nickel carbonyl, however, is extremely poisonous. On the toxic properties of nickel salts see A. Riche and Laborde, *Jour. Pharm. Chem.*, 1888, [5], 17, pp. 1, 59, 97.

Nickel is used for the manufacture of domestic utensils, for crucibles, coinage, plating, and for the preparation of various alloys, such as German silver, nickel steels such as invar (nickel, 35·7%; steel, 64·3%), which has a negligible coefficient of thermal expansion, and constantan (nickel, 45%; copper, 55%), which has a negligible thermal coefficient of its electrical resistance.

Compounds.

Nickel Oxides.—Several oxides of nickel are known. A suboxide, Ni_2O (?), described by W. Muller (*Pogg. Ann.*, 1869, 212, p. 59), is not certainly known. The *monoxide*, NiO, occurs naturally as bunsenite, and is obtained artificially when nickel hydroxide, carbonate, nitrate or sulphate is heated. It may also be prepared by the action of nickel on water, by the reduction of the oxide Ni_2O_3 with hydrogen at about 200° C. (H. Moissan, *Ann. Chim. Phys.*, [5], 21, p. 199), or by heating nickel chloride with sodium carbonate and extracting the fused mass with water. It is a green powder which becomes yellow when heated. It dissociates at a red heat, and is readily reduced to the metal when heated with carbon or in a current of hydrogen. It is readily soluble in acids, forming salts, the rate of solution being rapid if the oxide is in the amorphous condition, but slow if the oxide is crystalline. The *hydroxide*, $Ni(OH)_2$, is obtained in the form of a greenish amorphous powder when nickel salts are precipitated by the caustic alkalis. It is readily soluble in acids and in an aqueous solution of ammonia. *Nickel sesquioxide*, Ni_2O_3, is formed when the nitrate is decomposed by heat at the lowest possible temperature, by a similar decomposition of the chlorate, or by fusing the chloride with potassium chlorate. It is a black powder, the composition of which is never quite definite, but approximates to the formula given above. When heated with oxy-acids it dissolves, with evolution of oxygen, and with hydrochloric acid it evolves chlorine. Numerous hydrated forms of the oxide have been described (see W. Wernicke, *Pogg. Ann.*, 1870, 217, p. 122). A *peroxide*, NiO_2, has been obtained in the form of dinickelite of barium, $BaO{\cdot}2NiO_2$, by heating the monoxide with anhydrous baryta in the electric furnace (E. Dufau, *Comptes rendus*, 1896, 123, p. 495). G. Pellini and D. Meneghini (*Zeit. anorg. Chem.*, 1908, 60, p. 178) obtained a greyish green powder of composition $NiO_2{\cdot}xH_2O$, by adding an alcoholic solution of potassium hydrate to nickel-chloride and hydrogen peroxide at −50°. It has all the reactions of hydrogen peroxide, and S. Tanatar (*Ber.*, 1909, 42, p. 1516) regards it as $NiO{\cdot}H_2O_2$. An oxide, Ni_3O_4, has been obtained by heating nickel chloride in a current of moist oxygen at about 400° C. (H. Baubigny, *Comptes rendus*, 1878, 87, p. 1082), or by heating the sesquioxide in hydrogen at 190° C. (H. Moissan, *Ann. Chim. Phys.*, 1890 [5], 21, p. 199). The former method yields greyish, metallic-looking, microscopic crystals, the latter a grey amorphous powder. A hydrated form, $Ni_3O_4{\cdot}2H_2O$, is obtained when the monoxide is fused with sodium peroxide at a red heat and the fused mass extracted with water.

Nickel Salts.—Only one series of salts is known, namely those corresponding to the monoxide. In the anhydrous state they are usually of a yellow colour, whilst in the hydrated condition they are green. They may be recognized by the brownish violet colour they impart to a borax bead when heated in an oxidizing flame. The caustic alkalis added to solutions of nickel salts give a pale green precipitate of the hydroxide, insoluble in excess of the precipitant. This latter reaction is hindered by the presence of many organic acids (tartaric acid, citric acid, &c.). Potassium cyanide gives a greenish yellow precipitate of nickel cyanide, $Ni(CN)_2$, soluble in excess of potassium cyanide, forming a double salt, $Ni(CN)_2{\cdot}2KCN$, which remains unaltered when boiled with excess of potassium cyanide in presence of air (cf. COBALT). Ammonium sulphide precipitates black nickel sulphide, which is somewhat soluble in excess of the precipitate (especially if yellow ammonium sulphide be used), forming a dark-coloured solution. Ammonium hydroxide gives a green precipitate of the hydroxide, soluble in excess of ammonia, forming a blue solution. Numerous methods have been devised for the separation of nickel and cobalt, the more important of which are:—the cobaltinitrite method by which the cobalt is precipitated in the presence of acetic acid by means of potassium nitrite (the alkaline earth metals must not be present); the cyanide method (J. v. Liebig, *Ann.*, 1848, 65, p. 244; 1853, 87, p. 128), in which the two metals are precipitated by excess of potassium cyanide in alkaline solution, bromine being afterwards added and the solution warmed, when the nickel is precipitated. The latter method has been modified by adding potassium cyanide in slight excess to the solution of the mixed salts, heating for some time and then adding mercuric oxide and water, the whole being then warmed on the water bath, when a precipitate of mercuric oxide and nickel hydroxide is obtained

(Liebig). M. Ilinski and G. v. Knorre (*Ber.*, 1885, 18, p. 169) separate the metals by adding nitroso-β-naphthol in the presence of 50% acetic acid, a precipitate of cobalti nitroso-β-naphthol, $[C_{10}H_6O(NO)]_3Co$, insoluble in hydrochloric acid, being formed, whilst the corresponding nickel compound dissolves in hydrochloric acid. E. Pinerua separates the metals by taking advantage of the fact that cobalt chloride is soluble in ether which has been saturated with hydrochloric acid gas at low temperature. For an examination of the above and other methods see E. Hintz, *Zeit. anal. Chem.*, 1891, 30, p. 227.

Nickel fluoride, NiF_2, obtained by the action of hydrofluoric acid on nickel chloride, crystallizes in yellowish green prisms which volatilise above 1000° C. It is difficultly soluble in water, and combines with the alkaline fluorides to form double salts. *Nickel chloride*, $NiCl_2$, is obtained in the anhydrous condition by heating the hydrated salt to 140° C., or by gently heating the finely divided metal in a current of chlorine. It readily sublimes when heated in a current of chlorine, forming golden yellow scales. It is easily reduced when heated in hydrogen. It forms crystalline compounds with ammonia and the organic bases. It is soluble in alcohol and in water. Three hydrated forms are known, viz. a mono-, di-, and hexa-hydrate; the latter being the form usually obtained by the solution of the oxide or carbonate in hydrochloric acid. *Nickel chloride ammonia*, $NiCl_2{\cdot}6NH_3$, is obtained as a white powder when anhydrous nickel chloride is exposed to the action of ammonia gas (H. Rose, *Pogg. Ann.*, 1830, 96, p. 155), or in the form of blue octahedra by evaporating a solution of nickel chloride in aqueous ammonia. When heated to 100° C. it loses four molecules of ammonia. Two hydrated forms have been described, one containing three molecules of water and the other half a molecule. Numerous double chlorides of nickel and other metals are known. The bromide and iodide of nickel resemble the chloride and are prepared in a similar fashion.

Several sulphides of the element have been obtained. A *subsulphide*, Ni_2S(?), results when the sulphate is heated with sulphur or when the precipitated monosulphide is heated in a current of hydrogen. It forms a light yellow amorphous mass which is almost insoluble in acids. The *monosulphide*, NiS, is obtained by heating nickel with sulphur, by heating the monoxide with sulphuretted hydrogen to a red heat, and by heating potassium sulphide with nickel chloride to 160-180° C. When prepared by dry methods it is an exceedingly stable, yellowish, somewhat crystalline mass. When prepared by the precipitation of nickel salts with alkaline sulphide in neutral solution it is a greyish black amorphous compound which readily oxidizes in moist air, forming a basic nickel sulphate. The freshly precipitated sulphide is soluble in sulphurous acid and somewhat soluble in hydrochloric acid and yellow ammonium sulphide (see H. Baubigny, *Comptes rendus*, 1882, 94, pp. 961, 1183; 95, p. 34). *Nickel sulphate*, $NiSO_4$, is obtained anhydrous as a yellow powder when any of its hydrates are heated. When heated with carbon it is reduced to the metal. It forms hydrates containing one, two, five, six and seven molecules of water. The heptahydrate is obtained by dissolving the metal or its oxide, hydroxide or carbonate in dilute sulphuric acid (preferably in the presence of a small quantity of nitric acid), and allowing the solution to crystallize between 15° and 20° C. It crystallizes in emerald-green rhombic prisms and is moderately soluble in water. It effloresces gradually on exposure to air and passes into the hexahydrate. It loses four molecules of water of crystallization when heated to 100° C. and becomes anhydrous at about 300° C. The hexahydrate is dimorphous, a tetragonal form being obtained by crystallization of a solution of the heptahydrate between 20° and 30° C., and a monoclinic form between 50° and 70° C. Nickel sulphate combines with many metallic sulphates to form double salts, and also forms addition compounds with ammonia aniline and hydroxylamine. The *nitrate*, $Ni(NO_3)_2.6H_2O$, is obtained by dissolving the metal in dilute nitric acid and concentrating the solution between 40° and 50° C. It crystallizes in green prisms which deliquesce rapidly on exposure to moist air.

Nickel carbonyl, $Ni(CO)_4$, is obtained as a colourless mobile liquid by passing carbon monoxide over reduced nickel at a temperature of about 60° C. (L. Mond, Langer and Quincke, *Jour. Chem. Soc.*, 1890, 57, p. 749). It boils at 43° C. (751 mm.), and sets at −25° C. to a mass of crystalline needles. It is readily soluble in hydrocarbon solvents, in chloroform and in alcohol. Its critical pressure is 30 atmospheres and its critical temperature is in the neighbourhood of 195° C. (J. Dewar, *Proc. Roy. Soc.*, 1903, 71, p. 427). It decomposes with explosive violence when heated rapidly. Dewar and Jones (*Journ. Chem. Soc.*, 1904, p. 203) have made an exhaustive study of its reactions, and find that it is decomposed by the halogens (dissolved in carbon tetrachloride) with liberation of carbon monoxide and formation of a nickel halide. Cyanogen iodide and iodine mono- and tri-chloride effect similar decompositions with simultaneous liberation of iodine; sulphuric acid reacts slowly, forming nickel sulphate and liberating hydrogen and carbon monoxide. Hydrochloric and hydrobromic acids are without action; hydriodic acid only reacts slowly. With aromatic hydrocarbons in the presence of anhydrous aluminium chloride, in the cold, there is a large evolution of hydrochloric acid gas, and an aldehyde is formed; at 100° C., on the other hand, anthracene derivatives are produced. Thus by using benzene, benzaldehyde and anthracene are obtained. Dewar and Jones suggest that in the latter reaction it is the metallic nickel which is probably the reducing agent effecting the change, since it is only dissolved in any quantity when the anthracene hydrocarbon is produced. When mesitylene is used, the reaction does not proceed beyond the aldehyde stage since hydrocarbon formation is prevented by the presence of a methyl group in the ortho-position to the -CHO group. Acids and alkalis are in general without action on nickel carbonyl. The vapour of nickel carbonyl burns with a luminous flame, a cold surface depressed in the flame being covered with a black deposit of nickel. It is an extremely powerful poison. Mond and his assistants have discovered several other carbonyls. For example cobalt gives $Co(CO)_4$, as orange crystals which melt at 51°, decomposing at a higher temperature, giving $Co(CO)_3$ and CO at 60°; $Co(CO)_3$ forms jet black crystals. For iron carbonyls see IRON; also L. Mond, H. Hirtz and M. D. Cowap, *Jour. Chem. Soc.*, 1910, 97, p. 798. *Nickel carbonate*, $NiCO_3$, is obtained in the anhydrous state by heating nickel chloride with calcium carbonate in a sealed tube to 150° C. (H. de Sénarmont, *Ann. Chim. Phys.*, 1850 [3], 30, 138). It crystallizes in microscopic rhombohedra insoluble in cold acids. By precipitation of nickel salts with solutions of the alkaline carbonates, basic carbonates of variable composition are obtained.

Numerous determinations of the atomic weight of nickel have been published, the values obtained varying from 58·0 to approximately 59·5. The more recent work of T. W. Richards and Cushman (*Chem. News*, 1899, 79, 163, 174, 185) gives for the atomic weight of the metal the values 58·69 and 58·70.

NICKNAME, a name given to a person in addition to his personal names, Christian and surname, either as a playful or familiar form of address or as a mark of ridicule, contempt or hatred. The Middle English form of the word, *nekename*, shows that it is a corruption of "an ekename" (*i.e.* "added" name; *eke*, earlier *eche*, from the root seen in Lat. *augere*, Gr. *αὐξάνειν*), and is therefore equivalent to the Lat. *agnomen*.

There is an interesting list of national nicknames in *Notes and Queries*, 9th series, 4; 212-214.

NICOBAR ISLANDS, a British group of twelve inhabited and seven uninhabited islands in the Bay of Bengal, between Sumatra and the Andaman Islands, to which latter they are administratively appended. They have an aggregate area of about 635 sq. m., Great Nicobar (*Loöng*), the largest and southernmost of any size, covering 333 sq. m. Six others range in area from about 20 sq. m. to 62 sq. m.; the rest are mere islets. A careful census of the natives, taken by Mr E. H. Man in 1901, gave a total population of some 6700, at about which figure the estimates of the number of inhabitants have always stood. Car Nicobar (*Pu*), the most northerly island, with an area of 49 sq. m., was by far the most densely populated, and had 3500 inhabitants, Great Nicobar containing only 450. The marine surveys of these islands are still meagre and unsatisfactory, but the whole of the Nicobars and outlying islands were surveyed topographically by the Indian Survey Department in 1886–1887, when a number of maps on the scale of 2 in. to the mile were produced, giving an accurate coast-line. Some of the islands have mere flat, coral-covered surfaces; others, again, are hilly, the Great Nicobar rising to 2105 ft. On that island there are considerable and beautiful streams, but the others generally are badly off for fresh surface water. There is one good harbour, a magnificent land-locked shelter called Nancowry Harbour, formed by the islands of Camorta and Nancowry (both known to natives as *Nankauri*).

Geology.—The Nicobars form part of a great submarine chain, of which the Andamans are a continuation. Elaborate geological reports were issued by a Danish scientific expedition in 1846 and an Austrian expedition in 1858. Dr Rink of the former found no trace of true volcanic rocks, though the chain as a whole is known for its volcanic activity, but features were not wanting to indicate considerable upheavals in the most recent periods. He considered that the islands belonged to the Tertiary age. Von Hochstetter of the Austrian expedition classified the most important formations thus: eruptive, serpentine and gabbro; marine deposits, probably late Tertiary, consisting of sandstones, slates, clay, marls, and plastic clay; recent corals. He considered the whole group connected geologically with the great islands of the Malay Archipelago farther south. The vexed question of the presence of coal and tin in the Nicobars has so far received no decided scientific support. The white clay marls of Camorta and Nancowry have become famous as being true polycistinan marls like those of Barbados. Earthquakes of great violence were recorded in 1847 and 1881 (with tidal wave), and mild shocks were experienced in December 1899.

Meteorology.—It has always been held to be important to maintain a meteorological station on the Nicobars, for the purpose of supplementing the information obtained from the Andamans regarding cyclones in the Bay of Bengal. From 1869 to 1888 an observatory was properly maintained in Nancowry harbour, but after the latter year observations were recorded only in a more or less desultory way until 1897, when the station was removed to Mus in Car Nicobar. The climate is unhealthy for Europeans. The islands are exposed to both monsoons, and smooth weather is only experienced from February to April, and in October. Rain falls throughout the year, generally in sharp, heavy showers. During the five years ending 1888 the annual rainfall varied from 91 in. to 133 in., and the number of wet days per annum from 148 to 222. The highest temperature in the shade was 98·2° F., and the lowest 64° F.

Flora and Fauna.—Although the vegetation of the Nicobars has received much desultory attention from scientific observers, it has not been subjected to a systematic examination by the Indian Forest Department like that of the Andamans, and indeed the forests are quite inferior in economic value to those of the more northerly group; besides fruit trees—such as the coco-nut (*Cocos nucifera*), the betel-nut (*Areca catechu*), and the mellori (*Pandanus leeram*)—a thatching palm (*Nipa fruticans*) and various timber trees have some commercial value, but only one timber tree (*Myristica irya*) would be considered first-class in the Andamans. The palms of the Nicobars are, however, exceedingly graceful. Instances of the introduction of foreign economic plants are frequently mentioned in the old missionary records, and nowadays a number of familiar Asiatic fruit-trees are carefully and successfully cultivated. As with the geology and the flora, certain phases of the fauna of the islands have been extensively reported. The mammals are not numerous. In the southernmost islands are a small monkey, rats and mice, tree-shrews (*Cladobates nic.*), bats, and flying-foxes, but it is doubtful if the "wild" pig is indigenous; cattle, when introduced and left, have speedily become "wild." There are many kinds of birds, notably the megapod (*Megapodius nic.*), the edible-nest-building swift (*Collocalia nidifica*), the hackled and pied pigeons (*Calaenas nic.* and *Carpophaga bicolor*), a paroquet (*Palaeornis caniceps*) and an oriole (*Oriolus macrourus*). Fowls, snipe and teal thrive after importation or migration. Reptiles—snakes, lizards and chameleons, crocodiles, turtles and an enormous variant of the edible Indian crab—are numerous; butterflies and insects, the latter very troublesome, have not yet been systematically collected. The fresh-water fish are reported to be of the types found in Sumatra.

Natives.—The Nicobarese may be best described as a Far Eastern race, having generally the characteristics of the less civilized tribes of the Malay Peninsula and the south-eastern portion of the Asiatic continent, and speaking varieties of the Mon-Annam group of languages, though the several dialects that prevail are mutually unintelligible. Their figure is not graceful, and, owing to their habit of dilating the lips by betel-chewing, the adults of both sexes are often repulsive in appearance. Though short according to the standard of whites (average height, man, 5 ft. 3¾ in.; woman, 5 ft.), the Nicobarese are a fine, well-developed race, and live to seventy or eighty years of age. Their mental capacity is considerable, though there is a great difference between the sluggish inhabitant of Great Nicobar and the keen trader of Car Nicobar. The religion is an undisguised animism, and all their frequent and elaborate ceremonies and festivals are aimed at exorcising and scaring spirits. Though for a long time they were callous wreckers and pirates, and cruel, and though they show great want of feeling in the "devil murders"—ceremonial murders of one of themselves for grave offences against the community, which are now being gradually put down—still on the whole the Nicobarese are a quiet, inoffensive people, friendly to each other, and not quarrelsome, and by inclination friendly and not dangerous to foreigners. The old charge of cannibalism may be generally said to be quite untrue. Tribes can hardly be distinguished, but there are distinctions, chiefly territorial. All the differences observed in the several kinds of Nicobarese may with some confidence be referred to habitat and the physical difficulties of communication. Such government as there is, is by the village; but the village chiefs have not usually much power, though such authority as they have has always been maintained by the foreign Powers who have possessed the islands. The clothing, when not a caricature of European dress, is of the scantiest, and the waggling tags in which the loin-cloths are tied behind early gave rise to fanciful stories that the inhabitants were naked and tailed. The houses are good, and often of considerable size. The natives are skilful with their lands, and though they never cultivate cereals, exercise some care and knowledge over the coco-nut and tobacco, and have had much success with the foreign fruits and vegetables introduced by the missionaries. The staple article of trade has always been the ubiquitous coco-nut, of which it is computed that 15 million are produced annually, 10 million being taken by the people, and 5 million exported about equally from Car Nicobar and the rest of the islands. The usual cheap European goods are imported, the foreign trade being carried on with the native traders of the neighbouring Asiatic countries. There is an old-established internal trade, chiefly between the older islands and Chowra, for pots (which are only made there) and racing and other canoes.

History.—The situation of the Nicobars along the line of a very ancient trade route has caused them to be reported by traders and seafarers through all historical times. In the 17th century the islands began to attract the attention of missionaries. At various times France, Denmark, Austria and Great Britain all had more or less shadowy rights to the islands, the Danes being the most persistent in their efforts to occupy the group, until in 1869 they relinquished their claims in favour of the British, who at once began to put down the piracies of the islanders, and established a penal settlement, numbering in all about 350 persons, in Nancowry harbour. The health of the convicts was always bad, though it improved with length of residence and the adoption of better sanitary measures; and an attempt to found a Chinese colony having failed in 1884 through mismanagement, the settlement was withdrawn in 1888. There are native agencies at Nancowry harbour and on Car Nicobar, both of which places are gazetted ports. At the latter is a Church of England mission station under a native Indian catechist attached to the diocese of Rangoon.

Authorities.—E. H. Man, *Dictionary of the Central Nicobarese Language* (London, 1889); F. Maurer, *Die Nikobaren* (Berlin, 1867); Dr Svoboda, *Die Bewohner des Nikobaren-Archipels* (Leiden, 1893); F. A. De Roepstorff, *Dictionary of the Nancowry Dialect* (Calcutta, 1884); *Vocabulary of Dialects in the Nicobar and Andaman Islands* (2nd ed., Calcutta, 1875); Prevost and Heing, *Report on Preliminary Tour through the Nicobar Islands* (Government, Rangoon, 1897); J. B. Kloss, *In the Andamans and Nicobars* (London, 1902); A. Alcock, *A Naturalist in the Indian Seas* (London, 1902). (R. C. T.)

NICOL, JAMES (1810–1879), Scottish geologist, was born at Traquair, near Innerleithen, in Peeblesshire, on the 12th of August 1810. His father, the Rev. James Nicol (1769–1819), was minister of Traquair, and acquired some celebrity as a poet. Educated at Edinburgh University (1825), James Nicol attended the lectures of Jameson, and thereby gained a keen interest in geology and mineralogy; and he pursued their study in the universities of Bonn and Berlin. After returning home he worked zealously at the local geology and obtained prizes from the Highland Society for essays on the geology of Peeblesshire and Roxburghshire; he subsequently extended his researches over various parts of Scotland, and in 1844 published his able *Guide to the Geology of Scotland*. In 1847 he was appointed assistant secretary to the Geological Society of London, in 1849 professor of geology in Queen's College, Cork, and in 1853 professor of natural history in the University of Aberdeen, a post which he retained until a few months before he died, on the 8th of April 1879. During these years he carried out important researches on the southern uplands of Scotland and on the structure of the Highlands. In the former region he gave the first clear account of the succession of the fossiliferous Lower Palaeozoic rocks (1848–1852); and when he came to deal with the still older Highland rocks he made out the position of the Torridon sandstone and Durness limestone and their relations to the schists and gneisses. His matured views, although contested by Murchison, have subsequently been substantiated by Professor C. Lapworth and others.

The more important of his papers were: "On the Structure of the North-Western Highlands" (*Quart. Journ. Geol. Soc.*, 1861), and "On the Geological Structure of the Southern Grampians" (*ib.*, 1863). He contributed the article "Mineralogy" to the ninth edition of the *Encyclopædia Britannica*. Among his other works were *Manual of Mineralogy* (1849); *Elements of Mineralogy* (1858, 2nd ed., 1873); *Geological Map of Scotland* (1858); and *Geology and Scenery of the North of Scotland* (1866).

NICOL, WILLIAM (? 1768–1851), Scottish physicist, was born about 1768, and died at Edinburgh on the 2nd of September

1851. Nothing is known of his early history beyond the fact that, after amassing a small competence as a popular lecturer on natural philosophy, he settled in Edinburgh to live a very retired life in the society of his apparatus alone. Besides the invention of the prism known by his name ("A method of increasing the divergence of the two rays in calcareous spar, so as to produce a single image," *New Edin. Journ.*, 1828), he devoted himself chiefly to the examination of fluid-filled cavities in crystals, and of the microscopic structure of various kinds of fossil wood. His skill as a working lapidary was very great; and he prepared a number of lenses of garnet and other precious stones, which he preferred to the achromatic microscopes of the time.

NICOLAI, CHRISTOPH FRIEDRICH (1733–1811), German author and bookseller, was born on the 18th of March 1733 at Berlin, where his father, Christoph Gottlieb Nicolai (d. 1752), was the founder of the famous Nicolaische Buchhandlung. He received a good education, and in 1749 went to Frankfort-on-Oder to learn his father's business, finding time also to become acquainted with English literature. In 1752 he returned to Berlin, and began to take part in literary controversy by defending Milton against the attacks of J. C. Gottsched. His *Briefe über den jetzigen Zustand der schönen Wissenschaften in Deutschland*, published anonymously in 1755 and reprinted by G. Ellinger in 1894, were directed against both Gottsched and Gottsched's Swiss opponents, Johann Jakob Bodmer and Johann Jakob Breitinger; his enthusiasm for English literature won for him the friendship of Lessing and Moses Mendelssohn. In association with Mendelssohn he established in 1757 the *Bibliothek der schönen Wissenschaften*, a periodical which he conducted until 1760. With Lessing and Mendelssohn Nicolai founded in 1759 the famous *Briefe, die neueste Literatur betreffend*; and from 1765 to 1792 he edited the *Allgemeine deutsche Bibliothek*. This latter periodical served as the organ of the so-called "popular philosophers," who warred against authority in religion and against what they conceived to be extravagance in literature. The new movement of ideas represented by Herder, Goethe, Schiller, Kant and Fichte, Nicolai was incapable of understanding, and he made himself ridiculous by foolish misrepresentation of the aims of these writers. Of Nicolai's independent works, perhaps the only one which has some historical value is his *Anekdoten von Friedrich II.* (1788–1792). His romances are forgotten, although *Das Leben und die Meinungen des Herrn Magister Sebaldus Nothanker* (1773–1776), and his satire on Goethe's Werther, *Freuden des jungen Werthers* (1775), had a certain reputation in their day. Between 1788 and 1796 Nicolai published in 12 vols. a *Beschreibung einer Reise durch Deutschland und die Schweiz*, which bears witness to the narrow conservatism of his views in later life. He died in Berlin on the 11th of January 1811.

Nicolai's *Bildniss und Selbstbiographie* was published by M. S. Löwe in the *Bildnisse jetzt lebender Berliner Gelehrter*, in 1806. See also L. F. G. von Göckingk, *F. Nicolai's Leben und literarischer Nachlass* (1820); J. Minor, *Lessings Jugendfreunde*, in J. Kürschner's *Deutsche Nationalliteratur*, vol. lxxii. (1883); O. Hoffmann, *Herders Briefwechsel mit Nicolai* (1887); E. Friedel, *Zur Geschichte der Nicolaischen Buchhandlung* (1891); and E. Altenkrüger, *F. Nicolais Jugendschriften* (1894).

NICOLAÏ, OTTO (1810–1849), German composer, was born on the 9th of June in Königsberg. He studied music in Berlin and in 1833 became organist to the German embassy in Rome. There his operas *Enrico II* (1839) and *Il Templario* (1840) were produced, besides some church music, a series of songs, and a number of compositions for the pianoforte. He was subsequently appointed Hof Kapellmeister at the Berlin Opera House; and there, only two days before he died (on the 11th of March 1849), was performed his brilliant opera, *The Merry Wives of Windsor*, the work by which he is now remembered.

NICOLAS, SIR NICHOLAS HARRIS (1799–1848), English antiquary, fourth son of John Harris Nicolas (d. 1844), was born at Dartmouth on the 10th of March 1799. Having served in the navy from 1812 to 1816, he studied law and was called to the bar at the Inner Temple in 1825. His work as a barrister, however, was confined principally to peerage cases before the House of Lords, and his time was mainly devoted to genealogical and historical studies. In 1831 he was made a knight of the order of the Guelphs, and in 1832 chancellor and knight-commander of the order of St Michael and St George, being advanced to the grade of the grand cross in 1840. He became a member of the council of the Society of Antiquaries in 1826, but soon began to criticize the management of the society's affairs, and withdrew in 1828. He then criticized the Record Commission, which he regarded as too expensive. These attacks, which brought him into controversy with Sir Francis Palgrave, led in 1836 to the appointment of a select committee to inquire into the public records. He was also responsible for several reforms at the British Museum. In 1822 Nicolas married Sarah (d. 1867), daughter of John Davison of Loughton, Essex, a reputed descendant of the Tudor statesman William Davison. By her he left two sons and six daughters. Pecuniary difficulties compelled him to leave England, and he died near Boulogne on the 3rd of August 1848. Although a sharp and eager controversialist Nicolas was a genial and generous man, with a great knowledge of genealogical questions.

The most important of the works of Nicolas is his *History of the Orders of Knighthood of the British Empire; of the Order of the Guelphs; and of Medals, Clasps, &c., for Naval and Military Services* (London, 1841–1842). Among his numerous other writings are, *The Chronology of History* (London, 1833); *Life of William Davison* (London, 1823); *Synopsis of the Peerage of England* (London, 1825); *Life and Times of Sir Christopher Hatton* (London, 1847); and an uncompleted *History of the Royal Navy* (London, 1847). He edited *Proceedings and Ordinances of the Privy Council of England, 1386–1542* (London, 1834–1837), and *Despatches and Letters of Lord Nelson* (London, 1844–1846); wrote lives of Chaucer, Burns, Cowper, Thomson, Collins, Kirke White and others for Pickering's Aldine edition of the poets; lives of Izaak Walton and Charles Cotton for an edition of the *Compleat Angler*; and several elaborate works on genealogical and kindred subjects printed for private circulation only.

NICOLAUS DAMASCENUS, Greek historian and philosopher of Damascus, flourished in the time of Augustus and Herod the Great, with both of whom he was on terms of friendship. He instructed Herod in rhetoric and philosophy, and had attracted the notice of Augustus when he accompanied his patron on a visit to Rome. Later, when Herod's conduct aroused the suspicions of Augustus, Nicolaus was sent on a mission to bring about a reconciliation. He survived Herod, and it was through his influence that the succession was secured for Archelaus; but the date of his death, like that of his birth, is unknown. Fragments of his universal history (Ἱστορία καθολική), from the time of the Assyrian empire to his own days, his autobiography, and his life of Augustus (Βίος Καίσαρος) have been preserved, chiefly in the extracts of Constantine Porphyrogenitus. Nicolaus also wrote comedies and tragedies, paraphrased and wrote commentaries on parts of Aristotle, and was himself the author of philosophical treatises.

Fragments in C. Müller, *Fragmenta historicorum Graecorum*, iii.; see also F. Navet, *Nikolaus von Damascus* (1853), containing an account of his life and writings, and translation of the fragments.

NICOLAUS OF LYRA (*c.* 1265–1349), French commentator, was born in Lire, now Vieille-Lyre, in the department of Eure, Normandy. He entered the Franciscan order at Verneuil about 1300, and studied at Paris, where, becoming a doctor some time before 1309, he taught for many years. From 1319 he was provincial of his order in France, and was present in that capacity at the general chapter at Pérouse (1321). In 1325 he was provincial of Burgundy, and as executor of the estate of Jeanne of Burgundy, widow of King Philip VI., he founded the college of Burgundy at Paris, where he died in the autumn of 1349, being buried in the chapter hall of the convent of the Cordeliers. Among the authentic works of Nicolaus of Lyra are: (1) two commentaries on the whole Bible, one (*Postilla litteralis*, 1322–1331) following the literal sense, the other (*Postilla mystica seu moralis*, 1339) following the mystic sense. There are numerous editions (Rome, 1471–1472; Douai, 1617; Antwerp, 1634). (2) *Tractatus de differentia nostrae translationis* (*i.e.* Vulgate) *ab Hebraica veritate*, 1333. (3) Two treatises against the Jews. (4) A theological treatise on the Beatific Vision, directed against pope John XXII. (1334), unpublished. (5)

Contemplatio de vita S. Francisci, a book of devotions. Nicolaus was above all a commentator. His exegesis, which was dominated by his polemics against the Jews, is characterized by a fidelity to the literal sense, the comparison with the Hebrew text, the direct use of Jewish commentators, a very independent attitude towards traditional interpretations, and a remarkable historical and critical sense. In all this he resembled Roger Bacon. His works, especially the *Postilla litteralis*, were very popular in the 14th and 15th centuries, but produced few imitators.

In addition to the notices in Wadding, du Moustier, Sbaraglia and Fabricius, see C. Siegfried, in *Archiv. f. wissenschaftliche Erforschung des A.T.*, vols. i., ii.; A. Merx, *Die Prophetie des Joel und ihre Ausleger* (1879, pp. 305-366); M. Fischer in *Jahrbücher f. protestantische Theologie*, xv.; F. Maschkowski, in *Zeitschrift f. alttestamentliche Wissenschaft*, xv.; Neumann in *Revue des études juives*, vols. 26 and 27; H. Labrosse in *Positions des thèses de l'École des Chartes* (1906).

NICOLAY, the name of a French family of Vivarais which came rapidly into legal prominence at the end of the 15th century. Jean Nicolay (d. 1527), son of a *bailli* of Bourg Saint-Andéol, became councillor at the parlement of Toulouse and afterwards at the Grand Council, chancellor of the kingdom of Naples, Maître des Requêtes, and, finally, first president of the Chambre des Comptes of Paris (1506). This last post was filled continuously up to the Revolution by his descendants. Antoine Chrétien de Nicolay (1712–1777) became marshal of France in 1775. His brother, Aymar Chrétien François Michel (1721–1769), bishop of Verdun, was first almoner of Marie Josephe of Saxony, wife of the dauphin Louis (d. 1765), and her influential counsellor.

See A. de Boislisle, *Pièces justificatives pour servir à l'histoire des premiers présidents de la Chambre des Comptes* (1873), and *Histoire de la maison de Nicolay* (1875).

NICOLE, PIERRE (1625–1695), one of the most distinguished of the French Jansenists, was the son of a provincial barrister, and was born at Chartres. Sent to Paris in 1642 to study theology, he soon entered into relations with the Jansenist community at Port Royal (*q.v.*) through his aunt, Marie des Anges Suireau, who was for a short time abbess of the convent. Some scruple of conscience forbade him to proceed to the priesthood, and he remained throughout life a "clerk in minor orders," although a profound theological scholar. For some years he was a master in the "little school" for boys established at Port Royal, and had the honour of teaching Greek to young Jean Racine, the future poet. But his chief duty was to act, in collaboration with Antoine Arnauld, as general editor of the controversial literature put forth by the Jansenists. He had a large share in collecting the materials for Pascal's *Provincial Letters* (1656); in 1658 he translated the *Letters* into Latin, under the pseudonym of Nicholas Wendrock. In 1664 he himself began a series of letters, *Les Imaginaires*, intended to show that the heretical opinions commonly ascribed to the Jansenists really existed only in the imagination of the Jesuits. His letters being violently attacked by Desmaretz de Saint-Sorlin, an erratic minor poet who professed great devotion to the Jesuits, Nicole replied to him in another series of letters, *Les Visionnaires* (1666). In the course of these he observed that poets and dramatists were no better than "public poisoners." This remark stung Racine to the quick; he turned not only on his old master, but on all Port Royal, in a scathing reply, which—as Boileau told him—did more honour to his head than to his heart. About the same time Nicole became involved in a controversy about transubstantiation with the Huguenot Claude; out of this grew a massive work, *La Perpétuité de la foi de l'église catholique touchant l'eucharistie* (1669), the joint effort of Nicole and Antoine Arnauld. But Nicole's most popular production was his *Essais de morale*, a series of short discussions on practical Christianity. The first volume was published in 1671, and was followed at irregular intervals by others; altogether the series numbers fourteen volumes. In 1679, on the renewal of the persecution of the Jansenists, Nicole was forced to fly to Belgium in company with Arnauld. But the two soon parted. Nicole was elderly and in poor health; the life of a fugitive was not to his taste, and he complained that he wanted rest. "Rest," answered Arnauld, "when you have eternity to rest in!" In 1683 Nicole made a rather ambiguous peace with the authorities, and was allowed to come back to Paris. There he continued his literary labours up to the last; he was writing a refutation of the new heresy of the Quietists, when death overtook him on the 16th of November 1695.

Nicole was one of the most attractive figures of Port Royal. Many stories are told of his quaint absent-mindedness and unreadiness in conversation. His books are distinguished by exactly opposite qualities; they are neat and orderly to excess. Hence they were exceedingly popular with Mme de Sévigné and readers of her class. No other Jansenist writer, not even Pascal, was so successful in putting the position of Port Royal before the world. And although a modern appetite quails before fourteen volumes on morality, there is much solid sense and practical knowledge of human nature to be found in the *Essais de morale*. Several abridgments of the work exist, notably a *Choix des essais de morale de Nicole*, ed. Silvestre de Saci (Paris, 1857).

Nicole's life is told at length in the 4th volume of Sainte Beuve's *Port-Royal*. (St. C.)

NICOLL, ROBERT (1814–1837), Scottish poet, was born on the 7th of January, 1814, at the farm of Little Tullybeltane, in the parish of Auchtergaven, Perthshire. When Robert was five years old his father was reduced to poverty. He became a day-labourer, and was only able to give his son a very slight education. At sixteen the boy was apprenticed to a grocer and wine-merchant at Perth. In 1833 he began to contribute to *Johnstone's Magazine* (afterwards *Tait's Magazine*), and in the next year his apprenticeship was cancelled. He visited Edinburgh, and was kindly received there, but obtained no employment. He opened a circulating library at Dundee, but in 1836 he became editor of the *Leeds Times*. He held pronounced Radical opinions, and overtaxed his slender physical resources in electioneering work for Sir William Molesworth in the summer of 1837. He was obliged to resign his editorship, and died at the house of his friend William Tait, at Trinity, near Edinburgh, on the 7th of December 1837, in his twenty-fourth year. He had published a volume of *Poems* in 1835; and in 1844 appeared a further volume, *Poems and Lyrics*, with an anonymous memoir of the author by Mrs C. I. Johnstone. The best of his lyrics are those written in the Scottish dialect. They are simple in feeling and expression, genuine folk-songs.

An eloquent appreciation of his character and his poetry was included in Charles Kingsley's article on "Burns and his School" in the *North British Review* for November 1851. See also P. R. Drummond, *Life of Robert Nicoll, Poet* (1884).

NICOLL, SIR WILLIAM ROBERTSON (1851–), Scottish Nonconformist divine and man of letters, was born at Auchindoir, Aberdeenshire, on the 10th of October 1851, the son of a Free Church minister. He graduated M.A. at Aberdeen in 1870, and studied for the ministry at the Free Church College there until 1874, when he was ordained minister of the Free Church at Dufftown. Three years later he moved to Kelso, and in 1884 became editor of the *Expositor*. In 1886 he founded the *British Weekly*, a Nonconformist organ which obtained great influence over opinion in the free churches. Robertson Nicoll secured many writers of exceptional talent for his paper, to which he was himself a considerable contributor, the papers signed "Claudius Clear" being among those from his hand. He also founded and edited the *Bookman* (1891, &c.), and acted as chief literary adviser to the publishing firm of Hodder & Stoughton. Among his other enterprises were *The Expositor's Bible* and *The Theological Educator*. He edited *The Expositor's Greek Testament* (1897, &c.), and a series of *Contemporary Writers* (1894, &c.), and of *Literary Lives* (1904, &c.). He wrote a history of *The Victorian Era in English Literature*, and edited, with T. J. Wise, *Literary Anecdotes of the Nineteenth Century*. The knighthood bestowed on him among the birthday honours in 1909 was an apt recognition of his long and able devotion to the "journeyman work" of literature.

A list of his publications is included in a monograph on Dr Nicoll by Jane T. Stoddart ("New Century Leaders," 1903).

NICOLLS, RICHARD (1624–1672), American colonial governor, was born probably at Ampthill, Bedfordshire, England, in 1624. He commanded a royalist troop of horse during the Civil War, and on the defeat of the king went into exile. Soon after the Restoration he became groom of the bedchamber to the duke of

York, through whose influence he was appointed in 1664 on a commission with Sir Robert Carr (d. 1667), George Cartwright and Samuel Maverick, to conquer New Netherland from the Dutch and to regulate the affairs of the New England colonies and settle disputes among them. The expedition set sail from Portsmouth on the 25th of May 1664, and New Amsterdam was surrendered to Nicolls on the 8th of September. Under authority of a commission from the duke of York, Nicolls assumed the position of deputy-governor of New Netherland (New York). His policy was vigorous but tactful, and the transition to the new regime was made smoothly and with due regard to the interests of the conquered people. They were guaranteed in the possession of their property rights, their laws of inheritance, and the enjoyment of religious freedom. The English system of law and administration was at once introduced into Long Island, Staten Island and Westchester, where the English element already predominated, but the change was made much more slowly in the Dutch sections. A code of laws, known as the "Duke's Laws," drafted by the governor with the help of his secretary, Matthias Nicolls[1] (*c.* 1630–1687), and dated the 12th of March, was proclaimed at Hempstead, Long Island, on the 1st of March 1665 and continued in force until 1683; the code was compiled from the codes of the New England colonies, and it provided for trial by jury, for proportional taxation on property, for the issuance of new patents for land and for land tenure only by licence from the duke. Nicolls returned to England in the summer of 1668 and continued in the service of the duke of York. He was killed in the naval battle of Southwold Bay on the 28th of May 1672.

See J. R. Brodhead, *History of the State of New York* (2 vols., rev. ed., 1872). For the "Duke's Laws" see *Laws of Colonial New York*, i. 6-100.

NICOLSON, WILLIAM (1655–1727), English divine and antiquary, was educated at Queen's College, Oxford (M.A., 1679; fellow, 1679–1682). After visiting Leipzig to learn German he was made prebendary of Carlisle in 1681, archdeacon in 1682. Twenty years later he was appointed bishop of the same diocese, where he remained until his translation to Derry in 1718. In 1727 he was nominated archbishop of Cashel and Emly, but died before he could assume charge. Nicolson is remembered by the impulsiveness of his temperament, which led him into a good deal of strife as a bishop, and more happily by his zeal in collecting and guarding manuscripts and other official documents. For this purpose he had special rooms built at Derry. His chief works were the *Historical Library* (English, 1696–97–99; Scottish, 1702; Irish, 1724; complete later editions, 1732 and 1776), and *Leges Marchiarum or Border Laws* (1705, new ed., 1747).

NICOMACHUS, a Neo-pythagorean philosopher and mathematician, born at Gerasa in Arabia Petraea, flourished about A.D. 100. In his musical treatise he mentions Thrasyllus (d. 36), the astrologer and confidant of Tiberius, and his *Arithmetic* was translated by Apuleius, who wrote under Antoninus Pius and Marcus Aurelius. He is the author of two extant treatises: (1) Ἀριθμητικὴ εἰσαγωγή (*Introduction to Arithmetic*), a metaphysical account of the theory and properties of numbers, and the first work in which arithmetic was treated quite independently of geometry. It was extremely popular, was the subject of commentaries by Iamblichus (ed. H. Pistelli, 1894) and others, was translated into Latin by Apuleius (according to Cassiodorus, the translation itself being lost) and Boëtius, and used as a schoolbook down to the Renaissance. (2) Ἐγχειρίδιον ἁρμονικῆς (*Manual of Harmony*), complete in one book, to which are erroneously appended as a second book some fragments probably belonging to a larger treatise *On Music* now lost. It is the oldest authority on the Pythagorean theory of music. Photius (*cod.* 187) also mentions a work by Nicomachus called Ἀριθμητικὰ θεολογούμενα (*The Theology of Arithmetic*), written in a spirit of Pythagorean mysticism and Oriental superstition, and setting forth the application of arithmetic, or rather of the first ten numbers, to the origin and attributes of the gods. But the extracts in Photius are now generally attributed to Iamblichus. Other works of Nicomachus were: a *Life of Pythagoras* and a *Collection of Pythagorean Doctrines*, the chief source of the life of Pythagoras and the account of his philosophy by Iamblichus.

EDITIONS.—*Introd. to Arith.*, by R. Hoche (1866); *Manual of Harmony*, by C. de Jan in *Musici scriptores Graeci* (1895), with account of Nicomachus and his works, and French translation, with bibliography and notes, by C. E. Ruelle (1881); *Theology of Arithmetic*, by F. Ast (1817); see W. Christ, *Geschichte der griechischen Literatur* (1898); M. Cantor, *Vorlesungen über Geschichte der Mathematik*, i. (1894) p. 400, and J. Gow, *A Short History of Greek Mathematics* (1884), p. 88, both of whom give summaries of the *Arithmetic*.

NICOMACHUS, of Thebes, Greek painter, of the early part of the 4th century, was a contemporary of the greatest painters of Greece; Vitruvius observes that if his fame was less than theirs, it was the fault of fortune rather than of demerit. Pliny (xxxv. 108) gives a list of his works; among them a "Rape of Persephone," "Victory in a Quadriga," a group of Apollo and Artemis, and the "Mother of the Gods seated on a Lion." Pliny tells us that he was a very rapid worker and used but four colours (the last seems impossible). Plutarch mentions his paintings as possessing the Homeric merit of ease and absence of effort.

NICOMEDES I., son of Zipoetes, king of Bithynia (*c.* 278–248 B.C.). He made himself master of the whole country and put to death his brother, who had set himself up as an independent ruler. He enlarged and consolidated the kingdom, founded the great city of Nicomedia as the capital, and fought successfully for some time with Antiochus of Syria. His reign seems to have been prosperous and uneventful; the year of his death is uncertain.

Livy xxxviii. 16; Justin xxv. 2; Memnon in C. Müller, *Frag. hist. Graec.* iii. 535.

NICOMEDES II., Epiphanes, king of Bithynia, 149–91 B.C., fourth in descent from Nicomedes I., was the son of Prusias II. He was so popular with the people that his father sent him to Rome. Here he was so much favoured by the senate that Prusias sent an emissary to Rome with secret orders to assassinate him. But the emissary revealed the plot, and persuaded the prince to rebel against his father. Supported by Attalus II., king of Pergamum, he was completely successful, and ordered his father to be put to death at Nicomedia. During his long reign Nicomedes adhered steadily to the Roman alliance, and assisted them against Aristonicus of Pergamum. He made himself for a time master of Paphlagonia, and in order to have a claim on Cappadocia married Laodice (the widow of Ariarathes VI.), who had fled to him when Mithradates the Great endeavoured to annex the country. When her two sons died, Nicomedes brought forward an impostor as a claimant to the throne; but the plot was detected. The Romans refused to recognize the claim, and required Nicomedes to give up all pretensions to Cappadocia and to abandon Paphlagonia.

Appian, *Mithrad.* 4-7; Strabo xiii. 624, 646; Diod. Sic. xxxii. 20, 21; Justin xxxiv. 4, xxxvii. 4, xxxviii. 1, 2.

NICOMEDES III., Philopator, king of Bithynia, 91–74 B.C., was the son and successor of Nicomedes II. His brother Socrates, assisted by Mithradates, drove him out, but he was reinstated by the Romans (90). He was again expelled by Mithradates, who defeated him on the river Amneus (or Amnias) in Paphlagonia. This led to the first Mithradatic War, as the result of which Nicomedes was again restored (84). At his death he bequeathed his kingdom to the Romans, a legacy which subsequently brought about the third Mithradatic War.

Justin xxxvii. 4, xxxviii. 1, 2; Appian, *Mithrad.* 7, 10-20, 57, 60; Memnon in C. Müller, *Frag. hist. Graec.* iii. 541; Plutarch, *Sulla*, 22, 24; Eutropius vi. 6.

NICOMEDIA [mod. *Ismid*], an ancient town at the head of the Gulf of Astacus, which opens on the Propontis, was built in 264 B.C. by Nicomedes I. of Bithynia, and has ever since been one of the chief towns in this part of Asia Minor. It was the metropolis of Bithynia under the Roman empire (see NICAEA), and

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[1] Matthias may have been a cousin of Richard Nicolls; his family were of Islip, Oxford; he was secretary of the province, held various judicial positions, and was mayor of New York City in 1672. Matthias's son William (1657–1723), a lawyer, was a member of the New York Assembly from 1702 until his death and was speaker in 1702–1718; he received a royal patent for what is now the town of Islip on Long Island. Descendants of Richard and of Matthias Nicolls spell the name "Nicoll."

Diocletian made it the chief city of the East. Owing to its position at the convergence of the Asiatic roads to the new capital, Nicomedia retained its importance even after the foundation of Constantinople and its own capture by the Turks (1338).

See C. Texier, *Asie mineure* (Paris, 1839); V. Cuenet, *Turquie d'Asie* (Paris, 1894).

NICOPOLIS, or ACTIA NICOPOLIS, an ancient city of Epirus, founded 31 B.C. by Octavian (Augustus) in memory of his victory over Antony and Cleopatra at Actium. The colony, composed of settlers from a great many of the towns of the neighbouring countries (Ambracia, Anactorium, Calydon, Argos Amphilochicum, Leucas, &c.), proved highly successful, and the city was considered the capital of southern Epirus and Acarnania, and obtained the right of sending five representatives to the Amphictyonic council. On the spot where Octavian's own tent had been pitched he erected a sanctuary to Neptune adorned with the beaks of the captured galleys; and in further celebration of his victory he instituted the so-called Actian games in honour of Apollo Actius. The city was restored by the emperor Julian, and again after the Gothic invasion by Justinian; but in the course of the middle ages it was supplanted by the town of Prevesa. The ruins of Nicopolis, now known as Palaeoprevesa (Old Prevesa), lie about 3 m. north of that city, on a small bay of the Gulf of Arta (Sinus Ambracius) at the narrowest part of the isthmus of the peninsula which separates the gulf from the Ionian Sea. Besides the acropolis, the most conspicuous objects are two theatres (the larger with twenty-seven rows of seats) and an aqueduct which brought water to the town from a distance of 27 m.

Nicopolis was also the name of (1) a city in Cappadocia in the valley of the Lycus, founded by Pompey on the spot where he defeated Mithradates; (2) a city in Egypt, founded by Octavian 24 B.C. to commemorate his final victory over Antony; and (3) a city in Thrace (Nikup) at the junction of the Iatrus with the Danube, founded by Trajan in memory of his victory over the Dacians.

NICOSIA, the capital of Cyprus, situated in the north central part of the island. Pop. (1901) 14,752 (Moslem, 6013; Christian, 8739). Its earliest name was Ledra, but Leucos, son of Ptolemy Soter (280 B.C.), is said to have restored it and changed its name to Leuteon, Leucotheon or Levcosia. A mile S.W. of the town lies the very large Bronze Age necropolis known as Hagia Paraskevi, which has been repeatedly explored with valuable results. The circuit of the city was reduced in 1567, under the direction of the Venetian engineer G. Savorgnano, from 9 m. to 3 m.; eighty churches and a number of fine houses were sacrificed. The new walls were given a circular shape, with eleven bastions and three gates. Water is supplied by two aqueducts. Government House, the residence of the high commissioner, the government offices, hospital, central prison and the new English church are without the walls. The fosse has been planted, and part of it used as an experimental garden. Carriage roads have been completed to Kyrenia, Kythraia, Famagusta, Larnaca, Limasol and Morphou. The principal monuments of the Lusignan period are the fine cathedral church of St Sophia, an edifice of French Gothic, at once solid and elegant (the towers were never completed); the church of St Catherine, an excellent example of the last years of the 14th century (both these are now mosques); and the church of St Nicolas of the English (now a grain store), built for the order of the Knights of St Thomas of Acre. A gateway of no great importance is nearly all that remains of the palace last used by the Venetian *provveditori*. It dates from the end of the 15th century. There is a museum, with a valuable catalogue. The chief industries are tanning and hand weaving, both silk and cotton.

NICOSIA, a city and episcopal see (since 1816) of Sicily, in the province of Catania, 21 m. by road N. of the railway station of Leonforte (which is 49 m. W. of Catania) and 42 m. W.N.W. of Catania direct, 2840 ft. above sea-level. Pop. (1901) 16,004. The town retains a thoroughly medieval appearance, with a fine Norman cathedral and some other interesting churches, among them S. Maria Maggiore, with a reredos by Antonio Gagini. A Lombard dialect is still spoken here, and the town is less modernized in every respect than any other in Sicily. The Sicel town of *Herbita* is usually placed here, but without sufficient reason, and the origin of Nicosia is unknown. It was destroyed by the Saracens and repopulated by the Normans.

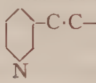
NICOTERA, GIOVANNI (1828–1894), Italian patriot and politician, was born at San Biagio on the 9th of September 1828. Joining the party of young Italy he was among the combatants at Naples in May 1848, and was at San Pancrazio with Garibaldi during the defence of Rome. After the fall of Rome he fled to Piedmont, where he organized the expedition to Sapri in 1857, but shortly after his arrival there he was defeated and severely wounded by the Bourbon troops. Condemned to death, but reprieved through the intervention of the British minister, he remained a prisoner at Naples and at Favignana until 1860, when he joined Garibaldi at Palermo. Sent by Garibaldi to Tuscany, he attempted to invade the Papal States with a volunteer brigade, but his followers were disarmed and disbanded by Ricasoli and Cavour. In 1862 he was with Garibaldi at Aspromonte; in 1866 he commanded a volunteer brigade against Austria; in 1867 he invaded the Papal States from the south, but the defeat of Garibaldi at Mentana put an end to his enterprise. His parliamentary career dates from 1860. During the first ten years he engaged in violent opposition, but from 1870 onwards he joined in supporting the military reforms of Ricotti. Upon the advent of the Left in 1876, Nicotera became minister of the interior, and governed with remarkable firmness. He was obliged to resign in December 1877, when he joined Crispi, Cairoli, Zanardelli and Baccarini in forming the "pentarchy" in opposition to Depretis, but he only returned to power thirteen years later as minister of the interior in the Rudini cabinet of 1891. On this occasion he restored the system of uninominal constituencies, resisted the socialist agitation, and pressed, though in vain, for the adoption of drastic measures against the false bank-notes put in circulation by the Roman bank. He fell with the Rudini cabinet in May 1892, and died at Vico Equense, near Naples, on the 13th of June 1894.

See V. Giordano, *La Vita ed i discorsi di Giovanni Nicotera* (Salermo, 1878); Mauro, *Biografia di Giovanni Nicotera* (Rome, 1886; German trans., Leipzig, 1886); and Mario, *In memoria di Giovanni Nicotera* (Florence, 1894).

NICOTINE, $C_{10}H_{14}N_2$, an alkaloid, found with small quantities of nicotimine, $C_{19}H_{14}N_2$, nicoteine, $C_{10}H_{12}N_2$, and nicotelline, $C_{10}H_8N_2$, in tobacco. The name is taken from *Nicotiana*, the tobacco plant, so called after Jean Nicot (1530–1600), French ambassador at Lisbon, who introduced tobacco into France in 1560. These four alkaloids exist in combination in tobacco chiefly as malates and citrates. The alkaloid is obtained from an aqueous extract of tobacco by distillation with slaked lime, the distillate being acidified with oxalic acid, concentrated to a syrup and decomposed by potash. The free base is extracted by ether and fractionated in a current of hydrogen. It is a colourless oil, which boils at 247° C. (745 mm.), and when pure is almost odourless. It has a sharp burning taste, and is very poisonous. It is very hygroscopic, dissolves readily in water, and rapidly undergoes oxidation on exposure to air. The free alkaloid is strongly laevo-rotatory. F. Ratz (*Monats.*, 1905, 26, p. 1241) obtained the value $[\alpha]_D = -169\cdot54°$ at 20°; its salts are dextro-rotatory. It behaves as a di-acid as well as a di-tertiary base.

On oxidation with chromic or nitric acids, or potassium permanganate, it yields nicotinic acid or β-pyridine carboxylic acid, $C_5H_4N\cdot CO_2H$; alkaline potassium ferricyanide gives nicotyrine, $C_{10}H_{10}N_2$, and hydrogen peroxide oxynicotine, $C_{10}H_{14}N_2O$. Oxidation of its isomethylhydroxide with potassium permanganate yields trigonelline, $C_7H_7NO_2$ (A. Pictet and P. Genequand, *Ber.*, 1897, 30, p. 2117). It gives rise to various decomposition products such as pyridine, picoline, &c., when its vapour is passed through a red-hot tube. The hydrochloride on heating with hydrochloric acid gives methyl chloride (B. Blau, *Ber.*, 1893, 26, p. 631). Hydriodic acid and phosphorus at high temperature give a dihydro-compound, whilst sodium and alcohol give hexa- and octo-hydro derivatives. Nicotine may be recognized by the addition of a drop of 30 % formaldehyde, the mixture being allowed to stand for one hour and the solid residue then moistened by a drop of concentrated sulphruic acid, when an intense rose-red colour is produced (I. Schindelmeiser, *Pharm. Zentralhalle*, 1899, 40, p. 704).

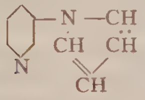
The constitution of nicotine was established by A. Pinner (see papers in the *Berichte*, 1891 to 1895). With bromine in acetic acid solution at ordinary temperature, nicotine yields a perbromide, $C_{10}H_{10}Br_2N_2O \cdot HBr_3$, which with sulphur dioxide, followed by potash, gives dibromcotinine, $C_{10}H_{10}Br_2N_2O$, from which cotinine, $C_{10}H_{12}N_2O$, is obtained by distillation over zinc dust. By heating nicotine with bromine in hydrobromic acid solution for some hours at 100° C., dibromticonine hydrobromide, $C_{10}H_8N_2Br_2O_2 \cdot HBr$, results. Dibromcotinine on hydrolysis yields oxalic acid, methylamine and β-methyl pyridyl ketone: $C_{10}H_{10}Br_2N_2O + 3H_2O + O = H_2C_2O_4 + CH_3NH_2 + C_5H_4N \cdot COCH_3 + 2HBr$; whilst dibromticonine yields methylamine, malonic acid and nicotinic acid: $C_{10}H_8Br_2N_2O_2 + 4H_2O = CH_3NH_2 + CH_2(CO_2H)_2 + C_5H_4N \cdot CO_2H + 2HBr$, or if heated with zinc and caustic potash, methylamine and pyridyl-βγ-dioxybutyric acid. Thus the groupings



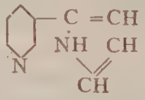
, $—C \cdot C—$, $>N \cdot CH_3$ and $—C \cdot C \cdot C—$

exist in the molecule, and the alkaloid is to be represented as α-pyridyl-N-methyl-pyrollidine.

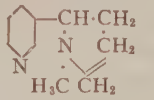
This result has been confirmed by its synthesis by A. Pictet and P. Crépieux (*Comptes rendus*, 1903, 137, p. 860) and Pictet and Rotschy (*Ber.*, 1904, 37, p. 1225): β-aminopyridine is converted into its mucate, which by dry distillation gives N-β-pyridylpyrrol. By passing the vapour of this compound through a red-hot tube, it yields the isomeric αβ-pyridylpyrrol, the potassium salt of which with methyl iodide gives a substance methylated both in the pyridine and pyrrol nuclei. By distillation over lime, the methyl group is removed from the pyridine ring, and the resulting α-pyridyl-N-methylpyrrol gives *i*-nicotine on reduction. This base is resolved into its active components by *d*-tartaric acid, *l*-nicotine-*d*-tartrate crystallizing out first. The natural (laevo) base is twice as toxic as the dextro. The following formulae are important:—



N-β-Pyridylpyrrol,



αβ-pyridylpyrrol,



nicotine.

Acetyl and benzoyl derivatives of nicotine on hydrolysis do not yield nicotine, but an isomeric, inactive oily liquid (metanicotine). It is a secondary base, and boils at 275°-278° C.

Nicotimine is a colourless liquid which boils at 250°-255° C. Its aqueous solution is alkaline. *Nicoteine* is a liquid which boils at 267° C. It is separated from the other alkaloids of the group by distilling off the nicotine and nicotimine in steam and then fractionating the residue. It is soluble in water and is very poisonous. *Nicotelline* crystallizes in needles which melt at 147° C. and is readily soluble in hot water.

NICTHEROY, or NITEROY, a city of Brazil and capital of the state of Rio de Janeiro, on the E. shore of the Bay of Rio de Janeiro, opposite the city of that name. Pop. (1890) 34,269, (1900 estimate) 35,000. A railway connects the city with the interior—the old Cantagallo line, now a part of the Leopoldina system, a branch of which runs north-eastward to Macahé, on the coast, and another northward from Nova Friburgo to a junction with the railway lines of Minas Geraes. Nictheroy is practically a residential suburb of Rio de Janeiro. It occupies, in great part, the low alluvial plain that skirts the shores of the bay and fills the valleys between numerous low wooded hills. The site is shut off from the sea coast by a range of high rugged mountains. The shore line of the bay is broken by large, deeply indented bays (that of Jurujuba being nearly surrounded by wooded hills), shallow curves and sharp promontories. Within these bays are beaches of white sand, called *praias*, such as the Praia da Icarahy, Praia das Flechas and Praia Grande, upon which face low tile-covered residences surrounded with gardens. The city consists of a number of these partially separated districts—Praia Grande, São Domingos, Icarahy, Jurujuba, Santa Rosa, São Lourenço, Ponta d'Areia and Barreto—all together covering 8 or 9 m. of the shore. An electric street railway connects all the outlying districts with the ferry stations of Praia Grande and São Domingos. The city is characteristically Portuguese in the construction and style of its buildings—low, heavy walls of broken stone and mortar, plastered and coloured outside, with an occasional facing of glazed Lisbon tiles, and covered with red tiles. Among the public buildings are several churches and hospitals (including the Jurujuba yellow-fever hospital and the Barreto isolation hospital), the government palace, a municipal theatre and a large Salesian college situated in the suburbs of Santa Rosa on an eminence overlooking the lower bay. Several large islands fill the upper bay near the eastern shore; some are used as coal deposits for the great steamship companies, and one (Flores) is used as an immigrants' depôt. There is a small, rocky and picturesque island nearer the harbour entrance, which is crowned by a small chapel, dedicated to Nossa Senhora da Boa Viagem. Manufactures include cotton and woollen fabrics, tobacco, spirits, soap and tiles.

The first settlement on the east side of the Bay of Rio de Janeiro dates from 1671, when a chapel was erected at Praia Grande, in the vicinity of an Indian village. The settlement did not become a village until 1819, when it was named Villa Real da Praia Grande. In 1834 the city and municipal district of Rio de Janeiro was separated from the province, and Praia Grande became the capital of the latter in the following year. In 1836 it was raised to the dignity of a city and received the appropriate name of Nictheroy, from the Indian name *Nyterōi*, "hidden water." In the naval revolt of 1893–94 the older districts of the city suffered much damage from desultory bombardments, but the insurgents were too few to take possession. Soon afterwards the seat of government was removed to Petropolis, where it remained until 1903, when Nictheroy again became the capital of the state.

NIDIFICATION (from Lat. *nidus*), the process of making a nest (*q.v.*). Nidification is with most birds the beginning of the breeding season, but with many it is a labour that is scamped if not shirked. Some of the auk tribe place their single egg on a bare ledge of rock, where its peculiar conical shape is but a precarious safeguard when rocked by the wind or stirred by the thronging crowd of its parents' fellows. The stone-curlew and the goatsucker deposit their eggs without the slightest preparation of the soil on which they rest; yet this is not done at haphazard, for no birds can be more constant in selecting, almost to an inch, the very same spot which year after year they choose for their procreant cradle. In marked contrast to such artless care stand the wonderful structures which others, such as the tailor-bird, the bottle-titmouse or the fantail-warbler, build for the comfort or safety of their young. But every variety of disposition may be found in the class. The apteryx seems to entrust its abnormally big egg to an excavation among the roots of a tree-fern; while a band of female ostriches scrape holes in the desert-sand and therein promiscuously drop their eggs and leave the task of incubation to the male. Some megapodes bury their eggs in sand, leaving them to come to maturity by the mere warmth of the ground, while others raise a huge hotbed of dead leaves wherein they deposit theirs, and the young are hatched without further care on the part of either parent. Some of the grebes and rails seem to avail themselves in a less degree of the heat generated by vegetable decay and, dragging from the bottom or sides of the waters they frequent fragments of aquatic plants, form of them a rude half-floating mass which is piled on some growing water-weed—but these birds do not spurn the duties of maternity.

Many of the gulls, sandpipers and plovers lay their eggs in a shallow pit which they hollow out in the soil, and then as incubation proceeds add thereto a low breastwork of haulm. The ringed plover commonly places its eggs on shingle, which they so much resemble in colour, but when breeding on grassy uplands it paves the nest-hole with small stones. Pigeons mostly make an artless platform of sticks so loosely laid together that their pearly treasures may be perceived from beneath by the inquisitive observer. The magpie, as though self-conscious that its own thieving habits may be imitated by its neighbours, surrounds its nest with a hedge of thorns. Very many birds of almost every group bore holes in some sandy cliff, and at the end of their tunnel deposit their eggs with or without bedding. Such bedding, too, is very various in character; thus, while the sheldduck and the sand-martin supply the softest of materials—the one of down from her own body, the other of feathers collected by dint of diligent search—the kingfisher forms a couch of the undigested spiny fish bones which she ejects in pellets from her own stomach. Other birds, such as the woodpeckers, hew holes in living trees, even when the timber is of considerable hardness, and therein establish their nursery. Some of the swifts secrete from their salivary glands a fluid which rapidly hardens as it dries on exposure to the air into a substance resembling isinglass, and thus furnish the "edible birds' nests" that are the delight of Chinese epicures. In the architecture of nearly all the passerine birds, too, some salivary secretion seems to play an important part. By its aid they are enabled to moisten and bend the otherwise refractory twigs and straws, and glue them to their place. Spiders' webs also are employed with great advantage for the purpose last mentioned, but perhaps chiefly to attach fragments of moss and lichen so as to render the whole structure less obvious to the eye of the spoiler. The tailor-bird deliberately spins a thread of cotton and therewith stitches together the edges of a pair of leaves to make a receptacle for its nest. Beautiful, too, is the felt fabricated of fur or hairs by the various species of titmouse, while many birds ingeniously weave into a compact mass both animal and vegetable fibres, forming an admirable non-conducting medium which guards the eggs from the extremes of temperature outside. Such a structure may be open and cup-shaped, supported from below as that of the chaffinch and goldfinch, domed like that of the wren and bottle-titmouse, slung hammock-wise as in the case of the golden-crested wren and the orioles, or suspended by a single cord as with certain grosbeaks and humming-birds.

Certain warblers (*Aedon* and *Thamnobia*) invariably lay a piece of snake's slough in their nests—to repel, it has been suggested, marauding lizards who may thereby fear the neighbourhood of a deadly enemy. The clay-built edifices of the swallow and martin are known to everybody, and the nuthatch plasters up the gaping mouth of its nest-hole till only a postern large enough for entrance and exit, but easy of defence, is left. In South America the oven-birds (*Furnariidae*) construct on the branches of trees globular ovens, so to speak, of mud, wherein the eggs are laid and the young hatched. The flamingo erects in the marshes it frequents a mound of earth sometimes 2 ft. in height, with a cavity atop. The females of the hornbills submit to incarceration during this interesting period, the males immuring them by a barrier of mud, leaving only a small window to admit air and food.

But though in a general way the dictates of hereditary instinct are rigidly observed by birds, in many species a remarkable degree of elasticity is exhibited, or the rule of habit is rudely broken. Thus the falcon, whose ordinary eyry is on the beetling cliff, will for the convenience of procuring prey condescend to lay its eggs on the ground in a marsh, or appropriate the nest of some other bird in a tree. The golden eagle, too, remarkably adapts itself to circumstances, now rearing its young on a precipitous ledge, now on the arm of an ancient monarch of the forest and again on a treeless plain, making a humble home amid grass and herbage. Herons will breed according to circumstances in an open fen, on sea-banks or (as is most usual) on lofty trees. Such changes are easy to understand. The instinct of finding food for the family is predominant, and where most food is there will the feeders be gathered together. This explains, in all likelihood, the associated bands of ospreys or fish-hawks, which in North America breed (or used to breed) in large companies where sustenance is plentiful, though in the Old World the same species brooks not the society of aught but its mate. Birds there are of eminently social predilections. In Europe, apart from sea-fowls—whose congregations are universal and known to all—only the heron, the fieldfare and the rook habitually flock during the breeding season; but in other parts of the world many birds unite in company at that time, and in none possibly is this habit so strongly developed as in the anis of the neotropical region, the republican swallow of North America and the sociable grosbeak of South Africa, which last joins nest to nest until the tree is said to break down under the accumulated weight of the common edifice.

In the strongest contrast to these amiable qualities is the parasitic nature of the cuckoos of the Old World and the cow-birds of the New. The egg of the parasite is introduced into the nest of the dupe, and after the necessary incubation by the fond fool of a foster-mother the interloper successfully counterfeits the heirs, who perish miserably, victims of his superior strength. The whole process has been often watched, but the reflective naturalist will pause to ask how such a state of things came about, and there is not much to satisfy his inquiry. Certain it is that some birds whether by mistake or stupidity do not infrequently lay their eggs in the nests of others. It is within the knowledge of many that pheasants' eggs and partridges' eggs are often laid in the same nest, and gulls' eggs have been found in the nests of eider-ducks and vice versa; a redstart and a pied flycatcher will lay their eggs in the same convenient hole—the forest being rather deficient in such accommodation; an owl and a duck will resort to the same nest-box, set up by a scheming woodsman for his own advantage; and the starling, which constantly dispossesses the green woodpecker, sometimes discovers that the rightful heir of the domicile has to be brought up by the intruding tenant. In all such cases it is not possible to say which species is so constituted as to obtain the mastery, but it is not difficult to conceive that in the course of ages that which was driven from its home might thrive through the fostering of its young by the invader, and thus the abandonment of domestic habits and duties might become a direct gain to the evicted householder. (A. N.)

Nests and Coloration.—The correlation between nests and the coloration of the birds has been investigated by A. R. Wallace. Accordingly he divides birds into two main groups, first those in which the sexes are alike and of conspicuous or showy colours, and which nidificate in a covered site; secondly, those in which the males are showy and the females sombre, and which use open sites for their nests. The many exceptions to these generalizations caused J. A. Allen (*Bull. Nutt. Orn. Club*, 1878) to write an adverse criticism. C. Dixon (H. Seebohm's *Hist. Brit. Birds*, ii., 1884, introduction) has reviewed the question from Wallace's point of view. He established the following categories.

1. Birds in which the plumage of the male is bright and conspicuous in colour, and that of the female dull and sombre, and which nidificate in open sites. In these very common cases, the female alone incubates, and obviously derives protection from its inconspicuous plumage.

2. Birds in which the plumage of both sexes is showy or brilliant in colour, and which nidificate in open nests. This group forms one of those exceptions which at first sight appear seriously to affect the validity of Wallace's theory. In most of the cases, however, the birds, as, for instance, crows, gulls, herons, are either well able to defend themselves and their nests or, as, for instance, the sandpipers, they seek safety for themselves in flight, relying upon the protective tints of their eggs or young.

3. Birds in which the male is less brilliant than the female, and which nidificate in open nests. Such birds are exceedingly few, *e.g.* the Phalaropes, the common cassowary, the emu, a carrion hawk (*Milvago leucurus*) from the Falkland Islands, an Australian tree-creeper (*Climacteris erythrops*) and an Australian goatsucker (*Eurystopodus albigularis*). In all these cases the male performs the duty of incubation. The male tinamous do the same, although they do not differ from their mates, but the conspicuously coloured male ostrich takes this duty upon himself during the night.

4. Birds in which both sexes are brightly coloured, and which rear their young in holes or covered nests. For instance, the gaudy coloured rollers, bee-eaters, kingfishers, the hoopoe, hornbills, toucans, parrots, tits, the sheldrake and many others.

5. Birds in which both sexes are dull in colour, and which build covered nests from motives of safety other than concealment. For example, the swifts (*Cypselus*), the sand-martin (*Cotyle riparia*), wrens, dippers and owls.

6. Birds in which the female is duller in colour than the male, and which nidificate in covered nests; *e.g.* the redstart (*Ruticilla phoenicura*), the pied flycatcher (*Muscicapa atricapilla*), rock-thrushes (*Monticola*), chats (*Saxicola*) and robin-chats (*Thamnobia*), and birds of the genus *Malurus*. In some of these cases the showy male bird assists in incubation, the kind of nest allowing him to do so with safety.

Similar difficulties beset the generalizations concerning the correlation of the colour of the eggs and the exposed or hidden condition of the nest. The eggs of most birds which breed in holes, or even in covered nests, are white, but the number of exceptions is so great that no general rule can be laid down to this effect. Conversely the number of birds which lay purely white eggs in open nests, *e.g.* pigeons, is also large. The eggs of owls are always white, whether they be deposited in holes on the bare ground or in open nests in a tree. The eggs of the goshawk are white, but those of its small relation, the sparrowhawk, are always blotched, the nest of both being built precisely in the same kind of position, &c. In regard to the almost countless cases of spotted eggs in holes or covered nests, of which so many groups of birds furnish examples either wholly or in part, it has been suggested that the species in question has taken to hiding its eggs in times comparatively recent, and has not yet got rid of the ancestral habit of secreting and despositing pigment.

Length of Time of Incubation.—Most of the smaller Passeres seem to hatch their young in from 13-15 days. The shortest period, only 10 days, is recorded of the small *Zosterops coerulescens*; the largest, amounting to about 8 weeks, is that of some of the larger Ratitae, penguins and the condor. The best list, comprising birds of most groups, is that by W. Evans (*Ibis*, 1891, pp. 52-93; and 1892, pp. 55-58). Speaking broadly, the largest birds lay the largest eggs and require the longest time for incubation, but there are very many exceptions, and only birds of the same group can be compared with each other. The domestic fowl takes 21 days, but the pheasant, though so very nearly allied, takes 2 or 3 days longer, and even the small partridge requires 24 days. The mallard takes 26, the domestic duck 27, the musk duck 35 days, like most of the swans. The cuckoo, with 13 to 14 days, seems to have adapted itself to the short period of its foster parents.

The whole question still affords ample opportunities of experimental investigation and comparison. The condition of the newly hatched birds also varies extremely. The *Nidifugae* are born with their eyes open, are thinly clothed with neossoptiles of simple structure, leave the nest on the first day and feed themselves. The *Nidicolae* are born blind, remain a long time in the nest and have to be fed by their parents. Taken as a whole, the *Nidifugae* comprise most of the phylogenetically older groups; but many of these may include some closely allied members which have reached the developmental level of the *Nidicolae*: for instance, some Alcidae, the pigeons, Sphenisci, Tubinares, Ciconiae. For detail see BIRDS: *Classification*. While in the first category the sense organs, tegumentary and locomotory organs are far advanced, these are retarded in the *Nidicolae*, the development of these structures being shifted on to the postembryonic period. Yet the length of the incubation is by no means always longer in the *Nidifugae*, when compared with equal-sized *Nidicolae*.

For further information the reader may be referred to: A. R. Wallace, "A Theory of Birds' Nests," *Journ. of Travel and Nat. Hist.*, 1868, p. 73, reprinted in his *Contributions to the Theory of Natural Selection* (London, 1870); A. McAldowie, "Observations on the Development and the Decay of the Pigment Layer in Birds' Eggs," *Journ. An. Phys.* xx., 1886, pp. 225-237; W. Hewitson, *Coloured Illustrations of the Eggs of British Birds* (3rd ed., London, 1856); T. M. Brewer, *North American Oology* (4to, Washington, 1857); A. Lefèvre, *Atlas des œufs des oiseaux d'Europe* (8vo, Paris, 1845); F. W. Baedeker, *Die Eier der europäischen Vögel* (fol., Leipzig, 1863); E. Rey, *Eier d. Vögel Mittel-Europa's* (Gera, 1905); A. Newton, *Ootheca Wolleyana* (8vo, London, 1864–1907); and articles on "Eggs" and "Nidification" in *Dict. Birds* (London, 1893–1896). (H. F. G.)

NIEBUHR, BARTHOLD GEORG (1776–1831), German statesman and historian, son of Karsten Niebuhr (*q.v.*), was born at Copenhagen on the 27th of August 1776. From the earliest age young Niebuhr manifested extraordinary precocity, and from 1794 to 1796, being already a finished classical scholar and acquainted with several modern languages, he studied at the university of Kiel. After quitting the university he became private secretary to Count Schimmelmann, Danish minister of finance. But in 1798 he gave up this appointment and travelled in Great Britain, spending a year at Edinburgh studying agriculture and physical science. In 1799 he returned to Denmark, where he entered the state service; in 1800 he married and settled at Copenhagen. In 1804 he became chief director of the National Bank, but in September 1806 quitted this for a similar appointment in Prussia. He arrived in Prussia on the eve of the catastrophe of Jena. He accompanied the fugitive government to Königsberg, where he rendered considerable service in the commissariat, and was afterwards still more useful as commissioner of the national debt and by his opposition to ill-considered schemes of taxation. He was also for a short time Prussian minister in Holland, where he endeavoured without success to contract a loan. The extreme sensitiveness of his temperament, however, disqualified him for politics; he proved impracticable in his relations with Hardenberg and other ministers, and in 1810 retired for a time from public life, accepting the more congenial appointment of royal historiographer and professor at the university of Berlin.

He commenced his lectures with a course on the history of Rome, which formed the basis of his great work *Römische Geschichte*. The first two volumes, based upon his lectures, were published in 1812, but attracted little attention at the time owing to the absorbing interest of political events. In 1813 Niebuhr's own attention was diverted from history by the uprising of the German people against Napoleon; he entered the *Landwehr* and ineffectually sought admission into the regular army. He edited for a short time a patriotic journal, the *Prussian Correspondent*, joined the headquarters of the allied sovereigns, and witnessed the battle of Bautzen, and was subsequently employed in some minor negotiations. In 1815 he lost both his father and his wife. He next accepted (1816) the post of ambassador at Rome, and on his way thither he discovered in the cathedral library of Verona the long-lost *Institutes* of Gaius, afterwards edited by Savigny, to whom he communicated the discovery under the impression that he had found a portion of Ulpian. During his residence in Rome Niebuhr discovered and published fragments of Cicero and Livy, aided Cardinal Mai in his edition of Cicero *De Republica*, and shared in framing the plan of the great work on the topography of ancient Rome by Christian C. J. von Bunsen and Ernst Platner (1773–1855), to which he contributed several chapters. He also, on a journey home from Italy, deciphered in a palimpsest at St Gall the fragments of Flavius Merobaudes, a Roman poet of the 5th century. In 1823 he resigned the embassy and established himself at Bonn, where the remainder of his life was spent, with the exception of some visits to Berlin as councillor of state. He here rewrote and republished (1827–1828) the first two volumes of his *Roman History*, and composed a third volume, bringing the narrative down to the end of the First Punic War, which, with the help of a fragment written in 1811, was edited after his death (1832) by Johannes Classen (1805–1891). He also assisted in August Bekker's edition of the Byzantine historians, and delivered courses of lectures on ancient history, ethnography, geography, and on the French Revolution. In February 1830 his house was burned down, but the greater part of his books and manuscripts were saved. The revolution of July in the same year was a terrible blow to him, and filled him with the most dismal anticipations of the future of Europe. He died on the 2nd of January 1831.

Niebuhr's *Roman History* counts among epoch-making histories both as marking an era in the study of its special subject and for its momentous influence on the general conception of history. "The main results," says Leonhard Schmitz, "arrived at by the inquiries of Niebuhr, such as his views of the ancient population of Rome, the origin of the plebs, the relation between the patricians and plebeians, the real nature of the ager publicus, and many other points of interest, have been acknowledged by all his successors." Other alleged discoveries, such as the construction of early Roman history out of still earlier ballads, have not been equally fortunate; but if every positive conclusion of Niebuhr's had been refuted, his claim to be considered the first who dealt with the ancient history of Rome in a scientific spirit would remain unimpaired, and the new principles introduced by him into historical research would lose nothing of their importance. He suggested, though he did not elaborate, the theory of the myth, so potent an instrument for good and ill in modern historical criticism. He brought in inference to supply the place of discredited tradition, and showed the possibility of writing history in the absence of original records. By his theory of the disputes between the patricians and plebeians arising from original differences of race he drew attention to the immense importance of ethnological distinctions, and contributed to the revival of these divergences as factors in modern history. More than all, perhaps, since his conception of ancient Roman story made laws and manners of more account than shadowy lawgivers, he undesignedly influenced history by popularizing that conception of it which lays stress on institutions, tendencies and social traits to the neglect of individuals.

Niebuhr's personal character was in most respects exceedingly attractive. His heart was kind and his affections were strong;

he was magnanimous and disinterested, simple and honest. He had a kindling sympathy with everything lofty and generous, and framed his own conduct upon the highest principles. His chief defect was an over-sensitiveness, leading to peevish and unreasonable behaviour in his private and official relations, to hasty and unbalanced judgments of persons and things that had given him annoyance, and to a despondency and discouragement which frustrated the great good he might have effected as a philosophic critic of public affairs.

The principal authority for Niebuhr's life is the *Lebensnachrichten über B. G. Niebuhr, aus Briefen desselben und aus Erinnerungen einiger seiner nächsten Freunde*, by Dorothea Hensler (3 vols., 1838–1839). In the English translation by Miss Winkworth (1852) a great deal of the correspondence is omitted, but the narrative is rendered more full, especially as concerns Niebuhr's participation in public affairs. It also contains interesting communications from Bunsen and Professor Loebell, and select translations from the *Kleine Schriften*. See also J. Classen, *Barthold Georg Niebuhr, eine Gedächtnisschrift* (1876), and G. Eyssenhardt, *B. G. Niebuhr* (1886). The first edition of his *Roman History* was translated into English by F. A. Walter (1827), but was immediately superseded by the translation of the second edition by Julius Hare and Connop Thirlwall, completed by William Smith and Leonhard Schmitz (last edition, 1847–1851). The *History* has been discussed and criticized in a great number of publications, the most important of which, perhaps, is Sir George Cornwall Lewis's *Essay on the Credibility of the Early Roman History*. See further J. E. Sandys, *History of Classical Scholarship* (1908), iii., pp. 78–82.

NIEBUHR, KARSTEN (1733–1815), German traveller, was born at Lüdingworth, Lauenburg, on the southern border of Holstein, on the 17th of March 1733, the son of a small farmer. He had little education, and for several years of his youth had to do the work of a peasant. His bent was towards mathematics, and he managed to obtain some lessons in surveying. It was while he was working at this subject that one of his teachers, in 1760, proposed to him to join the expedition which was being sent out by Frederick V. of Denmark for the scientific exploration of Egypt, Arabia and Syria. To qualify himself for the work of surveyor and geographer, he studied hard at mathematics for a year and a half before the expedition set out, and also managed to acquire some knowledge of Arabic. The expedition sailed in January 1761, and, landing at Alexandria, ascended the Nile. Proceeding to Suez, Niebuhr made a visit to Mount Sinai, and in October 1762 the expedition sailed from Suez to Jeddah, journeying thence overland to Mocha. Here in May 1763 the philologist of the expedition, van Haven, died, and was followed shortly after by the naturalist Forskål. Sana, the capital of Yemen, was visited, but the remaining members of the expedition suffered so much from the climate or from the mode of life that they returned to Mocha. Niebuhr seems to have saved his own life and restored his health by adopting the native habits as to dress and food. From Mocha the ship was taken to Bombay, the artist of the expedition dying on the passage, and the surgeon soon after landing. Niebuhr was now the only surviving member of the expedition. He stayed fourteen months at Bombay, and then returned home by Muscat, Bushire, Shiraz and Persepolis, visited the ruins of Babylon, and thence went to Bagdad, Mosul and Aleppo. After a visit to Cyprus he made a tour through Palestine, crossing Mount Taurus to Brussa, reaching Constantinople in February 1767 and Copenhagen in the following November. He married in 1773, and for some years held a post in the Danish military service which enabled him to reside at Copenhagen. In 1778, however, he accepted a position in the civil service of Holstein, and went to reside at Meldorf, where he died on the 26th of April 1815.

Niebuhr was an accurate and careful observer, had the instincts of the scholar, was animated by a high moral purpose, and was rigorously conscientious and anxiously truthful in recording the results of his observation. His works have long been classics on the geography, the people, the antiquities and the archaeology of much of the district of Arabia which he traversed. His first volume, *Beschreibung von Arabien*, was published at Copenhagen in 1772, the Danish government defraying the expenses of the abundant illustrations. This was followed in 1774–1778 by two other volumes, *Reisebeschreibung von Arabien und anderen umliegenden Ländern*. The fourth volume was not published till 1837, long after his death, under the editorship of Niebuhr's daughter. He also undertook the task of bringing out the work of his friend Forskål, the naturalist of the expedition, under the titles of *Descriptiones animalium*, *Flora Aegyptiaco-Arabica*, and *Icones rerum naturalium* (Copenhagen, 1775–1776). To a German periodical, the *Deutsches Museum*, Niebuhr contributed papers on the interior of Africa, the political and military condition of the Turkish empire, and other subjects.

French and Dutch translations of his narratives were published during his lifetime, and a condensed English translation, by Robert Heron, of the first three volumes in Edinburgh (1792). His son Barthold (see above) published a short *Life* at Kiel in 1817; an English version was issued in 1838 in the *Lives of Eminent Men*, published by the Society for the Diffusion of Useful Knowledge. See D. G. Hogarth, *The Penetration of Arabia* ("Story of Exploration" series) (1904).

NIEDERBRONN, a town of Germany, in the imperial province Alsace-Lorraine, on the Falkensteiner Bach, situated under the eastern slope of the Vosges, 12 m. N.W. from Hagenau by rail. Pop. (1905) 3120. It contains an Evangelical and a Roman Catholic church, a convent of the Sisters of the Divine Redeemer, and a high-grade and other schools. Niederbronn is one of the best-known watering-places in the Vosges. Its brine springs, with a hydropathic establishment attached, are specific in cases of gout, obesity and liver disorders. Here, on the 26th of July 1870, the first engagement between the Germans and the French in the Franco-German war took place. There are several ruined castles in the neighbourhood, the most noteworthy of which is one on the Wesenburg (1415 ft. high) erected in the 14th century. Various Celtic and Roman antiquities have been found around Niederbronn.

See Kuhn, *Les Eaux de Niederbronn* (3rd ed., Strassburg, 1860); Mathis, *Aus Niederbronns alten Zeiten* (Strassburg, 1901); and Kirstein, *Das Wasgaubad Niederbronn* (Strassburg, 1902).

NIEDERLAHNSTEIN, a town of Germany, in the Prussian province of Hesse-Nassau, situated on the right bank of the Rhine at the confluence of Lahn, 3 m. S.E. from Coblenz by the railway to Ems, and at the junction of lines to Hochheim and Cologne. Pop. (1905) 4351. It has two Roman Catholic churches. The chief industries are the making of machinery and shipbuilding. Niederlahnstein obtained civic rights in 1332, and was until 1803 on the territory of the electors of Trier. Here on the 1st of January 1814 a part of the Russian army crossed the Rhine. In the vicinity are the Johanniskirche, a Romanesque church restored in 1857, and the Allerheiligenberg, whereon stands a chapel, once a famous place of pilgrimage.

NIEDER-SELTERS, a village of Germany, in the Prussian province of Hesse-Nassau, situated in a well-wooded country on the Ems, 12 m. S.E. from Limburg by the railway to Frankfort-on-Main. Pop. (1900) 1339. Here are the springs of the famous Selters or Seltzer water, employed as specific in cases of catarrh of the respiratory organs, the stomach and bladder. Until 1866 the springs belonged to the duke of Nassau; since this date they have been the property of Prussia. They became famous in the earlier part of the 19th century, although they had been known many years previously.

See Grossmann, *Die Heilquellen des Taunus* (Wiesbaden, 1887).

NIEDERWALD, a broad hill in Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Rhine, between that river and the Wisper, opposite Bingen, forming the south-western apex of the Taunus range. Its summit is clothed with dense forests of oak and beech, while its southern and western sides, which descend sharply to Rüdesheim and Assmannshausen on the Rhine, are covered with vineyards, and produce some of the finest wines of the district. At the edge of the forest, on the crest of the hill above Rüdesheim, stands the gigantic "Germania" statue, the national monument of the war of 1870–71, which was unveiled on the 28th of September 1883 by the emperor William I., in the presence of all the rulers in Germany or their representatives. It was designed by Johannes Schilling, and the bronze figure of Germania is 33 ft. high; the pedestal is adorned with allegorical figures and portraits of German princes and generals. Cogtooth mountain railways run up the hill from Rüdesheim and Assmannshausen.

See Spielmann, *Niederwald und Nationaldenkmal* (Wiesbaden, 1898).

NIEHAUS, CHARLES HENRY (1855–), American sculptor, of German parentage, was born at Cincinnati, Ohio, on the 24th of January 1855. He was a pupil of the McMichen School of Design, Cincinnati, and also studied at the Royal Academy, Munich, returning to America in 1881; in 1885, after several years in Rome, he established his studio in New York City. In 1906 he became a National Academician. His principal works are: a statue of President Garfield, for Cincinnati; the Hahnemann Memorial, in Washington; "Moses" and "Gibbons," for the Congressional Library, and "James A. Garfield," "John J. Ingalls," "William Allen," and "Oliver P. Morton," for Statuary Hall, Capitol, Washington; "Hooker" and "Davenport," State House, Hartford, Connecticut; the Astor Memorial doors, Trinity Church, New York; "General Forrest," Memphis, Tennessee; Generals Sherman and Lee, and William the Silent; "The Scraper; or Greek Athlete using a Strigil"; statues of Lincoln, Farragut and McKinley, at Muskegon, Michigan; a statue of McKinley and a lunette for McKinley's tomb, at Canton, Ohio; and "The Driller," at Titusville, Pennsylvania, in memory of Colonel E. L. Drake, who, in 1859, sank the first oil well in Pennsylvania.

NIEL, ADOLPHE (1802–1869), marshal of France, was born at Muret on the 4th of October 1802, and entered the École Polytechnique in 1821, whence he passed to the engineer school at Metz, becoming lieutenant in the Engineers in 1827 and captain in 1833. At the storming of Constantine he led the engineer detachment with one of the storming parties, and his conduct gained for him the rank of *chef de bataillon* (1837). In 1840 he was promoted lieutenant-colonel, and in 1846 colonel, and his next war service was as chief of staff to General Vaillant during the siege of Rome (1849), after which he was made general of brigade and director of engineer services at headquarters. In 1851 he became a member of the Committee of Fortifications, in the following year a member of the council of state, and in 1853 general of division. In the first part of the Crimean War he was employed in the expedition to the Baltic, and directed engineer operations against Bomarsund, but early in 1855 he was sent to the Crimea, where he succeeded General Bizot as chief of engineers. For some years he had been the most trusted military adviser of Napoleon III., and he was now empowered to advise the generals on the spot in accordance with the wishes of the sovereign and the home government. This delicate and difficult task Niel managed to carry out with as much success as could be expected, and he had the credit of directing the siege operations against the Malakoff (see CRIMEAN WAR). His reward was the grand cross of the Legion of Honour. From 1855 to 1859 he was employed at headquarters, and also served in the senate. In the war against the Austrians in the latter year (see ITALIAN WARS) Niel commanded the IV. corps, and took a brilliant part in the battles of Magenta and Solferino. On the field of battle of Solferino he was made a marshal of France. After service for some years in a home command, he became minister of war (1867). In this capacity he drafted and began to carry out a far-reaching scheme of army reform, based on universal service and the automatic creation of large reserves, which needed only time to mature. He also rearmed the whole of the army with the chassepôt rifle. But he did not live to complete the development of his system. He died on the 13th of August 1869 in Paris, and a year later the Franco-German War destroyed the old imperial army upon which the new formations were to have been grafted.

NIELLO (the Italian form of Lat. *nigellum*, diminutive of *niger*, "black"; Late Gr. *μελανόν*), a method of producing delicate and minute decoration on a polished metal surface by incised lines filled in with a black metallic amalgam. In some cases it is very difficult to distinguish niello from black enamel; but the black substance differs from true enamel in being metallic, not vitreous. Our knowledge of the process and materials employed in niello-work is derived mainly from four writers,—Eraclius the Roman (a writer probably of the 11th century), Theophilus the monk, who wrote in the 12th or 13th century,[1] and, in the 16th century, Benvenuto Cellini[2] and Giorgio Vasari.[3] The design was cut with a sharp graving tool on the smooth surface of the metal, which was usually silver, but occasionally gold or even bronze. An alloy was formed of two parts silver, one-third copper and one-sixth lead; to this mixture, while fluid in the crucible, powdered sulphur in excess was added; and the brittle amalgam, when cold, was finely pounded, and sealed up in large quills for future use. A solution of borax to act as a flux was brushed over the metal plate and thoroughly worked into its incised lines. The powdered amalgam was then shaken out of the quills on to the plate, so as to completely cover all the engraved pattern. The plate was now carefully heated over a charcoal fire, fresh amalgam being added, as the powder fused, upon any defective places. When the powder had become thoroughly liquid, so as to fill all the lines, the plate was allowed to cool, and the whole surface was scraped, so as to remove the superfluous niello, leaving only what had sunk into and filled up the engraved pattern. Last of all the nielloed plate was very highly polished, till it presented the appearance of a smooth metal surface enriched with a delicate design in fine grey-black lines. This process was chiefly used for silver work, on account of the vivid contrast between the whiteness of the silver and the darkness of the niello. As the slightest scratch upon the metal received the niello, and became a distinct black line, ornament of the most minute and refined description could easily be produced.

The earliest specimens of niello belong to the Roman period. Two fine examples are in the British Museum. One is a bronze statuette of a Roman general, nearly 2 ft. high, found at Barking Hall in Suffolk. The dress and armour have patterns partly inlaid in silver and partly in niello. The dark tint of the bronze rather prevents the niello from showing out distinctly. This statuette is apparently a work of the 1st century.[4] The other example is not earlier than the 4th century. It is a silver casket or lady's toilet box, in which were found an ampulla and other small objects, enriched with niello-work.[5]

From Roman times till the end of the 16th century the art of working in niello seems to have been constantly practised in some part at least of Europe, while in Russia and India it has survived to the present day. From the 6th to the 12th century a large number of massive and splendid works in the precious metals were produced at Byzantium or under Byzantine influence; many of which were largely decorated with niello; the silver dome of the baldacchino over the high altar of S. Sophia was probably one of the most important of these. Niello is frequently mentioned in the inventories of the treasures belonging to the great basilicas of Rome and Byzantium. The Pala d'Oro at S. Mark's, Venice, 10th century, owes much of its refined beauty to niello patterns in the borders. This art was also practised by Bernward, artist-bishop of Hildesheim (*ob.* 1023); a fine silver paten, decorated with figures in niello, attributed to his hand, still exists among the many rich treasures in the church of Hanover Palace. Other nielli, probably the work of the same bishop, are preserved in the cathedral of Hildesheim. In France, too, judging both from existing specimens of ecclesiastical plate and many records preserved in church inventories, this mode of decoration must have been frequently applied all through the middle ages: especially fine examples once existed at Notre Dame, Paris, and at Cluny, where the columns of the sanctuary were covered with plates of silver in the 11th century, each plate being richly ornamented with designs in niello. Among the early Teutonic and Celtic races, especially from the 8th to the 11th centuries, both in Britain and other countries, niello was frequently used to decorate the very beautiful personal ornaments of which so many specimens enrich the museums of Europe. The British Museum possesses a fine fibula of silver decorated with a simple pattern in niello and thin plates of repoussé gold. This, though very similar in design to many fibulae from Scandinavia and Britain, was found in a tomb at Kerch (Panticapaeum). Several interesting gold rings of Saxon workmanship have been found at different times, on which the owner's name and ornamental patterns are formed in gold with a background of niello. One with the name of Ethelwulf, king of Wessex (836–838), is now in the British Museum (see figure). Another in the Victoria and Albert Museum has the name of Alhstan, who was bishop of Sherborne from 823 to 867. The metal-workers of Ireland, whose skill was quite unrivalled, practised largely the art of niello from the 10th to the 12th century, and possibly even earlier. Fine croziers, shrines, fibulae, and other objects of Irish workmanship, most skilfully enriched with elaborate niello-work, exist in considerable numbers. From the 13th to the 16th century but little niello-work appears to have been produced in England. Two specimens have been found, one at Matlask, Norfolk, and the other at Devizes, which from the character of the design appear to be English. They are both of gold, and seem to be the covering plates of small pendant reliquaries about 1 in. long, dating about the end of the 15th century. One has a crucifix between St John the Baptist and a bishop; the other, that found at Devizes, has the two latter figures, but no crucifix.[1] It is, however, in Italy that the art of niello-work was brought to greatest perfection. During the whole medieval period it was much used to decorate church plate, silver altar-frontals, and the like. The magnificent frontals of Pistoia cathedral and the Florence baptistery are notable instances of this. During the 15th century, especially at Florence, the art of niello-work was practised by almost all the great artist-goldsmiths of that period. Apart from the beauty of the works they produced, this art had a special importance and interest from its having led the way to the invention of printing from engravings on metal plates (see LINE-ENGRAVING). Vasari's account of this invention, given in his lives of Pollaiuolo and Maso Finiguerra, is very interesting, but he is wrong in asserting that Maso was the first worker in niello who took proofs or impressions of his plates. An important work of this sort, described at length by Vasari and wrongly ascribed by him to Maso Finiguerra (*q.v.*), still exists in the Opera del Duomo at Florence. It is a pax with a very rich and delicate niello picture of the coronation of the Virgin; the composition is very full, and the work almost microscopic in minuteness; it was made in 1452. Impressions from it are preserved in the British Museum, the Louvre and other collections. The British Museum possesses the finest existing example of 15th-century German niello. It is a silver beaker, covered with graceful scroll-work, forming medallions, in which are figures of cupids employed in various occupations (see Shaw's *Dresses and Decorations of the Middle Ages*, 1858, vol. ii.).

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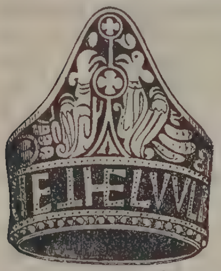
[1] *Div. Art. Sched.* iii. 27-29 (see Hendrie's edition, 1847).

[2] *Trattato dell' oreficeria.*

[3] *Tre arti del disegno.*

[4] See *Soc. Ant. Vet. Mon.* iv. pls. 11-15.

[5] See Visconti, *Una Antica Argentaria* (Rome, 1793).



Gold and Niello Ring.

AUTHORITIES.—*The Archaeological Journal* of 1862 (vol. xix. p. 323) has an excellent monograph on the subject, see also vol. xii. p. 79 and vol. iv. p. 247; *Archaeologia*, xxxi. 404; Merrifield, *Ancient Practice of Painting*, vol. i. (1849) (gives MSS. of Eraclius and other early writers); Catalogue of Museum of Royal Irish Academy; *Les Nielles à la cath. d'Aix-la-Chapelle* (Paris, 1859); Alvin, *Nielles de la bibliothèque roy. de Belgique* (1857); Duchesne, *Nielles des orfèvres florentins* (1826); Passavant, *Le Peintre-graveur* (1860–1864); Ottley, *History of Engraving* (1816) and *Collection of Facsimiles of Prints* (1826); Cicognara, *Storia della scultura*, iii. p. 168 (Prato, 1823), and *Storia della calcografia* (Prato, 1831); Lanzi, *Storia pittorica*, ep. i. sec. iii. (1809); Baldinucci, *Professori del disegno* (1681–1728) and *L'Arte di intagliare in rame* (1686); Zani, *Origine dell' incisione in rame* (1802); Labarte, *Arts of the Middle Ages* (1855); Texier, *Dictionnaire de l'orfèvrerie* p. 1822 (Paris, 1857); Bartsch, *Le Peintre-graveur*, xiii. 1-35; Rumohr, *Untersuchung der Gründe für die Annahme*, &c. (Leipzig, 1841); Lessing, *Collectaneen zur Literatur* (vol. xii. art. "Niellum"); C. Davenport, in *Journal of Soc. of Arts* (1901), vol. xlviii. (J. H. M.)

NIEM [NYEM, or NIEHEIM], **DIETRICH OF** (*c.* 1345–1418), medieval historian, was born at Nieheim, a small town subject to the see of Paderborn. He became a notary of the papal court of the rota at Avignon, and in 1376 went with the Curia to Rome. Urban VI. here took particular notice of him, made him an abbreviator to the papal chancery, and in 1383 took him with him on his visit to King Charles at Naples, an expedition which led to many unpleasant adventures, from which he escaped in 1385 by leaving the Curia. In 1387 he is again found among the abbreviators, and in 1395 Pope Boniface IX. appointed him to the bishopric of Verden. His attempt to take possession of the see, however, met with successful opposition; and he had to resume his work in the chancery, where his name again appears in 1403. In the meantime he had helped to found a German hospice in Rome, which survives as the Instituto dell' Anima, and had begun to write a chronicle, of which only fragments are extant. His chief importance, however, lies in the part he took in the controversies arising out of the Great Schism. He accompanied Gregory XII. to Lucca in May 1408, and, having in vain tried to make the pope listen to counsels of moderation, he joined the Roman and Avignonese cardinals at Pisa. He adhered to the pope elected by the council of Pisa (Alexander V.) and to his successor John XXIII., resuming his place at the Curia. In view of the increasing confusion in the Church, however, he became one of the most ardent advocates of the appeal to a general council. He was present at the council of Constance as adviser to the German "nation." He died at Maastricht on the 22nd of March 1418.

Niem wrote about events in which he either had an intimate personal share or of which he was in an excellent position to obtain accurate information. His most important works are the *Nemus unionis* and the *De schismate*. Of these the first, compiled at Lucca after the breach with Gregory XII., is a collection of documents which had fallen into his hands during the negotiations for union: papal pronouncements, pamphlets, letters written and received by himself, and the like. The *De schismate libri III.*, completed on the 25th of May 1410, describes the history of events since 1376 as Niem himself had seen them. It was continued in the *Historia de vita Johannis XXIII.* Other works are *De bono regimine Rom. pontificis*, dedicated to the new pope (John XXIII.); *De modis uniendi ac reformandi ecclesiam* and *De difficultate reformationis in concilio universali*, advocating the convocation of a council, to which the pope is to bow; *Contra dampnatos Wiclivitas Pragae*, against the Hussites; *Jura ac privilegia imperii*, a glorification of the empire in view of the convocation of the council of Constance; *Avisamenta pulcherrima de unione et reformatione membrorum et capitis fienda*, a programme of church reform based on his experiences of the evils of the papal system.

For bibliography see Potthast, *Bibl. hist. medii aevi* (2nd ed., Berlin, 1896), p. 1051, s.v. "Theodoricus de Niem"; and generally see the article on Niem by Theodor Lindner in *Allgemeine deutsche Biographie* (Leipzig, 1886); and Erler, *Dietrich von Nieheim* (Leipzig, 1887).

NIEMCEWICZ, JULIAN URSIN (1758–1841), Polish scholar, poet and statesman, was born in 1757 in Lithuania. In the earlier part of his life he acted as adjutant to Kosciusko, was taken prisoner with him at the fatal battle of Maciejowice (1794), and shared his captivity at St Petersburg. On his release he travelled for some time in America, where he married. After the Congress of Vienna he was secretary of state and president of the constitutional committee in Poland, but in 1830–1831 he was again driven into exile. He died in Paris on the 21st of April 1841. Niemcewicz tried many styles of composition. His comedy *The Return of the Deputy* (1790) enjoyed a great reputation, and his novel, *John of Tenczyn* (1825), in the style of Scott, gives a vigorous picture of old Polish days. He also wrote a *History of the Reign of Sigismund III.* (3 vols., 1819), and a collection of memoirs for ancient Polish history (6 vols., 1822–1823). But he is now best remembered by his *Historical Songs of the Poles* (Warsaw, 1816), a series of lyrical compositions in which the chief heroes are of the golden age of Sigismund I., and the reigns of Stephen Bathori and Sobieski.

His collected works were published in 12 vols. at Leipzig (1838–1840).

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[1] See *Proc. Norfolk Archaeo. Soc.* iii. p. 97.

NIENBURG ON THE SAALE, a town of Germany, in the duchy of Anhalt, situated at the influx of the Bode into the Saale, 6 m. N. of Bernburg on the railway Calbe-Könnern. Pop. (1905) 5748. It contains a beautiful Gothic Evangelical church, an old castle, once a monastery (founded 975, dissolved 1546), and now devoted to secular uses, and a classical school. The industries embrace iron-founding and machine-making, malting and tanning.

NIENBURG ON THE WESER, a town of Germany, in the Prussian province of Hanover, situated on the Weser, 33 m. N.W. from Hanover by the railway to Bremen. Pop. (1905) 9638. It has an Evangelical and a Roman Catholic church, a classical school and an agricultural college. Its industries consist chiefly in glass-blowing, distilling, biscuit-making and the manufacture of manures. The town is mentioned as early as 1025. It was fortified in the 12th century, obtained municipal rights in 1569, and passed in 1582 to the house of Lüneburg. It was occupied by the imperialists from 1627 to 1634, and by the French during the Seven Years' War. The walls were dismantled by order of Napoleon I. in 1807.

See Gade, *Geschichte der Stadt Nienburg an der Weser* (1862).

NIEPCE, JOSEPH NICÉPHORE (1765–1833), French physicist, and one of the inventors of photography, was born at Châlon-sur-Saône on the 7th of March 1765. In 1792 he entered the army as a sub-lieutenant, and in the following year he saw active service in Italy. Ill-health and failing eyesight compelled him to resign his commission before he had risen above the rank of lieutenant; but in 1795 he was nominated *administrateur* of the district of Nice, and he held the post until 1801. Returning in that year to his birthplace, he devoted himself along with his elder brother Claude (1763–1828) to mechanical and chemical researches; and in 1811 he directed his attention to the rising art of lithography. In 1813 the idea of obtaining sun pictures first suggested itself to him in this connexion; and in 1826 he learned that L. J. M. Daguerre was working in the same direction. In 1829 the two united their forces, "pour coopérer au perfectionnement de la découverte inventée par M. Niepce et perfectionnée par M. Daguerre" (see also PHOTOGRAPHY). Niepce died at Gras, his property near Châlon, on the 3rd of July 1833. A nephew, CLAUDE FÉLIX ABEL NIEPCE DE SAINT-VICTOR (1805–1870), served with distinction in the army, and also made important contributions towards the advancement of the art of photography; he published *Recherches photographiques* (Paris, 1855) and *Traité pratique de gravure héliographique sur acier et sur verre* (Paris, 1866).

NIEREMBERG, JUAN EUSEBIO (1595–1658), Spanish Jesuit and mystic, was born at Madrid in 1595, joined the Society of Jesus in 1614, and subsequently became lecturer on Scripture at the Jesuit seminary in Madrid, where he died on the 7th of April 1658. He was highly esteemed in devout circles as the author of *De la afición y amor de Jesús* (1630), and *De la afición y amor de María* (1630), both of which were translated into Arabic, Flemish, French, German, Italian and Latin. These works, together with the *Prodigios del amor divino* (1641), are now forgotten, but Nieremberg's version (1656) of the *Imitation* is still a favourite, and his eloquent treatise, *De la hermosura de Dios y su amabilidad* (1649), is the last classical manifestation of mysticism in Spanish literature. Nieremberg has not the enraptured vision of St Theresa, nor the philosophic significance of Luis de León, and the unvarying sweetness of his style is cloying; but he has exaltation, unction, insight, and his book forms no unworthy close to a great literary tradition.

NIERSTEIN, a village of Germany, in the grand duchy of Hesse-Darmstadt, on the left bank of the Rhine, 8 m. S. from Mainz by the railway to Worms. Pop. (1905) 4445. It contains a Roman Catholic and a Protestant church, an old Roman bath—Sironabad—and sulphur springs. It is famous for its wines, in which a large export trade is done. Nierstein was originally a Roman settlement, and was a royal residence under the Carolingian rulers. Later it passed from the emperor to the elector palatine of the Rhine.

NIETZSCHE, FRIEDRICH WILHELM (1844–1900), German philosopher, was the son of the pastor at Röcken, near Leipzig, where he was born on 15th October 1844. He was educated at Schulpforta, and studied the classics at the universities of Bonn and Leipzig. In 1869, while still an undergraduate, he was, on F. W. Ritschl's recommendation, appointed to an extraordinary professorship of classical philology in the university of Basel, and rapidly promoted to an ordinary professorship. Here he almost immediately began a brilliant literary activity, which gradually assumed a more and more philosophical character. In 1876 eye (and brain) trouble caused him to obtain sick leave, and finally, in 1879, to be pensioned. For the next ten years he lived in various health resorts, in considerable suffering (he declares that the year contained for him 200 days of pure pain), but dashing off, at high pressure, the brilliant essays on which his fame rests. Towards the end of 1888, after recovering from an earlier attack, he was pronounced hopelessly insane, and in this condition he remained until he died on the 25th of August 1900. Nietzsche's writings must be understood in their relation to these circumstances of his life, and as the outcome of a violent revolt against them on the part of an intensely emotional and nervous temperament. His philosophy, consequently, is neither systematic in itself nor expounded in systematic form. It is made up of a number of points of view which successively appeared acceptable to a personality whose self-appreciation verges more and more upon the insane, and exhibits neither consecutiveness nor consistency. Its natural form is the aphorism, and to this and to its epigrammatic brilliance, vigour, and uncompromising revolt against all conventions in science and conduct it owes its persuasiveness. Revolt against the whole civilized environment in which he was brought up is the keynote of Nietzsche's literary career. His revolt against Christian faith and morals turns him into a proudly atheistic "free-thinker," and preacher of a new "master" morality, which transposes the current valuations, deposes the "Christian virtues," and incites the "over-man" ruthlessly to trample under foot the servile herd of the weak, degenerate and poor in spirit. His revolt against the theory of state supremacy turns him into an anarchist and individualist; his revolt against modern democracy into an aristocrat. His revolt against conventional culture leads him to attack D. F. Strauss as the typical "Philistine of culture"; his revolt against the fashion of pessimism to demand a new and more robust affirmation of life, not merely *although*, but *because*, it is painful. Indeed, his very love of life may itself be regarded as an indignant revolt against the toils that were inexorably closing in around him. He directs this spirit of revolt also against the sources of his own inspiration; he turns bitterly against Wagner, whose intimate friend and enthusiastic admirer he had been, and denounces him as the musician of decadent emotionalism; he rejects his "educator" Schopenhauer's pessimism, and transforms his will to live into a "Will to Power." Nevertheless his reaction does not in this case really carry him beyond the ground of Schopenhauerian philosophy, and his own may perhaps be most truly regarded as the paradoxical development of an inverted Schopenhauerism. Other influences which may be traced in his writings are those of modern naturalism and of a somewhat misinterpreted Darwinism ("strength" is generally interpreted as physical endowment, but it has sometimes to be reluctantly acknowledged that the physically feeble, by their combination and cunning, prove stronger than the "strong"). His writings in their chronological order are as follows: *Die Geburt der Tragödie aus dem Geiste der Musik* (1872); *Unzeitgemässe Betrachtungen* (1873–1876) (*Strauss—Vom Nutzen und Nachteil der Historie für das Leben—Schopenhauer als Erzieher—Richard Wagner in Bayreuth*); *Menschliches, Allzumenschliches* (1876–1880); *Morgenröte* (1881); *Die fröhliche Wissenschaft* (1882); *Also sprach Zarathustra* (1883–1884); *Jenseits von Gut und Böse* (1886); *Zur Genealogie der Moral* (1887); *Der Fall Wagner* (1888); *Götzendämmerung* (1888); *Nietzsche contra Wagner*, *Der Antichrist*, and *Poems* first appeared in the complete edition of his works, which also contains the notes for *Wille* *zur Macht*, in which Nietzsche had intended to give a more systematic account of his doctrine (1895–1901). (F. C. S. S.)

An edition of Nietzsche's complete works began to appear in 1895; there are also two popular editions, 1899 ff. (15 vols. have been published) and 1906 (10 vols.). In 1900 Nietzsche's *Briefe* began to be published. An English translation in 18 vols., edited by Oskar Levy, reached the 13th vol. in 1910. His biography, by his sister, Elisabeth Förster-Nietzsche (*Das Leben Friedrich Nietzsches*, 1895 ff.), reached its third volume in 1907. There are also lives by D. Halévy (1909) and M. A. Mügge (*F. Nietzsche: his Life and Work*, 1908), the latter of a somewhat popular character. G. Brandes first drew European attention to Nietzsche by his famous essay in 1889; since then an enormous literature has grown up round the subject. See especially L. Andreas Salomé, *F. Nietzsche in seinen Werken* (1894); A. Riehl, *F. Nietzsche* (1897; 3rd ed., 1901); F. Tönnies, *Nietzsche-Kultus* (1897); H. Ellis, *F. Nietzsche* (in *Affirmations*, 1898); H. Lichtenberger, *La Philosophie de Nietzsche* (1895; German trans., 1899); E. Horneffer, *Vorträge über F. Nietzsche* (1900); T. Ziegler, *F. Nietzsche* (1900); J. Zeitler, *Nietzsches Ästhetik* (1900); P. Deussen, *Erinnerungen an F. Nietzsche* (1901); R. Richter, *F. Nietzsche, sein Leben und sein Werk* (1903); G. Simmel, *Schopenhauer und Nietzsche* (1907). For an estimate of his moral theory see ETHICS, *ad fin.*

NIEUPORT (Flem. *Nieuwpoort*), a town of Belgium in the province of West Flanders. Pop. (1904) 3780. It was the port of Ypres, and is situated on the Yser about 10 m. S. of Ostend. It was strongly fortified in the middle ages and its siege by the French in 1488–1489 is an episode of its heroic period. Under its walls in 1600 Maurice of Nassau defeated the Archduke Albert and the Spaniards. It contains an ancient cloth market, a fine town-hall and an old church, and outside is a lighthouse dating from 1289. Nieuport Bains, 2 m. from the town, is a fashionable seaside resort dating only from 1869. It has a fine pier extending 1500 yds. out to sea and flanking the entrance to the Yser, which has been canalized. The bathing is excellent, and in the season the place is largely frequented by visitors.

NIÈVRE, a department of central France, formed from the old province of Nivernais with a small portion of the Orléanais. It is bounded N.W. by Loiret, N. by Yonne, E. by Côte d'Or, E. and S.E. by Saône-et-Loire, S. by Allier and W. by Cher. Pop. (1906) 313, 972. Area, 2659 sq. m. Nièvre falls into three regions differing in elevation and in geological formation. In the east are the granitic mountains of the Morvan, one of the most picturesque portions of France, containing Mont Prénelay (2789 ft.) and several lesser heights. The north and centre are occupied by plateaus of jurassic limestone with a maximum elevation of 1400 ft. The west and south-western part of the department is a district of plains, composed mainly of tertiary formations with alluvial deposits, and comprising the valleys of the Loire and the Allier. The lowest level of the department is 446 ft., at the exit of the Loire. Nièvre belongs partly to the basin of the Loire, partly to that of the Seine. The watershed dividing these two basins follows the general slope of the department from S.E. to N.W.—from Mont Prénelay to the Puisaye, the district in the extreme north-west. Towards the west the limits of Nièvre are marked by the Allier-Loire valley—the Loire striking across the south-west corner of the department by Decize and Nevers and then continuing the line of its great affluent the Allier northwards by Fourchambault, La Charité, Pouilly and Cosne. Secondary feeders of the Loire are the Nièvre, which gives its name to the department, and the Aron, whose valley is traversed by the Nivernais Canal. The largest tributary of the Seine in Nièvre is the Yonne, which rises in the south-east, passes by Clamecy, and carries along with it the northern part of the Nivernais Canal. The Cure, the principal affluent of the Yonne (with which, however, it does not unite till after it has left the department), is the outlet of a lake, Lac des Settons, which serves as a reservoir for the regulation of the river and the canal. Owing to its greater elevation and the retention of the rain-water on its impermeable surface in the shape of ponds and streams, Morvan shows a mean temperature 6° F. lower than that of the western district, which, in the valley of the Loire, is almost identical with that of Paris (52° F.). At Nevers the annual rainfall amounts to only 21 in., but in Morvan it is nearly three times as great.

The principal cereals are oats and wheat; potatoes are also largely grown. Much land is given over to pasture and the cultivation of various kinds of forage, and the fattening of cattle is a thriving agricultural industry. The Nivernais and *Charolais* are the chief breeds. The rearing of sheep and draught-horses is also of importance. Vines are grown in the valley of the Loire and in the neighbourhood of Clamecy. The white wines of Pouilly on the Loire are widely known. Nièvre abounds in forests, the chief trees being the oak, beech, hornbeam, elm and chestnut. Coal is mined at Decize, and gypsum, building stone, and kaolin are among the quarry products. The best-known mineral springs are those of Pougues and St Honoré. Of the iron-works for which Nièvre is famous, the most important are those of Fourchambault. At Imphy there are large steel-works. The government works of La Chaussade at Guérigny make chain-cables, anchors, armour-plates, &c. There are also manufactories of agricultural implements and hardware, potteries, manufactories of porcelain, and faïence (at Nevers), tile-works, chemical works, paper-mills and saw-mills, as well as numerous tanneries, boot and shoe factories, cask manufactories and oil works (colza, poppy and hemp). In the Morvan district a large part of the population is engaged in the timber industry; the logs carried down by the streams to Clamecy are then put into boats and conveyed to Paris.

A great deal of the traffic is by water: the canal along the left bank of the Loire runs through the department for 38 m., and the Nivernais canal for 78 m. The chief railway is that of the Paris-Lyons-Méditerranée Company, whose main line to Nîmes follows the valley of the Loire and Allier throughout the department. Nièvre is divided into 4 arrondissements (Nevers, Château-Chinon, Clamecy and Cosne being their capitals), 25 cantons, 313 communes. It forms the diocese of Nevers, and part of the educational district of Dijon and of the region of the VIII. *corps d'armée*. Its court of appeal is at Bourges. The most noteworthy towns are Nevers, the capital, Clamecy, Fourchambault, Cosne, La Charité and Decize. Varzy and Tannay have fine churches of the 14th, and the 12th, 13th and 16th centuries respectively, and there is an interesting church, chiefly Romanesque in style, at St Pierre-le-Moûtier.

NIFO, AGOSTINO [AUGUSTINUS NIPHUS] (*c.* 1473–1538 or 1545), Italian philosopher and commentator, was born at Japoli in Calabria. He settled for a time at Sezza and subsequently proceeded to Padua, where he studied philosophy. He lectured at Padua, Naples, Rome and Pisa, and won so high a reputation that he was deputed by Leo X. to defend the Catholic doctrine of Immortality against the attack of Pomponazzi and the Alexandrists. In return for this he was made Count Palatine, with the right to call himself by the name Medici. In his early thought he followed Averroes, but afterwards modified his views so far as to make himself acceptable to the orthodox Catholics. In 1495 he produced an edition of the works of Averroes; with a commentary compatible with his acquired orthodoxy. In the great controversy with the Alexandrists he opposed the theory of Pomponazzi that the rational soul is inseparably bound up with the material part of the individual, and hence that the death of the body carries with it the death of the soul. He insisted that the individual soul, as part of absolute intellect, is indestructible, and on the death of the body is merged in the eternal unity.

His principal philosophical works are *De immortalitate animi* (1518 and 1524); *De intellectu et daemonibus*; *De infinitate primi motoris quaestio* and *Opuscula moralia et politica*. His numerous commentaries on Aristotle were widely read and frequently reprinted, the best-known edition being one printed at Paris in 1654 in fourteen volumes (including the *Opuscula*).

NIGDEH (Arab. *Nakidah*), the chief town of a sanjak of the same name in the Konia vilayet of Asia Minor, situated on the Kaisarieh-Cilician Gates road. It is remarkable for the beauty of its buildings, dating from almost all ages of the Seljuk period. After the fall of the sultanate of Rum (of which it had been one of the principal cities), Nigdeh became independent, and, according to Ibu Batuta, ruinous, and did not pass into Ottoman hands till the time of Mahommed II. It represents no classical town, but, with Bor, has inherited the importance of Tyana, whose site lies about 10 m. S.W. A Hittite-inscribed monument, brought perhaps from Tyana, has been found at Nigdeh. The population (20,000) includes a large Greek and a small Armenian community. The Orthodox metropolitan of Iconium resides here.

NIGEL (d. 1169), bishop of Ely, head of the exchequer in the reigns of Henry I. and Henry II., was brought into the exchequer in early life (1130). Soon after his uncle Roger of Salisbury secured him the bishopric of Ely, much to the disgust of the monks. Nigel was at first retained in Stephen's service; but, like his uncle and his brothers, incurred the suspicion of leaning towards the Angevin interest, when Roger of Salisbury and Alexander of Lincoln were arrested by Stephen (January 1139). Nigel attempted to maintain himself in his see by force of arms, but he was forced to fly to the empress at Gloucester He was reconciled to Stephen in 1142 and restored to his see; but he now became involved in a quarrel with the powerful Henry of Winchester. Ranulph, his first treasurer and representative at Ely, had been extortionate and dishonest, and the monks accused Nigel, probably with some justification, of spending the estates and treasures of the see in maintaining knights and gaining court influence. Henry of Winchester, who can have had little sympathy with bishops of Nigel's type, took up their quarrel, and Nigel was forced to go to Rome. Fortunately, both in these quarrels and in all his difficulties with Stephen, he secured the strong and uniform support of the Roman Curia. At the accession of Henry II. (1154) Nigel was summoned to reorganize the exchequer. He was the only surviving minister of Henry I., and his knowledge of the exchequer business was unrivalled. This was the great work of his life. It is to the work of his son Richard, the *Dialogus de Scaccario*, that we are indebted for our knowledge of the procedure of the exchequer as it was left by Nigel. The bishop took little part in politics, except as an administrator. In 1166 his health was broken by a paralytic seizure. Except for another quarrel with his monks, who accused him of despoiling their church and gained the ear of Pope Adrian, the last part of his life was laborious and uneventful.

See Dr Liebermann's *Einleitung in den Dialogus de Scaccario*; J. H. Round's *Geoffrey de Mandeville.*

NIGER, GAIUS PESCENNIUS, governor of Syria under the emperor Commodus. On the death of Pertinax (A.D. 193), he was saluted emperor by the troops at Antioch, but unaccountably delayed marching on Rome until he learned that Septimius Severus, one of the rival claimants, had assumed the offensive. He then strongly garrisoned Byzantium and the principal towns of Asia Minor, but after his legate Aemilianus had been defeated and slain near Cyzicus he himself was driven from Nicaea and routed near the Cilician Gates. Having failed in an effort to escape towards the Euphrates, he was brought back and put to death in 194.

Aelius Spartianus, *Pescennius Niger*; Dio Cassius lxxii. 8; lxxiii. 13, 14.

NIGER, a great river of West Africa, inferior only to the Congo and Nile among the rivers of the continent, and the only river in Africa which, by means of its tributary the Benue, affords a waterway uninterrupted by rapids, and available for shallow-draught steamers, to the far interior. Rising within 150 m. of the sea in the mountainous zone which marks the N.E. frontiers of Sierra Leone and French Guinea, it traverses the interior plateaus in a vast curve, flowing N.E., E. and S.E., until it finally enters the Gulf of Guinea through an immense delta. Its total length is about 2600 m. About 250 m. from its mouth it is joined by the Benue, coming from the east from the mountainous region of Adamawa. From its mouth to the limit of navigability from the sea the river is in British territory; above that point it flows through French territory.

The birthplace of the river.

The source of the Niger lies in 9° 5′ N. and 10° 47′ W., and the most northerly point of the great bend is about 17° N. The area of the Niger basin, excluding the arid regions with a slope towards the stream, has been calculated by Dr. A. Bludau at 584,000 sq. m. The river is known locally under various names, the most common being Joliba (a Mandigo word meaning Great River) and Kworra or Quorra. By the last name the Niger was known in its lower reaches before its identity with the upper river was established. The stream considered the chief source of the Niger is called the Tembi. A narrow watershed separates it from the headwaters of the streams flowing south-west through Sierra Leone. The birthplace of the Niger is in a deep ravine 2800 ft. above sea-level. From a moss-covered rock a tiny spring issues and has made a pool below. This little stream is the Tembi, which within a short distance is joined by two other rivulets, the Tamincono and Falico, which have their origin in the same mountainous district. After flowing north for about 100 m., the river turns eastward and receives several tributaries from the south. At its confluence with the Tankisso (a northern tributary), 210 m. from its source, the river has attained dimensions sufficient to earn for itself the title Joliba. Taking at this point a decided trend northward, the Niger, 100 m. lower down, at Bamako—the first considerable town on its banks—has a depth of 6 ft. with a breadth of 1300 ft. Seven or eight miles below Bamako the Sotuba rocks mark the end of what may be considered the upper river. From this point the navigable portion of the Niger begins. Thirty miles below Sotuba are the rapids of Tulimandio, but these are navigable when the river is at its highest, namely from July to October. A little lower down is Kulikoro, from which point the bed of the stream for over 1000 m. is fairly free from impediments.

The middle Niger and lake region.

The river here turns more directly to the east and increases in volume and depth. At Sansandig the stream is deep enough to permit of steamers of considerable size plying upon the river. After Sansandig is passed the banks of the stream become low and the Niger is split up into a number of channels. Mopti is at the junction of the main stream with a large right-hand backwater or tributary, the Bani or Mahel Balevel, on which is situated the important town of Jenné. The banks of the Niger below Mopti become swampy and treeless, and the first of a series of lakes (Debo) is reached. These lakes are chiefly on the left of the main stream, with which they are connected by channels conveying the water in one direction or the other according to the season. At high water most of these are united into one general inundation. The largest lake, Faguibini, is nearly 70 m. long by 12 m. broad, has high shores and reaches a depth exceeding, in parts, 160 ft. It is not until Kabara, the port of Timbuktu, is reached, a distance of 450 m. from Sansandig, that the labyrinth of lakes, creeks and backwaters ceases. Below Kabara the river reaches its most northerly point. At Bamba it is shut in by steep banks and narrows to 600 to 700 yds., again spreading out some distance down. At Barka (200 m. from Timbuktu) the stream turns south-east and preserves that direction throughout the remainder of its course. At Tosaye, just before the bend becomes pronounced, the Baror and Chabar rocks reduce the width of the river to less than 500 ft., and at low water the strength of the current is a serious danger to navigation. Below Timbuktu for a considerable distance the Niger receives no tributaries; from the north none until the region of the Sahara is passed. In places the desert approaches close to the river on both banks and immense sand dunes fill the horizon.

Bussa rapids and lower river.

At Ansongo, 430 m. below Timbuktu, the navigable reach of the middle Niger, in all 1057 m., ends. Four huge flint rocks bar the river at Ansongo and effectually prevent further navigation except in very small vessels. From Ansongo to Say, some 250 m., the river flows through several rocky passes, the current attaining great velocity. Throughout this distance the river is a hopeless labyrinth of rocks, islands, reefs and rapids. From Say, where the stream is about 700 yds. in breadth, to Bussa, there is another navigable stretch of water extending 300 m. After the desert region is past the Niger receives the waters of the river Sokoto, a considerable stream flowing from the north-east. Some distance below this confluence are the Bussa rapids, which can only be navigated with considerable difficulty. These rapids—though not such a hindrance to navigation—are of a more dangerous character than any encountered between Ansongo and Say. "In one pass, some 54 yds. wide, shut in between two large reefs, a good half of the waters of the Niger flings itself over with a tremendous roar" (Hourst). The rapids extend for 50 m. or more; in a less obstructive form they continue to Rabba, but light-draught steamers ascending the stream during flood season experience little difficulty in reaching Bussa. A little above Rabba the river makes a loop south-west, at the head of the loop being (right bank) Jebba. Here the river is bridged by the railway from Lagos. Sixty miles lower down is the mouth of the (left hand) tributary the Kaduna, a river of some magnitude which gives access to Zungeru, the headquarters of the British administration in Northern Nigeria. The head waters of the Kaduna are not far from Kano. Below the mouth of the Kaduna, on the right bank of the Niger, is Baro, the starting-point of a railway to Kano. In 7° 50′ N. 6° 45′ E. the Niger is joined by its great tributary the Benue. At their confluence the Niger is about three-quarters of a mile broad and the Benue rather more than a mile. The united stream forms a lake-like expansion about 2 m. in width, dotted with islands and sandbanks; the peninsula at the junction is low, swampy, and intersected by numerous channels. On the western bank of the Niger at this point is situated Lokoja (*q.v.*), an important commercial centre. The stream, as far south as Iddah (Ida), a town on the east bank, rushes through a valley cut between the hills, the sandstone cliffs at some places rising 150 ft. high. Between Iddah and Onitsha, 80 m., the banks are lower and the country flatter, and to the south of Onitsha the whole land is laid under water during the annual floods. ***The Delta.*** Here may be said to begin the great delta of the Niger, which, extending along the coast for about 120 m., and 140 or 150 m inland, forms one of the most remarkable of all the swampy regions of Africa. The river breaks up into an intricate network of channels, dividing and subdividing, and intercrossing not only with each other but with the branches of other streams, so that it is exceedingly difficult to say where the Niger delta ends and another river system begins. The Rio Nun is a direct continuation of the line of the undivided river, and is thus the main mouth of the Niger

From the sea the only indication of a river mouth is a break in the dark green mangroves which here universally fringe the coast. The crossing of the bar requires considerable care, and at ebb tide the outward current runs 5½ knots per hour. For the first 20 m. (or as far as Sunday Island, the limit of the sea tide in the dry season) dense lines of mangroves 40, 50, or 60 ft in height shut in the channel; then palm and other trees begin to appear, and the widening river has regular banks. East of the Nun the estuaries known as the Brass, Sombrero, New Calabar, Bonny, Opobo (or Imo), &c. (with the exception, perhaps, of the first-named), seem to derive most of their water from independent streams such as the Orashi, rising in about 6° N., which is, however, linked with the Niger by the Onita Creek in 5½° N. Behind the town of Okrika, some 30 m. up the Bonny river, the swampy ground gives place to firm land, partially forest-clad West of the Nun all the estuaries up to the Forcados seem to be true mouths of the great river, while the Benin river, though linked to the others by transverse channels, may be more properly regarded as an independent stream. (See Benin.) In this direction the largest mouth is the Forcados, a noble stream with a safe and relatively deep bar Its banks in its lower course are densely wooded, but the beach is sandy and almost free from marsh and malaria. The mouth is 2 m. wide. It has supplanted the Nun river as the chief channel of communication with the interior. There are 17 to 19 ft. of water over the Forcados bar, as against 13 ft. at the Nun mouth. Moreover the Forcados bar shifts little laterally, and within the bar is a natural harbour with an area of 3 to 4 sq. m. having a depth of 30 ft. at low water spring tides. From the mouth of the Forcados to the main stream is 105 m., with a minimum depth in the dry season of 7 ft. A northern arm affords ocean-going vessels access to Wari and Sapele. The other western mouths of the Niger have as a rule shallow and difficult bars. The delta is the largest in Africa and covers 14,000 sq. m.

The Benue.

The Benue is by far the most important of the affluents of the Niger. The name signifies in the Batta tongue "Mother of Waters." The river rises in Adamawa in about 7° 40′ N. and 13° 15′ E., a little north of the town of Ngaundere, at a height of over 3000 ft. above the sea, being separated by a narrow water parting from one of the headstreams of the Logone, whose waters flow to Lake Chad. In its upper course the Benue is a mountain torrent falling over 2000 ft. in some 150 m. With the Chad system it is connected by the Kebbi or Mayo Kebbi, a right-hand tributary whose confluence is in about 9½° N., 13½° E. The Kebbi, fed by many torrents rising in the eastern versant of the Mandara Hills, issues from the S.W. end of the Tuburi marshes. These marshes occupy an extensive depression in the moderately elevated plateau east of the Mandara Hills, and are cut by 10° N., 15° E. The central part of the marshes forms a deep lake, whence there is a channel going northward to the Logone and navigable for some months during the year. The Kebbi flows west, and soon after leaving Tuburi passes through a rocky barrier marked by a series of rapids and a fall at Lata of 165 ft. Below these obstructions the Kebbi to its junction with the Benue has a depth of not less than 6 ft. In places, as at Lere and Bifara, it widens into lake-like dimensions.

Below the Kebbi confluence the Benue, now a considerable river, turns from a northerly to a westerly direction and is navigable all the year round by boats drawing not more than 2½ ft. For some 40 m. below the confluence the river has an average width of 180 to 200 yds., and flows with a strong steady current, although a broad strip of country on each side is swampy or submerged. It is here joined by the Faro, which, rising in the Adamawa Mountains S.E. of Ngaundere, flows almost due north. About 50 m. below the junction of the Faro is Yola, the capital of Adamawa. It lies on the southern side of the Benue, some 850 m. by river from the sea and at an altitude of 600 ft. Here the width of the stream increases at flood time to 1000 or 1500 yds., and though it narrows at the somewhat dangerous rapids of Rumde Gilla to 150 or 180 yds., it soon expands again. About 50 m. below Yola the Benue receives, on the right bank, the Gongola, which rises in the Bauchi highlands and after a great curve north-east turns southward. It is over 300 m. long, and at flood time is navigable for about half of its course. The Benue receives several other tributaries both from the north and the south, but they are not of great importance. It flows onwards to the Niger with comparatively unobstructed current, its valleys marked for the most part by ranges of hills and its banks diversified with forests, villages and cultivated tracts. But though exceptionally free from obstruction by rapids, the river falls very low in the dry season, and for seven to eight months is almost useless for navigation. The Benue lies within British territory to a point 3 m. below the mouth of the Faro, in about 13° 8′ E. East of that point the river is in the German colony of Cameroon.

Flood and low seasons.

As the Niger and the Benue have different gathering grounds, they are not in flood at the same time. The upper Niger rises in June as the result of the tropical rains, and decreases in December, its breadth at Turella expanding from between 2000 and 2500 ft. to not less than 1½ m. The middle Niger, however, reaches its maximum near Timbuktu only in January; in February and March it sinks slowly above the narrows of Tosaye, and more rapidly below them, the level being kept up by supplies from backwaters and lakes; and by April there is a decrease of about 5 ft. In August the channel near Timbuktu is again navigable owing to rain in the southern highlands. The Benue reaches its greatest height in August or September, begins to fall in October, falls rapidly in November and slowly in the next three months, and reaches its lowest in March and April, when it is fordable in many places, has no perceptible flow and at the confluence begins to be covered with the water-weed *Pistia Stratiotes*. The flood rises with great rapidity, and reaches 50, 60, or even 75 ft. above the low-water mark.

The two confluents being so unlike, the united river differs from each under the influence of the other. Here the river is at its lowest in April and May; in June it is subject to great fluctuations; about the middle of August it usually begins to rise; and its maximum is reached in September. In October it sinks, often rapidly. A slight rise in January, known as the *yangbe*, is occasioned by water from the upper Niger. Between high- and low-water mark the difference is as much as 35 ft.

Geological changes.

The geological changes which have taken place in the Niger basin are imperfectly known. The French scientists E. F. Gautier and R. Chudeau, summing up the evidence available in 1909, set forth the hypothesis that the existing upper Niger and the existing lower Niger were distinct streams. According to this theory the upper Niger, somewhat above where Timbuktu now stands, went north and north-west and emptied into the Juf, which in the beginning of the quaternary age was a salt-water lake, the remnant of an arm of the sea which in the tertiary age covered the northern Sudan and southern Sahara as far east as Bilma. Lake Fagubini is regarded as a remnant of the ancient course of the upper river. When the upper Niger had this direction, the Wadi Taffassassent, now a dried-up river of the central Sahara, which rose in the Ahaggar mountains, is believed to have formed the upper course of the existing lower Niger. While the upper and lower parts of the Niger have all the appearance of ancient streams, the middle Niger is the result of a "recent" capture; "it has no past, it scarcely has a present" (see R. Chudeau, *Sahara soudanais*, Paris, 1909).

History and exploration.

Vague ideas of the existence of the river were possessed by the ancients. The great river flowing eastward reached by the Nasamonians as reported by Herodotus can be no other than the Niger. Pliny mentions a river Nigris, of the same nature with the Nile, separating Africa and Ethiopia, and forming the boundary of Gaetulia; and it is not improbable that this is the modern Niger. In Ptolemy, too, appears along with Gir (possibly the Shari) a certain Nigir (Νίγειρ) as one of the largest rivers of the interior; but so vague is his description that it is impossible definitely to identify it with the Niger.[1] Arabian geographers, such as Ibn Batuta, who were acquainted with the middle course of the river, called it the Nile of the Negroes. At the same time contradictory opinions were held as to the course of the stream. It was supposed by some geographers to run west, an opinion probably first stated by Idrisi in the 12th century. Idrisi gave the Nile of Egypt and the Nile of the Negroes a common source in the Mountain of the Moon. Fountains from the mountain formed two lakes, whence issued streams which united in a very large lake. From this third lake issued two rivers—the Nile of Egypt flowing north, and that of the Negroes flowing west (see R. Dozy and M. J. de Goeje's *Edrisi*, Leiden, 1866: Premier Climat, 1st 4 sections). From Idrisi's description it would appear that he regarded the Shari, Lake Chad, the Benue, Niger and Senegal as one great river which emptied into the Atlantic.[2] That the Niger flowed west and reached the ocean was also stated by Leo Africanus. The belief that a western branch of the Nile emptied itself into the Atlantic was held by Prince Henry of Portugal, who instructed the navigators he despatched to Guinea to look for the mouth of the river, and when in 1445 they entered the estuary of the Senegal the Portuguese were convinced that they had discovered the Nile of the Negroes (see Azurara's *Discovery and Conquest of Guinea*, Beazley and Prestage's translation, vol. ii., London, 1899, chaps. lx. and lxi., and introduction and notes). The Senegal being proved an independent river and the eastward flow of the Niger assumed, the theory that it ran into the Nile was revived, and almost to the very year in which the course of the river was actually demonstrated geographers and travellers, such as J. G. Jackson in his *Empire of Marocco*, first published in 1809, fought zealously for the identity of the Nile of the Negroes with the river of Egypt. The highest scientific authority of the day, Major James Rennell, believed, however, that the Niger ended, *by evaporation*, in the country of "Wangara"—a region located by him, through a misreading of Idrisi, far too much to the east, between 15° and 20° E. (see Rennell's map in Hornemann's *Travels*, 1802). To Rennell the Benue was an east-flowing continuation of the Niger.[3] The imagined existence of mountains—called Kong in the west and Komri (Lunar) in the east—stretching in a high and unbroken chain across Africa about 10° N. long prevented geographers from thinking of a possible southern bend to the Niger.

That the vast network of rivers on the Guinea coast, of which the Nun was the chief, known as the Oil Rivers, formed the delta of the Niger does not appear to have been suspected before the beginning of the 19th century. Consequently it was from the direction of its source that the river was first explored in modern times. In 1795 Mungo Park (*q.v.*) was sent out by the African Association, and was the first European to see and describe the upper river. Park landed at the Gambia, and struck the Niger near Segu (a town some distance above Sansandig) on the 20th of July 1796, where he beheld it "glittering in the morning sun as broad as the Thames at Westminster and flowing slowly to the eastward" (*Travels*, 1st ed. p. 194). He descended the river some distance, and on his return journey went up stream as far as Bamako. In 1805 Park returned to Africa for the purpose of descending the Niger to its mouth. He started as before from the Gambia, reached the Niger, sailed down the river past Timbuktu, and on the eve of the successful accomplishment of his undertaking lost his life during an attack on his boat by the natives at Bussa (Nov. or Dec. 1805). Park held to the opinion that the Niger and Congo were one river, though in 1802 C. G. Reichard, a German geographer, had suggested that the Rio Nun was the mouth of the Niger.[4] Owing to Park's death the results of his second journey were lost, and the work had to be begun afresh. In 1822 Major A. G. Laing (who had reached Timbuktu by way of Tripoli) obtained some accurate information concerning the sources of the river, and in 1828 the French explorer René Caillié went by boat from Jenné to the port of Timbuktu. In 1826 Bussa was reached from Benin by Hugh Clapperton, and his servant Richard Lander. On Clapperton's death Richard Lander and his brother John led in 1830 an expedition which went overland from Badagry to the Niger. Canoeing down the river from Yawri—60 m. above Bussa—to the mouth of the Rio Nun they finally settled the doubt as to the lower course of the stream. In 1832 Macgregor Laird established the African Steamship Company, and Richard Lander and R. A. K. Oldfield (as members of its first expedition) ascended the Niger to Rabba, and the Benue as far as Dagbo (80 m.). In 1841 an expedition, consisting of three steamers of the British navy, under Captain (afterwards Admiral) H. D. Trotter, went up to Egga (Egam), but was forced to return owing to sickness and mortality.

Heinrich Barth (1851–1854) made known to Europe the course of the river from Timbuktu to Say. Barth sailed down from Saraiyamo (situated on a tributary stream south-west of Timbukutu) to Kabara; then skirted the left bank to a small town called Bornu in 16° N., and the right thence to Say. In 1880–1881 the German E. R. Flegel ascended the Niger to Gomba opposite the confluence of the Sokoto river with the main stream, and about 70 m. below Barth's southmost point. Zweifel and Moustier, sent out by M. Verminck, a Marseilles merchant, discovered (1879) the sources of the Falico, &c., and in 1885 the Tembi source was visited by Captain Brouet, a French officer. Indeed the additions to the knowledge of the Niger during the last two decades of the 19th century were largely the work of French officers engaged in the extension of French influence throughout the western Sudan. From 1880 onwards Colonel (afterward General) Gallieni took a leading part in the operations on the upper river, where in 1883 a small gunboat, the *Niger*, was launched for the protection of the newly established French posts. In 1885 a voyage was made by Captain Delanneau past the ruins of Sansandig, as far as Diafarabe. In 1887 the gunboat made a more extended voyage, reaching the port of Timbuktu, and correcting the mapping of the river down to that point. In 1894–1895 attention was directed to the middle and lower Niger, to which several expeditions started from the coast of Guinea. A still more important expedition was that of Lieutenant Hourst, who, starting from Timbuktu in January 1896, navigated the Niger from that point to its mouth, executing a careful survey of the river and the various obstructions to navigation. A voyage made in 1897 by Lieutenant de Chevigné showed that at low water the section between Timbuktu and Ansongo presents great difficulties, but the voyage from Timbuktu to Say was again successfully accomplished in 1899 by Captain Granderye. In 1901 Captain E. Lenfant ascended the river with a flotilla from its mouth to Say, and he demonstrated the "normal practicability" of the route, despite the Bussa rapids. The delta of the Niger has been partially surveyed since it became British territory by various ship captains, officials of the Royal Niger Company and others, including Sir Harry Johnston, sometime British consul for the Oil Rivers.

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[1] Sir Rufane Donkin in a curious and learned work, *A Dissertation on . . . the Niger* (1829), made the Niger join the Gir, which last stream he calls the Nile of Bornu. The united river ran north, disappeared underground in the Sahara and reached the Mediterranean at "the quicksands of the gulph of Sidra." Donkin believed that the desert, advancing eastwards, would overwhelm the Egyptian Nile also in its lower course. "The Delta," he exclaims, "shall become a plashy quicksand, a second Syrtis! and the Nile shall cease to exist from the Lower Cataract downwards."

[2] The hydrography of northern central Africa as now known largely explains the medieval belief in a connexion between the western rivers and the Egyptian Nile. Leaving out of account the Welle-Ubangi (and Idrisi's description of the two Niles may infer a knowledge of that stream, which was supposed by Schweinfurth to form part of the Chad system), there is an almost continuous waterway from the mouth of the Senegal to that of the Nile. The upper waters of the Bakoy branch of the Senegal and those of the navigable Niger are less than 40 m. apart; the Niger communicates directly through the Benue, Lake Tuburi and the Logone with the Shari; the easternmost affluents of the Shari and the most western tributaries of the Bahr el Ghazel affluent of the Nile are within 20 m. of one another. With but three short porterages a boat could be navigated the whole of this distance. Moreover, from the confluence of the Ghazel the Nile is navigable (at high water) the entire distance to the Mediterranean. (See also SHARI.)

[3] In 1816 James McQueen correctly divined that there was a great west-flowing tributary (the Benue) to the Niger, and that after its confluence the river ran south to the Atlantic. See his *View of Northern Central Africa* (1821) and *Geographical Survey of Africa* (1840).

[4] See *Éphémérides géographiques*, vol. xii. (Weimar, Aug. 1803).

In addition to the main stream, the Niger basin was made known by exploration during the last quarter of the 19th century and the early years of the 20th. The journeys of the German traveller G. A. Krause (north from the Gold Coast, 1886–1887) and the French Captain Binger (Senegal to Ivory Coast, 1887–1889) first defined its southern limits by revealing the unexpected northward extension of the basins of the Guinea coast streams, especially the Volta and Komoe, a fact which explained the absence of important tributaries within the Niger bend. This was crossed for the first time, in its fullest extent, by Colonel P. L. Monteil (French) in 1890–1891. At the eastern end of the basin much light has been thrown on the system of the Benue. In 1851 Barth crossed the Benue at its junction with the Faro, but the region of its sources was first explored by Flegel (1882–1884), who traversed the whole southern basin of the river and reached Ngaundere. Other German travellers added to the knowledge of the southern tributaries, the Tarabba, Donga and others, which in the rains bring down a large body of water from the highlands of southern Adamawa. British travellers who have done work in the same region are Sir W. Wallace, L. H. Moseley, W. P. Hewby, P. A. Talbot and Captain Claud Alexander. The last-named two were members of an expedition led by Lieut. Boyd-Alexander, who himself crossed Africa from the Niger to the Nile. Messrs Talbot and Claud Alexander surveyed the country between Ibi on the Benue and Lake Chad, mapping (1904) a considerable part of the Gongola.[1] In 1854 the Benue itself was ascended 400 m. by the "Pleiad" expedition, and in 1889 to 13½° E., and the Kebbi to Bifara by Major (afterwards Sir Claude) Macdonald, further progress towards the Tuburi marsh being prevented by the shallowness of the water. The upper basin of the Benue was also traversed by the French expeditions of Mizon (1892) and Maistre (1892–1893), the latter passing to the south of the Tuburi marsh without definitely settling the hydrographical question connected with it. This was accomplished by Captain Lenfant in 1903. He ascended the Kebbi and discovered the Lata Fall, continuing up the river to its point of issue from Tuburi. Crossing the marshes he found and navigated the narrow river leading to the Logone. Save for the porterage round the Lata Fall the whole journey from the mouth of the Niger to Lake Chad was made by water. The Benue in the neighbourhood of Yola was mapped in 1903–1904 by an Anglo-German boundary commission.

From 1904 onwards the French undertook works on the Niger between Bamako—whence there is railway communication with the Senegal—and Ansongo with a view to deepening the channel and removing obstructions to navigation. In 1910 the British began dredging with the object of obtaining from the mouth of the river to Baro a minimum depth of 6 ft. of water.

AUTHORITIES.—Mungo Park, *Travels in the Interior Districts of Africa . . . in the Years 1795, 1796 and 1797* (London, 1799). A geographical appendix by Major James Rennell summarizes the information then available about the Niger. R. and J. Lander, *Journal of an Expedition to explore the Course and Termination of the Niger . . .* (3 vols. London, 1833); H. Barth, *Travels and Discoveries in North and Central Africa . . .*, vols. iv. and v. (London, 1857–1858); Gen. J. S. Gallieni, *Mission d'exploration du Haut Niger . . .* (Paris, 1885); E. Caron, *De Saint Louis au Port de Timbouktou; Voyage d'une cannonière française* (Paris, 1891); M. Hourst, *Sur le Niger et au pays des Touaregs* (Paris, 1898), English translation, *French Enterprise in Africa . . . Exploration of the Niger* (London, 1898). The political references in this book are marked by jealous hostility to the British. Col. J. K. Trotter, *The Niger Sources . . .* (London, 1897); Sir H. H. Johnston, "The Niger Delta," *Proc. R.G.S.* (December 1888); Sir F. Lugard, "An Expedition to Borgu on the Niger," *Geo. Jnl.* (September 1895); E. Lenfant, *Le Niger; voie ouverte à notre empire africain* (Paris, 1903), chiefly a demonstration that the Bussa rapids are not an absolute bar to navigation.

The foregoing books deal almost entirely with the Niger. For the Benue see, besides Barth's *Travels*, A. F. Mockler Ferryman, *Up the Niger; Narrative of Major Claude Macdonald's Mission to the Niger and Benue Rivers . . .* (London, 1892); L. Mizon, "Itinéraire de la source de la Benoué au confluent des rivières Kadeï et Mambéré" and other papers in the *Bull. Soc. Géog. Paris* for 1895 and 1896; C. Maistre, *À travers l'Afrique central du Congo au Niger* (Paris, 1895); E. Lenfant, *La Grande Route du Chad* (Paris, 1905); Col. L. Jackson, "The Anglo-German Boundary Expedition in Nigeria," *Geo. Jnl.* (July 1905); P. A. Talbot, "Survey Work by the Alexander Gosling Expedition: Northern Nigeria 1904–1905," *idem* (February 1906); Boyd Alexander, *From the Niger to the Nile*, vol. i. (London, 1907). The British Blue Books, *Correspondence relating to Railway Construction in Nigeria* (1905) and *Further Correspondence*, &c. (1909), contain information about the navigability of the lower Niger and of the Kaduna. The best maps are those published by the French and British War Offices; an *Atlas du cours du Niger de Tombouctou aux rapides de Boussa* in 50 sheets on the scale of 1 : 50,000, by Lieut. Hourst and others, was published in Paris in 1899. (F. R. C.)

NIGERIA, a British protectorate in West Africa occupying the lower basin of the Niger and the country between that river and Lake Chad, including the Fula empire (*i.e.* the Hausa States) and the greater part of Bornu. It embraces most of the territory in the square formed by the meridians of 3° and 14° E. and the parallels of 4° and 14° N., and has an area of about 338,000 sq. m. The protectorate is bounded W., N. and N.E. by French possessions (Dahomey, Upper Senegal and Niger colony, and Chad territory), S.E. by the German colony of Cameroon and S. by the Atlantic.

Physical Features.—The country is divisible, broadly, into three zones running parallel with the coast: (1) the delta, (2) forest region, giving place to (3) the plateau region. The coast line, some 500 m. in length, extends along the Gulf of Guinea from 2° 46′ 55″ E. to 8° 45′ E. ending at the Rio del Rey, the point where the great bend eastwards of the continent ceases and the land turns south. The Niger (*q.v.*), which enters the protectorate at its N.W. corner and flows thence S.E. to the Atlantic, receives, 250 m. from the sea, the Benue, which, rising in the mountains of Adamawa south of Lake Chad, flows west across the plateau. Into the huge delta of the Niger several other rivers (the "Oil Rivers") empty themselves; the chief being, on the west, the Benin (*q.v.*), and on the east the Brass. East of the Niger delta is that formed by the Imo or Opobo, Bonny and other streams, and still farther east is the Calabar estuary, mainly formed by the Cross river (*q.v.*). West of the Niger delta are several independent streams discharging into lagoons, which here line the coast. The most westerly of these streams, the Ogun, enters the Lagos lagoon, which is connected by navigable waterways with the Niger (see LAGOS).

The delta region is swampy, and forms, for a distance of from 40 to 70 m. inland, a network of interlacing creeks and broad sluggish channels fringed with monotonous mangrove forests. The main rivers are navigable for ocean-going steamers for a distance of from 15 to 40 m. from their mouths. Beyond the delta firm ground takes the place of mud and the mangroves disappear. The land rises gradually at first, becoming, however, in many districts very hilly, and is covered with dense forests. The Niger at its confluence with the Benue is not more than 250 ft. above the sea. North of this point are hills forming the walls of the plateau which extends over the centre of the

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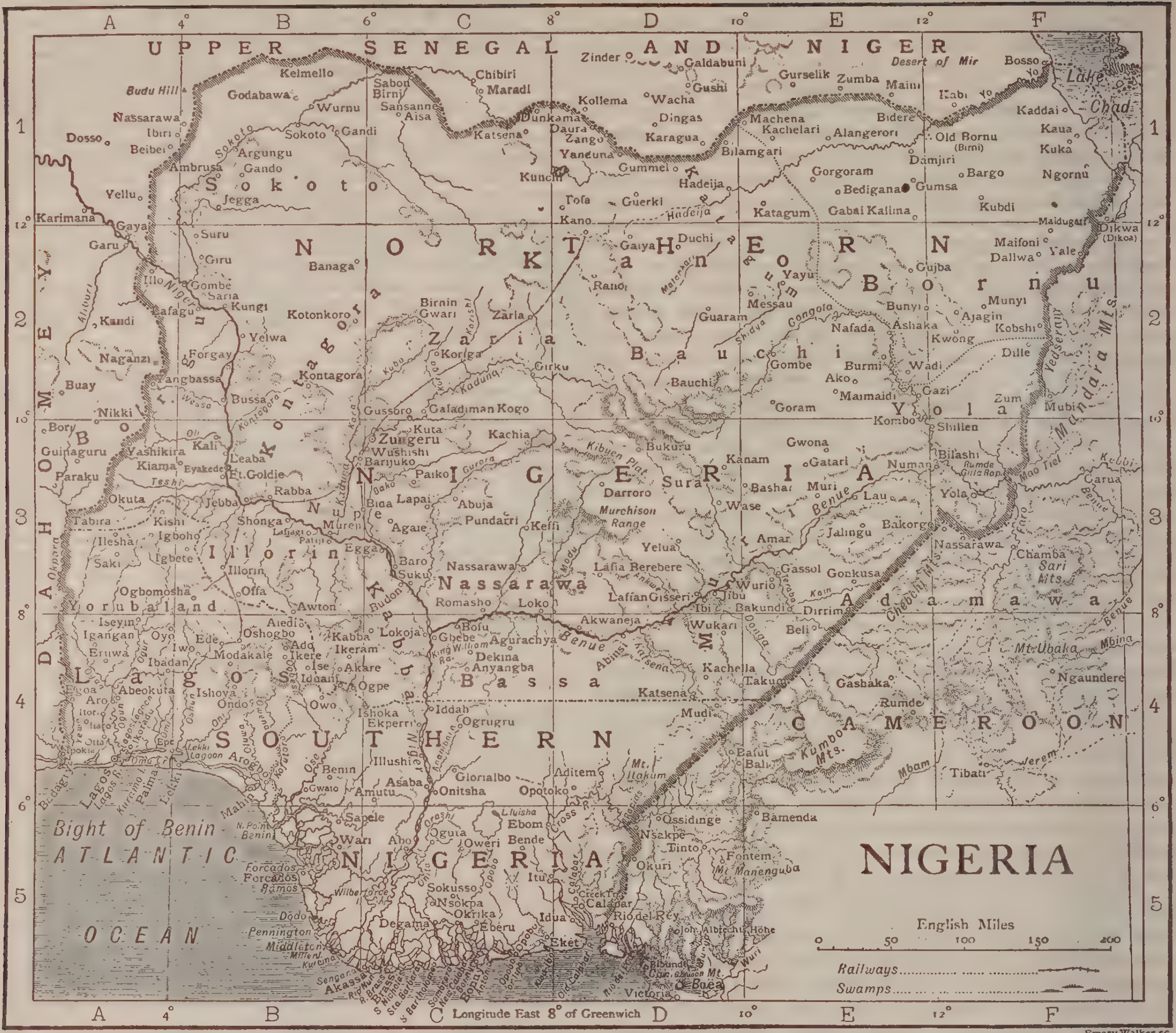
[1] Captain Claud Alexander died of fever in northern Nigeria on the 30th of November 1904. His brother, Lieut. Boyd Alexander, in a subsequent expedition across Africa was murdered in Wadai on the 2nd of April 1910.


NIGERIA
UPPER SENEGAL AND NIGER
NORTHERN NIGERIA
SOUTHERN NIGERIA
DAHOMEY
CAMEROON
Sokoto
Zaria
Bauchi
Bornu
Kano
Nupe
Ilorin
Nassarawa
Yola
Adamawa
Bassa
Kontagora
Yorubaland
Lagos
Muri
Bight of Benin
ATLANTIC OCEAN
Lake Chad
Desert of Mir
Benue
Niger
Kaduna
Gongola
Murchison Range
Mandara Mts.
Kumbo Mts.
Mt. Ubaka
Mt. Manenguba
Zungeru
Lokoja
Ibadan
Abeokuta
Calabar
Buea
Victoria
Forcados
Onitsha
Asaba
Benin
Katsena
Kuka
Dikwa
Ilorin
Jebba
Bussa
Sokoto
Yola
Ngaundere
English Miles
0 50 100 150 200
Railways
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A B C D E F
4° 6° 8° 10° 12°
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Longitude East 8° of Greenwich

Emery Walker sc.

protectorate and is part of the great plateau of North Africa. This plateau, broken only by the valleys of the rivers, does not attain an elevation approaching that of the plateaus of the southern half of the continent, the culminating point (apart from particular mountain districts), situated in about 10° N., reaching a height of 3000 ft. only. The valleys of the Niger and Benue, especially the latter, are very much lower, the town of Yola on the Benue, some 400 m. inland, lying at an altitude of little over 600 ft. The surface is generally undulating, with isolated "table mountains" of granite and sandstone often rising abruptly from the plain. It is clothed largely with thin forest, but becomes more open to the north until, near the French frontier, the arid steppes bordering the Sahara are reached. Much of the country north of Zaria (11° N.) is covered with heavy loose sand. The most mountainous districts are northern Bauchi (a little north of 10°), where heights of 6000 to 7000 ft. occur; parts of Muri, along the north bank of the Benue; and the southern border of the Benue basin, where the hills (consisting of ironstone, quartz and granite) appear rich in minerals. The mountainous area covers some 50,000 sq. m. On the east the plateau sinks to the plains of Bornu (*q.v.*), which extend to Lake Chad. Tributaries of the Niger traverse the western portion of the country, the most noteworthy being the Gulbin Kebbi or Sokoto river and the Kaduna, which flows through a valley not more than 500 ft. above the sea. The north-eastern part of the country drains to Lake Chad by the Waube or Yo, an intermittent stream, which in its lower course forms the Anglo-French boundary. The western portion of Lake Chad (*q.v.*) belongs to the protectorate, which contains no other large lake. The water parting between the Chad and Niger systems runs N.W. and S.E. from about Katsena in 13° N. to the Bauchi hills. Of the tributaries of the Benue the most important is the Gongola. During the dry season most of the small rivers cease running and the water in the larger streams is low. The great rise of the Niger within the protectorate takes place in August and September and there is a second rise about the beginning of the year.

Geology.—The fundamental formation consists of crystalline rocks. From the edge of the coast belt to near the confluence of the Benue and Niger they are overlain by unfossiliferous sandstones, lying undisturbed and possibly of the age of the sandstones of the Congo basin. Limestones, with fossils indicating a Tertiary age, have been found near Sokoto. Superficial deposits occupy the coast belt. Recent alluvium and a thick deposit of black earth border the upper reaches of the Benue and cover wide areas around Lake Chad.

Climate.—The country lies wholly within the tropics. The climate of the coast-lands is moist and hot, and extremely unhealthy, malarial fever being prevalent and deadly. The annual rainfall in the delta regions varies between 100 and 140 or more inches; the mean temperature is over 80° F. The heat does not vary greatly, rarely sinking below 70°, and not often exceeding 100° in the shade. The direction of the prevailing wind is S.W. Though unfavourable for the permanent residence of white men, the interior is much less deadly than the coast-lands. The northern part is a land of tornadoes. At the close of the dry season (end of February) cyclones from the N.E., usually accompanied by rain and thunder, burst over the land. They increase in frequency until they merge in the heavy rains which last from July to October. Then the "hamattan," or hot, dry wind from the Sahara, begins and brings with it clouds of impalpable dust. At this period the nights are cold, and in the north January and February are cold even in the day-time, while frosts are experienced in the neighbourhood of Lake Chad. The temperature in the central part of the protectorate is much the same average as at the coast, but the range is far greater, varying from a shade minimum of 59° to a shade maximum of 107°.[1] The rainfall is much scantier on the plateaus than in the maritime regions, averaging in Northern Nigeria about 50 in. a year. There is evidence of the increasing desiccation of the whole country north of the forest belt. This desiccation is partly attributable to the unrestricted felling of wood practised for many centuries by the inhabitants. Along the northern border of the protectorate this has resulted in the encroachment of the Saharan desert over once fertile districts.

The natives of the northern regions do not suffer to any extent from fever unless they move to a part of the country some distance from their home. Leprosy is common, especially in the inland towns; while ophthalmia is prevalent in the north, especially among the poorer classes, who are compelled to expose themselves to the blinding dust from the deserts and the excessive glare of the sun reflected from the burning sand.

Fauna and Flora.—The animals of Nigeria include the elephant, lion, leopard, giraffe, hyena, West-African buffalo, many kinds of antelope and gazelle and smaller game. Monkeys are numerous in the forests, and snakes are common. The camel is found in the northern regions bordering the Sahara. In the rivers are rhinoceros, hippopotamus and crocodile. The manatus is also found. The birds include the ostrich, marabout, vultures, kites, hawks, ground hornbill, great bustard, guinea fowl, partridge, lesser bustard, quail, snipe, duck, widgeon, teal, geese of various kinds, paraquets, doves, blue, bronze and green pigeons, and many others. Domestic animals include the horse and donkey in the plateaus, but baggage animals are rare in the coast-lands, where the tsetse fly is found. Mosquitoes are also abundant throughout the delta. Herds of cattle and flocks of sheep and goats are numerous throughout the country.

The mangrove is the characteristic tree of the swamps. North of the swamps the oil palm (*Elaeis guineensis*) flourishes abundantly. It is common as far as about 7° N. Rubber vines, mahogany, ebony and many valuable timber trees are found in the forest zone. Other trees, found chiefly on the plateaus, are the baobab, the shea-butter tree, the locust tree, gambier, palms, including the date and dum palm (Hyphaene), the tamarind, and, in the arid regions, the acacia and mimosa.

Inhabitants.—The population of Nigeria is estimated at 15,000,000. The Europeans (mostly British) number about a thousand, and are civil servants, soldiers, traders or missionaries. In the delta district and the forest zone the inhabitants are typical negroes. Besides the people of Benin, the coast tribes include the Jekri, living on the lower part of the Benin river and akin to the Yoruba, the Ijos, living in the delta east of the main mouth of the Niger, and the Ibos, occupying a wide tract of country just above the delta and extending for 100 m. east from the Niger to the Cross river. South of the Ibos live the Aros, a tribe of relatively great intelligence, who dominated many of the surrounding tribes and possessed an oracle or *ju-ju* of reputed great power. On the middle Cross river live the Akuna-kunas, an agricultural race, and in the Calabar region are the Efiks, Ibibios and Kwas. All these tribes are fetish worshippers, though Christian and Moslem missionaries have made numerous converts. The Efiks, a coast tribe which has come much into contact with white men, have adopted several European customs, and educated Efiks are employed in government service. The great secret society called Egbo (*q.v.*) is an Efik institution. Each tribe has a different *ju-ju*, and each speaks a separate language or dialect, the most widely diffused tongues being the Ibo and Efik, which have been reduced to writing. In general little clothing is worn, but none of the tribes go absolutely nude. In colour the majority are dark chocolate, others are coal-black (a tint much admired by the natives themselves) or dark yellow-brown. Cannibalism, human sacrifices and other revolting practices common to the tribes, are being gradually stamped out under British control. Trial by ordeal and domestic slavery are still among the recognized institutions.

In the northern parts of Nigeria the inhabitants are of more mixed blood, the negro substratum having been to a great extent driven out by the northern races of the continent. The most important race in Northern Nigeria is that of the Hausa (*q.v.*), among whom the superior classes adopted Mahommedanism in the 13th and 14th centuries. While the lower classes remained pagan, a fairly civilized system of administration, with an efficient judicial and fiscal organization, was established in the Hausa territories. The Hausa are keen traders and make excellent soldiers.

At the beginning of the 19th century the Hausa territories were conquered by another dominant Mahommedan race, the Fula (*q.v.*), who form a separate caste of cattle-rearers. Arab merchants are settled in some of the larger Hausa towns.

In general the people living in the river valleys have been unaffected by Moslem propaganda either in blood or religion. Thus along the banks of the Niger, Benue and other streams, the inhabitants are negro and pagans, and generally of a purely savage though often rather fine type. Of these the Munshi, who inhabit the district nearest the junction of the Benue with the Niger, were long noted for their intractability and hostility to strangers, whom they attacked with poisoned arrows. The Yoraghums, their neighbours, were cannibals. Nearer Yola live the Battas, who also had a bad reputation. These tribes, under British influence, are turning to trade and agricultural pursuits. In the central hilly region of Kachia are other pagan tribes. They wear no clothes and their bodies are covered with hair. South of the Benue, near the Niger confluence, dwell the savage and warlike Okpotos, Bassas and other tribes. In the districts of Illorin and Borgu, west of the Niger, the inhabitants are also negroes and pagan, but of a more advanced type than the tribes of the river valleys. To attempt any complete list of the tribes inhabiting Northern Nigeria would be vain. In the one province of Bauchi as many as sixty native languages are spoken.

In Bornu (*q.v.*) the population consists of (1) Berberi or Kanuri, the ruling race, containing a mixture of Berber and negro blood, with many lesser indigenous tribes; (2) so-called Arabs, and (3) Fula. The country to the back of Lagos is largely inhabited by Yorubas (*q.v.*), and the people of Borgu according to some native traditions claim to have had a Coptic origin.

Towns.—A large proportion of the population dwells in towns. The chief ports are Lagos (*q.v.*), capital of Southern Nigeria, with a population of about 50,000; Calabar (*q.v.*), pop. about 15,000, known as Old Calabar and Duke Town, on the Calabar river; Opobo, Bonny Town and Brass Town, all on the rivers of the same name. Brass Town contains a fine church, the gift of a native chief. These places are east of the Nun or main mouth of the Niger, where, on the western bank, is Akassa. Here are important engineering works and a slip for repairing ships. Further west at the Forcados mouth of the Niger is a town of the same name, which is the principal port of entry for the river. Benin (*q.v.*), about 60 m. inland from the mouth of the Benin river, and Bende, about 50 m. N.W. of Calabar, were noted *ju-ju* towns and have large populations. Wari and Sapele are towns in the Benin district. Owo, some 50 m. N. of Benin city, is an important trade centre for the Yoruba country, in which are the large cities of Abeokuta, Ibadan and Illorin, all separately noticed. On the Niger at the head of the delta are Asaba (west bank) and Onitsha (east bank); Iddah (Ida), in the palm-oil zone; Lokoja on the west bank opposite the confluence with the Benue, and the headquarters of the protectorate's military force; Baro, on the east bank, 70 m. above Lokoja, the river terminus of the Northern Nigeria railway; Egga, Mureji (at the Kaduna confluence), Jebba and Bussa (*q.v.*). The administrative headquarters of Northern Nigeria are at Zungeru, on the Kaduna river, in 6° 09′ 40″ E., 9° 48′ 32″ N.

Apart from the sea and river ports and the towns in Yorubaland, the chief centres of population are in the open plains east of the Niger. They are the capitals of various states founded by the Hausa. Of these cities the most important is Kano (*q.v.*), the great emporium of trade for the central Sudan, where Tuareg and Arab from the north meet merchants from the Niger, Lake Chad and the far southern regions. It is situated in 12° N. and 8° 32′ E. Some 220 m. W.N.W. of Kano is Sokoto, on a tributary of the Niger of the same name. Sokoto is the religious and political centre of the Fula. Next in importance among the Hausa towns are Bauchi (or Yakoba), pop. over 50,000, 140 m. S.E. of Kano; Zaria (*q.v.*), pop.

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[1] Returns at Zungeru for 1903.

about 60,000, 82 m. S.S.W. of Kano; Katsena (*q.v.*), 84 m. N.W. of Kano; Hadeija, near the N. eastern frontier; Gando, 60 m. S.W. of Sokoto; Bida (*q.v.*), 25 m. N.W. of Egga on the Niger; and Yola (*q.v.*) on the Benue near the German frontier. Jegga, 85 m. S.W. of Sokoto, is an important entrepôt for trade from the hinterland of the Guinea coast and the Hausa states. The chief towns of Bornu are Kuka (*q.v.*) on Lake Chad, and Maidugari, some 70 m. S.W. of that lake. Most of these towns are capitals of provinces and residences of native princes subordinate to the British administration. They are nearly all surrounded by strong mud walls and outer dry moats. Their interior is divided into a series of compounds, each entered through a flat-roofed audience chamber. Inside are the beehive-shaped huts of the household. The gateways are strongly fortified. In addition to the towns mentioned there are many others containing populations of from 10,000 to 20,000, the bulk of the inhabitants of the Hausa countries being town dwellers.

Communications.—The rivers are the great highways of communication, but, in consequence of the lowness of the water between October and May, navigation is then only possible for shallow draught stern-wheel steamers and launches. From the Forcados mouth of the Niger steamers can ascend the main stream as far as Jebba, a distance of 530 m. and, at some risk, to Fort Goldie, 30 m. farther up at the foot of the Bussa rapids. Steamers can also ascend the Benue to Yola, 480 m., above the confluence of that river with the Niger at Lokoja. It is also possible by this route to proceed by small boat via the Shari system to Lake Chad. The Kaduna from its confluence with the Niger can be ascended by steamer 50 m. to Barijuko, which is 22 m. by rail from Zungeru. The Gongola is navigable at high water for 130 m. from its junction with the Benue.

In the delta region every place of importance is easily reached by river steamers, and there is a regular service between Forcados and Lagos by the lagoons. The Cross river is navigable 240 m. up to and beyond the frontier of Cameroon.

A 3 ft. 6 in. gauge railway from the port of Lagos to Ibadan was completed in 1900, the distance by rail being 123 m. Only about half that distance intervenes between Ibadan and the sea. This line was, during 1906–1910, extended via Oshogbo, Illorin and Jebba to Zungeru, whence it is continued to She, 40 m. E. of Zungeru and about 450 m. from Lagos, where a junction is effected with the Baro-Kano line. A small light surface line 22 m. long, 2 ft. 6 in. gauge was built (1901–1902) in Northern Nigeria between Barijuko on the Kaduna and the capital, Zungeru, and proved most successful and lucrative. In 1907 the construction was begun of a 3 ft. 6 in. railway from Baro on the Niger via Bida and Zaria to Kano—a distance of about 400 m.

Good roads connect some of the great Hausa cities, and Kano and Kuka are starting-points for caravans across the Sahara to the Mediterranean. There are also old established caravan routes from Kano to Ashanti and neighbouring countries.

Regular communication is maintained with Europe by steamers running between Liverpool and Forcados, Bonny and Calabar, the steamers calling at other West African ports *en route*. The time occupied between Liverpool and Forcados is about seventeen days. Other steamers ply between the ports named (and others in the protectorate) and London and Hamburg. There is telegraphic communication between Brass and Bonny and Europe by submarine cable, and land lines from Calabar to Lagos and from Lagos to Jebba, Lokoja, Zungeru, Kano, &c., a connexion being also effected with the telegraph system of French West Africa.

Agriculture.—The natives of the coast region cultivate yams and other food plants, but in that district agriculture proper scarcely exists, the fruit of the oil-palm supplying an easy means of obtaining almost everything that the natives require. In the plains of the north, inhabited by Hausa and by agricultural pagan tribes, and in the fertile river valleys, agriculture is regularly carried on. Rice and wheat are cultivated in many parts, though the staple food is guinea corn. Sweet potatoes, ground nuts, yams, onions and other vegetables are largely grown. Of fruits, dates, pomegranates, citrons and bananas abound in certain areas. The shea-butter tree supplies an excellent oil for lamps, and also for cooking, though it is only used by the poorer classes. The most important vegetable products are cotton and indigo, which are universally grown. Tobacco and kola nuts are also grown.

Mineral Products.—Tin ore of excellent quality is found in the province of Bauchi, alkali salts are abundant in Kano province, iron ore and red and yellow ochres are found in Kontagora and other provinces, kaolin (china clay) and limestone in the west central regions. Silver and lead have been found in the Benue area.[1]

Trade.—Throughout Nigeria local trade is active and has shown rapid increase under British rule. Its further development will be fostered by the improvement of communications which is taking place. Export trade in the delta and forest regions is almost entirely confined to "jungle produce," the most important articles being palm oil and palm kernel. Rubber, ebony and other timber, cocoa and gum copal, come next in importance. Cotton is also grown for export. The quantity of palm oil exported annually exceeds 12,000,000 gallons, and is worth over £600,000. Of palm kernels 50,000 to 70,000 tons are shipped yearly, with an average value of £500,000 a year. The principal imports are cotton goods (nearly all from the United Kingdom), and in the southern region spirits—gin and geneva—almost wholly from Holland and Germany, salt, rice and other provisions, tobacco, hardware, cutlery and building material, &c., mostly from the United Kingdom. The value of the trade (imports and exports) of Southern Nigeria (exclusive of Lagos) increased from £1,566,000 in 1894–1895 to £3,464,000 in 1905. In 1906 the total trade, inclusive of Lagos, was valued at £6,299,000—imports, £3,148,000; exports, £3,151,000.

In Northern Nigeria up to the moment of the British occupation the foreign trade was chiefly in the hands of Tripoli Arabs whose caravans crossed the desert at great risk and expense, and carried to the markets of Kuka and Kano tea, sugar and other European goods, taking away the skins and feathers which constituted the principal articles of export to the Mediterranean coast. There was also a very considerable caravan trade in native goods which the industrious Hausa population carried for great distances through the western and central states of the Sudan. The principal articles of this trade are salt, kola nuts, ivory, leather, sodium carbonates and spices. The centre of the cloth manufacture is Kano. The cloth is made of the cotton grown in the country, woven on small hand-looms and dyed either with indigo or with a magenta dye obtained from the bark of a tree. If the Hausa history, which exists in written form, be correct, the manufacture of this cloth has been carried on in Kano since the 9th century. Kano and the district around it clothes half the population of the Sudan. The kola nut, chewed by almost every native of the country, is brought from west of the Niger, traders from Ashanti, Accra and Yorubaland frequenting the markets of Jegga. Salt and "potash" are imported from Absen in the Sahara; and ivory, ostrich feathers and leather goods are exported to Tripoli. The principal exports to Great Britain have come hitherto from the forest regions, and are of the same class as the forest products of the south. Rubber constitutes at present the most important export. The cultivation of cotton is however indigenous to the country. Inquiries made under the auspices of the British Cotton Growing Association have led to the conclusion that Northern Nigeria offers the most promising field contained within the empire for the growth of cotton required to render Lancashire looms independent of foreign supplies. Steps have been taken to stimulate the native industry, and it is hoped that cotton may take the place in Northern Nigeria which palm oil and kernels occupy in the coast zone. Any great expansion in the cotton trade is however dependent on the development of cheap and efficient means of transport—hence the importance, commercially, of the Baro-Kano railway, with its base on the navigable Niger. With the increase of transport facilities it is probable that the trade with the Mediterranean coasts will also be diverted to the south, and profitable minor branches of trade would be formed in leather, ostrich feathers, gums, fibres, &c. The imports from Great Britain, which come via Forcados, are mostly cotton goods, provisions and hardware. The importation of spirits is prohibited north of 7° N.

Currency and Banking.—The legal currency, and that in general use, is British sterling. There is a subsidiary coinage (introduced in 1908) consisting of a nickel penny and a nickel tenth of a penny (the last-named was first coined in aluminium, but this metal proved unsuitable and was withdrawn). Cowries (1000 = 3d.) are still occasionally employed, and on the coast, accounts are sometimes kept in gallons of palm oil. Banking is in the hands of the Bank of British West Africa and the Bank of Nigeria. There is also a government savings bank.

History.

Of the early history of the races inhabiting the coast lands little is known. The Beni appear to have been the most powerful race at the time of the discovery of the coast by the Portuguese in the 15th century, and the kings of Benin in the 17th century ruled a large part of the south-western portion of the existing British protectorate (see BENIN). The Benin influence does not seem to have reached east of the Forcados mouth of the Niger. In the greater part of the delta region each town owned a different chief and there was no one dominant tribe. Among these people, who occupied a low position even among the degenerate coast negroes, and who were constantly raided by the more virile tribes of the interior, trading stations were established by the Portuguese, and later on by other Europeans, British traders appearing as early as the 17th century. There was no assertion of political rights by the white men, who were largely at the mercy of the natives, and who rarely ventured far from their ships or the "factories" established on the various rivers and estuaries.

By the end of the 18th century British enterprise had almost entirely displaced that of other nations on the Niger coast. But the principal trade of all Europeans was still in slaves.

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[1] See Colonial Office Reports, *Northern Nigeria Mineral Survey 1906–1907*; *Southern Nigeria Mineral Survey 1905–1907* (Miscellaneous, Nos. 59, 67, 68).

After the abolition of the slave-trade in the 19th century palm oil formed the staple article of commerce, and the various streams which drain the Niger coast near the mouth of the great river became known as the "Oil Rivers." The opening up of the interior was in the meantime promoted, chiefly by the efforts of British travellers and merchants. Mungo Park traced the Niger from Segu to Bussa, where he lost his life in 1805. From Bussa to the sea the course of the river was first made known in 1830 by the brothers Richard and John Lander. Major Dixon Denham and Captain Hugh Clapperton entered the country now known as Northern Nigeria from the north in 1823, crossing the desert from Tripoli. Clapperton in 1826–1827 made a second journey, approaching the same territory from the Guinea coast. Dr Barth, travelling under the auspices of the British government, entered the country from the north and made the journeys, lasting over two years between 1852 and 1855, of which he has left the record that still remains the principal standard work for the interior. Macgregor Laird first organized in 1832 the navigation of the river Niger from its mouth to a point above the Benue confluence. During the next twenty-five years expeditions were despatched into the interior, and a British consul was posted at Lokoja. Possession was also taken, in 1861, of Lagos island, with the object of checking the slave trade still being carried on in that region. But the deadly climate discouraged the first efforts of the British government, and, after the parliamentary committee of 1865 had recommended a policy which would render possible the ultimate withdrawal of British official influence from the coast, the consulate of Lokoja was abandoned.

Formation of the Royal Niger Company.

It was re-established a few years later to meet the still steadily growing requirements of British trade upon the river. In 1880 the influence of the international "scramble for Africa" made itself felt by the establishment under the recognized protection of the French government of two French firms which opened upwards of thirty trading stations on the Lower Niger. The establishment of these firms was admittedly a political move which coincided with the extension of French influence from Senegal into the interior. Nearly at the same time a young Englishman, George Goldie-Taubman, afterwards better known as Sir George Goldie (*q.v.*), having some private interests on the Niger, conceived the idea of amalgamating all local British interests and creating a British province on the Niger. To effect this end the United African Company was formed in 1879, and trade was pushed upon the river with an energy which convinced the French firms of the futility of their less united efforts. They yielded the field and allowed themselves to be bought out by the United African Company in 1884. At the Berlin Conference held in 1884–1885 the British representative was able to state that Great Britain alone possessed trading interests on the Lower Niger, and in June 1885 a British protectorate was notified over the coast lands known as the Oil Rivers. Germany had in the meantime established itself in Cameroon, and the new British protectorate extended along the Gulf of Guinea from the British colony of Lagos on the west to the new German colony on the east, where the Rio del Rey marked the frontier. In the following year, 1886, the United African Company received a royal charter under the title of the Royal Niger Company. The territories which were placed by the charter under the control of the company were those immediately bordering the Lower Niger in its course from the confluence at Lokoja to the sea. On the coast they extended from the Forcados to the Nun mouth of the river. Beyond the confluence European trade had not at that time penetrated to the interior.

The interior was held by powerful Mahommedan rulers who had imposed a military domination upon the indigenous races and were not prepared to open their territories to European intercourse. To secure British political influence, and to preserve a possible field for future development, the Niger Company had negotiated treaties with some of the most important of these rulers, and the nominal extension of the company's territories was carried over the whole sphere of influence thus secured. The movements of Germany from the south-east, and of France from the west and north, were thus held in check, and by securing international agreements the mutual limits of the three European powers concerned were definitely fixed. The principal treaties relating to the German frontiers were negotiated in 1886 and 1893: the Anglo-French treaties were more numerous, those of 1890 and 1898, which laid down the main lines of division between French and British possessions on the northern and western frontiers of Nigeria, having been supplemented by many lesser rectifications of frontier. (See AFRICA, § 5.) It was not until 1909 that the whole of the frontier between Nigeria and the French and German possessions had been definitely demarcated. Thus, mainly by the action of the Royal Niger Company, a territory of vast extent, into which the chartered company itself was not able to carry either administrative or trading operations, was secured for Great Britain. In 1897, at a time when disputes with France upon the western frontier had reached a very active stage, the company entered upon a campaign against the Mahommedan sovereign of Nupe. This campaign would, no doubt, have led to important results had the company retained its administrative powers. In the expedition a force of 500 Hausa, drilled and trained by the company, and led by thirty white officers—of whom some were lent for the occasion by the War Office—decisively defeated a force of some thousands of native troops, led by the emir of Nupe himself. The capital town of Bida was taken and the emir deposed. From Bida the expedition marched to Illorin, where again the whole district submitted to the authority of the company. In Illorin the campaign had some lasting effect. In Nupe, on the northern side of the river, as the company was unable to occupy the territory conquered, things shortly reverted to their previous condition. When the company's troops were withdrawn the deposed emir returned and reoccupied the throne, leaving the situation to be dealt with after the territories of the company had been transferred to the crown.

Transfer of authority to the crown.

The complications to which the pressure of foreign nations, and especially of France, on the frontiers of the territories gave rise, became at this period so acute that the resources of a private company were manifestly inadequate to meet the possible necessities of the position. Relations with France on the western border became so strained that in 1897 Mr Chamberlain, who was then secretary of state for the colonies, thought it necessary to raise a local force, afterwards known as the West African Frontier Force, for the special defence of the frontiers of the West African dependencies. In these circumstances it was judged advisable to place the territories of the Royal Niger Company, to which the general name of Nigeria had been given, under the direct control of the crown. It was therefore arranged that in consideration of compensation for private rights the company should surrender its charter and transfer all political rights in the territories to the Crown. The transfer took place on the 1st of January 1900, from which date the company, which dropped the name of "royal," became a purely trading corporation. The southern portion of the territories was amalgamated with the Niger Coast Protectorate, the whole district taking the name of the Protectorate of Southern Nigeria, while the northern portion, extending from a line drawn slightly above 7° N. to the frontier of the French possessions on the north and including the confluence of the Niger and the Benue at Lokoja, was proclaimed a protectorate under the name of Northern Nigeria.

The company, during its tenure of administrative power under the charter, had organized its territories south of the confluence, into trading districts, over each of which there was placed a European agent. The executive powers in Africa were entrusted to an agent general with three provincial and twelve district superintendents. There was a small judicial staff directed by a chief justice, and there was a native constabulary of about 1000 men, trained and drilled by white officers. The company kept also upon the river a fleet of about thirty steamers. The entire direction of the proceedings of the company was, however, in the hands of the council in London, and the administrative control of the territories was practically from first to last vested in the person of Sir George Goldie. The local work of the representatives of the company was mainly commercial. When, on the surrender of the charter, Sir George Goldie withdrew from the company, the administrative element disappeared. No administrative records were handed over, and very little machinery remained. Two enactments, however, bore testimony to the legislation of the company. One, which by force of circumstances remained inoperative, was the abolition of the legal status of slavery, proclaimed in the year of Queen Victoria's jubilee (1897). The other, more practical, which has remained in operation to the present day, confirmed and enforced by the succeeding administration, was the absolute prohibition of the trade in spirits beyond the parallel of 7° N.

Progress in Southern Nigeria, 1885-1906.

While the development of the Royal Niger Company's territories was proceeding in the manner described, the regions under direct British control were also being opened up and law and order introduced. In 1893, when the title Oil Rivers Protectorate was changed to that of Niger Coast Protectorate, a regular administration was established (subject to the Foreign Office in London) under Sir Claude Macdonald, who was succeeded as commissioner and consul-general in 1896 by Sir Ralph Moor (1860-1909). Under these officials peace was gradually established between various tribes, trade routes opened and progress made in civilization. The work was one of extreme difficulty, largely because there was no central native authority with which to deal. Small military expeditions had constantly to be employed to break up slave-raiding gangs or reduce to order tribes which blocked trade routes or made war on other tribes living peaceably under British protection. The most serious military operations were against the Beni, a peaceful mission to the king of Benin having been massacred in the bush in January 1897. The operations were completely successful and the Benin country was added to the protectorate (see BENIN). In 1900, as stated, the southern portion of the Niger Company's territories was added to the protectorate, the change in administration being effected without difficulty of any kind. Sir Ralph Moor continued until 1904 to govern the country under the style of high commissioner. The efforts of the administration to better the condition of the natives without undue interference with customary law met with encouraging results, and the submission of the Aros to the government in 1902 brought to an end the system of tribal warfare for the purpose of making slaves, while the enforcement of a proclamation of 1901 prohibiting the buying, pawning or selling of slaves had a salutary effect. Trade steadily developed, and owing to the large sums paid as duty on imported spirits, the revenue of the protectorate was sufficient to cover the expenditure.

In Northern Nigeria in 1900 the establishment of British authority remained still to be effected. The man selected for the post of first high commissioner was Colonel—afterwards better known as Sir Frederick—Lugard, who had conducted one of the Royal Niger company's most successful expeditions into the western portion of the interior and had already been employed by the British government to raise and organize the West African Frontier Force.

Northern Nigeria brought under control.

The transference of influence from the company to the government was officially effected on the 1st of January 1900, on which day the Union Jack was hoisted at Lokoja, and the formation of a local administration was entered upon. The number of civilians in the employ of the government was very small, and the administrative machinery had to be evolved under the pressure of a somewhat acute military situation. The headquarters of the West African Frontier Force had been at Jebba, not far from the point at which Mungo Park had lost his life upon the river. Neither Jebba nor Lokoja was considered suitable for the permanent capital of the protectorate, and survey parties were sent out, with strict orders to avoid conflict with the nominally friendly natives, to find a more suitable site. This was selected on a branch of the Kaduna river in the south-western corner of the province of Zaria, at a place of which the native name of Zungeru was retained. The ruler of Zaria, while professing friendliness, was, however, unable or unwilling to restrain the rulers of Kontagora and Nupe from aggression. These two potentates raided for slaves to the borders of the rivers and openly threatened the British position on the Niger. The Ashanti War of 1900 claimed the despatch of a strong detachment of the West African Frontier Force, and it was not until the return of the troops in February 1901 that Nupe and Kontagora could be effectively dealt with. In that year both provinces were subdued, their emirs deposed, and letters of appointment given to new emirs, who undertook to rule in accordance with the requirements of humanity, to abolish slave-raiding and slave dealing, and to acknowledge the sovereignty of Great Britain. Illorin and Borgu with a portion of Kabba were already under British rule. The rulers of other neighbouring provinces offered their allegiance, and by the end of the year 1901 nine provinces, Illorin, Kabba, Middle Niger, Lower Benue, Upper Benue, Nupe, Kontagora, Borgu and Zaria had accepted the British occupation. These territories, with the exception of Zaria, were all in the more or less immediate neighbourhood of the valleys of the Niger and the Benue, and Zaria bordered upon the Kaduna. For all these territories an initial system of administration was organized, and British residents were appointed to each province. Seventeen legislative proclamations were enacted in the first year dealing with the immediate necessities of the position, and providing for the establishment of a supreme and provincial court of justice, for the legalization of native courts of justice, and dealing with questions of slavery, importation of liquor and firearms, land titles, &c. In the autumn of 1901 the emir of Yola, the extreme eastern corner of the territories bordering upon the Benue, was, in consequence of the aggressions upon a trading station established by the Niger Company, dealt with in the same manner as the emirs of Nupe and Kontagora, and a new emir was appointed under British rule. In 1902 Bauchi and Bornu were brought under British rule. In Bauchi the emir was deposed and a new emir was appointed. In Bornu the extension of British authority was very willingly accepted as a guarantee against other European encroachments, and the legitimate Shehu was restored to the throne under British protection. Military stations were established in Bornu and in Bauchi, and both provinces were included in the system of British administration. Later in the same year an act of treachery culminating in the murder of a British resident, Captain Moloney, in the province of Nassarawa, led to the military subjugation of that province. The murderer fled northwards through Zaria to Kano, which was still an independent Mahommedan state. The emir of Zaria was found to be in treasonable correspondence with the emir of Kano. It was thought desirable to arrest and dethrone him, and his prime minister was temporarily appointed to administer the province under British protection. To all these provinces British residents were appointed, and British legislative enactments became applicable to them all. By the end of the year 1902 British administration had been extended to the whole of the provinces in the south, east and west of the protectorate. The important Mahommedan states of Sokoto, Gando, Kano and Katsena remained independent. These states were regarded as the stronghold of Fula supremacy. The emir of Sokoto held the position of religious as well as political head of all the lesser states of Northern Nigeria, and in response to friendly overtures on the part of the British administration had declared that between Sokoto and Great Britain there could be nothing but war. Katsena was the centre of local learning, while Kano was at once the commercial and the military centre of power. By the end of 1902 it had become evident that a trial of strength between the Mahommedan powers and the new British administration was inevitable. The Mahommedan rulers were themselves of comparatively recent date. In fighting them there was no question of fighting the whole country. On the contrary it was presumed with justice that their overthrow would be hailed with satisfaction by many of the subject peoples. Every attempt was made to settle the question at issue by conciliatory methods, but these having failed, a campaign against Kano and Sokoto was entered upon in January 1903. It was entirely successful. The capital of Kano, a walled and fortified town of great extent and formidable strength, fell to a British assault in February of 1903. Sokoto submitted after a battle which took place on the 17th of May. The sultan fled, and on the 21st of May a new sultan, chosen by the council of elders, was installed by the British high commissioner, after he had publicly accepted the conditions imposed by the British government. These conditions were that all rights of conquest acquired by the Fulani throughout Northern Nigeria passed to Great Britain, that for the future every sultan and emir and principal officer of state should be appointed by Great Britain, that the emirs and chiefs so appointed should obey the laws of the British government, that they should no longer buy and sell slaves, nor enslave people, that they should import no firearms, except flint-locks, that they should enforce no sentences in their courts of law which were contrary to humanity, and that the British government should in future hold rights in land and taxation. When these conditions were accepted by the Fulani chiefs the supremacy of Great Britain was established over the entire country. Katsena and Gando followed the example set to them by Kano and Sokoto. Throughout Northern Nigeria all chiefs, Mahommedan and Pagan, now hold their appointments under the British crown and take the oath of allegiance to the British sovereign.

It remained to organize the territories for British rule, to institute a reformed system of taxation, to establish courts of justice, and to open the country to civilized occupation.

The following account of the legislation carried into force up to 1907 shows in effect what was done in that direction. After the conquest of the Hausa States in 1902–1903 the king's writ ran—with the exception of a few districts inhabited by primitive savages—through the whole area known as Northern Nigeria. The temporary enactments of the earlier days were then superseded by laws based upon a more accurate knowledge of local conditions and rendered possible by the effective administration which had been set up throughout the country.

Courts of Law and Administration of Justice.—A superior court was set up with jurisdiction over all non-natives and government employés. Its jurisdiction over natives was limited to the two centres of administration named "cantonments," and to such neighbouring territories as might be included by regulation within a feasible distance of those centres. It could, however, try any case in any province by special warrant of the high commissioner. The whole country was divided into seventeen provinces, in each of which there was a provincial court presided over by the resident in charge, whose assistants were commissioners of the court. They submitted their lists of criminal trials to the high commissioner, who, advised by the attorney-general, acted as a court of appeal, and no sentence exceeding six months could take effect without his confirmation. Cases could be referred by him for re-trial in the superior court if he so decided. A criminal code was drawn up, together with a criminal procedure proclamation. Native courts were established by warrant at all the chief native towns with varying powers. They were of two classes, the "Alkalis' Court," presided over by trained Mahommedan jurists, and "Judicial Councils," under the leading chiefs and natives presided over by the emir or other native ruler. In these courts native law and customs (principally the Mahommedan law) were administered with the proviso that no penalty could be enforced which was contrary to the laws of humanity or opposed to any specific proclamation of the protectorate. With the exception of two or three of the most enlightened courts, the criminal powers of these courts were restricted, but in civil actions they had full scope. No native court could carry a sentence of death into execution without the concurrence of the resident.

Cantonment courts were also set up in the two chief government centres (Zungeru and Lokoja), chiefly for the purpose of enforcing sanitary and municipal regulations. These were affiliated to the superior courts.

Lands and Minerals.—These constitute the main asset of the government. In the first instance, as following upon conquest or potential conquest, the Fulani emirs who were appointed by government to each of the great native states were installed under a letter of appointment in which (in addition to rights of legislation, taxation and other powers inherent in suzerainty) the ultimate title to all land was transferred from the Fulani dynasty and vested in the British. Private ownership was not interfered with, but all waste lands became the property of the crown, and no non-native could acquire title except as from the government. Similarly the sole title to minerals (subject to the share of profits assigned to the Niger Company by the deed of transfer) was vested in the government, and the terms upon which licences to prospect or mine could be acquired, together with full regulations regarding mining, were enacted by law. The right of natives to smelt iron and the question of compensation for any other existing mining industry or for surface disturbance was left to the discretion of government.

Slavery.—Practical effect was given to the abolition of the legal status of slavery, in so far as all British courts were concerned. This decree had been promulgated before the transfer of the administration, but had existed merely on paper. Every slave could thereby assert his freedom if he desired to do so, but it was not made illegal for a native to own a slave, and no penalty attached to mere possession in such a case. Slave-dealing and transactions of every kind in slaves were now made illegal. Civil questions arising from the institution of domestic slavery remained justiciable by the native courts; which in this matter were very carefully supervised by the British administration.

Taxation.—In the earlier years of the administration the tolls upon trade in transit, which had existed from time immemorial and had become the means of much extortion, were made a monopoly of the government, and were reorganized on an equitable and popular basis. To these were added certain licences (*e.g.* on canoes, &c.). In 1905 a complete reorganization of the direct taxation of the country was introduced. The innumerable taxes upon agriculture and industry of all kinds were consolidated into two principal taxes, viz. the land and general tax—in its nature an income tax—and the jangali or cattle tax upon nomad herdsmen. The imposition of this tax involved a rough and ready assessment of every village in the protectorate. Under this system the oppression and extortion practised under native rule gave place to a carefully regulated method of assessment. At its initiation the proceeds were divided in approximately equal shares between the central government and the native administration, and a means was thus found of creating a legitimate revenue for the native chiefs to supersede the proceeds of slave-raiding and slave-dealing, and of oppression and extortion, by which they had hitherto supplied their needs. As in India, the village with its lands and cultivation was constituted the unit of assessment, and the provinces were divided into districts under native headmen responsible for the collection of the tax, and its payment to the paramount chief, who in turn rendered the assigned share to district and village chiefs, to the officers of state recognized by government and to the government itself. The administrative officers were entrusted with the assessment and acted as arbitrators and referees in case of illegal exactions. In the Pagan districts where no native machinery existed and no previous taxation had been in force, a nominal impost was levied and collected by the officers of the government through the agency of the village chiefs. The taxation of the great cities formed a separate and very difficult problem. The law laid down the method to be employed in this case, but pending the completion of the rural taxation this detailed application of the system was allowed to remain in suspense. It was hoped that so soon as the scheme could be effectively put into operation the taxes on trade in transit could be largely if not completely abolished, and the traders and merchants—the wealthiest class of the community—would be assessed in their city domiciles. By these means a large and rapidly increasing revenue is being secured to government; while the condition of the peasantry and people is being greatly ameliorated, an adequate but not excessive income is being secured to the native rulers; and the class of middlemen who lived by extortion and absorbed a great part of the wealth of the country is being abolished.

Native Rulers.—By the operation of the native courts proclamation, the taxation proclamation, and finally by the enforcement of native authority proclamations, the status of the native rulers, their powers and authority, were defined and legalized. They receive the support of the government within the limits of their recognized sphere of action. The great chiefs are appointed by the government in consultation with the principal men, and in accordance with native customs and laws of succession. Minor chiefs are nominated by their paramount chiefs, subject to the approval of the high commissioner.

Military and Police.—The defensive force—the Northern Nigeria Regiment of the West African Frontier Force—is constituted by law, and the proclamation contains a military code based on the Army Act with modifications necessary in local circumstances. A police force is similarly organized and controlled by a second enactment. The military force is divided into three regiments and two batteries of artillery under the supreme command of a commandant. The distribution of the garrisons is under the direction of the high commissioner. The police, on the other hand, are more or less equally divided between the provinces (including the establishment at each cantonment), and while their interior economy and organization rests in the hands of a commissioner, they are for purposes of duty under the control of the resident of the province. A district superintendent is appointed to each province.

Miscellaneous Enactments.—A variety of other enactments deals with minor matters of administration. Commissions of inquiry may be appointed by the high commissioner to investigate the conduct of an individual or department and take evidence on oath. Discipline on board of steamers is prescribed by the Marine Discipline Act. The preservation of wild animals and birds in accordance with international agreements is enforced by law. The importation or possession of arms of precision is forbidden, except by permits in conformity with the Brussels Act, and in further application of that act the importation of spirits for sale to natives is wholly prohibited. The cantonments are regulated by a municipal ordinance, establishing rates and laying down various regulations for order and sanitation. In order to prevent hydrophobia dogs may only be kept under certain restrictions. Patents, marriages (of non-natives), &c., &c., form the subject of other laws.

Administrative Divisions.—For administrative purposes the territories were at first divided into seventeen provinces: Sokoto, Gando, Kano, Katsena, Bornu East, Bornu West, Zaria, Bauchi, Borgu, Kontagora, Nassarawa, Muri, Yola, Bassa, Kabba, Illorin, Nupe. Of these Sokoto and Gando, Kano and Katsena, Bornu East and Bornu West have been carried a step further in organization and now form three double provinces, each under the charge of a first-class resident. Illorin, Nupe and Kabba have been formed into one province called the Niger province, and also placed under the charge of a first-class resident, and it is intended to continue this process so as to make finally eight first-class provinces of the whole territory. The first-class residents of the double provinces are assisted by about twelve residents and assistant residents of subordinate rank. In the Mahommedan states the native system of administration remains intact, and is carried on under British supervision by native emirs and officials. In the Pagan states there is no organized system of native administration, and the British residents are responsible for good government.

Amalgamation of Lagos and Southern Nigeria.—The political reasons which had resulted in the Nigerian territories being divided into three distinct administrations no longer existing, it was decided to unite them under one government, and as a first step in that direction Sir Walter (then Mr) Egerton was in 1904 appointed both governor of Lagos and high commissioner of Southern Nigeria. This was followed in February 1906 by the amalgamation of the two administrations under the style of "the Colony and Protectorate of Southern Nigeria," with headquarters at Lagos town. The former colony and protectorate of Lagos (*q.v.*) became the western or Lagos province of the new administration. In the year the amalgamation was effected the revenue reached a record figure, the amount collected being £1,088,000, to which Lagos province contributed £424,000. Over 80% of the revenue was derived from customs. In the same year the expenditure from revenue was £1,056,000.

Northern Nigeria Railway.—In Northern Nigeria, which continued for the time to be a separate protectorate, Sir Frederick Lugard was, at the beginning of 1907, succeeded as high commissioner by Sir Percy Girouard. In August of that year the British government, on administrative, strategic and commercial grounds, came to a decision to build a railway which should place the important cities of Zaria and Kano in direct communication with the perennially navigable waters of the Lower Niger. In view of the approaching unification of Southern and Northern Nigeria, the money needed, about £1,250,000, was raised as a loan by Southern Nigeria. The route chosen for the line was that advocated by Sir Frederick Lugard. This important work, essential for the welfare of the northern territories, was begun under the superintendence of Sir Percy Girouard,[1] the builder of the Wadi Halfa-Khartum railway. At the same time the decision was taken to continue the Lagos railway till it effected a junction with the Kano line near Zungeru, the Niger being bridged at Jebba.

Land Tenure.—Sir Percy Girouard devoted much attention to land tenure, probably the most important of the questions concerning imperial policy in West Africa. He adopted the land policy of Sir F. D. Lugard, and recommended "a declaration in favour of the nationalization of the lands of the Protectorate." This was in accord with native laws—that the land is the property of the people, held in trust for them by their chiefs, who have not the power of alienation. Thereafter the secretary for the colonies appointed a strong committee, which, after hearing much evidence, issued a report in April 1910 in substantial agreement with the governor's recommendations. This policy was adopted by the Colonial Office. By this means the natives of Nigeria were secured in the possession of their land—the government imposing land taxes, which are the equivalent of rent. This exclusion of the European land speculator and denial of the right to buy and sell land and of freehold tenure was held by all the authorities to be essential for the moral and material welfare of the inhabitants of a land where the duty of the white man is mainly that of administration and his material advantages lie in trade. (See an article on "Land Tenure in West Africa" in *The Times*, May 24, 1910.)

AUTHORITIES.—Of early books dealing with large areas of Nigeria, H. Barth's *Travels and Discoveries in North and Central Africa* (London, 1857–1858) is a standard authority. See also Lady Lugard, *A Tropical Dependency* (London, 1905); Boyd Alexander, *From the Niger to the Nile* (London, 1907); C. Larymore, *A Resident's Wife in Nigeria* (London, 1908); the annual *Reports* on Southern and Northern Nigeria issued by the Colonial Office; E. D. Morel, *Affairs of West Africa* (London, 1902); C. H. Robinson, *Hausaland* (London, 1896); S. Vandeleur, *Campaigning on the Upper Nile and Niger* (London, 1898), with introduction by Sir George Goldie; Major A. G. Leonard, *The Lower Niger and its Tribes* (London, 1906); C. Partridge, *The Cross River Natives* (London, 1905); E. Dayrell, *Folk Stories from Southern Nigeria* (London, 1910). Maps of the country on the scale of $\frac{1}{1,000,000}$ and $\frac{1}{250,000}$ are published by the War Office. The Blue Books, Cd. 2325 (1904), 2787 (1905) and 4523 (1909), deal with railway construction, harbours and river navigation. (F. L. L.)

NIGHT, that part of the natural day of twenty-four hours during which the sun is below the horizon, the dark part of the day from sunset to sunrise (see DAY). The word in O. Eng. takes two forms, *neaht* and *night*, the latter form apparently being established by about the 10th century. The word is common in varying forms to Indo-European languages. The root is usually taken to be *nak-*, to perish, the word meaning the time when the light fails (cf. Gr. νέκος, Lat. *nex*, death, *nocere*, to hurt). It was customary to reckon periods of time by nights, and we still use "fortnight" (O. Eng. *feowertyne niht*, fourteen nights), but "se'n-night" (seven nights) has been displaced by "week" (*q.v.*).

NIGHTINGALE, FLORENCE (1820–1910), younger daughter of William Edward Nightingale of Embley Park, Hampshire, and Lea Hurst, Derbyshire, was born at Florence on the 15th of May 1820, and named after that city, but her childhood was spent in England, chiefly in Derbyshire. From her earliest years her strong love of nature and animals manifested itself. Her games, too, were characteristic, for her great delight was to nurse and bandage her dolls. Her first living patient was a shepherd's dog. From tending animals she passed to human beings, and wherever there was sorrow or suffering she was sure to be found. Her most ardent desire was to use her talents for the benefit of humanity. She had a natural shrinking from society; and though her social position necessitated her presentation at Court, her first season in town was spent in examining into the working of hospitals, reformatories and other charitable institutions. This was followed by a tour of inspection of foreign hospitals. At that time England was sadly behind-hand in matters of nursing and sanitation, and Miss Nightingale, who desired to obtain the best possible teaching for herself, went through a course of training in the Institute of Protestant Deaconesses at Kaiserswerth. She remained there six months, learning every detail of hospital management with a thoroughness rarely equalled. Miss Nightingale neglected nothing that could make her proficient in her self-chosen task. From Kaiserswerth she went to Paris, where she studied the system of nursing and management in the hospitals under the charge of the sisters of St Vincent de Paul. After her return to England she devoted herself to reorganizing the Governesses' Sanatorium in Harley Street (now the Home for Gentlewomen during Temporary Illness), which was at that time badly managed and in great need of funds. Miss Nightingale grudged neither time nor money to this work, and she had the satisfaction of placing it on a thoroughly satisfactory basis.

In the year 1854 England was stirred to its depths by the report of the sufferings of the sick and wounded in the Crimea. There was an utter absence of the commonest preparations to carry out the first and simplest demands in a place set apart to receive the sick and wounded of a large army. The condition of the large barrack-hospital at Scutari was deplorable. A royal commission of inquiry was appointed, a patriotic fund opened, and money flowed in fast. To Miss Nightingale this proved the trumpet-call of duty. She wrote to Sidney Herbert, secretary at war, and offered her services. Her letter crossed with one from him inviting her to proceed to the Crimea. She set out on the 24th October with a staff of thirty-seven nurses, partly volunteers, partly professionals trained in hospitals. They reached Scutari on the 4th of November, in time to receive the Balaklava wounded. A day or two later these were joined by 600 from Inkerman. The story of Miss Nightingale's labours at Scutari is one of the brightest pages in English annals. She gave herself, body and soul, to the work. She would stand for twenty hours at a stretch to see the wounded accommodated. She regularly took her place in the operation-room, to hearten the sufferers by her presence and sympathy, and at night she would make her solitary round of the wards, lamp in hand, stopping here and there to speak a kindly word to some patient. Soon she had 10,000 men under her charge, and the general superintendence of all the hospitals on the Bosporus. Gradually the effects of the measures adopted were seen in a lowered death-rate. In February 1855 it was as high as 42%, before many months it had sunk to 2. For a time Miss Nightingale was herself prostrated with fever, but she refused to leave her post, and remained at Scutari till Turkey was evacuated by the British in July 1856. The enthusiasm aroused in England by Miss Nightingale's labours was indescribable. A man-of-war was ordered to bring her home, and London prepared to give her a triumphant reception; but she returned quietly in a French ship, crossed to England, and escaped to her country home before the news of her return could leak out. The experiences of those terrible months permanently affected Miss Nightingale's health, but the quiet life she afterwards led was full of usefulness. With the £50,000 raised in recognition of her services she founded the Nightingale Home for training nurses at St Thomas's and King's College Hospitals. She also turned her attention to the question of army sanitary reform and army hospitals, and to the work of the Army Medical College at Chatham. In 1858 she published her *Notes on Nursing*, which gave an enormous stimulus to the study of this subject in England. According to Miss Nightingale nursing ought to signify the proper use of fresh air, light, warmth, cleanliness, quiet, and the selection and administration of diet—all at the least expense of vital force to the patient.

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[1] In 1909 Sir Percy Girouard was succeeded by Sir H. H. J. Bell. The title High Commissioner had meantime been changed to that of Governor.

Miss Nightingale followed with interest all the later improvements in sanitation, and was frequently consulted about hospital plans both at home and abroad. With the help of the County Council Technical Instruction Committee she organized in 1892 a health crusade in Buckinghamshire. Teachers were sent round among the cottagers to give practical advice on such points as ventilation, drainage, disinfectants, cleanliness, &c., a plan which, if widely carried out, would bring the most valuable knowledge to every home in England. She is understood to have drawn up a confidential report for the government on the working of the Army Medical Corps in the Crimea, and to have been officially consulted during the American Civil War and the Franco-German War. In 1907 she received the Order of Merit from King Edward VII. She died in London on the 13th of August 1910. She is the subject of a beautiful poem by Longfellow, "Santa Filomena," and the popular estimate of her character and mission was summed up in a particularly felicitous anagram, *Flit on, cheering angel*.

NIGHTINGALE (O. Eng. *Nihtegale*, literally "singer of the night"), the bird celebrated beyond all others by European writers for the admirable vocal powers which, during some weeks after its return from its winter-quarters in the south, it exercises at all hours of the day and night. The song itself is indescribable, though several attempts, from the time of Aristophanes to the present, have been made to express in syllables the sound of its many notes. Poets have descanted on the bird (which they nearly always make of the feminine gender) leaning its breast against a thorn and pouring forth its melody in anguish. But the cock alone sings, and there is no reason to suppose that the cause and intent of his song differ in any respect from those of other birds' songs (see SONG). In great contrast to the nightingale's pre-eminent voice is the inconspicuous coloration of its plumage, which is alike in both sexes, and is of a reddish-brown above and dull greyish-white beneath, the breast being rather darker, and the rufous tail showing the only bright tint.

The range of the European nightingale, *Daulias luscinia*, is peculiar. In Great Britain it is abundant in suitable localities to the south-east of a line stretching from the valley of the Exe, in Devonshire, to York, but it does not visit Ireland, its occurrence in Wales is doubtful or intermittent, and it is extremely improbable that it has ever reached Scotland. On the continent of Europe it does not occur north of a line stretching irregularly from Copenhagen to the northern Urals, and it is absent in Brittany; over south Europe otherwise it is abundant. It reaches Persia, and is a winter visitor to Arabia, Nubia, Abyssinia, Algeria and as far south as the Gold Coast. The larger eastern *D. philomela*, sometimes called the thrush-nightingale or *Sprosser* of German bird-catchers, is russet-brown in both sexes, and is a native of eastern Europe. *D. hafizi* of Persia, a true nightingale, is probably the Perso-Arabic bulbul of poets.

The nightingale reaches its English home about the middle of April,[1] the males (as is usual among migratory birds) arriving some days before the females. On the cocks being joined by their partners, the work for which the long and hazardous journey of both has been undertaken is speedily begun, and before long the nest is completed. This is of a rather uncommon kind, being placed on or near the ground, the outworks consisting chiefly of a great number of dead leaves ingeniously applied together so that the plane of each is mostly vertical. In the midst of the mass is wrought a deep cup-like hollow, neatly lined with fibrous roots, but the whole is so loosely constructed, and depends for lateral support so much on the stems of the plants, among which it is generally built, that a very slight touch disturbs its beautiful arrangement. Herein from four to six eggs of a deep olive colour are duly laid, and the young hatched. The nestling plumage of the nightingale differs much from that of the adult, the feathers above being tipped with a buff spot, just as in the young of the redbreast, hedge-sparrow and redstart, thereby showing the natural affinity of all these forms. Towards the end of summer the nightingale disappears to its African winter haunts.

The name nightingale has been vaguely applied to several other birds. The so-called "Virginian nightingale" is a species of grosbeak (*q.v.*); the "Pekin nightingale" or "Japanese nightingale" is a small babbler (*Liothrix luteus*) inhabiting the Himalayas and China, not Japan at all.

The nightingale holds a place in classical mythology. Procne and Philomela were the daughters of Pandion, king of Attica, who in return for warlike aid rendered him by Tereus, king of Daulis in Thrace, gave him the first-named in marriage. Tereus, however, being enamoured of her sister, feigned that his wife was dead, and induced Philomela to take her place. On her discovering the truth he cut out her tongue to hinder her from revealing his deceit; but she depicted her sad story on a robe which she sent to Procne; and the two sisters then contrived a horrible revenge for the infidelity of Tereus, by killing and serving to him at table his son Itys. Thereupon the gods interposed, changing Tereus into a hoopoe, Procne into a swallow, and Philomela into a nightingale, while Itys was restored to life as a pheasant, and Pandion (who had died of grief at his daughters' dishonour) as a bird of prey (see OSPREY). The fable has several variants. Ovid's version may be seen in the 6th book of his *Metamorphoses* (lines 412-676). (A. N.)

NIGHTSHADE, a general term for the genus of plants known to botanists as *Solanum*. The species to which the name of nightshade is commonly given in England is *Solanum Dulcamara* which is also called bittersweet or woody nightshade (see fig. 1). It is a common plant in damp hedgebanks and thickets, scrambling over underwood and hedges. It has slender slightly woody stems, with alternate lanceolate leaves more or less heart-shaped and auriculate at the base. The flowers are arranged in drooping clusters and resemble those of the potato in shape, although

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[1] Poets and novelists are apt to command at will the song of this bird, irrespective of season. If the appearance of truth is to be regarded, it is dangerous to introduce a nightingale as singing in England before the 15th of April or after the 15th of June. The "early nightingale" of newspaper paragraphs is generally a thrush.

much smaller. The flower clusters spring from the stems at the side of, or opposite to, the insertion of a leaf. The corolla is rotate, of a lilac-blue colour with a green spot at the base of each segment, or sometimes white, and bears the yellow sessile anthers united at their margins so as to form a cone in the centre of the flower. The flowers are succeeded by ovate scarlet berries, ½ in. long, which in large doses appear to be poisonous or, to say the least, dangerous to children, cases of poisoning by them having occurred. *Solanum Dulcamara* is subject to the same parasitic fungus (*Phytophthora infestans*) as the potato, and may serve as a medium for communicating the spores to the potato if not removed from the hedges of the fields where potatoes are grown. The plant derives its names of "bittersweet" and *Dulcamara* from the fact that its taste is at first bitter and then sweet. It is a native of Europe, North Africa and temperate Asia, and has been introduced into North America. The dried young branches are known in pharmacy under the name *dulcamara*.

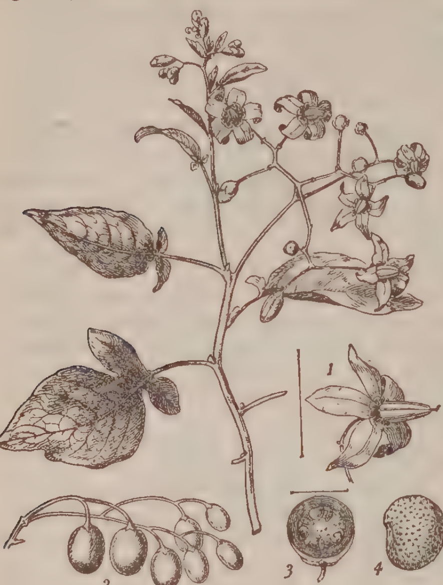

Fig. 1.—Bittersweet (*Solanum Dulcamara*), ⅔ nat. size. 1, Flower; 2, fruits, ½ nat. size; 3, berry, cut across, enlarged; 4, seed, much enlarged.

Dulcamara contains a bitter principle yielding by decomposition a sugar dextrose and the alkaloid solanine. It also contains another glucoside dulcamarin, which when boiled with dilute acid splits up into sugar and dulcamaretin. Solanine appears to exert a depressant action on the vagus nerve and an excitant action on the medulla oblongata.

Solanum nigrum differs from *S. Dulcamara* in having white flowers in small umbels and globose black berries. It is a common weed in gardens and waste places, growing about 12 or 18 in. high, and has ovate, entire or sinuate or toothed leaves. Two varieties of the plant, one with red and the other with yellow berries, are sometimes met with, but are comparatively rare. The berries have been known to produce poisonous effects when eaten by children, and owe their properties to the presence of solanine. In Réunion and Mauritius the leaves are eaten like spinach.

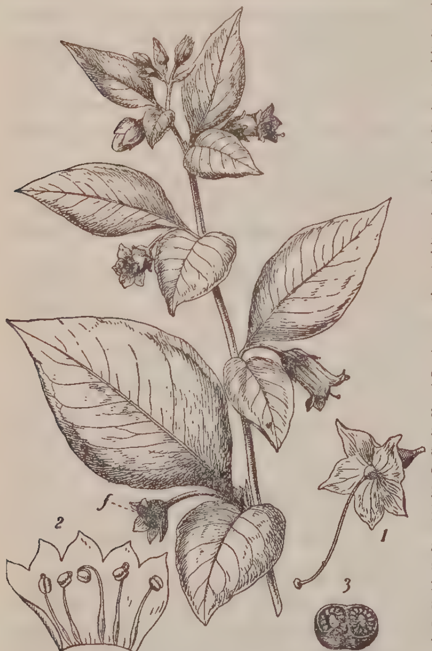

Fig. 2.—Deadly Nightshade (*Atropa belladonna*). Flowering branch, ⅓ nat. size. 1, Flower, after removal of the corolla, ⅔ nat. size; 2, corolla, with stamens, cut open and flattened, ⅗ nat. size; 3, cross section of ovary, much enlarged.

Deadly nightshade, dwale or belladonna (*Atropa belladonna*) is a tall bushy herb of the same natural order (fig. 2). It grows to a height of 4 or 5 ft., having leaves of a dull green colour, with a black shining berry fruit about the size of a cherry, and a large tapering root. The plant is a native of central and south Europe, extending into Asia, and is found locally in England, chiefly on chalk and limestone, from Westmorland and southwards. The entire plant is highly poisonous, and accidents not infrequently occur through children and unwary persons eating the attractive-looking fruit. Its leaves and roots are largely used in medicine, on which account the plant is cultivated, chiefly in south Germany, Switzerland and France (see Belladonna).

The name nightshade is applied to plants of different genera in other countries. American nightshade is *Phytolacca decandra* (pokeweed, *q.v.*). The three-leaved nightshade is an American species of *Trillium*. The Malabar nightshade is *Basella*, which is widely used as a pot-herb in India. Enchanter's nightshade is *Circaea lutetiana*, a small, glandular, softly-hairy plant, common in damp woods, with slender, erect or ascending stems, paired ovate leaves with long stalks, and small white flowers in terminal racemes, succeeded by a small fruit covered with hooked bristles; it is a member of the natural order Onagraceae, and is not known to possess any poisonous property; the name seems to have been given to it in the first place in mistake for a species of *Mandragora* (see Mandrake).

NIGRA, COSTANTINO, Count (1828–1907), Italian diplomatist, was born at Villa Castelnuovo, in the province of Turin, on the 11th of June 1828. During the war of 1848 he interrupted his studies to serve as a volunteer against Austria, and was wounded at the battle of Rivoli. On the conclusion of peace he entered the Piedmontese foreign office; he accompanied Victor Emmanuel and Cavour to Paris and London in 1855, and in the following year he took part in the conference of Paris by which the Crimean War was brought to an end. After the meeting at Plombières between Cavour and Napoleon III. Nigra was sent to Paris again to popularize a Franco-Piedmontese alliance, Nigra being, as Cavour said, "the only person perhaps who knows all my thoughts, even the most secret." He was instrumental in negotiating the marriage between Victor Emmanuel's daughter Clothilde and Napoleon's nephew, and during the war of 1859 he was always with the emperor. He was recalled from Paris when the occupation of the Marche and Umbria by the Piedmontese caused a breach in Franco-Italian relations, and was appointed secretary of state to the prince of Carignano, viceroy of the Neapolitan provinces. When Napoleon recognized the kingdom of Italy in 1861, Nigra returned to France as minister-resident, and for many years played a most important part in political affairs. In 1876 he was transferred to St Petersburg with the rank of ambassador, in 1882 to London, and in 1885 to Vienna. In 1899 he represented Italy at the first Hague Peace Conference. In 1904 he retired, and he died at Rapallo on the 1st of July 1907. He was created count in 1882 and senator in 1890. Nigra was a sound classical scholar, and published translations of many Greek and Latin poems with valuable comments; he was also a poet and the author of several works of folk-lore and popular poetry, of which the most important is his *Canti popolari del Piemonte*.

NIHILISM, the name commonly given to the Russian form of revolutionary Socialism, which had at first an academical character, and rapidly developed into an anarchist revolutionary movement. It originated in the early years of the reign of Alexander II., and the term was first used by Turgueniev in his celebrated novel, *Fathers and Children*, published in 1862. Among the students of the universities and the higher technical schools Turgueniev had noticed a new and strikingly original type—young men and women in slovenly attire, who called in question and ridiculed the generally received convictions and respectable conventionalities of social life, and who talked of reorganizing society on strictly scientific principles. They reversed the traditional order of things even in trivial matters of external appearance, the males allowing the hair to grow long and the female adepts cutting it short, and adding sometimes the additional badge of blue spectacles. Their appearance, manners and conversation were apt to shock ordinary people, but to this they were profoundly indifferent, for they had raised themselves above the level of so-called public opinion, despised Philistine respectability, and rather liked to scandalize people still under the influence of what they considered antiquated prejudices. For aesthetic culture, sentimentalism and refinement of every kind they had a profound and undisguised contempt. Professing extreme utilitarianism and delighting in paradox, they were ready to declare that a shoemaker who distinguished himself in his craft was a greater man than a Shakespeare or a Goethe, because humanity had more need of shoes than of poetry. Thanks to Turgueniev, these young persons came to be known in common parlance as "Nihilists," though they never ceased to protest against the term as a caluminous nickname. According to their own account, they were simply earnest students who desired reasonable reforms, and the peculiarities in their appearance and manner arose simply from an excusable neglect of trivialities in view of graver interests. In reality, whatever name we may apply to them, they were the extreme representatives of a curious moral awakening and an important intellectual movement among the Russian educated classes (see ALEXANDER II., of Russia).

In material and moral progress Russia had remained behind the other European nations, and the educated classes felt, after the humiliation of the Crimean War, that the reactionary regime of the emperor Nicholas must be replaced by a series of drastic reforms. With the impulsiveness of youth and the recklessness of inexperience, the students went in this direction much farther than their elders, and their reforming zeal naturally took an academic, pseudo-scientific form. Having learned the rudiments of positivism, they conceived the idea that Russia had outlived the religious and metaphysical stages of human development, and was ready to enter on the positivist stage. She ought, therefore, to throw aside all religious and metaphysical conceptions, and to regulate her intellectual, social and political life by the pure light of natural science. Among the antiquated institutions which had to be abolished as obstructions to real progress, were religion, family life, private property and centralized administration. Religion was to be replaced by the exact sciences, family life by free love, private property by collectivism, and centralized administration by a federation of independent communes. Such doctrines could not, of course, be preached openly under a paternal, despotic government, but the press censure had become so permeated with the prevailing spirit of enthusiastic liberalism, that they could be artfully disseminated under the disguise of literary criticism and fiction, and the public very soon learned the art of reading between the lines. The work which had perhaps the greatest influence in popularizing the doctrines was a novel called *Shto Dyelati?* (What is to be done?), written in prison by Tchernishevski, one of the academic leaders of the movement, and published with the sanction of the authorities!

Since the time of Peter the Great, Russia had been subjected to a wonderful series of administrative and social transformations, and it seemed to many people quite natural that another great transformation might be effected with the consent and co-operation of the autocratic power. The doctrines spread, therefore, with marvellous rapidity. In the winter of 1861–1862 a high official wrote to a friend who had been absent from Russia for a few months: "If you returned now you would be astonished at the progress which the opposition—one might say, the revolutionary party—has made. . . . The revolutionary ideas have taken possession of all classes, all ages, all professions, and they are publicly expressed in the streets, in the barracks, and in the government offices. I believe the police itself is carried away by them." Certainly the government was under the influence of the prevailing enthusiasm for reform, for it liberated all the serfs, endowed them liberally with arable land, and made their democratic communal institutions independent of the landed proprietors; and it was preparing other important reforms in a similar spirit, including the extension of self-government in the rural districts and the towns, and the reorganization of the antiquated judicial system and procedure according to the modern principles adopted in western Europe.

The programme of the government was extensive enough and liberal enough to satisfy, for the moment at least, all reasonable reformers, but the well-intentioned, self-confident young people to whom the term Nihilists was applied were not reasonable. They wanted an immediate, thorough-going transformation of the existing order of things according to the most advanced socialistic principles, and in their youthful, reckless impatience they determined to undertake the work themselves, independently of and in opposition to the government. As they had no means of seizing the central power, they adopted the method of endeavouring to bring about the desired political, social and economic changes by converting the masses to their views. They began, therefore, a propaganda among the working population of the towns and the rural population in the villages. The propagandists were recruited chiefly from the faculty of physical science in the universities, from the Technological Institute, and from the medical schools, and a female contingent was supplied by the midwifery classes of the Medico-Surgical Academy. Those of each locality were personally known to each other, but there was no attempt to establish among them hierarchical distinctions or discipline. Each individual had entire freedom as to the kind and means of propaganda to be employed. Some disguised themselves as artisans or ordinary labourers, and sought to convert their uneducated fellow-workmen in the industrial centres, whilst others settled in the villages as school-teachers, and endeavoured to stir up disaffection among the recently emancipated peasantry by telling them that the tsar intended they should have all the land, and that his benevolent intentions had been frustrated by the selfish landed proprietors and the dishonest officials. Landed proprietors and officials, it was suggested, should be got rid of, and then the peasants would have arable, pastoral and forest land in abundance, and would not require to pay any taxes. To persons of a certain education the agitators sought to prove that the general economic situation was desperate, that it was the duty of every conscientious citizen to help the people in such a dilemma, and that the first step towards the attainment of this devoutly to be wished consummation was the limitation or destruction of the uncontrolled supreme power. On the whole the agitators had very little success, and not a few of them fell into the hands of the police, several of them being denounced to the authorities by the persons in whose interest they professed to be acting; but the great majority were so obstinate and so ready to make any personal sacrifices, that the arrest and punishment of some of their number did not deter others from continuing the work. Between 1861 and 1864 there were no less than twenty political trials, with the result that most of the accused were condemned to imprisonment, or to compulsory residence in small provincial towns under police supervision.

The activity of the police naturally produced an ever-increasing hostility to the government, and in 1866 this feeling took a practical form in an attempt on the part of an obscure individual called Karakozov to assassinate the emperor. The attempt failed, and the judicial inquiry proved that it was the work of merely a few individuals, but it showed the dangerous character of the movement, and it induced the authorities to take more energetic measures. For the next four years there was an apparent lull, during which only one political trial took place, but it was subsequently proved that the Nihilists during this time were by no means inactive. An energetic agitator called Netchaiev organized in 1869 a secret association under the title of the Society for the Liberation of the People, and when he suspected of treachery one of the members he caused him to be assassinated. This crime led to the arrest of some members of the society, but their punishment had very little deterrent effect on the Nihilists in general, for during the next few years there was a recrudescence of the propaganda among the labouring classes. Independent circles were created and provided with secret printing-presses in many of the leading provincial towns—notably in Moscow, Nijni-Novgorod, Penza, Samara, Saratov, Kharkof, Kiev, Odessa, Rostov-on-the-Don and Taganrog; and closer relations were established with the revolutionary Socialists in western Europe, especially with the followers of Bakunin, who considered that a great popular rising should be brought about in Russia as soon as possible. Bakunin's views did not, it is true, obtain unanimous acceptance. Some of the Nihilists maintained that things were not yet ripe for a rising of the masses, that the pacific propaganda must be continued for a considerable time, and that before attempting to overthrow the existing social organization some idea should be formed as to the order of things which should take its place. The majority, however, were too impatient for action to listen to such counsels of prudence, and when they encountered opposition on the part of the government they urged the necessity of retaliating by acts of terrorism. In a brochure issued in 1874 one of the most influential leaders (Tkatchev) explained that the object of the revolutionary party should be, not the preparation of revolution in general, but the realization of it at the earliest possible moment, that it was a mistake to attach great importance to questions of future social organization, and that all the energies of the party should be devoted to "a struggle with the government and the established order of things, a struggle to the last drop of blood and to the last breath." In accordance with the fashionable doctrine of evolution, the reconstruction of society on the *tabula rasa* might be left, it was thought, to the spontaneous action of natural forces, or, to use a Baconian phrase, to *natura naturans*.

To this and similar declarations of irreconcilable hostility the government replied by numerous arrests, and in the winter of 1877–1878 no less than 193 agitators, selected from 2000 arrested on suspicion, were tried publicly in St Petersburg by a tribunal specially constituted for the purpose. Nearly all of them were condemned to imprisonment or exile, and the revolutionary organization in the northern provinces was thereby momentarily paralysed, but a few energetic leaders who had escaped arrest reorganized their scattered forces and began the work anew. They constituted themselves into a secret executive committee, which endeavoured to keep in touch with, and partially direct, the independent groups in the provincial towns. Though they never succeeded in creating an efficient centralized administration, they contrived to give to the movement the appearance of united action by assuming the responsibility for terrorist crimes committed by persons who were in reality not acting under their orders. During the years 1878, 1879 and 1880 these terrorist crimes were of frequent occurrence. General Trepov, prefect of St Petersburg, was shot by Vera Zasulitch under pretence of presenting a petition to him; General Mezentsov, chief of the political police, was assassinated in broad daylight in one of the principal streets of St Petersburg, and an attempt was afterwards made on the life of his successor, General Drenteln; Prince Krapotkin, governor of the province of Kharkof, was assassinated for having introduced stricter prison discipline with regard to political prisoners; a murderous attack was made on the emperor in front of the Winter Palace by an ex-student called Soloviev; repeated attempts were made to blow up the train conveying the Imperial family from the Crimea to St Petersburg; and a dynamite explosion, by which ten people were killed and thirty-four wounded, took place in the Winter Palace, the Imperial family owing their escape to the accident of not sitting down to dinner punctually at the usual hour. Assassination was used also by the agitators against confederates suspected of giving information to the police, and a number of gendarmes were murdered when effecting arrests. After each of these crimes a proclamation was issued by the executive committee explaining the motives and accepting the responsibility.

When repressive measures and the efforts of the police were found insufficient to cope with the evil, Alexander II. determined to try a new system. Count Loris Melikof was entrusted with semi-dictatorial powers, relaxed the severity of the police régime, and endeavoured to obtain the support of all loyal Liberals by holding out the prospect of a series of reforms in a liberal sense. His conciliatory methods failed signally, and were repaid by an attack on his life. A semblance of parliamentary institutions was not what the Anarchists wanted. They simply redoubled their activity, and hatched a plot for the assassination of the emperor. In March 1881 the plot was successful. Alexander II., when driving in St Petersburg, was mortally wounded by the explosion of small bombs, and died almost as soon as he had reached the Winter Palace. On the following day the executive committee issued a bombastic proclamation, in which it declared triumphantly that the tsar had been condemned to death by a secret tribunal on 26th August 1879, and that two years of effort and painful losses had at last been crowned with success.

These facts put an end to the policy of killing Anarchism by kindness, and one of the first acts of the new reign was a manifesto in which Alexander III. announced very plainly that he had no intention of limiting the autocratic power, or making concessions of any kind to the revolutionary party. The subsequent history of the movement presents little that is interesting or original, merely a continual but gradually subsiding effort to provoke local disturbances with a view to bringing about sooner or later a general rising of the masses and the overthrow not only of the government, but also of the existing social and economic regime. A serious manifestation on the part of the terrorists took the shape of a plot to assassinate the emperor by bombs in the streets of St Petersburg in March 1887. It was the work of a very small group, the members of which were being watched by the police, and were all arrested on the day when the crime was to be perpetrated. The movement afterwards showed occasionally signs of revival. In 1901, for example, there were troubles in the universities, and in 1902 there were serious disturbances among the peasantry in some of the central rural districts; and the assassination of M. Sipiaguine, the minister of the interior, was a disquieting incident; but the illusions and enthusiasm which produced Nihilism in the young generation during the early years of the reign of Alexander II. had been largely shattered and dispelled by experience. The revolutionary propaganda temporarily led to a serious situation in the early years of the reign of Tsar Nicholas II., but a new era opened for Russia with the inauguration of parliamentary government.

The following criminal statistics of the movement during six and a half years of its greatest activity (from 1st July 1881 to 1st January 1888) are taken from unpublished official records:—

Number of affairs examined in the police department	1500
Number of persons punished	3046

These 3046 punishments may be divided into the following categories:—

Death	20
Penal servitude	128
Exile in Siberia	681
Exile under police supervision in European Russia	1500
Lesser punishments	717
	3046

From the beginning of the movement up to 1902 the number of Anarchists condemned to death and executed was forty-eight, and the number of persons assassinated by the Anarchists was thirty-nine. There is no reason to suspect the accuracy of these statistics, for they were not intended for publication. They are taken from a confidential memorandum presented to the emperor.

(D M. W.)

NIIGATA, the chief town of the province of Echigo, Japan. Pop. (1903) 58,821. It lies on the west coast of the island of Nippon, on a narrow strip of sandy ground between the left bank of the Shinano and the sea, which though close at hand is shut out from view by a low range of sandhills. It occupies an area of rather more than 1 sq. m., and consists of five long parallel streets intersected by cross-streets, which in most cases have canals running down the middle and communicating with the river, so that the internal traffic of the city is mainly carried on by water. The houses are usually built with gables to the street, and roofs and verandas project so as to keep the windows and footpaths from being blocked up by the heavy winter snows. Niigata was originally chosen as one of the five open ports—Nagasaki, Kobe, Yokohama, Niigata and Hakodate—but it failed, chiefly owing to a bar which prevents the entry of vessels of any size. The town has been brought within the railway circuit, and the production of petroleum has been developed in the district. Ebisa, on the island of Sado, was opened as a supplementary harbour of refuge, but not as a trading port. There is a large manufacture of lacquer-ware in the town. The foreign trade is entirely in the hands of Japanese merchants. During winter Niigata suffers from a terribly severe climate; the summers, moreover, are excessively hot.

NIJAR, a town of south-eastern Spain, in the province of Almeria; on the southern slope of the Sierra Alhamilla, and on the small river Artal, which flows into the Mediterranean Sea 6 m. S.W. Pop. (1900) 12,497. Diespite the lack of railway communication, Nijar is a place of some commercial importance. Lead, iron and manganese are mined in the neighbouring mountains; the fertile plain watered by the Artal yields an abundance of wheat, fruit, olives and esparto grass; and fine porcelain and woollen and cotton goods are manufactured in the town.

NIJMWEGEN, Nimeguen, Nymegen or Nimwegen, a town in the province of Gelderland, Holland, on the left bank of the Waal, 24½ m. by rail E. by S. of Tiel. It has regular steamboat communication with Rotterdam, Cologne and Arnhem, and steam-tramways connect it with the popular resorts of Neerbosch, Beek and Berg-en-Dal in the vicinity. Pop. (1904) 49,342. Nijmwegen is very prettily situated on the slopes of five low hills rising from the river-side. It stands up with a boldness quite unusual in a Dutch town, and steps are even necessary to lead to the higher portions of the town. In 1877–1884 the old town walls were demolished, a promenade and gardens taking their place, and since then a new quarter has grown up on the south side with a fine open place called the Emperor Charles's Plain. On the east of the town is the beautiful park called the Valkhof, which marks the site of the old palace of the Carolingian emperors. The palace was still inhabitable in 1787, but was ruined by the French bombardment of 1794, and only two portions of it remain. These are a part of the choir of the 12th-century palace-church, and a sixteen-sided baptistry originally consecrated by Pope Leo III. in 799 and rebuilt in the 12th or 13th century. Close by is the lofty tower of the Belvedere, dating from 1646. The Groote Kerk of St Stephen forms with its tall square tower one of the most striking features in the general views of the town. Originally built about 1272, it dates in its present condition mainly from the 15th and 16th centuries. In the choir is the fine monument of Catherine of Bourbon (d. 1469), wife of Adolphus of Egmont, duke of Gelderland, with a brass of the duchess, and the heraldic achievements of the house of Bourbon. There is also a fine organ. The interesting Renaissance town-hall was built in 1554 (restored in 1879). It is adorned with the effigies of kings and emperors who were once benefactors of Nijmwegen. Inside are to be found some fine wood-carving, tapestries, pictures and a cumbrous safe in which the town charters were so jealously preserved that the garrison used to be called out and the city gates closed whenever they were consulted. There is also an interesting museum of antiquities. Other buildings of note are the theatre (1839), the Protestant hospital, the Roman Catholic or Canisius hospital (1866), and the old weigh-house and Flesher's Hall, probably built in 1612 and restored in 1885. Between 1656 and 1678 Nijmwegen was the seat of a university. Beer, Prussian blue, leather, tin, pottery, cigars, and gold and silver work are the chief industrial products, and there is a considerable trade by rail and river.

NIKĀYA ("collection"), the name of a division of the Buddhist canonical books. There are four principal Nikāyas, making together the Sutta Piṭaka ("Basket of Discourses"), the second of the three baskets into which the canon is divided. The fifth or miscellaneous Nikāya is by some authorities added to this Piṭaka, by others to the next. The first two Nikāyas, called respectively *Dīgha* and *Majjhima* (Longer and Shorter), form one book, a collection of the dialogues of the Buddha, the longer ones being included in the former, the shorter ones in the latter. The third, called the Anguttara (Progressive Addition), rearranges the doctrinal matter contained in the Dialogues in groups of ethical concepts, beginning with the units, then giving the pairs, then the groups of three, four, five, &c., up to ten. In the Dialogues the arrangement in such numbered groups is frequent. In an age when books, in our modern sense, were unknown, it was a practical necessity to invent and use aids to memory. Such were the repetition of memorial tags, of cues (as now used for a precisely similar purpose on the stage), to suggest what is to come. Such were also these numbered lists of technical ethical terms. Religious teachers in the West had similar groups—the seven deadly sins, the ten commandments, the four cardinal virtues, the seven Sacraments, and many others. These are only now, since the gradual increase of books, falling out of use. In the 5th century B.C. in India it was found convenient by the early Buddhists to classify almost the whole of their psychology and ethics in this manner. And the Anguttara Nikāya is based on that classification. In the last Nikāya, the *Saṃyutta* (The Clusters), the same doctrines are arranged in a different set of groups, according to subject. All the Logia (usually of the master himself, but also of his principal disciples) on any one point, or in a few cases as addressed to one set of people, are here brought together. That was, of course, a very convenient arrangement then. It saved a teacher or scholar who wanted to find the doctrine on any one subject from the trouble of repeating over, or getting some one else to repeat over for him, the whole of the Dialogues or the Anguttara. To us, now, the *Saṃyutta* seems full of repetitions; and we are apt to forget that they are there for a very good reason.

During the time when the canon was being completed there was great activity in learning, repeating to oneself, rehearsing in company and discussing these three collections. But there was also considerable activity in a more literary direction. Hymns were sung, lyrics were composed, tales were told, the results of some exciting or interesting talk were preserved in summaries of exegetical exposition. A number of these have been fortunately preserved for us in twenty-two collections, mostly of very short pieces, in the fifth or miscellaneous Nikāya, the *Khuddaka Nikāya*.

The text of the Dialogues fills about 2000 pages 8vo in the edition prepared for the Pali Text Society, of which five vols. out of six had been published in 1909, and the first had been translated into English. The *Saṃyutta*, of about the same size, and the Anguttara, which is a little smaller, have both been edited. Of the twenty-two miscellaneous books twenty have been edited (see Rhys Davids, *American Lectures* (1896), pp. 66-79), five have been translated into English and two more into German.

See *Dīgha Nikāya*, ed. Rhys Davids and Carpenter (3 vols.); *Saṃyutta Nikāya* (5 vols.), ed. Léon Feer, vol. vi. by Mrs Rhys Davids, containing indices; *Anguttara Nikāya*, ed. R. Morris and E. Hardy (5 vols.); all published by the Pali Text Society. Also Rhys Davids, *Dialogues of the Buddha*, vol. i. (Oxford, 1899); A. J. Edmunds, "Buddhist Bibliography," in *Journal of the Pali Text Society* (1903), pp. 5-12. (T. W. R. D.)

NIKĒ, in Greek mythology, the goddess of victory (Gr. νίκη). She does not appear personified in Homer; in Hesiod (*Theog.* 384) she is the daughter of the giant Pallas and Styx, and is sent to fight on the side of Zeus against the Titans. Nikē does not appear to have been the object of a separate cult at Athens. She was at first inseparably connected and confounded with Pallas Athena, the dispenser of victory, but gradually separated from her. As an attribute of both Athena and Zeus she is represented as a small figure carried by those divinities in their hand. Athena Nikē was always wingless, Nikē as a separate goddess winged. In works of art she appears carrying a palm branch or a wreath (sometimes a Hermes staff as the messenger of victory); erecting a trophy or recording a victory on a shield; frequently hovering with outspread wings over the victor in a competition, since her functions referred not only to success in war, but to all other human undertakings. In fact, Nikē gradually came to be recognized as a sort of mediator of success between gods and men.

At Rome the goddess of victory (Victoria) was worshipped from the earliest times. Evander was said to have erected a temple in her honour on the Palatine before the foundation of Rome itself (Dion. Halic. i. 32, 33). With the introduction of the Greek gods, Victoria became merged in Nikē. She always had a firm hold over the Roman mind, and her popularity lasted till the end of paganism. Special games were held in her honour in the circus, and generals erected statues of her after a successful campaign. She came to be regarded as the protecting goddess of the senate, and her statue (originally brought from Tarentum and set up by Augustus in memory of the battle of Actium) in the Curia Julia (Dio Cassius li. 22; Suetonius, *Aug.* 100) was the cause of the final combat between Christianity and paganism towards the end of the 4th century. Victoria had altars in camp, a special set of worshippers and colleges, a festival on the 1st of November, temples at Rome and throughout the empire. The Sabine goddess Vicuna and Vica Pota, one of the *dii indigetes* (both of them goddesses of victory), are earlier varieties of Victoria (Livy xxix. 14). Representations of Nikē-Victoria in Greek and Graeco-Roman art are very numerous. The statue of Nikē at Olympia by Paeonius has been in great part recovered.

See A. Baudrillart, *Les Divinités de la victoire en Grèce et en Italie* (1894), whose view that in the 5th century Nikē became detached from Athena, although Athena Nikē still continued to exist, is supported by Miss J. E. Harrison (*Classical Review*, April 1895) and L. R. Farnell (*Cults of the Greek States*, i., 1896), but opposed by E. Sikes (*C.R.*, June 1895), who holds that "while Nikē was a late conception, Athena Nikē was still later, and that the goddess of victory cannot have originated, either at Athens or elsewhere, from an aspect of Athena"; F. Studniczka, *Die Siegesgöttin* (Leipzig, 1898); Preller-Robert, *Griechische Mythologie* (1894); O. Benndorf, *Über das Cultusbild der Athena Nike* (Vienna, 1879); G. Boissier, *La fin du paganisme* (1891); Gibbon, *Decline and Fall*, ch. 28.

In the article GREEK ART, fig. 32 represents Nikē pouring water over a sacrificial ox; fig. 36 the floating Nikē of Paeonius; figs. 61, 62 (Pl. iii.), the winged Nikē of Samothrace; the running or flying figure (fig. 19) is also possibly a Nikē.

NIKISCH, ARTHUR (1855-), Hungarian conductor, became known as a musical prodigy at an early age, making a public performance as a pianist at eight years old. He studied at the Vienna Conservatoire from 1866 to 1873, and while there he composed a symphony and other works. For a time he was engaged as a violinist, but in 1877 he began as assistant conductor at the Leipzig opera and two years later became chief conductor. His success there, and his reputation as the producer of the more modern types of music as well as of classical masterpieces led to his being appointed conductor of the symphony orchestra at Boston, U.S.A., from 1889 to 1893; and subsequently, after having been director at the Budapest opera, he was made conductor at the Leipzig Gewandhaus. His fame was now widespread, and he made successful visits to London, Paris and other capitals, his ability as a pianoforte accompanist being recognized as no less marked than his brilliance as director of an orchestra.

NIKITIN, ATHANASIUS, of Tver (fl. 1468–1474), Russian merchant, traveller and writer, the earliest known Russian visitor to India. He started in 1468 on his "wanderings beyond the Three Seas" (Caspian, Euxine and Indian Ocean), and descended the Volga, passing by Uglich, Kostroma, Nizhniy Novgorod, Kazan, Sarai and Astrakhan. Near the latter he was attacked and robbed by Tatars; but he succeeded in reaching Derbent, where he joined Vasili Papin, the envoy of Ivan III. of Moscow to the shah of Shirvan; from Nizhniy Novgorod he had travelled with Hasan Bey, the Shirvan shah's ambassador, returning to his master with a present of falcons from Ivan. At Derbent Nikitin vainly endeavoured to get means of returning to Russia; failing in this, he went on to Batu, where he notices the "eternal fires," and thence over the Caspian to Bokhara. Here he stayed six months, after which he made his way southward, with several prolonged stoppages, to the Persian Gulf, through Mazandaran province and the towns of Amul, Demavend, Ray (near Tehran), Kashan, Nain, Yezd, Sirjan, Tarun, Lar and Bandar, opposite New (or insular) Hormuz. From Hormuz he sailed by Muscat to Gujarat, Cambay and Chaul in western India. Landing at Chaul, he seems to have travelled to Umrut in Aurangabad province, south-east of Surat, and thence to Beder, the modern Ahmedabad. Here, and in adjacent regions, Nikitin spent nearly four years; from the little he tells us, he appears to have made his living by horse-dealing. From Beder he visited the Hindu sanctuary ("their Jerusalem") of Perwattum. He returned to Russia by way of Calicut, Dabul, Muscat, Hormuz, Lar, Shiraz, Yezd, Isfahan, Kashan, Sultanieh, Tabriz, Trebizond and Kaffa (Theodosia) in the Crimea. He has left us descriptions of western Indian manners, customs, religion, court-ceremonies, festivals, warfare and trade, of some value; but the text is corrupt, and the narrative at its best is confused and meagre. His remarks on the trade of Hormuz, Cambay, Calicut, Dabul, Ceylon, Pegu and China; on royal progresses and other functions, both ecclesiastical and civil, at Beder; and on the wonders of the great fair at Perwattum—as well as his comparisons of things Russian and Indian—deserve special notice.

Two MSS. are known: (1) in the library of the cathedral of St Sophia in Novgorod; (2) in the library of the Troïtsa Monastery (Troitsko-Sergievskaya Lavra) near Moscow. See also the edition by Pavel Mikhailovich Stroev in *Sofiiskii Vremennik* (A.D. 862–1534), pt. ii. pp. 145-164 (Moscow, 1820–1821); and the English version in *India in the 15th Century*, pp. lxxiv.-lxxx.; 1-32 (separately paged, Nikitin's being the third narrative in the volume, translated and edited by Count Wielhorski; London, Hakluyt Society, 1857). (C. R. B.)

NIKKO, one of the chief religious centres of Japan. The name belongs properly to the district, but is as commonly applied to the principal village, Hachi-ishi, which is 91 m. N. of Tokyo by rail. The district is high-lying, mountainous and beautiful, and is in favour for summer residence. The chief mountain range is known as Nikko-Zan (Mountains of the Sun's Brightness). A Shinto temple seems to have existed at Nikko from time immemorial, and in 767 its first Buddhist temple was founded by Shodo Sho-nin (the subject of many strange legendary adventures); but the main celebrity of the place is due to the sepulchres and sanctuaries of Iyeyasu and Iyemitsu, the first and third shoguns of the Tokugawa dynasty. Iyeyasu was buried with amazing pomp in 1617, and Iyemitsu, his grandson, was slain in 1650 while visiting his tomb. From 1644 to 1868 the "abbots" of Nikko were always princes of the imperial blood; thirteen of them are buried within the sacred grounds. Though the magnificent abbots' residence was destroyed by fire in 1871, and the temples have lost most of their ritual and much of their material splendour, enough remains to astonish by excellence and bewilder by variety of decorative detail. Of the numerous structures which cluster round the shrine of Iyeyasu, it is sufficient to mention the cylindrical copper column (1643), a guardian against evil influences, 42 ft. high, adorned at the top with a series of lotus flowers, from the petals of which hang small bells; a five-storied pagoda (1659), 104 ft. high, with the signs of the zodiac carved round the base; the gate of the Two Kings, with its figures of unicorns, lions, tigers, elephants, mythical animals and tree-peonies; the vermilion-coloured timber enclosure to which this gate gives entrance, with three great storehouses, a sumptuous stable for the sacred horses, and a finely fashioned granite cistern (1618) for holy water; and the Yo-mei-mon gate, which with the contiguous cloister is covered with the most elaborate carving, and gives access by way of another gate (Kara-Mon) to the court in the midst of which stands the last and most sacred enclosure. This, known as the *Tamagaki*, is a quadrangle of gilt trellis-work 50 yds. square; within it stands the "chapel" or oratory (or rather a series of chambers), in the decoration of which gilding and black lacquer have been lavishly employed. The tomb of Iyeyasu lies apart about two hundred steps higher up the hills, in the shadow of tall cryptomerias—a single light-coloured bronze urn or casket standing on a circular base of three steps with a stone table in front on which rest a censer, a lotus-cluster and a stork with a candlestick in its mouth, the whole enclosed by a high stone wall. Somewhat similar are the tomb of Iyemitsu and its surroundings; and though the art displayed is of an inferior character, the profusion of buildings and embellishments is even more remarkable. Hotoké Iwa, the hill on which the tomb stands, is completely covered to the summit with trees of various tints. There are numerous temples and shrines of minor interest in the locality.

NIKOLAYEV, a town, seaport and chief naval station of Russia on the Black Sea, in the government of Kherson, 40 m. N.W. of the city of Kherson. Pop. (1881) 35,000; (1891) 77,210; (1897) 92,060. Nikolayev stands a little above the confluence of the Ingul with the Bug, at the head of the *liman*, or estuary, of the Bug, and is the natural outlet for the basin of that river. The estuary, which is 25 m. long, enters that of the Dnieper. The entrance to the double estuary is protected by the fortress of Ochakov and by the fort of Kinburn, erected on a narrow headland opposite, while several forts surround Nikolayev on both sides of the Bug and protect it from an attack by land. Over the bar at Ochakov the water has been deepened to 25 ft., and over the bar of the Dnieper to 20 ft. by dredging. The town, which occupies two flat peninsulas between the Bug and the Ingul, extends up the banks of the latter, while its suburbs reach still farther out into the steppe. The streets are wide, and intersect one another at right angles. The bank of the Ingul is taken up with shipbuilding yards, docks, slips and various workshops of the admiralty for the construction of armour-plates, guns, boilers, &c. On the river there is a floating dock for armoured ships. Before the Crimean War the activity of the dockyards was very great; the suburbs—which belong to the admiralty—were bound to supply the necessary hands to the number of 3000 every day, and all the inhabitants had to perform compulsory service. Since 1870 the construction of armoured ships and torpedo-boats has been carried on here. From 1893 Nikolayev was the chief port for the Russian volunteer fleet, which sailed to and fro between this port and Vladivostok until the Russo-Japanese War of 1904–05. Nikolayev has steam flour-mills, iron and machinery works, saw-mills, soap, tobacco, vinegar, carriage and agricultural machinery works. The foreign exports consist almost entirely of cereals, especially wheat and rye, with a little sugar, iron and manganese ore and oilcake. The total value reaches £7,000,000 to £9,000,000 annually. Navigation is maintained during the whole winter by the aid of a powerful ice-breaker. Nikolayev is the chief market for the governments of Kherson, Poltava, Kharkov, Ekaterinoslav and parts of Kiev, Kursk and Podolia. In addition to the naval harbour, there are the harbour of the Russian Steamship Company and the coasting harbour, made in 1893; while large storehouses stand close to the commercial port, 2 m. from the town, at Popovaya-Balka on the Bug. The educational institutions include an artillery school, a school of navigation, two technical schools, an astronomical and meteorological observatory, museums and libraries, and a hydrographical institute. Amongst the public buildings, the cathedral, which contains some good Italian pictures, the theatre, the artillery arsenal, the admiralty and other state buildings are worthy of mention.

The remains of the Greek colony *Olbia* have been discovered close to the confluence of the Ingul with the Bug, 10 m. S. of Nikolayev. In medieval times the country was under the Lithuanians, and subsequently under the Zaporogian Cossacks. Russian colonists settled in the locality about the end of the 18th century, and after the fall of Ochakov, Prince Potemkin established (1789) a wharf on the Ingul which received the name of Nikolayev. (P. A. K.; J. T. Be.)

NIKOLAYEVSK, a town of East Siberia, in the Maritime province, on the left bank of the Amur, 20 m. above its outflow into the Gulf of Amur, in 53° 8′ N. Pop. (1897) 8200. It is defended by a fort and batteries. Founded in 1851, Nikolayevsk was formerly the capital of the Maritime province.

NIKOLAYEVSK, a town of Russia, in the government of Samara, on the right bank of the Irgiz, 40 m. from the Volga and 100 m. S.W. of the town of Samara. Pop. (1897) 12,524. Its inhabitants are mostly Raskolniks (*i.e.* Nonconformists), who have numerous monasteries along the river, and members of the United Greek Church, with about 2000 Tatars. The chief occupations are agriculture and live stock breeding.

Under the name of Mechetnoye, Nikolayevsk was founded in 1762 by Raskolniks who had fled to Poland and returned when Catherine II. undertook to grant them religious freedom. In 1828 serious persecutions began, with the result that the monasteries were closed with the exception of three, which were handed over in 1829 and 1836 to the United Greek Church. In 1835 the name of the town was changed to Nikolayevsk.

NIKOLAYEVSKAYA, SLOBODA, a town of Russia in the government of Astrakhan, 3 m. from the left bank of the Volga, opposite Kamyshin, and 110 m. N. of Tsaritsyn. Pop. (1897) 20,000. It dates from the end of the 18th century, when a number of Little Russians settled there for the transport of salt from Lake Elton. It is one of the chief centres on the lower Volga for the trade in corn and salt.

NIKOLSBURG (Czech, *Mikulov*), a town of Austria, in Moravia, 53 m. S. of Brünn by rail. Pop. (1900) 8091. It is situated at the foot of the Polau Mountains and near the border of Lower Austria. It possesses a château of Prince Dietrichstein-Mensdorff, which contains an extensive library, with some valuable manuscripts. The Heiliger Berg, in the immediate vicinity, has sixteen chapels, and a church in the Byzantine style. The principal resources are viticulture, the manufacture of cloth, and trade in lime and limestone. On the 31st of December 1621 peace was concluded here between the emperor Ferdinand II. and Bethlen Gabor, prince of Transylvania; and on the 26th of July 1866 a preliminary treaty of peace between the Prussians and the Austrians was signed here.

NIKON [Nikita Minin] (1605–1681), 6th patriarch of Moscow, Russian reformer and statesman, son of a peasant farmer named Mina, was born on the 7th of May 1605 in the village of Valmanovo, 90 versts from Nizhny Novgorod. Misery pursued the child from his cradle, and prematurely hardened a character not naturally soft; he ran away from home to save his life from an inhuman stepmother. But he gave promise betimes of the energy and thoroughness which were to distinguish him throughout life, and contrived to teach himself reading and writing. When he was but twenty his learning and talents obtained for him a cure of souls. His eloquence attracted attention, and, through the efforts of some Moscow merchants, he was transferred to a populous parish in the capital. Shortly afterwards, seeing in the loss of his three little children a providential warning to seek the higher life, he first persuaded his wife to take the veil and then withdrew himself first to a desolate hermitage on the isle of Anzersky on the White Sea, and finally to the Kozhuzersky monastery, in the diocese of Novgorod, of which he became abbot in 1643. On becoming a monk he took the name of Nikon. In his official capacity he had frequently to visit Moscow, and in 1646 made the acquaintance of the pious and impressionable Tsar Alexius, who fell entirely under his influence. Alexius appointed Nikon archimandrite, or prior, of the wealthy Novospassky monastery at Moscow, and in 1648 metropolitan of Great Novgorod. Finally (1st of August 1652) he was elected patriarch of Moscow. It was only with the utmost difficulty that Nikon could be persuaded to become the archpastor of the Russian Church, and he only yielded after imposing upon the whole assembly a solemn oath of obedience to him in everything concerning the dogmas, canons and observances of the Orthodox Church.

Nikon's attitude on this occasion was not affectation, but the wise determination of a would-be reformer to secure a free hand. Ecclesiastical reform was already in the air. A number of ecclesiastical dignitaries, known as the party of the protopopes (deans), had accepted the responsibility for the revision of the church service-books inaugurated by the late Patriarch Joasaf, and a few other very trivial rectifications of certain ancient observances. But they were far too timid to attempt anything really effectual. Nikon was much bolder and also much more liberal. He consulted the most learned of the Greek prelates abroad; invited them to a consultation at Moscow; and finally the scholars of Constantinople and Kiev opened the eyes of Nikon to the fact that the Muscovite service-books were heterodox, and that the ikons actually in use had very widely departed from the ancient Constantinopolitan models, being for the most part imitations of later Polish and Frankish (West European) models. He at once (1654) summoned a properly qualified synod of experts to re-examine the service-books revised by the Patriarch Joasaf, and the majority of the synod decided that "the Greeks should be followed rather than our own ancients." A second council, held at Moscow in 1656, sanctioned the revision of the service-books as suggested by the first council, and anathematized the dissentient minority, which included the party of the protopopes and Paul, bishop of Kolomna. Heavily weighted with the fullest ecumenical authority, Nikon's patriarchal staff descended with crushing force upon the heterodox. His scheme of reform included not only service-books and ceremonies but the use of the "new-fangled" ikons, for which he ordered a house-to-house search to be made. His soldiers and servants were charged first to gouge out the eyes of these "heretical counterfeits" and then carry them through the town in derision. He also issued a *ukaz* threatening with the severest penalties all who dared to make or use such ikons in future. This ruthlessness goes far to explain the unappeasable hatred with which the "Old Ritualists" and the "Old Believers," as they now began to be called, ever afterwards regarded Nikon and all his works.

From 1652 to 1658, Nikon was not so much the minister as the colleague of the tsar. Both in public documents and in private letters he was permitted to use the sovereign title. Such a free use did he make of his vast power, that some Russian historians have suspected him of the design of establishing "a particular national papacy"; and he himself certainly maintained that the spiritual was superior to the temporal power. He enriched the numerous and splendid monasteries which he built with valuable libraries. His emissaries scoured Muscovy and the Orient for precious Greek and Slavonic MSS., both sacred and profane. But his severity raised up a whole host of enemies against him, and by the summer of 1658 they had convinced Alexius that the sovereign patriarch was eclipsing the sovereign tsar. Alexius suddenly grew cold towards his "own familiar friend." Nikon thereupon publicly divested himself of the patriarchal vestments and shut himself up in the Voskresensky monastery (19th of July 1658). In February 1660 a synod was held at Moscow to terminate "the widowhood" of the Muscovite Church, which had now been without a pastor for nearly two years. The synod decided not only that a new patriarch should be appointed, but that Nikon had forfeited both his archiepiscopal rank and his priest's orders. Against the second part of this decision, however, the great ecclesiastical expert Epifany Slavenitsky protested energetically, and ultimately the whole inquiry collapsed, the scrupulous tsar shrinking from the enforcement of the decrees of the synod for fear of committing mortal sin. For six years longer the Church of Muscovy remained without a patriarch. Every year the question of Nikon's deposition became more complicated and confusing. Almost every contemporary orthodox scholar was consulted on the subject, and no two authorities agreed. At last the matter was submitted to an ecumenical council, or the nearest approach to it attainable in the circumstances, which opened its sessions on the 18th of November 1666 in the presence of the tsar. On the 12th of December the council pronounced Nikon guilty of reviling the tsar and the whole Muscovite Church, of deposing Paul, bishop of Kolomna, contrary to the canons, and of beating and torturing his dependants. His sentence was deprivation of all his sacerdotal functions; henceforth he was to be known simply as the monk Nikon. The same day he was put into a sledge and sent as a prisoner to the Therapontov Byelozersky monastery. Yet the very council which had deposed him confirmed all his reforms and anathematized all who should refuse to accept them. Nikon survived the tsar (with whom something of the old intimacy was resumed in 1671) five years, expiring on the 17th of August 1681.

See R. Nisbet Bain, *The First Romanovs* (London, 1905); S. M. Solovev, *History of Russia* (Rus.), vol. x. (St Petersburg, 1895, &c.); A. K. Borozdin, *The Protopope Avvakum* (Rus.) (St Petersburg, 1898); V. S. Ikonnikov, *New Materials concerning the Patriarch Nikon* (Rus.) (Kiev, 1888); William Palmer, *The Patriarch and the Tsar* (London, 1871–1876). (R. N. B.)

NIKOPOL, a town of Russia, in the government of Ekaterinoslav, on the right bank of the Dnieper, 70 m. S.S.W. of the town of Ekaterinoslav. It was formerly called Nikitin Rog, and occupies an elongated peninsula between two arms of the Dnieper at a point where its banks are low and marshy, and has been for centuries one of the places where the middle Dnieper can most conveniently be crossed. Its inhabitants, 21,282 in 1900, are Little Russians, Jews and Mennonites, who carry on agriculture and shipbuilding. The old *secha*, or fortified camp of the Zaporogian Cossacks, brilliantly described in N. V. Gogol's novel *Taras Bulba* (1834), was situated a little higher up the river. Numbers of graves in the vicinity recall the battles which were fought for the possession of this important strategic point. One of them, close to the town, contained, along with other Scythian antiquities, the well-known precious vase representing the capture of wild horses. Even now Nikopol, which is situated on the highway from Ekaterinoslav to Kherson, is the point where the "salt-highway" of the Chumaks (Little Russian salt-carriers) to the Crimea crosses the Dnieper. Nikopol is, further, one of the chief places on the lower Dnieper for the export of corn, linseed, hemp and wool.

NIKOPOLI, or NICOPOLIS (Turkish, Nighebolu or Nebul), the chief town of a sub-prefecture in the district of Plevna (Pleven), Bulgaria. Pop. (1908) 5236, including 3339 Turks and 1615 Bulgarians. Nikopoli is picturesquely situated on the south bank of the Danube, where it receives the Osem. Until the creation of a new port at Somovit, in the neighbourhood, Nikopoli served as an outlet for the trade of Plevna, Lovtcha and other towns in the interior, the principal export being cereals. The chief industries are tanning and fishing. As a military post the town has for centuries been important. A ruined castle still dominates the place, and fortifications stretch down to the river.

Nikopoli occupies the site of the ancient Asamus, but by some medieval confusion bears the name of Nicopolis ad Istrum, which was founded by Trajan several miles down the river, at the inflow of the Iatrus or Yantra, at the spot still called Nikup. The following are the chief points in the modern history of the place:—capture of the fortress by Sigismund of Hungary in 1392 and 1395; defeat of Sigismund and his hosts in 1396 by Bayezid I.; siege of the town by King Ladislaus I. of Hungary in 1444; defeat of the Turks by Bathori in 1595 and by Michael of Walachia in 1598; capture of the town by Pasvan-oglu in 1797; occupation of the fortress by the Russians under Kamensky in 1810; destruction of the Turkish flotilla and storming of the Turkish camp by Govarov in 1829; capture and burning of the town by the Russians under Krüdener on the 15th of June 1877.

NIKSHICH (also written NIKSHITCH and NIKSHITI; Croatian, *Nikšić*), a town of Montenegro, lying in a flat plain enclosed by lofty mountains on the north-west, and watered by the river Zeta. Pop. (1900) about 3500. Owing to the prevalence of floods, a long viaduct, a gift from Russia, was raised between the town and the mountain road which leads to Podgoritsa, 60 m. S.E. Nikshich consists of a mass of white houses, dominated by the belfry and the pale yellow cupola of its cathedral, another gift from Russia. This building is chiefly Byzantine in style, and, though hardly beautiful, is the most impressive and by far the largest of Montenegrin churches. Close by stands a barrack-like royal palace; and a little beyond the town are the ruins of an old castle. As Nikshich possesses a brewery and a clothmill, besides being the chief mart of Western Montenegro for timber, hides, farm-produce and livestock, it ranks second in commercial importance to Podgoritsa. About 12 m. S.E. is the celebrated shrine of Ostrog (see MONTENEGRO). Nikshich was included in the Turkish province of Herzegovina until 1876, in which year it was stormed by the Montenegrins, led by Prince Nicholas in person. In 1878 the Montenegrin possession was ratified by the treaty of Berlin.

NILE, the longest river of Africa, and second in length of all the rivers of the globe, draining a vast area in north-east Africa, from the East African lake plateau to the shores of the Mediterranean. Although falling short of the length of the Mississippi-Missouri (4194 m. according to the estimate of General Tillo[1]), the Nile is at the head of all rivers as regards the length of its basin, which extends through 35° of latitude or 2450 m. in a direct line, with a waterway of about 4000 m. The Nile proper, *i.e.* from the outlet at Victoria Nyanza to the sea, is 3473 m. long.

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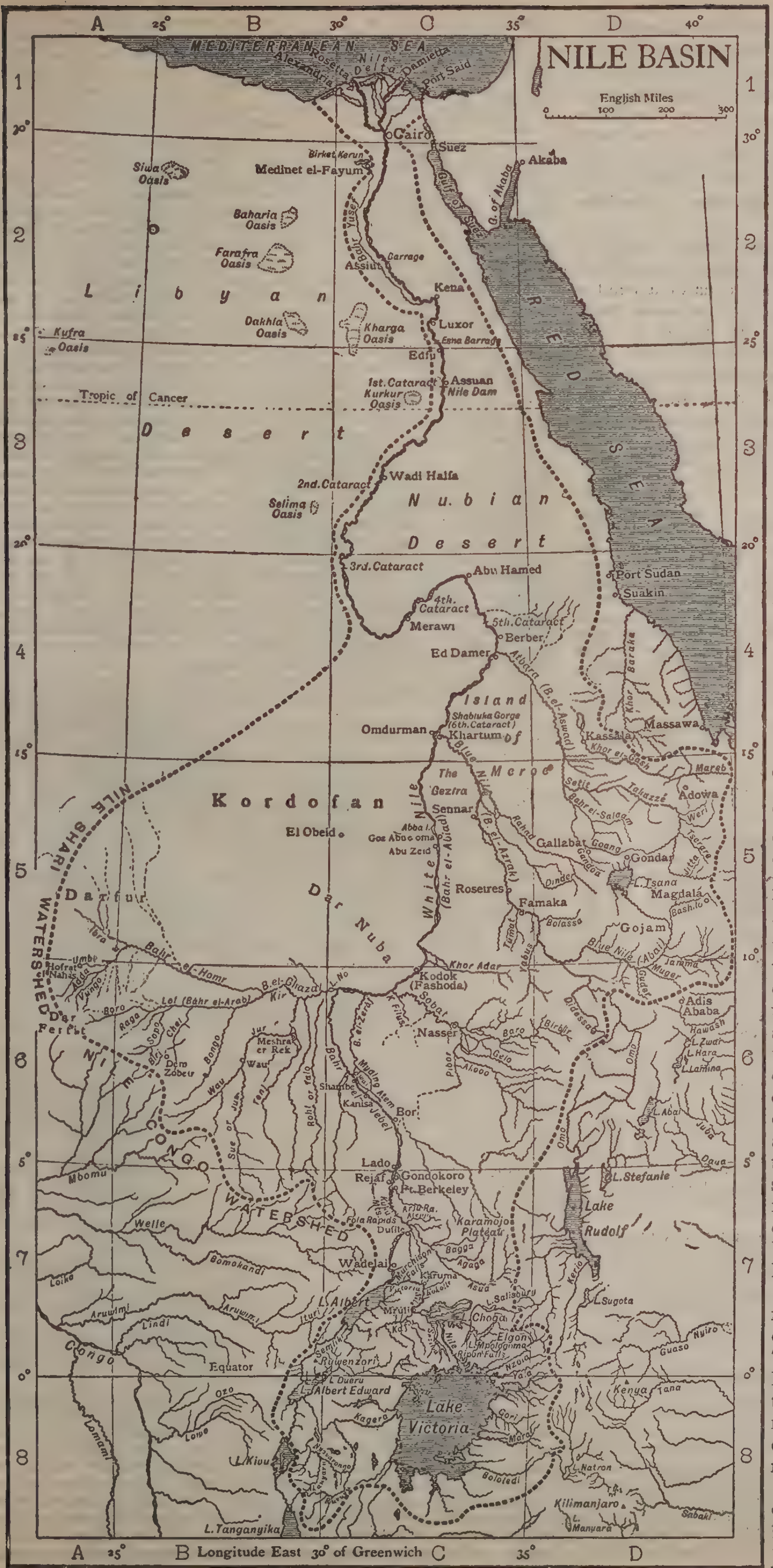
[1] General Alexi A. Tillo (1839–1900), Russian scientist and geographer, author of works on geodesy, meteorology, &c.


NILE BASIN
English Miles
0
100
200
300
A
B
C
D
25°
30°
35°
40°
1
2
3
4
5
6
7
8
30°
25°
20°
15°
10°
5°
0°
MEDITERRANEAN SEA
Alexandria
Rosetta
Nile
Delta
Damietta
Port Said
Cairo
Suez
Akaba
G. of Akaba
Birket Kerun
Medinet el-Fayum
Siwa Oasis
Baharia Oasis
Farafra Oasis
Dakhla Oasis
Kharga Oasis
Kufra Oasis
Bahr Yusef
Carrage
Assiut
Kena
Luxor
Esna Barrage
Edfu
Libyan Desert
Tropic of Cancer
1st Cataract
Assuan
Nile Dam
Kurkur Oasis
RED SEA
Wadi Halfa
2nd Cataract
Selima Oasis
Nubian Desert
3rd Cataract
Abu Hamed
4th Cataract
Merawi
5th Cataract
Berber
Ed Damer
Atbara
Island of Meroe
Shabluka Gorge (6th Cataract)
Khartum
Omdurman
Blue Nile
Port Sudan
Suakin
Khor Baraka
Massawa
Kassala
Khor el-Gash
Mareb
Setit
Takazze
Bahr el-Salaam
Adowa
The Gezira
Sennar
Abba I.
Goz Abu Goma
Abu Zeid
El Obeid
Kordofan
Rahad
Dinder
Gallabat
Goang
Gondar
L. Tsana
Magdala
Roseires
Famaka
Gojam
Blue Nile (Abai)
Jamma
Muger
Adis Ababa
Hawash
White Nile
(Bahr el-Abiad)
(B. el-Azrak)
Dar Nuba
Darfur
NILE SHARI WATERSHED
Hofrat en Nahas
Umbl
Bahr el-Homr
B. el-Ghazal
Kodok (Fashoda)
Khor Adar
Sobat
Nasser
Baro
Gelo
Akobo
Pibor
Omo
Meshra er Rek
Wau
Dem Zobeir
Bahr el-Arab
Jur
Bongo
Dar Fertit
Shambe
Kanisa
Bor
Bahr el-Jebel
L. Zwai
L. Hara
L. Lamina
L. Abai
Juba
Daua
Lado
Rejaf
Gondokoro
Pt. Berkeley
L. Stefanie
Lake Rudolf
CONGO WATERSHED
Mbomu
Welle
Fola Rapids
Dufile
Karamojo Plateau
Wadelai
Bomokandi
Murchison Falls
L. Albert
L. Salisbury
Lindi
Aruwimi
Congo
Equator
Semliki
Ruwenzori
Mruli
L. Choga
Elgon
Ripon Falls
Nzoia
L. Albert Edward
Lake Victoria
Kagera
Kenya
Tana
Guaso Nyiro
Sugota
L. Kivu
Natron
Kilimanjaro
L. Manyara
L. Tanganyika
Lomami
Lowa
Longitude East of Greenwich

Emery Walker sc.

The Name.—The early Egyptians called this river by a name which was probably pronounced Hap. It seems to be connected with a root meaning "concealed," "mysterious." This survived as a religious designation down to the fall of paganism. The "great river" was also a frequent name for the main stream, and this became the usual name of the Nile in late times as Ier-ʿo and continued in use amongst the Copts. In the Bible the Nile is regularly named Yeōr (יְאוֹר, יְאֹר), from the contemporary Egyptian Yor, "river." The origin of the Greek and Roman name Νεῖλος, *Nilus*, is quite unknown. *Αἴγυπτος* in the *Odyssey* is the name of the Nile (masc.) as well as of the country (fem.). The Arabs preserved the classical name of the Nile in the proper name En-Nīl النيل, or Nīl-Misr نيل مصر, the Nile of Misr (Egypt). The same word signifies indigo.[1]

The modern Egyptians commonly call the river El-Bahr, "the sea," a term also applied to the largest rivers, and the inundation "the Nile," En-Nīl; and the modern Arabs call the river Bahr-en-Nīl, "the river Nile."

Basin of the River.—The Nile system is a simple one with three principal divisions: (1) the main stream running south to north, and fed by the great lakes of East Central Africa; (2) the equatorial tributary rivers draining the country north-east of the Congo basin; (3) the Abyssinian affluents. The extent of the basin of the Nile is clearly indicated on the map. Its area is estimated at 1,107,227 sq. m., which compares with the 1,425,000 sq. m. area of the Congo basin. The smaller basin of the longer river is due to its narrowness when passing through the Sahara. Southward the basin includes the northern part of the plateau between the two "Rift" valleys which traverse that part of Africa, and also that portion of the Albertine (or western) "Rift" valley which lies north of the Mfumbiro mountains. That part of the plateau within the Nile basin is occupied by the Victoria Nyanza and its affluents. These affluents drain a comparatively small part of this plateau, which stretches south to Lake Nyasa. The most remote feeder of the Nile in this direction does not extend farther than 3° 20′ S. West and W.S.W. of Victoria Nyanza, however, the Nile basin reaches 3° 50′ S. (264 m. south of the equator) and 29° 15′ E., following the crest of the hills which dominate the north-eastern shores of Lake Tanganyika and the eastern shores of Lake Kivu. Turning north-westward from this point the Nile basin crosses the mountainous region of Mfumbiro and includes that of Ruwenzori. Its limit is marked by the western wall of the

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[1] "*En-Nīl* is the river (lit. the inundation) of Egypt: Es-Saghānī says—'But as to the *nīl* [indigo] with which one dyes, it is an Indian word Arabicized'" (*The Misbáh of El-Fayūmi*).

Albertine Rift valley, in which lie the Albert Edward and Albert Nyanzas. For a considerable distance the water-parting between the Congo and the Nile is close to the Albert Nyanza and to the Nile as it flows from that lake, but not far north of Wadelai (2° 46′ N.) the hills recede and the Nile basin expands westward, over the wide area drained by the Bahr-el-Ghazal and its tributaries. In this region there is no well-marked watershed between the Congo and Nile systems, which interlace. Farther north the limit of the valley is marked by the hills of Darfur. Below that point the valley of the Nile extends but a mile or two into the desert.

The south-eastern limits of the Nile basin extend nearly to the western escarpment of the eastern Rift valley—the dividing plateau being a narrow one. North of the equator a bend is made westward to Mt. Elgon, which on the north-east sends its water towards Lake Rudolf. From Mt. Elgon the Nile watershed is some distance to the west of that lake, while to its north a turn is made again, the watershed including a great part of the Abyssinian highlands. Beyond 15° N. it follows a line generally parallel to the west shore of the Red Sea, except where diverted to the west by the basin of the Khor Baraka.

Sources of the Nile.—The question of the sources of the Nile opens up a time-honoured controversy (see under *Story of Discovery* below). Victoria Nyanza (*q.v.*) is the great reservoir whence issues the Nile on its long journey to the Mediterranean. But if the source of the river be considered to be the most remote headstream (measured by the windings of the stream), the distinction belongs to one of the upper branches of the Kagera. Among the feeders of Victoria Nyanza the Kagera is by far the most important, both for length of course and volume of water carried, draining the region of greatest rainfall round Lake Victoria. Three chief branches unite to form the Kagera, and of these the most important for the volume of water carried is said to be the Nyavarongo. The Nyavarongo is formed by the union of various mountain streams, the Rukarara and the Mhogo being the chief. The Rukarara rises in about 2° 20′ S., 29° 20′ E., at an elevation of some 7000 ft., in a picturesque and bracing region immediately east of the Albertine Rift valley. The Nyavarongo first flows north to about 1° 40′ S., then turning in a sharp bend east and south, and on again reaching 2° 20′ S., unites with the Akanyaru just west of 30° E. The Akanyaru, which comes from the south-west, has been sometimes considered the larger stream, but according to Dr Richard Kandt it carries decidedly less water, while its course is shorter than that of the Nyavarongo. The combined stream takes an easterly and southerly direction, flowing in a swamp valley and joining a little west of 31° E. the third branch of the Kagera, the Ruvuvu, coming from the south. The source of the Ruvuvu is in about 2° 55′ S., 29½° E., but its most southern tributary, and the most distant stream sending its waters towards the Nile, is the Lavironza. The Lavironza rises in about 3° 45′ S., 29° 50′ E., and flows north-east, joining the Ruvuvu, which has hitherto had an easterly direction, in about 30° 25′ E., 3° 10′ S. From this point the Ruvuvu flows east and north to its junction with the Nyavarongo. From this confluence the combined stream of the Kagera flows north and north-west in a level valley strewn with small lakes until almost 1° S., when it turns east, and finally empties itself into Victoria Nyanza just north of 1° S., the mouth forming a small projecting delta. Its lower course is navigable by shallow draught steamers. The total length of the Kagera, reckoning from the source of the Nyavarongo, is some 430 m. Its volume is stated to vary between 21,000 and 54,000 cub. ft. per second. All the other feeders of Victoria Nyanza are small and often intermittent rivers, the largest being probably the Nzoia, which enters on the north-east from the plateaus south of Mount Elgon. (The rivers which enter Albert Edward and Albert Nyanzas and, with those lakes, form the western sources of the Nile, are dealt with under ALBERT NYANZA and ALBERT EDWARD NYANZA.)

The Victoria or Somerset Nile.—The ridge of high land which forms the northern shore of Victoria Nyanza is broken at its narrowest part, where the pent-up waters of the lake—through which a drift from the Kagera inlet to the Nile outlet is just perceptible—have forced a passage at the northern end of a beautiful bay named Napoleon Gulf. At this spot, 30 m. north of the equator, at an altitude of 3704 ft., the Nile issues from the lake between cliffs 200 and more ft. high with a breadth of some 500 yds. The scene is one of much grandeur. The escaping water precipitates itself over a rocky ledge with a clear fall of 16½ ft. The falls, some 300 yds. across, and divided into three channels by two small wooded islands, are named the Ripon Falls, after Earl de Grey and Ripon (afterwards 1st marquess of Ripon), president of the Royal Geographical Society in 1859. The Victoria or Somerset Nile, as this section is called, has at first the character of a mountain stream, racing swiftly through a rocky channel often walled in by cliffs (at times 180 ft. high) and broken by picturesque islands and countless rapids. It receives the waters of several streams, which, rising within a few miles of the Victoria Nyanza, flow north. For 133 m. its course is N.N.W., when, on being joined by the river Kafu (on which Fort Mruli stands), about 1° 39′ N., 32° 20′ E., it takes the north-east direction of that channel, and it is not till 2° N. that the river again turns westward towards the Albert Nyanza. Seventy miles below the Ripon Falls the Nile enters a marshy lake of irregular outline, running mainly east and west, and known as Kioga (or Choga). The current of the Nile is clearly discernible along the western shore of this lake, which is 3514 ft. above the sea. Eastwards the lake breaks into several long arms, which receive the waters of other lakes lying on the plain west of Mount Elgon. One of these, named Lake Salisbury, lies in 1° 40′ N. and 34° E.; east of this lake and connected with it is Lake Gedge. Lake Kioga also receives the Mpologoma, a river which rises in the foothills of Elgon and flows east and north, attaining a width of 1½ m.; and from the south (west of the Nile) a broad lacustrine river, the Seziwa. The Kioga lake system, lying north of the ridge which separates it from Victoria Nyanza, owes its formation in part to the waters pouring down from the Nyanza, and is in the nature of a huge Nile backwater. The lake itself is rarely more than 20 ft. deep; its greatest length is 85 m.; its greatest width 10 m. Below Mruli, the fall in the bed levels of the Nile, which up to this point has been comparatively gradual, increases considerably. At Karuma, where the western bend to the Albert Nyanza is made, the river falls over a wall-like ledge of rock, 5 ft. high, which extends across its bed. But the great feature of the Victoria Nile are the Murchison Falls (named by Sir Samuel Baker, their discoverer, after Sir Roderick Murchison, the geologist), situated in 2° 18′ N. and 31° 50′ E. At this point the river rages furiously through a rock-bound pass, and, plunging through a cleft less than 18 ft. wide, leaps about 130 ft. into a spray-covered abyss. Downstream from these falls the river flows for some 14 m. between steep forest-covered hills, a wide and noble stream with a current so slow and steady that, at certain seasons, it is only from the scarcely perceptible drifting of the green water-plants called *Pistia Stratioles* that it can be observed. About 24 m. below the Murchison Falls and 254 m. from the Victoria Nyanza the river enters, through a wide delta, and across a formidable bar, the N.E. end of Albert Nyanza. In its passages from the one lake to the other the Nile falls altogether about 1400 ft. Taking its name from a fort which once existed there, the delta district is known as Magungo.

From Albert Nyanza to the Plains.—Issuing from the north-west corner of Albert Nyanza some 5 m. from the spot where it entered that lake, the Nile, which is now known as the Bahr-el-Jebel, or Mountain river, flows in a generally northerly direction. As far as Dufile, 130 m. below Magungo, it has a gentle slope, a deep channel and a current generally slight. It forms a series of lake-like reaches often studded with reedy islands. Immediately below Dufile the Kuku mountains on the west and the Arju range on the east close in upon the river, which, from an average width of 700 yds., narrows to 230 yds. Here the hills cause the stream to make a sharp bend from the north-east to the north-west. Four or five miles lower down the river widens to 400 yds., and a large island divides the stream, the eastern channel carrying the main volume of water. This island marks the beginning of the Fola Rapids. At its southern end the water falls some 20 ft., and then, like a gigantic mill-race, rushes through a gorge 330 ft. long and nowhere more than 52 ft. wide, to leap into a deep cavity not more than 40 ft. across. Escaping from this "cauldron" the waters thunder on in a succession of rapids, which extend beyond the northern end of the island. In all the Fola Rapids are nearly 2 m. long. For the next 80 m. the Nile, save for the great volume of water, resembles a mountain torrent, its course interrupted by continual rapids. The last of these occurs at Bedden, where the river breaks through a line of low hills running athwart its channel. One of these hills forms an island in mid-stream. Below Bedden various stations are established upon the river. Fort Berkeley, in 4° 40′ N. (on the right bank), is the nearest to the rapids. Then follow Rejaf (left bank), Gondokoro (right bank) and Lado (left bank), all within 30 m. of one another. A striking feature of the scenery at Rejaf is a cone-shaped hill, about 370 ft. high, crowned by rocks which have the appearance of the ruins of an ancient castle. At Gondokoro the Nile is clear of the hill country, and enters a vast swamp-like expanse through which it flows with a very low slope and a very tortuous channel.

Between Albert Nyanza and the swamp region the Bahr-el-Jebel is joined by many streams. The most important of these affluents is the Asua (nearly 200 m. long), which enters the main stream from the east in 3° 50′ N. (19 m. N. of Dufile), but has little water in the dry season. The Asua and its subsidiary streams rise on the western versant of the Karamojo plateau and among the mountain ranges which run off from that plateau to the north-west, the most remote head-stream running originally due south.

The Region of Swamps.—The wide valley which the Nile enters at Gondokoro slopes so gradually towards the north that the river falls only some 182 ft. in a stretch of 475 m. Through this valley the river winds in an extremely tortuous course. Its channel has no banks, and the overflow has caused extensive swamps which are covered by a mass of papyrus and tall reeds, and are traversed by numerous shallow lagoons or "mayyas." The shape of these lagoons is constantly altering, as also is that of the channels connecting them with the river. About 8 m. below Bor, many of the eastern "spills" unite and form a stream of considerable breadth, with a strong current. This stream, which is known to the Dinkas as the Atem, follows a course generally parallel to the Jebel, being bounded eastward by forest land. Opposite Kanisa (6° 46′ N.), on the main river, the Atem divides into two channels, marshy land extending at this point a great distance to the east. The western branch, or Awai, rejoins the Jebel near Shambé 7° 6′ N. The eastern branch or Myding continues through the marshes, eventually joining the Bahr-el-Zeraf (see below) in its lower course.

Except for the Atem divergence the Nile, despite the swamps through which it passes, maintains a fairly definite course, with a considerable depth of water as far as Shambé, where, to the west, is a large lagoon. Five miles lower down the river splits into two great channels. That to the left, the main stream, continues to be known as Bahr-el-Jebel, but is sometimes called by its Dinka name Kir. The right branch, or Bahr-el-Zeraf (Giraffe river), has a more easterly direction, and does not rejoin the main river until 50 m. below its confluence with the Bahr-el-Ghazal (*q.v.*). From the point of bifurcation the Bahr-el-Jebel flows for 230 m. in a general north-westerly direction until it is joined by the Bahr-el-Ghazal coming from the south-west. The whole region is a vast expanse of low land crossed by secondary channels, and flooded for many miles in the rainy season. At the junction of the Bahr-el-Ghazal and the Bahr-el-Jebel in 9° 29′ N. the permanently submerged area is usually named Lake No, but the Arabs call it *Moghren-el-Bohur* (meeting of the rivers). Lake No in the rains covers about 50 sq. m. In the Bahr-el-Jebel occur the great accumulations of "sudd" (*q.v.*), masses of floating vegetation which obstruct and, if not removed, prevent navigation. The aspect of the river throughout the sudd region is monotonous and depressing. On all sides stretch reaches of the reed known as *um suf* or mother of wool (*Vossia procera*), ambach, Bus and papyrus. These grasses rise 15 to 20 ft. above the water, so as often to close the view like a thick hedge. The level of the flat expanse is broken only at intervals by mounds of earth, erected by the white ants and covered with a clump of brushwood or trees; the moisture in the air is excessive; mosquitoes and other swamp flies swarm in myriads. And yet touches of beauty are not wanting. Water-lilies (*Nymphaea stellata* and *Nymphaea Lotus*)—white, blue and crimson—often adorn the surface of the stream. Occasionally the rare and odd-looking whale-headed stork or *Balaeniceps rex* is met with among the reeds, and at night the scene is lit up by innumerable fire-flies.

The White Nile.—From the confluence with the Bahr-el-Ghazal at Lake No, the main stream, which here takes the name of Bahr-el-Abiad, or White river, adopts the easterly course of the tributary stream. Forty miles below the point where the Bahr-el-Zeraf reunites with the main branch, the Nile receives its first great eastern affluent—the Sobat (*q.v.*), whose head-streams rise in the mountains of south-west Abyssinia and the region north of Lake Rudolf. Just above the Sobat junction the Nile resumes its northern course. It passes through a great alluvial plain, stretching from the spurs of the Abyssinian highlands in the east, to the hilly districts of Kordofan in the west, and covered with high grass and scattered bush. The swamps still bound it on either bank, but the river again flows in a well-marked channel with defined banks. About 56 m. below the Sobat mouth, in 9° 55′ N., lies (on the left bank) Fashoda (renamed in 1904 Kodok), an Egyptian town founded in 1867 on the site of Denab, the old "capital" of the Shilluks, and famous for the crisis between England and France in 1898 through its occupation by the French officer Marchand. For the next 270 m. the scenery is very monotonous. The river flows in a wide channel between broad swamps bordered by a belt of forest on either bank. At Abu Zeid (about 13° 5′ N.) for a distance of nearly 4 m. the river is extremely broad and shallow, being fordable at low water. Fifteen miles lower down, at Goz Abu Goma—which is the northern limit of the sudd vegetation—the river is divided into two channels by Abba Island, wooded, narrow and 28 m. long. On Abba Island lived, for some years before 1881, Mahommed Ahmed, the Mahdi.

The Blue Nile.—Five hundred and twenty miles below the Sobat mouth and 1652 m. from Ripon Falls, in 15° 37′ N., the White Nile is joined by its greatest eastern confluent the Bahr-el-Azrak or Blue Nile. In the fork of the two rivers stands Khartum,[1] the capital of the Anglo-Egyptian Sudan, whilst on the western bank of the White Nile is Omdurman, the former Mahdist capital. The Blue Nile, or Abai as it is called in Abyssinia, rises in the Gojam highlands in 11° N. and 37° E., and flowing northwards 70 m. enters Lake Tsana (*q.v.*) near its south-west corner, to issue again at the south-east end. The Abai and its tributaries drain a great part of the Abyssinian plateau. The complicated river system is best understood by a study of the map. The Abai itself on leaving Lake Tsana makes a great semicircular sweep S.E. to N.W., from the highlands of Ethiopia to the plains of Sennar. In this section of its course its swirling waters rush over a long series of cataracts and rapids, descending from a height of 5770 ft. at the outlet to about 1400 ft. at Fazokl or Famaka (11° 17′ N., 35° 10′ E.), where it crosses the Abyssinian frontier, and flows through the plains of Sennar to its confluence with the White Nile at Khartum, 1300 ft. above sea-level. Of the tributaries of the Abai the majority join it on its left bank. The Bashilo, Jamma and Muger, which reach the Abai in the order named, drain the country east of the main stream between the basins of the Takazze and the Hawash. The Guder, with a south to north course, rises in the mountains which form the watershed between the Nile and the Lake Rudolf basin. Next comes the Didessa, a large stream rising near the head-waters of the Baro (the main upper branch of the Sobat) and flowing N.W. to the Abai, the confluence being in about 10° N., 35° 40′ E. It has an early rise and a long flood period, being by far the most important tributary of the Blue Nile. The Dabus or Yabus rises about 9° N., 34° 30′ E., and flowing north joins the Abai near the spot where that river breaks through the Abyssinian hills. All these affluents are perennial, as is the Bolassa or Yesien, a right-hand tributary which reaches the Abai below the Yabus. Four miles below Famaka the river is joined on its left bank by the auriferous Tumat, an intermittent stream. In Sennar it receives on its right bank two considerable tributaries from the Abyssinian heights, the Dinder, a very long but not perennial stream, and the Rahad, waterless in the dry season, copious and richly charged with sediment during the rains from June to September. At this period the discharge of the Blue Nile rises from less than 200 to over 10,000 cub. metres per second, thus greatly exceeding that of the White Nile itself, which is only about 800 cub. metres during the floods above the confluence. The length of the Blue Nile is about 850 m. The country, El Gezira, enclosed in the triangle formed by the junction of the White and Blue Niles forms the most fertile portion of the Sudan. It only requires irrigation to render it one of the finest grain-producing areas in the world.

The Atbara.—Two hundred miles below Khartum—at Ed-Damer—the Nile is joined by the last of its tributary streams—the Atbara or Bahr-el-Aswad (Black river). The Atbara, some 800 m. long, rises in the tableland north of Lake Tsana, being formed by the junction of the Angreb, Salaam, Aradeb, Goang and other mountain streams. Making its way towards the Nubian plains, the river flows in a north-westerly direction, joining, in 14° 10′ N., 36° E., the Bahr Setit or Takazze (see ABYSSINIA), a river coming from the east and having a volume of water as large as, if not larger than, the Atbara. The united stream preserves, however, the name of Atbara, and at its confluence with the Nile has a breadth in flood time of over 600 yds. The Atbara and its tributaries, like many of those which feed the Blue Nile, rapidly dwindle after the rains into the smallest limits. In its lower course the Atbara runs completely dry, but higher up water may be found in deep pools, hollowed out of the sand bed of the stream by the river when in flood. These pools are full of fish, turtles, crocodiles and hippopotami, which remain imprisoned until the return of the flood. The country comprised between the Nile proper, the Atbara and the Blue Nile is identified with the island of Meroë of ancient history.

The Cataracts.—Downstream of the Atbara junction the Nile continues its course to the Mediterranean, traversing a distance of over 1600 m. without receiving a single tributary on either bank. Below Khartum the river makes a great **S**-shaped bend, and leaving behind the cultivable land pierces the Nubian desert. In its progress the volume of water suffers continual diminution from evaporation, owing to the extreme dryness of the air. The valley of the river is here very narrow, and the desert land in places comes right to the water's edge. Elsewhere high and barren cliffs shut in the valley. Between Khartum and Wadi Halfa (the northern end of the great bend), a distance of over 900 m., occurs a series of cataracts, known as the 2nd, 3rd, 4th, 5th and 6th (the 1st cataract is lower down the river at Assuan). That first met with on descending the river from Khartum is the 6th (or Shabluka) cataract. The river here (53 m. below Khartum) is narrow and picturesque. The rapid is 11 m. in length, in which distance the Nile falls some 20 ft.[2] After 188 m. of smooth water the 5th cataract is reached. It begins 28 m. below Berber (a town on the right bank at the head of a caravan route to the Red Sea), and with three principal rapids extends for 100 m.—the drop in this distance being rather more than 200 ft. At the foot of this cataract is the town of Abu Hamed, at the eastern end of the middle of the **S** bend. The 4th cataract begins 60 m. down stream from Abu Hamed. It is 69 m. long and has a drop of 160 ft. Between the 4th and 3rd cataracts there is a stretch of 194 m. on a very gentle slope ($\frac{1}{12000}$). This reach constitutes the province of Dongola, and here the cultivable land on the western side of the river is of greater extent than usual in the desert zone. The 3rd cataract, 45 m. long, has a drop of some 36 ft. After another smooth reach extending 73 m. the 2nd cataract, which ends just above Wadi Halfa, the northern frontier town of the Anglo-Egyptian Sudan, is reached. This cataract is 124 m. long and has a fall of 216 ft. Between the 2nd cataract and Assuan are 214 m. of smooth water with a scarcely perceptible slope, $\frac{1}{12500}$. The average breadth of the river here is 1640 ft. It runs through a sandstone bed, and the current is guided in many places by spurs of masonry built by the ancient Egyptians.

Lower River and Delta.—For some distance above Assuan the river is studded with islands, including those of Philae and Elephantine. The rapids south of the town used to form the 1st cataract, where.

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[1] At Khartum the water of the one river is of a greenish-grey colour, that of the other is clear and blue, except when in flood, when it gains a chocolate brown from its alluvial burden.

[2] The fall in the river-bed, as given in these pages, is an approximation derived from barometric readings only.

in a length of 3 m., the river fell 16½ ft. Since the completion of the great dam and locks at the head of these rapids (Dec. 1902) they have to a certain extent disappeared, and a navigable channel has been formed. The dam, pierced by 180 sluices, stretches across the river—a wall 2000 yds. long and 26 ft. wide at the top. Below the water rushes between rocks in many channels (this being the relics of the cataract). Upstream from the dam a lake some 100 m. in length has been formed. The Assuan Dam was opened on the 10th of December 1902 (see under IRRIGATION). A ladder of four locks on the western side of the dam permits navigation between the upper and lower reaches. At Assuan the banks of the river are bordered by high granite hills. From this point to the apex of the delta the length of the Nile is 605 m. with a slope ($\frac{1}{13000}$) even slighter than that above Assuan. The valley is comparatively narrow, being an almost level depression in a limestone plateau—the area of fertility ends where the land ceases to be irrigated by the river. At Edfu, 68 m. below Assuan, a barrage, known as the Esna barrage, regulates the flow of the water, and at Assiut, 274 m. below Edfu, is another barrage fulfilling the same purpose. Cairo, the capital of Egypt, is built on the eastern bank of the Nile 12 m. north of the apex of the delta.

At the beginning of the delta the Nile separates into two channels, the Rosetta and the Damietta, which join the Mediterranean at its south-east angle. At the bifurcation is a double barrage, by means of which the water can be dammed to the height required for forcing the river into the canals which irrigate the delta. Of the two branches the Damietta is the more easterly. Both are about the same length—146 m.[1] Behind the coast-line, which is low and sandy, are a number of salt marshes or lagoons. Whilst the Damietta branch is gradually silting up, the Rosetta branch is scouring out a wider channel. In time of full flood the depth of the water in either branch is about 23 ft.

Hydrography.—The fertility and prosperity of Egypt and the northern part of the Sudan being entirely dependent on the irrigation of the land by the waters of the Nile, the variation in the supply at different seasons of the year is of vital importance. (In Egypt the height of the flood has been recorded annually, as the chief event of the year, since at least 3600 B.C.) Above the Sobat confluence the Nile traverses a region of heavy rainfall and the water-supply is superabundant. It is from Victoria, Albert and Albert Edward Nyanzas and their feeders, and in a lesser degree from the Bahr-el-Ghazal, that this river obtains its constant supply of water throughout the year. The great lakes and the region of swamps, retaining a large proportion of the water they receive, act as natural reservoirs and prevent the lower Nile from ever running dry in summer. The Abyssinian affluents are the chief cause of the Nile flood. In the equatorial regions rainfall varies from 30 to 80 in. during the year with a mean of about 50. It is heaviest in the months of January, February, March and April, and again in October and November. The most rainy portions of the lake plateau (where alone occurs a rainfall of 60 in. and over) lie along the eastern edge of the Albertine Rift valley, and west and north of Victoria Nyanza. These rains feed Albert Edward and Albert Nyanzas, and, through the Kagera, supply a great part of the water of Victoria Nyanza. The water in the Victoria Nyanza begins to rise in January, the rise becomes marked in June, is at its height in July, the level of the water reaching its lowest at the end of November. The Bahr-el-Jebel is at its lowest in March and April and at its highest in September. The seasonal supply of the Bahr-el-Ghazal does not vary very greatly, the maximum levels occurring in November and December. The Ghazal has but a slight discharge. The Sobat, from December to March, is at its lowest, and is in flood from June to October, during which period the water (milky coloured) which it pours into the Nile equals in volume that of the main stream. It is the colour of the Sobat water which gives its name to the White Nile. The Blue Nile, at its confluence at Khartum, begins to rise in June and is in flood from July to October; the Atbara is also in flood during the same months. The great difference in the supply of water from the equatorial regions and from Abyssinia arises from the fact that the first-named district is one of heavy rain practically all the year round; whereas in Abyssinia the season of heavy rain is usually limited to the months of June to September. Reduced to its simplest expression, the Nile system may be said to consist of a great steady flowing river fed by the rains of the tropics, controlled by the existence of a vast head reservoir and several areas of repose, and annually flooded by the accession of a great body of water with which its eastern tributaries are flushed.

At Khartum the Nile is lowest in April and May and highest in August and September. Its minimum depth is 18 ft. and its maximum depth 25 ft. At Assuan the Nile is at its lowest at the end of May, then rises slowly until the middle of July, and rapidly throughout August, reaching its maximum at the beginning of September; it then falls slowly through October and November. At Cairo the lowest level is reached about the middle of June, after which the rise is slow in July and fairly rapid in August, reaching the maximum at the beginning of October. By using the water stored by the Assuan dam in the months following high Nile, the river lower down has been, since 1902, replenished at times of low water to meet the needs of cultivators (see IRRIGATION: *Egypt*). At Assuan the average rise of the Nile is 26 ft., at Cairo it is 23 ft. A rise of 21 ft. only at Assuan is a "bad Nile"; on the other hand, a rise of 30 ft. causes a danger of flood, or rather it used to do so previous to the building of the dam. When the Nile below the swamps is at its lowest, the water acquires a green colour and a putrid taste and smell. This is caused by innumerable microscopic green algae, which are brought into the White Nile from the marshes of the Bahr-el-Jebel and Bahr-el-Ghazal, and descend the river when it is clear of all suspended matter. This "green water" is seen at Cairo about the end of June or beginning of July, and passes away with the first rise in the later month, the algae being unable to live in turbid water. By August the river in lower Egypt is full of dark red-brown sediment brought down by the Blue Nile and the Atbara from the plateaus of Abyssinia. It is estimated to be then carrying 8 cub. yds. per second; by September this has been reduced to half the amount, and then diminishes rapidly. It has been calculated[2] that the time taken by the water to travel from Khartum to the delta barrage varies from 14 days in September to 42 in May. On the island of Elephantine at Assuan is the famous Nilometer, dating from ancient Egyptian times, altered and extended in Roman times and repaired in 1870 by the Khedive Ismail. It is a well built of hewn stones, marked with scales to record the level of the water, which rises and falls with that of the river. The remains of other ancient Nilometers exist at Philae, Edfu and Esna, together with inscriptions recording about forty high Niles in the XXVth Dynasty, discovered on a quay wall of the temple of Karnak. The data furnished by these give about 4½ in. per century as the rate at which the Nile is silting up its bed north of the 1st cataract. The level of high Nile at the Semna rapids, between the 2nd and 3rd cataracts, is 24 ft. lower than that indicated by the marks sculptured *c.* 2500 B.C. This fall is attributed to the erosive action of the water as it passes over the hard gneiss which at Semna forms a barrier across the stream. The vertical extent of such erosion is equal to about two millimetres a year.

It is noteworthy that from the mouth of the Sobat to the Mediterranean the current of the Nile is generally deepest and strongest on its right (eastern) bank; the Nile in this respect resembling other great rivers of the northern hemisphere. The pressure of the water on the right bank is attributed to the prevailing N.W. winds.[3]

There are now gauges for registering the rise of the water at Cairo, Assuan, Berber and Khartum on the main river; at Wad Medani, Sennar and Roseires on the Blue Nile; El Duem and Taufikia on the White Nile; Nasser on the Sobat; Gondokoro on the Bahr-el-Jebel; and Ugowe, Jinja and Entebbe on Victoria Nyanza.

Navigation.—At high Nile there is uninterrupted water-communication from the sea to Fort Berkeley in 4° 40′ N.—a distance of 2900 m. Owing to the cataracts, navigation between Assuan and Khartum is impossible during low Nile, and from the 1st of March to the 1st of August the upper courses of the Damietta and Rosetta branches are closed to navigation; the water being utilized for summer irrigation in the delta. As far as Mansura (60 m.) on the Damietta branch and Kafr-el-Zayat (70 m.) on the Rosetta branch, and between Khartum and Fort Berkeley (1090 m.) the river is navigable all the year round, though between the Sobat confluence and Bor, navigation is dependent on the channel being kept clear of sudd. Above Fort Berkeley navigation is interrupted by the rapids and cataracts which extend to Dufile, but from the last-named town to Fajao at the foot of the Murchison Falls (a distance of 150 m.) the river is navigable throughout the year. There is a further navigable stretch between Foweira (just above the Karuma rapids) and the southern end of Lake Kioga. The Blue Nile is navigable for steamers during flood time from its confluence at Khartum to Roseires at the foot of the Abyssinian hills, a distance of 426 m. At low water small boats only can go up stream. The Atbara is never navigable, the current during flood time being too swift for boats. Including the Sobat and the Bahr-el-Ghazal the navigable waters of the Nile and its affluents exceed 4000 m.

Owing to the cataracts and the partial closing of the Damietta and Rosetta branches for irrigation purposes, the Nile below Khartum is subsidiary, as a means of communication, to the railways and highroads.[4] Above Khartum the river is the chief channel of trade and commerce. Steamers first ascended the Nile above the cataracts (to Korosko) in 1820. It was not till 1846 that a steamboat was placed on the White Nile. (W. E. G.; F. R. C.)

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[1] In ancient times the delta was watered by seven branches; five of these branches are now canals not always navigable. The ancient branches were, beginning at the west, the Canopic, Bolbitine, Sebennytic, Phatnitic, Mendesian, Tanitic and Pelusiac, of which the modern Rosetta and Damietta branches represent the Bolbitine and Phatnitic [illegible]

[2] By Sir Hanbury Brown, inspector-general of irrigation, Lower Egypt, 1892–1903.

[3] *Egyptian Irrigation* (p. 29), by Sir W. Willcocks (London, 1899).

[4] Between Assuan (Shellâl) and Wadi Halfa the river is, however, the main highway, there being no railway between the places named.

Story of Discovery.—Few problems in geographical research exercised for so long a period so potent an influence over the imaginations of man as that of the origin of the Nile. The ancient Egyptians, as is apparent from the records on their monuments, were acquainted with the main stream as far south as the junction of the White and Blue Niles. They appear also to have known the Blue Nile up to its source and the White Nile as far south as the Bahr-el-Ghazal confluence. Beyond that point the sudd probably barred progress. The knowledge acquired by the Egyptians passed to the Persians and Greeks. Herodotus (about 457 B.C.) ascended the Nile as far as the First Cataract. He was led to believe that the source of the river was far to the west—in the region of Lake Chad. Eratosthenes, superintendent of the Alexandrian library, in a map made about 250 B.C., showed, with fair accuracy, the course of the river as far as where Khartum now stands. He showed also the Atbara and Blue Nile. Eratosthenes was the first writer to hint at equatorial lakes as the sources of the river. Juba II., king of Mauretania (who died about A.D. 20), in his *Libyca*, quoted by Pliny, makes the Nile rise in western Mauretania, not far from the ocean, in a lake presenting characteristic Nile fauna, then pass underground for several days' journey to a similar lake in Mauretania Caesariensis, again continue underground for twenty days' journey to the source called Nigris on the borders of Africa and Ethiopia, and thence flow through Ethiopia as the Astapus. This remarkable story received considerable credence, and may be connected with the theory which made the Niger a branch of the Nile (see below). Strabo (a contemporary of Juba), who ascended the river as far as Syene, states that very early investigators had connected the inundation of the Lower Nile with summer rains on the far southern mountains, and that their theory had been confirmed by the observations of travellers under the Ptolemies. About the same time Dalion, a Greek, is believed to have ascended the White Nile. Nero despatched two centurions on an expedition for the express purpose of exploring the Nile, and Seneca states that they reached a marshy impassable region, which may be easily identified with the country of the White Nile above the mouth of the Sobat. To what they referred when they reported a great mass of water falling from between two rocks is not so readily determined. During this period more accurate knowledge concerning the Nile sources was obtained from the reports of Greek traders who visited the settlements on what is now called the Zanzibar coast. A merchant named Diogenes returning (about A.D. 50) from the east coast of Africa told a Syrian geographer, Marinus of Tyre, that journeying inland for twenty-five days he reached the neighbourhood of two great lakes and a range of snow mountains whence the Nile drew its sources. Marinus published this report in his geographical works. This book is lost, but the information is incorporated in the writings of Ptolemy, who in his book and map sums up all that was known or surmised of the Nile in the middle of the 2nd century of the Christian era. Ptolemy writes that two streams issuing from two lakes[1] (one in 6° and the other in 7° S.) unite in 2° N. to make the Nile, which, in 12° N., receives the Astapus, a river flowing from Lake Coloe (on the equator). His two southern lakes, he conceived, were fed by the melting of snows on a range of mountains running east and west for upwards of 500 m. —the Mountains of the Moon, τὸ τῆς σελήνης ὄρος, *Lunae Montes.* It will be seen that, save for placing the sources too far to the south, Ptolemy's statements were a near approximation to the facts. The two southern lakes may be identified with Victoria and Albert Nyanzas, and Lake Coloe with Lake Tsana. The snow-capped range of Ruwenzori occupies—at least in part—the position assigned to the Mountains of the Moon, with which chain Kilimanjaro and Kenya may also be plausibly identified. On all the subsequent history of the geography of the Nile Ptolemy's theory had an enormous influence. Medieval maps and descriptions, both European and Arabian, reproduce the Mountains of the Moon and the equatorial lakes with a variety of probable or impossible modifications. Even Speke (see below) congratulated himself on identifying the old Ptolemian range with the high lands to the north of Tanganyika, and connected the name with that of Unyamwezi, the "country of the moon."

In the fourteen centuries after Ptolemy virtually nothing was added to the knowledge of the geography of the Upper Nile. Arab writers of the 12th and 13th centuries make mention of the great lakes, and their reports served to revive the interest of Europe in the problem of the Nile. Idrisi made both the Nile and the Niger issue from a great lake, the Niger flowing west, the Nile north. Hence arose much confusion, the Senegal estuary being regarded by its discoverers (1445) as the mouth of a western branch of the Nile. Even until the early years of the 19th century the belief persisted in a connexion between the Nile and the Niger (see further NIGER). Portuguese explorers and missionaries, who in the 15th and 16th centuries visited the east coast of Africa and Abyssinia, gained some information about the equatorial lake region and the Nile,[2] the extent of the knowledge thus acquired being shown in the map of Africa of Filippo Pigafetta, Italian traveller and historian (1533–1603) published in 1580. It was not, however, till the 17th century that the sources of the Blue Nile were visited by Europeans. In 1615 Pedro Paez, a Portuguese priest, was shown them by the Abyssinians. Ten years later another Portuguese priest, Jeronimo Lobo, also visited the sources and left a vivid description of the rise of the river and its passage through Lake Tsana. An English version of the accounts of Paez and Lobo—written by Sir Peter Wyche—was published in 1669 by order of the Royal Society, of which Sir Peter was an original Fellow. Between 1625 (the date of Lobo's visit) and 1770, some attempts were made by French and other travellers to explore the Blue Nile, but they ended in failure. In the last-named year James Bruce (*q.v.*) reached Abyssinia, and in November 1772 he arrived in Egypt, having visited the source of the Blue Nile and followed it, in the main, to its confluence with the White Nile. On returning to Europe Bruce was mortified to find that whilst he was still in Egypt the French geographer D'Anville had (1772) issued a new edition of his map of Africa in which by a careful study of the writings of Paez and Lobo he had anticipated Bruce's discoveries, D'Anville's map is singularly accurate, if we remember the scanty information at his disposal. To Bruce, nevertheless, belongs the honour of being the first white man to trace the Blue Nile to its confluence with the White Nile. He himself, considering that the Blue Nile was the main branch of the river, claimed to be the discoverer of the long-sought *caput Nili*.[3]

From the time of Bruce, interest in the Nile problem grew rapidly. The Englishman W. G. Browne (*q.v.*) when in Darfur (1794–1796) heard that the Abiad rose far south in the Mountains of the Moon, but he makes no mention of the great lakes, and in Major Rennell's map of 1802 there is no hint of equatorial lakes at the Abiad sources. During the French occupation of Egypt the river from the sea to Assuan was accurately surveyed, the results being embodied in Jacotin's *Atlas de l'Égypte* (1807). In 1812–1814 J. L. Burckhardt, the Orientalist, went up the Nile to Korosko, travelled thence across the desert to Berber and Shendi, and crossing the Atbara made his way to the Red Sea. It was, however, due to the initiative of Mehemet Ali, Pasha of Egypt, that the While Nile was explored. In 1820–22 a military expedition under Ismail Pasha, a son of Mehemet Ali, which was joined by the French scientist Frédéric Cailliaud (who had visited Meroë in 1819) ascended the river to the confluence of the White and Blue Niles, founded the city of Khartum, and ascended the Blue Nile to Fazokl. In 1827 Adolphe Linant, a Belgian in the service of the British African Association, ascended the White Nile 132 m. above Khartum, being the first white man to do so since the 1st century A.D. Then followed three Egyptian expeditions sent in 1839–41 and 1842 by Mehemet Ali up the White Nile. The first expedition reached, on the 28th of January 1840, a point 6° 30′ N., the second and third pressed further south, reaching 4° 42′ N.—or the foot of the rapids above Gondokoro. A Turkish officer, Selim Bimbashi, commanded the expeditions, and among the members were the Frenchmen Thibaut (a convert to Islam and for nearly forty years French consular agent at Khartum), D'Arnaud and Sabatier, and a German, Ferdinand Werne. The last-named wrote a scientific account of the second expedition and drew a map of the Nile between Khartum and Gondokoro. An Austrian Roman Catholic mission was established in the Sudan, and in 1850 one of its members, Dr Ignatz Knoblecher, sent to Europe reports, gleaned from the natives, of the existence of great lakes to the south. About the same time two Protestant missionaries, Ludwig Krapf and John Rebmann, stationed on the Zanzibar coast, sent home reports of a vast inland sea in the direction where the Nile sources were believed to be. This sea was supposed to extend from 0° 30′ N. to 13° 30′ S. These reports revived interest in Ptolemy's Geography. The exploration of the Bahr-el-Ghazal by John Petherick, Miss Tinne and her companions, and others followed the opening up of the White Nile (see BAHR-EL-GHAZAL). The general result of the work carried on from the north was that by 1858 the Nile system was known as far south as the rapids at Bedden.

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[1] The two lakes afterwards received the names Lake of Crocodiles and Lake of Cataracts.

[2] Francisco Alvarez, a priest, who was in Abyssinia 1520–1526, afterwards wrote (about 1550) an account of Abyssinia in which he refers to the Atbara as the main Nile.

[3] Bruce, however, acknowledged in his *Travels* that the Abiad (White Nile) at its confluence with the Blue Nile was the larger river. The Abiad, he writes, "preserves its stream always undiminished, because rising in latitudes where there are continual rains, it therefore suffers not the decrease the Nile does by the six months' dry weather."

On the 3rd of August 1858 the English explorer J. H. Speke (*q.v.*) discovered the large *nyanza* (lake), which he rightly conceived to be the head reservoir of the White Nile, and which in honour of the queen of England he named Victoria Nyanza. Captain (Sir Richard) Burton and Speke had gone inland from Zanzibar to investigate the reports concerning the vast lake which Rebmann and Krapf had called the Sea of Unyamwezi. These reports proved to be exaggerated accounts of three distinct lakes—Nyasa, Tanganyika and Victoria Nyanza. In 1860 Speke returned to Zanzibar accompanied by J. A. Grant (*q.v.*), bent on solving the problem of the Nile. In spite of great difficulties he made his way to Uganda, on the north-west of Victoria Nyanza, and (without exploring the lake) succeeded in reaching its outlet. On the 28th of July 1862 Speke stood by the Ripon Falls—the birthplace of the Nile. In his journey he had discovered the Kagera river, now known to be the most remote headstream of the Nile, a fact of which Speke was uncertain, though he recognized that it was the largest river entering the nyanza. Speke and Grant paddled down the Nile a short distance, but before reaching Lake Kioga they were stopped by hostile natives and compelled to go westward to Unyoro. There they heard of another great lake further west, but the king of Unyoro refused them permission to visit it. In the end they descended the Kafu river to its confluence with the Nile and then down the main stream to the Karuma Rapids. Here Speke and Grant left the river, and travelled overland east of the stream, which they did not strike again until just above the Ausa confluence. Thence they travelled down the Nile to Gondokoro, reached on the 15th of February 1863.

This remarkable journey virtually solved the Nile problem so far as the source of the main stream was concerned, but there remained much to be done before the hydrography of the whole Nile basin was made known. At Gondokoro Speke and Grant met Mr (afterwards Sir Samuel) Baker[1] and his wife—a Hungarian lady—who had journeyed thither to afford the explorers help. To Baker Speke communicated the news he had heard concerning the western lake, and this lake Baker determined to find. On the 26th of March 1863 Baker and his wife left Gondokoro, and despite much opposition, especially from slave-dealers, followed, in the reverse direction, the route of Speke and Grant as far as Unyoro, whence they journeyed west. On the 14th of March 1864 they struck the lake (Albert Nyanza) on its S.E. side. They paddled up the lake to the point where a large river coming from the east poured its waters into the lake. This stream, which they rightly conjectured to be Speke's Nile, they followed up to the Murchison Falls. Thence they went overland to the Karuma Rapids, and so back to Gondokoro by their old tracks. It fell to the lot of General C. G. Gordon (when that officer administered the Egyptian Equatorial provinces) and his assistants to fill up the gap left by Speke and Baker in the course of the main stream. In 1874–75 two English engineer officers—Lieut. (afterwards Colonel Sir Charles M.) Watson and Lieut. H. Chippendall—followed the river between Gondokoro and Albert Nyanza; in 1876 an Italian, Romolo Gessi Pasha, circumnavigated that lake, proving Baker's estimate of its size to be vastly exaggerated; Gordon in the same year traced the river between Murchison Falls and Karuma Rapids, and an American, Colonel C. Chaillé-Long followed (1874) the Nile from the Ripon Falls to the Karuma Rapids, discovering in his journey Lake Kioga (which he named Ibrahim). In this manner the identity of the Victoria Nile with the river which issued from the Albert Nyanza was definitely established.

In 1874 H. M. Stanley (*q.v.*) went to Africa with the object of completing the work left unfinished by David Livingstone, who believed, erroneously, that the ultimate sources of the Nile were far to the south (see CONGO). Stanley, in 1875, circumnavigated Victoria Nyanza, setting at rest the doubt thrown on Speke's statement that it was a huge sheet of water,[2] but proving Speke mistaken in believing the nyanza to have more than one outlet. On the same journey Stanley encamped at the foot of the Ruwenzori range, not knowing that they were the "Mountains of the Moon," whose streams are the chief feeders of Albert Nyanza. (At the time of his visit the snow-peaks and glaciers were hidden by heavy clouds.) In 1888, however, Stanley saw the mountains in all their glory of snow and ice, discovered Albert Edward Nyanza, and traced the river (Semliki) which connects it with Albert Nyanza. The Semliki had been discovered, and its lower course followed in 1884 by Emin Pasha. Thus at length the riddle of the Nile was read, though much was still to do in the matter of scientific survey, and in the exploration of the valley of the Sobat (*q.v.*). The Kagera had been partly explored by Stanley (1875), by whom it was called the Alexandra Nile, and between 1891–98 its various branches were traced by the German travellers Oscar Baumann, Richard Kandt and Captain H. Ramsay, and by Lionel Dècle, a Frenchman. A British officer, Colonel C. Delmé-Radcliffe, made the first accurate survey (1900–1901) of the Nile between Albert Nyanza and Gondokoro. In 1903 an Anglo-German commission under Colonel Delmé-Radcliffe and Captain Schlobach made a detailed survey of the Kagera from 30° E. to its mouth. The Kioga system was surveyed in 1907–1908 by Lieut. C. E. Fishbourne. A trigonometrical survey of the upper river was begun by Colonel M. G. Talbot, director of Sudan surveys, in 1900, and other surveys were made by Captain H. G. Lyons, director-general of the Egyptian survey department. A fish-survey of the waters of the Nile was also undertaken.

The Removal of Sudd.—As already stated, the sudd above the Sobat confluence seems to have stopped the Roman centurions sent by the emperor Nero to explore the Nile. When the river above the Sobat was again reached by white men (1840) the stream was clear of sudd, and so continued until 1863–1864, when both the Bahr-el-Jebel and the Bahr-el-Zeraf became blocked by floating masses of vegetation. When Baker proceeded to Gondokoro in 1870 he thus described the increase that neglect had caused in the obstruction: "The immense number of floating islands that were constantly passing down the stream of the White Nile had no exit; thus they were sucked under the original obstruction by the force of the stream, which passed through some mysterious channel, until the subterranean passage became choked with a wondrous accumulation of vegetable matter. The entire river became a marsh, through which, by the great pressure of water, the stream oozed through innumerable small channels. In fact, the White Nile had disappeared." Baker, who had to cut through 50 m. of sudd in his passage to Gondokoro, urged to Khedive

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[1] Baker and his wife had in 1861–1862 explored the Atbara (to its upper waters) and other eastern tributaries of the Nile.

[2] In the map issued in 1873 to illustrate Schweinfurth's book, *The Heart of Africa*, Victoria Nyanza is shown as five small lakes.

Ismail to reopen the Nile. This work was efficiently done by Ismail Ayub Pasha, and the White Nile was clear for large vessels when Gordon reached Khartum in 1874. The river did not long remain free, for in 1878 Emin Pasha was unable to ascend the Bahr-el-Jebel from the south on account of sudd. It was cleared in 1879–1880 by officials in the Egyptian service, but had again accumulated in 1884. In consequence of the Mahdist movement nothing could then be done to clear the river, and the work was not taken in hand again until 1899, when, by direction of Sir William Garstin, the Egyptian inspector-general of irrigation, an expedition under Major Malcom Peake, R.A., was sent to cut through the sudd, which then extended from the Bahr-el-Ghazal confluence almost to Gondokoro. During 1900 a channel was cut through the northern and heaviest portion of the sudd. The work was one of much difficulty, some of the blocks being 1 m. long and 20 ft. deep; the water beneath flowed with great velocity. To remove the obstruction the surface was first burnt; then trenches were cut dividing the sudd into blocks 10 ft. square, and each of these was hauled out with wire hawsers and chains by gunboats working from below. For a distance of 172 m. N. of Shambe (*i.e.* about midway between the Ghazal confluence and Gondokoro) the true bed of the river could not, in many places, be found, but Major Peake forced a passage to Gondokoro through a spill channel or series of shallow lakes lying west of the main stream. In 1901 Lieut. Drury, a British naval officer, removed many of the remaining blocks of sudd, opening to navigation a further 147 m. of the river. Beyond this point for a distance of 25 m. the Bahr-el-Jebel could not be traced, so completely was the channel choked by sudd. In 1902, however, Major G. E. Matthews discovered the true bed of the river, which by 1904 was completely freed from obstructions, and freedom of navigation between Khartum and Gondokoro was permanently secured. The effect of the sudd-cutting operations on the supply of water available for irrigation purposes in the lower river was slight. Nevertheless, Sir William Garstin reported that the removal of the sudd "undoubtedly checked the fall in the river levels which would otherwise have taken place."

Political Relations.—Explored in part by Egyptian government expeditions, the upper Nile as far south as Albert Nyanza became subject, between 1840 and 1882, to Egypt. Possession of the greater part of the river above Wadi Halfa then fell to the followers of the Mahdi. In 1896–98 an Anglo-Egyptian army reconquered the country, and from Victoria Nyanza to the Mediterranean the main river came under British or Egyptian administration. The west bank of the Bahr-el-Jebel, as far north as 5° 30′ N., was in 1894 taken on lease from Great Britain by the Congo Free State during the sovereignty of Leopold II., the territory leased being known as the Lado enclave (*q.v.*). The Kagera, the main headstream, lies almost wholly in German East Africa.

AUTHORITIES.—For the story of exploration see the works of Bruce, Speke, Grant, Baker and other travellers (whose books are mentioned in the biographical notices). Their achievements, and those of ancient and medieval explorers, are ably summarized in *The Story of Africa*, vols. ii. and iii., by Dr Robert Brown (London, 1893–1894), and *The Nile Quest*, by Sir Harry Johnston (London, 1903). See also J. Partsch, *Des Aristotel's Buch*: "*Über das Steigen des Nil*" (Leipzig, 1909). For the Kagera region consult *Caput Nili*, by Richard Kandt (Berlin, 1904). Latest additions to geographical knowledge are recorded in the *Geographical Journal* (London) and the *Cairo Scientific Journal*. For the hydrography, geology and climate see: *The Physiography of the River Nile and its Basin*, by Captain H. G. Lyons, director-general, survey department, Egypt (Cairo, 1906), an authoritative work, and numerous other publications of the Survey and Public Works Departments; "Notes on the History of the Nile and its Valley," by W. F. Hume, in *Geog. Jnl.* (Jan. 1906); *Egyptian Irrigation* (2nd ed., London, 1899) and the *Nile Reservoir Dam at Assuan and After* (London, 1901), both by Sir William Willcocks; the *Annual Reports* (1899 and after) of the Egyptian Public Works Department, by Sir William Garstin and others, and those on Egypt and the Sudan by Lord Cromer and Sir Eldon Gorst (London; official publications). Of special value is the Blue Book *Egypt No. 2, 1904*, which is a report by Sir William Garstin on the basin of the upper Nile, dealing at length with the lake area, the Nile affluents and the main river as far south as Khartum, from the topographical as well as the hydrographical aspect. Sir W. Garstin and Captain Lyons give full bibliographical notes.

The study of the zoology of the Nile valley was the special object of a Swedish scientific expedition in 1901, under the direction of Prof. L. A. Jägerskiöld. The *Results* were published at Upsala, pt. iii. appearing in 1909. For the botanical and other aspects of the Nile valley, see the works of Petherick, Heuglin, Schweinfurth, Junker and Emin. An orographical map of the Nile basin was published by the Survey Department, Cairo, in 1908. It is in six sheets on a scale of 1:2,500,000, with inset maps showing political divisions, distribution of rainfall and of vegetation. (F. R. C.)

NILE, BATTLE OF THE. This was fought between the British and French fleets on the 1st of August 1798 in the roadstead of Aboukir. The peace of Campo Formio, signed on the 17th of October 1797, had left France without an opponent in arms on the continent. War with Great Britain still continued, and for a time the Directory appeared to be intent on its schemes for an invasion of Ireland. Napoleon, fresh from his Italian victories, was appointed to command, and he made a round of inspection of Brest and the Channel ports. But all this show of activity was designed to cover the preparations for an attack on Great Britain "from behind"—in India and by way of Egypt. The French naval forces at Toulon were got ready slowly in spite of Napoleon's urging and with the defects inevitable in the impoverished state of the arsenal. Thirty-six thousand soldiers, including the best of the army of Italy, were to be embarked from the southern French ports, from Italy and from Corsica. Information that a great offensive movement was about to be made by the French reached both Earl St Vincent, the commander-in-chief of the Mediterranean fleet, and the British government. Since Spain had entered into alliances with France in 1796, the British fleet had not cruised in the Mediterranean but had been occupied in blocking the Spanish ships at Cadiz. On the 2nd of May 1798 St Vincent detached Nelson, then the junior rear-admiral, with his flag into the Mediterranean, with three sail of the line and frigates to make a reconnaissance at Toulon. On the 17th of May a small French corvette was captured near Cape Sicié, and from the crew Nelson learnt that the French were still in the harbour. He could gain no information as to the aim of the armament. Napoleon enforced strict secrecy by not letting even the most important officers of the dockyard know whither he was bound. On the 2nd of May the British government had written to St Vincent stating their wish that a part of his fleet should be sent into the Mediterranean. The first lord of the admiralty, Lord Spencer, told him that he might either go himself or send a subordinate. If the latter course was followed Nelson was indicated as the officer to be chosen. Reinforcements were sent to him to enable him to provide both for the cruise in the Mediterranean and for the blockade of Cadiz. St Vincent had already selected Nelson, and when the reinforcements arrived he despatched Captain Troubridge with the inshore squadron engaged in watching Cadiz—"the choice fellows," as he described them, of his fleet—to join Nelson at Toulon. The ships were replaced by others similarly painted, so that the Spaniards might see no difference and therefore be unable to send news to their ally. Troubridge left on the 24th of May with as many vessels as would bring Nelson's whole command up to thirteen 74's and one 50-gun ship.

While these measures were being taken to intercept him, Napoleon had put to sea on the 19th of May with fifteen sail of the line, twelve frigates and some two hundred transports. He sailed down the eastern side of Corsica and Sardinia to pick up the detachments which were to join him from the first-named island and from Civita Vecchia. On the evening of the 20th a gale from the N.W. brought some confusion on his flock of ships, but it also drove Nelson to the S.W. His flagship the "Vanguard" (74) was dismasted and compelled to anchor at San Pietro to refit. His frigates were separated from him by the weather, and the captains made for Gibraltar, concluding that the admiral would go there to refit. The departure of his frigates left Nelson without vessels for scouting and had a material influence on the campaign. The "Vanguard" was made ready by the 27th of May, and resumed her station off Toulon. On the 7th of June Nelson was joined by Troubridge. Calms hampered his pursuit of the French, whom he now knew to be at sea, but on the 14th he was off Civita Vecchia; on the 17th he was at Naples, where he heard that the French had been seen going south, and made arrangements to obtain water and stores in the Neapolitan ports. On the 20th he was at Messina, where he first got definite information of the movements of the enemy. The French had appeared off Malta on the 9th and had occupied the island, which was surrendered to them on the 12th by the treachery of the French and Italian members of the order. Pushing on in the hope of finding them on the coast of the island, Nelson was off Cape Passaro on the 22nd, and there learnt that the French had sailed from the island. His instructions directed him to guard against possible French attacks on Sicily, or even an attempt to pass the Straits of Gibraltar and sail for Ireland.

But Nelson knew that the Neapolitan government had no fears for Sicily and that the westerly winds would prevent the French from going to Gibraltar. On a view of all the circumstances, and after consultation with those of his captains in whose judgment he had the most confidence, he came to the just conclusion that they were bound for Egypt. He therefore sailed for Alexandria on the most direct route eastward along the coast of Africa. The information given him at Cape Passaro was that the French had left Malta on the 16th; the actual date was the 19th. Napoleon, whose frigates had sighted the British squadron, and who knew that he might be pursued, did not take the direct route, but steered to the north-east along the south shore of Crete. Thus it happened that on the night of the 22nd of June the fleets crossed one another's tracks. Want of look-out vessels prevented Nelson from detecting the neighbourhood of his enemy. The French with their convoy going more slowly on the longer route to the north, and the active British squadron on the direct route to the south, both headed for Egypt, with barely 60 m. of sea between them, but neither aware of the position of the other.

On the 28th of June Nelson reached Alexandria to find the port occupied only by a few Turkish ships. It was from Nelson that the Turkish authorities gained their first knowledge of the impending invasion. Nelson, misled by the false date given him at Cape Passaro, and being unable to reconnoitre the position of the enemy, came to the erroneous conclusion that he was mistaken in supposing that the French were on the way to Egypt, and that they must be bound for some other part of the eastern Mediterranean. On the 29th of June he sailed from Alexandria, standing to the north-east. His topsails were still in sight to the north-east when the French appeared coming from the north-west. They sighted the coast on the 29th to the west of Alexandria, and on the 1st of July they occupied the anchorage and town. While Nelson was ranging along the coast of Asia Minor, seeking for news of them and finding none, on his way back to Sicily, the French were landing their army. The British squadron reached Syracuse on the 19th of July. Here Nelson was able to obtain water and stores and clear indications that the French had gone to Egypt. On the 24th he sailed, and on the 1st of August was again off Alexandria. The battle of the Pyramids had been fought on the 21st, and Napoleon was master of Egypt. The fear of the British admiral was that the French fleet had left the coast in the interval of his absence. Brueys, the French admiral, had had a choice of three courses open to him—to enter the old harbour of Alexandria, to sail for Corfu then occupied by the French or to take a strong anchorage on the coast and prepare to repel attack. To enter the harbour was difficult for large ships, and to leave it by its one narrow entrance in the presence of even an inferior force would have been impossible. Brueys therefore decided against that course. He did not sail for Corfu, partly because some of the army stores were still in his ships and partly because his squadron, ill fitted from the first, was short of provisions, and no more could as yet be obtained from the shore. He therefore stationed himself with thirteen of his ships of the line in the roadstead of Aboukir, some 15 m. north-east of Alexandria, between the island of Aboukir and the Rosetta mouth of the Nile. Here he was found on the evening of the 1st of August when the British fleet came in sight. The French line of thirteen ships was anchored to the east of Aboukir, now called Nelson's Island, in a curve stretching to the south-east. It consisted of the "Guerrier" (74), the "Conquérant" (74), the "Spartiate" (74), the "Aquilon" (74), "Souverain Peuple" (74), "Franklin" (80), "Orient" (120), Admiral Bruey's flagship "Tonnant" (80), "Heureux" (74), "Timoléon" (74), "Guillaume Tell" (80), "Mercure" (74) and "Généreux" (74), counting from the west end. The French ships had begun the voyage short-handed and many men were absent on shore filling the water-casks. They fought with a half to two-thirds of their complements, which suffered from the bad training and inexperience of the French republican navy. A council of flag officers and captains was being held in the "Orient" when the British squadron appeared.

When the enemy was sighted Nelson at once gave the order to attack. All the possibilities of battle had been fully discussed between him and his captains. Much controversy of a rather idle character has taken place as to assigning the credit for the actual course adopted; it was almost dictated to men so experienced and capable as the British captains and their admiral by the position of the enemy. If the French had been anchored so near the shore that it was not possible to pass between them and it, the British ships, coming from the west with a westerly wind, would have passed outside of them, endeavouring to anchor one on the bow and the next on the quarter of each French ship in succession. Those in the van might have been crushed before the ships in the rear and to leeward could come to their assistance. As it was, the French were so placed that there was room for the British ships to pass between them and the land. Therefore it was possible for the first comers of the British squadron to pass inside the French ships, to anchor there, and to allow the next comers to anchor outside so as to put the enemy's van between two fires. This disposition was not without its drawbacks, for it entailed the risk that the British ships might fire into one another while directing their guns on an object between them. The risk was the greater because the battle began at sundown and was continued in the dark. Yet it had the advantage that it produced an intense concentration of fire. In the circumstances it had the peculiar advantage, of which, however, the British captains may not have been aware, that as the French were very short-handed they were unable to work both broadsides to the full. It is to this fact that we must attribute the comparatively small loss suffered by the British ships in an attack which, if made against a well-appointed enemy, must have been extremely costly. Whether by previous arrangement with Nelson, or because he acted on the facts before him, the first British captain to come into action, Captain Foley of the "Goliath" (74), passed inside the French, and anchored abreast of the second of them, the "Conquérant." The "Zealous" (74), under Captain Hood, anchored on the bow of the first Frenchman, the "Guerrier." The "Audacious" (74), under Captain Davidge Gould, anchored between the "Zealous" and "Goliath." The "Theseus" (74), under Captain Miller, anchored inside of the third French ship, the "Spartiate." The "Orion" (74), under Captain Saumarez, anchored abreast of the fifth French vessel, the "Souverain Peuple." Then Nelson, in his flagship the "Vanguard" (74), the sixth British ship to come into action, anchored on the outside of the French line abreast of the "Spartiate" already engaged with the "Theseus." The "Minotaur" (74), under Captain Thomas Louis, and the "Defence" (74), under Captain Peyton, anchored next to the "Vanguard" and opposite the fourth French ship, the "Aquilon," and the "Souverain Peuple," already engaged with the "Orion." Thus eight British 74's which had only to fight one broadside at a time were thrown on five undermanned French 74's, which had to fight both and were speedily crushed. One British vessel, the "Culloden" (74), under Captain Troubridge, grounded on the shoal at Aboukir, and could not get into action. She served as a beacon to the vessels coming behind her. As the French van was silenced, and the fresh vessels came up from the British rear, the attack was carried down the French line. About 9.30 P.M. the "Orient" was seen to be in flames, and at 10 P.M. she blew up. The explosion imposed a brief suspension of battle, but the fire was soon renewed. By midnight the battle was over. In the course of the next day the "Guillaume Tell," the "Généreux" and two frigates succeeded in escaping, but they were the only survivors of the fleet attacked in the roadstead of Aboukir.

The destruction of the French fleet, which isolated Napoleon in Egypt, had profound political influence in Europe. The total loss of the British squadron was 218 killed and 678 wounded. The loss of the French was never exactly ascertained, but it was certainly very much greater. Admiral Brueys was killed on the quarter-deck of his flagship, and Nelson received a wound in the head from a langridge shot which disabled him.

See Captain Mahan's *Life of Nelson* (2nd. ed., 1899). (D. H.)

NILES, a city of Trumbull county, Ohio, U.S.A., on the Mahoning river, at the mouth of the Meander and Mosquito creeks, about 55 m. E.S.E. of Cleveland. Pop. (1890) 4289; (1900) 7468 (2104 foreign-born); (1910) 8361. It is served by the Baltimore & Ohio, the Erie and the Pennsylvania railways, and by an interurban electric system. Coal and iron-ore are abundant in the vicinity, and the city's principal manufactures are sheet steel, sheet iron, tin, metal lath, boilers and railway cars. The municipality owns and operates its waterworks and electric-lighting plant. Niles was settled in 1832, laid out in 1834, incorporated as a village in 1865 and chartered as a city in 1895. It was named (1834) in honour of Hezekiah Niles (1777–1839), the founder and editor of the weekly *Niles's Register* (1811–1849).

NILGAI, or NYLGHAU ("blue bull"), the largest antelope (*Boselaphus tragocamelus*) found in India, where it represents the kudu and eland group of Agrica. Only the bulls have horns, and these are short and insignificant. The general colour of the old bulls is bluish grey, but younger bulls and cows are browner. The nilgai is about the size of a mule (see ANTELOPE).

NILGIRIS, THE, or NEELGHERRIES (Blue Mountains), a range of hills in southern India, which gives its name to a district of the Madras Presidency. The Nilgiris are really a plateau rather than a range, rising abruptly from the plains on most sides, with a general elevation of about 6500 ft. above the sea.

The DISTRICT OF THE NILGIRIS is the smallest administrative district in Madras. It formerly consisted exclusively of a mountain plateau lying at an average elevation of 6500 ft., with an area of about 725 sq. m. In 1873 this was increased by the addition of the Ochterlony valley in the south-east Wynaad, and again, in 1877, by other portions of the Wynaad, making a total area of 958 sq. m. The administrative headquarters is at Ootacamund, which is also the summer capital of the government of Madras. The summit of the Nilgiri hills is an undulating plateau, frequently breaking into lofty ridges and steep rocky eminences. The descent to the plains is sudden and abrupt, the average fall from the crest to the general level below being about 6000 ft., save on the north, where the base of the mountains rests upon the elevated land of Wynaad and Mysore, standing between 2000 and 3000 ft. above sea-level. The Ochterlony valley and Wynaad country consist of a series of broken valleys, once forest-clad throughout, but now studded with tea and coffee-gardens. The highest mountain peaks are—Dodabetta, 8760 ft.; Kudiakad, 8502; Bevoibetta, 8488; Makurti, 8402; Davarsolabetta, 8380; Kunda, 8353; Kundamoge, 7816; Ootacamund, 7361; Tambrabetta, 7292; Hokabetta, 7267. There are six well-known passes or *ghats* by which the district communicates with the neighbouring plains, three of which are practicable to wheeled traffic. The chief rivers are the Moyar, Paikara and Calicut, none of which are navigable. The forests consist of fine timber trees, such as *sâl* (*Shorea robusta*), *kino* (*Pterocarpus Marsupium*), jack (*Artocarpus integrifolia*), blackwood (*Dalbergia latifolia*) and teak. Eucalyptus and Australian wattle have been extensively planted in the higher grounds of the Wynaad. The hills were first explored by British officers in 1814, and in 1821 the first English house was built on the plateau. The hill tribes include the Todas, the Badagas, the Kotas, the Kurumbas and the Irulas (*q.v.*). The total population of the district in 1901 was 111,437, showing an increase of 11·7% in the decade. The commercially important products are coffee, tea and cinchona. Coffee cultivation was introduced about 1844. One of its chief seats is the Ochterlony valley. The Madras government commenced the experimental cultivation of cinchona on the Nilgiris in 1860, and several private cinchona gardens were laid out, owing to the success of the government experiment. The climate of the Nilgiri hills is almost unrivalled for equability of temperature. The average is 58° F. The approach from the plains is by the branch of the Madras railway from Podanur to Mettapolliem, whence a metre-gauge line on the rack principle has been constructed to Coonoor, with an extension to Ootacamund. The chief educational institution is the Lawrence Asylum at Ootacamund maintained by government. The military quarters are at Wellington.

See *Nilgiris District Gazetteer* (Madras, 1908).

NILSSON, CHRISTINE (1843–), Swedish singer, was born at Wederslöff, near Wexiö, Sweden, on the 20th of August 1843. Her father was a poor working man, and she used as a girl to sing and perform on the violin at popular gatherings. In 1857 a wealthy man, M. Tornérhjelm, perceiving the unusual beauty of her voice while she was performing at a fair in Ljungby, provided the means for giving her a proper musical education, and in 1860 she was heard in the concert halls in Stockholm and Upsala, and then went to Paris, where, after four years' study, she made her début in the rôle of Violetta at the Théâtre Lyrique on the 27th of October 1864. Between that date and 1872, when she married M. Auguste Rouzaud, she was the leading prima donna. Her first appearance in London was in 1867. A year later, on the 9th of March, she made her first appearance in the Paris Opera House as Ophélie in *Hamlet*; and she visited the United States in 1870. She sang in St Petersburg in 1872; in America in 1873–1874 and in 1882; in Germany and Austria between 1876 and 1877; and in the next few years in Spain and Scandinavia; but after her marriage her appearances in public were rare. M. Rouzaud died in 1882, and five years afterwards Madame Nilsson married Count A. de Casa Miranda, and finally retired from the stage.

NIMAR, a district of British India, in the Nerbudda division of the Central Provinces. The administrative headquarters are at Khandwa; but the capital in Mahommedan times was Burhanpur. Area, 4273 sq. m. Pop. (1901) 329,615, showing an increase of 14·2% in the decade. The district consists of two portions of the Nerbudda and Tapti valleys, separated by a section of the Satpura range, about 15 m. in breadth. On the highest peak, about 850 ft. above the plain and 1800 above sea-level, stands the fortress of Asirgarh, commanding a pass which has for centuries been the chief highway between Upper India and the Deccan. The district contains extensive forests, but the only tract reserved by government is the Punasa forest, which extends for about 120 m. along the south bank of the Nerbudda, and contains young teak, besides *sáj* (*Terminalia tomentosa*) and *anjan* (*Hardwickia binata*). The staple crops are cotton and millet; *ganja* or Indian hemp is also allowed to be grown under government supervision. The Great Indian Peninsula railway runs through the district, and a branch of the Rajputana line from Indore joins it at Khandwa. There are factories for ginning and pressing cotton at Khandwa, and manufacture of gold-embroidered cloth at Burhanpur.

The name Nimar, derived from that of the ancient province, is also applied to a district in the state of Indore, lying W. of the British district on both banks of the Nerbudda. Area, 3871 sq. m.; pop. (1901) 257,110. From 1823 onwards this tract, then belonging to Sindhia, was under British management; in 1861 it was ceded in full sovereignty to the British, but in 1867 it passed to Holkar as the result of an exchange of territory.

See *Nimar District Gazetteer* (Allahabad, 1908).

NÎMES, a city of southern France, capital of the department of Gard, 174 m. S. by W. of Lyons on the Paris-Lyon railway, between Avignon and Montpellier. Pop. (1906) 70,708. Nîmes, important alike for its industries and for its archaeological treasures, lies at the foot of the Garrigues, a range of stony and barren hills which limit it on the north and west. The most prominent of these is the Mont Cavalier, the summit of which is crowned by the Tour Magne, a ruined Roman tower commanding a fine view of the town and its surroundings. To the south and east the town overlooks the monotonous plain traversed by the Vistre, and for the most part given over to the cultivation of the vine. Nîmes covers a large area, owing to the fact that its population is housed in low buildings, not in the lofty tenements which are found in most of the industrial towns of France. The central and oldest part is encircled by shady boulevards, which occupy the site of the old fortifications. Here are to be found the majority of the Roman remains for which Nîmes is remarkable. The most celebrated is the amphitheatre, the best preserved though not the largest in France. It dates from the 1st or 2nd century A.D., and was used as a fortress for some time during succeeding centuries. Occupied during the middle ages by a special quarter, with even a church of its own, it was cleared in 1809, and since then has been well kept in repair. It is built of large stones fitted together without mortar. In form it is elliptical, measuring approximately 440 by 336 ft. externally; the arena is 227 by 126½ ft. The elevation (70 ft. in all) consists of a ground story of 60 arches, an upper story of 60 arches and an attic with consoles pierced with holes for supporting the *velarium* or awning. The building, which was capable of holding nearly 24,000 persons, has 4 main gates, one at each of the cardinal points; and 124 doorways gave exit from the 35 tiers of the amphitheatre to the inner galleries. Originally designed for gladiatorial shows, naval spectacles, chariot races, wolf or boar hunts, the arena has in recent times been used for bull-fights. The celebrated Maison Carrée, a temple in the style of the Parthenon, but on a smaller scale, 82 ft. long by 40 wide, is one of the finest monuments of the Roman period, and according to an inscription is dedicated to Gaius and Lucius Caesar, adopted sons of Augustus, and dates from the beginning of the Christian era. It contains a collection of antique sculptures and coins. The so-called temple of Diana, which adjoins the Fountain Gardens, was probably a building connected with the neighbouring baths of which remains are visible. Two Roman gates, the Porte d'Auguste, consisting of two large archways flanked by two smaller ones and dating from A.D. 16, and the Porte de France are still preserved. The Tour Magne (Turris Magna) is still 92 ft. in height, and was formerly a third higher. Admittedly the oldest monument of Nîmes, it has been variously regarded as an old signal tower, a treasure house or a mausoleum. Attached to the ramparts erected by Augustus, and turned into a fortress in the middle ages by the counts of Toulouse, the Tour Magne was restored about 1840. Near the Tour Magne has been discovered the reservoir from which the water conveyed by the Pont du Gard (see AQUEDUCT) was distributed throughout the city.

When it still possessed its capitol, the temple of Augustus, the basilica of Plotina erected under Hadrian, the temple of Apollo, the baths, the theatre, the circus, constructed in the reign of Nero, the Campus Martius and the fortifications built by Augustus, Nîmes must have been one of the richest of the Roman cities of Gaul. The cathedral (St Castor), occupying, it is believed, the site of the temple of Augustus, is partly Romanesque and partly Gothic in style. The church of St Paul, a modern Romanesque building, is adorned with frescoes by Hippolyte and Paul Flandrin; St Baudile (modern Gothic) is of note for the two stone spires which adorn its façade; and the court-house has a fine Corinthian colonnade and a pediment. Other buildings of note are the old citadel (dating from 1687, and now used as a central prison), and the former lycée, which contains the public library and the museums of epigraphy, of archaeological models of the Roman and Romanesque periods, and of natural history. The town also has a collection of paintings. The esplanade in front of the court-house has in the centre a handsome fountain with five marble statues by James Pradier. The Fountain Gardens, in the north-west of the town, owe their peculiar character as well as their name to a spring of water which after heavy rains is copious enough not only to fill the ornamental basins (constructed in the 18th century with balustrades and statues on ancient foundations) but also to form a considerable stream. Neither the spring, however, nor the Vistre into which it discharges, is sufficient for the wants of the city, and water has consequently been brought from the Rhone, a distance of 17 m. A beautiful avenue, the Boulevard de la République, runs south for nearly 1 m. from the middle walk of the garden. Nîmes has erected monuments to the "Children of Gard" (by A. Merciá), to Alphonse Daudet and to the Provençal poet Jean Reboul, natives of the town.

The city is the seat of a bishop, a prefect, a court of appeal and a court of assizes, and has tribunals of first instance and of commerce, a board of trade-arbitrators, an exchange, a chamber of commerce and a branch of the Bank of France. Its educational establishments include lycées and training colleges for both sexes, and schools of music and art.

At the close of the middle ages the industries of Nîmes were raised to a state of great prosperity by a colony from Lombardy and Tuscany; and, though the plague, the Wars of Religion and the revocation of the edict of Nantes were all sufficiently disastrous in their effects, before the Revolution about half of the whole community, or from 10,000 to 12,000 persons, had come to be engaged in manufactures, chiefly that of silk. Upholstery materials, shawls, carpets, handkerchiefs, tapes and braidings, brandy, hosiery, leather, clothes, candles, machinery and boots and shoes are now manufactured, and there are a number of foundries. Nîmes is, besides, one of the great southern markets for wine and brandy, and there is a good trade in grain, groceries and colonial wares. Quarries of hard limestone, used as the material for the amphitheatre and other buildings by the Romans, are still worked in the vicinity.

Nîmes, the ancient *Nemausus*, derived its name from the sacred wood in which the Volcae Arecomici (who of their own accord surrendered to the Romans in 121 B.C.) were wont to hold their assemblies. Strabo states that it was the metropolis of a district containing twenty-four dependent towns, and that it was independent of the proconsuls of Gallia Narbonensis. Constituted a colony of veterans by Augustus, and endowed with numerous privileges, it built a temple and struck a medal in honour of its founder. The medal, which afterwards furnished the type for the coat of arms granted to the town by Francis I., bears on one side the heads of Caesar Augustus and Vipsanius Agrippa (the former crowned with laurel), while on the other there is a crocodile chained to a palm-tree, with the legend COL. NEM. It was Agrippa who built the public baths at Nîmes, the temple of Diana and the aqueduct of the Pont du Gard. The city-walls, erected by Augustus, were nearly 4 m. in circuit, 30 ft. high and 10 ft. broad, flanked by ninety towers and pierced by ten gates. Hadrian on his way back from Britain erected at Nîmes two memorials of his benefactress Plotina. In the very height of its prosperity the city was ravaged by the Vandals; the Visigoths followed, and turned the amphitheatre into a stronghold, which at a later date was set on fire along with the gates of the city when Charles Martel drove out the Saracens. Nîmes became a republic under the protection of Pippin the Short; and in 1185 it passed to the counts of Toulouse, who restored its prosperity and enclosed it with ramparts whose enceinte, less extensive than that of Augustus, may still be traced in the boulevards of the present day. The city took part in the crusade against the Albigenses in 1207. Under Louis VIII. it received a royal garrison into its amphitheatre; under Louis XI. it was captured by the duke of Burgundy, and in 1420 was recovered by the dauphin (Charles VII.). On a visit to Nîmes Francis I. enriched it with a university and a school of arts. By 1558 about three-fourths of the inhabitants had become Protestants, and in 1567 a massacre of Catholics took place on St Michael's day. From the accession of Henry IV. till the revocation of the edict of Nantes (1685) the Protestant community devoted itself to active industry; but after that disastrous event great numbers went into exile or joined the Camisards. Louis XIV. built a fortress (1687) to keep in check the disturbances caused by the rival religious parties. Nîmes passed unhurt through the storms of the Revolution; but in 1815 Trestaillon and his bandit followers pillaged and burned and plundered and massacred the Bonapartists and Protestants. Since then the city has remained divided into two strongly marked factions—Catholics and Protestants—though with no repetition of such scenes.

See H. Bazin, *Nîmes Gallo-Romain* (Nîmes, 1891); L. Menard, *Histoire civile, ecclésiastique et littéraire de la ville de Nismes*; R. Peyre, *Nîmes, Arles et Orange* (Nîmes, 1903).

NÎMES, COUNCILS OF (*Concilia Nemausensia*). Of the four councils held at Nîmes those of 886 and 1284 are relatively unimportant. The synod of 394 adopted seven canons on discipline, which were first printed in 1743 and have not as yet made their way into the great collections. At the council of July 1096 Pope Urban II. presided, and sixteen disciplinary canons were adopted, which have many points of contact with the canons of the council of Clermont.

See, for the first council of Nîmes, Lauchert, pp. 183-185; for the others, Hardouin vi. 1. 397, vi. 2. 1747 ff., vii. 903 ff.; full titles under COUNCIL. (W. W. R.*)

NIMROD (נִמְרוֹד, נִמְרֹד; Septuagint, Νεβρώδ: various reading in Gen. x. 8, Νεβρών: Vulg. *Nemrod*). Nimrod is only mentioned in three passages in the Bible; in Micah v. 6 Assyria is called "the land of Nimrod," and 1 Chron. i. 10 quotes a portion of the third, the most important reference, Gen. x. 8-12. The last-named is ascribed to one of the oldest writers of the Pentateuch, the Yahwist; but not perhaps to the oldest stratum of his work (Ball, *Sacred Books of the Old Testament*). In Gen. x. 8, as Jabal was the inventor of music, so Nimrod was the first warrior, *gibbôr*, the first hunter, "he became a mighty hunter, *gibbôr çayidh*, before Yahweh, so that it is said, A mighty hunter before Yahweh like Nimrod"; the first builder of cities and ruler of a widespread dominion, "the beginning of his kingdom was Babel, Erech, Accad and Calneh in the land of Shinar. Out of that land he went forth into Assyria,[1] and built Nineveh, Rehoboth-Ir, Calah and Resen between Nineveh and Calah (the same is the great city)." The general statement that Assyria was originally an offshoot and dependence of Babylon is substantially in accordance with Assyrian and Babylonian authorities. As the chapter stands, Nimrod is a descendant of Ham, cf. verses 6 and 8; but as Babylon and Assyria were Semitic, cf. verses 21, 22, and as verses 6, 7, on the one hand, and verses 8-12, on the other, come from different documents, we must dissociate the two consecutive paragraphs, and regard the "Cush" of verse 8 as the Babylonian Cash or Cassites, a people quite distinct from the Cush of verse 6, which is Ethiopia; the text and interpretation of portions of Gen x. 8-12 are doubtful.[2] The "mighty hunter before Yahweh" has been variously explained as "a divinely great hunter" (Spurrell); "a hunter in defiance of Yahweh" (Holzinger); "a hunter with the help of Yahweh" or "of some deity whose name has been replaced by Yahweh" (Gunkel, *Genesis*, p. 82).

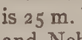
The name Nimrod has not been found in any ancient (say older than 500 B.C.) non-Israelite document or inscription; and there is no conclusive evidence for identifying Nimrod with any of the names found in such documents. In the absence of evidence, the theories are naturally endless, especially as both the legendary and the historical heroes of the ancient East were often "mighty hunters." Nimrod would suggest to a Jew or Syrian the idea of "rebel," *mrd*=rebel; but this is not likely to be the etymology. By regarding the "N" as performative, Nimrod has been identified with Merodach, the god of Babylon (Pinches, Hastings's *Bible Dict.*). He has also been identified with Gilgamesh, the hero of the epic which contains the Babylonian Deluge story (Jeremias, *Das A.T. im Lichte des alten Orients*), with various historical kings of Babylonia, with Orion, &c., &c. As the name *Nmrt* (Petrie, *Nemart*) frequently occurs in Egyptian documents of the XXIInd Dynasty, *c.* 972–749 (Petrie, *Hist. of Egypt*, iii. 242, &c.), the story of Nimrod is sometimes (E. Meyer *ap.* Holzinger, *Genesis*) conjectured to be of Egyptian origin. Some support might be obtained for this view by supposing Cush in verse 8 to be Ethiopia as in verse 6; but it seems impossible to reconcile it with the statements in Genesis and Micah which connect Nimrod with Babylon and Assyria. It is possible that the *Nebrod* of the Septuagint (similarly Philo and Josephus) is the more ancient form of the name (Cheyne, *Ency. Bibl.*).

Many later legends gathered round Nimrod; Philo, *De gigantibus*, § 15, allegorises *more suo.* Nimrod stands for treachery or desertion, according to the derivation from *mrd* mentioned above. According to Josephus, *Ant.* I. iv. 2, vi. 2, Nimrod built the Tower of Babel. According to the Rabbis (Tzeenah u Reenah, Hershon's tr., p. 59), Nimrod cast Abraham into the fire because he refused to worship idols. God, however, delivered him.

Nimrod, in the form *Nimrud* or *Nimroud*, is an element in many modern place-names in western Asia. (W. H. BE.)

NINE MEN'S MORRIS, known also as *Morelles* and *Merelles*, an ancient English game played with 9 counters a side on a board marked with four squares, one within the other. The middle points of the three inside squares are connected by straight lines, and, in a variation of the game, the corners also. The players, whose counters are of different colours, place these alternately one by one upon the intersections of the lines, the object of each being to get three of his own men in line, in which case he has the privilege of pounding, *i.e.* removing from the board, any one of his opponent's men; although he may not take one of a row of three, unless there are no others. When all 18 counters have been placed on the board they are moved to adjacent unoccupied intersections. When all but three of a player's men have been captured he is allowed to jump or hop to any vacant point he chooses. As soon as a player is reduced to two men he loses. In the time of Shakespeare (*Midsummer Night's Dream*, Act II. Scene 1) the game was commonly played out of doors.

NINEVEH (Heb. נִינְוֵה, in classical authors Νῖνος, Ninus; LXX. Νινευη, Νηνευη: Assyrian *Ninā* or *Ninūa*), the best known and highly renowned capital of the Assyrian empire. There was a quarter or suburb of the old Babylonian city of Lagash whose name was written in the same way; this may possibly have been the home of those settlers from Babylonia who gave its name to the Assyrian city. The name was carried elsewhere, probably by Assyrian settlers, and we meet with Ninoe in Asia Minor (Th. Nöldeke, *Hermes*, v. 464, n. 2). Philostratus calls a Hierapolis, ἡ ἀρχαῖα Νῖνος but it must not be confounded with the Egyptian Nī-y, Assur-bani-pal Nī, the frontier city to the east of Egypt's greatest extension, where Tethmosis (Thothmes) III. hunted elephants, probably situated on the Euphrates. This, however, may be the origin of Ctesias's statement (*ap.* Diod. ii. 3) that Nineveh stood on the Euphrates; the Arabic geographer Yaqut places a Nineveh on the lower Euphrates near Babylon, and this may be a colony from the great Nineveh, or possibly the Ninā of Lagash.

The derivation of the name is uncertain. The name Ninā was borne also by the goddess Ishtar, whose worship was the special cult of Nineveh, and Ninūa may well be a hypocoristicon of Ninā. The ideogram for Nineveh, as also for the Lagash city, , is a fish enclosed in the sign for house, possibly indicating a fish-pond, sacred to Ishtar. As the Semitic *nūnu* means a fish, a play upon *nūnu* and *Ninā* is suggested, but the name may be pre-Semitic. A derivation from the root נוי with a meaning like "lowland" is doubtful, unless we are sure that the name is Semitic, and that the Lagash city also lay low.

Nineveh was situated at the N.W. angle of an irregular trapezium of land which lay between the rivers Husur (Khausar, Choser) on the N.W., Gōmal on the N.E. and E., Upper Zāb on the S.E. and S. and Tigris on the S. and W. In extent this plain is 25 m. by 15 m., and contains the ruins of Nineveh at Kuyunjik and Nebi Yūnus, of Dūr Sargon at Khorsabad to the N.E. of Calah at Nimrud to the S. as well as of other towns not yet identified. The whole plain has a gradual slope from the low range of Jebel Maqtub and the hill of Ain-es-safra on the N.E. to the Tigris on the S.W. This plain was, for those days, amply protected on three sides by the two rapid broad streams of the Tigris and its tributary Zāb, by the hills on the N.E. and the river Gōmal at their base. The weak N.W. side was partly covered by the Husur, an impassable flood in winter but easily fordable in summer. The floods caused by the Husur were frequent and destructive, on one occasion sweeping away the palace terrace at Nineveh and exposing the tombs of the kings, on another isolating Khorsabad. A great series of dams was therefore constructed (mapped and described in "Topography of Nineveh," *J.R.A.S.* xiv. 318 ff.) which controlled the floods and filled the ditches and moats of Nineveh. One of these ditches can be traced over 2 m. with a breadth of 200 ft., and was lined with a rampart on the city side.

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[1] So Revised Version text with Kautzsch, Dillmann, Gunkel, Holzinger, &c.; Revised Version marg., "Out of that land went forth 'Asshur'," less probably following Septuagint, Vulgate, Authorized Version, &c.

[2] Dr. Cheyne's reconstructions in *Ency. Bibl.*, article "Nimrod," are generally regarded as far too sweeping. Ball, *Sacred Books of the Old Testament*, marks verse 9, which describes Nimrod as "a mighty hunter," as a later addition, giving a mistaken explanation of the *gibbôr* of verse 8.

The city on the river side of the Tigris extended about 2½ m., its north wall measured 7000 ft., the eastern wall was nearly 3 m. long and the southern about 1000 ft. The city thus formed a long narrow strip along the Tigris, pierced at right angles by the Husur, the waters of which, by closing the great dam in the eastern wall, could be sent round the moats to the N. and S. The Tigris may have swept the western wall, though now a wide belt of sand has accumulated between the ruins and its present channel which is perpetually shifting. The actual extent of the city may be reckoned at about 1800 acres, or about two-thirds the size of Rome within Aurelian's Wall. At the rate of 50 sq. yds. to a person, it would have held a population of 175,000; but the extent of the palaces, gardens, &c., forbid us to imagine any such multitude except as refugees during a siege. Outside this city proper lay wide outskirts (*kablu*) which were divided into quarters each with a separate governor (*šaknu*). Further afield lay the Rēbit-Ninūa, in which some have recognized the Rehoboth-Ir of Gen. x. 11 (Ninūa is often replaced by *ir* or *alu* in the inscriptions), a less closely populated area which extended to and included the site of Khorsabad, before Sargon II. built his city of Dūr-Sargon there. Across the Tigris, connected by a bridge, lay an extensive district, probably now replaced by Mōsul. As Esarhaddon entered Nineveh, on his triumphal return from Sidon, through Rēbit-Ninūa, it is probable that this name covered the western suburbs. The walled city formed a sort of Acropolis, and it is difficult to say exactly how far the name of Nineveh should be extended. Few traces of private houses have been found within the walls, but as deeds of sale speak of houses *in* Nineveh, which were bounded on three sides by other houses, there must have been continuous streets within the area denoted by that name. Great emphasis has been laid on the agreement of a tetrapolis, formed by Nineveh, Khorsabad, Calah and Keramlis, with the dimensions given by Diodorus and with the phrase "an exceeding great city of three days' journey" (Jonah iii. 3). Admitting that this whole area was thickly inhabited and might be regarded by those at a distance as one city, and that the district may well have had a common name, which could hardly be Assur, there is yet no native evidence that Nineveh extended so far. There is no trace of a common wall, each city was as strongly fortified towards the interior as on the outside. Each had its own *šaknu*, and the governor of Nineveh stands below the governors of Assur and Calah in official lists. In deeds of sale "the road to Calah" is as often named as the "king's highway" to Arbela or Assur.

The history of Nineveh is, of course, bound up with that of Assyria in general. Later Assyrian writers professed to carry back its foundation to the creation of the world, but we lack any historical evidence of its age or early history. We may conjecture that it was founded by settlers from Babylonia Ninā, and the statement that Nimrod founded it from Babylonia, along with Calah, Rehoboth-Ir and Resen, shows that this opinion was early held. We are, however, still without evidence that this was its first occupation. The mention of Gudea's building a temple for Ishtar in Ninā (2800 B.C.) may refer to the Lagash city and an inscription of Dungi, king of Ur (2700 B.C.), said to have been found at Nineveh, might have been carried there by some antiquary king. We reach firm ground with the statement of Khammurabi (2285 B.C.) that he "made the waters of Ishtar to be glorious in Nineveh in Ē-MEŠ-MEŠ," the temple of Ishtar there (Code IV. 60-62). As he had just spoken of "returning the gracious protecting god to Assur," and spells the name *Ni-nu-a*, there can be no doubt that Nineveh is meant. Shalmaneser I., in his *zikāti* inscriptions (L. W. King, *Records of the Reign of Tukulti-Ninib I.* p. 131), *c.* 1300 B.C., records his restoration of the temple of Ishtar of Nineveh, which had been built by Samsi-Hadad (Shamshi-Adad) and restored once before by Assur-uballit. Which Samsi-Hadad (out of six at least) this was, and which Assur-uballit we are not told; the first of the former name known to us was a contemporary of Khammurabi and, if he built the temple first, Khammurabi may have plundered it and then restored it again; but an even earlier Samsi-Hadad may be meant. Dushratta, king of Mitanni, about 1400 B.C., in the Tell el-Amarna letters offers to send to the king of Egypt an image of Ishtar of Nineveh; from which it has been inferred that Nineveh was then under foreign rule. The same letters mention Shaushbi as goddess of Nineveh. A statue of a female nude figure found at Nineveh bears an inscription showing it to have been in the palace of Assur-bēl-kala (1080 B.C.), who is therefore supposed to have resided in Nineveh. Assur-rēsh-ishi, Mutakkil Nusku and Tiglath-pileser I. restored a temple of Ishtar, probably in Nineveh. Assur-narsin-apli (885 B.C.) restored the temple Ē-MAŠ-MAŠ of Ishtar at Nineveh, but removed his residence to Calah. Shalmaneser II. set out on several of his expeditions from Nineveh, but in the latter part of his reign resided at Calah, and when rebellion broke out under his son Assur-danin-apli Nineveh sided with the rebel prince. Sennacherib records that several of his royal ancestors had been buried in Nineveh and they presumably had resided there. At the commencement of his reign Sennacherib found Nineveh a poor place. A storehouse, the ancient and renowned temple, an armoury or storehouse, were the chief buildings. Two lofty platforms along the Tigris front had served as foundations of the palaces hitherto built, but the platforms had been wrecked and the palaces were in decay. Sennacherib restored and enlarged the northern platform now covered by the Kuyunjik mound and built his palace on the south-western portion of it. It has been only partially excavated, though seventy-one rooms were opened, and it is the grandest architectural effort of Assyria. The bas-reliefs with which the walls are adorned are unrivalled in antiquity, for variety of subject, breadth of composition, truth of presentation and artistic treatment. The accuracy with which building operations are portrayed, and a sense of landscape, are great advances even on the superb work of Sargon's palace at Khorsabad. On the adjoining platform to the south, now Nebi-Yunus, Sennacherib erected an arsenal for military supplies. Nineveh was badly supplied with water for drinking; the inhabitants had to "turn their eyes to heaven for the rain," but Sennacherib conducted water by eighteen canals from the hills into the Husur and distributed its waters round the moats and into store tanks, or ponds, within the city. He laid out a fine park or Paradise, for pleasure and the chase, to the east of his palaces, and built up a magnificent "triumphal way" sixty-two cubits broad and forbade any householder to encroach upon the street. Sennacherib made Nineveh his court residence and, after his destruction of Babylon and the influx of the enormous booty brought back from his conquests, it must have been the most magnificent and wealthiest city of the East.

Esarhaddon began to rebuild Babylon and so departed from his father's purpose to make Nineveh the metropolis of the empire, but he did not altogether neglect the city. He rebuilt the temple of Assur at Nineveh, and a palace for himself now covered by the Nebi-Yunus mound and so inefficiently explored. Thither Assur-bani-pal brought the rebel Egyptian vassals Necho and Sharru-ludari, the Elamite kings, the booty and captives of his continual conquests. He rebuilt the temples and a palace for himself north of Sennacherib's on the site of the latter's harem; which was adorned with extraordinary variety and richness. His sculptures are at the highest range of original and effective delineation in antiquity. Especially is his palace famous for the celebrated library, of which Sennacherib had made a commencement. Tens of thousands of clay tablets, systematically arranged on shelves, contained the classics of the Babylonian literature for which his scribes ransacked and copied the treasures of all then known centres of literary life.

Very little trace is left of the fortunes of Nineveh during the reigns of the sons of Assur-bani-pal. Nineveh, according to Herodotus, was besieged by Cyaxares and the Medes but saved by Madyes and the Scythians some twenty or more years before the Medes in alliance with Nabopolassar, king of Babylon, finally took it, *c.* 606 B.C. Much conjecture has been lavished upon the varying accounts which have reached us of the capture, but it seems probable that a heavy flood or the besiegers burst the great dam and while thus emptying the moats launched a flood against the west wall on the inside and thus breached the defences.

It may be of interest to record the names of the governors of Nineveh: Nergal-mudammik, 835 B.C.; Ninib-mukin-ahi, 790–761 B.C.; Mahdē, 725 B.C.; Nabū-dini-epush, 704 B.C.; Ahi-ilai, 649 B.C., officiated as Eponyms for the year.

If, as generally admitted, the ruins of Mespila and Larissa "described" by Xenophon, *Anab.* iii. 4, 7 sq. were those of Kuyunjik and Nimrud, we may conclude that there was no inhabited city on the spot at the time of the march of the Greeks with Cyrus (cf. Strabo xvi. p. 245). The name of Nineveh (Syriac Nīnwē; Arabic Nīnawā, Nūnawā) continued, even in the middle ages, to be applied to a site opposite Mōsul on the east bank of the Tigris, where huge mounds and the traces of an ancient city wall bore witness of former greatness. Copious references to these mentions are collected in Tuch, *De Nino Urbe* (Leipzig, 1845). Ibn Jubair, p. 237 sq., followed by Ibn Batuta, ii. 137, gives a good description of the ruins and the great shrine of Jonah as existing in the 12th century. The name of Nīnawā applied, not to the ruins, but to the Rustak (fields and hamlets) on the site (Balādhurī, p. 331; Ibn Haukal, p. 145; Yaqut, ii. 694).

A very complete summary of the traditions will be found in Lincke, "Assyrien und Nineveh," in *Geschichte und Sage der Mittelmeervölker nach 607–606.*

The explorations of Sir A. H. Layard at Kuyunjik (1845–1847 and 1849–1851) definitely located the city, in confirmation of ancient tradition and the identifications of Rich and others. Excavations were carried on by Rawlinson, 1853–1855; H. Rassam, 1854; G. Smith, 1873–1874 and 1876; Rassam again, 1877–1883; E. A. Wallis Budge, 1888–1889; and King, 1902. The enormous mound of Kuyunjik now separated from that of Nebi-Yunus by the deep and rapid Khausar, marks the site of the palace of Sennacherib and Assur-bani-pal. The mound of Nebi-Yunus is crowned by the "Tomb of Jonah," a sacred shrine to the modern inhabitants, and could not be explored; but by sinking a shaft within the walls of a private house, some sculptured slabs were recovered, and the Turkish government later opened out part of a palace of Esarhaddon. Excavations at two of the great city gates showed them to have been erected by Sennacherib.

BIBLIOGRAPHY.—The architecture of these palaces is exhaustively treated in Ferguson's *Palaces of Nineveh and Persepolis Restored*, and in Perrot and Chipiez, *Art in Chaldea and Assyria*. Each palace was in itself a fort, and the external walls are still 80 ft. high in places. The many topographical details furnished by exploration when compared with the building inscriptions and the indications given by deeds of sale will doubtless enable us ultimately to map out the principal features of the ancient city, but much more systematic exploration is needed, as well as further publication of existing documents. (C. H. W. J.)

NING-PO (NING-PO-FU, *i.e.* City of the Peaceful Waves), a great city of China, the principal emporium of trade in the province of Chehkiang, standing in a fine plain bounded by mountains towards the west, on the left bank of the Ning-po river, about 16 m. from its mouth, in 29° 49′ N., 121° 35′ E. It was visited by Portuguese traders as early as 1522, and is one of the five seaports which were thrown open to foreign trade in 1842 by the treaty of Nanking. The population of the city and suburbs is estimated from 400,000 to 500,000. Ning-po is surrounded by a fine old wall, 25 ft. high and 16 ft. broad, pierced by six gates and two passages for ships in its circuit of 4 to 5 m. Just within the walls there is a considerable belt of open ground, and in many places the ramparts are thickly covered with jasmine and honeysuckle. In ascending the river a stranger's eye is first caught by the numerous huge ice-houses with high thatched roofs and by a tall white tower—the T'ien-fēng-t'a or Ning-po pagoda or obelisk—which rises to a height of 160 ft. and has fourteen stories and seven tiers of windows, but has unfortunately been stripped of its galleries and otherwise damaged. Another striking structure in the heart of the city is the Drum Tower, dating from before the 15th century. As is natural in a place long celebrated for its religious and educational pre-eminence, there is no lack of temples, monasteries and colleges, but few of these are of any architectural significance. Brick is the ordinary building material, and the dwelling-houses are mostly of one storey. Silks, cottons, carpets, furniture, white-wood carvings and straw hats are the chief products of the local industry. Large salt-works are carried on in the vicinity, and thousands of fishermen are engaged, mainly between April and July, in catching cuttle-fish. In spite of the powerful competition of Shanghai, Ning-po has a valuable foreign trade. It is regularly visited by the vessels of the China Navigation Company and the Chinese Merchants' Steam Navigation Company. From 216,191 register tons in 1873 the tonnage of the port had increased to 303,109 in 1880, and in 1904 the figures rose to 532,869 tons. The value of the trade passing through the custom house in 1904 was £3,052,629, as compared with £2,312,000 in 1900 and £3,405,000 in 1880. Straw or grass hats, straw mats, samshu (from the Shao-sing district), Chinese drugs, vegetable tallow and fish are among the chief exports; in 1904 the hats numbered 2,125,566, though in 1863 they had only amounted to 40,000, and the mats, mainly despatched to south China, average from 1,000,000, to 2,000,000. Missions are maintained in Ning-po by the Roman Catholic church, by the Church Missionary Society (1848), the American Presbyterians, the Reformed Wesleyans, the China Inland Mission (1857), &c. A mission hospital was instituted in 1843. After the storming of Chenhai—the fortified town at the mouth of the river—on the 10th of October 1841, the British forces quietly took possession of Ning-po on the 12th. In 1864 the T'aip'ings held the town for six months.

NINIAN, ST, a Briton, probably from Strathclyde, who was trained at Rome and founded a church at Whithorn on the west side of Wigtown Bay. Whithorn has been identified with the Leukopibia of Ptolemy, but this is uncertain. Bede, writing three centuries after Ninian, ascribes the name Ad Candidam Casam to the fact that the church of Ninian was built of stone. We are told by Bede that St Ninian dedicated his church to St Martin of Tours, who died between 397 and 400, but Ailred of Rievaulx is our only authority for the statement that St Martin supplied him with masons. The population of the north shore of the Solway Firth at the beginning of the 5th century were probably either Picts or Goidels or a blend of both, and naturally hostile to the Romanized Britons. Bede records that Ninian preached among the Picts within the Mounth, which indicates that he was acquainted with the Pictish language. The legends of his work in Ireland probably arise from the influence exercised in that country by the church of Whithorn. The date of Ninian's death is given by Archbishop Ussher as 432, but there is no authority for this statement.

See Bede, *Hist. Eccl.* (ed. C. Plummer, Oxford, 1896), iii., iv.; Ailred of Rievaulx, "Life of St Ninian," in the *Historians of Scotland* vol. v. (Edinburgh, 1874); W. F. Skene, *Celtic Scotland* (Edinburgh, 1877), ii. 2 ff.; and J. Rhys, *Celtic Britain* (London, 1904), p. 173.

NINIB, the ideographic designation of a solar deity of Babylonia. The phonetic designation is uncertain—perhaps Annshit. The cult of Ninib can be traced back to the oldest period of Babylonian history. In the inscriptions found at Shirgulla (or Shirpurla, also known as Lagash), he appears as Nin-girsu, that is, "the lord of Girsu," which appears to have been a quarter of Shirgulla. He is closely associated with Bel (*q.v.*), or En-lil of Nippur, as whose son he is commonly designated. The combination points to the amalgamation of the district in which Ninib was worshipped with the one in which Bel was the chief deity. This district may have been Shirgulla and surrounding places, which, as we know, fell at one time under the control of the rulers of Nippur.

Ninib appears in a double capacity in the epithets bestowed on him, and in the hymns and incantations addressed to him. On the one hand he is the healing god who releases from sickness and the ban of the demons in general, and on the other he is the god of war and of the chase, armed with terrible weapons. It is not easy to reconcile these two phases, except on the assumption that he has absorbed in his person various minor solar deities, representing different phases of the sun, just as subsequently Shamash absorbed the attributes of practically all the minor sun-deities.

In the systematized pantheon, Ninib survives the tendency towards centralizing all sun cults in Shamash by being made the symbol of a certain phase of the sun. Whether this phase is that of the morning sun or of the springtime with which beneficent qualities are associated, or that of the noonday sun or of the summer solstice, bringing suffering and destruction in its wake, is still a matter of dispute, with the evidence on the whole in favour of the former proposition. At the same time, the possibility of a confusion between Ninib and Nergal (*q.v.*) must be admitted, and perhaps we are to see the solution of the problem in the recognition of two diverse schools of theological speculation, the one assigning to Ninib the rôle of the spring-tide solar deity, the other identifying him with the sun of the summer solstice. In the astral-theological system Ninib becomes the planet Saturn. The swine seems to have been the animal sacred to him, or to have been one of the symbols under which he is represented. The consort of Ninib was Gula (*q.v.*). (M. Ja.)

NINUS, in Greek mythology, the eponymous founder of Nineveh (*q.v.*), and thus the city itself personified. He was said to have been the son of Belos or Bel, to have conquered in seventeen years the whole of western Asia with the help of Ariaeus, king of Arabia, and to have founded the first empire. During the siege of Bactra he met Semiramis, the wife of one of his officers, Onnes, whom he took from her husband and married. The fruit of the marriage was Ninyas, *i.e.* "The Ninevite." After the death of Ninus, Semiramis, who was accused of causing it, erected to him a temple-tomb, nine stades high and ten stades broad, near Babylon. According to Castor (*ap. Syncell.* p. 167) his reign lasted fifty-two years, its commencement falling 2189 B.C. according to Ctesias. Another Ninus is described by some authorities as the last king of Nineveh, successor of Sardanapalus.

See J. Gilmore, *Fragments of the Persika of Ktesias* (1888).

NIOBE, in Greek mythology, daughter of Tantalus and Dione, wife of Amphion, king of Thebes. Proud of her numerous family, six daughters and six sons, she boasted of her superiority to her friend Leto, the mother of only two children, Apollo and Artemis. As a punishment, Apollo slew her sons and Artemis her daughters. Their bodies lay for nine days unburied, for Zeus had changed the people to stone; on the tenth day they were buried by the gods. Out of pity for her grief, the gods changed Niobe herself into a rock on Mount Sipylus in Phrygia, in which form she continued to weep (Homer, *Iliad*, xxiv. 602-617; Apollodorus iii. 5; Ovid, *Metam.* vi. 146-312). The names and number of her children, and the time and place of their death, are variously given. This "Niobe," described by Pausanias (i. 21) and Quintus Smyrnaeus (i. 293-306), both natives of the district, was the appearance assumed by a cliff on Sipylus when seen from a distance and from the proper point of view (see Jebb on Sophocles, *Antigone*, 831). It is to be distinguished from an archaic figure still visible, carved in the northern side of the mountain near Magnesia, to which tradition has given the name of Niobe, but which is really intended for Cybele.

According to some, Niobe is the goddess of snow and winter, whose children, slain by Apollo and Artemis, symbolize the ice and snow melted by the sun in spring; according to others, she is an earth-goddess, whose progeny—vegetation and the fruits of the soil—is dried up and slain every summer by the shafts of the sun-god. Burmeister regards the legend as an incident in the struggle between the followers of Dionysus and Apollo in Thebes, in which the former were defeated and driven back to Lydia. Heffter builds up the story round the dripping rock in Lydia, really representing an Asiatic goddess, but taken by the Greeks for an ordinary woman. Enmann, who interprets the name as "she who prevents increase" (in contrast to Leto, who made women prolific), considers the main point of the myth to be Niobe's loss of her children. He compares her story with that of Lamia, who, after her children had been slain by Zeus, retired to a lonely cave and carried off and killed the children of others. The appearance of the rock on Sipylus gave rise to the story of Niobe having been turned to stone. The tragedians used her story to point the moral of the instability of human happiness; Niobe became the representative of human nature, liable to pride in prosperity and forgetfulness of the respect and submission due to the gods.

The tragic story of Niobe was a favourite subject in literature and art. Aeschylus and Sophocles wrote tragedies upon it; Ovid has described it at length in his *Metamorphoses*. In art, the most famous representation was a marble group of Niobe and her children, taken by Sosius to Rome and set up in the temple of Apollo Sosianus (Pliny, *Nat. Hist.* xxxvi. 4). What is probably a Roman imitation of this work was found in 1583 near the Lateran, and is now in the Uffizi gallery at Florence. In ancient times it was disputed whether the original was the work of Praxiteles or Scopas, and modern authorities are not agreed as to its identity with the group mentioned by Pliny.

On the whole subject see C.E. Burmeister, *De fabula quae de Niobe ejusque liberis agit* (Wismar, 1836); L. Curtze, *Fabula Niobes Thebanae* (Corbach, 1836); W. Heffter in *Zeitschrift für Gymnasialwesen*, ix. (1855); C. B. Stark, *Niobe und die Niobiden* (1863), the standard work; E. Thrämer, *Pergamos* (1888); C. Friederichs, *Praxiteles und die Niobegruppe* (1865); A. Mayerhöfer and H. Ohlrich, *Die Florentiner Niobegruppe* (1881 and 1888); for the Niobe on Mount Sipylus, see C. B. Stark, *Nach dem griechischen Orient* (1874); G. Weber, *Le Sipylos et ses monuments* (1880); W. Ramsay, "Sipylos and Cybele," in *Journal of Hellenic Studies*, iii. (1882); Frazer's *Pausanias*, iii. 555; for vase-paintings, see H. Heydemann, *Niobe und Niobiden auf griechischen Vasenbildern* (1875). For further literature on the subject, see A. Preuner's mythological bibliography in C. Bursian's *Jahresbericht über die Fortschritte der klassischen Altertumswissenschaft*, vol. xxv. (1891); the various derivations of the name and interpretations of the legend are given in Enmann's article in Roscher's *Lexikon der Mythologie*.

In Greek Art, fig. 29 (from an Orvieto vase) represents the slaying of the children of Niobe by Apollo and Artemis; fig. 78 (Pl. VI.), Niobe shielding her youngest daughter.

NIORT, a city of western France, chief town of the department of Deux-Sèvres, 42 m. E.N.E. of La Rochelle on the railway to Saumur. Pop. (1906) 20,538. Niort is situated on the left bank of the Sèvre Niortaise, partly in the valley and partly on the slopes of the enclosing hills. The tower of the church of Notre-Dame (15th and 16th centuries) has a spire 246 ft. high, with bell-turrets adorned with statues of the evangelists, and at the base a richly decorated daïs in the Renaissance style; and the north doorway shows a balustrade, of which the balusters form the inscription *O Mater Dei, memento mei.* St André, with a fine window in the apse, and St Hilaire, which contains some beautiful frescoes, both date from the 19th century. Of the old castle, whose site is partly occupied by the prefecture, there remains the donjon—two large square towers united by a central building, flanked by turrets, built, it is said, by Henry II. of England or Richard Cœur de Lion. The platform on the top affords a fine view of the public garden (one of the most picturesque in France) and the valley of the Sèvre. The old town-hall, Renaissance in style, is wrongly known as the Aliénor palace, after Eleanor of Guienne; it contains a collection of antiquities. The house is still shown in which Madame de Maintenon is erroneously stated to have been born. Near Niort are the fine feudal ruins of the fortress of Coudray-Salbart.

Niort is the seat of a prefect and a court of assizes, and has tribunals of first instance and of commerce, a board of trade-arbitration, lycées for both sexes, a school of drawing, a chamber of commerce and a branch of the Bank of France. Tanning, currying, shammy-dressing, glove-making and the manufacture of brushes and boots and shoes are the staple industries.

Up to the 7th century the Niort plain formed part of the Gulf of Poitou; and the mouth of the Sèvre lay at the foot of the hills now occupied by the town which grew up round the castle erected by Henry Plantagenet in 1155. The place was captured by Louis VIII. in 1224. By the peace of Brétigny it was ceded to the English; but its inhabitants revolted against the Black Prince, and most of them were massacred when his troops recovered the town by assault. In 1373 Duguesclin regained possession of the town for the French. Protestantism made numerous proselytes at Niort, and Gaspard de Coligny made himself master of the town, which successfully resisted the Catholic forces after the Battle of Jarnac, but surrendered without striking a blow after that of Moncontour. Henry IV. rescued it from the League. It suffered severely by the revocation of the edict of Nantes.

NIPIGON [Neepigon, or Nepigon], a lake and river of Thunder Bay district, Ontario, Canada. The lake is 30 m. N. of the bay of the same name on Lake Superior, at an altitude of 852 ft. above the sea. It is 70 m. long and 50 m. wide; contains over 1000 islands, is very deep, and has a much-indented shore-line measuring upwards of 580 m. The river, which drains the lake, descends several hundred feet in the 40 m. of its course and is the largest stream flowing into Lake Superior. It is widely known for the excellence of its trout fishing.

NIPISSING, a lake of the district of the same name in Ontario, Canada, situated nearly midway between Lake Huron and the Ottawa river, at an altitude of 644 ft. above the sea. It is of irregular shape, with bold shores, and contains many islands; from the north it receives the waters of Sturgeon river. It is 50 m. in length and 20 in breadth; discharges its waters by French river into Lake Huron, and is separated by a low watershed from the Mattawa river, a tributary of the Ottawa. It has been proposed as the summit level of the projected Ottawa and Georgian Bay canal, an important project rendered difficult by the numerous rapids both on French river and on the Ottawa. With the Ottawa, Mattawa and French, it formed the old *voyageur* route from Montreal to the Great Lakes.

NIPPUR, one of the most ancient of all the Babylonian cities of which we have any knowledge, the special seat of the worship of the Sumerian god, En-lil, lord of the storm demons. It was situated on both sides of the Shatt-en-Nil canal, one of the earliest courses of the Euphrates, between the present bed of that river and the Tigris, almost 100 m. S.E. of Bagdad, in 32° 7′ N. 45° 10′ E. It is represented by the great complex of ruin mounds known to the Arabs as Nuffar, written by the earlier explorers Niffer, divided into two main parts by the dry bed of the old Shatt-en-Nil (Arakhat). The highest point of these ruins, a conical hill rising about 100 ft. above the level of the surrounding plain, N.E. of the canal bed, is called by the Arabs Bint el-Amir or "prince's daughter." Here very brief and unsatisfactory excavations were conducted by Sir A. H. Layard in 1851, which served, however, by means of the inscribed bricks discovered, to identify the site. The university of Pennsylvania began systematic excavations in 1889 under the directorship of Dr John P. Peters. With some intermissions these excavations were continued until 1900 under the original director and his successors, Dr John Henry Haynes and Dr H. V. Hilprecht. The result of their work is a fairly continuous history of Nippur, and especially of its great temple, E-kur, from the earliest period.

Originally a village of reed huts in the marshes, similar to many of those which can be seen in that region to-day, Nippur underwent the usual vicissitudes of such villages—floods and conflagrations. For some reason habitation persisted at the same spot, and gradually the site rose above the marshes, partly as a result of the mere accumulation of débris, consequent on continuous habitation, partly through the efforts of the inhabitants. As these began to develop in civilization, they substituted, at least so far as their shrine was concerned, buildings of mud-brick for reed huts. The earliest age of civilization, which we may designate as the clay age, is marked by rude, hand-made pottery and thumb-marked bricks, flat on one side, concave on the other, gradually developing through several fairly marked stages. The exact form of the sanctuary at that period cannot be determined, but it seems to have been in some way connected with the burning of the dead, and extensive remains of such cremation are found in all the earlier, pre-Sargonic strata. There is evidence of the succession on this site of different peoples, varying somewhat in their degrees of civilization. One stratum is marked by painted pottery of good make, similar to that found in a corresponding stratum in Susa, and resembling the early pottery of the Aegean region more closely than any later pottery found in Babylonia. This people gave way in time to another, markedly inferior in the manufacture of pottery, but superior, apparently, as builders. In one of these earlier strata, of very great antiquity, there was discovered, in connexion with the shrine, a conduit built of bricks, in the form of an arch. Somewhere, apparently, in the 4th millennium B.C., we begin to find inscriptions written on clay, in an almost linear script, in the Sumerian tongue. The shrine at this time stood on a raised platform and apparently contained, as a characteristic feature, an artificial mountain or peak, a so-called *ziggurat*, the precise shape and size of which we are, however, unable to determine. So far as we can judge from the inscriptions, Nippur did not enjoy at this time, or at any later period for that matter, political hegemony, but was distinctively a sacred city, important from the possession of the famous shrine of En-lil. Inscriptions of Lugal-zaggisi and Lugal-kigub-nidudu, kings of Erech and Ur respectively, and of other early pre-Semitic rulers, on door-sockets and stone vases, show the veneration in which the ancient shrine was then held and the importance attached to its possession, as giving a certain stamp of legitimacy. So on their votive offerings some of these rulers designate themselves as *patesis*, or over-priests, of En-lil. Early in the 3rd millennium B.C. the city was conquered and occupied by the Semitic rulers of Akkad, or Agade, and numerous votive objects of Alu-usharsid (Urumush or Rimush), Sargon and Naram-Sin testify to the veneration in which they also held this sanctuary. En-lil was in fact adopted as the Bel or great lord of the Semitic pantheon. The last monarch of this dynasty, Naram-Sin, rebuilt both the temple and the city walls, and in the accumulation of débris now marking the ancient site his remains are found about half way from the top to the bottom. To this Akkadian occupation succeeded an occupation by the first Semitic dynasty of Ur, and the constructions of Ur-Gur or Ur-Engur, the great builder of Babylonian temples, are superimposed immediately upon the constructions of Naram-Sin. Ur-Gur gave to the temple its final characteristic form. Partly razing the constructions of his predecessors, he erected a terrace of unbaked bricks, some 40 ft. high, covering a space of about 8 acres, near the north-western edge of which, towards the western corner, he built a *ziggurat*, or stage-tower, of three stages of unburned brick, faced with kiln-burned bricks laid in bitumen. On the summit of this artificial mountain stood, apparently, as at Ur and Eridu, a small chamber, the special shrine or abode of the god. Access to the stages of the *ziggurat*, from the court beneath, was had by an inclined plane on the south-east side. To the north-east of the *ziggurat* stood, apparently, the House of Bel, and in the courts below the *ziggurat* stood various other buildings, shrines, treasure chambers and the like. The whole structure was roughly orientated, with the corners towards the cardinal points of the compass. Ur-Gur also rebuilt the walls of the city in general on the line of Naram-Sin's walls.

The restoration of the general features of the temple of this and the immediately succeeding periods has been greatly facilitated by the discovery of a sketch map on a fragment of a clay tablet. This sketch map represents a quarter of the city to the eastward of the Shatt-en-Nil canal, which was enclosed within its own walls, a city within a city, forming an irregular square, with sides roughly 2700 ft. long, separated from the other quarters of the city, as from the surrounding country to the north and east, by canals on all sides, with broad quays along the walls. A smaller canal divided this quarter of the city itself into two parts, in the south-eastern part of which, in the middle of its S.E. side, stood the temple, while in the N.W. part, along the Shatt-en-Nil, two great storehouses are indicated. The temple proper, according to this plan, consisted of an outer and inner court (each covering approximately 8 acres), surrounded by double walls, with *ziggurat* on the north-western edge of the latter.

The temple continued to be built upon or rebuilt by kings of various succeeding dynasties, as shown by bricks and votive objects bearing the inscriptions of the kings of various dynasties of Ur and Isin. It seems to have suffered severely in some manner at or about the time of the Elamite invasions, as shown by broken fragments of statuary, votive vases and the like, from that period, but at the same time to have won recognition from the Elamite conquerors, so that Eriaku (Sem. *Rim-Sin*, biblical *Arioch*), the Elamite king of Larsa, styles himself "shepherd of the land of Nippur." With the establishment of the Babylonian empire, under Khammurabi, early in the 2nd pre-Christian millennium, the religious as well as the political centre of influence was transferred to Babylon, Marduk became the Bel or lord of the pantheon, many of En-lil's attributes and myths were transferred to him, and E-kur was to some extent neglected. Under the succeeding Cossaean dynasty, however, shortly after the middle of the 2nd millennium, E-kur was restored once more to its former splendour, several monarchs of that dynasty built upon and adorned it, and thousands of inscriptions, dating from the time of those rulers, have been discovered in its archives. After the middle of the 12th century follows another long period of comparative neglect, but with the conquest of Babylonia by the Assyrian Sargon, at the close of the 8th century B.C., we meet again with building inscriptions, and under Assur-bani-pal, about the middle of the 7th century, we find E-kur restored with a splendour greater than ever before, the *ziggurat* of that period being 190 ft. by 128 ft. After that E-kur appears to have gradually fallen into decay, until finally, in the Seleucid period, the ancient temple was turned into a fortress. Huge walls were erected at the edges of the ancient terrace, the courts of the temple were filled with houses and streets, and the *ziggurat* itself was curiously built over in a cruciform shape, and converted into an acropolis for the fortress. This fortress was occupied and further built upon until the close of the Parthian period, about A.D. 250; but under the succeeding rule of the Sassanids it in its turn fell into decay, and the ancient sanctuary became, to a considerable extent, a mere place of sepulture, only a little village of mud huts huddled about the ancient *ziggurat* continuing to be inhabited. The store-house quarter of the temple town had not been explored as late as 1909.

As at Tello, so at Nippur, the clay archives of the temple were found not in the temple proper, but on an outlying mound. South-eastward of the temple quarter, without the walls above described, and separated from it by a large basin connected with the Shatt-en-Nil, lay a triangular mound, about 25 ft. in average height and 13 acres in extent. In this were found large numbers of inscribed clay tablets (it is estimated that upward of 40,000 tablets and fragments have been excavated in this mound alone), dating from the middle of the 3rd millennium B.C. onward into the Persian period, partly temple archives, partly school exercises and text-books, partly mathematical tables, with a considerable number of documents of a more distinctly literary character. For an account of one of the most interesting fragments of a literary or religious character, found at Nippur, see below.

The great complex of ruin mounds lying S.W. of the Shatt-en-Nil canal, larger in extent and mass than the N.E. complex, had not up to 1909 been so fully explored as the mounds to the N.E. Almost directly opposite the temple, however, a large palace was excavated, apparently of the Cossaean period, and in this neighbourhood and further southward on these mounds large numbers of inscribed tablets of various periods, including temple archives of the Cossaean and commercial archives of the Persian period, were excavated. The latter, the "books and papers" of the house of Murashu, commercial agents of the government, throw light on the condition of the city and the administration of the country in the Persian period, the 5th century B.C. The former give us a very good idea of the administration of an ancient temple. The whole city of Nippur appears to have been at that time merely an appanage of the temple. The temple itself was a great landowner, possessed of both farms and pasture land. Its tenants were obliged to render careful accounts of their administration of the property entrusted to their care, which were preserved in the archives of the temple. We have also from these archives lists of goods contained in the temple treasuries and salary lists of temple officials, on tablet forms specially prepared and marked off for periods of a year or less.

On the upper surface of these mounds was found a considerable Jewish town, dating from about the beginning of the Arabic period onward to the 10th century A.D., in the houses of which were large numbers of incantation bowls. Jewish names, appearing in the Persian documents discovered at Nippur, show, however, that Jewish settlement at that city dates in fact from a much earlier period, and the discovery on some of the tablets found there of the name of the canal Kabari suggests that the Jewish settlement of the exile, on the canal Chebar, to which Ezekiel belonged, may have been somewhere in this neighbourhood, if not at Nippur itself. Hilprecht indeed believes that the Kabari was the Shatt-en-Nil. Of the history and conditions of Nippur in the Arabic period we learn little from the excavations, but from outside sources it appears that the city was the seat of a Christian bishopric as late as the 12th century A.D.

The excavations at Nippur were the first to reveal to us the extreme antiquity of Babylonian civilization, and, as already stated, they give us the best consecutive record of the development of that civilization, with a continuous occupancy from a period of unknown antiquity, long ante-dating 5000 B.C., onward to the middle ages. But while Nippur has been more fully explored than any other old Babylonian city, except Babylon and Lagash, still only a small part of the great ruins of the ancient site had been examined in 1909. These ruins have been particularly fruitful in inscribed material, especially clay tablets, many of them from the very earliest periods; but little of artistic or architectural importance has been discovered. Excavation at Nippur is particularly difficult and costly by reason of the inaccessibility of the site, and the dangerous and unsettled condition of the surrounding country, and still more by reason of the immense mass of later débris under which the earlier and more important Babylonian remains are buried.

See A. H. Layard, *Nineveh and Babylon* (1853); John P. Peters, *Nippur* (1897); H. V. Hilprecht, *Excavations in Assyria and Babylonia* (1904); Clarence S. Fisher, *Excavations at Nippur* (1st part 1905, 2nd part 1906); *Babylonian Expedition of the University of Pennsylvania*, a monumental edition of the cuneiform texts found at Nippur, with brief introductions and notes of a more general character (1893 foll.). For a plan of the Parthian palace see ARCHITECTURE, vol. ii. p. 381. (J. P. PE.)

The Nippur Deluge Fragment.—From among the many tablets and fragments of tablets discovered at Nippur one of more than ordinary interest was published in 1910. Though mutilated portions of only a few of its lines have been preserved, and the text contains no proper name, it is clear that the tablet represents part of a Babylonian version of the Deluge Legend.[1] The portion of the story covered by the text relates to the warning given by Ea to Ut-napishtim, the Babylonian equivalent of the Hebrew Noah. The god here states that he is about to send a deluge, which will cause destruction to all mankind, and he gives directions for the building of a great ship in which "the beasts of the field and the birds of heaven" may be saved, along with Ut-napishtim and his family; he fixes the size of the ship and directs that it should be covered with a strong roof or deck. The text bears a general resemblance to the two well-known Assyrian versions on tablets in the British Museum, but it has been claimed that its phraseology presents a closer parallel to the biblical version of the Deluge story in the "Priestly Code." For several years the existence of Babylonian versions of the legend had been detected among collections of tablets dating from the earlier historical periods. A fragment of one such version belongs to the period of the First Dynasty of Babylon,[2] and part of a still earlier Semitic version of another portion of the Gilgamesh Epic has also been recovered.[3] The new fragment from Nippur has given rise to considerable discussion, in view of the light it is said to throw upon a disputed problem of biblical criticism. According to its discoverer it represents the oldest account of the Babylonian Deluge story extant; and he considers it of fundamental importance for determining the age of Israel's earliest traditions, since he would regard it as having been written "before Abraham had left his Babylonian home in Ur of the Chaldees."

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[1] See Hilprecht, *The Babylonian Expedition of the University of Pennsylvania*, ser. D, vol. v. fasc. 1.

[2] It is dated in the reign of Ammizaduga; cf. Scheil, *Recueil de travaux*, xx. 55 ff. For another fragment of the Atar-khasis legend of the same period, see *Cuneiform Texts in the British Museum*, pt. vi., and cf. Zimmern, *Zeits. für Assyr.* xiv. 278 f.

[3] See Meissner, *Mitteil. der Vorderas. Gesellschaft* (1902), i. For other Semitic legends of this early period, see *Cuneiform Texts in the British Museum*, pt. xv. (1902), Pls. I.-VI., and cf. King, *The Seven Tablets of Creation*, p. lxxvii. f.

Beyond the fact that it was found at Nippur during the fourth of the American expeditions, there does not appear to be any exact record of its provenance; and, in order to determine its date, it is necessary to rely on the external and internal evidence furnished by the tablet itself. A number of hymns and prayers addressed to the chief Babylonian gods, and written throughout in the Sumerian language, have been found at Nippur, and these may be dated in the era of the kings of Ur and Isin, since some of them are mentioned by name in the petitions. To the latter part of this period Professor Hilprecht would assign the new Deluge fragment. It is natural that under the Sumerian revival, which characterized the united kingdom of Sumer and Akkad, the ancient ritual should have been revived and the Sumerian service-books adapted for the use of the reigning monarch. Sumerian, in fact, predominated, not only on the historical monuments, but also throughout the religious literature, a fact which militates against assigning the newly discovered Semitic legend to the period of these early Sumerian texts. It has already been noted that the earliest deluge-fragment previously recovered dates from the latter half of the First Dynasty of Babylon, when the Western Semites had succeeded in establishing their authority throughout the greater part of the country. But, to judge from the photographic reproduction of the Nippur tablet, the characters upon it do not appear to resemble those in use at the time of the First Dynasty, nor those of the period of the Dynasties of Ur and Isin. On purely epigraphic grounds the suggestion has indeed been made that it should be assigned to the Kassite period (not earlier than 1700 B.C.), during which a very large number of the tablets found at Nippur were inscribed.[1]

But, even so, the fragment is one of the most interesting that has been recovered on the site of Nippur. For it strikingly illustrates the fact that the temple of En-lil, like that of the Sun-god at Sippar and the other great temples in Babylonia, possessed a body of mythological and religious texts, which formed subjects for study and comment among the priestly scribes. It was by the collection and reproduction of such documents, preserved in the ancient religious centres, that Assur-bani-pal was enabled to form his unique library of tablets at Nineveh. The temple of E-kur thus formed no exception to the rule that the great temples of Babylonia were centres of literary, as well as of religious, activity.

The text of this Deluge fragment also furnishes one more proof of the existence of parallel versions of the same legend. In some instances, as in the great Creation Series of Babylon, the later scribes subjected the different versions to processes of editing, with the result that the earlier forms gave place to the redactions of a militant priesthood. But where no theological nor local prejudices were involved, the tendency to a faithful reproduction of the earlier texts prevailed. Thus the resemblances which have been claimed between the Nippur Deluge fragment and the version of the "Priestly Code" in Genesis, in themselves furnish no significant evidence as to the latter's date. The possibility that Hebrew traditions were subject to Babylonian influence from the period of the Canaanite conquest has long been recognized, and to the Exilic and post-Exilic Jew the mythology of Babylon may well have presented many familiar features. (L. W. K.)

NĪRĪZ, or NAIRĪZ, a district and town in the province of Fars, Persia. The district has 24 villages and extends from near Istahbamat, south of the Bakhtegan lake, to about 50 m. E. Water is scarce and the plain is not much cultivated in consequence. The produce consists of some grain, cotton, tobacco, &c., but fruit is more abundant. Here, as in the neighbouring Darab district, villages situated in the hills are called madan (mine), and some travellers have in their itineraries indicated a mine in localities where there is none.

The town of Nīrīz is situated in a plain 7 m. from the south-eastern point of the lake, and about 130 m. from Shiraz, and has a population of about 9000. The people of Nīrīz were stanch followers of the Báb (see BĀBIISM), and rose against the government in 1850 and in 1852, with disastrous results. Nīrīz was formerly known for its manufacture of steel from iron ore brought from Parpa, 40 m. E.

NIRVANA, the term in Buddhist theology, meaning literally "blowing out" or "dying out," Skt. *nirvā*, "to blow," for a calm or sinless state or condition of the mind reached by a dying out or extinction of sin (see BUDDHISM).

NISARD, JEAN MARIE NAPOLEON DÉSIRÉ (1806–1888), French author and critic, was born at Châtillon-sur-Seine on the 20th of March 1806. In 1826 he joined the staff of the *Journal des Débats*, but subsequently transferred his pen to the *National*. Under the empire he was inspector-general of education (1852) and director of the *École normale* (1857–1867). His literary reputation was effectually established by his *Histoire de la littérature française* (1844–1861), which secured his election to the Academy (1850). His other works include *Études d'histoire et de littérature* (1859–1864), and *Les Quatres grands historiens latins* (1875). In all his books he vigorously supported the claims of classicism against romanticism. He died at San Remo on the 27th of March 1888.

NISBETT, LOUISA CRANSTOUN (1812–1858), English actress, was the daughter of Frederick Hayes Macnamara, an actor, whose stage name was Mordaunt. As Miss Mordaunt she had considerable experience, especially in Shakesperean leading parts, before her first London appearance in 1829 at Drury Lane as Widow Cheerly in Andrew Cherry's (1762–1812) *Soldier's Daughter*. Her beauty and high spirits made her at once a popular favourite in a large number of comedy parts, until in 1831 she was married to Captain John Alexander Nisbett and retired. Her husband, however, was killed the same year by a fall from his horse, and she was compelled to reappear on the stage in 1832. She was the original Lady Gay Spanker of *London Assurance* (1841). In 1844 she withdrew again from the stage to marry Sir William Boothby, Bart., but on his death (1846), returned to play Lady Teazle, Portia, Constantine in the *Love Chase*, Helen and Julia in the *Hunchback*. It was in the first of these parts that she made her final appearance in 1851. She died on the 15th of January 1858.

NISH (also written NISCH and NIŠ), the capital of the Nish department of Servia, lying in a plain among the southern mountains, on the left shore of the Nishava, a tributary of the Morava. Pop. (1900) 24,451. Among Servian cities, Nish is only surpassed by Belgrade in commercial and strategic importance; for it lies at the point where several of the chief Balkan highroads converge, and where the branch railway to Salonica leaves the main line between Belgrade and Constantinople. The administration of the Servian railways has its factory for repairing engines and principal store of materials in the city, which also possesses an iron foundry. The king and the government reside for at least three months in the year in Nish, where also the national assembly, before the constitution of 1901, was regularly held. It is the see of a bishop, the seat of the district prefecture and a tribunal, and the headquarters of the territorial militia corps, having besides a large number of regular troops in garrison. There is a small obsolete fortress on the right bank of the Nishava, believed to have been erected on the site of the Roman Naissus. The surrounding hills (Vinik, Goritsa, Kamenitsa) were, after 1886, fortified by modern earthworks.

After the Turks were driven from the city in 1878, it was in many respects modernized; but something of its former character is preserved in the ancient Turkish palace, mosque and fountain, the maze of winding alleys and picturesque houses in the older quarters, and, on market days, by the medley of peasant costumes—Bulgarian, Albanian and Rumanian, as well as Servian.

The ancient Roman city Naissus was mentioned as an important place by Ptolemy of Alexandria. Under its walls was fought in A.D. 269 the great battle in which Emperor Claudius destroyed the army of the Goths. It was at Naissus that

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[1] It has also been pointed out that the employment of the sign PI for *wa* and the use of *z* for *s*, cited in support of the earlier date, survived in the Kassite period.

Constantine the Great was born in A.D. 274. Though the emperor Julian improved its defences, the town was destroyed by the Huns under Attila, in the 5th century, but Justinian did his best to restore it. In the 9th century the Bulgarians became masters of Naissus, but had to cede it to the Hungarians in the 11th century, from whom the Byzantine emperor Manuel I. reconquered it in 1173. Towards the end of the 12th century the town was in the hands of the Servian prince Stephen Nemanya, who there received hospitably the German emperor Frederic Barbarossa and his Crusaders. In 1375 the Turks captured Naissus for the first time from the Servians. In 1443 the allied armies of the Hungarians under Hunyady and the Servians under George Brankovich, retook it from the Turks, but in 1456 it again came under Turkish dominion, and remained for more than 300 years the most important Turkish military station on the road between Hungary and Constantinople. In the frequent wars between Austria and Turkey during the 17th and 18th centuries the Austrians captured Naissus twice (in 1689 and 1737), but were not able to retain it long. The Servians having, in the beginning of the 19th century, successfully cleared Servia of Turks, were emboldened to attack Nish in 1809, but were repulsed with great loss. The Turks raised as a monument of their victory a high tower composed entirely of the heads of the Servians slain in the battle of Nish. The remnants of this monument are still kept up. It stands half a mile to the east from Nish, and is called to this day by the Turkish name "Tyele-Koula," "the Tower of Skulls." In the Russo-Turkish War the Servian army, under the personal command of King Milan, besieged Nish, and forced it to capitulate on the 10th January 1878. The Berlin congress decided that it should remain with Servia. (C. Mi.)

NISHĀPŪR, a province of Persia, situated between Meshed and Sabzevar, in northern Khorasan. The older name of the district was Abarshehr. It has a population of from 130,000 to 140,000, is divided into twelve districts, and pays a yearly revenue of about £12,000. It produces much grain and cotton, and is considered one of the most fertile districts of Persia. One of its subdivisions is that of Bār-i-Mādan, with chief place Mādan (situated 32 m. N.W. of the city of Nishāpūr, at an elevation of 5100 ft., in 36° 28′ N., 58° 20′ E.), where the famous mines are which have supplied the world with turquoises for at least 2000 years. The province used to be one of the administrative divisions of Khorasan, but is now a separate province, with a governor appointed by the shah.

NISHĀPŪR (Old Pers. *Nēv-shāpūr-nēv*, New Pers. *nīv*, *nīk* = good; Arab. *Naisābūr*), the capital of the province of Nishāpūr, Persia, situated at an elevation of 3920 ft., in 36° 12′ N., and 58° 40′ E., about 49 m. west of Meshed. The second element of the name is that of the traditional founder Shāpūr, or Sapor of the Western historians. Some accounts name the first (241–272), others the second Shāpūr (309–379). It was once one of the four great cities of Khorasan, rivalling Rai (Rhages), "the mother of cities," in importance and population, but is now a small and comparatively unimportant place with a population of barely 15,000. It has post and telegraph offices and a lively trade in wool, cotton and dry fruits (almonds, pistachios).

Eastward of the present city, amongst the mounds and ruins of the old town, in a dilapidated chamber adjoining a blue-domed building over the grave of an imamzadeh, is the tomb of the astronomer-poet Omar Khayyām, an unsightly heap of plaster without inscription, and probably fictitious. Near it is the grave of the celebrated poet and mystic Farīd ud dīn Attār, who was killed by the Mongols when they captured the city *c.* 1229.

Nishāpūr was an important place during the 5th century, for Yazdegerd II. (438–457) mostly resided there. During the latter Sassanids it is seldom mentioned, and when the Arabs came to Khorasan (641–642) it was of so little importance that, as Tabari relates, it did not even have a garrison. Under the Tahirids (820–872) it became a flourishing town and rose to great importance during the Samanids (874–999). Toghrul, the first ruler of the Seljuk dynasty, made Nishapur his residence in 1037. In 1153 the Ghuzz Turkomans overran the country and partly destroyed town and suburbs. In 1208 most of the town was destroyed by an earthquake. The town was hardly rebuilt when it was again destroyed, this time by the Mongols (April 1221) and so effectually that, completely levelled to the ground, it was turned into a vast barley field. The city was again rebuilt, suffered again at the hands of the Mongols (1269) and from another great earthquake (1280), and never again rose to its former greatness. (A. H.-S.)

NISIBIS (*Nasibina* in the Assyrian inscriptions), an ancient city and fortress in the north of Mesopotamia, near the point where the Mygdonius (mod. Jaghjagha) leaves the mountains by a narrow defile. The modern Nezib or Nasibin consists of some 4000 inhabitants, largely Jews, who pay tribute to the Shammar Bedouins. The neighbourhood, we are informed by Arab writers, was at one time richly wooded, but is now somewhat marshy and unhealthy. According to the Arabian geographer, Yaqut, Persian scorpions were thrown into the place when it was besieged by Anushirwan; hence their number to-day. The church of St James, belonging to a small community of Jacobite Christians, and a few pillars and blocks of masonry are the only remains of the former greatness of the town.

The site of Nisibis, on the great road between the Tigris and the Mediterranean, and commanding alike the mountain country to the north and the then fertile plain to the south, gave it an importance which began during the Assyrian period and continued under the Seleucid empire. From 149 B.C. to A.D. 14 Nisibis was the residence of the kings of Armenia, and there Tigranes had his treasure-houses. The place figured frequently as a frontier fortress in the wars of the Romans and the Parthians, its brick walls being unusually thick and its citadel very strong. Ceded to the Parthians by Hadrian, it became a Roman colony (Septimia Colonia Nisibis) under Septimius Severus. It was heroically defended against Shapur (Sapor) II., who unsuccessfully besieged it thrice. In the peace made by Jovian, however, it passed into the hands of the Persians, who established a strong colony there (A.D. 364). Nisibis early became the seat of a Jacobite bishop and of a Nestorian metropolitan, and under the Arabs (when it continued to flourish and became the centre of the district of Diyā'r Rebī'a) the population of the town and neighbourhood was still mostly Christian, and included numerous monasteries. Arab geographers and travellers of the middle ages speak in high terms of the gardens of Nisibis, and the magnificent returns obtained by the agriculturist. According to Mokaddasi (*ob.* 1024), acorns, preserved fruits and manufactured articles such as carriages and inkstands were exported. The town was so heavily taxed by the Hamdanid princes at Mosul that the Arab tribe of the Banu Habīb, although blood relations of the Hamdanids, migrated into Byzantine territory, where they were well received, accepted Christianity, attracted other emigrants from Nisibis, and at last began to avenge themselves by yearly raids upon their old home. Ibn Ḥaukal goes on to say that finally the Hamdanids took possession of the town, confiscated the estates of those who had emigrated, and compelled those who remained to substitute corn for their profitable fruit crops. This destroyed the prosperity of Nisibis, and the district, no longer protected against nomad tribes, became a wilderness. Nisibis (Nezib) appeared for the last time in history in 1839, when the Egyptians under Ibrahim Pasha defeated the Turkish army under Hafiz Pasha on the 24th of June in a battle at which von Moltke was present.

NISI PRIUS, in English law, a term used to denote generally all actions tried before judges of the king's bench division. For the history and meaning of this term see Assize. As a rule actions only are tried at *nisi prius*, and a judge is said to sit at *nisi prius* when he sits, usually in the king's bench division, for the trial of actions. By a resolution passed by the judges of the king's bench division in 1894 it was declared of the utmost importance that there should be at least three courts of *nisi prius* sitting continuously throughout the legal year—one for special jury causes, one for common jury causes, and one for causes without juries (see the *Annual Practice*).

Nisi Prius Record was before the Judicature Acts the name of the formal copy of proceedings showing the history of the case up to the time of trial. After the trial it was endorsed with the *postea*, showing the result of the trial, and delivered by the officer of the court to the successful party, whose possession of the *postea* was his title to judgment. Since the Judicature Acts there is no *nisi prius* record in civil actions, the nearest approach to it being the deposit of copies of the pleadings for the use of the judge, and there is no *postea*, the certificate of the associate or master as to the result of the trial superseding it.

NISUS, in Greek mythology, king of Megara, brother of Aegeus, king of Athens. When Minos, king of Crete, was on his way to attack Athens to avenge the murder of his son Androgeus, for which Aegeus was directly or indirectly responsible, he laid siege to Megara. He finally gained possession of the city through the treachery of the king's daughter Scylla, who, enamoured of Minos, pulled out the golden (or purple) lock from her father's head, on which his life and the safety of the city depended (for similar stories, see Frazer, *Golden Bough*, iii. 1900, p. 358). Megara was captured, and Nisus, who died fighting (or slew himself), was changed into a sea-eagle. Minos, disgusted at Scylla's treachery, tied her to the rudder of his ship, and afterwards cast her body ashore on the promontory called after her Scyllaeum; or she threw herself into the sea and swam after Minos, constantly pursued by her father, until at last she was changed into a *ciris* (a bird or a fish). In Virgil, Scylla, the daughter of Nisus, is confused with the sea-monster, the daughter of Phorcys. Nisus was the eponymous hero of the harbour of Nisaea, and local tradition makes no mention of his betrayal by his daughter. According to Roscher (in his *Lexikon der Mythologie*), who identifies the *ciris* with the heron, the story of Nisus and Scylla (like these of Aëdon, Procne, Philomela and Tereus) was invented to give an aetiological explanation of the characteristics of certain birds. The birds were regarded as originally human beings, whose acts and characters were supposed to account for certain habits of the birds into which they had been changed. E. Siecke, *De Niso et Scylla in aves mutatis* (progr. Berlin, 1884), holds that the purple or golden hair of Nisus is the sun, and Scylla the moon, and that the origin of the legend is to be looked for in a very ancient myth of the relations between the two, which he endeavours to explain with the aid of Indian and German parallels.

NITHARD (d. 844), Frankish historian, was the illegitimate son of Angilbert, the friend of Charlemagne, by Bertha, a daughter of the great emperor. He was educated at the imperial court and became abbot of St Riquier *in commendam*, never taking the vows. Little else is known about his life, but he appears to have served his cousin, Charles the Bald, on peaceful errands and also on the field of battle. He fought for Charles at Fontenoy in June 841, and died as the result of wounds received whilst fighting for him against the Northmen near Angoulême. The date of his death was probably the 14th of June 844. In the 11th century his body, with the fatal wound still visible, was found in the grave of his father, Angilbert. Nithard's historical work consists of four books on the history of the Carolingian empire under the turbulent sons of the emperor Louis I., especially during the troubled period between 840 and 843. This *Historiae* or *De dissensionibus filiorum Ludovici pii* is valuable for the light which it throws upon the causes which led to the disintegration of the Carolingian empire. Although rough in style, partisan in character and sometimes incorrect in detail, the books are the work of a man who had an intimate knowledge of the events which he relates, who possessed a clear and virile mind, and who above all was not a recluse but a man of action. They are dedicated to Charles the Bald, at whose request they were written.

The *Historiae* has been printed several times. Perhaps the best edition is in Band ii. of the *Monumenta Germaniae historica. Scriptores*; it has also been edited by A. Holder (Freiburg, 1882). It has been translated into German by J. von Jasmund (Berlin, 1851; new edition by W. Wattenbach, Leipzig, 1889); and into French in tome iii. of Guizot's *Collection des mémoires* (Paris, 1824).

See O. Kuntzemüller, *Nithard und sein Geschichtswerk* (Jena, 1873); G. Meyer von Knonau, *Über Nithards vier Bücher Geschichten* (Leipzig, 1866); and W. Wattenbach, *Deutschlands Geschichtsquellen*, Band i. (Berlin, 1904).

NITHSDALE, WILLIAM MAXWELL, 5TH EARL OF (1676–1744), Jacobite leader, was a member of the family of Maxwell (*q.v.*), being a son of Robert the 4th earl (d. 1696) and a collateral relation of Robert Maxwell (d. 1646) who was created earl of Nithsdale in 1620. He became famous by his loyalty to the royalist tradition of his family, and by the heroism of his wife Winifred, daughter of William Herbert, 1st marquess of Powis. After becoming earl in 1698 he served the exiled house of Stuart in secret, was suspected as a Jacobite conspirator, and was much molested on that account. In 1712 he resigned his estate to his son William (d. 1776), reserving a life rent to himself. When the Jacobite rising took place in 1715 he joined his friends in the north of England and was taken prisoner at Preston, being sent to London for trial. The countess of Nithsdale, who was at Terregles when she heard of the capture of her husband, followed him to London, making part of the journey on horseback in bitter winter weather. The earl and the other Jacobites were brought to trial in Westminster Hall on the 19th of January 1716, and condemned to death on the 9th of February. The execution was fixed for the 24th. The countess presented a petition to George I. which he refused to receive, and when she knelt before him and took hold of the skirts of his coat he dragged her half across the room before he could break away. Finding that no pardon could be obtained the countess laid a plan to rescue her husband from the Tower of London. With the help of two Jacobite ladies, Mrs Morgan and Mrs Mills, she very cleverly extricated her husband from his cell on the night before the day fixed for the execution by disguising him as a woman. The earl escaped from England and was followed by the countess, but not till she had gone back to Scotland to rescue important legal papers which proved the transfer of the estate to their son. The earl and countess went to Rome after a short stay in France. In Rome they were attached to the court of the Pretender and lived in poverty and obscurity. The earl died on the 20th of March 1744, and the countess in 1749. Their son, William Maxwell, regained the possession of the family property after his father's death in 1744, since the government could only confiscate his father's life-interest; but the title was forfeited, and he died childless.

See Sir A. Fraser, *The Book of Carlaverock* (Edinburgh, 1873).

NITRE, the name given to naturally occurring potassium nitrate; "cubic nitre" is sodium nitrate. The word is adapted from Lat. *nitrum*, which is itself adapted from Gr. νίτρον. These words were originally applied to the naturally occurring sodium carbonate; the connexion with potassium nitrate (*sal petrae* or *sal petrosum*) may be traced to Raimon Lull's name *sal nitri*, which substance, however, he distinguished from *nitrum*. In the 16th century the ancient nitrum became altered to natron, a term still used for native sodium carbonate, while *nitrum*, and its adaptation nitre, were retained for potassium nitrate or saltpetre (*q.v.*).

NITRIC ACID (*aqua fortis*), HNO_3, an important mineral acid. It is mentioned in the *De inventione veritatis* ascribed to Geber, wherein it is obtained by calcining a mixture of nitre, alum and blue vitriol. It was again described by Albert le Grand in the 13th century and by Raimon Lull, who prepared it by heating nitre and clay and called it "eau forte." Glauber devised the process in common use to-day, viz. by heating nitre with strong sulphuric acid. Its true nature was not determined until the 18th century, when A. L. Lavoisier (1776) showed that it contained oxygen, whilst in 1785 H. Cavendish determined its constitution and showed that it could be synthesized by passing a stream of electric sparks through moist air. The acid is found to exist to a slight extent in the free condition in some waters, but chiefly occurs in combination with various metals, as nitrates, principally as nitre or saltpetre, KNO_3, and Chile saltpetre, $NaNO_3$. It is formed when a stream of electric sparks is passed through moist air, and in the oxidation of nitrogenous matter in the presence of water.

For experimental purposes it is usually obtained by distilling potassium or sodium nitrate with concentrated sulphuric acid. The acid so obtained usually contains more or less water and some dissolved nitrogen peroxide which gives it a yellowish red colour. It may be purified by redistillation over barium and silver nitrates, followed by treatment of the distillate with a stream of ozonized air. The product so obtained is then redistilled under diminished pressure and finally distilled again from a sealed and evacuated apparatus (V. Veley and Manley, *Phil. Trans.*, 1898, A. 291, p. 365). On the large scale it is obtained by distilling Chile saltpetre with concentrated sulphuric acid in horizontal cast iron stills, the vapours being condensed in a series of stoneware Woulfe's bottles. In practice the theoretical quantity of acid and Chile saltpetre is not used, but the charge is so regulated that the mixture of acid and neutral sodium sulphate formed in the retort remains liquid at the temperature employed, and consequently can be readily removed. Various modifications have been made in the form of the condensing apparatus, the Guttmann condenser (*Jour. Soc. Chem. Ind.*, 1893, p. 203) being now frequently employed. This consists of a series of vertical earthenware condensing tubes through which compressed air is passed in order to reduce the quantity of nitrogen peroxide to a minimum. The temperature of the condenser is so regulated as to bring about the condensation of the nitric acid only, which runs out at the bottom of the pipe, whilst any uncondensed steam, nitrogen peroxide and other impurities pass into a Lunge tower, where they meet a descending stream of water and are condensed, giving rise to an impure acid. F. Valentiner [Eng. Pat. 610 (1892), 19192 (1895)] recommends distillation and condensation of nitric acid in a partial vacuum. For the production of nitric acid from air see NITROGEN. Fuming nitric acid consists of a solution of nitrogen peroxide in concentrated nitric acid and is prepared by distilling dry sodium nitrate with concentrated sulphuric acid.

Nitric acid is a colourless strongly fuming liquid, having a specific gravity of 1·50394 (24·2° C.) (V. Veley, *Proc. Roy. Soc.*, 62, p. 223). It is exceedingly hygroscopic and corrosive. On distillation, the pure acid begins to boil at 78·2° C. (W. Ramsay), partial decomposition into water, oxygen and nitrogen peroxide taking place. The acid solidifies when strongly cooled, the solid melting at −47° C. Concentrated nitric acid forms with water a constant boiling mixture which boils at 120·5° C., contains 68% of acid and possesses a specific gravity of 1·414 (15·5° C.). If a more dilute acid than this be distilled, water passes over in excess and the residue in the retort reaches the above composition and boiling point; on distillation of a stronger acid, excess of acid passes into the distillate and the boiling point rises until the values of the constant boiling mixture are reached. On the hydrates of nitric acid see V. Veley, *Jour. Chem. Soc.*, 1903, 83, p. 1015, and F. W. Kuster, *Zeit. anorg. Chem.* 1904, 41, p. 1. On mixing nitric acid with water there is a rise of temperature and a contraction in volume. The acid is a powerful oxidizing agent. It attacks most metals readily, usually with production of a nitrate or hydrated oxide of the metal and one or other of the oxides of nitrogen, or occasionally with the production of ammonium salts; magnesium, however, liberates hydrogen from the very dilute acid. Its action on metals depends in most cases on the temperature, strength of the acid, and the nature of the products of reaction. Thus in the case of copper, it is found that the diluted acid acts very slowly upon the metal at first, but as the reaction proceeds the copper dissolves more rapidly up to a certain point and then the rate of solution again diminishes. This is possibly due to the accelerating action of the nitrous acid which is produced in the direct action of the copper on the nitric acid and which, when a certain amount has been formed in the system, begins to decompose, thus $3HNO_2 = HNO_3 + 2NO + H_2O$ (V. Veley, *Phil. Trans.*, 1891, 182, p. 279; G. O. Higley, *Amer. Chem. Jour.*, 1893, 15, p. 71, 1895, 17, p. 18, 1896, 18, p. 587). Iron when brought into contact with nitric acid under certain conditions, remains passive to the acid. Thus at 55° C. it is passive to an acid of specific gravity 1·42, and at 31° C. to an acid of specific gravity 1·38. No satisfactory explanation of this passivity has been given (see J. B. Senderens, *Bull. Soc. Chem.*, 1896 [3], 15, p. 691; A. Finkelstein, *Zeit. phys. Chem.*, 1901, 39, p. 91; W. J. Müller, *ibid.* 1904, 48, p. 577). Nitric acid is without action on gold, platinum, iridium and rhodium.

The salts of nitric acid, known as *nitrates*, are mostly readily soluble in water and crystallize well. They are all decomposed when heated to a sufficiently high temperature, with evolution for the most part of oxygen and nitrogen peroxide, leaving a residue of oxide of the metal. They may be recognized by the fact that on the addition of a solution of ferrous sulphate, followed by that of concentrated sulphuric acid (the mixture being kept quite cold), the ferrous sulphate solution becomes of a deep brown colour, owing to the reducing action of the ferrous sulphate on the nitric acid which is liberated by the action of the sulphuric acid on the nitrate. As an alternative method the nitrate may be warmed with some fragments of copper and sulphuric acid which has been diluted with its own volume of water, when characteristic brown vapours will be seen.

Nitric acid finds extensive application in the manufacture of sulphuric acid, certain coal-tar colouring matters, explosives, and in the production of various nitrates.

In medicine, nitric acid is used externally in a pure state as a caustic to destroy chancres, warts and phagadenic ulcers; and diluted preparations are employed in the treatment of dyspepsia, &c. Poisoning by strong nitric acid produces a widespread gastro-enteritis, burning pain in the oesophagus and abdomen and bloody diarrhoea. There may also be blood in the urine. Death occurs from collapse or from secondary destructive changes in the intestinal canal. Characteristic yellow staining of the skin round the mouth from the formation of xanthoproteic acid serves to distinguish it from poisoning by other acids. The antidotes are mild alkalis, together with the use of opium to relieve pain.

NITROBENZENE, $C_6H_5NO_2$, the simplest aromatic nitro compound. It was first isolated in 1834 by E. Mitscherlich (*Pogg. Ann.*, 1834, 31, p. 625), and is prepared commercially by the gradual addition of benzene to a well-cooled mixture of concentrated nitric and sulphuric acids, the oily product being separated, washed with alkali, and then distilled. It also results in the oxidation of aniline by monopersulphuric acid (H. Caro, *Zeit. angew. Chem.*, 1898, p. 845) or by potassium permanganate (E. Bamberger, *Ber.*, 1893. 26, p. 496); by the oxidation of nitrosobenzene (below) with atmospheric oxygen; or by the decomposition of benzene diazonium nitrate mercury nitrite, $Hg(NO_2)_2\cdot 2C_6H_5N_2\cdot NO_3$, with copper powder (A. Hantzsch, *Ber.*, 1900, 33, p. 2551). It is a yellowish liquid possessing a strong smell of oil of bitter almonds. It boils at 209°C., and melts at 3·6° C. (C.E. Linebarger, *Amer. Chem. Jour.*, 1896, 18, p. 437). The products of its electrolytic reduction vary with the conditions: in sulphuric acid solution it yields para-aminophenol (L. Gattermann, *Ber.*, 1893, 26, p. 1844); in alcoholic alkaline solution it yields azoxybenzene; in acid alcoholic solution, benzidine; in ammoniacal alcoholic solution, phenylhydrazine. With chlorine, in the presence of iodine or antimony chloride, it yields meta-chlornitrobenzene. Hydrobromic acid at 185°-190°C. converts it into di- and tri-bromaniline. It occasionally acts as an oxidizing agent, as in the preparation of quinoline and fuchsine. It is used commercially for the preparation of aniline and of benzidine; and in perfumery (oil of mirbane).

Dinitrobenzenes, $C_6H_4(NO_2)_2$.—Ortho-dinitrobenzene is formed in small quantity in the preparation of meta-dinitrobenzene, and also results from the action of nitro-sulphuric acid on bismuth triphenyl (A. Gillmeister, *Ber.*, 1897, 30, p. 2844). It forms colourless crystals which melt at 116·5° C. and boil at 319° C. (773 mm.). On boiling with aqueous caustic soda, it yields ortho-nitrophenol. Meta-dinitrobenzene is formed by the direct nitration of nitrobenzene with fuming nitric acid, the product being poured into water and recrystallized from dilute alcohol. It forms practically colourless needles which melt at 89·7° C., and boil at 302·8° C. It is used for the preparation of meta-phenylene diamine. Para-dinitrobenzene results from the action of nitrogen peroxide on an ethereal solution of quinone dioxime (R. Oliveri-Tortorici, *Gazz.*, 1900, 30, i. p. 533). It crystallizes in colourless needles, which melt at 171°-172° C. It is only slightly soluble in cold water and cold alcohol.

Trinitrobenzenes, $C_6H_3(NO_2)_3$.—Asymmetrical (1.2.4) trinitrobenzene results from the action of fuming nitric and sulphuric acids on para-dinitrobenzene. It forms yellow crystals, which melt at 57·5° C. When boiled with dilute aqueous caustic soda it yields 2·4 dinitrophenol. Symmetrical (1.3.5) trinitrobenzene is formed by the further nitration of meta-dinitrobenzene with fuming sulphuric and nitric acids; by the action of hydrochloric acid on sodium malonyl aldehyde (H. B. Hill and J. Torray, *Ber.*, 1895, 28, p. 2598), or by the action of water on 2.4.6-trinitrobenzoic acid (German patent 77353). It crystallizes in prisms which melt at 121° C. It yields addition compounds with aniline and naphthalene, and combines directly with potassium methylate, sodio-malonic ester and hydrocyanic ester. Alkaline potassium ferricyanide oxidizes it to picric acid.

Nitrosobenzene, C_6H_5NO, was first obtained by the action of nitrosyl bromide or chloride on mercury diphenyl (A. Baeyer, *Ber.*, 1874, 7, p. 1638). It results, with other products, in the oxidation of phenyl diazonium chloride with alkaline potassium ferricyanide; of β-phenylhydroxylamine with chromic acid mixture (E. Bamberger, *Ber.*, 1893, 26, pp. 473, 483, 1894, 27, p. 1349), or of aniline by monopersulphuric acid (German patent 110575). It exists in two crystalline forms. Nitric acid passed into its chloroform solution gives phenyl diazonium nitrate. With aniline and acetic acid it yields azobenzene. It combines with aromatic amines to form azo-compounds, with arylhydroxylamines to form azoxy compounds, and with hydroxylamine it gives isodiazobenzene.

NITRO COMPOUNDS, in organic chemistry, compounds containing the monovalent radical $-NO_2$ directly combined with carbon.

Aiphatic Nitro Compounds.—The nitroparaffins may be obtained by the action of the alkyl iodides on silver nitrite (V. Meyer, *Ann.* 1874, 171, p. 1 et seq.). When methyl iodide is used, nitromethane is the sole product, but the higher homologues give more or less of the isomeric nitrous esters. Nitroparaffins may also be obtained by the action of sodium nitrite on the α-halogen fatty acids, the α-nitro fatty acids first formed readily eliminating carbon dioxide (H. Kolbe, *Jour. prak. Chem.*, 1872 [2] 5, p. 427). Tertiary nitro compounds may also be obtained by the oxidation of the corresponding amino-, hydroxylamino-, and nitroso-hydrocarbons with monopersulphuric acid (E. Bamberger, *Ber.*, 1903, 36, p. 385):

$$\rightarrow C\cdot NH_2 \longrightarrow \quad \rightarrow C\cdot NHOH \longrightarrow \quad \rightarrow C\cdot NO \longrightarrow \quad \rightarrow C\cdot NO_2.$$

The nitro compounds of the lower members of the paraffin series cannot be prepared by the direct action of nitric acid on the hydrocarbons themselves, but, in the case of some of the higher members of the series direct nitration is possible (M. Konowalow, *Comptes rendus*, 1892, 114, p. 26; *Ber.*, 1895, 28, p. 1852; R. A. Worstall, *Amer. Chem. Jour.*, 1898, 20, p. 202).

The nitro compounds are colourless, somewhat pleasant smelling liquids, which distil without decomposition and possess boiling points much higher than those of the isomeric nitrous esters. Reduction with acid-reducing agents gives amines. The primary and secondary nitro compounds (*i.e.* those containing the groupings $\cdot CH_2NO_2$ and $>CH\cdot NO_2$) form metallic derivatives; for example, sodium salts, which according to A. Hantzsch (*Ber.*, 1899, 32, pp. 577 et seq.) are probably derived from the isomeric *iso-nitro* compounds $R : NO(OH)$, and thus the nitro derivatives are to be looked upon as *pseudo-acids.* These sodium salts are crystalline solids which are readily soluble in water and are very explosive. Stannous chloride and hydrochloric acid reduce the nitroparaffins to β-alkyl hydroxylamines, amines and some ammonia being simultaneously produced (V. Meyer, *Ber.*, 1891, 24, p. 3530), whilst the primary nitro compounds on heating with hydrochloric acid yield hydroxylamine and an acid:

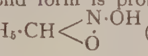
$$CH_3\cdot CH_2\cdot NO_2 + H_2O = CH_3\cdot CO_2H + NH_2OH$$

(V. Meyer, *Ann.*, 1876, 180, p. 163). When reduced by the Sabatier and Senderens' method (*Comptes rendus*, 1902, 135, p. 225) they are converted into amines, provided the temperature be kept at 150°-200° C., a higher temperature leading to the formation of paraffins and ammonia. The hydrogen in the primary and secondary nitro compounds which is attached to the same carbon atom as the nitro group is readily replaced by bromine in alkaline solution. The reactions of the nitroparaffins with nitrous acid are very characteristic and have been used as a method for discriminating between the primary, secondary and tertiary alcohols (*q.v.*) (V. Meyer, *Ann.*, 1875, 175, p. 93). The primary compounds form *nitrolic acids* of the type $R\cdot C(:NOH)NO$, the secondary yield *pseudo-nitrols* of the type $RR^1: C(NO)(NO_2)$, whilst the tertiary nitro compounds are not acted upon by nitrous acid. The primary nitroparaffins combine with nitric oxide in the presence of sodium ethylate, to form nitroalkylisonitramines, $R\cdot CH(NO_2)\cdot N_2O_2H$ (W. Traube, *Ann.*, 1898, 300, p. 95).

Nitromethane, CH_3NO_2, is a colourless oil which boils at 101° C. Fuming sulphuric acid decomposes it into carbon monoxide and hydroxylamine. It combines with aromatic aldehydes in the presence of alcoholic potash to form addition products which are converted by acids into styrol derivatives (J. Thiele, *Ber.*, 1899, 32, p. 1293). *Nitroethane*, $C_2H_5NO_2$, is a colourless liquid which boils at 114° C. *Nitroform* (trinitromethane), $CH(NO_3)_3$, is obtained in the form of its ammonium salt by the decomposition of trinitroacetonitrile with water (L. Schischkoff, *Ann.*, 1857, 103, p. 364). It is a colourless crystalline solid which melts at 15° C. and has the properties of a strong acid. The potassium salt is formed by the action of potassium ethylate on tetranitromethane (A. Hantzsch, *Ber.*, 1899, 32, p. 631). It is a deep yellow coloured solid, which is readily soluble in water. It explodes when heated. The silver salt, obtained by shaking an ether solution of nitroform with freshly prepared, slightly moist silver oxide, reacts with methyl iodide to form *trinitroethane*, a crystalline solid which melts at 56° C. Concentrated caustic potash decomposes the latter compound, forming the potassium salt of dinitroethane, $CH_3\cdot C(NO_2)_2K$. *Tetranitromethane,* $C(NO_2)_4$, obtained by adding nitroform to a hot mixture of nitric and sulphuric acids, is a crystalline solid which melts at 13° C. *Chlorpicrin*, CCl_3NO_2, is a liquid of suffocating odour obtained by the action of nitric acid and chloride of lime on many organic compounds. It boils at 112°.

Aromatic Nitro Compounds.—The aromatic nitro compounds are generally obtained by the direct action of nitric acid. Substitution takes place usually in the nucleus and only rarely in the side chain, and according to the conditions of the experiment and the nature of the compound acted upon, one or more nitro groups enter the molecule. The reaction is generally carried out in the presence of sulphuric acid, which is used to absorb the water formed during the process of nitration. Nitro compounds have also been prepared by the action of cuprous oxide on diazonium salts (T. Sandmeyer, *Ber.*, 1887, 20, p. 1494); by the action of copper powder on the double salt formed by the addition of potassium mercuric nitrite to diazonium nitrites; and by the oxidation of primary aromatic amines (E. Bamberger, *Ber.*, 1893, 26, p. 496). The mono-nitro compounds are stable and distil without decomposition; they have a pale yellow colour and possess an agreeable odour. Most of the polynitro compounds are not volatile, but undergo decomposition on heating. The nitro group in the aromatic series is bound very firmly in the molecule and is not readily exchanged for other groups. Several different products may be obtained by the reduction of the aromatic nitro compounds, the substances formed in any particular case depending on the conditions of experiment. In acid solution, amines are obtained, in alkaline solution, azoxy, azo and hydrazo compounds, and in neutral solution hydroxylamino compounds. The electrolytic reduction of the aromatic nitro compounds gives rise to substituted hydroxylamines which are immediately transformed into aminophenols or amines.

For the nitrobenzenes see NITROBENZENE. *Nitrotoluenes*, $C_6H_4(CH)_3(NO)_2$. Three isomers exist, the ortho- and para-compounds being the chief products of the direct nitration of toluene. They may be separated by fractional distillation. The ortho-compound melts at 10·5° C. and boils at 218° C., the para-compound melts at 54° C. and boils at 230° C. Meta-nitrotoluene (melting at 16° C.) is obtained by nitrating acetparatoluidide and then replacing the amino group by hydrogen.

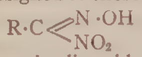


Phenylnitromethane, $C_6H_5\cdot CH_2\cdot NO_2$, isomeric with the nitrotoluenes, is prepared by the action of benzyl chloride on silver nitrite. It is a colourless oily liquid which boils at 225°-227° C., is somewhat soluble in water, and does not give a coloration with ferric chloride. It readily forms a sodium salt, from the aqueous solution of which on the addition of a mineral acid an isomeric solid form of the nitro compound (melting at 84° C.) is precipitated. This solid form gradually passes, on standing, into the oily variety. It is probably a hydroxy-compound, since it gives a red-brown colour with ferric chloride, reacts with phenyl isocyanate and with phosphorus pentachloride, and with benzoyl chloride yields dibenzhydroxamic acid, $C_6H_5CO\cdot NH\cdot O\cdot COC_6H_5$. Thus the solid form is probably to be represented as $C_6H_5CH: NO\cdot OH$ or $C_6H_5\cdot CH<\begin{smallmatrix} N\cdot OH \\ \dot{O} \end{smallmatrix}$ (see further, A. Hantzsch on Pseudo-acids, *Ber.*, 1899, 32, p. 575, 1902, 35, pp. 210, 226, 1001, 1906, 39, pp. 139, 1073 et seq.).

The *nitrolic acids*, $R\cdot C(:NOH)NO_2$, may be prepared by the action of nitrous acid on the primary nitroparaffins; by the action of hydroxylamine on the dibromnitroparaffins; and by the action of nitrogen peroxide on the α-isonitroso fatty acids (G. Ponzio, *Gazz.*, 1903, 33 (1), p. 508). They are colourless solids which are readily soluble in water and possess the character of weak acids. They are characterized by the deep red colour of their solutions in alkalis. When strongly heated they decompose, forming fatty acids, nitrogen peroxide and nitrogen. By passing hydrochloric acid gas into an ethereal solution of the acids, the nitro group is eliminated and the hydrochloride of an oximido-acid is obtained (A. Werner and H. Buss, *Ber.*, 1895, 28, p. 1282): $CH_3\cdot C(:NOH)NO_2 + 2HCl = HNO_2 + CH_3\cdot C(:NOH)Cl\cdot HCl$.

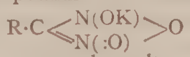
When heated with water and mineral acids, the nitrolic acids are completely decomposed, yielding fatty acids and nitrous oxide.

A. Hantzsch and O. Graul (*Ber.* 1898, 31, p. 2854) described several series of salts of the nitrolic acids, with particular reference to ethylnitrolic acid. They discriminate between the red or *erythro*-salts, which are well crystallized, very explosive and unstable compounds, and which regenerate the colourless nitrolic acid on the addition of dilute mineral acids, and the *leuco*-salts, which are colourless salts obtained by warming the erythro-salts or by exposing them to direct sunlight. These salts cannot be converted either into the red salts or into the free acid. An intensely yellow acid salt is described, as is also a very unstable colourless salt which could not be examined further owing to its very labile nature. The following structural formulae are assigned to these compounds:—



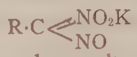
$\mathrm{R\cdot C}\begin{smallmatrix}\nearrow\mathrm{N\cdot OH}\\ \searrow\mathrm{NO_2}\end{smallmatrix}$

nitrolic acid;



$\mathrm{R\cdot C}\begin{smallmatrix}\nearrow\mathrm{N(OK)}\searrow\\ \searrow\mathrm{N(:O)}\nearrow\end{smallmatrix}\mathrm{O}$

erythro-salt;



$\mathrm{R\cdot C}\begin{smallmatrix}\nearrow\mathrm{NO_2K}\\ \searrow\mathrm{NO}\end{smallmatrix}$

leuco-salt.

The acid salts are obtained by the addition of one molecule of alkali to two molecules of the acid in concentrated alcoholic solution at a low temperature. They are unstable compounds which readily split into the red salt and the free acid on standing.

The *pseudo-nitrols*, $RR':C(NO)(NO_2)$, may be obtained by the action of nitrous acid on the secondary nitroparaffins; by the action of silver nitrite on such bromnitrosoparaffins as contain the bromine and the nitroso group united to the same carbon atom (O. Piloty, *Ber.*, 1902, 35, p. 3093); and by the action of nitrogen peroxide on ethereal solutions of ketoximes (R. Scholl, *Ber.*, 1888, 21, p. 508; G. Born, *Ber.* 1896, 29, p. 93). They exhibit an intense blue colour when in the liquid condition or dissolved in alkali and possess a very sharp smell. On oxidation with chromic acid they yield dinitrohydrocarbons, and on reduction with hydroxylamine (in alkaline solution) or with potassium sulphydrate give ketoximes, $RR':C:NOH$ (R. Scholl and K. Landsteiner, *Ber.*, 1896, 29, p. 87).

$$RR':C(NO)\cdot NO^2 \rightarrow RR':C(NH\cdot OH)_2 \rightarrow RR':C:N\cdot OH + NH_2OH.$$

Nitrosohydrocarbons have been prepared in the aliphatic series by the oxidation of the corresponding hydroxylamino compounds. Nitroso-tertiary butane, $(CH_3)_3C\cdot NO$, is formed when the corresponding hydroxylamine is oxidized by sulphuric monoper acid (E. Bamberger, *Ber.*, 1903, 36, p. 686). A nitrosooctane $(CH_3)_2C(NO)\cdot[CH_2]_2\cdot CH(CH_3)_2$, has been obtained by O. Piloty and O. Ruff (*Ber.*, 1898, 31, p. 457) from nitro-di-isobutyl by reducing it to the corresponding hydroxylamino compound with aluminium amalgam and oxidizing this with chromic acid mixture. It is a colourless solid which melts at 54° C. to a deep blue liquid. Numerous nitroso compounds are met with in the aromatic series.

NITROGEN [symbol N., atomic weight 14·01, O=16]. A non-metallic chemical element, first isolated in 1772 by D. Rutherford, who showed that on removing oxygen from air a gas remained, which was incapable of supporting combustion or respiration. Nitrogen forms approximately 79% by volume (or 77% by weight) of the atmosphere; actual values are: % by volume—79·07 (Regnault), 79·20 (Dumas); % by weight—76·87 (Regnault), 77·00 (Dumas), 77·002 (Léwy), 76·900 (Stas), 77·010 (Marignac). No absolutely accurate determinations appear to have been made recently. Free nitrogen is also found in some natural waters and has been recognized in certain nebulae. In the combined state nitrogen is fairly widely distributed, being found in nitre, Chile saltpetre, ammonium salts and in various animal and vegetable tissues and liquids. It is invariably present in soils, where compounds are formed by nitrifying bacteria.

Nitrogen may be obtained from the atmosphere by the removal of the oxygen with which it is there mixed. This may be effected by burning phosphorus in a confined volume of air, by the action of an alkaline solution of pyrogallol on air, by passing air over heated copper, or by the action of copper on air in the presence of ammoniacal solutions.

It is also prepared by heating ammonium nitrite (or a mixture of sodium nitrite and ammonium chloride): $NH_4NO_2=2H_2O+N_2$; by heating a mixture of ammonium nitrate and chloride (the chlorine which is simultaneously produced being absorbed by milk of lime or by a solution of sodium hydroxide): $4NH_4NO_3+2NH_4Cl=5N_2+Cl_2+12H_2O$; by heating ammonium dichromate (or a mixture of ammonium chloride and potassium dichromate): $(NH_4)_2Cr_2O_7=Cr_2O_3+4H_2O+N_2$; by passing chlorine into a concentrated solution of ammonia (which should be present in considerable excess): $8NH_3+3Cl_2=6NH_4Cl+N_2$; by the action of hypochlorites or hypobromites on ammonia: $3NaOBr+2NH_3=3NaBr+3H_2O+N_2$; and by the action of manganese dioxide on ammonium nitrate at 180-200° C. It is also formed by the reduction of nitric and nitrous oxides with hydrogen in the presence of platinized asbestos at a red heat (G. v. Knorre and K. Arndt, *Ber.*, 1899, 32, p. 2136); by the oxidation of hydroxylamine (*ibid.*, 1900, 33, p. 30); and by the electrolysis of hydrazine and its salts (E. Ch. Szarvasy, *Jour. Chem. Soc.*, 1900, 77, p. 603).

The chief importance of nitrogenous compounds depends upon their assimilation by living plants, which, in their development, absorb these compounds from the soil, wherein they are formed mainly by the action of nitrifying bacteria. Since these compounds are essential to plant life, it becomes necessary to replace the amount abstracted from the soil, and hence a demand for nitrogenous manures was created. This was met in a very large measure by deposits of natural nitre and the products of artificial nitrières, whilst additional supplies are available in the ammoniacal liquors of the gas-manufacturer, &c. The possible failure of the nitre deposits led to attempts to convert atmospheric nitrogen into manures by processes permitting economic success. Combination can be made in five directions, viz. to form (1) oxides and nitric acids, (2) ammonia, (3) readily decomposable nitrides, (4) cyanides, (5) cyanamides. The first three will be treated here; for the others see PRUSSIC ACID and CYANAMIDE.

The combination of nitrogen with oxygen was first effected by Cavendish in 1785, who employed a spark discharge. The process was developed by Madame Lefebre in 1859; by Meissner in 1863, who found that moist gases gave a better result; and by Prim in 1882, who sparked the gases under pressure; it was also used by Lord Rayleigh in his isolation of argon (*q.v.*). It was not, however, a commercial success, and the same result attended Siemens and Halske's application of the silent discharge. More effective was the electric arc. In 1892 Sir W. Crookes showed that the arc brought about combination; and in 1897 Lord Rayleigh went into the process more fully. But the first careful working-out of the conditions was made in 1900 by A. McDougall and F. Howles, who, employing a high tension alternating arc, showed that the effectiveness depended upon the temperature. The commercial manufacture of nitric acid was attempted by C. S. Bradley and D. R. Lovejoy at Niagara Falls, who passed atmospheric air, or air enriched with oxygen, about a high tension arc made as long as possible; but the company (the Atmospheric Products Company) was a failure. Better results have attended the process of K. Birkeland and S. Eyde, which is being worked on a large scale at Notodden, Norway. The arc is produced by leading a current of about 5000 volts equatorially between the poles of an electromagnet; this produces what is practically a disk of flame, 6½ ft. in diameter and having a temperature of about 3000°. The disk really consists of a series of successive arcs which increase in size until they burst. The first product of the reaction is nitric oxide, which on cooling with the residual gases produces nitrogen peroxide. The cooled gases are then led into towers where they meet a stream of water coming in the contrary direction. Nitric acid (up to 50%) is formed in the first tower, and weaker acids in the successive ones; the last tower contains milk of lime which combines with the gases to form calcium nitrite and nitrate (this product, being unsuitable as a manure, is decomposed with the acid, and the evolved gases sent back). It was found advantageous not to work for acid but for a basic calcium nitrate (normal calcium nitrate being very deliquescent); for this purpose the acid is treated with the requisite amount of milk of lime. In the process of the Badische Anilin- und Soda-Fabrik, the arc, which is said to be 30 to 50 ft. long or more, is formed in a long tube, and the gases are sent round the arc by obliquely injecting them. A 30% acid is said to be formed. I. Moscicki and J. von Kowalski have patented a process wherein the arc is formed at two vertical concentric copper electrodes and rotated by an electromagnet; it is worked at Vevey, Switzerland. The Rankin process, of which very little is known, produces the arc with much lower current.

The conversion of nitrogen into ammonia by electricity has received much attention, but the commercial aspect appears to have been first worked out by de Hemptinne in 1900, who used both the spark and silent discharge on mixtures of hydrogen and nitrogen, and found that the pressure and temperature must be kept low and the spark gap narrow. J. Schlutius in 1903 employed Dowson gas as a source of hydrogen, and induced combination by means of platinum and the silent discharge. Several non-electrical processes have been devised. In 1862 Fleck passed a mixture of steam, nitrogen and carbon monoxide over red-hot lime, whilst in 1904 Woltereck induced combination by passing steam and air over red-hot iron oxide (peat is used in practice). In de Lambilly's process air and steam is led over white-hot coke, and carbon dioxide or monoxide removed from the escaping gases according as ammonium formate or carbonate is wanted. The residual gas is then passed through a tube containing porous materials, such as wood- or bone-charcoal, platinized pumice or spongy platinum, then mixed with steam and again forced through the tube. The reactions are represented as

(1) $N_2+3H_2+2CO+2H_2O=2H\cdot CO_2NH_4$ (Ammonium formate).
(2) $N_2+3H_2+2CO_2+2H_2O=2HO\cdot CO_2NH_4$ (Ammonium carbonate).

The best temperature for the first reaction is between 80°C. and 130°C. and for the second between 40° C. and 60° C. In another process, which originated with C. Kaiser (*Abst. J.C.S.*, 1907, ii. p. 862), calcium is heated in a current of hydrogen, and nitrogen passed over the hydride so formed; this gives ammonia and calcium nitride, the latter of which gives up its nitrogen as ammonia and reforms the hydride when heated in a current of hydrogen.

The fixation of nitrogen as a nitride has not been attended with commercial success. H. Mehner patented heating the oxides of silicon, boron or magnesium with coal or coke in an electric furnace, and then passing in nitrogen, which forms, with the metal liberated by the action of the carbon, a readily decomposable nitride.

For an extended bibliography see Bulletin No. 63 of the Bureau of Soils, U.S. Department of Agriculture (Washington, 1910).

Nitrogen is a colourless, tasteless and odourless gas, which is only very slightly soluble in water. It is slightly lighter than air. Lord Rayleigh in 1894 found that the density of atmospheric nitrogen was about ½% higher than that of chemically prepared nitrogen, a discovery which led to the isolation of the rare gases of the atmosphere (see ARGON). The values obtained are shown below.

Atmospheric Nitrogen.	Chemical Nitrogen.	
0·97209	0·96727	Lord Rayleigh, *Chem. News*, 1897, 76, p. 315.
0·9720	0·9671	A. Leduc, *Comptes rendus*, 1896, 123, p. 805.

Nitrogen is a very inert gas: it will neither burn nor support the combustion of ordinary combustibles. It combines directly with lithium, calcium and magnesium when heated, whilst nitrides of the rare earth metals are also produced when their oxides are mixed with magnesium and heated in a current of nitrogen (C. Matignon, *Comptes rendus*, 1900, 131, p. 837). Nitrogen has been liquefied, the critical temperature being −149° C. and the critical pressure 27·54 atmospheres. The liquefied gas boils at −195·5° C., and its specific gravity at its boiling point is 0·8103 (E. C. C. Baly and F. G. Donnan, *Jour. Chem. Soc.*, 1902, 81, p. 912).

Compounds.

Nitrogen combines with hydrogen to form ammonia, NH_3, hydrazine, N_2H_4, and azoimide, N_3H (*qq.v.*); the other known hydrides, N_4H_4 and N_5H_5, are salts of azoimide, viz. $NH_4\cdot N_3$ and $N_2H_4\cdot N_3H$.

Nitrogen trichloride, NCl_3, discovered by P. L. Dulong in 1811 (*Schweigg. Journ.*, 1811, 8, p. 302), and obtained by the action of chlorine or sodium hypochlorite on ammonium chloride, or by the electrolysis of ammonium chloride solution, is a very volatile yellow oil. It possesses an extremely pungent smell, and its vapour is extremely irritating to the eyes. It is a most dangerous explosive (see D. L. Chapman and L. Vodden, *Jour. Chem. Soc.*, 1909, 95, p. 138). Chlorine azide, $Cl\cdot N_3$, was discovered by F. Raschig in 1908 (see AZOIMIDE); the corresponding iodine compound had been obtained in 1900 by A. Hantzsch (*Ber.*, 33, p. 522). For the so-called nitrogen iodide see AMMONIA.

Nitrogen forms five oxides, viz. nitrous oxide, N_2O, nitric oxide, NO, nitrogen trioxide, N_2O_3, nitrogen peroxide, NO_2, and nitrogen pentoxide, N_2O_5, whilst three oxyacids of nitrogen are known: hyponitrous acid, $H_2N_2O_2$, nitrous acid, HNO_2, and nitric acid, HNO_3 (*q.v.*). The first four oxides are gases, the fifth is a solid. *Nitrous oxide*, N_2O, isolated in 1776 by J. Priestley, who obtained it by reducing nitrogen peroxide with iron, may be prepared by heating ammonium nitrate at 170-260° C., or by reducing a mixture of nitric and sulphuric acid with zinc. It is a colourless gas, which is practically odourless, but possesses a sweetish taste. It is somewhat soluble in water. When liquefied it boils at −89·8° C., and by further cooling may be solidified, the solid melting at −102·3° C. (W. Ramsay, *Chem. News*, 1893, 67, p. 140). It does not burn, but supports the combustion of heated substances almost as well as oxygen. It is used as an anaesthetic, principally in dentistry, producing when inhaled a condition of hysterical excitement often accompanied by loud laughter, whence it is sometimes called "laughing gas."

Nitric oxide, NO, first obtained by Van Helmont, is usually prepared by the action of dilute nitric acid (sp. gr. 1·2) on copper. This method does not give a pure gas, varying amounts of nitrous oxide and nitrogen being present (see NITRIC ACID). In a purer condition it may be obtained by the action of sulphuric acid on a mixture of potassium nitrate and ferrous sulphate, or of hydrochloric acid on a mixture of potassium nitrate and ferric chloride. It is also formed by the action of concentrated sulphuric acid on sodium nitrite in the presence of mercury. It is a colourless gas which is only sparingly soluble in water. It may be liquefied, its critical temperature being −93·5°, and the liquid boils at −153·6° C. It is not a supporter of combustion, unless the sustance introduced is at a sufficiently high temperature to decompose the gas, when combustion will continue at the expense of the liberated oxygen. If the gas be mixed with the vapour of carbon disulphide, the mixture burns with a vivid lavender-coloured flame. Nitric oxide is soluble in solutions of ferrous salts, a dark brown solution being formed, which is readily decomposed by heat, with evolution of nitric oxide. It combines with oxygen to form nitrogen peroxide. Nascent hydrogen reduces it to hydroxylamine (*q.v.*), whilst solutions of hypochlorites oxidize it to nitric acid. In some instances it reacts as a reducing agent, *e.g.* silver oxide is reduced to metallic silver at 170° C., lead dioxide to the monoxide and manganese dioxide to sesquioxide.

Nitrogen trioxide, N_2O_3, was first mentioned by J. R. Glauber in 1648 as a product of the reaction between nitric acid and arsenious oxide. Sir W. Ramsay (*Jour. Chem. Soc.*, 1890, 5, p. 590), by distilling arsenious oxide with nitric acid and cooling the distillate, obtained a green liquid which consisted of nitrogen trioxide and peroxide in varying proportions, and concluded that the trioxide could not be obtained pure. He then tried the direct combination of nitric oxide with liquid nitrogen peroxide. A dark blue liquid is produced, and the first portions of gas boiling off from the mixture correspond fairly closely in composition with nitrogen trioxide. H. B. Baker (*Jour. Chem. Soc.*, 1907, 91, p. 1862) obtained nitrogen trioxide in the gaseous form by volatilizing the liquid under special conditions. L. Francesconi and N. Sciacca (*Gazz.*, 1904, 34 (i.), p. 447) have shown that liquid nitric oxide and oxygen, or gaseous nitric oxide and liquid oxygen, mixed in all proportions and yielded nitrogen trioxide, whilst gaseous nitric oxide mixed with excess of oxygen always gave the trioxide if the mixture was kept below −110° C. They also state that nitrogen trioxide is stable at ordinary pressure up to −21° C. N. M. v. Wittorf (*Zeit. anorg. Chem.*, 1904, 41, p. 85) obtained blue crystals of the trioxide (melting at −103° C.) on saturating liquid nitrogen peroxide with nitric oxide and cooling the mixture. The liquid prepared by Baker is green in colour, and has a specific gravity 1·11 at ordinary temperature, but below −2° C. becomes of a deep indigo blue colour. It forms a mass of deep blue crystals at the temperature of liquid air. It is exceedingly soluble in concentrated sulphuric acid.

Nitrogen peroxide, NO_2 or N_2O_4, may be obtained by mixing oxygen with nitric oxide and passing the red gas so obtained through a freezing mixture. The production of this red gas when air is mixed with nitric oxide was mentioned by R. Boyle in 1671. Nitrogen peroxide is also prepared by heating lead nitrate and passing the products of decomposition through a tube surrounded by a freezing mixture, when the gas liquefies. At low temperatures it is a colourless crystalline solid which melts at −10·14° C. (W. Ramsay, *Chem. News*, 1900, 61, p. 91). As the temperature increases the liquid becomes yellowish, the colour deepening with rise of temperature until at +15° C. it has a deep orange tint. The liquid boils at about 22° C. This change of colour is accompanied by a change in the vapour density, and is explained by the fact that nitrogen peroxide consists of a mixture of a colourless compound N_2O_4, and a red-brown gas NO_2, the latter increasing in amount at the expense of the former as the temperature is raised (G. Salet, *Comptes rendus*, 1868, 67, p. 488; see also E. and L. Natanson, *Wied. Ann.*, 1885, 24,

p. 454; 1886, 27, p. 606). M. Berthelot and J. Ogier (*Bull. Soc. Chim.*, 1882 [2], 37, p. 434; 38, p. 60) have also shown that the specific heat of the gas decreases with increase of temperature until it reaches a minimum at about 198-253° C. Cryoscopic determinations of the molecular weight of nitrogen peroxide dissolved in glacial acetic acid show that it corresponds to the molecular formula N_2O_4 at low temperatures (W. Ramsay, *Jour. Chem. Soc.*, 1888, 53, p. 621). Nitrogen peroxide is the most stable oxide of nitrogen. It is decomposed by water, giving at 0° C. a mixture of nitric and nitrous acids: $2NO_2+H_2O=HNO_3+HNO_2$. It combines with sulphuric acid to form nitro-sulphonic acid, $SO_2(OH)(NO_2)$. It does not support the combustion of a taper, but burning phosphorus and red-hot carbon will continue to burn in the gas. It converts many metallic oxides into mixtures of nitrates and nitrites, and attacks many metals, forming nitrates and being itself reduced to nitric oxide. It is an energetic oxidizing agent.

Nitrogen pentoxide, N_2O_5, was first obtained in 1849 by H. Sainte-Claire-Deville (*Ann. Chim. Phys.*, 1850 [3], 28, p. 241) by the action of dry chlorine on silver nitrate: $4AgNO_3+2Cl_2=4AgCl+2N_2O_5+O_2$. It may also be obtained by distilling nitric acid over phosphorus pentoxide. It crystallizes in large prisms which melt at 29-30° C. to a yellowish liquid, which boils at 45-50° C. with rapid decomposition. It is very unstable, decomposing slowly even at ordinary temperatures. It dissolves in water, forming nitric acid.

Hyponitrous acid, $H_2N_2O_2$, was first obtained in the form of its salts by E. Divers in 1871 (*Chem. News*, 23, p. 206) by reducing a solution of potassium nitrite with sodium amalgam, and subsequent precipitation as silver salt. Hyponitrites also result when hydroxy-amido-sulphonates, *e.g.* $HO\cdot NH\cdot SO_3Na$, are hydrolysed by caustic alkalis (E. Divers and T. Haga, *Jour. Chem. Soc.*, 1889, 55, p. 760), or when benzsulphohydroxamic acid, $C_6H_5SO_2\cdot NH\cdot OH$, is treated in the same manner (O. Piloty, *Ber.*, 1896, 29, p. 1560). They may also be prepared by the action of mercuric or cupric oxides on alkaline solutions of hydroxylamine (A. Hantzsch, *Ann.*, 1896, 292, p. 317); by the action of hydroxylamine sulphate on alkaline nitrites in the presence of lime or calcium carbonate, the mixture being rapidly heated to 60° C.; or by the hydrolysis of dimethyl nitroso-oxyurea, $(CH_3)_2N\cdot CO\cdot N(NO)\cdot OH$ (A. Hantzsch, *Ber.*, 1897, 30, p. 2356). The free acid, which crystallizes in brilliant scales, is best prepared by decomposing the silver salt with an ethereal solution of hydrochloric acid. It is very explosive, dissolves readily in water and behaves as a dibasic acid. It does not liberate iodine from potassium iodide, neither does it decolorize iodine solution. Bromine oxidizes it to nitric acid, but the reaction is not quantitative. In acid solution, potassium permanganate oxidizes it to nitric acid, but in alkaline solution only to nitrous acid. It decomposes slowly on standing, yielding water and nitrous oxide. The silver salt is a bright yellow solid, soluble in dilute sulphuric and nitric acids, and may be crystallized from concentrated solutions of ammonia. It slowly decomposes on exposure or on heating. The calcium salt, $CaN_2O_2\cdot 4H_2O$, formed by the action of calcium chloride on the silver salt in the presence of a small quantity of nitric acid, is a lustrous crystalline powder, almost insoluble in water but readily soluble in dilute acids. It is decomposed by sulphuric acid, with evolution of nitrous oxide.

Nitrous acid, HNO_2, is found to some extent in the form of its salts in the atmosphere and in rain water. The pure acid has not yet been obtained, since in the presence of water it decomposes with formation of nitric acid and liberation of nitric oxide: $3HNO_2=HNO_3+2NO+H_2O$. Its salts may be obtained in some cases by heating the corresponding nitrates, but the method does not give good results. Sodium nitrite, the most commonly used salt of the acid, is generally obtained by heating the nitrate with metallic lead; by heating sodium nitrate with sulphur and sodium hydroxide, the product then being fractionally crystallized (Read, Holliday & Sons): $3NaNO_3+S+2NaOH=Na_2SO_4+3NaNO_2+H_2O$; by oxidizing atmospheric nitrogen in an electric arc, keeping the gases above 300° C., until absorption in alkaline hydroxide solution is effected (German Pat. 188188); or by passing air, or a mixture of oxygen and ammonia, over heated metallic oxides (*ibid.*, 168272). The salts of the acid are colourless or faintly yellow. In aqueous solution the free acid acts as an oxidizing agent, bleaching indigo and liberating iodine from potassium iodide, or it may act as a reducing agent since it readily tends to pass into nitric acid: consequently it discharges the colour of acid solutions of permanganates and chromates. The acid finds considerable use in organic chemistry, being employed to discriminate between the different types of alcohols and of amines, and also in the production of diazo, azo and diazo-amino compounds. It may be recognized by the blue colour it gives with diphenylamine sulphate and by its reaction with potassium iodide-starch paper.

Nitrosyl chloride, NOCl, is obtained by the direct union of nitric oxide with chlorine; or by distilling a mixture of concentrated nitric and hydrochloric acids, passing the resulting gases into concentrated sulphuric acid and heating the so-formed nitrosyl hydrogen sulphate with dry salt: $HNO_3+3HCl=NOCl+Cl_2+H_2O$; $NOCl+H_2SO_4=HCl+NO\cdot SO_4H$; $NO\cdot SO_4H+NaCl=NOCl+NaHSO_4$ (W. A. Tilden, *Jour. Chem. Soc.*, 1860, p. 630). It is also prepared by the action of phosphorus pentachloride on potassium nitrite or on nitrogen peroxide. It is an orange-coloured gas which may be readily liquefied and by further cooling may be solidified. The liquid boils at −5° C. and the solid melts at −65° C. It forms double compounds with many metallic chlorides, and finds considerable application as a means of separating various members of the terpene group of compounds. It is readily decomposed by water and alkaline hydroxides, yielding a mixture of nitrite and chloride. On treatment with silver fluoride it yields *nitrosyl fluoride*, NOF (O. Ruff, *Zeit. anorg. Chem.*, 1905, 47, p. 190). *Nitroxyl fluoride*, NO_2F, is formed by the action of fluorine on nitric oxide at the temperature of liquid oxygen (H. Moissan and P. Lebeau, *Comptes rendus*, 1905, 140, pp. 1573, 1621). It is a gas at ordinary temperature; when liquefied it boils at −63·5° C. and on solidification melts at −139° C. Water decomposes it into nitric and hydrofluoric acids. *Nitramide*, NH_2NO_2, is obtained by the action of sulphuric and nitric acids on potassium imidosulphonate, or by the action of ice-cold sulphuric acid on potassium nitro-carbamate (J. Thiele and A. Lachmann, *Ann.*, 1895, 288, p. 297): $NO_2\cdot NK\cdot CO_2K+H_2SO_4=NH_2NO_2+K_2SO_4+CO_2$. It crystallizes in prisms or leaflets which melt at 72-75°C. and are readily soluble in water and in all organic solvents except ligroin. It is somewhat volatile at ordinary temperature, and its aqueous solution possesses a strongly acid reaction. It is very unstable, decomposing into nitrous oxide and water when mixed with copper oxide, lead chromate or even powdered glass. On reduction it gives a strongly reducing substance, probably hydrazine. According to A. Hantzsch (*Ann.*, 1896, 292, pp. 340 et seq.) hyponitrous acid and nitramide are to be regarded as stereo-isomers, being the anti- and syn- forms of the same compound. Thiele, however, regards nitramide as imidonitric acid, $HN:NO(OH)$.

Nitrogen sulphide, N_4S_4, first obtained by W. Gregory (*Jour. pharm.*, 1835, 21, p. 315) by the action of ammonia on sulphur chloride, has been investigated by O. Ruff and E. Geisel (*Ber.*, 1904, 37, p. 1573; 1905, 38, p. 2659), who also obtained it by dissolving sulphur in liquid ammonia. It is a reddish-yellow crystalline solid, insoluble in water and melting at 178° C. It explodes readily when melted or subjected to shock. Dry hydrochloric acid gives ammonia but no nitrogen; with ammonia it gives $N:SNH_2$ and $S:S(NH_2)_2$; and with secondary amines it forms thiodiamines, $S(NR_2)_2$, nitrogen and ammonia being liberated. When heated with CS_2 to 100° C. under pressure, it forms liquid nitrogen sulphide, N_2S_5, a mobile red liquid which solidifies to an iodine-like mass of crystals which melt at 10-11° C. Water, alkalis and acids decompose it into sulphur and ammonia (W. Muthmann, *Zeit. anorg. Chem.*, 1897, 13, p. 200).

For sulphonic acids containing nitrogen see AMMONIA.

Numerous determinations of the atomic weight of nitrogen have been made by different observers, the values obtained varying somewhat according to the methods used. These methods have been purely chemical (either gravimetric or volumetric), physical (determinations of the density of nitrogen, nitric oxide, &c.) or physico-chemical. P. A. Guye has given a critical discussion of the relative accuracy of the gravimetric and physico-chemical methods, and favours the latter, giving for the atomic weight a value less than 14·01. The more important papers dealing with the subject are: J. Stas, *Œuvres complètes*, i. pp. 342 et seq.; Lord Rayleigh, *Proc. Roy. Soc.* (1894), 55, p. 340; (1904) 73, p. 153; G. Dean, *Jour. Chem. Soc.* (1901), 79, p. 147; R. W. Gray, *Jour. Chem. Soc.* (1906), 88, p. 1174; A. Scott, *Proc. Chem. Soc.* (1905), 21, p. 309; P. A. Guye, *Chem. News* (1905), 92, pp. 261 et seq.; (1906) 93, p. 13 et seq.; D. Berthelot, *Comptes rendus* (1907), 144, p. 269.

NITROGLYCERIN, $C_3H_5(NO_3)_3$ or $CH_2NO_3\cdot CHNO_3\cdot CH_2NO_3$ glyceryl trinitrate, an explosive first obtained in 1846 by Ascanio Sobrero (*Mem. Acad. Torino*, 1847) by acting with a mixture of strong nitric and sulphuric acids on glycerin at the ordinary temperature. The reaction proceeds in several stages, mono-, di- and finally tri-nitrate being produced, the final stage requiring sulphuric acid as a dehydrator. When pure it is a very pale yellow oil of sp. gr. 1·614 at 4° C. and 1·60 at 15° C. One gram requires for solution between 800 and 1000 c.c. of water, 4 c.c. of absolute alcohol or 18 c.c. of wood spirit, and it is scarcely at all soluble in glycerin itself, but mixes in all proportions with ether, acetone, ethyl acetate and benzene.

In the manufacture glycerin is dropped in a very thin stream into a mixture of 3 parts of nitric (sp. gr. 1·5) and 5 parts of sulphuric acid (sp. gr. 1·84), the containing vessel being cooled by a water jacket and the acid mixture agitated by a stream of cooled air, the temperature being kept at about 15° C. A considerable excess of acids is necessary for the completion and safety of the reaction, usually about 8 parts of the acid mixture to 1 of glycerin. The higher the strength of the acids the higher the yield of nitroglycerin and the smaller the loss by solution in the waste acids. In recent practice some sulphur trioxide, or fuming sulphuric acid, is added, so that the mixture of acids contains less than 1% of water. The action is very rapid, and the product, which rises to the top of the acids, is separated and washed successively with cold and then tepid water, and finally with water made slightly alkaline with sodium carbonate or hydroxide, to remove all adhering or dissolved acids which would otherwise render the product very unstable. Nitroglycerin dissolves a little water and then appears thick or milky. Generally it is either dried, after being separated from the wash water, by means of common salt, upon a layer of which the moist nitroglycerin is gently run and allowed to drain or filter through, or it is filtered through a mass of dry sponge or similar dry and porous material.

Under ordinary pressure it boils at above 200° C. (L. de Bruyn). If gradually heated it begins to vaporize and decompose at about 130°, and as a rule it detonates when heated slightly above this temperature, previously giving off some red fumes. A little vapour is given off at ordinary temperatures and pressures, and when under a few millimetres pressure only it rapidly vaporizes below 100° C. The freezing-point is uncertain, owing perhaps to the existence of two modifications, as suggested by Kast (*Zeits. f. ges. Schiess- u. Sprengstoff*, 1-225; see also S. Nauckhoff, *Zeits. f. ang. Chem.*, 18, Heft 1 and 2). It is frequently given as 43° to 46° F. (about 6° to 8° C.), and it is stated to be more sensitive to percussion when frozen (Beilstein). It crystallizes (in long needles) more easily when gently agitated during the cooling, or when mixed with such substances as kieselguhr. At one time it was transported all over America in a frozen condition without serious accidents, and according to Sir F. Nathan (*Jour. Soc. Chem. Ind.*, 1908, 27, p. 5) it is safer to export in the frozen state. To prevent the freezing of nitroglycerin in dynamite it has been proposed to add various substances, such as chlordinitroglycerin, nitrated diglycerin or tetranitrodiglycerol, and also mono-and di-nitroglycerin. The latter two have been studied by C. W. Will (*Ber.*, 1908, 7, p. 407), who obtained two isomeric dinitroglycerins, one of which is eminently crystallizable and the other fluid. Both are sensitive to percussion, but a little less so than nitroglycerin. The mononitroglycerin also exists in two forms, neither of which is strictly speaking explosive. It appears that an addition of dinitroglycerin to nitroglycerin would materially retard its freezing or lessen its sensitiveness (see also C. Claessen, Ger. Pat. 210990 (1909)).

	Mono.	Di.	Tri.
Specific gravity .	1·40	1·47	1·6
Melting-point . .	α 58°	α hydrate, 26°	labile, 2·2°
	β 54°	β hydrate (fluid)	stable, 12·2°
Boiling-point 18 mm.	155-160°	145° about	160°
Solubility . . .	70 %	7·7 %	·16 %

The liquid when soaked into a porous combustible substance like blotting-paper burns rapidly and quietly, and when struck with a hammer on a hard surface violently detonates; when a little of the liquid is spread on an anvil and struck, the portion immediately under the hammer only will, as a rule, detonate, the remainder being scattered. Some solutions of nitroglycerin (in ether, acetone, &c.) burn quietly, and the same is the case when it is held in solution or suspension in a colloid substance, as gelatinized guncotton, &c.

Strong sulphuric acid dissolves nitroglycerin, and this solution on being poured into water yields dinitroglycerin (see Will, *loc. cit.*) and also some mononitroglycerin. When the solution in the strong acid is allowed to stand, some nitric acid is first evolved, and as the temperature rises this is followed by a general decomposition of the substance, though not necessarily an explosive one. Shaken with mercury and sulphuric acid, nitroglycerin yields its nitrogen as nitric oxide; the measurement of the volume of this gas is a convenient mode of estimating nitroglycerin. Ammonium hydroxide has no appreciable action at ordinary temperatures, but strong solutions of sodium or potassium hydroxides start a decomposition, with rise of temperature, in which some nitrate and always some nitrite is produced. Some glycerin may be re-formed, but with very strong alkaline solutions little of the glycerin molecule escapes destruction, oxalic acid and several other products resulting. Alcoholic solutions of the alkalis also produce much nitrite along with some formate and acetate. Calcium or potassium sulphides and potassium hydrosulphides completely reduce nitroglycerin to glycerin, some of the sulphur being oxidized and some precipitated. Hydriodic acid reduces it to glycerin and nitric oxide. Aniline and similar bases are oxidized and partially nitrated by nitroglycerin, with the production of non-explosive compounds.

The first attempts to utilize the explosive power of nitroglycerin were made by Nobel in 1863; they were only partially successful until the plan, first applied by General Pictot in 1854, of developing the force of gunpowder in the most rapid manner and to the maximum extent, through initiative detonation, was applied by Nobel to nitroglycerin. Even then, however, the liquid nature of the substance, though advantageous in one or two directions, constituted a serious obstacle to its safe transport and storage and to its efficient employment; it was therefore not until Nobel produced plastic solid preparations by mixing the liquid with porous substances, such as gunpowder, or carbon and sulphur, and finally kieselguhr in a fine state of division, capable of absorbing and retaining considerable quantities of it, that it could be employed as a blasting agent (see EXPLOSIVES, DYNAMITE, CORDITE). (W. R. E. H.)

Therapeutics.—Nitroglycerin has a sweet burning taste and is decidedly poisonous. Its vapour produces violent headache, and the same effect is often caused by handling compositions containing it. Prior to its use as an explosive, its alcoholic solution found application in medicine under the name of glonoin. Although a nitrate, its pharmacological actions resemble those of nitrites such as amyl nitrite, taken internally. The explanation is that in an alkaline medium at body heat nitroglycerin yields a nitrite, probably as a preliminary stage of resolution. Nitroglycerin shaken up with warm very dilute alkaline solutions, as sodium carbonate, for a few minutes only, always yields sufficient nitrite to give the diazoreaction; and, as stated, strong alkaline solutions always produce some nitrite as one of the decomposition products. This gradual conversion in the tissues is a valuable property of nitroglycerin, as its effects take longer to manifest themselves than is the case with amyl and other nitrites. Nitroglycerin is valuable as a preventive in cases of cardiac pain, such as angina pectoris, and it is also used in other conditions where it is desirable to reduce the arterial tension. The British Pharmacopoeia contains a *liquor trinitrini* (1 %), and tablets made up with chocolate, each containing one-hundredth of a grain.

NITZSCH, GREGOR WILHELM (1790–1861), German classical scholar, brother of Karl Immanuel Nitzsch, was born at Wittenberg on the 22nd of November 1790. In 1827 he was appointed professor of ancient literature at Kiel, but in 1852 was dismissed by the Danish government for his German sympathies. In the same year he accepted a similar post at Leipzig, which he held till his death on the 22nd of July 1861. Nitzsch is chiefly known for his writings on the Homeric epic. In opposition to Wolf and Lachmann, he maintained that the *Iliad* and *Odyssey* were not an aggregate of single short poems, but long complete poems, composed by one and the same author according to a uniform plan with a central dramatic idea.

His son, KARL WILHELM NITZSCH (1818–1880), became professor of history at Königsberg in 1862, and at Berlin in 1872.

The most important of his works were: *Erklärende Anmerkungen zu Homer's Odyssee*, i.-xii. (1826–1840); *Die Sagenpoesie der Griechen* (1852); *Beiträge zur Geschichte der epischen Poesie der Griechen* (pub. 1862, ed. C. W. Nitzsch). See memoir by F. Lübker (1864); C. Bursian, *Geschichte der klassischen Philologie in Deutschland* (1883) and J. E. Sandys, *Hist. of Class. Schol.* iii. (1908), p. 105.

NITZSCH, KARL IMMANUEL (1787–1868), Lutheran divine, was born at the small Saxon town of Borna near Leipzig on the 21st of September 1787. His father, Karl Ludwig Nitzsch (1751–1831), who at that time was pastor and superintendent in Borna, and afterwards (1790) became professor at Wittenberg and director (1817) of the seminary for preachers, has also left a name of some distinction in the theological world by a number of writings, among which may be mentioned a work entitled *De discrimine revelationis imperatoriae et didacticae prolusiones academicae* (2 vols., 1830). Theologically, he represented a combination of supernaturalism and rationalism (supernatural rationalism or a Kantian rational supernaturalism). Karl Immanuel was sent to study at Schulpforta in 1803, whence he proceeded to the university of Wittenberg in 1806. In 1809 he graduated, and in 1810 he became a *Privatdozent* at the university. Having become *diaconus* at the Schlosskirche in 1811, he showed remarkable energy and zeal during the bombardment and siege of the city in 1813. In 1817 he was appointed one of the preceptors in the preachers' seminary which had been established at Wittenberg after the suppression of the university. From 1820 to 1822 he was superintendent in Kemberg, and in the latter year he was appointed professor ordinarius of systematic and practical theology at Bonn. Here he remained until called to succeed Marheineke at Berlin in 1847; subsequently he became university preacher, rector of the university, provost of St Nicolai (in 1854) and member of the supreme council of the church, in which last capacity he was one of the ablest and most active promoters of the Evangelical Union. He died on the 21st of August 1868. He represented the *Vermittelungstheologie* of the school of Schleiermacher.

His son, Friedrich August Nitzsch (b. 1832), was made professor ordinarius of theology at Giessen in 1868 and at Kiel in 1872. He was the author of *Grundriss der christl. Dogmengeschichte* (1870, incomplete) and *Das System des Boëthius* (1860), amongst other works.

Karl Nitzsch's principal works are: *System der christlichen Lehre* (1829; 6th ed., 1851; Eng. trans., 1849), *Praktische Theologie* (1847–1860; 2nd ed., 1863–1868), *Akademische Vorträge über christliche Glaubenslehre* (1858) and several series of *Predigten*. "He took as his starting-point the fundamental thought of Schleiermacher, that religion is not doctrine but life, direct consciousness, feeling. At the same time he sought to bring religious feeling into closer connexion with knowledge and volition than Schleiermacher had done; he laid special stress—and justly—on the recognition of a necessary and radical union of religion with morality, treating both dogmatics and ethics together accordingly in his *System der christlichen Lehre*" (Otto Pfleiderer, *Development of Theology*, p. 123). His *Protestantische Beantwortung*, a reply to the *Symbolik* of Johann Adam Möhler (1796–1838), which originally appeared in the *Studien u. Kritiken*, of which he was one of the founders, may also be mentioned.

See Herzog-Hauck, *Realencyklopädie*, and the *Allgemeine deutsche Biographie*; F. Lichtenberger, *History of German Theology in the Nineteenth Century*, pp. 185-196.

NIU-CHWANG, a city of China, in the Manchurian province of Shêng-king (Liao-tung), in 40° 53′ N. and 122° 7′ E., about 35 m. (90 m. by water) from the coast of the Gulf of Liao-tung, on what is now a small branch of the main eastern affluent of the Liao-ho. The population is estimated at 80,000. The city proper is a comparatively unimportant place with broken-down walls, but it is surrounded by a number of large and flourishing suburbs. About the beginning of the Ta-ts'ing dynasty (1644) Niu-chwang was the chief port on the river, but in the reign of K'ien-lung, owing mainly to physical changes, it was supplanted by T'ien-chwang-tai farther down the stream, and towards the close of the 18th century this had in turn to give place to Ying-tsze still nearer the mouth. In ignorance of these facts Niu-chwang (now scarcely to be reached by a flat-bottomed river boat) was chosen as one of the ports to be opened to foreign trade by the treaty of Tien-tsin; and, though Ying-tsze had of necessity to be adopted as the site of the foreign settlements, Europeans still continue to speak of it as the port of Niu-chwang. Ying-tsze (otherwise known as Ying-k'ou, Niu-k'ou and in Mandarin as Muh-k'ou-ying) lies on the left bank of the Liao-ho on the lowest dry portion of the plain, not much above high-water mark. The British settlement immediately above the town has a river frontage of 1000 yds. opposite the deepest of the reaches, and runs back to the highway leading to Niu-chwang. Off the mouth of the river there is an extensive bar of hard mud which can only be crossed by certain channels at high tide, when it is covered by from 18 to 20 ft. of water; and the port is altogether closed by ice for four or five months of the year, between November and May. Niu-chwang has shown considerable vigour as a port of trade, sharing in the general prosperity of the provinces of Manchuria, of which it is the outlet. It was opened to foreign trade in 1858. In 1864 the total value of trade was £934,374, in 1878 £2,606,134, in 1898 £4,634,470, while in 1904 the figures reached £5,950,895. The principal exports (29%) are beans, bean-cake, bean-oil and wild silk. The bean-cake is a popular article of food with the natives of Kwang-tung and Fuh-kien, and is also largely employed for manuring the rice and sugar fields in the neighbourhood of Shanghai, Amoy, Swatow, &c. Of imports (71%) the principal are cotton yarn and cotton cloth, most of the latter being drawn from the United States in preference to English-made goods. The number of resident foreigners is about 150. Railways connect the port with Tientsin and Peking on the one hand, and with the Russian territories lying to the north on the other. In 1895 Niu-chwang was occupied by Japanese troops, and the town was included in the cession of territory originally granted by the treaty of peace. By a supplementary convention it was retroceded by the Japanese under pressure of France and Russia. Niu-chwang suffered considerably from the disturbances of 1900 and again during the Russo-Japanese war. In 1900 the Russians defeated the Chinese troops who attacked the town, and took possession of the port, and administered affairs until they in their turn were driven out by Japanese. At the conclusion of the war the Japanese restored the port to China.

NIUÉ (Savage Island or Niué-Fekai, as the natives call it), an island in the South Pacific Ocean, 14 m. long by 10 m. wide, in 19° 10′ S., 169° 47′ W. The entire island is an old coral reef upheaved 200 ft., honeycombed with caves and seamed with fissures. The soil, though thin, is, as in other limestone islands, very rich, and coco-nuts, tara, yams and bananas thrive. There is an abundant rainfall, but owing to the porous nature of the soil the water percolates into deep caves which have communication with the sea, and becomes brackish. The natives, a mixed Polynesian and Melanesian people of Samoan speech, are the most industrious in the Pacific, and many of the young men go as labourers to other islands. The consequent minority of men has been destructive of the sexual morality of the women, which formerly stood high. The natives are keen traders, and though uncouth in manners when compared with their nearest neighbours, the Tongans and Samoans, are friendly to Europeans. Their hostility to Captain Cook in 1774, which earned from him the name of Savage for the island, was due to their fear of foreign disease, a fear that has since been justified. The population (4079 in 1901) is slightly decreasing. The natives are all Christians, and the majority have learned to read and write, and to speak a little English, under the tuition of the London Missionary Society. They wear European clothes. The island became a British protectorate on the 20th of April 1900, and was made a dependency of New Zealand in October 1900, the native government, of an elected "king" and a council of headmen, being maintained. In 1900 there were thirteen Europeans on the island. The exports are copra, fungus and straw hats, which the women plait very cleverly.

See T. H. Hood, *Notes of a Cruise in H.M.S. "Fawn"* (Edinburgh, 1863); J. L. Brenchley, *Jottings during the Cruise of the "Curaçoa"* (London, 1873); B. H. Thomson, *Savage Island* (London, 1902).

NIVELLES (Flem. *Nyvel*), a town of Belgium in the province of Brabant, situated on the Thines 19 m. S. of Brussels. Pop. (1904) 12,109. It is a busy little place with many industries, notably the manufacture of parchment. The town is supposed to owe its origin to the foundation of a convent on the spot by Itta or Iduberge, wife of Pippin of Landen. The Romanesque church of St Gertrude, named after Itta's daughter, dates from the 11th century, but has been badly restored and is disfigured by a heavy tower. On the top of the tower is the effigy of a man in iron who strikes the hours with a hammer. He is called by the townspeople Jean de Nivelles, a celebrated baron of the 15th century whose title eventually became merged in that of the count de Hornes (Horn). The church is supposed to occupy the site of Itta's convent. Close to Nivelles is Seneffe, where Condé defeated William of Orange in 1674, and at Nivelles itself the French under Marceau defeated the Austrians in 1794.

NIVERNAIS, LOUIS CHARLES BARBON MANCINI MAZARINI, Duc de (1716–1798), French diplomatist and writer, was born in Paris on the 16th of December 1716, son of Philippe Jules François, duc de Nevers, and Maria Anne Spinola, and great-nephew of Cardinal Mazarin. He was educated at the Collège Louis le Grand, and married at the age of fourteen. He served in the campaigns in Italy (1733) and Bohemia (1740), but had to give up soldiering on account of his weak health. He was subsequently ambassador at Rome (1748–1752), Berlin (1755–1756) and London, where he negotiated the treaty of Paris (10th of February 1763). From 1787 to 1789 he was a member of the Council of State. He did not emigrate during the Revolution, but lost all his money and was imprisoned in 1793. He recovered his liberty after the fall of Robespierre, and died in Paris on the 25th of February 1798. In 1743 he was elected to the Academy for a poem entitled *Délie*, and from 1763 he devoted the greater part of his time to the administration of the duchy of Nevers and to *belles-lettres*. He wrote much and with great facility; but his writings are of little value, his *Fables* being his best productions. His *Œuvres complètes* were published in Paris in 1796; an edition of his *Œuvres posthumes* was brought out in Paris by François de Neufchâteau in 1807, and his *Correspondance secrète* was published in Paris by de Lescure in 1866.

See L. Perey (pseud. for Mlle. Luce Herpin), *Un Petit-Neveu de Mazarin* (Paris, 1890); *La Fin du XVIII^{e} siècle: le duc de Nivernais* (Paris, 1891), by the same writer; Sainte-Beuve, *Causeries du lundi* (vol. xiii.); Dupin, *Éloge du duc de Nivernais* (1840); Abbé Blampignon, *Le Duc de Nivernais, d'après sa correspondance inédite* (1888).

NIXIE, or Nixy, a female water-sprite. The word is adapted from Ger. *Nixe*, the male water-sprite being *Nix*. The general term covering both the male and female is "nicker," a kelpie. This also appears in Dutch *nikker*. The Old Teutonic *nikus* may be connected with the root which appears in Gr. *νίζειν* or *νίπτειν*, "to wash."

NIXON, JOHN (1815–1899), English mining engineer and colliery proprietor, was born at Barlow, Durham, on the 10th of May 1815, the son of a farmer. He was educated at the village school, and at an academy in Newcastle-on-Tyne, where he distinguished himself in mathematics. Leaving school at fourteen, he worked on his father's farm for two years, and then apprenticed himself to Mr Joseph Gray, one of the leading mining engineers in the north of England, and agent to the second marquis of Bute; subsequently he obtained employment as "overman" at one of the Bute collieries in Durham. In 1839 an advertisement drew him to the South Wales coalfield, where he was engaged in mine-surveying, and whence he proceeded to France as engineer to a coal and iron company. Returning to England, he noticed while travelling on one of the Thames steamers that the Welsh coal in use gave off no smoke and was preferred to north country coal both on this ground and because of its greater power-producing efficiency. His experience in France now suggested to him that a profitable market for this coal might be established among the French iron-founders and manufacturers generally who had hitherto imported English north country coal. For some time he was unable to procure any of this special Welsh coal. Eventually, however, by expending all his small savings he secured a cargo, freighted a small craft, and sent it across to Nantes, where with some difficulty he persuaded the local manufacturers to try it on the understanding that he bore the expense of the experiments. These tests, carried out under Nixon's personal directions, proved highly successful, and in due course the French government gave him a contract for Welsh coal for the French navy. Nixon's visit to Nantes laid the foundations of the Welsh steam-coal trade, English manufacturers and shipowners imitating the example of their French rivals. At first Nixon only sold the coal on commission, but eventually acquired what appeared to him a prospective field for steam-coal in the Aberdare valley, and after seven years' working at last struck a rich seam. This property is now known as Nixon's Navigation Collieries. Nixon subsequently acquired or developed other South Wales steam collieries, which yielded him a considerable fortune. He was also the inventor of many mechanical improvements in colliery working. He died in London on the 3rd of June 1899.

See J. E. Vincent, *John Nixon, Pioneer of the Steam Coal Trade in South Wales* (London, 1900).

NIZAM, the hereditary title of the reigning prince of Hyderabad (*q.v.*) in India, derived from an Arabic word meaning order, or administration. The same word is found in *Nazim*, applied to the Nawab of Bengal, and in *Nizamat*, the old term for criminal jurisdiction. Nizam-ul-Mulk (="administrator of the kingdom") was the title of Asaf Jah, the founder of the dynasty, a very able soldier and minister of the court of Aurangzeb, who was appointed governor of the Deccan in 1713, and established his independence before his death in 1748.

NIZĀMĪ (1141–1203). Nizām-uddīn Abū Mahommed Ilyās bin Yūsuf, Persian poet, was born 535 A.H. (1141 A.D.). His native place, or at any rate the abode of his father, was in the hills of Kum, but as he spent almost all his days in Ganja in Arrān (the present Elizavettpol) he is generally known as Nizāmī of Ganja or Ganjawī. The early death of his parents, which illustrated to him in the most forcible manner the unstableness of all human existence, threw a gloom over his whole life, and fostered in him that earnest piety and fervent love for solitude and meditation which have left numerous traces in his poetical writings, and served him throughout his literary career as a powerful antidote against the enticing favours of princely courts, for which he, unlike most of his contemporaries, never sacrificed a tittle of his self-esteem. The religious atmosphere of Ganja, besides, was most favourable to such a state of mind; the inhabitants, being zealous Sunnites, allowed nobody to dwell among them who did not come up to their standard of orthodoxy, and it is therefore not surprising to find that Nizāmī abandoned himself at an early age to a stern ascetic life, as full of intolerance to others as dry and unprofitable to himself. He was rescued at last from this monkish idleness by his inborn genius, which, not being able to give free vent to its poetical inspirations under the crushing weight of bigotry, claimed a greater share in the legitimate enjoyments of life and the appreciation of the beauties of nature, as well as a more enlightened faith of tolerance, benevolence, and liberality. The first poetical work in which Nizāmī embodied his thoughts on God and man, and all the experiences he had gained, was necessarily of a didactic character, and very appropriately styled *Makhzanul Asrār*, or "Storehouse of Mysteries," as it bears the unmistakable stamp of Sūfic speculations. It shows, moreover, a strong resemblance to Nāsir Khosrau's ethical poems and Sanā'ī's *Hadīkat-ulhakīkat*, or "Garden of Truth." The date of composition, which varies in the different copies from 552 to 582 A.H., must be fixed in 574 or 575 (1178–1179 A.D.). Although the *Makhzan* is mainly devoted to philosophic meditations, the propensity of Nizāmī's genius to purely epic poetry, which was soon to assert itself in a more independent form, makes itself felt even here, all the twenty chapters being interspersed with short tales illustrative of the maxims set forth in each. His claim to the title of the foremost Persian romanticist he fully established only a year or two after the *Makhzan* by the publication of his first epic masterpiece *Khosrau and Shīrīn*, composed, according to the oldest copies, in 576 A.H. (1180 A.D.). As in all his following epopees the subject was taken from what pious Moslems call the time of "heathendom"—here, for instance, from the old Sassānian story of Shāh Khosrau Parwiz (Chosroes Parvez), his love affairs with the princess Shīrīn of Armenia, his jealousy against the architect Ferhād, for some time his successful rival, of whom he got rid at last by a very ingenious trick, and his final reconciliation and marriage with Shīrīn; and it is a noteworthy fact that the once so devout Nizāmī never chose a strictly Mahommedan legend for his works of fiction. Nothing could prove better the complete revolution in his views, not only on religion, but also on art. He felt, no doubt, that the object of epic poetry was not to teach moral lessons or doctrines of faith, but to depict the good and bad tendencies of the human mind, the struggles and passions of men; and indeed in the whole range of Persian literature only Firdusī and Fakhr-uddīn Asʿad Jorjānī, the author of the older epopee *Wīs u. Rāmīn* (about the middle of the 11th century), can compete with Nizāmī in the wonderful delineation of character and the brilliant painting of human affections, especially of the joys and sorrows of a loving and beloved heart.

Khosrau and Shīrīn was inscribed to the reigning atābeg of Azerbaijān, Abū Jaʿfar Mahommed Pahlavān, and his brother Kizil Arslān, who, soon after his accession to the throne in 582 A.H., showed his gratitude to the poet by summoning him to his court, loading him with honours, and bestowing upon him the revenue of two villages, Hamd and Nijān. Nizāmī accepted the royal gift, but his resolve to keep aloof from a servile court-life was not shaken by it, and he forthwith returned to his quiet retreat. Meanwhile his genius had not been dormant, and two years after his reception at court, in 584 A.H. (1188 A.D.), he completed his *Dīwān*, or collection of kasīdas and ghazals (mostly of an ethical and parenetic character), which are said to have numbered 20,000 distichs, although the few copies which have come to us contain only a very small number of verses. About the same time he commenced, at the desire of the ruler of the neighbouring Shīrvān, his second romantic poem, the famous Bedouin love-story of *Laila and Majnūn*, which has so many points in common with Ariosto's *Orlando Furioso*, and finished it in the short space of four months. A more heroic subject, and the only one in which he made a certain attempt to rival Firdousī, was selected by our poet for his third epopee, the *Iskandarnāma*, or "Book of Alexander," also called *Sharafnāma* or *Iqbālnāma-i-Iskandarī* ("The Fortunes of Alexander"), which is split into two divisions. The first or semi-historical part shows us Alexander the Great as the conqueror of the world, while the second, of a more ethical tendency, describes him in the character of a prophet and philosopher, and narrates his second tour through the world and his adventures in the west, south, east and north. There are frequent Sūfic allegories, just as in the *Makhzan*; and quite imbued with pantheistic ideas is, for instance, the final episode of the first part, the mysterious expedition of Alexander to the fountain of life in the land of darkness. As for the date of composition, it is evident, from the conflicting statements in the different MSS., that there must have been an earlier and a later recension, the former belonging to 587–589 A.H., and dedicated to the prince of Mosul, ʿIzz-uddīn Masʿūd, the latter made for the atābeg Nusrat-uddīn Abū Bakr of Azerbaijan after 593 A.H., since we find in it a mention of Nizāmī's last romance *Haft Paikar*, or the "Seven Beauties," which comprises seven tales related by the seven favourite wives of the Sassānian king Bahrāmgūr. In this poem, which was written 593 A.H., at the request of Nūr-uddīn Arslān of Mosul, the son and successor of the abovementioned ʿIzz-uddīn, Nizāmī returned once more from his excursion into the field of heroic deeds to his old favourite domain of romantic fiction, and added a fresh leaf to the laurel crown of immortal fame with which the unanimous consent of Eastern and Western critics has adorned his venerable head. The most interesting of the seven tales is the fourth, the story of the Russian princess, in which we recognize at once the prototype of Gozzi's well-known *Turandot*, which was afterwards adapted by Schiller for the German stage. The five mathnawīs, from the *Makhzan* to the *Haft Paikar*, form Nizāmī's so-called "Quintuple" (*Khamsa*) or "Five Treasures" (*Panj Ganj*), and have been taken as pattern by all the later epic poets in the Persian, Turkish, Chaghatāi and Hindustānī languages. Nizāmī died at Ganja in his sixty-fourth year, 599 A.H. (1203 A.D.).

The fullest account of Nizāmī is given in Dr W. Bacher's *Nizāmī's Leben und Werke* (Leipzig, 1871; English translation by S. Robinson, London, 1873; reprinted in the same author's *Persian Poetry for English Readers*, 1883, pp. 103-244). All the errors of detail in Bacher's work have been corrected by Dr Rieu in his *Catalogue of the Persian MSS. in the British Museum* (1881), ii. 563 sqq.

Principal Editions.—The whole *Khamsa* (lithographed, Bombay, 1834 and 1838; Teheran, 1845); *Makhzan-ul Asrār* (edited by N. Bland, London, 1844; lithographed, Cawnpore, 1869; English translation in MS. by Hatton Hindley, in the British Museum Add. 6961); *Khosrau and Shīrīn* (lithographed, Lahore, 1871; German translation by Hammer in *Shīrīn, ein persisches romantisches Gedicht*, Leipzig, 1809); *Laila and Majnūn* (lithographed, Lucknow, 1879; English translation by J. Atkinson, London, 1836); *Haft Paikar* (lithographed, Bombay, 1849; Lucknow, 1873; the fourth tale in German by F. von Erdmann, *Behramgur und die russische Fürstentochter*, Kasan, 1844); *Iskandarnāma*, first part, with commentary (Calcutta, 1812 and 1825; text alone, Calcutta, 1853; lithographed with marginal notes, Lucknow, 1865; Bombay, 1861 and 1875; English translation by H. Wilberforce Clarke, London, 1881; compare also Erdmann, *De expeditione Russorum Berdaam versus*, Kasan, 1826, and Charmoy, *Expédition d'Alexandre contre les Russes*, St Petersburg, 1829); *Iskandarnāma-i-Bahrī*, second part, edited by Dr Sprenger (Calcutta, 1852 and 1869). (H. E.)

NIZHNE-TAGILSK, popularly known as Tagil, a town and ironworks of Russia, in the government of Perm, stands in a longitudinal valley on the eastern slope of the Ural Mountains, within a few miles of the place where the Tagil, cutting through the eastern wall of the valley, escapes to the lowlands to join the Tura, a tributary of the Tobol. The southern part of this valley is occupied by the upper Tagil, and its northern portion by the upper Tura, from which the Tagil is separated by a low watershed. Pop. (1897) 30,000, all Great-Russians and chiefly Nonconformists. The town is connected by railway (the first in Siberia) with Perm and Ekaterinburg, the latter distant 88 m. to the S.S.E. It was founded in 1725 by the Russian mine-owner Demidov, and is still the property of his family. Nizhne-Tagilsk is a central foundry for a number of iron-mines and other works scattered in the valley of the Tagil and its tributary the Salda. Gold, platinum and copper are also mined at Nizhne-Tagilsk. The town carries on a brisk corn trade. The inhabitants make wooden boxes and trays, which are sent to the fairs of Irbit and Nizhniy-Novgorod.

NIZHNE-UDINSK, a town of East Siberia, in the government of Irkutsk, 315 m. by rail W.N.W. of Irkutsk, on the Siberian railway, and on the Uda river. It is a centre for the Biryusa gold mines, and in winter the head of a line of communication with the Lena and Bratsky Ostrog, on the Angara. Pop. (1897) 5803.

NIZHNIY-NOVGOROD or Nijni-Novgorod, abbreviated into Nizhegorod, a government of Central Russia, bounded by the governments of Vladimir on the W., Kostroma and Vyatka on the N. and N.E., Kazan and Simbirsk on the E., and Penza and Tambov on the S., with an area of 19,792 sq. m., two-thirds being on the right and the rest on the left bank of the Volga. The smaller portion, with the exception of the better-drained lands close to the river, is a low, flat, marshy region, covered with thick forests and sandy hills, and thinly peopled. The space between the Oka and the Volga, in the west, is also flat and forest-grown. The best part of the government is that to the east of the Oka; it is hilly, trenched by deep ravines and better drained, and has patches of fertile black earth in the south. The government is drained by the Volga with its tributaries, the Kerzhenets and the Vetluga on the left, and the Sura (with the Pyana) and the Oka on the right. These and their numerous tributaries offer great facilities both for navigation and for the transportation of timber. Numerous small lakes dot the government, especially in the north, and close upon two-fifths of its entire surface is still covered with forests, which occupy nearly the whole of the Zavolyi (to the north of the Volga), and extend without a break for 50 and 80 m. to the west and south-west respectively. The climate is severe, especially in the Zavolyi, where the average yearly temperature is 5·6° Fahr. lower than at Nizhniy. Besides the Carboniferous, Permian and Triassic deposits ("variegated marls"), Jurassic deposits are found in patches, chiefly in the south-east, as also in the south-west and north. They are overlain with Cretaceous black clays and sandstones. Thick strata of Tertiary sands, containing petrified wood, are found in the Ardatov district, and over the whole lie Glacial deposits, sandy gravels and clays.

Black earth, known as the "black earth of the plateau," prevails on the high plains between the river valleys in the south-east; the "valley black earth," even more fertile than the former, covers the gently-sloping portions of the territory, also in the south-east. More or less sandy clays are met with elsewhere, and there are large patches of sand. Iron ores (brown and spherosideritic), alabaster, limestone, sand (used for glass), salt and phosphorites are the chief useful minerals. There are also extensive deposits of peat.

The population increased from 1,376,000 in 1880 to 1,602,292 in 1897; of these 841,245 were women, and 140,347 lived in towns. The estimated pop. in 1906 was 1,823,600. They consist of Russians, to the extent of 88%; Mordvinians, to the number of 53,100; Cheremisses, 6700; with Tatars and Chuvashes. Of the total number in 1897 1,525,735 were Orthodox and Old Believers, 75,848 Raskolniks (Nonconformists), 51,236 Mussulmans and 3388 Jews. Both the birth-rate (53 in 1000) and the death-rate (42 in 1000) are high. A little over 53% of the area is available for agriculture, and of this 59% is owned by noblemen and 16% only by the peasantry, the remainder being owned by merchants and others. Of the cultivable land owned by the peasantry 55% is under crops, but of similar land owned by noblemen only 30% is cultivated. The principal crops are wheat, rye, oats, barley, pease and potatoes. In some years the yield is quite insufficient for the population, and every year over 100,000 persons quit their villages in quest of temporary work in neighbouring governments. The *zemstvo* or district council of Nizhniy-Novgorod supports an agricultural school, an experimental farm and an agency for the purchase of improved seeds and machinery. The live-stock industry is inferior, as many as 41% of the peasant families having no horses, and 24% no cows. The domestic trades, such as the making of cutlery, felts, woollens, leather goods, wooden wares (sledges, spoons, boxes, window-frames, &c.), gloves, wirework, hardware, mats and sacks, are widely practised; 70% of the male working population among the peasants earn their livelihood in this way, as well as by shipping. This last is an industry of considerable magnitude, goods being shipped and unshipped to the annual value of over £5,000,000. Many of the villages and towns have each its own speciality, those in the district of Semenov being famous for wooden spoons, in Gorbatov for cutlery and locks, in Balakhna for spindles, in Makaryev for fancy boxes, in Arzamas, Knyaginin and Sergach for furs and leather goods. The Mordvinians and Cheremisses keep bees. Fruit and vegetables are cultivated along the Oka and the Volga. The factories are steadily developing, iron and machinery works, flour-mills, potteries, tanneries, shipbuilding yards, saw-mills and distilleries are the more important. Education, owing to the efforts of the *zemstvo*, is in a better condition than in many other governments of Russia. (P. A. K.; J. T. Be.)

NIZHNIY-NOVGOROD, or simply Nizhniy, a town of Russia, capital of the above government, situated at the confluence of the Oka and the Volga, 272 m. by rail E. of Moscow. It occupies an advantageous position on the great artery of Russian trade, at a place where the manufactured and agricultural products of the basin of the Oka meet the metal wares from that of the Kama, the corn and salt brought from the south-eastern governments, the produce of the Caspian fisheries, and the various wares imported from Siberia, Central Asia, Caucasia and Persia. It has thus become the seat of the great Makaryevskaya fair (see below), and one of the chief commercial centres of Russia. Its importance was still further increased during the latter part of the 19th century in consequence of the growth of manufacturing industry in the Oka basin, the rapid development of steamboat traffic on the Volga and its tributaries, the extension of the Russian railway system and the opening of Central Asia for trade.

Nizhniy-Novgorod consists of three parts: the upper city, including the Kremlin; the lower town, or Nizhniy Bazaar; and "the Fair," with the suburb of Kunavino. The upper city is built on three hills, which rise as steep crags 400 ft. (490 ft. above sea-level) above the right bank of both the Oka and the Volga. The Kremlin, or old fort, occupies one of these hills facing the Volga. It was begun in the second half of the 14th century, but was erected chiefly in the beginning of the 16th, on the site of the old palisaded fort, and has a wall 2300 yds. long, and 65 to 95 ft. high, with eleven towers; it contains the law-courts, the governor's residence, the arsenal, barracks, the military gymnasium of Count Arakchéev (transferred from old Novgorod), a small museum and two cathedrals, Preobrazhenski and Arkhangelski. These last were erected in 1225 and 1222 respectively, and have been rebuilt more than once; the present structures, in somewhat poor taste, date from 1829–1834 and 1732 respectively. The Preobrazhenski cathedral retains several relics of the past, such as holy pictures of the 14th and 17th centuries and a Bible of 1408; Minin, the hero of Nizhniy (see below) lies buried there. The Kremlin is adorned with a square, containing a monument to Minin and Pozharsky erected in 1826, and pretty boulevards have been laid out along its lower wall. The view from the Kremlin of the broad Volga, with its low-lying and far-spreading left bank, is very striking. The Pechersky monastery, close by, is archaeologically interesting; it was built in the first half of the 16th century—instead of the old monastery founded in 1330 and destroyed by a land-slip in 1596—and has several antiquities and a library which formerly contained very valuable MSS., now at St Petersburg. Another monastery, that of Blagovyeshchensk (1370, rebuilt 1647), is situated on the right bank of the Oka. Its old churches have been destroyed by fire, but it has a very ancient holy picture—probably the oldest in Russia, dating from 993, which attracts many pilgrims. In 1904 a town-house and a monument to Tsar Alexander II. were built in the principal square of the upper town. Besides the Kremlin, the upper town contains the best streets and public buildings. Five descents lead from it to the lower town, planted on the alluvial terrace, 30 to 35 ft. above the banks of the Oka and the Volga, and in the centre of a very lively traffic. Piles of salt line the salt wharves on the Oka; farther down are the extensive storehouses and heaps of grain of the corn wharves; then comes the steamboat quay on the Volga, opposite the Kremlin, and still farther east the timber wharves. The fair is held on the flat sandy tongue of land between the Oka and the Volga, connected with the town by only a bridge of boats, 1500 yds. long, which is taken to pieces in winter. The shops of the fair, 4000 in number, built of stone in regular rows, are surrounded by a canal, and cover half a square mile. Outside this inner fair are nearly 4000 more shops. Several buildings have been erected, and institutions established, in connexion with the fair, *e.g.* the house of the committee (1890), banks, a theatre, a circus, a new semicircular canal and a second floating bridge, underground galleries, a water-supply, an electrical tramway, temperance tea-shops and restaurants kept by the Society of Tradesmen. The Siberian harbour is conspicuous during the fair on account of its accumulations of tea boxes and temporary shelters, in which the different kinds of tea are tried and appraised by tasters. The point of the peninsula is occupied by the storehouses of the steamboat companies, while metal wares and corn are discharged on a long island of the Oka, at the iron harbour and in Grebnovskaya harbour. An island in the Volga is the place where various kinds of rough wares are landed. The railway from Moscow has its terminus close to the fair buildings, to the south of which is the suburb of Kunavino, widely known throughout the East as a place for amusements of the lowest kind during the fair. On the fair side the Alexander Nevski cathedral was erected in 1881, and there too is the older "Fair" cathedral of 1822.

The climate of Nizhniy is harsh and continental, the yearly average temperature being 39° Fahr. (10·6° in January and 64° in July), and the extreme thermometric readings −40° and 104° Fahr. The town has a settled population of (1897) 90,053 inhabitants, who are nearly all Great-Russians, and many of them Nonconformists. The mortality exceeds the birth-rate. The educational institutions include a military school, a technical school, a theological seminary, and two schools for sons and daughters of the clergy.

The manufactures include steam flour-mills, iron and machinery works, manufactories of ropes and candles, distilleries and potteries. Shipbuilding, especially for the transport of petroleum on the Caspian Sea, and steamboat building, have recently advanced considerably. Nizhniy is the chief station of the Volga steamboat traffic. The first steamer made its appearance on the Volga in 1821, but it was not till 1845 that steam navigation began to assume large proportions. The merchants carry on a brisk trade, valued (apart from that of the fair) at more than £2,000,000 of purchases and £1,800,000 of sales; the principal items are corn (£200,000 to £500,000), salt, iron, tea, fish, groceries and manufactured goods.

The chief importance of the city is due to its fair, which is held from the 29th of July to the 10th of September. From remote antiquity Russian merchants were wont to meet in summer with those from the East at different places on the Volga, between the mouths of the Oka and the Kama—the fair changing its site with the increasing or decreasing power of the nationalities which struggled for the possession of the middle Volga. Bolgari, Nizhniy-Novgorod, Kazan and Vasilsursk have successively been its seat since the 10th century. From 1641 its seat was at a monastery 55 m. below Nizhniy and close to Makaryev (whence its present name). The situation, however, being in many ways inconvenient, and a conflagration having destroyed the shops at Makaryev, the fair was transferred in 1817 to its present locality at Nizhniy-Novgorod.

The goods mostly dealt in are cotton, woollen, linen and silk stuffs (35 to 38 % of the whole), iron and iron wares, furs and skins, pottery, salt, corn, fish, wine and all kinds of manufactured goods. The Russian goods constitute four-fifths of the whole trade; those brought from Asia—tea (imported via Kiakhta and via Canton and Suez), raw cotton and silk, leather wares, madder and various manufactured wares—do not exceed 10 or 11 %. Manufactured wares, groceries and wines are the goods principally imported from western Europe. The total turnover of goods sold and "ordered" amounts to nearly 36½ millions sterling annually. The former category dropped, however, from 26 millions in 1881 to 14 millions in 1905.

In 1880, the Russian manufacturers depending chiefly on the barter-trade in tea at Kiakhta, their production was regulated principally by the prices of tea established at the fair; but now cotton takes the lead, and the prospective output for the year of the mills of central Russia is determined at the fair by the price of raw cotton imported from Asia, by that of madder, and by the results of the year's crop, which became known during the fair. The same holds good with regard to all other stuffs, the prices of wool (provisionally established at the earlier fairs of south-western Russia) being ultimately settled at Nizhniy, as well as those of raw silk. The whole of the iron production of the Urals depends also on the same fair. The "caravans" of boats laden with iron-ware, starting from the Urals works in the spring, reach Nizhniy in August, after a stay at the fair of Laishev, which supplies the lower Volga; and the purchases of iron made at Nizhniy for Asia and middle Russia determine the amount of credit that will be granted for the next year's business to the owners of the ironworks, on which credit most of them entirely depend. The fair thus influences directly all the leading branches of Russian manufacture. It exercises a yet greater influence on the corn and salt trades throughout Russia, and still more on the whole of the trade in Siberia and Turkestan, both depending entirely on the conditions of credit which the Siberian and Turkestan merchants obtain at the fair.

The Makaryevskaya fair attracts no fewer than 400,000 people from all parts of Russia, and partly from Asia.

Two other fairs of some importance are held at Nizhniy—one for wooden wares on the ice of the Oka, and another, in June, for horses.

History.—The confluence of the Oka and the Volga, inhabited in the 10th century by Mordvinian tribes, began to be coveted by the Russians as soon as they had occupied the upper Volga, and as early as the 11th century they established a fort, Gorodets, 20 m. above the mouth of the Oka. In 1221, the people of Suzdal, under Yuri Vsevolodovich, prince of Vladimir, erected a fort on the hill now occupied by the Kremlin of Nizhniy. Until the beginning of the 14th century Nizhniy-Novgorod, which grew rapidly as the Russians colonized the banks of the Oka, remained subject to Suzdal; it enjoyed, however, almost complete independence, being ruled by its popular assembly. In the 14th century, until 1390, it elected its own princes. Ill-protected by its palisaded walls, it was plundered in 1377 and 1378 by the Tatars, supported by the Mordvinians. In 1390 Prince Vasili of Moscow, in alliance with Toktamish, khan of the Golden Horde of the Mongols, took Nizhniy and established his own governors there; in 1417 it was definitely annexed to Moscow, becoming a stronghold for the further advance of that principality towards the east. It was fortified in 1508–1511, and was able to repel the Tatars in 1513, 1520 and 1536. The second half of the 16th century was for the city a period of peaceful and rapid development. It became a depôt for all merchandize brought from the south-east, and even English merchants established warehouses there. With the fall of Kazan, and the opening of free navigation on the Volga, it became the starting-place for the "caravan" of boats yearly sent to the lower Volga under the protection of a military force, whilst the thick forests of the neighbourhood favoured the development of shipbuilding. In 1606–1611 the trading classes of Nizhniy took an active part in the expeditions against the revolted serfs, and it was a Nizhniy dealer in cattle, Kozma Minin Sukhorukov, who took the initiative in sending an army for the delivery of Moscow from the Poles in 1612. In 1667 the robber chieftain, Stenka Razin, made an unsuccessful attempt to capture the city. During the 17th century the country around Nizhniy became the seat of a vigorous religious agitation, and in its forests the Raskolniks established hundreds of their monasteries and communities, those of the Kerzhenets playing an important part in the history of Russian Nonconformity even to the present time.

Nizhniy-Novgorod had at one time two academies, Greek and Slav, and took some part in the literary movement of the end of the 18th century; its theatre also was of some importance in the history of the Russian stage. (P. A. K; J. T. Be.)

NOAH (נֹחַ, rest; Septuagint, New Testament, Philo, Josephus, Νῶε, Νῶχος, Νώεος: Vulg. *Noë*). According to Gen. v.–x. the tenth patriarch in direct descent from Adam, counting Adam as the first; the son of Lamech; the father of Shem, Ham and Japheth; and the builder of the Ark, in which he and his family, &c. &c., were saved from a universal flood (see Deluge). After the flood subsided God made a covenant with Noah permitting the use of animal food, on condition that the flesh is not eaten with the blood; and forbidding homicide (ix. 1-7, cf. i. 29 f., both P.). Noah was the first to cultivate the vine and to experience the consequences of over-indulgence in its products, an occasion which called forth the filial respect of two of his sons and the irreverence of the third. Through his sons he became the ancestor of the whole human race. The name is mentioned in the genealogy in 1 Chron. i. 4; the "waters of Noah" occur in Isaiah liv. 9; and Noah is mentioned with Daniel and Job as an ancient worthy in Ezek. xiv. 14, 20. The story is referred to in the New Testament in Matt. xxiv. 37 f.; Luke iii. 36, xvii. 26 f.; Heb. xi. 7; 1 Pet. iii. 20; 2 Pet. ii. 5.

The name Noah is explained in Gen. v. 29 as connected with the root *nhm* "comfort," but this is etymologically impossible. As a Hebrew word it might connect with *nûah*, "rest"; and the Septuagint has, "he will give us rest," instead of "he will comfort us"; and this is sometimes accepted as the original reading.

As the tenth patriarch Noah corresponds to the tenth prehistoric Babylonian king, Xisuthros in Berossus, Ut-napistim or Atrahasis in the cuneiform tablets, the hero of the Babylonian flood story.

Gen. ix. 20-27 is a distinct episode, and has no necessary connexion with the narrative of the Deluge. Probably, as Gunkel, Dillmann and others suggest, it came originally from a cycle of stories different from that which contained the account of the Flood. There are some apparent inconsistencies. Noah is called "the husbandman." The proper rendering of verse 20 is "and Noah, the husbandman, was the first to plant a vineyard," the E.V.: "And Noah began to be an husbandman, and he planted a vineyard," is incorrect. It seems, therefore, that in the original context Noah had been described as "the husbandman," a title in no way suggested by Gen. vi. 9–ix. 19. Moreover, even after making allowance for lack of experience as to the effect of the new product, drunkenness and exposure hardly tally with the statement that "Noah was a just man and perfect in his generations, and Noah walked with God," vi. 9. This indeed comes from the late Priestly Code; but we are also told in the earlier story that "Noah found favour in the eyes of the Lord," vi. 8.

The name also occurs in the Bible (נֹעָה, Νουά, *Noa*) for the daughter of Zelophehad, of the tribe of Manasseh. Zelophehad having only daughters, the case is made the occasion of laying down the law that where there are no sons daughters inherit, but must marry within their own tribe (Num. xxvi. 33, xxvii. 1, xxxvi. 11; Josh. xvii. 3, all Priestly Code). (W. H. Be.)

NOAILLES, the name of a great French family, derived from the castle of Noailles in the territory of Ayen, between Brive and Turenne in the Limousin, and claiming to date back to the 11th century. It did not obtain fame until the 16th century, when its head, Antoine de Noailles (1504–1562), became admiral of France, and was ambassador in England during three important years, 1553–1556, maintaining a gallant but unsuccessful rivalry with the Spanish ambassador, Simon Renard. Henri (1554–1623), son of Antoine, was a commander in the religious wars, and was made comte d'Ayen by Henry IV. in 1593. Anne (d. 1678), the grandson of the first count, played an important part in the Fronde and the early years of the reign of Louis XIV., became captain-general of the newly won province of Roussillon, and in 1663 was made duc d'Ayen, and peer of France. The sons of the first duke raised the family to its greatest fame. The eldest son, Anne Julés (1650–1708), was one of the chief generals of France towards the end of the reign of Louis XIV., and, after raising the regiment of Noailles in 1689, he commanded in Spain during the war of the Spanish succession, and was made marshal of France in 1693. A younger son, Louis Antoine (1651–1729), was made archbishop of Paris in 1695, holding this high dignity until his death; he was made a cardinal in 1699. The name of Noailles occurs with almost confusing reiteration throughout the 18th century. Adrien Maurice (1678–1766), the third duke, served in all the most important wars of the reign of Louis XV. in Italy and Germany, and became a marshal in 1734. His last command was in the war of the Austrian succession, when he was beaten by the English at the battle of Dettingen in 1743. He married Françoise d'Aubigné, a niece of Madame de Maintenon and two of his sons also attained the rank of marshal of France. The elder, Louis (1713–1793), who bore the title of duc d'Ayen till his father's death in 1766, when he became duc de Noailles, served in most of the wars of the 18th century without particular distinction, but was nevertheless made a marshal in 1775. He refused to emigrate during the Revolution, but escaped the guillotine by dying in August 1793, before the Terror reached its height. On the 4th Thermidor (July 22) the aged duchesse de Noailles was executed with her daughter-in-law, the duchesse d'Ayen, and her granddaughter, the vicomtesse de Noailles. Jean Paul François (1739–1824), the fifth duke, was in the army, but his tastes were scientific, and for his eminence as a chemist he was elected a member of the Academy of Sciences in 1777. He became duc d'Ayen in 1766 on his grandfather's death, and duc de Noailles on his father's in 1793. Having emigrated in 1792, he lived in Switzerland until the Restoration in 1814, when he took his seat as a peer of France. He had no son, and was succeeded as duc de Noailles by his grand-nephew, Paul (1802–1885), who won some reputation as an author, and who became a member of the French Academy in the place of Chateaubriand in 1849. The grandfather of Paul de Noailles, and brother of the fifth duke, Emmanuel Marie Louis (1743–1822), marquis de Noailles, was ambassador at Amsterdam from 1770–1776, at London 1776–1783, and at Vienna 1783–1792.

One other branch of the family deserves notice. Philippe (1715–1794), comte de Noailles, afterwards duc de Mouchy, was a younger brother of the fourth duke, and a more distinguished soldier than his brother. He served at Minden and in other campaigns, and was made a marshal on the same day as his brother. He was long in great favour at court, and his wife was first lady of honour to Marie Antoinette, and was nicknamed by her Madame Étiquette. This court favour brought down punishment in the days of the Revolution, and the old marshal and his wife were guillotined on the 27th of June 1794. His two sons, the prince de Poix and the vicomte de Noailles, were members of the Constituent Assembly.

Philippe Louis Marc Antoine, duke of Noailles and prince of Poix (1752–1819), was born on the 21st of November 1752. In 1789 he was elected deputy of the States-General by the nobility of the *bailliages* of Amiens and Ham, but was compelled to resign in consequence of a duel with the commander of the Garde Nationale at Versailles. He left the country for some time, but returned to France and took part in the revolution of the 10th of August 1792. He was, however, forced to quit the country once more to evade the fate of his father and mother. Returning to France in 1800, he lived quietly at his residence at Mouchy during the empire. At the Restoration he was brought again into favour and became a peer of France. He died at Paris on the 17th of February 1819.

Louis Marie (1756–1804), vicomte de Noailles, was the second son of the marshal. He served brilliantly under La Fayette in America, and was the officer who concluded the capitulation of Yorktown. He was elected to the States-General in 1789. He began the famous "orgie," as Mirabeau called it, on the 4th of August, when all privileges were abolished, and with d'Aiguillon proposed the abolition of titles and liveries in June 1790. When the revolution became more pronounced he emigrated to America, and became a partner in Bingham's bank at Philadelphia. He was very successful, and might have lived happily had he not accepted a command against the English in San Domingo, under Rochambeau. He made a brilliant defence of the mole St Nicholas, and escaped with the garrison to Cuba; but in making for Havana his ship was attacked by an English frigate, and after a long engagement he was severely wounded, and died of his wounds on the 9th of January 1804.

NOAKHALI, a town and district of British India, in the Chittagong division of eastern Bengal and Assam. The town, also known as Sudharam, is on a small river channel 10 m. from the sea. Pop (1901) 6520. The District of Noakhali has an area of 1644 sq. m.; pop. (1901) 1,141,728. The district consists of an alluvial tract of mainland, together with several islands at the mouth of the Meghna. In general, each homestead is surrounded by a thick grove of betel- and coco-nut palms, and in the north-western tracts dense forests of betel-nut palms extend for miles. Rice is the great staple of cultivation. The district is very fertile; and, with the exception of some sandbanks and recent accretions, every part of it is under continuous cultivation. The process of alluvion is gradually but steadily going on, the mainland extending seawards. Noakhali is peculiarly liable to destructive floods from the sea, generally caused by southerly gales or cyclones occurring at the time when the Meghna is swollen by heavy rains, and at flood-tides—the tidal bore being sometimes 20 ft. high, and moving at the rate of 15 m. an hour. The cyclone and storm-wave of the 31st of October 1876 was terribly disastrous, sweeping over the whole delta of the Meghna. The loss of human life was estimated at 100,000. The east of the district is served by the Assam-Bengal railway.

The Mahommedan population of the islands at the mouth of the Meghna practised piracy up to a comparatively recent date, and at the beginning of the 17th century Portuguese pirates, under Sebastian Gonzales, occupied Sandwip. They were ultimately reduced to subjection by Shaista Khan, the governor of Bengal, about the middle of the century; and their descendants have sunk to the level of the natives surrounding them, whose dress, customs and language they have, for the most part, adopted. They are Christians, and retain the old Portuguese names. About 1756 the East India Company established factories in Noakhali and Tippera, the ruins of some of which still remain.

NOBEL, ALFRED BERNHARD (1833–1896), Swedish chemist and engineer, was the third son of Emmanuel Nobel (1801–1872), and was born at Stockholm on the 21st of October 1833. At an early age he went with his family to St Petersburg, where his father started torpedo works. In 1859 these were left to the care of the second son, Ludvig Emmanuel (1831–1888), by whom they were greatly enlarged, and Alfred, returning to Sweden with his father, devoted himself to the study of explosives, and especially to the manufacture and utilization of nitroglycerin. He found that when that body was incorporated with an absorbent, inert substance like kieselguhr it became safer and more convenient to manipulate, and this mixture he patented in 1867 as dynamite. He next combined nitroglycerin with another high explosive, gun-cotton, and obtained a transparent, jelly-like substance, which was a still more powerful explosive than dynamite. Blasting gelatin, as it was called, was patented in 1876, and was followed by a host of similar combinations, modified by the addition of potassium nitrate, wood-pulp and various other substances. Some thirteen years later Nobel produced ballistite, one of the earliest of the nitroglycerin smokeless powders, containing in its latest forms about equal parts of gun-cotton and nitroglycerin. This powder was a precursor of cordite, and Nobel's claim that his patent covered the latter was the occasion of vigorously contested law-suits between him and the British Government in 1894 and 1895. Cordite also consists of nitroglycerin and gun-cotton, but the form of the latter which its inventors wished to use was the most highly nitrated variety, which is not soluble in mixtures of ether and alcohol, whereas Nobel contemplated using a less nitrated form, which is soluble in such mixtures. The question was complicated by the fact that it is in practice impossible to prepare either of these two forms without admixture of the other; but eventually the courts decided against Nobel. From the manufacture of dynamite and other explosives, and from the exploitation of the Baku oil-fields, in the development of which he and his brothers, Ludvig and Robert Hjalmar (1829–1896), took a leading part, he amassed an immense fortune; and at his death, which occurred on the 10th of December 1896 at San Remo, he left the bulk of it in trust for the establishment of five prizes, each worth several thousand pounds, to be awarded annually without distinction of nationality.

The first three of these prizes are for eminence in physical science, in chemistry and in medical science or physiology; the fourth is for the most remarkable literary work *dans le sens d'idéalisme*; and the fifth is to be given to the person or society that renders the greatest service to the cause of international brotherhood, in the suppression or reduction of standing armies, or in the establishment or furtherance of peace congresses.

See *Les Prix Nobel en 1901* (Stockholm, 1904).

NOBILI, LEOPOLDO (1784–1835), Italian physicist, born at Reggio nell' Emilia in 1784, was in youth an officer of artillery, but afterwards became professor of physics in the archducal museum at Florence, the old habitat of the Accademia del Cimento. His most valuable contributions to science consist in the suggestion of the astatic combination of two needles for galvanometers, and in the invention of the so-called thermo-multiplier used by him and M. Melloni. In 1826 he described the prismatically-coloured films of metal, known as Nobili's rings, deposited electrolytically from solutions of lead and other salts when the anode is a polished iron plate and the cathode is a fine wire placed vertically above it. His papers were mostly published in the *Bibliothèque universelle* of Geneva. He died at Florence in August 1835.

NOBILIOR, MARCUS FULVIUS, Roman general, a member of one of the most important families of the plebeian Fulvian gens. When praetor (193 B.C.) he served with distinction in Spain, and as consul in 189 he completely broke the power of the Aetolian league. On his return to Rome, Nobilior celebrated a triumph (of which full details are given by Livy) remarkable for the magnificence of the spoils exhibited. On his Aetolian campaign he was accompanied by the poet Ennius, who made the capture of Ambracia, at which he was present, the subject of one of his plays. For this Nobilior was bitterly attacked by Cato the Censor, on the ground that he had compromised his dignity as a Roman general. He restored the temple of Hercules and the Muses in the Circus Flaminius, placed in it a list of Fasti drawn up by himself, and endeavoured to make the Roman calendar more generally known. He was a great enthusiast for Greek art and culture, and introduced many of its masterpieces into Rome, amongst them the picture of the Muses by Zeuxis from Ambracia.

NOBILITY. To form a true understanding of what is strictly implied in the word "nobility," in its social as opposed to a purely moral sense, it is needful to distinguish its meaning from that of several words with which it is likely to be confounded. In England nobility is apt to be confounded with the peculiar institution of the British peerage. Yet nobility, in some shape or another, has existed in most places and times of the world's history, while the British peerage is an institution purely local, and one which has actually hindered the existence of a nobility in the sense which the word bears in most other countries. Nor is nobility the same thing as aristocracy. This last is a word which is often greatly abused; but, whenever it is used with any regard to its true meaning, it is a word strictly political, implying a particular form of government. But nobility is not necessarily a political term; the distinction which it implies may be accompanied by political privileges or it may not. Again, it is sometimes thought that both nobility and aristocracy are in some special way connected with kingly government. To not a few it would seem a contradiction to speak of nobility or aristocracy in a republic. Yet, though many republics have eschewed nobility, there is nothing in a republican, or even in a democratic, form of government inconsistent with the existence of nobility; and it is only in a republic that aristocracy, in the strict sense of the word, can exist. Aristocracy implies the existence of nobility; but nobility does not imply aristocracy; it may exist under any form of government. The peerage, as it exists in the three British kingdoms, is something which is altogether peculiar to the three British kingdoms, and which has nothing in the least degree like it elsewhere.

Definition.

Nobility, then, in the strict sense of the word, is the hereditary handing on from generation to generation of some acknowledged pre-eminence, a pre-eminence founded on hereditary succession, and on nothing else. Such nobility may be immemorial or it may not. There may or there may not be a power vested somewhere of conferring nobility; but it is essential to the true idea of nobility that, when once acquired, it shall go on for ever to all the descendants—or, more commonly, only to all the descendants in the male line—of the person first ennobled or first recorded as noble. The pre-eminence so handed on may be of any kind, from substantial political power to mere social respect and precedence. It does not seem necessary that it should be formally enacted by law if it is universally acknowledged by usage. It may be marked by titles or it may not. It is hardly needful to prove that nobility does not imply wealth, though nobility without wealth runs some risk of being forgotten. This definition seems to take in all the kinds of nobility which have existed in different times and places. They have differed widely in the origin of the noble class and in the amount of privilege implied in membership of it; but they all agree in the transmission of some privilege or other to all the descendants, or to all the male descendants, of the first noble.

Nobility and gentry.

In strictness nobility and gentry are the same thing. This fact is overshadowed in England, partly by the habitual use of the word "gentleman" (*q.v.*) in various secondary uses, partly by the prevalent confusion between nobility and peerage. But that they are the same is proved by the use of the French word *gentilhomme*, a word which has pretty well passed out of modern use, but which, as long as it remained in use, never lost its true meaning. There were very wide distinctions within the French *noblesse*, but they all formed one privileged class as distinguished from the *roturier*. Here, then, is a nobility in the strictest sense. If there is no such class in England, it is simply because the class which answers to it has never been able to keep any universally acknowledged privileges. The word "gentleman" has lost its original meaning in a variety of other uses, while the word "nobleman" has come to be confined to members of the peerage and a few of their immediate descendants.

That the English peerage does not answer to the true idea of a nobility will be seen with a very little thought. There is no handing on of privilege or pre-eminence to perpetual generations. The peer holds a great position, endowed with substantial powers and privileges, and those powers and privileges are handed on by hereditary succession. But they are handed on only to one member of the family at a time. The peer's children, in some cases his grandchildren, have titles and precedence, but they have no substantial privileges. His remoter descendants have no advantage of any kind over other people, except their chance of succeeding to the peerage. The remote descendant of a duke, even though he may chance to be heir presumptive to the dukedom, is in no way distinguished from any other gentleman; it is even possible that he may not hold the social rank of gentleman. This is not nobility in the true sense; it is not nobility as nobility was understood either in the French kingdom or in the Venetian commonwealth.

Nobility thus implies the vesting of some hereditary privilege or advantage in certain families, without deciding in what such privilege or advantage consists. Its nature may differ widely according to the causes which have led to the establishment of the distinction between family and family in each particular case.

Roman Populus.

The way in which nobility has arisen in different times and places is very various, and there are several nations whose history will supply us with examples of a nobility of one kind giving way to a nobility of another kind. The history of the Roman commonwealth illustrates this perhaps better than any other.[1] What we may call the nobility of earlier occupation makes way for the nobility of office. Our first glimpses of authentic Roman history set before us two orders in the same state, one of which is distinguished from the other by many exclusive privileges. The privileged order—the *populus*, *patres*, patricians—has all the characteristics which we commonly expect to find in a privileged order. It is a minority, a minority strictly marked out by birth from other members of the commonwealth, a minority which seems further, though this point is less clearly marked, to have had on the whole the advantage in point of wealth. When we are first entitled to speak with any kind of certainty, the non-privileged class possess a certain share in the election of magistrates and the making of laws. But the privileged class alone are eligible to the greatest offices of the state; they have in their hands the exclusive control of the national religion; they have the exclusive enjoyment of the common land of the state—in Teutonic phrase, the *folkland*. A little research shows that the origin of these privileges was a very simple one. Those who appear in later times as a privileged order among the people had once been the whole people. The patricians, *patres*, housefathers, goodmen—so lowly is the origin of that proud name—were once the whole Roman people, the original inhabitants of the Roman hills. They were the true *populus Romanus*, alongside of whom grew up a secondary Roman people, the *plebs* or commons. As new settlers came, as the people of conquered towns were moved to Rome, as the character of Romans was granted to some allies and forced upon some enemies, this *plebs*, sharing some but not all of the rights of citizens, became a non-privileged order alongside of a privileged order. As the non-privileged order increased in numbers, while the privileged order, as every exclusive hereditary body must do, lessened, the larger body gradually put on the character of the nation at large, while the smaller body put on the character of a nobility. But their position as a nobility or privileged class arose solely because a class with inferior rights to their own grew up around them. They were not a nobility or a privileged class as long as there was no less privileged class to distinguish them from. Their exclusive possession of power made the commonwealth in which they bore rule an aristocracy; but they were a democracy among themselves. We see indeed faint traces of distinction among the patricians themselves, which may lead us to guess that the equality of all patricians may have been won by struggles of unrecorded days, not unlike those which in recorded days brought about the equality of patrician and plebeian. But at this we can only guess. The Roman patricians, the true Roman *populus*, appear at our first sight of them as a body democratic in its own constitution, but standing out as an order marked by very substantial privileges indeed from the other body, the *plebs*, also democratic in its own constitution, but in every point of honour and power the marked inferior of the *populus*.

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[1] For the ethnological problems raised by the relations of *populus* and *plebs*, see ROME: *History*, § I.; also PATRICIANS.

Patricians.

The old people of Rome thus grew, or rather shrank up, into a nobility by the growth of a new people by their side which they declined to admit to a share in their rights, powers and possessions. A series of struggles raised this new people, the *plebs*, to a level with the old people, the *populus*. The gradual character of the process is not the least instructive part of it. There are two marked stages in the struggle. In the first the plebeians strive to obtain relief from laws and customs which were actually oppressive to them, while they were profitable to the patricians. When this relief has been gained by a series of enactments, a second struggle follows, in which the plebeians win political equality with the patricians. In this second struggle, too, the ground is won bit by bit. No general law was ever passed to abolish the privileges of the patricians; still less was any law ever passed to abolish the distinction between patrician and plebeian. All that was done was done step by step. First, marriage between the two orders was legalized. Then one law admitted plebeians to one office, another law to another. Admission to military command was won first, then admission to civil jurisdiction; a share in religious functions was won last of all. And some offices, chiefly those religious offices which carried no political power with them, always remained the exclusive property of the patricians, because no special law was ever passed to throw them open to plebeians. In this gradual way every practical advantage on the part of the patricians was taken away. But the result did not lead to the abolition of all distinctions between the orders. Patricians and plebeians went on as orders defined by law, till the distinction died out in the confusion of things under the empire, till at last the word "patrician" took quite a new meaning. The distinction, in truth, went on till the advantage turned to the side of the plebeians. Both consuls might be plebeians, both could not be patricians; a patrician could not wield the great powers vested in the tribunes of the commons. These were greater advantages than the exclusive patrician possession of the offices of *interrex*, *rex sacrorum* and the higher flamens. And, as the old distinction survived in law and religion after all substantial privileges were abolished, so presently a new distinction arose of which law and religion knew nothing, but which became in practice nearly as marked and quite as important as the older one.

This was the growth of the new nobility of Rome, that body, partly patrician, partly plebeian, to whom the name *nobilitas* strictly belongs in Roman history. This new nobility gradually became as well marked and as exclusive as the old patriciate. But if differed from the old patriciate in this, that, while the privileges of the old patriciate rested on law, or perhaps rather on immemorial custom, the privileges of the new nobility rested wholly on a sentiment of which men could remember the beginning. Or it would be more accurate to say that the new nobility had really no privileges at all. Its members had no legal advantages over other citizens. They were a social caste, which strove to keep, and which largely succeeded in keeping, all high offices and political power in its own hands. Such privileges, even of an honorary kind, as the nobles did enjoy by law belonged to them, not as nobles, but as senators and senators' sons. Yet practically the new nobility was a privileged class; it felt itself to be so, and it was felt to be so by others. This nobility consisted of all those who, as descendants of curule magistrates, had the *jus imaginum*—that is, who could point to forefathers ennobled by office. That is to say, it consisted of the remains of the old patriciate, together with those plebeian families any members of which had been chosen to curule offices. These were naturally those families which had been patrician in some other Italian city, but which were plebeian at Rome. Many of them equalled the patricians in wealth and antiquity of descent, and as soon as inter marriage was allowed they became in all things their social equals. The practical result of the Licinian reform was that the great plebeian families became, for all practical purposes, patrician. They separated themselves from the mass of the plebeians to form a single body with the surviving patricians. Just as the old patricians had striven to keep plebeians out of high offices, so now the new nobles, patrician and plebeian alike, strove to keep "new men," men who had not the *jus imaginum*, out of high office. But there was still the difference that in the old state of things the plebeian was shut out by law, while in the new state of things no law shut out the new man. It needed a change in the constitution to give the consulship to Lucius Sextius; it needed only union and energy in the electors to give it to Gaius Marius.

The Roman case is often misunderstood, because the later Roman writers did not fully understand the case themselves. Livy could never get rid of the idea that the old struggle between patrician and plebeian was something like the struggle between the nobility and the people at large in the later days of the commonwealth. In a certain sense he knew better; at any rate, he often repeats the words of those who knew better; but the general impression given by his story is that the plebeians were a low mob and their leaders factious and interested ringleaders of a mob. The case is again often misunderstood because the words "patrician" and "plebeian," like so many other technical Roman and Greek words, have come in modern language to be used in a way quite unlike their original sense. The word "plebeian," in its strict sense, is no more contemptuous than the word *commoner* in England. The *plebs*, like the English commons, contained families differing widely in rank and social position, among them those families which, as soon as an artificial barrier broke down, joined with the patricians to form the new nobility. The whole lesson is lost if the words "patrician" and "plebeian" are used in any but their strict sense. The Catuli and Metelli, among the proudest nobles of Rome, were plebeians, and as such could not have been chosen to the purely patrician office of *interrex*, or *flamen* of Jupiter. Yet even in good writers on Roman history the words "patrician" and "plebeian" are often misapplied by being transferred to the later disputes at Rome, in which they are quite out of place.

We may now compare the history of nobility at Rome with its history in some other of the most famous city-commonwealths.

Comparison between Roman and Athenian nobilities.

Thus at Athens [1] its history is in its main outlines very much the same as its history at Rome up to a certain point, while there is nothing at Athens which at all answers to the later course of things at Rome. At Athens, as at Rome, an old patriciate, a nobility of older settlement, a nobility which had once been the whole people, was gradually shorn of all exclusive privilege, and driven to share equal rights with a new people which had grown up around it. The reform of Cleisthenes (*q.v.*) answers in a general way to the reform of Licinius, though the different circumstances of the two cities hinder us from carrying out the parallel into detail. But both at Rome and at Athens we see, at a stage earlier than the final reform, an attempt to set up a standard of wealth, either instead of or alongside of the older standard of birth. This same general idea comes out both in the constitution of Servius and in the constitution of Solon, though the application of the principle is different in the two cases. Servius made voting power depend on income; by Solon the same rule was applied to qualification for office. By this change power is not granted to every citizen, but it is put within the reach of every citizen. No man can change his forefathers, but the poor man may haply become richer. The Athenian εὐπατρίδαι, who were thus gradually brought down from their privileged position, seem to have been quite as proud and exclusive as the Roman patricians; but when they lost their privileges they lost them far more thoroughly, and they did not, as at Rome, practically hand on many of them to a new nobility, of which they formed part, though not the whole. While at Rome the distinction of patrician and plebeian was never wiped out, while it remained to the last a legal distinction even when practical privilege had turned the other way, at Athens, after the democracy had reached its full growth, the distinction seems to have had no legal existence whatever. At Rome down to the last it made a difference whether the candidate for office was patrician or plebeian, though the difference was in later times commonly to the advantage of the plebeian. At Athens, at any rate after Aristides, the eupatrid was neither better nor worse off than another man.

But, what is of far greater importance, there never arose at Athens any body of men which at all answered to the *nobilitas* of Rome. We see at Athens strong signs of social distinctions, even at a late period of the democracy; we see that, though the people might be led by the low-born demagogue—using that word in its strict and not necessarily dishonourable meaning—their votes most commonly fell on men of ancient descent. We see that men of birth and wealth often allowed themselves a strange licence in dealing with their low-born fellow-citizens. But we see no sign of the growth of a body made up of patricians and leading plebeians who contrived to keep office to themselves by a social tradition only less strong than positive law. We have at Athens the exact parallel to the state of things when Appius Claudius shrank from the thought of the consulship of Gaius Licinius; we have no exact parallel to the state of things when Quintus Metellus shrank from the thought of the consulship of Gaius Marius. The cause of the difference seems to be that, while the origin of the patriciate was exactly the same at Rome and at Athens, the origin of the commons was different. The four Ionic tribes at Athens seem to have answered very closely to the three patrician tribes at Rome; but the Athenian *demos* grew up in a different way from the Roman *plebs*. If we could believe that the Athenian *demos* arose out of the union of the other Attic towns with Athens, this would be an exact analogy to the origin of the Roman *plebs*; the εὐπατρίδαι would be the Athenians and the *demos* the Atticans (Ἀττικοί). But from such glimpses of early Attic history as we can get the union of the Attic towns would seem to have been completed before the constitutional struggle began. That union would answer rather to the union of the three patrician tribes of Rome. Such hints as we have, while they set before us, just as at Rome, a state of things in which small landed proprietors are burthened with debt, also set before us the Attic *demos* as, largely at least, a body of various origins which had grown up in the city. Cleisthenes, for instance, enfranchised many slaves and strangers, a course which certainly formed no part of the platform of Licinius, and which reminds us rather of Gnaeus Flavius somewhat later. On the whole it seems most likely that, while the kernel of the Roman *plebs* was rural or belonged to the small towns admitted to the Roman franchise, the Attic *demos*, largely at least, though doubtless not wholly, arose out of the mixed settlers who had come together in the city, answering to the μέτοικοι of later times. If so, there would be no place in Athens for those great plebeian houses, once patrician in some other commonwealth, out of which the later Roman *nobilitas* was so largely formed.

Thus the history of nobility at Athens supplies a close analogy to the earlier stages of its history at Rome, but it has nothing answering to its later stages. At Sparta we have a third instance of a people shrinking up into a nobility, but it is a people whose position differs altogether from anything either at Rome or at Athens. Sparta is the best case of a nobility of conquest. This is true, whether we look on the περίοικοι as Achaeans or as Dorians, or as belonging some to one race and some to the other (see PERIOECI). In any case the Spartans form a ruling body, and a body whose privileged position in the land is owing to conquest. The Spartans answer to the patricians, the περίοικοι to the *plebs*; the helots are below the position of *plebs* or *demos*. The only difference is that, probably owing to the fact that the distinction was due to conquest, the local character of the distinction lived on much longer than it did at Rome. We hardly look on the Spartans as a nobility among the other Lacedaemonians; Sparta rather is a ruling city bearing sway over the other Lacedaemonian towns. But this is exactly what the original Roman patricians, the settlers on the three oldest hills, were in the beginning. The so-called cities (πόλεις) of the περίοικοι answered pretty well to the local plebeian tribes; the difference is that the περίοικοι never became a united corporate body like the Roman *plebs*. Sparta to the last remained what Rome was at the beginning, a city with a *populus* (δῆμος) but no *plebs*. And, as at Rome in early times, there were at Sparta distinctions within the *populus*; there were ὅμοιοι and ὑπομείονες, like the *majores* and *minores gentes* at Rome. Only at Rome, where there was a *plebs* to be striven against, these distinctions seem to have had a tendency to die out, while at Sparta they seem to have had a tendency to widen. The Spartan patriciate could afford to disfranchise some of its own members.

The other old Greek cities, as well as those of medieval Italy and Germany, would supply us with endless examples of the various ways in which privileged orders arose. Venice, a city not exactly belonging to any of these classes, essentially a city of the Eastern empire and not of the Western, gives us an example than which none is more instructive. The renowned patriciate of Venice was as far removed as might be from the character either of a nobility of conquest or of a nobility of older settlement. Nor was it strictly a nobility of office, though it had more in common with that than with either of the other two. As Athens supplies us with a parallel to the older nobility of Rome without any parallel to the later, so Venice supplies us with a parallel to the later nobility of Rome without any parallel to the earlier. Athens has Fabii and Claudii, but no Catuli or Metelli; Venice has Catuli and Metelli, but no Fabii or Claudii.

In one point, however, the Venetian nobility differed from either the older or the newer nobility of Rome, and also from the older nobilities of the medieval Italian cities. Nowhere else did nobility so distinctly rise out of wealth, and that wealth gained by commerce. In the original island territory of Venice there could be no such thing as landed property. The agricultural plebeian of old Rome and the feudal noble of contemporary Europe were both of them at Venice impossible characters. The Venetian nobility is an example of a nobility which gradually arose out of the mass of the people as certain families step by step drew all political power into their own hands. The *plebs* did not gather round the *patres*, neither were they conquered by the *patres;* the *patres* were developed by natural selection out of the *plebs*, or, more strictly, out of the ancient *populus*. The *commune* of Venice, the ancient style of the commonwealth, changed into the *seigniory* of Venice. Political power was gradually confined to those whose forefathers had held political power. This was what the later nobility of Rome was always striving at, and what they did to a great extent practically establish. But, as the exclusive privileges of the nobility were never recognized by any legal or formal act, men like Gaius Marius would ever and anon thrust themselves in. The privileges which the Venetian nobility took to themselves were established by acts which, if not legal, were at least formal. The Roman nobility, resting wholly on sufferance, was overthrown by the ambition of one of its own members. The Venetian nobility, resting also in its beginnings on sufferance, but on sufferance which silently obtained the force of law, lasted as long as Venice remained a separate state.

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[1] See further ATHENS: *History*, and EUPATRIDAE.

The Roman Curiae and the Great Council of Venice.

The hereditary oligarchy of Venice was established by a series of changes which took place between the years 1297 and 1319. All of them together really go to make up the "Shutting of the Great Council," a name which is formally given to the act of the first of those years. In 1172 the Great Council began as an elective body; it gradually ousted the popular assembly from all practical power. It was, as might be looked for, commonly filled by members of distinguished families, descendants of ancient magistrates, who were already beginning to be looked on as noble. The series of revolutions already spoken of first made descent from former councillors a necessary qualification for election to the council; then election was abolished, and the council consisted of all descendants of its existing members who had reached the age of twenty-five. Thus the *optimates* of Venice did what the *optimates* of Rome strove to do: they established a nobility whose one qualification was descent from those who had held office in past times. This is what the nobility of office, if left unchecked, naturally grows into. But the particular way in which oligarchy was finally established at Venice had some singular results. Some of the great families which were already looked on as noble were not represented in the council at the time of the shutting; of others some branches were represented and others not. These families and branches of families, however noble they might be in descent, were thus shut out from all the political privileges of nobility. When one branch of a family was admitted and one shut out we have an analogy to the patrician and plebeian Claudii, though the distinction had come about in quite another way. And in the Great Council itself we have the lively image of the aristocratic popular assembly of Rome, the assembly of the *populus*, that of the *curiae*, where every man of patrician birth had his place. The two institutions are the same, only the way in which they came about is exactly opposite. The assembly of *curiae* at Rome, originally the democratic assembly of the original people, first grew into an aristocratic assembly, and then died out altogether as a new Roman people, with its own assembly, grew up by its side. It was a primitive institution which gradually changed its character by force of circumstances. It died out, supplanted by other and newer powers, when it became altogether unsuited to the times. The Great Council of Venice was anything but a primitive institution; it was the artificial institution of a late age, which grew at the expense of earlier institutions, of the prince on the one side and of the people on the other. But the two different roads led to the same result. The Great Council of Venice, the *curiae* of Rome, were each of them the assembly of a privileged class, an assembly in which every member of that class had a right to a place, an assembly which might be called popular as far as the privileged class was concerned, though rigidly oligarchic as regarded the excluded classes. But, close as the likeness is, it is merely a superficial likeness, because it is the result of opposite causes working in opposite directions. It is like two men who are both for a moment in the same place, though their faces are turned in opposite ways. If the later *nobilitas* of Rome had established an assembly in which every one who had the *jus imaginum* had a vote and none other, that would have been a real parallel to the shutting of the Venetian Great Council; for it would have come about through the working of causes which are essentially the same.

The nobility of Venice and aristocracy.

The nobility which was thus formed at Venice is the very model of a civic nobility, a nobility which is also an aristocracy. In a monarchy, despotic or constitutional, there cannot in strictness be an aristocracy, because the whole political power cannot be vested in the noble class. But in the Venetian commonwealth the nobility was a real aristocracy. All political power was vested in the noble class; the prince sank to a magistrate, keeping only some of the outward forms of sovereignty; the mass of the people were shut out altogether. And, if no government on earth ever fully carried out the literal meaning of aristocracy as the rule of the best, these civic nobilities come nearer to it than any other form of government. They do really seem to engender a kind of hereditary capacity in their members. Less favourable than either monarchy or democracy to the growth of occasional great men, they are more favourable than either to the constant supply of a succession of able men, qualified to carry on the work of government. Their weak point lies in their necessary conservatism; they cannot advance and adapt themselves to changed circumstances, as either monarchy or democracy can. When, therefore, their goodness is gone, their corruption becomes worse than the corruption of either of the other forms of government.

Civic aristocracies.

All this is signally shown in the history both of Venice and of other aristocratic cities. But we are concerned with them now only as instances of one form of nobility. The civic aristocracies did not all arise in the same way. Venice is the best type of one way in which they rose; but it is by no means the only way. In not a few of the Italian cities nobility had an origin and ran a course quite unlike the origin and the course which were its lot at Venice. The nobles of many cities were simply the nobles of the surrounding country changed, sometimes greatly against their will, into citizens. Such a nobility differed far more widely from either the Roman or the Venetian patriciate than they differed from one another. It wanted the element of legality, or at least of formality, which distinguished both these bodies. The privileges of the Roman patriciate, whatever we may call them, were not usurpations; and, if we call the privileges of the Venetian nobility usurpations, they were stealthy and peaceful usurpations, founded on something other than mere violence. But in many Italian cities the position of the nobles, if it did not begin in violence, was maintained by violence, and was often overthrown by violence. They remained, in short, as unruly and isolated within the walls of the cities as they had ever been without. A nobility of this kind often gave way to a democracy which either proved as turbulent as itself, or else grew into an oligarchy ruling under democratic forms. Thus at Florence the old nobles became the opposite to a privileged class. The process which at Rome gradually gave the plebeian a political advantage over the patrician was carried at Florence to a far greater length at a single blow. The whole noble order was disfranchised; to be noble was equivalent to being shut out from public office. But something like a new nobility presently grew up among the commons themselves; there were *popolani grossi* at Florence just as there were noble plebeians at Rome. Only the Roman commons, great and small, never shut out the patricians from office; they were satisfied to share office with them. In short, the shutting out of the old nobility was, if not the formation of a new nobility, at least the formation of a new privileged class. For a certain class of citizens to be condemned, by virtue of their birth, to political disfranchisement is as flatly against every principle of democracy as for a certain class of citizens to enjoy exclusive rights by reason of birth. The Florentine democracy was, in truth, rather to be called an oligarchy, if we accept the best definition of democracy (see Thucydides vi. 39), namely, that it is the rule of the whole, while oligarchy is the rule of a part only.

It is in these aristocractic cities, of which Venice was the most fully developed model, that we can best see what nobility really is. It is in these only that we can see nobility in its purest form—nobility to which no man can rise and from which no man can come down except by the will of the noble class itself. In a monarchy, where the king can ennoble, this ideal cannot be kept. Nor could it be kept in the later nobility of Rome. The new man had much to strive against, but he could sometimes thrust himself through, and when he did his descendants had their *jus imaginum.* But at Venice neither prince nor people could open the door of the Great Council; only the Great Council itself could do that. That in the better times of the aristocracy nobility was not uncommonly granted to worthy persons, that in its worse times it was more commonly sold to unworthy persons, was the affair of the aristocratic body itself. That body, at all events, could not be degraded save by its own act. But these grants and sales led to distinctions within the ranks of the noble order, like those of which we get faint glimpses among the Roman patricians. The ducal dignity rarely passed out of a circle of specially old and distinguished families. But this has often been the case with the high magistracies of commonwealths whose constitutions were purely democratic.

Rural nobility.

From this purest type of nobility, as seen in the aristocratic commonwealths, we may pass to nobility as seen in states of greater extent—that is, for the most part in monarchies. There are two marked differences between the two. They are differences which seem to be inherent in the difference between a republic and a monarchy, but which it would be truer to say are inherent in the difference between a body of men packed close together within the walls of a city and a body of men—if we can call them a body—scattered over a wide territory. The member of a civic nobility is more than a member of an order; he is a member of a corporation; he has no powers, he has hardly any being, apart from the body of which he is a member. He has a vote in making the laws or in choosing those who make them; but when they are made he is, if anything, more strictly bound by them than the citizen of the non-privileged order. To be a fraction of the corporate sovereign, if it had its gains, had also its disadvantages; the Venetian noble was fettered by burthens, restrictions and suspicions from which the Venetian citizen was free. The noble of the large country, on the other hand, the rural noble, as he commonly will be, is a member of an order, but he is hardly a member of a corporation; he is isolated; he acts apart from the rest of the body and wins powers for himself apart from the rest of the body. He shows a tendency—a tendency whose growth will be more or less checked according to the strength of the central power—to grow into something of a lord or even a prince on his own account, a growth which may advance to the scale of a German elector or stop at that of an English lord of a manor. Now many of these tendencies were carried into those Italian cities where the civic nobility was a half-tamed country nobility; but they have no place in the true civic aristocracies. Let us take one typical example. In many parts of western Europe the right of private war long remained the privilege of every noble, as it had once been the privilege of every freeman. And in some Italian cities, the right, or at least the privilege, of private war was continued within the city walls. But no power of imagination can conceive an acknowledged right of private war in Rome, Venice or Bern.

The other point of difference is that, whatever we take for the origin and the definition of nobility, in most countries it became something that could be given from outside, without the need of any consent on the part of the noble class itself. In other words, the king or other prince can ennoble. We have seen how much this takes away from the true notion of nobility as understood in the aristocratic commonwealths. The nobility is no longer all-powerful; it may be constrained to admit within its own body members for whose presence it has no wish. Where this power exists the nobility is no longer in any strictness an aristocracy; it may have great privileges, great influence, even great legal powers, but it is not the real ruling body, like the true aristocracy of Venice.

Nobilities in early Western Europe.

In the modern states of western Europe the existing nobility seems to have for the most part had its origin in personal service to the prince. And this nobility by personal service seems commonly to have supplanted an older nobility, the origin of which was, in some cases at least, strictly immemorial. In this way the later nobility of the thegns was in England substituted for the older nobility of the *eorls.* Now the analogy between this change and the change from the Roman patriciate to the later Roman *nobilitas* is obvious. In both cases the older nobility gives way to a newer; and in both cases the newer nobility was a nobility of office. Under a kingly government office bestowed by the sovereign holds the same place which office bestowed by the people holds in a popular government. This new nobility of office supplanted, or perhaps rather absorbed, the older nobility, just as the later *nobilitas* of Rome supplanted or absorbed the old patriciate. In our first glimpse of Teutonic institutions, as given us by Tacitus, this older nobility appears as strictly immemorial (see Waitz, *Deutsche Verfassungsgeschichte*, i. 185 sq.), and its immemorial character appears also in the well-known legend in the *Rigsmal-saga* of the separate creation of jarl, karl and thrall. These represent the three classes of mankind according to old Teutonic ideas—the noble, the simple freeman and the bondman. The kingly house, where there is one, is not a distinct class; it is simply the noblest of the noble. For, as almost everywhere else, this Teutonic nobility admits of degrees, though it is yet harder to say in what the degrees of nobility consisted than to say in what nobility consisted itself. The older nobility is independent of the possession of land; it is independent of office about the sovereign; it is hard to say what were the powers and privileges attached to it; but of its existence there is no doubt. But in no part of Europe can the existing nobility trace itself to this immemorial nobility of primitive days; the nobility of medieval and modern days springs from the later nobility of office. The nobles of modern Europe are rather *thegnas* than *eorlas.* The eorl of the old system would doubtless commonly become a thegn under the new, as the Roman patrician took his place in the new *nobilitas:* but others could take their place there also. The Old-English laws point out ways by which the churl might rise to thegn's rank, and in the centuries during which the change went on we find mention—complaining mention—both in England and elsewhere, at the court of Charles the Simple and at the court of Æthelred, of the rise of new men to posts of authority. The story that Earl Godwine himself was of churlish birth, whether true or false, marks the possibility of such a rise. A still wilder tale spoke of Hugh Capet as the son of a butcher of Paris. Stories like these prove even more than the real rise of Hagano and Eadric.

England.

In England the nobility of the thegns was to a great extent personally displaced, so to speak, by the results of the Norman Conquest. But the idea of nobility did not greatly change. The English thegn sometimes yielded to, sometimes changed into, the Norman baron, using that word in its widest sense, without any violent alteration in his position. The notion of holding land of the king became more prominent than the notion of personal service done to the king; but, as the land was held by the tenure of personal service, the actual relation hardly changed. But the connexion between nobility and the holding of land comes out in the practice by which the lord so constantly took the name of his lordship. It is in this way that the prefixes *de* and *von*, descriptions in themselves essentially local, have become in other lands badges of nobility. This notion has died out in England by the dropping of the preposition; but it long lived on wherever Latin or French was used. And before long nobility won for itself a distinguishing outward badge. The device of hereditary coat-armour, a growth of the 12th century, did much to define and mark out the noble class throughout Europe. As it could be acquired by grant of the sovereign, and as, when once acquired, it went on from generation to generation, it answers exactly to the *jus imaginum* at Rome, the hereditary badge of nobility conferred by the election of the people. Those who possessed the right of coat-armour by immemorial use, or by grant in regular form, formed the class of nobility or gentry, words which, it must again be remembered, are strictly of the same meaning. They held whatever privileges or advantages have attached in different times and places to the rank of nobility or gentry. In England indeed a variety of causes hindered nobility or gentry from ever obtaining the importance which they obtained, for instance, in France. But perhaps no cause was more important than the growth of the peerage. That institution at once set up a new standard of nobility, a new form of the nobility of office. The peer—in strictness, the peer in his own person only, not even his children—became the only noble; the ideas of nobility and gentry thus became divorced in a way in which they are not in any other country. Those who would elsewhere have been counted as the nobility, the bearers of coat-armour by good right, were hindered from forming a class holding any substantial privilege. In a word, the growth of the peerage hindered the existence in England of any nobility in the continental sense of the word. The esquires, knights, lesser barons, even the remote descendants of peers, that is, the *noblesse* of other countries, in England remained gentlemen, but not noblemen—simple commoners, that is, without legal advantage over their fellow-commoners who had no *jus imaginum* to boast of. There can be no doubt that the class in England which answers to the *noblesse* of other lands is the class that bears coat-armour, the gentry strictly so called.[1] Had they been able to establish and to maintain any kind of privilege, even that of mere honorary precedence, they would exactly answer to continental nobility. That coat-armour has been lavishly granted and often assumed without right, that the word "gentleman" has acquired various secondary senses, proves nothing; that is the natural result of a state of things in which the *status* of gentry carries with it no legal advantage, and yet is eagerly sought after on social grounds. If coat-armour, and thereby the rank of gentry, has been lavishly granted, some may think that the rank of peerage has often been lavishly granted also. In short, there is no real nobility in England; for the class which answers to foreign nobility has so long ceased to have any practical privileges that it has long ceased to be looked on as a nobility, and the word nobility has been transferred to another class which has nothing answering to it out of the three British kingdoms.[2] This last class in strictness takes in only the peers personally; at the outside it cannot be stretched beyond those of their children and grandchildren who bear the courtesy titles of lord and lady.

France.

Poland.

No attempt has been here made to trace out the history of nobility in the various countries and, we must add, cities of Europe. All that has been attempted has been to point out some general truths, and to refer to some specially striking instances. Once more, it must be borne in mind that, while it is essential to the idea of nobility that it should carry with it some hereditary privilege, the nature and extent of that privilege may vary endlessly. In the 18th century the nobility of France and the nobility of Poland alike answered to the very strictest definition of nobility; but the political positions of the two were as broadly contrasted as the positions of any two classes of men could be. The nobility of France, keeping the most oppressive social and personal privileges, had been shorn of all political and even administrative power; the tyrants of the people were the slaves of the king. In Poland sixty thousand gentlemen, rich and poor, famous and obscure, but all alike gentlemen, rode out to choose a king by a unanimous vote, and to bind him when chosen by such conditions as they thought good. Those sixty thousand, like the *populus* of Rome, formed a narrow oligarchy as regarded the rest of the nation, but a wild democracy among themselves. Poland, in short, came nearer than any kingdom or country of large extent to the nature of an aristocracy, as we have seen aristocracy in the aristocratic cities. The chief power of the state was placed neither in the prince nor in the nation at large; it was held by a noble class. The kingly power in Poland, like the ducal power at Venice, had been so narrowed that Poland, though she still kept a king, called herself a republic no less than Venice. And whatever was taken from the king went to the gain of the noble order. But the nobility of a large country, even though used to act politically as an order, could never put on that orderly and legal character which distinguishes the true civic patriciates. It never could come so nearly as a civic patriciate could to being something like the rule of the best in any sense of those words.

The tendency of modern times has been towards the breaking down of formal hereditary privileges. In modern commonwealths, above all, they have been thought to be essentially inconsistent with republican institutions. The truth of the matter is rather that the circumstances of most modern commonwealths have been unfavourable to the preservation, and still more to the growth, of privileged bodies. Where they existed, as in Switzerland, they have been overthrown. Where they did not exist, as in America, everything has made it more and more impossible that they should arise. And, as modern changes have commonly attacked the power both of kings and of nobles, the common notion has come that kingship and nobility have some necessary connexion. It has seemed as if any form of nobility was inconsistent with a republican form of government, while nobility, in some shape or other, has come to be looked on as a natural, if not a necessary, appendage to a monarchy. And as far as regards the social side of kingship this is true. A court seems more natural where a chain of degrees leads gradually up from the lowest subject to the throne than when all beneath the throne are nearly on a level. And from one point of view, that from which the kingly house is but the noblest of the noble, kingship and nobility are closely allied. But in the more strictly political view monarchy and nobility are strongly opposed. Even the modified form of absolute monarchy which has existed in some Western countries, while it preserves, perhaps even strengthens, the social position of a nobility, destroys its political power. Under the fully-developed despotisms of the East a real nobility is impossible; the prince raises and thrusts down as he pleases. It is only in a commonwealth that a nobility can really rule; that is, it is only in a commonwealth that the nobility can really be an aristocracy. And even in a democratic commonwealth the sentiment of nobility may exist, though all legal privilege has been abolished or has never existed. That is to say, traditional feeling may give the members of certain families a strong preference, to say the least, in election to office. We have seen that this was the case at Athens; it was largely the case in the democratic cantons of Switzerland; indeed the nobility of Rome itself, after the privileges of the patricians were abolished, rested on no other foundation. (E. A. F.)

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[1] This statement is mainly interesting as expressing the late Professor Freeman's view; it is, however, open to serious criticism. Coat-armour was in itself not necessarily a badge of nobility at all; it could be, and was, worn by people having no pretensions to be "gentlemen," and this is true both of England and the continent. In its origin it was a mere personal mark of distinction, in the primary sense of this word. No "grant" was necessary; it was assumed by all and sundry who had occasion to use it, though a reasonable convention forbade one man to assume the device of another. Later arose the custom of granting arms as a mark of personal favour or gratitude. This again was not at the outset an exclusive right of the crown; it was common for a leader in battle to grant to some one not of his family, who had specially distinguished himself, the right to bear the whole or part of his coat of arms, differenced or undifferenced. On the other hand, many undoubted "gentlemen" never assumed arms at all. The claim of the heralds to make "gentry" depend on the bearing of coat-armour, and the right to this depend on grant or recognition by themselves as officers of the crown, is of comparatively late growth. See further the article GENTLEMAN.—W. A. P.

[2] Compare *e.g.* the social conditions of Great Britain and Germany. In Germany there are two classes of nobility: (1) the *hoher Adel*, members of the mediatized, formerly sovereign families, who rank as the equals in blood (*ebenbürtig*) of the royal houses of Europe; (2) the *niederer Adel*, to which every one having the nobiliary prefix *von* belongs. In England "presentation at court" is the privilege of no particular class as such; and the wives of ministers of the crown, even if of quite humble origin, are "commanded" to court functions with their husbands. The strictness of the principle of admission or exclusion differs at the various German courts, and has tended to be modified by the growth of a new aristocracy of wealth; but a single instance known to the present writer may serve to illustrate the fundamental divergence of German (a fortiori Austrian) ideas from English in this matter. A wealthy publisher of European reputation attended the court of his native town, the capital of a small grand-duchy, in virtue of the honorary title *Hofrat*; his wife, not being noble, did not accompany him. His elder daughter married a cabinet minister, but, as he was not a noble, this did not confer on her the right to go to court. His younger daughter married a subaltern in a line regiment, belonging to the lesser nobility; as ennobled by marriage (according to the liberal rule of this particular court), she was duly "presented."—W. A. P.

AUTHORITIES.—Selden's *Titles of Honor* (London, 1672) remains the best comparative account in the English language of the nobility of various countries up to his date. For England see E. P. Shirley, *Noble and Gentle Men* (1860); Gneist, *Adel und Ritterschaft in England* (Berlin, 1853); Sir George Sitwell, "The English Gentleman," in the *Ancestor* (No. 1, April 1902); and J. H. Round's works, *passim.* A. C. Fox-Davies's *Armorial Families* (Edinburgh, 1895, and subsequent editions) represents an unhistorical attempt to create the idea of a *noblesse* in the United Kingdom. For the origin and growth of the nobility in France, see A. Luchaire, *Manuel des institutions françaises* (Paris, 1892), and P. Guilhiermoz, *Essai sur l'origine de la noblesse en France au moyen âge* (1902); for their later status and privileges, A. de Tocqueville, *L'Ancien Régime et la Révolution* (1856 ff.), and H. A. Taine, *Les Origines de la France contemporaine*, pt. i., *L'Ancien Régime* (1875 ff.). For the German and Austrian nobility, see v. Strantz, *Gesch. des deutschen Adels* (2nd ed., Waldenburg, 1851); von Maurer, *Über das Wesen des ältesten Adels der deutschen Stämme* (Munich, 1846); Rose, *Der Adel Deutschlands und seine Stellung im deutschen Reich* (Berlin, 1883); G. Meyer, *Lehrbuch des deutschen Staatsrechts* (5th ed., Leipzig, 1899), and the Gotha *Genealogische Taschenbücher.* For the Italian nobility see the eight magnificent folio volumes of Count Pompeo Litta, *Celebri famiglie italiane*, continued by various editors (Milan, 1819–1907); for Spanish, Fernandez de Béthencourt, *Hist. genealógica*, t. i.-vii. (1897–1907). The authoritative manual for the royal houses and the "higher nobility" of Europe is the *Almanach de Gotha*, published yearly. See also the articles TITLES OF HONOUR, PEERAGE, FEUDALISM, GENTLEMAN, DUKE, COUNT, &c.

NOBLE, SIR ANDREW (1832–), British physicist and artillerist, was born at Greenock on the 15th of September 1832, and was educated at Edinburgh Academy and at the Royal Military Academy, Woolwich. In 1849 he entered the Royal Artillery, attaining the rank of captain in 1855, and in 1857 he became secretary to the Royal Artillery Institution. About this time the question of the supersession of the old smooth-bores by rifled guns was coming to the fore, and on the appointment of the Select Committee on Rifled Cannon in 1858 to report on the matter, he was chosen its secretary, a capacity in which he devised an ingenious method for comparing the probable accuracy of the shooting attainable with each type of gun. In 1859 he was appointed Assistant-Inspector of Artillery, and in the following year he became a member of the Ordnance Select Committee and of the Committee on Explosives, serving on the latter for twenty years, until its dissolution. About the same time he was prevailed upon by Sir William, afterwards Lord, Armstrong to leave the public service and take up a post at Elswick. Here, in the first instance, he was put in charge of the ordnance department, but it was not long before his organizing and administrative ability and scientific attainments enlarged the sphere of his influence, until finally he became chairman of the company. Immediately on his appointment he began a systematic investigation of the phenomena which occur when a gun is fired, some of his first experiments being designed to discover with accuracy the pressures attained in the largest guns of that time. About 1862 he invented his chronoscope for the measurement of exceedingly small intervals of time, and began to apply it in ballistic experiments for ascertaining the velocity with which the shot moves along the barrel of a gun with different powders and different charges. Then he joined Sir Frederick Abel in a classical research on "Fired Gunpowder," the experimental work being largely carried on at Elswick, and the conclusions they arrived at had a great effect on the progress of gunnery, for they showed how increased muzzle velocities were to be attained without increased pressures in the gun. These inquiries, in fact, enabled Elswick in 1877 to turn out the 6-in. and 8-in. guns, with velocities of over 2000 ft. per second, that obliged the British government finally to give up the antiquated muzzle-loaders to which it had so obstinately adhered. Later, when the era of nitro or "smokeless" powders had begun, Captain Noble was an early advocate of their advantages, and when at length the British government awoke to the necessity of selecting a powder of that character for the naval and military services of Great Britain, Elswick extended its hospitality to the committee that invented cordite, and gave the members facilities, which were not offered by the government, for the necessary experimental work. Even after the powder was invented and the committee dissolved, inquiries—which it was nobody's official business to make, and which therefore were not made officially—were continued at Elswick to ascertain how by suitable modifications in form, composition, &c., cordite might the better perform the varied duties required of it. Noble became a member of the committee appointed in 1900 by Lord Lansdowne to consider, among other things, the excessive erosion alleged by some of the powder's critics to be produced by it in the barrels of the guns in which it is used. He was made C.B. in 1881, promoted to be K.C.B. in 1893, and was created a baronet among the Coronation honours in 1902; he was also the recipient of many foreign decorations and scientific honours, including a Royal medal from the Royal Society in 1880, and the Albert medal of the Society of Arts in 1909. He published a number of his scientific papers in a collected form as *Artillery and Explosives* in 1906.

NOBLESVILLE, a city and the county-seat of Hamilton county, Indiana, U.S.A., on the White river, about 20 m. N. by E. of Indianapolis. Pop. (1890) 3054; (1900) 4792 (226 negroes); (1910) 5073. It is served by the Lake Erie & Western, the Central Indiana and the Indiana Union (electric) Traction railways. It is in the natural gas region of the state, and has various manufactures. It was settled about 1825 and incorporated as a town in 1851.

NOCERA INFERIORE, formerly NOCERA DEI PAGANI (anc. *Nuceria Alfaterna, q.v.*), a town and episcopal see of Campania, Italy, in the province of Salerno, at the foot of Monte Albino, 23 m. E.S.E. of Naples by rail, 135 ft. above sea-level. Pop. (1901) 11,933 (town); 20,064 (commune). Nocera is connected with Codola on the line from Naples to Avellino by a branch railway (3 m.). In the old castle Helena, the widow of Manfred, died after the battle of Benevento, and here Urban VI. imprisoned the cardinals who favoured the antipope Clement VII. Two miles to the E. near the village of Nocera Superiore is the circular church of Sta Maria Maggiore, dating from the 4th century. Its chief feature is its dome, ceiled with stone internally, but covered externally with a false roof. It is supported by 40 ancient columns, and in its construction resembles S Stefano Rotondo in Rome. The walls are covered with frescoes of the 14th century.

At an early date the city became an episcopal see, and in the 12th century it sided with Innocent II. against Roger of Sicily, and suffered severely for its choice. A colony of Saracens introduced by Frederick II. probably gave rise to the epithet ("of the pagans") by which it was so long distinguished, as well as to the town of Pagani, which lies about 1 m. to the west. In 1385 Pope Urban VI. was besieged in the castle of Charles of Durazzo. Nocera was the birthplace of Solimena the painter and of Hugo de' Pagani, the founder of the Templars, and in the list of its bishops appears the name of Paulus Jovius.

NOCERA UMBRA (anc. *Nuceria Camellaria*), a town and episcopal see in the province of Perugia, Italy, 12 m. by rail N. by E. of Foligno, 1706 ft. above sea-level. Pop. (1901) 5685 (town), 7848 (commune). It has some old churches, containing pictures and frescoes; in the cathedral is a large altarpiece by Nicolo Alunno. Three miles to the south-east of the town are mineral springs.

NOCTURN, or NOCTURNE (Lat. *nocturnus*, of or belonging to the night, *nox*), in the Roman Church, one of the three divisions of the office of matins, corresponding with the vigils, beginning at 9 P.M. midnight and 3 A.M. respectively. The service consists of psalms, lessons and antiphons (see BREVIARY). The term "nocturne" is applied to a musical composition, answering to the earlier "serenade," of a quiet, dreamy and romantic character. The name and style are said to have originated with John Field (1782–1837). The best-known compositions of this kind are the pianoforte pieces of Chopin. J. McNeill Whistler also introduced the term into painting by using the name for some of his night-pieces. A "nocturnal" is an instrument for finding the hour of the night by observation of the relative positions of the pole-star and other stars, generally the pointers of Ursa Major. The British Museum contains a fine nocturnal made about 1560 by Humfray Cole (see NAVIGATION).

NODDY, the name applied, originally by sailors, to a sea-bird, from its showing so little fear of man as to be accounted stupid. It is the *Sterna stolida* of Linnaeus, and the *Anous stolidus* of modern ornithology, having the figure of a TERN (*q.v.*), and belonging to the sub-family *Sterninae*, but is heavier in flight, with shorter wings and the tail less deeply forked. The plumage is of a uniform sooty hue, excepting the crown of the head, which is light grey. The Noddy is very generally distributed throughout the tropical or nearly tropical oceans, but occasionally wanders into colder climates, and has been met with even in the Irish Sea. It breeds, often in astounding numbers, on low cays and coral-islets, commonly making a shallow nest of sea-weed or small twigs. Howard Saunders (*Proc. Zool. Society*, 1876, pp. 669-672) admits four other species of the genus: *Anous tenuirostris*, supposed to be confined to the southern part of the Indian Ocean, from Madagascar to West Australia; *A. melanogenys*, often confounded with the last, but having nearly as wide a range as the first; and *A. leucocapillus*, hitherto known only from Torres Strait and the Southern Pacific. These three have much resemblance to *A. stolidus*, but are smaller in size, and the two latter have the crown white instead of grey. The fourth species, *A. caeruleus* (with which he includes the *A. cinereus* of some authors), differs not inconsiderably, being of a dove-colour, lighter on the head and darker on the back, the wings bearing a narrow white bar, with their quill-feathers blackish-brown, while the feet are reddish and the webs yellow. Three more species—*A. superciliosus* from the Caribbean Sea and Gulf of Mexico, *A. plumbeigularis* from the Red Sea, and *A. galapagensis* from the Galapagos—have been added by R. Bowdler Sharpe (*Philos. Transactions*, clxviii. pp. 468, 469), according to whom (*Proc. Zool. Society*, 1878, p. 272) *A. cinereus* of the Eastern Pacific is distinct from *A. caeruleus* of Australia and the Western Pacific. (A. N.)

NODE (Lat. *nodus*, a loop), in astronomy, one of two opposite points at which a heavenly body passes through the principal co-ordinate plane to which its motion is referred. In the case of the heavenly bodies this plane is commonly that of the ecliptic, but, in special cases, the plane through the origin parallel to the earth's equator or the plane of a planet's orbit is used. The ascending node is that at which the body moves from the south or negative towards the north or positive side of the plane. The moon's nodes are the points in which its path intercepts the plane of the ecliptic. In the geometry of curves, a node is the name given to the loop formed by a continuous curve crossing itself, the point of crossing is termed a "double point," and at it there are two non-coincident tangents to the curve; the remaining species of double points, termed "acnode," "spinode" or "cusp," admits of two coincident tangents (see CURVE).

NODIER, CHARLES (1780–1844), French author, was born on the 29th of April 1780 at Besançon. His father, on the outbreak of the Revolution, was appointed mayor of Besançon and consequently chief police magistrate; he seems to have rather lent himself as an instrument to the tyranny of the Jacobins than to have shared their principles; but his son was for a time an ardent citizen, and is said to have been a club member when he could at the most have been twelve years old. In 1793 Charles saved the life of a lady guilty of sending money to an *émigré*, by declaring to his father that if she were condemned he would take his own life. He was sent to Strassburg, where he lived in the house of Eulogius Schneider, the notorious Jacobin governor of Alsace, but a good Greek scholar. During the Terror his father put him under the care of Girod de Chautrans, with whom he studied English and German. His love of books began very early, and he combined with it a strong interest in natural science. He became librarian in his native town, but his exertions in the cause of suspected persons brought him under suspicion. An inspection of his papers by the police, however, revealed nothing more dangerous than a dissertation on the antennae of insects. Entomology continued to be a favourite study with him, but he varied it with philology and pure literature and even political writing. For a skit on Napoleon, in 1803, he was imprisoned for some months. He then quitted Paris, whither he had gone after losing his position at Besançon, and for some years lived a very unsettled life at Besançon, Dôle, where he married, and in other places in the Jura. During these wanderings he wrote *Le Peintre de Salzbourg, journal des émotions d'un cœur souffrant, suivi des Méditations du cloître* (1803). The hero, Charles, who is a variation of the Werther type, desires the restoration of the monasteries, to afford a refuge from the woes of the world. In 1811 Nodier appears at Laibach as editor of a polyglot journal, the *Illyrian Telegraph*, published in French, German, Italian and Slav. On the evacuation of the Illyrian provinces he returned to Paris, and the restoration found him a royalist, though he retained something of republican sentiment. In 1824 he was appointed to the librarianship of the Bibliothèque de l'Arsenal. He was elected a member of the Academy in 1833, and made a member of the Legion of Honour in 1843, a year before his death on the 27th of January 1844. These twenty years at the arsenal were by far the most important and fruitful of Nodier's life. He had much of the Bohemian in his composition. But he had the advantage of a settled home in which to collect and study rare books; and he was able to supply a centre and rallying place to a knot of young literary men of greater individual talent than himself—the so-called Romanticists of 1830—and to colour their tastes and work very decidedly with his own predilections. Victor Hugo, Alfred de Musset and Sainte-Beuve all acknowledged their obligations to him. He was a passionate admirer of Goethe and of Shakespeare, and had himself contributed to the personal literature that was one of the leading traits of the Romantic school.

His best and most characteristic work, some of which is exquisite in its kind, consists partly of short tales of a more or less fantastic character, partly of nondescript articles, half bibliographic, half narrative, the nearest analogue to which in English is to be found in some of the papers of De Quincey. The best examples of the latter are to be found in the volume entitled *Mélanges tirés d'une petite bibliothèque*, published in 1829 and afterwards continued. Of his tales the best are *Smarra, ou les démons de la nuit* (1821); *Trilby, ou le lutin d'Argail* (1822); *Histoire du roi de Bohême et de ses sept châteaux* (1830); *La Fée aux miettes* (1832); *Inès de las Sierras* (1838); *Légende se Sœur Béatrix* (1838), together with some fairy stories published in the year of his death, and *Franciscus Columna*, which appeared after it. The *Souvenirs de jeunesse* (1832) are interesting but untrustworthy, and the *Dictionnaire universel de la langue française* (1823), which, in the days before Littré, was one of the most useful of its kind, is said to have been not wholly or mainly Nodier's. There is a so-called collection of *Œuvres complètes*, in 12 vols. (1832), but at that time much of the author's best work had not appeared, and it included but a part of what was actually published. Nodier found an indulgent biographer in Prosper Mérimée on the occasion of the younger man's admission to the academy.

An account of his share in the Romantic movement is to be found in Georg Brandes's *Main Currents in Nineteenth Century Literature*. His *Description raisonnée d'une jolie collection de livres* (1844), which is a catalogue of the books in his library, contains a life by Francis Wey and a complete bibliography of his numerous works. See also Sainte-Beuve, *Portraits littéraires*, vol. ii.; Prosper Mérimée, *Portraits historiques et littéraires* (1874); and A. Estignard, *Correspondance inédite de Charles Nodier, 1796–1844* (1876), containing his letters to Charles Weiss.

NOEGGERATH, JOHANN JACOB (1788–1877), German mineralogist and geologist, was born at Bonn on the 10th of

October 1788. In 1814–1815 he became commissioner of mines for some of the Rhine Provinces, and in 1818 professor of mineralogy and afterwards professor of geology, director of the Museum of Natural History and chief of the mining department in the university at Bonn. He obtained a very fine collection of minerals for the museum, was eminently successful as a teacher, and achieved a wide reputation among mining engineers. The following are his more important publications: *Über aufrecht im Gebirgsgestein eingeschlossene fossile Baumstämme und andere Vegetabilien* (1819–1821); *Das Gebirge in Rheinland-Westphalen, nach mineralogischem und chemischem Bezuge* (4 vols., 1822–1826); *Die Entstehung der Erde* (1843); and *Der Laacher See und seine vulkanischen Umgebungen* (1870). The Carboniferous plant *Noeggerathia*, allied to the Zamias and Cycads, was named after him. He died at Bonn on the 13th of September 1877.

NOEL, RODEN BERKELEY WRIOTHESLEY (1834–1894), English poet, son of Noel, Lord Barham, afterwards earl of Gainsborough, was born on the 27th of August 1834. He was educated at Trinity College, Cambridge, where he graduated M.A. in 1858. He then spent two years travelling in the East. He married in 1863 Alice de Broë, daughter of the director of the Ottoman Bank in Beirout. The third child of this marriage, Eric, who died at the age of five, is commemorated in Roden Noel's best-known book of verse, *A Little Child's Monument* (1881). His other volumes are *Behind the Veil, and other Poems* (1863), not included in his collected works, *Beatrice, and other Poems* (1868), *The Red Flag* (1872), *Livingstone in Africa* (1874), *Songs of the Heights and Deeps* (1885), *A Modern Faust, and other Poems* (1888), *Poor People's Christmas* (1890) and *My Sea, and other Poems* (1896). Roden Noel's versification was unequal and sometimes harsh, but he has a genuine feeling for nature, and the work is permeated by philosophic thought. The latter part of his life was spent at Brighton, but he died at Mainz, on the 26th of May 1894. His other works include a drama in verse, *The House of Ravensburg* (1877), a *Life of Byron* (1890, "Great Writers" series), a selection of Thomas Otway's plays (1888) for the "Mermaid" series, and critical papers on literature and philosophy.

His *Collected Poems* were edited (1902) by his sister, Victoria Buxton, with a notice by J. Addington Symonds, which had originally appeared in the *Academy* (19th of Jan. 1899) as a review of *The Modern Faust*. The selection (1892) in the series of *Canterbury Poets* has an introduction by Robert Buchanan.

NOETUS, a presbyter of the church of Asia Minor about A.D. 230, was a native of Smyrna, where (or perhaps in Ephesus) he became a prominent representative of the particular type of Christology now called modalistic monarchianism or patripassianism. His views, which led to his excommunication from the Asiatic Church, are known chiefly through the writings of Hippolytus, his contemporary at Rome, where he settled and had a large following. He accepted the fourth Gospel, but regarded its statements about the Logos as allegorical. His disciple Cleomenes held that God is both invisible and visible; as visible He is the Son.

NOGARET, GUILLAUME DE (d. 1313), councillor and keeper of the seal to Philip IV. of France, was born between 1260 and 1270. His father was a citizen of Toulouse, and was, so it was claimed, condemned as a heretic during the Albigensian crusade. The family held a small ancestral property of servile origin at Nogaret, near Saint Felix de Caramon, from which it took its name. In 1291 Guillaume was professor of jurisprudence at the university of Montpellier, and in 1296 he became a member of the Curia Regis at Paris. His name is mainly connected with the quarrel of Philip IV. with Pope Boniface VIII. In 1300 he was sent with an embassy to Boniface, of which he has left a picturesque but highly coloured account. His real ascendancy over the king dates from February 1303, when he persuaded Philip to consent to the bold plan of seizing Boniface and bringing him forcibly from Italy to a council in France which should depose him. On the 7th of March he received, with three others, a secret commission from the royal chancery to "go to certain places . . . and make such treaties with such persons as seemed good to them." On the 12th of March a solemn royal assembly was held in the Louvre, at which Guillaume de Nogaret read a long series of accusations against Boniface and demanded the calling of a general council to try him. Soon afterwards he went to Italy. By the aid of a Florentine spy, Nogaret gathered a band of adventurers and of enemies of the Gaetani (Boniface's family) in the Apennines. The great Colonna house, at bitter feud with the Gaetani, was his strongest ally, and Sciarra Colonna accompanied Nogaret to Anagni, Boniface's birthplace. On the 7th of September, with their band of some sixteen hundred men, Nogaret and Colonna surprised the little town. Boniface was taken prisoner. Sciarra wished to kill him, but Nogaret's policy was to take him to France and compel him to summon a general council. The tide soon turned, however. On the 9th a concerted rising of the townsmen in Boniface's favour put Nogaret and his allies to flight, and the pope was free. His death at Rome on the 11th of October saved Nogaret. The election of the timid Benedict XI. was the beginning of that triumph of France which lasted through the Avignon captivity. Early in 1304 Nogaret went to Languedoc to report to Philip IV., and was rewarded by gifts of land and money. Then he was sent back with an embassy to Benedict XI. to demand absolution for all concerned in the struggle with Boniface VIII. Benedict refused to meet Nogaret, and excepted him from the general absolution which he granted on the 13th of May 1304, and on the 7th of June issued against him and his associates at Anagni the bull *Flagitiosum scelus*. Nogaret replied by apologies for his conduct based upon attacks upon the memory of Boniface, and when Benedict died on the 7th of July 1304 he pointed to his death as a witness to the justice of his cause. French influence was successful in getting a Frenchman, Bertrand de Got (Clement V.) elected as Benedict's successor. The threat of proceedings against the memory of Boniface was renewed to force Clement to absolve Nogaret, and Clement had given way on this point when the further question of an inquiry into the condition of the Templars was brought forward by Philip as a preliminary to their arrest and the seizure of their property in October 1307. Nogaret was active in getting the renegade members of the order to give evidence against their fellows, and the whole proceedings against them bear traces of his unscrupulous and merciless pen. Clement's weak and ineffective resistance to this still further delayed the agreement between him and Philip. Nogaret had become keeper of the seal this year in succession to Pierre de Belleperche. His talents as an *advocatus diaboli* were given still further employment in the trial of Guichard, bishop of Troyes, charged with various crimes, including witchcraft and incontinence, which was begun in 1308 and lasted till 1313. The trial was a hint to Clement as to what might happen if the oft repeated threat of a trial of Boniface were fulfilled. Absolution was obtained from Clement on the 27th of April 1311. Guillaume de Nogaret was to go on the next crusade and visit certain places of pilgrimage in France and Spain as a penance, but never did so. He died in 1313 "with his tongue horribly thrust out," according to the chronicler Jean Desnouelles. He retained the seals till his death and was occupied with the king's affairs concerning Flanders as late as the end of March 1313.

See E. Renan in *Histoire littéraire de la France*, xxvii. 233; R. Holzmann, *Wilhelm von Nogaret* (Freiburg, 1898). For the sources consult Dom Bouquet, *Recueil de historiens des Gaules et de la France*, vols. xx.-xxiii.; *Annales regis Edwardi primi* in Rishanger ("Rolls" series), pp. 483-491, which gives the fullest account of the affair at Anagni.

NOGENT-LE-ROTROU, a town of northern France, formerly capital of the district of Perche and now capital of an arrondissement in the department of Eure-et-Loir on the Huisne, 38 m. W.S.W. of Chartres by rail. Pop. (1906) 6884. In the early part of the 17th century the overlordship was acquired by the duke of Sully, financial minister of Henry IV. In the courtyard of the hospital, originally founded at the end of the 12th century, there is a small building containing the tomb of Sully and his wife. On the hill overlooking the town stands the château of the counts of Perche, of which the donjon dating from the first half of the 11th century is the oldest portion. To Rotrou I., founder of the château, the town owes the second part of its name.

Nogent preserves three Gothic churches and the remains of the old priory of St Denis, and there are statues of General St Pol, killed at Sevastopol, and of the poet Rémy Belleau (16th century), a native of the town. The town has a sub-prefecture, a tribunal of first instance, a communal college and institution for deaf mutes.

NOGENT-SUR-MARNE, a town of northern France, in the department of Seine, on a hill on the right bank of the Marne, 6 m. E. of Paris by rail. Pop. (1906) 11,463. The Eastern railway here crosses the Marne valley by a viaduct 875 yds. in length. Nogent has a Gothic church, with a tower of the Romanesque period, in front of which there is a monument to Watteau, who died here in 1721. Chemical products are manufactured. The fine situation of the town gained it the name of Beauté, and Charles V. built a château here (demolished in the 18th century) which was presented by Charles VII. to Agnes Sorel with the title of Dame de Beauté. An island in the Marne to the south of the town is still known as the Île de Beauté.

NOGENT-SUR-SEINE, a town of north-central France, capital of an arrondissement in the department of Aube, on the left bank of the Seine, 35 m. N.W. of Troyes on the Paris-Belfort line. Pop. (1906) 3791. The river at this point forms an island, which supports a stone bridge of the 17th century. The chief building is the church of St Laurent (1421–1554). A lateral portal in the flamboyant style and the Renaissance tower at the west end are of great beauty. The town is the seat of a sub-prefect and has a tribunal of first instance. There is trade in grain, flour, fodder, wood and cattle. Nogen-sur-Seine was in 1814 the scene of fighting between the French and Austrians.

NOGI, KITEN, COUNT (1849–), Japanese general, was born in Choshu. He commanded a brigade at the battle of Kinchow (1894) and the subsequent capture of Port Arthur from the Chinese; but the most memorable events of his career were the siege of Port Arthur by the third army corps of Japan under his command in the Russo-Japanese War (1904–5), and the great flanking march made by the same army in the battle of Mukden.

NOIRMOUTIER, an island of western France, belonging to the department of Vendée, and protecting the Bay of Bourgneuf on the south-west. Pop. (1906) 8388. The area amounts to 22 sq. m., one-sixth dunes. Between the island and the mainland is a sandbank laid bare at low water, and crossed by an embankment and carriage road some 2½ m. long. It was not till about 1766 that it was found possible to walk across to the island, which lies from N.N.W. to S.S.E., and is 12 m. long, its breadth varying from 1 m. in the south part to 3 or 4 m. in the north. It appears to be formed of alluvial deposits gradually accumulated round a rock of no great size situated at the meeting-place of the Gascony and Brittany currents. Fishing, agriculture, oyster-breeding and work in the salt marshes also occupy the inhabitants. There are two communes, Noirmoutier and Barbâtre. Noirmoutier, which has a small port, has about 2165 of its 6644 inhabitants gathered together in a little town with narrow and winding streets. Its castle was once the residence of the abbot of Her. In the church (12th, 14th and 19th centuries) there is a crypt of the 11th century. A mile to the north of the town lies a pleasant watering-place, rendered picturesque by the La Chaise woods (evergreen oaks and pines), and a grand confusion of rocks, among which lie charming beaches. A dolmen, several menhirs, and the ruins of a Gallo-Roman villa with its hot baths show that the island must have been occupied at an early date; but the first fact in its recorded history is the foundation of the Benedictine monastery of Her by St Philibert about 680. From this monastery the name Noirmoutier (*Heri monasterium*, *Hermoutier*) is derived. It had already attained to great prosperity when it was pillaged by the Normans in 825 and 843. In 1205 the abbey of Notre Dame la Blanche was built at the north extremity of the island to take the place of a Cistercian convent established in the Île du Pilier, at that time attached to Noirmoutier by a dike. This abbey was ruined by the Protestants in 1562. In the 15th, 16th and 17th centuries the island belonged to the family of La Tremoille, and in 1650 the territory was made a duchy. In 1676 the island was captured by the Dutch. Having been seized by Charette during the war of Vendée, it was recovered by the Republican general, Haxo, who caused the Vendean leader, d'Elbée, to be shot.

NOISE (a word of doubtful origin; O. Fr. *nogse* or *nose*; Prov. *nausa*, which points to Lat. *nausea*, sickness, as the origin; others take Lat. *noxia*, harm, as the source), an excessive, offensive, persistent or startling sound. By the common law of England freedom from noise is essential to the full enjoyment of a dwelling house, and acts which affect that enjoyment may be actionable as nuisances. But it has been laid down that a nuisance by noise, supposing malice to be out of the question, is emphatically a question of degree (*Gaunt* v. *Finney*, 1872, 8 Ch. Ap. 8). The noise must be exceptional and unreasonable. The ringing of bells, building operations, vibration of machinery, fireworks, bands, a circus, merry-go-rounds, collecting disorderly crowds, dancing, singing, &c., have been held under certain circumstances to constitute nuisances so as to interfere with quiet and comfort, and have been restrained by injunction. Noise occasioned by the frequent repetition of street cries is frequently the subject of local by-laws, which impose penalties for infringement.

NOISOME, harmful, offensive, especially of that which causes physical disgust. The word is formed from the obsolete "noy," trouble, a shortened form of "annoy," now only used as a verb, to cause trouble, the usual substantive being "annoyance." The O. Fr. *anoi*, *anui* (modern *ennui*) is an adaptation of Lat. *in odio esse*, *venire* or *habere*, to be sick, tired of anything (*odium*, disgust, hatred). The word has no connexion with Lat. *nocere*, to hurt.

NOKES (NOKE, NOAK, NOAKES), **JAMES** (d. 1692), an English actor, whose laughter-arousing genius is attested by Cibber and other contemporaries. Sir Martin Mar-all, Sir Davy Dunce and Sir Credulous Easy were among his favourite parts. His success as the Nurse in Nevil Payne's *Fatal Jealousy* was so great that he was thereafter nicknamed "Nurse Nokes."

NOLA, a city and episcopal see of Campania, Italy, in the province of Caserta, pleasantly situated in the plain between Mount Vesuvius and the Apennines, 16¾ m. E.N.E. of Naples, 121 ft. above sea-level. Pop. (1901) 11,927 (town); 14,511 (commune). It is served by the local railway from Naples to Baiano, and is 22 m. from Naples by the main line via Cancello. The more conspicuous buildings are the ancient Gothic cathedral (restored in 1866, and again in 1870 after the interior was destroyed by fire), with its lofty tower, the cavalry barracks, the ex-convent of the Capuchins at a little distance from the city, and the seminary in which are preserved the famous Oscan inscription known as the Cippus Abellanus (from Abella, the modern Avella, *q.v.*) and some Latin inscriptions relating to a treaty with Nola regarding a joint temple of Hercules. Two fairs are held in Nola, on the 14th of June and the 12th of November; and the 26th of July is devoted to a great festival in honour of St Paulinus, one of the early bishops of the city, who invented the church bell (*campana*, taking its name from Campania). The church erected by him in honour of St Felix in the 4th century is extant in part. There is a monument (restored in 1887) to Giordano Bruno, the free-thinker, who was born at Nola in 1548.

Nola (Νῶλα) was one of the oldest cities of Campania, variously said to have been founded by the Ausones, the Chalcidians and the Etruscans. The last-named were certainly in Nola about 500 B.C. At the time when it sent assistance to Neapolis against the Roman invasion (328 B.C.) it was probably occupied by Oscans in alliance with the Samnites. The Romans made themselves masters of Nola in 313 B.C., and it was thenceforth faithful to Rome. In the Second Punic War it thrice bade defiance to Hannibal; but in the Social War it was betrayed into the hands of the Samnites, who kept possession till Marius, with whom they had sided, was defeated by Sulla, who in 80 B.C. subjected it with the rest of Samnium. Seven years later it was stormed by Spartacus. Whatever punishment Sulla may have inflicted, Nola, though it lost much of its importance, remained a municipium with its own institutions and the use of the Oscan language. It became a Roman colony under Augustus, who died at Nola. Sacked by Genseric in 455, and by the Saracens in 806 and 904, captured by Manfred in the 13th century, and damaged by earthquakes in the 15th and 16th, Nola lost much of its importance. The revolution of 1820 under General Pepe began at Nola. The sculptor Giovanni Marliano was a native of the city; and some of his works are preserved in the cathedral.

Nola lay on the Via Popillia from Capua to Nuceria and the south, and a branch road ran from it to Abella and Abellinum. Mommsen (*Corp. inscr. Lat.* x. 142) further states that roads must have run direct from Nola to Neapolis and Pompeii, but Kiepert's map annexed to the volume does not indicate them. In the days of its independence it issued an important series of coins, and in luxury it vied with Capua. Its territory was very fertile, and this was the principal source of its wealth. A large number of vases of Greek style were manufactured here and have been found in the neighbourhood. Their material is of pale yellow clay with shining black glaze, and they are decorated with skilfully drawn red figures. Of the ancient city, which occupied the same site as the modern town, hardly anything is now visible, and the discoveries of the ancient street pavement have not been noted with sufficient care to enable us to recover the plan. Numerous ruins, an amphitheatre, still recognizable, a theatre, a temple of Augustus, &c., existed in the 16th century, and have been since used for building material. They are described by A. Leone, *De Nola* (Venice, 1514). A few tombs of the Roman period are preserved. The neighbourhood was divided into pagi, the names of some of which are preserved to us (Pagus Agrifanus, Capriculanus, Lanitanus). (T. As.)

NÖLDEKE, THEODOR (1836–), German Semitic scholar, was born at Harburg on the 2nd of March 1836, and studied at Göttingen, Vienna, Leiden and Berlin. In 1859 his history of the Koran won for him the prize of the French Académie des Inscriptions, and in the following year he rewrote it in German (*Geschichte des Korans*) and published it with additions at Göttingen. In 1861 he began to lecture at the university of this town, where three years later he was appointed extraordinary professor. In 1868 he became ordinary professor at Kiel, and in 1872 was appointed to the chair of Oriental languages at Strassburg, which he resigned in 1906. Nöldeke's range of studies has been wide and varied, but in the main his work has followed the two lines already indicated by his prize essay, Semitic languages, and the history and civilization of Islam. While a great deal of his work (*e.g.* his *Grammatik der neusyrischen Sprache*, 1868, his *Mandäische Grammatik*, 1874, and his translations from the Arabian of Tabarī, 1881–1882) is meant for specialists, many of his books are of interest to the general reader. Several of his essays first appeared in the *Encyclopædia Britannica*, and his article on the Koran, with some others, was republished in a volume called *Oriental Sketches*. The articles dealing with Persia were republished in a German volume, *Aufsätze zur persischen Geschichte* (Leipzig, 1887). Among his best-known works are: *Das Leben Mohammeds* (1863); *Beiträge zur Kenntnis der Poesie der alten Araber* (1864); *Die alttestamentliche Literatur* (1868); *Untersuchungen zur Kritik des Alten Testaments* (1869); *Zur Grammatik des klassischen Arabisch* (1896); *Fünf Moʿallaqat, übersetzt und erklärt* (1899–1901); and *Beiträge zur semitischen Sprachwissenschaft* (1904). He has contributed frequently to the *Zeitschrift der deutschen morgenländischen Gesellschaft*, the *Göttingische gelehrte Anzeigen* and the *Expositor*.

NOLI, a coast village of Liguria, Italy, in the province of Genoa, from which it is 36 m. S.W. by rail, 13 ft. above sea-level. Pop. (1901) 1985. It is a town of considerable antiquity, now decayed, and has an ancient church of S. Paragorio, once the cathedral, a Romanesque basilica dating from the 11th century, with interesting works of art. The diocese has been united with that of Savona.

See A. d'Andrade, *Relazione dell' Ufficio Regionale per la conservazione dei monumenti del Piemonte e della Liguria* (Turin, 1899), 100 seq.

NOLLEKENS, JOSEPH (1737–1823) British sculptor, was born on the 11th of August 1737 in Dean Street, Soho, London, where his father, a native of Antwerp, the "old Nollekens" of Horace Walpole, was a painter of some repute. In his thirteenth year he entered the studio of the sculptor Peter Scheemakers, and practised drawing and modelling with great assiduity, ultimately gaining various prizes offered by the Society of Arts. In 1760 he went to Rome, and he executed a marble bas-relief, "Timoclea before Alexander," which obtained a prize of fifty guineas from that society in 1762. Garrick and Sterne were among the first English visitors who sat to him for busts; among his larger pieces belonging to this early period perhaps the most important is the "Mercury and Venus chiding Cupid." Having returned to England in 1770, he was admitted an associate of the Royal Academy in 1771, and elected a member in 1772, the year in which he married Mary, the second daughter of Saunders Welch. By this time he had become known to George III., whose bust he shortly afterwards executed, and henceforward, until about 1816, he was the most fashionable portrait sculptor of his day. He himself thought highly of his early portrait of Sterne. Among many others may be specially named those of Pitt, Fox, the prince of Wales (afterwards George IV.), Canning, Perceval, Benjamin West and Lords Castlereagh, Aberdeen, Erskine, Egremont and Liverpool. He elaborated a number of marble groups and statues, amongst which may be mentioned those of "Bacchus," "Venus taking off her Sandal," "Hope leaning on an Urn," "Juno," "Paetus and Arria," "Cupid and Psyche" and (his own favourite performance) "Venus anointing Herself"; all, however, although remarkable for delicacy of workmanship, are deficient in vigour and originality, and the drapery is peculiarly weak. The most prominent personal characteristic of Nollekens seems to have been his frugality, which ultimately developed into absolute miserliness. Mrs Nollekens died in 1817, and the sculptor himself died in London on the 23rd of April 1823, leaving a large fortune.

NOLLE PROSEQUI (sometimes shortened into *nol. pros.*), a technical term of English law, the meaning of which varies as it is used with reference to civil or criminal cases. In civil cases it applied only to actions in the king's bench division, and there signified a formal undertaking by the plaintiff that he intended to proceed no further with the action (*se ulterius nolle prosequi*). The more modern practice in such cases is to proceed by way of discontinuance. In proceedings either by indictment or by information, a *nolle prosequi* or stay of proceedings may be entered by the attorney-general. The *nolle prosequi* is a matter purely for his discretion, and will not be granted unless very good ground be shown for his interference. The object of it generally is to obtain a stay of proceedings against an accomplice in order to procure his evidence. This object is, however, more usually effected by the prosecution offering no evidence and the judge directing an acquittal.

In the United States the term bears the same meaning as in England, with one exception. The attorney-general has not the same discretion with which English law invests him. Although in some states the prosecuting officer may enter a *nolle prosequi* at his discretion, in others the leave of the court must be obtained.

NOLLET, JEAN ANTOINE (1700–1770), French physicist, of peasant origin, was born near Noyon (Oise) on the 19th of November 1700. He entered holy orders and ultimately attained the rank of abbé; but his tastes all lay in the direction of experimental research, especially on the subject of electricity. In 1734 he was admitted a member of the London Royal Society, four years later he entered the Academy of Sciences at Paris, and in 1753 he was appointed to the newly-instituted chair of experimental physics in the Collège de Navarre. In addition to many memoirs he wrote *Leçons de physique expérimentale* (1743), *Essai sur l'électricité des corps* (1747), *Recherches sur les causes particulières des phénomènes électriques* (1749 and 1754), *Recueil de lettres sur l'électricité* (1753), *L'Art de faire les chapeaux* (1764) and *L'Art des expériences* (1770). He died at Paris on the 24th of April 1770.

NOMAD (Gr. νομάς, νομάδες, wandering), a wanderer. The word is particularly used of tribes who shift continually from place to place in search of pasture (Gr. νέμειν). The νομάδες of ancient Greek writers meant particularly the pastoral tribes of North Africa; hence the Latin name of the Numidians (see NUMIDIA).

NOME, a mining town about 12 m. W. of Cape Nome, on the S. shore of Seward Peninsula, Alaska, in 1900 the largest settlement in the district. Pop. (1900) 12,488; (1910) 2600. Gulch gold was found near Nome on Anvil Creek in September 1898, and diggings in the ocean beach were first worked in July 1899. The rush to Nome in 1900 was one of the most remarkable stampedes in American mining history; the town soon had hotels, banks, stores, several newspapers and weekly mails from the States, and for part of the year there were, it was estimated, 20,000 inhabitants. This rapidity of growth and the isolation of the settlement raised prices to extraordinary heights, and in other respects created economic conditions remarkable even among Alaskan mining camps. By 1903 the population had greatly decreased, and in subsequent years the winter population averaged about 3500, the summer population from 7000 to 8000. In 1905 the gold output of the Nome region amounted to about $2,500,000, nearly all from placers, though some quartz mining was done. A municipal government and local police force were early organized after the fashion of American mining communities, and United States soldiers from the St Michael reservation aided in the preservation of order. The greatest drawback to the town's prosperity is the lack of any good harbour nearer than Point Clarence, 80 m. W. The winter ice-floes, sometimes 30 ft. high on the beach, render harbour improvements at Nome almost impossible. There is connexion with Seattle by steamer (since 1904) in about 8½ days. In 1901 the town was incorporated under the laws of the United States. It is the north-western terminus of the United States military telegraph. It was first called Anvil City; the name "Nome" is derived from Cape Nome, first so called on a chart dated 1849, and said to have been a draughtsman's mistake for the query "? Name" on the original chart.

NOMENOË, or NOMINOË (d. 851), duke of Brittany. The date of his birth is not known, and his origin is obscure; all that is known is that he was of Breton race. In the hope of pacifying Brittany, Louis the Debonair named him count of Vannes in 819 and governor or duke of Brittany in 826. Throughout the reign of Louis, Nomenoë's fidelity to the emperor never flagged; he put down several attempted insurrections, and maintained peace in Brittany for fifteen years. But in 841 he resolved to make himself independent of Charles the Bald. In 843 Charles made a vain attempt to subdue Brittany. In 844 Nomenoë invaded Maine, and in 845 the emperor was completely defeated at Ballon near Bain-de-Bretagne. In the following year Charles recognized the independence of Brittany. Having resolved to detach the duchy from the ecclesiastical province of Tours, Nomenoë accused the Frankish bishops of Vannes, Quimper, Dol and Léon of simony at the council of Coëtlouh in 848, replaced them by Bretons, and erected Dol into a metropolitan see. In 849 Nomenoë attacked the Frankish county of Anjou. Charles retaliated by establishing a garrison at Rennes; but Nomenoë seized Rennes, Nantes and, finally, the whole of Upper Brittany, and ravaged Maine. In 851 he seized Anjou and invaded Beauce; but he died suddenly, leaving as his successor his son Erispoë.

See A. de la Borderie, *Histoire de Bretagne*, vol. ii. (1898); R. Merlet, "Guerres d'indépendance de la Bretagne," in the *Revue de Bretagne, de Vendée et d'Anjou* (1891).

NOMENTANA, VIA, an ancient road of Italy, leading N.E. from Rome to Nomentum (*q.v.*), a distance of 14 m. It originally bore the name Via Ficulensis, from the old Latin village of Ficulea, about 8 m. from Rome. It was subsequently prolonged to Nomentum, but never became an important highroad, and merged in the Via Salaria (see SALARIA, VIA) a few miles beyond Nomentum. It is followed as far as Nomentum by the modern highroad, but some traces of its pavement still exist.

See T. Ashby in *Papers of Brit. School at Rome*, iii. 38 sqq. (T. As.)

NOMENTUM (mod. *Mentana*), an ancient town of Italy, 14 m. N.E. of Rome by the Via Nomentana. It was a Latin town, but was by some considered to be Sabine, and, like Fidenae and Ficulea, was excluded from the first region by Augustus, who made the Anio its northern boundary. Nomentum received the *civitas sine suffragio* after the last war of the Latins against Rome (338 B.C.); in its municipal constitution the chief magistrate even in imperial times bore the title of dictator. Pliny and Martial often praise the fertility of its neighbourhood. The site of the town is well protected by ravines except on the east; no ancient remains exist *in situ*, but inscriptions and other relics have been found.

See T. Ashby in *Papers of the British School at Rome*, iii. 68 sqq. (T. As.)

NOMINALISM (from Lat. *nomen*, name), the name of one of the two main tendencies of medieval philosophy, the other being Realism. The controversy between nominalists and realists arose from a passage in Boëthius' translation of Porphyry's *Introduction to the Categories of Aristotle*, which propounded the problem of genera and species, (1) as to whether they subsist in themselves or only in the mind; (2) whether, if subsistent, they are corporeal or incorporeal; and (3) whether separated from sensible things or placed in them. The Realists held that universals alone have substantial reality, existing *ante res*; the Nominalists that universals are mere names invented to express the qualities of particular things and existing *post res*; while the Conceptualists, mediating between the two extremes, held that universals are concepts which exist in our minds and express real similarities in things themselves. Though a strong realist tendency is evident in the system of Erigena (9th century), the controversy was not definitely started till the 11th century: it lasted till the middle of the 12th, when the first period of scholastic philosophy ends. Under an appearance of much vain subtlety the controversy about universals involved issues of the greatest speculative and practical importance: realism represented a spiritual, nominalism an anti-spiritual, view of the world; while realism was evidently favourable, and nominalism unfavourable, to the teaching of the Church on the dogmas of the Trinity and the Eucharist. Nominalism was a doctrine of sceptics and suspected heretics, such as Berengar of Tours and Roscellinus. Even Abelard's mediating doctrine of conceptualism (*q.v.*) was sufficiently near to obnoxious ideas to involve him in lifelong persecution. The principles of the great orthodox philosophers of the later scholastic period which begins in the 13th century, Albertus Magnus and Thomas Aquinas, were those of moderate realism. When nominalism was revived in the 14th century by the English Franciscan, William of Occam, it gave evidence of a new tendency in thought, a distrust of abstractions and an impulse towards direct observation and inductive research, a tendency which had its fulfilment in the scientific movement of the Renaissance. Occam's dictum "Entia non multiplicanda sunt praeter necessitatem" was inspired by a spirit similar to that of Bacon. Though nominalism is properly a medieval theory, the tendency has passed over into modern philosophy: the term "nominalist" is often applied to thinkers of the empirical, sensationalist school, of whom J. S. Mill may be taken as the chief representative. (H. St.)

NONCONFORMIST, a term denoting historically (*a*) those persons who at the beginning of the 17th century refused to conform to certain practices, *e.g.* the wearing of the surplice, kneeling at the reception of the Sacrament, &c., of the Church of England; (*b*) those who, after the passing of the Act of Uniformity 1662, refused to conform to that act and ceased to be members of the church. In current usage the term "nonconformist" is applied in Great Britain to any member of a church not conforming to the ceremonies, worship and doctrines ("forms") of the Church of England, but is generally used of a member of the so-called Free Churches, or Protestant Dissenters, and is not usually applied to Roman Catholics. The name can also be applied, in other countries, to those who do not belong to the established religion. Strictly a "dissenter" is one who dissents from the church as an "established" body, or who dissents from the establishment of a state church, while conforming or not to its forms, ceremonies or practice.

NONCONFORMITY, LAW RELATING TO. For the history of the gradual relief of nonconformists in England from their disabilities see English History, Baptists, Congregationalism, Methodism, Friends, Society of, &c.; also Oath. It is proposed here to note simply the present legal aspects of nonconformity apart from its history, that is, the matters in which the law as to nonconformists still differs from that applicable to members of the Church of England. The differences may be conveniently grouped under six heads.

(1) *Judicial Notice.*—The courts, both temporal and spiritual, take judicial notice of the tenets and authorities of the Church of England, the crown being head of the law and of the church. Where the tenets and authorities of a nonconformist body come in question, they must be proved by evidence. By Lord Lyndhurst's act, the Nonconformist Chapels Act 1844, where no particular religious doctrine or mode of worship has been prescribed by the deed or instrument of trust the usage of the congregation for twenty-five years is to be taken as conclusive evidence of the doctrine and worship which may be properly observed in such meeting-houses. (2) *Tribunal.*—Offences against the law ecclesiastical (not being crimes) committed by clergy of the Church of England as a rule come by letters of request from the bishop of the diocese before the arches court of Canterbury or the chancery court of York (of both of which the same person is judge). Similar matters arising in nonconformist bodies can only be tried by the ordinary secular courts, and generally depend upon the question whether a minister has done any act which is not in accordance with the rules governing the particular body of which he is a minister. A nonconformist body is in law nothing more than a voluntary association, whose members may enforce discipline by any tribunal assented to by them, but must be subject in the last degree to the courts of the realm. Brawling in a church was an offence which formerly fell solely under the cognizance of the spiritual courts, but by the Ecclesiastical Courts Jurisdiction Act 1860 any person guilty of brawling in churches or chapels of the Church of England or Ireland, or in any chapel of any religious denomination, is liable on conviction to a fine or imprisonment (see Brawling), while clergymen of the Church of England may also be dealt with under the Clergy Discipline Act 1892. (3) *Status of Ministers.*—A nonconformist minister is not in holy orders, and his chapel is not a consecrated building. His status is, however, recognized to a limited extent. By the Toleration Act, 1 Will. & Mar., c. 18, a minister, preacher or teacher of a nonconformist congregation is exempt from certain parochial offices, as that of churchwarden. He is also exempt from serving in the reserve forces or on a jury. These privileges only attach where the place of worship of which he is a minister has been duly registered (the Places of Worship Registration Act 1855), unless in the case of bodies subject to special legislation, as Quakers. Registration is not required in the case of consecrated buildings. By the Municipal Corporations Act 1882, s. 12, a nonconformist minister (as is a clerk in holy orders) is disqualified from being elected an alderman or councillor of a town council, but under the Local Government Act 1888 a clerk in holy orders, or other minister of religion, may be a councillor or alderman of a county council, and, under the London Government Act 1899, of a metropolitan borough. He cannot take a degree in divinity at Oxford, Cambridge or Durham (Universities Tests Act 1871), and so is debarred from holding any professorship of divinity in those universities. (4) *Marriage.*—Marriage by a person in holy orders was probably necessary at common law, at any rate from the Reformation up to 1836. (See Marriage.) And from the date of Lord Hardwicke's Marriage Act, 1753, up to 1836 the ceremony must have been performed in a consecrated building. The first act of parliament that relieved dissenters (other than Jews and Quakers) from these restrictions was the Marriage Act of 1836. By that act the ceremony of marriage might be performed in a nonconformist place of worship, but it must be after due notice to the superintendent registrar and in his presence or in that of a registrar, and the building must be one that is duly certified for marriages. The Marriage Act 1898 dispensed with the necessity of the attendance of a registrar at marriages celebrated at a nonconformist place of worship, substituting in place thereof a person duly authorized by the trustees of the place of worship, if the persons intending to be married so desire; but the parties may, if they wish, still require the presence of the registrar. Marriage by banns, licence or special licence cannot take place except in a church. (5) *Burial.*—By the Burial Laws Amendment Act 1880 burial may take place in a churchyard without the rites of the Church of England. But in such a case notice must be given in a specified form, which is unnecessary where the burial service is conducted by a clergyman of the Church of England. (6) *Parish Offices.*—By 1 Will. & Mar. c. 18, s. 5, a dissenter chosen churchwarden and scrupling to take the oaths may execute his office by deputy. His acceptance of office is made optional by the act; there is nothing to prevent his discharging it if he see fit to do so. This seems to be still the law, although a declaration was substituted for the oath by the Statutory Declarations Act 1835, s. 9.

British Colonies.—In crown colonies ecclesiastical jurisdiction may be conferred by the sole authority of the crown. In colonies which have parliamentary representation the crown cannot give to a metropolitan bishop jurisdiction or coercive legal authority over suffragan bishops or over any other person. In colonies of the former kind the Church of England may still preserve the privileges which attach to her in the mother country; in colonies of the latter kind she is in the same position as any other religious body, simply a voluntary association. Since the Irish Church Act 1869 the Church of Ireland has been practically in the same position as the Church of England in colonies which have representative government.

NONFEASANCE, Misfeasance, Malfeasance. The expressions "nonfeasance" and "misfeasance," and occasionally "malfeasance," are used in English law with reference to the discharge of public obligations existing by common law, custom or statute. The rule of law laid down is that no action lies for nonfeasance, *i.e.* for failure or refusal to perform the obligation, but that an action does lie for misfeasance or malfeasance, *i.e.* for negligently and improperly performing the obligation. The doctrine was formerly applied to certain callings carried on publicly (see *R.* v. *Kilderby*, 1669, 1 Will. Saund. 311, 312*c*). At present the terms misfeasance and nonfeasance are oftenest used with reference to the conduct of municipal authorities with reference to the discharge of their statutory obligations; and it is an established rule that an action lies in favour of persons injured by misfeasance, *i.e.* by negligence in discharge of the duty; but that in the case of nonfeasance the remedy is not by action but by indictment or *mandamus* or by the particular procedure prescribed by the statutes. This rule is fully established in the case of failure to repair public highways; but in other cases the courts are astute to find evidence of carelessness in the discharge of public duties and on that basis to award damages to individuals who have suffered thereby. Misfeasance is also used with reference to the conduct of directors and officers of joint-stock companies. The word malfeasance is sometimes used as equivalent to *mala praxis* by a medical practitioner. (W. F. C.)

NONIUS MARCELLUS, Latin grammarian and lexicographer, flourished at the end of the 3rd or the beginning of the 4th century A.D. He is often called the "Peripatetic of Thubursicum" (in Numidia, probably his birth-place). He is the author of a sort of lexicon called *De compendiosa doctrina*, in 20 sections or chapters, the first twelve of which deal with language and grammar, the remaining eight with special subjects (navigation, costume, food, arms). The work is a compilation from commentaries on the authors quoted (whom Nonius only knows at second hand) and from existing dictionaries and grammars. Nonius is especially indebted to Verrius Flaccus and Aulus Gellius. The *Doctrina* is valuable as preserving fragments from old dramatists, annalists, satirists and antiquarian writers. It is remarkable that in the quotations from the authors cited Nonius always follows the same order, beginning with Plautus and ending with Varro and Cato. The grammarians Priscian and Fulgentius borrowed largely from his book; and in the 5th century a certain Julius Tryphonianus Sabinus brought out a revised and annotated edition.

Editions by L. Müller (1888); J. H. Onions, bks. i.-iii. (1895); W. M. Lindsay (1903) (reviewed in *Classical Review*, October 1904). See also articles in the *Classical Review* (Dec. 1888, June and July 1889); J. H. Onions (Oct. 1890, Oct. 1895, Feb. 1896, Feb. 1902); W. M. Lindsay; *Journal of Philology*, xvi. (1888), xviii. (1890), (J. H. Onions), xxi. (1893). ("The Printed Editions of Nonius," by H. Nettleship); P. Monceaux, *Les Africains. Étude sur la littérature latine d'Afrique* (1894); Teuffel, *Hist. of Roman Literature* (Eng. trans.), 404A; M. Schanz, *Geschichte der römischen Literatur*, iv. 1 (1904).

NONJURORS, the name given to those beneficed clergy of the Church of England who refused to take the oaths of allegiance to William and Mary in 1689. They were about four hundred in number, and included William Sancroft, archbishop of Canterbury, and four others of the "Seven Bishops," Thomas Ken of Bath and Wells, John Lake of Chichester, Thomas White of Peterborough and Francis Turner of Ely, together with three other bishops, Robert Frampton of Gloucester, William Thomas of Worcester and William Lloyd of Norwich (who is sometimes confused with his namesake, the bishop of St Asaph, one of the

"Seven Bishops"). Other distinguished nonjurors among the clergy were: William Sherlock, master of the Temple, Jeremy Collier, the ecclesiastical historian, Charles Leslie, the controversialist, George Hickes, dean of Worcester, Nathanael Spinckes, John Fitzwilliam, canon of Windsor, and John Kettlewell, the devotional writer. The most famous nonjurors among the laity were Henry Dodwell, Camden professor of history at Oxford, Robert Nelson, Henry Hyde, second earl of Clarendon, and Roger North, the lawyer. Afterwards their number was augmented by the refusal of William Law, author of *The Serious Call*, Thomas Carte, the historian, Thomas Hearne, the antiquary, and others, to take the oaths of allegiance to George I. Ken, the most eminent of the nonjurors, disapproved of their subsequent proceedings, and Sherlock and Dodwell afterwards took the required oaths, the former becoming dean of St Paul's.

Believing in the doctrine of non-resistance to established authority, the nonjurors argued that James II. was still the rightful king, and likened the position of William to that of Cromwell. Taking examples from the Old Testament and from the practice of the early church, their antagonists traversed these arguments, and a long and voluminous controversy followed. Many have thought that the position of the nonjurors was inconsistent, and Dr Johnson said, "I never knew a nonjuror who could reason," although he appears to have excepted Leslie from this general condemnation. The government did not treat the nonjurors harshly. With the approval of William III., Gilbert Burnet, bishop of Salisbury, attempted to reconcile them to the new order; and it was only when the generous terms offered by Burnet had been refused, that, in February 1690, they were deprived of their sees and other benefices. Although they had only a small following among the mass of the people, who were not required to take the oaths of allegiance, Sancroft and his colleagues claimed to represent the true Church of England, and requested James II. in his exile to nominate two new bishops to carry on the episcopal succession. James chose Hickes and Thomas Wagstaffe (1645–1712), who were consecrated in 1694 as bishops of Thetford and Ipswich respectively. A further consecration took place in 1713 when Collier, Spinckes and Samuel Hawes (d. 1722), were consecrated "bishops at large." In 1718 the introduction of a new communion office with some "usages" taken partly from primitive liturgies, and partly from the first prayer-book of Edward VI. caused a schism among the nonjurors, dividing them into "Usagers" and "Non-Usagers." The four "usages" were: The mixed chalice, prayers for the faithful departed, prayer for the descent of the Holy Ghost on the consecrated elements, and the Oblatory Prayer, offering the elements to the Father as symbols of His Son's Body and Blood. Accepting the "usages" the two bodies united in 1731, but other dissensions followed, although the episcopal succession was maintained until the death of a bishop named Charles Booth in 1805. The last nonjuror is supposed to have been James Yeowell, who died in 1875. Public worship was conducted in chapels or "oratories," and sometimes in private houses.

In Scotland the nonjurors included the greater part of the clergy of the Episcopal Church, which ceased to be the state church in 1689. Many of these men and some of their English colleagues were ardent Jacobites, and were punished for sharing in the risings of 1715 and 1745, and in other Jacobite movements. The Scottish clergy maintained their attitude of resistance to the government until the death of Prince Charles Edward Stuart in 1788, when the bishops met at Aberdeen, and unanimously agreed to submit to the government of King George III. A large number of the Presbyterians in Scotland, principally found among the Cameronians, also refused to take the oaths of allegiance to William and Mary; but as their reasons for this refusal were quite different from those of the episcopalian nonjurors, they are not usually referred to by this name (see CAMERONIANS).

For the history of the nonjurors, see Macaulay, *History of England* vol. ii. (London, 1895); T. Lathbury, *History of the Nonjurors* (London, 1845); and especially J. H. Overton, *The Nonjurors* (London, 1902), a defence of the sect. (A. W. H.*)

NONNUS (Egyptian for "saint"), Greek epic poet, a native of Panopolis (Akhmim) in the Egyptian Thebaid, probably lived at the end of the 4th or the beginning of the 5th century A.D. His principal work is the *Dionysiaca*, an epic in forty-eight books, the main subject of which is the expedition of Dionysus to India and his return. The earlier portions treat of the rape of Europa, the battle of the giants, the mythical history of Thebes, and it is not until the eighth book that the birth of the god is described. Other poets had already treated the subject, and since the time of Alexander it had gained popularity from the favourite comparison of the king with the god and of his enemies with the giants. In its vast and formless luxuriance, its beautiful but artificial versification, its delineation of action and passion to the entire neglect of character, the poem resembles the epics of India. Like his countryman Claudian, Nonnus is a writer of copious learning and still more copious fancy, whose faults are those of the age in which he lived. His chief merit consists in the systematic perfection to which he brought the Homeric hexameter. But the very correctness of the versification renders it monotonous. His influence on the vocabulary of his successors was likewise very considerable.

We also possess under his name a paraphrase (μεταβολή) of the Gospel of St John, which is chiefly interesting as apparently indicating that Nonnus in his later years was a convert to Christianity. The style is not inferior to that of his epic, but, employed in embellishing the simple narrative of the evangelist, it produces an impression of extreme bombast and want of taste. According to an epigram in the Palatine Anthology (ix. 198), Nonnus was also the author of a *Battle of the Giants*, and four lines of the *Bassarica* (also on the subject of Dionysus) have been preserved in Stephanus of Byzantium.

Editio princeps (1569); H. Köchly ("Teubner" series, with critical introduction and full index of names, 1858); the most generally useful edition is that by the comte de Marcellus (1856), with notes and prolegomena, and a French prose translation. On the metre, see J. G. Hermann, *Orphica* (1805), p. 690; A. Ludwich, *Beiträge zur Kritik des Nonnus* (1873), critical, grammatical and metrical; C. Lehrs, *Quaestiones epicae* (1837), pp. 255-302, chiefly on metrical questions; on the sources, R. Köhler, *Über die Dionysiaka des Nonnus* (1853), a short and connected analysis of the poem, with a comparison of the earlier and later myths; see also I. Negrisoli, *Studio critico . . . Nonnus Panopolita*, with short bibliography (1903). The paraphrase on St John (editio princeps, *c.* 1505) is edited by F. Passow (1834) and A. Scheindler (1881), with complete index.

NONPAREIL, the name under which, from its supposed matchless beauty, a little cage-bird, chiefly imported from New Orleans, has long been known to English dealers (cf. Edwards, *Gleanings*, i. 132). It is the *Emberiza ciris* of Linnaeus, and the *Cyanospiza ciris* of most recent ornithologists, belonging to a small group, now included with the buntings and finches, although some authors have regarded it as a tanager (*q.v.*). The cock has the head, neck and lesser wing-coverts bright blue, the upper part of the back yellow, deepening into green, and the lower parts generally, together with the rump, bright scarlet, tinged on the latter with purple. This gorgeous colouring is not assumed until the bird is at least two years old. The hen is green above and yellow beneath; and the younger cocks present an appearance intermediate between the adults of both sexes. The species, which is often also called the painted bunting, after wintering in Central America or Mexico, arrives in the Southern states of the American Union in April, but does not ordinarily proceed to the northward of South Carolina. In Louisiana, where it is generally known to the French-speaking inhabitants as the *Pape*—as it was to the Spaniards of Florida as the *Mariposa pintada* (painted butterfly)—it is said to be very abundant; and on its appearance in spring advantage is, or was, taken of the pugnacious disposition of the males to capture them alive in great numbers by means of the stuffed skin of one so placed in connexion with a cage-trap that they instantly fall into the latter on attacking what they conceive to be a rival. Belonging to the same genus as the nonpareil is the indigo-bird, *Cyanospiza cyanea*, which, as a summer visitant, is widely diffused from the Missouri to the Atlantic, and extends into the provinces of

Ontario and New Brunswick, being everywhere regarded with favour. Though wanting most of the bright hues of its congener, the indigo-bird has yet much beauty, the adult cock being nearly all over of a deep blue, changing, according to the light, to green. The hen is brown above and ochreous-white beneath. The "pintailed nonpareil" of aviculture (*Erythrura prasina*) is a somewhat similarly coloured but really very different bird; the male has a long sharp tail, and the species belongs to the *Ploceidae* (see Weaver-Bird).

NONPAREIL (Fr. *non*, and *pareil*, like, Lat. *par*), having no equal, unrivalled. Apart from its uses as a descriptive name for particularly fine kinds of fruit, &c., and of certain birds, moths and butterflies, the chief application of the word in English is, in printing, to a size of type between "emerald" and "ruby," in the United States of America between "minion" and "agate" (see Typography).

NONSUIT (Fr. *non suit*, he does not pursue), in law the name given to a judgment whereby an issue is determined against the plaintiff. It was a term peculiar to the English common-law courts before the Judicature Acts, and was simply the expression of the opinion of the court that, apart from the merits, the plaintiff's case was incomplete. It did not in any way act as a bar to his bringing another action for the same cause. It might be entered either at the wish of the plaintiff himself (to whom it was of course much more beneficial than judgment for the defendant) or by direction of the court against the will of the plaintiff. Although judgment of nonsuit still exists, it has, since the Judicature Acts, the same effect as a judgment on the merits, unless the court otherwise directs. This effect of a nonsuit was specially provided for by the rules of the Supreme Court of 1875.

NOODT, GERHARD (1647–1725), Dutch jurist, was born at Nijmwegen in 1647. Educated at Leiden, Utrecht and Franeker, he became a professor of law at Leiden. As a writer on jurisprudence he acquired a wide reputation. His Latin style was modelled after the best writers, and his numerous works soon rose to the rank of standard authorities. Two of his political treatises were translated into French by Jean Barbeyrac, and appeared at Amsterdam in 1707 and 1714, under the respective titles of *Pouvoir des souverains* and *Liberté de conscience*.

The first edition of his collected works was published at Leiden in 1724 and the last in 1767. That of 1735 and those subsequent contain a life of the author by Barbeyrac.

NOON, midday, twelve o'clock. The O. Eng. *nón*, Nor. *non*, Dutch *noen*, are all from Lat. *nona* sc. *hora*, the ninth hour, *i.e.* according to the Roman system, three o'clock P.M. (see Day). The early uses of noon till the 13th and 14th centuries are either as translating the Latin, especially with reference to the Crucifixion, or as equivalent to the canonical hour of "nones" (see Breviary). The ordinary word for twelve o'clock was *middæg*, midday, also the equivalent of the canonical hour "sext." Both the office and the meal taken about that time were shifted to an earlier hour, and by the 14th century the ordinary use of "noon" is that current to-day.

For "nones" (*i.e. nonae*, sc. *dies*) in the Roman calendar, see Calendar.

NORA, an ancient town of Sardinia, 22 m. by road S.S.W. of Carales. It was founded, according to Pausanias (x. 17. 5), by the Iberians under Norax, son of Hermes, and was the most ancient town in the island. The discoveries made on the site have, however, shown that it was certainly of Phoenician origin. In Roman times too, we find the milestones on the road from Nora to Bitia and even on that from Nora to Carales reckoned from Nora (*Corp. inscr. Lat.* x. 831; *Ephemeris epigraphica*, viii. 180); but the authors and the sepulchral inscriptions found here give us no information as to its juridical condition. The town occupies a characteristically Phoenician site, a small peninsula joined to the mainland by an isthmus, low, narrow and sandy. Excavations have led to the discovery of a few Phoenician buildings, the foundations of a temple of Tanit, of a road, of quay walls at the water's edge and of a watch-tower on the extremity of the peninsula, which rises to some 150 ft. above the sea. Two cemeteries were found, one of the 7th-6th century B.C., consisting of tombs cut in the rock for inhumation, while in the other, going down to the 4th century B.C., cremation is the rule; there are ossuaries placed in holes in the sand, with a sculptured *stele* over each. A quantity of small objects, gems, ivories, glass, vases, terra-cottas, &c., were found; in some of them Egyptian, in others Greek, influence and importation are apparent. To the Roman period belong an aqueduct, bringing the water from the neighbouring hills—one pier of it rests upon a destroyed *nuraghe*—scanty remains of an amphitheatre, a theatre, considerable ruins of concrete foundations (perhaps of villas by the sea) and a watch-tower on the promontory close to the Phoenician tower. A full description of the site and the excavations is given by G. Patroni in *Monumenti dei Lincei*, xiv. (1905), 111. On the isthmus is the curious small old church of S Efisio, with a nave and two aisles divided by heavy square pillars. At the festival of the saint (May 1-4), his body is brought in procession from the cathedral at Cagliari; the festival is much frequented by people from all parts of Sardinia. (T.As.)

NORBA, an ancient town of Latium (*Adjectum*), Italy. It is situated 1 m. N.W. of the modern Norma, 1575 ft. above sea-level, on the west edge of the Volscian Mountains or Monti Lepini, above a precipitous cliff, with a splendid view over the Pomptine Marshes. It was a member of the Latin League of 499 B.C., and became a Latin colony in 492 B.C., as an important fortress guarding the Pomptine Marshes. It served in 199 as a place of detention for the Carthaginian hostages, and was captured and destroyed by Sulla's troops during the civil wars at the end of 82 B.C. Some revival in prosperity took place later. From excavations begun in 1901 it seems clear that the remains now visible on the site are entirely Roman. The well-preserved walls are in the polygonal style, 1½ m. in circuit, and are entirely embankment walls, not standing free above the internal ground level. Remains of a massive tower, and of several gateways (notably the Porta Grande, defended by a tower) exist. Within, the remains of several buildings, including the substructions of two temples, one dedicated to Juno Lucina, have been examined. At the foot of the cliff are the picturesque ruins of the medieval town of Nainfa (12th-13th centuries) abandoned owing to the malaria. The remains of a primitive settlement, on the other hand, have been discovered on the mountain-side to the S.E., above the 13th-century abbey of Valvisciolo, where there is a succession of terraces supported by walls of polygonal work, and approached by a road similarly supported. Here a quantity of primitive Latin pottery has been found. The necropolis of this settlement was probably the extensive one situated at Caracupa (8th-6th century B.C.), near the railway station of Sermoneta, which belongs also to the 8th-6th century B.C., terminating thus at the precise date at which the Roman city of Norba began to exist.

See L. Savignioni and R. Mengarelli in *Notizie degli scavi* (1901), 514; (1903) 299, 289; (1904) 407; and *Atti del Congresso Storico* (Rome, 1903), vol. v. (Archaeologia) 255. (T. As.)

NORBANUS, GAIUS, surnamed Bulbus (or Balbus), Roman politician, was a seditious and turbulent democrat. In 103 B.C., when tribune of the people, he accused Q. Servilius Caepio of having brought about the defeat of his army by the Cimbri through rashness, and also of having plundered the temple of Tolosa. Caepio was condemned and went into exile. About ten years later Norbanus himself was accused of treason on account of the disturbances that had taken place at the trial of Caepio, but the eloquence of M. Antonius, grandfather of the triumvir, procured his acquittal. In 89 Norbanus as praetor successfully defended Sicily against the Italian socii. During the civil war between Marius and Sulla he sided with the former, but was defeated by Sulla at mount Tifata near Capua, and again by Metellus at Faventia in Cisalpine Gaul (82). He fled to Rhodes, where he committed suicide, while the Rhodians were debating whether to hand him over to Sulla.

See Mommsen, *Hist. of Rome*, bk. iv. ch. v.; Greenidge, *Hist. of Rome.*

NORCIA (anc. *Nursia*), a town and episcopal see of the province of Perugia, Italy, 29 m. E.N.E. of Spoleto by road, and 40 m. W.

of Ascoli Piceno, 1980 ft. above sea-level, on the south-west foot-slopes of the Monti Sibillini, still surrounded by old walls. Pop. (1901) 4261 (town), 9584 (commune). There are a cathedral, the church of St Benedict and other churches, with Romanesque 14th-century façades; the town-hall; and the prefecture, with Romanesque arcades. Much injury was done by earthquakes in 1730 and 1859. The ancient Nursia was a Sabine city, though close to the Umbrian border. Its inhabitants fought in 43–41 B.C. against Octavian, and were punished by him for erecting a monument in honour of those who fell. It was governed by *octoviri* like other Sabine towns and became a *municipium* under the empire. At Ancarano near Norcia was situated a small *pagus*; remains of a temple were found there in 1880, which from the character of the objects seems to have been destroyed in the 5th century B.C. The tombs of the district have also produced interesting early bronzes, &c., some of which go back to the 7th century B.C., and a fine funeral couch decorated with sculptured pieces of bone. M. Guardabassi in *Notizie degli scavi*, 1878, 13 sqq.; 1880, 6 sqq.; A. Pasqui in *Monumenti dei Lincei*, i. (1891) 239. The town was the birthplace of Q. Sertorius (d. 72 B.C.), of Vespasia, mother of the emperor Vespasian of Plotina, wife of the emperor Trajan, and of St. Benedict, founder of the Benedictine order, and of his sister Scholastica. The town is famous for its pork and its cloth (the term *norcineria* for a pork butcher's shop is indeed used in Rome) and produces bricks and earthenware.

See F. Patrici Forti, *Memorie storiche di Norcia* (Norcia, 1869).

NORD, the most northern of the departments of France, formed chiefly out of Flanders, French Hainault and the district of Cambrai (Cambrésis). Area 2229 sq. m. Its population (1,895,861 in 1906), which includes a large proportion of Belgians, ranks next to that of Seine among French departments. Its length from south-east to north-west is 112 m.; its breadth nowhere exceeds 40 m., and contracts to 4 where it is crossed by the Lys. Bounded N.W. and N. for 21 m. by the North Sea, it has Belgian territory on the N.E. and E., the departments of Aisne and Somme on the S. and Pas-de-Calais on the W. The Flanders portion west of the Scheldt is very flat, the isolated hill at Cassel, only 535 ft. high, looking north towards Dunkirk over a stretch of fertile lowlands, the Wateringues and the Moëres, separated by a line of sand-dunes from the sea, by which about a thousand years ago they were still covered. The reclamation of this district, now covered by a network of canals, was begun as early as the 12th century. South-east of the Scheldt the country resembles the neighbouring Ardennes, is better wooded, and contains the highest point in the department (873 ft.). The greater part of Nord is in the Scheldt basin, but certain portions belong to those of the Sambre (Meuse), the Oise (Seine) and the little coast-streams the Aa and the Yser. The Scheldt, flowing by Cambrai, Bouchain, Valenciennes and Condé, receives the Scarpe, which touches Douai, Marchiennes and St Amand. The Lys, which does not join the Scheldt till it has entered Belgium, passes Armentières, and receives the Deule, on which Lille, the capital, is situated. The Sambre passes Landrecies and Maubeuge. The Aa falls into the port at Gravelines. The climate of Nord is colder than that of France in general, the mean temperature being 49° or 50° F. The average annual rainfall is about 28 in.

In agricultural and industrial importance Nord is the first of French departments. In the hilly region of the south-east stock-raising flourishes; in the central zone beetroot is the characteristic crop, while mixed farming prevails in the north-west. Cereals (especially wheat and oats) and potatoes are grown in abundance. Among minor crops, flax, tobacco, chicory and hops may be mentioned. Market-gardening and horticulture are practised on a considerable scale in some localities. The mineral wealth of the department lies principally in its coal mines forming part of the Valenciennes basin, the most important in France, which extends into Belgium and Pas-de-Calais. The textile industry is particularly active around Lille, Roubaix and Tourcoing which spin and weave cotton and wool, as also around Fourmies which is especially a weaving town. Other important centres are Armentières (cloth-weaving), Dunkirk (flax, jute and hemp-spinning), Cambrai (batiste and other delicate fabrics), Douai, Avesnes, le Cateau and Caudry. Other great industries are brewing, flour-milling, glass, brick, pottery and sugar manufacture, alcohol-distilling, dyeing, iron-founding and steel production and other branches of the metallurgical industry carried on at Denain, Hautmont, Maubeuge, Valenciennes, Douai, Raismes, &c. Dunkirk and Gravelines equip fleets for the cod and herring fisheries. Dunkirk is the chief port of the department, which is served by the Northern railway. Its system of inland navigation is highly developed and attains a length of 320 m., comprising a line of waterways from the Scheldt to the North Sea at Dunkirk, with which the coal basin of Valenciennes is linked up by way of the canalized Scheldt and the textile region of Lille by means of the Deûle canal and the canalized Lys. To these must be added the canalized Sambre and other less important waterways.

The department is divided into seven arrondissements (Avesnes, Cambrai, Douai, Dunkirk, Hazebrouck, Lille, Valenciennes) with 67 cantons and 667 communes. It forms the archiepiscopal diocese of Cambrai and part of the region of the I. army corps (headquarters at Lille) and of the educational division of Lille. Its court of appeal is at Douai. The most noteworthy places are Lille, Cambrai, Douai, Dunkirk, Valenciennes and Anzin, Tourcoing, Roubaix, Avesnes, Halluin, Armentières, Maubeuge, Condé-sur-Escaut, Fourmies, Hazebrouck, Gravelines, St Amand-les-Eaux, Bergues, Le Cateau, Comines, Denain, Cassel and Bavai, which are separately noticed. Other populous industrial towns not mentioned above are Loos (pop. 9294) and Haubourdin (7897) near Lille, Caudry (10,947), near Cambrai, and Aniche (7855), a coal mining centre, near Douai. Other places of interest are Bailleul (pop. in 1906, 7128), Bavai and Bergues, which have fine belfries of the 16th century, structures characteristic of the architecture of the department; Hondschoote, scene of a victory of the French over the allies in 1793, which has a church of the 15th and 16th centuries with a fine tower and spire; and Famars which preserves a curious ruined stronghold of the period of the Roman occupation.

NORDAU, MAX SIMON (1849–), German author and philosopher, was born of Jewish parents at Budapest on the 29th of July 1849. He studied medicine and travelled widely through Europe until 1878, when he settled down as a practitioner in his native town. In 1880 he removed to Paris, and in addition to his professional work took up the study of art, literature and social questions. His investigations were marked by a critical accuracy which endeavoured to weigh data and deduce results with a fearless disregard of conventional ideas. In his *Entartung* he applied the theory of physical degeneration to the intellectual side of civilized man, and endeavoured to show that in art, literature and social evolution there is decadence and hysteria; confused aesthetic theory, mysticism in thought, so-called "realism" in art, all alike indicate the vain spasmodic struggling of an effete civilization. In *Die konventionellen Lügen der Kulturmenschheit* (1884), the same destructive method is applied to politics and to social science. Yet Nordau was not a pessimist. In the *Paradoxes psychologiques* (1885) he expressed his profound and reasoned conviction that the "Degeneration" of the time was only temporary. This optimism was seen in his enthusiastic support of Dr Herzl's Zionist movement. In connexion with the British government's offer of land for a Jewish settlement in East Africa, there was a fundamental difference of opinion among the various Jewish societies. Herzl and Nordau were accused of giving up the idea of returning to Palestine, and substituting the African scheme. This idea provoked great hostility, and at a Zionist Ball in Paris (19th of December 1903) a Jew named Louban Chain Selik fired two shots at Nordau unsuccessfully. The outrage drew from Herzl a letter (*The Times*, 22nd of December) which clearly set forth the view held by himself and Nordau as to the ultimate destiny of the Zionist Movement.

WORKS.—Novels and Stories: *Seifenblasen*, *Federzeichnungen und Geschichten* (1879); *Die Krankheit des Jahrhunderts* (1889)

Gefühlskomödie (1892); *Die Drohnenschlacht* (1897); *Morganatisch* (1904). Dramas: *Die neuen Journalisten* (in collaboration with F. Gross, 1880); *Der Krieg der Millionen* (1882); *Das Recht zu lieben* (2nd ed., 1894); *Die Kugel* (1894); and *Doktor Kohn* (1898). He published also *Vom Kreml zur Alhambra* (1880), an account of his travels, and three works descriptive of Paris and the Parisians—*Pariser Studien aus dem wahren Milliardenlande* (1878); *Paris unter der dritten Republik* (1881); *Ausgewählte Pariser Briefe* (1887); two further volumes of criticism, *Zeitgenössische Franzosen*, literaturgeschichtliche essays (Berlin, 1901); and *Von Kunst und Künstlern* (Leipzig, 1905).

NORDEN, JOHN (1548–1625?), English topographer, was the first Englishman who designed a complete series of county histories and geographies. His earliest known work of importance was the *Speculum Britanniae, first part . . . Middlesex* (1593); the MS. of this in the British Museum (Harl. 570) has corrections, &c., in Lord Burleigh's handwriting. In 1595 he wrote a *Chorographical Description of . . . Middlesex, Essex, Surrey, Sussex, Hampshire, Wight, Guernsey and Jersey*, dedicated to Queen Elizabeth; the MS. of this is in the British Museum, Addit. MSS. 31,853. In 1596 he published his *Preparative to . . . Speculum Britanniae*, dedicated to Burleigh, and in 1598 his *Hertfordshire* (Lambeth Libr. MSS. 521). Before his death he had completed in manuscript his account of five other counties; three of these studies were printed long after his death, viz. *Essex*, edited for the Camden Society in 1840 by Sir Henry Ellis from a MS. at Hatfield (see also British Museum Addit. MSS. 33, 769); *Northamptonshire*, known to have been finished in 1610, but only published in 1720; *Cornwall*, likewise finished in 1610, published in 1728 (see Harl. MSS. 6252). Of *Kent* and *Surrey* even the MSS. are now lost; parts of the latter are perhaps identical with sections of the *Chorographical Description* of 1595. In 1600 Norden was appointed surveyor of the crown woods and forests in Berkshire, Devon, Surrey, &c.; in 1605 he obtained the surveyorship of the duchy of Cornwall; in 1607, after a careful survey, he composed his valuable *Description of the Honour of Windsor*, with fine maps and plans in colour, dedicated to James I. (see Harl. MSS. 3749). In 1608 he was mainly occupied with the surveying of crown woods, especially in Surrey, Berkshire and Devon, and with the writing of his works on forest culture—*Considerations touching . . . raising . . . of Coppices*, and . . . *Relation of . . . Proceedings upon . . . Commission concerning new forests*, to which he added in 1613 his *Observations concerning Crown Lands and Woods* (see Egerton MSS. 806; Ashmole MSS. 1148; and Lansdowne MSS. 165). In 1612 he was made surveyor of the royal castles in Kent, Surrey, Sussex, Hampshire, Berkshire, Dorset, Wiltshire, Somerset, Devon and Cornwall; in 1616 and 1617 he appears surveying the soke of Kirketon in Lindsey, as well as various manors and lands belonging to Prince Charles, afterwards Charles I. (see Cambridge University Library, Ff. iv. 30; London, British Museum Addit. MSS. 6027); his last works were a survey of Sheriff Hutton manor, Yorks, in 1624 (Harl. MSS. 6288), and *England, an intended guide for English travellers*, a series of tables to accompany Speed's county maps, executed in 1625, shortly before his death.

Norden's maps of London and Westminster (in his *Speculum Britanniae* of 1593) are the best representations known of the English metropolis under the Tudors; his maps of Middlesex (also from the *Spec. Brit.* of 1593), of Essex (1594, 1840), of Hertfordshire (1598, 1723) and of Cornwall (published in 1728; see above) are also noteworthy; in the last-named the roads are indicated for the first time in English topography. Norden also executed maps of Hampshire, Hertfordshire, Kent, Middlesex, Surrey and Sussex, for the fifth edition (1607) of Camden's *Britannia*, also maps of Middlesex, Essex, Sussex, Surrey and Cornwall for J. Speed (1610). Several important cartographical works of his are lost: *e.g.* his *Map . . . of . . . Battles fought in England from . . . William the Conqueror to . . . Elizabeth*, in 16 sheets, formerly in the Bodleian Gallery, Oxford, of which some part is probably preserved in the *Invasions of England*, an appendix to the *Prospect of the most Famous Parts of the World*, by J. Speed (1635); and his *View of London*, in 8 sheets, made *c.* 1604–1606, and *View of London Bridge*, published in 1624; in the Crace collection at the British Museum is an earlier *View of London* by Norden (1600), and an 1804 reprint of the *View of London Bridge*; a map of Surrey by Norden, said to have been copied by Speed and Kip in Camden's *Britannia* of 1607, has also disappeared.

Besides the works noticed above, see the accounts of Norden by C. Bateman in *Speculum Britanniae, pars Cornwall* (1728), and by Sir H. Ellis in *Spec. Brit., pars Essex* (Camden Society, 1840); also H. B. Wheatley in Harrison's *Description of England* (New Shakspere Society, 1877), and C. H. Coote's article in the *Dict. Nat. Biog.* (C. R. B.)

NORDEN, a town of Germany, in the Prussian province of Hanover, 4 m. from the North Sea and 20 m. by rail N. of Emden. Pop. (1905) 6717. It has a 16th-century town hall and its parish church was built in 1445. Gin, sugar, chocolate, yeast, beer, tobacco and machinery are manufactured. Norddeich, a small port 4 m. N.W., is the shipping place for passengers bound for Norderney. Norden was first mentioned in 842.

NORDENSKIÖLD, NILS ADOLF ERIK, Baron (1832–1901), geographer and Arctic explorer, was born at Helsingfors, 18th November 1832. His ancestors came originally from Sweden, but for some generations had been settled in Finland. His father, Nils Gustav Nordenskiöld, was both a mineralogist and a traveller. Nordenskiöld entered the university of Helsingfors in 1849, and applied himself specially to chemistry and mineralogy. In 1853 he accompanied his father to the Ural Mountains and studied the iron and copper mines at Tagilsk. On his return he received minor appointments both at the university and the mining office, but an unguarded speech at a convivial entertainment in 1855 drew the attention of the Russian authorities to his political views, and led to his dismissal. He then visited Berlin, continuing his mineralogical studies, and in 1856 obtained the Alexander travelling stipend at the university of Helsingfors and planned to expend it in geological research in Siberia and Kamchatka. Before starting he took his master's and doctor's degrees (1857), but he again aroused the suspicion of the authorities, so that he was forced to leave the country and was deprived of the right of ever holding office in the university. Settling at Stockholm he thenceforward became practically a Swedish citizen. He soon received an offer from Otto Torell, the geologist, to accompany him on an expedition to Spitsbergen. To the observations of Torell on glacial phenomena Nordenskiöld added the discovery at Bell Sound of remains of Tertiary plants, and on the return of the expedition he received the appointment of professor and curator of the mineralogical department of the Swedish State Museum. In 1861 he took part in Torell's second Spitsbergen expedition, which yielded even more important geological results. Of the further expedition to the same quarter promoted by the Swedish academy of science in 1864, Nordenskiöld was the leader. Three years later, chiefly through the support of the Swedish government and Oscar Dickson, who contributed largely towards the later expeditions of 1872 and 1875, he headed a well-organized expedition in the iron steamer "Sofia," and reached the highest northern latitude (81° 42′) then attained in the eastern hemisphere. Arctic exploration had now become his all-absorbing object in life, and in 1870, with three young naturalists, he visited the vast inland ice-sheet of Greenland. His next expedition in 1872 did not answer expectation, for the tenders were caught in the ice, and the crews of the three vessels were forced to winter in Spitsbergen. In 1875–1876, however, a successful voyage eastwards, including the ascent of the Yenisei, led him to attempt the discovery of the long-sought North-East Passage. This he accomplished in the voyage of the "Vega," navigating for the first time the northern coasts of Europe and Asia. Starting from Karlskrona on the 22nd of June 1878, the "Vega" doubled Cape Chelyuskin in the following August, and after being frozen in at the end of September near Bering Strait, completed the voyage successfully in the following summer. He edited a monumental record of the expedition in five octavo volumes, and himself wrote a more popular summary in two volumes.

On his return to Sweden he received an enthusiastic welcome, and in April 1880 was made a baron and a commander of the Order of the Nordstjerna. In 1883 he again visited the east coast of Greenland, and succeeded in taking his ship through the great ice barrier, a feat attempted in vain during more than three centuries. Baron Nordenskiöld also made a notable reputation in the field of historical geography by his *Facsimile Atlas* (1889) and *Periplus* (1897). The former contains reproductions of the most important geographical documents printed during the 15th and 16th centuries, and the latter, a work of far greater research, deals with the history of early cartography and the sailing charts in use among mariners during the middle ages. He died at Stockholm on the 12th of August 1901.

NORDERNEY (*i.e.* "northern island"), an island of Germany, in the North Sea, the largest of the East Friesland group, belonging to the Prussian province of Hanover. Pop. (1905) 3888. It is 8 m. long and about 1½ m. broad, and supports a seafaring and fishing population. It is reached by steamer from Geestemünde, Emden, Bremen or Hamburg, and at low tide by road from the mainland. The village at the S.W. end of the island is one of the most popular sea-bathing places in Germany, and is visited annually by some 26,000 visitors. On the S. side rises a lighthouse 175 ft. high, while the E. end of the island is filled with sand dunes ranging in height from 50 to 75 ft. Norderney is immortalized by its association with Heinrich Heine's *Nordseebilder*.

See Berenberg, *Das Nordseebad Norderney* (Norden, 1895); C. Herquet, *Geschichte der Insel Norderney 1398–1711* (1890); and the article FRISIAN ISLANDS.

NORDFJORD, an inlet of the west coast of Norway, penetrating the land for 50 m. in an easterly direction, its mouth being 115 m. by sea N. of Bergen (61° 50′ N.). No part of Norway affords finer scenery than the inner ramifications of this fjord among the snowy mountains of the northern Jostedalsbrae. Driving-roads penetrate the mountains from Visnaes eastward to the Gudbrandsdal, from Utvik southward to Vadheim on the Sogne Fjord, and from Faleide northward to Hellesylt (Geiranger Fjord) and Öje (Jorundsfjord). Nordfjordeid is a large village on the outer fjord, at the mouth of Hornindalen. Oiden and Loen are other favourite centres on the inner part of the fjord. A small but powerful breed of horses is peculiar to the Nordfjord district.

NORDHAUSEN, a town of Germany, in the province of Prussian Saxony. It is situated on the Zorge at the south base of the Harz Mountains, and at the west end of the Goldene Aue (Golden Plain), a fruitful valley watered by the Helme, 60 m. by rail W. of Halle, on the main line to Frankfort-on-Main and Cassel, and at the junction of railways to Erfurt and Blankenheim. Pop. (1885) 27,083; (1905) 29,882. It is built partly on the slope of the mountains and partly on the plain, and the upper and lower parts of the town are connected by flights of steps. Among its eight churches the most noteworthy are the Roman Catholic cathedral, late Gothic with a Romanesque crypt, and the Protestant church of St Blasius, containing two pictures by Lucas Cranach. Near the medieval town hall stands a Roland's column, the ancient symbol of free commercial intercourse and civic liberty. The town has a museum of antiquities and various public monuments, notably a fountain by Ernst Rietschel in the corn market, and another to Luther in the market square. There are statues of the emperor Frederick III. and of Prince Bismarck. The chief importance of the place arises from its distilleries, which annually yield about 10,000,000 gallons of "Korn Schnapps," a spirit somewhat akin to whisky. The breweries are also important and there are manufactures of leather, tobacco and cigars, cotton, linen goods, carpets, chicory, malt and chemicals. Nordhausen is sometimes called the Cincinnati of Germany on account of its extensive export trade in pork, corned beef, ham and sausages. There is also a large trade in corn.

Nordhausen is one of the oldest towns in North Germany. It possessed a royal palace in 874 and a convent was founded here in 962. It was destroyed by Henry the Lion, duke of Saxony, in 1180, but was soon rebuilt and was made a free imperial town in 1253. In this and the following century several diets and other assemblies were held here. The protector (*Vogt*) of the town was the elector of Saxony and later for a few years (1702–1715) the elector of Brandenburg. Nordhausen accepted the reformed doctrines in 1522. It was annexed by Prussia in 1803 and again in 1815, having in the meantime belonged to the kingdom of Westphalia.

See Förstemann, *Urkundliche Geschichte der Stadt Nordhausen bis 1250* (Nordhausen, 1828–1840) and *Kleine Schriften zur Geschichte der Stadt Nordhausen* (Nordhausen, 1855); Lesser, *Historische Nachrichten von Nordhausen*, edited by Förstemann (Nordhausen 1860); J. Schmidt, *Bau- und Kunstdenkmäler der Stadt Nordhausen* (Halle, 1886); T. Eckart, *Gedenkblätter aus der Geschichte der ehemaligen freien Reichsstadt Nordhausen* (Leipzig, 1895); Heine, *Nordhausen und Preussen* (Nordhausen, 1902); and Girschner, *Lokalführer für Nordhausen und Umgebung* (1891).

NORDICA, LILIAN (1859–   ), American operatic soprano, *née* Norton, was born at Farmington, Maine, and trained as a singer at Boston, and later at Milan. As Madame Nordica she made her operatic début at Brescia in 1879, and from that time took high rank among the prima donnas, appearing in all the principal capitals in Europe, and also in America.

NORDIN, CARL GUSTAF (1749–1812), Swedish statesman, historian and ecclesiastic. In 1774 he was made *docent* of Gothic antiquities at Upsala University in consequence of his remarkable treatise, *Monumenta svia-gothica vetustioris aevi falso meritoque suspecta*. Summoned to Stockholm in 1782 by Gustavus III. to edit a Swedish *Corpus diplomaticum*, half an hour's private conversation with the young priest convinced Gustavus that Nordin's proper place was by his side in the political arena. But he employed Nordin quite differently from his episcopal colleague Olaf Wallqvist. While the bishop publicly defended the royal measures, Nordin became the king's private adviser. In politics Nordin was a royalist from pure conviction. To him a parliament seemed little better than a mob. He was one of the king's secret managers during the troublesome and dangerous *riksdag* of 1789, but advised caution and compared the estate of clergy, which at one time held the balance between the jarring orders, to ice which might be walked upon but could not be driven over. He was appointed a member of an ecclesiastical commission for reforming the church in 1787, in which capacity he was virtually minister of public worship. In 1791–1792 he became a leading member of the financial and general committees of the *riksdag*. After the king's death Nordin shared in the general disgrace of the Gustavians and lived in retirement at the little town of Hernösand, where he held the post of *lector* at the gymnasium. But he reappeared prominently on the political scene during the *riksdag* of 1800, and in 1805 was consecrated bishop of Hernösand. Though he lacked the brilliant qualities of his rival Wallqvist, Nordin had the same alertness and penetration, and was infinitely more stable and disinterested. One of the most learned men of his day, he devoted his spare time to history, and discovered that many of the oldest and most cherished Scandinavian MSS. were clever forgeries. Like Jean Hardouin he got to believe that a great deal of what is called classical literature was compiled by anonymous authors at a much later date, and he used frequently to startle his colleagues, the Gustavian academicians, by his audacious paradoxes.

He left behind him a colossal collection of MSS., the so-called *Nordinska Samlingarna*, which were purchased and presented to Upsala university by Charles XIV. and form the groundwork of the well-known *Scriptores rerum Suecicarum medii aevi*. Nordin published during his lifetime *Handlingar till uplysning af svenska krigshistorien* (Stockholm, 1787–1788). His academical addresses came out at Stockholm in 1818 under the title *Minnen öfver namnkunniga svenska män*. His *Dagbok* did not appear till 1868.

See *Sveriges historia* (Stockholm, 1877, &c.), vol. v.; C. T. Odhner, *Sveriges politiska historia under Gustaf III.'s regering* (Stockholm, 1885, &c.); R. N. Bain, *Gustavus III.* vol. 2 (London, 1896).

NÖRDLINGEN, a town of Germany, in the kingdom of Bavaria, on the Eger, 40 m. N. of Augsburg by rail and at the junction of lines to Buchloe and Dombühl. Pop. (1905) 8512. It was formerly a free imperial town, owning a territory 35 sq. m. in extent, and is still surrounded with walls and towers. The Evangelical church of St George is a Gothic structure erected in the 15th century and restored in 1880. It has paintings by Hans Schäufelein, who was a native of Nördlingen, and a tower 290 ft. high. The Late Gothic town hall has a collection of pictures and antiquities. The chief manufactures of the town are linen goods, soap, malt, and agricultural implements, and a brisk trade is carried on in cattle, grain and geese. From 898, when first mentioned, to 1215 Nördlingen was subject to the bishops of Regensburg, but about 1215 it became a free city of the Empire. It was annexed to Bavaria in 1803.

Nördlingen was the scene of two great battles in the Thirty Years' War (*q.v.*). In the first, which was fought on the 5th and 6th of September 1634, the hitherto invincible Swedish army, commanded by Duke Bernhard of Saxe Weimar and Marshal Horn, was defeated with great loss by a somewhat superior army of Imperialists and Spaniards under General Gallas, Horn and 3000 men being made prisoners and 6000 killed or mortally wounded. In the second battle, fought eleven years later (3rd August 1645), Condé (then duke of Enghien) and Turenne were the leaders on the one side, and Mercy and Johann von Weert, the dashing cavalry commander whose onset had decided the battle of 1634, on the other. The Germans were posted some 5 m. to the east of Nördlingen, about Allerheim, with their right resting on a hill and the left on a castle, the guns with an infantry escort being placed on these points, and the village itself in the centre being also garrisoned and entrenched. In rear of the village the plain was occupied by Mercy's army in the customary two lines, foot in the centre, horse in the wings. The French army, similarly arrayed, but with a few battalions attached to the cavalry wings, was more heterogeneous than the German, being composed of French, Hessian, German mercenaries, and Liégeois. After a cannonade in which it suffered more severely than its entrenched enemy, the French centre furiously attacked the village of Allerheim; the fighting here was very heavy, and on the whole in favour of the Germans, although Mercy was killed. The right wing of the French cavalry was swept off the field by Johann von Weert's charge, but the German troopers, intoxicated with success, dispersed to plunder. On the French left, meanwhile, Turenne saved the day. Fighting cautiously at first with his leading line to gain time for his second to come up, he then charged and broke up the hostile right wing of cavalry, while some battalions of infantry scaled the hill and captured the Bavarian guns. Unlike Weert the marshal kept his troops in hand, and swung round upon the Bavarian infantry behind Allerheim, who were at the same time cannonaded by their lost guns. A prolonged fight now ensued, in which the Bavarians had the worst of it, and Weert, returning at last to the field, dared not attempt to engage afresh. The armies faced one another all night with their sentries fifty paces apart, but in the morning the Bavarians were found to have retreated. Nothing was gained by the victors but the trophies and the field of battle, and the losses of both sides had been enormous. Enghien had only 1500 of his foot in hand next day. Nördlingen, therefore, is a classical instance of the unprofitable and costly *bataille rangée* of the 17th century.

See Beyschlag, *Geschichte der Stadt Nördlingen* (Nördlingen, 1851), and Mayer, *Die Stadt Nördlingen, ihr Leben und ihre Kunst im Lichte der Vorzeit* (Nördlingen, 1856).

NORE, THE, a sandbank at the mouth of the river Thames, England, marked by various buoys and by a lightship, with revolving light. This ship lies 3 m. from the nearest point on the Kent coast, about the same distance from the Essex coast, and 47¾ m. below London Bridge. The first light was placed here as an experiment by Mr Hamblin, its patentee, in 1731. In 1797 the neighbouring anchorage was the scene of a mutiny in the British fleet then lying here, well known in history as the Mutiny of the Nore.

NORFOLK, EARLS AND DUKES OF. The 1st earl of Norfolk was RALPH DE GUADER, a follower of William the Conqueror, who forfeited the earldom when he revolted against William in 1075; the 2nd was HUGH BIGOD (d. 1177), one of Stephen's supporters, to whom the earldom was granted by this king before 1141. Hugh's grandson, HUGH (d. 1225), the 3rd earl of this line, married Matilda, daughter of William Marshal, earl of Pembroke, and from the Marshals their son ROGER (d. 1270), the 4th earl, inherited the office of marshal of England. This powerful family of Bigod retained the earldom until ROGER, the 5th earl, died childless in December 1306.

The next earl of Norfolk was THOMAS OF BROTHERTON (1300–1338), a younger son of Edward I., to whom the earldom was granted in 1312 by his half-brother, Edward II. In addition to the estates which had formerly belonged to the Bigods Thomas received the office of marshal. He joined Queen Isabella when she landed in England in 1326, and was one of the group of nobles who brought about the deposition of Edward II. He died in August 1338, leaving no son. The survivor of his two daughters, Margaret (*c.* 1320–1400), who was countess of Norfolk in her own right, married John de Segrave, 3rd Lord Segrave (d. 1353), and their only child Elizabeth (d. *c.* 1375) became the wife of John de Mowbray, 4th Lord Mowbray (d. 1368), and the mother of two sons John and Thomas. In 1397 the countess Margaret was created duchess of Norfolk, and at the same time her grandson Thomas Mowbray was made duke of Norfolk.

Mowbray line.

THOMAS MOWBRAY, 1st duke of Norfolk (*c.* 1366–1399), became Baron Mowbray and Baron Segrave when his elder brother John died in February 1382; about the same time Richard II. created him earl of Nottingham, a title held by his dead brother, and in 1385 made him marshal of England for life. For some years he enjoyed the favour and companionship of the king, but differences arose between them, and in 1387 Nottingham began to act with Thomas of Woodstock, duke of Gloucester, his own brother-in-law, Richard Fitzalan, earl of Arundel, and the party of nobles who wished to deprive the king of his power. They routed the royal favourite Robert de Vere, earl of Oxford, at Radcot Bridge, and Richard was at their mercy. Owing partly to Nottingham's moderate counsels the suggestion to depose him was not carried out, but in the "merciless parliament" of 1388 his favourites were "appealed" of treason and were sentenced to death. For nearly two years the chief power was in the hands of the lords appellant, as Nottingham and his friends were called, but in 1389 the king regained his authority. He detached Nottingham from his colleagues and made him warden of the Scottish marches; later he became captain of Calais and the royal lieutenant in the north-east of France. Richard took him to Ireland in 1394 and soon afterwards sent him to arrange a peace with France and his marriage with Isabella, daughter of King Charles VI. But the earl's supreme service to the king was in 1397 when Richard took a tardy but severe vengeance upon three of the appellants. In their turn these lords were "appealed" of treason before the parliament, and as on the former occasion Nottingham was one of the accusers. He was present when Gloucester was arrested at Pleshey, and Froissart says that he actually beheaded Arundel himself. Gloucester was entrusted to his keeping at Calais, and in September 1397 he reported that his prisoner was dead. The duke had been murdered, and Nottingham was probably responsible, although the evidence against him is not conclusive. As a reward he received most of Arundel's lands in Surrey and Sussex, and was created duke of Norfolk. He now began to fear for his own safety, and took the duke of Hereford, afterwards King Henry IV., into his confidence. Hereford carried his words to the king, who summoned him to his presence, and at Oswestry Norfolk accused Hereford of speaking falsely. A court of chivalry decided that the dispute should be referred to the arbitrament of single combat and Coventry was the place appointed for the duel; but when on the 16th of September 1398 everything was ready for the fight Richard interposed and ordered both combatants into banishment. Norfolk was deprived of his offices, but not of his titles; his "heavier doom" was exile for life, and he was ordered to confine himself to Germany, Hungary and Bohemia. At once he left England for Dordrecht, and after passing some months in wanderings he reached Venice, where he died on the 22nd or 27th of September 1399. The concluding scene of the duke's life in England forms the staple material of act i. of Shakespeare's *Richard II.* Norfolk left estates in nearly all the English counties. His wife was Elizabeth (*c.* 1372–1425), daughter of Richard Fitzalan, earl of Arundel, by whom he had two sons, Thomas and John, and two daughters.

His elder son, Thomas Mowbray (1385–1405), became earl of Nottingham and earl marshal on his father's death, but he was not allowed to assume the title of duke of Norfolk. He quarrelled with Richard Beauchamp, earl of Warwick, over the precedence of their respective earldoms, and left the court in anger when Henry IV. decided in favour of Warwick. At this time (1405) Richard le Scrope, archbishop of York, and other northern potentates were preparing to rise against the king. The earl marshal joined them, was taken prisoner at Shipton Moor, and was beheaded at York on the 8th of June 1405.

John Mowbray (1390–1432), 2nd duke, brother of the last-named, now became earl marshal and earl of Nottingham. He sat in judgment upon Richard, earl of Cambridge, and the other rebels in 1415, and went to France with Henry V. He took part in the siege of Harfleur, but illness prevented him from fighting at Agincourt. He saw service in France in subsequent years, and after Henry's death he was a member of the English governing council. In 1424 he followed Humphrey, duke of Gloucester, on his campaign in Hainaut, and in 1425 he secured his recognition as duke of Norfolk. He died on the 19th of October 1432 at Epworth, where his father had founded a Cistercian priory. By his wife Catherine, daughter of Ralph Neville, 1st earl of Westmorland, he left an only son, the 3rd duke.

John Mowbray, 3rd duke (1415–1461), became warden of the Scottish marches; he also served as a soldier and an ambassador in France. Upon the outbreak of the fierce rivalry between the houses of York and Lancaster about 1450 he joined Richard, duke of York, to whom he was related; he aided the Yorkist cause in Norfolk and in London, and it was he who in November 1453 demanded an inquiry into the administration of Edmund Beaufort, duke of Somerset. In 1459 he appeared on the Lancastrian side and took the oath of allegiance to Henry VI. and to his son Edward at Coventry, but soon he was again figuring as an active Yorkist. He was a member of the deputation which in March 1461 asked the duke of York (Edward IV.) to take the crown, and he fought at the second battle of St Albans and also at Towton, where one authority says he saved the day for the Yorkists.

John Mowbray, 4th duke (1444–1476), who had already been created earl of Surrey, a title formerly held by his ancestors, the Fitzalans, was the only son of the preceding. The names both of John and of his father appear frequently in the Paston Letters, as both dukes in turn seized Caister castle, which had been left by Sir John Fastolf to John Paston, and the 4th duke held it against the Pastons for some years. On his death in 1476 the dukedom became extinct, but the earldom passed to his daughter Anne (1472–1481), who married Richard, duke of York, the younger son of Edward IV. Richard was created duke of Norfolk and made earl marshal, but when he was murdered in 1483 the dukedom again became extinct, the earldom having reverted to the crown on the death of Anne.

Howard line.

The illustrious family of Howard (*q.v.*), members of which have been dukes of Norfolk from 1483 to the present day, with the exception of two periods during which the title was forfeited, was connected with the family of Mowbray.

John Howard, 1st duke of Norfolk (*c.* 1430–1485), was the son of Sir Robert Howard by his wife Margaret, daughter of Thomas Mowbray, the first duke of that family. In 1455 John Howard was sent to parliament as member for Norfolk, although he "hadde no lyvelode in the shire"; in 1461 he was knighted; and in 1470, although he appears to have been a consistent Yorkist, he was created a baron by Henry VI. He was treasurer of the royal household from 1467 to 1474, and went to France with Edward IV. in 1475. After Edward's death, however, he supported Richard III., who created him duke of Norfolk and made him earl marshal of England in June 1483. He was killed at Bosworth whilst fighting for this king on the 22nd of August 1485, and the title thus suffered attainder. He is frequently mentioned in the *Paston Letters*.

His son, Thomas Howard, afterwards 2nd duke (1443–1524), shared his father's fortunes; he fought at Barnet for Edward IV. and was made steward of the royal household and created earl of Surrey in 1483. Taken prisoner at Bosworth he was attainted and remained in captivity until January 1489, when he was released and restored to his earldom but not to the dukedom of Norfolk. He was then entrusted with the maintenance of order in Yorkshire and with the defence of the Scottish borders; he was made lord treasurer and a privy councillor in 1501, and he helped to arrange the marriage between Margaret, the daughter of Henry VII., and James IV. of Scotland. Henry VIII., too, employed him on public business, but the earl grew jealous of Wolsey, and for a short time he absented himself from court. He commanded the army which defeated the Scots at Flodden in September 1513, and was created duke of Norfolk in February of the following year, with precedency as of the creation of 1483. In his later years Norfolk worked more harmoniously with Wolsey. He was guardian of England during Henry's absence in France in 1520, and he acted as lord high steward at the trial of his friend Edward Stafford, duke of Buckingham, in 1521. Among his sons were William, 1st Lord Howard of Effingham, and Sir Edward Howard (*c.* 1477–1513), lord high admiral, who defeated the French fleet off Brest in August 1512, and lost his life during another engagement in April 1513.

Thomas Howard, 3rd duke (1473–1554), eldest son of the 2nd duke, married in 1495 Anne (1475–1512), daughter of Edward IV., thus becoming a brother-in-law of Henry VII., who had married Anne's sister Elizabeth. He became lord high admiral in 1513, and led the van of the English army at Flodden in September, being created earl of Surrey in February 1514. In 1513 he took for his second wife Elizabeth (d. 1558), daughter of Edward Stafford, duke of Buckingham. In 1520 Surrey went to Ireland as lord-deputy, but soon vacated this post to command the troops which sacked Morlaix and ravaged the neighbourhood of Boulogne in 1522; afterwards he raided and devastated the south of Scotland. He succeeded his father in May 1524, and as the most powerful nobleman in England he headed the party hostile to Cardinal Wolsey. He favoured the divorce of Henry VIII. from Catherine of Aragon, and the king's marriage with his niece Anne Boleyn. In 1529 he became president of the council, but in a few years his position was shaken by the fate of Anne Boleyn, at whose trial and execution he presided as lord high steward. But his military abilities rendered him almost indispensable to the king, and in 1536, just after the rising known as the Pilgrimage of Grace had broken out, he was despatched into the north of England; he temporized with the rebels until the danger was past, and then, as the first president of the council of the north, punished them with great severity. Sharing in the general hatred against Thomas Cromwell, Norfolk arrested the minister in June 1540. He led the English army into Scotland in 1542 and into France in 1544; but the execution of Catherine Howard, another of his nieces who had become the wife of the king, had weakened his position. His son Henry Howard, earl of Surrey (*q.v.*), was arrested on a charge of treason; Norfolk himself suffered the same fate as accessory to the crime. In January 1547 Surrey was executed; his father was condemned to death by a bill of attainder, but owing to the death of the king the sentence was not carried out. Norfolk remained in prison throughout the reign of Edward VI., but in August 1553 he was released and restored to his dukedom. Again taking command of the English army he was sent to suppress the rebellion which had broken out under Sir Thomas Wyat, but his men fled before the enemy. He acted as lord high steward at the trial of John Dudley, duke of Northumberland; and he died on the 25th of August 1554. Norfolk was a brutal and licentious man, but was a supporter of the Roman church, being, as he himself admits, "quick against the sacramentaries." As a soldier he was serviceable to Henry VIII., but as a diplomatist he was a failure, being far inferior to Wolsey and to Cromwell. He had two sons, Henry, earl of Surrey, and Thomas (*c.* 1528–1582), who in 1559 was created Viscount Howard of

Bindon, a title which became extinct in 1611. His only daughter Mary (d. 1557) married Henry, duke of Richmond, the natural son of Henry VIII.

Thomas Howard, 4th duke (1536–1572), son of Henry Howard, earl of Surrey, was born on the 10th of March 1536. His tutor was John Foxe, the martyrologist. Soon after Elizabeth became queen in 1558 she sent the young duke to take part in the war against the Scots and their French allies, but the conclusion of the treaty of Edinburgh in July 1560 enabled him to return to the court in London. Having married and lost three wives, all ladies of wealth and position, Norfolk was regarded as a suitable husband for Mary queen of Scots, who had just taken refuge in England. He presided over the commission appointed by Elizabeth to inquire into the relations between the Scottish queen and her subjects; and although he appears to have believed in Mary's guilt he was anxious to marry her. Among the Scots Maitland of Lethington favoured the proposed union; Mary herself consented to it; but Norfolk was unwilling to take up arms, and while he delayed Elizabeth ordered his arrest and he was taken to prison in October 1569. In August 1570, after the suppression of the rising in the north of England, the duke was released; but he entered into communication with Philip II. of Spain regarding the proposed invasion of England by the Spaniards. After some hesitation Norfolk placed himself at the head of the conspirators; and in return for his services he asked the king of Spain "to approve of my own marriage with the Queen of Scots." But the plot failed; Norfolk's treachery was revealed to Lord Burghley, and in September 1571 he was arrested. He was beheaded on the 2nd of June 1572. It is noteworthy that he always regarded himself as a Protestant. Norfolk's first wife, Mary (1540–1557), daughter and heiress of Henry Fitzalan, 12th earl of Arundel, bore him a son, Philip, who in consequence of his father's attainder was not allowed to succeed to the dukedom of Norfolk, but became 13th earl of Arundel in succession to his maternal grandfather in 1580. Norfolk left two other sons, Thomas Howard, created earl of Suffolk in 1603, and Lord William Howard (*q.v.*).

In 1660 the dukedom was restored by act of parliament to Thomas Howard, 4th earl of Arundel (1627–1677), a descendant of the 4th duke. The 5th duke was succeeded by his brother Henry (1628–1684), the friend of John Evelyn, who had been already created earl of Norwich; in 1672 he was made earl marshal, and this dignity was entailed on his male heirs.

Charles Howard, 11th duke (1746–1815), was the son of Charles Howard (1720–1786), who succeeded his cousin, Edward Howard (1686–1777), as 10th duke of Norfolk in 1777, and who wrote *Historical Anecdotes of some of the Howard Family* (1769 and 1817). Born in March 1746, the earl of Surrey, as Charles was called from 1777 until he became duke of Norfolk in 1786, represented Carlisle in the House of Commons, where he acted with the Whigs; unlike his father he was a Protestant. In 1780 he was a lord of the treasury. In 1789 at a dinner held in London the duke gave the toast "Our sovereign's health—the majesty of the people"; this greatly offended George III., who deprived him of some of his public offices.

When he died on the 16th of December 1815 he left no sons, and the dukedom passed to his kinsman, Bernard Edward Howard (1765–1842), a descendant of the 4th duke.

Bernard's only son, Henry Charles Howard (1791–1856), became 13th duke in 1842. As earl of Surrey he was the first Roman Catholic since the Reformation to sit in the House of Commons, of which he was a member from 1829 to 1841; as duke of Norfolk he was master of the horse from 1846 to 1852 and lord steward from 1853 to 1854. The second of his three sons, Edward George Fitzalan (1818–1883), was a member of the House of Commons from 1848 to 1868, and was created Baron Howard of Glossop in 1869. Lord Howard rendered great service to the cause of Roman Catholic education.

The 13th duke's eldest son, Henry Granville Fitzalan Howard (1815–1860), succeeded to the title. He was a devoted Roman Catholic, left the Liberal party and resigned his seat in parliament rather than support the Ecclesiastical Titles Bill of 1850. He edited the *Lives of Philip Howard, earl of Arundel, and of Anne Dacres, his wife* (1857 and 1861). He was succeeded by his son Henry Fitzalan Howard, 15th duke (b. 1847), who was postmaster-general from 1895 to 1900, first Lord Mayor of Sheffield in 1895, went out to the South African War in 1900, and whose position as head of the English Roman Catholics and as premier duke and Earl Marshal made him for many years conspicuous in public life. His only son by his first wife, a daughter of Baron Donington, died in early life; but by his second marriage (1904) to the daughter and heiress of Lord Herries he had a son born in 1908.

NORFOLK, an eastern county of England, bounded N. and E. by the North Sea, S.E. and S. by Suffolk and W. by Cambridgeshire and Lincolnshire. The area is 2044·4 sq. m., the county being the fourth in size in England. The surface falls into two divisions. The eastern and central portions consist of an undulating plain with rising ground skirting the river valleys and low chalk downs in the north. For the most part this section is fertile and well wooded, but there are some expanses of heath land. The principal rivers are the Yare and its tributaries the Wensum, Bure and Waveney, the last forming a large part of the boundary with Suffolk. In the west the county includes part of the Fen country (*q.v.*), where the principal rivers are the Great Ouse and its tributaries the Little Ouse or Brandon river, which also forms part of the Suffolk boundary, the Wissey and the Nar. The flat fens are crossed by innumerable drainage channels. They are comprised within that portion of the whole district known as the Bedford Level, and extend from Welney and Hilgay Fens near the junction of the Great and Little Ouse northward to the Wash.

The watershed is nearly in the centre of the county. The middle eastern portion is a low-lying flat area lifted slightly towards the coast in such a way that some of the tributary streams of the Bure rise very near the sea but flow at first inland or parallel to the coast. Here occur the well-known *Norfolk Broads*, shallow meres, having their low banks massed with luxuriant reeds and other water-plants, and possessing much quiet beauty of an individual character. Most of them abound with pike, bream and other coarse fish, and harbour innumerable waterfowl, including the water-hen, heron, bittern, king-fisher, mallard, teal and snipe. They are thus frequented by sportsmen, but still more by boating parties, and at Yarmouth, Wroxham Bridge, Acle and elsewhere sailing boats with cabins, and other boats, are hired in large numbers. Annual regattas are held on several Broads. The Broads are generally not widenings of the main river, but are connected with it by short channels. Their formation is probably due to a slight uprising of the land, whereupon the depressions in the undulated surface continued to carry water. The average depth of the Broads is only some eight feet, and their tendency is to become choked with sedges and bulrushes and to decrease in size. The Bure joins the Yare at Yarmouth, at the seaward end of Breydon Water, which does not rank among the Broads. Following the Bure upwards, a small stream is found uniting it with Filby, Rollesby and Ormsby Broads to the north, which form one sheet of water of irregular shape. The Thurne stream then enters from the same direction, draining Heigham Sound, Hickling Broad, Horsey Mere and Martham Broad. The second of these is the largest of all, measuring some 3 m. in length by one at its widest part. The next tributary, the Ant, drains Barton and Stalham Broads. Closely adjoining the upper Bure itself, there are Ranworth Broad, Horning Broad, and Salhouse, Hoveton and Wroxham Broads almost adjoining. South of Ranworth, on a tributary, is South Walsham Broad. Adjacent to the Yare towards Norwich is Rockland Broad. Between the Waveney and Lowestoft Oulton Broad is formed (in Suffolk; see Lowestoft).

Nearly two-thirds of the boundary of the county is formed by tidal water. There are few bays or inlets, and on the northern coast no river mouths. For the most part the coast-line is flat and low, and has been greatly encroached on by the sea, several villages having been engulfed since the Conquest. From the mouth of the Yare to Happisburgh the shore is skirted by sandbanks. Thence for 20 m. it is formed of cliffs consisting of clay and masses of embedded rocks, the average height being about 50 ft., although in some cases an altitude of 200 ft. is reached. These cliffs are succeeded by a low shingly or sandy coast stretching as far as St Edmund's Point. The shores of the Wash are formed of mudbanks, which are left dry at low water. West of Lynn a considerable extent of land has been reclaimed from the sea in modern times, and farther south an old Roman embankment stretches into Lincolnshire. At various points off the coast there are submarine forests, especially in Brancaster Bay and in the neighbourhood of Cromer and Happisburgh. Fossilized remains of large mammals are sometimes dragged up by the nets of fishermen, and mammoth tusks measuring from 6 to 9 ft. have been found at Knole Sand off Happisburgh. The fine sandy beaches and healthy climate have contributed to the growth of such popular watering-places as Cromer, Yarmouth and Hunstanton, while Mundesley and Wells-next-the-Sea are lesser resorts.

Geology.—The prevailing rock formation in Norfolk is the Chalk, which occupies a broad tract in the central and western portions of the county and underlies the Tertiary deposits in the eastern part, the general dip of the rocks being towards that direction. Pliocene beds predominate in the eastern third of the county; while a narrow belt of Lower Cretaceous and Jurassic rocks lies along the western border. Oxford Clay and Corallian beds have been proved by boring at Lynn, but the oldest formation to appear at the surface is the Kimeridge Clay, which stretches along the coast of the Wash from Hunstanton to King's Lynn and south to Downham, where it has been dug for bricks and tiles. The Lower Greensand, which forms the picturesque escarpment overlooking the Fen-land and the Wash, is represented in its upper part by the brown, iron-stained sandstone, the Carstone (up to 40 ft.), locally known as the "Gingerbread stone," which is quarried at Snettisham and elsewhere as a building stone. Below the Carstone are the Snettisham Clay beds, dug for brick-making at that village and at Dersingham and Heacham; these pass southwards into sandstones and ironstones. The lowest division of the Greensand, the Sandringham beds, highly-coloured sands and sandstones, are exposed at Sandringham Warren, Downham Market and Grimston Common. Overlying the Lower Greensand is the Gault Clay which extends from Shouldham northwards to Dersingham, where it begins to change in character and finally passes into the Red Chalk (4 ft.), so conspicuous in the cliffs at Hunstanton. In the same cliffs the Lower Chalk is exposed resting on the Red Chalk (which does not belong to the Chalk proper but the Gault); it is a hard grey or white limestone; at Marham and other places it is quarried for building and for lime. The Middle Chalk (about 300 ft.), with flints in the upper part and occasional marl beds, is exposed at Docking, Hillington and Methwold. The Upper Chalk (about 800 ft.) is much softer, with many flints, including the peculiar forms known as "paramoudras"; it has been largely exploited for lime and whiting, and the flints have been worked from prehistoric times. Dressed flints are still used for facing walls in churches and other buildings. At Trimingham occurs the highest horizon of the Chalk known in England. Eocene strata, Reading Beds (46 ft.) and London Clay (310 ft.) have been proved to lie beneath younger deposits at Yarmouth. Pliocene deposits, sands, gravels and clays are exposed along the coast from Weybourne and Cromer to Happisburg and in the river valleys over most of the eastern part of the country. The lower subdivision, the Norwich Crag Series (25-100 ft.), exhibits numerous local peculiarities to which distinctive names have been applied, as the "Fluvio-Marine beds" of Bramerton and Thorpe, the "mammaliferous crag," the "Weybourne Crag" and the "Chillesford Clays," &c. The upper subdivision, the Cromer Forest-Bed (10-30 ft.), contains the bones of the mammoth, rhinoceros, giant beaver, sabre-toothed tiger and many others, as well as the transported stumps of trees. Next in order come the glacial clays, sands and gravels, which cover and obscure so much of the older stratified rocks of the county and hence greatly influence the scenery. There is a lower "till" with boulders and an upper chalky boulder clay, sometimes with sands and gravels between; glacial gravels overlie the clays in large sheets as at Norwich, Mousehold Heath, Dereham, Fakenham. The drift is thicker in the east than in the west—very interesting exposures occur on the cliffs about Cromer. Later valley gravels occupy some of the stream courses, and among the more recent deposits are the Fen beds and blown sands.

Climate and Agriculture.—On account of the exposed position of the coast to east and north-east winds, the climate, especially in winter and early spring, is much colder than in the adjacent counties. The air is, however, generally dry, and unhealthy fogs are not common, except in the marshy districts. The *cynd* is a characteristic mist which sometimes rolls up like smoke from the sea over the eastern parts. Norfolk contains a greater variety of soil than any other county in England. In the north and west the soil is generally chalky; towards the south-east it is a light sand, assuming occasionally the form of blowing sand, but elsewhere capable of cultivation and of average fertility. In the centre and east the prevailing soil is loam, chiefly light and workable, but sometimes composed of stiff chalky boulder clay. Alluvial clays and loams occur on the borders of Lincolnshire and Cambridgeshire, and stretch along the river valleys. The marsh lands along the coast are subject to inundation, but afford capital pasturage. Farming is in an advanced condition, and, by means of draining, subsoil ploughing, &c., excellent crops are raised. The farms are for the most part large and the farm buildings superior. About four-fifths of the total area is under cultivation. Of this area corn crops occupy some two-fifths and consist mainly of wheat and barley, but in the production of oats also Norfolk is one of the first counties in England. As much attention is paid to the grazing of cattle and to the rearing and fattening of sheep, turnips and swedes are extensively grown. Large numbers of lean cattle, principally Irish shorthorns, are brought into the county mainly for winter grazing. The old Norfolk polled stock is recognized as a distinct breed. Good pasture lands are found in many districts of the county, especially along the river-beds and near the fens. A large acreage is under beans and a fair quantity of small fruit is grown.

Other Industries.—At an early period Norfolk was one of the principal seats of the cloth trade in England, worsted deriving its name from having been first manufactured at Worstead. The weaving of silk and wool is still carried on at Norwich and also shawl weaving, although the staple trade of the town is now boots and shoes. Silk is also manufactured at Yarmouth, Wymondham and North Walsham. Flour-mills are numerous all over the county, and there are agricultural implement works at Norwich, Lynn, Thetford, East Harling, North Walsham, Walsingham, and East Dereham. Lime-burning, brick-making, tanning, malting and brewing are carried on in various districts. There are extensive mustard and starch works at Norwich. One of the chief hindrances to commercial progress is the dangerous nature of the sea-coast, and the lack of harbours. A large trade, however, is carried on at Yarmouth. The other principal port is Lynn, and there is a small trade at Cromer and Wells.

Railway communication is provided principally by the Great Eastern railway, the principal lines of which are those from London and Ipswich to Norwich and Yarmouth, from Ely to Norwich and Yarmouth, Ely to Lynn, Lynn to Swaffham and Dereham, Norwich to Dereham and Wells and Norwich to Cromer. There are numerous branch lines. The Midland & Great Northern joint line, from Lynn, serves Cromer, Norwich, North Walsham and Yarmouth. The eastern rivers afford water communication with the port of Yarmouth and the Great and Little Ouse, with many of the drainage-cuts which are navigable, with Lynn.

Population and Administration.—The area of the ancient county is 1,308,439 acres, with a population in 1891 of 454,516, and in 1901 of 460,120. The area of the administrative county is 1,314,612. The county contains 33 hundreds. The municipal boroughs are—King's Lynn (pop. 20,288); Norwich, a city and county borough and the county town (111,733); Thetford (4613); and Yarmouth, properly Great Yarmouth, a county borough (51,316). The urban districts are Cromer (3781), Diss (3745), Downham Market (2472), East Dereham (5545), Hunstanton (1893), North Walsham (3981), Sheringham (2359), Swaffham (3371), Walsoken (3250), Wells-next-the-Sea (2494). Among other towns may be mentioned Fakenham (2907), Holt (1844), Wymondham (4733). The county is in the south-eastern circuit, and assizes are held at Norwich. There are two courts of quarter sessions, and 25 petty sessional divisions. Each of the four municipal boroughs has a separate commission of the peace and a separate court of quarter sessions. The total number of civil parishes is 700. Norfolk is mainly in the diocese of Norwich, with small parts in those of Ely and Lincoln; it contains 607 ecclesiastical parishes or districts, wholly or in part. For parliamentary purposes the county is divided into six divisions (North-Western, South-Western, Northern, Eastern, Mid, and Southern), and also includes the parliamentary boroughs of King's Lynn and Norwich, and part of the parliamentary borough of Great Yarmouth; each returning one member, except the city of Norwich, which returns two members.

History.—The district which is now Norfolk was invaded in the second half of the 5th century by Angle tribes from north Germany, who, having secured the coast districts, worked their way inland along the river valleys. In the 7th century the land of the North-folk formed the northern half of East Anglia which at the time owned the supremacy of Kent, and later appears successively as a dependency of Mercia and Northumbria, until in 827 the whole land was united under the rule of Ecgbert. In 867 the Danes under Inguar and Ubba defeated and killed King Edmund at Thetford, but, although it formed an integral part of the Danelaw, Norfolk remained thickly settled by an almost exclusively Teutonic population. In the renewed Danish attacks of the 11th century Norwich and Thetford were destroyed. At the time of the Norman invasion Norfolk formed part of Harold's earldom, but it offered no active resistance to the Conqueror, who built a castle at Norwich, and bestowed the earldom of East Anglia on Ralf Guader. The forfeited estates of Earl Ralf had passed at the time of the Domesday Survey to Roger Bigod, ancestor of the earls of Norfolk, whose line expired in 1306. The Norfolk fief of Count Alan later formed part of the honour of Richmond; Robert Malet's fief became the honour of Eye; Hermer de Ferrière's fief became the barony of Wormegay, afterwards held by the Bardolfs; Hugh de Montfort's fee, as the honour of Haughley, was afterwards attached to the office of constable of Dover. The Howards were settled in the county from the 13th century, Thomas Howard being created duke of Norfolk for his services at Flodden. Castle Acre was a seat of the earls of Warenne; Paston of the Pastons; Attleborough of the Mortimers; Caister of the Fastolfs.

The shire-system was not definitely established in East Anglia before the Conquest, but the Domesday boundaries of Norfolk were practically those of the present day. The thirty-six Domesday hundreds were subdivided into leets, of which no trace remains, and the boroughs of Norwich and Thetford ranked as separate hundreds, while Yarmouth was the chief town of three hundreds. The Domesday hundred of Emneth is now included in Freebridge, and Docking in that of Smithdon, and the boundary between Brothercross and Gallow hundred has been considerably changed. Norfolk and Suffolk were united under one sheriff until the reign of Elizabeth, the shire court for the former being held at Norwich. The hundred court of Humbleyard hundred was held in the parish of Swardeston; that of Clackclose at Clackclose hill on Stradsett common; Taverham at Frettenham Hill; Grimeshoe at a tumulus between Brandon and Norwich; Forehoe in the parish of Carleton Forehoe; Greenhoe by the tumuli on the London road to Swaffham; Smithdon in the parish of Bircham Magna; Freebridge at Flitcham Burgh, afterwards at an oak at Gaywood and still later at an oak at Wiggenhall St German's; Gallow in the 15th century at Fakenham; in the 16th century at Longfield Stone; Brothercross, at the cross by the ford over the Burnham; Eynsford at Reepham; Depwade, at the Deep ford over the Tas; Mitford, in 1639, at "Brokpit"; North Erpingham, at Guneby Gate, near Gunton; South Erpingham, at Cawston Park Gate; Launditch, at the crossing of the Norwich road with the long ditch between Longham and Beeston; Earsham, at an encampment near the church.

Norfolk formed part of the diocese of East Anglia from its foundation in 630, and in 1075 the bishop's see was placed at Thetford, whence it was transferred to Norwich in 1093. In 1121 the Norfolk portion of the diocese included the 12 deaneries of Norwich (or Taverham), Blofield, Ingworth, Sparham, Holt, Walsingham, Toftrees, Brisley, Breckles, Lynn, Thetford and Flegg—all in the archdeaconry of Norwich, and the 12 deaneries of Repps, Humbleyard, Depwade, Waxham, Brooke, Redenhall, Rockland, Cranwich, Fencham, Hitcham, Burnham and Hengham—in the archdeaconry of Norfolk. From this date the deaneries underwent little change, until the creation of the archdeaconry of Lynn in 1894, when they were entirely reconstituted.

In the wars between John and his barons Roger Bigod garrisoned Norwich castle against the king, who in 1216 on his retreat from Lynn lost his baggage in the Wash. In the rising of 1381 Norwich was plundered by the insurgents under Sir Roger Bacon of Baconsthorpe, and in the rising of 1549 against enclosures Norwich was again captured by the rebels under Ket. In the Civil War of the 17th century Norfolk as a whole adhered to the parliamentary cause, forming one of the six counties of the Eastern Association. Lynn, however, was held for the king by Sir Hamon Lestrange, and Norwich was one of the first cities to welcome back Charles II.

At the time of the Domesday Survey sheep-farming flourished almost throughout Norfolk, a flock of 1300 being mentioned at Walton, and horses were extensively bred; numerous beehives, nearly 600 water-mills and valuable river-fisheries are mentioned; and salt was made in the hundreds of Freebridge and East Flegg. The worsted trade was introduced by Flemish immigrants as early as the 12th century, and the woollen trade became especially prosperous in the hundreds adjoining the Wash. Linen was manufactured at Aylsham in the 14th century. Fuller, writing in the 17th century, describes Norfolk as abounding in all good things, and especially rabbits, herrings and worsteds. The leather industry flourished in Norman times.

Norfolk returned members to parliament in 1290, and in 1298 the county and the boroughs of Lynn, Norwich and Yarmouth returned each two members. Thetford acquired representation in 1529, and Castle Rising in 1558. Under the Reform Act of 1832 the county returned four members in two divisions, and Castle Rising was disfranchised. Under the act of 1868 the county returned six members in three divisions, and Thetford and Yarmouth were disfranchised, the latter for notorious corruption.

Antiquities.—There are few traces of Saxon architecture in the county, unless the towers of Dunham-Magna and Newton-by-Castleacre be assigned to this period. The round towers which are specially characteristic of the district are probably Norman. Although there are several fine specimens of Norman architecture in the county in addition to Norwich cathedral, and a few good examples of Early English, the majority of the churches are Decorated or Perpendicular, or a mixture of both styles. The most notable features of the churches are the flint and stone panels, the fine rood screens and the numerous brasses. The churches of the marshes in the N.W. are noteworthy, especially those of Tilney All Saints and Walsoken (Norman) and West Walton (Early English); the rich Norman church of Castle Rising should also be mentioned. At Northwold remains one of the rare Easter sepulchres. Apart from the churches in the towns, those of Worstead, Hingham, Cawston and Terrington St Clement may be quoted as typical examples of the numerous fine later Gothic village churches. Norfolk possessed an unusually large number of monastic foundations, but of these the remains are few and comparatively unimportant. The cathedral church of Norwich was originally connected with a very richly endowed Benedictine monastery. A foundation of almost equal importance was that of Augustinian canons at Walsingham, where there are remains of an Early English and Decorated church, a Decorated refectory and a Perpendicular gateway. The shrine of Our Lady of Walsingham was the resort of great numbers of pilgrims. Other monastic remains are Bromholm Priory near North Walsham; slight Early English fragments of Beeston Augustinian priory, W. of Cromer; good Norman and later remains at Binham (Benedictine) N.E. of Walsingham; the Benedictine nunnery of Carrow near Norwich; the fine church (Norman and later) of the Benedictine priory at Wymondham; and the remains at Castle Acre and Thetford.

Of Norman keeps there are remains of the building at Castle Acre; there is a magnificent ruin at Castle Rising N.E. of Lynn; and Norwich Castle is kept in restoration. There are several old mansions of interest, such as the Jacobean brick building of Blickling Hall, Barningham Hall (1612), Hunstanton, the moated Oxburgh Hall, and Cressingham Manor, both of the 15th century. The larger mansions, however, such as Sandringham (a seat of King Edward VII.), Holkham, Rainham, Costessey, Gunton, Houghton and Shadwell, are of more modern date. The Holkham estate was the scene of the agricultural work of Thomas William Coke, earl of Leicester (d. 1842), who successfully proved that wheat could be profitably grown in this part of the county, and also made great improvements in live stock. Among sites of other various interests are Burnham Thorpe, the birthplace of Nelson; Paston and Oxnead, successive seats of the Paston family whose Letters are famous; and Ket's Oak near Hethersett, W. of Norwich, where Robert Ket took oath as leader of the agrarian rebellion of 1549.

See *Victoria County History; Norfolk*; F. Blomefield, *Essay towards a Topographical History of . . . Norfolk* (London, 1739–1775 and 1805–1810); W. Rye, *History of Norfolk* (London, 1885); P. H. Emerson, *Pictures of East Anglian Life* (London, 1888), and other works; Rev. A. Jessopp, *Arcady* (London, 1887), and other works; *Quarterly Review* (London, 1897), where other literature is cited; G. C. Davies, *Norfolk Broads and Rivers* (Edinburgh, 1884).

NORFOLK, a city of Madison county, Nebraska, U.S.A., on the north branch of the Elkhorn river, 2 m. from its mouth, and about 75 m. S.W. of Sioux City. Pop. (1900) 3883 (622 foreign-born); (1910) 6025. It is served by the Union Pacific, the Chicago & North Western (of which it is a division headquarters), and the Chicago, St Paul, Minneapolis & Omaha railways. The city is the seat of the Northern Nebraska Insane Asylum. Cereals, alfalfa and fruit are raised in the surrounding country. The site was first permanently settled in 1866. Norfolk was incorporated as a village in 1881 and chartered as a city in 1886; it became a city of the first class in 1909.

NORFOLK, a city and port of entry of Norfolk county, Virginia, U.S.A., on the northern side of the Elizabeth river (an arm of the Chesapeake Bay) and at the mouth of its eastern branch, and on the Albemarle and Chesapeake and the Dismal Swamp canals, about 90 m. S.E. of Richmond. Pop. (1890) 34,871; (1900) 46,624, of whom 1705 were foreign-born and 20,230 were negroes; (1910 census) 67,452. It is served by the Atlantic Coast Line, the Seaboard Air line, the Southern, the New York, Philadelphia & Norfolk, the Chesapeake & Ohio, the Norfolk & Western, the Norfolk & Southern and the Virginian railways, by many steamship lines, by ferry to Portsmouth (immediately opposite), Newport News, Old Point Comfort and Hampton, and by electric lines to several neighbouring towns. The Norfolk and Portsmouth Belt Line encircles the two cities, and connects the various trunk lines. Among the prominent buildings and institutions are the Custom House, the Federal Building, Marine Hospital, St Christopher's Hospital, St Vincent's Hospital, Norfolk Protestant Hospital, Sara Leigh Hospital, Norfolk Public Library, Norfolk Academy, Cotton Exchange, City Market, Bank of Commerce Building, Citizens' Bank Building, Board of Trade Building, Law Building, Virginia Bank & Trust Company Building, Norfolk National Bank, Atlantic Hotel, Monticello Hotel, Lynnhaven Hotel, Norfolk Mission College (Presbyterian) for negroes and the historic St Paul's church, which was built in 1737 and was struck by a cannon-ball and partly burned in 1776; in the yard is one of the oldest cemeteries in the country. Norfolk is the see of a Protestant Episcopal bishopric. The city has a public park of 110 acres and various smaller ones, and in the vicinity are several summer resorts, notably Virginia Beach, Ocean View, Old Point Comfort, Pine Beach and Willoughby Beach. The "Norfolk" navy yard is in the southern part of the city of Portsmouth. The harbour is deep, easily accessible through a channel 30 ft. in depth, and well protected by forts Monroe and Wool. The city has immense coal piers. It is the largest peanut market in the world, is in a great truck-gardening region, and makes large shipments of cotton (822,930 bales in 1905), oysters, coal, fertilizers, lumber, grain, fruits, wine, vegetables, fish and live stock. Norfolk is combined with Portsmouth in one customs district, the foreign trade of which in 1908 amounted to $11,326,817 in exports and $1,150,044 in imports. One of the most important manufacturing industries is grading, roasting, cleaning and shelling peanuts (in 1905 valued at $791,760). In 1900 the value of the factory products was $4,691,779; in 1905 it was $5,900,129, the city ranking third among the cities of the state in value of factory products.

Norfolk was founded in 1682 in pursuance of an act of the Virginia Assembly passed in 1680 to establish towns for the encouragement of trade; it was incorporated as a borough in 1736 by a royal charter, was chartered as a city in 1845, its charter being revised in 1882 and 1884, and received a new charter in 1906 (amended in 1908), under which there are a mayor (elected for four years), a common council, a board of aldermen and a board of control of three members, which has charge of public works, streets, sewers, drains and water supply, the police and fire departments, the work of the board of health, &c. Norfolk is administratively independent of Norfolk county. In 1906 the town of Berkley (incorporated in 1890; pop. in 1900, 4988) was annexed. During the War of Independence Norfolk was bombarded on the 1st of January 1776 by the British under John Murray, 4th earl of Dunmore (1732–1809); much of the town was burned by the American troops to prevent Dunmore from establishing himself here. In 1855 it suffered severely from yellow fever. At the outbreak of the Civil War the city was abandoned, and the navy yard was burned by the Federals in April 1861; Norfolk was then occupied until the 9th of May 1862 by Virginia troops, first under General William Booth Taliaferro (1822–1898) and later under General Benjamin Huger (1806–1877). Five miles from Norfolk and with Norfolk as its headquarters was held from the 26th of April to the 30th of November 1907 the Jamestown Ter-Centennial Exposition, celebrating the first permanent English settlement in America at Jamestown, Virginia.

NORFOLK ISLAND, an island in the Pacific Ocean, about 800 m. E. of the nearest point of New South Wales, in 29° S., 167° 56′ E. It stands on a submarine tableland extending about 18 m. to the N. and 25 m. to the S., and has itself an area of 8528 acres or 13·3 sq. m. The islets of Nepean and Philip lie near it. Its high cliff-bound coast is difficult of access. With a general elevation of 400 ft. above the sea the island rises in the N.W. to 1050 ft. in the double summit of Mount Pitt. The soil, of decomposed basalt, is wonderfully fertile. The rich undulating pasture-land with clumps of trees and copses resembles a park. Oranges, lemons, grapes, passion fruit, figs, pine-apples, guavas and other fruits grow abundantly; while potatoes, onions, maize and arrowroot can be cultivated. The Norfolk Island pine (*Araucaria excelsa*) is a magnificent tree, with a height sometimes exceeding 200 ft. and a girth of 30. A small species of palm is known as the Norfolk Island cabbage. Tree-ferns are abundant. The flora is most closely associated with that of New Zealand, and the avifauna indicates the same connexion rather than one with Australia, as those birds which belong to Australian genera are apparently immigrants, while those which occur on the island in common with New Zealand would be incapable of such distant migration. The climate is healthy, the thermometer rarely sinking below 65° F. The island is a station of the British Pacific cable. It was discovered in 1774 by Captain Cook, and was taken by Philip King of the "Stirling" and twenty-four convicts from New South Wales. This settlement was abandoned in 1805, but in 1826 the island was made a penal settlement from New South Wales. In 1856, 194 Pitcairn islanders took the place of the convicts. Forty of them soon returned to Pitcairn Island, and the remainder deteriorated owing to intermarriage. The administration of justice by an elected magistrate was unsatisfactory. Crime was rarely punished, and debts were not recoverable. A remedy was attempted in 1896 by an improvement in the government. The island was brought under the immediate administration of New South Wales; a chief magistrate, appointed by the governor of New South Wales, took the place of the elected magistrate, and an elected council of twelve elders superseded the general gathering of the adult population. In 1867 a Melanesian mission station was established at St Barnabas, and in 1882 a church was erected to the memory of Bishop Patteson, with windows designed by Burne-Jones and executed by William Morris.

NORICUM (*Noricus ager*), in ancient geography, a district bounded on the N. by the Danube, on the W. by Raetia and Vindelicia, on the E. by Pannonia, on the S. by Pannonia and Italy, corresponding to the greater part of the modern Styria and Carinthia, and part of Austria, Bavaria and Salzburg. The original population appears to have consisted of Illyrians, who after the great emigration of the Gauls became subordinate to various Celtic tribes, chief amongst them being the Taurisci, probably called Norici by the Romans from their capital Noreia (Neumarkt). The country is mountainous and the soil poor, but it was rich in iron, and supplied material for the manufactories of arms in Pannonia, Moesia and northern Italy. The famous Noric steel was largely used for the Roman weapons (" Noricus ensis," Horace, *Odes*, i. 16. 9). The inhabitants were a brave and warlike people, who paid more attention to cattle-breeding than to agriculture, although it is probable that the Romans, by draining the marshes and cutting down timber, increased the fertility of the soil. Gold and salt were also found in considerable quantities; the plant called *saliunca* (the wild or Celtic nard) grew in abundance, and was used as a perfume (Pliny, *Nat. Hist.* xxi. 20. 43). Noricum was the southern outpost of the northern or Celtic peoples and the starting-point of their attacks upon Italy. It is in Noricum that we first hear of almost all these Celtic invaders. Archaeological researches, particularly in the cemeteries of Hallstatt (*q.v.*), less than 40 m. from Noreia, have shown that for centuries before recorded history there was a vigorous civilization. The Hallstatt cemeteries contained weapons and ornaments from the Bronze age, through the period of transition, up to the fully-developed Iron age. Professor Ridgeway (*Early Age of Greece*, i. ch. 5) has made out a strong case for the theory that in Noricum and the neighbouring districts was the cradle of the Homeric Achaeans. For a long time the Noricans enjoyed independence under princes of their own, and carried on commerce with the Romans. In 48 B.C. they took the side of Caesar in the civil war against Pompey. In 16, having joined with the Pannonians in invading Histria, they were defeated by Publius Silius, proconsul of Illyricum. From this time Noricum is called a province, although not organized as such, but remaining a kingdom with the title *regnum Noricum.* It was under the control of an imperial procurator. It was not until the reign of Marcus Antoninus that the Legio II. Pia (afterwards called *Italica*) was stationed at Noricum, and the commander of the legion became the governor of the province. Under Diocletian, Noricum was divided into *Noricum ripense* (along the Danube) and *mediterraneum* (the southern mountainous district). Each division was under a *praeses*, and both belonged to the diocese of Illyria in the prefecture of Italy. The Roman colonies and chief towns were Virunum (near Mariasaal), Ovilava (Wels), Celeia (Cilli), Juvavum (Salzburg), Lauriacum (Lorch, at the mouth of the Enns, the ancient Anisus).

See A. Muchar, *Das römische Norikum* (Grätz, 1825); T. Mommsen, *Corpus inscriptionum Latinarum*, iii. 587; J. Marquardt, *Römische Staatsverwaltung*, i. (2nd ed., 1881) p. 290; Smith's *Dict. of Gk. and Roman Geog.* (1873); Mary B. Peaks, *The General Civil and Military Administration of Noricum and Raetia* (Chicago, 1907); full references to ancient authorities in A. Holder, *Alt-celtischer Sprachschatz*, ii. (1904). (J. H. F.)

NORMAN, SIR HENRY WYLIE (1826–1904), field-marshal and colonial governor, was born on the 2nd of December 1826, and entered the Indian army at the age of seventeen. In 1840 his father, who had been for many years a merchant in Cuba, became a partner in a mercantile house in Calcutta, where he was joined by his son in 1842. In 1844 the latter obtained a cadetship. He went through the second Sikh campaign and having attracted the favourable notice of Sir Colin Campbell was selected by him to accompany an expedition against the Kohat Pass Afridis in 1850 as officiating brigade-major. The subaltern of twenty-four was given a substantive appointment in this capacity for a splendid deed of gallantry, which is recorded by Sir Charles Napier in the following terms: " In the pass of Kohat a sepoy picket, descending a precipitous mountain under fire and the rolling of large stones, had some men killed and wounded. Four of the latter, dreadfully hurt, crept under some rocks for shelter. They were not missed until the picket reached the bottom, but were then discovered by our glasses, high up and helpless. Fortunately the enemy did not see them, and some sepoys volunteered a rescue, headed by Norman of the 31st Native Infantry and Ensign Murray of the 70th Native Infantry. These brave men—would that the names of all were known to me for record!—ascended the rocks in defiance of the enemy, and brought the wounded men down." Norman served in numerous frontier expeditions between 1850 and 1854, and in the suppression of the Sonthal rebellion of 1855–56. In the Mutiny campaign he was constantly engaged, being present at the siege of Delhi, the relief of Lucknow and a number of other affairs. As adjutant-general of the Delhi Field Force, he was one of the leading spirits of the siege, and afterwards became its chief chronicler. Altogether he was mentioned twenty-five times in despatches. He afterwards became assistant military secretary for Indian affairs at the Horse Guards, military secretary to the government of India, military member of the viceroy's council and member of the secretary of state for India's council. In 1883 Sir Henry began his colonial career as governor of Jamaica, an appointment from which he was transferred in 1888 to the governorship of Queensland. Here he remained until 1895, when he came home to act as agent-general for the colony in London. In 1893 he was offered the viceroyalty of India, but, after first accepting, declined it. In 1897 he was chairman of the royal commission of inquiry into the condition of the West Indies. In April 1901 he was appointed governor of the Royal Hospital, Chelsea, in succession to Sir Donald Stewart. In 1902 he was made a field-marshal. He died on the 26th of October 1904.

See Sir William Lee Warner, *Memoirs of Field-marshal Sir Henry Wylie Norman* (1908).

NORMAN, a city and township (coextensive) and the county-seat of Cleveland county, Oklahoma, U.S.A., about 2 m. N. of the Canadian river, and 18 m. S. by E. of Oklahoma City. Pop. (1890) 787; (1900) 2225; (1910) 3724. It is served by the Atchison, Topeka & Santa Fé railway. It is the seat of the university of Oklahoma (chartered, 1892; opened 1894; coeducational), which includes a college of arts and sciences, schools of applied science, medicine, pharmacy, mines and fine arts, and a preparatory school, and in 1908 had 56 instructors and 790 students. The Oklahoma Insane Asylum is in the city. Cotton-seed oil, flour and ice are manufactured, and the neighbouring region produces much cotton, Indian corn, oats, alfalfa and wheat. Hogs, cattle and sheep are raised. The first settlement here was made in 1889, and Norman was chartered as a city in 1902.

NORMANBY, CONSTANTINE HENRY PHIPPS, 1st Marquess of (1797–1863), British statesman and author, son of Henry, 1st earl of Mulgrave (1755–1831), was born on the 15th of May 1797. The 1st earl (who was created baron in 1794 and earl in 1812), was a distinguished soldier, and Pitt's chief military adviser; and he held the offices of chancellor of the duchy of Lancaster (1804), secretary for foreign affairs (1805), first lord of the admiralty (1807–1810), and master of the ordnance (1810–1818). In 1792 he inherited the earlier Irish barony of Mulgrave—created in 1767 for his father, Constantine (1722–1775) grandson of Sir Constantine Phipps (1656–1723), the lord chancellor of Ireland—from his elder brother Constantine (1744–1792), a distinguished naval captain. His son, the future marquess, passed through Harrow and Trinity College, Cambridge, and sat for the family borough of Scarborough as soon as he attained his majority. But, speaking in favour of Catholic emancipation, and dissenting in other points from the family politics, he resigned his seat, and went to live in Italy for some two years. Returning in 1822, he was elected for Higham Ferrers, and made a considerable reputation by political pamphlets and by his speeches in the house. He was returned for Malton at the general election of 1826, becoming a supporter of Canning. He was already known as a writer of romantic tales, *The English in Italy* (1825); in the same year he made his appearance as a novelist with *Matilda,* and in 1828 he produced another novel, *Yes and No*. Succeeding his father as earl of Mulgrave in 1831, he was sent out as governor of Jamaica, and was afterwards appointed lord-lieutenant of Ireland (1835–1839). He was created marquess of Normanby in 1838, and held successively the offices of colonial secretary and home secretary in the last years of Lord Melbourne's ministry. From 1846 to 1852 he was ambassador at Paris, and from 1854 to 1858 minister at Florence. The publication in 1857 of a journal kept in Paris during the stormy times of 1848 (*A Year of Revolution*), brought him into violent controversy with Louis Blanc, and he came into conflict with Lord Palmerston and Mr Gladstone, after his retirement from the public service, on questions of French and Italian policy. He died in London on the 28th of July 1863. He had married in 1818 the daughter of Lord Ravensworth, and was succeeded as 2nd marquess by his son George (1819–1890), a liberal politican, who became governor of Queensland (1871–1874), New Zealand (1874–1879), and Victoria (1879–1884).

NORMANDY, a province of old France, bounded on the N.E. by the river Bresle, which falls into the Channel at Tréport and separates Normandy from Picardy, and then roughly by the Epte, which divides the Vexin into two parts. From the confluence of the Epte and Seine to Ivry, the boundary between Normandy and the Ile-de-France is artificial; it is afterwards practically determined by the course of the Eure and the Sarthe. But from there to the sea Normandy is separated by no natural boundary either from Maine or afterwards from Brittany; it lies fairly regularly in the direction from E. to W. The boundary between the coast of Normandy and that of Brittany is formed by the mouth of the Couesnon. Normandy is washed by the English Channel and lies opposite to England. The northern part of the coast consists of cliffs, which cease at the mouth of the Seine, the estuary of which is 12 km. wide from Havre to Trouville; the coast of Calvados consists of rocks and beaches; that of the peninsula of Cotentin is sandy on the eastern side and granite on the west; in the north it forms between the point of Barfleur and the cape of La Hague a kind of concave arc in which lies the harbour of Cherbourg.

Historical Geography.—In the time of Caesar the country which has since gone to form Normandy was inhabited by several tribes of the Gauls, the *Caleti*, who lived in the district of Caux, the *Veliocassi*, in the Vexin, the *Lexovii*, in the Lieuvin, the *Unelli* in Cotentin; these are the only ones whose names have been preserved for us by Caesar. At the beginning of the 5th century, when the *Notitia provinciarum* was drawn up, Normandy corresponded to the *Provincia Lugdunensis Secunda*, the chief town of which was Rouen (*Civitas Rotomagensium*); it included seven *civitates* with that of Rouen: those of Bayeux (*C. Bajocassium*), Lisieux (*C. Lexoviorum*), Coutances (*C. Constantia*), Avranches (*C. Abrincatum*), Séez (*C. Sagiorum*) and Evreux (*C. Ebroicorum*). For ecclesiastical purposes it formed the ecclesiastical province of Rouen, with six suffragan sees. For civil purposes, the province was divided into a number of *pagi*: the *civitas* of Rouen formed the *pagus Rotomagensis* (Roumois), the *p. Caletus* (pays de Caux), the *p. Vilcassinus* (Vexin), the *p. Tellaus* (Talou); that of Bayeux the *pagus Bajocassinus* (Bessin), and the *Otlinga Saxonia*; that of Lisieux the *pagus Lexovinus* (Lieuvin); that of Coutances the *p. Corilensis* and *p. Constantinus* (Cotentin); that of Avranches the *p. Abrincatinus* (Avranchin); that of Séez the *p. Oximensis* (Hiémois), the *p. Sagensis* and *p. Corbonensis* (Corbonnais); and that of Evreux the *p. Ebroicinus* (Evrecin) and *p. Madriacensis* (pays de Madrie). It is to the settlement of the Normans in the country that Normandy owes its name; from the 10th century onwards it formed a duchy, roughly coextensive with the ecclesiastical province of Rouen. Under the feudal regime, the energy of the Norman dukes prevented the formation of many powerful lordships, and there are few worthy of note, save the countships of Eu, Harcourt, Le Perche and Mortain.

The duchy of Normandy, which was confiscated in 1204 by King Philip Augustus of France, formed in the 16th century the *gouvernement* of Normandy; the extent of this *gouvernement* did not, as a matter of fact, correspond exactly to that of the duchy, for Le Perche, which had been part of the duchy, was annexed to the *gouvernement* of Maine, while the Thimerais, which had belonged to the countship of Blois, was joined to the *gouvernement* of Normandy. In the 17th century this *gouvernement* was divided into three *généralités* or *intendances*: those of Rouen, Caen and Alençon. For judicial purposes Normandy was under the jurisdiction of the parlement of Rouen, created in 1499. Since 1791 the territory of the old duchy has composed, roughly speaking, the departments of Seine-Inférieure, Eure, Calvados, Manche and Orne.

History.—The prosperity of Normandy in Roman times is proved by the number and importance of the towns which existed there at that time. The most important was Lillebonne (*Juliobona*), chief town of the Caletes, the Roman antiquities of which are famous. The evangelization of Normandy did not take place before the 3rd century: the first bishop of Rouen, about 260, seems to have been St Mallonus; it is possible, however, that before this date there were a few Christian communities in Normandy, as seems to be proved by the existence of St Nicasius, who was martyred in the Vexin.

The province of *Lugdunensis Secunda*, which at the end of the 5th century formed part of the kingdom of Syagrius, was conquered by Clovis before 506, and during the Merovingian times followed the fortunes of Neustria. In the 9th century this country was ravaged by the Northmen, who were constantly going up and down the Seine, and later on it was formally ceded to them. During these incursions Rouen was occupied several times, notably in 876 and 885.

The definitive establishment of the Normans, to whom the country owes its name, took place in 911, when by the treaty of Saint-Clair-sur-Epte, concluded between King Charles the Simple of France and Rolf or Rollo, chief of the Normans, the territory comprising the town of Rouen and a few *pagi* situated on the sea-coast was ceded to the latter; but the terms of the treaty are ill-defined, and it is consequently almost impossible to find out the exact extent of this territory or to know whether Brittany was at this time made a feudal dependency of Normandy. But the chronicler Dudo of Saint-Quentin's statement that Rollo married Gisela, daughter of Charles the Simple, must be considered to be legendary. In 924 Rollo received from the king of France Bessin and Maine. Although baptized, he seems to have preserved certain pagan customs. The history of Normandy under Rollo and his immediate successors is very obscure, for the legendary work of Dudo of Saint-Quentin is practically our only authority.

Rollo died in 927, and was succeeded by his son William "Long Sword," born of his union *more danico* with Poppa, daughter of count Bérenger; he showed some attachment to the Scandinavian language, for he sent his son William to Bayeux to learn Norse. The first two dukes also displayed a certain fidelity to the Carolingian dynasty of France, and in 936 William "Long-Sword" did homage to Louis IV. d'Outremer. He died on the 17th of December 942, assassinated by the count of Flanders.

During the minority of his successor, Duke Richard, King Louis IV., who was making an expedition into Normandy, was captured by the inhabitants of Rouen and handed over to Hugh the Great. From this time onwards the dukes of Normandy began to enter into relations with the dukes of France; and in 958 Duke Richard married Hugh the Great's daughter. He died in 996. At the beginning of the reign of his son, Richard II. (996–1026), there was a rising of the peasants, who formed assemblies with a view to establishing fresh laws for the management of the forests. This attempt at insurrection, described by William of Jumièges, and treated by many historians, on the authority of the poet Wace, as a sort of democratic movement, was put down with a firm hand. Richard III. reigned from 1026–1027; he seems to have been poisoned by his brother, Robert the Magnificent, or the Devil (1027–1035), who succeeded him. In 1031 Robert supported King Henry I. of France against his brother Robert, who was laying claim to the throne, and in return for his services received the French Vexin. The duke died on a pilgrimage to Jerusalem, leaving as his heir an illegitimate son, William, born of his union with the daughter of a tanner of Falaise.

William was very young when his father started for the Holy Land, leaving him under the protection of the king of France. In 1047 Henry I. had to defend the young duke against an army of rebellious nobles, whom he succeeded in beating at Val-ès-dunes. In the following year the king of France was in his turn supported by the duke of Normandy in his struggle against Geoffrey Martel, count of Anjou; the two allies besieged

Mouliherne (1048); and the war was continued between the duke of Normandy and the count of Anjou by the siege of Alençon, which was taken by Geoffrey Martel, then retaken by William, and that of Domfront, which in 1049 had to surrender to Duke William.

In 1054 William the Bastard married Matilda, daughter of Baldwin V., count of Flanders, in spite of the opposition of Pope Leo IX., who only gave his consent on condition that William and Matilda should each build an abbey: under these conditions were built the Abbaye-aux-Hommes and the Abbaye-aux-Dames at Caen. The king of France had at first protected William, but before long became alarmed at his ambitions; the first sign of his feeling of rivalry with the duke was the encouragement he gave to the revolt of William Busas, count of Eu and Montreuil, who claimed the ducal crown. In 1054 he invaded Normandy with his brother Odo and this count, but Odo was beaten at Mortemer. In 1058 the king of France, joined by Geoffrey Martel, count of Anjou, tried to revenge himself, but was beaten at the ford of Varaville (1058).

Towards the same time took place the annexation of Maine to Normandy, for a short period only. Herbert II., the young count of Maine, who was a vassal of the count of Anjou, did homage to William the Bastard between 1055 and 1060, perhaps after the defeat of Geoffrey Martel; he promised to marry one of William's daughters, and betrothed his sister Margaret to the duke's son, Robert Curthose, on the understanding that, if he died leaving no children, the countship was to fall to William. After his death, the people of Maine revolted (1063), choosing as their lord Walter of Mantes, count of Vexin; but William the Bastard, after one campaign, succeeded in imposing the authority of Normandy. Three years later, William took possession of England, of which he was crowned king in 1066. Normandy now became the scene of William's quarrels with his son, Robert Curthose, who laid claim to Normandy and Maine, and with the aid of King Philip I. of France succeeded in defeating his father at Gerberoi in 1079.

William the Conqueror died on the 7th of September 1087, and was buried in the church of St Etienne at Caen. After his death his eldest son, Robert Curthose, kept Normandy and Maine, and his second son, William Rufus, became king of England. In 1091 William Rufus made a vain attempt to recover Normandy; but in 1096 Robert departed on a crusade and pledged the duchy to his brother for 10,000 livres. When Robert returned, William Rufus had just died, and his youngest brother, Henry Beauclerc, had already taken possession of the crown. Henry was ambitious of uniting Normandy to England; in 1105, with the aid of Helias, count of Maine, and the son of Geoffrey Martel, count of Anjou, he took and burnt Bayeux, but failed to take Falaise. On the 28th of September 1106, by the help of William, count of Evreux, Robert, count of Meulan, Robert de Varenne, and Helias, count of Maine, he defeated his brother at Tinchebrai, took him prisoner, and seized Normandy. Duke Robert passed the rest of his life in captivity and died in 1134.

From 1106 to 1204 Normandy remained united to England. According to Ordericus Vitalis, whose *Historia ecclesiastica* is a chronicle of the greatest interest for the history of Normandy in the 11th and 12th centuries, Henry Beauclerc governed the two kingdoms wisely, checking the nobles, and protecting the Church and the common people. He carried on hostilities against the king of France and William Clito, son of Robert Curthose, whose claim to the duchy of Normandy was upheld by Louis VI., and won an important victory over his opponents at Brémule in Normandy (1119). After the disaster of the White Ship (1121), in which the Atheling William lost his life, Henry's only surviving child was a daughter, Matilda, widow of the emperor Henry V. In 1127 Matilda married Geoffrey the Fair, eldest son of Fulk V., count of Anjou. After the death of Henry I. in 1135, a struggle arose between Matilda, who claimed the kingdom of England and the duchy of Normandy in the name of her son Henry Plantagenet, and Theobald, count of Champagne, grandson of William the Conqueror on the side of his mother Adela, the candidate of the Normans of Normandy, while the Norman party in England supported Stephen, brother of Theobald. In 1144 Theobald, whose position had been much weakened since the taking of the castle of Rouen, gave up his rights in Normandy to Matilda's husband Geoffrey, count of Anjou, in favour of Henry Plantagenet. Between 1139 and 1145 Geoffrey, with French and Flemish help, gradually subdued Normandy, and on his death, in 1151, his son Henry Plantagenet was master of Normandy as well as count of Anjou. In 1152, by his marriage with Eleanor, duchess of Aquitaine, the divorced wife of Louis VII. of France, Aquitaine also was secured to himself and his descendants. Finally, in 1153, he was recognized by Stephen of Blois as heir to the throne of England. The duchy of Normandy, though nominally in feudal dependence on the king of France, thus became part of the great Angevin empire, of which the power and resources were more than equal to that of the French kings. The perennial struggle, dating from this period, between the kings of England and France is dealt with elsewhere (see FRANCE: *History*, and ENGLISH HISTORY).

From the first the French kings were fully conscious of the menace of the Angevin power. The reign of Louis VII. was occupied by the struggle against Henry II. In 1158 he committed the blunder of concluding a treaty with Henry, by which he was to give his daughter Margaret in marriage to Henry Short Mantle, eldest son of Henry II., with the French Vexin as her dowry. The Vexin was consequently the scene of hostilities in 1159 and 1165. In 1173 Louis VII., resuming the policy of his grandfather and father, took advantage of the strife which broke out in the family of the king of England, and took the part of Henry II.'s sons who were in revolt against their father. He negotiated with Henry Short Mantle, duke of Normandy, as though he were king of England, but owing to his weakness did not gain any serious advantage. In 1173 he abandoned the siege of Verneuil, in 1174 that of Rouen, and was no more successful in 1176.

Philip Augustus (1180–1223) pursued the same policy with greater tenacity and success. He began by taking part against Henry II. with his son and successor, Richard Cœur de Lion, who obtained the throne on the death of Henry II. in 1189. From the point of view of Normandy, the most important events of Richard's reign were: the truce of Issoudun, by which Philip Augustus kept the Norman Vexin which he had just conquered (1195), the building by Richard of Château-Gaillard (1196), and finally the defeat of Philip Augustus by Richard at Courcelles, near Gisors (1198). On the death of Richard at Chalus in 1199 the position of Philip Augustus was critical. This situation was modified under the reign of John Lackland, Richard's brother, who had himself crowned duke of Normandy at Rouen (April 25, 1199). Philip Augustus set up in opposition to him Arthur of Brittany, son of Geoffrey and grandson of Henry II., and the first phase of the struggle between the kings of France and England continued until the treaty of Goulet (1200). But in 1202 Philip made a fresh attempt to seize the continental possessions of the kings of England. An excuse for reopening hostilities offered itself in the abduction, by John, of Isabel of Angoulême, the betrothed of Hugh le Brun, son of the count of La Marche. The barons appealed to Philip Augustus, who summoned John to appear before the royal judges; he failed to appear, and was consequently condemned by default, as a disloyal vassal, to have all the fiefs which he held in France confiscated (April 1202). The confiscation, a purely legal and formal operation, was followed by the actual conquest.

In June 1202 Philip Augustus invaded Normandy and besieged the castle of Arques, near Dieppe; at the same time Arthur of Brittany was taken prisoner by John at Mirebeau in Poitou, and imprisoned in the castle of Falaise, from which he was removed to Rouen and died, probably assassinated by John's orders. The conquest of Normandy began with the occupation of Château-Gaillard after an eight months' siege (September 1203–April 1204); the rest of Normandy was taken during the following months, Rouen surrendering in 1204 but obtaining a guarantee of her privileges. The conquest of Normandy by the French was not, however, recognized officially till the treaty of Paris (1259).

Normandy enjoyed a time of comparative prosperity under French rule, up to the time of the Hundred Years' War. The institution of the Estates of Normandy even assured her a sort of independence. In 1329 the duchy of Normandy was revived in favour of John, son of King Philip VI.

Owing to her geographical position, Normandy suffered heavily during the Hundred Years' War. In 1346 Edward III., at the instance of Godefroi d'Harcourt lord of Saint-Sauveur, invaded Normandy, landing at Saint-Vast-la-Hougue (July 12); and arriving at Caen on the 25th of July, he laid waste the country as far as Poissy. After the accession of John II. (1350), Normandy was again separated from the crown and given as an appanage to the dauphin Charles. The treaty of London (1359) stipulated for its cession to England, but the provisions of the treaty were modified by those of the treaty of Brétigny (1360), and it remained in the possession of France.

John II. died in 1364, and was succeeded by his son Charles V. One of the chief feudatories of Normandy, Charles the Bad, grandson of Louis X. le Hutin, and a claimant to the crown of France, was in 1365, owing to his continued treachery, deprived of the countship of Longueville, and in 1378 of all his other possessions in Upper and Lower Normandy. The most striking event of the war between the French and English which took place in Normandy during the reign of Charles V. was the siege of Saint-Sauveur-le-Vicomte, which was occupied by the English, and only surrendered after a siege of several years.

The opening years of the reign of Charles VI. (1380–1422) were disturbed by a revolt which broke out at Rouen against the *aides* which the royal government had tried to impose (1381); a cloth-merchant was proclaimed king of Rouen, and Charles was obliged to go in person to Rouen to put down the insurrection. In 1415 the war with England was resumed: an English army of 60,000 men landed on the 14th of August at the mouth of the Seine, took Harfleur on the 16th of September, and finally defeated the army of the king of France at Agincourt. During the following years the whole of Normandy was occupied, Rouen holding out for nearly six months (July 29, 1418–January 13, 1419), and Henry V. of England entrusted the administration of Normandy to a special council. In spite of the moderation of the duke of Bedford's government, Normandy, ruined by the war, was in a state of great distress, and in the years following the treaty of Troyes (1420) there was a continual resistance offered to the English. This resistance became general after the expeditions of Joan of Arc and the treaty of Arras; at the end of 1435 the whole district of Caux, and in 1436 that of the Val de Vire revolted; Mont-Saint-Michel, which had never been taken by the English, continued to resist, and in order to keep guard over it the English built Granville. But Normandy was not recovered by the French till after the sack of Fougères (1449). Cotentin was reconquered by Richmond (see ARTHUR, duke of Brittany) and the duke of Brittany; Rouen surrendered on the 29th of October 1449. In face of these successes of the French, an English army was sent into Normandy under the leadership of Thomas Kyriel; it landed at Cherbourg and marched across Cotentin to Bayeux, but was met at Formigny (April 15, 1450) by the count of Clermont and utterly routed. Shortly afterwards Caen, and finally Cherbourg, capitulated.

After the French conquest, the history of Normandy is less eventful. In 1465 Normandy was given as an appanage to Charles, brother of King Louis XI., who was deprived of it in 1467. The kings of France tried to win the support of Normandy by certain favours, such as maintaining the provincial Estates and the University of Caen, founded by the kings of England, and transforming the Exchequer of Normandy into a permanent court of justice (1499) which was called the Parlement of Normandy and sat at Rouen in the famous Palais de Justice. Among the measures which contributed to the increase of the prosperity of Normandy should be noted the construction in 1752 of the Hâvre de Grace.

During the 16th century the Protestant Reformation met with some success in Normandy, where the Wars of Religion caused a certain amount of disturbance. The Reforming movement began with Pierre Bar in 1528, and the first apostle of the Reformation at Rouen was François Legay, called Boisnormand. In 1562 the town of Rouen was taken by the Calvinists, but retaken in the same year by the Catholics. Caen received the Reformed religion in 1531, and Alençon in 1582. In the massacre of Saint Bartholomew's day (1572) more than 500 victims were slaughtered by the Catholics.

In spite of the success of Protestant ideas, however, the Catholic party of the League succeeded after 1588 in establishing itself in Normandy, and King Henry IV. had to conquer it by force of arms. The most famous engagements during this expedition were the victories of Henry IV. at Arques and Ivry, but he failed to take Rouen, which was defended by Alexander Farnese, duke of Parma, and only surrendered after the abjuration of the king.

The history of Normandy in the 17th and 18th centuries contains few events of note, except for a few attempts at landing made by the English during the Seven Years' War (1756–1763); in 1758 the English admiral Anson attacked Cherbourg, and in 1759 Admiral Rodney bombarded Havre. From 1790 dates the creation of the departments, when Normandy ceased to have a separate political existence, and her history becomes one with that of France.

See G. Depping, *Histoire de la Normandie* (2 vols., 1835); Fr. Palgrave, *The History of Normandy and of England* (2 vols., 1851–1857); E. A. Freeman, *The History of the Norman Conquest of England* (3rd ed., 5 vols., Oxford, 1877); Joh. Steenstrup, *Les Normands* (1880); Louis du Bois, *Itinéraire descriptif, historique et monumental des cinq départements composant la Normandie* (1828); John Cotman, *Architectural Antiquities of Normandy* (2 vols., 1820); Léopold Delisle, *Étude sur la condition des classes agricoles en Normandie* (reprinted 1906), *La Normandie illustrée* (2 vols., 1852–1855); A. Duchesne, *Historiae Normanorum scriptores antiqui* (1619); E. J. Tardif, *Les Coutumiers de Normandie* (1881–1896); Édouard Frere, *Manuel de bibliographie normande* (1858–1860); Artur du Monstier, *Neustria pia* (1663); N. Oursel, *Nouvelle Biographie normande* (3 vols., 1886–1888). Publications of the learned societies of the province analysed in the *Bibliographie* of Robert de Lasteyrie.

(R. La.)

NORMANS, the softened form of the word "Northman," applied first to the people of Scandinavia in general, and afterwards specially to the people of Norway. In the form of "Norman" (*Northmannus, Normannus, Normand*) it is the name of those colonists from Scandinavia who settled themselves in Gaul, who founded Normandy, who adopted the French tongue and French manners, and who from their new home set forth on new errands of conquest, chiefly in the British Islands and in southern Italy and Sicily. From one point of view the expeditions of the Normans may be looked on as continuations of the expeditions of the Northmen. As the name is etymologically the same, so the people are by descent the same, and they are still led by the old spirit of war and adventure. But in the view of general history Normans and Northmen must be carefully distinguished. The change in the name is the sign of a thorough change, if not in the people themselves, yet in their historical position. Their national character remains largely the same; but they have adopted a new religion, a new language, a new system of law and society, new thoughts and feelings on all matters. Like as the Norman still is to the Northman, the effects of a settlement of Normans are utterly different from the effects of a settlement of Northmen. There can be no doubt that the establishment of the Norman power in England was, like the establishment of the Danish power, greatly helped by the essential kindred of Normans, Danes and English. But it was helped only silently. To all outward appearance the Norman conquest of England was an event of an altogether different character from the Danish conquest. The one was a conquest by a people whose tongue and institutions were still palpably akin to those of the English. The other was a conquest by a people whose tongue and institutions were palpably different from those of the English. The Norman settlers in England felt no community with the earlier Danish settlers in England. In fact the Normans met with the steadiest resistance in a part of England which was largely Danish. But the effect of real, though unacknowledged, kindred had none the less an important practical effect. There can be no doubt that this hidden working of kindred between conquerors and conquered in England, as compared with the utter lack of all fellowship between conquerors and conquered in Sicily, was one cause out of several which made so wide a difference between the Norman conquest of England and the Norman conquest of Sicily.

Character of the Normans.

These two conquests, wrought in the great island of the Ocean and in the great island of the Mediterranean, were the main works of the Normans after they had fully put on the character of a Christian and French-speaking people, in other words, after they had changed from Northmen into Normans. The English and the Sicilian settlements form the main Norman history of the 11th century. The 10th century is the time of the settlement of the Northmen in Gaul, and of the change in religion and language of which the softening of the name is the outward sign. By the end of it, any traces of heathen faith, and even of Scandinavian speech, must have been mere survivals. The new creed, the new speech, the new social system, had taken such deep root that the descendants of the Scandinavian settlers were better fitted to be the armed missionaries of all these things than the neighbours from whom they had borrowed their new possessions. With the zeal of new converts they set forth on their new errand very much in the spirit of their heathen forefathers. If Britain and Sicily were the greatest fields of their enterprise, they were very far from being the only fields. The same spirit of enterprise which brought the Northmen into Gaul seems to carry the Normans out of Gaul into every corner of the world. Their character is well painted by a contemporary historian of their exploits.[1] He sets the Normans before us as a race specially marked by cunning, despising their own inheritance in the hope of winning a greater, eager after both gain and dominion, given to imitation of all kinds, holding a certain mean between lavishness and greediness—that is, perhaps uniting, as they certainly did, these two seemingly opposite qualities. Their chief men, he adds, were specially lavish through their desire of good report. They were, moreover, a race skilful in flattery, given to the study of eloquence, so that the very boys were orators, a race altogether unbridled unless held firmly down by the yoke of justice. They were enduring of toil, hunger, and cold whenever fortune laid it on them, given to hunting and hawking, delighting in the pleasure of horses, and of all the weapons and garb of war. Several of these features stand out very clearly in Norman history. The cunning of the Normans is plain enough; so is their impatience of restraint, unless held down by a strong master. Love of imitation is also marked. Little of original invention can be traced to any strictly Norman source; but no people were ever more eager to adopt from other nations, to take into their service and friendship from any quarter men of learning and skill and eminence of every kind. To this quality is perhaps to be attributed the fact that a people who did so much, who settled and conquered in so large a part of Europe, has practically vanished from the face of the earth. If Normans, as Normans, now exist anywhere, it is certainly only in that insular fragment of the ancient duchy which still cleaves to the successor of its ancient dukes. Elsewhere, as the settlers in Gaul became French, the emigrants from Gaul became English, Irish, Scottish, and whatever we are to call the present inhabitants of Sicily and southern Italy. Everywhere they gradually lost themselves among the people whom they conquered; they adopted the language and the national feelings of the lands in which they settled; but at the same time they often modified, often strengthened the national usages and national life of the various nations in which they were finally merged.

Their faculty of adaptation.

But Geoffrey hardly did justice to the Normans if he meant to imply that they were simple imitators of others. Their position was very like that of the Saracens. Hasty writers who forget the existence of the eastern Rome are apt to claim for the Saracens of Bagdad, or more commonly for those of Cordova, a monopoly of science and art at some time not very clearly defined by dates. In so doing they slur over the real position and the real merit of the Saracens with regard to science and art. In neither department did any Saracen, strictly speaking, invent anything; but they learned much both from Constantinople and from Persia, and what they learned they largely developed and improved. The Normans did just the same. They adopted the French tongue, and were presently among the first to practise and spread abroad its literature. They adopted the growing feudal doctrines of France, and worked them, both in Normandy and in England, into a harmonious system. From northern Italy, as it would seem, they adopted a style of architecture which grew in their hands, both in Normandy and in England, into a marked and living form of art. Settled in Gaul, the Scandinavian from a seafaring man became a landsman. Even in land-warfare he cast aside the weapons of his forefathers; but he soon learned to handle the weapons of his new land with greater prowess than they had ever been handled before. He welcomed the lore of every stranger. Lanfranc brought law and discipline; Anselm brought theology and philosophy. The gifts of each were adopted and bore fruit on both sides of the Channel. And no people ever better knew how to be all things to all men. The Norman power in England was founded on full and speedy union with the one nation among whom they found themselves. The Norman power in Sicily was founded on a strong distinction between the ruling people and the many nations which they kept in peace and prosperity by not throwing in their lot with any one among them.

The quality which Geoffrey Malaterra expresses by the word "effrenatissima" is also clearly marked in Norman history. It is, in fact, the groundwork of the historic Norman character. It takes in one case the form of ceaseless enterprise, in another the form of that lawlessness which ever broke out, both in Normandy and in every other country settled by Normans, when the hand of a strong ruler was wanting. But it was balanced by another quality which Geoffrey does not speak of, one which is not really inconsistent with the other, one which is very prominent in the Norman character, and which is, no less than the other, a direct heritage from their Scandinavian forefathers. This is the excessive litigiousness, the fondness for law, legal forms, legal processes, which has ever been characteristic of the people. If the Norman was a born soldier, he was also a born lawyer. Ranulf Flambard, working together the detached feudal usages of earlier times into a compact and logical system of feudal law, was as characteristic a type of the people as any warrior in the Conqueror's following. He was the organizer of an endless official army, of an elaborate technical system of administration, which had nothing like it in England before, but which grew up to perfection under Norman rulers.[2] But nothing so well illustrates this formal side of the Norman character as the whole position of William the Conqueror himself. His claim to the crown of England is something without earlier precedent, something as far as possible removed from the open violence of aggressors who have no pretexts with which to disguise their aggression. It rested on a mass of legal assumptions and subtleties, fallacious indeed, but ingenious, and, as the result proved, effective. His whole system of government, his confiscations, his grants, all that he did, was a logical deduction from one or two legal principles, arbitrary certainly in their conception, but strictly carried out to their results. Even Norman lawlessness in some sort took a legal shape. In the worst days of anarchy, in the minority of William or under the no-reign of Robert, the robber-baron could commonly give elaborate reasons for every act of wrong that he did.

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[1] Geoffrey Malaterra, i. 3 "Est quippe gens astutissima, injuriarum ultrix, spe alias plus lucrandi, patrios agros vilipendens, quaestus et dominationis avida, cujuslibet rei simulatrix, inter largitatem et avaritiam quoddam medium habens. Principes vero delectatione bonae famae largissimi, gens adulari sciens, eloquentiis in studiis inserviens in tantum, ut etiam ipsos pueros quasi rhetores attendas, quae quidem, nisi jugo justitiae prematur, effrenatissima est; laboris, inediae, algoris, ubi fortuna expedit, patiens, venationi accipitrum exercitio inserviens. Equorum, caeterorumque militiae instrumentorum, et vestium luxuria delectatur. Ex nomine itaque suo terrae nomen indiderunt. North quippe Anglica lingua aquilonaris plaga dicitur. Et quia ipsi ab aquilone venerant terram ipsam etiam Normanniam appellarunt."

[2] This view of Ranulf Flambard's work, which on Freeman's authority superseded the older view, which attributed the feudal organization of England to the Conqueror himself, was subjected to a destructive criticism by Mr J. H. Round in his *Feudal England*. (Ed.)

Observance of Religious Forms.

It is perhaps less wonderful that this characteristic should have been left out in a picture of the Normans in Apulia and Sicily than if it had been left out in a picture of the Normans in Normandy and England. The circumstances of their Apulian and Sicilian conquests certainly did not tend to bring out this feature of their character so strongly as it was brought out by the circumstances of their English conquest. Possibly the same cause may have kept the chronicler from enlarging on their religious character; yet in Sicily at least they might pass for crusaders. Crusaders in fact they were before crusades were preached. Norman warriors had long before helped the Christians of Spain in their warfare with the Saracens of the Peninsula, and in Sicily it was from the same enemy that they won the great Mediterranean island. Others had done a kindred work in a more distant field as helpers of the Eastern emperors against the Turks of Asia. All these might pass for religious wars, and they might really be so; it needed greater ingenuity to set forth the invasion of England as a missionary enterprise designed for the spiritual good of the benighted islanders. The Norman, a strict observer of forms in all matters, attended to the forms of religion with special care. No people were more bountiful to ecclesiastical bodies on both sides of the Channel; the foundation of a Benedictine monastery in the 11th century, of a Cistercian monastery in the 12th seemed almost a matter of course on the part of a Norman baron. The Conqueror beyond doubt sincerely aimed at being a religious reformer both in his duchy and in his kingdom, while it is needless to say that his immediate successor was exceptionally ungodly, whether among Normans or among other men. But among their countrymen generally strict attendance to religious observances, a wide bounty to religious foundations, may be set down as national characteristics. On the other hand, none were less inclined to submit to encroachments on the part of the ecclesiastical power, the Conqueror himself least of all.

The Conquest of England and that of Sicily compared.

We thus see in the Scandinavian settlers in Gaul, after they had put on the outward garb of their adopted country, a people restless and enterprising above all others, adopting and spreading abroad all that they could make their own in their new land and everywhere else—a people in many ways highly gifted, greatly affecting and modifying at the time every land in which they settled, but, wherever they settled, gradually losing themselves among the people of the land. The Norman, as a visible element in the country, has vanished from England, and he has vanished from Sicily. The circumstances of his settlement in his two great fields of conquest were widely different; his position when he was fully established in his two insular realms was widely different; but the end has been the same in both cases. Neither island has for ages been in any sense a Norman land, and the tongue which the Norman brought with him into both has not for ages been spoken in either. Norman influence has been far stronger in England than in Sicily, and signs of Norman presence are far more easily recognized. But the Norman, as a distinct people, is as little to be seen in the one island as in the other. His disappearance in both cases is an illustration of one of the features which we have spoken of in the Norman character, the tendency which in fact made Normans out of Northmen, the tendency to adopt the language and manners of the people among whom they found themselves. But, as far as outward circumstances are concerned, we may say that the same effect has been brought about by different and almost opposite causes. The whole circumstances of the conquest of England constrained the conquerors to become Englishmen in order to establish themselves in the conquered land. In William's theory, the forcible conquest of England by strangers was an untoward accident. The lawful heir of the English crown was driven against his will to win his rights by force from outside. But he none the less held his crown as an English king succeeding according to English law. Moreover, every Norman to whom he granted lands and offices held them by English law in a much truer sense than the king held his; he was deemed to step into the exact position of his English predecessor, whatever that might be. This legal theory worked together with other causes to wipe out all practical distinction between the conquerors and the conquered in a wonderfully short time. By the end of the 12th century the Normans in England might fairly pass as Englishmen, and they had largely adopted the use of the English language. The fashionable use of French for nearly two centuries longer was far more a French fashion than a Norman tradition. When the tradition of speaking French had all but died out, the practice was revived by fashion. Still the tradition had its effect. The fashion could hardly have taken root except in a land where the tradition had gone before it.

The Normans in England therefore became Englishmen, because there was an English nation into which they could be absorbed. The Normans in Sicily could hardly be said to become Sicilians, for there assuredly was no Sicilian nation for them to be absorbed into. While the Normans in England were lost among the people of the land, the Normans in Sicily were lost among their fellow-settlers in the land. The Normans who came into Sicily must have been much less purely Norman than the Normans who came into England. The army of Duke William was undoubtedly very far from being wholly made up of Normans, but it was a Norman army; the element which was not Norman, though considerable, was exceptional. But we may doubt whether the Norman invaders of Sicily were Norman in much more than being commanded by Norman leaders. They were almost as little entitled to be called pure Scandinavians as the Saracens whom they found in the island were entitled to be called pure Arabs. The conquest of England was made directly from Normandy, by the reigning duke, in a comparatively short time, while the conquest of Sicily grew out of the earlier and far more gradual conquest of Apulia and Calabria by private men. The Norman settlements at Aversa and Capua were the work of adventurers, making their own fortunes and gathering round them followers from all quarters. They fought simply for their own hands, and took what they could by the right of the stronger. They started with no such claim as Duke William put forth to justify his invasion of England; their only show of legal right was the papal grant of conquests that were already made. The conquest of Apulia, won bit by bit in many years of what we can only call freebooting, was not a national Norman enterprise like the conquest of England, and the settlement to which it led could not be a national Norman settlement in the same sense. The Sicilian enterprise had in some respects another character. By the time it began the freebooters had grown into princes. Sicily was won by a duke of Apulia and a count of Sicily.[1] Still there was a wide difference between the duke of the Normans and the duke of Apulia, between an hereditary prince of a hundred and fifty years' standing and an adventurer who had carved out his duchy for himself. And, besides this, warfare in Sicily brought in higher motives and objects. Though crusades had not yet been preached, the strife with the Mussulman at once brought in the crusading element; to the Christian people of the island they were in many cases real deliverers; still, the actual process by which Sicily was won was not so very different from that by which Apulia had been won. Duke William was undisputed master of England at the end of five years; it took Count Roger thirty years to make himself undisputed master of Sicily. The one claimed an existing kingdom, and obtained full possession of it in a comparatively short time; the other formed for himself a dominion bit by bit, which rose to the rank of a kingdom in the next generation. When Count Roger at last found himself lord of the whole island, he found himself lord of men of various creeds and tongues, of whom his own Norman followers were but one class out of several. And the circumstances of his conquest were such that the true Normans among his following could not possibly lose themselves among the existing inhabitants of the island, while everything tended to make them lose themselves among their fellow-adventurers of other races, among whom, by the time the conquest was ended, they could hardly have been even a dominant element.

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[1] Roger de Hauteville, the conqueror of Sicily, was a brother of the first four dukes or counts of Apulia, and was invested with the countship of Sicily by the pope before starting on his adventure.

As far then as concerned the lands in which the settlements were made, the difference lay in this, that, as has been already said, while there was an English nation, there was no Sicilian nation. The characteristic point of Norman rule in Sicily is that it is the rule of princes who were foreign to all the inhabitants of the island, but who were not more foreign to the inhabitants of the island than different classes of them were to one another. The Norman conqueror found in Sicily a Christian and Greek-speaking people and a Mussulman and Arabic-speaking people. The relations between the two differed widely in different parts of the island, according to the way in which the Saracens had become possessed of different towns and districts. In one place the Christians were in utter bondage, in another they were simply tributary; still, everywhere the Mussulman Saracen formed the ruling class, the Christian Greek formed the subject class. We speak of the Saracen very much as we speak of the Norman; for of the Mussulman masters of Sicily very many must have been only artificial Arabs, Africans who had adopted the creed, language and manners of Arabia. In each case the Arab or the Norman was the kernel, the centre round which all other elements gathered and which gave its character to the whole. Besides these two main races, Greek and Saracen, others came in through the Norman invasion itself. There were the conquerors themselves; there were the Italians, in Sicily known as Lombards, who followed in their wake; there were also the Jews, whom they may have found in the island, or who may have followed the Norman into Sicily, as they certainly followed him into England. The special character of Norman rule in Sicily was that all these various races flourished, each in its own fashion, each keeping its own creed, tongue and manners, under the protection of a common sovereign, who belonged to none of them, but who did impartial justice to all. Such a state of things might seem degradation to the Mussulman, but it was deliverance to the native Christian, while to settlers of every kind from outside it was an opening such as they could hardly find elsewhere. But the growth of a united Sicilian nation was impossible; the usual style to express the inhabitants of the island is "omnes" or "universi Siciliae populi." In the end something like a Sicilian nation did arise; but it arose rather by the dying out of several of the elements in the country, the Norman element among them, than by any such fusion as took place in England. That is, as has been already said, the Norman as such has vanished in two different ways. In England the Norman duke came in as a foreign intruder, without a native supporter to establish his rule over a single nation in its own land. He could not profess to be, as the count of Sicily could honestly profess to be, a deliverer to a large part of the people of the land. But, coming in by a title which professed to be founded on English law, establishing his followers by grants which professed no less to be founded on English law, he planted a dynasty, and established a dominant order, which could not fail to become English. The Normans in England did not die out; they were merged in the existing nation. The Normans in Sicily, so far as they did not die out, were merged, not in a Sicilian nation, for that did not exist, but in the common mass of settlers of Latin speech and rite, as distinguished from the older inhabitants, Greek and Saracen. The Norman conquest of England was at the moment a curse; the Norman conquest of Sicily was at the moment a blessing. But the gradual and indirect results of the Norman conquest of England are easily to be seen to this day, and they have been largely, though indirectly, results for good. Its chief result has been, not so much to create anything new as at once to modify and to strengthen what was old, to call up older institutions to a new life under other forms. But whatever it has done it has done silently; there has not been at any time any violent change of one set of institutions for another. In Sicily and southern Italy there is hardly any visible Norman influence, except the great historic fact which we may call the creation of Sicily and southern Italy in their modern sense. The coming of the Norman ruled that these lands should be neither Saracen nor Greek, nor yet Italian in the same sense as northern Italy, but that they should politically belong to the same group of states as the kingdoms and principalities of feudal Europe. William assuredly did not create the kingdom of England; Roger assuredly did create the kingdom of Sicily. And yet, notwithstanding all this, and partly because of all this, real and distinct Norman influence has been far more extensive and far more abiding in England than it has been in Sicily.

In Sicily then the circumstances of the conquest led the Norman settlers to remain far more distinct from the older races of the land than they did in England, and in the end to lose themselves, not in those older races of the land, but in the settlers of other races who accompanied and followed them. So far as there ever was a Sicilian nation at all, it might be said to be called into being by the emperor-king Frederick II. In his day a Latin element finally triumphed; but it was not a Norman or French-speaking element of any kind. The speech of the Lombards at last got the better of Greek, Arabic and French; how far its ascendancy can have been built on any survival of an earlier Latin speech which had lived on alongside of Greek and Arabic this is not the place to inquire.

Use of languages in England and in Sicily.

The use of language and nomenclature during the time of Norman rule in the two countries forms a remarkable contrast, and illustrates the circumstances of the two as they have just been sketched. The chroniclers of the conquest of Apulia and Sicily use the Norman name in every page as the name of the followers of the conquerors from Hauteville. It was the natural name for a body of men who must, by the time the conquest of Sicily was over, have been very mixed, but whose kernel was Norman, whose strength and feelings and traditions all came from a Norman source. But if we turn to Hugo Falcandus, the historian of Sicily in the 12th century, the Norman name is hardly found, unless when it is used historically to point out (as in Muratori vii. 260) that the royal house of Sicily was of Norman descent. Of the various "Siciliae populi," we hear of Greeks, Saracens, Lombards, sometimes of Franci, for by that time there were many French-speaking settlers in Sicily who were not of Norman descent. There is a distinction between Christians and Saracens; among Christians there seems to be again a distinction between Greeks and Latins, though perhaps without any distinct use of the Latin name; there is again a further distinction between "Lombardi" and "Franci"; but Normans, as a separate class, do not appear. In England there is no room for such subtleties. The narratives of the conquest of England use both the Norman and the French names to express the followers of William. In the English chronicles "French" is the only name used. It appears also in the Bayeux Tapestry, and it is the only word used when any legal distinction had to be drawn between classes of men in the English kingdom. "Franci" and "Angli" are often opposed in Domesday and other documents, and the formula went on in charters long after all real distinction had passed away. That is to say, there were several purposes for which it was convenient to distinguish "English" and "French"—the last name taking in all the followers of the Conqueror; there were no purposes for which there was any need to distinguish Normans as such, either from the general mass of the people or from others who spoke the French tongue. We can see also that, though several languages were in use in England during the time of Norman rule, yet England was not a land of many languages in the same sense in which Sicily was. In the 12th century three languages were certainly spoken in London; yet London could not call itself the "city of threefold speech," as Palermo did. English, French, Latin, were all in use in England; but the distinction was rather that they were used for three different purposes than that they were used by three distinct races or even classes. No doubt there was a class that knew only English; there may have been a much smaller class that knew only French; any man who pretended to high cultivation would speak all as a matter of course; Bishop Gilbert Foliot, for instance, was eloquent in all three. But in Sicily we see the quite different phenomenon of three, four, five classes of men living side by side, each keeping its own nationality and speaking its own tongue. If a man of one people knew the speech of any of the others, he knew it strictly as a foreign language. Before the Norman Conquest England had two official tongues; documents were drawn up sometimes in English, sometimes in Latin, now and then in both. And the same usage went on after the Conquest; the use of English becomes gradually rarer, and dies out under the first Angevins, but it is in favour of Latin that it dies out. French, the language which the Normans brought with them, did not become an official language in England till after strictly Norman rule had passed away. French documents are unknown till the days of French fashion had come in, that is, till deep in the 13th century. So it was in Sicily also; of all the tongues of Sicily French was the most needful in the king's court ("Francorum lingua quae maxime necessaria esset in curia," says Hugo Falcandus, 321); but it was not an official tongue. The three tongues of Palermo are Greek, Arabic and Latin. King Roger's clock is commemorated in all three. Documents were drawn up in such and so many of these tongues as was convenient for the parties concerned; not a few private documents add a fourth tongue, and are drawn up in Greek, Arabic, Latin and Hebrew. In neither case is the actual speech of the conquerors one of the tongues in formal use. French, as a separate tongue from Latin, already existed as a literary speech, and no people had done more than the Normans to spread it as a literary speech, in both prose and verse. But neither in England nor in Sicily did official formalism acknowledge even French, much less Italian, as a fit tongue for solemn documents. In England, English, French, Latin, were the three tongues of a single nation; they were its vulgar, its courtly and its learned speeches, of which three the courtly was fast giving way to the vulgar. In Sicily, Greek, Arabic, Latin and its children were the tongues of distinct nations; French might be the politest speech, but neither Greek nor Arabic could be set down as a vulgar tongue, Arabic even less than Greek.

Normans in Scotland.

Wales.

Ireland.

The different positions then which the conquering Norman took in his two great conquests of England and of Sicily amply illustrate the way in which he could adapt himself to any circumstances in which he found himself, the way in which he could adopt whatever suited his purpose in the institutions of any other people, the way in which he commonly lost his national being in that of some other people. From England, moreover, he spread into Scotland, Wales and Ireland, and in each land his settlement put on a somewhat different character, according to the circumstances of the land. In Scotland he was not a conqueror, but a mere visitor, and oddly enough he came as a visitor along with those whom he had himself overcome in England. Both Normans and English came to Scotland in crowds in the days of Margaret, Edgar and David, and Scottish national feeling sometimes rose up against them. In Scotland again the Norman settlers were lost in the mixed nationality of the country, but not till they had modified many things in the same way in which they modified things in England. They gave Scotland nobles and even kings; Bruce and Balliol were both of the truest Norman descent; the true Norman descent of Comyn might be doubted, but he was of the stock of the Francigenae of the Conquest. In Wales the Norman came as a conqueror, more strictly a conqueror than in England; he could not claim Welsh crowns or Welsh estates under any fiction of Welsh law. The Norman settler in Wales, therefore, did not to any perceptible extent become a Welshman; the existing relations of England and Wales were such that he in the end became an Englishman, but he seems not unnaturally to have been somewhat slower in so doing in Wales than he was in England. At least Giraldus Cambrensis, the Norman Welshman or Welsh Norman, was certainly more alive to the distinction between Normans and English than any other of his contemporaries. In Ireland the Norman was more purely a conqueror than anywhere else; but in Ireland his power of adaptation caused him to sink in a way in which he sank nowhere else. While some of the Norman settlers in Ireland went to swell the mass of the English of the Pale, others threw in their lot with the native Irish, and became, in the well-known saying, *Hibernis ipsis Hiberniores* (see *e.g.* the article BURGH).

Norman architecture in England and in Sicily.

There is yet one point in which we may profitably go back to our comparison between England and Sicily. Both countries are rich in works of architecture raised during the time of Norman rule. And the buildings of both lands throw an instructive light on the Norman national character, as we have described it. Few buildings, at least few buildings raised in any reasonable style of architecture which makes use of the arched construction, can be less like one another than the buildings of the Norman kings in England and the buildings of the Norman kings in Sicily. In Sicily the Normans found the two most outwardly civilized of the nations of Europe, the two which had as yet carried the arts to the highest pitch. The Greek had created the column; the Roman had developed it; the Roman Greek or Greek Roman had taught the column to bear the cupola; the Saracen had taught it to bear arches of his own favourite pointed shape. Out of these elements the Saracens of Sicily had formed a noble and beautiful style, grand and simple in its construction, rich and graceful in its characteristic detail. With the Saracen and the Greek as his subjects, the Norman had really no need to innovate; he had simply to bid the men of the land to go on working for him instead of for any other. The palaces and churches of the Norman kings at Palermo and Monreale and Cefalu and Messina are in style simply Saracenic; they were most likely the work of Saracen builders; they were beyond doubt built after Saracenic models. In these buildings, as in those of Aquitaine, the pointed arch is the surest sign of Saracenic influence; it must never be looked on as marking the approach of the Gothic of the North. With that form of art the pointed style of Sicily has nothing in common. A Sicilian church has nothing in common with a French or an English church; it is sometimes purely Oriental, sometimes a basilica with pointed arches. But, if the Saracen gave the lines of the building, the Greek gave the mosaic decorations of its walls. In such a case the ruling people, rather the ruling dynasty, had really nothing to add to what they found ready for them. They had simply to make Saracen and Greek work in partnership. In England, on the other hand, the Normans did really bring in a new style of their own, their own form of Romanesque, differing widely indeed from the Saracenic style of Sicily. This Norman form of Romanesque most likely had its origin in the Lombard buildings of northern Italy. But it took firm root on Norman soil; it made its way to England at an early stage of its growth, and from that time it went on developing and improving on both sides of the Channel till the artistic revolution came by which, throughout northern Europe, the Romanesque styles gave way to the Gothic. Thus the history of architecture in England during the 11th and 12th centuries is a very different story from the history of the art in Sicily during the same time. There were no Greeks or Saracens in England; there was no Greek or Saracen skill. England indeed had, possibly in a somewhat ruder form, the earlier style of Romanesque once common to England with Italy, Gaul and Germany. To this style it is no wonder that the Normans preferred their own, and that style therefore supplanted the older one. A comparison of Norman buildings in England and in Normandy will show that the Norman style in England really was affected by the earlier style of England; but the modification was very slight, and it in no way affected the general character of the style. Thus, while the institutions of England in the 12th century were English with very considerable Norman modifications, the architecture of England in that century was Norman with a very slight English modification. The difference then is plain. Where, as in Sicily, the Normans felt that they could not improve, they simply adopted the style of the country. Where, as in England, they felt that they could improve, they substituted for the style of the country their own style—that is, a style which they had not created but which they had adopted, which they had made thoroughly their own, and which they went on improving in England no less than in Normandy. That is, the discerning Norman, as ever, adapted himself, but adapted himself in an intelligent way, to the circumstances of each land in which he found himself. And this comes out the more clearly if we compare Norman work in England and in Sicily with Norman work in at least some parts of Apulia. At Bari, Trani and Bitonto we see a style in which Italian and strictly Norman elements are really mingled. The great churches of those cities are wholly unlike those of Sicily; but, while some features show us that we are in Italy, while some features even savour of the Saracen, others distinctly carry us away to Caen and Peterborough. It is plain that the Norman settlers in Apulia were not so deeply impressed with the local style as they were in Sicily, while they thought much more of it than they thought of the local style of England. In each of the three cases there is adaptation, but the amount of adaptation differs in each case according to local circumstances. In Normandy itself, after the separation from England, architecture becomes French, but it is French of a remarkably good type. The buildings of the latest French style keep a certain purity and sobriety in Normandy which they do not keep elsewhere. (E. A. F.)

For a bibliography of the Normans and Northmen see Ulysse Chevalier, *Répertoire des sources hist. du moyen-âge. Topobibliogr.* (Montbéliard, 1903), ii. 2140; also, for sources for the Norman invasion of France, Molinier, *Sources de l'hist. de France* (Paris, 1901), i. 264. Many sources for the history of the Normans were collected by André Du Chesne in his *Hist. Normannorum scriptores antiqui . . . 838–1220*, &c. (Paris, 1619). Of modern works may be mentioned H. Dondorff, *Die Normannen und ihre Bedeutung für das europäische Kulturleben im Mittelalter* (Berlin, 1875); A. H. Johnson, *The Normans in Europe* (1877); E. A. Freeman, *Hist. of the Norman Conquest* (Oxford, 1867–1879) and *Hist. of Sicily* (1891–1894); O. Delarc, *Les Normands en Italie, 859–1073* (Paris, 1883); J. W. Barlow, *Short Hist. of the Normans in S. Europe* (London, 1886); A. F. von Schack, *Gesch. der Normannen in Sicilien* (Stuttgart, 1889); L. von Heinemann, *Gesch. der Normannen in Unteritalien und Sicilien* (Leipzig, 1894); W. Vogel, *Die Normannen und das*

fränkische Reich, 799–911 (1906); F. Chalandon, *La Dominion normande en Italie et Sicile, 1009–1194* (Paris, 1907); F. Lot, "La Grande Invasion normande, 856–862," in t. 69 of the *Bibliothèque de l'École des Chartes* (Paris, 1908).

NORMANTON, a town of Normanton county, Queensland, Australia, on the river Norman, 25 m. E. by S. of the Gulf of Carpentaria, and 1382 m. direct N.W. of Brisbane. Pop. (1901) 838. It is the centre of the Carpentaria district, one of the chief sheep and cattle farming districts in the colony. Normanton is also the outlet of the Croydon and Etheridge goldfields, and of the Cloncurry copper mines. It is the terminus of the railway to Croydon, and has large meat-packing works.

NORMANTON, an urban district in the Normanton parliamentary division of the West Riding of Yorkshire, England, on the river Calder, 3 m. N.E. of Wakefield on the Midland, North Eastern and Lancashire & Yorkshire railways. Pop. (1901) 12,352. The church of All Saints is Norman and Perpendicular, with a square tower rebuilt in 1717, and contains a number of interesting monuments; the ancient stained glass is good. The grammar-school was founded about the end of the 16th century. Traces remain of a moat surrounding the town. A mound in the neighbourhood called Haw Hill is supposed to be a barrow. Altofts, a neighbouring parish, was the home of Sir Martin Frobisher in the 16th century. There are numerous collieries in the neighbourhood.

NORNS (O. Norse, *Nornir*), in Northern mythology, the female divinities of fate, somewhat similar to the Gr. Μοῖραι and the Roman *Parcae*. Like them they are generally represented as three in number, and they are said to spin, or weave, the destiny of men. Their dwelling is beside the "Spring of fate," beneath the "world-tree," Yggdrasil's ash, which they water with draughts from the spring. In some cases the Norns are not easily to be distinguished from the Valkyries (*q.v.*). Sometimes again they appear as prophetesses (*völur*) at the birth of children, whose destiny they foretell. The most famous of these stories is contained in the *Tháttr af Nornagesti*, and has a curious resemblance to the Greek legend of Althaea and Meleager. Similar beings seem to have been known among other Teutonic peoples in early times. (See TEUTONIC PEOPLES, § 7). (H. M. C.)

NORRIS, FRANK (1870–1902), American novelist, was born in Chicago, Illinois, on the 5th of March 1870. He studied art in Paris in 1887–1889; studied at the University of California (1890–1894), and at Harvard University (1894–1895); in 1895–1896 served in South Africa as war correspondent for the San Francisco *Chronicle*; in 1896–1897 was associate editor of the San Francisco *Wave*; and in 1898 was sent to Cuba as war correspondent for *McClure's Magazine*. He died in San Francisco on the 25th of October 1902. He wrote *A Deal in Wheat, and Other Stories* (1903), *Responsibilities of the Novelist, and Other Literary Essays* (1903), and the following novels: *Moran of the Lady Letty* (1898), a story of adventure off the California coast; *McTeague* (1899), a story of the San Francisco slums; *Blix* (1899), a love story; *A Man's Woman* (1900); *The Octopus* (1901) and *The Pit* (1903). The last two were powerful stories, which made his reputation. *The Octopus* deals with wheat-raising in California and with the struggle between the growers and the railroad trust; *The Pit* with wheat-speculation in the Chicago market. His complete works were published in seven volumes in 1903.

NORRIS, HENRY NORRIS or NORREYS, BARON (*c.* 1525–1601), belonged to an old Berkshire family, many members of which had held positions at the English court. His father, Henry Norris, was a grandson of Sir William Norris, who commanded the royal troops against Lambert Simnel at the battle of Stoke in 1487. Like his brother John (d. 1564), the elder Henry Norris obtained a post at the court of Henry VIII.; he gained the king's favour and was rewarded with many lucrative offices. He belonged to the party which favoured the elevation of Anne Boleyn; but in May 1536 he was arrested on the charge of intriguing with her, and though he was probably innocent of any serious offence he was beheaded on the 17th of May 1536. His son Henry regained some of his father's lands and entered upon court life, being a member of parliament under Edward VI. During Mary's reign he was one of those who were entrusted with the custody of the princess Elizabeth, and when the princess became queen she amply repaid the kindness which Norris had shown to her when he was her guardian at Woodstock. In 1566 he was knighted and was sent as ambassador to France, where he remained until 1570, and in 1572 he was created Baron Norris of Rycote. He died in June 1601. By his wife Margaret (d. 1599), daughter of John, Lord Williams of Thame, Norris had six sons, all of whom distinguished themselves in the field. The Norris monument, with figures of Lord and Lady Norris and their six sons, is in St Andrew's Chapel in Westminster Abbey.

The eldest son, Sir WILLIAM NORRIS, died in Ireland in December 1579, leaving a son Francis (1579–1623), who succeeded to his grandfather's barony and also to the estates of his uncle Sir Edward Norris. In 1621 Francis was created earl of Berkshire. He left no sons and the earldom became extinct, but the barony descended to his daughter Elizabeth (d. 1645), the wife of Edward Wray (d. 1658). Their daughter Bridget (1627–1657) married as his second wife Montagu Bertie, 2nd earl of Lindsey, and their son James Bertie (1654–1699) became Baron Norris (or Norreys) in 1657, and was created earl of Abingdon in 1682. His descendants the Berties, earls of Abingdon, still hold this barony, and are the present representatives of the family of Norris.

Sir EDWARD NORRIS (d. 1603), the 1st Lord Norris's third son, served with the English troops in the Netherlands from 1585 to 1588. He is chiefly remembered owing to his fierce quarrel with Philip, count of Hohenlohe (1550–1606), called Hollock by the English, in August 1586 at Gertruydenberg (see J. L. Motley, *The United Netherlands*, vol. ii.). In 1589 he sailed with his brother Sir John and Sir Francis Drake on the expedition to Spain and Portugal, and from 1590 to 1599 he was governor of Ostend.

Sir THOMAS NORRIS (1556–1599), another son of the first lord, went as a soldier to Ireland in 1579 and acted for a few months as president of Connaught. He fought against the Fitzgeralds and also in Ulster; in 1585 he became vice-president of Munster, and in 1597 he succeeded his brother, Sir John Norris, as president. The three remaining brothers were: Sir Henry Norris (1554–1599), who fought in the Netherlands and then in Ireland, where he was killed in 1599; Maximilian Norris, who was killed in Brittany in 1593, and Sir John Norris (*q.v.*).

Two other members of another branch of this family remain to be mentioned, namely, Sir William Norris and his brother Sir John.

Sir WILLIAM NORRIS (*c.* 1657–1702), having been created a baronet, was sent in 1699 to the Mogul emperor in India to secure trading privileges for the new company which had been just formed to compete with the old East India Company. He reached India in September 1699, and after overcoming many difficulties he arrived at the emperor's residence in April 1701. The embassy, however, was a total failure; Norris was unable to make terms, and he died on the voyage to England.

Sir JOHN NORRIS (*c.* 1660–1749) entered the navy and saw a good deal of service during the war with France under William III. and Anne. Under George I. he was sent several times with a fleet into the Baltic Sea to forward the policy of this king by giving the northern nations some idea of the strength of England. In 1734 he became an admiral and commander-in-chief. Norris, who was known as "foul-weather Jack," was a member of parliament from 1708 until his death.

NORRIS, JOHN (1657–1711), English philosopher and divine, was born at Collingbourne-Kingston in Wiltshire. He was educated at Winchester and Exeter College, Oxford, being subsequently elected to a fellowship at All Souls'. His first original work was *An Idea of Happiness* (1683), in which, with Plato, he places the highest happiness or fruition of the soul in the contemplative love of God. Malebranche's *Recherche de la vérité*, which had appeared in 1674, made a strong impression upon him. Malebranche, he says, "is indeed the great Galileo of the intellectual world." He had also studied the works of Descartes himself, and most of what had been written for and against Cartesianism. Of English thinkers, More and Cudworth, the so-called Cambridge Platonists, had influenced him most; and in 1685 his study of their works led to a correspondence with the former, published after his death by Norris as an appendix to his Platonically conceived essay on *The Theory and Regulation of Love* (1688). He also corresponded with Mrs Astell (*q.v.*) and Lady Masham, the friend of Locke, to whom he addressed his *Reflections upon the Conduct of Human Life* (1689). Some time before this Norris had taken orders, and in 1689 he was presented to the living of Newton St Loe, in Somersetshire. In 1690 he published a volume of *Discourses upon the Beatitudes*, followed by three more volumes of *Practical Discourses* between 1690 and 1698. The year 1690 is memorable as the year of the publication of Locke's *Essay*, and the book came into Norris's hands just as his volume of *Discourses* was passing through the press. He at once appreciated its importance, but its whole temper was alien from the modes of thought in which he had been reared, and its main conclusions moved him to keen dissent. He hastened to "review" it in an appendix to his sermons. These *Cursory Reflections* constitute Norris the first critic of the *Essay*; and they anticipate some of the arguments that have since been persistently urged against Locke from the transcendental side. Though holding to the "grey-headed, venerable doctrine" of innate ideas as little as Locke himself, Norris finds the criticism in the first book of the *Essay* entirely inconclusive, and points out its inconsistency with Locke's own doctrine of evident or intuitively perceived truths. He also suggests the possibility of subconscious ideation, on which Leibnitz laid so much stress in the same connexion. He next complains that Locke neglects to tell us "what kind of things these ideas are which are let in at the gate of the senses." In other words, while giving a metaphorical account of how we come by our ideas, Locke leaves unconsidered the intellectual nature of the ideas or of thought in itself. Unless we come to some conclusion on this point, Norris argues, we have little chance of being right in our theory of how ideas "come to be united to our mind." He also saw the weakness of Locke's doctrine of nominal essences, showing how it ignores the relation of the human mind to objective truth, and instancing mathematical figures as a case "where the nominal essence and the real essence are all one." The last twenty years of Norris's life were spent at Bemerton, near Salisbury, the former home of George Herbert, to the living of which he had been transferred in 1691. In 1691–1692 he was engaged in controversy with his old enemies the "Separatists," and with the Quakers, his Malebranchian theory of the divine illumination having been confounded by some with the Quaker doctrine of the light within. In 1697 he wrote *An Account of Reason and Faith*, one of the best of the many answers to Toland's *Christianity not Mysterious*. Norris adopts the distinction between things contrary to reason and things above reason, and maintains that the human mind is not the measure of truth. Reason, according to him, is nothing but the exact measure of truth, that is to say, divine reason, which differs from human reason only in degree, not in nature. In 1701 appeared the first volume of the systematic philosophical work by which he is remembered, *An Essay towards the Theory of the Ideal or Intelligible World*. The first volume treats the intelligible world absolutely; the second, which appeared in 1704, considers it in relation to human understanding. It is a complete exposition of the system of Malebranche, in which Norris refutes the assertions of Locke and the sensualists. In 1708 Norris wrote *A Philosophical Discourse concerning the Natural Immortality of the Soul*, defending that doctrine against the assaults of Dodwell. After this he wrote little. He died at Bemerton, and a monument was erected to his memory in the parish church, with an inscription in which he is spoken of as one who "bene latuit."

Norris was neither an original thinker nor a master of style. His philosophy is hardly more than an English version of Malebranche, enriched by wide reading of "Platonic' thinkers of every age and country. His style is too scholastic and self-involved. His *Theory of the Intelligible World* is an attempt to explain the objective nature of truth, which he blamed Locke for leaving out of regard. By the intelligible world Norris understands the system of ideas eternally existent in the mind of God, according to which the material creation was formed. This ideal system he identifies with the Logos—the second person of the Trinity, the light that lighteth every man that cometh into the world. For it is these ideas and their relations that are alone the object-matter of science; whenever we know, it is because they are present to our mind. Material things are wholly dark to us, except so far as the fact of their existence is revealed in sensation. The matter which we say that we know is the idea of matter, and belongs, like other ideas, to the intelligible world. When stripped of its semi-mythical form of statement, Norris's emphatic assertion of the ideal nature of thought and its complete distinction from sense as such may be seen to contain an important truth. As the disciple and correspondent of More, he is, in a sense, the heir of the Cambridge Platonists, while, as the first critic of Locke's *Essay*, he may be said to open the protest of the church against the implicit tendencies of that work. He occupies a place, therefore, in the succession of churchly and mystical thinkers of whom Coleridge is the last eminent example.

See Wood, *Athenae Oxonienses* (ed. Bliss), iv.; *Biographia Britannica*; Leslie Stephen in *Dictionary of National Biography*; J. Tulloch, *Rational Theology and Christian Philosophy in England in the 17th Century* (1874), who calls Norris "as striking and significant a figure in the history of English philosophy" as another idealist, Berkeley.

NORRIS, SIR JOHN (*c.* 1547–1597), English soldier, was the second son of Henry Norris, Baron Norris of Rycote, and gained his earliest military experience in the civil wars in France. In 1573 he went to Ulster with Walter Devereux, earl of Essex, winning fame by his conduct in the guerilla wars against the Irish, and being responsible for the massacre on the island of Rathlin in July 1575; and in July 1577 he crossed over to the Netherlands to assist the Dutch against the Spaniards. Having added to his reputation by his valour at the battle of Rymenant, Norris returned to England in March 1584, and in the following July he was sent to Ireland as lord president of Munster; he accompanied the lord deputy, Sir John Perrot, on a campaign in Ulster, and spoke eloquently in the Irish parliament; but he disliked his work and soon obtained his recall. In August 1585 he was again in the Netherlands, commanding the English army of 4400 men which Elizabeth had sent to serve against the Spaniards. During his successful relief of Grave in April 1586 he was wounded, and just after this event he was knighted by the governor-general, the earl of Leicester; but he and Leicester were soon at variance, and many complaints of his conduct were sent to England. After taking part in the battle of Zutphen in October 1586 Sir John was recalled to England, but in 1587 he went again to the Netherlands and was soon quarrelling with his new superior, Peregrine Bertie, Lord Willoughby de Eresby, and with Sir William Stanley. In 1588, when the Spanish Armada was expected, he was marshal of the camp at Tilbury; later in the same year he served the queen as ambassador to the Dutch states, and in 1589 he and Sir Francis Drake led the fleet which ravaged the coasts of Spain and Portugal. In 1591, and again in 1593, he aided Henry IV. of France in his struggle with the League in Brittany; and in May 1595 he landed again in Ireland, where he was still lord president of Munster. But this time he was entrusted with more extensive powers and was to assist the lord deputy, Sir William Russell, in subjugating Ulster. He did not, however, work harmoniously with Russell; his health was failing and the gigantic task was too much for him. After fighting and negotiating with the O'Neills in Ulster, and warring in Connaught, he asked for his recall. This was not granted, but he was supplanted in his military command; and he retired to Munster and died at Mallow on the 3rd of July 1597. His monument is in the church of Tattendon, Berkshire.

See J. L. Motley, *The United Netherlands*, vol. ii. (1904); and R. Bagwell, *Ireland under the Tudors*, vol. iii. (1890).

NORRIS, WILLIAM EDWARD (1847–), English novelist, was born on the 18th of November 1847, the son of Sir W. Norris, chief justice of Ceylon. He was educated at Eton, and called to the bar at the Inner Temple in 1874. His first story, *Heaps of Money*, appeared in 1877, and was followed by a long series of novels, many of which first appeared in the *Temple Bar* and *Cornhill* magazines. The best of his numerous novels are *Mademoiselle de Mersac* (1880), *Matrimony* (1881), *No New*

Thing (1883), *My Friend Jim* (1886), *The Rogue* (1888), *The Despotic Lady* (1895), *Matthew Austin* (1895), *The Widower* (1898), *Nature's Comedian* (1904), *Pauline* (1908).

NORRISTOWN, a borough and the county-seat of Montgomery county, Pennsylvania, U.S.A., on the Schuylkill river, at the mouth of Stony Creek, opposite Bridgeport, and about 18 m. N.W. of Philadelphia. Pop. (1910 census) 27,875. Norristown is served by the Pennsylvania, the Philadelphia & Reading and the Stony Creek railways, by interurban electric railway to Philadelphia and Reading, and by the Schuylkill canal, and is connected by bridge with the borough of Bridgeport (pop. in 1910, 3860), where woollen and cotton goods are manufactured. Norristown is a residential suburb of Philadelphia, and commands fine views of the Schuylkill Valley. It has a State Hospital for the Insane (opened 1880), a fine County Court House, a general hospital, a Friends' Home, a home for aged women, St Joseph's Protectory (Roman Catholic) for girls, and the Norristown and McCann public libraries; in Montgomery cemetery are the tombs of General Winfield Scott Hancock and General John Frederick Hartranft (1830–1889), a distinguished Federal officer in the Civil War and governor of Pennsylvania in 1873–1879. Valley Forge is less than 6 m. distant to the W. The borough has a large trade with the surrounding country, which is well adapted to agriculture and abounds in limestone. Among Norristown's manufactures are hosiery and woollen goods; in 1905 its total factory product was valued at $5,925,243, an increase of 44·3% over the value in 1900. Norristown was founded in 1785, and was named in honour of Isaac Norris (*c.* 1671–1735), a friend of William Penn and a member of the Pennsylvania legislature, who had owned the land on which the borough is built. Norristown was incorporated as a borough in 1812, and its boundaries were extended in 1853.

NORRKÖPING, a town and port of Sweden, in the district (*län*) of Östergötland, 113 m. S.W. of Stockholm by the Malmö railway. Pop. (1880) 26,735; (1900) 41,008. It occupies both banks of the Motala, the wide and rapid emissary of lake Vetter, close to its outlet in the Bråvik, an inlet of the Baltic. Having been burned by the Russians in 1719 and visited by further fires in 1812, 1822 and 1826, the whole town has a modern appearance, with wide and regular streets. Among the more conspicuous buildings are St Olaf's church (erected by Gustavus Adolphus in 1616 and rebuilt in 1765–1767); St Hedvig's, built by the German colony in 1670; the town hall, dating from the beginning of the 19th century; the high school (1868), and technical and weaving schools. Norrköping is the fourth town in population and industrial importance in Sweden. The falls in the river afford motive power to the cloth and cotton mills (spinning and weaving)—the staple industries—and to factories for sugar, paper, lithography, tobacco and carpets, joinery works and breweries. There are also shipbuilding yards and docks. Fine granite is quarried at Grafversfors, 7½ m. N. The inlet of Bråvik affords excellent harbour accommodation, with from 33 ft. to 17½ ft. of water below the bridges in the town. The town returns two members to the second chamber of the *Riksdag* (parliament).

A bull of Pope Lucius III. shows that Norrköping existed in 1185. At the meeting of the states in 1604 Duke Charles assumed the Swedish crown as Charles IX.; and not long afterwards Duke John of Östergötland introduced German craftsmen into Norrköping, and thus originated its industrial activity. Under Charles XII. the town suffered not only from war but from pestilence, 2700 of its inhabitants perishing in 1710–1711. After the Russian invasion of 1719 the population was only 2600.

NORTH, BARONS. The English title of Lord North of Kirtling was created for Edward North (*c.* 1496–1564), son of Roger North, a London citizen, in 1554; he was a successful lawyer, clerk of the parliament (1531) and chancellor of the court of augmentations (1545). His second son was Sir Thomas North (*q.v.*), and he was succeeded as 2nd baron by his son Roger (1530–1600), a prominent courtier and soldier of Queen Elizabeth's day, who married the daughter of Lord Chancellor Rich, and whose eldest son, Sir John (*c.* 1551–1597), predeceased him.

Dudley North, 3rd Baron North (1581–1666), son of Sir John North and of Dorothy, daughter and heiress of Sir Valentine Dale, was born in 1581 and succeeded his grandfather, the 2nd Baron North, at the age of nineteen. He was educated at Cambridge, and married in 1599 Frances, daughter of Sir John Brockett of Brockett Hall in Hertfordshire. He travelled in Italy, took part in the campaign of 1602 in the Netherlands, and on his return became a conspicuous figure at court, excelling in athletic exercises as well as in poetry and music, and gaining the friendship of Prince Henry. In 1606, while returning from Eridge to London, he discovered the springs of Tunbridge Wells, which cured North himself of a complaint and quickly became famous. He also recommended the Epsom springs to the public. He supported and subscribed to the expedition to Guiana made by his brother Roger North (*c.* 1582–*c.* 1652) in 1619, and when Roger departed without leave Dudley was imprisoned for two days in the Fleet. In 1626 he attached himself to the party of Lord Saye and Sele in the Lords, who were in sympathy with the aims of the Commons; and when the civil war broke out he was on the side of the parliament. In 1641 he was a member of the Lords' committee on Religion, and served on the committee to consider Laud's attainder in 1644, finally voting for the ordinance in January 1645. He was placed on the admiralty commission in 1645, and acted as lord lieutenant for Cambridgeshire. He was one of the small group of Lords who continued attendance in the House of Peers, and on the 19th of December 1648, with three others, visited Fairfax, when they "cast down their honours at his Excellency's feet" and protested their desire not to retain any privileges prejudicial to the public interest.[1] He passed the rest of his life in retirement at Kirtling in Cambridgeshire, with his sons, daughters and grandchildren, finding "employment with many airy entertainments as poetry, writing essays, building, making mottoes and inscriptions as well as in music."[2] He wrote *A Forest of Varieties* (1645), a miscellany of essays and poems, another edition of which was published in 1659 under the title of *A Forest promiscuous of various Seasons' Productions*. He died on the 16th of January 1666. North is described as "full of spirit and flame," of imperious temper but of well-balanced judgment, Lord Holland declaring that "he knew no man less swayed with passion and sooner carried with reason and justice." He left, besides one daughter, two sons, the elder of whom, Sir Dudley, succeeded him as 4th Baron North.

Dudley North, 4th Baron North (1602–1677), increased the family fortune by marrying the daughter of Sir Charles Montagu, brother of the 1st earl of Manchester. He was an accomplished man, of studious bent, and had fourteen children, of whom the third son, Francis, became lord chancellor as Lord Guilford; the fourth was Sir Dudley North (*q.v.*), the economist; the fifth, John (1645–1683), master of Trinity, Cambridge, and professor of Greek in the university; and the sixth, Roger (*q.v.*), the lawyer and historian.

The eldest son, Charles (d. 1691), was created Lord Grey of Rolleston during his father's life, and succeeded his father as 5th Baron North; and on the death of his son, William, 6th Lord North, without issue, in 1734, the barony of North went to a cousin, Francis North, 3rd baron, afterwards 1st earl of Guilford. The title of Lord North is that by which the 2nd earl of Guilford, prime minister from 1770 to 1782, is best known in history (see Guilford, Barons and Earls of).

George Augustus, 3rd earl of Guilford (d. 1802), left three daughters, and the barony of North fell into abeyance till 1841 when it vested in Susan, Baroness North (1797–1884), wife of John Sidney Doyle, who took the name of North; at her death her son William Henry John North (b. 1836) succeeded as 11th baron, the title now being separate from that of Guilford.

NORTH, SIR DUDLEY (1641–1691), English economist, was 4th son of Dudley, 4th Lord North, who published, besides other things, *Passages relating to the Long Parliament,* of which he had himself been a member. He was born on the 16th of May 1641. In his early years he was carried off by gipsies and recovered with some difficulty by his family—an incident curiously similar to that which befell Adam Smith in his infancy. He engaged in foreign trade, especially with Turkey, and spent a number of years at Constantinople and Smyrna. Some notices of the manners and customs of the east were printed from his papers by his brother. Having returned to London with a considerable fortune, he continued to prosecute trade with the Levant. His ability and knowledge of commerce attracted the attention of the government, and he was further recommended by the influence of his brother Lord Guilford. During the Tory reaction under Charles II. he was one of the sheriffs forced on the city of London with an express view to securing verdicts for the crown in state trials. He was knighted, and was appointed a commissioner of customs, afterwards of the treasury, and again of the customs. Having been elected a member of parliament under James II., "he took," says Roger North, "the place of manager for the crown in all matters of revenue." After the Revolution he was called to account for his alleged unconstitutional proceedings in his office of sheriff. He died on the 31st of December 1691.

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[1] Gardiner's *Civil War*, iv. 285.

[2] Roger North's *Autobiography*, ed. by A. Jessopp, 68.

His tract entitled *Discourses upon Trade, principally directed to the cases of the interest, coinage, clipping and increase of money*, was published anonymously in 1691, and was edited in 1856 by J. R. M'Culloch in the *Select Collection of Early English Tracts on Commerce* printed by the Political Economy Club of London. In this thorough-going and emphatic assertion of the free-trade doctrine against the system of prohibitions which had gained strength by the Revolution, North shows that wealth may exist independently of gold or silver, its source being human industry, applied either to the cultivation of the soil or to manufactures. It is a mistake to suppose that stagnation of trade arises from want of money; it must arise either from a glut of the home market, or from a disturbance of foreign commerce, or from diminished consumption caused by poverty. The export of money in the course of traffic, instead of diminishing, increases the national wealth, trade being only an exchange of superfluities. Nations are related to the world just in the same way as cities to the state or as families to the city. North emphasizes more than his predecessors the value of the home trade. With respect to the interest of capital, he maintains that it depends, like the price of any commodity, on the proportion of demand and supply, and that a low rate is a result of the relative increase of capital, and cannot be brought about by arbitrary regulations, as had been proposed by Sir Josiah Child and others. In arguing the question of free trade, he urges that every advantage given to one interest over another is injurious to the public. No trade is unprofitable to the public; if it were, it would be given up; when trades thrive, so does the public, of which they form a part. Prices must determine themselves, and cannot be fixed by law; and all forcible interference with them does harm instead of good. No people can become rich by state regulations,—only by peace, industry, freedom and unimpeded economic activity. It will be seen how closely North's view of things approach to that embodied some eighty years later in Adam Smith's great work. North is named by Wilhelm Roscher as one of that "great triumvirate" which in the 17th century raised the English school of economists to the foremost place in Europe, the other members of the group being Locke and Petty.

NORTH, MARIANNE (1830–1890), English naturalist and flower-painter, was born at Hastings on the 24th of October 1830, the eldest daughter of a Norfolk landowner, descended from Roger North (1653–1734). She trained as a vocalist under Madame Sainton Dolby, but her voice failed, and she then devoted herself to painting flowers. After the death of her mother in 1855 she constantly travelled with her father, who was then member of parliament for Hastings; and on his death in 1869 she resolved to realize her early ambition of painting the flora of distant countries. In 1871–1872 with this object she went to Canada, the United States and Jamaica, and spent a year in Brazil, where she did much of her work at a hut in the depths of a forest. In 1875, after a few months at Teneriffe, she began a journey round the world, and for two years was occupied in painting the flora of California, Japan, Borneo, Java and Ceylon. The year 1878 she spent in India, and after her return she exhibited a number of her drawings in London. Her subsequent offer to present the collection to the botanical gardens at Kew, and to erect a gallery for their reception, was accepted, and the new buildings, designed by James Ferguson, were begun in the same year. At Darwin's suggestion she went to Australia in 1880, and for a year painted there and in New Zealand. Her gallery at Kew was opened in 1882. In 1883, after a visit by her to South Africa, an additional room was opened at the Kew gallery, and in 1884–1885 she worked at Seychelles and in Chile. Miss North died at Alderly in Gloucestershire on the 30th of August 1890. The scientific accuracy with which she represented plant life in all parts of the world gives her work a permanent value.

NORTH, ROGER (1653–1734), English lawyer and biographer, was the sixth son of the 4th Baron North. He acquired a good practice at the bar, being helped by his elder brother Francis, who became lord chancellor and was created Baron Guilford (*q.v.*), and in 1684 he became solicitor-general. But the Revolution stopped his advancement, and he retired to his estate of Rougham in Norfolk, and increased his fortune by marrying the daughter of Sir Robert Gayer. He collected books, and was constantly occupied in writing. But he is best known for his *Lives of the Norths*, published after his death, together with his own autobiography (see the edition in Bohn's *Standard Library*, 1890, by Jessopp), a classic authority for the period. He died at Rougham on the 1st of March 1734, leaving a family from whom the Norths of Rougham are descended.

He is to be distinguished from Roger North (1585–1652), brother of the 3rd baron, one of the captains who sailed with Raleigh in 1617, who projected the plantation of Guiana with an English colony.

NORTH, SIR THOMAS (1535?–1601?), English translator of *Plutarch*, second son of the 1st Baron North, was born about 1535. He is supposed to have been a student of Peterhouse, Cambridge, and was entered at Lincoln's Inn in 1557. In 1574 he accompanied his brother, Lord North, on a visit to the French court. He served as captain in the year of the Armada, and was knighted about three years later. His name is on the roll of justices of the peace for Cambridge in 1592 and again in 1597, and he received a small pension (£40 a year) from the queen in 1601. A third edition of his *Plutarch* was published, in 1603, with a supplement of other translated biographies. He translated, in 1557, Guevara's *Reloj de Principes* (commonly known as *Libro Aureo*), a compendium of moral counsels chiefly compiled from the *Meditations* of Marcus Aurelius, under the title of *Diall of Princes*. The English of this work is one of the earliest specimens of the ornate, copious and pointed style for which educated young Englishmen had acquired a taste in their Continental travels and studies. North translated from a French copy of Guevara, but seems to have been well acquainted with the Spanish version. The book had already been translated by Lord Berners, but without reproducing the rhetorical artifices of the original. North's version, with its mannerisms and its constant use of antithesis, set the fashion which was to culminate in Lyly's *Euphues*. His next work was *The Morall Philosophie of Doni* (1570), a translation of an Italian collection of eastern fables. The first edition of his translation of *Plutarch*, from the French of Jacques Amyot, appeared in 1579. The first edition was dedicated to Queen Elizabeth, and was followed by other editions in 1595 and 1603, containing in each case fresh *Lives*. It is almost impossible to over-estimate the influence of North's vigorous English on contemporary writers, and some critics have called him the first master of English prose. The book formed the source from which Shakespeare drew the materials for his *Julius Caesar*, *Coriolanus* and *Antony and Cleopatra*. It is in the last-named play that he follows the *Lives* most closely, whole speeches being taken direct from North.

North's *Plutarch* was reprinted for the "Tudor Translations" (1895), with an introduction by George Wyndham.

NORTH ADAMS, a city of Berkshire county, Massachusetts, U.S.A., situated at the junction of the N. and S. branches of the Hoosac river, and the Boston & Maine (at the W. terminus of the Hoosac Tunnel) and the Boston & Albany railways, in the extreme N.W. part of the state. Pop. (1905) 22,150; (1910) 22,019. Area, 19·9 sq. m. In the city are the villages of North Adams, Greylock and Blackinton. Within the city limits are a natural bridge across Hudson Brook, 50-60 ft. high, and ruins of Fort Massachusetts, which was captured in 1746 by French and Indians under the command of Pierre François de Rigaud, Chevalier de Vaudreuil (1704–1772). North Adams is the seat of a state Normal School (1897). Among its manufactures are cotton (especially print) and woollen goods, and boots and shoes. In 1900 the factory products of the city were valued at $10,741,495, and in 1905 at $8,035,705. North Adams secured incorporation as an independent township in 1878. Township government was abandoned and city government was organized in 1895; in 1900 part of Williamstown was annexed.

NORTHALLERTON, a market town in the Richmond parliamentary division of the North Riding of Yorkshire, England, 30 m. N.N.W. from York by the North Eastern railway, on which it is an important junction. Pop. of urban district (1901) 4009. It lies in a plain west of the Cleveland and Hambleton Hills, on the Sun Beck, a small tributary of the river Wiske. The church of All Saints is a large cruciform structure, Norman, Early English and Perpendicular, with a central tower 80 ft. in height. There is a grammar-school. Among the charities are a hospital founded in 1476 by Richard Moore. There are no traces of the fortified palace of the bishops of Durham, of the White Friars' monastery founded in 1354, or of the Austin priory founded in 1341. The town has a considerable agricultural trade, and there are motor-engineering works. In the neighbourhood of Northallerton is the priory of Mount Grace, a Carthusian foundation of 1397. It consists of an outer court entered through a gatehouse, the church and chapter-house, with other buildings lying on the north side, partly surrounded by monastic dwelling-houses. These houses, with gardens attached, also surround three sides of the cloister court, which lies north of the outer court. In the vicinity are a monks' well and a ruined chapel of the 16th century.

Northallerton (Alvetune, Allerton) is said to have been a Roman station and afterwards a Saxon "burgh," but nothing is known with certainty about it before the account given in the Domesday Survey, which shows that before the Conquest Earl Edwin had held the manor, but that the Normans had destroyed it so utterly that it was still waste in 1086. Soon after his accession William Rufus gave it to the bishop of Durham, whose successors continued to hold it until it was taken over by the ecclesiastical commissioners in 1865. As a borough by prescription Northallerton returned two members to the parliament of 1298, but was not represented again until 1640, when its ancient privileges were restored. The Municipal Reform Act of 1832 reduced the number of members to one, and in 1885 the town was disfranchised. The first account of the borough and its privileges is contained in an inquisition taken in 1333 after the death of Anthony, bishop of Durham, which shows that the burgesses held the town with the markets and fairs at a fee-farm rent of 40 marks yearly, and that they had two reeves who sat in court with the bishop's bailiff to hear the disputes of the townspeople. This form of government continued until 1851, when a local board was formed, which in 1894 was superseded by an urban district council. A weekly market on Wednesday was granted by King John to the bishop in 1205. A subsequent bishop obtained a grant of a fair on St Bartholomew's day, which according to Camden (*circa* 1585), had become almost "the most thronged" cattle fair in England, but is no longer held. In 1317 the town was burnt by the Scots under Robert Bruce, although the burgesses paid 3000 marks that it might be spared. In consequence they were exempted from taxes in 1319.

See *Victoria County History, Yorkshire*; C. J. D. Ingledew, *The History and Antiquities of Northallerton in the County of York* (1858); J. L. Saywell, *The History and Annals of Northallerton* (1885).

Comparison of North America and Eurasia.

NORTH AMERICA. In the article AMERICA a brief geographical survey is taken of the two continents which bear this name; and their points of similarity and contrast are broadly indicated. When North America is compared with the northern continents of the Old World, an important correspondence is found between it and the greater part of Eurasia; but here the corresponding parts are reversed, right and left, like the two hands. The Laurentian highlands agree with Scandinavia and Finland, both having escaped deformation since very ancient times. A series of water bodies (the Great lakes in North America; the southern Baltic, with Onega, Ladoga, &c. in Europe) occupy depressions that are associated with the boundary between the very ancient lands and their less ancient covering strata. The old worn-down and re-elevated Appalachian mountains of south-eastern North America agree well with the Hercynian mountains of similar history in middle Europe (Ardennes, Slate mountains of the middle Rhine, &c.), each range entering the sea at its Atlantic end (in Nova Scotia and Newfoundland; in Brittany, Wales and Ireland), and dipping under younger formations at its inland end. Certain younger ranges—seldom recognized as mountains because they are mostly submerged in the American mediterraneans (Gulf of Mexico and Caribbean Sea), but of great absolute relief and with crests rising in the larger West Indian islands—may be compared with the younger ranges of southern Europe (Pyrenees, Alps, Caucasus) bordering the classic Mediterranean and the seas farther east. The central plains of North America correspond well with the plains of Russia and western Siberia; both stretch from great enclosed water bodies on the south to the Arctic Ocean, and both are built of undisturbed Palaeozoic strata toward the axis of symmetry and of younger strata away from it. Finally, the Western highlands of North America may be compared with the great mountain complex of central and eastern Asia. In this remarkable succession of resemblances we find one of the best proofs of the continental unity of Eurasia. Moreover, the resemblances thus described controvert the idea, prevalent when geology was less advanced than to-day, that the New World of civilized discovery is an "old world" geologically, and that the Old World of history is geologically "new." Both worlds are so old, and both share so well the effects of successive geological changes from the most ancient to the most modern periods, that neither can regard the other as older or younger than itself.

There are several climatic similarities between North America and Eurasia. The Appalachians and the Hercynian mountains of middle Europe both contain extensive coal deposits of similar geological age, thus indicating a climatic and geographic resemblance at a time of great antiquity. The Laurentian highlands and the Scandinavian highlands were both heavily and repeatedly glaciated in recent geological times, and the ice sheets that crept out on all sides from those centres spread far over the lower lands to the south and away from the axis of symmetry towards the continental interior, scouring the highlands and leaving them rocky and barren, strewing extensive drift deposits over the peripheral areas, and thus significantly modifying their form and drainage; while the much loftier mountain ranges of western America and central Asia suffered, singularly enough, a far less extensive glaciation. At the present time, the plentiful and well-distributed rainfall of the continental border on either side of the Atlantic is succeeded by an increasing aridity towards the continental interior, until the broad plains that rise towards the distant mountain complexes are comparatively barren or even desert. Within each greater mountain area extensive interior drainage basins are found holding salt lakes, and the recently determined former extension of these lakes in Central Asia agrees with the well-proved extension of Pleistocene lacustrine conditions in western North America.

The following sketch of the geological development of North America considers the larger physiographic divisions already indicated.

The extensive area of ancient crystalline rocks (Archean), stretching from Labrador past Hudson Bay to the Arctic Ocean, is of greatly disordered structure, and hence must have once had a

Laurentian highlands.

mountainous form. Moreover, the crystalline texture and deformed foliation of the rocks prove that the surface now seen was once buried deep beneath the surface of an earlier time, for only at great depths can such texture and foliation be acquired. Both these lines of evidence lead to the conclusion that the moderate relief prevalent over the existing Laurentian region is the work of persevering erosion during a long continuance of dry land conditions, and hence that the region must be regarded as a worn-down mountain system. The worn-down old land is gently overlapped, chiefly around the south and west, and south of Hudson Bay, by very early Palaeozoic strata which rest upon the eroded surface of the crystallines, thus proving that the destruction of the ancient mountains had already been accomplished before some of the oldest fossiliferous formations of the world had been deposited. All the evidence goes to prove that from then to now the Laurentian region has been relatively quiescent. In all subsequent time there have been here only moderate oscillations of level, one of which allowed the transgression of the ancient sea in which the overlapping strata were deposited, while another of much more modern date gave the region its present highland altitude (1000 to 2000 ft.; mountains near the Labrador coast, 8000 ft.), again offering it to the forces of erosion.

It is this ancient Laurentian area that the earlier geologists named the "Continental Nucleus," as if it had been the first part of North America to rise from the primeval waters of an assumed universal ocean. The "Archean V," formed by the two arms of the Laurentian oldland stretching from Labrador to the Arctic, between which Hudson Bay is included, has been repeatedly described as the oldest area of the continent, the beginning around which many later additions have built the existing outlines; and as such it has been adduced in favour of the theory of the permanence of continents. But when thus stated, the half of the story in favour of this theory is not told. Hudson Bay is not due to a primitive failure of elevation between the arms of the "Archean V"; it is not a deep basin whose floor has never emerged from the primeval ocean, but an ancient and comparatively shallow depression in a pre-existent land, over which the sea flowed as the surface sank below sea-level. South and west from the "Archean Nucleus," the Cambrian strata of the medial plains of North America are found to lie, wherever their base is discovered, on a foundation that possesses all the essential features of the Laurentian oldland. This relation is found all around the Adirondack mountains in New York, along the Appalachians southward to Georgia, through the Mississippi basin in Wisconsin and Missouri, and beyond in Texas, and farther west in the Black Hills, as well as certain points in the Rocky Mountains region. Hence the pre-Cambrian land surface of the continent must have had not only a vastly greater area than was formerly attributed to it, but also an earlier origin; for at the time when it was thought by the older geologists to be first rising from the primeval ocean, it is now proved to have been slowly sinking after a prolonged land existence. The crystalline Archaean rocks in the Laurentian region and its scattered fellows cannot possibly be explained as a primitive sea bottom, rising above sea-level to make the beginning of a continent and receiving Cambrian strata upon its still submerged borders, but only as portions of an already old and deeply-denuded land area, which was in pre-Cambrian time much larger than the visible Laurentian area of to-day, and which was reduced to perhaps half its primeval dimensions by a gradual submergence beneath the transgressing sea in which the Cambrian sediments were laid down. We are thus led to believe that much of the continent of to-day was a continent in the earliest geological times, and that the seas which partly covered it in Palaeozoic and Mesozoic time were due to partial submergence, not to partial emergence. Furthermore, all the marine strata that now stretch over a large part of what is believed to have been the ancient continental surface are of relatively shallow water origin; none of them bears any close resemblance to the deposits of the deep oceans that have been so well studied of late years. Hence the Palaeozoic and Mesozoic seas of North America were not deep oceans, and as far as this continent is concerned it is by no means admissible to assume, as some of the earlier geologists did, that the position of continents and oceans have repeatedly changed places. The testimony of the rocks is decidedly in favour of Dana's view that continental masses are relatively permanent.

The early history of the Laurentian region has been dwelt upon because of its great importance in the history of the continent, and because its history has so generally been misunderstood. To these reasons may be added a third: through Palaeozoic and Mesozoic time the history of the Laurentian region is for the most part a blank. Records are wanting from the early Palaeozoic to the Pleistocene, when the Laurentian uplands became the centres from which the ice sheets of the Glacial period spread out on all sides. As a result of this late chapter in the history of the region, the weathered soils of earlier periods were swept away along with an unknown amount of firm rock, leaving bare ledges, scattered boulders and gravelly drift to-day upon a rugged upland without mountains (except in north-east Labrador), but diversified by innumerable knobs and hollows. The drainage of the region has thus been thrown into disorder; large and small lakes and marshy hollows abound; the streams are repeatedly interrupted by rapids, and frequently split into two or more channels, enclosing islands many miles in length. They are the only highways of this thinly inhabited region.

Appalachian highlands.

The Appalachian province is a generally hilly and mountainous belt, stretching from Newfoundland to Alabama. It seems for the most part to have belonged in the earliest times to the great pre-Cambrian land area, of which the Laurentian highland is the more manifest representative; for wherever the basal members of the Palaeozoic sedimentary series are found in the Appalachians, they rest upon a floor of denuded Archean rocks, and the lowest layers are largely composed of Archaean detritus. This province must, however, be set aside from the undisturbed Laurentian region because of the repeated movements of depression, deformation and elevation that it has suffered, generally along a north-east south-west trend, causing the successive alternations of heavy deposition, and almost equally heavy denudation that have prevailed with varying intensity during the whole stretch of geological time covered by the fossiliferous record. The earliest important mountain-making disturbances interrupted the conditions of deposition in Cambrian time, and produced what has been called the Green Mountain system. A later, and probably greater, disturbance, with its climax at the close of Carboniferous time, established the Appalachian Mountain system; but, as understood to-day, the "Appalachian revolution" of the older geologists should be regarded as a long-lasting process, perhaps intermittently enduring as long as the whole of Carboniferous time. A subordinate period of deposition and deformation occurred early in Mesozoic time, marked by the accumulation and disturbance of several basins of the Newark formation, roughly corresponding to the Triassic of Europe.

The Appalachian mountains of to-day were formerly regarded as the unconsumed remnants of the chief Appalachian uplift; but it is now generally agreed that Mesozoic erosion reduced the greater part of the range to a lowland of moderate or small relief, leaving only isolated groups of subdued mountains in the areas of the most resistant rocks, and that the altitude and form of the mountains of to-day are chiefly the result of the Tertiary elevation and dissection of the previously worn-down mass—the additional height thus given in Tertiary time to the pre-existent subdued mountain groups making them now the loftiest areas of the range, as in the White Mountains of New Hampshire (Mount Washington, 6293 ft.) and the Black Mountains of North Carolina (Mount Mitchell, 6711 ft.). It is interesting to note that the axis of Tertiary elevation is nearly parallel to and closely associated with the axes of the earlier disturbances, but it lies somewhat to the north-west of its predecessors, and therefore involves considerable areas of flat-lying Palaeozoic strata on the inner side of the previously disturbed belt from New York to Alabama, thus producing what is known as the Alleghany plateau (altitudes, 2000 to 4000 ft.). It should be added that the Ozark plateau of Missouri and the Ouachita mountains on the south, in Arkansas and farther west, are related to one another in much the same way as the Alleghany plateau and the middle ranges of the Appalachians—the two pairs corresponding to a remarkable degree in regard to conditions of ancient accumulation, medieval deformation and denudation, and more modern uplift and dissection; it is, therefore, admissible to classify this western group of uplifts as an annex to the normal Appalachians. Numerous and extensive coal seams occur in the worn-down Appalachians of Nova Scotia, Pennsylvania and Alabama, as well as in the Alleghany plateau from Pennsylvania to Alabama, and in the extension of the same strata through the Ohio and middle Mississippi basins.

The eastern coast of the continent has a rocky and ragged shore line from Maine to Greenland, with numerous submerged lowlands and valleys forming bays, and as many uplands and ridges outstretching in promontories and islands; this being the result of the summation of many movements of the land, whose total gives an increasing measure of depression to the north, where an archipelago at last replaces what was probably once a corner of the continent; but the measure of the depression is uncertain, because of the doubt regarding the depth beneath sea-level to which the Pleistocene glaciers may have worn the pre-Glacial valleys. South of New England, along the Atlantic coast, and around the border of the gulf into Mexico, the dominating movement of the land in late geological periods has been upward with respect to sea-level, whereby a former sea bottom, on which the land waste of Cretaceous and Tertiary times had been outspread, was revealed as a coastal plain, across which the rivers of the former land area now extend their courses, from the old shore line to the new. Part of the same plain, still submerged, forms the "continental shelf" of the mid-Atlantic border. Florida seems to be a projecting swell of this shelf, around whose extremity coral reefs have been added, but whose greater mass is still under a shallow sea cover. Along the ragged coast in the north a moderate and very modern movement of elevation has laid bare clay-floored lowlands that were lately beneath the sea, as in the plain of the lower St Lawrence valley, while along the coastal plain of the south a slight movement of depression has drowned a number of low valley floors, producing shallow arms of the sea, as Chesapeake Bay, Albemarle and Pamlico Sound and Mobile Bay. All the coast south of New York is low, and a great part of it is fringed with wave-built sand-reefs.

The great complex of mountains in the Western highlands

The Cordilleras of North America.

sometimes styled the Cordilleras of North America (the Rocky Mountains being the eastern members of the system in the United States and Canada), differ from the Laurentian and Appalachian regions in having suffered numerous disorderly movements at dates so recent that the existing relief of the region bears a significant relation to its irregular uplifts; a relation that doubtless once obtained in the older mountain areas of the east, where it has now been obliterated by erosion. It is not, however, only in modern geological periods that mountain-making disturbances have prevailed in the regions of the Western highlands; their geological history is one of repeated and long-continued movement—the ruins of the more ancient upheavals supplying materials for the strata of newer ranges. For example, in Canada an axial belt of ancient rocks is bordered on the east and west by stratified formations of enormous thickness (40,000 to 60,000 ft.), those on the west including a large share of contemporaneous volcanic materials; all three belts having been deformed and upheaved, as well as deeply dissected in the later chapters of geological time. It is, however, important to note that the interval between Palaeozoic and Mesozoic time, in which mountain-making disturbances were so general in western Europe and eastern North America that the older geologists thought them to be of world-wide extent, was here generally passed over in relative quiet, so that continuous sedimentation produced in certain districts a conformable series of deposits from Silurian to Cretaceous time. Furthermore, the Carboniferous period, which gained its name from the extensive coal deposits that were then formed in western Europe and eastern North America, was a marine limestone-making period in the Cordilleran region.

There is here exemplified, as might be expected in a region extending over 3000 m. from Alaska to southern Mexico, and measuring over 1000 m. in breadth at its middle, a great variety of plateau and mountain structures. The broad upheaval of adjacent blocks of earth-crust without significant tilting or disturbance has produced the plateaus of Arizona and Utah. Some of the simplest and youngest mountain ridges in the world are to be found in the broken and tilted lava blocks of southern Oregon. Tilted blocks on a larger scale, much more affected by processes of sculpture, are found in the lofty St Elias Alps of Alaska, the site of some of the greatest glaciers in the world. The wall of a huge fracture, now elaborately carved, constitutes the western slope of the Wahsatch range, facing the desert basin of Utah. Ranges of a relatively simple arch structure are seen in the Uinta mountains of Wyoming and Utah. Arched upheavals also characterize the front range of the Rocky Mountains proper in Colorado and Wyoming and in the Black Hills of South Dakota, bending up the strata of the adjacent plains in the simplest fashion, and producing dome-like mountains, now deeply dissected by outflowing consequent streams. A remarkable change in the structure of the Rocky Mountains occurs north of the Missouri river in Montana and northward into Canada, where the front range is of synclinal or trough structure, with the youngest instead of the oldest rocks along the axis, while the strata of the plains are bent down and overridden in the most abnormal manner. Indeed, mountain structure occurs of so great diversity in various parts of the Cordilleran region as to elude general description. The disturbances extend directly to the western coast line, including not only the coast range of California, but the peninsular area of Lower California (belonging to Mexico) and the detached mountainous islands of British Columbia and Alaska.

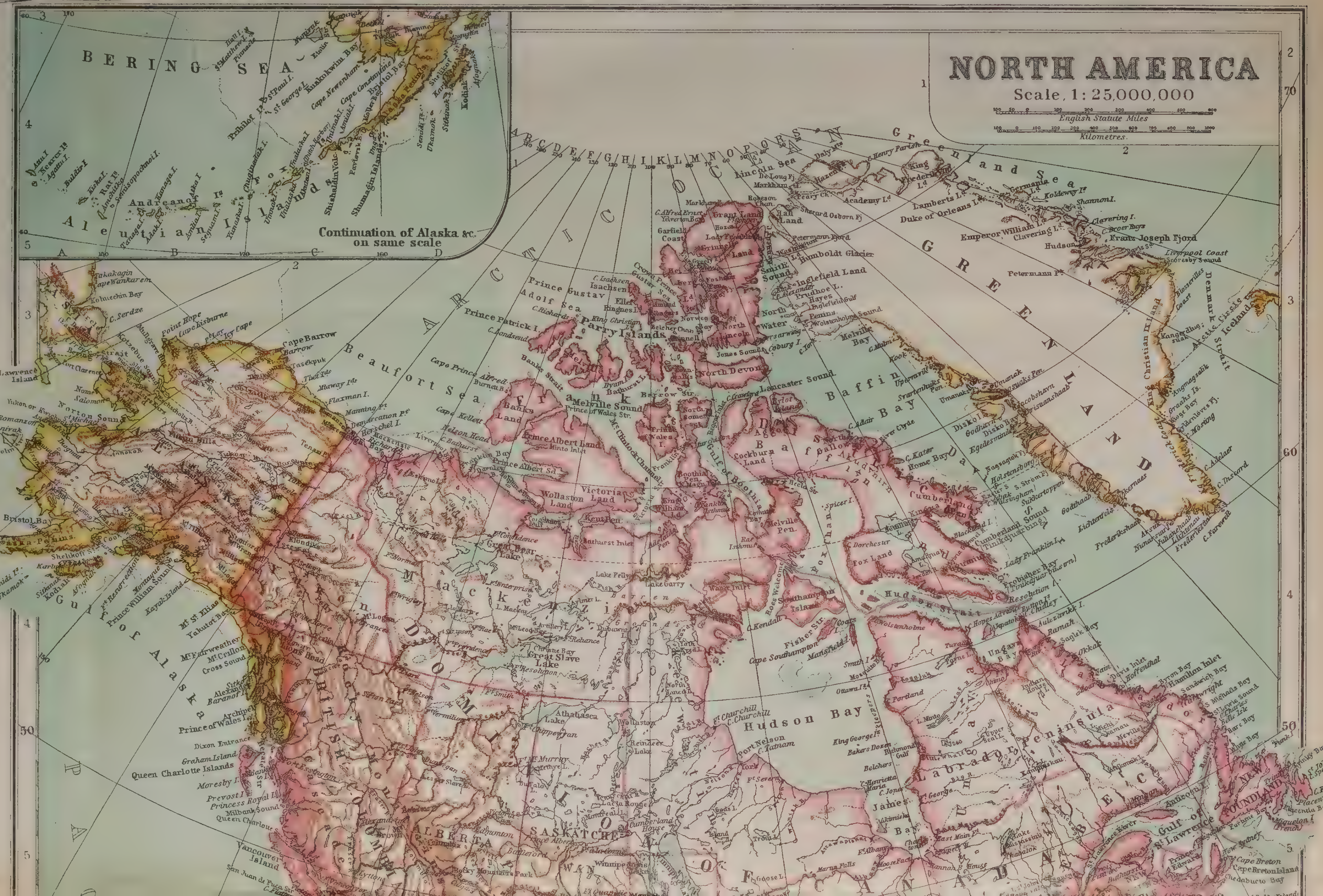
Volcanoes of commanding form here and there dominate the plateaus and mountains. Orizaba, Popocatepetl and their neighbours, terminating the Cordilleran system in Mexico; Mount San Francisco, bearing snow and Arctic plants above the nearly desert plateau of Arizona; Mount Shasta, with small glaciers in northern California; Mount Rainier, with extensive glaciers surmounting the Cascade range of Washington; Mount Wrangell in Alaska, and farther on the many cones in the curved chain of the Aleutian islands: all these have been heaped up around vents through which their lavas rose from some deep source. Vast lava floods have been poured out at different times. The southern part of the Mexican plateau is built up in large measure of lava sheets, capped with volcanoes. Extensive lava beds, barren and rugged, cover large areas in north-eastern California. The basins of Snake and Columbia rivers in Idaho and Washington are flooded with older and more extensive lava sheets, whose borders lap around promontories and islands of the "mainland." Still older lava-flows in British Columbia are now deeply dissected by the branches of Frazer river, and remain only in disconnected upland areas. High plateaus in Utah are protected by a heavy lava capping, the result of great eruptions before the plateaus were uplifted. Here and there rise dome-like mountains, the result of the underground intrusion of lavas in cistern-like spaces, forming "laccoliths," and blistering up the overlying strata. Thus, by mountain upheaval or volcanic eruption, great altitudes have been gained. Where the uplift has been strong, ranges of truly Alpine form with extensive snow-fields and glaciers occur, as in the Selkirk range of Canada (now traversed by the Canadian Pacific railway), and again in Alaska. Heights of 12,000 and 14,000 ft. are exceeded by numerous summits in the central part of the system; but the dominating peaks are found far in the north-west and in the south. Several mountains in Alaska exceed 18,000 ft. (Mount McKinley, 20,300 ft.; Mount Logan, 19,540 ft.; Mount St Elias, 18,000 ft.); and the great Mexican volcanoes rise nearly as high (Orizaba, 18,250 ft.). Widespread plateaus maintain upland altitudes of more than a mile over vast areas.

As in all regions of great altitude, the erosion of valleys has progressed on a magnificent scale in the Cordilleran region, and the actual form of many of its parts is more the result of sculpturing than of uplifting. The plateaus of Arizona are traversed by the deep cañons of the Colorado river and its branches, at places 1 m. deep, and with elaborately carved walls. Upon the plateaus themselves, long and ragged cliffs of recession attest an even greater work of erosion than the cañons. In all the mountain ranges except those of youngest uplift, valleys have been actively eroded, sometimes producing steep peaks as in Mount Assiniboine (11,500 ft.) in the Canadian Rockies, rivalling the Swiss Matterhorn in sharpness of form; but the greater number of summits have been worn to roughly pyramidal form between wide-flaring valleys, and the mountain flanks have thus come to be extensively covered with rock waste lying on slopes of relatively uniform declivity. Some of the ranges are in a second cycle of dissection, having been once worn down to moderate relief and now being elevated for renewed erosion; the Sierra Nevada of California is believed to be, in part, of this history, having at least in its central and northern parts been well reduced and now again enjoying a mountainous character in virtue of a later slanting uplift *en bloc*, with rapid descent on its eastern fractured face. Other ranges, almost completely worn down, still remain low, as in south-eastern California, where they are now represented by gently sloping rock floors veneered with gravel and retaining only small remnants of their original mass still unconsumed; thus the end, as well as the beginning, of the cycle of erosion, together with many complications of its progress, are illustrated in different parts of this great and varied mountain system. In the fjorded coast of Alaska, as well as in the higher northern ranges, signs of intense glacial erosion are seen in the cirques at the valley heads and in the discordant junction of the "hanging" lateral valleys and the deep trunk valleys—the floors of the former being cut off on the walls of the latter.

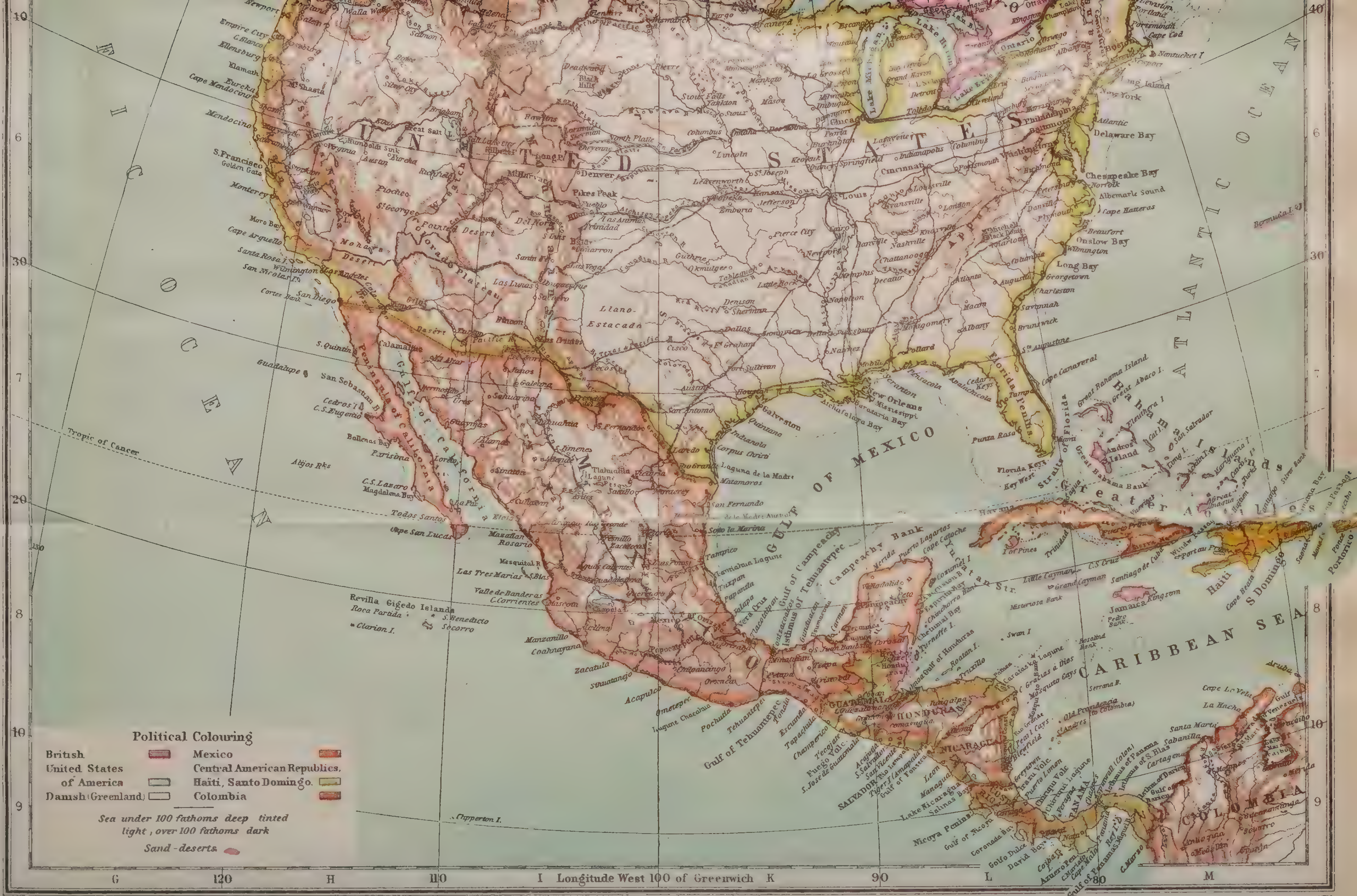
Fitting complements of the deeply-eroded mountains are found in the great accumulations of mountain waste now occupying basins of depression between the various ranges, as in Mexico, Utah, Nevada, Montana and elsewhere. Erosion and transportation here combine to build up the floors of the basins with the waste of the surrounding highlands; a result that is peculiarly beneficial in Mexico where the climate of the plateau basins is rendered relatively temperate by reason of its altitude, and where the surface is easily habitable by reason of its small relief. In the larger depressions, as along the boundary of the United States and Mexico, isolated ranges frequently rise like islands over the plain of waste that has been built up on their flanks. Shallow saline lakes or playas (wet-weather lakes) without outlets lie on the lowest parts of the waste-filled basins; their failure to overflow in rivers discharging to the sea being less the result of enclosure by barriers than of deficiency of rainfall; for it is chiefly in the arid region that the waste-floored basins are best developed. Indeed, the rainfall is often so scanty that the streams from the mountains—where most of the little precipitation occurs—often fail even to form lakes, withering away on the waste plains. In all these cases, the wash of rock waste from the mountains remains on the continent and builds up the basin plains, instead of being carried away from the land to form stratified sediments on the sea floor. The habit of gathering mountain waste in interior basins that characterizes so much of the Cordilleran region to-day is only the continuation of an earlier practice, for extensive basin deposits of Tertiary date are found in many parts of the Cordilleran region; some of them are famous for preserving vertebrate fossils, such as those of the many-toed ancestors of the horse.

The Medial Plains.

Between the loftier western highlands and the lower eastern highlands (Laurentian and Appalachian) lies a great extension of medial plains, stretching in moderate altitude from the Arctic Ocean to the Gulf of Mexico, and having in their middle a breadth of 1500 m. They are composed throughout of nearly horizontal strata and mark a region long exempt from strong disturbance. Although for the most part floored by marine formations, their structure and composition indicate, as has already been said, relatively shallow water. The ancient sea that once occupied the middle belt of the continent therefore had little likeness to the abysmal oceans, but resembled rather the shallow ocean margins that to-day overlap various continental masses—the largest example of this kind now existing being between Asia and Australia. The eastern part of the plains is underlaid by Palaeozoic strata, already mentioned as having been laid down upon the subsiding Archaean continent or folded in the making of the Appalachians; coal beds are here included in the Ohio and middle Mississippi basins. The area of the western plains remained submerged to a later date, preserving a stretch of marine waters to the end of Mesozoic time, and thus resembling the lowland belt of western Asia, which was similarly covered by a broad and a shallow arm of the ocean extending from the Arctic to the European mediterraneans until a late geological date. The surface of the medial plains is not always so even as might be inferred from their name. Both



NORTH AMERICA
Scale, 1: 25,000,000
English Statute Miles
Kilometres
Continuation of Alaska &c. on same scale
BERING SEA
Aleutian Islands
Fox Islands
Andreanof Is
Pribilof Is
Bristol Bay
Alaska Penins.
Kodiak
Shumagin Islands
ARCTIC OCEAN
Beaufort Sea
Lincoln Sea
Greenland Sea
GREENLAND
Denmark Strait
Iceland
Arctic Circle
Baffin Bay
Davis Strait
Baffin Land
Lancaster Sound
North Devon
Parry Islands
Melville Sound
Banks Land
Victoria Land
Wollaston Land
Prince Albert Land
Mc Clintock Channel
Gulf of Boothia
Fox Channel
Hudson Strait
Hudson Bay
James Bay
Southampton Island
Melville Pen.
Cumberland Sound
Frobisher Bay
Ungava Bay
Labrador Peninsula
Gulf of St Lawrence
Newfoundland
Cape Breton Island
Anticosti I.
Quebec
Mackenzie
Keewatin
Dominion of Canada
Great Bear Lake
Great Slave Lake
Athabasca Lake
Yukon
Klondike
Alaska
Gulf of Alaska
Norton Sound
Kotzebue Sound
Bering Strait
Cape Barrow
St. Lawrence Island
British Columbia
Alberta
Saskatchewan
Rocky Mountains
Queen Charlotte Islands
Vancouver Island
Prince of Wales I.
Mt St Elias
Mt Fairweather
Mt McKinley
Pacific


Political Colouring
British
United States of America
Danish (Greenland)
Mexico
Central American Republics.
Haïti, Santo Domingo.
Colombia
Sea under 100 fathoms deep tinted light, over 100 fathoms dark
Sand-deserts
UNITED STATES
MEXICO
GULF OF MEXICO
CARIBBEAN SEA
ATLANTIC OCEAN
PACIFIC OCEAN
Bahama Islands
Greater Antilles
Gulf of California
Peninsula of California
Tropic of Cancer
Longitude West 100 of Greenwich
G
120
H
110
I
K
90
L
80
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40
6
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7
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10
9

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the eastern and the western areas have been extensively denuded, even to the point of being reduced to peneplains. Their present altitude is not so much the result of their original uplift from the sea as of a later elevatory movement. The great river basins, for which North America is famous, have thus been formed between the eastern and western highlands—the Mississippi receiving the drainage of a vast area (about 1,240,000 sq. m.) for discharge to the south, while the Saskatchewan and Mackenzie gather their waters from somewhat less extensive areas in the north. Pleistocene glaciation covered the plains of the Ohio, upper Mississippi and Winnipeg districts with extensive deposits of ice-laid or water-laid drift, furnishing a generally smooth surface and a fertile soil: here are the true prairies—treeless, but richly grassed.

Central America and the West Indies.

The traditional continuity of the Cordilleras of North and South America has been broken by investigations in the isthmian portion of the northern continent. The structural peculiarities of the western highlands of North America may be traced only to the east and west belt of great volcanoes by which the plateau of central Mexico is terminated on the south. The ranges of the Andes fail to reach Panama, from which the nearest one is separated by the valley of the Atrato. The two Cordilleras are out of line with each other, and their ends are some 1200 m. apart. Central America, the West Indies and various submarine ridges by which the islands are connected with one another and with the mainland to the west, as well as certain ranges along the northern margin of South America, all belong together in what has been termed the Antillean mountain system, in which east and west trends of late geological date predominate, with abundant volcanic additions on the Pacific border of Central America, and along the eastern end of the system in the Windward islands of the Lesser Antilles. The unity of this system has been until recently overlooked partly because the Antillean ranges are for the most part still under water, and yet further because the volcanoes which form the strongest reliefs of the isthmian region are so arranged along the Pacific coast as to suggest the continuity of the Cordilleran systems on the north and south; but these volcanoes are really only superadded to a foundation of quite another kind. Geological studies on the mainland and on the islands have shown that both fundamental structure and surface form are not Cordilleran; and numerous soundings in the adjacent mediterraneans suggest that the islands are best interpreted as the somewhat denuded crests of great crustal ridges. The warm waters that bathe the West Indies come with a high temperature from the equatorial Atlantic, and favour the growth of corals along the shores. Fringing and elevated reefs are known on many of the islands. The Bahamas are the slightly overtopping parts of a broad platform of coral and other calcareous marine deposits, of which the greater area constitutes extensive shallow banks, which descend by a steep slope on the north-east to great depths in the Atlantic. The lowlands of Yucatan resemble Florida in being the emerged part of a much larger mass, of which an equal portion is still under water in the shelf around the Gulf of Mexico. All this region is luxuriantly productive and is advantageously surrounded by waters which would be barren and desert, like the Sahara, if replaced by lowlands. The active volcanoes on the Pacific slope have built many cones and uplands, some of their historic eruptions having been of terrible violence. Thus Lake Nicaragua, once a bay of the Pacific, has been cut off by volcanic deposits, leaving only the Gulf of Fonseca open to the western ocean, raising the level of the lake behind the barrier and turning its discharge eastward to the Caribbean Sea across what was once the inter-oceanic watershed.

Rivers.

The successive crustal movements by which the land area of what we now know as North America has been increased and connected have determined the growth of several great river systems through which the broader part of the continent is drained. The movements that resulted in the emergence of the Plains had the effect of engrafting many ancient rivers of moderate size upon trunks of unusual dimensions. The Mississippi system, some of whose eastern branches probably date from early Mesozoic time, received great reinforcements by the addition of many long western branches in Tertiary time, roughly contemporaneous with the uplift of the Gulf coastal plain by which the lower trunk of the river was extended to the sea. The present headwaters of that river-trunk to which the name of Mississippi is applied, and which for that reason have gained an undue subjective importance, are of relatively modern date, as they are controlled by the abundant glacial deposits of northern Minnesota. The evolution of the Mackenzie resembles that of the Mississippi in a very general way, although some of its eastern branches may be the descendants of ancestors more ancient than those flowing westward from the Appalachians; but the regime of the great northern river is strikingly unlike that of its still greater southern analogue on account of its course being from a warmer to a colder climate: hence ice-dams, obstructed discharge, and overflows recur every spring. The Nelson and the St Lawrence systems, draining eastward to Hudson Bay and St Lawrence Gulf, receive drainage from areas that would belong to the Mackenzie and the Mississippi systems under a simpler plan of continental growth; and there is much reason for thinking that this simpler plan obtained until the occurrence of those changes, in association with the Glacial period, whereby sea waters gained access to the depressions that now hold the bays and sounds of the north-eastern coast. In exemplification of the rule that the larger ocean receives the drainage of the smaller continental area, the rivers that flow into the Pacific rank below those belonging to the Atlantic. The greatest is the Yukon, of farther Canada and inner Alaska, one of the great rivers of the world, little known until the active exploration of its basin for goldfields. The Frazer drains much of the mountainous area of southern British Columbia, as the Columbia drains that of the north-western United States; the latter is peculiar in that one of its headwaters rises at the *eastern* base of the Rocky Mountains in northern Montana and flows westward through the ranges. The Colorado discharges a muddy current into the Gulf of California; but for the aridity of its large drainage area its volume would be much larger. The same is true of the Rio Grande, whose name would be better justified if so much of its basin were not semi-arid.

Lakes.

The most remarkable lacustrine region of the continent, rivalling that of Central Africa, forms a belt around the border of the Laurentian highland; here, in addition to ten large lakes, there are hundreds of medium size, and many thousand small lakes. They are peculiar in occupying a region of moderate relief, in which no strong dislocations have taken place in recent geological time (unless in the case of Lake Superior), and thus in contrasting with the great African lakes which occupy rift-valleys or *graben* of comparatively recent fracture. The Laurentian lakes are further characterized by an intimate association with the ice-sheets of the Glacial period; but while glacial erosion and drift obstruction suffice to account for the smaller lakes, it is very probable that broad crustal warping and drainage reversal have been potent aids to the other processes in producing the great lakes. The northern Cordilleran region contains many beautiful lakes of moderate size in deep valleys among the crowded ranges of the narrowed mountain belt. Their origin has not been closely studied. The basins among the spaced ranges of the middle and southern Cordilleras, in the United States and Mexico, contain many lakes that occupy shallow depressions in desert plains; they are usually without outlet and saline; many of the basins were formerly occupied by lakes of much greater size, some of which overflowed, implying a climate moister than that of to-day, probably correlated with the glacial climate of the regions farther north. Lakes in volcanic craters or behind volcanic barriers occur in Central America, while Florida possesses many small lakes in limestone basins. The following table is taken from Russell's *Lakes of North America*:—

Lake.	Altitude.	Area.	Depth.
	Ft.	Sq. m.	Ft.
Ontario	247	7,200 (?)	738
Erie	573	9,900	210
Huron	582	22,322	750
Michigan	582	21,729	870
Superior	602	31,000	1008

Climate.

The climatic features of North America are best appreciated when considered as exhibiting modifications of those general climatic conditions which prevail in consequence of the globular form of the earth as a whole. In January, when the isotherms of 65° to 75° F. stretch almost directly across land and sea in the north torrid zone, a mean temperature of zero or less invades the region north-west of Hudson Bay, which thus resembles north-eastern Asia in departing greatly from the mean prevailing in similar latitudes on the northern oceans, and in bringing upon the northern lands an extension of frigid conditions that have no analogue in the southern or oceanic hemisphere. In July, when the isotherms of 40° and 50° have a tolerably direct course around the latitude circles that border the continent on the north, a great middle area of North America becomes warmer than the seas on the east and west, having a mean of over 80°, and in part over 90°. In January the Hudson Bay region is 30° colder than the mean of its own latitude, about 60° colder than the mean of the corresponding southern latitude; while in July the Arizona-Mexican region is 20° above the mean of its own latitude, or about 40° above the mean of the corresponding southern latitude. In both winter and summer the isotherms are more closely crowded while crossing the continent than while crossing the adjacent oceans; or, in other words, the poleward temperature gradient is stronger on the land than on the oceans; and all these features should be regarded as inherent characteristics of the climate of North America in virtue of its being a continent chiefly in temperate latitudes.

An associated feature of continental climate is found in the strong annual range of temperature of the central land area. The range between the means of January and July exceeds 40° for the largest part of the lands, and 70° for much of the northern lands; the range of extreme temperatures is much greater. On corresponding oceanic areas in the northern hemisphere the range is little more than 20°, and in the southern hemisphere it is probably less than 10°. It must appear from this that if the largest part of North America is said to be in the north temperate zone, "temperate" must be taken as having little of the meaning originally given to it in southern Europe, for the winter cold is severe and the summer heat is excessive over much of the North American continent.

The several members of the terrestrial wind system, including therein the trade winds of a broadened torrid zone, the stormy westerly winds of middle latitudes and the irregular winds of the polar regions, are well exemplified over North America; but, as is usually the case on land, the systematic movement of the atmosphere is better seen in the drift of the clouds than in the movement of the surface winds, which are much modified by the changes from hill to valley, from mountain to plain. Nevertheless the prevalence of the general atmosphere currents has much to do with the control of certain values of annual temperature range, as well as with the distribution of rainfall. The former are small (about 20°) along a great stretch of the Pacific coast, even as far north as Alaska, where the moderating influences of the ocean are brought upon the land by the westerly winds; while a range appropriate to a continental interior (30° or 40°) is experienced over most of the eastern side of the continent in temperate latitudes, and even upon the North Atlantic ocean near the American coast, where strong seasonal changes of temperature are carried forward by the westerly winds. It is particularly in this respect that the general climatic resemblances between North America and Eurasia, above referred to, are broken; for eastern Canada and western Europe are strikingly unlike in seasonal variations of temperature. Labrador is about 10° cooler than northern Germany in July, but nearly 40° colder in January.

The distribution of rainfall is in general controlled by the prevailing course of the winds. The West Indies receive abundant rain from the passing trades. In Mexico and Central America the eastern slopes are for the most part better watered than the western, because the winds there come chiefly from the east (maximum over 100 in. in Guatemala and adjacent parts). Farther north the reverse holds true; the Pacific slope north of 40° latitude has an abundant rainfall (maximum over 100 in.), and its mountains are clothed with dense forests. There are large areas of deficient rainfall (less than 20 in.) in the interior of the continent, where the intermontane basins and the piedmont plains that slope eastward from the Rocky Mountains in middle latitudes are treeless. The areas afflicted with dryness are unsymmetrically distributed, being west of the medial meridian (95°), because of the ranges near the Pacific by which rain is withheld from the basins and from the plains farther east. The dryness is induced not only by light precipitation, but also by active evaporation in the warm season—a rule that holds true until a high latitude is reached. East of the medial meridian great profit is received from the warm and moist winds that are drawn inland from the water surface of the mediterraneans (Gulf of Mexico and Caribbean Sea) which so advantageously occupy the latitudes that are given up to the Sahara in the Old World. It is largely on this account that the central and eastern parts of the Mississippi basin enjoy a sufficient and well-distributed rainfall, producing forests or fertile prairies over great areas (rainfall over 40 in.). Regions of prevailing snowfall are chiefly in the north-west and north-east; the former includes the higher ranges of the western highlands in Canada and Alaska, where the snowfall from the Pacific winds is heavy, and extensive snowfields and glaciers are formed; the former includes Greenland, where a heavy ice-sheet shrouds the land, the snowfall of moderate measure being probably supplied mostly from the North Atlantic. In the northern continental interior snow covers the ground during the winter season, not that the snowfall is heavy but that the persistent cold weather preserves the moderate amount that falls.

The extension of the continent across the belts of the terrestrial wind system tends to turn branch winds from the westerlies toward the trades on the Pacific border, and from the trades toward the westerlies on the Atlantic border. This effect is strengthened in summer, when the higher temperature prevalent over the continent causes the air to flow away from above the lands, and to accumulate over the neighbouring oceans, on each of which a vast anticyclone is thereby established—the circulation of the atmosphere over the North Atlantic and North Pacific thus coming to simulate the circulation of the surface waters of the oceans themselves. It is partly on account of this deflection of the summer winds up the Mississippi valley that the eastern interior of the continent receives a beneficent rainfall as already stated. In winter when the inflow from the south is replaced by an outflow, little rain or snow would fall but for the indraft winds of cyclonic storms by which the outflow appropriate to the cold season of the continent is temporarily reversed. The free play of the cyclonic winds north and south over the great medial plains permits indrafts from torrid and frigid sources, which sometimes succeed each other rapidly, producing abrupt and frequent weather changes. Something of the same contrasts is produced by winds drawn in upon the eastern coast alternately from over the moist and warm waters of the Gulf Stream, and from over the moist and cold waters of the Labrador current.

The southerly flow of the branching winds along the Pacific coast gives them a drying quality, and thus still further broadens the western arid region towards the ocean until it reaches the coast in southern California and north-western Mexico (rainfall less than 10 in.), there joining the arid belt of western Mexico and presenting a strong contrast to the rainy forested coast farther north; but although unfavourably dry, the southern California coast is one of the most truly temperate regions of the world, in respect of mildness and constancy of temperature. The drying winds cover all California in summer, but they migrate southward in the winter, giving place to the stormy westerlies. Thus California has a subtropical climate of wet winters and dry summers; while north in British Columbia and Alaska there is plentiful rainfall all the year round, and farther south there is persistent aridity.

Fauna.

The fauna of North America (Nearctic) is more closely related to that of Europe-Asia (Palaearctic) than to that of any other zoogeographical province; the two being united by many writers in one faunal province (Holarctic). The reindeer (caribou), beaver and polar bear are common to both provinces. The moose, wapiti, bison and grizzly bear of North America are closely related to the elk, red deer or stag, aurochs and brown bear of Eurasia; and the following groups are well represented in both provinces: cats, lynxes, weasels, bears, wolves, foxes, seals, hares, squirrels, marmots, lemming, sheep and deer. On the other hand the following forms are characteristic of North America: (*rodents*) pouched rats or gophers, musk rat, prairie dog, Canadian porcupine; (*carnivora*) raccoon and skunk; (*ungulates*) musk ox, bighorn, Rocky Mountains goat, pronghorn; (*marsupial*) opossum. Among birds there is a close resemblance to those of Eurasia, with some admixture of South American forms, as in the humming birds. The forms especially characteristic of the northern continent are the Baltimore oriole, bobolink, cowbird, flycatchers, wood-warblers, Californian quail, tree grouse, sage grouse, wild turkey and turkey buzzard. The house sparrow of Europe has been introduced, and has become very common, especially in the cities, where it is known as the English sparrow. Reptilian and amphibian groups are well represented; turtles are especially numerous; salamanders are varied and large; rattlesnakes are among the more peculiar forms. Among fish, the characteristic forms are the cyprinoids (carp), sturgeon, salmon, pike and especially the suckers, sunfish, mudfish (*Amia*) and gar pike (*Lepidosteus*). The most characteristic group of invertebrates is the Unionidae or river mussels.

Flora.

The floral areas of North America, limited by the geographic divisions of the continent, may be divided into five belts: the eastern forested area, the western forested area, the interior unforested area, the northern barren lands and the Gulf coast. The eastern forested area extends from the Laurentian highland in Canada to the Great Lakes, and southward east of the Mississippi to the Gulf coast. In the north and along the mountains southward, the forests are largely coniferous, with a mixture of birches, poplars and maples. Southward, especially in the interior and at low altitudes, the conifers largely disappear, and oaks, hickories, plane-trees, tulip-trees, walnuts and other valuable deciduous species abound. The western forested area begins in the eastern Rocky Mountains and extends to the Pacific. Eastward in the mountains the forests are interspersed with arid districts which increase in area southward. Northward, in Canada, the mountains of the middle Cordilleras are densely wooded with continuous forest up to the timber line. Near the middle Pacific coast the forests attain a luxuriant development, the redwood (*Sequoia*) of California and Oregon sometimes reaching a height of from 300 to 400 ft. The unforested area of the interior consists of two very dissimilar portions. The vast fertile prairies extend from the Great Lakes westward to the Great Plains, and southward west of the Mississippi, with occasional eastward lobes at low altitudes. On these plains grasses and other herbaceous vegetation abound, and throughout this fertile belt agriculture is largely followed, the grain and hay crops being especially important. Northward in Canada the plains become wooded, the western mountains and the eastern highlands being thus connected by a narrow strip of forest. South-westward and westward the fertile prairie gives way to a vast arid region beginning on the Great Plains and extending as far as south-eastern California, and thence southward into Mexico. On this broad desert few trees are found, although piñons grow on the cliffs and ledges, and cottonwoods occur along the watercourses; but the various ranges that surmount the desert frequently carry forests. The desert vegetation as a whole consists of cacti, agaves, sage-brush (*Artemisia*) and other plants adapted to arid conditions. North of the eastern forested area and east of the northern Cordilleras are the "barren lands," with frozen subsoil, extending to the Arctic coast. The growing season here is short and the climate forbidding, so that trees cannot develop, although birches, poplars, willows and other genera, which southward attain large size, are present as dwarf shrubs. The vegetation of this northern barren district, like that of bleak mountain summits southward, is very similar in character to that of other extreme boreal regions. Blueberries, crowberries and some other small fruits are abundant, but the brief summer will not mature most crops of the temperate zone. The Gulf coast, on the other hand, supports a vegetation decidedly tropical in its nature. Somewhat developed in Florida and the other southern states, this flora becomes the prevailing one on the coast of Mexico and Central America, especially from the region of Vera Cruz southward, where the forests are largely composed of palms and live oaks, and where giant bamboos often attain a height of 40 ft. In these tropical forests many orchids and other showy plants of northern conservatories are native.

North America, with an area of about 8,000,000 sq. m. (16% of all the lands, or 4·12% of the whole earth's surface), and a mean altitude of about 2000 ft., at present plays a part in human history that is of greater importance than is warranted

Economic Development of the Continent.

by its size alone, although it has not in this respect the extraordinary importance of Europe. The continent has the good fortune to lie chiefly in a temperate rather than a torrid zone, and in temperate latitudes to be much nearer to Europe than to Asia. Whatever may have been the first home of the aboriginal inhabitants, the dominating people of to-day are derived from the leading countries of the Old World. Not only so; temperate North America has become the most progressive part of the continent because of receiving its new population chiefly from the most advanced nations of middle western Europe—Great Britain, France and Germany; while the torrid islands and the narrowing southern mainland of North America have been settled chiefly from the less energetic peoples of southern Europe; and the inhospitable northern lands are hardly entered at all by newcomers, except in the recently discovered goldfields of the far north-west. From the plantation of colonies on the eastern coast, the movement inland has been governed to a remarkable degree by physiographic factors, such as form, climate and products. The cities of the Atlantic harbours and of the adjacent lowlands still take a leading part in industry and commerce, because of their longer establishment and of their relation to Europe. The uplands, ridges and mountains of the Appalachian system—the "Backwoods" of a century ago—remain rather thinly occupied except at certain centres where coal or other earth-product attracts an industrial population. Beyond the Appalachians the middle interior contains a very large proportion of habitable land. It was long ago recognized as a land of great promise, and it is to-day a land of great performance, covered with a network of railways, yielding an enormous product of grain, and developing industries of all kinds. Indeed, within and closely around an area marked by the St Lawrence system on the north, the Ohio on the south, and stretching from the Atlantic coast between the Gulf of St Lawrence and Chesapeake Bay inland to the middle prairies, there is a remarkable concentration of the population, industry, progress, wealth and power of North America—the focus of attention from all other parts of the continent. The regions of the far north and north-east, including the greater part of the Laurentian highland and the extreme northern stretch of the medial plains and the western highlands, remain and will long remain thinly populated. The furs of wild animals are their characteristic product. Timber is taken from their more accessible forests; but only in mining districts does the population notably increase, as in the iron region around Lake Superior and in the Klondike gold region.

In the south-eastern United States lies a belt of coastal lowlands skirting the Appalachians, still affected by negro slavery and its consequences. The descendants of the early French settlers of Canada stand in political rights as well as in loyalty to the Government on an equal footing with the British citizens of the Dominion. The Italians of the cities, the Hungarians of the mines, the Scandinavians of the northern prairies, the Irish and Germans everywhere are "Americanized" in the second or third generation, rapidly entering local and national politics, and hardly less rapidly attaining an honourable social standing as tested by intermarriage with English and other stocks. But the negro is set aside, even though he has adopted the language and the religion of his former masters: political and social rights are denied him, and intermarriage with whites is practically excluded, although illegitimate mulattos are numerous. Thus has slavery left upon a people, amongst whom political rights and social opportunities should be equal for all, the heavy burden that always retards progress where strongly contrasted races are brought together. Farther south still are the tropical islands and the narrowing mainland, rich in possible productiveness, but slowly developed because of a prevailing diversity and instability of government and lack of progressive spirit among the people. Here also there is a considerable proportion of negroes, but they live under less unhappy conditions than those now obtaining in the United States. In Mexico and Central America, the proportionate number of aborigines is much greater than farther north.

West of the Mississippi in middle latitudes the population rapidly decreases in density, and over a large extent of the semi-arid plains it must long remain sparse. The settlements bordering the plains on the east for a long time marked the "Frontier" of civilization, for the vast stretch of dry country was a serious barrier to farther advance. But the plains are now crossed by many railways leading to the Cordilleran region—the "Far West"—in large part too rugged or too arid for occupation, but rich in minerals from one end to the other, the seat of many mining camps of unstable population, and containing numerous permanent settlements in the intermontane basins. Great irrigation enterprises, conducted under the National Reclamation Service of the United States, are employing all available water supplies for agriculture; but large areas must remain permanently desert. On nearing the farther ocean the climatic conditions improve, and the population is rapidly increasing in number and wealth; this district not being content to take its name with respect to the east, not considering itself as included in the "Far West," but choosing the distinctive designation of the "Pacific Slope," and, while maintaining an active intercourse all across the breadth of the continent, already opening relations with the distant Orient by a new approach. Among the earliest results of the latter movement was the arrival of Chinese labourers, a humble, industrious and orderly class of men, but one which stands apart in language, religion and race from the dominant population, lives largely without domestic ties, and gains neither political nor social standing in the New World.

Two centuries ago the aboriginal population of North America would have deserved description before the immigrant population. To-day the aborigines are displaced from nearly all the valuable parts of the continent. Never very numerous, they are now decreasing; many tribes are already extinct, many more are almost so. Those which remain less diminished are in the Far North or North-West where nature is rigorous; or in the tropical forests of Central America where nature is over bounteous; or in the more desert parts of the Middle West where nature is arid. The replacement of the native races by the foreign has too often been harsh, cruel and unjust; yet it has resulted in an advance of civilization. Many savage tribes, speaking many different languages, holding little intercourse with each other, and frequently engaged in intertribal wars, have given place in little more than two centuries to a great population of European origin, whose dominant parts speak one language, whose arts are highly advanced, whose home intercourse is most active, and whose foreign commerce had attained unexpected proportions at the opening of the 20th century. (W. M. D.)

NORTHAMPTON, EARLS AND MARQUESSES OF. The Northampton title has been held in various English families. About 1080 Simon de Senlis (d. 1109), a Norman noble, and the builder of Northampton Castle, was created earl of Northampton as well as earl of Huntingdon by William the Conqueror; his son Simon (d. 1153) was also recognized in the title about 1141, though his stepfather, David, king of Scotland (1084–1153), had meanwhile obtained the earldom in right of his wife. The second Simon died childless. In 1337 William de Bohun (*c.* 1310–1360), a distinguished soldier, son of Humphrey de Bohun, 4th earl of Hereford and 3rd earl of Essex, was created earl of Northampton; and his son Humphrey, who succeeded, fell heir in 1361 to the earldoms of Hereford and Essex, which thus became united under that of Hereford. The titles, however, became extinct at his death in 1372.

In 1547 William Parr (1513–1571), son of Sir Thomas Parr and brother of Catherine Parr, was created marquess of Northampton, and though attainted in 1553 was recreated marquess in 1559. He took part in suppressing the rising in the north of England in 1537, and after serving as member of parliament for Northamptonshire was made Baron Parr in 1539. In December 1543, just after his sister had married the king, he was created earl of Essex, a title formerly held by his father-in-law, Henry Bourchier, who had died in March 1540. Under Edward VI., who called him "his honest uncle," Parr was equally prominent, being lord-lieutenant of five of the eastern counties, and being great chamberlain from 1550 to 1553. He favoured the claim of Lady Jane Grey to the English throne and consequently the accession of Queen Mary was quickly followed by his attainder. Although sentenced to death he was pardoned and released from prison at the end of 1553. After enjoying the favour of Queen Elizabeth, Northampton died at Warwick on the 28th of October 1571. He left no children and his marquessate became extinct. In 1604 Henry Howard (see below) was created earl of Northampton, his title dying with him. It next passed into the Compton family, where it has since remained. The 1st earl of Northampton in this line, William Compton (d. 1630), who received the title in 1618, was a great-grandson of the Sir William Compton (1482–1528) who was with Henry VIII. at the Field of the Cloth of Gold, and his son the 2nd earl is noticed below. The 9th earl, Charles Compton (1760–1828), was created a marquess in 1812, receiving at the same time the titles of Earl Compton and Baron Wilmington. His son Spencer Joshua Alwyne, the 2nd marquess (1790–1851), was president of the Royal Society from 1838 to 1848; the latter's son Lord Alwyne Compton (1825–1906) was bishop of Ely from 1886 to 1905. The 5th marquess (b. 1851), son of the 4th marquess (1818–1897), was, as Earl Compton, a Liberal member of parliament from 1889 to 1897.

Henry Howard, earl of Northampton (1540–1614), was the second son of Henry Howard, earl of Surrey, the poet, and of Lady Frances Vere, daughter of the 15th earl of Oxford, and younger brother of Thomas Howard, 4th duke of Norfolk. He was educated first by Foxe the martyrologist, afterwards by John White, bishop of Lincoln, with whom he acquired Romanist opinions, and finally at the charge of Queen Elizabeth at King's College and Trinity Hall, Cambridge, where he obtained his M.A. degree in 1564, subsequently in 1568 being incorporated M.A. at Oxford. The discovery of his brother's plot to marry Mary, Queen of Scots, and of his own correspondence with her, deprived him of Elizabeth's favour, and he was arrested more than once on suspicion of harbouring treasonable designs. In 1583 he published a work entitled *A Defensative against the Poyson of supposed Prophecies*, an ostensible attack upon astrology, which, being declared to contain heresies and treason, led to his imprisonment. On regaining his liberty he is said to have travelled in Italy. His flattery of the queen in lengthy epistles met with no response, and his offer to take part in the national defence against the Spanish invasion was refused. He attached himself, however, both to Essex and to Robert Cecil, and through the influence of the latter was in 1600 again received by Elizabeth. At the close of the queen's reign he joined with Cecil in courting the heir to the throne in Scotland, the main object of his long letters of advice, which James termed "Asiatic and endless volumes," being to poison the royal mind against Sir Walter Raleigh and other rivals, whom he at the same time hoped to ensnare into compromising relations and correspondence with Spain. These methods, which could not influence Elizabeth, were completely successful with James, and on the latter's accession Howard received a multitude of favours. In 1603 he was made a privy councillor, on the 1st of January 1604 lord warden of the Cinque Ports, and on the 13th of March earl of Northampton and Baron Howard of Marnhull in Dorset; on the 24th of February 1605 he was given the Garter and on the 29th of April was appointed Lord Privy Seal. In 1609 he was elected high steward of the university of Oxford, and in 1612 chancellor of Cambridge university. The same year he was appointed one of the commissioners of the treasury.

He was one of the judges at the trials of Raleigh and Lord Cobham in 1603, of Guy Fawkes in 1605, and of Garnet in 1606, in each case pressing for a conviction. In 1604 he was one of the commissioners who composed the treaty of peace with Spain, and from that date he received from the Spanish Court a pension of £1000. The climax of his career was reached when he assisted his great-niece, Lady Essex, in obtaining her divorce from her husband in order to marry the favourite Somerset, whose mistress she already was, and whose alliance Northampton was eager to secure for himself. He obtained the divorce by the decree of a special commission, and when Sir Thomas Overbury's influence seemed likely to prevent Somerset completing the marriage project, he caused the former to be imprisoned in the Tower. Shortly afterwards Overbury died from the effects of poison administered by the direction of Lady Essex; and the close intimacy which existed between the latter and Northampton, together with his appointment of Sir Gervase Elwes or Helwys, a friend of his own, as the keeper of the victim, leaves his name tarnished with the blackest suspicions. The discovery of the crime was not made till some little time after Overbury had succumbed, and meanwhile Northampton's own death anticipated his fall, together with that of Somerset, from power. He advised against the summoning of parliament in 1614, and then fomented disputes to compel James to dissolve it. He died unmarried on the 15th of June 1614, when his title became extinct, and was buried in the chapel of Dover Castle, the monument erected above his grave being subsequently removed to the chapel at Greenwich College. His will shows that he died a Roman Catholic.

Northampton, who was one of the most unscrupulous and treacherous characters of the age, was nevertheless distinguished for his learning, artistic culture and his public charities. He built Northumberland House in London and superintended the construction of the fine house of Audley End. He founded and planned several hospitals. Bacon included three of his sayings in his "Apophthegms," and chose him as "the learnedest councillor" in the kingdom to present to the king his *Advancement of Learning*. He was the author of a *Treatise of Natural and Moral Philosophy* (1569; MS. in the Bodleian Library); of a pamphlet supporting the union between Elizabeth and the duke of Anjou (1580; Harleian MSS. 180); *A Defensative against the Poyson of supposed Prophecies* (1583); a reply to a pamphlet denouncing female government (1589; Harleian MS. 7021); *Duello Foiled*, printed in T. Hearne's *Collection of Curious Discourses* (1775), ii. 225, and ascribed there to Sir Edward Coke; *Translation of Charles V.'s Last Advice to Philip II.*, dedicated with a long epistle to the queen (Harl. 836, 1506 and elsewhere in Stowe 95, King's MSS. 106); devotional writings (Arundel MSS. 300); speeches at the trials of Guy Fawkes and Garnet in *State Trials*, vol. i. In Somers Tracts (ed. 1809), ii. 136, his opinions on the union between England and Scotland are recorded.

See the life in *Surrey's and Wyatt's Poems*, ed. by G. F. Nott (1815), and Sidney Lee's article in the *Dict. Nat. Biog.*

Spencer Compton, 2nd earl of Northampton in the Compton line (1601–1643), was the son of William, 1st earl, lord president of the marches, whose father had been created Baron Compton by Elizabeth, and of Elizabeth, daughter and heir of Sir John Spencer, lord mayor of London. On the 3rd of November 1616 he was created a Knight of the Bath, and was elected for Ludlow in the parliament of 1621, the same year being appointed master of the robes to the prince of Wales and attending the latter in the adventure to Spain in 1623. He warmly supported the king in the Scottish expeditions, at the same time giving his advice for the summoning of the parliament, which "word of four syllables" he declared was "like the dew of heaven."[1] On the outbreak of the Civil War he was entrusted with the execution of the commission of array in Warwickshire. After varying success and failure in the Midlands he fought at Edgehill, and after the king's return to Oxford was given, in November 1642, the military supervision of Banbury and the neighbouring country. He was attacked in Banbury by the parliamentary forces on the 22nd of December, but relieved by Prince Rupert the next day. In March 1643 he marched from Banbury to relieve Lichfield, and having failed there proceeded to Stafford, which he occupied. Thence on the 19th of March, accompanied by three of his sons, he marched out with his troops and engaged Sir John Gell and Sir William Brereton at Hopton Heath. He put to flight the enemy's cavalry and took eight guns, but in the moment of victory, while charging too far in advance, he was surrounded by the parliament soldiers. To these who offered him quarter he answered that "he scorned to take quarter from such base rogues and rebels as they were," whereupon he was despatched by a blow on the head. Clarendon describes his loss as a great one to the cause. Northampton married Mary, daughter of Sir Francis Beaumont, by whom besides two daughters he had six sons, of whom the eldest, James (1622–1681), succeeded him as 3rd earl of Northampton, Henry (1632–1713) became bishop of London, and Charles, William and Spencer all distinguished themselves in the king's cause. The 3rd earl's third son Spencer (1673–1743) was a favourite of George II. and in 1728 was created earl of Wilmington, a title which became extinct at his death.

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[1] *Hardwicke State Papers*, ii. 210.

See the article in the *Dict. of Nat. Biog.* by C. H. Firth; E. B. G. Warburton's *Life of Prince Rupert*: S. R. Gardiner's *Hist. of England and of the Civil War*; *Thomason* Tracts, E 99 (18) [Hopton Heath and Northampton's death], E 103 (11) [elegy], E 111 (11), E 110 (8) 1642 [Proceedings at Banbury], E 83 (47) [speech].

NORTHAMPTON, a municipal, county and parliamentary borough and the county town of Northamptonshire, England, 66 m. N.W. by N. from London by the London & North Western railway; served also by a branch of the Midland railway. Pop. (1891) 75,075, (1901) 87,021. It lies in a slightly undulating district mainly on the north bank of the river Nene. The main roads converging upon the town meet near the centre in a spacious market-place, where stands a fountain on the site of the ancient cross destroyed by the fire of 1675 which levelled a great part of the town. There were formerly seven ancient parish churches, but only four remain. Of these All Saints church was rebuilt after the fire of 1675, but retains its Decorated embattled tower, with which the style of the later building scarcely harmonizes, the principal feature being the fine Ionic portico. The church of St Giles was originally a cruciform structure of the beginning of the 12th century, but has been greatly changed, and besides a rich Norman doorway contains specimens of Early English, Decorated and Perpendicular work. St Peter's, near the site of the ancient castle, is supposed to be of the same date with it, and its interior is a fine specimen of Norman architecture. St Sepulchre's, one of the four round churches still remaining in England, may have been built by the Knights Templars at the close of the 11th century. There are several modern parish churches. Northampton is the seat of a Roman Catholic bishop, and there is a pro-cathedral, designed by A. W. Pugin (1864). In the neighbourhood of the town there were a Cluniac priory of St Andrew, a house (Delapré) for nuns of the same order, and one for Augustinian canons dedicated to St James; but the first has disappeared, the site of the second is occupied by a modern mansion, and of the third there are only slight fragments. Some portions of the castle were re-erected on a new site after their destruction when the Castle station was built by the London & North Western Railway Company. In the populous parish of Hardingstone, S. of the town, is one of the original Eleanor crosses, of which only three remain out of twelve erected by Edward I. to mark the resting-places of his queen's body on its way from Harby (Nottinghamshire) to burial at Westminster. The chief public buildings of Northampton are a town hall, county hall, county council room, corn exchange, antiquarian and geological museum, free library and barracks. The free grammar school was founded in 1552; the Northampton and county modern and technical schools were incorporated with it in 1894. There are a Roman Catholic convent with schools, and various charity schools. The charitable foundations include St John's hospital, founded in the 12th century; St Thomas's hospital, founded in 1450 in honour of Thomas à Becket, an infirmary, asylum, dispensary, &c. There is a race-course north of the town. The staple trade is the manufacture of boots and shoes, which is very large. There are also considerable currying and tanning works, breweries, iron foundries, and brick and tile works. The cattle market is extensive. The county borough was created in 1888. The municipal borough is under a mayor, 8 aldermen and 24 councillors. Area, 3469 acres.

British and Roman remains have been discovered near Northampton (*Hamtune*, *Northantone*), and it became the chief settlement of the Angle tribes who pushed their way up the Nen in the early part of the 6th century. It was occupied by the Danes in the reign of Edward the Elder and is said to have been burnt by Sweyn in 1010. In the reign of Edward the Confessor there were 60 burgesses in his demesne, and, although the number had decreased to 47 in 1086, a new borough containing 40 burgesses had been formed. The burgesses rendered yearly to the sheriff £30, 10s. "which belonged to his farm," and was probably the beginning of the fee farm which they were allowed to pay directly to the king in 1185 and which was then increased from £100 to £120. Forty marks of this farm were pardoned by Richard III. in 1484 because "the town had come to such ruin" that the bailiffs had to pay more than £53 from their own goods. The mayor was the chief officer in the 13th century, and Henry VI. granted the incorporation charter in 1460 under the title of mayor, bailiffs and burgesses. The town has been represented by two members since 1395. Tanning was an industry of Northampton in the time of Edward I. and in 1675 a law was made by the corporation forbidding strangers to purchase hides in the town except on fair-days. Boots and shoes are known to have been made here in the reigns of John and Edward I., although probably only for the use of the towns-people, and by the 17th century Northampton was one of the most noted places in England for their manufacture.

Northampton has been the meeting-place of several important councils and parliaments. In the wars between John and his barons the castle withstood a siege by the latter, but in 1264 it was occupied by the barons under the earl of Leicester. In the Wars of the Roses it was the scene of the battle in which Henry VI. was defeated and taken prisoner in 1460. During the Civil Wars of the 17th century it was held for the parliament by Lord Brooke. In 1675 the town suffered severely by fire, 600 houses being destroyed.

See *Victoria County History, Northampton*; C. H. Hartshorn, *Historical Memorials of Northampton* (1848).

NORTHAMPTON, ASSIZE OF, a short code of English laws issued in 1176, is drawn up in the form of instructions to six committees of three judges each, which were to visit the six circuits into which England was divided for the purpose. Though purporting to be a reissue of the Assize of Clarendon (1166), it contains in fact many new provisions. As compared with the earlier assize it prescribes greater severity of punishment for criminal offences; arson and forgery were henceforth to be crimes about which the jurors are to enquire; and those who failed at the ordeal were to lose a hand as well as a foot. In what is perhaps the most important section we may probably see the origin of the possessory action of *mort d'ancestor*, an innovation scarcely less striking than the institution of the *novel disseisin* in the winter of 1166. The justices were also ordered to try proprietary actions commenced by the king's writ for the recovery of land held by the service of half a knight's fee or less. In their fiscal capacity they were to enquire into escheats, churches, lands and women in the king's gift. The royal bailiffs were to answer at the exchequer for rents of assize and all the perquisites which they made in their offices, and apparently the duty of enforcing this provision was entrusted to the justices. As a result of the rebellion of 1173–1174 it was provided that an oath of fealty should be taken by all, "to wit, barons, knights, freeholders and even villeins (*rustici*)", and that any one who refused should be arrested as the king's enemy, and the justices were to see that the castles whose demolition had been ordered were completely razed.

AUTHORITIES.—Sir F. Pollock and F. W. Maitland, *History of English Law before the Time of Edward I.* (Cambridge, 1898); W. Stubbs, *Constitutional History of England* (Oxford, 1895). The text of the Assize occurs in *Cronica Rogeri de Howden* (Rolls Series), ii. 89, and *Gesta Henrici Regis Secundi* (Rolls Series), i. 108. It has been reprinted from the latter by W. Stubbs in *Select Charters* (Oxford, 1895). (G. J. T.)

NORTHAMPTON, a city and the county-seat of Hampshire county, Massachusetts, U.S.A., situated on the Connecticut river, about 16 m. N. of Springfield. Pop. (1910 census) 19,431. The city has an area of 35·3 sq. m. The chief village, Northampton, is on the New York, New Haven & Hartford, and the Boston & Maine railways. It lies on the border of the meadow-land, and with its irregular, semi-rural streets, and venerable trees is considered one of the prettiest villages in New England. About 2 m. S.E. of Northampton is Mount Holyoke (954 ft.), which may be ascended by carriage road and mountain railway, and the summit of which commands a magnificent view. The city is the seat of a state hospital for the insane;

of the Clarke School for the Deaf (1867, founded by John Clarke of Northampton); of Smith College, one of the foremost colleges for women in the country; of the Mary A. Burnham School for Girls (1877), a preparatory school chiefly for Smith College, founded by Miss Mary A. Burnham; and of the Miss Capen School (preparatory) for girls. Besides the college library, there are in Northampton two public libraries, the Clarke (1850) and the Forbes (1894). The Forbes library was established with funds left by Charles E. Forbes (1795–1881), from 1848 to 1881 a justice of the state supreme court. The People's Institute was started as a Home-Culture Clubs movement by George W. Cable, who became a resident of Northampton in 1886. The Smith Charities is a peculiar institution, endowed by Oliver Smith (1766–1845) of Hatfield, who left an estate valued at $370,000, to be administered by a board of three trustees, chosen by electors representing the towns of Northampton, Hadley, Hatfield, Amherst and Williamsburg in Hampshire county and Greenfield and Whately in Franklin county—the beneficiaries of the will. The will was contested by Smith's heirs, but in 1847 was sustained by the supreme judicial court of Massachusetts. Of the total sum, $200,000 was to accumulate until it became $400,000. Of this $30,000 was to found Smith's Agricultural School at Northampton, which opened for instruction in 1908; an income of $10,000 was to be paid to the American Colonization Society, but this society failed to comply with the restrictions imposed by the will, and the $10,000 was incorporated with the Agricultural School fund; and $360,000 was devoted to indigent boys and girls, indigent young women and indigent widows. The remainder of Smith's property was constituted a contingent fund to defray expenses and keep the principal funds intact. Florence, a village on the Mill river in the city limits, is a manufacturing village, silk being its principal product, and cutlery and brushes being of minor importance. The value of the city's factory products increased from $4,706,820 in 1900 to $5,756,381 in 1905, or 22·3%. Northampton was first settled in 1654, became a township in 1656, and was incorporated as a city in 1883. In September 1786, at the time of the Shays Rebellion, the *New Hampshire Gazette* (still published; daily edition since 1890) was established here in the interest of the state administration. Jonathan Edwards was pastor here from 1727 to 1750. Caleb Strong (1745–1819), a member of the Federal Constitutional Convention of 1787, and governor of Massachusetts in 1800–1807 and 1812–1816; Joseph Hawley (1723–1788), one of the most prominent patriots of western Massachusetts; Timothy Dwight; Arthur (1786–1865), Benjamin, and Lewis (1788–1873) Tappan, prominent philanthropists and anti-slavery men; and William D. Whitney were natives of Northampton.

See J. R. Trumbull, *History of Northampton* (2 vols., Northampton, 1898–1902).

NORTHAMPTONSHIRE, an east midland county of England, bounded N. by Lincolnshire, N.W. by Rutland and Leicestershire, W. by Warwickshire, S.W. and S. by Oxfordshire, S.E. by Buckinghamshire, and E. by Bedfordshire, Huntingdonshire and Cambridgeshire. The area is 1003·1 sq. m. The surface is undulating and somewhat monotonous, notwithstanding that the country is richly cultivated and in some parts finely wooded. Elevations over 700 ft. are few. The most picturesque scenery is found in the western and south-western districts. For long Northamptonshire has been famed for its ash trees, and there are also some very old oaks, such as that associated with Cowper's posthumous poem "Yardley Oak," in Yardley Chase near Northampton, as well as a few fine avenues of elm. The north-eastern extremity belongs to the great Fen district. The county forms the principal watershed of central England, nearly all the more important rivers of this region having their sources within its boundaries. The Avon, with a westward course, forms for some distance the northern boundary of the county, till near Lilbourne it passes into Warwickshire. The Nene passes southward past Northampton, whence it takes an easterly course, skirting the eastern boundary of the county. The Welland flows in an easterly direction, forming the boundary of the county with Leicester, Rutland and Lincoln. The Cherwell, rising in a spring at Charwelton, where it is crossed by a very ancient bridge, passes into Oxfordshire, and then forms for a considerable distance the southernmost portion of the boundary of Northamptonshire with that county; the Leam forms a portion of the boundary with Warwickshire. The Ouse, which rises near Brackley, soon afterwards leaves the county, but again touches it near Stony Stratford, separating it for some distance from Buckinghamshire.

Geology.—With the exception of the superficial glacial and river deposits, all the rocks exposed in the county are of Jurassic age; they all dip in a general way towards the S.E., the strike of the outcrops being from south-west to north-east. The oldest rocks exposed belong to the Liassic formation; they come to the surface over a large area in the south-west and centre, around Banbury, Daventry and Market Harborough, and by the removal of the overlying Oolitic strata they are exposed along the rivers and stream courses near Towcester, Northampton, Wellingborough and Kettering. The Lower Lias, blue clay with limestone bands and cement stones, has few exposures; it has been cut through by the railways at Kilsby and Catesby, and at Braunston it is dug for brick-making. The Middle Lias consists of grey micaceous marls, sandstones and clays, often ferruginous; ironstone appears near King's Sutton; at the top is the marlstone or "rock bed," used as a building stone and for road metal. The Upper Lias is again a blue argillaceous series of strata, with limestones and cement stones; it is employed for brick-making. Through the middle of the county from north-east to south-west is an elevated tract of Oolitic rocks which contrasts strongly with the low-lying grass-covered Liassic ground. The lowest subdivision of the Inferior Oolite, sands, sandstone and calcareous beds, is an important source of iron ore, with from 9 to 12 ft. of workable beds at Blisworth, Kettering, Northampton, Thrapstone, Towcester and Wellingborough. The flaggy sandstone of Duston (Duston slate) belongs to this series. The upper part of the Northampton sands is known as the Lower Estuarine Beds; these are white and reddish clays and sands. In the north-eastern part of the county from about Maidwell, the Lincolnshire Limestone is developed at the expense of the Northampton Sand; the well-known building stone of Barnack (Barnack Rag) and Weldon belong to this horizon; a hard shelly variety is known as Weldon or Stamford marble. Locally at the base is a series of flaggy strata, the Collyweston slates. The Great Oolite series comprise the Upper Estuarine Beds, the Great Oolite Limestone, Great Oolite Clay, Forest Marble and Cornbrash (very fossiliferous at Rushden). On the south-east border a belt of Oxford Clay occupies the surface; good exposures occur in the brick-fields about Peterborough. Glacial sands and gravels, including the great Chalky Boulder Clay, occur in patches on the older rocks, as at Hillmorton, and fill up old channels of the rivers sometimes to a considerable depth, as in the old valley of the Ouse at Furtho, where the Boulder Clay is 100 ft. thick. Borings have revealed the existence of Rhaetic and Keuper rocks resting on an ancient quartz-porphyrite beneath the Lias at Orton; and at Gayton and Northampton the Carboniferous and possibly Old Red Sandstone strata have been proved, but no Coal Measures were encountered. The water-bearing strata of Northamptonshire include the marlstone of the Lias, the Lincolnshire Limestone, Collyweston beds and ironstone beds of the Inferior Oolite, and the Cornbrash and Great Oolite Limestone.

Climate and Agriculture.—The climate of Northamptonshire is mild and genial, while the absence of lofty hills renders it much drier than many other inland districts. The mean annual rainfall at Wellingborough is 27·2 ins. The prevailing soil is a rich brown but light and crumbling mould, sometimes with a rocky subsoil. The richest soil is the black mould of the fen district, which is specially suited for grass, as are all the heavier soils. Nearly all the land is capable of cultivation, although there is some stiff wet soil on the slopes of the hills. Nearly nine-tenths of the total area, a high proportion, is under cultivation, and of this considerably over three-fifths is in permanent pasture, the acreage devoted to this use increasing steadily. Less than one-fifth is under grain crops, and the area decreases. Wheat and barley are the principal grain crops. The fattening of cattle is the chief occupation of the Northamptonshire farmer. The favourite stock for breeding purposes is the shorthorn, but the most common custom is to buy in Hereford, Scotch, Welsh and Irish cattle in the spring and fatten them on the rich pastures, a few being retained and fed for the Christmas market. In autumn additional cattle are bought in to eat the coarse grass off the pastures, and these are usually retained during winter. The most common breed of sheep on the rich pastures is the improved Leicester, which is preferred on account of its length of wool; but the Southdown, on account of its superior flesh, is also largely kept.

Manufactures.—The iron industry is of considerable importance, though only a small proportion of the metal is smelted in the county. The industry is carried on in the central part of the county, as in the Kettering, Wellingborough and Thrapston districts, and in the north near Stamford. But Northamptonshire is more famous for its manufacture of boots and shoes, which is chiefly prosecuted in the towns and villages of the central and southern districts, and along the eastern border. This trade occupies some three-quarters of the total number of hands employed in factories in the county.

Communications.—The main line of the London & North Western railway passes through the south-western portion of the county, with an alternative route to Northampton, and branches to Peterborough and elsewhere. With it are connected at Blisworth Junction the East and West Junction railway to Towcester, Woodford and Stratford-on-Avon, and the Northampton and Banbury Junction railway. The Great Central main line, crossing the county in the south, has connexion with the Great Westen railway at Banbury from Woodford. The Midland railway serves Wellingborough, Kettering and Northampton, and an important junction of systems is effected at Peterborough, which is on the main line of the Great Northern railway. Branch lines of this and the Midland system complete the railway communications of the county. The Grand Junction Canal, which is connected with the Oxford Canal, enters the county at Braunston on the borders of Warwickshire, and passes by Daventry and Blisworth into Buckinghamshire, a branch connecting it with Northampton. The Grand Union Canal unites with the Grand Junction near Daventry, and runs north until it joins the Leicester Canal at Foxton, branches passing to Welford and Market Harborough.

Population and Administration.—The area of the county is 641,992 acres, with a population in 1891 of 302,183 and in 1901 of 338,088. The area of the administrative county of Northampton is 585,148 acres, and that of the administrative county of the soke of Peterborough 53,464 acres. In Domesday the county is mentioned as containing 30 hundreds, but it then included a considerable part of Rutland. These divisions were first reduced to 28, and in the reign of Henry II. to 20, their present number. The administrative counties include four municipal boroughs, namely, Brackley (pop. 2467), Daventry (3780), Higham Ferrers (2540) and Peterborough (30,872), together with the municipal and county borough of Northampton (87,021). The urban districts are: Desborough (3573), Finedon (4129), Irthlingborough (4314), Kettering (28,653), Oundle (2404), Raunds (3811), Rothwell (4193), Rushden (12,453), Wellingborough (18,412). There are one court of quarter sessions and nine petty sessional divisions. The borough of Northampton and the liberty of the soke of Peterborough have each a separate court of quarter sessions and a separate commission of the peace. The total number of civil parishes is 346, of which 33 are in the soke of Peterborough. The ancient county contains 297 entire ecclesiastical parishes or districts, wholly or in part, most of them being in the diocese of Peterborough; but small parts of the county fall within the dioceses of Oxford, Ely and Worcester. For parliamentary purposes the county is divided into four divisions (Northern, Eastern, Mid and Southern), and includes the parliamentary borough of Northampton, and part of the parliamentary borough of Peterborough, each returning one member, except the borough of Northampton, which returns two members.

History.—At some time in the 7th century the district which is now Northamptonshire suffered a simultaneous invasion by the West Saxons from the south and the Anglian tribes from the north, and relics discovered in the county testify to a mingling of races, at the same time showing that West Saxon influence never spread farther north than a line from Daventry to Warwick, and with the extension of the Mercian kingdom under Penda and the conversion of the midland districts ceased altogether. The abbey at Medehamstede (now Peterborough) was begun by Peada in 655, and about the same time foundations were established at Peakirk, Weedon Beck, Castor and Oundle. In 870 the district was overrun by the Danes, and Northampton was one of the five Danish boroughs, until in 921 it was recovered by Edward the Elder, who fortified Towcester in that year. In the 11th century Northamptonshire was included in Tostig's northern earldom; but in 1065, together with Huntingdonshire, it was detached from Northumbria and bestowed on Waltheof. The only monastic foundation which survived the Conquest was Peterborough. Norman castles existed at Rockingham, Barnwell, Lilbourne and Northampton.

As a shire Northamptonshire was probably of Danish origin, representing in the 10th century the area which owed allegiance to Northampton as a political and administrative centre. In 921 this area extended to the Welland, the present northern limit of the county, and at the time of the Domesday Survey the boundaries were approximately those of the present day. Northamptonshire is first mentioned by name in the *Historia Eliensis*, in connexion with events which occurred at the close of the 10th century.

The Geld roll of the time of William I. and the Domesday Survey of 1086 mention 28 hundreds in Northamptonshire, and part of Rutland is assessed under this county. By 1316 the divisions had undergone considerable changes, both in name and in extent, and had been reduced to their present number, 20, since which date they have remained practically unaltered. The names of the hundreds point to primitive meeting-places gradually superseded by villages and towns, and the court for Fawsley hundred met under a large beech tree in Fawsley Park until the beginning of the 18th century, when it was transferred to Everdon. The shire-court originally met at Northampton.

Northamptonshire was originally included in the diocese of Lincoln. The archdeaconry of Northampton is mentioned in the 12th century, and in 1291 included the deaneries of Peterborough, Northampton, Brackley, Oundle, Higham, Daventry, Preston, Weldon, Rothwell and Haddon. The diocese of Peterborough was created in 1541, and in 1875 the archdeaconry of Oakham was formed and included in this county the first and second deaneries of Peterborough and the deaneries of Oundle, Weldon and Higham Ferrers. Northampton archdeaconry now includes the first, second and third deaneries of Brackwell and Rothwell; the first and second deaneries of Haddon and Preston, and the deaneries of Daventry, Northampton and Weldon.

At the time of the Domesday Survey the chief lay-tenant in Northamptonshire was Robert, earl of Mortain, whose fief escheated to the crown in 1106. The estates of William Peverel founder of the abbey of St James at Northampton, also escheated to the crown in the 12th century. Holdenby House was built by Sir Christopher Hatton, privy councillor to Queen Elizabeth, and Yardley Hastings was named from the Hastings, formerly earls of Pembroke. Higham Ferrers was the seat of the Ferrers family; Braybrook Castle was built by Robert de Braybrook, a favourite of King John; and Burghley House gave the title of baron to William Cecil.

Northampton was a favourite meeting-place of the councils and parliaments of the Norman and Plantagenet kings. In 1215 John was besieged in Northampton Castle by the barons, and in 1264 Henry III. captured the castle from the younger Simon de Montfort. During the Wars of the Roses Henry VI. was defeated at Northampton in 1460. In the Civil War of the 17th century the county declared almost unanimously for the parliament. A royalist garrison was placed at Towcester by Prince Rupert in 1644, but almost immediately withdrawn.

The iron-mines and stone-quarries of Northamptonshire were worked in Roman times, but the former were entirely neglected from the Plantagenet period until their rediscovery in 1850, while the two most famous quarries, those of Barnack and Stanion, were exhausted about the 16th century. The wool and leather industries flourished in Norman times. In the 17th century the weaving industry declined in the Northampton district, but became very flourishing about Kettering. Other early industries were charcoal-burning, brick and tile manufacture and brewing. The industries of whip-making, pipe-making, silk-weaving and paper-making were introduced in the 17th and 18th centuries.

In 1290 Northamptonshire returned two members to parliament, and in 1295 Northampton also returned two members.

In 1547 Brackley and Peterborough returned each two members, and in 1557 Higham Ferrers returned one member. Under the act of 1832 the county returned four members in two divisions, and Brackley and Higham Ferrers were disfranchised.

Antiquities.—Although Northamptonshire was rich in monastic foundations, remains, except of the abbey-church of Peterborough, afterwards the cathedral, are of small importance. At Geddington, and also at Hardingstone, near Northampton, there is an Eleanor cross, erected by Edward I. to the memory of his queen, in good preservation. For the architecture of its churches Northampton holds a place scarcely inferior to any other English county. To the Saxon period belong the tower of Earls Barton church, which stands on an eminence, probably the mound of an old English strong-house; the tower and other portions at Brigstock; the ground plan and other portions at Wittering; the remarkable tower at Barnack; and Brixworth church, constructed in part of Roman materials, and by some believed to include part of a Roman basilica. Of Norman, besides the cathedral of Peterborough, the finest examples are St Peter's and St Sepulchre's, Northampton, and the tower of Castor church. St Mary's church, Higham Ferrers, formerly collegiate, Early English and Decorated, is one of the finest churches in the county, and, as specially noteworthy among many beautiful buildings, there may be mentioned the churches at Irthlingborough and Lowick, with their lantern towers, Warmington, a very fine specimen of Early English work, Rushden, Finedon, Raunds and Fotheringhay. Of the church at Easton Maudit, Percy, author of the *Reliques*, and afterwards Bishop of Dromore, was rector.

A gateway at Rockingham, and earth-works at Higham Ferrers and Brackley are worthy of mention. Some castellated ruins remain of the castle at Fotheringhay, famous as the scene of the imprisonment, trial and execution of Mary, Queen of Scots. Barnwell Castle, founded by William the Conqueror, an interesting example of the defensive construction of the period, is still a fine ruin, which includes four of the round towers and an imposing gateway. Holdenby Manor House, where Sir Christopher Hatton (1540–1591) was born, and where Charles I. was staying when he was carried away by Cornet Joyce, is largely restored. Among ancient mansions are Castle Ashby, the seat of the Comptons, the oldest portion belonging to the reign of Henry VIII.; Althorp, the seat of the Spencers, of various dates; Drayton House, of the time of Henry VI.; the vast pile of Burghley House, Stamford, founded by Lord Burleigh (1553), but more than once altered and enlarged; and Kirby Hall, a beautiful Elizabethan building once the residence of Sir Christopher Hatton.

See *Victoria County History, Northamptonshire*; G. Baker, *History and Antiquities of the County of Northampton* (2 vols., London, 1822–1841); John Bridges, *History and Antiquities of Northamptonshire*, compiled by Rev. Peter Whalley (2 vols., Oxford, 1791); John Norden, *Speculi Britanniae, pars altera*, or *A Delineation of Northamptonshire* (London, 1720); Francis Whellan, *History, Topography and Directory of Northamptonshire* (2nd ed., London, 1874).

NORTH BERWICK, a royal and police burgh of Haddingtonshire, Scotland. Pop. (1901) 2614. It is situated on the south shore of the entrance to the Firth of Forth, 22½ m. E.N.E. of Edinburgh by the North British railway, being the terminus of a branch line from Drem Junction. It was created a royal burgh by Robert III. (d. 1406), and though once a port of some importance it dwindled to a fishing hamlet. In the latter half of the 19th century, however, it gradually became a fashionable watering-place, much frequented for its firm sandy beach and bathing, and especially for its two golf-courses. Near the station are the ruins of the abbey of Cistercian nuns founded by David I. Immediately to the south rises the fine cone of North Berwick Law (612 ft.), which was utilized as a signal point at the period of the Napoleonic scare.

About 3 m. E. stand the strikingly picturesque ruins of Tantallon Castle, which probably dates from the end of the 14th century and was for many generations the stronghold of the Angus Douglases. Though the 6th earl successfully resisted the sieges of James V. in 1528 and 1530, the castle had at last to be surrendered by treaty. It was besieged and captured by General Monk in 1651, and some time after the restoration became the property of Sir Hew Dalrymple, lord president of session, whose family still own it. It was then dismantled and fell into decay.

About 2 m. S.W. of North Berwick is Dirleton, with a castle dating from the 12th century. Edward I. took it in 1298, and in the reign of Robert Bruce it was acquired by the Haliburtons, from whom it passed to the family of Ruthven. On the failure of the Gowrie conspiracy (1600) the castle was forfeited and given to Sir Thomas Erskine (1566–1639), who became Baron Dirleton in 1604, two years later Viscount Fenton, and in 1619 earl of Kellie. Monk laid siege to the castle in 1650, and in 1663 it was purchased by Sir John Nisbet (1609–1687), lord advocate, afterwards a lord of session and Lord Dirleton.

NORTHBROOK, THOMAS GEORGE BARING, 1st Earl of (1826–1904), English statesman, eldest son of the first baron (long known as Sir Francis Baring; see Baring), was born on the 22nd of January 1826, and educated at Christ Church, Oxford, where he graduated with honours in 1846. He entered upon a political career, and was successively private secretary to Mr Labouchere (Lord Taunton), Sir George Grey, and Sir Charles Wood (Viscount Halifax). In 1857 he was returned to the House of Commons in the Liberal interest for Penryn and Falmouth, which constituency he continued to represent until he became a peer on the death of his father in 1866. He was a lord of the admiralty in 1857–1858; under-secretary for war, 1861; for India, 1861–1864; for the home department, 1864–1866; and secretary to the admiralty, 1866. When Mr Gladstone acceded to power in 1868, Lord Northbrook was again appointed under-secretary for war, and this office he held until February 1872, when he was appointed governor-general of India. In January 1876, however, he resigned. He had recommended the conclusion of arrangements with Shere Ali which, as has since been admitted, would have prevented the second Afghan war; but his policy was overruled by the duke of Argyll, then secretary of state. Lord Northbrook was created Viscount Baring of Lee in the county of Kent and earl of Northbrook in the county of Southampton. From 1880 to 1885 he held the post of first lord of the admiralty in Mr Gladstone's second government. During his tenure of office the state of the navy aroused much public anxiety and led to a strong agitation in favour of an extended shipbuilding programme. The agitation called forth Tennyson's poem "The Fleet." In September 1884 Lord Northbrook was sent to Egypt as special commissioner to inquire into its finances and condition. The inquiry was largely unnecessary, all the essential facts being well known, but the mission was a device of Mr Gladstone's to avoid an immediate decision on a perplexing question. Lord Northbrook, after six weeks of inquiry in Egypt, sent in two reports, one general, advising against the withdrawal of the British garrison, one financial. His financial proposals, if accepted, would have substituted the financial control of Great Britain for the international control proposed at the London Conference of June-August of the same year. A heavy blow would thus have been struck at internationalism in Egypt. Mr Gladstone was not, however, prepared to give a British guarantee of the interest of the loan, and so Lord Northbrook's mission proved abortive. The £9,000,000 loan issued in 1885 bound Egypt even more securely in international fetters (see Cromer's *Modern Egypt*, 1908, vol. ii. chap. xlv.). When Mr Gladstone formed his third ministry in 1886 Lord Northbrook held aloof, being opposed to the home rule policy of the premier; and he then ceased to take a prominent part in political life. In 1890 he was appointed lord-lieutenant of Hampshire. He died on the 15th of November 1904. He had married in 1848 Elizabeth Sturt, sister of Lord Alington, and was succeeded as 2nd earl by his eldest son, who as Lord Baring had been M.P. for Winchester (1880–1885) and North Bedford (1886–1892).

See B. Mallet, *Thomas George, Earl of Northbrook* (1908).

NORTH CAPE (*Nordkap*), a promontory on the island Magerö off the north coast of Norway in 70° 10′ 40″ N., 25° 45′ E., 78 m. N.E. of Hammerfest. Knivskjaerodden, an island a little to the west, actually reaches a point a little farther north than the North Cape, and Nordkyn, 45 m. E., is the northern extremity of the mainland (71° 7′ N.). The desolate cape, rising abruptly over 1000 ft. from the sea, is frequently visited during the summer period of the "midnight sun," but travellers are often prevented from seeing this phenomenon by adverse atmospheric conditions.

NORTH CAROLINA, a South Atlantic state of the United States of America, situated between latitudes 33° 51′ 37″ (the southernmost point of the southern boundary—35° is the northernmost) and about 36° 34′ 25·5″ N., and between longitudes 75° 27′ W. and 84° 20′ W. It is bounded N. by Virginia, E. and S.E. by the Atlantic Ocean, S. and S.W. by South Carolina, S. also by Georgia, and W. and N.W. by Tennessee. North Carolina has an extreme length from E. to W. of 503¼ m., which is greater than that of any other state east of the Mississippi river. It total area is 52,426 sq. m., of which 3686 sq. m. are water surface.

Physical Features.—The state lies wholly within the three leading topographical regions of the eastern portion of the United States: the Coastal Plain Region, which occupies approximately the eastern half, the Piedmont Plateau Region, which occupies about 20,000 sq. m. in the middle, and the Appalachian Region, which occupies about 6000 sq. m. in the west. At the eastern extremity of the Coastal Plain Region an outer coast line is formed by a chain of long narrow barrier beaches from which project capes Hatteras, Lookout and Fear, whose outlying shoals are known for their dangers to navigation. Between Hatteras and Lookout is Raleigh Bay and between Lookout and Fear is Onslow Bay; and between the chain of islands and the deeply indented mainland Currituck, Albemarle, Pamlico and other sounds form an extensive area, especially to the northward, of shallow, brackish and almost tideless water. Projecting into these sounds and between the estuaries of rivers flowing into them are extensive tracts of swamp land—the best known of these is Dismal Swamp, which lies mostly in Virginia and is about 30 m. long and 10 m. wide. Through most of the Coastal Plain Region, which extends inland from 80 to 150 m., the country continues very level or only slightly undulating, and rises to the westward at the rate of little more than 1 ft. to the mile. Along the W. border of this region, however, the slope becomes greater and there are some hills. The "Fall Line," the boundary between the Coastal Plain and the Piedmont Plateau, has a very irregular course across North Carolina, but lies in a general S.W. direction from the Falls of Roanoke between Halifax and Northampton counties to Anson county on the South Carolina border and marks a rapid increase in elevation of about 200 ft. The Piedmont Plateau Region extends from this line to the Blue Ridge Escarpment, toward which its mean elevation increases at the rate of about 3½ ft. to the mile. It is traversed from N.E. to S.W. by a series of ridges which in the E. portion produce only a general undulating surface but to the westward become higher and steeper until the country assumes a bold and rugged aspect. The S.E. face of the Blue Ridge Escarpment, which rises precipitously 1200-1500 ft. or more above the Piedmont Plateau, forms the S.E. border of North Carolina's Appalachian Mountain Region, which includes the high Unaka Mountain Range, segments of which are known by such local names as Iron Mountains, Bald Mountains and Great Smoky Mountains. These ranges reach their culmination in this state, and with a series of more or less interrupted cross ranges constitute the greatest masses of mountains in the E. half of the United States. Four peaks along the Blue Ridge have an elevation exceeding 5000 ft.—one of these, the Grandfather, rises 5964 ft.; and about thirty peaks in the Unakas and in the several cross ranges exceed 6000 ft., the highest being Mount Mitchell or Mitchell Dome (6711 ft.), of the Black Mountains, a short cross range extending N. from the Blue Ridge through Yancey county. Other noteworthy peaks are Black Brother (6690 ft.) and Hairy Bear (6681 ft.), the next highest mountains. Many of the neighbouring mountain ridges have uniform crests, but a greater number terminate in numerous peaks, some sharp, rugged and rocky, but more of them rounded domes. Throughout the whole region the slopes vary greatly: the N.W. slope of the Blue Ridge is almost imperceptible, or confused with the numerous mountain slopes that rise above it. As a rule the mountain slopes are well graded and subdued, but a few are steep and some are rocky and precipitous. The numerous valleys are usually narrow and deep, though few, if any, descend to less than 2000 ft. above the sea.

The Blue Ridge is the principal water parting of the state. West of it the Hiwassee, the Little Tennessee and the French Broad rivers flow W. or N.W. into Tennessee. Farther N. are the headwaters of the New river, which flows N.E. and finds its way to the Ohio. On the S.E. slope of the Blue Ridge rise the Broad, the Catawba and the Yadkin, which flow for some distance a little N. of E., then, finding a passage across one of the ridges of the Piedmont Plateau, turn to the S.S.E. and across the boundary line into South Carolina, in which state their waters reach the Atlantic. In the N.W. part of the Piedmont Plateau Region, and a little to the N. of the most N.E. course of the Yadkin rises the Dan, which in its N.E. course crosses the boundary into Virginia, where it becomes a tributary of the Roanoke, in which its waters are returned to North Carolina near the "Fall Line." The other principal rivers—the Cape Fear, the Neuse and the Tar—rise in the N.E. part of the Piedmont Plateau Region, have their S.E. courses wholly within the state, and, with the Roanoke, drain the Coastal Plain Region. In the Mountain Region and in the Piedmont Plateau Region the rivers have numerous falls and rapids which afford a total water power unequalled perhaps in any other state than Maine on the Atlantic Coast, the largest being on the Yadkin, Roanoke and Catawba; and in crossing some of the mountains, especially the Unakas, the streams have carved deep narrow gorges that are much admired for their scenery. In contrast with the rivers of these regions those of the Coastal Plain are sluggish, and toward their mouths expand into wide estuaries.

The Coastal Plain Region is the only part of the state that has any lakes, and these are chiefly shallow bodies of water, with sandy bottoms, in the midst of swamps. In all they number only about fifteen, and have an area estimated at 200 sq. m., about one-half of which is contained in Lake Mattamuskeet in Hyde county.

Flora.—In North Carolina's flora are many species common to sub-tropical regions and many common to temperate regions, and the variety is consequently very great. In the swamps are the bald cypress, the white cedar and the live oak, usually draped in southern long moss; south of Cape Fear river are palmettos, magnolias, prickly ash, the American olive and mock orange; along streams in the Coastal Plain Region are the sour gum, the sweet bay and several species of oak; but the tree that is most predominant throughout the upland portion of this region is the long-leaf or southern pine. In the Piedmont Plateau Region oaks, hickories and elms are the most common. In the Mountain Region at the bases of the mountains are oaks, hickories, chestnuts and white poplars; above these are hemlocks, beeches, birches, elms, ashes, maples and limes; and still higher up are spruce, white pine and balsam; and all but a comparatively few of the higher mountains are forest-clad to their summits. All of the species of pine and of magnolia, and nearly all of the species of oak, of hickory and of spruce, indigenous to the United States, are found in North Carolina. On the dome-like tops of such mountains as are too high for trees are large clusters of rhododendrons and patches of grasses fringed with flowers. The forests throughout most of the state have a luxuriant undergrowth consisting of a great variety of shrubs, flowering plants, grasses, ferns and mosses, and the display of magnolias, azaleas, kalmias, golden rod, asters, jessamines, smilax, ferns and mosses is often one of unusual beauty. Venus's fly-trap (*Dionaea muscipula*), a rare plant, is found only south of the Neuse river; and there are several varieties of *Sarracenia*, carnivorous pitcher plants. Among the fruit-bearing trees, shrubs, vines and plants the grape, the blue-berry, the cherry, the plum and the cranberry are indigenous and more or less common. Aromatic and medicinal herbs, of which the state has several hundred distinct species, have been obtained in larger quantities than from any other state in the Union.

Fauna.—In North Carolina five of the seven life-zones into which North America has been divided are represented, but more of its area belongs to the upper-austral than to any other zone. The species of fauna that are at all characteristic of this part of the United States are found in the Piedmont Plateau Region and the western portion of the Coastal Plain Region. Among the song-birds are the mocking-bird, the Carolina wren and the cardinal grosbeak (or red bird); there are plenty of quail or "bob white" (called partridge in the South). Among the mammals are the opossum, raccoon, star-nosed mole (*Condylura cristata*), grey fox and fox squirrel. The mammals of the Mountain Region include the cotton-tail rabbit, red squirrel, lynx and woodchuck; and there is a considerable variety of migratory song-birds, which are common to the more northern states. In the eastern portion of the Coastal Plain Region are the cotton rat, rice-field rat, marsh rabbit, big-eared bat, brown pelican, swallow-tailed kite, black vulture and some rattlesnakes and cotton-mouth moccasin snakes, all of which are common farther south; and there are some turtles and terrapins, and many geese, swans, ducks, and other water-fowl. Large numbers of shad, blue fish, weak fish (squeteague), alewives, Spanish mackerel, perch, bass, croakers (*Micropogon undulatus*), mullet, menhaden, oysters and clams are caught in the sounds, in the lower courses of the rivers flowing into them, or in the neighbouring waters of the sea.

Climate.—North Carolina has a climate which varies from that of the S.E. corner, which approaches the sub-tropical, to that of the Mountain Region, which is like the medium continental type, except that the summers are cooler and the rainfall is greater. The mean annual temperature for the state (below an elevation of 4000 ft.) is about 59° F. For the Coastal Plain Region it is 61° F.; for the Piedmont Plateau Region, 60° F.; for the Mountain Region, 56° F.; for Southport, in the S.E. corner of the state, 64° F.; and for Highlands, at an elevation of 3817 ft. in the S.W. corner, 50° F. January, the coldest month, has a mean temperature of 38° F. in the Mountain Region, of 41° F. on the Piedmont Plateau, and of 44° F. on the Coastal Plain; and in July, the warmest month, the mean is about 79° F. on both the Coastal Plain and the Piedmont Plateau and 74° F. in the Mountain Region. Extremes have ranged from −19° F. at Highlands in 1899 to 107° F. at Chapel Hill, Orange county, in 1900 and again in 1902. The average precipitation for the state is about 52 in. a year, nearly all of it in the form of rain. For the Coastal Plain Region it is 54 in.; for the Piedmont Plateau Region, 48 in.; and for the Mountain Region, 53 in. On the E. slope of some of the mountains the rainfall is exceeded nowhere in the United States, save in the N. part of the Pacific Slope. At Highlands, Macon county, during 1898 it was 105·24 in., and during 1901 it was 106·17 in., 30·74 in. falling here during the month of August. The winds are variable and seldom violent, except along the coast during the sub-tropical storms of late summer and early autumn.

Soil.—On the Coastal Plain the soil is generally sandy, but in nearly all parts of this region more or less marl abounds; south of the Neuse river the soil is mostly a loose sand, north of it there is more loam on the uplands, and in the lowlands the soil is usually compact with clay, silt or peat; toward the western border of the region the sand becomes coarser and some gravel is mixed with it. Throughout much of the Piedmont Plateau and Mountain regions the decomposition of felspar and of other aluminous minerals has resulted in a deep soil of clay with which more or less sand is mixed. It is deeper and more sandy where granite is the underlying rock, deeper and more fertile on the north-western than on the south-eastern mountain slopes, and shallower and more clayey where slate is the underlying rock.

Agriculture.—Until the Civil War agriculture was about the only important industry in the state, and at the close of the 19th century it was still the leading one; but from 1880 to 1900 the ratio of agriculturists to all inhabitants of the state engaged in some gainful occupation decreased from 75·3 to 64·1%. The land included in farms amounted in 1900 to 22,745,356 acres or 73% of the total land surface of the state, and the percentage of farm land that was improved increased from 26·5 in 1870 to 36·6 in 1900. Throughout the colonial era the establishment of small estates was a part of the territorial policy of the government of North Carolina, 640 acres being the largest normal grant to any one person; as a consequence of this policy land holdings have always been much smaller here than in most of the other parts of the South, and since the Civil War the rise in the percentage of improved land, the development of truck farming, and the growth in number of negro holdings, have been accompanied by a further decrease in the average size of farms from 316 acres in 1860 to 101·3 acres in 1900. In the latter year there were in all 224,637 farms: of these 93,097 contained less than 50 acres, 55,028 between 50 and 100 acres, 44,052 between 100 and 175 acres, and 4224 over 500 acres. Of the total number of farms 128,978 were operated by owners or part owners, of whom 17,434 were coloured (including Indians); 19,916, by cash tenants, of whom 10,331 were coloured; and 73,092 by share tenants, of whom 26,892 were coloured. After the Civil War there have been several important changes in the crops raised: the development of cotton manufacturing in the South and the utilization of cotton-seed oil and meal gave impetus to cotton culture; and the discovery of the adaptability of much of the cotton land to the culture of tobacco of a superior quality resulted first in the development of a vast tobacco industry and then to a fluctuation in acreage of the crops of tobacco and of cotton, according as the price of either rose or fell. The destruction of pine forests to meet the demands for naval stores, and the introduction and increased use of the refrigerator car, resulted in much attention to the growth of garden produce for Northern markets. Peanut culture, introduced into the state from Virginia soon after the close of the Civil War, spread rapidly. In the meantime the crops of cereals increased little, and stock raising generally decreased.

The principal crops are cotton, Indian corn, tobacco, hay, wheat, sweet potatoes, apples and peanuts. The yield of cotton increased from 62,901,790 lb in 1869 to 307,500,000 lb in 1909. In 1909 2,898,000 acres were planted to Indian corn, with a crop of 48,686,000 bushels; 570,000 acres to wheat, with a crop of 5,415,000 bushels; and 196,000 acres to oats, with a crop of 3,234,000 bushels. In Caswell county, North Carolina, "lemon yellow" tobacco was first produced in 1852, and the demand for this "bright" variety became so great that except during the interruption of the Civil War its culture spread rapidly. In 1879 the state's crop amounted to 26,986,213 lb, in 1889 to 36,375,258 lb, in 1899 to 127,503,400 lb, and in 1909 to 144,000,000 lb. The hay and forage crop increased from 80,528 tons in 1879 to 246,820 tons in 1899; and in 1909 the hay crop was 242,000 tons. In the production of vegetables and fruits the state ranks high. Potatoes, cabbage and lettuce are much grown for the early Northern markets.

Farmers of the Piedmont Plateau formerly kept large numbers of horses and cattle from April to November in ranges in the Mountain Region, but with the opening of portions of that country to cultivation the business of pasturage declined, except as the cotton plantations demanded an increased supply of mules; there were 25,259 mules in 1850, 110,011 in 1890, 138,786 in 1900, and 181,000 in 1910. The number of horses was 192,000 in 1910; of dairy cows, 297,000; of hogs, 1,356,000; and of sheep, 215,000.

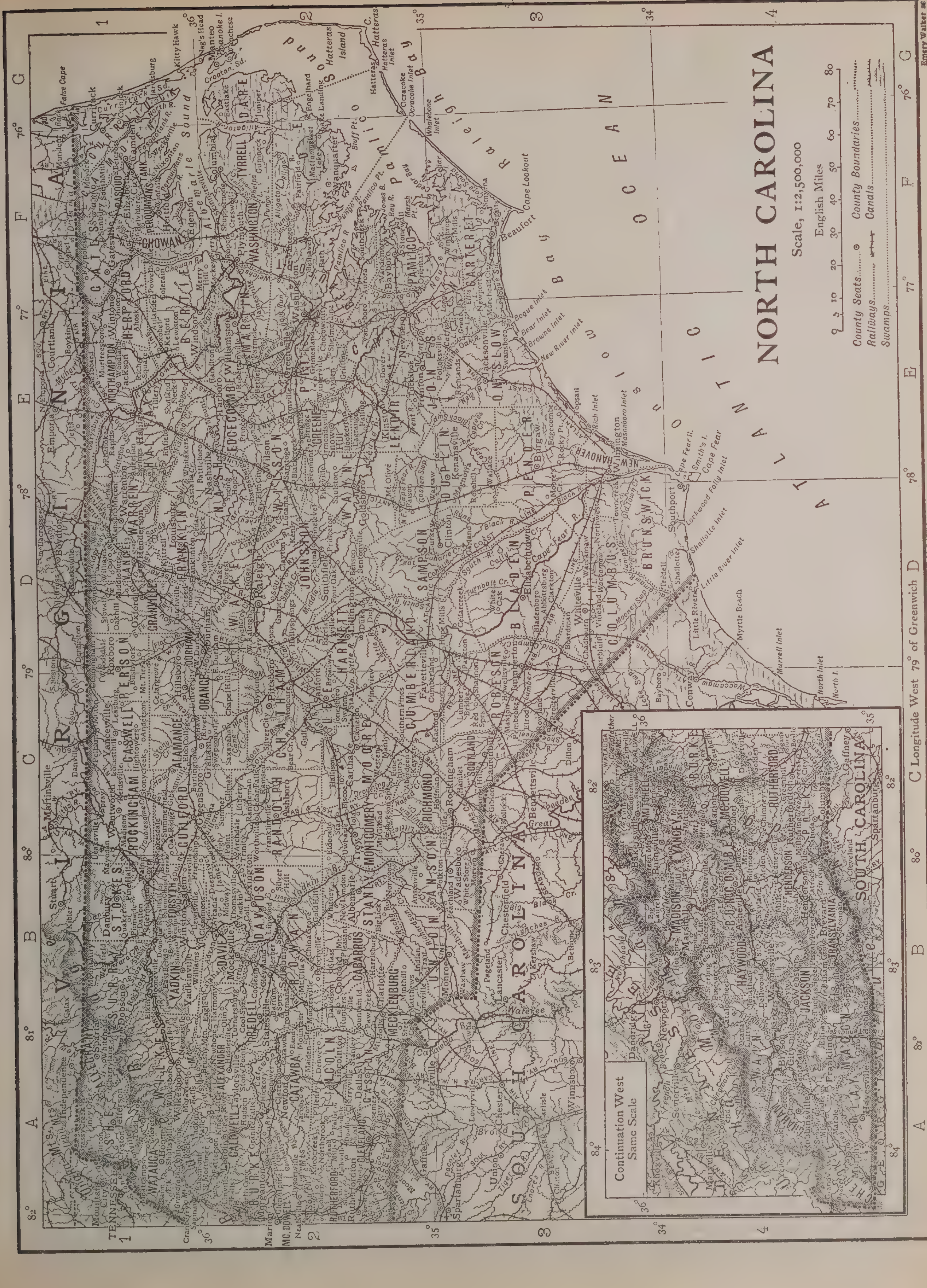
Cotton is grown most largely in the S. portion of the Piedmont Plateau and in a few counties along or near the W. border of the Coastal Plain; tobacco, in the N. portion of the Piedmont Plateau and in the central and N.W. portions of the Coastal Plain; rice, along the banks of rivers near the coast; wheat, in the valley of the Yadkin; orchard fruits, in the W. portion of the Piedmont Plateau and in the Mountain Region; vegetables and small fruits in the middle and S. portion of the Coastal Plain; peanuts, in the N. portion of the Coastal Plain; sorghum cane, almost wholly in Columbus county in the S. part of the Coastal Plain. The state government, through its Department of Agriculture, takes an active interest in the introduction of modern agricultural methods, and in the promotion of diversified farming; in 1899 it established the Edgecombe and in 1902 the Iredell test farm.

Forests.—North Carolina had in 1900 about 35,300 sq. m. of woodland; great quantities of merchantable timber still remained, especially in the Mountain Region and on the Coastal Plain. The trees of the greatest commercial value are oak and chestnut at the foot of the mountains and yellow pine on the uplands of the Coastal Plain. But mixed with the oak and chestnut or higher up are considerable hickory, birch and maple; farther up the mountain sides are some hemlock and white pine; and on the swamp lands of the Coastal Plain are much cypress and some cedar, and on the Coastal Plain south of the Neuse there is much long-leaf pine from which resin is obtained. Several other pines are found, and among the less important timber trees are black spruce, Carolina balsam, beeches, ashes, sycamore or button wood, sweet gum and lindens. The value of the lumber and timber products was $1,074,003 in 1860; $5,898,742 in 1890; $14,862,593 in 1900; and $15,731,379 in 1905.

Fisheries.—In the sounds along the coast, in the lower courses of the rivers that flow into them, and along the outer shores fishing is an important industry. The fisheries are chiefly of shad, oysters, mullet, alewives, clams, black bass, menhaden, croakers and bluefish. In 1908 the catch was valued at about $1,750,000. The State Geological and Economic Survey has made a careful study of the fishes of North Carolina, of the shad fisheries, of oyster culture, and of the development of terrapin. At Beaufort the United States Bureau of Fisheries has a marine biological laboratory, established in 1901 for the study of the aquatic fauna of the south-east coast.

Minerals.—At the beginning of the 20th century a great number of minerals were found in the Piedmont Plateau and Mountain regions, but most of them in such small quantities as to be of little or no commercial value, and in 1902 the total value of the products of the mines and quarries was only $927,376; but in 1907 their value was $2,961,381, and in 1908, $2,145,947. During the first half of the 19th century North Carolina was a mining state of the first importance; in 1804 it was the only state in the United States from which gold was obtained. Operations ceased during the Civil War, and although resumed soon after its close, they became somewhat desultory. Probably the earliest large find was a 17-lb nugget on the Reed Plantation in Cabarrus county in 1799; in the same mine a 28-lb nugget, probably the largest found in eastern United States, was discovered in 1803. The production in Rutherford and Burke counties and their vicinity was so great, and transportation to the United States Mint at Philadelphia so difficult, that from 1831 to 1857 gold was privately coined in 1, 2½ and 5 dollar pieces bearing the mark of the coiner "C. Bechtler, Rutherford county, N.C." The coins were of standard purity (or higher); they are now very rare. A branch mint of the United States was established in 1837 at Charlotte. Silver, which is rarer in the state than gold, is found chiefly in the W. portion of the Piedmont Plateau. In 1902 the value of the gold and silver product combined was $71,287, and in 1908, when the Iola mine 6 m. E. of Troy, Montgomery county, was the most productive, the value of the gold alone was $97,945, that of the silver $668, and that of copper, $2560.

In 1870 North Carolina's mica mines were reopened, and they produce the best grade of sheet mica for glazing and a large percentage of the country's yield of this mineral. Most of it has been found in the N.E. portion of the Mountain Region; and that mica was mined here before any European settlement of the country seems proved by numerous excavations and by huge heaps on which are large oak and chestnut trees, some fallen and decayed. North Carolina is also the leading state in the Union in the production of monazite. The mining of corundum was begun at Corundum Hill in Macon county in 1871, and from 1880 to 1902 the output was considerable, but with the discovery of the Canadian corundum

NORTH CAROLINA
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SOUTH CAROLINA
TENNESSEE
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deposits the importance of those of North Carolina greatly declined. It was along the coast of North Carolina that Europeans in 1585 made the first discovery of iron ore within the present limits of the United States. Iron ores are widely distributed within the state, and there have been times since the eve of the War of Independence when the mining of it was an industry of relatively great importance. In 1908 the product amounted to 48,522 long tons (all magnetite), and was valued at $76,877; almost the entire product is from the Cranberry mines, near Cranberry, Mitchell county. The state has two small areas in which bituminous coal occurs; one in the basin of the Dan and one in the basin of the Deep. Very little coal was produced in the state until the Civil War, when, in 1862 and again in 1863, 30,000 short tons were obtained for the relief of the Confederate government, an amount which up to 1905, when the yield was only 1557 short tons (falling off from 7000 short tons in 1904), had not since been equalled; in 1906, in 1907 and in 1908 no coal was mined in the state. The most valuable immediate product of the state's mines and quarries for nearly every year from 1890 to 1908 was building stones of granite and gneiss, which are found in all parts of the state west of the "Fall Line"; the best grades of granite are quarried chiefly in Gaston, Iredell, Rowan, Surry and Wilkes counties. The value of the building stone increased from $150,000 in 1892 to $800,177 (of which $764,272 was the value of granite) in 1908. Talc also is widely distributed in the state; the most extensive beds are in the south-western counties, Swain and Cherokee.

Manufactures.—During the quarter of a century between 1880 and 1905 a great change was wrought in the industrial life of the state by a phenomenal growth of cotton manufacturing. A cotton mill was erected in Lincoln county about 1813, and by 1840 about 25 small mills were in operation within the state. When the Civil War was over, the abnormally high price of cotton made cotton raising for more than a decade a great assistance to the people in recovering from ruin, but when the price had steadily declined from 23·98 cents a pound in 1870 to 10·38 cents a pound in 1879, they turned to the erection and operation of cotton mills. In 1880 the total value of the manufactured products of the state was $20,095,037; in 1900 the value of the cotton manufactures alone was $28,372,789, and in 1905 $47,254,054. The rapid extension of tobacco culture was accompanied by a corresponding growth in the manufacture of chewing and smoking tobacco and snuff, and some of the brands have a wide reputation. The product increased in value from $4,783,484 in 1890 to $25,488,721 in 1905. In 1890 the lumber and timber products, valued at $5,898,742, ranked second among the state's manufactures; by 1905 their value had increased to $15,731,379. The value of the state's factory product for 1900 was $85,274,083, and that for 1905, $142,520,776, an advance of 67·1%. The cotton mills are mostly in the Piedmont Plateau Region; Durham, Durham county, and Winston, Forsyth county, are leading centres of tobacco manufacture; and High Point (pop. in 1900, 4163) in Randolph is noted for its manufacture of furniture.

Transportation.—Railway building was begun in the state in 1836 with the Raleigh & Gaston line, opened from Raleigh to Gaston in 1844 and extended to Weldon in 1852. A longer line, that from Wilmington to Weldon, was completed in 1840. But the greatest period of building was from 1880 to 1890; during this decade the mileage was increased from 1486 m. to 3128 m., or 1642 m., which was more than one-third of all that had been built up to the year 1909, when the total mileage was 4464·14. The principal systems of railways are the Southern, the Atlantic Coast Line, the Norfolk & Southern and the Seaboard Air Line. By means of its navigable waters and safe harbours the state has an extensive coasting trade. The harbours along the sounds and in the estuaries of the rivers are well protected from the storms of the ocean by the long chain of narrow islands in front, but navigation by the largest vessels is interrupted by shoals in the sounds, and especially by bars crossing the inlets between islands. The channel leading to the harbour of Wilmington has been cleared to a depth of 20 ft. or more by dredging and by the construction of jetties and an immense dam, works which were begun by the state in 1823 but from 1828 were carried on from time to time by the national government. The Roanoke river is navigable to Weldon and the Cape Fear river to Fayetteville; the Neuse is navigable for small vessels only to Newbern.

Population.—The population[1] of North Carolina increased from 1,399,750 in 1880 to 1,617,949 in 1890, or 15·6%; to 1,893,810 in 1900, a further increase of 17·1%; and to 2,206,287 in 1910, an increase of 16·5% since 1900. Of the total in 1900 only 4492, or less than ¼ of 1% were foreign-born, nearly half of these being natives of Germany and England, 1,263,664 were whites, 624,469 negroes, 5687 Indians and 51 Chinese. Nearly one-fourth of the Indians are Cherokees, who occupy, for the most part, the Qualla Reservation in Swain and Jackson counties, not far from the south-western extremity of the state. The others, numbering in 1907 nearly 5000, living mostly in Robeson county, are of mixed breed and have been named the Croatans, on the assumption (probably baseless) that they are the descendants of John White's lost colony of 1587. The Cherokees have no ambition to accumulate property, but both they and the Croatans have been generally peaceable and many of them send their children to school—for the Croatans the state provides separate schools. The Baptist and Methodist churches are the leading religious denominations in the state; but there are also Presbyterians, Lutherans, members of the Christian Connexion (O'Kellyites), Disciples of Christ (Campbellites) Episcopalians, Friends, Roman Catholics, Moravians and members of other denominations. Until nearly a century after the founding of the Carolinas there was not a town in North Carolina that had a population of 1000, and the urban population of the state was exceptionally small at the beginning of the rapid rise of the manufacturing industries about 1880. In 1900 the urban population (in places having 4000 inhabitants or more) was 152,019, or 8% of the total; the semi-urban (in incorporated places having less than 4000 inhabitants) was 186,258 or 9·8% of the total; and the rural (outside of incorporated places) was 1,555,533 or 82·1% of the total. But between 1890 and 1900 the urban population increased 56·6% and the semi-urban 61·6%, while the rural increased only 10·6%. The principal cities are Wilmington, Charlotte, Asheville, Raleigh (the capital), Greensboro, Winston and Newbern.

Administration.—North Carolina has been governed under the charters of 1663 and 1665 (1663–1729), under commissions and instructions from the crown (1729–1776), and under the state constitutions of the 18th of December 1776 (amended in 1835, in 1856, and in the Secession Convention of 1861) and of April 1868 (amended in 1872–1873, 1875,[2] 1879, 1888 and 1899). The present constitution, as amended, prescribes that no convention of the people of the state may be called by the legislature unless by the concurrence of two-thirds of all the members of each house followed by an affirmative vote of a majority of the electors voting on the question; and that an amendment to the constitution may be adopted only by a three-fifths vote of each house followed by an affirmative vote of the majority of electors voting on the question. The suffrage provisions containing the famous "grandfather clause" (in Art vi. section 4), were adopted in the form of a constitutional amendment, ratified in August 1900, and in effect on the 1st day of July 1902. All persons otherwise qualified may place their names on the voting register, provided they can read and write any section of the constitution in the English language and have paid on or before the 1st of May the poll tax for the previous year. An exception to the educational requirement is made in favour of any male person who was, on the 1st day of January 1867, or at any time prior thereto, entitled to vote under the laws of any state in the United States wherein he then resided, and in favour of lineal descendants of such persons. This exception remained in force until the 1st of December 1908, after which time all who were on the list became (unless disqualified because convicted of felony) life voters, but new applicants had to stand the educational test.

Perhaps the most notable feature about the administration is the weakness of the governor's position. He is elected by popular vote[3] for four years, and cannot succeed himself in office. His power is limited by a council of state, a relic of colonial days. This body is not, however, a special board, as in Maine, New Hampshire, and Massachusetts, but a kind of administrative cabinet as in Iowa, consisting of the secretary of state, the auditor, the treasurer, and the superintendent of public instruction, and advising the governor in the administration of his office. Judges, heads of departments, and executive boards are elected, and even in the few instances in which the governor appoints to office the confirmation of the Senate is necessary. Furthermore, in North Carolina the governor has no veto power. In addition to the executive officials mentioned above there are a lieutenant-governor, an attorney-general, a Bureau of Labor Statistics, established in 1887, and a Corporation Commission, which in 1899 superseded the Railroad Commission, established in 1891. The governor and the lieutenant-governor must at the time of their election be at least thirty years of age, and must have been citizens of the United States for five years and residents of the state for two years.

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[1] The population of the state was 393,751 in 1790; 478,103 in 1800; 555,500 in 1810; 638,829 in 1820; 737,987 in 1830; 753,419 in 1840; 869,039 in 1850; 992,622 in 1860; and 1,071,361 in 1870.

[2] The changes made in 1875 were adopted in a convention, were ratified in 1876, and were so numerous that the amended constitution is frequently referred to as the Constitution of 1876.

[3] Up to 1835 he was elected annually by the two houses of the legislature, and no man could serve as governor for more than three years in any six successive years. Under an amendment of 1835 he was elected for two years by popular vote of electors for members of the House of Commons, and no man was eligible to serve for more than four years in any term of six years.

Sessions of the General Assembly are held biennially, beginning on the Wednesday after the first Monday in January. The Senate is composed of fifty members elected biennially by senatorial districts as nearly as possible equal to one another in population, and the House of Representatives (in the Constitution of 1776 called the House of Commons) of one hundred and twenty, elected biennially and chosen by counties[1] according to their population, each county having at least one representative, no matter how small its population. A senator must at the time of his election be at least 25 years of age, and must have been a resident and citizen of the state for at least two years, and a resident in his district for one year immediately preceding his election; and a representative must be a qualified elector of the state and must have resided in his county for at least one year immediately preceding his election. The pay for both senators and representatives is four dollars per day for a period not exceeding sixty days; should the session be prolonged the extra service is without compensation. Extra sessions, called by the governor on the advice of the council of state, are limited to twenty days, but may be extended under the same limitations in regard to compensation. The Senate may sit as a court of impeachment to try cases presented by the House, and a two-thirds vote is necessary for conviction.

There is a supreme court consisting of a chief justice and four associates, elected by popular vote for eight years, and a superior or circuit court, composed of sixteen judges elected by the people in each of sixteen districts for a term of eight years.

The county officials are the sheriff, a coroner, a treasurer, a register of deeds, a surveyor and five commissioners, elected for two years. The commissioners supervise the penal and charitable institutions, schools, roads, bridges and finances of the county. Subordinate to them are the township boards of trustees, composed of a clerk, and two justices of the peace.

By the constitution personal property to the value of $500 and any homestead to the value of $1000 is exempt from sale for debt, except for taxes on the homestead, or for obligations contracted for the purchase of said premises. Under the revised code (1905) a wife may hold property which she had acquired before marriage free from any obligation of her husband, but in general she is not permitted to make contracts affecting either her personal or real estate without the written consent of her husband. Neither can the husband convey real estate without the wife's consent, and a widow may dissent from her husband's will at any time within six months after the probate of the same, the effect of such dissent being to allow her the right of one-third of her deceased husband's property, including the dwelling house in which they usually resided. The constitution prescribes that "all marriages between a white person and a negro, or between a white person and a white person of negro descent to the third generation inclusive, are hereby forever prohibited." Until 1905 the only grounds for an absolute divorce were adultery, natural impotence, and pregnancy of the wife at the time of marriage; but an amendment of 1907 allows a divorce whenever there has been a separation of husband and wife for ten successive years, provided the parties have lived in the state for that period and no children have been born of the marriage. The working of children under twelve years of age in any factory or manufacturing establishment is unlawful, the working of children between the ages of twelve and thirteen in such places is allowed only on condition that they be employed as apprentices and have attended school for at least four months during the preceding year; and no boy or girl under fourteen is to work in such places during night time. An anti-trust law of 1907 makes it unlawful for any corporation controlling within the state the sale of 50% of an article to raise or lower the price of that article with the intention of injuring a competitor. On the 26th of May 1908 the people of the state voted "against the manufacture and sale of intoxicating liquors" in the state; the prohibition act thus approved went into effect on the 1st of January 1909. State prohibition had been defeated in 1881 by a vote of 100,000; in 1902 the Anti-Saloon League organized in the state; in 1903 the Watts Law enacted rural prohibition, giving towns local option, under which many of the towns voted "no licence"; and in 1905 severe police regulations were provided for towns in which saloons were licensed.

Charitable and Penal Institutions.—In the systematic care of the dependent and defective classes North Carolina was one of the pioneer states of the South. An institute for the deaf and dumb and blind was opened at Raleigh in 1845, and another for the deaf and dumb at Morganton in 1894; by a law of 1907 every deaf child of sound mind must attend, between the ages of eight and fifteen, a school for the deaf at least five terms of nine months each; and by a law of 1908 every blind child (between seven and seventeen), if of sound mind and body, must attend some school for the blind for nine months of each year. The North Carolina State Hospital (for the insane) at Raleigh was opened in 1856 as a result of the labours of Miss Dorothea Lynde Dix (1805–1887); in connexion with it there is an epileptic colony. The State Hospital at Morganton, opened in 1883, completed in 1886, and intended for the use of the western part of the state, is perhaps the best equipped institution of its kind south of the Potomac. In 1901 a department for criminal insane was opened in a wing of the state prison at Raleigh. The Oxford Orphan Asylum at Oxford (1872) is supported partly by the Masonic Order and partly by the state. A movement begun by the Confederate Veterans Association in October 1889 resulted in the establishment in 1890 of a home for disabled veterans at Raleigh; this became a state institution in 1891. In 1908 a state tuberculosis sanatorium was opened near Aberdeen, Moore county. The state also takes good care of the unfortunates among the negro race. The Institute for the Colored Deaf, Dumb and Blind (1867) at Raleigh and the Eastern Insane Hospital (1880) near Goldsboro are the oldest institutions of the kind for negroes in the world; in connexion with the last there is an epileptic colony for negroes. There is also (at Oxford) an Orphanage for the Colored (1883), which was established by the "Wake and Shiloh Associations of the Colored Baptist Church," first received state aid in 1891, and is now supported chiefly by the state. The state prison is at Raleigh, although most of the convicts are distributed upon farms owned and operated by the state. The lease system does not prevail, but the farming out of convict labour is permitted by the constitution; such labour is used chiefly for the building of railways, the convicts so employed being at all times cared for and guarded by state officials. A reformatory for white youth between the ages of seven and sixteen, under the name of the Stonewall Jackson Manual Training and Industrial School, was opened at Concord in 1909, and in March 1909 the Foulk Reformatory and Manual Training School for negro youth was provided for. Charitable and penal institutions are under the supervision of a Board of Public Charities, appointed by the governor for a period of six years, the terms of the different members expiring in different years. Private institutions for the care of the insane, idiots, feeble-minded and inebriates may be established, but must be licensed and regulated by the state board and become legally a part of the system of public charities.

Education.—The public school system was established in 1839, being based on the programme for state education prepared in 1816–1817 by Archibald Debow Murphey (1777–1832), whose educational ideas were far in advance of his day. Calvin Henderson Wiley (1819–1887), the author of several romances dealing with life in North Carolina, such as *Roanoke: or, Where is Utopia?* (1866), and of *Life in the South: a Companion to Uncle Tom's Cabin* (1852), was superintendent of common schools in 1853–1865 (the executive head of the state's educational department having previously been a "literary board"), and won the name of the "Horace Mann of the South" by his wise reforms. He kept the public schools going through the Civil War, having advised against the disturbance of the school funds and their reinvestment in Confederate securities. The present school system is supervised by a state board of education consisting of the governor, lieutenant-governor, secretary of state, treasurer, auditor, attorney-general, and superintendent of public instruction. In the counties there is a board of education and there is also a local school committee of three in each township. The compulsory attendance at school of children between the ages of eight and fourteen for sixteen weeks each year by a state law is optional with each county. A state library commission was established in 1909.

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[1] Under the Constitution of 1776 senators were elected by counties, one for each county, and representatives also by counties, two for each county—in addition, the towns of Edenton, Newbern, Wilmington, Salisbury, Hillsboro and Halifax each elected one representative; and a property qualification—a freehold of 50 acres held for six months before an election—was imposed on electors of senators. Under amendments of 1835 senators were chosen by districts formed on the basis of public taxes paid into the state treasury, representatives were still chosen by counties, and were apportioned among them on the same basis as their Federal representation (*i.e.* counting three-fifths of the slaves), and free negroes or mulattoes "descended from negro ancestors to the fourth generation inclusive" were excluded from the suffrage. In 1856 the property qualification for electors of senators was removed.

At the head of the state system of education is the university of North Carolina at Chapel Hill, chartered in 1789 and opened in 1795, one of the oldest state universities in the country and one of the oldest universities in the South; it consists of the college, the graduate department, the law department, the department of medicine (1890, part of whose work is done at Raleigh) and the department of pharmacy (1897). In 1907–1908 it had 75 instructors and 775 students. Other state educational institutions are the College of Agriculture and Mechanic Arts (1889) at West Raleigh, which in 1907–1908 had 42 instructors and 436 students; the State Normal and Industrial College (1892) for women, at Greensboro; and the East Carolina Teachers' Training School (1907), at Greenville. For the higher education of the negroes the state supports an Agricultural and Mechanical College (1891) at Greensboro, and normal and industrial schools at Fayetteville, Elizabeth City and Winston. The more important sectarian schools are Wake Forest College (Baptist, opened 1834 as a "manual labour and classical institute"; as a college, 1838) at Wake Forest, 16 m. north of Raleigh, with 371 students in 1907–1908; Davidson College (Presbyterian, 1837) at Davidson, with 308 students (1907–1908); Biddle University (Presbyterian) at Charlotte, for negroes; Greensboro Female College (Methodist Episcopal, South; 1846); Guilford College (coeducational; Society of Friends, 1837) near Greensboro; Trinity College (coeducational; Methodist, 1852) at Durham; Lenoir College (Lutheran, 1890) at Hickory; Catawba College (Reformed, 1851) at Newton; Weaverville College (Methodist Episcopal, 1873) at Weaverville; Elon College (Christian, 1890) at Elon; St Mary's College (Roman Catholic, 1877), under the charge of Benedictines, at Belmont; Shaw University (Baptist, 1865), for negroes, at Raleigh; and Livingston College (Methodist, 1879), for negroes, at Salisbury.

Finance.—The revenues of the state come from two sources; about two-thirds from taxation and about one-third in all from the earnings of the penitentiary, from the fees collected by state officials, from the proceeds from the sale of state publications, and from the dividends from stock and bonds. The state owned, in 1909, 30,002 shares of stock in the North Carolina Railroad Company,[1] with a market value (1907) of $5,580,372 (the stock being quoted at 186), and an annual income of $210,014 and 12,666 shares of stock in the Atlantic & North Carolina Railroad Company, from which the annual income is $31,665. In addition to the ordinary general property tax, licences and polls, there are a tax on corporations and an income tax. North Carolina is one of the few states to experiment with the inheritance tax, but the last law dealing with that subject was repealed in 1899. The total receipts of the general fund for the fiscal year 1907 were $2,603,293, and the total disbursements for the same year were $2,655,282.

The state debt at the close of the fiscal year 1907 amounted to $6,880,950. It may be divided into three parts: that contracted between 1848 and 1861 for the construction of roads, railways and canals; that contracted during the Civil War for other than war purposes; and that contracted during the Reconstruction era, nominally in the form of loans to railway companies. In their impoverished condition it was impossible for the people to bear the burden, so an act was passed in 1879 scaling part of the debt 60%, part of it 75% and part of it 85%. The remainder, $12,805,000, and all arrears of interest were repudiated outright. This of course impaired the obligation of a contract, but under the Eleventh Amendment to the Constitution of the United States the bondholders could not bring suit against the state in the Federal courts. Another state could do so, however, and in 1904, certain creditors having given ten of their bonds to South Dakota, the case of *South Dakota* versus *North Carolina* came before the Supreme Court. The court decided, four judges dissenting, that North Carolina must pay the amount due or suffer her railway bonds to be seized and sold to satisfy the judgment (192 U.S. Reports, 286. See also 108 U.S. 76).

History.—The history of North Carolina may be divided into four main periods: the period of discovery and early colonization (1520–1663); the period of proprietary rule (1663–1729); the period of royal rule (1729–1776); and the period of statehood (from 1776).

It is possible that some of the early French and Spanish explorers visited the coast of North Carolina, but no serious attempt was made by Europeans to establish a settlement until near the close of the 16th century. After receiving from Queen Elizabeth a patent for colonization in the New World, Sir Walter Raleigh, in April 1584, sent Philip Amadas, or Amidas (1550–1618), and Arthur Barlowe (*c.* 1550–*c.* 1620) to discover in the region bordering on Florida a suitable location for a colony. They returned in September with a glowing account of what is now the coast of North Carolina, and on the 9th of April 1585 a colony of about 108 men under Ralph Lane (*c.* 1530–1603) sailed from Plymouth in a fleet of seven small vessels commanded by Sir Richard Grenville. The colony was established at the north end of Roanoke Island on the 17th of August, and about a week later Grenville returned to England. Threatened with famine and with destruction from hostile Indians, the entire colony left for England on the 19th of June 1586 on Sir Francis Drake's fleet. Only a few days after their departure Sir Richard Grenville arrived with supplies and more colonists, fifteen of whom remained when he sailed away. Although greatly disappointed at the return of the first colony, Raleigh despatched another company, consisting of 121 persons under John White, with instructions to remove the plantation to the shore of Chesapeake Bay. They arrived at Roanoke Island on the 22nd of July 1587 and were forced to remain there by the refusal of the sailors to carry them farther. Of the fifteen persons left by Grenville not one was found alive. White's grand-daughter, Virginia Dare (b. 18th August 1587), was the first English child born in America. White soon returned to England for supplies, and having been detained there until 1591 he found upon his return no trace of the colony except the word "Croatan" carved on a tree; hence the colony was supposed to have gone away with some friendly Indians, possibly the Hatteras tribe, and proof of the assumption that these whites mingled with Indians is sought in the presence in Robeson county of a mixed people with Indian habits and occasional English names, calling themselves Croatans. In 1629 Charles I. granted to his attorney-general, Sir Robert Heath, all the territory lying between the 31st and 36th parallels and extending through from sea to sea, but the patent was in time vacated, and in 1663 the same territory was granted to the earl of Clarendon (1609–1674), the duke of Albemarle (1608–1670), and six other favourites of Charles II. By a second charter issued in 1665 the limits were extended to 29° and 36° 30′.

The proprietors had all the powers of a county palatine and proposed to establish a feudal and aristocratic form of government. To this end John Locke drafted for them in 1669 the famous Fundamental Constitutions providing for the division of the province into eight counties and each county into seigniories, baronies, precincts and colonies, and the division of the land among hereditary nobles who were to grant three-fifths of it to their freemen and govern through an elaborate system of feudal courts. But these constitutions, several times revised, actually served only as a theoretical standard for the proprietors and were abrogated altogether in 1693, and the colonists were governed by instructions which granted them much greater privileges. From the very beginning the territory tended to divide into two distinct sections, a northern and a southern. The northern section was first called Albemarle, then "that part of our province of Carolina that lies north and east of Cape Fear," and about 1689 North Carolina. Settled largely by people from Pennsylvania, this section came to be closely associated with the continental colonies. The southern section, influenced by its location, by the early settlers from Barbados, and by its trade connexions, was brought into rather more intimate relations with the island colonies and with the mother country. The proprietors struggled in vain to bring about a closer union. In 1691 one governor was placed over both settlements, but it was found necessary to appoint a deputy for North Carolina, and finally in 1712 again to allow her a governor of her own. So long as the intervening territory was a wilderness no effort was made to define the boundary line. The first steps were taken in that direction just after the close of the proprietary period in 1729, but the work was not completed until 1815.[1]

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[1] The North Carolina Railroad from Goldsboro, via Raleigh, Greensboro and Salisbury, to Charlotte, was an extension of the Raleigh & Gaston, which had come into the hands of the state; it was chartered in 1849, the act being passed by the casting vote of the speaker, whose action was the cause of his failure to be re-elected to that, or to be elected to any other office afterwards, since the poverty of the state did not warrant such an expenditure. The original stock of $3,000,000, of which the state was to subscribe $2,000,000, was increased in 1855 to $4,000,000, the state subscribing the added million. The road was leased in 1871 to the Richmond & Danville for thirty years at 6%; and in 1905 to the Southern Railway Company for ninety-nine years at 6½% for the first six years and at 7% for the remainder of the term. The Atlantic & North Carolina, the second great internal improvement undertaken by the state, was chartered in 1853, and was opened from Goldsboro to Morehead City (95 m.) in 1858; it was in 1910 a part of the Norfolk & Southern system. Although the state of North Carolina owns 70·3% of the stock (besides this Craven county holds 7·7%; Lenoir, 2·8%; and Pamlico county, 1·13%), the state casts only 350 votes to the 700 of the private stockholders.

The first permanent English colony in North Carolina was established at Albemarle on the Chowan river about 1660 by people from Virginia. The colony grew rapidly, and at the close of the colonial period (1776) the population numbered approximately 300,000, including English, Scotch, Scotch-Irish, Swiss, French Protestants, Moravians, and about 40,000 negroes. According to Dr Weeks "the earliest settlers . . . were not religious refugees, . . . they came to the province not from religious but economic motives."

The proprietary period (1663–1729) was a turbulent one, in spite of the supposedly peaceful influence of the Quakers. Six out of sixteen governors or deputy-governors were driven from office between 1674 and 1712, and there were two uprisings which have been deemed worthy of the term rebellion. The first under John Culpeper in 1677 was primarily economic in character, the chief grievance being the payment of an export duty on tobacco. It was evidently influenced by the recent uprising in Virginia under Nathaniel Bacon. The insurrection of dissenters (1708–1711), which was headed by Thomas Carey, who was deputy-governor while the trouble was brewing, was in opposition to the establishment of the Church of England; it was ultimately unsuccessful, the Church was established in 1711, a law was passed which deprived Quakers of the privilege of serving on juries or holding public office, and the establishment was continued until the War of Independence. A war with the Tuscarora Indians, in 1711–1713, resulted in the defeat of the Indians and the removal of the greater part of the tribe to New York, where they became the sixth nation of the Iroquois confederacy.

North Carolina did not join South Carolina in the revolution of 1719 (see SOUTH CAROLINA), but remained under proprietary rule until 1729. In that year an act was passed by parliament establishing an agreement with seven of the Lords Proprietors for the surrender of their claims to both provinces. They were allowed £17,500 for their rights and £5000 for arrears of quit rents. Lord Carteret refused to sell and continued to hold a one-eighth undivided share until 1744, when he gave up his claim in return for a large strip of land in North Carolina lying between latitude 35° 34′ and the Virginia line (36° 30′). So that while the king was governmental head of the whole of North Carolina from 1729 to 1776 he was, after 1744, territorial lord of only the southern half. The political history during the royal period is, like that of the other colonies, the story of a constant struggle between the representatives of the people and the representatives of the crown. The struggle was especially bitter during the administrations of the last three royal governors, Arthur Dobbs (1684–1765), William Tryon (1729–1788) and Josiah Martin (1737–1786). There were disputes over questions of government, of commerce, of finance and of religion. The ship which brought stamps and stamped paper to Wilmington in 1766 was not permitted to land, and the stampmaster was compelled by the people to take an oath that he would not exercise the functions of his office. Through the vigilance of Governor Tryon, however, the Assembly was prevented from sending delegates to the Stamp Act Congress. The colonists were also angered by the attempt to enforce the acts of trade and navigation and by the parliamentary statute of 1764 forbidding the issue of bills of credit; and the Scotch-Irish among them in particular were aroused by the repeal of an act of 1771 allowing Presbyterian ministers to perform the marriage ceremony and of another act of the same year for the establishment of Queen's College in Mecklenburg county for Presbyterians. In the "back country" extortionate fees, excessive taxes, and the oppressive manner of collecting them brought about a popular uprising, known as the Regulation, which centred in Orange and Anson counties, but was strong also in Brown, Edgecombe, Johnson, Granville and Halifax counties. Hermon Husband (*c.* 1724–1795) was the chief agitator of measures for relief, but, since, as a Quaker, he discouraged violence, the cause was left without a recognized leader. Governor Tryon manifested no sympathy for the oppressed and sought only the thorough suppression of the disturbance, which was organized in the spring of 1768 by Regulators, "for regulating public grievances and abuses of power." The Regulators agreed to pay no more taxes until satisfied that they were in accordance with law, and to pay nothing in excess of the legal fees. Violence speedily followed; the local militia was called out, but since only a few would serve the only means found to quiet the people was an alleged promise from the governor that if they would petition him for redress and go to their homes he would see that justice was done. In reply to their petition the governor denied that he had made any promise in their behalf; and in September he had at his command a military force of 1153, about one-fourth of whom were officers. Although the Regulators assembled to the number of about 3700 they were not prepared to withstand the governor's force and again submitted without bloodshed, there being only a few arrests made. In the following year the Regulators attempted to elect new members to the assembly and petitioned the newly-elected house. But as little had been accomplished when the superior court met at Hillsboro, Orange county, in September 1770, the Regulators became desperate again, whipped the chief offender, Colonel Edmund Fanning, and demolished his residence. These riotous proceedings provoked the second military expedition of the governor, and on the 16th of May 1771, with a force of about 1000 men and officers, he met about twice that number of Regulators on the banks of the Alamance, where, after two hours of fighting, with losses on each side nearly equal, the ammunition of the Regulators was exhausted and they were routed. About fifteen were taken prisoners, and of these seven were executed. This insurrection was in no sense a beginning of the War of Independence; on the contrary, during that war most of Tryon's militia who fought at Alamance were Patriots and the majority of the Regulators, who remained in the province, were Loyalists.

In August 1771 Governor Tryon was succeeded by Governor Josiah Martin, who was soon engaged in spirited controversies with the assembly on questions pertaining to taxes, the southern boundary, and the attachment of property belonging to non-residents. So complete became the breach between them that in 1773 the royal government had nearly ceased to operate, and in 1774 the governor was deserted by his hitherto subservient council. The first Provincial Congress met at Newbern on the 25th of August 1774 and elected delegates to the Continental Congress. When the governor learned that a second Provincial Congress was called to meet in April 1775 he resolved to convene the assembly on the same day. But the assembly, the members of which were nearly the same as those of the congress, refused to interrupt the meeting of the congress, and in the next month the governor sought safety in flight, first to Fort Johnson on the Cape Fear below Wilmington and then to a man-of-war along the coast. On the 31st of May 1775 a committee representing the militia companies of Mecklenburg county passed a series of resolutions which declared that the royal commissions in the several colonies were null and void, that the constitution of each colony was wholly suspended, and that the legislative and executive powers of each colony were vested in its provincial congress subject to the direction of the Continental Congress; and the resolutions requested the inhabitants of the county to form a military and civil organization independent of the crown of Great Britain which should operate until the Provincial Congress should otherwise provide or the British parliament should "resign its unjust and arbitrary pretensions with respect to America." The "Mecklenburg Declaration," which it is alleged was passed on the 20th of the same month by the same committee, "dissolves the political bonds" which have connected the county with the mother country, "absolves" the citizens of that county "from all allegiance to the British Crown," declares them "a free and independent people," and abounds in other phrases which closely resemble phrases in the great Declaration of the 4th of July 1776.

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[1] Between 1735 and 1746 the southern boundary was first definitely established by a joint commission of North Carolina, South Carolina and Georgia. The line was resurveyed in 1764, and in 1772 was extended; parts of the line were resurveyed under acts of the assembly of 1803, 1804, 1806, 1813, 1814 and 1815, and by an act of 1819 the last extension, to the Tennessee line, was confirmed and established. According to the charter the northern boundary was to be the line of 36° 30′, but the surveys (of 1728, 1749 and 1779) were not strictly accurate, and the actual line runs irregularly from 36° 33′ 15″ at its eastern to 36° 34′ 25·5″ at its western end. The boundary between North Carolina and Tennessee was surveyed in 1799 and 1821.

The Resolutions were published in at least two newspapers only a few days after they were passed. As for the "Declaration," the original records of the transactions of Mecklenburg county were destroyed by fire in 1800, but it is claimed that a copy of the "Declaration" was made from memory in the same year, and when, in 1819, a controversy had arisen as to where the movement for independence originated, this copy was published, first in the *Raleigh Register and North Carolina Gazette* and then in many other newspapers. Several aged men also testified that they had heard a declaration of independence read at Charlotte, the county-seat, in May 1775; and one of them stated that he had carried it to the Continental Congress. Thomas Jefferson and John Adams, however, declared that they had never heard of it before, and both believed it spurious. But Jefferson was charged with plagiarism by those who believed in the authenticity of the "Declaration," and in 1833 there was discovered a proclamation of Governor Martin, dated the 8th of August 1775, in which he mentioned a publication in the *Cape Fear Mercury* of a series of resolves by a committee of Mecklenburg county which declared "the entire dissolution of the laws, government and constitution of the country." Another stage of the controversy was reached in 1838–1847 when the Mecklenburg Resolutions of the 31st of May 1775 were discovered either in part or in full in newspaper files. There seems practically no basis for the contention that a declaration of independence was adopted on the 20th other than the tradition that independence was declared by the Mecklenburg Committee on that date, and the occasional references in print, even before 1819, to a declaration of independence in the county in 1775. Those who believe the "Declaration" to be spurious argue that survivors remembered only one such document, that the Resolutions might easily be thought of as a declaration of independence, that Governor Martin in all probability had knowledge only of these and not of the alleged "Declaration," and that the dates of publication in the Raleigh and Charleston newspapers, and the politics of those papers, show that the Resolutions are authentic. In July 1905 there appeared in *Collier's Weekly* (New York) what purported to be a facsimile reproduction of a copy of the *Cape Fear Mercury* which was referred to by Governor Martin and which contained the "Declaration"; but this was proved a forgery.[1]

The first and the second provincial congress did little except choose delegates to the Continental Congress and the management of affairs passed in large measure from the royal government to the several county committees. The third provincial congress, which met on the 21st of August 1775, still required its members to sign an oath of allegiance to King George III. but formed a provisional government consisting of a provincial council and six District Committees of Safety. The first sanction of independence by any body representing the whole province was given by the fourth Provincial Congress on the 12th of April 1776, and the same body immediately proceeded to the consideration of a new and permanent form of government. Their labours ended, however, in another provincial government by a Council of Safety, and the drafting of North Carolina's first state constitution was left to a constitutional convention which assembled at Halifax on the 12th of November.

North Carolinians fought under Washington at Brandywine and Monmouth and played a still more important part in the Southern campaigns of 1778–1781. The state was twice invaded, in 1776 and in 1780–1781, and two important battles were fought upon her soil, Moore's Creek on the 27th of February 1776 and Guilford Court House on the 15th of March 1781.

The territory now comprising the state of Tennessee belonged to Carolina under the charters of 1663 and 1665, and fell to North Carolina when the original province was divided. To this territory settlers, many of them from North Carolina, had gone immediately before and during the War of Independence, and had organized a practically independent government. In 1776 this was formally annexed to North Carolina, but in 1784 the state ceded this district to the national government on condition that it should be accepted within two years. The inhabitants of the district, however, objected to the cession, especially to the terms, which, they contended, threatened them with two years of anarchy; declared their independence of North Carolina and organized for themselves the state of Franklin. But the new state was weakened by factions, and after a brief and precarious existence it was forced into submission to North Carolina by which in 1790 the territory was again ceded to the national government with the proviso that no regulation made or to be made by Congress should tend to the emancipation of slaves (see TENNESSEE).

North Carolina sent delegates to the Philadelphia Constitutional Convention of 1787, but the state convention, at Hillsboro, called to pass upon the constitution for North Carolina, did not meet until the 21st of July 1788, when ten states had already ratified. On the first day of this convention the opponents to the constitution, among whom were most of the delegates from the western counties, were ready to reject it without debate, but yielded to a proposal for discussing it clause by clause. In this discussion, which was continued for nine days, the document was most strongly opposed because it contained no bill of rights and on the ground that it would provide for such a strong central government that the state governments would ultimately be sacrificed. At the conclusion of the debate the convention by a vote of 184 to 84 declared itself unwilling to ratify the constitution until a bill of rights had been added and it had been amended in several other particulars so as to guarantee certain powers to the states. By reason of this rejection the relations of North Carolina with the other states were severed upon the dissolution of the Confederation, and it took no part in the first election or in the organization of the new government. However, there was a speedy reaction against the oppositon which had in no small measure been inspired by fear of a requirement that debts be paid in gold and silver. A second convention met at Fayetteville in November 1789 and the constitution was speedily ratified (on the 13th) by a vote of 195 to 77.

The period from 1790 to 1835 was marked by a prolonged contest between the eastern and the western counties. When the state constitution of 1776 was adopted the counties were so nearly equal in population that they were given equal representation in the General Assembly, but the equality in population disappeared in the general westward movement, and in 1790 the West began to urge a new division of the state into representative districts according to population and taxation. This was stubbornly resisted, and the West assumed a threatening attitude as the East opposed its projects for internal improvements for which the West had the greater need. In 1823 the West called an extra-legal convention to meet at Raleigh, and delegates from 24 of the 28 western counties responded, but those from the far West, in which there were practically no slaves, wished free white population to be made the basis of representation, while those from the Middle West demanded the adoption of the basis for the national House of Representatives and the convention made only a divided appeal to the people. Ten years later, however, at the election of assemblymen, 33 of the western counties polled an extra-legal vote on the question of calling a constitutional convention, and 30,000 votes were cast for it to only 1000 against it. The effect of this was that in January 1835 the legislature passed a bill for submitting the question legally to all the voters of the state, although this bill itself limited the proposed convention's power relating to representation by providing that it should so amend the constitution that senators be chosen by districts according to public taxes, and that commoners be apportioned by districts according to Federal representation, *i.e.* five slaves to be counted equal to three whites. When the popular vote was taken, in the following April, every eastern county gave a majority against the convention, but the West, even with the limitation which was decidedly favourable to the East, voted strongly for it and carried the election with a total majority in the state of 5856 votes. Again, however, the advantage was with the East, for the delegates were chosen by counties, two from each; but in the convention, which was in session at Raleigh from the 4th of June to the 11th of July, the East made some concessions: such as the popular election of the governor (who had previously been elected by the two houses of the legislature), the disfranchisement of free negroes, and the abolition of representation from 6 boroughs, 4 of which were in the East. The number of senators was reduced to 50, the number of commoners to 120, and the manner of choosing senators and commoners was changed as directed in the act providing for the convention. The electorate gave its approval to the revision by a vote of 26,771 to 21,606, and with this the agitation over representation ceased.

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[1] The 20th of May has been made a holiday in North Carolina, and the date appears on the state flag and the state seal; and a statue has been erected at Charlotte in memory of the signers of the "Declaration."

The fundamental points of difference between North Carolina and South Carolina were exemplified in the slavery conflict. South Carolina led the extreme radical element in the South and was the first state to secede. North Carolina held back, worked for a compromise, sent delegates to the Washington Peace Convention in February 1861, and did not secede until the 20th of May 1861, after President Lincoln's call for troops to preserve the Union. Liberal support was given to the Confederacy, both in men and supplies, but Governor Vance, one of the ablest of the Southern war governors, engaged in acrimonious controversies with President Jefferson Davis, contending that the general government of the Confederacy was encroaching upon the prerogatives of the separate states. Owing to its distance from the border, the state escaped serious invasion until near the close of the war. Wilmington was captured by the Federals in February 1865; General Sherman's army crossed the southern boundary in March; a battle was fought at Bentonville, March 19–21; Raleigh was entered on April 13; and the Confederates under General Joseph E. Johnston surrendered near Durham Station, in Durham county, on the 26th.

Reconstruction was a costly experience here as in other Southern states. Jonathan Worth (1802–1869), elected governor under the presidential plan in 1865, was an honest and capable official, but the government established in accordance with the views of Congress in 1868 was corrupt, inefficient and tyrannical. Carpet-baggers, negroes and unscrupulous native whites, known as scalawags, were in control of affairs, while the people of wealth, refinement and education were disfranchised. Governor William Woods Holden (1818–1892; governor 1868–1870) was so weak and tyrannical that he was impeached by the legislature in December 1870. Under his successor, Tod R. Caldwell (1818–1874), there was some improvement in the condition of affairs, and in 1875 a constitutional convention, in session at Raleigh, with the Democrats slightly in the majority, amended the constitution, their work being ratified by the people at the state election in 1876. The native white element completely regained possession of the government in the following year, when the Democrats came into office under Governor Zebulon B. Vance. Since that time the most interesting feature in the political history has been the rise and fall of the People's party. The hard times which followed the financial panic of 1893 made it possible for them, in alliance with the Republicans, to carry the state in the election of 1894. Afterwards their strength declined, because the people became more prosperous, because the national Democratic party in 1896 and 1900 adopted their views on the money question, and because of the unpopularity of a coalition with Republicans, which made it necessary to give the coloured people a share of the offices. The race question was the chief issue in the election of 1898, the Democrats were successful, and what amounted to a negro-disfranchising amendment to the constitution was adopted in August 1900. In 1907 there was a serious clash between the state authorities and the Federal judiciary, arising from an act of the legislature of that year which fixed the maximum railway fare at 2½ cents a mile and imposed enormous fines for its violation. The two principal railway corporations, the Southern and the Seaboard Air Line, contended that the act was clearly contrary to the 14th Amendment to the Federal Constitution in that it denied the equal protection of law. The promise of the railways to give to every purchaser of a ticket a rebate check until the question of the validity of the act should be decided by the courts was not satisfactory to the state authorities, who arrested a ticket agent of the Southern railway, convicted him of violating the law, and sentenced him to the chain-gang for thirty days. Thereupon the attorneys for the railway applied to Judge Jeter Connelly Pritchard (b. 1857) of the United States Circuit Court for a writ of habeas corpus; this was granted and the prisoner was released. The governor of the state, Robert Brodnax Glenn (b. 1854), nevertheless urged the state courts and attorneys to proceed with the prosecution of other ticket agents, and threatened to resist with the force of the state any further interference of Federal judiciary; but in March 1908 the Supreme Court of the United States declared the North Carolina rate law unconstitutional on the ground that it was confiscatory.

GOVERNORS OF NORTH CAROLINA

Proprietary Period (1663–1729).

William Drummond	1663–1667
Samuel Stephens	1667–1669
Peter Carteret	1669–1673
John Jenkins, president of the council	1673–1676
Thomas Eastchurch	1676–1677
Thomas Miller, president of the council	1677–1678
John Harvey, president of the council	1678–1679
John Jenkins	1679–1681
Henry Wilkinson	1681–1683
Seth Sothel	1683–1689
Philip Ludwell	1689–1691
Alexander Lillington, deputy-governor	1691–1694
Thomas Harvey, deputy-governor	1694–1699
Henderson Walker, president of the council	1699–1704
Robert Daniel, deputy-governor	1704–1705
Thomas Carey, deputy-governor	1705–1706
William Glover, president of the council	1706–1707
Thomas Carey William Glover } contestants (Carey's rebellion)	1707–1710
Edward Hyde, deputy-governor	1710–1712
Thomas Pollock, president of the council	1712–1714
Charles Eden	1714–1722
Thomas Pollock, president of the council	1722
William Reid, president of the council	1722–1724
George Burrington	1724–1725
Edward Mosely, president of the council	1725
Sir Richard Everard	1725–1729

Royal Period (1729–1776).

George Burrington[1]	1731–1734
Nathaniel Rice, president of the council	1734
Gabriel Johnston	1734–1752
Nathaniel Rice, president of the council	1752–1753
Matthew Rowan, president of the council	1753–1754
Arthur Dobbs	1754–1765
William Tryon	1765–1771
James Hasell, president of the council	1771
Josiah Martin	1771–1775

Statehood Period (1776–   ).

Richard Caswell		1777–1779
Abner Nash		1779–1781
Thomas Burke		1781–1782
Alexander Martin		1782–1784
Richard Caswell		1784–1787
Samuel Johnston		1787–1789
Alexander Martin	Federalist	1789–1792
Richard Dobbs Spaight, Sr.	Dem.-Repub.	1791–1795
Samuel Ashe	,,	1795–1798
William Richardson Davie	,,	1798–1799
Benjamin Williams	,,	1799–1802
James Turner	,,	1802–1805
Nathaniel Alexander	,,	1805–1807
Benjamin Williams	,,	1807–1808
David Stone	,,	1808–1810
Benjamin Smith	,,	1810–1811
William Hawkins	,,	1811–1814
William Miller	,,	1814–1817
John Branch	,,	1817–1820

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[1] Burrington was appointed in 1730, but did not arrive in the province until February 1731. Either Everard held over or the president of the council was acting-governor from 1729–1731.

Jesse Franklin	Dem.-Repub.	1820–1821
Gabriel Holmes	„	1821–1824
Hutchings G. Burton	„	1824–1827
James Iredell	„	1827–1828
John Owen	Democrat	1828–1830
Montford Stokes	„	1830–1832
David Lowry Swain	„	1832–1835
Richard Dobbs Spaight, Jr.	„	1835–1837
Edward Bishop Dudley	Whig	1837–1841
John Motley Morehead	„	1841–1845
William Alexander Graham	„	1845–1849
Charles Manly	„	1849–1851
David Settle Reid	Democrat	1851–1854
Warren Winslow (ex-officio)	„	1854–1855
Thomas Bragg	„	1855–1859
John Willis Ellis	„	1859–1861
Henry Toole Clark (ex-officio)	„	1861–1862
Zebulon Baird Vance	„	1862–1865
William Woods Holden	Provisional	1865
Jonathan Worth	Conservative	1865–1867
Gen. Daniel Edgar Sickles	Military	1867
Gen. Ed. Richard Sprigg Canby	„	1867–1868
William Woods Holden	Republican	1868–1870
Tod R. Caldwell	„	1870–1874
Curtis Hooks Brogden	„	1874–1877
Zebulon Baird Vance	Democrat	1877–1879
Thomas Jordan Jarvis	„	1879–1885
Alfred Moore Scales	„	1885–1889
Daniel Gould Fowle	„	1889–1891
Thomas Michael Holt	„	1891–1893
Elias Carr	„	1893–1897
Daniel Lindsay Russell	Republican	1897–1901
Charles Brantley Aycock	Democrat	1901–1905
Robert Brodnax Glenn	„	1905–1909
William Walton Kitchin	„	1909–

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NORTHCOTE, JAMES (1746–1831), English painter, was born at Plymouth on the 22nd of October 1746. He was apprenticed to his father, a poor watchmaker of the town, and during his spare hours was diligent with brush and pencil. In 1769 he left his father and started as a portrait-painter. Four years later he went to London and was admitted as a pupil into the studio and house of Reynolds. At the same time he attended the Academy schools. In 1775 he left Reynolds, and about two years later, having acquired the requisite funds by portrait-painting in Devonshire, he went to study in Italy. On his return to England, three years later, he revisited his native county, and then settled in London, where Opie and Fuseli were his rivals. He was elected associate of the Academy in 1786, and full academician in the following spring. The "Young Princes murdered in the Tower," his first important historical work, dates from 1786, and it was followed by the "Burial of the Princes in the Tower," both paintings, along with seven others, being executed for Boydell's Shakespeare gallery, The "Death of Wat Tyler," now in the Guildhall, was exhibited in 1787; and shortly afterwards Northcote began a set of ten subjects, entitled "The Modest Girl and the Wanton," which were completed and engraved in 1796. Among the productions of Northcote's later years are the "Entombment" and the "Agony in the Garden," besides many portraits, and several animal subjects, like the "Leopards," the "Dog and Heron," and the "Lion"; these latter were more successful than the artist's efforts in the higher departments of art, as was indicated by Fuseli's caustic remark on examining the "Angel opposing Balaam"—"Northcote, you are an angel at an ass, but an ass at an angel." The works of the artist number about two thousand, and he made a fortune of £40,000. He died on the 13th of July 1831.

Northcote was emulous of fame as an author, and his first essays in literature were contributions to the *Artist*, edited by Prince Hoare. In 1813 he embodied his recollections of his old master in a *Life of Reynolds*. His *Fables*—the first series published in 1828, the second posthumously in 1833—were illustrated with woodcuts by Harvey from Northcote's own designs. In the production of his *Life of Titian*, his last work, which appeared in 1830, he was assisted by William Hazlitt, who previously, in 1826, had given to the public in the *New Monthly Magazine* his recollections of Northcote's pungent and cynical "conversations," the bitter personalities of which caused much trouble to the painter and his friends.

NORTH DAKOTA, one of the North Central states of the American Union, between 45° 55′ and 49° N., and 96° 25′ and 104° 3′ W. It is bounded N. by the Canadian provinces of Saskatchewan and Manitoba, S. by South Dakota, W. by Montana and E. by Minnesota, from which it is separated by the Red river (or Red river of the North). North Dakota has an extreme length, E. and W., of 360 m., an extreme width, N. and S., of 210 m., and a total area of 70,837 sq. m., of which 654 sq. m. are water surface.

Topography.—North Dakota lies in the Prairie Plains and Great Plains physiographic provinces. The escarpment of the Coteau du Missouri is the dividing line, that portion to the N. and E. lying in the Prairie Plains, that to the S.W. in the Great Plains. The surface presents few striking topographic features, and may be subdivided into three vast plains or prairie tablelands rising one above the other from E. to W., the two easternmost together constituting the Prairie Plains portion of the state. The lowest of these plains is the valley of the Red river, and this valley extends along the eastern edge of the state and varies in width from 25 to 70 m. Its elevation is 965 ft. at

Wahpeton, in the extreme S.E.; 903 ft. at Fargo; 836 ft. at Grand Forks; and 798 ft. at Pembina, in the extreme N.E., which is the lowest point within the state. To the W. of this valley lies a second plain, ranging in height from 1200 to 1600 ft. above sea level, and in width from 75 m. in the S. to 200 m. in the N. This plain is separated from the Red river valley in the N. by an abrupt slope rising to a height of from 300 to 500 ft. above the surrounding country, and called the Manitoba escarpment, because the greater part of it lies in the province of Manitoba. The Pembina Mountains, low hills near the international boundary and about 30 m. W. of the Red river, form a portion of this escarpment. From these hills southward the ridge gradually becomes less abrupt until in Walsh county it vanishes into prairie. The ascent to the upper plain then becomes very gentle, though there is a rise of 400 or 500 ft., until it reaches the south-eastern portion of Sargent county and changes into the more abrupt Coteau des Prairies, a plateau about 2000 ft. above the sea. The second plain, while not so level as the Red river valley, contains but one group of hills, the Turtle Mountains; these rise from 300 to 400 ft. above the general level, near the centre of the northern boundary. The prairies in this second table-land are gently rolling, and are covered with drift from the continental ice-sheet of the glacial period. They are bounded on the W. by a ridge from 300 to 400 ft. in height and from 20 to 50 m. in width, which roughly marks the dividing line between the farming lands of the E. and the grazing lands of the W. The northern portion of this ridge forms the water-parting between the streams that empty into Hudson Bay and those that flow into the Gulf of Mexico. To the W. of this ridge lies the third and highest plain within the state, the so-called Coteau du Missouri. It occupies nearly one half of the state, and rises gradually westward until it attains a general level of about 2700 ft. East of the Missouri river this region is covered with glacial drift, and is noticeably different from the more level lands of the lower plains. The ice-sheet wore down from the hills and filled the valleys with débris until the surface has a billowy appearance. As the Missouri river marks approximately the lower edge of the ice-sheet, the region W. of this stream is almost free from glacial deposits and presents a strong contrast to the rest of the state. The billowy plains still remain in places, but in the vicinity of streams the billows give way to deep ravines. The sands and clays found here are fine and soft, and as there is scant vegetation to protect the hillsides they are easily eroded by the rains. As a result, the surface has been carved into fantastic forms. The early French explorers called the region *les terres mauvaises*, on account of the difficulties that here met the traveller, and in its English equivalent, "the Bad Lands," this appellation still remains. High winds and seams of burning lignite coal have aided the rains in giving the Bad Lands their peculiar configuration. Prairie fires or spontaneous combustion have ignited many coal seams. Some have already burnt out; others still emit smoke and sulphurous fumes from the crevices in the hillsides, and through the fissures may be seen the glowing coal and rock. The earth surface above these natural furnaces has been hardened, cracked and sometimes melted into a reddish slag, called scoria, which, on account of its resemblance to lava, has given rise to an incorrect impression that the region was once the centre of volcanic disturbances. The picturesque effect of this sculpturing by water, wind and fire is greatly enhanced by the brilliant colours along the faces of the hills and ravines—grey, yellow, black and every shade of red and brown. Here too are found petrified forests and other evidences of a vegetable growth that has long ago disappeared. The lands are bad for the traveller and the farmer, but not for the ranchman. A few miles from the streams the country is less broken, and there are deep grassy valleys, in which the animals may find shelter in winter. Cattle sometimes congregate in cold weather around a burning coal seam and enjoy the warmth. The lignite in this region also warms the ranchman's cabin, being easily mined where a seam is exposed in the walls of a ravine or on the side of a hill.

North Dakota has a mean elevation of 1900 ft. The highest point in the state, about 3500 ft., is in the southern part of Bowman county, east of the Little Missouri river.

Rivers.—There are three drainage systems within the state: the Red river (of the North) and its tributaries, the Mouse, or Souris, river and its tributaries, and the Missouri river and its tributaries. The Red river flows in a winding channel along the eastern boundary and empties into Lake Winnipeg in Canada, thence reaching Hudson Bay through the Nelson river. Its tributaries are small, and are remarkable chiefly for the fact that they at first flow in a direction almost opposite to that of the main stream, and make a great bend to the N.E. before joining it.[1] The Sheyenne, the Goose, the Park and the Pembina rivers are the most important of these streams. The Mouse, or Souris, river rises in Canada, crosses the international boundary near the meridian of 102° W. long., flows S.E. for about 70 m., then turns to the N. and near the 101st meridian re-enters British territory, after receiving the waters of the Rivière des Lacs and other small streams. The Missouri river, the most important stream within the state, crosses the western boundary near the 48th parallel, and after pursuing a winding course in a general south-easterly direction, leaves the state near the centre of its southern boundary. The James river, flowing southward into South Dakota, is the Missouri's only important eastern tributary within the state. From the W. the Missouri receives the waters of the Little Missouri, Cannon Ball, Heart and Knife rivers. All that portion of the state lying W. of the Pembina Mountains and E. of the Mouse river valley is practically without river drainage, and for its surface and sub-surface drainage, Devils Lake, an irregular body of water about 40 m. in length and with an area of 400 sq. m., forms a natural reservoir. The waters of this lake are strongly saline. The entire region W. of the Red river valley and E. of the valleys of the Mouse and Missouri rivers is dotted with small lakes. The morainic belts and other obstructions in the drift plains hem in the waters in the intervening basins and create what are called "glacial lakes," varying in diameter from a few yards to several miles. All the lakes of the state are of this character, and many are strong with salt and alkali. The drift plains also contain numerous shallow hollows, locally termed "pots and kettles," which receive the drainage of their vicinity and form sloughs.

Fauna and Flora.—Before the advent of the white man, herds of bison roamed the prairies, but these have disappeared,[2] and, with the exception of deer and bears, large game is to be found only in the Bad Lands. Here are found the lynx, the "mountain lion" or puma, the prairie and timber wolves, the jack rabbit, the prairie dog (gopher), the black, the brown and, occasionally, the grizzly bear. A few fur-bearing animals, the mink, beaver and raccoon, still remain. The prairie dog is found everywhere. Among the lakes, sloughs and stubble-fields of the prairies, teal, ducks, coots and geese are found in abundance. Other prairie birds are the prairie chicken, and there are a great many birds that sing while flying; among them are the horned lark, bobolink, Smith's longspur and chestnut collared longspur, lark-sparrow, lark-bunting and Sprague's pipit.

The flora of North Dakota is typical of a semi-arid country. The prevailing plant-colour is a greyish green, due to a hard dry outer covering which serves as a protection from desiccation. All plant life has a remarkably large proportion of subterranean growth, because of the necessity of getting moisture from the earth and not from the air; hence roots and tubers are unusually well developed. The Red river valley is a meeting ground for many species of plants whose principal habitat lies in some other quarter. Many trees of the eastern forest, such as basswood, sugar, river and red maple, red, white and black ash, red and rock elm, black and bur oak, white and red pine and red cedar find their western limit here. Some species characteristic of the more northerly regions—for example, the mountain ash, balsam fir, tamarack and black and white spruce—find here their southern or south-western limits. The same is true of shrubs and herbaceous plants. The prickly ash, Virginian creeper and staff-tree find here their northern limit; and the mountain maple, Canada blueberry, dwarf birch and ground hemlock their southern limit. Of 1500 species of herbaceous plants in the Red river basin, it is estimated that fully half reach here their geographical limit or limit of frequent occurrence. Trees are found

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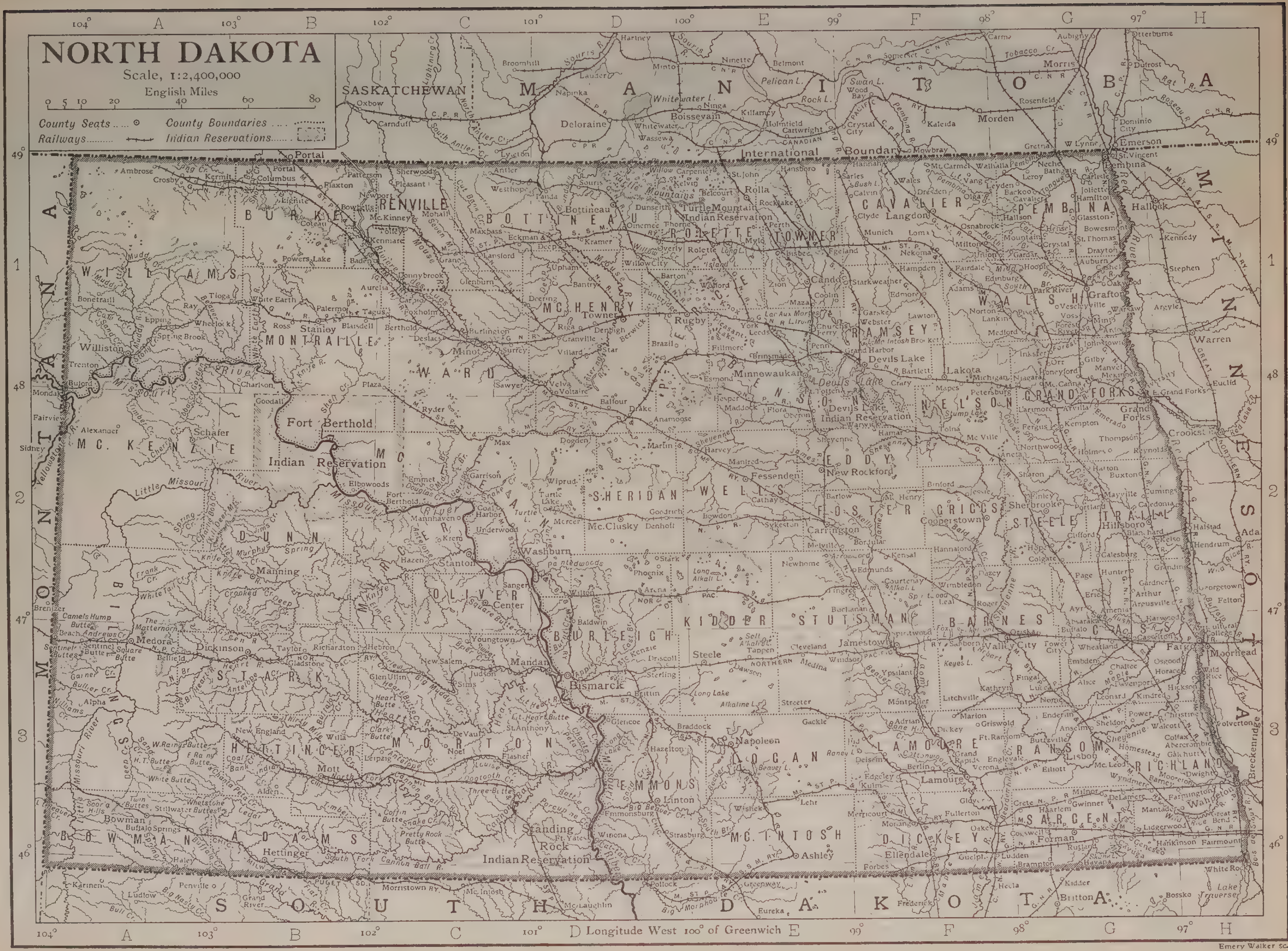
[1] The peculiar bow shape of these western tributaries of the Red river is due to the fact that these streams originally flowed S.E. into Lake Agassiz, now extinct. As the waters of the lake gradually receded, the rivers reached it by pushing their channels eastward through what was once its bed. The southern part of the lake bottom was finally uplifted by a movement of the earth crust, and the outlet was changed from the S. to the N.E. The waters continued to recede, and the tributaries, in cutting their way through the sediment, followed the slope of the land and gradually turned northward.

[2] The early settlers found the bones of the bison scattered over the prairies, and after the construction of railways the gathering and shipping of these for use in sugar refining and in the manufacture of superphosphate became temporarily a profitable industry. Between January and August 1889 a single dealer at Minot shipped 1200 tons, which sold at $8 the ton.

NORTH DAKOTA


Scale, 1:2,400,000
English Miles
0 5 10 20 40 60 80
County Seats .... ⊙
Railways
County Boundaries ....
Indian Reservations
Longitude West 100° of Greenwich
SASKATCHEWAN
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MONTANA
International Boundary
WILLIAMS
BURKE
RENVILLE
BOTTINEAU
ROLETTE
TOWNER
CAVALIER
PEMBINA
WALSH
RAMSEY
BENSON
McHENRY
WARD
MONTRAILLE
Mc. KENZIE
McLEAN
SHERIDAN
WELLS
EDDY
NELSON
GRAND FORKS
FOSTER
GRIGGS
STEELE
TRAILL
KIDDER
STUTSMAN
BARNES
CASS
BURLEIGH
OLIVER
MERCER
DUNN
BILLINGS
STARK
MORTON
EMMONS
LOGAN
LA MOURE
RANSOM
RICHLAND
SARGENT
DICKEY
McINTOSH
HETTINGER
ADAMS
BOWMAN
Fort Berthold Indian Reservation
Turtle Mountain Indian Reservation
Devils Lake Indian Reservation
Standing Rock Indian Reservation
Bismarck
Fargo
Grand Forks
Jamestown
Minot
Mandan
Dickinson
Valley City
Devils Lake
Williston
Missouri River
Red River
Sheyenne R.
James R.
Mouse R.

Emery Walker sc.

only on Turtle Mountains, in the vicinity of streams, and in a few other places sheltered from wind and sun. North Dakota's total woodland area is estimated at 600 sq. m., or less than 1 % of its entire surface. No other state in the Union has such a relatively small area of forest. By an executive proclamation, which came into effect on the 24th of November 1908, a Federal forest reservation of 21·8 sq. m. was created. The prairies of the more humid regions are covered with valuable grasses, and with masses of showy native flowers, which bloom from spring to autumn. The pasque flower is found on all the prairies and is the earliest to appear. The Bad Lands exhibit a vegetation typical of semi-arid regions. Cottonwoods flourish along the Little Missouri river, and in sheltered ravines grow stunted junipers and cedars, which seldom rise above the crest of some protecting bluff. Poplars grow in the valleys, and the cactus and sage brush are common. The faces of buttes and ravines that are turned toward the sun are usually devoid of vegetation.

Climate.—There are no mountains, forests or large bodies of water to moderate the extremes of summer and winter, and the uniformity of topography makes the ranges of temperature for different parts of the state very nearly the same. Between the extreme northern and southern sections there is a range of only 6° F. The mean annual temperature for the state is 39° F., with an extreme of 110° recorded for the summer and a minimum of – 54° for the winter. As a general rule, temperatures are highest in the W. and lowest in the E. In the central region of the state (at Jamestown, Stutsman county) the mean annual temperature is 40°; the mean for the winter, 10°, with a minimum of – 40° recorded in February; the mean for the summer is 67°, with an extreme of 103° recorded in July. The winters are long and severe. The season, however, on account of the dryness of the climate, is not so harsh as the low temperatures would seem to indicate. The seasons are sharply demarked; both winter and summer come suddenly. The summers are short, but as there are sixteen hours of sunlight per day in midsummer, vegetation grows rapidly. Killing frosts often occur in June and return again early in September. High winds are frequent, and prairie houses are often protected by rows of trees called "wind breaks." During the growing season the winds are usually light, but in the late summer and autumn occasional dry, hot, southerly winds ("hot southers") prove very destructive to vegetation. Tornadoes are not unknown, and local hail storms are frequent in the summer, but do little damage. The total precipitation for the state is 17 or 18 in., the heaviest, about 20 in., occurring in the Red river valley, and the lightest, about 14 in., in the extreme W. While the rainfall is always below the normal amount for humid regions, by far the greater part of it occurs in the spring and summer, and growing crops receive the full benefit. The precipitation rarely amounts to 2 in. for the entire winter. The snows are therefore very light, and are quickly swept from the prairies by the high winds, so that cattle may graze in the open plains throughout the year. There are, however, during every winter from one to four severe blizzards, which inflict great damage upon unprotected flocks and herds.

Soils.—As the Red river valley is the bed of the extinct Lake Agassiz, its soil is composed of the fine detritus and silty deposits carried into the lake by its tributaries. Over the whole basin this deposit, to a depth of 1 or 2 ft., is coloured black by decayed vegetation, and constitutes one of the most fertile tracts on the continent. Being remarkably free from trees, rocks and streams, the soil can be turned in furrows that run perfectly straight for miles, and favours the development of "bonanza farms," where thousands of acres are cultivated in a single field. The soils W. of the valley consist of glacial drift, and are well suited to the growing of grain. The drift becomes thinner toward the W., and finally disappears in the semi-arid regions of the Missouri river valley. In this region the soils of sand and clay are much finer than the drift, and are very productive where the water-supply is sufficient.

Irrigation.—Irrigation is confined to the western half of the state, and more especially to the north-west, being employed chiefly in the drainage basin of the Missouri river. The bed of the river is too far below the surrounding country to permit the use of its waters for irrigation purposes by the usual gravity methods. The ordinary process before 1906 was to dam small streams and "coulees" (deep gulches in which water flows intermittently) and flood the surrounding country. The total irrigated area in 1902 was 10,384 acres. The so-called Reclamation Act passed by Congress in 1902 provided for the construction of a system of irrigation works in this and other states by the Federal government. In 1908 the Federal Reclamation Service had five projects in North Dakota. The Buford-Trenton, Williston and Nesson projects are situated in Williams county, on the left bank of the Missouri river. The abundant lignite coal in the region was to operate pumps for raising water from the river into canals crossing the valley. The Washburn project was to irrigate 5000 acres in McLean county with water pumped from the Missouri river. It was estimated that the fourth project, the lower Yellowstone, on the western bank of the river of that name, would furnish water for 66,000 acres of land, of which 20,000 lie in Dawson county, North Dakota, and the rest in Montana. The fifth project, the Bowman, was to irrigate 10,000 acres in North Dakota and the north-western part of South Dakota by storing the waters of the North Fork of Grand river. Water for irrigation purposes is often derived from artesian wells, which are very numerous in the S. and E., particularly in the James river valley.

Agriculture.—Agriculture is by far the most important industry of the state, and, owing to climatic conditions, it is rigidly limited to a few staple crops. The growing season is too short for maize or Indian corn, which constituted only 1·2 % of the acreage of cereals in 1905. No winter wheat can be grown, and the climate is too harsh for the larger fruits, such as apples, pears, peaches, plums and grapes; but such hardy small fruits as currants, gooseberries, raspberries, blackberries and strawberries may be grown in abundance.

The total farm acreage in 1890 was 7,660,333; in 1900, 15,542,640. The value of the farm property in the same decade rose from $100,745,779 to $255,266,751, and the value of farm products from 1889 to 1899 from $21,264,938 to $64,252,494.

The average size of the farms (excluding farms under 3 acres with products valued at less than $500) was 277·4 acres in 1890 and 343·8 acres in 1900. With regard to tenure, 74·7 % of the farms were operated by their owners, 15·2 % by part owners and 7·2 % by share tenants. Hay and grain formed the principal source of income of 88·4 % of the farms, live-stock of 6·7 % and dairy produce of 2·6 %. Wheat is the state's most important product. In the acreage of this cereal in 1909 (according to the *Year-book* of the U.S. Department of Agriculture), North Dakota ranked first, and in the crop second among the states of the Union, its total yield being 90,762,000 bushels, valued at $83,501,000. Next in importance to wheat in 1909 was flaxseed, amounting to 14,229,000 bushels, valued at $22,340,000. In the production of this commodity the state ranked first, and produced about 55 % of the entire crop of the United States. The flax is cultivated for the seed, and only slightly for the fibre. Other important crops are oats ($16,368,000 in 1906) barley ($8,913,000), hay, potatoes, rye and Indian corn. The value of the various classes of live-stock on the 1st of January 1910 was as follows: horses, $81,168,000; mules, $1,040,000; cattle, $21,001,000; sheep, $2,484,000; swine, $2,266,000. Very little attention is paid to fruit and vegetable growing.

Minerals.—With the exception of lignite, which underlies a large portion of the western half of the state, North Dakota has few mineral deposits of commercial value. Sandstone occurs in large quantities, and W. of the Red river valley granite and gneiss are found, but these materials are not quarried. The coal is all in the form of brown lignite and is not very valuable as a fuel, as it soon crumbles into a fine powder on being exposed to air. The total area of the coal beds is estimated at 35,000 sq. m. A law enacted in 1896 required the use of lignite in all state buildings and institutions. Mining is carried on along the Northern Pacific railway W. of the Missouri river, in the Mouse river valley along the line of the Minneapolis, St Paul & Sault Ste Marie railway, and at a few places in the same region along the line of the Great Northern railway. Good clays for the manufacture of tile and brick are found at numerous places. The total value of the mineral products (except stone) in 1909 was $738,818, of which $522,116 was the value of coal and $206,222 of clay products.

Manufactures.—Manufacturing in North Dakota is of small importance, being largely confined, with the exception of flour and grist milling, to the supply of local needs. Under the factory system there were 337 establishments in 1900 and 507 in 1905: the capital invested in 1900 was $3,511,968 and in 1905 $5,703,837; and the value of products was $6,259,840 in 1900 and $10,217,914 (or 63·2 % more) in 1905. The products of the flour and grist mills increased in value from $4,134,023 in 1900 to $6,463,228 in 1905, and in this last year constituted in value 63·3 % of the total factory products of the state. Printing and publishing was next in importance, with products valued at $719,950 in 1900 and at $1,110,439 in 1905. Butter, cheese and condensed milk manufactured were valued at $122,128 in 1900 and at $562,481 in 1905. The chief manufacturing centres are Fargo and Grand Forks.

Transportation.—The total railway mileage within the state on the 31st of December 1908 was 4135·67 m. The main line of the Northern Pacific, from St Paul to Portland, Oregon, enters the state at Fargo and runs almost due W. throughout its length for about 380 m. Parallel with this road, but farther to the N., is the main line of the Great Northern system, running from St Paul to Seattle. The length of its route within the state, from Wahpeton to Buford via Larimore, is about 460 m. Both of these systems have numerous branch lines. The main line of the Minneapolis, St Paul & Sault Ste Marie enters the S.E. corner of the state at Fairmount and ends in the N.W. at Portal, on the international boundary, having in 1909 a length within the state of 361 m. Among its many branches are the "Wheat Line," running from Kenmare, North Dakota, to Thief River Falls, Minnesota, and having a length of 251 m. in the state; and the "Missouri River Line," penetrating the southern and central portions of the state from Hankinson to Garrison, with a length of 282 m. In 1909 the Northern Pacific was building about 140 m. of new track. The Chicago, Milwaukee & St Paul railway, running E. and W. through South Dakota, sends four short branches into the southern part of North Dakota. The Chicago & North-Western also sends a short branch line northward into the state, forming a junction with other lines at Oakes. The Red river is navigable as far S. as Belmont, and the Missouri river is navigable throughout its course within the state, although it requires a skilful pilot.

Population.—In 1870 the population of that portion of Dakota Territory included within the present limits of North Dakota was 2405; in 1880, 36,909. The population of the state in 1890 was 182,719; in 1900, 319,146; in 1905, 437,070; in 1910, 583,888. The number of the foreign-born population in 1900 was 113,091, or 35·4%, the highest proportion to be found in any state of the Union. The principal elements composing the white foreign population were as follows: Norwegians 30,206, English Canadians 25,004, Russians 14,979, Germans 11,546, Swedes 8419. The coloured population consisted of 4692 Indians not taxed, 2276 Indians taxed, 286 negroes, 148 Japanese and 32 Chinese. Most of the Indians not taxed live on reservations, of which there are four: Devils Lake Reservation in 1909 had a total area of 143·97 sq. m., a population of 980, consisting of Sisseton, Wahpeton, and Cut Head (or Pabaksa) Sioux; Turtle Mountain[1] Reservation, in Rolette county, established in 1882, and now allotted (excepting 186 acres for church and school purposes), had a population in 1909 of 2588, being for the most part a mixture of Pembina (or Turtle Mountain) Chippewa with French Canadians; Fort Berthold Reservation in the west central part of the state, on the Missouri river, established in 1870, had in 1909 an area of 1382·4 sq. m., and a population of 399 Arikara (Caddoan), and, of Siouan stock, 453 Hidatsa (or Grosventre) and 252 Mandan Indians; and Standing Rock Reservation, on the western bank of the Missouri river, was established in 1875, and in 1909 contained 2887·2 sq. m. (about three-fifths of which lies in South Dakota and much of which was opened to settlement in 1908–1909) and a population of 3399 Sioux. The population of the state is largely rural. The larger municipalities with the population of each in 1905 were: Fargo (12,512), Grand Forks (10,127), Jamestown (5093), Bismarck, the capital, (4913), Minot (4125), Valley City (4059), Dickinson (3188), Wahpeton (2741), Mandan (2714), Grafton (2423) and Devils Lake (2367); in 1905 there were fifteen other municipalities each with a population of more than 1000. In 1906 the Roman Catholic Church had the largest number of communicants (61,261 out of a total of 159,053 members of all denominations), and there were 59,923 Lutherans.

Administration.—The state is governed under its constitution of 1889, as subsequently amended. The governor is chosen biennially, and has a limited pardoning power. He may veto appropriation bills by items, but any of his vetoes may be overruled by a two-thirds vote of each house. The governor and lieutenant-governor must be at least thirty years old. The other administrative officers are a secretary of state, auditor, treasurer, superintendent of public instruction, commissioner of insurance, three commissioners of railways, attorney general and commissioner of agriculture and labour; each of these officers is chosen biennially and must be at least twenty-five years of age. The legislative department consists of a Senate, with members chosen every four years, and about half chosen at each biennial election; and a House of Representatives, with members chosen biennially. The sessions of the legislature are biennial, and are limited to sixty days. The minimum age for senators is twenty-five years and for representatives twenty-one years. Bills may originate in either house. A lieutenant-governor, chosen biennially, presides over the Senate. In 1907 the legislature proposed an amendment providing for the application of initiative and referendum to statutory laws and constitutional amendments; two years later the legislature passed a substitute resolution, which omits the clause regarding amendments of the constitution, and which, if passed by the legislature of 1911 will be put to popular vote at the general election of 1912. The judicial department consists of the supreme court, district courts, county courts, municipal courts, and justices of the peace. The supreme court consists of three judges (minimum age thirty years), chosen by popular vote for six years. Their number may be increased to five whenever the population of the state shall amount to 600,000. For each judicial district (the tenth district was created in 1907) there is one district judge, elected for four years; the district courts have original jurisdiction (except in probate matters) and certain appellate jurisdiction. The judge of the county court is chosen for two years. This court has exclusive original jurisdiction in probate matters, and in counties with over 2000 inhabitants its jurisdiction may be extended by popular vote to include concurrent jurisdiction with the district courts in civil matters involving amounts less than $1000, and in criminal actions below the grade of felony. Justices of the peace have jurisdiction in civil cases involving no land titles and sums of money not exceeding $200. They may also try misdemeanours in counties without other criminal jurisdiction.

For the administration of local government, the state is divided into counties (46 in 1910). In those counties that have not adopted a township organization county affairs are administered by a board of county commissioners; where the township organization has been adopted the county government is administered by the chairmen of the several township boards. For each county there are a judge, clerk, register of deeds, auditor, treasurer, sheriff and state's attorney.

All citizens of the United States residing in North Dakota are declared to be citizens of the state. The right of suffrage is confined by the constitution to males twenty-one years of age, who are citizens of the United States or have declared their intention of becoming citizens, and who have resided in the state one year, in the county six months, and in the voting precinct ninety days preceding the election. Civilized Indians who have severed their tribal relations two years before an election are entitled to vote. Women may vote for all school officers and upon all questions relating solely to school matters, and are eligible to any school office.

Amendments to the constitution must be passed by both houses of the legislature at two consecutive sessions, and must then be ratified by popular vote. By this arrangement a period of nearly four years usually elapses between the proposal and the final ratification of an amendment.

The amount of homestead exempt from seizure for debt is limited in value to $5000, and may not include more than two acres in a town plot or more than 160 acres elsewhere. The exemption is not valid against a debt created for the purchase money, or against taxes levied on the property, or against mechanics' or labourers' liens for work done or material furnished for improvements, or against a mortgage acknowledged by both husband and wife. The grounds for absolute divorce are adultery, cruelty, desertion (one year), neglect (one year), habitual drunkenness (one year) and conviction for felony; residence in the state for one year is required before application for divorce.

North Dakota is one of the few American states whose constitution forbids the manufacture, importation[2] or sale of intoxicating liquors. Attempts to secure the repeal of this provision have been unsuccessful. Apothecaries may secure a licence to sell liquors for purely medicinal purposes upon a petition signed by twenty-five reputable free-holders and twenty-five reputable women. In 1909 the advertisement of liquors, solicitation of orders for liquors, and the sale of cigarettes to minors were prohibited.

Education.—At the head of the public school system is a superintendent of public instruction, chosen for two years. He, with the governor and the president of the state university, constitutes a high-school board, having supervision of the secondary schools. In each county there is a county superintendent, elected biennially, and in each school district a board of directors. The proceeds of the sale of public lands donated to the state for educational purposes, and all escheats to the state, constitute a trust fund, the interest from which, with the proceeds of all fines for the violation of state laws, is annually apportioned among the school districts according to the school population; the total apportionment from the State Tuition Fund in 1908 was $357,238. This income is supplemented by local taxation. The minimum school term allowed by law is six months, and the schools are open to all pupils between the ages of six and twenty-one years. For children between the ages of eight and fourteen attendance for twelve weeks, six being consecutive, is compulsory. The total enrolment in the public schools in 1908 was 131,582, with an average daily attendance of 90,419. Educational facilities are also furnished by the state through university and school of mines at University, near Grand Forks, normal schools (opened in 1890) at Valley City and Mayville, an agricultural college and experiment station (1890) at Fargo, a normal and industrial school (opened in 1899) at Ellendale, a school for the deaf (1890) at Devils Lake, a scientific school (opened in 1903) at Wahpeton, and a school of forestry at Bottineau. Fargo College at Fargo, founded in 1887 by Congregationalists, is now non-sectarian. The Methodist Episcopal Church maintains Wesley College near Grand Forks (formerly the Red River Valley University at Wahpeton), affiliated with the state university. There is a state library commission. The state supports a hospital for the insane at Jamestown, an institution for the feeble-minded at Grafton, a home for old soldiers at Lisbon, a blind asylum at Bathgate, a reform school (opened 1902) at Mandan and a penitentiary at Bismarck. There is a state sanatorium for tuberculosis (1909).

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[1] The Devils Lake Reservation and the Turtle Mountain Chippewa are both under the Fort Totten School, which is on the Devils Lake Reservation.

[2] Before the law passed by the first Legislative Assembly of the state to carry out this provision could come into effect, it was partially annulled by the decision of the United States Supreme Court in the case of *Leisy* v. *Hardin* (1890), in which the court held that liquors might be imported into any state and sold in the original package (*q.v.*) without reference to local prohibitory or restrictive laws.

Finance.—The chief source of revenue for the state, counties and municipalities is the general property tax. There are no special corporation taxes, but licence-charges are levied upon express and sleeping-car companies, and a tax is laid on the premiums of insurance companies. No poll tax is levied for state purposes, but counties are authorized to levy such a tax for school purposes. There are boards of equalization and review for the state, counties and municipalities. The state board fixes the rate of the state tax. For defraying the expenses of the state government, exclusive of the interest on the bonded debt, the tax rate is limited by the constitution to four mills on the dollar of assessed valuation. The state debt, excluding the amount of Territorial indebtedness assumed when Dakota Territory was divided, may not exceed $200,000. Local indebtedness is limited to 5 % of the assessed value of the local property, but incorporated cities may by special vote increase this limit. The total bonded debt of the state on the 31st of October 1908 was $642,300 and was incurred for the most part for the construction of public buildings during the Territorial period. At the close of the fiscal year ending on the 31st of October 1908, the receipts for the year amounted to $3,259,668, the expenditures to $3,476,073 and the balance in the treasury to $582,905.

History.—The first attempts to establish permanent settlements in what is now North Dakota were made by traders of the Hudson's Bay Company, who began their operations in the Red river valley about 1793.[1] In 1797 C. J. B. Chaboillez, a French trader in the service of the North-West Fur Company, built a trading post on the southern bank of the Pembina river, near its mouth, but this was soon abandoned. Three years later Alexander Henry, the younger (d. 1814), built two trading posts in the present limits of the state for this company, one on the western bank of the Red river near the Park river, where he lived until 1808. David Thompson (1770–1857), an employee at different times of the Hudson's Bay and North-West Fur companies, explored the region of the Missouri river in 1797–1798, and thus anticipated the work of Lewis and Clark, who entered the present limits of the state in 1804 and wintered among the Mandans, constructing Fort Mandan in what is now McLean county. In 1801 John Cameron (d. 1804) erected a trading post for the North-West Fur Company on the site of the present Grand Forks.

The first real homeseekers to enter the state of whom there is any record were a colony of Scottish Highlanders who had first settled at Kildonan (Winnipeg) in 1812 under a grant from the Hudson's Bay Company to Thomas Douglas, 5th earl of Selkirk. A part of the Winnipeg colony soon migrated southward and settled on the site of the present city of Pembina, at the mouth of the Pembina river, which they thought to be in British territory, and named the settlement Fort Daer. When Major Stephen H. Long, commanding an exploring expedition to the Minnesota and Red rivers, reached Fort Daer in 1823, he found there about six hundred persons, a few being Scotch, but the greater part being half-breeds.

North Dakota formed part of the region ceded by France to the United States by the Louisiana Purchase in 1803. From 1803 to 1805 it was included in the District of Louisiana, and from 1805 to 1812 it was a part of the Louisiana Territory, the name of which was changed to Missouri Territory in 1812. In 1834 that part of the present state E. of the Missouri river was included in the newly organized Territory of Michigan, and became successively a part of Wisconsin Territory in 1836, of Iowa Territory in 1838, and of Minnesota Territory in 1849. In 1854 the Territory of Nebraska was organized from a portion of the Missouri Territory, and the part of the Dakotas W. of the Missouri, then locally called "Mandan Territory," was included in its limits. After Minnesota entered the Union, in 1858, the country between the Red and the Missouri rivers had no Territorial government for three years, but the inhabitants formed a provisional government. On the 2nd of March 1861 the Territory of Dakota was created, including the present Dakotas and portions of Wyoming and Montana. The seat of the Territorial government was fixed at Yankton, and remained there until 1883, when it was removed to Bismarck. The name of the Territory was derived from the Dakota Indians; the word "Dah-ko-ta" (signifying "allied" or "confederated"), being originally applied to the Sioux Confederation. In 1863 when Idaho Territory was formed, the boundaries of the Dakotas were fixed at practically their present limits. The boundary between Dakota Territory and Nebraska was slightly altered in 1870 and 1882. The Territory had hardly been organized before its settlement was impeded by the Civil War without and by Indian troubles within. In 1862 the Indians began a series of bloody massacres along the frontiers of Minnesota and Dakota. In the following year General Alfred Sully (1821–1879), commanding United States troops, marched up the Missouri river as far as Bismarck, and thence to the valley of the James river. On the 3rd of September 1863 with 1200 men he routed 2000 Sioux near the present town of Ellendale, in Dickey county, in an engagement called the battle of White Stone Hills. Four hundred warriors were slain, and a great number were captured. In 1864 Sully defeated the Sioux at the battle of Takaakwta, or Deer Woods, on the Knife river, and a few days later he again encountered them, and after a desperate struggle of three days administered a crushing defeat; the warriors abandoned their provisions and escaped into the Bad Lands. The Indians still remained hostile, however, and in 1865 Sully found it necessary to conduct his troops N. as far as Devils Lake, and thence W. to the Cannon Ball river. By these operations the Indian frontier was fixed W. of the Missouri river, and forts and garrisons were placed along this stream. The worst of the Indian troubles in northern Dakota were then at an end, though for many years there were occasional outbreaks.

A period of rapid development in the Red river basin followed the entrance of the Northern Pacific railway into this region in 1872. At the election in November 1887 the question of the division of the Territory into two states at the "seventh standard parallel" was submitted to the people, and was carried at the polls. In accordance with the Enabling Act, which received the president's approval on the 22nd of February 1889, a constitutional convention met at Bismarck on the 4th of July following, and drafted a frame of government for the state of North Dakota. In October this was ratified at the polls. The chief interest in the election turned on the prohibition clause in the constitution, which was submitted separately, and received a majority of only 1159 votes. On the 2nd of November 1889 President Harrison issued a proclamation declaring North Dakota a state. By an agreement between North and South Dakota, embodied in their constitutions, each state assumed the debt created for the erection of public buildings within its limits during the Territorial period.

In the development of the state since its admission into the Union the railways have been an important factor. In 1894 they inaugurated the so-called "concentration movement," and began to conduct annual excursions into North Dakota, thus bringing into the state thousands of immigrants. They have also adopted the policy of selecting favourable town-sites on the uninhabited prairie, erecting grain elevators at such points, and furnishing transportation facilities by means of branch roads tapping the main lines of travel. Under this system prosperous towns and villages have sprung up among the prairies

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[1] There seems to be no good authority for the statement often made that the first settlement in North Dakota was made by French Canadians in 1780.

In politics the state has been Republican, except in 1892, when the Democrats and Populists combined; in 1906, 1908 and 1910 a Democratic governor was elected.

Territorial Governors.[1]

William Jayne	1861–1863
Newton Edmunds	1863–1866
Andrew J. Faulk	1866–1869
John A. Burbank	1869–1874
John L. Pennington	1874–1878
William A. Howard[2]	1878–1880
Nehemiah G. Ordway	1880–1884
Gilbert A. Pierce	1884–1887
Louis K. Church	1887–1889
Arthur C. Melette	1889

State Governors.

John Miller	Republican	1889–1891
Andrew H. Burke	„	1891–1893
Eli C. D. Shortridge	Democratic	1893–1895
Roger Allin	Republican	1895–1897
Frank A. Briggs[3]	„	1897–1898
Joseph M. Devine[4]	„	1898–1899
Frederick B. Fancher	„	1899–1901
Frank White	„	1901–1905
Elmore Y. Sarles	„	1905–1907
John Burke	Democratic	1907–

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NORTHEIM, a town of Germany, in the Prussian province of Hanover, on the Ruhme, 12 m. by rail N. of Göttingen and at the junction of railways to Cassel and Nordhausen. Pop. (1905) 7984. It has an interesting Evangelical church, containing some old wood-carving and stained glass, a Roman Catholic church, several schools and a training college for schoolmasters. There are manufactures of tobacco, sugar and boots; other industries are flour-milling, tanning and brewing. The place is said to date from the 9th century; it obtained civic rights in 1208, and later became a member of the Hanseatic League. It was stormed by the imperial troops in June 1627. The Benedictine abbey of St Blasius was founded in 1063 and dissolved at the Reformation.

See Wennigerholz, *Beschreibung und Geschichte der Stadt Northeim* (Northeim, 1896).

NORTHER, a winter wind accompanying the "cold wave" that follows the passage of a cyclone across the United States of America. A warm S.E. or S.W. wind on the east of such a cyclone materially slackens or entirely dies away, and is followed, often suddenly, by the piercingly cold norther. The passage of a cyclone across America is usually from W. to E., and the cyclonic system of circulation would produce these results; but as the North American cyclones usually originate east of the Rocky Mountains, the warm air drawn from the Gulf of Mexico is not only followed by the cold air drawn from the Arctic regions, but the body of cold air slides down the eastern slopes of the Rockies and advances as a solid wedge (the "cold wave") under the cyclone itself. "Uncomfortably warm in the lightest clothing," a traveller upon the prairies of Texas may become "uncomfortably cold before he can wrap his blanket around him" (W. Ferrel, *A Popular Treatise on the Winds*). The temperature may fall 50° F. in twenty-four hours.

NORTHFIELD, a city of Rice county, Minnesota, U.S.A., on the Cannon river, about 35 m. S. of St Paul. Pop. (1905) 3438; (1910) 3265. It is served by the Chicago Great-Western, the Chicago, Milwaukee & St Paul, and the Chicago, Rock Island & Pacific railways. It is a shipping centre for the products of the farming and dairying region in which it lies, but it is most widely known for its educational institutions. It is the seat of the Baker School for Nervous and Backward Children, a private institution; of St Olaf College (Norwegian Lutheran), founded in 1874; and of Carleton College (founded in 1866 by Congregationalists but now non-sectarian, opened in 1870), one of the highest grade small colleges in the West, and the first in the North-west to abolish its preparatory academy. Carleton College has the Goodsell Observatory, which gives the time to the railways of the North-west, and publishes a magazine, *Popular Astronomy*. The Scoville Memorial Library (1896) of the College had 23,000 volumes in 1909. Northfield has a public library and the Minnesota Odd Fellows' Widows and Orphans Asylum. Named in honour of John W. North, who laid out Northfield and several other western towns, it was settled about 1851, incorporated as a village in 1868, and chartered as a city in 1875.

NORTHFIELD, a village of Washington county, Vermont, U.S.A., in Northfield township, about 35 m. S.E. of Burlington, in the Green Mountains region. Pop. (1910) of the village 1918; of the township 3226. Northfield is served by the Central Vermont railway. It is the seat of Norwich University, founded in 1819 as the American Literary, Scientific and Military Academy at Norwich, Windsor county, Vermont, by Captain Alden Partridge (1785–1854). Captain Partridge was a professor in the U.S. Military Academy in 1813–1816 and acting superintendent of the Academy in 1816–1817, and was president of Norwich University until 1843, he founded various other military schools besides the one at Norwich. Norwich University was incorporated in 1834 under its present name, and in 1866, when the buildings at Norwich were burned, was removed to Northfield. The charter requires "a course of military instruction, both theoretical and practical," and the discipline of the institution is military in form and principle. In 1898 the university was recognized by the General Assembly of Vermont as the military college of the state. It offers courses leading to the degrees of Bachelor of Arts and Bachelor of Science in civil engineering, in electrical engineering and in chemistry. In 1908 it had 13 instructors and 168 students. Dewey Hall (1902), the administration building, was named in honour of Admiral George Dewey, a former student in the university. In the township there are outcrops of good granite and of verde antique, and along a range of hills E. of the village there is a deposit of very fine black slate. The hills furnish excellent grazing for cattle, and much milk is shipped to New England cities. The township of Northfield was incorporated in 1781; the original settlement on the site of the present village was made in 1785, and the village was incorporated in 1855.

NORTHFLEET, an urban district of Kent, England, within the parliamentary borough of Gravesend, on the Thames, 22 m. E. by S. of London by the South Eastern and Chatham railway. Pop. (1901) 12,906. The church of St Botolph is of Norman foundation, but the nave is principally Decorated and the chancel Perpendicular, and the tower, having fallen down, was rebuilt in 1628. The church contains a brass of the 14th century and other interesting monuments. The nave and chancel have undergone modern restoration. Huggens College, with residences for impoverished ladies, was established in 1847 by John Huggens of Sittingbourne. Besides chemical manufactures, there are chalk, lime, cement and brick works and a shipbuilding yard. Swanscombe almost adjoins Northfleet on the south-west. Its name is said to be derived from a camp formed here by the Danish king, Sweyn, and tradition fixes at this spot the meeting between William the Conqueror and the men of Kent, to whom was confirmed the possession of all their ancient laws and privileges.

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[1] The Territorial government embraced both the present states of North and South Dakota.

[2] Died in office on the 10th of April 1880.

[3] Died in office, July 1898.

[4] Succeeded Frank A. Briggs, deceased, by virtue of his office of lieutenant-governor.

NORTH HOLLAND, a province of the kingdom of Holland, lying between the North Sea and the Zuider Zee, and on the landward side bounded by the provinces of South Holland and Utrecht. Pop. (1904) 1,053,083; area, 1070 sq. m. The province also includes the islands of Texel, Vlieland and Terschelling, belonging to the group of the Frisian Islands, as well as Wieringen, Marken and Urk in the Zuider Zee. There are three natural divisions—foreshore and sand-dunes, inner dunes and the *geest* grounds, and low fens and clay lands.

The dunes form the great natural barrier against the sea behind which the province lies secure. But the fact of there being no inlets of the sea is the reason of the absence of commercial towns along the sea-board, the only exception being Ymuiden, which has arisen at the mouth of the North Sea canal from Amsterdam. On the other hand the broad, gently-sloping, sandy beach is peculiarly fitted for sea-bathing, and in the absence of harbours permits the beaching of the characteristic flat-bottomed fishing boats. Petten, Egmond-on-Sea, Wyk-on-Sea and Zandvoort are fishing villages and watering-places.

In the depressions of the dunes and on the *geest* grounds at their foot, small woods have been planted in places, and in this sheltered strip market-gardening and horticulture are practised. Horticulture flourishes, especially along the margin of the *geest* grounds from about 5 m. north of Haarlem to twice that distance south, hyacinths, tulips, narcissus and crocuses being the flowers chiefly cultivated. The sight of these flowers in spring, with mile after mile of brilliant and varied colours, attracts visitors even from foreign countries. This region of the province was one of the earliest inhabited and includes the oldest towns and villages, such as Schagen, which was flourishing in the 12th century and was created into a lordship in the beginning of the 15th century for the benefit of a natural son of Count Albrecht of Holland. The castle was demolished in the 19th century, but two towers (restored in 1879) are standing. Among interesting places may be mentioned Alkmaar, Heilo, Egmond, Kastrikum and Beverwyk, which, like Velzen a few miles south, was granted by Charles Martel to Willebrord, the apostle of the Frisians, in the first half of the 8th century. The name is a corruption of Bedevaartswyk, "the village on the pilgrims' road," and refers to the pilgrimages once made to the church of St Agatha in the neighbourhood. Brederode, another ancient village, was the seat of the illustrious family of the same name. The remains of the castle are extensive. Other ancient towns are Zandpoort, Bakenes, Haarlem and Bennebroek, once the seat of a nunnery removed hither from Egmond by Dirk II. in the 10th century.

The third division of the province comprises by far the largest area, that, namely, which lies at or below sea-level. The reclamation of land which has been effected here is noteworthy. The whole of the lakes to the north of the former Y, including the famous Purmer and Beemster lakes, and the Wieringerwaard and Zype sea-polders, were drained in the beginning of the 17th century; but the Waard-en-Groet, the Anna Paulowna and the Koegras sea-polders to the north of these, were only added to the mainland in the first half of the 19th century. This region is traversed by the North Holland canal (1819–1825), between Amsterdam and the naval station of den Helder. The Y, which was formerly an inlet of the Zuider Zee, was drained, and the North Sea ship canal was formed in its stead (1865–1876), and carried through the dunes to Ymuiden. Of the drained lakes south of the former Y, the most important is the Haarlem Lake. The landscape in this division of the province is the most typical of Holland; green meadows stretching as far as the eye can see, dotted with windmills and cattle, and slashed by the regular lines of the drainage canals, bordered with pollarded willows.

As in Friesland, cattle-rearing and the making of cheese, chiefly of the Edam description, are the main industries, but agriculture and even a little market-gardening are also practised in the heavier clay lands, such as the Y and Anna Paulowna polders. Purmerend, Alkmaar and Enkhuizen are the chief market centres. Though the country is naturally poor in minerals, springs containing iron have been discovered, such as the Wilhelminabron at Haarlem. The security of the Zuider Zee for trade and fishing purposes was the first factor in the commercial development of North Holland, and the cities of Medemblik, Enkhuizen, Hoorn, Edam and Monnikendam, though now little more than market centres for the surrounding district, possessed a large foreign commerce in the 16th and 17th centuries. This prosperity finally concentrated itself upon the Y (that is, upon Amsterdam) and the series of industrial villages situated on its offshoot the Zaam, of which Zaandam and Wormerveer are the most important.

NORTHINGTON, ROBERT HENLEY, 1st Earl of (*c.* 1708–1772), lord chancellor of England, was the second son of Anthony Henley, a member of a well-to-do family in Hampshire, who was a Whig member of parliament, and a well-known wit and writer. Robert was educated at Westminster school and St John's College, Oxford; and after gaining a fellowship at All Souls he was called to the bar in 1732. In 1747 he was elected member of parliament for Bath, of which borough he became recorder in 1751. He acquired a lucrative practice at the bar, and in 1756 was appointed attorney-general. In the following year he was promoted to the office of lord keeper of the great seal, being the last person so designated. For three years Henley, though still a commoner, presided over the House of Lords in virtue of his office; but in 1760 he was created Baron Henley of Grainge in the county of Southampton. The delay in raising him to the peerage was due to the hostility of George II., who resented Henley's former support of the prince of Wales's faction, known as the Leicester House party; and it was in order that he might preside as lord high steward at the trial of Earl Ferrers for murder in 1760 that he then received his patent. On the accession of George III. the office of lord chancellor was conferred on Henley, and in 1764 he was created Viscount Henley and earl of Northington. In 1765 he presided at the trial of Lord Byron for killing William Chaworth in a duel. Northington, who was a member of the group known as "the king's friends," was instrumental in procuring the dismissal of the marquess of Rockingham and the recall of Pitt to office in 1766, and he himself joined the government as lord president of the council, Lord Camden becoming chancellor. He resigned office in 1767, and died at his residence in Hampshire on the 14th of January 1772. He married, in 1743, Jane, daughter of Sir John Huband of Ipsley, Warwickshire, by whom he had three sons and five daughters. His youngest daughter, Elizabeth, married Morton Eden, who in 1799 was created Baron Henley in the peerage of Ireland; and her grandson, the 3rd Baron Henley of this creation, was in 1885 created earl of Northington.

Lord Chancellor Northington was in his youth a man of convivial and boisterous manners, much addicted to swearing. Horace Walpole commented on his undignified bearing at the trial of Lord Ferrers; but Lord Eldon considered him "a great lawyer," and his integrity was unquestioned. His notes of cases tried by himself in the Court of Chancery were published in two volumes in 1818.

Robert Henley, 2nd earl of Northington (1747–1786), only surviving son of the lord chancellor, was appointed a teller of the exchequer in 1763, and lord lieutenant of Ireland in 1783, an office which he administered in a spirit of concession to popular claims in Ireland, encouraging native industries and public economy, by which he made himself beloved by the Irish people. He resigned in 1784, and died unmarried on the 5th of July 1786, when the titles granted to his father became extinct.

See Lord Henley, *Memoir of Robert Henley, Earl of Northington* (London, 1831); Campbell's *Lives of the Chancellors*; Foss's *Judges of England*; Horace Walpole's *Memoirs*.

NORTH SEA, a sea bounded E. by the continent of Europe and W. by Great Britain. At its southern end it communicates by the narrow Strait of Dover with the English Channel, and so with the Atlantic, and towards the north it widens out gradually to 345 m. between St Abb's Head and the coast of Denmark, and narrows again to 270 m. between Duncansby Head and the coast of Norway. To the north of Scotland it communicates with the Atlantic westwards by the Pentland Firth and the channel between the Orkney and Shetland Islands, and northwards with the Norwegian Sea.

Area and relief. Its total area is given by Murray as 162,600 sq. m., and by Krümmel as 571,910 sq. km., or 220,820 sq. statute m. Murray estimates the volume of the North Sea at 11,200 cub. m., and Krümmel at 53,730 cub. km. or 12,890 cub. m., giving mean depths of 61 and 48 fathoms respectively. The North Sea is thus on the whole shallow; its bed is part of the continental shelf on which the British Isles stand, and it slopes upwards with fair regularity from north to south. In the south and east there is a broad coastal strip over which the depth nowhere exceeds 20 fathoms, and the whole south-eastern part of the area is less than 30 fathoms deep. In about its middle latitude the Dogger Bank crosses the North Sea from east to west, extending for about one-third of the whole distance; near the English coast the depth here is under 10 fathoms and it increases eastwards to about 20 fathoms. South of the Dogger there are local depressions, mostly of small area, in which the depth is as much as 45 fathoms, as in the "Silver Pit." Krümmel points out that a line drawn from the northern edge of the Dogger to the middle of the Skagerrack constitutes a rough boundary of the shallow southern basin, the depth increasing very slowly beyond this line to the "Norwegian Channel"—a deep gully closely following the Scandinavian coast, and extending into the Skagerrack, in which the depth increases to as much as 400 fathoms.

History. According to Jukes-Browne, the North Sea, in its present form, first took shape as a result of the tectonic movements indicated by the break between the older and newer Pliocene deposits. The southern end of the North Sea was probably little affected by the general subsidence which occurred during the Glacial period; its boundary in this direction was apparently within the present land area of France and Belgium, while a narrow inlet may have run westwards between France and England in the present position of the Strait of Dover. Meanwhile immense quantities of ice detritus from Scotland and Scandinavia were deposited in the North Sea, to a thickness of perhaps 600 ft., and the whole region was subsequently raised above sea-level, constituting the "structural surface" upon which the present river system was developed as a series of tributaries to a great river which formed a continuation of the Rhine. Finally the land subsided again, the plain of the North Sea was again submerged, and the western inlet of Pleistocene times became the Strait of Dover.

Coasts. For reasons which will be sufficiently obvious from the historical sketch just given, the coasts of the southern part of the North Sea are of no great height. In England they consist of low cliffs with sandy beaches, while on the continental side are immense flats and marshes, with parts below sea-level protected by sand-dunes and artificial dykes. Suess has shown that no evidence is forthcoming of tectonic movement since the Bronze Age, and the rapid changes of coast-line now taking place in many parts are therefore wholly due to the action of the sea, which is probably specially effective on account of the relatively recent opening of the Strait of Dover. The erosion of the North Sea coasts has been made a subject of minute study (in England especially by the British Association and a committee of the Royal Geographical Society), and Harmer has obtained interesting results by comparing the British and Continental coasts as characteristic "weather" and "lee" shores.

The physical conditions of the waters of the North Sea have been extensively studied by expeditions sent out by the Swedish, Norwegian, Danish, German and British governments; and since 1902 by the International Council for the Study of the Sea, which owes its origin mainly to the work of the earlier expeditions. *Circulation.* Professor Pettersson of Stockholm, to whose initiative much of this work is due, classifies the waters found in the North Sea as follows: (1) oceanic water of 35 *pro mille* salinity or more; (2) water of salinity 34 to 35 *pro mille*, called "North Sea" water; (3) water of salinity 32 to 34 *pro mille*, found along the coasts of Holland, Germany, Denmark, and Norway, and called "bank-water"; (4) water of 32 *pro mille* salinity or less, belonging to the stream flowing out from the Baltic. Of these (1) and (4) are to be regarded as "in-flowing" waters, while the others are due to mixture, which may or may not take place in the North Sea itself. The oceanic water consists of a mixture of waters of Atlantic and Polar origin; it enters the North Sea from the north-west partly from the Norwegian sea, and partly from the Faewe channel by the passage between the Orkney and Shetland islands, and makes its way southwards along the coast of Scotland, especially during the early summer months.

The International Council, and more particularly the North Sea Fisheries Investigation Committee of the Fishery Board for Scotland, have studied the periodic and irregular variations in the distribution of these waters in minute detail; and the results, extending and confirming the observations of the earlier observers, have established the conclusion that the supply of fresher coastal waters from the land on both sides of the North Sea is greatest in late summer, after the occurrence of the maximum inflow of oceanic water. The autumn and early winter months accordingly represent a period of mixing rather than of inflow, and this mixing is clearly an extremely complicated process, depending on the relative amounts of the mixing waters (which are themselves liable to great variation), on their temperature and salinity, and also on the action of winds and tides. In the southern part of the North Sea area tidal action alone is sufficiently vigorous to ensure complete mixing of the waters from surface to bottom at all times.

Tides. The tides of the North Sea are of great complexity, and have not been fully investigated. The tidal wave of the Atlantic enters by the Strait of Dover and by the channels in the north. In the latter place a division into two parts takes place, one wave travelling southwards along the coast of Scotland in comparatively shallow water, while another moves with greater speed across the deeper water to the Norwegian Channel, and thence southwards to the Skagerrack and the Danish coast. The southwards-moving waves are greatly retarded in the shallow water over the Dogger Bank; the trough of the "Silver Pit" accordingly gives the Scottish wave a strong easterly component, and the three systems—the Scottish, Norwegian and Channel waves—meet to the east of the Dogger, producing complicated interference phenomena. Along the English coasts the tidal streams are for the most part normal, the flood stream running south to south-east and the ebb north to north-west, but on the Continental coast the movements become very complex on account of the varying influence of the waves from different sources.

Fauna. The North Sea is particularly rich in organisms of all kinds, and the abundance of food attracts fish in such quantities that the North Sea fisheries are the most productive in the world. Flat fishes, and those feeding at the bottom on smooth ground, are chiefly caught by means of the trawl. The favourite trawling-grounds are the Dogger Bank in winter, and the shallow waters off the Continental coasts in summer; these yield halibut, soles, turbot, brill, plaice, cod, haddock, whiting, &c. In rough ground where the trawl cannot be used, hook- and line-fishing are carried on most successfully, and "mid-water" fish are also taken in this way, although the trawl and line-fishing overlap considerably. Herring and mackerel are caught by means of drift-nets. The herring fishing off the British coasts exhibits a remarkable variation during summer and autumn, beginning in Shetland in June, and becoming progressively later southwards, until it ends off the Norfolk coast in November. Various attempts have been made to connect this succession with the physical changes already described, especially with the periodic influx of Atlantic water, but no very definite relation has been established.

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(H. N. D.)

NORTH SEA FISHERIES CONVENTION. This convention, dated May 6th, 1882, was the result of a conference which was held for the purpose of regulating the police of the fisheries in the North Sea. It was entered into by Great Britain, Germany, Denmark, Holland, Belgium and France for a period of five years and was thereafter to run on until notice of intention to terminate it, such notice to affect only the power giving it. The convention is operative only outside the three-mile limit from land. This limit is defined as follows:—

> "The fishermen of each country shall enjoy the exclusive right of fishery within the distance of 3 m. from low-water mark along the whole extent of the coasts of their respective countries, as well as of the dependent islands and banks. As regards bays, the distance of 3 m. shall be measured from a straight line drawn across the bay, in the part nearest the entrance, at the first point where the width does not exceed 10 m. The present article shall not in any way prejudice the freedom of navigation and anchorage in territorial waters accorded to fishing boats, provided they conform to the special police regulations enacted by the powers to whom the shore belongs."

Under the Herring Fishery (Scotland) Act 1889, the Scottish Fishery Board was empowered by by-law to forbid beam-trawling and otter-trawling within a line drawn from Duncansby Head to Rattras Point. Acting under this power, it forbade these methods of trawling. This gave rise to litigation on the question of whether the prohibition applied to non-British ships beyond the three-mile limit (see Mortensen *v.* Peters, July 20th, 1906). The high Court of Justiciary in Edinburgh held that it was not incumbent on the court to draw a distinction between foreigners and British subjects which had not been made by the legislature, and that therefore any infringements of general restrictions imposed, although outside the three-mile limit, were binding, whatever the nationality of the persons committing them. Outside the limits of territorial waters British law, however, does not apply. Thus a later act, the Sea Fisheries Regulation (Scotland) Act 1895, though it provided for the imposition of restrictions on certain methods of sea-fishing outside the limits of territorial waters (s. 8), constructively admitted that no power could be given to apply it to non-British fishermen fishing beyond British territorial waters. A provision of the act empowered the Scottish Fishery Board by by-laws to forbid these methods of fishing within 13 m. of the Scottish coast, but added that "no area of sea within the said limit of 13 m. shall be deemed to be under the jurisdiction of her majesty for the purposes of this section *unless the powers conferred thereby shall have been accepted as binding upon their own subjects with respect to such area by all the States signatories of the North Sea Convention* 1882."

A supplementary convention was signed at the Hague, November 16th, 1887, among the same High Contracting Parties, relating to the liquor traffic in the North Sea. It applies to the area set out in art. 4 of the Convention of May 6th, 1882, and forbids the sale of spirituous liquors within it to persons on board fishing vessels. A reciprocal right of visit and search is granted under this convention to the cruisers entrusted with the carrying out of its provisions. (T. BA.)

NORTH SHIELDS, a seaport of Northumberland, England, within the municipal and parliamentary borough of Tynemouth (*q.v.* for history, &c.). The town of that name adjoins it on the E. It lies on the N. bank of the Tyne, immediately above its mouth, and opposite to South Shields in Durham, 7½ m. E. of Newcastle by a branch of the North Eastern railway. It is a town of modern growth, and contains the municipal offices of the borough, a custom-house and various benevolent institutions for seamen. The harbour is enclosed by north and south piers, and there is a depth of 29 ft. at spring-tides besides the quays. Coal and coke are largely exported, and corn, timber and esparto grass are imported. There is an extensive fish quay, and about 14,000 tons of fish are landed annually. There are engineering, iron, salt and earthenware works, and some shipbuilding is carried on.

NORTH SYDNEY, a municipality in the county of Cumberland, New South Wales, Australia, on the N. shore of Port Jackson. Pop. (1901) 22,050. It is a rapidly growing town, immediately opposite and suburban to the city of Sydney, with which, however, the only connexion is by steam ferry. It is the terminus of a railway system serving the district N. of the town.

NORTH TONAWANDA, a city of Niagara county, New York, U.S.A., on the N. side and at the mouth of Tonawanda Creek (opposite Tonawanda), and on the Niagara river, about 14 m. N. of Buffalo. Pop. (1910 census) 11,955. It is served by the Erie, the Wabash, the Lehigh Valley, the West Shore, and the New York Central & Hudson River railways, by three interurban electric lines and by the Erie Canal. Electric power for its factories is furnished by Niagara Falls. In 1905 the value of its factory product was $6,499,312. The water-supply comes from the Niagara river. North Tonawanda was first settled as a part of Tonawanda in 1809; it became a part of Wheatfield township in 1857; was incorporated as a village in 1865, and chartered as a city in 1897. In 1825 Major Mordecai Manuel Noah (1785–1851), a New York journalist and politician of Portuguese Jewish descent, attempted unsuccessfully to found on Grand Island (area 27 sq. m.; pop. (1910) 914), Erie county, W. of North Tonawanda, the city of Ararat, a temporary refuge for Jews, who should return thence to the Holy Land.

See L. F. Allen in *Publications of the Buffalo Historical Society*, vol. i. (1879), pp. 305 sqq.

NORTHUMBERLAND, EARLS AND DUKES OF. The earldom, and later the dukedom, of Northumberland, famous in English history by its connexion with the noble house of Percy (*q.v.*) is to be traced from an origin anterior to a strictly regulated system of peerage. The Saxon kingdom of Northumbria embraced a far more extensive territory than the modern county of Northumberland; and for at least a century after the Norman Conquest Northumberland, as the name imports, comprised a great portion of the country north of the Humber, including the cities of Durham and of York. The geographical position of this territory, contiguous with the kingdom of Scotland, conferred vast responsibility as well as power on the earl or governor to whom its administration was entrusted; and it appears to have been the policy of William the Conqueror and his immediate successors to acknowledge the rights of the men who, though sometimes spoken of as earls, were in no strict sense members of the feudal nobility created by the Norman monarchy. William the Conqueror found Northumberland in the possession of Morcar, a younger son of Algar, the Saxon earl of Mercia, who on giving in his submission was confirmed in the government of the district, but was soon afterwards imprisoned for rebellion, and was replaced by Copsi, an uncle of Morcar's predecessor, Tostig. Copsi was murdered a few weeks after receiving the dignity, and the same fate befell several of his successors; those who escaped it being not infrequently deprived of the post for rebellion or incapacity. Henry, earl of Huntingdon, only son of David I., king of Scotland, was made governor of Northumberland in 1139, and was styled "earl of Northumberland" by the contemporary chronicler Roger of Hoveden. It was not for a long period, however, that the earldom of Northumberland came into existence as a title of honour heritable according to peerage law. Ever since the Conquest the house of Percy (*q.v.*) had been growing in power and importance, and at the coronation of Richard II. in 1377 Henry de Percy, 4th Baron Percy, who had distinguished himself in the French wars, officiated as marshal of England, and was then created earl of Northumberland. With his son Sir Henry Percy, the celebrated "Hotspur," the earl played a leading part in the turbulent history of the period, especially in bringing about the deposition of Richard II. and the accession of Henry IV. The quarrel of Northumberland and his son with King Henry over the ransom of their Scottish prisoners taken at Homildon Hill on the 14th of September 1402 has been immortalized by Shakespeare; and in consequence of their rebellion all the earl's honours were forfeited in 1406. He was not himself present at the battle of Shrewsbury in July 1403, when Hotspur was killed, but he was slain, heading a fresh rebellion, at Bramham Moor on the 19th of February 1408.

The 1st earl of Northumberland was succeeded by his grandson, Hotspur's son, Henry (*c.* 1394–1455), who was restored to the earldom and the estates of the Percies in 1414 and was killed at the battle of St Albans in May 1455. The title then descended in the male line till the death of the 6th earl in 1537. During the Wars of the Roses the Percies took the Lancastrian side, which led to the attainder of Henry the 3rd earl (1421–1461) during the time of the Yorkist triumph, his forfeited title being conferred in 1464 by Edward IV. on John Neville, Lord Montagu (see the separate article below), by a patent which was cancelled a few years later. The earldom, together with the barony of Poynings which his father had obtained by marriage, was restored in 1473 to Henry Percy, son of the 3rd earl, who attached himself to Edward IV., acquiesced in the accession of Richard III., and submitted to Henry VII., by whom he was received into favour. His grandson Henry, the 6th earl (*c.* 1502–1537), left no direct heir, and the latter's nephew, Thomas Percy, was debarred from the succession by an attainder passed on his father for his participation in the Pilgrimage of Grace. In 1549, however, Thomas was restored in blood, and in 1557 he became by a new creation earl of Northumberland, 7th of his line. Meantime, in 1551, John Dudley, earl of Warwick, was created duke of Northumberland (see the separate article below), his title being, however, forfeited by attainder in 1553.

The earldom restored to the house of Percy by the creation of 1557 continued without interruption in the male line till 1670. The 7th earl was beheaded in 1572 for sharing in a conspiracy in which he was joined by the earl of Westmorland with the object of securing the release of Mary Queen of Scots and the free exercise of the Catholic religion. By the earl's attainder the baronies of Percy and of Poynings and the earldom of Northumberland of the older creation were forfeited, but owing to a clause in the patent the newer earldom of Northumberland and the other honours conferred in 1557 passed to his brother Henry (*c.* 1532–1585), who, however, is usually known as the 8th and not the 2nd earl.

Henry's grandson, ALGERNON PERCY, 10th earl of Northumberland (1602–1668), son of Henry the 9th earl (1564–1632), became a peer in his father's lifetime as Baron Percy in 1626. During the years immediately preceding the Civil War he served as an admiral, making earnest but unsuccessful efforts to reform the navy, and in 1637 he was made lord high admiral of England. In 1639 Charles I. appointed him general of the forces north of the Trent, and a member of the council of regency. Northumberland played a distinguished and honourable part in the troubled times of the Civil War. He was a friend of Strafford, and gave evidence at his trial which, though favourable on the important point of bringing the Irish army to England, was on the whole damaging; and he afterwards leaned more and more towards the popular party, of which he soon became leader in the House of Lords. He was a member of the committee of safety, and later of the committee of both kingdoms; and he took an active part in the attempts to come to terms with the king, whom he visited at Oxford for that purpose in 1643 and at Uxbridge two years later. Northumberland helped to organize the new model army; and in 1646 he was entrusted by parliament with the charge of the king's younger children. He led the opposition in the House of Lords to the proposal to bring Charles I. to trial, and during the Commonwealth he took no part in public affairs. At the Restoration he was called to the privy council by Charles II., and with his habitual moderation he deprecated harsh proceedings against the regicides. His second wife, Elizabeth (d. 1705), daughter of Theophilus Howard, 2nd earl of Suffolk, brought him Northumberland House in the Strand, London, which was demolished in 1874 to make room for Northumberland Avenue. On the death of his son Joceline, the 11th earl, in 1670, the male line became extinct.

George Fitzroy (1665–1716), third son of Barbara, duchess of Cleveland, the wife of Roger Palmer, earl of Castlemaine, by King Charles II., was created by his father earl of Northumberland in 1674, and duke in 1683. This second dukedom of Northumberland became extinct on his death at Epsom on the 3rd of July 1716.

Meanwhile Elizabeth Percy, daughter of Joceline, the 11th earl, had married Charles Seymour, 6th duke of Somerset; and her son Algernon, the 7th duke, was in 1749 created Baron Warkworth and earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, Bart., son of Langdale Smithson of Langdale, Yorkshire. Sir Hugh Smithson (*c.* 1714–1786) took the name and arms of Percy on inheriting the earldom in 1750; in 1766 he was created Earl Percy and duke of Northumberland, and in 1784 he was further created Baron Lovaine of Alnwick, with special remainder to his second son, Lord Algernon Percy. He took a somewhat prominent part in politics as a follower of Lord Bute, and was one of George III.'s confidential advisers, holding the office of lord-lieutenant of Ireland from 1763 to 1765, and that of master of the horse from 1778 to 1780. He was a man of cultivated tastes, and spent large sums of money in repairing and improving Alnwick Castle and his other residences. His wife, Elizabeth (1716–1776), who was a prominent figure in society, inherited in her own right her father's barony of Percy. The duke was succeeded by his eldest son Hugh; and his second son Algernon, Lord Lovaine, was created earl of Beverley in 1790.

Hugh, 2nd duke of this line (1742–1817), first inherited his mother's barony of Percy. He was present at the battle of Minden, and although in parliament, where he was member for Westminster from 1763 to 1776, he had opposed the policy that led to the American war, he proceeded to Boston in 1774 as colonel commanding the 5th Fusiliers, a regiment that has since then been known as the Northumberland Fusiliers. His generosity to his men made him exceedingly popular in the army; he became a general in 1793, and after succeeding to the dukedom in 1786 he exercised considerable influence in politics, though he never obtained office. His son Hugh, 3rd duke (1785–1847), was lord-lieutenant of Ireland in 1829–1830, when the Catholic Emancipation Act was passed, and was pronounced by Sir Robert Peel "the best chief governor that ever presided over the affairs of Ireland." Both he and his brother Algernon, 4th duke (1792–1865), who was created Baron Prudhoe in 1816, died without issue; the barony of Percy devolved on their great-nephew, the duke of Atholl, and the dukedom passed to George (1778–1867), eldest son of Algernon, 1st earl of Beverley, and so to his son, the 6th duke (1810–1899), and grandson, the 7th duke (b. 1846), who married the daughter of the 8th duke of Argyll. The 7th duke's eldest son, Earl Percy (1871–1910), seemed destined to take a great place in public life when he was prematurely cut off; he had a distinguished career at Oxford and from 1895 in the House of Commons, being under-secretary for India in 1902–1903 and under-secretary for foreign affairs in 1903–1905.

See Edward Barrington de Fonblanque, *The House of Percy* (2 vols., London, 1887); G. E. C(okayne), *Complete Peerage*, vol. vi. (London, 1895).

NORTHUMBERLAND, JOHN DUDLEY, VISCOUNT LISLE, EARL OF WARWICK, and DUKE OF (*c.* 1502–1553), was the eldest son of Henry VII.'s extortionate minister, Edmund Dudley (*q.v.*), by his second wife Elizabeth, daughter of Edward Grey, Viscount Lisle, and co-heiress of her brother John, Viscount Lisle. He was probably descended from the old baronial house of Sutton *alias* Dudley; but his father's attainder and execution in 1509 clouded his prospects. His mother, however, married as her second husband in 1511 Arthur Plantagenet, the illegitimate son of Edward IV., who in 1523 was created Viscount Lisle in his wife's right; and Lisle's rise in Henry VIII.'s favour brought young Dudley into prominence. In 1512 he was restored in blood and in 1538 he was made deputy to his stepfather, who was governor of Calais, and he does not appear to have suffered by Lisle's temporary disgrace and imprisonment in the Tower. Lisle died early in 1542 and Dudley was created Viscount Lisle on the 12th of March and was made warden of the Scottish marches in November, and lord high admiral of England in 1543 in succession to his future rival, Edward Seymour, earl of Hertford. He was also created a knight of the garter and sworn of the privy council on the 23rd of April 1543. In 1544 he accompanied Hertford to the capture and burning of Edinburgh. On the capture of Boulogne in September Lisle was given command of the town and of the Boulonnais; in 1545 he directed the operations of the fleet in the Solent which foiled the French attack on Portsmouth and the Isle of Wight; and he was sent to Paris to ratify the peace concluded in 1546.

Lisle had thrown in his lot with the reforming party, and he took an active share in the struggle at Henry VIII.'s court for control of affairs when Henry should die. Hertford and he were described by the Spanish ambassador as holding the highest places in Henry VIII.'s affections and as being the only noblemen of fit age and ability to carry on the government. The Howards were infuriated by the prospect, and Surrey's hasty temper ruined their prospects. Lisle quarrelled bitterly with Bishop Gardiner, served as commissioner at Surrey's trial, and was nominated one of the body of executors to Henry's will from which Norfolk and Gardiner were excluded. On Henry's death Lisle was raised to the earldom of Warwick and promoted to be lord great chamberlain of England, again in succession to Hertford, who became duke of Somerset and Protector. But he was not long content with Somerset's superiority, though he concealed his resentment and ambition for the time. He accompanied Somerset on his Pinkie campaign, and materially contributed to the winning of that victory. Nor did he exhibit any sympathy with the intrigues of the Protector's brother, Thomas Seymour, the lord high admiral; his subtler policy was to exasperate the brothers and thus weaken the influence of the house of Seymour. He took a leading part in the proceedings which brought the admiral to the block in March 1549; and then used the Protector's social policy to bring about his deposition. Warwick, like most of the privy council, detested Somerset's ideas of liberty and his championship of the peasantry against the inclosure movement; one of his own parks was ploughed up as a result of a commission of inquiry which Somerset appointed; and when the peasants rebelled under Kett, Warwick gladly took the command against them. His victory at Dussindale made him the hero of the landed gentry, and as soon as he had returned to London in September 1549, he organized the general discontent with the Protector's policy into a conspiracy. He played upon the prejudices of Protestants and Catholics alike, holding out to one the prospect of more vigorous reform and to the other hopes of a Catholic restoration, and to all gentry the promise of revenge upon the peasants.

The coalition thus created effected Somerset's deposition and imprisonment in October 1549; and the parliament which met in November carried measures of political coercion and social reaction. But the coalition split upon the religious question. Warwick threw over the Catholics and expelled them from office and from the privy council, and the hopes they entertained were rudely dashed to the ground. But it was difficult to combine coercion of the Catholics with the proscription of Somerset; the duke was therefore released early in 1550 and restored to the privy council; and his daughter was married to Warwick's son. Warwick himself assumed no position of superiority over his colleagues, and he was never made protector. But he gradually packed the council with his supporters, and excluded his enemies from office and from access to the king. His plan was to dominate Edward's mind, and then release him from the trammels of royal minority. He abandoned the Tudor designs on Scotland, and made a peace with France in 1550 by which it recovered Boulogne and was left free to pursue its advantage in Scotland. Nor did the betrothal of Edward to Henry's daughter Elizabeth prevent the French king from intriguing to undermine English influence in Ireland. In domestic affairs Warwick pushed on the Reformation with none of the moderation shown by Somerset; and the difference between the two policies is illustrated by the change effected between the first and second Books of Common Prayer. Warwick, however, was widely distrusted; and the more arbitrary his government grew, the more dangerous became Somerset's rivalry. A parliamentary movement had early been started for Somerset's restoration. Warwick therefore kept parliament from meeting, and the consequent lack of supplies drove him into the seizure of church plate, sale of chantry lands, and other violent financial expedients. At length he resolved to get rid of his opponent; his opposition was magnified into conspiracy, and in October 1551, after Warwick had made himself duke of Northumberland and his ally Dorset, duke of Suffolk, and had scattered other rewards among his humbler followers, Somerset was arrested, condemned by the peers on a charge of felony, and executed on the 22nd of January 1552.

Parliament was permitted to meet on the following day, but for the next eighteen months Northumberland grew more and more unpopular. He saw that his life was safe only so long as he controlled the government and prevented the administration of justice. But Edward VI. was slowly dying, and Northumberland's plot to alter the succession was his last desperate bid for life and power. Its folly was almost delirious. Edward had no legal authority to exclude Mary, and the nation was at least nine-tenths in her favour. Northumberland bullied the council and overawed London for a few days; but the rest of England was in an uproar, and as he rode out to take the field against Mary, not a soul cried "God speed." A few days later he returned as Mary's prisoner. He was tried for treason, professed himself a Catholic in the delusive hope of pardon, and was executed on the 22nd of August. He was a competent soldier and one of the subtlest intriguers in English history; but he had no principles. He was, says a contemporary French account, "de parole affable, se composant à gracieusité et doulceur, mais au dedans felon, orgueilleux, vindicatif s'il en fut jamais." The violence of his rule and of his pretended Protestantism was largely responsible for the reaction of Mary's reign. His best-known son was Robert Dudley, earl of Leicester, Queen Elizabeth's favourite.

See *Letters and Papers of Henry VIII.*; *State Papers, Domestic and Foreign, Edward VI. and Mary*; MS. 15,888, *Bibliothèque Nationale de France*; G. E. C(okayne), *Complete Peerage*; A. F. Pollard, *England under Somerset* (1900), *Life of Cranmer* (1904) and vol. vi. of the *Political History of England* (1910). (A. F. P.)

NORTHUMBERLAND, JOHN NEVILLE, EARL OF (*c.* 1430–1471), English soldier, was the third son of Richard Neville, earl of Salisbury, and a brother of Richard Neville, earl of Warwick, the "king-maker." At the battle of Blore Heath in 1459 John Neville was taken prisoner by the Lancastrians, although the Yorkists under his father had won the victory; he was among those who were attainted in the parliament of Coventry, and he was not released until 1460 when his own party had gained the upper hand. Just afterwards he was created Lord Montagu and was made chamberlain of the royal household. He was not present at the battle of Wakefield, when his father was taken prisoner, but he was again a captive after the second battle of St Albans in 1461. He was speedily released by Edward IV., whom he served in the north of England, being rewarded with lands and honours. In 1463 he became warden of the east marches towards Scotland, and he was responsible for the Yorkist victories at Hedgeley Moor and at Hexham in April and May 1464; after the latter battle he secured the execution of Henry Beaufort, duke of Somerset, and other captives of high station. In this year (1464) he was created earl of Northumberland, the

Percies being now crushed, and their head, Henry Percy, being in prison. Northumberland did not at first join his brother Warwick and the other Nevilles when they revolted against Edward IV., but neither did he help the king. Edward, doubtless suspecting him, restored the earldom of Northumberland and its vast estates to Henry Percy, while John Neville's only recompense was the barren title of marquess of Montagu. At Pontefract in 1470 he and his men declared for Henry VI., a proceeding which compelled Edward IV. to fly from England, and under the restored king he regained his position as warden, but not the earldom of Northumberland. He did not attempt to resist Edward IV. when this king landed in Yorkshire in March 1471, but he fought under Warwick at Barnet, where he was slain on the 14th of April 1471. His son George (d. 1483) was betrothed to Elizabeth, daughter of Edward IV., and was created duke of Bedford in 1470, but the marriage did not take place and he was deprived of his dukedom in 1477.

NORTHUMBERLAND, the northernmost county of England, bounded N.W. by the Scottish counties of Berwick and Roxburgh, W. by Cumberland, S. by Durham, and E. by the North Sea. The area is 2018 sq. m. It has a general inclination eastward from the hill-borders of Scotland and Cumberland. The Cheviot range partly separates Northumberland from Scotland, and reaches in the Cheviot, its culminating point north-eastward, the greatest elevation in the county, 2676 ft. The elevation of the Cheviots rarely falls below 1300 ft. along the Border, and generally exceeds 1600. A line of high ground, bending southward, forms the watershed between the North and Irish Seas. The boundary with Cumberland crosses the low divide between the Irthing and the South Tyne, after coinciding with the former river for a short distance, and giving Northumberland a small drainage area westward. In the south-west a small area of the Pennine uplands is included in the county, reaching elevations up to 2206 ft. in Kilhope Law. Few eminences break the general eastward incline, which appears as a wide billowing series of confluent hills that for half the year mingle tints of brown, russet, and dun in a rich pattern, and at all times communicate a fine sense of altitude and expanse. The Simonside Hills (1447 ft.) form one not very conspicuous exception. The configuration of much of these uplands has a certain linearity in its details due to groups and ranges of ridges, crags, and terrace-like tiers, termed "edges" (escarpments) by the country folk, and generally facing the interior, like broad ends of wedges. The line of pillared crags and prow-like headlands between the North and South Tynes along the verge of which the Romans carried their wall is a fine specimen. Passing eastwards from the uplands the moors are exchanged for enclosed grounds, "drystone" walls for hedgerows, and rare sprinklings of birch for a sufficiently varied wooding. The hills and moors sink to a coast generally low, a succession of sands, flat tidal rocks and slight cliffs. Its bays are edged by blown sandhills; its borders are severely wind-swept. Several islands lie over against it. Holy Island, the classic Lindisfarne, 1051 acres in extent, but half "links" and sandbanks, is annexed to the mainland and accessible to conveyances every tide. The Farne Islands (*q.v.*) are a group of rocky islets farther south.

Deep glens and valleys, scoring the uplands, and richly wooded except at their heads, are characteristic of the rivers. Of these the chief are the Tweed, forming the north-eastern part of the Scottish border, its tributary the Till (with its feeders the Glen and College), the Aln and the exquisite Coquet, flowing into Alnmouth Bay, the Wansbeck, with its tributary the Font, the Blyth and the Tyne, forming part of the boundary with Durham, the union of the North and South Tynes. Many of the upland streams attract trout-fishermen.

Geology.—The core of the county, in a geological aspect, is the northern Cheviots from Redesdale head nearly to the Tweed. Its oldest rocks are gritty and slaty beds of Silurian age, about the head of the rivers Rede and Coquet and near the Breamish south of Ingram—a part of the great Silurian mass of the southern uplands of Scotland. Volcanic activity about the period of the Old Red Sandstone resulted in the felspathic porphyrites, passing into the syenites and granites, that form the mass of the northern Cheviots. Round this core there now lie relays of Carboniferous strata dipping east and south, much faulted and repeated in places, but passing into Coal Measures and Magnesian Limestone in the south-eastern part of the county. The whole system consists of (1) the Carboniferous Limestone series in three divisions; (2) the Millstone Grit; and (3) the Coal Measures. Lowest in Northumberland lies Tate's Tuedian group, the first envelope of sinking Cheviot-land. Some reddish shore-like conglomerates lie in places at its base, as at Roddam Dene; its shales are often tinged with distemper greens; its coals are scarcely worthy of the name; its limestones are thin, except near Rothbury; and its marine fossils are few. The Tuedian group is overlaid by the Carbonaceous group; its shales are carbonaceous-grey, its coals, though mostly small, very numerous, its limestones often plant-limestones, and its calcareous matter much diffused. Upon this lies the Calcareous group; its lime occurs in well-individualized marine beds, cropping up to the surface in green-vested strips; its fossils are found in recurrent cycles, with the limestones and coals forming their extremes. These three groups now range round the northern Cheviots in curved belts broadening southwards, and occupy nearly all the rolling ground between the Tweed and the South Tyne, the sandstones forming the chief eminences. The middle division becomes thinner and more like the Coal Measures in passing northwards, and the upper division, thinning also, loses many of its limestones. The Millstone Grit is a characterless succession of grits and shales. The Coal Measures possess the same zone-like arrangement that prevails in the Limestone series, but are without limestones. They also are divided, very artificially, into three groups. The lowest, from the Brockwell seam downwards, has some traces of Gannister beds, and its coal-seams are thin. The famous Hutton collection of plants was made chiefly from the roof-shales of two seams—the Bensham and the Low Main. The unique Atthey collection of fishes and Amphibia comes from the latter. The Coal Measures lie along the coast in a long triangle, of which the base, at the Tyne, is produced westwards on to the moors south of that river, where it is wedged against lower beds on the south by a fault. The strata within the triangle give signs of departing from the easterly dip that has brought them where they are, and along a line between its apex (near Amble) and an easterly point in its base (near Jarrow) they turn up north-eastwards, promising coal-crops under the sea.

The top of the Coal Measures is wanting. After a slight tilting of the strata and the denudation that removed it, the Permian rocks were deposited, consisting of Magnesian Limestone, a thin fish-bed below it, and yellow sands and some red sandstone (with plants of Coal Measure species) at the base. These rocks are now all but removed. They form Tynemouth rock, and lie notched-in against the 90-fathom dyke at Cullercoates, and again are touched (the base only) at Seaton Sluice. No higher strata have been preserved. The chief faults of the county extend across it. Its igneous rocks, other than the Cheviot porphyrites and a few contemporaneous traps in the lowest Carboniferous, are all intrusive. An irregular sheet of basalt forced between planes of bedding (perhaps at the close of the Carboniferous period) forms the crag-making line of the Great Whinsill, which, with many shifts, breaks and gaps, extends from Greenhead near Gilsland to the Kyloe Hills. Numbers of basalt dykes cross the county, and were probably connected with the plateau of Miocene volcanic rocks in the Hebrides. Everywhere the Glacial period has left rocks rounded and scored, and rock-fragments from far and near rubbed up into boulder-clay. The glaciers at first held with the valleys, but as the ice-inundation grew they spread out into one sheet—the Cheviot tops, heavily ice-capped, alone rising above it. Two great currents met in confluence around these hills—one from across the western watershed, the other skirting the coast from the north. Boulders from Galloway, Criffel, the Lake District and other places adjacent, and from the Lammermuirs and Berwickshire, lie in their track. Of moraines there are only a few towards the hills. Glaciated shell-fragments have been detected at Tynemouth. Laminated brick clays occur among the boulder-clays. Sheets and mounds of gravel of the nature of kames exist here and there on the low grounds, and stretch in a chain over the low watershed between Haltwhistle and Gilsland, sparsely dotting also some more upland valleys. An upper boulder-clay, containing flints, skirts the coast.

The older valleys are all pre-Glacial, and may date from the Miocene period. They are much choked up with Glacial deposits, and lie so deep below the surface that, if they were cleared-out arms of the sea, one of them, 140 ft. deep at Newcastle, would extend for miles inland. After the departure of the glaciers the streams here and there wandered into new positions, and hence arises a great variety of smooth slope and rocky gorge. In the open country atmospheric waste has hollowed out the shales at their outcrops, leaving the sandstones, &c., as protruding "edges," roughened here and there into crags. In the lower grounds, where this surface-dissection first began, the "edges" have much run together; on the heights, whose turn came last, they are often prominent and crest-like, but have glacier-rounded brows. Many old tarns are now sheeted over with peat. The sloping peat-fields are often the sites of straggling birch-woods, now buried.

Climate.—The climate is bracing and healthy, with temperate summers (*e.g.* the average July temperature at Alnwick is 57·9° F.). In spring east winds prevail over the whole county. The lambing season in the higher uplands is fixed for the latter half of April, and is even then often too early. In summer and autumn west winds are general. The rainfall gradually increases as the country rises from the coast, thus the mean annual fall at Shields is 26·32 in., at Alnwick 31·04 in., while on the western borders 40 to 60 in. are recorded. East winds in summer bring rain to the interior. The smell from the coal-field, the lighter grime of which is detected as far as Cumberland, is taken by the shepherd for a sign of wet.

Agriculture, &c.—About five-ninths of the total area is under cultivation, and of this nearly five-sevenths is in permanent pasture. There are also about 470,000 acres under hill pasture. South of the river Coquet there is a broad tract of cultivation towards the coast that sends lessening strips up the valleys into the interior. From the Coquet northwards another breadth of enclosed ground stretches almost continuously along the base of the Cheviot hills. In the basin of the Till it becomes very fertile, and towards the Tweed the two breadths unite. In the porphyritic Cheviots the lower hills show a great extent of sound surface and good grass. The average hill-farms support about one sheep to 2 acres. A coarser pasturage covers the Carboniferous hills, and the proportion of stock to surface is somewhat less. In the highest fells the congeries of bogs, hags and sandstone scars, with many acres dangerous to sheep, are worthless to the farmer. The lower uplands are a patchwork of coarse grasses (mown by the "muirmen" into "bent-hay") and heather, or, in the popular terms, heather and "white ground," for it is blanched for eight months in the year. Heather is the natural cover of the sandstones and of the sandy glacier-débris near them. On the uplands they grow bents; lower down they are apt to be cold and strong, but are much relieved by patches and inworkings of gravel, especially north of the Wansbeck. The prevalent stream-alluvium is sandy loam, with a tincture of peat. The arable regions are very variable. Changes of soil are probably as numerous as fields. The bulk of the acreage under corn crops, which has greatly diminished, is under oats and barley, and turnips occupy some five-sixths of the area under green crops. Northumberland is one of the largest sheep-rearing counties in Great Britain. Of these, the half-breds—crosses between the Leicester (or Shropshire) and Cheviot breeds—occupy the lower enclosed grounds, the pure Cheviots are on the uplands and the hardier black-faced breeds lie out on the exposed heathery heights. The cattle are chiefly shorthorns and Galloways. They are very largely raised, chiefly for fattening purposes.

The practice of paying wages in kind has passed greatly into disuse. Some of the shepherds still receive "stock-wages," being allowed to keep forty or fifty sheep and several cows on their employers' farms in lieu of pay. This arrangement, which makes them really copartners, has probably done much to render them the singularly fine class of men they are.

Other Industries.—The manufactures of the county chiefly come from the Tyne, which is a region of ironworks, blast-furnaces, shipbuilding yards, ropeworks, coke-ovens, alkali-works and manufactories of glass, pottery and fire-bricks, from above Newcastle to the sea. Machines, appliances, conveyances and tools are the principal articles of manufacture in metal. There is great activity in all trades concerned in pit-sinking and mine-working. In the other parts of the county there are a few small cloth-mills, a manufactory of tan gloves at Hexham, some potteries and numbers of small brick and tile works. There are several sea-fishing stations, of which North Shields is by far the most important. The salmon fisheries are also valuable.

Communications.—Communications are provided almost wholly by the North-Eastern railway, of which the main line enters the county at Newcastle and runs N. by Morpeth, and near the coast, to Berwick, where a junction on the East Coast route from London to Scotland is effected with the North British railway. Numerous branch railways serve the populous south-eastern district, and there are connexions westward to Hexham and Carlisle, up the Tweed valley into Scotland and (by the North British line) up the North Tyne valley from Hexham. The principal ports besides the Tyne ports are Blyth, Amble (Warkworth Harbour), Alnmouth and Berwick. The Tyne is one of the most important centres of the coal-shipping trade in the world.

Population and Administration.—The area of the ancient county is 1,291,530 acres with a population in 1891 of 506,442, and in 1901 of 603,498. In physique the Northumbrian is stalwart and robust, and seldom corpulent. The people have mostly grey eyes, brown hair and good complexions. The inhabitants of the fishing villages appear to be Scandinavian; and parts of the county probably contain some admixture of the old Brit-Celt, and a trace of the Gipsy blood of the Faas of Yetholm. The natives have fine characteristics: they are clean, thrifty and plodding, honest and sincere, shrewd and very independent. Their virtues lie rather in solidity than in aspiration.

Northumbrian speech is characterized by a "rough vibration of the soft palate" or pharynx in pronouncing the letter *r*, well known as the *burr*, a peculiarity extending to the town and liberties of Berwick, and absent only in a narrow strip along the north-west. Over the southern part of the county there is the same duplication of vowel-sounds, such as "peöl" for "pool," that is found in the English counties adjacent. Many Old-English forms of speech strike the ear, such as "to butch a beef," *i.e*, to kill a bullock, and curious inversions, such as "they not can help." There is the Old-English distinction in the use of "thou" to familiars and "ye" to superiors.

The area of the administrative county is 1,291,515 acres. The county is divided into nine wards, answering to hundreds. Population is densest in the south-east, where the mining district and the Tyneside industrial area are situated. The municipal boroughs in this district are: Newcastle-upon-Tyne (city, county of a city and county borough; pop. 215,328), Tynemouth (county borough, 51,366), Morpeth (6158), Wallsend (20,918). In this district the following are urban districts: Amble (4428), Ashington (13,956), Bedlington (18,766), Blyth (5472), Cowpen (17,879), Cramlington (6437), Earsdon (9020), Gosforth (10,605), Newbiggin-by-the-Sea (2032), Newburn (12,500), Seghill (2213), Weetslade (5453), Whitley and Monkseaton (7705), Willington Quay (7941). The remainder of the county contains the municipal borough of Berwick-upon-Tweed (13,437) and the urban districts of Alnwick (6716), Hexham (7071) and Rothbury (1303). The county is in the north-eastern circuit, and assizes are held at Newcastle-upon-Tyne. The total number of civil parishes is 523. The ancient county, which is in the diocese of Newcastle-upon-Tyne, with the exception of a small portion in that of Durham, contains 173 ecclesiastical parishes or districts, wholly or in part. The parliamentary divisions of the county are Berwick-upon-Tweed, Hexham, Wansbeck and Tyneside, each returning one member; while the parliamentary borough of Newcastle-upon-Tyne returns two members, and those of Morpeth and Tynemouth one member each.

History.—The first English settlement in the kingdom of Bernicia, which included what is now Northumberland, was effected in 547 by Ida, who, accompanied by his six sons, pushed through the narrow strip of territory between the Cheviots and the sea, and set up a fortress at Bamburgh, which became the royal seat of the Saxon kings. About the end of the 6th century Bernicia was first united with the rival kingdom of Deira under the rule of Æthelfrith, and the district between the Humber and the Forth became known as the kingdom of Northumbria. In 634 Cadwalla was defeated at Hefenfeld (the site of which lies in the modern parish of St John Lee) by Oswald, under whom Christianity was definitely established in Northumbria, and the bishop's see fixed at Hexham, where Bishop Wilfrid erected the famous Saxon church. Oswald also erected a church of stone at Tynemouth, which was destroyed in 865 in an incursion of the Danes under Hinguar and Hubba. The extent of Danish influence in Northumberland has been much exaggerated, however, for though in 876 Halfden, having conquered the whole of Northumbria, portioned out the lands among his followers, the permanent settlements were confined to the southern portion of the kingdom. In the northern half, which is now Northumberland, the English princes continued to reign at Bamburgh as vassals of the Danes, and not a single place-name with the Danish suffix "by" or "thorpe" is found north of the Tyne. In 938 Æthelstan annexed Northumberland to his dominions, and the Danish authority was annulled until its re-establishment by Canute in 1013. The vigorous resistance of Northumbria to the Conqueror was punished by ruthless harrying. The Normans rebuilt the Saxon monasteries of Lindisfarne, Hexham and Tynemouth; Eustace Fitz John founded Alnwick Abbey, and other Norman abbeys were Brinkburn, Hulne, Blanchland and Newminster. Castles were set up at Alnwick, Warkworth, Prudhoe, Dunstanborough, Morpeth, Ford, Chillingham, Langley, Newcastle, Bamburgh, Wark and Norham, a stronghold of the palatine bishops of Durham.

The term Northumberland is first used in its contracted modern sense in 1065 in an entry in the Saxon Chronicle relating to the northern rebellion. The county is not mentioned in the Domesday Survey, but the account of the issues of the county, as rendered by Odard the sheriff, is entered in the Great Roll of the Exchequer for 1131. In the reign of Edward I. the county of Northumberland was found to comprise the whole district between the Tees and the Tweed, and to have within it the several liberties of Durham, Sadberg and Bedlington south of the Coquet, and Norham beyond the Coquet, all subject to the bishop of Durham; the liberty of Hexham belonging to the archbishop of York; that of Tynedale to the king of Scotland; that of Emildon to the earl of Lancaster; and that of Redesdale to Gilbert de Umfraville, earl of Angus. These franchises were all held exempt from the ordinary jurisdiction of the shire. By statute of 1495–1496 the lordship of Tynedale was annexed to Northumberland on account of flagrant abuses of the liberties of the franchise; the liberty of Hexham was annexed to Northumberland in 1572; Norhamshire, Islandshire and Bedlingtonshire continued to form detached portions of Durham until 1844, when they were incorporated with Northumberland. The division into wards existed at least as early as 1295, the Hundred Roll of that year giving the wards of Coquetdale, Bamburgh, Glendale and Tynedale.

The shire-court for Northumberland was held at different times at Newcastle, Alnwick and Morpeth, until by statute of 1549 it was ordered that the court should thenceforth be held in the town and castle of Alnwick, and under the same statute the sheriffs of Northumberland, who had lately been in the habit of appropriating the issues of the county to their private use, were required to hereafter deliver in their accounts to the Exchequer in the same manner as the sheriffs of other counties. The assizes were held at Newcastle, and the itinerant justices, on their approach to the county, were met by the king of Scotland, the archbishop of York, the bishop of Durham and the prior of Tynemouth, who pleaded their liberties either at a well called Chille near Gateshead, if the justices were proceeding from York, or, if from Cumberland, at Fourstanes. In these franchises the king's writ did not run, and their owners performed the office of sheriff and coroner. Among other Northumbrian landowners claiming privileged jurisdiction in 1293 was Robert de Quonla, who claimed that he and his men were quit of the suits of the shire and wapentake; the prior of St Mary of Carlisle claimed to exclude the king's bailiffs from executing their office in his fee of Corbridge, and that he and his men were quit of the suits of the shire and wapentake. The burgesses of Newcastle claimed return of writs in their borough, and Edmund, the brother of Edward I., claimed return of writs and exemptions from the sheriff's jurisdiction in his manor of Stamford. Newcastle was made a county by itself by Henry IV. in 1400, and has jurisdiction in admiralty cases. Ecclesiastically the county was in the diocese of Durham, and in 1291 formed the archdeaconry of Northumberland, comprising the deaneries of Newcastle, Corbridge, Bamburgh and Alnwick. In 1535 the archdeaconry included the additional deanery of Morpeth. The archdeaconry of Lindisfarne was formed in 1845, and subdivided into the rural deaneries of Alnwick, Bamburgh, Morpeth, Norham and Rothbury; the archdeaconry of Northumberland then including the deaneries of Bellingham, Corbridge, Hexham and Newcastle-upon-Tyne. In 1882 Northumberland was formed into a separate diocese with its see at Newcastle, the archdeaconries and deaneries being unaltered. In 1885 the additional deaneries of Tynemouth and Bedlington were formed in the archdeaconry of Northumberland, and in 1900 the deanery of Glendale in the archdeaconry of Lindisfarne.

Pre-eminent among the great families connected with Northumberland is that of Percy (*q.v.*). Ford and Chipchase were seats of the Heron family. The Widdringtons were established at Widdrington in the reign of Henry I. and frequently filled the office of sheriff of the county. The barony of Prudhoe was granted by Henry I. to the Umfravilles, who also held the castles of Otterburn and Harbottle and the franchise of Redesdale. From the Ridleys of Willimoteswyke was descended Bishop Ridley, who was martyred in 1555. Aydon Castle was part of the barony of Hugh Baliol. The Radcliffes, who held Dilston and Cartington in the 15th century and afterwards acquired the extensive barony of Langley, became very powerful in Northumberland after the decline of the Percies, and were devoted adherents of the Stuart cause.

From the Norman Conquest until the union of England and Scotland under James I., Northumberland was the scene of perpetual inroads and devastations by the Scots. Norham, Alnwick and Wark were captured by David of Scotland in the wars of Stephen's reign, and in 1290 it was at Norham Castle that Edward I. decided the question of the Scottish succession in favour of John Baliol. In 1295 Robert de Ros and the earls of Athol and Menteith ravaged Redesdale, Coquetdale and Tynedale. In 1314 the county was ravaged by Robert Bruce, and in 1382 by special enactment the earl of Northumberland was ordered to remain on his estates in order to protect the county from the Scots. In 1388 Henry Percy was taken prisoner and 1500 of his men slain at the battle of Otterburn, immortalized in the ballad of "Chevy Chase." Alnwick, Bamburgh and Dunstanborough were garrisoned for the Lancastrian cause in 1462, but after the Yorkist victories of Hexham and Hedgley Moor in 1464, Alnwick and Dunstanborough surrendered, and Bamburgh was taken by storm. In 1513 the king of Scotland was slain in the battle of Flodden Field on Branxton Moor. During the Civil War of the 17th century Newcastle was garrisoned for the king by the earl of Newcastle, but in 1644 it was captured by the Scots under the earl of Leven, and in 1646 Charles was led there a captive under the charge of David Leslie. Many of the chief Northumberland families were ruined in the rebellion of 1715.

The early industrial development of Northumberland was much impeded by the constant ravages of internal and border warfare, and in 1376 the commonalty of Northumberland begged consideration for their sheriff, who, although charged £100 for the profits of the county, through death and devastation by the Scots could only raise £53, 3s. 4d. Again Aeneas Sylvius Piccolomini (Pope Pius II.), who passed through the county disguised as a merchant in 1436, leaves a picture of its barbarous and desolate condition, and as late as the 17th century, Camden, the antiquarian, describes the lands as rough and unfit for cultivation. The mineral resources, however, appear to have been exploited to some extent from remote times. It is certain that coal was used by the Romans in Northumberland, and some coal ornaments found at Angerton have been attributed to the 7th century. In a 13th-century grant to Newminster Abbey a road for the conveyance of sea-coal from the shore about Blyth is mentioned, and the Blyth coal-field was worked throughout the 14th and 15th centuries. The coal trade on the Tyne did not exist to any extent before the 13th century, but from that period it developed rapidly, and Newcastle acquired the monopoly of the river shipping and coal-trade. Lead was exported from Newcastle in the 12th century, probably from Hexhamshire, the lead mines of which were very prosperous throughout the 16th and 17th centuries. In a charter from Richard I. to Bishop Pudsey creating him earl of Northumberland, mines of silver and iron are mentioned, and in 1240 the monks of Newminster had an iron forge at Stretton. A salt-pan is mentioned at Warkworth in the 12th century; in the 13th century the salt industry flourished at the mouth of the river Blyth, and in the 15th century formed the principal occupation of the inhabitants of North and South Shields. In the reign of Elizabeth glass-houses were set up at Newcastle by foreign refugees, and the industry spread rapidly along the Tyne. Tanning, both of leather and of nets, was largely practised in the 13th century, and the salmon fisheries in the Tyne were famous in the reign of Henry I.

The county of Northumberland was represented by two members in the parliament of 1290, and in 1295 Bamburgh, Corbridge and Newcastle-upon-Tyne each returned two members. From 1297, however, Newcastle was the only borough represented, until in 1524 Berwick acquired representation and returned two members. Morpeth returned two members from 1553. Under the Reform Act of 1832 the county returned four members in two divisions; Berwick and Newcastle were represented by two members each, and Morpeth and Tynemouth by one member each. Under the act of 1885 the county now returns four members in four divisions.

Antiquities.—Of Anglo-Saxon buildings the Danes left almost nothing. The crypt of Wilfrid's abbey of St Andrew at Hexham is one undoubted remnant; portions of several other churches are very doubtfully pre-Norman. Some thousand Saxon *stycas* found buried at Hexham, the "fridstool" there, and an ornate cross now shared between Rothbury and Newcastle are the other principal vestiges of Saxon times. The Black Dyke, a bank and ditch crossing the line of the Roman wall about 3 m. east of the Irthing, is supposed by some antiquaries to be the continuation of the Catrail at Peel Fell; the latter was the probable boundary-fence between the Saxon Bernicia and the British Strathclyde.

The ecclesiastical buildings of the county suffered greatly at the hands of the Scots. Not a few of the churches were massive structures, tower-like in strength, and fit to defend on occasion. Lindisfarne Priory, the oldest monastic ruin in the country, dates from 1093. Hexham Abbey Church, raised over the crypt of Wilfrid's cathedral, has been termed a "text-book of Early English architecture." Of Brinkburn Priory the church remains, and has been well restored. Hulne Abbey was the first Carmelite monastery in Britain. Besides these there are fragments of Newminster Abbey (1139), Alnwick Abbey (1147) and others. An exquisitely graceful fragment of Tynemouth church is associated with some remains of the older priory. St Nicholas's church, Newcastle (1350), was the prototype of St Giles's, Edinburgh. There is a massive Norman church at Norham, and other Norman and Early English churches at Mitford, Bamburgh, Warkworth (with its hermitage), Alnwick (St Michael's) &c., most of them with square towers. The stone roof of the little church at Bellingham, with its heavy semicircular girders, is said to be now unique.

"It may be said of the houses of the gentry herein," writes Fuller, "'quot mansiones, tot munitiones,' as being all castles or castle-like." Except a few dwellings of the 16th century in Newcastle, and some mansions built after the Union of England and Scotland, the older houses are all castles. A survey of 1460 mentions thirty-seven castles and seventy-eight towers in Northumberland, not probably including all the bastle-houses or small peels of the yeomen. At the Conquest Bamburgh, the seat of the Saxon kings, was the only fortress north of York. Norham Castle was built in 1121. None of the baronial castles are older than the time of Henry I. A grass mound represents Wark Castle. Alnwick Castle is an array of walls and towers covering about five acres. Warkworth, Prudhoe and Dunstanburgh castles are fine groups of ruins. Dilston Castle has still its romantic memories of the earl of Derwentwater. Belsay, Haughton, Featherstone and Chipchase castles are joined with modern mansions. The peel-towers of Elsdon, Whitton (Rothbury) and Embleton were used as fortified rectory-houses. Seaton Delaval was the work of Vanbrugh.

The place-names of the county may be viewed as its etymological antiquities. The Danish test-suffix *by* is absent. Saxon *tons*, *hams*, *cleughs* (clefts or ravines) and various patronymics are met with in great numbers; and the Gaelic *knock* (hill) and Cymric *caer*, *dwr* (water), *cefn* (ridge), *bryn* (brow), &c., mingle with the Saxon. Many curiosities of place-nomenclature exist, some strange, some expressive, *e.g.* Blink-bonny, Blaw-wearie, Skirl-naked, Pity Me.

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NORTHUMBRIA (*regnum Northanhymbrorum*), one of the most important of the Anglo-Saxon kingdoms, extended from the Humber to the Forth. Originally it comprised two independent kingdoms, Bernicia and Deira (*q.v.*). Each of these had a dynasty of its own. The first known king of the former was Ida, who, according to tradition, acquired the throne in 547 and reigned twelve years. To him the foundation of Bamburgh is attributed. Four of Ida's sons successively occupied his throne: Glappa 559–560, Adda 560–568, Aethelric 568–572, and Theodoric 572–579. Of the first three nothing is known, but Theodoric is said (*Historia Brittonum*) to have been besieged by the Welsh under Urien in Lindisfarne. Theodoric was succeeded by Frithuwald 579–585 or 586 and Hussa 586–592 or 593. Then Æthelfrith (*q.v.*), son of Æthelric, came to the throne. He greatly extended his territories at the expense of the Welsh, and eventually provoked an invasion of Aidan, king of the Scots, whom he defeated at a place called Daegsastan (603). The first king of Deira of whom we know was Ella, or Aelle, who, according to Bede, was still reigning when Augustine arrived in 597. The Saxon Chronicle, which is a less reliable authority for Northumbrian history, places his death in the year 588. The compiler of this work, however, seems to have used a regnal list of the Bernician kings, which differed considerably from most of those found in our early authorities. Æthelfrith eventually acquired possession of Deira, probably in 604 or 605, perhaps on Ella's death, expelling his son Edwin (*q.v.*). Thenceforward, with rare intervals, the two kingdoms remained united. Æthelfrith became involved in war with the Welsh towards the end of his reign and captured Chester, probably about 613. Shortly afterwards, in 616, he was defeated and slain in battle on the river Idle by Edwin, who was assisted by the East Anglian king Raedwald. Edwin now became king over both Northumbrian provinces. By his time the kingdom must have reached the west coast, as he is said to have conquered the islands of Anglesea and Man. Under Edwin the Northumbrian kingdom became the chief power in the country. At his death in 633 the kingdom was again divided, Deira falling to his nephew Osric, while Bernicia was occupied by Eanfrith son of Æthelfrith. Both these kings were slain by Ceadwalla in the following year, but shortly afterwards the Welsh king was overthrown by Oswald (*q.v.*), brother of Eanfrith, who reunited the whole of Northumbria under his sway and acquired a supremacy analogous to that previously held by Edwin. After Oswald's defeat and death at the hands of Penda in 642 Bernicia fell to his brother Oswio, while Oswine son of Osric became king in Deira, though probably subject to Oswio. Oswine's death was compassed by Oswio in 651, and the throne of Deira was then obtained by Æthelwald son of Oswald. He is not mentioned, however, after 655, so it is probable that Deira was incorporated in the Bernician kingdom not long afterwards. After Oswio's victory over Penda in 654–655 he annexed the northern part of Mercia to his kingdom and acquired a supremacy over the rest of England similar to that held by his predecessors. The Mercians, however, recovered their independence in 658, and from this time onward Northumbria played little part in the history of southern England. But Oswio and his son Ecgfrith greatly extended their territories towards the north and north-west, making themselves masters of the kingdoms of Strathclyde and Dalriada, as well as of a large part of the Pictish kingdom. Ecgfrith (*q.v.*), who succeeded on Oswio's death in 671, expelled the Mercians from Lindsey early in his reign, but was in turn defeated by them in 679, his brother Ælfwine being slain. From this time onwards the Humber formed the boundary between the two kingdoms. In 684 we hear of the first English invasion of Ireland, but in the following year Ecgfrith was slain and his army totally destroyed by the Picts at a place called Nechtansmere (probably Dunnichen Moss in Forfarshire). The Picts and Britons now recovered their independence; for Aldfrith, apparently an illegitimate son of Oswio, who succeeded, made no attempt to reconquer them. He was a learned man and a patron of scholars, and during his reign the Northumbrian kingdom partially recovered its prosperity. He was succeeded in 705 by his son Osred, and under him and his successors Northumbria began rapidly to decline through the vices of its kings and the extravagance of their donations. Osred was slain in 716. He was succeeded by Coenred 716–718, and Coenred by Osric 718–729. The next king was Ceolwulf, to whom Bede dedicated his *Historia Ecclesiastica* in 731. In the same year he was deposed and forced to become a monk, but was soon restored to the throne. In 737 he voluntarily retired to a monastery and left the kingdom to his cousin Eadberht. The latter appears to have been a vigorous ruler; in the year 740 we hear of his being involved in war with the Picts. Æthelbald of Mercia seems to have taken advantage of this campaign to ravage Northumbria. In 750 Eadberht is said to have annexed a large part of Ayrshire to his kingdom. Finally in 756, having now allied himself with

Œngus king of the Picts, he successfully attacked Dumbarton (Alcluith), the chief town of the Britons of Strathclyde. Eadberht showed considerable independence in his dealings with the church, and his brother Ecgberht, to whom the well-known letter of Bede is addressed, was from 734 to 766 archbishop of York. In 758 Eadberht resigned the kingdom to his son Oswulf, and became a monk. After his abdication Northumbrian history degenerates into a record of dynastic murders. Oswulf was slain by his household at a place called Mechil Wongtun in 759. Moll Æthelwald, who may have been a brother of Eadberht, succeeded, and after a victory over a certain Oswine, who fell in the battle, abdicated and became a monk probably under compulsion in 765. His successor Alchred claimed descent from Ida, but Simeon of Durham appears to doubt the truth of his claim. He sent an embassy to Charlemagne in 768 and was deposed in 774, whereupon he fled to Bamburgh and afterwards to the Picts. His deposition has been ascribed to a formal act of the Witan, but this seems an antedating of constitutional methods and the circumstances point to a palace revolution. The successor of Alchred was Æthelred son of Moll Æthelwald. In 778 three high-reeves were slain at the instigation of the king. Æthelred was expelled during the next year, perhaps in consequence of this event, and Ælfwald son of Oswulf became king. Ælfwald was murdered by Sicga in 789, whereupon Osred his nephew the son of Alchred succeeded. In 790 the banished Æthelred returned to the throne and drove out Osred, whom he put to death in 792. Æthelred, who had married Ælflaed the daughter of Offa, also killed Œlf and Œlfwine, the sons of Œlfwald and was murdered himself at Corbridge in 796. Oswald, who is called *patricius* by Simeon of Durham, succeeded, but reigned only twenty-seven days, when he was expelled and eventually became a monk. Eardwulf *dux*, who had apparently fled abroad to escape the wrath of Æthelred, was now recalled and held the crown until 807 or 808. Ælfwald then became king, but Eardwulf was restored in 808 or 809 after appealing to the emperor and the pope. Eanred, son of Eardwulf, probably came to the throne in 809 and reigned until 841. It was during his reign in 827 that Northumbria acknowledged the supremacy of Ecgberht, king of Wessex. Eanred was succeeded by his son Æthelred, who was slain in 850, when Osberht came to the throne and reigned until 863. On the expulsion of Osberht, Ella or Ælle, succeeded. The chroniclers emphasize the fact that this king was not of royal descent. He is said to have slain Ragnarr Loðbrok. In the year 866 Loðbrok's sons Ingwaere (I'varr, *q.v.*), Healfdene, Ubba and others brought a vast army to England to avenge the death of their father. In the following year they obtained possession of York. Ella seems now to have made peace with the exiled king Osberht, and their united forces succeeded in recovering the city. In the great battle which ensued the Northumbrian army was annihilated and both kings slain (the death of Ella, according to Irish tradition, being due to the treachery of one of his followers). The southern part of Northumbria now passed entirely into the hands of the invaders, but they allowed a certain Ecgberht to reign over the portion of the kingdom north of the Tyne. Ecgberht was expelled in 872 and died in the course of the following year. His successor Ricsig died in 876 and was followed by Ecgberht II., who reigned until 878. He was the last English king who reigned in Northumbria. After him the chief power north of the Tyne came into the hands of a certain Eadulf of Bamburgh, who did not take the kingly title, but accepted the overlordship of Alfred the Great perhaps in 886. In the winter of 874–875 Healfdene returned to Northumbria, which he partitioned among his followers. He was probably killed in Ireland in 877. Simeon of Durham makes his death occur about the same time, after he had been expelled from his country and had lost his reason as a punishment for his misdeeds. After an interregnum of a few years a certain Guthred became king in 883. He is said to have been a slave and to have been appointed king at the command of St Cuthbert, who appeared to Eadred the abbot of Carlisle in a dream. There is some reason for the conjecture that he belonged to the family of Loðbrok. He died in 894, after which date little is known of Northumbrian history for a number of years. About the year 919 the country was invaded by Raegenald (Rögnvaldr grandson of I'varr), a Norwegian king from Ireland, who seized York and occupied the lands of St Cuthbert. Aldred, the son of Eadulf, who now ruled north of the Tyne, appealed to Constantine II., king of the Scots, for help, but the Scottish and Northumbrian armies were defeated at Corbridge. Shortly after this, however, all the northern princes submitted to Edward the Elder. Raegenald was succeeded by Sihtric (Sigtryggr, another grandson of I'varr), who married Æthelstan's sister. He died in 926, and his brother and successor Guthfrith was soon afterwards expelled by Æthelstan and fled to Eugenius, king of Strathclyde. The Welsh and Scottish kings, however, both submitted to Æthelstan, and Guthfrith was again driven into exile. He died in 934, leaving a son Anlaf (Olafr), Godfredsson or Godfreyson. In 934 Æthelstan invaded Scotland as far as the Tay. In 937 a great fleet and army were brought together by Constantine and Anlaf, the son of Sihtric, another Norwegian chieftain who had allied himself with the Scots, helped by Anlaf Godfreyson from Ireland. Æthelstan, however, won a complete victory over them at a place called Brunanburh, probably Burnswark in Dumfriesshire. Anlaf Godfreyson returned to Ireland and died in 941–942 in a raiding expedition in the south of Scotland. Anlaf the son of Sihtric again came to England in 940 just after the death of Æthelstan. He became king of Northumbria and extended his territories as far as Watling Street. Peace was made with King Edmund by the capture of King Anlaf, and a good deal later by the confirmation of King Raegenald, brother to Anlaf Godfreyson and cousin to Anlaf Sihtricson. About two years later, however, both these kings were expelled by Edmund, and the whole of Northumbria was brought under his power. About the second year of Eadred's reign there was another revolt and Eric Bloodaxe, the exiled king of Norway, obtained the throne. During the next few years the kingdom alternated between Eric and Anlaf until 954, when Eadred finally succeeded in establishing his power. Eric was killed by Maccus, the son of Anlaf, while Anlaf himself withdrew to Ireland, where he died in 980. Eadred placed Northumbria in the hands of a certain Osulf, who is called high-reeve at Bamburgh. In the reign of Edgar, Oslac was appointed earl of southern Northumbria, but he was banished at the beginning of the following reign. The next earl was Waltheof and after him Uhtred, who defeated Malcolm II., king of the Scots, in 1006. Twelve years later, however, the Northumbrians were completely defeated at Carhan, and Lothian was annexed by the Scots (see LOTHIAN). Uhtred was slain by the orders of Canute, who gave the province to Eric (Eirikr) earl of Lade. Shortly afterwards, however, part of it at least came into the hands first of Eadulf and then Aldred and another Eadulf, the brother and sons respectively of Uhtred. The younger Eadulf was slain by Siward, probably in the reign of Hardacanute. Siward held the earldom till his death in 1055, when it was given to Tostig, son of earl Godwine, and after his banishment to Morkere, son of Ælfgar, earl of Mercia. Tostig's banishment led to the invasion of Harold Hardrada, king of Norway, and the battle of Stamford Bridge, in which both perished.

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NORTH WALSHAM, a market town in the eastern parliamentary division of Norfolk, England; 131 m. N.E. by N. from London by the Great Eastern railway. Pop. of urban district (1901) 3981. It lies in a pastoral district near the river Ant, a tributary of the Bure. The church of St Nicholas is a fine Perpendicular structure exhibiting the flint-work common to the district, and possessing a beautiful south porch and the ruin of a massive western tower which partly collapsed early in the 18th century. A grammar school was founded in 1606, and reorganized and moved to new buildings in modern times. There is a market house of the 16th century. A considerable agricultural trade is carried on, and cattle-shows and fairs are held. The river Ant provides a route southward to the Norfolk Broads. The coast village of Mundesley, 5 m. N.E. by a branch railway, is in favour as a watering-place, having fine sands beneath the cliffs. In the district between this and North Walsham are Paston, taking name from the family which is famous through the Paston Letters (*q.v.*), and the fragments of Bromholm Priory, a Cluniac foundation. These are of various dates from Norman onwards, but are incorporated with farm buildings. The rood of Bromholm was a reputed fragment of the Cross which attracted many pilgrims. To the south of North Walsham is North Walsham Heath, whither in June 1381 a body of insurgents in connexion with the Peasants' Revolt were driven from before Norwich by Henry le Despenser, bishop of Norwich, and defeated; after which their leader, Geoffrey Lister, and others were sent to the scaffold.

NORTH-WEST FRONTIER PROVINCE, the most northerly province of British India, created on the 25th of October 1901. Roughly it may be defined as the tract of country N. of Baluchistan, lying between the Indus and Afghanistan. More exactly it consists of (1) the cis-Indus district of Hazara; (2) the comparatively narrow strip between the Indus and the hills constituting the settled districts of Peshawar, Kohat, Bannu and Dera Ismail Khan; and (3) the rugged mountainous region between these districts and the borders of Afghanistan, which is inhabited by independent tribes. This last region is divided into five agencies: Dir, Swat and Chitral, with headquarters at Malakand; Khyber, Kurram, Tochi and Wana. The province lies between 31° 4′ and 36° 57′ N., and 69° 16′ and 74° 7′ E. The approximate area is 38,665 sq. m., of which 13,193 sq. m. are British territory and the remainder is held by tribes under the political control of the Agent to the Governor-General. On the N. it abuts on the Hindu Kush. To the S. it is bounded by Baluchistan and Dera Ghazi Khan district of the Punjab, on the E. by Kashmir and the Punjab, and on the W. by Afghanistan.

1. *Hazara District.*—The district of Hazara extends northeastwards into the outer Himalayan Range, tapering to a narrow point at the head of the Kagan valley. The mountain chains which enclose Kagan sweep southward into the broader portion of the district, throwing off well-wooded spurs which break up the country into numerous isolated glens. Approaching Rawalpindi district the hills open out, and rich plain lands take the place of the terraced hillsides and forests of the more northern uplands. The Babusar Pass at the head of the Kagan valley marks the most direct approach to Chilas and Gilgit from the plains of India. (See HAZARA).

2. *The Settled Districts.*—The tract between the Indus and the hills consists of four open districts, Peshawar, Kohat, Bannu and Dera Ismail Khan, divided one from the other by low hills. The vale of Peshawar is for the most part highly irrigated and well wooded, presenting in the spring and autumn a picture of waving cornfields and smiling orchards framed by rugged hills. It has, however, an evil name for malarial fever. Adjoining Peshawar, and separated from it by the Jowaki hills, lies the district of Kohat, a generally hilly tract intersected by narrow valleys. The largest of these traverses the district from Kushalgarh on the Indus to Thal on the Kurram, narrowing in places, but usually opening out into wide cornlands and pastures dotted with the dwarf palm. This district affords striking contrasts of scenery, from the sheltered fields of Miranzai to the barren desolation of the salt mines. The southern spurs of the Kohat hills gradually subside into the Bannu plain. Where irrigated from the Kurram river, especially round Bannu itself, this tract is well cultivated and forms a great contrast to the harsh desolation of the Kohat hills. But beyond the sphere of irrigation, where the land is dependent on the rainfall, there is much rough stony ground broken by great fissures cut by flood-water from the border hills. To the east this gives way to the broad level plain of Marwat, which in favourable years presents a uniform expanse of rich cultivation extending from Lakki to the base of the Shekh Budin hills. These hills consist of a broken range of sandstone and conglomerate dividing the Bannu plain from the cultivated flats of Dera Ismail Khan.

3. *The Country of the Independent Tribes.*—Turning to the mountainous region between the settled districts and Afghanistan, to the extreme north lies the agency of Dir, Swat and Chitral. Chitral itself consists of a narrow valley enclosed between rugged mountains. Below Chitral are found the thickly timbered forests of Dir and Bajour, and the fertile valleys of the Panjkora and Swat rivers. Between this agency and the Khyber Pass lie the Mohmand hills, a rough country with but little cultivation, under the political control of Peshawar. West and south-west of the Khyber again is the country of the Afridis and the Orakzais. The boundary of the province here follows the line of the Safed Koh, which overlooks the Afridi Tirah and the upper Kurram valley. Dotted with towered hamlets and stately *chinar* groves the valley of the Kurram runs south-east from the Peiwar Kotal (below the great peak of Sikaram), past Thal in the Miranzai valley, through the southern Kohat hills to Bannu. South of the Kurram is the Tochi valley, separating it from Waziristan, an isolated mountainous district bounded on the south by the Gomal and the gorges that lead to the Wana plain. The lower ridges of the frontier mountain system are usually bare and treeless, but here and there, as in the Kaitu valley, in northern Waziristan and round Kaniguram in the south, are forest clad and enclose narrow but fertile and well-irrigated dales. In places, too, as, for instance, round Shawal, the summer grazing ground of the Darwesh Khel Waziris, and on the slopes of Pir Ghol, there is good pasturage and a fair sprinkling of deodars. The valleys of the Tochi and Wana are both fertile, but are very different in character. The former is a long narrow valley, with a rich fringe of cultivation bordering the river; the latter is a wide open alluvial plain, cultivated only on one side, and for the rest rough stony waste. South of the Gomal the Suliman Range culminates in the famous Takht-i-Suliman in the Largha Sherani country, a political dependency of Dera Ismail Khan district. The Kaisargarh peak of the Takht-i-Suliman is 11,300 ft. above sea-level.

Mountain Systems.—The mountains of the Hindu Kush running from east to west form the northern boundary of the province, and are met at the north-east corner of the Chitral agency by the continuation of an outer chain of the Himalayas after it crosses the Indus above the Kagan valley. From this chain minor ranges run in a south-westerly direction the whole length of Bajour and Swat, till they merge into the Mohmand hills and connect the mid-Himalayas with the Safed Koh. The range of the Safed Koh flanks the Kurram valley and encloses the Kabul basin, which finds its outlet to the Indus through the Mohmand hills. The Suliman system lies south of the Gomal unconnected with the northern hills. To the east the Safed Koh extends its spurs into the Kohat district. The Salt Range crosses the Indus in the Mianwali *tahsil* of the Punjab, and forms the boundary between Bannu and Dera Ismail Khan, merging eventually in the Waziri hills. The chief peaks in the province are Kaisargarh (11,300 ft.) and Pir Ghol (11,580 ft.) in Waziristan; Shekh Budin (4516 ft.), in the small range; Sikaram (15,621 ft.) in the Safed Koh; Istragh (18,900 ft.), Kachin (22,641 ft.) and Tirach Mir (25,426 ft.), in the Hindu Kush on the northern border of the Chitral agency; while the Kagan peaks in Hazara district run from 10,000 ft. to 16,700 ft.

Rivers.—With the exception of the Kunhar river, which flows down the Kagan valley to the Jhelum, the whole drainage of the province eventually finds its way into the Indus. The Indus enters the province between tribal territory and Hazara district. After leaving Hazara it flows in a southerly direction between the Punjab and the North-West Frontier Province, till it enters Mianwali district of the Punjab, from which it emerges to form again the eastern boundary of the province. From the east it is fed by three or four rivers of Hazara district (see INDUS). At Attock the Kabul river brings down to the Indus the whole drainage of Kafiristan, Chitral, Panjkora, Swat and Peshawar district (see KABUL RIVER). The Kurram river rises in the southern slopes of the Safed Koh, and after leaving the Kurram valley passes through the Kohat hills and enters Bannu district. Three miles below Lakki it is joined by the Tochi or Gambela, which carries the drainage of North Waziristan. The Kurram then empties itself into the Indus. From this point until it leaves the province the Indus receives no tributary of any importance. The Gomal river drains a large area of central Afghanistan and forms the most important povindah (or Kafila) route on the frontier.

The Pathan Races.—The North-West Frontier Province as now constituted may be described as the country of the Pathans (*q.v.*). The true Pathan is possibly of Indian extraction. But around this nucleus have collected many tribes of foreign origin. The whole have now become blended by the adoption of a common language, but remain tribally distinct; all alike have accepted Islam, and have invented traditions of common descent which express their present association. For centuries these tribes maintained their independence in the rugged hills which flank the present kingdom of Afghanistan. In the 15th century they began to settle in the plains. The 16th century saw the Pathan tribes established in their present homes. The spirit of independence which always characterized them soon brought them into collision with the Mogul empire. In the 17th century, after a long struggle, the settlers in the plains wrested from Aurangzeb terms which left them almost as independent as their brothers in the hills. The invasion in 1738 of Nadir Shah, who traversed the province from Peshawar to Dera Ismail Khan, is a landmark in the history of the frontier. From his death to the rise of Ranjit Singh, the frontier districts remained an appendage of the Durani empire. Little control was exercised by the rulers of Kabul, and the country was administered by local chiefs or Afghan Sirdars very much as they pleased. The Sikh invasions began in 1818, and from that date to the annexation by the British government the Sikhs were steadily making themselves masters of the country. After the Second Sikh War, by the proclamation of the 29th of March 1849, the frontier districts were annexed by the British government. From that time until the creation of the North-West Frontier Province the settled districts formed part of the Punjab, while the independent tribes were controlled at different times by the Punjab government, and the government of India. Their turbulence still continued, and since 1849 they have been the object of over fifty punitive expeditions. The chief tribes, under the political control of the N.W. Frontier agency, besides Chitralis and Bajouris, are the Utman Khel, Yusafzais, Hassanzais, Mohmands, Afridis, Jowakis, Mullagoris, Orakzais, Zaimukhts, Chamkannis, Khattaks, Bangashes, Turis, Waziris, Battannis (Bhitanis) and Sheranis. These tribes are referred to under separate headings.

Creation of the Province.—The North-West Frontier Province differs from the older provinces of India in having been artificially built up out of part of a previous province together with new districts for a definite administrative purpose. The proposal to make the frontier districts into a separate province, administered by an officer of special experience, dates back to the viceroyalty of Lord Lytton, who, in a famous minute of the 22nd of April 1877, said:—

> "I believe that our North-West Frontier presents at this moment a spectacle unique in the world; at least I know of no other spot where, after 25 years of peaceful occupation, a great civilized power has obtained so little influence over its semi-savage neighbours, and acquired so little knowledge of them, that the country within a day's ride of its most important garrison is an absolute *terra incognita*, and that there is absolutely no security for British life a mile or two beyond our border."

The result of this minute was that a frontier commissionership, including Sind, was sanctioned by the home government, and Sir Frederick (afterwards Lord) Roberts had been designated as the first Commissioner, when the outbreak of the Second Afghan War caused the project to be postponed. It was afterwards shelved by Lord Ripon. Twenty-three years elapsed before the idea was revived and successfully brought to completion by Lord Curzon, whose scheme was on a more modest scale than Lord Lytton's. It omitted Sind altogether, and confined the new province to the Pathan trans-Indus districts north of the Gomal. The purpose of the change was to subject all the independent tribes from Chitral to the Gomal Pass to the control of a single hand, and to ensure a firm and continuous policy in their management. The administration of the province is conducted by a chief Commissioner and Agent to the Governor-General.

Population.—In the census of 1901 the operations were extended for the first time to the Kurram Valley and the Sherani country, trans-frontier territories containing a population of 66,628 souls, which had not been previously enumerated. The military cantonments and posts in Malakand, Dir, Swat and Chitral were also enumerated, as were those in the Tochi Valley (the Northern Waziristan Agency) and in the Gomal (the Southern Waziristan Agency), the former figures being included in the census returns of Bannu district, and those of the latter in the returns of Dera Ismail Khan. The total population of the province was 2,125,480; but this figure omits the great majority of the frontier tribes. The province is almost wholly agricultural. The urban population is only one-eighth of the total, and shows no tendency to increase. There are no large industries to attract the population to the towns; these, except Peshawar and Dera Ismail Khan, are either expansions of large agricultural villages or bazaars which have grown up round the many cantonments of the province. The great majority of the population are Pathan by race and Mahommedan by religion. The predominant language is Pushtu (*q.v.*). The conquered strata of the population speak servile Indian dialects, called Hindki in the north and Jatki in the south, while Gujari is spoken by the large Gujar population in the hills of Hazara and north of Peshawar.

Crops and Climate.—The area under cultivation represents an average of 1·3 acres per head of the total, and of nearly 1·5 acres per head of the rural population. The limit of profitable cultivation has almost been reached. It is therefore from an improvement in the methods of agriculture rather than to an extension of the area under cultivation that recourse must be had to supply the needs of a rapidly increasing population. The Pathan, however, is a slovenly cultivator and slow to adopt any new methods which involve increased effort. The principal crops are—in the cold weather, maize and *bajra*; in the spring, wheat, barley and gram. Rice and sugar-cane are largely grown on the irrigated lands of Hazara, Peshawar and Bannu districts, and the well and canal irrigated tracts of Peshawar district produce fine crops of cotton and tobacco. In the trans-border agencies the valleys of the Swat, Kurram and Tochi rivers yield abundant rice crops. The province is mainly a mountainous region, but includes the Peshawar valley and the broad riverain tract of the Indus in Dera Ismail Khan district. The climatic conditions are hence extremely diversified. Dera Ismail Khan district is one of the hottest areas in the Indian continent, while over the mountain region to the north the weather is temperate in the summer and intensely cold in the winter. The air is generally dry, and hence the daily and annual range of temperature is frequently very large. There are two seasons of rainfall over the province: the monsoon season, when supplies of moisture are brought up by the ocean winds from the Arabian Sea and the Bay of Bengal; and the winter season, when storms advancing eastwards from Persia and the Caspian districts occasion winds, widespread rain and snowfall. Both sources of supply are precarious, and instances are not infrequent of the almost entire failure of either the winter or the summer rainfall.

Irrigation.—Canals are the main source of irrigation in the province, and fall under three heads: (1) Private canals in the various districts, the property of the people and managed on their behalf; (2) the Michni Dilazak and Shabkadar branch in Peshawar, constructed by the district board, which receives water rates; and (3) the Swat and Kabul river canals, which were constructed by and are the property of government, and are managed by the irrigation department.

About 20% of the cultivated area is irrigated by canals, 2% by wells and 3% by perennial streams. Throughout the province the area in which well-cultivation is possible is extremely limited, and the field has already been covered. In Kohat and Hazara any considerable extension of canal irrigation is out of the question, but in the remaining districts much can still be done to promote irrigation.

Railways.—The railways of the province are mostly intended in the first instance for strategic purposes. The main line of the North-Western railway runs from Rawalpindi to Peshawar, whence it has been extended 9 m. to Jamrud at the entrance to the Khyber Pass. From Nowshera a frontier light line, involving a break of gauge, is carried to Dargai at the foot of the Malakand Pass. From Rawalpindi again another branch extends to the Indus at Kushalgarh. A bridge has been built at this point, and the railway continued through Kohat to Thal at the entrance of the Kurram valley.

See *North-West Frontier Province Gazetteer* (Calcutta, 1908); Sir Thomas Holdich, *The Indian Borderland* (1901); Paget and Mason, *Record of Frontier Expeditions* (1884). (T. H. H.*)

NORTH-WEST TERRITORIES. The North-West Territory was at first a general name given to all the districts of British North America lying N.W. of the St Lawrence basin. In the British North America Act of 1867 provision was made for the admission to Canada of "Rupert's Land and the North-West Territory." Manitoba was formed out of this district in 1870. The territory remaining was then called the "North-West Territories," and until other arrangements were made was to be under the governor of Manitoba. In 1876 the district of Keewatin was established; in 1881 the limits of Manitoba were enlarged; and in 1882 four new districts—Assiniboia, Saskatchewan, Alberta and Athabasca—were organized. In 1905 the two first of these with some modification became the province of Saskatchewan, and the two last the province of Alberta. The territories of Canada outside of the eight provinces and Yukon district of the mainland are now organized as the North-West Territories, and are under an administrator or acting governor. They include the districts of Keewatin, Ungava, Mackenzie and Franklin. These territories have an Indian population of about 8500, the

Indians throughout the southern part being chiefly Chipewyans, or, as they are sometimes called, Tinné. The northern parts are inhabited by Eskimo. In these territories a short hot summer is followed by a long cold winter with extremely low temperatures, the spirit thermometer at times showing 60° to 65° F. below zero. The following observations may be quoted:—

	Feet above Sea-level.	Mean Temperature, F.		Average Precipitation, Inches.
		Summer.	Winter.	
Norway House, Keewatin .	710	..	..	19·26
York Factory	0	48·7°	12·6	28·73
Fort Simpson, 41° 51′ N. .	400	59·4°	−10°	..
Fort Franklin, 65° 12′ N. .	500	50·4°	−17°	..

With the exception of southern Keewatin and the district south of James Bay the animals of the North-West Territories are chiefly fur-bearing. Great herds of musk-oxen are found in Mackenzie, and vast flocks of ducks, geese and other migratory birds spend summer in the northern wilds. Except in southern Keewatin and the James Bay district the flora is decidedly northern, becoming Arctic in the far north. Forest trees grow small and ill formed. Sedges abound, exceeding grasses; mustards are abundant, and saxifrages plentiful. Mosses and lichens are numerous.

The history of the north-west follows three different branches. (1) The story of Arctic exploration and the search for the North-West Passage, with a concentration of interest upon the name of Sir John Franklin, whose loss was followed by a great development of investigation in the Arctic regions; (2) the story of the fur trade, connected with the Hudson Bay forts, from the establishment of the first Charles Fort in 1669; (3) the story of immigration, the beginning of which is to be found in the coming of the Selkirk colonists, the real founders of Manitoba (*q.v.*), to Red river by way of Hudson Bay.

NORTHWICH, a market town in the Northwich parliamentary division of Cheshire, England, 171½ m. N.W. of London, on the London and North-Western railway and the Cheshire lines. Pop. of urban district, 17,611. It lies in a low open valley at the confluence of the rivers Weaver and Dane, and is the centre of the principal salt-producing district in the United Kingdom. In its narrow and irregular streets many of the houses are strongly bolted to keep them secure from the subsidences which result not infrequently from the pumping of brine. Despite these precautions many accidents have occurred; some of the houses have sunk or stand at fantastic angles, and in 1892 a portion of the High Street, which had subsided below the level of the Weaver, had to be raised 6 ft. Both rock salt and white salt obtained by evaporation from brine are exported. The amount supplied by the whole district, which includes the neighbouring town of Winsford 6 m. south, is about 1,500,000 tons annually. The white salt is shipped chiefly to America. The principal buildings are the church of St Helen, Witton, noted for its finely carved roof of the 17th century, a museum and free library and market house. The Verdin Park was presented to the town by Robert Verdin, M.P. for Northwich, in 1887. There is a considerable industry in the building of flat boats to convey salt to Liverpool, the river Weaver being navigable, and connected by a hydraulic lift, 1 m. from the town, with the Trent and Mersey Canal on a higher level. Rope- and brick-making, iron and brass-founding, chemical manufactures, brewing and tanning, are also carried on.

NORTON, CAROLINE ELIZABETH SARAH (1808–1877), afterwards Lady Stirling-Maxwell, English writer, was born in London in 1808. One of the three beautiful granddaughters of Richard Brinsley Sheridan, daughters of his son Thomas, the "three Graces" of London society in the reign of George IV., she began to write before she was out of her teens. Her two sisters Helen and Georgina became respectively Lady Dufferin and duchess of Somerset. Lady Dufferin described the sisters to Disraeli with characteristic modesty. "Georgey's the beauty," she said, "and Carry's the wit, and I ought to be the good one, but I am not." At the age of seventeen, Caroline published a merry satire, *The Dandies' Rout*, illustrated by herself, and full of girlish high spirits and wit. Her first essay in serious verse was made in 1829 with *The Sorrows of Rosalie*, the next in 1830 with *The Undying One*, a version of the legend of the Wandering Jew. She made an unfortunate marriage in 1827 with the Hon. George Norton, brother of Lord Grantley. After three years of protests on her part and good promises on his, she had left his house for her sister's, had "condoned" on further good promises, and had returned, to find matters worse. The husband's persecutions culminated in 1836 in an action brought against Lord Melbourne for seduction of his wife, which the jury decided against Mr Norton without leaving the box. The case against Lord Melbourne was so weak that it was suggested that Norton was urged to make the accusation by Melbourne's political enemies, in the hope that the scandal would prevent him from being premier when the princess Victoria should succeed William IV. In 1853 legal proceedings between Mrs Norton and her husband were again entered on, because he not only failed to pay her allowance, but demanded the proceeds of her books. Mrs Norton made her own experience a plea for addressing to the queen in 1855 an eloquent letter on the divorce laws, and her writings did much to ripen opinion for changes in the legal status of married women. George Meredith, in *Diana of the Crossways*, used her as the model for his "Diana." Mrs Norton was not a mere writer of elegant trifles, but was one of the priestesses of the "reforming" spirit; her *Voice from the Factories* (1836) was a most eloquent and rousing condemnation of child labour. *The Dream, and other Poems* appeared in 1840. *Aunt Carry's Ballads* (1847), dedicated to her nephews and nieces, are written with charming tenderness and grace. Later in life she produced three novels, *Stuart of Dunleath* (1851), *Lost and Saved* (1863), and *Old Sir Douglas* (1868). Mrs Norton's last poem was the *Lady of La Garaye* (1862), her last publication the half-humorous, half-heroic story of *The Rose of Jericho* in 1870. She died on the 15th of June 1877. Mr Norton died in 1875; and Mrs Norton in the last year of her life married Sir W. Stirling-Maxwell.

See *The Life of Mrs Norton*, by Jane G. Perkins (1909).

NORTON, CHARLES BOWYER ADDERLEY, 1st Baron (1814–1905), English politician, eldest son of Charles Clement Adderley (d. 1818), one of an old Staffordshire family, was born on the 2nd of August 1814, and inherited Hams Hall, Warwickshire and the valuable estates of his great-uncle, Charles Bowyer Adderley, in 1826. He was educated at Christ Church, Oxford, and in 1841 he became one of the members of parliament for Staffordshire, retaining his seat until 1878, when he was created Baron Norton. Adderley's official career began in 1858, when he served as president of the board of health and vice-president of the committee of the council on education in Lord Derby's short ministry. Again under Lord Derby he was under-secretary for the colonies from 1866 to 1868, being in charge of the act which called the Dominion of Canada into being, and from 1874 to 1878 he was president of the board of trade. He died on the 28th of March 1905. Norton was a strong churchman and especially interested in education and the colonies. In 1842 he married Julia (1820–1887) daughter of Chandos, 1st Lord Leigh, by whom he had several sons. His eldest son Charles Leigh (b. 1846) became 2nd Baron Norton. Another son, James Granville Adderley (b. 1861), vicar of Saltley, Birmingham, became well known as an advocate of Christian socialism.

See W. S. Childe-Pemberton, *The Life of Lord Norton* (1909).

NORTON, CHARLES ELIOT (1827–1908), American scholar and man of letters, was born at Cambridge, Massachusetts, on the 16th of November 1827. His father, Andrews Norton (1786–1853) was a Unitarian theologian, and Dexter professor of sacred literature at Harvard; his mother was Catherine Eliot, Charles William Eliot, president of Harvard, being his cousin. Charles Eliot Norton graduated from Harvard in 1846, and started in business with an East Indian trading firm in

Boston, for which he travelled to India in 1849. After a tour in Europe, he returned to America in 1851, and thenceforward devoted himself to literature and art.

In 1881 Norton inaugurated the Dante Society, whose first presidents were Longfellow, Lowell and Norton. He translated the *Vita Nuova* (1860 and 1867) and the *Divina Commedia* (1891–1892, 2 vols.). After work as secretary to the Loyal Publication Society during the Civil War, he edited from 1864–1868 the *North American Review*, in association with James Russell Lowell. In 1861 he and Lowell helped Longfellow in his translation of Dante and in the starting of the informal Dante Club. In 1875 he was appointed professor of the history of art at Harvard, a chair which was created for him and which he held until he became *emeritus* in 1898. The Archaeological Institute of America chose him to be the first president (1879–1890). From 1856 until 1874 Norton spent much time in travel and residence on the continent of Europe and in England, and it was during this period that his friendships began with Carlyle, Ruskin, Edward FitzGerald and Leslie Stephen, an intimacy which did much to bring American and English men of letters into close personal relation. Norton, indeed, had a peculiar genius for friendship, and it is on his personal influence rather than on his literary productions that his claim to remembrance mainly rests. From 1882 onward he confined himself to the study of Dante, his professorial duties, and the editing and publication of the literary memorials of many of his friends. In 1883 came the *Letters of Carlyle and Emerson*; in 1886, 1887 and 1888, *Carlyle's Letters and Reminiscences*; in 1894, the *Orations and Addresses of George William Curtis* and the *Letters of Lowell*. Norton was also made Ruskin's literary executor, and he wrote various introductions for the American "Brantwood" edition of Ruskin's works. His other publications include *Notes of Travel and Study in Italy* (1859), and an *Historical Study of Church-building in the Middle Ages: Venice, Siena, Florence* (1880). He organized exhibitions of the drawings of Turner (1874) and of Ruskin (1879), for which he compiled the catalogues.

He died on the 21st of October 1908 at "Shady-hill," the house where he was born. He bequeathed the more valuable portion of his library to Harvard. In 1862 he had married Miss Susan Sedgwick. He had the degrees of Litt.D. (Cambridge) and D.C.L. (Oxford), as well as the L.H.D. of Columbia and the LL.D. of Harvard and of Yale.

NORTON, THOMAS (1532–1584), English lawyer, politician and writer of verse, was born in London in 1532. He was educated at Cambridge, and early became a secretary to the Protector Somerset. In 1555 he was admitted a student at the Inner Temple, and married Margery Cranmer, the daughter of the archbishop. From his eighteenth year Norton had begun to compose verse. We find him connected with Jasper Heywood; as a writer of "sonnets" he contributed to *Tottel's Miscellany*, and in 1560 he composed, in company with Sackville, the earliest English tragedy, *Gorboduc*, which was performed before Queen Elizabeth in the Inner Temple on the 18th of January 1561. In 1562 Norton, who had served in an earlier parliament as the representative of Gatton, became M.P. for Berwick, and entered with great activity into politics. In religion he was inspired by the sentiments of his father-in-law, and was in possession of Cranmer's MS. code of ecclesiastical law; this he permitted John Foxe to publish in 1571. He went to Rome on legal business in 1579, and from 1580 to 1583 frequently visited the Channel Islands as a commissioner to inquire into the status of these possessions. Norton's Calvinism grew with years, and towards the end of his career he became a rabid fanatic. His punishment of the Catholics, as their official censor from 1581 onwards, led to his being nicknamed "Rackmaster-General." At last his turbulent puritanism made him an object of fear even to the English bishops; he was deprived of his office and thrown into the Tower. Walsingham presently released him, but Norton's health was undermined, and on the 10th of March 1584 he died in his house at Sharpenhoe, Bedfordshire.

The *Tragedie of Gorboduc* was first published, very corruptly, in 1565, and, in better form, as *The Tragedie of Feerex and Porrex*, in 1570. Norton's early lyrics have in the main disappeared. The most interesting of his numerous anti-Catholic pamphlets are those on the rebellion of Northumberland and on the projected marriage of Mary Queen of Scots to the duke of Norfolk. Norton also translated Calvin's *Institutes* (1561) and Alexander Nowell's *Catechism* (1570).

Gorboduc appears in various dramatic collections, and was separately edited by W. D. Cooper (Shakespeare Soc. 1847), and by Miss Toulmin Smith in Volkmöller's *Englische Sprach- und Literaturdenkmale* (1883). The best account of Norton, and his place in literary history, is that of Sidney Lee in his *Dictionary of National Biography*. (E. G.)

NORWALK, a city of Fairfield county, Connecticut, U.S.A., on the Norwalk river, in the township of Norwalk, adjoining the city of South Norwalk in the same township, and 13 m. W.S.W. of Bridgeport. Pop. (1900) 6125 (1023 foreign-born and 189 negroes); (1910) 6945; of the township (1900) 19,932; (1910) 24,211. The city is served by the New York, New Haven & Hartford railroad, by interurban electric lines, and by steamboats to New York. The city has a green with several old churches and some fine elms, a public library, a hospital, a state armoury and a county children's home. The Norwalk Chapter of the Daughters of the American Revolution has erected here a drinking fountain in memory of Nathan Hale, who obtained in Norwalk his disguise as a Dutch school teacher and then started on his fatal errand to Long Island. Norwalk has some manufactures, including woollen goods and typewriting machines; and there is some coasting trade, oysters especially being shipped from Norwalk.

The site of the township was purchased from the Indians in 1640 by Roger Ludlow and Daniel Patrick, Ludlow giving six fathoms of wampum, six coats, ten hatchets, ten hoes, ten knives, ten scissors, ten jew's harps, ten fathoms of tobacco, three kettles of six hands, and about ten looking-glasses for all the land between the Norwalk and Saugatuck rivers and extending one day's walk N. from the Sound. The first settlement in the township was made in 1650 at what is now the village of East Norwalk by a small company from Hartford, and the township was incorporated in the next year. The village was burned by the British under Governor Tryon on the 12th of July 1779, and the chair in which it is alleged Tryon sat, on Grumman's Hill, as he watched the flames, has been kept as a relic. Norwalk was incorporated as a borough in 1836 and was chartered as a city in 1893.

See C. M. Selleck, *Norwalk* (Norwalk, 1896); and *Norwalk after Two Hundred and Fifty Years, an Account of the Celebration of the 250th Anniversary of the Charter of the Town* (South Norwalk 1901).

NORWALK, a city and the county-seat of Huron county, Ohio, U.S.A., about 55 m. W.S.W. of Cleveland. Pop. (1900) 7074, including 762 foreign-born and 101 negroes; (1910) 7858 It is served by the Lake Shore & Michigan Southern, and the Wheeling & Lake Erie railways, and by interurban electric lines. It has a public library in which a small museum is maintained by the Firelands Historical Society. The city is the centre of a rich agricultural district. Among its manufactures are machine-shop products (the Wheeling & Lake Erie has shops here), iron and steel, pianos and automobile fittings.

Norwalk was settled in 1817 and was named from Norwalk, Connecticut; it was incorporated as a town in 1829 and chartered as a city in 1881. Huron county and Erie county immediately N. are the westernmost of the counties created from the "Western Reserve," and comprise the "Fire Lands" grant made in 1792 by the state of Connecticut to the people of Greenwich, Fairfield, Danbury, Ridgefield, Norwalk, New Haven, East Haven and New London to indemnify them for their fire losses during the British expeditions in Connecticut under Governor Tryon in 1779 and Benedict Arnold in 1781. The Connecticut grantees were incorporated in 1803 as "the proprietors of the half-million acres of land lying south of Lake Erie."

NORWAY (*Norge*), a kingdom of northern Europe, occupying the W. and smaller part of the Scandinavian peninsula. Its E. frontier marches with that of Sweden, except in the extreme N., where Norway is bounded by Russian territory. On the N., W., S. and S.E. the boundary is the sea—the Arctic Ocean, that part of the Atlantic which is called the Norwegian Sea, the North Sea and the Skagerrack successively. The S. extremity of the country is the island of Slettingen in 57° 58′ N., and the N. that of Knivskjærodden, off the North Cape in 71° 11′ N. Of the mainland, the southernmost promontory is Lindesnæs, in 57° 59′ N., while the northernmost is Nordkyn, in 71° 7′ N. The S. of the country, that is to say, the projection between the Skagerrack and the North Sea proper, lies in the same latitude as the N. of Scotland and Labrador, and the midland of Kamchatka. The most western island, Utvær, lies off the mouth of the Sogne Fjord (4° 30′ E.), and the eastermost point of the country is within the Arctic lands, near Vardö (31° 11′ E). The direct length of Norway (S.W. to N.E.) is about 1100 m. The extreme breadth in the S. (about 61° N.) is 270 m., but in the N. it is much less—about 60 m. on the average, though the Swedish frontier approaches within 6 m. of a head-branch of Ofoten Fjord, and the Russian within 19 m. of Lyngen Fjord. The length of the coast line is difficult to estimate; measured as an unbroken line it is nearly 1700 m., but including the fjords and greater islands it is set down as 12,000. The area is estimated at 124,495 sq. m.

Physical Features. Relief.—The main mountain system of the Scandinavian peninsula hardly deserves its name of Kjölen[1] (the keel). It may rather be described as a plateau deprived of the appearance of a plateau, being on the one hand grooved by deep valleys, while on the other many salient peaks tower above its average level. Such peaks, during the later Glacial period, stood above the ice-field. Peaks and ridges were formed by the action of small glaciers cutting out each its circular hollow (*botn*) just as they still work on the remaining snow-fields. But where the power of the main ice-mass was at work, the characteristic rounded forms of base rock are seen, close above the sea along the coast, but even as high as 5000 ft. in some inland localities. The high plateau lies along the W. side of the peninsula, so that except in the S.E. Norway is mountainous throughout. Even the part excepted is hilly, but it partakes of the character of the long eastern or Swedish slope of the peninsula. Beyond the coast line their floors sink far below sea-level, and thus are formed the fjords and the belt of rugged islands which characterize almost the entire seaboard of Norway. Where Norway marches with Russia, a few heights exceed 3000 or even 4000 ft., but the land is not generally of great elevation. But from the point of junction with Swedish territory the mountains increase considerably in height. For a short distance, as far south as Lake Torne, the loftiest points lie within Norwegian territory, such as Jæggevarre (6283 ft.), between Lyngen and Ulfs fjords, and Kiste Fjeld (5653 ft.) farther inland. Thereafter the principal heights lie approximately along the crest-line of the plateau and within Swedish territory. Sulitelma, however (6158 ft.), lies on the frontier. Southward again the higher summits fall to Norway. S. of Bodö, Svartisen ("the black ice"), a magnificent snow-field bordering the coast, and feeding many glaciers, culminates at 5246 ft. Thereafter, Okstinderne or Oxtinderne (6273 ft.), and the Store Börge Fjeld (5587 ft.) are the principal elevations as far as 64° N. A little S. of this latitude the so-called Trondhjem depression is well marked right across the central upland, the height of the mountains not often exceeding 4000 ft., while the peaked form characteristic of the heights which rose clear of the glaciers of the later Glacial period is wanting. It is from this point too that Norwegian territory broadens so as to include not only the highest land in the peninsula, but a considerable part of the general E. and S.E. slope. The high plateau broadens and follows the S.W. sweep of the coast. Pursuing it S. the Dovre Fjeld is marked off by the valleys of the rivers Driva and Sundal, Laagen (or Laugen) and Rauma, and the fjords of the coastland of Nordmöre. Here Snehætta reaches a height of 7615 ft., and the Romsdal (the name under which the Rauma valley is famous among tourists) is flanked by many abrupt jagged peaks up to 6000 ft. high. The valley of the Laagen forms the upper part of Gudbrandsdal. East of this and S.E. of the Dovre is another fjeld, Rondane, in which Högronden rises to 6929 ft. South of the Otta valley is Jotunheim or Jötun Fjeld, a sparsely peopled, in parts almost inaccessible, district, containing the highest mountains in Scandinavia, Galdhöpiggen reaching 8399 ft. On the seaward side of Jotunheim is Jostedalsbræ, a great snow-field in which Lodalskaupen reaches a height of 6795 ft. South of Sogne Fjord (61° N.) mountains between 5000 and 6000 ft. are rare; but in Hallingskarvet there are points about 6500 ft. high, and in the Hardanger Vidda (waste), a broad wild upland E. of Hardanger Fjord, Haarteigen reaches 6063 ft. The highland finally sinks towards the S. extremity of Norway in broken masses and short ranges of hills, separated by valleys radiating S.E., S. and W.

Glaciers.—The largest glacier in continental Europe is Jostedalsbræ, with an area of 580 sq. m., the snow-cap descending to 4000 or 4500 ft. Several of its branches fall nearly to the sea, as the Böiumsbræ above the Fjærland branch of Sogne Fjord. The largest branch is the Nigardsbræ. Skirting Hardanger Fjord, and nearly isolated by its main channel and two arms, is the great glacier of Folgefond (108 sq. m.). Two branches descending from the main mass are visited by many who penetrate the Hardanger—Buarbræ on the E., falling towards Lake Sandven above Odde, and Bondhusbræ on the W. The extreme elevation of the Folgefond in 5270 ft. Continuing N. other considerable snow-fields are those of Hallingskarvet, the Jotunheim, Snehætta in Dovre Fjeld, and Store Börge Fjeld at the head of the Namsen valley. Next follow Svartisen, second in extent to Jostedalsbræ (nearly 400 sq. m.), the Sulitelma snow-field and Jökel Fjeld, between Kvænang and Öxfjords. One glacier actually reaches the edge of Jökel Fjord, a branch of Kvænang Fjord, so that detached fragments of ice float away on the water. This is the only instance of the kind in Norway. The Seiland snow-field, on Seiland island near Hammerfest, is the most northerly *névé* in Europe. The snow-line in Norway is estimated at 3080 ft. in Seiland, 5150 ft. on Dovre Fjeld, and from 4100 to 4900 ft. in Jotunheim. The lowness of the snow-line adds to the grandeur of Norwegian mountains.

Skjærgaard or island-fence.

Coast.—The flanks of the plateau fall abruptly to the sea almost throughout the coast-line, and its isolated fragments appear in the innumerable islands which fringe the mainland. This island fringe, which has its counterpart in a modified form along the Swedish coast, is called in Norwegian the *skjærgaard* (skerry-fence, pronounced shārgoord). This fringe and the fjord-coast are most fully developed from Stavanger nearly as far as the North Cape. The channels within the islands are of incalculable value to coastwise navigation, which is the principal means of communication in Norway. The voyage northward from Stavanger may be made in quiet waters almost throughout. Only at rare intervals vessels must enter the open sea for a short distance, as off the port of Haugesund, or when rounding the promontory of the Stat or Statland, S. of Aalesund, passing the coast of Hustadviken, S. of Christiansund, or crossing the mouth of some large fjord. At some points large steamers, following the carefully marked channel, pass in deep water between rocks within a few yards on either hand. Small ships and boats, fishing or trading between the fjord-side villages, navigate the ramifying "leads" (*leder*) in security. In some narrow sounds, however, the tidal current is often exceedingly strong. The largest island of the skjærgaard is Hindö of the Lofoten and Vesteraalen group. Its area is 860 sq. m. The number of islands is estimated at 150,000 and their area at 8500 sq. m. Many of them are of great elevation, especially the more northerly; thus the jagged peaks characteristic of Lofoten culminate at about 4000 ft. Hornelen, near the mouth of Nordfjord, 3000 ft. high, rises nearly sheer above the Fröjfjord, and vessels pass close under the towering cliff. Torghatten (" the market hat "), N. of Namsos, is pierced through by a vast natural tunnel 400 ft. above the sea; and Hestmandö (" horseman island "), on the Arctic circle, is justly named from its form. The dark blue waters of the inner leads and fjords are clouded, and show a milky tinge on the surface imparted by the glacier-fed rivers. Bare rock is the dominant feature of the coast and islands, save where a few green fields surround a farmstead. In the N., where the snow-line sinks low, the scenery at all seasons has an Arctic character.

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[1] In Norwegian the definite article (when there is no epithet) is added as a suffix to the substantive (masc. and fem. *en*, neuter *et*). Geographical terms are similarly suffixed to names, thus *Suldalsvandet*, the lake Suldal. The commonest geographical terms are: *elv*, river; *vand*, lake; *fjeld*, mountain or highland; *ö*, island; *dal*, valley; *næs*, cape; *fos*, waterfall; *bræ*, glacier; *vik*, *vig*, bay; *eide*, isthmus; *fjord*. *Aa* is pronounced aw.

Fjords.

Christiania Fjord, opening from the N. angle of the Cattegat and Skagerrack, differs from the great fjords of the W. Its shores are neither so high nor so precipitous as theirs; it is shallower, and contains a great number of little islands. From its mouth, round Lindesnæs, and as far as the Bukken Fjord (Stavanger) there are many small fjords, while the skjærgaard provides an inner lead only intermittently. Immediately S. of Bukken Fjord, from a point N. of Egersund, the flat open coast of Jæderen, dangerous to shipping, fringing a narrow lowland abundant in peat-bogs for some 30 m., forms an unusual feature. Bukken Fjord is broad and island-studded, but throws off several inner arms, of which Lyse Fjord, near Stavanger, is remarkable for its extreme narrowness, and the steepness of its lofty shores. The Hardanger Fjord, penetrating the land for 114 m., is known to more visitors than any other owing to its southerly position; but its beauty is exceeded by that of Sogne Fjord and Nord Fjord farther N. Sogne is the largest and deepest fjord of all; its head is 136 m. from the sea, and its extreme depth approaches 700 fathoms. Stor Fjord opens inland from Aalesund, and one of its head branches, Geiranger Fjord, is among the most celebrated in Norway. Trondhjem Fjord, the next great fjord northward, which broadens inland from a narrow entrance, lacks grandeur, as the elevation of the land is reduced where the Trondhjem depression interrupts the average height of the plateau. The coast N. of Trondhjem, though far from losing its beauty, has not at first the grandeur of that to the south, nor are the fjords so extensive. The principal of these are Namsen, Folden and Vefsen, at the mouth of which is Alsten Island, with the mountains called Syv Söstre (Seven Sisters), and Ranen, not far S. of the Arctic circle. Svartisen sends its glaciers seaward, and the scenery increases in magnificence. Salten Fjord, to the N. of the great snow-field, is connected with Skjerstad Fjord by three narrow channels, where the water, at ebb and flow, forms powerful rapids. The scenery N. of Salten is unsurpassed. The Lofoten and Vesteraalen islands are separated from the mainland by the Vest Fjord, which is continued inland by Ofoten Fjord. If these two be considered as one fjord, its length is about 175 m., but the actual penetration of the mainland is little more than a fifth of this distance. The main fjords N. of Vesteraalen have a general northerly direction; among them is Lyngen Fjord near Tromsö, with high flanking cliffs and glaciers falling nearly to the sea. Alten Fjord is remarkable for the vegetation on its shores. From Lofoten N. there is a chain of larger islands, Senjen, Kvalö, Ringvadsö, Sorö, Stjernö, Seiland, Ingö and Magerö. These extend to the North Cape, but hereafter the skjærgaard ends abruptly. The coast to the E. is of widely different character; flat mountain wastes descend precipitously to the sea without any islands beyond, save Vardö, with two low islets at the E. extremity of Norway. The fjords are broader in proportion to their length. The chief are Porsanger, Laxe and Tana, opening N., and Varanger opening E. N. of this fjord the land is low and the landscape monotonous; on the S. a few island and branch fjords break the line of the shore.

Stavanger Fjord has an extreme depth of 380 fathoms; Hardanger Fjord 355, Sogne Fjord 670, Nordfjord 340, Trondhjem Fjord 300, Ranen Fjord 235, Vestfjord 340, Alten Fjord 225, and Varanger Fjord 230. Marine terraces are met with in the E. of the country, and near Trondhjem, at 600 ft. above sea-level; and they are also seen at a slighter elevation at the heads of some western fjords. Moreover, at some points (as on the Jæderen coast) " giant kettles " may be observed close to sea-level, even below the level of high tide; and these glacial formations indicate the greater elevation of the land towards the close of the Glacial epoch. Former beach-lines are most commonly to be observed in northern Norway (*e.g.* in Alten Fjord), and in some cases there are two lines at different altitudes. The land above the raised beach is generally bare and unproductive, and human habitation tends to confine itself in consequence to the lower levels.

Hydrography.—In S.E. Norway there are long valleys, carrying rivers of considerable size, flowing roughly parallel but sometimes uniting as they approach the sea. The Glommen, rising N. of Röros in Aursund Lake, and flowing with a southerly curve parallel with the frontier for 350 m. to the Skagerrack, is the largest river in the Scandinavian peninsula. Its upper middle valley is called Österdal,[1] the richest timber district in Norway. Its drainage area is 16,000 sq. m. Seven miles above its mouth it forms the fine Sarpsfos, and not far above this it traverses the large lake Öieren. A right bank tributary, the Vormen, has one of its sources (under the name of Laagen) in Lake Lesjekogen, which also drains in the opposite direction by the Rauma. The stream, after watering Gudbrandsdal, enters Mjösen, the largest lake in Norway. It is 60 m. long, but, like most of the greater Norwegian lakes, has no great breadth. It has, however, an extreme depth of 1500 ft. The Drammen river, which enters a western arm of Christiania Fjord below the town of Drammen, is the common outlet of several large rivers. The Hallingdal river drains the valley of that name, and forms Lake Kröderen, which is connected with the Drammen river by the Snarum. A short distance above the junction the Drammen flows out of Lake Tyrifjord, 50 sq. m. in area, into which flow the united waters of the Rand, from the valley district of Valdres, and the Bægna. The whole basin of the Drammen has an area of 6600 sq. m. The rivers between Christiania Fjord and Lindesnæs preserve the characteristics of those of the Glommen and Drammen systems. They rise on the Hardanger Vidda or adjacent uplands. The most important are the Laagen (to be distinguished from the river of that name in Gudbrandsdal), draining the Numedal; the Skien, the Nid and the Otter. Lakes are very numerous, the chief, beyond those already named, being Nordsjö on the Skien river, Tinsjö in the same system, which receives the river Maan, famous as forming the Rjukanfos (smoking fall) of 415 ft., and Nisservand on the Nid. The larger lakes lie, with a certain regularity, at elevations about 400 ft. above the sea, and it is considered that their basins were the heads of fjords when the land lay at a lower level, and were formed during an earlier glacial period than the present fjords. The great Lake Fæmund, lying E. of the Glommen valley and drained by the river of the same name, which becomes the Klar in Sweden, to which country it mainly belongs, is similar in type to the lakes of the northern highlands of Sweden. The streams of the coast of Jæderen reach the sea through sluggish channels, brown with peat.

Not only do the valleys of the W. far surpass in beauty those of the S. and E., but they carry streams of much greater volume in proportion, owing to the heavier average rainfall of the W. slope. The first to be noted is that of the Sand or Logen river, a brilliant, rapid stream, famous for its salmon-fishing, which debouches at Sand into Sands fjord. The valley which opens from Odde at the head of a branch (Sör fjord) of Hardanger Fjord, is noted as containing two of the finest waterfalls in Norway. The one, Lotefos (which is joined by the smaller Skarsfos), is a powerful cataract following a tortuous cleft. The other, Espelandsfos, is formed by a very small stream; it falls quite sheer and spreads out like a fine veil. The only other considerable river entering Hardanger Fjord is the Bjoreia, with its mouth at Vik in Eidfjord. On this stream is the magnificent Vöringsfos. Lesser streams within the basin of the Hardanger form the Skjæggedal and several other beautiful falls. From Hardanger N. to Romsdal the streams of the W. slope are insignificant, but there are several splendid valleys, such as the sombre Nærödal, which descends to the Nærö branch of Sogne Fjord, or the valleys which sink S. and N. from the Jostedalsbræ to the head branches of Sogne Fjord and Nordfjord respectively. Above those of Nordfjord is a series of lakes, Olden, Loen and Stryn, whose milky waters are supplied almost directly from the Jostedal glaciers, while above Eidsfjord a corresponding trough contains Lake Hornindal. The next important valley is the Romsdal, the stream of which, the Rauma, forms the W. outlet of Lake Lesjekogen, as the Laagen forms the E. This lake, which lies 2011 ft. above sea-level, is the most remarkable example of an indefinite watershed to be found in S. Norway. N. from Romsdal the Driva debouches into Sundals Fjord, while the Orkla, draining Orkedal, the Gula draining Guldal, and the Nea or Nid, draining Lake Selbu, and

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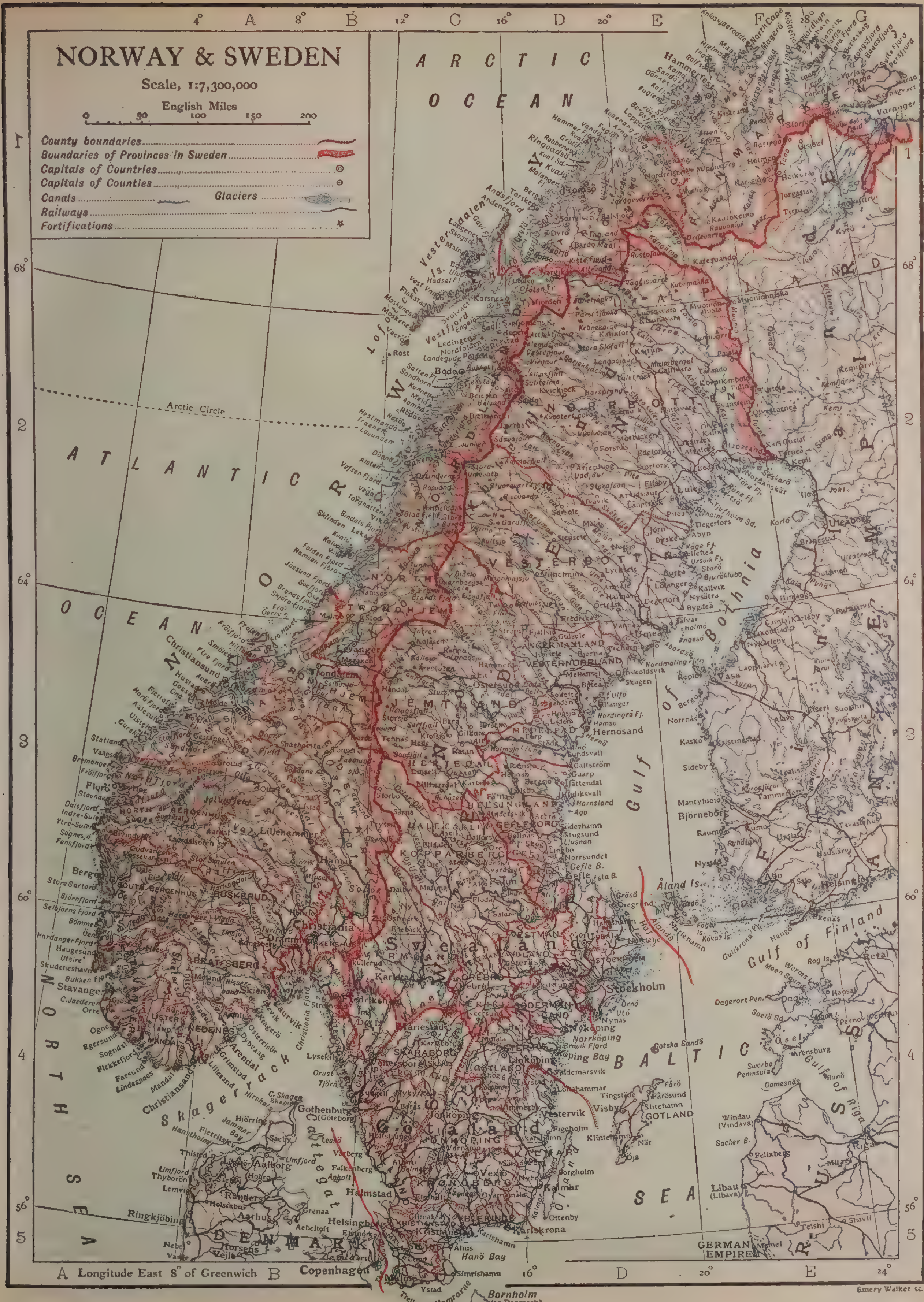
[1] The middle and upper parts of many valleys in Norway are known by different names from those of the rivers which water them, and such names may extend in common usage over the district on either side of the valley.

NORWAY & SWEDEN

Scale, 1:7,300,000


English Miles
0 50 100 150 200
County boundaries
Boundaries of Provinces in Sweden
Capitals of Countries
Capitals of Counties
Canals
Glaciers
Railways
Fortifications
4° A 8° B 12° C 16° D 20° E F G
A Longitude East 8° of Greenwich B 16° D 20° E 24°
68° 64° 60° 56°
1 2 3 4 5
ARCTIC OCEAN
ATLANTIC OCEAN
NORTH SEA
Arctic Circle
NORWAY
SWEDEN
FINMARKEN
TROMSÖ
NORDLAND
NORRBOTTEN
VESTERBOTTEN
NORTH TRONDHJEM
SOUTH TRONDHJEM
JEMTLAND
ANGERMANLAND
VESTERNORRLAND
MEDELPAD
HERJEDAL
HELSINGLAND
GEFLEBORG
KOPPARBERG
ROMSDAL
NORTH BERGENHUS
SOUTH BERGENHUS
BUSKERUD
BRATSBERG
LISTER OG MANDAL
NEDENES
Svealand
Götaland
SKARABORG
JÖNKÖPING
KRONOBERG
BLEKINGE
GOTLAND
LAPLAND
FINLAND
RUSSIA
DENMARK
GERMAN EMPIRE
Lofoten
Vesteraalen Is.
North Cape
Hammerfest
Tromsö
Bodö
Vardö
Varanger Fj.
Haparanda
Luleå
Piteå
Umeå
Östersund
Hernösand
Sundsvall
Söderhamn
Gefle
Falun
Trondhjem
Levanger
Namsos
Christiansund
Molde
Aalesund
Bergen
Stavanger
Lillehammer
Hamar
Christiania
Drammen
Skien
Arendal
Christiansand
Mandal
Lindesnaes
Fredrikshald
Karlstad
Örebro
Vesterås
Upsala
Stockholm
Norrköping
Linköping
Nyköping
Mariestad
Vänersborg
Gothenburg (Göteborg)
Halmstad
Helsingborg
Malmö
Lund
Ystad
Trelleborg
Kristianstad
Karlshamn
Karlskrona
Kalmar
Vexiö
Visby
Borgholm
Öland
Copenhagen
Bornholm (to Denmark)
Rönne
Nekso
Simrishamn
Hanö Bay
Skagerrack
Cattegat
Skagen
Aalborg
Randers
Aarhus
Horsens
Vejle
Ringkjöbing
Thisted
Gulf of Bothnia
Åland Is.
Gulf of Finland
BALTIC SEA
Gulf of Riga
Uleåborg
Vasa
Björneborg
Åbo
Helsingfors
Reval
Riga
Libau (Libava)
Windau (Vindava)
Memel
Dagö
Ösel
Gotska Sandö
Fårö

Emery Walker sc.

forming the Lerfos, enter Trondhjem Fjord from the S., and range in length from 70 to 100 m. The Stjördal, a beautiful wooded valley, leads up from the fjord to the lowest pass over the Trondhjem depression (at Storlien), and is followed by the railway from Trondhjem into Sweden.

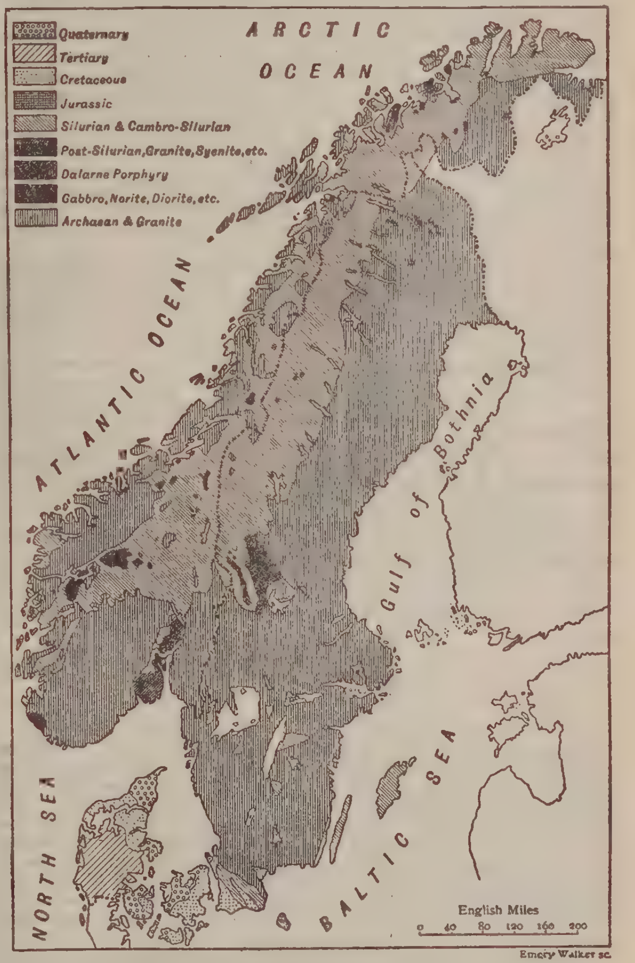
N. of Trondhjem Fjord, in spite of the close proximity of the mountains to the W. coast, several considerable rivers are found, flowing generally about N.E. or S.W. in valleys nearly parallel to the coast. Such are the Namsen (85 m. in length) and the Vefsen, discharging into Namsen Fjord and Vefsen Fjord respectively, and the Dunderland, flowing into Ranen Fjord. In the basin of the same fjord is the short Rös river, which drains Rös Vand, second in extent of the Norwegian lakes. In the extreme N., where the coastward slope is longer, there are such large rivers as the Alten, 98 m. long, discharging into the fjord of that name, and the Tana, also giving name to the fjord into which it flows, and forming a great part of the Russo-Norwegian frontier. It is 180 m. long, and drains an area of 4000 sq. m.

Though the lakes of Norway are not comparable with those of Sweden as regards either number or size, they are very numerous and are estimated to cover somewhat less than one-fortieth of the total area.

Glacial Action.—While the coast is considered to owe its fjords and islands to the work of former great glaciers, the results are even more patent inland. The actual tracks of the old glaciers are constantly to be traced. Nowhere are the evidences of glacial action better illustrated than in the barren tract behind the low coastal belt of Jæderen. Here are vast expanses of almost naked rock, often riven and piled up in fantastic forms; numerous small lakes or bogs occupy the rock basins, and vast numbers of perched blocks are seen, frequently poised in remarkable positions. The great valleys of Norway are of U-section and exhibit the irregular erosive action of the glaciers, as distinct from the regular action of the rivers. If a main glacier, after working steadily in the formation of its trough for a considerable distance, be imagined to receive an accretion of power at a certain point, it will begin from that point to erode more deeply. The result of such action is seen in the series of ledges over which the main rivers of Norway plunge in falls or rapids.

Geology.—Norway consists almost entirely of Archaean and Lower Palaeozoic rocks, imperfectly covered by glacial and other recent deposits. The whole of the interval between the Devonian and the Glacial periods is represented, so far as is known, only by a small patch of Jurassic beds upon the island of Andö. An archaean zone stretches along the W. coast from Bergen to Hammerfest, interrupted towards the N., by overlying patches of Palaeozoic deposits. Gneiss predominates, but other crystalline rocks occur subordinately. The Lofoten Islands consist chiefly of eruptive granite, syenite and gabbro. S. of a line drawn from the head of the Hardanger Fjord to Lake Mjösen is another great Archaean area. Here again gneiss and granite form the greater part of the mass, but in Telemarken there are also conglomerates, sandstones and clay-slates which are believed to be Archaean. Between these two Archaean areas the Lower Palaeozoic rocks form a nearly continuous belt which follows approximately the watershed of the peninsula and extends from Bergen and Stavanger on the S. to the North Cape and Vardö in the N. They occur also as a broad strip inlaid in the Archaean floor, from the Christiania Fjord northward to Lake Mjösen. A line drawn from the Nase to the North Cape coincides roughly with a marked change in the character and structure of the Palaeozoic beds. East of this line even the Cambrian beds are free from overfolding, overthrusting and regional metamorphism. They lie flat upon the Archaean floor, or have been faulted into it in strips, and they are little altered except in the neighbourhood of igneous intrusions. W. of the line the rocks have been folded and metamorphosed to such an extent that it is often difficult to distinguish the Palaeozoic rocks from the Archaean. They form in fact a mountain chain of ancient date similar in structure to the Alps or the Himalayas. The relations of the two areas have been studied by A. E. Törnebohm in the Trondhjem region, and he has shown that the western mass has been pushed over the eastern upon a great thrust-plane. The relations, in fact, are similar to those between the Dalradian schists of the Scottish Highlands and the Cambrian beds of the W. coast of Sutherland. In Scotland, however, it is the eastern rocks which have been pushed over the western. Corresponding with the difference in structure between the E. and the W. regions there is a certain difference in the nature of the deposits themselves. In the Christiania district the Cambrian, Ordovician and Silurian beds consist chiefly of shales and limestones. Farther north sandstones predominate, and especially the Sparagmite, a felspathic sandstone or arkose at the base of the Cambrian; but the deposits are still sedimentary. In the Trondhjem district, on the other hand, belonging to the folded belt, basic tuffs and lavas are interstratified with the normal deposits, showing that in this region there was great volcanic activity during the early part of the Palaeozoic era. In both the E. and the W. region the Devonian is probably represented by a few patches of red sandstone, in which none but obscure remains of fossils have yet been found. It may be noted here that in the extreme N. of Norway, E. of the North Cape, there is a sandstone not unlike the Sparagmite of the S., which is said by Reusch to contain ice-worn pebbles and to rest upon a striated pavement of Archaean rocks.

The Mesozoic era is represented only by the sandy deposits with seams of lignite which occur on the island of Andoën in the Vesteraalen. They contain remains of plants and have been correlated with the Lower Oolite of Great Britain. No Tertiary beds have been found, but Pleistocene deposits of various kinds are met with. The evidences of ice action during the Glacial Period are conspicuous over the whole country and are similar to those in other glaciated regions. But the most remarkable features produced in recent geological times are the terraces which appear as if ruled on the sides of the valleys and fjords. They are partly platforms cut in the solid rock and partly accumulations of gravel and sand like a modern beach, and they were evidently formed by the action of waves. Some of them contain marine shells of living species and mark the former position of the sea-level; but others are of more doubtful origin and may indicate the shores of lakes formed by the damming of the lower part of the fjords by means of glaciers, as in the case of the Parallel Roads of Glen Roy. They occur at various levels, and have been observed as high as 3000 ft. above the sea.



No volcanic rocks of modern date are known in Norway, but great intrusions of igneous rock took place in early geological times. Amongst them may be mentioned the gabbro of the Jotunfjeld, and the elaeolite syenites and associated rocks of the Christiania region. The latter form the subject of a valuable series of memoirs by Brögger, who shows that they have all been derived from a single magma, and that the differentiation of this magma led to the production of several different types of rock. (P. La.)

Temperature.

Meteorology.—The most powerful influence on the climate of Norway is that of the warm drift across the Atlantic Ocean from the S.W. The highest mean annual temperature in Norway is found on the S. and W. coasts, where it ranges from 44·5° to 45·5° F., and the lowest is found at Karasjok and Kautokeino, lying at elevations of 430 and 866 ft. respectively in Finmarken, near the Russian frontier. Here the mean temperature is 26·4°, while at Vardö, on the north coast, it is 33°. At Röros (2067 ft.) at the head of the Glommen valley, and at Fjeldberg (3268 ft.) in the upper Hallingdal, the mean annual temperature is 31°. The longest winter is found in the interior of Finmarken, 243 days with a mean temperature below 32° being recorded at

Kautokeino, contrasted with 205 at Vardö. In the S. uplands (as at Fjeldberg) there is an average of 200 such days, and at Christiania about 120. On the S.W. coast there is no day of which the mean temperature falls below 32°; the most westerly insular stations, however, such as Utsire and Skudeness off Bukken Fjord, record frost during some part of 60 days. The lowest winter average temperature is found in a centre of cold in the N. which extends over Swedish and Russian territory as well as Norwegian. The Norwegian station of Karasjok, within it, records 4° during December, January and February, and in this area there have also been observed the extreme minima of temperature in the country, *e.g.* 60·5° below zero at Karasjok. The contrast with the S.W. coast may be continued. Here at some of the island stations, the coldest month, February, has an average about 35°, and the lowest temperature recorded at Ona near Christiansund is 10·5°. It may be noted here that in several cases the lower-lying inland stations in the south show a distinctly lower winter temperature than the higher in the immediate vicinity. Thus the average for Röros (2067 ft.), 13°, contrasts with 11° for Tönset; at Listad in Gudbrandsdal (909 ft.) it is 16·5°, but at Jerkin in the Dovre Fjeld (3160 ft.) it is 17·5°. The summer is hottest in S.E. Norway (Christiania, July, 62·5°). On the other hand, the lowest summer average in the interior of Finmarken is not less than 53·5° in July; but at Vardö it is only 48° in August, usually the warmest month on this coast. In the lofty inland tracts of the S.E. the July temperature ranges, from 59° in the valleys, to as low as 49° at the high station of Jerkin. The interior having a warm summer and a cold winter, and the coast a cool summer and a mild winter, the annual range of temperature is remarkably greater inland than on the coast.

An important result of the warm Atlantic drift is that the fjords are not penetrated by the cold water from the lower depths of the outer ocean, and in consequence are always ice-free, except in winters of exceptional severity in the innermost parts of fjords, and along shallow stretches of coast.

The "midnight sun."

The sun is above the horizon at the North Cape continuously from the 12th of May to the 29th of July, and at Bodö, not far from the Arctic circle, from the 3rd of June to the 7th of July. Even at Trondhjem there is practically full daylight from the 23rd of May to the 20th of July. Even in the extreme S. of Norway there is no darkness from the end of April to the middle of August. In winter, on the other hand, the sun does not rise above the horizon at the North Cape from the 18th of November, to the 23rd of January, and at Bodö from the 15th to the 27th of December. There is only a twilight at midday. In the extreme S. the sun is above the horizon for 6½ hours at mid-winter.

Winds.

The prevailing winter winds are from the land seaward, while the system is reversed in summer. The winds in Norway may therefore be roughly classified according to locality thus:—

	South-east Coast (Skagerrack).	West Coast.	North.
Winter . .	N.E.	S.	S.W.
Summer . .	S.W. to W.	N.	N.

The force of the wind is greater in winter on the coast; inland, on the contrary, the winter is normally calm; and at all seasons, on the average, the periods of calm are longer inland than on the coast. The average annual number of stormy days, however, ranges from ten to twenty on the S. coast, from forty-five to sixty-two on the coast of Finmarken, and sixty to seventy at Ona; whereas in the interior of Finmarken the average number is four, while in the S. inland districts stormy days are rare. December and January are the stormiest months. Hailstones are rare and seldom destructive. Thunderstorms are not frequent. They reach a maximum average of ten annually in the Christiania district.

The number of days on which rain or snow falls is greatest on the coast from Jæderen to Vardö, least in the S.E. districts and the interior of Finmarken. At the North Cape, in Lofoten, and along the W. coast between the Stad and Sogne Fjord, precipitation occurs on about 200 days in the year, although by contrast in the inner part of Sogne Fjord there is precipitation only on 121 days. On Dovre Fjeld and the S.E. coast the average is about 100 days. Snowfall occurs least frequently in the S. (*e.g.* at Mandal, 25 snowy days out of 116 on which precipitation occurs), increasing to 50 at Christiania, or Dovre Fjeld, and about the mouth of Trondhjem Fjord, to 90 at Vardö, and to 100 at the North Cape. From Vardö to the Dovre Fjeld and in the upland tracts, snow occurs at least as frequently as rain. Snowfall has been recorded in all months on the coast as far S. as Lofoten. The amount of precipitation is greatest on the coast, where, at certain points on the mainland between Bukken Fjord and Nordfjord, an annual average of 83 in. is reached or even exceeded. On the outer islands there is a slight decrease; inland the decrease is rapid and great. In Dovre Fjeld a minimum of 12 in. is found. In the extreme S. of the country the average is 39 in., N. of Trondhjem Fjord 53 in. are recorded, and there is a well-marked maximum of 59 in. at Svolvær in Lofoten, N. of which there is a diminution along the coast to 26 in. at the North Cape. In the northern interior a minimum of 16 in. is recorded. Strongly marked local variations are observed.

The amount of cloudiness is on the whole great. The coast of Finmarken has over three cloudy days to one clear day; in the interior of the country clear and cloudy days are about equally divided. Fog is most frequent on the W. and N.W. coasts in summer; on the S.E. coast in winter. In winter a frosty fog often occurs about the heads of the fjords during severe cold or with a breeze from the land.

Flora.—The forests of Norway consist chiefly of conifers. The principal forest regions are the S.E. and S. Here, in the Trondhjem district, and in Nordland there are extensive forests of pine and fir. In the coastal and fjord region of the W. the pine is the only coniferous forest tree, and forests are of insignificant extent. In S. Norway the highest limit of conifers is from 2500 to 3000 ft. above sea-level; in the inland parts of the Trondhjem region it is from 1600 to 2000 ft. (though on the coast only from 600 to 1200); farther N. it falls to 700 ft. about 70° N. The birch belt reaches 3000 to 3500 ft. Next follow various species of willows, and the dwarf birch (*betula nana*), and last of all, before the snow-line, the lichen belt, in which the reindeer moss (*cladonia rangiferina*) is always conspicuous. A few trees of the willow belt sometimes extend close up to the snow-line. In the S. and less elevated districts the lowest zone of forests includes the ash, elm, lime, oak, beech and black alder; but the beech is rare, flourishing only in the Laurvik district. The snow ranunculus and the Alpine heather are abundant. The Dovre Fjeld is noted as the district in which the Arctic flora may be studied in greatest variety and within comparatively narrow limits. On the coastal banks the marine flora is very finely developed.

Fauna.—The great forests are still the haunt of the bear, the lynx, and the wolf. Bears are found chiefly in the uplands N. of Trondhjem, in the Telemark and the W. highlands, but the cutting of forests has limited their range. The wolves decreased very suddenly in S. Norway about the middle of the 19th century, probably owing to disease, but are still abundant in Finmarken, and the worst enemy of the herds of tame reindeer. The elk occurs in the eastern forests, and northward to Namdal and the Vefsen district. The red deer is confined chiefly to the W. coast districts; its principal haunt is the island of Hitteren, off the Trondhjem Fjord. On the high fjelds are found the wild reindeer, glutton, lemming and the fox (which is of wide distribution). The wild reindeer has decreased, though large tame herds are kept in some parts, especially in the N. The lemming is noted for its curious periodic migrations; at such times vast numbers of these small animals spread over the country from their upland homes, even swimming lakes and fjords in their journeys. They are pursued by beasts and birds of prey, and even the reindeer kill them for the sake of the vegetable matter they contain. Hares are very common all over Norway up to the snow-line. The beaver still occurs in the Christiansand district.

Avifauna.

Game birds are fairly abundant in most districts. The most notable are the two sorts of *rype*, the *skov* or *dal rype* (willow grouse, *lagopus albus*) and the *fjeld rype* (*lagopus alpina*). Black grouse are widely distributed; hazel grouse are found mainly in the pine forests of the E. and N., as are capercailzie. Woodcock and snipe are fairly common. The partridge is an immigrant from Sweden, and occurs principally in the E. and S.E. A severe winter occasionally almost exterminates it. A very large proportion of the Norwegian avifauna consists of geese and ducks, various birds of prey, golden plover, &c. These birds, at the autumn migration, leave by three well-defined routes—one from Finmarken into Finland, one by the Christiania valley, and one by the W. coast, where they congregate in large numbers on the lowlands of Jæderen. The Lapland bunting and snow bunting (*plectrophanes laponica* and *nivalis*), the snowy owl (*mgetea scandiaca*) and rough-legged buzzard (*archibuteo lagopus*) and sea-birds are exceedingly numerous. In some localities such birds as the puffin and kittiwake form great colonies (*fugleberge*, bird cliffs).

Marine fauna.

The common seal is very frequent; and arctic seals and occasionally the walrus visit the northern coasts; among these the harp seal (*phoca groenlandica*) is believed to be particularly destructive to the fisheries. These last are of great importance; a large number of the best food-fisheries occur along the coasts, including cod, herring, mackerel, coal-fish, &c. The basking shark was formerly of some economic importance; the Japanese shark, a strictly local variety, also occurs in the neighbourhood of Vardö. Various small species of whales visit the coast; among these the lesser rorqual may be mentioned, as an antique method of hunting it with bow and arrows is still practised in the neighbourhood of Bergen. In the fjords many invertebrates as well as fish are found. Of fresh-water fish the *salmonidae* are by far the most important. Next to these, perch, pike, gwyniad and eel are most common.

As regards insect life, Norway may be divided into three areas, the S. being richer than the W., while the N. is distinct from either in the number of peculiarly arctic insects.

Sport.—Norway is much frequented by British anglers. Moderate rod-fishing for trout is to be obtained in many parts. But most of the owners of water rights have a full appreciation of the value of good fishing to sportsmen, especially when netting rights are given up for the sake of rod-fishing. The same applies to good shooting. Foreigners may not shoot without a licence, the cost of which is 100 kroner (£5 : 11 : 0) whether on crown lands or on private properties, whose owners always possess the shooting rights.

Amter.	Population 1900.	Area in sq. m.
Southern—		
Smaalenene	136,167	1,600
Akershus	116,896	2,054
Christiania (city)	229,101	6·5
Buskerud	112,743	5,789
Jarlsberg and Laurvik	101,003	896
Bratsberg	98,298	5,863
Nedenes	75,925	3,608·5
Lister and Mandal	78,259	2,804
South-eastern (inland)—		
Hedemarken	126,703	10,618
Christians	116,280	9,790
Western—		
Stavanger	125,658	3,530·5
South Bergenhus	132,687	6,024·5
Bergen (city)	72,179	5·5
North Bergenhus	88,214	7,130
Romsdal	136,519	5,786
South Trondhjem	134,718	7,182
Northern—		
North Trondhjem	83,449	8,788·5
Nordland	150,637	14,513
Tromsö	72,966	10,131
Finmarken	33,387	18,291

Population.—The resident population of Norway in 1900 was 2,221,477. The Table shows the area and population of each of the administrative divisions (*amt*, commonly translated "county"). Norway is, as a whole, the most thinly populated of the political divisions of Europe. It may be noted for the sake of comparison that the density of population in the most sparsely populated English county, Westmorland, is about equalled by that in Smaalenene amt (85 per sq. m.), and considerably exceeded in Jarlsberg and Laurvik amt (112·7 per sq. m.), but is not nearly approached in any other Norwegian county. The two counties named are small and lie almost wholly within the coastal strip along the Skagerrack, which, with the coast-lands about Stavanger, Haugesund, Bergen and Trondhjem, the outer Lofoten Islands and the land about Lake Mjösen, are the most thickly populated portions of the country, the density exceeding 50 persons per sq. m. A vast area practically uninhabited, save in the N. by nomadic Lapps, reaches from the northmost point of the Norwegian frontier as far S. as the middle of Hedemarken, excepting a markedly more populous belt across the Trondhjem depression. Thus of the counties, Finmarken is the least thickly populated (1·8 per sq. m.). In such highland regions as Jotunheim and Hardanger Vidda habitations are hardly less scanty than in the N. About two-thirds of the population, then, dwell by the coast and fjords, and about one-quarter in the inland lowlands, leaving a very small upland population. The rural and urban populations form respectively about 76 and 24% of the whole. Of the chief towns of Norway, Christiania, the capital, had a population in 1900 of 229,101, Bergen of 72,179, Trondhjem of 38,156, Stavanger of 30,541, Drammen of 23,093. The towns with populations between 15,000 and 10,000 are Christiansand, Fredrikstad, Christiansund, Fredrikshald, Aalesund, Skien, Arendal and Laurvik. All these are ports.

The population of Norway in 1801 was returned as 883,038. A rapid increase obtained from 1815 to 1835, a lesser increase thereafter till 1865, and a very slight increase till 1890. The second half of the 19th century, down to 1890, was the period of heaviest emigration from Norway. The vast majority of Norwegian emigrants go to the United States of America. But emigration slackened in the last decade of the 19th century, during which period the movement from rural districts to towns, which had decreased from about the middle of the century, revived. The number of Norwegians abroad may be taken at 350,000. The Lapps, commonly called Finns by the Norwegians, and confined especially to Finmarken (which is named from them), are estimated at 1% of the population. There are also a few Finns (about half the number of Lapps), whom the Norwegians call *Kvæner*, a name of early origin. The excess of births over deaths, about as 1·4 to 1, is much above the European average; the death-rate is also unusually low. The number of marriages is rather low, and the average age of marriage is high. The percentage of illegitimacy has shown some increase, but is not so high as in Sweden or Denmark. The percentage of longevity is high. The preponderance of females over males (about 1073 to 1000) is partly accounted for by the number of males who emigrate. The higher mortality of males is traced in part to the dangers of a seafaring life.

Down to the middle of the 19th century drunkenness was a strongly-marked characteristic of Norwegians. A strict licensing system was then introduced with success. Local boards were given a wide control over the issue of licences, and in 1871 companies (*samlag*) were introduced to monopolize and control the retail trade in spirits. Their profits do not, as in the Gothenburg system, go to the municipal funds, but are applied directly to objects of public utility. In 1894 a general referendum resulted in the entire prohibition of the sale of spirits in some towns for five years. The control of retail trade in beer and wine by the *samlag* has been introduced to some extent.

In Norway a strongly individual national character is to be expected, combined with conservatism of ancient customs and practices. The one finds no better illustration than the individuality of modern Norwegian music and painting. The other is still strong. Such customs as the lighting of the midsummer fires and the attendant celebrations still survive. Peculiar local costumes are still met with, such as those associated with weddings. In the coastwise shipping trade and the fisheries of the north, high-prowed square-sailed boats are frequently employed which are the direct descendants of the vessels of the early vikings. Some examples of the ancient farmstead, composed of a group of wooden buildings each of a single chamber, are preserved, and medieval ornamental woodwork is met with. Wood is the principal building material except in some larger towns where brick and stone have superseded it. Where this is not the case, fires have left few, if any, ancient domestic buildings, but the preservation of ancient models in wooden houses makes Norwegian towns peculiarly picturesque. Norway retains a few highly interesting examples of ecclesiastical architecture. There are the peculiar small wooden churches (*stavekirke*) dating from the 11th to the 14th century, with high-pitched roofs rising in tiers so as to give the building something of the form of a pyramid. The roofs are beautifully shingled in wood. The wall timbers are vertical. To protect them from the weather, the roofs overhang deeply, and the lowest sometimes covers a species of external colonnade. The carving is often very rich. The most famous of these churches is that of Borgund near Lærdalsören; another fine example is at Hitterdal on the Kongsberg-Telemark road. On the other hand there are a few Romanesque and Gothic stone churches. In some of these the influence of English architecture is clear, as in the metropolitan cathedral of Trondhjem and the nave of Stavanger cathedral. St Mary's Church at Bergen, however, tends towards the French models. A good example of the smaller stone church is at Vossevangen, and there are several of Late Romanesque character in the Trondhjem district. There are ruins of a cathedral at Hamar, and a few monastic remains, as at Utstein, north of Stavanger, and on the island of Selje off Statland. Remains of pure Early English work are occasionally found, as at Ogne in Jæderen, but the later Gothic styles were not developed in Norway.

Routes.

Tourist Traffic and Communications.—During the later decades of the 19th century Norway was rapidly opened up to British, American and German visitors. Passenger communications from Great Britain are maintained chiefly between Hull and Stavanger, Bergen, Aalesund, Christiansund and Trondhjem; Hull, Christiansand and Christiania; Newcastle and Stavanger, Bergen and the North; London and Christiania, &c., and there are also passenger services from Grimsby, Grangemouth and other ports. Yachting cruises to the great fjords and the North Cape are also provided. A daily service of mail steamers works between Christiania and all ports to Bergen; thence the summer service is hardly less frequent to Trondhjem. From each large port small steamers serve the fjords and inner waters in the vicinity, and there are also

Roads.

steamers on several of the larger lakes. The season lasts from June to the middle of September. The voyage to the North Cape is taken by many in order to see the "midnight sun" in June and July. Among the land-routes connecting the great fjords of the west the following may be mentioned. (1) The road from Sand on Sandsfjord (a branch of Bukken Fjord), which follows the Sand river up to the foot of Lake Suldal, near the head of which is Næs. From here a finely engineered road runs up the Bratlandsdal, crosses the Horrebrække and descends past Seljestad to Odde at the head of a branch of Hardanger Fjord. (2) From Eide on another branch of the same fjord a road runs to Vossevangen (which is connected by rail with Bergen) and continues N. to Stalheim, where it descends through the Nærödal to Gudvangen on a branch of Sogne Fjord. (3) From Vadheim on this fjord a road runs N. to Sandene and Utvik on Nordfjord. Routes N. from this fjord are (4) that from Faleide by Grodaas on Lake Hornindal to Hellesylt on Sunelv Fjord and Öje on Norangs Fjord, and (5) that from the same station or from Visnæs, by way of Lake Stryn, to Grotlid, and Merok on Geiranger Fjord. All these routes pass through magnificent scenery. For the same reason there should also be mentioned (6) the road through the Telemark, which branches from the Bratlandsdal road at Breifond, mounts the Haukelidsæter and descends to Dalen, from which the Bandaks canal route gives access to Skien on the S.E. coast, the road continuing from Dalen E. to Kongsberg; also those running E. from the great fjords—from Lærdalsören on Sogne Fjord, branching (7) through Hallingdal, and (8) through Valdres; (9) the road from Grotlid to Otta in Gudbrandsdal, running N. of the Jotunheim; (10) the road from Veblungsnæs on a branch of Molde Fjord, running through the Romsdal and over to Domaas; (11) the N. road across Dovre Fjeld from Domaas to Stören on the railway to Trondhjem. Beyond the districts thus indicated, the Sætersdal, a southern valley, is visited by many, and in the far N. the Lofoten Islands and some of the fjords, as Lyngen and Alten, are very fine. The mountains of Jotunheim have attracted several well-known mountaineers.

The main roads of Norway, the construction of which has demanded the highest engineering skill, were not brought into existence until the last half of the 19th century. A Highways Act of 1851 placed the roads under the immediate control of local authorities, but government grants are made for the construction not only of main roads, but in many cases of cross-roads also. In a country where railways are few, posting is of prime importance, and in Norway the system is well developed and regulated. Along all main roads there are posting stations (*skydsstationer*, pronounced shüss-stashōner), hotels, inns or farms, whose owners are bound to have horses always in readiness; at some stations on less frequented roads time is allowed for them to be procured. Posting stations are under strict control and the tariff is fixed. The vehicles are the *stolkjærre* (pronounced approximately stolchārer) for two passengers, and the *kariol* or *carriole* for one. A similar posting system obtains by rowing-boats on lakes and fjords.

Railways.

The first railway, that between Christiania and Eidsvold, was constructed by agreement between British capitalists and the Norwegian government, and opened in 1854. The total length of railways is only about 1600 m., Norway having the lowest railway mileage in proportion to area of any European state, though in proportion to population the length of lines is comparatively great. Almost the whole are state lines. Railways are most fully developed in the S.E., both N. and S. of Christiania. The principal trunk line connects Christiania with Trondhjem by way of Hamar and the Osterdal, Röros and Stören. Four lines cross the frontier into Sweden—from Christiania by Kongsvinger (Kongsvinger railway) and by Fredrikshald (Smaalenenes railway), from Trondhjem by Storlien (Meraker railway), and from Narvik on Ofoten Fjord, the most northerly line in the world. Among other important lines may be mentioned that serving Lillehammer, Otta, &c., in Gudbrandsdal, that running S.W. from Christiania to Drammen, Skien and Laurvik; the Sætersdal line N. from Christiansand; the Jæderen line from Stavanger to Egersund and Flekkefjord; the Bergen-Vossevangen line; and the branch from Hell on the Meraker railway northward to Levanger. These local lines form links in important schemes for trunk lines. Norwegian railways are divided between the standard gauge and one of 3 ft. 6 in.; on the N. line a change of gauge is made at Hamar.

Canals.

Some of the large lakes form important channels for inland navigation; the rivers, however, are not navigable for any considerable distance. A canal from Fredrikshald gives access N. to Skellerud, and the Bandaks canal connects Dalen in the Telemark with Skien.

The post-office is well administered, and both telegraph and telephone systems are exceptionally extensive.

INDUSTRIES. *Agriculture.*—About 70% of the total area of Norway is barren, and about 21% is forest land, but the small agricultural area employs, directly or indirectly, about 40% of the population. The great majority of the peasantry are freeholders. Legislation has provided for the retention of landed property by families to which it has belonged for any considerable period—thus, under certain conditions, a family which has parted with land can reacquire it at an appraisement—or land alienated by its owner may on his death be acquired by his next of kin. The chief crops are oats, barley, potatoes, *mangcorn* (a mixed crop of oats and barley), rye and wheat, the last being little cultivated. Cattle and sheep are kept in large numbers. Farmers commonly hold upland summer pastures together with their lowland farms, and in the open season frequently occupy a *sæter* (upland farmstead) and devote themselves to dairy work. Norwegian horses are small and thick-set, and remarkably sure-footed. In the north large herds of reindeer are kept by Lapps. There is an agricultural college and model farm at Aas near Christiania.

Forestry.—Forest industries are confined chiefly to the S.E. and to the Trondhjem-Namsen district. Lumbering is an important industry. Forestry is controlled by the Department of Agriculture, and its higher branches are taught at the Aas college.

Fisheries.—The sea fisheries are of high economic importance. The principal are the cod fisheries. In March and April the cod shoal on the coastal banks for the purpose of spawning, and this gives rise to the well-known fishery for which the Lofoten Islands are the principal base. In April and May shoals of capelan appear off Finmarken, followed by cod and other fish, small whales, &c., which prey upon them; this affords a second fishery. For herring there is a spring fishery off Stavanger and Haugesund, and one in November and December off Nordland. Mackerel fisheries are important from Trondhjem Fjord S. to the Skagerrack. Salmon and sea-trout fisheries are important in the rivers and still more off the coast. Fishermen from Tönsberg, Tromsö, Hammerfest, Vardö, Vadsö, &c., work with the arctic fisheries, sealing, whaling, &c., from Greenland to Spitsbergen and Novaya Zemlya. A fishery board at Bergen administers the Norwegian fisheries. The annual value of the coast fisheries ranges from £1,000,000 to £1,500,000.

Mining.—Norway is not rich in minerals. Coal occurs only on Andö, an island in Vesteraalen. Silver is mined at Kongsberg; copper at Röros, Sulitelma, and Aamdal in Telemarken; iron at Klodeberg near Arendal and in the Dunderlandsdal (developed early in the 20th century). Granite is quarried near Fredrikstad, Fredrikshald and Sarpsborg, and exported as paving setts and kerbstones, mostly to Great Britain and Germany. Good marble is found near Fredrikshald, and also in the Salten and Ranen districts.

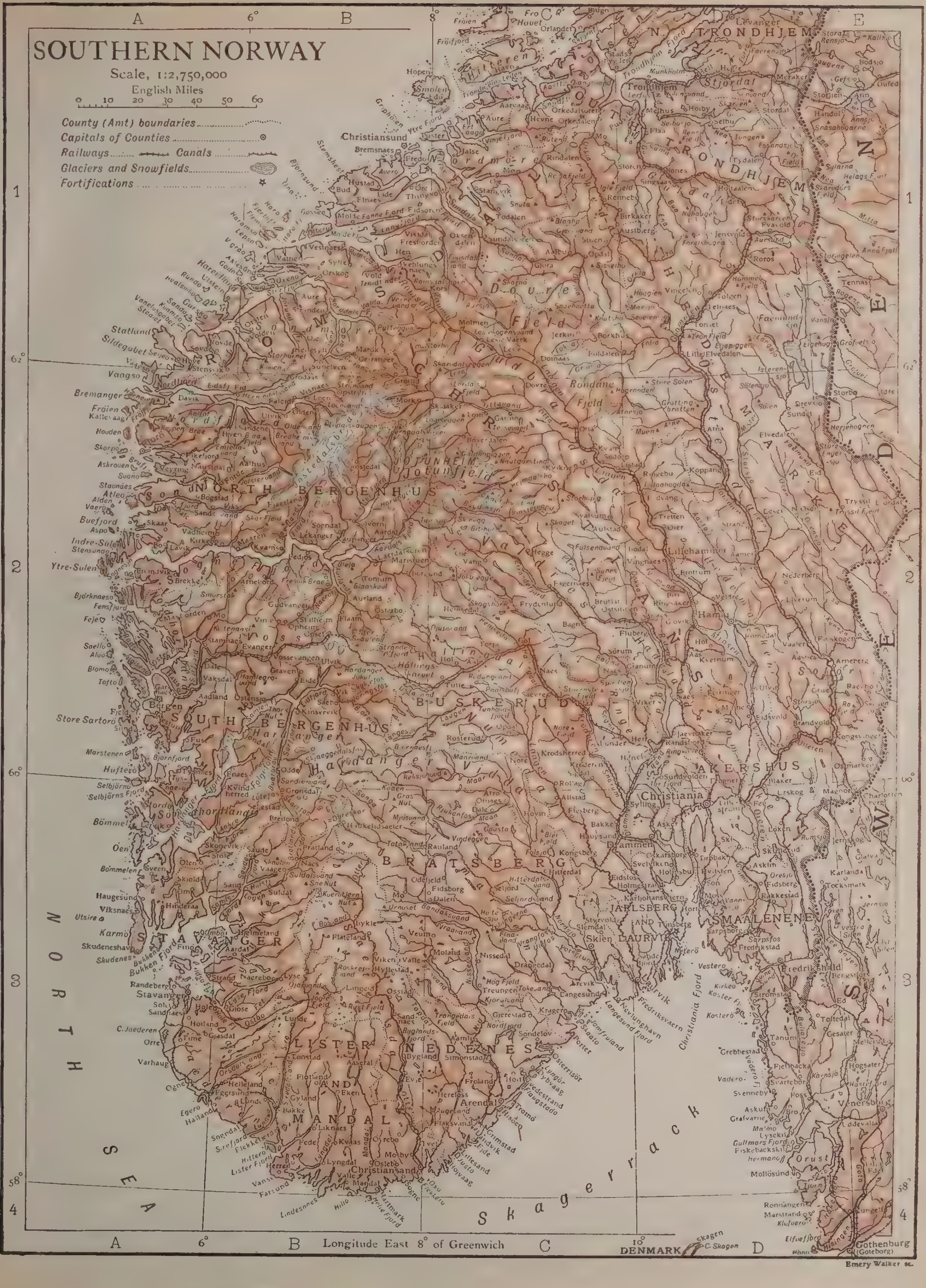
Manufacturing Industries.—The most important are works connected with the timber trade, foundries and engineering shops, spinning and weaving mills, brick and tile works, breweries, paper-mills, tobacco factories, flour-mills, glass works, and potteries, nail works, shipbuilding yards, rope works, factories for preserved food (especially fish), margarine, matches, fish guano, boots, and hosiery, distilleries and tanneries. The chief industrial centres are Christiania, Bergen, Fredrikstad and Sarpsborg, Drammen, Skien and Porsgrund, Trondhjem, Fredrikshald and Stavanger. Large water-power is available in many districts. A powerful impulse was given to industrial enterprise by the non-renewal of the customs treaty with Sweden in 1897, which established a protective system against that country.

Shipping and Commerce.—The Norwegians, in proportion to their numbers, are the first nation in the world in the mercantile marine industry. Actually their mercantile marine is only exceeded by those of Great Britain, Germany and the United States. From 1850 to 1880 the tonnage increased from 289,000 to more than 1,500,000. The tonnage now exceeds the latter figure, but steam has greatly increased the carrying power. In 1880 Norwegian steam vessels had a tonnage of about 52,000; they now exceed 640,000 tons. The annual value of imports is about £16,500,000, and of exports about £10,000,000. The growth of both may be judged from periodic averages—

	1851–1855.	1866–1870.	1886–1890.
Imports	£2,800,000	£5,600,000	£9,200,000
Exports	2,400,000	3,000,000	6,600,000

Great Britain and Germany are the countries principally trading with Norway. Great Britain takes about 40% (by value) of Norwegian exports, and sends about 26% of the total imports into Norway; Germany takes 14% of the exports, and sends 28% of the imports. The chief articles of export are timber, wooden wares and wood pulp, principally to Great Britain, and fish products, principally to Germany, Sweden and Spain. These make 65% of the exports—others of importance are paper, ships, ice, stone and nails. Of the imports about 58% by value are for consumption, 42% material for production. Among the first are cereals (principally from Russia), groceries (from Germany), and clothing (from Germany and Great Britain). Among the second are coal (chiefly from Great Britain), hides and skins, cotton and wool, oil and machinery, steamships, and metal goods (from Great Britain, Germany and Sweden).

Government.—Norway is an independent, constitutional and hereditary monarchy, the union with Sweden having been dissolved on the 7th of June 1905, after lasting 91 years. The constitution rests on the fundamental law (*grundlov*) promulgated at Eidsvold on the 17th of May 1814, and altered in detail at various times. The executive is vested in the king, who



SOUTHERN NORWAY

Scale, 1:2,750,000

English Miles

0 10 20 30 40 50 60
County (Amt) boundaries
Capitals of Counties
Railways
Canals
Glaciers and Snowfields
Fortifications
A
B
C
D
E
1
2
3
4
6°
8°
10°
62°
60°
58°
Longitude East 8° of Greenwich
N. TRONDHJEM
S. TRONDHJEM
ROMSDAL
NORDRE BERGENHUS
SOUTH BERGENHUS
CHRISTIANS
HEDEMARKEN
BUSKERUD
AKERSHUS
BRATSBERG
JARLSBERG AND LAURVIK
SMAALENENE
STAVANGER
LISTER AND MANDAL
NEDENES
SWEDEN
NORTH SEA
Skagerrack
DENMARK
Trondhjem
Christiansund
Bergen
Christiania
Stavanger
Christiansand
Drammen
Hamar
Lillehammer
Arendal
Gothenburg (Göteborg)
Skagen
C. Skagen
Lindesnaes
Dovre Fjeld
Jotunheim
Jotun Fjeld
Hardanger
Sogne Fjord
Mjösen
Fredrikshald
Fredrikstad
Sarpsborg
Kongsberg
Skien
Laurvik
Röros
Levanger

Emery Walker sc.

comes of age at eighteen. His authority is exercised through, and responsibility for his official acts rests with, a council of state consisting of a minister and councillors, who are the heads of finance, public accounts, church and education, defence, public works, agriculture, commerce, navigation and industry and foreign affairs. The king appoints these councillors and high officials generally in the state, church, army, navy, &c. He can issue provisional ordinances pending a meeting of parliament, can declare war (if a war of offence, only with the consent of parliament) and conclude peace, and has supreme command of the army and navy. The legislative body is the parliament (*storthing*), the members of which are elected directly by the people divided into electoral divisions, each returning one member. Until the election of 1906 the members were chosen by electors nominated by the voters. Elections take place every three years. The franchise is extended to every Norwegian male who has passed his twenty-fifth year, has resided five years in the country, and fulfils the legal conditions of citizenship. Under the same conditions, and if they or their husbands have paid taxes for the past year, the franchise is extended to women under a measure adopted by the Storthing in June 1907. Members of parliament must possess the franchise in their constituency, and must have resided ten years in the country; their age must not be less than thirty. The Storthing meets at Christiania, normally for two months in each year; it must receive royal assent to the prolongation of a session. After the opening of parliament the assembly divides itself into two sections, the upper (*lagthing*) consisting of one-quarter of the total number of members, and the lower (*odelsthing*) of the remainder. Every bill must be introduced in the Odelsthing; if passed there it is sent to the Lagthing, and if carried there also the royal assent gives it the force of law. If a measure is twice passed by the Odelsthing and rejected by the Lagthing, it is decided by a majority of two-thirds of the combined sections. The king has a veto, but if a measure once or twice vetoed is passed by three successive parliaments it becomes law *ipso facto*. This occurred when in 1899 the Norwegians insisted on removing the sign of union with Sweden from the flag of the mercantile marine. Members of parliament are paid 13s. 4d. a day during session and their travelling expenses. Parliament fixes taxation, and has control of the members of the council of state, who are not allowed to vote in either house, though they may speak.

Finance, &c.—The annual revenue and expenditure are each about $5\frac{1}{2}$ millions sterling. Considerable sums, however, have been raised by loans, principally for railways. These amounted, between 1900 and 1906 (the financial year ending the 31st of March) to nearly £4,500,000. The principal sources of revenue are customs, railways, post office and telegraphs, the income tax (which is graduated and not levied on incomes below 1000 kroner or £55, 6s. 8d.), and excise. The principal items of expenditure are railways, defence (principally the army), the post office, interest on debt, the church and education, and justice. The Bank of Norway is a private joint-stock corporation, in which the state has large interests. It is governed by special acts of parliament, and its chief officials are publicly appointed. It alone has the right to issue notes, which are in wide circulation. The Mortgage Bank (*Norges Hypothekbank*) was established by the state to grant loans on real estate. The currency of Norway is based on a gold standard; but the monetary unit is the *krone* (crown), of 1s. $1\frac{1}{3}$d. value, divided into 100 *öre*. The metric system is in use.

Army and Navy.—The army consists of the line, the militia or reserve (*landværn*), and the second reserve (*landstorm*). All capable men of twenty-two years of age and upwards are liable for conscription (except the clergy and pilots), and when called they serve 6 years in the line, 6 years with the reserve and 4 years with the second reserve. In war, men are liable to service from the 18th to the 50th year of age. Only the line can be sent out of the country. The men only meet for military training from 18 to 102 days in each year. The peace establishment of the line is 12,000 men, with 750 officers; its war footing 26,000, or more, but may not exceed 18,000 without the authority of parliament. Of enlisted troops there are only fortress garrisons, and the Christiania garrison of Norwegian Guards. The principal fortresses are Oscarsborg on Christiania Fjord, Agdenes (Trondhjem Fjord), Bergen, Tönsberg and Christiansand. A number of Norwegian forts along the S. Swedish frontier were dismantled under the convention with Sweden of 1905, when a neutral zone was established on either side of the frontier southward from 61° N. The navy consists of about 1200 officers and men on permanent service; but all seafaring men between twenty-two and thirty-eight are liable for maritime conscription, and are put through some preliminary training. The war vessels include four battleships of 3500 to 4000 tons each, and about 16 other vessels, besides a torpedo flotilla—intended for coast defence only. The chief naval station is at Karljohansværn (Horten).

Justice.—Civil cases are usually brought first before a commission of mediation (*forligelseskommission*), from which an appeal lies to the local inferior courts, which are also tribunals of first instance, and are worked by judges on circuit and assessors. There are three superior courts of appeal (*overretter*), at Christiania, Bergen and Trondhjem, and one supreme court (*höiesteret*). Criminal cases are tried either in jury courts (*lagmandsret*) or courts of assize (*meddomsret*). The first is for more serious offences; the second deals with minor offences and is a court of first instance. Military crimes are dealt with by a military judicial organization. Finally there is a high court of impeachment (*rigsret*), before which members of parliament, the government, &c., are tried for misdemeanours committed in their public capacity.

Local Government.—The country is divided into twenty counties (*amter*) (see population), the cities of Christiania and Bergen being included in these. Other towns are formed into communes, governed by representatives, from whom a council (*formænd*) is elected by themselves. Rural communes (*herreder*) are similarly administered, and their chairmen form a county council (*amtsthing*) for each county. At the head is the *amtmand*, the county governor. The electoral franchise for local council election is for men the same as the parliamentary franchise, and, like it, is extended in a limited degree to women.

Religion and Education.—The state religion, to which the king must conform, is Evangelical Lutheran. Only about 2·4% of the population are dissenters. All Christian sects except Jesuits are tolerated. The king nominates the clergy of the established church. Norway is divided into six bishoprics (*stifter*), Christiania, Hamar, Christiansand, Bergen, Trondhjem, Tromsö; and these into deaneries (*provstier*), with subdivisions into clerical districts (*præstegjeld*), parishes and sub-parishes. The clergy take a leading part in primary education, which, in spite of the difficulties arising in a sparsely populated country, reaches a high standard. Education is compulsory, the school-going age being from $6\frac{1}{2}$ to 14 years in towns and 7 to 14 years in the country. About 94% of the children of school-going age attend the primary schools, which are administered by school boards in the municipalities and the counties. Teachers must belong to the established church. Their training colleges include one free public college in each diocese. The municipalities and counties bear the cost of primary education with a state grant. There are continuation schools, evening schools, &c., and for secondary education, communal middle schools, and state *gymnasier*. There is a state-aided university at Christiania.

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(O. J. R. H.)

History.

Early History.—Archaeological and geological researches have revealed a fishing and hunting population in Norway, possibly as far back as *c.* 6000 B.C. Until lately this aboriginal people, which was certainly non-Aryan, was held to be Lappish, but recent investigations seem to show that the Lapps only entered Norway about A.D. 900–1000, and that the original population was probably of Finnish race, though only distantly allied to the Ugro-Finns now inhabiting Finland. To them belong perhaps certain non-Aryan names for natural features of the country, such as Toten, Vefsen, Bukn.

Teutonic immigration.

The time of the immigration of a Teutonic element is far from certain. It did not extend N. beyond the Trondhjem district until about the beginning of our era, but there can be little doubt that the immigrants' advance was extremely slow, and it is suggested, on the evidence of archaeology, that the Teutonic element entered S. Norway towards the end of the (Scandinavian) later Stone age, *c.* 1700 B.C. (see SCANDINAVIAN CIVILIZATION). But whatever were the stages of the process, the language of the older race was superseded by Teutonic, and those aborigines who were not incorporated (probably most often as slaves) were driven into the mountains or the islands that fringe the coast. In the highlands the "Finns" maintained some independence down to historical times. The old English poem *Beowulf* mentions a "Finnaland" which should perhaps be located in S. Norway in about the 6th century, and later on the ancient laws of this region forbid the practice of visiting the "Finns" to obtain knowledge of the future. But only in Finmark, which even in the 13th century stretched far into Sweden and included the Norwegian district of Tromsö, could the earlier inhabitants live their old life, and here they finally fell into the utmost want and misery. Their existence is mentioned as a thing of the past by a North Trondhjem writer in 1689.

The new Teutonic element of population seems to have flowed into Norway from two centres; one western, probably from Jutland, the other eastern, from the W. coast of Sweden. The western stream covered Agder, Rogaland and Hordaland (the modern districts of Christiansand and Söndre Bergenhus), and finally extended N. as far as Söndmöre, while the eastern stream flowed across Romerike and Hadeland through the Dales to the Trondhjem district, where it divided, one stream flowing down the W. coast till it met the western settlements, another penetrating N. into Haalogaland (which included the modern Nordland as well as Helgeland), and a third E. into the N. Swedish districts of Jämtland and Helsingland. The bodies of immigrants were no doubt more or less independent, and each was probably under a king. It is probable that the Horder, who gave their name to Hordaland and Hardanger, were a branch of the Harudes whom Ptolemy in the 2nd century mentions as living in Jutland, where their name remains in the present Hardesyssel. The Ryger, who gave their name to Rogaland, and the modern Ryfylke, are probably akin to the Rugii, an E. Germanic tribe at one time settled in N.E. Pomerania, where we have a reminiscence of their name in Rügenwalde. The first mention of any tribe settled in Norway is by Ptolemy, who speaks of the Chaidenoi or Heiner, inhabiting the W. of his island Scandia. The system of settlement in Norway appears to have been different from that adopted by the same race in other lands. In Denmark, for instance, a group of as many as twenty settlers held land more or less in common, but this system, which demanded that a considerable extent of land should be readily accessible, was not feasible in the greater part of Norway, and except in one or two flatter districts each farm was owned, or at least worked, by a single family.

Early kingship.

When history first sheds a faint light over Norway we find each small district or "fylke" (Old Norse *fylkir*, from *folk*, army) settled under its own king, and about twenty-nine *fylker* in the country. At times a king would win an overlordship over the neighbouring tribes, but the character of the country hindered permanent assimilation. The king always possessed a *hird*, or company of warriors sworn to his service, and indeed royal birth and the possession of such a *hird*, and not land or subjects, were the essential attributes of a king. There was no law of primogeniture, and on the death of a king some of his heirs would take their share of the patrimony in valuables, gather a *hird*, and spend their lives in warlike expeditions (see VIKINGS), while one would settle down and become king of the fylke. There are indications that these conditions were fostered by a matriarchal system, and that it would often occur that a wandering king would marry the daughter of a fylkes-king and become his heir. Probably the king's power was only absolute over his own *hird*. He was certainly commander-in-chief and perhaps chief priest of the fylke, but the administrative power was chiefly in the hands of the *herser* and possibly of an earl. The position of earls is vague, but it is noticeable that both those of whom we hear in Harald Haarfager's time take the opposite side to their king. The *herser* (Old Norse *hersir*), of whom there were several in each fylke, united high birth with wealth and political power, and with the *holder*, the class of privileged hereditary landowners from which they sprang, formed an aristocracy of which there seems little trace in the other Scandinavian countries at this period. Its rise in Norway is perhaps due to the fact that the nature of the country, as well as the individualistic system of settlement, left more scope for inequalities of wealth than in Denmark or Sweden. Once a family had become wealthy enough to fit out Viking ships, it must have added wealth to wealth, besides enormously raising its prestige. The lands of almost all the most powerful families were on islands, whence it was easy to set forth on roving expeditions. The family property of the earls of Lade, for instance, whose representative in the latter half of the 9th century was the most powerful man of the district, was on the island of Nærö. These islands had been the refuge of the aborigines, and it is possible that, as A. Hansen has suggested, the rise of the aristocracy depends here, as elsewhere, on a subject population. Among the proper names of thralls in a poem in the Elder Edda are several which can only be explained on the hypothesis that they are Finnish, *e.g.* Klums, Lasmer, Drumba. Harald Haarfager's decree concerning "those who clear forests and burn salt, fishermen and hunters" probably refers to the Finns as a class apart. There can be no doubt that, in Haalogaland for instance, the aristocracy gained its wealth not only from the tribute extorted from the Finns in Finmark, but also from slave labour.

The eight Trondhjem *fylker* had a common *Thing* or assembly very early, but these districts were remote, while the wealthy western districts were too much cut off from each other to unite effectively, though here also a common Thing was early established. The first successful attempt at unification originated round Vestfold, the modern Jarlsberg and Laurvik Amt on the Christiania fjord. Here also there was a certain degree of union very early, and it is possible that national feeling was fostered by proximity to the Danish and Swedish kingdoms. The district was thickly populated, and a centre of commerce. Tradition made the royal family a branch of the great Yngling dynasty of Upsala, which claimed descent from the god Frey. Through several generations this family had extended its kingdom by marriage, conquest and inheritance, and by the end of the reign of Halfdan the Black, it included the greater part of Hamar and Oslo Stift, and the fylke of Sogn, the district round the modern Sognefjord.

Harald Haarfager.

Halfdan's son, Harald Haarfager, having no brothers, succeeded to the whole kingdom, and was further fortunate in that an uncle helped him to maintain his rights. By 866 his power was so well established in S. Norway that he contemplated the conquest of the whole land. The chief obstacle appears to have been the resistance, not only of the petty kings, but also of the aristocratic families, who dreaded the power of a monarchy established by force, and consequently supported the vaguer authority of their own kinglets. There can be no doubt that Harald introduced a feudal view of obligations towards the king, and landowning families, who had regarded their *odel*, or inherited property, as absolutely their own, resented being forced to pay dues on it. In each district Harald offered the *herser* the opportunity of becoming his vassals, answerable to him for the government of the district. The increased dues and the grants of land made by Harald rendered the position of one of his earls more lucrative than that of king under the older system; and it shows to what a paramount position the old aristocracy must have attained, that numbers of the *herser* and *holder* could not reconcile themselves to the limitation of their independence, but quitted the lands which were their real title to influence, rather than submit to the new order. But the little kingdoms only made futile attempts at combination, except in the western districts of Agde (comprising the modern Lister and Mandal and Nedenæs), Rogaland and Hordaland. Here was the home of the "western Vikings" who for nearly a century had owed wealth and fame to their raids on the British Isles. Attack by land was impossible, and Harald had to gather men and ships for three years before he could meet the fleet of the allied kings at Hafsfjord. The battle (872) resulted in a victory to him, and with it all opposition in Norway was at an end. An expedition to Scotland and the Scottish isles (*c.* 891) dispersed enemies who could harry the Norwegian coast, many of them taking refuge in Iceland; and the earldom of the Orkneys and Shetlands became an appanage of the Norwegian Crown. For the moment the whole country was under a single king, but Harald himself destroyed his work, in accordance with old custom, by giving about twenty of his sons the title of king, and dividing the country among them, only qualifying this retrograde step by installing his favourite son Erik Blodöxe as over-king (930). Moreover, Harald had established no common Thing for the whole of his kingdom. Norway is naturally divided into three parts, and each of these remained more or less separate for centuries, even having separate laws until the second half of the 13th century. The Frostathing district (so called from Frosta near Trondhjem) included the eight Trondhjem *fylker*, and also Naumdal, Nordmöre and Raumsdal. The Gulathing district consisted of Söndmöre, Firdafylke, Sogn, Valdres, Hallingdal, Hordaland and Agde, and met at Gula in Hordaland. The third, the Eidsivathing, met on the shores of Lake Mjösen, and included the Uplands and also the "Vik," *i.e.* all the districts round Christiania fjord, until St Olaf established the Borgarthing at Sarpsborg as a centre for these latter. The king's council was composed of the local *lendermænd*, and thus varied with the district he happened to be visiting, an arrangement that had its advantages, since the local chiefs were acquainted with the laws of their district, though it was another hindrance to unification. It was only in 1319 that a permanent council was formed, the *Rigets Raad*.

Haakon the Good.

Harald died in 933. Erik Blodöxe (Bloody-axe) only managed to rid himself of two rival over-kings, Olaf and Sigfred, his half-brothers, for on hearing of his father's death, another son, Haakon (*q.v.*), called the Good, who had been brought up at Æthelstan's court, came to Norway with a small force and succeeded in ejecting Erik (934). After Haakon's death in 961 at the battle of Fitje, where his long struggle against Erik's sons and their Danish allies terminated, these brothers, headed by Harald Graafeld (grey-cloak) became masters of the W. districts, though the ruling spirit appears to have been their mother Gunhild. Earl Sigurd of Lade ruled the N., and the S. was held by vassal kings whom Haakon had left undisturbed. By 969 the brothers had succeeded in ridding themselves of Sigurd and two other rivals, but the following year Harald Graafeld was lured to Denmark and treacherously killed at the instigation of Earl Haakon, son of Sigurd, who had allied himself with the Danish king Harald Gormssön. With the latter's support Earl Haakon won Norway, but threw off his yoke on defeating Ragnfred Erikssön at Tingenes in 972. The S.E. districts were, however, still held by Harald Grenske, whose father had been slain by the sons of Erik. Haakon ruled ably though tyrannically, and his prestige was greatly increased by his victory over the Jomsvikings, a band of pirates inhabiting the island of Wollin at the mouth of the Oder, who had collected a large fleet to attack Norway. The date of their defeat at Hjörungavaag, now Lidvaag, is uncertain. But finally the earl's disregard of the feelings of the most powerful "bonder," or landed proprietors, worked them up to revolt, and, in 995, there landed in Norway Olaf, great-grandson of Harald Haarfager and son of the king Tryggve of the Vik whom Gudröd Eriksson had slain, and whose father Olaf had been slain by Erik Blodöxe.

Introduction of Christianity by Olaf.

The earl was treacherously killed by his thrall while in hiding, and Olaf entered unopposed upon his short and brilliant reign. His great work was the enforced conversion to Christianity of Norway, Iceland and Greenland. In this undertaking both Olaf and his successor and namesake looked for help to England, whence they obtained a bishop and priests; hence it comes that the organization of the early church in Norway resembles that of England. No more than England did Norway escape the struggle between Church and State, but the hierarchical party in Norway only rose to power after the establishment of an archiepiscopal see at Trondhjem in 1152, after which the quarrel raged for over a century. Until the year 1100, when tithes were imposed, the priests depended for their livelihood on their dues, and Adam of Bremen informs us that this made them very avaricious.

Relations with Denmark.

In the year 1000 Olaf fell at the battle of Svolder off Rügen, fighting against the combined Danish and Swedish fleets. The allies shared Norway between them, but the real power lay in the hands of Erik and Svein, sons of Earl Haakon. In 1015, when Erik was absent in England, another descendant of Harald Haarfager appeared, Olaf, the son of Harald Grenske, a great-grandson of Harald Haarfager (see OLAF II. HARALDSSÖN). He defeated Svein at Nesje in 1016, which left him free to work towards a united and Christian Norway. For some years he was successful, but he strained the loyalty of his subjects too far, and on the appearance of Knut the Great in 1029 he fled to Russia. His death at the battle of Stiklestad on his return in 1030 was followed by a few years of Danish rule under Svein Knutssön, which rendered Olaf's memory sweet by contrast, and soon the name of St Olaf came to stand for internal union and freedom from external oppression. In 1035 his young son Magnus, afterwards called the Good, was summoned from Russia, and was readily accepted as king. A treaty was made with Hardeknut which provided that whichever king survived should inherit the other's crown. Hardeknut died in 1042, and Magnus became king of Denmark, but a nephew of Knut the Great, Svein Estridssön, entered into league with Harald Haardraade (see HARALD III.), the half-brother of St Olaf, who had just returned from the East. As soon, however, as overtures were made to him by Magnus, he forsook the cause of Svein, and in 1046 agreed to become joint king of Norway with Magnus. The difficulties arising out of this situation were solved by Magnus's death in 1047.

End of Harald Haarfager's line.

Harald's attempts to win Denmark were vain, and in 1066 he set about a yet more formidable task in attacking England, which ended with his death at Stamford Bridge in 1066. His son Olaf Kyrre (the Quiet) shared the kingdom with his brother Magnus until the latter's death in 1069, after which the country enjoyed a period of peace. A feature of this reign is the increasing importance of the towns, including Bergen, which was founded by Olaf. In 1093 Olaf was succeeded by his turbulent son Magnus Barfod (barefoot) and by Haakon, son of Magnus the Good. The latter died in 1095. Besides engaging in an unsuccessful war against the Swedish king Inge, in which he was defeated at Foxerne in 1101, Magnus undertook three warlike expeditions to the Scottish isles. It was on the last of these expeditions, in 1103, that he met his death. He was succeeded by his three sons, Eystein, Sigurd and Olaf. Olaf died young. Sigurd undertook a pilgrimage, from which he gained the name of Jorsalfar (traveller to Jerusalem). He won much booty from the Moors in Spain, from pirates in the Mediterranean, and finally at Sidon, which he and his ally Baldwin I. of Jerusalem took and sacked. Eystein died in 1122. Sigurd lived till 1130, but was subject to fits of insanity in his later years. He was the last undoubted representative of Harald Haarfager's race, for on his death his son Magnus was ousted by Harald Gille, or Gilchrist, who professed to be a natural son of Magnus Barfod.

Disputed successions.

Harald Gille was slain in 1136 by another pretender, and anarchy ruled during the reign of his sons Eystein, Inge and Sigurd Mund. At last Inge's party attacked and killed first Sigurd (1155) and then Eystein (1157). Inge fell in a fight against Sigurd's son Haakon Herdebred in 1161, but a powerful baron, Erling, succeeded in getting his son Magnus made king, on the plea that the boy's maternal grandfather was King Sigurd Jorsalfar. Descent through females was not valid in succession to the throne, and to render his son's position more secure, Erling obtained the support of the Church. In 1164 the archbishop of Trondhjem crowned Magnus, demanding that the crown should be held as a fief of the Norwegian Church. Owing to such concessions the Church was gaining a paramount position, when a new pretender appeared. Sverre (O.N. Sverrir) claimed to be the son of Sigurd Mund, and was adopted as leader by a party known as the Birkebeiner or Birchlegs. He possessed military genius of a rare order, and in spite of help from Denmark, the support of the Church and of the majority of barons, Magnus was defeated time after time, till he met his death at the battle of Nordnes in 1184. The aristocracy could offer little further opposition. In joining hands with the Church against Sverre, the local chiefs had got out of touch with the small landowners, with whose support Sverre was able to build up a powerful monarchy. Sverre's most dangerous opponent was the Church, which offered the most strenuous resistance to his efforts to cut down its prerogatives. The archbishop found support in Denmark, whence he laid his whole see under an interdict, but Sverre's counter-claim of his own divine right as king had much more influence in Norway.

Magnus.

Sverre died in 1202, his last years harassed by the rise of the Baglers, or "crozier-men," with a new claimant at their head. His son Haakon III. died two years later, perhaps of poison, but the Birkebeiner party in 1217 succeeded in placing Haakon's son and namesake on the throne (see HAAKON IV.). In 1240 the last of the rival claimants fell, and the country began to regain prosperity. The acquisition of Iceland was at length realized. Haakon's death occurred after the battle of Largs in the Orkneys in 1263. The war with Scotland was soon terminated by his son Magnus, who surrendered the Hebrides and the Isle of Man at the treaty of Perth in 1268. Magnus saw the worthlessness of a doubtful suzerainty over islands which had lost their value to Norway since the decay of Viking enterprise. He gained his title of Law-Mender from the revision of the laws, which had remained very much as in heathen days, and which were still different for the four different districts. By 1274 Magnus had secured the acceptance of a revised compilation of the older law-books. The new code repealed all the old wergild laws, and provided that the major part of the fine for manslaughter should be paid to the victim's heir, the remainder to the king. Henceforward the council comes more and more to be composed of the king's court officials, instead of a gathering of the *lendermænd* or barons of the district in which the king happened to be. During Magnus's reign we hear of a larger council, occasionally called *palliment* (parliament), which is summoned at the king's wish. The old landed aristocracy had lost its power so completely that even after Magnus's death in 1280 it was unable to reinstate itself during the minority of his son Erik.

Paralysis of the aristocracy.

Erik was succeeded in 1299 by his brother Haakon V., who in 1308 felt himself strong enough to abolish the dignity of the *lendermænd*. This paralysis of the aristocracy is no doubt partly to be ascribed to the civil wars, but in part also to the gradual impoverishment of the country, which told especially upon this class. Russia had long eclipsed Norway as the centre of the fur trade, and other industries must have suffered, not only from the civil wars, but also from the supremacy of the Hanseatic towns, which dominated the North, and could dictate their own terms. In earlier times the aristocratic families had owed their wealth to three main sources: commerce, Viking expeditions and slave labour. Trade had been a favourite means of enrichment among the aristocracy up to the middle of the 13th century, but now it was almost monopolized by Germans, and Viking enterprise was a thing of the past. The third source of wealth had also failed, for it is clear from the laws of Magnus that the class of thralls had practically disappeared. This must have greatly contributed to shatter the power of the class which had once been the chief factor in the government of Norway.

Union of Norwegian, Swedish, and Danish thrones.

Haakon's daughter Ingeborg had married Duke Erik of Sweden, and on Haakon's death in 1319 their three-year-old son Magnus succeeded to the Norwegian and Swedish thrones, the two countries entering into a union which was not definitely broken till 1371. It was during this reign that Norway was ravaged by the Black Death. In 1343 Magnus handed over the greater part of Norway to his son Haakon VI., who married Margrete, daughter of King Valdemar III. of Denmark. Their young son Olaf V., already king of Denmark, succeeded to his father's throne on Haakon's death in 1380, but died in 1387, leaving the royal line extinct, and the nearest successor to the throne the hostile King Albrecht of Sweden, of the Mecklenburg family. The difficulty was met by filling the throne by election—an innovation in Norway, though it was the custom in Sweden and Denmark. The choice fell on King Haakon's widow Margrete, but a couple of years later, chiefly in order to gain German support in a coming struggle with the Mecklenburgers, the Norwegians elected as king the young Erik of Pomerania, great-nephew of the queen, who henceforth acted as regent. Erik had claims on the Swedish and Danish thrones, and in 1397, at Kalmar, he was solemnly crowned king over the three countries, which entered into a union "never to be dissolved."

Reigns of the Kings of Norway.

Harald (I.) Haarfager	972–930	(d. 933)
Erik Blodöxe	930–934	
Haakon (I.) den Gode	935–961	
Harald (II.) Graafeld	961–970	
(Earl Haakon of Lade 970–995)		
Olaf (I.) Tryggvessön	995–1000	
(Earls Erik and Haakon 1000–1016)		
Saint Olaf (II.)	1016–1029	(k. 1030)
Svein, son of Knut the Great	1030–1035	
Magnus (I.) den Gode	1035–1047	
Harald (III.) Haardraade	1046–1066	
Olaf (III.) Kyrre	1066–1093	
Magnus (II.)	1066–1069	
Magnus (III.) Barfod	1093–1103	
Eystein (I.)	1103–1122	
Sigurd (I.) Jorsalfar	1103–1130	
Olaf (IV.)	1103–1116	
Magnus (IV.)	1130–1135	
Harald Gille	1130–1136	
Sigurd (II.) Mund	1136–1155	
Eystein (II.)	1136–1157	
Inge	1136–1161	
Haakon (II.) Herdebred	1161–1162	
Magnus (V.)	1162–1184	
Sverre	1184–1202	
Haakon (III.)	1202–1204	
Haakon (IV.) den gamle	1217–1263	
Magnus (VI.)	1263–1280	
Erik	1280–1299	
Haakon (V.)	1299–1319	
Magnus (VII.)	1319–1343	
Haakon (VI.)	1343–1380	
Olaf (V.)	1381–1387	
Margrete	1387–1389	
Erik of Pomerania	1389–	

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1397–1814.—The history of Norway from 1397 down to the union with Sweden in 1814 falls naturally into four divisions. First, in 1450, the triple bond gave place to a union in which Norway became more firmly joined to Denmark. Next, in 1536, as the result of the Reformation, Norway sank almost to the level of a province. After 1660 she gained something in status from the establishment of autocracy in Denmark, and at the close of the period she became a constitutional kingdom on a footing of approximate equality with Sweden. But for the convulsions to which some of these changes gave rise, Norway possesses during this period but little history of her own, and she sank from her former position as a considerable and independent nation. The kings dwelt outside her borders, her fleet and army decayed, and her language gradually gave place to Danish. Germans plundered her coasts and monopolized her commerce, and after 1450 Danes began to appropriate the higher posts in her administration. When in 1448 Karl Knutsson was chosen king by the Swedes, and Christian of Oldenburg by the Danes, it was by force that Norway fell to the latter. On the 24th of November 1449 the Norwegians protested against Christian's assumption of sovereignty over them, and against separation from the Swedes. Next year, however, the Swedes assented to the separation. Christian I. (1450–1481) gave estates and offices in Norway to his Danish subjects and raised money by pawning her ancient possessions, the Orkneys and Shetland islands, to the king of Scotland. His son Hans (1482–1513) purchased the obedience of the Norwegian nobles by concessions to their power. The imposing union continued in name, but the weakness of the nation and its government was strikingly illustrated when the Germans in Bergen besieged a monastery in which their enemy Olaf Nilsson, a high official, had taken refuge.

15th century.

After the downfall of Christian II. (1513–1524) the position of Norway in relation to Denmark was changed for the worse. She was ruled for a century and a quarter by Danish officials; the churches and monasteries of Norway were sacked by Danes, and Danes were installed as pastors under the Lutheran system, which the Norwegians were compelled to accept in 1539. Soon Norway was dragged by Denmark into the so-called Seven Years' War of the North (1563–70). However, the power of the Hanse League in Bergen was broken. The rule of the Oldenburg dynasty proved neglectful rather than tyrannical, and under it the mass of the peasants was not flagrantly oppressed. Christian IV. (1588–1648), who founded Christiania, may almost be said to have discovered Norway anew. He reformed its government and strove to develop its resources, but his policy involved Norway in the loss of the provinces of Jemtland and Herjedalen, which were ceded to the Swedes by the peace of Brömsebro (1645). The Danish war of revenge against Carl X. of Sweden resulted in further territorial loss by Norway. By the peace of Roskilde (1658) she was compelled to renounce the counties of Trondhjem and Baahus, and although the former was restored by the peace of Copenhagen, two years later, her population fell below half a million. The Swedes had now acquired the rich provinces in the south and south-west of the Scandinavian peninsula, and their ambition to extend their frontiers to the North Sea became more pronounced and more possible of accomplishment. From the middle of the 17th century, however, the Dutch and English made their influence felt, and the political status of Norway could no longer be regarded as a purely Scandinavian affair. The establishment of hereditary autocracy in Denmark by Frederick III. in 1660 conferred many benefits upon Norway. Personal liberty perhaps suffered, but the Norwegian peasant remained a freeman while his counterpart in Denmark was a serf. Norwegian law was revised and codified under Christian V. (1670–1699), who was well served by the Norwegians in his attempt to regain the lost provinces.

16th century.

17th century.

Under the sons of these monarchs, Frederick IV. and Carl XII., Norway was once more compelled to pay for Danish aggression. Her shipping was destroyed, and in 1716, when driven from continental Europe, the Swedish hosts fell upon her. Two years later, however, the death of Carl XII. at the border fortress of Frederikshald averted the danger. During this war Peter Tordenskjold, the greatest among a long series of Norwegian heroes who served in the Danish fleet, won undying fame. Before the close of the 18th century something had been done towards dispelling the intellectual darkness. Holberg, though he flourished outside Norway, was at least born there, and by stemming the tide of German influence he made the future of Norwegian literature possible. At the close of the century Hans Nielson Hauge, the Wesley of Norway, appeared, while the growth of the timber trade with England gave rise to a great increase in wealth and population. In a century and a half the number of the Norwegian people was doubled, so that by 1814 Norway comprised some 900,000 souls. In 1788 the oppressive law that grain should be imported into Norway only from Denmark was repealed, and thanks to Danish policy Norway actually drew financial profit from the wars of the French Revolution.

18th century.

The Norwegian national movement was to render a decade at the beginning of the 19th century more memorable in Norwegian history than any century which had passed since the Calmar Union. In 1800 the Danish government committed the Norwegians to the second Armed Neutrality, and therefore to a share in the battle of Copenhagen, by which it was broken up. It was not until 1807, however, that Norway was fully involved in the Napoleonic wars. Then, after the bombardment of Copenhagen, she was compelled by Danish policy to embrace the cause of Napoleon against both England and Sweden. Commerce was annihilated, and the supply of food failed. The national distress brought into the forefront of politics national leaders, among whom Count Hermann Jasper von Wedel-Jarlsberg was the most conspicuous. As yet, however, patriotism went no further than a demand for an administration distinct from that of Denmark, which was conceded in 1807, and for a university nearer home than Copenhagen. In 1811 the government assented to the foundation of the university of Christiania. (W. F. R.)

Beginning of Norwegian national movement.

1814–1907.—After a union of nearly 400 years between Norway and Denmark, the Danish king, Frederick VI., without consulting the Norwegians, ceded Norway to Sweden by the treaty of Kiel (January 14, 1814). Some time previously Sweden had joined the allies in their struggle against Napoleon, while Denmark had, unwisely, sided with the French. In 1813 the Swedish crown prince, Bernadotte, afterwards King Carl XIV.,[1] proceeded to Germany and took command of one of the armies of the allies. After the power of Napoleon had been broken at

Events leading to the union with Sweden.

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[1] In 1810 he was elected heir to the Swedish throne, in succession to the childless king Carl XIII., who died in 1818

the battle of Leipzig, he advanced against Denmark, and King Frederick soon saw himself compelled to accede to the cession of Norway, which had long been the aspiration of the Swedes, especially after the loss of Finland in 1809. In the treaty of Kiel Frederick VI. absolved the Norwegians from their oath of allegiance, and called upon them to become the loyal subjects of the Swedish king. But the Norwegians, who had not been consulted in the matter, refused to acknowledge the treaty, declaring that, while the Danish king might renounce his right to the Norwegian crown, it was contrary to international law to dispose of an entire kingdom without the consent of its people. A meeting of delegates was convened at Eidsvold, not far from the Norwegian capital, where, on the 17th of May 1814, a constitution, framed upon the constitutions of America, of France (1791), and of Spain (1812), was adopted. Among its most important features are that the Storthing, or National Assembly, is a single-chamber institution, and that the king is not given an absolute veto, or the right to dissolve the Storthing. The Danish governor of Norway, Prince Christian Frederick, was unanimously elected king. Soon afterwards the Swedes, under the crown prince, invaded Norway. The hostilities lasted only a fortnight, when Bernadotte opened negotiations with the Norwegians. A convention was held at Moss, where it was proposed that the Norwegians should accept the Swedish king as their sovereign, on the condition that their constitution of the 17th of May should remain intact, except with such alterations as the union might render necessary. An extraordinary Storthing was then summoned at Christiania, and on the 4th of November 1814 Norway was declared to be "a free, independent, and indivisible kingdom, united with Sweden under one king." A month previously Prince Christian Frederick had laid down his crown and left the country.

The union was more fully defined by the "Act of Union," which was accepted by the national assemblies of both countries in the following year. In the preamble to the act it is clearly stated that the union between the two peoples was accomplished "not by force of arms, but by free conviction," and the Swedish foreign minister declared to the European Powers, on behalf of Sweden, that the treaty of Kiel had been abandoned, and that it was not to this treaty, but to the confidence of the Norwegian people in the Swedish, that the latter owed the union with Norway. The constitution framed at Eidsvold was retained, and formed the *Grundlov*, or fundamental law of the kingdom. The union thus concluded between the two countries was really an offensive and defensive alliance under a common king, each country retaining its own government, parliament, army, navy and customs.

In Sweden the people received only an imperfect and erroneous insight into the nature of the union, and for a long time believed it to be an achievement of the Swedish arms. They had hoped to make Norway a province of Sweden, and now they had entered into a union in which both countries were equally independent. During the first fifteen years the king was represented in Norway by a Swedish viceroy, while the government was, of course, composed only of Norwegians. Count Wedel Jarlsberg was the first to be entrusted with the important office of head of the Norwegian government, while several of Prince Christian Frederick's councillors of state were retained, or replaced by others holding their political views. The Swedish Count von Essen was appointed the first viceroy of Norway, and was succeeded two years afterwards by his countryman Count von Mörner, over both of whom Count Wedel exercised considerable influence.

Strained relations between king and Storthing.

During the first years of the union the country suffered from poverty and depression of trade, and the finances were in a deplorable condition. The first Storthing was chiefly occupied with financial and other practical measures. In order to improve the finances of the country a bank of Norway was founded, and the army was reduced to one half. The paid-up capital of the bank was procured by an extraordinary tax, and this, together with the growing discontent among the peasantry, brought about a rising in Hedemarken, the object of which was to dissolve the Storthing and to obtain a reduction in the taxation. The rising, however, soon subsided, and the bountiful harvest of 1819 brought more prosperous times to the peasantry. Meanwhile, however, the financial position of the country had nearly endangered its independence. The settlement with Denmark with regard to Norway's share of the national debt common to both, assumed threatening proportions. In the interest of Denmark, the allied powers asked for a speedy settlement, and in order to escape their collective intervention, Bernadotte, who had now succeeded to the throne of Sweden and Norway, on the death (February 5, 1818) of the old king Carl XIII., accepted England's mediation, and was enabled in September 1819 to conclude a convention with Denmark, according to which Norway was held liable for only 3,000,000 specie dollars (nearly £700,000). But the Norwegians considered that this was still too much, and the attitude of the Storthing in 1821 nearly occasioned a fresh interference of the powers. The Storthing, however, yielded at last, and agreed to raise a loan and pay the amount stipulated in the convention, but the king evidently had his doubts as to whether the Norwegians really intended to fulfil their obligations. As his relations with the Storthing had already become strained, and as he was occupied at that time with plans, which it is now known meant nothing less than a *coup d'état* in connexion with the revision of the Norwegian constitution, he decided to adopt military preparations, and in July 1821 he collected a force of 3000 Swedish and 3000 Norwegian troops in the neighbourhood of Christiania, ostensibly for the mere purpose of holding some manœuvres. In a circular note (June 1) to the European powers, signed by the Swedish foreign minister, Engström—but it is not difficult to recognize the hand of the king as the real author—the minister complained bitterly of the treatment the king had met with at the hands of the Storthing, and represented the Norwegians in anything but a favourable light to the powers, the intention being to obtain their sympathy for any attempt that might be made to revise the Norwegian constitution. About this time another important question had to be settled by the Storthing. The Storthings of 1815 and 1818 had already passed a bill for the abolition of nobility, but the king had on both occasions refused his sanction. The Norwegians maintained that the few counts and barons still to be found in Norway were all Danish and of very recent origin, while the really true and ancient nobility of the country were the Norwegian peasants, descendants of the old jarls and chieftains. According to the constitution, any bill which has been passed by three successively elected Storthings, elections being held every third year, becomes law without the king's sanction. When the third reading of the bill came on, the king did everything in his power to obstruct it, but in spite of his opposition the bill was eventually carried and became law.

Royal proposals for constitutional revision.

In 1822 Count Wedel Jarlsberg retired from the government. He had become unpopular through his financial policy, and was also at issue with the king on vital matters. In 1821 he had been impeached before the Rigsret, the supreme court of the realm, for having caused the state considerable losses. Jonas Collett (1772–1851) was appointed as his successor to the post of minister of finance. The king had by this time apparently abandoned his plan of a *coup d'état*, for in the following August he submitted to the Storthing several proposals for fundamental changes in the constitution, all of which aimed at removing all that was at variance with a monarchical form of government. The changes, in fact, were the same as he had suggested in his circular note to the Powers, and which he knew would be hailed with approval by his Swedish subjects. When the Storthing met again in 1824 the royal proposals for the constitutional changes came on for discussion. The Storthing unanimously rejected not only the king's proposals, but also several others by private members for changes in the constitution. The king submitted his proposals again in the following session of the Storthing, and again later on, but they were always unanimously rejected. In 1830 they were discussed for the last time, with the same result.

The king's insistence was viewed by the people as a sign of absolutist tendencies, and naturally excited fresh alarm. In the eyes of the people the members of the opposition in the Storthing were the true champions of the rights and the independence which they had gained in 1814.

The king's absolutist tendencies.

For several years the Norwegians had been celebrating the 17th of May as their day of independence, it being the anniversary of the adoption of the constitution of 1814; but as the tension between the Norwegians and the king increased, the latter began to look upon the celebration in the light of a demonstration directed against himself, and when Collett, the minister of finance, was impeached before the supreme court of the realm for having made certain payments without the sanction of the Storthing, he also considered this as an attack upon his royal prerogatives. His irritation knew no bounds, and although Collett was acquitted by the supreme court, the king, in order to express his irritation with the Storthing and the action they had taken against one of his ministers, dissolved the national assembly with every sign of displeasure. The Swedish viceroy at the time, Count Sandels, had tried to convince him that his prejudice against the celebration of the 17th of May was groundless, and for some years the king had made no objection to the celebration. In 1827 it was, however, celebrated in a very marked manner, and later in the same year there was a demonstration against a foolish political play called *The Union*, and this being privately reported to the king in as bad a light as possible, he thought that Count Sandels, who had not considered it worth while to report the occurrence, was not fitted for his post, and had him replaced by Count Beltzar Bojilaus Platen (1766–1829), an upright but narrow-minded statesman. Count Platen's first act was to issue a proclamation warning the people against celebrating the day of independence; and in April 1828 the king, against the advice of his ministers, summoned an extraordinary Storthing, his intention being to wrest from the Storthing the supremacy it had gained in 1827. He also intended to take steps to prevent the celebration of the 17th of May, and assembled a force of 2000 Norwegian soldiers in the neighbourhood of the capital. The king arrived in Christiania soon after the opening of the extraordinary Storthing. He did not succeed, however, in his attempt to make any constitutional changes, but the Storthing met the king's wishes with regard to the celebration of the 17th of May by deciding not to continue the celebration, and the people all over the country quietly acquiesced. The following year trouble broke out again. The students had decided to celebrate the 17th of May with a festive gathering, which, however, passed off quietly. But large masses of the people paraded the streets, singing and shouting, and gathered finally in the market-place. There was a little rioting, and the police and the military eventually dispersed the people and drove them to their homes with sword and musket. This episode has become known as the "battle of the market-place," and did much to increase the general ill-feeling against Count Platen. His health eventually broke down from disappointment and vexation at the indignities and abuse heaped upon him. He died in Christiania at the end of the year, and his post remained vacant for several years, the presidency of the Norwegian government in the meantime being taken by Collett, its oldest member.

The "battle of the market-place."

Increased political power of the peasantry.

By the July Revolution of 1830 the political situation in Europe became completely changed, and the lessons derived from that great movement reached also to Norway. The representatives of the peasantry, for whom the constitution had paved the way to become the ruling element in political life, were also beginning to distinguish themselves in the national assembly, where they now had taken up an independent position against the representatives of the official classes, who in 1814 and afterwards had played the leading and most influential part in politics. This party was now under the leadership of the able and gifted Ole Ueland, who remained a member of every Storthing from 1833 to 1869. The Storthing of 1833 was the first of the so-called "peasant Storthings." Hitherto the peasantry had never been represented by more than twenty members, but the elections in 1833 brought their number up to forty-five, nearly half of the total representation. The attention of this new party was especially directed to the finances of the country, in the administration of which they demanded the strictest economy. They often went too far in their zeal, and thereby incurred considerable ridicule.

Wergeland; opposed by Welhaven.

About this time the peasant party found a champion in the youthful poet Henrik Wergeland, who soon became one of the leaders of the "Young Norway" party. He was a republican in politics, and the most zealous upholder of the national independence of Norway and of her full equality with Sweden in the union. A strong opposition to Wergeland and the peasant party was formed by the upper classes under the leadership of another rising poet and writer, Johan Sebastian Welhaven, and other talented men, who wished to retain the literary and linguistic relationship with Denmark, while Wergeland and his party wished to make the separation from Denmark as complete as possible, and in every way to encourage the growth of the national characteristics and feeling among the people. He devoted much of his time, by writing and other means, to promote the education of the people; but although he was most popular with the working and poorer classes, he was not able to form any political party around him, and at the time of his death he stood almost isolated. He died in 1845, and his opponents became now the leaders in the field of literature, and carried on the work of national reconstruction in a more restrained and quiet manner. The peasant party still continued to exist, but restricted itself principally to the assertion of local interests and the maintenance of strict economy in finance.

The violent agitation that began in 1830 died away. The tension between the king and the legislature, however, still continued, and reached its height during the session of 1836, when all the royal proposals for changes in the constitution were laid aside, without even passing through committee, and when various other steps towards upholding the independence of the country were taken. The king, in his displeasure, decided to dissolve the Storthing; but before it dispersed it proceeded to impeach Lövenskiold, one of the ministers, before the supreme court of the realm, for having advised the king to dissolve the Storthing. He was eventually sentenced to pay a fine of 10,000 kroner (about £550), but he retained his post. Collett, another minister who had greatly displeased the king by his conduct, was dismissed; but unity in the government was brought about by the appointment of Count Wedel Jarlsberg as viceroy of Norway. From this time the relations between the king and the Norwegian people began to improve, whereas in Sweden he was, in his later years, not a little disliked.

The national flag question.

When the king's anger had subsided, he summoned the Storthing to an extraordinary session, during which several important bills were passed. Towards the close of the session an address to the king was agreed to, in which the Storthing urged that steps should be taken to place Norway in political respects upon an equal footing with Sweden, especially in the conduct of diplomatic affairs with foreign countries. The same address contained a petition for the use of the national or merchant flag in all waters. According to the constitution, Norway was to have her own merchant flag, and in 1821 the Storthing had passed a resolution that the flag should be scarlet, divided into four by a blue cross with white borders. The king, however, refused his sanction to the resolution, but gave permission to use the flag in waters nearer home; but beyond Cape Finisterre the naval flag, which was really the Swedish flag, with a white cross on a red ground in the upper square, must be carried. In reply to the Storthing's address the king in 1838 conceded the right to all merchant ships to carry the national flag in all waters. This was hailed with great rejoicings all over the country; but the question of the national flag for general use had yet to be settled With regard to the question raised in the address of the Storthing about the conduct of diplomatic affairs, and other matters concerning the equality of Norway in the union, the king in 1839 appointed a committee of four Norwegians and four Swedes, who were to consider and report upon the questions thus raised.

Death of King Carl Johan; succeeded by Oscar I.

During the sitting of this first "Union Committee" its powers were extended to consider a comprehensive revision of the Act of Union, with the limitation that the fundamental conditions of the union must in no way be interfered with. But before the committee had finished their report the king died (March 8th 1844), and was succeeded by his son Oscar I. According to the constitution the Norwegian kings must be crowned in Throndhjem cathedral, but the bishop of Throndhjem was in doubt whether the queen, who was a Roman Catholic, could be crowned, and the king decided to forego the coronation both of himself and his queen. The new king soon showed his desire to meet the wishes of the Norwegian people. Thus he decided that in all documents concerning the internal government of the country Norway should stand first where reference was made to the king as sovereign of the two kingdoms. After having received the report of the committee concerning the flag question, he resolved (June 20th, 1844) that Norway and Sweden should each carry its own national flag as the naval flag, with the mark of union in the upper corner; and it was also decided that the merchant flag of the two kingdoms should bear the same mark of union, and that only ships sailing under these flags could claim the protection of the state.

The financial and material condition of the country had now considerably improved, and King Oscar's reign was marked by the carrying out of important legislative work and reforms, especially in local government. New roads were planned and built all over the country, the first railway was built, steamship routes along the coast were established, lighthouses were erected and trade and shipping made great progress. The king's reign was not disturbed by any serious conflicts between the two countries. No change took place in the ministry under the presidency of the viceroy Lövenskiold upon King Oscar's accession to the throne, but on the death or retirement of some of its members the vacant places were filled by younger and talented men, among whom was Fredrik Stang, who in 1845 took over the newly established ministry of the interior. During the Schleswig-Holstein rebellion (1848–1850) and the Crimean War King Oscar succeeded in maintaining the neutrality of Norway and Sweden, by which Norwegian shipping especially benefited. The abolition of the English navigation acts in 1850 was of great importance to Norway, and opened up a great future for its merchant fleet.

Relations with Russia.

In 1826 a treaty had been concluded with Russia, by which the frontier between that country and the adjoining strip of Norwegian territory in the Polar region was definitely delimited; but in spite of this treaty Russia in 1851 demanded that the Russian Lapps on the Norwegian frontier should have the right to fish on the Norwegian coast, and have a portion of the coast on the Varanger fjord allotted to them to settle upon. The Norwegian government refused to accede to the Russian demands, and serious complications might have ensued if the attention of Russia had not been turned in another direction. While his father had looked to Russia for support, King Oscar was more inclined to secure western powers as his allies, and during the Crimean War he concluded a treaty with England and France, according to which these countries promised their assistance in the event of any fresh attempts at encroachment on Norwegian or Swedish territory by Russia. In consequence of this treaty the relations between Norway and Sweden and Russia became somewhat strained; but after the peace of Paris in 1856, and the accession of Alexander II., whose government was in favour of a peaceful policy, the Russian ambassador at Stockholm succeeded in bringing about more friendly relations.

Death of Oscar I.; accession of Carl XV.

Question of Norwegian viceroy.

Owing to the king's ill-health, his son, the crown prince Carl, was appointed regent in 1857, and two years later, when King Oscar died, he succeeded to the thrones of the two countries as Carl XV. He was a gifted, genial and noble personality, and desired to inaugurate his reign by giving the Norwegians a proof of his willingness to acknowledge the claims of Norway, but he did not live to see his wishes in this respect carried out. According to the constitution, the king had the power to appoint a viceroy for Norway, who might be either a Norwegian or Swede. Since 1829 no Swede had held the post, and since 1859 no appointment of a viceroy had been made. But the paragraph in the constitution still existed, and the Norwegians naturally wished to have this stamp of "provinciality" obliterated. A proposal for the abolishment of the office of viceroy was laid before the Storthing in 1859, and passed by it. The king, whose sympathies on this question were known, had been appealed to, and had privately promised that he would sanction the proposed change in the constitution; but as soon as the resolution of the Storthing became known in Sweden, a violent outcry arose both in the Swedish press and the Swedish estates. Under the pressure that was brought to bear upon the king in Sweden, he eventually refused to sanction the resolution of the Storthing; but he added that he shared the views of his Norwegian counsellors, and would, when "the convenient moment" came, himself propose the abolition of the office of viceroy.

Swedish proposals for revision of Act of Union.

In the following year the Swedish government again pressed the demands of the Swedish estates for a revision of the Act of Union, which this time included the establishment of a union or common parliament for the two countries, on the basis that, according to the population, there should be two Swedish members to every Norwegian. The proposal was sent to the Norwegian government, which did not seem at all disposed to entertain it; but some dissensions arose with regard to the form in which its reply was to be laid before the king. The more obstinate members of the ministry resigned, and others, of a more pliable nature, were appointed under the presidency of Fredrik Stang, who had already been minister of the interior from 1845 to 1856. The reconstructed government was, however, in accord with the retiring one, that no proposal for the revision of the Act of Union could then be entertained. The king, however, advocated the desirability of a revision, but insisted that this would have to be based upon the full equality of both countries. In 1863 the Storthing assented to the appointment by the king of a Union committee, the second time that such a committee had been called upon to consider this vexatious question. It was not until 1867 that its report was made public, but it could not come on for discussion in the Storthing till it met again in 1871. During this period the differences between the two countries were somewhat thrust into the background by the Danish complications in 1863–1864, which threatened to draw the two kingdoms into war. King Carl was himself in favour of a defensive alliance with Denmark, but the Norwegian Storthing would only consent to this if an alliance could also be effected with at least one of the western powers.

In 1869 the Storthing passed a resolution by which its sessions were made annual instead of triennial according to the constitution of 1814. The first important question which the first yearly Storthing which met in 1871 had to consider was once more the proposed revision of the Act of Union. The Norwegians had persistently maintained that in any discussion on this question the basis for the negotiations should be (1) the full equality of the two kingdoms, and (2) no extension of the bonds of the union beyond the line originally defined in the act of 1815. However, the draft of the new act contained terms in which the supremacy of Sweden was presupposed and which introduced important extensions of the bonds of the union; and, strangely enough, the report of the Union committee was adopted by the new Stang ministry, and even supported by some of the most influential newspapers under the plausible garb of "Scandinavianism." In these circumstances the "lawyers' party," under the leadership of Johan Sverdrup, who was to play such a prominent part in Norwegian politics, and the "peasant party," led by Sören

Foundation of the Norwegian national party.

Jaabœk, a gifted peasant proprietor, who was also destined to become a prominent figure in the political history of the country, formed an alliance, with the object of guarding against any encroachment upon the liberty and independence which the country had secured by the constitution of 1814. This was the foundation of the great national party, which became known as the "Venstre" (the left), and which before long became powerful enough to exert the most decisive influence upon the political affairs of the country. When, therefore, the proposed revision of the Act of Union eventually came before the Storthing in 1871, it was rejected by an overwhelming majority. The position which the government had taken up on this question helped to open the eyes of the Norwegians to some defects in the constitution, which had proved obstacles to the development and strengthening of the parliamentary system.

Question of admittance of ministers to seats in the Storthing.

In 1872 a private bill came before the Storthing, proposing that the ministers should be admitted to the Storthing and take part in its proceedings. After a number of stormy debates, the bill was successfully carried under the leadership of Johan Sverdrup by a large majority, but the government, evidently jealous of the growing powers and influence of the new liberal party in the Storthing, advised the king to refuse his sanction, although the government party itself had several times in the preceding half-century introduced a similar bill for admitting the ministers to the Storthing. At that time, however, the opposition had looked with suspicion on the presence of the ministers in the national assembly, lest their superior skill in debate and political experience should turn the scale too readily in favour of government measures. Now, on the contrary, the opposition had gained more experience and had confidence in its own strength, and no doubt found that the legislative work could better be carried on if the ministers were present to explain and defend their views; but the government saw in the proposed reform the threatened introduction of full parliamentary government, by which the ministry could not remain in office unless supported by a majority in the Storthing. Before the Storthing separated the liberals carried a vote of censure against the government; but the king declared that the ministers enjoyed his confidence and took no further notice of the vote. Two of the ministers, who had advised the ratification of the bill, resigned, however; and a third minister, who had been in the government since 1848, resigned also, and retired from public life, foreseeing the storm that was brewing on the political horizon. Numerous public meetings were held all over the country in support of the proposed reform, and among the speakers was Johan Sverdrup, now the acknowledged leader of the liberal party, who was hailed with great enthusiasm as the champion of the proposed reform.

Death of Carl XV.; accession of Oscar II.

This was the political situation when King Carl died (18th September 1872). He was succeeded by his brother, who ascended the throne as Oscar II. In the following year he gave his sanction to the bill for the abolition of the office of viceroy, which the Storthing had again passed, and the president of the ministry was afterwards recognized as the prime minister and head of the government in Christiania. Fredrik Stang, who was the president of the ministry at the time, was the first to fill this office. In the same year Norway celebrated its existence for a thousand years as a kingdom, with great festivities.

Proposals by the Storthing for full popular control.

In 1874 the government, in order to show the people that they to some extent were willing to meet their wishes with regard to the great question before the country, laid before the Storthing a royal proposition for the admittance of the ministers to the national assembly. But this was to be accompanied by certain other constitutional changes, such as giving the king the right of dissolving the Storthing at his pleasure, and providing fixed pensions for ex-ministers, which was regarded as a guarantee against the majority of the assembly misusing its new power. The bill which the government brought in was unanimously rejected by the Storthing, the conservatives also voting against it, as they considered the guarantees insufficient. The same year, and again in 1877, the Storthing passed the bill, but in a somewhat different form from that of 1872. On both occasions the king refused his sanction.

The king's veto.

The Storthing then resorted to the procedure provided by the constitution to carry out the people's will. In 1880 the bill was passed for the third time, and on this occasion by the overwhelming majority of 93 out of 113. Three Storthings after three successive elections had now carried the bill, and it was generally expected that the king and his government would at length comply with the wishes of the people, but the king on this occasion also refused his sanction, declaring at the same time that his right to the absolute veto was "above all doubt." Johan Sverdrup, the leader of the liberal party and president of the Storthing, brought the question to a prompt issue by proposing to the Storthing that the bill, which had been passed three times, should be declared to be the law of the land without the king's sanction. This proposal was carried by a large majority on the 9th of June 1880, but the king and his ministers in reply declared that they would not recognize the validity of the resolution.

Struggle between the king and the Storthing.

From this moment the struggle may be said to have centred itself upon the existence or non-existence of an absolute veto on the part of the crown. The king requested the faculty of law at the Christiania university to give its opinion on the question at issue, and with one dissentient the learned doctors upheld the king's right to the absolute veto in questions concerning amendments of the constitution, although they could not find that it was expressly stated in the fundamental law of the country. The ministry also advised the king to claim a veto in questions of supply, which still further increased the ill-feeling in the country against the government, and the conflict in consequence grew more and more violent.

Elections of 1882.

Impeachment of ministers by the Storthing, 1883.

In the midst of the struggle between the king and the Storthing, the prime minister, Fredrik Stang, resigned, and Christian August Selmer (1816–1889) became his successor; and this, together with the appointment of another member to the ministry, K. H. Schweigaard, plainly indicated that the conflict with the Storthing was to be continued. In June 1882 the king arrived in Christiania to dissolve the Storthing, and on this occasion delivered a speech from the throne, in which he openly censured the representatives of the people for their attitude in legislative work and on the question of the absolute veto, the speech creating considerable surprise throughout the country. Johan Sverdrup and Björnstjerne Björnson, the popular poet and dramatist, called upon the people to support the Storthing in upholding the resolution of the 9th of June, and to rouse themselves to a sense of their political rights. The elections resulted in a great victory for the liberal party, which returned stronger than ever to the Storthing, numbering 83 and the conservatives only 31. The ministry, however, showed no sign of yielding, and, when the new Storthing met in February 1883, the Odelsthing (the lower division of the national assembly) decided upon having the question finally settled by impeaching the whole of the ministry before the Rigsret or the supreme court of the realm. The jurisdiction of the Rigsret is limited to the trial of offences against the state, and there is no appeal against its decisions. The charges against the ministers were for having acted contrary to the interests of the country by advising the king to refuse his sanction—first, to the amendment of the law for admitting the ministers to the Storthing; secondly, to a bill involving a question of supply; and thirdly, to a bill by which the Storthing could appoint additional directors on the state railways.

The ministry sentenced by the Rigsret.

The trial of the eleven ministers of the Selmer cabinet began in May 1883 and lasted over ten months. In the end the Rigsret sentenced the prime minister and seven of his ministers to be deprived of their offices, while three, who had either recommended the king to sanction the bill for admitting the ministers to the Storthing, or had

Acquiescence by the king.

First Liberal ministry 1884.

entered the cabinet at a later date, were heavily fined. The excitement in the country rose to feverish anxiety. Rumours of all kinds were afloat, and it was generally believed that the king would attempt a *coup d'état*. Fortunately the king after some hesitation issued (11th March 1884) an order in council announcing that the judgment of the supreme court would be carried into effect, and Selmer was then called upon to resign his position as prime minister. King Oscar, however, in his declaration upheld the constitutional prerogative of the crown, which, he maintained, was not impaired by the judgment of the Rigsret. The following month the king, regardless of the large liberal majority in the Storthing, asked Schweigaard, one of the late ministers, whose punishment consisted in a fine, to form a ministry, and the so-called "April ministry" was then appointed, but sent in its resignation in the following month. Professor Broch, a former minister, next failed to form a ministry, and the king was at last compelled to appoint a ministry in accordance with the majority in the Storthing. In June 1884 Johan Sverdrup was asked to form one. He selected for his ministers leading men on the liberal side in the Storthing, and the first liberal ministry that Norway had was at length appointed. The Storthing, in order to satisfy the king, passed a new resolution admitting the ministers to the national assembly, and this received formal sanction.

The question of diplomatic representation.

During the following years a series of important reforms was carried through. Thus in 1887 the jury system in criminal matters was introduced into the country after violent opposition from the conservatives. A bill intended to give parishioners greater influence in church matters, and introduced by Jakob Sverdrup, the minister of education, and a nephew of the prime minister, met, however, with strong opposition, and was eventually rejected by the Storthing, the result being a break-up of the ministry and a disorganization of the liberal party. In June 1889 the Sverdrup ministry resigned, and a conservative one was formed by Emil Stang, the leader of the conservatives in the Storthing, and during the next two years the Storthing passed various useful measures; but the ministry was eventually wrecked on the rock of the great national question which about this time came to the front—that of Norway's share in the transaction of diplomatic affairs. At the time of the union in 1814 nothing had been settled as to how these were to be conducted, but in 1835 a resolution was issued, that when the Swedish foreign minister was transacting diplomatic matters with the king which concerned both countries, or Norway only, the Norwegian minister of state in attendance upon the king at Stockholm should be present. This arrangement did not always prove satisfactory to the Norwegians, especially as the Swedish foreign minister could not be held responsible to the Norwegian government or parliament.

The Norwegian claim.

By a change in the Swedish constitution in 1885 the ministerial council, in which diplomatic matters are discussed, came to consist of the Swedish foreign minister and two other members of the cabinet on behalf of Sweden, and of the Norwegian minister at Stockholm on behalf of Norway. The king, wishing to remedy this disparity, proposed that the composition of the council should be determined by an additional paragraph in the Act of Union. The representatives of the Norwegian government in Stockholm proposed that three members of the cabinet of each country should constitute the ministerial council. To this the Swedish government was willing to agree, but on the assumption that the minister of foreign affairs should continue to be a Swede as before, and this the Norwegians, of course, would not accept. At the king's instigation the negotiations with the Swedish government were resumed at the beginning of 1891, but the Swedish Riksdag rejected the proposals, while the Norwegian Storthing insisted upon "Norway's right, as an independent kingdom, to full equality in the union, and therewith her right to watch over her foreign affairs in a constitutional manner." The Stang ministry then resigned, and a liberal ministry, with Steen, the recognized leader of the liberal party after Sverdrup's withdrawal from politics, as prime minister, was appointed.

Question of separate consular service.

The new ministry had placed the question of a separate minister of foreign affairs for Norway prominently in their programme, but little progress was made during the next few years. Another and more important question for the country, as far as its shipping and commerce are concerned, now came to the front. The Storthing had in 1891 appointed a committee to inquire into the practicability of establishing a separate Norwegian consular service, and in 1892 the Storthing, acting upon the committee's report, determined to establish a consular service. The king, influenced by public opinion in Sweden, refused his sanction, and the Norwegian government in consequence sent in their resignation, whereupon a complete deadlock ensued. This was terminated by a compromise to the effect that the ministry would return to office on the understanding that the question was postponed by common consent. The following year the Storthing again passed a resolution calling upon the Norwegian government to proceed with the necessary measures for establishing the proposed consular service for Norway, but the king again refused to take any action in the matter. Upon this the liberal ministry resigned (May 1893), and the king appointed a conservative government, with Emil Stang as its chief. Thus matters went on till the end of 1894, when the triennial elections took place, with the result that the majority of the electors declared in favour of national independence on the great question then before the country. The ministry did not at once resign, but waited till the king arrived in Christiania to open the Storthing (January 1895). The king kept the country for over four months without a responsible government, during which time the crisis had become more acute than ever. A coalition ministry was at last formed, with Professor G. F. Hagerup as prime minister. A new committee, consisting of an equal number of Norwegians and Swedes, was appointed to consider the question of separate diplomatic representation; but after sitting for over two years the committee separated without being able to come to any agreement.

The elections in 1897 proved again a great victory for the liberal party, 79 liberals and 35 conservatives being returned, and in February 1898 the Hagerup ministry was replaced by a liberal, once more under the premiership of Steen. Soon afterwards the bill for the general adoption of the national or "pure" flag, as it was called, was carried for the third time, and became law without the king's sanction. In 1898 universal political suffrage for men was passed by a large majority, but the proposal to include women received the support of only 33 votes.

The crisis of 1902-1905.

In January 1902, on the initiative of the Swedish foreign minister, another committee, consisting of an equal number of leading Norwegians and Swedes, was appointed by the king to investigate the consular question. The unanimous report of the committee was to the effect that "it was possible to appoint separate Norwegian consuls exclusively responsible to Norwegian authority and separate Swedish consuls exclusively responsible to Swedish authority." The further negotiations between the two governments resulted in the so-called *communiqué* of the 24th of March 1903, which announced the conclusion of an agreement between the representatives of the two countries for the establishment of the separate consular service. The terms of the *communiqué* were submitted to a combined Norwegian and Swedish council of state on the 21st of December 1903, when they were unanimously agreed to and were signed by the king, who commissioned the Norwegian and the Swedish governments to proceed with the drafting of the laws and regulations for the separate consular services. In due course the Norwegian government submitted to the Swedish government their draft of the proposed laws and regulations, but no reply was forthcoming for several months. About this time the Swedish foreign minister, Mr Lagerheim, who had zealously worked for a friendly solution of the consular question, resigned, and in November the same year Boström, the Swedish prime minister, suddenly submitted to the Norwegian government a number of new conditions under which the Swedish government was prepared to agree to the establishment of separate consuls. This came as a surprise to the Norwegians in view of the fact that the basis for the establishment of separate consuls had already been agreed upon and confirmed by the king in December 1903. According to Boström's proposals the Norwegian consuls were to be placed under the control of the Swedish foreign minister, who was to have the power to remove any Norwegian consul. The Norwegians felt it would be beneath the dignity of a self-governing country to agree to the Swedish proposals, and that these new demands were nothing less than a breach of faith with regard to the terms of agreement arrived at two years before by both governments and approved and signed by the king. The Norwegian government would have been perfectly justified if, after this, they had withdrawn from the negotiations, but they did not wish to jeopardize the opportunity of arriving at a friendly settlement, and Hagerup, the Norwegian prime minister, proceeded to Stockholm to confer with Boström; but no satisfactory agreement could be arrived at. There was therefore nothing left but for the Norwegians to take matters into their own hands.

On the 8th of February 1905 Hagerup announced to the Norwegian Storthing that the negotiations had fallen through, and on the 17th the Storthing decided unanimously to refer the matter to a special committee. Owing to some difference of opinion between the members of his ministry, Hagerup resigned on the 1st of March and was succeeded by Christian Michelsen, who formed a ministry composed of members of both political parties. The special committee decided that a bill should be immediately submitted to the Storthing for the establishment of a Norwegian consular service and that the measure should come into force not later than the 1st of April 1906. An attempt was made by the Swedish crown prince, acting as Prince Regent during the king's illness, to enter into new negotiations with the Norwegian government, but the proposals were not favourably received in Norway. In April 1905 Boström resigned, which was considered to be a move on the part of Sweden to facilitate negotiations with Norway. The bill for the establishment of Norwegian consuls was passed by the Storthing without a dissentient voice on the 23rd of May, and it was generally expected that the king, who again had assumed the reins of government, would sanction the bill, but on the 27th of May, in spite of the earnest entreaties of his Norwegian ministers, the king formally refused to do so. The Norwegian Ministry immediately resigned, but the king informed the ministers that he could not accept their resignation. They, however, declined to withdraw it. A few days afterwards the Norwegian government informed the Storthing of the king's refusal, whereupon the assembly unanimously agreed to refer the matter to the special committee. On the 7th of June the Storthing met to hear the final decision of the government. Michelsen, the prime minister, informed the Storthing that all the members of the government had resigned in consequence of the king's refusal to sanction the consular law, that the king had declined to accept the resignation, and that, as an alternative government could not be formed, the union with Sweden, based upon a king in common, was consequently dissolved. The president of the Storthing submitted a resolution that the resigning ministry should be authorized to exercise the authority vested in the king in accordance with the constitution of the country. The resolution was unanimously adopted.

Declaration of Independence.

Separation from Sweden.

King Oscar, on receiving the news of the action of the Norwegian Storthing, sent a telegraphic protest to the Norwegian prime minister and to the president of the Storthing. The Swedish government immediately decided to summon an extraordinary session of the Swedish parliament for the 20th of June, when a special committee was appointed to consider what steps should be taken by Sweden. On the 25th of July the report of the committee was laid before the Riksdag, in which it was stated that Sweden could have no objection to enter into negotiations about the severance of the union, when a vote to that effect had been given by a newly-elected Storthing or by a national vote in the form of a referendum by the Norwegian people. The report was unanimously adopted by the Swedish Riksdag on the 27th of July, and on the following day the Norwegian Storthing decided that a general plebiscite should be taken on the 13th of August, when 368,211 voted in favour of the dissolution and only 184 against it. It was thereupon agreed that representatives of Norway and of Sweden should meet at Karlstad in Sweden on the 31st of August to discuss and arrange for the severance of the union. The negotiations lasted till the 23rd of September, though more than once they were on the point of being broken off. The agreement stipulated a neutral zone on both sides of the southern border between the two countries, the Norwegians undertaking to dismantle some fortifications within that zone. The agreement was to remain in force for ten years, and could be renewed for a similar period, unless one of the countries gave notice to the contrary. The Karlstad agreement was ratified by the Norwegian Storthing on the 9th of October and by the Swedish Riksdag on the 16th of the same month. On the 27th of October King Oscar issued a proclamation to the Norwegian Storthing, in which he relinquished the crown of Norway. The Norwegian government was thereupon authorized by the Storthing to negotiate with Prince Charles of Denmark and to arrange for a national vote as to whether or no the country would approve of his election for the Norwegian throne. The plebiscite resulted in 259,563 votes for his election and 69,264 against. On the 18th of November the Storthing unanimously elected Prince Charles as king of Norway, he taking the name of Haakon VII. On the 25th of November the king and his consort, Queen Maud, the youngest daughter of King Edward VII. of England, entered the Norwegian capital. Their coronation took place in the Trondhjem cathedral the following year.

Election of Haakon VII.

In 1907 parliamentary suffrage was granted to women with the same limitation as in the municipal suffrage granted to them in 1901, viz. to all unmarried women over 25 years, who pay taxes on an income of 300 kroner (about £16) in the country districts and on 400 kroner (about £22) in the towns, as well as to all married women, whose husbands pay taxes on similar incomes. Norway was thus the first sovereign country in Europe where the parliamentary vote was granted to women. (H. L. B.)

NORWEGIAN LITERATURE

Early Norse literature is inextricably bound up with Icelandic literature. Iceland was colonized from Norway in the 9th century, and the colonists were drawn chiefly from the upper and cultured classes. They took with them their poetry and literary traditions. Old Norse literature is therefore dealt with under Iceland (*q.v.*). (See also EDDA, SAGA, RUNES.)

The modern literature of Norway bears something of the same relation to that of Denmark that American literature bears to English. In each case the development and separation of a dependency have produced a desire on the part of persons speaking the mother-tongue for a literature that shall express the local emotions and conditions of the new nation. Two notable events led to the foundation of a separate Norwegian literature: the one was the creation of the university of Christiania in 1811, and the other was the separation of Norway from Denmark in 1814. Before this time Norwegian writers had been content, as a rule, to publish their works at Copenhagen. The first name on the annals of Danish literature, Peder Clausen, is that of a Norwegian; and if all Norse writers were removed from that roll, the list would be poorer by some of its most illustrious names, by Holberg, Tullin, Wessel, Treschow, Steffens and Hauch.

The first book printed in Norway was an almanac, brought out in Christiania in 1643 by a wandering printer named Tyge Nielsen, who brought his types from Copenhagen. But the first press set up definitely in Norway was that of Valentin Kuhn, brought over from Germany in 1650 by the theologian Christian Stephensen Bang (1580–1678) to help in the circulation of his numerous tracts. Bang's *Christianiae Stads Beskrifuelse* (1651), is the first book published in Norway. Christen Jensen (d. 1653) was a priest who collected a small glossary or *glosebog* of the local dialects, published in 1656. Gerhard Milzow (1629–1688), the author of a *Presbyterologia Norwegica* (1679), was also a Norse priest. The earliest Norwegian writer of any original merit was Dorthe Engelbrechtsdatter (1634–1716), afterwards the wife of the pastor Ambrosius Hardenbech. She is the author of several volumes of religious poetry which have enjoyed great popularity. The hymn-writer Johan Brunsmann (1637–1707), though a Norseman by birth, belongs by education and temper entirely to Denmark. Not so Petter Dass (1647–1708) (*q.v.*), the most original writer whom Norway produced and retained at home during the period of annexation. Another priest, Jonas Ramus (1649–1718), wrote *Norriges Kongers Historie* (History of the Norse Kings) in 1719, and *Norriges Beskrivelse* (1735). The celebrated missionary to Greenland, Hans Egede (1686–1758), wrote several works on his experiences in that country. Peder Hersleb (1689–1757) was the compiler of some popular treatises of Lutheran theology. Frederik Nannestad, bishop of Trondhjem (1693–1774), started a weekly gazette in 1760. The missionary Knud Leem (1697–1774) published a number of works on the Lapps of Finmark, one at least of which, his *Beskrivelse over Finmarkens Lapper* (1767), still possesses considerable interest. The famous Erik Pontoppidan (1698–1764) cannot be regarded as a Norwegian, for he did not leave Denmark until he was made bishop of Bergen, at the age of forty-nine. On the other hand the far more famous Baron Ludvig Holberg (1684–1754), belongs to Denmark by everything but birth, having left Norway in childhood.

A few Norsemen of the beginning of the 18th century distinguished themselves chiefly in science. Of these Johan Ernst Gunnerus (1718–1773), bishop of Trondhjem, was the first man who gave close attention to the Norwegian flora. He founded the Norwegian Royal Society of Sciences in 1760, with Gerhard Schöning (1722–1780) the historian and Hans Ström (1726–1797) the zoologist. Peder Christofer Stenersen (1723–1776), a writer of occasional verses, merely led the way for Christian Braumann Tullin (1728–1765), a lyrical poet of exquisite genius, who is claimed by Denmark but who must be mentioned here, because his poetry was not only mainly composed in Christiania, but breathes a local spirit. Danish literature between the great names of Evald and Baggesen presents us with hardly a single figure which is not that of a Norseman. The director of the Danish national theatre in 1771 was a Norwegian, Niels Krog Bredal (1733–1778), who was the first to write lyrical dramas in Danish. A Norwegian, Johan Nordahl Brun (1745–1816), was the principal tragedian of the time, in the French taste. It was a Norwegian, J. H. Wessel (1742–1785), who laughed this taste out of fashion. In 1772 the Norwegian poets were so strong in Copenhagen that they formed a *Norske Selskab* (Norwegian Society), which exercised a tyranny over contemporary letters which was only shaken when Baggesen appeared. Among the leading writers of this period are Claus Frimann (1746–1829), Peter Harboe Frimann (1752–1839), Claus Fasting (1746–1791), Johan Wibe (1748–1782), Edvard Storm (1749–1794), C. H. Pram (1756–1821), Jonas Rein (1760–1821), Jens Zetlitz (1761–1821), and Lyder Christian Sagen (1771–1850), all of whom, though Norwegians by birth, find their place in the annals of Danish literature. To these poets must be added the philosophers Niels Treschow (1751–1833) and Henrik Steffens (1773–1845), and in later times the poet Johannes Carsten Hauch (1790–1872).

The "Trefoil."

The first form which Norwegian literature took as an independent thing was what was called "Syttendemai-Poesi," or poetry of the 17th of May, that being the day on which Norway obtained her independence and proclaimed her king. Three poets, called the "Trefoil," came forward as the inaugurators of Norwegian thought in 1814. Of these Conrad Nicolai Schwach (1793–1860) was the least remarkable. Henrik Anker Bjerregaard (1792–1842), born in the same hamlet of Ringsaker as Schwach, had a much brighter and more varied talent. His *Miscellaneous Poems*, collected at Christiania in 1829, contain some charming studies from nature, and admirable patriotic songs. He brought out a tragedy of *Magnus Barfods Sönner* (Magnus Barefoot's Sons) and a lyrical drama, *Fjeldeventyret* (The Adventure in the Mountains) (1828). He became judge of the supreme court of the diocese of Christiania. The third member of the Trefoil, Mauritz Kristoffer Hansen (1794–1842), was a schoolmaster. His novels, of which *Ottar de Bretagne* (1819) was the earliest, were much esteemed in their day, and after his death were collected and edited (8 vols., 1855–1858), with a memoir by Schwach. Hansen's *Poems*, printed at Christiania in 1816, were among the earliest publications of a liberated Norway, but were preceded by a volume of *Smaadigte* (Short Poems) by all three poets, edited by Schwach in 1815, as a semi-political manifesto. These writers, of no great genius in themselves, did much by their industry and patriotism to form a basis for Norwegian literature.

Wergeland, Welhaven.

The creator of Norwegian literature, however, was the poet Henrik Arnold Wergeland (1808–1845) (*q.v.*), a man of great genius and enthusiasm, who contrived within the limits of a life as short as Byron's to concentrate the labours of a dozen ordinary men of letters. He held views in most respects similar to those pronounced by Rousseau and Shelley. His obscurity and extravagance stood in the way of his teaching, and his only disciples in poetry were Sylvester Sivertson (1809–1847), a journalist of talent whose verses were collected in 1848, and Christian Monsen (1815–1852).

A far more wholesome and constructive influence was that of Johann Sebastian Cammermeyer Welhaven (1807–1873) (*q.v.*), who was first brought to the surface by the conservative reaction in 1830 against the extravagance of the radical party. A savage attack on *Henrik Wergeland's Poetry*, published in 1832, caused a great sensation, and produced an angry pamphlet in reply from the father, Nikolai Wergeland. The controversy became the main topic of the day, and in 1834 Welhaven pushed it into a wider arena by the publication of his beautiful cycle of satirical sonnets called *Norges Dæmring* (The Dawn of Norway), in which he preached a full conservative gospel. He was assisted in his controversy with Wergeland by Henrik Hermann Foss (1790–1853), author of *Tidsnornerne* (The Norns of the Age) (1835) and other verses.

Munch.

Andreas Munch (1811–1884) took no part in the feud between Wergeland and Welhaven, but addicted himself to the study of Danish models independently of either. He published a series of poems and dramas, one of which latter, *Kong Sverres Ungdom* (1837), attracted some notice. His popularity commenced with the appearance of his *Poems Old and New* in 1848. His highest level as a poet was reached by his epic called *Kongedatterens Brudefart* (The Bridal Journey of the King's Daughter) (1861). Two of his historical dramas have enjoyed a popularity greatly in excess of their merit; these are *Solomon de Caus* (1854) and *Lord William Russell* (1857).

Minor poets.

A group of minor poetical writers may now be considered. Magnus Brostrup Landstad (1802–1880) was born on Maasö, an island in the vicinity of the North Cape, and, therefore, in higher latitudes than any other man of letters. He was a hymn-writer of merit, and he was the first to collect, in 1853, the *Norske Folkeviser* or Norwegian folk-songs. Landstad was ordered by the government to prepare an official national hymn-book, which was brought out in 1861. Peter Andreas Jensen (1812–1867) published volumes of lyrical poetry in 1838, 1849, 1855 and 1861, and two dramas. He was also the author of a novel, *En Erindring* (A Souvenir), in 1857. Aasmund Olafsen Vinje (1818–1870) was a peasant of remarkable talent, who was the principal leader of the movement known as the "maalstræv," an effort to distinguish Norwegian from Danish literature by the adoption of a peasant dialect, or rather a new language arbitrarily formed on a collation of the various dialects. Vinje wrote a volume of lyrics, which he published in 1864, and a narrative poem, *Storegut* (Big Lad) (1866), entirely in this fictitious language, and he even went so far as to issue in it a newspaper, *Dölen* (The Dalesman), which appeared from 1858 to Vinje's death in 1870. In these efforts he was supported by Ivar Aasen and by Kristoffer Janson (b. 1841) the philologist, the author of an historical tragedy, *Jon Arason* (1867); several novels: *Fraa Bygdom* (1865); *Torgrim* (1872); *Fra Dansketidi* (1875); *Han og Ho* (1878); and *Austanfyre Sol og Vestanfyre Maane* (East of the Sun and West of the Moon) (1879); besides a powerful but morbid drama in the ordinary language of Norway, *En Kvindeskjebne* (A Woman's Fate) (1879). In 1882 he left Norway for America as a Unitarian minister, and from this exile he sent home in 1885 what is perhaps the best of his books, *The Saga of the Prairie.* Superior to all the preceding in the quality of his lyrical writing was the bishop of Christiansand, Jörgen Moe (1813–1882). He is, however, better known by his labours in comparative mythology, in conjunction with P. C. Asbjörnsen (see ASBJÖRNSEN AND MOE).

Modern novelists and dramatists. The names of the Norwegians Ibsen (*q.v.*) and Björnson (*q.v.*), in the two fields of the drama and the novel, stand out prominently in the European literature of the later 19th century; and two writers of novels who owe much to their example are Jonas Lie (*q.v.*), and Alexander Kielland (1849–1906). Nicolai Ramm Östgaard (1812–1872) to some extent preceded Björnson in his graceful romance *En Fjeldbygd* (A Mountain Parish), in 1852. Frithjof Foss (1830–1899), who wrote under the pseudonym of Israél Dehn, attracted notice by seven separate stories published between 1862 and 1864. Jacobine Camilla Collett (1813–1895), sister of the poet Wergeland, wrote *Amtmandens Döttre* (The Governor's Daughters) (1855), an excellent novel, and the first in Norwegian literature which attempted the truthful description of ordinary life. She was a pioneer in the movement for the emancipation of women in Norway. Anne Magdalene Thoresen (1819–1903), a Dane by birth, wrote a series of novels of peasant life in the manner of Björnson, of whom she was no unworthy pupil. One of her best novels is *Signes Historie* (1864). She also wrote some lyrical poetry and successful dramas. **History, etc.** The principal historian of Norway is Peter Andreas Munch (1810–1863), whose multifarious writings include a grammar of Old Norse (1847); a collection of Norwegian laws until the year 1387 (1846–1849); a study of Runic inscriptions (1848); a history and description of Norway during the middle ages (1849); and a history of the Norwegian people in 8 vols. (1852–1863); Jakob Aall (1773–1844) was associated with Munch in this work. Christian Berg (1775–1852) was another worker in the same field. Jakob Rudolf Keyser (1803–1864) printed and annotated the most important documents dealing with the medieval history of Norway. Carl Richard Unger (b. 1817) took part in the same work and edited *Morkinskinna* in 1867. His edition of the elder Edda (1867) forms a landmark in the study of Scandinavian antiquities. Oluf Rygh (1833–1899) contributed to the archaeological part of history. The modern language of Norway found an admirable grammarian in Jakob Olaus Lökke (1829–1881). A careful historian and ethnographer was Ludvig Kristensen Daa (1809–1877). Ludvig Daae (b. 1834) has written the history of Christiania, and has traced the chronicles of Norway during the Danish possession. Bernt Moe (1814–1850) was a careful biographer of the heroes of Eidsvold. Eilert Lund Sundt (1817–1875) published some very curious and valuable works on the condition of the poorer classes in Norway. Professor J. A. Friis (b. 1821) published the folk-lore of the Lapps in a series of valuable volumes. The German orientalist, Christian Lassen (1800–1876) was a Norwegian by birth. Lorentz Dietrichson (b. 1834) wrote voluminously both on Swedish and Norwegian, chiefly on Norwegian art and literature. In jurisprudence the principal Norwegian authorities are Anton Martin Schweigaard (1808–1870) and Frederik Stang (1808–1884). Peter Carl Lasson (1798–1873) and Ulrik Anton Motzfelt (1807–1865) were the lights of an earlier generation. In medical science, the great writer of the beginning of the 19th century was Michael Skjelderup (1769–1852), who was succeeded by Frederik Holst (1791–1871). Daniel Cornelius Danielsen (b. 1815) was a prominent dermatologist; but probably the most eminent of modern physiologists in Norway is Carl Wilhelm Boeck (1808–1875). The elder brother of the last-mentioned, Christian Peter Bianco Boeck (1798–1877), also demands recognition as a medical writer. Christopher Hansteen (1784–1873) was professor of mathematics at the university for nearly sixty years. Michael Sars (1805–1869) obtained a European reputation through his investigations in invertebrate zoology. He was assisted by his son Georg Ossian Sars (b. 1837). Baltazar Matthias Keilhau (1797–1858) and Theodor Kjerulf (1825–1888) have been the leading Norwegian geologists. Mathias Numsen Blytt (1789–1862) represents botany. His *Norges Flora*, part of which was published in 1861, was left incomplete at his death. Niels Henrik Abel (1802–1829) (*q.v.*) was a mathematician of extraordinary promise; Ole Jakob Broch (1818–1889) must be mentioned in the same connexion. Among theological writers may be mentioned Hans Nielsen Hauge (1771–1824), author of the sect which bears his name; Svend Borchman Hersleb (1784–1836); Stener Johannes Stenersen (1789–1835); Wilhelm Andreas Wexels (1797–1866); a writer of extraordinary popularity; and Carl Paul Caspari (1814–1892), a German of Jewish birth, who adopted Christianity and became professor of theology in the university of Christiania.

The new movement. The political crisis of 1884–1885, which produced so remarkable an effect upon the material and social life of Norway, was not without its influence upon literature. There had followed to the great generation of the 'sixties, led by Ibsen and Björnson, a race of entirely prosaic writers, of no great talent, much exercised with "problems." The movement which began in 1885 brought back the fine masters of a previous imaginative age, silenced the problem-setters, and encouraged a whole generation of new men, realists of a healthier sort. In 1885 the field was still held by the three main names of modern Norse literature—Ibsen, Björnson and Lie. Henrik Ibsen proceeded deliberately with his labours, and his name at the same time grew in reputation and influence. The advance of Björnstjerne Björnson was not so regular, because it was disturbed by political issues. Moreover, his early peasant tales once more, after having suffered great neglect, grew to be a force, and Björnson's example has done much to revive an interest in the art of verse in Norway. Jonas Lie, the most popular novelist of Norway, continued to publish his pure, fresh and eminently characteristic stories. His style, colloquial almost to a fault, has neither the charm of Björnson nor the art of some of the latest generation. Ibsen, Björnson and Lie continued, however, to be the three representative authors of their country. Kristian Elster (1841–1881) showed great talent in his pessimistic novels *Tora Trondal* (1879) and *Dangerous People* (1881). Kristian Glöersen (b. 1838) had many affinities with Elster. Arne Garborg (1851) was brought up under sternly pietistic influences in a remote country parish, the child of peasant parents, in the south-west corner of Norway, and the gloom of these early surroundings has tinged all his writings. The early novels of Garborg were written in the peasant dialect, and for that reason, perhaps, attracted little attention. It was not until 1890 that he addressed the public in ordinary language, in his extraordinary novel, *Tired Men*, which produced a deep sensation. Subsequently Gargorg returned, with violence, to the cultivation of the peasant language, and took a foremost part in the *maalstræv*. A novelist of considerable crude force was Amalie Skram (1847–1905), wife of the Danish novelist, Erik Skram. Her novels are destitute of literary beauty, but excellent in their local colour, dealing with life in Bergen and the west coast. But the most extravagant product of the prosaic period was Hans Jæger (b. 1854), a sailor by profession, who left the sea, obtained some instruction and embarked on literature. Jæger accepted the naturalistic formulas wholesale, and outdid Zola himself in the harshness of his pictures of life. Several of Jæger's books, and in particular his novel *Morbid Love* (1893), were immediately suppressed, and can with great difficulty be referred to. Knud Hamsun (b. 1860) has been noted for his egotism, and for the bitterness of his attacks upon his fellow-writers and the great names of literature. Hamsun is seen at his best in the powerful romance called *Hunger* (1888). A writer of a much more pleasing, and in its quiet way of a much more original order, is Hans Aanrud (b. 1863). His humour, applied to the observation of the Ostland peasants—Aanrud himself comes from the Gulbrandsdal—is exquisite; he is by far the most amusing of recent Norwegian writers, a race whose fault it is to take life too seriously. His story, *How Our Lord made Hay at Asmund Bergemellum's* (1887), is a little masterpiece. Peter Egge (b. 1869), a young novelist and playwright from Trondhjem, came to the front with careful studies of types of Norwegian temperament. In his *Jacob and Christopher* (1900) Egge also proved himself a successful writer of comedy. Gunnar Heiberg (b. 1857), although older than most of the young generation, has but lately come into prominence. His poetical drama, *The Balcony*, made a sensation in 1894, but ten years earlier his comedy of *Aunt Ulrica* should have awakened anticipation. His strongest work is *Love's Tragedy* (1904). Two young writers of great promise were removed in the very heyday of success, Gabriel Finne (1866–1899) and Sigbjörn Obstfelder (1866–1900). The last mentioned, in *The Red Drops* and *The Cross*, published in 1897, gave promise of something new in Norwegian literature. Obstfelder, who died in a hospital in Copenhagen in August 1900, left an important book in MS., *A Priest's Diary* (1901).

Verse was banished from Norwegian literature, during the years that immediately preceded 1885. The credit of restoring it belongs to Sigurd Bödtker, who wrote an extremely naturalistic piece called *Love*, in the manner of Heine. The earliest real poet of the new generation is, however, Niels Collett Vogt (b. 1864), who published a little volume of *Poems* in 1887. Arne Dybfest (1868–1892), a young anarchist who committed suicide, was a decadent egotist of the most pronounced type, but a poet of unquestionable talent, and the writer of a remarkably melodious prose. In 1891 was printed in a magazine Vilhelm Krag's (b. 1871) very remarkable poem called *Fandango*, and shortly afterwards a collection of his lyrics. Vogt and V. Krag continued to be the leading lyrical writers of the period, and although they have many imitators, they cannot be said to have found any rivals. Vilhelm Krag turned to prose fiction, and his novels *Isaac Seehuusen* (1900) and *Isaac Kapergast* (1901) are excellent studies of Westland life. More distinguished as a novelist, however, is his brother, Thomas P. Krag (b. 1868), who published a series of romantic novels, of which *Ada Wilde* (1897) is the most powerful. His short stories are full of delicate charm. Hans E. Kinck (b. 1865) is an accomplished writer of short stories from peasant life, written in dialect. Bernt Lie (b. 1868) is the author of popular works of fiction, mainly for the young. Sven Nilssen (b. 1864) is the author of a very successful novel, *The Barque Franciska* (1901). With him may be mentioned the popular dramatist and memoir-writer, John Paulsen (b. 1851), author of *The Widow's Son*. Johan Bojer (b. 1872) has written satirical romances, of which the most powerful is *The Power of Faith* (1903). Jakob Hilditch (b. 1864) has written many stories and sketches of a purely national kind, and is the anonymous author of a most diverting parody of banal provincial journalism, *Tranviksposten* (1900–1901).

The leading critics are Carl Nærup (b. 1864) and Hjalmar Christensen (b. 1869), each of whom has published collections of essays dealing with the aspects of recent Norwegian literature. The death of the leading bibliographer and lexicographer of Norway, Jens Braage Halvorsen (1845–1900), inflicted a blow upon the literary history of his country; his *Dictionary of Norwegian Authors* (1885–1900)—left for completion by Halfdan Koht—is one of the most elaborate works of its kind ever undertaken. Among recent historians of Norway much activity has been shown by Ernst Sars (b. 1835) and Yngvar Nielsen (b. 1843). The great historian of northern jurisprudence was L. M. B. Aubert (1838–1896), and in this connexion T. H. Aschehoug (b. 1822) must also be mentioned. The leading philosopher of Norway in those years was the Hegelian Marcus Jakob Monrad (b. 1816), whose *Aesthetics* of 1889 is his masterpiece.

The "maal" controversy.

The close of 1899 and the beginning of 1900 were occupied by a discussion, in which every Norwegian author took part, as to the adoption of the *landsmaal*, or composite dialect of the peasants, in place of the *rigsmaal* or Dano-Norwegian. Political prejudice greatly embittered the controversy, but the proposition that the *landsmaal*, which dates from the exertions of Ivar Aasen (*q.v.*) in 1850, should oust the language in which all the classics of Norway are written, was opposed by almost every philologist and writer in the country, particularly by Björnson and Sophus Bugge (b. 1833). On the other side, Arne Garborg's was almost the only name which carried any literary weight. The *maal* has no doubt enriched the literary tongue of the country with many valuable words and turns of expression, but there the advantage of it ends, and it is difficult to feel the slightest sympathy with a movement in favour of suppressing the language in which every one has hitherto expressed himself, in order to adopt an artificial dialect which exists mainly on paper, and which is not the natural speech of any one body of persons throughout the whole of Norway.

AUTHORITIES.—*La Norvège littéraire*, by Paul Botten-Hansen (1824–1869), is an admirable piece of bibliography, but comes down no farther than 1866. Jens Braage Halvorsen (1845–1900) left his admirable and exhaustive *Norsk Forfatter-Lexikon*, 1814–1880 (Norwegian Dictionary of Authors) incomplete; but the work was continued by Halfdan Koht. See also Henrik Jæger, *Illustreret norsk literaturhistorie* (Christiania, 1892–1896); to which an appendix *Siste Tidsrum 1890–1904* was added by Carl Nærup in 1905; Ph. Schweitzer, *Geschichte der skandinavischen Literatur* (Leipzig, 1889); F. W. Horn, *History of the Literature of the Scandinavian North* (Eng. trans., Chicago, 1884); Edmund Gosse, *Northern Studies* (2nd ed., 1882). (E. G.)

NORWEGIAN SEA, the sea enclosed between Norway, the Shetland and Faeroe Islands, Iceland, Greenland, Spitsbergen and Bear Island. Its basin is bounded on the E. by the Spitsbergen platform, the continental shelf of the Barents Sea and the Norwegian coast: on the S. and S.W. by the North Sea, the Wyville-Thomson ridge, the Faeroe-Iceland ridge and the Iceland-Greenland ridge; on the W. by the coast of Greenland and on the N., so far as is known, by a ridge extending from Greenland to Spitsbergen. The Norwegian Sea is thus placed between the basins of the Atlantic on the one side and of the Arctic Ocean on the other: the mean depth of the submarine ridge separating it from the former being about 300 fathoms, and from the latter probably about 400 fathoms. The basin itself consists of a series of deeps, separated from one another by transverse ridges. Nansen and Helland-Hansen give the following results of measurements of the area:

Area of surface . . .	2·58 million sq. km.
Water area at 600 metres .	1·79 " "
" " 1000 " .	1·65 " "
" " 2000 " .	1·05 " "
" " 3000 " .	0·30 " "
Volume	4·12 million cubic km.
Mean depth	1600 metres.

The Norwegian Sea forms the meeting-place of waters coming from the Atlantic and Arctic oceans, and it also receives coastal waters from the North Sea and connecting areas, and from the Barents Sea. As communication with other basins is cut off comparatively near the surface, the inflow and outflow of waters must take place entirely in the upper strata, and the isolated water in the deep basin has typical physical characters of its own.

The distribution and circulation of these waters are of great complexity, and have formed the subject of study by oceanographers since the region was first opened up by the Norwegian North Atlantic Expedition, 1876–1878. Much fresh light has been thrown on the subject by the work of the International Council for the study of the sea, and more particularly by the Norwegian investigators Nansen and Helland-Hansen, whose report on Norwegian Fishery and Marine Investigations (vol. ii. No. 2, 1909) contains a complete survey of present knowledge. (H. N. D.)

NORWICH, GEORGE GORING, EARL OF (1583?–1663), English soldier, was the son of George Goring of Hurstpierpoint and Ovingdean, Sussex, and of Anne Denny, sister of Edward Denny, earl of Norwich. He was knighted in 1608, and became a favourite at court, benefiting largely from monopolies granted by Charles I. He became Baron Goring in 1628, and privy councillor in 1639. When the troubles between Charles and his parliament became acute Goring devoted his fortune freely to the royal cause; and the king in November 1644 renewed for him the title of earl of Norwich which had become extinct at his uncle's death. He went with the queen to Holland in 1642 to raise money for the king, and in the autumn of the next year he was seeking arms and money from Mazarin in Paris. His proceedings were revealed to the parliament in January 1644 by an intercepted letter to Henrietta Maria. He was consequently impeached of high treason, and prudently remained abroad until 1647 when he received a pass from the parliament under a pretext of seeking reconciliation. Thus he was able to take a prominent part in the Second Civil War of 1648 (see GREAT REBELLION). He commanded the Kentish levies, which Fairfax dispersed at Maidstone and elsewhere, and was forced to surrender unconditionally at Colchester. He was condemned to exile in November 1648 by a vote of the House of Commons, but in the next month the vote was annulled. Early in the next year a court was formed under Bradshaw to try Norwich and four others. All five were condemned to death on the 6th of March, but petitions for mercy were presented to parliament, and Norwich's life was spared by the Speaker's casting vote. Shortly after his liberation from prison in May he joined the exiled court of Charles II., by whom he was employed in fruitless negotiations with the duke of Lorraine. He became captain of the king's guard at the Restoration, and in consideration of the fortune he had expended in the king's service a pension of £2000 a year was granted him. He died at Brentford on the 6th of January 1663. By his wife Mary Nevill (d. 1648), daughter of the 6th Lord Abergavenny, he had four daughters and two sons: George, Lord Goring (*q.v.*); and Charles, who fought in the Civil War, succeeded his father in the earldom, and died without heirs in March 1671.

NORWICH, a city and one of the county-seats of New London county, Connecticut, U.S.A., in the township of Norwich, at the point where the Yantic (which expands here in "The Cove") and Shetucket rivers join and form the Thames. Pop. (1900) of the township, 24,637, which included that of the city (17,251, including 4597 foreign-born); (1910) of the city, 20,367, and of the township, 28,219. The city area in 1906 was 5·63 sq. m. Norwich is served by the New York, New Haven & Hartford and the Central Vermont railways, by steamers from New York and New London, and by interurban electric lines connecting with Willimantic, New London and other neighbouring places. The city is at the head of navigation on the Thames river, whose channel is 100-200 ft. wide and 14 ft. deep. The residential and older portion of the city is built on the rising ground between the valleys of the two streams; along their banks lies the business district. In Sachem Street is the grave of Uncas (d. *c.* 1682), a Mohegan Indian chief and friend of the early settlers; the corner-stone of the granite monument over the grave was laid by President Andrew Jackson in 1833. North-east of the Roman Catholic Cemetery, in the extreme eastern part of the city, is a monument to Miantonomo, a sachem of the Narraganset tribe of Indians, who was put to death here. Among the principal buildings and institutions are the Congregational Church, organized in 1660; the Norwich Free Academy (1856) and its Slater Memorial Hall, in which are the Peck Library and an Art Museum, and the Converse Art Annex and Art Collection; the Otis Public Library (1848); the William W. Backus Hospital; a state hospital for the insane and a state armoury. In the 18th century, and early in the 19th, Norwich had a lucrative trade with the Atlantic ports and the West Indies, but later manufacturing became the most important industry; the manufactures including textiles, cutlery, fire-arms, paper, electrical supplies, printing presses, &c. In 1905 the factory products were valued at $6,022,391. With the city's growth in manufacturing there has been a large increase in the foreign element in the population. The municipality owns and operates the waterworks, and gas and electric-lighting plants.

Norwich was settled in 1659 by colonists from Saybrook under the leadership of Captain John Mason (1600–1672), who had crushed the power of the Pequot Indians in Connecticut in 1637, and the Rev. James Fitch (1622–1702), who became a missionary to the Mohegans.[1] The tract was purchased from the Mohegan chiefs, Uncas, Owaneco and Attawanhood, and the settlement was called Mohegan until 1662, when the present name was adopted. During and preceding the War of Independence the citizens of Norwich were ardent Whigs, various members of the well-known Huntington family being among their leaders.[2] In December 1767, in reply to a message from Boston, a town-meeting forbade the use of tea, wines, liquors and foreign manufactures; in 1770 all citizens were forbidden to hold intercourse with a schoolmaster who had continued to drink tea, and in 1776 a town-meeting directed the town clerk to proceed with his duties without reference to the Stamp Act. Norwich was chartered as a city in 1784. Among the early settlers in Ohio many were inhabitants of Norwich. Benedict Arnold was a native of Norwich; Mrs Lydia H. Sigourney was born here in a house still standing; Donald G. Mitchell ("Ik Marvel") was also born here; and Norwich was the home after 1825 of William Alfred Buckingham (1804–1875), war governor of Connecticut.

See F. M. Caulkins, *History of Norwich* (Hartford, 1866).

NORWICH, a city and county of a city, municipal, county and parliamentary borough, and the county town of Norfolk, England; 114 m. N.E. by N. from London. Pop. (1901), 111,733. It is served by the Great Eastern railway and also by the Midland and Great Northern joint line. The Great Eastern company owns the Thorpe and Victoria stations, and the joint line the City station. The city lies in the valley of the Wensum, which joins the Yare immediately below. The ancient city lay in a deep bend of the Wensum, and the walls (1294–1342), with their many towers and twelve gatehouses, of which fragments only remain, were 4 m. in circuit. These narrow limits, however, were long ago outgrown, for Evelyn writes in 1671 that "the suburbs are large, the prospects sweete, with other amenities, not omitting the flower gardens, in which all the inhabitants excel." The castle, standing high upon a steep mound, is still partly surrounded by earthworks and a ditch spanned by a very early bridge. Only the early Norman square keep remains, with four tiers of arcading without, and an ornate doorway into the great tower. The building long served as a prison, but, on the erection of a new gaol without the city, was acquired in 1884 by the corporation and in 1894 adapted as a museum and art gallery.

The cathedral church of the Holy Trinity lies between the castle and the river, on low ground. In 1094 the seat of the East Anglian bishopric was removed by Bishop Herbert de Lozinga or Lorraine from Thetford to Norwich, where in 1096 he laid the foundation of the cathedral and dedicated it in 1101, establishing at the same time a Benedictine monastery. As completed by his successor before the middle of the 12th century the cathedral in style was purely Norman; and it still retains its original Norman plan to a great degree. Changes and additions, however, were made from time to time—the Early English lady chapel (demolished about 1580) belonging to the middle of the 13th century; the Perpendicular spire, erected after the collapse of two previous spires of wood, to the 15th; the west window and porch and the lierne stone vaulting of the nave, with its elaborate 328 bosses, to the 15th, and to the 16th the vaulting of the transepts and Bishop Nix's chantry, whilst the fine cloisters, 175 ft. square, 12 ft. wide, with 45 windows, in style mainly Decorated, were begun in 1297 and not completed till 1430. The following are the dimensions in feet of the cathedral: total length, 407; length of nave, 204; length of transepts, 178; breadth of nave and aisles, 72; total height of spire, 315 (in England exceeded by Salisbury only); height of tower, $140\frac{5}{12}$; height of nave, $69\frac{1}{2}$; height of choir, $83\frac{1}{2}$. The chief entrance on the west is a Perpendicular archway, above which is an immense window filled with poor modern stained glass. The nave within is grand and imposing, of great length, divided by fourteen semicircular arches, whose massive piers are in two instances ornamented with spiral mouldings. The triforium is composed of similar arches. The side aisles are low, their vaultings plain. The choir, extending westward some way beyond the crossing, is of unusual length, and terminates in an apse. The oak stalls and *misereres* are very richly carved work of the 15th century. A curious quatrefoil, opening on the north side of the presbytery, beneath the confessio or relic chapel, deserves mention. There is a monumental effigy of Bishop Goldwell (*c.* 1499), and another of Bishop Bathurst (1837) by Sir F. Chantrey. Mural monuments are plentiful. Sir William Boleyn, great-grandfather of Queen Elizabeth, is buried on the south side of the presbytery, in the midst of which stood the tomb of Bishop Herbert, the founder. Of three circular apsidal chapels two remain; and in one—the Jesus chapel—the ancient colouring has been renewed. Two richly sculptured gateways lead to the cathedral—the Erpingham gate (1420) and the Ethelbert gateway (*c.* 1300). The bishop's palace and the deanery are buildings of high antiquity, but both have undergone many alterations. The latter has a well-restored chapel. A beautiful Early Decorated ruin in the palace garden, known as "Bishop Salmon's gateway," is supposed to have been the porch to the great hall (*c.* 1319). The diocese covers nearly all Norfolk, the greater part of Suffolk, and a small part of Cambridgeshire.

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[1] The principal village of the Mohegans was originally, it seems, on the site of Norwich. Subsequently the village of Mohegan (on the W. bank of the Thames, about 3 m. S. of Norwich) became their principal settlement, and the remnant, numbering about 100 individuals of mixed blood in 1904, still live here and in the vicinity.

[2] Norwich was the birthplace of Benjamin Huntington (1736–1800), a member of the Continental Congress in 1780–1784 and 1787–1788, a representative in Congress in 1789–1791, judge of the state superior court in 1793–1798, and first mayor of Norwich in 1784–1796; of Jabez Huntington (1719–1786), a patriot leader and major-general of Connecticut militia during the War of Independence; of his son, Jedediah Huntington (1743–1818), also a patriot leader, a brigadier-general in the Continental Army (1777–1783), and a founder of the Society of the Cincinnati; of Jedediah's brother, Ebenezer Huntington (1754–1834), a soldier and in 1810–1811 and 1817–1819 a representative in Congress; and of Jedediah's nephew, Jabez Williams Huntington (1788–1847), a jurist, a representative in Congress in 1829–1834, and a member of the U.S. Senate in 1840–1847. Samuel Huntington (1731–1796) removed to Norwich about 1758, was a member of the Continental Congress in 1776–1783 and its president in 1779–1781, was a signer of the Declaration of Independence, a justice of the supreme court of Connecticut in 1774–1784, and governor of Connecticut in 1786–1796.

Of the remarkable number of churches, over forty in all, St Peter Mancroft is by many esteemed the finest parish church in England. Measuring 212 by 70 ft., it has a richly ornamented tower and flèche, 148 ft. high, with a beautiful peal of twelve bells, a long, light clerestory of thirty-four windows, a fine carved oak roof, a remarkable font cover, and the tomb of Sir Thomas Browne (d. 1682). The majority of the Norwich churches are of Perpendicular flint work, mostly of the 15th century. St Andrew, St Stephen, St Michael Coslany, with the fine Perpendicular Thorpe chapel, St John Maddermarket, St Lawrence, St Giles, with a tower 126 ft. high, St Gregory, St Helen, St Swithin, and St Michael at Plea (so called from the archdeacon's court held here) are also noticeable. The Roman Catholic church of St John the Baptist, begun in 1884 from designs by Sir G. G. Scott, occupies a commanding position outside St Giles's gate. At Carrow, E. of the city, there remain the hall, a decorated doorway, and other fragments of a Benedictine nunnery.

The grammar school is a Decorated edifice, formerly a chapel of St John, of *c.* 1316, with a "carnary" or crypt below. Among its scholars were Sir Edward Coke, Lord Nelson, Raja Brooke and George Borrow, the traveller and author, in whose work *Lavengro* (chap. xiv.) occurs a noteworthy description of Norwich. St Andrew's Hall (124 by 64 ft.) is the seven-bayed nave of the Black Friars' church, rebuilt with the aid of the Erpinghams between 1440 and 1470. It is a splendid specimen of Perpendicular work, with its twenty-eight clerestory windows and chestnut hammer-beam roof, and has served since the Reformation as a public hall, in which from 1824 have been held the triennial musical festivals. It was restored in 1863. The guildhall, on the site of an earlier tolbooth, is a fine flint Perpendicular structure of 1408–1413; the mayor's council-chamber, with furniture of the time of Henry VIII., is an interesting specimen of a court of justice of that period. The city regalia, kept here, include several objects of historical interest, amongst them a sword of a Spanish admiral captured by Nelson, with his autograph letter presenting it to the city, and a curious figure formerly used in the procession of the mayor elect through the city. Other public buildings include a shire hall, within the castle precincts, corn exchange, agricultural hall, volunteer drill hall, barracks and gaol on Mousehold Heath, the Norfolk and Norwich Library, rebuilt in 1900 after a fire, and a theatre. Educational establishments, besides the grammar school, include the Norwich and Ely Diocesan Training College, and the Municipal Technical Institute. The museum in the castle contains collections of British birds, insects, fossils, antiquities, and MSS. and early books. The chief charitable institutions are the Norfolk and Norwich Hospital, lunatic asylum, blind asylum and schools, Jenny Lind Infirmary for children, a soldiers' and sailors' institute, St Giles's or old men's hospital (an ancient foundation), and Doughty's Hospital (1687).

The principal industries include foundries and engineering works, iron and wire fence works, brewing, brick works, chemical works, tanneries, and the production of mustard, starch, and crêpe, gauze and lace; and there are large boot and shoe factories. The great cattle market lies below the castle. The municipal, county and parliamentary boroughs are coextensive. The parliamentary borough returns two members. The city is governed by a lord mayor (this title having been conferred in 1910), 16 aldermen and 48 councillors. Area, 7905 acres.

History.—There is no conclusive evidence that Norwich (Northwic, Norwic) was an important settlement before the coming of the Angles. Caistor-by-Norwich, 4 m. S. of Norwich, is on the site of what was probably a Romano-British country town. A few Roman remains have been discovered in Norwich, itself, but not enough to indicate any real occupation or habitation. According to tradition Uffa made a fortification here about 570, but its history as a royal borough cannot be traced before the reign of Æthelstan (924–940), when it possessed a mint. After being destroyed by the Danes Norwich enjoyed a period of prosperity under Danish influence and was one of the largest boroughs in the kingdom at the Conquest. Ralph de Guader, earl of East Anglia under William I., formed the nucleus of a French borough with different customs from the English, and after his forfeiture, which involved the ruin of many of the old burgesses, a masonry castle was built and the centre of burghal life gradually transferred to the new community west of it. By 1158, when Henry II. granted the burgesses a charter confirming their previous liberties, the two boroughs seem to have amalgamated. A fuller charter given by Richard I. in 1194 and confirmed by later sovereigns made Norwich a city enjoying the same liberties as London. From Henry IV. the citizens obtained a charter (1404), making their city a county with a mayor and two sheriffs instead of four bailiffs, and Henry V. added twenty-four aldermen and sixty common councilmen (1418). The cathedral precinct became parcel of the city at the Dissolution and in 1556 the neighbouring hamlets were incorporated in the county of Norwich. The charter of Charles II. (1683) remained in force till 1835, when one sheriff was removed and the number of aldermen, common councilmen and wards diminished. Since 1298 Norwich has been represented in parliament by two members. Two annual fairs, existing before 1332, were formally granted to the city in 1482. One was then held in Lent, the other began on the feast of the Commemoration of St Paul (the 30th of June). These have been succeeded by the Maunday Thursday horse and cattle fair, and the pleasure fairs of Easter and Christmas. The market, which must have existed before the Conquest, was held daily in the 13th century, when citizens enclosed stalls by royal licence. Edward III. made Norwich a staple town, and the importance of its trade in wool and worsted dates from his reign.

See *Victoria County History, Norfolk*; W. Hudson, *Records of the City of Norwich* (1906).

NORWICH, a village and the county-seat of Chenango county, New York, U.S.A., on the Chenango river, 42 m. N.E. of Binghamton. Pop. (1910 census), 7422. It is served by the Delaware, Lackawanna & Western and the New York, Ontario & Western railways. The village has three parks, two libraries—the Guernsey Memorial Library and the D. L. Follett Memorial Law Library—and the Chenango Valley Home for Aged Women. Norwich is in a dairying and farming region, where hops especially are grown; and there are bluestone quarries in the vicinity. There are a variety of manufactures, and the New York, Ontario & Western has repair shops and division headquarters here. The first settlement was made in 1792, and the village was incorporated in 1857.

NORWOOD, a southern district of London, England, partly in Surrey and partly in the county of London (metropolitan borough of Lambeth). The district is hilly and well wooded, hence the name. It is divided into Upper, Lower and South Norwood, all consisting principally of villa residences and detached houses inhabited by the better classes. Among numerous institutions are almshouses for the poor of St Saviour's, Southwark, opened at South Norwood in 1863, a Jewish convalescent home in 1869, and the Royal Normal College and Academy of Music for the Blind at Upper Norwood in 1872. At Gipsy Hill, Upper Norwood, lived Margaret Finch, queen of the Gipsies, who died in 1740 at the age of 109, and was buried in the churchyard at Beckenham.

NORWOOD, a township in Norfolk county, Massachusetts, about 14 m. S.W. of Boston. Pop. (1900) 5840 (1497 foreign-born); (1910) 8014; area about 10 sq. m. Norwood is served by the New York, New Haven & Hartford railway. The township is traversed by the Neponset river. It has the Morrill Memorial Library (12,000 volumes in 1909). Norwood's manufactories include printing-ink and glue factories, tanneries, an iron foundry, and the printing-presses and binderies of J. S. Cushing Co., H. M. Plimpton & Co., and the Norwood Press Co. Originally the South or Second Precinct of Dedham, Norwood was incorporated as a township (with the addition of a part of Walpole) under its present name in 1872.

See D. Hamilton Hurd, *History of Norfolk County, Massachusetts* (Philadelphia, 1864).

NORWOOD, a city of Hamilton county, Ohio, U.S.A., adjoining Cincinnati on the N. E. Pop. (1900), 6480 (718 foreign-born); (1910) 16,185. It is served by the Baltimore & Ohio South Western and the Cincinnati, Lebanon and Northern railways, and by interurban electric railways. Norwood has various manufactures, but as one of the hill suburbs of Cincinnati it is primarily a place of residence. It has a Carnegie library (a branch of the public library of Cincinnati) and a Catholic maternity hospital. Norwood, originally called Sharpsburg, was settled about 1798, laid out as a town in 1873, incorporated as a village in 1888, and chartered as a city in 1903.

NORZAGARAY, a town of the province of Bulacan, Luzon, Philippine Islands, on the Quingua river, about 25 m. N. by E. of Manila. Pop. (1903), 5131. The inhabitants are engaged chiefly in the cultivation of rice and Indian corn, and in lumbering; good timber grows on the neighbouring mountains, and some iron and gold have been found in this region. Near the town there is a sulphur spring. The language is Tagalog.

NOSAIRIS (also known as Ansayrii, sometimes Ansariyeh), the people who inhabit the mountainous country of N. Syria, which is bounded on the S. by the north end of the Lebanon at the Nahr el-Kebīr (Eleutherus), on the N. by Mt Casius, Antioch and the Nahr el-ʿAsi (Orontes). Various settlements of them are found also in Antioch itself and in Tarsus, Adana, and a few other places, while in harvest time they come down as far as the Biqʿa (Bukaʿa). From the time of Strabo until about two centuries ago, the country was famed for its wine, but now more for its tobacco (especially at Latakia). The total number of Nosairis inhabiting this country is variously estimated at from 120,000 to 150,000.

The origin of the name Nosairi is uncertain. Among the more possible explanations is that the name is derived from that of Mahommed ibn Nuṣair, who was an Ismaʿīlite follower of the eleventh imām of the Shiites at the end of the 9th century. This view has been accepted by Nosairi writers, but they transfer Ibn Nuṣair to the 7th century and make him the son of the vizier of Moawiyā I., while another tradition (cf. Abulfeda, *Geog.* vol. ii. p. 11, No. 7) identifies him with Nuṣair, a freedman of the caliph ʿAli. It is, however, noteworthy that Pliny (*Hist. nat.* v. 81) gives the name *Nazerini* to the inhabitants of this district. In this part of Syria paganism remained even up to the middle ages (cf. *Archives de l'Orient latin*, vol. ii. 2, p. 375), and there is a complete absence of churches of the 5th to the 7th centuries in these mountains. In the 7th century the Arabs invaded Syria, but do not seem to have got into these mountains. At the end of the 10th century, however, the Ismaʿīlite propaganda won some success among the people. Their strongholds were taken by Raymond in 1099, and later Tancred secured the very summits. In 1132–1140 the Assassins (*q.v.*) gained possession of their chief towns, but Saladin recovered them in 1188. In 1317 the sultan Bibars endeavoured to convert them to orthodox Islam, and built many mosques, but Ibn Batūta (i. 177) says they did not use them. A *fatwa* of Ibn Taimīyya (d. 1327) of this time shows that the Nosairis were regarded with fear and hatred by the orthodox. For the next 500 years they were given over to their own internal disputes, until they came under the power of Ibrahim Pasha in 1832. At the present time they are under the direct administration of the Turks.

The religion of the Nosairis seems to have been almost the same in the first years of the 5th century A.H. (11th century A.D.) as it is to-day, judging by the references in the sacred books of the Druses. As set forth in their own sacred book, the *Majmūʿ*, it seems to be a syncretism of Ismaʿīlite doctrines and the ancient heathenism of Harrān. The ages of the world are seven in number, each of these having its own manifestation of deity. But the manifestation of the 7th age is not a Mahdi who is yet to come, but the historical person ʿAli ibn abu Ṭālib. This is stated in the crudest form in *Sura* 11 of the *Majmūʿ*: "I testify that there is no god but ʿAli ibn abu Ṭālib." ʿAli is also called the *Maʿnā* ("Idea"; cf. the *Logos* of the New Testament), hence the Nosairis are also called the Maʿnawīyya. ʿAli created Mahomet, who is known as the *Ism* ("Name"), and a trinity is formed by the addition of Salmān ul-Fārisī, who is the *Bāb* ("Door"), through whom the propaganda is made, and through whom one comes to God. A mysterious symbol much used in their ceremonies of initiation consists of the three letters *ʿAin*, *Mim*, *Sin*, these being the initials of ʿAli, Mahomet and Salmān. Of these three, however, ʿAli is the supreme. In *Sura* 6 of the *Majmūʿ* the Nosairi says: "I make for the Door, I prostrate myself before the Name, I worship the Idea." Each of the seven manifestations of God in the ages of the world has been opposed by an adversary.

The Nosairis are divided into four sects. (1) The Haidarīs (from the name *haidari*, "lion," given to ʿAli on account of his valour) are the most advanced. (2) The Shamālis or Shamsis preserve many traces of the old nature-worship. ʿAli (*i.e.* the supreme god) is the heaven, Mahomet is the sun, Salmān the moon. (3) On the other hand the Kalazis, so named from a sheik Mahommed ibn Kalazi (cf. E. Salisbury in the *Journal of the American Oriental Society*, viii. 237), or Qamaris, hold that the supreme god (ʿAli) is the moon, not the sun. Their poetry addressed to the moon is translated by C. Huart in the *Journal asiatique*, ser. vii. vol. xiv. pp. 190 ff. (4) The Ghaibis are worshippers of the air, for God is invisible. In this they come nearer to the ordinary Ismaʿīlite doctrine. Religion is restricted among the Nosairis to the initiated, who must be adults over fifteen years of age and of Nosairi parentage. The initiator, who must not be a relative, becomes a spiritual father, and the relation cannot be broken except by his consent. The initiation consists of three stages. In the first the novice is received and told to meditate on the three mystic letters; in the second, after a period of forty days, he is taught the titles of the 16 *suras* of the *Majmūʿ*; in the third, after seven or nine months (intended to correspond with the ordinary period of gestation), he is taught *Suras* 5, 6 and 9, learns the meaning of the three mystic letters and goes through a further period of instruction from his initiator. The initiated are divided into two classes, the sheiks, who are recruited from the families of sheiks only, and the ordinary members.

The Nosairis are believers in metempsychosis. The pious Nosairi takes his rank among the stars, but the body of the impious undergoes many transformations.

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NOSARI, or Navsari, a town in India, in the state of Baroda, on the left bank of the Purna river, 147 m. by rail N. of Bombay. Pop. (1901), 21,451. It is an ancient place, known to Ptolemy as Nasaripa. It was one of the earliest settlements of the Parsees in Gujarat, after their banishment from Persia in the 12th century. It is still the home of their *mobeds*, or sacerdotal class, and contains their most venerated "fire temple." Many small industries are carried on, including the weaving of the *kusti*, or sacred thread of the Parsees. There is also considerable trade by both rail and water, for the river is navigable. The public buildings and the private houses, especially those in the suburbs, are unusually good.

NOSE (O.Eng. *nosu*, cf. Dutch *neus*, Swed. *nos*, snout; the connexion with O.Eng. *nasu* is obscure, cf. Ger. *Nase*, Lat. *nares*, nostrils, *nasus*, nose, Fr. *nez*), the organ of the sense of smell (*q.v.*) in man and other animals (see Olfactory System). The projecting feature above the mouth, to which the word is usually restricted in man, is, in the case of the lower animals, called snout or muzzle, or, if much prolonged, proboscis or trunk. "Nostril," the external opening into the nose, is from O.Eng. *nosthyrl* (*thyrl* or *thirl*, hole or opening).

NOSOLOGY (Gr. *νόσος*, disease, and *λόγος*, science), that branch of medical science which deals with the classification of diseases; the term is applied also to a collection of diseases, and to the special character of a particular disease and the different opinions concerning it.

NOSSEN, a town of Germany, in the kingdom of Saxony, pleasantly situated on the Freiberger Mulde, 51 m. S.E. from Leipzig by the railway to Dresden via Döbeln, and at the junction of a line to Moldau. Pop. (1905), 4879. It possesses an ancient castle crowning a height above the river, and has extensive manufactures of boots and shoes, leather and paper. In the immediate vicinity are the ruins of the Cistercian monastery of Altenzella, or Altzella, founded in 1145, and a noted school of philosophy during the 13th-15th centuries. In the chapel, which was built in 1347 and restored in 1787, lie the remains of ten margraves of Meissen, members of the family of Wettin. The foundation was secularized in 1544. The valuable annals, *Chronicon vetere Cellense majus* and *Chronicon minus*, giving a history of Saxony during the 13th and 14th centuries, were removed to the university library of Leipzig in 1544. They are printed in Band xvi. of the *Monumenta Germaniae historica. scriptores* (1859).

See E. Beyer, *Das Cistercienstift und Kloster Alt-Celle* (Dresden, 1855).

NOSSI-BÉ, properly Nòsy-bé, *i.e.* "Great island," an island about 8 m. off the N.W coast of Madagascar, in 13° 23′ S., 48° 15′ E. It is 14 m. long by 10 broad, and has an area of 130 sq. m. Nossi-bé is volcanic, the N. and S. parts of older, the central part of more modern date. Besides a number of true volcanic craters (Lòkobé, the highest point, is 1486 ft. above the sea) there are numerous crater-lakes level with the ground (see *Nature*, March 1877, p. 417). The climate is similar to that of Mayotte (see Comoro Islands), and the neighbouring islet of Nossi-komba, about 2000 ft. above the sea, serves for a sanatorium. Pop. (1902), 9291. Hellville, the chief town (so called after De Hell, governor of Réunion at the time of the French annexation), is a port of call for the Messageries Maritimes and a centre for the coasting trade along the western shores of Madagascar. There is excellent anchorage, and a pier 800 ft. long. The soil is very fertile, and there are forests of palms and bamboos. The chief products are coffee, sesame, the sugar-cane, cocoa, vanilla and tobacco. There are numerous sugar factories and rum distilleries.

In 1837 Tsioméko, chieftainess of one of the numerous divisions of the western Malagasy known under the common name of Sàkalàva, was expelled by the Hova and fled to Nossi-bé and Nossi-komba. Failing assistance from the imam of Muscat, she accepted French protection in 1840, ceding such rights as she possessed on the N.W. coast of the mainland. The French took possession in 1841, and in 1849 an unsuccessful attempt was made to expel them. The administration was entrusted to a subordinate of the governor of Mayotte until 1896, when Nossi-bé was placed under the administration of Madagascar (*q.v.*). (J. Si.*)

NOSTALGIA (Gr. *νόστος*, return home, and *ἄλγος*, grief), home-sickness, the desire when away to return home, amounting sometimes to a form of melancholia.

NOSTRADAMUS (1503–1566), the assumed name of Michel de Notredame, a French astrologer, of Jewish origin, who was born at St Remi in Provence on the 13th of December 1503. After studying humanity and philosophy at Avignon, he took the degree of doctor of medicine at Montpellier in 1529. He settled at Agen, and in 1544 established himself at Salon near Aix in Provence. Both at Aix and at Lyons he acquired great distinction by his labours during outbreaks of the plague. In 1555 he published at Lyons a book of rhymed prophecies under the title of *Centuries*, which secured him the notice of Catherine de' Medici; and in 1558 he published an enlarged edition with a dedication to the king. The seeming fulfilment of some of his predictions increased his influence, and Charles IX. named him physician in ordinary. He died on the 2nd of July 1566.

The *Centuries* of Nostradamus have been frequently reprinted, and have been the subject of many commentaries. In 1781 they were condemned by the papal court, being supposed to contain a prediction of the fall of the papacy. Nostradamus was the author of a number of smaller treatises. See Bareste, *Nostradamus* (Paris, 1840).

NOSTRUM (neuter of Lat. *noster*, our), the name given to preparations of which the ingredients are not made publicly known, a patent or "quack" medicine; it is taken from the label ("of our own make") formerly attached to such medicines.

NOTARY, or Notary Public. In Roman law the *notarius* was originally a slave or freedman who took notes (*notae*) of judicial proceedings in shorthand. The modern notary corresponds rather to the *tabellio* or *tabularius* than to the *notarius*. In canon law it was a maxim that his evidence was worth that of two unskilled witnesses.

The office of notary in England is a very ancient one. It is mentioned in the Statute of Provisors, 25 Edward III. stat. 4. The English notary is an ecclesiastical officer, nominated, since the Peterpence Dispensations Act 1533-1534, by the archbishop of Canterbury through the master of the faculties (now the judge of the provincial courts of Canterbury and York), in order to secure evidence as to the attestation of important documents. All registrars of ecclesiastical courts must be notaries. A notary's duties, however, are mainly secular. "The general functions of a notary consist in receiving all acts and contracts which must or are wished to be clothed with an authentic form; in conferring on such documents the required authenticity; in establishing their date; in preserving originals or minutes of them which, when prepared in the style and with the seal of the notary, obtain the name of original acts; and in giving authentic copies of such acts". (Brooke, *On the Office of a Notary*, chap. iii.). The act of a notary in authenticating or certifying a document is technically called a "notarial act." In most countries the notarial act is received in evidence as a semi-judicial matter, and the certificate of a notary is probative of the facts certified. But English law does not recognize the notarial act to this extent. An English court will, in certain cases, take judicial notice of the seal of a notary, but not that the facts that he has certified are true, except in the case of a bill of exchange protested abroad.

The most important part of an English notary's duty is the noting and protest of foreign bills of exchange in case of non-acceptance or non-payment. This must be done by a notary in order that the holder may recover. He also prepares ship protests and protests relating to mercantile matters, and authenticates and certifies copies of documents and attests instruments to be sent abroad. The office of notary is now usually held by a solicitor. In London he must be free of the Scriveners' Company.

In Scotland, before the reign of James III., papal and imperial notaries practised until the 29th of November 1469, when an act was passed declaring that notaries should be made by the king. It would appear, however, that for some time afterwards there were in Scotland clerical and legal notaries—the instruments taken by the latter bearing faith in civil matters. In 1551 an act was passed directing sheriffs to bring or send both kinds of notaries to the lords of session to be examined; and in a statute, passed in 1555, it was ordained that no notary, "by whatsoever power he be created," should use the office "except he first present himself to the said lords, showing his creation, and be admitted by them thereto." It does not appear that this statute vested the right of making notaries in the court of session; but in 1563 it was by law declared that no person should take on him the office, under the pain of death, unless created by the sovereign's special letters, and thereafter examined and admitted by the lords of session. Since then the Court of Session has in Scotland exercised exclusive authority on the admission of notaries in all legal matters, spiritual and temporal. The position of notaries in Scotland is somewhat higher than it is in England.

In the United States, notaries are appointed by the governors of the states, and their authority to act is limited to the state to which they are appointed. They are state officers, and their duties in the main are attesting deeds and other instruments, and taking affidavits and depositions; all such documents which are intended to be used in the federal courts must have the notarial seal affixed. They also protest bills of exchange, and in some states they have the powers of a justice of the peace.

In France, notaries receive all acts and contracts to which the parties thereto must give or desire to give the authenticity attached to the acts of a public authority; they certify the date, preserve the originals and give copies or duplicates. Notaries are nominated by the president of the republic on the recommendation of the keeper of the seals. They cannot act as notaries and practise as advocates, or hold any magisterial office, nor must they engage in business. Notaries are divided into three classes: those of towns which have a court of appeal; those of towns which have a court of first instance; those of the other towns and communes. The first and second classes can practise wherever the jurisdiction of their courts extends; the third class only in their canton. They must obtain the sanction of the minister of justice should they desire to change from one district to another. They must serve an apprenticeship of six years (with exceptions) to a notary of the class to which they desire to belong. Every notary is bound in a certain sum fixed by the government as security for the due discharge of his duties. Since 1896 the remuneration of the more important classes of notaries has been regulated by law. Each district has a chamber of notaries, which exercises disciplinary powers over its members.

In Germany, notaries are appointed by the president of the courts of law and the minister of justice in their respective states; they carry on their profession for their own benefit, and do not, except in Württemberg, receive any fixed salary, but take fees from the parties they represent. They may not refuse their services, save on good and sufficient ground. In some German states, notably Saxe-Weimar and Hesse-Darmstadt, there are no notaries. In Württemberg, Baden, Bavaria, Alsace-Lorraine, Rhenish Prussia and Austria, they form a distinct class, while in the other German states they generally combine the notarial office with that of advocate. There is no code of rules for the whole empire, the new *Bürgerliches Gesetzbuch* leaving it to each state to frame its own regulations.

NOTE (Lat. *nota*, mark, sign, from *noscere*, to know), a mark, particularly a sign by which a musical sound (also called a note) is indicated in writing (see Musical Notation). The term is also applied to an abstract or memorandum of documents, speeches, &c. This appears to have been first in legal use, especially in the process of the transfer of land by fine and recovery (see Fine). Further extensions of this meaning are to an explanation, comment or addition, added in the margin or at the foot of the page to a passage in a book, &c., or to a communication in writing shorter or less formal than a letter.

The ordinary distinction between note and letter is reversed in diplomacy. *Diplomatic notes* are written communications exchanged between diplomatic agents or between them and the ministers of foreign affairs of the government to which they are accredited; they differ from ordinary letters in having a more formal character and in dealing with matters of more immediate and definite importance: *e.g.* the notification of adhesion to a treaty, of the re-establishment of diplomatic relations after a war, &c. Sometimes, by agreement, a mere exchange of notes has the force of a convention. *Collective notes* are those signed by the representatives of several powers acting in concert. Sometimes *identical notes* are substituted for collective, *i.e.* notes identical as to form and substance, but signed and delivered separately by the representatives of the several powers. Thus in 1822, at the congress of Verona, in order to overcome the objection of Great Britain to any interference of the European concert in Spain, identical notes were presented to the Spanish government instead of a collective note. *Circular notes* are those addressed by one power to the other powers generally, *e.g.* that addressed by Thiers (November 9, 1870), on the proposed armistice, to the representatives of the great powers accredited to the government of national defence. *Confidential notes* are directed to inspiring confidence by giving an explicit account of the views and intentions of the plenipotentiaries and their governments. Such a note was sent, for instance, by the plenipotentiaries of the allied powers at the conference of Poros, on the 8th of December 1828, to Capo d'Istria, the Greek president, to instruct him confidentially as to the results of their deliberations. The so-called *notes verbales* are unsigned, and are merely of the nature of memoranda (of conversations, &c.). *Notes ad referendum* are addressed by diplomatic agents to their own governments asking for fresh powers to deal with points not covered by their instructions, which they have had to "refer." Diplomatic notes are usually written in the third person; but this rule has not always been observed (see P. Pradier-Fodéré, *Cours de droit diplomatique*, Paris, 1899; vol. ii. p. 524).

For notes of hand or promissory notes see Negotiable Instruments and Bill of Exchange, and for notes passing as currency see Banks and Banking, Bank-Note and Post.

NOTHOMB, JEAN BAPTISTE, Baron (1805–1881), Belgian statesman and diplomat, was born at Messancy in Luxemburg on the 3rd of July 1805. He was educated at the Athenaeum of Luxemburg and the university of Liége. He was in Luxemburg when the revolution of August broke out, but was nominated a member of the commission appointed to draw up the constitution. He was a member of the national congress, and became secretary-general of the ministry of foreign affairs under Surlet de Chokier. He supported the candidature of the duke of Nemours, and joined in the proposal to offer the crown to Prince Leopold of Saxe-Coburg, being one of the delegates sent to London. When the Eighteen Articles were replaced by the Twenty-four less favourable to Belgium, he insisted on the necessity of compliance, and in 1839 he faced violent opposition to support the territorial cessions in Limburg and Luxemburg, which had remained an open question so long as Holland refused to acknowledge the Twenty-four Articles. His *Essai historique et politique sur la révolution belge* (1838) won for him the praise of Palmerston and the cross of the Legion of Honour from Louis Philippe. In 1837 he became minister of public works, and to him was largely due the rapid development of the Belgian railway system, and the increase in the mining industry. In 1840 he was sent as Belgian envoy to the Germanic confederation, and in 1841, on the fall of the Lebeau ministry, he organized the new cabinet, reserving for himself the portfolio of minister of the interior. In 1845 he was defeated, and retired from parliamentary life, but he held a number of diplomatic appointments before his death at Berlin on the 6th of September 1881.

See T. Juste, *Souvenirs du baron Nothomb* (Brussels, 1882).

NOTICE, a term primarily meaning knowledge (Lat. *notitia*), as in "judicial notice"; thence it comes to signify the means of bringing to knowledge, as in "notice to quit"; at last it may be used even for the actual writing by which notice is given. The most important legal uses of the word are judicial notice and the equitable doctrine of notice. Judicial notice is the recognition by courts of justice of certain facts or events without proof. Thus in England the courts take judicial notice of the existence of states and sovereigns recognized by the sovereign of England, of the dates of the calendar, the date and place of the sittings of the legislature, &c. The equitable doctrine of notice is that a person who purchases an estate, although for valuable consideration, after notice of a prior equitable right, will not be enabled by getting in the legal estate to defeat that right. On the other hand, a purchaser for valuable consideration without notice of an adverse title is as a rule protected in his enjoyment of the property. Other common uses of the word are notice to quit, *i.e.* a notice required to be given by landlord to tenant, or by tenant to landlord in order to terminate a tenancy (see Landlord and Tenant); notice of dishonour, *i.e.* a notice that a bill of exchange has been dishonoured; notice of action, *i.e.* a notice to a person of an action intended to be brought against him, which is required by statute to be given in certain cases; notice of trial, *i.e.* the notice given by a plaintiff to a defendant that he intends to bring on the cause for trial; notice in lieu of personal service of a writ, *i.e.* by advertisement or otherwise; notice given by one party in an action to the other, at a trial, to produce certain documents in his possession or power; notice to treat, given under the Land Clauses Acts by public bodies having compulsory powers of purchasing land as a preliminary step to putting their powers in force. Notice may be either express or constructive. The latter is where knowledge of a fact is presumed from the circumstances of the case, *e.g.* notice to a solicitor is usually constructive notice to the client. Notice in some cases may be either oral or written. It is usually advisable to give written notice even where oral evidence is sufficient in law, as in the case of notice to quit. The American use of notice is practically the same as in England.

NOTKER, a name of frequent occurrence in the ecclesiastical history of the middle ages. Notker Balbulus (*c.* 840–912) was a native of northern Switzerland, and for many years *magister* in the school of St Gall. He compiled a martyrology and other works, but is famous for his services to church music and for the "sequences" of which he was the composer. He was canonized in 1513. His life is in the Bollandist *Acta Sanctorum*, April 6th. Notker Labeo (d. June 29th, 1022) was also an instructor at St Gall. His numerous translations, including those of the Old Testament Psalms, the categories of Aristotle, the *De nuptiis Mercurii et Philologiae* of Martianus Capella, and the *De consolatione* of Boëthius, into Old High German, may possibly have been the work of his pupils. They possess considerable philological interest, and have been edited by E. G. Graff (Berlin, 1837–1847), and by P. Piper under the title *Notkers und seiner Schule Schriften* (1883–1884).

See J. Kelle, *Die Sankt Galler deutschen Schriften und Notker Labeo* (Munich, 1888); G. Meyer von Knonau, "Lebensbild des heiligen Notker," in *Mitteil. Antiq. Gesellschaft Zürich* (1877).

NOTO, a city of Sicily, in the province of Syracuse, and 20 m. S.W. of it by rail, 520 ft. above sea-level. Pop. (1901) 22,564. The present town, rebuilt after the earthquake of 1693, has some fine buildings of the early 18th century. The older town lies 5 m. direct to the north (1378 ft.). It was the ancient *Netum*, a city of Sicel origin, left to Hiero II. by the Romans by the treaty of 263 B.C. and mentioned by Cicero as a *foederata civitas* (*Verr.* v. 51. 133), and by Pliny as *Latinae conditionis* (*H.N.* iii. 8. 14). The remains of this city are almost entirely hidden beneath the ruins of the medieval town, except three chambers cut in the rock, one of which is shown, by an inscription in the library at Noto, to have belonged to the gymnasium, while the other two were *heroa*, or shrines of heroes. But explorations have brought to light four cemeteries of the third Sicel period, and one of the Greek period, of the 3rd and 2nd centuries B.C. There are also catacombs of the Christian period and some Byzantine tombs. See P. Orsi in *Notizie degli scavi*, 1897, 69–90. Four miles to the S. of Noto, on the left bank of the Tellaro (*Helorus*) (E. Pais, *Atakta*, Pisa, 1891, p. 75 seq.) stands a stone column about 35 ft. in height, which is believed to be a memorial of the surrender of Nicias. This is uncertain; but, in any case, in the 3rd century B.C. a tomb was excavated in the rectangular area which surrounds it, destroying apparently a pre-existing tomb. The later burial belongs to the necropolis of the small town of *Heloron*, 750 yds. to the S.E., some remains of which have been discovered. It was a small advanced post of Syracuse, belonging probably to the 6th century B.C. See P. Orsi in *Notizie degli scavi*, 1899, 241.

NOTT, ELIPHALET (1773–1866), American divine, was born on the 25th of June 1773 at Ashford, Connecticut. He was left an orphan without resources, but graduated in 1795 at Brown University. In 1804 he became president of Union College, Schenectady, New York, a position which he held till his death on the 29th of January 1866. He found the college financially embarrassed, but succeeded in placing it on a sound footing. He was known also as the inventor of the first stove for anthracite coal. His publications include sermons, *Counsels to Young Men* (1810), and *Lectures on Temperance* (1847).

Life by C. van Santvoord (ed. Tayler Lewis, 1876).

NOTT, SIR WILLIAM (1782–1845), English general, was the second son of Charles Nott, a Herefordshire farmer, who in 1794 became an innkeeper at Carmarthen. William Nott was indifferently educated, but he succeeded in obtaining a cadetship in the Indian army and proceeded to India in 1800. In 1825 he was promoted to the command of his regiment of native infantry; and in 1838, on the outbreak of the first Afghan war, he was appointed to the command of a brigade. From April to October 1839 he was in command of the troops left at Quetta, where he rendered valuable service. In November 1840 he captured Khelat, and in the following year compelled Akbar Khan and other tribal chiefs to submit to the British. On receiving the news of the rising of the Afghans at Kabul in November 1841, Nott took energetic measures. On the 23rd of December the British envoy, Sir William Hay Macnaghten, was murdered at Kabul; and in February 1842 the weak and incompetent commander-in-chief, General Elphinstone, sent orders that Kandahar was to be evacuated. Nott at once decided to disobey, on the supposition that Elphinstone was not a free agent at Kabul; and as soon as he heard the news of the massacre in the Khyber Pass, he urged the government at Calcutta to maintain the garrison of Kandahar with a view to avenging the massacre and the murder of Macnaghten. In March he inflicted a severe defeat on the enemy near Kandahar, and in May drove them with heavy loss out of the Baba Wali Pass. In July he received orders from Lord Ellenborough, the governor-general of India, to evacuate Afghanistan, with permission to retire by Kabul. Nott arranged with Sir George Pollock, now commander-in-chief, to join him at Kabul. On the 30th of August he routed the Afghans at Ghazni, and on the 6th of September occupied the fortress, from which he carried away, by the governor-general's express instructions, the gates of the temple of Somnath; on the 17th he joined Pollock at Kabul. The combined army recrossed the Sutlej in December. Nott's services were most warmly commended; he was immediately appointed resident at Lucknow, was presented with a sword of honour, and was made a G.C.B. In 1843 he returned to England, where the directors of the East India Company voted him a pension of £1000 per annum. He died at Carmarthen on the 1st of January 1845.

See *Memoirs and Correspondence of Sir William Nott*, edited by J. H. Stocqueler (2 vols., London, 1854); Charles R. Low, *The Afghan War 1838–1842* (London, 1879), and *Life and Correspondence of Sir George Pollock* (London, 1873); Sir J. W. Kaye, *History of the War in Afghanistan* (2 vols., London, 1851).

NOTTINGHAM, EARLS OF. The English title of earl of Nottingham has been held by different families, notably by the Mowbrays (1377 to 1475; merged in the Norfolk title from 1397), the Howards (1596–1681), and the Finches (1681; since 1729 united with that of Winchilsea). For the Howard line see the separate article below. Here only the ancestors of the Finch line are dealt with.

Heneage Finch (1621–1682), first earl of Nottingham in the Finch line, lord chancellor of England, was descended from an old family (see Finch, Finch-Hatton), many of whose members had attained to high legal eminence, and was the eldest son of Sir Heneage Finch, recorder of London, by his first wife Frances, daughter of Sir Edmund Bell of Beaupré Hall, Norfolk. In the register of Oxford university he is entered as born in Kent on the 23rd of December 1621, and probably his native place was Eastwell in that county. He was educated at Westminster and at Christ Church, Oxford, where he remained till he became a member of the Inner Temple in 1638. He was called to the bar in 1645, and soon obtained a lucrative practice. He was a member of the convention parliament of April 1660, and shortly afterwards was appointed solicitor-general, being created a baronet the day after he was knighted. In May of the following year he was chosen to represent the university of

Oxford, and in 1665 the university created him a D.C.L. In 1670 he became attorney-general, and in 1675 lord chancellor. He was created Baron Finch in 1674, and earl of Nottingham in May 1681. He died in Great Queen Street, London, on the 18th of December 1682, and was buried in the church of Ravenstone in Bucks.

His contemporaries of both sides of politics agree in their high estimate of his integrity, moderation and eloquence, while his abilities as a lawyer are sufficiently attested by the fact that he is still spoken of as "the father of equity." His most important contribution to the statute book is "The Statute of Frauds." While attorney-general he superintended the edition of Sir Henry Hobart's *Reports* (1671). He also published *Several Speeches and Discourses in the Tryal of the Judges of King Charles I.* (1660); *Speeches to both Houses of Parliament* (1679); *Speech at the Sentence of Viscount Stafford* (1680). He left Chancery Reports in MS., and notes on Coke's *Institutes*.

Daniel Finch (1647–1730), second earl, son of the preceding, entered parliament for Lichfield in 1679. He was one of the privy councillors who in 1685 signed the order for the proclamation of the duke of York, but during the whole of the reign of James II. he kept away from the court. At the last moment he hesitated to join in the invitation to William of Orange, and after the abdication of James II. he was the leader of the party who were in favour of a regency. He declined the office of lord chancellor under William and Mary, but accepted that of secretary of state, retaining it till December 1693. Under Anne he in 1702 again accepted the same office in the ministry of Godolphin, but finally retired in 1704. On the accession of George I. he was made president of the council, but in 1716 he finally withdrew from office. He succeeded to the earldom of Winchilsea (with which the Nottingham title now became united) on the 9th of September 1729, and died on the 1st of January 1730.

NOTTINGHAM, CHARLES HOWARD, 1st Earl of[1] (1536–1624), English lord high admiral (also known as 2nd Lord Howard of Effingham), was the eldest son of William, 1st Baron Howard of Effingham, lord high admiral, by his wife, Margaret, daughter of Sir Thomas Gamage of Coity in Glamorganshire, and was born in 1536. He was nearly connected with Queen Elizabeth, his father's sister, Elizabeth Howard, being mother of Anne Boleyn. During Mary's reign he is said to have served at sea with his father, and on the accession of Elizabeth his kinship, together with his good looks and abilities, secured his early advancement. In 1559 he was sent as ambassador to France to congratulate Francis II. on his accession, and in 1569 was general of the horse under the earl of Warwick for suppressing the Roman Catholic rebellion in the north. The next year he commanded a squadron of ships to watch the Spanish fleet which came to conduct the queen of Spain from Flanders, on which occasion "His lordship, accompanied with 10 ships only of Her Majestie's Navy Royal, environed their Fleet in a most strange and warlike sort, enforced them to *stoop gallant* and to vail their bonnets for the queen of England."[2] In the parliaments of 1563 and 1572 he represented Surrey, and succeeded to his father's title on the 29th of January 1573. He was installed a knight of the Garter on the 24th of April 1574, and made lord chamberlain of the household, an appointment which he retained till May 1585, when he became lord high admiral of England. He also filled the offices of lord lieutenant of Surrey and high steward of Kingston-upon-Thames. He was one of the commissioners at the trial of the conspirators in the Babington Plot and of Mary, queen of Scots, in 1586, and, according to Davison, Elizabeth's secretary of state, it was owing chiefly to his persuasion and influence that Elizabeth signed the death-warrant.[3]

In December 1587 he hoisted his flag on the "Ark." His letters at this time reflect vividly his sense of the impending danger. "For the love of Jesus Christ, Madam," he writes to Elizabeth, "awake thoroughly and see the villainous treasons round about you, against your Majesty and your realm, and draw your forces round about you like a mighty prince to defend you. Truly, Madam, if you do so, there is no cause for fear."[4] On the approach of the Armada on the 6th of July 1588, Howard describes thus the disposal of his forces: "I have divided myself here into three parts, and yet we lie within sight of one another, so as if any of us do discover the Spanish fleet we give notice thereof presently the one to the other and thereupon repair and assemble together. I myself do lie in the middle of the channel with the greatest force. Sir Francis Drake hath 20 ships and 4 or 5 pinnaces which lie beyond Ushant and Mr Hawkins with as many more lieth towards Scilly."[5] He directed the various engagements (see Armada), and stayed himself to conduct the attack on the "San Lorenzo," stranded off Calais, arriving in consequence at the great fight off Gravelines some time after the engagement had begun. His tactics have been criticized both by contemporary and by later authorities, but his position was a perilous one, opposed to an overwhelming force of the enemy, and rendered still more difficult by the queen's untimely economy, Howard himself contributing largely to the naval expenses and to the relief of the numerous seamen poisoned by bad food and landed at Margate. "It were too pitiful to have men starve after such a service."[6] Instead of risking all in a pitched battle with the enemy, a course which probably appealed more to his dashing subordinates, he resolved to pursue the less heroic method of "plucking their feathers little by little";[7] and his prudence, while justified by the extraordinary results, was also greatly praised by so good a judge as Raleigh. Shortly afterwards, under Howard's directions, a "Relation of Proceedings" was drawn up (now printed in the *Navy Records Society Publications*, i. 1-18).

In 1596 Howard and Essex commanded the expedition against Cadiz, when a squadron of the enemy's ships was destroyed and two of the number brought home. Howard's intention was to limit the expedition entirely to naval operations, but Essex insisted on landing, and Howard, who had been specially charged by Elizabeth to protect her favourite,[8] was obliged to follow in his support. The town was sacked and the forts destroyed; the naval prizes, however, but for this diversion would have been more numerous. The council of war then refusing to countenance any further attempts on land, Howard and Essex returned with the expedition to England. On the 22nd of October 1596 Howard was created earl of Nottingham.

In February 1598, on a scare of an intended invasion, he was ordered to take measures for the defence of the country, and again in 1599, when he was appointed "Lord Lieut.-general of all England," and exercised full authority both over the army and the navy. He took a leading part in suppressing the rebellion of Essex, and served as a commissioner on his trial in February 1601. In December 1602 he entertained Elizabeth at Arundel House, but made no attempt to rival the gorgeous and expensive entertainments given to the queen by some of his contemporaries. Elizabeth's favour, in his case, required no courting by such methods, and it was to Nottingham that she named James as her successor on her deathbed. He continued to hold his office as lord high admiral under the new king, and in 1605 was despatched as ambassador to Spain, where his great reputation, together with his amiable character, perfect temper and unfailing courtesy, secured the successful negotiation of peace. He served on numerous commissions, including those on the union of the two kingdoms in 1604, for the trial of the conspirators of the Gunpowder Plot and of Henry Garnett in 1606, and for reviewing the articles and rules of the order of the Garter in 1618, and he attended Princess Elizabeth on her marriage to the elector palatine with a squadron to Flushing in 1613. Nottingham, who, unlike many of the Howards, was a staunch Protestant,[1] was commissioner in Surrey for inquiring after recusants,[2] and in the diocese of Winchester for hearing ecclesiastical causes; he sat on the government commission for discovering and expelling Roman Catholic priests, and was mentioned in 1602 from Douay as one of the three enemies most feared by the recusants.[3]

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[1] *i.e.* In the Howard line; see above.

[2] Fuller's *Worthies*, ii. 361.

[3] Nicolas's *Life of Davison*, pp. 232, 258, 281.

[4] *Navy Records Society*: *Papers Relating to the Spanish Armada*, June 23rd, i. 225.

[5] Howard to Walsingham, July 6. Ib. i. 245.

[6] Ib. ii. 183.

[7] Ib. i. 341 and *Cal. of State P. Dom. 1581–1590*, p. 516.

[8] See H.'s letter to Essex on this subject, *Hist. MSS. Comm. Marquess of Salisbury's MSS.* vi. 239.

On the report of the commission on the navy in 1618 and of the abuses then exposed, Lord Nottingham, though no blame was attached to himself, being now an old man over eighty years of age, vacated his office of lord high admiral, receiving the sum of £3000 with a pension of £1000, and being granted a special precedence, limited to his person, as earl of Nottingham of the earlier Mowbray creation, and still keeping the lord-lieutenancy of Surrey. He died at Haling House, near Croydon, on the 14th of December 1624, and was buried at Reigate, a monument being afterwards placed to his memory in St Margaret's church at Westminster. He was a striking and almost heroic figure in the Elizabethan annals, no unworthy leader of such men as Drake, Hawkins and Raleigh, the defender of his country at a time of imminent peril, and by his splendid character and services he was placed beyond the reach of the intrigues and jealousies which troubled the reputation of many of his contemporaries and above even the suspicion of ill-doing.

Lord Nottingham married (1), in July 1563, Catherine, daughter of Henry Carey, 1st Lord Hunsdon, cousin to the queen, by whom he had, besides three daughters, two sons—William, who died in his father's lifetime, and Charles (1579–1642), who succeeded as second earl of Nottingham; and (2), when in his 68th year, Margaret, daughter of James Stuart, earl of Murray, by whom he had two sons, the youngest of whom, on the death of his half-brother without male issue, succeeded as third earl of Nottingham; on his dying childless in April 1681 the earldom became extinct, the barony of Effingham passing to the descendants of the first earl of Nottingham's younger brother, Sir William Howard, from whom the fourth earl of Effingham (creation of 1837) and 14th baron Howard of Effingham (b. 1866), who succeeded in 1898, was descended.

NOTTINGHAM, a city and county of a city, municipal, county and parliamentary borough, and county town of Nottinghamshire, England. Pop. (1901) 239,743. It stands on the left (north) bank of the Trent and its tributary the Leen. It is 125 m. N.N.W. from London by the Midland railway, and is also served by the Great Central and Great Northern railways. Water communications are afforded by the Grantham canal eastward, by the Nottingham and Erewash canals westward, communicating with the Cromford canal in Derbyshire, and by the Trent. The plan of the town is irregular, and the main thoroughfares are generally modern in appearance, many of the old narrow streets having been wholly altered or renewed. About the centre of the town is an open market-place some 5½ acres in area, said to be the largest of its kind in England. Nottingham Castle occupies a fine site to the S., on an abrupt rocky hill. The ancient remains are not large, including only a restored Norman gateway and fragments of the fortifications. In 1878 the site was acquired on lease by the corporation, and the building was opened as the Nottingham and Midland Counties Art Museum. The church of St Mary is a fine Perpendicular cruciform structure, with a central tower. St Peter's church is mainly Perpendicular, but shows traces of an earlier building. St Nicholas' church, near the castle, is a plain building of brick dating from 1676. There are several handsome modern churches, among which is the Roman Catholic cathedral of St Barnabas, from the designs of A. W. Pugin, erected in 1842–1844. There are a large number of Nonconformist places of worship. The principal secular buildings are the guildhall and city sessions court (1887), the shire hall, the Albert Hall and the Exchange; there are two principal theatres, the Theatre Royal and the Empire Theatre. Among educational establishments the principal is University College, for which a fine range of buildings was opened in 1881, containing the free municipal library and the museum of natural history. The free grammar school, founded in 1513, for some time in disuse, was revived in 1807, and on its removal in 1868 to new buildings, became known as the High School. There are also the Nottingham High School for girls; the blue-coat school, founded in 1723; the People's College, founded in 1846; two technical schools; the Congregational Institute; and the Nottingham school of art, for which a fine building was erected in 1865 in the Italian style. The Midland Baptist college was transferred from Chilwell to Nottingham in 1882.

The General Hospital was founded in 1781, and there are the Nottingham and Midland eye infirmary, the county asylum and the Midland institution for the blind. The Arboretum and the Forest are the principal public pleasure-grounds; the county cricket club plays matches on the Trent Bridge ground, and there is a racecourse at Colwick, E. of the city. To the N.W., but within the city boundaries, are the industrial districts of Radford and Basford, beyond which lies Bulwell, with collieries, limestone quarries and earthenware manufactures. Bestwood Park, in the vicinity, contained a hunting lodge of Henry I., being included in Sherwood Forest. To the N., Sherwood is a growing residential district; another extends towards Gedling on the E. Southward, across the Trent, West Bridgford is another large residential suburb. To the W. is Lenton, and Beeston has become a populous suburb mainly owing to the establishment of large cycle and motor works.

Nottingham itself became an important seat of the stocking trade towards the close of the 18th century. It was here that Richard Arkwright in 1769 erected his first spinning frame, and here also James Hargreaves had the year previously removed with his spinning jenny after his machine had been destroyed by a mob at Blackburn. Nottingham has devoted itself chiefly to cotton, silk and merino hosiery. Up to 1815 point lace was also an important manufacture. In 1808 and 1809 John Heathcoat obtained patents for machines for making bobbin net, which inaugurated a new era in the lace manufacture. The industries also include bleaching, the dyeing, spinning and twisting of silk, the spinning of cotton and woollen yarn, tanning, engineering and brewing, while cycle works and tobacco factories are important, and the industries have the advantage of the close proximity of coal-mines. Besides the general market there is a large cattle market.

Nottingham received its style of a city and county of a city by letters patent of the 7th of August 1897. The parliamentary borough returns three members to parliament, being divided into W., E. and S. divisions. The city is governed by a mayor, 16 aldermen and 48 councillors. Area, 10,935 acres.

History.—The advantageous position of Nottingham (*Snotengaham, Notingeham*) on the Trent, where it was crossed by an ancient highway, accounts for its origin, whether in Roman or Saxon times. The Saxon form of the name is taken to refer to the caves, anciently used as dwelling-places, which were hollowed out of the soft sandstone. Examples of these occur in the Castle rock, in the Rock Holes W. of the castle, in the suburb of Sneinton and elsewhere. It was chosen by the Danes for their winter quarters in 868, and constituted one of their five burghs. In 922 it was secured and fortified by Edward the Elder, who in 924 built a second "burgh" opposite the first and connected with it by a bridge over the river. Æthelstan, the successor of Edward the Elder, established there a royal mint. In 1013 the town submitted to Sweyn. William I. erected a castle, and mention of a new borough occurs in Domesday Book, and this seems to be the first evidence of the existence of the "French borough" which grew up in Nottingham under the Normans, and was distinguished from the English borough by the different customs which prevailed in it. Parliaments were held at Nottingham in 1334, 1337 and 1357, and it was the scene of the conference of the judges with Richard II. in August 1387. Several important persons have been imprisoned in the castle, among others David II. of Scotland. Edward IV. assembled his troops at Nottingham in 1461; and it was the headquarters of Richard III. before the battle of Bosworth in 1485. In 1642 Charles I. finally broke with the Parliament by setting up his standard at Nottingham, and during the ensuing Civil War the castle was held by each of the two parties more than once. In 1644 it was dismantled by Cromwell's orders.

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[1] See esp. his letter to Walsingham, *Naval Record Soc. Pub.* i. 65.

[2] *Hist. MSS. Comm. Marquess of Salisbury's MSS.* iv. 203.

[3] *Cal. St Pap. Dom. 1601–1603*, p. 181.

Henry II. granted the first extant charter, which confirmed to the burgesses the liberties they had under Henry I., referred to a market on Saturdays, and forbade the working of dyed cloth, except in Nottingham, within ten leagues of the borough. This was confirmed by John, who also granted a gild-merchant. Henry III. allowed the burgesses to hold the town in fee-farm, and Edward I. granted them a mayor and two bailiffs, one to be chosen from each borough. Henry VI. confirmed all preceding privileges, first incorporated the mayor and burgesses, and granted that the town, except the castle and the gaol, should be a county of itself. Two sheriffs were to replace the two bailiffs. This charter remained, except for temporary surrenders under Charles II. and James II., the governing charter of the corporation until the Municipal Act of 1835. Nottingham returned two members to parliament from 1295 until 1885, when the number was increased to three. Edward I. granted an eight-days' fair in September and a fifteen-days' fair in November, the last altered by Richard II. to a five-days' fair in February. Two other fairs were granted by Anne; one large fair, Goose Fair, is still held. This begins on the first Thursday in October and lasts three days. The markets on Wednesdays and Saturdays are held by prescriptive right. Besides the Reform riots of 1831, Nottingham witnessed in 1811 the Luddite disturbances. In 1870 Nottingham was made the seat of a suffragan bishop of the diocese of Lincoln, but as it is now in the diocese of Southwell there is no suffragan bishopric.

NOTTINGHAMSHIRE, or NOTTS, an inland county of England, bounded N.W. by Yorkshire, W. by Derbyshire, S. by Leicestershire and E. and N.E. by Lincolnshire. The area is 843·4 sq. m. The N. is included in the great plain of York, and in the extreme N. there is some extent of marshes. The valley of the lower Trent and that of the Idle are also very flat. In the S.W. between Nottingham and Warsop, the undulations swell into considerable elevations, reaching near Mansfield a height over 600 ft. This district includes the ancient Sherwood Forest (*q.v.*). Some portions of it are still retained in their original condition, and there are many very old oaks, especially in the portion known as the Dukeries (*q.v.*). The county generally is finely wooded, although to the E. of the valley of the Soar there is a considerable stretch of wolds. The principal rivers are the Trent, the Erewash, the Soar and the Idle. The Trent, which enters the county near Thrumpton in the S.W., where it receives the Erewash from the N. and the Soar from the S., flows N.E. past Nottingham and Newark, where it takes a more northerly direction, forming the N. part of the E. boundary of the county till it reaches the Isle of Axholm (Lincolnshire). The Soar forms for a short distance the boundary with Leicestershire, and the Erewash the boundary with Derbyshire. The Idle, which is formed of several streams in Sherwood Forest, flows N. to Bawtry, and then turns E. to the Trent.

Geology.—All formations, from Lower and Middle Coal Measures, overlain unconformably by Permian, to Lower Lias, crop out successively eastward across the county, with a general but slight dip away from the Pennine uplift. The strike of the Carboniferous rocks veers from S. to E. in the S.; that of younger formations bends to S.W. The Coal Measures, about 3000 ft. thick, continue the Derbyshire Coalfield. A boring at Ruddington proved the lowest measures, underlain by Millstone Grit. The remaining Lower and Middle Measures below the important Top Hard Coal, with the Kilburn, Main, Deep Hard and Soft Coals, crop out in the south and along the Erewash Valley; higher strata farther N. All these consist of shale, clay and little sandstone. They contain *Carbonicola acuta*, *C. robusta*, *Neuropteris heterophylla*, *Alethopteris* and *Lepidodendron*, showing essentially non-marine conditions. But several thin marine beds occur. The highest measures, divisible into red Etruria Marls, Newcastle Sandstones and a red sandy Keele series have been proved underground in eastward succession. A thin basal breccia, a sandy and marly group, the Magnesian Limestone with *Productus horridus* and *Schizodus obscurus* (granular dolomite typically, its upper part locally a dolomitic sandstone, the Mansfield building-stone), red gypsiferous Middle Marls, an Upper Limestone, and Upper Red Marls, collectively 550 ft. thick in the north of Nottinghamshire, terminate a Permian outcrop continuous from Durham, but dying out at Nottingham. Only the lowest divisions persist so far. The more extensive Trias overlaps southward on to the Carboniferous. Its lower sandstones (Bunter, 600 ft. thick, consisting of Lower Red Sandstone with breccias, and Pebble Beds; Keuper Waterstones, 200 ft. in the east, mainly brown sandstones, conglomeratic at the base and containing the fish *Semionotus*) form an undulating wooded district. Higher red and pale green Keuper Marl (700 ft.), with subordinate sandstones and gypsum, makes a low agricultural tract on the E., traversed longitudinally by the Trent. Black Rhaetic shales succeed with *Pteria* (*Avicula*) *contorta*, *Protocardium rhaeticum* and bone-beds, below light-coloured marls and limestones ("White Lias"). Lower Lias, almost up to the *Semicostatus* zone, crops out within the county. The basal *Planorbis* zone contains argillaceous limestones, worked for hydraulic cement at Barnston, and saurian remains. Of two types of Glacial boulder-clay, mainly confined to the Triassic and Jurassic clays on the E. and S.E., one containing Carboniferous and some extraneous boulders probably came with the Pennine ice from the N.W. The other, uppermost where both occur, and full of chalk and flint, belongs to the Chalky Boulder Clay of the North Sea ice. Glacial gravels cap the higher ground of the Triassic sandstones. Church Hole, one of the Magnesian Limestone caves of Creswell Crags, yielded remains of cave-lion, bear, mammoth, rhinoceros, &c. Older river-gravels flank the pasture land of the Trent alluvium.

Climate and Agriculture.—As the higher regions of Derbyshire and Yorkshire attract the rain clouds, the climate of Nottinghamshire is above the average in dryness; thus, the mean annual rainfall at Bawtry is 23·57 in. and at Nottingham 26·83 in. On this account crops ripen nearly as early as in the S. counties. The soil of about one-half the county is gravel and sand, including Sherwood Forest, where it inclines to sterility, and the valley of the Trent, where there is a rich vegetable mould on a stratum of sand or gravel. The land along the banks of the Trent is equally suitable for crops and pasture. The farms generally are of moderate size, the great majority being under 300 acres. Most of the immediate occupants are tenants-at-will. Roughly four-fifths of the total area is under cultivation. Apples and pears are grown in considerable quantities, but there are not many orchards of large size. Shorthorns are the favourite breed of cattle, and dairy farming is considerably prosecuted. The old forest breed of sheep is almost extinct, Leicesters and various crosses being common.

Industries.—Coal is mined chiefly on the S.W. border of the county near Nottingham and near Mansfield; there are also mines near Worksop. Clay, sandstone and limestone are also extensively raised. The lace and hosiery industries are of old establishment in the county, Nottingham being the principal centre. There are silk, worsted and cotton mills. A large number of hands are employed in machinery works, and the cycle and motor manufacture of Beeston is important. The manufacture of tobacco and cigars is considerable at Nottingham and Hucknall Torkard.

Communications.—The main line of the Midland railway touches the S.W. border of the county, with an alternative route through Nottingham, and branches thence N. through Hucknall and Mansfield to Worksop, to Newark and Lincoln, from Mansfield to Southwell and Newark, &c. The main line of the Great Central railway serves Nottingham and Hucknall. That of the Great Northern railway serves Newark and Retford, with a branch to Nottingham and local lines in that vicinity. A branch of the Great Central railway, formerly (till 1908) the main line of the Lancashire, Derbyshire and East Coast railway, enters the county on the W. from Chesterfield, and crosses the Dukeries by Ollerton to Dukeries Junction (G.N.R.) and Lincoln. The Sheffield-Grimsby line of the Great Central crosses the N. of the county by Worksop and Retford. The Trent is navigable throughout the county, and the Idle between Bawtry and the Trent. The principal canals centre upon Nottingham.

Population and Administration.—The area of the ancient county is 539,756 acres, with a population in 1901 of 514,578. The area of the administrative county is 540,123. The county contains the city and county and municipal borough of Nottingham (pop. 239,743), and the municipal boroughs of Retford or East Retford (12,340), Mansfield (21,445) and Newark (14,992). The urban districts are Arnold (8757), Beeston (8960), Carlton (10,041), Eastwood (4815), Hucknall Torkard (15,250), Hucknall under Huthwaite (4076), Kirkby in Ashfield (10,318), Mansfield Woodhouse (4877), Sutton in Ashfield (14,862), Warsop (2132), West Bridgford (7018), Worksop (16,112). For parliamentary purposes the ancient county is divided into four divisions (Bassetlaw, Newark, Rushcliffe and Mansfield), each returning one member; and the parliamentary borough of Nottingham returns one member for each of its three divisions. There are one court of quarter sessions and seven petty sessional divisions. The boroughs of Newark and Nottingham have separate commissions of the peace, also separate courts of quarter sessions;

that of East Retford has a separate commission of the peace. The total number of civil parishes is 266. The ancient county contains 231 ecclesiastical parishes and districts, wholly or in part; it is situated principally in the diocese of Southwell and partly in the diocese of York.

History.—The earliest Teutonic settlers in the district which is now Nottinghamshire were an Anglian tribe who, not later than the 5th century, advanced from Lincolnshire along the Fosseway, and, pushing their way up the Trent valley, settled in the fertile districts of the S. and E., the whole W. region from Nottingham to within a short distance of Southwell being then occupied by the vast forest of Sherwood. At the end of the 6th century Nottinghamshire already existed as organized territory, though its W. limit probably extended no farther than the Saxon relics discovered at Oxton and Tuxford. Nottingham after the treaty of Wedmore became one of the five Danish boroughs. On the break-up of Mercia under Hardicanute, Nottinghamshire was included in the earldom of the Middle English, but in 1049 it again became part of Leofric's earldom of Mercia, and descended to Edwin and Morkere. The first mention of the shire of Nottingham occurs in 1016, when it was harried by Canute. The boundaries have remained practically unaltered since the time of the Domesday Survey, and the eight Domesday wapentakes were unchanged in 1610; in 1719 they had been reduced to six, their present number, Oswaldbeck being absorbed in Bassetlaw, of which it forms the North Clay division, and "Side" in Thurgarton. Nottinghamshire was originally included in the diocese and province of York, and in 1291 formed an archdeaconry comprising the deaneries of Nottingham, Newark, Bingham and Retford. By act of parliament of 1836 the county was transferred to the diocese of Lincoln and province of Canterbury, with the additional deanery of Southwell. In 1878 the deaneries of Mansfield, South Bingham, West Bingham, Collingham, Tuxford and Worksop were created, and in 1884 most of the county was transferred to the newly-created diocese of Southwell, the deaneries being unchanged. The deaneries of Bawtry, Bulwell, Gedling, East Newark and Norwell were created in 1888. Until 1568 Nottinghamshire was united with Derbyshire under one sheriff, the courts and tourns being held at Nottingham until the reign of Henry III., when with the assizes for both counties they were removed to Derby. In the time of Edward I. the assizes were again held at Nottingham, where they are held at the present day. The Peverel Court, founded before 1113 for the recovery of small debts, had jurisdiction over 127 towns in Nottinghamshire, and was held at Nottingham until 1321, in 1330 at Algarthorpe and in 1790 at Lenton, being finally abolished in 1849. The most interesting historic figure in the Domesday Survey of Nottinghamshire is William Peverel. His fief represents the honour of Nottingham, and in 1068 he was appointed constable of the castle which William the Conqueror had raised at Nottingham. The Cliftons of Clifton and the Byrons of Newstead held lands in Nottinghamshire at the time of the Survey. Holme Pierrepoint belonged to the Pierrepoints from the time of Edward I.; Shelford was the seat of the Stanhopes, and Langer of the Tibetots, afterwards earls of Worcester. Archbishop Cranmer was a descendant of the Cranmers of Aslockton near Bingham.

The political history of Nottinghamshire centres round the town and castle of Nottingham, which was seized by Robert of Gloucester on behalf of Maud in 1140; captured by John in 1191; surrendered to Henry III. by the rebellious barons in 1264; formed an important station of Edward III. in the Scottish wars; and in 1397 was the scene of a council where three of the lords appellant were appealed of treason. In the Wars of the Roses the county as a whole favoured the Yorkist cause, Nottingham being one of the most useful stations of Edward IV. In the Civil War of the 17th century most of the nobility and gentry favoured the Royalist cause, but Nottingham Castle was garrisoned for the parliament, and in 1651 was ordered to be demolished.

Among the earliest industries of Nottinghamshire were the malting and woollen industries, which flourished in Norman times. The latter declined in the 16th century, and was superseded by the hosiery manufacture which sprang up after the invention of the stocking-loom in 1589. The earliest evidence of the working of the Nottinghamshire coalfield is in 1259, when Queen Eleanor was unable to remain in this county on account of the smoke of the sea-coal. Collieries are scarcely heard of in Nottinghamshire in the 17th century, but in 1620 the justices of the peace for the shire report that there is no fear of scarcity of corn, as the counties which send up the Trent for coal bring corn in exchange, and in 1881 thirty-nine collieries were at work in the county. Hops were formerly extensively grown, and Worksop was famous for its liquorice. Numerous cotton-mills were erected in Nottinghamshire in the 18th century, and there were silk-mills at Nottingham. The manufacture of tambour lace existed in Nottinghamshire in the 18th century, and was facilitated in the 19th century by the manufacture of machine-made net. From 1295 the county and town of Nottingham each returned two members to parliament. In 1572 East Retford was represented by two members, and in 1672 Newark-upon-Trent also. Under the Reform Act of 1832 the county returned four members in two divisions. By the act of 1885 it returned four members in four divisions; Newark and East Retford were disfranchised, and Nottingham returned three members in three divisions.

Antiquities.—At the dissolution of the monasteries there were no fewer than forty religious houses in Nottinghamshire. The only important monastic remains, however, are those at Newstead, but the building is partly transformed into a mansion which was formerly the residence of Lord Byron (see HUCKNALL TORKARD). There are also traces of monastic ruins at Beauvale, Mattersey, Radford and Thurgarton. The finest parish church in the county is that of Newark. The churches of St Mary, Nottingham, and of Southwell were collegiate churches; Southwell, now a cathedral, is a splendid building, principally Norman. The churches of Balderton, Bawtry, Hoveringham, Mansfield and Worksop are also partly Norman, and those of Coddington, Hawton and Upton St Peter near Southwell, Early English. Of the old castles, the principal remains are those at Newark, but there are several interesting old mansions, as at Kingshaugh, Scrooby, Shelford and Southwell. Wollaton Hall, near Nottingham, is a fine old building (*c.*1580). The finest residences of more modern date are Welbeck and others in the Dukeries (*q.v.*).

See *Victoria County History, Nottinghamshire*; R. Thoroton, *The Antiquities of Nottinghamshire* (Lond., 1677; republished with additions by J. Thoresby, 3 vols., Lond., 1797); Thomas Bailey, *Annals of Nottinghamshire* (4 vols., Lond., 1852–1856); J. P. Briscoe, *Old Nottinghamshire* (1881); J. Ward, *Descriptive Catalogue of Books relating to Nottinghamshire* (Nottingham, 1892).

NOÜMENON (Gr. νοούμενον, a thing known, from νοεῖν), a philosophical term put into currency by Kant and not much used except in definite reference to his doctrine. In the Kantian system the term "noümena" means things-in-themselves as opposed to "phenomena" or things as they appear to us. According to Kant the human mind is such that it can never penetrate by its speculative powers to things-in-themselves, but can only know phenomena. Thus we have the odd position that noümena, or the contents of the intelligible world, are just the things to which thought can never penetrate. The term, however, is a relic of an early period of Kant's mental development. In his fully mature or critical position he held that the noümenal world was inaccessible to the speculative reason, and yet that we are not altogether excluded from it, since the practical reason, *i.e.* our capacity for acting as moral agents, assures us of the existence of a noümenal world wherein freedom, God and immortality have a real place. The relation of noümena to phenomena in the Kantian system is a most difficult one; and, in view of the fact that the acutest intellects of Europe have been engaged vainly for more than a century in reconciling the various passages on the subject, the safest conclusion is that they are irreconcilable. The course adopted by Kant's immediate successors in German idealism was to reject the whole conception of noümena, for the reason that what is essentially unknowable has no existence for our intelligence. Kant, however, protested strongly against this development when it was propounded by Fichte, and held that he had precluded it by his "refutation of idealism": he stood unshakably to the belief in an absolutely real world behind phenomena. Kant's position may be illogical as he himself stated it; but it is the expression of a sound principle: we must connect it with his general tendency to recognize the dynamic side of things. He saw, what so many of his successors failed to see, that the world as we know it is an expression of power; and he could not imagine whence the power could come if not from a world beyond phenomena. (See KANT; PHENOMENON.) (H. ST.)

NOVALICHES, MANUEL PAVIA Y LACY, 1ST MARQUIS DE (1814–1896), Spanish marshal, was born at Granada on the 6th of July 1814. He was the son of Colonel Pavia, and after a few years at the Jesuit school of Valencia he entered the Royal Artillery Academy at Segovia. In 1833 he became a lieutenant in the guards of Queen Isabella II., and during the Carlist War from 1833 to 1840 he became general of division in the latter year at the early age of twenty-six. The Moderate party made him war minister in 1847, and sent him to Catalonia, where his efforts to put down a Carlist rising were not attended with success. He had been made a senator in 1845, and marquis in 1848. He was sent out to Manila in 1852 as captain-general of the Philippine Islands. In April 1854 he crushed with much sternness a formidable insurrection and carried out many useful reforms. On his return to Spain he married the countess of Santa Isabel, and commanded the reserves in the Peninsula during the war with Morocco. He refused the war portfolio twice offered him by Marshals O'Donnell and Narvaez and undertook to form a cabinet of Moderates in 1864 that lived but a few days. He volunteered to crush the insurrection in Madrid on the 22nd of June 1866, and when the revolution broke out in September 1868 accepted the command of Queen Isabella's troops. He was defeated by Marshal Serrano at the bridge of Alcolea on the 28th of September 1868, and was so badly wounded in the face that he was disfigured for life He kept apart during the revolution and went to meet King Alfonso when he landed at Valencia in January 1875. The Restoration made the marquis de Novaliches a senator, and the new king gave him the Golden Fleece. He died in Madrid on the 22nd of October 1896.

NOVALIS, the pseudonym of FRIEDRICH LEOPOLD, FREIHERR VON HARDENBERG (1772–1801), German poet and novelist. The name was taken, according to family records, from an ancestral estate. He was born on the 2nd of May 1772 on his father's estate at Oberwiederstedt in Prussian Saxony. His parents were members of the Moravian (*Herrnhuter*) sect, and the strict religious training of his youth is largely reflected in his literary works. From the gymnasium of Eisleben he passed, in 1790, as a student of philosophy, to the university of Jena, where he was befriended by Schiller. He next studied law at Leipzig, when he formed a friendship with Friedrich Schlegel, and finally at Wittenberg, where, in 1794, he took his degree. His father's cousin, the Prussian minister Hardenberg, now offered him a government post at Berlin; but the father feared the influence upon his son of the loose-living statesman, and sent him to learn the practical duties of his profession under the *Kreisamtmann* (district administrator) of Tennstedt near Langensalza. In the following year he was appointed auditor to the government saltworks in Weissenfels, of which his father was director. His grief at the death in 1797 of Sophie von Kühn, to whom he had become betrothed in Tennstedt, found expression in the beautiful *Hymnen an die Nacht* (first published in the *Athenäum*, 1800). A few months later he entered the Mining Academy of Freiberg in Saxony to study geology under Professor Abraham Gottlob Werner (1750–1817), whom in the fragment *Die Lehrlinge zu Sais* he immortalized as the "Meister." Here he again became engaged to be married, and the next two years were fruitful in poetical productions. In the autumn of 1799 he read at Jena to the admiring circle of young romantic poets his *Geistliche Lieder*. Several of these, such as "Wenn alle untreu werden," "Wenn ich ihn nur habe," "Unter tausend frohen Stunden," still retain, as church hymns, great popularity. In 1800 he was appointed *Amtshauptmann* (local magistrate) in Thuringia, and was preparing to marry and settle, when pulmonary consumption rapidly set in, of which he died at Weissenfels on the 25th of March 1801.

His works were issued in two volumes by his friends Ludwig Tieck and Friedrich Schlegel (2 vols. 1802; a third volume was added in 1846). They are for the most part fragments, of which *Heinrich von Ofterdingen*, an unfinished romance, is the chief. It was undertaken at the instance of Tieck, and reflects the ideas and tendencies of the older Romantic School, of which Hardenberg was a leading member. Heinrich von Ofterdingen's search for the mysterious "blue flower" is an allegory of the poet's life set in a romantic medieval world. Novalis, however, did not succeed in blending his mystic and philosophical conceptions into a harmonious whole. The "fragments" contain idealistic though paradoxical views on philosophy, art, natural science, mathematics, &c.

There are editions of his collected works by C. Meisner and B. Wille (1898), by E. Heilborn (3 vols., 1901), and by J. Minor (3 vols., 1907). *Heinrich von Ofterdingen* was published separately by J. Schmidt in 1876. Novalis's Correspondence was edited by J. M. Raich in 1880. See R. Haym, *Die romantische Schule* (Berlin, 1870); A. Schubart, *Novalis' Leben, Dichten und Denken* (1887); C. Busse, *Novalis' Lyrik* (1898); J. Bing, *Friedrich von Hardenberg* (Hamburg, 1899), E. Heilborn, *Friedrich von Hardenberg* (Berlin, 1901). Carlyle's fine essay on *Novalis* (1829) is well known.

NOVARA, a town and episcopal see, of Piedmont, Italy, capital of the province of Novara, 31 m. by rail W. of Milan, 538 ft. above sea-level. Pop. (1906) 37,962 (town), 48,694 (commune). Railways diverge hence to Varallo Sesia, Orta, Arona (for Domodossola), Busto Arsizio, Milan, Vigevano and Vercelli. Previous to 1839 Novara was still surrounded by its old Spanish ramparts, but it is now an open, modern-looking town. Part of the old citadel is used as a prison. The cathedral dates from the 4th century (?), but (with the exception of the octagonal dome-roofed baptistery belonging to the first part of the 10th century, and separated from the west end by an atrium) was rebuilt between 1860 and 1870 after designs by Antonelli; the church of S Gaudenzio, dedicated to Bishop Gaudentius (d. 417), who is buried under the high altar, rebuilt by Pellegrino Tibaldi about 1570, has a baroque campanile and a dome 396 ft. high, the latter added by Antonelli in 1875–1878; and San Pietro del Rosario is the church in which the papal anathema was pronounced against the followers of Fra Dolcino. The two first contain pictures by Gaudenzio Ferrari. The city also contains handsome market-buildings erected in 1817–1842, a large hospital dating from the 9th century and a court-house constructed in 1346. The town has also a museum of Roman antiquities. The principal industry is the carding and spinning of silk; there are also iron-works and foundries, cotton mills, rice-husking mills, organ factories, dye-works and printing works.

Novara, the ancient *Novaria*, according to Pliny a place of Celtic origin, according to Cato (but wrongly) of Ligurian origin, was a municipal city, and lay on the road between Vercellae and Mediolanum. Its rectangular plan may well be a survival of Roman days. Dismantled in 386 by Maximus for siding with his rival Valentinian, it was restored by Theodosius; but it was afterwards ravaged by Radagaisus (405) and Attila (452). A dukedom of Novara was constituted by the Lombards, a countship by Charlemagne. In 1110 the city was taken and burned by the emperor Henry V. Before the close of the 12th century it accepted the protection of Milan, and thus passed into the hands, first, of the Visconti, and, secondly, of the Sforzas. In 1706 the city, which had long before been ceded by Maria Visconti to Amadeus VIII. of Savoy, was occupied by the Savoy troops. At the peace of Utrecht it passed to the house of Austria with the duchy of Milan; but, having been occupied by Charles Emmanuel in 1734, it was granted to him in the following year. Under the French it was the chief town of the department of Agogna. Restored to Savoy in 1814, it was in 1821 the scene of the defeat of the Piedmontese by the Austrians, and in 1849 of the more disastrous battle which led to the abdication of

Charles Albert and an Austrian occupation of the city. The painter Gaudenzio Ferrari was a native of Novara; and so was Peter Lombard. (T. As.)

NOVA SCOTIA, a province of the Dominion of Canada, lying between 43° 25′ and 47° N. and 59° 40′ and 66° 25′ W., and composed of the peninsula proper and the adjoining island of Cape Breton (*q.v.*), which is separated from the mainland by the Strait of Canso. The extreme length from S.W. to N.E. is 374 m. (N.S. 268, C.B. 108); breadth 60 to 100 m.; area 21,428 sq. m. The isthmus of Chignecto, 11½ m. wide, connects it with the province of New Brunswick.

Physical Features.—Nova Scotia is intersected by chains of hills. The Cobequid Mountains, stretching from E. to W. and terminating in Cape Chignecto, form the chief ridge. Several of the elevations are as high as 1100 ft., and are cultivable almost to their summits. Lying on each side of this range are two extensive tracts of arable land. A ridge of precipices runs for 130 m. along the Bay of Fundy from Brier Island at the farthest extremity of Digby Neck and culminates in Capes Split and Blomidon. Here and there rocks, from 200 to 600 ft. in height and covered with stunted firs, overhang the coasts. Beyond them lies the garden of Nova Scotia, the valley of the Annapolis. The Atlantic coast from Cape Canso to Cape Sable is high and bold, containing many excellent harbours, of which Halifax (Chebucto Bay) is the chief. The N. shore is, as a rule, low, with hills some distance from the coast. Of its harbours the most important is Pictou. Of the inlets the most remarkable is Minas Basin, the eastern arm of the Bay of Fundy; it penetrates some 60 m. inland, and terminates in Cobequid Bay, where the tides rise sometimes as high as 53 ft., while on the opposite coast, in Halifax Harbour, the spring tides scarcely exceed 7 or 8 ft. The height of the Fundy tides has, however, been often exaggerated, the average being 42·3 ft. Many islands occur along the coast, particularly on the S.E.; of these the most celebrated is Sable Island (*q.v.*). The rivers are, with few exceptions, navigable for coasting vessels for from 2 to 20 m. The principal are the Annapolis, Avon, Shubenacadie, the East, Middle and West rivers of Pictou, the Musquodoboit and the Lahave. The largest of the fresh-water lakes is Lake Rossignol, situated in Queen's county, and more than 20 m. long. Ship Harbour Lake, 15 m. in length, and Grand Lake are in Halifax county.

Geology.—The Lower Cambrian formation forms an almost continuous belt along the Atlantic coast, varying in width from 10 to 75 m. and covering an area estimated at 8500 sq. m. It is interrupted by large masses of intrusive granite, extending from the extreme S.W. of the province as far as Halifax, and cropping out in detached areas as far as Cape Canso. This part of the province is rugged and sterile, and abounds in small lakes and peat bogs. Along the N.E. coast extends a Carboniferous area, including two large and productive coal-fields in Cumberland and Pictou counties, and continued in the coal-fields of Cape Breton. On the S. coast of the Bay of Fundy, and at Minas Basin and Channel, the Triassic Red Sandstone formation predominates, more or less protected by a narrow rim of trap rock, culminating at its E. end in the basaltic promontory of Blomidon (Blow-me-down). The Cobequid Mountains are a mass of slates, quartzites and intrusive rocks (apparently Siluro-Cambrian). At the Joggins, near Cape Chignecto, occurs a splendid exposure, rich in curious minerals and fossils, and very celebrated among geologists.

Climate; Flora and Fauna.—The climate of Nova Scotia is more temperate than that of New Brunswick, and more equable than that of the inland provinces, though not so dry. Spring and winter begin about a fortnight later than in Ontario. Dense fogs often drift in from the Atlantic, but are not considered unhealthy.

Most of the principal birds of North America are to be found, and the game of the country includes moose, caribou, duck, teal, geese, woodcock, partridge, snipe, plover, &c. The game laws are strict and well enforced. The chief wild animals are bears, foxes and wild-cats. Wolves, once numerous, are now extinct. The natural flora does not differ greatly from that of the New England states. The sweet-smelling may-flower, or trailing arbutus (*Epigaea repens*), grows extensively, and has long been the provincial emblem.

Population.—The population increases slowly, having risen only from 440,572 in 1881 to 459,574 in 1901, an average of 21·8 to the square mile (total area, 21,428 sq. m.). The rural population is grouped along the river valleys, and the natural increase is normal, but there is a large emigration to the manufacturing cities of the E. states and to the Canadian N.W. The great mass of the people are of British descent, but in parts of Cape Breton are found descendants of the early French settlers; in Lunenburg and the S.E. is a large German colony; near Halifax are a number of negroes from the West Indies, and scattered through the province are about 2000 Micmac Indians, who now confine themselves chiefly to the making of bows and arrows, baskets and trinkets; though they carry on a certain amount of mixed farming. Few are of absolutely pure Indian blood. The settlers of English and Scotch descent are about equal in numbers, but the latter have been more prominent in the development of the province. The Irish are found chiefly in Halifax and in the mining towns of Cape Breton. Roman Catholics, Presbyterians and Baptists predominate, though the Church of England is strong in Halifax, and still retains a certain social prestige.

Administration.—The executive authority is in the hands of a lieutenant-governor appointed for five years by the federal government, and of a council appointed from and responsible to the local legislature. This consists of a lower house of assembly, and of a legislative council of twenty life members, which the assembly has frequently, but in vain, endeavoured to abolish. The municipal system was introduced subsequent to federation, and is modelled on that of Ontario.

The revenue is chiefly made up of the Dominion subsidy (see ONTARIO), and of royalties on mining concessions, chiefly those on coal. Owing to the great increase of mining in Cape Breton, its payments towards the revenue are larger in proportion than those of the mainland.

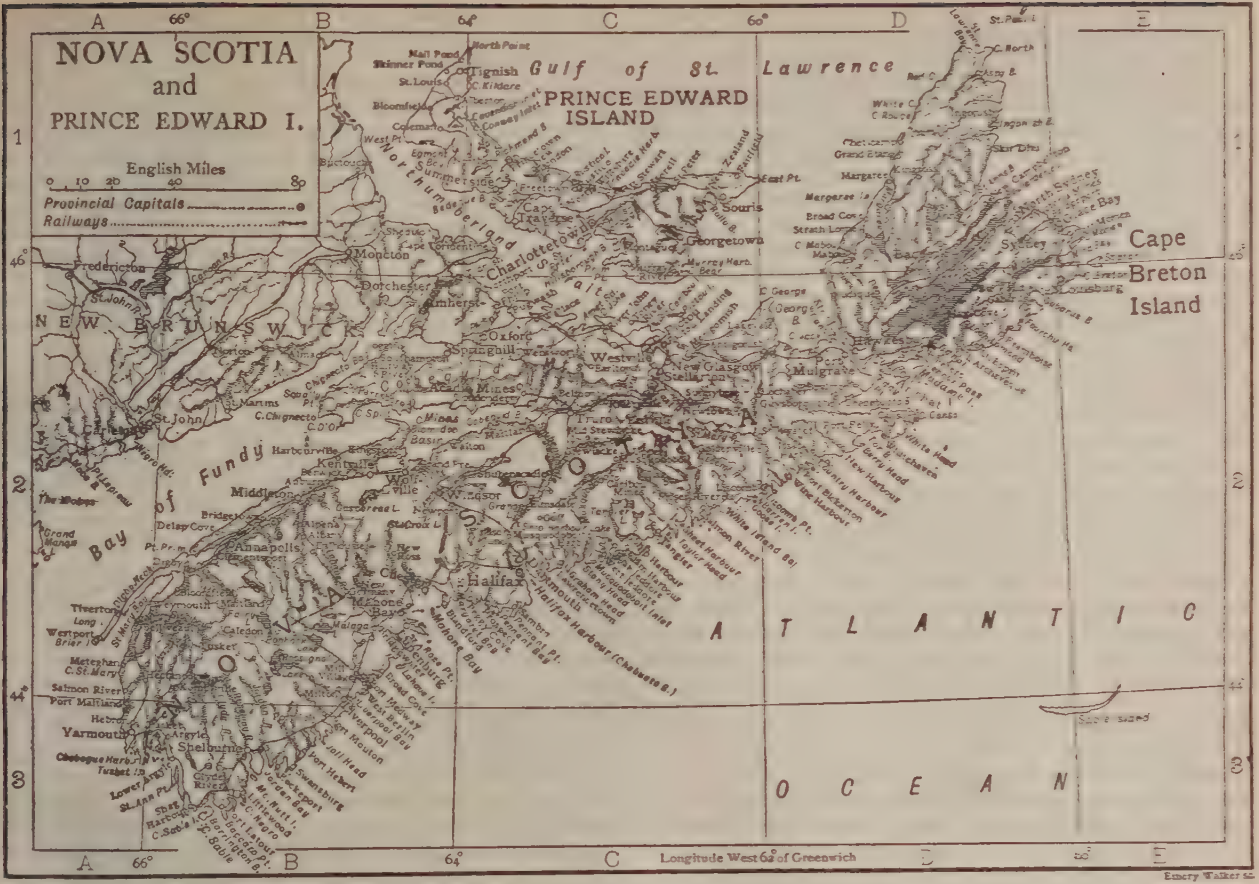
Education.—Primary education is free and compulsory; secondary education is also free but optional. In each county one high school is raised to the rank of an academy, free to all qualified students in the county, and receives an additional grant. Roman Catholics have not won the right of separate schools, as in Ontario, but in Halifax and other districts where that church is strong, a compromise has been arranged. Thus the two Roman Catholic colleges, St Francis Xavier (English) at Antigonish, and St Anne (French) at Church Point (Digby county), and most of the convents are in affiliation with the public school system. There are also many private schools, chiefly for girls, and under denominational control. But while primary and secondary education is widespread and of good quality, higher education has suffered from denominational bickerings, and the universities are still too many and too small. They are: King's College, Windsor (Anglican), founded in 1790; Acadia University, Wolfville (Baptist, 1839); St Francis Xavier, Antigonish (Roman Catholic, 1866); and Dalhousie University, Halifax (Undenominational), established by charter in 1818, reorganized in 1863, the largest and the most efficient, possessing faculties of arts, science, medicine and law. The province supports a normal school and schools of agriculture and of horticulture at Truro, and has voted $100,000 for a College of Technology at Halifax.

Commerce and Manufactures.—Nova Scotia is naturally a sea-going province, and till about 1881 had the largest tonnage, in proportion to population, in the world. Since then, her shipping has greatly diminished, though Halifax is still one of the chief winter ports of the Dominion, and Sydney is also a favourite port of call for steamers in need of "bunker" coal. The water-power provided by the rivers supports many manufactures. Several sugar-refineries exist, and a large trade is carried on with Bermuda and the West India islands.

Fisheries.—The fisheries of Nova Scotia are the most important in Canada, and the value of their products ($7,841,602 in 1904) is about one-third that of the whole Dominion. Lobsters, cod and mackerel constitute the bulk of the catch. Many boats are also fitted out in Lunenburg, Digby, Yarmouth and other ports for the Grand Banks of Newfoundland. A bounty is paid by the Dominion government, and attempts are being made to introduce more scientific methods among the fishermen. The vessels are manned by over 25,000 men, and many more are employed in the lobster canneries and kindred industries. Trout and salmon abound in the inland lakes and streams.

Lumber.—Lumbering was long the chief industry of the province, and is still very important, though the percentage of forest left uncut is only about 30%. The network of small lakes and rivers enables the logs to be brought to the mills with great ease, and little rough timber is now exported. The chief export is that of spruce deals, almost entirely from Halifax. The manufacture of wood-pulp for paper is also carried on.

Minerals.—Bituminous coal is mined in various parts of Cape Breton (*q.v.*) and in the counties of Cumberland and Pictou. The seams dip at a low angle, and are of great thickness, especially in Pictou county. The total product exceeds 5,000,000 tons, annually, more than two-thirds that of the whole Dominion. Of this over half is mined in the neighbourhood of Sydney, Cape Breton. Other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Northumberland Strait
Cape Breton Island
Sydney
North Sydney
Glace Bay
Louisburg
Fredericton
NEW BRUNSWICK
St. John
Moncton
Dorchester
Amherst
Oxford
Springhill
Westville
New Glasgow
Stellarton
Truro
Bay of Fundy
Minas Basin
Kentville
Wolfville
Windsor
Middleton
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Digby
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important centres are Springhill, Acadia Mines, Stellarton and Glace Bay (C.B.). It is shipped as far west as Montreal, and to the New England states. Iron is largely produced, chiefly in the vicinity of the Cumberland and Pictou coal-fields. The deposits include magnetite, red haematite, specular, limonite and carbonate ores. Blast furnaces are in operation, especially at New Glasgow, Sydney and North Sydney, though most of the ore used at Sydney is imported from Newfoundland. The quarries of easily worked limestone, the product of which is used as a "flux" in the blast furnaces, add to the value of the iron deposits. Gold occurs in workable quantities in the quartz all along the Atlantic coast, and several small but successful mining enterprises are in operation, yielding about $500,000 annually. Large deposits of gypsum occur, especially at Windsor in Hants county. Manganese and copper are also worked on a small scale.

Agriculture.—The attention paid to lumbering, fishing and shipping, and the subsequent emigration westwards have lessened the importance of this industry. Mixed farming is however largely carried on, and of late years dairy farming has been greatly extended and improved, and much butter and cheese is exported to England. Both the Dominion and the provincial governments have endeavoured to introduce scientific methods. Nova Scotia ranks second to Ontario in its production of apples and peaches. The centre of this industry is the valley of the Annapolis, where, it is said, one "may ride for fifty miles under apple-blossoms." At the head of the Bay of Fundy and on Minas Basin the low-lying meadows produce splendid crops of hay. Owing to high Fundy tides, the air in the neighbourhood is constantly in motion, the result being a cool temperature, even in the height of summer, which is well fitted for stock-raising.

Roads and Railroads.—Road-making machines are employed for the improvement of the ordinary highways, and steel bridges are replacing the wooden structures; but the roads in the country districts still leave much to be desired. The Intercolonial railway, owned and worked by the Dominion government, is the chief means of communication with the other provinces, and for the carriage of local traffic. Besides the main line from Halifax to Amherst, a branch runs from Truro to Sydney, and another from Oxford Junction to Pictou and Stellarton. The Canadian Pacific railway has running rights over it from St John (N.B.) to Halifax; on its completion, similar rights will be granted from Moncton to Halifax to the Grand Trunk Pacific. The Dominion Atlantic railway extends from Windsor Junction, near Halifax, to Yarmouth; the Nova Scotia Central railway from Lunenburg to Middleton on the Dominion Atlantic railway. A line along the Atlantic coast connects Halifax and Yarmouth, whence a daily line of steamers sails for Boston. Other lines connect Halifax with a number of the S.W. coast and inland towns, and a line has been projected from New Glasgow to Guysborough and the coast. Several smaller lines are owned by the various coal-mining companies. Telegraph and telephone lines extend all over the province, and there are two cable stations—one at Canso and the other at Sydney. The Marconi Company has stations for wireless telegraphy at Halifax, Cape Sable, Sable Island and Glace Bay.

History.—Nova Scotia may well have been the Markland of early Norse and Icelandic voyages, and Cape Breton was visited by the Cabots in 1497–1498, but not till 1604 was any attempt at permanent colonization made by Europeans. In that year an expedition was headed by a Frenchman, Pierre de Guast, Sieur de Monts (1560–*c.* 1630), who had received from Henry IV. full powers to explore and take possession of all lands in North America lying between the 40th and 46th parallels of north latitude. De Monts and his friend de Poutrincourt (d. 1615), endeavoured to form settlements at Port Royal (now Annapolis), St Croix (in New Brunswick) and elsewhere, but quarrels broke out with the Jesuits, and in 1613 the English colonists of Virginia made a descent upon them, claimed the territory in right of the discovery by the Cabots, and expelled the greater part of the inhabitants. In 1621 Sir William Alexander obtained from James I. a grant of the whole peninsula, which was named in the patent, Nova Scotia, instead of Acadia, the old name given to the colony by the French. During the reign of Charles I. the still existing order of Baronets of Nova Scotia was instituted, and their patents ratified in parliament. The treaty of St Germain-en-Laye (1632) confirmed France in the possession of Acadia, Cape Breton and New France; but fierce feuds broke out among the French settlers, and in 1654 a force sent out by Cromwell took possession of the country, but by the treaty of Breda (1667) it was restored to France by Charles II. Continual fighting went on between the French and the British colonists of New England, the Indians taking part, usually on the side of the French; in 1710 the province was finally captured by Great Britain and ceded to her in 1713 by the treaty of Utrecht, under the name of "Acadia or Nova Scotia," the French remaining masters of Cape Breton. Perpetual quarrels went on concerning the boundaries of the district ceded; the English claim comprised the present Nova Scotia, Prince Edward Island, most of New Brunswick and the Gaspé peninsula, while the French restricted it to the S. half of what is now Nova Scotia. In 1749 Halifax was founded as a counterpoise to Louisbourg in Cape Breton, and over 4000 colonists sent out, but the French opposed the new settlers. In 1755 about 6000 French were suddenly seized by Governor Charles Laurence (d. 1760) and hurried into exile. After undergoing many sufferings, some eventually found their way back, while others settled in Cape Breton, or in distant Louisiana. By the treaty of Paris in 1763, France resigned all claim to the country. In 1769 Prince Edward Island (formerly Isle St Jean) was made a separate government. Meanwhile, immigration from the New England colonies had filled the fertile meadows left vacant by the Acadians. A later influx of American Loyalists led in 1784 to the erection of New Brunswick into a separate colony. In the same year, Cape Breton was also separated from Nova Scotia but reunited in 1820.

During the wars of the American and French revolutions Halifax grew apace. Hither, in June 1813, came the "Shannon" with her prize the "Chesapeake," captured off Boston harbour. Meanwhile, between 1784 and 1828, a large Scottish emigration, chiefly from the Highlands, had settled in the counties around Pictou, and the lumbering industry rose to great proportions. Agriculture was for some time neglected, but in 1818 the letters of "Agricola" (John Young, 1773–1837) gave it an impetus. Representative institutions had been granted as early as 1758, but power long rested mainly in the hands of a Council of Twelve, comprising the chief justice, the Anglican bishop and other high officials. In 1848, after a long struggle, responsible government was won by the legislative assembly, led by Joseph Howe.

In these political struggles, education was often the battleground, the fight ending in 1864 in the establishment of free primary and secondary schools by Dr (afterwards Sir Charles) Tupper, and the re-organization on an undenominational basis of Dalhousie University (see HALIFAX). In 1867 the province entered the new Dominion of Canada. For some years afterwards an agitation in favour of repeal was maintained, but gradually died away. Since then its history is a record of uneventful progress.

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NOVATIANUS, Roman presbyter, and one of the earliest antipopes, founder of the sect of the Novatiani or Novatians, was born about the beginning of the 3rd century. On the authority of Philostorgius (*H.E.* viii. 15) he has been called a native of Phrygia, but perhaps the historian merely intended to indicate the persistence of Novatianism in Phrygia at the time when he wrote. Little is known of his life, and that only from his opponents. His conversion is said to have taken place after an intense mental struggle; he was baptized by sprinkling, and without episcopal confirmation, when in hourly expectation of death; and on his recovery his Christianity retained all the gloomy character of its earliest stages. He was ordained at Rome by Fabian, or perhaps by an earlier bishop; and during the Decian persecution he maintained the view which excluded from ecclesiastical communion all those (lapsi) who after baptism had sacrificed to idols—a view which had frequently found expression, and had caused the schism of Hippolytus. Bishop Fabian suffered martyrdom in January 250, and, when Cornelius was elected his successor in March or April 251, Novatian objected on account of his known laxity on the above-mentioned point of discipline, and allowed himself to be consecrated bishop by the minority who shared his views. He and his followers were excommunicated by the synod held at Rome in October of the same year. He is said by Socrates (*H.E.* iv. 28) to have suffered martyrdom under Valerian. After his death the Novatians spread rapidly over the empire; they called themselves *καθαροί*, or Puritans, and rebaptized their converts from the Catholic view. The eighth canon of the council of Nice provides in a liberal spirit for the readmission of the clergy of the *καθαροί* to the Catholic Church, and the sect finally disappeared some two centuries after its origin. Novatian has sometimes been confounded with his contemporary Novatus, a Carthaginian presbyter, who held similar views.

Novatian was the first Roman Christian who wrote to any considerable extent in Latin. Of his numerous writings three are extant: (1) a letter written in the name of the Roman clergy to Cyprian in 250; (2) a treatise in thirty-one chapters, *De trinitate*; (3) a letter written at the request of the Roman laity, *De cibis judaicis*. They are well-arranged compositions, written in an elegant and vigorous style. The best editions are by Welchman (Oxford, 1724) and by Jackson (London, 1728); they are translated in vol. ii. of Cyprian's works in the *Ante-Nicene Theol. Libr.* (Edinburgh, 1869). The Novatian controversy can be advantageously studied in the *Epistles* of Cyprian.

NOVATION, a legal term derived from the Roman law, in which *novatio* was of three kinds—substitution of a new debtor (*expromissio* or *delegatio*), of a new creditor (*cessio nominum vel actionum*), or of a new contract. In English law the term (though it occurs as early as Bracton) is scarcely naturalized, the substitution of a new debtor or creditor being generally called an assignment, and of a new contract a merger. It is doubtful, however, whether merger applies except where the substituted contract is one of a higher nature, as where a contract under seal supersedes a simple contract. Where one contract is replaced by another, it is of course necessary that the new contract should be a valid contract, founded upon sufficient consideration (see CONTRACT). The extinction of the previous contract is sufficient consideration. The question whether there is a novation most frequently arises in the course of dealing between a customer and a new partnership, and on the assignment of the business of a life assurance company with reference to the assent of the policyholders to the transfer of their policies. The points on which novation turns are whether the new firm or company has assumed the liability of the old, and whether the creditor has consented to accept the liability of the new debtors and discharge the old. The question is one of fact in each case. See especially the Life Assurance Companies Act 1872, s. 7, where the word "novations" occurs in the marginal note to the section, and so has quasi-statutory sanction. Scots law seems to be more stringent than English law in the application of the doctrine of novation, and to need stronger evidence of the creditor's consent to the transfer of liability. In American law, as in English, the term is something of a novelty, except in Louisiana, where much of the civil law is retained.

NOVAYA ZEMLYA (*Nova Zembla*, "new land"), an Arctic land off the coast of European Russia, to which it belongs, consisting of two large islands separated by a narrow winding channel, the Matochkin Shar. It lies between 70° 31′ and 77° 6′ N., and between 51° 35′ and 69° 2′ E. It forms an elongated crescent, being nearly 600 m. long with a width of 30 to 90 m., and an area of about 36,000 sq. m. It separates the Barents Sea on the W. from the Kara Sea on the E. With Vaygach Island, between it and the mainland, Novaya Zemlya forms a continuation of the Paë-Khoy hills. Vaygach is separated from it by the Kara Strait, 30 m. wide, and from the continent by the Yugor or Ugrian Strait, only 7 m. across. On the E. coast of Novaya Zemlya, especially between the Matochkin Shar and 75° N., there are a number of fjord-like inlets—such as Chekina, Rasmyslov and Medvizhiy bays. The greater part of the W. coast is fretted into bays and promontories, and a large number of islets lie off it. At the S. extremity there are a number of fjords and the wide bay of Sakhanikha. Then farther N. is the Kostin Shar, a strait separating Mezhdusharskiy Island from the coast, and having at its N. entrance South Goose Cape, which forms the S. extremity of Goose Land (Gusinaya Zemlya) in 72° N. Next follows Moller Bay, between Goose Land and Cape Britvin, with several minor bays affording anchorages. On the W. coast of the N. island are Krestovaya, Mashigin and Nordenskjöld bays, and to the N. are several groups of islands—Gorbovyi, Pankratiev, the Gulf Stream Islands and the Orange Islands. Off the E. coast that called Pakhtusov (actually divided by a strait into two) may be mentioned. Little is known of the interior of Novaya Zemlya. It is mountainous throughout. Transverse chains are thrown off from the main chain, and are separated by deep narrow valleys, some of which are watered by streams of considerable size, which, at the spring thaw, bring down a remarkable bulk of detritus. The general slope of the land is steeper on the E. than on the W., and at the N. and S. extremities there is a descent to a comparatively low plateau. In the S. this plateau is broken by several parallel ridges, with level valleys between them, dotted with numerous small lakes. On either side of the Matochkin Shar the hills reach 4000 ft. and upwards. The more elevated region is covered with snow-fields which feed glaciers in some cases, while the N. seems to be covered with a great ice-sheet.

Geology.—The geological structure of the central region is of the most varied description. The primary rocks which appear at Mitushev Kameñ are overlaid with thick beds of quartzites and clay-slates containing sulphide of iron, with subordinate layers of talc or mica slate, and thinner beds of fossiliferous limestone, Silurian or Devonian. More recent clay-slates and marls belonging to the middle Jurassic occur in the western coast-region about Matochkin Shar. About 74° N. the crags of the E. coast are composed of grey sandstone, while in 76° Barents's Islands, and possibly a much greater part of the N. coast, show Carboniferous strata. Traces of Eocene deposits have not been discovered on Novaya Zemlya. During the Glacial period its glaciers were much larger than at present, whilst during a later portion of the Quaternary period (to judge by the marine fossils found as high as 300 ft. above the sea) Novaya Zemlya, like the whole of the arctic coast of Russia, was submerged for several hundred feet. At present it appears to partake of the movement of upheaval common to the whole of N. Russia.

Climate.—Novaya Zemlya is colder than Spitsbergen (which lies more to the N.) as in some degree it shares in the continental conditions of northern Russia and Siberia. The middle and northern parts of the W. coast are not so cold as the E. On the W. coast the temperature appears to decrease S. of the Matochkin Shar, being reduced by a cold current from the Kara Sea through Kara Strait. On the other hand, the climate of the northern part of the W. coast is affected by a relatively warm drift from the W. Under this influence there are years when the islands can be circumnavigated without difficulty. In the Matochkin Shar region the snow-line is estimated at about 1800 to 2000 ft. Glaciers are rare S. of 72° N.

Flora and Fauna.—Grass does not grow to any extent except in Goose Land. Elsewhere even the leaved lichens are precarious, though the leather lichens flourish. Of Phanerogams, only the *Dryas octopetala* covers small areas of the débris, interspersed with isolated *Cochlearia*, &c., and, where a layer of thinner clay has been deposited in sheltered places, the surface is covered with saxifrages, &c.; and a carpet of mosses allows the arctic willow (*Salix polaris*) to develop. Where a thin sheet of humus, fertilized by lemmings, has accumulated, a few flowering plants appear, but even so their brilliant flowers spring direct from the soil, concealing the developed leaflets, while their horizontally spread roots grow out of proportion; only the *Salix lanata* rises to 7 or 8 in., sending out roots 1 in. thick and 10 to 12 ft. long. This applies only to the better-known neighbourhoods of Matochkin Shar and Kostin Shar; N. of 74° N. very few species have been found. The phanerogamic flora of Novaya Zemlya and Vaygach numbers about two hundred species. As to the genetic connexions of the Novaya Zemlya flora, it appears, according to M. Kjellmann's researches, to belong to the Asiatic rather than to the European arctic region.

The interior of Novaya Zemlya shows hardly a trace of animal life, save here and there a vagrant bird, a few lemmings, an ice-fox, a brown or white bear, and at times immigrant reindeer. Even insects are few. The sea-coast, however, is occupied by countless birds, which come from the S. for the breeding season, and at certain parts of the sea-coast the rocks are covered with millions of guillemots, while great flocks of ducks of various sorts, geese and swans swarm every summer on the valleys and lakes of the south. Whales, walruses, various seals and dolphins are frequently met with. Only two species of fish are of any importance—the goltzy (*Salmo alpinus*) in the western rivers, and the omul (*Salmo omul*) in the eastern.

The numbers of sea mammals and birds attracted Russian hunters, and even in the 16th century they had extended their huts (*stanovishtcha*) to the extreme N. of the island. Many of them wintered for years on Novaya Zemlya without great loss from scurvy Owing to the ice in the White Sea Russian hunters found Novaya Zemlya less easy of access than did the Norwegians But about 1877 systematic attempts at settlement were made by the Russian government, several families of Samoyedes being established at stations on the W. coast of the S. island, the chief of which is Karmakuly on Moller Bay, where there is a church. Novaya Zemlya is included in the Russian province of Archangel.

History.—Novaya Zemlya seems to have been known to Novgorod hunters in the 11th century; but its geographical discovery dates from the great movement for the discovery of the N.E. passage. In 1553 Sir Hugh Willoughby sighted what was probably Goose Land; Richard Chancellor penetrated into the White Sea. In 1556 Stephen Borough reached the S. extremity of the island, being the first western European to do so. William Barents touched the island (1594) at Sukhoy Nos (73° 46′), and followed the coast N. to the Orange Islands and S. to the Kostin Shar. Rumours of silver ore having been found induced the Russian government to send out expeditions during the second half of the 18th century. In 1760 Savva Loshkin cruised along the E. coast, spent two winters there, and in the next year, after having reached Cape Begehrte (Begheerte), returned along the W. coast, thus accomplishing the first circumnavigation; but the valuable records of his voyage have been lost. In 1768 the Russian Lieutenant Rozmyslov reached Goose Land and penetrated into the Kara Sea by the Matochkin Shar, where he spent the winter; in the following year he pursued the exploration of the Kara Sea, but was compelled to return and abandon his ship. The first real scientific information about the island is due to the expeditions (1821–1824) of Count Feodor Petrovich Lütke (1797–1882), after whom part of the N. island is named Lütke Land. Nearly all the W. coast as far as Cape Nassau, as well as Matochkin Shar, was mapped, and valuable scientific information obtained. In 1832 Lieutenant Pakhtusov mapped the E. coast as far as Matochkin Shar; and in 1835 Pakhtusov and Tsivolka his pilot, or commander of his second ship, mapped the coast as far as 74° 24′. The next expedition was that of the naturalist Karl von Baer in 1838. A new era of scientific exploration began in 1868, while Norwegian sea-hunters brought in valuable geographical information. In 1870 the Norwegian Captain Johannesen penetrated as far as 79° E., in 76° 13′ N., and afterwards accomplished the second circumnavigation of Novaya Zemlya. These explorations led the way for the famous voyages of Baron Nordenskiöld (1875–1878), which included investigations in Novaya Zemlya. In 1877 the Russian Lieutenant, Tyaghin, attempted to cross the S. island, and in 1878 M. Grinevetskiy succeeded in doing so. Among later expeditions may be mentioned those of C. Nossilov (1887–1892), T. N. Chernychev (1895) who made a crossing of the S. island, H. J. Pearson (1895 and 1897), Lieutenant Borisov (1899 and 1900) and O. Ekstam (1900 and 1903).

See accounts of the expeditions above mentioned, and especially, among earlier works, K. E. von Baer, *Expédition à Novaïa Zemlia et en Lapponie* (St Petersburg, 1838, &c.); and among later works H. J. Pearson, *Beyond Petsora Eastward*, with botanical and geological appendices by H. W. Feilden (London, 1899); also J. Spörer, *Nowaja Semlja* (Gotha, 1867); A. P. Engelhardt, *A Russian Province of the North* (Archangel, of which the author was governor), translated by H. Cooke (London, 1899).

NOVEL (from *novellus*, diminutive of Lat. *novus*, new; through the Italian *novella*), the name given in literature to a study of manners, founded on an observation of contemporary or recent life, in which the characters, the incidents and the intrigue are imaginary, and, therefore, "new" to the reader, but are founded on lines running parallel with those of actual history.

1. With the word *novel* is identified a certain adherence to the normal conditions of experience. A novel is a sustained story which is, indeed, not historically true, but might very easily be so. It is essentially a modern form of literature—that is to say, it makes its appearance when the energy of a people has considerably subsided or has taken purely civic forms, and is ready to contemplate and to criticize pictures drawn from conventional manners. The novel has been made the vehicle for satire, for instruction, for political or religious exhortation, for technical

information; but these are side issues. The plain and direct purpose of the novel is to amuse by a succession of scenes painted from nature, and by a thread of emotional narrative.

It was not until the 18th century that it began to be a prominent factor in literary life, and not until the 19th that it took a place in it which was absolutely predominant. The novel requires, from those who are content to be only fairly proficient in it, less intellectual apparatus than any other species of writing. This does not militate against the fact that the greatest novelists, always a small class, produce work which is as admirable in its art as the finest poetry. But the novel adapts itself to so large a range of readers, and covers so vast a ground in the imitation of life, that it is the unique branch of literature which may be cultivated without any real distinction or skill, and yet for the moment may exercise a powerful purpose.

2. *Classical Antiquity.*—The place held by the novel in antiquity offers interesting analogies with its position in modern times. It was Voltaire, in his *Pyrrhonisme de l'histoire*, who set the fashion of calling the *Cyropaedeia* a novel, but it is probable that Xenophon, in composing this great work on the education of Cyrus, had a purpose that was didactic and historical rather than imaginative. The vogue of the novel really began in Alexandrian times, when social life was so far settled in tradition that the pleasure of reflecting on reality had definitely set in. In the 2nd century B.C. a certain Aristides wrote, in six books, the *Milesiaka*, which was probably the beginning of the modern novel. These Tales of Miletus, the town in which Aristides lived, are lost, but from existing imitations of them in Greek and Latin we can gather that they consisted of humorous and sarcastic episodes of contemporary life. There seems to be good evidence that the bulk of these novelettes, and of the tales which followed them, dealt mainly with the adventures of lovers. In the 2nd century A.D. Lucian preserved for us invaluable pictures of the life in which he moved: his *Lucius or the Ass* and his *True History* are fantastic and extraordinary fictions in which the nature of the novel is not unfrequently approached. But a Syrian Christian, Heliodorus, bishop of Tricca in the 4th century, may claim to have come much closer to it in his *Aethiopica*, which has the unique merit of being a perfectly pure love story, in which the marvellous is not absolutely banished, but in which on the whole the solid structure of experience is preserved. In the 6th century, as is supposed, a Greek who is called Longus (Λόγγος), but of whose life nothing is known, wrote the voluptuous pastoral story of *Daphnis and Chloë*, which is far superior to all other remnants of Greek fiction which have come down to us, and which is the only one of them which can strictly be called a novel. In Latin literature, the *Golden Ass* of Apuleius is manifestly a translation of a lost Greek book, to which Lucian also was indebted. It is probable that in the great age of Roman literature prose fiction was cultivated, but we should be limited to pure conjecture as to its scope, if we did not possess a fragment of a work which is absolutely invaluable to the comparative student of literature. If the *Satyricon* of Petronius was not an isolated phenomenon—and it is highly improbable that this was the case—then the Romans of the Neronian epoch understood to the full the secret of how to produce in prose a satirical, not to say cynical, study of manners in fiction. The *Satyricon* is not less skilfully managed than such later novels as *Gil Blas* or *Peregrine Pickle*, and it is of the same class. From the extent of the principal episode which has been preserved, it is supposed that this novel was not a short tale of intrigue, but was a sustained record, drawn up with careful and lengthy observation of manners, for the single purpose of entertainment. Unfortunately this extraordinary work remains not merely solitary in its class, but itself a fragment. In early Christian times, such books as *The Shepherd of Hermas*, and the productions of Palladius and of Synesius, indistinctly testified to a certain appetite for prose fiction.

3. *Italian.*—It was in northern Italy that the novel of modern Europe (both the literary type and the name) came into existence. A collection of tales, called *Il Novellino* or *Cento novelle antiche* (although only 66 of the 100 survive), was composed at the end of the 13th century, and started this class of literature in Europe. These anonymous stories are of extraordinary diversity, chivalrous, mythological, moral and scandalous. The medieval view of women and priests and peasants is found in its full development, and there is something of the realistic reflection of customs which was to flourish later in a whole class of fiction. The earliest Italian novelist whose name is connected with his writings is Francesco da Barberino (1264–1348), whose *Documenti d'Amor* were first published in 1640. He was followed by the celebrated Giovanni Boccaccio, who wrote his *Filocopo* about 1339 and the *Decameron* some nine years later. Of his disciples the most eminent was Francesco Sacchetti (1335–1400), a Florentine. Sacchetti's *Trecente novelle*, which remained in MS. until the 18th century (1724), are ironical and realistic studies of the life around him in Tuscany. To Giovanni Fiorentino is attributed a collection of 50 tales, called *Il Pecorone*, printed first in 1558, but written in 1378. Shakespeare was indebted to one of these stories for the plot of *The Merchant of Venice*. A great name in the evolution of European fiction is that of Tommaso Guardato, called Masuccio (1415?–1477?); he was a native of Salerno, and was the first of the south Italian novelists. Masuccio imitated no one; his conceptions and his observations are wholly his own. His *Novellino*, printed at Naples in 1476, is divided into five books, each containing ten stories. These deal satirically with the three favourite subjects of the age—namely, jealous husbands, unfaithful wives and debauched priests. He was followed in this, as well as in his vivacity, by Antonio Cornazzano (1431?–1500?), an inhabitant of Piacenza, who wrote Italian with much greater purity than Masuccio, but less vigour. His stories were frequently reprinted, under the title of *Proverbii*. Of the novels of Giovanni Brevio (1480?–1562?) only five have been preserved, but these are of unusual merit. We then reach Matteo Bandello (1480–1561), long the most famous of all the Italian novelists, whose *Novelle*, first issued in 1554, were eagerly read in all parts of Europe; they are 214 in number. After Bandello the decline of the Italian *novella* is evident. Francesco Maria Molza (1489–1544), whose stories appeared in 1547, was a rival to Bandello, and has been preferred to him by several modern critics. The *Ragionamenti d'Amor* (1548) of Agnolo Firenzuola (1493–1545) was the work of a poet writing in richly embroidered prose. After Firenzuola the great school of Italian story-tellers declined. There was no more novel writing of any importance in Italy until the close of the 18th century, when an admiring study of German literature produced the romances of Alessandro Verri (1741–1816) and Ugo Foscolo (1778–1827). The first Italian novelist of merit in recent times, however, is Alessandro Manzoni (1785–1873), whose *I Promessi Sposi* (1825) enjoyed an unbounded popularity. Manzoni had a troop of imitators, but no rivals. In the fourth quarter of the 19th century Italy produced some very brilliant and original novelists, in particular Giovanni Verga (b. 1840), Matilda Serao (b. 1856) and Gabriele d'Annunzio (b. 1863).

4. *France.*—In the 14th century, when Italy was already proceeding in a modern direction, France was satisfied with ancient tales of *Fierabras* or *Les Quatre fils d'Aynon*, which were nothing but epics told in rambling prose. It was not until about 1450 that the anonymous *Quinze joies du mariage* showed the French to be influenced by the Italian discovery of the novelette of manners. The author of this extraordinary work was perhaps Antoine de la Sale who seems certainly to have written the whole of the *Cent nouvelles nouvelles*, imitated from Boccaccio and Sacchetti. This bud of realistic fiction, however, was immediately nipped by the romances of chivalry, of Spanish extraction, which were only destroyed by the vogue of *Don Quixote*. The translation of Montalvo's celebrated *Amadis de Gaule* enjoyed at this time an extraordinary popularity.

The habit of telling tales freely in prose was not, however, formed in France until after 1500. Bonaventure Despériers (d. 1544) was the author of the *Cymbalum mundi*, and of *Nouvelles récréations*, mordant satires and gay stories. Probably to this age also belongs the semi-fabulous Béroalde de Verville, who is supposed to be the author of a collection of facetious anecdotes and conversations, *Le Moyen de Parvenir*. These, and other experiments in fiction, lead us up to Rabelais, whose magnificent genius adopted as its mode of address the chain of burlesque prose narratives which we possess in *Gargantua* and *Pantagruel*, recording the family history of a race of giant kings, but his influence on the novel is insignificant. It was half a century later that, in the romantic pastoral of *Astrée*, published in 1610, France may be said to have achieved her first attempt at a novel. This famous book was written by Honoré d'Urfé; in spite of its absurdities it is full of talent, and succeeds, for the first time in the history of French narrative, in depicting individual character. D'Urfé was followed, with less originality, by Marin Le Roy de Gomberville (1600–1674), who was the author of a Mexican romance, *Polexandre*, and by Gombauld (1570?–1666), the author of *Endymion* (1624). These were fictions of interminable adventures, broken by an infinite number of episodes; they seem tedious enough to us nowadays, but with their refinement of language, and their elevation of sentiment, they fascinated readers like Madame de Sévigné. To Gomberville, who has been called the Alexandre Dumas of the 17th century, succeeded Mdlle de Scudéry (1607–1701), who preserved the romantic framework of the novel, but filled it up with modern and familiar figures disguised under ancient names. Her huge *romans à clef*, tiresome as they are, form the necessary stepping-stone between *Astrée*, in which the novel was first conceived, and *La Princesse de Clèves*, where at last it found perfect expression. Meanwhile, the elephantine heroic romances were ridiculed by Charles Sorel in his *Francion* (1622) and *Le Berger extravagant* (1628). Later examples of a realistic reaction against the pompous beauty of Gomberville and Scudéry were the *Roman comique* (1651) of Scarron and *Le Roman bourgeois* (1666) of Furetière.

All these, however, were mere preparations. The earliest novelist of France is Marguerite de la Vergne, comtesse de La Fayette (1634–1693), and the earliest genuine French novels were her *Princesse de Montpensier* (1662), and her far more important *Princesse de Clèves* (1678). Madame de La Fayette was the first writer of prose narrative in Europe who portrayed, as closely to nature as she could, the actual manner and conversations of well-bred people. To show that she was capable of writing in the old style, she published, with the help of Segrais, in 1670, a *Zayde*, which is in the Spanish manner affected by Mdlle de Scudéry. It was long before the peculiar originality of the *Princesse de Clèves* was appreciated. Meanwhile La Fontaine, in 1669, published a fine romance of *Psyché*, partly in verse, and Fénelon, in 1699, his celebrated *Télémaque*. The influence of La Bruyère on the novelists, although he wrote no novels, must not be overlooked. But the *Princesse de Clèves* remained the solitary novel of moral analysis when its author died and the 17th century closed. The successes of Alain René Lesage seemed to be wholly reactionary. His realistic novels, *Gil Blas* and *Le Diable boiteux*, depended upon their comic force, their picaresque vivacity, rather than upon the sober study of average human character. But Marivaux (1688–1763) took up the psychological novel again, and produced in *Marianne* (1731) and *Le Paysan parvenu* (1735) analytical stories of Parisian manners and character which were wholly modern in form. If *Marianne* was deliberate, the exquisite *Manon Lescaut* (1731), by the Abbé Prévost d'Exiles (1697–1763), was almost an accident; but, between them, these simultaneous works started the French novel of the analysis of emotion. The brilliant stories of Voltaire, which began with *Zadig* and included *Candide*, hardly belonged to this category; they are rather satires and diversions, in which class must also be placed the fashionable boudoir novels of Crébillon *fils*, La Morlière and others. But the English taste, exemplified mainly by Richardson, Sterne and Fielding, prevailed, and its effect was seen again in the imperfect novels of Diderot and Rousseau. The *Nouvelle Héloïse* and the *Émile* of the latter are not skilfully constructed as stories, but they mark the starting-point of the novel which aims at familiarising the public mind with great ideas in an attractively romantic form. The moral purpose is equally evident in the famous *Paul et Virginie* of Bernardin de St Pierre. It was less didactically present in Mme de Staël's *Delphine* (1802) and *Corinne* (1807), where the misinterpreted woman of genius, so often depicted since, is first introduced to French novel-readers. It was not, however, until about 1830 that the novel began to be one of the main channels of imaginative writing in France, and the development of this kind of fiction was one of the main features of the romantic revival. Stendhal showed that, without any of the charms of style, and relying exclusively upon minute psychological observation, the record of a human life could be made enthrallingly interesting. Alexandre Dumas, under the direct influence of Sir Walter Scott, allowed his tropic imagination to revel and riot in brilliant chains of adventure. The imaginative novel was admirably conceived by George Sand. But it was Balzac who filled canvas after canvas with the astounding intensity of life itself, and who insisted with irresistible force that the function of the novel is to draw a consistent and unprejudiced picture of humanity under the strain of a succession of probable passions. This has been clearly comprehended by the host of later French novelists, whose record cannot be traced here, to be the function of the novel, as Mme de La Fayette invented it, as Marivaux and Prévôst developed it, and as George Sand and Balzac finally laid down its laws and settled its borders. Certain dates, however, must be recorded in the briefest record of the evolution of the French novel, and 1856 is one of these; in that year Gustave Flaubert published *Madame Bovary*, a work in which the rival realistic and romantic tendencies are combined with a mastery that had not been approached and has not since been equalled. Another is 1871, when Zola began to roll out the enormous canvas of *Les Rougon-Macquart*. Yet another in 1880, when *Boule de suif* first revealed in Maupassant a novelist whose creations were not merely amusing and striking, but absolutely convincing and logical.

5. *English.*—If we take no heed of translations of Latin stories, such as those from the *Gesta Romanorum*, we may say that the beginning of prose fiction in England is *Le Morte d'Arthur*, of Sir Thomas Malory, finished in or about 1470, and printed by Caxton in 1485. The great merits of this writer were that he got rid of the medieval burden of allegory, essayed an interpretation of the human heart, and invented a lucid and vigorous style of narrative. But his book became, as Professor W. Raleigh has said, "the feeder of poetry rather than of prose," and it gave no inkling of the methods of the modern novel. The same may be said of such versions of the Charlemagne Amadis and Palmeria cycles of romances as *Huon of Bordeaux*, published by Lord Berners, perhaps in 1535, and innumerable others. It was the *novella* of Italy from which the English novel first faintly started. Between 1560 and 1580 versions of the Italian novelists became exceedingly popular in England. Paynter in introducing the tales of Bandello and Straparola struck the true novelist's note by offering them not as works of morality or edification, but "instead of a merry companion to shorten the tedious toil of weary ways." The appreciation of these Italian stories led to the composition of the *Euphues* of Lyly (1579), a book of great interest and merit, which has been called "the first original prose novel written in English." This is somewhat to exaggerate, since *Euphues* is rather a work of elegant philosophy than a narrative. Lyly had many imitators, Munday, Greene, Dickenson, Barnabe Rich, Lodge, Nash and others, who formed a school of prose fiction which was not without a certain romantic beauty, but which possessed as little narrative vigour as possible. To compare a story written by Sacchetti in 1385 with one written by Greene in 1585 is to perceive that not merely had no progress been made towards the modern novel, but that a great deal of ground had been lost. The genius of the Elizabethan age lay in the direction of lyrical and dramatic poetry, not of prose fiction. The absence of the comic element in Elizabethan romances is very marked. M. Jusserand has claimed a peculiar merit in this and other respects for the *Jack Wilton* of Nash (1594), which, as he points out, is the earliest English example of picaresque literature. During

the reign of the heroic romances in France, their vogue violently affected the English book-market. The huge stories of Calprenède and Gomberville were imported, and translated and imitated to the exclusion of every other species of prose fiction, between 1645 and 1670. The long-winded books of Mdlle de Scudéry, especially *Cassandra* and *The Great Cyrus*, were read so universally in England as to leave their stamp on the national manners. Of original English romances, written in competition with the French masterpieces of tenderness and chivalry, the *Parthenissa* of Lord Orrery (1654) is the best known. The first definite stand against these Gallicized romances was made by two dramatists, Aphara Behn and William Congreve. Congreve's *Incognita* (1692) is remarkable for its light raillery and humour, and perhaps deserves as well as any 17th-century composition to be called the earliest novel in English. The stories of Mrs Behn have the merit of a romantic simplicity of narrative, but they are dull and devoid of art. But the novel still lingered, unwilling to make its appearance in England, and its place was taken during the age of Anne by the labours of the essayists. So rich is the character painting, so lively the touches of social colour in the *Spectator* and *Tatler*, that these periodicals have, by enthusiastic critics, been styled brilliant examples of prose fiction. But it is obvious that in the delightful essays of Addison and Steele there was no attempt made at construction, that the sustained evolution of characters was not essayed, and that even in the studies of Mr Bickerstaff's Club anything like a plot was studiously avoided. Yet these are all essential characteristics of the novel, and until they make their appearance in English literature we must not say that the secret has been discovered. Very near to the mystery, if he did not quite grasp it, was Daniel Defoe, who introduced into his narrative a minute and rude system of realistic observation, by way of giving an impression of truth to it. This exactitude he combined with a survival of the old picaresque method, the result being those strange and entertaining works *Colonel Jack* (1722) and *Roxana* (1724). Still closer he came to positive success in the immortal narrative of *Robinson Crusoe*, in which the fascination of the desolate island was first worked up in English.

6. Not even yet had the English novel been invented. It came into the world in 1740 from the unconscious hands of Samuel Richardson (1689–1761), who had hit upon the notion that morality might be helped and young persons of inexperience protected by the preparation of a set of letters exchanged between imaginary persons. The result was *Pamela: or Virtue Rewarded*, a book which is in every strict sense the earliest English novel. It has even a claim to be considered the earliest European novel of the modern kind, for the assumption of French criticism that Richardson borrowed his ideas and his characters from the *Marianne* of Marivaux is not supported by evidence. There is no reason to suppose that Richardson met with the name of Marivaux earlier than 1749. At all events, it would seem to be certain that, whether in France or England, the fourth decade of the 18th century saw the spontaneous conception of this "new species of writing." The name of the heroine of Richardson's book was Miss Pamela Andrews, and the second English novel was Fielding's *Joseph Andrews* (1742), which started as a mere burlesque of *Pamela*, but proceeded upon admirably original lines of its own, in a study of the humours and manners of contemporary country life. Fielding rejected the epistolary artifice of Richardson, and told his story in a straightforward narrative, broken indeed by arguments and ejaculations which bound the new novel to the old essay of the *Spectator* type. The creative force of Fielding filled the pages of this book with a crowd of vividly-presented characters, and this marked a step in advance, for Richardson's practice was to concentrate minute attention upon only one or two figures. It was from Richardson that the next important fiction came, in the shape of the long-drawn tragedy of *Clarissa* (1748). But a third great novelist was now at work; in 1748 appeared the *Roderick Random* of Smollett, and here we have neither the sculptural manner of Richardson nor the busy world of Fielding's realism, but a comic impression founded on an artful employment of emphasis and exaggeration. Smollett gives us neither breathing statues nor a crowd of men and women, but a gallery of "freaks," arranged with great art, indeed, but exhibited in such a way as to expose not their likeness but their unlikeness to the common stock of humanity. It is very important to note this curious divergency between the three great writers, because they exemplified the three classes into which almost all subsequent novels can with more or less ease be divided. The next move was made by Fielding, who in 1749 published his *Tom Jones*. Starting with the pungent horror of hypocrisy ever before him, Fielding constructs a fragment of the world in which men and women are seen, without exaggeration, plying their daily trades under the eye of an impartial observer who can penetrate to their secret motives. This was a great advance, and a still greater one was the sustained skill with which the author conducted the plot, the interwoven series of the actions of his characters. It may almost be said that until the publication of *Tom Jones* no novel with a real plot had been conceived in English. The rivalry of the great novelists of this time was of signal help to them, and there can be no question that the astounding richness of *Tom Jones* stirred Smollett to the exercise of increased energy in *Peregrine Pickle* (1751), a coarse and savage book, illuminated by brilliant flashes of humour. A better, because a tenderer and truer study of life was *Amelia*, which Fielding published in the same year; yet most readers have found this novel a little languid after *Tom Jones*. But if the ideal of life depicted in it was quieter and sadder, it was perhaps for that very reason more in harmony with the facts of life. Now Richardson, who had long been silent, reasserted his mastery of epistolary analysis in the huge *History of Sir Charles Grandison* (1753), in which, as its admirers claimed, "all the recesses of the human heart are explored and its whole texture unfolded." Richardson had scarcely been affected by the experiments of his contemporaries, of the very nature of which he affected to be ignorant, and the result is that in his third and last novel he depends entirely on qualities which he had already developed, and owes nothing to the discoveries of others.

7. With this book, the first great group of English novels comes to a close, and we may observe that in these eight stories everything is to be found, in germ if not in full evolution, which was during the next century and a half to make the abundant out-put of the English novel prominent. New forms, above all new subjects, were to present themselves to the imagination of capable British novelists, but the starting-point of every experiment was to be discovered in the ripest work of Richardson, Fielding and Smollett. Their influence was manifest in the writings of the second school of English novelists, in whom, however, several interesting varieties of subject and treatment were discovered. The *Tristram Shandy* (1759–1766) of Sterne, is the most masterly example in English of a humour which goes direct to pathos for its most "sentimental" effects, and of the kind of loosely-strung, reflective fiction which is hardly a narrative at all. Neither *Tristram Shandy* nor *A Sentimental Journey* (1768) can properly be included among novels. In *Rasselas* (1759) Dr Johnson showed that the new kind of writing could be used to give entertainment to a sermon and in this he was to have a multitude of followers. In *Chrysal* (1760) Charles Johnstone (d. 1800) showed that the picaresque romance could still exist, tinctured by the newly-found art of the novelist. In *The Castle of Otranto* (1764) Horace Walpole adapted the methods of the novelist to a pseudo-historical theme of horror and romance, and prophesied of Walter Scott. In *The Vicar of Wakefield* (1766) Goldsmith was indebted to most of his immediate predecessors, but fused their qualities in an amalgam of gentle wit and delicate sweetness and conversational brevity which has made his one loosely-constructed novel a foremost classic of our literature. Thus, in the one quarter of a century which divides *Pamela* from *The Vicar of Wakefield*, English novel-writing was born, grew into full maturity, and adopted its adult and final forms.

8. During the remainder of the 18th century, little or nothing was done to extend the range of prose fiction in England, but one or two of those departments of novel-writing which had already

been invented were developed and adapted to changing taste. In particular, the rapid increase of reticence and refinement in conversation made such a novel in letters as Smollett's *Humphrey Clinker* (1771) repulsively coarse to women of delicacy, who were charmed on the other hand with the *Evelina* of Frances Burney (1778). These two typical books are composed on the same plan, yet essentially a whole age lies between the former and the latter. What has been called "the novel of the tea-table" now came into existence, and the 18th century was about to close in mediocrity, when its credit was partially saved by a development of Horace Walpole's romance of terror in the vigorous and sensational narratives of Anne Radcliffe (1764–1823), whose *Mysteries of Udolpho* appeared in 1794. The same year saw the publication of *Caleb Williams*, in which William Godwin (1756–1836) evolved a tragic theory of politics. A finer study than either of the works just mentioned, although not truly a novel, was the gorgeous and sinister *Vathek* (1786) of William Beckford, an oriental tale of horror. In all these books there existed an element of grotesque mingled with romantic colour, which announced the coming revival.

9. The two schools here indicated, and they may be roughly defined as the school of the Tea-Table and the school of the Skeleton-in-the-Cupboard, did not, however, betray their real significance until the second decade of the 19th century, when after several unimportant efforts, they developed into the novel of psychological satire and the romance of historical imagination. Two writers, the greatest who had yet attempted to address English readers through prose fiction, almost simultaneously came forward as the protagonists in these two spheres of work. Jane Austen published *Sense and Sensibility* in 1811, Walter Scott *Waverley* in 1814. These were epoch-making dates; in each case a new era opened for the countless readers of novels. The first-named writer, all exactitude, conscience and literary art, worked away at her "little bit (two inches wide) of ivory"; the other, with bold and flowing brush, covered vast spaces with his stimulating and noble compositions. It is, however, to be noted that the isolation in which we now regard these great writers— a *solitude à deux* only broken in measure by the presence of Miss Maria Edgeworth—is an optical delusion due to the veils of distance. The bookshops from 1810 to 1820 and onwards were thronged and glutted with novels, many of them infinitely more successful, as far as sales were concerned, than the most popular of Miss Austen's works. The novels of Miss Austen were written between 1796 and 1810, although published from 1811 to 1818; those of Sir Walter Scott date from 1814 (*Waverley*) to 1829 (*Anne of Geierstein*). Practically speaking, no additions were made to the formula of the social novel or of the historical romance, to the study of national manners, that is to say, from the satirical or from the picturesque point of view, until a quarter of a century later.

10. The next artist in prose fiction whose force of invention was sufficient to start the novel on wholly fresh tracks was born forty years later than Scott. This was Charles Dickens, whose *Pickwick Papers* (1836) marks another epoch in novel writing. His career of prodigal production ceased abruptly in 1870, by which time it had long been obvious that he was the pioneer of a great and diverse school of novelists, all born within the second decade of the century. Of these Thackeray was not really made obvious until *Vanity Fair* (1849), nor Charlotte Brontë till *Jane Eyre* (1847), nor Mrs Gaskell till *Mary Barton* (1848), nor George Eliot till *Adam Bede* (1859). The most noticeable point on which the five illustrious novelists of the Early Victorian age resembled one another and differed from all their predecessors, was the sociological or even humanitarian character of their writings. All of them had projects of moral or social reform close at heart; all desired to mend the existing scheme of things. In several of them, particularly in Dickens and Miss Brontë, the element of insubordination is extremely marked; it is present in them all; and a determination not to be content to see life beautifully, through coloured glasses, or to be content with a sarcastic travesty of it, but to realize in detail its elements of pain and injustice. The novel, which had already learned to compete with all the amusing sections of literature, became the successful rival of the serious ones also. The task of the novelist was, therefore, so far as the indication of the scope of his particular kind of art is concerned, now complete. The names of Anthony Trollope, Charles Kingsley, Charles Reade, George Meredith, Thomas Hardy and Robert Louis Stevenson represent, in their least challenged form, different movements in novel-writing during the second half of the 19th century; we must be content here to refer for particulars concerning them to the separate biographical articles.

11. *Spain.*—Prose narrative in Spain practically begins in the 15th century with chronicles and romances of chivalry, tempered occasionally and faintly by some knowledge of what had been attempted in Italy by Boccaccio. The Spanish version of *Amadís de Gaula*, in which the romance of knight errantry culminated, belongs to 1508; the lost original is supposed to have been Portuguese. This was the only book of its class which is saved from the burning in *Don Quixote*; it was followed by *Palmerin of England*. These interminable books, and a hundred worse than they, occupied the leisure of 16th-century readers of both sexes. Without approaching the form of novels, they prepared the ground for novel-reading. The exploration of America led to the composition of monstrous tales of the New World, which generally took the form of continuations of *Amadís*. A new thing was begun in 1554, when the anonymous picaresque romance of *Lazarillo de Tormes* started the story of fantastic modern adventure; this highly entertaining book has been called the 16th-century *Pickwick*, and Mr Fitzmaurice-Kelly remarks that it "fixed for ever the type of the comic prose epic." The pastoral romance, in the hands of Jorge de Montemór (d. 1561), who wrote an insipid *Diana* which was popular for a while throughout Europe, took readers a step backward, away from the ultimate path of the novel. It is of interest to us, however, to note that it was in one of these "vain imaginings," in his pastoral romance of *Galatea*, that Cervantes approached the field of fiction, in 1585. Few of his peculiar merits are to be found in this early work; he turned for the present to the composition of plays. It was not until 1604 that he returned to prose fiction by printing his immortal *Don Quixote*, which made an epoch in the history of the novel. This book was originally intended to ridicule the already fading passion for the romances of chivalry, but it proceeded much further than that, and there is hardly any branch of fiction which may not be traced back to the splendid initiation of some chapter of *Don Quixote*. In 1613 Cervantes published his twelve *Exemplary Novels*; these are not so well known as the great romance, and they owed not a little of their form to Italian sources, but they are very brilliant. One of the best anonymous Spanish stories of the period, *The Mock Aunt*, is a type of excellence in facetious narrative of the sarcastic class; this is now commnonly attributed to Cervantes himself. No other novelist of Spain has moulded the thought of Europe, but the heroic romance which occupied so much of the attention of France in the 17th century was invented by a little-known Spanish soldier, Pérez de Hita, who, about 1600, wrote fantastic stories about Granada and the Moors. The farcical romance of *Fray Gerundio de Campazas*, 1758, by J. F. de Isla (1703–1718), competed in popularity with *Gil Blas*. Speaking broadly, however, Spain made no appreciable progress in novel-writing from the days of Cervantes to those of Walter Scott, when the *Waverley Novels* began to find such artless imitators as Martinez de la Rosa and Zorrilla. But the first original novelist of Spain was Cecilia Böhl de Faber (Fernán Caballero) (1796–1877), whose *La Gaviota*, 1848, a study of life in an Andalusian village, was the earliest Spanish novel, in the modern sense. She was followed by Valera (1824–1904), by Alarcón (1833–1891), by Pereda (b. 1834), by Perez Galdós (b. 1845) and by Palacio Valdés (b. 1853), in whom the tendencies of recent European fiction have been competently illustrated without any striking contributions to originality.

12. *Germany.*—The cultivation of the novel in its proper sense began late in Germany. It is usual to consider that H. J. C. von Grimmelshausen (1625?–1675) is the earliest German novelist;

his very curious romance, *Abenteuerliche Simplicius Simplicissimus*, was printed at Mömpelgard in 1669. This is an account of the adventures of a simple-minded fellow during the Thirty Years' War, and is a chain of episodes, brilliantly recorded, but hardly a novel. Early in the 18th century, an extraordinary number of imitations of Defoe's great romance were published in Germany, and these are known to scholars as the *Robinsonaden*. Later on, Wieland imitated *Don Quixote*, but the earliest German novel which possesses original value is the celebrated work of Goethe, *The Sorrows of Young Werther* (1774). The still more celebrated *Wilhelm Meister* did not appear until 1796. A third novel, *Elective Affinities*, was published by Goethe in 1809. Meanwhile, a very characteristic group of picturesque stories had been issued by Johann Paul Richter (Jean Paul) (1763–1825), destined to have a wide influence upon romantic literature throughout Europe. Purely romantic were the stories of Tieck, of Brentano, of Arnim, of Fouqué, of Kleist, of Immermann. The German novelists of this period wrote like poets, deprived of the discipline of verse. In later times novels of high merit have been written by Gustav Freytag, Wilibald Alexis (1798–1871), called the German Walter Scott, Laube, Fontane, Ebers, Jeremias Gotthelf, Berthold Auerbach, Spielhagen, Heyse and many others, but the 19th century produced no German novelist of commanding originality.

13. *Russia.*—In Russia alone, among the countries of central and eastern Europe, the novel has developed with a radical originality. Until the second quarter of the 19th century the prose fiction of Russia was confined to imitators of Sir Walter Scott, but about the year 1834 Gogol (1809–1852) began to revolt against the historico-romantic school and to produce stories in which an almost savage realism was curiously blended with the Slavonic dreaminess and melancholy. Since then the Russian novel has consistently been the novel of resignation and pity, but wholly divorced from sentimentality. Gogol was succeeded by Gontcharor, Tourgéniev, Dostoïevski, Pissemski 1820–1881) and Tolstoi, forming the most consistent and, doubtless, the most powerful school of novelists which Europe saw in the 19th century. The influence of these writers on the rest of the world was immense, and even in England, where it was least acutely felt, it was significant. That the Russians have indicated the path to new fields in the somewhat outworn province of novel-writing is abundantly manifest.

14. *Oriental.*—In a primitive form, the novel has long been cultivated in Asia. It was introduced into China, but whence is unknown, in the 13th century, and Le Kuan-chung was the first Chinese novelist. The productions of this writer and of his followers are tales of bloody warfare, or record the adventures of travellers. The novel called *The Twice-Flowering Plum-Trees*, belonging to the 16th (or 17th) century, is a typical example of the moral Chinese novel, written with a virtuous purpose. Professor Giles holds that the novel of China reached its highest point of development in *The Dream of the Red Chamber*, an anonymous story of the end of the 17th century; this is a panorama of Chinese social life, "worked out with a completeness worthy of Fielding." Prose stories began to be met with in the literature of Japan early in the 10th century. But the inventor of the Japanese novel was a woman of genius, Murasaki no Shikibu, whose *Genji Monogatari* has been compared to the writings of Richardson; it was finished in 1004 and may, therefore, be considered the oldest novel in the world. This book, which is one of the great classics of Japan, was widely imitated. After the classic period novel-writing was long neglected in Japan, but the humours of 17th-century life were successfully translated into popular fiction by Saikaku (1641–1693), and later by Jisho and Kiseki, who collaborated in a great number of remarkable stories.

See Dunlop, *The History of Fiction* (1816); Borroneo, *Catalogo de' novellieri italiani* (1805); Ém. Gebhart, *Conteurs du moyen âge* (1901); E. M. de Voguë, *Le Roman russe* (1886); Forsyth, *Novels and Novelists of the 18th Century* (1871); Bever and Sansot-Orland, *Œuvres galantes des conteurs italiens* (1903); Rivadeneyra, *Biblioteca de autores españoles* (1846–1880); Gosse, *A Century of French Romance* (1900–1902); G. Pellissier, *Le Mouvement littéraire au XIXe siècle* (1889); Zola, *Les Romanciers naturalistes* (1880); *Le Roman expérimental* (1879); Brunetière, *Le Roman naturaliste* (1883); W. Raleigh, *The English Novel* (1894); V. Chauvin, *Les Romanciers grecs et latins* (1862); Fancan, *Le Tombeau des romans* (1626). (E. G.)

NOVELDA, a town of E. Spain, in the province of Alicante; on the right bank of the river Vinalopó, and on the railway from Madrid to Alicante. Pop. (1900) 11,388. The country around is flat and fertile, producing much wine, dates, oranges, oil, saffron and aniseed. In the town there are tanneries, and manufactures of alcohol, chocolate and soap. The women make fine lace. In the neighbouring village of Salinetas de Elda there are warm sulphur and saline baths.

NOVELLI, ERMETE (1851–), Italian actor and playwright, was born in Lucca on the 5th of March 1851, the son of a prompter. He made his first appearance in 1866, and played character and leading comedy parts in the best companies between 1871 and 1884. By 1885 he had his own company, and made a great success in Paris in 1898 and 1902. He established in Rome in 1900 a new theatre, the Casa di Goldoni, on the lines of the Comédie Française. He dramatized Gaboriau's *Monsieur Lecoq*, and alone or in collaboration wrote several comedies and many monologues.

NOVELLO, VINCENT (1781–1861), English musician, son of an Italian who married an English wife, was born in London on the 6th of September 1781. As a boy he was a chorister at the Sardinian chapel in Duke Street, Lincoln's Inn Fields, where he learnt the organ; and from 1796 to 1822 he became in succession organist of the Sardinian, Spanish (in Manchester Square) and Portuguese (in South Street, Grosvenor Square) chapels, and from 1840 to 1843 of St Mary's chapel, Moorfields. He was an original member of the Philharmonic Society, of the Classical Harmonists and of the Choral Harmonists, officiating frequently as conductor. In 1849 he went to live at Nice, where he died on the 9th of August 1861. He composed an immense quantity of sacred music, much of which is still deservedly popular; but his great work lay in the introduction to England of unknown compositions by the great masters. The Masses of Haydn and Mozart were absolutely unknown in England until he edited them, as were also the works of Palestrina, the treasures of the Fitzwilliam Museum, and innumerable great compositions now well known to every one. His first work, a collection of *Sacred Music, as performed at the Royal Portuguese Chapel*, which appeared in 1811, has the additional interest of giving a date to the practical founding of the publishing firm with which his name is associated, as Novello issued it from his own house; and he did the same with succeeding works, till his son JOSEPH ALFRED NOVELLO (1810–1896), who had started as a bass singer, became a regular music publisher in 1829. It was the latter who really created the business, and who has the credit of introducing cheap music, and departing from the method of publishing by subscription. From 1841 Henry Littleton assisted him, becoming a partner in 1861, when the firm became Novello & Co., and, on J. A. Novello's retirement in 1866, sole proprietor. Having incorporated the firm of Ewer & Co. in 1867, the title was changed to Novello, Ewer & Co., and still later back to Novello & Co., and, on Henry Littleton's death in 1888, his two sons carried on the business.

Vincent Novello had several other children besides his son Joseph Alfred. Four of his daughters (of whom the youngest, Mary, married Charles Cowden Clarke) were gifted singers; but the most famous was CLARA NOVELLO (1818–1908), whose beautiful high soprano and pure style made her one of the greatest vocalists, alike in opera, oratorio and on the concert stage, from 1833 onwards. In 1843 she married Count Gigliucci, but after a few years returned to her profession, and only retired in 1860. Charles Lamb wrote a poem (*To Clara N.*) in her praise.

NOVEMBER (Lat. *novem*, nine), the ninth month of the old Roman year, which began with March. By the Julian arrangement, according to which the year began with the 1st of January, November became the eleventh month and had thirty days assigned to it. The 11th of November was held to mark the beginning of winter; the sacred banquet called *epulum Jovis* took place on the 13th. It is said that the senate desired to rename the month in honour of Tiberius—his birthday occurring on the 16th, but the emperor declined, saying, "What will you do, Conscript Fathers, if you have *thirteen* Caesars?" The Anglo-Saxon names for November were *Windmonath*, "wind-month" and *Blodmonath* "bloodmonth." In the calendar of the first French republic November reappeared partly as Brumaire and partly as Frimaire. The principal November festivals in the calendar of the Roman Church are: All Saints' Day on the 1st, All Souls' on the 2nd, St Martin's on the 11th, the Presentation of the Virgin on the 21st, St Cecilia's on the 22nd, St Catherine's on the 25th and St Andrew's on the 30th. St Hubert commemorated on the 3rd. In the English calendar All Saints' and St Andrew's are the only feasts retained.

NOVERRE, JEAN GEORGES (1727–1810), French dancer and ballet master, was born in Paris on the 29th of March 1727. He first performed at Fontainebleau in 1743, and in 1747 composed his first ballet for the Opéra Comique. In 1748 he was invited by Prince Henry of Prussia to Berlin, but a year later he returned to Paris, where he mounted the ballets of Glück and Piccini. In 1755 he was invited by Garrick to London, where he remained two years. Between 1758 and 1760 he produced several ballets at Lyons, and published his *Lettres sur la danse et les ballets*. From this period may be dated the revolution in the art of the ballet for which Noverre was responsible. (See PANTOMIME and BALLET.) He was next engaged by the duke of Württemburg, and afterwards by the empress Maria Theresa, until, in 1775, he was appointed, at the request of Queen Marie Antoinette, *maître des ballets* of the Paris Opera. This post he retained until the Revolution reduced him to poverty. He died at St Germain on the 19th of November 1810.

Noverre's friends included Voltaire, Frederick the Great and David Garrick (who called him "the Shakespeare of the dance"). The ballets of which he was most proud were his *La Toilette de Vénus*, *Les Jalousies du sérail*, *L'Amour corsaire* and *Le Jaloux sans rival*. Besides the letters, Noverre wrote *Observations sur la construction d'une nouvelle salle de l'Opéra* (1781); *Lettres sur Garrick écrites à Voltaire* (1801); and *Lettre à un artiste sur les fêtes publiques* (1801).

NOVGOROD, a government of N.W. Russia, bounded W. and N. by the governments of St Petersburg and Olonets, S.E. by Vologda, Yaroslav and Tver, and S.W. by Pskov, stretching from S.W. to N.E. 450 m. Area, 47,223 sq. m. Pop. (1906) 1,555,700. The S. is occupied by the Valdai plateau, in which are the highest elevations of middle Russia (600 to over 1000 ft.), as well as the sources of nearly all the great rivers of the country. The plateau is deeply furrowed by valleys with abrupt slopes, and descends rapidly towards the basin of Lake Ilmen in the W. (only 60 ft. above the sea-level). The N.E. of the government belongs to the lacustrine region of N.W. Russia. This tract is dotted over with innumerable sheets of water, of which Byelo-ozero (White Lake) and Vozhe are the largest of more than 3000. Immense marshes, overgrown with thin forests of birch and elm, occupy more than one-seventh of the entire area of the government; several of them have an area of 300 to 450 sq. m. each. They admit of being crossed only when frozen. Six centuries ago they were even less accessible, but the slow upheaval of N.W. Russia, going on at the rate of 3 or more feet per century, has exercised a powerful influence upon the drainage of the country. Of recent years artificial drainage has been carried out on a large scale. The forests still occupy 55% of the total area of the government.

Geologically, Novgorod exhibits in the W. vast beds of Devonian limestones and sandstones; these are elsewhere overlaid with Carboniferous limestone, dolomite, sandstones and marls. The Devonian gives rise to salt-springs, especially at Staraya Russa (S. of Lake Ilmen), and contains iron-ores, while the more recent formation has coal strata of inferior quality. The whole is covered with a thick sheet of boulder-clay, very often arranged in ridges or *eskers*, the bottom moraine of the N. European ice-sheet of the Glacial period. Numerous remains of the neolithic Stone Age are found, especially round the extinct lakes. The Baltic and Caspian Sea basins are connected by the Mariinsk, Tikhvin and Vyshniy-Volochok canals, while the Alexander-von-Württemberg canal connects the tributaries of the White Sea with those of the Baltic. The chief river is the Volkhov, which flows from Lake Ilmen into Lake Ladoga. Other navigable rivers are the Syas, also flowing into Lake Ladoga, and the Sheksna and the Mologa, tributaries of the Volga. The Msta and the Lovat are the principal streams in the basin of Lake Ilmen. All boats from the Volga to St Petersburg pass through this government.

The yearly average temperature at Novgorod is only 40° Fahr. (14·5° in January, 62·5° in July). The severe climate, the marshy or stony soil, and the want of grazing grounds render agriculture unprofitable, though it is carried on everywhere. The yield of rye and other cereals is insufficient for the wants of the inhabitants. Fireclay, coal and turf are extracted in commercial quantities. Building, smith-work, fishing, shipbuilding, distilleries, glass and match factories, sawmills and a variety of domestic industries give occupation to about 40,000 families. Hunting is still profitable. But most of the inhabitants are dependent on the river-boat traffic; and nearly one-fourth of the able-bodied males are annually driven to other parts of Russia in search of work. The Novgorod carpenters and masons have long been renowned. Trade is chiefly in grain and timber, and in manufactures and grocery wares from St Petersburg. The fairs are numerous, and several of them (Kirilovsk monastery, Staraya Russa and Cherepovets) show considerable returns.

The inhabitants are almost exclusively Great-Russians, but they are discriminated by some historians from the Great-Russians of the basin of the Oka, as showing remote affinities with the Little-Russians. They belong mostly (96½%) to the Orthodox Greek Church, but there are many Nonconformists. There are 10,000 Karelians and 9000 Chudes, with some Jews and some Germans. Novgorod is well provided with educational institutions, and primary education is widely diffused in the villages. (P. A. K.; J. T. BE.)

NOVGOROD (formerly known as *Velikiy-Novgorod*, Great Novgorod), a town of Russia, capital of the government of the same name, and the seat of an archbishop of the Orthodox Greek Church, situated 119 m. by rail S. of St. Petersburg, on the low flat banks of the Volkhov, 2 m. below the point where it issues from Lake Ilmen. Pop. (1900) 26,972. The present town is but a poor survival of the wealthy city of medieval times. It consists of a kremlin (old fortress), and of the city, which stands on both banks of the river, connected by a handsome stone bridge. The kremlin was much enlarged in 1044, and again in 1116. Its stone walls, originally palisades, were begun in 1302, and much extended in 1490. Formerly a great number of churches and shops, with wide squares, stood within the enclosure. Its historical monuments include the cathedral of St Sophia, built in 1045–1052 by architects from Constantinople to take the place of the original wooden structure (989), destroyed by fire in that year. Some minor changes were made in 1688 and 1692, but otherwise (notwithstanding several fires) the building remained unaltered until its restoration in 1893–1900. It contains many highly-prized relics, including bronze doors of the 12th century, one brought reputedly from Sigtuna, the ancient capital of Sweden. Another ancient building in the kremlin is the Yaroslav Tower, in the square where the Novgorod *vyeche* (common council) used to meet; it still bears the name of "the court of Yaroslav"; and was the chancellery of the secretaries of the *vyeche*. Other remarkable monuments of ancient Russian architecture are the church of St. Nicholas erected in 1135, the Snamenski cathedral of the 14th century, and churches of the 14th and 15th centuries. Within the town itself there are four monasteries and convents, two of them dating from the 11th century and two from the 12th century; and the large number in the immediate neighbourhood shows the great extent which the city formerly had. A monument to commemorate the thousandth anniversary of the foundation of Russia (the calling in of the Varangians by Novgorod in 862) was erected in 1862. Another monument commemorates the repulse of the Napoleonic invasion of 1812.

The date at which the Slavs first erected forts on the Volkhov (where it leaves Lake Ilmen and where it flows into Lake Ladoga) is unknown. That situated on a low terrace close by Lake Ilmen was soon abandoned, and Novgorod or "New-town" (in contradistinction to the Scandinavian Aldegjeborg or Ladoga) was founded by Scandinavian sea-rovers as Holmgård on another terrace which extended a mile lower on both banks of the river. The older fort (Gorodishche) still existed in the 13th century. Even in the 9th century the new city on the Volkhov exercised a kind of supremacy over the other towns of the lake region, when its inhabitants in 862 invited the Varangians, under the leadership of Rurik, to the defence of the Russian towns of the north. Down to the end of the 10th century Novgorod was in some sort depended on Kiev; yet in 997 its inhabitants obtained from their own prince Yaroslav a charter which granted them self-government. For five centuries this charter was the bulwark of the independence of Novgorod. From the end of the 10th century the princes of Novgorod, chosen either from the sons of the great princes of Kiev (until 1136) or from some other branch of the family of Rurik, were always elected by the *vyeche*; but they were only its military defenders, and their delegates were merely assessors in the courts which levied taxes for the military force raised by the prince. The *vyeche* invariably expelled the princes as soon as they provoked discontent. Their election was often a subject of dispute between the wealthier merchants and landowners and the poorer classes; and Novgorod, which was dependent for its corn supply upon the land of Suzdal, was sometimes compelled to accept a prince from the Suzdal branch instead of from that of Kiev. After 1270 the city often refused to have princes at all, and the elected mayor was the representative of the executive. Novgorod in its transactions with other cities took the name of "Sovereign Great Novgorod" (*Gospodin Velikiy Novgorod*). The supreme power was in the hands of the *vyeche*. The city, which had a population of more than 80,000, was divided into wards, and each ward constituted a distinct commune. The wards were subdivided into streets, which corresponded to the prevailing occupations of their inhabitants, each of these again being quite independent with regard to its own affairs.

Trade was carried on by corporations. By the Volkhov and the Neva, Novgorod—then known also as Naugart and Novwerden—had direct communication with the Hanseatic and Scandinavian cities, especially with Visby or Wisby on the island of Gotland. The Dnieper brought it into connexion with the Bosporus, and it was intermediary in the trade of Constantinople with northern Europe. The Novgorod traders penetrated at an early date to the shores of the White Sea, hunted on Novaya Zemlya in the 11th century, colonized the basins of the northern Dvina, descended the Volga, and as early as the 14th century extended their trading expeditions beyond the Urals into Siberia. Two great colonies, Vyatka and Vologda, organized on the same republican principles as the metropolis, favoured the further colonization of N.E. Russia.

At the same time a number of flourishing minor towns such as Novyi Torg (Torzhok), Novaya Ladoga, Pskov, and many others arose in the lake region. Pskov soon became quite independent, and had a history of its own; the others enjoyed a large measure of independence, still figuring, however, as subordinate towns in all circumstances which necessitated common action. It is said that the population of Novgorod in the 14th century reached 400,000, and that the pestilences of 1467, 1508 and 1533 carried off no fewer than 134,000 persons. These figures, however, seem to relate rather to the whole Ilmen region.

Novgorod's struggle against the Suzdal region (now the government of Vladimir) began as early as the 12th century. In the following century it had to contend with the Swedes and the Germans, who were animated not only by the desire of territorial acquisition, but also by the spirit of religious proselytism. The advances of both were checked by battles at Ladoga and Pskov in 1240 and 1242 respectively. Protected by its marshes, Novgorod escaped the Mongol invasion of 1240–42, and was able to repel the attacks of the princes of Moscow by whom the Mongols were supported. It also successfully resisted the attacks of Tver, and aided Moscow in its struggle against this powerful neighbour; but soon the ambition of the growing Moscow state was turned against itself. The first serious invasion, in 1332, was rolled back with the aid of the Lithuanians. But in 1456 the great prince of Moscow succeeded in imposing a heavy tribute. Ivan III. of Moscow took possession of the colonies in the northern Dvina and the Perm regions, and began two bloody wars, during which Novgorod fought for its liberty under the leadership of Martha Boretskaya, the mayor. In 1475–1478 Ivan III. entered Novgorod, abolished its charters, and carried away 1000 of the wealthier families, substituting for them families from Moscow; the old free city then recognized his sovereignty. A century later Ivan IV. (the Terrible) abolished the last vestiges of the independence of the city. Having learned that a party favourable to Lithuania had been organized in Novgorod, he took the field in 1570, and entered the city (much weakened by the recent pestilences) without opposition. His followers killed the heads of the monasteries, the wealthier of the merchants and clergy, and burned and pillaged the city and villages. No fewer than 15,000 men, women and children were massacred at Novgorod alone (60,000 according to some authorities). A famine ensued, and the district of Novgorod fell into utter desolation. Thousands of families were transported to Moscow, Nizhniy-Novgorod, and other towns of the principality of Moscow. In the beginning of the 17th century Novgorod was taken and held for seven years by the Swedes; and in the 18th century the foundation of St Petersburg ultimately destroyed its trade. Its position, however, on the water highway from the Volga to St Petersburg and on the trunk road from Moscow to the capital, still gave it some commercial importance; but even this was destroyed by the opening of the Vishera canal, connecting the Msta with the Volkhov below the city, and by the construction of the railway from St Petersburg to Moscow, which passes 46 m. to the east of Novgorod. (P. A. K.; J. T. Be).

NOVIBAZAR, Novi-Bazar, or Novipazar (ancient Rassia, Rascia, or Rashka, Turkish Yenipazar, *i.e.* "New Market"), a sanjak of European Turkey, in the vilayet of Kossovo. Pop. (1905) about 170,000. Novibazar is a mountainous region, watered by the Lim, which flows north into Bosnia, and by several small tributaries of the Servian Ibar. About three-fourths of the inhabitants are Christian Serbs, and the remainder are chiefly Moslem Albanians, with a few gipsies, Turkish officials and about 3000 Austro-Hungarian soldiers. The local trade is mainly agricultural. The sanjak is of great strategic importance, for it is the N.W. part of the Turkish empire, on the direct route between Bosnia and Salonica, and forms a wedge of Turkish territory between Servia and Montenegro. The union of these powers, combined with the annexation of Novibazar, would have impeded the extension of Austrian influence towards Salonica. But by the treaty of Berlin (1878) Austria-Hungary was empowered to garrison the towns of Byelopolye, Priyepolye, Plevlye and other strategic points within the sanjak, although the entire civil administration remained in Turkish hands. This decision was enforced in 1879. The chief approaches from Servia and Montenegro have also been strongly fortified by the Turks.

Novibazar, the capital of the sanjak, is a town of about 12,000 inhabitants, on the site of the ancient Servian city of Rassia. Near it there are Roman baths, and the old church of St Peter and St. Paul, the metropolitan church of the bishopric of Rassia, in which Stephen Nemanya, king of Servia, passed from the Roman to the Greek Church in 1143.

NOVICE (through French from Lat. *novicius* or *novitius*, one who has newly arrived, *novus*, new), a person who joins a religious order on probation. He or she is subject to the authority of the superior, wears the dress of the order, and obeys the rules. At the end of the "novitiate," which must last at least one year, the novice is free to leave without taking the vows, and the order is free to refuse to allow him or her to take them. The word was early used of a beginner in any art or science, hence an inexperienced person.

NOVI LIGURE, a town of Piedmont, Italy, in the province of Alessandria, from which it is 14 m. S.E. by rail, situated among wooded hills, 646 ft. above sea-level. Pop. (1901) 17,868. It was the scene of a victory by the Austrians and Russians under

Suvorov over the French in 1799. It is now an important railway junction, the main lines from Turin and Milan to Genoa converging here. Cotton, silk, coal briquettes, &c., are also manufactured here.

NOVO-BAYAZET, a town of Russian Transcaucasia, in the government of Erivan, 35 m. E.N.E. of the town of Erivan, and 4 m. W. of Gok-chai Lake, 5870 ft. above the sea. Pop. 8507 in 1897, mainly Armenians. An Armenian village which stood here was destroyed by Nadir Shah of Persia in 1736, and it was not till the Turkish War of 1828–29 that the site was again occupied by Armenian refugees from the Turkish town of Bayazet or Bayazid.

NOVOCHERKASSK, a town of Russia, capital of the Don Cossacks territory, situated on a hill 400 ft. above the plain, at the confluence of the Don with the Aksai, 45 m. from the Sea of Azov, and 32 m. by rail N.E. from Rostov. Pop. (1897) 52,005. It was founded in 1805, when the inhabitants of the Cherkassk *stanitsa* (now Old Cherkassk) were compelled to leave their abodes on the banks of the Don on account of the frequent inundations. The town is an archiepiscopal see of the Orthodox Greek Church, and possesses a cathedral (1904), a museum, the palace of the *ataman* (chief) of the Cossacks, and monuments to M. I. Platov (a Cossack chief) and T. Yermak (1904), the conqueror of West Siberia. Wide suburbs extend to the S.W., and the right bank of the Aksai is dotted with the villas of the Cossack officials. Manufactures make slow progress. An active trade is carried on in corn, wine and timber (exports), and manufactures and grocery wares (imports).

NOVOGEORGIEVSK. (1) A town of Russia, usually known under the name of KRYLOV, in the government of Kherson, at the confluence of the Tyasmin with the Dnieper, 17 m. W.N.W. of Kremenchug. Its fort was erected by the Poles in 1615. The inhabitants carry on a lively trade in timber, grain and cattle, and have a few flourmills and candle-works. Pop. (1897) 11,214. (2) A first-class fortress of Russian Poland (called Modlin till 1831), at the confluence of the Narev (Bug) with the Vistula, 23 m. by rail N.W. of Warsaw. Modlin was first fortified under the Napoleonic régime in 1807, and in the wars of 1813 and 1830–31 underwent several sieges. Since that time the Russians have made many additions to the works, and the place now forms, with Warsaw, Ivangorod and Brest-Litovsk, the so-called Polish Quadrilateral. The strength of Novogeorgievsk lies mainly in the new circle of eight powerful forts, erected at a mean distance of 10 m. from the enceinte. The importance of the fortress lies in the fact that it prevents Warsaw from being turned by a force on the lower Vistula and commands the railway between Danzig and Warsaw.

NOVOMOSKOVSK, a town of Russia, in the government of Ekaterinoslav, 16 m. N.E. of the town of Ekaterinoslav. Including several villages which have been incorporated with it, it extends for nearly 7 m. along the right bank of the Samara, a tributary of the Dnieper. In the 17th century the site was occupied by several villages of Zaporogian Cossacks, known under the name of Samarchik. In 1687 Prince Golitsuin founded here the Ust-Samara fort, which was destroyed after the treaty of the Pruth (1711), but rebuilt in 1736, and the settlement of Novoselitsy established. The inhabitants of Novomoskovsk, who numbered 23,381 in 1900, are chiefly engaged in agriculture, though some are employed in tanneries, and there is a trade in horses, cattle, tallow, skins, tar and pitch. In the immediate neighbourhood is the Samarsko-Nikolayevskiy monastery, which is visited by many pilgrims.

NOVO-RADOMSK, or RADOMSKO, a town of Russian Poland, in the government of Piotrków, 28 m. by rail S.S.W. of the town of Piotrków. It has factories for bentwood furniture, woollens and cloth, tanneries, ironworks and sawmills, and is the centre of a very active trade. Pop. (1900) 14,464, many being Jews.

NOVOROSSIYSK, a seaport town of S. Russia, in the Chernomorsk or Black Sea territory, on a bay of the same name (also named Tsemes), on the N.E. coast of the Black Sea. Pop. (1900) 40,384. The bay, nearly 3 m. wide at its entrance on the E., and 5 m. deep from E. to W., is exposed to the N.E. wind (*bora*), which sweeps down from the Caucasus Mountains with great violence. There is an artificial harbour (1893) protected by a mole. Novorossiysk is connected by a branch railway to Tikhoryetskaya (169 m.) with the main Caucasian line, which crosses the Volga near Tsaritsyn, and has become an important centre for the export of corn, and since the petroleum wells of Groznyi in northern Caucasia were tapped it has become an entrepôt for the export of petroleum. Cement is manufactured. Large grain elevators have been built, and a new commercial town has grown up. Besides cereals, which amount to 69% of the whole, the exports consist of petroleum and petroleum waste, oilcake, linseed, timber, bran, millet seed, wool, potash, zinc ore and liquorice, the total annual value ranging between 3½ and 5¼ millions sterling. The imports are small. Some 1500 acres in the vicinity of the town are planted with vines. Novorossiysk has belonged to Russia since 1829.

NOWELL, ALEXANDER (*c.* 1507–1602), dean of St Paul's, London, was the eldest son of John Nowell of Read Hall, Whalley, Lancashire, by his second wife Elizabeth Kay of Rochdale. He was educated at Middleton, Lancashire, and at Brasenose College, Oxford, where he is said to have shared rooms with John Foxe the martyrologist. He was elected fellow of Brasenose in 1526. In 1543 he was appointed master of Westminster school, and in December 1551 prebendary of Westminster. He was elected in September 1553 member of parliament for Looe in Cornwall in Queen Mary's first parliament, but in October 1553 a committee of the house reported that, having as prebendary of Westminster a seat in convocation, he could not sit in the House of Commons. He was also deprived of his prebend, probably as being a married man, before May 1554, and sought refuge at Strassburg and Frankfort, where he developed puritan and almost presbyterian views. He submitted, however, to the Elizabethan settlement of religion, and was rewarded with the archdeaconry of Middlesex, a canonry at Canterbury and in 1560 with the deanery of St Paul's. His sermons occasionally created some stir, and on one occasion Elizabeth interrupted his sermon, telling him to stick to his text and cease slighting the crucifix. He held the deanery of St Paul's for forty-two years, surviving until the 13th of February 1602. Nowell is believed to have composed the Catechism inserted before the Order of Confirmation in the Prayer Book of 1549, which was supplemented in 1604 and is still in use; but the evidence is not conclusive. Early in Elizabeth's reign, however, he wrote a larger catechism, to serve as a statement of Protestant principles; it was printed in 1570, and in the same year appeared his "middle" catechism, designed it would seem for the instruction of "simple curates." Nowell also established a free school at Middleton and made other benefactions for educational purposes. He was twice married, but left no children.

See Ralph Churton, *Life of Alexander Nowell* (Oxford, 1809); G. Burnet, *History of the Reformation* (new ed., Oxford, 1865); and R. W. Dixon, *History of the Church of England*. Also the *Works* of John Strype; the *Publications* of the Parker Society; the *Calendar of State Papers, Domestic*; and the *Dict. Nat. Biog.*, vol. lv.

NOWGONG, a town of India, headquarters of the Bundelkhand agency and a military cantonment, in the native state of Chhatarpur, on the border of the British district of Jhansi. Pop. (1901) 11,507. It has accommodation for a force of all arms. The college for the education of the sons of chiefs in Central India, opened here in 1872, was abolished in 1898, owing to the small attendance.

NOWGONG, a town and district of British India, in the Brahmaputra valley division of eastern Bengal and Assam. The town is situated on the Kalang river. Pop. (1901) 4430. The district of Nowgong has an area of 3843 sq. m. It consists of a wide plain overgrown with jungle and canebrakes, intersected by numerous tributaries of the Brahmaputra, and dotted with shallow marshes. The Mikir hills cover an area of about 65 M by 35 in the S. of the district; the highest peak is about 3500 ft. The slopes are very steep, and are covered with dense forest.

The Kamakhya hills near the bank of the Brahmaputra, are about 1500 ft. high. On the summit of the highest peak is a celebrated temple of Kamakhya, the local goddess of love, where three annual festivals are held. The staple crop is rice. Tea cultivation and manufacture are carried on by European capital and under European supervision, though the soil and climate are not so favourable as in Upper Assam. The population in 1901 was 261,160, showing a decrease of 24·8% in the decade, due to the extreme unhealthiness of the climate. In the previous ten years the number of deaths recorded from fever and *kala azar* was 93,824. The section of the Assam-Bengal railway from Gauhati to the hills passes through part of the district, but not very near Nowgong town; and feeder roads to the stations lead from the main road that runs parallel to the Kalang river.

See *Nowgong District Gazetteer* (Calcutta, 1905).

NOWSHERA, or NAUSHAHRA, a town and cantonment in Peshawar district of the North-West Frontier Province of India, situated on the right bank of the Kabul river 27 m. E. of Peshawar. Pop. (1901) 9518. It is the headquarters of a brigade in the 1st division of the northern army, and also the junction for the frontier railway that runs to the station of Mardan and continues to Dargai and Malakand on the route to Chitral.

NOY, WILLIAM (1577–1634), English jurist, was born on the family estate of Pendrea in Buryan, Cornwall, in 1577, his father belonging to a family whose pedigree is included in the visitation of Cornwall in 1620. He went to Exeter College, Oxford, but left without taking a degree. He entered Lincoln's Inn in 1594. From 1603 until his death he was elected, with one exception, to each parliament, sitting invariably for a constituency of his native county. For several years his sympathies were in antagonism to the court party. Every commission that was appointed numbered Noy among its members, and even those who were opposed to him in politics acknowledged his learning. A few years before his death he was drawn over to the side of the court, and in October 1631 he was created attorney-general, but was never knighted. It was through his advice that the impost of ship-money was levied. Noy had long suffered from stone, and died in great agony on the 9th of August 1634; two days later he was buried at New Brentford church. His principal works are *On the Grounds and Maxims of the Laws of this Kingdom* (1641) and *The Compleat Lawyer* (1661).

NOYON, a city of N. France, in the department of Oise, 67 m. N.N.E. of Paris by the railway to Brussels. Pop. (1906) 5968. Noyon is built at the foot and on the slopes of a hill, and traversed by a small stream, the Verse, which joins the Oise 1 m. farther down. The old cathedral of Notre-Dame, constructed on the site of a church burned in 1131, is a fine example of the transition from Romanesque to Gothic architecture. In plan it is a Latin cross, with a total length from E. to W. of about 340 ft.; the height of the nave vaulting is 75 ft. The west front has a porch, added in the 14th century, and two unfinished towers, their upper portions dating from the 13th century; its decorations have been greatly mutilated. The nave consists of eleven bays, including those of the W. front, which, in the interior, forms a kind of transept. In the windows of the aisles, the arches of the triforium, and the windows of the clerestory the round type is maintained; but double pointed arches appear in the lower gallery; and the vaults of the roof, originally six-ribbed, were rebuilt after a fire in 1293 in the prevailing Pointed style. The transepts have apsidal terminations. Side chapels were added in the N. aisle in the 14th century and in the S. aisle in the 15th and the 16th, one of the latter (15th) is especially rich in decorations. The flying buttresses of the building were restored in the 19th century in the style of the 12th century. From the N.W. corner of the nave runs the western gallery of a fine cloister erected in 1230; and next to the cloister is the chapter-house of the same date, with its entrance adorned with statues of the bishops and other sculpture. The bishops' tombs within the cathedral were destroyed during the Revolution. The chapel of the bishops' palace is an example of the Early Pointed style; the canons' library was built of wood early in the 16th century; and the town-hall (Gothic and Renaissance) dates from 1485–1523. Among the town manuscripts is the Red Book or communal charter of Noyon. Remains of the Roman walls may be traced. There is a statue to Jacques Sarrazin, the painter (1592–1660), a native of the town. Noyon has good trade in grain and live-stock, and contains chemical and artificial manure works, tanneries and ironfoundries and carries on sawmilling and sugar manufacture.

Noyon, the ancient Noviomagus Veromanduorum, was christianized by St Quentin at the close of the 3rd century; and about 530 St Medard, bishop of the district of Vermandois, transferred his see thither from St Quentin. The episcopate of St Eligius towards the middle of the 7th century, the burial of Chilperic I., the coronation of Pippin the Short in 752, and on the same occasion the coronation of his infant son Carloman with the title of king of Noyon, the coronation of Charlemagne in 768 and the election of Hugh Capet in 987, the plunder of the town by the Normans in 859 are the chief events in the history of Noyon down to the 10th century. Till the Revolution the bishopric was one of the ecclesiastical peerages of the kingdom. At the beginning of the 12th century Noyon easily obtained a communal charter through the favour of its bishops. The extent of the bishopric was considerably curtailed towards the middle of the 12th century by the breaking off of the diocese of Tournai. Noyon was ravaged by the English and the Burgundians during the Hundred Years' War. In 1516 a truce was signed there by Francis I. and Charles V. The city was captured by the Spaniards in 1552, and afterwards by the Leaguers, who were expelled in 1594 by Henry IV. John Calvin was born at Noyon in 1509.

See A. Lefranc, *Histoire de Noyon jusqu'à la fin du XIII^e siècle* (Paris, 1887).

NOZU, MICHITSURA, MARQUESS (1840–1908), Japanese field-marshal, was born in Satsuma. He fought against the Satsuma rebels in 1877, became a general in 1894 and led the Hiroshima division at the battle of Pingyang (1894). He succeeded Yamagata in the command-in-chief of the Manchurian army, and fought in that capacity throughout the China-Japan War, being raised to the rank of viscount (1895). He commanded the fourth army in the Russo-Japanese War, and received a marquessate at its close. He died in 1908.

NUBAR PASHA (1825–1899), Egyptian statesman, was born at Smyrna in January 1825, the son of an Armenian merchant named Moghreditch, who had married a relative of Boghos Bey, an influential minister of Mehemet Ali. Boghos had promised to interest himself in the future of his young relative, and at his suggestion he was sent first to Vevey, and then to Toulouse, to be educated by the Jesuits, from whom he acquired a very perfect knowledge of French, and perhaps that singular suppleness and subtlety of character by which he was mainly distinguished. Before he was eighteen he went to Egypt, and after some eighteen months' training as secretary to Boghos, who was then minister of both commerce and foreign affairs, he was made second secretary to Mehemet Ali. In 1845 he became first secretary to Ibrahim Pasha, the heir apparent, and accompanied him on a special mission to Europe. Abbas Pasha, who succeeded Ibrahim in 1848, maintained Nubar in the same capacity, and sent him in 1850 to London as his representative to resist the pretensions of the sultan, who was seeking to evade the conditions of the treaty under which Egypt was secured to the family of Mehemet Ali. Here he was so completely successful that he was made a bey; in 1853 he was sent to Vienna on a similar mission, and remained there until the death of Abbas in July 1854. The new viceroy, Said, at once dismissed him from office, but two years afterwards appointed him his chief secretary, and later gave him charge of the important transport service through Egypt to India. Here Nubar was mainly instrumental in the completion of railway communication between Cairo and Suez, and exhibited strong organising ability combined with readiness of resource. After a second time falling a victim to Said's caprice and being dismissed, he was again sent to Vienna, and returned as principal secretary to Said, a position he held till Said's death in January 1863.

On the accession of Ismail Pasha, Nubar Bey was in the prime of life. He was already on friendly terms with him; he even claimed to have saved his life—at all events, it was a coincidence that the two had together refused to travel by the train the accident to which caused the death (on the 14th of May 1858) of the prince Ahmed, who would otherwise have succeeded Said. Ismail, himself a more capable man than his immediate predecessors, at once recognized the ability of Nubar, and charged him with a mission to Constantinople, not only to notify his accession, but to smooth the way for the many ambitious projects he already entertained, notably the completion of the Suez Canal, the change in title to that of khedive and the change in the order of succession. In the first of these he was completely successful; the sultan, believing as little as every one else that the canal was anything more than a dream, gave his consent at a price the moderation of which he must afterwards have regretted. The gratified Ismail created Nubar a pasha, and the sultan himself, persuaded to visit Cairo, confirmed the title so rarely accorded to a Christian. Half the work was, however, yet to be done, and Nubar was sent to Paris to complete the arrangements, and to settle the differences between Egypt and the Canal Company. In what he used to call "an expensive moment of enthusiasm," he left these differences to the arbitration of the emperor Napoleon III. and cost Egypt four millions sterling. On his return he was made Egypt's first minister of public works, and was distinguished for the energy which he threw into the creation of a new department; but in 1866 he was made minister of foreign affairs, and at once went on a special mission to Constantinople, where he succeeded in the other two projects that had been left in abeyance since his last visit. In June 1867 Ismail was declared khedive of Egypt, with succession in favour of his eldest son. Nubar now had a harder task to undertake than ever before. The antiquated system of "capitulations" which had existed in the Ottoman empire since the 15th century had grown in Egypt to be a practical creation of seventeen *imperia in imperio*: seventeen consulates of seventeen different powers administered seventeen different codes in courts before which alone their subjects were amenable. A plaintiff could only sue a Frenchman in the French court, with appeal to Aix; an Italian in the Italian court, with appeal to Ancona; a Russian in the Russian court, with appeal to Moscow. Nubar's bold design, for which alone he deserves the credit, was to induce these seventeen powers to consent to abandon their jurisdiction in civil actions, to substitute mixed International Courts and a uniform code binding on all. That in spite of the jealousies of all the powers, in spite of the opposition of the Porte, he should have succeeded, places him at once in the first rank of statesmen of his period. Nubar made no attempt to get rid of the criminal jurisdiction exercised by the consular representatives of the foreign powers —such a proposal would have had, at that time, no chance of success.

The extravagant administration of Ismail, for which perhaps Nubar can hardly be held wholly responsible, had brought Egypt to the verge of bankruptcy, and Ismail's disregard of the judgments of the Court at last compelled Great Britain and France to interfere. Under pressure, Ismail, who began to regret the establishment of the International Courts, assented to a mixed ministry under Nubar, with Rivers Wilson as minister of finance and de Blignières as minister of public works. Nubar, finding himself supported by both Great Britain and France, tried to reduce Ismail to the position of a constitutional monarch, and Ismail, with an astuteness worthy of a better cause, took advantage of a somewhat injudicious disbandment of certain regiments to incite a military rising against the ministry. The governments of Great Britain and France, instead of supporting the ministry against the khedive, weakly consented to Nubar's dismissal; but when this was shortly followed by that of Rivers Wilson and de Blignières they realized that the situation was a critical one, and they succeeded in obtaining from the sultan the deposition of Ismail and the substitution of his son Tewfik as khedive (1879). Nubar remained out of office until 1884.

In the interval Great Britain had intervened in Egypt—the battle of Tel-el-Kebir had been fought, Arabi had been banished, and Sir Evelyn Baring (afterwards earl of Cromer) had succeeded Sir Edward Malet. The British government, under the advice of Baring, insisted on the evacuation of the Sudan, and Sherif having resigned office, the more pliant Nubar was induced to become premier, and to carry out a policy of which he openly disapproved, but which he considered Egpyt was forced to accept under British dictation. At this period he used to say, "I am not here to govern Egypt, but to administer the British government of Egypt. I am simply the greaser of the official wheels." It might have been well if Nubar had confined himself to this modest programme, but it was perhaps hardly to be expected of a man of his ability and restless energy. It must be admitted, however, that the characters of Nubar and Lord Cromer were not formed to run in harness, and it was with no surprise that the public learnt in June 1888 that he had been relieved of office, though his dismissal was the direct act of the khedive Tewfik, who did not on this occasion seek the advice of the British agent. Riaz Pasha, who succeeded him, was, with one interval of eight months, prime minister until April 1894, when Nubar returned to office. By that time Lord Cromer had more completely grasped the reins of administration as well as of government, and Nubar had realized more clearly the rôle which an Egyptian minister was called on to play: Lord Cromer was the real ruler of Egypt, and the death of Tewfik in 1890 had necessitated a more open exercise of British authority. In November 1895 Nubar completed his fifty years of service, and, accepting a pension, retired from office. He lived little more than three years longer, spending his time between Cairo and Paris, where he died in January 1899 at the age of seventy-four. (C. F. M. B.)

NUBIA, a region of north-east Africa, bounded N. by Egypt, E. and W. by the Red Sea and the Libyan Desert respectively, and extending S. indefinitely to about the latitude of Khartum. It may be taken to include the Nile valley from Assuan near the First Cataract southwards to the confluence of the White and Blue Niles, stretching in this direction for about 560 m. between 16° and 24° N. Nubia, however, has no strictly defined limits, and is little more than a geographical expression. The term appears to have been unknown to the ancients, by whom everything south of Egypt was vaguely called Ethiopia, the land of the dark races. It is first associated historically, not with any definite geographical region, but with the Nobatae, a negro people removed by Diocletian from Kharga oasis to the Nile valley above Egypt (Dodecaschoenus), whence the turbulent Blemmyes had recently been driven eastwards. From Nūba, the Arabic form of the name of this people, comes the modern Nubia, a term about the precise meaning of which no two writers are in accord. Within the limits indicated the country consists mainly of sandy desert and rugged and arid steppes and plateaus through which the Nile forces its way to Upper Egypt. In this section of the river there occurs a continuous series of slight falls and rapids, including all the historical "six cataracts," beginning below Khartum and terminating at Philae. Between those places the river makes a great S-shaped bend, the region west of the Nile within the lower bend being called the Bayuda Desert, and that east of the Nile the Nubian Desert. The two districts roughly correspond to the conventional divisions of Upper and Lower Nubia respectively. Except along the narrow valley of the Nile only the southernmost portion of Nubia contains arable land. The greater part is within the almost rainless zone. An auriferous district lies between the Nile and the Red Sea, in 22° N. Politically the whole of Nubia is now included either in Egypt or the Anglo-Egyptian Sudan, and has no administrative existence.

Ethnology.—As an ethnical expression the term Nuba or Nubian has little value. Rejected by the presumable descendants of Diocletian's Nobatae, who now call themselves Berber or Barābara, it has become synonymous in the Nile valley with "slave," or "negro slave." This is due to the large number of slaves drawn by Arab dealers from the Nūba negroes of Kordofan, who appear to constitute the original stock of the Nubian races (but see Hamitic Races). On the other hand, the name has never included all the inhabitants of Nubia. Peoples of three distinct stocks inhabit the country—the comparatively recent Semitic Arab intruders, mainly in Upper Nubia, the Beja (? Hamitic) family of tribes (the Ababda, Bisharin, Hadendoa, Beni-Amer, &c.), everywhere between the Nile and the Red Sea; and the Nubians (Nuba or Barābira), in Lower Nubia, where they are now almost exclusively confined to the banks of the Nile, from Assuan southwards to Dongola. Ethnologically these modern Nubians are a very mixed people, but their affiliation to negroes or negroids, which is based on physical and linguistic grounds, is confirmed by what is known of the history of the Nilotic peoples.

The first inhabitants of the region beyond Egypt appear to have been the Uaua, whose name occurs in an inscription on a tomb at Memphis of the VIth Dynasty, and again constantly in subsequent inscriptions down to the time of the Ptolemies, as the chief negro race to the south of Syene. (For the history of the country during this period see Ethiopia). It thus appears that throughout the historic period down to the arrival of the Romans the Nile-country above Egypt was occupied by a negro people. Egyptian monuments are found as far south as Mount Barkal (Napata), but no Egyptian settlements beyond Syene. Hence these Uaua negroes probably remained unaffected, or very slightly affected, by foreign elements until about the 3rd century A.D. Their domain then began to be encroached upon from the east by the Blemmyes, who have been identified with the present Beja of the Nubian desert. It was owing to their incessant raids that Diocletian withdrew the Roman garrisons above the cataracts, and called in the warlike Nobatae to protect the Egyptian frontier from their attacks. These negro Nobatae, originally from Kordofan, as is now evident, had advanced to the Great Oasis (Kharga) in Upper Egypt, whence they passed into the Nile valley between the cataracts. Here they absorbed the older Uaua of kindred stock, and ultimately came to terms with the Blemmyes. The two races even became intermingled, and, making common cause against the Romans, were defeated by Maximinus in 451.

The Blemmyes, remaining pagan after the Nubas had embraced Christianity (6th century) were soon after driven from the Nile valley eastwards to the kindred Megabares, Memnons and other nomads, who, with the Troglodytes, had from time immemorial held the whole steppe region between the Nile and the Red Sea from Axum to Egypt. Here their most collective name was Bugaitae (Βουγαειταί), as appears from the Axumite inscription, whence the forms Buja, Beja, which occur in the oldest Arab records, and by which they are still known.

In the 7th century the Arabs who had conquered Egypt penetrated into Lower Nubia, where the two Jawābareh and Al-Gharbīya tribes became powerful, and amalgamated with the Nūbas of that district. Their further progress south was barred by the Christian kings of Dongola (*q.v.*) until the 14th century, when the Arabs became masters of the whole region. Still later another element was added to the population in the introduction by the Turkish masters of Egypt of a number of Bosnians. These Bosnians (Kalaji as they called themselves) settled in the country and intermarried with the Arabs and Nubians, their descendants still holding lands between Assuan and Derr. Hence it is that the Nubians of this district, fairest of all the race, still claim Arab and Osmanli (Bosnian) descent.

Nevertheless, the Nubian type remains essentially negro, being characterized by a very dark complexion, varying from a mahogany brown and deep bronze to an almost black shade, with tumid lips, large black animated eyes, doli-chocephalic head (index 73, 72), hair often woolly or strongly frizzled, and scant beard worn under the chin like the figures of the fugitives (Uaua?) in the battle-pieces sculptured on the walls of the Egyptian temples. At the same time the nose is much larger and the zygomatic arches less prominent than in the full-blood negro. The Nilotic Nubians are on the whole a strong muscular people, essentially agricultural, more warlike and energetic than the Egyptians. Many find employment as artisans, small dealers, porters and soldiers in Egypt, where they are usually noted for their honesty, and frank and cheerful temperament. Since the overthrow of the native Christian states all have become Mahommedans, but not of a fanatical type. Although a native of Dongola, the mahdi, Mahommed Ahmed, found his chief support, not among his countrymen, but among the more recently converted Kordofan negroes and the nomad Arabs and Beja. (For ethnology see also Hamitic Races, Beja, Abābda, Bisharin, Hadendoa, &c.).

Language.—Little is known of the language of the ancient Nubians or of its connexion, if any, with the language, known as Meroitic, of the "Ethiopians" who preceded them. The hieroglyphs and inscriptions in Meroitic belong mostly to the first six centuries A.D.; the existing Nubian MSS. are medieval and are written chiefly in Greek letters, and in form and character resemble Coptic. They are, with one exception, written on parchment and contain lives of saints, &c., the exception being a legal document. The most noteworthy of these MSS. was found near Edfu, in Upper Egypt, early in the 20th century and purchased for the British Museum in 1908. Eutychius, patriarch of Alexandria about 930, included "Nubi" among the six kinds of writing which he mentions as current among the Hamitic peoples, and "Nubi" also appears among a list of six writings mentioned in an ancient manuscript now in the Berlin Museum.

The modern Nubian tongue, clearly the descendant of the Nubian of the MSS., is very sonorous and expressive. Its distinctly negro character is betrayed in the complete absence of grammatical gender, in its primitive vowel-system and highly-developed process of consonantal assimilation, softening all harsh combinations, lastly, in the peculiar infix *j* inserted between the verbal root and the plural pronominal object, as in *ai tokki-j-ir* = I shake them. As in Bantu, the verb presents a multiplicity of forms, including one present, three past and future tenses, with personal endings complete, passive, interrogative, conditional, elective, negative and other forms, each with its proper participial inflexions. In Lepsius's grammar the verbal paradigm fills altogether 110 pages.

Of the Nilotic as distinguished from the Kordofan branch of the Nūba language there are three principal dialects current from Assuan along the Nile southwards to Meroë, as under:—

I. Northern: Dialect of *Banī Kenz* or *Mattokki*, from the first cataract to Sebū' and Wādi al-'Arab, probably dating from the Diocletian period.

II. Central: The *Mahaī* or *Marīsī*, from Ḳorosko to Wādi Ḥalfā (second cataract). Here the natives are called Saidokki, in contradistinction to the northern Mattokki.

III. Southern: *Dongolawi*, throughout the province of Dongola from the second cataract to J. Dēja near Meroë, on the northern frontier of the Arab district of Dar Shagia. By the Mahasi people it is called Biderīn Bannid, "language of the poor," or, collectively with the Kenz, Oshkirīn Bannid, "language of slaves."

The northern and southern varieties are closely related to each other, differing considerably from the central, which shows more marked affinities with the Kordofan Nūba, possibly because the Saidokki people are later arrivals from Kordofan. For topography, &c. and archaeology, see Sudan § *Anglo-Egyptian* and Egypt.

Authorities.—C. R. Lepsius, *Nubische Grammatik* (Berlin, 1880), and *Briefe aus Aegypten, Aethiopien*, &c. (Berlin, 1852); D. R. MacIver, *Areika* (Oxford, 1909); *Nubian Texts*, edited by E. A. Wallis Budge (British Museum, 1909); F. Ll Griffith, "Some old Nubian Christian Texts" in *Journal of Theological Studies* (July, 1909); E. A. Wallis Budge, *The Egyptian Sudan* (London, 1907); J. Ward, *Our Sudan, its Pyramids and Progress* (London, 1905); E. Rüppell, *Reisen in Nubien, Kordofan*, &c. (Frankfort a. M., 1829); F. Caillaud, *Voyage à Méroë* (Paris, 1826); L. Reinisch, *Die Nuba-Sprache* (Vienna, 1879); *Memoirs* of the Société khédiviale de Géographie, Cairo; J. L. Burckhardt, *Travels in Nubia, &c.* (London, 1819); G. Waddington and B. Hanbury, *Journal of a Visit to some parts of Ethiopia* (London, 1822); E. F. Gau, *Nubische Denkmäler* (Stuttgart, 1821). Consult also the bibliography under Sudan.

ÑUBLE, a province of central Chile, bounded N. by Linares, E. by the Argentine Republic, S. by Concepción and W. by Concepción and Maule. Area, 3407 sq. m.; pop. (1895) 152,935. The province lies partly in the great central valley of Chile, noted for its fine climate and fertility, and partly on the western slopes of the Andes. The Itata river, which forms the southern boundary, and its principal tributary, the Ñuble, form the drainage system of the province. Agriculture and grazing are the principal industries. Wheat is largely produced, and there are vineyards in some localities. Stock-raising is pursued chiefly in the east, where the pastures are rich and the water supply unfailing. The state railway from Santiago to the southern provinces passes through Ñuble, from N.N.E. to S.S.W., and sends off a branch from Bulnes W. to Jan Tomé on the Bay of Concepción. The capital is Chillan, and the only other important town is Bulnes, a railway junction and active commercial centre. The hot baths of Chillan, in the eastern part of the province on the slope of the volcano of that name, about 7000 ft. above sea level, are very popular in Chile.

NUCERIA ALFATERNA (mod. *Nocera Inferiore*, *q.v.*), an ancient town of Campania, Italy, in the valley of the Sarnus (Sarno), about 10 m. E. of the modern coast line at Torre Annunziata, and 8 m. E. of Pompeii. In the period before the Roman supremacy it appears to have been the chief town in the valley of the Sarnus, Herculaneum, Pompeii, Stabiae and Surrentum all being dependent upon it. The coins of the town bear the head of the river god. It maintained its allegiance to Rome till 309 B.C. when it joined the revolted Samnites. In 308 it repulsed a Roman attempt to land at the mouth of the Sarnus, but in 307 it was besieged and surrendered. It obtained favourable terms, and remained faithful to Rome even after Cannae. Hannibal reduced it in 216 by starvation, and destroyed and plundered the town. The inhabitants returned when peace was restored. Even during the Social War Nuceria remained true to Rome, though the dependent towns joined the revolt; after it they were formed into independent communities, and Nuceria received the territory of Stabiae, which had been destroyed by Sulla in 89 B.C., as a compensation. In 73 B.C. it was plundered by Spartacus. Of the buildings of the ancient city nothing at all is to be seen; but on the hillsides on the S. are remains of villas of the Roman period, and here tombs have been found. (T. As.)

NUCLEUS (Lat. for the kernal of a nut, *nux*, the stone of fruit), the central portion of things, round which other parts of the same thing or other things collect together. The term is particularly applied to the central mass of protoplasm in a plant or animal cell (see CYTOLOGY).

NUER, a Nilotic negro people of the upper Nile, dwelling in the swampy plains south of Fashoda and at the Bahr-el-Ghazal confluence, and having for neighbours the Dinka, whom they resemble. They are long-legged and flat-footed, and live, like the aquatic birds, on fish, roots and river plants. They tattoo tribal marks on the forehead, and the women pierce the upper lips. A few Nuer families live on the floating islets of grass and reeds brought down by the river in flood.

NUEVA SAN SALVADOR, or SANTA TECLA, the capital of the department of La Libertad, Salvador; on the railway between San Salvador (10 m. N.) and the Pacific port of La Libertad. Pop. (1905) about 18,000. The town was founded in 1854, and intended to replace the capital, San Salvador, which was ruined by an earthquake in that year but soon afterwards rebuilt. Nueva San Salvador is an attractive town with a large and growing trade.

NUEVO LEÓN, a northern state of Mexico, bounded N., E. and S.E. by Tamaulipas, S. and S.W. by San Luis Potosí and W. and N. by Coahuila. Pop. (1900) 327,937; area 23,592 sq. m. Nuevo León lies partly upon the great Mexican plateau and partly upon its eastern slopes, the Sierra Madre Oriental crossing the state N.W. to S.E. A branch of the Sierra Madre extends northward from the vicinity of Salinas, but its elevations are low. The average elevation of the Sierra Madre within the state is slightly under 5500 ft. The general character of the surface is mountainous, though the western and south-western sides are level and dry as in the adjoining state of Coahuila. In the N. the general elevation is low, the surface sandy and covered with cactus and mesquite growth, and hot, semi-arid conditions prevail. The eastern slopes receive more rain and are well clothed with vegetation, but the lower valleys are subtropical in character and are largely devoted to sugar production. The higher elevations have a dry, temperate, healthful climate. There are many rivers and streams, notably the Salado, Pesqueria and Presas, but none is navigable within the state, though many furnish good water power. Agriculture is the principal industry, the chief products being sugar, barley, Indian corn and wheat. Rum is a by-product of the sugar industry, and "mescal" is distilled from the agave. The gathering and preparation of "ixtle" fibres from the agave and yucca forms another important industry, the fibre being sent to Tampico for export. Stock-raising receives considerable attention; there are about a score of large cattle ranges, and there is a considerable export of live cattle to Texas and to various Mexican states. Considerable progress has been made in manufacturing industries, and there are a large number of sugar-mills, cotton factories, woollen mills, smelting works and iron and steel works. The state is well served with railways, the capital, Monterrey, being one of the most important railway centres in northern Mexico. The Mexican National line crosses the northern half of the state and has constructed a branch from Monterrey to Matamoros, and a Belgian line (F. C. de Monterrey al Golfo Mexicano) runs from Tampico N.N.W. to Monterrey, and thence westward to Treviño (formerly Venadito) in Coahuila, a station on the Mexican International. The other principal towns are: Linares, or San Felipe de Linares (pop. 20,690 in 1900), 112 m. by rail S.E. of the capital in a rich agricultural region; Lampazos, or Lampazos de Naranjo (7704), 96 m. by rail N.W. of the capital; Cadereyta Jiminez, García, Santiago and Doctor Arroyo, the last in the extreme southern part of the state.

NUGENT, ROBERT NUGENT, EARL (1702–1788), Irish politician and poet, son of Michael Nugent, was born at Carlanstown, Co. Westmeath. He was tersely described by Richard Glover as "a jovial and voluptuous Irishman who had left popery for the Protestant religion, money and widows." His change of religion took place at a very early period in life; he married in 1736 Anna (d. 1756), daughter of James Craggs, the secretary of state, a lady who had already been twice given in marriage. His wife's property comprised the borough of St Mawes in Cornwall, and Nugent sat for that constituency from 1741 to 1754, after which date he represented Bristol until 1774, when he returned to St Mawes. He was a lord of the treasury from 1754 to 1759 and president of the board of trade from 1766 to 1768. He married in 1757 Elizabeth, dowager-countess of Berkeley, who brought him a large fortune. His support of the ministry was so useful that he was created in 1767 Viscount Clare, and in 1776 Earl Nugent, both Irish peerages. He died on the 13th of October 1788. Lord Nugent was the author of some poetical productions, several of which are preserved in the second volume of Dodsley's *Collections* (1748). The earldom descended by special remainder to the earl's son-in-law, George Nugent Temple Grenville, marquess of Buckingham, and so to his successors, the dukes of Buckingham and Chandos.

NUISANCE (through Fr. *noisance*, *nuisance*, from Lat. *nocere*, to hurt), that which gives offence or causes annoyance, trouble or injury. In English law nuisance is either public or private. A public or common nuisance is defined by Sir J. F. Stephen as "an act not warranted by law, or an omission to discharge a legal duty, which act or omission obstructs or causes inconvenience or damage to the public in the exercise of rights common to all His Majesty's subjects" (*Digest of the Criminal Law*, p. 120). A common nuisance is punishable as a misdemeanour at common law, where no special provision is made by statute. In modern times many of the old common law nuisances have been the subject of legislation. It is no defence for a master or employer that a nuisance is caused by the acts of his servants, if such acts are within the scope of their employment, even though such acts are done without his knowledge and contrary to his orders. Nor is it a defence that the nuisance has been in existence for a great length of time, for no lapse of time will legitimate a public nuisance.

A private nuisance is an act or omission which causes inconvenience or damage to a private person, and is left to be redressed by action. There must be some sensible diminution of these rights affecting the value or convenience of the property. "The real question in all the cases is the question of fact, whether the annoyance is such as materially to interfere with the ordinary comfort of human existence" (Lord Romilly in *Crump* v.

Lambert, 1867, L.R. 3 Eq. 409). A private nuisance, differing in this respect from a public nuisance, may be legalized by uninterrupted use for twenty years. It used to be thought that, if a man knew there was a nuisance and went and lived near it, he could not recover, because, it was said, it is he that goes to the nuisance and not the nuisance to him. But this has long ceased to be law, as regards both the remedy by damages and the remedy by injunction.

The remedy for a public nuisance is by information, indictment, summary procedure or abatement. An information lies in cases of great public importance, such as the obstruction of a navigable river by piers. In some matters the law allows the party to take the remedy into his own hands and to "abate" the nuisance. Thus, if a gate be placed across a highway, any person lawfully using the highway may remove the obstruction, provided that no breach of the peace is caused thereby. The remedy for a private nuisance is by injunction, action for damages or abatement. An action lies in every case for a private nuisance; it also lies where the nuisance is public, provided that the plaintiff can prove that he has sustained some special injury. In such a case the civil is in addition to the criminal remedy. In abating a private nuisance, care must be taken not to do more damage than is necessary for the removal of the nuisance.

In Scotland there is no recognized distinction between public and private nuisances. The law as to what constitutes a nuisance is substantially the same as in England. A list of statutory nuisances will be found in the Public Health (Scotland) Act 1867, and amending acts. The remedy for nuisance is by interdict or action.

The American law on the subject is practically the same as the English law.

NUKHA, a town of Russian Caucasia, in the government of Elizavetpol, and previous to 1819 the capital of the khanate of Sheki, lying 57 m. N.E. of the town of Elizavetopol, at the S. foot of the main chain of the Caucasus. Pop. (1861) 22,618; (1897) 24,811; mainly Tatars, with some Armenians. The cupola of the church in the fortress is 2455 ft. above the sea-level, in 41° 12′ 18″ N. and 47° 12′ 7″ E. The fortress, a square enclosure, erected in 1765, contains the palace, built in 1790 in the original Persian style. The leading industry is the breeding of silkworms and the spinning of silk. Nukha was a mere village down to the middle of the 18th century, when it was chosen by Hajji Chelyabi, the founder of the khanate of Sheki, as his residence. The Russian occupation dates from 1807, though the annexation was not completed till 1819.

NULLAH (Hindostani for an arm of the sea, stream or watercourse), a steep narrow valley. Like the *wadi* of the Arabs, the nullah is characteristic of mountainous or hilly country where there is little rainfall. In the drier parts of India, and in many parts of Australia there are small steep-sided valleys penetrating the hills, clothed with rough brushwood or small trees growing in the stony soil. During occasional heavy rains torrents rush down the nullahs and quickly disappear. There is little local action upon the sides, while the bed is lowered, and consequently these valleys are narrow and steep.

NULLIFICATION, the process of making null or of no effect (Lat. *nullus*, none). In United States history the term is applied to the process by which a state either (*a*) in fact suspended, or (*b*) claimed a constitutional right of suspending, the operation of a federal law within its own territory. The doctrine of nullification as a constitutional theory was probably never held by a majority of the states or of the American people at any one time, though before 1860 most of the states asserted or practised it. The belief in nullification was based on the theory that the union of the states was a voluntary one, each member retaining its sovereignty, though for purposes of convenience delegating certain powers of government to an agent—the federal government. The powers of this agent were strictly limited by the Constitution, and should it transcend these powers the states must interpose to protect their rights. This view held that the Supreme Court created by the Constitution was not a proper tribunal to decide causes arising beyond the Constitution or relating to the nature of the Union, but that its jurisdiction was limited to cases arising under the Constitution. If the Federal government usurped a right belonging to the state, the latter, being a sovereignty, must judge for itself.

As later perfected by John C. Calhoun (*q.v.*), the theory of nullification required a practice as follows. A state aggrieved by a law of the Federal congress might, in constituent convention, suspend the operation of the objectionable law, and report its action to the other states. If three-fourths of them should decide that the law in question was not unconstitutional, then in effect it became ratified (see United States Constitution, art. v.). The dissatisfied state must then submit or must draw out of the union by the act of secession (see SECESSION, and CONFEDERATE STATES). This theory of the right of nullification was considered by those who held it to be in accord with the principles laid down in the Constitution. It must be distinguished from secession, which was considered a sovereign right, one above the Constitution; yet nullification presumed the sovereignty of the state.

The earliest assertions of the doctrine of nullification are found in the Kentucky and Virginia Resolutions of 1798–1799, written respectively by Thomas Jefferson and James Madison in protest against the Alien and Sedition Acts of Congress. Nullification was first practised in 1809 by Pennsylvania, the governor ordering out the state troops to resist the execution of a decree of a Federal court. In the New England states, 1809–1815, the United States laws relating to embargo, non-intercourse and army enlistments were nullified by state action. From 1825–1829 the state of Georgia forcibly prevented the execution of Federal laws and court decrees relating to the Indians within her borders and in Alabama, 1832–1835, there was a similar nullification. The only example of nullification in which theory and practice coincided was the nullification in 1832 by South Carolina of the Federal tariff laws. In this the state acted upon the theory outlined above which was perfected by Calhoun. In the last decade before the Civil War fourteen of the Northern states in the so-called "Personal Liberty laws" nullified the Federal statutes relating to slaves and slavery by making it a crime for their citizens to obey these laws and by setting the state administration against the Federal officials. Since the Reconstruction the Southern states have in practice effected a nullification of the Fourteenth and Fifteenth Amendments to the Constitution providing for negro suffrage.

See John C. Calhoun, *Works*, vols. i. and vi. (New York, 1853–1855); D. F. Houston, *Critical Study of Nullification in South Carolina* (New York, 1897); C. W. Loring, *Nullification and Secession* (New York, 1893); E. P. Powell, *Nullification and Secession in the United States* (New York, 1897); and U. B. Phillips, *Georgia and States Rights* (Washington, 1902). (W. L. F.)

NUMANTIA, an ancient hill fortress in northern Spain, in the province of Soria (Old Castile), overhanging the village of Garray, near the town of Soria, on the upper Douro. Here, on a small isolated high plateau in the middle of the valley, was the stronghold which played the principal part in a famous struggle between the conquering Romans and the native Spaniards during the years 154–133 B.C. Numantia was especially concerned in the latter part of this war from 144 onwards. It was several times unsuccessfully besieged. Once the Roman general Hostilius Mancinus with his whole army was compelled to surrender (137). Finally, Scipio Aemilianus, Rome's first and only general in that age, with some 60,000 men drew round the town 6 m. of continuous entrenchments with seven camps at intervals. After 15 months (134–133) he reduced by hunger the 6000-8000 Numantine soldiers, much as Caesar afterwards reduced Alesia in Gaul. The result was regarded as a glorious victory, and in Roman literature the fall of Numantia was placed beside the fall of Carthage (149 B.C.). In truth, the maintenance in effective condition of so large a Roman force in so remote and difficult a region was in itself a real achievement and such as at that time no one but Scipio could have performed. He redeemed by organized strategy the vacillations and follies of statesmen who had sat at home and sent out inadequate expeditions or incompetent commanders. The site was, under the Roman Empire, occupied by a Roman town called Numantia, and the *Itinerary* tells of a Roman road which ran past it. It is to-day a "Monumento Nacional" of Spain, and has yielded remarkable discoveries to the skilful excavations of Dr Schulten

(1905–1910), who has traced the Celtiberian town, the lines of Scipio and several other Roman camps dating from the Numantine Wars. (F. J. H.)

NUMA POMPILIUS, second legendary king of Rome (715–672 B.C.), was a Sabine, a native of Cures, and his wife was the daughter of Titus Tatius, the Sabine colleague of Romulus. He was elected by the Roman people at the close of a year's interregnum, during which the sovereignty had been exercised by the members of the senate in rotation. Nearly all the early religious institutions of Rome were attributed to him. He set up the worhip of Terminus (the god of landmarks), appointed the festival of Fides (Faith), built the temple of Janus, reorganized the calendar and fixed days of business and holiday. He instituted the flamens (sacred priests) of Jupiter, Mars and Quirinus; the virgins of Vesta, to keep the sacred fire burning on the hearth of the city; the Salii, to guard the shield that fell from heaven; the pontifices and augurs, to arrange the rites and interpret the will of the gods; he also divided the handicraftsmen into nine gilds. He derived his inspiration from his wife, the nymph Egeria, whom he used to meet by night in her sacred grove. After a long and peaceful reign, during which the gates of Janus were closed, Numa died and was succeeded by the warlike Tullus Hostilius. Livy (xl. 29) tells a curious story of two stone chests, bearing inscriptions in Greek and Latin, which were found at the foot of the Janiculum (181 B.C.), one purporting to contain the body of Numa and the other his books. The first when opened was found to be empty, but the second contained fourteen books relating to philosophy and pontifical law, which were publicly burned as tending to undermine the established religion.

No single legislator can really be considered responsible for all the institutions ascribed to Numa; they are essentially Italian, and older than Rome itself. Even Roman tradition itself wavers; *e.g.* the fetiales are variously attributed to Tullus Hostilius and Ancus Marcius. The supposed law-books, which were to all appearance new when discovered, were clearly forgeries.

See Livy i. 18-21; Plutarch, *Numa*; Dion. Halic. ii. 58-76; Cicero, *De republica*, ii. 13-15. For criticism: Schwegler, *Römische Geschichte*, bk. xi.; Sir G. Cornewall Lewis, *Credibility of early Roman History*, ch. xi.; W. Ihne, *Hist. of Rome*, i.; E. Pais, *Storia di Roma*, i. (1898), where Numa is identified with Titus Tatius and made out to be a river god, Numicius, closely connected with Aeneas; J. B. Carter, *The Religion of Numa* (1906); O. Gilbert, *Geschichte und Topographie der Stadt Rom im Altertum* (1883–1885); and ROME: *Ancient History*.

NUMBER[1] (through Fr. *nombre*, from Lat. *numerus*; from a root seen in Gr. *νέμειν* to distribute), a word generally expressive of quantity, the fundamental meaning of which leads on analysis to some of the most difficult problems of higher mathematics.

1. The most elementary process of thought involves a distinction within an identity—the A and the not-A within the sphere throughout which these terms are intelligible. Again A may be a generic quality found in different modes Aa, Ab, Ac, &c.; for instance, colour in the modes, red, green, blue and so on. Thus the notions of "one," "two," and the vague "many" are fundamental, and must have impressed themselves on the human mind at a very early period: evidence of this is found in the grammatical distinction of singular, dual and plural which occurs in ancient languages of widely different races. A more definite idea of number seems to have been gradually acquired by realizing the equivalence, as regards plurality, of different concrete groups, such as the fingers of the right hand and those of the left. This led to the invention of a set of names which in the first instance did not suggest a numerical system, but denoted certain recognized forms of plurality, just as blue, red, green, &c., denote recognized forms of colour. Eventually the conception of the series of natural numbers became sufficiently clear to lead to a systematic terminology, and the science of arithmetic was thus rendered possible. But it is only in quite recent times that the notion of number has been submitted to a searching critical analysis: it is, in fact, one of the most characteristic results of modern mathematical research that the term *number* has been made at once more precise and more extensive.

2. *Aggregates* (also called *manifolds* or *sets*).—Let us assume the possibility of constructing or contemplating a permanent system of things such that (1) the system includes all objects to which a certain definite quality belongs; (2) no object without this quality belongs to the system; (3) each object of the system is permanently recognizable as the same thing, and as distinct from all other objects of the system. Such a collection is called an *aggregate*: the separate objects belonging to it are called its *elements*. An aggregate may consist of a single element.

It is further assumed that we can select, by a definite process, one or more elements of any aggregate A at pleasure: these form another aggregate B. If any element of A remains unselected, B is said to be a part of A (in symbols, $B \prec A$): if not, B is identical with A. Every element of A is a part of A. If $B \prec A$ and $C \prec B$, then $C \prec A$.

When a correspondence can be established between two aggregates A and B in such a way that to every element of A corresponds one and only one element of B, and conversely, A and B are said to be *equivalent*, or to have the same *power* (or *potency*); in symbols, $A \backsim B$. If $A \backsim B$ and $B \backsim C$, then $A \backsim C$. It is possible for an aggregate to be equivalent to a part of itself: the aggregate is then said to be *infinite*. As an example, the aggregates $2, 4, 6, \ldots 2n$, &c., and $1, 2, 3, \ldots n$, &c., are equivalent, but the first is only a part of the second.

3. *Order.*—Suppose that when any two elements a, b of an aggregate A are taken there can be established, by a definite criterion, one or other of two alternative relations, symbolized by $a<b$ and $a>b$, subject to the following conditions:—(1) If $a>b$, then $b<a$, and if $a<b$, then $b>a$; (2) If $a>b$ and $b>c$, then $a>c$. In this case the criterion is said to arrange the aggregate in order. An aggregate which can be arranged in order may be called *ordinable*. An ordinable aggregate may, in general, by the application of different criteria, be arranged in order in a variety of ways. According as $a<b$ or $a>b$ we shall speak of a as anterior or posterior to b. These terms are chosen merely for convenience, and must not be taken to imply any meaning except what is involved in the definitions of the signs $>$ and $<$ for the particular criterion in question. The consideration of a succession of events in time will help to show that the assumptions made are not self-contradictory. An aggregate arranged in order by a definite criterion will be called an *ordered* aggregate. Let a, b be any two elements of an ordered aggregate, and suppose $a<b$. All the elements c (if any) such that $a<c<b$ are said to fall within the interval (a, b). If an element b, posterior to a, can be found so that no element falls within the interval (a, b), then a is said to be *isolated* from all subsequent elements, and b is said to be the element next after a. So if $b'<a$, and no element falls within the interval (b', a), then a is isolated from all preceding elements, and b' is the element next before a. As will be seen presently, for any assigned element a, either, neither, or both of these cases may occur.

An aggregate A is said to be *well-ordered* (or *normally ordered*) when, in addition to being ordered, it has the following properties: (1) A has a first or lowest element a which is anterior to all the rest; (2) if B is any part of A, then B has a first element. It follows from this that every part of a well-ordered aggregate is itself well-ordered. A well-ordered aggregate may or may not have a last element.

Two ordered aggregates A, B are said to be *similar* ($A \underline{\backsim} B$) when a one-one correspondence can be set up between their elements in such a way that if b, b' are the elements of B which correspond to any two elements a, a' of A, then $b>b'$ or $b<b'$ according as $a>a'$ or $a<a'$. For example, $(1, 3, 5, \ldots) \underline{\backsim} (2, 4, 6, \ldots)$, because we can make the even number $2n$ correspond to the odd number $(2n-1)$ and conversely.

Similar ordered aggregates are said to have the same *order-type*. Any definite order-type is said to be the *ordinal number* of every aggregate arranged according to that type. This somewhat vague definition will become clearer as we proceed.

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[1] See also NUMERAL.

4. *The Natural Scale.*—Let a be any element of a well-ordered aggregate A. Then all the elements posterior to a form an aggregate A′, which is a part of A and, by definition, has a first element a'. This element a' is different from a, and immediately succeeds it in the order of A. (It may happen, of course, that a' does not exist; in this case a is the last element of A.) Thus in a well-ordered aggregate every element except the last (if there be a last element) is succeeded by a definite next element. The ingenuity of man has developed a symbolism by means of which *every* symbol is associated with a definite next succeeding symbol, and in this way we have a set of visible or audible signs 1, 2, 3, &c. (or their verbal equivalents), representing an aggregate in which (1) there is a definite order, (2) there is a first term, (3) each term has one next following, and consequently there is *no last term.* Counting a set of objects means associating them in order with the first and subsequent members of this conventional aggregate. The process of counting may lead to three different results: (1) the set of objects may be finite in number, so that they are associated with a part of the conventional aggregate which has a last term; (2) the set of objects may have the same power as the conventional aggregate; (3) the set of objects may have a higher power than the conventional aggregate. Examples of (2) and (3) will be found further on. The order-type of 1, 2, 3, &c., and of similar aggregates will be denoted by ω; this is the first and simplest member of a set of transfinite ordinal numbers to be considered later on. Any finite number such as 3 is used ordinally as representing the order-type of 1, 2, 3 or any similar aggregate, and cardinally as representing the power of 1, 2, 3 or any equivalent aggregate. For reasons that will appear, ω is only used in an ordinal sense. The aggregate 1, 2, 3, &c., in any of its written or spoken forms, may be called the natural scale, and denoted by N. It has already been shown that N is infinite: this appears in a more elementary way from the fact that $(1, 2, 3, 4, \ldots) \simeq (2, 3, 4, 5, \ldots)$, where each element of N is made to correspond with the next following. Any aggregate which is equivalent to the natural scale or a part thereof is said to be *countable.*

5. *Arithmetical Operations.*—When the natural scale N has once been obtained it is comparatively easy, although it requires a long process of induction, to define the arithmetical operations of addition, multiplication and involution, as applied to natural numbers. It can be proved that these operations are free from ambiguity and obey certain formal laws of commutation, &c., which will not be discussed here. Each of the three direct operations leads to an inverse problem which cannot be solved except under certain implied conditions. Let a, b denote any two assigned natural numbers: then it is required to find natural numbers, x, y, z such that

$$a=b+x, \quad a=by, \quad a=z^b$$

respectively. The solutions, when they exist, are perfectly definite, and may be denoted by $a-b$, a/b and $\sqrt[b]{a}$; but they are only possible in the first case when $a>b$, in the second when a is a multiple of b, and in the third when a is a perfect bth power. It is found to be possible, by the construction of certain elements, called respectively *negative*, *fractional* and *irrational numbers*, and *zero*, to remove all these restrictions.

6. There are certain properties, common to the aggregates with which we have next to deal, analogous to those possessed by the natural scale, and consequently justifying us in applying the term *number* to any one of their elements. They are stated here, once for all, to avoid repetition; the verification, in each case, will be, for the most part, left to the reader. Each of the aggregates in question (A, suppose) is an ordered aggregate. If α, β are any two elements of A, they may be combined by two definite operations, represented by + and ×, so as to produce two definite elements of A represented by $\alpha+\beta$ and $\alpha\times\beta$ (or $\alpha\beta$); these operations obey the formal laws satisfied by those of addition and multiplication. The aggregate A contains one (and only one) element ι, such that if α is any element of A (ι included), then $\alpha+\iota>\alpha$, and $\alpha\iota=\alpha$. Thus A contains the elements ι, $\iota+\iota$, $\iota+\iota+\iota$, &c., or, as we may write them, ι, 2ι, $3\iota, \ldots m\iota \ldots$ such that $m\iota+n\iota=(m+n)\iota$ and $m\iota\times n\iota=mn\iota$; also $\iota<2\iota<3\iota \ldots$ We may express this by saying that A contains an *image* of the natural scale. The element denoted by ι may be called the *ground element* of A.

7. *Negative Numbers.*—Let any two natural numbers a, b be selected in a definite order a, b (to be distinguished from b, a, in which the order is reversed). In this way we obtain from N an aggregate of symbols (a, b) which we shall call *couples*, or more precisely, if necessary, *polar couples.* This new aggregate may be arranged in order by means of the following rules:—

Two couples (a, b), (a', b') are said to be equal if $a+b'=a'+b$. In other words (a, b), (a', b') are then taken to be equivalent symbols for the same thing.

If $a+b'>a'+b$, we write $(a, b)>(a', b')$; and if $a+b'<a'+b$, we write $(a, b)<(a', b')$.

The rules for the addition and multiplication of couples are:

$$(a, b)+(a', b')=(a+a', b+b')$$
$$(a, b)\times(a', b')=(aa'+bb', ab'+a'b).$$

The aggregate thus defined will be denoted by $\bar{\mathrm{N}}$; it may be called the scale of relative integers.

If ι denotes (2, 1) or any equivalent couple, $(a, b)+\iota=(a+2, b+1)>(a, b)$ and $(a, b)\times\iota=(2a+b, a+2b)=(a, b)$. Hence ι is the ground element of $\bar{\mathrm{N}}$. By definition, $2\iota=\iota+\iota=(4, 2)=(3, 1)$: and hence by induction $m\iota=(m+1, 1)$, where m is any natural integer. Conversely every couple (a, b) in which $a>b$ can be expressed by the symbol $(a-b)\iota$. In the same way, every couple (a, b) in which $b>a$ can be expressed in the form $(b-a)\iota'$, where $\iota'=(1, 2)$.

8. It follows as a formal consequence of the definitions that $\iota+\iota'=(2, 1)+(1, 2)=(3, 3)=(1, 1)$. It is convenient to denote (1, 1) and its equivalent symbols by 0, because

$$(a, b)+(1, 1)=(a+1, b+1)=(a,b)$$
$$(a, b)\times(1, 1)=(a+b, a+b)=(1, 1);$$

hence $\iota+\iota'=0$, and we can represent $\bar{\mathrm{N}}$ by the scheme—

$$\ldots 3\iota', 2\iota', \iota', 0, \iota, 2\iota, 3\iota \ldots$$

in which each element is obtained from the next before it by the addition of ι. With this notation the rules of operation may be written (m, n, denoting natural numbers)—

$$\begin{aligned} m\iota+n\iota &=(m+n)\iota \quad m\iota'+n\iota'=(m+n)\iota' \\ m\iota+n\iota' &=(m-n)\iota \text{ if } m>n \\ &=(n-m)\iota' \quad m<n \end{aligned}$$
$$m\iota\times n\iota=mn\iota, \quad m\iota'\times n\iota'=mn\iota, \quad m\iota\times n\iota'=mn\iota',$$

with the special rules for zero, that if α is any element of $\bar{\mathrm{N}}$,

$$\alpha+0=\alpha, \quad \alpha\times0=0.$$

To each element, α, of $\bar{\mathrm{N}}$ corresponds a definite element α' such that $\alpha+\alpha'=0$; if $\alpha=0$, then $\alpha'=0$, but in every other case α, α' are different and may be denoted by $m\iota$, $m\iota'$. The natural number m is called the *absolute value* of $m\iota$ and $m\iota'$.

9. If α, β are any two elements of $\bar{\mathrm{N}}$, the equation $\xi+\beta=\alpha$ is satisfied by putting $\xi=\alpha+\beta'$. Thus the symbol $\alpha-\beta$ is always interpretable as $\alpha+\beta'$, and we may say that within $\bar{\mathrm{N}}$ subtraction is always possible; it is easily proved to be also free from ambiguity. On the other hand, α/β is intelligible only if the absolute value of α is a multiple of the absolute value of β.

The aggregate $\bar{\mathrm{N}}$ has no first element and no last element. At the same time it is countable, as we see, for instance, by associating the elements 0, $a\iota$, $b\iota'$ with the natural numbers 1, $2a$, $2b+1$ respectively, thus—

(N) 1, 2, 3, 4, 5, 6, . . .
($\bar{\mathrm{N}}$) 0, ι, ι', 2ι, $2\iota'$, 3ι . . .

It is usual to write $+a$ (or simply a) for $a\iota$ and $-a$ for $a\iota'$; that this should be possible without leading to confusion or ambiguity is certainly remarkable.

10. *Fractional Numbers.*—We will now derive from N a different aggregate of couples $[a, b]$ subject to the following rules:

The symbols $[a, b]$, $[a', b']$, are equivalent if $ab'=a'b$. According as ab' is greater or less than $a'b$ we regard $[a, b]$ as being greater or less than $[a', b']$. The formulae for addition and multiplication are

$$[a, b]+[a', b']=[ab'+a'b, bb']$$
$$[a, b]\times[a', b']=[aa', bb'].$$

All the couples $[a, a]$ are equivalent to [1, 1], and if we denote this by υ we have $[a, b]+\upsilon=[a+b, b]>[a, b]$, $[a, b]\times\upsilon=[a, b]$, so that υ is the ground element of the new aggregate.

Again $2\upsilon=\upsilon+\upsilon=(2, 1)$, and by induction $m\upsilon=[m, 1]$. Moreover, if a is a multiple of b, say mb, we may denote $[a, b]$ by $m\upsilon$.

11. The new aggregate of couples will be denoted by R. It differs from N and $\overline{N}$ in one very important respect, namely, that when its elements are arranged in order of magnitude (that is to say, by the rule above given) they are not isolated from each other. In fact if $[a, b]=\alpha$, and $[a', b']=\alpha'$, the element $[a+a', b+b']$ lies between α and α'; hence it follows that between any two different elements of R we can find as many other elements as we please. This property is expressed by saying that R is in *close order* when its elements are arranged in order of magnitude. Strange as it appears at first sight, R is a countable aggregate; a theorem first proved by G. Cantor. To see this, observe that every element of R may be represented by a "reduced" couple $[a, b]$, in which a, b are prime to each other. If $[a, b]$, $[c, d]$ are any two reduced couples, we will agree that $[a, b]$ is anterior to $[c, d]$ if either (1) $a+b<c+d$, or (2) $a+b=c+d$, but $a<c$. This gives a new criterion by which all the elements of R can be arranged in the succession

$[1, 1], [1, 2], [2, 1], [1, 3], [3, 1], [1, 4], [2, 3], [3, 2], [4, 1], \ldots$

which is similar to the natural scale.

The aggregate R, arranged in order of magnitude, agrees with $\overline{N}$ in having no least and no greatest element; for if α denotes any element $[a, b]$, then $[2a-1, 2b]<\alpha$, while $[2a+1, 2b]>\alpha$.

12. The division of one element of R by another is always possible; for by definition

$$[c, d]\times[ad, bc]=[acd, bcd]=[a, b],$$

and consequently $[a, b]\div[c, d]$ is always interpretable as $[ad, bc]$. As a particular case $[m, 1]\div[n, 1]=[m, n]$, so that every element of R is expressible in one of the forms $m\upsilon$, $m\upsilon/n\upsilon$. It is usual to omit the symbol υ altogether, and to represent the element $[m, n]$ by m/n, whether m is a multiple of n or not. Moreover, $m/1$ is written m, which may be done without confusion, because $m/1+n/1=(m+n)/1$, and $m/1\times n/1=mn/1$, by the rules given above.

13. Within the aggregate R subtraction is not always practicable; but this limitation may be removed by constructing an aggregate $\overline{R}$ related to R in the same way as $\overline{N}$ to N. This may be done in two ways which lead to equivalent results. We may either form symbols of the type (α, β), where α, β denote elements of R, and apply the rules of § 7; or else form symbols of the type $[\alpha, \beta]$, where α, β denote elements of $\overline{N}$, and apply the rules of §10. The final result is that $\overline{R}$ contains a zero element, 0, a ground element υ, an element υ' such that $\upsilon+\upsilon'=0$, and a set of elements representable by the symbols $(m/n)\upsilon$, $(m/n)\upsilon'$. In this notation the rules of operation are

$$\frac{m}{n}\upsilon+\frac{m'}{n'}\upsilon=\left(\frac{mn'+m'n}{nn'}\right)\upsilon,\quad \frac{m}{n}\upsilon'+\frac{m'}{n'}\upsilon'=\left(\frac{mn'+m'n}{nn'}\right)\upsilon';$$

$$\frac{m}{n}\upsilon+\frac{m'}{n'}\upsilon'=\frac{mn'-m'n}{nn'}\upsilon, \text{ or } \frac{m'n-mn'}{nn'}\upsilon', \text{ as } mn'>\text{or}<m'n;$$

$$\frac{m}{n}\upsilon\times\frac{m'}{n'}\upsilon=\frac{mm'}{nn'}\upsilon=\frac{m}{n}\upsilon'\times\frac{m'}{n'}\upsilon'\quad \frac{m}{n}\upsilon\times\frac{m'}{n'}\upsilon'=\frac{mm'}{nn'}\upsilon';$$

$$\frac{m}{n}\upsilon\div\frac{m'}{n'}\upsilon=\frac{mn'}{m'n}\upsilon=\frac{m}{n}\upsilon'\div\frac{m'}{n'}\upsilon',\quad \frac{m}{n}\upsilon\div\frac{m'}{n'}\upsilon'=\frac{mn'}{m'n}\upsilon'=\frac{m}{n}\upsilon'\div\frac{m'}{n'}\upsilon;$$

$$\alpha-\beta=\alpha+\beta', \text{ where } \beta+\beta'=0;$$
$$\alpha+0=\alpha,\ \alpha\times 0=0.$$

Here α and β denote any two elements of $\overline{R}$. If $\beta=(m/n)\upsilon$, then $\beta'=(m/n)\upsilon'$, and if $\beta=(m/n)\upsilon'$, then $\beta'=(m/n)\upsilon$. If $\beta=0$, then $\beta'=0$.

14. When $\overline{R}$ is constructed by means of couples taken from $\overline{N}$, we must put $[m\iota, n\iota]=[m\iota', n\iota']=(m/n)\upsilon$, $[m\iota, n\iota']=[m\iota', n\iota]=(m/n)\upsilon'$, and $[0, \alpha]=0$, if α is any element of $\overline{N}$ except 0. The symbols $[0, 0]$ and $[\alpha, 0]$ are inadmissible; the first because it satisfies the definition of equality (§ 10) with every symbol $[\alpha, \beta]$, and is therefore indeterminate; the second because, according to the rule of addition,

$$[\alpha, 0]+[\iota, \iota]=[\alpha\iota, 0]=[\alpha, 0],$$

which is inconsistent with $\xi+\upsilon>\xi$.

In the same way, if 0 denotes the zero element of $\overline{R}$, and ξ any other element, the symbol $0/0$ is indeterminate, and $\xi/0$ inadmissible, because, by the formal rules of operation, $\xi/0+\upsilon=\xi/0$, which conflicts with the definition of the ground element υ. It is usual to write $+\frac{m}{n}$ $\left(\text{or simply } \frac{m}{n}\right)$ for $\frac{m}{n}\upsilon$, and $-\frac{m}{n}$ for $\frac{m}{n}\upsilon'$. Each of these elements is said to have the absolute value m/n. The criterion for arranging the elements of $\overline{R}$ in order of magnitude is that, if ξ, η are any two elements of it, $\xi>\eta$ when $\xi-\eta$ is positive; that is to say, when it can be expressed in the form $(m/n)\upsilon$.

15. The aggregate $\overline{R}$ is very important, because it is the simplest type of a *field of rationality*, or *corpus*. An algebraic corpus is an aggregate, such that its elements are representable by symbols α, β, &c., which can be combined according to the laws of ordinary algebra; every algebraic expression obtained by combining a finite number of symbols, by means of a finite chain of rational operations, being capable of interpretation as representing a definite element of the aggregate, with the single exception that division by zero is inadmissible. Since, by the laws of algebra, $\alpha-\alpha=0$, and $\alpha/\alpha=1$, every algebraic field contains $\overline{R}$, or, more properly, an aggregate which is an image of $\overline{R}$.

16. *Irrational Numbers.*—Let α denote any element of $\overline{R}$; then α and all lesser elements form an aggregate, A say; the remaining elements form another aggregate A′, which we shall call complementary to A, and we may write $\overline{R}=A+A'$. Now the essence of this separation of $\overline{R}$ into the parts A and A′ may be expressed without any reference to α as follows:—

I. The aggregates A, A′ are complementary; that is, their elements, taken together, make up the whole of $\overline{R}$.

II. Every element of A is less than every element of A′.

III. The aggregate A′ has no least element. (This condition is artificial, but saves a distinction of cases in what follows.)

Every separation $\overline{R}=A+A'$ which satisfies these conditions is called a *cut* (or *section*), and will be denoted by (A, A′). We have seen that every rational number α can be associated with a cut. Conversely, every cut (A, A) in which A has a last element α is perfectly definite, and specifies α without ambiguity. But there are other cuts in which A has no last element. For instance, all the elements (α) of $\overline{R}$ such that either $\alpha\leqq 0$, or else $\alpha>0$ and $\alpha^2<2$, form an aggregate A, while those for which $\alpha>0$ and $\alpha^2>2$, form the complementary aggregate A′. This separation is a cut in which A has no last element; because if p/q is any positive element of A, the element $(3p+4q)/(2p+3q)$ exceeds p/q, and also belongs to A. *Every cut of this kind is said to define an irrational number.* The justification of this is contained in the following propositions:—

(1) A cut is a definite concept, and the assemblage of cuts is an aggregate according to definition; the generic quality of the aggregate being the separation of $\overline{R}$ into two complementary parts, without altering the order of its elements.

(2) The aggregate of cuts may be arranged in order by the rule that (A, A′) < (B, B′) if A is a part of B.

(3) This criterion of arrangement preserves the order of magnitude of all rational numbers.

(4) Cuts may be combined according to the laws of algebra, and, when the cuts so combined are all rational, the results are in agreement with those derived from the rational theory.

As a partial illustration of proposition (4) let (A, A′), (B, B′) be any two cuts; and let C′ be the aggregate whose elements are obtained by forming all the values of $\alpha'+\beta'$, where α' is *any* element of A′ and β' is any element of B′. Then if C is the complement of C′, it can be proved that (C, C′) is a cut; this is said to be the sum of (A, A′) and (B, B′). The difference, product and quotient of two cuts may be defined in a similar way. If $\mathfrak{n}$ denotes the irrational cut chosen above for purposes of illustration, we shall have $\mathfrak{n}^2=(C, C')$ where C′ comprises all the numbers $\alpha'\beta'$ obtained by multiplying *any* two elements, α', β' which are rational and positive, and such that $\alpha'^2>2$, $\beta'^2>2$. Since $\alpha'^2\beta'^2>4$ it follows that $\alpha'\beta'$ is positive and greater than 2; it can be proved conversely that every rational number which is greater than 2 can be expressed in the form $\alpha'\beta'$. Hence $\mathfrak{n}^2=2$, so that the cut $\mathfrak{n}$ actually gives a real arithmetical meaning to the positive root of the equation $x^2=2$; in other words we may say that $\mathfrak{n}$ defines the irrational number $\sqrt{2}$. The theory of cuts, in fact, provides a logical basis for the treatment of all finite numerical irrationalities, and enables us to justify all arithmetical operations involving the use of such quantities.

17. Since the aggregate of cuts ($\mathfrak{N}$ say) has an order of magnitude, we may construct cuts in this aggregate. Thus if a is any element of $\mathfrak{N}$, and $\mathfrak{A}$ is the aggregate which consists of a and all anterior elements of $\mathfrak{N}$, we may write $\mathfrak{N}=\mathfrak{A}+\mathfrak{A}'$, and $(\mathfrak{A}, \mathfrak{A}')$ is a cut in which $\mathfrak{A}$ has a last element a. It is a remarkable fact that no other kind of cut in $\mathfrak{N}$ is possible; in other words, *every conceivable cut* in $\mathfrak{N}$ *is defined by one of its own elements*. This is expressed by saying that $\mathfrak{N}$ is a *continuous* aggregate, and $\mathfrak{N}$ itself is referred to *as the numerical continuum* of *real numbers*. The property of continuity must be carefully distinguished from that of close order (§ 11); a continuous aggregate is necessarily in close order, but the converse is not always true. The aggregate $\mathfrak{N}$ is not countable.

18. Another way of treating irrationals is by means of *sequences*. A sequence is an unlimited succession of rational numbers

$$a_1, a_2, a_3 \;.\;.\;.\; a_m, a_{m+1} \;.\;.\;.$$

(in order-type ω) the elements of which can be assigned by a definite rule, such that when any rational number ϵ, however small, has been fixed, it is possible to find an integer m, so that for *all* positive integral values of n the absolute value of $(a_{m+n}-a_m)$ is less than ϵ. Under these conditions the sequence may be taken to represent a definite number, which is, in fact, the limit of a_m when m increases without limit. Every rational number a can be expressed as a sequence in the form $(a, a, a, \ldots)$, but this is only one of an infinite variety of such representations, for instance—

$$1=(\cdot 9, \cdot 99, \cdot 999, \;.\;.\;.\;)=\left(\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \;.\;.\;.\; \frac{2^n-1}{2^n} \;.\;.\;.\;\right)$$

and so on. The essential thing is that we have a mode of representation which can be applied to rational and irrational numbers alike, and provides a very convenient symbolism to express the results of arithmetical operations. Thus the rules for the sum and product of two sequences are given by the formulae

$$(a_1, a_2, a_3, \;.\;.\;.\;)+(b_1, b_2, b_3, \;.\;.\;.\;)=(a_1+b_1, a_2+b_2, a_3+b_3 \;.\;.\;.\;)$$
$$(a_1, a_2, a_3, \;.\;.\;.\;)\times(b_1, b_2, b_3, \;.\;.\;.\;)=(a_1b_1, a_2b_2, a_3b_3 \;.\;.\;.\;)$$

from which the rules for subtraction and division may be at once inferred. It has been proved that the method of sequences is ultimately equivalent to that of cuts. The advantage of the former lies in its convenient notation, that of the latter in giving a clear definition of an irrational number without having recourse to the notion of a limit.

19. *Complex Numbers.*—If a is an assigned number, rational or irrational, and n a natural number, it can be proved that there is a real number satisfying the equation $x^n=a$, except when n is even and a is negative: in this case the equation is not satisfied by any real number whatever. To remove the difficulty we construct an aggregate of polar couples $\{x, y\}$, where x, y are any two real numbers, and define the addition and multiplication of such couples by the rules

$$\{x, y\}+\{x', y'\}=\{x+x', y+y'\};$$
$$\{x, y\}\times\{x', y'\}=\{xx'-yy', xy'+x'y\}.$$

We also agree that $\{x, y\}<\{x', y'\}$, if $x<x'$ or if $x=x'$ and $y<y'$. It follows that the aggregate has the ground element $\{1, 0\}$, which we may denote by σ; and that, if we write τ for the element $\{0, 1\}$,

$$\tau^2=\{-1, 0\}=-\sigma.$$

Whenever m, n are rational, $\{m, n\}=m\sigma+n\tau$, and we are thus justified in writing, if we like, $x\sigma+y\tau$ for $\{x, y\}$ in all circumstances. A further simplification is gained by writing x instead of $x\sigma$, and regarding τ as a symbol which is such that $\tau^2=-1$, but in other respects obeys the ordinary laws of operation. It is usual to write i instead of τ; we thus have an aggregate $\mathfrak{J}$ of complex numbers $x+yi$. In this aggregate, which includes the real continuum as part of itself, not only the four rational operations (excluding division by $\{0, 0\}$, the zero element), but also the extraction of roots, may be effected without any restriction. Moreover (as first proved by Gauss and Cauchy), if $a_0, a_1, \;.\;.\;.\; a_n$ are any assigned real or complex numbers, the equation

$$a_0z^n+a_1z^{n-1}+\ldots+a_{n-1}z+a_n=0,$$

is always satisfied by precisely n real or complex values of z, with a proper convention as to multiple roots. Thus any algebraic function of any finite number of elements of $\mathfrak{J}$ is also contained in $\mathfrak{J}$, which is, in this sense, a closed arithmetical field, just as $\mathfrak{N}$ is when we restrict ourselves to rational operations. The power of $\mathfrak{J}$ is the same as that of $\mathfrak{N}$.

20. *Transfinite Numbers.*—The theory of these numbers is quite recent, and mainly due to G. Cantor. The simplest of them, ω, has been already defined (§ 4) as the order-type of the natural scale. Now there is no logical difficulty in constructing a scheme

$$u_1, u_2, u_3 \;.\;.\;.\; | \; v_1,$$

indicating a well-ordered aggregate of type ω immediately followed by a distinct element v_1: for example, we may think of all positive odd integers arranged in ascending order of magnitude and then think of the even number 2. A scheme of this kind is said to be of order-type $(\omega+1)$; and it will be convenient to speak of $(\omega+1)$ as the *index* of the scheme. Similarly we may form arrangements corresponding to the indices

$$\omega+2, \omega+3 \;.\;.\;.\; \omega+n,$$

where n is any positive integer. The scheme

$$u_1, u_2, u_3 \;.\;.\;.\; | \; v_1, v_2, v_3 \;.\;.\;.$$

is associated with $\omega+\omega=2\omega$;

$$u_{11}, u_{12}, u_{13} \;.\;.\;.\; | \; u_{21}, u_{22}, u_{23} \;.\;.\;.\; | \;.\;.\;.\; | \; u_{n1}, u_{n2} \;.\;.\;.\; | \;.\;.\;.$$

with $\omega.\omega$ or ω^2; and so on. Thus we may construct arrangements of aggregates corresponding to any index of the form

$$\phi(\omega)=a\omega^n+b\omega^{n-1}+\;.\;.\;.\;+k\omega+l,$$

where $n, a, b, \ldots l$ are all positive integers.

We are thus led to the construction of a scheme of symbols—

$$\begin{array}{rl}
\text{I.} & 1, 2, 3, \;.\;.\;.\; n \;.\;.\;. \\
\text{II.} & \left\{\begin{array}{l}
\omega, \omega+1, \;.\;.\;.\; \omega+n, \;.\;.\;. \\
2\omega, 2\omega+1, \;.\;.\;.\; 2\omega+n, \;.\;.\;. \\
\vdots \\
\omega^2, \omega^2+1, \omega^2+2 \;.\;.\;.\; \omega^2+n, \;.\;.\;. \\
\vdots \\
\phi(\omega), \phi(\omega)+1, \;.\;.\;.\; \phi(\omega)+n, \;.\;.\;. \\
\vdots
\end{array}\right. \\
\text{III.} & \left\{\begin{array}{l}
\omega^\omega, \omega^\omega+1, \;.\;.\;.\; \omega^\omega+n, \;.\;.\;. \\
\vdots \\
\omega^{\phi(\omega)}, \omega^{\phi(\omega)}+1, \;.\;.\;.\; \omega^{\phi(\omega)}+n, \;.\;.\;. \\
\vdots
\end{array}\right.
\end{array}$$

The symbols $\phi(\omega)$ form a countable aggregate: so that we may, if we like (and in various ways), arrange the rows of block (II.) in a scheme of type ω: we thus have each element a succeeded in its row by $(a+1)$, and the row containing $\phi(\omega)$ succeeded by a definite next row. The same process may be applied to (III.), and we can form additional blocks (IV.), (V.), &c., with first elements $\omega_4=\omega^{\omega^\omega}$, $\omega_5=\omega^{\omega_4}$, &c. All the symbols in which ω occurs are called *transfinite ordinal numbers*.

21. The index of a finite set is a definite integer however the set may be arranged; we may take this index as also denoting the power of the set, and call it the *number* of things in the set. But the index of an infinite ordinable set depends upon the way in which its elements are arranged; for instance, ind. $(1, 2, 3, \;.\;.\;.\;)=\omega$, but ind. $(1, 3, 5, \;.\;.\;.\; | \; 2, 4, 6, \;.\;.\;.\;)=2\omega$. Or, to take another example, the scheme—

$$\begin{array}{l}
1, 3, 5, \;.\;.\;.\; (2n-1) \;.\;.\;. \\
2, 6, 10, \;.\;.\;.\; 2(2n-1) \;.\;.\;. \\
\vdots \quad \vdots \quad \vdots \\
2^m, 2^m.\,3, 2^m.\,5, \;.\;.\;.\; 2^m(2n\div 1) \;.\;.\;. \\
\vdots
\end{array}$$

where each row is supposed to follow the one above it, gives a permutation of $(1, 2, 3, \;.\;.\;.\;)$, by which its index is changed from ω to ω^2. It has been proved that there is a permutation of the natural scale, of which the index is $\phi(\omega)$, any assigned element of (II.); and that, if the index of any ordered aggregate is $\phi(\omega)$, the aggregate is countable. Thus the power of all aggregates which can be associated with indices of the class (II.) is the same as that of the natural scale; this power may be denoted by a. Since a is associated with all aggregates of a particular power, independently of the arrangement of their elements, it is analogous to the integers, 1, 2, 3, &c., when used to denote powers of finite aggregates; for this reason it is called the *least transfinite cardinal number*.

22. There are aggregates which have a power greater than a: for instance, the arithmetical continuum of positive real numbers, the power of which is denoted by c. Another one is the aggregate of all those order-types which (like those in II. above) are the indices of aggregates of power a. The power of this aggregate is denoted by $\aleph_1$. According to Cantor's theory it is the transfinite cardinal number next superior to a, which for the sake of uniformity is also denoted by $\aleph_0$. It has been conjectured that $\aleph_1 = c$, but this has neither been verified nor disproved. The discussion of the aleph-numbers is still in a controversial stage (November 1907) and the points in debate cannot be entered upon here.

23. Transfinite numbers, both ordinal and cardinal, may be combined by operations which are so far analogous to those of ordinary arithmetic that it is convenient to denote them by the same symbols. But the laws of operation are not entirely the same; for instance, 2ω and $\omega 2$ have different meanings: the first has been explained, the second is the index of the scheme $(a_1 b_1 \mid a_2 b_2 \mid a_3 b_3 \mid \ldots \mid a_n b_n \mid \ldots)$ or any similar arrangement. Again if n is any positive integer, $na = a^n = a$. It should also be observed that according to Cantor's principles of construction every ordinal number is succeeded by a definite next one; but that there are definite ordinal numbers (*e.g.* ω, ω^2) which have no ordinal immediately preceding them.

24. *Theory of Numbers.*—The theory of numbers is that branch of mathematics which deals with the properties of the natural numbers. As Dirichlet observed long ago, the whole of the subject would be coextensive with mathematical analysis in general; but it is convenient to restrict it to certain fields where the appropriateness of the above definition is fairly obvious. Even so, the domain of the subject is becoming more and more comprehensive, as the methods of analysis become more systematic and more exact.

The first noteworthy classification of the natural numbers is into those which are prime and those which are composite. A prime number is one which is not exactly divisible by any number except itself and 1; all others are composite. The number of primes is infinite (Eucl. *Elem.* ix. 20), and consequently, if n is an assigned number, however large, there is an infinite number (a) of primes greater than n.

If m, n are any two numbers, and $m > n$, we can always find a definite chain of positive integers (q_1, r_1), (q_2, r_2), &c., such that

$$m = q_1 n + r_1, \quad n = q_2 r_1 + r_2, \quad r_1 = q_3 r_2 + r_3, \quad \text{\&c.}$$

with $n > r_1 > r_2 > r_3 \ldots$; the process by which they are calculated will be called *residuation*. Since there is only a finite number of positive integers less than n, the process must terminate with two equalities of the form

$$r_{h-2} = q_h r_{h-1} + r_h, \quad r_{h-1} = q_{h+1} r_h.$$

Hence we infer successively that r_h is a divisor of $r_{h-1}, r_{h-2}, \ldots r_1$, and finally of m and n. Also r_h is the greatest common factor of m, n: because any common factor must divide r_1, r_2, and so on down to r_h; and the highest factor of r_h is r_h itself. It will be convenient to write $r_h = \text{dv}\,(m, n)$. If $r_h = 1$, the numbers m, n are said to be *prime to each other*, or *co-primes*.

25. The foregoing theorem of residuation is of the greatest importance; with the help of it we can prove three other fundamental propositions, namely:—

(1) If m, n are any two natural numbers, we can always find two other natural numbers x, y such that

$$\text{dv}(m,n) = xm - yn.$$

(2) If m, n are prime to each other, and p is a prime factor of mn, then p must be a factor of either m or n.

(3) Every number may be uniquely expressed as a product of prime factors.

Hence if $n = p^\alpha q^\beta r^\gamma \ldots$ is the representation of any number n as the product of powers of different primes, the divisors of n are the terms of the product

$(1 + p + p^2 + \ldots + p^\alpha) \quad (1 + q + \ldots + q^\beta) \quad (1 + r + \ldots + r^\gamma) \ldots$ their number is $(\alpha + 1)\ (\beta + 1)\ (\gamma + 1) \ldots$; and their sum is $\Pi(p^{\alpha+1} - 1) \div \Pi(p - 1)$. This includes 1 and n among the divisors of n.

26. *Totients.*—By the totient of n, which is denoted, after Euler, by $\phi(n)$, we mean the number of integers prime to n, and not exceeding n. If $n = p^\alpha$, the numbers not exceeding n and *not* prime to it are $p, 2p, \ldots (p^\alpha - p), p^\alpha$ of which the number is $p^{\alpha-1}$: hence $\phi(p^\alpha) = p^\alpha - p^{\alpha-1}$. If m, n are prime to each other, $\phi(mn) = \phi(m)\phi(n)$; and hence for the general case, if $n = p^\alpha q^\beta r^\gamma \ldots$, $\phi(n) = \Pi p^{\alpha-1}(p-1)$, where the product applies to all the different prime factors of n. If d_1, d_2, &c., are the different divisors of n,

$$\phi(d_1) + \phi(d_2) + \ldots = n.$$

For example, $15 = \phi(15) + \phi(5) + \phi(3) + \phi(1) = 8 + 4 + 2 + 1$.

27. *Residues and congruences.*—It will now be convenient to include in the term "number" both zero and negative integers. Two numbers a, b are said to be *congruent with respect to the modulus* m, when $(a - b)$ is divisible by m. This is expressed by the notation $a \equiv b \pmod m$, which was invented by Gauss. The fundamental theorems relating to congruences are

If $a \equiv b$ and $c \equiv d \pmod m$, then $a \pm c \equiv b \pm d$, and $ab \equiv cd$.
If $ha \equiv hb \pmod m$ then $a \equiv b \pmod{m/d}$, where $d = \text{dv}(h, m)$.

Thus the theory of congruences is very nearly, but not quite, similar to that of algebraic equations. With respect to a given modulus m the scale of relative integers may be distributed into m classes, any two elements of each class being congruent with respect to m. Among these will be $\phi(m)$ classes containing numbers prime to m. By taking any one number from each class we obtain a *complete system of residues* to the modulus m. Supposing (as we shall always do) that m is positive, the numbers $0, 1, 2, \ldots (m-1)$ form a system of least positive residues; according as m is odd or even, $0, \pm 1, \pm 2, \ldots \pm \frac{1}{2}(m-1)$, or $0, \pm 1, \pm 2, \ldots \pm \frac{1}{2}(m-2), \frac{1}{2}m$ form a system of absolutely least residues.

28. *The Theorems of Fermat and Wilson.*—Let $r_1, r_2, \ldots r_t$ where $t = \phi(m)$, be a complete set of residues prime to the modulus m. Then if x is any number prime to m, the residues $xr_1, xr_2, \ldots xr_t$ also form a complete set prime to m (§ 27). Consequently $xr_1 \cdot xr_2 \ldots xr_t \equiv r_1 r_2 \ldots r_t$, and dividing by $r_1 r_2 \ldots r_t$, which is prime to the modulus, we infer that

$$x^{\phi(m)} \equiv 1 \pmod m.$$

which is the general statement of Fermat's theorem. If m is a prime p, it becomes $x^{p-1} \equiv 1 \pmod p$.

For a prime modulus p there will be among the set $x, 2x, 3x, \ldots (p-1)x$ just one and no more that is congruent to 1: let this be xy. If $y \equiv x$, we must have $x^2 - 1 = (x-1)(x+1) \equiv 0$, and hence $x \equiv \pm 1$: consequently the residues $2, 3, 4, \ldots (p-2)$ can be arranged in $\frac{1}{2}(p-3)$ pairs (x, y) such that $xy \equiv 1$. Multiplying them all together, we conclude that $2.3.4.\ldots(p-2) \equiv 1$ and hence, since $1.(p-1) \equiv -1$,

$$(p-1)! \equiv -1 \pmod p,$$

which is Wilson's theorem. It may be generalized, like that of Fermat, but the result is not very interesting. If m is composite $(m-1)! + 1$ cannot be a multiple of m: because m will have a prime factor p which is less than m, so that $(m-1)! \equiv 0 \pmod p$. Hence Wilson's theorem is invertible: but it does not supply any practical test to decide whether a given number is prime.

29. *Exponents, Primitive Roots, Indices.*—Let p denote an odd prime, and x any number prime to p. Among the powers $x, x^2, x^3, \ldots x^{p-1}$ there is certainly one, namely x^{p-1}, which $\equiv 1 \pmod p$; let x^e be the lowest power of x such that $x^e \equiv 1$. Then e is said to be the exponent to which x appertains $(\text{mod } p)$: it is always a factor of $(p-1)$ and can only be 1 when $x \equiv 1$. The residues x for which $e = p - 1$ are said to be *primitive roots of* p. They always exist, their number is $\phi(p-1)$, and they can be found by a methodical, though tedious, process of exhaustion. If g is any one of them, the complete set may be represented by $g, g^a, g^b, \ldots$ &c. where a, b, &c., are the numbers less than $(p-1)$ and prime to it, other than 1. Every number x which is prime to p is congruent, mod p, to g^i, where i is one of the numbers $1, 2, 3, \ldots (p-1)$; this number i is called *the index of* x *to the base* g. Indices are analogous to logarithms: thus

$$\text{ind}_g(xy) \equiv \text{ind}_g x + \text{ind}_g y.\ \text{ind}_g(x^h) \equiv h\ \text{ind}_g x \pmod{\overline{p-1}}.$$

Consequently tables of primitive roots and indices for different primes are of great value for arithmetical purposes. Jacobi's *Canon Arithmeticus* gives a primitive root, and a table of numbers and indices for all primes less than 1000.

For moduli of the forms $2p$, p^m, $2p^m$ there is an analogous theory (and also for 2 and 4); but for a composite modulus of other forms there are no primitive roots, and the nearest analogy is the representation of prime residues in the form $\alpha^x \beta^y \gamma^z \ldots$, where $\alpha, \beta, \gamma, \ldots$ are selected prime residues, and $x, y, z, \ldots$ are indices of restricted range. For instance, all residues prime to 48 can be exhibited in the form $5^x\ 7^y\ 13^z$, where $x = 0, 1, 2, 3$; $y = 0, 1$; $z = 0, 1$; the total number of distinct residues being $4.2.2 = 16 = \phi(48)$, as it should be.

30. *Linear Congruences.*—The congruence $a'x \equiv b' \pmod{m'}$ has no solution unless $\text{dv}(a', m')$ is a factor of b'. If this condition is satisfied, we may replace the given congruence by the equivalent one $ax \equiv b \pmod m$, where a is prime to b as well as to m. By residuation (§§ 24, 25) we can find integers h, k such that $ah - mk = 1$, and thence obtain $x \equiv bh \pmod m$ as the complete solution of the given congruence. To the modulus m' there are m'/m incongruent solutions. For example, $12x \equiv 30 \pmod{21}$ reduces to $2x \equiv 5 \pmod 7$ whence $x \equiv 6 \pmod 7 \equiv 6, 13, 20 \pmod{21}$. There is a theory of simultaneous

linear congruences in any number of variables, first developed with precision by Smith. In any particular case, it is best to replace as many as possible of the given congruences by an equivalent set obtained by successively eliminating the variables x, y, z, . . . in order. An important problem is to find a number which has given residues with respect to a given set of moduli. When possible, the solution is of the form $x \equiv a \pmod{m}$, where m is the least common multiple of the moduli. Supposing that p is a prime, and that we have a corresponding table of indices, the solution of $ax \equiv b \pmod{p}$ can be found by observing that ind $x \equiv$ ind $b-$ind a (mod $\overline{p-1}$).

31. *Quadratic Residues. Law of Reciprocity.*—To an odd prime modulus p, the numbers 1, 4, 9, . . . $(p-1)^2$ are congruent to $\frac{1}{2}(p-1)$ residues only, because $(p-x)^2 = x^2$. Thus for $p=5$, we have 1, 4, 9, $16 \equiv 1$, 4, 4, 1 respectively. There are therefore $\frac{1}{2}(p-1)$ quadratic residues and $\frac{1}{2}(p-1)$ quadratic non-residues prime to p; and there is a corresponding division of incongruent classes of integers with respect to p. The product of two residues or of two non-residues is a residue; that of a residue and a non-residue is a non-residue; and taking any primitive root as base the index of any number is even or odd according as the number is a residue or a non-residue. Gauss writes $a\mathrm{R}p$, $a\mathrm{N}p$ to denote that a is a residue or non-residue of p respectively.

Given a table of indices, the solution of $x^2 \equiv a \pmod{p}$ when possible, is found from 2ind $x \equiv$ ind a (mod $\overline{p-1}$), and the result may be written in the form $x \equiv \pm r \pmod{p}$. But it is important to discuss the congruence $x^2 \equiv a$ without assuming that we have a table of indices. It is sufficient to consider the case $x^2 \equiv q \pmod{p}$, where q is a positive prime less than p; and the question arises whether the quadratic character of q with respect to p can be deduced from that of p with respect to q. The answer is contained in the following theorem, which is called *the law of quadratic reciprocity* (for real positive odd primes): if p, q are each or one of them of the form $4n+1$, then p, q are each of them a residue, or each a non-residue of the other; but if p, q are each of the form $4n+3$, then according as p is a residue or non-residue of q we have q a non-residue or a residue of p.

Legendre introduced a symbol $\left(\frac{m}{q}\right)$ which denotes $+1$ or -1 according as $m\mathrm{R}q$ or $m\mathrm{N}q$ (q being a positive odd prime and m any number prime to q); with its help we may express the law of reciprocity in the form

$$\left(\frac{p}{q}\right)\left(\frac{q}{p}\right) = (-1)^{\frac{1}{4}(p-1)(q-1)}.$$

This theorem was first stated by Legendre, who only partly proved it; the first complete proof, by induction, was published by Gauss, who also discovered five (or six) other more or less independent proofs of it. Many others have since been invented.

There are two supplementary theorems relating to -1 and 2 respectively, which may be expressed in the form

$$\left(\frac{-1}{p}\right) = (-1)^{\frac{1}{2}(p-1)}, \quad \left(\frac{2}{p}\right) = (-1)^{\frac{1}{8}(p^2-1)},$$

where p is any positive odd prime.

It follows from the definition that

$$\left(\frac{p_1{}^{\alpha} p_2{}^{\beta} p_3{}^{\gamma} \ldots}{q}\right) = \left(\frac{p_1}{q}\right)^{\alpha} \left(\frac{p_2}{q}\right)^{\beta} \left(\frac{p_3}{q}\right)^{\gamma} \ldots$$

and that $\left(\frac{m}{q}\right) = \left(\frac{m'}{q}\right)$, if $m = m' \pmod{q}$. As a simple application of the law of reciprocity, let it be required to find the quadratic character of 11 with respect to 1907. We have

$$\left(\frac{11}{1907}\right) = -\left(\frac{1907}{11}\right) = -\left(\frac{6}{11}\right) = 1$$

because 6N11. Hence 11R1907.

Legendre's symbol was extended by Jacobi in the following manner. Let P be any positive odd number, and let p, p', p'', &c. be its (equal or unequal) prime factors, so that $\mathrm{P} = pp'p'' \ldots.$ Then if Q is any number prime to P, we have a generalized symbol defined by

$$\left(\frac{\mathrm{Q}}{\mathrm{P}}\right) = \left(\frac{\mathrm{Q}}{p}\right)\left(\frac{\mathrm{Q}}{p'}\right)\left(\frac{\mathrm{Q}}{p''}\right) \ldots$$

This symbol obeys the law that, if Q is odd and positive,

$$\left(\frac{\mathrm{P}}{\mathrm{Q}}\right)\left(\frac{\mathrm{Q}}{\mathrm{P}}\right) = (-1)^{\frac{1}{4}(\mathrm{P}-1)(\mathrm{Q}-1)},$$

with the supplementary laws

$$\left(\frac{-1}{\mathrm{P}}\right) = (-1)^{\frac{1}{2}(\mathrm{P}-1)}, \quad \left(\frac{2}{\mathrm{P}}\right) = (-1)^{\frac{1}{8}(\mathrm{P}^2-1)}.$$

It is found convenient to add the conventions that

$$\left(\frac{\mathrm{Q}}{-\mathrm{P}}\right) = \left(\frac{\mathrm{Q}}{\mathrm{P}}\right)$$

when Q and P are both odd; and that the value of the symbol is 0 when P, Q are not co-primes.

In order that the congruence $x^2 \equiv a \pmod{m}$ may have a solution it is necessary and sufficient that a be a residue of each distinct prime factor of m If these conditions are all satisfied, and $m = 2^{\kappa} p^{\lambda} q^{\mu} \ldots$, where p, q, &c., are the distinct odd prime factors of m, being t in all, the number of incongruent solutions of the given congruence is 2^t, 2^{t+1} or 2^{t+2}, according as $\kappa < 2$, $\kappa = 2$, or $\kappa > 2$ respectively. The actual solutions are best found by a process of exhaustion. It should be observed that $\left(\frac{a}{m}\right) = 1$ is a necessary but not a sufficient condition for the possibility of the congruence.

32. *Quadratic forms.*—It will be observed that the solution of the linear congruence $ax \equiv b \pmod{m}$ leads to all the representations of b in the form $ax+my$, where x, y are integers. Many of the earliest researches in the theory of numbers deal with particular cases of the problem: given four numbers m, a, b, c, it is required to find all the integers x, y (if there be any) which satisfy the equation $ax^2+bxy+cy^2=m$. Fermat, for instance, discovered that every positive prime of the form $4n+1$ is uniquely expressible as the sum of two squares. There is a corresponding arithmetical theory for forms of any degree and any number of variables; only those of linear forms and binary quadratics are in any sense complete, as the difficulty of the problem increases very rapidly with the increase of the degree of the form considered or of the number of variables contained in it.

The form $ax^2+bxy+cy^2$ will be denoted by $(a, b, c)\,(x, y)^2$ or more simply by (a, b, c) when there is no need of specifying the variables. If k is the greatest common factor of a, b, c, we may write $(a, b, c) = k(a', b', c')$ where (a', b', c') is a *primitive* form, that is, one for which dv $(a', b', c') = 1$. The other form is then said to be derived from (a', b', c') and to have a divisor k. For the present we shall concern ourselves only with primitive forms. Writing $\mathrm{D} = b^2-4ac$, the invariant D is called the *determinant* of (a, b, c), and there is a first classification of forms into *definite* forms for which D is negative, and *indefinite* forms for which D is positive. The case $\mathrm{D}=0$ or a positive square is rejected, because in that case the form breaks up into the product of two linear factors. It will be observed that $\mathrm{D} \equiv 0, 1 \pmod{4}$ according as b is even or odd; and that if k^2 is any odd square factor of D there will be forms of determinant D and divisor k.

If we write $x' = \alpha x+\beta y$, $y' = \gamma x+\delta y$, we have identically

$$(a, b, c)\,(x', y')^2 = (a', b', c')\,(x, y)^2$$

where

$$\begin{aligned} a' &= a\alpha^2+b\alpha\gamma+o\gamma^2 \\ b' &= 2a\alpha\beta+b(\alpha\delta+\beta\gamma)+2c\gamma\delta \\ c' &= a\beta^2+b\beta\delta+\delta^2 \end{aligned}$$

Hence also

$$\mathrm{D}' = b'^2-4a'c' = (\alpha\delta-\beta\gamma)^2(b^2-4ac) = (\alpha\delta-\beta\gamma)^2\,\mathrm{D}.$$

Supposing that α, β, γ, δ are integers such that $\alpha\delta-\beta\gamma=n$, a number different from zero, (a, b, c) is said to be transformed into (a', b', c') by the substitution $\begin{pmatrix}\alpha, & \beta \\ \gamma, & \delta\end{pmatrix}$ of the nth order. If $n^2=1$, the two forms are said to be *equivalent*, and the equivalence is said to be *proper* or *improper* according as $n=1$ or $n=-1$. In the case of equivalence, not only are x', y' integers wherever x, y are so, but conversely; hence every number representable by (a, b, c) is representable by (a', b', c') and conversely. For the present we shall deal with proper equivalence only and write $f \sim f'$ to indicate that the forms f, f' are properly equivalent. Equivalent forms have the same divisor. A complete set of equivalent forms is said to form a *class*; classes of the same divisor are said to form an *order*, and of these the most important is the *principal* order, which consists of the primitive classes. It is a fundamental theorem that for a given determinant the number of classes is finite; this is proved by showing that every class must contain one at least of a certain finite number of so-called *reduced* forms, which can be found by definite rules of calculation.

33. *Method of Reduction.*—This differs according as D is positive or negative, and will require some preliminary lemmas. Suppose that any complex quantity $z=x+yi$ is represented in the usual way by a point (x, y) referred to rectangular axes. Then by plotting off all the points corresponding to $(\alpha z+\beta)\,/\,(\gamma z+\delta)$, we obtain a complete set of properly equivalent points. These all lie on the same side of the axis of x, and there is precisely one of them and no more which satisfies the conditions: (i.) that it is not outside the area which is bounded by the lines $2x = \pm 1$; (ii.) that it is not inside the circle $x^2+y^2=1$; (iii.) that it is not on the line $2x=1$, or on the arcs of the circle $x^2+y^2=1$ intercepted by $2x=1$ and $x=0$. This point will be called the *reduced* point equivalent to z. In the positive half-plane $(y>0)$ the aggregate of all reduced points occupies the interior and half the boundary of an area which will be called the *fundamental triangle*, because the areas equivalent to it, and finite, are all triangles bounded by circular arcs, and having angles $\frac{1}{3}\pi$, $\frac{1}{3}\pi$, 0 and the fundamental triangle may be considered as a special case when one vertex goes to infinity. The aggregate of equivalent triangles forms a kind of mosaic which fills up the whole of the positive half-plane. It will be convenient to denote the fundamental triangle (with its half-boundary, for which $x<0$) by ∇; for a reason which will appear later, the set of equivalent triangles will be said to make up the *modular dissection* of the positive half-plane.

Now let $f'=(a', b', c')$ be any definite form with a' positive and determinant $-\Delta$. The root of $a'z^2+b'z+c'=0$ which is represented by a point in the positive half-plane is

$$\omega=\frac{-b'+i\sqrt{\Delta}}{2a'},$$

and this is a reduced point if either

$$\begin{array}{ll} \text{(i.)} & b' < a' < c' \\ \text{(ii.)} & b' = a', \; a' \leqq c' \\ \text{(iii.)} & a' = c', \; 0 < b' \leqq a'. \end{array}$$

Cases (ii.) and (iii.) only occur when the representative point is on the boundary of ∇. A form whose representative point is reduced is said to be a reduced form. It follows from the geometrical theory that every form is equivalent to a reduced form, and that there are as many distinct classes of positive forms of determinant $-\Delta$ as there are reduced forms. The total number of reduced forms is limited, because in case (i.) we have $\Delta=4ac-b^2>3b^2$, so that $b<\sqrt{\frac{1}{3}\Delta}$, while $4a^2<4ac<\Delta+b^2<\frac{4}{3}\Delta$; in case (ii.) $\Delta=4ac-a^2>3a^2$, or else $a=b=c=\sqrt{\frac{1}{3}\Delta}$; in case (iii.) $\Delta=4a^2-b^2>3b^2, 4a^2=\Delta+b^2<\frac{4}{3}\Delta$, or else $a=b=c=\sqrt{\frac{1}{3}\Delta}$. With the help of these inequalities a complete set of reduced forms can be found by trial, and the number of classes determined. The latter cannot exceed $\frac{1}{3}\Delta$; it is in general much less.

With an indefinite form (a, b, c) we may associate the representative circle

$$a(x^2+y^2)+bx+c=0,$$

which cuts the axis of x in two real points. The form is said to be reduced if this circle cuts ∇; the condition for this is $a(a\pm\frac{1}{2}b+c)<0$, which can be expressed in the form $3a^2+(a\pm b)^2<D$, and it is hence clear that the absolute values of a, b, and therefore of c, are limited. As before, there are a limited number of reduced forms, but they are not all non-equivalent. In fact they arrange themselves, according to a law which is not very difficult to discover, in cycles or *periods*, each of which is associated with a particular class. The main result is the same as before: that the number of classes is finite, and that for each class we can find a representative form by a finite process of calculation.

34. *Problem of Representation.*—It is required to find out whether a given number m' can be represented by the given form (a', b', c'). One condition is clearly that the divisor of the form must be a factor of m'. Suppose this is the case; and let m, (a, b, c) be the quotients of m' and (a', b', c') be the divisor in question. Then we have now to discover whether m can be represented by the primitive form (a, b, c). First of all we will consider proper representations

$$m=(a, b, c)\ (\alpha, \gamma)^2$$

where α, γ are co-primes. Determine integers β, δ such that $\alpha\delta-\beta\gamma=1$, and apply to (a, b, c) the substitution $\begin{pmatrix}\alpha, & \beta \\ \gamma, & \delta\end{pmatrix}$; the new form will be (m, n, l), where

$$n^2-4ml=D=b^2-4ac.$$

Consequently $n^2=D \pmod{4m}$, and D must be a quadratic residue of m. Unless this condition is satisfied, there is no proper representation of m by any form of determinant D. Suppose, however, that $n^2=D \pmod{4m}$ is soluble and that n_1, n_2, &c. are its roots. Taking any one of these, say n_i, we can find out whether (m, n_i, l_i) and (a, b, c) are equivalent; if they are, there is a substitution $\begin{pmatrix}\alpha, & \beta \\ \gamma, & \delta\end{pmatrix}$ which converts the latter into the former, and then $m=a\alpha^2+b\alpha\gamma+c\gamma^2$. As to derived representations, if $m=(a, b, c)\ (tx, ty)^2$, then m must have the square factor t^2, and $m/t^2=(a, b, c)\ (x, y)^2$; hence everything may be made to depend on proper representation by primitive forms.

35. *Automorphs. The Pellian Equation.*—A primitive form (a, b, c) is, by definition, equivalent to itself; but it may be so in more ways than one. In order that (a, b, c) may be transformed into itself by the substitution $\begin{pmatrix}\alpha, & \beta \\ \gamma, & \delta\end{pmatrix}$, it is necessary and sufficient that

$$\begin{pmatrix}\alpha, & \beta \\ \gamma, & \delta\end{pmatrix} = \begin{pmatrix}\frac{1}{2}(t+bu), & -cu \\ au, & \frac{1}{2}(t-bu)\end{pmatrix}$$

where (t, u) is an integral solution of

$$t^2-Du^2=4.$$

If D is negative and $-D>4$, the only solutions are $t=\pm2, u=0$; $D=-3$ gives $(\pm2, 0), (\pm1, \pm1)$; $D=-4$ gives $(\pm2, 0), (0, \pm1)$. On the other hand, if $D>0$ the number of solutions is infinite, and if (t_1, u_1) is the solution for which t, u have their least positive values, all the other positive solutions may be found from

$$\frac{t_n+u_n\sqrt{D}}{2}=\left(\frac{t_1+u_1\sqrt{D}}{2}\right)^n (n=2, 3, 4\ldots).$$

The substitutions by which (a, b, c) is transformed into itself are called its *automorphs*. In the case when $D=0 \pmod 4$ we have $t=2T$, $u=2U$, $D=4N$, and (T, U) any solution of

$$T^2-NU^2=1.$$

This is usually called the Pellian equation, though it should properly be associated with Fermat, who first perceived its importance. The minimum solution can be found by converting $\sqrt{N}$ into a periodic continued fraction.

The form (a, b, c) may be improperly equivalent to itself; in this case all its improper automorphs can be expressed in the form

$$\begin{pmatrix}\lambda & , (\kappa+b\lambda)/2a \\ (\kappa-b\lambda)/2c, & -\lambda\end{pmatrix}$$

where $\kappa^2-D\lambda^2=4ac$. In particular, if $b\equiv0 \pmod a$ the form (a, b, c) is improperly equivalent to itself. A form improperly equivalent to itself is said to be *ambiguous*.

36. *Characters of a form or class. Genera.*—Let (a, b, c) be any primitive form; we have seen above (§ 32) that if $\alpha, \beta, \gamma, \delta$ are any integers

$$4(a\alpha^2+b\alpha\gamma+c\gamma^2)(a\beta^2+b\beta\delta+c\delta^2)=b'^2-(\alpha\delta-\beta\gamma)^2D$$

where $b'=2a\alpha\beta+b(\alpha\delta+\beta\gamma)+2c\gamma\delta$. Now the expressions in brackets on the left hand may denote any two numbers m, n representable by the form (a, b, c); the formula shows that $4mn$ is a residue of D, and hence mn is a residue of every odd prime factor of D, and if p is any such factor the symbols $\left(\frac{m}{p}\right)$ and $\left(\frac{n}{p}\right)$ will have the same value. Putting $(a, b, c)=f$, this common value is denoted by $\left(\frac{f}{p}\right)$ and called a *quadratic character* (or simply character) of f with respect to p. Since a is representable by f $(x=1, y=0)$ the value $\left(\frac{f}{p}\right)$ is the same as $\left(\frac{a}{p}\right)$. For example, if $D=-140$, the scheme of characters for the six reduced primitive forms, and therefore for the classes they represent, is

	$\left(\frac{f}{5}\right)$	$\left(\frac{f}{7}\right)$
(1, 0, 35)	+	+
(4, ±2, 9)		
(5, 0, 7)	−	−
(3, ±2, 12)		

In certain cases there are supplementary characters of the type $\left(\frac{-1}{f}\right)$ and $\left(\frac{2}{f}\right)$, and the characters $\left(\frac{f}{p}\right)$ are discriminated according as an odd or even power of p is contained in D; but in every case there are certain combinations of characters (in number one-half of all possible combinations) which form the *total characters* of actually existing classes. Classes which have the same total character are said to belong to the same *genus*. Each genus of the same order contains the same number of classes.

For any determinant D we have a principal primitive class for which all the characters are +; this is represented by the principal form $(1, 0, -n)$ or $(1, 1, -n)$ according as D is of the form $4n$ or $4n+1$. The corresponding genus is called the principal genus. Thus, when $D=-140$, it appears from the table above that in the primitive order there are two genera, each containing three classes; and the non-existent total characters are $+-$ and $-+$.

37. *Composition.*—Considering X, Y as given lineo-linear functions of (x, y), (x', y') defined by the equations

$$\begin{aligned} X&=p_0xx'+p_1xy'+p_2x'y+p_3yy' \\ Y&=q_0xx'+q_1xy'+q_2x'y+q_3yy' \end{aligned}$$

we may have identically, in x, y, x', y',

$$(A, B, C)\ (X, Y)^2=(a, b, c)\ (x, y)^2\times(a', b', c')\ (x', y')^2$$

and, this being so, the form (A, B, C) is said to be compounded of the two forms (a, b, c), (a', b', c'), the order of composition being indifferent. In order that two forms may admit of composition into a third, it is necessary and sufficient that their determinants be in the ratio of two squares. The most important case is that of two primitive forms ϕ, χ of the same determinant; these can be compounded into a form denoted by $\phi\chi$ or $\chi\phi$ which is also primitive and of the same determinant as ϕ or χ. If A, B, C are the classes to which ϕ, χ, $\phi\chi$ respectively belong, then any form of A compounded with any form of B gives rise to a form belonging to C. For this reason we write $C=AB=BA$, and speak of the multiplication or composition of classes. The principal class is usually denoted by 1, because when compounded with any other class A it gives this same class A.

The total number of primitive classes being finite, h, say, the series A, A^2, A^3, &c., must be recurring, and there will be a least exponent e such that $A^e=1$. This exponent is a factor of h, so that every class satisfies $A^h=1$. Composition is associative as well as commutative, that is to say, $(AB)C=A(BC)$; hence the symbols $A_1, A_2, \ldots A_h$ for the h different classes define an Abelian group (see GROUPS) of order h, which is representable by one or more base-classes $B_1, B_2, \ldots B_i$ in such a way that each class A is enumerated once and only once by putting

$$A=B_1^xB_2^y\ldots B_i^z \qquad (x\leqq m, y\leqq n, \ldots z\leqq p)$$

with $mn\ldots p=h$, and $B_1^m=B_2^n=\ldots=B_i^p=1$. Moreover, the bases may be so chosen that m is a multiple of n, n of the next corresponding index, and so on. The same thing may be said with regard to the symbols for the classes contained in the principal genus, because two forms of that genus compound into one of the same kind. If this latter group is cyclical, that is, if all the classes of the principal genus can be represented in the form $1, A, A^2, \ldots A^{\nu-1}$, the determinant D is said to be *regular*; if not, the determinant is irregular. It has been proved that certain specified classes of determinants are always irregular; but no complete criterion has been found, other than working out the whole set of primitive classes, and determining the group of the principal genus, for deciding whether a given determinant is irregular or not.

If A, B are any two classes, the total character of AB is found by compounding the characters of A and B. In particular, the class A^2, which is called the duplicate of A, always belongs to the principal genus. Gauss proved, conversely, that every class in the principal genus may be expressed as the duplicate of a class. An ambiguous class satisfies $A^2=1$, that is, its duplicate is the principal class; and the converse of this is true. Hence if $B_1, B_2, \ldots B_i$ are the base-classes for the whole composition-group, and $A=B_1^x B_2^y \ldots B_i^z$ (as above) $A^2=1$, if $2x=0$ or m, $2y=0$ or n, &c.; hence the number of ambiguous classes is 2^i. As an example, when $D=-1460$, there are four ambiguous classes, represented by

$$(1, 0, 365), (2, 2, 183), (5, 0, 73), (10, 10, 39);$$

hence the composition-group must be dibasic, and in fact, if we put B_1, B_2 for the classes represented by (11, 6, 34) and (2, 2, 183), we have $B_1^{10}=B_2^2=1$ and the 20 primitive classes are given by $B_1^x B_2^y (x \leqq 10,\ y \leqq 2)$. In this case the determinant is regular and the classes in the principal genus are $1, B_1^2, B_1^4, B_1^6, B_1^8$.

38. On account of its historical interest, we may briefly consider the form x^2+y^2, for which $D=-4$. If p is an odd prime of the form $4n+1$, the congruence $m^2 \equiv -4 (\text{mod } 4p)$ is soluble (§ 31); let one of its roots be m, and $m^2+4=4lp$. Then (p, m, l) is of determinant -4, and, since there is only one primitive class for this determinant, we must have $(p, m, l) \sim (1, 0, 1)$. By known rules we can actually find a substitution $\begin{pmatrix}\alpha, & \beta \\ \gamma, & \delta\end{pmatrix}$ which converts the first form into the second; this being so, $\begin{pmatrix}\delta, & -\beta \\ -\gamma, & \alpha\end{pmatrix}$ will transform the second into the first, and we shall have $p=\gamma^2+\delta^2$, a representation of p as the sum of two squares. This is unique, except that we may put $p=(\pm\gamma)^2+(\pm\delta)^2$. We also have $2=1^2+1^2$ while no prime $4n+3$ admits of such a representation.

The theory of composition for this determinant is expressed by the identity $(x^2+y^2)(x'^2+y'^2)=(xx' \pm yy')^2+(xy' \mp yx')^2$; and by repeated application of this, and the previous theorem, we can show that if $N=2^a p^b q^c \ldots$, where $p, q, \ldots$ are odd primes of the form $4n+1$, we can find solutions of $N=x^2+y^2$, and indeed *distinct* solutions. For instance $65=1^2+8^2=4^2+7^2$, and conversely two distinct representations $N=x^2+y^2=u^2+v^2$ lead to the conclusion that N is composite. This is a simple example of the application of the theory of forms to the difficult problem of deciding whether a given large number is prime or composite; an application first indicated by Gauss, though, in the present simple case, probably known to Fermat.

39. *Number of classes. Class-number Relations.*—It appears from Gauss's posthumous papers that he solved the very difficult problem of finding a formula for $h(D)$, the number of properly primitive classes for the determinant D. The first published solution, however, was that of P. G. L. Dirichlet; it depends on the consideration of series of the form $\Sigma(ax^2+bxy+cy^2)^{-1-s}$ where s is a positive quantity, ultimately made very small. L. Kronecker has shown the connexion of Dirichlet's results with the theory of elliptic functions, and obtained more comprehensive formulae by taking (a, b, c) as the standard type of a quadratic form, whereas Gauss, Dirichlet, and most of their successors, took $(a, 2b, c)$ as the standard, calling (b^2-ac) its determinant. As a sample of the kind of formulae that are obtained, let p be a prime of the form $4n+3$; then

$$h(-4p)=\Sigma\alpha-\Sigma\beta, \quad h(4p) \log (t+u\sqrt{p})=\log \Pi\left(\tan\frac{b\pi}{4p}\right)$$

where in the first formula $\Sigma\alpha$ means the sum of all quadratic residues of p contained in the series $1, 2, 3, \ldots \frac{1}{2}(p-1)$ and $\Sigma\beta$ is the sum of the remaining non-residues; while in the second formula (t, u) is the least positive solution of $t^2-pu^2=1$, and the product extends to all values of b in the set $1, 3, 5, \ldots (4p-1)$ of which p is a non-residue. The remarkable fact will be noticed that the second formula gives a solution of the Pellian equation in a trigonometrical form.

Kronecker was the first to discover, in connexion with the complex multiplication of elliptic functions, the simplest instances of a very curious group of arithmetical formulae involving sums of class-numbers and other arithmetical functions; the theory of these relations has been greatly extended by A. Hurwitz. The simplest of all these theorems may be stated as follows. Let H (Δ) represent the number of classes for the determinant $-\Delta$, with the convention that $\frac{1}{2}$ and not 1 is to be reckoned for each class containing a reduced form of the type $(a, 0, a)$ and $\frac{1}{3}$ for each class containing a reduced form (a, a, a); then if n is any positive integer,

$$\sum_{\kappa=0, \pm 1, \ldots} H(4n-\kappa^2)=\Phi(n)+\Psi(n) \qquad (-2\sqrt{n} \leqq \kappa \leqq 2\sqrt{n})$$

where $\Phi(n)$ means the sum of the divisors of n, and $\Psi(n)$ means the excess of the sum of those divisors of n which are greater than $\sqrt{n}$ over the sum of those divisors which are less than $\sqrt{n}$. The formula is obtained by calculating in two different ways the number of reduced values of z which satisfy the modular equation $J(nz)=J(z)$, where $J(z)$ is the absolute invariant which, for the elliptic function $\wp(u;\ g_2, g_3)$ is $g_2^3 \div (g_2^3-27g_3^2)$, and z is the ratio of any two primitive periods taken so that the real part of iz is negative (see below, § 68). It should be added that there is a series of scattered papers by J. Liouville, which implicitly contain Kronecker's class-number relations, obtained by a purely arithmetical process without any use of transcendents.

40. *Bilinear Forms.*—A bilinear form means an expression of the type $\Sigma a_{ik}x_i y_k$ $(i=1, 2, \ldots m;\ \ k=1, 2, \ldots n)$; the most important case is when $m=n$, and only this will be considered here. The invariants of a form are its determinant $[a_{nn}]$ and the elementary factors thereof. Two bilinear forms are equivalent when each can be transformed into the other by linear integral substitutions $x'=\Sigma\alpha x$, $y'=\Sigma\beta y$. Every bilinear form is equivalent to a *reduced* form $\sum_1^r e_i x_i y_i$, and $r=n$, unless $[a_{nn}]=0$. In order that two forms may be equivalent it is necessary and sufficient that their invariants should be the same. Moreover, if $a \sim b$ and $c \sim d$, and if the invariants of the forms $a+\lambda c$, $b+\lambda d$ are the same for all values of λ, we shall have $a+\lambda c \sim b+\lambda d$, and the transformation of one form to the other may be effected by a substitution which does not involve λ. The theory of bilinear forms practically includes that of quadratic forms, if we suppose x_i, y_i to be cogredient variables. Kronecker has developed the case when $n=2$, and deduced various class-relations for quadratic forms in a manner resembling that of Liouville. So far as the bilinear forms are concerned, the main result is that the number of classes for the positive determinant $a_{11}a_{22}-a_{12}a_{21}=\Delta$ is $12\{\Phi(\Delta)+\Psi(\Delta)\}+2\epsilon$, where ϵ is 1 or 0 according as Δ is or is not a square, and the symbols Φ, Ψ have the meaning previously assigned to them (§ 39).

41. *Higher Quadratic Forms.*—The algebraic theory of quadratics is so complete that considerable advance has been made in the much more complicated arithmetical theory. Among the most important results relating to the general case of n variables are the proof that the class-number is finite; the enumeration of the arithmetical invariants of a form; classification according to orders and genera, and proof that genera with specified characters exist; also the determination of all the rational transformations of a given form into itself. In connexion with a definite form there is the important conception of its *weight*; this is defined as the reciprocal of the number of its proper automorphs. Equivalent forms are of the same weight; this is defined to be the weight of their class. The weight of a genus or order is the sum of the weights of the classes contained in it; and expressions for the weight of a given genus have actually been obtained. For binary forms the sum of the weights of all the genera coincides with the expression denoted by $H(\Delta)$ in § 39. The complete discussion of a form requires the consideration of $(n-2)$ associated quadratics; one of these is the contravariant of the given form, each of the others contains more than n variables. For certain quaternary and senary classes there are formulae analogous to the class-relations for binary forms referred to in § 39 (see Smith, *Proc. R.S.* xvi., or *Collected Papers*, i. 510).

Among the most interesting special applications of the theory are certain propositions relating to the representation of numbers as the sum of squares. In order that a number may be expressible as the sum of two squares it is necessary and sufficient for it to be of the form PQ^2, where P has no square factor and no prime factor of the form $4n+3$. A number is expressible as the sum of three squares if, and only if, it is of the form m^2n with $n \equiv 1, \pm 2 \pm 3$ (mod 8); when $m=1$ and $n \equiv 3$ (mod 8), all the squares are odd, and hence follows Fermat's theorem that every number can be expressed as the sum of three triangular numbers (one or two of which may be 0). Another famous theorem of Fermat's is that every number can be expressed as the sum of four squares; this was first proved by Jacobi, who also proved that the number of solutions of $n=x^2+y^2+z^2+t^2$ is $8\Phi(n)$, if n is odd, while if n is even it is 24 times the sum of the odd factors of n. Explicit and finite, though more complicated, formulae have been obtained for the number of representations of n as the sum of five, six, seven and eight squares respectively. As an example of the outstanding difficulties of this part of the subject may be mentioned the problem of finding all the integral (not merely rational) automorphs of a given form f. When f is ternary, C. Hermite has shown that the solution depends on finding all the integral solutions of $F(x, y, z)+t^2=1$, where F is the contravariant of f.

Thanks to the researches of Gauss, Eisenstein, Smith, Hermite and others, the theory of ternary quadratics is much less incomplete than that of quadratics with four or more variables. Thus methods of reduction have been found both for definite and for indefinite forms; so that it would be possible to draw up a table of representative forms, if the result were worth the labour. One specially important theorem is the solution of $ax^2+by^2+cz^2=0$; this is always possible if $-bc$, $-ca$, $-ab$ are quadratic residues of a, b, c respectively, and a formula can then be obtained which furnishes all the solutions.

42. *Complex Numbers.*—One of Gauss's most important and far-reaching contributions to arithmetic was his introduction of complex

integers $a+bi$, where a, b are ordinary integers, and, as usual, $i^2=-1$. In this theory there are four units ±1, $\pm i$; the numbers $i^k(a+bi)$ are said to be *associated*; $a-bi$ is the conjugate of $a+bi$ and we write $N(a\pm bi)=a^2+b^2$, the *norm* of $a+bi$, its conjugate, and associates. The most fundamental proposition in the theory is that the process of residuation (§ 24) is applicable; namely, if m, n are any two complex integers and $N(m)>N(n)$, we can always find integers q, r such that $m=qn+r$ with $N(r)\leq\frac12N(n)$. This may be proved analytically, but is obvious if we mark complex integers by points in a plane. Hence immediately follow propositions about resolutions into prime factors, greatest common measure, &c., analogous to those in the ordinary theory; it will only be necessary to indicate special points of difference.

We have $2=-i(1+i)^2$, so that 2 is associated with a square: a real prime of the form $4n+3$ is still a prime, but one of the form $4n+1$ breaks up into two conjugate prime factors, for example, $5=(1-2i)(1+2i)$. An integer is even, semi-even, or odd according as it is divisible by $(1+i)^2$, $(1+i)$ or is prime to $(1+i)$. Among four associated odd integers there is one and only one which $\equiv 1 \pmod{2+2i}$; this is said to be *primary*; the conjugate of a primary number is primary, and the product of any number of primaries is primary. The conditions that $a+bi$ may be primary are $b\equiv0 \pmod 2$ $a+b-1\equiv0 \pmod 4$. Every complex integer can be uniquely expressed in the form $i^m(1+i)^n a^\alpha b^\beta c^\gamma\ldots$, where $0\leq m<4$, and $a, b, c, \ldots$ are primary primes.

With respect to a complex modulus m, all complex integers may be distributed into $N(m)$ incongruous classes. If $m=h(a+bi)$ where a, b are co-primes, we may take as representatives of these classes the residues $x+yi$ where $x=0, 1, 2,\ldots\{(a^2+b^2)h-1\}$; $y=0, 1, 2, \ldots(h-1)$. Thus when $b=0$ we may take $x=0, 1, 2,\ldots(h-1)$; $y=0, 1, 2,\ldots(h-1)$, giving the h^2 residues of the real number h; while if $a+bi$ is prime, $1, 2, 3,\ldots(a^2+b^2-1)$ form a complete set of residues.

The number of residues of m that are prime to m is given by

$$\phi(m)=N(m)\Pi\left(1-\frac{1}{N(p)}\right)$$

where the product extends to all prime factors of m. As an analogue to Fermat's theorem we have, for any integer prime to the modulus,

$$x^{\phi(m)}\equiv 1 \pmod m,\quad x^{N(p)-1}\equiv 1 \pmod p$$

according as m is composite or prime. There are $\phi\{N(p)-1\}$ primitive roots of the prime p; a primitive root in the real theory for a real prime $4n+1$ is also a primitive root in the new theory for each prime factor of $(4n+1)$, but if $p=4n+3$ be a prime its primitive roots are necessarily complex.

43. If p, q are any two odd primes, we shall define the symbols $\left(\frac{p}{q}\right)_2$ and $\left(\frac{p}{q}\right)_4$ by the congruences

$$p^{\frac12\{N(q)-1\}}\equiv\left(\frac{p}{q}\right)_2,\quad p^{\frac14\{N(q)-1\}}\equiv\left(\frac{p}{q}\right)_4 \pmod q,$$

it being understood that the symbols stand for absolutely least residues. It follows that $\left(\frac{p}{q}\right)_2=1$ or -1 according as p is a quadratic residue of q or not; and that $\left(\frac{p}{q}\right)_4=1$ only if p is a biquadratic residue of q. If p, q are primary primes, we have two laws of reciprocity, expressed by the equations

$$\left(\frac{p}{q}\right)_2=\left(\frac{q}{p}\right)_2,\quad \left(\frac{p}{q}\right)_4\left(\frac{q}{p}\right)_4=(-1)^{\frac14\{N(p)-1\}\cdot\frac14\{N(q)-1\}}.$$

To these must be added the supplementary formulae

$$\left(\frac{i}{p}\right)_2=(-1)^{\frac14\{N(p)-1\}},\quad \left(\frac{1+i}{a+bi}\right)_2=(-1)^{\frac18\{(a+b)^2-1\}},$$

$$\left(\frac{i}{a+bi}\right)_4=i^{\frac12(a-1)}\qquad \left(\frac{1+i}{a+bi}\right)_4=i^{\frac14\{a+b-(1+b)^2\}},$$

$a+bi$ being a primary odd prime. In words, the law of biquadratic reciprocity for two primary odd primes may be expressed by saying that the biquadratic characters of each prime with respect to the other are identical, unless $p=q\equiv3+2i \pmod 4$, in which case they are opposite. The law of biquadratic reciprocity was discovered by Gauss, who does not seem, however, to have obtained a complete proof of it. The first published proof is that of Eisenstein, which is very beautiful and simple, but involves the theory of lemniscate functions. A proof on the lines indicated in Gauss's posthumous papers has been developed by Busche; this probably admits of simplification. Other demonstrations, for instance Jacobi's, depend on cyclotomy (see below).

44. *Algebraic Numbers.*—The first extension of Gauss's complex theory was made by E. E. Kummer, who considered complex numbers represented by rational integral functions of any roots of unity, thus including the ordinary theory and Gauss's as special cases. He was soon faced by the difficulty that, in some cases, the law that an integer can be uniquely expressed as the product of prime factors appeared to break down. To see how this happens take the equation $\eta^2+\eta+6=0$, the roots of which are expressible as rational integral functions of 23rd roots of unity, and let η be either of the roots. If we define $a\eta+b$ to be an integer, when a, b are natural numbers, the product of any number of such integers is uniquely expressible in the form $l\eta+m$. Conversely every integer can be expressed as the product of a finite number of indecomposable integers $a+b\eta$, that is, integers which cannot be further resolved into factors of the same type. But this resolution is not necessarily unique: for instance $6=2.3=-\eta(\eta+1)$, where $2, 3, \eta, \eta+1$ are all indecomposable and essentially distinct. To see the way in which Kummer surmounted the difficulty consider the congruence

$$u^2+u+6\equiv0 \pmod p$$

where p is any prime, except 23. If $-23\,R\,p$ this has two distinct roots u_1, u_2; and we say that $a\eta+b$ is divisible by the ideal prime factor of p corresponding to u_1, if $au_1+b\equiv0 \pmod p$. For instance, if $p=2$ we may put $u_1=0$, $u_2=1$ and there will be two ideal factors of 2, say p_1 and p_2 such that $a\eta+b\equiv0 \pmod{p_1}$ if $b\equiv0 \pmod 2$ and $a\eta+b\equiv0 \pmod{p_2}$ if $a+b\equiv0 \pmod 2$. If both these congruences are satisfied, $a\equiv b\equiv0 \pmod 2$ and $a\eta+b$ is divisible by 2 in the ordinary sense. Moreover $(a\eta+b)(c\eta+d)=(bc+ad-ac)\eta+(bd-6ac)$ and if this product is divisible by p_1, $bd\equiv0 \pmod 2$, whence either $a\eta+b$ or $c\eta+d$ is divisible by p_1; while if the product is divisible by p_2 we have $bc+ad+bd-7ac=0 \pmod 2$ which is equivalent to $(a+b)(c+d)\equiv0 \pmod 2$, so that again either $a\eta+b$ or $c\eta+d$ is divisible by p_2. Hence we may properly speak of p_1 and p_2 as *prime* divisors. Similarly the congruence $u^2+u+6\equiv0 \pmod 3$ defines two ideal prime factors of 3, and $a\eta+b$ is divisible by one or the other of these according as $b\equiv0 \pmod 3$ or $2a+b\equiv0 \pmod 3$; we will call these prime factors p_3, p_4. With this notation we have (neglecting unit factors)

$$2=p_1p_2,\quad 3=p_3p_4,\quad \eta=p_1p_3,\quad 1+\eta=p_2p_4.$$

Real primes of which -23 is a non-quadratic residue are also primes in the field (η); and the prime factors of any number $a\eta+b$, as well as the degree of their multiplicity, may be found by factorizing $(6a^2-ab+b^2)$, the norm of $(a\eta+b)$. Finally *every* integer divisible by p_2 is expressible in the form $\pm2m\pm(1+\eta)n$ where m, n are natural numbers (or zero); it is convenient to denote this fact by writing $p_2=[2, 1+\eta]$, and calling the aggregate $2m+(1+\eta)n$ a compound modulus with the base $2, 1+\eta$. This generalized idea of a modulus is very important and far-reaching; an aggregate is a modulus when, if α, β are any two of its elements, $\alpha+\beta$ and $\alpha-\beta$ also belong to it. For arithmetical purposes those moduli are most useful which can be put into the form $[\alpha_1, \alpha_2,\ldots\alpha_n]$ which means the aggregate of all the quantities $x_1\alpha_1+x_2\alpha_2+\ldots+x_n\alpha_n$ obtained by assigning to $(x_1,x_2,\ldots x_n)$, independently, the values $0_1\pm1$, ±2, &c. Compound moduli may be multiplied together, or raised to powers, by rules which will be plain from the following example. We have

$$\begin{aligned}p_2^2&=[4, 2(1+\eta), (1+\eta)^2]=[4, 2+2\eta, -5+\eta]=[4, 12, -5+\eta]\\&=[4, -5+\eta]=[4, 3+\eta]\end{aligned}$$

hence

$$\begin{aligned}p_2^3&=p_2^2.p_2=[4, 3+\eta]\times[2, 1+\eta]=[8, 4+4\eta, 6+2\eta, 3+4\eta+\eta^2]\\&=[8, 4+4\eta, 6+2\eta, -3+3\eta]=(\eta-1)[\eta+2, \eta-6, 3]=(\eta-1)[1, \eta].\end{aligned}$$

Hence every integer divisible by p_2^3 is divisible by the actual integer $(\eta-1)$ and conversely; so that in a certain sense we may regard p_2 as a cube root. Similarly the cube of any other ideal prime is of the form $(a\eta+b)[1, \eta]$. According to a principle which will be explained further on, all primes here considered may be arranged in three classes; one is that of the real primes, the others each contain ideal primes only. As we shall see presently all these results are intimately connected with the fact that for the determinant -23 there are three primitive classes, represented by $(1, 1, 6)$ $(2, 1, 3)$, $(2, -1, 3)$ respectively.

45. Kummer's definition of ideal primes sufficed for his particular purpose, and completely restored the validity of the fundamental theorems about factors and divisibility. His complex integers were more general than any previously considered and suggested a definition of an algebraic integer in general, which is as follows: if $a_1, a_2,\ldots a_n$ are ordinary integers (*i.e.* elements of $\overline{N}$, § 7), and θ satisfies an equation of the form

$$\theta^n+a_1\theta^{n-1}+a_2\theta^{n-2}+\ldots+a_{n-1}\theta+a_n=0,$$

θ is said to be an algebraic integer. We may suppose this equation irreducible; θ is then said to be of the nth order. The n roots $\theta, \theta', \theta'',\ldots\theta^{(n-1)}$ are all different, and are said to be conjugate. If the equation began with $a_0\theta^n$ instead of θ^n, θ would still be an algebraic number; every algebraic number can be put into the form θ/m, where m is a natural number and θ an algebraic integer.

Associated with θ we have a *field* (or *corpus*) $\Omega=R(\theta)$ consisting of all rational functions of θ with real rational coefficients; and in like manner we have the conjugate fields $\Omega'=R(\theta')$, &c. The aggregate of integers contained in Ω is denoted by $\mathfrak{o}$.

Every element of Ω can be put into the form

$$\omega=c_0+c_1\theta+\ldots+c_{n-1}\theta^{n-1}$$

where $c_0, c_1,\ldots c_{n-1}$ are real and rational. If these coefficients are all integral, ω is an integer; but the converse is not necessarily true. It is possible, however, to find a set of integers $\omega_1, \omega_2\ldots\omega_n$ belonging to Ω, such that every integer in Ω can be uniquely expressed in the form

$$\omega=h_1\omega_1+h_2\omega_2+\ldots+h_n\omega_n$$

where $h_1, h_2, \dots h_n$ are elements of N which may be called the *co-ordinates* of ω with respect to the *base* $\omega_1, \omega_2, \dots \omega_n$. Thus $\mathfrak{o}$ is a modulus (§ 44), and we may write $\mathfrak{o}=[\omega_1, \omega_2, \dots \omega_n]$. Having found one base, we can construct any number of equivalent bases by means of equations such as $\omega_i'=\sum_j c_{ij}\omega^j$, where the rational integral coefficients c_i^j are such that the determinant $|c_{nn}|=\pm 1$.

If we write

$$\sqrt{\Delta}=\begin{vmatrix} \omega_1, & \omega_2, & \dots & \omega_n \\ \omega'_1, & \omega'_2, & \dots & \omega'_n \\ \omega''_1, & \omega''_2, & \dots & \omega''_n \\ \vdots & & & \\ \omega_1^{(n-1)}, & \omega_2^{(n-1)}, & \dots & \omega_n^{(n-1)} \end{vmatrix}$$

Δ is a rational integer called the *discriminant* of the field. Its value is the same whatever base is chosen.

If α is any integer in Ω, the product of α and its conjugates is a rational integer called the *norm* of α, and written $N(\alpha)$. By considering the equation satisfied by α we see that $N(\alpha)=\alpha\alpha_1$ where α_1 is an integer in Ω. It follows from the definition that if α, β are any two integers in Ω, then $N(\alpha\beta)=N(\alpha)N(\beta)$; and that for an ordinary real integer m, we have $N(m)=m^n$.

46. *Ideals.*—The extension of Kummer's results to algebraic numbers in general was independently made by J. W. R. Dedekind and Kronecker; their methods differ mainly in matters of notation and machinery, each having special advantages of its own for particular purposes. Dedekind's method is based upon the notion of an *ideal*, which is defined by the following properties:—

(i.) An ideal $\mathfrak{m}$ is an aggregate of integers in Ω.

(ii.) This aggregate is a modulus; that is to say, if μ, μ' are any two elements of $\mathfrak{m}$ (the same or different) $\mu-\mu'$ is contained in $\mathfrak{m}$. Hence also $\mathfrak{m}$ contains a zero element, and $\mu+\mu'$ is an element of $\mathfrak{m}$.

(iii.) If μ is any element of $\mathfrak{m}$, and ω any element of $\mathfrak{o}$, then $\omega\mu$ is an element of $\mathfrak{m}$. It is this property that makes the notion of an ideal more specific than that of a modulus.

It is clear that ideals exist; for instance, $\mathfrak{o}$ itself is an ideal. Again, all integers in Ω which are divisible by a given integer α (in $\mathfrak{o}$) form an ideal; this is called a *principal ideal*, and is denoted by $\mathfrak{o}\alpha$. Every ideal can be represented by a base (§§ 44, 45), so that we may write $\mathfrak{m}=[\mu_1, \mu_2, \dots \mu_n]$, meaning that every element of $\mathfrak{m}$ can be uniquely expressed in the form $\Sigma h_i\mu_i$, where h_i is a rational integer. In other words, every ideal has a base (and therefore, of course, an infinite number of bases). If $\mathfrak{a}$, $\mathfrak{b}$ are any two ideals, and if we form the aggregate of all products $\alpha\beta$ obtained by multiplying each element of the first ideal by each element of the second, then this aggregate, together with all sums of such products, is an ideal which is called the product of $\mathfrak{a}$ and $\mathfrak{b}$ and written $\mathfrak{ab}$ or $\mathfrak{ba}$. In particular $\mathfrak{oa}=\mathfrak{a}$, $\mathfrak{o}^2=\mathfrak{o}$, $\mathfrak{o}\alpha \,.\, \mathfrak{o}\beta=\mathfrak{o}\alpha\beta$. This law of multiplication is associative as well as commutative. It is clear that every element of $\mathfrak{ab}$ is contained in $\mathfrak{a}$: it can be proved that, conversely, if every element of $\mathfrak{c}$ is contained in $\mathfrak{a}$, there exists an ideal $\mathfrak{b}$ such that $\mathfrak{ab}=\mathfrak{c}$. In particular, if α is any element of $\mathfrak{a}$, there is an ideal $\mathfrak{a}'$ such that $\mathfrak{o}\alpha=\mathfrak{aa}'$. A *prime ideal* is one which has no divisors except itself and $\mathfrak{o}$. It is a fundamental theorem that every ideal can be resolved into the product of a finite number of prime ideals, and that this resolution is unique. It is the decomposition of a principal ideal into the product of prime ideals that takes the place of the resolution of an integer into its prime factors in the ordinary theory. It may happen that all the ideals in Ω are principal ideals; in this case every resolution of an ideal into factors corresponds to the resolution of an integer into actual integral factors, and the introduction of ideals is unnecessary. But in every other case the introduction of ideals or some equivalent notion, is indispensable. When two ideals have been resolved into their prime factors, their greatest common measure and least common multiple are determined by the ordinary rules. Every ideal may be expressed (in an infinite number of ways) as the greatest common measure of two principal ideals.

47. There is a theory of congruences with respect to an ideal modulus. Thus $\alpha\equiv\beta \pmod{\mathfrak{m}}$ means that $\alpha-\beta$ is an element of $\mathfrak{m}$. With respect to $\mathfrak{m}$, all the integers in Ω may be arranged in a finite number of incongruent classes. The number of these classes is called the *norm* of $\mathfrak{m}$, and written $N(\mathfrak{m})$. The norm of a prime ideal $\mathfrak{p}$ is some power of a real prime p; if $N(\mathfrak{p})=p^f$, $\mathfrak{p}$ is said to be a prime ideal of degree f. If $\mathfrak{m}$, $\mathfrak{n}$ are any two ideals, then $N(\mathfrak{mn})=N(\mathfrak{m})N(\mathfrak{n})$. If $N(\mathfrak{m})=m$, then $m\equiv 0 \pmod{\mathfrak{m}}$, and there is an ideal $\mathfrak{m}'$ such that $\mathfrak{o}m=\mathfrak{mm}'$. The norm of a principal ideal $\mathfrak{o}\alpha$ is equal to the absolute value of $N(\alpha)$ as defined in § 45.

The number of incongruent residues prime to $\mathfrak{m}$ is—

$$\phi(\mathfrak{m})=N(\mathfrak{m})\Pi\left(1-\frac{1}{N(\mathfrak{p})}\right),$$

where the product extends to all prime factors of $\mathfrak{m}$. If ω is any element of $\mathfrak{o}$ prime to $\mathfrak{m}$,

$$\omega^{\phi(\mathfrak{m})}\equiv 1 \pmod{\mathfrak{m}}.$$

Associated with a prime modulus $\mathfrak{p}$ for which $N(\mathfrak{p})=p^f$ we have $\phi(p^f-1)$ primitive roots, where ϕ has the meaning given to it in the ordinary theory. Hence follow the usual results about exponents, indices, solutions of linear congruences, and so on. For any modulus $\mathfrak{m}$ we have $N(\mathfrak{m})=\Sigma\phi(\mathfrak{d})$, where the sum extends to all the divisors of $\mathfrak{m}$.

48. Every element of $\mathfrak{o}$ which is not contained in any other ideal is an *algebraic unit*. If the conjugate fields $\Omega, \Omega', \dots \Omega^{(n-1)}$ consist of r_1 real and $2r_2$ imaginary fields, there is a system of units $\epsilon_1, \epsilon_2, \dots \epsilon_r$, where $r=r_1+r_2-1$, such that every unit in Ω is expressible in the form $\epsilon=\rho\epsilon_1{}^a\epsilon_2{}^b \dots \epsilon_r{}^l$ where ρ is a root of unity contained in Ω and $a, b, \dots l$ are natural numbers. This theorem is due to Dirichlet.

The norm of a unit is $+1$ or -1; and the determination of all the units contained in a given field is in fact the same as the solution of a Diophantine equation

$$F(h_1, h_2, \dots h_n)=\pm 1.$$

For a quadratic field the equation is of the form $h_1^2-nh_2^2=\pm 1$, and the theory of this is complete; but except for certain special cubic corpora little has been done towards solving the important problem of assigning a definite process by which, for a given field, a system of fundamental units may be calculated. The researches of Jacobi, Hermite, and Minkowsky seem to show that a proper extension of the method of continued fractions is necessary.

49. *Ideal Classes.*—If $\mathfrak{m}$ is any ideal, another ideal $\mathfrak{n}$ can always be found such that $\mathfrak{mn}$ is a principal ideal; for instance, one such multiplier is $\mathfrak{m}^{-1}N(\mathfrak{m})$. Two ideals $\mathfrak{m}$, $\mathfrak{m}'$ are said to be equivalent $(\mathfrak{m}\sim\mathfrak{m}')$ or to belong to the same *class*, if there is an ideal $\mathfrak{n}$ such that $\mathfrak{mn}$, $\mathfrak{m}'\mathfrak{n}$ are both principal ideals. It can be proved that two ideals each equivalent to a third are equivalent to each other and that all ideals in Ω may be distributed into a finite number, h, of ideal classes. The class which contains all principal ideals is called the principal class and denoted by O.

If $\mathfrak{m}$, $\mathfrak{n}$ are any two ideals belonging to the classes A, B respectively, then $\mathfrak{mn}$ belongs to a definite class which depends only upon A, B and may be denoted by AB or BA indifferently. Thus the class-symbols form an Abelian group of order h, of which O is the unit element; and, *mutatis mutandis*, the theorems of § 37 about composition of classes still hold good.

The principal theorem with regard to the determination of h is the following, which is Dedekind's generalization of the corresponding one for quadratic fields, first obtained by Dirichlet. Let

$$\zeta(s)=\sum_{(\mathfrak{m})} N(\mathfrak{m})^{-s}$$

where the sum extends to all ideals $\mathfrak{m}$ contained in Ω; this converges so long as the real quantity s is positive and greater than 1. Then κ being a certain quantity which can be calculated *when a fundamental system of units is known*, we shall have

$$\kappa h=\underset{s=1}{Lt}\{(s-1)\zeta(s)\}.$$

The expression for κ is rather complicated, and very peculiar; it may be written in the form

$$\kappa=\frac{2^{r1+r2}\pi^{r2}}{w}\cdot\frac{R}{|\sqrt{\Delta}|}$$

where $|\sqrt{\Delta}|$ means the absolute value of the square root of the discriminant of the field, r_1, r_2 have the same meaning as in § 48, w is the number of roots of unity in Ω, and R is a determinant of the form $|l_i(\epsilon^j)|$, of order (r_1+r_2-1), with elements which are, in a certain special sense, "logarithms" of the fundamental units $\epsilon_1, \epsilon_2, \dots \epsilon_r$.

50. The discriminant Δ enjoys some very remarkable properties. Its value is always different from ± 1; there can be only a finite number of fields which have a given discriminant; and the rational prime factors of $\Delta(\Omega)$ are precisely those rational primes which, in Ω, are divisible by the square (or some higher power) of a prime ideal. Consequently, every rational prime not contained in Δ is resolvable, in Ω, into the product of distinct primes, each of which occurs only once. The presence of multiple prime factors in the discriminant was the principal difficulty in the way of extending Kummer's method to all fields, and was overcome by the introduction of compound moduli—for this is the common characteristic of Dedekind's and Kronecker's procedure.

51. *Normal Fields.*—The special properties of a particular field Ω are closely connected with its relations to the conjugate fields $\Omega', \Omega'', \dots \Omega^{(n-1)}$. The most important case is when each of the conjugate fields is identical with Ω: the field is then said to be *Galoisian* or *normal*. The aggregate $R(\theta, \theta', \dots \theta^{(n-1)})$ of all rational functions of θ and its conjugates is a normal field: hence every arithmetical field of order n is either normal, or contained in a normal field of a higher order. The roots of an equation $f(\theta)=0$ which defines a normal field are associated with a group of substitutions: if this is Abelian, the field is called Abelian; if it is cyclic, the field is called cyclic. A cyclotomic field is one the elements of which are all expressible as rational functions of roots of unity; in particular the complete cyclotomic field C_m, of order $\phi(m)$, is the aggregate of all rational functions of a primitive mth root of unity. To Kronecker is due the very remarkable theorem that all Abelian (including cyclic) fields are cyclotomic: the first published proof of this was given by Weber, and another is due to D. Hilbert.

Many important theorems concerning a normal field have been established by Hilbert. He shows that if Ω is a given normal field of order m, and $\mathfrak{p}$ any of its prime ideals, there is a finite series of associated fields Ω_1, Ω_2, &c., of orders m_1, m_2, &c., such that $m_i\equiv 0$ (mod. $m^i{}_{+1}$), and that if $r^i=m/m^i$, $\mathfrak{p}^{r^i}=\mathfrak{p}_i$, a prime ideal in Ω^i. If Ω_l is the last of this series, it is called the *field of inertia*

(*Trägheitskörper*) for $\mathfrak{p}$: next after this comes another field of still lower order called the *resolving field* (*Zerlegungskörper*) for $\mathfrak{p}$, and in this field there is a prime *of the first degree*, $\mathfrak{p}_{l+1}$, such that $\mathfrak{p}_{l+1}=\mathfrak{p}^k$, where $k=m/m_l$. In the field of inertia $\mathfrak{p}_{l+1}$ remains a prime, but becomes of higher degree; in Ω_{l-1}, which is called the *branch-field* (*Verzweigungskörper*) it becomes a power of a prime, and by going on in this way from the resolving field to Ω, we obtain $(l+2)$ representations for any prime ideal of the resolving field. By means of these theorems, Hilbert finds an expression for the exact power to which a rational prime p occurs in the discriminant of Ω, and in other ways the structure of Ω becomes more evident. It may be observed that whem m is prime the whole series reduces to Ω and the rational field, and we conclude that every prime ideal in Ω is of the first or mth degree: this is the case, for instance, when $m=2$, and is one of the reasons why quadratic fields are comparatively so simple in character.

52. *Quadratic Fields.*—Let m be an ordinary integer different from $+1$, and not divisible by any square: then if x, y assume all ordinary rational values the expressions $x+y\sqrt{m}$ are the elements of a field which may be called $\Omega(\sqrt{m})$. It should be observed that $\sqrt{m}$ means one definite root of $x^2-m=0$, it does not matter which: it is convenient, however, to agree that $\sqrt{m}$ is positive when m is positive, and $i\sqrt{m}$ is negative when m is negative. The principal results relating to Ω will now be stated, and will serve as illustrations of §§ 44-51.

In the notation previously used

$$\mathfrak{o}=[1,\ \tfrac{1}{2}(1+\sqrt{m})]\ \text{or}\ [1,\ \sqrt{m}]$$

according as $m\equiv1 \pmod 4$ or not. In the first case $\Delta=m$, in the second $\Delta=4m$. The field Ω is normal, and every ideal prime in it is of the first degree.

Let q be any odd prime factor of m; then $q=\mathfrak{q}^2$, where $\mathfrak{q}$ is the prime ideal $[q,\ \frac{1}{2}(q+\sqrt{m})]$ when $m\equiv1 \pmod 4$ and in other cases $[q, \sqrt{m}]$. An odd prime p of which m is a quadratic residue is the product of two prime ideals $\mathfrak{p}$, $\mathfrak{p}'$, which may be written in the form $[p,\ \frac{1}{2}(a+\sqrt{m})]$, $[p, \frac{1}{2}(a-\sqrt{m})]$ or $[p,\ a+\sqrt{m}]$, $[p, a-\sqrt{m}]$, according as $m\equiv1 \pmod 4$ or not: here a is a root of $x^2\equiv m \pmod p$, taken so as to be odd in the first of the two cases. All other rational odd primes are primes in Ω. For the exceptional prime 2 there are four cases to consider: (i.) if $m\equiv1 \pmod 8$, then $2=[2,\frac{1}{2}(1+\sqrt{m})]\times[2,\frac{1}{2}(1-\sqrt{m})]$. (ii.) If $m\equiv5 \pmod 8$, then 2 is prime: (iii.) if $m\equiv2 \pmod 4$, $2=[2,\sqrt{m}]^2$: (iv.) if $m=3$ (mod $\equiv4$), $2=[2,1+\sqrt{m}]^2$. Illustrations will be found in § 44 for the case $m=23$.

53. *Normal Residues. Genera.*—Hilbert has introduced a very convenient definition, and a corresponding symbol, which is a generalization of Legendre's quadratic character. Let n, m be rational integers, m not a square, w any rational prime; we write $\left(\frac{n,\ m}{w}\right)=+1$ if, to the modulus w, n is congruent to the norm of an integer contained in $\Omega(\sqrt{m})$; in all other cases we put $\left(\frac{n,\ m}{w}\right)=-1$. This new symbol obeys a set of laws, among which may be especially noted $\left(\frac{n,\ w}{w}\right)=\left(\frac{w,\ n}{w}\right)=\left(\frac{n}{w}\right)$ and $\left(\frac{n,\ m}{w}\right)=+1$, whenever n, m are prime to p.

Now let q_1, q_2, . . . q_t be the different rational prime factors of the discriminant of $\Omega(\sqrt{m})$; then with any rational integer a we may associate the t symbols

$$\left(\frac{a,\ m}{q_1}\right),\ \left(\frac{a,\ m}{q_2}\right),\ \ldots\left(\frac{a\ \ m}{q_t}\right)$$

and call them the total character of a with respect to Ω. This definition may be extended so as to give a total character for every ideal $\mathfrak{a}$ in Ω, as follows. First let Ω be an imaginary field $(m<0)$; we put $r=t$, $\bar{n}=\mathrm{N}(\mathfrak{a})$, and call

$$\left(\frac{\bar{n},\ m}{q_1}\right),\ \ldots\left(\frac{\bar{n},\ m}{q_r}\right)$$

the total character of $\mathfrak{a}$. Secondly, let Ω be a real field; we first determine the t separate characters of -1, and if they are all positive we put $\bar{n}=+\mathrm{N}(\mathfrak{a})$, $r=t$, and adopt the r characters just written above as those of $\mathfrak{a}$. Suppose, however, that one of the characters of -1 is negative; without loss of generality we may take it to be that with reference to q_t. We then put $r=t-1$, $\bar{n}=\pm\mathrm{N}(\mathfrak{a})$ taken with such a sign that $\left(\frac{\bar{n},\ m}{q_t}\right)=+1$, and take as the total character of $\mathfrak{a}$ the symbols $\left(\frac{\bar{n},\ m}{q_i}\right)$ for $i=1, 2, \ldots (t-1)$.

With these definitions it can be proved that all ideals of the same class have the same total character, and hence there is a distribution of classes into genera, each genus containing those classes for which the total character is the same (cf. § 36).

Moreover, we have the fundamental theorem that an assigned set of r units ±1 corresponds to an actually existing genus if, and only if, their product is $+1$, so that the number of actually existing genera is 2^{r-1}. This is really equivalent to a theorem about quadratic forms first stated and proved by Gauss; the same may be said about the next proposition, which, in its natural order, is easily proved by the method of ideals, whereas Gauss had to employ the theory of ternary quadratics.

Every class of the principal genus is the square of a class.

An ambiguous ideal in Ω is defined as one which is unaltered by the change of $\sqrt{m}$ to $-\sqrt{m}$ (that is, it is the same as its conjugate) and not divisible by any rational integer except ±1. The only ambiguous prime ideals in Ω are those which are factors of its discriminant. Putting $\Delta=\mathfrak{q}_1^2\,\mathfrak{q}_2^2\ldots\mathfrak{q}_t^2$, there are in Ω exactly 2^t ambiguous ideals: namely, those factors of Δ, including $\mathfrak{o}$, which are not divisible by any square. It is a fundamental theorem, first proved by Gauss, that the number of ambiguous classes is equal to the number of genera.

54. *Class-Number.*—The number of ideal classes in the field $\Omega(\sqrt{m})$ may be expressed in the following forms:—

(i.) $m<0$:

$$h=\frac{\tau}{2\Delta}\sum_n\left(\frac{\Delta}{n}\right)n\qquad(n=1,\ 2,\ldots,-\Delta);$$

(ii.) $m>0$:

$$h=\frac{1}{2\log\epsilon}\log\frac{\Pi\sin\frac{b\pi}{\Delta}}{\Pi\sin\frac{a\pi}{\Delta}}.$$

In the first of these formulae τ is the number of units contained in Ω; thus $\tau=6$ for $\Delta=-3$, $\tau=4$ for $\Delta=-4$, $\tau=2$ in other cases. In the second formula, ϵ is the fundamental unit, and the products are taken for all the numbers of the set $(1, 2,\ldots\Delta)$ for which $\left(\frac{\Delta}{a}\right)=+1$, $\left(\frac{\Delta}{b}\right)=-1$ respectively. In the ideal theory the only way in which these formulae have been obtained is by a modification of Dirichlet's method; to prove them without the use of transcendental analysis would be a substantial advance in the theory.

55. Suppose that any ideal in Ω is expressed in the form $[\omega_1,\ \omega_2]$; then any element of it is expressible as $x\omega_1+y\omega_2$, where x, y are rational integers, and we shall have $\mathrm{N}\ (x\omega_1+y\omega_2)=ax^2+bxy+cy^2$, where a, b, c are rational numbers contained in the ideal. If we put $x=\alpha x'+\beta y', y=\gamma x'+\delta y'$, where α, β, γ, δ are rational numbers such that $\alpha\delta-\beta\gamma=\pm1$, we shall have simultaneously $(a,\ b,\ c)\ (x,\ y)^2=(a',b',c')\ (x',y')^2$ as in § 32 and also

$$(a',b',c')\ (x',y')^2=\mathrm{N}\{x'(\alpha\omega_1+\gamma\omega_2)+y'(\beta\omega_1+\delta\omega_2)\}=\mathrm{N}(x'\omega'_1+y'\omega'_2),$$

where $[\omega'_1,\ \omega'_2]$ is the same ideal as before. Thus all equivalent forms are associated with the same ideal, and the numbers representable by forms of a particular class are precisely those which are norms of numbers belonging to the associated ideal. Hence the class-number for ideals in Ω is also the class-number for a set of quadratic forms; and it can be shown that all these forms have the same determinant Δ. Conversely, every class of forms of determinant Δ can be associated with a definite class of ideals in $\Omega(\sqrt{m})$, where $m=\Delta$ or $\frac{1}{4}\Delta$ as the case may be. Composition of form-classes exactly corresponds to the multiplication of ideals: hence the complete analogy between the two theories, so long as they are really in contact. There is a corresponding theory of forms in connexion with a field of order n: the forms are of the order n, but are only very special forms of that order, because they are algebraically resolvable into the product of linear factors.

56. *Complex Quadratic Forms.*—Dirichlet, Smith and others, have discussed forms (a, b, c) in which the coefficients are complex integers of the form $m+ni$; and Hermite has considered bilinear forms $axx'+bxy'+b'x'y+cyy'$, where x', y', b' are the conjugates of x, y, b and a, c, are real. Ultimately these theories are connected with fields of the fourth order; and of course in the same way we might consider forms (a, b, c) with integral coefficients belonging to any given field of order n: the theory would then be ultimately connected with a field of order $2n$.

57. *Kronecker's Method.*—In practice it is found convenient to combine the method of Dedekind with that of Kronecker, the main principles of which are as follows. Let $\mathrm{F}(x, y, z,\ldots)$ be a polynomial in any number of indeterminates (*umbrae*, as Sylvester calls them) with ordinary integral coefficients; if n is the greatest common measure of the coefficients, we have $\mathrm{F}=n\mathrm{E}$, where E is a primary or unit form. The positive integer n is called the divisor of F; and the divisor of the product of two forms is equal to the product of the divisors of the factors. Next suppose that the coefficients of F are integers in a field Ω of order n. Denoting the conjugate forms by F', F'', $\ldots\mathrm{F}^{(n-1)}$, the product $\mathrm{F}\mathrm{F}'\mathrm{F}''\ldots\mathrm{F}^{(n-1)}=f\mathrm{E}$, where f is a real positive integer, and E a unit form with real integral coefficients. The natural number f is called the norm of F. If F, G are any two forms (in Ω) we have $\mathrm{N}(\mathrm{FG})=\mathrm{N}(\mathrm{F})\mathrm{N}(\mathrm{G})$. Let the coefficients of F be α_1, α_2, &c., those of G β_1, β_2, &c., and those of FG γ_1, γ_2, &c.; and let $\mathfrak{p}$ be any prime ideal in Ω. Then if $\mathfrak{p}^m$ is the highest power of $\mathfrak{p}$ contained in each of the coefficients α_i, and $\mathfrak{p}^n$ the highest power of $\mathfrak{p}$ contained in each of the coefficients β_i, $\mathfrak{p}^{m+n}$ is the highest power of $\mathfrak{p}$ contained by the whole set of coefficients γ_i. Writing $\mathrm{dv}(\alpha_1, \alpha_2,\ldots)$ for the highest ideal divisor of α_1, α_2, &c., this is called the *content* of F; and we have the theorem that the

product of the contents of two forms is equal to the content of the product of the forms. Every form is associated with a definite ideal $\mathfrak{m}$, and we have $N(F)=N(\mathfrak{m})$ if $\mathfrak{m}$ is the content of F, and $N(\mathfrak{m})$ has the meaning already assigned to it. On the other hand, to a given ideal correspond an indefinite number of forms of which it is the content; for instance (§ 46, end) we can find forms $\alpha x+\beta y$ of which any given ideal is the content.

58. Now let $\omega_1, \omega_2, \dots \omega_n$ be a basis of $\mathfrak{o}$; $u_1, u_2, \dots u_n$ a set of indeterminates; and

$$\xi=\omega_1 u_1+\omega_2 u_2+\dots+\omega_n u_n:$$

ξ is called the *fundamental form* of Ω. It satisfies the equation $N(x-\xi)=0$, or

$$F(x)=x^n+U_1x^{n-1}+\dots+U_n=0$$

where $U_1, U_2, \dots U_n$ are rational polynomials in $u_1, u_2, \dots u_n$ with rational integral coefficients. This is called the fundamental equation.

Suppose now that p is a rational prime, and that $p=\mathfrak{p}^a\mathfrak{q}^b\mathfrak{r}^c\dots$ where $\mathfrak{p}, \mathfrak{q}, \mathfrak{r}, \dots$ &c., are the different ideal prime factors of p, then if $F(x)$ is the left-hand side of the fundamental equation there is an identical congruence

$$F(x)=\{P(x)\}^a\{Q(x)\}^b\{R(x)\}^c\dots(\text{mod } p)$$

where $P(x)$, $Q(x)$, &c., are prime functions with respect to $\mathfrak{p}$. The meaning of this is that if we expand the expression on the right-hand side of the congruence, the coefficient of every term $x^l u_1^m \dots u_n^t$ will be congruent, mod p, to the corresponding coefficient in $F(x)$. If f, g, h, &c., are the degrees of $\mathfrak{p}, \mathfrak{q}, \mathfrak{r}$, &c. (§ 47), then $f, g, h, \dots$ are the dimensions in $x, u_1, u_2, \dots u_n$ of the forms of P, Q, R, respectively. For every prime p, which is not a factor of Δ, $a=b=c=\dots=1$ and $F(x)$ is congruent to the product of a set of different prime factors, as many in number as there are different ideal prime factors of p. In particular, if p is a prime in Ω, $F(x)$ is a prime function (mod p) and conversely.

It generally happens that rational integral values $a_1, a_2, \dots a_n$ can be assigned to $u_1, u_2, \dots u_n$ such that U_n, the last term in the fundamental equation, then has a value which is prime to p. Supposing that this condition is satisfied, let $a_1\omega_1+a_2\omega_2+\dots+a_n\omega_n=\alpha$; and let $P_1(\alpha)$ be the result of putting $x=\alpha$, $u_i=a_i$ in $P(x)$. Then the ideal $\mathfrak{p}$ is completely determined as the greatest common divisor of p and $P_1(\alpha)$; and similarly for the other prime factors of p. There are, however, exceptional cases when the condition above stated is not satisfied.

59. *Cyclotomy.*—It follows from de Moivre's theorem that the arithmetical solution of the equation $x^m-1=0$ corresponds to the division of the circumference of a circle into m equal parts. The case when m is composite is easily made to depend on that where m is a power of a prime; if m is a power of 2, the solution is effected by a chain of quadratic equations, and it only remains to consider the case when $m=q^\kappa$, a power of an odd prime. It will be convenient to write $\mu=\phi(m)=q^{\kappa-1}(q-1)$; if we also put $r=e^{2\pi i/m}$, the *primitive* roots of $x^m=1$ will be μ in number, and represented by r, r^a, r^b, &c. where $1, a, b$, &c., form a complete set of prime residues to the modulus m. These will be the roots of an irreducible equation $f(x)=0$ of degree μ; the symbol $f(x)$ denoting $(x^m-1)\div(x^{m/q}-1)$. There are primitive roots of the congruence $x^\mu=1$ (mod m); let g be any one of these. Then if we put $r^{g^h}=r_h$, we obtain all the roots of $f(x)=0$ in a definite cyclical order $(r_1, r_2 \dots r_\mu)$; and the change of r into r^g produces a cyclical permutation of the roots. It follows from this that every cyclic polynomial in $r_1, r_2, \dots r_\mu$ with rational coefficients is equal to a rational number. Thus if we write $l+ag+bg^2+.+kg^{\mu-1}=n$, we have, in virtue of $r_k=r^{g^k}$, $r_1^a r_2^b \dots r_{\mu-1}^k r_\mu^l=r^n$, and, if we use S to denote cyclical summation, $S(r_1^a r_2^b \dots r_\mu^l)=r^n+r^{ng}+\dots+r^{ng^{\mu-1}}$, the sum of the nth powers of all the roots of $f(x)=0$, and this is a rational integer or zero. Since every cyclic polynomial is the sum of parts similar to $S(r_1^a r_2^b \dots r_\mu^l)$, the theorem is proved. Now let e, f be any two conjugate factors of μ, so that $ef=\mu$, and let

$$\eta_i=r_i+r_{i+e}+r_{i+2e}+\dots+r_{i+(f-1)e} \qquad (i=1, 2, \dots e)$$

then the elementary symmetric functions $\Sigma\eta_i$, $\Sigma\eta_i\eta^j$, &c., are cyclical functions of the roots of $f(x)=0$ and therefore have rational values which can be calculated: consequently $\eta_1, \eta_2, \dots \eta_e$, which are called the f-nomial periods, are the roots of an equation

$$F(\eta)=\eta^e+c_1\eta^{e-1}+\dots+c_e=0$$

with rational integral coefficients. This is irreducible, and defines a field of order e contained in the field defined by $f(x)=0$. Moreover, the change of r into r^g alters n_i into η_{i+1}, and we have the theorem that any cyclical function of $\eta_1, \eta_2, \dots n_e$ is rational. Now let h, k be any conjugate factors of f and put

$$z_i=r_i+r_{i+he}+r^i{}_{+2he}+\dots r^i{}_{+(f-h)e} \qquad (i=1, 2, 3,)$$

then $\zeta_1, \zeta_{1+e}, \zeta_{1+2e} \dots \zeta_{1+(h-1)e}$ will be the roots of an equation

$$G(\zeta)=\zeta^h-\eta_1\zeta^{h-1}+c_2\zeta^{h-2}+\dots+c_h=0,$$

the coefficients of which are expressible as rational polynomials in η_1. Dividing h into two conjugate factors, we can deduce from $G(\zeta)=0$ another period equation, the coefficients of which are rational polynomials in η_2, ζ_1, and so on. By choosing for e, h, &c., the successive prime factors of μ, ending up with 2, we obtain a set of equations of prime degree, each rational in the roots of the preceding equations, and the last having r_1 and r_1^{-1} for its roots. Thus to take a very interesting historical case, let $m=17$, so that $\mu=16=2^4$, the equations are all quadratics, and if we take 3 as the primitive roct of 17, they are

$$\eta^2+\eta-4=0, \qquad \zeta^2-\eta\zeta-1=0$$
$$2\lambda^2-2\zeta\lambda+(\eta\zeta-\eta+\zeta-3)=0, \quad \rho^2-\lambda\rho+1=0.$$

If two quantities (real or complex) a and b are represented in the usual way by points in a plane, the roots of $x^2+ax+b=0$ will be represented by two points which can be found by a Euclidean construction, that is to say, one requiring only the use of rule and compass. Hence a regular polygon of seventeen sides can be inscribed in a given circle by means of a Euclidean construction; a fact first discovered by Gauss, who also found the general law, which is that a regular polygon of m sides can be inscribed in a circle by Euclidean construction if and only if $\phi(m)$ is a power of 2; in other words $m=2^\kappa P$ where P is a product of different odd primes, each of which is of the form 2^n+1.

Returning to the case $m=q^k$, we shall call the chain of equations $F(\eta)=0$, &c., when each is of prime degree, a set of Galoisian auxiliaries. We can find different sets, because in forming them we can take the prime factors of μ in any order we like; but their number is always the same, and their degrees always form the same aggregate, namely, the prime factors of μ. No other chain of auxiliaries having similar properties can be formed containing fewer equations of a given prime degree p; a fact first stated by Gauss, to whom this theory is mainly due. Thus if $m=q^\kappa$ we must have at least $(\kappa-1)$ auxiliaries of order q, and if $q-1=2^\alpha p^\beta \dots$, we must also have α quadratics, β equations of order p, and so on. For this reason a set of Galoisian auxiliaries may be regarded as providing the simplest solution of the equation $f(x)=0$.

60. When m is an odd prime p, there is another very interesting way of solving the equation $(x^p-1)\div(x-1)=0$. As before let $(r_1, r_2, \dots r_{p-1})$ be its roots arranged in a cycle by means of a primitive root of $x^{p-1}\equiv 1$ (mod p); and let ϵ be a primitive root of $\epsilon^{p-1}=1$. Also let

$$\theta_1=r_1+\epsilon r_2+\epsilon^2 r_3+\dots+\epsilon^{p-2}r_{p-1}$$
$$\theta_k=r_1+\epsilon^k r_2+\epsilon^{2k}r_3+\dots+\epsilon^{-k}r_{p-1} \qquad (k=2, 3, \dots p-2)$$

so that θ_k is derived from θ_1 by changing ϵ into ϵ^k.

The cyclical permutation $(r_1, r_2, \dots r_{p-1})$ applied to θ_k converts it into $\epsilon^{-k}\theta_k$; hence $\theta_1\theta_k/\theta_{k+1}$ is unaltered, and may be expressed as a rational, and therefore as an integral function of ϵ. It is found by calculation that we may put

$$\psi_k(\epsilon)=\frac{\theta_1\theta_k}{\theta_{k+1}}=\sum_{m=2}^{m=p+1}\epsilon^{\text{ind } m+k \text{ ind}(p+1-m)} \qquad [k=1, 2, \dots (p-3)]$$

while

$$\theta_1\theta_{p-2}=-p.$$

In the exponents of $\psi_k(\epsilon)$ the indices are taken to the base g used to establish the cyclical order $(r_1, r_2 \dots r_{p-1})$. Multiplying together the $(p-2)$ preceding equalities, the result is

$$\theta_1^{p-1}=-p\psi_1(\epsilon)\psi_2(\epsilon)\dots\psi_{p-3}(\epsilon)=R(\epsilon)$$

where $R(\epsilon)$ is a rational integral function of ϵ the degree of which, in its reduced form, is less than $\phi(p-1)$. Let ρ be any one definite root of $x^{p-1}=R(\epsilon)$, and put $\theta_1=\rho$: then since

$$\frac{\theta_1{}^k}{\theta_k}=\psi_1\psi_2\dots\psi_{k-1}$$

we must take $\theta_k=\rho^k/\psi_1\psi_2\dots\psi_{k-1}=R_k(\epsilon)\rho^k$, where $R_k(\epsilon)$ is a rational function of ϵ, which we may suppose put into its reduced integral form; and finally, by addition of the equations which define θ_1, θ_2, &c.,

$$(p-1)r_1=\rho+R_2(\epsilon)\rho^2+R_3(\epsilon)\rho^3+\dots+R_{p-2}(\epsilon)\rho^{p-2}.$$

If in this formula we change ρ into $\epsilon^{-h}\rho$, and r_1 into r_{h+1}, it still remains true.

It will be observed that this second mode of solution employs a Lagrangian resolvent θ_1; considered merely as a solution it is neither so direct nor so fundamental as that of Gauss. But the form of the solution is very interesting; and the auxiliary numbers $\psi(\epsilon)$ have many curious properties, which have been investigated by Jacobi, Cauchy and Kronecker.

61. When $m=q^\kappa$, the discriminant of the corresponding cyclotomic field is $\pm q^\lambda$, where $\lambda=q^{\kappa-1}(\kappa q-\kappa-1)$. The prime q is equal to $\mathfrak{q}^\mu$, where $\mu=\phi(m)=q^{\kappa-1}(q-1)$, and $\mathfrak{q}$ is a prime ideal of the first degree. If p is any rational prime distinct from g, and f the least exponent such that $p^f\equiv 1$ (mod. m), f will be a factor of μ, and putting $\mu/f=e$, we have $p=\mathfrak{p}_1\mathfrak{p}_2\dots\mathfrak{p}_e$, where $\mathfrak{p}_1, \mathfrak{p}_2 \dots \mathfrak{p}_e$ are different prime ideals each of the fth degree. There are similar theorems for the case when m is divisible by more than one rational prime.

Kummer has stated and proved laws of reciprocity for quadratic and higher residues in what are called regular fields, the definition of which is as follows. Let the field be $R(e^{2\pi i/p})$, where p is an odd prime; then this field is regular, and p is said to be a regular prime, when h, the number of ideal classes in the field, is not divisible by p. Kummer proved the very curious fact that p is regular if, and only if, it is not a factor of the denominators of the first $\frac{1}{2}(p-3)$ Bernoullian numbers. He also succeeded in showing that in the field $R(e^{2\pi i/p})$ the equation $\alpha^p+\beta^p+\gamma^p=0$ has no integral solutions whenever h is not divisible by p^2. What is known as the "last" theorem of Fermat is his assertion that if m is any natural number exceeding 2, the equation $x^m+y^m=z^m$ has no rational solutions, except the obvious ones for which $xyz=0$. It would be sufficient to prove Fermat's theorem for all prime values of m; and whenever Kummer's theorem last quoted applies, Fermat's theorem will hold. Fermat's theorem is true for all values of m such that $2<m<101$, but no complete proof of it has yet been obtained.

Hilbert has studied in considerable detail what he calls Kummer fields, which are obtained by taking x, a primitive pth root of unity, and y any root of $y^p-a=0$, where a is any number in the field $R(x)$ which is not a perfect pth power in that field. The Kummer field is then $R(x, y)$, consisting of all rational functions of x and y. Other fields that have been discussed more or less are general cubic fields, some special biquadratic and a few Abelian fields not cyclic.

Among the applications of cyclotomy may be mentioned the proof which it affords of the theorem, first proved by Dirichlet, that if m, n are any two rational integers prime to each other, the linear form $mx+n$ is capable of representing an infinite number of primes.

62. *Gauss's Sums.*—Let m be any positive real integer; then

$$\sum_{s=0}^{s=m-1} e^{2s^2\pi i/m}=\frac{i+i^{1-m}}{1+i}\sqrt{m}.$$

This remarkable formula, when m is prime, contains results which were first obtained by Gauss, and thence known as Gauss's sums. The easiest method of proof is Kronecker's, which consists in finding the value of $\int\{e^{2\pi iz^2/m}dz/(1-e^{2\pi iz})\}$, taken round an appropriate contour. It will be noticed that one result of the formula is that the square root of any integer can be expressed as a rational function of roots of unity.

The most important application of the formula is the deduction from it of the law of quadratic reciprocity for real primes: this was done by Gauss.

63. One example may be given of some remarkable formulae giving explicit solutions of representations of numbers by certain quadratic forms. Let p be any odd prime of the form $7n+2$; then we shall have $p=7n+2=x^2+7y^2$, where x is determined by the congruences

$$2x\equiv\frac{(3n)!}{(n)!\,(2n)!}(\text{mod } p);\quad x\equiv 3 \ (\text{mod } 7).$$

This formula was obtained by Eisenstein, who proved it by investigating properties of integers in the field generated by $\eta^3-21\eta-7=0$, which is a component of the field generated by seventh roots of unity. The first formula of this kind was given by Gauss, and relates to the case $p=4n+1=x^2+y^2$; he conceals its connexion with complex numbers. Probably there are many others which have not yet been stated.

64. *Higher Congruences. Functional Moduli.*—Suppose that p is a real prime, and that $f(x)$, $\phi(x)$ are polynomials in x with rational integral coefficients. The congruence $f(x)\equiv\phi(x)$ (mod p) is identical when each coefficient of f is congruent, mod p, to the corresponding coefficient of ϕ. It will be convenient to write, under these circumstances, $f\sim\phi$(mod p) and to say that f, ϕ are equivalent, mod p. Every polynomial of degree h is equivalent to another of equal or lower degree, which has none of its coefficients negative, and each of them less than p. Such a polynomial, with unity for the coefficient of the highest power of x contained in it, may be called a reduced polynomial with respect to p. There are, in all, p^h reduced polynomials of degree h. A polynomial may or may not be equivalent to the product of two others of lower degree than itself; in the latter case it is said to be prime. In every case, F being any polynomial, there is an equivalence $F\sim cf_1f_2\dots f_l$ where c is an integer and $f_1, f_2,\dots f_l$ are prime functions; this resolution is unique. Moreover, it follows from Fermat's theorem that $\{F(x)\}^p\sim F(x^p)$, $\{F(x)\}^{p^2}\sim F(x^{p^2})$, and so on.

As in the case of equations, it may be proved that, *when the modulus is prime*, a congruence $f(x)\equiv 0$ (mod p) cannot have more incongruent roots than the index of the highest power of x in $f(x)$, and that if $x\equiv\xi$ is a solution, $f(x)\sim(x-\xi)f_1(x)$, where $f_1(x)$ is another polynomial. The solutions of $x^p\equiv x$ are all the residues of p; hence $x^p-x\sim x(x+1)(x+2)\dots(x+p-1)$, where the right-hand expression is the product of all the linear functions which are prime to p. A generalization of this is contained in the formula

$$x(x^{p^m-1}-1)\sim\Pi f(x) \ (\text{mod } p)$$

where the product includes every prime function $f(x)$ of which the degree is a factor of m. By a process similar to that employed in finding the equation satisfied by primitive mth roots of unity, we can find an expression for the product of all prime functions of a given degree m, and prove that their number is $(m>1)$

$$\frac{1}{m}(p^m-\Sigma p^{m/a}+\Sigma p^{m/ab}-\dots)$$

where $a, b, c\dots$ are the different prime factors of m. Moreover, if F is any given function, we can find a resolution

$$F\sim cF_1F_2\dots F_m(\text{mod } p)$$

where c is numerical, F_1 is the product of all prime linear functions which divide F, F_2 is the product of all the prime quadratic factors, and so on.

65. By the functional congruence $\phi(x)\equiv\psi(x)$ (mod $p, f(x)$) is meant that polynomials U, V can be found such that $\phi(x)=\psi(x)+pU+Vf(x)$ identically. We might also write $\phi(x)\sim\psi(x)$ (mod $p, f(x)$); but this is not so necessary here as in the preceding case of a simple modulus. Let m be the degree of $f(x)$; without loss of generality we may suppose that the coefficient of x^m is unity, and it will be further assumed that $f(x)$ is a prime function, mod p. Whatever the dimensions of $\phi(x)$, there will be definite functions $\chi(x)$, $\phi_1(x)$ such that $\phi(x)=f(x)\chi(x)+\phi_1(x)$ where $\phi_1(x)$ is of lower dimension than $f(x)$; moreover, we may suppose $\phi_1(x)$ replaced by the equivalent reduced function $\phi_2(x)$ mod p. Finally then, $\phi\equiv\phi_2$ (mod $p, f(x)$) where ϕ_2 is a reduced function, mod p, of order not greater than $(m-1)$. If we put $p^m=n$, there will be in all (including zero) n residues to the compound modulus (p, f): let us denote these by $R_1, R_2,\dots R_n$. Then (cf. § 28) if we reject the one zero residue (R_n, suppose) and take any function ϕ of which the residue is not zero, the residues of ϕR_1, ϕR_2, $\dots\phi R_{n-1}$ will all be different, and we conclude that $\phi^{n-1}\equiv 1$ (mod p, f). Every function therefore satisfies $\phi^n\sim\phi$ (mod p, f); by putting $\phi=x$ we obtain the principal theorem stated in § 64.

A still more comprehensive theory of compound moduli is due to Kronecker; it will be sufficiently illustrated by a particular case. Let m be a fixed natural number; X, Y, Z, T assigned polynomials, with rational integral coefficients, in the independent variables x, y, z; and let U be any polynomial of the same nature as X, Y, Z, T. We may write $U\sim 0$ (mod m, X, Y, Z, T) to express the fact that there are integral polynomials M, X′, Y′, Z′, T′ such that

$$U=mM+X'X+Y'Y+Z'Z+T'T$$

identically. In this notation $U\sim V$ means that $U-V\sim 0$. The number of independent variables and the number of functions in the modulus are unrestricted; there may be no number m in the modulus, and there need not be more than one. This theory of Kronecker's is admirably adapted for the discussion of all algebraic problems of an arithmetical character, and is certain to attain a high degree of development.

It is worth mentioning that one of Gauss's proofs of the law of quadratic reciprocity (*Gött. Nachr.* 1818) involves the principle of a compound modulus.

66. *Forms of Higher Degree.*—Except for the case alluded to at the end of § 55, the theory of forms of the third and higher degree is still quite fragmentary. C. Jordan has proved that the class number is finite. H. Poincaré has discussed the classification of ternary and quaternary cubics. With regard to the ternary cubic it is known that from any rational solution of $f=0$ we can deduce another by a process which is equivalent to finding the tangential of a point (x_1, y_1, z_1) on the curve, that is, the point where the tangent at (x_1, y_1, z_1) meets the curve again. We thus obtain a series of solutions (x_1, y_1, z_1), (x_2, y_2, z_2), &c., which may or may not be periodic. E. Lucas and J. J. Sylvester have proved that for certain cubics $f=0$ has no rational solutions; for instance $x^3+y^3-Az^3=0$ has rational solutions only if $A=ab(a+b)/c^3$, where a, b, c are rational integers. Waring asserted that every natural number can be expressed as the sum of not more than 9 cubes, and also as the sum of not more than 19 fourth powers; these propositions have been neither proved nor disproved.

67. *Results derived from Elliptic and Theta Functions.*—For the sake of reference it will be convenient to give the expressions for the four Jacobian theta functions. Let ω be any complex quantity such that the real part of $i\omega$ is negative; and let $q=e^{\pi i\omega}$. Then

$$\theta_{00}(v)=\sum_{-\infty}^{+\infty} q^{s^2}e^{2s\pi iv}=1+2q\cos 2\pi v+2q^4\cos 4\pi v+2q^9\cos 6\pi v+\dots$$
$$=\prod_1^{\infty}(1-q^{2s})(1+2q^{2s-1}\cos 2\pi v+q^{4s-2}),$$

$$\theta_{01}(v)=1-2q\cos 2\pi v+2q^4\cos 4\pi v-2q^9\cos 6\pi v+\dots$$
$$=\prod_1^{\infty}(1-q^{2s})(1-2q^{2s-1}\cos 2\pi v+q^{4s-2}),$$

$$\theta_{10}(v)=2q^{\frac{1}{4}}\cos\pi v+2q^{\frac{9}{4}}\cos 3\pi v+2q^{\frac{25}{4}}\cos 5\pi v+\dots$$
$$=2q^{\frac{1}{4}}\cos\pi v\prod_1^{\infty}(1-q^{2s})(1+2q^{2s}\cos 2\pi v+q^{4s}),$$

$$\theta_{11}(v)=2q^{\frac{1}{4}}\sin\pi v-2q^{\frac{9}{4}}\sin 3\pi v+2q^{\frac{25}{4}}\sin 5\pi v-\dots$$
$$=2q^{\frac{1}{4}}\sin\pi v\prod_1^{\infty}(1-q^{2s})(1-2q^{2s}\cos 2\pi v+q^{4s}).$$

Instead of $\theta_{00}(0)$, &c., we write θ_{00}, &c. Clearly $\theta_{11}=0$; we have the important identities

$$\theta_{11}'=\pi\theta_{00}\theta_{10}\theta_{01}\qquad\theta_{00}^4=\theta_{01}^4+\theta_{10}^4$$

where θ_{11}' means the value of $d\theta_{11}(v)/dv$ for $v=0$. If, now, we put

$$\sqrt{\kappa}=\frac{\theta_{10}}{\theta_{00}},\quad\sqrt{\kappa'}=\frac{\theta_{01}}{\theta_{00}},\quad u=\pi\theta_{00}^2v,$$

so that $\kappa^2+\kappa'^2=1$, we shall have

$$\frac{\theta_{11}(v)}{\theta_{01}(v)}=\sqrt{\kappa}\cdot\operatorname{sn} u,\ \frac{\theta_{10}(v)}{\theta_{01}(v)}=\sqrt{\frac{\kappa}{\kappa'}}\cdot\operatorname{cn} u,\ \frac{\theta_{00}(v)}{\theta_{01}(v)}=\frac{1}{\sqrt{\kappa'}}\cdot\operatorname{dn} u,$$

and, supposing for simplicity that $i\omega$ is a real negative quantity,

$$\pi\theta_{00}{}^2=2\mathrm{K},\quad \omega\pi\theta_{00}{}^2=2i\mathrm{K}',\quad \omega=i\mathrm{K}'/\mathrm{K},$$

the notation being that which is now usual for the elliptic functions. It is found that

$$\frac{\kappa\mathrm{K}}{\pi}\operatorname{sn}2\mathrm{K}u=2\sum_1^\infty\frac{q^{s-\frac{1}{2}}}{1-q^{2s-1}}\sin(2s-1)\pi u,$$

$$\frac{\kappa\mathrm{K}}{\pi}\operatorname{cn}2\mathrm{K}u=2\sum_1^\infty\frac{q^{s-\frac{1}{2}}}{1-q^{2s-1}}\cos(2s-1)\pi u,$$

$$\frac{\mathrm{K}}{\pi}\operatorname{dn}2\mathrm{K}u=\tfrac{1}{2}+2\sum_1^\infty\frac{q^s}{1+q^{2s}}\cos 2s\pi u.$$

From the last formula, by putting $u=0$, we obtain

$$1+4\sum_1^\infty\frac{q^s}{1+q^{2s}}=\frac{2\mathrm{K}}{\pi}=\theta_{00}{}^2(1+2q+2q^4+2q^9+\ldots)^2,$$

and hence, by expanding both sides in ascending powers of q, and equating the coefficients of q^n, we arrive at a formula for the number of ways of expressing n as the sum of two squares. If δ is any odd divisor of n, including 1 and n itself if n is odd, we find as the coefficient of q^n in the expansion of the left-hand side $4\Sigma(-1)^{\frac{1}{2}(\delta-1)}$; on the right-hand side the coefficient enumerates all the solutions $n=(\pm x)^2+(\pm y)^2$, taking account of the different signs (except for 0^2) and of the order in which the terms are written (except when $x^2=y^2$). Thus if n is an odd prime of the form $4k+1$, $\Sigma(-1)^{\frac{1}{2}(\delta-1)}=2$, and the coefficient of q^n is 8, which is right, because the one possible composition $n=a^2+b^2$ may be written $n=(\pm a)^2+(\pm b)^2=(\pm b)^2+(\pm a)^2$, giving eight representations.

By methods of a similar character formulae can be found for the number of representations of a number as the sum of 4, 6, 8 squares respectively. The four-square theorem has been stated in § 41; the eight-square theorem is that the number of representations of a number as the sum of eight squares is sixteen times the sum of the cubes of its factors, if the given number is odd, while for an even number it is sixteen times the excess of the cubes of the even factors above the cubes of the odd factors. The five-square and seven-square theorems have not been derived from q-series, but from the general theory of quadratic forms.

68. Still more remarkable results are deducible from the theory of the transformation of the theta functions. The elementary formulae are

$$\theta_{11}(u,\omega+1)=e^{\pi i/4}\theta_{11}(u,\omega),\quad \theta_{10}(u,\omega+1)=e^{\pi i/4}\theta_{10}(u,\omega),$$

$$\theta_{01}(u,\omega+1)=\theta_{00}(u,\omega),\quad \theta_{00}(u,\omega+1)=\theta_{01}(u,\omega),$$

$$e^{-\pi iu^2/\omega}\theta_{11}\left(\frac{u}{\omega},\ -\frac{1}{\omega}\right)=-i\sqrt{-i\omega}\,\theta_{11}(u,\omega),$$

$$e^{-\pi iu^2/\omega}\theta_{10}\left(\frac{u}{\omega},\ -\frac{1}{\omega}\right)=\sqrt{-i\omega}\,\theta_{10}(u,\omega),$$

$$e^{-\pi iu^2/\omega}\theta_{10}\left(\frac{u}{\omega},\ -\frac{1}{\omega}\right)=\sqrt{-i\omega}\,\theta_{01}(u,\omega),$$

$$e^{-\pi iu^2/\omega}\theta_{00}\left(\frac{u}{\omega},\ -\frac{1}{\omega}\right)=\sqrt{-i\omega}\,\theta_{00}(u,\omega),$$

where $\sqrt{-i\omega}$ is to be taken in such a way that its real part is positive. Taking the definition of κ given in § 67, and considering κ as a function of ω, we find

$$\kappa(\omega+1)=i\theta_{10}{}^2/\theta_{01}{}^2=i\kappa(\omega)/\kappa'(\omega),$$

$$\kappa\left(-\frac{1}{\omega}\right)=\theta_{01}{}^2/\theta_{00}{}^2=\kappa'(\omega).$$

For convenience let $\kappa^2(\omega)=\sigma$: then the substitutions $(\omega,\omega+1)$ and $(\omega,-\omega^{-1})$ convert σ into $\sigma/(\sigma-1)$ and $(1-\sigma)$ respectively. Now if α, β, γ, δ are any real integers such that $\alpha\delta-\beta\gamma=1$, the substitution $[\omega,(\alpha\omega+\beta)/(\gamma\omega+\delta)]$ can be compounded of $(\omega,\omega+1)$ and $(\omega,-\omega^{-1})$; the effect on σ will be the same as if we apply a corresponding substitution compounded of $[\sigma,\ \sigma/(\sigma-1)]$ and $[\sigma,\ 1-\sigma]$. But these are periodic and of order 3, 2 respectively]; therefore we cannot get more than six values of σ, namely

$$\sigma,\ 1-\sigma,\ \frac{\sigma}{\sigma-1},\ \frac{1}{1-\sigma},\ \frac{\sigma-1}{\sigma},\ \frac{1}{\sigma},$$

and any symmetrical function of these will have the same value at any two equivalent places in the modular dissection (§ 33). Their sum is constant, but the sum of their squares may be put into the form

$$\frac{2(\sigma^2-\sigma+1)^3}{\sigma^2(\sigma-1)^2}-3;$$

hence $(\sigma^2-\sigma+1)^3\div\sigma^2(\sigma-1)^2$ has the same value at equivalent places. F. Klein writes

$$\mathrm{J}=\frac{4(\sigma^2-\sigma+1)^3}{27\sigma^2(\sigma-1)^2};$$

this is a transcendental function of ω, which is a special case of a Fuchsian or automorphic function. It is an analytical function of q^2, and may be expanded in the form

$$\mathrm{J}=\frac{1}{1728}\{q^{-2}+744+c_1q^2+c_2q^4+\ldots\}$$

where c_1, c_2, &c., are rational integers.

69. Suppose, now, that a, b, c, d are rational integers, such that $\mathrm{dv}(a,b,c,d)=1$ and $ad-bc=n$, a positive integer. Let $(a\omega+b)/(c\omega+d)=\omega'$; then the equation $\mathrm{J}(\omega')=\mathrm{J}(\omega)$ is satisfied if and only if $\omega'\sim\omega$, that is, if there are integers $\alpha,\beta,\gamma,\delta$ such that $\alpha\delta-\beta\gamma=1$, and

$$(a\omega+b)(\gamma\omega+\delta)-(c\omega+d)(\alpha\omega+\beta)=0.$$

If we write $\psi(n)=n\Pi(1+p^{-1})$, where the product extends to all prime factors (p) of n, it is found that the values of ω fall into $\psi(n)$ equivalent sets, so that when ω is given there are not more than $\psi(n)$ different values of $\mathrm{J}(\omega')$. Putting $\mathrm{J}(\omega')=\mathrm{J}'$, $\mathrm{J}(\omega)=\mathrm{J}$, we have a modular equation

$$f_1(\mathrm{J}',\mathrm{J})=0$$

symmetrical in J, J′, with integral coefficients and of degree $\psi(n)$. Similarly when $\mathrm{dv}(a,b,c,d)=\tau$ we have an equation $f_\tau(\mathrm{J}',\mathrm{J})=0$ of order $\psi(n/\tau^2)$; hence the complete modular equation for transformations of the nth order is

$$\mathrm{F}(\mathrm{J}',\mathrm{J})=\Pi f_\tau(\mathrm{J}',\mathrm{J})=0,$$

the degree of which is $\Phi(n)$, the sum of the divisors of n.

Now if in $\mathrm{F}(\mathrm{J}',\mathrm{J})$ we put $\mathrm{J}'=\mathrm{J}$, the result is a polynomial in J alone, which we may call G(J). To every linear factor of G corresponds a class of quadratic forms of determinant (κ^2-4n) where $\kappa^2<4n$ and κ is an integer or zero: conversely from every such form we can derive a linear factor $(\mathrm{J}-\alpha)$ of G. Moreover, if with each form we associate its weight (§ 41) we find that with the notation of § 39 the degree of G is precisely $\Sigma\mathrm{H}(4n-\kappa^2)-\epsilon_n$, where $\epsilon_n=1$ when n is a square, and is zero in other cases. But this degree may be found in another way as follows. A complete representative set of transformations of order n is given by $\omega'=(a\omega+b)/d$, with $ad=n$, $0\leqq b<d$; hence

$$\mathrm{G(J)}=\Pi\left\{\mathrm{J}(\omega)-\mathrm{J}\left(\frac{a\omega+b}{d}\right)\right\},$$

and by substituting for $\mathrm{J}(\omega)$ and $\mathrm{J}\left(\frac{a\omega+b}{d}\right)$ their values in terms of q, we find that the lowest term in the factor expressed above is either $q^{-2}/1728$ or $q^{-2a/d}/1728$, or a constant, according as $a<d$, $a>d$ or $a=d$. Hence if ν is the order of G(J), so that its expansion in q begins with a term in $q^{-2\nu}$ we must have

$$\nu=\sum_{d>\sqrt{n}}(1\cdot d)+\sum_{d>\sqrt{n}}\left(\frac{a}{d}\cdot d\right)=\sum_{d>\sqrt{n}}d+\sum_{a>\sqrt{n}}a$$
$$=2\Sigma d$$

extending to all divisors of n which exceed $\sqrt{n}$. Comparing this with the other value, we have

$$\sum_{\kappa}\mathrm{H}(4n-\kappa^2)=2\sum_{d>\sqrt{n}}d+\epsilon_n=\Phi(n)+\Psi(n),$$

as stated in § 39.

70. Each of the singular moduli which are the roots of $\mathrm{G(J)}=0$ corresponds to exactly one primitive class of definite quadratic forms, and conversely.

Corresponding to every given negative determinant $-\Delta$ there is an irreducible equation $\psi(j)=0$, where $j=1728\mathrm{J}$, the coefficients of which are rational integers, and the degree of which is $h(-\Delta)$. The coefficient of the highest power of j is unity, so that j is an arithmetical integer, and its conjugate values belong one to each primitive class of determinant $-\Delta$. By adjoining the square roots of the prime factors of Δ the function $\psi(j)$ may be resolved into the product of as many factors as there are genera of primitive classes, and the degree of each factor is equal to the number of classes in each genus. In particular, if $\{1,\ 1,\ \frac{1}{4}(\Delta+1)\}$ is the only reduced form for the determinant $-\Delta$, the value of j is a real negative rational cube. At the same time its approximate value is $\exp\left[-2\pi i\cdot\frac{1+i\sqrt{\Delta}}{2}\right]+744=744-e^{\pi\sqrt{\Delta}}$, so that, approximately, $e^{\pi\sqrt{\Delta}}=m^3+744$ where m is a rational integer. For instance $e^{\pi\sqrt{43}}=884736743{\cdot}9997775\ldots=960^3+744$ very nearly, and for the class (1, 1, 11) the exact value of j is -960^3. Four and only four other similar determinants are known to exist, namely -11, -19, -67, -163, although thousands have been classified. According to Hermite the decimal part of $e^{\pi\sqrt{163}}$ begins with twelve nines; in this case Weber has shown that the exact value of j is $-2^{18}\cdot3^3\cdot5^3\cdot23^3\cdot29^3$.

71. The function $j(\omega)$ is the most fundamental of a set of quantities called *class-invariants*. Let (a,b,c) be the representative of any class of definite quadratic forms, and let ω be the root of $ax^2+bx+c=0$ which has a positive imaginary part; then $\mathrm{F}(\omega)$ is said to be a class-invariant for (a,b,c) if $\mathrm{F}\left(\frac{\alpha\omega+\beta}{\gamma\omega+\delta}\right)=\mathrm{F}(\omega)$ for all real integers α, β, γ, δ such that $\alpha\delta-\beta\gamma=1$. This is true for $j(\omega)$ whatever ω may be, and it is for this reason that j is so fundamental. But, as will be seen from the above examples, the value of j soon becomes so large that its calculation is impracticable. Moreover, there is the difficulty of constructing the modular equation $f_1(\mathrm{J},\mathrm{J}')=0$ (§69), which

has only been done in the cases when $n=2, 3$ (the latter by Smith in *Proc. Lond. Math. Soc.* ix. p. 242).

For moderate values of Δ the difficulty can generally be removed by constructing algebraic functions of j. Suppose we have an irreducible equation

$$x^m+c_1x^{m-1}+ \dots +c_m=0,$$

the coefficients of which are rational functions of $j(\omega)$. If we apply any modular substitution $\omega'=S(\omega)$, this leaves the equation unaltered, and consequently only permutates the roots among themselves: thus if $x_1(\omega)$ is any definite root we shall have $x_1(\omega')=x_i(\omega)$, where i may or may not be equal to 1. The group of unitary substitutions which leave all the roots unaltered is a factor of the complete modular group. If we put $y=x(n\omega)$, y will satisfy an equation similar to that which defines x, with j' written for j; hence, since j, j' are connected by the equation $f_1(j, j')=0$, there will be an equation $\psi(x, y)=0$ satisfied by x and y. By suitably choosing x we can in many cases find $\psi(x, y)$ without knowing $f_1(j, j')$; and then the equation $\psi(x, x)=0$ defines a set of singular moduli, each one of which belongs to a certain value of ω and all the quantities derived from it by the substitutions which leave $x(\omega)$ unaltered.

As one of the simplest examples, let $n=2$, $x^3-j(\omega)=y^3-j(\omega')=0$. Then the equation connecting x, y in its complete form is of the ninth degree in each variable; but it can be proved that it has a rational factor, namely

$$y^3-x^2y^2+495xy+x^3-2^4 . 3^3 . 5^3=0,$$

and if in this we put $x=y=u$, the result is

$$u^4-2u^3-495u^2+2^4.3^3.5^3=0,$$

the roots of which are 12, 20, −15, −15. It remains to find the values of ω, to which they belong. Writing $\gamma_2(\omega)=\sqrt[3]{j}$, it is found that we may define γ_2 in such a way that $\gamma_2(\omega+1)=e^{-2\pi i/3}\gamma_2(\omega)$, $\gamma_2(-\omega^{-1})=\gamma_2(\omega)$, whence it is found that

$$\gamma_2\left(\frac{\alpha\omega+\beta}{\gamma\omega+\delta}\right)=e^{-\frac{2\pi i}{3}(\gamma\delta+\gamma\alpha+\beta\delta-\beta\delta\gamma^2)}\gamma_2(\omega).$$

We shall therefore have $\gamma_2(2\omega)=\gamma_2(\omega)$ for all values of such that

$$2\omega=\frac{\alpha\omega+\beta}{\gamma\omega+\delta},\ \alpha\delta-\beta\gamma=1,\ \gamma\delta+\gamma\alpha+\beta\delta-\beta\delta\gamma^2\equiv 0 \pmod 3.$$

Putting $(\alpha, \beta, \gamma, \delta)=(0, -1, 1, 0)$ the conditions are satisfied, and $2\omega=i\sqrt{2}$. Now $j(i)=1728$, so that $\gamma_2(i)=12$; and since $j(\omega)$ is positive for a pure imaginary, $\gamma_2(i\sqrt{2})=20$. The remaining case is settled by putting

$$\frac{\omega}{2}=\frac{\alpha\omega+\beta}{\gamma\omega+\delta},$$

with $\alpha, \beta, \gamma, \delta$ satisfying the same conditions as before. One solution is $(-1, 2, 1, 1)$ and hence $\omega^2+3\omega+4=0$, so that $\gamma_2\left(\frac{-3+i\sqrt{7}}{2}\right)=-15$.

Besides γ_2, other irrational invariants which have been used with effect are $\gamma_3=\sqrt{(j-1728)}$, the moduli κ, κ', their square and fourth roots, the functions f, f_1, f_2 defined by

$$f=2^{\frac{1}{6}}(\kappa\kappa')^{-\frac{1}{12}},\ f_1=\sqrt[4]{\kappa'}.f,\ f_2=\sqrt[4]{\kappa}.f,$$

and the function $\eta(n\omega)/\eta(\omega)$ where $\eta(\omega)$ is defined by

$$\eta(\omega)=q^{\frac{1}{12}}\sum_{-\infty}^{+\infty}(-1)^s q^{3s^2+s}=\frac{1}{\sqrt{3}}\theta_{11}\left(\frac{2}{3}, \frac{\omega}{3}\right)=q^{\frac{1}{12}}\prod_{1}^{\infty}(1-q^{2s}).$$

72. Another powerful method, developed by C. F. Klein and K. E. R. Fricke, proceeds by discussing the deficiency of $f_1(j, j')=0$ considered as representing a curve. If this deficiency is zero, j and j' may be expressed as rational functions of the same parameter, and this replaces the modular equation in the most convenient manner. For instance, when $n=7$, we may put

$$j=\frac{(\tau^2+13\tau+49)(\tau^2+5\tau+1)^3}{\tau}=\phi(\tau),\ j'=\phi(\tau'),$$

$$\tau\tau'=49.$$

The corresponding singular moduli are found by solving $\phi(\tau)=\phi(\tau')$. For deficiency 1 we may find in a similar way two auxiliary functions x, y connected by some simple equation $\psi(x, y)=0$ not exceeding the fourth degree, and such that j, j' are each rational functions of x and y.

Hurwitz has extended this field of research almost indefinitely, not only by generalising the formulae for class-number sums, such as that in § 69, but also by bringing the modular-function theory into connexion with that of algebraic correspondence and Abelian integrals. A comparatively simple example may help to indicate the nature of these researches. From the formulae given at the beginning of § 67, we can deduce, by actual multiplication of the corresponding series,

$$\frac{1}{\pi}\theta'_{11}\theta_{00}=\theta^2_{00}\theta_{01}\theta_{10}=\sum_{-\infty}^{+\infty}\left(\frac{-1}{\xi}\right)|\xi|q^{\xi^2/4}\times\sum_{-\infty}^{+\infty}q^{\eta^2}\quad\left[\begin{matrix}\xi=\pm1, \pm3, \dots ;\\ \eta=0, \ \pm1, \ \pm2, \dots\end{matrix}\right.$$

$$=\Sigma\chi(m)q^{m/4}\qquad[m=1, 5, 9, \dots$$

where

$$\chi(m)=\Sigma\left(\frac{-1}{\xi}\right)|\xi|$$

extended over all the representations $m=\xi^2+4\eta^2$. In a similar way

$$\frac{1}{\pi}\theta'_{11}\theta_{10}=\theta_{00}\theta_{10}{}^2\theta_{01}=2\Sigma(-1)^{\frac{1}{4}(m-1)}\chi(m)q^{m/2}$$

$$\frac{1}{\pi}\theta'_{11}\theta_{01}=\theta_{00}\theta_{10}\theta_{01}{}^2=\Sigma(-1)^{\frac{1}{4}(m-1)}\chi(m)q^{m/4}$$

If, now, we write

$$j_1(\omega)=\Sigma\frac{(-1)^{\frac{1}{4}(m-1)}\chi(m)}{m}q^{m/2},\quad j_2(\omega)=2\Sigma\frac{(-1)^{\frac{1}{4}(m-1)}\chi(m)}{m}q^{m/4},$$

$$j_3(\omega)=2\Sigma\frac{\chi(m)}{m}q^{m/4}$$

we shall have

$$dj_1:dj_2:dj_3=\theta_{10}:\theta_{01}:\theta_{00}$$

where θ_{10}, θ_{01}, θ_{00}, are connected by the relation (§ 67)

$$\theta_{10}{}^4+\theta_{01}{}^4-\theta_{00}{}^4=0$$

which represents, in homogeneous co-ordinates, a quartic curve of deficiency 3. For this curve, or any equivalent algebraic figure, $j_1(\omega)$, $j_2(\omega)$ and $j_3(\omega)$ supply an independent set of Abelian integrals of the first kind. If we put $x=\sqrt{\kappa}$, $y=\sqrt{\kappa'}$, it is found that

$$\int\frac{dx}{y^3}=\tfrac{1}{2}j_3(\omega),\quad \int\frac{dx}{y^2}=\tfrac{1}{2}j_2(\omega),\quad \int\frac{xdx}{y^3}=\tfrac{1}{2}j_1(\omega),$$

so that the integrals which the algebraic theory gives in connexion with $x^4+y^4-1=0$ are directly identified with $j_1(\omega)$, $j_2(\omega)$, $j_3(\omega)$, provided that we put $x=\sqrt{\kappa(\omega)}$.

Other functions occur in this theory analogous to $j_1(\omega)$, but such that in the q-series which are the expansions of them the coefficients and exponents depend on representations of numbers by quaternary quadratic forms.

73. In the *Berliner Sitzungsberichte* for the period 1883–1890, L. Kronecker published a very important series of articles on elliptic functions, which contain many arithmetical results of extreme elegance; some of these Kronecker had announced without proof many years before. A few will be quoted here, without any attempt at demonstration; but in order to understand them, it will be necessary to bear in mind two definitions. The first relates to the Legendre-Jacobi symbol $\left(\frac{a}{b}\right)$. If a, b have a common factor we put $\left(\frac{a}{b}\right)=0$; while if a is odd and $b=2^hc$, where c is odd, we put $\left(\frac{a}{b}\right)=\left(\frac{2^h}{a}\right)\left(\frac{a}{c}\right)$. The other definition relates to the classification of discriminants of quadratic forms. If D is any number that can be such a discriminant, we must have $D\equiv 0$ or 1 (mod. 4), and in every case we can write $D=D_0Q^2$, where Q^2 is a square factor of D, and D_0 satisfies one of the following conditions, in which P denotes a product of different odd primes:—

$D_0=P$, with $P\equiv 1 \pmod 4$
$D_0=4P$, $P\equiv -1 \pmod 4$
$D_0=8P$, $P\not\equiv \pm 1 \pmod 4$

Numbers such as D_0 are called *fundamental discriminants*; every discriminant is uniquely expressible as the product of a fundamental discriminant and a positive integral square.

Now let D_1, D_2 be any two discriminants, then D_1D_2 is also a discriminant, and we may put $D_1D_2=D=D_0Q^2$, where D_0 is fundamental: this being done, we shall have

$$\tau\sum_{h=1}^{h=\infty}\sum_{k=1}^{k=\infty}\left(\frac{D_1Q^2}{h}\right)\left(\frac{D_2Q^2}{k}\right)F(hk)$$

$$=\tfrac{1}{2}\sum_{a,b,c}\left[\left(\frac{D_1}{}\right)+\left(\frac{D_2}{A}\right)\right]\sum_{m,n}\left(\frac{Q^2}{m}\right)F(am^2+bmn+cn^2)$$

where we are to take $h, k=1, 2, 3, \dots +\infty$; $m, n=0, \pm1, \pm2, \dots \pm\infty$ except that, if $D<0$, the case $m=n=0$ is excluded, and that, if $D>0$, $(2am+bn)T \ngeqq nU$ where (T, U) is the least positive solution of $T^2-DU^2=4$. The sum $\sum\limits_{a, b, c}$ applies to a system of representative primitive forms (a, b, c) for the determinant D, chosen so that a is prime to Q, and b, c are each divisible by all the prime factors of Q. A is any number prime to 2D and representable by (a, b, c); and finally $\tau=2, 4, 6, 1$ according as $D<-4$, $D=-4$, $D=-3$ or $D>0$. The function F is quite arbitrary, subject only to the conditions that $F(xy)=F(x)F(y)$, and that the sums on both sides are convergent. By putting $F(x)=x^{-1-\rho}$, where ρ is a real positive quantity, it can be deduced from the foregoing that, if D_2 is not a square, and if D_1 is different from 1,

$$\tau H(D_1Q^2)H(D_2Q^2)=\mathop{\mathrm{Lt}}_{\rho=0}\sum_{a, b, c}\left(\frac{D_1}{A}\right)\sum_{m,n}\left(\frac{Q^2}{m}\right)(am^2+bmn+cn^2)^{-1-\rho}$$

where the function $H(d)$ is defined as follows for any discriminant d:—

$$d=-\Delta<0 \qquad \tau H(d)=\frac{2\pi}{\sqrt{\Delta}}h(-\Delta)$$

$$d>0 \qquad H(d)=\frac{h(d)}{2\sqrt{d}}\log\frac{T+U\sqrt{d}}{T-U\sqrt{d}}$$

$h(d)$ meaning the number of primitive forms for the determinant d. This is a generalisation of a theorem due to Dirichlet.

There is another formula which, in a certain sense, is the generalisation of Gauss's sums (§ 62) in cyclotomy. Let $\psi(u, v)$ denote the function $\theta_{11}(u+v) \div \theta_{01}(u)\theta_{01}(v)$ and let D_1, D_2 be any two fundamental discriminants such that D_1D_2 is also fundamental and negative: then

$$\frac{\tau\theta'_{11}}{2\pi|\sqrt{D_1D_2}|} \sum_{s_1, s_2} \left(\frac{D_1}{s_1}\right) \left(\frac{D_2}{s_2}\right) \psi\left(\frac{2s_1}{|D_1|}, \frac{2s_2}{|D_2|}\right)$$

$$= \sum_{a, b, c} \left[\left(\frac{D_1}{A}\right) + \left(\frac{D_2}{A}\right) \right] \sum_{m, n} q^{\frac{1}{2}(am^2+bmn+cn^2)}$$

where, on the left-hand side, we are to sum for $s_i = 1, 2, 3 \ldots |D_i|$; and on the right we are to take a complete set of representative primitive forms (a, b, c) for the determinant D_1D_2, and give to m, n all positive and negative integral values such that $am^2+bmn+cn^2$ is odd. The quantity τ is 2, if $D_1D_2 < -4$, $\tau=4$ if $D_1D_2=-4$, $\tau=6$ if $D_1D_2=-3$. By putting $D_2=1$, we obtain, after some easy transformations,

$$\sum_{s=1}^{s=\Delta} \left(\frac{-\Delta}{s}\right) \operatorname{sn}\frac{4sK}{\Delta} = \frac{4\sqrt{\Delta}}{\tau\theta_{10}^2} \Sigma\Sigma q^{\frac{1}{2}(am^2+bmn+cn^2)},$$

which holds for any fundamental discriminant $-\Delta$. For instance, taking $\omega = iK'/K$, and $\Delta=3$, we have $\theta_{10}^2 = 2\kappa K/\pi$, and $\Sigma q^{\frac{1}{2}(m^2+mn+n^2)} = \frac{2\kappa K\sqrt{3}}{\pi}\operatorname{sn}\frac{4K}{3}$; a verification is afforded by making 2K approach the value π, in which case q, κ vanish, while the limit of $q^{\frac{1}{4}}/\kappa$ is $\frac{1}{4}$, whence the limiting value of $\operatorname{sn}\frac{4K}{3}$ is that of $6q^{\frac{1}{4}}/\kappa\sqrt{3}$, which $=6/4\sqrt{3}=\sqrt{3}/2$, as it should be.

Several of Kronecker's formulae connect the solution of the Pellian equation with elliptic modular functions: one example may be given here. Let D be a positive discriminant of the form $8n+5$, let (T, U) be the least solution of $T^2-DU^2=1$: then, if $h(D)$ is the number of primitive classes for the determinant D,

$$(T-U\sqrt{D})^{h(D)} = \Pi(2\kappa\kappa')^2$$

where the product on the right extends to a certain sixth part of those values of $2\kappa\kappa'$ which are singular, and correspond to the field $\Omega(\sqrt{-D})$, or in other words are connected with the class invariant $j(\sqrt{-D})$. For instance, if $D=5$, the equation to find $(\kappa\kappa')^2$ is

$$4.\delta\{(\kappa\kappa')^2-1\}^3+(25+13\sqrt{5})^3(\kappa\kappa')^4=0$$

one root of which is given by $(2\kappa\kappa')^2=9-4\sqrt{5}=T-U\sqrt{5}$ which is right, because in this case $h(D)=1$.

74. *Frequency of Primes.*—The distribution of primes in a finite interval $(a, a+b)$ is very irregular, if we change a and keep b constant. Thus if we put $n!=\mu$, the numbers $\mu+2$, $\mu+3, \ldots (\mu+n-1)$ are all composite, so that we can form a run of consecutive composite numbers as extensive as we please; on the other hand, there is possibly no limit to the number of cases in which p and $p+2$ are both primes. Legendre was the first to find an approximate formula for $F(x)$, the number of primes not exceeding x. He found by induction

$$F(x) = x \div (\log_e x - 1{\cdot}08366)$$

which answers fairly well when x lies between 100 and 1,000,000, but becomes more and more inaccurate as x increases. Gauss found, by theoretical considerations (which, however, he does not explain), the approximate formula

$$F(x) = L(x) = \int_2^x \frac{dx}{\log x}$$

(where, as in all that follows, $\log x$ is taken to the base e). This value is ultimately too large, but when x exceeds a million it is nearer the truth than the value given by Legendre's formula.

By a singularly profound and original analysis, Riemann succeeded in finding a formula, of the same type as Gauss's, but more exact for very large values of x. In its complete form it is very complicated; but, by omitting terms which ultimately vanish (for sufficiently large values of x) in comparison with those retained, the formula reduces to

$$F(x) = A + \sum_m (-1)^\mu \frac{1}{m} L(x^{1/m}) \quad (m=1, 2, 3, 5, 6, 7, 11, \ldots)$$

where the summation extends to all positive integral values of m which have no square factor, and μ is the number of different prime factors of m, with the convention that when $m=1$, $(-1)^\mu=1$. The symbol A denotes a constant, namely

$$A = \Sigma\frac{(-1)^\mu}{m} \times \left\{\tfrac{1}{2} - \int_2^\infty \frac{dx}{x(x^2-1)\log x}\right\}$$

and L is used in the sense given above.

P. L. Tchébichev obtained some remarkable results on the frequency of primes by an ingenious application of Stirling's theorem. One of these is that there will certainly be $(k+1)$ primes between a and b, provided that

$$a < \frac{5b}{6} - 2\sqrt{b} - \frac{16}{25}R\log 6\,(\log b)^2 - \frac{5}{24R}(4k+25) - \frac{25}{6R}$$

where $R = \frac{1}{2}\log 2 + \frac{1}{3}\log 3 + \frac{1}{5}\log 5 - \frac{1}{30}\log 30 = 0{\cdot}921292 \ldots$ From this may be inferred the truth of Bertrand's conjecture that there is always at least one prime between a and $(2a-2)$ if $2a>7$. Tchébichev's results were generalized and made more precise by Sylvester.

The actual calculation of the number of primes in a given interval may be effected by a formula constructed and used by D. F. E Meissel. The following table gives the values of $F(n)$ for various values of n, according to Meissel's determinations:—

n	$F(n)$
20,000	2,262
100,000	9,592
500,000	41,538
1,000,000	78,498

Riemann's analysis mainly depends upon the properties of the function

$$\zeta(s) = \sum_n n^{-s} \qquad (n=1, 2, 3, \ldots),$$

considered as a function of the complex variable s. The above definition is only valid when the real part of s exceeds 1; but it can be generalized by writing

$$2\sin\pi z\Gamma(z)\zeta(z) = i\int_\infty^\infty \frac{(-x)^{z-1}dx}{e^x-1}$$

where the integral is taken from $x=+\infty$ along the axis of real quantities to $x=\epsilon$, where ϵ is a very small positive quantity, then round a circle of radius ϵ and centre at the origin, and finally from $x=\epsilon$ to $x=+\infty$ along the axis of real quantities. This function $\zeta(z)$ is of great importance, and has been recently studied by von Mangoldt Landau and others.

Reference has already been made to the fact that if l, m are coprimes the linear form $lx+m$ includes an infinite number of primes. Now let (a, b, c) be any primitive quadratic form with a total generic character C; and let $lx+m$ be a primitive linear form chosen so that all its values have the character C. Then it has been proved by Weber and Meyer that (a, b, c) is capable of representing an infinity of primes all of the linear form $lx+m$.

75. *Arithmetical Functions.*—This term is applied to symbols such as $\phi(n)$, $\Phi(n)$, &c., which are associated with n by an intrinsic arithmetical definition. The function $\Phi(n)$ was written $\int n$ by Euler, who investigated its properties, and by proving the formula $\prod_1^\infty(1-q^s) = \sum_{-\infty}^{+\infty} q^{\frac{1}{2}(3s^2+s)}$ deduced the result that

$$\int n = \int(n-1) + \int(n-2) - \int(n-5) - \ldots = \Sigma(-1)^{s-1}\int\left(n-\frac{3s^2\pm s}{2}\right)$$

where on the right hand we are to take all positive values of s such that $n-\frac{1}{2}(3s^2\pm s)$ is not negative, and to interpret $\int o$ as n, if this term occurs. J. Liouville makes frequent use of this function in his papers, but denotes it by $\zeta(n)$.

If the quantity x is positive and not integral, the symbol $E(x)$ or $[x]$ is used to denote the integer (including zero) which is obtained by omitting the fractional part of x; thus $E(\sqrt{2})=1$, $E(0{\cdot}7)=0$, and so on. For some purposes it is convenient to extend the definition by putting $E(-x)=-E(x)$, and agreeing that when x is a positive integer, $E(x)=x-\frac{1}{2}$; it is then possible to find a Fourier sine-series representing $x-E(x)$ for all real values of x. The function $E(x)$ has many curious and important properties, which have been investigated by Gauss, Hermite, Hacks, Pringsheim, Stern and others. What is perhaps the simplest proof of the law of quadratic reciprocity depends upon the fact that if p, q are two odd primes, and we put $p=2h+1$, $q=2k+1$

$$\sum_{r=1}^{r=h} E\left(\frac{rp}{q}\right) + \sum_{s=1}^{s=k} E\left(\frac{sp}{q}\right) = hk = \tfrac{1}{4}(p-1)(q-1)$$

the truth of which is obvious, if we rule a rectangle $p'' \times q''$ into unit squares, and draw its diagonal. This formula is Gauss's, but the geometrical proof is due to Eisenstein. Another useful formula is $\sum_{r=1}^{r=m-1} E\left(x+\frac{r}{m}\right) = E(mx)-E(x)$, which is due to Hermite.

Various other arithmetical functions have been devised for particular purposes; two that deserve mention (both due to Kronecker) are δ_{hk}, which means 0 or 1 according as h, k are unequal or equal, and sgn x, which means $x \div |x|$.

76. *Transcendental Numbers.*—It has been proved by Cantor that the aggregate of all algebraic numbers is countable. Hence immediately follows the proposition (first proved by Liouville) that there are numbers, both real and complex, which cannot be defined by any combination of a finite number of equations with rational integral coefficients. Such numbers are said to be transcendental. Hermite first completely proved the transcendent character of e; and Lindemann, by a similar method, proved the transcendence of π. Thus it is now finally established that the quadrature of the circle is impossible, not only by rule and compass, but even with the help of any number of algebraic curves of any order when the coefficients in their equations are rational (see Hermite, *C.R.* lxxvii., 1873, and Lindemann, *Math. Ann.* xx., 1882). Another number which is almost certainly transcendent is Euler's constant C. It may be convenient to give here the following numerical values:—

$\pi = 3{\cdot}14159 \quad 26535 \quad 89793 \quad 23846\ldots$
$e = 2{\cdot}71828 \quad 18284 \quad 59045 \quad 23536\ldots$
$C = 0{\cdot}57721 \quad 56649 \quad 01532 \quad 8606065\ldots$ (Gauss-Nicolai)
$\log_{10} = (\pi \log_{10} e) = 0{\cdot}13493 \quad 41840\ldots$ (Weber),

the last of which is useful in calculating class-invariants.

77. *Miscellaneous Investigations.*—The foregoing articles (§§ 24-76) give an outline of what may be called the analytical theory of numbers, which is mainly the work of the 19th century, though many of the researches of Lagrange, Legendre and Gauss, as well as all those of Euler, fall within the 18th. But after all, the germ of this remarkable development is contained in what is only a part of the original Diophantine analysis, of which, beyond question, Fermat was the greatest master. The spirit of this method is still vigorous in Euler; but the appearance of Gauss's *Disquisitiones arithmeticae* in 1801 transformed the whole subject, and gave it a new tendency which was strengthened by the discoveries of Cauchy, Jacobi, Eisenstein and Dirichlet. In recent times Edouard Lucas revived something of the old doctrine, and it can hardly be denied that the Diophantine method is the one that is really germane to the subject. Even the strange results obtained from elliptic and modular functions must somehow be capable of purely arithmetical proof without the use of infinite series. Besides this, the older arithmeticians have announced various theorems which have not been proved or disproved, and made a beginning of theories which are still in a more or less rudimentary stage. As examples of the latter may be mentioned the partition of numbers (see NUMBERS, PARTITION OF, below), and the resolution of large numbers into their prime factors.

The general problem of partitions is to find all the integral solutions of a set of linear equations $\Sigma c_i x_i = m_i$ with integral coefficients, and fewer equations than there are variables. The solutions may be further restricted by other conditions—for instance, that all the variables are to be positive. This theory was begun by Euler: Sylvester gave lectures on the subject, of which some portions have been preserved; and various results of great generality have been discovered by P. A. MacMahon. The author last named has also considered Diophantine inequalities, a simple problem in which is "to enumerate all the solutions of $7x \geqslant 13y$ in positive integers."

The resolution of a given large number into its prime factors is still a problem of great difficulty, and tentative methods have to be applied. But a good deal has been done by Seelhoff, Lucas, Landry, A. J. C. Cunningham and Lawrence to shorten the calculation, especially when the number is given in, or can be reduced to, some particular form.

It is well known that Fermat was led to the erroneous conjecture (he did *not* affirm it) that $2^m + 1$ is a prime whenever m is a power of 2. The first case of failure is when $m = 32$; in fact $2^{32} + 1 \equiv 0 \pmod{641}$. Other known cases of failure are $m = 2^n$, with $n = 6$, 12, 23, 26 respectively; at the same time, Eisenstein asserted that he had proved that the formula $2^m + 1$ included an infinite number of primes. His proof is not extant; and no other has yet been supplied. Similar difficulties are encountered when we examine Mersenne's numbers, which are those of the form $2^p - 1$, with p a prime; the known cases for which a Mersenne number is prime correspond to $p = 2, 3, 5, 7, 13, 17, 19, 31, 61$.

A perfect number is one which, like 6 or 28, is the sum of its aliquot parts. Euclid proved that $2^{p-1}(2^p - 1)$ is perfect when $(2^p - 1)$ is a prime: and it has been shown that this formula includes all perfect numbers which are even. It is not known whether any odd perfect numbers exist or not.

Friendly numbers (*numeri amicabiles*) are pairs such as 220, 284, each of which is the sum of the aliquot parts of the other. No general rules for constructing them appear to be known, but several have been found, in a more or less methodical way.

78. In conclusion it may be remarked that the science of arithmetic (*q.v.*) has now reached a stage when all its definitions, processes and results are demonstrably independent of any theory of variable or measurable quantities such as those postulated in geometry and mathematical physics; even the notion of a limit may be dispensed with, although this idea, as well as that of a variable, is often convenient. For the application of arithmetic to geometry and analysis, see FUNCTION.

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NUMBERS, BOOK OF, the fourth book of the Bible, which takes its title from the Latin equivalent of the Septuagint Ἀριθμοί. While the English version follows the Septuagint directly in speaking of Genesis, Exodus, Leviticus and Deuteronomy, it follows the Vulgate in speaking of Numbers. Since this book describes the way in which an elaborate census of Israel was taken on two separate occasions, the first at Sinai at the beginning of the desert wanderings and the second just before their close on the plains of Moab, the title is quite appropriate. The name given to it in modern Hebrew Bibles from its fourth word *Bemidhbar* ("In the desert") is at least equally appropriate. The other title in use among the Jews, *Vayyidhabber* ("And he said"), is simply the first word of the book and has no reference to its contents.

Numbers is the first part of the second great division of the Hexateuch. In the first three books we are shown how God raised up for Himself a chosen people and how the descendants of Israel on entering at Sinai into a solemn league and covenant with Yahweh (Jehovah) became a separate nation, a peculiar people. In the last three books we are told what happened to Israel between the time it entered into this solemn covenant and its settlement in the Promised Land under the successor of Moses. Yet, though thus part of a larger whole, the book of Numbers has been so constructed by the Redactor as to form a self-contained division of that whole.

The truth of this statement is seen by comparing the first verse of the book with the last. The first is as evidently meant to serve as an introduction to the book as the last is to serve as its conclusion. This is not to say, however, that the book is all of a piece, or written on a systematic plan. On the contrary, no book in the Hexateuch gives such an impression of incoherence, and in none are the different strata which compose the Hexateuch more distinctly discernible.

It is noteworthy that the problems of Hexateuchal criticism are gradually changing their character, as one after another of the main contentions of Biblical scholars regarding the date and authorship of the Hexateuch passes out of the list of debatable questions into that of acknowledged facts. No competent scholars now question the existence, hardly any one the relative dates, of J, E, and P. In Numbers one can tell almost at a glance which parts belong to P, the Priestly Code, and which to JE, the narrative resulting from the combination of the Judaic work of the Yahwist with the Ephraimitic work of the Elohist. The main difficulty in Numbers is to determine to which stratum of P certain sections should be assigned.

The first large section (i.—x. 10) is wholly P, and the last eleven chapters are also P with the exception of two or three paragraphs in chap. xxxii., while the intervening portion is mainly P with the exception of three important episodes and two or three others of less importance. The three main episodes are those of the twelve spies, the rebellion of Korah, Dathan and Abiram, and Balaam's mission to Balak. The last is the only one even of these three in which there is nothing belonging to P. Another passage which we may here mention is one where the elements of JE can be readily separated and assigned to their respective authors, viz. chaps. xi. and xii. It is generally agreed that to E belongs the passage describing the outpouring of the Spirit on Eldad and Medad and the remarkable prayer of Moses in xi. 29, "Would God that all the Lord's people were prophets that the Lord would put his Spirit upon them," a prayer that closely approaches the New Testament idea that all Christians are "priests unto God." As usual, the J and E elements possess such a vivid character as to render them familiar to ordinary readers. The legislative and statistical and especially the ritualistic parts belonging to P are so detailed and uninteresting that they make no impression on a reader's memory, and P's diffuseness, always undue, reaches a climax in chap. vii. where the offerings presented by each tribe at the dedication of the Tabernacle are actually described in such full detail that six, in themselves extremely uninteresting, verses are repeated in identical terms no fewer than twelve times. Compare also the very similar repetitions and diffuseness in chap. xxix.

Perhaps, however, the most illuminating example of the difference between traditions as recorded in J or E and traditions as given by P is found in the very first passage that occurs after the first long section of P describing the order of march of the several tribes and the position of the ark in the very centre of the host, both when encamped and on the march. Notwithstanding all this, in x. 30 we find Moses entreating Hobab, the son of Reuel his father-in-law, to come along with the Israelites to be "eyes" unto them; and in x. 33 it is stated that the ark went *before* them to seek out a resting-place for them. Whether we ascribe this whole passage simply to JE or consider, as many scholars do, that the first statement is by J and the second by E, it is clear that these statements directly contradict P's elaborate scheme, according to which the people march, tribe by tribe, with the ark in the very centre of the square, and guided by the pillar of cloud by day and the pillar of fire by night. There can be equally little doubt that these statements are much more likely to be in accordance with fact than P's. The latter's elaborate plans go on the supposition that great masses of men, women and children could be moved about over the desert as easily as pawns on a chess-board; but even the greatest military leader the world has seen would have been unable to preserve such complicated formations amid the difficulties inevitable on a desert march; and the more carefully an intelligent reader has studied the details of P's plan, the more astonished will he be to read the statement in x. 33 as to the position of the ark, and to learn that Moses, instead of simply following the pillar of cloud, requests Hobab to determine the line of march and select the sites for encampment. No clearer proof could be desired of the utterly uncritical spirit of the age in which the Hexateuch got its present form than that this detailed account should be immediately followed by two short paragraphs in palpable contradiction of the whole plan of camp and march so elaborately worked out in the preceding narrative.

The fact is that Numbers is the result of a long literary process of amalgamation both of traditions and of documents, a process that began in the closing decades of the 9th century B.C. and did not finally end till the 2nd century B.C., the earliest date being that of J, and the latest probably that of the various addenda to Balaam's prophecies, *e.g.* xxiii. 10*b*, xxiv. 9*b*, xxiv. 18–24. Balaam's prayer in xxiii. 10*b* is not only metrically superfluous, but the personal, individual note in it is quite out of keeping with every other reference in this poem, which is purely national. This addition may therefore have been originally the marginal note of a pious scribe which was afterwards transferred to the text. In xxiv. 24 Kittim is a name originally derived from Kitium, a city of Cyprus. The meaning of "Kittim" was then extended to include the inhabitants of all the islands and coast-lands of the Mediterranean. Hence it might mean not only Macedonia or Greece, but even Italy. In Dan. xi. 30 it is certainly applied to Rome, the Vulgate rendering it "Romam" there just as that version translates it here by "Italia." Hence Baentsch would refer this oracle to the time of Antiochus IV. (Epiphanes) and even to the embassy of Popillius Laenas in 168 B.C. when that haughty Roman humiliated the Syrian king by drawing a circle round him with his cane, and daring him to step out of it till he had given him an answer.

The book falls naturally into three sections, chronologically arranged: (1) Chaps. i.-x. 10, Israel's twenty days' sojourn at Sinai during which a census of the people is taken and various laws are promulgated by Moses. (2) Chaps. x. 11-xxii., incidents that occurred during the march of Israel from Sinai to the plains of Moab. These incidents seem to have been chosen for the purpose of casting light on the religious history and character of the people and showing how later generations explained the origin of various place names, cf. Taberah and Kibrothhattaavah, xi. 3, 34, and modes or objects of worship, cf. the worship of the brazen serpent, xxi. 4-11, which, as we learn from 2 Kings xviii. 4, continued down to the time of Hezekiah. (3) Chaps. xxii. 2-xxxvi., Israel's sojourn in the plains of Moab, their experiences while there, and the taking of a second census, preliminary to the invasion of Canaan.

Two examples of the very miscellaneous contents of the book will suffice to show the different literary strata of which it is composed.

(A) We shall take first the account given in chap. xvi. of the rebellion of Korah, Dathan and Abiram. There would be originally *four* independent narratives, J, E, and two very distinct strata of P, which we may call P^1 and P^2 or P^s, *i.e.* later supplements to P. The narratives of J and E can no longer be distinguished except from slight linguistic data, perceptible only to Hebrew scholars; but the three stages of development are quite apparent even in translations.

1. The first narrative is that of JE, which relates how two *Reubenites*, Dathan and Abiram, rebelled against the *civil* authority of Moses, and were punished by being buried alive, they and their households. Read together verses 1*b*, 2*a*, 12-15 and 25-34, omitting 32*b*, *i.e.* "and all the men that appertained unto Korah and all their goods," a clause due to the Redactor, who put it in to unite the narratives, forgetting that Korah, not being a Reubenite, could not have had his *tent* with its belongings among the tents of the Reubenites.

2. The second narrative is P^1, which tells how Korah, himself a Levite, at the head of 250 *Israelites* rebelled against the *religious* authority of Moses and Aaron because of the privileges conferred on the *tribe* of Levi. Korah and his associates maintained that the other tribes, belonging as they did to a holy people, had as much right as the Levites to approach Yahweh directly, without the mediation of any Levite, and offer sacrifices and even incense to Yahweh Read together verses 1*a*, 2*b*-7, 19-24.

3. The third narrative is P^2, which relates how Korah at the head of 250 *Levites* protested against the *priestly* privileges of Aaron, claiming that all the Levites had as much right to sacrifice and offer incense to Yahweh as Aaron and his sons had. Read together verses 8-11 and 16 and 17. In both P^1 and P^2 the disputants are summoned from their tents and ordered to assemble before the Dwelling of Yahweh; and in both cases the same fate overtook the rebels. Fire descended from heaven and consumed Korah and his confederates. It is to be noticed that in both P^1 and P^2 incense is burned in pans or censers, so that even the author of P^2 knew nothing about an *altar* of incense. Indeed in xvii. 3 and 4 *the* altar is spoken of in such a way as to imply that there was only one altar, viz. the altar of burnt-offering. xvi. 2 proves that according to the second account the members of Korah's band, so far from being all Levites, as they are represented to have been in verses 8-11, were probably, with the exception of Korah himself, leading members of the secular tribes. In xxvii. 3 we find a proof, all the more conclusive from being incidental, that Korah's followers were not all Levites; for, had they been so, it could never have occurred to the daughters of Zilpahad to repudiate the idea that their father, a *Manassite*, had had a share in Korah's conspiracy. Of course none of the narratives is found in its entirety, anything common to two or more of them being given only once; and great skill has been shown in weaving them together.

(B) The story of Balaam as we have it in chaps. xxii.-xxiv. is an amalgam of J and E with later additions; but xxxi. 8, 16 proves that Balaam was not unknown to P. According to E, Balak sent certain Moabite *princes* all the way to Pethor on the Euphrates to ask Balaam to come and curse Israel. But *Elohim* came to Balaam by night and forbade him to go. So the princes returned disappointed. A second and still more influential embassy having been sent, Elohim again appeared by night, and this time permitted Balaam to go on condition that he said nothing but what Elohim bade him say. The journey being a long one and across a difficult desert, requiring a caravan well equipped with camels, the *princes of Moab* waited till Balaam was ready to accompany them. When Balaam reached the frontier of Moab Balak was waiting to welcome him, but could not refrain from asking why he had not come with the first embassy. With equal frankness Balaam replied that, though he had come now, he had no power to say anything but what Elohim might put into his mouth. On being taken to Bamoth-Baal he was met by Elohim. Thereupon, instead of cursing the Israelites, Balaam blessed them. Though bitterly disappointed Balak still attempted to effect his purpose and took Balaam to the top of Pisgah, with the result that Israel received a second blessing. Balak, now utterly disheartened, abandoned his project altogether.

According to J, Balaam was among his own people the Bne-Ammon when Balak sent *messengers* to him with presents such as soothsayers generally received, asking him to come and curse a people that had come up out of Egypt. Balaam protested that, though he were to receive a houseful of silver and gold, he could not go beyond the word of Yahweh, his God. Nevertheless his scruples were somehow overcome; and, without consulting Yahweh, he agreed to go. As the journey was not a long or dangerous one, the servants of Balak returned at once to inform their master of their success, leaving Balaam to follow at his own convenience. So Balaam, still without consulting Yahweh, saddled his ass and set out for Moab, attended only by two servants. The land through which he had to pass, so far from being a desert, was a land of oil and wine; and when Balaam was riding along a narrow path between two vineyards, the angel of Yahweh would have slain him, had not his ass swerved and saved him. That this episode belongs to J no one need ever forget, since the only parallel in Scripture to the speaking ass is the serpent that spoke in Eden. Balaam, after being sternly rebuked, was allowed to proceed, but only on condition that "the word that I shall speak to thee, that thou shalt speak." Balak met Balaam at Ar-Moab, whence they went to Kiriath-Huzoth and thence to the top of Peor. There Balaam blessed Israel. Balak angrily taunted Balaam with having lost the honours intended for him, and bade him flee to his own place. Balaam reminded Balak of his declaration that he could not go beyond the word of Yahweh, and then boldly announced the respective destinies of Israel and Moab, xxiv. 15-19.

As *seven* is the perfect number and as Balaam had ordered seven altars to be built, the Redactor thought it would be well to have seven Mĕshālîm or metrical oracles; and so he added other three which are certainly not pertinent to the situation, as they allude not merely to the Assyrian empire but to the Macedonian, and even, as some maintain, to the Roman empire, cf. xxiv. 24.

The poetical quotations in Numbers are of the utmost importance, not only as helping to determine the date of the book but as indicating the value of poetry in its bearing on history. In xxi. 14 we have a poetical quotation from a lost volume of early poetry entitled "The Book of the Wars of Yahweh." It is highly probable that Deborah's song was also originally in this book; and when we compare the statement in that song as to Israel's full fighting strength, viz. 40,000 men, with the statements in the prose of Numbers as to 600,000 men and more, we at once realise how much closer to actual facts we are brought by early poetry than by the later prose of writers like P. Perhaps it is in chap. xxxi. that we have the clearest proof of the non-historical character of the book. There we are told that 12,000 Israelites, without losing a single man, slew every male Midianite, children included, and every Midianite woman that had known a man, and took so much booty that there had to be special legislation as to how is should be divided. But if this were actual fact, how could the Midianites have ever reappeared in history? And yet in Gideon's time they were strong enough to oppress Israel. From this chapter, unhistorical as it must be, we see how the legislation of Israel, whatever its character or origin, was referred back to Moses the great Law giver of Israel. (J. A. P.*)

NUMBERS, PARTITION OF. This mathematical subject, created by Euler, though relating essentially to positive integer numbers, is scarcely regarded as a part of the Theory of Numbers (see NUMBER). We consider in it a number as made up by the *addition* of other numbers: thus the partitions of the successive numbers 1, 2, 3, 4, 5, 6, &c., are as follows:—

1;
2, 11;
3, 21, 111;
4, 31, 22, 211, 1111;
5, 41, 32, 311, 221, 2111, 11111;
6, 51, 42, 411, 33, 321, 3111, 222, 2211, 21111, 111111.

These are formed each from the preceding ones; thus, to form the partitions of 6 we take first 6; secondly, 5 prefixed to each of the partitions of 1 (that is, 51); thirdly, 4 prefixed to each of the partitions of 2 (that is, 42, 411); fourthly, 3 prefixed to each of the partitions of 3 (that is, 33, 321, 3111); fifthly, 2 prefixed, not to each of the partitions of 4, but only to those partitions which begin with a number not exceeding 2 (that is, 222, 2211, 21111); and lastly, 1 prefixed to all the partitions of 5 which begin with a number not exceeding 1 (that is, 111111); and so in other cases.

The method gives *all* the partitions of a number, but we may consider different classes of partitions: the partitions into a given number of parts, or into not more than a given number of parts; or the partitions into given parts, either with repetitions or without repetitions, &c. It is possible, for any particular class of partitions, to obtain methods more or less easy for the formation of the partitions either of a given number or of the successive numbers 1, 2, 3, &c. And of course in any case, having obtained the partitions, we can count them and so obtain the number of partitions.

Another method is by L. F. A. Arbogast's rule of the last and the last but one; in fact, taking the value of a to be unity, and, understanding this letter in each term, the rule gives b; c, b^2; d, bc, b^3; e, bd, c^2, b^2c, b^4, &c., which, if b, c, d, e, &c., denote 1, 2, 3, 4, &c., respectively, are the partitions of 1, 2, 3, 4, &c., respectively.

An important notion is that of conjugate partitions. Thus a partition of 6 is 42; writing this in the form $\left\{\begin{matrix}1111,\\11\end{matrix}\right.$ and summing the columns instead of the lines, we obtain the conjugate partition 2211; evidently, starting from 2211, the conjugate partition is 42. If we form all the partitions of 6 into not more than three parts, these are

6, 51, 42, 33, 411, 321, 222,

and the conjugates are

111111, 21111, 2211, 222, 3111, 321, 33,

where no part is greater than 3; and so in general we have the theorem, the number of partitions of n into not more than k parts is equal to the number of partitions of n with no part greater than k.

We have for the number of partitions an analytical theory depending on generating functions; thus for the partitions of a number n with the parts 1, 2, 3, 4, 5, &c., without repetitions, writing down the product

$$1+x\,.\,1+x^2\,.\,1+x^3\,.\,1+x^4\ldots,=1+x+x^2+2x^3\ldots+Nx^n+\ldots,$$

it is clear that, if x^α, x^β, x^γ, ... are terms of the series x, x^2, x^3, ... for which $\alpha+\beta+\gamma+\ldots=n$, then we have in the development of the product a term x^n, and hence that in the term Nx^n of the product the coefficient N is equal to the number of partitions of n with the parts 1, 2, 3, ..., without repetitions; or say that the product is the generating function (G. F.) for the number of such partitions. And so in other cases we obtain a generating function.

Thus for the function

$$\frac{1}{1-x\,.\,1-x^2\,.\,1-x^3\ldots},=1+x+2x^2+\ldots+Nx^n+\ldots,$$

observing that any factor $1/1-x^l$ is $=1+x^l+x^{2l}+\ldots$, we see that in the term Nx^n the coefficient is equal to the number of partitions of n, with the parts 1, 2, 3, ..., with repetitions.

Introducing another letter z, and considering the function

$$1+xz\,.\,1+x^2z\,.\,1+x^3z\ldots,=1+z(x+x^2+\ldots)\ldots+Nx^nz^k+\ldots,$$

we see that in the term Nx^nz^k of the development the coefficient N is equal to the number of partitions of n into k parts, with the parts 1, 2, 3, 4, ..., without repetitions.

And similarly, considering the function

$$\frac{1}{1-xz\,.\,1-x^2z\,.\,1-x^3z\ldots},=1+z(x+x^2+\ldots)\ldots+Nx^nz^k+\ldots$$

we see that in the term Nx^nz^k of the development the coefficient N is equal to the number of partitions of n into k parts, with the parts 1, 2, 3, 4, ..., with repetitions.

We have such analytical formulae as

$$\frac{1}{1-xz\,.\,1-x^2z\,.\,1-x^3z\ldots}=1+\frac{zx}{1-x}+\frac{z^2x^2}{1-x\,.\,1-x^2}+\ldots,$$

which lead to theorems in the partition of numbers. A remarkable theorem is

$$1-x\,.\,1-x^2\,.\,1-x^3\,.\,1-x^4\,.=1-x-x^2+x^5+x^7-x^{12}-x^{15}+\ldots,$$

where the only terms are those with an exponent $\frac{1}{2}(3n^2\pm n)$, and for each such pair of terms the coefficient is $(-)^n1$. The formula shows that except for numbers of the form $\frac{1}{2}(3n^2\pm n)$ the number of partitions without repetitions into an odd number of parts is equal to the number of partitions without repetitions into an even number of parts, whereas for the excepted numbers these numbers differ by unity. Thus for the number 11, which is not an excepted number, the two sets of partitions are

11, 821, 731, 641, 632, 542
10.1, 92, 83, 74, 65, 5321,

in each set 6.

We have

$$1-x\,.\,1+x\,.\,1+x^2\,.\,1+x^4\,.\,1+x^8\ldots=1;$$

or, as this may be written,

$$1+x\,.\,1+x^2\,.\,1+x^4\,.\,1+x^8\ldots=\frac{1}{1-x},=1+x+x^2+x^3+\ldots,$$

showing that a number n can always be made up, and in one way only, with the parts 1, 2, 4, 8, ... The product on the left-hand side may be taken to k terms only, thus if $k=4$, we have

$$1+x\,.\,1+x^2\,.\,1+x^4\,.\,1+x^8,=\frac{1-x^{16}}{1-x},=1+x+x^2\ldots+x^{15},$$

that is, any number from 1 to 15 can be made up, and in one way only, with the parts 1, 2, 4, 8; and similarly any number from 1 to 2^k-1 can be made up, and in one way only, with the parts 1, 2, 4, . . 2^{k-1}. A like formula is

$$\frac{1-x^3}{x\,.\,1-x}\cdot\frac{1-x^9}{x^3\,.\,1-x^3}\cdot\frac{1-x^{27}}{x^9\,.\,1-x^9}\quad\frac{1-x^{81}}{x^{27}\,.\,1-x^{27}}=\frac{1-x^{81}}{x^{40}\,.\,1-x};$$

that is,

$$x^{-1}+1+x\,.\,x^{-3}+1+x^3\,.\,x^{-9}+1+x^9\,.\,x^{-27}+1+x^{27}$$
$$=x^{-40}+x^{-39}\,.\,+1+x\,\ldots\,+x^{39}+x^{40},$$

showing that any number from −40 to +40 can be made up, and that in one way only, with the parts 1, 3, 9, 27 taken positively or negatively; and so in general any number from $-\frac{1}{2}(3^k-1)$ to $+\frac{1}{2}(3^k-1)$ can be made up, and that in one way only, with the parts 1, 3, 9, . . 3^{k-1} taken positively or negatively.

See further COMBINATORIAL ANALYSIS. (A. CA.)

NUMENIUS, a Greek philosopher, of Apamea in Syria, Neo-Pythagorean and forerunner of the Neo-Platonists, flourished during the latter half of the 2nd century A.D. He seems to have taken Pythagoras as his highest authority, while at the same time he chiefly follows Plato. He calls the latter an "Atticizing Moses." His chief divergence from Plato is the distinction between the "first god" and the "demiurge." This is probably due to the influence of the Valentinian Gnostics and the Jewish-Alexandrian philosophers (especially Philo and his theory of the Logos). According to Proclus (*Comment. in Timaeum*, 93) Numenius held that there was a kind of trinity of gods, the members of which he designated as πατήρ, ποιητής, ποίημα ("father," "maker," "that which is made," *i.e.* the world), or πάππος, ἔκγονος, ἀπόγονος (which Proclus calls "exaggerated language"). The first is the supreme deity or pure intelligence (νοῦς), the second the creator of the world (δημιουργός), the third the world (κόσμος). His works were highly esteemed by the Neoplatonists, and Amelius is said to have composed nearly 100 books of commentaries upon them.

Fragments of his treatises on the points of divergence between the Academicians and Plato, on the Good (in which according to Origen, *Contra Celsum*, iv. 51, he makes allusion to Jesus Christ), and on the mystical sayings in Plato, are preserved in the *Praeparatio Evangelica* of Eusebius. The fragments are collected in F. G. Mullach, *Frag. phil. Graec.* iii.; see also F. Thedinga, *De Numenio philosopho Platonico* (Bonn, 1875); Ritter and Preller, *Hist. Phil. Graecae* (ed. E. Wellmann, 1898), § 624-7; T. Whittaker, *The Neo-Platonists* (1901).

NUMERAL (from Lat. *numerus*, a number), a figure used to represent a number. The use of visible signs to represent numbers and aid reckoning is not only older than writing, but older than the development of numerical language on the denary system; we count by tens because our ancestors counted on their fingers and named numbers accordingly. So used, the fingers are really numerals, that is, visible numerical signs; and in antiquity the practice of counting by these natural signs prevailed in all classes of society. In the later times of antiquity the finger symbols were developed into a system capable of expressing all numbers below 10,000. The left hand was held up flat with the fingers together. The units from 1 to 9 were expressed by various positions of the third, fourth, and fifth fingers alone, one or more of these being either closed on the palm or simply bent at the middle joint, according to the number meant. The thumb and index were thus left free to express the tens by a variety of relative positions, *e.g.* for 30 their points were brought together and stretched forward; for 50 the thumb was bent like the Greek Γ and brought against the ball of the index. The same set of signs if executed with the thumb and index of the right hand meant hundreds instead of tens, and the unit signs if performed on the right hand meant thousands.[1]

The fingers serve to express numbers, but to make a permanent note of numbers some kind of mark or tally is needed. A single stroke is the obvious representation of unity; higher numbers are indicated by groups of strokes. But when the strokes become many they are confusing, and so a new sign must be introduced, perhaps for 5, at any rate for 10, 100, 1000, and so forth. Intermediate numbers are expressed by the addition of symbols, as in the Roman system ccxxxvi = 236. This simplest way of writing numbers is well seen in the Babylonian inscriptions, where all numbers from 1 to 99 are got by repetition of the vertical arrowhead 𒁹 = 1, and a barbed sign 𒌋 = 10. But the most interesting case is the Egyptian, because from its hieratic form sprang the Phoenician numerals, and from them in turn those of Palmyra and the Syrians, as illustrated in table 1. Two things are to be noted in this table—first, the way in which groups of units come to be joined by a cross line, and then run together into a single symbol, and, further, the substitution in the hundreds of a principle of multiplication for the mere addition of symbols. The same thing appears in Babylonia, where a smaller number put to the right of the sign for 100 (𒁹𒀸) is to be added to it, but put to the left gives the number of hundreds. Thus 𒌋𒁹𒀸 = 1000, but 𒁹𒀸𒌋 = 110. The Egyptians had hieroglyphics for a thousand, a myriad, 100,000 (a frog), a million (a man with arms stretched out in admiration), and even for ten millions.

Alphabetic writing did not do away with the use of numerical symbols, which were more perspicuous, and compendious than words written at length. But the letters of the alphabet themselves came to be used as numerals. One way of doing this was to use the initial letter of the name of a number as its sign. This was the old Greek notation, said to go back to the time of Solon, and usually named after the grammarian Herodian, who described it about A.D. 200. Ι stood for 1, Π for 5, Δ for 10, Η for 100, Χ for 1000, and Μ for 10,000; Π with Δ in its bosom was 50, with Η in its bosom it was 500. Another way common to the Greeks, Hebrews, and Syrians, and which in Greece gradually displaced the Herodian numbers, was to make the first nine letters stand for the units and the rest for the tens and hundreds.

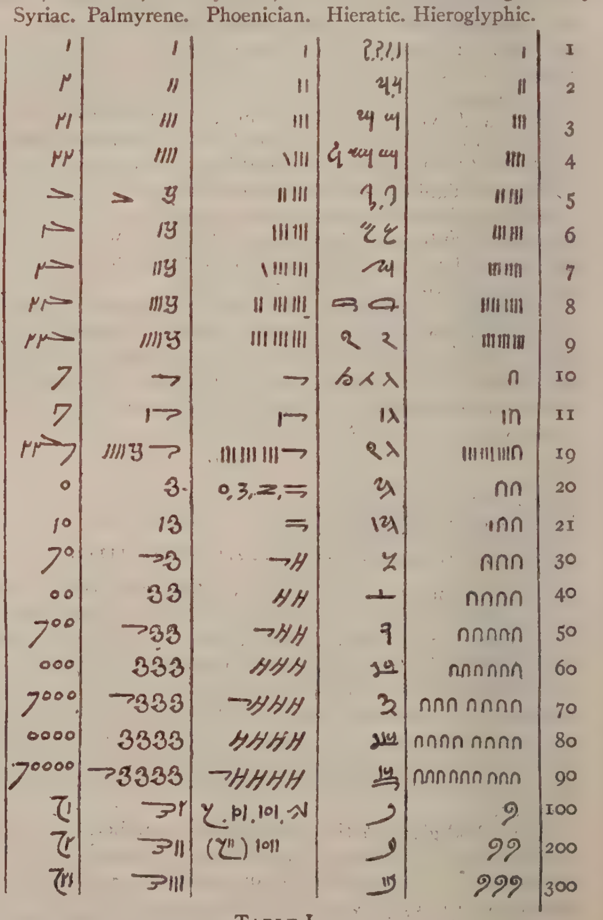
Syriac. Palmyrene. Phoenician. Hieratic. Hieroglyphic.
1
2
3
4
5
6
7
8
9
10
11
19
20
21
30
40
50
60
70
80
90
100
200
300

TABLE I.

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[1] The system is described by Nicolaus Rhabda of Smyrna (8th century A.D.), ap. N. Caussinus, *De eloquentia sacra et humana* (Paris, 1636). The Venerable Bede gives essentially the same system, and it long survived in the East; see especially Rödiger, "Über die im Orient gebräuchliche Fingersprache, &c.," *D.M.G.* (1845), and Palmer in *Journ. of Philology*, ii. 247 sqq.

With the old Semitic alphabet of 22 letters this system broke down at ת=400, and the higher hundreds had to be got by juxtaposition; but when the Hebrew square character got the distinct final forms ך, ם, ן, ף, ץ these served for the hundreds from 500 to 900. The Greeks with their larger alphabet required but three supplemental signs, which they got by keeping for this purpose two old Phoenician letters which were not used in writing (ϝ or ϛ=ו=6, and ϙ=ק=90), and by adding sampi ϡ for 900.[1]

Among the Greeks the first certain use of this system seems to be on coins of Ptolemy II. The first trace of it on Semitic ground is on Jewish coins of the Ḥasmoneans. It is the foundation of gematria as we find it in Jewish book and in the apocalyptic number of the beast (נרון קסר=666). But we do not know how old gematria is; the name is borrowed from the Greek.

The most familiar case of the use of letters as numerals is the Roman system. Here C is the initial of centum and M of mille; but instead of these signs we find older forms, consisting of a circle divided vertically for 1000 and horizontally, Θ, or in the cognate Etruscan system divided into quadrants, ⊕, for 100. From the sign for 1000, still sometimes roughly shown in print as CIↃ, comes D, the half of the symbol for half the number; and the older forms of L, viz. ⊥ or ⊥, suggest that this also was once half of the hundred symbol. So V (Etruscan Λ) is half of X, which itself is not a true Roman letter. The system, therefore, is hardly alphabetic in origin, though the idea has been thrown out that the signs for 10, 50, and 100 were originally the Greek X, Ψ, Φ, which were not used in writing Latin.[2]

When high numbers had to be expressed systems such as we have described became very cumbrous, and in alphabetic systems it became inevitable to introduce a principle of periodicity by which, for example, the signs for 1, 2, 3, &c., might be used with a difference to express the same number of thousands. Language itself suggested this principle, and so we find in Hebrew א̈ or in Greek ͵α=1000. So further βMυ, βM., or simply β.=20,000 (2 myriads). If now the larger were always written to the left of the smaller elements of a number the diacritic mark could be dispensed with in such a case as βωλα (instead of ͵βωλα)=2831, for here it was plain that β=2000, not =2, since otherwise it would not have preceded ω=800. We have here the germ of the very important notion that the value of a symbol may be periodic and defined by its position. The same idea had appeared much earlier among the Babylonians, who reckoned by powers of 60, calling 60 a *soss* and 60 sixties a *sar*. On the tablets of Senkerah a list of squares and cubes is given on this principle, and here the square of 59 is written 58·1—that is, $58\times60+1$; and the cube of 30 is 7·30—that is, 7 sar+30 soss $=7\times60^2+30\times60$. Here again we have value by position; but, as there is no zero, it is left to the judgment of the reader to know which power of 60 is meant in each case. The sexagesimal system, long specially associated with astronomy, has left a trace in our division of the hour and of the circle, but as language goes by powers of 10 it is practically very inconvenient for most purposes of reckoning. The Greek mathematicians used a sort of decimal system; thus Archimedes was able to solve his problem of stating a number greater than that of the grains of sand which would fill the sphere of the fixed stars by dividing numbers into octades, the unit of the second octade being 10^8 and of the third 10^{16}. So too Apollonius of Perga teaches multiplication by regarding 7 as the πυθμήν or 70, 700 and so forth. One must then find successively the product of the several pythmens of the multiplier and the multiplicand, noticing in each case what are tens, what hundreds, and so on, and adding the results. The want of a sign for zero made it impossible mechanically to distinguish the tens, hundreds, &c., as we now do.

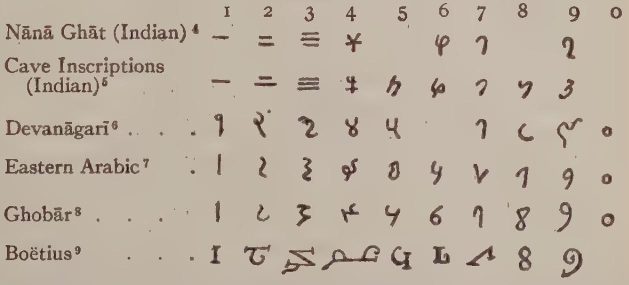
Very early, however, a mechanical contrivance, the abacus, had been introduced for keeping numbers of different denominations apart. This was a table with compartments or columns for counters, each column representing a different value to be given to a counter placed on it. This might be used either for concrete arithmetic—say with columns for pence, shillings and pounds; or for abstract reckoning—say with the Babylonian sexagesimal system. An old Greek abacus found at Salamis has columns which, taken from right to left, give a counter the value of 1, 10, 100, 1000 drachms, and finally of 1 talent (6000 drachms) respectively. An abacus on the decimal system might be ruled on paper or on a board strewed with fine sand, and was then a first step to the decimal system. Two important steps, however, were still lacking: the first was to use instead of counters distinctive marks (ciphers) for the digits from one to nine; the second and more important was to get a sign for zero, so that the columns might be dispensed with, and the denomination of each cipher seen at once by counting the number of digits following it. These two steps taken, we have at once the modern so-called Arabic numerals and the possibility of modern arithmetic; but the invention of the ciphers and zero came but slowly, and their history is a most obscure problem.

What is quite certain is that our present decimal system, in its complete form, with the zero which enables us to do without the ruled columns of the abacus, is of Indian origin. From the Indians it passed to the Arabians, probably along with the astronomical tables brought to Bagdad by an Indian ambassador in 773 A.D. At all events the system was explained in Arabic in the early part of the 9th century by the famous Abū Jaʿfar Moḥammed b. Musa al-Khwārizmī (Hovarezmi), and from that time continued to spread, though at first slowly, through the Arabian world.

In Europe the complete system with the zero was derived from the Arabs in the 12th century, and the arithmetic based on this system was known by the name of algoritmus, algorithm, algorism. This barbarous word is nothing more than a transcription of Al-Khwārizmī, as was conjectured by Reinaud, and has become plain since the publication of a unique Cambridge MS. containing a Latin translation—perhaps by Adelhard of Bath—of the lost arithmetical treatise of the Arabian mathematician.[3] The arithmetical methods of Khwārizmī were simplified by later Eastern writers, and these simpler methods were introduced to Europe by Leonardo of Pisa in the West and Maximus Planudes in the East. The term zero appears to come from the Arabic ṣifr through the form zephyro used by Leonardo.

Thus far modern inquirers are agreed. The disputed points are—(1) the origin and age of the Indian system, and (2) whether or not a less developed Indian system, without the zero but with the nine other ciphers used on an abacus, entered Europe before the rise of Islam, and prepared the way for a complete decimal notation.

TABLE II.


1
2
3
4
5
6
7
8
9
0
Nānā Ghāt (Indian)[4]
Cave Inscriptions (Indian)[5]
Devanāgarī[6]
Eastern Arabic[7]
Ghobār[8]
Boëtius[9]

1. The use of numerals in India can be followed back to the Nānā Ghāt inscriptions, supposed to date from the early part of the 3rd century B.C. These are signs for units, tens and hundreds, as

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[1] The Arabs, who quite changed the order of the alphabet and extended it to twenty-eight letters, kept the original values of the old letters (putting س for ס and ش for ש), while the hundreds from 500 to 1000 were expressed by the new letters in order from ث to غ. In the time of Caliph Walīd (A.D. 705-715) the Arabs had as yet no signs of numeration.

[2] See further Fabretti, *Paläographische Studien*.

[3] Published by Boncompagni in *Trattati d' aritmetica* (Rome, 1857).

[4] From Sir E. C. Bayley's paper in *J.R.A.S.* (1882).

[5] From Burnell's *South Indian Palaeography* (1874).

[6] Of the 10th century. (From Burnell, *op. cit.*)

[7] Of the 10th century; from a MS. written at Shirāz. (From Woepcke, *Mémoire sur la propagation des chiffres indiens.*)

[8] From a MS. at Paris. (From Woepcke, *op. cit.*)

[9] Erlangen (Altdorf) MS. (From Woepcke, *op. cit.*)

in the other old systems we have dealt with. Like the Indian alphabet, they are probably derived from abroad, but, as in the case of the alphabet, their origin is obscure. The forms of the later Indian numerals for the nine digits appear to be clearly derived from the earlier system. In table II. the first two lines give forms earlier than the introduction of the system of position, while the Devanāgarī in the third line was used with a zero and position value. The "cave" numerals were employed during the first centuries of the Christian era. The earliest known example of a date written on the modern system is of A.D. 738, while the old system is found in use as late as the early part of the 7th century (Bayley). On the other hand, there is some evidence that a system of value by position was known to Sanskrit writers on arithmetic in the 6th Christian century. These writers, however, do not use ciphers, but symbolical words and letters, so that it is not quite clear whether they refer to a system which had a zero, or to a system worked on an abacus, where the zero is represented by a blank column. There is no proof as yet for the use of any system of position in India before the 6th century, and nothing beyond conjecture can be offered as to its origin.

2. In Europe, before the introduction of the algorithm or full Indo-Arabic system with the zero, we find a transition system in which calculations were made on the decimal system with an abacus, but instead of unit counters there were placed in the columns ciphers, with values from one to nine, and of forms that are at bottom the Indian forms and agree most nearly with the numerals used by the Arabs of Africa and Spain. For among the Arabs themselves there were varieties in the forms of the Indian numeral, and in particular an eastern and a western type. The latter is called ghobār (dust), a name which seems to connect it with the use of a sand-spread tablet for calculation. The abacus with ciphers instead of counters was used at Rheims about 970–980 by Gerbert, who afterwards was pope under the title of Sylvester II., and it became well known in the 11th century. Where did Gerbert learn the use of the abacus with ciphers? There is no direct evidence as to this, for the story in William of Malmesbury, that he stole it from an Arab in Spain, is generally given up as fabulous. On the other hand, no evidence is offered for an earlier use of the abacus with ciphers, except a passage describing the system in the *Geometria* ascribed to Boëtius. If this book is genuine the Indian numerals were known in Europe and applied to the abacus in the 5th century, and Gerbert only revived the long-forgotten system. On this view we have to explain how Boëtius got the ciphers. The *Geometria* ascribes the system to the "Pythagorici"—*i.e.* the Neo-Pythagoreans—and it has been thought possible that the Indian forms for the numerals reached Alexandria, along with the cruder form of value by position involved in the use of the abacus without a zero, before direct communication between Europe and India ceased, which it did about the 4th century A.D. It is then further conjectured by Woepcke that the ghobār numerals of the western Arabs were by them borrowed from the system of Boëtius before the full Indian method with the zero reached them; and thus the resemblance between these forms and those in MSS. of Boëtius, which are essentially the same as in other MSS. of the 11th century, would be explained. This view, however, presents great difficulties, of which the total disappearance of all trace of the system between Boëtius and Gerbert is only one. We have no proof that the Indians ever used such an abacus, or that they had value by position at so early a date as is required, and the ghobār numerals are too similar to those of the eastern Arabs to make it very credible that the two systems had been separated for centuries. The genuineness of the *Geometria* is maintained by Moritz Cantor, but it has been attacked on other grounds than that of the passage about the abacus; and on the whole it is still an open question whether the abacus with ciphers is not the outcome of an early imperfect knowledge of the Arabic system, Gerbert or some other having got the signs and a general idea of value by position without having an explanation of the zero.

See M. Cantor, *Geschichte der Mathematik*, vol. i. (Leipzig, 1880); also M. Chasles, papers in the *Comptes rendus* (1843); G. Friedlein, *Die Zahlzeichen und das elementare Rechnen der Griechen und Römer*, &c. (1869); F. Woepcke, *Sur l'introduction de l'arithmétique indien en occident* (Rome, 1859), and *Mémoire sur la propagation des chiffres indiens* (Paris, 1863). For the palaeography of the Indian numerals see Burnell, *Elements of S. Indian Palaeography* (1874); and Sir E. C. Bayley in *J.R.A.S.* (1882, 1883). For Boëtius compare Friedlein's edition of his arithmetic and geometry (Leipzig, 1867), and Weissenborn in *Zeitsch. Math. Phys.* xxiv. Other references to the copious literature will be found in Cantor and Friedlein, who also discuss the subject of the notation for fractions, which cannot be entered on here. For systems passed over here, see Pihan, *Exposé des signes de numération usités chez les peuples orientaux* (Paris, 1860). (W. R. S.)

NUMERIANUS, MARCUS AURELIUS, son of the Roman emperor Carus. On the death of his father, whom he accompanied on his expedition against the Persians, he was proclaimed emperor (December, A.D. 283). He resolved to abandon the campaign, and died mysteriously on his way back to Europe, eight months afterwards. Arrius Aper, praefect of the praetorian guards, his father-in-law, who was suspected of having murdered him, was slain by Diocletian, whom the soldiers had already proclaimed his successor. Numerianus is represented as having been a man of considerable literary attainments, and of remarkably amiable character.

NUMIDIA, the name given in ancient times to a tract of country in the north of Africa, extending along the Mediterranean from the confines of Mauretania to those of the Roman province to Africa. When the Romans first came into collision with Carthage in the 3rd century B.C., the name was applied to the whole country from the river Mulucha (now the Muluya), about 100 m. W. of Oran, to the frontier of the Carthaginian territory, which nearly coincided with the modern regency of Tunis. It is in this sense that the name Numidia is used by Polybius and all historians down to the close of the Roman republic. The Numidians, as thus defined, were divided into two great tribes,—the Massyli on the east, and the Massaesyli on the west—the limit between the two being the river Ampsaga, which enters the sea to the west of the promontory called Tretum, now known as the Seven Capes. At the time of the second Punic War the eastern tribe was governed by Massinissa, who took the side of the Romans in the contest, while Syphax his rival, king of the Massaesyli, supported the Carthaginians. At the end of the war the victorious Romans confiscated the dominions of Syphax, and gave them to Massinissa, whose sway extended from the frontier of Mauretania to the boundary of the Carthaginian territory, and also south and east as far as the Cyrenaica (Appian, *Punica*, 106), so that the Numidian kingdom entirely surrounded Carthage except towards the sea. Massinissa, who reached a great age, retained the whole of these dominions till his death in 148 B.C. and was succeeded in them by his son Micipsa, who died in 118. For the war with Rome which followed the death of Micipsa see JUGURTHA.

After the death of Jugurtha as a captive at Rome in 106, the western part of his dominions was added to those of Bocchus, king of Mauretania, while the remainder (excluding perhaps the territory towards Cyrene) continued to be governed by native princes until the civil war between Caesar and Pompey, in which Juba I., then king of Numidia, who had espoused the cause of the Pompeians, was defeated by Caesar, and put an end to his own life (46 B.C.). Numidia, in the more restricted sense which it had now acquired, became for a short time a Roman province under the title of Africa Nova, but in the settlement of affairs after the battle of Actium it was restored to Juba II. (son of Juba I.), who had acquired the favour of Augustus. Soon afterwards, in 25 B.C., Juba was transferred to the throne of Mauretania, including the whole western portion of the ancient Numidian monarchy as far as the river Ampsaga, while the eastern part was added to the province of Africa, *i.e.* that part which had been called Africa Nova before it was given to Juba. It retained the official title, though it may also have been known as Numidia; together with Africa Vetus it was governed by a proconsul, and was the only senatorial province in which a legion was permanently stationed, under the orders of the senatorial governor. In A.D. 37 the emperor Gaius put an end to this arrangement by sending a legatus of his own to take over the command of the legion, thus separating the military from the civil administration, and practically separating Numidia or Africa Nova from Africa Vetus, though the two were still united in name (Tac. *Hist.* 4. 48). Under Septimus Severus (A.D. 193–211) Numidia was separated from Africa Vetus, and governed by an imperial procurator (*procurator per Numidiam*); finally, under the new organization of the empire by Diocletian, Numidia became one of the seven provinces of the diocese of Africa, being known as Numidia Cirtensis, and after Constantine as N. Constantina, corresponding closely in extent to the modern French province of Constantine. During all this period it reached a high degree of civilization, and was studded with numerous towns, the importance of which is attested by inscriptions (see vol. viii. of the *Corpus inscriptionum*), and by the massive remains of public buildings. The invasion of the Vandals in A.D. 428 reduced it to a condition of gradual decay; and the invasion of the Arabs in the 8th century again brought desolation on the land, which was aggravated by continual misgovernment till the conquest of Algeria by the French in 1833.

The chief towns of Numidia under the Romans were: in the north, Cirta, the capital, which still retains the name Constantine given it by Constantine; Rusicada on the coast, serving as its port, on the site now occupied by Philippeville; and east of it Hippo Regius, well known as the see of St Augustine, near the modern Bona. To the south in the interior were Theveste (Tebessa) and Lambaesis (Lambessa) with extensive and striking Roman remains, connected by military roads with Cirta and Hippo respectively. Lambaesis was the seat of the legion III. Augusta, and the most important strategic centre, as commanding the passes of the Mons Aurasius, a mountain block which separated Numidia from the Gaetulian tribes of the desert, and which was gradually occupied in its whole extent by the Romans under the Empire. Including these towns there were altogether twenty which are known to have received at one time or another the title and status of Roman colonies; and in the 5th century the Notitia enumerates no less than 123 sees whose bishops assembled at Carthage in 479.

For bibliography and account of Roman remains, see under AFRICA, ROMAN.

NUMISMATICS (Lat. *numisma*, *nomisma*, a coin; from the Greek, derived from *νομίζειν*, to use according to law), the science treating of coins (Low Lat. *cuneus*, a die) and medals (Low Lat. *medalla*, a small coin).

The earliest known coins were issued by the Greeks in the 7th century before the Christian era. By the 4th century the whole civilized world used money (*q.v.*), each state generally having its proper coinage. This has continued to be the case to the present time; so that now there are few nations without a metal currency of their own, and of these but a small proportion are wholly unacquainted with the use of coins.

Coins, although they confirm history, rarely correct it, and never very greatly. The earliest belong to a time and to nations as to which we are not otherwise wholly ignorant, and they do not afford us that precise information which would fill in any important details of the meagre sketch of contemporary history. We gain from them scarcely any direct historical information, except that certain cities or princes issued money. When in later times the devices and inscriptions of the coins give more detailed information, history is far fuller and clearer, so that the numismatic evidence is rarely more than corroborative. There are, indeed, some remarkable exceptions to this rule, as in the case of the Bactrian and Indian coins, which have supplied the outlines of a portion of history which was otherwise almost wholly lost. The value of the corroborative evidence afforded by coins must not, however, be overlooked. It chiefly relates to chronology, although it also adds to our knowledge of the pedigrees of royal houses. But perhaps the most interesting manner in which coins and medals illustrate history is in their bearing contemporary, or nearly contemporary, portraits of the most famous kings and captains, from the time of the first successors of Alexander the Great to the present age, whereas pictures do not afford portraits in any number before the latter part of the middle ages; and works of sculpture, although occupying in this respect the same place as coins in the last-mentioned period and under the Roman empire, are neither so numerous nor so authentic. There is no more delightful companion in historical reading than a cabinet of coins and medals. The strength and energy of Alexander, the ferocity of Mithradates, the philosophic calmness of Antoninus, the obstinate ferocity of Nero, and the brutality of Caracalla are as plain on the coins as in the pages of history. The numismatic portraits of the time following the founding of Constantinople have less individuality; but after the revival of art they recover that quality, and maintain it to our own day, although executed in very different styles from those of antiquity. From this last class we can form a series of portraits more complete and not less interesting than that of the ancient period.

Mythology.

While coins and medals thus illustrate the events of history, they have an equally direct bearing on the belief of the nations by which they were issued; and in this reference lies no small part of their value in connexion with history. The mythology of the Greeks, not having been fixed in sacred writings, nor regulated by a dominant priesthood, but having grown out of the different beliefs of various tribes and isolated settlements, and having been allowed to form itself comparatively without check, can scarcely be learned from ancient books. Their writers give us but a partial or special view of it, and modern authors, in their attempts to systematize, have often but increased the confusion. The Greek coins, whether of kings or cities, until the death of Alexander, do not, with a few negligible exceptions, represent the human form. Afterwards, on the regal coins, the king's head usually occupies the obverse and a subject, usually sacred, is placed on the reverse. The coins of Greek cities under the empire have usually an imperial portrait and a reverse type usually mythological. The whole class thus affords us invaluable evidence for the reconstruction of Greek mythology. We have nowhere else so complete a series of the different types under which the divinities were represented. There are in modern galleries very few statues of Greek divinities, including such as were intended for architectural decoration, which are in good style, fairly preserved, and untouched by modern restorers. If to these we add reliefs of the same class, and the best Graeco-Roman copies, we can scarcely form a complete series of the various representations of these divinities. The coins, however, supply us with the series we desire, and we may select types which are not merely of good work, but of the finest. The mythology of ancient Italy, as distinct from that of the Greek colonies of Italy, is not so fully illustrated by the coins of the country, because these are for the most part of Greek design. There are, however, some remarkable exceptions, especially in the money of the Roman commonwealth, the greater number of the types of which are of a local character, including many that refer to the myths and traditions of the earliest days of the city. The coins of the empire are especially important, as bearing representations of those personifications of an allegorical character to which the influence of philosophy gave great prominence in Roman mythology.

Geography.

Coins are scarcely less valuable in relation to geography than to history. The position of towns on the sea or on rivers, the race of their inhabitants, and many similar particulars are positively fixed on numismatic evidence. The information that coins convey as to the details of the history of towns and countries has a necessary connexion with geography, as has also their illustration of local forms of worship. The representations of natural productions on ancient money are of special importance, and afford assistance to the lexicographer. This is particularly the case with the Greek coins, on which these objects are frequently portrayed with great fidelity. We must recollect, however, that the nomenclature of the ancients was vague, and frequently comprised very different objects under one appellation, and that therefore we may find very different representations corresponding to the same name.

Art.

The art of sculpture, of which coin-engraving is the offspring, receives the greatest illustration from numismatics. Not only is the memory of lost statues preserved to us in the designs of ancient coins, but those of Greece afford admirable examples of that skill by which her sculptors attained their great renown. The excellence of the designs of very many Greek coins struck during the period of the best art is indeed so great that, were it not for their smallness, they would form the finest series of art-studies in the world. The Roman coins, though at no time to be compared to the purest Greek, yet represent not unworthily the Graeco-Roman art of the empire. From the accession of Augustus to the death of Commodus they are often fully equal to the best Graeco-Roman statues. This may be said, for instance, of the dupondii struck in honour of Livia by Tiberius and by the younger Drusus, of the sestertii of Agrippina, and of the Flavian emperors, and of the gold coins of Antoninus Pius and the two Faustinas, all which present portraits of remarkable beauty and excellence. The Italian medals of the Renaissance are scarcely less useful as records of the progress and characteristics of art, and, placed by the side of the Greek and Roman coins, complete the most remarkable comparative series of monuments illustrating the history of the great schools of art that can be brought together. Ancient coins throw some light upon the architecture as well as upon the sculpture of the nations by which they were struck. Under the empire, the Roman coins issued at the city very frequently bear representations of important edifices. The Greek imperial coins struck in the provinces present similar types, representing the most famous temples and other structures of their cities, of the form of some of which we should otherwise have been wholly ignorant. The art of gem-engraving among the ancients is perhaps most nearly connected with their coinage. The subjects of coins and gems are so similar and so similarly treated that the authenticity of gems, that most difficult of archaeological questions, receives the greatest aid from the study of coins.

Literature.

After what has been said it is not necessary to do more than mention how greatly the study of coins tends to illustrate the contemporary literature of the nations which issued them. Not only the historians, but the philosophers and the poets, are constantly illustrated by the money of their times. This was perceived at the revival of letters; and during the 17th and 18th centuries coins were very frequently engraved in the larger editions of the classics.

Origin of the Science.

The science of numismatics is of comparatively recent origin. The ancients do not seem to have formed collections, although they appear to have occasionally preserved individual specimens for their beauty. Petrarch has the credit of having been the first collector of any note; but it is probable that in his time ancient coins were already attracting no little notice. The importance of the study of all coins has since been by degrees more and more recognised, and at present no branch of the pursuit is left wholly unexplored.

Practical Use.

Besides its bearing upon the history, the religion, the manners, and the arts of the nations which have used money, the science of numismatics has a special modern use in relation to art. Displaying the various styles of art prevalent in different ages, coins supply us with abundant means for promoting the advancement of art among ourselves. If the study of many schools be at all times of advantage, it is especially so when there is little originality in the world. Its least value is to point out the want of artistic merit and historical commemoration in modern coins, and to suggest that modern medals should be executed after some study of the rules which controlled the great works of former times.

Definitions.—The following are the most necessary numismatic definitions.

1. A *coin* is a piece of metal of a fixed weight, stamped by authority of government, and employed as a circulating medium.[1]

2. A *medal* is a piece, having no place in the currency, struck to commemorate some event or person. Medals are frequently comprised with coins in descriptions that apply to both equally; thus, in the subsequent definitions, by the term coins, coins and medals must generally be understood.

3. The coinage of a country is usually divided into the classes of gold, silver and bronze (copper), for which the abbreviations *AV*, AR, and Æ are employed in catalogues. In addition to these metals, and to the modifications of them created by the presence of varying amounts of alloy, certain other compounds were frequently used, notably electrum, billon, brass and potin.

4. *Electrum* (ἤλεκτρον, ἤλεκτρος, λευκὸς χρυσός), a compound metallic substance, consisting of gold with a considerable alloy of silver. Pliny makes the proportion to have been four parts of gold to one of silver.[2] The material of early coins of Asia Minor struck in the cities of the western coast is the ancient electrum. The amount of silver varies very considerably with time and place. Gold largely alloyed with silver, not struck by the ancient Greeks or their neighbours, should be termed *pale gold*, as in the case of some of the late Byzantine coins.

5. *Billon*, a term applied to the base metal of some Roman coins, and also to that of some medieval and modern coins. It contains about one-fifth silver to four-fifths copper. When the base silver coins are replaced by copper washed with silver the term billon becomes inappropriate.

6. *Brass*, a mixture of copper and zinc. It may be used as an equivalent to the orichalcum of the Romans, a fine kind of brass of which the sestertii and dupondii were struck, but it is commonly applied indiscriminately to the whole of their copper currency under the empire.

7. *Potin*, an alloy of copper and tin (therefore a variety of bronze) used for some late Gaulish coins.

8. Various other metallic substances have been used in coinage, including iron (in Peloponnesus) and an alloy of copper and nickel employed for some Bactrian coins. The so-called "glass coins" of the Arabs are merely coin-weights.

9. The *forms* of coins have greatly varied in different countries and at different periods. The usual form in both ancient and modern times has been circular, and generally of no great thickness.

10. Coins are usually measured by millimetres, or by inches and tenths, the greatest dimension being taken, or, when they are square or oval, the greatest dimension in two directions.

11. The *weight* of a coin is of great importance, both in determining its genuineness and in distinguishing its identity. Metric weights are used by most numismatists except in England, where troy weight is still in general use.

12. The *specific gravity* of a coin may be of use in determining the metals in its composition.

13. Whatever representations or characters are borne by a coin constitute its *type*. The subject of each side is also called a type, and, when there is not only a device but an inscription, the latter may be excluded from the term. This last is the general use. No distinct rule has been laid down as to what makes a difference of type, but it may be considered to be an essential difference, however slight.

14. A difference too small to constitute a new type makes a *variety*.

15. A coin is a *duplicate* of another when it agrees with it in all particulars but those of exact size and weight. Strictly speaking, ancient coins are rarely, if ever, duplicates, except when struck from the same pair of dies.

16. *Struck* coins are those on which the designs are produced by dies impressed on the blank piece (or *flan*) of metal by some form of hammering or pressure; they are distinguished from *cast* coins made by running metal into a mould.

17. Of the two sides of a coin, that is called the *obverse* which bears the more important device. In early Greek coins it is the convex side, or the side impressed by the lower die; in Greek and Roman imperial it is the side bearing the head; in medieval and modern that bearing the royal effigy, or the king's name, or the name of the city; and in Oriental that on which the inscription begins. The other side is called the *reverse*.

18. The *field* of a coin is the space unoccupied by the principal devices or inscriptions. Any detached independent device or character is said to be in the field, except when it occupies the exergue.

19. The *exergue* is that part of the reverse of a coin which is below the main device, and distinctly separated from it; it often bears a secondary inscription. Thus, the well-known inscription CONOB occupies the exergue of the late Roman and early Byzantine gold coins.

20. The *edge* of a coin is the surface of its thickness.

21. By the *inscription* or *inscriptions* of a coin all the letters it bears are intended; an inscription is either principal or secondary.

22. In describing coins the terms *right* and *left* mean the right and left of the spectator, not the heraldic and military right and left, or those of the coin.

23. A *bust* is the representation of the head and neck; it is commonly used of such as show at least the collar-bone, other busts being called heads. A *head* properly means the representation of a head alone, without any part of the neck, but it is also commonly used

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[1] This definition excludes, on the one hand, paper currencies and their equivalents among barbarous nations, such as cowries, because they are neither of metal nor of fixed weight, although either stamped or sanctioned by authority, and, on the other hand, modes of keeping metal in weight, like the so-called Celtic "ring-money," because it is not stamped, although perhaps sanctioned by authority. The latter has attracted much attention, but it is by no means made out that the rings were made with the primary intention of serving as money. But it is a very common usage among savage or semi-savage races to wear all their wealth in the form of ornaments (as a woman may even now wear her dowry as ornaments in the form of coins) and to use the ornaments (or cut-off portions of them, "skillings") whenever occasion arises as a medium of exchange. These rings then were doubtless used in this manner, but they were no more money than were any other precious possessions which could be used in exchange. There is no good evidence for the use of the little Gaulish "wheels" as money. On these questions see Blanchet, *Monn. gaul.* pp. 24-29. On the border of the definition are such prehistoric "dumps" of metal as have been found at Enkomi in Cyprus and at Cnossus in Crete; one of these indeed seems to bear traces of a mark of some kind.

[2] *Hist. nat.* xxxiii. 23; cp. xxxvii. 11. Pliny distinguishes two kinds of "electron,"—amber, and this metallic substance. In Greek poetry the name seems to apply to both, but it is generally difficult to decide which is meant in any particular case. Sophocles, however, where he mentions τἀπὸ Σάρδεων ἤλεκτρον, . . . καὶ τὸν Ἰνδικὸν χρυσόν (*Ant.* 1037–1039), can scarcely be doubted to refer to the metallic electrum.

when any part of the neck above the collar-bone is shown. The present article follows custom in the use of the terms *bust* and *head*. When the neck is clothed, the bust is said to be draped.

24. A bust or head is either facing, usually three-quarter face, or in profile, in which latter case it is described as *to right* or *to left*. Two busts may be placed in various relative positions, as jugate or confronted.

25. A bust wearing a laurel-wreath is said to be *laureate*.

26. A bust bound with a regal fillet (diadem) is called *diademed*.

27. A bust wearing a crown with rays is said to be *radiate*.

28. An object in the field of a coin which is neither a letter nor a monogram is usually called a *symbol*. This term is, however, only applicable when such an object is evidently the badge of a town or individual. The term *adjunct*, which is sometimes employed instead of symbol, is manifestly incorrect.

29. A *mint-mark* is a difference placed by the authorities of the mint upon all money struck by them, or upon each new die or separate issue.

30. A coin is said to be "over-struck" or "re-struck" when it has been struck on an older coin, of which the types are not altogether obliterated.

31. A *double-struck* coin is one in which the die or dies have shifted so as to cause a double impression.

32. A coin which presents two obverse types, or two reverse types, or of which the types of the obverse and reverse do not correspond, is called a *mule*; it is the result of mistake or caprice.

Arrangement of Coins.—No uniform system has as yet been applied to the arrangement of all coins. It is usual to separate them into the three great classes of ancient coins (comprising Greek and Roman), medieval and modern, and Oriental coins. The details of these classes have been differently treated, both generally and specially. The arrangement of the Greek series has been first geographical, under countries and towns, and then chronological, for a further division; that of the Roman series, chronological, without reference to geography; that of the medieval and modern, the same as the Greek; and that of the Oriental, like the Greek, but unsystematically—a treatment inadmissible except in the case of a single empire. Then, again, some numismatists have separated each denomination or each metal, or have separated the denominations of one metal and not of another. There has been no general and comprehensive system, constructed upon reasonable principles, and applicable to every branch of this complicated science. Without laying down a system of rules, or criticizing former modes of arrangement, we offer the following as a classification which is uniform without being servile.

1. *Greek Coins.*—All coins of Greeks, or barbarians who adopted Greek money, struck before the Roman rule or under it, but without imperial effigies. The countries and their provinces are placed in a geographical order from west to east, according to the system of Eckhel, with the cities in alphabetical order under the provinces, and the kings in chronological order. The civic coins usually precede the regal, as being the more important. The coins are further arranged chronologically, the civic commencing with the oldest and ending with those bearing the effigies of Roman emperors. The gold coins of each period take precedence of the silver and the silver of the copper. The larger denominations in each metal are placed before the smaller. Coins of the same denomination and period are arranged in the alphabetical order of the magistrates' names, or the letters, &c., that they bear.

2. *Roman Coins.*—All coins issued by the Roman commonwealth and empire, whether struck at Rome or in the provinces. The arrangement is chronological, or, where this is better, under geographical divisions.

3. *Medieval and Modern Coins of Europe.*—All coins issued by Christian European states, their branches and colonies, from the fall of the empire of the West to the present day. This class is arranged in a geographical and chronological order, as similar as possible to that of the Greek class, with the important exception of the Byzantine coins and the coins following Byzantine systems, which occupy the first place. The reason for this deviation is that the Byzantine money may be regarded not only as the principal source of medieval coinage but as the most complete and important medieval series, extending as it does without a break throughout the middle ages. The regal coins usually precede the civic ones, as being the more important. The medals of each nation should be arranged in two series: (1) medals of rulers, according to their dates; (2) medals of private persons, as far as possible according to the artists.

4. *Oriental Coins.*—All coins bearing inscriptions in Eastern languages, excepting those of the Jews, Phoenicians and Carthaginians, which are classed with the Greek coins from their close connexion with them. These coins should be arranged under the following divisions: Ancient Persian, Arab, Modern Persian, Indian, Chinese and coins of the Far East.

This method of arrangement will be found to be as uniform as it can be made, without being absolutely mechanical. It differs in some important particulars from most or all of those which have previously obtained; but these very differences are the result of the consideration of a complete collection, and have therefore an inductive origin. A general uniformity is no slight gain, and may well reconcile us to some partial defects.

I. GREEK COINS

There are some matters relating to Greek coins in general which may be properly considered before they are described in geographical order. These are their general character, the chief denominations, with the different talents of which they were the divisions, their devices and inscriptions, their art, and the mode of striking.

The period during which Greek coins were issued was probably not much less than a thousand years, commencing about the beginning of the 7th century B.C. and generally ending at the death of Gallienus (A.D. 268). If classed with reference only to their form, fabric, and general appearance they are of three principal types—the archaic Greek, the ordinary Greek, and the Graeco-Roman. The coins of the first class are of silver, electrum and sometimes gold. They are thick lumps of an irregular round form, bearing on the obverse a device, with in some cases an accompanying inscription, and on the reverse a square or oblong incuse stamp (*quadratum incusum*), usually divided in a rude manner. The coins of the second class are of gold, electrum, silver and bronze. They are much thinner than those of the preceding class, and usually have a convex obverse and a slightly concave or flat reverse. The obverse ordinarily bears a head in bold relief. The coins of the third class are, with very few exceptions, of bronze. They are flat and broad, but thin, and generally have on the obverse the portrait of a Roman emperor. Many Greek cities, however, during the empire issued *quasi-autonomous* coins bearing the head of some deity or personification. Greek coins thus fall mainly into the classes of autonomous, quasi-autonomous and imperial. The coinage of Roman colonies in Greek as in other lands is usually distinguished by Latin inscriptions.

Monetary Systems.

Since Greek coinage originated in Asia Minor, the coins were adjusted to the weight-systems there in use, and these go back to a Babylonian origin. But it is possible that some of the standard of Greece proper had a native origin. The unit of weight in the East was the shekel (*siglos*). This was $\frac{1}{60}$ of the manah (*mina*, *mna*), and this $\frac{1}{60}$ of the talent (*talanton*). This scale the Greeks modified, in that, starting from the siglos as unit, they invented a money-mina of 50 sigli, with a money-talent of 60 minae or 3000 sigli. The siglos-units (and corresponding standards) chiefly employed in Asia Minor were the following (the relation between gold and silver at the time of the invention of these units seems to have been $13\frac{1}{3}:1$):—

Gold shekel, 8·40 grammes.
Phoenician silver shekel, 7·44 g. = $\frac{1}{15}$ of 111·72 g. of silver, which was equivalent to 8·4 g. of gold.
Babylonian or Persic silver shekel, 11·17 g. = $\frac{1}{10}$ of 111·72 g. of silver, which was equivalent to 8·4 g. of gold.

Thus one gold shekel was the equivalent of 15 Phoenician or 10 Babylonian silver shekels. Side by side with this system was another in which the weights were exactly double of those just given; a shekel of the heavier system might be regarded as a double shekel of the lighter. Various Babylonian weights are extant, dating from 2000 B.C. downwards, which prove the existence of minae of the two systems. The gold shekel standard was almost invariably used for gold coins, sometimes also for electrum. The Babylonian and Phoenician standards were also sometimes used for gold or electrum as well as silver. A weight more or less approaching that of the gold shekel or its multiples seems to have been usual all over the civilized world in Greek times; *e.g.* the Phocaean standard of 16·52 g. was but a modification of it. But for silver in Greece proper, from a very early period, the following standards prevailed: the Aeginetic (unit, didrachm or stater, of 12·6 g.) and the Euboic-Attic (stater of 8·72 g.), with its modification the Corinthian. The Euboic-Attic standard attained enormous importance owing to the spread of Athenian trade and the adoption of the weight by Alexander of Macedon. It was used for both gold and silver. The Corinthian standard differed only in its divisional system, the stater being divided into thirds instead of halves. From it were derived some of the standards in use among the Greeks of S. Italy. Other standards of more local importance were: the Campanian, used in a large part of S. Italy (didrachm originally of 7·41 g., afterwards reduced), and perhaps derived from the Phoenician; the Rhodian (instituted about 400 B.C., tetradrachm about 15 g.); and the cistophoric (from about 200 B.C., with a tetradrachm of about 12·73 g.).

Denominations. The following table exhibits the weights in grammes of the principal denominations of the Greek systems:—

	Gold Shekel System.	Babylonian or Persic.	Phoenician.	Aeginetic.	Euboic-Attic.
Double shekel, distater or tetradrachm	16·80	22·40	14·92	25·20	17·44
Shekel, stater or didrachm	8·40	11·20	7·46	12·60	8·72
Hemistater or drachm	4·20	5·60	3·73	6·30	4·36
Third or tetrobol	2·80	3·73	2·49	4·48	2·92
Twelfth or obol	0·70	0·93	0·62	1·12	0·73

The term stater is usually applied to the didrachm, but also to the tetradrachm, and at Cyrene to the drachm.

The bronze standards have been less fully discussed. Some notice of them will be given under different geographical heads.

Types. In the types of Greek coins (using the term in its restricted sense) the first intention of the designers was to indicate the city or state by which the money was issued. The necessity for distinctive devices was most strongly felt in the earlier days of the art, when the obverse of a coin alone bore a design, and, if any inscription, only the first letter, or the first few letters, of the name of the people by whom it was issued. Whatever may have been the original significance of the type in itself, religious or otherwise, it was adopted for the coinage—at least in the earliest times—because it was the badge by which the issuing authority was recognized. It was only with the increased complexity of the denominations in later times, when new distinguishing types had to be found, that—as in the 4th century B.C.—the religious motive in the choice of types came deliberately into play.

Classes. Greek coins, if arranged according to their types, fall into three classes: (1) civic coins, and regal without portraits of sovereigns; (2) regal coins bearing portraits; and (3) Graeco-Roman coins, whether with imperial heads or not. The coins of the first class have either a device on the obverse and the *quadratum incusum* on the reverse, or two devices; and these last are again either independent of each other, though connected by being both local, or—and this is more common—that on the reverse is a kind of complement of that on the obverse. It will be best first to describe the character of the principal kinds of types of the first class, and then to notice their relation. It must be noted that a head or bust is usually an obverse type, and a figure or group a reverse one, and that, when there is a head on both obverse and reverse, that on the former is usually larger than the other, and represents the personage locally considered to be the more important of the two. We must constantly bear in mind that these types are local if we would understand their meaning.

Types of Civic, &c., Coins. In the following list the types of Greek coins of cities, and of kings, not having regal portraits, are classed in a systematic order, without reference to their relative antiquity.

1. Head or figure of a divinity worshipped at the town, or by the people, which issued the coin, as the head of Athena on coins of Athens, and the figure of Heracles on coins of Boeotian Thebes. Groups are rare until the period of Graeco-Roman coinage.

2. Natural or artificial objects—(*a*) animal, often sacred to a divinity of the place, as the owl (Athens) and perhaps the tortoise (Aegina); (*b*) tree or plant, as the silphium (Cyrene) and the olive-branch (Athens); (*c*) arms or implements of divinities, as the arms of Heracles (Erythrae), the tongs of Vulcan (Aesernia). It is difficult to connect many objects comprised in this class with local divinities. Some of them, as the tunny at Cyzicus, are doubtless only so connected because the chief industry of a place was placed under the tutelage of its chief divinity.

3. Head or figure of a local genius—(*a*) river-god, as the Gelas (Gela); (*b*) nymph of a lake, as Camarina (Camarina); (*c*) nymph of a fountain, as Arethusa (Syracuse).

4. Head or figure of a fabulous personage or half-human monster, as a Gorgon (Neapolis Macedoniae), the Minotaur (Cnossus).

5. Fabulous animal, as Pegasus (Corinth), a griffin (Panticapaeum), the Chimaera (Sicyon).

6. Head or figure of a hero or founder, as Ulysses (Ithaca), the Lesser Ajax (Locri Opuntii), Taras, founder of Tarentum (Tarentum).

7. Objects connected with heroes—animal connected with local hero, as the Calydonian boar or his jaw-bone (Aetolians).

8. Celebrated real or traditional sacred localities, as mountains on which divinities are seated, the labyrinth (Cnossus).

9. Representations connected with the public religious festivals and contests, as a chariot victorious at the Olympic games (Syracuse).

The relation of the types of the obverse and reverse of a coin is a matter requiring careful consideration, since they frequently illustrate one another. As we have before observed, this relation is either that of two independent objects, which are connected only by their reference to the same place, or the one is a kind of complement of the other. Among coins illustrating the former class we may instance the beautiful silver didrachms of Camarina, having on the obverse the head of the river-god Hipparis and on the reverse the nymph of the lake carried over its waters by a swan, and those of Sicyon, having on the obverse the Chimaera and on the reverse a dove. The latter class is capable of being separated into several divisions. When the head of a divinity occurs on the obverse of a coin, the reverse is occupied by an object or objects sacred to that divinity. Thus the common Athenian tetradrachms have on the one side the head of Athene and on the other an owl and an olive-branch; the tetradrachms of the Chalcidians in Macedonia have the head of Apollo and the lyre; and the copper coins of Erythrae have the head of Heracles and his weapons. The same is the case with subjects relating to the heroes: thus there are drachms of the Aetolian League which have on the obverse the head of Atalanta and on the reverse the Calydonian boar, or his jaw-bone and the spear-head with which he was killed. In the same manner the coins of Cnossus, with the Minotaur on the obverse, have on the reverse a plan of the Labyrinth. Besides the two principal devices there are often others of less importance, which, although always sacred, and sometimes symbols of local divinities, are generally indicative of the position of the town, or have some reference to the families of magistrates who used them as badges. Thus, for example, besides such representations as the olive-branch sacred to Athene on the Athenian tetradrachms, as a kind of second device dolphins are frequently seen on coins of maritime places; and almost every series exhibits many symbols which can only be the badges of the magistrates with whose names they occur. Regal coins of this class, except Alexander's, usually bear types of a local character, owing to the small extent of most of the kingdoms, which were rather the territories of a city than considerable states at the period when these coins were issued.

Regal, with Portraits. The second great class—that of coins of kings bearing portraits—is necessarily separate from the first. Religious feeling affords the clue to the long exclusion of regal portraits—the feeling that it would be profane for a mortal to take a place always assigned hitherto to the immortals. Were there any doubt of this, it would be removed by the character of the earliest Greek regal portrait, that of Alexander, which occurs on coins of Lysimachus. This is not the representation of a living personage, but of one who was not only dead but had received a kind of apotheosis, and who, having been already called the son of Zeus Ammon while living, had been treated as a divinity after his death. He is therefore portrayed as a young Zeus Ammon. Probably, however, Alexander would not have been able, even when dead, thus to usurp the place of a divinity upon the coins, had not the Greeks become accustomed to the Oriental "worship" of the sovereign, which he did not discourage. This innovation rapidly produced a complete change; every king of the houses which were raised on the ruins of the Greek empire could place his portrait on the money which he issued, and few neglected to do so, while the sovereigns of Egypt and Syria even assumed divine titles.

The reign of Alexander produced another great change in Greek coinage, very different from that we have noticed. He suppressed the local types almost throughout his empire, and compelled the towns to issue his own money, with some slight difference for mutual distinction. His successors followed the same policy; and thus the coins of this period have a new character. The obverses of regal coins with portraits have the head of the sovereign, which in some few instances gives place to that of his own or his country's tutelary divinity, while figures of the latter sort almost exclusively occupy the reverses. Small symbols, letters, and monograms on the reverses distinguish the towns in this class.

Graeco-Roman.

The Graeco-Roman coins begin, at different periods, with the seizure by Rome of the territories of the Greek states. They are almost all bronze; and those in that metal are the most characteristic and important. In their types we see a further departure from the religious intention of those of earlier times in the rare admission of representations, not only of eminent persons who had received some kind of apotheosis, such as great poets, but also of others who, although famous, were not, and in some cases probably could not have been, so honoured. We also observe on these coins many types of an allegorical character.

The following principal kinds of types may be specified, in addition to those of the two previous classes. (1) Head or figure of a famous personage who either had received a kind of apotheosis, as Homer (Smyrna), or had not been so honoured, as Herodotus (Halicarnassus) and Lais (Corinth). (2) Pictorial representations, always of a sacred character, although occasionally bordering on caricature. We may instance, as of the latter sort, a very remarkable type representing Athene playing on the double pipe and seeing her distorted face reflected in the water, while Marsyas gazes at her from a rock—a subject illustrating the myth of the invention of that instrument (Apamea Phrygiae). (3) Allegorical types, as Hope, &c., on the coins of Alexandria of Egypt, and many other towns. These were of Greek origin, and owed their popularity to the sculpture executed by Greeks under the empire; but the feeling which rendered such subjects prominent was not that of true Greek art, and they are essentially characteristic of the New Attic school which attained its height at Rome under the early emperors.

There is a class of coins which is always considered as part of the Graeco-Roman, although in some respects distinct. This is the colonial series, struck in Roman coloniae, and having almost always Latin inscriptions. As, however, these coloniae were towns in all parts of the empire, from Emerita in Spain (Merida) to Bostra in Arabia, in the midst of a Greek population and often of Greek origin, their coins help to complete the series of civic money, and, as we might expect, do not very markedly differ from the proper Greek imperial coins except in having Latin inscriptions and showing a preference for Roman types.

Inscriptions.

We have now to speak of the meaning of the inscriptions of Greek coins. These are either principal or secondary; but the former are always intended when inscriptions are mentioned without qualification, since the secondary ones are non-essential. The inscription of civic money is almost always the name of the people by which it was issued, in the genitive plural, as **ΑΘΗΝΑΙΩΝ** on coins of the Athenians, **ΣΥΡΑΚΟΣΙΩΝ** on coins of the Syracusans, or the name of the city in the genitive singular, as **ΑΚΡΑΓΑΝΤΟΣ** at Agrigentum. The inscription of regal money is the name, or name and title, of the sovereign in the genitive, as **ΑΛΕΞΑΝΔΡΟΥ**, or **ΒΑΣΙΛΕΩΣ ΑΛΕΞΑΝΔΡΟΥ**, on coins of Alexander the Great. Instead of this genitive an adjective is sometimes found, as Ἀρκαδικόν on early Arcadian coins, Ἀλεξάνδρειος on staters of Alexander of Pherae. This genitive or adjectival form implies a nominative understood, which has been generally supposed to be νόμισμα "money," or the name of some denomination.

There are a few instances in which a nominative of this kind is expressed on coins—**ΦΑΕΝΟΣ ΕΜΙ ΣΗΜΑ**, "I am the badge of Phaeno (?) or Phanes" on an archaic Ionian coin; **ΓΟΡΤΥΝΟΣ ΤΟ ΠΑΙΜΑ**, "the striking, struck piece, or type of Gortys"; **ΦΑΙΣΤΙΟΝ ΤΟ ΠΑΙΜΑ ΣΕΥΘΑ ΑΡΓΥΡΙΟΝ** (silver money), or **ΚΟΜΜΑ** ("striking" or "struck piece"); and **ΚΟΤΥΟΣ ΧΑΡΑΚΤΗΡ** ("engraving" or "engraved piece"). Seuthes (end of 5th century B.C.) and Cotys (1st century B.C.), semi-barbarian Thracians, afford no evidence for Greek usage. The other instances (all archaic) point to the nominative understood in *early* times being in reality some word meaning type, or badge. But, if so, this latent nominative was eventually superseded by one meaning "money" or "coin." Thus the staters of Alexander of Pherae are inscribed Ἀλεξάνδρειος, his drachms Ἀλεξανδρεία. Probably from the 4th century onwards "coin" was always understood. Occasionally the name of the issuing authority is found in the nominative, as Κύμε (at Cumae), Δάνκλε (Zancle-Messana), Ἀθε. ὁ δε̃μος on a late coin probably issued by the Athenians in Delos, Τάρας at Tarentum. These are by no means always descriptive of the type, but merely a straightforward way of naming the issuing authority. The simple inscriptions of the early period of Greek coinage are under the kings and the Roman empire replaced by elaborate legends, most of which, however, fall under the description above given. A certain number of inscriptions directly describe the type (not merely giving the name of its owner) as Σωσίπολις (the goddess of Gela) or Νίκα (at Terina). Others, especially in Roman times, indicate the reason of issue, as Ἰουδαίας ἑαλωκυίας on coins of Judaea under Vespasian, or names of festivals for which the coins were issued. These, however, properly belong to the class of secondary inscriptions which either describe secondary types, as **ΑΘΛΑ**, "rewards," accompanying the representation of the arms given to the victor in the exergues of Syracusan decadrachms,[1] or are the names of magistrates or other officers, or in regal coins those of cities, or are those of the engravers of the dies, of whom sometimes two were employed, one for the obverse and the other for the reverse, or are dates. These inscriptions are often but abbreviations or monograms, especially when they indicate cities on the regal coins.

Art of Coins.

The importance of Greek coins as illustrating the character of contemporary art cannot be easily overrated. They are beyond all other monuments the grammar of Greek art. Their geographical and historical range is only limited by Greek history and the Greek world; as a series they may be called complete; in quality they are usually worthy of a place beside contemporary sculpture, having indeed a more uniform merit; they are sometimes the work of great artists, and there is no question of their authenticity, nor have they suffered from the injurious hand of the restorer. Thus they tell us what other monuments leave untold, filling up gaps in the sequence of works of art, and revealing local schools known from them alone.

The art of coins belongs to the province of relief, which lies between the domains of sculpture and of painting, partaking of the character of both, but most influenced by that which was dominant in each age. Thus in antiquity relief mainly shows the rule of sculpture; in the Renaissance that of painting.

It may be expected that Greek coins will bear the impress of the sister art of sculpture, filling up the gaps in the sequence of examples of the art of which we have remains, telling us somewhat of that which has but a written tradition. Our first duty is to endeavour to place the documents in the best order, separating the geographical from the historical indications, first examining the evidence of local schools, then those of the succession of styles. It is from coins alone that we can discover the existence of great local schools, reflecting the character of the different branches of the Hellenic race. In tracing the changes in these schools we gain a great addition to our ideas of the successive styles, and can detect new examples of those which owe their fame to the leading masters. But in dealing with works in relief we have the advantage due to their intermediate character. In our larger geographical horizon we can trace the character of the successive styles, not of sculpture only, but also of sculpture and painting.

Local Schools.

Greek coins clearly indicate three great schools, each with its subordinate groups. The school of central Greece holds the first place, including the northern group centred in Thrace and Macedonia, and the southern in the Peloponnesus, with the outlying special schools of Crete and Cyrene. The Ionian school has its northern group, Ionia, Mysia and Aeolis, and its southern, Rhodes and Caria. Beyond these are certain barbarous and semi-barbarous groups, of which the most important is that of eastern Asia Minor, Persia and Phoenicia, with Cyprus. The school of the West comprises the two groups of Italy and Sicily.

The whole duration of the schools is limited, by the repulse of the Persians and the accession of Alexander, from 480 to 332 B.C. Before this age all is archaic, and it is hard to trace local characteristics. After it, the centralizing policy of the sovereigns and the fall of the free cities destroyed local art. In certain cultivated centres under enlightened kings a local art arose, but it speedily became general, and we have thus to think of a succession of styles during the rest of the life of Greek art. The century and a half of the local schools is significantly the great age of this art.

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[1] The arms on the Syracusan decadrachms represent a reward given to the victors in the Assinarian games (see below).

In the study of each school we have first to determine its character, and then to look in its successive phases for the influence of the great masters of style. Two dangers must be avoided. We must not too sharply divide the sculptors and the painters as if they always were true to the special functions of their arts. It is well to bear in mind that the earliest great painter, Polygnotus, was a portrayer of character, *καλὸς ἠθογράφος, ἠθικός*, as Aristotle calls him, whereas the latest great sculptors represented expression (*τὰ πάθη*). Thus since *ἦθος* is the special province of sculpture, and *τὰ πάθη* of painting, sculpture first weighed down the balance, afterwards painting; but it must be remembered that relief can be truer to painting than sculpture in the round, which is more limited by the conditions of the material and mechanical necessities. Our second danger is due to the ease with which local qualities may be ascribed to the influence of a leading style. It is also to be borne in mind that the movement of art in coins was during one period slower than in sculpture—hence an influence more general than particular. Pheidias and Myron do not make their mark so much as Polyclitus. In all cases the direct influence of great masters is to be looked for later than their age.

Central Greece.

The school of central Greece in its southern group, comprehending Attica, is remarkable for its widespread extent. It has its colonies in Magna Graecia at Thurium, an Athenian foundation, probably at Terina, and in Macedonia at Amphipolis and Chalcidice under Athenian rule. It alone shows instances comparable to the works of Pheidias, though its most numerous fine works are of the age of Polyclitus and that of Praxiteles and Scopas. Its qualities may be seen by comparison of the same subjects as treated by the other schools and groups. The earliest works are marked more than any others by the qualities of high promise which characterized the Aeginetan marbles—the same dignified self-restraint and calm simplicity. Next we perceive a series strong in style, and showing that lofty dignity, that reposeful embodiment of character, which are the stamp of the works of Pheidias and his contemporaries. The subjects are more remarkable for fidelity, breadth and boldness than for delicacy of execution or elaboration of ornament. Every subject is ideal, even the portrayal of animal form. Thus the character shows us what divinity is intended and the ideality what is intended by the representation of beast or bird. From these works we pass to those which reflect the style of the time of Praxiteles and Scopas, when the influence of painting began to be felt, and art inclined towards feeling and descended to sentiment. Still, to the last, character rules these coins, and the chief difference we see is in the increased love of beauty for its own sake and the fondness for representing movement, not to the exclusion of repose, but by its side. In other respects there is little change except in the finer execution and more ornamental quality of the work. Even when the greatest achievement of the Sicilian school, the female head on the decadrachms of Syracuse, is copied by the Locrians and the Messenians, the larger quality of the school of Greece asserts itself, and the copy is better than the original: there is less artifice and more breadth. The northern group is at first ruder, in the age of Pheidias severer, and afterwards it merges into the greater softness of its southern rival. If it copies, as Larissa may copy Syracuse and Neapolis in Campania, it again asserts its superior simplicity, and we prefer the copy to the original.

Ionia.

The Ionian school lacks the sequence which the rest of the Greek world affords. It is broken by the baneful influence of the Persian dominion, and consequently the best works belong to the earliest and latest part of the period. The earliest coins, of the Aeginetan age, present nothing special; the later, of the time of Praxiteles and Scopas, comprise works not inferior to those of central Greece, and remarkable, like the Western and the Cretan, as the sole records of a school otherwise unknown. They are markedly characterized by the qualities of the style of feeling, that of Praxiteles and Scopas; but more than this, they are the expression of that style in pictorial form. They represent expression, and they treat it as it could not be treated in sculpture in the round, portraying locks streaming in the air and flowing draperies. It must be remembered that, while Hellas produced the great sculptors, western Asia Minor bred the great painters after Polygnotus, himself a sculptor in painting rather than a painter. In the native land of Zeuxis, Parrhasius and Apelles we see the evidence of the rule of painting. The technical skill is inferior to that of the West, yet the skill in modelling is far greater, and has no parallel in the medallic work of any other time or country.

The West.

The school of the West, if we except such outlying examples of the art of Hellas as those of Thurium and Terina, has its highest expression in Italy, its most characteristic in Sicily. It has distinctive qualities throughout the age. Even in the earlier period we trace a striving after beauty and a delicacy of finish, with a weakness of purpose, that mark the school with an influence increasing to a time long after the extinction of its rivals. At the same time there is a knowledge of the capacity of the materials and the form of the coin and a masterly power of finish, on the whole a completeness of technical skill which is unequalled. The result in the lower subjects is splendid, if wanting in variety, but in the higher we miss the noble achievements of the greater schools. So far there is a general agreement in the northern and southern groups. Yet the Italian shows a nobler and simpler style, with some affinity to that of central Greece, which we look for in vain in Sicily, though we are dazzled by the rich beauty of the magnificent series of coins which marks her wealthiest age. Sicilian art has this apparent advantage, that the great cities, save Syracuse, perished in the Carthaginian invasion, or under the tyranny of the elder Dionysius. Thus we have no important works save of Syracuse during the second half of our period, and cannot judge fully to what this school would have fallen. The key to this exceptional development of Greek art is found in the absence of sculptors or painters in the West, except only Pythagoras of Rhegium at the very beginning of the age, whose influence is thought to be traceable on the money of his native town. On the other hand, there can be no doubt that many of the Sicilian die-engravers, as Phrygillos (to mention one whose signature is actually found on an intaglio) were gem-engravers. The Western art is that of engravers accustomed to minute and decorative work, uninfluenced by sculpture or painting. Their designs will not bear enlargement, which only enhances the charm of those of the other leading schools. Those of the great Syracusan decadrachms are small; those of the minute hectae of Cyzicus are large.

Crete.

The most important of the lesser schools is the Cretan. Crete, retaining the primitive life of older Hellas, was never truly civilized, but to the last enjoyed the privileges and exhibited the faults of an undeveloped condition. Producing in the age of high art neither sculptor nor painter of renown, the Cretans, to judge from their coins, were copyists of nature or art. At first rude, their work acquires excellence in design, but never in execution. While we see their poor reproductions of the designs of the Peloponnesus, we are amazed by their skill in portraying nature. Their gods are seated in trees with a background of foliage. Their bulls are sketched as they wandered in the meadows. All fitness for the mode of relief, as well as for the material and the shape of the coin, is entirely ignored. Hence a delight in foreshortening, and a free choice of subject with no reference to the circle in which it must be figured. In spite, however, of their skill, the Cretans never attempted the three-quarter face, which is at once the best suited to the surface of a coin and the most trying to the skill of the artist. Yet their work is delightfully fresh, as if done in the open air. There is no idealism, but much life and movement. In a word, the school is naturalistic and picturesque. Its works are of the highest value in the study of Greek art, but as examples of the application of that art to coins they are to be used with caution. Nowhere else do we see the artist so freely copying nature and art, nowhere so unshackled by academic rules, nowhere so little aware of the limitation of his province.

Mode of Coining.

It is important to study the mode in which Greek money was coined, because the forms of the pieces thus receive explanation, and true coins are discriminated from such modern falsifications as have been struck, and in some degree from those which have been cast. Our direct information on the subject is extremely scanty, but we are enabled by careful inference to obtain a very near approximation to the truth on all the most important points.

Of the dies used by the Greeks exceedingly few have been preserved. In the museum at Sofia is an iron die for the reverse of a coin of Philip II. of Macedon; and several Gaulish dies exist. Most ancient dies are of bronze, others of hardened iron or steel. The blanks were, as a rule, first cast, sometimes in a spherical form, sometimes in a form more resembling that assumed by the finished coin. The blank was placed between two dies, the lower, let into an anvil, producing the obverse, the other, let into the end of a bar, producing the reverse. The bar was struck with a hammer, so that the blank received at the same time the impressions of both dies. This general rule was of course often modified; in some parts of the Greek world the dies were hinged together, in others not; and this arrangement of hinging the dies came in at different times in different places. The machinery of striking was probably much elaborated under the Roman empire, but a collar seems never to have been used in ancient times. Greek dies must usually have worn out very quickly; hence an enormous number of slightly varying representations of the same type. But the idea that it is uncommon to find two Greek coins from the same die is exaggerated. A great number of early Italian and Roman, and a few Greek coins, of large size, were cast in moulds, not struck; and under the empire many coins, originally struck, were reproduced, not always fraudulently, by casting; but the genuine ancient coin of small size is, as an almost invariable rule, struck and not cast.

Greek Coinage of the Far West.

We may now pass on to notice the Greek coinage of each country, following Eckhel's arrangement. The series begins with Spain, Gaul and Britain, constituting the only great class of barbarous Greek coinage. It must not be supposed that the money of the whole class is of one general character; on the contrary, it has very many divisions, distinguished by marked peculiarities; it has, however, everywhere one common characteristic—its devices are corrupt copies of those of Greek or Roman coins. The earliest of these barbarous coinages begin with the best imitations of the gold and silver money of Philip II. of Macedon. They probably first appeared to the north of his kingdom, but the gold soon spread as far as Gaul, and even found their way into southern Britain, by which time the original types had almost disappeared through successive degradations. Next in order of time are the silver imitations of Roman coins, the victoriati and denarii of the commonwealth, which began in Spain and passed into Gaul, being current with the gold money of Greek origin; even in Britain the later coinage shows much Roman influence. The copper money of Spain follows the imitated silver types; that of Gaul and Britain, though showing Roman influence, is more original.

Spain.

Side by side with these large coinages we find Greek money of colonies in Gaul and Spain, and a far ampler issue of Phoenician coins by the Carthaginian kings and cities of the Peninsula. The coinage of Hispania, corresponding to the modern Spain and Portugal, was issued during a period of about four centuries, closing in A.D. 41. There are four classes of money, which in the order of their relative antiquity, are Greek, of two groups, Carthaginian, Romano-Iberian and Latin. The first or older group of Greek money (from before *c.* 350 B.C.) belongs to the widespread currency, which reveals the maritime power of the Ionians of Phocaea. It consists of fractions of the drachm of the Phocaean standard, from the diobol or third downwards. Its later pieces are of the Phocaean colony of Emporiae, founded by the earlier settlement of Massilia. Next in order and in part contemporary, beginning before the middle of the 3rd century B.C., come the drachms of Emporiae, which betray the influence of Siculo-Punic art. Their standard is probably Carthaginian. Of the neighbouring Rhoda, a Rhodian colony, there is similar money. Carthaginian coins of Spain begin in the same period with the issues of the great colony of Gades, following the same weights as the Emporian drachms. These are followed by the issues of the Barcides from 234 to 210 B.C., with Carthaginian types and of Phoenician weight, struck of six denominations, from the hexadrachm to the hemidrachm. Señor Zobel de Zangróniz has classed them to Spain, on the grounds of provenance and the possession of the silver mines by the Barcide kings, against Müller, who attributes them to Africa. The types are Carthaginian, and present some interesting subjects. The true Iberian currency begins not long after the Punic. The later drachms of Emporiae, ultimately following the weight of the contemporary Roman denarius, have Iberian legends, and form the centre of a group of imitations issued by neighbouring native tribes with their distinctive inscriptions. This coinage ceased when the Roman province was formed in 206 B.C. A little before this date the Romans had begun to introduce Latin money; about this time, however, they took the backward step of permitting native coinages of Latin weight. Probably they found that native legends and types were more welcome to their subjects than those of Rome. Consequently this coinage of Spain under the republic, which lasted until 133 B.C., may be almost considered national. The two provinces Hispania Citerior and Hispania Ulterior have this marked difference: the coins of the nearer province, of silver and bronze, have always Iberian inscriptions on the reverse, and are clearly under distinct Roman regulation; those of the farther are apparently of independent origin, and consequently bear Iberian, Phoenician, Libyo-Phoenician and Latin legends, but they are of bronze alone. The interest of these coins lies mainly in their historical and geographical information. They bear the names of tribes, often the same as those of the town of mintage. The art is poor, and lacks the quaint originality and decorative quality of that of Gaul. Ultimately the native money was wholly latinized (133 B.C.), silver was no longer issued, and although the Ulterior continued to have its own coinage, in the Citerior only Emporiae and Saguntum were allowed to strike coins. Political circumstances for a time renewed the coinage under Sertorius (80–72 B.C.) in the modified form of a bilingual currency. The purely Latin issues of the two provinces, and under the empire more largely (from 27 B.C.) of the three, Tarraconensis, Baetica and Lusitania, present little of interest. They closed in the reign of Caligula (A.D. 37–41), though in later times purely Roman money in gold and silver was issued at different times in Hispania down to the establishment of the Visigothic kingdom.

The imperial money of Hispania introduces us to one of the two great classes of provincial coins under the empire; the larger of these was the Greek imperial, bearing Greek inscriptions, the smaller the Roman colonial, with Latin inscriptions, deriving its name from the circumstance that among Greek-speaking nations the coloniae were distinguished by the use of the Latin language on their money. In the coinage of Hispania, issued by a nation adopting Latin for official use, the aspect of the coinage is colonial, though it was not wholly issued by colonies. Many of the Spanish towns belong to the kindred class of municipia; others are neither coloniae nor municipia. In Hispania the obverse of the coin bears, as usual in the colonial class, the head of the emperor or of some imperial personage, the reverse a subject proper to the town. The priest guiding a plough drawn by an ox and a cow is peculiarly proper to a colonia, as portraying the ceremony of describing the walls of the city, so also an ox, with the same reference, the altar of the imperial founder, or, as connected with his cultus, a temple, probably in some cases that of Roma and Augustus. Other types, however, portray the old temples in restored Roman shapes, or indicate directly by fishes, ears of corn and more rarely bunches of grapes, the products of the country. Some original and grotesque types have a markedly local character. The money of Augusta Emerita (Merida) in Lusitania, a colony of pensioners (emiriti), is specially interesting, including as it does the silver issues of P. Carisius, the legatus of Augustus.

The Gauls.

The coinage commonly called that of Gaul belongs to the people more properly than to the country, for it comprehends pieces issued by the Gauls or other barbarians from the borders of Macedonia and Illyricum to the English Channel and the Bay of Biscay, through Pannonia, part of Germany, Helvetia and Gaul. It influenced the money of northern Italy, and, crossing the Channel, produced that of

Britain, which has its own distinctive features. Four classes of coinage are found in these vast limits. Arranging them by date, they are the money of the Greek colony of Massilia and her dependencies, that of the Gauls and other barbarians of central and western Europe, that which can be classed to the tribes and chiefs of Gaul and the imperial coinage of that country. The coins of the Gauls and other barbarians outside Gallia include the gold coins known as "rainbow cups" (*Regenbogenschüsselchen*), which seem to have been an original currency of the tribes inhabiting the Bohemian and Bavarian districts, and other gold and silver coins (the later series bearing names in Latin characters) which circulated in Noricum, Pannonia, Helvetia, Upper Germany, &c.

Massilia.

The great mart of Massilia (Marseilles), founded about 600 B.C. by the Phocaeans, was the centre of the Greek settlements of Gaul and northern Spain. Emporiae was her colony, with other nearer towns of inferior fame. Yet Massilia always held the first place, as is proved by the abundance of her money. At first it consisted of Phocaean obols, part of the widespread Western currency already noticed in speaking of Emporiae. These were succeeded by Attic drachms, some of which, about Philip of Macedon's time, are beautiful in style and execution. Their obverse type is the head of Artemis, crowned with olive, at once marking the sacred tree, which had grown from a branch carried by the colonists, so tradition said, with a statue of the goddess, from Ephesus, and proclaiming the value of the olive-groves of Massilia. On the reverse we note the Asiatic lion, common to it and the last colony of Phocaea, the Italian Velia in Lucania. These coins circulated extensively in southern Gaul, and were much imitated by the barbarians on both sides of the Alps.

Gaul.

The Gauls, on their predatory incursions into Greece, must have seized large quantities of the gold coinage circulating there, but it is probable that the gold staters of Philip (Pl. I. fig. 14), from which the chief types of the Gaulish gold are derived (Pl. I. fig. 1), had already found their way, independently of such raids, by means of trade along the Danube valley into the districts then inhabited by the Gauls. This is clear from the fact that the gold coins of Alexander were never, his silver rarely, imitated by the Gauls, yet these were in circulation at the time of the incursions. Nor did the influence of Philip's silver travel far west. But his gold money evidently travelled through central Europe to Gallia. The money of Gallia before the complete Roman conquest, to which it may be anterior in its commencement by half a century, belongs in the gold to degraded types of the earlier widespread currency. The undoubted gold and electrum of this imitative class, identified as bearing regal or geographical names, are extremely limited. By far the most interesting coin of the group is the gold piece which bears the name at full length of the brave and unfortunate Vercingetorix. The silver money is comparatively common. The Gauls were ready to copy any types that came in their way, so that in the coinage of Gaul we find imitations of the coinage of Tarentum, Campania, various Spanish cities such as Rhoda, and Roman coins of the republic and early empire. The effect of the silver of Massilia and other Greek colonies is especially noticeable in S. Gaul, and the Roman denarius naturally exerted a strong influence. The bronze money of Gaul is still more abundant than the silver, and has a special interest from its characteristic types. Some of the later local coins are casts of an alloy of copper and tin called *potin*, but merely a variety of bronze. The Roman coins recall those of Hispania, but are limited to a few coloniae. They range in date from Antony and Augustus to Claudius. The best-known coins of this time, those struck at the colony of Copia Lugdunum (Lyons) with the "Altar of Roma and Augustus," belong, however, strictly speaking, to the Roman series. The coins of Nemausus (Nîmes), commemorating the conquest of Egypt in the crocodile chained to a palm-tree, were sometimes made in the shape of the hind-leg of an animal, evidently for dedication in the sacred fountain, from the mud of which all the specimens of this variety are derived.

Britain.

The ancient coinage of Britain is the child of that of Gaul, retaining the marks of its parentage, yet with characters of its own due to independent growth. Money first came in trade by the easiest sea-passage, and, once established in Kent, gradually spread north and west, until the age of the earlier Roman wars, when it was issued in Yorkshire, probably in Lincolnshire, and in a territory of which the northern limits are marked by the counties of Norfolk, Cambridge, Huntingdon, Bedford, Buckingham, Oxford, Gloucester and Somerset. The oldest coins are gold imitations of Philip's staters, which, whether struck in Gaul or Britain, had a circulation on the British side of the Channel. They are the prototypes of all later money. From a careful comparison of their weights with those of later coins, and from a study of the gradual degradation of the types, Evans places the origin of the coinage between 200 and 150 B.C. Its close may be placed about the middle of the 1st century A.D. The inscribed coins occupy the last century of this period, being contemporary with uninscribed ones. The uninscribed coins are of gold, silver, bronze and tin, the gold being by far the most common. There is small variety in the types, nearly all in gold and silver, and some in copper, presenting in more or less degraded form the original Gaulish type for gold. It may be suspected that all new types and the extremely barbarous descendant of the tin series are of the age of the inscribed coins, or but little earlier. The Channel Islands are remarkable for a peculiar coinage of billon, a very base silver, presenting the usual types modified by Gaulish grotesqueness. The place of this group in the British series is merely accidental; in character as in geography it is Gaulish.

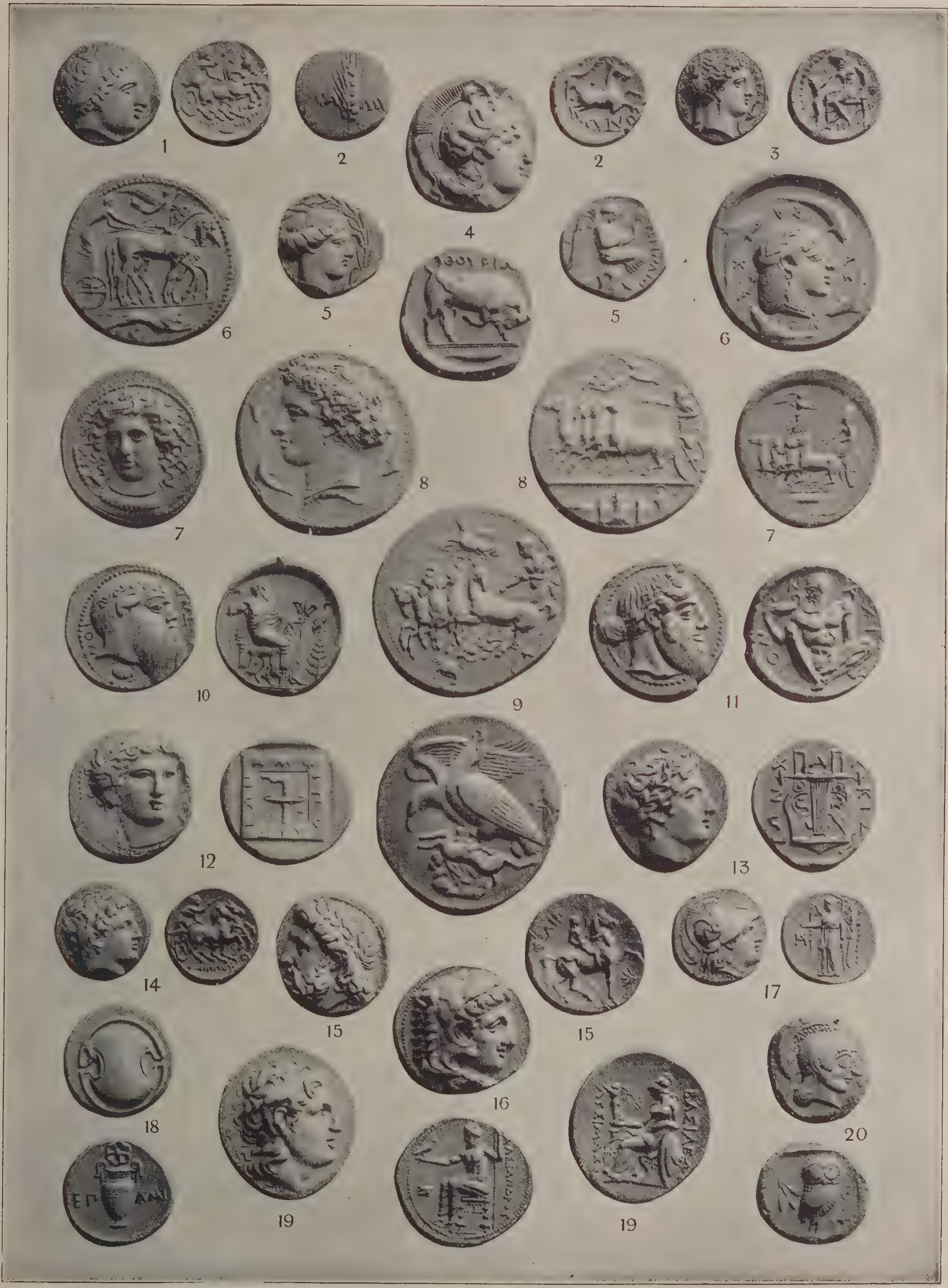
The inscribed coins are evidently in most cases of chiefs, though it is certain that one town (Verulamium) and some tribes had the right of striking money. The most interesting coins are those of known chiefs and their families—of Commius, probably the active prince mentioned by Caesar, of Dubnovellaunus, mentioned in the famous Ancyra inscription, which has been called the will of Augustus, and most of all the large and interesting series of Cunobelinus, Shakespeare's Cymbeline (Pl. I. fig. 2), his brother Epaticcus, and his father Tasciovanus. It is evident from the coins and historical evidence collected by Evans that Tasciovanus had a long reign. His chief town, as we learn from his money, was Verulamium. His coins are in three metals, repeat the traditional types, and present new ones, some showing a distinctly Roman influence. The money of Epaticcus is scanty, but that of Cunobelinus, with Camulodunum (Colchester) for his chief town, is even more abundant than his father's, indicating a second long reign, and having the same general characteristics. The gold shows a modification of the traditional type, the silver and bronze the free action of Roman influence and a remarkable progress in art. With the death of this prince not long before A.D. 43 the bulk of the British coinage probably ceases, none being known of his sons, Adminius, Togodumnus and the more famous Caractacus, but the coins of the Iceni may have continued as late as A.D. 50, and the Brigantes issued silver coins as late as the time of Cartimandua, whose name is partly preserved on one of them.

Italy.

The ancient coins of Italy occupy the next place. They appear to have been struck during a period of more than 500 years, the oldest being probably of the beginning of the 6th century B.C. and the latest somewhat anterior to the time of Julius Caesar. The larger number, however, are of the age before the great extension of Roman power, which soon led to the use of Roman money almost throughout Italy. There are two great classes, which may be called the proper Italian and the Graeco-Italian; but many coins present peculiarities of both. The proper Italian coins are of gold, silver and bronze. Of these, the gold coins are extremely rare, and can never have been struck in any large numbers. The silver are comparatively common, but the bronze are very numerous and characteristic. A few of the earliest gold and silver coins of Etruria have a perfectly plain reverse. The most remarkable bronze coins of this class are of the kind called *aes grave*, most of which were the early proper coinage of Rome, although others are known to have been

NUMISMATICS

PLATE I.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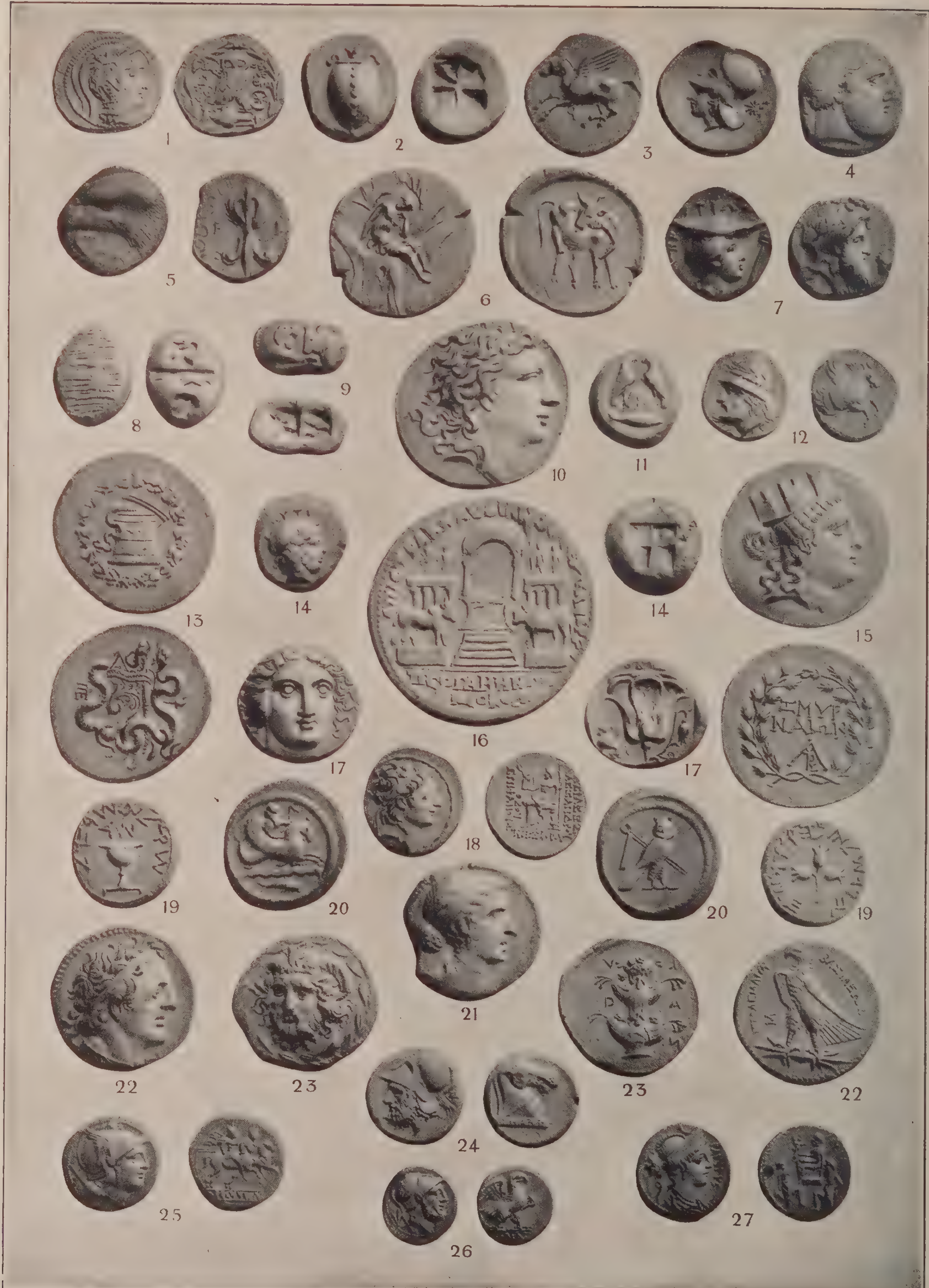
GREEK COINS.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GREEK AND ROMAN COINS.

issued by other Italian cities. These are very thick coins, some of which are of great size, while most have a rude appearance. They are always cast, and were preceded by formless lumps of bronze, known as *aes rude*, which were not properly a state-coinage. The designs of the Italian coins are generally, if not always, of Greek origin, although the influence of the native mythology may be sometimes traced. The inscriptions are in Latin, Oscan or Etruscan, and follow a native orthography; sometimes on the earlier coins they are retrograde. The art of this class is generally poor, or even barbarous. The denominations are common to Greek money, except in the case of the bronze, which follows a native system. Of this system the early proper Roman coins afford the best known examples. The Graeco-Italian coins are of gold, silver and bronze. The silver and bronze are very common, and the gold comparatively so, although struck by few states or cities. A number of the cities of S. Italy issued in the 6th century coins with an incuse design on the reverse repeating with slight modifications the design of the obverse. The designs are of Greek origin, although here, as in the proper Italian coins, but less markedly, native influence can be detected. This influence is evident in the frequent occurrence of types symbolically representing rivers, showing a bias towards the old nature-worship, and still more in the use of Latin inscriptions, with half-Italian forms of the letters on coins otherwise Greek. Of the best art of ancient Italian money we have already spoken, and we shall have occasion to mention some of its most beautiful examples. The denominations of the gold and silver coins are unquestionably derived from those of Greece, according to the weight of the Attic talent, the heaviest gold piece being the stater or 3000th part of that talent; in silver there are few tetradrachms, the didrachms are extremely common, and smaller denominations are usually not rare. We thus learn that the silver currency was chiefly of didrachms, smaller pieces being less used, and larger ones scarcely used at all. It is important here to notice that the interchange of the native or Italian bronze coinage with the Greek silver coinage led to a double standard, silver and bronze. The bronze standard, as might be suspected, was of Italian origin, the silver of foreign introduction.

The peculiarity of the Italian bronze is that in its oldest cast form it was of such weight as to show the absence in some parts of the country of silver equivalents. It was long after silver had been introduced everywhere, with struck bronze equivalents, before the heavy coinage (aes grave) went out of circulation. The silver money is at first remarkable for the evidence it affords of its extraneous character in presenting two standards. Afterwards it becomes equivalent to the bronze, or supplies equivalent pieces, and is quite regular. The original condition of the Italian currencies is best illustrated by the money of Etruria in the 4th and 3rd centuries B.C. Etruria, be it remembered, was an early goal of oriental commerce by sea. At the great mart of Populonia, and in the country round, we find, besides a few gold coins, not only silver coins of two different foreign standards, the Euboic and the so-called Persic, but also cast aes grave and later struck bronze pieces. Without discussing the origin of these various currencies it is enough to note that they bear witness to the effects of a widely-spread commerce, and show that here was the meeting-point of the native system and of foreign ones.

In Italy the aes grave long ruled. Originally it was libral, the principal coin being the as, nominally of the weight of the Italic pound of 273 grammes; this, at least, is the weight of the earliest Roman coinage. On the other hand, the aes grave of some places in E. Italy, as Hatria and Ariminum, is heavier. The successive reductions of the as belong to Roman numismatics, and it is only necessary here to add that they affected the local bronze coinages as Italy fell under the rule of the republic. The silver coinages, on the other hand, survived for a longer time throughout the Greek cities. Apart from the complicated silver coinage of Etruria, and from the Roman issues, we find in central Italy a few silver coins (the unit of 1·18 grammes being the equivalent, at the rate of 1·250, of a bronze as of 11-10 oz.) and a large silver coinage of didrachms and smaller denominations in lower Italy. This was chiefly issued by the wealthy marts which dotted the coasts of Campania, Calabria, Lucania and the Bruttii. We find Etruscan inscriptions on the coins of Etruria, and Oscan on some of those of middle and lower Italy, where they are eclipsed in number and style by the Greek issues. The chief silver standards of S. Italy are (1) the Campanian (with a didrachm of 7·41 grammes); (2) the Italic, with a stater of 8·16 grammes, divided into thirds; and (3) the Tarentine, with a stater of 8·32 grammes, divided into halves. The Tarentine stater was known as *νοῦμμος*. The independent coinage of Italy, with one exception, came to an end in 89 B.C.

Beginning in the north of Italy, the first coins that strike us are those of Populonia in Etruria. The silver money of this place is generally of the peculiar fabric in which the reverse is left perfectly plain. The aes grave of upper and middle Italy was largely dominated by the issues of the Roman mints at Rome and Capua (to be treated later). Samnium shows us a curious revival of native silver money after the local coinage of the Italian towns had been almost abolished by Rome. It was the result of the Social or Marsic War of the confederate tribes, who struck for Italy against the Roman supremacy during the years between 90 and 88 B.C. The coins present the head of Italia, and reverse types, of which the most striking are warriors, varying in number, taking an oath over a sacrificial pig, and a bull for Italy goring the prostrate wolf of Rome. The inscriptions are Oscan or Latin.

Greek towns of Italy.

Certain of the Greek towns of Italy deserve special mention for the splendour of their coinage—beautiful in style and delicate in execution. In Campania (leaving the Romano-Campanian for later notice) the two most interesting currencies are of Cumae and Neapolis, the modern Naples. Cumae presents silver money of the archaic and the early fine style, in which last we first observe the peculiar naïveté of western Greek art before it had attained elaboration. The abundant silver coins of Neapolis are of the early and the late fine periods and of the decline. The types are usually the head of the siren Parthenope, more rarely Athene; the reverse presents the man-headed bull common on Campanian money, and possibly meant for the river-god Acheloüs, father of the Sirens. The bronze money is of good style, and age has beautified it with the rich blue or green patina due to the sulphurous soil. When we reach Calabria the Greek money startles us in astonishing wealth of beauty in the currency of the opulent and luxurious mart of Tarentum, second only to Syracuse in the whole West, of all the main periods of art, and including in the age of its present prosperity and its fall (the time of the contest with Rome) the most abundant gold issues of any Greek city. The gold money of Tarentum (see Plate) is a delight to the eye, with the varied beauty of its gem-like types, which, while they show the gem-engraver's art, prove the medallist's knowledge of the rich but opaque metallic material. Several heads of divinities adorn these coins, and the chief reverse types relate to the legendary founder, Taras, son of Poseidon. Always a youth, he appears as a charioteer, perhaps as a horseman, and riding on a dolphin—the familiar Tarentine type. The most remarkable subject represents him with outstretched arms praying to Poseidon, probably in allusion to the Tarentines' appeal to Sparta for aid about 346 B.C. (Pl. I. fig. 3). The silver coinage is chiefly of didrachms of reduced Corinthian weight. The prevalent type is Taras seated on a dolphin; in the earliest money the type is single, and repeated incuse on the reverse; afterwards this subject occupies the reverse, and, itself a charming composition, is delightfully varied. On the early fine coins the people or demos, personified generally as a youth, often holding a spindle, occupies the obverse, but gives place in the 4th century to a horseman in various attitudes, affording great scope to the engraver's skill; probably he is Taras himself, save when he is a full-grown warrior. These representations illustrate the famed horsemanship of the Tarentines, and refer to contests and games which were probably local. Heraclea in Lucania shows us didrachms of the fine age, with heads of Athene and subjects connected with Heracles: the contest with the Nemean lion is most skilfully treated, and the series is very characteristic of the gem-engraver's art. The powerful city of Metapontum begins with early coins having the incuse reverse, and then displays a long series stretching down to the decline of art. The constant type, which recurs with the heraldic instinct of the West, is the ear of barley, reminding us of the "golden harvest" (*χρυσοῦν θέρος*) which the Metapontines dedicated at Delphi. Like the Tarentine badge, it first occupies the obverse, then the reverse, balanced by a charming series of heads of divinities. Persephone is the most appropriate counterpart; we also note heads of Concordia (*Ὁμόνοια*) and Hygieia, marked by an ingenuous grace peculiar to the early fine work of the Western school, of Leucippus the founder as a helmeted warrior (occurring on a rare tetradrachm and the usual didrachms), and many other types of unusual variety and originality of conception.

Poseidonia issued coins from the archaic period (beginning with the usual incuse fabric) to its capture by the Lucanians early in the 4th century. Its successor Paestum began to coin about 300, and was allowed to keep its mint open even after 89 B.C., when all other local mints in Italy were closed, until the time of Tiberius.

The ancient Sybaris, famous for her luxury, has left archaic coins; she was, however, destroyed by Croton in 510 B.C. The Athenian colony of Thurium eventually arose near the site of the old Sybaris in 443, and immediately began to issue a splendid series of coins. Not only is the face of the coin occupied by the head of Athene, and the great currency, as at Athens, of tetradrachms, but the severe beauty of the style points to the direct influence of the art of central Greece (Pl. I. fig. 4). The head of Athene is covered by a helmet adorned first with a wreath of olive and then a splendid figure of the sea-monster Scylla. The reverse shows a bull butting (*θούριος*), in a strikingly ideal form. Probably the obverse type affords the nearest reflection of the masterpiece of Pheidias, or at least the closest following of his style.

Velia, the last colony of Phocaea, whose citizens sailed away to the far west rather than submit to the Persian tyrant (544 B.C.), shows coins from its foundation. The pieces of fine work witness to an Asiatic origin in the types of the lion, devouring the stag or as a single device, while the obverse displays the head of Athene so much in favour in Magna Graecia. The style, which lacks strength but not beauty, is Italian, and we see no trace of the pictorial qualities of Ionian art, which indeed had not taken its mature form when the exiles left the mother country.

The Bruttii are the first native Italians whom we find striking a fair Greek coinage. Their gold and silver is of late style, the gold presenting the head of Poseidon and Thetis on a sea-horse, the silver the head of Thetis and the figure of Poseidon, both with other subjects. Caulonia has early coins running down to the early fine period, mythologically interesting in type, and the later with a beautifully designed stag on the reverse. For Croton the ruling type is the tripod. The eagle occurs on the obverse and the tripod on the reverse. The bird of Zeus is inferior to that at Agrigentum, as this again is inferior to the eagle of Elis. We note also beautiful types of Heracles seated, one of marvellously delicate work, on the reverse of which Apollo aims an arrow at the Python from behind his tripod—a remarkable composition. The other Heracles types form a most interesting series of recollections, "memory sketches," of a famous statue, the pose of which recalls the so-called Theseus of the Parthenon, while the obverse presents the head of the Hera Lacinia worshipped on the promontory close by. The latest coins, like the parallel ones of Metapontum, are weak and pretty. The money of the Locri Epizephyrii affords two curious types of reverse, Eirene seated, of fine style, with the legend **ΕΙΡΗΝΗ ΛΟΚΡΩΝ**, and the later yet more remarkable subject of Roma seated while Pistis crowns her, the legend being **ΡΩΜΑ ΠΙΣΤΙΣ ΛΟΚΡΩΝ**. There are beautiful coins of the little known town of Pandosia, bearing the head of the nymph Pandosia (?); the reverse has the river Crathis, a splendid head of the Lacinian Hera, and Pan.

Rhegium was closely connected with Messene in Sicily opposite, and thus the great Sicilian currency of tetradrachms prevails. Anaxilaus, tyrant of Rhegium from 494 to 476 B.C., early in his rule acquired Messene through Samian adventurers. The coins of both towns at first present Samian types, and then, the Samians having been expelled, Anaxilaus commemorates his Olympic victory in the mule-car. The same type appears at Messene and last longer. In both cases the reverse bears a running hare, an animal which Anaxilaus introduced into Sicily. The later 5th-century coinage of Rhegium shows a seated figure of the Rhegine Demos, and a fine head of Apollo, by the engraver Hippocrates.

The little-known town of Terina is illustrious as having produced a series of silver didrachms which, on the whole, is the most beautiful in Italy (Pl. I. fig. 5). The obverse has the head of a goddess, who is portrayed winged on the reverse—a wonderfully fine subject, well conceived and most delicately executed in a variety of different attitudes, some recalling the Victories which adorn the balustrade of the temple of Wingless Victory at Athens. Very curiously, the money of Terina begins with an archaic coin which bears on the reverse the named figure of a Wingless Victory, surrounded by the olive-wreath.

Sicily.

The coinage of Sicily is Greek. The Hellenic and Carthaginian colonies of the coast left the barbarous natives undisturbed in the inland country, and both issued Greek money, the Punic with a tincture of Phoenician style. The coinage ranges from the 6th century B.C. until the subjugation of the island by the Romans, after which a few cities struck colonial or imperial coins for a short space. The marked periods are those of the preponderance of Syracuse from 480 to 212 B.C., interrupted by the great Carthaginian wars, which were fatal to the cities of the southern coast. The coinage is in gold and electrum, mainly issued at Syracuse, in silver and in bronze. The standard is Attic, except the earliest money of the Chalcidian colonies Himera, Zancle (Messene), and Naxos, which follows the Aeginetan weight. The metrology of Sicily has a distinct relation to that of Italy. Here also there is a double standard, silver and bronze, and in consequence an intrusive silver coin, differing but little from the obol, weighing 0·87 instead of ·73 grammes, the silver equivalent of the bronze litra, whose name it borrows. The litra in bronze was the Sicilian pound of 218 grammes, equal to half an Attic mina, and to two-thirds of the Roman libra or pound. So important was the litra in Sicily that the silver litra supplanted the obol, and the didrachm was sometimes called a stater of ten litrae, the decadrachm a piece of fifty litrae, pentecontalitron. The leading coin is the tetradrachm, not, as in Italy, the didrachm.

The Sicilian money is of extremely careful artistic work, not unfrequently even in the case of bronze allowing for a more rapid execution of the die; and the highest technical excellence is attained. The art is that of the southern branch of the great Western school, generally more skilful than the art of southern Italy, but less varied. The earlier fine work has a naïve beauty peculiar to the West and almost confined to Sicily; all that follows is evidently gem-engravers' work. These coins are remarkable for the frequency of artists' signatures, which for the short period of highest skill are almost universal on the larger silver money of Syracuse, and occur less frequently on that of the other great cities. Among these artists may be mentioned Exacestidas (at Camarina), Eucleidas, Eumenes, Phrygillus (at Syracuse), Euaenetus (Syracuse, Camarina, Catana), Cimon (Messana, Syracuse Pl. I. figs. 7, 8), Heracleidas and Choirion (Catana). As in Italy, the decline is more rapid than elsewhere in the Greek world, in consequence of the inherent weakness of the style; but it is in part due to the calamities of the island, as of lower Italy.

The fame won by the tyranni and other leading aristocrats of Sicily in the great national contests of Hellas, in the race with the quadriga, the mule-car and the horse, led to the introduction and supremacy of types commemorating these victories, probably in most cases those achieved at Olympia. It is obvious that no success could be so appropriately figured on the coinage; the charioteer or the horseman, not the city, was the victor, but at the same time the renown of the city was indissolubly connected with the citizen who won it. Hence these types are almost confined to states ruled by tyranni or oligarchies; outside Sicily they are practically only found at Rhegium when it was closely connected with Sicily, at Cyrene, in the money of Philip II. of Macedon and at Olynthus and in Euboea. The horseman is not a frequent type; the mule-car is limited to Messene (and Rhegium); but the quadriga becomes the stereotyped subject for the reverse of the great Sicilian tetradrachms—the bulk of the coinage—and only escapes heraldic sameness by a charming variety in the details. In the age of finest art a divinity of the city takes, in Homeric guise, the place of the charioteer, or Victory herself so wins the contest; commonly she hovers above, about to crown the charioteer or the horses. Yet more interesting are the types connected with nature-worship, especially those portraying river-gods in the form of a man-headed bull, or a youth with the budding horns of a calf, or in the shape of a dog, and also the subjects of the nymphs of fountains. These types occur on either side of the coin. On nearly all, one side (in early times the reverse, later the obverse) is held by the head of a divinity, Persephone and Athene taking the first place.

Syracuse.

The leading position which Syracuse held in the island makes it proper to notice her splendid currency first, the finest for knowledge of the materials, for skill in suitably filling the space, and for delicacy of execution in the whole range of Greek money, though we miss the noble simplicity of Greece, the strong feeling of western Asia Minor, and the simple picturesqueness of Crete. Syracuse was founded in 734 B.C. by Archias of Corinth, an origin which, remembered on both sides, served her well in later history. In the 6th century, perhaps while still under the oligarchy of the Geomori, she issued her most archaic silver money, which, primitive as it is, gives promise of the care of the later coinage, and begins the agonistic types, thus indicating some early victory at a great Hellenic contest. Gelo, tyrant of Gela, won the chariot race at Olympia in 488 B.C., secured Syracuse in 485 B.C., and, when the Carthaginians, probably by agreement with Xerxes, invaded Sicily, utterly routed them at the great battle of Himera (480 B.C.), the Salamis of the West. These events find their record in the issue and subjects of his Syracusan money, which, however, was struck, as usual in that age, in the name of the people. The chariot type is varied, for Victory appears hovering above the charioteer, about to crown the horses, and the coins issued after the great battle show the lion of Libya beneath the car in the exergue (Pl. I. fig. 6). These last pieces are fixed in date by the famous story how Gelo's wife Demarete, having gained favourable terms for the vanquished Carthaginians, was presented by them with a hundred talents of gold, by means of which were coined the great silver pieces of fifty litrae or ten drachms, which were called after her Demareteia. They bear the head of Victory, crowned with laurel, and the quadriga and lion. The battle of Himera and the death of Gelo (478 B.C.) fix the date of these remarkable coins, which close the archaic series of Syracuse and give us a fixed point in Greek art, at about 479 B.C.

Hiero I. (478–466 B.C.), the brother and successor of Gelo, continues the same types, alluding, as Head well remarks (*loc. cit.*), to his great victory over the Etruscans off Cumae (474 B.C.), by the marine monster in the exergue of the reverse which denotes the vanquished maritime power. It is to be noted that as Gelo introduces the Victory in the chariot type, so in the horseman type we now first see Victory crowning the rider. Gelo had won an Olympic victory in the four-horse contest, Hiero in the horse-race, though he also won with the four horses in the Pythian games. With Hiero's money we say farewell to archaic art. The female heads on the obverse now have the eye in profile and snow beauty and variety, and the horses are even exceptionally represented in rapid action. With the short rule of Thrasybulus, the last brother of the house, it came to an end, and the age of the democracy (466–406 B.C.) began. The victories by land and sea of Gelo and Hiero had established the power of the city on a sure basis, and fifty years of prosperity followed. To the earlier part of this age belong the beautiful transitional coins in which the female heads are marked by a youthful simplicity of beauty combined with fanciful and even fantastic treatment of the hair; the reverses remain extremely severe. Towards the close of this age, beginning about 430, there are very fine works, the first signed coins, with the old dignity yet with greater freedom of style, the horses of the quadriga in rapid movement.

The victory of Syracuse in the contest with Athens was the occasion for the reissue of ten-drachm pieces, commonly but erroneously called medallions. On the reverses of these are a victorious chariot and a panoply of arms, representing the prizes offered at the games by which the Syracusans commemorated the defeat of the Athenians on the Assinarus in 413. On the obverses is the head of the local nymph Arethusa. The designs are by the artists Cimon (Pl. I. fig. 8), Euaenetus, and a third who is nameless. These pieces continued to be issued down to about 360 B.C. through the Dionysian period. Contemporary with them are numerous splendid tetradrachms—signed and unsigned—as well as the first gold and bronze issued by Syracuse. The interference of Dion in Syracusan politics (357–353) was marked by the introduction of an electrum coinage, and of a silver didrachm of Corinthian type, corresponding in weight to the tridrachm of Corinth, and with the same types, the head of Athena and the Pegasus. The Dionysian dynasty closed in anarchy, until Syracuse appealed to Corinth, and Timoleon was sent to restore order (344 B.C.). His advent marks an epoch in Sicilian coinage. He restored the gold coinage and issued various silver coins which allude to Corinth and to liberty, and under his influence many small cities in Sicily awoke to political life as members of Timoleon's league and issued a scanty but interesting bronze coinage. The Syracusan democracy was overthrown in 317 B.C. and the city seized by Agathocles (317–289 B.C.), the worst of the tyrants of Syracuse. In the course of his reign he adopted the royal style, and his coins, a reflection of earlier work, give his name first without and then with the title king—a double innovation. The most interesting of his coins are those which bear allusions to his campaign in Africa.

The tyrant Hicetas (288–280 B.C.) and the next ruler, Pyrrhus, king of Epirus (278–275 B.C.), continue the coinage, Pyrrhus issuing money in the name of the Syracusans and also striking his own pieces. The departure of Pyrrhus led to the establishment by Hiero II. (*c.* 270–216 B.C.) of a dynasty which, so long as he ruled, restored the ancient prosperity and preponderance of the rule of his namesake. At first content with inscribing his name alone, he soon not only takes the title of king, conferred on him in the early years of his reign, but also places his portrait on the money. Of his time is the beautiful portrait of his queen Philistis. The money of the short reign of Hieronymus (215–214 B.C.) and of the brief democracy which fell before the Romans (214–212 B.C.) close the independent series of this great city. But her name still appears in bronze money issued after the conquest.

Other Cities of Sicily.

Taking the rest of the money of Sicily in alphabetical order, we first note a very fine bronze coin bearing a beautiful female head, perhaps that of Sicilia, crowned with myrtle, and a lyre, which belongs to the time of Timoleon's league. This coin is conjecturally attributed to Adranum. The first great town is Agrigentum, represented by archaic, transitional, and fine coins, the fine series ending with the overthrow of the city by the Carthaginians in 406 B.C.—a blow from which it never recovered. The usual types are the eagle and the fresh-water crab, but in the age of finest art we see two eagles devouring a hare (cf. Aeschylus, *Agam.* 109 seq.) and a victorious chariot; these occur in the rare decadrachm (Pl. I. fig. 9), on which the river-god Acragas himself drives the car, and the tetradrachms. The eagle is superior to that of Croton, inferior to that of Elis. Many of the bronze coins are of good work. The type most worthy of note is the head of a river-god, with the name Acragas, which was that of the local stream, and on the reverse an eagle standing on an Ionic capital, the Olympic turning-post. The success of Agrigentum at the games is attested by Pindar, while Virgil (*Aen.* iii. 704), Gratius (*Cyneg.* 526) and Silius Italicus (xiv. 210) mention its ancient renown for horses.

The money of Camarina is of especial beauty and interest. Camarina struck but few coins before the year of liberation (461), soon after which was issued a didrachm having on the obverse a helmet upon a round shield and on the reverse a pair of greaves, between which is a dwarf palm. This piece is followed by tetradrachms and didrachms of the best period, most beautiful in style, and varying a little from difference of age. The tetradrachms bear on the obverse the head of Heracles in the lion's skin, and on the reverse Athena as a victor at the Olympic games in a quadriga. It was Athena, protector of the city (*πολιάοχε Παλλάς*), whose sacred grove was made more illustrious by the success of Psaumis. The didrachms have on the obverse the head of a river-god, portrayed as a young man with small horns and with wet hair. Of the two rivers of Camarina, the Oanus and the Hipparis, the Hipparis is here represented, for in one case the name is given on the coin. Pindar seems to show the same preference, for, while he merely mentions the Oanus (*ποταμὸν . . . Ὤανιν*), he speaks of the sacred channels by which the Hipparis watered the city (*σεμνοὺς ὀχετοὺς, Ἵππαρις οἷσιν ἄρδει στρατόν*). On the reverse the nymph Camarina (*Ὠκεανοῦ θύγατερ . . . Καμαρίνα*) is seen carried across her lake (*ἐγχωρίαν . . . λίμναν*) by a swan swimming with expanded wings, while she aids it by spreading her veil in the manner of a sail. Some of these didrachms have on either side, around the chief device, fresh-water fishes. The series of Catana comprises fine archaic tetradrachms and others of the time of the best art. The archaic tetradrachms have the types of a river in the form of a man-headed bull and of the figure of Victory, of a type remarkably advanced for the time at which they were struck. From 476 to 461, under the name of Aetna, its coinage is represented especially by a unique tetradrachm (Pl. I. fig. 10), with a wonderful head of Silenus, and Zeus as the god of the volcano holding a thunderbolt and a sceptre made of a vine-branch; before him is an eagle perched on one of the Aetnaean pines. The head of Apollo succeeds, with for reverse the victorious quadriga, in one case passing the turning-post, an Ionic column. Historically interesting is a small silver coin issued by Catana and Leontini in alliance between 405 and 403. Eryx towards the end of the 5th century produced some rare tetradrachms on which Eros is represented at the knees of his mother, asking for the dove which she holds.

Gela is represented by coins of which the archaic tetradrachms must be especially mentioned. They have on the obverse the forepart of the river-god Gelas, whence the city took its name. The Gelas is represented as a bull, having the face of a bearded man. On the reverse is a victorious quadriga, in some examples represented passing an Ionic column, as on coins of Catana. A beautiful tetradrachm represents the city goddess (Sosipolis) placing a wreath on the head of the monstrous river-god. A little later is a tetradrachm which has types of the head of the Gelas as a young man horned, surrounded by three fishes, and on the reverse Victory in a biga with a wreath above. Small gold coins, and a didrachm representing a Geloan cavalryman spearing an Athenian hoplite, are among the coins issued shortly before the fall of Gela in 405. The money of Himera is of great interest. The oldest didrachms of Himera, which probably began in the 6th century B.C., bear on the obverse a cock and on the reverse an incuse pattern; later, a hen. During the time that Thero of Agrigentum held the city (before 480 to 472), the crab of Agrigentum appears on the didrachms. The transitional tetradrachms bear on the one side a victorious quadriga and on the other a nymph sacrificing, near whom a little Silenus stands under the stream of a fountain issuing from a lion's head in a wall. Leontini is represented by tetradrachms with the head of Apollo and the victorious car, which gives place to a lion's head. The series of Messene begins, when the town was called Zancle, or, as it is written upon the coins, Dancle, with early drachms or smaller pieces of the Aeginetan weight, and of very archaic work. On the obverse is a dolphin, and around it a sickle; on the reverse the earliest pieces repeat the same design incuse (as in the earliest coinage of S. Italy), but later we find a shell in the midst of an incuse pattern. The place is said to have received its name on account of the resemblance of the harbour to a sickle (ζάγκλον or ζάγκλη). Next to these first coins of Zancle may be placed, as the oldest piece of the Attic weight, a tetradrachm with the Samian types, a lion's scalp on one side and on the other the head of a calf, and bearing the inscription **ΜΕΣΣΕΝΙΟΝ**. This coin was doubtless struck during the rule of the Samians, who took the place about 494 B.C., at the instigation of Anaxilaus, tyrant of Rhegium, by whom they were subsequently expelled (Thucyd. vi. 4). The next pieces are the earliest of those which have on the obverse the mule-car and on the reverse a running hare, like the contemporary coins of Rhegium, with the same devices and equally of the rule of Anaxilaus. These types cease at Rhegium, though they continue at Messene, some of the tetradrachms bearing them being of the age of fine art. About 450 there must have been a temporary restoration of the Zancleans, who struck a tetradrachm with Poseidon and the dolphin as types. A fine piece of rather later date represents Pan caressing a hare. When the town had been seized (287 B.C.) by the Mamertini, money was struck with their name. Naxos is represented by early Aeginetic drachms with an archaic head of Dionysus. Immediately after the year of liberation (461) it produced a tetradrachm with a head of Dionysus and, on the reverse, a squatting Silenus, remarkable for the study of anatomical detail (see Pl. I. fig. 11). These types are repeated in a less severe style some fifty years later, when also an engraver Procles signs some pretty didrachms. Segesta is represented by coins from about 480 B.C. We first notice the head of the nymph Segesta and a hound, probably the river-god Crimisus; then the same type for reverse associated with a young hunter accompanied by two hounds—a charming composition. Another interesting type is a victorious car driven by Persephone, who carries ears of corn.

In the series of the city of Selinus the first coins are didrachms, bearing on the obverse a leaf and on the reverse an incuse square. The city and the river of the same name no doubt derived their name from the plant σέλινον (probably wild celery, *Apium graveolens*), the leaf of which must be here intended. Tetradrachms and didrachms of transitional and of good art have devices of more than usual interest. The obverse exhibits a river-god, sometimes the Selinus, sometimes the Hypsas, sacrificing at an altar to the god of healing, while on the didrachm a wading-bird is sometimes seen behind him, as if departing. The obverse of the didrachms shows Heracles subduing the bull, and the reverse of the tetradrachms generally shows a quadriga in which Apollo stands drawing his bow, while Artemis is charioteer. The reference in all these cases must be to the driving away of the pestilence from the neighbourhood of Selinus by the draining of the marshes.

The Siculo-Punic coins, that is, those actually struck by the Carthaginians in Sicily, will best be dealt with under Carthage, below.

The islands of Melita, Gaulos and Cossura near Sicily issued late coins which belong to the African series, showing a curious mixture of Phoenician and Egyptian elements in some of their types. Of Lipara there is heavy bronze money on the Sicilian system, having on the obverse a head of Hephaestus, or sometimes a figure of the same divinity seated, holding a hammer and a vase, which he seems to have just formed.

The Tauric Chersonese, &c.

In the Tauric Chersonese there are interesting coins, in the three metals, of the city of Panticapaeum, the modern Kertch. Their obverse usually bears the head of Pan and their reverse a griffin and other subjects; some are of fine Greek style. The gold is of higher weight than usual, owing to the cheapness of the metal at this place. The money of Sarmatia, of Dacia, and of upper and lower Moesia, is chiefly bronze of the Graeco-Roman class. In Sarmatia we may notice the autonomous and imperial pieces of Olbia, which alone amongst Greek cities produced a series of cast bronze coins, and in Dacia the series bearing the name of the province. The Roman colonia Viminacium in upper Moesia is represented by numerous coins of a late time. Of Istrus, in lower Moesia, there are drachms having a strange type on the obverse, representing two beardless heads, side by side, the one upright and the other upside down; on the reverse is an eagle devouring a fish. The style of these coins is in general fair, though it sometimes approaches to barbarism. Apollonia Pontica produced fine silver coins with a head of Apollo and an anchor. There are abundant Greek imperial coins of Marcianopolis and Nicopolis, while Tomi is represented in this class as well as by autonomous money.

Thrace.

The coins of Thrace are of high interest. Here and in Macedonia we observe the early efforts of barbarous tribes to coin the produce of their silver mines, and the splendid issues of the Greek colonies; and we see in the weights the influence of the Asiatic Greeks and the Athenians. The oldest coins are of the early 5th century B.C., and there are others of all subsequent times, both while the country was independent and while it was subject to the Romans, until the cessation of Greek coinage. Some of the best period are of the highest artistic merit. So long as they maintain any general distinctive peculiarities of fabric and design, that is, from their commencement until the age of Philip, the Thracian coins resemble those of Macedonia. The money of Abdera comprises tetradrachms and smaller coins of the periods of archaic and fine art, all but the latest of the Phoenician standard, ultimately superseded by the Persic. The principal type is a seated griffin, copied from its mother-city, Teos. The reverse type, an incuse square, has at first four divisions, but in the age of the finest art contains a variety of beautiful subjects, the signets of the magistrates. Aenus is remarkable for the great beauty of some of its coins. These are tetradrachms of Attic weight, of the late archaic and best ages. The interesting turning-point from growth to maturity is seen in a vigorous head of Hermes in profile, wearing the petasus. A little later is the splendid series of facing heads, the broad, severe, and sculptural treatment of which is truly admirable, and far superior to the more showy handling of the same subject in later drachms. A goat is the reverse type of the larger coins. The money of the city of Byzantium begins with coins on the Persic standard of good style, having on the obverse a bull above a dolphin and on the reverse an incuse square of four divisions, and closes with the series of bronze coins issued under the empire. The star and crescent type first appears in the Roman period. Of Maronea, anciently famous for its wine, there is an interesting series, among which we notice fine tetradrachms of Phoenician weight, having on the obverse a prancing horse and on the reverse a vine within a square. The standard changes to Persic, of which there is a beautiful series of didrachms. Then the series is interrupted by the rule of the Macedonian kings, and resumed in a barbarous coinage of the native Thracians, issued in the second and first centuries before the Christian era, consisting of spread Attic tetradrachms with the types of the head of beardless Dionysus crowned with ivy and on the other side his figure. The Greek imperial coins of Pautalia and Perinthus are worthy of notice. Among those of the latter town we may mention fine pieces of Antoninus Pius and Severus, and large coins, commonly called medallions, of Caracalla and other emperors. The money of the imperial class issued by Philippopolis, Serdica and Trajanopolis should also be noticed. In the Thracian Chersonese the most important series is one of small autonomous silver pieces, probably of the town of Cardia. There is a limited but highly interesting group of coins of Thracian kings and dynasts. The earliest are of kings of the Odrysae, including Sparadocus and Seuthes I., who began to reign in 424 B.C.; and whose money bears the two remarkable inscriptions **ΣΕΥΘΑ ΚΟΜΜΑ** and **ΣΕΥΘΑ ΑΡΓΥΡΙΟΝ**. It closes with the issues of Roman vassals, such as Cotys IV. (A.D. 12–19). Lysimachus, commonly classed as king of Thrace, belongs to the group of

Alexander's western successors (see below). Among the islands of Thrace, Imbros with its trace of Pelasgic worship, and, equally with Lemnos, showing evidence of Athenian dominion, and Samothrace with the Asiatic worship of Cybele yield in interest to Thasos. Here a long and remarkable currency begins with very early Persic didrachms, the obverse type a Silenus carrying a nymph, the reverse an incuse square of four divisions. Under the Athenian supremacy we see a decline of weight, and in style the attainment of high excellence. After this we observe coins of Phoenician weight, bearing for their obverse types the head of Dionysus. These are of the best period of art, and some tetradrachms are among the very finest Greek coins. The head of Dionysus is treated in a sculptural style that is remarkably broad and grand. The massive, powerful features, and the formal hair, nearly falling to the neck in regular curls like those of the full beard, are relieved by a broad wreath of ivy-leaves, designed with great delicacy and simplicity. The reverse bears a Heracles kneeling on one knee and discharging his bow—a subject powerfully treated. Of a far later period there are large tetradrachms, much resembling those of Maronea, with the same type of the beardless Dionysus, but on the reverse Heracles.

Macedonia.

The money of Macedonia both civic and regal is of great variety and interest. It begins at an early time, probably towards the end of the 6th century B.C. The old pieces are of silver, bronze having come into use a century later, and gold about the middle of the 4th century B.C. The character of the coinage resembles that of Thrace; the earliest pieces are of the Phoenician, Babylonic and Attic standards. The most remarkable denominations are the pieces of eight and twelve Phoenician drachms. The largest coins are of the time of Alexander I. (498–454), and somewhat earlier, and indicate the metallic wealth of the country more than its commercial activity. The chief groups of coins are those of the Pangaean, Bisaltian, Strymonian and Chalcidian districts, of the kings of Macedon and Paeonia, and of Macedon under the Romans. This last series begins with the coins of the "regions" issued by permission of the senate and bearing the name of the Macedonians, from 158 to 150 B.C.; these are followed by coins of the Roman generals against Andriscus and of the pretender himself, and, from 146 onwards, of the Roman province. Under the empire a large series of bronze coins was issued in the name of the Koinon, *i.e.* the provincial diet. As regards the earlier civic coinage: the coinage of Acanthus comprises fine archaic tetradrachms of Attic weight and others of Phoenician weight and very vigorous in style, of the commencement of the period of good art. The type of their obverse is a lion seizing a bull (cf. Herodot. vii. 125 f.). The money of Aeneia is chiefly interesting from its bearing the head of the hero Aeneas; and on one extraordinary coin of archaic fabric, an Attic tetradrachm, the subject is the hero carrying Anchises from Troy, preceded by Creusa carrying Ascanius; this is in date before 500 B.C. The town of Amphipolis is represented by a long series. There are Phoenician tetradrachms of about 400 B.C. having on the obverse a head of Apollo, facing, sometimes in a splendid style, which recalls the art of the immediate successors of Pheidias (Pl. I. fig. 12). The reverse type is a flaming race-torch in an incuse square. The territory of Chalcidice is eminent for the excellence of some of its silver coins. There is a very early Attic tetradrachm of Olynthus, with a quadriga, and an eagle within a double square, which reminds us of the idea of the great Sicilian currencies, the record of Olympic victory. The Phoenician tetradrachms of the best period struck by the Chalcidian League (392–379 B.C., and later), Olynthus being probably the mint, are of great stylistic interest (Pl. I. fig. 13). The obverse bears the head of Apollo in profile crowned with laurel. It is in very high relief and treated with great simplicity, though not with the severity of somewhat earlier pieces. The delicacy of the features is balanced by the simple treatment of the hair and the broad wreath of laurel. On the reverse is a lyre. There is an early series of coins of Lete, none later than about 480. The obverse type is a satyr with a nymph, and on the reverse is an incuse square divided fourfold, first diagonally and then in squares. Mende has money of Attic weight, the types being connected with Silenus, who on a tetradrachm of fine style is portrayed reclining, a wine-vase in his hand, on the back of an ass; the reverse bears a vine. Of Neapolis (Datenon) there are early coins with the Gorgon's head and the incuse square, which in the period of fine art gives way to a charming head of the "Virgin Goddess" crowned with olive. The coins of Philippi in the three metals are mainly of the time of Philip II., who, having found a rich gold mine near Crenides, changed its name to Philippi. The gold coins are Attic staters, the silver pieces of the Phoenician or Macedonian weight, like Philip's own money. The earliest bear the name of the "Thasians of the Mainland," who immediately preceded Philip's colony. All bear the head of young Heracles in a lion's skin, and a tripod. Imperial pieces were struck by the city as a colonia. There is a long but late series of Thessalonica which in the time of the regions was the mint of the second region; the numerous bronze coins of the Roman period show a figure of Cabirus among other types. Uranopolis has a few coins with very curious astronomical types, probably issued by the eccentric Alexarchus, brother of Cassander. The issues of the Thraco-Macedonians are extremely interesting. They are all just anterior to, or it may be contemporary with, Alexander I. of Macedon. The leading coins are octadrachms of the Phoenician standard. They have usually but one type, the reverse bearing a quadripartite incuse square. Their sudden appearance and heavy weight are due to the working of the silver mines on the border of Macedonia and Thrace. The usual types are a warrior leading a horse or a yoke of oxen. The coins bear the names of the Bisaltae, Getas, king of the Edoni, the Orrescii and other tribes. Besides these there are very curious Attic decadrachms of the Derronians of Sithonia, bearing the unusual type of an ox-car, in which is a figure seated, and on the reverse a symbol of three legs.

Kings of Macedonia.

The oldest coins of the Macedonian kings are of Alexander I., from 498 to 454 B.C., the contemporary of Xerxes. These are Phoenician octadrachms, having on the obverse a cavalryman by the side of a horse, and coins of a lower denomination with the same or a similar type. The money of Alexander's successors illustrates the movement of art, but it is not until the reign of Philip II. that we have an abundant coinage. He first strikes gold pieces, chiefly Attic didrachms, from the produce of his mine near Philippi (Pl. I. fig. 14). They are of fair style, and bear on the obverse the head of Ares. On the reverse is a victorious Olympic biga. These coins were afterwards known as Φιλιππειοι and the gold money of Alexander as 'Αλεξάνδρειοι—appellations which probably did not include larger or smaller pieces. Horace calls the gold coins of Philip "Philips" ("regale nomisma Philippos," *Epist.* ii. 1, 232). The silver coinage of Philip is mainly composed of tetradrachms of the Phoenician standard (Pl. I. fig. 15). Their type of obverse is a head of Zeus and of reverse either a horseman wearing a causia or a victor in the horse-race with a palm—these last coins being the best of Philip's, although the horse is clumsy.

The coinage of Alexander the Great, both in the number of the cities where it was issued and in its abundance, excels all other Greek regal money; but its art is, without being despicable, far below excellence. The system of both gold and silver is Attic. The gold coins are distaters or gold tetradrachms, staters or didrachms (see Pl. I. fig. 17), hemistaters or drachms, with their half or a smaller denomination. The types of the distaters or staters, which last were the most common pieces, are for the obverse the head of Athena and for the reverse Victory bearing a naval standard. The largest silver piece is the decadrachm, which is of extreme rarity. The types of the tetradrachms and most of the lower coins are on the obverse the head of Heracles in the lion's skin and on the reverse Zeus seated, bearing on his hand an eagle (Pl. I. fig. 16). The head has been supposed to be that of Alexander, but this is not the case, although there may be some assimilation to his portrait. The great currency was of tetradrachms. The coinage was struck in different cities, distinguished by proper symbols and monograms. The classification of the series is difficult, but is gradually advancing. (For Alexander's Eastern coinage see § iv. Oriental Coins.)

The coinage of Alexander is followed by that of Philip Arrhidaeus, with the same types in gold and silver. That of Alexander IV. was issued by Ptolemy I. alone. In these coins the types of Alexander were modified, the dead king being represented with the ram's horn of Ammon, and wearing an elephant's skin head-dress and aegis. Meanwhile Seleucus, Lysimachus, Antigonus, king of Asia, struck Alexander's money with their own names, and the tetradrachms of Macedonia were generally of this kind until the time of Philip V. The same coinage, marked by a large flat form, was reissued later by various cities, especially of western Asia, when the Romans, after the battle of Magnesia in 190 B.C., restored the liberties which Alexander had granted. The series of Alexandrine money is interrupted by various small coinages and the later issues of Lysimachus, king of Thrace, with a fine portrait—head of Alexander with the ram's horn, as the son of Zeus Ammon, a work sometimes worthy of Lysippus and an excellent indication of his style. The reverse has a figure of Athena holding a little Victory (Pl. I. fig. 19). The coins of Demetrius I. (Poliorcetes) comprise fine tetradrachms, some of the types of which have an historic reference. They bear either on the obverse his portrait with a bull's horn and on the reverse a figure of Poseidon, or on the one side a winged female figure (Victory) on the prow of a galley, blowing a trumpet, and on the other Poseidon striking with his trident. The latter types cannot be doubted to relate to the great naval victory which Demetrius gained over Ptolemy in 306; the Victory reproduces the "Victory of Samothrace," dedicated by Demetrius and now in the Louvre. The tetradrachms of Antigonus II. (Gonatas), which are of inferior style and work to those of Demetrius, have types which appear to refer in like manner to the great event of his time. The obverse type is a Macedonian buckler with the head of Pan in the midst, and the reverse type Athene Promachos. The head of Pan is supposed to have been taken as a device in consequence of the panic which led to the discomfiture of the Gauls at Delphi. Another pair of types, the head of Poseidon and Apollo seated on the prow of a warship, probably refers to the victory of Leucolla about 258 B.C. The tetradrachms of Philip V. have on the obverse a head in the helmet of Perseus, representing probably Philip's son, Perseus, in the character of that hero. The reverse bears a club. Other tetradrachms and smaller coins have a simple portrait of Philip. The tetradrachms of Perseus are of fair style, considering the time at which they were struck. They bear on one side the king's head and on the other an eagle on a thunderbolt. Andriscus (Philip VI., 150-149 B.C.) issued tetradrachms some of which represent him as Perseus. The coins of the Paeonian kings (from about 359 to 286 B.C.) show Macedonian influence, but are semi-barbarous.

Thessaly.

The coin systems of northern Greece, Thessaly, Epirus, Corcyra, Acarnania and Aetolia present certain difficulties which disappear if we consider them as originally Aeginetan, modified in the west by Corinthian, and later by Roman, influence. The coinage of Thessaly represents very few specimens of a remote period, while pieces of the best time are numerous. These are in general remarkably like the finest coins of Sicily and Italy, although the style is simpler. The prevalence of the horse and horseman is significant. The money of the Thessalian Confederacy, being of late date (196–146 B.C.), is of little interest. The commonest types are the head of Zeus crowned with oak and the Thessalian Athena Itonia in a fighting attitude. The coinage is resumed in imperial times. Numerous small places, such as Gomphi, Homolium, Lamia, Phalanna, produced coins of considerable beauty; more extensive are the issues of Pharsalus, Pherae (with fine coins of the tyrant Alexander), and especially Larissa. The last series begins with archaic pieces and some of the early period of good art, but sometimes of rather coarse execution. The small silver pieces have very interesting reverse types relating to the nymph of the fountain, and to be compared for mutual illustration with the didrachms of Terina and with some of those of Elis. These are followed by coins of fine work. The usual obverse type is the head of Larissa, the nymph of the fountain, facing, and on the reverse is generally a horse, either free or drinking. The head is treated in a very rich manner, like that of the fountain-nymph Arethusa, facing, on tetradrachms of Syracuse; indeed, the debt to the Sicilian type is obvious. The bronze money is also good. The wine-producing island of Peparethus, off the Thessalian coast, is represented by a remarkable series of Attic tetradrachms (about 500–480 B.C.) with a variety of types, partly Dionysiac.

Illyricum.

The coinage of Illyria (strictly Illyris or Illyricum) is usually of inferior or rude art; the pieces are Aeginetic, ultimately changing to Corinthian, and then, in 229 B.C., to the standard of the Roman *Victoriatus*. Of Apollonia there is a large series. The earliest (early 4th century) have the Corcyraean types of the cow and the calf and the floral pattern; the latest, usually the head of Apollo and three nymphs dancing round a fire, the outer ones holding torches. Dyrrhachium, which never bears on its coins the more famous name of Epidamnus, is represented by an important series. First there are reduced Aeginetan didrachms with Corcyraean types. These are succeeded by tridrachms with Corinthian types, and of Corinthian weight; and then the old types are resumed, but the standard is that of the victoriatus. Dyrrhachium, it must be remembered, was founded partly by Corcyraean and partly by Corinthian colonists. The Illyrio-Epirote mining towns, Damastium, &c., struck barbarous silver coins in the 4th century; on some of the small pieces we see an ingot of metal or a miner's pick.

Epirus.

The coins of Epirus are of higher interest and beauty than those of Illyria. Of the Epirots there are bronze coins of the regal period (342-272 B.C.), and both silver and bronze of the republic (238-168 B.C.), with the heads of the Dodonaean Zeus and Dione, together or apart. Ambracia is represented by silver pieces, with on the one side a head of Dione, on the other the obelisk of Apollo Agyieus.

The series of Greek imperial money of Nicopolis must also be mentioned. The coinage of the kings begins under Alexander I. His coins have been found in the three metals, but they are rare. It is probable that both gold and silver were struck in Italy while he was in that country. The coins of Pyrrhus in all metals are of high interest, and remarkable for their beauty, though the style is usually florid. There can be little doubt that they were for the most part struck in Italy and Sicily, at Tarentum and Syracuse. The tetradrachm has for the type of the obverse a head of the Dodonaean Zeus crowned with oak and for that of the reverse Dione seated. A fine didrachm bears on the obverse a head of Achilles helmeted, with for the reverse Thetis on a sea-horse carrying the shield of her son. Among the copper coins of Pyrrhus we must remark the beautiful ones with the portrait of his mother Phthia.

Corcyra.

The coinage of the island of Corcyra begins with very early reduced Aeginetic didrachms and drachms of the 6th century. The types are the cow suckling the calf and the floral pattern, as at Dyrrhachium. These leading subjects are varied in later times by others illustrating the Corinthian origin of the nation, its maritime power, and the fame of its wine. Not the least curious are the bronze pieces with galleys bearing their names, as Freedom, Glory, Orderly Government, Corcyra, Comus, Cypris, Victory, Youth, Preserver, Fame, Light-bearer. The abundant bronze series goes on under the emperors.

Acarnania.

The coins of Acarnania are not remarkable for beauty or for variety in their types. The money of several cities in the 4th century B.C. is Corinthian in types and weight. That of the Acarnanian League (229–168 B.C.) bears the head of the Acheloüs as a man-headed bull and the seated Apollo Actius. Of Leucas the silver coins show the archaic cultus-figure of Aphrodite Aeneias.

Aetolia.

In Aetolia the gold and silver coins of the Aetolian League have some merit (279–168 B.C.). The gold pieces have on the obverse the head of Athena or that of Heracles in the lion's skin and on the reverse Aetolia personified, seated on Gaulish and Macedonian shields (a figure dedicated after the repulse of the Gauls; Paus. x. 18, 7). These subjects recur, with others indicating the hunter-life of the population, on the silver money; of especial interest are the head of Atalanta and the Calydonian boar, and the spear-head with which he was slain. On some of the copper the spear-head and the jaw-bone of the boar are seen.

Locris.

The coinage of Locris, Phocis and Boeotia is entirely on the Aeginetic standard. The coins of the Locri Epicnemidii are mainly didrachms, struck at Opus, with the head of Persephone and the figure of the Lesser Ajax in a fighting attitude, sometimes accompanied by his name. These coins were struck between 369 and 338 B.C., and are remarkable for the manner in which a Syracusan head is copied, if indeed the dies were not actually in some cases made in the western city.

Phocis.

The money of Phocis begins at a very early age, some time in the 6th century B.C., and extends in silver down to the conquest by Philip (346 B.C.). The prevalent type is a bull's head. The generals Onymarchus and Phalaecus in the Sacred War placed their names on bronze coins. Delphi, geographically included in Phocis, strikes very remarkable money, wholly distinct in types from the Phocian. The principal subjects are heads of rams and goats, the symbols of Apollo as a pastoral divinity, a dolphin (Apollo Delphinius), the omphalos and tripod, and a negro's head, which has not been satisfactorily explained. The Amphictyonic Council struck beautiful didrachms, probably on the occasion of Philip's presidency (346 B.C.), with the head of Demeter, and the Delphian Apollo seated on the omphalos. Under Hadrian and the Antonines there is an imperial coinage of Delphi, some pieces bearing the representation of the temple of Apollo, on one type the letter **E** appearing between the columns of the face, representing the mystic Delphic **EI**, on which Plutarch wrote a treatise.

Boeotia.

The coinage of Boeotia is chiefly of a period anterior to the reign of Alexander, under whom the political importance of Thebes and the whole country came to an end. The standard until the end of the 4th century is Aeginetic. The main characteristic of the money is the almost exclusive use of the Boeotian shield as the obverse type, marking the federal character of the issues. These were struck by various cities, or by Thebes as ruling the League. The earliest pieces are drachms, presumably of Thebes, issued between 600 and 550 B.C.

These are followed by didrachms of the same and other cities until the time of the Persian War. The result of the unpatriotic policy of Thebes and most of the towns of Boeotia was the degradation of the leading city, and the coins reveal the curious fact that Tanagra for a time became the centre of the League-coinage. We now notice the abandonment of the old incuse reverse and the adoption of regular types, the wheel at Tanagra and the amphora at Thebes. These types increase, and indicate several cities during the short period of Athenian influence (456–446 B.C.). The democratic institutions were next overthrown, and Thebes became again the head of Boeotia, and struck alone and in her own name, not in that of the League. To the earlier part of this period belong splendid didrachms with reverse types chiefly representing Heracles, subsequently varied by heads of Dionysus in a series only less fine. With the peace of Antalcidas (387 B.C.) Thebes lost her power, the League was dissolved, and the other Boeotian cities issued a coinage of some merit. In 379 B.C. Thebes became the chief state in Greece, and the patriotic policy of Pelopidas and Epaminondas is shown in the issue of the Boeotian coins at the great city without any name but that of a magistrate. Among those which occur is **ΕΠΑΜ**, or **ΕΠΑΜΙ**, who can scarcely be any other than the illustrious general (Pl. I. fig. 18). After the battle of Chaeronea (338 B.C.), swiftly followed by the destruction of Thebes, the coinage is comparatively unimportant, save only for the appearance of new league-money of Attic weight, with the head of Zeus and the figure of Poseidon, between 288 and 244 B.C.

Athens.

In Attica the great series of Athens is dominant. Eleusis issued a small bronze coinage of good style in the 4th century. Oropus and the island of Salamis also had an unimportant coinage. The Athenian coinage, apparently introduced by Solon, begins with didrachms on the Euboic standard, which, owing to the fame of the Athenian money, received the name of Attic. The type is an owl, the reverse having only the incuse square. These didrachms were succeeded under Peisistratus by the well-known Attic tetradrachms with head of Athena on the obverse, and owl and olive-spray on the reverse (Pl. I. fig. 20). The change supposed to have been introduced by Hippias (Pseudo-Arist. *Oecon.* ii. 4) was merely one of nomenclature; by calling in the coinage and reissuing it at double its old nominal value he only paid back half of what he had received. To what had previously been called didrachms he gave the name of tetradrachms, by which they have since been known. An obol bearing the name of Hippias himself, and types similar to those of Athens, was probably issued by him during his exile. From the time of the Persian wars the helmet of Athena is adorned with three olive-leaves. A rare decadrachm corresponds at Athens to the Demareteia at Syracuse, and was probably issued for similar reasons in commemoration of victory over the barbarians. Otherwise historical events seem to have left little record in the coinage and the Athenians deliberately affected archaism in the style of their coins, which bear no mark of the splendour of Athens as the centre of the sculptor's art. No doubt commercial reasons dictated this conservative policy, which makes the coinage of Athens a disappointment in numismatics. Her money was precious for its purity not only in the Greek world but among distant barbarians, so that imitations reach us from the Punjab and from southern Arabia, and any change would have injured its wide reception. There are many divisions of silver coinage with the types a little varied, and some different ones; and towards the end of the 5th century (probably in 407 B.C.) gold and bronze were introduced. The gold, of good quality and bad style, was never plentiful. The Macedonian empire put an end to the autonomy of Athens, and when the money is again issued it is of a wholly new style and the types are modified. The great series of spread tetradrachms may be dated from about 229 B.C., and lasted probably until the time of Augustus. The obverse type is a head of Athena with a richly-adorned helmet, unquestionably borrowed from the famous statue by Pheidias in ivory and gold, but a poor shadow of that splendid original, and an owl on an amphora within an olive-wreath. The earliest coins have the monograms of two magistrates, the later the names of two who are annual (although the nature of their offices is not certain—possibly they were λειτουργίαι), and, during the period 146–86, a third name, of the treasurer of the prytany in which the coin was issued. Among the names are those of Antiochus (175 B.C.), afterwards Antiochus IV. of Syria, and of Mithradates the Great (Pl. II. fig. 1) and his creature, Aristion (87–86 B.C.); but comparatively few of the coins can be dated exactly. Mithradates issued the only gold staters in this series. The symbols in the field often represent local statues of great interest. The abundance of this money shows the great commercial importance of Athens in these later times. Under the empire Athens issued only quasi-autonomous coins, but these are of great archaeological value as they bear representations of the Acropolis, with the grotto of Pan, the statue of Pallas Promachus, the Parthenon, and the Propylaea, with the steps leading up to the latter; of the theatre of Dionysus, above which are caverns in the rock, and higher still the Parthenon and the Propylaea; and of various statues and groups of sculpture. Megara and other places in Megaris issued a small but interesting coinage.

Aegina.

The money of the island of Aegina is of especial interest since with it coinage originated, so far as Greece proper is concerned, probably fairly early in the 7th century B.C. There is no good evidence for connecting the institution of the coinage with Pheidon, king of Argos, who established a system of measures and weights, known as the Pheidonian. The weight of the coins is of course on the Aeginetic standard. The oldest pieces are very primitive didrachms, bearing on the obverse a sea-tortoise and on the reverse a rude incuse stamp (Pl. II. fig. 2). Afterwards the stamp becomes less rude, and later has a peculiar shape. The sea-tortoise is also replaced by a land-tortoise. There are some coins of the early part of the fine period of excellent work. The great currency was of didrachms. The bronze coins are not remarkable, but some appear to be of an earlier time than most Greek pieces in this metal.

Achaea.

The series of Achaea begins under the Achaean League in the time of Epaminondas, with a fine Aeginetic stater and smaller coins in the name of the Achaeans. The later silver coins are either Attic tetrobols or Aeginetic hemidrachms. On all but the earliest, *i.e.* after about 280 B.C., monograms or symbols indicate the cities which were members of the league; on the later bronze coins the names are given in full. The type of the silver is the head of Zeus Homagyrius, the reverse bearing the monogram of the Achaeans in a laurel-wreath. The oldest bronze repeats the silver types; the later bear a standing Zeus and a seated Demeter, with the name of the city at full length. About forty-five cities are represented by this coinage.

Corinth.

Corinth is represented by a very large series of coins, the weight of which is always on the Corinthian standard, equivalent to Attic but differently divided,—the Corinthian tridrachm, the chief coin, corresponding to the Attic didrachm. The oldest pieces, of the 6th century B.C. (some perhaps even earlier), bear on the obverse Pegasus with the letter ϙ, koppa, the initial of the name of Corinth, and on the reverse an incuse pattern. In course of time (about 500 B.C.) the head of Athena in an incuse square occupies the reverse. The incuse square disappears, as generally elsewhere, in the early period of fine art. Of the age of the excellence and decline of art we find beautiful work, though generally wanting in the severity of the highest Greek art (Pl. II. fig. 3). Pegasus is ordinarily seen galloping, but sometimes standing or drinking, the koppa is usually retained, and the helmet of Athena, always Corinthian, is sometimes bound with an olive-wreath. The smaller coins have the same reverse, but on the obverse a charming series of types, principally female heads, mostly representing Aphrodite. There are some drachms with Bellerophon in a combatant attitude mounted on Pegasus on the one side and the Chimaera on the other. The autonomous bronze money is poor, but often of fair work, and interesting, especially when the type relates to the myth of Bellerophon. In 46 B.C. this city was made a colonia; and we have a large and interesting series of the bronze coins struck by it as such, including the remarkable type of the tomb of Lais. The coins of the "colonies" of Corinth form a long and important series, struck by Acarnanian towns with Corcyra, and in the west by Locri Epizephyrii in Italy and Syracuse. Some of these cities were not strictly colonies of Corinth, but the Pegasus staters struck by them form a homogeneous group. They range from the time of Dion (357 B.C.) to nearly the end of the 3rd century. The coins are distinguished by the absence of the koppa, and bear the names or monograms of the cities.

Patrae, Sicyon, &c.

There are bronze coins of Patrae as an important Roman colonia, and silver and bronze money of Phlius, both of the period of good art. The coinage of Sicyon, on the Aeginetic standard dominant in the rest of the Peloponnesus, is disappointing for a famous artistic centre. It begins shortly before the period of fine art; in that age the silver is abundant and well executed, but the leading types, the Chimaera and the flying dove within an olive-wreath, are wearying in their repetition, and good work could not make the Chimaera an agreeable subject. Small coins with types of Apollo are the only subjects which suggest the designs of the great school of Sicyon.

Elis.

The money of the Eleans is inferior to none in the Greek world in its art, which reaches the highest level of dignified restraint, and in the variety of its types, which are suggested by a few subjects. The leading types are connected, as we might expect, with the worship of Zeus and Hera and Victory, the divinities of the great Panhellenic contest at Olympia, and the coinage is rather the money of Olympia than of the Eleans as a civic community. The prevalent representations are the eagle and the winged thunderbolt of Zeus, the head of Hera and the figure of Victory. The series begins early in the 5th century B.C. with coins, some of which are didrachms (Aeginetic), having as subjects an eagle carrying a serpent or a hare, and on the reverse a thunderbolt or Victory bearing a wreath—archaic types which in their vigour promise the excellence of later days. From 471 to 421 B.C., while Elis was allied with the Spartans, such types continue; the eagle and Victory (sometimes seated) are both treated with great force and beauty, and the subject of seated Zeus is remarkable for its dignity. The Argive alliance (421–400 B.C.) seems marked by the pre-eminence given to Hera, whose head may suggest the famous statue of Polycleitus at Argos. About the same time was issued a didrachm with a noble head of Zeus (Pl. II. fig. 4), which probably recalls, though it is not a copy of, the Zeus of Pheidias. This alliance broken, the old types recur. Magnificent eagles, some admirably designed on a shield, and eagles' heads (see Pl. II. fig. 5), the seated Victory, and fantastically varied thunderbolts mark this age. Among the artists' signatures at this time is ΔA, which may represent the sculptor Daedalus of Sicyon. In 364 B.C. the coinage is interrupted for a year, the Pisatans, who conducted the festival then, issuing small gold coins; these are immediately followed by Elean money with the heads of Zeus and the nymph Olympia. Aristotimus, who was tyrant in 272 B.C., issued coins with his initials. The coinage closes with imperial money, some types of which have a local interest, notably two of Hadrian bearing the head and figure of Zeus, copied from the famous statue by Pheidias.

Cephallenia, &c.

Cephallenia gives us the early silver coins of Cranii, the money of Pale, of charming style, with the figure of Cephalus on the reverse, and that of Same, all cities of this island. Of the island of Zacynthus there are silver pieces, usually of rather coarse work, but sometimes of the style of the best Cephallenian money. Some struck in 357 bear the name of Dion of Syracuse, who collected the forces for his expedition in this island. The coins of Ithaca are of bronze. They are of interest on account of their common obverse type, which is a head of Odysseus.

Messene.

Returning to the mainland, we first notice the money of Messene, or the Messenians. The earliest coin is a splendid Aeginetic didrachm, having on the obverse a head of Persephone, and excels in design the similar subjects on the money of Syracuse, from which it must have been copied, for it is of about the time of Epaminondas. It shows the purer style of Greece, which, copying Syracusan work, raised its character. On the reverse is a figure of Zeus, inspired by the work of Hageladas. The other silver coins are of about the period of the Achaean League. The bronze money is plentiful, but not interesting. **Laconia.** Lacedaemon, as we might have expected, has no early coins, the silver money being mostly of the age of the Achaean League, but the King Areus (309–265 B.C.) and the tyrant Nabis (207–192 B.C.) are represented by Attic tetradrachms. On a tetradrachm of the time of the former is a figure of the Apollo of Amyclae. Among the types of the autonomous bronze pieces may be noticed the head of the Spartan lawgiver Lycurgus, with his name. **Argolis.** The series of Argos in Argolis begins early in the 5th century. The standard is Aeginetic. The first pieces are the drachm and smaller denominations with a wolf, half-wolf or wolf's head on the obverse, and A on the reverse. A rare iron coin was issued with these types. At the end of the 5th century begin the didrachms, which have for the obverse type the head of the Polycleitan Hera—a design which is not equal to that of the coins of Elis, the style being either careless or not so simple. The reverse type of the drachm represents Diomedes stealthily advancing with the palladium in his left hand and a short sword in his right. A 4th-century drachm of Epidaurus represents the famous seated figure of Asclepius by Thrasymedes of Paros.

Arcadia.

Of the money of Arcadia some pieces are doubtless among the most ancient struck by the Greeks; and the types of these and later coins are often connected with the remarkable myths of this primeval part of Hellas, showing particularly the remains of its old nature-worship. The first series to be noticed is that of the Arcadian League; it begins about 500 B.C. with hemidrachms having the type of Zeus Lycaeus seated, the eagle represented as if flying from his hand, and a female head. Of a later time, from the age of Epaminondas, there are very fine coins (issued from Megalopolis) with the head of Zeus, and Pan seated. The coins of Heraea begin deep in the 6th century B.C. The earliest have for obverse type the veiled head of Hera, and on the reverse the beginning of the name of the town. The silver coins of Mantinea (beginning early in the 5th century) have on the obverse a bear, representing Callisto, the mother of Arcas, who was worshipped here, and on the reverse the letters **MA**, or three acorns, in an incuse square. Later coins, especially the bronze, have subjects connected with the worship of Poseidon at this inland town. The silver coins of Pheneus must be noticed as being of fine work. The didrachms of the age of Epaminondas have a head of Persephone, and Hermes carrying the child Arcas. The obverse type is interesting as a copy of the Syracusan subject, as in Locris and Messene. As in Locris, the merit is in the greater force and simplicity of the face, here most successful, the hair being treated more after the Syracusan manner than after that of the Messenians, who simplified the whole subject. The finest coin attributed to Stymphalus is a magnificent didrachm of the age of Epaminondas, with a head of the local Artemis laureate, and Heracles striking with his club. The smaller silver coins have on the one side a head of Heracles and on the other the head and neck of a Stymphalian bird. There were representations of these birds in the temple of Artemis. The series of Tegea is not important, but two of the reverse types of its bronze coins are interesting as relating to the myth of Telephus and to the story that Athena gave a jar containing the hair of Medusa to her priestess Sterope, daughter of Cepheus, in order that she might terrify the Argives should they attack Tegea in the absence of Cepheus, when Heracles desired his aid in an expedition against Sparta. Iron coins were issued by Tegea, and also perhaps by Heraea.

Crete.

The peculiar position of Crete and her long isolation from the political, artistic and literary movements of Hellas have been already touched on. It is not until the age of Philip V. that Crete appears in the field of history, and then only as the battle-ground of rival powers. The most remarkable influence of this age was when Athens, by the diplomacy of Cephisodorus, succeeded about 200 B.C. in drawing the Cretans into a great league against Philip V. of Macedon. That this project took actual shape is proved by the issue at all the chief mints of the island of tetradrachms with the well-known types of Athens, to be distinguished from the Atticizing types of other cities at this time.

The oldest coins are probably of about 500 B.C., but few cities seem to have issued many until a hundred years later. Then there is a great outburst of coinage, sometimes beautiful, sometimes barbarously careless, which lasts until the age of Alexander, when the local currency was probably in great part replaced by Alexandrine coins. At the end of the 3rd century the local coinages are revived until the Roman conquest (67 or 66 B.C.). The chief issue is of silver; bronze is less abundant; and gold is all but unknown. The Cretan types have a markedly local character, yet they copy in some instances other coinages. The chief divinities on the pieces are Zeus, Hera, Poseidon, Heracles and Britomartis, and the leading myths are those of Minos, the story of the Minotaur and the labyrinth being prominent, and also that of Europa. There is frequent reference to nature-worship as in Sicily, yet with a distinctive preference for trees, the forms of which, however, lend themselves readily to the free representation of Cretan art, which may in part explain their prominence. The peculiarity of Cretan art lies in its realism. At some places, as Aptera, Polyrrhenium and Cydonia, we find engravers' signatures. The weight is at first Aeginetic of reduced form; and in the resumption of the coinage after Alexander's time it is Attic.

Of the island in general there are Roman silver and bronze coins of the earlier emperors, some of which are of fine work for the period. The most interesting types are Dictynna and

Zeus Cretagenes. The autonomous coins are very varied. The obverse of the didrachms of Aptera bears a head of Artemis and the reverse a warrior (*Ptolioikos*) before a sacred tree. Of Chersonesus, the port of Lyctus, there are didrachms of coarse style, with a head of Artemis Britomartis, who had a temple at the place. The head is copied from Stymphalus, as also is one of the reverse types, Heracles wielding his club. The money of Cnossus is of great interest. The oldest coins may be as early as 480 B.C. They bear the figure of the Minotaur as a bull-headed man, kneeling on one knee, and a maeander-pattern, in one case enclosing a star (the sun), in another a head (Theseus?). Of the period 431–350 there are didrachms with the head of Persephone, and the labyrinthine pattern enclosing the sun or the moon or a bull's head for the Minotaur, and at length becoming a regular maze. To this time belongs the wonderful coin in the Berlin Museum with Minos seated, his name in the field, and the head of Persephone within the maeander-pattern. In the later 4th century a head of Hera (copied without spirit from the coins of Argos) occupies the obverse of didrachms and drachms, and the reverse has a maze through which the way may be clearly traced. This series closes with Alexander's empire, and the native coinage disappears until the league of Cephisodorus revives it with the Athenian tetradrachm of Attic weight, bearing the name of the Cnossians. It is of inferior style, and is followed by base coins with heads of Minos and Apollo, and the Labyrinth, either square as before or in a new circular form, which is interesting as showing it was a mere matter of tradition.

There are interesting coins of Cydonia, some of them of beautiful style and work. One bears an engraver's name, Neuantos. The head is that of a Maenad, and the reverse has a figure of the traditional founder Cydon, stringing his bow, who on other didrachms is seen suckled by a bitch. The style is good, but the execution poor. Gortys, or Gortyna, is represented by most remarkable coins, which generally allude to the myth of Europa. Didrachms of archaic style have on the obverse Europa carried by the bull and on the reverse the lion's scalp. These pieces are followed by a remarkably fine class of spread didrachms; the best are of about 400 B.C. They have on the obverse Europa seated in a pensive attitude on the trunk of a tree, doubtless the sacred plane at Gortyna, mentioned by Pliny, which was said never to shed its leaves, and on the reverse a bull suddenly turning his head as if stung by a fly (Pl. II. fig. 6). Nothing in Greek art exceeds the skill and beauty of these designs. The truth with which the tree is sketched, and the graceful position of the forlorn Europa are as much to be admired as the fidelity with which the bull is drawn, even when foreshortened, sharply turning his head, with his tongue out and his tail raised. These designs, beautiful in themselves, are strikingly deficient in fitness, and afford equally strong illustrations of the excellencies and of the one great fault of the art of Cretan coins. Many pieces of the same class are of rude execution. Of Itanus there are remarkable coins, the earlier, some of which are of good style, with the subject of a Tritonian sea-god (Glaucus?) and two sea-monsters. Lyctus (Lyttus) is represented by strangely rude pieces, with the types of a flying eagle and a boar's head. The coins of Phaestus form a most interesting series. Among the didrachms are some of admirable work, with on the obverse Heracles slaying the Hydra with his club and on the reverse a bull. Others have on the obverse Heracles seated on the ground, resting. Another noticeable obverse type is the beardless Zeus seated in a tree, with his Cretan name, Velchanos. On his knee is a cock crowing, showing that he was a god of the dawn. We also find Talos, the man of brass, said to have been made by Hephaestus or Daedalus, portrayed as a winged youth naked, bearing in each hand a stone, and in a combatant attitude. Apollonius Rhodius (*Argonaut.* iv. 1638 sqq.) relates that Talos prevented the Argonauts from landing in Crete by hurling stones at them, until he was destroyed by the artifice of Medea. The important town of Polyrrhenium is represented by carefully-executed coins with a head of Zeus and a bull's head. A later piece has a *whiskered* head of Apollo, probably Philip V. in that character. Priansus shows the remarkable type of Persephone seated beside a date-palm, placing her right hand on the head of a serpent in reference to the myth of the birth of Zagreus. As usual, the figure is foreshortened. The reverse has a standing figure of Poseidon. Rhaucus has Poseidon beside his horse. The rare didrachms of Sybritia, or Sybrita, may fitly close the series; one, among the most exquisite of Greek coins, has heads of Dionysus and Hermes in high relief (see Pl. II. fig. 7); another has on the obverse a charming subject, Dionysus seated on a running panther, and on the reverse Hermes drawing on his right buskin,—a delightful figure. Another beautiful type is a seated Dionysus.

Euboea.

The coinage of Euboea is all on the native standard, of which the Attic was a variety. It includes some of the very earliest Greek money. Carystus begins in the time of the Persian War with the type of the cow and calf, as in Corcyra, and its special badge is the cock. In the period 197–146 it issued gold drachms. Chalcis, the mother of western colonies, has already in the 6th century, or even earlier, a long series with the wheel-type and an incuse diagonally divided, and later, a nymph's head and an eagle devouring a serpent. Eretria probably begins as early as Chalcis, but the obverse type is the Gorgon's head. This is succeeded by the same type and a panther's or bull's head, and fine late archaic coins bear the cow and the cuttle-fish. Eretria was probably the mint of coins with the head of a nymph and a cow or cow's head struck in the name of Euboeans in the fine period. Of Histiaea the usual type is the head of a Maenad and a female figure seated on the stern of a galley.

Cyclades and Sporades.

Among the other islands classed after Euboea, Amorgos must not be passed by, as a bronze coin of Aegiale, one of its towns, presents the curious type of a cupping-glass. To Andros has been attributed a group of early coins bearing an amphora. The silver money of Carthaea, Coressia and Iulis in Ceos is extremely old, beginning in each case in the 6th century. The weight is Aeginetic, and there are didrachms and smaller coins. The usual types of Carthaea are an amphora and then a bunch of grapes; that of Coressia is a cuttle-fish and dolphin. The coinage of Delos is insignificant. Melos coined from the early 5th century to imperial times: its chief type is a canting one, the μῆλον (pomegranate). Naxos is represented by early Aeginetic didrachms and coins of the fine period, the latter being chiefly bronze pieces of remarkably delicate and good work. The types are Dionysiac. A 7th-century coin with the head of a satyr (one of the earliest representations of the human head on a coin) is probably Naxian. Of Paros there are early Aeginetic didrachms with the type of a kneeling goat and beneath a dolphin. Of the 3rd and 2nd centuries B.C. there are Attic didrachms with a head, possibly of Artemis, at first of a charming style, and a goat on the reverse. There are very archaic Aeginetic didrachms of Siphnos, which was famous for its gold and silver mines. A late tetradrachm of Syros is interesting as representing the Cabiri.

Asia Minor.

The coinage of Asia begins with that of Asia Minor. It falls into certain great classes—first, the ancient gold and electrum, Lydian and Greek, in time succeeded by electrum or gold and silver, all struck in the west and mainly on the coast. Then the Persian dominion appears in the silver money of the satraps, circulating with the gold and silver of Persia, and the Greek money is limited to a few cities of the coast, none save the electrum of the great mint of Cyzicus uninterrupted by the barbarian. With the decay of the barbarian empire the renewed life of the Greek cities is witnessed by a beautiful coinage along the coast from the Propontis to Cilicia. On Alexander's conquest autonomy is granted to the much-enduring Hellenic communities, and is again interrupted, but only partially, by the rule of his successors, for there was no time at which Asia Minor was wholly parcelled out among the kings, Greek or native. The Romans, after the battle of Magnesia (190 B.C.), repeated Alexander's policy so far as the cities of the western coast were concerned, and there is a fresh outburst of coinage, which, in remembrance, follows the well-known types of Alexander. When the province of Asia was constituted and the neighbouring states fell one by one under Roman rule, the autonomy of the great cities was generally reduced to a shadow. Still the abundant issues of imperial coinage, if devoid of high merit, are the best in style of late Greek coins, and for mythology the richest in illustration.

The oldest money is the electrum of Lydia, which spread in very early times along the western coast. This coinage, dating from the 7th century B.C., has an equal claim with the Aeginetic silver to be the oldest of all money.

Oldest coinage

Probably the two currencies arose at the same period, and by interchange became the recognized currency of the primeval marts; otherwise we can scarcely explain the absence of Asiatic silver, though it is easy to explain that of European electrum or gold. The electrum of the coins is gold—the precious metal washed down by the Pactolus—with a native alloy of a varying part of silver. Its durability recommended it to the Lydians, and it had (by convention) the advantage of exchanging decimally with gold, then in the ratio 13·3 to silver. But this commercial advantage allowed the issue of electrum coins on silver standards, while it was natural to coin them on those of gold; hence a variety of weight-systems perplexing to the metrologist. The classification of the earliest coins is exceedingly obscure; it is hardly possible to say which were struck in Lydia itself, which in the Greek coast cities, such as Miletus; but the majority probably belong to Greek mints. The most primitive in appearance are those in which the obverse is merely marked with lines, corresponding to the original rough surface of the die, while the reverse has three depressions, an oblong one flanked by two squares (Pl. II. fig. 8); there are also various coins of small denomination with a plain convex obverse, and a single rough depression on the reverse, known from the excavations at Ephesus. Both the Babylonian and the Phoenician standards were in use in early times. This double currency, as Head suggests, was probably intended, so far as the Lydians were concerned, for circulation in the interior and in the coast towns to the west, the Babylonic weight being that of the land trade, the Phoenician that of the commerce by sea. Croesus (Pl. II. fig. 9) abandoned electrum, and issued pure gold (on the Babylonic and gold-shekel standards), and pure silver (Babylonic), the silver stater exchanging as the tenth of the Euboic gold stater. These results are explained by the metrological data given earlier in this article. Of the Greek marts of the western coast we have a series of early electrum staters, for the most part on the Phoenician weight. An interesting homogeneous group was issued by the various cities which took part in the Ionian revolt (500–494 B.C.). The Euboic weight naturally found its way into the currencies, but was as yet limited to Samos. Phocaea, Teos and Cyzicus, with other towns, followed from a very early period the Phocaic standard, which for practical purposes may be called the double of the Euboic. They alone before Croesus issued gold money, which was superseded at Phocaea and Cyzicus by electrum. This is the main outline of the native coinage of Asia Minor before the Persian conquest. Its later history will appear under the several great towns, the money of Persia (which circulated largely in Asia Minor) being treated in a subsequent place.

Bosporus, Colchis, Pontus.

The first countries of Asia Minor are Bosporus and Colchis, the coins of the cities of which are few and unimportant. The autonomous coinages of the cities of Pontus are more numerous, but the only place meriting a special notice is Amisus, which almost alone of the cities of Pontus seems to have issued autonomous silver money. The common subjects of the bronze money of this place relate to the myth of Perseus and Medusa, a favourite one in this country.

The regal coins are of the old kingdoms of Pontus and of the Cimmerian Bosporus, of the two united as the state of Bosporus and Pontus under Mithradates VI. (the Great), and as reconstituted by the Romans when Polemon I. and II. still held the kingdom of Mithradates, which was afterwards divided into the province of Pontus and the kingdom of Bosporus. The early coinage of the kingdom of Bosporus is of little interest. Of that of Pontus there are tetradrachms, two of which, of Mithradates IV. and Pharnaces I., are remarkable for the unflinching realism with which their barbarian type of features is preserved. Mithradates VI., king of Bosporus and Pontus, is represented by gold staters, and tetradrachms. The portrait on the best of these (see Pl. II. fig. 10) is fine despite its theatrical quality, characteristic of the later schools of Asia Minor. The kings of Bosporus struck a long series of coins for the first three and a half centuries after the Christian era. Their gold money (the only non-imperial gold allowed under the empire) is gradually depreciated and becomes electrum, and ultimately billon and bronze. They bear the heads of the king and the emperor, and are dated by the Pontic era (297 B.C.).

Paphlagonia.

In Paphlagonia we must specially notice the coins of the cities Amastris and Sinope. The silver pieces of the former place bear a youthful head in a laureate Phrygian cap, probably representing Mithras, Amastris, the foundress, being seated on the reverse. The silver pieces of Sinope are plentiful. In the 4th century they bear the names of Persian governors. The types are the head of the nymph Sinope and, as at Istrus, an eagle preying on a dolphin.

Bithynia.

Bithynia is represented by a more important series. The provincial diet issued Roman silver medallions of the weight of cistophori (to be presently described), with Latin inscriptions, and bronze pieces with Greek inscriptions. The ordinary silver coins of Chalcedon strikingly resemble on both sides those of Byzantium, and a monetary convention evidently at times existed between these sister-cities. Of Cius, also called Prusias ad Mare, there are gold staters and smaller imperial silver pieces. Of Heraclea there are silver coins of good style; the most interesting type is a female head wearing a turreted head-dress, one of the earliest representations of a city-goddess (early 4th century). The tyrants of Heraclea, Clearchus, Satyrus, Timotheus and Dionysius are represented by coins. Of the imperial class there is a large series of Nicaea, and many coins of Nicomedia. The series of the Bithynian kings consists of Attic tetradrachms and bronze pieces, issued by Ziaëlas, Prusias I. and II., and Nicomedes I.–IV.

Mysia.

The fine Greek coinage of Asia may be considered to begin with Mysia. Cyzicus is in numismatics a most important city. Its coinage begins in the 6th century; and the famous electrum Cyzicene staters were struck here for nearly a century and a half (*c.* 500–350 B.C.). During that whole period they were not only the leading gold coinage in Asia Minor but the chief currency in that metal for the cities on both shores of the Aegean; the value at which they were rated was doubtless a matter of convention, and varied from time to time. The actual weight is of the Phocaic standard, just over 248 grains. The divisions were the hecta or sixth, and the twelfth. The extraordinary variety of "types" at Cyzicus is due to the fact that these types are really symbols differentiating the issues, the true badge of the city, the tunny-fish, being relegated to a subordinate position (Pl. II. fig. 11). The reverse invariably has the quadripartite incuse square in four planes of the so-called mill-sail pattern. The coins are very thick and the edges are rude. The art is frequently of great beauty, though sometimes careless. The silver coinage of Cyzicus comprises beautiful tetradrachms of the Rhodian standard, with a head of Persephone **ΣΩΤΕΙΡΑ**, veiled and wreathed with ears of corn. Both late autonomous and imperial coins in bronze are well executed and full of interest, the two classes running parallel under the earlier emperors.

Lampsacus is represented by a long series of coins. Its distinctive type is the forepart of a Pegasus, which occurs on its coins from the 6th century onwards. In the first half of the 4th century it issued splendid gold staters with various types (really, as at Cyzicus, symbols distinguishing the issues) on the obverse and the half-Pegasus on the reverse. The most remarkable type is a bearded head (probably of a Cabirus) with streaming hair in a conical cap, bound with a wreath, singularly pictorial in treatment as well as in expression (Pl. II. fig. 12). In contrast to this is a most carefully executed head of a Maenad with goat's ear; and other types of great interest are the Earth-goddess rising from the earth, and Victory nailing a helmet to a trophy, or sacrificing a ram.

The money of the great city of Pergamum is chiefly of a late time. Apart from some rare pieces of gold, the silver coinage is chiefly supplied by the money of the kings of Pergamum and by cistophori. The bronze pieces of the city are numerous, both autonomous and imperial, the two classes overlapping, and there are medallions of the emperors. The local worship of

Aesculapius is especially promient under the Roman rule. The chief coins of the kings are Attic tetradrachms, with on the obverse a laureate head of Philetaerus, the founder of the state, and on the reverse a seated Athene, the common type of Lysimachus, from whom Philetaerus revolted. Variations from these types are rare,the most important being a coin with the name of Eumenes (II.), representing his portrait and the Dioscuri. Otherwise the inscription is always **ΦΙΛΕΤΑΙΡΟΥ**. The cistophorus probably originated at Ephesus towards the end of the 3rd century, but was soon adopted for the Pergamene dominions, and down to imperial times was the only important silver currency in Asia Minor. It acquired its name from its obverse type, the *cista mystica*, a basket from which a serpent issues, the whole enclosed in an ivy-wreath. The reverse type represents two serpents, and between them usually a bow-case (Pl. II. fig. 13). The half and the quarter of the cistophorus have on one side a bunch of grapes on a leaf or leaves of the vine, and the club with the lion's skin of Heracles within an ivy-wreath. They were tetradrachms equal in weight to about three Attic drachms or three denarii. These coins became abundant when the kingdom of Pergamum was transformed into the province of Asia, and are struck at its chief cities, as Pergamum, Adramyttium, the Lydian Stratoniceia, Thyatira, Sardis, Smyrna, Ephesus, Tralles, Nysa, Laodicea and Apamea. They have at first the names of Greek magistrates, afterwards coupled with those of Roman proconsuls or propraetors. The silver medallions of Asia, the successors of the cistophori, range from Mark Antony to Hadrian and Sabina. They bear no names of cities, but some may be attributed by their references to local forms of worship. The obverse bears an imperial head, the reverse a type either Greek or Roman. The art is the best of this age, more delicate in design and execution than that of any other pieces, the Roman medallions excepted. One of the most remarkable imperial bronze coins of Pergamum represents the Great Altar (Pl. II. fig. 16).

Troas.

The coinage of the Troad is interesting from its traditional allusions to the Trojan War. Of Abydos there is a fine gold stater, with the unusual subject of Victory sacrificing a ram, and the eagle, which is the most constant type of the silver money. One of the few imperial coins commemorates the legend of Hero and Leander. The late tetradrachms of Alexandria Troas bear the head of Apollo Smintheus, and on the reverse his figure armed with a bow. There is a long series of the town as a colonia, of extremely poor work. Ilium Novum strikes late Attic tetradrachms with a head of Athene, and on the reverse the same goddess carrying spear and distaff, with the inscription **ΑΘΗΝΑΣ ΙΛΙΑΔΟΣ**. On the autonomous and imperial bronze we notice incidents of the tale of Troy, as Hector in his car, or slaying Patroclus, or fighting; and again the flight of Aeneas. The island of Tenedos is represented by very early coins, and others of the fine and late periods. The usual obverse type of all the silver pieces is a Janus-like combination of two heads, presumably some primitive god and his consort; this double type is balanced on the reverse by the double-axe, which played an important part in the primitive cults of Asia Minor and the Aegaean.

In Aeolis the most noteworthy coins are the late tetradrachms of Cyme and Myrina, both of the time of decline, yet with a certain strength which relieves them from the general weakness of the work of that age. Cyme has the head of the Amazon Cyme, and a horse within a laurel-wreath; Myrina, a head of the Grynean Apollo and his figure with lustral branch and patera.

Lesbos is remarkable for having coined in base as well as pure silver, its early billon coins being peculiar to the island. This base coinage, which was probably common to Mytilene and Methymna, ceases about 450 B.C., when the Mytilenaean silver begins. Methymna has very interesting archaic silver coins, with the boar and the head of Athene. But the most important coinage of Lesbos is the beautiful electrum coinage (a unique stater, Pl. II. fig. 14, and innumerable sixths) which was issued from about 480 to 350. Phocaea in Ionia issued similar coins, distinguished by a seal (the badge of the city), and a convention regulating the weight and quality of the two coinages, and arranging for the two mints to work in alternate years, is still extant. The types vary accordingly, as at Cyzicus and Lampsacus. There is a long and important series of Mytilene of the imperial time, including very interesting commemorative coins, some of persons of remote history, as Pittacus and Sappho, others of benefactors of the city, as Theophanes the friend of Pompey, from whom he obtained for this his native place the privileges of a free city. The usual style for these persons is hero or heroine, but Theophanes is called a god, and Archedamis, probably his wife, a goddess.

Ionia.

The money of Ionia is abundant and beautiful. For the first century and a half (*c.* 700–545) the chief coinage is of electrum. To the 7th century belongs the remarkable coin inscribed **ΦΑΕΝΟΣ ΕΜΙ ΣΗΜΑ** ("I am the badge of the Bright One" or "of Phanes"), with a stag, which was perhaps issued at Ephesus. From 545 to the Ionic revolt (494) there is considerable diminution in the coinage; silver attains more importance. Thenceforward, the course of the coinage is fairly uniform until the period 301–190, when there is a general cessation of autonomous issues. After the battle of Magnesia there is a great revival, tetradrachms of Alexandrine and also of local types being issued in vast numbers. After the constitution of the Roman province of Asia (133), the cistophori supply the silver coinage. The imperial bronze coinage is numerous, with many interesting local types. Of the coins of the various cities the following demand mention. At Clazomenae in the 4th century there are splendid coins, having for types the head of Apollo, three-quarter face, and a swan. The chief pieces, the gold drachm and a half or octobol, and the silver stater or tetradrachm present two types of the head of Apollo, very grand on the gold and the silver, with the signature of Theodotus, the only known Asiatic engraver, and richly beautiful on the other silver piece. These coins are marked by the intense expression of the school of western Asia Minor. Colophon has fine severe coins of the 5th century with the head of Apollo and the lyre.

Ephesus.

The money of Ephesus is historically interesting, but very disappointing in its art, which is limited by the small range of subjects and their lack of beauty. The leading type is the bee; later the stag and the head of Artemis appear. Thus the subjects relate to the worship of the famous shrine. The oldest coins are electrum and silver, both on the Phoenician standard. The type is a bee and the reverse is incuse. The silver coinage continues with the same types, unbroken by the Persian dominion, until in 394 B.C. a remarkable new coin appears. When Conon and Pharnabazus defeated the Lacedaemonian fleet and liberated the Greek cities of Asia from Spartan tryanny a federal coinage was issued by Rhodes, Cnidus, Samos, Ephesus, Iasus and Byzantium with their proper types on the reverse, but on the obverse the infant Heracles strangling two serpents; these are Rhodian tridrachms. About this time the Rhodian standard was introduced, and a series of tetradrachms began with the bee, having for reverse the forepart of a stag looking back, and behind him a date-palm. The head of Artemis as a Greek goddess begins to appear in the 3rd century. Other series of coins follow with types associated with Artemis, Rhodian and Attic standards alternating; there are also Alexandrine tetradrachms and of course cistophori. The connexion of the city with Lysimachus, who called it Arsinoë, after his wife, is commemorated by coins inscribed **ΑΡΣΙ**. The Ephesian form of Artemis, as the cultus figure of a nature-goddess, first appears as a symbol on the cistophori, and then on gold coins struck during the revolt of 87–84, when Ephesus took the side of Mithradates. The imperial money provides many representations of the temples of the city, including that of the famous shrine of Artemis, which shows the bands of sculpture on the columns, as well as many other remarkable subjects, particularly the Zeus of rain seated on Mount Pelion, a shower falling from his left hand, while below are seen the temple of Artemis and the river-god Caÿster; on another coin the strange Asiatic figure of the goddess, frequent in this series, stands between the personified rivers Caÿster and

Cenchrius. The money of the Ionian Magnesia begins with the issue of Themistocles, when he was dynast under Persian protection. The ordinary silver coins (350–190 B.C.) representing a cavalryman and the river-god Maeander as a bull are common. After 190 B.C. we have spread tetradrachms of the decline of art, more delicately executed than those of Cyme and Myrina, with a bust of Artemis and a figure of Apollo standing on a maeander and leaning against a lofty tripod, the whole in a laurel-wreath.

Miletus.

The great city of Miletus is disappointing in its money. The period of its highest prosperity is too early for an abundant coinage, yet in the oldest electrum issues we see the lion and the sun of Apollo Didymeus. In the early 4th century the Carian dynasts issued coins from Ephesus. To about 350 B.C. belong the beautiful coins bearing the head of Apollo facing and the lion looking back at a sun, with the inscription **ΕΓ ΔΙΔΥΜΩΝ ΙΕΡΗ** (*scil.* δραχμή), showing that this was the "sacred" money of the famous temple at Didyma. The types of the head of Apollo in profile and the lion with the sun continue through a series of various standards with very rare Attic gold staters of the early 2nd century. Phocaea is represented by two very interesting currencies; an electrum series of hectae, characterized by a seal, the badge of the town, beneath the type, struck in convention with Mytilene (see above); and also a widespread early silver coinage, apparently common to the western colonies of the city. The autonomous money is wholly anterior to the Persian conquest.

Smyrna.

Smyrna issued in the 4th century a very rare coin with the head of Apollo and a lyre, of Colophonian style. Among the earliest coins of New Smyrna are some showing that Lysimachus named it Eurydicea after his daughter. After 190 B.C. it strikes Attic tetradrachms, with the turreted head of Cybele or the city or the Amazon Smyrna (Pl. II. fig. 15), and an oak-wreath sometimes enclosing a lion. A rare silver coin and common bronze coins present on the reverse the seated figure of Homer. A gold coin issued by the Prytaneis of the Smyrnaeans probably belongs to the time of the Mithradatic revolt against Rome (87–84). The imperial coins have numerous types, among others the two Nemeses appearing to Alexander in a vision.

Teos.

Of Teos there are early Aeginetic didrachms, bearing on the one side a seated griffin and on the other a quadripartite incuse square. These ceased at the moment when the population left the town, destroyed by the Persians, and fled to Abdera, where we recognize their type on the coinage of the time. There are much later coins of less importance.

Chios.

Chios and Samos, islands of Ionia, are represented by interesting currencies. Chios struck electrum and abundant silver. The type was a seated sphinx with curled wing, and before it stands an amphora, above which is a bunch of grapes; the reverse has a quadripartite incuse. The coins begin before the Persian conquest (490 B.C.).

Samos.

The coinage of Samos is artistically disappointing, but as a whole has many claims to interest. The earliest money included electrum. The silver begins before 494 B.C. The types are the well-known lion's scalp and bull's head. The Athenian conquest (439 B.C.) is marked by the introduction of the olive-spray as a constant symbol on the reverse and the occasional occurrence of Attic weight. The Samians, having joined the anti-Laconian alliance after Conon's victory in 394 B.C., struck the coin with Heracles strangling the serpents already noticed under Ephesus; the Rhodian weight is here introduced. The long series of imperial money is not without interesting types. The most remarkable is the figure of the Samian Hera, which clearly associates her with the group of divinities to which the Ephesian Artemis belongs. Very noticeable also are the representations of Pythagoras, seated or standing, touching a globe with a wand.

Caria.

The money of Caria does not present any one great series. Autonomous silver coins are not numerous except at Cnidus, and rarely of good style. Antiochia and Alabanda have tetradrachms in the 2nd century. The imperial coins of Antiochia and of Aphrodisias are worthy of notice. Cnidus is represented at first by archaic coins of Aeginetic weight, some as early as the first half of the 7th century, with a very rude head of Aphrodite. The head of the famous statue of Aphrodite by Praxiteles is not reproduced, but the whole statue figures on imperial coins. Among the imperial types of Halicarnassus the head of Herodotus is noteworthy. There is late silver money of Iasus with the head of Apollo, and a youth swimming beside a dolphin around which his arm is thrown. Idyma has silver pieces of fine style on which the head of Apollo is absolutely facing; the reverse type is a fig-leaf. On imperial coins of Mylasa the figure of the Zeus of Labranda holding double-axe and spear is represented. Of Termera we have the rare coin of its tyrant Tymnes, dating about the middle of the 5th century and struck on the Persic system.

The Carian satraps prove their wealth by their series of silver coins, which bear the names of Hecatomnus, Mausolus, Hidrieus and Pixodarus. The weight is Rhodian; the types are the three-quarter face of Apollo, and Zeus Labrandeus standing, holding the labrys or two-headed axe. Pixodarus also strikes gold of Attic weight. His silver is the best in the series, and clearly shows the Ionian style in its quality of expression.

Calymna and Cos.

Among the islands of Caria, Calymna begins in the 6th century or earlier with curious archaic Persian didrachms bearing a helmeted male head and on the reverse a lyre. The series of Cos begins with small archaic pieces, the type a crab and the reverse incuse. Next come fine coins of transitional style and Attic weight, with the types of a discobolus before a tripod, and a crab. The break so common in the coinage of this coast then interrupts the issue, and a new coinage occurs before the time of Alexander. The weight is Rhodian, the types the head of Heracles and the crab. After Alexander there is another currency which ceases about 200 B.C. It is resumed later with the new types of the head of Asclepius and his serpent. This continues in Roman times. The bronze of that age comprises a coin with the head of Hippocrates and on the reverse the staff of Asclepius. Xenophon's head likewise occurs, and the portrait of Nicias tyrant in Cos (*c.* 50 B.C.) on his bronze. Imperial money ends the series.

Rhodes.

The island of Rhodes, great in commerce and art, has a rich series of coins. The want of variety in the types—at the city of Rhodes almost limited to the head of Helios and the rose—is disappointing, but happily the principal subject could not fail to illustrate the movements of art, one of which had here its centre. The city of Rhodes was founded *c.* 408 B.C. on the abandonment by their inhabitants of the three chief towns of the island, Camirus, Ialysus and Lindus. The money of Camirus seems to begin in the 6th century B.C. The type is the fig-leaf, the weight Aeginetic, later degraded. The coins of Ialysus, of the 5th century, follow the Phoenician standard. Their types are the forepart of a winged boar and an eagle's head. The money of Lindus, apparently before 480 B.C., is of Phoenician weight, with the type of a lion's head. The people of the new city of Rhodes adopted another standard, the Attic, and very shortly abandoned it, except for gold money, using instead that peculiar weight which has been called Rhodian; this they retained until the last years of their independent coinage, when they resumed the Attic. The types are the three-quarter face of Helios and the rose. There is a grandeur and noble outlook in the earlier heads of Helios which well befits his character, but the pictorial style is evident in the form of the hair and the expression, which, with all its reserve, has a dramatic quality (see Pl. II. fig. 17). Towards the end of the 4th century the radiate head is introduced; the Alexandrine tetradrachms, which were issued after the battle of Magnesia, find a place in the Rhodian mintage. During the age after Alexander there is an abundant bronze coinage, with some pieces of unusual size. The series closes with a few imperial coins ranging from Nerva to Marcus Aurelius.

Lycia.

The early coinage of Lycia introduces us at once into a region of Asiatic mythology, art and language, raising many questions as yet without an answer. The standard of the oldest coins (beginning about 520 B.C.) is low Persic, and it falls perhaps under Athenian influence, until it is often indistinguishable from the Attic. The Lycian character belongs to the primitive alphabets of Asia Minor, which combine with archaic Greek forms others which are unknown to the Greek alphabet, and it expresses a native language as yet but imperfectly understood. The art is stiff and delights in animal forms, sometimes of monstrous types, which recall the designs of Phoenicia and Assyria. The most remarkable symbol is the triskeles or tetraskeles symbol, an object resembling a ring, to which three or four hooks are attached. It is supposed to be a solar symbol like the swastika. The oldest money has a boar or his fore-part and an incuse. This is succeeded by a series with an animal reverse, and then by one in which the hooked ring is the usual reverse type. The fourth series bears Lycian inscriptions, which give the names of dynasts and places. A fifth series is characterized by the type of a lion's scalp. This coinage reaches as late as Alexander's time. It is followed by silver and bronze money of the Lycian League before Augustus and under his reign, but ceasing in that of Claudius—the usual types of the chief silver piece, a hemidrachm, being the head of Apollo and the lyre. The districts of Cragus and Masicytus have coinages, as well as the individual cities. Besides this general currency there are some special ones of towns not in the League. The imperial money rarely goes beyond the reign of Augustus, and is resumed during that of Gordian III. There is a remarkable coin of Myra of this emperor, showing the goddess of the city, of a type like the Ephesian Artemis, in a tree; two woodcutters, each armed with a double axe, hew at the trunk, from which two serpents rise as if to protect it and aid the goddess. Phaselis is an exceptional town, for it has early Greek coins, the leading type being a galley.

Pamphylia.

The coinage of Pamphylia offers some examples of good art distinctly marked by the Asiatic formality. Aspendus shows a remarkable series of Persic didrachms, extending from about 500 B.C. to Alexander's time. The oldest coins have the types of a warrior and the triskelion or three legs, more familiarly associated with Sicily; it is probably a solar symbol. These coins are followed by a long series with the types of two wrestlers engaged and a slinger. The main legend is almost always in the Panphylian character and language. There are also very curious imperial types. The money of Perga begins in the 2nd century with Greek types of the Artemis of Perga. Her figure in a remarkable Asiatic form occurs in the long imperial series. Bronze coins earlier in date than the silver money with the Greek types have the Pamphylian title of the goddess, **ϜΑΝΑΣΣΑΣ ΠΡΕΙΙΑΣ**, "of the Lady of Perga." Side has at first Persic didrachms of about 480 B.C., their types the pomegranate and dolphin and head of Athene; then there are money with an undeciphered Aramaizing inscription of the 4th century and figures of Athene and Apollo, and late Attic tetradrachms, their types being the head of Athene and Victory. These were carried on by Amyntas, king of Galatia, when he made his mint in Side (36 B.C.). The pomegranate (*σίδη*) is throughout the badge of the city.

Pisidia, &c.

The money of Pisidia is chiefly imperial. There is a long series of this class of the colonia Antiochia. The autonomous coins of Selge have the wrestlers and the slinger of Aspendus in inferior and even barbarous copies. Of Isauria and Lycaonia a few cities, including Derbe and the colonies of Iconium and Lystra, strike coins, chiefly of imperial time.

Cilicia.

Cilicia, for the most part a coastland, is numismatically of high interest. To Aphrodisias is assigned an interesting series of archaic coins with a winged figure and a pyramidal fetish-stone; in the 4th century Aphrodite is represented in human form seated between sphinxes; the Parthenos of Pheidias is also represented. Celenderis has a coinage beginning in the 5th century, with a horseman seated sideways on the obverse, and on the reverse a goat kneeling on one knee. Mallus has a most interesting series of silver coins, some with curious Asiatic types. Of Nagidus there are Persic didrachms of good style, one interesting type being Aphrodite seated, before whom Eros flies crowning her, with, on the other side, a standing Dionysus. Soli has silver coins of the same weight, the types being an archer or the head of Athene, one variety imitated from remote Velia, and a bunch of grapes. The coinage of Tarsus begins in the 5th century with Persic staters representing a Cilician king on horseback, and a hoplite kneeling. In the 4th century it was the mint of a large series of satrapal coins, issued by Pharnabazus, Mazaeus and other governors (Issus, Mallus and Soli also sharing the cost of minting). The chief type is the Baal of Tarsus. The autonomous bronze of the Seleucid age shows the remarkable subject of the pyre of Sandan, the local form of Heracles; and there is a long and curious imperial series. The coinage of Anazarbus (imperial, showing rivalry with Tarsus), Seleucia on the Calycadnus, Mopsus, and the priest-kings of Olba are also full of interest.

Cyprus.

The coinage of the great island of Cyprus is, as we might expect from its monuments, almost exclusively non-Hellenic in character. The weight-system, except of gold, which is Attic, is Persic, save only in the later coins of some mints, struck on the reduced Rhodian standard, and a solitary Attic tetradrachm of Paphos. The art is usually very stiff down to about 400 B.C., with types of Egypto-Phoenician or Phoenician or of Greek origin. The inscriptions are in the Cyprian syllabic character and the earliest coins resemble the early Etruscan in being one-sided. The prevalent types are animals or their heads, the chief subjects being the bull, eagle, sheep, lion, the lion seizing the stag, the deer and the mythical sphinx. The divinities we can recognize are Aphrodite, Heracles, Athene, Hermes and Zeus Ammon. But the most curious mythological types are a goddess carried by a bull or by a ram, in both cases probably Astarte, the Phoenician Aphrodite. The most remarkable symbol is the well-known Egyptian sign of life. The coins appear to have been struck by kings until before the age of Alexander, when civic money appears. The mints to which coins are ascribed with certainty are Salamis, Paphos, Marium, Idalium and Citium. The coins of the Salaminian line are in silver and gold. The earlier, beginning with Evelthon about 560 B.C., have Cyprian, the later Greek inscriptions, the types generally being native, though after a time under Hellenic influence. They are of Evagoras I., Nicocles, Evagoras II., Pnytagoras and Nicocreon, and the coinage is closed by Menelaus, brother of Ptolemy I. The Phoenician kings of Citium, from about 500 to 312, strike silver and in one case gold, their general types being Heracles and the lion seizing the stag. Bronze begins soon after 400 B.C., and of the same age there are autonomous pieces in silver and bronze. There is Greek imperial money from Augustus to Caracalla (chiefly issued by the Κοινόν). The most remarkable type is the temple at Paphos, represented as a structure of two storeys with wings. Within the central portion is the sacred stone, in front a semicircular court.

Lydia.

The earliest coinage of Lydia is no doubt that of the kings, already described. The next currency must have been of Persian darics (gold) and drachms (silver), followed by that of Alexander, the Seleucids, and the Attalids of Pergamum, and then by the cistophori of the province of Asia. There is an abundant bronze coinage of the cities, autonomous from the formation of the province, and of imperial time, but mostly of the imperial class. The largest currencies are of Philadelphia, Sardis, Thyatira and Tralles. The art is not remarkable, though good for the period, and the types are mostly Greek.

Phrygia.

The coinage of Phrygia has the same general characteristics as that of Lydia, but the workmanship is poorer. Among noteworthy types must be noticed Men or Lunus, the Phrygian moon-god. There are curious types of Apamea, surnamed Kibotos or the Ark, and more anciently Celaenae. One of Severus represents the legend of the invention of the double pipe, a type already described. Of the same and later emperors are coins bearing the famous type of the ark of Noah and the name **ΝΩΕ**. The town of Cibyra is remarkable for a silver coinage of the 1st century B.C., of which the large pieces have the weight of cistophori.

Galatia.

Galatia has little to offer of interest. Trajan issued bronze imperial coins for the province, and there is imperial money of Ancyra, Pessinus and Tavium. The only remarkable regal issue is that of Amyntas, Strabo's contemporary, who struck tetradrachms at Side in Pamphylia.

Cappadocia, &c.

With the coinage of Cappadocia we bid farewell to Greek art and enter on the domain of Oriental conventionalism, succeeded by inferior Roman design coarsely executed. There is one large imperial series, that of Caesarea, intended for general circulation in the province. The issues range from Tiberius to Gordian III., and are in silver and bronze. The most common type is the sacred Mount Argaeus, on which a statue is sometimes seen—a remarkable type curiously varied. There are scanty issues of a few other towns. There is an interesting series of coins of the kings of Cappadocia, beginning with Ariarathes I. (*c.* 332–322 B.C.), who struck Persic drachms at Sinope and Gaziura, and continuing with other kings, called usually Ariarathes or Ariobarzanes, who struck Attic drachms and occasionally tetradrachms. The rare tetradrachms of Orophernes, a successful usurper (158–157 B.C.), bear a fine portrait. The coins of Archelaus, the last king set up by Antony (36 B.C.–A.D. 17), have a good head on the obverse. Of Armenia there are a few silver and bronze coins of late sovereigns.

The great series of Syrian money begins with the coinage of the Seleucid kings of Syria, only rivalled for length and

Syria.

abundance by that of the Ptolemies, which it excels in its series of portraits, though it is far inferior in its gold money and wants the large and well-executed bronze pieces which make the Egyptian currency complete. The gold of the Seleucids is scarce, and their main coinage is a splendid series of tetradrachms bearing the portraits of the successive sovereigns. The reverse types are varied for the class of regal money. The execution of the portraits is good, and forms the best continuous history of portraiture for the third and second centuries before our era. The reverses are far less careful. The weight is Attic, but the cities of Phoenicia were ultimately allowed to strike on their own standard. Many of the coins of the earlier kings were issued in their Bactrian or Indian dominions. Seleucus I. (312–280 B.C.) began by striking gold staters and tetradrachms with the types of Alexander the Great. The same king, like his contemporaries, then took his own types: for gold staters, his head with a bull's horn, and on the reverse a horse's head with bull's horns; for tetradrachms, his own head in a helmet of hide with bull's horn and lion's skin, and Victory crowning a trophy, or the head of Zeus, and Athene fighting in a car drawn by four or two elephants with bull's horns. Antiochus I. (293–261), like his father, first struck tetradrachms with Alexandrine types, and then with his own head, Apollo on the omphalos occupying the reverse. The portrait of Antiochus has a characteristic realism. Antiochus III. (222–187) is represented by a fine and interesting series with a vigorous portrait. He alone of the Seleucids seems to have struck the great octadrachm in gold in rivalry of the Ptolemies. Coins dated by the Seleucid era (312 B.C.) first appear in his reign. The portrait of Antiochus IV. Epiphanes (175–164) is extremely characteristic, marked by the mad obstinacy which is the key to the tyrant's history. The most remarkable coin is a tetradrachm with the head of Antiochus in the character of Zeus. In his time mints became numerous in the bronze coinage, and there is a remarkable series in that metal with Ptolemaic types, marking his short-lived usurpation in Egypt. From the time of Demetrius I. (162–150) the silver tetradrachms bear both mints and dates. In one type the heads of Demetrius and Queen Laodice occur side by side. With Alexander I. Balas (152–144), Tyre and Sidon begin to strike royal tetradrachms on their own Phoenician weight. Tarsus also first strikes coins for him with the type of the pyre of Sandan. The money of young Antiochus VI. presents the most carefully executed portrait in the whole series, which, despite its weakness, has a certain charm of sweetness that marks it as a new type in art. The same artist's hand seems apparent in the fine portrait of the cruel usurper Tryphon, and also in the picturesque spiked Macedonian helmet with a goat's horn and cheek-piece which occupies the reverse. Antiochus VII. (138–129) continues the series with, amongst other coins, the solitary bronze piece of Jerusalem, bearing the lily and the Seleucid anchor. Alexander II. Zebina (128–123) is represented by a unique gold coin (Pl. II. fig. 18), as well as by silver and bronze. The empire closes with the money of the Armenian Tigranes (83–69), bearing his portrait with the lofty native tiara, and for reverse Antioch seated, the Orontes swimming at her feet (a copy of the famous group by Eutychides).

Commagene.

There is a copper coinage of the Syrian *koinon* under Trajan; also of the cities of Commagene, Samosata and Zeugma, and less important mints. The money of the kings of Commagene is in bronze (*c.* 140 B.C. to A.D. 72).

Cyrrhestica.

Cyrrhestica has bronze coins of a few cities, nearly all imperial, the chief mints being Cyrrhus and Hieropolis. Hieropolis in the time of Alexander the Great issued some remarkable silver coins in the name of Abd-Hadad and Alexander himself, with figures of the Syrian goddess Atergatis, who also appears on its imperial coins.

Chalcidene, &c.

Of Chalcidene there are bronze coins of Chalcis and of the tetrarchs, and Palmyrene shows only the small bronze pieces of Palmyra, the money of Zenobia and the family of Odenathus being found in the series of Alexandria.

Antioch.

In Seleucis and Pieria, the four cities of Antioch, Apamea, Laodicea ad Mare and Seleucia Pieria issued a joint coinage inscribed ΑΔΕΛΦΩΝ ΔΗΜΩΝ about the middle of the 2nd century B.C. But the bulk of the money of this territory is of the great city of Antioch on the Orontes. The coinage is both autonomous bronze before and of Roman times, and imperial silver, base metal and bronze. Other mints (as Tyre and Sidon) in this same province issued silver of the same class as Antioch, with different symbols. A large series of coins was issued bearing on the reverse the letters S.C. (*Senatus consulto*), showing that the coinage was under the control of the Roman senate. Both Latin and Greek inscriptions are used until the reign of Trajan. The city is first called a colony on the coins of Elagabalus. The earliest coins are dated by various eras (Seleucid, Caesarian, Actian); later the emperor's consulships are used to date the silver. The leading types are the figure of Antioch seated, the river Orontes swimming at her feet, from the famous statue by Eutychides, and the eagle on a thunderbolt, a palm in front. Under Hadrian the eagle is represented carrying an ox's leg, a reference to the story of the foundation of the city when an eagle carried off part of the sacrifice and deposited it on the site which was consequently chosen. There are few other types. The series (which, strictly speaking, was not the local coinage of Antioch, but an imperial coinage for the province) is very full and includes money of the Syrian emperor Sulpicius Uranius Antoninus (who also struck bronze at Emesa and gold of the Roman imperial class). It ends with Valerian, though it begins anew in the Roman provincial money of the reform of Diocletian, to be noticed later.

Apamea, &c.

Of the other cities of this district, Emisa presents the type of the sacred stone of Elagabal. The imperial money of Gabala shows the veiled cultus-statue of a goddess flanked by sphinxes. Laodicea has an important series. It begins with bronze money of the later Seleucids. The autonomous tetradrachms of the 1st century B.C. have a turreted and veiled female bust of the city, a favourite Syrian and Phoenician type. From 47 B.C. its title is Julia Laodicea; from Caracalla downwards it is a colonia; the inscriptions become Latin; then, very strangely, Greek on the obverse of the coins and Latin on the reverse. Seleucia has a similar regal autonomous and imperial currency, but does not become a colonia. A shrine containing the sacred stone of Zeus Casius, and the thunderbolt of Zeus Keraunius resting on a throne, are among the types.

Coele-Syria, &c.

In Coele-Syria, Damascus issues coins from the 3rd century B.C. (beginning with Alexandrine tetradrachms) onwards; the city becomes a colonia under Philip I. The imperial money of Heliopolis (Baalbek), a colonia, shows a great temple (of the Zeus of Heliopolis) in perspective, another temple containing an ear of corn as the central object of worship, and a view of the Acropolis with the great temple upon it, and steps leading up the rock.

Phoenicia.

The coinage of Phoenicia is a large and highly interesting series. The autonomous money is here important, and indicates the ancient wealth of the great marts of the coast. The earliest coins were struck about the middle of the 5th century and usually bear Phoenician inscriptions. The coinage falls into three main periods; the first pre-Alexandrine; the second, that of Alexandrine, Ptolemaic and Seleucid rule; the third, that of the empire. In the first period Aradus strikes silver, usually on the Babylonian standard, staters with a head of Melkarth and a galley, and smaller denominations. All the other cities use the Phoenician standard. The regal silver coins of Byblus have a galley as obverse type; on the reverse, a vulture standing on a ram, or a lion devouring a bull. Here and at Sidon and Tyre portions of the types are represented incuse. Sidon has a large and important series of silver octadrachms and smaller denominations; on the obverse is a galley (at first with sails set, then without sails, first lying before a fortress, afterwards alone). On the reverse is the king of Persia in a chariot, or slaying a lion. These coins were issued by the kings such as Strato I. and II. and Tennes, and by the satrap Mazaeus. The early silver of Tyre has as reverse type an owl with a crook and flail over its shoulder; on the obverse a dolphin, or Melkarth riding on a sea-horse; a common symbol is the purple-shell (Pl. II. fig. 20). In the second period, besides Alexandrine silver and regal coins of the Ptolemies and Seleucidae, there are certain large and important issues of autonomous or semi-autonomous silver tetradrachms and smaller denominations, as at Aradus (head of the City, and Victory; also drachms with types copied from Ephesus: obv., bee, rev., stag and date-palm), Marathus (head of the City, and nude figure at Marathus seated on a pile of shields), Sidon (head of the City, and eagle), Tripolis (busts of the Dioscuri, and figure of the City holding cornucopiae) and Tyre (head of the Tyrian Heracles, Melkarth, and eagle). Tyre also issued a gold decadrachm with the head of the City, and a double cornucopiae. On these and other coins Sidon and Tyre claim the rights of asylum. Berytus first coins in this period, sometimes under the name of Laodicea in Canaan. Ace-Ptolemais (Acre) was an important mint under the Ptolemies; for a time, under the Seleucidae, it was called Antiochia in Ptolemais. Besides the Seleucid era autonomous eras are in use at some of the cities, as at Aradus (259 B.C.), Sidon (111 B.C.) and Tyre (126 B.C.). Under the empire there are some very large coinages of bronze, besides a certain amount of silver resembling that of Antioch. The quasi-autonomous silver of Tyre was also issued as late as A.D. 57. Berytus (a *colonia*) has types relating to the cults of Astarte and Poseidon; Astarte is also prominent at Sidon (a colonia from Elagabalus onwards; a common type represents the wheeled shrine of the goddess) and Tripolis. At Byblus a temple is represented with a conical fetish. Tyre has many interesting types: Dido building Carthage; the Ambrosial Rocks; Cadmus fighting the serpent or founding Thebes, &c. Ptolemais issued coins as a colony from Claudius onwards.

Palestine.

In Trachonitis, the only city of importance is Caesarea Panias, with a famous grotto of Pan, perhaps represented on an imperial coin. Several cities in Decapolis issued imperial coins, among them Gadara and Gerasa. In Galilee the coins struck at Tiberias by its founder, Herod Antipas, may be mentioned. Samaria has money of Caesarea, both autonomous and imperial, the last for the most part colonial, and also imperial of Neapolis, among the types of which occurs the interesting subject of Mount Gerizim surmounted by the Samaritan temple. The coinage of Judaea is an interesting series. The money of Jerusalem is of high interest, and more extensive than appears at first sight. Here was struck the coin of Antiochus VII., with the native lily as a type, the series of the Maccabaean princes, that of the Roman procurators, and the bronze coins countermarked by the tenth legion, quartered by Titus in the ruins of the city. One of these bears the remarkable symbol of a pig. After the reduction of Judaea in the reign of Hadrian, Jerusalem was rebuilt as a colonia with the name Aelia Capitolina. The earliest coin commemorates the foundation. The coinage lasts as late as Valerian. Ascalon strikes autonomous silver and bronze, including remarkable tetradrachms with the portraits of Ptolemy Auletes, of his elder son Ptolemy XIV., and of his daughter Cleopatra (see Pl. II. fig. 21). There is also money of Gaza of some importance; the earliest coins are Attic drachms, &c., of barbarous style, inspired by Greek, especially Athenian models; on its imperial coins the god Marna, and Minos and Io are named.

Jewish coinage.

The independent Jewish coinage begins with the famous shekels. They have been assigned to various periods, but the preponderance of evidence would class them to Simon Maccabaeus, to whom the right of coining was granted by Antiochus VII. The series is of shekels and half-shekels, of the weight of Phoenician tetradrachms and didrachms. The obverse of the shekel bears the inscription "the shekel of Israel," and for type a sacred vessel of the temple, above which (after year 1) is the letter indicating the year of issue and the initial of the word year. The reverse reads "Jerusalem the Holy," and the type is a flowering branch (Pl. II. fig. 19). The half-shekel differs in having the inscription "half-shekel" on the obverse. The types are markedly peculiar; the obverse inscription is equally so, for the regular formula of the neighbouring cities would give nothing but the name of the city; but the reverse inscription is like that of Tyre and Sidon, for instance, "of Tyre sacred and inviolable." This agreement is confirmatory of the assignment to Simon Maccabaeus. This coinage bears the dates of years 1, 2, 3, 4 (rare), and 5 (very rare). There has been much discussion as to the date. It is best reckoned from the decree of Antiochus VII. granting the right of coinage to Simon (139–138 B.C.). The coins of the fifth year were then struck by John Hyrcanus. The certain coins of the successors of Simon are small bronze pieces of John Hyrcanus (135–104), of Judas Aristobulus (104–103), of Alexander Jannaeus (103–76), who strikes bilingual Hebrew and Greek and also Hebrew coins, showing his native name to have been Jonathan, and of Antigonus (40–37), who has the Hebrew name Mattathiah. The types represent only inanimate objects. The Maccabaean coinage is followed by that of the Herodian family, equally of bronze, the two most important issues being those of Herod the Great and Agrippa II. The silver coinage under the early empire was chiefly supplied by the issues of Antioch and Roman denarii; the "penny" with Caesar's image and superscription was such a denarius. The money of the procurators of Judaea, in part parallel with the Herodian, is of small bronze coins, struck between A.D. 6–7 and A.D. 58–59, the latest period of their administration being as yet unrepresented. These are followed by two classes, the money of the first revolt (A.D. 66–70) and that of the second (suppressed A.D. 135). Both risings caused the issue of native coinage, some of which may be assigned with certainty to each. Of the first revolt are bronze pieces of years 2, 3 and 4. Of the second revolt are restruck Antiochene tetradrachms and Roman denarii, usually with the name of Simon, which appears to have been that of the leader surnamed Bar Cochebas. The obverse type of the tetradrachms or shekels is the portico of the temple; on the reverse are a bundle of branches and a citron, symbols of the feast of tabernacles. Besides this native currency there are coins struck in Palestine by Vespasian, Titus and Domitian.

Arabia, Mesopotamia, Babylonia.

Of Roman Arabia there are bronze imperial coins of Bostra and less important mints; the kings of Nabataea also issued silver and bronze coins from Aretas III. (*c.* 87–62 B.C.) to Rabbel II. (A.D. 75–101). From S. Arabia comes a remarkable silver coinage issued by the Himyarites, beginning in the 4th century B.C., and imitated originally from Attic tetradrachms (both of the old and new style). In Mesopotamia the colonia of Carrhae deserves notice, and the city of Edessa, which issues imperial money as a colonia, and has a series of coins of its kings, striking with Roman emperors in silver and bronze. Curiously, this and the colonial issue are long contemporary. The colonial coinages of Nisibis and of Resaena, which became a colonia, close the group. Babylon was probably a mint of Alexander the Great and of many of the Seleucid kings, certainly of the usurpers Molon (222–220) and Timarchus (162 B.C.).

Africa.

Egypt.

The coins of Africa are far less numerous then those of the other two continents, as Greek, Phoenician and Roman civilization never penetrated beyond Egypt and the northern coast to the west. The series of Egypt is first in geographical order. As yet no coins have been here assigned of a date anterior to Alexander. The old Egyptians kept their gold, electrum and silver in rings, and weighed them to ascertain the value. During the Persian rule the Persian money must have been current, and the satrap Aryandes is said to have issued a coinage of silver under Darius I. With Alexander a regular Greek coinage must have begun, and some of his coins are of Egyptian mints. A rare bronze coin was struck at Naucratis, probably during his lifetime. With Ptolemy I. the great Ptolemaic currency begins, which lasted for three centuries. The characteristics of this coinage are its splendid series of gold pieces and the size of the bronze money. The execution of the earlier heads is good; afterwards they become coarse and careless. At first the fine pieces were issued by the Phoenician, Cyprian and other foreign mints, the Egyptian work being usually inferior. While the Seleucids were still striking good coins, the Ptolemies allowed their money to fall into barbarism in Egypt and even in Cyprus. The obverse type is a royal head, that of Ptolemy I. being the ordinary silver type (see Pl. II. fig. 22), while that of Arsinoë II. was long but not uninterruptedly continued on the gold. The head of Zeus Ammon is most usual on the bronze coinage. A type once adopted was usually retained. Thus Ptolemy I., Arsinoë II., Ptolemy IV., Cleopatra I., have a kind of commemoration in the coinage on the analogy of the priesthoods established in honour of each royal pair. The almost universal type of reverse of all metals is the Ptolemaic badge, the eagle on the thunderbolt, which, in spite of variety, is always heraldic. For art and iconography this series is far inferior to that of the Seleucids. The weight after the earlier part of the reign of Ptolemy I. (who experimented with the Attic and Rhodian standards) is Phoenician for gold and silver; the metrology of the bronze is obscure. The chief coins are octadrachms in gold and tetradrachms in silver, besides the abundant bronze money. Ptolemy I. appears to have issued his money while regent for Philip Arrhidaeus (323–318); it only differs in the royal name from that of Alexander. He then struck money for Alexander IV. (317–311) on the Attic standard with the head of Alexander the Great, with the horn of Ammon in the elephant's skin and Alexander's reverse. He soon adopted a new reverse, that of Athene Promachos. This money he continued to strike after the young king's death until he himself (305) took the royal title, when he issued his own money, his portrait on the one side and the eagle and thunderbolt with his name as king on the other. This type in silver, with the inscription "Ptolemy the king," is thenceforward the regular currency. He also issued gold staters (reverse, Alexander the Great in an elephant-car). Ptolemy II. (Philadelphus, 285–247), the richest of the family, continued his father's coinage. Philadelphus also began (after the death and deification of Arsinoë II., about 271 B.C.), the issue of the gold octadrachms with the busts of Ptolemy I. and Berenice I., Ptolemy II. and Arsinoë II., and certainly struck beautiful octadrachms in gold and decadrachms in silver of Arsinoë II., the gold being long afterwards continued. Philadelphus also began the great bronze issues of the system. Ptolemy III. (Euergetes I. *c.* 247–222) struck gold octadrachms with his own portrait, wearing a crown of rays. His queen Berenice II., striking in her own right as heiress of the Cyrenaica and also as consort, issued a showy currency with her portrait, both octadrachms and decadrachms like those of Arsinoë, and a coinage for the Cyrenaica of peculiar divisions. Under Ptolemy IV. (Philopator, 222–205) the gold octadrachms are continued with his portrait and that of Arsinoë III. Ptolemy V. (Epiphanes, 205–181) still strikes octadrachms with his portrait and with that of Arsinoë, and begins the continuous series of the tetradrachms of the three great cities of Cyprus. The coinage henceforward steadily degenerates in style and eventually also in metal. In the latest series, the money of the famous Cleopatra VII., it is interesting to note the Egyptian variety of her head, also occurring on Greek imperial money and on that of Ascalon.

Under the Roman rule the imperial money of Alexandria, the coinage of the imperial province of Egypt, is the most remarkable in its class for its extent and the interest and variety of its types. It begins under Augustus and ends with the usurper or patriot Achilleus, called on his money Domitius Domitianus, overthrown by Diocletian (A.D. 297), thus lasting longer than Greek imperial money elsewhere. In the earlier period there are base silver coins continuing the base tetradrachms struck by Auletes, and bronze money of several sizes. Most of the coins are dated by the regnal years of the emperors, the letter L being used for "year." The types are very various, and may be broadly divided into Greek, Graeco-Roman and Graeco-Egyptian. The Graeco-Roman types have the closest analogy to those of Rome herself; the Graeco-Egyptian are of high interest as a special class illustrative of the latest phase of Egyptian mythology. These native types, at first uncommon, from the time of Domitian are of great frequency. The money of Trajan, Hadrian and Antoninus Pius is abundant and interesting. A coin of Antoninus, dated in his sixth year, records the beginning of a new Sothiac cycle of 1460 years, which happened in the emperor's second year (A.D. 139). The reverse type is a crested crane, the Egyptian bennu or phoenix, with a kind of radiate nimbus round its head, and the inscription ΑΙΩΝ. Under Claudius II. (Gothicus) and thenceforward there is but a single kind of coin of bronze washed with silver. In this series we note the money of Zenobia, and of her son Vabalathus.

Coins bearing the names and local types of the nomes of Egypt were struck by a few emperors at the Alexandrian mint. Their metal is bronze, and they are of different sizes.

Passing by the unimportant coinage of the Libyans, we reach the interesting series of the Cyrenaica, the only truly Greek currency of Africa. It begins under the line of Battus about the middle of the 7th century, and reaches to the Roman rule as far as the reign of Augustus. The coins were issued at Cyrene, Barca, Euesperides and smaller towns. The weight of the gold always, and of the silver until some date not long after 450 B.C., is Euboic; afterwards it is Phoenician. The ruling types are the silphium plant and its fruit, and the head of Zeus Ammon, first bearded (Pl. II. fig. 23) then beardless. The art is vigorous, and in the transitional and fine period has the best Greek qualities. It is clearly an outlying branch of the school of central Greece. The oldest coins are uninscribed, so that it cannot always be said at which mint they were struck. The money with the name of Cyrene comprises a fine series of gold Attic staters and silver tetradrachms. It was an important mint of the Ptolemies. Barca has a smaller coinage then Cyrene. It comprises a wonderful tetradrachm (Phoenician), with the head of Ammon bearded, boldly represented, absolutely full face, and three silphiums joined, between their heads an owl, a chameleon and a jerboa. The money of Euesperides is less important.

Syrtica and Byzacena offer little of interest. Their coins are late bronze, first with Punic inscriptions, then in imperial times with Latin and Punic or Latin. Latin and Greek are used in the same coins at Leptis Minor in Byzacena.

Carthage.

In Zeugitana the great currency of Carthage is the last representative of Greek money, for, despite its Orientalism, its origin is Hellenic, and of this origin it is at first not unworthy. Its range in time is from about 410 B.C., when the Carthaginians invaded Sicily, to the fall of Carthage in 146 B.C. The earliest coins are Attic tetradrachms of the class usually called Siculo-Punic. These, and certain gold coins with similar types, were issued in Sicily down to about 310 B.C. The types owe much to the coinage of Sicilian cities, especially Syracuse; but they show also distinct Punic motives, such as a lion before a palm-tree, or a head of a Punic queen. The Punic inscriptions enable some to be attributed to mints such as Motya, Solus, Eryx; others name "Carthage," "the Camp," "the Paymasters," many, inscribed *Ziz*, were issued from Panormus. The coinage from about 340 to 242 B.C., perhaps all issued at Carthage itself, is scanty; the types, head of Persephone and a horse, or horse and palm-tree, now come in, and prevail to the end of the independent coinage. The acquisition of the Spanish mines about 241 caused the issue of a large coinage, but the gold and silver soon degenerate into electrum and potin. The metrology of the various series (excepting the Siculo-Punic) is obscure, but the standard seems to be Phoenician. The late silver 12-drachm pieces and some of the bronzes are among the heaviest struck coins of the ancients. The art of the earlier coins is sometimes purely Greek of Sicilian style. There is even in the best class a curious tendency to exaggeration, which gradually develops itself and finally becomes very barbarous. Roman Carthage has a bronze coinage which is insignificant. There are a few other towns which issued money with Roman legends, such as Utica. The denarii of Clodius Macer, who revolted in A.D. 68, are curiously illustrative of his policy, which was to restore the Roman republic.

Numidia, Mauretania.

The cities of Numidia and Mauretania have a late bronze coinage; but an interesting series of silver and bronze coins is attributed with more or less certainty to the Numidian kings from Massinissa (202–148), to Juba I. (60–46 B.C.), and to the Mauretanian kings from Syphax (213–202 B.C.), to Juba II. (who also struck coins with his consort Cleopatra, daughter of Mark Antony and the famous Egyptian queen) and Ptolemy their son, the last of the great family of the kings of Egypt (A.D. 23–40).

II. ROMAN COINS

The Roman coinage is of two great classes,—the republican and the imperial; the first lasted from the origin of money at Rome to the reform of Augustus in 16 B.C., and the second from this date to the fall of the Western empire in A.D. 476. The evidence of the coins themselves as to the origin of the republican coinage is at variance with that of the ancient writers; but the general principles of criticism must be maintained here as in other matters of early Roman story.

The tradition which ascribed the introduction of coins bearing types to Servius Tullius must be unhesitatingly rejected. The style and types of the earliest Roman coins point clearly to a date not earlier than the middle of the 4th century. The native copper which the Italians used from primitive times as a sort of medium of exchange, in amorphous blocks (*aes rude*) was probably not a state-currency, being produced by private enterprise. It was not until Rome unified Latium and Campania under her rule that central Italy acquired a true coinage. This must have been about 338 B.C. The history of the republican coinage from 338 to 16 B.C. falls into two great periods—the second being marked by the introduction of the denarius system in 269. From 338 to 269 three minor periods may be distinguished, indicating in a striking way the growth of the Roman organization of central Italy. In the period 338–312 Rome consolidated her dominion in Latium and Campania as against her rivals the Samnites. In the second period (312 to *c.* 290) she finally subdued the Samnites. The system of her coinage is from the beginning based on a double mint, one in Rome and one in Capua (perhaps also she struck in some other cities in south Italy). The weight-units with which she starts are, for bronze, the Osco-Latin pound of 273 grammes, for silver the didrachm of 7·58 grammes (the latter being $\frac{1}{36}$ of the former and more or less coincident with the Phocaic-Campanian didrachm current in Campania). The relation between silver and bronze was as 1 : 120 or 1 : 125. The bronze unit was the *as* of 1 pound weight, which was divided into 12 unciae. The reverse type of all bronze denominations was a prow, which alluded to the establishment of Roman sea-power (in 348 she concluded her treaty with Carthage, in 338 she subjugated Antium, her chief rival on the Latin coast, and set up the beaks of the Antiate ships in her forum). The denominations are marked by I (the as), S (semis = $\frac{1}{2}$ as) and for the smaller denominations a number of pellets indicating the value in unciae. On the obverses appear the heads of deities: Janus on the as (see Plate), Jupiter on the semis, Minerva on the triens (4 unciae), Hercules on the quadrans (3 unciae), Mercury on the sextans (2 unciae) and Bellona on the uncia. These heavy coins were all cast at Rome. The Roman mint at Capua, on the other hand, produced a series of silver coins (chiefly didrachms) and small *struck* bronze change with the inscription ROMANO (see Pl. II. fig. 24). In the second period (312 to *c.* 290) the mint at Rome continues to issue cast bronze of the same weights and types. But at Capua the mint becomes much more active, being opened for cast bronze as well as struck silver. The Osco-Latin silver standard is superseded by the Roman scruple-standard (1 scruple of 1·137 grammes = $\frac{1}{240}$ of the pound of 273 grammes). Silver being to bronze as 1 : 120, 2 scruples of silver were equivalent to 1 bronze as of 273 grammes. The first issue of silver in this period consisted of didrachms (six-scruple pieces) with a head of Roma in a Phrygian helmet (alluding to her Trojan foundation), the inscription is ROMANO. Parallel with this is a Capuan issue of libral cast bronze (*aes grave*) for the use of the Latin territory; the 3-asses (tressis), 2-asses (dupondius) and as all have the head of Roma as on the didrachm, and the reverse type of all denominations is a wheel. (This wheel probably alludes to the completion of the internal routes of communication in Roman territory, especially of the via Appia, which was finished in 312). Finally, to this first issue is attributed one of the quadrilateral ingots generally known as *aes signatum*; its types are the Roman eagle on a thunderbolt, and a Pegasus with the inscription ROMANOM. These ingots, according to a plausible but not quite convincing conjecture, were probably not used as money, but only in sacral and legal ceremonies—such as dedication to the gods, *venditio per aes et libram*, &c.—in which the use of *aes rude* was traditional. But from this time onward each issue of silver and aes grave from the Capuan mint was, it is supposed, accompanied by a new ingot of this kind. Three further issues of silver from the Capuan mint took place in this period, each accompanied by its corresponding aes grave series and ingot. These heavy bronze pieces are all uninscribed; on the silver and small struck bronze ROMA replaces ROMANO. The evidence of hoards shows that in this period there must have been some sort of convention between Rome and the autonomous mints of her allies, permitting the circulation, throughout the bronze-using district under Roman control, of all the coins issued from Rome and Capua, on the one hand, and, on the other, all the aes grave issued by the autonomous mints. In the third sub-period (*c.* 290–269) the silver coinage of the Capuan mint becomes thoroughly Romanized; its inscription is, of course, ROMA; its types are the typically Roman ones of the youthful head of Janus and Jupiter in his quadriga (these are the *nummi quadrigati*). There is also a series of struck bronze inscribed ROMA issued from the same mint. The important feature of this period is that bronze is no longer regarded as the most important element in the currency, but is subordinated to silver; the result is that we have what is called the semi-libral reduction, the weight of the as issued from the Roman mint being half the pound. But opinions vary as to whether the pound of which the as represented the half in this period was the old one of 273 grammes or the new Roman pound of 327·45 grammes. As the latter was certainly used for a special series of *aes grave* issued from the Roman mint for the Latins (see below), we may assume that it was also used for the regular Roman coinage. Now since the $\frac{1}{2}$ ℔ as (163·72 grammes) was equated to 1 scruple of silver (1137 grammes), we get a forced relation of silver to copper of 1 : 144. The as being regarded merely as representing so much silver (1 scruple), so long as the state guaranteed the cover, there was no reason why the as, being merely token money, should not fall in weight; and that it does, sinking by the end of this or beginning of the next period to the weight of $\frac{1}{5}$ of the Oscan or $\frac{1}{6}$ (sextans) of the new Roman pound. We may note the occurrence in this series of the *decussis* or 10-as piece. Of the two series of aes grave issued in this period for the benefit of the Latin district, both are heavier than in the preceding period; the new Roman pound of 327·45 grammes is used for a series issued from the mint of Rome; a still higher weight (perhaps of 341 grammes) for a series issued from Capua. The relation between silver and copper involved in this standard is not quite clear. In this period also we have ingots corresponding according to the theory above mentioned, to the various series of aes grave; one, with a pair of chickens feeding and a pair of rostra, refers to the augury taken by the Roman imperator before battle. Two other ingots commemorate historical events; one, with a Samnite bull on each side, the subjugation of Rome's great rival; the other, with an elephant and a pig, the alleged rout of Pyrrhus's elephants by the grunting of swine at Asculum in 278.

After the introduction in 269 B.C. of the silver denarius (piece of 10 asses, marked X, Pl. II. fig. 25) with its half (the quinarius, V) and its quarter (the sestertius, IIS), no changes of obviously great economic importance take place in the coinage until near the close of the republican period. Although it is not true, as is sometimes stated, that the coinage of silver at all local mints in south Italy, except the Bruttian, came to a close with the introduction of the denarius, yet the new Roman coin entirely dominated the currency from the first. Many mints, however, continued to issue bronze coinage down to 89 B.C., and a Roman coinage in various metals is also attributed to certain local mints, such as Croton and Hatria; not to mention the Roman issues which still continued to be made from Capua, though in a less degree than before. At Rome itself the mint was now localized in the temple of Juno Moneta, who probably received her surname from, rather than gave it to, *money*. The denarius, being equivalent to 10 asses, and weighing 4·55 grammes, would at the rate of 1 : 120 (which was now restored) be equivalent to 546 grammes of bronze. The as of the time must therefore have been the one weighing 54·6 grammes, that is $\frac{1}{5}$ of the Oscan pound of 273 grammes, or $\frac{1}{6}$ (sextans) of the Attic-Roman pound of 327·45 grammes. In other words, the legally recognized as of this period was the as of the sextantal reduction. The bronze coins of this reduction are, like the silver, struck, not cast; the process of striking had already been introduced for the lower denominations of bronze in the previous period. About 241 B.C. the weight of the denarius, having sunk under the stress of the first Punic war, was fixed at 3·90 grammes. Possibly the reduction of the as to the weight of an uncia, which Pliny attributes to the time of the Hannibalian crisis, may really have taken place at the same time. In 228 B.C. (some critics prefer to say nearly forty years earlier) a new silver extra-Roman coin, the *victoriatus*, was introduced. It replaced the old Campanian drachm and, wherever it may have been minted, was meant for circulation outside Rome. The quinarius and sestertius at the same time disappeared from the regular coinage, but the sesterce remained the unit of account. Marks of value occur on all the coins from 269 B.C. for some time onward, except on the smallest bronze and the victoriatus. After the reduction of the bronze had been carried far, it became possible to issue large denominations of a circular form; thus circular bronze decusses (equal each to 1 denarius) are known of various periods, weighing from over 1100 to 650 grammes.

Gold was not regularly coined by the Romans until the close of the republic; but certain exceptional issues must be noticed. The earliest (some time during the first Punic War) consisted of pieces of 60 (Pl. II. fig. 26), 40 and 20 sestertii; they were issued both from Rome and from some external mint or mints. To the crisis of the second Punic War may be assigned certain electrum coins of $1\frac{1}{2}$ scruple weight (types: janiform female head, and Jupiter in quadriga). It is to this time that Pliny attributes the fixing of the as at the weight of an uncia, and the valuation of the denarius at 16 instead of 10 asses (although in estimating the pay of soldiers the denarius continued to be given for 10 asses). Finally there is some probability in the attribution to the year 209 of the well-known gold coins of 6 and 3 scruples which have on the obverse a head of the young Janus, and on the reverse two soldiers taking an oath of alliance over the carcass of a pig—in allusion to the loyalty to Rome of her Latin colonies (Livy xxvii. 9, 10).

Without following the fortunes of the various denominations, we may note that in 89 B.C. the lex Papiria suppressed all local mints throughout Italy, ordered the reissue of the silver sestertius, and introduced the semuncial ($\frac{1}{2}$ ounce) standard for bronze. This was just after the close of the Social War, which had been signalized by the issue, on the part of the revolted allies, of an interesting series of coins (denarii and—most treasonable of all—a gold piece) chiefly from Italia, as they called Corfinium. These coins bear in Oscan letters the names of the Italian military leaders, such as C. Papius Mutilus. In 81 B.C. the regular bronze coinage came to an end, and the denarius remained for a long time the only coin issued by the Roman mint. Roman generals sometimes, however, issued exceptional coins in their own names, such as "bronze sesterces."

We have already dealt with the earliest gold money of the republic. Another exceptional issue was the gold coin bearing the name of T. Quinctius Flamininus, the liberator of Hellas (struck between 198 and 190 B.C.); but it was minted in Greece and conformed to Greek standards. The earliest Roman aurei proper (those of Sulla) were also struck outside Rome. They weigh $\frac{1}{30}$ or $\frac{1}{36}$ of a Roman pound. The aurei of Pompeius were $\frac{1}{36}$, those of Julius Caesar $\frac{1}{40}$, of the pound. After Caesar's time the weight of the aureus fell to $\frac{1}{42}$ lb, under Augustus.

Of the administrative side of the Roman system of coinage little is known but what the coins reveal. The earliest indication of monetary magistrates is found in symbols, which occur on the coins before the close of the first Punic War. Then the names begin to appear, at first abbreviated, then at length. Probably the right of coinage was in the beginning vested in the consuls, but it would seem that about the time of the second Punic War it was transferred to a special board of magistrates, the *tresviri aere argento auro flando feriundo*. Whether they were appointed every year, or only when need arose, we do not know; but it is improbable that there was an annual board until the beginning of the 1st century, if then; and even when annually appointed, they cannot all have exercised their right. On the other hand, there were in some years, as 92 B.C., no less than five moneyers; in *c.* 86 B.C. there were four, two being aediles exercising a specially conferred right. Exceptional issues of this kind were often authorized by the senate, and bear inscriptions indicating the fact, such as P.E.S.C. (*Publice ex Senatus consulto*). An issue for the purpose of the Apollinarian games, defrayed out of a special treasury, bears the inscription S.C.D(e) T(hesauro). Julius Caesar added a fourth moneyer to the board. The first issue of gold by such a board took place in 43 B.C.; all previous issues of gold had been made, so far as we know, in virtue of military imperium (in 44 B.C. by the praetors). Augustus, after the troublous period 41–27 was over, returned to the triumviral system; after his reform of 15 B.C. the bronze coinage which he introduced in that year is signed by the triumvirs, although the gold and silver bears no such names. Shortly afterwards, however, he organized the system which will be dealt with under the empire.

The types of the Roman republican coins are of great interest, although their art never rises above mediocrity. The chief types of the period before 269 have already been mentioned. The earliest denarii, quinarii and sestertii bear a head of the goddess Roma, helmeted, and the Dioscuri charging on horseback, as they appeared at Lake Regillus. The victoriatus has a head of Jupiter and a figure of Victory crowning a trophy. The types of the bronze coins are practically the same as in the earlier period. About 190 B.C. the goddess Diana in her chariot begins to appear on the reverses of some of the denarii. Later, other types gradually encroach on the reverses; first, Victory in a chariot; still later such types as the Juno of Lanuvium in a chariot drawn by goats. This and other types which now begin to relieve the monotony of the series usually have a personal allusion to the moneyer, or to his family history. Thus, on a denarius of Sex. Pompeius Fostlus is seen the shepherd Faustulus discovering Romulus and Remus suckled by the she-wolf. Imaginary or more or less authentic portraits of ancestors, such as Numa, L. Junius Brutus or M. Claudius Marcellus, belong to the same category. An elephant's head on a Macedonian shield, on a coin of M. Caecilius Metellus (*c.* 94 B.C.), alludes to victories won by Caecilii at Panormus (in 251, over Punic elephants) and in Macedonia (in 148). The cult of Venus by the Julian family is illustrated by a denarius of L. Julius Caesar (*c.* 90 B.C.) with a head of Mars and a figure of Venus in a car drawn by two Cupids. The surrender of Jugurtha by Bocchus to Sulla is represented on a denarius of Sulla's son Faustus (62 B.C., Pl. II. fig. 27). The type is probably a copy of the design which we know the dictator used for his signet-ring. M. Aemilius Lepidus (TVTOR REGis) crowning Ptolemy Epiphanes, or Paullus Aemilius erecting a trophy, while King Perseus and his two children stand before him, are other historical types. A contemporary event is commemorated on a special issue inscribed AD FRV(mentum) EMV(ndum) EX S(enatus) C(onsulto), coined by L. Calpurnius Piso and Q. Servilius Caepio in 100 B.C. Caepio, quaestor in that year, defeated the proposal of Saturninus to sell corn publicly at a nominal price; but the senate voted a special issue of money to meet the strain of the market. On the obverse is a head of Saturn, from whose treasury the funds for the issue were drawn; on the reverse are Caepio and Piso on their official seat, and two ears of corn. Perhaps the most graphic allusion to a contemporary event to be found on any coin is furnished by the cap of liberty with two daggers and the inscription EID(ibus) MAR(tiis) on coins of Brutus. Representations of a less obviously historical character, as personifications of countries or places (Hispania, Alexandria) or qualities (Honos and Virtus) or mythological figures (Scylla), are all, it would seem, inspired by some personal interest. Many types will only be explained when more light is thrown on the obscure corners of Roman mythology and ritual; but they will all probably be found to have some personal reference to the moneyer. Roman types of the later republic, therefore, though they may be classified externally as "religious," "historical," "canting," &c., are all inspired by some personal motive. The inevitable outcome of this character was that, when once contemporary portraiture was regarded as legitimate on the coins, it speedily became its most important feature. The portrait of Flamininus on his gold coin struck in Greece long remained without a Roman analogy. In 44 B.C., by order of the senate, the head of Julius Caesar was placed on the silver coins (Pl. III. fig. 1; the gold coin bearing his portrait is of doubtful authenticity). After Caesar's death portraits occur on coins issued by men of all shades of political opinion, showing that portraiture on the coins was not then regarded as the monarchical prerogative, which it became from A.D. 6 onwards, when it was limited to members of the imperial family.

Augustus.

The history of the imperial coinage is full of metrological difficulties. These arise from the conditions fixed by Augustus (16–15 B.C.), by which the emperor alone coined gold and silver, the senate alone bronze. Consequently the senate was wholly at the mercy of the emperor. Augustus struck the aureus at 42 to the pound, equal to 25 denarii at 84 to the pound (Pl. III. fig. 3). He introduced a new coinage in two metals, the sestertius of 4 asses and dupondius of 2, both in fine yellow brass (orichalcum), and the as semis and quadrans in common red copper. This distinction of metals, however, was sometimes ignored, as in the time of Nero, when we have sestertius (Pl. III. fig. 2), dupondius and as, all in brass, and of three different sizes. The as is usually nearly equal in size and weight to the dupondius, but is distinguished by its metal and inferior fabric. All this brass and copper coinage bears the letters S.C., *senatus consulto*. Emperors not acknowledged by the senate are without such money; thus we have no specimens of Otho or Pescennius Niger.

Changes under later emperors.

Nero reduced the denarius to $\frac{1}{96}$th of the pound, and alloyed its silver with from 5 to 10% of base metal. Henceforward the quality of the denarius gradually sank, until under Sept. Severus the proportion of alloy was from 50 to 60%. Caracalla also issued lead plated with silver and, among his aurei, copper plated with gold. He also introduced a new coin, called after him the argenteus Antoninianus. It was struck at $\frac{1}{60}$th to $\frac{1}{64}$th of the pound, and seems to have been originally a double denarius struck on a lower standard. The characteristic of this coin is that the head of the emperor is radiate as Sol (Pl. III. fig. 4), that of the empress on a crescent as Luna. Towards the end of Caracalla's reign the weight of the aureus had fallen to $\frac{1}{50}$ lb. Under Elagabalus the taxes were paid in gold alone; this was ruinous, for the treasury paid in debased silver at nominal value, which had to be used to purchase gold by the taxpayer at real value. Under Gordian III. the silver contained 67% of alloy; and eventually under Gallienus the "argenteus" frequently contained no silver whatever. Aurelian (A.D. 270–275) attempted a reform of the coinage by which the previous coin was reduced from its nominal to its intrinsic value. The coins were now of bronze with a wash of silver, and we now find them marked with their value as two denarii. These coins replace at once the base silver and the bronze, which now disappear. The moneying right of the senate had become illusory by the depreciation of silver, which had ceased to have any real value. Aurelian entirely suppressed this right; Tacitus and Florian restored it for a few years, after which the S.C. disappears from the coinage. The reform of Aurelian caused a serious outbreak at Rome, but was maintained by him and by Tacitus. Aurelian also suppressed all local mints but Alexandria. It was the work of Diocletian to restore the issue of relatively pure money in the three metals. He made no less than four unsuccessful attempts to regulate the weight of gold. Not later than 290 he restored a pure silver coinage with a piece of $\frac{1}{96}$ lb. His reformed bronze coins are the *follis*, marked XX, XX·I., K, KA, &c. (all meaning "2 denarii = the unit") and the half-denarius of centenionalis.

Constantine, probably in A.D. 312 (though some critics attribute the reform to Constantius Chlorus) desiring to rectify the gold coinage, which had long been quite irregular in weight, reduced the chief gold piece to $\frac{1}{72}$ of the pound, and issued the solidus (Pl. III. fig. 5), a piece destined to play a great part in commercial history. It was never lowered in weight, though many centuries later it was debased, long after it had become the parent of the gold coinages of Westerns and Easterns alike throughout the civilized world. The letters OB, which are commonly found in the exergue of gold coins from the 4th century onwards mean *Obryzum* (refined gold), and the letters PS, found on silver coins *Pustulatum* (refined silver). Under Constantius II. (A.D. 360) and Julian the silver coin of $\frac{1}{96}$ lb was suppressed, and the siliqua of $\frac{1}{144}$th of the pound (which had already been issued in small quantities before) took its place. From about 360 there was a system of 4 bronze coins (follis, denarius, centenionalis and $\frac{1}{2}$ centenionalis). The last soon disappeared, and under Honorius (395) only the centenionalis remained. Honorius and his successors issued the silver decargyrus (= 10 denarii). The bronze coinage of this time was small and mean. It will be seen that a fuller system of bronze was originated by Anastasius, the Byzantine emperor.

Under Augustus the Roman monetary system became the official standard of the empire, and no local mint could exist without the imperial licence. Thus the Greek imperial money is strictly Roman money coined in the provinces, with the legends and types of the towns. Many cities were allowed to strike bronze, several silver. The kings of the Cimmerian Bosporus enjoyed the exceptional privilege of striking gold, which, however, became rapidly debased. The silver becomes limited about Nero's time, but lasts under the Antonines, and is also found under Caracalla and Macrinus. It is chiefly supplied by the mints of Caesarea in Cappadocia, Antioch and subsidiary mints in Syria, and Alexandria in Egypt. None of these were strictly city-mints, but served the purposes of the provincial government. The bronze increased in mints and quantity in the 2nd century, but, through the debasement of the Roman silver, one city after another ceased to strike about the middle of the 3rd. The provincial mint of Alexandria, however, continued to strike until the end of the century. From the coins of the ordinary Greek and other cities under the empire must be distinguished the issues of the Roman colonies. In the west these practically ceased in Nero's time; in the east they lasted as long as the other Greek coinage. Purely Roman gold and silver was coined in certain of the provinces, in Spain and Gaul, and at the cities of Antioch and Ephesus. When the base silver had driven the Greek imperial bronze out of circulation, Gallienus established local mints which struck pure Roman types. Diocletian increased the number of these mints, which lasted until the fall of the empire of the West, and in the East longer. These mints were (with others added later), Londinium (or Augusta), Camulodunum, Treviri, Lugdunum, Arelate (or Constantina), Ambianum, Tarraco, Carthago, Roma, Ostia, Ravenna, Aquileia, Mediolanum, Siscia, Serdica, Sirmium, Thessalonica, Constantinopolis, Heraclea, Nicomedia, Cyzicus, Antiochia (ultimately Theupolis) and Alexandria. A few were speedily abandoned.

As regards the internal organization of the mints under the empire, we know that, although the names of the *triumviri monetales* do not occur on the coins after 15 B.C., they continued to exist (with the title *IIIviri aere argento auro flando feriundo*, although their competence was restricted to the first metal) until probably the time of Aurelian, who withdrew the right of coinage from the senate. Officials of the imperial treasury superintended the gold and silver coinage; Trajan placed a *procurator monetae Augusti* of equestrian rank at the head of the whole system, subject to the emperor's *rationalis* (the chief official of the treasury). The system of procurators was extended and regularized by Diocletian. In the Roman colonies (which were only allowed to issue bronze) the formula D.D. or EX D.D. (*ex decurionum decreto*) often occurs, corresponding to the S.C. of the Roman mint. At many colonies, especially in the west, the monetary duumviri sign the coins. At Rome the imperial mint itself was situated behind the Colosseum, near the Caelian hill, the senate retaining its mint on the Capitol probably until the time of Trajan. The three monetae (of the three metals) appear together on medallions for the first time under Hadrian, and probably indicate the organization of the mints for the three metals in one place. From the middle of the 3rd century mint-marks begin to occur on the coins, indicating the various mints, the *officinae* in each mint, &c. Sometimes these marks form "secret combinations"; thus the letters I, O and BI found on three different coins of Diocletian (struck at three different officinae), and the letters HP, KOY and AI on three corresponding coins of Maximian, combine into Greek words representing the genitives of the Latin titles *Iovius* and *Herculius* assumed by these two emperors.

Types and inscriptions.

The obverse type of the imperial coins is the portrait of an imperial personage, emperor, empress or Caesar. The type only varies in the treatment of the head or bust—if male, laureate, radiate or bare; if female, sometimes veiled, but usually bare. The reverse types of the pagan period are mythological of divinities, allegorical of personifications, historical of the acts of the emperors. Thus the coins of Hadrian, besides bearing the figures of the chief divinities of Rome, commemorate by allegorical representations of countries or cities the emperor's progresses, and by actual representations his architectural works. Types often occur purely personal to the emperor, such as the sphinx which Augustus used as his signet, or the capricorn, his natal sign. The most remarkable feature of imperial types is the increase of personifications, such as Abundantia, Concordia, Liberalitas, Pudicitia—for the most part drearily conventional. The inscriptions are either simply descriptive, such as the emperor's names and titles in the nominative on the obverse, or partly on the obverse and partly on the reverse, and the name of the subject on the reverse; or else they are dedicatory, the imperial names and titles being given on the obverse in the dative and the name of the type on the reverse. Sometimes the reverse bears a directly dedicatory inscription to the emperor. The inscriptions on the earlier imperial coins from Tiberius to Severus Alexander are generally chronological, usually giving the current or last consulship of the emperor and his tribunitian year. It must be noted that Christian symbols first made their appearance on coins in an unsystematic, almost accidental way. The earliest instance is at the mint of Tarraco in A.D. 314, when a cross occurs as a symbol on the reverse. In A.D. 320 the Christian monogram is found as a detail in the field at several mints. But the types still remain pagan; these symbols are not introduced by order, although the officials who introduced them doubtless knew they could do so with impunity. As times goes on the Christian emblems become more popular; on a coin of Constantius II. we find Victory crowning the emperor, who holds the standard of the cross; the inscription is HOC SIGNO VICTOR ERIS. Another type of the same reign is the Christian monogram flanked by *alpha* and *omega*. Under Julian there is a temporary recrudescence of pagan types; with the revival of Christianity monotony of type sets in.

The art of Roman imperial coins, although far inferior to that of Greek, is well worthy of study in its best ages, for its intrinsic merit, for its illustration of contemporary sculpture, and on account of the influence it exercised on medieval and modern art. On the whole the finest work is produced under Augustus, when the portraits still betray a certain refinement of imagination in the artists. Some of it reflects the beauty of Roman monumental sculpture in relief of the time, whether that sculpture be regarded as the work of Greeks or of purely Roman artists. The most vigorous portraiture is perhaps found under the Flavians. Under the Antonines, although still striking and powerful, the portraits lost in subtlety and from the time of Commodus there is a rapid decline. The age of Diocletian and Constantine shows a well-meant but hopeless attempt at revival of art. In spite of its defects, the fact that many of the greatest medallists of the Renaissance drew their inspiration from the art of imperial coins shows that it had many good qualities, of which the chief was an honest directness of effort. The realism in which this resulted is perhaps best seen in the portraits of Nero, the growth of whose bad passions may be seen in the increasing brutality of his features and expression. The medallion series is full of charming subjects, though when they have been treated by Greek artists of earlier ages the contrast is trying; the most satisfactory are the representations of older statues; the purely new compositions are either poor inventions, or have a theatrical air that removes them from the province of good art.

III. Medieval and Later Coins of Europe

The period of the medieval and later coins of Europe must be considered to begin about the time of the fall of the Western empire, so that its length to the present day is about 1400 years. It is impossible to separate the medieval and later coins, either in the entire class, because the time of change varies, or in each group, since there are usually pieces indicative of transition which display characteristics of both periods. The clearest division of the subject is to place the Byzantine coinage first, then to notice the characteristics of its descendants, and lastly to sketch the monetary history of each country. The coinage of the present day, however, having certain definite characteristics, may be dealt with separately.

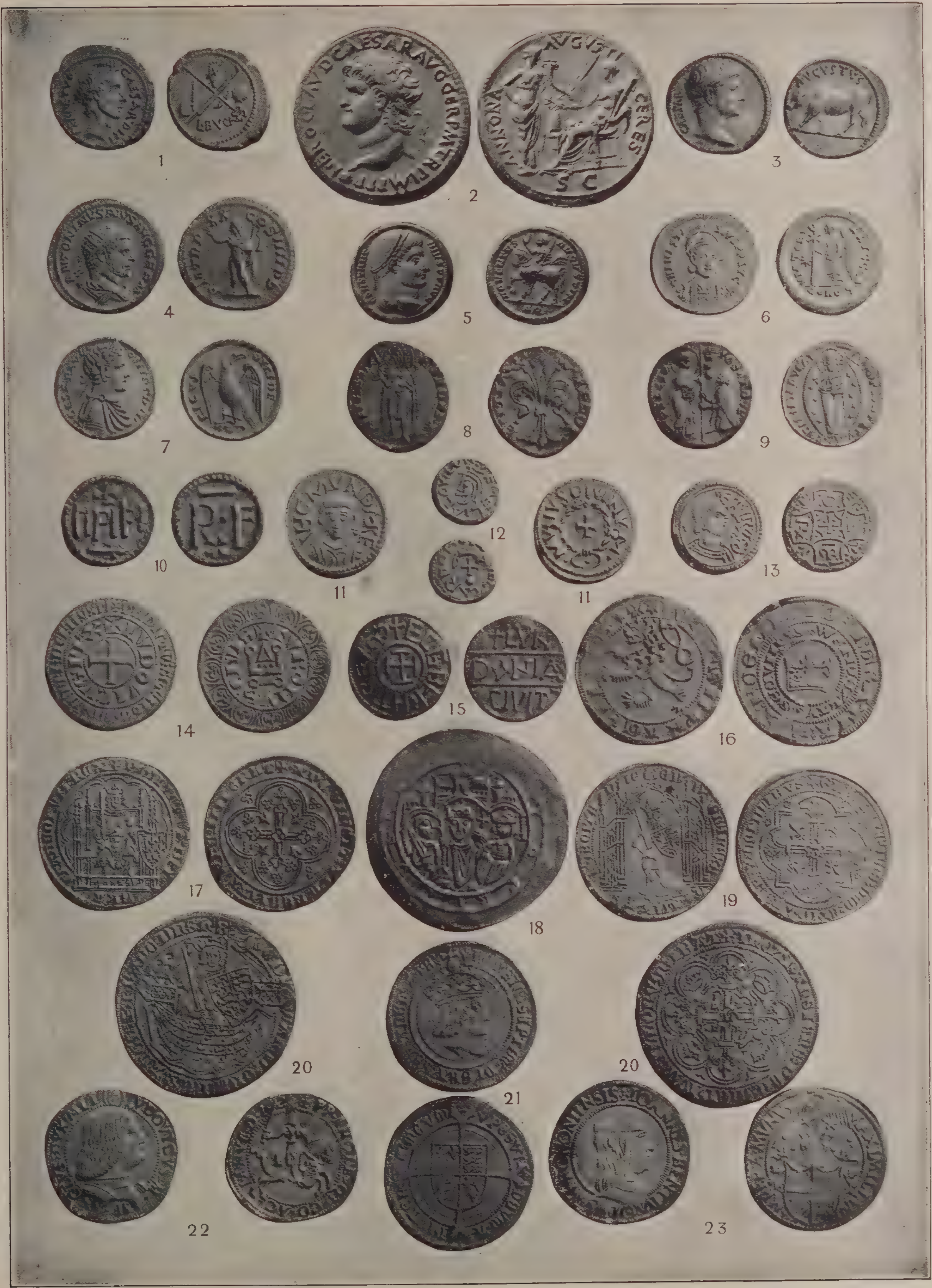
Byzantine empire.

The Byzantine money is usually held to begin in the reign of Anastasius (A.D. 491–518, Pl. III. fig. 6). The coinage is always in the three metals, but the silver money is rare, and was probably struck in small quantities. At first both the gold and the silver are fine, but towards the close of the empire they are much alloyed. The gold coin is the solidus of Constantine, with its half and its third, the so-called semissis and tremissis. The Byzantine solidus (*besant*) had an enormous vogue throughout the middle ages, being the chief gold coin until the introduction of the Italian gold in the 13th century. The chief silver coin was the miliarision, and a smaller coin, the siliqua or keration. Under Heraclius (610–641) the hexagram or double miliarision was first coined. The silver money of the restored Greek empire is obscure. In 498 Anastasius introduced a new copper coinage, bearing on the reverse, at his time, the following indexes of value as the main type: **M, K, I** and **E,** 40 nummi, 20, 10 and 5. These coins bear beneath the indexes the abbreviated name of the place of issue. Justinian I. added the regnal year in A.D. 538, his twelfth year. The money of this class presents extraordinary variations of weight, which indicate the condition of the imperial finances. The Alexandrian coins of this class begin under Anastasius and end with the capture of the city by the Arabs. They have two denominations, **IB** and **S**, and **Γ** or 12, 6 and 3 denarii, and there is an isolated variety of Justinian with **ΛΓ**(33). The Alexandrian bronze never lost its weight, while that of the empire generally fell, and thus some of the pieces of Heraclius, while associated with his sons Heraclius Constantinus and Heraclonas, have the double index **IB** and **M.** Under Basil I. the bronze money appears to have been reformed, but the absence of indexes of value makes the whole later history of the coinage in this metal very difficult. There was one curious change in the aspect of the money. Early in the 11th century the solidus begins to assume a cup-shaped form, and this subsequently became the shape of the whole coinage except the smaller bronze pieces. These novel coins are called nummi scyphati. The types, except when they refer simply to the sovereign, are of a religious and consequently of a Christian character. This feeling increases to the last. Thus, on the obverse of the earlier coins the emperors are represented alone, but from about the 10th century they are generally portrayed as aided or supported by some sacred personage or saint. On the reverses of the oldest coins we have such types as a Victory holding a cross (other personifications all but disappear), but on those of later ones a representation of Our Saviour or of the Virgin Mary. Christ first appears on a coin of about A.D. 450, where He is represented marrying Pulcheria to Marcian. He does not appear again until the end of the 7th century, when His bust is introduced by Justinian II. It was perhaps this type, so offensive to Mahommedan feeling, that caused the Caliph Abdalmalik to initiate the Mussulman coinage. From the 9th century Christ appears in various forms on the coins; about 900 we find the Virgin; a few years later saints begin to appear. A remarkable type was introduced by Michael VIII., Palaeologus, who recovered Constantinople from the Latins in 1261, and issued coins with the Virgin standing in the midst of the walls of the city. The principal inscriptions for a long period almost invariably relate to the sovereign, and express his name and titles. The secondary inscriptions of the earlier coins indicate the town at which the piece was struck, and, in the case of the larger bronze pieces, the year of the emperor's reign is also given. From about the 10th century there are generally two principal inscriptions, the one relating to the emperor and the other to the sacred figure of the reverse, in the form of a prayer. The secondary inscriptions at the same time are descriptive, and are merely abbreviations of the names or titles of the sacred personages near the representations of whom they are placed. From the time of Alexius I. (Comnenus) the principal inscriptions are almost disused, and descriptive ones alone given. These are nearly always abbreviations, like the secondary ones of the earlier period. The language of the inscriptions was at first Latin with a partial use of Greek; about the time of Heraclius Greek began to take its place on a rude class of coins, probably local; by the 9th century Greek inscriptions occur in the regular coinage; and at the time of Alexius I. Latin wholly disappears. The Greek inscriptions are remarkable for their orthography, which indicates the changes of the language. In the 11th century we notice a few metrical inscriptions, the forerunners of verse-mottoes on later coins. Of the art of these coins little need be said. It has its importance in illustrating contemporary ecclesiastical art, but is generally inferior to it both in design and in execution. It is noticeable that from the beginning of the Byzantine period the facing representation of the bust begins to be popular, and that from the time of Justinian (6th century) onwards the profile practically disappears from the coinage. The last Byzantine gold coin (a piece of John V., 1341–1391) shows a figure of John the Baptist imitated from the Florentine coinage.

Cognate groups.

Besides the regular series of the Byzantine empire, in which we include the money assigned to the Latin emperors of Constantinople, there are several cognate groups connected with it, either because of their similarity, or because the sovereigns were of the imperial houses. There are the coinages of the barbarians to be next noticed, and the money of the emperors of Nicaea, of Thessalonica and of Trebizond. The last group consists of small silver pieces, which were prized for their purity; they were called Comnenian white-money (ἄσπρα Κομνήνατα), the princes of Trebizond having sprung from the illustrious family of the Comneni.

The coinage of the other states of the West falls into well-defined periods, which have been distinguished as (1) transitional period, from Roman to true medieval coinage; from the fall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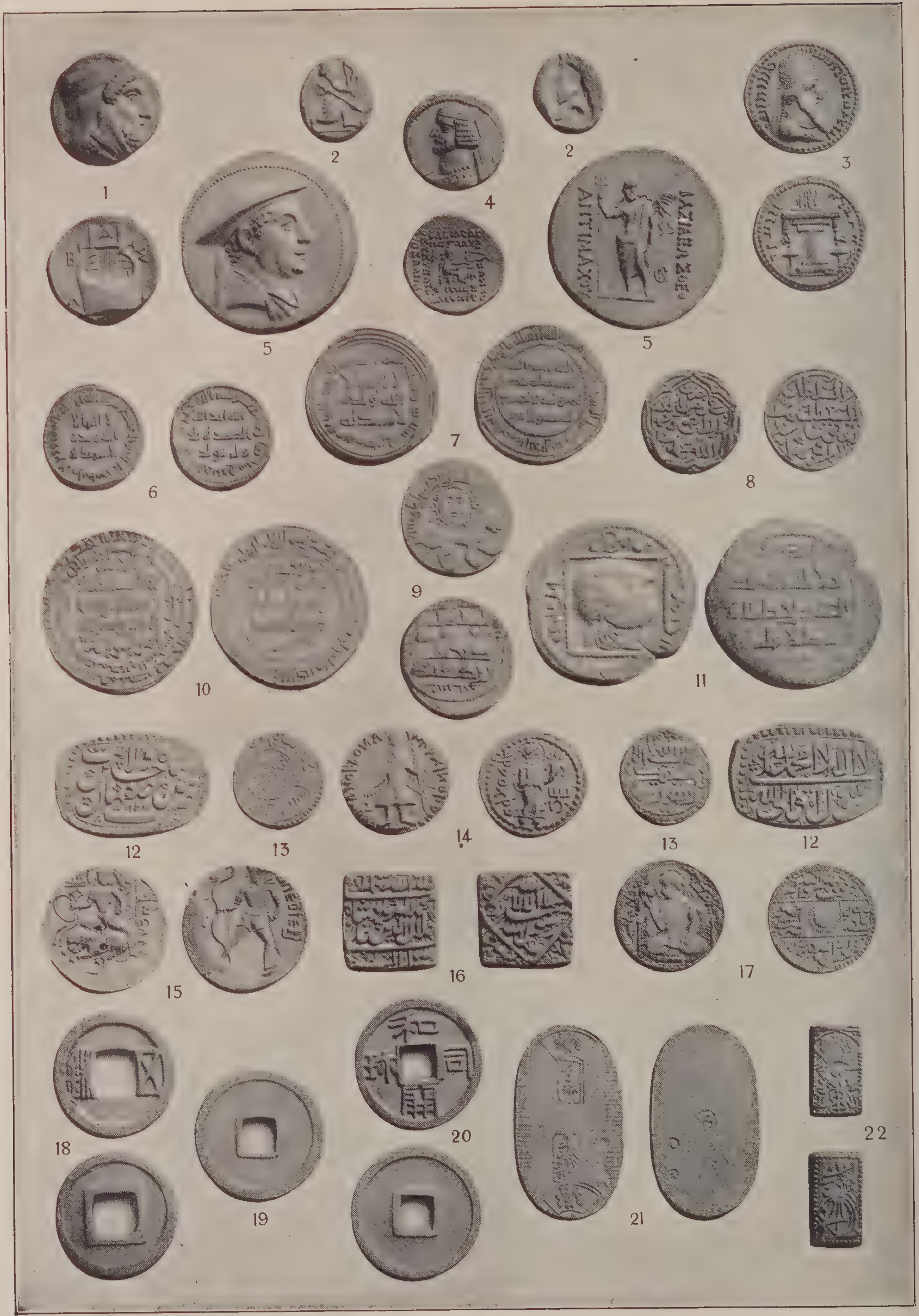
ROMAN AND MEDIEVAL COINS.

PLATE IV.

NUMISMATICS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ORIENTAL COINS.

Periods of other European coinage.

of Rome (476) to the accession of Charlemagne (768); (2) true medieval age, during which the Carolingian money was the currency of western Europe, from Charlemagne to the fall of the Swabian house (1268); (3) early Renaissance, from the striking of the florin in Florence (1252) to the classical Renaissance (1450); (4) the classical Renaissance, from 1450 to 1600; (5) the modern period.

1. The various coinages of the transitional period will best be considered together (see below).

Medieval.

2. The inconvenience of gold money when it represents a very large value in the necessaries of life must have caused its abandonment and the substitution of silver by the Carlovingians. The denier (denarius) or penny of about 24 grains was at first practically the sole coin. The solidus in gold was struck but very rarely, perhaps as a kind of proof of the right of coining. The Byzantine solidus or bezant was used and probably the equivalent Arab gold. The Arab silver piece, the *dirhem*, was almost exactly the double of the denier, and seems to have been widely current in the north. The new coinage spread from France, where it was first royal and then royal and feudal, to Germany, Italy, where the Byzantine types did not wholly disappear, England, Scandinavia, Castile and Aragon. In Germany and France feudal money was soon issued, and in Italy towns and ecclesiastical foundations largely acquired from the empire the right of coinage, which was elsewhere rare. The consequence of the extended right of coinage was a depreciation in weight, and in the middle of the 12th century the one-sided pennies called bracteates appeared in Germany, which were so thin that they could only be stamped on one side. The types of this whole second coinage are new, except when the bust of the emperor is engraved. The most usual are the cross; and the church as a temple also appears, ultimately taking the form of a Gothic building. There are also sacred figures, and more rarely heads in the later age.

Of early Renaissance.

3. The true herald of the Renaissance was the emperor Frederick II. In restoring the gold coinage, however, he followed in the steps of the Norman dukes of Apulia. With a large Arab population, these princes had found it convenient to continue the Oriental gold money of the country, part of the great currency at that time of all the western Moslems, and Roger II. (1130–1154) also struck Latin coins of his own as DVX APVLIAE, the first ducats. Frederick II. (1215–1250), continuing the Arab coinage, also struck his own Roman gold money, solidi and half solidi, with his bust as emperor of the Romans, Caesar Augustus, and on the reverse the imperial eagle (Pl. III. fig. 7). In workmanship these were the finest coins produced in the middle ages. But the calamities which overwhelmed the Swabian house and threw back the Renaissance deprived this effort of any weight, and it was left to the great republics to carry out the idea of a worthy coinage—a necessity of their large commercial schemes. The famous gold florin was first issued in 1252 (Pl. III. fig. 8). The obverse type is the standing figure of St John the Baptist, the reverse bears the lily of Florence. The weight was about 54 grains, but the breadth of the coin and the beauty of the work gave it dignity. The commercial greatness of Florence and the purity of the florin caused the issue of similar coins in almost all parts of Europe. Venice was not long in striking (in 1284) a gold coin of the same weight as the florin, but with the types of a standing figure of Christ, and the doge receiving the gonfalon at the hands of St Mark (see Pl. III. fig. 9). It was first called the ducat, the name it always bears in its inscription; later it is known as the zecchino or sequin. Though not so largely imitated as the florin, the extreme purity of the sequin was unquestioned to a time within the memory of living persons. Genoa likewise had a great gold currency, and the other Italian states struck in this metal. It is significant of the power of the Italian republics that the later Mameluke sultans of Egypt found it convenient or necessary for their position between Europe and India to adopt the weight of the florin and sequin for their gold money. Many varieties of gold money appear in course of time in France, England and to a less extent in other countries. The need for a heavier silver coinage caused the issue of the large denier (grossus denarius, gros or groat). This coin appears early in the 14th century. The types from the 14th century onwards are very various and distinctly worthy of the art of the time, which as yet is purely decorative and conventional, so that portraits are not possible. The religious intention also is gradually giving way to the desire to produce a beautiful result, and the symbol of the cross is varied to suit the decorative needs of the coin. Heraldic subjects also appear, and in the shield, which is frequently a reverse type, we see the origin of the usual modern reverse of the most important coins.

Of classical Renaissance, and modern.

4, 5. With the classical Renaissance we find ourselves in the presence of modern ideas. The elaborate systems of coinage of the various states of Europe are soon to begin, and the prevalence of a general currency to become for the time impossible. Silver money now gains new importance with the issue of the thaler or dollar in Germany, in 1518. This great coin speedily became the chief European piece in its metal, but as it was coined of various weights and varying purity it failed to acquire the general character of the denier. The style of this age is at first excellent. The medals gave the tone to the coinage. Art had wholly thrown off the rules of the age before and attained the faculty of portraiture and the power of simply representing objects of nature and art. Great masters now executed medals and even coins, but speedily this work became a mere matter of commerce, and by the beginning of the modern period it was fast falling into the poverty and barbarism in which it has ever since remained. The details of the numismatics of these two periods belong to the notices of the money of the several countries.

Money of account.

A word must be added on money of account. While the denier was the chief and practically the sole coin, the solidus passed from use as a foreign piece into a money of account. The solidus, like the German schilling (shilling), contained usually 12 deniers. As there were 20 shillings to the pound of silver, we obtain the reckoning by £ s. d., librae, solidi and denarii. The pound as a weight contained 12 oz., and its two-thirds was the German mark of 8 oz.

Art.

It would be interesting, did space permit, to notice fully the art of this entire class, to examine its growth, and to trace its decline; but, as with that of Greek and Roman coins, we must mainly limit ourselves to the best period. This is a space of about a hundred and fifty years, the age of the classical Renaissance, from the middle of the 15th century to the close of the 16th. The finest works are limited to the first half-century of this period, from a little before 1450 to about 1500, in Italy, and for as long a time, beginning and ending somewhat later, in Germany. The artists were then greater than afterwards, and medal-making had not degenerated into a trade; but with the larger production of the period following the work was more mechanical, and so fell into the hands of inferior men. The medals of this first period may not unworthily be placed by the side of its sculpture and its painting. Not only have some of its medallists taken honourable places in a list where there was no room for ignoble names, but to design medals was not thought an unworthy occupation for the most famous artists. There are, as we should expect, two principal schools, the Italian and the German. The former attained a higher excellence, as possessing not merely a nobler style but one especially adapted to coins or medals. The object which the artists strove to attain was to present a portrait or to commemorate an action in the best manner possible, without losing sight of the fitness of the designs to the form and use of the piece on which they were to be placed. For the successful attainment of this purpose the style of the later pre-Raphaelites was eminently suited. Its general love of truth, symmetrical grouping, simple drapery and severely faithful portraiture were qualities especially fitted to produce a fine portrait and a good medal. It is to be noted that their idea of portraiture did not depend on such a feeling for beauty as influenced the Greeks. Rather did it set before it the moral or intellectual attainments and capabilities, what the Italians called the *virtù*, of the subject. The German art, as seen in the medals, is mostly the work of carvers in wood or honestone, or goldsmiths. It excels in vigorous, realistic portraiture, and in decorative treatment of heraldic subjects, but is lacking in breadth of style and in the imagination shown by the best Italian medallists. Both these schools, but especially the Italian, afford the best foundation for a truly excellent modern medallic art. The finest coins and medals of Italy and Germany have an object similar to that which it is sought to fulfil in the English, and their nearness in time makes many details entirely appropriate. Thus, without blindly imitating them, modern artists may derive from them the greatest aid.

There are some delicately beautiful Italian medals of the 16th century, too closely imitated from the Roman style. A vigorous realistic school, the only great one of modern times, arose in France before the close of the 16th century and lasted into the next. It was rendered illustrious by Dupré and the inferior but still powerful Warin. From this age until the time of Napoleon there is nothing worthy of note. The style of his medallists is the weak classical manner then in vogue, but yet is superior to what went before and what has followed.

It is not intended here to enter in any detail into the various divisions of the subject already treated in its main outlines. The questions that would require consideration are of too complicated and technical a nature to be illustrated within reasonable limits; the principal matters of inquiry may, however, be indicated.

Transitional coinages.

We begin with a survey of the transitional coinages in the various countries of the West. They cover the period from the 5th to the 8th centuries, and are of immense historical significance. The types throughout are monotonous: the bust of a Roman emperor or local ruler, a cross of some kind, a Victory, &c. The style is quite barbarous. The classification of the earliest servile imitations of Roman and Byzantine money rests solely upon provenance and is uncertain. The following general series are distinguished: (A) The *Vandals* (in Africa, 428–534) issued gold (?), silver and bronze from Hunneric (477–484) to Gelamir (530–534); the gold is anonymous. (B) The *Suevians* (Spain, 409–585) had little but imitations of

Byzantine gold; but Richiar (448–456) issued a denarius in his own name. (C) The *Ostrogoths* (Italy, 489–553) were preceded by the Herulian Odoacer (476–494), who coined silver and bronze; their kings (including Theodoric, 493–526, and Totila or Baduila, 541–552) issued gold, silver and bronze in their own names, from Rome, Ravenna, Milan, &c. (D) The *Lombards* (Italy, 568–774) had no coins in their own names before Grimoald, duke of Beneventum (662–671); later there are gold solidi and thirds and silver from many mints. Gold was issued for the duchy of Beneventum in the 8th century. (E) The *Burgundians* (Gaul, to 534) first issued recognizable coins under Gondebald (473–516). (F) The *Visigoths* (South Gaul and Spain) had imitative gold thirds in the 5th and 6th centuries; the kings' names appear from Leovigild (573–586) to Roderic (710–711). Sixty-one mints were in operation. (G) The *Meroving Franks* first issued under Clovis I. (481–511) coins recognizably Frankish (solidi and thirds). Royal names first appear on silver and copper under Theuderic of Austrasia (511–534) and Childebert I. of Paris (511–558). The chief Frankish inscribed coinage is, however, of gold solidi and thirds, from Theodebert I. (534–548), who broke down the Roman imperial prerogative and issued *gold with his own name in full*, to the beginning of the 8th century. The last Merovings issued no coins in their own names, being mere puppets. And from the middle of the 6th century the coins with kings' names are far less numerous than those bearing the names only of mints and moneyers; some 800 places (not only in what is now France, but in Germany, the Low Countries and Switzerland) are thus named (Pl. III. fig. 12). This coinage seems to have been intimately connected with the fiscal organization, though the generally accepted theory that the taxes collected in each place were there and then converted into money is by no means proved. Certain religious establishments also possessed the right of coining in their own name. The close of the Meroving dynasty saw a revival of silver in the *saiga*, which heralded the introduction of the denier. (H) The Anglo-Saxons began with an imitative coinage similar to the Merovingian, viz. gold, *solidi* and *thirds*, and silver *sceattas* (=treasure, Ger. *Schatz*) of about 20 grains troy, and *stycas* (=pieces, Ger. *Stück*), first of silver, then of copper. The gold is rare and confined to the south; only two *solidi* are known, imitations of Honorius, with runic legends on the reverse. The types of the gold *thirds*, as of the coinage in other metals (which does not begin until the 7th century), are derived more or less directly from Roman. Some of the inscribed sceattas bear the name of London in Roman letters; others, in runes, the names of Epa and Peada (who is perhaps the son of Penda), king of Mercia (d. 655). Sceattas with runic inscriptions were also issued in East Anglia towards the end of the 8th century. But the sceatta was superseded by the penny introduced by Offa (757–796). Offa also struck a gold coin, bearing his name and an inscription copied directly from an almost contemporary Arab coin; but this is quite an exceptional issue, represented now by a unique specimen. The styca, which begins *c.* 670, was characteristic of the Northumbrian coinage, lasting, long after the introduction of the penny farther south, down to the Danish invasions of the second half of the 9th century. A series was issued by the archbishops of York. Wigmund (837–854) struck a gold solidus inscribed MVNVS DIVINVM, copied from the solidi of Louis le Debonnaire, and evidently meant for a religious purpose (Pl. III. fig. 11). For the whole question of Anglo-Saxon coins see BRITAIN: *Anglo-Saxon.* (I) The Frisians had a small coinage of gold thirds (imitated from Byzantine), and one with the name of Audulfus also exists (end of the 6th century?). The chief mint was probably Doccum.

Portugal.

We now proceed to the consideration of the coinages of the various countries from the 8th century to modern times. The money of Portugal begins, after the expulsion of the Moors, with Alphonso I. (1112); it is exclusively regal, and not of great interest except as affording indications of the wealth and commercial activity of the state in the early part of the 18th century. The coinage of Spain, after the reconquest from the Moors, is almost without exception regal. The kingdom of Navarre had a coinage from the time of Sancho III. (1000–1035). The series of Castile and Leon begins with Alphonso VI. (1053) with deniers and obols. Aragon first has coins under Sancho Ramirez I. (1063). Gold (imitated from Moorish money) is introduced in the middle of the 12th century. A plentiful coinage was issued after the union of the crowns in 1479. The Spanish dollar of the 17th and 18th centuries was one of the most widely circulating currencies in the West (see Pl. V. fig. 5). The medals of Spain are not important.

Spain.

France.

In 755 Pippin abolished the gold coinage of his Merovingian predecessors and introduced the silver denier (see Pl. III. fig. 10); the coinage became a royal prerogative once more, and was confined to a few mints. The denier, which at first weighed *c.* 1·28 gramme (19¾ grains), was for centuries the most important of European silver coins. Under Charlemagne the weight was slightly raised; the Caroline monogram appears, and there are other modifications in the types. Charlemagne also issued money from various Italian, German and Spanish mints. He also introduced the obol, and struck gold (chiefly at Italian mints). Among his types must be noted the temple with the inscription XPISTIANA RELIGIO. Louis le Debonnaire (814–840) was the last Carolingian to strike gold. In the 9th century are perceptible the first traces of the movement which led to the extensive feudal coinage. The advent of the house of Capet made no great change in the system, but the feudal issues now become important. The most widespread denier was that of the abbey of St Martin at Tours (*denier tournois*); the royal coinage was known as the *monnaie parisis*. St Louis (1226–1270) effected a great reform late in his reign, making the sou (hitherto a money of account) into a real coin as the *gros* (see Pl. III. fig. 14), and introducing a gold coinage. Henceforward the coinage increases in complexity; in the 14th century it has great artistic merit (see Pl. III. fig. 17). The French medals are far more interesting than the modern coins. The earliest of artistic importance not by Italian artists show nevertheless strong Italian influence (medals of Charles VIII. and Anne of Brittany, of Philibert of Savoy and Margaret of Austria). A series of large medallions of the Valois is attributed to Germain Pilon. The most characteristically French artists are Guillaume Dupré (working 1595–1643) and Jean and Claude Warin (middle and second half of 17th century). The long historical series of Louis XIV. has no artistic value; but that of the Napoleonic period shows great technical ability on the part of artists like Andrieu, in spite of the false classicalism of their designs.

England.

The silver penny was introduced into England by Offa, king of Mercia (757–796), following the lead of Pippin in France (see Pl. III. fig. 13). It soon rose in weight to about 22 grains troy (1·42 gramme), at which it long remained. The types were usually, *obverse* the king's head, or some form of cross or religious symbol; *reverse* some form of cross, religious symbol or ornament. The inscriptions gave the names of the king and of the moneyer, later also the mint. An important gold coin of Offa was imitated from an Arab *dinar* of 774, with the addition of the words OFFA REX. The Mercian coinage ends about 874. The pennies of the kings of Kent extend from 765 to 825; the archbishops of Canterbury went on striking to the beginning of the 10th century. The East Anglian regal series extends to 890; the memorial coinage of St Edmund circulated largely in East Anglia in the 9th century. The penny appears in Northumbria with the Dane Halfdan (875–877) and continues to the middle of the next century. A coinage of "St Peter" pennies was issued from York *c.* 920–940. The coinage of Wessex begins with Ecgbert, probably *c.* 825, when he got possession of the mint at Canterbury (see Pl. III. fig. 15 with the name of London). The coinage marks the gradual growth of Wessex, until England is united under Edgar (957–975). There is henceforward for a long time no change of great importance in the coinage, which continued to consist of pennies, with rare halfpennies (the pennies were usually cut into halves and quarters along the lines of the cross to make small change). During the reign of Stephen the monotony is relieved by a few issues by barons like Robert, earl of Gloucester. The number of mints is much reduced by the time of Henry III., and the moneyers cease to sign the coins in Edward I.'s reign. Henry III. made an abortive attempt to introduce a gold coinage, which was successfully established by Edward III. in 1343, with the gold florin, and in 1344 with the gold noble (see Pl. III. fig. 20). (The obverse type of the noble, the king in a ship, is generally thought to refer to the victory of Sluys in 1340.) He also introduced the silver groat (4d.) and half-groat. The English coinage, both gold and silver, was now of such high quality and reputation that it (especially the silver sterling) was largely exported and imitated, chiefly in the Low Countries. The gold coinage of Edward III. is perhaps the most successful, from an artistic point of view, in the English series. Subsequent developments of the coinage now become very complicated. Edward IV. distinguished his noble by a rose on the obverse and a sun on the reverse, and introduced a new gold coin, the angel. The Tudor period is distinguished by the splendour, variety and size of the coins; Henry VII. introduced the sovereign of 20s. (240 grains) and the shilling, and on his coins the first serious attempt at portraiture is found (see Pl. III. fig. 21). Under Henry VIII. the quality of the silver money declines, being not effectually restored until the reign of Elizabeth, when an unsuccessful attempt was made to introduce a copper coinage. Private tokens came into use, but the official copper coinage does not begin until the next reign. The use of the mill, as distinct from the hammer, was begun in 1562, but it took just a century to oust the old-fashioned method. In 1613 John, Lord Harrington, obtained a patent for the issue of copper farthings, and private tradesmen's tokens were prohibited. The gold sovereign of James I., from its inscription (FACIAM EOS IN GENTEM VNAM) and the fact that it was meant to circulate on both sides of the Border, was known as the unite. The coinage of Charles I. presents great varieties owing to the civil war. The best workmanship is seen on the milled coins issued by Nicolas Briot. But the majority of the money was still hammered. The scarcity of gold in the royal treasury during the troubles induced the king to coin twenty- and ten-shilling pieces of silver, in addition to the crowns and smaller denominations. Gold three-pound pieces, or triple-unites, however, were issued from the Oxford mint. One of the most remarkable of his pieces is a crown struck at Oxford by Rawlins. It bears on the obverse the king on horseback, with a representation of the town beneath the horse, and on the reverse the heads of the "Oxford Declaration." The so-called "Juxon medal," given by Charles to Bishop Juxon on the scaffold, is really a pattern-piece by Rawlins (see Pl. V. fig. 1). Of equal interest are the siege-pieces of many castles famous in the annals of those days. They are mostly of silver, often mere pieces of plate with a stamp; but Colchester and Pontefract issued gold. The coinage of the Commonwealth is of a plainness proper to the principles of those who sanctioned it. The great Protector, however, caused money to be designed of his own bearing his head. It is not certain that this was ever sent forth, and it is therefore put in the class of patterns. Simon, the chief of English medallists, designed the coins, which are unequalled in the whole series for the vigour of the portrait (a worthy presentment of the head of Cromwell) and the beauty and fitness of every portion of the work. The finest coin produced under Charles II., and technically the best executed piece in the whole English series, is the "Petition Crown" (see Pl. V. fig. 2), a pattern by Simon, to which, however—probably for political reasons—the work of Jan Roettier was preferred. Maundy money was first struck in this reign, and the name guinea was now applied to the 20s. piece. In 1672 a true copper coinage of halfpence and farthings was introduced. Henceforward there is a decline in the coinage, although skill is perceived in the portrait of William III., whose grand features could scarcely have failed to stimulate an artist to more than a common effort. Queen Anne's money is also worthy of note, on account of the attempt, on Dean Swift's suggestion, to commemorate current history on the copper coinage, which led to the issue of the famous farthings (see Pl. V. fig. 4). These have been the cause of an extraordinary delusion, to the effect that a very small number (some say three) of these pieces were struck, and that their value is a thousand pounds each, instead of usually some shillings. Worthless casts of genuine farthings, and counters made in imitation of the sixpence of the time, are constantly mistaken for such farthings. After this there is little to remark, except the baseness of the art of the coins under the first three Georges, until the talent of Pistrucci gave a worthier form to the currency. Between 1760 and 1816 hardly any silver or copper money was issued. The gap was filled by the use of Spanish dollars counterstamped, and silver tokens issued by the Banks of England and Ireland, as well as by vast quantities of tokens issued by private persons. In 1816 the new coinage of gold and silver was issued, since when there have been few changes in the British currency.

English Medals.

The English medals are far more interesting for their bearing on events than as works of art. The best are almost all by foreigners, but the fine pieces of the Simons form notable exceptions. The medals of the Tudors are good in style, and show some excellent portraits, in particular those by Trezzo and Stephen H. (generally known as Stephen of Holland). There is one of Mary queen of Scots by Primavera, representing her in middle life, which is perhaps her most characteristic portrait. Elizabeth's are of historical importance, and some of them, as the Armada medals (see Pl. V. fig. 7), have a certain barbaric grandeur, being probably the work of English artists. The richer series of the Stuart period contains some medals of fine style. These include works by Warin, the Simons and the Roettiers, besides the excellent coin engravers Briot and Rawlins. The numerous badges worn by adherents of various parties during the civil war and Commonwealth have a personal and historical interest. The most curious pieces are those popular issues relating to current events, such as the so-called "Popish plot," and a certain interest attaches to medals of the exiled Stuarts. From this time there are no works deserving notice except military and naval medals, the historical interest of which makes some amends for their poverty of design and execution. The English tokens form a curious class. They are of two periods: the earlier, which are almost always of copper, were issued chiefly at the middle of the 17th century and somewhat later; the later, which are mainly of copper, but also sometimes of silver, were struck during the scarcity of the royal coinage in this metal at the end of the 18th century, and during the earlier years of the 19th century. Both were chiefly coined by tradesmen and bear their names. The colonial money of England was until lately unimportant, but now (except in style) it is not unworthy of the wealth and activity of the dependencies. The "Anglo-Gallic" money struck by the English kings for their French dominions forms a peculiar class. It was begun by Henry II., who struck deniers and half-deniers for Aquitaine. Richard I. (whose name is not found on his English coinage) struck for most of the French domains, but no coins are attributed to John or Henry III. Edward I.'s coins are of billon; of Edward II. there are none. Gold was introduced before 1337, and there are fine series of gold, silver, and billon of Edward III. (see Pl. III. fig. 19) and the Black Prince. Henry, earl of Lancaster, struck silver at Bergerac (1345–1361). The succeeding kings down to Henry VI. (first reign) all issued Anglo-Gallic coins. There was a temporary revival under Henry VIII. at Tournay (1513–1519). The whole series, with the exception of the Calais coinage, is French in character.

Scotland.

The coinage of Scotland is allied to that of England, although generally ruder; but it seems to have been more influenced in the early period from England, and towards its close from France. The oldest pieces are silver pennies or sterlings, resembling the contemporary English money of the reign of David I. (1124–1153). David II. after 1357 introduced a gold coinage. In the 15th and 16th centuries there is an important coinage, both in gold and silver, not the least interesting pieces being the fine bonnet-piece of James V., and the various issues of Queen Mary, many of which bear her portrait. The indifferent execution of the coins of Mary's reign is traceable to the disturbed state of the kingdom. The Scottish coinage came to an end in 1709.

Wales.

Wales has never had a coinage of its own, properly speaking. A unique penny attributed with good reason to Howel the Good, a contemporary of Edmund (died *c.* 950), was perhaps struck at Chester. Various English kings struck coins at Welsh mints such as Rhuddlan, Pembroke.

Ireland.

The money of Ireland is more scanty and of less importance than that of Scotland. The pieces most worthy of notice are the silver pennies of the early Danish kings, the earliest being that of Sihtric III. (989–1029), copied from contemporary English pennies. The Anglo-Irish coinage begins in 1177, when John as lord of Ireland received the right of coinage. A copper coinage was introduced as early as the reign of Henry VI. The quality of the Irish coinage was exceedingly poor in the 16th century, especially under Elizabeth. Between 1642 and 1647 various kinds of money of necessity were issued, including the only gold Irish coin, the Inchiquin pistole. After his expulsion from England James II. issued enormous quantities of coins of necessity made of gunmetal or pewter. The latest Irish coins were the penny and halfpenny of 1822.

Isle of Man.

The Isle of Man had a regular copper coinage, beginning in 1709 with pence and halfpence under the Derby family, continued by James, duke of Athol (issue of 1758), and by the English sovereigns from 1786 to 1864. The badge of the island is the three-legged symbol, with the motto *Quocunque jeceris stabit.*

Belgium and Holland.

Belgium occupies the next place in our arrangement. Its coinage, which, except for the few mints operating under the Merovingians and Carolingians, does not begin until the 11th century, comprises many pieces struck by foreign rulers, and has little of an independent character in either the regal or the seignorial class. The most important coinages are those of the house of Burgundy and Charles V. and his son, and of the bishops of Liége. In character the coinage of Belgium approximates to the French on the one side, the German on the other. About 1400 the Burgundian school produced a remarkable series of medals representing Roman emperors, of which two (those of Constantine and Heraclius) have come down to us; these form a link between the late Roman medallion and the Italian medal of the Renaissance. The series of Holland is similar in character until the period of the revolt of the provinces. The Dutch dollars of the 16th to the 18th centuries had an immense circulation (see Pl. V. fig. 3). Among the early Dutch medallists must be mentioned Stephen H., generally without reason known as Stephen of Holland (working 1558–1572), whose portraits show great charm. The Dutch historical medals are of great interest, more especially those which were struck by the Protestants in commemoration of current events. There is also a remarkable series of bronze medallets or jettons, which form a continuous commentary on history during the 16th and early part of the 17th centuries. Both are interesting as largely illustrating not only local events but also those of the chief European states. Such are the pieces recording the raising of the siege of Leiden, likened to the destruction of Sennacherib's army, the assassination of William the Silent, and the discomfiture of the Armada, affording striking indications of the zeal, the piety and the confidence in the right which built up the great political structure of the Dutch republic. After this time the medals lose much of their interest.

Switzerland.

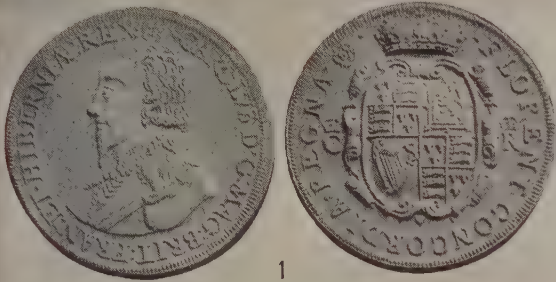
The money of Switzerland illustrates the varying fortunes of this central state, and the gradual growth of the stronghold of European freedom. First we have the gold money of the Frankish kings, among whose mints Basel, Lausanne, St Maurice-en-Valais and Sitten (Sion) already appear. The silver deniers, which Charlemagne made the coinage of the empire, are issued by fewer mints; the dukes of Swabia began to strike at Zurich in the 10th century, and the empire granted during the 10th and to the 13th century the right of coinage to various ecclesiastical foundations, bishoprics and abbeys. Bern was allowed a mint by the emperor Frederick II. in 1218, and other towns and seigneurs subsequently gained the same right. The demi-bracteate appears about the middle of the 11th century, and about 1125 is superseded by the true bracteate, which lasts until about 1300. The 14th century witnessed the rise of the Swiss confederation, and by degrees the cantons struck their own money. These, together with the coins of some few sees and abbacies, form the bulk of Swiss money of the medieval and modern periods. The separate cantonal coinage, interrupted by the French occupation, was finally suppressed in 1848, when a uniform currency was adopted by the whole republic. The monetary systems of the cantonal and ecclesiastical mints were extremely complicated. This was partly due to the variety of coins, partly to the debasement practised by the ecclesiastical mints. Geneva had a peculiar system of her own.

Modern Italy and Sicily.

Italy, with Sicily, has peculiar features. Here the barbaric coinages were mixed with the Byzantine issues which marked the recovery of the Eastern empire, and left a lasting influence in the north at Venice, and in the south at Beneventum. Later the Arab conquest left its mark in the curious Oriental coinages of the Normans of Sicily and the emperor Frederick II., mixed after his fashion with Latin coinage. The earliest money is that of the barbarians, Ostrogoths and Lombards, and local Byzantine issues in Sicily. This is followed by the deniers of Charlemagne and his successors, supplanted by the gold currencies of the Normans and Frederick II. The age of the free cities is marked by the great coinages of Florence, Venice and Genoa, while the Angevin and Aragonese princes coined in the south, and the popes began to issue a regular currency of their own at Rome. The Italian princes of the next period coined in Savoy, and at Florence, Modena, Mantua and other cities, while Rome and the foreign rulers of the south continued their mintages, Venice and Genoa of the republics alone surviving. The Italian monetary systems have already been touched on in the introductory notice. For art the series is invaluable. First in Italy the revival influenced the coins, and in them every step of advance found its record. The Italian medals are without rivals in the works of modern times.

Following the geographical order which is best suited to the Italian coinage, we first notice the money of Savoy, which is inferior in art to that of the rest of the country. It begins with Umberto II. (1080); in 1720 the dukes became kings of Sardinia, and their coinage merged eventually in 1861 in that of the kingdom of Italy. Genoa is the first of the great republics. She obtained the right of coinage from Conrad II. in 1139, and struck gold coins from the time of the general origin of civic coinage in that metal; these are ducats and their divisions, and after a time their multiples also. In the 17th century there are very large silver pieces. In the money of Mantua there are fine coins of Gianfrancesco III. (1484–1519) and Vincenzo II. (1627–1628), these last splendid examples of the late Renaissance, large pieces of gold and silver; the portrait is fine, and the hound on the reverse a powerful design. The vicissitudes of the story of Milan find their record in no less than ten groups of money—Lombard regal coins, Carolingian deniers, money of the republic (1260–1310), next of the Visconti family (1329–1447), succeeded by the republic (1447–1450) and by the Sforza line, next of Louis XII. and Francis I. of France, of the restored Sforza, of Charles V. by Spanish right and his successors of Spain, and lastly of Austria. There are extremely fine coins of the 15th century, showing great beauty in their portraits (see Pl. III. fig. 22). The money of Florence is disappointing in its art. The Athens of the middle ages had the same reason as her prototype to preserve as faithfully as might be the types and aspect of her most famous coin, the gold florin (see Pl. III. fig. 8), and thus those who expect to see in this series the story of Italian art will be much disappointed. The silver florin was first struck in 1189. It is heavier than the denier, weighing about 27 grains, and bears the lily of Florence and the bust of St John the Baptist. These are thenceforward the leading types, the flower never changing, but the representation of the saint being varied. On the gold florin, first issued in 1252, the Baptist is represented standing, while in the contemporary silver florins he is seated. In the 14th century the arms of a moneyer appear in the field, two such officers have had the right of striking yearly, each for six months. The coins of the duchy from 1532, in spite of their new types, are not a fine series; the best are those of Alessandro, designed by Cellini.

Venice as a mint even surpasses Florence in conservatism, and, the early style being distinctly Byzantine, this is the more striking in a great artistic city. We find Venice as an imperial mint issuing Carolingian deniers; but the doges begin to coin, placing their own names on their currency, in the 12th century.



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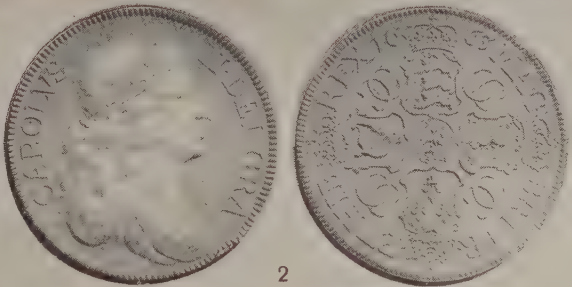

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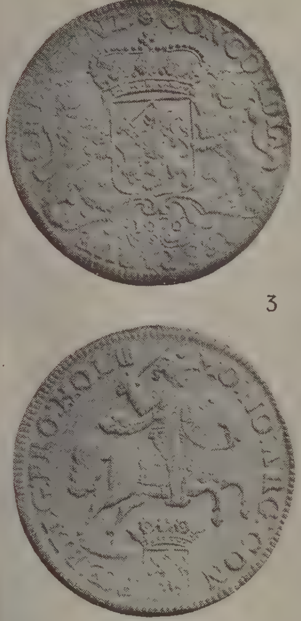

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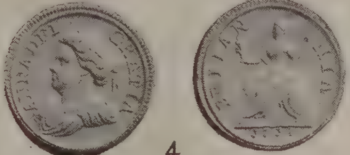

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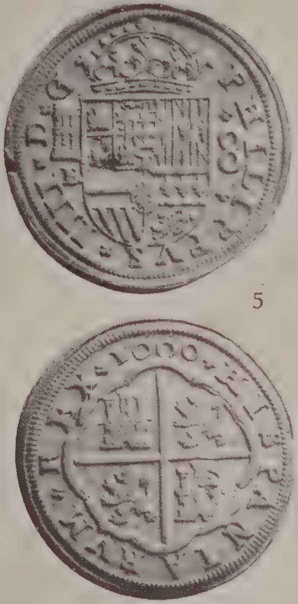

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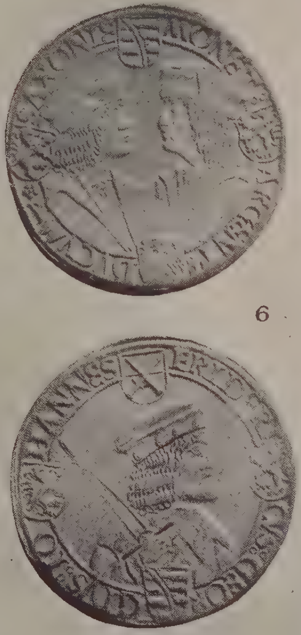

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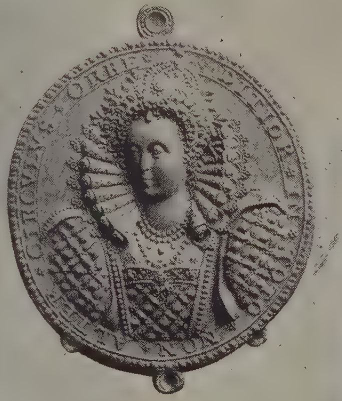

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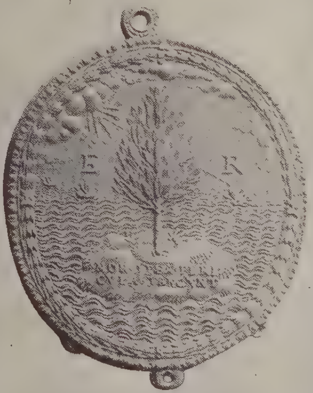

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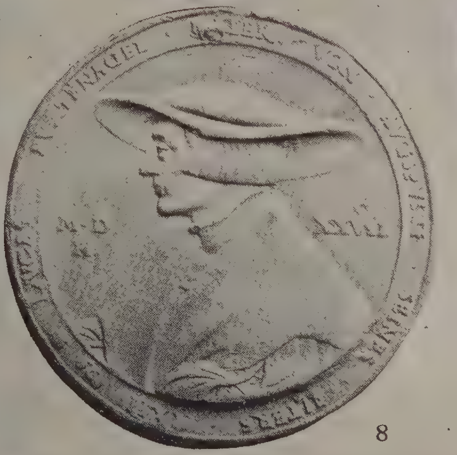
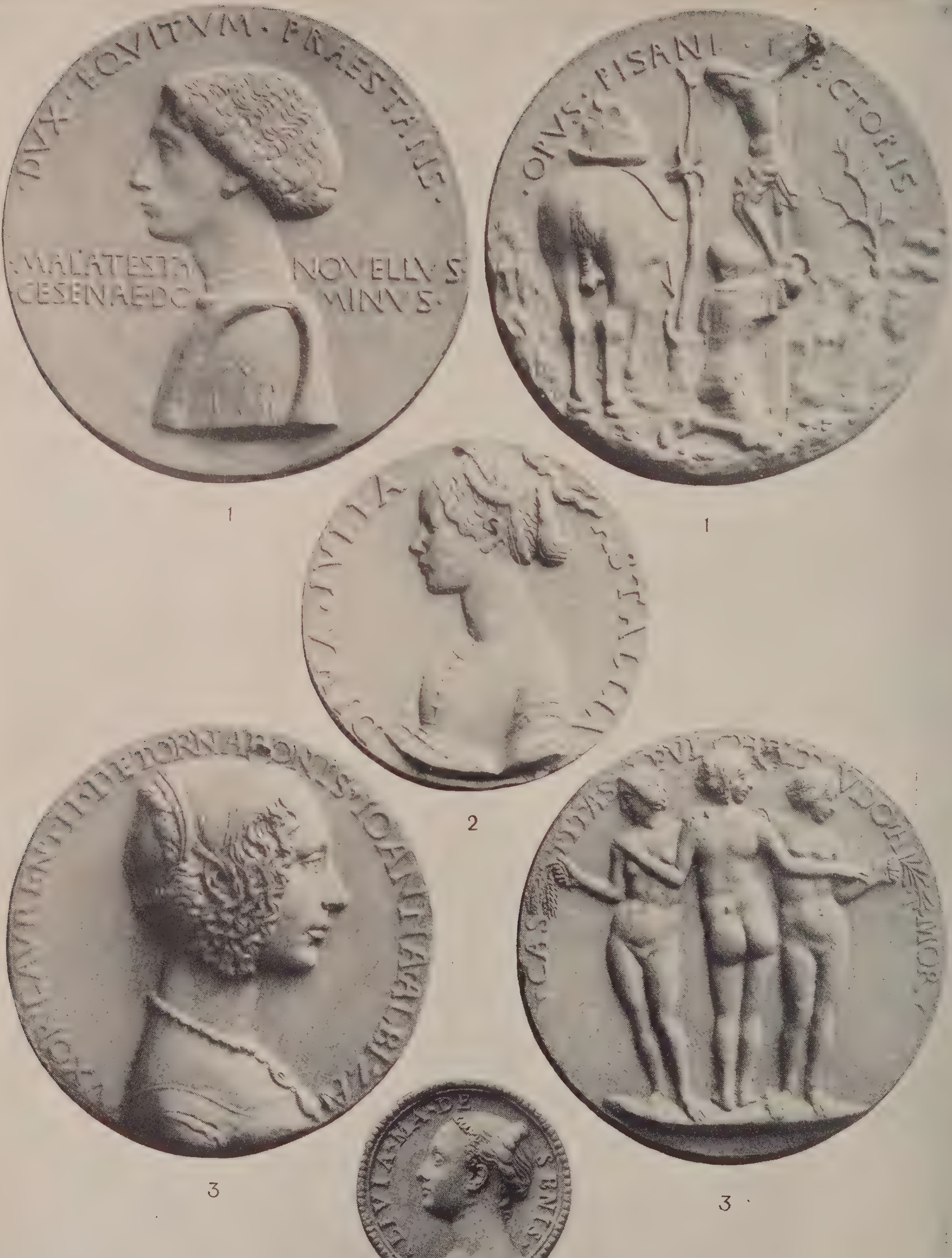


8

MODERN COINS AND MEDALS.


DVX·EQVITVM·PRAESTANS
MALATESTA NOVELLVS
CESENAE DO MINVS
1
OPVS PISANI PICTORIS
1
IVLIA ASTALLIA
2
VXOR LAVRENTII DE TORNABONIS IOANNA ALBIZA
3
CASTITAS PVLCHRITVDO AMOR
3
4

ITALIAN MEDALS.

The most famous silver coin, the matapan, was first struck in the brilliant time of Enrico Dandolo (1192–1205). This coin is a grossus weighing about 33 grains, with on the obverse St Mark giving the standard or gonfalon to the doge, both figures standing, and on the reverse the seated figure of the Saviour. The famous Venetian zecchino or sequin (see Pl. III. fig. 9), the rival of the florin of Florence, appears to have been first issued under Giovanni Dandolo (1284). On the obverse St Mark gives the gonfalon to the kneeling doge, and on the reverse is a standing figure of the Saviour within an oval nimbus. Niccolo Trono (1471–1473) introduces his portrait on most of his coins, but this custom is not continued. By the latest part of the 15th century large silver coins appear. The archaic style changes in the beginning of the 16th century, but there is no later movement. The large silver pieces increase in size, and large gold is also struck; the last doge, Ludovico Manin (1788–1797), issued the 100-sequin piece in gold, a monstrous coin, worth over £40. The doges of Venice from 1521 to 1797 issued a peculiar silver token or medallet, the osella, five of which they annually presented to every member of the Great Council. They replaced the wild ducks (*uccelle*) which it had been customary to present at Christmas. Two dogaressas struck similar medallets. Their types are usually allegorical; some are commemorative.

Papal Coins.

The series of the coins of Rome is rather of historical than of artistic merit. The popes begin to strike money with Adrian I. (A.D. 772–795), whose deniers are in a Byzantino-Lombard style. The coins of his successors, with few exceptions, down to Leo IX. (1049) associate the names of pope and emperor. From Leo IX. to Urban V. (1362) there is no papal coinage at Rome. The Roman senate strikes from 1188 onwards. We then see on the silver the style of the senate and Roman people, and ROMA CAPUT MUNDI. Some coins have the figures of St Paul and St Peter, others Rome seated and a lion. Charles of Anjou, king of Sicily (1263–1285), strikes as a senator, and Cola di Rienzo (1347–1348) as tribune. The gold ducat of about 1300 imitates the types of the Venetian sequin. St Peter here gives the gonfalon to a kneeling senator. The arms of the moneying senator next appear in the field. The papal coinage is resumed at Avignon; and Urban V., on his return to Rome, takes the sole right of the mint. From Martin V. (1417) to Pius IX. there is a continuous papal coinage. The later coins, though they have an interest from their bearing on the history of art, are disappointing in style. There is indeed a silver coin of Julius II. struck at Bologna and attributed to Francia, with a very fine portrait. We have beautiful gold coins of Giovanni Bentivoglio (see Pl. III. fig. 23), lord of Bologna, who employed Francia at his mint, and we know that the artist remained at his post after Julius II. had taken the city. There are also pieces of Clement VII. by Cellini, vigorous in design but careless in execution. There were papal mints at Ancona, Bologna, Piacenza, Parma, Ferrara and other Italian towns; and coins were also struck at Avignon from 1342 to 1700. The papal portraits are highly characteristic and interesting. It is, however, in the fine series of papal medals that we find a worthier artistic record.

Sicily.

The coinage of Sicily, afterwards that of the Two Sicilies, or Naples and Sicily, begins with the Normans. Theirs is a curiously mixed series. It begins with Robert Guiscard as duke of Apulia (1075) and Roger I. of Sicily (1072). The gold money is almost wholly Arabic, though Roger II. struck the Latin ducat, the earliest of its class; the silver is Arabic, except the great Latin scyphati of Roger II. with Roger III.; the copper is both Latin and Arabic. The gold series (*Augustales*) of the emperor Frederick II. (1198–1250) shows the first sentiment of reviving classical art, its work being far in advance of the age. These are Latin coins; he also struck small Arabic pieces in gold. Under Conrad and Manfred there is an insignificant coinage, copper only, but with Charles I. of Anjou (1266–1285) the gold money in purely medieval style is very beautiful, quite equal to that of his brother, St Louis of France. After this time there is a great issue of *gigliati*, silver coins with, for reverse, a cross fleurdelisée cantoned with fleurs-de-lis. These coins acquired a great reputation in the Levant, and were even struck by the emirs of Asia Minor. With Alphonso, the founder of the Aragonese line, we note the old style of the coins, which are in singular contrast to his fine medals. Good portraiture begins on the money of Ferdinand I., his successor. The later coinage is interesting only for its illustration of the varying fortunes of the Two Sicilies. The curious early gold coinage of the Lombard dukes of Beneventum, which follows the Byzantine type, has been mentioned under the transitional series; the dukes and princes of Beneventum and the princes of Salerno continued to issue coins (sometimes gold, usually deniers) down to the middle of the 11th century.

Italian Medals.

Italian medals (Pl. VI.) are next in merit to the works of the Greek die-engravers. Certain small pieces of a medallic character were made in Italy, at Padua, as early as the end of the 14th century, and there existed also large cast and chased pieces representing various Roman emperors (perhaps Burgundian work of the 14th century), which influenced the beginnings of the true medal. This began, and also reached its highest excellence, with Vittore Pisano (Pisanello), the Veronese painter, whose medals date from 1438 (or earlier) to 1449. The finest work of Italian medallists is seen in the cast medals of the 15th and early 16th century; with the increase of classicism in the 16th the style declines rapidly. The earlier medals are independent works, marked by simple vigorous truthfulness. The designs are skilful and the portraits strongly characteristic; the expression of character and *virtù* takes precedence over ideal beauty, especially in the work of the Florentine school. As the art became popular the execution of medals passed into the hands of inferior artists, and by degrees striking became usual for the smaller pieces; at the same time, a slavish imitation of the classical style weakened or destroyed originality and stamped the works with the feebleness of copies. The great medallists of the first age are Pisano, Matteo de' Pasti, Enzola, Boldù, Sperandio, Guazzalotti, Bertoldo, Gambello, Niccolò Fiorentino, Lysippus, Candida, Caradosso. Some of the most beautiful medals, however, are by unknown artists (Pl. VI. fig. 2). In the 16th century must be mentioned Pomedello, Benvenuto Cellini, Leone Leoni, Giovanni Cavino "the Paduan," Pastorino of Siena, Giacomo da Trezzo, Pietro Paolo Galeotto, called Romano, and Antonio Abondio. Incomparably the finest of all Italian medals are the works of Pisano, particularly the medals of Alphonso the Magnanimous, with the reverses of the boar-hunt and the eagle and lesser birds of prey, those of Sigismondo Malatesta, his brother surnamed Novello (see Pl. VI. fig. 1), Leonello d'Este, John VIII. (Palaeologus), Nicolò Piccinino, Inigo d'Avalos (marquis of Pescara), Ludovico and Cecilia Gonzaga of the same family, the great humanists Vittorino da Feltre and Pier Candido Decembrio. Pisano is great in portraiture, great in composition and design, and marvellously skilful in depicting animals. He alone represents the moral qualities of his subject in their highest expression and even capability. That he has high ideal power is seen at once if we compare with his portrait Pasti's inferior though powerful head of Sigismondo Malatesta. Pasti's medal of Isotta, wife of Sigismondo, is also noteworthy, likewise the medal by the otherwise unknown Constantius of Mahomet II., the conqueror of Constantinople—interesting works, but lacking Pisano's technical skill and inspiration. An artist of great power is Sperandio of Mantua; but his productions lack the finish necessary to good medallic work, his drawing and composition are careless, and his realism too often becomes brutal or vulgar. The work of Niccolò Fiorentino and of his pupils is astonishingly vigorous in portraiture, but they lack the power of designing reverses (see Pl. VI. fig. 3). In the later age Cavino executed a remarkable series of imitations of Roman sestertii, which have been frequently mistaken for originals. In art these Italian works frequently surpass the originals in spite of a degree of weakness inseparable from copies. A comparison of the Italian with the Roman pieces is thus most instructive. The works of Pastorino of Siena (who had an extraordinary facility in graceful portraiture) are especially charming (see Pl. VI. fig. 4). Historically the Italian medals supply the defects of the coinages of Florence and Rome, and in a less degree of Venice. The papal series is invaluable as a continuous chronicle, although artistically, after the earliest period, it is monotonous.

Germany.

The money of Germany is, like that of Italy, far too various for it to be possible here to do more than sketch some of its main features. In the Frankish period mints were in operation at cities in the west, such as Mainz, Strassburg, Spires, Treves, Worms, Cologne. Pippin issued denarii from Strassburg and Mainz; under his successors denarii and obols were also coined at other mints, as Bonn, Cologne, Spires, Treves. After the reign of Louis the Child (910–911) the Carolingian system was continued until the advent of the Swabians with Conrad III. (1138–1152). In the succeeding period, which ends with the introduction of the grossus and the gold coinage under Louis of Bavaria (1314–1347), the uniformity of the currency disappears. In the west (in Lotharingia, including the southern Low Countries, the Moselle and Rhine-lands, in Frisia, Bavaria, parts of Franconia and Swabia) the denier continues; but elsewhere we find the bracteate. The right of coinage is acquired in an increasing measure by the feudatories of the empire. These local coinages entirely dominated the system, so that even the imperial coinage is not uniform, but consists of denarii in the west and bracteates in the east. The earliest imperial bracteate is of Frederick I.; the large fine bracteates last but a short time, reaching their acme about the end of the 12th century (see Pl. III. fig. 18). The fine pieces of the bishops of Halberstadt and the abbesses of Quedlinburg are characteristic of this class. With the introduction of the regular gold coinage (chiefly florins) and the grossus in the 14th century, Germany enters on the modern period. From the 16th century the thaler (so called from Joachimsthal in Bohemia, where the counts of Schlick first struck the coin in 1518) dominates the silver currency (see Pl. V. fig. 6). The thalers and other large coins of the 16th and 17th centuries are often good and always vigorous in workmanship. By the convention of 1857 the thaler was recognized as the unit for Berlin and the north, the florin of 100 kreuzers for Austria, the florin of 60 kr. for the south. The present system, based on the gold reichsmark of 100 pfennigs, was established all over the German empire in 1876. Of particular currencies in Germany we must be content with the bare mention of some of the more important. Among the great rulers we note the dukes of Bavaria, who coined from Henry I. (948–955), and issued fine thalers in the 16th century. The Counts Palatine of the Rhine coined from 1294, their mints being at Heidelberg, Frankfort, &c. The Saxon coinage begins with Duke Bernard (973) and includes a large series of bracteates and thalers, the latter being especially famous. The Brunswick coinage begins in the 11th century; besides its bracteates we note the large mining-thalers of the 16th and 17th centuries (up to ten-thaler pieces). There are good bracteates and thalers of the margraves of Brandenburg; from 1701 they coin as kings of Prussia. In Austria there is a ducal coinage from the 12th century; the gold florin of Florentine character appears under Albert II. (1330–1358). The marriage-coin of Maximilian and Maria of Burgundy (a 16th-century reproduction of a medal made by the Italian Candida in 1479) is a striking piece, and in the 16th century there is a large series of fine thalers. The thalers of Maria Theresa had an enormous circulation among savage races, and those of the date 1780 were recoined for the purposes of the Abyssinian War of 1867. In Bohemia there is a ducal coinage from the early 10th century to 1192; then came the regal bracteates. Wenceslas II. (1278–1305) struck the first German grossus at Prague (see Pl. III. fig. 16). The gold florin appears under John of Luxemburg (1310–1347). In Hungary the regal coinage begins with St Stephen (1000). Charles I. of Anjou (1310–1342) introduced the florin and grossus. Of historical interest is the money of John Hunyady as regent (1441–1452). The abundance of gold about this time and later shows the metallic wealth of the land. The same is true of the rich gold coinage of the Transylvanian princes in the 16th and 17th centuries. Of ecclesiastical coinages the most important are at Münster, Cologne, Mainz, Treves, Augsburg, Magdeburg, Spires, Würzburg, Salzburg. The Cologne series of coins is almost continuous from the Frankish period; the archbishops first received the right from Otto I., Bruno (953–965) being the first to coin; from Pilgrim (1021–1036) the series, issued at various mints in the Rhineland, is very complete down to 1802. The series of Treves ranges from Theodoric I. (965–975) to Clement Wenceslas (1794). The archiepiscopal coinage of Mainz begins with Willigis (975) and lasts until 1802; its mints included Erfurt, Bingen and many other places. The Salzburg series (beginning 996) is remarkable for its fine thalers (especially of Mathias Lang, 1519–1540). The patriarchs of Aquileia, who may be mentioned here, acquired the right of coinage from Louis II. in the 9th century, but the first who can be identified on the coins is Godfrey (1184); thence onwards there is an interesting series of denarii and smaller coins down to the early 15th century. Of cities with large coinages it is sufficient to mention Aix-la-Chapelle (from the time of Frederick I. to 1795), Frankfort-on-the-Main, Hamburg (with great gold pieces of the 16th and 17th centuries, up to 10 ducats) and Nuremberg. Lastly, we may mention the coins of the grand-masters of the Teutonic Order, issued in Prussia from 1351 to 1512.

German medals perhaps rank next to Italian, although they lack the higher artistic qualities. They are the work of craftsmen —jewellers, wood-carvers, workers in hone-stone— and show great facility of minute workmanship and chasing and decorative design (the last is especially clear in the heraldic reverses); the faults of these qualities are to some extent redeemed by the native German vigour and directness of the portraiture. The original models from which the medals were cast were in many cases made in hone-stone or box-wood, which did not, like the favourite wax of the Italian artists, give much scope for subtlety. The chief centres of the art were Nuremberg and Augsburg. Many medals have been attributed to Albrecht Dürer; whether he did more than design them is uncertain. Among other medallists may be mentioned Hans Schwarz (working 1516–1527), Ludwig Krug, Friedrich Hagenauer (working 1525–1546, see Pl. V. fig. 8), Peter Flötner (*c.* 1538, although it is doubtful whether this artist, whose plaquettes are famous, made any of the portrait-medals ascribed to him), Mattes Gebel, Hans Reinhardt the Elder, &c. Some other good artists are known only by their initials, or quite unidentified. After the middle of the 16th century the art declines, although we still have skilful artists like Valentin Maler (1568–1593). In this later period striking gradually supersedes casting.

Poland.

The earliest Polish coins are of the 10th century; the types are copied from English, German and Byzantine sources. In the 12th and 13th centuries there is a bracteate coinage. The grossus was introduced about 1300. In later times the town of Danzig, while belonging to the kingdom, issued remarkable gold pieces, thalers, &c., down to its restoration to Prussia (1793).

Scandinavia.

The origin of the coinage of the Scandinavian states: Norway, Denmark and Sweden, is clearly English and due to the Danish conquest of England. The runic alphabet is employed, though not by any means exclusively, on many of the early coins of Denmark and Norway. The Norwegian series begins with Hakon Jarl (989–996), who copies the pennies of Æthelred II. In the second half of the 11th century begins a coinage of small, thin pennies, which develop into bracteates. Magnus IV. (1263–1280) restores the coinage, more or less imitating the English sterlings of the time. Norway and Denmark were united under Eric of Pomerania in 1396. The money of Denmark begins with pennies of Sweyn (985–1014) which are copied from the coinage of Æthelred II.; the coins of Canute the Great (1014–1035) and Hardicanute (1036–1042) are mainly English in character. With Magnus (1042–1047) other influences, especially Byzantine, appear, and the latter is very strong under Sweyn Æstrithson (1047–1076). Bracteates come in in the second half of the 12th century. The coinage is very difficult of classification until the time of Eric of Pomerania (1396). There are important episcopal coinages at Roskilde and Lund in the 12th and 13th centuries. Sweden has very few early coins, beginning with imitations by Olaf Skötkonung (995) of English pennies and showing the usual bracteate coinage. The money was restored by Albert of Mecklenburg (1363–1387). The thaler is introduced by Sten Sture the younger (1512–1520). The money of Gustavus Adolphus is historically interesting. Under Charles XII. there is highly curious money of necessity. The daler is struck as a small copper coin, sometimes plated. The types include the Roman divinities. At the same time and later there was a large issue of enormous plates of copper, stamped with their full value in silver money as a countermark.

Russia.

The earliest Russian coinage begins with the princes of Kiev as early as the end of the 10th century; it shows strong Byzantine influence. The grand princes from the early 15th century struck curious little silver pieces. The coinage was modernized by Peter the Great, who introduced a regular gold coinage. The large silver and copper coins of his successors are very plentiful. Nicholas I. (1825–1855) introduced a platinum coinage of about two-fifths the value of gold.

Balkan States.

The Christian coinages of the northern Balkan States are of great interest. They are chiefly silver grossi, showing a mixture of Byzantine and Venetian influences. The Bulgarians had a regular silver coinage from Asien I. (1186–1196) to John Sismana (1371–1395). The Servian coinage lasts from Vladislas I. (1234–1240) to the middle of the 15th century. There is also a coinage of the Bans of Bosnia (late 13th to 15th century). The modern coinage of the Balkan States is of interest only as a revival. The independent city of Ragusa is remarkable for the bold style of its early copper (13th century, inspired by Roman models of the 4th century) and the richness and variety of its later issues.

Latin East.

There is a most interesting class of coins struck during the middle ages within the limits of the present Turkish empire, the money of the crusaders and other Latin princes of the East. The multitude of states thus designated have been classed by Schlumberger, the authority on the subject, in the following order, the chief divisions of which are here given: First group, principalities of Syria and Palestine, counts of Edessa, princes of Antioch, kings of Jerusalem, counts of Tripoli, fiefs of Jerusalem, crusaders who struck imitations of Arab coins, kings of Cyprus, lords of Rhodes, grand-masters of the order of St John at Rhodes, to which may be added the later grand-masters at Malta; second group, Latin emperors of Constantinople, Frankish princes and lords of Greece and the Archipelago whose power was due to the crusade of 1204, such as the princes of Achaia, the dukes of Athens, Neapolitan kings who struck money for their Eastern possessions, Latin lords of the Archipelago, the Genoese at Chios, the Gattilusi at Mytilene, the Genoese colonies, the Venetian colonies, the Turkoman emirs of western Asia Minor who struck Latin coins. The most important currencies are the billon and copper of the princes of Antioch (Bohemund I., 1098, to Bohemund IV., 1201–1232) and the kings of Jerusalem (Baldwin II., 1118, to Conrad, 1243), the silver and copper of the counts of Tripoli (12th and 13th centuries) and the gold imitations of Arab dīnārs, the currency in that metal of the crusaders of Palestine. These *Bisantii Sarracenati*, or Saracen bezants, are at first imitations of Fatimite dīnārs, known to have been struck by Venetian moneyers at Acre, and probably at Tyre and Tripoli also. After these coins had been current for nearly a century and a half they were forbidden on account of their Mahommedan aspect by Pope Innocent IV. The Venetians then issued gold and silver coins with the same aspect but with Christian inscriptions. The kings of Cyprus issued a really good coinage in the three metals and in billon from Guy de Lusignan (1192) to Catherina Cornaro; from 1489 to 1571 the Venetians issued coins for the island. The coinage of the order of St John begins on the conquest of the island of Rhodes (1309) and the suppression of the Templars; the earliest coins known are of Foulques de Villaret (1305–1319), and the last of the Rhodian series are of Villiers de l'Isle-Adam, the gallant defender of the island who was forced to capitulate to the Turks and sail for a new home in 1522. The coinage is of fine gold, silver, billon and copper. On the establishment of the order at Malta in 1530 it is resumed there till the capture of the island by the French at the close of the 18th century; it has little interest except as showing the wealth of the order. The other currencies of the crusaders, notwithstanding their great historical interest, are far less remarkable numismatically; the influence of the *denier tournois* is, however, noticeable on the coinage of the princes of Achaia (1245–1364), and the dukes of Athens (1225–1308).

Of the money of America little need be said here. Neither the coinages of the Spanish and Portuguese dependencies, and of the states which succeeded them, nor those of the English colonies and of the United States, present much that is worthy of note. In style they all resemble those of the parent countries, but, originating in the decline of art, they are inferior in style and work. They are most remarkable in the south for the abundance of gold and silver. The chief coin is the dollar. Some coins are of historical interest, and there are a few rarities, such as the colonial money of Lord Baltimore struck for Maryland, the pine-tree coins of Massachusetts, and the hog-money of Bermuda.

IV.—Oriental Coins

Oriental coins may be best classed as ancient Persian, Arab, modern Persian and Afghan, Indian and Chinese, and other issues of the far East. The first place is held by the money of the old Persian empire, the Parthians and the Sassanians. The conquests of the Arabs introduce a new currency, carried on by the Moslem inheritors of their empire. The modern Persian and Afghan money, though of Arab origin, is distinguished by the use of the Persian language with Arabic. The Indian currencies, though Greek, Sanskrit, Arab and Persian in their inscriptions, must be grouped together on account of their mutual dependence. They rise with the Bactrian kings, whose Greek types are gradually debased by the Indo-Scythians and Guptas; these are followed by a group of currencies with Sanskrit legends; next follow the money of Arab conquerors and the great series of the Pathans of Delhi and subsidiary dynasties, with Arabic inscriptions; the main series is continued in the currency of the Moguls, who largely use Persian, and the last series is closed by local currencies mainly with Sanskrit or Arabic legends. The Chinese coinages form the source and centre of the group of the far East, which, however, includes certain exceptional issues. The order throughout is historical, each empire or kingdom being followed by the smaller states into which it broke up, and then by the larger ones which were formed by the union of these fragments.

The Persian coinage was probably originated by Darius I. about the time that he organized the empire in satrapies. The regular taxation thus introduced made a uniform coinage necessary. Avoiding the complex gold system of Croesus, which was intended to accommodate the Greek cities in commercial relation with Lydia, Darius chose two weights, the gold shekel of 8·4 grammes and the silver drachm of 5·58 grammes. One gold piece was equal to twenty silver. The gold coin was called the daric, the silver the siglos. The metal was very pure, especially that of the daric. Thus not only were the Lydian gold and silver coins of inferior weight thrown out of circulation, but the Persian gold, from its purity, became dominant, and was the chief gold currency of the ancient world so long as the empire lasted. The issuing of gold was a royal prerogative. Silver money was coined not only by the king but in the provinces by satraps, who used local types, and by tributary states. The following classes must be distinguished: (1) regal, (2) satrapal, (3) of tributary states. The art of Persian coins varies according to the locality, from the beautiful purely Greek work of the west coast of Asia Minor to the more formal style of Cilicia and the thoroughly hieratic stiffness of Phoenicia and Persia.

The regal coinage is of darics (Pl. IV. fig. 2) and subdivisions in gold and of sigli and subdivisions in silver. The obverse type is the king as an archer, the reverse an irregular oblong incuse. The darics show differences of style, and must extend through the whole period of the empire. The sigli no doubt run parallel with them. Both these denominations are uninscribed.

The satrapal coinage is very important and interesting. It belongs mainly to Cilicia. The most remarkable series is that with a bearded head wearing a tiara, with various reverses, struck apparently at Colophon, Cyzicus and Lampsacus, and in one instance bearing the name of the satrap Pharnabazus, but usually the word "king" in Greek. The coin of Colophon shows a splendid portrait, one of the finest instances of Ionian work. It probably represents Pharnabazus (see Pl. IV. fig. 1). Of other satrapal issues those of Datames, of Tiribazus and Cilician issues, struck at Tarsus, are specially noteworthy. Their inscriptions are Aramaic.

The coinages of the tributary states have been in part noticed in their geographical order.

After the fall of the empire, the generals and satraps such as Mazaeus who governed Alexander's newly-acquired dominions issued coins from various mints, especially Babylon. The gold coins were double darics of the same types as their single predecessors. The silver coins were mainly modelled on the coins which Mazaeus had previously issued in Cilicia with the types of Baal-Taro and Lion. Some of them may have been issued as far East as Bactria and North West India. These are followed by the first native coinage, inscribed below under India.

The conquest of Alexander did not wholly destroy the independence of Persia. Within less than a century the warlike Parthians, once subjects of Persia, revolted (249–248 B.C.) against the Seleucids and formed a kingdom which speedily became an empire, ultimately the one successful rival of Rome. Their money is Greek in standard and inscriptions, as well as in the origin of types. The coins are silver, following the Attic weight, the chief piece being the drachm, though the tetradrachm is not infrequent; there are also bronze coins, but none in gold are known. The drachm has the head of the king on the obverse, diademed or with a regal head-dress, and on the reverse the founder Arsaces seated, holding a strung bow, the later tetradrachms varying this uniformity. Every king is styled Arsaces, to which many of the later sovereigns add their proper names. The inscriptions are usually long, reaching a climax in such as **ΒΑΣΙΛΕΩΣ ΒΑΣΙΛΕΩΝ ΜΕΓΑΛΟΥ ΑΡΣΑΚΟΥ ΔΙΚΑΙΟΥ ΕΠΙΦΑΝΟΥΣ ΘΕΟΥ ΕΥΠΑΤΟΡΟΣ ΦΙΛΕΛΛΗΝΟΣ** of Mithradates III. (57–54 B.C.; see Pl. IV. fig. 4), where we see the double influence of Persian and Seleucid styles and the desire to conciliate the Greek cities. Very noticeable are the coins which bear the portraits of Phraataces (3 B.C.-A.D. 4) and his mother, the Italian slave Musa, with the title queen (**ΘΕΑΣ ΟΥΡΑΝΙΑΣ ΜΟΥΣΗΣ ΒΑΣΙΛΙΣΣΗΣ**). The last of the Parthian coins are those attributed to Artavasdes (*c.* A.D. 227).

Parthians.

The coinage of Persis, beginning in the second half of the 3rd century B.C., consists of silver tetradrachms and drachms; the earliest have fine portraits of the kings, but the style rapidly degenerates. The prevailing reverse type is the Persian fire-altar.

Persis.

The dynasts of Characene, on the lower Tigris, issued coins (silver, bronze and base metal) from the time of the founder, Hyspaosines (*c.* 124 B.C.), down to the 2nd century A.D. The obverses of the tetradrachms have portraits of the kings; the usual reverse type is a seated Heracles.

Characene.

The Persian line of the Sassanians arose about A.D. 220, and wrested the empire from the Parthians in 226–227, under the leadership of Ardashir or Artaxerxes. This dynasty issued a national and thus Oriental coinage in gold and silver. The denominations follow the Roman system, and there are but two coins, equivalent to the aureus or solidus and the denarius. The obverse has the king's bust, usually wearing a very large and elaborate head-dress, varied with each sovereign, and the reverse the sacred fire-altar (see Pl. IV. fig. 3) ordinarily flanked by the king and a priest. The attachment which Ardashir, the founder, bore to Zoroastrianism established this national reverse type, which endured through the four hundred years of the sovereignty of his line to A.D. 652. The inscriptions are Pahlavi.

Sassanians.

The Arab coinage forms the most important Oriental group. It has a duration of twelve centuries and a half, and at its widest geographical extension was coined from Morocco to the borders of China. When the Arabs made their great conquests money became a necessity. They first adopted in the East imitations of the current Persian silver pieces of the last Sassanians, but in Syria and Palestine of the Byzantine copper, in Africa of the gold of the same currency. Of these early coins the Sassanian imitations are very curious with Pahlavi inscriptions and shorter ones in Arabic (Cufic). The regular coinage with purely Moslem inscriptions begins with the issue of a silver coin at Basrah, in 40 A.H. (A.D. 660), by the caliph ʽAlī; after subsequent efforts thus to replace the Sassanian currency, the orthodox mintage was finally established, in 76 A.H. (A.D. 695), by Abdalmalik. The names of the denominations and the weight of the gold are plainly indicative of Byzantine influence. There were three coins. The dīnār of gold (Pl. IV. fig. 6) took its name from the aureus or denarius aureus, of which the solidus must have been held to be the representative, for the weight of the Arab coin (about 4·3 grammes) is clearly derived from the Byzantine gold piece. The dirhem of silver (see Pl. IV. fig. 7) is in name a revival of the Greek drachm; it weighs at most about 3 grammes. The copper piece is the fels, taking its name from the follis of the Greek empire. Commercially the gold easily exchanged, and the silver soon passed as the double of the Carolingian denier. For long these were the only coins issued, except, and this but rarely, half and quarter dīnārs. There are properly no types. There was indeed an attempt in the early Byzantino-Arab money to represent the caliph, and in the course of ages we shall observe some deviations from the general practice of Islam, particularly in the coinage of the atābegs and in Mahommedan coinages not of the Arab group, the modern Persian and that of the Moguls of Delhi. The inscriptions are uniformly religious, save in some Tatar coinages and that of the Turks. In general the coins are for the first five centuries of their issue remarkably uniform in fabric and general appearance. They are always flat and generally thin. The whole of both sides of the coins is occupied by inscriptions in the formal Cufic character usually arranged horizontally in the area and in a single or double band around. Towards the fall of the caliphate a new type of coin begins, mainly differing in the greater size of the pieces. There are new multiples of the dīnār and ultimately of the dirhem, and the silver pieces frequently have their inscriptions within and around a square, a form also used for gold. The Cufic character becomes highly ornamental, and speedily gives way to the flexuous naskhī of modern writing. The inscriptions are religious, with the addition of the year by the era of the Flight (A.D. 622), the month sometimes being added, and the mint occurs uniformly on silver and copper, but does not appear on the gold until after the fall of the Omayyad dynasty. Subsequently the official name of the caliph occurs. The religious part of the inscriptions is various, the most usual formulae being the profession of the Moslem faith: "There is no deity but God; Mahomet is the apostle of God," to which the Shiʽites or followers of ʽAli in Persia and Africa add "ʽAli is the friend of God." The Moorish coins give long formulae and religious citations and ejaculations, and they, like the money of the Pathans of Delhi of the Indian class, have occasionally admonitions urging or suggesting the purer use of wealth. As Arab and other dynasties arose from the dismemberment of the caliphate, the names of kings occur, but for centuries they continued to respect the authority of their religious chief by coining in his name, even in the case of the shadowy ʽAbbāsids of Egypt, adding their own names even when at war with the caliph, as though they were mere provincial governors. After the fall of the caliphate some new denominations came in, chiefly of heavier weight than the dirhem and dīnār, but the influence of the commercial states of Italy made the later Egyptian Mamelukes, the Turks and the later Moors adopt the gold sequin. In more modern times the dollar found its way into the Moslem coinage of the states bordering on the Mediterranean. It can be readily seen that Arab coins have no art in the same sense as those of the Greeks. The beautiful inscriptions and the arabesque devices of the pieces of the close of the middle ages have, however, a distinct artistic merit.

Caliphates.

The Omayyad coins owe their only historical value to the evidence which the silver affords of the extent of the empire at different times. The first separation of that empire dates from the overthrow of this dynasty (which had its capital at Damascus, A.D. 661–750) by the ʽAbbāsids (A.D. 750, capital Bagdād) speedily followed by the formation of the rival Omayyad caliphate of the West with its capital at Cordova. The Abbāsid money has the same interest as that which it succeeded, but its information is fuller. Towards the fall of the line (which ended at Bagdād in 1258) it becomes very handsome in the great coins, which are multiples of the dīnār (see Pl. IV. fig. 10). The Spanish Omayyads (756–1031) struck silver almost exclusively. Their rise was followed by that of various lesser lines—the Idrisites (788–985, silver) and Aghlabites (800–909, gold chiefly) in western Africa, the Benī Tūlūn (868–905, gold), and, after a short interval, the Ikhshidīds (935–969, gold), both of Turkish origin, in Egypt. Meanwhile a new caliphate arose (909) in western Africa which subdued Egypt (969), the Fātimid of the line of ʽAli, and for a while the allegiance of the Moslems was divided between three rival lines, the Omayyads of Spain, the Fātimids of Africa, and the Abbāsids of Bagdād. The Fātimids introduced a new type of dīnār, with the inscriptions in concentric circles, and struck little but gold. In the interim the Persians, who had long exercised a growing influence at the court of Bagdād, revived their power in a succession of dynasties which acknowledged the supremacy of the caliphate of Bagdād, but were virtually independent. These were the Tāhirids (820–872), Saffārids (867–903), Sāmānids (874–999), Ziyārids (928–1042), and Buwoyhids or Būyids (932–1055), who mostly struck silver, but the last gold also. As the Persians had supplanted the Arabs, so they were in turn forced to give place to the Turks. The Ghaznevids formed a powerful kingdom in Afghanistan (962–1186, gold and silver), and the Seljuks established an empire (gold), which divided into several kingdoms, occupying the best part of the East (1037–1194). Of these dynasties the Seljuks of Rūm or Asia Minor (1077–1300) first strike a modern type of Arab coinage (silver, Pl. IV. fig. 9).

Omayyads.

Abbāsids.

The Seljūk dominions separated into many small states, the central ruled by atābegs or generals (12th–13th cent.), and the similar Turkoman Urtuḳis (1101–1312). The atābeg money and that of the Turks of the house of Urtuk are mainly large copper pieces bearing on one side a figure borrowed from Greek, Roman, Byzantine and other sources. They form a most remarkable innovation (Pl. IV. fig. 11). In the same age the great but short-lived empire of Khwārizm (Khiva, 1150–1231) arose in the far East. The first caliphate to disappear was that of Spain, which broke up (*c.* 1031) into small dynasties, some claiming the prerogative of the caliphates. They chiefly struck base silver (billon) coins. The Christian kings gradually overthrew most of these lines. In the meantime various Berber families had gained power in western Africa and the Almoravides and the Almohades crossed the straits and restored the Moslem power in Spain. They struck gold money of fine work, and that of the later Muwaḥḥids is remarkable for its size and thinness. At the fall of the Muwaḥḥids the only powerful kingdom remaining was the Arab house of Granada (Naṣrids), which, supported by the Berbers of Africa, lingered on until the days of Ferdinand and Isabella (1492). The Fātimite dynasty was supplanted by the Kurdish line of the Ayyubites, the family of Saladin, who from 1169 to 1250 ruled Egypt, Syria and Mesopotamia, with a number of vassal states, some governed by princes of their own family, some by the older lines of the atābeg class which they allowed to survive. In Egypt the Ayyubite coinage is of gold, elsewhere of silver and copper. The caliphate of Bagdād, which latterly was almost limited to that town, though its abundant heavy gold coinage at this very time indicates great wealth, was overthrown by the new power of the Mongols (A.D. 1258), who established a group of empires and kingdoms, comprising the whole

Eastern world eastward of the Euphrates and thence extending northward and reaching into Europe. The most important of these states for their money are that of the Mongols of Persia (1256–1349), founded by Hulagu, the conqueror of Bagdād, and that of the khans of the Golden Horde (1224–1502). Both struck silver, but there is also gold coinage of the Mongols of Persia, who more frequently use the Mongol character for their names and titles than is done under the kindred line. The power of the Mongols was held in check by the Mameluke kings of Egypt and Syria, slave-princes of two dynasties, the Baḥri (1250–1390) and the Burji (1382–1517), who struck money in the three metals. The Mongol power waned, but was revived by Tīmūr (Tamerlane), who during his rule (1369–1405) recovered all that had been lost. He and his successors (to 1500) struck silver, copper, and brass money (see Pl. IV. fig. 13). The Ottoman Turks, whose power had been gradually growing from 1299 onwards, after a desperate struggle with Tīmūr (defeat of Bayezid I. at Angora in 1402), gradually absorbed the whole Mahommedan world west of the Tigris, except only Morocco, where they had but a momentary dominion. Constantinople fell to them in 1453, Syria, Egypt and Arabia in 1517. Their money of gold, silver, base metal and bronze is devoid of historical interest. In Tunis and Morocco a group of Berber lines long maintained themselves, but at length only one survived, that of the sharīfs of Morocco, claiming Arab descent, now ruling as the sole independent Moslem dynasty of northern Africa. Its recent coinage is singularly barbarous. It may be remarked that Tunis and Egypt have long coined Turkish money in their own mints, the more western state latterly adding the name of its hereditary prince to that of the sultan.

Persia. The coins of the shahs of Persia have their origin with Ismā'īl (1502). They are struck in the three metals, and are remarkable for the elegance of their inscriptions, sometimes in flowing Arabic, sometimes in the still more flexuous native character (see Pl. IV. fig. 12). The inscriptions are at first Arabic; after a time the religious formulae are in this language and the royal legend in Persian, usually as a poetical distich. The Persian series is also remarkable for the autonomous issues of its cities in copper, the obverse bearing some type, usually an animal. The coins of the Afghan amirs form a class resembling in inscriptions those of the Persians, and equally using Persian distichs. They commence with Ahmad Shāh Durrāni (1747).

India. The first native Indian coinage consists of primitive pieces (the earliest perhaps of the 4th century B.C.) of silver and copper with countermarks (known as "punch-marked" coins). Foreign coins (Persian and Athenian) circulated in the country from the 5th century; the silver coinage of Sophytes, a contemporary of Alexander the Great, shows Athenian influence; and there are not a few coins of Indian provenance showing direct imitation or modification of Athenian types (as the substitution of an eagle for the owl). Alexander himself is represented by a coinage of square bronze pieces. Certain tetradrachms and diobols with the name of Alexander and types: head of Zeus and eagle, probably belong to the end of the 4th century. But the coinage which was to have most effect on that of India was the Bactrian (see also under BACTRIA). This is at first a pure Greek coinage, of fine style, beginning with Diodotus (gold, silver, bronze), who revolted from Antiochus II., *c.* 250 B.C. For about a century the art of these coins, at least as regards portraiture, ranks very high for realism and vigour. The Bactrian rulers seem first to have made incursions into the Kabul valley and north India about 200 B.C., the first Indian conquests being perhaps made by Euthydemus and Demetrius. Of the latter there exists a bronze coin with the regular Greek types, but of the characteristic square Indian form, with a translation on the reverse into Kharoshṭhi characters of the obverse Greek inscription. Some of the coins of succeeding kings are very remarkable, as the tetradrachms of Antimachus (see Pl. IV. fig. 5), with a portrait reminding us of good Italian medals, and the unique 20-stater gold piece of Eucratides (the largest Greek gold coin known to us, although its genuineness has been questioned). The coinage from about 160 B.C. becomes more and more Indian, the Greek power being definitely transferred south of the Paropanisus in the second half of the 2nd century. The Attic standard which had been used for the silver gradually gave way to the Persian. The Greek princes went on reigning in India to about 20 B.C.; their chronology is very obscure. During the last two centuries B.C. several other coinages existed in north India. (1) The Scythic Sacae or Śakas invaded Bactria and then India; the earliest Śaka coinage of north India (that of Maues in the Punjab, *c.* 120 B.C.) shows Parthian influence; so do the slightly later coins of Vonones and others who reigned in Kandahar and Seistan. (2) Another large and varied group of coins consists of the issues of native states, some of which go back to before 200 B.C. Of these we may note the coins of Eran (Sagar district) showing the gradual development of the punch-marked coin into the coin with a type, made up of a collection of such punch-symbols struck from one die; and the coins of Taxila, the earliest of which are struck with a type on one side only. From these were imitated the copper coins of the Greeks, Pantaleon and Agathocles (*c.* 190 B.C.), which again inspired the later coins of Taxila with types on both sides.—In the first century of our era the Indo-Parthian dynasty of Gondophares (Gundophorus, of the Apocryphal Acts of St Thomas) reigned in Kandahar and Seistan and in India, and is represented by coins. About 25 B.C. the Kushanas (as the Yue-chi were called, after their most important tribe) conquered the remains of the Greek kingdom in the Kabul valley, and in the 1st century of our era they subdued the Punjab and the territory as far as the Jumna. The well-known gold coinage of the Kushanas (due probably to the influx of Roman gold into India) is begun by Hima Kadphises (*c.* A.D. 30–78; see Pl. IV. fig. 14). The best-known kings are Kanishka, Huvishka and Vasudeva. The types are interesting, combining deities of the Greeks, Scythians, the Avesta and the Vedas and Buddha. The Greek inscriptions become meaningless after *c.* A.D. 180. The coinage in gold (of Roman weight) and copper, however, continues probably as late as A.D. 425 in the Kabul valley and the Punjab. Of other dynasties contemporary with the Kushanas, the most important are: (i.) The Andhras, a south Indian power, with territory extending across the peninsula from the Kistna and Godavari deltas to Kolhapur. The coins are chiefly of lead, but copper and silver are also known. (ii.) the satraps of Surāshṭra and Mālwa, whose coinage (chiefly of silver) is copied from the half-drachms of the Greek princes of the Punjab; it lasts until the end of the 4th century. (iii.) Early in the 4th century the important imperial Gupta coinage begins with Chandragupta, and continues unbroken to the death of Skandagupta, *c.* A.D. 480. The empire at its greatest extent comprised the whole of north India, except the Punjab. The earliest gold coinage was derived from that of the Kushanas (see Pl. IV. fig. 15); later there was silver derived from the coinage of the satraps; the copper is more original in style. After *c.* A.D. 480 the empire broke up into various dynasties which lasted until A.D. 606. The Great Kushanas had been succeeded in Gandhāra (Kabul valley and Punjab) by the Kidāra Kushanas, and these, *c.* 465–470, were conquered by the Hūṇas (a branch of the Ephthalites or White Huns). The Hūṇa coinage consists almost entirely of imitations of Sassanian, Kushana or Gupta coins. Their power probably broke up *c.* A.D. 544. Of other ancient and medieval non-Mahommedan coinages in India the following may be mentioned: (1) Various series of dynasties reigning in Kanauj and Delhi, from the 7th to the 12th century. (2) Kashmir—coinage beginning probably as early as Kanishka and continuing with the same types (obverse, king standing, reverse, goddess seated) until the Mahommedan coinage in the 13th century. The coins are very rude; but the succession of the kings from *c.* A.D. 850 is fairly certain. (3) Later Shāhi coinage of Gandhara, especially the "bull and horseman" coins (*c.* A.D. 860–950). (4) Pāṇḍya, in the extreme south: this district used first the early punch-marked coins, then coins with a type on one side only, and later double-type coins; these are earlier than *c.* A.D. 300. There is a later gold coinage (type, fish) from the 7th to 10th century. (5) Cola: an earlier coinage, before *c.* A.D. 1022, with the Cola emblem, a tiger; the later coinage (obverse, king standing, reverse, king seated) influenced the coinage over most of south India. (6) Ceylon: a coinage of the rajas imitated from the Cola coins, from A.D. 1153 to 1296. (7) Chalukya coinage, chiefly of gold, in west Deccan and in Pallava country between the Kistna and Godāvari; the emblem is a boar. They range from the 7th to the 11th century. (8) Vijayanagar: this power preserved the old character of the coinage south of the Kistna long after the Mahommedan conquest had transformed the coinage north of that boundary. The later coinage of South India is too obscure to be dealt with here.

The Arabs in the first days of conquest had subdued Sind and founded an independent state on the banks of the Indus, which was ruled by them for nearly two centuries from 711; but it is hard to subdue India from this direction, and the strangers decayed and disappeared. The way into India was first really opened by the campaigns of Maḥmud of Ghazni (1001–1024) who annexed the Punjab and gave a raja to Gujarat. The Pathan kings came of the Ghuri stock which rose on the ruins of the empire of Ghazni (1186). Mohammad ibn Sām (d. 1206) made Delhi his capital, and here he and his successors, Pathans or slave-kings, ruled in great splendour as the first exclusively Mahommedan Indian dynasty, latterly rivalled by a line of Pathans of Bengal. Of the Pathans of Delhi (1206–1554) we have an abundant coinage, the principal pieces being the gold mohur of about 168 grains and the silver rupee of about the same weight, besides many pieces of bronze, and at one period of base metal. The coins are large and thick, with the profession of Islam or the style of the caliph on one side, on the other the name and titles of the reigning king. Moḥammad ibn Tughlak (1324–1351, Pl. IV. fig. 8) struck coins with a great variety of inscriptions, some in the name of the shadowy 'Abbāsid caliphs of Egypt, whose successors were for a time similarly honoured by later sovereigns. Towards the close of the rule of the Pathans several dynasties arose (about 1400) in central and southern India and struck similar money, the kings of Gujarāt, of Mālwā and the Bahmanids of the Deccan (1347–1526). The Pathan lines closed with Shēr Shāh, an Afghan, the last ruler of Bengal (d. 1539). Bābar, the Turki, of the family of Timur, seeking a kingdom, adventured (1525) on the conquest of Hindustan; and after long wars with Shēr Shāh, carried on by Bābar's son Humāyūn, the famous Shāh Akbar, grandson of the invader, was at length peaceably settled on the throne of Delhi, and he and his successors, the so-called Moguls of Delhi, practically subdued the whole of India. They retained the existing standard, but used the Arabic and Persian languages like the shahs of Persia. Akbar (1556–1605) issued a splendid coinage in gold and silver (Pl. IV. fig. 16), far more elegant than that of the Pathans, but the money of his son, Jahāngir (1605–1628) is still more remarkable. He issued the famous zodiacal mohurs and rupees, as well as those astonishing Bacchanalian mohurs on which he is represented holding the wine-cup (see Pl. IV. fig. 17). Scarcely less strange is the money of the beautiful queen Nūr-Jahān. Under Shāh Jāhān (1628–1659) there is a visible falling away in the merit of the coins, and an ordinary modern style is reached in the reign of Aurungzib (1659–1707). To the close of the rule of Shāh 'Alam, the last Mogul who actually reigned (1759–1806), gold and silver money is abundant. Much of the money of the East India Company is closely imitated from this late Mogul coinage. Latterly, native states coin with Arabic and also with Sanskrit inscriptions. The most important are the kings of Oudh, the nizams of the Deccan, and the kings of Mysore, besides the maharajas of Indore and the kings of Nepāl. The coinage of Tipu Sultān (Tippu Ṣāhib) is extremely curious from his innovations in the calendar. Besides these there are a multitude of small states. Most of the Indian princes acknowledged the emperor of Delhi, but some struck independently. At last the English coinage of India has swept away nearly all these moneys, though some native states still issue their own.

We must be content with the briefest summary of the strange coinages of China and the Further East.

China. The money of China, more certainly than the square punch-marked coinage of India, may claim an origin independent of the Lydian and Greek issues. Although "money" is mentioned in Chinese literary sources as having been in use from a very early period (3rd millennium B.C.) it is probable that before the 7th century B.C. it consisted either of uncoined metal or of other media, such as silk, tortoise-shell, cowries. The shell-currency indeed played a very important part in China even in later times. It was suppressed in 335 B.C., but the usurper Wang Mang, whose reign (A.D. 9–23) separates the two Han dynasties, made an abortive attempt to revive it. The earliest metal currency of which specimens are extant is, like nearly all subsequent Chinese money, of cast bronze. The gold and silver currency, which appeared sporadically, can never have been of much importance; a *kin*, or cubic inch, of gold, representing currency of Han times, is preserved in the Paris collection. The bronze coins fall into two main classes. The earlier (as a rule) have the shape of implements, such as spades, knives, &c.; the later are the well-known round "cash" with a square hole in the centre (see Pl. IV. figs. 18, 19). They are carried strung together, and their value is minute. From the earliest knife-money should be distinguished that of Wang Mang; his coins are short and thick, and the plain ring at the end of the handle is replaced by a piece resembling in shape a cash with ring and square central hole. The older knife-currency practically came to an end with the foundation of the Ts'in dynasty in 221 B.C., though it doubtless lingered on in remote districts. With this dynasty appears the first organized state mintage. Nevertheless the economic history of Chinese coinage continues to be a melancholy record of doubtful financial expedients, debasement and forgery. The value of the coins was supposed to depend on their weight; but the weight inscribed on them was by no means always the true one. The bronze coinage from the reform of Wu-ti in 138 B.C. down to A.D. 622 is fairly uniform; it is chiefly cash of 5 chu (see Pl. IV. fig. 18). Iron money was issued at various periods. The disturbance of the coinage by the usurper Wang Mang has already been noted. The modern coinage may be said in a sense to date from the introduction of the *K'ai yuan* pattern of 7½ chu under the T'ang dynasty in A.D. 622. On the reverse of this coin was a mark (supposed to have been made by the empress Wen-teh in touching with her nail the wax model submitted to her) which has been much copied on coins of other countries in the Far East (see Pl. IV. fig. 19). From this time to the present there has been little change. Paper-money was introduced in the 9th century. The modern cash usually bears on the obverse the name of the reign and the words *t'ung pao* ("current money"), on the reverse the name of the mint. The coinage under the present (Manchu) dynasty has been regular, except during the Taiping rebellion, when some iron coins and copper tokens were issued, owing to the failure of the copper supply. Gold and silver have not been issued by the government until quite recent times (see below), with one or two unimportant exceptions, but circulate by weight. Imitations of Spanish and Mexican dollars, bearing numerous punch-marks placed on them by successive owners, are common. The most interesting Chinese coins are those of small rival dynasties and of rebels, the study of which is important for the elucidation of the obscurities of the history of the country. The Chinese medals are talismans, usually larger than coins, and bear both subjects and inscriptions. They are distributed by Taoist and Buddhist priests of temples. The money of Korea and Annam is similar to that of China, and Chinese coins were long the currency of Java, which more recently has issued the money of its Mahommedan princes.

Japan. The empire of Japan shows in its coinage that Chinese source modified by the influence of native independence which marks all its institutions. The use of a metallic currency probably began in the 5th century of our era. In character the coins show strong Chinese influence. Amongst the earliest are rude silver pieces, disks of somewhat irregular shape, with a central hole, attributed to the early 5th century; and there are also copper coins of similar character dating from the end of the 7th century. A regular copper coinage, Chinese in pattern, began with the exploitation of the copper mines in A.D. 708. There was a silver coinage in A.D. 760, and a gradually deteriorating copper currency was issued at various dates down to A.D. 958. The twelve varieties issued in these two and a half centuries are known as the twelve antique sen (see Pl. IV. fig. 20). No copper was issued by the government for six hundred years after this date; but coins of the old patterns in lead or tin circulated down to 1302. The lack of copper was supplied by the importation and imitation of Chinese cash. These imitations were due to the great nobles, who made them on their own domains. At the end of the 16th century (*Ten-sho* period) a regular currency of gold, silver and copper, and also iron was instituted, which lasted, with modifications, down to recent times (iron coins with wave-pattern reverse being cast as late as 1860). There is a billon coinage of bean-shaped pieces issued at various dates from 1601–1859. Silver also was frequently issued on the same pattern as the copper coinage; but the greater part of it circulated in ingots or plates. The small oblong pieces known as ichi-bu and ni-bu belong to the 19th century (not issued after 1868). Large plates of silver, like the gold coins to be mentioned immediately, were issued in the 16th century by some provinces. Round coins of gold of the Chinese shape were rarely cast (one in A.D. 760, another in A.D. 1599). But from the 16th century to modern times gold circulated chiefly in large oblong plates, with rounded angles, varying from over 6½ to ⅝ in. in length. These are called *o-ban* ("large plate" of 10 ryo), *ko-ban* ("small plate" of 1 ryo; see Pl. IV. fig. 21), &c. They bore various countermarks, including the mikado's crest, mint-assayer's test-marks, &c.; some bear the attestations merely written in ink (a device of the imperial officials, who charged fees for the attestations, and were not sorry that they should be easily obliterated). Small gold oblong pieces were cast at various times from 1601–1856 (Pl. IV. fig. 22). A European system of currency, with coins in gold (20 yen and under), silver (1 yen and under), nickel (5 sen) and copper (2 sen and under), was adopted in 1870. Japan has also "picture sen" (E-sen) of a magical and religious character like the temple medals already noticed under China.

Korea. Korea has had a copper coinage of Chinese style from the beginning of the twelfth century during its intervals of independence; but its coins do not become common until 1790. During the 19th century it issued an extensive copper coinage from various mints.

Annam. The earliest coins of Annam were imitations of Chinese coins, but since the 10th century its kings have issued a regular coinage bearing their regnal titles as in China. Since 1820 round and oblong silver coins have been struck, the tael and its subdivisions. Peculiar to Annam are the fine series of medals in gold, silver and copper struck since 1841 by its kings for presentation purposes, bearing lucky inscriptions, quotations from the Chinese classics, &c.

Burma, Malay Peninsula, &c. The peculiar forms of primitive currency characteristic of certain parts of Further India and the Malay Peninsula can only be barely mentioned here. Burma provides silver-money in the shape of snail-shells (a relic of a still more primitive shell-currency). The earlier Siamese ticals are derived from a ring of silver wire doubled up and countermarked. From Pahang come very curious tin "hat coins," shaped like a hollow square pyramid, truncated, with broad, square brim projecting from its base. The peoples of the Indian Ocean and Persian Gulf used in the 16th and 17th centuries pieces of silver wire called larins which in Ceylon took the shape of fish-hooks.

V. Coins of the Present Day

United Kingdom.—The standard of gold and silver has remained unchanged for over two hundred years, and until 1887 the denominations were practically the same as instituted at the great recoinage of 1816. The substitution of a bronze for a copper currency had already taken place in 1860. On the occasion of Queen Victoria's Jubilee in 1887 it was determined to mark the event by a new coinage of gold and silver, and to revise the royal portrait. Two new denominations of five and two pounds were added to the gold series, and the double florin to the silver. For the reverse type of all the gold and of the five-shilling piece, Pistrucci's design of St George and the Dragon was used, and former types of Anne and George IV. were revived for the double florin, florin, half-crown and sixpence; that of the last was, however, soon abandoned. This new coinage did not meet with general approval, especially as regards the portrait of the Queen, and in consequence a third portrait was

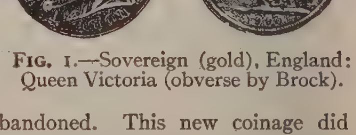


Fig. 1.—Sovereign (gold), England: Queen Victoria (obverse by Brock).

adopted for the gold and silver in 1893, new reverse types were prepared for the half-crown, florin and shilling, and the issue of the double florin was discontinued. The portrait of the queen was the work of the sculptor Thomas Brock, R.A., who was careful to avoid the defects which had been somewhat severely criticized in Sir J. Edgar Boehm's design of 1887. The new type for the half-crown, a spade-shaped shield within the garter, was also executed by Mr Brock; and those for the florin and shilling, three shields placed triangularly, were by Sir Edward Poynter. In 1895 a new issue of bronze money was ordered, when the queen's bust of 1893 was adopted, and a slight alteration made in the reverse type, the representation of a lighthouse and a ship, which had been added to the design in 1860, being eliminated. The coinage of Edward VII. differed but slightly from that of Queen Victoria. The denominations were the same; but on the obverse the head of the king (by G. W. de Saulles, engraver to the Mint) was represented bare, the title "Britanniarum" was changed to "Britanniarum Omnium Rex," the reverse of the florin showed Britannia standing on a ship, and that of the shilling the royal crest, the lion on a crown, as on the so-called "lion-shillings" of 1826. The designing of the new coinage of George V. was entrusted to Mr Bertram Mackennal.

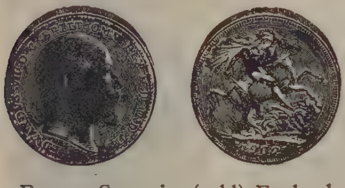


FIG. 2.—Sovereign (gold), England: King Edward VII. (obverse by de Saulles).

France.—On the establishment of the Third Republic in France in 1870, the coinage was continued on the same lines as before, the types only being altered. The silver franc of 5 grammes (78 grains) as ordered in 1793 and confirmed by the Latin Monetary Union of 1865, which included Belgium, Italy and Switzerland, and subsequently in 1868 Greece, has remained the unit of value. The denominations ordered were, in *gold*, the 100, 50 and 20 francs; in *silver*, the 5, 2 and 1 franc, and 50 and 20 centimes; and in *bronze*, the 10, 5, 2 and 1 centime. The types adopted were those which had been used previously—thus for the gold that of a genius inscribing the tables of the law, as designed by Augustin Dupré for the reverse of the constitutional coinage of Louis XVI.; for the silver and copper the head of the Republic as executed by Oudiné for the money of 1848. Subsequently, in 1871, the type of the 5 francs was changed for that of Hercules leaning on Liberty and Strength, as made by Dupré for the First Republic. In 1889 the 10 francs in gold was added to the list, having the head of the Republic crowned with corn, the work of Merley for the Republic of 1848; but only a small number of these coins was struck in that year and in 1895. No further alteration was made till after 1895, when, in consequence of suggestions that the types should be modified so as to mark the Third Republic, the artists Chaplain, Roty and Dupuis were commissioned to execute new designs—the first for the gold, the second for the silver, and the last for the bronze. The types approved were: for the gold 20 francs, the head of the Republic with a Phrygian cap, and the Gallic cock; for the silver 2 and 1 franc and 50 centimes, the sower sowing, with the rising sun in the background, and a laurel branch; and for the bronze, the bust of the Republic wearing a Phrygian cap, and on the reverse France seated amidst clouds, holding a branch and a flag, and accompanied by a genius. These coins were not issued simultaneously—the 50 centimes appearing in 1897, and 2 and 1 franc and 10, 5, 2 and 1 centime in 1898, and the 20 francs in 1899. In 1903 a nickel piece of 25 centimes was introduced, since 1904 with a polygonal edge to facilitate distinction from the silver. The quartering of the franc is a departure from the strictly decimal system, also adopted in Italy. These later coins are characteristic of modern French medallic art, which has a strong tendency to imitate that of Italy of the 16th century.

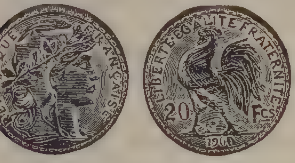


FIG. 3.—Twenty Francs (gold), France (Chaplain).

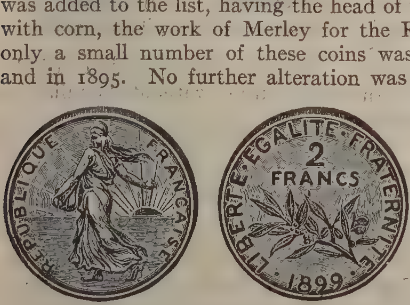


FIG. 4.—Two Francs (silver), France (Roty).

Belgium.—Of the other states which formed the Latin Monetary Union, Belgium had already in 1832 adopted the French decimal and bimetallic system, with the franc as the unit of value. Her accession to the Union, therefore, only entailed a slight modification of type and denominations, which latter were the same as in France, except that the only gold coin was the 20 francs, the 25 centimes in silver was not issued, and the pieces of 10 and 5 centimes are now in nickel. The gold and silver coins have for types the head of the king and the royal shield, those in nickel the Belgic lion and mark of value, and those in bronze the royal monogram and the lion holding the tables of the constitution. Some of the silver coins have the inscriptions in Flemish. The nickel coinage introduced in 1902 is perforated in the centre to prevent confusion with silver.

Switzerland.—Like Belgium, Switzerland had before her adhesion to the Latin Monetary Union adopted the French system, with the franc of 100 centimes or rappen as the unit of value. The denominations in gold and silver were the same as issued for Belgium, but no gold was struck before 1883. The coins of baser metal were the 20, 10 and 5 centimes in billon, which metal was in 1879 changed for the nickel, and in copper the 2 and 1 centime. Certain changes of type have from time to time occurred. The first issue of the 20 francs in 1883 shows the head of the Republic and the shield of the Confederation; but this was changed in 1897 for the head of Helvetia above a range of mountains, and on the reverse a wreath with mark of value. On the silver coins from 1874 Helvetia is represented standing instead of seated, and on the nickel money of 1879 the shield of the Republic is replaced by the head of Helvetia. The mark of value and a wreath form the general reverse type of all the silver, nickel and copper coins. Since 1888 a 5-franc piece, similar in type to the 20 francs of 1883, has been issued.

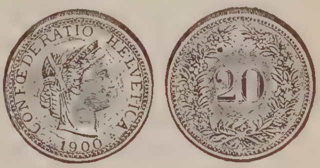


FIG. 5.—Twenty Centimes (nickel), Switzerland.

Italy.—When Italy joined the Latin Monetary Union in 1865, she adopted as the unit of her coinage the lira of 100 centesimi, equal to the franc. The coins were of gold, silver and bronze, and of the same denominations as those struck in Belgium and Switzerland. In 1894 a nickel coinage of 20 centesimi was ordered. The general type for all the coinage is the head of the king and the royal arms, but on the reverse of the copper is the mark of value; and the nickel money has on the reverse a crown with a wreath. A new nickel piece of 25 centesimi indicates a departure from the strictly decimal system. The coinages of all the small Italian states, including the Papal, have now passed out of currency.

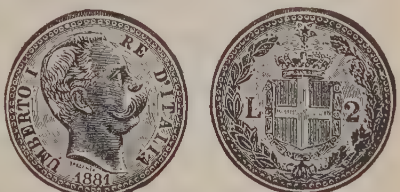


FIG. 6.—Two Lire (silver), Italy.

Greece.—A special stipulation was made, when Greece was enrolled in the Latin Monetary Union in 1868, that all her money should be struck at a French mint. The unit of the coinage is the drachm of 100 lepta, which, like the lira, is equivalent to the franc. The denominations are—in *gold*, the 100, 50, 20, 10 and 5 drachms; in *silver*, the 5, 2 and 1 drachm, and 50 and 20 lepta; and in *bronze*, the 10, 5, 2 and 1 lepton. In 1893 nickel was substituted for bronze, and coins of the value of 20, 10 and 5 lepta were issued in this metal. The types of the coins of Greece are similar to those of Italy. Crete has had since 1900 a coinage of its own similar to the Greek (silver of 5, 2 drachmae, 1 and ½ drachma; bronze and nickel of 20, 10, 5, 2 lepta and 1 lepton).

Germany.—Since 1871 the coinage of the German empire has been entirely remodelled. By a convention in 1857 between the states of Germany, north and south, and Austria a general coinage of a silver standard was established on the basis of the new pound of 500 grammes as sanctioned by the *Zollverein*. The contracting countries were divided into three sections, North Germany, South Germany and Austria. From the pound of fine silver of 500 grammes the Northern States struck 30 thalers, Austria 45 florins and the Southern States 52½ florins; their relation being 1 North German thaler = 1½ Austrian florins = 1¾ South German florins. The free towns of Hamburg, Lübeck and Bremen did not join the convention. The first reform in the coinage of the German empire occurred in 1871, when a new gold money was introduced, which had for its unit the silver mark (a money of account) of 100 pfennigs weighing 5·555 grammes. The new gold pieces were of the value of 10 and 20 marks, called crowns and double crowns, and the fineness was $\frac{9}{10}$ pure to $\frac{1}{10}$ alloy. This new issue necessitated a readjustment of the current values of the various silver coinages in circulation. In 1873 a further step was made by the introduction of an entirely new silver coinage throughout the empire, which was also based on the silver mark, and of a new base metal coinage in nickel and bronze. The silver coins were the 5, 2 and 1 mark and 50 and 20 pfennigs; those in nickel the 10 and 5 pfennigs, and in bronze the 2 and 1 pfennig. The silver coins were, like the gold, $\frac{9}{10}$ fine, so that 90 marks were struck to the pound of pure metal. The gold 5 marks was struck in 1877 and 1878, and the 20 pfennigs in silver was replaced by a coin of the same value in nickel in 1886. The reverse type for all the coins is the imperial eagle, but that of the obverse varies; the gold and silver showing the portrait of the reigning king or prince, but the mark, and all lesser denominations, the current value. An exception was made in the case of the coinage of the Free Towns struck at Hamburg, which has the arms of the city instead of a portrait. Each state retained its full rights of coinage, and the various mints throughout the empire with their special marks are: Berlin, A; Hanover, B; Frankfort, C; Munich, D; Dresden (removed since 1877 to Müldner-Hütte), E; Stuttgart, F; Karlsruhe, G; Darmstadt, H; and Hamburg, J. In 1876 a gold standard was proclaimed, and henceforth no person was legally bound to accept in payment more than 20 marks in silver and the value of 1 mark in nickel or bronze. The old thalers (worth 3 marks) still circulate.

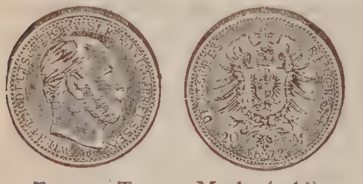


Fig. 7.—Twenty Marks (gold), Germany.

Austria-Hungary.—After the convention of 1857 with Germany (see above), when Austria based her coinage on the silver standard of the florin, two series were issued—(i.) Vereinsmünzen (money of the union), in *gold*, the crown and half-crown; in *silver*, the double thaler (= 3 florins) and thaler; (ii.) Landesmünzen (money of the state), in *gold*, the 4 and 1 ducat; in *silver*, the double florin and florin; in *billon*, the 20, 10 and 5 kreuzers; and in *copper*, the 4, 3, 1 and ½ kreuzer. In 1868 Austria abandoned the convention, but made no change in her money; and in the same year the coinage of Hungary was made uniform with that of the empire, both in standard and denominations. In 1870 the Vereinsmünzen crown and half-crown were discontinued, and their place was taken by 8- and 4-florin pieces which were of the current value of 20 and 10 francs. In 1892 the monetary system of Austria-Hungary was entirely reformed on a gold standard, the unit of account being the crown of 100 hellers. This is a decimal coinage, and the denominations are, in *gold*, the 20 crowns (of 164 from the kilogramme of fine gold), 10 crowns and ducat (= 9 silver crowns 60 hellers); in *silver*, the crown (= 10d.) and half-crown; in *nickel*, the 20 and 10 hellers; and in *bronze*, the 2 and 1 heller. The gold ducat was a trade-money (Handelsmünze) of the current value of 10 francs, and it displaced the 8- and 4-florin pieces of 1870. The types of the Austrian and Hungarian coins somewhat vary. The Austrian gold coins show the head of the emperor and the two-headed eagle, but those of Hungary a full-length figure of the emperor and the national shield surmounted by the crown of St Stephen held by angels. The silver coins of both series have the head of the emperor and the mark of value under the imperial or royal crown. The nickel and bronze money of Austria displays the imperial eagle on the obverse, whilst that of Hungary has the crown of St Stephen. The legends are respectively in Latin and Magyar.

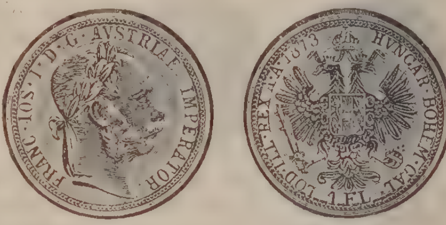


Fig. 8.—Florin (silver), Austria-Hungary.

Spain.—The unit of the Spanish coinage from 1864 to 1868 was the silver escudo of 200 grains divisible into 10 reals. On the dethronement of Isabella in 1868 the provisional government adopted the principles of the Latin Monetary Union and made the peseta the unit of account, this coin being equivalent to the franc. The coins struck during 1869–1870 were, in *gold*, the 100 pesetas; in *silver*, the 5, 2 and 1 peseta, and the 50 and 20 centimos; and in *bronze*, the 10, 5, 2 and 1 centimo. The obverse type of each metal varied; on the gold Spain is standing; on the silver she is reclining; and on the bronze she is seated. During his short reign (1870–1873) Amadeus I. struck only gold coins of 100 and 25 pesetas and silver of 5 pesetas, and there was practically no money issued during the republic which followed his abdication. Don Carlos during the insurrection of 1874–1875 struck 5 pesetas in silver and 10 and 5 centimos in bronze bearing his portrait and title "Carolus VII." After the restoration of Alphonso XII. the coinage consisted of 25 and 10 pesetas in gold; 5, 2 and 1 peseta and 50 centimos in silver; and 10 and 5 centimos in bronze. This coinage was continued under Alphonso XIII., but in 1887 the 20 pesetas in gold was substituted for the 25 pesetas, and in 1897 large coins were struck of 100 pesetas. The types show the head of the king on the obverse and the shield with or without the pillars of Hercules on the reverse.

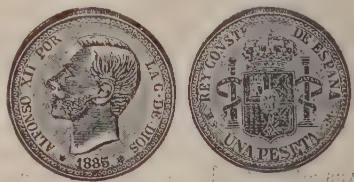


Fig. 9.—Peseta (silver), Spain.

Portugal.—A gold standard was adopted by Portugal in 1854, the unit of value being the milreis of 1000 reis. The coins are, in *gold*, the crown or 10 milreis and the half, fifth and tenth crown or milreis; in *silver*, the 10, 5 and 2 testoon; in *nickel*, the 100 and 50 reis; and in *bronze*, the 20, 10 and 5 reis. The general type of the gold and silver is the head or bust of the king and the royal shield; but the bronze varies in having on the obverse a shield and on the reverse the mark of value.

Denmark, Sweden and Norway.—Previous to 1872 in Denmark the unit of value was the silver *rigsbankdaler* of 96 skillings; in Sweden, the *rigsdaler* of 100 öre; and in Norway, the *species-thaler* of 120 skillings; but in that year a monetary convention was concluded between these countries establishing a decimal coinage, which had for its unit the krone of 100 öre, and of which the standard was gold. The denominations are, in *gold*, the 20, 10 and 5 kroner; in *silver*, the 2 and 1 krone, and 50, 25 and 10 öre; and in *bronze*, the 5, 2 and 1 ör. The gold and silver money of Sweden and Norway to the 50 öre bears the head of the king and the royal shield; the silver of smaller denominations and the bronze, the monogram of the king and the mark of value. Since the separation of the two kingdoms in 1906, Norway has a coinage of its own in the name of Haakon VII. In Denmark the gold and silver have the head of the king, and, for reverse type, a figure of Denmark, a shield, or the mark of value. The bronze coins are similar to those of Norway and Sweden.

Russia.—The Russian coinage previous to 1885 was based on the silver rouble of 278 grains of pure metal; but during the greater part of the reign of Alexander II. (1855–1881) the currency consisted almost entirely of paper money. In 1885 Alexander III. determined to place the coinage on a proper footing, and introduced the rouble of 100 copeks as the unit of account, with a relative value of gold and silver of 1 to $15\frac{1}{2}$. The coins issued were, in *gold*, the imperial of 10 roubles, and the half-imperial; in *silver*, the rouble, and the 50, 25, 20, 15, 10 and 5 copeks; and in *copper*, the 5, 3, 2, 1, $\frac{1}{2}$ and $\frac{1}{4}$ copek. In 1897 the relative value of gold and silver was advanced to 1 to $23\frac{1}{4}$, thus raising the current value of the imperial to 15 roubles; but no change was made in the weights of the coins, and the silver rouble remained the unit of account. In the same year a piece of 5 roubles, called the one-third imperial, was added to the gold coins. The general types of the gold and silver show the head of the emperor and the imperial eagle; and of the copper, the imperial eagle and mark of value.

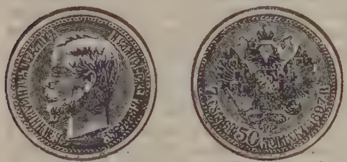


FIG. 10.—Seven and one-half Roubles (gold), Russia.

Georgia, Poland and Finland.—The separate issues of Georgia and Poland were suppressed in 1833 and 1847 respectively; but Finland in 1878 established a decimal coinage of gold, silver and bronze on the principles of the Latin Monetary Union, having the *markhaa* (=1 franc) as its unit of value.

Turkey.—There has been practically no change in the money of the Ottoman empire since the reforms of Abdul-Medjid in 1844, when the piastre, or 40-para piece, of the current value of $2\frac{1}{4}$d., was made the unit of the coinage; 100 piastres go to the gold medjidieh or pound. The denominations are, in *gold*, the 500, 250, 100, 50 and 25 piastres; in *silver*, the 20, 10, 5, 2, 1 and $\frac{1}{2}$ piastre; and in *copper*, the 40, 20, 10, 5 and 1 para. The type in all metals is, on the obverse, the Sultan's *tughra*, or cipher, and on the reverse, a wreath, and the name of the mint, date, &c.

Balkan States.—Since the dismemberment of the Ottoman empire the kingdoms of Rumania and Servia, and the principality of Bulgaria, have each adopted the decimal system of the Latin Monetary Union. In Rumania the unit of account is the *leu* of 100 *bani*; in Servia, the *dinar* or 100 *paras*; and in Bulgaria, the *lev* of 100 *stotinki*—each of these units being the equivalent of the franc. In all these states gold, silver, bronze and nickel is current money.

United States.—In America the most important event connected with the coinage was a change of standard. (See MONEY). Previous to 1873 the standard was silver, having for its unit the dollar of $412\frac{1}{2}$ grains of $\frac{9}{10}$ fine; but in that year a gold standard was adopted, the gold dollar of 25·8 grains and $\frac{9}{10}$ fine being the sole unit of value. This change of standard was accompanied by a slight modification of the denominations, which became, in *gold*, the double-eagle, eagle, half and quarter eagle, three dollars and dollar; in *silver*, the half and quarter dollar, 20 cents and dime; in *nickel*, the 5 and 3 cents; and in *bronze*, the cent. In addition to these a silver piece called the "trade dollar" of 420 grains was struck, not for circulation in the States, but for export to China. The following changes have since occurred: In 1878 the silver dollar of $412\frac{1}{2}$ grains was resumed, and the 20 cents discontinued; in 1887 the issue of the "trade dollar" was suspended; and in 1890 the same fate befell the three dollars and dollar in gold, and the three cents in nickel. The types are—*gold*, head of Liberty and eagle; *silver*, head of Liberty, or Liberty seated, and eagle, except the dime, which has the mark of value; *nickel*, shield (5 cents) and head of Liberty; *bronze*, head of an Indian, and (1910) bust of Lincoln; with reverse types for either metal, the mark of value.

Canada, &c.—The currency for the Dominion of Canada, which includes Nova Scotia, New Brunswick and British Columbia, is of silver and bronze, based on the system of the United States. The denominations are 50, 25, 20, 10 and 5 cents in silver, and the cent in bronze; and they also have a uniform type of the sovereign's head and mark of value. The same system prevails in Newfoundland, which also issues the double dollar in gold: this is the only gold coin issued in a British colony whose standard is not the same as that of the mother country. There is a separate coinage for Jamaica, but of nickel only, and consisting of the penny, halfpenny and farthing.

Mexico, &c.—We need not give any detailed account of the coins of Mexico, and of the various states of Central and South America, in nearly all of which there have been radical changes since 1870. Most of them have adopted the decimal system, with a gold, silver or bi-metallic standard; the unit of value in the gold standard being generally the peso of 3·225 grammes, and in the silver also the peso, but of silver of 20, 25 or 27 grammes.

India.—As to the coins of the East and Far East, we will limit our remarks to the more important countries. In British India the rupee of silver of 150 grains is still the unit of value. In 1893 the mints were closed to the unrestricted coinage of silver for the public. In 1899 they were opened to the free coinage of gold, the sovereign being declared legal tender. At present £1=15 rupees of 1s. 4d.; 1 rupee=16 annas; 1 anna=4 pice; 1 pice=3 pie=1 farthing.

Persia.—In Persia since 1879 a decimal system in conformity with the principles of the Latin Monetary Union has been adopted, having for its unit the *krān* weighing 78 grs., thus being equivalent to the franc, but since reduced to 71 grs. or even less. The denominations are: in *gold*, the 10, 5, 2, 1, $\frac{1}{2}$ and $\frac{1}{4}$ toman (the toman=10 krāns); in *silver*, the 5, 2 and 1 krān (=20 shahis), and the 10 and 5 shahis; and in copper, the 4, 2 and 1 shahi (=2 pals), and the pal.

Japan.—Since 1870 Japan has formed its coinage on the European decimal system in place of the ancient national coins, the *obangs* and *itsibus*, the unit being the *yen* of 100 *sen*. The standard was bimetallic, and the relation of gold and silver stood at 1–16·17. In 1898 a gold standard was adopted, the issue of the silver yen was suspended, and the weight of the gold money was reduced by one-half. The coins issued since that date are, in *gold*, the 20, 10 and 5 yen; in *silver*, the 50, 20 and 10 sen; in *nickel*, the 5 sen; and in *bronze*, the sen and half-sen. There is one general type for all the silver, nickel and bronze coins, being the dragon on the obverse and a wreath of flowers with mark of value on the reverse. The gold varies in having flags and flowers on the reverse. On the silver and bronze coins the legends are in English as well as in Japanese.

China.—In 1890 China followed the example of Japan, but only to a limited extent, and instituted a silver coinage having as its unit a dollar of the same value as the United States silver dollar and the Japanese yen. It is calculated in fractions of the *tael*, a money of account of the value of 2s. $11\frac{3}{4}$d. The coins are the dollar, and the 50, 25, 10 and 5 cents, with the Chinese dragon and inscriptions, mint and mark of value in English on the obverse, and on the reverse the mark of value in Chinese and Manchu. They were first struck at Canton and Wei-Chang, but later other mints have been established. These are not, strictly speaking, imperial money, the sole official coinage and monetary unit being the copper cash. A decree of the 20th of November 1905 proposed to establish an official dollar on the basis of the Kuping tael. An edict of May 1910 provides for a standard currency dollar of 72 candareens, with a subsidiary decimal coinage in silver, nickel and copper, for circulation throughout the empire.

Korea has had since 1905 a new coinage on the Japanese system, but with the Korean date.

Hong Kong.—The only other Asiatic coinage we shall note is that of Hong Kong, where in 1866 was established a coinage, which was also based on the United States standard, having the silver dollar as its unit. The denominations are the dollar and 50, 20 and 5 cents in silver, and the cent and mill in bronze; and, with the exception of the mill, they all have for type the sovereign's head and the mark of value. In connexion with this coinage there was issued in 1895 a "trade dollar" for special currency in the Straits Settlements and Hong Kong in lieu of the Mexican dollar, the scarcity of which was a considerable hindrance of trade. This coin, which was struck at the Bombay mint, shows on the obverse Britannia holding a trident and shield, and on the reverse within an ornamental design the denomination in Chinese and Malay. Since 1903, however, a new special dollar with the king's head has been issued for the Straits Settlements.

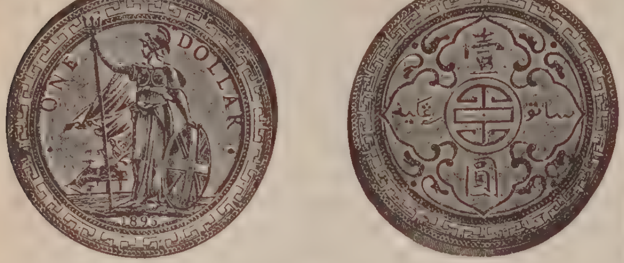


FIG. 11.—" Trade Dollar " (silver), Hong Kong.

Egypt.—Glancing cursorily at the coinage of Africa, we may note that since 1885 Egypt has adopted a gold standard with the gold pound of 100 piastres as the unit of account. The piastre is no longer divisible into 40 paras, but into 10 *ochr-el-guerche* or tenths. The types are similar to the Turkish money, and though bearing the legend " struck at Cairo " the coins are really made at Birmingham. For some years gold has not been issued.

Abyssinia.—In Abyssinia since 1893 there has been a silver coinage, but the Austrian Maria Theresa dollar is still current. The new coins are, in silver, the talari (=dollar, worth about 2s.), $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$ talari, and in copper, the guerche, and $\frac{1}{2}$ and $\frac{1}{4}$ guerche. They show on one side the head of the king, and on the other a lion holding a banner.

Zanzibar.—Zanzibar has also issued a dollar of the fixed value of 2 rupees and 2 annas, and a copper coin called a *pessa* (=136th of a dollar).

Sudan.—The African coinages which have attracted exceptional attention are those of the Sudan and the South African Republic. The former dates from 1885, when the Mahdi struck the pound of 100 piastres in gold and the 20 piastres in silver, of the same type as the Egyptian coins, but on the silver piece were placed the words " By order of the Mahdi," but no mint name. His successor, Abdullah, struck pieces of 20, 10, 5, 2 and 1 piastre in silver and 10 paras in copper, but no gold. They bear the name of the mint, Omdurman, and the word *makbul*, *i.e.* accepted. At first the silver coins were of 6 parts silver and 2 copper, but in a few years they were so debased that they degenerated into mere pieces of copper washed with silver. The last issue is dated 1897 (A.H. 1315).

Congo Free State (*Belgian Congo*).—The coinage issued since 1887 consists of silver of 5, 2, 1 fr. and 50 centimes, and copper (with central hole) from 10 centimes to 1 centime.

Transvaal.—The first attempt at a separate coinage in the Transvaal was in 1874, when President Burgers issued sovereigns or pounds showing his portrait on the obverse and the shield of the Republic on the reverse. They were struck by Messrs Heaton of Birmingham, but as each piece of the current value of 20s. cost 26s. to strike, only £680 worth was issued, and but few of these passed into circulation, being preserved as curiosities. No further attempt was made till 1891, when President Kruger induced the Raad to order a coinage in gold, silver and bronze after the English standard. The first issue occurred in 1892, and consisted of the pound and half-pound in gold; the crown, half-crown, florin, shilling, sixpence and threepence in silver; and the penny in bronze. They are all of the same type as the pound of 1874, but with the portrait of President Kruger on the obverse. The first issue of the pound, half-pound and crown was minted at Berlin, and a curious mistake was made in the arms of the state, the wagon being represented with two shafts instead of with one. This blunder was soon noticed, and a recoinage took place in the same year at Pretoria. Since the annexation British coins have been legal tender, but a new copper coinage was approved in 1904.

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(R. S. P.; H. A. G.; G. F. H.*)

NUMMULITE, NUMMULITES, A. d'Orbigny's name for a genus of Perforate Foraminifera (*q.v.*), distinguished by the flattened, lenticular discoid shell of many turns, finely perforated; chambers subdivided by incomplete septa into squarish chamberlets. This genus is especially abundant in Eocene Limestones, which attain great thickness around the Mediterranean basin; the Pyramids of Egypt are built of it.

NUN (O. Eng. *nunne*, from Lat. *nonnus*, *nonna*, familiar terms for an old man or woman), a member of a community of women, living under vows a life of religious observance (see Monasticism). In ecclesiastical Latin *nonnus* was used by the younger members of a religious community for their elders, and so, in the *regula* of St Benedict, cap. 62, *Juniores autem Priores suos nonnos vocant quod intelligitur paterna reverentia* (Du Cange, *Glossarium*, *s.v. nonnus*). While *nonna* has remained as the generic name of a female religious, *nonnus* has been replaced by *monachus* and its various derivatives (see Monk).

NUNATAK, a name applied in Greenland (and thence extended in use elsewhere) to a hill or mountain peak appearing above the surface of a glacier. Greenland is for the most part covered by an ice-cap of a certain thickness which moves slowly downwards to the sea. It will rise upwards and pass over a barrier if there is no outlet, but it will flow between and around mountain peaks leaving them standing as hills (nunataks) above the general surface of the ice-cap. These prominences are sometimes covered with arctic vegetation, and arctic flowers bloom freely upon them in the summer.

NUNCIO, or Nuntius Apostolicus, a representative of the pope sent on diplomatic mission. The nuncios are of lower rank than the *legati a latere*, but have practically superseded them as ambassadors of the papacy. Nuncios were permanently established at various courts and ecclesiastical centres during the 16th century. According to the decision of the congress of Vienna the diplomatic rank of a papal nuncio corresponds to that of an ambassador. The powers of a nuncio are limited by his instructions. If a cardinal, as rarely is the case, he uses the title pro-nuntius. The pro-nuntius at Vienna has practically the position of a *legatus a latere*.

NUNCOMAR or Nanda kumar (d. 1775), Indian official, best known for his connexion with Warren Hastings (*q.v.*), was governor of Hugli in 1756, and in 1764 he was appointed collector of Burdwan in place of Hastings, which resulted in a long-standing enmity. In 1775, when Hastings was governor-general, Nuncomar brought accusations of peculation against him, which were entertained by Francis and the other members of council inimical to Hastings. While the matter was still pending Nuncomar was indicted for forgery, condemned and executed. Warren Hastings and Sir Elijah Impey, the chief justice, were both impeached, and were accused by Burke and afterwards by Macaulay of committing a judicial murder; but Sir James Stephen, who examined the trial in detail, states that the indictment for forgery arose in the ordinary course, was not brought forward by Hastings, and that Impey conducted the trial with fairness and impartiality.

See Sir James Stephen, *The Story of Nuncomar* (2 vols., 1885); and, for another treatment of the case, H. Beveridge, *The Trial of Nanda Kumar* (Calcutta, 1886).

NUNEATON, a market town and municipal borough in the Nuneaton parliamentary division of Warwickshire, England, on the river Anker, a tributary of the Tame, and on the Coventry canal. It is an important junction of the London and North

Western railway, by which it is 97 m. N.W. from London, and it is served by the Leicester-Birmingham branch of the Midland railway. Pop. (1901) 24,996, rapidly increasing. The situation is low and almost encircled by rising ground. The church of St Nicholas is a large and handsome structure in various styles of architecture, and consists of nave, chancel and aisles, with a square embattled tower having pinnacles at the angles. It contains several interesting monuments. A free grammar school was founded in the reign of Edward VI., and an English free school for the instruction of forty boys and thirty girls by Richard Smith in 1712. The ribbon industry is of less importance than formerly, but there are ironworks, cotton, hat, elastic and worsted factories, and tanneries; the making of drain-pipes, tiles and blue and red bricks is a considerable industry. In the neighbourhood there are also coal and ironstone mines. The prefix of the name of the town is derived from a priory of nuns founded here in 1150. In the reign of Henry III. a weekly market was granted to the prioress. Nuneaton was incorporated in 1907, and the corporation consists of a mayor, six aldermen and twelve councillors. Area 10,597 acres.

NUNEZ, PEDRO (Petrus Nonius) (1492–1577), Portuguese mathematician and geographer, was born at Alcacer do Sal, and died at Coimbra, where he was professor of mathematics. He published several works, including a copiously-annotated translation of portions of Ptolemy (1537), and a treatise in two books, *De arte atque ratione navigandi* (1546). His clear statement of the scientific equipment of the early Portuguese explorers has become famous. A complete edition of all his writings appeared at Basel in 1592.

See F. de B. Garcão-Stockler, *Ensaio historico sobre a origem e progressos das mathematicas em Portugal* (Paris, 1819); R. H. Major, *Prince Henry the Navigator* (London, 1868, p. 55).

NUÑEZ CABEZA DE VACA, ALVARO (*c.* 1490–*c.* 1564), Spanish explorer, was the lieutenant of Pamfilo de Narvaez in the expedition which sailed from Spain in 1527; when Narvaez was lost in the Gulf of Mexico, Cabeza de Vaca succeeded in reaching the mainland somewhere to the west of the mouths of the Mississippi, and, striking inland with three companions, succeeded, after long wandering and incredible hardship, in reaching the city of Mexico in 1536. Returning to Spain in 1537, he was appointed "adelantado" or administrator of the province of Rio de la Plata in 1540. Sailing from Cadiz in the end of that year, after touching at Cananea (Brazil), he landed at the island of St Catharine in the end of March 1541. Leaving his ships to proceed to Buenos Aires, he set out in November with about 150 men to find his way overland to Ascension (Asunción) for the relief of his countrymen there. The little band reached their destination in the following year. After various successes in war and diplomacy in his dealings with the Indians, Nuñez was sent home under arrest in 1544, and in 1551 was banished to Africa by the council of the Indies for eight years. He was recalled in about a year and appointed to a judgeship in Seville, where he died not later than 1564.

The *Naufragios* ("Shipwrecks") of Cabeza de Vaca, which relate to the Florida expedition and his journey to the city of Mexico, appeared at Zamora in 1542; the work has frequently been reprinted, and an annotated English translation was published by T. Buckingham Smith in 1851. His *Comentarios* (1555) chronicle the events of the South American expedition. See Fanny Bandelier, *Journey of A. Nuñez Cabeza de Vaca* (ed. A. F. Bandelier, New York, 1905).

NUÑEZ DE ARCE, GASPAR (1834–1903), Spanish poet, dramatist and statesman, was born at Valladolid, where he was educated for the priesthood. He had no vocation for the ecclesiastical state, plunged into literature, and produced a play entitled *Amor y Orgullo* which was acted at Toledo in 1849. To the displeasure of his father, an official in the post office, the youth refused to enter the seminary, and escaped to Madrid, where he obtained employment on the staff of *El Observador*, a Liberal newspaper. He afterwards founded *El Bachiller Honduras*, a journal in which he advocated a policy of Liberal concentration, and he attracted sufficient notice to justify his appointment as governor of Logroño, and his nomination as deputy for Valladolid in 1865. He was imprisoned at Cáceres for his violent attacks on the reactionary ministry of Narvaez, acted as secretary to the revolutionary Junta of Catalonia when Isabella was dethroned, and wrote the "Manifesto to the Nation" published by the provisional government on the 26th of October 1868. During the next few years he practically withdrew from political life till the restoration, when he attached himself to Sagasta's party. He served under Sagasta as minister for the colonies, the interior, the exchequer and education; but ill-health compelled him to resign on the 27th of July 1890, and henceforth he refused to take office again. He was elected to the Spanish Academy on the 8th of January 1874 and was appointed a life-senator in 1886. He died at Madrid on the 12th of February 1903.

Nuñez de Arce first came into notice as a dramatist, and he remained faithful to the stage for nearly a quarter of a century. In addition to three plays written in collaboration with Antonio Hurtado, he produced *¿Quién es el autor?* (1859), *La Cuenta del Zapatero* (1859), *¡Como se empeña un marido!* (1860), *Deudas de la honra* (1863), *Ni tanto ni tan poco* (1865), *Quien debe, paga* (1867) and *El haz de leña* (1872). But Nuñez de Arce's talent was more lyrical than dramatic, and his celebrity dates from the appearance of *Gritos del combate* (1875), a collection of poems exhorting Spaniards to lay aside domestic quarrels and to save their country from anarchy, more dangerous than a foreign foe. He maintained his position (in popular esteem) as the only possible rival of Campoamor by a series of philosophic, elegiac and symbolic poems:—*Raimundo Lulio*, *Ultima lamentación de Lord Byron* (1879), *Un Idilio y una Elegía* (1879), *La Selva oscura* (1879) and *La Visión de Fray Martín* (1880). The old brilliance sets off the naturalistic observation of *La Pesca* (1884) and *La Maruja* (1886). The list of his works is completed by *Poemas cortos* (1895) and *¡Sursum corda!* (1900); *Hernán el lobo*, published in *El Liberal* (January 23, 1881) and *Luzbel* remain unfinished. His strength lies in the graciousness of his vision, his sincerity and command of his instrument; his weakness derives from his divided sympathies, his moods of obvious sentiment and his rhetorical facility. But at his best, as in the *Gritos del combate*, he is a master of virile music and patriotic doctrine. (J. F.-K.)

NUORO, a town and episcopal see of Sardinia, Italy, in the province of Sassari, 38½ m. E. of Macomer by rail. Pop. (1901) 6739. It is situated 1905 ft. above sea-level in the east central portion of the island, amid fine scenery. Nuoro was the capital of a province from 1848 to 1860. It is connected by road with Fonni, Bitti and Orosei. An inscription discovered *in situ* about 13 m. W. of Nuoro in 1889, near Orotelli, has the letters FIN NVRR (*fin*(*es*)*Nurr*. . .), which are explained as referring to the boundaries of the territory of Nuoro in Roman times, showing (what was not known before) that the name and the place are of Roman origin (F. Vivanet in *Notizie degli scavi*, 1889, 202). (T. As.)

NUPE, formerly an independent state of W. Africa, now a province in the British protectorate of Nigeria. Under Fula rule, Nupe occupied both banks of the Niger for a distance of some 150 m. above the Benue confluence. Only the part of Nupe north of the Niger now constitutes the province; area 6400 sq. m.; estimated pop. about 150,000. It is in many portions highly cultivated, and owing to its admirable water supply is likely to prove particularly valuable as a field for the extensive cultivation of cotton. Bida (*q.v.*), the capital, is connected by railway (built 1907–1908) with Baro, a port on the Niger 70 m. above Lokoja.

Nupe had an ancient and very interesting constitution of which the leading features were adopted by the Fula when their rule was established about the year 1859. Bida was founded in that year. Nupe was conquered by the troops of the Niger Company in 1897, and the legal status of slavery was then nominally abolished. The company was, however, unable to occupy the country, and on the withdrawal of its troops the deposed emir returned. In 1901 it became necessary to subdue Nupe a second time. British troops marched to Bida. The emir fled without fighting and was deposed. Another emir was appointed in his place, took the oath of allegiance to the British crown, and worked cordially with the British resident who was stationed at Bida. The province is divided into three administrative districts—Bida, Lapai and Agaie. These are again divided into nine native districts, five to the west and four to the east of the Kaduna river. Provincial courts of justice have been established.

See NIGERIA, BIDA. For an interesting account of the ancient constitution of Nupe see "The Fulani Emirates of Northern Nigeria," by Major J. A. Burdon in the *Geo Journ.*, vol. xxiv. (London, 1904).

NUREMBERG (Ger. *Nürnberg*), a city of Germany, the second town in Bavaria in size, and the first in commercial importance. It lies in the district of Middle Franconia in a sandy but well-cultivated plain, 124 m. by rail N.W. from Munich. The city is divided by the small river Pegnitz, a tributary of the Main, into two parts, called respectively the Lorenzer Seite and the Sebalder Seite, after the two principal churches. There are four islands in the Pegnitz, which is crossed here by fourteen bridges. Formerly among the richest and most influential of the free imperial towns, Nuremberg is one of the few cities of Europe that have retained their medieval aspect largely unimpaired. Considerable sections of the ancient walls and moat still remain, though the demolition of portions to meet the exigencies of modern traffic and expansion has somewhat destroyed its quaint medieval character. Of the 365 bastions which formerly strengthened the walls, however, nearly 100 are still *in situ*, and a few of the interesting old gateways have also been preserved. Most of the streets are narrow and crooked, and the majority of the houses have their gables turned towards the street. The general type of architecture is Gothic, but the rich details, which are lavished with especial freedom in the interior courts, are usually borrowed from the Renaissance. Most of the private dwellings date from the 16th century, and there are practically none of earlier date than the 15th century. A praiseworthy desire to maintain the picturesqueness of the town has led most of the builders of new houses to imitate the lofty peaked gables, oriel windows and red-tiled roofs of the older dwellings. Altogether Nuremberg presents a faithful picture of a prosperous town of three hundred years ago.

The old burg, or castle (Kaiserschloss), is picturesquely placed on a rock on the north side of the town. This dates most probably from the early part of the 11th century, but it received its present form mainly during the reign of the emperor Frederick I. about 150 years later. It was restored in careful harmony with its original appearance in 1854–1856, and part of the interior is fitted up as a royal residence, the families of the German emperor and of the king of Bavaria having apartments therein. In the Heidenturm are two late Romanesque chapels, one above the other. Other parts of the castle are the pentagonal tower, the oldest building in the town, wherein are preserved the famous "iron virgin of Nuremberg," and other instruments of torture; the granary (Kornhaus), also called the Kaiserstallung; and the Vestnertor or Vestnerturm. The castle of Nuremberg was a favourite residence of the German sovereigns in the later middle ages, and the imperial regalia were kept here from 1424 to 1796. Near it are the remains of the burg of the Hohenzollerns, the principal existing part of which is the chapel of St Walpurgis, which was destroyed with the rest of the building in 1420, but was restored in 1892. Not far from these ruins stands the Luginsland, a stronghold with four corner turrets, said to have been built by the burghers in 1367 as a watch-tower against the burg of the Hohenzollerns.

Nuremberg contains several interesting churches, the finest of which are those of St Lorenz, of St Sebald and of Our Lady. All three are Gothic edifices and are notable for their elaborately carved doorways, in which free play has been given to the exuberant fancy of the Gothic style, and all three enshrine valuable treasures of art. The Church of St Lawrence, the largest of the three, was built in the 13th and 14th centuries and has recently been restored. In it is the masterpiece of the sculptor, Adam Krafft, consisting of a ciborium, or receptacle for the host, in the form of a florid Gothic spire 65 ft. high; the carving of this work is exquisitely minute and delicate. The west front contains a magnificent rose-window, and some of the stained glass dates from the 15th and 16th centuries. In front of the altar hangs a curious piece of wood-carving by Veit Stoss, representing the Salutation. The shrine of St Sebald, in the church of St Sebald, consisting of a bronze sarcophagus and canopy, in the richest Gothic style, adorned with numerous statues and reliefs, is looked upon as one of the greatest achievements of German art. It was executed by Peter Vischer, the celebrated artist in bronze, who was occupied on the work for thirteen years (1506–1519), and has here shown himself no unworthy rival of Lorenzo Ghiberti. The church of Our Lady possesses some fine old stained-glass windows and some paintings by Michael Wohlgemuth. The Tuchersche altar, with its winged picture, is one of the finest works of the Nuremberg school about the middle of the 15th century. This church was restored in 1878–1881. Other noteworthy churches are those of St Jacob, founded about 1200 and restored in 1824; and of St Aegidius.

The town hall (Rathaus), an edifice in the Italian style, erected in 1616–1619, contains frescoes by Dürer, and a curious stucco relief of a tournament held at Nuremberg in 1446. The building incorporated an older one of the 14th century, of which the great hall, with its timber roof, is part. The most interesting secular buildings are the houses of the old patrician families. Among the most characteristic of these are the old residence of the counts of Nassau, and the houses of the Tucher, Funk and Peller families. A special interest attaches to the dwellings of Albert Dürer, Hans Sachs, the cobbler-poet, and Johann Palm, the patriotic bookseller who was shot by order of Napoleon in 1806. There are statues of Dürer, Sachs, Melanchthon, the reputed founder of the grammar-school, the navigator Martin Behaim, and Peter Henlein, the inventor of the watch; and the streets are further embellished with several fountains, the most noteworthy of which are the Schöne Brunnen, 1385–1396, in the form of a large Gothic pyramid, adorned with statues of the seven electors, the "nine worthies," and Moses and the prophets; and the Gänsemännchen or goose-mannikin, a clever little bronze figure by Pankratz Labenwolf. On the way to the cemetery of St John, which contains the graves of Dürer, Sachs, Behaim and other Nuremberg worthies, are Krafft's stations, seven pillars bearing stone reliefs of the Passion, and ranked among the finest works of the sculptor.

The Germanic national museum, established in an old Carthusian monastery, has developed into one of the largest and most important institutions of its kind in Germany. It includes a picture-gallery, principally of German works of the 15th and 16th centuries, including masterpieces by Holbein, Dürer, Wohlgemuth and others. The municipal library contains about 2000 manuscripts and 80,000 printed books, some of which are of great rarity.

The population of Nuremberg was, in 1905, including a garrison of about 3000 men, 294,344, of whom 145,354 were males and 148,990 females. Of these again 196,907 were Protestants (Evangelical), 86,939 Roman Catholics and 6819 Jews. At the height of its prosperity in the middle ages the population has been estimated at as high a figure as 150,000, but there seems good reason to believe that it did not exceed 40,000 to 50,000 souls. In 1818 it had sunk to 27,000, but since then has steadily increased. On the 1st of January 1899, thirteen outlying communes were incorporated, extending the area of the town from 2805 to 13,700 acres.

Nuremberg occupies a high place among the industrial and commercial centres of Europe. The principal manufactures are toys and fancy articles in metal, carved wood and ivory, which are collectively known as Nuremberg wares. Nuremberg is the chief market in Europe for hops. It is an important junction for railways to all parts of Germany, and is on the main line from Cologne and Frankfort-on-Main to Munich, Vienna and Eger. In addition to its railways, trade is facilitated by the Ludwig canal, connecting the Danube and the Main.

History.—The first authentic mention of Nuremberg, which seems to have been called into existence by the foundation of the castle, occurs in a document of 1050; and about the same period it received from the emperor Henry III. permission to establish a mint and a market. It is said to have been destroyed by the emperor Henry V. in 1105, but if this was the case the town must have been very speedily rebuilt, as in 1127 we find the emperor Lothair taking it from the duke of Swabia and assigning it to Henry the Proud, duke of Bavaria. An imperial officer, styled the burggrave of Nuremberg, who, however, seems to have been merely the military governor of the castle, and to have exercised no sway over the citizens, became prominent in the 12th century. This office came into the hands of the counts of Hohenzollern at the beginning of the 13th century, and burggrave of Nuremberg is still one of the titles of their descendant, the German emperor. The government of the town was vested in the patrician families, who, contrary to the usual course of events in the free towns, succeeded in permanently excluding the civic gilds from all share of municipal power, although in 1347 there was a sharp rising against this oligarchy. The town was specially favoured by the German monarchs, who frequently resided and held diets here, and in 1219 Frederick II. conferred upon it the rights of a free imperial town. By the terms of this charter the town appears to have been immediately subject to the king, who was represented by his magistrate (or *Schultheiss*). In a short time, however, the latter appears to have been assisted by a council, consisting of 13 *consules* (burgomasters) and 13 *scabini* (assessors), who collectively formed the governing and administrative body under the presidency of the bailiff. The last-named official soon confined himself to the judicial magisterial office, and a further increase in the numbers of the council having taken place by the appointment of 8 nominees of the king, a municipal council of 34, under the direction of the senior consul or burgomaster, dealt with matters exclusively civic. Later this council (the kleine Rat) was increased to 42 members, 8 of whom belonged to the artisan class.

In 1356 Nuremberg witnessed the promulgation of the famous Golden Bull of the emperor Charles IV. At the beginning of the 15th century the burggraves of Nuremberg, who had in the meantime raised themselves to the rank of princes of the Empire, were invested with the margraviate of Brandenburg, and sold their castle to the town. They, however, reserved certain rights, and their insistence on these led to fierce and sanguinary feuds between the burghers and the margraves Albert Achilles and Frederick and Albert Alcibiades of Bayreuth.

The quarrel with the margraves, however, did not interfere with the growth of the town's prosperity, which reached its acme in the 16th century. Like Augsburg, Nuremberg attained great wealth as an intermediary between Italy and the East on the one hand, and northern Europe on the other. Its manufactures were so well known that it passed into a proverb—"Nuremberg's hand goes through every land." Its citizens lived in such luxury that Aeneas Sylvius (Pope Pius II.) has left it on record that a simple burgher of Nuremberg was better lodged than the king of Scotland. The town had gradually extended its sway over a territory nearly 500 sq. m. in extent, and was able to furnish the emperor Maximilian with a contingent of 6000 troops. But perhaps the great glory of Nuremberg lies in its claim to be the principal fount of German art. Its important architectural features have already been described. The love of its citizens for sculpture is abundantly manifest in the statues and carvings on their houses. Adam Krafft, Veit Stoss and Peter Vischer form a trinity of sculptors of which any city might be proud. In painting Nuremberg is not less prominent, as the names of Wohlgemuth and Dürer sufficiently indicate. In the decorative arts the Nuremberg handicraftsman attained great perfection in ministering to the luxurious tastes of the burghers, and a large proportion of the old German furniture, silver-plate, stoves and the like, which are now admired in industrial museums, was made in Nuremberg workshops. Wenzel Jamnitzer (1508–1585), the worker in silver, is perhaps eminent enough to be added to the above list of artists. Its place in literary history—by no means an unimportant one—it owes to Hans Sachs and the other meistersänger. A final proof of its vigorous vitality at this period may be found in the numerous inventions of its inhabitants, which include watches, at first called "Nuremberg eggs," the air-gun, gun-locks, the terrestrial and celestial globes, the composition now called brass, and the art of wire-drawing.

Nuremberg was the first of the imperial towns to throw in its lot with the Reformation, and it embraced Protestantism with its wonted vigour about 1525. Its name is associated with a peace concluded between Charles V. and the Protestants in 1532. The first blow to its prosperity was the discovery of the sea-route to India in 1497; and the second was inflicted by the Thirty Years' War, during which Gustavus Adolphus was besieged here in an entrenched camp by Wallenstein. During the eight or ten weeks that the blockade lasted no fewer than 10,000 of the inhabitants are said to have died of want or disease. The downfall of the town was accelerated by the illiberal policy of its patrician rulers; and the French Revolution reduced it to such a degree that in 1796 it offered itself and its territories to the king of Prussia on condition that he would pay its debts. Prussia, however, refused the offer. In 1803 Nuremberg was allowed to maintain its nominal position as a free city, but in 1806 it was annexed to Bavaria.

See Lochner, *Nürnberger Jahrbücher bis 1313* (Nuremberg, 1832–1835); *Nürnbergs Vorzeit und Gegenwart* (Nuremberg, 1845); and *Geschichte der Reichsstadt Nürnberg zur Zeit Kaiser Karls IV.* (Berlin, 1873); Priem, *Geschichte der Stadt Nürnberg bis auf die neueste Zeit* (Nuremberg, 1874); B. Schönlank, *Altnürnbergische Studien* (Leipzig, 1894); L. Rösel, *Alt-Nürnberg* (Nuremberg, 1895); E. Mummenhoff, *Altnürnberg bis zum Jahre 1350* (1890); R. Hagen, *Bilder aus Nürnbergs Geschichte* (Nuremberg, 1889); F. Roth, *Die Einführung der Reformation in Nürnberg* (Würzburg, 1885); J. M. Lotter, *Sagen, Legenden und Geschichten der Stadt Nürnberg* (Nuremberg, 1898); the *Quellenschriften zur Staats- und Kulturgeschichte der Reichsstadt Nürnberg* (Nuremberg, 1893, fol.); and the *Mitteilungen* of the *Verein für Geschichte der Stadt Nürnberg* (Nuremberg, 1879, fol.). See also C. Headlam, *The Story of Nuremberg* (London, 1899).

NURSE (a shortened form of the earlier "nourice," adapted through the French from Lat. *nutrix*, *nutrire*, to nourish), primarily a woman who suckles and takes care of an infant, and more generally one who has the general charge of children; also a person, male or female, who attends to the sick, and particularly one who has been trained professionally for that purpose (see NURSING).

History.

NURSING. The development of sick-nursing, which has brought into existence a large, highly-skilled, and organised profession, is one of the most notable features of modern social life. The evolution of the sick-nurse is mainly due to three very diverse influences—religion, war and science—to name them in chronological order. It was religion which first induced ladies, in the earlier centuries of Christianity, to take up the care of the sick as a charitable duty. The earliest forerunner of the great sisterhood of nurses of whom we have any record was Fabiola, a patrician Roman lady, who in A.D. 380 founded a hospital in Rome with a convalescent home attached, and devoted herself and her fortune to the care of the sick poor. She had a rival in the empress Flaccilla, the pious consort of Theodosius I. (A.D. 379–395), who also personally visited the hospitals and attended on the sick. Organized nursing does not appear to have formed any part of medical treatment, except in so far as the deacons of the church attended on the poor, until the 4th century of the Christian era. After that date the employment of women for this purpose must have developed rapidly, for in the reign of Honorius (A.D. 395–423) six hundred women were engaged in the hospitals of Alexandria. These institutions were managed by the clergy, and throughout the dark and middle ages the hospital and nursing systems were connected with religious bodies. Nurses were provided by the male and female monastic orders, an arrangement which still continues in most Roman Catholic countries, though it is gradually being abandoned through the increasing demands of medical science, which have led the hospitals to establish training schools of their own. The names of the oldest foundations which still survive, such as the Hôtel Dieu in Paris, St Thomas's and St Bartholomew's in London, the order of St Augustine, and (in the form of a modern revival) that of St John of Jerusalem, sufficiently indicate the original religious connexion. The order of St Vincent de Paul, founded in 1633 for the express purpose, is still the largest nursing organization in the world. Even in Protestant England, where purely secular training schools have reached their highest development, the generic title of Sister, alike prized by its holders and honoured by the public, remains the popular and professional synonym for head nurse, and perpetuates the old association. Nursing, as a popular or fashionable occupation, is not a modern invention. Sir Henry Burdett quotes an order, dated 30th May 1578, directing the master and the prior of the Hôtel Dieu "not to receive henceforth any novices without speaking of it to the company, because there are an excessive number of nuns and novices, who cause great expense to the said Hôtel Dieu." In Protestant countries a secular nursing system came in with the Reformation. The staff appointed for St Bartholomew's, on its re-establishment by Henry VIII. in 1544, consisted of a matron and twelve nurses, who were engaged in domestic occupations when off duty. Thus nursing became a menial office and an inferior means of livelihood, adopted by women of the lower orders without any training or special skill; and so it continued down to the middle of the 19th century, when a new movement began which was destined to revolutionize the status of the nurse.

Its distinctive feature was the systematic training of nurses for their vocation. Previously a certain amount of regular instruction had no doubt been given here and there by individual physicians and surgeons; lectures to nurses were delivered in the New York Hospital as early as 1790. But these were isolated efforts. Such skill as nurses possessed was picked up in the wards. No qualifications were required, nor indeed would they have been forthcoming, so low had the calling sunk in public estimation. The credit of inaugurating the new order of things belongs to Germany, and here again the religious influence came into play. The beginning of the modern system dates from the foundation of the institute for training deaconesses at Kaiserswerth by Pastor Fliedner in 1836. It is true that state training schools for male nurses had previously existed in Prussia, the oldest having been founded at Magdeburg in 1799; but the employment of men in hospital wards is a feature of the German system which has not been copied by other advanced countries, and seems to be in process of abandonment in Germany. It is a heritage from the middle ages, when the Knights Hospitallers undertook for men the duties discharged in female institutions by the nuns. The male schools, therefore, stand somewhat apart, though they mark a stage in the evolution of nursing as the earliest regular training establishments. The Kaiserswerth Institute, on the contrary, had a far-reaching and lasting influence, and may fairly claim to be the mother of the modern system. England, in particular, owes much to it, for there Florence Nightingale acquired the practical knowledge which enabled her afterwards to turn her remarkable gift of organization to such brilliant account. The example of Kaiserswerth was soon followed, and not in Germany only. In 1838 the Society of Friends founded a nursing organization in Philadelphia, and in 1840 Mrs Fry, a member of the same community, started the Institution of Nursing Sisters in London. In 1857 the nurses attached to it numbered ninety. They received their practical training at Guy's and St Thomas's Hospitals. On the continent institutes for nursing deaconesses were founded at Strassburg, Utrecht, Berlin, Breslau, Königsberg and Carlsruhe between 1842 and 1851. In London a Church of England training institution (St John's House) was opened in 1848. There were three classes —(1) sisters, (2) probationers, (3) nurses. The nursing at King's College Hospital was for many years undertaken by this society, whose members were trained at the hospital.

The training system, thus inaugurated on a semi-religious basis, received a new impetus from the Crimean War, which was further emphasized by the Civil War in America and the subsequent great conflicts on the continent. The despatch of Florence Nightingale with a staff of trained nurses, to superintend the administration of the military hospitals was the direct result of the publicity given to the details of the Crimean War by *The Times*, and it formed a new departure which riveted the eyes of the civilized world. The work undertaken and accomplished by this lady was far more important than the mere nursing of sick and wounded soldiers. She had grasped the principles of hygiene, which were then beginning to be understood, and she applied them to the reform of the hospital administration. In civil life it had a marked effect in stimulating the training movement and raising the status of the nurse; but substantial results were only obtained by degrees. It was not until 1860 that the modern hospital school system was definitely inaugurated by the opening of the Nightingale Fund School at St Thomas's Hospital, founded with the money subscribed by the British public in recognition of Miss Nightingale's national services, and worked on principles laid down by her. In the meantime several nursing societies, in addition to those previously mentioned, had been founded in England, and elsewhere. Among them the Baden Ladies' Society, founded in 1859 by the Grand Duchess Luise, deserves mention. In the same year the first district nurse began work in Liverpool; and in 1865 the reform of the much-neglected workhouse nursing was inaugurated by Miss Agnes Jones and twelve nurses from St Thomas's, who took up the work in Liverpool. At this time England took a decided lead, which she has never lost. Other countries gradually followed. In Germany the Albert Nursing Society was founded by Queen Carola of Saxony, and the Alice Society by the Grand Duchess Alice of Hesse, both in 1867. In France, where the nursing was comparatively well performed by the religious orders, no change was made until 1877, when a training school was opened in Paris by the municipality, and two others by the Assistance Publique, in connexion with the Salpêtrière and Bicêtre Hospitals. In the United States schools were opened in New York, New Haven and Boston in 1873. The British colonies, Austria, and other European countries followed some years later.

It remained for the third influence to complete the work begun and to develop systematic nursing to its present dimensions. Since 1880 the increasing demands of medical knowledge have well-nigh revolutionized the craft in the home, the hospital and the workhouse. A large part of the change may be summed up in the words "scientific cleanliness." The outcome has been to raise the dignity of the calling, to induce persons of a superior class to adopt it in increasing numbers, to enlarge the demand for their services, and to multiply the means of educating them.

Training and organization.

Nursing does not appear to be regulated by law in any country, though attempts in this direction had been made in England.[1] Its organization is voluntary, and even in state or municipal institutions is dependent on the direction of the administration. In Great Britain nearly all the general and special hospitals and many of the poor-law infirmaries offer systematic professional training to nurses. The provisions differ considerably in detail, but in the larger schools the system is uniform in all important respects. Candidates must be between 23 (sometimes 21 or 22) and 35 years of age, and must produce satisfactory evidence of character, education, health and physique; after a personal interview and one, two or three months' trial they are admitted for three years' training. During this period they receive regular instruction in theoretical and practical knowledge, and have to pass periodical examinations. At the end of it they are granted certificates and may serve as staff nurses. They pay no premium, and generally receive a salary of £8 to £12 in the first year, rising annually to £30 or £35 as staff nurse, and subsequently to £40 or £50 as sister or head nurse. They live in a home attached to the institution, under a matron, and in the most modern establishments each nurse has a separate bedroom, with common dining and recreation rooms. Private nursing staffs are attached to several of the hospitals; they are recruited from the staff nurses and probationers on completion of their course, and supply nurses to private patients. In the special hospitals the training is shorter, being for one or two years. There seems to be a constant tendency to increase the requirements. At St Bartholomew's, St George's, the London Hospital, St Thomas's and others, probationers must enter for four years, and at St Bartholomew's they have to pass an entrance examination in elementary anatomy, physiology and other subjects. At all the more important schools the number of applications is many times greater than the vacancies.

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[1] In 1902 an act was passed to establish a Central Midwives Board and regulated the training and employment of midwives.

In Great Britain trained and certificated nurses generally belong to a society or association. The most noteworthy of the associations is Queen Victoria's Jubilee Institute for Nurses. It was founded in 1887 with the object of providing skilled nursing for the sick poor in their own homes. A great many of the provincial nursing associations are affiliated to it. The number of nurses supported by each branch varies. The qualifications for a Queen's nurse are as follows: (1) training at an approved general hospital or infirmary for two years; (2) approved training in district nursing for not less than six months, including the nursing of mothers and infants after child-birth; (3) nurses in country districts must in addition have had at least three months' approved training in midwifery. Candidates possessing the first qualification are received on trial for one month, after which they complete their six months' training for the second qualification, at the same time entering into an agreement to serve as district nurse for one or two years at the end of the six months. The salary during training is £12, 10s., and afterwards £30 to £35 a year, with board, lodging, laundry and uniform. With regard to the earnings of nurses in general, the salaries paid in hospitals have already been mentioned; for private work the scales in force at different institutions vary considerably, according to the other advantages and benefits provided. At some the nurses receive all their own earnings, minus a percentage deducted for the maintenance of the institute; at others they are paid a fixed salary, as a rule from £25 to £30 a year, plus a varying percentage on their earnings or a periodical bonus according to length of service. This is perhaps the commonest system, but some of the best nursing homes give a somewhat higher fixed salary without any percentage. In all these cases the nurses receive in addition board and lodging, laundry and uniform, or an equivalent allowance. For special cases—infectious, massage, mental and maternity—nurses on a fixed salary usually receive extra pay. The fees commonly charged by high-class institutions for the services of a trained and certificated nurse are—for ordinary cases £2, 2s. a week, for special cases £2, 12s. 6d. or £3, 3s. a week; but many provincial associations supply nurses for £1, 1s. a week and upwards. The discrepancy between the fees paid by patients and the salaries received by nurses, especially in London, has occasionally excited unfavourable comment, but it is to be remembered that the nurses are maintained when out of work or ill, and have other advantages; many institutions either provide pensions or assist the members of their staff to join the Royal National Pension Fund.

To complete this account of the organization in Great Britain a few details with regard to special nursing are added.

Fever.—Regular training on the same plan as in general hospitals is provided in London at the fever hospitals of the Metropolitan Asylums Board (12 in number, with from 360 to 760 beds each), and at a considerable number of provincial institutions.

Insanity.—The Medico-Psychological Association of Great Britain and Ireland holds examinations and grants certificates in mental nursing; candidates must undergo three years' regular training, with instruction by lectures, &c., which may be obtained in a large number of public asylums by arrangement with the Association; one county asylum (Northampton) gives its own certificates after a three years' course.

District Nursing.—In addition to the Queen's nurses, of whom details have been given above, many local associations train their own nurses for this work. *Cottage* and *village* nursing are varieties of the same department; the former is organized on the benefit system, and aims at supplying domestic help and sick-nursing combined in rural districts for an annual subscription of from 2s. to 10s., according to the class in life of the family, and a weekly fee of the same amount during attendance.

Monthly Nursing and Midwifery.—Systematic instruction in these subjects is given at some fifty lying-in institutions in different parts of the kingdom. The usual course for nursing is not less than three months, and for midwifery not less than six months; a premium is required of 12 or 13 guineas for three months, and 25 guineas for six months.

Male Nursing.—Two or three associations in London supply male nurses (fees 2 to 4 guineas a week), but there appears to be only one institution, apart from the military and naval services, at which they are systematically trained—namely, the National Hospital for the Paralysed and Epileptic.

Massage is taught regularly at the hospital just named, and at a few other special hospitals. Competent operators are supplied by the Incorporated Society of Trained Masseuses and, to some extent, by other nursing associations; but this branch of the profession is still imperfectly organized (see MASSAGE).

Children.—A large number of children's hospitals throughout the country give regular training in the nursing of children; they take probationers at a somewhat earlier age than the general schools; the course is usually shorter (one or two years), and the salaries slightly lower.

The State offers employment to nurses in the naval and military hospitals. *Queen Alexandra's Imperial Nursing Service* was organized in 1902. Candidates for it must be between 25 and 35 years, single or widows and of good social status. They must have had three years' training in a general hospital. Foreign Service must be taken as required. Nurses are eligible for a pension after 10 years' service, the amount increasing up to the age of 55 when retirement is compulsory. The *Royal Naval Nursing Service* is organized on much the same basis. Other organizations are *The Army Nursing Reserve* and *Queen Alexandra's Imperial Military Nursing Reserve*, and there is also a nursing reserve attached to the territorial forces.

In the more important *British colonies*—Australasia, Canada and South Africa—there are now a considerable number of hospital schools and other institutions formed and conducted on the English model. Salaries and fees are very much the same in Australia; in Canada and South Africa they are higher.

In the *United States* a similar system prevails in New York, Boston, Brooklyn, Chicago, Baltimore, Philadelphia, New Haven and many other large towns. The period of training is either two or three years. At the Johns Hopkins School at Baltimore twelve scholarships of $100 and $120 each are awarded annually; graduate nurses are paid $360 (£72) a year. Salaries are altogether much higher in the United States. At the Boston City Hospital graduate nurses receive $420 (£84) a year, and at the Indianapolis City Hospital those on private duty are paid $72 a month, which is equivalent to £172 a year, with board, lodging, laundry and uniform. This may be taken to indicate the possible earnings of trained nurses working independently, as they usually do in America. The fees charged for trained nurses run from $12 to $25 a week, and even more for special cases. Male nurses are trained at the Bellevue Hospital, New York, the Grace Hospital, Detroit, and elsewhere. In the American schools more attention is paid to the preparation of nurses for private work than in the British (Burdett), and a directory or registry of them is kept in most large towns.

In *Germany*, their original home, both training schools and societies have multiplied and developed. The period of training appears to be considerably shorter than in Great Britain and America. Members of the Albert Society of Saxony, however, spend two years in the wards at Dresden, and a third at Leipzig, attending lectures and demonstrations. They are sent out to nurse rich and poor alike, and their pay is very small. Most of the German institutes have pension funds.

In *France* a great deal of the nursing was formerly in the hands of religious orders, but there too the hospital school system, inaugurated in 1877, has grown. The schools managed by the *Assistance Publique* in Paris give a very thorough course of instruction.

In *Russia* nursing is mainly in the hands of the Red Cross Society, whose members are, however, trained in the hospital schools.

In *Italy*, *Spain*, *Portugal* and *Belgium* scientific nursing is in a backward state. The old religious system still prevails to a large extent, and, though some of the orders do their work with great devotion, the standard of knowledge and skill is not up to modern requirements. At San Remo and Rome institutions have been established for providing English trained nurses to private cases.

Austria is also in a very backward state, in spite of the fame of the Vienna cliniques. The Red Cross Society provides a certain amount of trained nursing, and next to it the best-organized work is done by religious orders; but the nursing in the hospitals appears to be still in a neglected state. The Brothers of Mercy have charge of some of the men's hospitals, and also carry on a remarkable system of district nursing.

In *Holland* and the *Scandinavian countries* the organization is more modern and fairly adequate.

Duties and qualifications.

For full details on the large subject of the duties and qualifications of nurses the reader is referred to the numerous text-books and other technical authorities. Only a few general observations can be made here. Many candidates approach the calling with a very imperfect appreciation of its exacting character. The work is not easy or to be taken up lightly. It demands physical strength, sound health, scrupulous cleanliness, good temper, self-control, intelligence and a strong sense of duty. It embraces many duties—some of them menial and disagreeable—besides the purely medical and surgical functions. This is especially the case with district nursing, which is the highest and most exacting branch of the profession, because it imposes the greatest responsibility with the fewest resources and demands the most varied qualifications, while affording none of the attractions incidental to hospital work or private nursing among the rich. It is comparatively easy to fulfil routine duties, when every means is at hand and the standing conditions are the most favourable possible; when ventilation, warmth, light and cleanliness are all provided of the best, and when assistance can be summoned in a moment. To be thrown on your own resources and make the best of adverse conditions is an entirely different matter; it requires a thorough knowledge not of routine, but of principles. It is impossible, therefore, for nurses to be over-educated in the fullest sense of the word; but it is possible for them to be inappropriately educated, and perhaps that is sometimes the case now. Probably nursing has been elaborated to the inevitable point of specialization, and a somewhat different preparation is needed for different branches of the art.

Allusion has been made above to the subject of male nursing. It hardly finds a place in the British civil system, and was condemned for hospitals in Germany, where it is at its best, by so eminent an authority as Professor Virchow. In the South African War of 1899–1902 it was even suggested that female nurses should replace orderlies at the front. The only valid reason for preferring women to attend men rather than members of their own sex is the difficulty of obtaining a supply of equally well qualified and satisfactory male nurses. But this difficulty need not be permanent, and the assumption is much to be deprecated. It is, indeed, most desirable that men should be nursed by men. The advantages are many and real. For one thing women do not possess the physical strength which is often required. They cannot lift a heavy man, and ought not to be asked to do it. Then it is excessively irksome to a sensitive man to be attended by women for various necessary offices. In order to avoid it he will endeavour to do without assistance, and seriously prejudice his chances of recovery.

AUTHORITIES.—Sir Henry C. Burdett, *Hospitals and Asylums of the World*; *The Nursing Profession* (annual); Hampton, *Nursing*; Percy G. Lewis, *Nursing, its Theory and Practice*; Eva C. E. Luckes, *Hospital Sisters and their Duties*; Morten, *How to become a Nurse*; Florence Nightingale, *Notes on Nursing*; Nightingale Boyd, "Nursing," in Quain's *Dictionary of Medicine.*

NUSHKI, a town and district of Baluchistan. The town lies 70 m. south-west of Quetta, and is situated in a plain at the base of the Quetta plateau, 2900 ft. above the sea. Pop. (1901) 644. From this point the flat Baluchistan desert stretches away northwards and westwards to the Helmund river. The administration of the Nushki district was taken over from the khan of Kalat by the Indian government in 1896, and was leased from him on a perpetual quit rent in 1899. In 1902 a railway of 91 m. was sanctioned from Quetta to Nushki, which was completed in 1905. This railway makes Nushki the starting-point of the caravan route to Seistan. From the strategic point of view a force operating from Nushki would flank any advance from the north on Kandahar, and would also guard the south-west approach to the fortress of Quetta.

NUSKU, the name of the light and fire-god in Babylonia and Assyria, who is hardly to be distinguished, from a certain time on, from a god Girru—formerly read Gibil. Nusku-Girru is the symbol of the heavenly as well as of the terrestrial fire. As the former he is the son of Anu, the god of heaven, but he is likewise associated with Bel of Nippur as the god of the earth and regarded as his first-born son. A centre of his cult in Assyria was in Harran, where, because of the predominating character of the moon-cult, he is viewed as the son of the moon-god Sin (*q.v.*). Nusku-Girru is by the side of Ea, the god of water, the great purifier. It is he, therefore, who is called upon to cleanse the sick and suffering from disease, which, superinduced by the demons, was looked upon as a species of impurity affecting the body.

The fire-god is also viewed as the patron of the arts and the god of civilization in general, because of the natural association of all human progress with the discovery and use of fire. As among other nations, the fire-god was in the third instance looked upon as the protector of the family. He becomes the mediator between humanity and the gods, since it is through the fire on the altar that the offering is brought into the presence of the gods.

While temples and sanctuaries to Nusku-Girru are found in Babylonia and Assyria, he is worshipped more in symbolical form than the other gods. For the very reason that his presence is common and universal he is not localized to the same extent as his fellow-deities, and, while always enumerated in a list of the great gods, his place in the systematized pantheon is more or less vague. The conceptions connected with Nusku are of distinctly popular origin, as is shown by his prominence in incantations, which represent the popular element in the cult, and it is significant that in the astro-theological system of the Babylonian priests Nusku-Girru is not assigned to any particular place in the heavens. (M. JA.)

NUSRETABAD, the capital of Persian Seistan, so called after Nusret el Mulk, a former deputy governor of Seistan; when built, *c.* 1870, it was first called Nasirabad in honour of Nasr-ud-din Shah; other names, used locally, are Shahr (town) i Seistan, Shahr i Nassiriyeh, or simply Shahr, the town. It is the residence of British and Russian consuls, and has post and telegraph offices.

NUT (O. Eng. *hnutu*, cf. Dutch *noot*, Ger. *Nuss*; allied with Gael. *cno*; it is not of the same form as Lat. *nux*), a term applied to that class of fruit which consists generally of a single kernel enclosed in a hard shell. Botanically speaking, nuts are one-celled fruits with hardened pericarps, sometimes more or less enveloped in a cupule or cup, formed by the aggregation of the bracts as in the hazel and the acorn. In commerce, however, the term has a wider application and embraces many fruits having hard woody indehiscent shells or coverings without reference to their enclosed seeds or kernels, besides leguminous pods, and even tuberous roots. A great number of nuts enter into commerce for various purposes, principally as articles of food or sources of oil, and for several ornamental and useful purposes. For the most part the edible nuts are very rich in oil, with only a small percentage of the other carbohydrates, starch, sugar, &c., and they also contain a large proportion of nitrogenous constituents. Thus possessing rich nutrient principles in a highly concentrated form, nuts are by themselves rather difficult of digestion, and the liability of many of them to become rancid is also a source of danger and a hindrance to their free use. Oleaginous nuts used for food are likewise employed more or less as sources of oil, but on the other hand there are many oil-nuts of commercial importance not embraced in the list of edible nuts.

On the following page is set out an alphabetical enumeration of the more important nuts, and of products passing under that name, used either as articles of food or as sources of oil.

Name.	Source.	Locality.	Remarks.
Almond	*Amygdalus communis*, var. *dulcis*	S. Europe	Food, oil.
Almond (bitter)	*Amygdalus communis*, var. *amara*	....	Oil.
Ar nut or earth nut	Tubers of *Bunium flexuosum* and other species	W. Europe (Britain)	Food.
Bambarra ground nut	*Voandzeia subterranea*	Tropics, especially Africa	Food.
Ben nut	*Moringa pterygosperma* (a winged seed)	India	Oil.
Bitter nut	*Carya amara* (swamp hickory)	N. America	See HICKORY.
Brazil nut	*Bertholletia excelsa*	S. America	Food, oil.
Bread nut	*Brosimum Alicastrum*	W. Indies	Food.
Butter or Souari nut	*Caryocar nuciferum*	Guiana	Food.
Cahoun nut	*Attalea Cohune*	Honduras	Oil.
Candle nut	*Aleurites triloba*	S. Sea Islands	Oil.
Cashew nut	*Anacardium occidentale*	W. Indies and Tropical America	Food, oil.
Chestnut	*Castanea vesca*	S. Europe	Food.
Cob, filbert, or hazel	*Corylus Avellana*	Europe (Britain), &c.	See HAZEL.
Cob nut of Jamaica	*Omphalea diandra*	W. Indies and Tropical America	Food.
Coco-nut	*Cocos nucifera*	Tropics	Food, oil.
Cola nut	*Cola acuminata*	W. Africa	Food.
Dika nut	*Irvingia Barteri*	W. Africa	Food, oil.
Ginkgo nut	*Ginkgo biloba* (seed)	Japan, China	Food, oil.
Ground nut or pea nut	*Arachis hypogaea*	Tropics	See GROUND NUT.
Hickory nut	*Carya alba*	N. America	See HICKORY.
Hog nut	*Carya porcina*	N. America	Eaten by animals.
Jesuit's nut	*Trapa natano*	S. Europe	Food.
Mocker nut	*Carya tomentosa*	N. America	See HICKORY.
Moreton Bay chestnut	*Castanospermum australe*	Australia	Food.
Nutmeg	*Myristica moschata*	E. Indies	Spice. See NUTMEG.
Nutmeg (wild)	*Myristica fatua, M. tomentosa*, &c.	Tropics	Spice. See NUTMEG.
Olive nut	*Eleocarpus Ganitrus*, &c.	E. Indies	Food.
Palm nut	*Elaeis guineensis*	W. Africa	Oil. See PALM.
Pecan nut	*Carya olivaeformis*	N. America	Food, oil. See HICKORY.
Pekea nut	*Caryocar butyrosum*	Guiana	Food.
Physic nut	*Curcas purgans*	Tropical America	Oil.
Pine nut	*Pinus Pinea*, &c.	Italy	Food.
Pistachio nut	*Pistachia vera*	S. Europe, &c.	Food.
Quandang nut	*Fusanus acuminatus*	Australia	Food.
Ravensara nut	*Agathophyllum aromaticum*	Madagascar	Spice.
Rush nut	*Cyperus esculentus* (tubers)	S. Europe, &c.	Food.
Sapucaya nut	*Lecythis Ollaria*	Brazil	Food.
Tahiti chestnut	*Inocarpus edulis*	S. Sea Islands	Food.
Walnut	*Juglans regia*	Asia, Europe	Food, oil.
Water chestnut	Various species of *Trapa*	S. Europe, India, &c.	Food.

There remain to be enumerated a number of nuts of commercial value for turnery and ornamental purposes, for medicinal use, and for several miscellaneous applications in the arts. These include:

Name.	Source.	Locality.	Remarks.
Betel nut	*Areca Catechu*	E. Indies	....
Bladder nut	*Staphylea pinnata*	S. Europe	Necklaces.
Boomah nut	*Pycnocoma macrophylla*	Africa	Tanning.
Bonduc nut	*Guilandina Bonduc*	India	Medicine, beads.
Clearing nut	*Strychnos potatorum*	India	Clearing water.
Coquilla nut	*Attalea funifera*	Brazil	Turnery.
Corozo nut or vegetable ivory	*Phytelephas macrocarpa*	Tropical S. America	See PALM.
Cumara nut (Tonka bean)	*Dipterix odorata*	Tropical S. America	Perfume.
Grugru nut	*Acrocomia sclerocarpa*	S. America	Beads.
Horse chestnut	*Aesculus Hippocastanum*	S. Europe	Starch.
Marking nut	*Semecarpus Anacardium*	E. Indies	Marking ink and varnish.
Nut galls	*Quercus infectoria*	Levant	Dyeing and ink making. See GALLS.
Poison nut	*Strychnos Nux-Vomica*	E. Indies	Medicine. See NUX VOMICA.
Sassafras nut	*Nectandra Puchury*	S. America	Aromatic.
Snake nut	*Ophiocaryon paradoxum*	S. America	Curiosity.
Soap nut	*Sapindus Saponaria*	W. Indies	Washing; ornamental

The application of the term nut to many of these products is purely arbitrary, and it is obvious that numerous other bodies not known commercially as nuts might with equal propriety be included in the list. Most of the nuts of real commercial importance are or will be separately noticed, and here further allusion is only made to a few which form current articles of commerce, not otherwise treated of.

The bread nut of Jamaica is the fruit of a lofty tree, *Brosimum Alicastrum*. It is about an inch in diameter, and encloses a single seed, which, roasted or boiled, is a pleasant and nutritious article of food.

The souari or surahwa nut, called also the "Butter nut of Demerara," and by fruiterers the "Suwarrow nut," is the fruit of *Caryocar nuciferum*, a native of the forests of Guiana, growing 80 ft. in height. This is perhaps the finest of all the fruits called nuts. The kernel is large, soft, and even sweeter than the almond, which it somewhat resembles in taste. The few that are imported come from Demerara, and are about the size of an egg, somewhat kidney-shaped, of a rich reddish-brown colour, and covered with large rounded tubercles.

The pekea nut, similar in appearance and properties, is the produce of *Caryocar butyrosum*, growing in the same regions of tropical America.

The Jamaica cob nut is the produce of a euphorbiaceous tree, *Omphalea diandra*, the seeds of which resemble in taste the ordinary cob or hazel nut. The seed, however, contains a deleterious embryo, which must not be eaten.

Cola, kola or goora nuts are the seeds of *Cola acuminata* (Sterculiaceae), a tree, native of tropical Africa, now introduced into the West Indies and South America. The nuts form an important article of commerce throughout Central Africa, being used over a wide area as a kind of stimulant condiment. The nuts, of which there are numerous varieties, are found to contain a notable proportion of theine, as much as 2·13 %, besides theobromine and other important food-constituents, to which circumstances, doubtless, their valuable properties are due.

Coquilla nuts, the hard inner portion ("stone") of the palm, *Attalea funifera*, the piassaba of Brazil, are highly valued for turnery purposes. They have an elongated oval form, 3 to 4 in. in length, and being intensely hard they take a fine polish, displaying a richly streaked brown colour.

The marking nut, *Semecarpus Anacardium*, is a fruit closely allied in its source and properties to the cashew nut (*q.v.*). The marking nut is a native of the East Indies, where the extremely acrid juice of the shell of the fruit in its unripe state is mixed with quicklime and used as a marking-ink. The juice also possesses medicinal virtues as an external application, and when dry it is the basis of a valuable caulking material and black varnish. The seeds are edible, and the source of a useful oil.

Physic nuts are the produce of the euphorbiaceous tree, *Curcas purgans*, whence a valuable oil, having similar purgative properties to castor oil, is obtained. The plant is a native of South America, but is now found throughout all tropical countries.

Pine nuts are the seeds of several species of *Pinus*, eaten in the countries of their growth, and also serving to some extent as sources of oil. Of these the most important are the stone pine, *Pinus Pinea*, of Italy and the Mediterranean coasts, and the Russian stone pine, *Pinus Cembra*. The *Pinus Sabiniana* of California and *P. Gerardiana* of the Himalayas similarly yield edible seeds. These seeds possess a pleasant, slightly resinous flavour.

Ravensara nuts, the fruit of *Agathophyllum aromaticum* (Lauraceae), a native of Madagascar, is used as a spice under the name of the Madagascar clove nutmeg.

The Sapucaya nut, a native of Brazil, is seen occasionally in fruit-shops. It is produced by a large tree, *Lecythis Ollaria*, or "cannon-ball tree." Its specific name is taken from the large urn-shaped capsules, called "monkey-pots" by the inhabitants, which contain the nuts. The sapucaya nut has a sweet flavour, resembling the almond, and if better known would be highly appreciated. It is, however, scarce, as the monkeys and other wild animals are said to be particularly fond of it. This nut, which is of a rich amber-brown, is not unlike the Brazil nut, but it has a smooth shell furrowed with deep longitudinal wrinkles.

Soap nuts are the fruits of various species of *Sapindus*, especially *S. Saponaria*, natives of tropical regions. They are so called because their rind or outer covering contains a principle, saponine, which lathers in water, and so is useful in washing. The pods of *Acacia concinna*, a native of India, possess the same properties, and are also known as soap nuts.

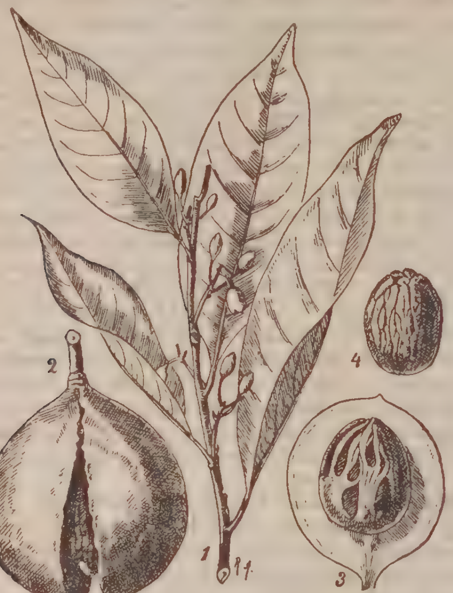
NUTATION (from Lat. *nutare*, to nod), a revolution of the celestial pole around its mean position, due to inequalities in the action of the sun and moon, on an earth of ellipsoidal form. When either of these attracting bodies is in the plane of the equator, it produces no change in the direction of the celestial pole. The greater their distance from this plane, the greater the change, for reasons shown in the article ASTRONOMY (*Celestial Mechanics*). The result is a motion which can be divided into two components. One of these is the progressive and nearly uniform motion of a fictitious mean pole, called precession (*q.v.*), and the other a revolution of the true around the mean pole, depending on the varying declinations of the sun and moon, and called nutation. Owing to the revolution of the moon's node and the inclination of its orbit, this body moves through a wider range of declination in some positions of the node than in others. The period of the revolution of the node is 18·6 years. At one time of this period the limits of its declination are more than 28° north and south, while, at the opposite point, they are little more than 18°. The result of these periodic changes is that the nutation takes place nearly in an ellipse, differing little from a circle, at a distance of about 9″, in a period of about 18·6 years. The motion is not exactly an ellipse, having a great number of minute inequalities arising from the ellipticity of the orbits of the sun and moon and their varying declinations. The amount and formulae of nutation from year to year are given in the *Nautical Almanac*.

NUTCRACKER, the name given by G. Edwards in 1758 (*Gleanings*, No. 240) to a bird which had hitherto borne no English appellation, though described in 1544 by Turner, who, meeting with it in the Rhaetic Alps, where it was called "Nousbrecher" (*hodie* "Nussbrecher"), translated that term into Latin as *Nucifraga*. In 1555 C. Gesner figured it and conferred upon it another designation, *Caryocatactes*. It is the *Corvus caryocatactes* of Linnaeus and the *Nucifraga caryocatactes* of modern ornithology. F. Willughby and J. Ray obtained it on the road from Vienna to Venice as they crossed what must have been the Sömmerring Pass, 26th September 1663. The first known to have occurred in Britain was, according to T. Pennant, shot at Mostyn in Flintshire, 5th October 1753, and about fifteen more examples have since been procured, and others seen, in the island. Contrary to what was for many years believed, the nest of the Nutcracker seems to be invariably built on the bough of a tree, some 20 ft. from the ground, and is a comparatively large structure of sticks, lined with grass. The eggs are of a very pale bluish-green, sometimes nearly spotless, but usually more or less freckled with pale olive or ash-colour. The chief food of the Nutcracker appears to be the seeds of various conifers, which it extracts as it holds the cones in its foot, and it has been questioned whether the bird has the faculty of cracking nuts—properly so called—with its bill, though that can be used with much force and, at least in confinement, with no little ingenuity. The old supposition that the Nutcrackers had any affinity to the Woodpeckers (*Picidae*) or were intermediate in position between them and the Crows (*Corvidae*) is now known to be wholly erroneous, for they undoubtedly belong to the latter family (see also CROW). (A. N.)

NUTHATCH, in older English NUTHACK, from its habit of hacking or chipping nuts, which it cleverly fixes, as though in a vice, in a chink or crevice of the bark of a tree, and then hammers them with the point of its bill till the shell is broken. This bird was long thought to be the *Sitta europaea* of Linnaeus; but that is now admitted to be the northern form, with the lower parts white, and its buff-breasted representative in central, southern and western Europe, including England, is known as *Sitta caesia*. It is not found in Ireland, and in Scotland its appearance is merely accidental. Without being very plentiful anywhere, it is generally distributed in suitable localities throughout its range—those localities being such as afford it a sufficient supply of food, consisting during the greater part of the year of insects, which it diligently seeks on the boles and larger limbs of old trees; but in autumn and winter it feeds on nuts, beech-mast, the stones of yew-berries and hard seeds. Being of a bold disposition, and the trees favouring its mode of life often growing near houses, it will become on slight encouragement familiar with men; and its neat attire of ash-grey and warm buff, together with its sprightly gestures, render it an attractive visitor. It generally makes its nest in a hollow branch, plastering up the opening with clay, leaving only a circular hole just large enough to afford entrance and exit; and the interior contains a bed of dry leaves or the filmy flakes of the inner bark of a fir or cedar, on which the eggs are laid. In the Levant occurs another species, *S. syriaca*, with somewhat different habits, as it haunts rocks rather than trees; and four or five representatives of the European arboreal species have their respective ranges from Asia Minor to the Himalayas and Northern China. North America possesses nearly as many; but, curiously enough, the geographical difference of coloration is just the reverse of what it is in Europe—the species with a deep rufous breast, *S. canadensis*, being that which has the most northern range, while the white-bellied *S. carolinensis*, with its western form, *S. aculeata*, inhabits more southern latitudes. The Ethiopian Region has as representative of the group the *Hypositta corallirostris* of Madagascar. *Callisitta* and *Dendrophila* are nearly allied genera, inhabiting the Indian Region, and remarkable for their beautiful blue plumage. *Sittella*, with four or five species, is found in Australia and New Guinea, whilst *Daphnoesitta* occurs in New Guinea. The nuthatches are placed in the *Passerine* family *Sittidae*, intermediate between the *Paridae* and the *Certhiidae*. (A. N.)

NUTMEG (from "nut," and O. Fr. *mugue*, musk, Lat. *muscus*), the commercial name of a spice representing the kernel of the seed of *Myristica fragrans* (fig. 1), a dioecious evergreen tree, about 50 to 60 ft. high, found wild in the Banda Islands and a few of the neighbouring islands, extending to New Guinea.

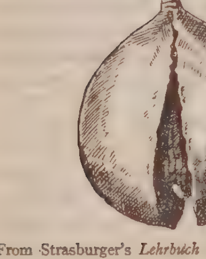
Nutmeg and mace are almost exclusively obtained from the Banda Islands, although the cultivation has been attempted with varying success in Singapore, Penang, Bengal, Réunion, Brazil, French Guiana and the West Indies. The trees yield fruit in eight years after sowing the seed, reach their prime in twenty-five years, and bear for sixty years or longer. Almost the whole surface of the Banda Islands is planted with nutmeg trees, which thrive under the shade of the lofty *Canarium commune*. In Bencoolen the tree bears all the year round, but the chief harvest takes place in the later months of the year, and a smaller one in April, May and June. The ripe fruit is about 2 in. in diameter, of a rounded pear-shape, and when mature splits into two, exposing a crimson arillus surrounding a single seed (figs. 1, 2). When the fruit is collected the pericarp is first removed; then the arillus is carefully stripped off and dried, in which state it forms the mace of commerce. The seed consists of a thin, hard testa or shell, enclosing a wrinkled kernel, which, when dried, is the nutmeg. The kernel consists mainly of the abundant endosperm, which is firm, whitish in colour and marbled with numerous reddish-brown vein-like partitions, into which the inner seed-coat penetrates, forming what is known botanically as ruminated endosperm.



From Strasburger's *Lehrbuch der Botanik*, by permission of Gustav Fischer.

Fig. 1.—*Myristica fragrans*. (Official.)

1. Twig with male flowers.
2. Ripe pendulous fruit opening.
3. Fruit after removal of one-half of the pericarp, showing the dark brown seed surrounded by the ruptured arillus.
4. Kernel freed from the seed-coat.



After Berg and Schmidt. From Strasburger's *Lehrbuch der Botanik*, by permission of Gustav Fischer.

Fig. 2.—*Myristica fragrans*, seed cut through longitudinally. (Official.)

g, Aril.
h, Outer integument, interrupted at *r* by the raphe.
m, Ruminated endosperm.
n, Embryo (nat. size).

To prepare the nutmegs for use, the seed enclosing the kernel is dried at a gentle heat in a drying-house over a smouldering fire for about two months, the seeds being turned every second or third day. When thoroughly dried the shells are broken with a wooden mallet or flat board and the nutmegs picked out and sorted, the smaller and inferior ones being reserved for the expression of the fixed oil which they contain, and which forms the so-called oil of mace.

The dried nutmegs are then rubbed over with dry sifted lime. The process of liming, which originated at the time when the Dutch held a monopoly of the trade, was with the view of preventing the germination of the seeds, which were formerly immersed for three months in milk of lime for this purpose, and a preference is still manifested in some countries for nutmegs so prepared. It has, however, been shown that this treatment is by no means necessary, since exposure to the sun for a week destroys the vitality of the kernel. Penang nutmegs are never limed. The entire fruit preserved in syrup is used as a sweetmeat in the Dutch East Indies.

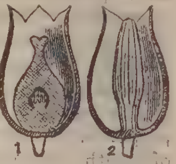


Fig. 3.—*Myristica fragrans.*

1. Male flower.
2. Female flower.

"Oil of mace," or nutmeg butter, is a solid fatty substance of a reddish-brown colour, obtained by grinding the refuse nutmegs to a fine powder, enclosing it in bags and steaming it over large cauldrons for five or six hours, and then compressing it while still warm between powerful wedges, the brownish fluid which flows out being afterwards allowed to solidify. Nutmegs yield about one-fourth of their weight of this substance. It is partly dissolved by cold alcohol, the remainder being soluble in ether. The latter portion, about 10% of the weight of the nutmegs, consists chiefly of *myristin*, which is a compound of *myristic acid*, $C_{14}H_{28}O_2$, with glycerin. The fat which is soluble in alcohol appears to consist, according to Schmidt and Roemer (*Arch. Pharm.* [3], xxi. 34-48), of free myristic and stearic acids; the brown colouring matter has not been satisfactorily investigated. Nutmeg butter yields on distillation with water a volatile oil to the extent of about 6%, consisting almost entirely of a hydrocarbon called *myristicene*, $C_{10}H_{16}$, boiling at 165° C. It is accompanied by a small quantity of an oxygenated oil, *myristicol*, isomeric with carvol, but differing from it in not forming a crystalline compound with hydrosulphuric acid. Mace contains a similar volatile oil, *macene*, boiling at 160° C., which is said by Cloëz to differ from that of nutmegs in yielding a solid compound when treated with hydrochloric acid gas.

The name nutmeg is also applied to other fruits or seeds in different countries. The Jamaica or calabash nutmeg is derived from *Monodora Myristica*, the Brazilian from *Cryptocarya moschata*, the Peruvian from *Laurelia sempervirens*, the Madagascar or clove nutmeg from *Agathophyllum aromaticum*, and the Californian or stinking nutmeg from *Torreya Myristica*. The cotyledons of *Nectandra Puchury* were at one time offered in England as nutmegs.

NUTRITION. The physiology of nutrition involves the study of the way in which the tissues of the body, and more especially the great master tissues, muscle and nerve, obtain the material for growth and repair and the energy for mechanical work and heat production, and of the mode in which they get rid of the waste products of their activity. The study is therefore very largely a study of the history of the food of the body, since it is in the food that the necessary matter and energy are supplied. Under Dietetics the composition and special importance of various foods and the laws which regulate the supply of food under different conditions of the body are separately dealt with. Here the mode of digestion, the utilization and the elimination of the end products of the three great constituents, proteins, carbohydrates and fats, are alone considered. They are treated under the following heads: I. The Chemistry of Digestion; II. The Mode of Formation of the Digestive Secretions; III. The Mechanism by which the Food is passed along the Alimentary Canal; IV. The Absorption of Food; V. Metabolism; VI. Excretion.

I. Chemistry of Digestion

The essential step which prepares the ordinary food for utilization in the body, for the change into living matter, is digestion, a process which the food undergoes under the influence of the ferments or enzymes present in the gastro-intestinal tract. By this process it is broken down into simpler substances, which can be utilized by the body tissues for conversion into protoplasm and as the supply of energy. That part which is unsuited for use in the body is either passed as faeces or absorbed and excreted in the urine.

1. *Enzyme Action generally.*—The substances which bring about this change are known as ferments, enzymes or zymins. Formerly it was believed that there were two distinct classes

of enzymes, those which were living or associated with living cells, and those which were non-living. In 1897, however, E. Buchner and M. Hahn showed that from living cells (yeast) a ferment could be obtained which acted quite as well extracellularly as when it was bound up within the cell. Subsequent work has shown that other organisms act by the enzymes they contain, so that it is now recognized that there is no essential difference between the living or organized ferment and the non-living or unorganized ferment. All ferments probably act as catalysators or catalysts. Catalysis is the process by which reactions are either initiated or accelerated by the mere presence of certain substances which remain unchanged during the process; to these substances the name of catalysators has been given. As an example of such catalytic action the acceleration of the decomposition of hydrogen peroxide (H_2O_2) into water (H_2O) and oxygen (O) by the action of a colloidal solution of platinum may be given. C. Oppenheimer defines an enzyme as a substance produced by living cells, which acts by catalysis. E. Fischer has shown that the action of ferments is specific, that is, the ferment only exerts its action on definite substances or substrates of definite structural arrangement. He has compared the relation of ferment to substrate to that of a key to its lock. Ferments which bring about the breakdown of proteins are without influence on fats and carbohydrates; those which decompose fats leave proteins and carbohydrates untouched, and so on.

The chemical composition of enzymes is unknown. It has been assumed that they are protein in nature, but this is mainly because it has been found that when they are extracted from tissues they are apparently in combination with proteins. In all probability the protein is there as an impurity owing to incomplete separation.

As regards the general properties of enzymes, most of them can be precipitated from their solutions by means of alcohol. They can also be carried down by fine precipitates of certain inorganic salts or by protein precipitation, *e.g.* when a precipitate of casein is produced by acidifying a casein solution with acetic acid. Most of the ferments are soluble in water or saline solutions, and in glycerin and water. The ferments are found to have an optimum temperature of action. This temperature in most cases ranges from 37° to 40° C. All true ferments are thermolabile, being destroyed at about 70° C. Ferments are hindered in their action to some extent by the general protoplasmic poisons, such as salicylic acid, chloroform, &c. The action of many of them is retarded when the products of their action are allowed to accumulate. Just as when a chemical reaction is set up its rate tends to decrease and finally comes to a standstill before the reaction is completed—an equilibrium being established—so the reactions set up by enzymes also tend to come to an equilibrium before the complete conversion of the original substance. In the case of certain enzymes at least this equilibrium may be reached from either side; thus the enzyme maltase may either bring about the breakdown of the sugar maltose to dextrose or cause a synthesis of dextrose to maltose.

A number of the body ferments have now been shown to exist in the tissues in an inactive form. This condition is known as the proferment or zymogen state, and before any action can be exerted it must be activated, usually by some specific substance, as in the case of the activation of trypsinogen by means of enterokinase. The following table gives a list of the principal ferments concerned in the digestion and metabolism of food-stuffs:—

Material acted on.	Enzyme.	Where found.
I. Protein	Pepsin	Gastric juice
	Trypsin	Pancreatic juice
	Erepsin	Small intestine
	Various autolytic enzymes	Tissues generally
II. Fats	Lipase	Pancreatic juice and certain tissues
III. Carbohydrates	Ptyalin (salivary diastase)	Saliva
	Pancreatic diastase	Pancreatic juice
	Maltase	Pancreatic juice Small intestine
	Invertase	Small intestine
	Lactase	Small intestine
	Various tissue diastases	Liver, muscle, &c.

Certain oxydases, catalases and de-amidizing enzymes are found in the tissues generally and play an important part in the various metabolic processes.

2. *Digestion in the Mouth.*—The first of the digestive secretions which food comes into contact with is the saliva. This is the mixed secretion from the various glands, salivary and other, the ducts of which open in the mouth. The saliva, which is for the most part produced by the three large salivary glands, the parotid, the sub-maxillary and the sub-lingual, is a colourless or a slightly turbid viscous fluid with a faintly alkaline reaction and of low specific gravity. It contains a very small proportion of solids, which vary somewhat in amount and character in the secretions of the different glands. Mucin and traces of other proteins are present. Small amounts of potassium sulphocyanide may nearly always be detected. The functions of the saliva are twofold. First, it has a mechanical action moistening the mouth and the food and thus aiding mastication and swallowing by securing the formation of a proper bolus of food; it also assists by binding the particles together, an action of special importance when the food is dry. Second, in man and in some of the lower animals the enzyme ptyalin exerts an action in digestion on part of the carbohydrates of the diet. The starches or polysaccharides are broken down, first of all to the simple dextrins and then to the still more simple disaccharide, maltose. The further breakdown of the maltose is carried out in the intestine by the action of a ferment maltase which does not exist at all or only in the merest traces in the buccal secretion. The action of ptyalin on starches is thus very similar to that of acids, except that it stops at the formation of maltose. Ptyalin acts best at a temperature of about 40° C. and in a neutral or faintly alkaline medium, its action being inhibited by the presence of even very dilute solutions of the mineral acids. If the acid be in sufficient amount the enzyme is destroyed. For this reason the action ceases in the stomach whenever the bolus is completely permeated by the gastric juice. As it takes time for the gastric juice thoroughly to permeate the food mass, which remains for a considerable period in the fundus of the stomach unmixed with the secretion, salivary digestion goes on for about half an hour after food is taken.

3. *Gastric Digestion.*—The passage of food from the mouth to the stomach will be dealt with later. The stomach has two digestive functions: (1) It acts as a store chamber permitting a full meal to be taken; (2) It acts as a digestive organ of importance in preparing the food for further attack in the intestinal canal. But the stomach cannot be regarded as an essential organ, since it has been removed in dogs and in man without apparent interference with nutrition and health.

Gastric digestion is brought about by the action of the gastric juice, a clear watery, colourless and strongly acid fluid with a specific gravity of about 1003. The amount of solids present is extremely small, about 0·3 %. They consist of protein, nucleic acid, lecithin and inorganic salts, in addition to the more important constituents, the enzymes and hydrochloric acid.

The amount of hydrochloric acid present in the juice varies with the period of digestion. In man the maximum acid concentration is about 0·2 %. The acid exists in the stomach in two forms as free hydrochloric acid and as combined hydrochloric acid. The amount of each depends on various factors: (1) the secretion itself; (2) the nature of the food; and (3) the rapidity with which the stomach empties itself, &c. For instance, after a protein-free meal the hydrochloric acid is for the most part free, whereas, when protein is present, it combines with it and, unless secreted in very large amount, most of the acid is in a fixed condition.

The hydrochloric acid is formed by the activities of certain gland cells in the middle region of the stomach, and the fact that it does not exist as such in the blood proves that it is formed within these cells. Further, it has been found that the gastric mucous membranes of starving dogs contain 0·74 % of sodium and potassium chloride, much more than is present in any other organ or in the blood plasma. That the chlorine comes from the sodium chloride in the food has been shown by the fact that, when the tissues are deprived of this salt, and sodium bromide is given, hydrobromic acid may appear in the gastric secretion.

The hydrochloric acid is essential for the action of the gastric enzyme, pepsin, in splitting up the protein of the food. In addition to this, the acid has a slight action in splitting polysaccharides and disaccharides. Lastly, it acts as a bactericidal agent, preventing bacterial decomposition from taking place, and it may thus prevent certain noxious bacteria, taken in in the food, from gaining access to the intestinal tract, where there is a chance of their flourishing in the rich alkaline medium. It is owing to the presence of hydrochloric acid that gastric juice can be kept for prolonged periods without undergoing putrefaction.

The quantity of juice secreted varies with the nature of the food consumed. Thus in one experiment, after the use of a test meal consisting of 25 grammes bread and 250 c.c. tea, there was a flow of 106 c.c., whereas in another case with an ordinary meal there was an output of practically 600 c.c. gastric juice.

Pawlow has shown that not only does the amount of juice secreted vary with the nature of the food ingested but that the digestive activity of the secretion also varies in the same way. He gives the following table:—

Quantities and Properties of Gastric Juice with Different Diets: 200 gms. Flesh, 200 gms. Bread, 600 c.c. Milk.

Hour.	Quantities of Juice in c.c.			Digestive Power in mm.		
	Flesh.	Bread.	Milk.	Flesh.	Bread.	Milk.
1st	11·2	10·6	4·0	4·94	6·10	4·21
2nd	11·3	5·4	8·6	3·03	7·97	2·35
3rd	7·6	4·0	9·2	3·01	7·51	2·35
4th	5·1	3·4	7·7	2·87	6·19	2·65
5th	2·8	3·3	4·0	3·20	5·29	4·63
6th	2·2	2·2	0·5	3·58	5·72	6·12
7th	1·2	2·6	. .	2·25	5·48	. .
8th	0·6	2·6	. .	3·87	5·50	. .
9th	. .	0·9	. .	. .	5·75	. .
10th	. .	0·4	. .	. .	. .	. .

Thus each separate food gives rise to a definite hourly secretion of the juice and to a characteristic alteration in its properties. The meat diet brings about a very rapid flow, the maximum output taking place within the first two hours; with bread the maximum output is even earlier. With milk somewhat later. When the juice is examined as regards its digestive activity, it is found that with meat the most active juice is secreted within the first hour, with bread in the second and third hours, and with milk in the sixth hour.

According to the nature of the food, the stomach seems to be stimulated to form a secretion which will best serve its purpose and give the minimum of waste. It thus works economically.

The principal ferment found in the gastric juice is pepsin, a ferment which acts only in the presence of a mineral acid. The action proceeds best at a temperature of about 37° C. in an acid medium of 0·2% to 0·3%. Pepsin is elaborated in the so-called chief cells of the gastric glands as an inert precursor—propepsin. It is only when it comes into contact with the acid of the juice that it is activated and rendered capable of attacking the protein of the food.

As already mentioned, the main function of the gastric juice is to deal with the protein moiety of the food and to prepare it for further digestion in the intestine.

The first result of the action of this secretion on protein matter is to render it soluble—a metaprotein or acid albumin (syntonin), being formed. This body may be regarded mainly as the product of the action of the hydrochloric acid independently of the pepsin.

The following steps of decomposition are the result of the action of pepsin. From the metaprotein primary and secondary proteoses, the so-called proto-, hetero- and deutero-albumoses are formed, and from these peptones are finally produced. The result of this process of digestion or hydrolysis induced by the pepsin is that complex protein substances of high molecular weight are converted into simpler bodies of comparatively low molecular weight. Formerly it was believed that the action of the pepsin on protein could not carry the decomposition further than the peptones, but recently it has been shown that still further splitting can be brought about, and that the simple amino acids of which the protein molecule is built up can be produced. This latter process, however, takes a very long time even under favourable circumstances, and it probably never occurs under normal conditions. The contents of the stomach—products of protein digestion—are passed on into the duodenum, chiefly as proteoses and peptones.

In addition to the principal ferment of the gastric juice some workers hold that another enzyme is present. This is the ferment rennet, rennin, or chymosin, the sole action of which, so far as is known at present, is to bring about the curdling of milk, the curd formed being dealt with in the ordinary way by the pepsin. Clotting of milk under the action of rennin occurs at a suitable temperature with great rapidity. This process is said to take place in two stages: (1) the rennin converts the caseinogen of the milk into paracasein, and (2) this paracasein unites with the lime salts present in the milk and forms the curd or precipitate. That lime salts are absolutely essential for this process of clotting has been shown by the fact that, if they are removed by precipitation as by oxalates, no clotting will take place even after the addition of a large amount of active rennin. Immediate clotting takes place, however, when the necessary lime salts are restored. Many observers now hold that this rennet action is not the property of a specific ferment but simply another phase of the action of pepsin. For this view, which has been put forward by well-known workers, there is much to be said and certainly the power of curdling milk is not confined to the stomach, but has been found in various tissue extracts, and, indeed, wherever proteolytic enzymes are found.

The speed with which the stomach is emptied depends to a great extent on the nature of the food. Plain water leaves the stomach almost at once, salt and sugar solutions at a somewhat slower rate. Milk under the action of rennin curdles. The whey rapidly leaves the stomach, whereas the casein and fat are retained for further treatment. On a mixed diet, emptying of the stomach in man proceeds very slowly, requiring about four hours. Cannon, by feeding with food impregnated with bismuth and using X-rays, showed that carbohydrates leave most rapidly, then mixtures of carbohydrates and proteins, then proteins, then fats, and finally mixtures of fats and proteins. The diet which remains longest in the stomach is a mixture of fats and proteins—rich food, as it is popularly called. Here two factors enter to prevent rapid emptying: (1) the presence of much fat, and (2) the acid secretion engendered by the abundant protein.

There is no doubt that fats present in fine emulsion can be decomposed in the stomach. The action proceeds in a medium which is slightly acid or neutral, being entirely prevented by the presence of strong acids and alkalis. Many workers believe this gastrolipase to be of pancreatic or intestinal origin, and suppose that it gains entrance to the stomach by a reflux flow through the pylorus. Evidence is accumulating to show that this view is correct.

By means of pepsin and gastrolipase proteins and fats are dealt with. No specific enzyme for carbohydrates has been found in the stomach in man. Certainly a small amount of polysaccharide decomposition takes place, but this is dependent (1) on the ptyalin which comes from the mouth, and (2) on a certain amount of hydrolysis due to the action of the free hydrochloric acid.

4. *Digestion in the Intestine.*—The passage of food from the stomach to the intestine will be considered later. The food so far digested in the stomach is known as chyme, and it is passed on to undergo intestinal digestion under the influence of (1) the enzymes of the pancreas, and (2) of other enzymes present in the different secretions of the intestine. Digestion in the intestine may accordingly be described under these two heads.

(*a*) *Pancreatic Digestion.*—The pancreatic juice is the secretion from the pancreas and is discharged into the duodenum. The secretion obtained from a fistula of the pancreatic duct varies in character according to whether the opening into the duct has been made recently or some time before the examination. It is a clear, usually thin fluid with a specific gravity of about 1008, and with an alkaline reaction. It contains a certain amount of protein and ash. The most important inorganic constituent is sodium carbonate, which gives the alkaline reaction (alkalinity is, as NaOH = 0·47%). This alkaline salt, along with that contained in the intestinal juice, plays an important part in neutralizing the acid chyme.

In the pancreatic secretion there are at least three important enzymes, each with a definite action: (*a*) trypsin, the proteolytic enzyme which brings about the further breakdown of the food proteins; (*b*) a diastase which deals with the carbohydrates, and (*c*) a lipase which acts on the fats.

(*a*) *Trypsin.*—This ferment, in the form in which it is secreted—trypsinogen—is inert. Before it can exert its hydrolytic action it must be activated. This activation is brought about by another enzyme which is found in the intestinal tract—enterokinase. The conversion is brought about as soon as the trypsinogen comes into contact with the enterokinase, the merest trace of which suffices to activate a large amount of trypsinogen.

Trypsin acts on the protein just as pepsin does, by bringing about hydrolytic changes. It differs from the latter in acting best in an alkaline or neutral medium. Its effect is much more energetic than that of pepsin, so that the protein molecule is more completely decomposed. Whilst it generally finishes the decomposition which the pepsin has begun, it can break down the original protein quite as easily if not more easily than does pepsin, and it carries the splitting as far as the comparatively simple crystalline bodies, the amino acids, or groups of these, the polypeptides, bodies intermediate between the complex peptones and the simple amino acids of which the protein is built up.

The character and properties of the products formed in such digestion depend on the nature of the protein acted upon. As will be seen from the following table these proteins vary fairly widely in the proportion of amino acids which they contain.

100 *Grammes Protein yielded*

	Caseinogen.	Gelatine.	Globine from Oxy-haemoglobine.	Elastine.
Glycocoll	..	16·5	..	25·75
Alanine	0·9	0·8	4·19	6·58
Leucine	10·5	2·1	29·04	21·38
*a*Proline	3·1	5·2	2·34	1·74
Phenyalanine	3·2	0·4	4·24	3·89
Glutamic acid	10·7	0·88	1·73	0·76
Aspartic acid	1·2	0·56	4·43	..
Cystine	0·065	..	0·31	..
Serine	0·23	..	0·56	..
Oxyproline	0·25	3·0	1·04	..
Tyrosine	4·5	..	1·33	0·34
Lysine	5·80	2·75	4·28	..
Histidine	2·59	0·40	10·96	..
Arginine	4·84	7·62	5·42	0·3
Tryptophane	1·5	..	Present	..

Whether any of the polypeptides found in digestion are further broken down in the course of normal pancreatic digestion is a moot point, but E. Fischer and E. Abderhalden have shown that many of the synthetic polypeptides prepared by them can be broken into their constituents by the action of trypsin. The previous peptic digestion seems to play some part in the extent to which tryptic digestion is carried out, as one of these observers has demonstrated that protein digested first with pepsin and then with trypsin gives a smaller yield of polypeptide and a larger yield of monamino acids than when digestion has been carried out with trypsin alone.

b. Diastase.—This ferment is found in the pancreatic juice apparently secreted in an active form, although some observers hold that it also is secreted in a zymogen form. It is practically identical in its action with the ptyalin of the saliva, converting starch into maltose. It deals with all the starchy food which has escaped conversion into the simple sugars by the ptyalin.

c. Lipase.—Most of this ferment, if not all, is apparently secreted in the form of a zymogen. There is evidence that the bile is the activating agent here, just as the enterokinase acts in the case of trypsin. Lipase can act in any medium acid, neutral, and alkaline, and both on emulsified and non-emulsified fats. It converts the fats by a process of hydrolysis into fatty acids and glycerin. Kastle and Loevenhart found that not only can this enzyme break up fats into their components, but that it also has the power to act in the reverse direction, and in this way bring about the union of fatty acids and glycerin so as to form fats, a process which occurs in the intestinal epithelial cells after absorption.

In addition to these three enzymes the pancreatic juice may contain traces of others, for example, a rennet-like ferment which curdles milk. This again, as in the case of the stomach rennet, is held by some to be only another phase of proteolytic action. Maltase is also said to be present in small amount, as is also lactase under certain conditions. In pancreatic, as in gastric digestion, the nature of the food is said to play a part in controlling the amount and the composition of the secretion with respect to its ferments. The action, if it does exist, is not very well defined.

b. Intestinal Digestion.—By this is meant the other digestive processes which go on in the intestine under the action of the secretion of Lieberkühn's follicles—the *succus entericus.* This is a yellowish, often opalescent, strongly alkaline fluid. The alkalinity is due to the presence of sodium carbonate. It contains a small amount of protein, shed epithelial cells, &c. The secretion of some 170 c.c. in 24 hours has been observed in a short loop of human intestine by H. S. Hamburger and E. Hekma, but it is almost impossible to get a measure of the actual amount of secretion from the whole gut. Most of the ferments are present in very small amount in the intestinal juice. They seem to be actually within the epithelial lining of the intestine, for extracts made from the intestinal mucous membrane are richer in ferments than the secretion.

Apparently the intestinal secretion contains no trace of a ferment acting on native protein, but a ferment—erepsin—is present in fair amount in the intestinal mucous membrane and in small amount in the secretion, which acts in an alkaline medium on proteoses, peptones, and on casein, converting them into crystalline products of the nature of amino acids.

Another ferment, arginase, has been isolated from the intestinal mucous membrane by A. Kossel and H. D. Dakin, which splits the diamino acid arginin into urea and ornithin. A lipase has also been detected which is very similar to pancreatic lipase; it, however, attacks only emulsified fats.

Several carbohydrate hydrolysing enzymes have been described in the small intestine. Invertin, the ferment which splits cane-sugar, is present in small amount in the secretion, more abundantly in the extract of mucous membrane. In all probability it deals with the saccharose after or in process of absorption. Maltase is also present in large amount, and here again in greater amount in the extract than in the secretion. The presence of lactase has been much discussed, and it seems probable that suckling animals do possess this enzyme. Some workers have stated that an intestinal diastase is to be found, but, if so, it is present in very small amount.

In the large intestine a small amount of erepsin has been discovered at the upper end. Any digestion which does take place is probably either bacterial in origin, or due to ferments which have originated in the lower end of the small intestine, and which have been carried down.

5. *Bile.*—This fluid, in all probability, has little direct action in ordinary digestion, although it contains substances which act indirectly. The bile salts act as solvents for fats and fatty acids, and as activators of pancreatic lipase. The salts also serve to keep cholestrin in solution. Bile is to be looked upon rather as the excretion, the result of the hepatic metabolism, than as a digestive juice. Various workers have shown that when the bile is prevented from entering the intestine owing to a fistula having been made, the animal or patient may continue to enjoy good health, thus proving that this fluid is not essential to any of the digestive processes which normally take place.

Bile as secreted has an orange-brown colour, but the colour varies according to the pigment present. It is more or less viscous (not so viscous as bile taken from the gall bladder) and has a specific gravity of about 1010. It has a slightly alkaline reaction, a bitter taste and a characteristic smell. The daily output is, for a normal individual, over 500 c.c. On analysis it is found to have over 2% of solids, of which more than half are organic. It contains in addition to a nucleo-albumin, derived mainly from the bile passages and gall bladder, bile acids, bile pigments, cholesterin, lecithin, fats, &c. The most abundant solids are the salts of the bile acids, of which in man the most important is sodium glycocholate, sodium taurocholate being present in very small amount. The bile acids are formed in the liver cells, and when the duct is ligatured they tend to accumulate in the blood.

The pigments amount to only about 0·2%. In human bile the chief pigment is bilirubin, whilst in herbivora biliverdin is more abundant. They are derived from the haemoglobin of the blood, but the pigments are iron-free. They may be regarded as purely excretory products arising from the breakdown of the haemoglobin of effete blood corpuscles.

Cholesterin is a monatomic alcohol, and is probably a waste product. It occurs in the bile only in small amount, and there is some evidence that it is not secreted by the liver cells but is added to the bile from the bile passages. Fats and lecithin are both derived from the liver cells. Of the inorganic constituents phosphate of calcium is the most abundant.

The secretion of bile is practically continuous, but it seems to enter the duodenum intermittently. The taking of food increases the flow of bile, the amount of the increase depending to a certain extent on the nature of the food. A protein meal has been found to have the greatest effect and a carbohydrate one the least. The entry of the acid chyme into the duodenum is the stimulus which brings about the ejection of the bile. Pressure on the liver also seems to cause a flow (see section II.).

In connexion with bile secretion attention may be drawn here to a peculiar enterohepatic circulation which is stated to exist. The bile salts are partly absorbed from the intestine, to be carried again by the portal blood to the liver and to be again eliminated. By this circulation the entrance of various alkaloidal and ptomaine poisons into the general circulation may be prevented.

Faeces.—The bulk of the waste matter arising from the foods along with the secretions from the alimentary canal form the faeces. On an absorbable diet the faeces are almost purely intestinal in origin. As a channel of excretion of nitrogenous metabolic waste products they are not very important, although the work of C. Voit indicates that they do play a certain part. The nature of the excreted nitrogenous substances has not been fully examined. Of the inorganic constituents iron is probably for the most part excreted into the large intestine. It is, however, very difficult to come to any definite conclusion as to what is unabsorbed material and what excreted.

II. THE MODE OF FORMATION OF THE DIGESTIVE SECRETIONS

1. *Salivary Glands.*—The secretion from the various glands is generally evoked by nervous impulses, through the secretory

nerves. K. Ludwig found that the stimulation of the chorda tympani produced a copious flow of watery saliva from the submaxillary gland, and a general dilatation of the blood-vessels supplying the gland. The same is the case in the sublingual gland. In addition to the chorda tympani fibres also pass to the gland through the cervical sympathetic, and when these are stimulated the saliva excreted is viscous and turbid, and contains much solid matter, while the blood-vessels are contracted. The conclusion formerly drawn was that the flow of saliva was dependent on the increased blood supply. But it has been definitely proved that true secretory fibres exist. If atropine be administered before stimulation of the chorda tympani, the dilatation of the vessels takes place, but no flow of saliva. Further, if the circulation be cut off from the gland the stimulation of the chorda tympani may cause a temporary flow of saliva.

The parotid gland is supplied by the auriculo-temporal nerve which receives its secreting fibres from the glossopharyngeal. Stimulation of these fibres brings about an abundant watery secretion poor in solids. Stimulation of the sympathetic fibres system is not followed by any salivary flow, yet it has an effect on the gland, for, if after the sympathetic has been stimulated a secretion be evoked by stimulation of the glossopharyngeal nerve, the saliva secreted is very rich in organic solids.

2. *Gastric Glands.*—The control of the gastric secretion seems to be under two entirely different mechanisms. Pawlow has clearly shown that the stomach is supplied with secretory nerves which reach that organ through the vagus. The stimuli which bring these nerves into action are the sight, the odour or the taste of food. That the course of the stimulus is through the vagus is shown by the fact that an abundant flow of juice may be caused so long as the vagi are intact, but this flow does not take place when these nerves are cut. Between the stimulation and the secretion there is a lengthy latent time amounting to several minutes. The other stimulus of the secretion is apparently a chemical one. Pawlow states that mechanical stimulation of the mucous membrane fails to bring about a flow of juice, but Beaumont in his classical observation on the stomach of St Martin found that the insertion of a tube did cause a flow. There may be certain substances either present in the food or developed in the course of digestion, which directly stimulate the secretion originally started by a nervous reflex. E. Starling has drawn attention to this chemical mode of stimulating different organs. To the substances known and unknown which evoke the action, he gives the name of hormones, and such "hormone" action he does not limit merely to the secretory organs but extends to all cases where one organ is stimulated by chemical products formed in the same or another organ. Attention has already been drawn to the influence of different food-stuffs on the amount and nature of the gastric secretion.

3. *Pancreatic Secretion.*—The stimuli which evoke this secretion are again two in number. Many have failed to demonstrate that the secretion of the pancreas is under nervous control, but Pawlow and his school have shown that stimulation of the vagus evokes a secretion of pancreatic juice. This flow, as in the case of the stomach, has a latent period of several minutes. Most modern workers hold that the most effective stimulus to the pancreatic flow is the chemical one—a hormone discovered by W. Bayliss and E. Starling, who found that extracts of the duodenal mucous membrane made with dilute hydrochloric acid when injected into the blood caused a flow of pancreatic juice. The active substance present in this extract is known as "secretin," and is supposed to be formed under natural conditions by the action of the acid chyme on a prosecretin. This secretin is not of the ordinary zymin nature, as it is not destroyed by boiling and is soluble in alcohol. The secretin when formed must be absorbed into the blood and then carried round the circulation to the pancreas before it can act.

4. *Intestinal Juice.*—The mode of action of the stimuli which evoke this secretion has not yet been fully investigated. As has been stated, it is quite possible that very little ferment is secreted, and that ferment action mainly takes place within the cells after the various substances have been absorbed. How far the flow is controlled by nervous action, and how far by hormone action, is not known.

III. MOTOR MECHANISM OF THE ALIMENTARY CANAL

Mastication.—This is a purely voluntary act, and consists of a great variety of movements produced by the various muscles in connexion with the lower jaw. By the act of chewing the food is thoroughly broken up and intimately mixed with the saliva.

Deglutition.—The food after thorough mastication is collected on the surface of the tongue, principally by the action (voluntary) of the buccinator muscles, and by the contraction of the tongue muscles it is passed backwards. As soon as the food by the action of the tongue enters the pillars of the fauces the action becomes involuntary and reflex. The soft palate is raised to prevent the food entering the nasal cavity, and the larynx is shut off by closure of the glottis, and approximation of the arytenoid cartilages to one another and to the back of the epiglottis. The food is now passed on into the oesophagus proper by the constrictors of the pharynx. In the oesophagus the downward movement varies with the nature of the food swallowed. If it be fluid it reaches the lower end of the oesophagus in about three seconds and lies at the lower end of the gullet for two or three seconds before entering the stomach. When the consistency is firmer the progress downwards is much slower. Either by the force exerted by the wave of contraction passing down the gullet or by some inhibition of the sphincter, the cardiac orifice opens and permits the food to enter the stomach.

Stomach Movements.—For our knowledge of these we are indebted principally to the work of Cannon, who studied them by feeding an animal with food containing bismuth and then following the movements of the shadow of the food on a screen by means of the X-rays. Soon after food is taken it is found that a contraction begins somewhere about the middle of the stomach and slowly passes towards the pylorus. This is followed by others, in man at regular intervals of about twenty seconds, so that the pyloric part of the organ is soon in active peristalsis. The fundus of the stomach is not actively concerned in these movements; it simply acts as a reservoir. At certain periods, but not with each peristaltic wave, the pyloric sphincter relaxes and allows a portion of the fluid acid chyme to escape into the duodenum. It only opens when stimulated by fluid material; if solid food be forced against it it remains tightly closed. Grützner, by experiments with feeding with different coloured foods, has shown that the food at the fundus may remain undisturbed for quite prolonged periods. In this connexion it must be remembered, of course, that the food is not lying loose in a sack larger than the contents. The cavity of the stomach is only the size of the amount of food present; in other words, the food exactly fills the cavity. The motor nerve fibres to the stomach run in the vagi, which also contain fibres inhibitory to the cardiac sphincter. The splanchnic nerves mainly contain inhibitory fibres. The automatic movements are probably in connexion with the intrinsic plexus of Auerbach, since they continue after section of the extrinsic nerves.

Intestinal Movements.—The intestines owe their peculiar movements to the arrangement of their muscular coats, which are disposed in two layers, an inner circular, and an outer longitudinal. The movements are of two kinds, the so-called swaying myogenic contraction and the peristaltic waves. The former are rapid and have very little to do with the downward movement of the contents. Probably their action is to mix the contents, since Cannon has shown that these contents, in the lower animals at least, get divided into segments. From time to time the separated segments are caught in the course of a peristaltic wave and carried downward a short distance. Then again in their new situation the rhythmic contractions break up the contents anew.

The peristaltic movements are much more powerful. Under normal conditions they begin at the pylorus and passing downwards carry the intestinal contents onwards. The normal movement progresses slowly, although under abnormal conditions peristaltic waves may become extremely violent and rapid, and may indeed run over the whole length of the intestine within a minute. The muscular coat in front of the contracting zone is relaxed, as is that behind the wave. The waves are probably due mainly to the circular fibres, the longitudinal pulling the gut up over the contents as they are forced onwards. The downward movement seems to be due to some definite arrangement within the intestinal wall, since it has been shown that, when a segment of bowel has been cut out and then the continuity of the canal made good by fixing the section so that the lower end of the excised portion is fixed to the upper divided end of the real gut, upward peristalsis takes place in this segment. An anti-peristalsis has been described in which the movements are all towards the stomach. Under certain conditions the introduction of foreign substances, as hairs, &c., may evoke such anti-peristaltic waves.

The rhythmical movements are held by some to be purely myogenic in origin, as they still continue after section of all the nerves and when the intrinsic ganglia in the intestinal wall have been thrown out of action by the application of nicotine. But recent work by R. Magnus would tend to show that they are controlled by Auerbach's plexus. Peristaltic waves, on the other hand, according to W. Bayliss and E. Starling, although they continue and indeed may become more energetic after section of the extrinsic nerves, are prevented by the application of nicotine and cocaine; in other words, it is presumed that peristalsis is a complicated reflex action through the intrinsic ganglia. The intestines are therefore not dependent for their movement on their connexion with the central nervous system, although of course their activity is more or less regulated by such a connexion.

As regards the movements of the large intestine, they resemble those of the small, although they are much less frequent. The forward movement is slow, thus permitting of the solidification of the contents by the removal of the water. In the first part of the large intestine anti-peristaltic movements are frequent, the regular peristaltic downward movements only becoming prominent when the descending colon is reached to carry contents to the rectum. The anti-peristalsis serves a useful purpose in giving time for the absorption of the fluid in the formation of faeces. The rate at which the contents travel along the intestine varies greatly. Under average conditions the food residue reaches the ileo-caecal valve between the small and large intestine at about four to four and a half hours after a meal, while it takes nine hours to reach the splenic flexure of the colon.

Defaecation.—Food residues, cellular débris and substances derived from the various secretions of the gastro-intestinal tract are forced downwards by peristalsis, and eventually reach the rectum and accumulate there as the faeces. The pressure of the solid and semi-solid mass gives rise to a definite sensation and a desire to empty the rectum. The faeces are retained within the canal partly by the horizontal direction of the rectum before it opens into the anal canal, and partly by the action of two sphincter muscles. At the act of defaecation the strong internal sphincter is first of all relaxed, but unless the rectal stimulus is very strong, the external can be kept contracted, as it is to a certain extent, under the control of the will. The act of defaecation normally is partly voluntary and partly involuntary. The voluntary part consists in the contraction of the abdominal muscles, the closure of the glottis, and the relaxation of the external sphincter and of the levator ani muscle, thus allowing the horizontal part of the rectum to become more vertical; the involuntary in the energetic contractions of the muscular walls of the colon and rectum which sweep the contents of the whole colon downwards. There is a centre in the lumbar enlargement of the spinal cord which presides over the sphincter muscles and probably over the whole involuntary mechanism of defaecation.

Vomiting.—Sometimes the gastric contents are ejected through the cardiac opening of the stomach instead of through the pylorus. The act is a reflex one, probably originally protective in nature, irritation of the gastric mucous membrane being the most frequent cause. The act is generally preceded by a feeling of nausea and a copious salivation, succeeded by a series of powerful expiratory efforts with the glottis closed. The diaphragm is held firmly contracted, then a convulsive contraction of the abdominal muscles with a simultaneous opening of the cardiac orifice of the stomach brings about the sudden ejection of the contents. The wall of the stomach may also contract and press upon the contents. During the act the glottis is firmly closed, and at the same time, if the act be not too violent, the gastric contents are prevented from entering the nasal cavity by the contraction of the soft palate.

IV. Absorption

Mouth.—No absorption of food-stuffs takes place here.

Stomach.—Absorption from the stomach occurs only to a small extent. Water passes rapidly through the stomach and is practically unabsorbed. Salts are apparently absorbed in a limited amount from their watery solution, the extent of absorption depending to some extent on the concentration of the solution. Sugar is also absorbed to a small extent from its solutions, the greater the concentration the greater being the amount of sugar taken up. Alcohol is readily absorbed from the stomach. A small amount of the products of protein digestion may be absorbed. There is no evidence that fats are absorbed under any conditions in the stomach.

Intestine.—The greatest absorption of the foods takes place in the intestine, especially in the small intestine. It has been shown that over 85% of the protein has disappeared before the lower end of the small intestine is reached. How does the absorption take place? There are two channels for the removal of the material from the intestine: (1) the blood capillaries spread in the villi, and (2) the lacteals also present in the villi. The foods may reach the blood direct or through the various lymph channels into the thoracic duct and finally into the blood. The lacteals of the villi are channels for the absorption of the fatty parts of the food. The products of the digestion of the proteins and carbohydrates reach the body directly through the capillaries via the portal system.

Can absorption be explained by the ordinary laws of diffusion and osmosis, or are there certain selective activities of the living epithelial lining? The work of R. Heidenhain, E. Weymouth Reid, and others shows clearly that whatever part the physical laws play in this exchange, there are other activities also at work. For instance, an animal's own serum can be readily absorbed from its intestine, as can also salt and other solutions of higher concentration than that of the blood. Such absorption cannot be explained by ordinary physical laws. In all such cases of absorption the epithelial lining of the gut must be intact and uninjured. O. Cohnheim and others have shown that when the epithelial lining is damaged or destroyed, the intestinal wall behaves like any other animal membrane, and the physical laws governing osmotic pressure come into play. Whether the nervous system plays any part in this absorption is not yet determined.

The form in which the various products resulting from digestion are absorbed must next be considered.

Carbohydrates.—These reach the body, as already mentioned, by way of the blood, and in the form of monosaccharides or simple sugars. F. Rohmann found that the absorption of the disaccharides is dependent on the invert ferment action, and not upon their osmotic characters. E. Weinland too has shown that if lactose be put into a lactase-free intestine, no absorption takes place, the lactose gradually disappearing under bacterial action, whereas when the ferment lactase is present glucose and galactose the products of its splitting are absorbed as readily as cane-sugar and maltose. E. Voit has also demonstrated the fact that the body deals with its carbohydrate supply in the form of mono-saccharides. He injected solutions of various sugars, mono- and di-saccharides, and found that the simple sugars were retained, whereas the double sugars were excreted in the urine. The only di-saccharide which can be dealt with in the body is maltose, as there is a maltase present in the blood which splits it. Carbohydrates which are not absorbed from the intestine are disposed of by bacterial action, giving rise to various fatty acids, carbon dioxide, &c.

Fats. -Fats are absorbed from the intestine in the form of fatty acids and glycerin; *i.e.* in the form in which they exist after the action of the lipase. That a resynthesis takes place in the epithelium is shown by the fact that fatty acids are of equal value with fat as a source of energy, and that as fat absorption goes on fat droplets are seen to grow in the protoplasm away from the free margin of the cells. As already mentioned, the fat is removed by the lacteals from the cells to the thoracic duct, and then to the general circulation. A small amount of the fat may pass into the body via the blood, but this is practically all retained by the liver. The amount of fat absorbed depends a good deal on the nature of the fat, especially with reference to its melting-point, fats of low melting-point being most readily taken up.

Protein.—The older workers held that the protein was absorbed in the form of proteose and peptone. In support of this it was stated that both proteoses and peptones could be detected in the blood stream. The result of the most recent work tends to show that the material is absorbed in the form of the amino acids either simple or in complex groups, the polypeptides, and that if proteoses or peptones be absorbed they are attacked by the intra-cellular enzyme erepsin, which breaks them down into the simpler products as soon as they are within the intestinal mucous membrane. Certain proteins appear to be absorbed unchanged; for instance, blood serum disappears from the intestine without apparently any change through zymin attack. This fact is made use of in practical medicine, as, when administration of food by the mouth is impossible, patients are frequently kept alive by the giving of nutrient enemata. That the food thus given is absorbed is shown by the increase of nitrogen excretion in the urine.

In the large intestine very little absorption of nutrient matter takes place under normal conditions, mainly of course because most of the absorbable material is removed whilst the food is in the small intestine. That protein matter can be absorbed is shown by the above statement regarding nutrient enemata. The principal substance absorbed here is water; and thus the excreta become firm and formed.

V. METABOLISM

In all living matter there is a constant cycle of chemical changes going on, a constant breaking down (catabolism), and a correspondingly constant building up (anabolism). Unless the former is covered by the latter wasting and finally death must supervene. These two changes together make up the metabolism, and the study of this involves a study of the fate of the food absorbed both when it is used immediately and after it has been stored in the tissues of the body. Protein matter is undoubtedly the main constituent of protoplasm, but in what form it exists there is absolutely unknown. One thing is certain, that for the maintenance of life a constant supply of protein matter is necessary. In fact it might be said that this is the essential food and keeps the body alive, fats and carbohydrates being merely subsidiary. In the mammalian organism with which we are specially concerned a supply of these latter substances is also necessary to yield the energy required. The amounts of these various food stuffs which should be present in a suitable diet are dealt with under DIETETICS (*q.v.*). Here we are only concerned with the part played by the different materials in the various chemical changes which are the basis of vital activity.

Not many years ago physiologists were very much in the position of unskilled labourers who saw loads of heterogeneous material being "dumped" for building purposes, but who did not know for what particular purpose each individual substance was used. Thanks, however, to the brilliant work of E. Fischer we are no longer in this position. Gradually our knowledge is being broadened by actual facts obtained by direct experiment, or by inference from previous experiments. But it is still far from complete. It is only possible to outline what is at present known about the part played by the different food constituents in metabolism.

Proteins.—Since these alone contain the nitrogen necessary for the building up and repair of the tissues they are essential and will be dealt with first. In considering the digestion of proteins it was shown that in all probability all protein food was reduced in the intestine to comparatively simple crystalline bodies. O. Loewi has shown that an animal can be maintained in health without loss of weight by feeding it on a diet consisting of amino acids obtained by prolonged pancreatic digestion in place of proteins. In addition to these acids abundant carbohydrates and fats were given. It has since been shown that the presence of carbohydrate a certain amount of is absolutely essential before utilization of the amino acids can take place. Further, it has been demonstrated that only a mere fraction of the total amino acids resulting from pancreatic digestion is sufficient as the source of nitrogen supply for the animal organism. Not only so, but, in spite of the attempt to insist on the polypeptides as being the valuable nuclei for the rebuilding up of protein in the body, it has been shown that mixtures of amino acids from which the polypeptides have been removed can serve as the nitrogen supply.

What then does the body gain by breaking down food material to such simple bodies, if it is immediately to be resynthesized? This complete breakdown appears to be to facilitate rebuilding. The protein in the protoplasm of each animal is characteristic and to build up these different proteins the material must be separated into its nuclei. An experiment carried out by E. Abderhalden shows this very clearly. A protein gliadin absolutely different in constitution from the proteins of blood plasma was fed to an animal from which much of its blood had been removed, so that an active reformation had to take place. The question to be solved was whether by feeding with a protein so absolutely different in constitution the nature of the freshly forming serum protein could be radically changed. But the newly-formed serum was found to be exactly the same in constitution as the old. The tissues had selected simply those nuclei of the gliadin which were required and had rejected the others.

In addition to this breakdown of protein in the intestine, another factor of importance comes into play. After absorption from the lumen of the gut the amino acids are not wholly conveyed as such by the portal blood to the liver. That the portal blood contains a greater amount of ammonia than the systemic blood has long been known, and Jacoby and Lang have shown that many tissues, and among them the intestinal tissues, are able to split off from the amino acids their amino group NH_2. Thus it would seem probable that any excess of the amino acids formed does not reach the liver as such but denitrified as members of the fatty acid series. The ammonia split off is also conveyed to the liver and is excreted for the most part as urea, within the first few hours after a protein meal. Thus, in all probability very early after absorption and before the products of digestion enter into combination or any synthesis occurs, all excess of the absorbed nitrogen is disposed of. The rest of the products circulate in the blood, yielding to the cells the materials of which they are in need. On the other hand some investigators still hold that resynthesis into a neutral protein like serum albumin takes place in the intestinal wall immediately after absorption of the digest products. That the leucocytes play an important part in carrying the products of protein digestion to the tissues is indicated by the enormous increase in their number which occurs during the digestion and absorption of protein foods. How they act, whether simply as carriers of the products of protein digestion combined or uncombined, and how they give the material to the tissues is unknown.

Carbohydrates are generally assumed simply to serve the purpose of yielding energy in their combustion to CO_2 and H_2O, and to act as protein sparers, *i.e.* they save the ingestion of large amounts of costly protein material as a source of energy. There may, however, be other activities in which the ingested sugars play a part, for instance, in the utilization of the nitrogen of proteins. It has already been indicated that the nitrogen in the products of pancreatic digestion can be used only when a sufficient amount of carbohydrates is given at the same time. Only carbohydrates seem to be able to do this, for it has been found that when isodynamic amounts of fat are given the utilization does not take place.

When taken into the body in excess of the immediate requirements the sugar is not utilized all at once, but any excess is stored in the form of glycogen both in the liver and the muscles. This glycogen is an insoluble polysaccharide, and is only utilized according to the requirements of the body, especially during muscular exertion. Carbohydrates, when taken in in excess, are also stored in the tissues in the form of fat. This was demonstrated by the feeding experiments of Lawes and Gilbert at Rothamstead. They took two young pigs of a litter, killed and analysed one, then fed the other for a definite time upon food of known composition, determining the amount of protein absorbed by analysing the urine and the faeces. They then killed the pig and by analysis ascertained the amount of fat put on. They found that this was far in excess of the amount of the protein of the food which had been absorbed and was also in excess of what could have been formed from the small amount of fat in the food. The fat must therefore have been formed from the carbohydrates of the food. The consumption of larger amounts of sugar than can be used or stored as glycogen results in its passing straight through the body and being excreted in the urine. This condition is known as alimentary glycosuria. The power of using and storing sugar varies greatly in different individuals and in the same individual at different times.

Fats.—The fats simply serve as stores of energy. After ingestion, if in small amount, they are, like carbohydrates, oxidized to the same final products CO_2, and H_2O. If in larger amount they are stored as fat, to serve as a reserve in case of need, in the body tissues. Like the carbohydrates they serve as the sources of part of the energy dissipated as heat, but they are not so efficient as sparers of protein material, evidently in part at least because they are less easily digested and absorbed.

Factors which influence Normal Metabolism.

1. *Fasting.*—During fasting the body draws upon its own reserve of stored material for the requirements in the production of energy, and the rate of breakdown varies with the energy requirements. An individual who is kept warm in bed therefore stands fasting longer than one who is compelled to take exercise in a cold place. The breakdown of tissue during the early days of a fast is much greater than later, for as the fast progresses the body becomes more economical in its utilization of tissue. During a fast the tissues do not all waste at an equal rate; those which are not essential are utilized at a much greater rate than those which are essential to the maintenance of the organism. For instance, it has been shown that during a fast the skeletal muscles may lose over 40% of their weight, whereas an essential organ like the heart loses only some 3%.

The essential tissues obtain their nourishment from the less essential probably by ferment action, a process which has been termed autolysis. The autolytic products of the stored material in the tissues are practically identical with those which arise during the ordinary gastro-intestinal digestion.

2. *Muscular Work.*—The muscular tissue plays the most important part in general metabolism. Not only is muscle the most abundant tissue present, but it is constantly active and is the great energy-liberating machine of the body. Formerly it was believed on the authority of Liebig that muscular work was done at the expense of the protein material, but it has been conclusively shown that the real source of energy in moderate work is the non-protein material, carbohydrates and fats; of these the former plays the greater part in a man on ordinary diet. If, however, the supply of non-nitrogenous material be insufficient, then the energy has to be supplied by the protein and the output of nitrogen is thus increased. Variations in the amount of creatinin and uric acid (both products of muscle metabolism) excreted have been described. In hard work it is sometimes found that there may be no immediate rise in the nitrogen output on the day of the work, but that an increase is manifest on the second or third day after. While the excretion of nitrogen shows no increase proportionate to the work done, the output of carbon dioxide produced by the combustion of the carbohydrates and of the fats is increased proportionately to the work done.

3. *Internal Secretions.*—Evidence is accumulating to show that the activities of the various tissues of the body are presided over and controlled not merely by the action of the nervous system but also by chemical substances, the result of the activity of certain organs. To these chemical substances, as already stated, the name of hormones has been given.

The hormone which has been most thoroughly investigated is *adrenalin*, a perfectly definite chemical compound consisting of a secondary alcohol linked to a benzene ring. It is a product of the central or medullary part of the suprarenal bodies. The medullary part of these organs is developed from the sympathetic part of the nervous system, and adrenalin acts as a stimulant to the terminations of the sympathetic nerves which spring from the thoraco-abdominal region. These nerves control the small arteries, and the main action of adrenalin is to cause a powerful contraction of these vessels, and as a result a great rise in the arterial blood pressure. For this purpose it is now largely used in medicine. The constant supply of adrenalin in small quantities seems to play an important part in keeping up the tone of the blood vessels, and when, as a result of disease of the suprarenals, the supply is cut off a serious train of symptoms supervenes.

Allied to adrenalin is a hormone derived from the *pituitary body*. This also causes a constriction of the small arteries except those of the kidney, which it dilates. An increased flow of urine is produced.

In the *thyroid gland* a substance, *iodothyrin*, is constantly being produced, and this appears to exercise a stimulating action on the rate of chemical exchange in the various tissues. Under its administration the waste of both proteins and fats is increased. When the thyroid is removed or destroyed by disease a condition of decreased chemical change and mental sluggishness results, accompanied often by nervous tremors.

A difficulty in explaining these symptoms is caused by the fact that in the thyroid are imbedded four small parathyroids, and it is possible that these produce a special hormone. It has been suggested that this exercises a particular influence upon the nervous system, but further evidence is wanting.

The well-known effects of removal of the *ovaries* or *testes* on the development and character of an animal is due to the absence of the special hormone or hormones of these structures. These hormones appear to be produced, in the case of the testes at least, not in the true genital cells, but in the intermediate cells, since it has been found that ligature of the duct, which leads to destruction of the genital cells, does not abolish the development of the sexual characters of the animal.

There is growing evidence that from the ovaries different hormones may be produced in varying amounts which play an important part in regulating the phenomena of sexual life.

The *thymus gland* is a structure lying in the front of the neck, which is best developed at the time of birth, grows very slowly after birth, and atrophies when the age of puberty is reached. In castrated male animals it continues to grow and persists throughout life. There is some evidence that it may exercise some effect upon the growth of the testes, probably by hormone action.

Pancreas.—Within recent years it has been shown that the internal secretion of this organ plays a very important part in the metabolism of sugar. When the organ is completely extirpated the animal becomes diabetic, *i.e.* sugar appears in the urine and the animal emaciates. How the internal secretion effects the combustion of the sugar is not yet known. Some workers hold that the action of the pancreatic internal secretion is to control the sugar formation in the various sugar-forming organs, of which the liver is the chief, others that it dominates the utilization of sugar as a source of energy by the muscles.

These are some of the best-known examples of the way in which the products of the activity of one organ modify the functions of other organs. In all probability many more examples of hormone action will be discovered, and it will be found that it plays probably even a more important part than the nervous system in the co-ordination of function in the animal.

Other factors, besides these already dealt with, play a part in modifying the various metabolic processes, as age, temperature, climate, &c. Very little, however, is definitely known about these various factors.

Water and inorganic salts are quite as essential for the well-being of the body as the energy-yielding proteins, carbohydrates and fats. They, however, probably undergo little or no change in the body; they are excreted pretty much in the same form in which they are ingested. Although they are not subjected to any very great change yet they are of immense importance. No animal tissue can carry on its work in the absence of the various salts. Many experiments have been carried out in which animals have been fed on food as free from salts as possible, and, although the food was much in excess of the energy requirements, yet all these animals died, whereas other animals to which similar food with salts was given throve well. The most important acids are hydrochloric and phosphoric, and the most important bases sodium of potassium. Calcium and magnesium are also of importance, especially where bone formation is taking place. Another element of really vital importance is iron, which is required for the formation of haemoglobin.

VI. EXCRETION

While we know comparatively little of the intermediate stages in the breakdown of the food constituents, and more particularly of the protein moiety, our knowledge of the final products of the metabolic changes excreted is fairly full. The urine is the main channel of excretion for the nitrogenous waste products. CO_2, arising for the most part from the metabolism of carbohydrates and fats, is excreted mainly through the lungs. Water is excreted by the lungs, the kidneys and the skin.

So far no entirely satisfactory explanation has been given of how a fluid like urine, having an acid reaction and containing about one hundred times as much urea and generally more than twice as much sodium chloride as the blood, is formed in the kidneys. The urine is a yellowish fluid which varies greatly in its depth of colour, from pale amber to a deep brown. It has a specific gravity of about 1020, varying with the percentage of solids in solution, and it usually has an acid reaction. It is a fluid of complex character, containing, as already mentioned, practically all the waste nitrogen of the body. Among the principal organic substances present are urea, ammonia, purins (uric acid and the so-called purin bases, xanthin, &c.), creatinin, conjugated sulphates, various aromatic bodies and many other substances in small amount, together with the water and inorganic salts.

The following table from Folin gives a good idea of the average composition of the urine as regards the nitrogen-containing constituents, and its variation according to the nature of the diet when this is free of creatin creatinin and the precursors of the purins:—

	Nitrogen-rich Diet.	Nitrogen-poor Diet.
Total nitrogen	14·8-18·2 grms. per day	4·8- 8·0 grms. per day
Urea nitrogen	86·3-89·4 % of total	62·0-80·4 % of total
Ammonia nitrogen . . .	3·3- 5·1 % ,,	4·2-11·7 % ,,
Creatinin nitrogen . . .	3·2- 4·5 % ,,	5·5-11·1 % ,,
Uric acid nitrogen . . .	0·5- 1·0 % ,,	1·2- 2·4 % ,,
Undetermined nitrogen . .	2·7- 5·3 % ,,	4·8-14·6 % ,,

Urea, which forms the chief nitrogenous constituent, amounting on an ordinary diet to about 30 grms. per diem, is for the most part formed in the liver, from ammonia obtained either directly from the blood after absorption from the intestine, or resulting from the denitrification of the amino acids. It may also arise in part from the diamino acids and from uric acid.

Ammonia is present in the form of ammonium salts, and forms about 4 % of the total urinary nitrogen. It may exceed this amount under certain conditions, for the most part pathological. The ammonia is utilized by the body to neutralize acids which arise during the various metabolic processes.

Purins (uric acid, xanthin, hypoxanthin, &c.) are all members of a series which have as their common nucleus a body which E. Fischer called purin. The most important member of this series is uric acid. It forms about 2 % of the total urinary nitrogen. Recent work has shown that it has two quite definite sources of origin: (1) from ingested food containing the precursors, and (2) from the tissue metabolism. The first is known as the exogenous source, and the second as the endogenous. This acid is chemically known as trioxy-purin, and may be regarded as the union of two urea molecules with a three-carbon chain fatty acid. All the uric acid formed in the body is not excreted as such, part being, as already mentioned, converted into urea. The amount which is converted into urea varies with the species of animal. In man, Burian and Schur state that one half of the total amount is so converted. Some workers, like Wiener, hold that uric acid may be synthesized in the body, but while this is undoubtedly so in the case of the bird, in the mammal it has not been definitely established. The other chief purin bodies present in urine are xanthin and hypoxanthin, purins less oxidized than uric acid; the first is a dioxypurin, and the second is a monoxypurin. The main source of total purin supply would seem to be muscle metabolism. The mother substances from which all are derived in the body are the nucleins. These complex bodies are apparently first broken down by enzyme action to aminopurins. These in their turn have their amino groups split off, and then, according to the degree of oxidation, the different purin bodies are formed.

Creatinin.—The physiological significance of this substance is as yet unknown. The daily excretion varies little with the character of the diet, provided, of course, that the diet be creatin creatinin free. It appears to be proportional to the muscular development and muscular activity of the individual. Hence it would seem to be derived from the creatin of muscle, a substance which is very readily changed into creatinin outside the body. In the body the conversion of creatin into creatinin seems to be strictly limited, and hence when creatin is taken in flesh in the food it tends to appear as such in the urine. It would seem that it is either in great part decomposed in the body into what we do not at present know or that, as suggested by Folin, it may be used as a specialized food. Whatever its source, after urea and ammonia it is one of the most important nitrogenous substances excreted, the daily excretion being about 1·5 grms.

The *sulphur* excreted in the urine comes chiefly from the sulphur of the protein molecule. It is excreted in various forms. (1) As the ordinary preformed sulphates, that is, sulphur in the form of sulphuric acid combined with the ordinary bases. (2) As ethereal sulphates, that is, in combination with various aromatic substances like phenol, indol, &c. (3) In the form of so-called neutral sulphur in such substances as cystin, which are intermediate products in the complete oxidation of sulphur.

Phosphorus appears linked to the alkalis and alkaline earths as phosphoric acid. A very small part of the phosphoric acid may be eliminated in organic combination such as the glycero-phosphates, &c.

Sodium (mostly as sodium chloride), potassium, calcium and magnesium are the common bases present in the urine.

The lungs are *the* important channel of excretion for the waste product of carbon metabolism CO_2 (see RESPIRATORY SYSTEM); and also a very important channel for the excretion of water. As regards the skin, the sweat carries off a large amount of the water, but it is difficult to determine the total amount. It has been estimated that about 500 c.c. is excreted per diem under normal conditions. Sweat contains salts, chiefly sodium chloride, and organic waste products. Of the organic solids excreted from this source urea forms the most important under normal conditions. Under pathological conditions, especially when there is interference with free renal action, the amount of nitrogenous waste excreted may become quite important. There is also a small amount of CO_2 excreted by this channel. (D. N. P.; E. P. C.)

NUTTALL, THOMAS (1786–1859), English botanist and ornithologist, who lived and worked in America from 1808 until 1842, was born at Settle in Yorkshire on the 5th of January 1786, and spent some years as a journeyman printer in England. Soon after going to the United States he was induced by Professor B. S. Barton (1766–1815) to apply himself to the study of the plants of that country. In 1825–1834 he was curator of the botanic gardens of Harvard university. In 1834 he crossed the continent to the Pacific Ocean, and visited the Hawaiian Islands. Some property having been left him in England on condition of his residing on it during part of each year, he left America in 1842, and did not again revisit it except for a short time in 1852. He died at St Helens, Lancashire, on the 10th of September 1859.

Almost the whole of his scientific work was done in the United States, and his published works appeared there. The more important of these are, *The Genera of North American Plants, and a Catalogue of the Species to the year 1817* (2 vols., 1818); *Journal of Travels into the Arkansas Territory during the year 1819* (1821); *The North American Sylva: Trees not described by F. A. Michaux* (3 vols.; 1842–1849); *Manual of the Ornithology of the United States and of Canada* (1832 and 1834); and numerous papers in American scientific periodicals.

NUWARA ELIYA, a town and sanatorium of Ceylon. Pop. (1901) 5026, with 1000 additional visitors during the season. It is situated 6240 ft. above sea-level, with the highest mountain in the island, Pedrotallagalla, towering over the plain for 2056 ft. more. Nuwara Eliya is reached from Colombo by railway, eight hours to Namuoya, and thence, by a light 2½-ft.-gauge line, running up to the heart of the sanatorium. The average shade temperature for the year is 58° F.; the rainfall, 95 in. Considerable sums have been spent by the government in improving the place.

NUX VOMICA, a poisonous drug, consisting of the seed of *Strychnos Nux-Vomica*, a tree belonging to the natural order Loganiaceae, indigenous to most parts of India, and found also in Burma, Siam, Cochin China and northern Australia. The tree is of moderate size, with a short, thick, often crooked, stem, and ovate entire leaves, marked with three to five veins radiating from the base of the leaf. The flowers are small, greenish-white and tubular, and are arranged in terminal corymbs. The fruit is of the size of a small orange, and has a thin hard shell, enclosing a bitter, gelatinous white pulp, in which from 1 to 5 seeds are vertically embedded. The seed is disk-shaped, rather less than 1 in. in diameter, and about ¼ in. in thickness, slightly depressed towards the centre, and in some varieties furnished with an acute keel-like ridge at the margin. The external surface of the seed is of a greyish-green colour and satiny appearance, due to a coating of appressed silky hairs. The interior of the seed consists chiefly of horny albumen, which is easily divided along its outer edge into halves by a fissure, in which lies the embryo. The latter is about $\frac{3}{10}$ in. long, and has a pair of heart-shaped membranous cotyledons.

The chief constituents of the seeds are the alkaloids strychnine (*q.v.*) and brucine, the former averaging about 0·4%, and the latter about half this amount. The seeds also contain an acid, strychnic or igasuric acid; a glucoside, loganin; sugar and fat. The dose of the seeds is 1 to 4 grains. The British Pharmacopoeia contains three preparations of nux vomica. The liquid extract is standardized to contain 1·5% of strychnine; the extract is standardized to contain 5%; and the tincture, which is the most widely used, is standardized to contain 0·25%.

The pharmacology of nux vomica is practically that of strychnine. The tincture is chiefly used in cases of atonic dyspepsia, and is superior to all other bitter tonics, in that it is antiseptic and has a more powerful action upon the movements of the gastric wall. The extract is of great value in the treatment of simple constipation.

NYACK, a village of Rockland county, New York, U.S.A., in the town of Orangetown, on the western bank of the Hudson river, about 25 m. north of New York City. Pop. (1890) 4111; (1900) 4275, of whom 583 were foreign-born; (1905) 4441; (1910) 4619. Nyack is served by the Northern Railroad of New Jersey (a branch of the Erie), and is connected by ferry with Tarrytown, nearly opposite, on the eastern bank of the Hudson. The New York, Ontario & Western and the West Shore railways pass through West Nyack, a small village about 2 m. west. For about 2 m. above and 3 m. below Nyack the river expands into Tappan Zee or Bay, which is about 3 m. wide immediately opposite the village. The first grant of land within the present limits of Nyack was made by Governor Philip Carteret, of New Jersey, to one Claus Jansen, in 1671, but the permanent settlement apparently dates from about 1700. The adjacent villages of Upper Nyack, pop. (1905) 648, (1910) 591, and South Nyack, pop. (1910) 2068, form with Nyack practically one community. Nyack was named from a tribe of Algonquian Indians.

See David Cole, *History of Rockland county*, (New York, 1884).

NYANZA (from the ancient Bantu root word *anza*, a river or lake), the Bantu name for any sheet or stream of water of considerable size; especially applied to the great lakes of east Central Africa. The word is variously spelt, and the form "Nyasa" has become the proper name of a particular lake. Nyanza is the spelling used in designating the great lakes which are the main reservoirs of the river Nile.

NYASA, the third in size of the great lakes of Central Africa, occupying the southern end of the great rift-valley system which traverses the eastern half of the equatorial region from north to south. Extending from 9° 29′ to 14° 25′ S., or through nearly 5° of latitude, the lake measures along its major axis, which is slightly inclined to the west of north, exactly 350 m., while the greatest breadth, which occurs near the middle of its length, between 11° 30′ and 12° 20′ S., is 45 m. In the northern and southern thirds of the length the breadth varies generally from 20 to 30 m., and the total area may be estimated at 11,000 sq. m.

The lake lies at an altitude of about 1650 ft. above the sea. The sides of the valley in which Nyasa lies, which are somewhat irregular towards its southern end, take a decided character of fault scarps in the northern third, and are continued as such beyond the northern extremity. Apart from the recent alluvium on the immediate shores, the lake lies almost entirely in granite and gneiss formations, broken, however, by a band of horizontally-bedded sandstones, which cuts the axis of the lake in about 10° 30′ S., the flat-topped, terraced form of the latter contrasting strangely with the jagged or rounded outlines of the former. Near the margin, overlying the sandstones, there are beds of limestone with remains of recent molluscs, pointing, like the raised beaches which occur elsewhere, to an upward movement of the coasts. Lacustrine deposits up to 700 ft. above the present lake-level have been discovered. Geologically, the lake is believed to be of no great age, a view supported by topographical evidence. The depth of the lake seems to vary in accordance with the steepness of the shores, increasing from south to north. The greater part of the northern half shows depths of over 200 fathoms, while a maximum of 430 fathoms was obtained by Mr. J. E. S. Moore in 1899, off the high western coast in about 11° 40′ S. A more complete series of soundings, however, since made by Lieut. Rhoades, and published in the *Geographical Journal* in 1902, gives a maximum of 386 fathoms off the same coast in 11° 10′ S. The lake receives its water-supply chiefly from the streams which descend from the mountains to the north, all the rest becoming very small in the dry season. Like other lakes of Central Africa it is subject to fluctuations of level, apparently caused by alternations of dry and wet series of years.

At the north-western end is a plain of great fertility, traversed by the Kivira, Songwe and other streams, rising either among the volcanic masses to the north or on the western plateau. Just north of 10° S. on the delta of the Rukuru, is the British station of Karonga, the northern port of call for the lake steamers, though with but an open roadstead. Southwards the plain narrows, and in about 10½° S. the sandstone scarp of Mount Waller rises sheer above the indentation of Florence Bay, the high western plateaus continuing to fall steeply to the water in wooded cliffs for more than 80 m. In this stretch occur the land-locked bays of Ruarwe (11° 5′ S.) and Nkata (11° 36′ S.), and the mouth of the Rukuru (10° 43′ S)., which drains the plateau from south to north. At Cape Chirombo (11° 40′ S.) the coast bends to the west, and soon the plateau escarpments recede, and are separated from the lake along its southern half by an undulating plain of varying width. In 11° 56′ S. is the British station of Bandawe, and in 12° 55′ that of Kota Kota, on a lake-like inlet, forming a sheltered harbour. A little north of the latter the Bua river, coming from a remote source on the upper plateau, enters by a projecting delta. At Domira Bay, in 13° 35′, the coast turns suddenly east, contracting the lake to a comparatively narrow neck, with the British stations of Fort Rifu on the west, and Fort Maguire, near the headland of Makanjira Point, on the east. Beyond this the lake runs southwards into two bays separated by a granitoid peninsula, off which lie several small rocky islands. On this peninsula was placed the mission station of Livingstonia, the first to be established on the shores of Nyasa. From the extremity of the eastern bay the Shiré makes its exit to the Zambezi. On the eastern side the plateau escarpments keep generally close to the lake, leaving few plains of any extent along its shores. The crest of the eastern watershed runs generally parallel to the shore, which it approaches in places within 20 m. From the north point to 10° 30′ S. the coast is formed by the unbroken wall of the Livingstone or Kinga range, rising where highest (9° 41′ S.) fully 6000 ft. above the water. On this coast, on a projecting spit of land, is the German station of Old Langenburg, some 10 m. from the northern extremity. In 10° 30′ the plateau is broken by the valley of the Ruhuhu, the only important stream which enters the lake from the east. The formation is here sandstone, corresponding to that of Mount Waller on the opposite shore. Just north of the Ruhuhu is the German station of Wiedhafen, on an excellent harbour, formerly Amelia Bay. South of the Ruhuhu the wall of mountains recedes somewhat, and the remainder of the eastern shore shows a variation between rocky cliffs, marshy plains of restricted area and groups of low hills. In 11° 16′ is the deep inlet of Mbampa Bay, offering a sheltered anchorage. South of it the coast forms a wide semicircular bay, generally rock-bound, and ending south in Malo Point (12° 10′ S.), off which are the largest islands the lake possesses, Likoma and Chisamulu, the former measuring about 4 m. by 3. In the southern half the coast is highest in about 13° 10′ S., where the Mapangi hills rise to 3000 ft.

Nyasa, reached in 1859 both by David Livingstone (from the south) and by the German traveller Albrecht Roscher (from the east), was explored by the former to about 11°, and to its northern end by E. D. Young in 1876. From this date onwards it has been the scene of much civilizing work on the part of British (principally Scottish) missionaries, traders and government officials, and, in more recent years, of Germans also. Its shores have been divided between Great Britain, Portugal and Germany, Great Britain holding (within the British Nyasaland Protectorate) all the west coast south of the Songwe, and the southern extremity of the east coast (south of 13½° S.); Portugal the rest of the east coast south of 11½° S.; and Germany the remainder. British steamers, including two or three gunboats, have been launched on Nyasa, which forms an important link in the water-route from the Zambezi mouth to the heart of the continent. Germany also has a gunboat on the lake. The first detailed survey of its shores was executed by Dr James Stewart (1876–1877), but this has been superseded by later work, especially that of Lieuts. Rhoades and Phillips.

See *Proc. R.G.S.* (1883), p. 689; *Geogr. Journal*, vol. xii. p. 580; J. E. S. Moore, *ib.* vol. x. p. 289, and "The Geology of Nyasaland," by A. R. Andrew and T. E. G. Bailey, with note on fossil plants, fish remains, &c., by E. A. N. Arber and others and bibliography in vol. 66 of *Quart. Jnl. Geog. Society* (May 1910). (E. He.)

NYBORG, a seaport of Denmark on the east side of the island of Fünen, in the *amt* (county) of Svendborg, and the point from which the ferry crosses the Great Belt to Korsör in Zealand (15 m.). Pop. (1901) 7790. The fortress, built by Christian IV. and Frederick III., was dismantled in 1869, and the ruins of the castle are used as a prison. In the 12th century the town was founded and a castle erected on Knudshoved (Canute's Head) by Knud, nephew of Waldemar the Great; and from the 13th to the 15th century Nyborg was one of the most important places in Denmark. In 1658 it surrendered to the Swedes; but by the defeat of the latter under the walls of the fortress on the 24th of November 1659, the country was freed from their dominion. In 1808 the Marquis La Romana, who with a body of Spanish troops garrisoned the fortress for France, revolted from his allegiance, and held out till he and a portion of his men escaped with the English fleet.

NYCKELHARPA (Swed. *nyckel*=key, *harpa*=harp; Ger. *Schlüsselfiedel*), a kind of bowed hurdy-gurdy, much used in Scandinavia during the late middle ages, and still in use in some parts of Sweden. It consists of a body some 2 ft. long, shaped like an elongated viol, with sloping shoulders and highly arched sound-board glued over a less arched back, and ribs cut out of a single block of wood. There is no fingerboard, but along the neck, arranged like frets, are a number of keys or wooden tangents, which when pressed inwards bring a little knob or stud into contact with the first string of thin catgut, thus stopping it and raising the pitch as in the hurdy-gurdy. At three points these keys also act upon the third string. There are in the comparatively modern instruments usually four melody strings of catgut and three drones of fine spun wire. The bridge is quite flat, so that when the bow is passed over the strings, they all sound at once. The tailpiece is very long, extending over half the length of the body, and the two oval sound-holes, far removed from the strings, are at the tail end of the instrument.

NYE, EDGAR WILSON (1850–1896), American humorist, was born at Shirley, Maine, on the 25th of August 1850. His parents removed to a farm on the St Croix river in northern Wisconsin in 1852, and young Nye was educated in Wisconsin at the academy at River Falls, where he studied law. In 1876 he was admitted to the bar at Laramie, Wyoming, where he served as justice of the peace, superintendent of schools, member of the city council and postmaster. Here he began to contribute humorous articles under the pseudonym of "Bill Nye" to newspapers, especially the Cheyenne *Sun* and the Denver *Tribune*. In 1881 he founded at Laramie the *Boomerang*, and his reputation as a humorist was soon widespread. Later he became a successful lecturer, and in 1885, with James Whitcomb Riley, the poet, made an extended tour through the country, each reading from his own writings. Nye removed to New York City in 1886, and passed the later years of his life at Arden, a village in Buncombe county, North Carolina (about 10 m. south of Asheville), where he died on the 22nd of February 1896. His principal books are *Bill Nye and Boomerang* (1881); *Forty Liars and Other Lies* (1882); *Nye and Riley's Railway Guide* (1886), with James Whitcomb Riley; and two comic histories, *Bill Nye's History of the United States* (1894) and *Bill Nye's History of England from the Druids to the Reign of Henry VIII.* (1896).

NYEZHIN or NEZHIN, a town of Russia, in the government of Chernigov, 62 m. by rail S.E. of the town of Chernigov and 79 m. N.E. of Kiev, on the railway between Kursk and Kiev. The old town is built on the left bank of the (canalized) river Oster, and its suburbs, Novoye-Myesto and Magerki, on the right. It has an old cathedral, a technical school and a former high school (lyceum of Bezborodko, at which N. V. Gogol, the novelist, was a student), now transformed into a philological institute. The inhabitants (33,000), are mostly Little-Russians and Jews; there are also some Greeks, descendants of those who immigrated in the 17th century at the invitation of the Cossack chieftain Bogdan Chmielnicki.

Unyezh, which is supposed to have been the former name of Nyezhin, is mentioned as early as 1147. At that time it belonged to the principality of Chernigov; afterwards it fell under the rule of Poland. It was ceded to Russia about 1500, but again became a Polish possession after the treaty of Deulina (1619) between Poland and Russia. In 1649, after the revolt of Little Russia and its liberation from the Polish rule, Nyezhin was the chief town of one of the most important Cossack regiments. It was annexed to Russia in 1664.

NYIREGYHÁZA, the capital of the county of Szabolcs, in Hungary, 169 m. E.N.E. of Budapest by rail. Pop. (1900) 31,875. It is a busy railway junction, and its inhabitants are engaged in agriculture, wine-growing and the manufacture of soda, matches and saltpetre. About 20 m. to the N.W. lies the famous wine-producing district of Tokaj (Tokay).

NYKJÖBING, a seaport of Denmark, in the *amt* (county) of Maribo, on the west shore of the island of Falster, 94 m. S.S.W. of Copenhagen by rail. Pop. (1901) 7345. Its church contains a genealogical tree of the Mecklenburg ducal family, with portraits, dating from 1627 or earlier. Here is the house occupied by Peter the Great of Russia in 1716, restored in 1898. A railway runs south to Gjedser (14 m.), from which the sea-passage (29 m.) to Warnemünde links the fastest route between Copenhagen and Berlin.

Other towns of the name of NYKJÖBING in Denmark are (1) on Limfjord in Thisted amt (pop. 4492); and (2) in Zealand, Holbaek amt (pop. 2000).

NYKÖPING, a seaport of Sweden, chief town of the district (*län*) of Södermanland, 98 m. S.W. of Stockholm by a branch from the Stockholm-Malmö railway. Pop. (1900) 7375. It lies at the head of the Byfjord, an inlet of the Baltic. The ruins of its once famous castle, the town hall (1662), and the district governor's residence, are notable buildings. The port, together with that of Oxelösund (10 m. S.E.) at the mouth of the bay, which is seldom closed in winter, exports iron and zinc ore, timber, wood-pulp and oats.

Nyköping (*i.e.* New-Market, Latinized as *Nicopia*) begins to appear as a town early in the 13th century. Its castle was the seat of the kings of Södermanland, and after those of Stockholm and Kalmar was the strongest in Sweden. The death of Waldemar in 1293, the starving to death of Dukes Waldemar and Eric in 1318, the marriage and the deaths both of Charles IX. and his consort Christina of Holstein, the birth of their daughter Princess Catherine and in 1622 the birth of her son Charles X. are the main incidents of which it was the scene. Burned down in 1665 and again damaged by fire in 1719, it still remained the seat of the provincial authorities till 1760. The town was burned by Albert of Mecklenburg's party in 1389, by an accidental conflagration in 1665, and by the Russians in 1719.

NYLSTROOM, a town of the Transvaal, South Africa, capital of the Waterberg district, and 81 m. N. of Pretoria by rail; altitude 4250 ft. Pop. (1904) 599. It was founded about 1860 and owes its name to the belief of the early Boer trekkers that the river which they had discovered was the head stream of the Nile. The Waterberg gold-fields are 20 m. N.N.E. of the town.

NYMPHAEUM (Gr. νύμφαιον, νυμφαῖον), in Greek and Roman antiquities, a monument consecrated to the nymphs (*q.v.*), especially those of springs. These monuments were originally natural grottoes, which tradition assigned as habitations to the local nymphs. They were sometimes so arranged as to furnish a supply of water. Subsequently, artificial took the place of natural grottoes. The *nymphaea* of the Roman period were borrowed from the constructions of the Hellenistic east. The majority of them were rotundas, and were adorned with statues and paintings. They served the threefold purpose of sanctuaries, reservoirs and assembly-rooms. A special feature was their use for the celebration of marriages. Such *nymphaea* existed at Corinth, Antioch and Constantinople; the remains of some twenty have been found at Rome and of many in Africa. The so-called *exedra* of Herodes Atticus (which answers in all respects to a *nymphaeum* in the Roman style), the *nymphaeum* in the palace of Domitian and those in the villa of Hadrian at Tibur (five in number) may be specially mentioned. The term *nymphaeum* was also applied to the fountains of water in the atrium of the Christian basilica, which according to Eusebius (x. 4) were symbols of purification.

NYMPHENBURG, formerly a village, but since 1899 an incorporated suburb of Munich, in the kingdom of Bavaria. It has a palace, built about the middle of the 17th century, on the model of that at Versailles, and long a favourite residence of the Bavarian elector, Maximilian Joseph. The famous china manufactory of Nymphenburg, founded in 1754 at Neudeck by a potter named Niedermeyer, was shortly afterwards removed hither and, after being long under royal patronage, is now a private undertaking. The elector Charles Albert of Bavaria was reputed to have made a treaty with Louis XV. of France in May 1741 at the beginning of the War of the Austrian Succession for the division of Austria, and this was called the treaty of Nymphenburg. It has, however, been conclusively proved a forgery. But a treaty was concluded here on the 28th of May 1741, between Bavaria and Spain, and another between Bavaria and the Rhenish Palatinate in 1766.

NYMPHS, in Greek mythology, the generic name of a large number of female divinities of inferior rank, personifications of the creative and fostering activities of nature. The word is possibly connected with the root of νέφος, *nubes* ("cloud"), and originally meant "veiled," referring to the custom of a bride being led veiled from her home to that of the husband: hence, a married woman, and, in general, one of marriageable age. Others refer the word (and also Lat. *nubere* and the Ger. *Knospe*) to a root expressing the idea of "swelling" (according to Hesychius, one of the meanings of νύμφη is "rose-bud"). The home of the nymphs is on mountains and in groves, by springs and rivers, in valleys and cool grottoes. They are frequently associated with the superior divinities, the huntress Artemis, the prophetic Apollo, the reveller and god of trees Dionysus, and with rustic gods such as Pan and Hermes (as the god of shepherds).

The nymphs were distinguished according to the different spheres of nature with which they were connected. Sea nymphs were *Oceanids* or *Nereïds*, daughters of Oceanus or Nereus. *Naiades* (from Gr. νάειν, flow, cf. νᾶμα, "stream") presided over springs, rivers and lakes. *Oreades* (ὄρος, mountain) were nymphs of mountains and grottoes, one of the most famous of whom was Echo. *Napaeae* (νάπη, dell) and *Alseïdes* (ἄλσος, grove) were nymphs of glens and groves. *Dryades* (*q.v.*) or *Hamadryades* were nymphs of forests and trees.

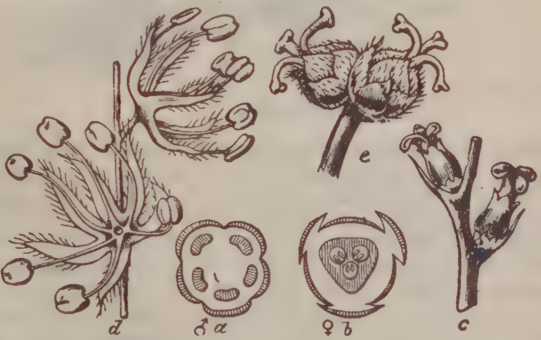
The Greek nymphs, after the introduction of their cult into Latium, gradually absorbed into their ranks the indigenous Italian divinities of springs and streams (Juturna, Egeria, Carmentis, Fons), while the Lymphae (originally Lumpae), Italian water-goddesses, owing to the accidental similarity of name, were identified with the Greek Nymphae. Among the Romans their sphere of influence was restricted, and they appear almost exclusively as divinities of the watery element.

F. G. Ballentine, "Some Phases of the Cult of the Nymphs" in *Harvard Studies in Classical Philology*, xv. (1904).

O The sixteenth letter of the Phoenician and early Greek alphabets, the fifteenth in English and the fourteenth in Latin. Between N and O the Phoenician and the Ionic Greek alphabet have a sibilant—in Greek Ξ=*x*. The Western Greek alphabet had a different symbol, X, for the sound of *x* and placed it at the end, as did its descendant the Latin alphabet. The original form of *o* was a more or less roughly formed circle. The Aramaic 𐡏 and Hebrew ע, which seem so different, arise from a circle left open at the top, ∪, a form which can be traced in Aramaic from the 5th or 6th century B.C. In the Greek alphabets the circle appears sometimes with a dot in the centre, but in many cases it is doubtful whether this mark is intentional, or is only the result of fixing a sharp point there while describing the circle. Sometimes O is lozenge-shaped ◊ and rarely (in Arcadia and Elis) rectangular □. In many varieties of the Greek alphabet this symbol was used, as it always was in Latin, for the long as well as the short *o*-sound and also for the long vowel (in the Ionic alphabet written *ου*) which arose from contraction of two vowels or the loss of a consonant (δηλοῦτε=δηλόετε, οἴκους=οἴκονς). As early as the 8th century Ionic Greek had invented a separate symbol for the long *o*-sound, viz. Ω. This when borrowed by other dialects showed at first some variety of usage, though practically none in form. As this was placed at the end of the ordinary (not the numeral) Greek alphabet, "alpha and omega" has become a proverbial phrase for first and last. The Greeks themselves, however, did not call Ω omega (great *o*) nor did they call O omicron (little *o*), though these names are given even in modern Greek grammars. The former was called simply *o* and the latter *u* (*ου*, pronounced as *oo* in *moon*). The Hebrew and probably the Phoenician name for O was Ain (Ayin), and in the Semitic alphabet, which does not indicate vowels, the symbol stood for a "voiced glottal stop" and also for a "voiced velar spirant" (Zimmern). The most important feature of this vowel is the rounding of the lips in its production, which, according to its degree, modifies the nature of the vowel considerably, as can be observed in the pronunciation of the increasingly rounded series *saw*, *no*, *who*. In Attic Greek O and Ω were not really a pair, for *o* + *o* became not *ω* but *ου*, *o* being a close and *ω* an open sound. In Latin the converse was more nearly true. Though short *o* changed in the Latin of the last age of the Roman republic to *u* in unaccented syllables always (except after *u* whether vowel or consonant), and sometimes also in accented syllables, this was not equally true of vulgar Latin, as is shown by the Romance languages. In English also the short and the long *o* are of different qualities, the short in words like *not*, *got* being in Sweet's phonetic terminology a low-back-wide-round, the long in words like *no* a mid-back-wide-round. The long vowel becomes more rounded as it is being pronounced, so that it ends in a *u*-sound, though this is not so noticeable in weak syllables like the final syllable of *follow*. The so-called modified *ö* is a rounded *e*-sound found in several varieties. The sound heard in words like the German *Götter* is, according to Sweet, a low-front-wide-round, while Jespersen regards it as not low but middle. A mid-front-narrow-round vowel is found short in French words like *peu*, long in *jeûne* and in endings like that of *honteuse*. The Norse sound written ϕ is of the same nature. (P. Gi.)

OAK (O. Eng., *āc*), a word found, variously modified, in all Germanic languages, and applied to plants of the genus *Quercus*, natural order *Fagaceae* (*Cupuliferae* of de Candolle), including some of the most important timber trees of the north temperate zone. All the species are arborescent or shrubby, varying in size from the most stately of forest trees to the dwarfish bush. Monoecious, and bearing their male flowers in catkins, they are readily distinguished from the rest of the catkin-bearing trees by their peculiar fruit, an acorn or nut, enclosed at the base in a woody cup, formed by the consolidation of numerous involucral bracts developed beneath the fertile flower, simultaneously with a cup-like expansion of the thalamus, to which the bracteal scales are more or less adherent. The ovary, three-celled at first, but becoming one-celled and one-seeded by abortion, is surmounted by an inconspicuous perianth with six small teeth. The male flowers are in small clusters on the usually slender and pendent stalk, forming an interrupted catkin; the stamens vary in number, usually six to twelve. The alternate leaves are more or less deeply sinuated or cut in many species, but in some of the deciduous and many of the evergreen kinds are nearly or quite entire on the margin.

The oaks are widely distributed over the temperate parts of Europe, Asia, North Africa and North America. In the western hemisphere they range along the Mexican highlands and the Andes far into the tropics, while in the Old World the genus, well represented in the Himalayas and the hills of China, exists likewise in the peninsula of Malacca, in the Indian Archipelago and Malaya to the Philippine Islands and Borneo. On the mountains of Europe and North America they grow only at moderate elevations, and none approach the arctic circle. The multitude of species and the many intermediate forms render their exact limitation difficult, but those presenting sufficiently marked characters to justify specific rank probably approach 300 in number.

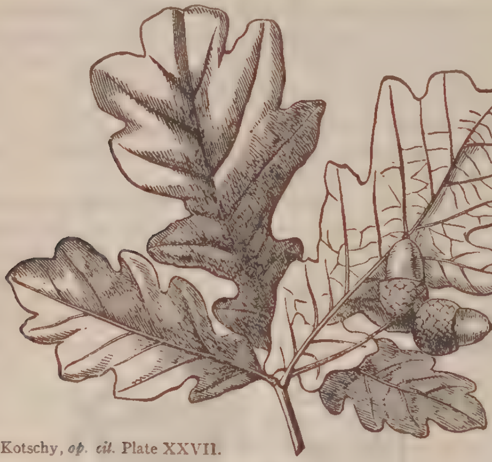


From Kotschy, *Die Eichen Europas*, Vienna, 1862, Plate XXXII.

FIG. 1.—Flowers of Oak (*Quercus*).

a, Diagram of male flower.
b, Diagram of female flower.
c, Female flowers of *Q. pedunculata*, slightly enlarged.
d, Male flowers of *Q. sessiliflora*, much enlarged.
e, Female flowers of *Q. sessiliflora*, after fertilization, enlarged.

The well-known *Q. Robur*, one of the most valued of the genus, and the most celebrated in history and myth, may be taken as a type of the oaks with sinuated leaves. Though known in England, where it is the only indigenous species, as the British oak, it is a native of most of the milder parts of Europe, extending from the shores of the Atlantic to the Ural; its most northern limit is attained in Norway, where it is found wild up to lat. 63°, and near the Lindesnaes forms woods of some extent, the trees occasionally acquiring a considerable size. In western Russia it flourishes in lat. 60°, but on the slope of the Ural the 56th parallel is about its utmost range. Its northern limit nearly coincides with that of successful wheat cultivation. Southwards it extends to Sardinia, Sicily and the Morea. In Asia it is found on the Caucasus, but does not pass the Ural ridge into Siberia. In Britain and in most of its Continental habitats two varieties exist, regarded by many as distinct species: one, *Q. pedunculata*, has the acorns, generally two or more together, on long stalks, and the leaves nearly sessile; while in the other, *Q. sessiliflora*, the fruit is without or with a very short peduncle, and the leaves are furnished with well-developed petioles. But, though the extreme forms of these varieties are very dissimilar, innumerable modifications are found between them; hence it is more convenient to regard them as at most sub-species of *Q. Robur*. The British oak is one of the largest trees of the genus, though old specimens are often more remarkable for the great size of the trunk and main boughs than for very lofty growth. The spreading branches have a tendency to assume a tortuous form, owing to the central shoots becoming abortive, and the growth thus being continued laterally, causing a zigzag development, more exaggerated in old trees and those standing in exposed situations; to this peculiarity the picturesque aspect of ancient oaks is largely due. When standing in dense woods the trees are rather straight and formal in early growth, especially the sessile-fruited kinds, and the gnarled character traditionally assigned to the oak applies chiefly to its advanced age. The broad deeply-sinuated leaves with blunt rounded lobes are of a peculiar yellowish colour when the buds unfold in May, but assume a more decided green towards midsummer, and eventually become rather dark in tint; they do not change to their brown autumnal hue until late in October, and on brushwood and saplings the withered foliage is often retained until the spring. The catkins appear soon after the young leaves, usually in England towards the end of May; the acorns, oblong in form, are in shallow cups with short, scarcely projecting scales; the fruit is shed the first autumn, often before the foliage changes.

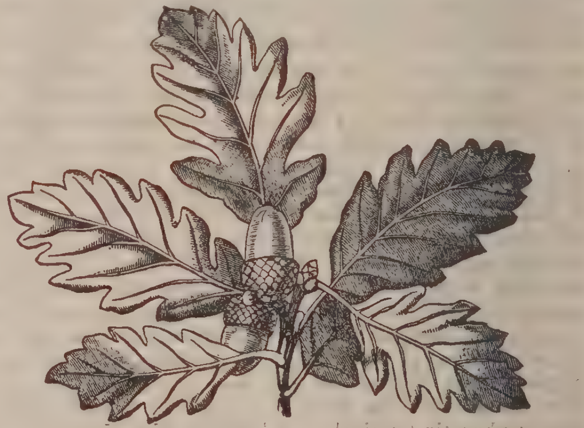


From Kotschy, *op. cit.* Plate XXVII.

FIG. 2.—*Q. pedunculata.*

Vast oak forests still covered the greater part of England and central Europe in the earlier historic period; and, though they have been gradually cleared in the progress of cultivation, oak is yet the prevailing tree in most of the woods of France, Germany and southern Russia, while in England the coppices and the few fragments of natural forest yet left are mainly composed of this species. The pedunculated variety is most abundant in the southern and midland counties, the sessile-fruited kinds in the northern parts and in Wales, especially in upland districts; the straighter growth and abundant acorns of this sub-species have led to its extensive introduction into plantations. The name of "durmast" oak, originally given to a dark-fruited variety of *Q. sessiliflora* in the New Forest, has been adopted by foresters as a general term for this kind of oak; it seems to be the most prevalent form in Germany and in the south of Europe. Many of the ancient oaks that remain in England may date from Saxon times, and some perhaps from an earlier period; the growth of trees after the trunk has become hollow is extremely slow, and the age of such venerable giants only matter of vague surmise. The celebrated Newland oak in Gloucestershire, known for centuries as "the great oak," was by the latest measurement 47½ ft. in girth at 5 ft. from the ground. The Cowthorpe oak, standing (a ruin) near Wetherby in Yorkshire, at the same height measures 38½ ft., and seems to have been of no smaller dimensions when described by Evelyn two centuries ago; like most of the giant oaks of Britain, it is of the pedunculate variety.

The wood of the British oak, when grown in perfection, is the most valuable produced in temperate climates. The heart-wood varies in colour from dark brown to pale yellowish-brown; hard, close-grained, and little liable to split accidentally, it is, for a hard wood, easy to work. Under water it excels most woods in durability, and none stand better alternate exposure to drought and moisture, while under cover it is nearly indestructible as long as dry-rot is prevented by free admission of air. Its weight varies from 48 to about 55 lb the cubic foot, but in very hard slowly-grown trunks sometimes approaches 60 lb. The sap-wood is lighter and much more perishable, but is of value for many purposes of rural economy. The relative qualities of the two varieties have been the frequent subject of debate, the balance of practical testimony seeming to establish the superiority of *Q. pedunculata* as far as durability in water is concerned; but when grown under favourable circumstances the sessile oak is certainly equally lasting if kept dry. The wood of the durmast oak is commonly heavier and of a darker colour, hence the other is sometimes called by woodmen the white oak, and in France is known as the "chêne blanc." The oak of Britain is still in demand for the construction of merchant shipping, though teak has become in some measure its substitute, and foreign oak of various quality and origin largely takes its place. Its great abundance of curved trunks and boughs rendered the oak peculiarly valuable to the shipwright when the process of bending timber artificially was less understood; the curved pieces are still useful for knees. The younger oaks are employed by the carpenter, wheelwright, wagon-builder and for innumerable purposes by the country artisan. The most durable of fences are those formed of small oaks, split lengthwise by the wedge into thin boards. The finely-grained heart-wood is sought by the cabinetmaker for the manufacture of furniture, and high prices are often given for the gnarled and knotted portions of slowly-grown trees, to be sawn into veneers. Oak was formerly largely used by wood-carvers, and is still in some demand for those artists, being harder and more durable than lime and other woods that yield more readily to the sculptor's tool. Oak was thus applied at a very early date; the shrine of Edward the Confessor, still existing in the abbey at Westminster, sound after the lapse of 800 years, is of dark-coloured oak-wood. The wood, of unknown age, found submerged in peat-bogs, and of a black hue, is largely used in decorative art under the name of "bog-oak."



From Kotschy, *op. cit.* Plate XXXII.

FIG. 3.—*Q. sessiliflora.*

The oak grows most luxuriantly on deep strong clays, calcareous marl or stiff loam, but will flourish in nearly any deep well-drained soil, excepting peat or loose sand; in marshy or moist places the tree may grow well for a time, but the timber is rarely sound; on hard rocky ground and exposed hillsides the growth is extremely slow and the trees small, but the wood is generally very hard and durable. The oak will not bear exposure to the full force of the sea gale, though in ravines and on sheltered slopes oak woods sometimes extend nearly to the shore. The cultivation of this tree in Europe forms one of the most important branches of the forester's art. It is frequently raised at once by sowing the acorns on the ground where the trees are required, the fruit being gathered in the autumn as soon as shed, and perfectly ripe seeds selected; but the risk of destruction by mice and other vermin is so great that transplanting from a nursery-bed is in most cases to be preferred.

The acorns should be sown in November on well-prepared ground, and covered to a depth of 1½ or 2 in.; the seeds germinate in the spring, and the seedlings are usually transplanted when one or two years old to nursery-beds, where they are allowed to grow from two to four years, till required for the plantation. Some authorities recommend the tap-roots to be cut in the second year, with the view of increasing the ball of fibre; but, if the trees are removed from the seed-bed sufficiently early, the root is best left to its natural development. The oak requires shelter in the early stages of growth; in England the Scotch pine is thought best for this purpose, though Norway spruce answers as well on suitable ground, and larch and other trees are sometimes substituted. The conifers are allowed to grow to a height of from 3 to 5 ft. before the young oaks are planted, and are gradually thinned out as the latter increase in size. The distance between the oaks depends upon the growth intended before thinning the young wood; usually they are placed from 8 to 12 ft. apart, and the superabundant trees cut out as they begin to interfere with each other. The lower branches often require removal, to ensure the formation of a tall straight trunk, and this operation should be performed before the superfluous shoots get too large, or the timber will be injured; but, as with all trees, unnecessary pruning should be avoided, as every branch removed lessens the vigour of growth. Where artificial copsewood is the object, hazel, hornbeam and other bushes may be planted between the oaks; but, when large timber is required, the trees are best without undergrowth.

The growth of the oak is slow, though it varies greatly in different trees; Loudon states that an oak, raised from the acorn in a garden at Sheffield Place, Sussex, became in seventy years 12 ft. in circumference; but the increase of the trunk is usually very much slower, and when grown for large timber oak can rarely be profitably felled till the first century of its growth is completed. The tree will continue to form wood for 150 or 200 years before showing any symptoms of decay. As firewood oak holds a high position, though in Germany it is considered inferior to beech for that purpose. It makes excellent charcoal, especially for metallurgic processes; the Sussex iron, formerly regarded as the best produced in Britain, was smelted with oak charcoal from the great woods of the adjacent Weald, until they became so thinned that the precious fuel was no longer obtainable.

An important product of oak woods is the bark that from a remote period has been the chief tanning material of Europe. The most valuable kind is that obtained from young trees of twenty to thirty years' growth, but the trunks and boughs of timber trees also furnish a large supply; it is separated from the tree most easily when the sap is rising in the spring. It is then carefully dried by the free action of the air, and when dry built into long narrow stacks until needed for use. The value of oak bark depends upon the amount of tannin contained in it, which varies much, depending not only on the growth of the tree but on the care bestowed on the preparation of the bark itself, as it soon ferments and spoils by exposure to wet, while too much sun-heat is injurious. That obtained from the sessile-fruited oak is richer in tannic acid than that yielded by *Q. pedunculata*, and the bark of trees growing in the open is more valuable than the produce of the dense forest or coppice. The bark of young oak branches has been employed in medicine from the days of Dioscorides, but is not used in modern practice. The astringent principle is a peculiar kind of tannic acid, called by chemists *quercitannic*, which, yielding more stable compounds with gelatine than other forms, gives oak bark its high value to the tanner. According to Neubauer, the bark of young oaks contains from 7 to 10% of this principle; in old trees the proportion is much less.

The acorns of the oak possess a considerable economic importance as food for swine. In the Saxon period the "mast" seems to have been regarded as the most valuable produce of an oak wood; nor was its use always confined to the support of the herds, for in time of dearth acorns were boiled and eaten by the poor as a substitute for bread both in England and France, as the sweeter produce of *Q. Esculus* is still employed in southern Europe. Large herds of swine in all the great oak woods of Germany depend for their autumn maintenance on acorns; and in the remaining royal forests of England the inhabitants of the neighbouring villages yet claim their ancient right of "pannage," turning their hogs into the woods in October and November. Some trees of the sessile-fruited oak bear sweet acorns in Britain, and several varieties were valued by the ancient Italians for their edible fruit. A peculiar kind of sugar called *quercite* exists in all acorns. A bitter principle to which the name of *quercin* has been applied by Gerber, its discoverer, has also been detected in the acorn of the common oak; the nutritive portion seems chiefly a form of starch. A spirit has been distilled from acorns in process of germination, when the saccharine principle is most abundant.

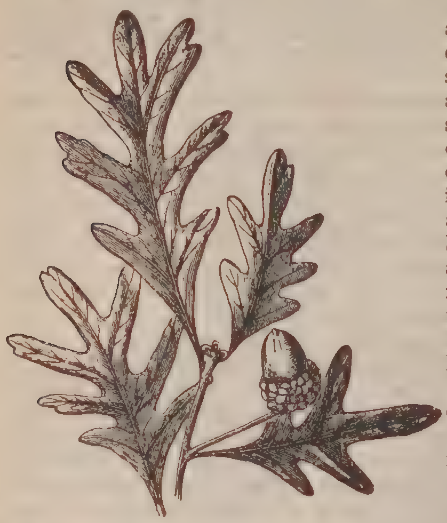
The British oak grows well in the northern and middle states of America; and, from the superiority of the wood to that of *Q. alba* and its more abundant production of acorns, it will probably be much planted as the natural forests are destroyed. The young trees require protection from storms and late frosts even more than in England; the red pine of the north-eastern states, *Pinus resinosa*, answers well as a nurse, but the pitch pine and other species may be employed. In the southern parts of Australia and in New Zealand the tree seems to flourish as well as in its native home.

The oak in Europe is liable to injury from a great variety of insect enemies: the young wood is attacked by the larvae of the small stag-beetle and several other *Coleoptera*, and those of the wood-leopard moth, goat moth and other *Lepidoptera* feed upon it occasionally; the foliage is devoured by innumerable larvae; indeed, it has been stated that half the plant-eating insects of England prey more or less upon the oak, and in some seasons it is difficult to find a leaf perfectly free from their depredations. The young shoots are chosen by many species of *Cynipidae* and their allies as a receptacle for their eggs, giving rise to a variety of gall-like excrescences, from which few oak trees are quite free.

Of the European timber trees of the genus, the next in importance to the British oak is *Q. Cerris*, the Turkey oak of the nurserymen. This is a fine species, having when young straighter branches than *Q. Robur*, but in old age the boughs generally curve downwards, and the tree acquires a wide spreading head; the bark is dark brown, becoming grey and furrowed in large trees; the foliage varies much, but in the prevailing kinds the leaves are very deeply sinuated, with pointed, often irregular lobes, the footstalks short, and furnished at the base with long linear stipules that do not fall with the leaf, but remain attached to the bud till the following spring, giving a marked feature to the young shoots. The large sessile acorns are longer than those of *Q. Robur*, and are dark-brown when ripe; the hemispherical cups are covered with long, narrow, almost bristly scales, giving them a mossy aspect; the fruit ripens the first autumn. The foliage in some of the numerous varieties is almost evergreen, and in Britain is retained long after the autumnal withering.

This oak abounds all over the Turkish peninsula, and forms a large portion of the vast forests that clothe the slopes of the Taurus ranges and the south shores of the Black Sea; it is likewise common in Italy and Sardinia, and occurs in the south of France and also in Hungary. It was introduced into England by Philip Miller about 1735, and is now common in parks and plantations, where it seems to flourish in nearly all soils. The Turkey oak in southern England grows twice as fast as *Q. Robur*; in the mild climate of Devonshire and Cornwall it has reached a height of 100 ft. and a diameter of 4 ft. in eighty years, which is about the limit of its profitable growth for timber. The wood is hard, heavy and of fine grain, quite equal to the best British oak for indoor use, but of very variable durability where exposed to weather. The ships of Greece and Turkey are largely built of it, but it has not always proved satisfactory in English dockyards. The heart-wood is dark in colour, takes a fine polish, and from the prominence of the medullary rays is valuable to the furniture maker; it weighs from 40 to 50 lb the cubic foot. The comparatively rapid growth of the tree is its great recommendation to the planter; it is best raised from acorns sown on the spot, as they are very bitter and little liable to the attacks of vermin; the tree sends down a long tap-root, which should be curtailed by cutting or early transplanting, if the young trees are to be removed. It seems peculiarly adapted for the mild moist climate of Ireland.

In North America, where the species of oak are very numerous, the most important member of the group is *Q. alba*, the white oak, abounding all over the eastern districts of the continent from Lake Winnipeg and the St Lawrence countries to the shores of the Mexican Gulf. In aspect it more nearly resembles *Q. Robur* than any other species, forming a thick trunk with spreading base and, when growing in glades or other open places, huge spreading boughs, less twisted and gnarled than those of the English oak, and covered with a whitish bark that gives a marked character to the tree. The leaves are large, often irregular in form, usually with a few deep lobes dilated at the end; they are of a bright light green on the upper surface, but whitish beneath; they turn to a violet tint in autumn. The egg-shaped acorns are placed singly or two together on short stalks; they are in most years sparingly produced, but are occasionally borne in some abundance. On rich loams and the alluvial soils of river-valleys, when well drained, the tree attains a large size, often rivalling the giant oaks of Europe; trunks of 3 or 4 ft. in diameter are frequently found, and sometimes these dimensions are greatly exceeded. The wood is variable in quality and, though hard in texture, is less durable than the best oak of British growth; the heart-wood is of a light reddish brown varying to an olive tint; a Canadian specimen weighs 52¼ lb the cubic foot.

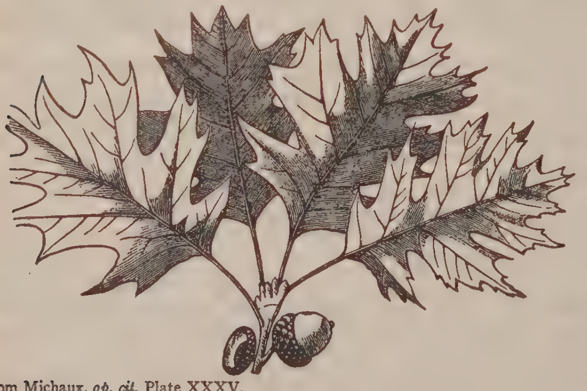


From Michaux, *Histoire des chênes de l'Amérique.*

FIG. 4.—*Q. alba.*

Q. obtusiloba, the post oak of the backwoodsman, a smaller tree with rough leaves and notched upper lobes, produces an abundance of acorns and good timber, said to be more durable than that of the white oak.

The pin oak, sometimes called the "burr-oak," *Q. macrocarpa*, is remarkable for its large acorns, the cups bordered on the edge by a fringe of long narrow scales; the leaves are very large, sometimes from 10 in. to 1 ft. in length, with very deep lobes at the lower part, but dilated widely at the apex, and there notched. The tree is described by Prof. C. S. Sargent (*Silva of North America*) as one of the most valuable timber trees of North America, its wood being superior in strength even to that of *Q. alba*, with which it is commercially confounded.



From Michaux, *op. cit.* Plate XXXV.

FIG. 5.—*Q. rubra.*

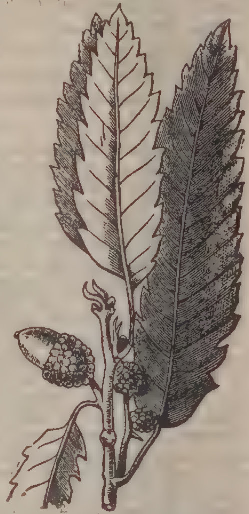
The over-cup oak, *Q. lyrata*, is a large tree, chiefly found on swampy land in the southern states; the lyrate leaves are dilated at the end; the globose acorns are nearly covered by the tuberculated cups.

In the woods of Oregon, from the Columbia river southwards, an oak is found bearing some resemblance to the British oak in foliage and in its thick trunk and widely-spreading boughs, but the bark is white as in *Q. alba*; it is *Q. Garryana*, the western oak of T. Nuttall. This tree acquires large dimensions, the trunk being often from 4 to 6 ft. in diameter; the wood is strong, hard and close-grained; the acorns are produced in great quantity, and are used by the Indians as food.

The red oak, *Q. rubra*, has thin large leaves on long petioles, the lobes very long and acute, the points almost bristly; they are pink when they first expand in spring, but become of a bright glossy green when full-grown; in autumn they change to the deep purple-red which gives the tree its name. Common throughout the northern and middle states and Canada, the red oak attains a large size only on good soils; the wood is of little value, being coarse and porous, but it is largely used for cask-staves; the bark is a valuable tanning material.

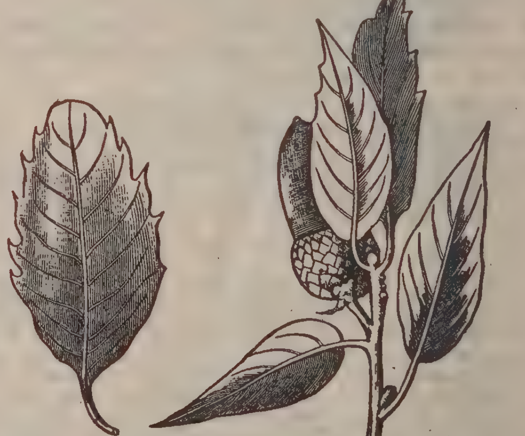
A species nearly allied is the scarlet oak, *Q. coccinec*, often confounded with the red oak, but with larger leaves, with long lobes ending in several acute points; they change to a brilliant scarlet with the first October frosts, giving one of the most striking of the various glowing tints that render the American forests so beautiful in autumn. The trunk, though often of considerable size, yields but an indifferent wood, employed for similar purposes to that of *Q. rubra*; the bark is one of the best tanning materials of the country. Both these oaks grow well in British plantations, where their bright autumn foliage, though seldom so decided in tint as in their native woods, gives them a certain picturesque value.

Nearly akin to these are several other forms of little but botanical interest; not far removed is the black or dyer's oak, *Q. tinctoria*, a large and handsome species, with a trunk sometimes 4 ft. in diameter, not uncommon in most forests east of the Mississippi, especially in somewhat upland districts. The leaves are frequently irregular in outline, the lobes rather short and blunt, widening towards the end, but with setaceous points; the acorns are nearly globular. The wood is coarsely grained, as in all the red-oak group, but harder and more durable than that of *Q. rubra*, and is often employed for building and for flour-barrels and cask-staves. The bark, very dark externally, is an excellent tanning substance; the inner layers form the *quercitron* of commerce, used by dyers for communicating to fabrics various tints of yellow, and, with iron salts, yielding a series of brown and drab hues; the colouring property depends on a crystalline principle called *quercitrin*, of which it should contain about 8%. The cut-leaved oaks are represented in eastern Asia by several species, of which *Q. mongolica* is widely spread over Dahuria, north China and the adjacent countries; one of the Chinese silkworms is said to feed on the leaves.



From Kotschy, *op. cit.* Plate XL.

FIG. 6.—*Q. castaneaefolia.*



From Kotschy, *op. cit.* Plate XXXVIII.

FIG. 7.—*Q. Ilex.*

The chestnut oaks of America represent a section distinguished by the merely serrated leaves, with parallel veins running to the end of the serratures. *Q. Prinus*, a beautiful tree of large growth, and its subspecies *castanea* and *montana*, yield good timber. *Q. Chinquapin* or *prinoides*, a dwarf species, often only 1 ft. in height, forms dense miniature thickets on the barren uplands of Kansas and Missouri, and affords abundant sweet acorns; the tree is called by the hunters of the plains the "shin-oak." *Q. castaneaefolia*, represented in fig. 6, is a native of the woods of the Transcaucasian region of western Asia.

Evergreen oaks with entire leaves are represented in North America by *Q. virginiana*, also known as *Q. virens*, the live oak of the southern states; more or less abundant on the Atlantic coasts of the Carolinas and Florida, its true home is the country around the Mexican Gulf, where it rarely grows more than 50 or 60 m. inland. The oval leaves are dark-green above, and whitish with stellate hairs beneath, the margin entire and slightly recurved. The live oak is one of the most valuable timber trees of the genus, the wood being extremely durable, both exposed to air and under water; heavy and close-grained, it is perhaps the best of the American oaks for shipbuilding, and is invaluable for water-wheels and mill-work. The tree in England is scarcely hardy, though it will grow freely in some sheltered places.

The evergreen oak of southern Europe is *Q. Ilex*, usually a smaller tree, frequently of rather shrub-like appearance, with abundant glossy dark-green leaves, generally ovate in shape and more or less prickly at the margin, but sometimes with the edges entire; the under surface is hoary; the acorns are oblong on short stalks. The ilex, also known as the "holm oak" from its resemblance to the holly, abounds in all the Mediterranean countries, showing a partiality for the sea air. The stem sometimes grows 80 or 90 ft. in height, and old specimens are occasionally of large diameter; but it does not often reach a great size. In its native lands it attains a vast age; Pliny attributes to several trees then growing in Rome a greater antiquity than the city itself. The wood is very heavy and hard, weighing 70 lb the cubic foot; the colour is dark brown; it is used in Spain and Italy for furniture, and in the former country for firewood and charcoal. In Britain the evergreen oak is quite hardy in ordinary winters, and is useful to the ornamental planter from its capacity for resisting the sea gales; but it generally remains of small size. *Q. Ballota*, a closely allied species abundant in Morocco, bears large edible acorns, which form an article of trade with Spain; an oil, resembling that of the olive, is obtained from them by expression. *Q. Ilex*, var. *Gramuntia*, also furnishes a fruit which, after acquiring sweetness by keeping, is eaten by the Spaniards.

In America several oaks exist with narrow lanceolate leaves, from which characteristic they are known as "willow oaks." *Q. Phellos*, a rather large tree found on swampy land in the southern states, is the most important of this group; its timber is of indifferent quality.

The cork oak, *Q. Suber*, the bark of which yields cork (*q.v.*), is a native of the west Mediterranean area. In Spain the wood is of some value, being hard and close-grained, and the inner bark is used for tanning. From its rugged silvery bark and dark-green foliage, it is a handsome tree, quite hardy in Cornwall and Devonshire, where it has grown to a large size.

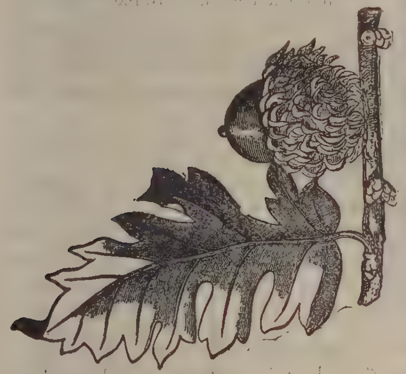

From Kotschy, *op. cit.* Plate VII.

Fig. 8.—*Q. Vallonea*.

The valonia of commerce, one of the richest of tanning materials, is the acorn of *Q. Aegilops*, a fine species indigenous to Greece and the coasts of the Levant, and sometimes called the "Oak of Bashan." The very large acorns are remarkable for their thick cups with long reflexed scales; the leaves are large, oblong, with deep serratures terminating in a bristle-like point. The cups are the most valuable portion of the valonia, abounding in tannic acid; immature acorns are sometimes exported under the name of "camatina." The allied *Q. Vallonea* of Asia Minor likewise yields valonia.

Some oaks are of indirect importance from products formed by their insect enemies. Of these the Aleppo gall (see Galls) is yielded by *Q. infectoria*, a native of Asia Minor and western Asia. *Q. coccifera*, a small bush growing in Spain and many countries around the Mediterranean, furnishes the kermes dye (Kermes). *Q. persica*, or according to some *Q. mannifera*, attacked by a kind of *Coccus*, yields a sweet exudation which the Kurds collect and use as manna, or as a substitute for honey or sugar in various confections (see Manna).

OAKHAM, a market town, and the county town of Rutland, England, 94 m. N. by W. of London by the Midland railway. Pop. (1901) 3294. The church of All Saints ranges in style from Early English to Perpendicular, belonging in appearance mainly to the latter style. Of Oakham Castle, founded in the reign of Henry II., the principal remnant is the notable Norman hall, used as the county hall. The manor came in the time of Henry II. into the hands of Walcheline de Ferrers, and subsequently passed, through many owners, to the duchy of Buckingham, whence it descended to the earls of Winchelsea. A peculiar custom attaching to the manor is to claim a horseshoe from every peer who, for the first time, passes through the town. Flore's House in the main street is an interesting building dating from the 13th century. Oakham school was endowed as a grammar school by Robert Johnson, archdeacon of Leicester, in 1584; it now has classical and modern sides. Not far from the town are the kennels of the Cottesmore hunt.

OAKLAND, a city and the county-seat of Alameda county, California, U.S.A., situated opposite and about 6 m. distant from San Francisco, on the eastern shore of San Francisco Bay. Pop. (1890) 48,682; (1900) 66,960, of whom 17,256 were foreign-born, 3197 being Irish, 2742 German, 2026 English, 1544 English-Canadians, 1020 Portuguese and 994 Swedish; (1910 census) 150,174. It is the terminus of the Ogden branch of the Southern (formerly Central) Pacific, of the Coast Line of the Atchison, Topeka & Santa Fé, and of the Western Pacific railways. Passengers and freight from the East to San Francisco are transferred by ferry from Oakland. A branch of the bay (called Oakland Harbour) divides Oakland from Alameda, and the railway piers of Oakland run directly out into the bay for more than 2 m. toward San Francisco, thus shortening the ferry connexions. Lake Merritt, in the heart of the city, a favourite pleasure resort, is the centre of the city's park system. Oakland is the seat of California College (co-educational, Baptist, opened in 1870), and of St Mary's College (Roman Catholic, 1863) for men; and in the suburban village of Mills College, west of the city, is Mills College (non-sectarian, 1871) for women, an institution of high rank. Electric power for the city is derived from Colgate, on the Yuba river, 219 m. distant. Oakland has important manufacturing interests, the total value of its factory products in 1905 being $9,072,539, 69% more than in 1900.

The site of the present city (as well as that of Alameda and Berkeley) lay originally within the limits of a great private Mexican grant which was confirmed by the United States authorities. A settlement was begun—at first by "squatters" in defiance of the private claim—in 1850; in May 1852 this was incorporated as a town (the name being derived from a wood of oaks in the midst of which the first settlement was made), and in March 1854 it was chartered as a city. In 1869 it was selected as the western terminus of the Central Pacific, a choice which greatly promoted Oakland's commercial importance. The water front was recklessly given away in 1852, and the resulting disputes and litigation lasted for more than thirty years; in 1908 the water front reverted to the city. The population increased more than sixfold from 1860 to 1870, and doubled in 1900–1910. It became the county-seat in 1874. In December 1910 a commission form of government was adopted.

OAKUM (O. Eng. *ácumbe* or *æcumbe*, tow, literally "off-combings"), a preparation of tarred fibre used in shipbuilding, for caulking or packing joints of timbers in wood vessels and the deck planking of iron and steel ships. Oakum is made by preference from old tarry ropes and cordage of vessels, and its picking and preparation has been a common penal occupation in prisons and workhouses. White oakum is made from untarred materials.

OAMARU, a municipal borough on the east coast of South Island, New Zealand, in the county of Waitaki and provincial district of Otago; on the main railway between Christchurch (152 m. N.E.) and Dunedin (78 m. S.S.W.). Pop. (1906) 5071. It is the outlet of the largest agricultural district in New Zealand. A breakwater and mole, constructed of blocks of concrete. enclose a commodious basin, forming one of the safest harbours in the colony. The export of frozen meat is important. The town is built of white Oamaru limestone. Brown coal is obtained at the entrance of Shag valley, 40 m. S. The district is famed for its stock, and the fine quality of its grain; also for the character of the English grasses laid down there, which flourish in a rich black loam on a limestone formation.

OANNES, in Babylonian mythology, the name given by Berossus to a mythical being who taught mankind wisdom. He is identical with the god Ea (*q.v.*), although there may not be any direct connexion between the two names. Berossus describes Oannes as having the body of a fish but underneath the figure of a man. He is described as dwelling in the Persian Gulf, and rising out of the waters in the daytime and furnishing mankind instruction in writing, the arts and the various sciences. The culture-myth on which the account of Berossus rests has not yet been found in Babylonian literature, but there are numerous indications in hymns and incantations that confirm the indentification with Ea, and also prove the substantial correctness of the conceptions regarding Oannes-Ea as given by Berossus. (M. Ja.)

OAR (A.S. *âr*; M. Eng. *ore*; Lat. *rēmus*; Gr. *ἐρετμός*: Sans. *aritra*; Fr. *rame*; Ital. Span., Port. *rama*), the instrument used for propelling a boat in rowing (*q.v.*). The word "oar" is probably derived from an old root *ar*, meaning to drive, to force away (cf. *ar-ar-e*, *aratrum*, plough). Such an appellation would easily be suggested by the visible difference in the action of the power employed by means of the oar against a thowl, or rowlock, from that of the more primitive paddle, where the power is gained by the action of one hand against the other. In the development of rowing from paddling the task of shaping the instrument of propulsion must have followed gradually the necessities indicated by use. In rowing, as well as in paddling, the leverage is of the second order, in which the weight lies between the power and the fulcrum. The point at which the power pressed the arm of the lever against the weight in rowing would soon attract attention by the frequent breakage of the paddle so employed. Experience would demand a thicker loom, and would soon teach the desirability of increasing the leverage where possible, and upon this would arise naturally the practical questions of the length of the oar, of the breadth of the blade, and of the right proportion of the parts of the oar, inboard and outboard, to each other. Then would also occur the problem of how to keep this proportion, which in practice would be liable to disarrangement by the slipping outward of the oar during the recovery from each stroke. Hence would arise the use of the thong (*τροπός, τροπωτήρ*), familiar to ancient Greek and modern Levantine, and, in northern and western waters, the invention of the "button," with which in various shapes the rowing world is now provided. Other devices, such as a hole bored in a piece of wood attached to the oar, or even a metal ring, will, in different localities, be found answering the same purpose.

Table showing Oars used in Royal Navy.

Description of Vessel.	Oars.		Blades.		Material.	No. allowed.
	Length.	Thickness.	Length.	Breadth.		
1. Launches, 42′ . .	17–16	17 2¼–1⅞	5′ 8″	5½″	White ash or Fir	18
	..	16 2⅛–1¾	5′ 4″	5⅜″		..
2. Pinnaces, 36′ . .	17–16	..	..	..		16
32′ . .	16–15	15 2⅛–1¾	5′ 0″	5¼″		14
30′ . .	16–15	..	..	..		12
3. Cutters, 34′ . .	15–14	14 2 –1⅝	4′ 8″	5⅛″		14
32′ . .	15–14	..	..	..		14
30′ . .	15–14	..	..	..		12
28′ . .	15–14	..	..	..		10
26′ . .	15–14	..	..	..		10
,, gig, 20′ . .	15–14	..	..	..		4
4. Galleys 32′ . .	17–16	..	..	..		6
5. Gigs, 30′ . .	17–16	..	..	..		6
28′ . .	17–16	..	..	..		6
6. Whalers, 27′ . .	15–14	..	..	..		5
	..	13 2 –1⅝	4′ 4″	5″		..
7. Skiff dinghies, 16′ .	10–8	10 1⅝–1⅜	3′ 4″	4¾″		4*
		9 1⅝–1⅜	3′	4⅝″		..
8. Dinghies, 13½′ . .	10–8	8 1⅝–1⅜	2′ 10″	4½″		4

* Allowed spoon-blade oars

Notes.—(1) Since 1893 some curved or spoon-bladed oars have been made at Devonport. (2) There is no record of buttons being used, but on fir oars, which were covered with canvas on the loom, it was sometimes customary to work a Turk's head at the end of the canvas for ornament. (3) As regards sweeps, they used to be made of ash and were 30 ft. long. They were used last in training brigs, but there is no record of them for the last twenty years.

In the early stages of the transition from paddling to rowing, the oar would naturally be used at an acute angle vertically to the boat's side. In paddling the upper hand is used to push from you, the lower hand to pull towards you. But in rowing both hands are used to pull towards you. As long as the oar was used at an acute angle vertically to the boat's side, the position of the upper hand on the oar would have to be reversed, as it would more easily grasp the oar with the wrist turned inward towards the body. In many of the earlier representations of rowing this position of the upper hand seems to be indicated. This distinction should not be lost sight of, as the position of the hands on the oar affects not only the character of the stroke, but also the requirements as to the length of the oar and the breadth of the blade. The form of the oars given in the representations of early Egyptian ships is suggestive of paddles used as oars. Paddle-shaped also are the oars of the Phoenician ships shown on the Assyrian sculptures at Koyunjik (Layard), the date of which is about 700 B.C. The same form is seen on some of the early vases, but in some that are attributed to two centuries later the form is modified, and the oar blade proper begins to take shape.

The types exhibited in the representations of the Roman galleys are generally heavy and clumsy enough in appearance. Still they are veritable oars, not paddles. The material of which the ancient oars were usually made was pine, which then, as now, was most suitable for the purpose, being tough and comparatively light and easily shaped as regards loom and blade.

The oars of the Attic trireme were, if we may judge by those of which only we have the measurement recorded, not much longer for the upper bank than those of a modern racing eight, while those of the middle and lower banks could not have been much longer than those used now in the whalers and dinghies of the Royal Navy. As the oarsmen on either side probably sat in the same vertical plane, the inboard portion of the oars amidships was longer than the inboard of those fore and aft, having to conform to the curvature of the vessel's sides (cf. Aristotle, *Mechanica*, v.). No doubt in vessels of larger size the upper tiers of oars would be longer, and, if we are to believe Callixenus, as cited by Athenaeus, in the great ship of Ptolemy the oars of the upper tier were over 50 ft. in length with handles leaded so as to equalize the weight inboard and outboard.

It is difficult to trace any detail of difference between the oars of the Roman period and those of the Byzantine and medieval galleys. In the medieval galley by the invention of the "apostis," a framework on which the thowls were fixed, sufficient room was given for the play of longer oars, and, as the necessity of combining speed with greater carrying power in the galley became pressing, the arrangement *alla scaloccio* came into vogue, employing four or five or even seven men to each of the long sweeps by which the galleys and galleasses were propelled. For these large oars we hear of ash and beech being used as well as pine.

In the Mediterranean the galley propelled by oars long remained the principal type of war vessel. In the Atlantic, and in the northern seas, it was otherwise.

The employment of artillery on board ship gradually determined a change in the method of propulsion. The use of sails became necessary, and remained dominant until the introduction of steam (see Ship). But as late as the time of the Spanish Armada, and even later, large sea-going vessels were provided with long sweeps which came into use when sailing was not available. In our own time, in the lighters on tidal rivers, may be seen long oars, plied by one or two or more men, which recall the type of oars once in general use in large galleys three centuries ago.

The oars used by the Northmen were, to judge by the remains discovered along with old Viking ships[1] at Gokstad and elsewhere, very similar to those in use at the present time in the fishing boats around our coasts. Those of the large craft were, to judge by the length of one found whole, somewhat over 18 ft. in length with a 5-in. blade and a diameter of 3 in. halfway down the loom. Some smaller oars, evidently used for boats, measured 11 ft. with a 4-in. blade. The oars were of pine, and the looms of some of them showed a groove cut for a clamp at the place where the oar rested on the sill of the rowlock. Comparing these oars with the measurements given below of oars now in use in the Royal Navy, it is apparent that there is no great difference in type between them.

Passing on to oars used on rivers and fresh water generally, we find the type differs considerably from that of the oars used in sea-going craft. The chief difference consists in the shape of the blade, which, instead of continuing the straight line of the loom in its expansion to its proper breadth, is fashioned in a curve calculated to offer a rigid resistance to the water during the stroke.[2] The loom below the button is not rounded but is more of an oval to the front with a flat back. From the oval front a spine runs down into the blade, in some cases to nearly half its length. During the last few years the so-called "girder" oars, with much thicker looms but double grooved along their length, have been used for racing purposes. This invention gives additional strength and stiffness, without increasing the weight of the oar, which varies a little but is usually about 8 lb. The blades vary much in breadth, as indeed do the oars in total length, and in proportion of inboard to outboard. The necessities of the sliding seat in racing boats have given rise to much difference of opinion among rowing men as to the right proportion. In the middle of the 19th century the use of square looms inboard, and of a button to turn inside and against the thowl, was common, and most oars had a small slab of hard wood let in below the button, so as to save the oar from wear and tear at the rowlock. But since round looms came into vogue the round leather ear has taken the place of the old square button, and the loom is covered with leather for some inches above and below this so as to protect it from abrasion.

Of late the introduction of swivel rowlocks for racing boats has caused a further modification in the form of buttons. Swivel rowlocks have come into general use for sculling boats, pair oars and coxswainless fours. But as yet they do not appear to have captured the racing eight, except in a few instances. Neither crews nor coaches in English waters seem inclined to part with the time-honoured rhythmic music of the oar in the rowlock, which from the days of antiquity even until now has, to practised ears, told its own tale as to the crew being together or not in the stroke.

In the case of racing eights, when the round loom oars superseded the square loom, the early patterns were commonly (*e.g.* in 1857) 12′ 6″ over all, 3′ 8″ inboard, with a long blade 4½″ to 5″ in breadth. These were succeeded by a pattern 12′ 6″ over all, 3′ 6″ inboard, with a much shorter blade 6″ broad.

Since sliding seats came in the average oar has been 12′ 4″ over all, 3′ 8½″ inboard, with 5½″ to 6¼″ blades. The modern racing oar may be said to date from 1869, the year of the Oxford and Harvard race at Putney. Until very lately no material alteration had taken place in this pattern, except in the matter of width of blade. Some authorities, however, are, as has been said above, far from satisfied with the present average oar, and are using shorter patterns, 11′ 10″ or 12′ 0″ over all, 3′ 7″ inboard, and 7″ blades.

Single grooved oars were first made in America. But with the single groove a side weakness is often developed in the loom, and hence the double girder, invented by G. Ayling, has generally superseded the single groove, though many oarsmen prefer the box loom by the same inventor.

It is clear, however, that no finality has been reached in the making of oars. Tubular oars, first introduced at Henley by the Belgian crew in 1906, are now being tried, with circular or quadrangular bores, strengthened by the insertion of an aluminium shell.

For much of the information above given respecting the recent developments in oar-making for racing purposes and river work, the writer is indebted to Messrs Ayling & Sons of Putney, whose patented inventions and improvements are well known to rowing men. (E. Wa.)

OASIS (Gr. ὄασις, the name given by Herodotus to the fertile spots in the Libyan desert: it probably represents an Egyptian word, cf. Coptic *ouahe*, *ouih*, to dwell, from which the Egyptian Arabic *wā* is derived), a fertile spot surrounded by desert. For example, where the high plateau of the Libyan desert descends into a longitudinal valley between Syrtis and the Nile delta there are a few spots where the water comes to the surface or is found in shallow wells. It may come to the surface in springs, upon the artesian principle, or it may collect and remain in mountain hollows. These areas are of small extent and are closely cultivated, and support thick forests of date-palms. All kinds of tropical vegetables, grains and small fruits grow under cultivation, and land is so precious in these limited areas of great richness and fertility that very narrow pathways divide each owner's plot from his neighbour's. Wherever oases are found they present similar features, and are naturally the halting-places and points of departure of desert caravans.

OAST (O. Eng. *āst*, cf. Dutch *eest*, "kiln"; the Teutonic root is *aidh-* "to burn"; the pre-Teutonic *idh-* is seen in Lat. *aestus*, "heat," *aestas*, "summer," Gr. αἶθος, "burning heat"), a kiln, particularly one used for drying hops; the word usually appears in the term "oast-house," a building containing several of such kilns (see Hop). "Oast" is also sometimes used of a kiln for drying tobacco.

OASTLER, RICHARD (1789–1861), English reformer, was born at Leeds on the 20th of December 1789, and in 1820 succeeded his father as steward of the Thornhills' extensive Fixby estates at Huddersfield, Yorkshire. In 1830 John Wood, a Bradford manufacturer, called Oastler's attention to the evils of child employment in the factories of the district. Oastler at once started a campaign against the existing labour conditions by a vigorous letter, under the title "Yorkshire Slavery," to the *Leeds Mercury*. Public opinion was eventually aroused, and, after many years of agitation, in which Oastler played a leading part, the Ten Hours Bill and other Factory Acts were passed, Oastler's energetic advocacy of the factory-workers' cause procuring him the title of "The Factory King." In 1838, however, owing to his opposition to the new poor law and his resistance of the commissioners, he had been dismissed from his stewardship at Fixby; and, in 1840, being unable to repay £2000 which he owed his late employer, Thomas Thornhill, he was sent to the Fleet prison, where he remained for over three years. From prison he published the *Fleet Papers*, a weekly paper devoted to the discussion of factory and poor-law questions. In 1844 his friends raised a fund to pay his debt, and on his release he made a triumphant entry into Huddersfield. Oastler died at Harrogate on the 22nd of August 1861. A statue to his memory was erected at Bradford in 1869.

OAT (O. Eng. *āte*; the word is not found in cognate languages; it may be allied with Fr. *eitel*, knot, nodule, cf. Gr. οἶδος swelling), a cereal (*Avena sativa*) belonging to the tribe *Aveneæ* of the order Gramineae or grasses. The genus *Avena* contains about fifty species mostly dispersed through the temperate regions of the Old World. The spikelets form a loose panicle, familiar in the cultivated oat (fig. 1), the flowering glume having its dorsal rib prolonged into an awn (fig. 2), which is in some species twisted and bent near the base.

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[1] See *Viking Ship*, Nicolaysen (Christiania, 1882).

[2] Since 1890 the curved blade seems to have been adopted in some cases in the oars made at Devonport for the Royal Navy.

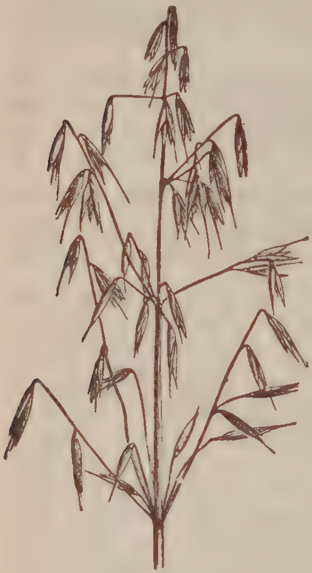

FIG. 1.—Panicle of Oat, *Avena sativa.* (After Le Maout.)

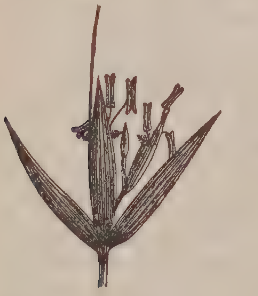

FIG. 2.—Spikelet of Oat, *A. sativa*, with two fertile florets, and one terminal, rudimentary.

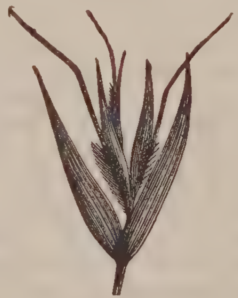

FIG. 3.—Spikelet of Wild Oat, *A. fatua*, glumes hairy and long-pointed, awn twisted at base. (After Buckman.)

The origin of the cultivated oat is generally believed to be *A. fatua*, or "wild oat," or some similar species, of which several exist in southern Europe and western Asia. Professor J. Buckman succeeded in raising "the potato-oat type" and "the white Tatarian oat" from grain of this species. *A. strigosa*, Schreb, "the bristle-pointed oat," is the origin of the Scotch oat, according to Buckman. The white and black varieties of this species were cultivated in England and Scotland from remote times, and are still grown as a crop in Orkney and Shetland. *A. strigosa* is probably only a variety of the cultivated oat. The "naked oat," *A. nuda*, was found by Bunge in waste ground about Peking; it was identified by the botanist Lindley with the pilcorn of the old agriculture, and we see from Rogers[1] that it was in cultivation in England in the 13th century. Both this and the "common otes," *A. vesca*, are described by Gerard.[2] Parkinson tells us that in his time (early in the 17th century) the naked oat was sown in sundry places, but "nothing so frequent" as the common sort. The chief differences between *A. fatua* and *A. sativa*, are, that in the former the chaff-scales which adhere to the grain are thick and hairy, and in the latter they are not so coarse and are hairless. The wild oat, moreover, has a long stiff awn, usually twisted near the base. In the cultivated oat it may be wanting, and if present it is not so stiff and is seldom bent. The grain is very small and worthless in the one, but larger and full in the other. There are now many varieties of the cultivated oat included under two principal races—common oat or panicled oats with a spreading panicle, *A. sativa* proper, and Tatarian oats or banner oats which has sometimes been regarded as a distinct species, *A. orientalis*, with contracted one-sided panicles. With regard to the antiquity of the oat, A. de Candolle[3] observes that it was not cultivated by the Hebrews, the Egyptians, the ancient Greeks and the Romans. Central Europe appears to be the locality where it was cultivated earliest, at least in Europe, for grains have been found among the remains of the Swiss lake-dwellings perhaps not earlier than the bronze age, while Pliny alludes to bread made of it by the ancient Germans. Pickering also records Galen's observations (*De Alim. Fac.* i. 14), that it was abundant in Asia Minor, especially Mysia, where it was made into bread as well as given to horses.

Besides the use of the straw when cut up and mixed with other food for fodder, the oat grain constitutes an important food for both man and beast. The oat grain (excepting the naked oat), like that of barley, is closely invested by the husk. Oatmeal is made from the kiln-dried grain from which the husks have been removed; and the form of the food is the well-known "porridge." In Ireland, where it is sometimes mixed with Indian-corn meal, it is called "stirabout." Groats or grits are the whole kernel from which the husk is removed. Their use is for gruel, which used to be consumed as an ordinary drink in the 17th century at the coffee-houses in London. The meal can be baked into "cake" or biscuit, as the Passover cake of the Jews; but it cannot be made into loaves in consequence of the great difficulty in rupturing the starch grains, unless the temperature be raised to a considerable height. With regard to the nutritive value of oatmeal, as compared with that of wheat flour, it contains a higher percentage of albuminoids than any other grain, viz. 12·6—that of wheat being 10·8—and less of starch, 58·4 as against 66·3 in wheat. It has rather more sugar, viz. 5·4—wheat having 4·2—and a good deal more fat, viz. 5·6, as against 2·0 in flour. Lastly, salts amount to 3·0% in oat, but are only 1·7 in wheat. Its nutritive value, therefore, is higher than that of ordinary seconds flour.

OATES, TITUS (1649–1705), English conspirator, was the son of Samuel Oates (1610–1683), an Anabaptist preacher, chaplain to Pride, and afterwards rector of All Saints' Church, Hastings. He was admitted on the 11th of June 1665 to Merchant Taylors' school, having, according to one authority, been previously at Oakham. There he remained a year, more or less, and "seems afterwards to have gone to Sedlescombe school in Sussex, from whence he passed to Caius College, Cambridge, on the 29th of June 1667, and was admitted a sizar of St John's, on the 2nd of February 1668–1669, aged 18." Upon very doubtful authority he is stated to have been also at Westminster school before going to the university. On leaving the university he apparently took Anglican orders, and officiated in several parishes, Hastings among them. Having brought malicious charges in which his evidence was rejected, he narrowly escaped prosecution for perjury. He next obtained a chaplaincy in the navy, from which he appears to have been speedily dismissed for bad conduct with the reputation of worse. He now, it is said, applied for help to Dr Israel Tonge, rector of St Michael's in Wood Street, an honest half-crazy man, who even then was exciting people's minds by giving out quarterly "treatises in print to alarm and awake his majesty's subjects." Oates offered his help, and it was arranged that he should pretend to be a Roman Catholic so as the better to unearth the Jesuit plots which possessed Tonge's brain. Accordingly he was received into the church by one Berry, himself an apostate, and entered the Jesuit College of Valladolid as Brother Ambrose. Hence he was soon expelled. In October 1677 he made a second application, and was admitted to St Omer on 10th December. So scandalous, however, was his conduct that he was finally dismissed in 1678. Returning in June 1678 to Tonge, he set himself to forge a plot by piecing together things true and false, or true facts falsely interpreted, and by inventing treasonable letters and accounts of preparations for military action. The whole story was written by Oates in Greek characters, copied into English by Tonge, and finally told to one of Charles II.'s confidential servants named Kirkby. Kirkby having given the king his information, Oates was sent for (13th August), and in a private interview gave details, in forty-three articles, of the plot and the persons who had engaged to assassinate Charles. The general improbability of the story was so manifest, and the discrepancies were so glaring, that neither then nor at any subsequent time did Charles express anything but amused incredulity. To bolster up the case a fresh packet of five forged letters was concocted (31st August); but the forgery was transparent, and even Sir William Jones, the attorney-general, though a violent upholder of the plot, dared not produce them as evidence.

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[1] *Rarer Kinds of Grain*, ii. 173.

[2] *Herball*, p. 68 (1597).

[3] *Origin of Cultivated Plants*, p. 373.

Oates now (6th September) made an affidavit before Sir Edmond Berry Godfrey (*q.v.*) to an improved edition of his story, in eighty-one articles. Among the persons named was Coleman, secretary to the duchess of York, whom Godfrey knew, and to whom he sent word of the charges. Coleman in turn informed the duke, and he, since the immediate exposure of the plot was of the utmost consequence to him, induced Charles to compel Oates to appear (28th September) before the privy council. Here Oates delivered himself of a story the falsehood of which was so obvious that the king was able to expose him by a few simple questions. At this moment an accident most fortunate for Oates took place. Amongst the papers seized at his request were Coleman's, and in them were found copies of letters written by the latter to Père la Chaise, suggesting that Louis should furnish him with money, which he would use in the French and Catholic interest among members of parliament. Among them, too, were these passages: "Success will give the greatest blow to the Protestant religion that it has received since its birth"; "we have here a mighty work upon our hands, no less than the conversion of three kingdoms, and by that perhaps the utter subduing of a pestilent heresy, which has so long domineered over great part of the northern world." The credit of Oates was thus, in the eyes of the people, re-established, and Coleman and others named were imprisoned. Charles was anxious for his brother's sake to bring the matter to a conclusion, but he dared not appear to stifle the plot; so, when starting for Newmarket, he left orders with Danby (see Leeds, Duke of,) that he should finish the investigation at once. But Danby purposely delayed; an impeachment was hanging over his head, and anything which took men's minds off that was welcome.

On the 12th of October occurred the murder of Godfrey, and the excitement was at its highest pitch. On the 21st of October parliament met, and, though Charles in his speech had barely alluded to the plot, all other business was put aside and Oates was called before the House. A new witness was wanted to support Oates's story, and in November a man named William Bedloe came forward. At first he remembered little; by degrees he remembered everything that was wanted. Not even so, however, did their witness agree together, so, as a bold stroke, Oates, with great circumstantiality, accused the queen before Charles of high treason. Charles both disbelieved and exposed him, whereupon Oates carried his tale before the House of Commons. The Commons voted for the queen's removal from court, but, the Lords refusing to concur, the matter dropped. It was not, however, until the 18th of July 1679 that the slaughter of Jesuits and other Roman Catholics upon Oates's testimony and that of his accomplices was to some extent checked. Sir George Wakeman, the queen's physician, was accused of purposing to poison the king, and the queen was named as being concerned in the plot. The refusals of Charles to credit or to countenance the attacks on his wife are the most creditable episodes in his life. Scroggs had intimation that he was to be lenient. Sir Philip Lloyd proved Oates to have perjured himself in open court, and Wakeman was acquitted. On the 26th of June 1680, upon Oates's testimony, the duke of York was presented as a recusant at Westminster. But the panic had now worn itself out, and the importance of Oates rapidly declined; so much so that after the dissolution in 1682 he was no more heard of during Charles's reign, but enjoyed his pension of £600 or £900, it is uncertain which, in quiet. Shortly before the death of Charles, James brought, and won, a civil action against Oates, with damages of £100,000; in default of payment Oates was taken to prison; while there he was indicted for perjury, and was tried in May 1685, soon after the accession of James II. He was convicted and received a severe sentence, with repeated floggings, the execution of which was expected to kill him, and which was rigorously carried out; but to the astonishment of all he survived.

Oates was in prison for three and a half years. Upon the flight of James, and during the excitement against the Catholics, he partially gained his liberty, and brought an appeal against his sentence before the Lords, who, while admitting the sentence to be unjust, confirmed it by a majority of thirty-five to twenty-three. The Commons, however, passed a bill annulling the sentence; and a conference was held in which the Lords, while again acknowledging that legally they were wrong, adhered to their former determination. The matter was finally settled by Oates receiving a royal pardon, with a pension of £300 a year. The remainder of his life was spent in retirement, varied by a good deal of sordid intrigue. In 1691 he became acquainted with William Fuller, whom he induced to forge another plot, though not with the success he had himself attained. He married a wealthy widow in 1693, but his extravagance soon brought him into straits. In 1696 he dedicated to William III. a book called *Eikon Basilike*, an elaborate tissue of invection against "the late king James." In 1698 he obtained admission as a member of the Baptist Church, and used to preach at Wapping; but in 1701, as the result of a financial scandal, he was formally expelled from the sect. He died on the 12th of July 1705.

Authorities.—Oates's, Dangerfield's and Bedloe's *Narratives*; *State Trials*; *Journals of Houses of Parliament*; North's *Examen*; the various memoirs and diaries of the period; Fuller's *Narrative*; Dryden's *Absalom and Achitophel*; Burnet's *History*; Narcissus Luttrell's *Relation*. Lingard's *History* gives an exhaustive and trustworthy account of the Popish terror and its victims; and the chief incidents in Oates's career are graphically described by Macaulay. On the question of the place of his education see *Notes and Queries* (22nd December 1883). See also T. Seccombe's essay in *Twelve Bad Men* (1894), where a bibliography is given.

OATH (O. Eng. *âdh*), a term which may be defined as an asseveration or promise made under non-human penalty or sanction. The word is found throughout the Teutonic languages (Goth. *aiths*, Mod. Ger. *Eid*), but without ascertainable etymology. The verb to *swear* is also Old Teutonic (Goth. *svaran*, Mod. Ger. *schwören*); this word, too, is not clear in original meaning, but is in some way connected with the notion of answering—indeed it still forms part of the word *answer*, O. Eng. *and-swarian*; it has been suggested that the swearer answered by word or gesture to a solemn formula or act. Among other terms in this connexion, the Lat. *jurare*, whence English law has such derivatives as *jury*, seems grounded on the metaphorical idea of binding (root *ju*, as in *jungo*); the similar idea of a bond or restraint may perhaps be traced in Gr. ὅρκος. It may be worth notice that Lat. *sacramentum* (whence Mod. Fr. *serment*) does not really imply the sacredness of an oath, but had its origin in the money paid into court in a Roman lawsuit, the loser forfeiting his pledge, which went to pay for the public rites (*sacra*); thence the word passed to signify other solemn pledges, such as military and judicial oaths.

Writers viewing the subject among civilized nations only have sometimes defined the oath as an appeal to a deity. It will be seen, however, by some following examples, that the harm or penalty consequent on perjury may be considered to result directly, without any spirit or deity being mentioned; indeed it is not unlikely that these mere direct curses invoked on himself by the swearer may be more primitive than the invocation of divinities to punish. Examples of the simplest kind of curse-oath may be seen among the Nagas of Assam, where two men will lay hold of a dog or a fowl by head and feet, which is then chopped in two with a single blow of the dao, this being emblematic of the fate expected to befall the perjurer. Or a man will stand within a circle of rope, with the implication that if he breaks his vow he may rot as a rope does, or he will take hold of the barrel of a gun, a spear-head or a tiger's tooth, and solemnly declare, "If I do not faithfully perform this my promise, may I fall by this!" (Butler in *Journ. Asiatic Soc. Bengal*, 1875, p. 316). Another stage in the history of oaths is that in which the swearer calls on some fierce beast to punish him if he lies, believing that it has the intelligence to know what he says and the power to interfere in his affairs. In Siberia, in lawsuits between Russians and the wild Ostiaks, it is described as customary to bring into court the head of a bear, the Ostiak making the gesture of eating, and calling on the bear to devour him in like manner if he does not tell the truth (G. A. Erman, *Travels in Siberia*, i. 492, London, 1848). Similar oaths are still sworn on the head or skin of a tiger by the Santals and other indigenous tribes of India. To modern views, a bear or a tiger seems at any rate a more rational being to appeal to than a river or the sun, but in the earlier stage of nature-religion these and other great objects of nature are regarded as animate and personal. The prevalence of river-worship is seen in the extent to which in the old and modern world oaths by rivers are most sacred. In earlier ages men swore inviolably by Styx or Tiber, and to this day an oath on water of the Ganges is to the Hindu the most binding of pledges, for the goddess will take awful vengeance on the children of the perjurer. The Tungus brandishes a knife before the sun, saying, "If I lie may the sun plunge sickness into my entrails like this knife." The natural transition from swearing by these great objects of nature to invoking gods conceived in human form is well shown in the treaty-oath between the Macedonians and the Carthaginians recorded by Polybius (vii. 9); here the sun and moon and earth, the rivers and meadows and waters, are invoked side by side with Zeus and Hera and Apollo, and the gods of the Carthaginians. The heaven-god, able to smite the perjurer with his lightning, was invoked by the Romans, when a hog was slain with the sacred flint representing the thunderbolt, with the invocation to Jove so to smite the Roman people if they broke the oath (Liv. i. 24; Polyb. iii. 25). Another form of this Aryan rite was preserved by the old Slavonic nation of Prussia, where a man would lay his right hand on his own neck and his left on the holy oak, saying, "May Perkun (the thunder-god) destroy me!" The oaths of the lower culture show a remarkable difference from those of later stages. In the apparently primitive forms the curse on the perjurer is to take effect in this world. But as nations became more observant, experience must have shown that bears and tigers were as apt to kill truth-tellers as perjurers, and that even the lightning-flash falls without moral discrimination. In the *Clouds* of Aristophanes, indeed, men have come openly to ridicule such beliefs, the Socrates of the play pointing out that notorious perjurers go unharmed, while Zeus hurls his bolts at his own temple, and the tall oaks, as if an oak-tree could perjure itself. The doctrine of miraculous earthly retribution on the perjurer lasted on in legend, as where Eusebius relates how three villains conspired to bring a false accusation against Narcissus, bishop of Jerusalem, which accusation they confirmed by solemn oath before the church, one wishing that if he swore falsely he might perish by fire, one that he might die of the pestilence, one that he might lose his eyes; a spark no man knew from whence burned to ashes the first perjurer's house and all within, the second was consumed by the plague from head to foot, whereupon the third confessed the crime with tears so copious that he lost his sight (Euseb. *Hist. Eccl.* vi. 9). As a general rule, however, the supernatural retribution on perjury has been transferred from the present world to the regions beyond the grave, as is evident from any collection of customary oaths. A single instance will show at once the combination of retributions in and after the present life, and the tendency to heap up remote penalties in the vain hope of securing present honesty. The Siamese Buddhist in his oath, not content to call down on himself various kinds of death if he breaks it, desires that he may afterwards be cast into hell to go through innumerable tortures, among them to carry water over the flames in a wicker basket to assuage the thirst of the infernal judge, then that he may migrate into the body of a slave for as many years as there are grains of sand in four seas, and after this that he may be born a beast through five hundred generations and an hermaphrodite five hundred more.

The forms of oath belonging to all nations and ages, various as they are in detail, come under a few general heads. It may be first observed that gestures such as grasping hands, or putting one hand between the hands of another in token of homage, are sometimes treated as of the nature of oaths, but wrongly so, they being rather of the nature of ceremonies of compact. The Hebrew practice of putting the hand under another's thigh is usually reckoned among oath-rites, but it may have been merely a ceremony of covenant (Gen. xxiv. 2, xlvii. 29; see Joseph. *Ant.* i. 16). Even the covenant among many ancient and modern nations by the parties mixing their blood or drinking one another's is in itself only a solemn rite of union, not an oath proper, unless some such ceremony is introduced as dipping weapons into the blood, as in the form among the ancient Scythians (Herod. iv. 70); this, by bringing in the idea of death befalling the covenant-breaker, converts the proceeding into an oath of the strongest kind. The custom of swearing by weapons, though frequent in the world, is far from consistent in meaning. It may signify, in cases such as those just mentioned, that the swearer if forsworn is to die by such a weapon; or the warrior may appeal to his weapon as a powerful or divine object, as Parthenopaeus swears by his spear that he will level to the ground the walls of Thebes (Aeschyl. *Sept. contra Theb.* 580; see the custom of the Quadi in Ammian. Marcellin. xvii.); or the weapon may be a divine emblem, as when the Scythians swore by the wind and the sword as denoting life and death (Lucian, *Toxaris*, 38). Oaths by weapons lasted into the Christian period; for instance, the Lombards swore lesser oaths by consecrated weapons and greater on the Gospels (see Du Cange, *s.v.* "Juramenta super arma"; Grimm, *Deutsche Rechtsalterth.* p. 896). Stretching forth the hand towards the object or deity sworn by is a natural gesture, well shown in the oath of Agamemnon, who with uplifted hands (*Διὶ χεῖρας ἀνασχών*) takes Heaven to witness with Sun and Earth and the Erinyes who below the earth wreak vengeance on the perjurer (Homer *Il.* xix. 254; see also Pindar, *Olymp.* vii. 120). The gesture of lifting the hand towards heaven was also an Israelite form of oath: Abraham says, "I have lifted up my hand to Jehovah," while Jehovah Himself is represented as so swearing, "For I lift up My hand to heaven, and say, I live for ever" (Gen. xiv. 22; Deut. xxxii. 40; see Dan. xii. 7; Rev. x. 5). This gesture established itself in Christendom, and has continued to modern times. In England, for example, in the parliament at Shrewsbury in 1398, when the Lords took an oath on the cross of Canterbury never to suffer the transactions of that parliament to be changed, the members of the Commons held up their hands to signify their taking upon themselves the same oath (J. E. Tyler, *Oaths*, p. 99). In France a juror takes oath by raising his hand, saying, "Je jure!" The Scottish judicial oath is taken by the witness holding up his right hand uncovered, and repeating after the usher, "I swear by Almighty God, and as I shall answer to God at the great day of judgment, that I will," &c.

In the ancient world sacrifice often formed part of the ceremony of the oath; typical examples may be found in the Homeric poems, as in Agamemnon's oath already mentioned, or the compact between the Greeks and Trojans (*Il.* iii. 276), where wine is poured out in libation, with prayer to Zeus and the immortal gods that the perjurer's brains shall, like the wine, be poured on the ground; the rite thus passes into a symbolic curse-oath of the ordinary barbaric type. Connected with such sacrificial oaths is the practice of laying the hand on the victim or the altar, or touching the image of the god. A classic instance is in a comedy of Plautus (*Rudens*, v. 2, 45), where Gripus says, "Tange aram hanc Veneris," and Labrax answers "Tango" (Greek instance, Thucyd. v. 47; see Justin xxiv. 2). Thus Livy (xxi. 1) introduces the phrase "touching the sacred objects" (*tactis sacris*) into the picturesque story of Hannibal's oath. Details of the old Scandinavian oath have been preserved in Iceland in the Landnámabók (*Islendinga Sögur*, Copenhagen, 1843); a bracelet (baugr) of two rings or more was to be kept on the altar in every head court, which the godi or priest should wear at all law-things held by him, and should redden in the blood of the bullock sacrificed, the witness pronouncing the remarkable formula: "Name I to witness that I take oath by the ring, law-oath; so help me Frey, and Niörd, and almighty Thor" (hialpi mer svâ Freyr, ok Niördr, ok hinn almâttki Âss), &c. This was doubtless the great oath on the holy ring or bracelet which the Danes swore to King Alfred to quit his kingdom ("on tham halgan beage," *Anglo-Sax. Chron.*; "in eorum armilla sacra," Ethelwerd, *Chron.* iv.). An oath, though not necessarily expressed in words, is usually so. In the Homeric instances the prayer which constitutes the oath has a somewhat conventional form, and in the classical ages we find well-marked formulas. These are often references to deities, as " by Zeus!" " I call Zeus to witness" (*ναὶ μὰ Δία: ἴστω Ζεύς*); " by the immortal gods!" " I call to witness the ashes of my ancestors " (per deos immortales; testor majorum cineres). Sometimes a curse is invoked on himself by the swearer, that he may perish if he fail to keep his oath, as " the gods destroy me," " let me perish if," &c. (dii me perdant; dispeream si). An important class of Roman oaths invokes the deity to favour or preserve the swearer in so far as he shall fulfil his promise —" as the gods may preserve me," " as I wish the gods to be propitious to me " (me ita di servent; ita deos mihi velim propitios). The best Roman collection is to be found in the old work of Brissonius. *De Formulis et Solemnibus Populi Romani Verbis* (Paris, 1583). Biblical examples of these classes of oaths are " as the Lord liveth " (1 Sam. xiv. 39, and elsewhere), " so do God to me, and more also " (2 Sam. iii. 35, and elsewhere).

The history of oaths in the early Christian ages opens a controversy which can hardly be said even yet to have closed. Under Christ's injunction, " Swear not at all " (Matt. v. 34; also James v. 12), many Christians seem at first to have shrunk from taking oaths, and, though after a time the usual customs of judicial and even colloquial oaths came to prevail among them, the writings of the Fathers show efforts to resist the practice. Chrysostom perhaps goes furthest in inveighing against this " snare of Satan ": " Do as you choose; I lay it down as a law that there be no swearing at all. If any bid you swear, tell him, Christ has spoken, and I do not swear " (Homil. ix. in *Act. Apostol.*; see a collection of patristic passages in Sixt. Senens. *Bibliothec. Sanct.* vi. adnot. 26). The line mostly taken by influential teachers, however, was that swearing should indeed be avoided as much as possible from its leading to perjury, but that the passages forbidding it only applied to superfluous or trifling oaths, or those sworn by created objects, such as heaven or earth or one's own head. On the other hand, they argued that judicial and other serious swearing could not have been forbidden, seeing that Paul in his epistles repeatedly introduces oaths (2 Cor. i. 23; Phil. i. 8; Gal. i. 20). Thus Athanasius writes: " I stretch out my hand, and as I have learned of the apostle, I call God to witness on my soul " (*Apol. ad Imp. Const.*; see Augustine, *De Mend.* 28; *Epist.* cl. iii. 9; cl. iv. 250; *Enarr. in Psalm.* lxxxviii. (4); *Serm.* 307, 319). This argument is the more forcible from Paul's expressions being actually oaths in accepted forms, and it has also been fairly adduced that Christ, by answering to the adjuration of the high priest, took the judicial oath in solemn form (Matt. xxvi. 63). The passages here referred to will give an idea of the theological grounds on which in more modern times Anabaptists, Mennonites and Quakers have refused to take even judicial oaths, while, on the other hand, the laws of Christendom from early ages have been only directed against such swearing as was considered profane or otherwise improper, and against perjury. Thus from the 3rd or 4th century we find oaths taking much the same place in Christian as in non-Christian society. In the 4th century the Christian military oath by God, Christ, the Holy Spirit, and the majesty of the emperor is recorded by Vegetius (*Rei Milit. Inst.* ii. 5). Constantine's laws required every witness in a cause to take oath; this is confirmed in Justinian's code, which even in some cases requires also the parties and advocates to be sworn (*Cod. Theod.* xi. 39; *Justin. Cod.* iv. 20, 59). Bishops and clergy were called upon to take oath in ordination, monastic vows, and other ecclesiastical matters (see details in Bingham, *Antiq. of Chr. Church*, xvi. 7). By the middle ages oaths had increased and multiplied in Christendom far beyond the practice of any other age or religion. The Reformation made no change in principle, as is seen, for instance, in Art. xxxix. of the church of England: " As we confess that vain and rash swearing is forbidden Christian men by our Lord Jesus Christ, and James His apostle, so we judge, that Christian Religion doth not prohibit, but that a man may swear when the Magistrate requireth, in a cause of faith and charity, so it be done according to the Prophet's teaching, in justice, judgement and truth."

The history of swearing in early Christendom would lead us to expect that the forms used would be adopted with more or less modification from Hebrew or Roman sources, as indeed proves to be the case. The oath introduced in the body of one of Constantine's laws—" As the Most High Divinity may ever be propitious to me " (Ita mihi summa Divinitas semper propitia sit)—follows an old Roman form. The Roman oath by the genius of the emperor being objected to by Christians as recognizing a demon, they swore by his safety (Tertull. *Apol.* 32). The gesture of holding up the hand in swearing has been already spoken of. The Christian oath on a copy of the Gospels seems derived from the late Jewish oath taken holding in the hand the scroll of the law (or the phylacteries), a ceremony itself possibly adapted from Roman custom (see treatise " Shebuoth " in *Gemara*). Among the various mentions of the oath on the Gospels in early Christian writers is that characteristic passage of Chrysostom in a sermon to the people of Antioch: " But do thou, if nothing else, at least reverence the very book thou holdest forth to be sworn by, open the Gospel thou takest in thy hands to administer the oath, and, hearing what Christ therein saith of oaths, tremble and desist " (*Serm. ad pop. Antioch.* Homil. xv.). The usual mode was to lay the hand on the Gospel, as is often stated in the records, and was kept up to a modern date in the oath in the university of Oxford, " tactis sacrosanctis Evangeliis "; the practice of kissing the book, which became so well established in England, appears in the middle ages (J. E. Tyler, *Oaths*, pp. 119, 151). The book was often laid on the altar, or (after the manner of ancient Rome) the swearer laid his hand on the altar itself, or looked towards it; above all, it became customary to touch relics of saints on the altar, a ceremony of which the typical instance is seen in the representation of Harold's oath in the Bayeux tapestry. Other objects, as the cross, the bishop's crosier, &c., were sworn by (see Du Cange, *s.v.* " Jurare "). An oath ratified by contact or inspection of a sacred object was called a " corporal " or bodily oath, as distinguished from a merely spoken or written oath; this is well seen in an old English coronation oath, " so helpe me God, and these holy euangelists by me bodily touched vppon this hooly awter." The English word signifying the " sacred object " on which oath is taken is *halidome* (A.S. *hâligdôm*; Ger. *Heiligthum*); the halidome on which oaths are now sworn in England is a copy of the New Testament. Jews are sworn on the Old Testament; the sacred books of other religions are used in like manner, a Mohammedan swearing on the Koran, a Hindu on the Vedas.

Among the oath-formulas used in Christendom, that taken by provincial governors under Justinian is typical of one class: " I swear by God Almighty, and His only begotten Son our Lord Jesus Christ, and the Holy Ghost, and the Most Holy Glorious Mother of God and ever Virgin Mary, and by the Four Gospels which I hold in my hand, and by the Holy Archangels Michael and Gabriel," &c. The famous oath of the kings Louis and Charles at Strassburg in 842 (A.D.) runs: " By God's love and the Christian people and our common salvation, as God shall give me knowledge and power," &c. Earlier than this, as in the oath of fealty in the capitularies of Charlemagne in 802, is found the familiar form " Sic me adjuvet Deus," closely corresponding to above-mentioned formulas of pre-Christian Rome. This became widely spread in Europe, appearing in Old French " Si m'ait Dex," German " So mir Gott helfe," English " So help me God." A remarkable point in its history is its occurrence in the " So help me Frey," &c., of the old Scandinavian ring-oath already described. Among the curiosities of the subject are quaint oaths of kings and other great personages: William Rufus swore " by that and that " (per hoc et per hoc), William the Conqueror " by the splendour of God," Richard I. " by God's legs," John " by God's teeth "; other phrases are given in Du Cange (*l.c.*), as " per omnes gentes," " per coronam," " par la sainte figure de Dieu," " par la mort Dieu," &c.

Profane swearing, the trifling or colloquial use of sacred oaths, is not without historical interest, formulas used being apt to keep up traces of old manners and extinct religions. Thus the early Christians were reproved for continuing to say " *mehercle!* " some of them not knowing that they were swearing by Hercules (Tertull. *De idol.* 20). Oaths by deities of pre-Christian Europe lasted into the modern world, as when a few generations ago Swedish peasants might be heard to swear, "Odin take me if it is not true!" (Hylten-Cavallius, *Wärend och Wirdarne*, i. 228). The thunder-god holds his place still in vulgar German exclamations, such as "Donner!" (Grimm. *Deutsche Mythologie*, pp. 10, 166). The affected revival of classical deities in Italy in the middle ages still lingers in such forms as "per Bacco!" "cospetto di Bacco!" (by Bacchus! face of Bacchus!). In France the concluding oath of the last paragraph dwindled into "mordieu!" or "morbleu!" much as in England the old oaths by God's body and wounds became converted into "oddsbodikins!" and "zounds!" (E. B. T.)

Law.—Politicians and moralists have placed much reliance on oaths as a practical security. It has been held, as Lycurgus the orator said to the Athenians, that "an oath is the bond that keeps the state together" (Lycurg. *Leocr.* 80; see Montesquieu, *Spirit of Laws*). Thus modern law-books quote from the leading case of *Omichund* v. *Barker*: "No country can subsist a twelvemonth where an oath is thought not binding; for the want of it must necessarily dissolve society." On the other hand, wherever the belief in supernatural interference becomes weakened, and oaths are taken with solemn form but secret contempt or open ridicule, they become a serious moral scandal, as had already begun to happen in classical times. The yet more disastrous effect of the practice of swearing is the public inference that, if a man has to swear in order to be believed, he need not speak the truth when not under oath. The early Christian fathers were alive to this depreciation of ordinary truthfulness by the practice of swearing, and opposed, though unavailingly, the system of oaths which more and more pervaded public business. How in the course of the middle ages oaths were multiplied is best seen by examining a collection of formulas such as the *Book of Oaths* (London, 1649), which range from the coronation oath to the oaths sworn by such as valuers of cloths and the city scavengers.[1] Oaths of allegiance and other official oaths are still taken throughout Europe, but experience shows that in times of revolution they are violated with little scruple, and in the case of the United Kingdom it is doubtful whether they have any more practical value than, if so much as, simple declarations. The question of legal oaths is more difficult. On the one hand, it is admitted that they do induce witnesses, especially the ignorant and superstitious, to give evidence more truthfully than they would do on even solemn declaration. On the other hand, all who practise in courts of justice declare that a large proportion of the evidence given under oath is knowingly false, and that such perjury is perceptibly detrimental to public morals.

The oaths now administered among civilized nations are chiefly intended for maintaining governments and securing the performance of public business. In England the coronation oath is to be administered by one of the archbishops or bishops in the presence of all the people, who, on their parts, reciprocally take the oath of allegiance to the crown. *The archbishop or bishop shall say*: "Will you solemnly promise and swear to govern the people of this United Kingdom of Great Britain and Ireland and the dominions thereto belonging according to the statutes in parliament agreed on, and the respective laws and customs of the same?" *The king shall say*: "I solemnly promise so to do." *Archbishop or bishop*: "Will you to the utmost of your power cause law and justice, in mercy, to be executed in all your judgements?" *King*: "I will." *Archbishop or bishop*: "Will you, to the utmost of your power, maintain the laws of God, the true profession of the Gospel, and the Protestant reformed religion established by law? And will you maintain and preserve inviolably the settlement of the Church of England and the doctrine, worship, discipline and government thereof, as by law established in England. And will you preserve unto the bishops and clergy of England, and to the churches therein all such rights and privileges as by law do or shall appertain to them, or any of them?" *King*: "All this I promise to do." *After this the king, laying his hand upon the holy Gospels, shall say*: "The things which I have here before promised I will perform and keep; so help me God," *and then shall kiss the book.*

The chief officers of state take an "official" oath well and truly to serve his majesty. Special oaths are taken by privy councillors, archbishops and bishops, peers, baronets and knights, recruits and others. The old oath of allegiance, as administered (says Blackstone) upwards of 600 years, contained a promise "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to know or hear of any ill or damage intended him without defending him therefrom" (Blackstone, *Commentaries*, book i. chap. x.). In the reign of William III. it was replaced by a shorter form; and it now runs: "I . . . do swear that I will be faithful and bear true allegiance to His Majesty . . . , his heirs and successors, according to law." Statutes of Charles II. and George I. enacted that no member should vote or sit in either house of parliament without having taken the several oaths of allegiance, supremacy and abjuration. The oath of supremacy in the reign of William III. was: "I A B doe swear that I doe from my heart abhorr detest and abjure as impious and hereticall this damnable doctrine and position that princes excommunicated or deprived by the pope or any authority of the see of Rome may be deposed or murdered by their subjects or any other whatsoever. And I doe declare that no forreigne prince person prelate state or potentate hath or ought to have any jurisdiction power superiority preeminence or authoritie ecclesiasticall or spirituall within this realme. Soe," &c. The oath of abjuration introduced in the time of William III. recognizes the king's rights, engages the juror to support him and disclose all traitorous conspiracies against him, promises to maintain the Hanoverian Protestant succession, and expressly renounces any claim of the descendants of the late Pretender. This oath was not only taken by persons in office, but might be tendered by two justices to any person suspected of disaffection. In modern times a single parliamentary oath was substituted for the three, and this was altered to enable Roman Catholics to take it, and Jews were enabled to sit in parliament by being allowed to omit the words "on the true faith of a Christian." In its present form the parliamentary oath consists of an oath of allegiance and a promise to maintain the succession to the crown as limited and settled in the reign of William III.

The "judicial" oath taken by judges of the court of appeal or of the High Court of Justice, and by justices of the peace, is "to do right to all manner of people after the laws and usages of this realm, without fear or favour, affection or ill-will." Jurors are sworn, whence indeed their name (*juratores*); in felonies the oath administered is: "You shall well and truly try and true deliverance make between our sovereign lord the king and the prisoner at the bar whom you shall have in charge, and a true verdict give according to the evidence." In misdemeanours the form is: "Well and truly try the issue joined between our sovereign lord the king and the defendant, and a true verdict," &c. The oath of the jurors in the Scottish criminal courts is: "You [the jury collectively] swear in the name of Almighty God and as you shall answer to God at the great day of judgment that you will truth say and no truth conceal in so far as you are to pass upon this assize." The oldest trace of this form of oath in Scotland is in *Reg. maj.* i. cap. 11, copied from Glanvill, which points to an origin in the Norman inquest or "recognition." In the ancient custom of compurgation, once prevalent in Europe, the accused's oath was supported by the oaths of a number of helpers or compurgators who swore to their belief in its validity.

Witnesses in English law courts must give their evidence under the sanction of an oath, or of what is equivalent to an oath, and the ordinary form of oath adapted to Christians is: "The evidence you shall give . . . shall be the truth, the whole truth, and nothing but the truth. So help you God." Many alterations of the English law as to oaths have been made in relief of (1) those Christians who object on conscientious grounds to the taking of an oath, and (2) of those persons who refuse to admit the binding force of an oath. Special provision was first made for Quakers, Moravians and Separatists; then followed general enactments relating to civil and criminal proceedings respectively, till finally the law was embodied in the Oaths Act 1888, which enacted that "every person upon objecting to being sworn, and stating, as the ground of such objection, either that he has no religious belief, or that the taking of an oath is contrary to his religious belief, shall be permitted to make his solemn affirmation instead of taking an oath in all places and for all purposes where an oath is or shall be required by law, which affirmation shall be of the same force and effect as if he had taken the oath; and if any person making such affirmation shall wilfully, falsely and corruptly affirm any matter or thing which, if deposed on oath, would have amounted to wilful and corrupt perjury, he shall be liable to prosecution, indictment, sentence and punishment in all respects as if he had committed wilful and corrupt perjury." The form of affirmation prescribed by the Oaths Act was as follows: "I, *A. B.*, do solemnly, sincerely, and truly declare and affirm," &c. Under s. 5 of the same act a person might swear in the Scottish form, with uplifted hand (no book of any kind being used) and if he desired to do so "the oath shall be administered to him in such form and manner without question." With the desire of making universal this method of administering the oath the Oaths Act 1909 was passed. It enacted that any oath might be administered and taken in the following form: "The person taking the oath shall hold the New Testament, or in the case of a Jew, the Old Testament, in his uplifted hand, and shall say or repeat after the officer administering the oath the words 'I swear by Almighty God that . . . ,' followed by the words of the oath prescribed by law." The officer also is directed by the act to administer it in this fashion, unless the person about to take it voluntarily objects or is physically incapable of taking it so. To a person who is neither a Christian nor a Jew the oath may be administered in any way in which it was previously lawful.

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[1] As to reform of the excessive multiplication of oaths, see Paley, *Moral Philosophy*, bk. iii. pt. i. ch. 16; and J. E. Tyler, *Oaths*.

The form of affirmation given above is that used for Quakers, Moravians and Separatists in the witness-box: "I, *A. B.*, being one of the people called Quakers (one of the United Brethren called Moravians), do, &c." A Christian swears on the Gospels, holding a copy of the New Testament in his right hand (the hand being uncovered), and his head being also uncovered. A witness may elect to be sworn on any version of the Bible which he considers most binding on him, as a Roman Catholic on the Douai Testament or Bible. A Jew is sworn on the Pentateuch, holding a copy thereof in his right hand, the head being covered. A Mahommedan is sworn upon the Koran. He places his right hand flat upon the book and puts the other hand upon his forehead, bringing his head down to the book and in contact with it. He then looks at the book for some moments. Buddhists are sworn on the Buddhist doctrines, Sikhs upon the Granth, Parsees upon the Zend Avesta, Hindus upon the Vedas, or by touching the Brahmin's foot, and, according to caste custom, Indian witnesses sometimes insist upon the oath being administered by a Brahmin; but in India witnesses now generally affirm. Kaffir witnesses swear by their own chief, and a Kaffir chief by the king of England. When a Chinese witness is to be sworn, a saucer is handed to him, which he takes in his hand and kneeling down breaks into fragments. The colonial legislatures generally make provision for receiving unsworn evidence of barbarous and uncivilized people who have no religious belief. The great number of oaths formerly required was much reduced by the Promissory Oaths Act 1868, which prescribed the forms of oath of allegiance, the official oath and the judicial oath. The right to affirm in lieu of taking the parliamentary oath in the case of atheists was first raised in the case of Charles Bradlaugh (*q.v.*).

Profane swearing and cursing is punishable by the Profane Oaths Act 1745, any labourer, sailor or soldier being liable to forfeit 1s., every other person under the degree of a gentleman 2s., and every gentleman or person of superior rank 5s., to the poor of the parish.

The administering or taking of unlawful oaths is criminal in English and Scots law. Statutes relating to the offence were passed in 1797, 1799, 1810 and 1812, and it is evident from the preamble of the latter act (Unlawful Oaths Act 1812) that they were aimed at those societies in the United Kingdom at the time of the French Revolution which required or permitted their members to take an unlawful oath. Supplementary statutes were passed in 1817 and 1837. Children of tender years, who, in the opinion of the court, have not sufficient intelligence to understand the nature of an oath, may give evidence without being sworn.

In the United States an oath is required in practically every case in which it is required in the United Kingdom, and with the same latitude as to affirmation. The formula or details may vary in different states of the Union. The same may be said generally of every civilized country, with the reservation that an affirmation is not so usually accepted as in English-speaking countries. In Germany an oath is compulsory on a witness in criminal cases, except in the case of certain sects, whose tenets forbid the taking of an oath.

Authorities.—Coke's *Institutes*; *Book of Oaths* (1689); Stephen's *Commentaries*; Stringer's *Oaths and Affirmations*; Tyler, *Oaths; Origin, Nature, History* (1835); Ford, *On Oaths*.

OAXACA, or Oajaca (officially Oaxaca de Juárez), a southern state of Mexico, lying partly on the southern slope of the great Mexican plateau and covering the southern and larger part of the Isthmus of Tehuantepec, bounded N. by Puebla, N.E. and E. by Vera Cruz, S.E. by Chiapas, S. by the Pacific and W. by Guerrero. Pop. (1900) 948,633, a large majority of whom are Indians. The state has an area of 35,382 sq. m. broken by mountain ranges into numerous broad fertile valleys, chiefly lying in the *tierra templada* region. The isthmus districts, however, have lower elevations and are distinctly tropical. The coast line is 329 m. long; behind it is a narrow strip of lowlands lying within the *tierras calientes*. In places this strip nearly disappears, the sierras rising almost immediately from the seashore. The culminating points within the state are Zempoaltepetl (11,145 ft.) about 50 m. E. by N. of the city of Oaxaca in a knot of sierras, San Felipe del Agua (10,253 ft.) standing on the eastern margin of the beautiful Oaxaca Valley, and the Cerro del Leone, south-west of Tehuantepec, the highest summit in the Sierra Madre del Sur. Tributaries of the Mescala drain the western quarter of the state, among which is the Atoyac or headstream of the Mescala, which rises in Tlaxcala, and flows across the state of Puebla. The streams flowing northward to the Gulf coast are the Coatzacoalcos and Papaloápam with its tributary, the San Juan, all flowing across the state of Vera Cruz. The Papaloápam is navigable up to the town of Tuxtepec, in the state of Oaxaca. The largest of the Pacific coast streams is the Tehuantepec, which with its many tributaries has an aggregate length of 182 m. The Rio Verde has its source farther inland and drains the Oaxaca Valley, but its tributaries are small and less numerous. The only ports on the coast open to foreign trade are Salina Cruz and Puerto Angel—the first, the Pacific terminus of the Tehuantepec railway, with a spacious artificial harbour, and the second a deep but narrow natural harbour, the projected coast terminus of the Mexican Southern railway. The greater part of the state has a sub-tropical climate, with high sun temperatures, moderate rainfall and mild, healthful conditions. The less healthful regions include the isthmus districts, the coastal zone on the Pacific and the low country on the border of Vera Cruz. Agriculture is the principal occupation of the people; the chief products are Indian corn, wheat, coffee, sugar, rubber, cotton, cacao, tobacco, indigo and a great variety of tropical fruits. Among the manufactured products are cotton, woollen and "pita" fibre fabrics, sugar, rum, mescal, beer, furniture, pottery, soap, candles, leather, matches, chocolate, flour and cigarettes. Two important railway lines traverse the state—the Tehuantepec (trans-isthmus) line between the ports of Salina Cruz and Coatzacoalcos (Puerto Mexico), and the Mexican Southern line (narrow-gauge) from Puebla to Oaxaca, with branches to San Geronimo on the Tehuantepec line with the Guatemalan frontier as its destination, and toward Puerto Angel on the coast. Two of the most progressive Indian races of Mexico, the Zapotecas and Mixtecas, descendants, it is believed, of the prehistoric races who built the remarkable cities where the ruins of Mitla and Monte Alban (see Central America:

§ *Antiquities*) now stand, still form the greater part of the population.

OAXACA, Oajaca (from Aztec *Huaxyacac*), or Oaxaca de Juarez (official title), capital of the Mexican state of Oaxaca, in the central part of the state 288 m. S.E. of the City of Mexico, and about 153 m. from Puerto Angel on the Pacific; in lat. 17° 3′ N., long. 96° 40′ W. Pop. (1900) 35,049, largely Indians, most of whom are Mixtecas and Zapotecas. Oaxaca is connected with Puebla (211 m.) by the Mexican Southern railway. The city lies in a broad, picturesque valley 5085 ft. above sea-level, and has a mild temperate climate; annual rainfall about 33 in.; mean annual temperature 68° F. It forms the see of a bishopric dating from 1535, and has a fine old cathedral (occupying the north side of the *plaza mayor*), built in the Spanish Renaissance style and dating from 1553; rebuilt in 1702.

According to tradition the Aztec military post and town of Huaxyacac was founded in 1486. The date of the first Spanish settlement is uncertain, but it was probably between 1522 and 1528. The Oaxaca Valley, including several native towns, had been given to Cortés, together with the title marquez del Valle de Oaxaca. To injure him, the *audiencia* then administering the government, founded the *villa* of Antequera in close proximity to Huaxyacac and on lands belonging to Cortés in 1529, though a settlement had been made at the Indian town at an earlier date. Antequera was made a city in 1532 and the see of a bishopric in 1535, though it had but few Spanish inhabitants and no opportunity to expand. This anomalous state of affairs was eventually settled, Antequera was absorbed by Huaxyacac, and the Spanish corrupted the pronunciation to Oaxaca. The city suffered severely in the earthquakes of 1727 and 1787, the cathedral being greatly damaged in the former. It had a chequered career in the War of Independence, being captured by Morelos in 1812, reoccupied by the royalists in 1814, and recaptured by Antonio Leon in 1821. In 1823 it was again captured by Nicolas Bravo in the revolution against Iturbide. In 1865 it was besieged by the French under Bazaine and surrendered by General Diaz (4th Feb.) but was recaptured by him on the 1st of November 1866, after his escape from Puebla. In the revolution promoted by Diaz in 1871–1872 the city was captured by the Juarist general Alatorre on the 4th of January 1872, and in a second revolution of 1876 it was captured by the friends of Diaz on the 27th of January of that year.

OB, or Obi, a river of West Siberia, known to the Ostiaks as the As, Yag, Kolta and Yema; to the Samoyedes as the Kolta or Kuay; and to the Tatars as the Omar or Umar. It is formed, 8 m. S.W. of Biysk in the government of Tomsk, by the confluence of the Biya and the Katun. Both these streams have their origin in the Altai (Sailughem) Mountains, the former issuing from Lake Teletskoye, the latter, 400 m. long, bursting out of a glacier on Mount Byelukha. The Ob zigzags W. and N. until it reaches 55° N.; thence it curves round to the N.W., and again N., wheeling finally eastwards into the Gulf of Ob, a deep (600 m.) bay of the Arctic Ocean. The river splits up into more than one arm, especially after receiving the large river Irtysh (from the left) in 69° E. Other noteworthy tributaries are: on the right, the Tom, the Chulym, the Ket, the Tym and the Vakh; and, on the left, the Vasyugan, the Irtysh (with the Ishim and the Tobol) and the Sosva. The navigable waters within its basin reach a total length of 9300 m. By means of the Tura, an affluent of the Tobol, it secures connexion with the Ekaterinburg-Perm railway at Tyumen, and thus is linked on to the rivers Kama and Volga in the heart of Russia. Its own length is 2260 m., and the area of its basin 1,125,200 sq. m. A system of canals, utilizing the Ket river, 560 m. long in all, connects the Ob with the Yenisei. The Ob is ice-bound at Barnaul from early in November to near the end of April, and at Obdursk, 100 m. above its mouth, from the end of October to the beginning of June. Its middle reaches have been navigated by steamboats since 1845.

OBADIAH, the name prefixed to the fourth of the Old Testament "minor prophets," meaning "servant" or "worshipper" of Yahweh; of a type common in Semitic proper names; cf. the Arabic ʽAbdallāh, Taimallāt, ʽAbd Manāt, &c., the Hebrew Abdiel and Obed Edom, and many Phoenician forms. "The vision of Obadiah" bears no date, or other historical note, nor can we connect Obadiah the prophet with any other Obadiah of the Old Testament,[1] and our only clue to the date and composition of the book lies in internal evidence.

The prophecy is directed against Edom. Yahweh has sent a messenger forth among the nations to stir them up to battle against the proud inhabitants of Mount Seir, to bring them down from the rocky fastnesses which they deem impregnable. Edom shall be not only plundered but utterly undone and expelled from his borders, and this he shall suffer (through his own folly) at the hand of trusted allies (vers. 1-9). The cause of this judgment is his cruelty to his brother Jacob. In the day of Jerusalem's overthrow the Edomites rejoiced over the calamity, grasped at a share of the spoil, lay in wait to cut off the fugitives (vers. 10-14). But now the day of Yahweh is near upon all nations, Esau and all the heathen shall drink full retribution for their banquet of carnage and plunder on Yahweh's holy mountain. A rescued Israel shall dwell in Mount Zion in restored holiness; the house of Jacob shall regain their old possessions; Edom shall be burned up before them as chaff before the flame; they shall spread over all Canaan, over the mountain of Esau and the south of Judah, as well as over Gilead and the Philistine and Phoenician coast. The victorious Israelites shall come up on Mount Zion to rule the mountain of Esau, and the kingdom shall be Yahweh's (vers. 15-21).

The most obvious evidence of date lies in the cause assigned for the judgment on Edom (vers. 10-14). The calamity of Jerusalem can only be the sack of the city by Nebuchadrezzar (586 B.C.); the malevolence and cruelty of Edom on this occasion are characterized in similar terms by several writers of the exile or subsequent periods, but by none with the same circumstance and vividness of detail as here (Ezek. xxv. 8, 12 f., xxxv.; Lam. iv. 21; Psalm cxxxvii. 7). The prominence given to Edom, and the fact that Chaldea is not mentioned at all, make it probable that the passage was not written in Babylonia. On this evidence, taken alone, we should be justified in saying that the prophecy was written at some time after 586 B.C., at a period when misfortunes incurred by Edom were interpreted as a Divine judgment on its unforgotten treachery in that year of tragedy.

The critical problem is, however, complicated by certain phenomena of literary relationship.[2] Obad. 1-6, 8 agree so closely and in part verbally with Jer. xlix. 14-16, 9, 10, 7 that the two passages cannot be independent; nor does it seem possible that Obadiah quotes from Jeremiah, for Obad. 1-8 is a well-connected whole, while the parallel verses in Jeremiah appear in different order, interspersed with other matter, and in a much less lucid connexion. In Jeremiah the picture is vague, and Edom's unwisdom (ver. 7) stands without proof. In Obadiah the conception is quite definite. Edom is attacked by his own allies, and his folly appears in that he exposes himself to such treachery. Again, the probability that the passage in Jeremiah incorporates disjointed fragments of an older oracle is greatly increased by the fact that the prophecy against Moab in the preceding chapter uses, in the same way, Isa. xv., xvi., and the prophecy of Balaam. Scholars who assign the passage in Jeremiah to 604 B.C. (*e.g.* Driver, *L.O.T.* chap. vi. § 4), explain this relationship by assuming with Ewald (*Propheten*, i. 489 f.), Graf (*Jeremia*, p. 558 f.), Robertson Smith and others, that Jeremiah and our book of Obadiah alike quote from an older oracle. Others, however, who do not regard Jer. xlix. as Jeremianic, explain the relationship as one of dependence on Obadiah. This explanation, simpler in itself, is not discredited by the fact that in some details (cf. Obad. 2 and Jer. xlix. 15) the text of the dependent passage may be preferable to that of the original. On this latter, and more probable, view (taken by Wellhausen, Nowack and Marti) there is no need to separate Obad. 1-7 from 10-14. The immediate occasion of the prophecy[1] was doubtless the pressure of nomadic Arabs ("the men of thy covenant," "the men of thy peace," *v.* 7) upon Edom, which had resulted, by 312 B.C. at latest, in the occupation by Arabs of Petra, the chief city of the Edomites (Wellhausen, p. 214). But the desolation of Edom has already been accomplished in the time of Malachi i. 1-5, a passage belonging to the earlier half of the 5th century. We may, therefore, with Wellhausen, Nowack and Marti, assign Obadiah 1-14 to the same period.

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[1] An early Hebrew tradition recorded by Jerome (*Comm. in Ob.*) identified the prophet with the best-known Obadiah of the historical books, the protector of the prophets in the reign of Ahab (1 Kings xviii.).

[2] Between Joel and Obadiah there are points of material and verbal agreement so close as to imply that Joel used the earlier book (Joel iii. 19—Ob. 10, 14; Joel iii. 3—Ob. 11; Joel ii. 32, iii. 7—Ob. 17).

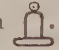
The remainder of the book, vers. (15) 16-21, must belong to a later date. That the book of Obadiah, short as it is, is a complex document might have been suspected from an apparent change of view between vers. 1-7 and vers. 15 f. In the former verses Esau is destroyed by his allies, and they occupy his territory, but in the latter he perishes with the other heathen in the day of universal retribution, he disappears before the victorious advance of Israel, and the southern Judaeans occupy his land.[2] The ideas of this passage belong to the eschatological outlook of later centuries, but afford no data for chronology. The conceptions of the "rescued ones" (R.V. "those that escape," *v.* 17), of the sanctity of Zion, of the kingship of Yahweh, are the common property of the post-exilic writers. The restoration of the old borders of Israel and the conquest of Edom and the Philistines are ideas as old as Amos ix., Isa. xi. 14; but such passages represent this conquest as a suzerainty of Israel over its neighbours, as in the days of David, while in Obadiah, as in other later books, the intensified antithesis—religious as well as political—between Judah and the surrounding heathen finds its expression in the idea of a consuming judgment on the latter—the great "day of Yahweh." The chief interest of the book of Obadiah lies in its references to the historical relations between Israel and Edom. From the point of view of religion, we may notice the emphasis on the doctrine of strict retribution (vers. 10 f., 15 *b*) which remains applicable to other peoples, even when its inadequacy as a complete theory of providence has been slowly and painfully discovered in the case of Israel itself.

LITERATURE.—Wellhausen, *Die kleinen Propheten*^{3} (1898); Nowack, *id.* (1897, 2nd ed., 1904); G. A. Smith, *The Book of the Twelve*, vol. ii. (1898); J. A. Selbie, art. "Obadiah," in Hastings's *Dict. of the Bible*, iii. 577-580 (1900); Cheyne, *id.* in *Ency. Biblica*, iii. c. 3455-3462 (incorporating the article of W. Robertson Smith in the 9th edition of the *Ency. Brit.*) (1902); Marti, *Dodekapropheton* (1903). For a sketch of the history of the Edomites, see Nöldeke's article "Edom" in the *Ency. Biblica*. (W. R. S.; H. W. R.*)

OBAN, a municipal and police burgh and seaport of Argyllshire, Scotland. Pop. (1901) 5374. It is situated 113 m. N.W. of Glasgow by the Caledonian railway via Stirling and Callander, and about the same distance by water via the Crinan Canal. The fine bay on which it lies is screened from the Atlantic gales by the island of Kerrera (4½ m. long by 2 m. broad), which practically converts it into a land-locked harbour. Being also sheltered from the north and east by the hills at the foot of which it nestles, the town enjoys an exceptionally mild climate for its latitude. The public buildings include the Roman Catholic pro-cathedral, erected by the 3rd marquis of Bute, the county buildings and two hospitals. It is the centre of tourist traffic for western Argyllshire and the islands. Oban was a small village at the date of Johnson's visit during his Hebridean tour; in 1786 it became a government fishing station; it was made a burgh of barony in 1811 and a parliamentary burgh in 1832. With Ayr, Campbeltown, Inveraray and Irvine (the Ayr burghs) it unites to send one member to parliament.

At the north end of the bay stands the ruin of Dunolly Castle, the old stronghold of the Macdougalls of Lorne, whose modern mansion adjoins it. In the grounds is a huge conglomerate rock called the Dog Stone (*Clach-a-choin*), from the legend that Fingal used to fasten his favourite dog Bran to it. About 3 m. N.E. are the ruins of Dunstaffnage Castle. It was here that the "Stone of Destiny," now contained in the base of the coronation chair at Westminster Abbey, was kept before its removal to Scone. At the south end of the island of Kerrera stand the ruins of Gylen Castle, an old fortalice of the Macdougalls.

OBBLIGATO, or OBLIGATO, in the modern sense, a musical term (adopted from the Italian, and strictly meaning obligatory or binding) for an instrumental accompaniment to a musical composition which, while in one way independent, is included by the composer on purpose and in a prescribed form, instead of being left to the discretion (*ad libitum*) of a performer.

OBELISK (Gr. ὀβελίσκος, diminutive of ὀβελός, a spit), a form of monumental pillar; and also the term for a bibliographical reference-mark in the form of a dagger. The typical Egyptian obelisk is an upright monolith of nearly square section, generally 10 diameters in height, the sides slightly convex, tapering upwards very gradually and evenly, and terminated by a pyramidion whose faces are inclined at an angle of 60°. Obelisks were usually raised on pedestals of cubical form resting on one or two steps, and were set up in pairs in front of the entrance of temples. Small obelisks have been found in tombs of the age of the Old Kingdom. The earliest temple obelisk still in position is that of Senwosri I. of the XIIth Dynasty at Heliopolis (68 ft. high). A pair of Rameses II. (77 and 75 ft. high respectively) stood at Luxor until one of them was taken to Paris in 1831. Single ones of Tethmosis I. and Hatshepsut (109 ft. high) still stand at Karnak and remains of others exist there and elsewhere in Egypt. Colossal granite obelisks were erected by only a few kings, Senwosri I. in the Middle Kingdom and Tethmosis I., Hatshepsut, Tethmosis III. and Rameses II. of the Empire. Smaller obelisks were made in the Saïte period. The Romans admired them, and the emperors carried off some from their original sites and caused others to be made in imitation (*e.g.* that for Antinous at Benevento): twelve are at Rome, one in Constantinople; two, originally set up by Tethmosis III. at Heliopolis, were taken by Augustus to adorn the Caesareum at Alexandria: one of these, "Cleopatra's Needle," was removed in 1877 to London, the other in 1879 to New York. Such obelisks were probably more than mere embellishments of the temples. The pyramidions were sheathed in bright metal, catching and reflecting the sun's rays as if they were thrones of the sunlight. They were dedicated to solar deities, and were especially numerous at Heliopolis, where there was probably a single one sacred to the sun of immemorial antiquity. The principal part of the sun-temple at Abusir built by Neuserrē of the Vth Dynasty appears to have been in the shape of a stumpy obelisk on a vast scale, only the base now remains, but hieroglyphic pictures indicate this form. The hieroglyph of some other early sun-temples shows a disk on the pyramidion . The material employed for the great obelisks was a pink granite from the quarries of Syene, and in these quarries there still remains, partially detached, an example 70 to 80 ft. long. The largest obelisk known is that in the piazza of St John Lateran at Rome; this had been set up by Tethmosis III. at Heliopolis in the 15th century B.C., was brought over from Egypt by Constantine the Great and erected in the Circus Maximus, being ultimately re-erected in 1552 by Pope Sixtus V. It was 105 ft. 9 in. high, including the pyramidion, and its sides measured 9 ft. 10 in. and 9 ft. 8 in. respectively. On the base of the magnificent obelisk of Hatshepsut at Karnak, 97 ft. 6 in. high, there is an inscription stating that it and its fellow were made within the short space of seven months. In consequence of the breaking away of the lower part of "Cleopatra's Needles" when removed to Alexandria and re-erected, the Roman engineers supported the angles on bronze crabs, one of which with three reproductions now supports the angles of the obelisk on the Thames Embankment.

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[1] Wellhausen and Nowack regard *vv.* 8, 9 as a later addition, intended to apply *vv.* 1-7 to the future; so Marti, who groups with these verses 15*a*, because of the common reference to "the day of Yahweh."

[2] The Judaeans are addressed in *v.* 16 ("as ye have drunk"), not the Edomites. Verse 20 anticipates that the exiles from northern Israel will occupy Phoenician territory, whilst those from Jerusalem "which are in Sepharad" will occupy the southern districts in the Messianic restoration. "Sepharad" has been connected with various places, *e.g.* Saparda in south-west Media (G. A. Smith), and Çparda of Darius in the Behistun inscription (Robertson Smith); whilst, according to Winckler (*K.A.T.*^{3} p. 301), it is the name, from the Persian period onwards, for Asia Minor. Many of the Jews were doubtless sold as slaves by Nebuchadrezzar. Lydia was a great slave-market, and Asia Minor was a chief seat of the Diaspora at an early date (comp. Gutschmidt, *Neue Beiträge*, p. 77), so that "Sepharad" in itself does not supply ground for Hitzig's argument that Obadiah was written in the Greek period, when we read of many Jews being transplanted to Asia Minor (Jos. *Ant.* xii. 3).

There was another form of obelisk, also tapering, but more squat than the usual type, with two of the sides narrow and terminating in a rounded top. One such of Senwosri I., covered with sculpture and inscriptions, lies at Ebgīg in the Fayum. Stelae, inscribed with the names of the kings, occurred in pairs in the royal tombs of the Ist Dynasty at Abydos, and pairs of small obelisks are said to have been found in private tombs of the IVth Dynasty. The origin of the obelisk may be sought in sacred upright stones set up in honour of gods and dead, like the menhirs, and the Semitic Massebahs and bethels.

In Abyssinia, at Axum and elsewhere, there is a marvellous series of obelisk-like monuments, probably sepulchral. They range from rude menhirs a few feet high to elaborately sculptured monoliths of 100 ft. The loftiest of those still standing at Axum is about 60 ft. high, 8 ft. 7 in. wide, and about 18 in. thick, and is terminated by a rounded apex united by a necking to the shaft. The back of the obelisk is plain, but the front and sides are subdivided into storeys by a series of bands and plates, each storey having panels sunk into it which seem to represent windows with mullions and transom. These architectural decorations are derived from a style of building found by the recent German expedition extant in an ancient church; courses of stone here alternate in the walls (both inside and out) with beams of wood held by circular clamps. In front of the best-preserved obelisk is a raised altar with holes sunk in it apparently to receive the blood of the sacrifice to the ancestors. Most of these must date before the adoption of Christianity as the state religion in the 6th century.

See G. Maspero, *L'Archéologie égyptienne* (new ed., Paris, 1907), p. 105; H. H. Gorringe, *Egyptian Obelisks* (New York, 1882; London, 1885, &c.); F. W. von Bissing and L. Borchardt, *Das Re-Heiligtum des Königs Ne-woser-Re* (Berlin, 1905); on the ancient method of raising obelisks, L. Borchardt, "Zur Baugeschichte des Amonstempel von Karnak," in Sethe's *Untersuchungen zur Geschichte und Altertumskunde Aegyptens*, v. 15. For the Abyssinian obelisks see especially E. Littmann and D. Krencker, *Vorbericht der deutschen Aksum Expedition* (Berlin, 1906). (F. Ll. G.)

OBERAMMERGAU, a village of Bavaria, Germany, district of Upper Bavaria, situated amongst the foot-hills of the Alps in the valley of the Ammer, 64 m. S.S.W. of Munich. Pop. about 1400. The village folk are mainly engaged in making toys, and carving crucifixes, rosaries and images of saints.

The place is famous for their performance of a Passion Play every tenth year (*e.g.* in 1910), to which thousands of visitors flock. This dramatic representation of the sufferings of Christ is not a survival of a medieval mystery or miracle-play, but took its rise from a vow made by the inhabitants in 1633, with the hope of staying a plague then raging. The original text and arrangements were probably made by the monks of Ettal, a monastery a little higher up the valley; but they were carefully remodelled by the parish priest at the beginning of the present century, when the Oberammergau play obtained exemption from the general suppression of such performances by the Bavarian government. The music was composed by Rochus Dedler, schoolmaster of the parish in 1814. The performances take place on the Sundays of summer, in a large open-air theatre holding 6000 persons, and each lasts about nine hours, with a short intermission at noon. Each scene from the history of Christ is prefaced by a tableau of typical import from the Old Testament. About 700 actors are required, all belonging to the village. The proceeds of the performances are devoted to the good of the community, after defrayal of the costs and payment of a small remuneration to the actors. The villagers regard the Passion Play as a solemn act of religious worship, and the performances are characterized by the greatest reverence. The principal parts are usually hereditary in certain families and are assigned with regard to moral character as well as dramatic ability. It is considered a disgrace not to be allowed to take part in the play, and the part of Christ is looked upon as one of the greatest of earthly honours.

Edward Devrient (in 1850) was among the first to direct general attention to Oberammergau; and numerous accounts have since appeared. An English version of the text of the Passion Play has been published by E. Childe (1880).

OBERHAUSEN, a town of Germany, in the Prussian Rhine province. It is situated 5 m. from the east bank of the Rhine, 20 m. N.E. of Düsseldorf, on the main line of railway to Hanover and Berlin, and at the centre of an important network of lines radiating hence into the extensive Westphalian coal and iron fields. Pop. (1905) 52,096. The town possesses large iron-works, coal-mines, rolling-mills, zinc smelting-works, railway workshops and manufactures of wire-rope, glass, chemicals, porcelain and soap. The first houses of Oberhausen were built in 1845, and it received its municipal character in 1874.

OBERLAHNSTEIN, a town of Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Rhine, at the confluence of the Lahn 4 m. above Coblenz, on the railway from Cologne to Frankfort-on-Main. Pop. (1905) 8472. It still retains parts of its ancient walls and towers, and possesses a castle, the Schloss Martinsburg, formerly the residence of the electors of Mainz, and the chapel, Marien Kapelle, in which the German king Wenceslaus was deposed by the electors in 1400. Near the town is the castle of Lahneck, built about 1290, destroyed by the French in 1689, and restored in 1854. In the neighbourhood are lead and silver mines.

See J. Wegeler, *Lahneck und Oberlahnstein* (Trier, 1881).

OBERLÄNDER, ADAM ADOLF (1845–), German caricaturist, was born at Ratisbon, but after 1847 lived in Munich. He studied painting at the Munich Academy under Piloty, and soon discovered that the true expression of his genius was in the field of caricature and comic drawings. He joined the staff of the *Fliegende Blätter*, to which he became a constant contributor. Unlike Busch, whose aim was the utmost simplicity of line and whose drawings form a running commentary to the legend, Oberländer's work is essentially pictorial, and expressive in itself, without the extraneous aid of the written line. Among his best drawings are his parodies on the style of well-known painters, such as the "Variations on the Kissing Theme." His works have been collected in the *Oberländer-Album*, published by Braun and Schneider in Munich.

OBERLIN, JEAN FRÉDÉRIC (1740–1826), German Protestant pastor and philanthropist, the son of a teacher, was born on the 31st of August 1740 at Strassburg, where he studied theology. In 1766 he became Protestant pastor of Waldbach, a remote and barren region in the Steinthal (Ban-de-la-Roche), a valley in the Vosges on the borders of Alsace and Lorraine. He set himself to better the material equally with the spiritual condition of the inhabitants. He began by constructing roads through the valley and erecting bridges, inciting the peasantry to the enterprise by his personal example. He introduced an improved system of agriculture. Substantial cottages were erected, and various industrial arts were introduced. He founded an itinerant library, originated infant schools, and established an ordinary school at each of the five villages in the parish. In the work of education he received great assistance from his housekeeper, Louisa Scheppler (1763–1837). He died on the 1st of June 1826, and was interred with great manifestations of honour and affection at the village of Urbach.

Among the many accounts of the labours of Oberlin, mention may be made of Thomas Sims, *Brief Memorials of Oberlin* (London, 1830); *Memoirs of Oberlin, with a short notice of Louisa Scheppler* (London, 1838, 2nd ed. 1852); H. Ware, *Biography of Oberlin* (Boston, 1845); L. Spach, *Oberlin le pasteur* (Strassburg, 1865, 2nd ed. 1868); F. W. Bodemann, *J. F. Oberlin* (3rd ed., 1879); K. F. Riff, *Drei Bilder aus dem Leben von Papa Oberlin* (Strassburg, 1880); Josephine Butler, *Life of J. F. Oberlin* (1882); G. H. von Schubert, *Züge aus dem Leben Oberlins* (11th ed., 1890); Armin Stein, *Johann Friedrich Oberlin, ein Lebensbild* (1899). See also the article in Herzog-Hauck, *Realencyklopädie*. The collected writings of Oberlin were published by Burkhardt at Stuttgart in 1843 in 4 vols.

OBERLIN, JÉRÉMIE JACQUES (1735–1806), Alsatian philologist and archaeologist, brother of Jean Frédéric Oberlin, was born at Strassburg on the 8th of August 1735. While studying theology at the university he devoted special attention to Biblical archaeology. In 1755 he was chosen professor at the gymnasium of his native town, in 1763 librarian to the university, in 1770 professor of rhetoric, and in 1782 of logic and metaphysics. Oberlin published several manuals on archaeology and ancient geography, and made frequent excursions into different provinces of France to investigate antiquarian remains and study provincial dialects, the result appearing in *Essai sur le patois Lorrain* (1775); *Dissertations sur les Minnesingers* (1782–1789); and *Observations concernant le patois et les mœurs des gens de la campagne* (1791). He also published several editions of Latin authors. He died on the 10th of October 1806.

OBERLIN, a village of Lorain county, Ohio, U.S.A., 34 m. W.S.W. of Cleveland. Pop. (1890) 4376; (1900) 4082 (641 negroes); (1910) 4365. It is served by the Lake Shore & Michigan Southern railway, and by the Cleveland & South-Western (electric) railway, which furnishes connexions directly with Cleveland and Elyria, and at the village of Wellington (about 10 m. S.) connects with the Cleveland, Cincinnati, Chicago & St Louis, and the Wheeling & Lake Erie railways. Oberlin is primarily an educational centre, the seat of Oberlin College, named in honour of Jean Frédéric Oberlin, and open to both sexes; it embraces a college of arts and sciences, an academy, a Theological Seminary (Congregational), which has a Slavic department for the training of clergy for Slavic immigrants, and a conservatory of music. In 1909 it had twenty buildings, and a Memorial Arch of Indiana buff limestone, dedicated in 1903, in honour of Congregational missionaries, many of them Oberlin graduates, killed in China in 1900. Its libraries contained in 1909 98,000 bound volumes and an equal number of pamphlets, and the college had a faculty numbering 113 and a student enrolment of 1944. The resources of the college in 1909 were about $3,500,000. Under the editorship of a professor emeritus is published the *Bibliotheca Sacra*, a quarterly founded in 1843, and for many years the organ of the Andover Theological Seminary.

The village was founded as Oberlin Colony in 1833 (in 1846 it was incorporated as the village of Oberlin), by the Rev. John J. Shipherd (1802–1844), pastor of a church in Elyria, and the Rev. Philo Penfield Stewart (1798–1868), a missionary to the Choctaws of Mississippi, as a home for Oberlin Collegiate Institute, which was chartered in 1834; the name Oberlin College was adopted in 1850. To the Theological Seminary, opened in 1835, there came in the same year forty students from Lane Theological Seminary in Cincinnati, after the discussion of slavery there had been forbidden by its board of trustees. A former member of the board, Asa Mahan (1800–1889), who had strongly disapproved of the action of the trustees, came to Oberlin, and became the first president of the college. Oberlin was the first American college to adopt coeducation of sexes, and was a pioneer in America (1835) in the coeducation of the white and black races.[1] The village became a station on the Underground Railway, and an important centre of anti-slavery sentiment. Manual labour was adopted at first as a means for students to defray their college expenses. As late as 1906 it was estimated that nearly two-thirds of the men were to a greater or less degree self-supporting, as were many of the young women. What is known as the "Oberlin Theology" (no longer identified with the college) centred in the teaching of Charles Grandison Finney (1792–1875), who became professor of theology in 1835 and was Mahan's successor in the presidency (1851–1866). He was a powerful preacher and teacher, who broke from Calvinism in denying imputation and teaching perfect freedom of the will, by which perfect holiness might be attained. Finney carried on remarkable revival services in Western New York, in Philadelphia (1828), in New York City (1829–1830 and 1832, the New York *Evangelist* being founded to carry on his work), in Boston (1831, 1842–1843, 1856–1857), in London (1849–1850) and throughout England and Scotland (1858).

James Harris Fairchild (1817–1902) was president from 1866 to 1889; William Gay Ballantine (b. 1848), a distinguished Hebrew scholar, was president in 1891–1896, and John Henry Barrows (1847–1902) from 1899 to 1902, when he was succeeded by Henry Churchill King (b. 1858).

The modern theological position of Oberlin college is reflected in the writings of President King and of Dean Edward I. Bosworth (b. 1861) of the Theological Seminary, especially in President King's *Reconstruction in Theology* (1901); *Theology and the Social Consciousness* (1902); *The Seeming Unreality of the Spiritual Life* (1908) and *The Laws of Friendship—Human and Divine* (1909).

See Finney's autobiographical *Memoirs* (New York, 1876); J. H. Fairchild, *Oberlin, the College and the Colony* (Oberlin, 1883); D. L. Leonard, *The Story of Oberlin* (Boston, 1898); and A. T. Swing, *Life of J. H. Fairchild* (New York, 1907).

OBERON (Fr. *Alberon*, *Auberon*, Ger. *Alberich*, i.e. *rich*, Goth. *reiks*, "ruler"—cf. Lat. *rex*—and O.H. and M.H. Ger. pl. *elbi*, *elbe*, "elves," pl. *alp*), king of the elves. In the legendary history[2] of the Merovingian dynasty he figures as a magician, and is the brother of Merowech (Mérovée). He wins for his eldest son Walbert the hand of a princess of Constantinople. In the *Nibelungenlied* he guarded the treasure of the Nibelungen, but was overcome by Sigfrid. In the German medieval poem of *Ortnit*, the hero is aided in his wooing by his father Alberich, the king of the dwarfs. As Oberon, king of the fairies, he fills a similar rôle in *Huon of Bordeaux* (*q.v.*). The fairy element in the romance provided Shakespeare with the fairy scenes of the *Midsummer Night's Dream*, and Wieland with the subject of his epic *Oberon* (1780). Ben Jonson wrote a masque of *Oberon, or the Fairy Prince* (*Works*, 1616). Weber's opera, *Oberon*, to the words of J. R. Planché, was first produced at Covent Garden on the 12th of April 1826. In the Wagner dramas Alberich is the Nibelung who steals the magic gold from the Rhine maidens. He is there the father of Hagen, and has throughout the *Ring* a darker character than that assigned to him in the original legend. There have been attempts to find the original Oberon in the Celtic Gwyn Aron, but there is no doubt of his Germanic origin, although his history, as given by the poet of *Huon of Bordeaux*, contains elements derived from Celtic tradition—the magic cup which remains full for the virtuous, and his parentage (he is the son of Morgan la fay and Julius Caesar). With Oberon in the character of guardian of the treasure should be compared Andvari, the dwarf of Scandinavian legend, who, in the shape of a pike, was seized by Loki and made to give up his treasure and the magic ring by which he could create more gold. This ring, the Andvaranautr, with the curse of Andvari upon it, caused the misfortunes of the Volsungs and the Burgundian Nibelungs, and is known in German romance as the Ring of the Nibelungen.

See also C. Voretzsch, *Epische Studien. Die Kompositionen des Huon von Bordeaux* (Halle, 1900); J. Seemüller, "Die Zwergensage von Ortnit," in *Zeitschr. für deut. Altert.* vol. xvi. (1882).

OBERSTEIN, a town of Germany, in the principality of Birkenfeld, belonging to the grand duchy of Oldenburg, on the river Nahe, 33m. S.W. of Kreuznach, by the railway to Münster-am-Stein. Pop. (1905) 9669. It is famous for the cutting and setting of agates and other precious stones, an industry which has been established here, and in the neighbouring township of Idar, since the 16th century. The Evangelical church, built in the 12th century and restored in 1482, is partly hewn out of the solid rock. On the hills above the town are the ruins of two castles.

See Hisserich, *Die Idar-Obersteiner Industrie* (Oberstein, 1894).

OBIT (through O. Fr., from Lat. *obitus*, death, *obire*, to go down, to die), a term for death, formerly used for the account of a person's death (now "obituary"). An "obit" was also a service performed at a funeral or in commemoration of a dead person, particularly the founder or benefactor of a church, college or other institution, hence "obit-days," "obit Sunday," &c. A "post-obit" is a bond given as a security for the repayment of money lent upon the death of a person from whom the borrower has expectations (see BOND).

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[1] A runaway slave, Littlejohn, was taken at Oberlin in September 1858 by a United States marshal, but was rescued at Wellington. Several of the rescuers, notably Professor Henry Everard Peck of Oberlin College, were arrested and were imprisoned in Cleveland for several months. This was a famous fugitive slave case.

[2] The last history of Hugo of Toul (12th century) was the authority of Jacques de Guyse (14th century) in his *Annales historiae ill. princip. Hannoniae* (*Mon. Germ.* xxx.), where there is an account (bk. ix. ch. 6) of Alberich.

OBITER DICTUM, that which is said by the way or in passing (Lat. *ob*, by, and *iter*, road); specifically, in law, an opinion expressed by a judge incidentally in the course of a case, on a point of law not necessarily connected with the issue or not forming part of the grounds of the decision; such *obiter dicta* have no binding authority.

OBJECT and **SUBJECT,** in philosophy, the terms used to denote respectively the external world and consciousness. The term "object" (from Lat. *ob*, over against, and *jacere*, to throw) is used generally in philosophy for that in which an activity of the mind ends, or towards which it is directed. With these may be compared the ordinary uses of the term for "thing" simply, or for that after which one strives, or at which one aims. "Subject," literally that which is "thrown under" (*sub*), is originally the material or content of a discussion or thought, but in philosophy is used for the thought or the thinking person. The relation between the thinking subject and the object thought is analogous to the grammatical antithesis of the same terms: the "subject" of a verb is the person or thing from which the action proceeds, while the "object," direct or indirect, is the person or thing affected. The true relation between mind or thought (subject) and matter or extension (object) is the chief problem of philosophy, and may be investigated from various standpoints (see PSYCHOLOGY and METAPHYSICS). It should be observed that the philosophical use of "subject" is precisely the opposite of the common use. In ordinary language the "subject" of discussion, of a poem, of a work of art, is that which the speaker, author or artist treats.

OBJECTIVE, or OBJECT GLASS, the lens of any optical system which first receives the light from the object viewed; in a compound system the rays subsequently traverse the eye-piece. The theoretical investigations upon which the construction of an optical system having specified properties is based, are treated in the article ABERRATION, and, from another standpoint, in the article DIFFRACTION. Here we deal with the methods by which the theoretical deductions are employed by the practical optician. It should be noted that the mathematical calculations provide data which are really only approximations, and consequently it is often found that a system constructed on such data requires modification before it fulfils the practical requirements. For example, take the case of a photographic objective. Calculations of the paths of two extreme rays in the meridional section of an oblique pencil of large aperture may prove that the rays intersect on a plane containing the axial focus, but similar calculations of many other rays would be necessary before the mean point of intersection could be settled with sufficient exactness. Suppose, however, that the optician has accurately realized the results of the mathematician, he can then determine the divergence of the practical from the theoretical properties by measuring the positions and conformation of the most distinct or mean foci, and, if sufficiently acquainted with the theory of the construction, he can modify one or more curvatures or thicknesses and so attain to a closer agreement with the ideal. Theory and practice co-operate in the realization of an original system. The order is not always the same, but generally the mathematician, by notoriously laborious calculations, supplies data which are at first closely followed by the constructor and afterwards modified in accordance with experimental observations.

In addition to the problem of constructing an original system, the optician has to deal with the reproduction of a realized system in different sizes. Two questions then arise: (1) To what degree of accuracy the radii of curvature can, or should, be repeated, and (2) to what degree of uniformity the surfaces can, or should be figured. With regard to the first point there is no great difficulty in working the requisite iron or brass tools of any curvature to within an error of $\frac{1}{10}$th % of the radius; male and female templets being used for very deep curves, and the spherometer for tools of longer radii (by appropriate grinding together, the radii are alterable at will within narrow, but sufficient, limits). The accuracy attained in the grinding, however, is open to very perceptible modification by the subsequent polishing and figuring processes. This is particularly undesirable in the case of deep curves and large apertures. A variation in a radius of curvature may occasion a little spherical aberration at the axial focus, but if the amount be small it may be neutralized by imparting to the lens a parabolic form or its opposite. Such an artifice is frequently adopted in correcting large telescope objectives.

With optical systems which transmit large pencils with considerable obliquity (such as wide angle photographic objectives) the curves are very deep, and a departure from the true radius which would be tolerated in a telescope cannot be permitted here. Such lenses are usually tested by means of a master curve worked in glass. The master curve is fitted to the experimental lens, and an inspection of the interference fringes shows the quality of the fit—whether it be perfect, or too shallow or too deep. The workman then modifies his polisher or stroke in order to correct the divergence. Flat surfaces are tested similarly. This test by contact has been strongly advocated and has been regarded as sufficient to detect all irregularities of any moment. This claim, however, is not justified, for the test is not sensitive to errors sufficient in amount to render a telescope objective almost valueless; but such errors are easily discernible by other optical devices. In general, accuracy in the radii of curvature is of primary importance and trueness of figuring is of secondary importance in photographic objectives, while the reverse holds with telescopic objectives; in wide angle microscopic objectives these two conditions are of equal moment. Eye pieces do not require the same degree of accuracy either in the curvature or the figuring.

A rough idea of the exactitude to which the figuring of the finest telescope objectives must be carried out is readily deduced. If two slips of paper, bearing printed letters $\frac{1}{20}$ of an in. high be placed in almost exact alignment, one 31·2 in. from the eye and the other 39 in., and viewed in moderate daylight with the eye having a pupillary aperture of $\frac{1}{8}$ of an in., one set of the letters will be legible while the other is not. In this case the difference of convergence or refracting power exercised by the eye in transferring its focus from one slip to the other is $\frac{1}{156}$ or one quarter diopter. If an image on the retina is $\frac{1}{4}$ diopter out of focus, then each point of the object is represented by a circle of confusion 0·0004 in. or $2' \, 45''$ in angular measure in diameter, the focal length of the eye being assumed to be 0·5 in. and the pupillary aperture $\frac{1}{8}$ of an in. If the effective aperture of the pupil or the aperture of a pencil traversing the pupil be $1/n$th of this standard, the size of the disk of confusion will be the same (viz. 0·0004 in.) if the retinal image be n quarter diopters out of focus. In general, for a constant size of the circle of confusion or, in other words, the same amount of visual blurring, the apertures of the pencils traversing the pupil and the focussing errors (expressed in quarter diopters) vary inversely.

If a portion of a figured surface of a telescope objective differs in curvature from the major portion of the lens so as to form a circle of confusion on the retina of a diameter not less than $2' \, 45''$, it is clear that the lens is faulty, the image formed by the perfect portion being sharp and well defined, and that formed by the imperfect portion blurred to the extent above determined, and to a greater extent if we allow for the effect of diffraction in the formation of the image. For example, a protuberance 1 in. in diameter at the centre of an object glass of 12 in. aperture refracting to a separate focus would theoretically form a spurious disk of about 5 seconds diameter, which would subtend a diameter of 50 minutes at the retina under a power of 600.

Regarding $2' \, 45''$ as the maximum diameter of a geometric circle of confusion permissible in a telescopic object glass, we proceed to determine the heights of the protuberance or depression which causes it. If f be the equivalent focal length of the eye-piece and F that of the objective (the back focal length in the case of the microscope), then the linear error at the focus of the eye-piece is $\frac{1}{156}f^2$, or, expressed as a variation of $1/\mathrm{F}$, $\frac{1}{156}(f/\mathrm{F})^2$, $(=\Delta\frac{1}{\mathrm{F}})$. If a lens has one side plane and is worked to a mathematically sharp edge, its thickness t at the centre is (approximately) $\mathrm{A}^2/8r$, where A is the whole aperture and r the radius; and if g be the equivalent focal length and μ the refractive index, we may write $r=g(\mu-1)$ and obtain

$$t=\mathrm{A}^2/8g(\mu-1) \quad . \quad . \quad . \quad . \qquad (1).$$

It is clear that for lenses in which the focal length is large compared with the aperture, the thickness t is independent of the shape of the lens so long as the focal length and aperture remain constant. Consequently a protuberance may be regarded as a thin meniscus lens with mathematically sharp edges accurately fitted to a perfectly regular spherical surface. Substituting for $1/g$ the $\frac{1}{156}(f/F)^2$ obtained above it follows that

$$t=\frac{A^2}{8(\mu-1)}\frac{1}{156}\left(\frac{f}{F}\right)^2 \quad . \quad . \quad . \quad (2).$$

The effective aperture of the eye has been supposed to be $\frac{1}{8}$ in.; calling this P, it is then obvious that (since F/f is the magnifying power) $P(F/f)$ is the theoretical aperture of objective requisite to supply the $\frac{1}{8}$ in. eye-pencil. Substituting $P(F/f)$ for A in equation (2) we obtain

$$t=P^2/8(\mu-1)\times 156 \quad . \quad . \quad . \quad . \quad (3).$$

This relation gives the thickness of a meniscus protuberance fitted to an objective (assumed to have an unlimited aperture) which fills the $\frac{1}{8}$ in. pupil and occasions the maximum blurring permissible. If μ be 1·5, t is equal to 1/39,936 in

If the thickness t correspond to the aperture A, then for another aperture a to produce the same blurring we must have $\Delta'(1/F)=\Delta(1/F)A/a$, *i.e.* the focal length of the protuberance, and therefore the thickness t must vary as A. Consider a telescope of 12 in. aperture, focal length of objective (F) = 180 in., focal length of eye-piece (f) 0·3 in. and magnifying power $(F/f)=600$. The aperture theoretically requisite to transmit the pupillary pencil of $\frac{1}{8}$ in. aperture is $\frac{1}{8}\cdot 600=75$ in. If the permissible protuberance cover the entire aperture of 75 in. its thickness would be 1/39,936 in. as above, but if restricted to a diameter of 1 in., then the maximum allowable thickness would be $1/75\times 1/39{,}936$ in. = say 1/3,000,000 in. Since the latter protuberance is assumed to fill only $\frac{1}{75}$ of the aperture of the pupil of the eye, it produces an error in focussing equivalent to 75 quarter diopters or $\frac{75}{156}$. If we take the power of the eye-piece to be $1/\cdot 3$ in. and subtract from it 75/156, we obtain $1/\cdot 35$, so that ΔF is $-\cdot 05$ in.

Either the knife-edge test, or the more usual method of testing figuring by examining the out-of-focus disks formed on the retina when the eye-piece is inside and outside its correct focus, would certainly show the effect of this protuberance as a bright central spot when inside focus, and a dark central patch when outside; a practised eye can detect one-half the above error, and a quarter when the power is 1200 instead of 600. It may be noticed that, under the same circumstances, the error permissible in a reflecting telescope is only one quarter of that admitted in the refractor. In the case of a microscope objective of 10 in. back-focal-length used with a 1 in. eye-piece, the aperture required to transmit the pupillary pencil of $\frac{1}{8}$ in. aperture is $1\frac{1}{4}$ in. Regarding the supposititious protuberance or depression as $\frac{1}{20}$ in. in diameter, its thickness or depth must not exceed $1/39{,}936\times 0{\cdot}05/1{\cdot}25$, or say 1/1,000,000 in. Therefore the accuracy of figuring required in the best microscopes does not fall far short of that required in telescopes.

The best optical workmanship, as applied to large reflecting surfaces, aims at reducing local protuberances or depressions to within the limiting height or depth of one twelve-millionth part of their diameter (A) and the optical methods which detect these errors are exceedingly delicate. The finest spherometer detects errors down to about three-millionths of an inch, below which it is valueless. The same applies to the study of the interference fringes formed when a master curve is fitted. It will not show up such fine errors. The figuring of spherical surfaces 12 in. or more in diameter by abrasion with a polisher so that no part of the surface is elevated or depressed above the average level by more than the above defined amounts is commonly practised, but much technical knowledge is necessary for success. It is a *sine qua non* that the material of the polisher should be as plastic and inelastic as is consistent with a moderate degree of hardness. The best material for large work is Stockholm pitch from which the greater part of the turpentine has been removed by evaporation, and the abrasive used is the finest rouge and water. For small work certain waxes, more or less mixed with rouge or putty powder, are used. Water is used as the lubricant. During delicate figuring temperature changes must be carefully avoided, otherwise buckling and consequent bad figuring of the lens or a variation in the hardness of the polisher may supervene. The motion of the polisher must therefore be leisurely. Moreover, any surface must be allowed to attain a uniform temperature before testing. When, as often happens, an elevation or depression on a large lens apparently refuses to be dislodged by straightforward polishing, recourse is had to local retouching. The faulty parts are localized by optical tests and then rubbed down by small polishers of an inch or more in diameter. In this way a central protuberance 1 in. in diameter and 1/2,000,000 of an in. high standing on the centre of a large objective may be removed by a polisher less than an inch in diameter worked at 200 half inch strokes per minute and at a pressure of 6 ozs. in about a minute. Great care is required, for if the process be carried too far, the whole surface must be re-figured. Local retouching serves to remove those conspicuous zones of aberration to which certain photographic lenses of large relative aperture are necessarily liable. An annular channel is polished out at a mean distance equal to $\frac{7}{10}$ of the semi-aperture from the centre of the lens, and this is carefully shaded off towards the centre and also towards the edge; this corrects the zone of rays which focus at a point short of the focus of the centre and edge rays. This correction is particularly necessary in the case of certain lenses designed for stellar photography. (H. D. T.)

OBJECTIVISM, in philosophy, a term used, in contradistinction to SUBJECTIVISM, for any theory of knowledge which to a greater or less extent attributes reality (as the source and necessary pre-requisite of knowledge) to the external world. The distinction is based upon the philosophical antithesis of the terms Object and Subject, and their respective adjectival forms "objective" and "subjective." In common use these terms are opposed as synonymous respectively with "real" and "imaginary," "practical" and "theoretical," "physical" and "psychic." A man "sees" an apparition; was there any physical manifestation, or was it merely a creation of his mind? If the latter the phenomenon is described as purely subjective. Subjectivism in its extreme form denies that mind can know more than its own states. Objects, *i.e.* things-in-themselves, may or may not exist: the mind knows only its own sensations, perceptions, ideal constructions and so forth. In a modified form "subjectivism" is that theory which attaches special importance to the part played by the mind in the accumulation of experience. See PSYCHOLOGY; RELATIVITY OF KNOWLEDGE.

OBLATION, an offering (Late Lat. *oblatio*, from *offerre*, *oblatum*, to offer), a term, particularly in ecclesiastical usage, for a solemn offering or presentation to God. It is thus applied to certain parts of the Eucharistic service in the Roman Church. There are "two oblations," the "lesser oblation," generally known as the "offertory," in which the bread and wine yet unconsecrated are presented, and the "greater oblation," the "oblation" proper, forming the latter part of the prayer of consecration, when the "Body and Blood" are ceremonially presented. The word "oblate" is an ecclesiastical term for persons who have devoted themselves or have been devoted as children by their parents to a monastic life. "Oblate" is more familiar in the Roman Church as the name of a religious congregation of secular priests, the Oblate Fathers of St Charles. They are placed under the absolute authority of the bishop of the diocese in which they are established and can be employed by him on any duties he may think fit. This congregation was founded in 1578 under the name of Oblates of the Blessed Virgin and St Ambrose by St Charles Borromeo, archbishop of Milan (see BORROMEO, CARLO). There is a similar congregation of secular priests, the Oblates of Mary the Immaculate, founded at Marseilles in 1815.

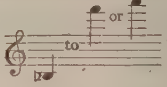
OBLIGATION, in law, a term derived from the Roman law, in which *obligatio* signified a tie of law (*vinculum juris*) whereby one person is bound to perform or forbear some act for another. The *obligatio* of Roman law arose either from voluntary acts or from circumstances to which legal consequences were annexed. In the former case it was said to arise *ex contractu*, from contract, in the latter *quasi ex contractu*, *ex delicto*, or *quasi ex delicto*—that is to say, from tort, or from acts or omissions to which the law practically attached the same results as it did to contract or tort. *Obligatio* was used to denote either end of the legal chain that bound the parties, the right of the party who could compel fulfilment of the *obligatio*, the *creditor*, or the duty of the party who could be compelled to fulfilment, the *debitor*. In English law obligation has only the latter sense. Creditor and debtor have also lost their Roman law signification; they have been narrowed to mean the parties where the obligation is the payment of a sum of money. In English law obligation is used in at least four senses—(1) any duty imposed by law; (2) the special duty created by a *vinculum juris*; (3) not the duty, but the evidence of the duty—that is to say, an instrument under seal, otherwise called a bond; (4) the operative part of a bond. The third use of the word is chiefly confined to the older writers. *Simplex* and *duplex obligatio* were the old names for what are now more commonly called a single and a double or conditional bond. The party bound is still called the obligor, the party in whose favour the bond is made the obligee. The fourth, like the third, is a use scarcely found except in the older writers. The word "bond" is of course a mere translation of *obligatio*. Obligations may be either perfect or imperfect. A perfect obligation is one which is directly enforceable by legal proceedings; an imperfect or moral obligation (the *naturalis obligatio* of Roman law) is one in which the *vinculum juris* is in some respects incomplete, so that it cannot be directly enforced, though it is not entirely destitute of legal effect. A perfect obligation may become imperfect by lapse of time or other means, and, conversely, an imperfect obligation may under certain circumstances become perfect. Thus a debt may be barred by the Statute of Limitations and so cease to be enforceable. The obligation, however, remains, though imperfect, for if there be a subsequent acknowledgment by the debtor, the debt revives, and the imperfect obligation becomes again perfect. At one period there was some doubt among English lawyers whether a moral obligation could be regarded as sufficient consideration for a contract; it has now, however, been long decided that it cannot be so regarded.

American law is in general agreement with English, except in the case of Louisiana, where the terms obligor and obligee are used in as wide a sense as the *debitor* and *creditor* of Roman law. By art. 3522 of the Louisiana civil code obligor or debtor means the person who has engaged to perform some obligation, obligee or creditor the person in favour of whom some obligation is contracted, whether such obligation be to pay money or to do or not to do something. The term obligation is important in America from its use in art. i. s. 10 of the constitution of the United States, "No state . . . shall pass any . . . law . . . impairing the obligation of contracts." This does not affect the power of Congress to pass such a law. Contracts between private individuals are of course within the provision. So are private conveyances, charters of private corporations and statutory and other grants by a state. On the other hand, marriage and divorce, and arrangements which are political in their nature, such as charters of municipal corporations, licences to carry on particular trades or regulations of police are not within the provision. In order to fall within it, the law must act upon the terms of the agreement, and not merely upon the mode of procedure. If it act not upon the terms but upon the remedy, it impairs the obligation if it purport to be retrospective, but it is valid so far as it applies to subsequent contracts.

OBNOXIOUS (Lat. *obnoxiosus*, from *ob*, over, against, and *noxa*, harm), a word originally meaning "exposed to harm or injury," but now "exciting aversion or dislike." The current use dates from the later 17th century.

OBOE, or HAUTBOY (Fr. *hautbois*, Ger. *Hoboe*, Ital. *oboe*), the treble member of the class of wood-wind instruments, having a conical bore and a double reed mouthpiece. The oboe consists of a conical wooden tube, composed of three joints, upper, middle and bell, and of a short metal tube to which are bound by many turns of waxed silk the two thin pieces of cane that form the mouthpiece. These pieces of cane are so bevelled and thinned at the end which is taken into the mouth that the gentlest stream of compressed air suffices to set them vibrating. Practice has demonstrated that the reed stalk of which the double reed mouthpiece is made, should not be of narrower internal diameter than the pipe containing the column of air upon which it is destined to act. The player breathes gently into the aperture, which has the form of a very narrow ellipse, managing his breath as for singing. The vibrations of the double reed produce in the stream of compressed air issuing from the player's lips the rhythmical series of pulses necessary to generate sound waves in the stationary column of air within the main tube of the instrument.

In the upper and middle joints are the rings and keys covering lateral holes bored through the tube, by means of which the column of air, and consequently the wave length, may be shortened at will; the bell joint contains one or two keys normally open, which when closed extend the lowest register by lengthening the air column. These holes and keys produce the fundamental scale of the oboe, which possesses notes sufficient for an octave with all chromatic intervals. The next octaves are obtained by means of cross fingering (Fr. *doigté fourchu*, Ger. *Gabelgriff*), and of the octave keys, which do not give out an independent note of their own, but determine a node in the column of air, whereby the latter divides and vibrates in two half sections producing the second harmonic overtone or octave. In order to obtain this result the player increases the pressure of his breath and also the tension of his lips against the reed.

The compass of the oboe is from 

with all chromatic semitones. The G clef is used in notation and all notes are sounded as written.

The quality of tone or timbre depends primarily on the configuration of the sound waves (see HORN), which is influenced by the special characteristics of the mouthpiece: the musical tone of an instrument may be said to be due more directly to the prevalence and relative strength of the many harmonics which go to make up a composite tone or clang. The quality of the oboe tone resembles that of the E string of the violin, but is more nasal, more penetrating and shriller. The lower register is thin and somewhat sweeter, approximating to the upper register of the *cor anglais*. But the timbre does not vary appreciably in the different registers, and to this want of variety in tone colour is due the unpopularity of the oboe as a solo instrument, although it is invaluable as a melody-leading instrument in the orchestra, balanced by clarinets and flutes. The oboe lends itself admirably to pastoral music. The technical capabilities of the instrument are very varied. It is possible to play on it diatonic and chromatic scale and arpeggio passages, legato and staccato; leaps; cantabile passages; sustained notes, crescendo and diminuendo, grace notes and shakes (with reservations). The keys having many sharps and flats are the most difficult for the oboist.

The double reed is the most simple, as it is probably the oldest, of all reed contrivances. It is sufficient to flatten the end of a wheat straw to constitute an apparatus capable of setting in vibration by the breath the column of air contained in the rudimentary tube; the invention of this reed is certainly due to chance. An apparatus for sonorous disturbance thus found, it was easy to improve it: for the wheat stalk a reed stalk was substituted, and in the extremity of its pipe another reed stalk much shorter in length was inserted, pared and flattened at the end; and then came the lateral holes, probably another discovery of the great inventor chance. For the reed tube a wooden one was substituted, still preserving the reed tongue, and it is in this form, after having played an important part amongst the sonorous contrivances of antiquity, that we find the ancestor of the oboe playing a part no less important in the 16th century, in which it formed the interesting families of the cromornes, the corthols and the cervelas. All these families have disappeared from the instrumental combinations of Europe, but they are still to be found in Eastern wind instruments, such as the Caucasian *salamouri*, the Chinese *kwantze*, and the *hitshiriki* of Japan.

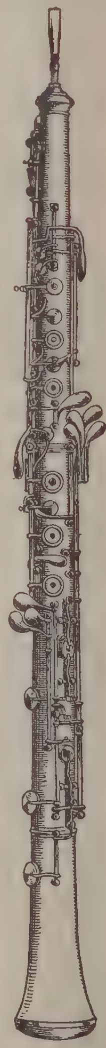

Rudall, Carte & Co.

FIG. 1.—The Oboe.

It is impossible to say when it was that man first employed the phenomena of double reeds and conical pipes, but the knowledge of them must at least have been later than that of the cylindrical pipe, which we may regard as directly furnished by nature. That antiquity made use of them, however, has been proved by Gevaert in his admirable *Histoire de la musique dans l'antiquité*; but this learned author states that the double-reed pipes held but an insignificant place in the instrumental music of ancient Greece and Rome, a statement which is open to challenge (see AULOS).

The first appearance of the instrument we call oboe in a musical work occurs in Sebastian Virdung's *Musica getutscht und aussgezogen* (1511). It there bears the name of *Schalmey*, and is already associated with an instrument of similar construction called *Bombardt*.

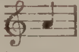
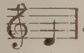
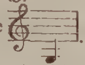
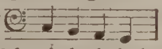
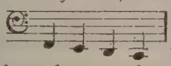
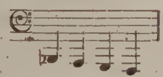
There exists, however, much earlier evidence, in the illuminated MSS. and in the romances of the middle ages, of the great popularity of the instrument in all parts of Europe. The origin of wind instruments with conical tubes must be sought in the East, in Asia. An early medieval Schalmey with three holes may be seen on the silver cup of the goddess Nana-Anat.[1]

There are two or three Schalmeys in the fine 13th-century Spanish MS. *Cantigas de Santa Maria* executed for Alphonso the Wise, preserved in the Library of the Escorial[2] (J. b 2).

The oboe was known during the early middle ages as *Calamus*, *Chalumeau* (France), *Schalmei* (Germany), *Shawm* (England). It is mentioned in the *Roman de Brut* (12th century) (line 10,822 seq.) "Lyres, tympres, et chalemiax." An interesting MS. at the British Museum, Sloane 3983, contains among other musical instruments on fol. 13 a large shawm with 6 finger-holes described at the side as *Calamus aureus.*

A miniature in the Paris Manesse MS.[3] of the 14th century depicts Heinrich von Meissen, better known as Frauenlob, conducting, from a raised platform, a band of musicians, one of whom is holding a Schalmey with 6 or 7 holes.

The chaunter of the bagpipe was a shawm, having the double reed concealed within an air-chamber, while the drones had single beating reeds concealed in the same manner. Mersenne calls both *chalumeaux.*[4] The cornemuse or chalemie of shepherds and peasants was of this kind, but a special cornemuse, used in the 17th century in concert with the hautbois de Poitou, had double reeds throughout in chaunter and drone. The hautbois de Poitou was a primitive oboe with the reed placed in a bulb, forming an air-chamber, having a raised slit at the top through which the performer breathed in compressed air; as the reed could not be controlled by the lips, it was impossible to play with expression on the hautbois de Poitou or to obtain the harmonic octaves; the compass was therefore limited. The kind of bagpipe (*q.v.*) known as *Musette*,[5] inflated by bellows, also had double reeds throughout in spite of having a cylindrical chaunter.

The manufacture of musical instruments could not remain unaffected by the great artistic movement known as the Renaissance; accordingly, we find them not only improved and purified in form in the 16th century, but also ranged in complete families from the soprano to the bass. Praetorius, in his *Syntagma Musicum* (1615–1620), gives us the full nomenclature of the family with which we are concerned, composed of the following individuals: (1) The little Schalmey, rarely employed, measured about 17 in. in length, and had six lateral holes. Its deepest note was . (2) The discant Schalmey (fig. 2), the primitive type of the modern oboe; its length was about 26 in., and its deepest note . (3) The alto Pommer (fig. 3), 30½ in. long, with its deepest note . (4) The tenor Pommer (fig. 4), measuring about 4 ft. 4 in.; besides the six lateral holes of the preceding numbers there were four keys which produced the notes . (5) The bass Pommer, having a length of nearly 6 ft.; it had six lateral holes and four keys which produced . (6) The great double quint Pommer, measuring about 9 ft. 8 in. in length; its four keys permitted the production of the notes . These instruments, and especially numbers (2), (3), (4) and (5), occupied an important place on the continent of Europe in the instrumental combinations of the 16th-18th centuries. Fig. 5, borrowed from a picture[6] painted in 1616 by Van Alsloot, represents six musicians playing the following instruments indicated in the order of their position in the picture from left to right: a bass oboe, bent over and become the bassoon, an alto Pommer, a cornet (German "zinke"), a discant Schalmey, a second alto Pommer and a trombone.[7]

The 17th century brought no great changes in the construction of the four smaller instruments of the family. Michel de la Barre writing in 1740 states that in the archives of the Chambre des Comptes are 4 charges for hautbois and musettes de Poitou created by King John[8] (14th century). Extensively used in France, they were there called "haulx bois" or "haultbois," to distinguish them from the two larger instruments which were designated by the words "gros bois." Haultbois became hautbois in French, and oboe in English, German and Italian; and this word is now used to distinguish the smallest instrument of the family.

During the 17th century some of the most important names connected with instrumental music in France are to be found amongst the *Grands Hautbois* of the Grande Écurie du Roi, such as Hotteterre (Jean, Louis and Nicholas), Philidor (Jacques and André), Gilles Allain, Destouches, &c.[9]

In Germany the Schalmey was represented in the town band, in the Court and the Church orchestras, and later in that of the Opera. In 1580 it is recorded that the Orchestra of the elector of Brandenburg[10] included Schalmeys and Bombarts. In Dresden the orchestra possessed (1593) no less than 16 Schalmeys, large and small. Heinrich Schütz, who founded the first Opera in Germany, at Dresden, used two fiffari or early oboes in 1629 in one of his works.[11]

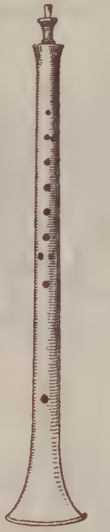


FIG. 2. The Discant Schalmey.

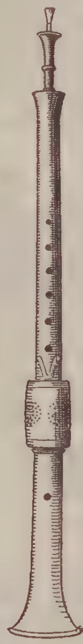


FIG. 3. The Alto Pommer.

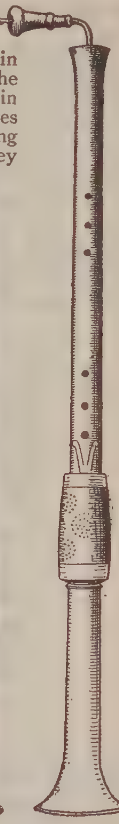
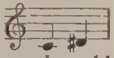
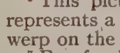


FIG. 4. The Tenor Pommer.

The little Schalmey and the tenor Pommer seem to have disappeared in the 17th century; it is the discant Schalmey and the alto Pommer which by improvement have become two important members of the modern orchestra. The oboe, as such, was employed for the first time in 1671 in the orchestra of the Paris opera in *Pomone* by Cambert. The first two keys  date from the end of the 17th century. It is not known who added the first keys to the oboe; there is, however, a drawing of a *French Hoboy* in an English MS. by the third Randle Holme, which formed part of his *Academy of Armoury*[12] known to have been written before 1688, in which the two keys are shown. The instrument must have been well known in England at the time, and Randle Holme's rough little drawing fixes the date of the transformation approximately as not later than 1680, probably earlier, since the oboe was used in *Pomone* in 1671. According to the flautist Quantz[13] the transformation of Schalmey into oboe took place when the keys for C sharp and D sharp were added, at about the same time as they were added to the flute.

In 1727 Gerhard Hoffmann of Rastenberg[14] added the keys . A Parisian maker, Delusse, furnished at the end of

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[1] See *Gaz. Archéol.* (Paris, 1886), xi. pp. 70 et seq. Pl. X.; also 1885, pp. 288-296.

[2] A facsimile in colours of part of the *Cantigas* containing figures of 52 instrumentalists has been published by the Real Academia Española (Madrid, 1889), and can be seen at the British Museum. A reproduction in black and white is included in Juan F. Riaño's *Critical and Bibliographical Notes on Early Spanish Music* (Quaritch, 1887).

[3] The miniature is reproduced in Naumann's *History of Music*, i. p. 249, fig. 151.

[4] *Harmonie universelle*, ii. pp. 282-289 and 305.

[5] See Mersenne—*op. cit.* ii. pp. 287-292 and Hotteterre le Romain. *Méthode pour la musette, le hautbois*, &c. (Paris, 1737), chap. xvi.

[6] This picture, belonging to the National Museum of Madrid, represents a procession of all the religious orders in the city of Antwerp on the festival of the Virgin of the Rosary.

[7] For further details see Mahillon's catalogue of the *Musée du Conservatoire royal de musique de Bruxelles* (Ghent, 1896, vol. ii. p. 25).

[8] See I. Écorcheville, "Quelques documents sur la musique de la Grande Écurie du Roi," *Int. Mus. Ges.* Sbd. ii. 4, p. 633.

[9] Ib., Table II.

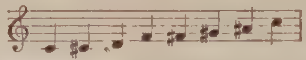
[10] See Gropius, *Beiträge z. Gesch. Berlins*, 1840, Bd. ii.

[11] Complete edition, vol. v. No. 7. See Ernst Euting, *Zur Geschichte der Blasinstrumente im 16 u. 17 Jahrh.* (Berlin Inaugural Dissertation, 1899), published by A. Schulze, Rixdorf (Berlin), p. 47.

[12] See British Museum, Harleian MS. 2034, fol. 207b.

[13] See *Versuch einer Anleitung die Flöte traversière zu spielen*, p. 24.

[14] See Mattheson, *Orchester*, i. p. 268 and Eisel, *Musikus αὐτοδίδακτος*, p. 96.

the 18th century much-appreciated improvements in the boring of the instrument. The *Méthode* of Sellner, published at Vienna in 1825, shows nine keys , and one, the octave key, which, when opened, establishes a loop or ventral segment of vibration in the column of air, facilitating the production of sounds in the octave higher. Triebert of Paris owes his great reputation to the numerous improvements he introduced in the construction of the oboe.

The alto Pommer was but slowly transformed: it was called in French "hautbois de chasse," in Italian "oboe di caccia." In the 18th century we find it more elegant in form, but with all the defects of the primitive instrument. The idea of bending the instrument into a half circular form to facilitate the handling is usually attributed to an oboist of Bergamo, one Jean Ferlendis, who was established at Salzburg at about 1760. This is obviously incorrect, since Ferlendis would then have been five years old.[1] It has been suggested that the fact of the instrument's resembling a kind of hunting horn used at that time in England probably gained for it the name of "corno inglese," which it still retains ("cor anglais" in French).[2] The first employment of it in the orchestra is referred to Gluck, who had two "cors anglais" in his *Alceste*, as played at Vienna in 1767. But it was not until 1808 that the cor anglais was first heard in the Paris opera; it was played by the oboist Vogt in *Alexandre chez Apelle* by Catel. The improvements in manufacture of this instrument closely followed those introduced in the oboe. The 18th century produced an intermediate oboe between (2) and (3), which was called hautbois d'amour, and was frequently employed by J. S. Bach. It was a third lower than the ordinary oboe, and was characterized by the pear-shaped bell with narrow aperture common to all wind instruments known as *d'amour* to which is due their veiled sweet quality. In the Spanish *Cantigas*, there are two Schalmeys with pear-shaped bells. This is in all probability the *douçaine* mentioned in the 13th and 14th-century romances. The oboe d'amore fell into disuse after the death of the great German composer. It has been resuscitated by the firm of C. Mahillon of Brussels, and reconstructed with the improvements of modern manufacture. A similar timbre was artificially produced in the oboe by means of mutes or *sordini* composed of hollow cones of wood, balls of paper,[3] pieces of sponge,[4] &c.

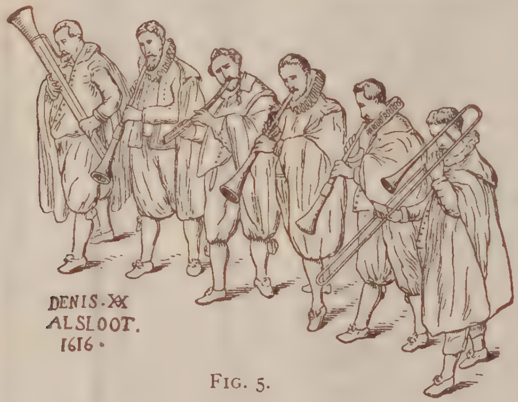
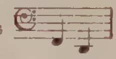


FIG. 5.

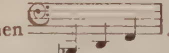
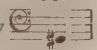
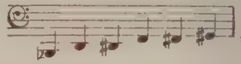
After the 16th century we find the instruments which were designated by the name of "gros bois," the (5) and (6) of Praetorius, transformed into shorter instruments, the Fagott and Contrafagott, having a column of air of the same length and form as the Pommers, but the instrument itself consisted of two conical tubes communicating at the lower part of the instrument; they were pierced in a single piece of wood. It is probably owing to the aspect of this double pipe that the satirical name of fagot was given, preserved in Italian as fagotto, and in German as Fagott. A canon of Ferrara named Afranio has been named as the author of the transformation, about 1539, of the bass Pommer, but Count Valdrighi, the curator of the Estense library,[5] and Wasielewski,[6] who has reproduced the drawing of Afranio's invention, deprive him of the merit of the innovation. The fagottino was transformed in the same fashion.

Sigismund Schnitzer of Nuremberg[7] acquired a great reputation in the 16th century for making the "basson," a French word substituted for the old fagot, and adopted in England as bassoon. His instrument had only two keys . We cannot tell when the bassoon gained its present form, but it was probably at the end of the 17th century. It was used in the orchestra in Germany by H. Schütz in 1619 (*cir.*),[8] and in 1625, 5 fagotti were in use.[9]

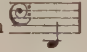
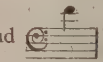
Cesti, in his grand opera *il Pomo d'oro*,[10] which was performed with the utmost brilliancy at the nuptials of the emperor Leopold in Vienna, where printed editions of 1667 and 1668 are preserved, used fagotti combined with two cornets, three trombones and a regal to suggest the terrors of Hades.

Michael Praetorius (1618) expressly mentions the fagotto as an orchestral instrument.

In France it was used with the oboe in 1671 in Cambert's *Pomona* in the newly founded French Opera, for which Cambert & Perrin had received in 1669 a Royal *Privilège* expiring in 1672, and thereafter granted to Lully.

It had three keys then . The B flat key rendering a lengthening of the instrument necessary, we may suppose it took its modern form at that epoch. The fourth key  is found in a bassoon stamped Stanesby Junior, London, 1747,[11] and also in one without maker's name, obviously earlier, to judge by the very early pattern of the keys.[12] The bassoon appears with four keys in the *Encyclopédie* of Diderot and d'Alembert (Paris, 1751–1765). The number of keys increased by the beginning of the present century to eight, viz.: , and two keys to facilitate the production of acute harmonics. It was improved by Almenräder in Germany, Savari, and more recently Triebert and Goumas, Paris, and C. Mahillon, Brussels. (See also BASSOON.)

The reform in the construction of the flute due to Theobald Boehm of Munich about 1840, a reform which principally consisted in the rational division of the tube by the position of the lateral holes, prompted Triebert to try to adapt the innovation to the oboes and bassoons; but he failed, because the application of the system denaturalized the timbre of the instruments, which it was necessary, before all things, to preserve, but further improvements made upon the same lines by Barret and later by Rudall Carte, have transformed the oboe into the most delicate and perfect of reed instruments. In 1856 a French bandmaster, M. Sarrus, thought out the construction of a family of brass instruments with conical tubes pierced at regular distances, which, by diminishing the length of the air column, has rendered a series of fundamental sounds easy—more equal and free in timbre than that of the oboe family. Gautrot of Paris realized the inventor's idea, and, under the name of "sarrusophones," has created a complete family, from the sopranino in E flat to the contrabass in B flat, of which his firm preserves the monopoly.

In order to replace the old double-bassoon of wood, the firm of C. Mahillon, Brussels, produced in 1868, a reed contrabass of metal, since much used in orchestras and military bands. The first idea of this instrument goes back to 1839, and is attributed to Schöllnast & Son of Pressburg. It is a conical brass tube of very large proportions, with lateral holes placed as theory demands, in geometrical relation, with a diameter almost equal to the section of the tube at the point where the hole is cut. From this it results that for each sound one key only is required, and the seventeen keys give the player almost the facility of a keyboard. The compass written for this contrabass is comprised between  and  but sounds an octave lower. *See* CONTRAFAGOTTO. (V. M.; K. S.)

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[1] See Henri Lavoix, *Histoire de l'instrumentation* (Paris), p. 111; also Gerber's *Lexikon*, "Giuseppe Ferlendis"; and Robert Eitner, *Quellenlexikon der Tonkünstler*, "Gioseffo Ferlendis," born 1755.

[2] This question is more fully treated under COR ANGLAIS.

[3] See Mattheson, *Orchester*, p. 266.

[4] See Quantz, *op. cit.* p. 203.

[5] Musurgiana, *Il Phagotus d'Afranio*.

[6] *Geschichte der Instrumentalmusik im 16ten Jahrhundert* (Berlin, 1878), p. 74.

[7] See Doppelmayr, *Historische Nachrichten von Nürnbergischen Matematikern und Künstlern*, Nürnberg, 1730.

[8] See complete edition, vol. iii. No. 4.

[9] Vol. xiii. No. 1.

[10] A fine edition has been published with reproductions of the original sketches for the scenes and the full score by Adler in *Denkmäler der Tonkunst in Oesterreich*, Bd. iii. p. xxv.

[11] See Captain C. R. Day's *Catalogue of the Musical Instruments exhibited at the Royal Military Exhibition* (London, 1891), p. 75, No. 151.

[12] Ib. p. 75, No. 150.

OBOK, a seaport on the north shore of the Gulf of Tajura, N.E. Africa, acquired by France in 1862. It gave its name to the colony of Obok, now merged in the French Somali coast protectorate (see SOMALILAND: *French*). The port is separated from the open sea by coral reefs, but is only partially sheltered from the winds. This led to the practical abandonment of the town by the French, who in 1896 transferred to Jibuti, on the opposite shore of the Gulf of Tajura, the seat of government of the colony. Obok is connected with Aden and Jibuti by submarine cables. Population about 500.

OBRA, a river of Germany, in the Prussian province of Posen, a left-bank tributary of the Warthe. It rises near Obra, N.W. from Koschmin, and forms in its course marshes, lakes and the so-called Great Obrabruch (fen). The latter, 50 m. long and about 5 m. broad, is a deep depression in the undulating country of south-west Posen. The river is here dammed in and canalized and affords excellent water transit for the agricultural produce of the district.

O'BRIEN, WILLIAM SMITH (1803–1864), Irish revolutionary politician, son of Sir Edward O'Brien, a descendant of Brian Boroimhe (d. 1014), king of Ireland (see CLARE), was born in Co. Clare on the 17th of October 1803, and received his education at Harrow and at Cambridge. He took the additional name of Smith on inheriting his maternal grandfather's estates in Limerick. He entered parliament in 1828 as member for Ennis, and from 1835 to 1848 represented the county of Limerick. Although he spoke in 1828 in favour of Catholic emancipation, he for many years continued to differ on other points from the general policy of O'Connell. But he opposed the Irish Arms Act of 1843, and became an active member of the Repeal Association. Though he was destitute of oratorical gifts, his arraignment of the English government of Ireland secured him enthusiastic attachment as a popular leader. In July 1846 the "Young Ireland" party, with Smith O'Brien and Gavan Duffy at their head, left the Repeal Association, and in the beginning of 1847 established the Irish Confederation. In May 1848 he was tried at Dublin for sedition, but the jury disagreed. In the following July he established a war directory, and attempted to make a rising among the peasantry of Ballingarry, but although he was at first joined by a large following the movement wanted cohesion, and the vacillating crowd dispersed as soon as news reached them of the approach of the dragoons. O'Brien was arrested at Thurles, tried and sentenced to death. The sentence was, however, commuted to transportation to Tasmania for life. In February 1854 he received his liberty on condition of never revisiting the United Kingdom; and in May 1856 he obtained a full pardon, and returned to Ireland. In 1856 he published *Principles of Government, or Meditations in Exile*. He died at Bangor, north Wales, on the 18th of June, 1864. He had five sons and two daughters. His eldest brother, Lucius, became 13th Baron Inchiquin in 1855, as heir male to the 3rd marquis of Thomond, at whose death in 1855 the marquisate of Thomond and the earldom of Inchiquin became extinct. (See INCHIQUIN, 1ST EARL OF.)

OBSCENITY (from the adjective "obscene," Lat. *obscenus*, evil-looking, filthy). By English law it is an indictable misdemeanour to show an obscene exhibition or to publish any obscene matter, whether it be in writing or by pictures, effigy or otherwise. The precise meaning of "obscene" is, however, decidedly ambiguous. It has been defined as "something offensive to modesty or decency, or expressing or suggesting unchaste or lustful ideas or being impure, indecent or lewd." But the test of criminality as accepted in England and Canada is whether the exhibition or matter complained of tends to deprave and corrupt those whose minds are open to immoral influences and who are likely to visit the exhibition, or to see the matter published. If the exhibition or publication is calculated to have this effect, the motive of the publisher or exhibitor is immaterial. Even in the case of judicial proceedings, newspapers are not privileged to publish evidence which falls within the definition. In dealing with writings alleged to be obscene, the court and jury have to consider the effect of the whole work and not merely the particular extract challenged as improper; and in practice it is difficult to induce juries to convict the publishers of well-known and old-established works of real literary quality on the ground that they contain passages offensive to modern notions of propriety. In the case of exhibitions of sculpture and pictures some difficulty is found in drawing the line between representations of the nude and works which fall within the definition above stated—a difficulty raised in a somewhat acute form before the London County Council in 1907 by theatrical representations of "living statuary."

Besides the remedy by indictment there are statutory provisions for punishing as vagabonds persons who expose to public view in public streets or adjacent premises obscene prints, pictures or other indecent exhibitions. These are supplemented by similar provisions, applicable to the metropolis and to county towns, and (by a statute of 1889) for suppressing certain kinds of indecent advertisements. By an act of 1857 powers are given for searching premises on which obscene books, &c., are kept for sale, distribution, &c., and for ordering their destruction, and the post office authorities have power to seize postal packets containing such matter and to prosecute the sender. In 1906 the London publisher of a weekly comic paper was punished for inserting advertisements inviting readers to acquire by post from abroad matter of this kind.

The use of obscene or indecent language in public places is punishable as a misdemeanour at common law, but it is usually dealt with summarily, under the Metropolitan Police Act 1839, or the Town Police Clauses Act 1847, or under local by-laws.

British Possessions.—In British India obscene publications, exhibitions, &c., are punished under articles 292, 293 and 294 of the Penal Code. Special exception is made for representations in temples or on cars used for conveyance of idols or kept or used for religious purposes. In those British possessions whose law is based on the common law the offences above dealt with are offences at common law or under colonial statutes embodying the common law, *e.g.* Queensland Code, 1899, ss. 172, 227, 228, 374 (3); Western Australian Code, 1901, ss. 203, 204, 352 (3); Canadian Criminal Code, s. 179. In New South Wales and Western Australia, by acts of 1901 and 1902, provisions have been made for dealing summarily with indecent and obscene publications based to some extent on the English legislation of 1889 against indecent advertisements. In the Colonial acts no penalty is incurred if the defence can prove that the incriminated publication is a work of recognized literary merit, *e.g.* Aristophanes or Boccaccio's *Decameron*, or is a bonâ-fide medical work circulated in the manner permitted by the statutes.

United States.—Under the Federal Law (Revised Statutes, s. 3893) penalties are imposed for transmitting obscene matter by the U.S. mails; see *U.S.* v. *Wales* (1892), 51 Fed. Rep. 41. (W. F. C.)

OBSEQUENS, JULIUS, a Latin writer of uncertain date, generally placed about the middle of the 4th century A.D. He is the author of a small extant work *De prodigiis*, taken from an epitome of Livy, and giving an account of the prodigies and portents that occurred in Rome between 249–12 B.C.

The editio princeps was published by Aldus (1508); later editions by F. Oudendorp (1720) and O. Jahn (1853, with the *periochae* of Livy).

OBSEQUIES (Med. Lat. *obsequiae*, formed after class. Lat. *exsequiae*), a term for funeral rites and ceremonies, especially such as are carried out with great ceremony. The Lat. *obsequium* (from *obsequi*, to follow close after) produced the obsolete English "obsequy," in the sense of ready complaisant service, especially of an inferior to a superior, still found in the adjective "obsequious."

OBSERVATORY. Up to a comparatively recent date an "observatory" was a place exclusively devoted to the taking of astronomical observations, although frequently a rough account of the weather was kept. When the progress of terrestrial magnetism and meteorology began to make regular observations necessary, the duty of taking these was often thrown on astronomical observatories, although in some cases separate institutions were created for the purpose. In this article the astronomical observatories will be chiefly considered.

Up to about 300 B.C. it can scarcely be said that an observatory existed anywhere, as the crude observations of the heavens then taken were only made by individuals and at intervals, employing the simplest possible apparatus. Thus, according to Strabo, Eudoxus had an observatory at Cnidus. But, when philosophical speculation had exhausted its resources, and an accumulation of facts was found to be necessary before the knowledge of the construction of the universe could advance farther, the first observatory was founded at Alexandria, and continued in activity for about four hundred years, or until the middle or end of the 2nd century of the Christian era. Hipparchus of Rhodes, the founder of modern astronomy, by repeating observations made at Alexandria, discovered the precession of the equinoxes, and investigated with considerable success the motions of the sun, moon and planets. His work was continued by more or less distinguished astronomers, until Ptolemy (in the 2nd century A.D.) gave the astronomy of Alexandria its final development. When science again began to be cultivated after the dark ages which followed, we find several observatories founded by Arabian princes; first one at Damascus, next one at Bagdad built by the caliph Al-Mamun early in the 9th century, then one on the Moḳattam near Cairo, built for Ibn Yunis by the caliph Ḥakim (about 1000 A.D.), where the Ḥakimite tables of the sun, moon and planets were constructed. The Mongol khans followed the example; thus arose the splendid observatory at Maragha in the north-west of Persia, founded about A.D. 1260 by Hulagu Khan, where Nasir Uddin constructed the Ilohkhanic tables; and in the 15th century the observatory at Samarkand was founded by Ulugh Beg, and served not only in the construction of new planetary tables but also in the formation of a new catalogue of stars.

With the commencement of scientific studies in Europe in the 15th century the necessity of astronomical observations became at once felt, as they afforded the only hope of improving the theory of the motions of the celestial bodies. Although astronomy was taught in all universities, the taking of observations was for two hundred years left to private individuals. The first observatory in Europe was erected at Nuremberg in 1472 by a wealthy citizen, Bernhard Walther, who for some years enjoyed the co-operation of the celebrated astronomer Regiomontanus. At this observatory, where the work was continued till the founder's death in 1504, many new methods of observing were invented, so that the revival of practical astronomy may be dated from its foundation. The two celebrated observatories of the 16th century, Tycho Brahe's on the Danish island of Hven (in activity from 1576 to 1597) and that of Landgrave William IV. at Cassel (1561–1597), made a complete revolution in the art of observing. Tycho Brahe may claim the honour of having been the first to see the necessity of carrying on for a number of years an extensive and carefully-planned series of observations with various instruments, worked by himself and a staff of assistants. In this respect his observatory (Uraniburgum) resembles our modern larger institutions more closely than do many observatories of much more recent date. The mighty impulse which Tycho Brahe gave to practical astronomy at last installed this science at the universities, among which those of Leiden and Copenhagen were the first to found observatories. We still find a large private observatory in the middle of the 17th century, that of Johannes Hevelius at Danzig, but the foundation of the royal observatories at Paris and Greenwich and of numerous university observatories shows how rapidly the importance of observations had become recognized by governments and public bodies, and it is not until within the last hundred and thirty years that the development of various new branches of astronomy has enabled private observers to compete with public institutions.

The instruments employed in observatories have of course changed considerably during the last two hundred years. When the first royal observatories were founded, the principal instruments were the mural quadrant for measuring meridian zenith distances of stars, and the sextant for measuring distances of stars *inter se*, with a view of determining their difference of right ascension by a simple calculation. These instruments were introduced by Tycho Brahe, but were subsequently much improved by the addition of telescopes and micrometers. When the law of gravitation was discovered it became necessary to test the correctness of the theoretical conclusions drawn from it as to the motions within the solar system, and this necessarily added to the importance of observations. By degrees, as theory progressed, it made greater demands for the accuracy of observations, and accordingly the instruments had to be improved. The transit instrument superseded the sextant and offered the advantage of furnishing the difference of right ascension directly; the clocks and chronometers were greatly improved; and lastly astronomers began early in the 19th century to treat their instruments, not as faultless apparatuses but as imperfect ones, whose errors of construction had to be detected, studied and taken into account before the results of observations could be used to test the theory. That century also witnessed the combination of the transit instrument and the mural quadrant or circle in one instrument—the transit or meridian circle.

While the necessity of following the sun, moon and planets as regularly as possible increased the daily work of observatories, other branches of astronomy were opened and demanded other observations. Hitherto observations of the "fixed stars" had been supposed to be of little importance beyond fixing points of comparison for observations of the movable bodies. But when many of the fixed stars were found to be endowed with "proper motion," it became necessary to include them among the objects of constant attention, and in their turn the hitherto totally neglected telescopic stars had to be observed with precision, when they were required as comparison stars for comets or minor planets. Thus the field of work for meridian instruments became very considerably enlarged.

In addition to this, the increase of optical power of telescopes revealed hitherto unknown objects—double stars and nebulae—and brought the study of the physical constitution of the heavenly bodies within the range of observatory work. Researches connected with these matters were, however, for a number of years chiefly left to amateur observers, and it is only since about 1830 that many public observatories have taken up this kind of work. The application of spectrum analysis, photometry, &c., in astronomy has still more increased the number and variety of observations to be made, while the use of photography in work of precision has completely revolutionized many branches of practical astronomy. It has now become necessary for most observatories to devote themselves to one or two special fields of work.

It would be difficult to arrange the existing observatories into classes either according to the work pursued in them or their organization, as the work in many cases at different times has been directed to different objects, while the organization depends mostly on national and local circumstances. As already alluded to above, one of the principal characteristics of the larger observatories of the present day is the distribution of the work among a number of assistants under the general superintendence of a director. This applies principally to the great observatories, where the sun, moon, planets and a limited number of fixed stars are without interruption being observed, but even among these institutions hardly two are conducted on the same principles. Thus in Greenwich the instruments and observations are all treated according to strict rules laid down by the astronomer-royal, while in Washington or Pulkowa each astronomer has to a certain extent his choice as to the treatment of the instrument and arrangement of the observations. The same is the case with the smaller institutions, in most of which these arrangements vary very much with change of personnel.

The way in which the results of observations are published depends principally on the size of the institutions. The larger observatories issue their "annals" or "observations" as separate periodically-published volumes, while the smaller ones chiefly depend on scientific journals to lay their results before the public, naturally less fully as to details.

Subjoined is a catalogue of public and private observatories still in activity in 1910 or in existence within the past hundred years. ($4^m = 1°$ of long.)

(*Abbreviations*: ap., aperture; equat., equatorial; obs., observatory or observations; o.g., object-glass; phot., photographic; refl., reflector; refr., refractor; s.g., silvered glass; vis., visual; univ., university. Where the names of two makers are given, the first is responsible for the optical, the second for the mechanical part of the instrument.)

Great Britain and Ireland

A. Public Observatories.

Greenwich, royal obs., lat. +51° 28′ 38·4″. Founded in 1675 for the promotion of astronomy and navigation. The obs. have therefore from the first been principally intended to determine the positions of standard stars, the sun and planets, and above all to follow the motion of the moon with as little interruption as possible, both on and outside the meridian. Since 1873 spectroscopic obs. and a daily phot. record of sun-spots have been taken. The eighth satellite of Jupiter was discovered photographically in 1908. The obs. is under the direction of the astronomer-royal; and from the time of its first astronomer, Flamsteed, the institution has always maintained its place in the foremost rank of obs. Thus the obs. of Bradley (*ob.* 1762) form the foundation of modern stellar astronomy; but it was especially during the directorship of Airy (1835–1881) that the obs. rose to its present high state of efficiency. There are now two chief assistants, six assistants, and a staff of computers employed. The principal instruments now in use are: a meridian circle by Simms (and Ransomes and May as engineers), erected in 1850, having a circle of 6-ft. diameter and a telescope of 8-in. ap., Lassell's 2-ft. refl., erected 1884; 13-in. phot. refr. with 10-in. vis. o.g. by Grubb; 28-in. refr. by Grubb; 26-in. phot. refr. by Grubb, with the old 12·8-in. refr. as guiding telescope; 9-in. phot. refr. by Grubb, and 30-in. s.g. refl. by Common, the last four being on one stand; 8-in. altazimuth by Simms, erected 1896. The 26-in. and the 9-in. were presented by Sir H. Thompson. The standard "motor clock" is the centre of a system of electrically-controlled clocks scattered over the United Kingdom. The magnetic and meteorological department was founded in 1838; it contains a complete set of instruments giving continuous phot. records. The *Observations* are published with all details from 1750, beginning with 1836 in annual bulky quarto volumes; special results—*e.g.*, *Star Catalogues*, *Reductions of Lunar and Planetary Observations*—are published in separate volumes.

South Kensington, Solar physics obs., lat. +51° 29′ 48·0″, long. 0 h. 0 m. 41·5 s. W. Founded 1879, under Sir N. Lockyer; 3-ft. refl. and 30-in. refl. by Common; 10-in. refr. by Cooke, and several siderostats with attachments for spectroscopic and phot. work.

Oxford, Radcliffe obs., lat. +51° 45′ 35·4″, long. 0 h. 5 m. 2·6 s. W. Founded in 1771 by the Radcliffe trustees. Obs. were regularly made, but none were published until 1839, when systematic obs. were begun with an 8-ft. transit instrument by Bird (1773) and a 6-ft. mural circle by Jones (1836). Heliometer (7½ in.) by Repsold (1849); meridian circle by Troughton and Simms, mounted in 1861, formerly belonging to Mr Carrington; 10-in. refr. by Cooke (1887), Grubb refr. with 24-in. phot. and 18-in. vis. o.g. (1902); self-recording meteorological instruments. Besides the annual 8vo vols. of *Observations* (from 1840), four catalogues of stars have been published.

Oxford, univ. obs., lat. +51° 45′ 34·2″, long. 0 h. 5 m. 0·4 s. W. Finished in 1875; is under the Savilian professor of astronomy; 12¼-in. refr. by Grubb, and a 13-in. refl. made and presented by De La Rue. The former has been used for photometric obs.; the latter for taking lunar photographs, by means of which the late Professor Pritchard investigated the libration of the moon; 13-in. phot. refr. by Grubb attached to the 12¼-in., used for phot. zone work.

Cambridge, lat. +52° 12′ 51·6″, long. 0 h. 0 m. 22·8 s. E. Founded by the univ. senate in 1820. Chiefly devoted to meridian work—up to 1870 with a 5-in. transit by Dollond and a mural circle by Jones; a new meridian circle by Simms, of 8-in. ap. and 3-ft. circles, was then erected. The "Northumberland equatorial" was mounted in the "English" fashion in 1838; the o.g. by Cauchoix is of 11½-in. ap. R. S. Newall's 25-in. refr. by Cooke, erected 1891, used for spectrographic work; siderostatic refr. with 12-in. o.g. by Cooke, 1898. In 1908 the instruments of Sir W. Huggins' obs. were presented by the Royal Society.

Durham, univ. obs., lat. +54° 46′ 6·2″, long. 0 h. 6 m. 19·8 s. W. Founded in 1841; small meridian circle by Simms, refr. by Fraunhofer of 6½-in. ap., Almucantar of 6-in. ap. by Cooke (1900).

Liverpool (Bidston, Birkenhead), lat. +53° 24′ 4·8″, long. 0 h. 12 m. 17·3 s. W. Founded in 1838 by the municipal council; transferred in 1856 to the Docks and Harbour Board; moved to Birkenhead in 1867. Specially intended for testing the rates of chronometers under different temperatures. Transit instrument by Troughton and Simms, and an 8-in. refr. by Merz.

Kew (Richmond), lat. +51° 28′ 6″, long. 0 h. 1 m. 15·1 s. W. The central meteorological obs. of the United Kingdom, with self-registering meteorological and magnetical instruments. Established in 1842 under the auspices of the British Association, afterwards transferred to the Royal Society. Since 1900 a department of the National Laboratory. A photoheliograph was employed at De La Rue's expense to take daily sun-pictures from 1863 to 1872.

Edinburgh, royal obs., Blackford Hill, lat. +55° 57′ 28·0″, long. 0 h. 12 m. 44·2 s. W. Founded in 1811 by subscription; the building on Calton Hill erected in 1818. In 1834 the founders handed over the administration to the government, and in 1846 the ownership was similarly transferred. Since 1834 the obs. has been under the direction of the astronomer-royal for Scotland, who is also professor of practical astronomy in the univ. Professor T. Henderson (1833–1845) began extensive meridian obs. of fixed stars with a mural circle of 6-ft. diameter and an 8-ft. transit. A 2-ft. s.g. refl. by Grubb was erected in 1872. New obs. erected on Blackford Hill 1893–1895 for the instruments presented by Lord Crawford; 15-in. refr. by Grubb, transit circle by Simms of 8-in. ap., 12-in. s.g. refl. by Browning, two 6-in. refrs. and a very fine library; also the 2-ft. refl. The old obs. on Calton Hill now belongs to the city and is used for instruction; a 21-in. refr. by Wragge has been erected.

Glasgow, univ. obs., lat. +55° 52′ 42·8″, long. 0 h. 17 m. 10·6 s. W. Organized in 1840 by subscription, aided by subsidies from the univ. and the state. Meridian circle by Ertel of 6-in. ap.; 9-in. refr. by Cooke, 20-in. s.g. refl. by Grubb with spectrograph. Two catalogues of stars were published by the late director, R. Grant.

Dublin, situated about 4 m. N.W. of Dublin at Dunsink, lat. +53° 23′ 13·1″, long. 0 h. 25 m. 21·1 s. W. Belongs to the univ.; erected in 1785; is under the direction of the "Andrews professor of astronomy and royal astronomer of Ireland." In 1808 a reversible meridian circle by Ramsden and Berge of 8-ft. diameter was put up, with which Brinkley observed assiduously till 1827. In 1868 was erected a refr. of 11¾-in. ap. by Cauchoix (o.g. formerly belonging to and given by Sir J. South), which has been used for researches on stellar parallax. A meridian circle by Pistor and Martins of 6·4-in. ap. was mounted in 1873, and a 15-in. s.g. refl. for phot. work in 1889. *Astronomical Observations and Researches made at Dunsink* in 4to parts.

Armagh, lat. +54° 21′ 12·7″, long. 0 h. 26 m. 35·4 s. W. Founded and endowed by Archbishop R. Robinson in 1790. Possessed very few instruments until the obs. was enlarged by Archbishop Lord John George Beresford in 1827, when a mural circle and a transit by Jones were provided, with which meridian obs. were made till 1883, published in two star catalogues; 10-in. refr. by Grubb (1885) used for micrometer work.

B. Principal Private Observatories in 1908.

Mr W. Coleman's obs., Buckland, Dover, lat. +51° 8′ 12″, long. 0 h. 5 m. 11 s. E. Cooke 8-in. refr. used for obs. of double stars.

Mr J. Franklin-Adams's obs., Mervel Hill, Hambledon, Surrey, lat. +51° 8′ 11·6″, long. 0 h. 2 m. 30·2 s. W. Erected 1903; twin equatorial by Cooke with 12-in. and 6-in. lenses, another with 8-in. and 6-in. lenses, used for phot. survey of the heavens with special reference to the Milky Way. The former instrument was used at the Cape in 1903–1904.

Rev. T. E. Espin's obs., Tow Law, Darlington, lat. +54° 43′ 30″, long. 0 h. 7 m. 14 s. W. 17¼-in. refl. by Calver, used since 1888 for spectroscopy and obs. of double stars.

Mr W. H. Maw's obs., Kensington, lat. +51° 30′ 2·8″, long. 0 h. 0 m. 49·4 s. W., 6-in. refr. by Cooke (1886). Also at Outwood, Surrey, lat. +51° 11′ 38″, long. 0 h. 0 m. 23·7 s. W., 8-in. refr. by Cooke (1896), both used on double stars.

Sir Wilfrid Peek's obs., Rousdon, Lyme Regis, lat. +50° 42′ 38″, long. 0 h. 11 m. 59·0 s. W. Erected by the late Sir Cuthbert Peek in 1885; 6·4-in. refr. by Merz used for obs. variable stars.

Earl of Rosse's obs., Birr Castle, King's county, Ireland, lat. +53° 5′ 47″, long. 0 h. 31 m. 40·9 s. W. In 1839 the earl made and mounted a refl. of 3-ft. ap. (remounted as equat. in 1876), and in 1845 he completed the celebrated refl. of 6-ft. ap. and 54-ft. focal length. These instruments, particularly the latter, were used from 1848 to 1878 for obs. of nebulae, and revealed many new features in these bodies; results published in the *Phil. Trans.* and collected systematically in the *Trans. Roy. Dubl. Soc.* (1879–1880). Experiments were made by the present earl to determine the amount of heat radiated from the moon.

Rugby School (Temple Obs.), lat. +52° 22′ 7″, long. 0 h. 5 m. 2 s. W. Founded in 1872; 8¼-in. refr. by Clark, used for obs. of double stars and of stellar spectra.

Stonyhurst College obs., Lancashire, lat. +53° 50′ 40″, long. 0 h. 9 m. 52·7 s. W. An 8-in. refr. by Troughton and Simms, mounted in 1867, used for spectroscopic and micrometric obs.; 15-in. Perry memorial refr. by Grubb mounted in 1893, used chiefly for solar work.

C. Private Observatories now discontinued.

Mr J. G. Barclay's obs., Leyton, Essex, lat. +51° 34′ 34″, long. 0 h. 0 m. 0·9 s. W. In activity from 1862 till 1886, 10-in. refr. by Cooke; chiefly devoted to double stars.

Mr G. Bishop's obs., South Villa, Regent's Park, London, lat. +51° 31′ 29·9″, long. 0 h. 0 m. 37·1 s. W. In activity from 1836 to 1861, then removed to Twickenham, and discontinued in 1874; had a 7-in. refr. by Dollond, with which Mr J. R. Hind discovered ten minor planets and several comets, and constructed maps of stars near the ecliptic.

Mr R. C. Carrington's obs., Redhill, lat. +51° 14′ 25·3″, long. 0 h. 0 m. 41·3 s. W. Established in 1854; had a 4½-in. refr. and transit circle of 5-in. ap. (now at Radcliffe Obs.). With the latter a catalogue of the positions of 3735 stars within 9° of the pole, with the former regular obs. of sun-spots, were made from 1853 to 1861.

Mr A. A. Common's obs., Ealing, London, W. (1876–1903). 18-in. s.g. refl. erected in 1876, s.g. refl. of 36-in. ap. (mirror by Calver, mounting by the owner), erected in 1879; chiefly used for celestial photography, replaced by a refl. of 5-ft. ap. in 1889.

Colonel Cooper's obs., Markree Castle, Co. Sligo, Ireland, lat. +54° 10′ 31·8″, long. 0 h. 33 m. 48·4 s. W. Founded by the late E. J. Cooper, who in 1834 erected a refr. of 13·3-in. ap. (o.g. by Cauchoix). This instrument was from 1848 to 1856 used for determining the approximate places of 60,000 stars near the ecliptic. The obs. was restored in 1874, and the refr. was used for double-star obs. till 1883.

Earl of Crawford's obs., Dunecht, Aberdeenshire, lat. +57° 9′ 36″, long. 0 h. 9 m. 40 s. W. Founded in 1872; 15-in. refr. by Grubb, 12-in. s.g. refl. by Browning, two 6-in. and several smaller refrs. meridian circle by Simms similar to the one at Cambridge, numerous spectroscopes and minor instruments, also a large library and a collection of physical instruments. Chiefly devoted to spectroscopic and cometary obs. Whole equipment presented to Edinburgh obs. in 1888.

Mr E. Crossley's obs., Bermerside, Halifax, Yorkshire. Equatorial refr. by Cooke of 9·3 in. ap., erected in 1871, chiefly used for obs. of double stars till 1902.

Rev W. R. Dawes's obs., first at Ormskirk (1830–1839), lat. +53° 43′ 18″, long. 0 h. 11 m. 36 s. W.; afterwards at Cranbrook, Kent (1844–1850), lat. +51° 6′ 31″, long. 0 h. 2 m. 10·8 s. E.; then at Wateringbury, near Maidstone, lat. +51° 15′ 12″, long. 0 h. 1 m. 39·8 s. E., till 1857; and finally at Hopefield, Haddenham, lat. +51° 45′ 54″, long. 0 h. 3 m. 43·4 s. W., till Mr Dawes's death in 1868. Possessed at first only small instruments, then successively a 6-in. refr. by Merz, a 7½-in. and an 8¼-in. refr. by Clark, and an 8-in. refr. by Cooke, with all of which a great many measures of double stars were made.

Mr W. De La Rue's obs., Cranford, Middlesex, lat. +51° 28′ 57·8″, long. 0 h. 1 m. 37·5 s. W. Established in 1857; with 13-in. refl., devoted to solar and lunar photography. The Kew photoheliograph was employed here from 1858 to 1863 to take daily photographs of the sun. The refl. was presented to the Oxford univ. obs. in 1874.

Mr S. Groombridge's obs., Blackheath, lat. +51° 28′ 2·7″, long. 0 h. 0 m. 0·6 s. E. In 1806 Mr Groombridge obtained a new transit circle of 4-ft. diameter by Troughton, with which he up to 1816 observed stars within 50° of the pole forming a catalogue of 4243 stars.

Sir William and Sir John Herschel's obs. at Slough near Windsor, lat. +51° 30′ 20″, long. 0 h. 2 m. 24 s. W. William Herschel settled at Datchet in 1782, and at Slough in 1786, and erected several 20-ft. refl. (of 18-in. ap.), and in 1789 his 40-ft. refl. of 4-ft. ap. The latter was comparatively little used (two satellites of Saturn were discovered with it), while the former served to discover about 2500 nebulae and clusters, 800 double stars, and two satellites of Uranus, as also to make the innumerable other obs. which have made the name of Herschel so celebrated. Sir J. Herschel used a 20-ft. refl. at Slough from 1825 to 1833, and from 1834 to 1838 at the Cape of Good Hope, to examine the nebulae and double stars of the whole of the visible heavens, discovering 2100 new nebulae and 5500 new double stars.

Sir William Huggins's obs., Upper Tulse Hill, London, lat. +51° 26′ 47″, long. 0 h. 0 m. 27·7 s. W. Founded in 1856; furnished with an 8-in. refr. (by Clark and Cooke). In 1870 was erected an equat. mounting with a 15-in. refr. and a Cassegrain refl. of 18-in. ap., both made by Grubb for the Royal Society. With these Sir W. Huggins has made his well-known spectroscopic observations and photographs of stellar spectra. The instruments were transferred to the Cambridge obs. in 1908.

Rev T. J. Hussey's obs., Hayes, Kent, lat. +51° 22′ 38″, long. 0 h. 0 m. 3·6 s. E. In activity from about 1825 for about twelve years; 6½-in. refr. by Fraunhofer, used for making one of the star maps published by the Berlin Academy.

Mr G. Knott's obs., Cuckfield, Sussex (from 1860 to 1873 at Woodcroft, lat. +51° 0′ 41″, long. 0 h. 0 m. 34 s. W., afterwards at Knowles Lodge, Cuckfield); 7·3-in. refr. by Clark, used for observing double stars and variable stars till 1894.

Mr W. Lassell's obs., from 1840 to 1861 at Starfield near Liverpool, lat. +53° 25′ 28″, long. 0 h. 11 m. 38·7 s. W.; contained refl. of 9- and 24-in. ap.; employed for obs. of the satellites of Saturn, Uranus and Neptune, and of nebulae. The 2-ft. refl. was used at Malta in 1852–1853, and a 4-ft. refl. was mounted in 1861, also at Malta, and used till 1864 for obs. of satellites and nebulae. The eighth satellite of Saturn, the two inner satellites of Uranus and the satellite of Neptune were discovered at Starfield by Mr Lassell.

Dr J. Lee's obs., Hartwell, Bucks, lat. +51° 48′ 36″, long. 0 h. 3 m. 24·3 s. W. In 1836 Dr Lee came into possession of Captain Smyth's 6-in. refr., and mounted it at Hartwell House where it continued to be occasionally employed for double-star obs. and other work up to about 1864.

Mr F. McClean's obs., Rusthall House, Tunbridge Wells. Phot. 12-in. refr. and o.g. prism by Grubb used for photos. of star spectra, 1895–1904.

Mr R. S. Newall's obs., Gateshead, Newcastle-on-Tyne. A 25-in. refr. by Cooke was mounted in 1870 but never used; presented to Cambridge obs. in 1891.

Dr Isaac Roberts's obs., Crowborough, Sussex, lat. +51° 3′ 7″, long. 0 h. 0 m. 37 s. E. 20-in. s.g. refl. by Grubb (with 7-in. refr.) used for phot. of nebulae and clusters 1890–1904.

Captain W. H. Smyth's obs., Bedford, lat. +52° 8′ 27·6″, long. 0 h. 1 m. 52·0 s. W. In 1830 Captain (afterwards Admiral) Smyth erected a 6-in. refr. by Tulley, and observed the double stars and nebulae contained in his "Bedford Catalogue" (1844).

Sir James South's obs., from 1816 to 1824 at Blackman Street, Southwark, long. 0 h. 0 m. 21·8 s. W. Here South took transit obs. of the sun, and he and J. Herschel measured double stars, in 1821–1823. In 1826 South erected an obs. at Campden Hill, Kensington, lat. +51° 30′ 12″, long. 0 h. 0 m. 46·8 s. W., and procured a 12-in. o.g. from Cauchoix. As Troughton, however, failed to make a satisfactory mounting, the glass was never used till after it had been presented to Dublin obs. in 1862.

Colonel Tomline's obs. at Orwell Park, Ipswich, lat. +52° 0′ 33″, long. 0 h. 4 m. 55·8 s. E. 10-in. refr. by Merz, used for obs. of comets from 1874 to 1889.

Mr W. E. Wilson's (d. 1908), obs., Daramona, Streete, Co. Westmeath, Ireland, lat. +53° 41′ 12″, long. 0 h. 29 m. 59 s. W. 2-ft. refl. by Grubb, and other instruments for phot. and solar work.

Lord Wrottesley's obs., from 1829 to 1841 at Blackheath, lat. +51° 28′ 2″, long. 0 h. 0 m. 2·7 s. E., where a catalogue of the right ascensions of 1318 stars was formed from obs. with a transit instrument by Jones. In 1842 a new obs. was built at Wrottesley Hall, lat. +52° 37′ 2·3″, long. 0 h. 8 m. 53·6 s. W., where the transit and a 7¾ in.-refr. by Dollond were mounted. Obs. were here made of double stars.

FRANCE

Paris, national obs., lat. +48° 50′ 11·2″, long. 0 h. 9 m. 20·9 s. E. Founded in 1667, when the construction of a large and monumental building was commenced by the architect Claude Perrault. J. D. Cassini's obs. made the institution for some time the most celebrated obs. existing, but later the activity declined, although several eminent men, as Bouvard and Arago, have held the post of director. Since 1854, when Leverrier assumed the directorship, the obs. have been conducted with regularity, and, together with a number of most important theoretical works, published in the *Annals* (*Observations* and *Memoirs*). The principal instruments now in use are: a meridian circle by Secretan and Eichens, with an o.g. of 9·5-in. ap., another by Eichens (given by M. Bischoffsheim) of 7·5-in. ap., a 15-in. refr. by Lerebours and Brünner, a 12-in. refr. by Secretan and Eichens, a refr. of 9·5-in. ap., an equat. coudée by Henry and Gautier of 10½-in. ap. (1883), another by the same of 23½-in. ap., vis. and phot. (1891), phot. refr. of 13 in. by the same. A s.g. refl. of 4-ft. ap. was mounted in 1875, but has never been used.

In addition to this national obs. there were during the latter half of the 18th century several minor obs. in Paris, which only lasted for some years. Among these were the obs. at *Collège Mazarin*, lat. +48° 51′ 29″, where Lacaille observed from 1746 to 1750, and from 1754 to 1762, and the obs. at the *École Militaire*, lat. +48° 51′ 5″, built in 1768 and furnished with an 8-ft. mural quadrant by Bird, with which J. L. d'Agelet observed telescopic stars (1782–1785), and which was afterwards (1789–1801), under Lalande's direction, employed for observing more than 50,000 stars, published in the *Histoire Céleste* (1801).

Meudon, close to Paris, lat. +48° 48′ 18″, long. 0 h. 8 m. 55·6 s. E. Founded in 1875; devoted to physical astronomy, and especially to celestial photography, under the direction of J. Janssen; 32-in. vis. and 24½-in. phot. refr. by Henry and Gautier, refl. by the same of 39-in. ap. There is a branch obs. on Mont Blanc, where a polar siderostat with 12-in. o.g. and 20-in. mirror is occasionally used for solar and spectroscopic work (15,780 ft. above sea-level).

Montsouris, situated in the Montsouris Park, south of Paris, lat. +48° 49′ 18″, long. 0 h. 9 m. 20·7 s. E. Founded in 1875 for the training of naval officers.

Juvissy (Seine-et-Oise), private obs. of N. C. Flammarion, lat. +48° 41′ 37″, long. 0 h. 9 m. 29·0 s. E. 9½-in. refr. used for obs. of planets.

Chevreuse (Seine-et-Oise), private obs. of M. Farman (1903), lat. +48° 42′ 33″, long. 0 h. 8 m. 4·5 s. E.; 8-in. refr. by Mailhat used on double stars.

Besançon, chronometric and meteorol. obs., lat. +47° 14′ 59·0″, long. 0 h. 23 m. 57·1 s. E. Opened 1884; 8-in. refr., 12-in. equat. coudée, 7½-in. transit circle, all by Gautier.

Lyons, old obs. in lat. 45° 45′ 46″, long. 0 h. 19 m. 18 s. E., at the Jesuit college. A new obs. was erected in 1877 at St Génis-Laval, at some distance from the city, lat. +45° 41′ 41·0″, long. 0 h. 19 m. 8·5 s. E. Transit circle by Eichens (6-in. o.g.), 12-in. equat. coudée by Gautier, 12-in. siderostat.

Bordeaux, univ. obs. at Floirac, 4 km. N.W. of the city, lat. +44° 50′ 7·3″, long. 0 h. 2 m. 5·5 s. W. Founded 1882; 7-in. transit circle by Eichens, 14-in. refr. by Merz and Gautier, 13-in. phot. refr. by Henry and Gautier.

Marseilles, lat. 43° 18′ 17·5″, long. 0 h. 21 m. 34·6 s. E. Originally belonging to the Jesuits, taken over by the ministry of the navy in 1749. It was here that J. L. Pons made his numerous discoveries of comets. New buildings erected in 1869; 9½-in. Merz. refr., refl. of 32-in. ap. s.g. by Foucault, 7½-in. transit circle.

Toulouse, lat. 43° 36′ 45·0″, long. 0 h. 5 m. 49·9 s. E. Erected in 1841 (Darquier had observed at the Lyceum towards the end of the 18th century); reorganized 1873; 9-in. refr. and 13-in. phot. refr. by Gautier, 13-in. and 32-in. refl.

Nice, lat. + 43° 43′ 16·9″, long. 0 h. 29 m. 12·2 s. E., founded and endowed by R. L. Bischoffsheim for the Bureau de Longitude (1880), situated at Mont Gros, north-east of Nice; a refr. of 30-in. ap. by Henry and Gautier, a meridian circle by Brünner of 8-in. ap., 15-in. refr. and 15¾-in. equat. coudée by Henry and Gautier.

Abbadia (Basses Pyrénées), lat. + 43° 22′ 52·2″, long. 0 h. 7 m. 0·1 s. W. Founded by A. d'Abbadie, 1858, belongs now to the Paris Acad. of Science. 6-in. transit circle.

Germany

Altona, lat. + 53° 32′ 45·3″, long. 0 h. 39 m. 46·1 s. E. Founded in 1823 by the Danish government to assist in the geodetic operations in Holstein. A meridian circle by Reichenbach (of 4-in. ap.) was procured, to which in 1858 was added a 4½-in. equat. by Repsold. The obs. is best known by the fact that the *Astronomische Nachrichten*, the principal astronomical journal, was published here from 1821 (by H. C. Schumacher up to 1850, by C. F. W. Peters from 1854). The obs. was moved to Kiel in 1874.

Bamberg, lat. + 49° 53′ 6·0″, long. 0 h. 43 m. 33·6 s. E. Founded and endowed by the late Dr K. Remeis, completed 1889; 7½-in. heliometer by Merz and Repsold, 10½-in. refr. by Schröder.

Berlin, royal obs., lat. + 52° 30′ 16·7″, long. 0 h. 53 m. 34·9 s. E. Was erected in 1705 as part of the building of the Academy of Sciences (lat. + 52° 31′ 12·5″, long. 0 h. 53 m. 35 s. E.), a very unsuitable locality. A new obs. was built in the southern part of the city, finished in 1835. Refr. by Utzschneider and Fraunhofer of 9-in. ap. (used chiefly for obs. of minor planets), a meridian circle by Pistor and Martins of 4-in. ap., another by the same makers of 7-in. ap.

Berlin, obs. of Urania Society for diffusing natural knowledge, lat. + 52° 31′ 30·7″, long. 0 h. 53 m. 27·4 s. E. Opened 1889; 12-in. refr. by Schott. In the Treptow Chaussee is a popular obs. with a 27-in. refr. by Schott and Steinheil.

Bonn, univ. obs., lat. + 50° 43′ 45·0″, long. 0 h. 28 m. 23·2 s. E. Finished in 1845; meridian circle by Pistor of 4½-in. ap., heliometer by Merz of 6-in. ap. The former was used by F. W. A. Argelander for observing the stars contained in his three great catalogues. The obs. is chiefly known by the zone obs., made from 1852 to 1859, with a small comet-seeker, on which Argelander's great atlas of 324,198 stars between the north pole and −2° decl. is founded, continued with a 6-in. refr. from −2° to −31° decl. by Schönfeld. A meridian circle of 6-in. ap. by Repsold was mounted in 1882.

Bothkamp, F. G. von Bülow's obs., lat. + 54° 12′ 9·6″, long. 0 h. 40 m. 31·2 s. E. Situated a few miles from Kiel, founded in 1870. With a refr. of 11-in. ap. by Schröder, Dr K. H. Vogel obtained valuable results in 1871–1874; since then it has only been used occasionally.

Bremen. In the third storey of his house in Sandstrasse, H. W. M. Olbers (d. 1840) had his obs., lat. + 53° 4′ 38″, long. 0 h. 35 m. 10 s. E.; though the principal instrument was only a 3¾-in. refr. by Dollond, many comets and the planets Pallas and Vesta were discovered and observed here.

Breslau, univ. obs., lat. + 51° 6′ 55·8″, long. 1 h. 8 m. 8·7 s. E. Founded 1790. In a small and unsuitable locality; 8-in. refr. by Clark and Repsold erected 1898.

Dresden, Baron von Engelhardt's obs., lat. + 51° 2′ 16·8″, long. 0 h. 54 m. 54·8 s. E. A 12-in. refr. by Grubb (mounted 1880), used for obs. of comets and double stars, presented to Kasan obs. in 1897.

Düsseldorf (Bilk, originally a suburb, now part of the city), lat. + 51° 12′ 25·0″, long. 0 h. 27 m. 5·5 s. E. Founded and endowed by Professor J. F. Benzenberg (d. 1846); best known by the discovery of twenty-one minor planets by K. T. R. Luther; 4½-in. refr. by Merz, 7½-in. refr. by Merz and Bamberg.

Gotha.—In 1791 an obs. was founded by Duke Ernest II. at Seeberg, lat. + 50° 56′ 5·2″, long. 0 h. 42 m. 55·8 s. E., on a hill a few miles from Gotha, the chief instrument being a large transit instrument by Ramsden. Through the labours, principally theoretical, of F. X. Zach, B. A. von Lindenau, J. F. Encke and P. A. Hansen, the institution ranked with the first obs. A new obs. was built at Gotha in 1857, lat. + 50° 56′ 37·5″, long. 0 h. 42 m. 50·4 s. E., which received the instruments from Seeberg, including a small transit circle by Ertel (made in 1824), also a new equat. by Repsold of 4½-in. ap.

Göttingen, univ. obs., lat. + 51° 31′ 48·2″, long. 0 h. 39 m. 46·2 s. E. An obs. had existed here from 1751, where Tobias Mayer worked. In 1811 a new building was constructed. Besides his mathematical works, K. F. Gauss found time to engage in important geodetic and magnetic obs.; meridian circle by Repsold (4½-in. ap.), another by Reichenbach (4½-in.), 6-in. heliometer by Repsold (1888).

Hamburg, lat. + 53° 33′ 7·0″, long. 0 h. 39 m. 53·6 s. E. Built in the year 1825. With a meridian circle of 4-in. ap. by Repsold, K. L. C. Rümker observed the places of 12,000 stars. A refr. of 10-in. ap. by Merz and Repsold was mounted in 1868. A new obs. is now being built 20 km. south-east of the city, lat. + 53° 28′ 46″, long. 0 h. 40 m. 58·5 s. E., with a 23½-in. refr by Steinheil and Repsold, 7½-in. transit circle by Repsold, and a 39-in. refl.

Heidelberg, grand ducal obs., lat. + 49° 23′ 54·9″, long. 0 h. 34 m. 53·1 s. E. On the Königstuhl hill, 500 ft. above the Neckar; opened 1898. Consists of an astrometric and an astrophysical department. The former has a 13-in. refr. by Steinheil and Repsold, an 8-in. refr. by Merz and a 6½-in. transit circle by Repsold. The astrophysical department is chiefly devoted to phot. work with a triple equat. with two 16-in. lenses and 10-in. guiding telescope, as well as with a 28-in. s.g. refl. by Zeiss.

Jena, univ. obs., lat. + 50° 55′ 34·9″, long. 0 h. 46 m. 20·3 s. 7-in. refr. mounted 1891.

Kiel, univ. obs., lat. + 54° 20′ 27·6″, long. 0 h. 40 m. 35·6 s. E. Contains the instruments removed from Altona in 1874, also an 8-in refr. by Steinheil and a 9-in. transit circle by Repsold.

Königsberg, univ. obs., lat. + 54° 42′ 50·4″, long. 1 h. 21 m. 59·0 s. E. Built 1813; F. W. Bessel was the director till his death in 1846, and nearly all his celebrated investigations were carried out here, *e.g.* obs. of fundamental stars, zone obs. of stars, researches on refraction, heliometric obs., by which the annual parallax of the star 61 Cygni was first determined, &c. The instruments are a 4-in. transit circle by Repsold (1841), a 6-in. heliometer by Utzschneider (1829), and a 13-in. refr. by Reinfelder and Repsold (1898).

Landstuhl (Palatinate), private obs. of J. P. H. Fauth, lat. + 49° 24′ 42·9″, long. 0 h. 30 m. 16·3 s. E.; 7½-in. refr.

Leipzig, univ. obs. Erected 1787–1790 on the "Pleissenburg"; lat. + 51° 20′ 20·5″, long. 0 h. 49 m. 30·2 s. E.; possessed only small instruments, the largest being a 4½-in. refr. by Fraunhofer (1830). In 1861 a new obs. was erected, lat. + 51° 20′ 5·9″, long. 0 h. 49 m 33·9 s. E., with a refr. of 8½-in. ap. by Steinheil, replaced in 1891 by a 12-in. refr. by Reinfelder and Repsold, a meridian circle by Pistor and Martins of 6·3-in. ap. and a 6-in. heliometer by Repsold.

Lilienthal, near Bremen, lat. + 53° 8′ 25″, long. 0 h. 36 m. 1 s. E. J. H. Schröter's private obs.; from 1779 to 1813. Contained a number of refl. by Herschel and Schrader, the largest being of 27-ft. focal length and 20-in. ap. (movable round the eye-piece), used for physical obs., chiefly of planets. Destroyed during the war in 1813; the instruments (which had been bought by the government in 1800) were, for the greater part, sent to the Göttingen obs.

Mannheim, lat. + 49° 29′ 10·9″, long. 0 h. 33 m. 50·5 s. E. Built in 1772; very few obs. were published until the obs. was restored in 1860, when a 6-in. refr. by Steinheil was procured. In 1879 the obs. was moved to Karlsruhe and later to Heidelberg.

Munich, at Bogenhausen, royal obs., lat. + 48° 8′ 45·5″, long. 0 h. 46 m. 26·1 s. E. Founded in 1809; a transit circle by Reichenbach was mounted in 1824, an 11-in. equat. refr. by Fraunhofer in 1835. The former was used from 1840 for zone obs. (about 80,000) of telescopic stars. 6-in. transit circle by Repsold mounted 1891.

Potsdam, lat. + 52° 22′ 56·0″, long. 0 h. 52 m. 15·9 s. E. "Astrophysical obs.," founded in 1874, devoted to spectroscopic and photographic obs. A refr. by Schröder of 11½-in. ap., another by Grubb of 8-in. ap., a refr. by Steinheil and Merz with 9-in. vis. and 13-in. phot. o.g. and a refr. by Steinheil and Repsold with 31-in. phot. and 19½-in. vis. o.g., spectroscopes, photometers, &c. Results are published in 4to vols.

Strassburg, univ. obs., lat. + 48° 35′ 0·3″, long. 0 h. 31 m. 4.5 s. E. Finished in 1881; an 18-in. refr. by Merz; altazimuth of 5½-in. ap., meridian circle of 6½-in. ap., and a 6½ in. orbit sweeper, all by Repsold.

Wilhelmshaven (Prussia), naval obs., lat. + 53° 31′ 52·2″, long. 0 h. 32 m. 35·1 s. E.; situated on the Jahde to the north of Oldenburg. Founded in 1874; meridian circle by Repsold of 4½-in. ap., and meteorological, magnetical, and tide-registering instruments.

Austria-Hungary

Vienna, imperial and royal obs. On the univ. building an obs. was founded in 1756, lat. + 48° 12′ 35·5″, long. 1 h. 5 m. 31·7s. E. Owing to the unsuitable locality and the want of instruments, very few obs. of value were taken until the obs. was rebuilt in 1826, when some better instruments were procured, especially a meridian circle of 4-in. ap., and a 6-in. refr. by Fraunhofer (mounted in 1832), used for obs. of planets and comets. From 1874 to 1879 a large and magnificent building (with four domes) was erected at Währing, north-west of the city, lat. + 48° 13′ 55·4″, long. 1 h. 5 m. 21·5 s. E. In addition to the old instruments, two refrs. were erected, one by Clark of 11¾-in. ap., another by Grubb of 27-in. ap. (mounted 1882); later a 15-in. equat. coudée by Gautier and a 13-in. phot. refr. by Repsold have been mounted.

Vienna (Josephstadt), private obs. of T. von Oppolzer (d. 1886), lat. + 48° 12′ 53·8″, long. 1 h. 5 m. 25·3 s. E. Established in 1865; 5-in. refr. by Merz, 4-in. meridian circle.

Vienna (Ottakring), private obs. of M. von Kuffner, lat. + 48° 12′ 46·7″, long. 1 h. 5 m. 11·0 s. E. Completed 1886; 10½-in. vis. and 6·3-in. phot. refr. by Steinheil and Repsold, 8-in. heliometer and 4¾-in. transit circle by Repsold.

Prague, univ. obs., lat. + 50° 5′ 15·8″, long. 0 h. 57 m. 40·3 s. E. Founded in 1751 at the Collegium Clementinum, on a high tower. 6-in. refr. by Steinheil and a 4-in. meridian circle.

Senftenberg (in the east of Bohemia), lat. + 50° 5′ 55″, long. 1 h. 5 m. 51 s. E. Baron von Senftenberg's obs.; established in 1844. Obs. of comets and planets made with small instruments till the owner's death (1858).

Olmütz, lat. +49° 35′ 40″, long. 1 h. 9 m. 0 s. E. E. von Unkrechtsberg's obs.; 5-in. refr. by Merz. J. F. Julius Schmidt observed planets and comets from 1852 to 1858.

Kremsmünster (Upper Austria), lat. +48° 3′ 23·1″, long. 0 h. 56 m. 31·6 s. E. Founded in 1748 at the gymnasium of the Benedictines. 3-in. meridian circle (mounted in 1827); 5½-in. refr. (mounted in 1856), used for comets and minor planets. Transit circle by Repsold (1907).

Pola (sea-coast, Austria), naval obs., lat. +44° 51′ 48·7″, long. 0 h. 55 m. 23·1 s. E. Founded in 1871; meridian circle of 6-in. ap. by Simms, 6-in. refr. by Steinheil, magnetic and meteorological instruments. Twenty-eight minor planets were discovered here from 1874 to 1880 by J. Palisa.

Cracow, univ. obs., lat. +50° 3′ 50·0″, long. 1 h. 19 m. 51·1 s. E. Possesses only small instruments.

Lussinpiccolo (island of Lussin, Adriatic), private obs. of Madame Manora, lat. +44° 32′ 11·0″, long. 0 h. 57 m. 52·4 s. E. Erected 1894; 7-in. refr. by Reinfelder, used for obs. of planets.

Kis Kartal (north-east of Budapest), private obs. of Baron Podmaniczky, lat. +47° 41′ 54·8″, long. 1 h. 18 m. 11·7 s. E. 7½-in. refr. by Merz and Cooke.

O'Gyalla (near Komorn, Hungary), lat. +47° 52′ 27·3″, long. 1 h. 12 m. 45·6 s. E. Nicolas de Konkoly's obs., since 1899 a royal obs. Established in 1871, rebuilt and enlarged in 1876, devoted to astrophysics. A 10-in. s.g. refl. by Browning was in use up to 1881, when it was disposed of and a 10-in. refr. (o.g. by Merz) mounted in its place; also a 6-in. refr. by Merz, and a 6·3 in. phot. refr.

Kalocza (south of Budapest), lat. +46° 31′ 41″, long. 1 h. 15 m. 54 s. E. Obs. of the Jesuit college, founded in 1878 by Cardinal Haynald; 7-in. refr. by Merz, used for solar obs.

Herény (Vas, Hungary), lat. +47° 15′ 47·4″, long. 1 h. 6 m. 24·7 s. E. E. and A. von Gothard's obs. Founded in 1881; 10-in. refl. by Browning.

Switzerland

Zürich, lat. +47° 22′ 40·0″, long. 0 h. 34 m. 12·3 s. E. An obs. existed since 1759; handed over to the Polytechnic School in 1855; new building erected in 1863. A 6-in. refr. by Merz and Kern with two phot. telescopes, two transit instruments, &c. Sun-spots are regularly observed, but the institution is chiefly devoted to educational purposes.

Neuchâtel, lat. +46° 59′ 51·0″, long. 0 h. 27 m. 49·9 s. E. Erected in 1858; meridian circle of 4¼-in. ap. by Ertel, 6½-in. refr. by Merz.

Geneva, lat. +46° 11′ 59·3″, long. 0 h. 24 m. 36·6 s. E. Founded in 1773; a new building erected in 1830. The obs. has been the centre of the important geodetic operations carried on in Switzerland since 1861. An 11-in. refr. (o.g. by Merz) was presented by the director E. Plantamour in 1880; 4-in. transit circle.

Spain and Portugal

Madrid, royal obs., lat. +40° 24′ 29·7″, long. 0 h. 14 m. 45·1 s. W. 10½-in. refr. by Merz, 8¾-in. refr. by Grubb, 6-in. transit circle by Repsold.

Barcelona, obs. of Acad. of Science, lat. +41° 25′ 18″, long. 0 h. 8 m. 28 s. E. Opened 1904; 15-in. refr., phot. and vis. by Mailhat, 7¾-in. transit circle by the same.

Cadiz, naval obs., at San Fernando, lat. +36° 27′ 42·0″, long. 0 h. 24 m. 49·3 s. W. Founded in 1797; 11-in. refr. by Brünner, 13-in. phot. refr. by Henry and Gautier, 8-in. transit circle by Simms.

Lisbon, royal obs., lat. +38° 42′ 31·3″, long. 0 h. 36 m. 44·7 s. W. Founded 1861; 15½-in. refr. by Merz and Repsold, transit circle by Repsold.

Coimbra, univ. obs., lat. +40° 12′ 25·5″, long. 0 h. 33 m. 43·1 s. W. Founded 1792; 6¾-in. transit circle by Repsold, 16-in. refl. by Secretan.

Italy

Turin, univ. obs., lat. +45° 4′ 7·9″, long. 0 h. 30 m. 47·2 s. E. Founded in 1790 by the Academy of Science; rebuilt in 1820 on a tower of the Palazzo Madama, 4½-in. transit circle by Reichenbach, 12-in. refr. by Merz; handed over to the univ. in 1865. A new obs. is being erected 6 km. from the city.

Milan, originally obs. of Brera College, now royal obs. of Brera, lat. +45° 27′ 59·2″, long. 0 h. 36 m. 45·9 s. E. Founded in 1763. The publication of an annual ephemeris from 1775 to 1875 and important theoretical works absorbed most of the time of the directors B. Oriani and F. Carlini, and the instruments were rather insufficient. In 1875 an 8-in. refr. by Merz was mounted, with which G. V. Schiaparelli has made valuable obs. of Mars; 18-in. refr. by Merz.

Padua, univ. obs., lat. +45° 24′ 1·0″, long. 0 h. 47 m. 29·2 s. E. Founded in 1767. In 1837 a meridian circle by Starke of 4-in. ap. was mounted, with which stars from Bessel's zones were reobserved; the results were published in five catalogues; 4½-in. refr. by Merz and Starke (1858); Dembowski's 7-in. refr. mounted in 1881.

Gallarate, near Lago Maggiore, from 1860 to 1879, Baron E. Dembowski's obs. From 1852 to 1859 Baron Dembowski had observed double stars at Naples with a 5-in. dialyte by Plössl and a small transit circle by Starke. From 1860 he used a 7-in. refr. by Merz.

Bologna, univ. obs., lat. +44° 29′ 47·0″, long. 0 h. 45 m. 24·5 s. E. Founded in 1724 on a tower of the univ. building. Obs. have only been made occasionally. A 3½-in. meridian circle was mounted in 1846.

Florence.—In 1774 a museum of science and natural history was established, part of which was used as an obs., but very few obs. were made; a new obs., built 1872 at Arcetri, lat. +43° 45′ 14·4″, long 0 h. 45 m. 1·3 s. E. 11-in. and 9½-in. refrs. by Amici.

Teramo (Abruzzo), private obs. of V. Cerulli, lat. +42° 39′ 27″, long 0 h. 54 m. 56 s. E. 15½-in. refr. by Cooke.

Rome, obs. of the Roman College, lat. +41° 53′ 53·6″, long. 0 h. 49 m. 55·4 s. E. Established in 1787, taken over by the government 1879. In 1853 a new obs. was erected on the unfinished piles of the church of St Ignatius, and furnished with a 9-in. refr. by Merz, a meridian circle by Ertel of 3½-in. ap. (in use from 1842). With these instruments, to which were later added powerful spectroscopes, A. Secchi made a great many obs., chiefly relating to spectrum analysis and physical astronomy; 15-in. refr. by Steinheil.

Rome, obs. of the Capitol, lat. +41° 53′ 33·6″, long. 0 h. 49 m. 56·3s. E. Established in 1848; belongs to the univ.; small transit circle and a 4½-in. refr. by Merz. The latter was used by L. Respighi for obs. of solar prominences.

Rome (Vatican), papal obs., lat. +41° 54′ 4·8″, long. 0 h. 49 m. 49·3s. E. Founded 1890; 10½-in. refr. by Merz, 13-in. phot. and 8-in. vis. refr. and 5½-in. photoheliograph by Henry.

Naples, royal obs., situated at Capo di Monte, lat. +40° 51′ 46·3″, long. 0 h. 57 m. 1·7 s. E. Erected in 1812–1819; a 4-in. meridian circle by Reichenbach, a 6½-in. refr. by Reichenbach and Fraunhofer, 6-in. Merz. refr.

Palermo, royal obs., lat. +38° 6′ 44·5″, long. 0 h. 53 m. 25·9 s. E. Erected in 1790 on a tower of the royal palace. The principal instruments were a reversible vertical circle by Ramsden of 5-ft. diameter with a 3-in. telescope, and a transit instrument of 3-in. ap. With these G. Piazzi observed the stars contained in his celebrated Catalogue of 7641 Stars (1814); this work led him to the discovery of the first minor planet, Ceres, on the 1st of January 1801. The activity was revived in 1857, when a meridian circle by Pistor and Martins of 5-in. ap. was mounted; a 9½-in. refr. by Merz has been used for spectroscopic work.

Catania, lat. +37° 30′ 13·3″, long. 1 h. 0 m. 20·6 s. E. Founded 1885; 13-in. phot. refr. by Henry and Gautier, and a 13-in. refr. by Merz. The latter is used in summer on a duplicate mounting on Mount Etna, where in 1879–1880 an obs. was built at the "Casa degl' Inglesi," 9650 ft. above the sea, for solar obs.

Greece

Athens, lat. +37° 58′ 20″, long. 1 h. 34 m. 55·7 s. E. Erected in 1846; founded by Baron Sina. With a refr. of 6½-in. ap. Julius Schmidt (d. 1884) made obs. of the physical appearance of the moon, planets and comets. Reorganized 1895; 15½-in. refr. by Gautier, 6½-in. transit circle.

Russia

St Petersburg, obs. of the Academy of Sciences, lat. +59° 56′ 29·7″, long. 2 h. 1 m. 13·5 s. E. Founded in 1725, restored in 1803; meridian circle by Ertel. Abolished in 1884. A univ. obs. was founded in 1880, lat. +59° 56′ 32·0″, long. 2 h. 1 m. 11·4 s. E.; 9½-in. refr. by Reinfelder and Repsold, used on double stars, during the summer at Domkino, lat. +58° 35·6′, long. 1 h. 59 m. 25 s. E.

Pulkovo (Pulkowa), Nicholas Central Obs., lat. +59° 46′ 18·7″, long. 2 h. 1 m. 18·6 s. E. Finished in 1839. Was under the direction of F. G. W. Struve till 1861, then of his son O. Struve till 1889. The staff consists now of the director, five astronomers, six assistants and computers. The principal instruments are: a transit instrument by Ertel of 6-in. ap., a vertical circle by Ertel of 6-in. ap. (the circle of 3½-ft. diameter has been redivided by Repsold),—these two instruments are for determining standard places of stars; a meridian circle by Repsold (6-in. ap., 4-ft. circles), used since 1841 to observe all stars north of −15° decl. down to the 6th mag., and all others observed by Bradley; a prime vertical transit by Repsold with 6¼-in. ap., used for determining the constant of aberration; a 7½-in. heliometer by Merz; a refr. by Merz of 14·9-in. ap. (remounted by Repsold in 1880), which was used by O. Struve to observe double stars; 30-in. refr. by Clark and Repsold, erected 1884, chiefly used for spectrographic work; 13-in. phot. refr. See also Odessa.

Åbo (Finland), univ. obs., lat. +60° 26′ 56·8″, long. 1 h. 29 m. 8·3 s. E. Founded in 1819. With the meridian circle by Reichenbach of 4-in. ap. F. W. A. Argelander observed the 560 stars contained in the Åbo catalogue. In consequence of a great fire in 1827 the univ. and obs. were moved to Helsingfors.

Helsingfors (Finland), univ. obs., lat. +60° 9′ 42·6″, long. 1 h. 39 m. 49·1 s. E. Erected in 1832–1835; furnished with a 7-in. refr. and the instruments from Åbo, including a transit instrument by Fraunhofer of 5½-in. ap.; 13-in. phot. refr. erected 1890.

Dorpat (Yuriev), univ. obs., lat. +58° 22′ 46·8″, long. 1 h. 46 m. 53·2 s. E. Founded in 1808; 1814–1839 under the direction of F. G. W. Struve. With a meridian circle by Reichenbach obs. were made from 1822 to 1843, chiefly of double stars, while the 9½-in. refr. by Fraunhofer was used from 1824 to 1837 for measuring double stars.

Warsaw, univ. obs., lat. +52° 13′ 5·7″, long. 1 h. 24 m. 7·3 s. E. Erected in 1820–1824; meridian circle by Reichenbach; 6-in. refr. by Merz.

Moscow, univ. obs., lat. +55° 45′ 19·8″, long. 2 h. 30 m. 17·0 s. E. An obs. was built in 1825–1832; the present building was erected about 1850; 10·7-in. refr by Merz; a meridian circle by Repsold of 5·3-in. ap.; 15½-in. vis.; and phot. refr. by Henry and Repsold.

Kazan, univ. obs., lat. +55° 47′ 24·2″, long. 3 h. 16 m. 28·9 s. E Founded in 1814, restored in 1842; 6½-in. refr. by Merz; meridian circle by Repsold. New obs. built 1899, lat. +55° 50′ 20·0″, long. 3 h. 15 m. 16·5 s. E., for Engelhardt's instruments (see Dresden).

Kharkov, univ. obs., lat. +50° 0′ 9·6″, long. 2 h. 24 m. 55·8 s. E.; 6½-in. transit circle by Repsold.

Kiev, univ. obs., lat. +50° 27′ 11·8″, long. 2 h. 2 m. 0·6 s E. Erected in the years 1840–1845; 9-in. refr. by Merz and Repsold; and a meridian circle.

Odessa, univ. obs., lat. +46° 28′ 36·7″, long. 2 h. 3 m. 2·0 s. E.; 6½ vis. and 6-in. phot. refr.

Odessa, branch of Pulkowa obs., lat. +46° 28′ 37·9″, long. 2 h. 3 m. 2·2 s. E. Established 1898 for obs. of more southerly standard stars, with a 4-in. transit by Freiberg and a 4-in. vertical circle by Repsold.

Nikolayev, naval obs., lat. +46° 58′ 21·8″, long. 2 h. 7 m. 53·8 s. E. Erected in 1824; meridian circle by Ertel of 4-in. ap.; 9½-in. refr. by Repsold.

Sweden, Norway and Denmark

Stockholm, lat. +59° 20′ 33·0″, long. 1 h. 12 m. 14·0 s. E., is under the Academy of Sciences. Founded in 1750. Meridian circle by Ertel of 4½-in. ap.; 7½-in. vis. and 6¼-in. phot. refr. by Repsold.

Upsala, univ. obs., lat. +59° 51′ 29·4″, long. 1 h. 10 m. 30·1 s. E. Founded in 1730, but very little was done until the obs. acquired a 9-in. refr. by Steinheil, which was used by Schultz for micrometric obs. of nebulae. 13-in. phot. and 14-in. vis. refr. by Steinheil.

Lund, univ. obs., lat. +55° 41′ 52·0″, long 0 h. 52 m. 45·0 s. E. Built in 1866; 9½-in. refr., o.g. by Merz; meridian circle by Repsold of 6½-in ap.

Christiania, univ. obs., lat. +59° 54′ 44·0″, long. 0 h. 42 m. 53·6 s.E. Erected in 1831; meridian circle by Ertel of 4-in. ap.; 7-in. refr. by Merz.

Copenhagen, univ. obs. Founded in 1641 on the top of a high tower, lat. +55° 40′ 53·0″, long. 0 h. 50 m. 19·8 s. E. The locality was so very unsuitable that O. Römer (the inventor of the transit instrument and modern equat., d. 1710) established his own obs. at Vridlösemagle, at some distance from the city. A new obs. was erected in 1861, lat. +55° 41′ 12·9″, long. 0 h. 50 m. 18·7 s. E., furnished with a refr. by Merz of 11-in. ap., with which H. L. d'Arrest made obs. of nebulae, and a meridian circle by Pistor and Martins of 4½-in. ap. Later the refr. was replaced by a 14-in. vis. and 8-in. phot. refr. by Steinheil.

Copenhagen, Urania obs. (private), lat. +55° 41′ 19·2″, long. 0 h. 50 m. 9·1 s. E. Established 1898; 9¾-in. refr. by Cooke.

Holland and Belgium

Leiden, univ. obs., lat. +52° 9′ 20·0″, long. 0 h. 17 m. 56·2 s. E. Founded already in 1632, but the instruments were always very small, and hardly any obs. were taken until F. Kaiser became director in 1837. In 1858–1860 a new obs. was erected and furnished with a 7-in. refr. by Merz, and a meridian circle by Pistor and Martins of 6·3-in. ap. Later a 10½-in. refr. by Clarke and Repsold has been erected.

Groningen, astron. laboratory of the univ., lat. +53° 13′ 19·1″, long. 0 h. 26 m. 15·2 s. E. Established 1896; instruments for measuring celestial photographs.

Utrecht, univ. obs., lat. +52° 5′ 9·5″, long. 0 h. 20 m. 31·0 s. E. Erected in 1855; 10-in. refr. by Steinheil.

Brussels, royal obs., lat. +50° 51′ 10·7,″ long. 0 h. 17 m. 28·6 s. E. Erected in 1829–1834. Had a transit instrument by Gambey and a mural circle by Troughton, but the institution was, while under the direction of L. A. J. Quetelet, chiefly devoted to physics and meteorology. In 1877 a 6-in. refr. by Merz was mounted, and a meridian circle by Repsold and a 15-in. refr. by Cooke provided. A new obs. was erected in 1891 at Uccle, lat. +50° 47′ 55·5″, long. 0 h. 17 m. 26·9 s. E., with the instruments from Brussels, a 9-in. phot. refr. by Grubb, and a 13-in. phot. refr. by Gautier.

Liége, univ. obs., lat. +50° 37′ 6″, long. 0 h. 22 m. 15·4 s. E.; 10-in. refr. and 7-in. transit circle by Cooke.

United States

Albany (New York), Dudley obs. Erected in 1851–1856 by subscription, lat. +42° 39′ 49·5″, long. 4 h. 54 m. 59·2 s.W. Refr. by Fitz of 13-in. ap., meridian circle by Pistor and Martins of 8-in. ap. New obs. erected 1893, lat. +42° 39′ 12·7″, long. 4 h. 55 m. 6·8 s. W.; 12-in. refr. by Brashear.

Allegheny (Pa.), lat. +40° 27′ 41·6″, long. 5 h. 20 m. 2·9 s. W. Founded in 1859, transferred to the Western Univ. of Penn. (now Univ. of Pittsburgh) in 1867; 13-in. refr. by Fitz (improved by Clark), mounted in 1867; instruments for researches on solar energy.

Amherst (Mass.), lat. +42° 21′ 56·5″, long. 4 h. 50 m. 5·9 s. W. Founded in 1857 as an annex to Amherst College; 7¼-in. refr. by Clark. New building 1903; 18-in. refr. by Clark; 6½-in. transit circle by Pistor and Martins.

Ann Arbor (Michigan), lat. +42° 16′ 48·8″, long 5 h. 34 m. 55·2 s. W. Detroit obs. of the Univ. of Michigan; erected in 1854; meridian circle by Pistor and Martins of 6½ in. ap.; 12½-in. refr. by Fitz.

Berkeley (Cal.), Students' obs. of Univ. of California, lat. +37° 52′ 23·6″, long. 8 h. 9 m. 2·7 s. W.; 8-in. refr.

Cambridge (Mass.), Harvard College obs., lat. +42° 22′ 47·6″, long. 4 h. 44 m. 31·0 s. W. Erected in 1839. Refr. of 15-in. ap. by Merz, with which W. C. Bond discovered a satellite of Saturn (Hyperion) in 1848, employed by E. C. Pickering for extensive photometric obs. of fixed stars and satellites; a meridian circle by Troughton and Simms of 8¼-in. ap., mounted in 1870; 12-in. horizontal telescope for photometric obs. of faint stars, 11-in. and 8-in. Draper refrs. for phot. work; 15-in. Draper refl.; 24-in. phot. doublet (Bruce telescope) with which the ninth and tenth satellites of Saturn have been discovered by W. H. Pickering. Branch obs. at Arequipa, Peru.

Charlottesville (Va.), obs. of Univ. of Virginia, lat. +38° 2′ 1·2,″ long. 5 h. 14 m. 5·2 s. W. Founded 1882; 26-in. refr. by Clark.

Chicago (Illinois), Dearborn obs., lat. +41° 51′ 1·0″, long. 5 h. 50 m. 26·8 s. W. Attached to North-western Univ., founded in 1862; 18½-in. refr. by Clark; 6-in. meridian circle by Repsold. Obs. removed to Evanston (Ill.) in 1889, lat. +42° 3′ 33·4″, long. 5h. 50 m. 42·3 s.W.

Cincinnati (Ohio). In 1842 an obs. was founded by subscription, lat. +39° 6′ 26·5″, long. 5 h. 37 m. 58·9 s. W., and furnished with a refr. of 11¼-in. ap. by Merz. In 1873 the obs. was removed to a distance from the city, to Mount Lookout, lat. + 39° 8′ 19·5″, long. 5 h. 37 m. 41·3 s. W.; 5-in. transit circle by Fauth.

Clinton (New York), Litchfield obs. of Hamilton College, lat. +43° 3′ 16·5″, long. 5 h. 1 m. 37·4 s. W. Erected by subscription 1852–1855; refr. of 13½ in. by Spencer, employed by C. H. F. Peters for construction of celestial charts, in the course of which work he discovered forty-one minor planets.

Columbia (Mo.), Laws obs. of Univ. of Missouri, lat. +38° 56′ 51·7″, long. 6 h. 9 m. 18·3 s. W. Founded 1853; 7½-in. refr. by Merz.

Columbus (Ohio), State Univ. obs., lat. +40° 0′ 1″, long. 5h. 32 m. 10 s. W.; 12-in. refr. by Brashear and Warner & Swasey.

Denver (Col.), Univ. of Denver obs., lat. +39° 40′ 36″, long. 6 h. 59m. 47·6 s. W.; 5400 ft. above sea-level. Founded 1891; 20-in. refr. by Clark; 6-in. refr. by Grubb; 4-in. transit circle by Saegmüller.

Flagstaff (Arizona), private obs. of Percival Lowell, lat. +35° 12′ 30·5″, long. 7 h. 26 m. 44·6 s. W. 7300 ft. above sea-level. Erected 1894; 24-in. refr. by Clark; 6-in. vis. by Clark; and 5-in. phot. refr. by Brashear, all used chiefly on planets.

Georgetown (District of Columbia), Georgetown Univ. obs., lat. +38° 54′ 26·7″, long. 5 h. 8 m. 18·3 s. W. Erected in 1844; 12-in. refr. by Clacey and Saegmüller; 9-in. phot. transit instr. (1890) by Saegmüller; 6-in. phot. zenith telescope by Brashear.

Glasgow (Missouri), Morrison obs., lat. +39° 16′ 16·8″, long. 6 h. 11 m. 18·1 s. W. Founded in 1876; attached to Pritchett College; 12¼-in. refr. by Clark; meridian circle by Simms of 6-in. ap.

Hanover (New Hampshire), Shattuck obs. of Dartmouth College, lat. +43° 42′ 15·3″, long. 4 h. 49 m. 7·9 s. W. Founded in 1853; 9¼-in. refr. by Clark; meridian circle by Simms of 4-in. ap.

Hastings (New York), Professor Henry Draper's obs., lat. +40° 59′ 25″, long. 4 h. 55 m. 29·7s. W. Built in 1860; 28-in. refl. by the owner, 11-in. refr. (with photo. lens) by Clark, both used up to the owner's death (1882) for celestial and spectrum photography.

Haverford (Pa.), Haverford College obs., lat. +40° 0′ 40·1″, long. 5 h. 1 m. 12·7 s. W.; 10-in. refr. by Clark.

Madison (Wisconsin), Washburn obs., lat. +43° 4′ 36·8″, long. 5 h. 57 m. 38·1 s.W. Erected at the expense of Governor Washburn in 1878; belongs to the Univ. of Wisconsin; meridian circle by Repsold of 4·8-in. ap.; 15½-in. refr. by Clark.

Mount Hamilton (Cal.), Lick obs. of the Univ. of California, lat. +37° 20′ 25·6″, long. 8 h. 6 m. 34·9 s. W., about 4250 ft. above sea-level. Erected in pursuance of the will of James Lick (1796–1876), opened in 1888; 36-in. refr. by Clark with 33-in. phot. lens, 12-in. refr. by Clark, 6½-in. transit circle by Repsold, 3-ft. s.g. refl. by Common, several phot. telescopes, a second 3-ft. s.g. refl. by Brashear with spectrograph. The 5th satellite of Jupiter was discovered by E. E. Barnard in 1892 with the 36 in., and the 6th and 7th by C. D. Perrine on photos with the refl. in 1904–1905.

Mount Wilson (Cal.). Solar obs. of the Carnegie Institution, lat. +34° 12′ 59·5″, long. 7h. 52 m. 14·3 s. W. Erected 1904; 60-in. refl.; "Snow telescope" with 30-in. coelostat and 24-in. concave mirror with large spectroheliograph. A 100-in. refl. has been ordered.

New Haven (Connecticut), Winchester obs. of Yale College, lat. +41° 19′ 22·3″, long. 4 h. 51 m. 40·6 s. W. An obs. had existed since 1830, possessing a 9-in. refr. by Clark and a meridian circle by Ertel. In 1881 the obs. was rebuilt, and furnished with a 6-in. heliometer by Repsold, and an 8-in. refr. by Grubb.

New York, L. M. Rutherfurd's obs., lat. +40° 43′ 48·5″, long. 4 h. 55 m. 56·6 s.W.; 13-in. refr. by Rutherfurd and Fitz, used for celestial photography. Presented to Columbia College in 1884. New obs. (Wilde), lat. +40° 45′ 23·1″, long. 4 h. 55 m. 53·6 s.

Northfield (Minnesota), Goodsell obs. of Carleton College, lat. +44° 27′ 41·6″, long. 6 h. 12 m. 35·8 s. W. Erected in 1878, enlarged 1887; 8¼-in. refr. by Clark with phot. o.g.; 16-in. refr. by Brashear; 4¾-in. transit circle by Repsold.

Philadelphia, Flower obs. of Univ. of Pennsylvania, lat. +39° 58′ 2·1″, long. 5 h. 1 m. 6·6 s. W. Founded 1895; 18-in. refr., 4-in. transit circle and 4-in. zenith telescope, all by Brashear and Warner & Swasey.

Poughkeepsie (N.Y.), Vassar College obs., lat. +41° 41′ 18″, long. 4 h. 55 m. 33·7 s. W. Founded 1865; 12-in. refr. by Fitz and Clark; small transit circle.

Princeton (New Jersey). Attached to Princeton Univ. are two obs.—the "Observatory of Instruction," lat. +40° 20′ 57·8″, long. 4 h. 58 m. 37·6 s. W., erected in 1877, and furnished with a 9½-in. refr. by Clark; and the Halsted obs., lat. +40° 20′ 55·8″, long. 4 h. 58 m. 39·4 s. W., in which a 23-in. refr. by Clark was mounted in 1883.

Rochester (New York), Warner obs., lat. +43° 9′ 16·8″, long. 5 h. 10 m. 21·8 s. W. Erected by H. H. Warner in 1879–1880; 16-in. refr. by Clark. Discontinued 1895.

Washington (D.C.), U.S. naval obs., lat. +38° 53′ 38·8″, long. 5 h. 8 m. 12·1 s. W. Organized in 1842; obs. begun in 1845 with a mural circle by Troughton & Simms of 4 in., a transit instrument by Ertel of 5·3-in. ap., and a 9·6-in. refr. by Merz. A meridian circle by Pistor & Martins of 8·5-in. ap., mounted in 1865, and used for observing standard stars and planets; a 26-in. refr. by Clark, mounted in 1873—with this instrument A. Hall discovered the satellites of Mars in 1877. A new obs. on Georgetown Heights was opened in 1893, lat. +38° 55′ 14·0″, long. 5 h. 8 m. 15·8 s. W.; in addition to the old instruments there is a 40-ft. photoheliograph of 5-in. ap., 6-in. transit circle built of steel by Warner & Swasey, 5-in. steel altazimuth by same, 12-in. refr. by Clark.

Washington (D.C.), astrophysical obs. of the Smithsonian Institution, lat. +38° 53′ 17·3″, long. 5 h. 8 m. 6·2 s. W. Founded 1890 for the study of solar radiation; 20-in. siderostat, spectrobolometer, &c.

Williams Bay (Wis.).—Yerkes obs. of Univ. of Chicago, lat. +42° 34′ 12·6″, long. 5 h. 54 m. 13·2 s. W. Opened 1897; 40-in. refr. by Clark and Warner & Swasey; also a 12-in. refr., 24-in. refl., 10-in. phot. refr.

Williamstown (Mass.), lat. +42° 42′ 49″, long. 4 h. 52 m. 33·5 s. W. Founded in 1836; 7½-in. refr. by Clark; meridian circle of 4½-in. ap. by Repsold, mounted in 1882 in the Field Memorial obs., lat. +42° 40′ 30″, long. 4 h. 52 m. 50 s. W.

CANADA

Ottawa, Dominion obs., lat. +45° 23′, long. 5 h. 3 m. W. Founded 1902; 15-in. refr. by Brashear; 8-in. transit circle by Simms; 16-in. coelostat.

MEXICO

Tacubaya.—National obs. erected 1882, lat. +19° 24′ 17·5″, long. 6 h. 36 m. 46·7 s. W., 7600 ft. above sea-level; 15-in. refr. by Grubb, 13-in. phot. refr. by Henry & Gautier, 8-in. transit circle by Simms.

SOUTH AMERICA

Santiago (Chile), national obs., lat. −33° 26′ 42·0″, long. 4 h. 42 m. 46·2 s. W. In 1849 the U.S. government sent an astronomical expedition to Chile. When the expedition returned in 1852, the government of Chile bought the instruments—a 6-in. meridian circle by Pistor and Martins, a 6½-in. refr. by Fitz, &c. New building erected 1860; 9½-in. refr. by Merz and Repsold, 13-in. phot. refr. by Gautier.

Arequipa (Peru).—Branch of Harvard College obs., lat. −16° 24′, long. 4 h. 45 m. 30 s. W., 8060 ft. above sea-level; 24-in. Bruce refr. by Clark; and 13-in. Boyden telescope for phot. charts and spectra of faint stars; 4-in. transit photometer extends the Harvard photometry to the south pole.

Rio de Janeiro (Brazil), national obs., lat. −22° 54′ 23·7″, long. 2 h. 52 m. 41·4 s. W. Founded in 1845; no work done until 1871. The principal instruments are a meridian circle by Gautier of 7¾-in. ap., an altazimuth, a 9½-in. refr. by Henry, &c.

Cordoba (Argentina), national obs., lat. −31° 25′ 15·4″, long. 4 h. 16 m. 45·1 s. W. Erected in 1871 under the direction of B. A. Gould till 1883. With a meridian circle by Repsold of 5-in. ap. 105,000 zone obs. of stars between −23° and −80° decl. have been made; 11½-in. phot. refr. by Clarke; 5-in. phot. refr. by Henry & Gautier.

La Plata (Argentina), univ. obs., lat. −34° 54′ 30·3″, long. 3 h. 51 m. 37·0 s. W. Founded 1883; 18-in. equat. coudée, 13-in. phot. refr. and transit circle, all by Henry & Gautier.

AFRICA

Cape of Good Hope, royal obs., lat. −33° 56′ 3·5″, long. 1 h. 13 m. 54·8 s. E. Founded in 1820; erected in 1825–1829, about 3½ m. from Cape Town. Obs. were begun in 1829 with a transit instrument by Dollond of 5-in. ap. and a mural circle by Jones. Thomas Maclear undertook to verify and extend the arc of meridian measured by N. L. de Lacaille in 1751–1753, which work occupied the obs. staff for a number of years. In 1849 a 7-in. refr. by Merz was mounted, and in 1855 a new meridian circle, a facsimile of the one at Greenwich, superseded the older instruments. Maclear was succeeded by E. J. Stone (1870 to 1879), who devoted himself and the staff to obs. of stars, embodied in a catalogue of 12,441 stars for the epoch 1880. Under Sir David Gill (1879–1906) a 7-in. heliometer by Repsold has been used since 1887 for researches on solar parallax and annual parallax of stars, while a complete review of the heavens has been made south of −23° decl. with a 6-in. phot. Dallmeyer lens. A 24-in. phot. and 18-in. vis. refr. by Grubb, with 24-in. o.g. prism, and a 6-in. transit circle by Simms have also been mounted.

Besides the obs. of Lacaille in Cape Town (lat. −33° 55′ 16·1″, long. 1 h. 13 m. 41 s. E.), another temporary obs. at Feldhausen, lat. −33° 58′ 56·6″, long. 1 h. 13 m. 51 s. E., 6 m. from Cape Town, deserves to be mentioned. It was here that Sir John Herschel observed nebulae and double stars from 1834 to 1838 with a refl. of 18¼-in. ap.

Durban (Natal).—Government obs., lat. −29° 50′ 46·6″, long. 2 h. 4 m. 1·2 s. E. Erected in 1882; 8-in. refr. by Grubb.

Mauritius.—Royal Alfred obs., lat. −20° 5′ 39″, long. 3 h. 50 m. 12·5 s. E. Chiefly meteorological, but solar photos regularly taken.

Helwân (near Cairo, Egypt), khedivial obs., lat. +29° 51′ 34″, long. 2 h. 5 m. 22 s. E. Erected in 1904; 30-in. refl. used for photos of southern nebulae.

Algiers (Algeria), national obs., lat. +36° 47′ 50″, long. 0 h. 12 m. 8·4 s. E. Founded 1881; 12·5-in. equat. coudée and 13-in. phot. refr. by Gautier; transit circle.

St Helena, lat. −15° 55′ 26·0″, long. 0 h. 22 m. 54·6 s. W. With a transit instrument and mural circle. M. Johnson observed the places of 606 southern stars from 1829 to 1833.

INDIA

Madras, government obs., lat. +13° 4′ 8·0″, long. 5 h. 20 m. 59·6 s. E. In 1831 a transit instrument and a mural circle, both of 3¾-in. ap., by Dollond, were mounted, and with these T. G. Taylor observed 11,000 stars. A meridian circle by Simms was mounted in 1858, and in 1865 an 8-in. refr., also by Simms, was put up; with the former 5303 stars were observed in 1862–1887. New obs. built in 1899 at Kodaikanal (Palni Hills), lat. +10° 13′ 50″, long. 5 h. 9 m. 52 s. E., 7700 ft. above sea-level; 12-in. siderostat and phot. vis. o.g. by Cooke, spectroheliograph, &c. To be devoted chiefly to solar physics.

Poona.—Obs. of College of Science. Founded 1888. 12-in. siderostat by Cooke with 9-in. lens by Grubb; 16½-in. s.g. refl. by Grubb, with 6-in. refr. by Cooke; spectroscopes, &c., chiefly for solar work.

Dehra Dûn.—Obs. of Indian Survey, lat. +30° 18′ 51·8″, long. 5 h. 12 m. 13·5 s. E. Regular solar phot. work.

Trivandrum, lat. + 8° 30′ 32″, long. 5 h. 7 m. 59 s. E. Founded by the raja of Travancore in 1836. No astronomical work done, but valuable magnetical and meteorological obs. were made by J. A. Broun from 1852 to 1863.

JAPAN

Tokyo, univ. obs., lat. +35° 39′ 17·5″, long. 9 h. 18 m. 58·0 s. E.; 5½-in. transit circle by Repsold; 6½-in. refr.

CHINA

Zo-Se (near Shanghai), Jesuit obs., lat. +31° 5′ 47·1″, long. 8 h. 4 m. 44·7 s. E. Erected 1899–1901; 16-in. vis., and phot. refr. for solar and stellar phot. and spectroscopic work.

Hong Kong, lat. +22° 18′ 13·2″, long. 7 h. 36 m. 41·9 s. E. In 1883 the colonial government established an obs., furnished with a 6-in. refr., a small transit instrument and full equipment of magnetical and meteorological instruments.

TURKESTAN

Tashkent, lat. +41° 19′ 31·4″, long. 4 h. 37 m. 10·8 s. E. Founded in 1874; 6-in. refr. and meridian circle by Repsold; 13-in. phot. refr. by Henry & Repsold.

AUSTRALIA

Paramatta (New South Wales), lat. −33° 48′ 50″, long. 10 h. 4 m. 6·3 s. E. Erected by Sir Thomas Macdougall Brisbane in 1821; handed over to the New South Wales government in 1826; furnished with a transit instrument and a mural circle by Troughton. From about 1835 no obs. seem to have been made; the obs. was abolished in 1855.

Sydney (New South Wales), lat. −33° 51′ 41·1″, long. 10 h. 4 m. 49·5 s. E. Founded in 1855; furnished with the instruments from Paramatta. In 1861 a 7¼-in. refr. by Merz, and in 1874 an 11½-in. refr. by Schröder, were mounted; in 1879 a meridian circle by Simms of 6-in. ap. was acquired, and later a 13-in. phot. refr. by Grubb.

Windsor (New South Wales), lat. −33° 36′ 28·9″, long. 10 h. 3 m. 21·7 s. E. Private obs. of Mr J. Tebbutt, who has devoted himself since 1861 to discoveries and obs. of comets, using a 4½-in. refr. by Cooke and an 8-in. refr. by Grubb.

Melbourne (Victoria).—Founded in 1853 at Williamstown, lat. −37° 52′ 7·2″, long. 9 h. 39 m. 38·8 s. E. In 1861 a meridian circle by Simms of 5-in. ap. was mounted, but in 1863 the obs. was removed to Melbourne, lat. −37° 49′ 53·2″, long. 9 h. 39 m. 54·0 s. E. "The great Melbourne telescope," a Cassegrain refl., equatorially mounted, of 4-ft. ap., made by T. Grubb, was erected in 1869, but very little used; there is also an 8-in. refr. by Cooke and a 13-in. phot. refr. by Grubb.

Adelaide (South Australia), lat. −34° 55′ 33·8″, long. 9 h. 14 m. 21·3 s. E. In operation since 1861; has been gradually improved, and contains now an 8-in. refr. by Cooke and a 6-in. transit circle by Simms.

Perth (West Australia), lat. −31° 57′ 7·4″, long. 7 h. 43 m. 21·7 s. E. Founded 1897; 13-in. phot. and 10-in. vis. refr. by Grubb; 6-in. transit circle by Simms.

AUTHORITIES.—In addition to their *Annals* or *Observations*, the leading national obs. (Greenwich, Paris, Washington, &c.) publish annual reports stating the nature of the work and changes in *personnel* and instruments. Short reports from nearly all British obs. are annually published in the February number of the *Monthly Notices R. Astr. Soc.*, and from most German and some other continental obs. in the *Vierteljahrsschrift d. astr. Gesellschaft.* Since 1889 much information about American obs. is given in the *Publications of the Astr. Soc. of the Pacific.* Stroobant's *Les Observatoires astronomiques et les astronomes* (Brussels, 1907) gives a convenient summary of the *personnel* and equipment of all existing obs. (J. L. E. D.)

OBSIDIAN, a glassy volcanic rock of acid composition. A similar rock was named *obsianus* by medieval writers, from its resemblance to a rock discovered in Ethiopia by one Obsius. The early printed editions of Pliny erroneously named the discoverer Obsidius, and the rock *obsidianus.* Rhyolitic lavas frequently are more or less vitreous, and when the glassy matter greatly predominates and the crystals are few and inconspicuous the rock becomes an obsidian; the chemical composition is essentially the same as that of granite; the difference in the physical condition of the two rocks is due to the fact that one consolidated at the surface, rapidly and under low pressures, while the other cooled slowly at great depths and under such pressures that the escape of the steam and other gases it contained was greatly impeded. Few obsidians are entirely vitreous; usually they have small crystals of felspar, quartz, biotite or iron oxides, and when these are numerous the rock is called a porphyritic obsidian (or hyalo-liparite). These crystals have, as a rule, very good crystalline form, but the quartz and felspar are often filled with enclosures of glass.

All obsidians have a low specific gravity (about 2.4) both because they are acid rocks and because they are non-crystalline. Their lustre is vitreous except when they contain many minute crystals; they are then velvety or even resinous in appearance. Thin splinters and the sharp edges of fragments are transparent. Black, grey, yellow and brown are the prevalent colours of these rocks. In hand specimens they often show a well-marked banding which is sometimes flat and parallel, but may be sinuous and occasionally is very irregular, resembling the pattern of damascened steel. In such cases the molten rock cannot have been homogeneous, and as it flowed along the ground the different portions of it were drawn out into long parallel streaks. As the rock was highly viscous and the surface over which it moved was often irregular the motion was disturbed and fluctuating; hence the sinuous and contorted appearance frequently assumed by the banding. When crystals are present they generally have their long axes parallel to the fluxion.

Even when conspicuous and well formed crystals are not visible in the rock there is nearly always an abundance of minute imperfect crystallizations (microlites, &c.). They are often so small that high magnifications may be necessary to ascertain their presence. Some are globular and others are rod-shaped; they may be grouped in clusters, stars, rosettes, rows, chains or swarms of indefinite shape. In banded obsidians these microlites may be numerous in some parts but few or absent in others. The larger ones polarize light, have angular outlines like those of crystals, and may even show twinning and definite optical properties by which they can be identified as belonging to felspar, augite or some other rock-forming mineral. The variety of their shapes is endless. Some are black, very thin and curved like threads or hairs (trichites); often a group of these is seated on a small crystal of augite or magnetite and spreads outwards on all sides. Others have hollow or funnel-shaped ends and are constricted at the middle like a dice cup. In some rocks small rod-like microlites are grouped together in a regular way to form growths which resemble fir branches, fern leaves, brushes or networks, in the same manner as minute needles of ice produce star-like snow crystals or the frost growths on a window pane.

These crystallites (*q.v.*) show that the glassy rock has a tendency to crystallize which is inhibited only by the very viscous state of the glass and the rapidity with which it was cooled. Another type of incipient crystallization which is excessively common in obsidian is spherulites (*q.v.*), or small rounded bodies which have a radiating fibrous structure. They are of globular shape, less frequently irregular or branching, and may be elongated and cylindrical (axiolites). In some obsidians from Teneriffe and Lipari the whole rock consists of them, so closely packed together that they assume polygonal shapes like the cells of a honeycomb. In polarized light they show a weak grey colour with a black cross, the arms of which are parallel to the cobwebs in the eyepiece of the microscope and remain stationary when the section is rotated. Often bands of spherulites alternate with bands of pure glass, a fact which seems to indicate that the growth of these bodies took place before the rock ceased to flow.

As cooling progresses the glassy rock contracts and strain phenomena appear in consequence. Porphyritic crystals often contract less than the surrounding glass, which accordingly becomes strained, and in polarized light may show a weak double refraction in a limited area surrounding the crystal. Minute cracks are sometimes produced by the contraction; they are often more or less straight, but in other cases a very perfect system of rounded fissures arises. These surround little spherules of glass which are detached when the rock is struck with a hammer. There may be concentric series of cracks one within another. The minute globular bodies have occasionally a sub-pearly lustre, and glassy rocks which possess this structure have been called perlites (*q.v.*). If we take a thin layer of natural Canada balsam and heat it strongly for a little time most of the volatile oils are driven out of it. When it cools it becomes hard, but if before it is quite cold we plunge it into cold water a very perfect perlitic structure will arise in it. Occasionally the rounded cracks extend from the matrix into some of the crystals especially those of quartz which have naturally a conchoidal fracture. If the matrix, however, is originally crystalline it does not seem probable that perlitic structure can develop in it. Hence it may be regarded as diagnostic of rocks which were vitreous when they consolidated.

In mineralogical collections rounded nodules of brown glass, varying from the size of a pea to that of an orange, may often be seen labelled *marekanite.* They have long been known to geologists and are found at Okhotsk, Siberia, in association with a large mass of perlitic obsidian. These globular bodies are, in fact, merely the more coherent portions of a perlite; the rest of the rock falls down in a fine powder setting free the glassy spheres. They are subject to considerable internal strain, as is shown by the fact that when struck with a hammer or sliced with a lapidary's saw they often burst into fragments. Their behaviour in this respect closely resembles the balls of rapidly cooled, unannealed glass which are called Prince Rupert's drops. In their natural condition the marekanite spheres are doubly refracting, but when they have been heated and very slowly cooled they lose this property and no longer exhibit any tendency to sudden disintegration.

Although rocks wholly or in large part vitreous are known from very ancient geological systems, such as the Devonian, they are certainly most frequent in recent volcanic countries. Yet among the older rocks there are many which, though finely crystalline, have the chemical composition of modern obsidians and possess structures, such as the perlitic and spherulitic, which are very characteristic of vitreous rocks. By many lines of evidence we are led to believe that obsidians in course of time suffer devitrification, in other words they pass from the vitreous into a crystalline state, but as the changes take place in a solid mass they require a very long time for their achievement, and the crystals produced are only of extremely small size. A dull stony-looking rock results, the vitreous lustre having entirely disappeared, and in microscopic section this exhibits a cryptocrystalline structure, being made up of exceedingly minute grains principally of quartz and felspar. Often this felsitic devitrified glass is so fine-grained that its constituents cannot be directly determined even with the aid of the microscope, but chemical analysis leaves little doubt as to the real nature of the minerals which have been formed. Many vitreous rocks show alteration of this type in certain parts where either the glass has been of unstable nature or where agencies of change such as percolating water have had easiest access (as along joints, perlitic cracks and the margins of dikes and sills). Obsidians from Lipari often have felsitic bands alternating with others which are purely glassy. In Arran there are pitchstone dikes, some of which are very completely vitreous, while others are changed to spherulitic felsites more or less silicified. The pitchstone of the Scuir of Eigg is at its margins characterized by a dull semi-opaque matrix which seems to be the result of secondary devitrification. In the same way artificial glass can be devitrified if it be kept at a temperature slightly below the fusing point for some days. Window glass exposed to alkaline vapours often shows a thin iridescent surface film which is supposed to be due to crystallization; the same change is found in pieces of Roman glass which have been dug out of the ruins of Pompeii.

Obsidians occur in many parts of the world along with rhyolites and pumice. In Europe the best-known localities for them are the Lipari Islands, Pantellaria, Iceland and Hungary. Very fine obsidians are also obtained in Mexico, at the Yellowstone Park, in New Zealand, Ascension and in the Caucasus. Included in this group are some rocks which are more properly to be regarded as vitreous forms of trachyte than as glassy rhyolites (Iceland), but except by chemical analyses they cannot be separated. It is certain, however, that most obsidians are very acid or rhyolitic. The dark, semi-opaque glassy forms of the basic igneous rocks are known as tachylytes. The typical obsidians exhibit the chemical peculiarities of the acid igneous rocks (viz. high percentage of silica, low iron, lime and magnesia, and a considerable amount of potash and soda).

The chemical composition of typical obsidians is shown by the following analyses:—

	SiO_2.	A_2O_3.	FeO.	Fe_2O_3.	CaO.	MgO.	K_2O.	Na_2O.	H_2O.
I. Yellowstone Park .	74·70	13·72	0·62	1·01	0·78	0·14	4·02	3·90	0·62
II. Iceland . . .	75·28	10·22	. .	4·24	1·81	0·25	2·44	5·53	0·23
III. Mexico . . .	73·63	14·25	1·80	. .	tr.	1·42	4·39	4·61	. .

Obsidian, when broken, shows a conchoidal fracture, like that of glass, and yields sharp-edged fragments, which have been used in many localities as arrow-points, spear-heads, knives and razors. For such purposes, as also for use as mirrors, masks and labrets, it was extensively employed, under the name of *itztli*, by the ancient Mexicans, who quarried it at the Cerro de las Navajas, or "Hill of Knives," near Timapan. The natives of the Admiralty Islands have used it for the heads of spears. By the ancient Greeks and Romans obsidian was worked as a gem-stone; and in consequence of its having been often imitated in glass there arose among collectors of gems in the 18th century the practice of calling all antique pastes "obsidians." At the present time obsidian is sometimes cut and polished as an ornamental stone, but its softness (H=5 to 5·5) detracts from its value. Certain varieties, notably some from Russia, possess a beautiful metallic sheen, referable to the presence of either microscopic fissures or enclosures. The substance known as moldavite, often regarded as an obsidian, and the so-called obsidian bombs, or obsidianites, are described under MOLDAVITE. (J. S. F.)

OBSTETRICS, the science and art of midwifery (Lat. *obstetrix*, a midwife, from *obstare*, to stand before). Along with Medicine and Surgery, Obstetrics goes to form what has been called the Tripos of the medical profession, because every person desiring to be registered under the Medical Acts must pass a qualifying examination alike in medicine, surgery and midwifery. The term Gynaecology (*q.v.*), which has come to be applied to the study of the diseases of the female generative system, in its primary sense includes all that pertains to women both in health and disease. Obstetrics, or midwifery, is more specially that part of the science of gynaecology which deals with the care of a pregnant woman and the ushering of her child into the world.

Tokology—the doctrine of parturition—is the most distinctive sphere of interest for obstetricians, and here their activities bring them into a closer approximation to the work of surgeons. As a science it demands a study of the phenomena of labour, which in their ordered succession are seen to present three distinct stages: one of preparation, during which the uterus dilates sufficiently to allow of the escape of the infant; a second, of progress, during which the infant is expelled; and a third, of the extrusion of the after-birth or placenta. In each of the stages analysis of the phenomena reveals the presence of three elements which are known as the factors of labour, viz. the powers or forces which are engaged in the emptying of the uterus; the passages or canals through which the ovum is driven; and the passenger or body that is being extruded. The mechanism of labour depends on the balance of these factors as they become adjusted to each other in the varying phenomena of the several stages. The diversities that are met with in different labours even of the same woman have led to their being classified into different groups. A natural labour is commonly defined as one where the child presents by the head and the labour is terminated within twenty-four hours. From this it is obvious that no case of labour can be defined at its onset. The relation of the factors may warrant a favourable expectation; but until the labour is completed, and completed within a reasonably safe period, it cannot be classed as natural. The element of time has this importance, that it is found that, apart from all accidents and interferences, the mortality both to mother and child becomes greater the longer the duration of the labour. Hence lingering or tedious labours, in which the child still presents with the head, but is not expelled within twenty-four hours after the onset of labour-pains, are properly grouped in a separate class, although they are terminated without operative interference. In the class of preternatural labours, where the head comes last instead of first, there are two subdivisions, according as the child presents by the breech and feet, or lies transversely as a cross-birth, and has usually to be delivered artificially. Operative or instrumental labours vary according as the procedures adopted are safe in principle to mother and child, such as turning and the application of the midwifery forceps; or as they involve damage to the infant in the various forms of embryotomy; or are more dangerous to the mother, as in the Caesarean section and symphysiotomy. A final class of labours includes the cases where some complication or anomaly arises and becomes a source of danger, independently of disturbances of the mechanism or of any operative interference. These complex labours are due to complications that may be maternal, such as haemorrhage and convulsions; or foetal, such as twins or prolapse of the umbilical cord. To cope with these anomalies an obstetrician requires all the resource of a physician and all the dexterity of a surgeon.

The interest of obstetricians in their patients does not end with the birth of the children, even after natural labours. The puerpera is still a subject of care. The uterus, that during its nine months' evolution had been increasing enormously in all its elements, has in six weeks to undergo an involution that will restore it to its pregravid condition. The allied organs share in their measure in the change, all the systems of the body feel the influence, and especially the mammary glands take on their function of providing milk for the nutriment of the new-born infant. A patient with some latent flaw in her constitution may pass the test of pregnancy and labour with success, only to succumb during the puerperium. Of patients who become insane in connexion with child-bearing, a half manifest their mental disorder first during the days or weeks immediately succeeding their confinement, and numbers more whilst they are suckling their infants. A woman may have had an easy labour, and may have been thankful at the time for help from a hand that she did not know to be unclean; three days later germs left by that hand may have so multiplied within her that she is in mortal danger from septicaemia. The management of the puerperal patient requires not only the warding off of deleterious influences, but the watching of the normal processes, because slight deviations in these, undetected and uncorrected now, may become later a source of lifelong invalidism. It remains further to be noted that to obstetricians belong the earliest stages of pediatrics in their care of the new-born child. In some old works practitioners of this branch of the profession are described as ὀμφαλοτόμοι, because their first business was to cut the umbilical cord. The causes of the high death-rate among infants, whether due to ante-natal, intra-natal or neo-natal conditions, come under their observation. They have charge of the whole wide field of the hygiene, pathology and therapeutics of infancy.

Historical Sketch.—The origin of midwifery is lost in the mists of human origins. The learned Jean Astruc, who gave a lead to higher critics in their analysis of the Pentateuch by pointing out the presence of Elohistic and Jehovistic elements, exercised his imagination in fancying how the earliest pair comported themselves at the birth of their first child, and especially how the husband would have to learn what to do with the placenta and umbilical cord. His speculations are not in the least illuminative. The Mosaic writings let us see women of some experience and authority by the side of a Rachel dying in labour, or a Tamar giving birth to twins, and superintending the easy labours of Hebrew slaves in Egypt. The Ebers Papyrus (1550 B.C.), which Moses may have studied when he grew learned in all the wisdom of the Egyptians, is the oldest known medical production. It contains prescriptions for causing abortion, for promoting labour, for curing displacements of the uterus, &c. But there is no indication as to how labours are to be managed, and with regard to the child there are only auguries given as to whether it will live or die, according, *e.g.* as its first cry after it is born sounds like *nī* or *bá*.

The story of the rise and progress of midwifery is intimately bound up with the history of medicine in general. The obstetrician, looking for the dawn of his science, turns like his fellow-workers in other medical disciplines to the Hippocratic writings (400 B.C.). Now the father of medicine was not an obstetrician. As with Egyptians and Hebrews, the skilled attendants on women in labour among the Greeks were also women. But since nothing that concerned the ailments of humanity was foreign to Hippocrates, there are indications in the writings that are accounted genuine of his interest in the disorders of females—in their menstrual troubles, in their sterility, in their gestation symptoms, and in their puerperal diseases; his oath forswears the use of abortifacients, and he recommends the use of sternutatories to hasten the expulsion of the after-birth. In the Hippocratic writings that are supposed to be products of his followers, some of these subjects are more fully dealt with; but whilst the physician is sometimes called in to give advice in difficult labours, so that he can describe different kinds of presentation and can speak of the possibility of changing an unfavourable into a favourable lie of the infant, it is usually only with cases where the child is already dead that he has to deal, and then he tells how he has to mutilate and extract it. So these writings furnish us with the earliest account of the accoucheur's armamentarium, and let us see him possessed of a *μαχαίριον*—a knife or perforator for opening the head; a *πίεστρον*—a comminutor for breaking up the bones; and a *ἑλκυστήρ*—an extractor for hooking out the infant. The classical writers of Greece give the same impression as to the primitive stage of obstetrics. Women, like the mother of Socrates, have the charge of parturient women. Where divine aid is sought, goddesses are invoked to facilitate the labour. Gods or men are only called in where graver interference is required, as when Apollo rescued the infant Aesculapius by a Caesarean section performed on the dying Semele. Some midwives are known to history, and extracts from the writings of one Aspasia are embedded in the works of later authors. In the great medical school of Alexandria, when the science of human anatomy began to take shape, Herophilus rendered a service to obstetrics in giving a truer idea of the anatomy of the female than had previously prevailed; other physicians give evidence of their interest in midwifery and the diseases of women, and some experience was gradually being acquired and transmitted through the profession until we find from Celsus (in the reign of Augustus) that when surgeons were called in to help the attendant woman they could sometimes bring about the delivery, without destroying the infant, by the operation of turning. In the 2nd century Soranus wrote a work on midwifery for the guidance of midwives, in which for the first time the uterus is differentiated from the vagina and instruction is given for the use of a speculum. A contemporary, Moschion, wrote a guide for midwives which, with that of Soranus, may be said to touch the high-water mark of archaic midwifery. It is written in the form of question and answer, was much prized at the time of the Renaissance, and was used as the basis of the first obstetric work that issued from a printing-press. Philumenos wrote a treatise of some value at the same epoch, but it is only known from the free use made of it by subsequent writers, such as Aëtius in the beginning of the 6th century. Like Oribasius, who preserved in his compilation the work of Soranus, Aëtius draws largely on preceding writers. His treatises on female diseases constitute an advance on previous knowledge, but there is no progress in midwifery, though he still makes mention of turning. This operation has disappeared from the pages of Paulus Aegineta, an 8th-century author, the last to treat at length of obstetrics and gynaecology ere the night of the dark ages settled down on the Roman world, and it is not heard of again till a millennium had passed. During the centuries when the progress of medicine was dependent on the work of the Arabian physicians, the science of obstetrics stood still. We are curious to know what Rhazes and Avicenna in the 9th and 10th centuries have to say on this subject. But they know little but what they have learned from the Greek writers, and they show a great tendency to relapse to the rudest procedures and to have recourse to operative interferences destructive to the child. Interest attaches to the work of Albucasis in the 12th century, in that he is the first to illustrate his pages with figures of the knives, crushers and extractors that were employed in their gruesome practices, and that he gives the first history of a case of extra-uterine pregnancy.

We come down to the 16th century before we begin to see any indication of the development of obstetrics towards a place among the sciences. Medicine and surgery profited earlier by the intellectual awakenings of the Renaissance and the Reformation. In anatomical theatres and hospital wards associated with universities great anatomists and clinicians began to discard the dogmas of Galen, and to teach their pupils to study the body and its diseases with unprejudiced minds. But the practice of midwifery was still among all people in the hands of women, and when in 1513 Eucharius Roesslin of Frankfort published a work on midwifery, it bore the title *Der schwangeren Frawen und hebammen Rosengarten.* Translated into English by Thomas Raynald with the altered title, *The Birth of Mankynd*, it is mainly compiled from Moschion, and the Soranus and Philumenos fragments of Oribasius and Aëtius, and is intended as a guide to pregnant women and their attendant nurses. It was illustrated with fanciful figures of the foetus *in utero* that were reproduced in other works of later date—as in the *Rosengarten* of Walter Reiff of Strassburg in 1546 and the *Hebammenbuch* of Jacob Rueff of Zurich in 1554, the latter of which appears in English dress as *The Expert Midwife.* The greatest impulse to the progress of midwifery was given in the middle of the 16th century by the famous French surgeon Ambroise Paré, who revived the operation of podalic version, and showed how by means of it surgeons could often rescue the infant even in cases of head presentation, instead of breaking it up and extracting it piecemeal. He was ably seconded by his pupil Guillemeau, who translated his work into Latin, and at a later period himself wrote a treatise on midwifery, an English translation of which was published in 1612 with the title *Child-Birth; or, The Happy Deliverie of Women.* The close of the 16th century is rendered further memorable in the annals of midwifery by the publication of a series of works specially devoted to it. Three sets of compilations, containing extracts from the various writers on obstetrics and gynaecology from the time of Hippocrates onwards, were published under the designation of *Gynaecia* or *Gynaeciorum*—the first edited by Caspar Wolff of Zurich in 1566, the second by Caspar Bauhin of Basel in 1586, and the third by Israel Spach of Strassburg in 1597. Spach includes in his collection not only Paré's obstetrical chapters, but the Latin translation of the important *Traitte nouveaux de l'hysterotomotokie*, published by the French surgeon Francis Rousset in 1581, which is the first distinct treatise on an obstetric operation, and advocates the performance of Caesarean section on living women with difficult labours. From this time onwards evidence accumulates of the growing interest of members of the medical profession, and more especially of surgeons, in the practice of midwifery, and after the middle of the 17th century they began to publish the records of their experiences in special treatises. The most important of these writers were French—as Mauriceau, Viardel, Paul Portal, Peu and Dionis. The work of Mauriceau, which first appeared in 1668, is specially interesting from its having been translated into English in 1672 by Hugh Chamberlen, who in his preface made the then incredible statement that his father, his brothers, and himself had long attained to and practised a way to deliver women in difficult labours without hooks, where other artists used them, and without prejudice to mother or child. Many years had still to elapse before the secret of the Chamberlens leaked out. In the course of this century some women who had large experience in midwifery appeared as authors. Thus in England Jane Sharp in 1671 wrote *The Midwives' Book, or the whole art of Midwifery discovered*; in Germany, Justine Siegemund, in 1690, *Die Chur-Brandenburgische Hoff-Wehemutter*; and earlier and better than either, in France, Louise Bourgeois in 1626 published *Observations sur la sterilité et maladies des femmes*. Perhaps they were beginning to feel that there was some need to assert their power, for it was during this century that parturient ladies began to call in men to attend them in natural labours. According to Astruc, Madame de la Vallière wished her confinement to be kept secret, and Louis XIV., in June 1663, sent for Jules Clement, the court surgeon, to superintend the delivery. This was accomplished successfully. The king gave him the title of accoucheur. Clement afterwards attended the dauphiness and other court ladies, and went thrice to Madrid to assist at the confinement of the queen of Philip IV. Up till this epoch physicians and surgeons had only been summoned to the lying-in room by midwives who found themselves at the end of their resources, to give help in difficult cases where the child was usually dead and the mother often moribund. Now that it began to be a fashion for women in their ordinary confinements to be under the surveillance of a physician, it became possible for men with their scientific training to study the normal phenomena of natural labour, and through the medium of the printing-press to communicate the results of their observation and experience to their professional brethren. Hence the books of the men already referred to, and of others that appeared later, such as the *Traité complet des accouchemens* of De la Motte, 1721, which is a storehouse of acute observations and wise discussion of obstetric measures. In other countries than France physicians and surgeons began to take up midwifery as a speciality and not as a subsidiary part of their practice, of which they were somewhat ashamed (le Bon, one of the writers whose work is found in Bauhin's *Gynaecia*, says: "Haec ars viros dedecet"), and it was in Holland that a work was produced that has earned for its author the designation of the Father of Modern Midwifery. Heinrich van Deventer, who practised as an obstetrician at the Hague along with his wife (a Vroedvrow, as he was a Vroedmeester), published in 1696 a preliminary treatise called *Dageraat* (*Aurora*) *der Vroedvrowen*, and in 1701 he followed it up by a more complete second volume, of which the Latin edition that came out simultaneously with the Dutch has a title beginning *Operationes Chirurgicae Novum Lumen Exhibentes Obstetricantibus*. It has the supreme value of being the first work to give a scientific description of the pelvis, and to take some steps towards the development of the mechanism of labour. The "obstetricantes" for whom Deventer wrote are both men and women. In the early part of the 18th century women had still the main and often the sole charge of their parturient sisters; but the practice of having a doctor to superintend or to supersede the midwives kept spreading among the classes who could afford to pay the doctor's fee; and by the time Deventer's treatise was doing its educational work in an English translation, as *The Art of Midwifery Improved*, in 1716, the doctors were getting into their hands the "harmless forceps" with which a living child could be extracted without detriment to the mother, in conditions where formerly her child's life was sacrificed and her own endangered. This life-saving instrument was invented in London, but by a man not of English birth. The Huguenot, William Chamberlen, fled from Paris to escape the St Bartholomew massacres, carrying with him to Southampton his wife, his two sons, and a daughter. William Chamberlen seems to have been a surgeon, and his descendants through four generations had large and lucrative practices in London. The eldest son Peter, who was old enough when he came to England to be able to attest the birth and baptism of a younger brother, is, on good grounds, credited with being the inventor of the forceps, which for a century was kept a secret among brothers, sons and grandsons. Hugh, indeed, a great-grandson of William, and the translator of Mauriceau, had offered to sell the family secret for 10,000 crowns; but his failure to effect delivery in a test case that Mauriceau put to him led the profession to believe that he was a boastful quack. Palfyn of Ghent, when in Paris in 1723, putting a work on anatomy through the press, laid before the Academy of Science a pair of forceps, which was figured in Heister's surgery in 1724. He has thus the honour of first laying before the profession a midwifery forceps. But his implement was ill-constructed, and never came into general use. Meanwhile the knowledge that the Chamberlens were really possessed of a serviceable instrument must have stimulated other practitioners. Perhaps a colleague with a keen eye may have got sight of it on some occasion, or an intelligent midwife had been able to describe the "tongs" which she had seen one of the family apply. In 1734 Dr Edward Hody published a record of *Cases in Midwifery* that had been written by Mr William Giffard, "surgeon and man-midwife." The dates range from January 1724 to 1731. Amongst the cases are several where he effected the delivery by means of the forceps—"extractor," he calls it—of which a figure is given; and when Edmund Chapman, who practised first at Halstead and afterwards in London, published his *Treatise on the Improvement of Midwifery* in 1733, he speaks of the use of the forceps as "now well known to all the principal men of the profession both in town and country."

In the course of the 18th century the development of midwifery in the hands of medical men made greater strides than in all the preceding ages. The progress was accelerated by the establishment of chairs of midwifery in the universities of various countries, Edinburgh taking the lead in the appointment of a professor in 1726, and Strassburg coming closely after in 1728. In Strassburg the chair had the advantage of being at once associated with a clinical service. Lecturing was carried out, moreover, by men who were devoting themselves as specialists in midwifery and the diseases of women and infants, and were succeeding in developing lying-in institutions for the benefit of poor women in labour that became schools of instruction both for midwifery nurses and for medical students. Two new operations came during this epoch to enhance the powers of the obstetrician, viz. symphysiotomy, first introduced by Sigault in Paris; and the induction of premature labour, first carried out by Macauley in London in circumstances described by Denman in the preface to his *Midwifery*. William Hunter in London, Sir Fielding Ould in Dublin, Röderer in Göttingen, Camper in Amsterdam, Baudelocque in Paris, Saxtorph in Copenhagen, and many other authors contributed to progress by their atlases and their books. But there are three whose names stand out pre-eminently because of the influence they exerted on the whole obstetric world—Levret, Smellie and Boër. Kilian, in his vidimus of the history of midwifery, calls Levret "one of the greatest masters in the department that ever lived." Of Smellie he says: "Inferior to Levret in nothing, he excels him in much." Boër he characterizes as "the most meritorious and important of German obstetricians." Levret improved the construction of the forceps, and widened the sphere of their applicability; Smellie worked in the same direction, and furnished, moreover, descriptions and illustrations of natural and morbid labours that are of classical value; and Boër first clearly placed pregnancy (which Mauriceau, *e.g.* had spoken of as "a nine months' disease") and parturition in the category of physiological processes that might be hindered rather than helped by the pragmatical interferences of meddlesome midwives.

Throughout the 19th century midwifery continued to advance, gynaecology grew into a special department with an extensive literature, the mechanism of labour developed under the clinical observations of men like Nägele and the study of such frozen sections of cadavera as were made by Braune, the indications for interference became more clear and the methods of interference more simple and safe, and a whole realm of antenatal pathology and teratology was added to the domain of science, while practitioners learned the art of saving premature and delicate infants by the use of the incubator and proper alimentation. Every advance in all the cognate sciences was appreciated and applied for the advancement of obstetrics. But there are two achievements which will make the 19th century for ever memorable in the annals of midwifery—the abolition of the pains of labour and the arrest laid on mortality from the so-called puerperal fever. In February 1847 Sir J. Y. Simpson, choosing a case where he had to deliver by turning, put the patient asleep with ether. Seeing that the uterine contractions continued, though the attendant pain was abolished, he proceeded to administer ether in cases of natural labour, and in November of the same year demonstrated the virtues of chloroform, and so furnished the most serviceable anaesthetic, not only to the obstetrician in the lying-in room, but to the surgeon on the battlefield, and to the general practitioner in his everyday work. Ignaz Philipp Semmelweiss, assistant in the maternity hospital of Vienna, was struck and saddened with the appalling mortality that attended the delivery of the women under his care, as many as one (in some months three) out of every ten of the puerperae being carried out dead. He observed that the mortality was much higher in the wards allotted to the tuition of students than in those set apart for the training of nurses. In the spring of 1847 he saw at the post-mortem examination of a young colleague who had died of a poisoned wound, that the appearances were the same as he had too often had occasion to see at the post-mortem examinations of his puerperae. He ordered that every student who assisted a woman in her labour must first wash his hands in a disinfectant solution of chloride of lime, and in 1848 already the mortality was less in the students' than it was in the nurses' wards. Thus the first light was shed on the nature of the mischief of which multitudes of puerperal patients perished, and the first intelligent step was taken to lessen the mortality. When, some twenty years later, Lister had applied the bacteriological principles of Pasteur with beneficent results to surgery, obstetricians gladly followed his lead, and the 19th century beheld added to the comfort of anaesthetic midwifery the confidence of midwifery antiseptic and even aseptic.

The most exhaustive treatise on the earlier history of midwifery is von Siebold, *Versuch einer Geschichte der Geburtshülfe* (Berlin, 1839). (A. R. S.)

OCALA (a Seminole word for green or fertile land), a city and the county-seat of Marion county, Florida, U.S.A., in the N. central part of the state, about 100 m. S.W. of Jacksonville. Pop. (1900) 3380, (1905) 4493, of whom 2467 were negroes, (1910) 4370. It is served by the Seabord Air Line and the Atlantic Coast Line railways. About 6 m. E. is Silver Spring, the largest and best known of the springs of Florida. Its basin is circular, about 600 ft. in diameter; it is about 65 ft. in depth, and its waters are remarkable for their transparency and refractive powers. According to the estimate of Dr D. G. Brinton, the spring discharges more than 300,000,000 gallons of water daily, its outflow forming what is known as Silver Spring Run, 9 m. long, emptying into the Oklawaha river and navigable by small river steamers. For the drainage and sewerage of the city a subterranean river whose source and mouth are unknown is utilized. The city is the seat of the Emerson Memorial and Industrial Home (Methodist Episcopal) for negro girls. Ocala was settled in 1845, but its development dates from 1880, when it was first chartered as a city. In December 1890 it was the meeting-place of the National Convention of the Farmers' Alliance, which promulgated a statement of political principles generally known as the "Ocala Platform." (See FARMERS' MOVEMENT.)

OCAÑA, a town of central Spain, in the province of Toledo; on the extreme north of the tableland known as the Mesa de Ocaña, with a station on the railway from Aranjuez to Cuenca. Pop. (1900) 6616. The town is surrounded by ruined walls, and in it are the remains of an old castle. In one of its parish churches is the chapel of Nuestra Señora de los Remedios, in which Ferdinand and Isabella were married in 1469. Ocaña is the Vicus Cuminarius of the Romans, and was the dowry that El Motamid of Seville gave his daughter Zaida on her marriage with Alphonso VI. of Castile (1072–1109). Near Ocaña, on the 19th of November 1809, the Spanish under their Irish general Lacy were routed by the French under Joseph Bonaparte and Marshal Soult.

OCARINA, a wind instrument invented in Italy, which must be classed with musical toys or freaks, although concerted music has been written for it. The ocarina consists of an earthenware vessel in the shape of an egg with a pointed base and a tube like a spout in the side, which contains the mouthpiece. There are usually 10 holes in the front surface of the instrument, nine for fingers and thumb and a vent hole; the newer models have 8 holes and two keys. By half covering the holes the semitones are obtained.

O'CAROLAN (or CAROLAN), **TURLOGH** (1670–1738), Irish bard, son of John O'Carolan, a farmer, was born at Newtown, near Nobber, in the county of Meath. The family is said to have belonged to the sept of MacBradaigh, and the bard's great-grandfather was a chieftain. The O'Carolans forfeited their estates during the civil wars, and Turlogh's father settled at Alderford, Co. Roscommon, on the invitation of the family of M'Dermott Roe. In his eighteenth year he became blind from smallpox. He received special instruction in music, and used to wander with his harp round the houses of the surrounding gentry, mainly in Connaught. The famous song *Receipt for Drinking* may be responsible for the allegation that he was addicted to intemperate drinking, but Charles O'Conor (1710–1791), the antiquary, who had personal knowledge of him, gives him a good character in private life. The number of Carolan's musical pieces, to nearly all of which he composed verses, is said to exceed two hundred. He died on the 25th March 1738, and was buried at Kilronan.

His poetical *Remains* in the original Irish, with English metrical translations by Thomas Furlong, were printed in Hardiman's *Irish Minstrelsy* (1831). Many of his songs were preserved among the Irish MSS. in the British Museum.

OCCAM, WILLIAM OF (d. *c.* 1349), English schoolman, known as *Doctor invincibilis* and *Venerabilis inceptor*, was born in the village of Ockham, Surrey, towards the end of the 13th century. Unattested tradition says that the Franciscans persuaded him while yet a boy to enter their order, sent him to Merton College, Oxford (see G. C. Brodrick, *Memorials of Merton College*, p. 194), and to Paris, where he was first the pupil, afterwards the successful rival, of Duns Scotus. He probably left France about 1314, and there are obscure traces of his presence in Germany, in Italy, and in England during the following seven years. It has generally been held that in 1322 he appeared as the provincial of England at the celebrated assembly of the Franciscan order at Perugia, and that there he headed the revolt of the Franciscans against Pope John XXII.; but, according to Little (*English Historical Review*, vi. 747), the provincial minister on this occasion was William of Nottingham. Probably, however, Occam was present at the assembly. His share in this revolt resulted in his imprisonment, on the charge of heresy, for seventeen weeks in the dungeons of the papal palace at Avignon. He and his companions—Michael of Cesena, general of the order, and Bonagratia—managed to escape, and found their way to Munich, where they aided Louis IV. or V. (*q.v.*) of Bavaria in his long contest with the papal curia. It was for Occam's share in this controversy that he was best known in his lifetime. Michael of Cesena died in 1342, and Occam, who had received from him the official seal of the order, was recognized as general by his party. The date of his death and the place of his burial are both uncertain. He probably died at Munich in 1349.

William of Occam was the most prominent intellectual leader in an age which witnessed the disintegration of the old scholastic realism, the rise of the theological scepticism of the later middle ages, the great contest between pope and emperor which laid the foundations of modern theories of government, and the quarrel between the Roman curia and the Franciscans which showed the long-concealed antagonism between the theories of Hildebrand and Francis of Assisi; and he shared in all these movements.

The common account of his philosophical position, that he reintroduced nominalism, which had been in decadence since the days of Roscellinus and Abelard, by teaching that universals were only *flatus vocis*, is scarcely correct. The expression is nowhere found in his writings. He revived nominalism by collecting and uniting isolated opinions upon the meaning of universals into a compact system, and popularized his views by associating them with the logical principles which were in his day commonly taught in the universities. He linked the doctrines of nominalism on to the principles of the logic of Psellus, which had been introduced into the West in the *Summulae* of Peter of Spain, and made them intelligible to common understandings. The fundamental principles of his system (see SCHOLASTICISM) are that "Essentia non sunt multiplicanda praeter necessitatem" ("Occam's Razor"), that nouns, like algebraical symbols, are merely denotative terms whose meaning is conventionally agreed upon (*suppositio*), and that the destructive effect of these principles in theological matters does not in any way destroy faith (see the *Centilogium Theologicum*, Lyons, 1495, and *Tractatus de Sacramento Altaris*).

In the *Opus nonaginta dierum* (1330) (written in reply to John XXII.'s libellus against Michael of Cesena), and in its successors, the *Tractatus de dogmatibus Johannis XXII. papae* (1333–1334), the *Compendium errorum Johannis XXII. papae* (1335–1338) and in the *Defensorium contra errores Johannis XXII. papae* (1335–1339), Occam only incidentally expounds his views as a publicist; the books are mainly, some of them entirely, theological, but they served the purpose of the emperor and of his party, because they cut at the root of the spiritual as well as of the temporal supremacy of the pope. In his writing *Super potestate summi pontificis octo quaestionum decisiones* (1339–1342) Occam attacks the temporal supremacy of the pope, insists on the independence of kingly authority, which he maintains is as much an ordinance of God as is spiritual rule, and discusses what is meant by the state. His views on the independence of civil rule were even more decidedly expressed in the *Tractatus de jurisdictione imperatoris in causis matrimonialibus*, in which, in spite of the medieval idea that matrimony is a sacrament, he demands that it belongs to the civil power to decide cases of affinity and to state the prohibited degrees. By 1343 there was in circulation his great work the *Dialogus* (see Goldast ii. 398-957), in which he attempted to present his views in a complete summary. It consists of three parts. The first is the *De fautoribus hereticorum*, and deals with the pope as arbiter in the matter of heresy. The second part is the refutation of the doctrines of John XXII. (see above treatises). The third was to be in nine sections, of which the first and second sections alone remain to us. It is probable that the *Opus nonaginta dierum* and the *Compendium errorum* were intended to form part of the work. His last work, *De Electione Caroli IV.*, restates his opinions upon temporal authority and adds little that is new.

In all his writings against Pope John XXII. (*q.v.*), Occam inveighs against the pope's opinions and decisions on the value of the life of poverty. The *Compendium errorum* selects four papal constitutions which involved a declaration against evangelical poverty, and insists that they are full of heresy. Occam was a sincere Franciscan, and believed with his master that salvation was won through rigid imitation of Jesus in His poverty and obedience, and up to his days it had always been possible for Franciscans to follow the rules of their founder within his order. John XXII., however, condemned the doctrine and excommunicated its supporters, some of whom were so convinced of the necessity of evangelical poverty for a truly Christian life that they denounced the pope when he refused them leave to practise it as Antichrist. After Occam's days the opinions of Francis prevailed in many quarters, but the genuine Franciscans had no place within the church. They were Fraticelli, Beghards, Lollards or other confraternities unrecognized by the church and in steady opposition to her government.

Beside the theological and political works above quoted, Occam wrote *Summa Logices* (Paris, 1488, Oxford, 1675) commentaries on Porphyry's *Isagoge*, on the *Categoriae*, *De Interpretatione* and *Elenchi* of Aristotle. These latter were printed in 1496 at Bologna, and entitled *Expositio Aurea super totam artem veterem*; *Quaestiones in quattuor libros sententiarum* (Lyons, 1495).

There is no good monograph on Occam. For an account of his logic, see Prantl, *Geschichte der Logik* (1855–1870); for his philosophy, see Stöckl, *Geschichte der Philosophie des Mittelalters* (1864–1866), vol. ii., for his publicist writings, see Riezler, *Die literarischen Widersacher der Päpste zur Zeit Ludwig des Baiers* (1874). See also T. M Lindsay's article on "Occam and his connexion with the Reformation," in the *Brit. Quart. Review* (July, 1872). Among ancient documents consult Denifle and Chatelain's *Chartularium Universitatis Parisiensis*, vol. ii. pt. i. (Paris, 1887); Wadding's *Annales Minorum* (ed. Fonseca, vols. 7 and 8, Rome, 1733). For a list of Occam's works, see Little's *Grey Friars*, pp. 225-234.

(T. M. L.)

OCCASIONALISM (Lat. *occasio*, an event), in philosophy, a term applied to that theory of the relation between matter and mind which postulates the intervention of God to bring about in the one a change which corresponds to a similar change in the other. The theory thus denies any direct interaction between matter and mind. It was expounded by Geulincx and Malebranche to avoid the difficulty of Descartes's dualism of thought and extension, and to explain causation. Thus mind and matter are to Geulincx only the "occasional" causes of each other's changes, while Malebranche, facing further the epistemological problem, maintains that mind cannot even know matter, which is merely the "occasion" of knowledge.

OCCLEVE (or HOCCLEVE), **THOMAS** (1368–1450?), English poet, was born probably in 1368/9, for, writing in 1421/2 he says he was fifty-three years old (*Dialog*, i. 246). He ranks, like his more voluminous and better known contemporary Lydgate, among those poets who have a historical rather than intrinsic importance in English literature. Their work rarely if ever rises above mediocrity; in neither is there even any clear evidence of a poetic temperament. Yet they represented for the 15th century the literature of their time, and kept alive, however faintly, the torch handed on to them by their "maister" Chaucer, to whom Occleve pays an affectionate tribute in three passages in the *De Regimine Principum*. What is known of Occleve's life has to be gathered mainly from his works. At eighteen or nineteen he obtained a clerkship in the Privy Seal Office, which he retained on and off, in spite of much grumbling, for about thirty-five years. He had hoped for a benefice, but none came; and in 1399 he received instead a small annuity, which was not always paid as regularly as he would have wished. "The Letter to Cupid," his first poem to which we can affix a date, was translated from *L'Epistre au Dieu d'Amours* of Christine de Pisan in 1402, evidently as a sort of antidote to the moral of *Troilus and Cressida*, to some MSS. of which we find it attached. "La Male Regle," one of his most readable poems, written about 1406, gives some interesting glimpses of his "misruly" youth. But about 1410 he settled down to married life, and the composition of moral and religious poems. His longest work, *The Regement of Princes* or *De Regimine Principum*, written for Prince Hal shortly before his accession, is a tedious homily on the virtues and vices, imitated from Aegidius de Colonna's work of the same name, from the suppositious epistle of Aristotle, known as the *Secreta secretorum*, and the work of Jacques de Cessoles (fl. 1300) englished later by Caxton as *The Game and Playe of Chesse*. It is relieved by a proem, about a third of the whole, containing some further reminiscences of London tavern and club life, in the form of dialogue between the poet and a beggar. On the accession of Henry V. Occleve turned his muse to the service of orthodoxy and the Church, and one of his poems is a remonstrance addressed to Oldcastle, calling upon him to "rise up, a manly knight, out of the slough of heresy." Then a long illness was followed for a time, as he tells us, by insanity. His "Dialog with a Friend," written after his recovery, gives a naïve and pathetic picture of the poor poet, now fifty-three, with sight and mind impaired, but with hopes still left of writing a tale he owes his good patron, Humphrey of Gloucester, and of translating a small Latin treatise, *Scite Mori*, before he dies. His hopes were fulfilled in his moralized tales of "Jereslaus' Wife" and of "Jonathas," both from the *Gesta Romanorum*, which, with his "Learn to die," belong to his old age. After finally retiring from his privy seal clerkship, he was granted in 1424 sustenance for life in the priory of Southwick, Hants, on which, with his former annuity, he appears to have lived till about the middle of the century. A "Balade to my gracious Lord of Yorke" probably dates from 1448 or later.

The main interest for us in Occleve's poems is that they are characteristic of his time. His hymns to the Virgin, balades to patrons, complaints to the king and the king's treasurer, versified homilies and moral tales, with warnings to heretics like Oldcastle, are illustrative of the blight that had fallen upon poetry on the death of Chaucer. The nearest approach to the realistic touch of his master is to be found in Occleve's "Male Regle." But these pictures of 15th-century London are without even the occasional flash of humour that lightens up Lydgate's *London Lackpenny*. Yet Occleve has at least the negative virtue of knowing the limits of his powers. He says simply what he means, and does not affect what he does not feel. A Londoner, to whom the country was evidently a bore, he has not afflicted us with artificial May mornings; and it is doubtful whether a single reference to nature can be found among his poems. He has yet another distinction among his contemporaries: he wrote no allegory. Whether we ascribe it to his lack of "engine," or to the influence of Chaucer when in his later years he had discovered the limitations of this poetic form, we cannot but be grateful to the poet who has spared us. As a metrist Occleve is also modest of his powers. He confesses that

> Fader Chaucer fayn wolde han me taught,
> But I was dul and learned lite or naught;

and it is true that the scansion of his verses seems occasionally to require, in French fashion, an accent on an unstressed syllable. Yet his seven-line (or *rime royale*) and eight-line stanzas, to which he limited himself, are perhaps more frequently reminiscent of Chaucer's rhythm than are those of Lydgate.

A poem, "Ad beatam Virginem," generally known as the "Mother of God," and once attributed to Chaucer, is copied among Occleve's works in MS. Phillipps 8151 (Cheltenham), and may thus be regarded as his work. Occleve found an admirer in the 17th century in William Browne, who included his "Jonathas" in the *Shepheards Pipe* (1614). Browne added a eulogy of the old poet, whose works he intended to publish in their entirety (*Works*, ed. W. C. Hazlitt, 1869, ii. 196-198). In 1796 George Mason printed six *Poems by Thomas Hoccleve never before printed* . . .; "De Regimine Principum" was printed for the Roxburghe Club in 1860, and by the Early English Text Society in 1897. See Dr F. J. Furnivall's introduction to *Hoccleve's Works; I. The Minor Poems, in the Phillipps MS. 8151, and the Durham MS. III. 9* (Early English Text Society, 1892). (W. S. M.)

OCCULTATION (from Lat. *occultare*, the frequentative of *occulere*, to hide), in astronomy, the hiding of one celestial body by another passing in front of it; commonly the passage of the moon or of a planet between the observer and a star or another planet.

OCEAN AND OCEANOGRAPHY. "Ocean" is the name applied to the great connected sheet of water which covers the greater part of the surface of the Earth. It is convenient to divide the subject-matter of physical geography into the atmosphere, hydrosphere and lithosphere, and in this sense the ocean is less than the hydrosphere in so far as the latter term includes also the water lying on or flowing over the surface of the land. The conception of an encompassing ocean bounding the habitable world is found in the creation myths of the most ancient civilizations. The Babylonians looked on the world as a vast round mountain rising from the midst of a universal sheet of water. In the Hebrew scriptures the waters were gathered together in one place at the word of God, and the dry land appeared. The Ionian geographers looked on the circular disk of the habitable world as surrounded by a mighty stream named Oceanus, the name of the primeval god, father of gods and men, and thus the bond of union between heaven and earth. The Greek word ὠκεανός is related to the Sanskrit *açāyanas*, "the encompassing." Philologists do not know of any related word in Semitic languages. Pictet, however, recognizes allied forms in Celtic languages, *e.g.* the Irish *aigean* and Cymric *eigiawn*.

Since the Pythagorean school of philosophy upheld the spherical as against the disk-shaped world, some of the ancient geographers, including Eratosthenes and Strabo, looked upon the hydrosphere as forming two belts at right angles to each other, one belt of ocean following the equator, the other surrounding the earth from pole to pole as in the *terra quadrifida* of Macrobius; while others, including Aristotle and Ptolemy, looked upon the inhabited land, or *oikumene*, as occupying the greater part of the earth's surface, so that the Indian Ocean was an enclosed sea and India (*i.e.* eastern Asia) was only separated from Europe by the Atlantic Ocean. The latter view prevailed and was as a rule held by the Arab geographers of the middle ages, so that until the discovery of America and of the Pacific Ocean the belief was general that the land surface was greater than the water surface, or that at least the two were equal, as Mercator and Varenius held. Thus it was that a great South Land appeared on the maps, the belief in the prodigious extension of which certainly received a severe shock by Abel Tasman's voyage of circumnavigation, but was only overthrown after Cook's great voyages had proved that any southern land which existed could not extend appreciably beyond the polar circle. Only in our own day has the existence of the southern continent been demonstrated within the modest limits of Antarctica.

Oceanography is the science which deals with the ocean, and since the ocean forms a large part of the earth's surface oceanography is a large department of geography. The science is termed *talassografia* by the Italians, and attempts have been made without success to introduce the name "thalassography." Of recent years the use of "hydrography" as the equivalent of physical oceanography has acquired a certain currency, but as the word is also used with more than one other meaning (see SURVEYING) it ought not to be used for oceanography.

Like geography, oceanography may be viewed in two different ways, and is conveniently divided into *general oceanography*, which deals with phenomena common to the whole ocean, and *special oceanography*, which has to do with the individual characteristics of the various divisions of the ocean. This article is restricted to general oceanography in its physical aspects, the closely-related meteorological, biological and economic aspects being dealt with elsewhere.

Methods of Research.—When research in oceanography began, the conditions of the sea were of necessity observed only from the coast and from islands, the information derived from mariners as to the condition of parts of the sea far from land being for the most part mere anecdotes bearing on the marvellous or the frightful. In recent times, especially since the rapid increase in the study of the exact sciences during the 19th century, observations at sea with accurate instruments have become common, and the ships' logs of to-day are provided with headings for entering daily observations of the phenomena of the sea-surface. The contents of the sailors' scientific logs were brought together by the American enthusiast in the study of the sea, Matthew Fontaine Maury (1806–1873), whose methods and plans were discussed and adopted at international congresses held in Brussels in 1853 and in London in 1873. By 1904 more than 6800 of these meteorological logs with 7,000,000 observations had been accumulated by the Meteorological Office in London; 20,000 with 10,600,000 observations by the German Marine Observatory at Hamburg; 4700 with 3,300,000 observations by the Central Institute of the Netherlands at de Bilt near Utrecht. The Hydrographic Office of the United States had collected 3800 meteorological logs with 3,200,000 entries before 1888; but since that time the logs have contained only one observation daily (at Greenwich noon) and of these 2,380,000 entries had been received by 1904. In the archives of the French Marine in Paris there were 3300 complete logs with 830,000 entries and 11,000 abstract logs from men-of-war. The contents of these logs, it is true, refer more to maritime meteorology than to oceanography properly so-called, as their main purpose is to promote a rational system of navigation especially for sailing ships, and they are supplied by the voluntary co-operation of the sailors themselves.

While the sailors' logs supply the greater part of the scientific evidence available for the study of the surface phenomena of the ocean, they have been supplemented by the records of numerous scientific expeditions and latterly by publications embodying systematic observations on a permanent basis. Valuable observations were made in oceanography during the expeditions of Captain James Cook and the polar explorers, especially those of Sir John Ross in the north and Sir James Ross in the south, but the voyage of H.M.S. "Challenger" in 1872–1876 formed an epoch marking the end of the older order of things and the beginning of modern oceanography as a science of precision. The telegraph cable companies were quick to apply and to extend the oceanographical methods useful in cable-laying, and to their practical acuteness many of the most important improvements in apparatus are due. A second epoch comparable to that of the "Challenger" and resulting like it in a leap forward in the precision of the methods previously employed was marked by the institution in 1901 of the International Council for the Study of the Sea. This council was nominated by the governments of Norway, Sweden, Denmark, Finland, Russia, Germany, Great Britain, Holland and Belgium, with headquarters in Copenhagen and a central laboratory at Christiania, and its aim was to furnish data for the improvement of the fisheries of the North Sea and surrounding waters. In the course of investigating this special problem great improvements were made in the methods of observing in the deep sea, and also in the representation and discussion of the data obtained, and a powerful stimulus was given to the study of oceanography in all the countries of Europe. The efforts of individual scientific workers cannot as a rule produce such results in oceanography as in other sciences, but exceptions are found in the very special services rendered by the prince of Monaco, who founded the Oceanographical Institute in Paris and the Oceanographical Museum in Monaco; and by Professor Alexander Agassiz in the investigation of the Pacific.

Extent of the Ocean.—The hydrosphere covers nearly three-quarters of the earth's surface as a single and continuous expanse of water surrounding four great insular land-masses known as the continents of the Old World (Europe, Asia, Africa), America, Australia and Antarctica. As we are still ignorant of the proportions of land and water in the polar regions, it is only possible to give approximate figures for the extent of the ocean, for the position of the coast-lines is not known exactly enough to exclude possible errors of perhaps several hundred thousand square miles in estimates of the total area. Speaking generally, we may say with confidence that water predominates in the unexplored north polar area, and that it is very unlikely that new land of any great extent exists there. On the other hand, recent Antarctic exploration makes it practically certain that a great continent surrounds the south pole with a total area considerably more than Sir John Murray's estimate in 1894, when he assigned to it an area of 9,000,000 sq. km. (3,500,000 sq. statute miles). It is probable that the Antarctic continent measures about 13,000,000 sq. km. (5,000,000 sq. statute miles); and thus if we accept Bessel's figure of 509,950,000 sq. km. (196,900,000 sq. m.) for the whole surface of the sphere, there is a total land area of 148,820,000 sq. km. (57,460,000 sq. m.), and a total water area of 361,130,000 sq. km. (139,435,000 sq. m.), 29% of land and 71% of water, or a ratio of 1: 2·43.

Divisions of the Ocean.—The arrangement of the water surface on the globe is far from uniform, the ocean forming 61% of the total area of the northern and 81% of that of the southern hemisphere. Of the whole ocean only 43% (154·9 million sq. km.) lies in the northern hemisphere and 57% (206·2 million sq. km.) in the southern. If the globe is divided into hemispheres by the meridians of 20° W. and 160° E., as is usual in atlases, the eastern hemisphere, to which the Old World belongs, has 62% of its surface made up of water, while the western hemisphere, including America, has 81%. A great circle can be drawn upon a terrestrial globe in such a way as to divide it into two hemispheres, one of which contains the greatest amount of land and the other the greatest amount of sea of any possible hemispheres. The centre of the so-called land-hemisphere lies near the mouth of the Loire (47½° N. and 2½° W.), while the centre of the so-called water-hemisphere lies to the S.E. of New Zealand and eastward of Antipodes Island. Even in the land hemisphere the water area (134·5 million sq. km.) is in excess of the land area (121 million sq. km.), while in the water-hemisphere the amount of land is quite insignificant, being only 24·5 million sq. km. compared with 230·5 million sq. km. of water.

The outline of the water surface depends on the outline of the basins in which it is contained. The four great continental masses therefore give the ocean a distinctly tripartite form, the three great divisions being known as the Atlantic, the Indian and the Pacific Oceans, all three running together into one around Antarctica. Thus the connecting belt of water is narrow as compared with the extent of the oceans from north to south—Drake Strait south of South America is barely 400 m. wide, from Cape Agulhas to Enderby Land, 2200 m., and from Tasmania to Wilkes Land, 1550 m., while the meridianal extension of the Indian Ocean is 6200 m., of the Pacific, 9300 m., and of the Atlantic, 12,500 m., measuring across the North Pole to Bering Strait. These proportions are not readily grasped from a map of the world on Mercator's projection, and must be studied on a globe. A simple, practical boundary between the three oceans can be obtained by prolonging the meridian of the southern extremity of each of the three southern continents to the Antarctic circle. A committee of the Royal Geographical Society—the deliberations of which were interrupted by the departure on his last voyage of Sir John Franklin, one of the members—suggested these meridians as boundaries; the north and south boundaries of the Atlantic and Pacific Oceans being the polar circles, leaving an Arctic and an Antarctic Ocean to complete the hydrosphere. We now know, however, that the Antarctic circle runs so close to the coast of Antarctica that the Antarctic Ocean may be left out of account. It has been found more convenient to take as northern boundaries the narrowest part of the straits near the Arctic circle, Bering Strait on the Pacific side, and on the Atlantic side the narrowest part of Davis Strait, and of Denmark Strait, then the shortest line from Iceland to the Faeroes, thence to the most northerly island of the Shetlands and thence to Cape Statland in Norway. It has also been found convenient to take the boundary between the Atlantic and Pacific, as the shortest line across Drake Strait, from Cape Horn through Snow Island to Cape Gunnar, instead of the meridian of Cape Horn. Possibly ridges of the sea-bed running southward from the southern continents may yet be discovered which would form more natural boundaries than the meridians. The committee of the Royal Geographical Society settled the existing nomenclature of the three great oceans. Some authors include the Arctic Sea in the Atlantic Ocean, and some prefer to consider the southern part of the Atlantic, Indian and Pacific Oceans as a Great Southern Ocean. Sir John Herschel took as the northern boundary of the southern ocean the greatest circle which could touch the southernmost extremities of the three southern continents. Such a circle, however, runs so near the coast of Antarctica as to make the southern ocean very small. Others, like Malte Brun (1803) and Supan (1903), take the loxodromes between the three capes and call the ocean to the south the Antarctic Ocean. G. v. Boguslawski suggested the parallel of 55° S. and Ratzel that of 40° S. as limits; but in none of these schemes has the coast of Antarctica been adequately considered, and they have all been too much influenced by the Mercator map. Each of the three oceans, Atlantic, Indian and Pacific, possesses an Antarctic facies in the southern part and a tropical facies between the tropics, and the Atlantic and Pacific an Arctic facies in their northern parts.

Where the ocean touches the continents the margin is in places deeply indented by peninsulas and islands marking off portions of the water surface which from all antiquity have been known as "seas." These seas are entirely dependent on the ocean for their regime, being filled with ocean water, though subject to influence by the land, and the tides and currents of the ocean affect them to a greater or less extent. They owe their origin to depressions of the earth's crust of no very wide extent and not running very far into the continental mass, and geologically they are of recent age and still subject to change. In these respects they contrast with the great oceans which owe their origin to the most extensive and the profoundest depressions of the crust, date back at least to Mesozoic times, and have perhaps remained permanently in their present position from still remoter ages.

Seas may be classified according to their form either as "enclosed" or as "partially enclosed" (or "fringing"). Enclosed seas extend deeply into the land and originate either by the breaking through of the ocean or by the overflowing of a subsiding area. They are connected with the ocean by narrow straits, the salinity of the water contained in them differs in a marked degree from that of the ocean, and the tidal waves are of small amplitude. Four great intercontinental enclosed seas are included between adjacent continents—the Arctic Sea, the Central American or West Indian Sea, the Australo-Asiatic or Malay Sea and the Mediterranean Sea. There are also four smaller continental enclosed seas each with a single channel of communication with the ocean, viz. the Baltic Sea and Hudson Bay with very low salinity, the Red Sea and Persian Gulf with very high salinity.

The fringing or partially enclosed seas adjoin the great land masses and are only separated from the oceans by islands or peninsulas. Hence their tidal conditions are quite oceanic, though their salinity is usually rather lower than that of ocean water. The four fringing seas of eastern Asia, those of Bering, Okhotsk, Japan and East China, are arranged parallel to the main lines of dislocation in the neighbouring land-masses, and so are the Andaman Sea and the Gulf of California. On the contrary, the North Sea, the British fringing seas (English Channel, Irish Sea and Minch), and the Gulf of St Lawrence cross the main lines of dislocation.

In addition to these seas notice must be taken of the subordinate marginal features, such as gulfs and straits. Gulfs may be classified according to their origin as due to fractures of the crust or overflowing of depressed lands. The former are either the extensions of oceanic depressions, *e.g.* the Arabian Sea, Bay of Bengal and Gulf of Arica, or such caldron-depressions as the Gulfs of Genoa and Taranto, or rift-depressions like the Gulfs of Aden and Akaba. Compound gulfs are formed seawards by fracture and landwards by the overflowing of depressed land, *e.g.* the Bay of Biscay, Gulf of Alaska and Gulf of the Lion. Gulfs formed by the overflowing of depressed lands lie upon the continental shelf, *e.g.* the Gulf of Maine, Bay of Fundy, Bay of Odessa, Gulf of Martaban.

Straits have been formed (1) by fracture across isthmuses, and such may be by longitudinal fracture as in the Strait of Bab-el-Mandeb, or transverse fracture as in the Strait of Gibraltar or Cook Strait; (2) by erosion, *e.g.* the Strait of Dover, the Dardanelles and Bosporus; (3) by overflowing through the subsidence of the land, as in the straits of Bering, Torres and Formosa.

Surface of the Ocean.—If the whole globe were covered with a uniformly deep ocean, and if there were no difference of density between one part and another, the surface would form a perfect ellipsoid of revolution, that is to say, all the meridians would be exactly equal ellipses and all parallels perfect circles. At any point a sounding line would hang in the line of the radius of curvature of the water surface. But as things are the water-surface is broken by land, and the mean density of the substance of the land is 2·6 times as great as that of sea-water, so that the gravitational attraction of the land must necessarily cause a heaping up of the sea around the coasts, forming what has been called the continental wave, and leaving the sea-level lower in mid-ocean. Hence the geoid or figure of the sea-surface is not part of an ellipsoid of rotation but is irregular. The differences of level between different parts of the geoid have been greatly overestimated in the past; F. G. Helmert has shown that they cannot exceed 650 ft. and are probably much less. Recent pendulum observations have shown that it is incorrect to assume a uniform density of 2·6 in the elevated part of the earth's crust, that on the contrary there are great local differences in density, the most important being a confirmation of Airy's discovery that there is a marked deficiency of mass under high mountains and a marked excess under the bed of the ocean. The intensity of gravity at the surface of the sea far from land has been measured on several occasions. During Nansen's expedition on the "Fram" in 1894–1895, Scott Hansen made observations with a Sterneck's half-seconds pendulum on the ice where the sea was more than 1600 fathoms deep and found only an insignificant deviation from the number of swings corresponding to a normal ellipsoid. In 1901 O. Hecker took the opportunity of a voyage from Hamburg to La Plata, and in 1904 and 1905 of voyages in the Indian and Pacific Oceans to determine the local attraction over the ocean by comparing the atmospheric pressure measured by means of a mercurial barometer and a boiling-point thermometer, and obtained results similar to Scott Hansen's. The inequalities of the geoid in no case exceed 300 ft. Distortion of the ocean surface may also arise from meteorological causes, and be periodic or unperiodic in its occurrence, but it does not amount to more than a few feet at the utmost. Solar radiation warms the tropical more than the polar waters, but, assuming equal salinity, this cause would not account for a difference of level of more than 20 ft. between tropical and polar seas. The annual range of temperature between summer and winter of a surface layer of water about 25 fathoms thick in the Baltic is as much as 20° F., but this only corresponds to a difference of level of 1¼ in. due to expansion or contraction.

Atmospheric precipitation poured into the sea by the great rivers must necessarily create a permanent rise of the sea-level at their mouths, and from this cause the level round the coasts of rainy lands must be greater than in mid-ocean. H. Mohn has shown how the inequalities of what he terms the density-surface can be found from the salinity and temperature; and he calculates that the level of the Skagerrak should be about 2 ft. higher than that of the open Norwegian Sea between Jan Mayen and the Lofoten Islands. The level of the Gulf of Finland at Kronstadt and of the Gulf of Bothnia at Haparanda should similarly be 15 in. higher than that of the Skagerrak. Recent levellings along the Swedish and Danish coasts have confirmed the higher level of the Baltic; and the level of the Mediterranean has also been determined by exact measurements to be from 15 to 24 in. lower than that of the Atlantic on account of evaporation. Apart from the effects of varying precipitation and evaporation the atmosphere affects sea-level also by its varying pressure, the difference in level of the sea-surface from this cause between two given points being thirteen times as great as the difference between the corresponding readings of the mercurial barometer. In the north tropical belt of high pressure south of the Azores the atmospheric pressure in January is 0·87 in. higher than in the Irminger Sea; hence the sea-level near the Azores is almost 1 ft. lower than in the northern sea. In the monsoon region, where the barometer rises 0·38 in. between July and January, the level of the sea falls in consequence by 5 in. Wind also gives rise to differences of level by driving the water before it, and the prevailing westerly wind of the southern Baltic is the chief cause of the sea-level at Kiel being 5½ in. lower than at Arkona on Rügen. Periodic variations of level due to meteorological causes account for the Baltic being fuller in the time of the summer rains than in winter, when the rivers and lakes are frozen and most of the precipitation on the land is in the form of snow. The range on the Arkona gauge is from 3·5 in. below mean level in April to 2·75 in. above the mean level in August. A similar range occurs on the Dutch coast in the North Sea, where the maximum level is reached in October, the month of highest rainfall, and there is a range of 8 in. to the minimum level at the time of least rainfall in early spring. In the monsoon regions the half-yearly change from on-shore to off-shore winds produces noticeable differences in level; thus fifteen years' observations at Aden show a maximum in May at the end of the north-east monsoon, and a rapid falling off after the beginning of the south-west monsoon to a minimum in August, the total range being 9½ in. The influence of wind on water-level is most remarkable in heavy storms on the flat coasts of the North Sea and Baltic, when the rise may amount to very many feet. In the region of tropical hurricanes the converging wind system of a circular storm causes a heaping up of water capable of devastating the low coral islands of the Pacific. On the 1st of November 1876 a cyclone acting in this way submerged a great area of the level plain of the Ganges delta to a depth of 46 ft.; here the influence of the difference of pressure within and without the cyclone acted in the same direction as the wind. The old speculations as to a great difference of level between the Mediterranean and the Red Sea, and on the two sides of the Isthmus of Panama, which hindered the projects for canals connecting those waters, have been proved by modern levelling of high precision to be totally erroneous.

Deep-sea Soundings.—The hand-lead attached to a line divided into fathoms was a well-known aid to navigation even in high antiquity, and its use is mentioned in Herodotus (ii. 5) and in the Acts of the Apostles (xxvii. 29). Greater depths than those usually sounded by a hand-line may possibly not have been beyond the reach of the earlier navigators, for Strabo says "of measured seas the Sardonian is the deepest with full one thousand fathoms" (i. 3, p. 53 Cas.). Yet we find that the great discoverers of the modern period were only familiar with the hand-lead, and the lines in use did not exceed 200 fathoms in length. Ingenious devices had indeed been tried in the 17th century and earlier, by which a lead thrown into the sea without a line detached a float on striking the bottom, and it was proposed to calculate the depth by the time required for the float to reappear. The earliest deep-sea sounding on record is that of Captain Phipps on the 4th of September 1773 in the Norwegian Sea, in 65° N. 3° E., on his return from his expedition to Spitsbergen. He spliced together all the sounding-lines on board, and with a weight of 150 ℔ attached he found bottom in 683 fathoms and secured a sample of fine soft blue mud. He detected the moment of the lead touching the bottom by the sudden slackening in the rate at which the line ran out. Polar explorers frequently repeated those experiments in deep-sea soundings, both William Scoresby and Sir John Ross obtaining notable results, though not reaching depths of more than 1200 fathoms. The honour of first sounding really oceanic depths belongs to Sir James Clark Ross, who made some excellent measurements in very deep water, though in a few instances he overestimated the depth by failing to detect the moment at which the lead touched bottom. The pursuit of these isolated investigations received a great impetus from the enthusiasm of the great American oceanographer Captain Matthew Fontaine Maury, U.S.N., who directed the whole impetuous strength of his character to the task of compelling the silent depths of the ocean to tell their tale. Instead of the expensive mile-long stout hemp lines used by Ross, Maury introduced a ball of strong twine attached to a cannon shot, which ran it out rapidly; when the bottom was reached the twine was cut and the depth deduced from the length of string left in the ball on board. The time of touching bottom was judged by timing each 100-fathom mark and noting the sudden increase in the time interval when the shot reached the bottom. Maury, however, recognized that in great depths the surest guarantee of bottom having been reached was to bring up a sample of the deposit. To do this with a heavy lead attached required a very strong hemp line, and the twine used in the American method was useless for this purpose. In 1854 J. M. Brooke, a midshipman of the U.S.N., invented the principle already foreshadowed by Nicolaus Cusanus in the 15th century and by Robert Hooke in the 17th, of using a heavy weight so hung on the sounding-tube that it was automatically released on striking the bottom and left behind, while the light brass tube containing a sample of the deposit was easily hauled up. This principle has been adopted universally for deep soundings, and is now applied in many forms. In 1855 Maury published the first chart of the depths of the Atlantic between 52° N. and 10° S. At this period an exact knowledge of the depths of the ocean assumed an unlooked-for practical importance from the daring project for laying a telegraph cable between Ireland and Newfoundland. Deep soundings were made in the Atlantic for this purpose by vessels both of the British and of the American navies, while in the Mediterranean and in the Indian Ocean many soundings were made in connexion with submarine cables to the East. Another stimulus came from the biologists, who began to realize the importance of a more detailed investigation of the life conditions of organisms at great depths in the sea. The lead in this direction was taken by British biologists, beginning with Edward Forbes in 1839, and in 1868 a party on board H.M.S. "Lightning" pursued researches in the waters to the north of Scotland. In 1869 and 1870 this work was extended to the Irish Sea and Bay of Biscay in H.M.S. "Porcupine," and to the Mediterranean in H.M.S. "Shearwater." The last-named vessel secured 157 trustworthy deep soundings, with samples of the deposits, and also observations of temperature and salinity in different depths, as well as dredgings for the collection of the organisms of the deep sea.

These preliminary trips of scientific marine investigation were followed by the greatest purely scientific expedition ever undertaken, the voyage of H.M.S. "Challenger" round the world under the scientific direction of Sir Wyville Thomson and the naval command of Sir George Nares. This epoch-making expedition lasted from Christmas 1872 to the end of May 1876, and gave the first wide and general view of the physical and biological conditions of the ocean as a whole. Almost simultaneously with the "Challenger," a German expedition in S.M.S. "Gazelle" conducted observations in the South Atlantic, Indian and South Pacific Oceans; and the U.S.S. "Tuscarora" made a cruise in the North Pacific, sounding out lines for a projected Pacific cable. The successor of Sir Wyville Thomson in the editorship of the "*Challenger*" *Reports*, Sir John Murray, has rightly said that since the days of Columbus and Magellan no such revelation regarding the surface of our planet had been made as in that eighth decade of the 19th century. Since that time the British cable-ships have been busy in all the oceans making sections across the great expanses of water with ever-increasing accuracy, and in that work the government surveying ships have also been engaged, vast stretches of the Indian and Pacific Oceans having been opened up to knowledge by H.M.SS. "Egeria," "Waterwitch," "Dart," "Penguin," "Stork," and "Investigator." American scientific enterprise, mainly under the guidance of Professor Alexander Agassiz, has been active in the North Atlantic and especially in the Pacific Ocean, where very important investigations have been made. The eastern part of the North Atlantic has been the scene of many expeditions, often purely biological in their purpose, amongst which there may be mentioned the cruises of the "Travailleur" and "Talisman" under Professor Milne-Edwards in 1880–1883, and since 1887 those of the prince of Monaco in his yachts, as well as numerous Danish vessels in the sea between Iceland and Greenland, conspicuous amongst which were the expeditions in 1896–1898 on board the "Ingolf." The Norwegian Sea was studied by the Norwegian expedition on board the "Vöringen" in 1876–1878, and the north polar basin by Nansen and Sverdrup in the "Fram" in 1893–1896, the Mediterranean by the Italians on the "Washington" and by the Austrians on the "Pola" in 1890–1893, the latter carrying the investigations to the Red Sea in 1895–1898, while the Russians investigated the Black Sea in 1890–1893. For high southern latitudes special value attaches to the soundings of the German deep-sea expedition on the "Valdivia" in 1898–1899, and to those of the "Belgica" in 1897–1898, the "Gauss" in 1902–1903, and the "Scotia" in 1903–1904. The soundings of the Dutch expedition on the "Siboga" during 1899–1900 in the eastern part of the Malay seas and those of the German surveying ship "Planet" in 1906 in the South Atlantic, Indian and North Pacific Oceans were notable, and Sir John Murray's expedition on the "Michael Sars" in the Atlantic in 1910 obtained important results.

Modern surveying ships no longer make use of hempen lines with enormously heavy sinkers, such as were employed on the "Challenger," but they sound instead with steel piano wire not more than $\frac{1}{30}$ to $\frac{1}{25}$ of an inch in diameter and a detachable lead seldom weighing more than 70 lb. The soundings are made by means of a special machine fitted with a brake so adjusted that the revolution of the drum is stopped automatically the instant the lead touches the bottom, and the depth can then be read directly from an indicator. The line is hauled in by a steam or electric winch, and the sounding-tube containing a sample of the bottom deposit is rapidly brought on board. The sounding machines most frequently employed are those of Admiral C. D. Sigsbee, U.S.N., of Lucas, which was perfected in the Telegraph Construction and Maintenance Company's ships, and of the Prince of Monaco, constructed by Leblanc of Paris. All attempts to dispense with a lead and line and to measure the depth by determining the pressure at the bottom have hitherto failed when applied to depths greater than 200 fathoms; a new hydraulic manometer has been tried on board the German surveying ship "Planet." A. Siemens has pointed out that a profile of the sea-bed can be delineated by taking account of the varying strain on a submarine cable while it is being laid, and the average depth of a section can thus be ascertained with some accuracy. All deep-sea measurements are subject to uncertainty because the sounding machine merely measures the length of wire which runs out before the lead touches bottom, and this agrees with the depth only when the wire is perpendicular throughout its run. It is improbable, however, that the smooth and slender wire is much influenced by currents, and the best deep-sea soundings may be taken as accurate to within 5 fathoms.

Relief of the Ocean Floor.—Recent soundings have shown that the floor of the ocean on the whole lies some 2 or 3 m. beneath the surface, and O. Krümmel has calculated the mean depth to be 2010 fathoms (12,060 ft.), while the mean elevation of the surface of the continents above sea-level is only 2300 ft. Viewed from the floor of the ocean the continental block would thus appear as a great plateau rising to a height of 14,360 ft. Nevertheless, the greatest depths of the ocean below sea-level and the greatest heights of the land above it are of the same order of magnitude, the summit of Mount Everest rising to 29,000 ft. above the sea-level, while the Nero Deep near Guam sinks to 31,600 ft. (5268 fathoms) below sea-level. Of course the area at great heights is very much less than the area at corresponding depths. Above the height of 15,000 ft. there are 800,000 sq. km. (310,000 sq. m.), and below the depth of 15,000 ft. there are 120,000,000 sq. km. (46,300,000 sq. m.); above the height of 20,000 ft. there are on the whole surface of the earth only 33,000 sq. km. (12,800 sq. m.), while below the depth of 20,000 ft. there are no less than 5,400,000 sq. km. (2,100,000 sq. m.). According to Krümmel's calculation the areas of the ocean beyond various depths are as follows:—

Fathoms.	sq. km.	sq. st. m.
More than		
100	350,500,000	135,300,000
500	319,500,000	123,400,000
1000	304,000,000	117,400,000
1500	276,500,000	106,800,000
2000	215,000,000	83,000,000
2500	120,000,000	46,300,000
3000	22,500,000	8,700,000
3500	3,000,000	1,200,000
4000	1,200,000	460,000

On the whole the floor of the ocean is very smooth in its contours, and great stretches can almost be called level. Modern orometry has introduced the calculation of the mean angle of the slope of a given uneven surface provided that maps can be prepared showing equidistant contour lines. If the distance between the contour lines is h and the length of the individual contour lines l, the sum of their lengths $\Sigma(l)$, and A the area of the surface under investigation, then the mean angle of slope is obtained from the equation

$$\tan \alpha = \frac{h\Sigma(l)}{\mathrm{A}}.$$

Calculating from sheet A I of the Prince of Monaco's *Atlas of Ocean Depths*,[1] Krümmel obtained a mean angle of slope of 0° 27′ 44″ or an average fall of 1 in 124 for the North Atlantic between 0° and 47° N., the enclosed seas being left out of account. In the same way a mean angle of slope of approximately half a degree was found for the Adriatic and the Black Sea. Large angles of slope may, however, occur on the flanks of oceanic islands and the continental borders. On the submarine slopes leading up to isolated volcanic islands angles of 15° to 20° are not uncommon, at St Helena the slopes run up to 38½° and even 40°, at Tristan d'Acunha to 33½°. E. Hull found a mean angle of slope of 13° to 14° for the edge of the continental shelf off the west coast of Europe, and off Cape Toriñana (43° 4′ N.) as much as 34°. Where the French telegraph cable between Brest and New York passes from the continental shelf of the Bay of Biscay to the depths of the Atlantic the angle of slope is from 30° to 41°. Such gradients are of a truly mountainous character, the angle of slope from the Eibsee to the Zugspitze is 30°, and that from Alpiglen station to the summit of the Eiger is 42°. Particularly steep slopes are found in the case of submarine domes, usually incomplete volcanic cones, and there have been cases in which after such a dome has been discovered by the soundings of a surveying ship it could not be found again as its whole area was so small and the deep floor of the ocean from which it rose so flat that an error of 2 or 3 m. in the position of the ship would prevent any irregularity of the bottom from appearing. While such steep mountain walls are found in the bed of the ocean it must be remembered that they are very exceptional, and except where there are great dislocations of the submarine crust or volcanic outbursts the forms of the ocean floor are incomparably gentler in their outlines than those of the continents. Being protected by the water from the rapid subaerial erosion which sharpens the features of the land, and subjected to the regular accumulation of deposits, the whole ocean floor has assumed some approach to uniformity. Still there are everywhere gentle inequalities on the smoothest ocean floor which give to its greater features a distinct relief.

In spite of the increase of deep-sea soundings in the last few decades, they are still very irregularly distributed in the open ocean, and the attempt to draw isobaths (lines of equal depth) on a chart of the world is burdened with many difficulties which can only be evaded by the widest generalizations. Bearing this caution in mind the existing bathymetrical charts, amongst which that of the prince of Monaco stands first, give a very fair idea of the great features of the bed of the oceans. A definite terminology for the larger forms of sub-oceanic relief was put forward by the International Geographical Congress at Berlin in 1899 and adopted by that at Washington in 1904. Equivalent terms, which are not necessarily identical or literal translations, were adopted for the English, French and German languages, the equivalence being closest and most systematic between the English and German terms.

The larger forms designated by special generic terms include the following. The *continental shelf* is the gentle slope which extends from the edge of the land to a depth usually about 100, though in some cases as much as 300 fathoms, and is there demarcated by an abrupt increase in the steepness of the slope to ocean depths. In the deep sea two types of feature are recognized under the general names of *depression* and *elevation*. The depression is distinguished according to form and slope as (1) a *basin* when of a roughly round outline, (2) a *trough* when wide and elongated, or (3) a *trench* when narrow and elongated lying along the edge of a continent. The extension of a basin or trough stretching towards the continent is termed an *embayment* when relatively wide and a *gully* when narrow. The elevation includes (1) the gently swelling *rise* which separates troughs and basins in the middle of the ocean, (2) the steeply sloping *ridge* which interposes a narrower barrier between two depressions, and (3) the *plateau* or wide elevation rising steeply on all sides from a depression. The deepest part of a depression is termed a *deep*, and the highest part of an elevation when not reaching the surface a *height*. In addition to these large forms a few minor forms must be recognized. Amongst these are the *dome*, an isolated elevation rising steeply but not coming within 100 fathoms of the surface; the *bank*, an elevation coming nearer the surface than 100 fathoms, but not so near as 6 fathoms; and finally the *shoal* or *reef*, which comes within 6 fathoms of the surface, and so may constitute a danger to shipping. Similarly we may note the *caldron* or small steep depression of a round outline, and the *furrow* or long narrow groove in the continental shelf.

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[1] *Carte générale bathymétrique des océans dressée par ordre de S.A.S. le Prince Albert de Monaco*, 24 sheets (Paris, 1904).

According to the resolutions of the International Geographical Congress the larger individual forms which have been described by generic terms shall have specific names of a purely geographical character; but in the case of the minor forms the names of ships and persons are considered applicable. In 1899 A. Supan published a chart of the oceans with a suggested nomenclature based on these principles; and the larger forms in the Prince of Monaco's great chart also are named in accordance with the rule. Although put forward by the highest international authority recognized by geographers the system of nomenclature has not been adopted universally. In particular Sir John Murray considers that only deeps exceeding 3000 fathoms in depth should be named, and in his charts he has named these deeps after persons whether the individuals thus honoured had themselves discovered or explored the deeps in question or not. Some of the "deeps" to which names have been given disappear or are divided into two or three smaller deeps when the contour lines representing hundreds of fathoms are translated into contour lines representing hundreds of metres. A similar change in the contour lines may result from the substitution of lines in fathoms for those originally drawn in metres, and hence it is extremely desirable that specific names should only be given to such features as are pronounced enough to appear on maps drawn with either unit. For the sake of uniformity it is to be hoped that the system of nomenclature recommended by the International Geographical Congress will ultimately be adopted.

The continental shelves are parts of the great continental blocks which have been covered by the sea in comparatively recent times, and their surface consequently presents many similarities to that of the land, modified of course by the destructive and constructive work of the waters. Waves and tidal currents produce their full effects in that region, and in high latitudes the effect of transport of materials by ice is very important; while in the warm water of the tropics the reef-building animals and plants (corals and calcareous algae) carry on their work most effectively there. The continental shelves include not only the oceanic border of the continents but also great areas of the enclosed seas and particularly of the fringing seas, the origin of which through secular subsidence is often very clearly apparent, as for instance in the North Sea and the tract lying off the mouth of the English Channel. A closer investigation of the numerous long, narrow banks which lie off the Flemish coast and the Thames estuary shows that they are composed of fragments of rock abraded and transported by tidal currents and storms in the same way that the chalk and limestone worn off from the eastern continuation of the island of Heligoland during the last two centuries has been reduced to the coarse gravel of the off-lying Düne. Numerous old river valleys and furrows entrenched in the continental shelf bear witness to its land origin. Such valleys are very clearly indicated in the belts of the western Baltic by furrows a thousand yards wide and twenty to thirty fathoms deeper than the neighbouring sea-bed. Amongst the best known of the furrows of the continental shelf are the Cape Breton Deep, in the Bay of Biscay, the Hudson Furrow, southward of New York, the so-called Congo Cañon, the Swatch of No Ground off the Ganges delta, the Bottomless Pit off the Niger delta, and numerous similar furrows on the west coast of North America and outside the fjords of Norway, Iceland and the west of Scotland, as well as in the Firth of Forth and Moray Firth.

The seaward edge of the continental shelf often falls steeply to the greatest depths of the ocean, and not infrequently forms the slope of a *trench*, a form of depression which has usually a steep slope towards a continent or an island-bearing rise on one side and a gentler slope towards the general level of the ocean on the other. All the greatest depths of ocean, *i.e.* all soundings exceeding 4000 fathoms, occur in trenches, and there are only a few small trenches known (on the west coast of Central America) in which the maximum depth is less than 3000 fathoms. Most trenches are narrow, but of considerable length, and their steeper side is believed to be due in every case to a great fracture of the earth's crust. Strong evidence of this is afforded by the association of some of the depressions, notably the Japan Trench and the Atacama Trench, with the origin of frequent submarine earthquakes. Troughs and rises are features of more frequent occurrence and are best described as they occur in the particular oceans.

In the Atlantic the prevailing meridianal direction of the shore lines extends to the submarine features also. Captain Sherard Osborn in 1870 was the first to recognize that the North Atlantic Basin was divided by a central rise running generally from north to south into two parallel depressions. In 1876 the "Challenger" expedition found that a similar configuration exists in the South Atlantic also. As the result of all the deep-sea surveys now available we know that the central rise of the Atlantic starts from Iceland as the Reykjanes Ridge with less than 1000 fathoms of water over it in most parts and runs south-westward until in 51° N. it widens into what was called by Maury the Telegraph Plateau. Continuing southwards the rise joins the Azores Plateau, which has in parts a very marked relief, and runs thence southward almost exactly in the middle of the ocean, becoming gradually lower as it goes. As far as 29° N. the depth over it is less than 1500 fathoms, thence to 12° N. the depths are between 1500 and 2000 fathoms, and then it rises again to about 1500 fathoms and runs eastward under the name of the Equatorial Ridge. Crossing the equator in 13° W. the rise resumes a southerly direction and from Ascension to Tristan d'Acunha, the depth is in many places less than 1500 fathoms. The soundings of Bruce's Antarctic expedition in the "Scotia" showed that the rise cannot be traced beyond 55° S. where the depths increase rapidly to over 2000 fathoms. The whole length of the rise which divides the Atlantic into an eastern and a western basin may be taken as 7500 nautical miles. Between 30° and 40° S. two lateral ridges diverge from the great Atlantic rise, the Rio Grande ridge towards the north-west and the Walfisch ridge towards the north-east. The existence of the latter, which extends to the African continent, was announced by Sir Wyville Thomson in 1876 as a result of his discussion of the deep-sea temperature observations of the "Challenger" expedition, though the fact was not confirmed by soundings until many years later.

The West Atlantic Trough lying on the western side of the Central Rise widens in the north into the North American Basin, and its greatest depths appears to be in the Porto Rico Trench, where in 1882 Capt. W. H. Brownson, U.S.N., obtained a sounding of 4561 fathoms in 19° 36′ N., 66° 26′ W. The Brazilian Basin has also a large area lying at a depth greater than 2500 fathoms and culminates in the Romanche Deep close to the Equatorial Ridge in 0° 11′ S., 18° 15′ W. with a depth of 4030 fathoms. The Eastern Atlantic Trough cannot boast of such great depths though the Peake Deep with 3284 fathoms sinks abruptly from the Azores Plateau in 43° 9′ N., 19° 45′ W., and several soundings exceeding 2700 fathoms have been obtained in the Bay of Biscay east of the meridian of 5° E. The North African Basin has several deeps with more than 3300 fathoms to the north-west and the south-west of the Cape Verde Islands, but the South African Basin is less deep. In the South Atlantic there is no connexion between the Central Rise and the Antarctic Shelf, for the Indo-Atlantic Antarctic Basin stretches from near the South Sandwich Islands towards Kerguelen with depths exceeding 2500 fathoms and reaching in places 3100. The Cape Trough runs northward from this basin. It was long believed on the strength of a sounding of "4000 fathoms, no bottom" reported by Sir James Ross in 68° 22′ S., 12° 49′ W., that the Indo-Atlantic Basin was of enormous depth, but W. S. Bruce, in the "Scotia," showed in 1904 that the real depth at that point is only 2660 fathoms.

In the Indian Ocean the Kerguelen Rise stretches broadly southward, east of the island which gives it a name, to the Antarctic Shelf with the greatest depths upon it usually less than 2000 fathoms, and it stretches northward beyond New Amsterdam to 30° S. This rise is separated from the Crozet Rise by a depression extending to 2675 fathoms, through which the Kerguelen Trough (which lies north of Kerguelen) is brought into free communication with the Indo-Atlantic Antarctic Basin. The greater part of the Indian Ocean is occupied by the great Indian Basin, which covers 35,000,000 sq. km. (13,500,000 sq. m.) and extends from the Chagos Islands eastward to Australia and south-eastward to Tasmania. The Australian Shelf rises steeply as a rule from depths of 2500 to 3000 fathoms. A broad depression with depths of from 3300 to 3500 fathoms lies to the east of the Cocos Islands and extends into the angle between the Malay Archipelago and Australia. On the north this depression sinks into the long and narrow Sunda Trench south of Java, and here in 10° 15′ S., 108° 5′ E., the German surveying-ship "Planet" obtained a sounding of 3828 fathoms in 1906. The Sunda Trench is distinguished by the wave-like configuration of its floor, and this wave-like character is continued to the westward of Sumatra with islands rising from the higher portions. The western part of the Indian Ocean has been shown by the surveys of H.M.S. "Sealark" and the German surveying-ship "Planet" to have a somewhat complicated configuration, the island groups and banks of atolls which occur there rising abruptly as a rule from depths of about 2000 fathoms or more. Between the Seychelles and Sokotra (0°–9° N.) there are great stretches of the ocean floor forming an almost level expanse at a depth of 2800 fathoms. The Arabian Gulf and Gulf of Aden are also very uniform with depths of about 1900 fathoms, while the floor of the Bay of Bengal rises very gradually northwards and is 1000 fathoms deep close up to the Ganges Shelf.

The Pacific Ocean consists mainly of one enormous basin bounded on the west by New Zealand and the Tonga, Marshall and Marianne ridges, on the north by the festoons of islands marking off the North Pacific fringing seas, on the east by the coast of North America and the great Easter Island Rise and on the south by the Antarctic Shelf. The total area of this basin is about 80,000,000 sq. km. (30,000,000 sq. m.), its surface being almost twice that of Asia. Half of this basin lies deeper than 2750 fathoms, and the greater part of it belongs to the northern hemisphere. From the floor of this vast and profound depression numerous isolated volcanic cones rise with abrupt slopes, and even between the islands of the Hawaiian group there are depths of more than 2000 fathoms. The Society Islands and Tahiti crown a rise coming within 1500 fathoms of the surface, two similar rises form the foundation of the Paumotu group where Agassiz found soundings of 2187 fathoms between Marokau and Hao. This greatest of ocean basins contains also the largest and deepest trenches. The Tuscarora Deep of the Japan Trench (4655 fathoms in 44° 55′ N., 152° 26′ E.) was famed for many years as the deepest depression of the earth's crust. This great trench is continued along the Luchu Islands where the cable-steamer "Stephan" sounded in 4080 fathoms, and through the Bonin Trench (with a maximum of 3595 fathoms) to the famous Marianne Trench in which the U.S.S. "Nero" in 1899 found 5269 fathoms in 12° 43′ N., 145° 49′ E., the greatest depth yet measured. The northern part of the Marianne Trench leads to a wave-like configuration of the ocean floor, the depth to the east of Saipan being over 4300 fathoms, followed by a rise to 1089 fathoms and then a descent to 3167 fathoms. The trenches of Yap (4122 fathoms) and Palau (Pelew) (4450 fathoms) are not immediately connected with that of Marianne. To the east of the Philippines a sounding of 3490 fathoms is found close to the Strait of St Bernardino and north-east of Talaut there is a trench with 4648 fathoms. To the north-east the Japan Trench adjoins the Aleutian Trench, where a depth of 4038 fathoms has been found south-west of Attu. Trenches of great size also occur south of the equator. The Tonga and Kermadec trenches, both deeper than 4000 fathoms, stretch from the Samoa Islands southwards toward New Zealand for a distance of 1600 nautical miles. The deepest sounding obtained in the Tonga Trench is 5022 fathoms in 23° 39·4′ S., 175° 4′ W., and in the Kermadec Trench, 5155 fathoms, 30° 27·7′ S., 176° 39′ W. The steep western sides of these trenches often show an angle of slope of 7°.

The south-western part of the Pacific Ocean has a very rich and diversified submarine relief, abounding in small basins separated by ridges and rises. There are no depths, however, much exceeding 2500 fathoms amongst these depressions. The south-eastern part of the Pacific is mainly occupied by the Easter Island Rise with depths rarely so great as 2000 fathoms; but close to the continent of South America the Atacama Trench is a typical example of the deepest form of depression culminating with 4175 fathoms in 25° 42′ S., 71° 31·5′ W. The Pacific Antarctic Basin occupies the vast region south of 50° S. right up to the Antarctic Shelf, with depths ranging down to 2500–3000 fathoms, and communicating with the main Pacific Basin to the east of New Zealand.

The greatest of the intercontinental seas, the Arctic, comes nearest to oceanic conditions in the extent and depth of its depressions. The soundings of Nansen and Sverdrup on the "Fram" expedition indicate that northward from the Siberian Shelf the great North Polar Basin has an area of about 4,000,000 sq. km. (1,500,000 sq. m.) with depths down to 2200 fathoms. A rise between Spitsbergen and Greenland separates the Norwegian Trough (greatest depth 2005 fathoms in 68° 21′ N., 2° 5′ W.) which in turn is divided from the Atlantic by the Wyville Thomson Ridge which runs between the Faeroe and Shetland islands and is covered by only 314 fathoms of water at the deepest point. The ridge across Denmark Strait west of Iceland nowhere exceeds 300 fathoms in depth, so that the deeper water of the North Polar Basin is effectively separated from that of the Atlantic. A third small basin occupies Baffin Bay and contains a maximum depth of 1050 fathoms. Depths of from 100 to 300 fathoms are not uncommon amongst the channels of the Arctic Archipelago north of North America, and Bering Strait, through which the surface water of the Arctic Sea meets that of the Pacific, is only 28 fathoms deep.

The Central American Sea communicates with the Atlantic through the channels between the Antilles, none of which is quite 1000 fathoms deep, and it sinks to a depth of 2843 fathoms in the Caribbean Basin, 3428 fathoms in the Cayman Trench and 2080 fathoms in the Gulf of Mexico.

The Austral-Asiatic or Malay Sea is occupied by a great shelf in the region west of Borneo and north of Java, while in the east there are eight abruptly sunk basins of widely different size. The China Sea on the north has a maximum depth of 2715 fathoms off the Philippines, the Sulu Basin reaches 2550 fathoms, and the Celebes Basin 2795 fathoms. Some of the channels between the islands are of very great depth, Macassar Strait exceeding 1000 fathoms, the Molucca Passage exceeding 2000 fathoms, and the Halmahera Trough sinking as deep as 2575 fathoms. The deepest of all is the Banda Basin, a large area of which lies below 2500 fathoms and reaches 3557 fathoms in the Kei Trench. A depth of 2789 fathoms also occurs north of Flores. The borders of the Malay Sea are everywhere shallower on the side of the Indian Ocean than on that of the Pacific, and consequently water from the Pacific preponderates in the depths.

The Mediterranean Sea, the best-known member of the intercontinental class, is separated from the Atlantic Ocean by a ridge running from Cape Spartel to Cape Trafalgar on which the greatest depth is only 175 fathoms. The depth increases so rapidly towards the east that soundings exceeding 500 fathoms occur off Gibraltar. The Balearic Basin, between Spain and the rise bearing Corsica and Sardinia, has a maximum depth of 1742 fathoms, and the Tyrrhenian Basin between that rise, Italy and Sicily deepens to 2040 fathoms. The larger Eastern Mediterranean Basin stretches eastward from Sicily with large tracts more than 2000 fathoms below the surface, and the greatest depth ascertained during the detailed researches of the Austrian expedition on board the "Pola" was 2046 fathoms in 35° 44·8′ N., 21° 46·8′ E. The Adriatic Sea though very shallow in the north deepens southward to about 900 fathoms, and the Aegean Sea has a maximum depth of 1230 fathoms north of Crete. The Black Sea, connected with the Mediterranean by long and narrow channels, is occupied in the north by an extensive shelf on which lies the extremely shallow Gulf of Azov; but the greater part of the sea consists of a deep basin, the central part of which is an almost flat expanse at a uniform depth of 1220 fathoms.

The smaller enclosed seas are for the most part very shallow. The Persian Gulf nowhere exceeds 50 fathoms, the southern part of Hudson Bay does not exceed 100 fathoms except at one spot, though in the less-known fjords of the northern part depths up to 200 fathoms have been reported. The Baltic Sea exceeds 50 fathoms in few places except the broad central portion, though small caldron-like depressions here and there may sink below 200 fathoms. The Red Sea on the other hand, though shut off from the Indian Ocean by shallows of the Strait of Bab-el-Mandeb with little more than 100 fathoms, sinks to a very considerable depth in its central trough, which reaches 1209 fathoms in 20° N.

The fringing seas as a rule show little variety of submarine relief. The Bass Sea (Bass Strait), Irish Sea and North Sea lie on the continental shelf. In the North Sea the depth of 100 fathoms is only exceeded to any extent in the Norwegian gully, which has a maximum depth of 383 fathoms in the Skagerrack. Most of the other seas of this class are formed on a common plan. Towards the continent there is a broad shelf, and just before the chain of islands separating them from the ocean runs a narrow and deep trough. In the Bering Sea the trough north of Buldir in the Aleutian Islands sinks to 2237 fathoms, and in the Sea of Okhotsk, north-west of the Kuriles, to 1859 fathoms. Similar conditions prevail in the East China Sea and the Andaman Sea. The Sea of Japan has a wide shelf only in the north, the central part forms a broad basin with depths of 1650 fathoms. The Laurentian Sea (Gulf of St Lawrence) has a narrow branching gully running between wide shelves, in which a depth of 312 fathoms is found south of Anticosti.

The area, general depth and total volume of the oceans and principal seas have been recalculated by Krümmel, and the accompanying table presents these figures.

Mean Depths of Oceans and Seas.

Name.	Depth. Fathoms.	Area.		Volume.	
		sq. km.	sq. st. m.	cb. km.	cb. st. m.
Atlantic Ocean	2110	81,657,800	31,529,390	314,821,680	75,533,900
Indian Ocean	2148	73,441,960	28,357,150	288,527,610	69,225,200
Pacific Ocean	2240	165,715,490	63,985,370	678,837,190	162,870,600
I. Oceans	2186	320,815,250	123,871,910	1,282,186,480	307,629,700
Arctic Sea	640	14,352,340	5,541,630	16,794,140	4,029,400
Malay Sea	595	8,125,060	3,137,210	8,848,110	2,122,900
Central American Sea	1143	4,584,570	1,770,170	9,579,490	2,298,400
Mediterranean Sea	782	2,967,570	1,145,830	4,249,020	1,019,400
Intracontinental Seas	718	30,029,540	11,595,840	39,470,760	9,470,100
Baltic Sea	30	406,720	157,040	22,360	5,360
Hudson Bay	70	1,222,610	472,070	156,690	37,590
Red Sea	267	458,480	177,030	223,810	53,700
Persian Gulf	14	232,850	89,910	5,910	1,420
Smaller Enclosed Seas	96	2,320,660	896,050	408,770	98,070
II. Enclosed Seas	674	32,350,200	12,490,890	39,879,530	9,568,170
Bering Sea	790	2,274,800	878,340	3,286,230	788,500
Okhotsk Sea	694	1,507,610	582,110	1,895,100	454,700
Japan Sea	837	1,043,820	403,040	1,597,040	383,200
East China Sea	97	1,242,480	479,740	219,820	52,700
Andaman Sea	426	790,550	305,240	615,910	147,770
Californian Gulf	540	166,790	64,400	164,590	39,490
North Sea	51	571,910	220,820	53,730	12,890
Irish Sea	34	213,380	82,390	13,320	3,200
Laurentian Sea	70	219,300	84,670	28,100	6,740
Bass Sea	39	83,170	32,110	6,020	1,440
III. Fringing Seas	531	8,113,810	3,132,860	7,879,860	1,890,630
Seas (Enclosed and Fringing)	645	40,464,010	15,623,750	47,759,390	11,458,800
Hydrosphere	2013	361,279,160	139,495,660	1,329,945,870	319,087,500

Oceanic Deposits.—It has long been known that the deposits which carpet the floor of the ocean differ in different places, and coasting sailors have been accustomed from time immemorial to use the lead not only to ascertain the depth of the water but also to obtain samples of the bottom, the appearance of which is often characteristic of the locality. In depths down to 100 fathoms the old-fashioned hand-lead, hollow below and "armed" with tallow, suffices to bring up a sample large enough to be recognizable. Captain Phipps in 1773 secured samples of soft blue clay in this manner from a depth of 683 fathoms, but as a rule when sounding in great depths the sample is washed off the tallow before it can be brought on board. Various devices have consequently been attached to leads intended to catch and hold the material when soft enough to be penetrated. One of the most effective early forms was the snapper or "deep-sea clamm" of Sir John Ross, a pair of powerful spring jaws held apart by an arrangement which when released on striking the bottom allowed the jaws to close, biting out and holding securely a substantial portion of the ground. A simpler form of collector, now almost universally used, is a plain brass tube which is driven into the bottom of the sea by the weight of the sounding lead, and in which the deposit may be retained by a valve or other contrivance, though in many cases friction alone suffices to hold the punched-out core. Larger quantities of deposit may be conveniently collected by means of the dredge, which can be worked in any depth and brings up large stones, concretionary nodules or fossils, of the existence of which a sounding-tube could give no indication.

The voyage of the "Challenger" supplied for the first time the nucleus of a collection of deep-sea deposits sufficient to serve as the basis for comprehensive classification and mapping. The "Challenger" collections supplemented by those of other expeditions and of many telegraph and surveying-ships were studied in detail by Sir John Murray and Professor A. Renard, whose monograph,[1] published in 1891, laid the foundations and reared the greater part of the structure of our present knowledge on the subject. The classification adopted was a double one, taking account both of the origin and of the distribution in depth of the various deposits, thus:—

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[1] "*Challenger*" *Reports*, "Deep Sea Deposits."

I. DEEP SEA DEPOSITS (beyond 100 fathoms)	1. Red Clay.	A. PELAGIC DEPOSITS (formed in deep water remote from land)
	2. Radiolarian Ooze	
	3. Diatom Ooze	
	4. Globigerina Ooze	
	5. Pteropod Ooze	
	6. Blue Mud	B. TERRIGENOUS DEPOSITS (formed in deep or shallow water close to land)
	7. Red Mud	
	8. Green Mud	
	9. Volcanic Mud	
	10. Coral Mud	
II. SHALLOW WATER DEPOSITS (in less than 100 fathoms)	Sands, gravels, muds, &c.	
III. LITTORAL DEPOSITS (between high and low-water marks)	Sands, gravels, muds, &c.	

Krümmel prefers to simplify this by grouping the deposits in a single category arranged according to their position into:

(α) *Littoral* (including Murray and Renard's littoral and shallow water deposits [II. and III.]).
(β) *Hemipelagic* (including Nos. 6-10 of Deep Sea Deposits).
(γ) *Eupelagic* (including Nos. 1-5 of Deep Sea Deposits).

As so defined the hemipelagic deposits are those which occur in general on the slope from the continental shelves to the ocean depths and also in the deep basins of enclosed and fringing seas. The eupelagic deposits are subdivided by Krümmel into two main groups; (*a*) *epilophic*,[1] including the pteropod, globigerina and diatom oozes occurring on the rises and ridges and in the less deep troughs. (*b*) *Abyssal*, including the radiolarian ooze and red clay of the deepest abysses.

The littoral deposits include those of the actual shore on the wash of the waves and of the surface of the continental shelf.

Shore Deposits are the product of the waste of the land arranged and bedded by the action of currents or tidal streams. On the rocky coast of high latitudes blocks of stone detached by frost fall on the beach and becoming embedded in ice during winter are often drifted out to sea and so carry the shore deposits to some distance from the land. Similar effects are produced along the boulder-clay cliffs of the Baltic. Where the force of the waves on the beach produces its full effect the coarser material gets worn down to gravel, sand and silt, the finest particles remaining long suspended in the water to be finally deposited as mud in quiet bays. A particularly fine-grained mud is formed on the low coasts of the eastern border of the North Sea by a mixture of the finest sediment carried down by the slow-running rivers with the calcareous or siliceous remains of plankton. Pure calcareous sand and calcareous mud are formed by wave action on the shores of coral islands where the only material available is coral and the accompanying calcareous algae, crustacea, molluscs and other organisms secreting carbonate of lime. Recent limestones are being produced in this way and also in some places by the precipitation of calcium carbonate by sodium or ammonium carbonate which has been carried into the sea or formed by organisms. The precipitated carbonate may agglomerate on mineral or organic grains which serve as nuclei, or it may form a sheet of hard deposit on the bottom as occurs in the Red Sea, off Florida, and round many coral islands in the Pacific. Only the sand and the finest-grained sediments of the shore zone are carried outwards over the continental shelf by the tides or by the reaction-currents along the bottom set up by on-shore winds. The very finest sediment is kept in a state of movement until it drops into the gulleys or furrows of the shelf, where it can come to rest together with the finer fragments of the remains of littoral or bank vegetation. Thus are formed the "mud-holes" of the Hudson Furrow so welcome as guides telling their position to ship captains making New York harbour in a fog. Sand may be taken as the predominating deposit on the continental shelves, often with a large admixture of remains of calcareous organisms, for instance the deposits of *maërl* made up of nullipores off the coasts of Brittany and near Belle Isle. Amongst the most widely distributed of the deposits actually formed on the continental shelf are phosphatic nodules; these are especially abundant on the east coast of the United States and on the Agulhas Bank, where the amount of calcium phosphate in the nodules is as much as 50%. Sir John Murray finds the source of the phosphoric acid to be the decomposition of large quantities of animal matter, and he illustrates this by the well-known circumstance of the death of vast shoals of fish when warm Gulf-Stream water displaces the cold current which usually extends to the American coast. Glacial detritus naturally plays a great part in the deposits on the polar continental shelves.

Hemipelagic deposits are a mixture of deposits of terrigenous and pelagic origin. The most abundant of the terrigenous materials are the finest particles of clay and calcium carbonate as well as fragments derived from land vegetation, of which twigs, leaves, &c., may form a perceptible proportion as far as 200 m. from land. Blue mud, according to Murray and Renard, is usually of a blue or slaty or grey-green colour when fresh, the upper surface having, however, a reddish tint. The blue colouring substance is ferrous sulphide, the upper reddish layer contains more ferric oxide, which the predominance of decomposing organic matter in the substance of the mud reduces to ferrous oxide and subsequently by further action to sulphide. The proportion of calcium carbonate varies greatly according to the amount of foraminifera and other calcareous organisms which it contains. Blue mud prevails in large areas of the Pacific Ocean from the Galapagos Islands to Acapulco. In the Indian Ocean it covers the Bay of Bengal, the Arabian Gulf, the Mozambique Channel and the region to the south-west of Madagascar. In the Atlantic it is the characteristic deposit of the slopes of continental shelves of western Europe and of New England, being largely mixed with ice-borne material to the south of Newfoundland. It is particularly in evidence round the whole of the Antarctic Shelf, where it occurs down to depths of 2500 fathoms. It is the chief deposit, according to Nansen, of the North Polar Basin and, according to Schmelck and Böggild, of the Norwegian Sea also, where it is largely mixed with the shells of the bottom-living foraminifer Biloculina. Max Weber states that blue mud occurs in the deep basins of the eastern part of the Malay Sea. In the form of volcanic mud it is common round the high volcanic islands of the South-Western Pacific.

Red mud may be classed as a variety of blue mud, from which it differs on account of the larger proportion of ochreous substance and the absence of sufficient organic matter to reduce the whole of the ferric oxide. This variety surrounds the tropical parts of the continental shelves of South America, South Africa and eastern China.

Green mud differs to a greater extent from the blue mud, and owes its characteristic nature and colour to the presence of glauconite, which is formed inside the cases of foraminifera, the spines of echini and the spicules of sponges in a manner not yet understood. It occurs in such abundance in certain geological formations as to give rise to the name of green-sand. Green mud abounds off the east coast of North America seawards of Cape Hatteras, also to the north of Cuba, and on the west off the coast of California. The "Challenger" expedition found it on the Agulhas Bank, on the eastern coasts of Australia, Japan, South America and on the west coast of Portugal. When the proportion of calcium carbonate in the blue mud is considerable there results a calcareous ooze, which when found on the continental slope and in enclosed seas is largely composed of remains of deep-sea corals and bottom-living foraminifera, pelagic organisms including pteropods being less frequently represented. The floors of the Caribbean, Cayman and Mexican Basins in the Central American Sea are covered with a white calcareous ooze, which is clearly distinguished from the eupelagic pteropod and globigerina oozes by the presence of abundant large mineral particles and the remains of land plants. In this deposit the occurrence of calcareous concretions is very characteristic, as L. F. de Pourtalès pointed out in 1870; they consist of remains of deep-sea corals, serpulae, echinoderms and mollusca united by a calcareous cement. Similar formations are found in the Mediterranean, where a dark mud predominates in the western part, passing into a grey, marly slime in the Tyrrhenian Basin and replaced by a typical calcareous ooze in the Eastern Basin. The bottom of the Black Sea is covered by a stiff blue mud in which Sir John Murray found much sulphide of iron,[1] grains or needles of pyrites making up nearly 50% of the deposit, and there are also grains of amorphous calcium carbonate evidently precipitated from the water. The formation of the blue mud is largely aided by the putrefaction of organic matter, and as a result the water deeper than 120 fathoms is extraordinarily deficient in dissolved oxygen and abounds in sulphuretted hydrogen, the formation of which is brought about by a special bacterium, the only form of life found at depths greater than 120 fathoms in the Black Sea.

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[1] ἐπὶ λόφοις—on the threshold.

In the Red Sea the "Pola" expedition discovered a calcareous ooze similar to that of the Mediterranean, and the formation of a stony crust by precipitation of calcium and magnesium carbonates may be recognized as giving origin to a recent dolomite.

The terrigenous ingredients in the deposits become less and less abundant as one goes farther into the deep ocean and away from the continental margins. Still, according to Murray and Irvine, finely divided colloidal clay is to be found in all parts of the ocean however remote from land, though in very small amount, and there is less in tropical than in cooler waters. A minute fraction is always separating out of the water, and as a prodigious length of time may be accepted for the accomplishment of all the chemical and physical processes in the deep sea, we must take account of the gradual accumulation of even this infinitesimal precipitation. As well as the finest of terrigenous clay there is present in sea-water far from land a different clay derived from the decomposition of volcanic material. Volcanic dust thrown into the air settles out slowly, and some of the products of submarine and littoral volcanoes, like pumice-stone, possess a remarkable power of floating and may drift into any part of the ocean before they become waterlogged and sink. To this inconceivably slowly-growing deposit of inorganic material over the ocean floor there is added an overwhelmingly more rapid contribution of the remains of calcareous and siliceous planktonic and benthonic organisms, which tend to bury the slower accumulating material under a blanket of globigerina, pteropod, diatom or radiolarian ooze. When those deposits of organic origin are wanting or have been removed, the red clay composed of the mineral constituents is found alone. It is a remarkable geographical fact that on the rises and in the basins of moderate depth of the open ocean the organic oozes preponderate, but in the abysmal depressions below 2500 or 3000 fathoms, whether these lie in the middle or near the edges of the great ocean spaces, there is found only the red clay, with a minimum of calcium carbonate, though sometimes with a considerable admixture of the siliceous remains of radiolarians. Thus red clay and radiolarian ooze are distinguished as abyssal deposits in contradistinction to the epilophic calcareous oozes.

Globigerina ooze was recognized as an important deposit as soon as the first successful deep-sea soundings had been made in the Atlantic. It was described simultaneously in 1853 by Bailey of West Point and Ehrenberg in Berlin. Murray and Renard define globigerina ooze as containing at least 30% of calcium carbonate, in which the remains of pelagic (not benthonic) foraminifera predominate and in which remains of pelagic mollusca such as pteropods and heteropods, ostracodes and also coccoliths (minute calcareous algae) may also occur. Not more than 25% of the deposit may consist of bottom-dwelling foraminifera, echini or worm-tubes, and as a rule these make up only from 9 to 10%. These peculiarities, combined with the striking absence of mineral constituents, distinguish the eupelagic globigerina ooze from the hemipelagic calcareous mud. Out of 118 samples of globigerina ooze obtained by the "Challenger" expedition 84 came from depths of 1500 to 2500 fathoms, 13 from depths of 1000 to 1500 and only 16 from depths greater than 2500 fathoms. Viewed as a whole this deposit may be taken as a partial precipitation of the plankton living in the upper waters of the open sea. A small proportion of organic matter including the fat globules of the plankton is mixed with the calcium carbonate, the amount according to Gümbel's analysis being about 1 part in 1000. Secondary products, such as glauconite, phosphatic concretions and manganese nodules, occur though less frequently than in the hemipelagic sediments. Globigerina ooze is the characteristic deposit of the Atlantic Ocean, where it covers not less than 44,000,000 sq. km. (17,000,000 sq. statute m.). In the Indian Ocean the area covered is 31,000,000 sq. km. (12,000,000 sq. m.) and in the huge Pacific Ocean only 30,000,000 sq. km. (11,500,000 sq. m.).

Pteropod ooze is merely a local variety of globigerina ooze in which the comparatively large but very delicate spindle-shaped shells of pteropods happen to abound. These shells do not retain their individuality at depths greater than 1400 or 1500 fathoms, and in fact pteropod ooze is only found in small patches on the ridges near the Azores, Antilles, Canaries, Sokotra, Nicobar, Fiji and the Paumotu islands, and on the central rise of the South Atlantic between Ascension and Tristan d'Acunha.

Diatom ooze was recognized by Sir John Murray as the characteristic deposit in high latitudes in the Indian Ocean, and later it was found to be characteristic also of the corresponding parts of the Indian and Pacific covering a total area of about 22,000,000 sq. km. (8,500,000 sq. m.). It has been found sporadically near the Aleutian Islands, between the Philippines and Marianne Islands and to the south of the Galapagos group. It is made up to a large extent of the siliceous frustules of diatoms. It is usually yellowish-grey and often straw-coloured when wet, though when dried it becomes white and mealy.

Red clay was discovered and named by Sir Wyville Thomson on the "Challenger" in 1873 when sounding in depths of 2700 fathoms on the way from the Canary Islands to St Thomas. The reddish colour comes from the presence of oxides of iron, and particles of manganese also occur in it, especially in the Pacific region, where the colour is more that of chocolate; but when it is mixed with globigerina ooze it is grey. Red clay is the deposit peculiar to the abysmal area; 70 carefully investigated samples collected by the "Challenger" came from an average depth of 2730 fathoms, 97 specimens collected by the "Tuscarora" came from an average depth of 2860 fathoms, and 26 samples obtained by the "Albatross" in the Central Pacific came from an average depth of 2620 fathoms. Red clay has not yet been found in depths less than 2200 fathoms. The main ingredient of the deposit is a stiff clay which is plastic when fresh, but dries to a stony hardness. Isolated gritty fragments of minerals may be felt in the generally fine-grained homogeneous mass. The dredge often brings up large numbers of nodules formed upon sharks' teeth, the ear-bones of whales or turtles or small fragments of pumice or other volcanic ejecta, and all more or less incrusted with manganese oxide until the nodules vary in size from that of a potato to that of a man's head. A very interesting feature is the small proportion of calcium carbonate, the amount present being usually less as the depth is greater; red clay from depths exceeding 3000 fathoms does not contain so much as 1% of calcareous matter.

Murray and Renard recognize the progressive diminution of carbonate of lime with increase of depth as a characteristic of all eupelagic deposits. The whole collection of 231 specimens of deep-sea deposits brought back by the "Challenger" shows the following general relationship:—

Proportion of Calcium Carbonate in Deep-Sea Deposits.

68 samples from less than 2000 fathoms = 60-80 %
68 ,, ,, 2000-2500 ,, 46·7 %
65 ,, ,, 2500-3000 ,, 17·4 %
8 ,, ,, more than 3000 ,, 0·9 %

In deep water there is a regular process of solution of the calcareous shells falling from the surface. Murray and Renard ascribe this to the greater abundance of carbonic acid in the deeper water, which aided by the increased pressure adds to the solvent power of the water for carbonate of lime. It is, however, a curious question how, considering the increase of carbonic acid by the decomposition of organic bodies and possible submarine exhalations of volcanic origin, the water has not in some places become saturated and a precipitate of amorphous calcium carbonate formed in the deepest water. The whole subject still requires investigation.

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[1] *Scot. Geog. Mag.*, vol. 16 (1900), p. 695.

Amongst the foreign material found embedded in the red clay are globules of meteoric iron, which are sometimes very abundant. Derived products in the form of crystals of phillipsite are not uncommon, but the most abundant of all are the incrustations of manganese oxide, as to the origin of which Murray and Renard are not fully clear. The manganese nodules afford the most ample proof of the prodigious period of time which has elapsed since the formation of the red clay began; the sharks' teeth and whales' ear-bones which serve as nuclei belong in some cases to extinct species or even to forms derived from those familiar in the fossils from the seas of the Tertiary period. This fact, together with the extraordinarily rare occurrence of such remains and meteoric particles in globigerina ooze, although there is no reason to suppose that at any one time they are unequally distributed over the ocean floor, can only be explained on the assumption that the rate of formation of the epilophic deposits through the accumulation of pelagic shells falling from the surface is rapid enough to bury the slow-gathering material which remains uncovered on the spaces where the red clay is forming at an almost infinitely slower rate. Sir John Murray believes that no more than a few feet of red clay have accumulated in the deepest depressions since the close of the Tertiary period. The red clay is the characteristic deposit of the Pacific Ocean, where about 101,000,000 sq. km. (39,000,000 sq. m.) are covered with it, while only 15,000,000 sq. km. (5,800,000 sq. m.) of the Indian Ocean and 14,000,000 sq. km. (5,400,000 sq. m.) of the Atlantic are occupied by this deposit; it is indeed the dominant submarine deposit of the water-hemisphere just as globigerina ooze is the dominant submarine deposit of the land-hemisphere.

Radiolarian ooze was recognized as a distinct deposit and named by Sir John Murray on the "Challenger" expedition, but it may be viewed as red clay with an exceptionally large proportion of siliceous organic remains, especially those of the radiolarians which form part of the pelagic plankton. It does not occur in the Atlantic Ocean at all, and in the Indian Ocean it is only known round Cocos and Christmas Islands; but it is abundant in the Pacific, where it covers a large area between 5° and 15° N., westward from the coast of Central America to 165° W., and it is also found in patches north of the Samoa Islands, in the Marianne Trench and west of the Galapagos Islands.

The total areas occupied by the various deposits according to the latest measurements of Krümmel are as follows:—

Area of Submarine Deposits.

Deposit.	Sq. km.	Sq. st. m.	%.
I. Littoral deposits	33,000,000	12,700,000	9·1
II. Hemipelagic ,,	55,700,000	21,500,000	15·4
III. Eupelagic ,,	272,700,000	105,300,000	75·5
1. Globigerina ooze	105,600,000	40,800,000	(29·2)
2. Pteropod ooze	1,400,000	500,000	(0·4)
3. Diatom ooze	23,200,000	8,900,000	(6·4)
4. Red clay	130,300,000	50,300,000	(36·1)
5. Radiolarian ooze	12,200,000	4,700,000	(3·4)

Geologists are agreed that littoral and hemipelagic deposits similar to those now forming are to be found in all geological systems, but the existence in the rocks of eupelagic deposits and especially of the abysmal red clay, though viewed by some as probable, is totally denied by others. There is even some hesitation in accepting the continuity of the chalk with the globigerina ooze of the modern ocean. From the obvious rarity of true abysmal rocks in the continental area Sir John Murray deduces the permanence of the oceans, which he holds have always remained upon those portions of the earth's crust which they occupy now, and both J. Dana and Louis Agassiz had already arrived at the same conclusion. This theory accords well with the enormous lapse of time required in the accumulation of the red clay.

Salts of Sea-water.—Sea-water differs from fresh water by its salt and bitter taste and by its unsuitability for the purposes of washing and cooking. The process of natural evaporation in the *salines* or salt gardens of the margin of warm seas made the composition of sea-salt familiar at a very early time, and common salt, Epsom salts, gypsum and magnesium chloride were recognized amongst its constituents. The analyses of modern chemists have now revealed the existence of 32 out of the 80 known elements as existing dissolved in sea-water, and it is scarcely too much to say that the remaining elements also exist in minute traces which the available methods of analysis as yet fail to disclose. Many of the elements such as copper, lead, zinc, nickel, cobalt and manganese have only been found in the substance of sea-weeds and corals. Silver and gold also exist in solution in sea-water. Malaguti and Durocher[1] estimate the silver in sea-water as 1 part in 100,000,000 or 1 grain in 1430 gallons. If this estimate is correct there exists dissolved in the ocean a quantity of silver equal to 13,300 million metric tons, that is to say 46,700 times as much silver as has been produced from all the mines in the world from the discovery of America down to 1902. No quantitative determination of the amount of gold in solution is available. E. Sonnstadt[2] detected gold by means of a colour test and roughly estimated the amount as 1 grain per ton of sea-water, and on this estimate all the projects for extracting gold from sea-water have been based.

The elements in addition to oxygen which exist in largest amount in sea salt are chlorine, bromine, sulphur, potassium, sodium, calcium and magnesium. Since the earliest quantitative analyses of sea-water were made by Lavoisier in 1772, Bergman in 1774, Vogel in 1813 and Marcet in 1819 the view has been held that the salts are present in sea-water in the form in which they are deposited when the water is evaporated. The most numerous analyses have been carried out by Forchhammer, who dealt with 150 samples, and Dittmar, who made complete analyses of 77 samples obtained on the "Challenger" expedition. Dittmar showed that the average proportion of the salts in ocean water of 35 parts salts per thousand was as follows (calculated as parts per thousand of the sea-water, as percentage of the total salts and per hundred molecules of magnesium bromide):—

The Salts in Ocean Water.

	Per 1000 Parts Water.	Per cent. Total Salts.	Per 100 Molecules $MgBr_2$.
Common salt, sodium chloride ($NaCl$)	27·213	77·758	112,793
Magnesium chloride ($MgCl_2$)	3·807	10·878	9,690
Magnesium sulphate ($MgSO_4$)	1·658	4·737	3,338
Gypsum, calcium sulphate ($CaSO_4$)	1·260	3·600	2,239
Potassium sulphate (K_2SO_4)	0·863	2·465	1,200
Calcium carbonate ($CaCO_3$) and residue	0·123	0·345	298
Magnesium bromide ($MgBr_2$)	0·076	0·217	100
	35·000	100·000	

As Marcet had foreshadowed from the analysis of 14 samples in 1819, the larger series of exact analyses proved that the variations in the proportion of individual salts to the total salts are very small, and all analyses since Dittmar's have confirmed this result. Although the salts have been grouped in the above table it is not to be supposed that a dilute solution like sea-water contains all the ingredients thus arbitrarily combined. There must be considerable dissociation of molecules, and as a first approximation it may be taken that of 10 molecules of most of the components about 9 (or in the case of magnesium sulphate 5) have been separated into their ions, and that it is only during slow concentration as in a natural *saline* that the ions combine to produce the various salts in the proportions set out in the above table. One can look on sea-water as a mixture of very dilute solutions of particular salts, each one of which after the lapse of sufficient time fills the whole space as if the other constituents did not exist, and this interdiffusion accounts easily for the uniformity of composition in the sea-water throughout the whole ocean, the only appreciable difference from point to point being the salinity or degree of concentration of the mixed solutions.

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[1] *Comptes rendus, Acad. Sciences* (Paris, 1859), 49, 463, 536.

[2] *Chemical News* (1870), vol. 22, pp. 25, 44; (1872) vol. 26, p. 159.

The origin of the salt of the sea is attributed by some modern authorities entirely to the washing out of salts from the land by rain and rivers and the gradual concentration by evaporation in the oceans, and some (*e.g.* J. Joly) go so far as to base a calculation of the age of the earth on the assumption that the ocean was originally filled with fresh water. This hypothesis, however, does not accord with the theory of the development of the earth from the state of a sphere of molten rock surrounded by an atmosphere of gaseous metals by which the first-formed clouds of aqueous vapour must have been absorbed. The great similarity between the salts of the ocean and the gaseous products of volcanic eruptions at the present time, rich in chlorides and sulphates of all kinds, is a strong argument for the ocean having been salt from the beginning. Two other facts are totally opposed to the origin of all the salinity of the oceans from the concentration of the washings of the land. The proportions of the salts of river and sea-water are quite different, as Julius Roth shows thus:—

	Carbonates.	Sulphates.	Chlorides.
River water . . .	80	13	7
Sea water	0·2	10	89

The salts of salt lakes which have been formed in the areas of internal drainage in the hearts of the continents by the evaporation of river water are entirely different in composition from those of the sea, as the existence of the numerous natron and bitter lakes shows. Magnesium sulphate amounts to 4·7% of the total salts of sea-water according to Dittmar, but to 23·6% of the salts of the Caspian according to Lebedinzeff; in the ocean magnesium chloride amounts to 10·9% of the total salts, in the Caspian only to 4·5%; on the other hand calcium sulphate in the ocean amounts to 3·6%, in the Caspian to 6·9%. This disparity makes it extremely difficult to view ocean water as merely a watery extract of the salts existing in the rocks of the land.

The determination of salinity was formerly carried out by evaporating a weighed quantity of sea-water to dryness and weighing the residue. Forchhammer, however, pointed out that this method gave inexact and variable results, as in the act of evaporating to dryness hydrochloric acid is given off as the temperature is raised to expel the last of the water, and Tornöe found that carbonic acid was also liberated and that the loss of both acids was very variable. Tornöe vainly attempted to apply a correction for this loss by calculation; and subsequently S. P. L. Sörensen and Martin Knudsen after a careful investigation decided to abandon the old definition of salinity as the sum of all the dissolved solids in sea-water and to substitute for it the weight of the dissolved solids in 1000 parts by weight of sea-water on the assumption that all the bromine is replaced by its equivalent of chlorine, all the carbonate converted into oxide and the organic matter burnt. The advantage of the new definition lies in the fact that the estimation of the chlorine (or rather of the total halogen expressed as chlorine) is sufficient to determine the salinity by a very simple operation. According to Knudsen the salinity is given in weight per thousand parts by the expression $S=0{\cdot}030+1{\cdot}8050$ Cl where S is the salinity and Cl the amount of total halogen in a sample. Such a simple formula is only possible because the salts of sea-water are of such uniform composition throughout the whole ocean that the chlorine bears a constant ratio to the total salinity as newly defined whatever the degree of concentration. This definition was adopted by the International Council for the Study of the Sea in 1902, and it has since been very widely accepted.

Besides the determination of salinity by titration of the chlorides, the method of determination by the specific gravity of the sea-water is still often used. In the laboratory the specific gravity is determined in a pyknometer by actual weighing, and on board ship by the use of an areometer or hydrometer. Three types of areometer are in use: (1) the ordinary hydrometer of invariable weight with a direct reading scale, a set of from five to ten being necessary to cover the range of specific gravity from 1·000 to 1·031 so as to take account of sea-water of all possible salinities; (2) the "Challenger" type of areometer designed by J. Y. Buchanan, which has an arbitrary scale and can be varied in weight by placing small metal rings on the stem so as to depress the scale to any desired depth in sea-water of any salinity, the specific gravity being calculated for each reading by dividing the total weight by the immersed volume; (3) the total immersion areometer, which has no scale and the weight of which can be adjusted so that the instrument can be brought so exactly to the specific gravity of the water sample that it remains immersed, neither floating nor sinking; this has the advantage of eliminating the effects of surface tension and in Fridtjof Nansen's pattern is capable of great precision.

In all areometer work it is necessary to ascertain the temperature of the water sample under examination with great exactness, as the volume of the areometer as well as the specific gravity of the water varies with temperature. All determinations must accordingly be reduced to a standard temperature for comparison. Following the practice of J. Y. Buchanan on the "Challenger" it has been usual for British investigators to calculate specific gravities for sea-water at 60° F. compared with pure water at the maximum density point (39·2°) as unity. On the continent of Europe it has been more usual to take both at 17·5° C. (63·5° F.), which is expressed as "$S\frac{17{\cdot}5}{17{\cdot}5}$", but for pyknometer work in all countries where the sample is cooled to 32° F. before weighing and pure water at 39·2° taken as unity the expression is (0°/4°). On the authority of the first meeting of the International Conference for the Study of the Northern European Seas at Stockholm in 1899 Martin Knudsen, assisted by Karl Forch and S. P. L. Sörensen, carried out a careful investigation of the relation between the amount of chlorine, the total salinity and the specific gravity of sea-water of different strengths including an entirely new determination of the thermal expansion of sea-water. The results are published in his *Hydrographical Tables* in a convenient form for use.

The relations between the various conditions are set forth in the following equations where σ_0 signifies the specific gravity of the sea-water in question at 0° C., the standard at 4° being taken as 1000, S the salinity and Cl the chlorine, both expressed in parts by weight per mille.

(1) $\sigma_0=-0{\cdot}093+0{\cdot}8149\,S-0{\cdot}000482\,S^2+0{\cdot}0000068\,S^3$
(2) $\sigma_0=-0{\cdot}069+1{\cdot}4708\,Cl-0{\cdot}00157\,Cl^2+0{\cdot}0000398\,Cl^3$
(3) $S=\ 0{\cdot}030+1{\cdot}8050\,Cl.$

The temperature of maximum density of sea-water of any specific gravity was found by Knudsen to be given with sufficient accuracy for all practical purposes by the formula $\theta=3{\cdot}95-0{\cdot}266\sigma_0$, where θ is the temperature of maximum density in degrees centigrade. The temperature of maximum density is lower as the concentration of the sea-water is greater, as is shown in the following table:—

Maximum Density Point of Sea-Water of Different Salinities.

Salinity per mile . .	0	10	20	30	35	40
Temperature θ° C .	3·95°	1·86°	−0·31°	−2·47°	−3·52°	−4·54°
Density σ_θ, . . .	0·00°	8·18°	16·07°	24·15°	28·22°	32·32°

Further Physical Properties of Sea-water.—The laws of physical chemistry relating to complex dilute solutions apply to sea-water, and hence there is a definite relation between the osmotic pressure, freezing-point, vapour tension and boiling-point by which when one of these constants is given the others can be calculated.

The most easily observed is the freezing-point, and according to the very careful determinations of H. T. Hansen the freezing-point τ° C. varies with the degree of concentration according to the formula

$$\tau = -0{\cdot}0086 - 0{\cdot}0064633\sigma_0 - 0{\cdot}0001055\sigma_0^2.$$

According to the investigations of Svante Arrhenius the osmotic pressure in atmospheres may be obtained by simply multiplying the temperature of freezing (τ) by the factor −12·08, and it varies with temperature (t) according to the law which holds good for gaseous pressure.

$$P_t = P_0(1 + 0{\cdot}00367t)$$

and can thus be reduced to its value at 0° C. Sigurd Stenius has calculated tables of osmotic pressure for sea-water of different degrees of concentration. The relation of the elevation of the boiling-point (t°) to the osmotic pressure (P) is very simply derived from the formula $t = 0{\cdot}02407F_0$, while the reduction of vapour pressure proportional to the concentration can be very easily obtained from the elevation of the boiling-point, or it may be obtained directly from tables of vapour tension.

Physical Properties of Sea-Water.

Salinity per mille	10	20	30	35	40
Freezing-point (C.)	−0·53	−1·07	−1·63	−1·91	−2·20
Osmotic pressure P_0 atmospheres	6·4	13·0	19·7	23·1	26·6
Elevation of boiling-point (C.)	0·16	0·31	0·47	0·56	0·64
Reduction of vapour pressure (mm.)	4·2	8·5	13·0	15·2	17·6

The importance of the osmotic pressure of sea-water in biology will be easily understood from the fact that a frog placed in sea-water loses water by exosmosis and soon becomes 20% lighter than its original weight, while a true salt-water fish suddenly transferred to fresh water gains water by endosmosis, swells up and quickly succumbs. The elevation of the boiling-point is of little practical importance, but the reduction of vapour pressure means that sea-water evaporates more slowly than fresh water, and the more slowly the higher the salinity. Unfortunately no observations of evaporation from the surface of the open sea have been made and very few comparisons of the evaporation of salt and fresh water are on record. The fact that sea-water does evaporate more slowly than fresh water has been proved by the observations of Mazelle at Triest and of Okado in Azino (Japan). Their experiments show that in similar conditions the evaporation of sea-water amounts to from 70 to 91% of the evaporation of fresh water, a fact of some importance in geophysics on account of the vast expanses of ocean the evaporation from which determines the rainfall and to a large extent the heat-transference in the atmosphere.

The optical properties of sea-water are of immediate importance in biology, as they affect the penetration of sunlight into the depths. The refraction of light passing through sea-water is dependent on the salinity to the extent that the index of refraction is greater as the salinity increases. From isolated observations of J. Soret and E. Sarasin and longer series of experiments by Tornöe and Krümmel this relation is shown to be so close that the salinity of a sample can be ascertained by determining the index of refraction. According to Krümmel the following relations hold good at 18° C. for the monochromatic light of the D line of the sodium spectrum in units of the fifth decimal place.

Relation of Refractive Index and Salinity.

For water of salinity (per mille)	0	10	20	30	35	40
Refractive index 1·33000+ units of 5th decimal place	308	502	694	885	981	1077

The refractometer constructed by C. Pulfrich (of the firm of Zeiss, in Jena) has been successfully used by G. Schott and E. von Drygalski for the measurement of salinity at sea, and was found to have the same degree of accuracy as an areometer with the great advantage of being quite unaffected by the motion of the ship in a sea-way.

The transparency of sea-water has frequently been measured at sea by the simple expedient of sinking white-painted disks and noting the depth at which they become invisible as the measure of the transparency of the water. For the north European seas disks of about 18 or 20 in. in diameter are sufficient for this purpose, but in the tropics, where the transparency is much greater, disks 3 ft. in diameter at least must be used or the angle of vision for the reflected light is too small. In shallow seas the transparency is always reduced in rough weather. In the North Sea north of the Dogger Bank, for instance, the disk is visible in calm weather to a depth of from 10 to 16 fathoms, but in rough weather only to 6½ fathoms. Knipovitch occasionally observed great transparency in the cold waters of the Murman Sea, where he could see the disk in as much as 25 fathoms, and a similar phenomenon has often been reported from Icelandic waters. The greatest transparency hitherto reported is in the eastern basin of the Mediterranean, where J. Luksch found the disk visible as a rule to from 22 to 27 fathoms, and off the Syrian coast even to 33 fathoms. In the open Atlantic there are great differences in transparency; Krümmel observed a 6 ft. disk to depths of 31 and 36 fathoms in the Sargasso Sea, but in the cold currents of the north and also in the equatorial current the depth of visibility was only from 11 to 16½ fathoms. In the tropical parts of the Indian and the Pacific Oceans the depth of visibility increases again to from 20 to 27 fathoms. Some allowance should be made for the elevation of the sun at the time of observation. Mill has shown that in the North Sea off the Firth of Forth the average depth of visibility of a disk in the winter half-year was 4½ fathoms and in the summer half-year 6½ fathoms, and, although the greater frequency of rough weather in winter might tend to obscure the effect, individual observations made it plain that the angle of the sun was the main factor in increasing the depth to which the disk remained visible.

There are some observations on the transparency of sea-water of an entirely different character. Such, for instance, were those of Spindler and Wrangell in the Black Sea by sinking an electric lamp, those of Paul Regnard by measuring the change of electric resistance in a selenium cell or the chemical action of the light on a mixture of chlorine and hydrogen, by which he found a very rapid diminution in the intensity of light even in the surface layers of water. Many experiments have also been made by the use of photographic plates in order to find the greatest depth to which light penetrates. Fol and Sarasin detected the last traces of sunlight in the western Mediterranean at a depth of 254 to 260 fathoms, and Luksch in the eastern Mediterranean at 328 fathoms and in the Red Sea at 273 fathoms. The chief cause of the different depths to which light penetrates in sea-water is the varying turbidity due to the presence of mineral particles in suspension or to plankton. Schott gives the following as the result of measurements of transparency by means of a white disk at 23 stations in the open ocean, where quantitative observations of the plankton under 1 square metre of surface were made at the same time.

	Volume of Plankton.	Depth of Visibility.
Mean of 11 stations poor in plankton	85 cc.	14¼ fathoms
Mean of 12 stations rich in plankton	530 ,,	8¾ ,,

Any influence on transparency which may be exercised by the temperature or salinity of the water is quite insignificant.

The colour of ocean water far from land is an almost pure blue, and all the variations of tint towards green are the result of local disturbances, the usual cause being turbidity of some kind, and this in the high seas is almost always due to swarms of plankton. The colour of sea-water as it is seen on board ship is most readily determined by comparison with the tints of Forel's xanthometer or colour scale, which consists of a series of glass tubes fixed like the rungs of a ladder in a frame and filled with a mixture of blue and yellow liquids in varying proportions. For this purpose the zero or pure blue is represented by a solution of 1 part of copper sulphate and 9 parts of ammonia in 190 parts of water. The yellow solution is made up of 1 part of neutral potassium chromate in 199 parts of water, and to give the various degrees of the scale, 1, 2, 3, 4, &c., % of the yellow solution is mixed with 99, 98, 97, 96, &c., % of the blue in successive tubes. Observations with the xanthometer have not hitherto been numerous, but it appears that the purest blue (0–1 on Forel's scale) is found in the Sargasso Sea, in the North Atlantic and in similarly situated tropical or subtropical regions in the Indian and Pacific Oceans. The northern seas have an increasing tendency towards green, the Irminger Sea showing 5–9 Forel, while in the North Sea the water is usually a pure green (10–14 Forel), the western Mediterranean shows 5–9 Forel, but the eastern is as blue as the open ocean (0–2 Forel). A pure blue colour has been observed in the cold southern region, where the "Valdivia" found 0–2 Forel in 55° S. between 10° and 31° E., and even the water of the North Sea has been observed at times to be intensely blue. The blue of the sea-water as observed by the Forel scale has of course nothing to do with the blue appearance of any distant water surface due to the reflection of a cloudless sky. Over shallows even the water of the tropical oceans is always green. There is a distinct relationship between colour and transparency in the ocean; the most transparent water which is the most free from plankton is always the purest blue, while an increasing turbidity is usually associated with an increasing tint of green. The natural colour of pure sea-water is blue, and this is emphasized in deep and very clear water, which appears almost black to the eye. When a quantity of a fine white powder is thrown in, the light reflected by the white particles as they sink assumes an intense blue colour, and the experiments of J. Aitken with clear sea-water in long tubes leave no doubt on the subject.

Discoloration of the water is often observed at sea, but that is always due to foreign substances. Brown or even blood-red stripes have been observed in the North Atlantic when swarms of the copepod *Calanus finmarchicus* were present; the brown alga *Trichodesmium erythraeum*, as its name suggests, can change the blue of the tropical seas to red; swarms of diatoms may produce olive-green patches in the ocean, while some other forms of minute life have at times been observed to give the colour of milk to large stretches of the ocean surface.

On account of its salinity, sea-water has a smaller capacity for heat than pure water. According to Thoulet and Chevallier the specific heat diminishes as salinity increases, so that for 10 per mille salinity it is 0·968, for 35 per mille it is only 0·932, that of pure water being taken as unity. The thermal conductivity also diminishes as salinity increases, the conductivity for heat of sea-water of 35 per mille salinity being 4·2% less than that of pure water. This means that sea-water heats and cools somewhat more readily than pure water. The surface tension, on the other hand, is greater than that of pure water and increases with the salinity, according to Krümmel, in the manner shown by the equation $\alpha = 77{\cdot}09 + 0{\cdot}0221\ S$ at 0° C., where α is the coefficient of surface tension and S the salinity in parts per thousand. The internal friction or viscosity of sea-water has also been shown by E. Ruppin to increase with the salinity. Thus at 0° C. the viscosity of sea-water of 35 per mille salinity is 5·2% greater and at 25° C. 4% greater than that of pure water at the same temperatures; in absolute units the viscosity of sea-water at 25° C. is only half as great as it is at 0° C.

The compressibility of sea-water is not yet fully investigated. It varies not only to a marked degree with temperature, but also with the degree of pressure. Thus J. Y. Buchanan found a mean of 20 experiments made by piezometers sunk in great depths on board the "Challenger" give a coefficient of compressibility $\kappa = 491 \times 10^{-7}$; but six of these experiments made at depths of from 2740 to 3125 fathoms gave $\kappa = 480 \times 10^{-7}$. The value usually adopted is $\kappa = 450 \times 10^{-7}$. The compressibility is in itself very small, but so great in its effect on the density of deep water *in situ* that the specific gravity (0°/4°) at 2000 fathoms increases by 0·017 and at 3000 fathoms by 0·026. In other words, water which has a specific gravity of 1·0280 at the surface would at the same temperature have a specific gravity of 1·0450 at 2000 and 1·0540 at 3000 fathoms. If the whole mass of water in the ocean were relieved from pressure its volume would expand from 319 million cub. m. to 321·7 million cub. m., which for a surface of 139·5 million sq. m. means an increased depth of 100 ft. The rate of propagation of sound depends on the compressibility, and in ocean water at the tropical temperature of 77° F. the speed is 1482·6 metres (4860 ft.) per second, in Baltic water of 8 per mille salinity and a temperature of 50° F. it is 1448·5 metres (4750 ft.) per second, that is to say, 4½ times greater than the velocity of sound in air. This accounts for the great range of submarine sound signals, which can thus be very serviceable to navigation in foggy weather.

The electrical conductivity of sea-water increases with the salinity; at 59° F. it is given according to E. Ruppin's formula as $L = 0{\cdot}001465\,S - 0{\cdot}00000978\,S^2 + 0{\cdot}0000000876\,S^3$ in reciprocal ohms.

The radio-activity of sea-water is extraordinarily small; indeed in samples taken from 50 fathoms in the Bay of Danzig it was imperceptible, and R. T. Strutt found that salt from evaporated sea-water did not contain one-third of the quantity of radium present in the water of the town supply in Cambridge.

Dissolved Gases of Sea-water.—The water of the ocean, like any other liquid, absorbs a certain amount of the gases with which it is in contact, and thus sea-water contains dissolved oxygen, nitrogen and carbonic acid absorbed from the atmosphere. As Gay-Lussac and Humboldt showed in 1805, gases are absorbed in less amount by a saline solution than by pure water. The first useful determinations of the dissolved gases of sea-water were made by Oskar Jacobsen in 1872. Since that time much work has been done, and the methods have been greatly improved. In the method now most generally practised, which was put forward by O. Pettersson in 1894, two portions of sea-water are collected in glass tubes which have been exhausted of air, coated internally with mercuric chloride to prevent the putrefaction of any organisms, and sealed up beforehand. The exhausted tube, when inserted in the water sample and the tip broken off, immediately fills, and is then sealed up so that the contents cannot change after collection. One portion is used for determining the oxygen and nitrogen, the other for the carbonic acid. The former determination is made by driving out the dissolved gases from solution and collecting them in a Torricellian vacuum, where the volume is measured after the carbonic acid has been removed. The oxygen is then absorbed by some appropriate means, and the volume of the nitrogen measured directly, that of the oxygen being given by difference. In the second portion the carbonic acid is driven out by means of a current of hydrogen, collected over mercury and absorbed by caustic potash.

C. T. T. Fox, of the Central Laboratory of the International Council at Christiania, has investigated the relation of the atmospheric gases to sea-water by very exact experimental methods and arrived at the following expressions for the absorption of oxygen and nitrogen by sea-water of different degrees of concentration. The formulae show the number of cubic centimetres of gas absorbed by 1 litre of sea-water; t indicates the temperature in degrees centigrade and Cl the salinity as shown by the amount of chlorine per mille:—

$$
\begin{aligned}
O_2 = {} & 10{\cdot}291 - 0{\cdot}2809\,t + 0{\cdot}006009\,t^2 - 0{\cdot}0000632\,t^3 - \\
& \mathrm{Cl}(0{\cdot}1161 - 0{\cdot}003922\,t^2 + 0{\cdot}000063\,t^3) \\
N_2 = {} & 18{\cdot}561 - 0{\cdot}4282\,t + 0{\cdot}0074527\,t^2 - 0{\cdot}00005494\,t^3 \\
& \mathrm{Cl}(0{\cdot}2149 - 0{\cdot}007117\,t^2 + 0{\cdot}0000931\,t^3)
\end{aligned}
$$

In the case of ocean water with a salinity of 35 per mille, this gives for saturation with atmospheric gases in cc. per litre:—

	at 0° C.	15° C.	25° C.
Oxygen . . .	8·03	5·84	4·93
Nitrogen . .	14·40	11·12	9·78

The reduction of the absorption of gas by rise of temperature is thus seen to be considerable. As a rule the amount of both gases dissolved in sea-water is found to be that which is indicated by the temperature of the water *in situ*. Jacobsen on some occasions found water in the surface layers of the Baltic supersaturated with oxygen, which he ascribed to the action of the chlorophyll in vegetable plankton; in other cases when examining the nearly stagnant water from deep basins he found a deficiency of oxygen due no doubt to the withdrawal of oxygen from solution, by the respiration of the animals and by the oxidation of the deposits on the bottom. When these processes continue for a long time in deep water shut off from free circulation so that it does not become aerated by contact with the atmosphere the water becomes unfit to support the life of fishes, and when the accumulation of putrefying organic matter gives rise to sulphuretted hydrogen as in the Black Sea below 125 fathoms, life, other than bacterial, is impossible. The water from the greatest depths of the Black Sea, 1160 fathoms, contains 6 cc. of sulphuretted hydrogen per litre.

The distribution of dissolved oxygen in the depths of the open ocean is still very imperfectly known. Dittmar's analysis of the "Challenger" samples indicated an excess of oxygen in the surface water of high southern latitudes and a deficiency at depths below 50 fathoms.

The facts regarding carbonic acid in sea-water are even less understood, for here we have to do not only with the solution of the gas but also with a chemical combination. On this account it is very difficult to know when all the gas is driven out of a sample of sea-water, and a much larger proportion is present than the partial pressure of the gas in the atmosphere and its coefficient of absorption would indicate. These constants would lead one to expect to find 0·5 cc. per litre at 0° C. while as a matter of fact the amount absorbed approaches 50 cc. The form of combination is unstable and apparently variable, so that the quantities of free carbonic acid, bicarbonate and normal carbonate are liable to alter. Since 1851 it has been known that all sea-water has an alkaline reaction, and Tornöe defined the *alkalinity* of sea-water as the amount of carbonic acid which is necessary to convert the excess of bases into normal carbonate. The alkalinity of North Atlantic water of 35 per mille salinity is 26·86 cc. per litre, corresponding to a total amount of carbonic acid of 49·07 cc. According to the researches of August Krogh,[1] the alkalinity is greatly increased by the admixture of land water. This is proved by E. Ruppin's analysis of Baltic water, which has an alkalinity of 16 to 18 instead of the 5 or 6 which would be the amount proportional to the salinity, while the water of the Vistula and the Elbe with a salinity of 0·1 per mille has an alkalinity of 28 or more. Thus the alkalinity serves as an index of the admixture of river water with sea-water. Carbonic acid passes from the atmosphere into the ocean as soon as its tension in the latter is the smaller; hence in this respect the ocean acts as a regulator. The amount of carbonic acid in solution may also be increased by submarine exhalations in regions of volcanic disturbance, but it must be remembered that the critical pressure for this gas is 73 atmospheres, which is reached at a depth of 400 fathoms, so that carbonic acid produced at the bottom of the ocean must be in liquid form. The respiration of marine animals in the depths of deep basins in which there is no circulation adds to the carbonic acid at the expense of the dissolved oxygen. This is frequently the case in fjord basins; for instance, in the Gullmar Fjord at a depth of 50 fathoms with water of 34·14 per mille salinity and a temperature of 40·1° F., the carbonic acid amounts to 51·55 cc. per litre, and the oxygen only to 2·19 cc. Vegetable plankton in sunlight can reverse this process, assimilating the carbon of the carbonic acid and restoring the oxygen to solution, as was proved by Martin Knudsen and Ostenfeld in the case of diatoms. Little is known as yet of the distribution of carbonic acid in the oceans, but the amount present seems to increase with the salinity as shown by the four observations quoted:—

Water from
Gulf of Finland of 3·2 per mille salinity = 17·2 cc. CO_2 at 4·1° C.
Western Baltic of 14·2 „ „ = 37·0 „ at 1·6° C.
North Atlantic of 35·0 „ „ = 49·0 „ at about 10°C.
Eastern Mediterranean of 39·0 „ „ = 53·0 „ at 26·7°C.

Unfortunately the very numerous determinations of carbonic acid made by J. Y. Buchanan on the "Challenger" were vitiated by the incompleteness of the method employed, but they are none the less of value in showing clearly that the waters of the far south of the Indian Ocean are relatively rich in carbonic acid and the tropical areas deficient.

Distribution of Salinity.—A great deal of material exists on which to base a study of the surface salinity of the oceans, and Schott's chart published in *Petermanns Mitteilungen* for 1902 incorporates the earlier work and substantially confirms the first trustworthy chart of the kind compiled by J. Y. Buchanan from the "Challenger" observations. In each of the three oceans there are two maxima of salinity—one in the north, the other in the south tropical belt, separated by a zone of minimum salinity in the equatorial region, and giving place poleward to regions of still lower salinity. The three oceans differ somewhat between themselves. The North Atlantic maximum is the highest with water of 37·9 per mille salinity; the maximum in the South Atlantic is 37·6; in the North Indian Ocean, 36·7; the South Indian Ocean, 36·4; the South Pacific, 36·9; and the North Pacific has the lowest maximum of all, only 35·9. The comparatively fresh equatorial belt of water, has a salinity of 35·0 to 34·5 in the Atlantic, 35·0 to 34·0 in the Indian Ocean, 34·5 in the Western and 33·5 in the Eastern Pacific. Taking each of the oceans as a whole the Atlantic has the highest general surface salinity with 35·37.

The salinity of enclosed seas naturally varies much more than that of the open ocean. The saltest include the eastern Mediterranean with 39·5 per mille, the Red Sea with 41 to 43 per mille in the Gulf of Suez, and the Persian Gulf with 38. The fresher enclosed seas include the Malay and the East Asiatic fringing seas with 30 to 34·5 per mille, the Gulf of St Lawrence with 30 to 31, the North Sea with 35 north of the Dogger Bank diminishing to 32 further south, and the Baltic, which freshens rapidly from between 25 to 31 in the Skagerrak to 7 or 8 eastward of Bornholm and to practically fresh water at the heads of the Gulfs of Bothnia and Finland. The Arctic Sea presents a great contrast between the salinity of the surface of the ice-free Norwegian Sea with 35 to 35·4 and that of the Central Polar Basin, which is dominated by river water and melted ice, and has a salinity less than 25 per mille in most parts. The average salinity of the whole surface of the oceans may be taken as 34·5 per mille.

The vertical distribution of salinity has only recently been investigated systematically, as the earlier expeditions were not equipped with altogether trustworthy apparatus for collecting water samples at great depths. Two main types of water-bottle for collecting samples have been long in use. The older, devised by Hooke in 1667, is provided with valves above and below, both opening upward, through which the water passes freely during descent, but which are closed by some device on hauling up. The newer or slip water-bottle type consists of a cylinder allowed to drop on to a base-plate when a sample is to be collected. The first form of slip water-bottle due to Meyer retained the water merely by the weight of the cylinder pressing on the base-plate. J. Y. Buchanan introduced an improved form on the "Challenger," also remaining closed by weight, the cylinder being very heavy and ground to fit the bevelled base-plate very accurately.

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[1] *Meddelelser om Grönland* (Copenhagen, 1904), p. 331.

H. R. Mill in 1885 devised a self-locking arrangement by which the bottle once closed was automatically locked and rendered watertight; H. L. Ekman made further improvements; and, finally, O. Pettersson and F. Nansen perfected the instrument, adapting it not only for enclosing a portion of water at any desired depth, but by a series of concentric divisions insulating in the central compartment water at the temperature it had at the moment of collection. By means of a weight dropped along the line the water-bottle can be shut and a sample enclosed at any desired depth. The use of a sliding weight is not recommended in depths much exceeding 200 fathoms on account of the time required and the risk of the line sagging at a low angle and so stopping the weight. In deep water the closing mechanism is usually actuated by a screw propeller which begins to work when the line is being hauled in and can be set so as to close the water-bottle in a very few fathoms. A small but heavy water-bottle has been devised by Martin Knudsen, provided with a pressure gauge or bathometer, by which samples may be collected from any moderate depth down to about 100 fathoms, on board a vessel going at full speed. This has made it possible to obtain many samples from moderate depths along a long line in a very short space of time. Sigsbee's small water-bottle on the double valve principle actuated by a propeller requires extremely skilful handling to enable it to give good results.

As yet it is only possible to speak with confidence of the vertical distribution of salinity in the seas surrounding Europe, where there is a general increase of salinity with depth. For the open ocean the only quite trustworthy results are those obtained by the prince of Monaco in the North Atlantic, and by the recent Antarctic expeditions in the South Atlantic and South Indian Oceans. The observations made on the "Challenger" and "Gazelle," though enabling some perfectly sound general conclusions to be drawn, require to be supplemented. It appears, as J. Y. Buchanan pointed out in 1876, that the great contrasts in surface salinity between the tropical maxima and the equatorial minima give place at the moderate depth of 200 fathoms to a practically uniform salinity in all parts of the ocean.

In the North Atlantic a strong submarine current flowing outward from the Mediterranean leaves the Strait of Gibraltar with a salinity of 38 per mille, and can be traced as far as Madeira and the Bay of Biscay in depths of from 600 to 2800 fathoms, still with a salinity of 35·6 per mille, whereas off the Azores at equal depths the salinity is from 0·5 to 0·7 per mille less. In the tropical and subtropical belts of the Atlantic and Indian Oceans south of the equator the salinity diminishes rapidly from the surface downwards, and at 500 fathoms reaches a minimum of 34·3 or 34·4 per mille; after that it increases again to 800 fathoms, where it is almost 34·7 or 34·8, and this salinity holds good to the bottom, even to the greatest depths, as was first shown by the "Gauss" and afterwards by the "Planet" between Durban and Ceylon.

Our knowledge of the Pacific in this respect is still very imperfect, but it appears to be less salt than the other oceans at depths below 800 fathoms, as on the surface, the salinity at considerable depths being 34·6 to 34·7 in the western part of the ocean, and about 34·4 to 34·5 in the eastern, so that, although the data are by no means satisfactory, it is impossible to assign a mass-salinity of more than 34·7 per mille for the whole body of Pacific water.

The causes of difference of salinity are mainly meteorological. The belt of equatorial minimum salinity corresponds with the excessively rainy belt of calms and of the equatorial counter-current, the salinity diminishing towards the east. The tropical maxima of salinity on the poleward side of the trade-winds coincide with the regions of minimum rainfall, high temperature, strong winds and consequently of maximum evaporation. Evaporation is naturally greatest in the enclosed seas of the nearly rainless subtropical zone such as the Mediterranean and Red Sea. Where the evaporation is at a minimum, the inflow of rivers from a large continental area and the precipitation from the atmosphere at a maximum, there is necessarily the greatest dilution of the sea-water, the Baltic and the Arctic Sea being conspicuous examples.

Temperature of the Oceans.—There is no difficulty in observing the temperature of the surface of the sea on board ship, the only precautions required being to draw the water in a bucket which has not been heated in the sun in summer or exposed to frost in winter, to draw it well forward of any discharge pipes of the steamer, to place it in the shade on deck, insert the thermometer immediately and make the reading without delay. The measurement of temperature in the depths, unless a high-speed water-bottle be used, involves stopping the ship and employing thermometers of special construction. Many forms have been tried, but only three types are in general use. The first is the slow-action thermometer which was originally used with good effect by de Saussure in the Mediterranean in 1780. He covered the bulb of the thermometer with layers of non-conducting material and left it immersed at the desired depth for a very long time to enable it to take the temperature of its surroundings. When brought up again the thermometer retained its temperature so long that there was ample time to take a correct reading. Since 1870 thermometers on this principle have been in use for regular observations at German coast and light-ship stations. Following the suggestion of Cavendish, Irving made observations of deep temperature on Phipps's Spitsbergen voyage of 1773 with a valved water-bottle, insulated by non-conducting material. A similar instrument gave excellent results in the hands of E. von Lenz on Kotzebue's second voyage of circumnavigation in 1823–1826. The last elaboration of the insulated slip water-bottle by Ekman, Nansen and Pettersson has produced an instrument of great perfection, in which the insulation is effected by layers of water between a series of concentric ebonite cylinders, all of which are closed both above and below when the apparatus encloses a sample, and each of which in turn must be warmed considerably before there is any rise of temperature in the chamber within. This can be used with certainty to ·02° C. for water down to 250 fathoms, after taking account of the slight disturbance produced by the expansion of the greatly compressed deep water.

The second form of deep-sea thermometer is the self-registering maximum and minimum on James Six's principle. These instruments must be constructed with the greatest care, but when well made in accordance with J. Y. Buchanan's large model they can be trusted to give a good account of the vertical distribution of temperature, provided the water grows cooler as the depth increases. They would act equally well if the water grew continually warmer as the depth increases, but they cannot give an exact account of a temperature inversion such as is produced when layers of warmer and colder water alternate.

The third form is the outflow or reversing thermometer, first introduced by Aimé, who used a very inconvenient form in the Mediterranean in 1841–1845, but greatly improved and simplified by Negretti and Zambra in 1875. The principle is to have a constriction in the tube above the bulb so proportioned that when the instrument is upright it acts in every way as an ordinary mercurial thermometer, but when it is inverted the thread of mercury breaks at the constriction, and the portion above the point runs down the now reversed tube and remains there as a measure of the temperature at the moment of turning over. For convenience in reading, the tube is graduated inverted, and when it is restored to its original position the mercury thread joins again and it acts as before. Various modifications of this form of thermometer have been made by Chabaud of Paris and others. It has the advantage over the thermometer on Six's principle that, being filled with mercury, it does not require such long immersion to take the temperature of the water. A correction has, of course, to be made for the expansion or contraction of the mercury thread if the temperature of reading differs much from that of reversing. Magnaghi introduced a convenient method of inverting the thermometer by means of a propeller actuated on beginning to heave in the line, and this form is used for all work at great depths. For shallow water greater precision and certainty are obtained by using a lever actuated by a weight slipped down the line to cause the reversal, as in the patterns of Rung, Mill and others.

All thermometers sunk into deep water must be protected against the enormous pressure to which they are exposed. This may be done by the method suggested by Arago in 1828, introduced by Aimé in 1841 and again suggested by Glaisher in 1858, of sealing up the whole instrument in a glass tube exhausted of air; or, less effectively, by surrounding the bulb alone with a strong outer sheath of glass. In both forms it is usual to have the space between the bulb and the protecting sheath partly filled with mercury or alcohol to act as a conductor and reduce the time necessary for the thermometer to acquire the temperature of its surroundings.

The warming of the ocean is due practically to solar radiation alone; such heat as may be received from the interior of the earth can only produce a small effect and is fairly uniformly distributed. On account of the high specific heat of sea-water the diurnal range of temperature at the surface is very small. According to A. Buchan's discussion of the two-hourly observations on the "Challenger" the total range between the daily maximum and minimum in the warmer seas is between 0·7° and 0·8° F., and for the colder seas still less (0·2° F.), compared with 3·2° F. in the overlying air. The maximum usually occurs between 1 and 2·30 P.M., the minimum shortly before sunrise. The temperature of the surface water is generally a little higher than that of the overlying air, the daily average difference being about 0·6° F., varying from 0·9° lower at 1 P.M. to 1·6° higher at 1 A.M. There are few observations available for ascertaining the depth to which warmth from the sun penetrates in the ocean. The investigations of Aimé in 1845 and Hensen in 1889 indicate that the amount of cloud has a great effect. Aimé showed that on a calm bright day in the Mediterranean the temperature rose 0·1° C. between the early morning and noon at a depth of about 12 fathoms. Luksch deduced a much greater penetration of solar warmth from the comparison of observations at different hours at neighbouring stations in the eastern Mediterranean, but his methods were not exact enough to give confidence in the result. The penetration of warmth from the surface is effected by direct radiation, and by convection by particles rendered dense by evaporation increasing salinity. Conduction has practically no effect, for the coefficient of thermal conductivity in sea-water is so small that if a mass of sea-water were cooled to 0° C. and the surface kept at a temperature of 30° C., 6 months would elapse before a temperature of 15° C. was reached at the depth of 1·3 metres, 1 year at 1·85 metres, and 10 years at 5·8 metres. Great irregular variations in radiation and convection sometimes produce a remarkably abrupt change of temperature at a certain depth in calm water; the layer in which this sudden change occurs has been termed the *Sprungschicht*. How closely two bodies of water at different temperatures may come together is shown by the fact that in the Baltic in August between 10 and 11 fathoms there is sometimes a fall of temperature from 57° to 46·5° F. Such a condition of things is only possible in very calm weather, the action of waves having the effect of mixing the water to a considerable depth. After a storm the whole of the water in the North Sea assumes a homothermic condition, *i.e.* the temperature is the same from surface to bottom, and this occurs not only south of the Dogger Bank, where the condition is normal, but also, though less frequently, in the deeper water farther north. Similar effects are produced in narrow waters by the action of tidal currents, and the influence of a steady wind blowing on- or off-shore has a powerful effect in mixing the water.

The warmest parts of the Indian Ocean and Western Pacific have a mean annual temperature of 82° to 84° F., but such high temperatures are not found in the tropical Atlantic. In the Indian Ocean between 15° N. and 5° S. the surface temperature in May averages 84° to 86° F., and in the Bay of Bengal the temperature is 86°, and no part of the Atlantic has so high a monthly mean temperature at any season. G. Schott's investigations show that the annual range of surface temperature in the open ocean is greatest in 40° N., with 18·4° F., and in 30° S., with 9·2° F.; on the contrary, near the equator it is less, only 4° F. in 10° N., and in high latitudes it is also small, 5·2° F. in 50° S. The figures quoted above are differences between the average surface temperatures of the warmest and of the coldest month. As to the absolute extremes of surface temperature, Sir John Murray points out that 90° F. frequently occurs in the western part of the tropical Pacific, while among seas the Persian Gulf reaches 96° F., only 2° under blood-heat, and the Red Sea follows closely with a maximum of 94°. The greatest change of temperature at any place has been recorded to the east of Nova Scotia, a minimum of 28° F. and a maximum of 80°, and to the north-east of Japan with a minimum of 27° F. and a maximum of 83°. In those localities, however, it is not the same water which varies in temperature with the season, but the water of different warm and cold currents which periodically occupy the same locality as they advance and retreat. The zones of surface temperature are arranged roughly parallel to the equator, especially in the southern hemisphere. Between 40° N. and 40° S. the currents produce a considerable rearrangement of this simple order, the belts of warm water being wider on the western sides of the oceans and narrower on the eastern.

The arrangement of the isotherms thus affords a basis for valuable deductions as to the direction of ocean currents. The surface temperature of the Atlantic is relatively lower than that of the other oceans when the whole area is considered. According to Krümmel's calculation the proportional areas at a high temperature are as follows:—

Percentage of Ocean Surface with Temperature.

	Atlantic.	Indian.	Pacific.
Over 77° F. (25° C) . . .	22·4	38·0	40·1
Over 68° F. (20° C) . . .	50·1	51·7	58·4

This disparity results in some degree at least from the comparative narrowness of the inter-tropical Atlantic, and the absence of a cool northern area in the Indian Ocean. Krümmel calculates that the mean temperature of the whole ocean surface is 63·3° F., while the mean sea-level temperature of the whole layer of air at the surface of the earth is given by Hann as 57·8° F.

We are still ignorant of the depth to which the annual temperature wave penetrates in the open ocean, but observations in the Mediterranean enable us to form some opinion on the matter. The observations of Aimé in 1845 and of Semmola in the Gulf of Naples in 1881 show that the surface water in winter cools until the whole mass of water from the surface to the bottom, in 1600 fathoms or more, assumes the same temperature. Towards the end of summer the upper layers have been warmed to a depth which indicates how far the influence of solar radiation and convection have reached. Aimé estimated this depth at 150–200 fathoms, while the observations of the Austrian expedition in the eastern Mediterranean found it to be from 200 to nearly 400 fathoms. In the Red Sea, where a similar seasonal change occurs, the depth to which the surface layer warms up is about 275 fathoms. The great difference in salinity between the surface and the deep water excludes the possibility of effective convection in the seas of northern Europe, and in the open ocean the currents which are felt everywhere, and especially those with a vertical component, must exercise a very disturbing influence on convection.

The vertical distribution of temperature in the open ocean is much better known than that of salinity. The regional differences of temperature at like depths become less as the depth increases. Thus at 300 fathoms greater differences than 9° F. hardly ever occur between 50° N. and 50° S., in 800 fathoms the differences are less than 5·5° and in 1500 fathoms less than 2°. Even in the tropics the high temperature of the surface is confined to a very shallow layer; thus in the Central Pacific where the surface temperature is 82° F. the temperature at 100 fathoms is only 52° F. The whole ocean must thus form but a cold dwelling-place for the organisms of the deep sea. Sir John Murray calculates that at least 80% of the water in the ocean has a temperature always less than 40° F., and a recent calculation by Krümmel gave in fact a mean temperature of 39° F. for the whole ocean.

The normal vertical distribution of temperature is illustrated in curve A of fig. 1, which represents a sounding in the South Atlantic; and this arrangement of a rapid fall of temperature giving place gradually to an extremely slow but steady diminution as depth increases is termed *anathermic* (ἀνά, back, and θερμός, warm). Curve B shows the typical distribution of temperature in an enclosed sea, in this case the Sulu Basin of the Malay Sea, where from the level of the barrier to the bottom the temperature remains uniform or *homothermic*. Curve C shows a typical summer condition in the polar seas, where layers of sea-water at different temperatures are superimposed, the arrangement from the surface to 200 fathoms is termed *dichathermic* (δίχα, apart), from 1000 to 2000 fathoms it is termed *katathermic* (κατά, down). In autumn the enclosed seas of high latitudes frequently present a thermal stratification in which a warm middle layer is sandwiched between a cold upper layer and a cold mass below, the arrangement being termed *mesothermic* (μέσος, middle). The nature of the change of temperature with depth below 2500 fathoms is entirely dependent on the position of the sub-oceanic elevations, for the rises and ridges act as true submarine watersheds. As the Arctic Basin is shut off from the North Atlantic by ridges rising to within 300 fathoms of the surface and from the Pacific by the shallow shelf of the Bering Sea, and as the ice-laden East Greenland and Labrador currents consist of fresh surface water which cannot appreciably influence the underlying mass, the Arctic region has no practical effect upon the bottom temperature of the three great oceans, which is entirely dominated by the influence of the Antarctic. The existence of deep-lying and extensive rises or ridges in high southern latitudes has been indicated by the deep-sea temperature observations of Antarctic expeditions. Temperatures so low as 31·5° to 31·3° F. do not occur much beyond 50° S. The "Belgica" even found a temperature of 33·1° F. in 61° S., 63° W., at a depth of 2018 fathoms. The conditions of temperature in the South Atlantic are characteristic. South of 55° S. in approximately 3000 fathoms the bottom temperature is 31·1° F.; in the Cape Trough it is 32·7° in 45° S., and 33·8° to 34·3° in 35° S., while north of the Walfisch Ridge and east of the South Atlantic Rise bottom temperatures of 36° to 36·7° F. prevail right northwards across the equator into the Bay of Biscay, showing a steady rise of bottom temperature as successive submarine elevations restrict communication with the Antarctic. On the other hand, in the more open Argentine Basin, which carries deep water far to the south, the bottom temperature in 40° S. is only from 32·2° to 32·7° F., and the same low temperature continues throughout the Brazil Basin to the equator; but in the North American Basin from the West Indies to the Telegraph Plateau no satisfactory bottom temperature lower than 35·6° F. has been reported. On the floor of the Indian Ocean temperatures of 33·3° to 33·6° occur south of 35° S. in depths of 2700 fathoms or more, but north of 35° S. the prevailing bottom temperatures are from 34·0° to 34·3°. In similar depths in the Pacific south of the equator temperatures of 33·8° to 34·5° are found, and north of the equator bottom temperatures at the same depth increase to 35·1° in the neighbourhood of the Aleutian Islands, again completely justifying the conclusion as to the Antarctic control of deep water temperature throughout the ocean.

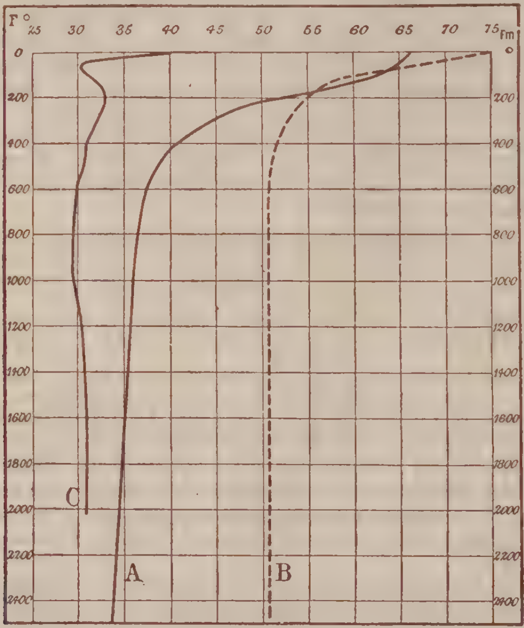

Fig. 1.—Diagram illustrating Distribution of Sea Temperature.

The marginal rises and continental shelves prevent this cold bottom water from penetrating into the depths of the enclosed and fringing seas. Thus in the Central American Sea below 930 fathoms, the depth on the bar, no water is found at a temperature lower than that prevailing in the open ocean at that depth, viz. 39·6° F., not even at the bottom of the great Bartlett Deep in 3439 fathoms. Such homothermic masses of water are characteristic of all deep enclosed seas. Thus in the Malay Sea the various minor seas or basins are homothermic below the depth of the rim, at the temperature prevailing at that depth in the open ocean: in the China Sea below 875 fathoms with 36·5° F.; in the Sulu Sea (depth 2550 fathoms) below 400 fathoms with 50·5° F.; in the Celebes Sea below 820 fathoms with 38·6° F.; in the Banda Sea below 902 fathoms with 37·9° F. In other enclosed seas which are shut off from the ocean by a very shallow sill the rule holds good that the homothermic water below the level of the sill is at the lowest temperature reached by the surface water in the coldest season of the year, provided always that the stratification of salinity is such as to permit of convection being set up. To this group belongs the Arctic Sea; the Norwegian Sea is homothermic below 550 fathoms at 29·8° F., but this cold water does not penetrate into the Arctic Basin on account of the ridge between Spitsbergen and Greenland, and there the water below 1400 fathoms has a temperature of 30·6° to 30·7° F. because the surface layers of water are too light, on account of the low salinity due to ice-melting, to enable even the cold of a polar winter to set up a downward convection current. The Mediterranean Sea also belongs to this group; its various deep basins are homothermic (at the winter surface temperature) below the level of their respective sills—the Balearic Basin below 190 fathoms at 55° F.; the Eastern Basin below 270 fathoms at 55·9° F; the Ionian Sea at 56·3° F.; and at 56·7° south of Cyprus. Similarly in the Red Sea the water below 380 fathoms is homothermic at 70·7° F.

An under-current flows out from the Red Sea through the Strait of Bab-el-Mandeb, and from the Mediterranean through the Strait of Gibraltar, raising the salinity as well as the temperature of the part of the ocean outside the gates of the respective seas. The action of the Red Sea water affects the whole of the Gulf of Aden and Arabian Sea, raising the temperature at the depth of 550 fathoms to 52° or 53° F. or 9 Fahrenheit degrees higher than the water of the Bay of Bengal at the same depth. The effect of the Mediterranean water in the North Atlantic does not require such large figures to express it, but is none the less extraordinarily far-reaching, as first indicated by the work of the "Challenger" and subsequently defined by H. N. Dickson's discussion of the observations of Wolfenden in the little sailing yacht "Silver Belle." The temperature at 550 fathoms is raised to 49° or 50° F. between Madeira and the Biscay Shelf, *i.e.* 5·4° F. above the temperature at the same depth off the Azores.

In shallow seas such as the North Sea and the British fringing seas, where tidal currents run strong, there is a general mixing together of the surface and deeper water, thus making the arrangement of vertical temperature anathermic in summer and katathermic in winter, while at the transitional periods in spring and autumn it is practically homothermic. Thus at Station E_2 of the international series at the mouth of the English Channel in 49° 27′ N., 4° 42′ W., the following distribution of temperature F. has been observed by Matthews:—

	August 1904.	November 1904.	February 1905.	May 1905.
Surface	63·7°	56·2°	50·7°	51·3°
16½ fathoms	55·5	56·5	50·8	50·5
52 fathoms	55·4	56·5	50·8	50·5

It is noticeable that there is a marked vertical temperature gradient only at the end of summer when a warm surface layer is formed, though in August 1904 that was only 8 fathoms thick. In small nearly land-locked basins shut off from one another by bars rising to within a short distance of the surface and affected both by strong tidal currents and by a considerable admixture of land water, the contrasts of vertical distribution of temperature with the seasons are strongly marked, and there are also great unperiodic changes effected mainly by wind, as is shown by the investigations of H. R. Mill in the Clyde Sea Area, and of O. Pettersson, J. Hjort and Helland-Hansen in the Scandinavian fjords.

Sea Ice.—The freezing-point of sea-water is lower as the salinity increases and normal sea-water of 35 per mille salinity freezes at 28·6° F. Experience shows that sea-water can be cooled considerably below the freezing-point without freezing if there is no ice or snow in contact with it. Freezing takes place by the formation of pure ice in flat crystalline plates of the hexagonal system, which form in perpendicular planes and unite in bundles to form grains so that a thick covering of ice exhibits a fibrous structure. It is only the water that freezes; the dissolved salts are excluded in the process in a regular order according to temperature. At temperatures about 17° F. sodium sulphate is the first ingredient of the salts to separate out, potassium chloride follows at 12° F., sodium chloride at −7·4° F., magnesium chloride at −28·5° F., and, as O. Pettersson was the first to point out, calcium chloride not until −67° F. During the rapid formation of ice the still unfrozen brine is often imprisoned between the little plates of frozen water; hence without some special treatment sea-ice is not suitable as a source of drinking water. After long continued frost the last of the included brine may be frozen and the salts driven out in crystals on the surface; these crystals are known to polar explorers by the Siberian name of *rassol*. Ice is a very poor conductor of heat and accordingly protects the surface of the water beneath from rapid cooling; hence new-formed pancake ice does not increase excessively in thickness in one winter, and even in the centre of the Arctic Basin the ice-covering only amounts to 6 or at most 9 ft. in the course of a year, while in the Antarctic regions the season's growth is only half as great; in the latter also the accumulated snow is an important factor in the thickness of the ice, and snow is an even worse conductor of heat. The influence of wind and tide breaks up the frozen surface of the sea, and sheets yielding to the pressures slide over or under one another and are worked together into a hummocky ice-pack, the irregularities on the surface of which, caused by repeated fractures and collisions, may be from 10 to 20 ft. high. Such formations, termed *toross* by the Russians, may extend under water, according to Makaroff's investigations, to at least an equal depth. Such old sea-ice when prevented from escaping forms the palaeocrystic sea of Nares; but, as a rule, it is carried southward in the East Greenland and Labrador currents, and melted in the warmer seas of lower latitudes. In the southern hemisphere the ice-pack forms a nearly continuous fence around the Antarctic continent. Pack-ice forms regularly in the inner part of the Baltic every winter, but not in the Norwegian fjords. Even in the Mediterranean sea-ice is formed annually in the northern part of the Black Sea, and more rarely in the Gulf of Salonica and at the head of the Adriatic off Triest. Hudson Bay is blocked by ice for a great part of the year, and the Gulf of St Lawrence is blocked every winter. Ice also clothes the continental shores of the northern fringing seas of eastern Asia. In addition to sea-ice, icebergs which are of land origin occur at sea. In the north, icebergs break off, as a rule, from the ends of the great glaciers of Greenland, and in the far south from the edge of the great Antarctic ice-barrier. The latter often gives birth to prodigious icebergs and ice islands, which are carried northward by ocean currents, nearly as far as the tropical zone before they melt. Thus in December 1906, an iceberg was seen off the mouth of the La Plata in 38° S., and in 1840 one was seen near Cape Agulhas in 35° S. The Antarctic icebergs are of tabular form and much larger than those of Greenland, but in either case an iceberg rising to 200 ft. above sea-level is uncommon, and one exceeding 300 ft. is very rare. The Greenland icebergs are carried by the Labrador current across the great banks of Newfoundland, where they are often very numerous in the months from February to August, when they constitute a danger to shipping as far south as 40° N. No icebergs occur in the North Pacific, and none has ever been reported nearer the coasts of Europe than off the Orkney Islands, and there only once, in 1836.

Oceanic Circulation.—Although observations on marine currents were made near land or between islands even in antiquity, accurate observations on the high seas have only been possible since chronometers furnished a practicable method of determining longitude, *i.e.* from the time of Cook, the circumnavigator. The difference between the position as determined astronomically and by dead-reckoning gives an excellent idea of the general direction and velocity of the surface currents. The first comprehensive study of the currents of the Atlantic was that carried out by James Rennell (1790–1830), and since that time Findlay in his *Directories*, Heinrich Berghaus, Maury and the officials of the various Hydrographic Departments have produced increasingly accurate descriptions of the currents of the whole ocean, largely from material supplied by merchant captains. Direct observations of currents in the open sea are difficult, and even when the ship is anchored the veering and rolling of the vessel produce disturbances that greatly affect the result. Such current-meters as those used by Aimé in 1841 and by Irminger since 1858 only gave the direction of the deeper current by comparison with the surface current at the time of observation. Later apparatus, such as Pettersson's bifilar current-meter or his more recent electric-photographic apparatus, and Nansen and Ekman's propeller current-meter, measure both the direction and the velocity at any moderate depth from an anchored vessel. One of the indirect methods of investigating currents is by taking account of the initial temperature of the current and following it by the thermometer throughout its course; hence the familiar contrast between warm and cold currents, of which the Gulf Stream and the Labrador current are types. Benjamin Franklin in 1775 and Charles Blagden in 1781, by means of numerous observations of temperature made on board the packets plying on the Atlantic passage, determined the boundaries of these two currents and their seasonal variations with considerable precision. The differences of salinity support this method, and, especially in the northern European seas, often prove a sharper criterion of the boundaries than temperature itself; this is especially the case at the entrance to the Baltic. Evidence drawn from drift-wood, wrecks or special drift bottles is less distinct but still interesting and often useful; this method of investigation includes the use of icebergs as indicators of the trend of currents and also of plankton, the minute swimming or drifting organisms so abundant at the surface of the sea.

The general lines of the currents of the oceans are fairly well understood, and along the most frequented ocean routes the larger seasonal variations have also been ascertained. The general scheme of ocean currents depends on the prevailing winds taken in conjunction with the configuration of the coast and its submarine approaches. The trade-wind regions correspond pretty closely with westward-flowing currents, while in the equatorial calm belts there are eastward-running counter-currents, these lying north of the equator in the Atlantic and Pacific, but south of the equator in the Indian Ocean. In the region of the westerly winds on the poleward side of 40° N. and S. the currents again flow generally eastward. A cyclonic circulation of the atmosphere is associated with a cyclonic circulation of the water of the ocean, as is well shown in the Norwegian Sea and North Atlantic between the Azores and Greenland. Where the trade-winds heap up the surface water against the east coasts of the continents the currents turn poleward. The north equatorial current divides into the current entering the Caribbean Sea and issuing thence by the Strait of Florida as the Gulf Stream, and the Antilles current passing to the north of the Antilles. Both currents unite off the coast of the United States and run northward, turning towards the east when they come within the influence of the prevailing westerly winds. In a similar manner the Brazil current, the Agulhas current and the East Australian current originate from the drift of the south-east trades, and in the North Pacific the Japan current arises from the north-east trade drift. The west-wind drifts on the poleward side carry back part of the water southward to reunite with the equatorial current, and thus there is set up an anticyclonic circulation of water between 10° and 40° in each hemisphere, the movement of the water corresponding very closely with that of the wind. The coincidence of wind and current direction is most marked in the region of alternating monsoons in the north of the Indian Ocean and in the Malay Sea.

The accordance of wind and currents is so obvious that it was fully recognized by seafaring men in the time of the first circumnavigators. Modern investigations have shown, however, that the relationship is by no means so simple as appears at first. We must remember that the ocean is a continuous sheet of water of a certain depth, and the conditions of continuity which hold good for all fluids require that there should be no vacant space within it; hence if a single water particle is set in motion, the whole ocean must respond, as Varenius pointed out in 1650. Thus all the water carried forward by any current must have the place it left immediately occupied by water from another place, so that only a complete system of circulation can exist in the ocean. Further, all water particles when moving undergo a deviation from a straight path due to the forces set up by the rotation of the earth deflecting them towards the right as they move in the northern hemisphere and towards the left in the southern. This deflecting force is directly proportional to the velocity and the mass of the particle and also to the sine of the latitude; hence it is zero at the equator and comes to a maximum at the poles. When the wind acts on the surface of the sea it drives before it the particles of the surface layer of water, and, as these cannot be parted from those immediately beneath, the internal friction of the fluid causes the propelling impulse to act through a considerable depth, and if the wind continued long enough it would ultimately set the whole mass of the ocean in motion right down to the bottom. The current set up by the grip of the wind sweeping over the surface is deflected by the earth's rotation about 45° to the right of the direction of the wind in the northern hemisphere and to the left in the southern. The deeper layers lag behind the upper in deflection and the velocity of the current rapidly diminishes in consequence. The older theory of the origin of drift currents enunciated by Zöppritz in 1878 was modified as indicated above by Nansen in 1901, and Walfrid Ekman subsequently went further. He showed that at a certain depth the direction of the current becomes exactly the opposite of that which has been imposed by deflection on the surface current, and the strength is reduced thereby to only one-twentieth of that at the surface. He called the depth at which the opposed direction is attained the drift-current depth, and he found it to be dependent on the velocity of the surface current and on the latitude. According to Ekman's calculation with a trade-wind blowing at 16 m. per hour, the drift-current depth in latitude 5° would be approximately 104 fathoms, in latitude 15°, 55 fathoms, and in latitude 45° only from 33 to 38 fathoms. A strong wind of 38 m. an hour would produce a drift-current depth of 82 fathoms in latitude 45°, and a light breeze of 3 m. an hour only 22 fathoms. It follows that a pure trade-wind drift cannot reach to any great depth, and this seems to be confirmed by observation, as when tow-nets are sunk to depths of 50 fathoms and more in the region of the equatorial current they always show a strong drift away from the side of the ship, the ship itself following the surface current. Ekman shows further that in a pure drift current the mean direction of the whole mass of the current is perpendicular to the direction of the wind which sets it in motion. This produces a heaping-up of warm water towards the middle of the anticyclonic current circulation between 10° and 40°, and on the other hand an updraught of deep water along the outer side of the cyclonic currents. The latter phenomenon is most clearly shown by the stripes of cold water along the west coasts of Africa and America, the current running along the coast tending to draw its water away seawards on the surface and the principle of continuity requiring the updraught of the cool deep layers to take its place. For this reason the up-welling coastal water is coldest close to the shore, and hence it only appears on the Somali coast during the south-west monsoon. On the flat coasts of Europe the influence of on-shore wind in driving in warm water, and of off-shore wind in producing an updraught of cold water, has long been familiar to bathers. In a similar way updraughts of cold water to the surface occur in the neighbourhood of the equator, especially in the Central Atlantic and Pacific.

When a drift-current impinges directly upon a coast there is a heaping up of surface water, giving rise to a counter-current in the depths, which maintains the level, and this counter-current, although subject to deflection on account of the rotation of the earth, is deflected much less than a pure drift-current would be. Such currents, due to the banking up of water, have a large share in setting the depths of the sea in motion, and so securing the vertical circulation and ventilation of the ocean.

The difference in density which occurs between one part of the ocean and another, shares with the wind in the production of currents. Vertical movements are also produced by difference of temperature in the water, but these can only be feeble, as below 1000 fathoms the temperature differences between tropical and polar waters are very small. If we assign to a column of water at the equator the density $S\frac{4}{t}=1{\cdot}022$ at the surface and 1·028 at 1000 fathoms, or an average of 1·025, and to a column of water at the polar circle a mean density of 1·028, there would result a difference of level equal to $(1{\cdot}028-1{\cdot}025)\times 1000=3$ fathoms in a distance from the equator to the polar circle of some 4600 m. A gradient like this, only 1 in 1,350,000, could give rise only to an extremely feeble surface current polewards and an extremely feeble deep current towards the equator. If there were strong currents at the bottom of the ocean the uniform accumulation of the deposit of minute shells of globigerina and radiolarian ooze would be impossible, the rises and ridges would necessarily be swept clear of them, and the fact that this is not the case shows that from whatever cause the waters of the depths are set in motion, that motion must be of the most deliberate and gentlest kind. In exceptional cases, when a strong deep current does flow over a rise, as in the case of the Wyville Thomson Ridge, the bottom is swept clear of fine sediment.

Strongly marked differences in density are produced by the melting of sea-ice, and this is of particular importance in the case of the great ice barrier round the Antarctic continent. O. Pettersson has made a careful study of ice melting as a motive power in oceanic circulation, and points out that it acts in two ways: on the surface it produces dilution of the water, forming a fresh layer and causing an outflow seaward of surface water with very low salinity; towards the deep water it produces a strong cooling effect, leading to increase of density and sinking of the chilled layers. Both actions result in the drawing in of an intermediate layer of water from a distance which takes part in the double system of vertical circulation as is indicated in fig. 2. The actual direction of this circulation is strongly modified by the influence of the earth's rotation. The existence of a layer of water of low salinity at a depth of 500 fathoms in the tropical oceans of the southern hemisphere is to be referred to this action of the melting ice of the Antarctic regions. Pettersson's view that ice-melting dominates the whole circulation of the oceans and regulates in particular the currents of the seas round northern Europe must, however, be looked on as carrying the explanation too far.

Differences of density between the waters of enclosed seas and of the ocean are brought about in some instances by concentration of the water of the sea on account of active evaporation, and in other instances by dilution on account of the great influx of land water. A very powerful vertical circulation is thus set up between enclosed seas and the outer ocean. The very dense water of the Red Sea and the Mediterranean makes the column of water salter and heavier and the level lower than in the ocean beyond the straits. Hence a strong surface current sets inwards through the Straits of Bab-el-Mandeb and Gibraltar, while an undercurrent flows outwards, raising the temperature and salinity of the ocean for a long distance beyond the straits. Through the Bosporus and Dardanelles at the entrance of the Black Sea, and through the sound and belts at the entrance of the Baltic, streams of fresh surface-water flow outwards to the salter Mediterranean and North Sea, while salter water enters in each case as an undercurrent. Wind and tide greatly alter the strength of these currents due to difference of density, and the surface outflow may either be stopped or, in the case of the belts, actually reversed by a strong and steady wind. Both outflowing and inflowing currents are subject to the deflection towards the right imposed by the earth's rotation.

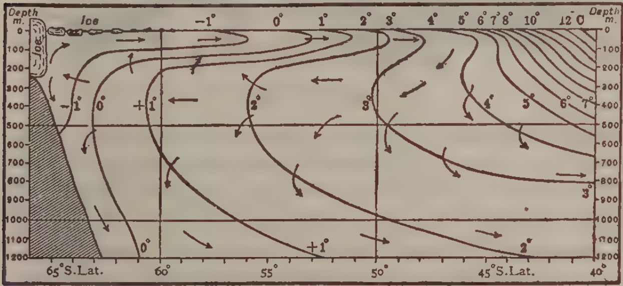

Fig. 2.—Diagram of the stratification of temperature and the vertical components of currents in high southern latitudes.

Modern oceanography has found means to calculate quantitatively the circulatory movements produced by wind and the distribution of temperature and salinity not only at the surface but in deep water. The methods first suggested by H. Mohn and subsequently elaborated by V. Bjerknes have been usefully applied in many cases, but they cannot take the place of direct observations of currents and of the fundamental processes and conditions underlying them. The determination of the exact relationship of cause and effect in the origin of ocean currents is a matter of great practical importance. The researches of Pettersson, Meinardus, H. N. Dickson and others leave no doubt, for example, that the variations in the intensity of the Gulf Stream, whether these be measured by the change in the strength of the current or in the heat stored in the water, produce great variations in the character of the weather of northern Europe. The connexion between variations of current strength and the conditions of existence and distribution of plankton are no less important, especially as they act directly or indirectly on the life-conditions of food fishes.

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Important current and temperature charts of the ocean and occasional memoirs are published for the Admiralty by the Meteorological Office in London, by the U.S. Hydrographic Office in Washington, the Deutsche Seewarte in Hamburg, and also at intervals by the French, Russian, Dutch and Scandinavian admiralties. *Pilot Charts* of the North Atlantic and North Pacific are issued monthly by the U.S. Hydrographic Office, and of the North Atlantic and of the Indian Ocean and Red Sea by the British Meteorological Office, giving a conspectus of the normal conditions of weather and sea.

Reports of Important Expeditions.—Sir C. Wyville Thomson, *The Depths of the Sea* (cruises of "Porcupine" and "Lightning") (London, 1873); *The Atlantic* (cruise of "Challenger") (London, 1877); *Die Forschungsreise S.M.S. "Gazelle" in den Jahren 1874 bis 1876* (5 vols., Berlin, 1889–1890); *Report of the Scientific Results of the Voyage of H.M.S. "Challenger" in the years 1872–1876* (50 vols., London, 1880–1895); A. Agassiz, *Three Cruises of the U.S. Coast and Geodetic Survey Steamer "Blake" . . . from 1877 to 1880* (2 vols., Boston, Mass., 1888); S. Makaroff, *Le Vitiaz et l'Océan Pacifique, 1886–1889* (St Petersburg, 1894); S. Makaroff, *The Yermak in the Ice* (in Russian) (St Petersburg, 1901); *The Norwegian North Atlantic Expedition (on the "Vöringen"), 1876–1878* (Christiania, 1880–1900); *Expéditions scientifiques du "Travailleur" et du "Talisman," 1880–1883* (Paris, 1891 et seq.); *Die Ergebnisse der Plankton-Expedition, 1889* (Kiel, 1892 et seq.); *Résultats des campagnes scientifiques accomplies sur son yacht par Albert Ier Prince Souverain de Monaco* (Monaco, from 1889); *The Danish "Ingolf" Expedition, 1806* (Copenhagen, 1900); Prof. Luksch, *Expeditionen S.M. Schiff "Pola" in das Mittelmeer und in das Rote Meer*, Kais. Akad. Wissenschaften (Vienna, 1891–1904); *Die Deutsche "Valdivia" Tief-See Expedition, 1898–1899* (Berlin, 1900); M. Weber, "Siboga Expedition," *Petermanns Mitteilungen* (1900); *Siboga Expeditië* (Leiden, 1902 et seq.); F. Nansen, *The Norwegian North Polar Expedition, 1893–1896* (Christiania and London, 1900); R. S. Peake, "On the Results of a Deep-sea Sounding Expedition in the North Atlantic Ocean during the Summer, 1899" (Extra Publ. Geogr. Soc., London); *Bulletin des résultats acquis pendant les courses périodiques* (Conseil permanent international pour l'exploration de la mer) (Copenhagen, 1902 seq.).

Reports of many minor expeditions and researches have appeared in the *Reports* of the Fishery Board for Scotland; the Marine Biological Association at Plymouth; the Kiel Commission for the Investigation of the Baltic; the Berlin Institut für Meereskunde; the bluebooks of the Hydrographic Department; the various official reports to the British, German, Russian, Finnish, Norwegian, Swedish, Danish, Belgian and Dutch governments on the respective work of these countries in connexion with the international cooperation in the North Sea; the *Bulletin du musée océanographique de Monaco* (1903 seq.); the *Scottish Geographical Magazine*; the *Geographical Journal*; *Petermanns Mitteilungen*; Wagner's *Geographisches Jahrbuch*; the *Proceedings* and *Transactions* of the Royal Societies of London and Edinburgh; the *Annalen der Hydrographie*; and the publications of the Swedish Academy of Sciences.

(O. K.; H. R. M.)

OCEAN CITY, a city and seaside resort of Cape May county, New Jersey, U.S.A., in the S.E. part of the state, about 10 m. S.W. of Atlantic City. Pop. (1890), 452; (1900), 1307; (1905), 1835; (1910), 1950. It is served by the Atlantic City and the West Jersey & Seashore railways. The city is laid out to face both the ocean and Great Egg Harbor Bay, and is a popular resort during the summer months. Ocean City was incorporated as a borough in 1884, and was chartered as a city in 1897.

OCEAN GROVE, a summer resort of Monmouth county, New Jersey, U.S.A., in the eastern part of the state, on the Atlantic coast, and 55 m. by rail S. of New York City. Pop. (1909), about 2500. It is served by the Pennsylvania and the Central of New Jersey railways. It is noted as a religious and musical seaside resort, and in July and August, and especially in the last ten days of August, during its annual camp-meeting, is visited by thousands of people. Ocean Grove was founded in 1869 by the Ocean Grove Camp-Meeting Association of the Methodist Episcopal Church, as a place for religious worship, rest and recreation, free from all forms of questionable amusement, and is governed under a corporation charter, the corporation having power to place restrictions in all leases.

OCEANIA, or OCEANICA, a name used to cover all the islands of the Pacific Ocean (*q.v.*) which are included in the divisions of Polynesia, Micronesia, Melanesia, Australasia, &c.

OCEANUS (Gr. Ὠκεανός), in Greek mythology, the greatest of rivers and at the same time a divine personification. Never mingling with the sea which it encloses, according to Homer it has neither source nor mouth. On its southern banks, from east to west, dwell the "blameless Aethiopians" in perfect happiness, and beyond it on the west, in the realms of eternal night, the "Cimmerians," wrapped in fogs and darkness. Here are the grove of Persephone and the entrance of the underworld. Personified, Oceanus is in Hesiod (*Theog.* 133, 337-370) the son of Uranus and Gaea, the husband of Tethys, father of 3000 streams and 4000 ocean nymphs. In Homer he is the origin of all things, even the father of the gods, and the equal in rank of all of them save Zeus. This conception recurs in the theory of Thales, who made water the first principle of all things. The idea of Oceanus as a river flowing unceasingly round the earth, which was regarded as a flat circle, was of long continuance. Euripides was the first among the tragic poets to speak of it as a sea, but Herodotus before him ridiculed the notion of Oceanus as a river as an invention of the poets and described it as the great world sea. As the geographical knowledge of the Greeks extended, the name was applied to the outer sea (especially the Atlantic).

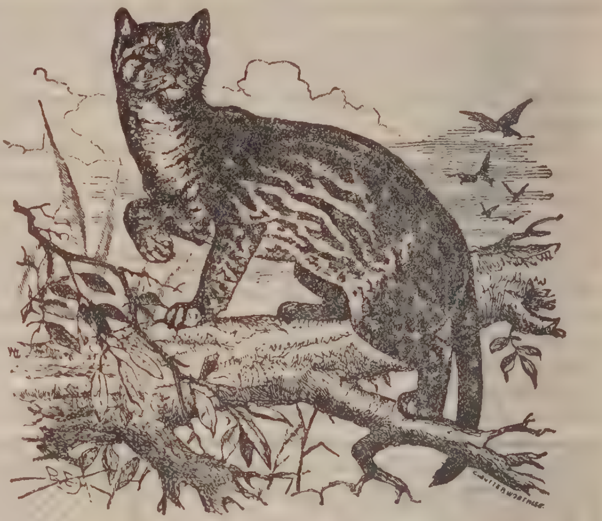
In art, Oceanus was represented as an old man of noble presence and benevolent expression, with the horns of an ox and sometimes crab's claws on his head. His attributes are a pitcher, cornucopiae ("horn of plenty"), rushes, marine animals and a sceptre. On the altar of Pergamum he is depicted taking part in the battle of the giants.

Homer, *Iliad*, i. 423, xiv. 201, 245, xxi. 196; *Odyssey*, x. 508, xi. 14; Herodotus ii. 23, iv. 8; Euripides, *Orestes*, 1376; Caesar, *Bell. Gall.* iii. 7, iv. 10.

OCELLUS LUCANUS, a Pythagorean philosopher, born in Lucania in the 5th century B.C., perhaps a pupil of Pythagoras himself. Stobaeus (*Ecl. Phys.* i. 13) has preserved a fragment of his *Περὶ νόμου* (if he was really the author) in the Doric dialect, but the only one of his alleged works which is extant is a short treatise in four chapters in the Ionic dialect generally known as *On the Nature of the Universe*. Excerpts from this are given in Stobaeus (i. 20), but in Doric. It is certainly not authentic, and cannot be dated earlier than the 1st century B.C. It maintains the doctrine that the universe is uncreated and eternal; that to its three great divisions correspond the three kinds of beings—gods, men and daemons; and, finally, that the human race with all its institutions (the family, marriage and the like) must be eternal. It advocates an ascetic mode of life, with a view to the perfect reproduction of the race and its training in all that is noble and beautiful.

Editions of the *Περὶ τῆς τοῦ παντὸς φύσεως*, by A. F. Rudolph (1801, with commentary), and by F. W. Mullach in *Fragmenta philosophorum graecorum*, i. (1860); see also E. Zeller, *History of Greek Philosophy*, i. (Eng. trans.), and J. de Heyden-Zielewicz in *Breslauer philologische Abhandlungen*, viii. 3 (1901). There is an English translation (1831) by Thomas Taylor, the Platonist.

OCELOT (Mexican *Flalocelotl*, literally field-jaguar, from *Flalli*, field, and *ocelotl*, tiger, jaguar), an American member (*Felis pardalis*) of the family *Felidae*, ranging from Arkansas in the north to Paraguay. The species is subject to great racial variation. The fur has, however, a tawny yellow or reddish-grey ground colour, marked with black spots, aggregated in streaks and blotches, or in elongated rings enclosing areas rather darker than the general ground-colour. In the typical form the total length may reach 4 ft.; the average measurement of the head and body lies between 26 in. and 33 in., and of the tail between 11 in. and 15 in. The ocelot is essentially a forest cat, and a ready climber; its disposition is said to be fierce and bloodthirsty but in confinement it becomes tame and playful. In Asia the group is represented by the Tibetan *Felis tristis*.



Ocelot (*Felis pardalis*).

OCHAKOV, a fortified town and port of Russia, in the government of Kherson, 41 m. E. of Odessa, on a cape of the Black Sea, at the entrance to the estuary of the Dnieper, and opposite to Kinburn. Pop. (1897), 10,784. Strong fortifications have been built at Ochakov and on the Kinburn promontory, to protect the entrance to the Dnieper. Ochakov stands close to the site of the old Miletan (Greek) colony of *Olvia* and the Greek colony of *Alektor*. The fortress of Kara-kerman or Ozu-kaleh was built on this spot by the khan of the Crimea, Mengli Girai, in 1492. At a later date it became the centre of a Turkish province which included Khaji-dereh (Ovidiopol), Khaji-bey (Odessa), and Dubossary, as well as some 150 villages. Russia, regarding it as the main obstacle to the possession of the Black Sea littoral, besieged it in 1737, when it was captured by Marshal Münnich, but in the following year it was abandoned, and in 1739 restored to Turkey. The second siege by Russia was begun in 1788, and lasted six months, until the fortress was stormed and taken, after a terrible loss of life. By the peace of 1791 it became Russian. In 1855 it was bombarded by the Anglo-French fleet, and after that the Russians demolished the fortifications.

OCHILTREE, a barony in the county of Ayr, Scotland, from which a title in the Scottish peerage was held in the 16th and 17th centuries by a branch of the house of Stewart. Sir Andrew Stewart (d. 1488), chancellor of Scotland, a great-grandson of the regent Albany (d. 1420), was created Baron Avandale or Avondale about 1457. This peerage became extinct at his death, but was revived about 1499 in favour of his nephew and heir Andrew Stewart, who, being killed at the battle of Flodden in 1513, was succeeded by his son Andrew, 2nd Baron Avandale of this creation; and the latter obtained an act of parliament in 1543 empowering him to exchange the title of Lord Avandale for that of Lord Ochiltree, or Lord Stewart of Ochiltree. His son, Andrew, 2nd Lord Ochiltree (d. *c.* 1600), was a zealous supporter of the lords of the congregation, and especially of John Knox, in the struggle against Mary queen of Scots, and was wounded at the battle of Langside while fighting against the queen. Of his five sons, William was slain by the earl of

Bothwell in 1588, and James, created earl of Arran in 1581, was the father of Sir James Stewart of Killeith who became 4th Lord Ochiltree in 1615; his daughter Margaret was the second wife of John Knox. His brother Henry Stewart married Margaret Tudor, widow of James IV. of Scotland, and was created Baron Methven by James V. in 1528; and another brother, Sir James Stewart of Beath, was ancestor of the Stewart earls of Moray, through his son James who was created Lord Doune in 1581.

The second Lord Ochiltree was succeeded in the peerage by his grandson Andrew, who resigned the title in 1615, and having been summoned by writ to the Irish House of Lords was created Baron Castle Stewart in the Irish peerage in 1619. The barony of Ochiltree which he thus resigned was conferred in 1615 on his cousin Sir James Stewart of Killeith (see above), son of the earl of Arran; and on the death without issue of his son William, 5th Lord Ochiltree, in 1675, the title became extinct. In 1774 Andrew Thomas Stewart successfully claimed the barony of Castle Stewart in the peerage of Ireland as heir male under the creation of 1619; but although he was permitted in 1790 to vote as Lord Ochiltree in an election of Scottish representative peers, his claim to this barony as collateral heir of the grantee of 1615 was disallowed by the House of Lords in 1793.

OCHINO, BERNARDINO (1487–1564), Italian Reformer, was born at Siena in 1487. At an early age he entered the order of Observantine Friars, the strictest sect of the Franciscans, and rose to be its general, but, craving a yet stricter rule, transferred himself in 1534 to the newly founded order of Capuchins, of which in 1538 he was elected vicar-general. In 1539, urged by Bembo, he visited Venice and delivered a remarkable course of sermons, showing a decided tendency to the doctrine of justification by faith, which appears still more evidently in his *Dialogi VII.* published soon after. He was suspected and denounced, but nothing ensued until, at the instigation of the austere zealot Caraffa, the Inquisition was established at Rome, June 1542. Ochino was at once cited, but was deterred from presenting himself at Rome by the warnings of Peter Martyr and of Cardinal Contarini, whom he found at Bologna, dying of poison administered by the reactionary party. After some hesitation he escaped across the Alps to Geneva. He was cordially received by Calvin, and within two years published six volumes of *Prediche*, tracts rather than sermons, explaining and vindicating his change of religion. Twenty-five of these were published in English at Ipswich in 1548. In 1545 he became minister of the Italian Protestant congregation at Augsburg, which he was compelled to forsake when, in January 1547, the city was occupied by the imperial forces in the Schmalkaldic War. Escaping by way of Strassburg he found an asylum in England, where he was made a prebendary of Canterbury, received a pension from Edward VI.'s privy purse, and composed his chief work, *A Trajedy or Dialogue of the unjust usurped Primacy of the Bishop of Rome* (1549). This remarkable performance, originally written in Latin, is extant only in the translation of John Ponet, bishop of Winchester, a splendid specimen of nervous English. The conception is highly dramatic; the form is that of a series of dialogues. Lucifer, enraged at the spread of Christ's kingdom, convokes the fiends in council, and resolves to set up the pope as Antichrist. The state, represented by the emperor Phocas, is persuaded to connive at the pope's assumption of spiritual authority; the other churches are intimidated into acquiescence; Lucifer's projects seem fully accomplished, when Heaven raises up Henry VIII. and his son for their overthrow. The conception bears a remarkable resemblance to that of *Paradise Lost*; and it is almost certain that Milton, whose sympathies with the Italian Reformation were so strong, must have been acquainted with it, and with some of his later works. In the *Labyrinth* (dedicated to Queen Elizabeth of England), a discussion of the freedom of the will, he covertly assailed the Calvinistic doctrine of predestination, and showed that his views were tinged with Socinianism.

The accession of Mary in 1553 drove him from England, and he became pastor of the Italian congregation at Zürich. In 1563 the long-gathering storm of obloquy burst upon the occasion of the publication of his *Thirty Dialogues*, in one of which his adversaries maintained that he had justified polygamy under colour of a pretended refutation. His dialogues on divorce and the Trinity were also obnoxious. Ochino was banished from Zürich, and, after being refused a shelter by other Protestant cities, directed his steps towards Poland, at that time the most tolerant state in Europe. He had not resided there long when the edict of the 6th of August 1564 banished all foreign dissidents. Flying from the country, he encountered the plague at Pinczoff; three of his four children were carried off; and he himself, worn out by age and misfortune, died in solitude and obscurity at Schlakau in Moravia, about the end of 1564. His reputation among Protestants was at the time so bad that he was charged with the authorship of the treatise *De tribus impostoribus*, as well as with having carried his alleged approval of polygamy into practice. It was reserved for Dr Benrath to justify him, and to represent him as a fervent evangelist and at the same time as a speculative thinker with a passion for free inquiry. The general tendency of his mind ran counter to tradition, and he is remarkable as resuming in his individual history all the phases of Protestant theology from Luther to Socinus.

See *Life* by B. O. Benrath (2nd ed., Brunswick, 1892), translated into English by Helen Zimmern (London, 1876). In addition to the books already named, he wrote Italian expositions of *Romans* (Geneva, 1545) and *Galatians* (Augsburg, 1546).

OCHRES, a class of pigments varying in colour from yellow to red, and consisting mainly of hydrated iron oxide. The *Yellow Ochres* are native earths coloured with hydrated ferric oxide, the brownish yellow substance that colours, and is deposited from, highly ferruginous water. These ochres are of two kinds—one having an argillaceous basis, while the other is a calcareous earth, the argillaceous variety being in general the richer and more pure in colour of the two. Both kinds are widely distributed, fine qualities being found in Oxfordshire, the Isle of Wight, near Jena and Nuremberg in Germany, and in France in the departments of Yonne, Cher and Nièvre. The original colour of these ochres can be modified and varied into browns and reds of more or less intensity by calcination. The nature of the associated earth also influences the colour assumed by an ochre under calcination, aluminous ochres developing red and violet tints, while the calcareous varieties take brownish-red and dark-brown hues. The well-known ochre *Terra da Sienna* which in its raw state is a dull-coloured ochre, becomes when burnt a fine warm mahogany brown hue highly valued for artistic purposes. Yellow ochres are also artificially prepared—*Mars Yellow* being either pure hydrated ferric oxide or an intimate mixture of that substance with an argillaceous or calcareous earth, and such compounds by careful calcination can be transformed into *Mars Orange*, *Violet* or *Red*, all highly important, stable and reliable pigments.

OCHRIDA (also written OKHRIDA and ACHRIDA; Turkish *Ochri*), a city of Albania, European Turkey, in the vilayet of Monastir; on the north-eastern shore of Lake Ochrida, and at the eastern end of the Roman Via Egnatia. Pop. (1905) about 11,000, including Albanians, Turks, Greeks and Slavs. Ochrida occupies the site of the ancient Lychnidos, which was added to the Macedonian empire by Philip II. (382–336 B.C.), and destroyed by the Bulgarians in A.D. 861. It is the seat of Bulgarian and Greek bishops. From the creation of the Bulgarian patriarchate of Ochrida in 893 to its abolition in 1767 the city was the ecclesiastical headquarters of the Bulgarians in the west of the Balkan Peninsula. Lake Ochrida is 2260 ft. above sea-level, in a mountainous limestone region of Karst formation. It measures 107 sq. m., and has a maximum depth of 938 ft. Its waters are supplied by subterranean streams. Its chief outlet is the river Black Drin, on the north.

See Gelzer, *Der Patriarchat von Achrida* (Leipzig, 1902); and "Dr Jovan Cvijić's Researches in Macedonia, &c.," in *The Geographical Journal*, vol. xvi. (London, 1900).

OCHSENFURT, a town of Germany, in the kingdom of Bavaria, situated on the left bank of the Main, here crossed by a stone bridge, 13 m. S. from Würzburg by the railway to Munich, and at the junction of a line to Röttingen. Pop. (1905) 3333. It contains an Evangelical and five Roman Catholic churches, among them that of St Michael, a fine Gothic edifice. There is a considerable trade in wine and agricultural produce, other industries being brewing and malting.

OCHTERLONY, SIR DAVID, Bart. (1758–1825), British general, was born at Boston, Mass., U.S.A., on the 12th of February 1758, and went to India as a cadet in 1777. He served under Lord Lake in the battles of Koil, Aligarh and Delhi, and was appointed resident at Delhi in 1803. In 1804, having been promoted to the rank of major-general, he defended the city with a very inadequate force against an attack by Holkar. On the outbreak of the Nepal War (1814–15) he was given the command of one of four converging columns, and his services were rewarded with a baronetcy in 1815. Subsequently he was promoted to the command of the main force in its advance on Katmandu, and outmanœuvring the Gurkhas by a flank march at the Kourea Ghat Pass, brought the war to a successful conclusion and obtained the signature of the treaty of Segauli (1816), which dictated the subsequent relations of the British with Nepal. For this success Ochterlony was created G.C.B., the first time that honour had been conferred on an officer of the Indian army. In the Pindari War (1817–18) he was in command of the Rajputana column, made a separate agreement with Amir Khan, detaching him from the Pindaris, and then, interposing his own force between the two main divisions of the enemy, brought the war to an end without an engagement. He was appointed resident in Rajputana in 1818, with which the residency at Delhi was subsequently combined. When Durjan Sal revolted in 1825 against Balwant Singh, the infant Raja of Bharatpur, Ochterlony acting on his own responsibility supported the raja by proclamation and ordered out a force to support him. Lord Amherst, however, repudiated these proceedings. Ochterlony, who was bitterly chagrined by this rebuff, resigned his office, and retired to Delhi. The feeling that the confidence which his length of service merited had not been given him by the governor-general is said to have accelerated his death, which occurred at Meerut on the 15th of July 1825. The Ochterlony column at Calcutta commemorates his name.

See Major Ross of Bladensburg, *The Marquess of Hastings* ("Rulers of India" series) (1893).

OCHTMAN, LEONARD (1854–), American painter, was born in Zonnemaire, Zeeland, Holland, on the 21st of October 1854. His family removed to Albany, New York, in 1866. In 1882 he began to exhibit landscapes at the National Academy, and he became a National Academician in 1904. His most characteristic pictures, which recall the work of Inness, are scenes on Long Island Sound and on the Mianus river.

OCKLEY, SIMON (1678–1720), English orientalist, was born at Exeter in 1678. He was educated at Queen's College, Cambridge, became fellow of Jesus College and vicar of Swavesey, and in 1711 was made professor of Arabic at Cambridge. He had a large family, and the pecuniary embarrassments of his later days form the subject of a chapter in D'Israeli's *Calamities of Authors*. The preface to the second volume of his *History of the Saracens* is dated from Cambridge Castle, where he was imprisoned for debt. Ockley maintained that a knowledge of Oriental literature was essential to the proper study of theology, and in the preface to his first book, the *Introductio ad linguas orientales* (1706), he urges the importance of the study. In 1707 he published a translation of Leon Modena's *History of the Present Jews throughout the World*; and in 1708 *The Improvement of Human Reason, exhibited in the Life of Hai Ebn Yokdhan*. His chief work is *The History of the Saracens* (1708–1718), of which a third volume was published posthumously in 1757. Unfortunately Ockley took as his main authority a MS. in the Bodleian of the pseudo-Wakidi's *Futuh al-Sham*, which is rather historical romance than history. He also translated from the Arabic the *Second Book of Esdras* and the *Sentences of Ali.* Ockley died at Swavesey on the 9th of August 1720.

O'CLERY, MICHAEL (1575–1643), Irish chronicler, grandson of a chief of the sept of O'Clery in Donegal, was born at Kilbarrow on Donegal Bay, and was baptized Tadhg (or "poet"), but took the name of Michael when he became a Franciscan friar. He was a cousin of Lughaidh O'Clery (fl. 1595–1630), who, with his son Cacrigcriche O'Clery (d. 1664)—one of Michael's co-workers—is also famous as an Irish historian. He had already gained a reputation as an antiquary and student of Irish history and literature, when he entered the Irish College of St Anthony at Louvain. In 1620, through the initiative of Hugh Boy Macanward (1580–1635), warden of the college, and himself a famous Irish historian and poet, and one of an old family of hereditary bards in Tyrconnell, he began to collect Irish manuscripts and to transcribe everything he could find of historical importance; he was assisted by other Irish scholars, and the results were his *Reim Rioghroidhe* (Royal List) in 1630, *Leabhar Gabhala* (Book of Invasions) in 1631, and his most famous work, called by John Colgan (d. 1659), the Irish biographer, the "Annals of the Four Masters" (1636). Subsequently he produced his *Martyrologium* of Irish saints, based on various ancient manuscripts, an Irish glossary and other works. He lived in poverty, and died at Louvain.

O'CONNELL, DANIEL (1775–1847), Irish statesman, known as "the Liberator," was born on the 6th of August 1775 near Cahirciveen, a small town in Kerry. He was sprung from a race the heads of which had been Celtic chiefs, had lost their lands in the wars of Ireland, and had felt the full weight of the harsh penal code which long held the Catholic Irish down. His ancestors in the 18th century had sent recruits to the famous brigade of Irish exiles in the service of France,[1] and those who remained at home either lived as tenants on the possessions of which they had once been lords, or gradually made money by smuggling, a very general calling in that wild region. Thus he inherited from his earliest years, with certain traditions of birth and high station, a strong dislike of British rule in Ireland and of the dominant owners of the soil, a firm attachment to his proscribed faith, and habitual skill in evading the law; and these influences may be traced in his subsequent career. While a boy he was adopted by his uncle, Maurice O'Connell of Derrynane, and sent to a school at Queenstown, one of the first which the state in those days allowed to be opened for Catholic teaching; and a few years afterwards he became a student, as was customary with Irish youths of his class, in the English colleges of St Omer and Douai in France. These years in France had a decided effect in forming his judgment on political questions of high moment. He was an eye-witness on more than one occasion of the folly and excesses of the French Revolution; and these scenes not only increased his love for his church, but strongly impressed him with that dread of anarchy, of popular movements ending in bloodshed, and of communistic and socialistic views which characterized him in after life. To these experiences, too, we may partly ascribe the reverence for law, for the rights of property, and for the monarchical form of government which he appears to have sincerely felt; and, demagogue as he became in a certain sense, they gave his mind a deep Conservative tinge. In 1798 he was called to the bar of Ireland, and rose before long to the very highest eminence among contemporary lawyers and advocates. This position was in the main due to a dexterity in conducting causes, and especially in examining witnesses, in which he had no rival at the Irish bar. He was, however, a thorough lawyer besides, inferior in scientific learning to two or three of his most conspicuous rivals, but well read in every department of law, and especially a master in all that relates to criminal and constitutional jurisprudence. As an advocate, too, he stood in the very highest rank; in mere oratory he was surpassed by Plunket, and in rhetorical gifts by Bushe, the only speakers to be named with him in his best days at the Irish bar; but his style, if not of the most perfect kind, and often disfigured by decided faults, was marked by a peculiar subtlety and manly power, and produced great and striking effects. On the whole, in the art of winning over juries he had scarcely an equal in the law courts.

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[1] See the account of O'Connell's uncle, Count Daniel O'Connell (1745–1833), to whose property he fell heir, in Mrs O'Connell's *Last Colonel of the Irish Brigade* (1892), and O'Callaghan's *Irish Brigade in the Service of France* (1870).

To understand, however, O'Connell's greatness we must look to the field of Irish politics. From early manhood he had turned his mind to the condition of Ireland and the mass of her people. The worst severities of the penal code had been, in a certain measure, relaxed, but the Catholics were still in a state of vassalage, and they were still pariahs compared with the Protestants. The rebellion of 1798 and the union had dashed the bopes of the Catholic leaders, and their prospects of success seemed very remote when, in the first years of the 19th century, the still unknown lawyer took up their cause. Up to this juncture the question had been in the hands of Grattan and other Protestants, and of a small knot of Catholic nobles and prelates; but their efforts had not accomplished much, and they aimed only at a kind of compromise, which, while conceding their principal claims, would have placed their church in subjection to the state. O'Connell inaugurated a different policy, and had soon given the Catholic movement an energy it had not before possessed. Himself a Roman Catholic of birth and genius, unfairly kept back in the race of life, he devoted his heart and soul to the cause, and his character and antecedents made him the champion who ultimately assured its triumph. He formed the bold design of combining the Irish Catholic millions, under the superintendence of the native priesthood, into a vast league against the existing order of things, and of wresting the concession of the Catholic claims from every opposing party in the state by an agitation, continually kept up, and embracing almost the whole of the people, but maintained within constitutional limits, though menacing and shaking the frame of society. He gradually succeeded in carrying out his purpose: the Catholic Association, at first small, but slowly assuming larger proportions, was formed; attempts of the government and of the local authorities to put its branches down were skilfully baffled by legal devices of many kinds; and at last, after a conflict of years, all Catholic Ireland was arrayed to a man in an organization of enormous power, that demanded its rights with no uncertain voice. O'Connell, having long before attained an undisputed and easy ascendancy, stood at the head of this great national movement; but it will be observed that, having been controlled from first to last by himself and the priesthood, it had little in common with the mob rule and violence which he had never ceased to regard with aversion. His election for Clare in 1828 proved the forerunner of the inevitable change, and the Catholic claims were granted the next year, to the intense regret of the Protestant Irish, by a government avowedly hostile to the last, but unable to withstand the overwhelming pressure of a people united to insist on justice. The result, unquestionably, was almost wholly due to the energy and genius of a single man, though the Catholic question would have been settled, in all probability, in the course of time; and it must be added that O'Connell's triumph, which showed what agitation could effect in Ireland, was far from doing his country unmixed good.

O'Connell joined the Whigs on entering parliament, and gave effective aid to the cause of reform. The agitation, however, on the Catholic question had quickened the sense of the wrongs of Ireland, and the Irish Catholics were engaged ere long in a crusade against tithes and the established church, the most offensive symbols of their inferiority in the state. It may be questioned whether O'Connell was not rather led than a leader in this; the movement, at least, passed beyond his control, and the country for many months was terrorized by scenes of appalling crime and bloodshed. Lord Grey, very properly, proposed measures of repression to put this anarchy down, and O'Connell opposed them with extreme vehemence, a seeming departure from his avowed principles, but natural in the case of a popular tribune. This caused a breach between him and the Whigs; but he gradually returned to his allegiance to them when they practically abolished Irish tithes, cut down the revenues of the established church and endeavoured to secularize the surplus. By this time O'Connell had attained a position of great eminence in the House of Commons: as a debater he stood in the very first rank, though he had entered St Stephen's after fifty; and his oratory, massive and strong in argument, although too often scurrilous and coarse, and marred by a bearing in which cringing flattery and rude bullying were strangely blended, made a powerful, if not a pleasing, impression. O'Connell steadily supported Lord Melbourne's government, gave it valuable aid in its general measures, and repeatedly expressed his cordial approval of its policy in advancing Irish Catholics to places of trust and power in the state, though personally he refused a high judicial office. Though a strict adherent of the creed of Rome, he was a Liberal, nay a Radical, as regards measures for the vindication of human liberty, and he sincerely advocated the rights of conscience, the emancipation of the slave and freedom of trade. But his rooted aversion to the democratic theories imported from France, which were gradually winning their way into England, only grew stronger with advancing age. His conservatism was most apparent in his antipathy to socialistic doctrines and his tenacious regard for the claims of property. He actually opposed the Irish Poor Law, as encouraging a communistic spirit; he declared a movement against rent a crime; and, though he had a strong sympathy with the Irish peasant, and advocated a reform of his precarious tenure, it is difficult to imagine that he could have approved the cardinal principle of the Irish Land Act of 1881, the judicial adjustment of rent by the state.

O'Connell changed his policy as regards Ireland when Peel became minister in 1841. He declared that a Tory régime in his country was incompatible with good government, and he began an agitation for the repeal of the union. One of his motives in taking this course no doubt was a strong personal dislike of Peel, with whom he had often been in collision, and who had singled him out in 1829 for what must be called a marked affront. O'Connell, nevertheless, was sincere and even consistent in his conduct: he had denounced the union in early manhood as an obstacle to the Catholic cause; he had spoken against the measure in parliament; he believed that the claims of Ireland were set aside or slighted in what he deemed an alien assembly; and, though he had ceased for some years to demand repeal, and regarded it as rather a means than an end, he was throughout life an avowed repealer. It should be observed, however, that in his judgment the repeal of the union would not weaken the real bond between Great Britain and Ireland; and he had nothing in common with the revolutionists who, at a later period, openly declared for the separation of the two countries by physical force. The organization which had effected such marvellous results in 1828–1829 was recreated for the new project. Enormous meetings, convened by the priesthood, and directed or controlled by O'Connell, assembled in 1842–1843, and probably nine-tenths of the Irish Catholics were unanimous in the cry for repeal. O'Connell seems to have thought success certain; but he had not perceived the essential difference between his earlier agitation and this. The enlightened opinion of the three kingdoms for the most part approved the Catholic claims, and as certainly it condemned repeal. After some hesitation Peel resolved to put down the repeal movement. A vast intended meeting was proclaimed unlawful, and in October 1843 O'Connell was arrested and held to bail, with ten or twelve of his principal followers. He was convicted (February 1844) after the trials that followed, but they were not good specimens of equal justice, and the sentence of imprisonment for a year and a fine of £2000 was reversed on a writ of error by the House of Lords (September 1844), and he and his colleagues were again free. The spell, however, of O'Connell's power had vanished; his health had suffered much from a short confinement; he was verging upon his seventieth year; and he was alarmed and pained by the growth of a party in the repeal ranks who scoffed at his views, and advocated the revolutionary doctrines which he had always feared and abhorred. Before long famine had fallen on the land, and under this visitation the repeal movement, already paralysed, wholly collapsed. O'Connell died on the 15th of May 1847, at Genoa, whilst on his way to Rome. His body was brought back to Dublin and buried in Glasnevin cemetery.

O'Connell was a remarkable man in every sense of the word, of splendid physique, and with all the attractions of a popular leader. Catholic Ireland calls him her "Liberator" still; and history will say of him that, with some failings, he had many and great gifts, that he was an orator of a high order, and that, agitator as he was, he possessed the wisdom, the caution and the tact of a real statesman. Nevertheless he not only failed to accomplish the chief aim of his life, but Lecky trenchantly observes that "by a singular fatality the great advocate of repeal did more than any one else to make the Union a necessity. . . . He destroyed the sympathy between the people and their natural leaders; and he threw the former into the hands of men who have subordinated all national to ecclesiastical considerations, or into the hands of reckless, ignorant, and dishonest adventurers." O'Connell married in 1802 his cousin Mary O'Connell, by whom he had three daughters and four sons, Maurice, Morgan, John (1810–1858), known as the "Young Liberator," and Daniel, who all sat in parliament.

His son John published a *Life* in 1846 and *Recollections and Experiences* in 1849. There are also biographies by W. Fagan (1847), M. F. Cusack (1872), J. O'Rourke and O'Keeffe (1875), and J. A. Hamilton (1888). See especially W. E. H. Lecky's essay in the revised edition of his *Leaders of Public Opinion in Ireland* vol. ii. (1903). (W. O. M.)

O'CONNOR, FEARGUS EDWARD (1794–1855), Chartist leader, was a son of the Irish Nationalist politician Roger O'Connor (1762–1834), and nephew of Arthur O'Connor (1763–1852), who was the agent in France for Emmet's rebellion; both belonged to the "United Irishmen." He entered parliament as member for the county of Cork in 1832. Though a zealous supporter of repeal, he endeavoured to supplant O'Connell as the leader of the party, an attempt which aroused against him the popular antipathy of the Irish. In 1835 he was unseated on petition, and after standing unsuccessfully for Oldham he took to stumping England in favour of the new Radical doctrines of the day, and the use of physical force for their adoption. In 1837 he established the *Northern Star* newspaper at Leeds, and became a vehement advocate of the Chartist movement. He was imprisoned for seditious libel in 1840, and after his release became prominent for his attack on John Bright, and the anti-corn-law league. In 1847 he was returned for Nottingham, and in 1848 he presided at a Chartist demonstration on Kennington Common, which caused great alarm (see Chartism). But the projected march on Westminster fizzled out when the preparations made to receive it became known. The eccentricity which had characterized his opinions from the beginning of his career gradually became more marked until they developed into insanity. He began to conduct himself in a disorderly manner in the House of Commons, and in 1852 he was found to be of unsound mind by a commission of lunacy. He died at London on the 30th of August 1855, and was buried in Kensal Green cemetery.

OCONOMOWOC, a city of Waukesha county, Wisconsin, U.S.A., about 33 m. W. of Milwaukee. Pop. (1890) 2729; (1900) 2880; (1905) 3013; (1910) 3054. It is served by the Chicago, Milwaukee & St Paul railway and by an electric railway connecting with Milwaukee. Oconomowoc is one of the most popular summer resorts in the Middle West. Along the shore of Lakes Fowler and La Belle are some beautiful country estates, several large hotels and fine club houses, and two sanatoria. At Delafield and at Dousman (8 m. S. of Oconomowoc) there are state fish hatcheries, the former for black bass. Oconomowoc was settled about 1837 and incorporated in 1875; its name is an Indian word, said to mean "home of the beaver."

O'CONOR, CHARLES (1804–1884), American lawyer, was born in the city of New York on the 22nd of January 1804, and was the son of Thomas O'Conor (1770–1855), who in 1801 emigrated from Roscommon county, Ireland, to New York, where he devoted himself chiefly to journalism. The son studied law, was admitted to the bar in 1824, and soon won high reputation in his profession. He was United States district attorney for New York in 1853–1854. In politics an extreme States'-Rights Democrat, he opposed the coercion of the South, and after the Civil War became senior counsel for Jefferson Davis on his indictment for treason, and was one of his bondsmen; these facts and O'Conor's connexion with the Roman Catholic Church affected unfavourably his political fortunes. In 1872 he was nominated for the presidency by the "Bourbon" Democrats, who refused to support Horace Greeley, and by the "Labour Reformers"; he declined the nomination but received 21,559 votes. He took a prominent part in the prosecution of William M. Tweed and members of the "Tweed Ring," and published *Peculation Triumphant, Being the Record of a Five Years' Campaign against Official Malversation,* A.D. *1871–1875* (1875). He removed to Nantucket, Massachusetts, in 1881, and died there on the 12th of May 1884.

OCONTO, a city and the county-seat of Oconto county, Wisconsin, U.S.A., about 130 m. N. of Milwaukee, on the W. shore of Green Bay, at the mouth of the Oconto river. Pop. (1890) 5219; (1900) 5646, of whom 1544 were foreign-born; (1905) 5722; (1910) 5629. It is served by the Chicago & North-Western and the Chicago, Milwaukee & St Paul railways. The city lies in a good farming country, and has a considerable lake commerce in lumber and fish. The first settlement was made here in 1846, and Oconto was chartered as a city in 1882.

OCRICULUM (mod. *Otricoli*), an ancient town of Umbria, Italy, on the Via Flaminia, near the E. bank of the Tiber, 44 m. N. of Rome and 12 m. S. of Narnia. It concluded an alliance with Rome in 308 B.C. The modern village lies higher than the ancient town, and excavations on the site of the latter in 1775 and following years led to the discovery of the baths, a theatre, a basilica and other buildings. In the baths were found a number of works of art, now in the Vatican, notably the mosaic pavement of the Sala della Rotonda, and the celebrated head of Zeus and the head of Claudius in the same room. An amphitheatre is still visible, but the other buildings have in the main been covered up again.

OCTAHEDRON (Gr. ὀκτώ, eight, ἕδρα, base), a solid bounded by eight triangular faces; it has 6 vertices and 12 edges. The regular octahedron has for its faces equilateral triangles; it is the reciprocal of the cube. Octahedra having triangular faces other than equilateral occur as crystal forms. See Polyhedron and Crystallography.

OCTAVE (from Lat. *octavus*, eighth, *octo*, eight), a period or series of eight members. In ecclesiastical usage the octave is the eighth day after a particular church festival, the feast day itself and the "octave" being counted. The octave thus always falls on the same day of the week as the festival, and any event occurring during the period is said to be "in the octave." In music, an octave is the eighth full tone above or below any given note. It is produced by double or half the number of vibrations corresponding to the given note. In the interval between a note and its octave is contained the full scale, the octave of a note forming the starting-point of another scale of similar intervals to the first. The interval between a note and its octave is also called an octave. The name is also applied to an open metal stop in an organ, and to a flute (more usually known as the piccolo) one octave higher in pitch than the regular flute. It is also a term for a "parade" in fencing. The "law of octaves" was a term applied in 1865 to a relationship among the chemical elements enunciated by J. A. R. Newlands.

In literature an octave is a form of verse consisting of eight iambic lines, and complete in itself. From its use by the poets of Sicily, the recognized type of this form is usually called the Sicilian Octave. It is distinguished from a single stanza of *ottava rima*, in which the rhyme-arrangement is *abababcc*, by having only two rhymes, arranged *abababab*. In German literature the octave has been used not infrequently since 1820, when Ruckert published "Sicilianen," as they are called in German, for the first time. The word octave is also often used to describe the eight opening lines of a sonnet, in which the rhyme-arrangement is *abbaabba*, or some modification of this, but properly always on two rhymes only.

OCTAVIA, the name of two princesses of the Augustan house. (1) Octavia, daughter of Gaius Octavius and sister of the emperor Augustus, was the wife of Gaius Marcellus, one of the bitterest enemies of Julius Caesar. In 41 B.C. her husband died, and she was married to Marcus Antonius, with the idea of bringing about a reconciliation between him and her brother. Her efforts were at first successful, but in 36 Antony left for the Parthian War and renewed his intrigue with Cleopatra. Though Octavia took out troops and money to him (35), he refused to see her and formally divorced her in 32, but she always protected his children, even those by Fulvia and Cleopatra. Her beauty and virtues are praised by all ancient authorities. By her first husband she was the mother of Marcus Marcellus (*q.v.*), who died in 23 B.C. (2) OCTAVIA, daughter of the emperor Claudius, was the wife of Nero, by whom she was put to death. A Latin tragedy on her fate is attributed, though wrongly, to Seneca.

OCTAVO, a shortened form of Lat. *in octavo*, "in an eighth, *i.e.* of a sheet of paper, a term applied to a size of paper and to a size of a printed volume. Paper is *in octavo* when a whole single sheet is folded three times to form eight leaves; a book is technically termed of "octavo" size when made up of sheets folded three times (see BIBLIOGRAPHY and PAPER).

OCTOBER, the eighth month of the old Roman year, which began in March. In the Julian calendar, while retaining its old name, it became the tenth month, and had thirty-one days assigned to it. The meditrinalia, when a libation of new wine was made in honour of Meditrina, were celebrated on the 11th, the faunalia on the 13th, and the equiria, when the *equus October* was sacrificed to Mars in the Campus Martius, on the 15th. Several attempts were made to rename the month in honour of the emperors. Thus it was in succession temporarily known as Germanicus, Antoninus, Tacitus and Herculeus, the latter a surname of Commodus. The senate's attempt to christen it Faustinus in honour of Faustina, wife of Antoninus, was equally unsuccessful. The principal ecclesiastical feasts in October are those of St Luke on the 18th and of St Simon and St Jude on the 28th. By the Slavs it is called "yellow month," from the fading of the leaf; to the Anglo-Saxons it was known as Winterfylleth, because at this full moon (*fylleth*) winter was supposed to begin.

OCTODON, the generic name for a small South American rodent mammal (*Octodon degus*) locally known as the degu. It is the type of the family *Octodontidae*, the members of which—collectively termed octodonts—are exclusively Central and South American. Several of them, such as *Echinomys* and *Loncheres*, are rat-like creatures with spiny or bristly fur (see RODENTIA).

OCTOPUS (Gr. ὀκτώ, eight and πούς, foot), the name in scientific zoology belonging to a single genus of eight armed Cephalopoda (*q.v.*), one of whose distinguishing characters is that it has two rows of suckers on each arm. This true octopus occurs occasionally on the British coasts, at least the south coast, but is usually rare. It is more common on the southern coasts of Europe, including those of the Mediterranean. The usual species of Octopoda on the British south coast is *Eledone cirrosa*, which has only one row of suckers on each arm, and is a smaller animal. The celebrated account of the octopus given by Victor Hugo in his *Travailleurs de la mer* is not so fictitious as some critics with a knowledge of natural history have maintained. It is true that the great French author has made the mistake of using the name Cephaloptera, which belongs to a large tropical fish similar to a skate, instead of Cephalopoda, and that he applies the term devil-fish, which belongs to Cephaloptera, to the octopus. His description is exaggerated, imaginative and sensational; but it is correct in its most important particulars, and bears evidence that the author was to some extent personally acquainted with the animal and its habits, although he was not a scientific observer. The octopus feeds on crabs, and crabs feed on carrion, and, therefore, there is nothing impossible in Hugo's account of the skeleton of a drowned man surrounded by the shells of numbers of crabs which the octopus had devoured. Whether an octopus would attack and kill a man is another question, but it certainly might seize him with its arms and suckers while holding to the rocks by other arms, and a man seized in this way when in the water might be in danger of being drowned.

The octopus and many of the Octopoda move about by means of their arms on the sea bottom, and are not free-swimming, though like other Cephalopods they can propel themselves on occasion backwards through the water by means of the funnel. Other Octopoda, however, are pelagic and free-swimming, and such habits are not confined to those forms which are provided with lateral fins. The Argonaut (see NAUTILUS) is one of the Octopoda. The separation of one of the arms of the male for purposes of reproduction is one of the most remarkable peculiarities of the Octopoda. It does not occur, however, in octopus nor in many other members of the group. One arm is always considerably modified in structure and employed in copulation, but it is only in three genera, one of which is Argonauta, that the arm spontaneously separates. The detached arm is found still alive and moving in the mantle cavity of the female, and when first discovered in these circumstances was naturally regarded by the older naturalists as a parasite. Cuvier, on account of the numerous suckers of the detached arm, gave it the name Hectocotylus (hundred suckers). When the arm is not detached but only altered in structure it is said to be hectocotylized. In Octopus and Eledone it is the third right arm which is hectocotylized. The extremity of this arm is expanded and assumes the shape of a spoon. Whether detached or not the modified arm possesses a cavity into which the spermatophores are passed and the arm serves to convey them to the mantle cavity of the female.

It has been mentioned above that the true octopus (*Octopus vulgaris*) is usually rare on the English coast. In 1899 and 1900, however, they became so abundant on the south coast as to attract general notice, and to constitute a veritable plague which threatened complete ruin to the shell-fish fisheries. This visitation and its effects were described by W. Garstang in the *Journal of the Marine Biological Association*. The abnormal abundance occurred all along the west coast of France, whence it extended to the Channel, and was probably due to a succession of unusually warm summers and mild winters, beginning with the warm spring and hot summer of 1893. The octopus in the years mentioned entered the lobster pots of the fishermen and devoured or killed the crabs and lobsters captured. The pots when hauled contained usually only living octopus and the mutilated remains of their victims. One fisherman took in a single week 64 specimens of octopus and only 15 living uninjured lobsters. The octopus also almost exterminated the swimming crabs (*Portunus*) in Plymouth Sound, and in the tanks of the Plymouth aquarium attacked and devoured all the specimens of its smaller relative *Eledone cirrosa*.

With regard to the size which the octopus may attain, the dimensions of the body are not usually given in records, but it is stated that the arms in the largest specimens measured 3½ ft., and in numerous cases were 3 ft. in length. This would enable the eight arms to extend over a circle 6 ft. in diameter, but the globular body is not more than about a third of the length of an arm in diameter. When not in pursuit of prey the octopus hides itself in a hole between rocks and covers itself with stones and shells. Like its victims it seems to be active chiefly at night and to remain in its nest during the day.

For a technical account of the Octopoda see CEPHALOPODA; also W. Garstang, "The Plague of Octopus on the South Coast, and its Effect on the Crab and Lobster Fisheries," *Journ. Mar. Biol. Assoc.* vol. vi. (1900) p. 260. (J. T. C.)

OCTOROON, or OCTAROON (from Lat. *octo*, eight, formed on the example of quadroon), the offspring of a quadroon and a white; a person having one-eighth negro blood. In rare instances such persons are called tercerons, as being *third* in descent from a negro ancestor. Occasionally persons are called octoroons when the non-white element is not negro but some other coloured blood.

OCTOSTYLE (Gr. ὀκτώ eight, and στῦλος, a column), in architecture, a portico of eight columns in front (see TEMPLE).

OCTROI (O. Fr. *octroyer*, to grant, authorize; Lat. *auctor*), a local tax collected on various articles brought into a district for consumption. Octroi taxes have a respectable antiquity, being known in Roman times as *vectigalia*. These vectigalia were either the *portorium*, a tax on the entry from or departure to the provinces (those cities which were allowed to levy the portorium shared the profits with the public treasury); the *ansarium* or *foricarium*, a duty levied at the entrance to towns; or the *edulia*, sale imports levied in markets. Vectigalia were levied on wine and certain articles of food, but it was seldom that the cities were allowed to use the whole of the profits of the taxes. Vectigalia were introduced into Gaul by the Romans, and remained after the invasion by the Franks, under the name of *tonlieux* and *coutumes*. They were usually levied by the owners of seigniories. But during the 12th and 13th centuries, when the towns succeeded in asserting their independence, they at the same time obtained the recognition of their right to establish local taxation, and to have control of it. The royal power, however, gradually asserted itself, and it became the rule that permission to levy local taxes should be obtained from the king. From the 14th century onwards, we find numerous charters granting (*octroyer*) to French towns the right to tax themselves. The taxes did not remain strictly municipal, for an ordinance of Cardinal Mazarin (in 1647) ordered the proceeds of the octroi to be paid into the public treasury, and at other times the government claimed a certain percentage of the product, but this practice was finally abandoned in 1852. From an early time the octroi was farmed out to associations or private individuals, and so great were the abuses which arose from the system that the octroi was abolished during the Revolution. But such a drastic measure meant the stoppage of all municipal activities, and in 1798 Paris was allowed to re-establish its octroi. Other cities were allowed gradually to follow suit, and in 1809 a law was passed laying down the basis on which octrois might be established. Other laws have been passed from time to time in France dealing with the octroi, especially those of 1816, 1842, 1867, 1871, 1884 and 1897. By the law of 1809 octroi duties were allowed on (1) beverages and liquids; (2) eatables; (3) fuel; (4) forage; (5) building materials. A scale of rates was fixed, graduated according to the population, and farming out was strictly regulated. A law of 1816 enacted that an octroi could only be established at the wish of a municipal council, and that only articles destined for local consumption could be taxed. The law of 1852 abolished the 10% of the gross receipts paid to the treasury. Certain indispensable commodities are allowed to enter free, such as grain, flour, fruit, vegetables and fish.

French octroi duties are collected either by the (1) *régie simple*, *i.e.* by special officers under the direction of the maire; (2) by the *bail à ferme*, *i.e.* farming, the contractor paying yearly a certain agreed upon sum calculated on the estimated amount; (3) the *régie interessé*, a variation of the preceding method, the contractor sharing the profits with the municipality when they reach a given sum; and (4) the *abonnement avec la régie des contributions indirectes*, under which a department of the treasury undertakes to collect the duties. More than half the octrois are collected under (1), and the numbers tend to increase; (2) is steadily decreasing, while (3) has been practically abandoned; (4) tends to increase. The gross receipts in 1901 amounted to £11,132,870. A law of 1897 created new sources of taxation, giving communes the option of (1) new duties on alcohol; (2) a municipal licence duty on retailers of beverages; (3) a special tax on wine in bottle; (4) direct taxes on horses and carriages, clubs, billiard tables and dogs; (5) additional centimes to direct taxes.

From time to time there has been agitation in France for the abolition of octroi duties, but it has never been pushed very earnestly. In 1869 a commission was appointed to consider the matter, and reported in favour of their retention. In Belgium, on the other hand, they were abolished in 1870, being replaced by an increase in customs and excise duties; and in 1903 those in Egypt were also abolished. Octroi duties exist in Italy, Spain, Portugal and in some of the towns of Austria.

AUTHORITIES.—A. Guignard, *De la suppression des octrois* (Paris); Saint Julien and Bienaimé, *Histoire des droits d'octroi à Paris*; M. Tardit and A. Ripert, *Traité des octrois municipaux* (Paris, 1904); L. Hourcade, *Manuel encyclopédique des contributions indirectes et des octrois* (Paris, 1905); much useful matter from some of the foregoing will be found in *Report on the French Octroi System*, by Consul-general Hearn (British Diplomatic and Consular Reports, 1906); the abolition of the Belgian octrois produced a voluminous official report: *Abolition des octrois communaux en Belgique: documents et discussions parlementaires.* (T. A. I.)

O'CURRY, EUGENE (1796–1862), Irish scholar, was born at Dunaha, county Clare, in 1796, the son of a farmer who was a man of unusual intelligence. After being employed for some time in the topographical and historical section of the Irish ordnance survey, O'Curry earned his living by translating and copying Irish manuscripts. The catalogue of Irish manuscripts in the British Museum was compiled by him. On the founding of the Roman Catholic University of Ireland (1854) he was appointed professor of Irish history and archaeology. His lectures were published by the university in 1860, and give a better knowledge of Irish medieval literature than can be obtained from any other one source. Three other volumes of lectures were published posthumously, under the title *On the Manners and Customs of the Ancient Irish* (1873). His voluminous transcripts, notably eight huge volumes of ancient Irish law, testify to his unremitting industry. The Celtic Society, of the council of which he was a member, published two of his translations of medieval tales. He died in Dublin in 1862.

OCYDROME, a word formed from *Ocydromus*, meaning "swift-runner," and suggested by J. Wagler in 1830 as a generic term for the New Zealand bird called in the then unpublished manuscripts of J. R. Forster *Rallus troglodytes*, and so designated in 1788 by S. G. Gmelin, who knew of it through J. Latham's English description. Wagler's suggestion has since been generally adopted, and the genus *Ocydromus* is accepted by most ornithologists as a valid group of *Rallidae*; but the number of species it contains is admittedly doubtful, owing to the variability in size and plumage which they exhibit, and their correct nomenclature must for the present be considered uncertain. Sir W. Buller in his *Birds of New Zealand* identifies the "Wood-hen," observed in great abundance on the shores of Dusky Bay in 1773 by Cook and his companions on his second voyage, with the *Gallirallus fuscus* described and figured by Du Bus in 1847, and accordingly calls it *O. fuscus*; but it cannot be questioned that the species from this locality—which appears to have a somewhat limited range in the Middle Island,[1] and never to be met with far from the sea-coast, where it lives wholly on crustaceans and other marine animals—is identical with that of the older authors just mentioned. In 1786 Sparrman, who had also been of Cook's company, figured and described as *Rallus australis* a bird which, though said by him to be that of the southern coast of New Zealand, differs so much from the *R. troglodytes* as to compel a belief in its specific distinctness; and indeed his species has generally been identified with the common "Weka" of the Maories of the Middle Island, which can scarcely be the case if his statement is absolutely true, since the latter does not appear to reach so far to the southward, or to affect the seashore. It may therefore be fairly inferred that his subject was obtained from some other locality. The North Island of New Zealand has what is allowed to be a third species, to which the name of *Ocydromus earli* is attached, and this was formerly very plentiful; but its numbers have rapidly decreased, and there is every chance of its soon being as extinct as is the species which tenanted Norfolk Island on its discovery by Cook in 1774, and which was doubtless distinct from all the rest, though no specimen of it is known to exist in any museum.[1] Another species, *O. sylvestris*, smaller and lighter in colour than any of the rest, was found in 1869 to linger yet in Lord Howe's Island (*Proc. Zool. Society*, 1869, p. 473, pl. xxxv.). Somewhat differing from *Ocydromus*, but apparently very nearly allied to it, is a little bird peculiar, it is believed, to the Chatham Islands (*Ibis*, 1872, p. 247), and regarded by Captain Hutton as the type of a genus *Cabalus* under the name of *C. modestus*, while other naturalists consider it to be the young of the rare *Rallus dieffenbachi*. So far the distribution of the Ocydromine form is wholly in accordance with that of most others characteristic of the New Zealand sub-region; but a curious exception is asserted to have been found in the *Gallirallus lafresnayanus* of New Caledonia, which, though presenting some structural differences, has been referred to the genus *Ocydromus*.

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[1] It also occurs in Stewart Island, and singularly enough on the more distant group known as the Snares. The *Gallirallus brachypterus* of Lafresnaye, of which the typical (and unique?) specimen from an unknown locality is in the Caen Museum, has also been referred to this species, but the propriety of the act may be doubted.

The chief interest attaching to the Ocydromes is their inability to use in flight the wings with which they are furnished, and hence an extreme probability of the form becoming wholly extinct in a short time. Of this inability there are other instances among the *Rallidae* (see MOOR-HEN); but here we have coupled with it the curious fact that in the skeleton the angle which the scapula makes with the coracoid is greater than a right angle, a peculiarity shared only, so far as is known, among the *Carinatae* by the dodo. The Ocydromes are birds of dull plumage, and mostly of retiring habits, though the common species is said to show great boldness towards man, and, from the accounts of Cook and the younger Forster, the birds seen by them displayed little fear. They are extremely destructive to eggs and to any other birds they can master. (A. N.)

ODAENATHUS, or ODENATUS (Gr. Ὀδαίναθος, Palm, ארינת= "little ear"), the Latinized form of ODAINATH, the name of a famous prince of Palmyra, in the second half of the 3rd century A.D., who succeeded in recovering the Roman East from the Persians and restoring it to the Empire. He belonged to the leading family of Palmyra, which bore, in token of Roman citizenship, the *gentilicium* of Septimius; hence his full name was Septimius Odainath (Vogüé, *Syrie centrale*, Nos. 23, 28= Cooke, *North-Semitic Inscrr.* Nos. 126, 130). It is practically certain that he was the son of Septimius Ḥairān the "senator and chief of Tadmor," the son of Septimius Odainath "the senator" (*N.S.I.* p. 285). The year when he became chief of Palmyra is not known, but already in an inscription dated A.D. 258 he is styled "the illustrious consul our lord" (*N.S.I.* No. 126). He possessed the characteristic vigour and astuteness of the old Arab stock from which he sprang; and in his wife, the renowned Zenobia (*q.v.*), he found an able supporter of his policy. The defeat and captivity of the emperor Valerian (A.D. 260) left the eastern provinces largely at the mercy of the Persians; the prospect of Persian supremacy was not one which Palmyra or its prince had any reason to desire. At first, it seems, Odainath attempted to propitiate the Parthian monarch Shāpūr (Sapor) I.; but when his gifts were contemptuously rejected (Petr. Patricius, § 10) he decided to throw in his lot with the cause of Rome. The neutrality which had made Palmyra's fortune was abandoned for an active military policy which, while it added to Odainath's fame, in a short time brought his native city to its ruin. He fell upon the victorious Persians returning home after the sack of Antioch, and before they could cross the Euphrates inflicted upon them a considerable defeat. Then, when two usurping emperors were proclaimed in the East (A.D. 261), Odainath took the side of Gallienus the son and successor of Valerian, attacked and put to death the usurper Quietus at Emesa (Ḥōmṣ), and was rewarded for his loyalty by the grant of an exceptional position (A.D. 262). He may have assumed the title of king before; but he now became "totius Orientis imperator," not indeed joint-ruler, nor Augustus, but "independent lieutenant of the emperor for the East" (Mommsen, *Provinces*, ii. p. 103).[2] In a series of rapid and successful campaigns, during which he left Palmyra under the charge of Septimius Worod his deputy (*N.S.I.* Nos. 127-129), he crossed the Euphrates and relieved Edessa, recovered Nisībis and Carrhae, and even took the offensive against the power of Persia, and twice invested Ctesiphon itself, the capital; probably also he brought back Armenia into the Empire. These brilliant successes restored the Roman rule in the East; and Gallienus did not disdain to hold a triumph with the captives and trophies which Odainath had won (A.D. 264). While observing all due formalities towards his overlord, there can be little doubt that Odainath aimed at independent empire; but during his lifetime no breach with Rome occurred. He was about to start for Cappadocia against the Goths when he was assassinated, together with Herōdes his eldest son, by his nephew Maconius; there is no reason to suppose that this deed of violence was instigated from Rome. After his death (A.D. 266–267) Zenobia succeeded to his position, and practically governed Palmyra on behalf of her young son Wahab-allath or Athenodorus (see PALMYRA). (G. A. C.*)

ODALISQUE, a slave-woman who is a member of an oriental harem, especially one in the harem or seraglio of the sultan of Turkey. The word is the French adaptation of the Turkish *ōdaliq*, formed from *ōdah*, chamber or room in a harem.

ODD (in middle English *odde*, from old Norwegian *oddi*, an angle of a triangle; the old Norwegian *oddamann* is used of the third man who gives a casting vote in a dispute), that which remains over after an equal division, the unit in excess of an even number; thus in numeration the word is used of a number either above or below a round number, an indefinite cardinal number, as "eighty and odd," or "eighty odd." As applied to individuals, the sense of "one left after a division" leads to that of "solitary," and thus of "uncommon" or "strange." In the plural, "odds" was originally used to denote inequalities especially in the phrase "to make odds even." The sense of a difference in benefit leads to such colloquialisms as "makes no odds," while that of variance appears in the expression "to be at odds." In betting "the odds" is the advantage given by one person to another in proportion to the supposed chances of success.

ODDE, or ODDA, a village of Norway, in South Bergenhus *amt* (county), on the Sör Fjord, a head-branch of the great Hardanger Fjord. It is 48 m. directly S.E. of Bergen, but 123 by water (to Eide), road (to Vossevangen), and rail thenceforward, or about the same distance by water alone. It is one of the principal tourist-centres in southern Norway, being at the end of the road from Breifond (27 m.) near which the routes join from Stavanger by Sand, Lake Suldal, and the Bratlandsdal, and from the south-eastern coast towns by the Telemark. This road, descending from the Horrebraekke, passes through the gorge of Seljestadjuvet, passes the Espelandsfos and Lotefos falls, and skirts the Sandven lake. Odde is also a centre for several favourite excursions, as to the Buarbrae, one of the glaciers descending from the great Folgefond snowfield, situated in a precipitous valley (*Jordal*) to the west of Sandven lake; to the Skjaeggedalsfos, a magnificent fall (525 ft.); or across the Folgefond to Suldal, a station on the Mauranger branch of the Hardanger fjord. Touring steamers and frequent local steamers from Bergen call at Odde, and there are several large hotels.

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[1] The younger Forster remarked that the birds of Norfolk Island, though believed by the other naturalists of Cook's ship to be generally the same as those of New Zealand, were distinguished by their brighter colouring (see also NESTOR). There can be no doubt that all the land-birds were specifically distinct. It is possible that Sparrman's *R. australis*, which cannot very confidently be referred to any known species of *Ocydromus*, may have been from Norfolk Island.

[2] The late Roman chronicler Trebellius Pollio goes further and asserts "Odenatus rex Palmyrenorum optinuit totius Orientis imperium. . . . Gallienus Odenatum participato imperio Augustum vocavit," *Hist. Aug.* xxiii. 10 and 12. This is not borne out by the evidence. The highest rank claimed for him by his own people is recorded in an inscription dated 271 (*N.S.I.* No. 130) set up by the two generals of the Palmyrene army; Odainath is styled "king of kings and restorer of the whole city"; but this does not mean that he ever held the title of Augustus, and the inscription was set up after his death and during the revolt of Palmyra.

ODDFELLOWS, ORDER OF, a secret benevolent and social society, having mystic signs of recognition, initiatory rites and ceremonies, and various grades of dignity and honour. Great antiquity has been claimed for the order of Oddfellows—the most popular tradition ascribing it to the Jewish legion under Titus, who, it is asserted, received from the emperor its first charter written on a golden tablet. Oddfellows themselves, however, now generally admit that the institution cannot be traced back beyond the first half of the 18th century, and explain the name as adopted at a time when the severance into sects and classes was so wide that persons aiming at social union and mutual help were a marked exception to the general rule. Mention is made by Defoe of the society of Oddfellows, but the oldest lodge of which the name has been handed down is the Loyal Aristarcus, No. 9, which met in 1745 "at the Oakley Arms, Borough of Southwark; Globe Tavern, Hatton Garden; or the Boar's Head in Smithfield, as the noble master may direct." The earliest lodges were supported by each member and visitor paying a penny to the secretary on entering the lodge, and special sums were voted to any brother in need. If out of work he was supplied with a card and funds to reach the next lodge, and he went from lodge to lodge until he found employment. The lodges gradually adopted a definite common ritual and became confederated under the name of the Patriotic Order. Towards the end of the century many of the lodges were broken up by State prosecutions on the suspicion that their purposes were "seditious," but the society continued to exist as the Union Order of Oddfellows until 1809. In 1813, at a convention in Manchester, was formed the Independent Order of Oddfellows, Manchester Unity, which now overshadows all the minor societies in England. Oddfellowship was introduced into the United States from the Manchester Unity in 1819, and the grand lodge of Maryland and the United States was constituted on the 22nd of February 1821. It now rivals in membership and influence the Manchester Unity, from which it severed its connexion in 1842. In 1843 it issued a dispensation for opening the Prince of Wales Lodge No. 1 at Montreal, Canada. The American society, including Canada and the United States, has its headquarters at Baltimore. Organizations, connected either with the United States or England, have been founded in France, Germany, Switzerland, Gibraltar and Malta, Australia, New Zealand, the Fiji Islands, the Hawaiian Islands, South Africa, South America, the West Indies and Barbados, and elsewhere.

The rules of the different societies, various song-books, and a number of minor books on Oddfellowship have been published, but the most complete and trustworthy account of the institution is that in *The Complete Manual of Oddfellowship, its History, Principles, Ceremonies and Symbolism*, privately printed (1879). See also FRIENDLY SOCIETIES.

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F. Wa.	Francis Watt, M.A. Barrister-at-Law, Middle Temple. Author of *Law's Lumber Room.*	**Paterson, William.**
F. W. Mo.	Frederick Walker Mott, F.R.S., M.D. Physician to Charing Cross Hospital. Pathologist to the London County Asylums. Fullerian Professor of Physiology at the Royal Institution.	**Paralysis.**
F. W. R.*	Frederick William Rudler, I.S.O., F.G.S. Curator and Librarian of the Museum of Practical Geology, London, 1879–1902. President of the Geologists' Association, 1887–1889.	**Onyx;** **Opal.**
F. X. K.	Franz Xaver Kraus (1840–1901). Professor of Church History, University of Freiburg-im-Breisgau, 1878–1901. Author of *Geschichte der christlichen Kunst*; &c.	**Papacy:** *1870–1900.*
G. A. Gr.	George Abraham Grierson, C.I.E., Ph.D., D.Litt. Member of the Indian Civil Service, 1873–1903. In charge of Linguistic Survey of India, 1898–1902. Gold Medallist, Royal Asiatic Society, 1909. Vice-President of the Royal Asiatic Society. Formerly Fellow of Calcutta University. Author of *The Languages of India*; &c.	**Pahari.**
G. A. C.*	Rev. George Albert Cooke, D.D. Oriel Professor of the Interpretation of Holy Scripture, and Fellow of Oriel College, Oxford. Canon of Rochester. Hon. Canon of St Mary's Cathedral, Edinburgh.	**Palmyra.**
G. B. B.	Gerard Baldwin Brown, M.A. Professor of Fine Art, University of Edinburgh. Formerly Fellow of Brasenose College, Oxford. Author of *The Fine Arts*; *The Arts in Early England*; &c.	**Painting.**
G. B. G.	George Brown Goode (1851–1896). Assistant Secretary of the Smithsonian Institution, Washington, 1887–1896. Author of *American Fishes.*	**Oyster** (*in part*).
G. Ch.	George Chrystal, M.A., LL.D. Professor of Mathematics and Dean of the Faculty of Arts, Edinburgh University. Hon. Fellow and formerly Fellow and Lecturer of Corpus Christi College, Cambridge.	**Pascal** (*in part*).
G. C. W.	George Charles Williamson, Litt.D. Chevalier of the Legion of Honour. Author of *Portrait Miniatures*; *Life of Richard Cosway, R.A.*; *George Engleheart*; *Portrait Drawings*; &c. Editor of the New Edition of Bryan's *Dictionary of Painters and Engravers.*	**Oliver, Isaac;** **Oliver, Peter.**

G. E.	Rev. George Edmundson, M.A., F.R.Hist.S. Formerly Fellow and Tutor of Brasenose College, Oxford. Ford's Lecturer, 1909. Hon. Member, Dutch Historical Society, and Foreign Member, Netherlands Association of Literature.	**Oldenbarneveldt;** **Orange (House of);** **Ostend Company.**
G. E. C.	George Earl Church. See the biographical article: Church, G. E.	**Orinoco.**
G. H. C.	George Herbert Carpenter, B.Sc. Professor of Zoology in the Royal College of Science, Dublin. Author of *Insects: their Structure and Life.*	**Orthoptera.**
G. Sa.	George Saintsbury, LL.D., D.C.L. See the biographical article: Saintsbury, George E. B.	**Orleans, Charles, Duke of;** **Pascal** (*in part*).
G. S. W.	German Sims Woodhead, M.A., M.D., F.R.S. (Edin.). Professor of Pathology, Cambridge University. Fellow of Trinity Hall, Cambridge. Member of Royal Commission on Tuberculosis, 1902.	**Parasitic Diseases.**
H. A. B.	Henry Arthur Bethell. Lieut.-Col. Commanding 49th Brigade R.F.A. Associate Member of R.A. Committee. Awarded Lefroy Medal for Contributions to Artillery Science. Author of *Modern Guns and Gunnery*; *The Employment of Artillery*; &c.	**Ordnance:** *Field Artillery Equipments.*
H. Br.	Henry Bradley, M.A., Ph.D. Joint-editor of the *New English Dictionary* (Oxford). Fellow of the British Academy. Author of *The Story of the Goths*; *The Making of English*; &c.	**Orm.**
H. Ch.	Hugh Chisholm, M.A. Formerly Scholar of Corpus Christi College, Oxford. Editor of the 11th edition of the *Encyclopaedia Britannica.* Co-editor of the 10th edition.	**Parliament** (*in part*).
H. Cl.	Sir Hugh Charles Clifford, K.C.M.G. Colonial Secretary, Ceylon. Fellow of the Royal Colonial Institute. Formerly Resident, Pahang. Colonial Secretary, Trinidad and Tobago, 1903–1907. Author of *Studies in Brown Humanity*; *Further India*, &c. Joint-author of *A Dictionary of the Malay Language.*	**Pantun.**
H. E.	Karl Hermann Ethé, M.A., Ph.D. Professor of Oriental Languages, University College, Aberystwyth (University of Wales). Author of *Catalogue of Persian Manuscripts in the India Office Library, London* (Clarendon Press); &c.	**Omar Khayyām** (*in part*).
H. E. R.	Sir Henry Enfield Roscoe, LL.D. See the biographical article: Roscoe, Sir Henry Enfield.	**Pasteur.**
H. F. B.	Horatio Robert Forbes Brown, LL.D. Editor of the *Calendar of Venetian State Papers*, for the Public Record Office, London. Author of *Life on the Lagoons*; *Venetian Studies*; *John Addington Symonds, a Biography*; &c.	**Padua.**
H. F. G.	Hans Friedrich Gadow, F.R.S., Ph.D. Strickland Curator and Lecturer on Zoology in the University of Cambridge. Author of "Amphibia and Reptiles," in the *Cambridge Natural History.*	**Odontornithes.**
H. F. O.	Henry Fairfield Osborn, LL.D., D.Sc., F.R.S. (Edin.). Da Costa Professor of Zoology, Columbia University, New York. President, American Museum of Natural History, New York. Curator of Department of Vertebrate Palaeontology. Palaeontologist U.S. Geological Survey. Author of *From the Greeks to Darwin*; &c.	**Palaeontology.**
H. F. P.	Henry Francis Pelham, LL.D., D.C.L. See the biographical article: Pelham, Henry Francis.	**Otho, Marcus S.**
H. Ja.	Henry Jackson, Litt.D., LL.D., O.M. Regius Professor of Greek in the University of Cambridge. Fellow of Trinity College. Fellow of the British Academy. Author of *Texts to illustrate the History of Greek Philosophy from Thales to Aristotle.*	**Parmenides of Elea.**
H. L. H.	Harriet L. Hennessy, M.D. (Brux.), L.R.C.P.I., L.R.C.S.I.	**Olfactory System:** *Diseases.*
H. M. C.	Hector Munro Chadwick, M.A. Librarian and Fellow of Clare College, Cambridge. Reader in Scandinavian, Cambridge University. Author of *Studies on Anglo-Saxon Institutions.*	**Odin.**
H. N. D.	Henry Newton Dickson, M.A., D.Sc., F.R.S. (Edin.), F.R.G.S. Professor of Geography at University College, Reading. Formerly Vice-President, Royal Meteorological Society. Lecturer in Physical Geography, Oxford. Author of *Meteorology*; *Elements of Weather and Climate*; &c.	**Pacific Ocean** (*in part*).
H. R. T.	Henry Richard Tedder, F.S.A. Secretary and Librarian of the Athenaeum Club, London.	**Pamphlets.**
H. W. C. D.	Henry William Carless Davis, M.A. Fellow and Tutor of Balliol College, Oxford. Fellow of All Souls' College, Oxford, 1895–1902. Author of *England under the Normans and Angevins*; *Charlemagne.*	**Odo of Bayeux;** **Orderic Vitalis.**
H. Y.	Sir Henry Yule, K.C.S.I. See the biographical article, Yule, Sir Henry.	**Odoric** (*in part*).
J. A. C.	Sir Joseph Archer Crowe, K.C.M.G. See the biographical article: Crowe, Sir Joseph Archer.	**Ostade** (*in part*).

J. A. F.	John Ambrose Fleming, M.A., D.Sc., F.R.S. Pender Professor of Electrical Engineering in the University of London. Fellow of University College, London. Formerly Fellow of St John's College, Cambridge. Vice-President of the Institution of Electrical Engineers. Author of *The Principles of Electric Wave Telegraphy*; *Magnets and Electric Currents*; &c.	**Ohmmeter;** **Oscillograph.**
J. A. H.	John Allen Howe, B.Sc. Curator and Librarian of the Museum of Practical Geology, London. Author of *Geology of Building Stones.*	**Oligocene System;** **Oolite; Ordovician System;** **Oxfordian; Palaeozoic Era.**
J. Bra.	Joseph Braun, S.J. Author of *Die Liturgische Gewandung* &c.	**Pastoral Staff.**
J. Bt.	James Bartlett. Lecturer on Construction, Architecture, Sanitation, Quantities, &c., at King's College, London. Member of Society of Architects. Member of Institute of Junior Engineers.	**Painter-work.**
J. B. A.	Joseph Beavington Atkinson. Formerly art-critic of the *Saturday Review*. Author of *An Art Tour in the Northern Capitals of Europe*; *Schools of Modern Art in Germany.*	**Overbeck.**
J. C. van D.	John Charles van Dyke. Professor of the History of Art, Rutgers College, New Brunswick, N.J. Formerly Editor of *The Studio* and the *Art Review*. Author of *Art for Art's Sake*; *History of Painting*; *Old English Masters*; &c.	**Painting:** ***United States.***
J. E. S.*	John Edwin Sandys, M.A., Litt.D., LL.D. Public Orator in the University of Cambridge. Fellow of St John's College, Cambridge. Fellow of the British Academy. Author of *History of Classical Scholarship*; &c.	**Pausanias:** ***Traveller.***
J. Fi.	John Fiske, LL.D. See the biographical article: Fiske, John.	**Parkman, Francis.**
J. F.-K.	James Fitzmaurice-Kelly, Litt.D., F.R.Hist.S. Gilmour Professor of Spanish Language and Literature, Liverpool University. Norman McColl Lecturer, Cambridge University. Fellow of the British Academy. Member of the Royal Spanish Academy. Knight Commander of the Order of Alphonso XII. Author of *A History of Spanish Literature*; &c.	**Palacio Valdés, Armando;** **Pardo Bazán.**
J. H. A. H.	John Henry Arthur Hart, M.A. Fellow, Theological Lecturer and Librarian, St John's College, Cambridge.	**Palestine:** ***History*** **(*in part*)**
J. H. F.	John Henry Freese, M.A. Formerly Fellow of St John's College, Cambridge.	**Orpheus (*in part*).**
J. H. M.	John Henry Middleton, M.A., Litt.D., F.S.A., D.C.L. (1846–1896). Slade Professor of Fine Arts in the University of Cambridge, 1886–1895. Director of the Fitzwilliam Museum, Cambridge, 1889–1892. Art Director of the South Kensington Museum, 1892–1896. Author of *The Engraved Gems of Classical Times*; *Illuminated Manuscripts in Classical and Medieval Times.*	**Orcagna.**
J. Hl. R.	John Holland Rose, M.A., Litt.D. Christ's College, Cambridge. Lecturer on Modern History of the Cambridge University Local Lectures Syndicate. Author of *Life of Napoleon I.*; *Napoleonic Studies*; *The Development of the European Nations*; *The Life of Pitt*; &c.	**Pasquier.**
J. Ja.	Joseph Jacobs, Litt.D. Professor of English Literature in the Jewish Theological Seminary, New York. Formerly President of the Jewish Historical Society of England. Corresponding Member of the Royal Academy of History, Madrid. Author of *Jews of Angevin England*; *Studies in Biblical Archaeology*; &c.	**Passover.**
J. Lh.	Julius Lewkowitsch, M.A., Ph.D. Examiner to the City and Guilds of London Institute. Vice-President of Chemical Society. Member of Council of Chemical Society; Institute of Chemistry; and Society of Public Analysts. Author of *Chemical Technology and Analysis of Oils, Fats, and Waxes*; &c.	**Oils.**
J. L. M.	John Linton Myres, M.A., F.S.A., F.R.G.S. Wykeham Professor of Ancient History in the University of Oxford and Fellow of Magdalen College. Formerly Gladstone Professor of Greek and Lecturer in Ancient Geography, University of Liverpool. Lecturer of Classical Archaeology in the University of Oxford.	**Paphos.**
J. M.*	James Muirhead, LL.D. (1831–1889). Scotch Advocate; Professor of Civil Law in the University of Edinburgh, 1862–1889. Author of *Historical Introduction to the Private Law of Rome*, and of an edition of the *Institutes of Gaius and Rules of Ulpian.*	**Patron and Client (*in part*).**
J. Mn.	John Macpherson, M.A., M.D., M.R.C.S. (1817–1890). Formerly Inspector-General of Hospitals, Bengal. Author of *The Baths and Wells of Europe*; &c.	**Paranoia.**
J. M. M.	John Malcolm Mitchell. Sometime Scholar of Queen's College, Oxford. Lecturer in Classics, East London College (University of London). Joint-editor of Grote's *History of Greece.*	**Ostracism;** **Patricians.**
J. P.-B.	James George Joseph Penderel-Brodhurst. Editor of the *Guardian* (London).	**Pawnbroking.**
J. P. E.	Jean Paul Hippolyte Emmanuel Adhémar Esmein. Professor of Law in the University of Paris. Officer of the Legion of Honour. Member of the Institute of France. Author of *Cours élémentaire d'histoire du droit français*; &c.	**Parlement.**

J. R. J. J.	Julian Robert John Jocelyn. Colonel, R.A. Formerly Member of the Ordnance Committee, Commandant, Ordnance College, and Commandant, School of Gunnery. Author of *Notes on Tactics and Reconnaissances*; &c.	**Ordnance:** *Heavy Field and Siege Equipments, Garrison Mountings.*
J. R. T.	James Richard Thursfield, M.A. Honorary Fellow of Jesus College, Oxford. Formerly Dean, Fellow, Lecturer and Tutor of Jesus College. Author of *Peel*; &c.	**Parnell, Charles Stewart.**
J. S. Co.	James Sutherland Cotton, M.A. Editor of the *Imperial Gazetteer of India.* Hon. Secretary of the Egyptian Exploration Fund. Formerly Fellow and Lecturer of Queen's College, Oxford. Author of *India*; &c.	**Omichund;** **Orme.**
J. T. Be.	John Thomas Bealby. Joint-author of Stanford's *Europe*. Formerly Editor of the *Scottish Geographical Magazine.* Translator of Sven Hedin's *Through Asia, Central Asia and Tibet*; &c.	**Odessa; Onega;** **Orel; Orenburg.**
J. T. C.	Joseph Thomas Cunningham, M.A., F.Z.S. Lecturer on Zoology at the South-Western Polytechnic, London. Formerly Fellow of University College, Oxford. Assistant Professor of Natural History in The University of Edinburgh. Naturalist to the Marine Biological Association.	**Oyster** (*in part*).
J. V. B.	The Rev. James Vernon Bartlet, M.A., D.D. Professor of Church History, Mansfield College, Oxford. Author of *The Apostolic Age*; &c.	**Papias;** **Paul, the Apostle.**
J. W. W.	J. W. Wyatt, A.M.Inst.C.E. Author of *The Art of Making Paper*; &c.	**Paper:** *Manufacture.*
K. S.	Kathleen Schlesinger. Editor of the *Portfolio of Musical Archaeology.* Author of *The Instruments of the Orchestra*; &c.	**Ophicleide** (*in part*); **Orchestra; Orchestrion;** **Organ:** *Ancient History*; **Organistrum; Pandura;** **Parsifal Bell-instrument.**
L. Be.	Léonce Bénédite. Keeper of the Musée National du Luxembourg. Professor at the École du Louvre. President of the Société des Peintres Orientalistes français. Author of *Histoire des Beaux Arts*; &c.	**Painting:** *Modern French.*
L. D.*	Louis Duchesne. See the biographical article: Duchesne, L. M. O.	**Papacy:** *to 1087*; **Paschal I.**
L. v. P.	Ludwig von Pastor, Ph.D. Director of the Austrian Institute of Historical Studies at Rome. Professor of History and Director of the Historical Seminary in the University of Innsbruck. Hofrat of the Austrian Empire. Commander of the Order of Francis Joseph; &c. Author of *Geschichte der Päpste*; &c. Editor of the *Acta pontificum Romanorum.*	**Papacy:** *1305–1590.*
L. F. D.	Lewis Foreman Day, F.S.A. (1845–1909). Formerly Vice-President of the Society of Arts. Past Master of the Art Workers' Gild. Author of *Windows: a book about Stained Glass*; &c.	**Ornament.**
L. J. B.	Lawrence Johnston Burpee. Public Librarian of the City of Ottawa. Author of *The Search for the Western Sea*; &c. Joint-author of *Canadian Life in Town and Country*; &c.	**Ottawa** (*Canada*).
L. J. S.	Leonard James Spencer, M.A. Assistant in Department of Mineralogy, British Museum. Formerly Scholar of Sidney Sussex College, Cambridge, and Harkness Scholar. Editor of the *Mineralogical Magazine.*	**Oligoclase;** **Olivenite; Olivine;** **Orthoclase;** **Parisite.**
L. R. F.	Lewis Richard Farnell, M.A., Litt.D. Fellow and Senior Tutor of Exeter College, Oxford; University Lecturer in Classical Archaeology; Wilde Lecturer in Comparative Religion. Author of *Cults of Greek States*; *Evolution of Religion.*	**Oracle.**
M. G. D.	Rt. Hon. Sir Mountstuart Elphinstone Grant Duff, G.C.S.I., F.R.S. (1829–1906). M.P. for the Elgin Burghs, 1857–1881. Under-Secretary of State for India, 1868–1874. Under-Secretary of State for the Colonies, 1880–1881. Governor of Madras, 1881–1886. President of the Royal Geographical Society, 1889–1893. President of the Royal Historical Society, 1892–1899. Author of *Studies in European Politics*; *Notes from a Diary*; &c.	**Oliphant, Laurence.**
M. H. S.	Marion H. Spielmann, F.S.A. Formerly Editor of the *Magazine of Art.* Member of Fine Art Committee of International Exhibitions of Brussels, Paris, Buenos Aires, Rome and the Franco-British Exhibition, London. Author of *History of "Punch"*; *British Portrait Painting to the Opening of the Nineteenth Century*; *Works of G. F. Watts, R.A.*; *British Sculpture and Sculptors of To-day*; *Henriette Ronner*; &c.	**Painting:** *Recent British*; **Pastel.**
M. Ja.	Morris Jastrow, Ph.D. Professor of Semitic Languages, University of Pennsylvania. Author of *Religion of the Babylonians and Assyrians*; &c.	**Omen.**
M. M. Bh.	Sir Mancherjee Merwanjee Bhownaggree. Fellow of Bombay University. M.P. for N.-E. Bethnal Green, 1895–1906. Author of *History of the Constitution of the East India Company*; &c.	**Patel.**
M. N. T.	Marcus Niebuhr Tod, M.A. Fellow and Tutor of Oriel College, Oxford. University Lecturer in Epigraphy. Joint-author of *Catalogue of the Sparta Museum.*	**Pausanias:** *Commander.*

M. P.*	Leon Jacques Maxime Prinet. Formerly Archivist to the French National Archives. Auxiliary of the Institute of France (Academy of Moral and Political Sciences). Author of *L'Industrie du sel en Franche-Comté*; *François I. et le comté de Bourgogne*; &c.	**Orleans, Ferdinand, Duke of;** **Orleans, Gaston, Duke of;** **Orleans, Philip I. and II., Dukes of.**
O. Ba.	Oswald Barron, F.S.A. Editor of *The Ancestor*, 1902–1905. Hon. Genealogist to Standing Council of the Honourable Society of the Baronetage.	**Paulet:** *Family.*
O. J. R. H.	Osbert John Radcliffe Howarth, M.A. Christ Church, Oxford. Geographical Scholar, 1901. Assistant Secretary of the British Association.	**Oxford.**
O. T.	Oldfield Thomas, F.R.S., F.Z.S. Senior Assistant, Natural History Department of the British Museum. Author of *Catalogue of Marsupialia in the British Museum.*	**Pangolin** (*in part*).
P. A. K.	Prince Peter Alexeivitch Kropotkin. See the biographical article: Kropotkin, Prince P. A.	**Odessa; Onega;** **Orel; Orenburg.**
P. C. M.	Peter Chalmers Mitchell, M.A., F.R.S., F.Z.S., D.Sc., LL.D. Secretary to the Zoological Society of London. University Demonstrator in Comparative Anatomy and Assistant to Linacre Professor at Oxford, 1888–1891. Author of *Outlines of Biology*; &c.	**Ornithology** (*in part*); **Parasitism.**
P. Gi.	Peter Giles, M.A., LL.D., Litt.D. Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University Reader in Comparative Philology. Formerly Secretary of the Cambridge Philological Society. Author of *Manual of Comparative Philology*; &c.	**P.**
P. G. K.	Paul George Konody. Art Critic of the *Observer* and the *Daily Mail.* Formerly Editor of *The Artist.* Author of *The Art of Walter Crane*; *Velasquez, Life and Work*; &c.	**Ostade** (*in part*).
R. A. S. M.	Robert Alexander Stewart Macalister, M.A., F.S.A. St John's College, Cambridge. Director of Excavations for the Palestine Exploration Fund.	**Ophir;** **Palestine** (*in part*).
R. B. McK.	Ronald Brunlees McKerrow, M.A. Trinity College, Cambridge. Editor of the *Works* of Thomas Nashe; &c.	**Parnassus Plays.**
R. C. J.	Sir Richard Claverhouse Jebb, LL.D., D.C.L. See the biographical article: Jebb, Sir Richard Claverhouse.	**Olympia** (*in part*).
R. G.	Richard Garnett, LL.D., D.C.L. See the biographical article: Garnett, Richard.	**Panizzi.**
R. H. M. B.	Robert Holford Macdowall Bosanquet, M.A., F.R.S., F.R.A.S., F.C.S. Fellow of St John's College, Oxford. Author of *Musical Temperament*; &c.	**Organ.**
R. H. R.	Robert Hallowell Richards, LL.D. Professor of Mining and Metallurgy, Massachusetts Institute of Technology, Boston. President American Institute of Mining Engineers, 1886. Author of *Ore-dressing*; &c.	**Ore-dressing.**
R. J. G.	R. J. Grewing, Captain, Reserve of Officers.	**Officers.**
R. J. M.	Ronald John McNeill, M.A. Christ Church, Oxford. Barrister-at-Law. Formerly Editor of the *St James's Gazette*, London.	**O'Donnell:** *Family*; **O'Neill:** *Family.*
R. K. D.	Sir Robert Kennaway Douglas. Formerly Keeper of Oriental Printed Books and MSS. in the British Museum; and Professor of Chinese, King's College, London. Author of *The Language and Literature of China*; &c.	**Parkes, Sir H. S.**
R. L.*	Richard Lydekker, M.A., F.R.S., F.G.S., F.Z.S. Member of the Staff of the Geological Survey of India, 1874–1882. Author of *Catalogues of Fossil Mammals, Reptiles and Birds in British Museum*; *The Deer of all Lands*; *The Game Animals of Africa*; &c.	**Okapi; Opossum;** **Otter** (*in part*); **Ox; Palaeotherium;** **Pangolin** (*in part*).
R. Mr.	Richard Muther (1860–1909). Professor of the History of Art, Breslau University, 1895–1909. Author of *The History of Modern Painting.*	**Painting:** *Recent Dutch, German, Austrian, Italian, Spanish, Danish, Swedish, Norwegian, Russian and Balkan States.*
R. Mr.*	Richard Muir. Demonstrator of Pathological and Bacteriological Technique, University of Edinburgh.	**Pathology** (*in part*).
R. N. B.	Robert Nisbet Bain (d. 1909). Assistant Librarian, British Museum, 1883–1909. Author of *Scandinavia, the Political History of Denmark, Norway and Sweden, 1513–1900*; *The First Romanovs, 1613–1725*; *Slavonic Europe, the Political History of Poland and Russia from 1469 to 1796*; &c.	**Oleg; Olgierd;** **Orduin-Nashchokin;** **Orlov; Osterman;** **Oxenstjerna; Panin; Patkul.**
R. O.	Sir Richard Owen, K.C.B. See the biographical article: Owen, Sir Richard.	**Oken.**
R. P. S.	R. Phené Spiers, F.S.A., F.R.I.B.A. Formerly Master of the Architectural School, Royal Academy, London. Past President of Architectural Association. Associate and Fellow of King's College, London. Corresponding Member of the Institute of France. Editor of *Fergusson's History of Architecture.* Author of *Architecture: East and West*; &c.	**Order; Orientation.**

R. S. C.	Robert Seymour Conway, M.A., D.Litt. (Cantab.). Professor of Latin and Indo-European Philology in the University of Manchester. Formerly Professor of Latin in University College, Cardiff; and Fellow of Gonville and Caius College, Cambridge. Author of *The Italic Dialects*.	**Paeligni;** **Osca Lingua.**
R. Tr.	Roland Truslove, M.A. Formerly Scholar of Christ Church, Oxford. Fellow, Dean and Lecturer in Classics at Worcester College, Oxford.	**Paris:** ***Geography and Statistics.***
S. A. C.	Stanley Arthur Cook, M.A. Lecturer in Hebrew and Syriac, and formerly Fellow, Gonville and Caius College, Cambridge. Editor for the Palestine Exploration Fund. Examiner in Hebrew and Aramaic, London University, 1904–1908. Author of *Glossary of Aramaic Inscriptions*; *The Law of Moses and the Code of Hammurabi*; *Critical Notes on Old Testament History*; *Religion of Ancient Palestine*; &c.	**Omri;** **Palestine:** ***Old Testament History***
S. Fr.	Sydney R. Fremantle. Captain, R.N. Naval Mobilization Department, Admiralty, London.	**Ordnance:** ***Naval Guns and Gunnery.***
S. G. O.	Sidney George Owen, M.A. Student and Tutor of Christ Church, Oxford.	**Ovid.**
S. N.	Simon Newcomb, D.Sc., LL.D. See the biographical article: Newcomb, Simon.	**Orbit;** **Parallax.**
S. P.	Stephen Paget, F.R.C.S. Surgeon to Throat and Ear Department, Middlesex Hospital. Hon. Secretary, Research Defence Society. Author of *Memoirs and Letters of Sir James Paget*; &c.	**Paget, Sir James.**
T. As.	Thomas Ashby, M.A., D.Litt. Director of British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Conington Prizeman, 1906. Member of the Imperial German Archaeological Institute. Author of *The Classical Topography of the Roman Campagna*.	**Olbia:** ***Sardinia;*** **Orbetello; Oristano;** **Ortona a Mare; Orvieto;** **Ostia; Otranto; Paestum;** **Palermo** ***(in part);*** **Pantelleria; Patavium;** **Pavia.**
T. A. I.	Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.	**Patents** ***(in part);*** **Payment;** **Payment of Members.**
T. Ba.	Sir Thomas Barclay. Member of the Institute of International Law. Member of the Supreme Council of the Congo Free State. Officer of the Legion of Honour. Author of *Problems of International Practice and Diplomacy*; &c. M.P. for Blackburn, 1910.	**Pacific Blockade.**
T. E. M.	Rt. Hon. Lord Farnborough. See the biographical article: Farnborough, Thomas Erskine May, Baron.	**Parliament** ***(in part).***
T. F. C.	Theodore Freylinghuysen Collier, Ph.D. Assistant Professor of History, Williams College, Williamstown, Mass.	**Orange:** ***France;*** **Paul III., IV., V.** ***(Popes).***
T. H.	Thomas Hodgkin, Litt. D., LL.D., D.C.L. See the biographical article: Hodgkin, T.	**Odoacer.**
T. H. H.*	Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., D.Sc. Superintendent, Frontier Surveys, India, 1892–1898. Gold Medallist, R.G.S., London, 1887. Author of *The Indian Borderland*; *The Countries of the King's Award*; *India*; *Tibet*.	**Oman; Oxus;** **Pamirs.**
T. K. C.	Rev. Thomas Kelly Cheyne, M.A., D.D., LL.D. See the biographical article: Cheyne, T. K.	**Paradise.**
Th. N.	Theodor Nöldeke. See the biographical article: Nöldeke, Theodor.	**Pahlavi.**
T. L. H.	Sir Thomas Little Heath, K.C.B., D.Sc. Assistant Secretary to the Treasury. Formerly Fellow of Trinity College, Cambridge.	**Pappus of Alexandria.**
T. O.	Thomas Okey. Examiner in Basket Work for the City and Guilds of London Institute.	**Osier.**
T. W. R. D.	Thomas William Rhys Davids, LL.D., Ph.D. Professor of Comparative Religion, Manchester University. President of the Pali Text Society. Fellow of the British Academy. Secretary and Librarian of Royal Asiatic Society, 1885–1902. Author of *Buddhism*; *Sacred Books of the Buddhists*; *Early Buddhism*; *Buddhist India*; *Dialogues of the Buddha*; &c.	**Pali.**
V. M.	Victor Charles Mahillon. Principal of the Conservatoire Royal de Musique at Brussels. Chevalier of the Legion of Honour.	**Ophicleide** ***(in part).***
W. Ar.	Sir Walter Armstrong. Director of National Gallery of Ireland. Author of *Art in the British Isles*; &c. Joint-editor of Bryan's *Dictionary of Painters*; &c.	**Orchardson.**
W. A. B. C.	Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Ph.D. Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880–1881. Author of *Guide du Haut Dauphiné*; *The Range of the Tödi*; *Guide to Grindelwald*; *Guide to Switzerland*; *The Alps in Nature and in History*; &c. Editor to *The Alpine Journal*, 1880–1881; &c.	**Olivier, J. D.;** **Orta, Lake of;** **Ortler.**
W. A. H.	William Alfred Hinds. President of the Oneida Community, Ltd.; Author of *American Communities*; &c.	**Oneida Community.**

W. A. P.	Walter Alison Phillips, M.A. Formerly Exhibitioner of Merton College and Senior Scholar of St John's College, Oxford. Author of *Modern Europe*; &c.	**Papacy:** *1870–1911.* **Paris:** *History (in part).*
W. A. S.	William Augustus Simpson. Colonel and Acting Adjutant-General, U.S. Army.	**Officers:** *United States.*
W. B.*	William Burton, M.A., F.C.S. Chairman, Joint Committee of Pottery Manufacturers of Great Britain. Author of *English Stoneware and Earthenware*; &c.	**Palissy.**
W. E. A.*	Rev. William E. Addis, M.A. Professor of Old Testament Criticism, Manchester College, Oxford. Author of *Christianity and the Roman Empire*; &c.	**Order, Holy.**
W. E. G. F.	William Edward Garrett Fisher, M.A. Author of *The Transvaal and the Boers.*	**Paper:** *India Paper.*
W. H. F.	Sir William Henry Flower, F.R.S. See the biographical article: Flower, Sir W. H.	**Otter** *(in part).*
W. L. G.	William Lawson Grant, M.A. Professor at Queen's University, Kingston, Canada. Formerly Beit Lecturer in Colonial History at Oxford University. Editor of *Acts of the Privy Council* (Colonial Series); *Canadian Constitutional Development* (in collaboration).	**Ontario.**
W. M. R.	William Michael Rossetti. See the biographical article: Rossetti, Dante Gabriel.	**Palma, Jacopo; Parmigiano; Paul Veronese.**
W. P. A.	Lieut.-Colonel William Patrick Anderson, M.Inst.C.E., F.R.G.S. Chief Engineer, Department of Marine and Fisheries of Canada. Member of the Geographic Board of Canada. Past President of Canadian Society of Civil Engineers.	**Ontario, Lake.**
W. P. C.	William Prideaux Courtney. See the biographical article: Courtney, L. H., Baron.	**Orford, 1st Earl of (Sir Robert Walpole); Oxford, 1st Earl of.**
W. S. R.	William Smyth Rockstro. Author of *A General History of Music from the Infancy of the Greek Drama to the Present Period*; and other works on the history of music.	**Palestrina** *(in part).*
W. W. R.*	William Walker Rockwell, Lic.Theol. Assistant Professor of Church History, Union Theological Seminary, New York.	**Papacy:** *1590–1870;* **Paschal III.**

PRINCIPAL UNSIGNED ARTICLES

Ohio.
Oklahoma.
Old Age Pensions.
Old Catholics.
Oldenburg.
Olive.
Oporto.
Oran.
Orange.
Orchids.
Oregon.
Original Package.
Orkney Islands.
Orleans.
Orthodox Eastern Church.
Oxfordshire.
Oxygen.
Pacific Ocean: *Islands.*
Paisley.
Palatinate.
Pallium.
Palm.
Palmerston, Viscount.
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Pampas.
Panama *(Republic).*
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Pan-American Conferences.
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Paris, Treaties of.
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Patna.
Pau.

ENCYCLOPÆDIA BRITANNICA

ELEVENTH EDITION

VOLUME XX

ODE (Gr. ᾠδή, from ἀείδειν, to sing), a form of stately and elaborate lyrical verse. As its name shows, the original signification of an ode was a chant, a poem arranged to be sung to an instrumental accompaniment. There were two great divisions of the Greek *melos* or song; the one the personal utterance of the poet, the other, as Professor G. G. Murray says, "the choric song of his band of trained dancers." Each of these culminated in what have been called odes, but the former, in the hands of Alcaeus, Anacreon and Sappho, came closer to what modern criticism knows as lyric, pure and simple. On the other hand, the choir-song, in which the poet spoke for himself, but always supported, or interpreted, by a chorus, led up to what is now known as ode proper. It was Alcman, as is supposed, who first gave to his poems a strophic arrangement, and the strophe has come to be essential to an ode. Stesichorus, Ibycus and Simonides of Ceos led the way to the two great masters of ode among the ancients, Pindar and Bacchylides. The form and verse-arrangement of Pindar's great lyrics have regulated the type of the heroic ode. It is now perceived that they are consciously composed in very elaborate measures, and that each is the result of a separate act of creative ingenuity, but each preserving an absolute consistency of form. So far from being, as critics down to Cowley and Boileau, and indeed to the time of August Böckh, supposed, utterly licentious in their irregularity, they are more like the *canzos* and *sirventes* of the medieval troubadours than any modern verse. The Latins themselves seem to have lost the secret of these complicated harmonies, and they made no serious attempt to imitate the odes of Pindar and Bacchylides. It is probable that the Greek odes gradually lost their musical character; they were accompanied on the flute, and then declaimed without any music at all. The ode, as it was practised by the Romans, returned to the personally lyrical form of the Lesbian lyrists. This was exemplified, in the most exquisite way, by Horace and Catullus; the former imitated, and even translated, Alcaeus and Anacreon, the latter was directly inspired by Sappho.

The earliest modern writer to perceive the value of the antique ode was Ronsard, who attempted with as much energy as he could exercise to recover the fire and volume of Pindar; his principal experiments date from 1550 to 1552. The poets of the Pleïad recognized in the ode one of the forms of verse with which French prosody should be enriched, but they went too far, and in their use of Greek words crudely introduced, and in their quantitative experiments, they offended the genius of the French language. The ode, however, died in France almost as rapidly as it had come to life; it hardly survived the 16th century, and neither the examples of J. B. Rousseau nor of Saint-Amant nor of Malherbe possessed much poetic life. Early in the 19th century the form was resumed, and we have the *Odes* composed between 1817 and 1824 by Victor Hugo, the philosophical and religious odes of Lamartine, those of Victor de Laprade (collected in 1844), and the brilliant *Odes funambulesques* of Théodore de Banville (1857).

The earliest odes in the English language, using the word in its strict form, were the magnificent *Epithalamium* and *Prothalamium* of Spenser. Ben Jonson introduced a kind of elaborate lyric, in stanzas of rhymed irregular verse, to which he gave the name of ode; and some of his disciples, in particular Randolph, Cartwright and Herrick, followed him. The great "Hymn on the Morning of Christ's Nativity," begun by Milton in 1629, may be considered an ode, and his lyrics "On Time" and "At a Solemn Music" may claim to belong to the same category. But it was Cowley who introduced into English poetry the ode consciously built up, on a solemn theme and as definitely as possible on the ancient Greek pattern. Being in exile in France about 1645, and at a place where the only book was the text of Pindar, Cowley set himself to study and to imitate the *Epinikia*. He conceived, he says, that this was "the noblest and the highest kind of writing in verse," but he was no more perspicacious than others in observing what the rules were which Pindar had followed. He supposed the Greek poet to be carried away on a storm of heroic emotion, in which all the discipline of prosody was disregarded. In 1656 Cowley published his Pindaric odes, in which he had not even regarded the elements of the Greek structure, with strophe, antistrophe and epode. His idea of an ode, which he impressed with such success upon the British nation that it has never been entirely removed, was of a lofty and tempestuous piece of indefinite poetry, conducted "without sail or oar" in whatever direction the enthusiasm of the poet chose to take it. These shapeless pieces became very popular after the Restoration, and enjoyed the sanction of Dryden in three or four irregular odes which are the best of their kind in the English language. Prior, in a humorous ode on the taking of Namur (1695), imitated the French type of this poem, as cultivated by Boileau. In 1705 Congreve published a *Discourse on the Pindarique Ode*, in which many of the critical errors of Cowley were corrected; and Congreve wrote odes, in strophe, antistrophe and epode, which were the earliest of their kind in English; unhappily they were not very poetical. He was imitated by Ambrose Philips, but then the tide of Cowley-Pindarism rose again and swept the reform away. The attempts of Gilbert West (1703–1756) to explain the prosody of Pindar (1749) inspired Gray to write his "Progress of Poesy" (1754) and "The Bard" (1756). Collins, meanwhile, had in 1747 published a collection of odes devised in the Aeolian or Lesbian manner. The odes of Mason and Akenside were more correctly Pindaric, but frigid and formal. The odes of Wordsworth, Coleridge and Tennyson are entirely irregular. Shelley desired to revive the pure manner of the Greeks, but he understood the principle of the form so little that he began his noble "Ode to Naples" with two epodes, passed on to two strophes, and then indulged in four successive antistrophes. Coventry Patmore, in 1868, printed a volume of *Odes*, which he afterwards enlarged; these were irregularly built up on a musical system, the exact consistency of which is not always apparent. Finally Swinburne, although some of his odes, like those of Keats, are really elaborate lyrics, written in a succession of stanzas identical in form, has cultivated the Greek form also, and some of his political odes follow very closely the type of Bacchylides and Pindar.

See Philipp August Böckh, *De metris Pindari* (1811); Wilhelm Christ, *Metrik der Griechen und Römer* (1874); Edmund Gosse, *English Odes* (1881). (E. G.)

ODENKIRCHEN, a town of Germany, in the Prussian Rhine province, 21 m. by rail S.W. of Düsseldorf, and at the junction of lines to Munich, Gladbach and Stolberg. Pop. (1905) 16,808. It has a Roman Catholic church, an Evangelical one, a synagogue and several schools. Its principal industries are spinning, weaving, tanning and dyeing. Odenkirchen became a town in 1856.

See Wiedemann, *Geschichte der ehemaligen Herrschaft und des Hauses Odenkirchen* (Odenkirchen, 1879).

ODENSE, a city of Denmark, the chief town of the *amt* (county) of its name, which forms the northern part of the island of Fünen (Fyen). Pop. (1901) 40,138. The city lies 4 m. from Odense Fjord on the Odense Aa, the main portion on the north side of the stream, and the industrial Albani quarter on the south side. It has a station on the railway route between Copenhagen and Jutland and Schleswig-Holstein via Korsör. A canal, 15½ to 21 ft. deep, gives access to the town from the fjord. St Canute's cathedral, formerly connected with the great Benedictine monastery of the same name, is one of the largest and finest buildings of its kind in Denmark. It is constructed of brick in a pure Gothic style. Originally dating from 1081–1093, it was rebuilt in the 13th century. Under the altar lies Canute (Knud), the patron saint of Denmark, who intended to dispute with William of Normandy the possession of England, but was slain in an insurrection at Odense in 1086; Kings John and Christian II. are also buried within the walls. Our Lady's church, built in the 13th century and restored in 1851–1852 and again in 1864, contains a carved altarpiece (16th century) by Claus Berg of Lübeck. Odense Castle was erected by Frederick IV., who died there in 1730. In Albani are tanneries, iron-foundries and machine-shops. Exports, mostly agricultural produce (butter, bacon, eggs); imports, iron, petroleum, coal, yarn and timber.

Odense, or Odinsey, originally Odinsoe, *i.e.* Odin's island, is one of the oldest cities of Denmark. St Canute's shrine was a great resort of pilgrims throughout the middle ages. In the 16th century the town was the meeting-place of several parliaments, and down to 1805 it was the seat of the provincial assembly of Fünen.

ODENWALD, a wooded mountainous region of Germany, almost entirely in the grand duchy of Hesse, with small portions in Bavaria and Baden. It stretches between the Neckar and the Main, and is some 50 m. long by 20 to 30 broad. Its highest points are the Katzenbuckel (2057 ft.), the Neunkircher Höhe (1985 ft.) and the Krähberg (1965 ft.). The wooded heights overlooking the Bergstrasse are studded with castles and medieval ruins, some of which are associated with some of the most memorable adventures of German tradition. Among them are Rodenstein, the reputed home of the wild huntsman, and near Grasellenbach, the spot where Siegfried of the *Nibelungenlied* is said to have been slain.

See F. Montanus, *Der Odenwald* (Mainz, 1884); T. Lorentzen, *Der Odenwald in Wort und Bild* (Stuttgart, 1904); G. Volk, *Der Odenwald und seine Nachbargebiete* (Stuttgart, 1900), and Windhaus, *Führer durch den Odenwald* (Darmstadt, 1903).

ODER (Lat. *Viadua*; Slavonic, *Vjodr*), a river of Germany, rises in Austria on the Odergebirge in the Moravian tableland at a height of 1950 ft. above the sea, and 14 m. to the east of Olmütz. From its source to its mouth in the Baltic it has a total length of 560 m., of which 480 m. are navigable for barges, and it drains an area of 43,300 sq. m. The first 45 m. of its course lie within Moravia; for the next 15 m. it forms the frontier between Prussian and Austrian Silesia, while the remaining 500 m. belong to Prussia, where it traverses the provinces of Silesia, Brandenburg and Pomerania. It flows at first towards the south-east, but on quitting Austria turns towards the north-west, maintaining this direction as far as Frankfort-on-Oder, beyond which its general course is nearly due north. As far as the frontier the Oder flows through a well-defined valley, but, after passing through the gap between the Moravian mountains, and the Carpathians and entering the Silesian plain, its valley is wide and shallow and its banks generally low. In its lower course it is divided into numerous branches, forming many islands. The main channel follows the left side of the valley and finally expands into the Pommersches, or Stettiner Haff, which is connected with the sea by three arms, the Peene, the Swine and the Dievenow, forming the islands of Usedom and Wollin. The Swine, in the middle, is the main channel for navigation. The chief tributaries of the Oder on the left bank are the Oppa, Glatzer Neisse, Katzbach, Bober and Lausitzer Neisse; on the right bank the Malapane, Bartsch and Warthe. Of these the only one of importance for navigation is the Warthe, which through the Netze is brought into communication with the Vistula. The Oder is also connected by canals with the Havel and the Spree. The most important towns on its banks are Ratibor, Oppeln, Brieg, Breslau, Glogau, Frankfort, Cüstrin and Stettin, with the seaport of Swinemünde at its mouth. Glogau, Cüstrin and Swinemünde are strongly fortified.

The earliest important undertaking with a view of improving the waterway was due to the initiative of Frederick the Great, who recommended the diversion of the river into a new and straight channel in the swampy tract of land known as the Oderbruch, near Cüstrin. The work was carried out in the years 1746–1753, a large tract of marshland being brought under cultivation, a considerable detour cut off, and the main stream successfully confined to the canal, 12 m. in length, which is known as the New Oder. The river at present begins to be navigable for barges at Ratibor, where it is about 100 ft. wide, and for larger vessels at Breslau, and great exertions are made by the government to deepen and keep open the channel, which still shows a strong tendency to choke itself with sand in certain places. The alterations made of late years consist of three systems of works:—(1) The canalization of the main stream (4 m.) at Breslau, and from the confluence of the Glatzer Neisse to the mouth of the Klodnitz canal, a distance of over 50 m. These engineering works were completed in 1896. (2) In 1887–1891 the Oder-Spree canal was made to connect the two rivers named. The canal leaves the Oder at Fürstenberg (132 m. above its mouth) at an altitude of 93 ft., and after 15 m. enters the Friedrich-Wilhelm canal (134 ft.). After coinciding with this for 7 m., it makes another cut of 5 m. to the Spree at Fürstenwalde (126 ft.). Then it follows the Spree for 12 m., and at Gross Tränke (121 ft.) passes out and goes to Lake Seddin (106 ft.), 15 m. (3) The deepening and regulation of the mouth and lower course of the stream, consisting of the Kaiserfahrt, 3 m. long, affording a waterway between the Stettiner Haff and the river Swine for the largest ocean-going vessels; a new cut, 4¼ m. long, from Vietzig on the Stettiner Haff to Wollin Island; the Parnitz-Dunzig and Dunzig-Oder canals, together 1 m. long, constituting the immediate approach to Stettin. Vessels drawing 24 ft. are now able to go right up to Stettin. In 1905 a project was sanctioned for improving the communication between Berlin and Stettin by widening and deepening the lower course of the river and then connecting this by a canal with Berlin. Another project, born at the same time, is one for the canalization of the upper course of the Oder. About 4,000,000 tons of merchandize pass through Breslau (up and down) on the Oder in the year.

See *Der Oderstrom, sein Stromgebiet und seine wichtigsten Nebenflüsse; hydrographische, wasserwirtschaftliche und wasserrechtliche Darstellung* (Berlin, 1896).

ODERBERG, a town of Germany, in the Prussian province of Brandenburg, on the Alte Oder, 2 m. from Bralitz, a station 44 m. N.W. from Frankfort-on-Oder, by the railway to Angermünde. Pop. (1905) 4,015. It has a fine Gothic church, dedicated to St Nicholas, and the ruins of an ancient castle, called Bärenkasten. Oderberg is an important emporium for the Russian timber trade.

ODESCALCHI-ERBA, the name of a Roman princely family of great antiquity. They are supposed to be descended from Enrico Erba, imperial vicar in Milan in 1165. Alessandro Erba married Lucrezia Odescalchi, sister of Pope Innocent IX., in 1709, who is believed to have been descended from Giorgio Odescalchi (*floruit* at Como in 1290). The title of prince of the Holy Roman Empire was conferred on Alessandro in 1714, and that of duke of Syrmium in Hungary in 1714, with the qualification of "serene highness." The head of the family now bears the titles of Fürst Odescalchi, duke of Syrmium, prince of Bassano, &c., and he is an hereditary magnate of Hungary and a grandee of Spain; the family, which is one of the most important in Italy, owns the Palazzo Odescalchi in Rome, the magnificent castle of Bracciano, besides large estates in Italy and Hungary.

See A. von Reumont, *Geschichte der Stadt Rom* (Berlin, 1868), and the *Almanach de Gotha.*

ODESSA, one of the most important seaports of Russia, ranking by its population and foreign trade after St Petersburg, Moscow and Warsaw. It is situated in 46° 28′ N. and 30° 44′ E., on the southern shore of a semi-circular bay, at the north-west angle of the Black Sea, and is by rail 1017 m. S.S.W. from Moscow and 610 S. from Kiev. Odessa is the seaport for the basins of two great rivers of Russia, the Dnieper, with its tributary the Bug, and the Dniester (20 m. to S.). The entrances to the mouths of both these offering many difficulties for navigation, trade has from the remotest antiquity selected this spot, which is situated half-way between the two estuaries, while the level surface of the neighbouring steppe allows easy communication with the lower parts of both rivers. The bay of Odessa, which has an area of 14 sq. m. and a depth of 30 ft. with a soft bottom, is a dangerous anchorage on account of its exposure to easterly winds. But inside it are six harbours—the quarantine harbour, new harbour, coal harbour and "practical" harbour, the first and last, on the S. and N. respectively, protected by moles, and the two middle harbours by a breakwater. Besides these, there are the harbour of the principal shipping company—the Russian Company for Navigation and Commerce, and the petroleum harbour. The harbours freeze for a few days in winter, as also does the bay occasionally, navigation being interrupted every year for an average of sixteen days; though this is materially shortened by the use of an ice-breaker. Odessa experiences the influence of the continental climate of the neighbouring steppes; its winters are cold (the average temperature for January being 23·2° F., and the isotherm for the entire season that of Königsberg), its summers are hot (72·8° in July), and the yearly average temperature is 48·5°. The rainfall is scanty (14 in. per annum). The city is built on a terrace 100 to 155 ft. in height, which descends by steep crags to the sea, and on the other side is continuous with the level of the "black earth" steppe. Catacombs, whence sandstone for building has been taken, extend underneath the town and suburbs, not without some danger to the buildings.

The general aspect of Odessa is that of a wealthy west-European city. Its chief embankment, the Nikolai boulevard, bordered with tall and handsome houses, forms a fine promenade. The central square is adorned with a statue of Armand, duc de Richelieu (1826), who was governor of Odessa in 1803–1814. A little back from the sea stands a fine bronze statue of Catherine II. (1900). A magnificent flight of nearly 200 granite steps leads from the Richelieu monument down to the harbours. The central parts of the city have broad streets and squares, bordered with fine buildings and mansions in the Italian style, and with good shops. The cathedral, founded in 1794 and finished in 1809, and thoroughly restored in 1903, can accommodate 5000 persons; it contains the tomb of Count Michael Vorontsov, governor-general from 1823 to 1854, who contributed much towards the development and embellishment of the city. The "Palais Royal," with its parterre and fountains, and the spacious public park are fine pleasure-grounds, whilst in the ravines that lead down to the sea cluster the houses of the poorer classes. The shore is occupied by immense granaries, some of which look like palaces, and large storehouses take up a broad space in the west of the city. Odessa consists (i.) of the city proper, containing the old fort (now a quarantine establishment) and surrounded by a boulevard, where was formerly a wall marking the limits of the free port; (ii.) of the suburbs Novaya and Peresyp, extending northward along the lower shore of the bay; and (iii.) of Moldavanka to the south-west. The city, being in a treeless region, is proud of the avenues of trees that line several of its streets and of its parks, especially of the Alexander Park, with a statue of Alexander II. (1891), and of the summer resorts of Fontaine, Arcadia and Langeron along the bay. Odessa is rising in repute as a summer sea-bathing resort, and its mud-baths (from the mud of the *limans* or lagoons) are considered to be efficacious in cases of rheumatism, gout, nervous affections and skin diseases. The German colonies Liebenthal and Lustdorf are bathing-places.

Odessa is the real capital, intellectual and commercial, of so-called Novorossia, or New Russia, which includes the governments of Bessarabia and Kherson. It is the see of an archbishop of the Orthodox Greek Church, and the headquarters of the VIII. army corps, and constitutes an independent "municipal district" or captaincy, which covers 195 sq. m. and includes a dozen villages, some of which have 2000 to 3000 inhabitants each. It is also the chief town of the Novorossian (New Russian) educational district, and has a university, which replaced the Richelieu Lyceum in 1865, and now has over 1700 students.

In 1795 the town had only 2250 inhabitants; in 1814, twenty years after its foundation, it had 25,000. The population has steadily increased from 100,000 in 1850, 185,000 in 1873, 225,000 in 1884, to 449,673 in 1900. The great majority of inhabitants are Great Russians and Little Russians; but there are also large numbers of Jews (133,000, exclusive of Karaites), as well as of Italians, Greeks, Germans and French (to which nationalities the chief merchants belong), as also of Rumanians, Servians, Bulgarians, Tatars, Armenians, Lazes, Georgians. A numerous floating population of labourers, attracted at certain periods by pressing work in the port, and afterwards left unemployed owing to the enormous fluctuations in the corn trade, is one of the features of Odessa. It is estimated that there are no less than 35,000 people living from hand to mouth in the utmost misery, partly in the extensive catacombs beneath the city.

The leading occupations are connected with exporting, shipping and manufactures. The industrial development has been rather slow: sugar-refineries, tea-packing, oil-mills, tanneries, steam flour-mills, iron and mechanical works, factories of jute sacks, chemical works, tin-plate works, paper-factories are the chief. Commercially the city is the chief seaport of Russia for exports, which in favourable years are twice as high as those of St Petersburg, while as regards the value of the imports Odessa is second only to the northern capital. The total returns amount to 16 to 20 millions sterling a year, representing about one-ninth of the entire Russian foreign trade, and 14% if the coast trade be included as well. The total exports are valued at 10 to 11 millions sterling annually, and the imports at 6 to 9 millions sterling, about 8½% of all the imports into Russia. Grain, and especially wheat, is the chief article of export. The chief imports are raw cotton, iron, agricultural machinery, coal, chemicals, jute, copra and lead. A new and spacious harbour, especially for the petroleum trade, was constructed in 1894–1900.

History.—The bay of Odessa was colonized by Greeks at a very early period, and their ports—*Istrianorum Portus* and *Isiacorum Portus* on the shores of the bay, and *Odessus* at the mouth of the Tiligul *liman*—carried on a lively trade with the neighbouring steppes. These towns disappeared in the 3rd and 4th centuries, and for ten centuries no settlements in these tracts are mentioned. In the 14th century this region belonged to the Lithuanians, and in 1396 Olgerd, prince of Lithuania, defeated in battle three Tatar chiefs, one of whom, Khaji Beg or Bey, had recently founded, at the place now occupied by Odessa, a fort which received his name. The Lithuanians, and subsequently the Poles, kept the country under their dominion until the 16th century, when it was seized by the Tatars, who still permitted, however, the Lithuanians to gather salt in the neighbouring lakes. Later on the Turks left a garrison here, and founded in 1764 the fortress Yani-dunya. In 1789 the Russians, under the French captain de Ribas, took the fortress by assault. In 1791 Khaji-bey and the Ochakov region were ceded to Russia. De Ribas and the French engineer Voland were entrusted in 1794 with the erection of a town and the construction of a port at Khaji-bey. In 1803 Odessa became the chief town of a separate municipal district or captaincy, the first captain being Armand, duc de Richelieu, who did very much for the development of the young city and its improvement as a seaport. In 1824 Odessa became the seat of the governors-general of Novorossia and Bessarabia. In 1866 it was brought into railway connexion with Kiev and Kharkov via Balta, and with Jassy in Rumania. In 1854 it was unsuccessfully attacked by the Anglo-Russian fleet, and in 1876–1877 by the Turkish, also unsuccessfully. In 1905–1906 the city was the scene of violent revolutionary disorders, marked by a naval insurrection. (P. A. K.; J. T. Be.)

ODEUM (Gr. *Odeion*), the name given to a concert hall in ancient Greece. In a general way its construction was similar to that of a theatre, but it was only a quarter of the size and was provided with a roof for acoustic purposes, a characteristic difference. The oldest known Odeum in Greece was the Skias at Sparta, so called from its resemblance to the top of a parasol, said to have been erected by Theodorus of Samos (600 B.C.); in Athens an Odeum near the spring Enneacrunus on the Ilissus was referred to the age of Peisistratus, and appears to have been rebuilt or restored by Lycurgus (*c.* 330 B.C.). This is probably the building which, according to Aristophanes (*Wasps*, 1109), was used for judicial purposes, for the distribution of corn, and even for the billeting of soldiers. The building which served as a model for later similar constructions was the Odeum of Pericles (completed *c.* 445) on the south-eastern slope of the rock of the Acropolis, whose conical roof, a supposed imitation of the tent of Xerxes, was made of the masts of captured Persian ships. It was destroyed by Aristion, the so-called tyrant of Athens, at the time of the rising against Sulla (87), and rebuilt by Ariobarzanes II., king of Cappadocia (Appian, *Mithrid.* 38). The most magnificent example of its kind, however, was the Odeum built on the south-west cliff of the Acropolis at Athens about A.D. 160 by the wealthy sophist and rhetorician Herodes Atticus in memory of his wife, considerable remains of which are still to be seen. It had accommodation for 8000 persons, and the ceiling was constructed of beautifully carved beams of cedar wood, probably with an open space in the centre to admit the light. It was also profusely decorated with pictures and other works of art. Similar buildings also existed in other parts of Greece; at Corinth, also the gift of Herodes Atticus; at Patrae, where there was a famous statue of Apollo; at Smyrna, Tralles, and other towns in Asia Minor. The first Odeum in Rome was built by Domitian, a second by Trajan.

ODILIENBERG, or Ottilienberg (called *Allitona* in the 8th century), a peak of the Vosges Mountains in Germany, in the imperial province of Alsace-Lorraine, immediately W. of the town of Barr. Its crest (2500 ft.) is surmounted by the ruins of the ancient Roman wall, the Heidenmauer, and by the convent and church of St Odilia, or Ottilia, the patron saint of Alsace, whose remains rest within. It is thus the object of frequent pilgrimages. The convent is said to have been founded by Duke Eticho I., in honour of his daughter St Odilia, about the end of the 7th century, and it is certain that it existed at the time of Charlemagne. Destroyed during the wars of the middle ages, it was rebuilt by the Premonstrants at the beginning of the 17th century, and was acquired later by the bishop of Strassburg, who restored the building and the adjoining church, in 1853. Since 1899 the convent has contained a museum of antiquities.

See Reinhard, *Le Mont Ste Odile* (Strassburg, 1888); Pfister, *Le Duché mérovingien d'Alsace et la légende de Sainte Odile* (Nancy, 1892); and R. Forrer, *Der Odilienberg* (Strassburg, 1899).

ODIN, or Othin (O. Norse *Óðinn*), the chief god of the Northern pantheon. He is represented as an old man with one eye. Frigg is his wife, and several of the gods, including Thor and Balder, are his sons. He is also said to have been the father of several legendary kings, and more than one princely family claimed descent from him. His exploits and adventures form the theme of a number of the Eddaic poems, and also of several stories in the prose Edda. In all these stories his character is distinguished rather by wisdom and cunning than by martial prowess, and reference is very frequently made to his skill in poetry and magic. In *Ynglinga Saga* he is represented as reigning in Sweden, where he established laws for his people. In notices relating to religious observances Odin appears chiefly as the giver of victory or as the god of the dead. He is frequently introduced in legendary sagas, generally in disguise, imparting secret instructions to his favourites or presenting them with weapons by which victory is assured. In return he receives the souls of the slain who in his palace, Valhalla (*q.v.*), live a life of fighting and feasting, similar to that which has been their desire on earth. Human sacrifices were very frequently offered to Odin, especially prisoners taken in battle. The commonest method of sacrifice was by hanging the victim on a tree; and in the poem *Hávamál* the god himself is represented as sacrificed in this way. The worship of Odin seems to have prevailed chiefly, if not solely, in military circles, *i.e.* among princely families and the retinues of warriors attached to them. It is probable, however, that the worship of Odin was once common to most of the Teutonic peoples. To the Anglo-Saxons he was known as Woden (*q.v.*) and to the Germans as Wodan (Wuotan), which are the regular forms of the same name in those languages. It is largely owing to the peculiar character of this god and the prominent position which he occupies that the mythology of the north presents so striking a contrast to that of Greece.

See Teutonic Peoples, *ad fin.*; and Woden. (H. M. C.)

ODO, or Eudes (d. *c.* 736), king, or duke, of Aquitaine, obtained this dignity about 715, and his territory included the south-western part of Gaul from the Loire to the Pyrenees. In 718 he appears as the ally of Chilperic II., king of Neustria, who was fighting against the Austrasian mayor of the palace, Charles Martel; but after the defeat of Chilperic at Soissons in 719 he probably made peace with Charles by surrendering to him the Neustrian king and his treasures. Odo was also obliged to fight the Saracens who invaded the southern part of his kingdom, and inflicted a severe defeat upon them at Toulouse in 721. When, however, he was again attacked by Charles Martel, the Saracens renewed their ravages, and Odo was defeated near Bordeaux; he was compelled to crave protection from Charles, who took up this struggle and gained his momentous victory at Poitiers in 732. In 735 the king abdicated, and was succeeded by his son Hunold.

ODO, or Eudes (d. 898), king of the Franks, was a son of Robert the Strong, count of Anjou (d. 866), and is sometimes referred to as duke of France and also as count of Paris. For his skill and bravery in resisting the attacks of the Normans

Odo was chosen king by the western Franks when the emperor Charles the Fat was deposed in 887, and was crowned at Compiègne in February 888. He continued to battle against the Normans, whom he defeated at Montfaucon and elsewhere, but was soon involved in a struggle with some powerful nobles, who supported the claim of Charles, afterwards King Charles III., to the Frankish kingdom. To gain prestige and support Odo owned himself a vassal of the German king, Arnulf, but in 894 Arnulf declared for Charles. Eventually, after a struggle which lasted for three years, Odo was compelled to come to terms with his rival, and to surrender to him a district north of the Seine. He died at La Fère on the 1st of January 898.

See E. Lavisse, *Histoire de France*, tome ii. (Paris, 1903); and E. Favre, *Eudes, comte de Paris et roi de France* (Paris, 1893).

ODO[1] OF BAYEUX (*c.* 1036–1097), Norman bishop and English earl, was a uterine brother of William the Conqueror, from whom he received, while still a youth, the see of Bayeux (1049). But his active career was that of a warrior and statesman. He found ships for the invasion of England and fought in person at Senlac; in 1067 he became earl of Kent, and for some years he was a trusted royal minister. At times he acted as viceroy in William's absence; at times he led the royal forces to chastise rebellions. But in 1083 he was suddenly disgraced and imprisoned for having planned a military expedition to Italy. He was accused of desiring to make himself pope; more probably he thought of serving as a papal condottiere against the emperor Henry IV. The Conqueror, when on his death-bed, reluctantly permitted Odo's release (1087). The bishop returned to his earldom and soon organized a rebellion with the object of handing over England to his eldest nephew, Duke Robert. William Rufus, to the disgust of his supporters, permitted Odo to leave the kingdom after the collapse of this design (1088), and thenceforward Odo was the right-hand man of Robert in Normandy. He took part in the agitation for the First Crusade, and started in the duke's company for Palestine, but died on the way, at Palermo (February 1097). Little good is recorded of Odo. His vast wealth was gained by extortion and robbery. His ambitions were boundless and his morals lax. But he was a patron of learning and, like most prelates of his age, a great architect. He rebuilt the cathedral of his see, and may perhaps have commissioned the unknown artist of the celebrated Bayeux tapestry.

See the authorities cited for WILLIAM I. and WILLIAM II., the biographical sketch in *Gallia Christiana*, xi. 353-360; H. Wharton *Anglia Sacra*, i. 334-339 (1691); and F. R. Fowke, *The Bayeux Tapestry* (London, 1898). (H. W. C. D.)

ODOACER, or ODOVACAR (*c.* 434–493), the first barbarian ruler of Italy on the downfall of the Western empire, was born in the district bordering on the middle Danube about the year 434. In this district the once rich and fertile provinces of Noricum and Pannonia were being torn piecemeal from the Roman empire by a crowd of German tribes, among whom we discern four, who seem to have hovered over the Danube from Passau to Pest, namely, the Rugii, Scyrri, Turcilingi and Heruli. With all of these Odoacer was connected by his subsequent career, and all seem, more or less, to have claimed him as belonging to them by birth; the evidence slightly preponderates in favour of his descent from the Scyrri.

His father was Aedico or Idico, a name which suggests Edeco the Hun, who was suborned by the Byzantine court to plot the assassination of his master Attila. There are, however, some strong arguments against this identification. A certain Edica, chief of the Scyrri, of whom Jordanes speaks as defeated by the Ostrogoths, may more probably have been the father of Odoacer, though even in this theory there are some difficulties, chiefly connected with the low estate in which he appears before us in the next scene of his life, when as a tall young recruit for the Roman armies, dressed in a sordid vesture of skins, on his way to Italy, he enters the cell of Severinus, a noted hermit-saint of Noricum, to ask his blessing. The saint had an inward premonition of his future greatness, and in blessing him said, "Fare onward into Italy. Thou who art now clothed in vile raiment wilt soon give precious gifts unto many."

Odoacer was probably about thirty years of age when he thus left his country and entered the imperial service. By the year 472 he had risen to some eminence, since it is expressly recorded that he sided with the patrician Ricimer in his quarrel with the emperor Anthemius. In the year 475, by one of the endless revolutions which marked the close of the Western empire, the emperor Nepos was driven into exile, and the successful rebel Orestes was enabled to array in the purple his son, a handsome boy of fourteen or fifteen, who was named Romulus after his grandfather, and nicknamed Augustulus, from his inability to play the part of the great Augustus. Before this puppet emperor had been a year on the throne the barbarian mercenaries, who were chiefly drawn from the Danubian tribes before mentioned, rose in mutiny, demanding to be made proprietors of one-third of the soil of Italy. To this request Orestes returned a peremptory negative. Odoacer now offered his fellow-soldiers to obtain for them all that they desired if they would seat him on the throne. On the 23rd of August 476 he was proclaimed king; five days later Orestes was made prisoner at Placentia and beheaded; and on the 4th of September his brother Paulus was defeated and slain near Ravenna. Rome at once accepted the new ruler. Augustulus was compelled to descend from the throne, but his life was spared.

Odoacer was forty-two years of age when he thus became chief ruler of Italy, and he reigned thirteen years with undisputed sway. Our information as to this period is very slender, but we can perceive that the administration was conducted as much as possible on the lines of the old imperial government. The settlement of the barbarian soldiers on the lands of Italy probably affected the great landowners rather than the labouring class. To the herd of *coloni* and *servi*, by whom in their various degrees the land was actually cultivated, it probably made little difference, except as a matter of sentiment, whether the master whom they served called himself Roman or Rugian. We have one most interesting example, though in a small way, of such a transfer of land with its appurtenant slaves and cattle, in the donation made by Odoacer himself to his faithful follower Pierius.[2] Few things bring more vividly before the reader the continuity of legal and social life in the midst of the tremendous ethnical changes of the 5th century than the perusal of such a record.

The same fact, from a slightly different point of view, is illustrated by the curious history (recorded by Malchus) of the embassies to Constantinople. The dethroned emperor Nepos sent ambassadors (in 477 or 478) to Zeno, emperor of the East, begging his aid in the reconquest of Italy. These ambassadors met a deputation from the Roman senate, sent nominally by the command of Augustulus, really no doubt by that of Odoacer, the purport of whose commission was that they did not need a separate emperor. One was sufficient to defend the borders of either realm. The senate had chosen Odoacer, whose knowledge of military affairs and whose statesmanship admirably fitted him for preserving order in that part of the world, and they therefore prayed Zeno to confer upon him the dignity of patrician, and entrust the "diocese" of Italy to his care. Zeno returned a harsh answer to the senate, requiring them to return to their allegiance to Nepos. In fact, however, he did nothing for the fallen emperor, but accepted the new order of things, and even addressed Odoacer as patrician. On the other hand, the latter sent the ornaments of empire, the diadem and purple robe, to Constantinople as an acknowledgment of the fact that he did not claim supreme power. Our information as to the actual title assumed by the new ruler is somewhat confused. He does not appear to have called himself king of Italy. His kingship seems to have marked only his relation to his Teutonic followers, among whom he was "king of the Turcilingi," "king of the Heruli," and so forth, according to the nationality with which he was dealing. By the Roman inhabitants of Italy he was addressed as "dominus noster," but his right to exercise power would in their eyes rest, in theory, on his recognition as patricius by the Byzantine Augustus. At the same time he marked his own high pretensions by assuming the prefix Flavius, a reminiscence of the early emperors, to which the barbarian rulers of realms formed out of the Roman state seem to have been peculiarly partial. His internal administration was probably, upon the whole, wise and moderate, though we hear some complaints of financial oppression, and he may be looked upon as a not altogether unworthy predecessor of Theodoric.

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[1] Odo must be distinguished from two English prelates of the same name and also from an English earl. Odo or Oda (d. 959), archbishop of Canterbury, was bishop of Ramsbury from 927 to 942, and went with King Æthelstan to the battle of Brunanburh in 937. In 942 he succeeded Wulfhelm as archbishop of Canterbury, and he appears to have been an able and conscientious ruler of the see. He had great influence with King Edwy, whom he had crowned in 956. Odo (d. 1200), abbot of Battle, was a monk of Christ Church, Canterbury, and was prior of this house at the time when Thomas Becket was murdered. In 1175 he was chosen abbot of Battle, and on two occasions the efforts of Henry II. alone prevented him from being elected archbishop of Canterbury. Odo or Odda (d. 1056), a relative of Edward the Confessor, during whose reign he was an earl in the west of England, built the minster at Deerhurst in Gloucestershire.

[2] Published in Marini's *Papiri diplomatici* (Rome, 1815, Nos. 82 and 83) and in Spangenberg's *Juris Romani Tabulae* (Leipzig, 1822, pp. 164-173), and well worthy of careful study.

In the history of the papacy Odoacer figures as the author of a decree promulgated at the election of Felix II. in 483, forbidding the pope to alienate any of the lands or ornaments of the Roman Church, and threatening any pope who should infringe this edict with anathema. This decree was loudly condemned in a synod held by Pope Symmachus (502) as an unwarrantable interference of the civil power with the concerns of the church.

The chief events in the foreign policy of Odoacer were his Dalmatian and Rugian wars. In the year 480 the ex-emperor Nepos, who ruled Dalmatia, was traitorously assassinated in Diocletian's palace at Spalato by the counts Viator and Ovida. In the following year Odoacer invaded Dalmatia, slew the murderer Ovida, and reannexed Dalmatia to the Western state. In 487 he appeared as an invader in his own native Danubian lands. War broke out between him and Feletheus, king of the Rugians. Odoacer entered the Rugian territory, defeated Feletheus, and carried him and "his noxious wife" Gisa prisoners to Ravenna. In the following year Frederick, son of the captive king, endeavoured to raise again the fallen fortunes of his house, but was defeated by Onulf, brother of Odoacer, and, being forced to flee, took refuge at the court of Theodoric the Ostrogoth, at Sistova on the lower Danube.

This Rugian war was probably an indirect cause of the fall of Odoacer. His increasing power rendered him too formidable to the Byzantine court, with whom his relations had for some time been growing less friendly. At the same time, Zeno was embarrassed by the formidable neighbourhood of Theodoric and his Ostrogothic warriors, who were almost equally burdensome as enemies or as allies. In these circumstances arose the plan of Theodoric's invasion of Italy, a plan by whom originated it would be difficult to say. Whether the land when conquered was to be held by the Ostrogoth in full sovereignty, or administered by him as lieutenant of Zeno, is a point upon which our information is ambiguous, and which was perhaps intentionally left vague by the two contracting parties, whose chief anxiety was not to see one another's faces again. The details of the Ostrogothic invasion of Italy belong properly to the life of Theodoric. It is sufficient to state here that he entered Italy in August 489, defeated Odoacer at the Isontius (Isonzo) on the 28th of August, and at Verona on the 30th of September. Odoacer then shut himself up in Ravenna, and there maintained himself for four years, with one brief gleam of success, during which he emerged from his hiding-place and fought the battle of the Addua (11th August 490), in which he was again defeated. A sally from Ravenna (10th July 491) was again the occasion of a murderous defeat. At length, the famine in Ravenna having become almost intolerable, and the Goths despairing of ever taking the city by assault, negotiations were opened for a compromise (25th February 493). John, archbishop of Ravenna, acted as mediator. It was stipulated that Ravenna should be surrendered, that Odoacer's life should be spared, and that he and Theodoric should be recognized as joint rulers of the Roman state. The arrangement was evidently a precarious one, and was soon terminated by the treachery of Theodoric. He invited his rival to a banquet in the palace of the Lauretum on the 15th of March, and there slew him with his own hand. "Where is God?" cried Odoacer when he perceived the ambush into which he had fallen. "Thus didst thou deal with my kinsmen," shouted Theodoric, and clove his rival with the broadsword from shoulder to flank. Onulf, the brother of the murdered king, was shot down while attempting to escape through the palace garden, and Thelan, his son, was not long after put to death by order of the conqueror. Thus perished the whole race of Odoacer.

LITERATURE.—The chief authorities for the life of Odoacer are the so-called "Anonymus Valesii," generally printed at the end of Ammianus Marcellinus; the *Life of Severinus*, by Eugippius; the chroniclers, Cassiodorus and "Cuspiniani Anonymus" (both in Roncalli's collection); and the Byzantine historians, Malchus and John of Antioch. A fragment of the latter historian, unknown when Gibbon wrote, is to be found in the fifth volume of Müller's *Fragmenta Historicorum Graecorum.* There is a thorough investigation of the history of Odoacer in R. Pallmann's *Geschichte der Völkerwanderung*, vol. ii. (Weimar, 1864). See also T. Hodgkin, *Italy and her Invaders*, vol. iii. (Oxford, 1885). (T. H.)

ODOFREDUS, an Italian jurist of the 13th century. He was born at Bologna and studied law under Balduinus and Accursius. After having practised as an advocate both in Italy and France, he became professor at Bologna in 1228. The commentaries on Roman law attributed to him are valuable as showing the growth of the study of law in Italy, and for their biographical details of the jurists of the 12th and 13th centuries. Odofredus died at Bologna on the 3rd of December 1265.

Over his name appeared *Lecturae in codicem* (Lyons, 1480) *Lecturae in digestum vetus* (Paris, 1504), *Summa de libellis formandis* (Strassburg, 1510), *Lecturae in tres libros* (Venice, 1514), and *Lecturae in digestum novum* (Lyons, 1552).

O'DONNELL, the name of an ancient and powerful Irish family, lords of Tyrconnel in early times, and the chief rivals of the O'Neills in Ulster. Like the family of O'Neill (*q.v.*), that of O'Donnell was descended from Niall of the Nine Hostages, king of Ireland at the beginning of the 5th century; the O'Neills, or Cinel[1] Owen, tracing their pedigree to Owen (Eoghan), and the O'Donnells, or Cinel Connell, to Conall Gulban, both sons of Niall. Tyrconnel, the district named after the Cinel Connell, where the O'Donnells held sway, comprised the greater part of the modern county of Donegal except the peninsula of Inishowen; and since it lay conterminous with the territory ruled by the O'Neills of Tyrone, who were continually attempting to assert their supremacy over it, the history of the O'Donnells is for the most part a record of tribal warfare with their powerful neighbours, and of their own efforts to make good their claims to the overlordship of northern Connaught.

The first chieftain of mark in the family was Goffraidh (Godfrey), son of Donnell Mor O'Donnell (d. 1241). Goffraidh, who was "inaugurated" as "The O'Donnell," *i.e.* chief of the clan, in 1248, made a successful inroad into Tyrone against Brian O'Neill in 1252. In 1257 he drove the English out of northern Connaught, after a single combat with Maurice Fitzgerald in which both warriors were wounded. O'Donnell while still incapacitated by his wound was summoned by Brian O'Neill to give hostages in token of submission. Carried on a litter at the head of his clan he gave battle to O'Neill, whom he defeated with severe loss in prisoners and cattle; but he died of his wound immediately afterwards near Letterkenny, and was succeeded in the chieftainship by his brother Donnell Oge, who returned from Scotland in time to withstand successfully the demands of O'Neill.

In the 16th century, when the English began to make determined efforts to bring the whole of Ireland under subjection to the crown, the O'Donnells of Tyrconnel played a leading part; co-operating at times with the English, especially when such co-operation appeared to promise triumph over their ancient enemies the O'Neills, at other times joining with the latter against the English authorities.

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[1] The Cinel, or Kinel, was a group of related clans occupying an extensive district. See P. W. Joyce, *A Social History of Ireland* (London, 1903); i. 166.

Manus O'Donnell (d. 1564), son of Hugh Dubh O'Donnell, was left by his father to rule Tyrconnel, though still a mere youth, when Hugh Dubh went on a pilgrimage to Rome about 1511. Hugh Dubh had been chief of the O'Donnells during one of the bitterest and most protracted of the feuds between his clan and the O'Neills, which in 1491 led to a war lasting more than ten years. On his return from Rome in broken health after two years' absence, his son Manus, who had proved himself a capable leader in defending his country against the O'Neills, retained the chief authority. A family quarrel ensued, and when Hugh Dubh appealed for aid against his son to the Maguires, Manus made an alliance with the O'Neills, by whose assistance he established his hold over Tyrconnel. But in 1522 the two great northern clans were again at war. Conn Bacach O'Neill, 1st earl of Tyrone, determined to bring the O'Donnells under thorough subjection. Supported by several septs of Munster and Connaught, and assisted also by English contingents and by the MacDonnells of Antrim, O'Neill took the castle of Ballyshannon, and after devastating a large part of Tyrconnel he encamped at Knockavoe, near Strabane. Here he was surprised at night by Hugh Dubh and Manus O'Donnell, and routed with the loss of 900 men and an immense quantity of booty. Although this was one of the bloodiest fights that ever took place between the O'Neills and the O'Donnells, it did not bring the war to an end; and in 1531 O'Donnell applied to the English government for protection, giving assurances of allegiance to Henry VIII. In 1537 Lord Thomas Fitzgerald and his five uncles were executed for rebellion in Munster, and the English government made every effort to lay hands also on Gerald, the youthful heir to the earldom of Kildare, a boy of twelve years of age who was in the secret custody of his aunt Lady Eleanor McCarthy. This lady, in order to secure a powerful protector for the boy, accepted an offer of marriage by Manus O'Donnell, who on the death of Hugh Dubh in July 1537 was inaugurated The O'Donnell. Conn O'Neill was a relative of Gerald Fitzgerald, and this event accordingly led to the formation of the Geraldine League, a federation which combined the O'Neills, the O'Donnells, the O'Briens of Thomond, and other powerful clans; the primary object of which was to restore Gerald to the earldom of Kildare, but which afterwards aimed at the complete overthrow of English rule in Ireland. In August 1539 Manus O'Donnell and Conn O'Neill were defeated with heavy loss by the lord deputy at Lake Bellahoe, in Monaghan, which crippled their power for many years. In the west Manus made unceasing efforts to assert the supremacy of the O'Donnells in north Connaught, where he compelled O'Conor Sligo to acknowledge his overlordship in 1539. In 1542 he went to England and presented himself, together with Conn O'Neill and other Irish chiefs, before Henry VIII., who promised to make him earl of Tyrconnel, though he refused O'Donnell's request to be made earl of Sligo. In his later years Manus was troubled by quarrels between his sons Calvagh and Hugh MacManus; in 1555 he was made prisoner by Calvagh, who deposed him from all authority in Tyrconnel, and he died in 1564. Manus O'Donnell, though a fierce warrior, was hospitable and generous to the poor and the Church. He is described by the Four Masters as "a learned man, skilled in many arts, gifted with a profound intellect, and the knowledge of every science." At his castle of Portnatrynod near Strabane he supervised if he did not actually dictate the writing of the *Life of Saint Columbkille* in Irish, which is preserved in the Bodleian Library at Oxford. Manus was several times married. His first wife, Joan O'Reilly, was the mother of Calvagh, and two daughters, both of whom married O'Neills; the younger, Margaret, was wife of the famous rebel Shane O'Neill. His second wife, Hugh's mother, by whom he was ancestor of the earls of Tyrconnel (see below), was Judith, sister of Conn Bacach O'Neill, 1st earl of Tyrone, and aunt of Shane O'Neill.

Calvagh O'Donnell (d. 1566), eldest son of Manus O'Donnell, in the course of his above-mentioned quarrel with his father and his half-brother Hugh, sought aid in Scotland from the MacDonnells, who assisted him in deposing Manus and securing the lordship of Tyrconnel for himself. Hugh then appealed to Shane O'Neill, who invaded Tyrconnel at the head of a large army in 1557, desiring to make himself supreme throughout Ulster, and encamped on the shore of Lough Swilly. Calvagh, acting apparently on the advice of his father, who was his prisoner and who remembered the successful night attack on Conn O'Neill at Knockavoe in 1522, surprised the O'Neills in their camp at night and routed them with the loss of all their spoils. Calvagh was then recognized by the English government as lord of Tyrconnel; but in 1561 he and his wife were captured by Shane O'Neill in the monastery of Kildonnell. His wife, Catherine Maclean, who had previously been the wife of the earl of Argyll, was kept by Shane O'Neill as his mistress and bore him several children, though grossly ill-treated by her savage captor; Calvagh himself was subjected to atrocious torture during the three years that he remained O'Neill's prisoner. He was released in 1564 on conditions which he had no intention of fulfilling; and crossing to England he threw himself on the mercy of Queen Elizabeth. In 1566 Sir Henry Sidney by the queen's orders marched to Tyrconnel and restored Calvagh to his rights. Calvagh, however, died in the same year, and as his son Conn was a prisoner in the hands of Shane O'Neill, his half-brother Hugh MacManus was inaugurated The O'Donnell in his place. Hugh, who in the family feud with Calvagh had allied himself with O'Neill, now turned round and combined with the English to crush the hereditary enemy of his family; and in 1567 he utterly routed Shane at Letterkenny with the loss of 1300 men, compelling him to seek refuge with the MacDonnells of Antrim, by whom he was treacherously put to death. In 1592 Hugh abdicated in favour of his son Hugh Roe O'Donnell (see below); but there was a member of the elder branch of the family who resented the passing of the chieftainship to the descendants of Manus O'Donnell's second marriage. This was Niall Garve, second son of Calvagh's son Conn. His elder brother was Hugh of Ramelton, whose son John, an officer in the Spanish army, was father of Hugh Baldearg O'Donnell (d. 1704), known in Spain as Count O'Donnell, who commanded an Irish regiment as brigadier in the Spanish service. This officer came to Ireland in 1690 and raised an army in Ulster for the service of James II., afterwards deserting to the side of William III., from whom he accepted a pension.

Niall Garve O'Donnell (1569–1626), who was incensed at the elevation of his cousin Hugh Roe to the chieftainship in 1592, was further alienated when the latter deprived him of his castle of Lifford, and a bitter feud between the two O'Donnells was the result. Niall Garve made terms with the English government, to whom he rendered valuable service both against the O'Neills and against his cousin. But in 1601 he quarrelled with the lord deputy, who, though willing to establish Niall Garve in the lordship of Tyrconnel, would not permit him to enforce his supremacy over Cahir O'Dogherty in Inishowen. After the departure of Hugh Roe from Ireland in 1602, Niall Garve and Hugh Roe's brother Rory went to London, where the privy council endeavoured to arrange the family quarrel, but failed to satisfy Niall. Charged with complicity in Cahir O'Dogherty's rebellion in 1608, Niall Garve was sent to the Tower of London, where he remained till his death in 1626. He married his cousin Nuala, sister of Hugh Roe and Rory O'Donnell. When Rory fled with the earl of Tyrone to Rome in 1607, Nuala, who had deserted her husband when he joined the English against her brother, accompanied him, taking with her her daughter Grania. She was the subject of an Irish poem, of which an English version was written by James Mangan from a prose translation by Eugene O'Curry.

Hugh Roe O'Donnell (1572–1602), eldest son of Hugh MacManus O'Donnell, and grandson of Manus O'Donnell by his second marriage with Judith O'Neill, was the most celebrated member of his clan. His mother was Ineen Dubh, daughter of James MacDonnell of Kintyre; his sister was the second wife of Hugh O'Neill, 2nd earl of Tyrone. These family connexions with the Hebridean Scots and with the O'Neills made the lord deputy, Sir John Perrot, afraid of a powerful combination against the English government, and induced him to establish garrisons in Tyrconnel and to demand hostages from Hugh MacManus O'Donnell, which the latter refused to hand over. In 1587 Perrot conceived a plan for kidnapping Hugh Roe (Hugh the Red), now a youth of fifteen, who had already given proof of exceptional manliness and sagacity. A merchant vessel laden with Spanish wines was sent to Lough Swilly, and anchoring off Rathmullan, where the boy was residing in the castle of MacSweeny his foster parent, Hugh Roe with some youthful companions was enticed on board, when the ship immediately set sail and conveyed the party to Dublin. The boys were kept in prison for more than three years In 1591 young O'Donnell made two attempts to escape, the second of which proved successful; and after enduring terrible privations from exposure in the mountains he made his way to Tyrconnel, where in the following year his father handed the chieftainship over to him. Red Hugh lost no time in leading an expedition against Turlough Luineach O'Neill, then at war with his kinsman Hugh, earl of Tyrone, with whom O'Donnell was in alliance. At the same time he sent assurances of loyalty to the lord deputy, whom he met in person at Dundalk in the summer of 1592. But being determined to vindicate the traditional claims of his family in north Connaught, he aided Hugh Maguire against the English, though on the advice of Tyrone he abstained for a time from committing himself too far. When, however, in 1594 Enniskillen castle was taken and the women and children flung into the river from its walls by order of Sir Richard Bingham, the English governor of Connaught, O'Donnell sent urgent messages to Tyrone for help, and while he himself hurried to Derry to withstand an invasion of Scots from the isles, Maguire defeated the English with heavy loss at Bellanabriska (The Ford of the Biscuits). In 1595 Red Hugh again invaded Connaught, putting to the sword every soul above fifteen years of age unable to speak Irish; he captured Longford and soon afterwards gained possession of Sligo, which placed north Connaught at his mercy. In 1596 he agreed in conjunction with Tyrone to a cessation of hostilities with the English, and consented to meet commissioners from the government near Dundalk. The terms he demanded were, however, refused; and his determination to continue the struggle was strengthened by the prospect of help from Philip II. of Spain, with whom he and Tyrone had been in correspondence. In the beginning of 1597 he made another inroad into Connaught, where O'Conor Sligo had been set up by the English as a counterpoise to O'Donnell. He devastated the country and returned to Tyrconnel with rich spoils; in the following year he shared in Tyrone's victory over the English at the Yellow Ford on the Blackwater; and in 1599 he defeated an attempt by the English under Sir Conyers Clifford, governor of Connaught, to succour O'Conor Sligo in Collooney castle, which O'Donnell captured, forcing Sligo to submission. The government now sent Sir Henry Docwra to Derry, and O'Donnell entrusted to his cousin Niall Garve the task of opposing him. Niall Garve, however, went over to the English, making himself master of O'Donnell's fortresses of Lifford and Donegal. While Hugh Roe was attempting to retake the latter place in 1601, he heard that a Spanish force had landed in Munster. He marched rapidly to the south, and was joined by Tyrone at Bandon; but a night-attack on the English besieging the Spaniards in Kinsale having utterly failed, O'Donnell, who attributed the disaster to the incapacity of the Spanish commander, took ship to Spain on the 6th of January 1602 to lay his complaint before Philip III. He was favourably received by the Spanish king, but he died at Simancas on the 10th of September in the same year.

Rory O'Donnell, 1st earl of Tyrconnel (1575–1608), second son of Hugh MacManus O'Donnell, and younger brother of Hugh Roe, accompanied the latter in the above-mentioned expedition to Kinsale; and when his brother sailed for Spain he transferred his authority as chief to Rory, who led the O'Donnell contingent back to the north. In 1602 Rory gave in his allegiance to Lord Mountjoy, the lord deputy; and in the following summer he went to London with the earl of Tyrone, where he was received with favour by James I., who created him earl of Tyrconnel. In 1605 he was invested with authority as lieutenant of the king in Donegal. But the arrangement between Rory and Niall Garve insisted upon by the government was displeasing to both O'Donnells, and Rory, like Hugh Roe before him, entered into negotiations with Spain. His country had been reduced to a desert by famine and war, and his own reckless extravagance had plunged him deeply in debt. These circumstances as much as the fear that his designs were known to the government may have persuaded him to leave Ireland. In September 1607 "the flight of the earls" (see O'Neill) took place, Tyrconnel and Tyrone reaching Rome in April 1608, where Tyrconnel died on the 28th of July. His wife, the beautiful daughter of the earl of Kildare, was left behind in the haste of Tyrconnel's flight, and lived to marry Nicholas Barnewell, Lord Kingsland. By Tyrconnel she had a son Hugh; and among other children a daughter Mary Stuart O'Donnell, who, born after her father's flight from Ireland, was so named by James I. after his mother. This lady, after many romantic adventures disguised in male attire, married a man called O'Gallagher and died in poverty on the continent.

Rory O'Donnell was attainted by the Irish parliament in 1614, but his son Hugh, who lived at the Spanish Court, assumed the title of earl; and the last titular earl of Tyrconnel was this Hugh's son Hugh Albert, who died without heirs in 1642, and who by his will appointed Hugh Balldearg O'Donnell (see above) his heir, thus restoring the chieftainship to the elder branch of the family. To a still elder branch belonged Daniel O'Donnell (1666–1735), a general of the famous Irish brigade in the French service, whose father, Turlough, was a son of Hugh Dubh O'Donnell, elder brother of Manus, son of an earlier Hugh Dubh mentioned above. Daniel served in the French army in the wars of the period, fighting against Marlborough at Oudenarde and Malplaquet at the head of an O'Donnell regiment. He died in 1735.

The famous Cathach, or Battle-Book of the O'Donnells, was in the possession of General Daniel O'Donnell, from whom it passed to more modern representatives of the family, who presented it to the Royal Irish Academy, where it is preserved. This relic, of which a curious legend is told (see P. W. Joyce, *A Social History of Ancient Ireland*, vol. i. p. 501), is a Psalter said to have belonged to Saint Columba, a kinsman of the O'Donnells, which was carried by them in battle as a charm or talisman to secure victory. Two other circumstances connecting the O'Donnells with ancient Irish literature may be mentioned. The family of O'Clery, to which three of the celebrated "Four Masters" belonged, were hereditary Ollaves (doctors of history, music, law, &c.) attached to the family of O'Donnell; while the "Book of the Dun Cow" (*Lebor-na-h Uidhre*), one of the most ancient Irish MSS., was in the possession of the O'Donnells in the 14th century; and the estimation in which it was held at that time is proved by the fact that it was given to the O'Conors of Connaught as ransom for an important prisoner, and was forcibly recovered some years later.

See O'Neill, and the authorities there cited. (R. J. M.)

O'DONNELL, HENRY JOSEPH (1769–1834), count of La Bisbal, Spanish soldier, was descended from the O'Donnells who left Ireland after the battle of the Boyne.[1] Born in Spain, he early entered the Spanish army, and in 1810 became general, receiving a command in Catalonia, where in that year he earned his title and the rank of field-marshal. He afterwards held posts of great responsibility under Ferdinand VII., whom he served on the whole with constancy; the events of 1823 compelled his flight into France, where he was interned at Limoges, and where he died in 1834. His second son Leopold O'Donnell (1809–1867), duke of Tetuan, Spanish general and statesman, was born at Santa Cruz, Teneriffe, on the 12th of January 1809. He fought in the army of Queen Christina, where he attained the rank of general of division; and in 1840 he accompanied the queen into exile. He failed in an attempt to effect a rising in her favour at Pamplona in 1841, but took a more successful part in the movement which led to the overthrow and exile of

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[1] A branch of the family settled in Austria, and General Karl O'Donnell, count of Tyrconnel (1715–1771), held important commands during the Seven Years' War. The name of a descendant figures in the history of the Italian and Hungarian campaigns of 1848 and 1849.

Espartero in 1843. From 1844 to 1848 he served the new government in Cuba; after his return he entered the senate. In 1854 he became war minister under Espartero, and in 1856 he plotted successfully against his chief, becoming head of the cabinet from the July revolution until October. This rank he again reached in July 1858; and in December 1859 he took command of the expedition to Morocco, and received the title of duke after the surrender of Tetuan. Quitting office in 1863, he again resumed it in June 1865, but was compelled to resign in favour of Narvaez in 1866. He died at Bayonne on the 5th of November 1867.

There is a *Life* of Leopold O'Donnell in *La Corona de laurel*, by Manuel Ibo Alfaro (Madrid, 1860).

O'DONOVAN, EDMUND (1844–1883), British war-correspondent, was born at Dublin on the 13th of September 1844, the son of John O'Donovan (1809–1861), a well-known Irish archaeologist and topographer. In 1866 he began to contribute to the *Irish Times* and other Dublin papers. After the battle of Sedan he joined the Foreign Legion of the French army, and was wounded and taken prisoner by the Germans. In 1873 the Carlist rising attracted him to Spain, and he wrote many newspaper letters on the campaign. In 1876 he represented the London *Daily News* during the rising of Bosnia and Herzegovina against the Turks, and in 1879, for the same paper, made his adventurous and famous journey to Merv. On his arrival at Merv, the Turcomans, suspecting him to be a Russian spy, detained him. It was only after several months' captivity that O'Donovan managed to get a message to his principals through to Persia, whence it was telegraphed to England. These adventures he described in *The Merv Oasis* (1882). In 1883 O'Donovan accompanied the ill-fated expedition of Hicks Pasha to the Egyptian Sudan, and perished with it.

O'DONOVAN, WILLIAM RUDOLF (1844–), American sculptor, was born in Preston county, Virginia, on the 28th of March 1844. He had no technical art training, but after the Civil War, in which he served in the Confederate army, he opened a studio in New York City and became a well-known sculptor, especially of memorial pieces. Among these are statues of George Washington (in Caracas), Lincoln and Grant (Prospect Park, Brooklyn), the captors of Major André (Tarrytown, N.Y.), and Archbishop Hughes (Fordham University, Fordham, N.Y.), and a memorial tablet to Bayard Taylor (Cornell University). In 1878 he become an associate of the National Academy of Design.

ODONTORNITHES, the term proposed by O. C. Marsh (*Am. Journ. Sci.* ser 3, v. (1873) pp. 161–162) for birds possessed of teeth (Gr. ὀδούς, tooth, ὄρνις, ὄρνιθος, bird), notably the genera *Hesperornis* and *Ichthyornis* from the Cretaceous deposits of Kansas. In 1875 (*op. cit.* x. pp. 403–408) he divided the "subclass" into *Odontolcae*, with the teeth standing in grooves, and *Odontotormae*, with the teeth in separate alveoles or sockets. In his magnificent work, *Odontornithes: A monograph on the extinct toothed birds of North America*, New Haven, Connecticut, 1880, he logically added the Saururae, represented by *Archaeopteryx*, as a third order. As it usually happens with the selection of a single anatomical character, the resulting classification was unnatural. In the present case the Odontornithes are a heterogeneous assembly, and the fact of their possessing teeth proves nothing but that birds, possibly all of them, still had these organs during the Cretaceous epoch. This, by itself, is a very interesting point, showing that birds, as a class, are the descendants of well-toothed reptiles, to the complete exclusion of the Chelonia with which various authors persistently try to connect them. No fossil birds of later than Cretaceous age are known to have teeth, and concerning recent birds they possess not even embryonic vestiges.

E. Geoffroy St Hilaire stated in 1821 (*Ann. Gén. Sci. Phys.* viii. pp. 373–380) that he had found a considerable number of tooth-germs in the upper and lower jaws of the parrot *Palaeornis torquatus*. E. Blanchard ("Observations sur le système dentaire chez les oiseaux," *Comptes rendus* 50, 1860, pp. 540–542) felt justified in recognizing flakes of dentine. However, M. Braun (*Arbeit Zool. Inst.*, Würzburg, v. 1879) and especially P. Fraisse (*Phys. Med. Ges.*, Würzburg, 1880) have shown that the structures in question are of the same kind as the well-known serrated "teeth" of the bill of anserine birds. In fact the papillae observed in the embryonic birds are the soft cutaneous extensions into the surrounding horny sheath of the bill, comparable to the well-known nutritive papillae in a horse's hoof. They are easily exposed in the well-macerated under jaw of a parrot, after removal of the horny sheath. Occasionally calcification occurs in or around these papillae, as it does regularly in the "egg-tooth" of the embryos of all birds.

The best known of the Odontornithes are *Hesperornis regalis*, standing about 3 ft. high, and the somewhat taller *H. crassipes*. Both show the general configuration of a diver, but it is only by analogy that *Hesperornis* can be looked upon as ancestral to the Colymbiformes. There are about fourteen teeth in a groove of the maxilla and about twenty-one in the mandible; the vertebrae are typically heterocoelous; of the wing-bones only the very slender and long humerus is known; clavicles slightly reduced; coracoids short and broad, movably connected with the scapula; sternum very long, broad and quite flat, without the trace of a keel. Hind limbs very strong and of the Colymbine type, but the outer or fourth capitulum of the metatarsus is the strongest and longest, an unique arrangement in an otherwise typically steganopodous foot. The pelvis shows much resemblance to that of the divers, but there is still an incisura ischiadica instead of a foramen. The tail is composed of about twelve vertebrae, without a pygostyle. *Enaliornis* of the Cambridge Greensand of England, and *Baptornis* of the mid-Cretaceous of North America, are probably allied, but imperfectly known. The vertebrae are biconcave, with heterocoelous indications in the cervicals; the metatarsal bones appear still somewhat imperfectly anchylosed. The absence of a keel misled Marsh who suspected relationship of *Hesperornis* with the Ratitae, and L. Dollo went so far as to call it a carnivorous, aquatic ostrich (*Bull. Sci. Départ. du Nord*, ser. 2, iv. 1881, p. 300), and this mistaken notion of the "swimming ostrich" was popularized by various authors. B. Vetter (*Festschr. Ges. Isis.*, Dresden, 1885) rightly pointed out that *Hesperornis* was a descendant of Carinatae, but adapted to aquatic life, implying reduction of the keel. Lastly, M. Fürbringer (*Untersuchungen*, Amsterdam, 1888, pp. 1543, 1505, 1580) relegated it, together with *Enaliornis* and the Colymbo-Podicipedes, to his suborder Podicipitiformes. The present writer does not feel justified in going so far. On account of their various, decidedly primitive characters, he prefers to look upon the Odontolcae as a separate group, one of the three divisions of the Neornithes, as birds which form an early offshoot from the later Colymbo-Pelargomorphous stock; in adaptation to a marine, swimming life they have lost the power of flight, as is shown by the absence of the keel and by the great reduction of the wing-skeleton, just as in another direction, away from the later *Alectoromorphous* stock the Ratitae have specialized as runners. It is only in so far as the loss of flight is correlated with the absence of the keel that the Odontolcae and the Ratitae bear analogy to each other.

There remain the *Odontotormae*, notably *Ichthyornis victor*, *I. dispar*, *Apatornis* and *Graculavus* of the middle and upper Cretaceous of Kansas. The teeth stand in separate alveoles; the two halves of the mandible are, as in *Hesperornis*, without a symphysis. The vertebrae are amphicoelous, but at least the third cervical has somewhat saddle-shaped articular facets. Tail composed of five free vertebrae, followed by a rather small pygostyle. Shoulder girdle and sternum well developed and of the typical carinate type. Pelvis still with incisura ischiadica. Marsh based the restoration of *Ichthyornis*, which was obviously a well-flying aquatic bird, upon the skeleton of a tern, a relationship which cannot be supported. The teeth, vertebrae, pelvis and the small brain are all so many low characters that the Odontotormae may well form a separate, and very low, order of the typical Carinatae, of course near the Colymbomorphous Legion. (H. F. G.)

ODORIC (*c.* 1286–1331), styled "of Pordenone," one of the chief travellers of the later middle ages, and a *Beatus* of the Roman Church, was born at Villa Nuova, a hamlet near the town of Pordenone in Friuli, in or about 1286. According to the ecclesiastical biographers, in early years he took the vows of the Franciscan order and joined their convent at Udine, the capital of Friuli.

Friar Odoric was despatched to the East, where a remarkable extension of missionary action was then taking place, about 1316–1318, and did not return till the end of 1329 or beginning of 1330; but, as regards intermediate dates, all that we can deduce from his narrative or other evidence is that he was in western India soon after 1321 (pretty certainly in 1322) and that he spent three years in China between the opening of 1323 and the close of 1328. His route to the East lay by Trebizond and Erzerum to Tabriz and Sultanieh, in all of which places the order had houses. From Sultanieh he proceeded by Kashan and Yázd, and turning thence followed a somewhat devious route by Persepolis and the Shiraz and Bagdad regions, to the Persian Gulf. At Hormuz he embarked for India, landing at Thana, near Bombay. At this city four brethren of his order, three of them Italians and the fourth a Georgian, had shortly before met death at the hands of the Mahommedan governor. The bones of the martyred friars had been collected by Friar Jordanus of Séverac, a Dominican, who carried them to Supera—the *Suppara* of the ancient geographers, near the modern Bassein, about 26 m. north of Bombay—and buried them there Odoric tells that he disinterred these relics and carried them with him on his further travels. In the course of these he visited Malabar, touching at Pandarani (20 m. north of Calicut), at Cranganore, and at Kulam or Quilon, proceeding thence, apparently, to Ceylon and to the shrine of St Thomas at Maylapur near Madras. From India he sailed in a junk to Sumatra, visiting various ports on the northern coast of that island, and thence to Java, to the coast (it would seem) of Borneo, to Champa (South Cochin-China), and to Canton, at that time known to western Asiatics as *Chin-Kalan* or Great China (Mahachin). From Canton he travelled overland to the great ports of Fukien, at one of which, Zayton or Amoy harbour, he found two houses of his order; in one of these he deposited the bones of the brethren who had suffered in India. From Fuchow he struck across the mountains into Cheh-kiang and visited Hangchow, then renowned, under the name of *Cansay*, *Khanzai*, or *Quinsai* (i.e. *Kingsze* or royal residence), as the greatest city in the world, of whose splendours Odoric, like Marco Polo, Marignolli, or Ibn Batuta, gives notable details. Passing northward by Nanking and crossing the Yangtsze-kiang, Odoric embarked on the Great Canal and travelled to *Cambalec* (otherwise *Cambaleth*, *Cambaluc*, &c.) or Peking, where he remained for three years, attached, no doubt, to one of the churches founded by Archbishop John of Monte Corvino, at this time in extreme old age. Returning overland across Asia, through the Land of Prester John and through Casan, the adventurous traveller seems to have entered Tibet, and even perhaps to have visited Lhasa. After this we trace the friar in northern Persia, in Millestorte, once famous as the Land of the Assassins in the Elburz highlands. No further indications of his homeward route (to Venice) are given, though it is almost certain that he passed through Tabriz. The vague and fragmentary character of the narrative, in this section, forcibly contrasts with the clear and careful tracing of the outward way. During a part at least of these long journeys the companion of Odoric was Friar James, an Irishman, as appears from a record in the public books of Udine, showing that shortly after Odoric's death a present of two marks was made to this Irish friar, *Socio beati Fratris Odorici, amore Dei et Odorici.* Shortly after his return Odoric betook himself to the Minorite house attached to St Anthony's at Padua, and it was there that in May 1330 he related the story of his travels, which was taken down in homely Latin by Friar William of Solagna. Travelling towards the papal court at Avignon, Odoric fell ill at Pisa, and turning back to Udine, the capital of his native province, died in the convent there on the 14th of January 1331. The fame of his vast journeys appears to have made a much greater impression on the laity of his native territory than on his Franciscan brethren. The latter were about to bury him without delay or ceremony, but the *gastald* or chief magistrate of the city interfered and appointed a public funeral; rumours of his wondrous travels and of posthumous miracles were diffused, and excitement spread like wildfire over Friuli and Carniola; the ceremony had to be deferred more than once, and at last took place in presence of the patriarch of Aquileia and all the local dignitaries. Popular acclamation made him an object of devotion, the municipality erected a noble shrine for his body, and his fame as saint and traveller had spread far and wide before the middle of the century, but it was not till four centuries later (1755) that the papal authority formally sanctioned his beatification. A bust of Odoric was set up at Pordenone in 1881.

The numerous copies of Odoric's narrative (both of the original text and of the versions in French, Italian, &c.) that have come down to our time, chiefly from the 14th century, show how speedily and widely it acquired popularity. It does not deserve the charge of mendacity brought against it by some, though the adulation of others is nearly as injudicious. Odoric's credit was not benefited by the liberties which Sir John Mandeville took with it. The substance of that knight's alleged travels in India and Cathay is stolen from Odoric, though amplified with fables from other sources and from his own invention, and garnished with his own unusually clear astronomical notions. We may indicate a few passages which stamp Odoric as a genuine and original traveller. He is the first European, after Marco Polo, who distinctly mentions the name of Sumatra. The cannibalism and community of wives which he attributes to certain races of that island do certainly belong to it, or to islands closely adjoining. His description of sago in the archipelago is not free from errors, but they are the errors of an eye-witness. In China his mention of Canton by the name of *Censcolam* or *Censcalam* (Chin-Kalan), and his descriptions of the custom of fishing with tame cormorants, of the habit of letting the finger-nails grow extravagantly, and of the compression of women's feet, are peculiar to him among the travellers of that age; Marco Polo omits them all.

Seventy-three MSS. of Odoric's narrative are known to exist in Latin, French and Italian: of these the chief is in Paris, National Library, MSS. Lat. 2584, fols. 118 r.–127 v., of about 1350. The narrative was first printed at Pesaro in 1513, in what Apostolo Zeno calls *lingua inculta e rozza.* Ramusio's collection first contains it in the 2nd vol. of the 2nd edition (1574) (Italian version), in which are given two versions, differing curiously from one another, but without any prefatory matter or explanation. (See also edition of 1583, vol. ii. fols. 245 r.–256 r.) Another (Latin) version is given in the *Acta Sanctorum* (Bollandist) under the 14th of January. The curious discussion before the papal court respecting the beatification of Odoric forms a kind of blue-book issued *ex typographia rev. camerae apostolicae* (Rome, 1755). Professor Friedrich Kunstmann of Munich devoted one of his valuable papers to Odoric's narrative (*Histor.-polit. Blätter von Phillips und Görres*, vol. xxxviii. pp. 507–537). The best editions of Odoric are by G. Venni, *Elogio storico alle gesta del Beato Odorico* (Venice, 1761); H. Yule in *Cathay and the Way Thither*, vol. i. pp. 1-162, vol. ii. appendix, pp. 1-42 (London, 1866), Hakluyt Society; and H. Cordier, *Les Voyages . . . du . . . frère Odoric . . .* (Paris, 1891) (edition of Old French version of *c.* 1350). The edition by T. Domenichelli (Prato, 1881) may also be mentioned; likewise those texts of Odoric embedded in the *Storia universale delle Missione Francescane*, iii. 739-781, and in Hakluyt's *Principal Navigations* (1599), ii. 39-67. See also John of Viktring (Joannes Victoriensis) in *Fontes rerum Germanicarum*, ed. J. F. Boehmer; vol. i. ed. by J. G. Cotta (Stuttgart, 1843), p. 391; Wadding, *Annales Minorum*, A.D. 1331, vol. vii. pp. 123-126; Bartholomew Albizzi, *Opus conformitatum . . . B. Francisci . . .*, bk. i. par. ii. conf. 8 (fol. 124 of Milan, edition of 1513); John of Winterthur in Eccard, *Corpus historicum medii aevi*, vol. i. cols. 1894-1897, especially 1894; C. R. Beazley, *Dawn of Modern Geography*, iii. 250-287, 548-549, 554, 565-566, 612-613, &c.

(H. Y.; C. R. B.)

ODYLIC FORCE, a term once in vogue to explain the phenomenon of hypnotism (*q.v.*). In 1845 considerable attention was drawn to the announcement by Baron von Reichenbach of a so-called new "imponderable" or "influence" developed by certain crystals, magnets, the human body, associated with heat, chemical action, or electricity, and existing throughout the universe, to which he gave the name of *odyl*. Persons sensitive to odyl saw luminous phenomena near the poles of magnets, or even around the hands or heads of certain persons in whose bodies the force was supposed to be concentrated. In Britain an impetus was given to this view of the subject by the translation in 1850 of Reichenbach's *Researches on Magnetism, &c., in relation to Vital Force*, by Dr Gregory, professor of chemistry in the university of Edinburgh. These *Researches* show many of the phenomena to be of the same nature as those described previously by F. A. Mesmer, and even long before Mesmer's time by Swedenborg.

ODYSSEUS (in Latin *Ulixes*, incorrectly written Ulysses), in Greek legend, son of Laërtes and Anticleia, king of Ithaca, a famous hero and typical representative of the Greek race. In Homer he is one of the best and bravest of the heroes, and the favourite of Athena, whereas in later legend he is cowardly and deceitful. Soon after his marriage to Penelope he was summoned to the Trojan war. Unwilling to go, he feigned madness, ploughing a field sown with salt with an ox and an ass yoked together; but Palamedes discovered his deceit by placing his infant child Telemachus in front of the plough; Odysseus afterwards revenged himself by compassing the death of Palamedes. During the war, he distinguished himself as the wisest adviser of the Greeks, and finally, the capture of Troy, which the bravery of Achilles could not accomplish, was attained by Odysseus' stratagem of the wooden horse. After the death of Achilles the Greeks adjudged his armour to Odysseus as the man who had done most to end the war successfully. When Troy was captured he set sail for Ithaca, but was carried by unfavourable winds to the coast of Africa. After encountering many adventures in all parts of the unknown seas, among the lotus-eaters and the Cyclopes, in the isles of Aeolus and Circe and the perils of Scylla and Charybdis, among the Laestrygones, and even in the world of the dead, having lost all his ships and companions, he barely escaped with his life to the island of Calypso, where he was detained eight years, an unwilling lover of the beautiful nymph. Then at the command of Zeus he was sent homewards, but was again wrecked on the island of Phaeacia, whence he was conveyed to Ithaca in one of the wondrous Phaeacian ships. Here he found that a host of suitors, taking advantage of the youth of his son Telemachus, were wasting his property and trying to force Penelope to marry one of them. The stratagems and disguises by which with the help of a few faithful friends he slew the suitors are described at length in the *Odyssey*. The only allusion to his death is contained in the prophecy of Teiresias, who promised him a happy old age and a peaceful death from the sea. According to a later legend, Telegonus, the son of Odysseus by Circe, was sent by her in search of his father. Cast ashore on Ithaca by a storm, he plundered the island to get provisions, and was attacked by Odysseus, whom he slew. The prophecy was thus fulfilled. Telegonus, accompanied by Penelope and Telemachus, returned to his home with the body of his father, whose identity he had discovered.

According to E. Meyer (*Hermes*, xxx. p. 267), Odysseus is an old Arcadian nature god identical with Poseidon, who dies at the approach of winter (retires to the western sea or is carried away to the underworld) to revive in spring (but see E. Rohde, *Rhein. Mus.* l. p. 631). A more suitable identification would be Hermes. Mannhardt and others regard Odysseus as a solar or summer divinity, who withdraws to the underworld during the winter, and returns in spring to free his wife from the suitors (the powers of winter). A. Gercke (*Neue Jahrbücher für das klassische Altertum*, xv. p. 331) takes him to be an agricultural divinity akin to the sun god, whose wife is the moon-goddess Penelope, from whom he is separated and reunited to her on the day of the new moon. His cult early disappeared; in Arcadia his place was taken by Poseidon. But although the personality of Odysseus may have had its origin in some primitive religious myth, chief interest attaches to him as the typical representative of the old sailor-race whose adventurous voyages educated and moulded the Hellenic race. The period when the character of Odysseus took shape among the Ionian bards was when the Ionian ships were beginning to penetrate to the farthest shores of the Black Sea and to the western side of Italy, but when Egypt had not yet been freely opened to foreign intercourse. The adventures of Odysseus were a favourite subject in ancient art, in which he may usually be recognized by his conical sailor's cap.

See article by J. Schmidt in Roscher's *Lexikon der Mythologie* (where the different forms of the name and its etymology are fully discussed); O. Gruppe, *Griechische Mythologie*, ii. pp. 624, 705-718; J. E. Harrison, *Myths of the Odyssey in Art and Literature* (1881), with appendix on authorities. W. Mannhardt, *Wald- und Feldkulte* (1905), ii. p. 106; O. Seeck. *Gesch. des Untergangs der antiken Welt*, ii. p. 576; G. Fougères, *Mantinée et l'Arcadie orientale* (1898), according to whom Odysseus is an Arcadian chthonian divinity and Penelope a goddess of flocks and herds, akin to the Arcadian Artemis; S. Eitrem, *Die göttlichen Zwillinge bei den Griechen* (1902), who identifies Odysseus with one of the Dioscuri ('Ολυκγες = Πολυδεύκης); V. Bérard, *Les Phéniciens et l'Odyssée* (1902–1903), who regards the *Odyssey* as "the integration in a Greek *νόστος* (home-coming) of a Semitic periplus," in the form of a poem written 900–850 B.C. by an Ionic poet at the court of one of the Neleid kings of Miletus. For an estimate of this work, the interest of which is mainly geographical, see *Classical Review* (April 1904) and *Quarterly Review* (April 1905). It consists of two large volumes, with 240 illustrations and maps.

OEBEN, JEAN FRANÇOIS, French 18th-century cabinet-maker, is believed to have been of German or Flemish origin; the date of his birth is unknown, but he was dead before 1767. In 1752, twenty years after Boulle's death, we find him occupying an apartment in the Louvre sublet to him by Charles Joseph Boulle, whose pupil he may have been. He has sometimes been confused with Simon Oeben, presumably a relative, who signed a fine bureau in the Jones collection at the Victoria and Albert Museum. J. F. Oeben is also represented in that collection by a pair of inlaid corner-cupboards. These with a bureau and a chiffonier in the Garde Meuble in which bouquets of flowers are delicately inlaid in choice woods are his best-known and most admirable achievements. He appears to have worked extensively for the marquise de Pompadour by whose influence he was granted lodgings at the Gobelins and the title of "Ébéniste du Roi" in 1754. There he remained until 1760, when he obtained an apartment and workshops at the Arsenal. His work in marquetry is of very great distinction, but he would probably never have enjoyed so great a reputation had it not been for his connexion with the famous Bureau du Roi, made for Louis XV., which appears to have owed its inception to him, notwithstanding that it was not completed until some considerable time after his death and is signed by J. H. Riesener (*q.v.*) only. Documentary evidence under the hand of the king shows that it was ordered from Oeben in 1760, the year in which he moved to the Arsenal. The known work of Oeben possesses genuine grace and beauty; as craftsmanship it is of the first rank, and it is remarkable that, despite his Teutonic or Flemish origin, it is typically French in character.

OECOLAMPADIUS, JOHN (1482–1531), German Reformer, whose real name was Hussgen or Heussgen,[1] was born at Weinsberg, a small town in the north of the modern kingdom of Württemberg, but then belonging to the Palatinate. He went to school at Weinsberg and Heilbronn, and then, intending to study law, he went to Bologna, but soon returned to Heidelberg and betook himself to theology. He became a zealous student of the new learning and passed from the study of Greek to that of Hebrew, taking his bachelor's degree in 1503. He became cathedral preacher at Basel in 1515, serving under Christopher von Uttenheim, the evangelical bishop of Basel. From the beginning the sermons of Oecolampadius centred in the Atonement, and his first reformatory zeal showed itself in a protest (*De risu paschali*, 1518) against the introduction of humorous stories into Easter sermons. In 1520 he published his *Greek Grammar*. The same year he was asked to become preacher in the high church in Augsburg. Germany was then ablaze with the questions raised by Luther's theses, and his introduction into this new world, when at first he championed Luther's position especially in his anonymous *Canonici indocti* (1519), seems to have compelled Oecolampadius to severe self-examination, which ended in his entering a convent and becoming a monk. A short experience convinced him that this was not for him the ideal Christian life (" amisi monachum, inveni Christianum "), and in February 1522 he made his way to Ebernburg, near Creuznach, where he acted as chaplain to the little group of men holding the new opinions who had settled there under the leadership of Franz von Sickingen.

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[1] Changed to Hausschein and then into the Greek equivalent.

The second period of Oecolampadius's life opens with his return to Basel in November 1522, as vicar of St Martin's and (in 1523) reader of the Holy Scripture at the university. Lecturing on Isaiah he condemned current ecclesiastical abuses, and in a public disputation (20th of August 1523) was so successful that Erasmus writing to Zürich said " Oecolampadius has the upper hand amongst us." He became Zwingli's best helper, and after more than a year of earnest preaching and four public disputations in which the popular verdict had been given in favour of Oecolampadius and his friends, the authorities of Basel began to see the necessity of some reformation. They began with the convents, and Oecolampadius was able to refrain in public worship on certain festival days from some practices he believed to be superstitious. Basel was slow to accept the Reformation; the news of the Peasants' War and the inroads of Anabaptists prevented progress; but at last, in 1525, it seemed as if the authorities were resolved to listen to schemes for restoring the purity of worship and teaching. In the midst of these hopes and difficulties Oecolampadius married, in the beginning of 1528, Wilibrandis Rosenblatt, the widow of Ludwig Keller, who proved to be *non rixosa vel garrula vel vaga*, he says, and made him a good wife. After his death she married Capito, and, when Capito died, Bucer. She died in 1564. In January 1528 Oecolampadius and Zwingli took part in the disputation at Berne which led to the adoption of the new faith in that canton, and in the following year to the discontinuance of the mass at Basel. The Anabaptists claimed Oecolampadius for their views, but in a disputation with them he dissociated himself from most of their positions. He died on the 24th of November 1531.

Oecolampadius was not a great theologian, like Luther, Zwingli or Calvin, and yet he was a trusted theological leader. With Zwingli he represented the Swiss views at the unfortunate conference at Marburg. His views on the Eucharist upheld the metaphorical against the literal interpretation of the word " body," but he asserted that believers partook of the sacrament more for the sake of others than for their own, though later he emphasized it as a means of grace for the Christian life. To Luther's doctrine of the ubiquity of Christ's body he opposed that of the presence and activity of the Holy Spirit in the church. He did not minutely analyse the doctrine of predestination as Luther, Calvin and Zwingli did, contenting himself with the summary " Our Salvation is of God, our perdition of ourselves."

See J. J. Herzog, *Leben Joh. Oecolampads u. die Reformation der Kirche zu Basel* (1843); K. R. Hagenbach, *Johann Oecolampad u. Oswald Myconius, die Reformatoren Basels* (1859). For other literature see W. Hadorn's art. in Herzog-Hauck's *Realencyklopädie für prot. Rel. u. Kirche.*

OECOLOGY, or Ecology (from Gr. *οἶκος*, house, and *λόγος*, department of science), that part of the science of biology which treats of the adaptation of plants or animals to their environment (see Plants: *Ecology*).

OECUMENICAL (through the Lat. from Gr. *οἰκουμενικός*, universal, belonging to the whole inhabited world, *ἡ οἰκουμένη sc. γῆ*, *οἰκεῖν*, to dwell), a word chiefly used in the sense of belonging to the universal Christian Church. It is thus specifically applied to the general councils of the early church (see Council). In the Roman Church a council is regarded as oecumenical when it has been summoned from the whole church under the presidency of the pope or his legates; the decrees confirmed by the pope are binding. The word has also been applied to assemblies of other religious bodies, such as the Oecumenical Methodist Conferences, which met for the first time in 1881. " Oecumenical " has also been the title of the patriarch of Constantinople since the 6th century (see Orthodox Eastern Church).

OECUS, the Latinized form of Gr. *οἶκος*, house, used by Vitruvius for the principal hall or saloon in a Roman house, which was used occasionally as a triclinium for banquets. When of great size it became necessary to support its ceiling with columns; thus, according to Vitruvius, the tetrastyle oecus had four columns; in the Corinthian oecus there was a row of columns on each side, virtually therefore dividing the room into nave and aisles, the former being covered over with a semicircular ceiling. The Egyptian oecus had a similar plan, but the aisles were of less height, so that clerestory windows were introduced to light the room, which, as Vitruvius states, presents more the appearance of a basilica than of a triclinium.

OEDIPUS (*Οἰδίπους*, *Οἰδιπόδης*, *Οἴδιπος*, from Gr. *οἰδεῖν* swell, and *πούς* foot, *i.e.* " the swollen-footed ") [1] in Greek legend, son of Laïus, king of Thebes, and Jocasta (Iocastē). Laïus, having been warned by an oracle that he would be killed by his son, ordered him to be exposed, with his feet pierced, immediately after his birth. Thus Oedipus grew up ignorant of his parentage, and, meeting Laïus in a narrow way, quarrelled with him and slew him. The country was ravaged by a monster, the Sphinx; Oedipus solved the riddle which it proposed to its victims, freed the country, and married his own mother. In the *Odyssey* it is said that the gods disclosed the impiety. Epicastē (as Jocasta is called in Homer) hanged herself, and Oedipus lived as king in Thebes tormented by the Erinyes of his mother. In the tragic poets the tale takes a different form. Oedipus fulfils an ancient prophecy in killing his father; he is the blind instrument in the hands of fate. The further treatment of the tale by Aeschylus is unknown. Sophocles describes in his *Oedipus Tyrannus* how Oedipus was resolved to pursue to the end the mystery of the death of Laïus, and thus unravelled the dark tale, and in horror put out his own eyes. The sequel of the tale is told in the *Oedipus Coloneus*. Banished by his sons, he is tended by the loving care of his daughters. He comes to Attica and dies in the grove of the Eumenides at Colonus, in his death welcomed and pardoned by the fate which had pursued him throughout his life. In addition to the two tragedies of Sophocles, the legend formed the subject of a trilogy by Aeschylus, of which only the *Seven against Thebes* is extant; of the *Phoenissae* of Euripides; and of the *Oedipus* and *Phoenissae* of Seneca.

See A. Höfer's exhaustive article in Roscher's *Lexikon der Mythologie*; F. W. Schneidewin, *Die Sage von Oedipus* (1852); D. Comparetti, *Edipo e la mitologia comparata* (1867); M. Bréal, " Le Mythe d'Œdipe," in *Mélanges de mythologie* (1878), who explains Oedipus as a personification of light, and his blinding as the disappearance of the sun at the end of the day; J. Paulson in *Eranos. Acta philologica Suecana*, i. (Upsala, 1896) places the original home of the legend in Egyptian Thebes, and identifies Oedipus with the Egyptian god Seth, represented as the hippopotamus " with swollen foot," which was said to kill its father in order to take its place with the mother. O. Crusius (*Beiträge zur griechischen Mythologie*, 1886, p. 21) sees in the marriage of Oedipus with his mother an agrarian myth (with special reference to *Oed. Tyr.* 1497), while Höfer (in Roscher's *Lexikon*) suggests that the episodes of the murder of his father and of his marriage are reminiscences of the overthrow of Cronus by Zeus and of the union of Zeus with his own sister.

Medieval Legends.—In the *Golden Legend* of Jacobus de Voragine (13th century) and the *Mystère de la Passion* of Jean Michel (15th century) and Arnoul Gréban (15th century), the story of Oedipus is associated with the name of Judas. The main idea is the same as in the classical account. The Judas legend, however, never really became popular, whereas that of Oedipus was handed down both orally and in written national tales (Albanian, Finnish, Cypriote). One incident (the incest unwittingly committed) frequently recurs in connexion with the life of Gregory the Great. The Theban legend, which reached its fullest development in the *Thebaïs* of Statius and in Seneca, reappeared in the *Roman de Thèbes* (the work of an unknown imitator of Benoît de Sainte-More). Oedipus is also the subject of an anonymous medieval romance (15th century), *Le Roman d'Œdipus, fils de Layus*, in which the sphinx is depicted as a cunning and ferocious giant. The Oedipus legend was handed down to the period of the Renaissance by the *Roman* and its imitations, which then fell into oblivion. Even to the present day the legend has survived amongst the modern Greeks, without any traces of the influence of Christianity (B. Schmidt, *Griechische Märchen*, 1877). The works of the ancient tragedians (especially Seneca, in preference to the Greek) came into vogue, and were slavishly followed by French and Italian imitators down to the 17th century.

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[1] It is probable that the story of the piercing of his feet is a subsequent invention to explain the name, or is due to a false etymology (from *οἰδέω*), *οἰδίπους* in reality meaning the " wise " (from *οἶδα*), chiefly in reference to his having solved the riddle, the syllable *-πους* having no significance.

See L. Constans, *La Légende d'Œdipe dans l'antiquité, au moyen âge, et dans les temps modernes* (1881); D. Comparetti's *Edipo* and Jebb's introduction for the *Oedipus* of Dryden, Corneille and Voltaire; A. Heintze, *Gregorius auf dem Steine, der mittelalterliche Oedipus* (progr., Stolp, 1877); V. Diederichs, "Russische Verwandte der Legende von Gregor auf dem Stein und der Sage von Judas Ischariot," in *Russische Revue* (1880); S. Novakovitch, "Die Oedipussage in der südslavischen Volksdichtung," in *Archiv für slavische Philologie* xi. (1888).

OEHLER, GUSTAV FRIEDRICH (1812–1872), German theologian, was born on the 10th of June 1812 at Ebingen, Württemberg, and was educated privately and at Tübingen where he was much influenced by J. C. F. Steudel, professor of Old Testament Theology. In 1837, after a term of Oriental study at Berlin, he went to Tübingen as *Repetent*, becoming in 1840 professor at the seminary and pastor in Schönthal. In 1845 he published his *Prolegomena zur Theologie des Alten Testaments*, accepted an invitation to Breslau and received the degree of doctor from Bonn. In 1852 he returned to Tübingen as director of the seminary and professor of Old Testament Theology at the university. He declined a call to Erlangen as successor to Franz Delitzsch (1867), and died at Tübingen on the 19th of February 1872. Oehler admitted the composite authorship of the Pentateuch and the Book of Isaiah, and did much to counteract the antipathy against the Old Testament that had been fostered by Schleiermacher. In church polity he was Lutheran rather than Reformed. Besides his *Old Testament Theology* (Eng. trans., 2 vols., Edinburgh, 1874–1875), his works were *Gesammelte Seminarreden* (1872) and *Lehrbuch Symbolik* (1876), both published posthumously, and about forty articles for the first edition of Herzog's *Realencyklopädie* which were largely retained by Delitzsch and von Orelli in the second.

OEHRINGEN, a town of Germany, in the kingdom of Württemberg, agreeably situated in a fertile country, on the Ohrn, 12 m. E. from Heilbronn by the railways to Hall and Crailsheim. Pop. (1905) 3,450. It is a quaint medieval place, and, among its ancient buildings, boasts a fine Evangelical church, containing carvings in cedar-wood of the 15th century and numerous interesting tombs and monuments; a Renaissance town hall; the building, now used as a library, which formerly belonged to a monastery, erected in 1034; and a palace, the residence of the princes of Hohenlohe-Oehringen.

Oehringen is the *Vicus Aurelii* of the Romans. Eastwards of it ran the old Roman frontier wall, and numerous remains and inscriptions dating from the days of the Roman settlement have been recently discovered, including traces of three camps.

See Keller, *Vicus Aurelii, oder Öhringen zur Zeit der Römer* (Bonn, 1872).

OELS, a town of Germany, in the Prussian province of Silesia, formerly the capital of a mediatized principality of its own name. It lies in a sandy plain on the Oelsbach, 20 m. N.E. of Breslau by rail. Pop. (1905) 10,940. The princely château, now the property of the crown prince of Prussia, dating from 1558 and beautifully restored in 1891–1894, contains a good library and a collection of pictures. Of its three Evangelical churches, the Schlosskirche dates from the 13th century and the Propstkirche from the 14th. The inhabitants are chiefly engaged in making shoes and growing vegetables for the Breslau market.

Oels was founded about 940, and became a town in 1255. It appears as the capital of an independent principality at the beginning of the 14th century. The principality, with an area of 700 sq. m. and about 130,000 inhabitants, passed through various hands and was inherited by the ducal family of Brunswick in 1792. Then on the extinction of this family in 1884 it lapsed to the crown of Prussia.

See W. Häusler, *Geschichte des Fürstentums Öls bis zum Aussterben der piastischen Herzogslinie* (Breslau, 1883); and Schulze, *Die Succession im Fürstentum Öls* (Breslau, 1884).

OELSCHLÄGER [OLEARIUS], **ADAM** (1600–1671), German traveller and Orientalist, was born at Aschersleben, near Magdeburg, in 1599 or 1600. After studying at Leipzig he became librarian and court mathematician to Duke Frederick III. of Holstein-Gottorp, and in 1633 he was appointed secretary to the ambassadors Philip Crusius, jurisconsult, and Otto Brüggemann or Brugman, merchant, sent by the duke to Muscovy and Persia in the hope of making arrangements by which his newly-founded city of Friedrichstadt should become the terminus of an overland silk-trade. This embassy started from Gottorp on the 22nd of October 1633, and travelled by Hamburg, Lübeck, Riga, Dorpat (five months' stay), Revel, Narva, Ladoga and Novgorod to Moscow (August 14, 1634). Here they concluded an advantageous treaty with Michael Romanov, and returned forthwith to Gottorp (December 14, 1634–April 7, 1635) to procure the ratification of this arrangement from the duke, before proceeding to Persia. This accomplished, they started afresh from Hamburg on the 22nd of October 1635, arrived at Moscow on the 29th of March 1636; and left Moscow on the 30th of June for Nizhniy Novgorod, whither they had already sent agents (in 1634–1635) to prepare a vessel for their descent of the Volga. Their voyage down the great river and over the Caspian was slow and hindered by accidents, especially by grounding, as near Derbent on the 14th of November 1636; but at last, by way of Shemakha (three months' delay here), Ardebil, Sultanieh and Kasvin, they reached the Persian court at Isfahan (August 3, 1637), and were received by the shah (August 16). Negotiations here were not as successful as at Moscow, and the embassy left Isfahan on the 21st of December 1637, and returned home by Resht, Lenkoran, Astrakhan, Kazan, Moscow, &c. At Revel Oelschläger parted from his colleagues (April 15, 1639) and embarked direct for Lübeck. On his way he had made a chart of the Volga, and partly for this reason the tsar Michael wished to persuade, or compel, him to enter his service. Once back at Gottorp, Oelschläger became librarian to the duke, who also made him keeper of his Cabinet of Curiosities, and induced the tsar to excuse his (promised) return to Moscow. Under his care the Gottorp library and cabinet were greatly enriched in MSS., books, and oriental and other works of art: in 1651 he purchased, for this purpose, the collection of the Dutch scholar and physician, Bernard ten Broecke ("Paludanus"). He died at Gottorp on the 22nd of February 1671.

It is by his admirable narrative of the Russian and the Persian legation (*Beschreibung der muscowitischen und persischen Reise*, Schleswig, 1647, and afterwards in several enlarged editions, 1656, &c.) that Oelschläger is best known, though he also published a history of Holstein (*Kurtzer Begriff einer holsteinischen Chronic*, Schleswig, 1663), a famous catalogue of the Holstein-Gottorp cabinet (1666), and a translation of the Gulistan (*Persianisches Rosenthal*, Schleswig, 1654), to which was appended a translation of the fables of Lokman. A French version of the *Beschreibung* was published by Abraham de Wicquefort (*Voyages en Moscovie, Tartarie et Perse, par Adam Olearius*, Paris, 1656), an English version was made by John Davies of Kidwelly (*Travels of the Ambassadors sent by Frederic, Duke of Holstein, to the Great Duke of Muscovy and the King of Persia*, London, 1662; 2nd ed., 1669), and a Dutch translation by Dieterius van Wageningen (*Beschrijvingh van de nieuwe Parciaensche ofte Orientaelsche Reyse*, Utrecht, 1651); an Italian translation of the Russian sections also appeared (*Viaggi di Moscovia*, Viterbo and Rome, 1658). Paul Flemming the poet and J. A. de Mandelslo, whose travels to the East Indies are usually published with those of Oelschläger, accompanied the embassy. Under Oelschläger's direction the celebrated globe of Gottorp (11 ft. in diameter) and armillary sphere were executed in 1654–1664; the globe was given to Peter the Great of Russia in 1713 by Duke Frederick's grandson, Christian Augustus. Oelschläger's unpublished works include a *Lexicon Persicum* and several other Persian studies. (C. R. B.)

OELSNITZ, a town of Germany, in the kingdom of Saxony, on the Weisse Elster, 26 m. by rail S.W. of Zwickau. Pop. (1905) 13,966. It has two Evangelical churches, one of them being the old Gothic Jakobskirche, and several schools. There are various manufactories. Oelsnitz belonged in the 14th and 15th centuries to the margraves of Meissen, and later to the electors of Saxony. Near it is the village of Voigtsberg, with the remains of a castle, once a residence of the governor (Vogt) of the Vogtland.

See Jahn, *Chronik der Stadt Ölsnitz* (1875).

OELWEIN, a city of Fayette county, Iowa, U.S.A., in the N.E. part of the state, about 132 m. N.E. of Des Moines. Pop. (1890) 830; (1900) 5142, of whom 789 were foreign-born; (1910 U.S. census) 6028. It is served by the Chicago, Rock Island & Pacific and the Chicago Great Western railways, the latter having large repair shops here, where four lines of its road converge. Oelwein was named in honour of its founder, August Oelwein, who settled here in 1873; it was incorporated in 1888, and chartered as a city in 1897.

OENOMAÜS, in Greek legend, son of Ares and Harpinna, king of Pisa in Elis and father of Hippodameia. It was predicted that he should be slain by his daughter's husband. His father, the god Ares-Hippius, gave him winged horses swift as the wind, and Oenomaüs promised his daughter to the man who could outstrip him in the chariot race, hoping thus to prevent her marriage altogether. Pelops, by the treachery of Myrtilus, the charioteer of Oenomaüs, won the race and married Hippodameia. The defeat of Oenomaüs by Pelops, a stranger from Asia Minor, points to the conquest of native Ares-worshippers by immigrants who introduced the new religion of Zeus.

See Diod. Sic. iv. 73; Pausanias vi. 21, and elsewhere; Sophocles, *Electra*, 504; Hyginus, *Fab.* 84. 253. Fig. 33 in article Greek Art represents the preparations for the chariot race.

OENONE, in Greek legend, daughter of the river-god Kebren and wife of Paris. Possessing the gift of divination, she warned her husband of the evils that would result from his journey to Greece. The sequel was the rape of Helen and the Trojan War. Just before the capture of the city, Paris, wounded by Philoctetes with one of the arrows of Heracles, sought the aid of the deserted Oenone, who had told him that she alone could heal him if wounded. Indignant at his faithlessness, she refused to help him, and Paris returned to Troy and died of his wound. Oenone soon repented and hastened after him, but finding that she was too late to save him slew herself from grief at the sight of his dead body. Ovid (*Heroïdes*, 5) gives a pathetic description of Oenone's grief when she found herself deserted.

OERLAMS, the name (said to be a corruption of the Dutch *Oberlanders*) for a Hottentot tribal group living in Great Namaqualand. They came originally from Little Namaqualand in Cape Colony. They are of very mixed Hottentot-Bantu blood.

OESEL (in Esthonian *Kure-saare* or *Saare-ma*), a Russian island in the Baltic, forming with Worms, Mohn and Runö, a district of the government of Livonia, and lying across the mouth of the Gulf of Riga, 106 m. N.N.W. of the city of Riga. It has a length of 45 m., and an area of 1010 sq. m. The coasts are bold and steep, and, especially towards the north and west, form precipitous limestone cliffs. Like those of Shetland, the Oesel ponies are small, but prized for their spirit and endurance. The population, numbering 50,566 in 1870 and 60,000 in 1900, is mainly Protestant in creed, and, with the exception of the German nobility, clergy and some of the townsfolk, Esthonian by race. The chief town, Arensburg, on the south coast, is a place of 4600 inhabitants, with summer sea-bathing, mud baths and a trade in grain, potatoes, whisky and fish. In 1227 Oesel was conquered by the Knights of the Sword, and was governed by its own bishops till 1561, when it passed into the hands of the Danes. By them it was surrendered to the Swedes by the peace of Brömsebro (1645), and, along with Livonia, it was united to Russia in 1721.

OESOPHAGUS (Gr. οἴσω=I will carry, and φαγεῖν, to eat), in anatomy, the gullet; see Alimentary Canal for comparative anatomy. The human oesophagus is peculiarly liable to certain accidents and diseases, due both to its function as a tube to carry food to the stomach and to its anatomical situation (see generally Digestive Organs). One of the commonest accidents is the lodgment of foreign bodies in some part of the tube. The situations in which they are arrested vary with the nature of the body, whether it be a coin, fishbone, toothplate or a portion of food. An impacted substance may be removed by the oesophageal forceps, or by a coin-catcher; if it should be impossible to draw it up it may be pushed down into the stomach. When it is in the stomach a purgative should never be given, but soft food such as porridge. Should gastric symptoms develop it may have to be removed by the operation of gastrotomy. Charring and ulceration of the oesophagus may occur from the swallowing of corrosive liquids, strong acids or alkalis, or even of boiling water. Stricture of the oesophagus is a closing of the tube so that neither solids nor liquids are able to pass down into the stomach. There are three varieties of stricture; spasmodic, fibrous and malignant. *Spasmodic stricture* usually occurs in young hysterical women; difficulty in swallowing is complained of, and a bougie may not be able to be passed, but under an anaesthetic will slip down quite easily. *Fibrous stricture* is usually situated near the commencement of the oesophagus, generally just behind the cricoid cartilage, and usually results from swallowing corrosive fluids, but may also result from the healing of a syphilitic ulcer. Occasionally it is congenital. The ordinary treatment is repeated dilatation by bougies. Occasionally division of a fibrous stricture has been practised, or a Symond's tube inserted. Mikulicz recommends dilatation of the stricture by the fingers from inside after an incision into the stomach or a permanent gastric fistula may have to be made. *Malignant strictures* are usually epitheliomatous in structure, and may be situated in any part of the oesophagus. They nearly always occur in males between the ages of 40 and 70 years. An X-ray photograph taken after the patient has swallowed a preparation of bismuth will show the situation of the growth, and Killian and Brünig have introduced an instrument called the oesophagoscope, which makes direct examination possible. The remedy of constant dilatation by bougies must not be attempted here, the walls of the oesophagus being so softened by disease and ulceration that severe haemorrhage or perforation of the walls of the tube might take place. The patient should be fed with purely liquid and concentrated nourishment in order to give the oesophagus as much rest as possible, or if the stricture be too tight rectal feeding may be necessary. Symond's method of tubage is well borne by some patients, the tube having attached to it a long string which is secured to the cheek or ear. The most satisfactory treatment, however, is the operation of gastrotomy, a permanent artificial opening being made into the stomach through which the patient can be fed.

OETA (mod. *Kotavothra*), a mountain to the south of Thessaly, in Greece, forming a boundary between the valleys of the Spercheius and the Boeotian Cephissus. It is an offshoot of the Pindus range, 7080 ft. high. In its eastern portion, called Callidromus, it comes close to the sea, leaving only a narrow passage known as the famous pass of Thermopylae (*q.v.*). There was also a high pass to the west of Callidromus leading over into the upper Cephissus valley. In mythology Oeta is chiefly celebrated as the scene of the funeral pyre on which Heracles burnt himself before his admission to Olympus.

OETINGER, FRIEDRICH CHRISTOPH (1702–1782), German divine and theosophist, was born at Göppingen on the 6th of May 1702. He studied theology at Tübingen (1722–1728), and was much impressed by the works of Jakob Böhme. On the completion of his university course, Oetinger spent some years in travel. In 1730 he visited Count Zinzendorf at Herrnhut, remaining there some months as teacher of Hebrew and Greek. During his travels, in his eager search for knowledge, he made the acquaintance of mystics and separatists, Christians and learned Jews, theologians and physicians alike. At Halle he studied medicine. After some delay he was ordained to the ministry, and held several pastorates. While pastor (from 1746) at Waldorf near Berlin, he studied alchemy and made many experiments, his idea being to use his knowledge for symbolic purposes. These practices exposed him to the attacks of persons who misunderstood him. "My religion," he once said, "is the parallelism of Nature and Grace." Oetinger translated Swedenborg's philosophy of heaven and earth, and added notes of his own. Eventually (1766) he became prelate at Murrhardt, where he died on the 10th of February 1782.

Oetinger's autobiography was published by J. Hamberger in 1845. He published about seventy works, in which he expounded his theosophic views. A collected edition, *Sämtliche Schriften* (1st section, *Homiletische Schriften*, 5 vols., 1858–1866; 2nd section, *Theosophische Werke*, 6 vols., 1858–1863), was prepared by K. F. C. Ehmann, who also wrote Oetinger's *Leben und Briefe* (1859). See also C. A. Auberlen, *Die Theosophie Friedr. Chr. Oetinger's* (1847; 2nd ed., 1859), and Herzog, *Friedrich Christoph Ötinger* (1902).

OEYNHAUSEN, a town and watering-place of Germany, in the Prussian province of Westphalia, on the Werre, situated just above its confluence with the Weser, 9 m. W. from Minden by the main line of railway from Hanover to Cologne, with a station on the Löhne-Hameln line. Pop. (1905) 3894. The place, which was formerly called Rehme, owes its development to the discovery in 1830 of its five famous salt springs, which are heavily charged with carbonic acid gas. The waters are used both for bathing and drinking, and are particularly efficacious for nervous disorders, rheumatism, gout and feminine complaints.

OFFA, the most famous hero of the early Angli. He is said by the Anglo-Saxon poem *Widsith* to have ruled over Angel, and the poem refers briefly to his victorious single combat, a story which is related at length by the Danish historians Saxo and Svend Aagesen. Offa (Uffo) is said to have been dumb or silent during his early years, and to have only recovered his speech when his aged father Wermund was threatened by the Saxons, who insolently demanded the cession of his kingdom. Offa undertook to fight against both the Saxon king's son and a chosen champion at once. The combat took place at Rendsburg on an island in the Eider, and Offa succeeded in killing both his opponents. According to *Widsith* Offa's opponents belonged to a tribe or dynasty called Myrgingas, but both accounts state that he won a great kingdom as the result of his victory. A somewhat corrupt version of the same story is preserved in the *Vitae duorum Offarum*, where, however, the scene is transferred to England. It is very probable that the Offa whose marriage with a lady of murderous disposition is mentioned in Beowulf is the same person; and this story also appears in the *Vitae duorum Offarum*, though it is erroneously told of a later Offa, the famous king of Mercia. Offa of Mercia, however, was a descendant in the 12th generation of Offa, king of Angel. It is probable from this and other considerations that the early Offa lived in the latter part of the 4th century.

See H. M. Chadwick, *Origin of the English Nation* (Cambridge, 1907), where references to the original authorities will be found.

OFFA (d. 796), king of Mercia, obtained that kingdom in A.D. 757, after driving out Beornred, who had succeeded a few months earlier on the murder of Æthelbald. He traced his descent from Pybba, the father of Penda, through Eowa, brother of that king, his own father's name being Thingferth. In 779 he was at war with Cynewulf of Wessex from whom he wrested Bensington. It is not unlikely that the Thames became the boundary of the two kingdoms about this time. In 787 the power of Offa was displayed in a synod held at a place called Cealchyth. He deprived Jænberht, archbishop of Canterbury, of several of his suffragan sees, and assigned them to Lichfield, which, with the leave of the pope, he constituted as a separate archbishopric under Hygeberht. He also took advantage of this meeting to have his son Ecgferth consecrated as his colleague, and that prince subsequently signed charters as *Rex Merciorum.* In 789 Offa secured the alliance of Berhtric of Wessex by giving him his daughter Eadburg in marriage. In 794 he appears to have caused the death of Æthelberht of East Anglia, though some accounts ascribe the murder to Cynethryth, the wife of Offa. In 796 Offa died after a reign of thirty-nine years and was succeeded by his son Ecgferth. It is customary to ascribe to Offa a policy of limited scope, namely the establishment of Mercia in a position equal to that of Wessex and of Northumbria. This is supposed to be illustrated by his measures with regard to the see of Lichfield. It cannot be doubted, however, that at this time Mercia was a much more formidable power than Wessex. Offa, like most of his predecessors, probably held a kind of supremacy over all kingdoms south of the Humber. He seems, however, not to have been contented with this position, and to have entertained the design of putting an end to the dependent kingdoms. At all events we hear of no kings of the Hwicce after about 780, and the kings of Sussex seem to have given up the royal title about the same time. Further, there is no evidence for any kings in Kent from 784 until after Offa's death. To Offa is ascribed by Asser, in his life of Alfred, the great fortification against the Welsh which is still known as "Offa's dike." It stretched from sea to sea and consisted of a wall and a rampart. An account of his Welsh campaigns is given in the *Vitae duorum Offarum*, but it is difficult to determine how far the stories there given have an historical basis.

See *Anglo-Saxon Chronicle*, ed. J. Earle and C. Plummer (Oxford, 1899), *s.a.* 755, 777, 785, 787, 792, 794, 796, 836; W. de G. Birch, *Cartularium Saxonicum* (London, 1885–1893), vol. i.; Asser, *Life of Alfred*, ed. W. H. Stevenson (Oxford, 1904); *Vitae duorum Offarum* (in works of Matthew Paris, ed. W. Wats, London, 1640).

OFFAL, refuse or waste stuff, the "off fall," that which falls off (cf. Dutch *afval*, Ger. *Abfall*). The term is applied especially to the waste parts of an animal that has been slaughtered for food, to putrid flesh or carrion, and to waste fish, especially to the little ones that get caught in the nets with the larger and better fish, and are thrown away or used as manure. As applied to grain "offal" is used of grains too small or light for use for flour, and also in flour milling of the husk or bran of wheat with a certain amount of flour attaching, sold for feeding beasts (see FLOUR).

OFFENBACH, JACQUES (1819–1880), French composer of *opéra bouffe*, was born at Cologne, of German Jewish parents, on the 21st of June 1819. His talent for music was developed at a very early age; and in 1833 he was sent to Paris to study the violoncello at the conservatoire, where, under the care of Professor Vaslin, he became a fairly good performer. In 1834 he became a member of the orchestra of the Opéra Comique; and he turned his opportunities to good account, so that eventually he was made conductor at the Théâtre Français. There, in 1848, he made his first success as a composer in the *Chanson de Fortunio* in Alfred de Musset's play *Le Chandelier*. From this time forward his life became a ceaseless struggle for the attainment of popularity. His power of production was apparently inexhaustible. His first complete work, *Pepito*, was produced at the Opéra Comique in 1853. This was followed by a crowd of dramatic pieces of a light character, which daily gained in favour with Parisian audiences, and eventually effected a complete revolution in the popular taste of the period. Encouraged by these early successes, Offenbach boldly undertook the delicate task of entirely remodelling both the form and the style of the light musical pieces which had so long been welcomed with acclamation by the frequenters of the smaller theatres in Paris. With this purpose in view he obtained a lease of the Théâtre Comte in the Passage Choiseul, reopened it in 1855 under the title of the Bouffes Parisiens, and night after night attracted crowded audiences by a succession of brilliant, humorous trifles. Ludovic Halévy, the librettist, was associated with him from the first, but still more after 1860, when Halévy obtained Henri Meilhac's collaboration (see HALÉVY). Beginning with *Les Deux Aveugles* and *Le Violoneux*, the series of Offenbach's operettas was rapidly continued, until in 1867 its triumph culminated in *La Grande Duchesse de Gérolstein*, perhaps the most popular *opéra bouffe* that ever was written, not excepting even his *Orphée aux enfers*, produced in 1858. From this time forward the success of Offenbach's pieces became an absolute certainty, and the new form of *opéra bouffe*, which he had gradually endowed with as much consistency as it was capable of assuming, was accepted as the only one worth cultivating. It found imitators in Lecocq and other aspirants of a younger generation, and Offenbach's works found their way to every town in Europe in which a theatre existed. Tuneful, gay and exhilarating, their want of refinement formed no obstacle to their popularity, and perhaps even contributed to it. In 1866 his own connexion with the Bouffes Parisiens ceased, and he wrote for various theatres. In twenty-five years Offenbach produced no less than sixty-nine complete dramatic works, some of which were in three or even in four acts. Among the latest of these were *Le Docteur Ox*, founded on a story by Jules Verne, and *La Boîte au lait*, both produced in 1877, and *Madame Favart* (1879). Offenbach died at Paris on the 5th of October 1880.

OFFENBACH, a town of Germany, in the grand-duchy of Hesse, on the left bank of the Main, 5 m. S.E. of Frankfort-on-Main, with which it is connected by the railway to Bebra and by a local electric line. Pop. (1905) 58,806, of whom about 20,000 were Roman Catholics and 1400 Jews. The most interesting building in the town is the Renaissance château of the counts of Isenburg. Offenbach is the principal industrial town of the duchy, and its manufactures are of the most varied description. Its characteristic industry, however, is the manufacture of portfolios, pocket-books, albums and other fancy goods in leather. The earliest mention of Offenbach is in a document of 970. In 1486 it came into the possession of the counts of Isenburg, who made it their residence in 1685, and in 1816, when their lands were mediatized, it was assigned to Hesse. It owes its prosperity in the first place to the industry of the French Protestant refugees who settled here at the end of the 17th, and the beginning of the 18th century, and in the second place to the accession of Hesse to the German Zollverein in 1828.

See Jöst, *Offenbach am Main in Vergangenheit und Gegenwart* (Offenbach, 1901); Hager, *Die Lederwarenindustrie in Offenbach* (Karlsruhe, 1905).

OFFENBURG, a town of Germany, in the grand-duchy of Baden, 27 m. by rail S.W. of Baden, on the river Kinzig. Pop. (1905) 15,434. It contains a statue of Sir Francis Drake, a mark of honour due to the fact that Drake is sometimes regarded as having introduced the potato into Europe. The chief industries of the town are the making of cotton, linen, hats, malt, machinery, tobacco and cigars and glass. Offenburg is first mentioned about 1100. In 1223 it became a town; in 1248 it passed to the bishop of Strassburg; and in 1289 it became an imperial free city. Soon, however, this position was lost, but it was regained about the middle of the 16th century, and Offenburg remained a free city until 1802, when it became part of Baden. In 1632 it was taken by the Swedes, and in 1689 it was destroyed by the French.

See Walter, *Kurzer Abriss der Geschichte der Reichsstadt Offenburg* (Offenburg, 1896).

OFFERTORY (from the ecclesiastical Lat. *offertorium*, Fr. *offertoire*, a place to which offerings were brought), the alms of a congregation collected in church, or at any religious service. Offertory has also a special sense in the services of both the English and Roman churches. It forms in both that part of the Communion service appointed to be said or sung, during the collection of alms, before the elements are consecrated. In music, an offertory is the vocal or instrumental setting of the offertory sentences, or a short instrumental piece played by the organist while the collection is being made.

OFFICE (from Lat. *officium*, "duty," "service," a shortened form of *opifacium*, from *facere*, "to do," and either the stem of *opes*, "wealth," "aid," or *opus*, "work"), a duty or service, particularly the special duty cast upon a person by his position; also a ceremonial duty, as in the rites paid to the dead, the "last offices." The term is thus especially used of a religious service, the "daily office" of the English Church or the "divine office" of the Roman Church (see BREVIARY). It is also used in this sense of a service for a particular occasion, as the Office for the Visitation of the Sick, &c. From the sense of duty or function, the word is transferred to the position or place which lays on the holder or occupier the performance of such duties. This leads naturally to the use of the word for the buildings or the separate rooms in which the duties are performed, and for the staff carrying on the work or business in such offices. In the Roman curia the department of the Inquisition is known as the Holy Office, in full, the Congregation of the Holy Office of the Inquisition (see INQUISITION and CURIA ROMANA).

Offices of Profit.—The phrase "office of profit under the crown" is used with a particular application in British parliamentary practice. The holders of such offices of profit have been subject in regard to the occupation of seats in the House of Commons to certain disabilities which were in their origin due to the fear of the undue influence exercised by the crown during the constitutional struggles of the 17th century. Attempts to deal with the danger of the presence of "place-men" in the House of Commons were made by the Place Bills introduced in 1672–1673, 1694 and 1743. The Act of Settlement 1700 (§ 3) laid it down that no person who has an office or place of profit under the king or receives a pension from the crown shall be capable of serving as a member of the House of Commons. This drastic clause, which would have had the disastrous effect of entirely separating the executive from the legislature, was repealed and the basis of the present law was laid down in 1706 by 6 Anne (c. 41). This first disqualifies (§ 24) from membership all holders of "new offices,"[1] *i.e.* those created after October 1705; secondly (§ 25) it renders void the election of a member who shall accept any office of profit other than "new offices" but allows the member to stand for re-election. The disqualification attaching to many "new offices" has been removed by various statutes, and by § 52 of the Reform Act 1867 the necessity of re-election is avoided when a member, having been elected subsequent to the acceptance of any office named in a schedule of that act, is transferred to any other office in that schedule. The rules as to what offices disqualify from membership or render re-election necessary are exceedingly complicated, depending as they do on a large number of statutes (see Erskine May, *Parliamentary Practice*, 11th ed., pp. 632-645, and Rogers, *On Elections*, vol. ii., 1906). The old established rule that a member, once duly elected, cannot resign his seat is evaded by the acceptance of certain minor offices (see CHILTERN HUNDREDS).

OFFICERS. Historically the employment of the word "officer" to denote a person holding a military or naval command as representative of the state, and not as deriving his authority from his own powers or privileges, marks an entire change in the character of the armed forces of civilized nations. Originally signifying an official, one who performs an assigned duty (Lat. *officium*), an agent, and in the 15th century actually meaning the subordinate of such an official (even to-day a constable is so called), the word seems to have acquired a military significance late in the 16th century.[2] It was at this time that armies, though not yet "standing," came to be constituted almost exclusively of professional soldiers in the king's pay. Mercenaries, and great numbers of mercenaries, had always existed, and their captains were not feudal magnates. But the bond between mercenaries and their captains was entirely personal, and the bond between the captain and the sovereign was of the nature of a contract. The non-mercenary portion of the older armies was feudal in character. It was the lord and not a king's officer who commanded it, and he commanded in virtue of his rights, not of a warrant or commission.

European history in the late 15th century is the story of the victory of the crown over the feudatories. The instrument of the crown was its army, raised and commanded by its deputies. But these deputies were still largely soldiers of fortune and, in the higher ranks, feudal personages, who created the armies themselves by their personal influence with the would-be soldier or the unemployed professional fighting man. Thus the first system to replace the obsolete combination of feudalism and "free companies" was what may be called the proprietary system. Under this the colonel was the proprietor of his regiment, the captain the proprietor of his company. The king accepted them as his officers, and armed them with authority to raise men, but they themselves raised the men as a rule from experienced soldiers who were in search of employment, although, like

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[1] This section also disqualifies colonial governors and deputy governors and holders of certain other offices.

[2] At sea the relatively clear partition of actual duties amongst the authorities of a ship brought about the adoption of the term "officer" somewhat earlier.

Falstaff, some captains and colonels "misused the King's press damnably." All alike were most rigorously watched lest by showing imaginary men on their pay-sheets they should make undue profits. A "muster" was the production of a number of living men on parade corresponding to the number shown on the pay-roll. An inspection was an inspection not so much of the efficiency as of the numbers and the accounts of units. A full account of these practices, which were neither more nor less prevalent in England than elsewhere, will be found in J. W. Fortescue's *History of the British Army*, vol. i. So faithfully was the custom observed of requiring the showing of a man for a man's pay, that the grant of a special allowance to officers administering companies was often made in the form of allowing them to show imaginary John Does and Richard Roes on the pay-sheets.

The next step was taken when armies, instead of being raised for each campaign and from the qualified men who at each recruiting time offered themselves, became "standing" armies fed by untrained recruits. During the late 17th and the 18th centuries the crown supplied the recruits, and also the money for maintaining the forces, but the colonels and captains retained in a more or less restricted degree their proprietorship.

Thus, the profits of military office without its earlier burdens were in time of peace considerable, and an officer's commission had therefore a "surrender value." The practice of buying and selling commissions was a natural consequence, and this continued long after the system of proprietary regiments and companies had disappeared. In England "purchase" endured until 1873, nearly a hundred years after it had ceased on the continent of Europe and more than fifty after the clothing, feeding and payment of the soldiers had been taken out of the colonels' hands. The purchase system, it should be mentioned, did not affect artillery and engineer officers, either in England or in the rest of Europe. These officers, who were rather semi-civil than military officials until about 1715, executed an office rather than a command—superintended gun-making, built fortresses and so on. As late as 1780 the right of a general officer promoted from the Royal Artillery to command troops of other arms was challenged. In its original form, therefore, the proprietary system was a most serious bar to efficiency. So long as war was chronic, and self-trained recruits were forthcoming, it had been a good working method of devolving responsibility. But when drill and the handling of arms became more complicated, and, above all, when the supply of trained men died away, the state took recruiting out of the colonels' and captains' hands, and, as the individual officer had now nothing to offer the crown but his own potential military capacity (part of which resided in his social status, but by no means all), the crown was able to make him, in the full sense of the word, an officer of itself. This was most fully seen in the reorganization of the French army by Louis XIV. and Louvois. The colonelcies and captaincies of horse and foot remained proprietary offices in the hands of the nobles but these offices were sinecures or almost sinecures. The colonels, in peace at any rate, were not expected to do regimental duty. They were at liberty to make such profits as they could make under a stringent inspection system. But they were expected to be the influential figure-heads of their regiments and to pay large sums for the privilege of being proprietors. This classification of officers into two bodies, the poorer which did the whole of the work, and the richer upon which the holding of a commission conferred an honour that birth or wealth did not confer, marks two very notable advances in the history of army organization, the professionalization of the officer and the creation of the prestige attaching to the holder of a commission *because* he holds it and not for any extraneous reason.

The distinction between working and quasi-honorary officers was much older, of course, than Louvois's reorganization. Moreover it extended to the highest ranks. About 1600 the "general" of a European army[1] was always a king, prince or nobleman. The lieutenant-general, by custom the commander of the cavalry, was also, as a rule, a noble, in virtue of his command of the aristocratic arm. But the commander of the foot, the "sergeant-major-general" or "major-general," was invariably a professional soldier. It was his duty to draw up the army (not merely the foot) for battle, and in other respects to act as chief of staff to the general. In the infantry regiment, the "sergeant-major" or "major" was second-in-command and adjutant combined. Often, if not always, he was promoted from amongst the lieutenants and not the (proprietary) captains. The lieutenants were the backbone of the army.

Seventy years later, on the organization of the first great standing army by Louvois, the "proprietors," as mentioned above, were reduced to a minimum both in numbers and in military importance. The word "major" in its various meanings had come, in the French service, to imply staff functions. Thus the sergeant-major of infantry became the "adjudant-major." The sergeant-major-general, as commander of the foot, had disappeared and given place to numerous lieutenant-generals and "brigadiers," but as chief of the staff he survived for two hundred years. As late as 1870 the chief of staff of a French army bore the title of "the major-general."

Moreover a new title had come into prominence, that of "marshal" or "field marshal." This marks one of the most important points in the evolution of the military officer, his classification by rank and not by the actual command he holds. In the 16th century an officer was a lieutenant *of*, not *in*, a particular regiment, and the higher officers were general, lieutenant-general and major-general *of* a particular army. When their army was disbanded they had no command and possessed therefore no rank—except of course when, as was usually the case, they were colonels of permanent regiments or governors of fortresses. Thus in the British army it was not until late in the 18th century that general officers received any pay as such. The introduction of a distinctively military *rank*[2] of "marshal" or "field marshal," which took place in France and the empire in the first years of the 17th century, meant the establishment of a list of general officers, and the list spread downwards through the various regimental ranks, in proportion as the close proprietary system broke up, until it became the general army list of an army of to-day. At first field marshals were merely officers of high rank and experience, eligible for appointment to the offices of general, lieutenant-general, &c., in a particular army. On an army being formed, the list of field marshals was drawn upon, and the necessary number appointed. Thus an army of Gustavus Adolphus's time often included 6 or 8 field marshals as subordinate general officers. But soon armies grew larger, more mobile and more flexible and more general officers were needed. Thus fresh grades of general arose. The next rank below that of marshal, in France, was that of lieutenant-general, which had formerly implied the second-in-command of an army, and a little further back in history the king's lieutenant-general or military viceroy.[3] Below the lieutenant-general was the *maréchal de camp*, the heir of the sergeant-major-general. In the imperial service the ranks were field marshal and lieutenant field marshal (both of which survive to the present day) and major-general. A further grade of general officer was created by Louis XIV., that of brigadier, and this completes the process of evolution, for the regimental system had already provided the lower titles.

The ranks of a modern army, with slight variations in title, are therefore as follows:

(*a*) *Field marshal*: in Germany, *Generalfeldmarschall*; in Spain "captain-general"; in France (though the rank is in abeyance) "marshal." The marshals of France, however, were neither so few in number nor so restricted to the highest commands as are marshals elsewhere. In Germany a new rank, "colonel-general"

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[1] Except in the Italian republics.

[2] The title was, of course, far older.

[3] In England, until after Marlborough's death, rank followed command and not vice versa. The first field marshals were the duke of Argyll and the earl of Cadogan. Marlborough's title, or rather office, was that of captain-general.

(*Generaloberst*), has come into existence—or rather has been revived[1]—of late years. Most of the holders of this rank have the honorary style of general-field-marshal.[2]

(*b*) *General*: in Germany and Russia, "general of infantry," "general of cavalry," "general of artillery." In Austria generals of artillery and infantry were known by the historic title of *Feldzeugmeister* (ordnance-master) up to 1909, but the grade of general of infantry was created in that year, the old title being now restricted to generals of artillery. In France the highest grade of general officer is the "general of division." In the United States army the grade of full "general" has only been held by Washington, Grant, Sherman and Sheridan.

(*c*) *Lieutenant-general* (except in France): in Austria the old title of lieutenant field marshal is retained. In the United States army the title "lieutenant-general," except within recent years, has been almost as rare as "general." Winfield Scott was a brevet lieutenant-general. The substantive rank was revived for Grant when he was placed in command of the Union Army in 1864. It was abolished as an American rank in 1907.

(*d*) *Major-general* (in France, general of brigade): this is the highest grade normally found in the United States Army, generals and lieutenant-generals being promoted for special service only.[3]

(*e*) *Brigadier-general*, in the United States and (as a temporary rank only) in the British services.

The above are the five grades of higher officers. To all intents and purposes, no nation has more than four of these five ranks, while France and the United States, the great republics, have only two. The correspondence between rank and functions cannot be exactly laid down, but in general an officer of the rank of lieutenant-general commands an army corps and a major-general a division. Brigades are commanded by major-generals, brigadier-generals or colonels. Armies are as a rule commanded by field marshals or full generals. In France generals of division command divisions, corps, armies and groups of armies.

The above are classed as general officers. The "field officers" (French *officiers supérieurs*, German *Stabsoffiziere*) are as follows:

(*a*) *Colonel.*—This rank exists in its primitive significance in every army. It denotes a regimental commander, or an officer of corresponding status on the staff. In Great Britain, with the "linked battalion" system, regiments of infantry do not work as units, and the executive command of battalions, regiments of cavalry and brigades of field artillery is in the hands of lieutenant-colonels. Colonels of British regiments who are quasi-honorary (though no longer proprietary) chiefs are royal personages or general officers. Colonels in active employment as such are either on the staff, commanders of brigades or corresponding units, or otherwise extra-regimentally employed.

(*b*) *Lieutenant-colonel*: in Great Britain "the commanding officer" of a unit. Elsewhere, where the regiment and not the battalion is the executive unit, the lieutenant-colonel sometimes acts as second in command, sometimes commands one of the battalions. In Russia all the battalion leaders are lieutenant-colonels.

(*c*) *Major.*—This rank does not exist in Russia, and in France is replaced by *chef de bataillon* or *chef d'escadron*, colloquially *commandant*. In the British infantry he preserves some of the characteristics of the ancient "sergeant-major," as a second in command with certain administrative duties. The junior majors command companies. In the cavalry the majors, other than the second-in-command, command squadrons; in the artillery they command batteries. In armies which have the regiment as the executive unit, majors command battalions ("wings" of cavalry, "groups" of artillery).

Lastly the "company officers" (called in France and Germany subaltern officers) are as follows:—

(*a*) *Captain* (Germany and Austria, *Hauptmann*, cavalry *Rittmeister*): in the infantry of all countries, the company commander. In Russia there is a lower grade of captain called "staff-captain," and in Belgium there is the rank of "second-captain." In all countries except Great Britain captains command squadrons and batteries. Under the captain, with such commands and powers as are delegated to them, are the subalterns, usually graded as—

(*b*) *Lieutenant* (first lieutenant in U.S.A., *Oberleutnant* in Germany and Austria).

(*c*) *Sub-lieutenant* (second-lieutenant in Great Britain and U.S.A., *Leutnant* in Germany and Austria).

(*d*) Aspirants, or probationary young officers, not of full commissioned status.

The continental officer is on an average considerably older, rank for rank, than the British; but he is neither younger nor older in respect of command. In the huge "universal service" armies of to-day, the regimental officer of France or Germany commands, *in war*, on an average twice the number of men that are placed under the British officer of equal rank. Thus a German or French major of infantry has about 900 rifles to direct, while a British major may have either half a battalion, 450, or a double company, 220; a German captain commands a company of 250 rifles as against an English captain's 110 and so on. At the same time it must be remembered that at peace strength the continental battalion and company are maintained at little more than half their war strength, and the under-officering of European armies only makes itself seriously felt on mobilization.

It is different with the questions of pay and promotion, which chiefly affect the life of an army in peace. As to the former (see also PENSIONS) the Continental officer is paid at a lower rate than the British, as shown by the table of *ordinary pay* per annum (without special pay or allowances) below:—

	Great Britain.	France.	Germany.
Lieutenant-colonel[1]	328	263	292
Major[1]	248	224	292
Captain[1]	210	139 to 200	150 to 195
Oberleutnant (Lieutenant)[1]	118	101 to 120	78
Second Lieutenant (*Leutnant*, *Sous-lieutenant*)[1]	94	93	45 to 60

[1] Infantry, lowest scale, other arms and branches higher, often considerably higher.

It must be noted that in France and Germany the major is a battalion commander, corresponding to the British lieutenant-colonel. But the significance of this table can only be realized when it is remembered that promotion is rapid in the British army and very slow in the others. The senior *Oberleutnants* of the German army are men of 37 to 38 years of age; the senior captains 47 to 48. In 1908 the youngest captains were 36, the youngest majors 45 years of age. As another illustration, the captain's maximum pay in the French army, £10 per annum less than a British captain's, is only given after 12 years' service in that rank, *i.e.* to a man of at least twenty years' service. The corresponding times for British regular officers in 1905 (when the effects of rapid promotions during the South African War were still felt) were 6 to 7½ years from first commission to promotion to captain, and 14 to 19 years from first commission to promotion to major. In 1908, under more normal conditions, the times were 7 to 8½ years to captain, 15 to 20 to major. In the Royal Engineers and the Indian army a subaltern is automatically promoted captain on completing 9 years' commissioned service, and a captain similarly promoted major after 18.

The process of development in the case of naval officers (see NAVY) presents many points of similarity, but also considerable differences. For from the first the naval officer could only offer to serve on the king's ship: he did not build a ship as a colonel raised a regiment, and thus there was no proprietary system. On the other hand the naval officer was even more of a simple office-holder than his comrade ashore. He had no rank apart from that which he held in the economy of the ship, and when the ship went out of commission the officers as well as the crew were disbanded. One feature of the proprietary system, however, appears in the navy organization; there was a marked distinction between the captain and the lieutenant who led the combatants and the master and the master's mate who sailed the ship. But here there were fewer "vested interests," and instead of remaining in the condition, so to speak, of distinguished passengers, until finally eliminated by the "levelling up" of the working class of officers, the lieutenants and captains were (in England) required to educate themselves thoroughly in the subjects of the sea officer's profession. When this process had gone on for two generations, that is, about 1670, the formation of a permanent staff of naval officers was begun by the institution of half-pay for the captains, and very soon afterwards the methods of admission and early training of naval officers were systematized.

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[1] The 16th-century "colonel-general" was the commander of a whole section of the armed forces. In France there were several colonels-general, each of whom controlled several regiments, or indeed the whole of an "arm." Their functions were rather those of a war office than those of a troop-leader. If they held high commands in a field army, it was by special appointment *ad hoc*. Colonels-general were also proprietors in France of one company in each regiment, whose services they accepted.

[2] In Russia the rank of marshal has been long in abeyance.

[3] In the Confederate service the grades were general for army commanders, lieutenant-general for corps commanders, major-general for divisional commanders and brigadier-general for brigade commanders.

The ranks in the British Royal Navy are shown with the relative ranks of the army in the following table (taken from *King's Regulations*), which also gives some idea of the complexity of the non-combatant branches of naval officers.

Corresponding Ranks.

Army.	Navy.	
1. Field Marshals	Admirals of the Fleet	
2. Generals	Admirals	
3. Lieutenant-Generals	Vice-Admirals	Engineer-in-Chief, if Engineer Vice-Admiral.
4. Major-Generals	Rear-Admirals	Inspectors-General of Hospitals and Fleets. Engineer-in-Chief, if Engineer Rear-Admiral. Engineer Rear-Admiral.
5. Brigadier-Generals	Commodores	
6. Colonels	Captains of 3 years' seniority	Deputy Inspectors-General of Hospitals and Fleets. Secretaries to Admirals of the Fleet. Paymasters-in-Chief. Engineer Captains of 8 years' seniority in that rank. Staff Captains of 4 years' seniority.
7. Lieutenant-Colonels	Captains under 3 years' seniority	Staff Captains under 4 years' seniority (navigating branch). Secretaries to Commanders-in-Chief, of 5 years' service as such. Engineer Captains under 8 years' seniority in that rank.
	Commanders, but junior of that rank	Fleet-Surgeons.[1] Secretaries to Commanders-in-Chief under 5 years' service.[1] Fleet Paymasters.[1] Engineer Commanders.[1] Naval Instructors of 15 years' seniority.[1]
8. Majors	Lieutenants of 8 years' seniority	Engineer Lieutenants of 8 years' seniority, qualified and selected. Staff-Surgeons. Secretaries to Junior Flag Officers, Commodores, 1st Class. Staff Paymasters and Paymaster. Naval Instructors of 8 years' seniority. Carpenter Lieutenant of 8 years' seniority.
9. Captains	Lieutenants under 8 years' seniority	Surgeons. Secretaries to Commodores, 2nd Class. Naval Instructors under 8 years' seniority. Engineer Lieutenant under 8 years' seniority, or over if not duly qualified and selected. Assistant Paymasters of 4 years' seniority. Carpenter Lieutenant under 8 years' seniority.
10. Lieutenants	Sub-Lieutenants	Assistant Paymasters under 4 years' seniority. Engineer Sub-Lieutenants.
11. Second Lieutenants		Chief Gunner.[1] Chief Boatswain.[1] Chief Carpenter.[1] Chief Artificer Engineer.[1] Chief Schoolmaster.[1]
12. Higher ranks of Warrant Officers		Midshipmen.[2] Clerks.[2] Gunners.[1] Boatswains.[1] Carpenters.[1] Artificer Engineer.[1] Head Schoolmaster.[1] Head Wardmaster.[1]

[1] But junior of the army rank.

[2] But senior of the army rank.

Training of British Army Officers.—This may be conveniently divided into two parts: (I.) that which precedes the appointment to a commission; (II.) that which succeeds it.

I. Omitting those officers who obtain their commissions from the ranks, the training which precedes the appointment to a commission is subdivided into: (*a*) General Education; (*b*) Technical Instruction.

(*a*) *General Education.*—A fairly high standard of education is considered essential. Candidates from universities approved by the Army Council must have resided for three academic years at their university, and have taken a degree in any subject or group of subjects other than Theology, Medicine, Music and Commerce. A university candidate for a commission in the Royal Artillery must further be qualified in Mathematics. The obtaining of first-class honours is considered equivalent to one year's extra service in the army, and an officer can count that year for calculating his service towards his pension. University candidates are eligible for commissions in the Cavalry, Royal Artillery, Infantry, Indian Army and Army Service Corps. For other branches of the service special regulations are in force.

Those candidates who have not been at a university are examined by the Civil Service Commissioners as to their educational qualifications. This examination is competitive in so far that vacancies at the Royal Military College at Sandhurst (for Cavalry, Infantry and Army Service Corps), or the Royal Military Academy at Woolwich (for Engineers and Artillery), go to those who pass highest, if physically fit. Before presenting himself for this examination, the candidate must produce a "leaving certificate" from the school at which he was educated, showing that he already possesses a fair knowledge of the subjects of examination. Candidates who fail to secure admission to these institutions, but satisfy the examiners that they are sufficiently well educated, can obtain commissions in the Special Reserve.

Candidates for commissions in the Royal Army Medical Corps and the Army Veterinary Corps are not required to pass an educational examination, the ordinary course of medical or veterinary education being deemed sufficient, but the Army Council may reject a candidate who shows any deficiency in his general education.

Officers of the Colonial military forces wishing to obtain commissions in the British Army must either produce a school or college "leaving certificate" or pass an examination held by the Army Qualifying Board, or must show that they have passed one of certain recognized examinations.

(*b*) *Technical Instruction.*—In addition to general educational attainments, a fair knowledge of technical matters is expected from candidates.

For Cavalry, Infantry, Royal Engineers, Royal Artillery and Army Service Corps, an examination must be passed in administration and organization; military history, strategy and tactics; military topography, engineering and law. In addition, the following conditions must be complied with: (1) *University candidates* are required to be members of the Senior Division of the Officers' Training Corps (see UNITED KINGDOM: *Army*) should there be a unit of that corps at the university to which they belong. They are further required to be attached for six weeks to a Regular unit during their residence at the university. If there is no Officers' Training Corps at his university, the candidate is attached to a Regular unit for twelve weeks (consecutively or in two stages). The final examination in military subjects is competitive. (2) *Cadets of the Royal Military College* are instructed in the following additional subjects: sanitation, French or German (or both), riding and horse management, musketry, physical training, drill and signalling. Hindustani may be taken instead of French or German. (3) *Cadets of the Royal Military Academy* are instructed in the same subjects as the cadets at the Royal Military College, with the addition of artillery, advanced mathematics, chemistry, light, heat, electricity and workshop practice. Cadets who pass highest in the final examination for commissions are as a rule appointed to the Royal Engineers, the remainder to the Royal Artillery. (4) *Officers of the Special Reserve, Territorial Force* and certain other forces must have completed a continuous period of attachment of twelve months to a Regular unit of Cavalry, Artillery, Engineers or Infantry, and have served and been trained for at least one year in the force to which they belong, before presenting themselves at the competitive examination in military subjects. The period of attachment to Regular units may be reduced if certain certificates are obtained. Candidates for commissions in the artillery must belong to the artillery branches of the above forces and have a certificate in riding and mathematics. They are not eligible for the Royal Engineers. (5) The conditions for *Officers of the Colonial Military Forces* are similar to those for the Special Reserve, &c., except that only two months' attachment to a Regular unit, or unit of the Permanent Colonial Forces, is required. (6) Commissions are also given to *Cadets of the Royal Military College, Kingston, Canada*; the training of that establishment being similar to that at the Royal Military College and the Royal Military Academy.

Candidates for commissions in the Royal Army Medical Corps and Army Veterinary Corps are not examined in military subjects, but must pass in the appropriate technical subjects; those for the Royal Army Medical Corps passing two written and two oral examinations, one each in medicine and surgery; those for the Army Veterinary Corps passing a written and an oral examination in veterinary medicine, surgery and hygiene. Candidates for the Royal Army Medical Corps have further to proceed to the Royal Army Medical College for instruction in recruiting duties, hygiene, pathology, tropical medicine, military surgery and military medical administration.

Royal Engineers attend the School of Military Engineering at Chatham, where long and elaborate courses of instruction are given in all subjects appertaining to the work of the corps, including practical work in the field and in fortresses.

II. The training which succeeds the appointment to a commission consists partly of more detailed instruction in the subjects already learned, partly of the practical application of those subjects, and partly of more advanced instruction with its practical application.

On first joining his unit the young officer is put through a course of preliminary drills, lasting, as a rule, for from three months (infantry) to six months (cavalry), though the time depends upon the individual officer's rate of progress. During this period, and for some considerable time afterwards, officers are instructed in "regimental duties," consisting of the interior economy of a regiment, such as financial accounts, stores, correspondence, the minor points of military law in their actual working, customs of the service, the management of regimental institutes, &c., with, in the case of the mounted branches, equitation and the care and management of horses. They are required to attend a number of courts-martial, as supernumerary members, before being permitted to attend one in the effective and official capacities of member or prosecutor, although from a legal point of view their qualification depends simply upon their rank and length of service. A course of musketry, theoretical and practical, is then gone through. Field training begins with lectures on the various evolutions of the squadron, battery or company, followed by actual practice in the field, arranged by the commanders of squadrons, batteries or companies.

Before promotion from the rank of second-lieutenant to lieutenant, an examination must be passed in "Regimental Duties" (practical, oral and written) and "Drill and Field Training" (practical only). The officer is then taken in hand by the commanding officer of his regiment, battalion or brigade. He is frequently examined in the subjects in which he has already been instructed, and is practically taught the more advanced stages of topography, engineering, tactics, law and organization. The next stage consists of regimental drills, which include every kind of practical work in the field which can be done by a unit under the command of a lieutenant-colonel. After this come brigade, division and army manœuvres. Officers have to pass examinations in military subjects for promotion until they attain the rank of major. The chief of these subjects are tactics, military topography, military engineering, military law, administration and military history. For majors, before promotion to lieutenant-colonel, an examination in "Tactical Fitness for Command" has to be passed. This examination is a test of ability in commanding the "three arms" in the field; a course of attachment to the two arms to which the officer does not belong being a necessary preliminary.

Army Service Corps.—The officers of this corps have usually served for at least one year in the cavalry, infantry or Royal Marines, though commissions are also given to cadets of the Royal Military College. On joining, the officer first spends nine months on probation, during which he attends lectures and practical demonstrations in the following subjects: military administration and organization generally; and as regards Army Service Corps work, in detail; organization of the Field Army and Lines of Communication; war organization and duties of the A.S.C.; registry and care of correspondence; contracts; special purchases; precautions in receiving supplies, and care and issue of same; accounts, forms, vouchers and office work in general and in detail; barrack duties (including all points relating to coal, wood, turf, candles, lamps, gas, water, &c). A thorough and detailed description of all kinds of forage, breadstuffs, meat, groceries and other field supplies is given. The lectures and demonstrations in transport include, beside mounted and dismounted drill, wagon drill; carriages; embarkation and disembarkation of men and animals; entraining and detraining; harness and saddlery; transport by rail and sea, with the office work involved. This course of instruction is given at the Army Service Corps Training Establishment at Aldershot.

A satisfactory examination having been passed, the officer is permanently taken into the corps. Before promotion to captain he is examined in accounts, correspondence and contracts; judging cattle and supplies; duties of an A.S.C. officer in charge of a sub-district; interior economy of a company; military vehicles and pack animals; embarkation, disembarkation and duties on board ship; convoys; duties of brigade supply and transport officer in war. Captains, before promotion to major, are examined in lines of communication of an army in war; method of obtaining supplies and transport in war, and formation and working of depots; organization of transport in war; schemes of supply and transport for troops operating from a fixed base; duties of a staff-officer administering supply, transport and barrack duties at home. These are in addition to general military subjects.

Royal Army Medical Corps.—On completion of the course of instruction at the Royal Army Medical College, lieutenants on probation proceed to the R.A.M.C. School of Instruction at Aldershot for a two months' course in the technical duties of the corps, and at the end of the course are examined in the subjects taught. This passed, their commissions are confirmed. After eighteen months' service, officers are examined in squad, company and corps drills and exercises; the Geneva Convention; the administration, organization and equipment of the army in its relation to the medical services; duties of wardmasters and stewards in military hospitals and returns, accounts and requisitions connected therewith; duties of executive medical officers; military law. These successful candidates are then eligible for promotion to captain. Before promotion to major the following examination must be passed, after a course of study under such arrangements as the director-general of the Army Medical Service may determine: (1) medicine, (2) surgery, (3) hygiene, (4) bacteriology, (5) one out of seven special subjects named, and (6) military law. The examination for promotion from major to lieutenant-colonel embraces army medical organization in peace and war; sanitation of towns, camps, transports, &c.; epidemiology and the management of epidemics; medical history of important campaigns; the Army Medical Service of the more important powers; the laws and customs of war, so far as they relate to the sick and wounded; and a tactical problem in field medical administration. Officers who pass these examinations with distinction are eligible for accelerated promotion.

Army Ordnance Department.—An officer of this department must have had at least four years' service in other branches of the army and must have passed for the rank of captain. They are then eligible to present themselves at an elementary examination in mathematics, after passing which they attend a one year's course at the Ordnance College, Woolwich. The course comprises the following: (*a*) *Gunnery* (including principles of gun construction and practical optics); (*b*) *Matériel*, guns, carriages, machine guns, small arms and ammunition of all descriptions; (*c*) *Army Ordnance Duties* (functions of the corps; supply, receipt and issue of stores, &c.); (*d*) *Machinery*; (*e*) *Chemistry and Metallurgy*; (*f*) *Electricity*. An advanced course follows in which officers take up any two of the subjects of applied mathematics, chemistry and electricity, combined with either small arms, optics or mechanical design. They are then appointed to the department and hold their appointments for four years, with a possible extension of an additional three years.

Army Veterinary Corps.—A candidate on appointment as veterinary officer, on joining at Aldershot, undergoes a course of special training at the Army Veterinary School. The course lasts one year, and consists of (*a*) hygiene; conformation of the foot and shoeing, conformation, points, colours, markings; stable construction and management; management of horses in the open and of large bodies of sick; saddles and sore backs; collars and sore shoulders; bits and bitting; transport by sea and rail; mules, donkeys, camels and oxen; remount depots; training of army horses; marching. (*b*) Diseases met with specially on active service. (*c*) Military etiquette and ethics; accounts and returns; administration and organization; veterinary hospitals, mobilization, map-reading and law. At the end of the course he is examined, and if found satisfactory, is retained in the service. Before promotion to captain he is examined in the duties of executive veterinary officers and in law: before promotion to major, in medicine, surgery, hygiene, bacteriology and tropical diseases, and in one special subject selected by the candidate; and before promotion to lieutenant-colonel, in law, duties of administrative veterinary officers at home and abroad, management of epizootics, sanitation of stables, horse-lines and transports.

Army Pay Department.—Officers are appointed to the department, on probation for a period not exceeding one year, after serving for five years in one of the other arms or branches of the service. At the end of this period the candidates are examined in the following subjects: examination of company pay lists and pay and mess book; method of keeping accounts and preparing balance-sheets and monthly estimates; knowledge of pay-warrant, allowance regulations and financial instructions, book-keeping, by double entry and the duties attending the payment of soldiers; aptitude for accounts, and quickness and neatness in work. On completion of five years' service, officers return to their regiments, unless they elect to remain with the department or are required by the Army Council to be permanently attached to it.

Schools and Colleges.—The training of the officer in his regiment is necessarily incomplete, owing to a far wider knowledge of his profession in general, and of his own branch of the service in particular, being essential, than can be acquired within the comparatively confined limits of his own unit. Accordingly, schools and colleges have been established, in which special courses of instruction are given, dealing more fully with the generalities and details of the various branches of the service.

There is a cavalry school at Netheravon.

Mounted Infantry schools have been established at Longmoor, Bulford and Kilworth, which train both officers and men in mounted infantry duties. The officers selected to be trained at these schools must have at least two years' service, have completed a trained soldier's course of musketry and should have some knowledge of horsemanship and be able to ride. The instruction consists for the most part of riding school and field training.

The *School of Gunnery* at Shoeburyness gives five courses of instruction per annum; one "Staff" course for Ordnance officers, lasting one month; two courses for senior officers of the Royal Artillery, lasting a fortnight each, and two courses for junior officers of the same regiment, lasting one month each. For Royal Garrison Artillery officers there is one "Staff" course lasting for seven months (this being a continuation of the previous "Staff" course), and two courses, lasting four months each, for junior officers. There is also a school of gunnery at Lydd, where two courses, lasting for three weeks each, in siege artillery, are given each year.

The *Ordnance College* at Woolwich provides various courses of instruction in addition to those intended for officers of the Ordnance Department. There is a "Gunnery Staff Course" for senior officers, in gunnery, guns, carriages, ammunition, electricity and machinery; two courses for junior officers of the Royal Artillery in the same subjects; a course for officers of the Army Service Corps in mechanical transport, which includes instruction in allied subjects, such as electricity and chemistry. It also gives courses of instruction to officers of the Royal Navy.

The *School of Military Engineering* at Chatham trains officers of the Royal Engineers, compiles official text-books on field defences, attack and defence of fortresses, military bridging, mining, encampments, railways.

The *School of Musketry* at Hythe (besides assisting and directing the musketry training of the army at large by revising regulations, experiments, &c.) trains officers of all branches of the service in theoretical and practical musketry, the courses lasting about a month each and embracing fire control, the training of the eye in quick perception, fire effect and so on. Courses in the Maxim gun usually follow.

The *Staff College* (see also STAFF) at Camberley is the most important of the military colleges. Only specially selected officers are eligible to attempt the entrance examination. The course lasts two years, and is divided into: (*a*) military history, strategy, tactics, imperial strategy, strategic distribution, coast defence, fortification, war organization, reconnaissance; (*b*) staff duties, administration, peace distribution, mobilization, movements of troops by land and sea, supply, transport, remounts, organization, law and topographical reconnaissance. Visits are paid to workshops, fortresses, continental battlefields, &c., and staff tours are carried out. Officers of the non-mounted branches attend riding school, and students can be examined in any foreign languages they may have previously studied. They are also attached for short periods to arms of the service other than those to which they belong, and attend at staff offices to ensure their being conversant with the work done there.

The *Army Service Corps Training Establishment* at Aldershot gives courses of instruction to senior officers of the corps at which a limited number of officers of other corps may attend, provided they have passed through or been recommended for the Staff College. Other courses, in addition to the nine months' course for officers on probation for the corps are, one of twelve days for senior officers of the corps in mechanical transport; two (one long and one short) in the same subject for other officers; one for officers in other branches of the service in judging provisions; and one for lieutenants of the Royal Army Medical Corps in supply and transport.

Other colleges and schools are: the *Balloon School* at Farnborough, for officers of the Royal Engineers; *Schools of Electric Lighting* at Plymouth and Portsmouth; the *School of Signalling* at Aldershot, for officers of all branches of the service; the *School of Gymnastics*, also at Aldershot; and the *Army Veterinary School*, where a one month's course is given to officers of the mounted branches in the main principles of horsemastership, stable management and veterinary first aid, in addition to the one year's course for officers on probation for the Army Veterinary Corps.

To encourage the study of foreign languages, officers who pass a preliminary examination in any language they may select are allowed to reside in the foreign country for a period of at least two months. After such residence they may present themselves for examination, and if successful, receive a grant in aid of the expenses incurred. The grant is £80 for Russian, £50 for German, £24 for French and £30 for other languages. The final or "Interpretership" examination for which the grant is given is of a very high standard. In the case of Russian, £80 is paid to the officer during his residence in Russia, in addition to the grant. Special arrangements are made with regard to the Chinese and Japanese languages; three officers for the former and four officers for the latter being selected annually for a two years' residence in those countries. During such residence officers receive £150 per annum, in addition to their pay, and a reward of £175 on passing the "Interpretership" examination.

There has been a tendency of late years to give officers facilities for going through civilian courses of instruction; for example, at the London School of Economics and in the workshops of the principal railway companies. These courses enable the officer not only to profit by civilian experience and progress, but also to form an opinion as to his own knowledge, as compared with the knowledge of those outside his immediate surroundings.

Promotion from the Ranks.—In several armies aspirant officers may join as privates and pass through all grades. This is hardly promotion from the ranks, however, because it is understood from the first that the young *avantageur*, as he is called in Germany, is a candidate for officer's rank, and he is treated accordingly, generally living in the officers' mess and spending only a brief period in each of the non-commissioned ranks. True promotion from the ranks, won by merit and without any preferential treatment, is practically unknown in Germany. In France, on the other hand, one-third of the officers are promoted non-commissioned officers. In Italy also a large proportion of the officers comes from the ranks. In Great Britain, largely owing to the chances of distinction afforded by frequent colonial expeditions, a fair number of non-commissioned officers receive promotion to combatants' commissions. The number is, however, diminishing, as shown by the following extracts from a return of 1909 (combatants only):—

1885–1888	annual	average	34	(Sudan Wars, &c.)
1889–1892	"	"	25	
1893–1898	"	"	19	
1899–1902	"	"	35	(S. African War)
1903–1908	"	"	14	

Quartermasters and riding masters are invariably promoted from the lower ranks.

Officers of reserve and second line forces are recruited in Great Britain both by direct appointment and by transfer from the regular forces. In universal service armies reserve officers are drawn from retired regular officers, selected non-commissioned officers, and most of all from young men of good social standing who are gazetted after serving their compulsory period as privates in the ranks.

FOREIGN ARMIES

The training of the officer of a foreign army differs very slightly from that of the British officer. Each country specializes according to its individual requirements, but in the main the training is much the same.

Germany.—The Germans attend more closely to detail—being even microscopical—and it has been said that a little grit in the German military machine would cause a cessation of its working. Unfortunately for this argument, the German army has not yet given any signs of cessation of work, so few deviations from the smooth working of the military machine being permitted that the introduction of grit into this air-tight casing is practically impossible. At the same time, the German officer is trained to have initiative and to use that initiative, but he is expected to be discreet in the use of it and consequently undue insistence on literal obedience to instructions (as distinct from formal orders), and undue reticence on the part of senior, especially staff, officers is held to be dangerous, in that the regimental officer, if ignorant of the military situation, may, by acts of initiative out of harmony with the general plan, seriously prejudice the issue. The Germans attach special importance to instruction in the tactical handling of artillery.

Italy.—The Italians make a speciality of horsemanship, their cavalry officers studying for two years at the cavalry school at Modena; later at the school at Pinerolo, and later still at the school at Tor di Quinto. They also attach much importance to mountain warfare.

France.—The formal training of the French officer does not appear to differ seriously from that of the British officer, with this exception, that as one-third or so of French officers are promoted from the non-commissioned ranks, a great feature of the educational system is the group of schools comprising the Saumur (cavalry), St Maixent (infantry) and Versailles (artillery and engineers), which are intended for under-officer candidates for commissions. The generality of the officers comes from the "special school" of St Cyr (infantry and cavalry) and the *École Polytechnique* (artillery and engineers). (R. J. G.)

United States.—The principal source from which officers are supplied to the army is the famous Military Academy at West Point, N.Y. The President may appoint forty cadets and generally chooses sons of army and navy officers. Each senator and each representative and delegate in Congress may appoint one. These appointments are not made annually, but as vacancies occur through graduation of cadets, or their discharge before graduation. The maximum number of cadets under the Twelfth Census is 533. The commanding officer of the academy has the title of superintendent and commandant. He is detailed from the army, and has the temporary rank of colonel. The corps of cadets is organized as a battalion, and is commanded by an officer detailed from the army, having the title of commandant of cadets. He has the temporary rank of lieutenant-colonel. An officer of engineers and of ordnance are detailed as instructors of practical military engineering and of ordnance and gunnery respectively. The heads of the departments of instruction have the title of professors. They are selected generally from officers of the army, and their positions are permanent. The officers above mentioned and the professors constitute the academic board. The military staff and assistant instructors are officers of the army. The course of instruction covers four years and is very thorough. Theoretical instruction comprises mathematics, French, Spanish, English, drawing, physics, astronomy, chemistry, ordnance and gunnery, art of war, civil and military engineering, law (international, constitutional and military), history and drill regulations of all arms. Practical instruction comprises the service drills in infantry, cavalry and artillery, surveying, reconnaissances, field engineering, construction of temporary bridges, simple astronomical observations, fencing, gymnastics and swimming. Cadets are a part of the army, and rank between second lieutenants and the highest grade of non-commissioned officers. They receive from the government a rate of pay sufficient to cover all necessary expenses at the academy. About 50% of those entering are able to complete the course. The graduating class each year numbers, on an average, about 60. A class, on graduating, is arranged in order according to merit, and its members are assigned as second lieutenants to corps and arm, according to the recommendation of the academic board. A few at the head of the class go into the corps of engineers; the next in order generally go into the artillery, and the rest of the class into the cavalry and infantry. The choice of graduates as to arm of service and regiments is consulted as far as practicable. Any enlisted man who has served honestly and faithfully not less than two years, who is between twenty-one and thirty years of age, unmarried, a citizen of the United States and of good moral character, may aspire to a commission. To obtain it he must pass an educational and physical examination before a board of five officers. This board must also inquire as to the character, capacity and record of the candidate. Many well-educated young men, unable to obtain appointments to West Point, enlist in the army for the express purpose of obtaining a commission. Vacancies in the grade of second lieutenant remaining, after the graduates of the Military Academy and qualified enlisted men have been appointed, are filled from civil life. To be eligible for appointment a candidate must be a citizen of the United States, unmarried, between the ages of twenty-one and twenty-seven years, and must be approved by an examining board of five officers as to habits, moral character, physical ability, education and general fitness for the service. In time of peace very few appointments from civil life are made, but in time of war there is a large number.

There are, in addition to the Engineer School at Washington, D.C. four service schools for officers. These are: the Coast Artillery School at Fort Monroe, Virginia; the General Service and Staff College at Fort Leavenworth, Kansas; the Mounted Service School at Fort Riley, Kansas; the Army Medical School at Washington. The commandants, staffs and instructors at these schools are officers specially selected. The garrison at Fort Monroe is composed of several companies of coast artillery. The lieutenants of these companies, who constitute the class, are relieved and replaced by others on 1st September of each year. The course of instruction comprises the following subjects: artillery, ballistics, engineering, steam and mechanics, electricity and mines, chemistry and explosives, military science, practical military exercises, photography, telegraphy and cordage (the use of ropes, the making of various kinds of knots and lashings, rigging shears, &c., for the handling of heavy guns). July and August of each year are ordinarily devoted to artillery target practice. The course at the General Service and Staff College is for one year in each School. The class of student officers is made up of one lieutenant from each regiment of infantry and cavalry, and such others as may be detailed. They are assigned to the organizations comprising the garrison, normally a regiment of infantry, a squadron (four troops) of cavalry and a battery of field artillery. The departments of instruction are: military art, engineering, law, infantry, cavalry, military hygiene. Much attention is paid to practical work in the minor operations of war, the troops of the garrison being utilized in connexion therewith. At the close of the final examinations of each class at Fort Monroe and Fort Leavenworth, those officers most distinguished for proficiency are reported to the adjutant-general of the army. Two from each class of the Artillery School, and not more than five from each class at the General Service and Staff College, are thereafter, so long as they remain in the service, noted in the annual army register as "honour graduates." The work of the Mounted Service School at Fort Riley is mainly practical, and is carried on by the regular garrison, which usually, in time of peace, consists of two squadrons of cavalry and three field batteries. The government reservation at Fort Riley comprises about 40 sq. m. of varied terrain, so that opportunities are afforded, and taken advantage of, for all kinds of field operations. The Army Medical School is established at Washington. The faculty consists of four or more instructors selected from the senior officers of the medical department. The course of instruction covers a period of five months, beginning annually in November. The student officers are recently appointed medical officers, and such other medical officers, available for detail, as may desire to take the course. Instruction is by lecture and practical work, special attention being given to the following subjects: duties of medical officers in peace and war; hospital administration; military medicine, surgery and hygiene; microscopy and bacteriology; hospital corps drill and first aid to the wounded. (W. A. S.)

OFFICIAL (Late Lat. *officialis*, for class. Lat. *apparitor*, from *officium*, office, duty), in general any holder of office under the state or a public body. In ecclesiastical law the word "official" has a special technical sense as applied to the official exercising a diocesan bishop's jurisdiction as his representative and in his name (see ECCLESIASTICAL JURISDICTION). The title of "official principal," together with that of "vicar-general," is in England now merged in that of "chancellor" of a diocese (see CHANCELLOR).

OFFICINAL, a term applied in medicine to drugs, plants and herbs, which are sold in chemists' and druggists' shops, and to medical preparations of such drugs, &c., as are made in accordance with the prescriptions authorized by the pharmacopoeia. In the latter sense, modern usage tends to supersede "officinal" by "official." The classical Lat. *officina* meant a workshop, manufactory, laboratory, and in medieval monastic Latin was applied to a general store-room (see Du Cange, *Gloss.*, *s.v.*); it thus became applied to a shop where goods were sold rather than a place where things were made.

OGDEN, a city and the county-seat of Weber county, Utah, U.S.A., at the confluence of the Ogden and Weber rivers, and about 35 m. N. of Salt Lake City. Pop. (1890) 14,889; (1900) 16,313, of whom 3302 were foreign-born; (1910 census) 25,580. It is served by the Union Pacific, the Southern Pacific, the Oregon Short Line, and the Denver & Rio Grande railways. It is situated at an elevation of about 4300 ft. in the picturesque region of the Wasatch Range, Ogden Cañon and the Great Salt Lake. Ogden is in an agricultural and fruit-growing region, and gold and silver are mined in the vicinity. It has various manufactures, and the value of the factory product increased from $1,242,214 in 1900 to $2,997,057 in 1905, or 141·3%. Ogden, which is said to have been named in honour of John Ogden, a trapper, was laid out under the direction of Brigham Young in 1850, and was incorporated in the next year; in 1861 it received a new charter, but since 1898 it has been governed under a general law of the state.

OGDENSBURG, a city and port of entry of St Lawrence county, New York, U.S.A., on the St Lawrence river, at the mouth of the Oswegatchie, 140 m. N. by E. of Syracuse, New York. Pop. (1890) 11,662; (1900) 12,633, of whom 3222 were foreign-born; (1910 census) 15,933. It is served by the New York Central & Hudson River and the Rutland railways, and by several lake and river steamboat lines connecting with ports on the Great Lakes, the city being at the head of lake navigation on the St Lawrence. Steam ferries connect Ogdensburg with Prescott, Ontario. The city is the seat of the St Lawrence State Hospital for the Insane (1890), and has a United States Customs House and a state armoury. The city became the see of a Roman Catholic bishop in 1872, and here Edgar Philip Wadhams (1817–1891) laboured as bishop in 1872–1891. It is the port of entry of the Oswegatchie customs district, and has an extensive commerce, particularly in lumber and grain. The city has various manufactures, including lumber, flour, wooden-ware, brass-ware, silks, woollens and clothing. The value of the factory products increased from $2,260,889 in 1900 to $3,057,271 in 1905, or 35·2%. The site of Ogdensburg was occupied in 1749 by the Indian settlement of La Presentation, founded by the Abbé François Piquet (1708–1781) for the Christian converts of the Iroquois. At the outbreak of the War of Independence the British built here Fort Presentation, which they held until 1796, when, in accordance with the terms of the Jay Treaty, the garrison was withdrawn. Abraham Ogden (1743–1798), a prominent New Jersey lawyer, bought land here, and the settlement which grew up around the fort was named Ogdensburg. During the early part of the War of 1812 it was an important point on the American line of defence. On the 4th of October 1812 Colonel Lethbridge, with about 750 men, prepared to attack Ogdensburg but was driven off by American troops under General Jacob Brown. On the 22nd of February 1813 both fort and village were captured and partially destroyed by the British. During the Canadian rising of 1837–1838 Ogdensburg became a rendezvous of the insurgents. Ogdensburg was incorporated as a village in 1818, and was chartered as a city in 1868.

OGEE (probably an English corruption of Fr. *ogive*, a diagonal groin rib, being a moulding commonly employed; equivalents in other languages are Lat. *cyma-reversa*, Ital. *gola*, Fr. *cymaise*, Ger. *Kehlleisten*), a term given in architecture to a moulding of a double curvature, convex and concave, in which the former is the uppermost (see MOULDING). The name "ogee-arch" is often applied to an arch formed by the meeting of two contrasted ogees (see ARCH).

OGIER THE DANE, a hero of romance, who is identified with the Frankish warrior Autchar (Autgarius, Auctarius, Otgarius, Oggerius) of the old chroniclers. In 771 or 772 Autchar accompanied Gerberga, widow of Carloman, Charlemagne's brother, and her children to the court of Desiderius, king of the Lombards, with whom he marched against Rome. In 773 he submitted to Charles at Verona. He finally entered the cloister of St Faro at Meaux, and Mabillon (*Acta SS. ord. St Benedicti*, Paris, 1677) has left a description of his monument there, which had figures of Ogier and his friend Benedict or Benoît, with smaller images of Roland and la belle Aude and other Carolingian personages. In the chronicle of the Pseudo-Turpin it is stated that innumerable *cantilenae* were current on the subject of Ogier, and his deeds were probably sung in German as well as in French. The Ogier of romance may be definitely associated with the flight of Gerberga and her children to Lombardy, but it is not safe to assume that the other scattered references all relate to the same individual. Colour is lent to the theory of his Bavarian origin by the fact that he, with Duke Naimes of Bavaria, led the Bavarian contingent to battle at Roncesvaux.

In the romances of the Carolingian cycle he is, on account of his revolt against Charlemagne, placed in the family of Doon de Mayence, being the son of Gaufrey de "Dannemarche." The *Enfances Ogier* of Adenès le Rois, and the *Chevalerie Ogier de Dannemarche* of Raimbert de Paris, are doubtless based on earlier chansons. The *Chevalerie* is divided into twelve songs or branches. Ogier, who was the hostage for his father at Charlemagne's court, fell into disgrace, but regained the emperor's favour by his exploits in Italy. One Easter at the court of Laon, however, his son Balduinet was slain by Charlemagne's son, Charlot, with a chess-board (cf. the incident of Renaud and Bertholais in the *Quatre Fils Aymon*). Ogier in his rage slays the queen's nephew Loher, and would have slain Charlemagne himself but for the intervention of the knights, who connived at his flight to Lombardy. In his stronghold of Castelfort he resisted the imperial forces for seven years, but was at last taken prisoner by Turpin, who incarcerated him at Reims, while his horse Broiefort, the sharer of his exploits, was made to draw stones at Meaux. He was eventually released to fight the Saracen chief Bréhus or Braihier, whose armies had ravaged France, and who had defied Charlemagne to single combat. Ogier only consented to fight after the surrender of Charlot, but the prince was saved from his barbarous vengeance by the intervention of St Michael. The giant Bréhus, despite his 17 ft. of stature, was overthrown, and Ogier, after marrying an English princess, the daughter of Angart (or Edgard), king of England, received from Charlemagne the fiefs of Hainaut and Brabant.

A later romance in Alexandrines (Brit. Mus. MS. Royal 15 E vi.) contains marvels added from Celtic romance. Six fairies visit his cradle, the sixth, Morgan la Fay, promising that he shall be her lover. He has a conqueror's career in the East, and after two hundred years in the "castle" of Avalon returns to France in the days of King Philip, bearing a firebrand on which his life depends. This he destroys when Philip's widowed queen wishes to marry him, and he is again carried off by Morgan la Fay. The prose romance printed at Paris in 1498 is a version of this later poem. The fairy element is prominent in the Italian legend of *Uggieri il Danese*, the most famous redaction being the prose *Libro dele bataglie del Danese* (Milan, 1498), and in the English *Famous and renowned history of Morvine, son to Oger the Dane*, translated by J. M. (London, 1612). The Spanish Urgel was the hero of Lope de Vega's play, the *Marques de Mantua*. Ogier occupies the third branch of the Scandinavian Karlamagnus saga; his fight with Brunamont (*Enfances Ogier*) was the subject of a Danish folk-song; and as *Holger Danske* he became a Danish national hero, who fought against the German Dietrich of Bern (Theodoric "of Verona"), and was invested with the common tradition of the king who sleeps in a mountain ready to awaken at need. Whether he had originally anything to do with Denmark seems doubtful. The surname le Danois has been explained as a corruption of l'Ardennois and Dannemarche as the marches of the Ardennes.

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OGILBY, JOHN (1600–1676), British writer, was born in or near Edinburgh in November 1600. His father was a prisoner within the rules of King's Bench, but by speculation the son found money to apprentice himself to a dancing master and to obtain his father's release. He accompanied Thomas Wentworth, earl of Strafford, when he went to Ireland as lord deputy, and became tutor to his children. Strafford made him deputy-master of the revels, and he built a little theatre in St Werburgh Street, Dublin, which was very successful. The outbreak of the Civil War ruined his fortunes, and in 1646 he returned to England. Finding his way to Cambridge, he learned Latin from kindly scholars who had been impressed by his industry. He then ventured to translate Virgil into English verse (1649–1650), which brought him a considerable sum of money. The success of this attempt encouraged Ogilby to learn Greek from David Whitford, who was usher in the school kept by James Shirley the dramatist. *Homer his Iliads translated* . . . appeared in 1660, and in 1665 *Homer his Odysses translated* . . . Anthony à Wood asserts that in these undertakings he had the assistance of Shirley. At the Restoration Ogilby received a commission for the "poetical part" of the coronation. His property was destroyed in the Great Fire of 1666, but he rebuilt his house in Whitefriars, and set up a printing press, from which he issued many magnificent books, the most important of which were a series of atlases, with engravings and maps by Hollar and others. He styled himself "His Majesty's Cosmographer and Geographic Printer." He died in London on the 4th of September 1676.

Ogilby also translated the fables of Aesop, and wrote three epic poems. His bulky output was ridiculed by John Dryden in *Mac-Flecknoe* and by Alexander Pope in the *Dunciad*.

OGILVIE (or OGILBY), **JOHN** (*c.* 1580–1615), English Jesuit, was born in Scotland and educated mainly in Germany, where he entered the Society of Jesus, being ordained priest at Paris in 1613. As an emissary of the society he returned to Scotland in this year disguised as a soldier, and in October 1614 he was arrested in Glasgow. He defended himself stoutly when he was tried in Edinburgh, but he was condemned to death and was hanged on the 28th of February 1615.

A True Relation of the Proceedings against John Ogilvie, a Jesuit (Edinburgh, 1615), is usually attributed to Archbishop Spottiswoode. See also James Forbes, *L'Eglise catholique en Ecosse: martyre de Jean Ogilvie* (Paris, 1885); and W. Forbes-Leith, *Narratives of Scottish Catholics* (1885).

OGILVY, the name of a celebrated Scottish family of which the earl of Airlie is the head. The family was probably descended from a certain Gillebride, earl of Angus, who received lands from William the Lion. Sir Walter Ogilvy (d. 1440) of Lintrathen, lord high treasurer of Scotland from 1425 to 1431, was the son of Sir Walter Ogilvy of Wester Powrie and Auchterhouse, a man, says Andrew of Wyntoun, "stout and manfull, bauld and wycht," who was killed in 1392. He built a castle at Airlie in Forfarshire, and left two sons. The elder of these, Sir John Ogilvy (d. *c.* 1484), was the father of Sir James Ogilvy (*c.* 1430–*c.* 1504), who was made a lord of parliament in 1491; and the younger, Sir Walter Ogilvy, was the ancestor of the earls of Findlater. The earldom of Findlater, bestowed on James Ogilvy, Lord Ogilvy of Deskford, in 1638, was united in 1711 with the earldom of Seafield and became dormant after the death of James Ogilvy, the 7th earl, in October 1811 (see SEAFIELD, EARLS OF).

Sir James Ogilvy's descendant, James Ogilvy, 5th Lord Ogilvy of Airlie (*c.* 1541–1606), a son of James Ogilvy, master of Ogilvy, who was killed at the battle of Pinkie in 1547, took a leading part in Scottish politics during the reigns of Mary and of James VI. His grandson, James Ogilvy (*c.* 1593–1666), was created earl of Airlie by Charles I. at York in 1639. A loyal partisan of the king, he joined Montrose in Scotland in 1644 and was one of the royalist leaders at the battle of Kilsyth. The destruction of the earl's castles of Airlie and of Forther in 1640 by the earl of Argyll, who "left him not in all his lands a cock to crow day," gave rise to the song "The bonny house o'Airlie." His eldest son, James, the 2nd earl (*c.* 1615–*c.* 1704) also fought among the royalists in Scotland; in 1644 he was taken prisoner, but he was released in the following year as a consequence of Montrose's victory at Kilsyth. He was again a prisoner after the battle of Philiphaugh and was sentenced to death in 1646, but he escaped from his captivity at St Andrews and was afterwards pardoned. Serving with the Scots against Cromwell he became a prisoner for the third time in 1651, and was in the Tower of London during most of the years of the Commonwealth. He was a fairly prominent man under Charles II. and James II., and in 1689 he ranged himself on the side of William of Orange. This earl's grandson, James Ogilvy (d. 1731), took part in the Jacobite rising of 1715 and was attainted; consequently on his father's death in 1717 he was not allowed to succeed to the earldom, although he was pardoned in 1725. When he died his brother John (d. 1761) became earl *de jure*, and John's son David (1725–1803) joined the standard of Prince Charles Edward in 1745. He was attainted, and after the defeat of the prince at Culloden escaped to Norway and Sweden, afterwards serving in the French army, where he commanded "*le regiment Ogilvy*" and was known as "*le bel Ecossais*." In 1778 he was pardoned and was allowed to return to Scotland, and his family became extinct when his son David died unmarried in April 1812. After this event David's cousin, another David Ogilvy (1785–1849), claimed the earldom. He asserted that he was unaffected by the two attainders, but the House of Lords decided that these barred his succession; however, in 1826 the attainders were reversed by act of parliament and David became 6th earl of Airlie. He died on the 20th of August 1849 and was succeeded by his son, David Graham Drummond Ogilvy (1826–1881), who was a Scottish representative peer for over thirty years. The latter's son, David Stanley William Drummond Ogilvy, the 8th earl (1856–1900), served in Egypt in 1882 and 1885, and was killed on the 11th of June 1900 during the Boer War while at the head of his regiment, the 12th Lancers. His titles then passed to his son, David Lyulph Gore Wolseley Ogilvy, the 9th earl (b. 1893).

A word may be said about other noteworthy members of the Ogilvy family. John Ogilvy, called Powrie Ogilvy, was a political adventurer who professed to serve King James VI. as a spy and who certainly served William Cecil in this capacity. Mariota Ogilvy (d. 1575) was the mistress of Cardinal Beaton. Sir George Ogilvy (d. 1663), a supporter of Charles I. during the struggle with the Covenanters, was created a peer as lord of Banff in 1642; this dignity became dormant, or extinct, on the death of his descendant, William Ogilvy, the 8th lord, in June 1803. Sir George Ogilvy of Barras (d. *c.* 1679) defended Dunnottar Castle against Cromwell in 1651 and 1652, and was instrumental in preventing the regalia of Scotland from falling into his hands; in 1660 he was created a baronet, the title becoming extinct in 1837.

See Sir R. Douglas, *Peerage of Scotland*, new ed. by Sir J. B. Paul (1904 fol.).

OGIVE (a French term, of which the origin is obscure; *auge*, trough, from Lat. *augere*, to increase, and an Arabic astrological word for the "highest point," have been suggested as derivations), a term applied in architecture to the diagonal ribs of a vault. In France the name is generally given to the pointed arch, which has resulted in its acceptance as a title for Gothic architecture, there often called "*le style ogival*."

OGLETHORPE, JAMES EDWARD (1696–1785), English general and philanthropist, the founder of the state of Georgia, was born in London on the 21st of December 1696, the son of Sir Theophilus Oglethorpe (1650–1702) of Westbrook Place, Godalming, Surrey. He entered Corpus Christi College, Oxford, in 1714, but in the same year joined the army of Prince Eugène. Through the recommendation of the duke of Marlborough he became aide-de-camp to the prince, and he served with distinction in the campaign against the Turks, 1716–17, more especially at the siege and capture of Belgrade. After his return to England he was in 1722 chosen member of parliament for Haslemere. He devoted much attention to the improvement of the circumstances of poor debtors in London prisons; and for the purpose of providing an asylum for persons who had become insolvent, and for oppressed Protestants on the continent, he projected the settlement of a colony in America between Carolina and Florida (see GEORGIA). In 1745 Oglethorpe was promoted to the rank of major-general. His conduct in connexion with the Scottish rebellion of that year was the subject of inquiry by court-martial, but he was acquitted. In 1765 he was raised to the rank of general. He died at Cranham Hall, Essex, on the 1st of July 1785.

Sir Theophilus Oglethorpe, the father, had four sons and four daughters, James Edward being the youngest son, and another James (b. 1688) having died in infancy. Of the daughters, Anne Henrietta (b. 1680–1683), Eleanor (b. 1684) and Frances Charlotte (Bolingbroke's "Fanny Oglethorpe") may be specified as having played rather curious parts in the Jacobitism of the time; their careers are described in the essay on "Queen Oglethorpe" by Miss A. Shield and A. Lang, in the latter's *Historical Mysteries* (1904).

OGOWÉ, one of the largest of the African rivers of the second class, rising in 3° S. in the highlands known as the Crystal range, and flowing N.W. and W. to the Atlantic, a little south of the equator, and some 400 m. following the coast, north of the mouth of the Congo. Its course, estimated at 750 m., lies wholly within the colony of Gabun, French Congo. In spite of its considerable size, the river is of comparatively little use for navigation, as rapids constantly occur as it descends the successive steps of the interior tablelands. The principal obstructions are the falls of Dume, in 13° E.; Bunji, in 12° 35′; Chengwe, in 12° 16′; Boué, in 11° 53′; and the rapids formed in the passes by which it breaks through the outer chains of the mountainous zone, between 10$\frac{3}{4}$° and 11$\frac{3}{4}$° E. In its lower course the river passes through a lacustrine region in which it sends off secondary channels. These channels, before reuniting with the main stream, traverse a series of lakes, one north, the other south, of the river. These lakes are natural regulators of the river when in flood. The Ogowé has a large number of tributaries, especially in its upper course, but of these few are navigable. The most important are the Lolo, which joins on the south bank in 12° 20′ E., and the Ivindo, which enters the Ogowé a few miles lower down. Below the Ivindo the largest tributaries are the Ofowé, 400 yds. wide at its mouth (11° 47′ E.), but unnavigable except in the rains, and the Ngunye, the largest southern tributary, navigable for 60 m. to the Samba or Eugénie Falls. Apart from the narrow coast plain the whole region of the lower Ogowé is densely forested. It is fairly thickly populated by Bantu tribes who have migrated from the interior. The fauna includes the gorilla and chimpanzee.

The Ogowé rises in March and April, and again in October and November; it is navigable for steamers in its low-water condition as far as the junction of the Ngunye. At flood time the river can be ascended by steamers for a distance of 235 m. to a place called N'Jole. The first person to explore the valley of the Ogowé was Paul du Chaillu, who travelled in the country during 1857–1859. The extent of the delta and the immense volume of water carried by the river gave rise to the belief that it must either be a bifurcation of the Congo or one of the leading rivers of Africa. However, in 1882 Savorgnan de Brazza (the founder of French Congo) reached the sources of the river in a rugged, sandy and almost treeless plateau, which forms the watershed between its basin and that of the Congo, whose main stream is only 140 m. distant. Since that time the basin of the Ogowé has been fully explored by French travellers.

OGRE, the name in fairy tales and folk-lore of a malignant monstrous giant who lives on human flesh. The word is French, and occurs first in Charles Perrault's *Histoires ou contes du temps passé* (1697). The first English use is in the translation of a French version of the *Arabian Nights* in 1713, where it is spelled *hogre*. Attempts have been made to connect the word with *Ugri*, the racial name of the Magyars or Hungarians, but it is generally accepted that it was adapted into French from the O. Span. *huerco, huergo, uergo*, cognate with Ital. *orco, i.e. Orcus*, the Latin god of the dead and the infernal regions (see Pluto), who in Romance folk-lore became a man-eating demon of the woods.

OGYGES, or Ogygus, in Greek mythology, the first king of Thebes. During his reign a great flood, called the Ogygian deluge, was said to have overwhelmed the land. Similar legends were current in Attica and Phrygia. Ogyges is variously described as a Boeotian autochthon, as the son of Cadmus, or of Poseidon.

O'HAGAN, THOMAS O'HAGAN, 1st Baron (1812–1885), lord chancellor of Ireland, was born at Belfast, on the 29th of May 1812. He was educated at Belfast Academical Institution, and was called to the Irish bar in 1836. In 1840 he removed to Dublin, where he appeared for the repeal party in many political trials. His advocacy of a continuance of the union with England, and his appointment as solicitor-general for Ireland in 1861 and attorney-general in the following year, lost him the support of the Nationalist party, but he was returned to parliament as member for Tralee in 1863. In 1865 he was appointed a judge of common pleas, and in 1868 became lord chancellor of Ireland in Gladstone's first ministry. He was the first Roman Catholic to hold the chancellorship since the reign of James II., an act throwing open the office to Roman Catholics having been passed in 1867. In 1870 he was raised to the peerage, and held office until the resignation of the ministry in 1874. In 1880 he again became lord chancellor on Gladstone's return to office, but resigned in 1881. He died in London on the 1st of February 1885, and was succeeded by his eldest son, Thomas Towneley (1878–1900), and then by another son, Maurice Herbert Towneley (b. 1882).

O'HIGGINS, BERNARDO (1778–1842), one of the foremost leaders in the Chilean struggle for independence and head of the first permanent national government, was a natural son of the Irishman Ambrosio O'Higgins, governor of Chile (1788–1796), and was born at Chillan on the 20th of August 1778. He was educated in England, and after a visit to Spain he lived quietly on his estate in Chile till the revolution broke out. Joining the nationalist party led by Martinez de Rozas, he distinguished himself in the early fighting against the royalist troops despatched from Peru, and was appointed in November 1813 to supersede J. M. Carrera in command of the patriot forces. The rivalry that ensued, in spite of O'Higgins's generous offer to serve under Carrera, eventually resulted in O'Higgins being isolated and overwhelmed with the bulk of the Chilean forces at Rancagua in 1814. O'Higgins with most of the patriots fled across the Andes to Mendoza, where José de San Martin (*q.v.*) was preparing a force for the liberation of Chile. San Martin espoused O'Higgins's part against Carrera, and O'Higgins, recognizing the superior ability and experience of San Martin, readily consented to serve as his subordinate. The loyalty and energy with which he acted under San Martin contributed not a little to the organization of the liberating army, to its transportation over the Andes, and to the defeat of the royalists at Chacabuco (1817) and Maipo (1818). After the battle of Chacabuco O'Higgins was entrusted with the administration of Chile, and he ruled the country firmly and well, maintaining the close connexion with the Argentine, co-operating loyally with San Martin in the preparation of the force for the invasion of Peru, and seeking, as far as the confusion and embarrassments of the time allowed, to improve the welfare of the people. After the overthrow of the Spanish supremacy in Peru had freed the Chileans from fear of attack, an agitation set in for constitutional government. O'Higgins at first tried to maintain his position by calling a congress and obtaining a constitution which invested him with dictatorial powers. But popular discontent grew in force; risings took place in Concepcion and Coquimbo, and on the 28th of January 1823 O'Higgins was finally patriotic enough to resign his post of director-general, without attempting to retain it by force. He retired to Peru, where he was granted an estate and lived quietly till his death on the 24th of October 1842.

See B. Vicuña Machenna, *Vida de O'Higgins* (Santiago, 1882), and M. L. Armunàtegni, *La Dictadura de O'Higgins* (Santiago, 1853); both containing good accounts of O'Higgins's career. Also P. B. Figueroa, *Diccionario biográfico de Chile, 1550-1887* (Santiago, 1888), and J. B. Suarez, *Rasgos biográficos de hombres notables de Chile* (Valparaiso, 1886).

OHIO, a north central state of the United States of America, lying between latitudes 38° 27′ and 41° 57′ N. and between longitudes 80° 34′ and 84° 49′ W. It is bounded N. by Michigan and Lake Erie, E. by Pennsylvania and by the Ohio river which separates it from West Virginia, S. by the Ohio river which separates it from West Virginia and Kentucky, and W. by Indiana. The total area is 41,040 sq. m., 300 sq. m. being water surface.

Physiography.—The state lies on the borderland between the Prairie Plains and the Alleghany Plateau. The disturbances among the underlying rocks of Ohio have been slight, and originally the surface was a plain only slightly undulating; stream dissection changed the region to one of numberless hills and valleys; glacial drift then filled up the valleys over large broken areas, forming the remarkably level till plains of northwestern Ohio; but at the same time other areas were broken by the uneven distribution of the drift, and south-eastern Ohio, which was unglaciated, retains its rugged hilly character, gradually merging with the typical plateau country farther S.E. The average elevation of the state above the sea is about 850 ft., but extremes vary from 425 ft. at the confluence of the Great Miami and Ohio rivers in the S.W. corner to 1540 ft. on the summit of Hogues Hill about 1$\frac{1}{2}$ m. E. of Bellefontaine in the west central part.

The main water-parting is formed by a range of hills which are composed chiefly of drift and extend W.S.W. across the state from Trumbull county in the N.E. to Darke county, or about the middle of the W. border. North of this water-parting the rivers flow into Lake Erie; S. of it into the Ohio river. Nearly all of the streams in the N.E. part of the state have a rapid current. Those that flow directly into the lake are short, but some of the rivers of this region, such as the Cuyahoga and the Grand, are turned by drift ridges into circuitous courses and flow through narrow valleys with numerous falls and rapids. Passing the village of Cuyahoga Falls the Cuyahoga river descends more than 200 ft. in 3 m.; a part of its course is between walls of sandstone 100 ft. or more in height, and near its mouth, at Cleveland, its bed has been cut down through 60 ft. of drift. In the middle N. part of the state the Black, Vermilion and Huron rivers have their sources in swamps on the water-parting and flow directly to the lake through narrow valleys. The till plains of north-western Ohio are drained chiefly by the Maumee and Sandusky rivers, with their tributaries, and the average fall of the Maumee is only 1·1 ft. per mile, while that of the Sandusky decreases from about 7 ft. per mile at Upper Sandusky to 2·5 ft. per mile below Fremont. South of the water-parting the average length of the rivers is greater than that of those N. of it, and their average fall per mile is much less. In the S.W. the Great Miami and Little Miami rivers have uniform falls through basins that are decidedly rolling and that contain the extremes of elevation for the entire state. The central and S. middle part is drained by the Scioto river and its tributaries. The basin of this river is formed mostly in Devonian shale, and is bounded on the W. by a limestone rim and on the E. by preglacial valleys filled with glacial drift. In its middle portion the basin is about 40 m. wide and only moderately rolling, but toward the mouth of the river the basin becomes narrow and is shut in by high hills. In the E. part of Ohio the Muskingum river and its tributaries drain an area of about 7750 sq. m. or nearly one-fifth of the entire state. Much of the unglacial or driftless portion of the state is embraced within its limits, and although the streams now have a gentle or even sluggish flow, they have greatly broken the surface of the country. The upper portion of the basin is about 100 m. in width, but it becomes quite narrow below Zanesville. The Ohio river flows for 436 m. through a narrow valley on the S. border of the state, and Lake Erie forms the N. boundary for a distance of 230 m. At the W. end of the lake are Sandusky and Maumee bays, each with a good natural harbour. In this vicinity also are various small islands of limestone formation which are attractive summer resorts. On Put-in-Bay Island are some interesting "hydration" caves, *i.e.* caves formed by the uplifting and folding of the rocks while gypsum was forming beneath, followed by the partial collapse of those rocks when the gypsum passed into solution. Ohio has no large lakes within its limits, but there are several small ones on the water-parting, especially in the vicinity of Akron and Canton, and a few large reservoirs in the W. central section.

Fauna.—Bears, wolves, bison, deer, wild turkeys and wild pigeons were common in the primeval forests of Ohio, but they long ago disappeared. Foxes are still found in considerable numbers in suitable habitats; opossums, skunks and raccoons are plentiful in some parts of the state; and rabbits and squirrels are still numerous. All the song-birds and birds of prey of the temperate zone are plentiful. Whitefish, bass, trout and pickerel are an important food supply obtained from the waters of the lake, and some perch, catfish and sunfish are caught in the rivers and brooks.

Flora.—Ohio is known as the "Buckeye State" on account of the prevalence of the buckeye (*Aesculus glabra*). The state was originally covered with a dense forest mostly of hardwood timber, and although the merchantable portion of this has been practically all cut away, there are still undergrowths of young timber and a great variety of trees. The white oak is the most common, but there are thirteen other varieties of oak, six of hickory, five of ash, five of poplar, five of pine, three of elm, three of birch, two of locust and two of cherry. Beech, black walnut, butternut, chestnut, catalpa, hemlock and tamarack trees are also common. Among native fruits are the blackberry, raspberry, elderberry, cranberry, wild plum and pawpaw (*Asimina triloba*). Buttercups, violets, anemones, spring beauties, trilliums, arbutus, orchids, columbine, laurel, honeysuckle, golden rod and asters are common wild flowers, and of ferns there are many varieties.

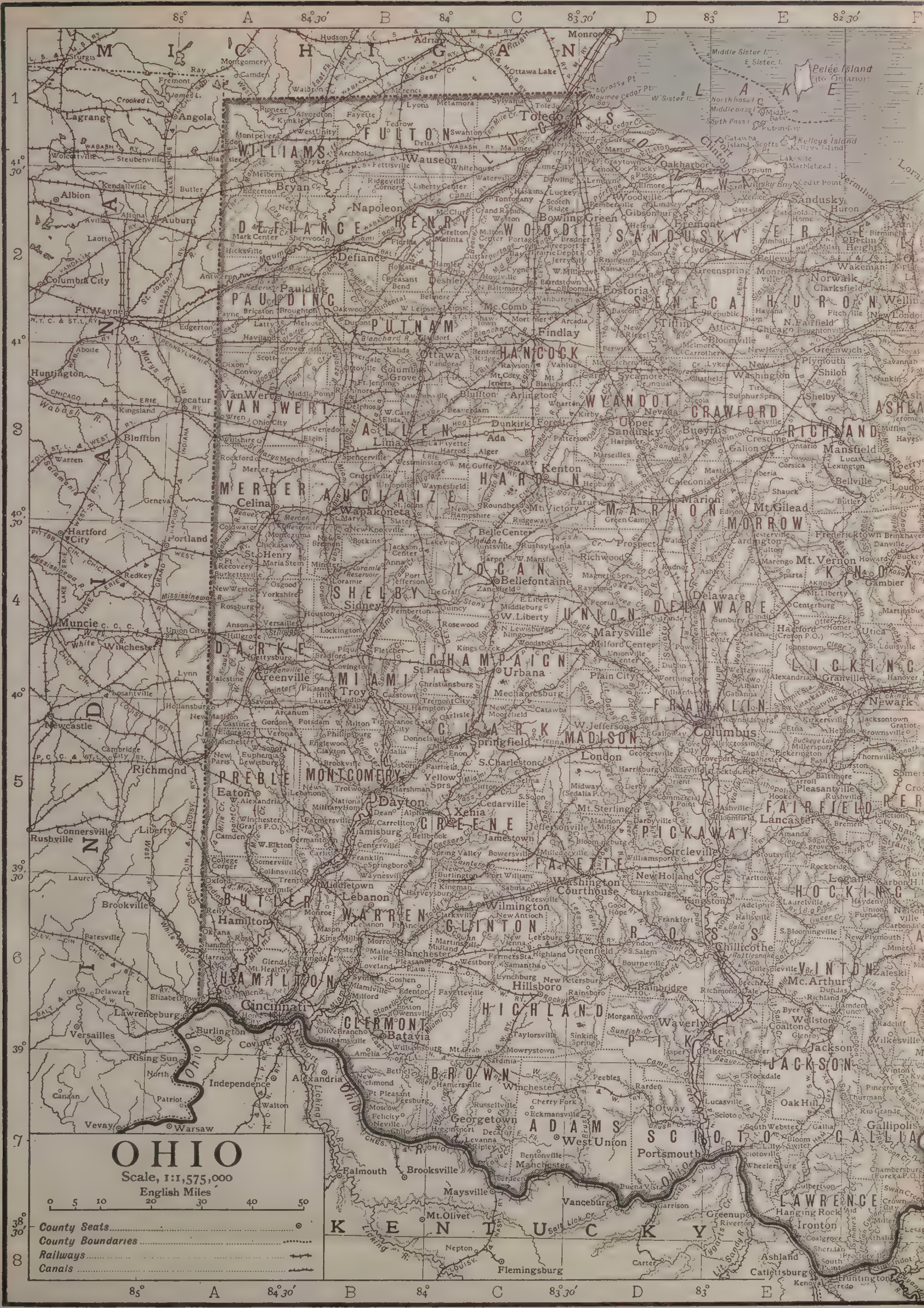
Climate.—The mean annual temperature of Ohio is about 51° F.; in the N., 49·5°, and in the S., 53·5°. But except where influenced by Lake Erie the temperature is subject to great extremes; at Coalton, Jackson county, in the S.E. part of the state, the highest recorded range of extremes is from 104° to −38° or 142°; at Wauseon, Fulton county, near the N.W. corner, it is from 104° to −32° or 136°; while at Toledo on the lake shore the range is only from 99° to −16° or 115° F. July is the warmest month, and in most parts of the state January is the coldest; in a few valleys, however, February has a colder record than January. The normal annual precipitation for the entire state is 38·4 in. It is greater in the S.E. and least in the N.W. At Marietta, for example, it is 42·1 in., but at Toledo it is only 30·8 in. Nearly 60% of it comes in the spring and summer. The average annual fall of snow is about 37 in. in the N. and 22 in. in the S. The prevailing winds in most parts are westerly, but sudden changes, as well as the extremes of temperature, are caused mainly by the frequent shifting of the wind from N.W. to S.W. and from S.W. to N.W. At Cleveland and Cincinnati the winds blow mostly from the S.E.

Soil.—In the driftless area, the S.E. part of the state, the soil is largely a decomposition of the underlying rocks, and its fertility varies according to their composition; there is considerable limestone in the E. central portion, and this renders the soil very productive. In the valleys also are strips covered with a fertile alluvial deposit. In the other parts of the state the soil is composed mainly of glacial drift, and is generally deep and fertile. It is deeper and more fertile, however, in the basins of the Great Miami and Little Miami rivers, where there is a liberal mixture of decomposed limestone and where extensive areas with a clay subsoil are covered with alluvial deposits. North of the lower course of the Maumee river is a belt of sand, but Ohio drift generally contains a large mixture of clay.

Agriculture.—Ohio ranks high as an agricultural state. Of its total land surface 24,501,820 acres or nearly 94% was, in 1900, included in farms and 78·5% of all the farm land was improved. There were altogether 276,719 farms; of these 93,028 contained less than 50 acres, 182,802 contained less than 100 acres, 150,060 contained less than 175 acres, 26,659 contained 175 acres or more, and 164 contained 1000 acres or more. The average size of the farms decreased from 125·2 acres in 1850 to 99·2 acres in 1880 and 88·5 acres in 1900. Nearly seven-tenths of the farms were worked in 1900 by owners or part owners, 24,051 were worked by cash tenants, 51,880 were worked by share tenants, and 1969 were worked by negroes as owners, tenants or managers. There is a great variety of produce, but the principal crops are Indian corn, wheat, oats, hay, potatoes, apples and tobacco. In 1900 the acreage of cereals constituted 68·4% of the acreage of all crops, and the acreage of Indian corn, wheat and oats constituted 99·3% of the total acreage of cereals. The Indian corn crop was 67,501,144 bushels in 1870; 152,055,390 bushels in 1899 and 153,062,000 in 1909, when it was grown on 3,875,000 acres and the state ranked seventh among the states of the Union in the production of this cereal. The wheat crop was 27,882,159 bushels in 1870; 50,376,800 bushels (grown on 3,209,014 acres) in 1899; and 23,532,000 bushels (grown on 1,480,000 acres) in 1909. The oat crop was 25,347,549 bushels in 1870; 42,050,910 bushels (grown on 1,115,149 acres) in 1899; and 56,225,000 bushels (grown on 1,730,000 acres) in 1909. The barley crop decreased from 1,715,221 bushels in 1870 to 1,053,240 bushels in 1899 and 829,000 bushels in 1909. The number of swine was 1,964,770 in 1850; 3,285,789 in 1900; and 2,047,000 in 1910. The number of cattle was 1,358,947 in 1850; 2,117,925 in 1900; and 1,925,000 in 1910. In 1900 there were 868,832 and in 1910 947,000 milch cows in the state. The number of sheep decreased slightly between 1870 and 1900, when there were 4,030,021; in 1910 there were 3,203,000 sheep in the state. The number of horses was 463,397 in 1850; 1,068,170 in 1900; and 977,000 in 1910. The cultivation of tobacco was of little importance in the state until about 1840; but the product increased from 10,454,449 ℔ in 1850 to 34,735,235 ℔ in 1880, and to 65,957,100 ℔ in 1899, when the crop was grown on 71,422 acres; in 1909 the crop was 83,250,000 ℔, grown on 90,000 acres. The value of all farm products in 1899 was $257,065,826. Indian corn, wheat and oats are grown in all parts, but the W. half of the state produces about three-fourths of the Indian corn and two-thirds of the wheat, and in the N. half, especially in the N.W. corner, are the best oat-producing counties. The N.E. quarter ranks highest in the production of hay. Domestic animals are evenly distributed throughout the state; in no county was their total value, in June 1900, less than $500,000, and in only three counties (Licking, Trumbull and Wood) did their value exceed $2,000,000; in 73 counties their value exceeded $1,000,000, but was less than $2,000,000. Dairying and the production of eggs are also important industries in all sections. Most of the tobacco is grown in the counties on or near the S.W. border.

Fisheries.—Commercial fishing is important only in Lake Erie. In 1903 the total catch there amounted to 10,748,986 ℔, valued at $317,027. Propagation facilities are being greatly improved, and there are stringent laws for the protection of immature fish. Inland streams and lakes are well supplied with game fish; state laws prohibit the sale of game fish and their being taken, except with hook and line.

Mineral Products.—The mineral wealth of Ohio consists largely of bituminous coal and petroleum, but the state also ranks high in the production of natural gas, sandstone, limestone, grindstone, lime and gypsum. The coal fields, comprising a total area of 10,000 sq. m. or more, are in the E. half of the state. Coal was discovered here as early as 1770, and the mining of it was begun not later than 1828, but no accurate account of the output was kept until 1872, in which year it was 5,315,294 short tons; this was increased to 18,988,150 short tons in 1900, and to 26,270,639 short tons in 1908—in 1907 it was 32,142,419 short tons. There are 29 counties in which coal is produced, but 81·4% of it in 1908 came from Belmont, Athens, Jefferson, Guernsey, Perry, Hocking, Tuscarawas and Jackson counties. Two of the most productive petroleum fields of the United States are in part in Ohio; the Appalachian field in the E. and S. parts of the state, and the Lima-Indiana field in the N.W. part. Some petroleum was obtained in the S.E. as early as 1859, but the state's output was comparatively small until after petroleum


OHIO
Scale, 1:1,575,000
English Miles
0 5 10 20 30 40 50
County Seats
County Boundaries
Railways
Canals
M I C H I G A N
I N D I A N A
K E N T U C K Y
L A K E   E R I E
85° A 84°30′ B 84° C 83°30′ D 83° E 82°30′ F
1 2 3 4 5 6 7 8
41°30′ 41° 40°30′ 40° 39°30′ 39° 38°30′
WILLIAMS
FULTON
LUCAS
OTTAWA
DEFIANCE
HENRY
WOOD
SANDUSKY
ERIE
PAULDING
PUTNAM
HANCOCK
SENECA
HURON
VAN WERT
ALLEN
WYANDOT
CRAWFORD
RICHLAND
ASHLAND
MERCER
AUGLAIZE
HARDIN
MARION
MORROW
KNOX
SHELBY
LOGAN
UNION
DELAWARE
LICKING
DARKE
MIAMI
CHAMPAIGN
FRANKLIN
CLARK
MADISON
PREBLE
MONTGOMERY
GREENE
FAYETTE
PICKAWAY
FAIRFIELD
PERRY
BUTLER
WARREN
CLINTON
ROSS
HOCKING
HAMILTON
CLERMONT
HIGHLAND
VINTON
BROWN
ADAMS
PIKE
JACKSON
SCIOTO
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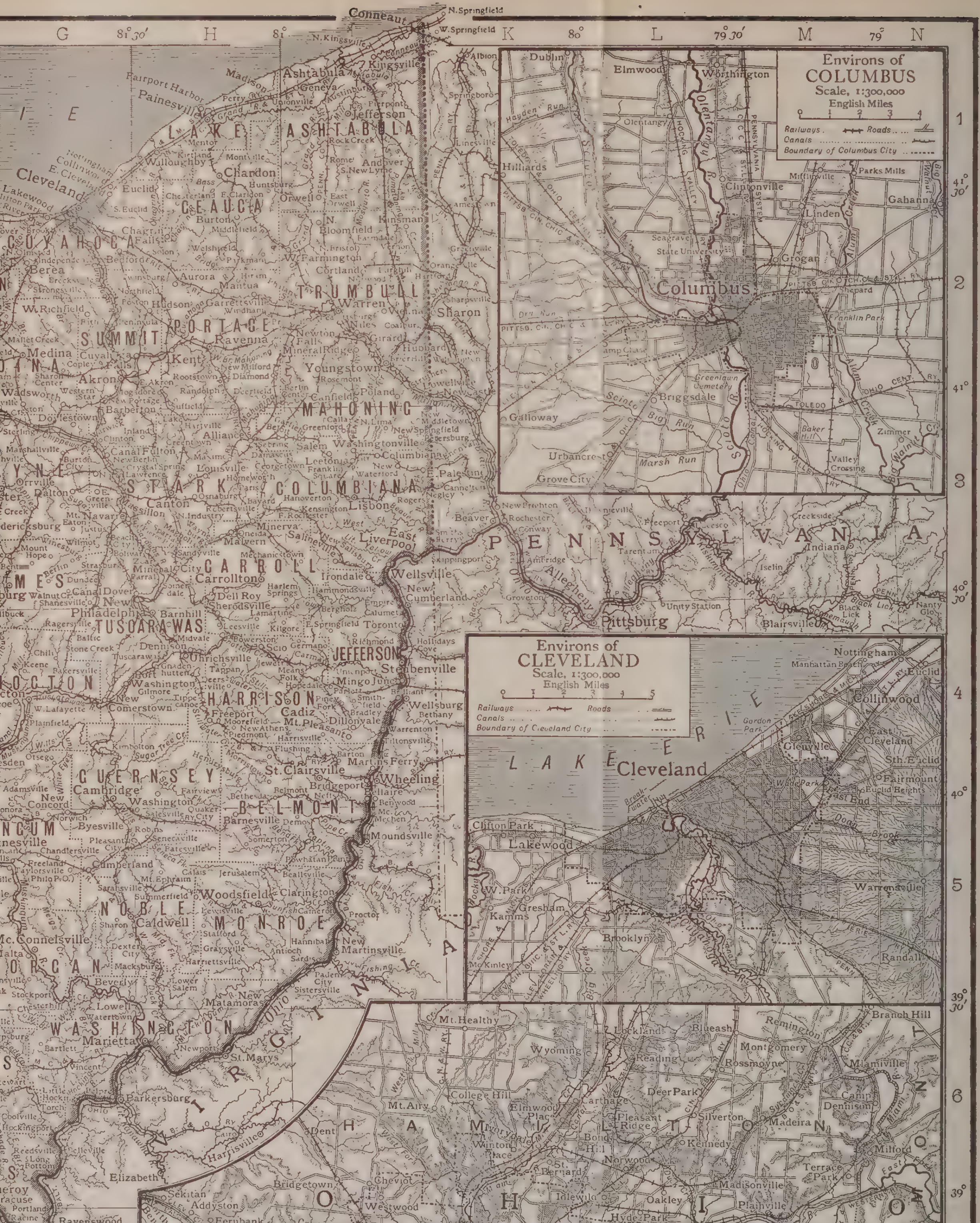
LAWRENCE
Toledo
Columbus
Cincinnati
Dayton



Environs of COLUMBUS
Scale, 1:300,000
English Miles
Railways
Roads
Canals
Boundary of Columbus City
Environs of CLEVELAND
Scale, 1:300,000
English Miles
Railways
Roads
Canals
Boundary of Cleveland City
Environs of CINCINNATI
Scale, 1:300,000
English Miles
Railways
Roads
Canals
County Boundaries
Boundary of Cincinnati City
Longitude West 81° of Greenwich
LAKE ERIE
LAKE
ASHTABULA
GEAUGA
CUYAHOGA
SUMMIT
PORTAGE
TRUMBULL
MAHONING
STARK
COLUMBIANA
CARROLL
TUSCARAWAS
JEFFERSON
HARRISON
GUERNSEY
BELMONT
NOBLE
MONROE
WASHINGTON
PENNSYLVANIA
VIRGINIA
HAMILTON
OHIO
KENTUCKY
Cleveland
Columbus
Cincinnati
Pittsburg
Wheeling
Ashtabula
Youngstown
Akron
Canton
Steubenville
Marietta
Parkersburg
Covington
Newport

Emery Walker sc.

was discovered in the N.W. in 1884; in 1883 the output was only 47,632 barrels, four years later it was 5,022,632 barrels, and in 1896 it was 23,941,169 barrels, or 39% of the total output in the United States. For the next ten years, however, there was a decrease, and in 1908 the output had fallen to 10,858,797 barrels, of which 6,748,676 barrels (valued at $6,861,885) was obtained in the Lima district, 4,109,935 barrels (valued at $7,315,667) from the south-east district, and 186 barrels (valued at $950), suitable for lubricating purposes, from the Mecca-Belden district in Trumbull and Lorain counties. Natural gas abounds in the eastern, central and north-western parts of the state. That in the E. was first used in 1866, the N.W. field was opened in 1884, and the central field was opened in 1887. The value of the state's yearly flow increased steadily from $100,000 in 1885 to $5,215,669 in 1889, decreased from the latter year to $1,171,777 in 1897, and then increased to $8,244,835 in 1908. Some of the best sandstone in the United States is obtained from Cuyahoga and Lorain counties; it is exceptionally pure in texture (about 97% being pure silica), durable and evenly coloured light buff, grey or blue grey. From the Ohio sandstone known as Berea grit a very large portion of the country's grindstones and pulpstones has been obtained; in 1908 the value of Ohio's output of these stones was $482,128. Some of the Berea grit is also suitable for making oilstones and scythestones. Although the state has a great amount of limestone, especially in Erie and Ottawa counties, its dull colour renders it unsuitable for most building purposes. It is, however, much used as a flux for melting iron and for making quick lime. The quantity of Portland cement made in Ohio increased from 57,000 barrels in 1890 to 563,113 barrels in 1902 and to 1,521,764 barrels in 1908. Beds of rock gypsum extend over an area of 150 acres or more in Ottawa county. There is some iron ore in the eastern and south-eastern parts of the state, and the mining of it was begun early in the 19th century; but the output decreased from 254,294 long tons in 1889 to only 26,585 long tons (all carbonate) in 1908. Ohio, in 1908, produced 3,427,478 barrels of salt valued at $864,710. Other valuable minerals are clay suitable for making pottery, brick and tile (in 1908 the value of the clay working products was $26,622,490) and sand suitable for making glass. The total value of the state's mineral products in 1908 amounted to $134,499,335.

Manufactures.—The total value of the manufactures increased from $348,298,390 in 1880 to $641,688,064 in 1890, and to $832,438,113 in 1900. The value of the factory product was $748,670,855 in 1900 and $960,811,857 in 1905.[1] The most important manufacturing industry is that of iron and steel. This industry was established near Youngstown in 1804. The value of the products increased from $65,206,828 in 1890 to $138,935,256 in 1900 and to $152,859,124 in 1905. Foundry and machine-shop products, consisting largely of engines, boilers, metal-working machinery, wood-working machinery, pumping machinery, mining machinery and stoves, rank second among the state's manufactures; their value increased from $43,617,072 in 1890 to $72,399,632 in 1900, and to $94,507,691 in 1905. Flour and grist mill products rank third in the state; the value of the products decreased from $39,468,409 in 1890 to $37,390,367 in 1900, and then increased tc $40,855,566 in 1905. Meat (slaughtering and packing) was next in the value of the product, and increased from $20,660,780 in 1900 to $28,729,044 in 1905. Clay products rank fifth in the state; they increased in value from $16,480,812 in 1900 to $25,686,870 in 1905. Boots and shoes rank sixth; their value increased from $8,489,728 in 1890 to $17,920,854 in 1900 and to $25,140,220 in 1905. Other leading manufactures are malt liquors ($21,620,794 in 1905), railway rolling-stock consisting largely of cars ($21,428,227), men's clothing ($18,496,173), planing mill products ($17,725,711), carriages and wagons ($16,096,125), distilled liquors ($15,976,523), rubber and elastic goods ($15,963,603), furniture ($13,322,608), cigars and cigarettes ($13,241,230), agricultural implements ($12,891,197), women's clothing ($12,803,582), lumber and timber products ($12,567,992), soap and candles ($11,791,223), electrical machinery, apparatus and supplies ($11,019,235), paper and wood pulp ($10,961,527) and refined petroleum ($10,948,864).

The great manufacturing centres are Cleveland, Cincinnati, Youngstown, Toledo, Columbus, Dayton and Akron, and in 1905 the value of the products of these cities amounted to 56·7% of that for the entire state. A large portion of the iron and steel is manufactured in Cleveland, Youngstown, Steubenville, Bellaire, Lorain and Ironton. Most of the automobiles are manufactured in Cleveland; most of the cash registers and calculating machines in Dayton; most of the rubber and elastic goods in Akron; nearly one-half of the liquors and about three-fourths of the men's clothing in Cincinnati. East Liverpool leads in the manufacture of pottery; Toledo in flour and grist mill products; Springfield in agricultural implements; Cincinnati and Columbus in boots and shoes; Cleveland in women's clothing.

Transportation and Commerce.—The most important natural means of transportation are the Ohio river on the S. border and Lake Erie on the N. border. One of the first great public improvements made within the state was the connexion of these waterways by two canals—the Ohio & Erie Canal from Cleveland to Portsmouth, and the Miami & Erie Canal from Toledo to Cincinnati. The Ohio & Erie was opened throughout its entire length (309 m.) in 1832. The Miami & Erie was completed from Middletown to Cincinnati in 1827; in 1845 it was opened to the lake (250 m. from Cincinnati). The national government began in 1825 to extend the National Road across Ohio from Bridgeport, opposite Wheeling, West Virginia, through Zanesville and Columbus, and completed it to Springfield in 1837. Before the completion of the Miami & Erie Canal to Toledo, the building of railways was begun in this region, and in 1836 a railway was completed from that city to Adrian, Michigan. By the close of 1850 the railway mileage had increased to 575 m., and for the next forty years, with the exception of the Civil War period, more than 2000 m. of railways were built during each decade. At the close of 1908 there was a total mileage of 9,300·45 m. Among the railways are the Cleveland, Cincinnati, Chicago & St Louis, the Baltimore & Ohio, the Lake Shore & Michigan Southern, the New York, Chicago & St Louis, the Pittsburgh, Cincinnati, Chicago & St Louis (Pennsylvania), the Pittsburgh, Ft. Wayne & Chicago (Pennsylvania), the Nypano (Erie), the Wheeling & Lake Erie, the Cincinnati, Hamilton & Dayton, the Detroit, Toledo & Ironton, and the Norfolk & Western. As the building of steam railways lessened, the building of suburban and interurban electric railways was begun, and systems of these railways have been rapidly extended until all the more populous districts are connected by them.

Ohio has six ports of entry. They are Cleveland, Toledo, Sandusky, Cincinnati, Columbus and Dayton, and the value of the foreign commerce passing through these in 1909 amounted to $9,483,974 in imports (more than one-half to Cleveland) and $10,920,083 in exports (nearly eight-ninths from Cleveland). Of far greater volume than the foreign commerce is the domestic trade in coal, iron, lumber, &c., largely by way of the Great Lakes.

Population.—The population of Ohio in the various census years was: (1800) 45,365; (1810) 230,760; (1820) 581,434; (1830) 937,903; (1840) 1,519,467; (1850) 1,980,329; (1860) 2,339,511; (1870) 2,665,260; (1880) 3,198,062; (1890) 3,672,316; (1900) 4,157,545; (1910) 4,767,121. In 1900 and 1910 it ranked fourth in population among the states. Of the total population in 1900, 4,060,204 or 97·6% were white and 97,341 were coloured (96,901 negroes, 371 Chinese, 27 Japanese and 42 Indians). Of the same total 3,698,811 or 88·9% were native-born and 458,734 were foreign-born; 93·8% of the foreign-born consisted of the following: 204,160 natives of Germany, 65,553 of Great Britain, 55,018 of Ireland, 22,767 of Canada (19,864 English Canadian), 16,822 of Poland, 15,131 of Bohemia, 11,575 of Austria and 11,321 of Italy. In 1906 there were 1,742,873 communicants of different religious denominations, over one-third being Roman Catholics and about one-fifth Methodists. From 1890 to 1900 the urban population (*i.e.* population of incorporated places having 4000 inhabitants or more) increased from 1,387,884 to 1,864,519, and the semi-urban (*i.e.* population of incorporated places having less than 4000 inhabitants) increased from 458,033 to 549,741, but the rural (*i.e.* population outside of incorporated places) decreased from 1,826,412 to 1,743,285. The largest cities are Cleveland, Cincinnati, Columbus (the capital), Toledo, Dayton, Youngstown, Akron, Canton, Springfield, Hamilton, Lima and Zanesville.

Administration.—Ohio is governed under the constitution of 1851 as amended in 1875, 1883, 1885, 1902, 1903, and 1905. An amendment may be proposed at any time by either branch of the General Assembly, and if after being approved by three-fifths of the members of both branches it is also approved at a general election by a majority of those voting on the question it is declared adopted; a constitutional convention may be called after a favourable two-thirds vote of the members of each branch of the Assembly and a favourable popular vote—a majority of those voting on the question; and the question of calling such a convention must be submitted to a popular vote at least once every twenty years. Under the constitution of 1802 and 1851 the suffrage was limited to "white male" citizens of the United States, but since the adoption of the Fifteenth Amendment to the Federal Constitution (1870), negroes vote, though the constitution is unchanged. Since 1894 women who possess the usual qualifications required of men may vote for and be voted for as members of boards of education. The constitution requires that all elections be by ballot, and the Australian ballot system was adopted in 1891; registration is required in cities having a population of 11,800 or more. The executive department consists of a governor, lieutenant-governor, secretary of state, auditor, treasurer and attorney-general. As a result of the dispute between Governor Arthur St Clair and the Territorial legislature, the constitution of 1802 conferred nearly all of the ordinary executive functions on the legislature. The governor's control over appointments was strengthened by the constitution of 1851 and by the subsequent creation of statutory offices, boards and commissions, but the right of veto was not given to him until the adoption of the constitutional amendments of 1903. The power as conferred at that time, however, is broader than usual, for it extends not only to items in appropriation bills, but to separate sections in other measures, and, in addition to the customary provision for passing a bill over the governor's veto by a two-thirds vote of each house it is required that the votes for repassage in each house must not be less than those given on the original passage. The governor is elected in November of even-numbered years for a term of two years. He is commander-in-chief of the state's military and naval forces, except when they are called into the service of the United States. He grants pardons and reprieves on the recommendation of the state board of pardons. If he die in office, resign or be impeached, the officers standing next in succession are the lieutenant-governor, the president of the Senate, and the speaker of the House of Representatives in the order named.

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[1] The statistics of 1905 were taken under the direction of the United States Census Bureau, but products other than those of the factory system, such, for example, as those of the hand trades, were excluded.

Members of the Senate and House of Representatives are elected for terms of two years; they must be residents of their respective counties or districts for one year preceding election, unless absent on public business of the state or of the United States. The ratio of representation in the Senate is obtained by dividing the total population of the state by thirty-five, the ratio in the House by dividing the population by one hundred. The membership in each house, however, is slightly above these figures, owing to a system of fractional representation and to the constitutional amendment of 1903 which allows each county at least one representative in the House of Representatives. The constitution provides for a reapportionment every ten years beginning in 1861. Biennial sessions are held beginning on the first Monday in January of the even-numbered years. The powers of the two houses are equal in every respect except that the Senate passes upon the governor's appointments and tries impeachment cases brought before it by the House of Representatives. The constitution prohibits special, local and retroactive legislation, legislation impairing the obligation of contracts, and legislation levying a poll tax for county or state purposes or a tax on state, municipal and public school bonds (amendment of 1905), and it limits the amount and specifies the character of public debts which the legislature may contract.

The judicial department in 1910 was composed of a supreme court of six judges, eight circuit courts[1] of three judges each, ten districts (some with sub-divisions) of the common pleas court, the superior court of Cincinnati, probate courts, courts of insolvency in Cuyahoga and Hamilton counties, juvenile courts (established in 1904), justice of the peace courts and municipal courts. Under the constitution of 1802 judges were chosen by the legislature, but since 1851 they have been elected by direct popular vote—the judges of the supreme court being chosen at large. They are removable on complaint by a concurrent resolution approved by a two-thirds majority in each house of the legislature. The constitution provides that the terms of supreme and circuit judges shall be such even number of years not less than six as may be prescribed by the legislature—the statutory provision is six years—that of the judges of the common pleas six years, that of the probate judges four years, that of other judges such even number of years not exceeding six as may be prescribed by the legislature—the statutory provision is six years—and that of justices of the peace such even number of years not exceeding four as may be thus prescribed—the statutory provision is four years.

Local Government.—The county and the township are the units of the rural, the city and the village the units of the urban local government. The chief county authority is the board of commissioners of three members elected for terms of two years. The other officials are the sheriff, treasurer and coroner, elected for two years; the auditor, recorder, clerk of courts, prosecuting attorney, surveyor and infirmary directors, elected for two years; and the board of school examiners (three) and the board of county visitors (six, of whom three are women), appointed usually by the probate judge for three years. The chief township authority is the board of trustees of three members, elected by popular vote for two years. In the parts of the state settled by people from New England township meetings were held in the early days, but their functions were gradually transferred to the trustees, and by 1820 the meetings had been given up almost entirely. The other township officials are the clerk, treasurer, assessor, supervisor of roads, justices of the peace, constables, board of education and board of health. Under the constitution of 1802, municipal corporations were established by special legislation. The constitution of 1851, however, provided for a general law, and the legislature in 1852 enacted a "general municipal corporations act," the first of its kind in the United States. The system of classification adopted in time became so elaborate that many municipalities became isolated, each in a separate class, and the evils of special legislation were revived. Of the two chief cities, Cleveland (under a special act providing for the government of Columbus and Toledo, also) in 1892–1902 was governed under the federal plan, which centralized power in the hands of the mayor; in Cincinnati there was an almost hopeless diffusion of responsibility among the council and various executive boards. The supreme court in June 1902 decided that practically all the existing municipal legislation was special in character and was therefore unconstitutional. (State *ex. rel.* Kniseley *vs.* Jones, 66 Ohio State Reports, 453. See also 66 Ohio State Reports, 491.) A special session of the legislature was called, and a new municipal code was adopted on the 22nd of October which went into effect in April 1903; it was a compromise between the Cleveland and the Cincinnati plans, with some additional features necessary to meet the conditions existing in the smaller cities. In order to comply with the court's interpretation of the constitution, municipalities were divided into only two classes, cities and villages, the former having a population of five thousand or more; the chief officials in both cities and villages were the mayor, council, treasurer and numerous boards of commissions. This was an attempt to devise a system of government that would apply to Cleveland, a city of 400,000 inhabitants, and to Painesville with its 5000 inhabitants. The code was replaced by the Paine Law of 1909, which provided for a board of control (something like that under the "federal plan" in Cleveland, Columbus and Toledo) of three members: the mayor and the directors (appointed and removable by the mayor) of two municipal departments—public service and public safety, the former including public works and parks, and the latter police, fire, charities, correction and buildings. The mayor's appointments are many, and are seldom dependent on the consent of the council. A municipal civil service commission of three members (holding office for three years) is chosen by the president of the board of education, the president of the city council, and the president of the board of sinking fund commissioners; the pay (if any) of these commissioners is set by each city. The city auditor, treasurer and solicitor are elected, as under the code.

In 1908 a direct primary law was passed providing for party primaries, those of all parties in each district to be held at the same time (annually) and place, before the same election board, and at public expense, to nominate candidates for township and municipal offices and members of the school board; nominations to be by petition signed by at least 2 % of the party voters of the political division, except that for United States senators ½ of 1 % is the minimum. The law does not make the nomination of candidates for the United States Senate by this method mandatory nor such choice binding upon the General Assembly.

Laws.—The property rights of husband and wife are nearly equal; a wife may hold her property the same as if single, and a widower or a widow is entitled to the use for life of one-third of the real estate of which his or her deceased consort was seized at the time of his or her death. Among the grounds on which a divorce may be obtained are adultery, extreme cruelty, fraud, abandonment for three years, gross neglect of duty, habitual drunkenness, a former existing marriage, procurement of divorce without the state by one party, which continues marriage binding on the other, and imprisonment in a penitentiary. For every family in which there is a wife, a minor son, or an unmarried daughter, a homestead not exceeding $1000 in value, or personal property not exceeding $500 in value, is exempt from sale for the satisfaction of debts.

In 1908 an act was passed providing for local option in regard to the sale of intoxicating liquors, by an election to be called an initiative petition, signed by at least 35 % of the electors of a county.

Charitable and Penal Institutions.—The state charitable and penal institutions are supervised by the board of charities of six members ("not more than three . . . from the same political party") appointed by the governor, and local institutions by boards of county visitors of six members appointed by the probate judge. Each state institution in addition has its own board of trustees appointed by the governor, and each county infirmary is under the charge of three infirmary directors chosen by popular vote. There are hospitals for the insane at Athens, Columbus, Dayton, Cleveland, Carthage (10 m. from Cincinnati; Longview Hospital), Massillon, Toledo and Lima; a hospital for epileptics at Gallipolis, opened in 1893; institutions for feeble-minded, for the blind (opened 1839) and for the deaf (opened 1829) at Columbus; a state sanatorium for tuberculous patients at Mt. Vernon (opened 1909); an institution for crippled and deformed children (authorized in 1907); a soldiers' and sailors' orphans' home at Xenia (organized in 1869 by the Grand Army of the Republic); a home for soldiers, sailors, marines, their wives, mothers and widows, and army nurses at Madison (established by the National Women's Relief Corps; taken over by the state, 1904); and soldiers' and sailors' homes at Sandusky (opened 1888), supported by the state, and at Dayton, supported by the United States. The state penal institutions are the boys' industrial school near Lancaster (established in 1854 as a Reform Farm), the girls' industrial home (1869) at Rathbone near Delaware, the reformatory at Mansfield (authorized 1884, opened 1896) and the penitentiary at Columbus (1816).

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[1] The provision for circuit courts was first made in the constitution by an amendment of 1883.

Education.—Congress in 1785 set apart 1 sq. m. in each township of 36 sq. m. for the support of education. The public school system, however, was not established until 1825, and then it developed very slowly. The office of state commissioner of common schools was created in 1837, abolished in 1840 and revived in 1843. School districts fall into four classes—cities, villages, townships and special districts—each of which has its own board of education elected by popular vote. Laws passed in 1877, 1890, 1893 and 1902 have made education compulsory for children between the ages of eight and fourteen. The school revenues are derived from the sale and rental of public lands granted by Congress, and of the salt and swamp lands devoted by the state to such purposes, from a uniform levy of one mill on each dollar of taxable property in the state, from local levies (averaging 7·2 mills in township districts and 10·07 mills in separate districts in 1908), from certain fines and licences, and from tuition fees paid by non-resident pupils. The total receipts from all sources in 1908 amounted to $25,987,021; the balance from the preceding year was $11,714,135, and the total expenditures were $24,695,157. Three institutions for higher education are supported in large measure by the state: Ohio University at Athens, founded in 1804 on the proceeds derived from two townships granted by Congress to the Ohio Company; Miami University (chartered in 1809) at Oxford, which received the proceeds from a township granted by Congress in the Symmes purchase; and Ohio State University (1873) at Columbus, which received the proceeds from the lands granted by Congress under the act of 1862 for the establishment of agricultural and mechanical colleges, and reorganized as a university in 1878. Wilberforce University (1856), for negroes, near Xenia, is under the control of the African Methodist Episcopal Church; but the state established a normal and industrial department in 1888, and has since contributed to its maintenance. Under an act of 1902 normal colleges, supported by the state, have also been created in connexion with Ohio and Miami universities. Among the numerous other colleges and universities in the state are Western Reserve University (1826) at Cleveland, the university of Cincinnati (opened 1873) at Cincinnati, and Oberlin College (1833) at Oberlin.

Finance.—The revenues of the state are classified into four funds; the general revenue fund, the sinking fund, the state common school fund and the university fund. The chief sources of the general revenue fund are taxes on real and personal property, on liquors and cigarettes, on corporations and on inheritances; in 1909 the net receipts for this fund were $8,043,257, the disbursements $9,103,301, and the cash balance at the end of the fiscal year $3,428,705. There is a tendency to reduce the rate on real property, leaving it as a basis for local taxation. The rate on collateral inheritances is 5%, on direct inheritances 2%, on the excess above $3000. There are state, county and municipal boards of equalization. A special tax is levied for the benefit of the sinking fund—one-tenth of a mill in 1909. The commissioners of the fund are the auditor, the secretary of state and the attorney-general. The public debt, which began to accumulate in 1825, was increased by the canal expenditures to $16,880,000 in 1843. The constitution of 1851 practically deprived the legislature of the power to create new obligations. The funded debt was then gradually reduced until the last installment was paid in 1903. There still remains, however, an irredeemable debt due to the common schools, Ohio University and Ohio State University, in return for their public lands. About one-half of the annual common school fund is derived from local taxes; the state levy for this fund in 1909 was one mill, and the total receipts were $2,382,353. The university fund is derived from special taxes levied for the four institutions which receive aid from the state; in 1909 the levy was 0·245 mills and the total receipts were $582,843. Several banks and trading houses with banking privileges were incorporated by special statutes between 1803 and 1817. Resentment was aroused by the establishment of branches of the Bank of the United States at Chillicothe and Cincinnati in 1817, and an attempt was made to tax them out of existence. State officials broke into the vaults of the Chillicothe branch in 1819 and took out $100,000 due for taxes. The Federal courts compelled a restoration of the money and pronounced the taxing law unconstitutional. In 1845 the legislature chartered for twenty years the State Bank of Ohio, based on the model of the State Bank of Indiana of 1834. It became a guarantee of conservative banking, and was highly successful. There were at one time thirty-six branches. Most of the state institutions secured Federal charters after the establishments of the national banking system (1863–1864), but the high price of government bonds and the large amount of capital required led to a reaction, which was only partially checked by the reduction of the minimum capital to $25,000 under the currency act of the 14th of March 1900.

History.—Ohio was the pioneer state of the old North-West Territory, which embraced also what are now the states of Indiana, Illinois, Michigan and Wisconsin, and the N.E. corner of Minnesota. When discovered by Europeans, late in the first half of the 17th century, the territory included within what is now Ohio was mainly a battle-ground of numerous Indian tribes and the fixed abode of none except the Eries who occupied a strip along the border of Lake Erie. From the middle to the close of the 17th century the French were establishing a claim to the territory between the Great Lakes and the Ohio river by discovery and occupation, and although they had provoked the hostility of the Iroquois Indians they had helped the Wyandots, Miamis and Shawnees to banish them from all territory W. of the Muskingum river. Up to this time the English had based their claim to the same territory on the discovery of the Atlantic Coast by the Cabots and upon the Virginia, Massachusetts and Connecticut charters under which these colonies extended westward to the Pacific Ocean. In 1701, New York, seeking another claim, obtained from the Iroquois a grant to the king of England of this territory which they claimed to have conquered but from which they had subsequently been expelled, and this grant was confirmed in 1726 and again in 1744. About 1730 English traders from Pennsylvania and Virginia began to visit the eastern and southern parts of the territory and the crisis approached as a French Canadian expedition under Céleron de Bienville took formal possession of the upper Ohio Valley by planting leaden plates at the mouths of the principal streams. This was in 1749 and in the same year George II. chartered the first Ohio Company, formed by Virginians and London merchants trading with Virginia for the purpose of colonizing the West. This company in 1750 sent Christopher Gist down the Ohio river to explore the country as far as the mouth of the Scioto river; and four years later the erection of a fort was begun in its interest at the forks of the Ohio. The French drove the English away and completed the fort (Fort Duquesne) for themselves. The Seven Years' War was the immediate consequence and this ended in the cession of the entire North-West to Great Britain. The former Indian allies of the French, however, immediately rose up in opposition to British rule in what is known as the Conspiracy of Pontiac (see PONTIAC), and the supression of this was not completed until Colonel Henry Bouquet made an expedition (1764) into the valley of the Muskingum and there brought the Shawnees, Wyandots and Delawares to terms. With the North-West won from the French Great Britain no longer recognized those claims of her colonies to this territory which she had asserted against that nation, but in a royal proclamation of the 7th of October 1763 the granting of land W. of the Alleghanies was forbidden and on the 22nd of June 1774 parliament passed the Quebec Act which annexed the region to the province of Quebec. This was one of the grievances which brought on the War of Independence and during that war the North-West was won for the Americans by George Rogers Clark (*q.v.*). During that war also, those states which had no claims in the West contended that title to these western lands should pass to the Union and when the Articles of Confederation were submitted for ratification in 1777, Maryland refused to ratify them except on that condition. The result was that New York ceded its claim to the United States in 1780, Virginia in 1784, Massachusetts in 1785 and Connecticut in 1786. Connecticut, however, excepted a strip bordering on Lake Erie for 120 m. and containing 3,250,000 acres. This district, known as the Western Reserve, was ceded in 1800 on condition that Congress would guarantee the titles to land already granted by the state. Virginia reserved a tract between the Little Miami and Scioto rivers, known as the Virginia Military District, for her soldiers in the War of Independence.

When the war was over and these cessions had been made a great number of war veterans wished an opportunity to repair their broken fortunes in the West, and Congress, hopeful of receiving a large revenue from the sale of lands here, passed an ordinance on the 20th of May 1785 by which the present national system of land-surveys into townships 6 m. sq. was inaugurated in what is now S.W. Ohio in the summer of 1786. In March 1786 the second Ohio Company (*q.v.*), composed chiefly of New England officers and soldiers, was organized in Boston, Massachusetts, with a view to founding a new state between Lake Erie and the Ohio river. The famous North-West Ordinance was passed by Congress on the 13th of July 1787. This instrument provided a temporary government for the Territory with the understanding that, as soon as the population was sufficient, the representative system should be adopted, and later that states should be formed and admitted into the Union. There were to be not less than three nor more than five states. Of these the easternmost (Ohio) was to be bounded on the N., E. and S. by the Lakes, Pennsylvania and the Ohio river, and on the W. by a line drawn due N. from the mouth of the Great Miami river to the Canadian boundary, if there were to be three states, or to its intersection with an E. and W. line drawn through the extreme S. bend of Lake Michigan, if there were to be five. Slavery was forbidden by the sixth article of the ordinance; and the third article read: "Religion, morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall for ever be encouraged." After the adoption of the North-West Ordinance the work of settlement made rapid progress. There were four main centres. The Ohio Company founded Marietta at the mouth of the Muskingum in 1788, and this is regarded as the oldest permanent settlement in the state. An association of New Jerseymen, organized by John Cleves Symmes, secured a grant from Congress in 1788–1792 to a strip of 248,540 acres on the Ohio between the Great Miami and the Little Miami, which came to be known as the Symmes Purchase. Their chief settlements were Columbia (1788) and Cincinnati (1789). The Virginia Military District, between the Scioto and the Little Miami, reserved in 1784 for bounties to Virginia continental troops, was colonized in large measure by people from that state. Their chief towns were Massieville or Manchester (1790) and Chillicothe (1796). A small company of Connecticut people under Moses Cleaveland founded Cleveland in 1796 and Youngstown was begun a few years later, but that portion of the state made very slow progress until after the opening of the Ohio & Erie Canal in 1832.

During the Territorial period (1787–1803) Ohio was first a part of the unorganized North-West Territory (1787–1799), then a part of the organized North-West Territory (1799–1800), and then the organized North-West Territory (1800–1803), Indiana Territory having been detached from it on the W. in 1800. The first Territorial government was established at Marietta in July 1788, and General Arthur St Clair (1784–1818), the governor, had arrived in that month. His administration was characterized by the final struggle with the Indians and by a bitter conflict between the executive and the legislature, which greatly influenced the constitutional history of the state. The War of Independence was succeeded by a series of Indian uprisings. Two campaigns, the first under General Josiah Harmar (1753–1813) in 1790, and the second under General St Clair in 1791, failed on account of bad management and ignorance of Indian methods of warfare, and in 1793 General Anthony Wayne (*q.v.*) was sent out in command of a large force of regulars and volunteers. The decisive conflict, fought on the 20th of August 1794, near the rapids of the Maumee, is called the battle of Fallen Timbers, because the Indians concealed themselves behind the trunks of trees which had been felled by a storm. Wayne's dragoons broke through the brushwood, attacked the left flank of the Indians and soon put them to flight. In the treaty of Greenville (3rd August 1795) the Indians ceded their claims to the territory E. and S. of the Cuyahoga, the Tuscarawas, and an irregular line from Fort Laurens (Bolivar) in Tuscarawas county to Fort Recovery in Mercer county, practically the whole E. and S. Ohio. The Jay Treaty was ratified in the same year, and in 1796 the British finally evacuated Detroit and the Maumee and Sandusky forts. By cessions and purchases in 1804, 1808 and 1817–1818 the state secured all of the lands of the Indians except their immediate homes, and these were finally exchanged for territory W. of the Mississippi. The last remnant migrated in 1841. General Wayne's victory was followed by an extensive immigration of New Englanders, of Germans, Scotch-Irish and Quakers from Pennsylvania, and of settlers from Virginia and Kentucky, many of whom came to escape the evils of slavery. This rapid increase of population led to the establishment of the organized Territorial government in 1799, to the restriction of that government in Ohio in 1800, and to the admission of the state into the Union in 1803.

The Congressional Enabling Act of the 30th of April 1802 followed that alternative of the North-West Ordinance which provided for five states in determining the boundaries, and in consequence the Indiana and Michigan districts were detached. A rigid adherence to the boundary authorized in 1787, however, would have resulted in the loss to Ohio of 470 sq. m. of territory in the N.W. part of the state, including the lake port of Toledo. After a long and bitter dispute—the Toledo War (see Toledo)—the present line, which is several miles N. of the S. bend of Lake Michigan, was definitely fixed in 1837, when Michigan came into the Union. (For the settlement of the eastern boundary, see Pennsylvania.)

After having been temporarily at Marietta, Cincinnati, Chillicothe and Zanesville the capital was established at Columbus in 1816.

Since Congress did not pass any formal act of admission there has been some controversy as to when Ohio became a state. The Enabling Act was passed on the 30th of April 1802, the first state legislature met on the 1st of March 1803, the Territorial judges gave up their offices on the 15th of April 1803, and the Federal senators and representatives took their seats in Congress on the 17th of October 1803. Congress decided in 1806 in connexion with the payment of salaries to Territorial officials that the 1st of March 1803 was the date when state government began. During the War of 1812 the Indians under the lead of Tecumseh were again on the side of the British. Battles were fought at Fort Meigs (1813) and Fort Stephenson (Fremont, 1813) and Commodore Oliver Hazard Perry's naval victory on Lake Erie in 1813 was on the Ohio side of the boundary line.

Owing to the prohibition of slavery the vast majority of the early immigrants to Ohio came from the North, but, until the Mexican War forced the slavery question into the foreground, the Democrats usually controlled the state, because the principles of that party were more in harmony with frontier ideas of equality. The Whigs were successful in the presidential elections of 1836 and 1840, partly because of the financial panic and partly because their candidate, William Henry Harrison, was a "favourite son," and in the election of 1844, because of the unpopularity of the Texas issue. Victory was with the Democrats in 1848 and 1852, but since the organization of the Republican party in 1854 the state has uniformly given to the Republican presidential candidates its electoral votes. In the Civil War Ohio loyally supported the Union, furnishing 319,659 men for the army. Dissatisfaction with the President's emancipation programme resulted in the election of a Democratic Congressional delegation in 1862, but the tide turned again after Gettysburg and Vicksburg; Clement L. Vallandigham, the Democratic leader, was deported from the state by military order, and the Republicans were successful in the elections of 1863 and 1864. A detachment of the Confederate cavalry under General John Morgan invaded the state in 1863, but was badly defeated in the battle of Buffington's Island (July 18th). Democratic governors were elected in 1873, 1877, 1883, 1889, 1905, 1908 and 1910. Five presidents have come from Ohio, William Henry Harrison, Rutherford B. Hayes, James A. Garfield, William McKinley, Jr., and William Howard Taft.

Governors of Ohio

Territorial Period (1787–1803).

Arthur St Clair	1787–1802	Federalist
Charles W. Byrd (Acting)	1802–1803	Dem.-Repub.

Period of Statehood.

Edward Tiffin	1803–1807	Dem.-Repub.
Thomas Kirker (Acting)	1807–1809	"
Samuel Huntington	1809–1811	"
Return Jonathan Meigs	1811–1814	"
Othniel Looker (Acting)	1814–1815	"
Thomas Worthington	1815–1819	"
Ethan Allen Brown	1819–1822	"
Allen Trimble (Acting)	1822–1823	"
Jeremiah Morrow	1823–1827	Democrat.
Allen Trimble	1827–1831	"
Duncan McArthur	1831–1833	Nat.-Repub.
Robert Lucas	1833–1837	Democrat
Joseph Vance	1837–1839	Whig
Wilson Shannon	1839–1841	Democrat
Thomas Corwin	1841–1843	Whig
Wilson Shannon	1843–1844	Democrat
Thomas W. Bartley (Acting)	1844–1845	"
Mordecai Bartley	1845–1847	Whig
William Bebb	1847–1849	"
Seabury Ford	1849–1851	"
Reuben Wood	1851–1853	Democrat
William Medill (Acting, 1853)	1853–1856	"
Salmon P. Chase	1856–1860	Republican
William Dennison, Jr.	1860–1862	"
David Tod	1862–1864	"
John Brough	1864–1865	"
Charles Anderson (Acting)	1865–1866	"
Jacob D. Cox	1866–1868	"
Rutherford B. Hayes	1868–1872	"
Edward F. Noyes	1872–1874	"
William Allen	1874–1876	Democrat
Rutherford B. Hayes	1876–1877	Republican
Thomas L. Young (Acting)	1877–1878	"
Richard M. Bishop	1878–1880	Democrat
Charles Foster	1880–1884	Republican
George Hoadley	1884–1886	Democrat
Joseph B. Foraker	1886–1890	Republican
James E. Campbell	1890–1892	Democrat
William McKinley, Jr.	1892–1896	Republican
Asa S. Bushnell	1896–1900	"
George K. Nash	1900–1904	"
Myron T. Herrick	1904–1906	"
John M. Pattison[1]	1906	Democrat
Andrew Lintner Harris	1906–1909	Republican
Judson Harmon	1909–	Democrat

BIBLIOGRAPHY.—For a brief but admirable treatment of the physiography see Stella S. Wilson, *Ohio* (New York, 1902), and a great mass of material on this subject is contained in the publications of the Geological Survey of Ohio (1837 et seq.). For the administration see the *Constitution of the State of Ohio, adopted June 1851* (Norwalk, Ohio, 1897), and amendments of 1903 and 1905 published separately; the annual reports of the state treasurer, auditor, board of state charities and commissioner of common schools, the Ellis municipal code (1902) and the Harrison school code (1904). The Civil Code, issued 1852, the Criminal Code in 1869 and the Revised Statutes in 1879, have several times been amended and published in new editions. There are two excellent secondary accounts: Samuel P. Orth, *The Centralization of Administration in Ohio*, in the Columbia University Studies in History, Economics and Public Law, xvi. No. 3 (New York, 1903); and Wilbur H. Siebert, *The Government of Ohio, its History and Administration* (New York, 1904). B. A. Hinsdale's *History and Civil Government of Ohio* (Chicago, 1896) is more elementary. For local government see J. A. Wilgus, "Evolution of Township Government in Ohio," in the *Annual Report* of the American Historical Association for 1894, pp. 403-412 (Washington, 1895); D. F. Wilcox, *Municipal Government in Michigan and Ohio*, in the Columbia University Studies in History, Economics and Public Law, v. No. 3 (New York, 1895); J. A. Fairlie, "The Municipal Crisis in Ohio," in the *Michigan Law Review* for February 1903; and Thomas L. Sidlo, "Centralization in Ohio Municipal Government," in the *American Political Science Review* for November 1909. On education see George B. Germann, *National Legislation concerning Education, its Influence and Effect in the Public Lands east of the Mississippi River, admitted prior to 1820* (New York, 1899); J. J. Burns, *Educational History of Ohio* (Columbus, 1905).

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OHIO COMPANY, a name of two 18th century companies organized for the colonization of the Ohio Valley. The first Ohio Company was organized in 1749, partly to aid in securing for the English control of the valley, then in dispute between England and France, and partly as a commercial project for trade with the Indians. The company was composed of Virginians, including Thomas Lee (d. 1750) and the two brothers of George Washington, Lawrence (who succeeded to the management upon the death of Lee) and Augustine; and of Englishmen, including John Hanbury, a wealthy London merchant. George II. sanctioned a grant to the company of 500,000 acres generally N.W. of the Ohio, and to the eastward, between the Monongahela and the Kanawha rivers, but the grant was never actually issued. In 1750–1751 Christopher Gist, a skilful woodsman and surveyor, explored for the company the Ohio Valley as far as the mouth of the Scioto river. In 1752 the company had a pathway blazed between the small fortified posts at Will's Creek (Cumberland), Maryland, and at Redstone Creek (Brownsville), Pennsylvania, which it had established in 1750; but it was finally merged in the Walpole Company (an organization in which Benjamin Franklin was interested), which in 1772 had received from the British government a grant of a large tract lying along the southern bank of the Ohio as far west as the mouth of the Scioto river. The War of Independence interrupted colonization and nothing was accomplished.

The second company, the Ohio Company of Associates, was formed at Boston on the 3rd of March 1786. The leaders in the movement were General Rufus Putnam, Benjamin Tupper (1738–1792), Samuel Holden Parsons (1737–1789) and Manasseh Cutler. Dr Cutler was selected to negotiate with Congress, and seems to have helped to secure the incorporation in the Ordinance for the government of the North-West Territory of the paragraphs which prohibited slavery and provided for public education and for the support of the ministry. Cutler's original intention was to buy for the Ohio Company only about 1,500,000 acres, but on the 27th of July Congress authorized a grant of about 5,000,000 acres of land for $3,500,000; a reduction of one-third was allowed for bad tracts, and it was also provided that the lands could be paid for in United States securities. On the 27th of October 1787 Cutler and Major Winthrop Sargent (1753–1820), who had joined him in the negotiations, signed two contracts; one was for the absolute purchase for the Ohio Company, at $66\frac{2}{3}$ cents an acre, of 1,500,000 acres of land lying along the north bank of the Ohio river, from a point near the site of the present Marietta, to a point nearly opposite the site of the present Huntington, Kentucky; the other was for an option to buy all the land between the Ohio and the Scioto rivers and the western boundary line of the Ohio Company's tract, extending north of the tenth township from the Ohio, this tract being pre-empted by "Manasseh Cutler and Winthrop Sargent for themselves and others"—actually for the Scioto Company (see GALLIPOLIS). On the same day Cutler and Sargent "for themselves and associates" transferred to William Duer, then Secretary of the Treasury Board, and his associates "one equal moiety of the Scioto tract of land mentioned in the second contract," it being provided that both parties were to be equally interested in the sale of the land, and were to share equally any profit or loss. Colonists were sent out by the Ohio Company from New England, and Marietta, the first permanent settlement in the present state of Ohio, was founded in April 1788.

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[1] Died in office.

OHIO RIVER, the principal eastern tributary of the Mississippi river, U.S.A. It is formed by the confluence of the Allegheny and Monongahela rivers at Pittsburg, Pennsylvania, and flows N.W. nearly to the W. border of Pennsylvania, S.S.W. between Ohio and West Virginia, W. by N. between Ohio and Kentucky, and W.S.W. between Indiana and Illinois on the N. and Kentucky on the S. It is the largest of all the tributaries of the Mississippi in respect to the amount of water discharged (an average of about 158,000 cub. ft. per sec.), is first in importance as a highway of commerce, and in length (967 m.) as well as in the area of its drainage basin (approximately 210,000 sq. m.) it is exceeded only by the Missouri. The slope of the river at low water ranges from 1 ft. or more per mile in the upper section to about 0·75 ft. per mile in the middle section and 0·29 ft. per mile in the lower section, and the total fall is approximately 500 ft. Nearly two-thirds of the bed is occupied by 187 pools, in which the fall is very gentle; and the greater part of the descent is made over intervening bars, which are usually composed of sand or gravel but occasionally of hard pan or rock. The greatest falls are at Louisville, where the river within a distance of 2·25 m. descends 23·9 ft. over an irregular mass of limestone. The rock floor of the valley is usually 30 to 50 ft. below low water level, and when it comes to the surface, as it occasionally does, it extends at this height only part way across the valley. In the upper part of the river the bed contains much coarse gravel and numerous boulders, but lower down a sand bed prevails. The ordinary width of the upper half of the river is quite uniform, from 1200 to 1500 ft., but it widens in the pool above Louisville, contracts immediately below the Falls, and then gradually widens again until it reaches a maximum width of more than a mile about 20 m. from its mouth. Islands are numerous and vary in size from an acre or less to 5000 acres; above Louisville there are fifty or more, and below it about thirty. Many of them are cultivated.

Besides its parent streams, the Allegheny and the Monongahela, the Ohio has numerous large branches. On the N. it receives the waters of the Muskingum, Scioto, Miami and Wabash rivers, and on the S. those of the Kanawha, Big Sandy, Licking, Kentucky, Green, Cumberland and Tennessee rivers.

The drainage basin of the Ohio, in which the annual rainfall averages about 43 in., is, especially in the S. part of the river, of the "quick-spilling" kind, and as the swift mountain streams in that section are filled in February or March by the storms from the Gulf of Mexico, while the northern streams are swollen by melting snow and rain, the Ohio rises very suddenly and not infrequently attains a height of 30 to 50 ft. or more above low water level, spreads out ten to fifteen times its usual width, submerges the bottom lands, and often causes great damage to property in the lower part of the cities along its banks.

Robert Cavelier, Sieur de La Salle, asserted that he discovered the Ohio and descended it until his course was obstructed by a fall (thought to be the Falls at Louisville); this was probably in 1670, but until the middle of the next century, when its strategic importance in the struggle of the French and the English for the possession of the interior of the continent became fully recognized, little was generally known of it. By the treaty of 1763 ending the Seven Years' War the English finally gained undisputed control of the territory along its banks. After Virginia had bought, in 1768, the claims of the Six Nations to the territory south of the Ohio, immigrants, mostly Virginians, began to descend the river in considerable numbers, but the Shawnee Indians, whose title to the land was more plausible than that of the Six Nations ever was, resisted their encroachments until the Shawnees were defeated in October 1774 at the battle of Point Pleasant. By the treaty of 1783 the entire Ohio country became a part of the United States and by the famous Ordinance of 1787 the north side was opened to settlement. Most of the settlers entered the region by the headwaters of the Ohio and carried much of their market produce, lumber, &c., down the Ohio and Mississippi to New Orleans or beyond. Until the successful navigation of the river by steamboats a considerable portion of the imports was carried overland from Philadelphia or Baltimore to Pittsburg. The first steamboat on the Ohio was the "New Orleans," which was built in 1811 by Nicholas J. Roosevelt and sailed from Pittsburg to New Orleans in the same year, but it remained for Captain Henry M. Shreve (1785–1854) to demonstrate with the "Washington," which he built in 1816, the success of this kind of navigation on the river. From 1820 to the Civil War the steamboat on the system of inland waterways of which the Ohio was a part was a dominant factor in the industrial life of the Middle West. Cincinnati, Louisville and Pittsburg on its banks were extensively engaged in building these vessels. The river was dotted with floating shops—dry-goods boats fitted with counters, boats containing a tinner's establishment, a blacksmith's shop, a factory, or a lottery office. Until the Erie Canal was opened in 1825 the Ohio river was the chief commercial highway between the East and the West. It was connected with Lake Erie in 1832 by the Ohio & Erie Canal from Portsmouth to Cleveland, and in 1845 by the Miami & Erie Canal from Cincinnati to Toledo.

In the natural state of the river navigation was usually almost wholly suspended during low water from July to November, and it was dangerous at all times on account of the numerous snags. The Federal government in 1827 undertook to remove the snags and to increase the depth of water on the bars by the construction of contraction works, such as dikes and wing dams, and appropriations for these purposes as well as for dredging were continued until 1844 and resumed in 1866; but as the channel obtained was less than 3 ft. in 1870, locks with movable dams—that is, dams that can be thrown down on the approach of a flood—were then advocated, and five years later Congress made an appropriation for constructing such a dam, the Davis Island Dam immediately below Pittsburg, as an experiment. This was opened in 1885 and was a recognized success; and in 1895 the Ohio Valley Improvement Association was organized in an effort to have the system extended. At first the association asked only for a channel 6 ft. in depth; and between 1896 and 1905 Congress authorized the necessary surveys and made appropriations for thirty-six locks and dams from the Davis Island Dam to the mouth of the Great Miami river. As the association then urged that the channel be made 9 ft. in depth Congress authorized the secretary of war to appoint a board of engineers which should make a thorough examination and report on the comparative merits of a channel 9 ft. in depth, and one 6 ft. in depth. The board reported in 1908 in favour of a 9-ft. channel and stated that fifty-four locks and dams would be necessary for such a channel throughout the course of the river, and Congress adopted this project. At the Falls is the Louisville & Portland Canal, originally built by a private corporation, with the United States as one of the stockholders, and opened in 1830, with a width of 50 ft., a length of 200 ft., and three locks, each with a lift of about 8⅔ ft. In 1860–1872 the width was increased to 90 ft. and the three old locks were replaced by two new ones. The United States gradually increased its holdings of stock until in 1855 it became owner of all but five shares; it assumed the management of the canal in 1874, abolished tolls in 1880, and thereafter improved it in many respects. Sixty-eight locks and dams have been constructed on the principal tributaries, and the Allegheny, Monongahela, Cumberland, Tennessee, Muskingum, Kanawha, Little Kanawha, Big Sandy, Wabash, and Green now afford a total of about 960 m. of slack-water navigation.

See the Board of Engineers' *Report of Examination of Ohio River with a view to obtaining Channel Depths of 6 and 9 ft. respectively* (Washington, 1908); A. B. Hulbert, *Waterways of Westward Expansion* (Cleveland, 1903) and *The Ohio River, a Course of Empire* (New York, 1906); also R. G. Thwaites, *Afloat on the Ohio* (New York, 1900).

OHLAU, a town of Germany, in the Prussian province of Silesia, 16 m. by rail S.E. of Breslau, on the left bank of the Oder. Pop. (1905) 9233. It has two Roman Catholic and two Evangelical churches, and a castle. Ohlau is the centre of a tobacco-growing district and has manufactures of tobacco and cigars, machinery, beer, shoes and bricks. It became a town in 1291 and passed to Prussia in 1742. In the 17th and 18th centuries it was often the residence of the dukes of Brieg and of the Sobieski family.

See Schulz, *Aus Ohlaus Vergangenheit* (Ohlau, 1902).

ÖHLENSCHLÄGER, ADAM GOTTLOB (1779–1850), Danish poet, was born in Vesterbro, a suburb of Copenhagen, on the 14th of November 1779. His father, a Schleswiger by birth, was at that time organist, and later became keeper, of the royal palace of Frederiksberg; he was a very brisk and cheerful man. The poet's mother, on the other hand, who was partly German by extraction, suffered from depressed spirits, which afterwards deepened into melancholy madness. Adam and his sister Sofia were allowed their own way throughout their childhood, and were taught nothing, except to read and write, until their twelfth year. At the age of nine Adam began to make fluent verses. Three years later, while walking in Frederiksberg Gardens, he attracted the notice of the poet Edvard Storm, and the result of the conversation was that he received a nomination to the college called "Posterity's High School," an important institution of which Storm was the principal. Storm himself taught the class of Scandinavian mythology, and thus Öhlenschläger received his earliest bias towards the poetical religion of his ancestors. He was confirmed in 1795, and was to have been apprenticed to a tradesman in Copenhagen. To his great delight there was a hitch in the preliminaries, and he returned to his father's house. He now, in his eighteenth year, suddenly took up study with great zeal, but soon again abandoned his books for the stage, where a small position was offered him. In 1797 he actually made his appearance on the boards in several successive parts, but soon discovered that he possessed no real histrionic talent. The brothers Örsted, with whom he had formed an intimacy fruitful of profit to him, persuaded him to quit the stage, and in 1800 he entered the university of Copenhagen as a student. He was doomed, however, to disturbance in his studies, first from the death of his mother, next from his inveterate tendency towards poetry, and finally from the attack of the English upon Copenhagen in April 1801, which, however, inspired a dramatic sketch (*April the Second 1801*) which is the first thing of the kind by Öhlenschläger that we possess. In the summer of 1802, when Öhlenschläger had an old Scandinavian romance, as well as a volume of lyrics, in the press, the young Norse philosopher, Henrik Steffens, came back to Copenhagen after a long visit to Schelling in Germany, full of new romantic ideas. His lectures at the university, in which Goethe and Schiller were for the first time revealed to the Danish public, created a great sensation. Steffens and Öhlenschläger met one day at Dreier's Club, and after a conversation of sixteen hours the latter went home, suppressed his two coming volumes, and wrote at a sitting his splendid poem *Guldhornene*, in a manner totally new to Danish literature. The result of his new enthusiasm speedily showed itself in a somewhat hasty volume of poems, published in 1803, now chiefly remembered as containing the lovely piece called *Sanct-Hansaften-Spil*. The next two years saw the production of several exquisite works, in particular the epic of *Thors Reise til Jotunheim*, the charming poem in hexameters called *Langelandsreisen*, and the bewitching piece of fantasy *Aladdin's Lampe* (1805). At the age of twenty-six Öhlenschläger was universally recognized, even by the opponents of the romantic revival, as the leading poet of Denmark. He now collected his *Poetical Writings* in two volumes. He found no difficulty in obtaining a grant for foreign travel from the government, and he left his native country for the first time, joining Steffens at Halle in August 1805. Here he wrote the first of his great historical tragedies, *Hakon Jarl*, which he sent off to Copenhagen, and then proceeded for the winter months to Berlin, where he associated with Humboldt, Fichte, and the leading men of the day, and met Goethe for the first time In the spring of 1806 he went on to Weimar, where he spent several months in daily intercourse with Goethe. The autumn of the same year he spent with Tieck in Dresden, and proceeded in December to Paris. Here he resided eighteen months and wrote his three famous masterpieces, *Baldur hin Gode* (1808), *Palnatoke* (1809), and *Axel og Valborg* (1810). In July 1808 he left Paris and spent the autumn and winter in Switzerland as the guest of Madame de Staël-Holstein at Coppet, in the midst of her circle of wits. In the spring of 1809 Öhlenschläger went to Rome to visit Thorwaldsen, and in his house wrote his tragedy of *Correggio*. He hurriedly returned to Denmark in the spring of 1810, partly to take the chair of aesthetics at the university of Copenhagen, partly to marry the sister-in-law of Rahbek, to whom he had been long betrothed. His first course of lectures dealt with his Danish predecessor Ewald, the second with Schiller. From this time forward his literary activity became very great; in 1811 he published the Oriental tale of *Ali og Gulhyndi*, and in 1812 the last of his great tragedies, *Staerkodder*. From 1814 to 1819 he, or rather his admirers, were engaged in a long and angry controversy with Baggesen, who represented the old didactic school. This contest seems to have disturbed the peace of Öhlenschläger's mind, and to have undermined his genius. His talent may be said to have culminated in the glorious cycle of verse-romances called *Helge*, published in 1814. The tragedy of *Hagbarth og Signe*, 1815, showed a distinct falling-off in style. In 1817 he went back to Paris, and published *Hroars Saga* and the tragedy of *Fostbrödrene*. In 1818 he was again in Copenhagen, and wrote the idyll of *Den lille Hyrdedreng* and the Eddaic cycle called *Nordens Guder*. His next productions were the tragedies of *Erik og Abel* (1820) and *Vaeringerne i Miklagaard* (1826), and the epic of *Hrolf Krake* (1829). It was in the last-mentioned year that, being in Sweden, Öhlenschläger was publicly crowned with laurel in front of the high altar in Lund cathedral by Bishop Esaias Tegnér, as the "Scandinavian King of Song." His last volumes were *Tordenskjold* (1833), *Dronning Margrethe* (1833), *Sokrates* (1835), *Olaf den Hellige* (1836), *Knud den Store* (1838), *Dina* (1842), *Erik Glipping* (1843), and *Kiartan og Gudrun* (1847). On his seventieth birthday, 14th November 1849, a public festival was arranged in his honour, and he was decorated by the king of Denmark under circumstances of great pomp. He died on the 20th of January 1850, and was buried in the cemetery of Frederiksberg. Immediately after his death his *Recollections* were published in two volumes.

With the exception of Holberg, there has been no Danish writer who has exercised so wide an influence as Öhlenschläger. His great work was to awaken in the breasts of his countrymen an enthusiasm for the poetry and religion of their ancestors, and this he performed to so complete an extent that his name remains to this day synonymous with Scandinavian romance. He supplied his countrymen with romantic tragedies at the very moment when all eyes were turned to the stage, and when the old-fashioned pieces were felt to be inadequate. His plays, partly, no doubt, in consequence of his own early familiarity with acting, fulfilled the stage requirements of the day, and were popular beyond all expectation. The earliest are the best—Öhlenschläger's dramatic masterpiece being, without doubt his first tragedy, *Hakon Jarl*. In his poems and plays alike his style is limpid, elevated, profuse; his flight is sustained at a high pitch without visible excitement. His fluent tenderness and romantic zest have been the secrets of his extreme popularity. Although his inspiration came from Germany, he is not much like a German poet, except when he is consciously following Goethe; his analogy is much rather to be found among the English poets his contemporaries. His mission towards antiquity reminds us of Scott; but he is, as a poet, a better artist than Scott; he has sometimes touches of exquisite diction and of overwrought sensibility which recall Coleridge to us. In his wide ambition and profuseness he possessed some characteristics of Southey, although his style has far more vitality. With all his faults he was a very great writer, and one of the principal pioneers of the romantic movement in Europe. (E. G.)

OHLIGS, a town of Germany, in the Prussian Rhine Province, 17 m. by rail N. of Cologne, on the railway to Elberfeld. Pop. (1905) 24,264. Its chief manufactures are cutlery and hardware, and there are iron-foundries and flour-mills. Other industries are brewing, dyeing, weaving and brick-making. Before 1891 it was known as Merscheid.

OHM, GEORG SIMON (1787–1854), German physicist, was born at Erlangen on the 16th of March 1787, and was educated at the university there. He became professor of mathematics in the Jesuits' college at Cologne in 1817 and in the polytechnic school of Nuremberg in 1833, and in 1852 professor of experimental physics in the university of Munich, where he died on the 7th of July 1854. His writings were numerous, but, with one important exception, not of the first order. The exception is his pamphlet published in Berlin in 1827, with the title *Die galvanische Kette mathematisch bearbeitet*. This work, the germs of which had appeared during the two preceding years in the journals of Schweigger and Poggendorff, has exerted most important influence on the whole development of the theory and applications of current electricity, and Ohm's name has been incorporated in the terminology of electrical science. Nowadays "Ohm's Law," as it is called, in which all that is most valuable in the pamphlet is summarized, is as universally known as anything in physics. The equation for the propagation of electricity formed on Ohm's principles is identical with that of J. B. J. Fourier for the propagation of heat; and if, in Fourier's solution of any problem of heat-conduction, we change the word "temperature" to "potential" and write "electric current" instead of "flux of heat," we have the solution of a corresponding problem of electric conduction. The basis of Fourier's work was his clear conception and definition of conductivity. But this involves an assumption, undoubtedly true for small temperature-gradients, but still an assumption, viz. that, all else being the same, the flux of heat is strictly proportional to the gradient of temperature. An exactly similar assumption is made in the statement of Ohm's law, *i.e.* that, other things being alike, the strength of the current is at each point proportional to the gradient of potential. It happens, however, that with our modern methods it is much more easy to test the accuracy of the assumption in the case of electricity than in that of heat; and it has accordingly been shown by J. Clerk Maxwell and George Chrystal that Ohm's law is true, within the limits of experimental error, even when the currents are so powerful as almost to fuse the conducting wire.

OHMMETER, an electrical instrument employed for measuring insulation-resistance or other high electrical resistances. For the purpose of measuring resistances up to a few thousand ohms, the most convenient appliance is a Wheatstone's Bridge (*q.v.*), but when the resistance of the conductor to be measured is several hundred thousand ohms, or if it is the resistance of a so-called insulator, such as the insulating covering of the copper wires employed for distributing electric current in houses and buildings for electric lighting, then the ohmmeter is more convenient. An ohmmeter in one form consists of two pairs of coils, one pair called the series coil and the other called the shunt coil. These coils are placed with their axes at right angles to one another, and at the point where the axes intersect a small pivoted needle of soft iron is placed, carrying a longer index needle moving over a scale.

Suppose it is desired to measure the insulation-resistance of a system of electric house wiring; the ohmmeter circuits are then joined up as shown in fig. 1, where W represents a portion of the wiring of the building and I a portion of the insulating materials surrounding it. The object of the test is to discover the resistance of the insulator I, that is, to determine how much current flows through this insulator by leakage under a certain electromotive force or voltage which must not be less than that which will be employed in practice when the electric lights supplied through these wires are in operation. For this purpose the ohmmeter is provided with a small dynamo D, contained in a box, which produces a continuous electromotive force of from 200 to 500 volts when the handle of the instrument is steadily turned. In making the test, the whole of the copper wires belonging to any section of the wiring and the test must be connected together at some point and then connected through the series coil of the ohmmeter with one terminal of the dynamo. The shunt coil Sh and the series coil Se are connected together at one point, and the remaining terminals of the dynamo and shunt coil must be connected to a "good earth," which is generally the gas or water pipes *w* of the building. On setting the dynamo in operation, a current passes through the shunt coil of the ohmmeter proportional to the voltage of the dynamo, and, if there is any sensible leakage through the insulator to earth, at the same time another current passes through the series coil proportional to the conductivity of the insulation of the wiring under the electromotive force used. The two coils, the shunt and the series coil, then produce two magnetic fields, with their lines of force at right angles to one another. The small pivoted iron needle *ns* placed in their common field therefore takes up a certain position, dependent on the relative value of these fields. The tangent of the angle of deflection θ of this needle measured from its position, when the shunt coil is disconnected, is equal to the ratio of the voltage of the dynamo to the current through the insulator. If we call this last resistance R, the voltage of the working dynamo V, and the current through the insulator C, then $\tan\theta = C/V = R$. Hence the deflection of the needle is proportional to the insulation resistance, and the scale can be graduated to show directly this resistance in megohms.

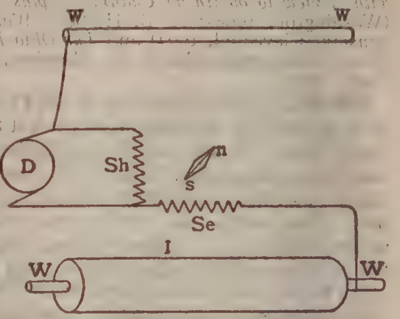


FIG. 1.

The Evershed and Vignoles form of the instrument is much used in testing the insulation resistance of electric wiring in houses. In this case the dynamo and ohmmeter are combined in one instrument. The field magnet of the dynamo has two gaps in it. In one the exciting armature is rotated, producing the working voltage of 250, 500 or 1000 volts. In the other gap are pivoted two coils wound on an iron core and connected at nearly a right angle to each other. One of these coils is in series with the armature circuit and with the insulation or high resistance to be measured. The other is a shunt across the terminals of the armature. When the armature is rotated, these two coils endeavour to place themselves in certain directions in the field so as to be perforated by the greatest magnetic flux. The exact position of the core, and, therefore, of an index needle connected with it, is dependent on the ratio of the voltage applied to the terminals of the high resistance or insulator and the current passing through it. This, however, is a measure of the insulation-resistance. Hence the instrument can be graduated to show this directly.

In the Nalder ohmmeter the electrostatic principle is employed. The instrument consists of a high-voltage continuous-current dynamo which creates a potential difference between the needle and the two quadrants of a quadrant electrometer (see ELECTROMETER). These two quadrants are interconnected by the high resistance to be measured, and, therefore, themselves differ in potential. The exact position taken up by the needle is therefore determined by the potential difference (P.D.) of the quadrants and the P.D. of the needle and each quadrant, and, therefore, by the ratios of the P.D. of the ends of the insulator and the current flowing through it, that is, by its insulation resistance.

The ohmmeter recommends itself by its portability, but in default of the possession of an ohmmeter the insulation-resistance can be measured by means of an ordinary mirror galvanometer (see GALVANOMETER) and insulated battery of suitable voltage. In this case one terminal of the battery is connected to the earth, and the other terminal is connected through the galvanometer with the copper wire, the insulation of which it is desired to test. If any sensible current flows through this insulator the galvanometer will show a deflection.

The meaning of this deflection can be interpreted as follows: If a galvanometer has a resistance R and is shunted by a shunt of resistance S, and the shunted galvanometer is placed in series with a large resistance R' of the order of a megohm, and if the same battery is applied to the shunted galvanometer, then the current C passing through the galvanometer will be given by the expression

$$C=\frac{SV}{R'(R+S)+RS'}$$

where V is the electromotive force of the battery. It is possible so to arrange the value of the shunt and of the high resistance R′ that the same or nearly the same deflection of the galvanometer is obtained as when it is used in series with the battery and the insulation-resistance. In these circumstances the current passing through the galvanometer is known, provided that the voltage of the battery is determined by means of a potentiometer (*q.v.*). Hence the resistance of the insulator can be ascertained, since it is expressed in ohms by the ratio of the voltage of the battery in volts to the current through the galvanometer in amperes. In applying this method to test the insulation of indiarubber-covered or of insulated copper wire, before employing it for electrical purposes, it is usual to place the coil of wire W (fig. 2) in an insulated tank of water T, which is connected to one terminal of the insulated battery B, the other terminal being connected to the metallic conductor CC of the wire under test, through a galvanometer G. To prevent leakage over the surface of the insulating covering of the wire which projects above the surface of the water, it is necessary to employ a "guard wire" P, which consists of a piece of fine copper wire, twisted round the extremity of the insulated wire and connected to the battery. This guard wire prevents any current which leaks over the surface of the insulator from passing through the galvanometer G, and the galvanometer indication is therefore only determined by the amount of current which passes through the insulator, or by its insulation-resistance.

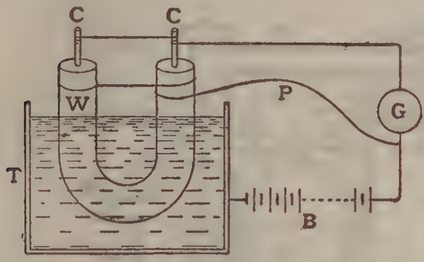


FIG. 2.

For further information on the measurement of high resistance, see J. A. Fleming, *A Handbook for the Electrical Laboratory and Testing Room* (2 vols., London, 1904); H. R. Kempe, *A Handbook of Electrical Testing* (London, 1900); H. L. Webb, *A Practical Guide to the Testing of Insulated Wires and Cables* (New York, 1902).
(J. A. F.)

OHNET, GEORGES (1848–), French novelist and man of letters, was born in Paris on the 3rd of April 1848. After the war of 1870 he became editor of the *Pays* and the *Constitutionnel* in succession. In collaboration with the engineer and dramatist Louis Denayrouze (b. 1848) he produced the play *Regina Sarpi*, and in 1877 *Marthe*. He was an admirer of Georges Sand and bitterly opposed to the realistic modern novel. He began a series of novels, *Les Batailles de la vie*, of a simple and idealistic character, which, although attacked by the critics as unreal and commonplace, were very popular. The series included *Serge Panine* (1881) which was crowned by the Academy; *Le Maître de forges* (1882), *La Grande Marnière* (1885), *Volonté* (1888), *Dernier amour* (1891). Many of his novels have been dramatized with great success, *Le Maître de forges*, produced at the Gymnase in 1883, holding the stage for a whole year. His later publications include *Le Crépuscule* (1902), *Le Marchand de poisons* (1903), *La Conquérante* (1905), *La Dixième Muse* (1906).

OHRDRUF, a town of Germany in the duchy of Saxe-Coburg-Gotha, 11 m. by rail S.E. of Gotha. Pop. (1905) 6114. It has a castle, two Evangelical churches, a technical and other schools, and manufactures of porcelain, paper, copper goods, shoes and small wares. Close by is the summer resort of Luisenthal. As early as 725 there was a monastery at Ohrdruf, which received municipal rights in 1399. With six neighbouring villages it forms the county of Obergleichen.

OIHENART, ARNAULD DE (1592–1668), Basque historian and poet, was born at Mauléon, and studied law at Bordeaux, where he took his degree in 1612. He practised first in his native town, and after his marriage with Jeanne d'Erdoy, the heiress of a noble family of Saint-Palais, at the bar of the parlement of Navarre. He spent his leisure and his fortune in the search for documents bearing on the old Basque and Bearnese provinces; and the fruits of his studies in the archives of Bayonne, Toulouse, Pau, Perigord and other cities were embodied in forty-five MS. volumes, which were sent by his son Gabriel to Colbert. Twenty-three of these are in the Bibliothèque Nationale of Paris (Coll. Duchesnc).

Oihenart published in 1625 a *Déclaration historique de l'injuste usurpation et retention de la Navarre par les Espagnols* and a fragment of a Latin work on the same subject is included in Galland's *Mémoires pour l'histoire de Navarre* (1648). His most important work is *Notitia utriusque Vasconiae, tum Ibericae, tum Aquitanicae, qua praeter situm regionis et alia scitu digna, Navarrae regum coeterarumque: in iis insignum vetustate et dignitate familiarum* . . . (Paris, 1638 and 1656), a description of Gascony and Navarre. His collection of over five hundred Basque proverbs, *Atsotizaç edo Refravac*, included in a volume of his poems *O^{ten} Gastaroa Nevrthizetan*, printed in Paris in 1657, was supplemented by a second collection, *Atsotizen Vrrhenquina*. The proverbs were edited by Francisque Michel (Paris, 1847), and the supplement by P. Hariston (Bayonne, 1892) and by V. Stempf (Bordeaux, 1894). See Julien Vinson, *Essai d'une bibliographie de la langue basque* (Paris, 1891); J. B. E. de Jaurgain, *Arnaud d'Oihenart et sa famille* (Paris, 1885).

OIL CITY, a city of Venango county, Pennsylvania, U.S.A., on the Allegheny river, at the mouth of Oil Creek, about 55 m. S.S.E. of Erie and about 135 m. N. of Pittsburg. Pop. (1890) 10,932; (1900) 13,264, of whom 2001 were foreign-born and 184 were negroes; (1910 census) 15,657. It is served by the Pennsylvania (two lines), the Erie, and the Lake Shore & Michigan Southern railways. The city lies about 1000 ft. above the sea, and is divided by the river and the creek into three sections connected by bridges. The business part of the city is on the low ground north of the river; the residential districts are the South Side, a portion of the flats, the West Side, and Cottage Hill and Palace Hill on the North Side. Oil City is the centre and the principal market of the Pennsylvania oil region. It has extensive oil refineries and foundries and machine shops, and manufactures oil-well supplies and a few other commodities. The city's factory products were valued at $5,164,059 in 1900 and at $3,217,208 in 1905, and in the latter year foundry and machine-shop products were valued at $2,317,505, or 72% of the total. Natural gas is used for power, heat and light. Oil City was founded in 1860, incorporated as a borough in 1863 and chartered as a city in 1874. The city was partially destroyed by flood in 1865, and by flood and fire in 1866 and again in 1892; on this last occasion Oil Creek was swollen by a cloud-burst on the 5th of June, and several tanks farther up the valley, which seem to have been struck by lightning, gave way and a mass of burning oil was carried by the creek to Oil City, where some sixty lives were lost and property valued at more than $1,000,000 was destroyed.

OIL ENGINE. Oil engines, like gas engines (*q.v.*), are internal combustion motors in which motive power is produced by the explosion or expansion of a mixture of inflammable material and air. The inflammable fluid used, however, consists of vapour produced from oil instead of permanent gas. The thermodynamic operations are the same as in gas engines, and the structural and mechanical differences are due to the devices required to vaporize the oil and supply the measured proportion of vapour which is to mix with the air in the cylinders.

Light and heavy oils are used; light oils may be defined as those which are readily volatile at ordinary atmospheric temperatures, while heavy oils are those which require special heating or spraying processes in order to produce an inflammable vapour capable of forming explosive mixture to be supplied to the cylinders. Of the light oils the most important is known as petrol. It is not a definite chemical compound. It is a mixture of various hydrocarbons of the paraffin and olefine series produced from the distillation of petroleum and paraffin oils. It consists, in fact, of the lighter fractions which distil over first in the process of purifying petroleums or paraffins.

The specific gravity of the standard petrols of commerce generally ranges between 0·700 to about 0·740; and the heat value on complete combustion per $\frac{1}{10}$ gallon burned varies from 14,240 to 14,850 British thermal units. The thermal value per gallon thus increases with the density, but the volatility diminishes. Thus, samples of petrol examined by Mr Blount of from ·700 to ·739 specific gravity showed that 98% of the lighter sample distilled over below 120° C. while only 88% of the heavier came over within the same temperature range. The heavier petrol is not so easily converted into vapour. The great modern development of the motor car gives the light oil engine a most important place as one of the leading sources of motive power in the world. The total petrol power now applied to cars on land and to vessels on sea amounts to at least two million H.P. The petrol engine has also enabled aeroplanes to be used in practice.

The earliest proposal to use oil as a means to produce motive power was made by an English inventor—Street—in 1794, but the first practical petroleum engine was that of Julius Hock of Vienna, produced in 1870. This engine, like Lenoir's gas engine, operated without compression. The piston took in a charge of air and light petroleum spray which was ignited by a flame jet and produced a low-pressure explosion. Like all non-compression engines, Hock's machine was very cumbrous and gave little power. In 1873, Brayton, an English engineer, who had settled in America, produced a light oil engine working on the constant pressure system without explosion. This appears to have been the earliest compression engine to use oil fuel instead of gas.

Shortly after the introduction of the "Otto" gas engine in 1876, a motor of this type was operated by an inflammable vapour produced by passing air on its way to the cylinder through the light oil then known as gasolene. A further air supply was drawn into the cylinder to form the required explosive mixture, which was subsequently compressed and ignited in the usual way. The Spiel petroleum engine was the first Otto cycle motor introduced into practice which dispensed with an independent vaporizing apparatus. Light hydrocarbon of a specific gravity of not greater than 0.725 was injected directly into the cylinder on the suction stroke by means of a pump. In entering it formed spray mixed with the air, was vaporized, and on compression an explosion was obtained just as in the gas engine.

Until the year 1883 the different gas and oil engines constructed were of a heavy type rotating at about 150 to 250 revolutions per minute. In that year Daimler conceived the idea of constructing very small engines with light moving parts, in order to enable them to be rotated at such high speeds as 800 and 1000 revolutions per minute. At that time engineers did not consider it practicable to run engines at such speeds; it was supposed that low speed was necessary to durability and smooth running. Daimler showed this idea to be wrong by producing his first small engine in 1883. In 1886 he made his first experiment with a motor bicycle, and on the 4th of March 1887 he ran for the first time a motor car propelled by a petrol engine. Daimler deserves great credit for realizing the possibility of producing durable and effective engines rotating at such unusually high speeds; and, further, for proving that his ideas were right in actual practice. His little engines contained nothing new in their cycles of operation, but they provided the first step in the startlingly rapid development of petrol motive power which we have seen in the last twenty years. The high speed of rotation enabled motors to be constructed giving a very large power for a very small weight.

Fig. 1 is a diagrammatic section of an early Daimler motor. A is the cylinder, B the piston, C the connecting rod, and D the crank, which is entirely enclosed in a casing. A small fly-wheel is carried by the crank-shaft, and it serves the double purpose of a fly-wheel and a clutch. *a* is the combustion space, E the single port, which serves both for inlet of the charge and for discharge of exhaust. W is the exhaust valve, F the charge inlet valve, which is automatic in its action, and is held closed by a spring *f*, G the carburettor, H the igniter tube, I the igniter tube lamp, K the charge inlet passage, L the air filter chamber, and M an adjustable air inlet cap for regulating the air inlet area. The light oil—or petrol, as it is commonly called—is supplied to the float chamber N of the vaporizer by means of the valve O. So long as the level of the petrol is high, the float *n*, acting by levers about it, holds the valve O closed against oil forced by air pressure along the pipe P. When the level falls, however, the valve opens and more petrol is admitted. When the piston B makes its suction stroke, air passes from the atmosphere by the passage K through the valve F, which it opens automatically. The pressure falls within the passage K, and a spurt of petrol passes by the jet G^1, separate air at the same time passing by the passage K^1 round the jet. The petrol breaks up into spray by impact against the walls of the passage K, and then it vaporizes and passes into the cylinder A as an inflammable mixture. When the piston B returns it compresses the charge into *a*, and upon compression the incandescent igniter tube H fires the charge. H is a short platinum tube, which is always open to the compression space. It is rendered incandescent by the burner I, fed with petrol from the pipe supplying the vaporizer. The open incandescent tube is found to act well for small engines, and it does not ignite the charge until the compression takes place, because the inflammable mixture cannot come into contact with the hot part till it is forced up the tube by the compression. The engine is started by giving the crank-shaft a smart turn round by means of a detachable handle. The exhaust is alone actuated from the valve shaft. The shaft Q is operated by pinion and a spur-wheel Q^2 at half the rate of the crank-shaft. The governing is accomplished by cutting out explosions as with the gas engine, but the governor operates by preventing the exhaust valve from opening, so that no charge is discharged from the cylinder, and therefore no charge is drawn in. The cam R operates the exhaust valve, the levers shown are so controlled by the governor (not shown) that the knife edge S is pressed out when speed is too high, and cannot engage the recess T until it falls. The engine has a water jacket V, through which water is circulated. Cooling devices are used to economize water.

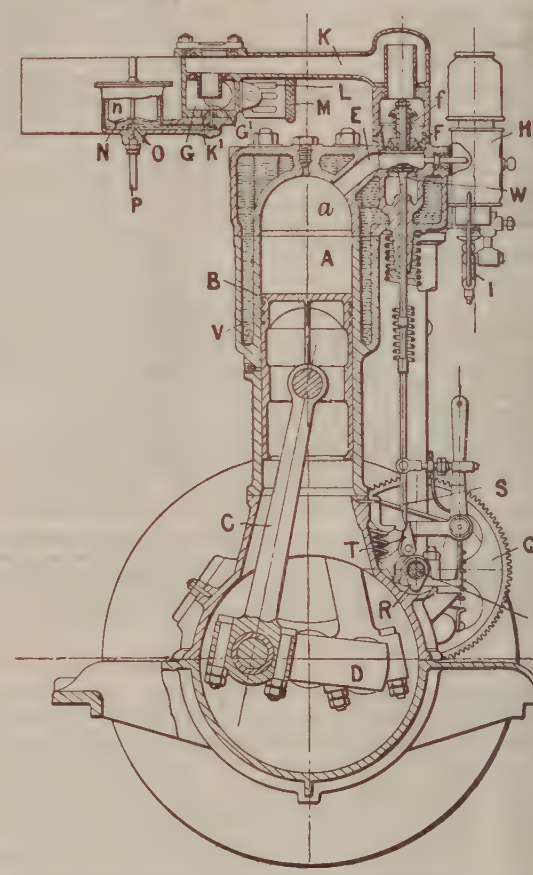


Fig. 1.

Benz of Mannheim followed close on the work of Daimler, and in France Panhard and Levassor, Peugeot, De Dion, Delahaye and Renault all contributed to the development of the petrol engine, while Napier, Lanchester, Royce and Austin were the most prominent among the many English designers.

The modern petrol engine differs in many respects from the Daimler engine just described both as to general design, method of carburetting, igniting and controlling the power and speed. The carburettor now used is usually of the float and jet type shown in fig. 1, but alterations have been made to allow of the production of uniform mixture in the cylinder under widely varying conditions of speed and load. The original form of carburettor was not well adapted to allow of great change of volume per suction stroke. Tube ignition has been abandoned, and the electric system is now supreme. The favourite type at present is that of the high-tension magneto. Valves are now all mechanically operated; the automatic inlet valve has practically disappeared. Engines are no longer controlled by cutting out impulses; the governing is effected by throttling the charge, that is by diminishing the volume of charge admitted to the cylinder at one stroke. Broadly, throttling by reducing charge weight reduces pressure of compression and so allows the power of the explosion to be graduated within wide limits while maintaining continuity of impulses. The object of the throttle control is to keep up continuous impulses for each cycle of operation, while graduating the power produced by each impulse so as to meet the conditions of the load.

Originally three types of carburettor were employed for dealing with light oil; first, the surface carburettor; second, the wick carburettor; and third, the jet carburettor. The surface carburettor has entirely disappeared. In it air was passed over a surface of light oil or bubbled through it; the air carried off a vapour to form explosive mixture. It was found, however, that the oil remaining in the carburettor gradually became heavier and heavier, so that ultimately no proper vaporization took place. This was due to the fractional evaporation of the oil which tended to carry away the light vapours, leaving in the vessel the oil, which produced heavy vapours. To avoid this fractionation the wick carburettor was introduced and here a complete portion of oil was evaporated at each operation so that no concentration of heavy oil was possible. The wick carburettor is still used in some cars, but the jet carburettor is practically universal. It has the advantage of discharging separate portions of oil into the air entering the engine, each portion being carried away and evaporated with all its fractions to produce the charge in the cylinder.

The modern jet carburettor appears to have originated with Butler, an English engineer, but it was first extensively used in the modification produced by Maybach as shown in fig. 1.

A diagrammatic section of a carburettor of the Maybach type is shown in a larger scale in fig. 2.

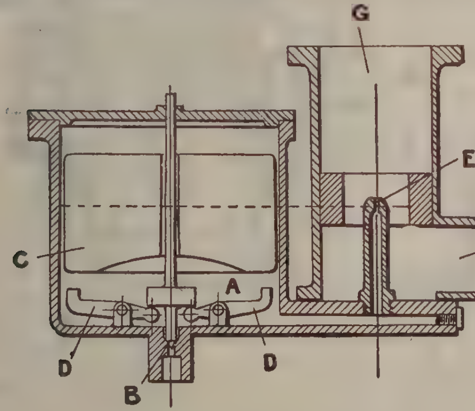


FIG. 2.

Petrol is admitted to the chamber A by the valve B which is controlled by the float C acting through the levers D, so that the valve B is closed when the float reaches a determined level and opened when it falls below it. The petrol flows into a jet E and stands at an approximately constant level within it. When the engine piston makes its suction stroke, the air enters from the atmosphere at F and passes to the cylinder through G. The pressure around the jet E thus falls, and the pressure of the atmosphere in the chamber A forces the petrol through E as a jet during the greater part of the suction stroke. An inflammable mixture is thus formed, which enters the cylinder by way of G. The area for the passage of air around the petrol jet E is constricted to a sufficient extent to produce the pressure fall necessary to propel the petrol through the jet E, and the area of the discharge aperture of the petrol jet E is proportioned to give the desired volume of petrol to form the proper mixture with air. The device in this form works quite well when the range of speed required from the engine is not great; that is, within limits, the volume of petrol thrown by the jet is fairly proportional to the air passing the jet. When, however, the speed range is great, such as in modern motors, which may vary from 300 to 1500 revolutions per minute under light and heavy loads, then it becomes impossible to secure proportionality sufficiently accurate for regular ignition. This implies not only a change of engine speed but a change of volume entering the cylinder at each stroke as determined by the position of the throttle. This introduces further complications. Throttle control implies a change of total charge volume per stroke, which change may occur either at a low or at a high speed. To meet this change the petrol jet should respond in such manner as to give a constant proportionality of petrol weight to air weight throughout all the variations—otherwise sometimes petrol will be present in excess with no oxygen to burn it, and at other times the mixture may be so dilute as to miss firing altogether. To meet these varying conditions many carburettors have been produced which seek by various devices to maintain uniformity of quality of mixture by the automatic change of throttle around the jet.

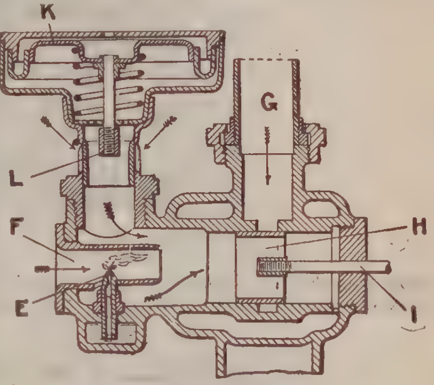


FIG. 3.

Fig. 3 shows in diagrammatic section one of the simplest of these contrivances, known as the Krebs carburettor. The petrol enters from the float chamber to the jet E; and, while the engine is running slowly, the whole supply of air enters by way of the passage F, mixes with the petrol and reaches the cylinders by way of the pipe G. The volume of charge entering the cylinder per stroke is controlled by the piston throttle valve H, operated by the rod I; and so long as the charge volume required remains small, air from the atmosphere enters only by F. When speed rises, however, and the throttle is sufficiently opened, the pressure within the apparatus falls and affects a spring-pressed diaphragm K, which actuates a piston valve controlling the air passages L, so that this valve opens to the atmosphere more and more with increasing pressure reduction, and additional air thus flows into the carburettor and mixes with the air and petrol entering through F. By this device the required proportion of air to petrol is maintained through a comparatively large volume range. This change of air admission is rendered necessary because of the difference between the laws of air and petrol flow. In order to give a sufficient weight of petrol at low speeds when the pressure drop is small, it is necessary to provide a somewhat large area of petrol jet. When suction increases owing to high speed, this large area discharges too much petrol, and so necessitates a device, such as that described, which admits more air.

A still simpler device is adopted in many carburettors—that of an additional air inlet valve, kept closed until wanted by a spring. Fig. 4 shows a diagrammatic section as used in the Vauxhall carburettor. Here the petrol jet and primary and secondary air passages are lettered as before.

The same effect is produced by devices which alter the area of the petrol jet or increase or diminish the number of petrol jets exposed as required. Although engine designers have succeeded in proportioning mixture through a considerable range of speed and charge demand, so as to obtain effective power explosions under all these conditions, yet much remains to be done to secure constancy of mixture at all speeds. Notwithstanding much which has been said as to varying mixture, there is only one mixture of air and petrol which gives the best results—that in which there is some excess of oxygen, more than sufficient to burn all the hydrogen and carbon present. It is necessary to secure this mixture under all conditions, not only to obtain economy in running but also to maintain purity of exhaust gases. Most engines at certain speeds discharge considerable quantities of carbonic oxide into the atmosphere with their exhaust gases, and some discharge so much as to give rise to danger in a closed garage. Carbonic oxide is an extremely poisonous gas which should be reduced to the minimum in the interests of the health of our large cities. The enormous increase of motor traffic makes it important to render the exhaust gases as pure and innocuous as possible. Tests were made by the Royal Automobile Club some years ago which clearly showed that carbonic oxide should be kept down to 2% and under when carburettors were properly adjusted. Subsequent experiments have been made by Hopkinson, Clerk and

Watson, which clearly prove that in some cases as much as 30% of the whole heat of the petrol is lost in the exhaust gases by imperfect combustion This opens a wide field for improvement, and makes it probable that with better carburettors motor cars would not only discharge purer exhaust gases but would work on very much less petrol than they do at present.

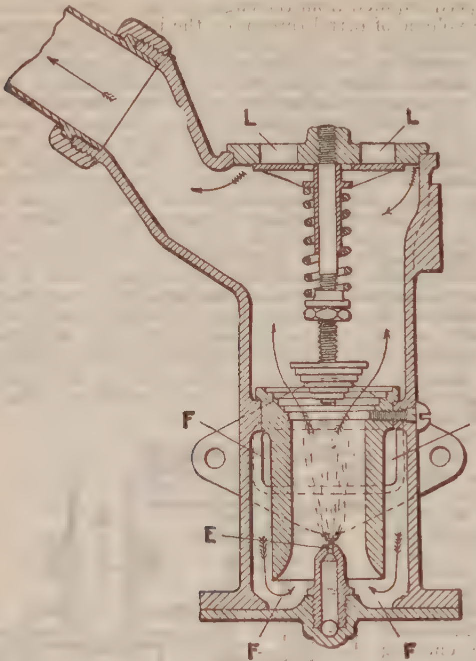
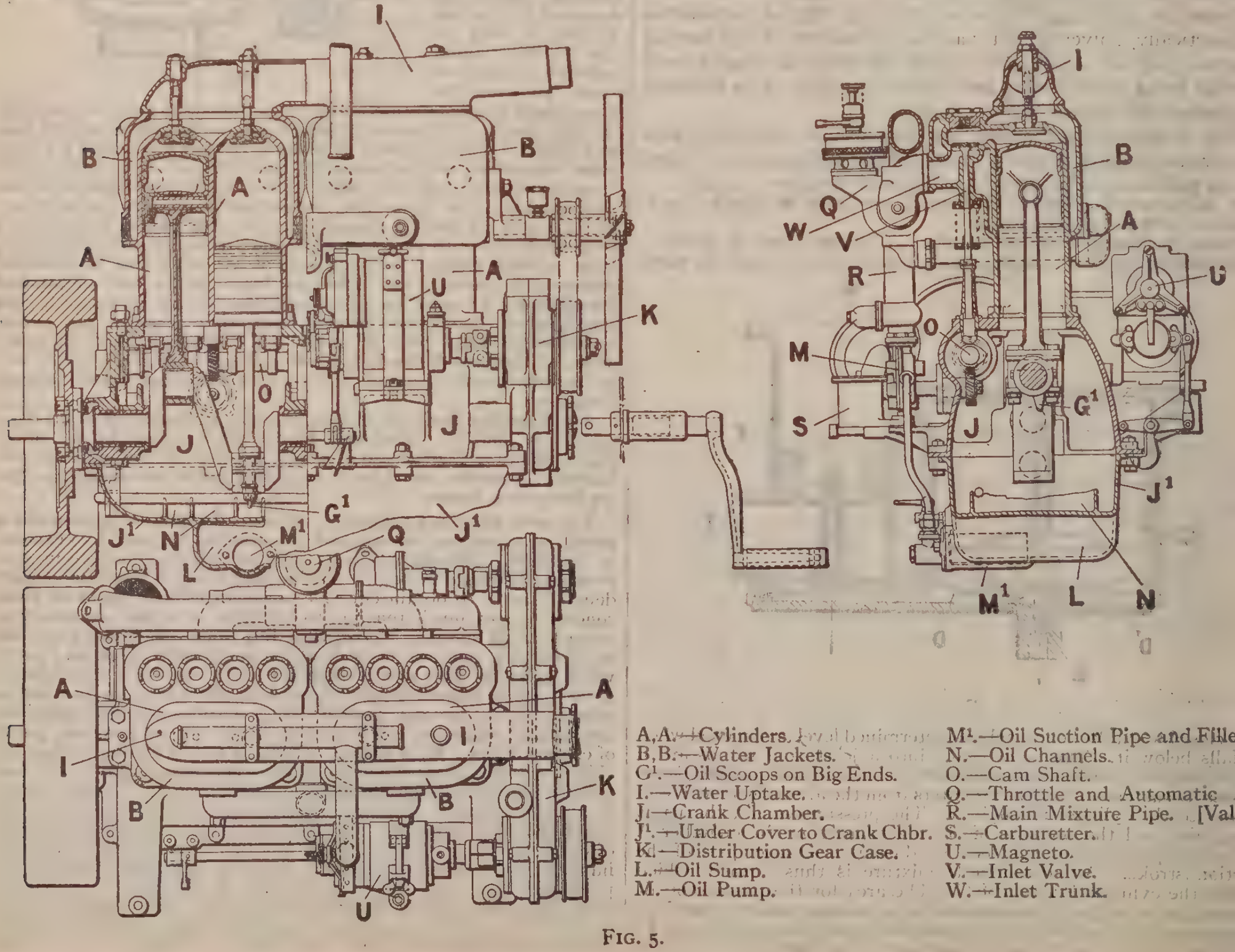


FIG. 4.

Practically all modern petrol engines are controlled by throttling the whole charge. In the earlier days several methods of control were attempted: (1) missing impulses as in fig. 1 of the Daimler engines; (2) altering the timing of spark; (3) throttling petrol supply, and (4) throttling the mixture of petrol and air. The last method has proved to be the best. By maintaining the proportion of explosive mixture, but diminishing the total volume admitted to the cylinder per stroke, graduated impulses are obtained without any, or but few, missed ignitions. The effect of the throttling is to reduce compression by diminishing total charge weight. To a certain extent the proportion of petrol to total charge also varies, because the residual exhaust gases remain constant through a wide range. The thermal efficiency diminishes as the throttling increases; but, down to a third of the brake power, the diminution is not great, because although compression is reduced the expansion remains the same. At low compressions, however, the engine works practically as a non-compression engine, and the point of maximum pressure becomes greatly delayed. The efficiency, therefore, falls markedly, but this is not of much importance at light loads. Experiments by Callendar, Hopkinson, Watson and others have proved that the thermal efficiency obtained from these small engines with the throttle full open is very high indeed; 28% of the whole heat in the petrol is often given as indicated work when the carburettor is properly adjusted. As a large gas engine for the same compression cannot do better than 35%, it appears that the loss of heat due to small dimensions is compensated by the small time of exposure of the gases of explosion due to the high speed of rotation. Throttle control is very effective, and it has the great advantage of diminishing maximum



A,A.—Cylinders.
B,B.—Water Jackets.
G^1.—Oil Scoops on Big Ends.
I.—Water Uptake.
J.—Crank Chamber.
J^1.—Under Cover to Crank Chbr.
K.—Distribution Gear Case.
L.—Oil Sump.
M.—Oil Pump.
M^1.—Oil Suction Pipe and Filler.
N.—Oil Channels.
O.—Cam Shaft.
Q.—Throttle and Automatic Air Valve.
R.—Main Mixture Pipe.
S.—Carburetter.
U.—Magneto.
V.—Inlet Valve.
W.—Inlet Trunk.

FIG. 5.

pressures to which the piston and cylinders are exposed while the engine is running at the lower loads. This is important both for smooth running and good wearing qualities. Theoretically, better results could be obtained from the point of view of economy by retaining a constant compression pressure, constant charge of air, and producing ignition, somewhat in the manner of the Diesel engine. Such a method, however, would have the disadvantage of producing practically the same maximum pressure for all loads, and this would tend to give an engine which would not run smoothly at slow speeds.

As has been said, tube ignition was speedily abandoned for electric ignition by accumulator, induction coil distributor and sparking plug. This in its turn was largely displaced by the low-tension magneto system, in which the spark was formed between contacts which were mechanically separated within the cylinders. The separable contacts gave rise to complications, and at present the most popular system of ignition is undoubtedly that of the high-tension magneto. In this system the ordinary high-tension sparking plugs are used, and the high-tension current is generated in a secondary winding on the armature of the magneto, and reaches the sparking plugs by way of a rotary distributor. In many cases the high-tension magneto system is used for the ordinary running of the engine, combined with an accumulator or battery and induction coil for starting the engine from rest. Such systems are called dual ignition systems. Sometimes the same ignition plugs are adapted to spark from either source, and in other cases separate plugs are used. The magneto systems have the great advantage of generating current without battery, and by their use noise is reduced to a minimum. All electrical systems are now arranged to allow of advancing and retarding the spark from the steering wheel. In modern magneto methods, however, the spark is automatically retarded when the engine slows and advanced when the speed rises, so that less change is required from the wheel than is necessary with battery and coil.

Sir Oliver Lodge has invented a most interesting system of electric ignition, depending upon the production of an extra oscillatory current of enormous tension produced by the combined use of spark gap and condenser. This extra spark passes freely even under water, and it is impossible to stop it by any ordinary sooting or fouling of the ignition plug.

The most popular engines are now of the four and six cylinder types.

Fig. 5 shows a modern four-cylinder engine in longitudinal and transverse sections as made by the Wolseley Company. A, A are the cylinders; B, B, water jackets; G^1, oil scoops on the large ends of the connecting-rods. These scoops take up oil from the crank chamber. Forced lubrication is used. The oil pump M is of the toothed wheel type, and it is driven by skew gearing. An oil sump is arranged at L, and the oil is pumped from this sump by the pump described. The overflow from the main bearings supplies the channels in the crank case from which the oil scoops take their charge. It will be seen that the two inside pistons are attached to cranks of coincident centres, and this is true of the two outside pistons also. This is the usual arrangement in four-cylinder engines. By this device the primary forces are balanced; but a small secondary unbalanced force remains, due to the difference in motion of the pistons at the up and down portions of their stroke. A six-cylinder engine has the advantage of getting rid of this secondary unbalanced force; but it requires a longer and more rigid crank chamber. In this engine the inlet and exhaust valves of each cylinder are placed in the same pocket and are driven from one cam-shaft. This is a very favourite arrangement; but many engines are constructed in which the inlet and exhaust valves operate on opposite sides of the cylinder in separate ports and are driven from separate cam-shafts. Dual ignition is applied to this engine; that is, an ignition composed of high-tension magneto and also battery and coil for starting. U is the high-tension magneto. Under the figure there is shown a list of parts which sufficiently indicate the nature of the engine.

An interesting and novel form of engine is shown at fig. 6. This is a well-known engine designed by Mr Knight, an American inventor, and now made by the Daimler and other companies. It will be observed in the figure that the ordinary lift valves are entirely dispensed with, and slide valves are used of the cylindrical shell type. The engine operates on the ordinary Otto cycle, and all the valve actions necessary to admit charge and discharge exhaust gases are accomplished by means of two sleeves sliding one within the other. The outer sleeve slides in the main cylinder and the inner sleeve slides within the outer sleeve. The piston fits within the inner sleeve. The sleeves receive separate motions from short connecting links C and E, driven by eccentrics carried on a shaft W. This shaft is driven from the main crank-shaft by a strong chain so as to make half the revolutions of the crank-shaft in the usual manner of the Otto cycle. The inlet port is formed on one side of the cylinder and is marked I. The exhaust port is arranged on the other side and marked J. These ports are segmental. A water-jacketed cylinder head carries stationary rings L, K, which press outwards. These are clearly shown in the drawing. The inner sleeve ports run past the lower broad ring L when compression is to be accomplished, and the contents of the cylinder are retained within the cylinder and compression space by the piston rings and the fixed rings referred to.

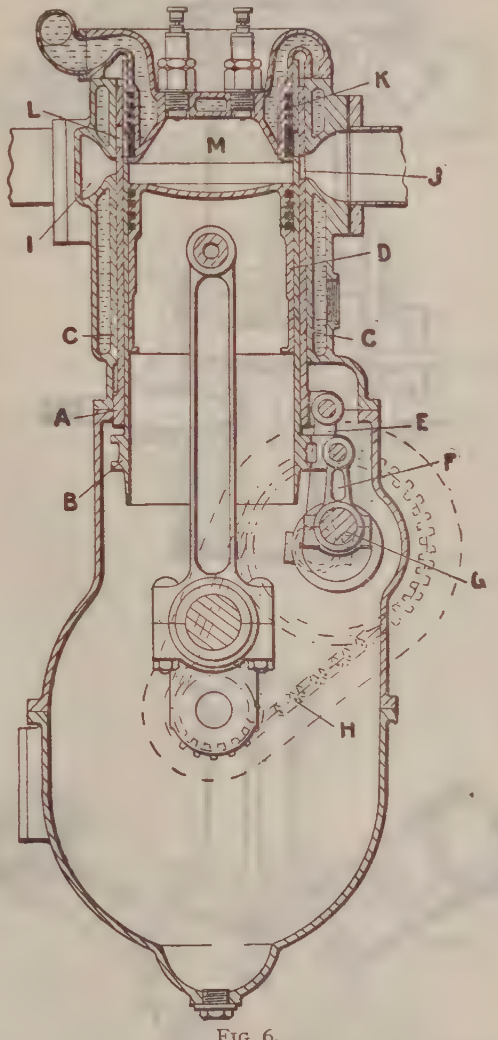


Fig. 6.

The outer sleeve does not require rings at all. Its function is simply to distribute the gases so that the exhaust port is closed by the outer sleeve when the inlet port is open. The outer sleeve acts really as a distributor; the inner sleeve supplies the pressure tightness required to resist compression and explosion. The idea of working exhaust and inlet by two sleeves within which the main piston operates is very daring and ingenious; and for these small engines the sleeve valve system works admirably. There are many advantages; the shape of the compression space is a most favourable one for reducing loss by cooling. All the valve ports required in ordinary lift valve engines are entirely dispensed with; that is, the surface exposed to the explosion causing loss of heat is reduced to a minimum. The engines are found in use to be very flexible and economical.

The petrol engines hitherto described, although light compared to the old stationary gas engines, are heavy when compared with recent motors developed for the purpose of aeroplanes. Many of these motors have been produced, but two only will be noticed here—the Anzani, because Bleriot's great flight across the Channel was accomplished by means of an Anzani engine, and the Gnome engine, because it was used in the aeroplane with which Paulhan flew from London to Manchester.

Fig. 7 shows transverse and longitudinal sections through the Anzani motor. Looking at the longitudinal section it will be observed that the cylinders are of the air-cooled type; the exhaust valves alone are positively operated, and the inlet valves are of the automatic lift kind. The transverse section shows that three radially arranged cylinders are used and three pistons act upon one crank-pin. The Otto cycle is followed so that three impulses are obtained for every two revolutions. The cylinders are spaced apart 60° and project from the upper side of the crank chamber. Although not shown in the drawing, the pistons overrun a row of holes at the out end of the stroke and the exhaust first discharges through these holes. This is a very common device in aeroplane engines, and it greatly increases the rapidity of the exhaust discharged and reduces the work falling upon the exhaust valve. The pistons and cylinders are of cast iron; the rings are of cast iron; the ignition is electric, and the petrol is fed by gravity. The engine used by Blériot in his Cross-Channel flight was 25 H.P., cylinders 105 mm. bore × 130 mm. stroke; revolutions, 1600 per minute; total weight, 145 ℔. The engine, it will be seen, is exceedingly simple, although air-cooling seems somewhat primitive for anything except short flights. The larger Anzani motors are water-cooled.

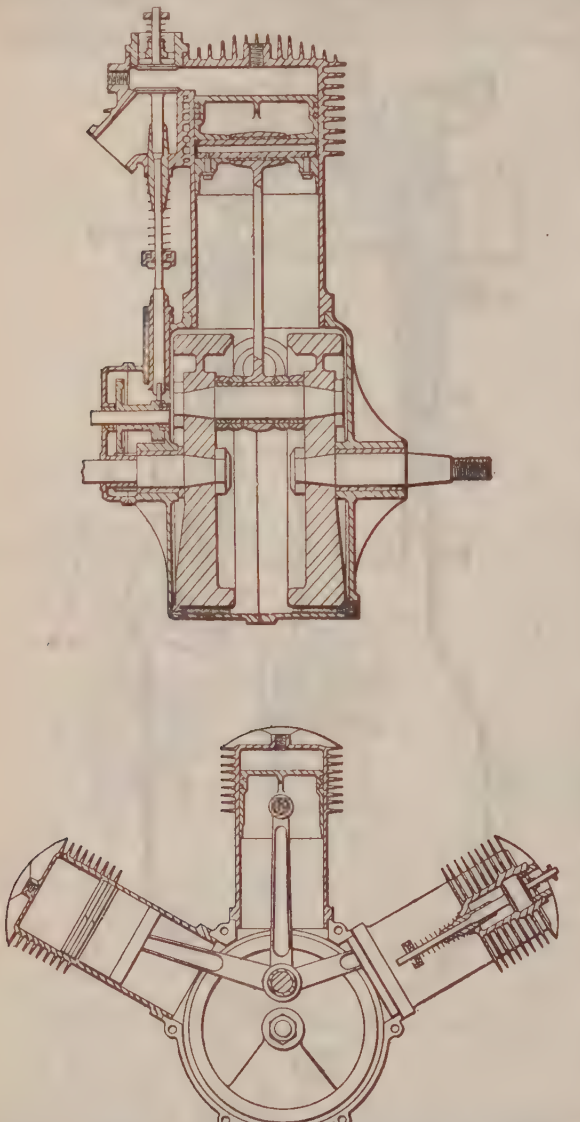


FIG. 7.

A diagrammatic transverse section of the Gnome motor is shown at fig. 8. In this interesting engine there are seven cylinders disposed radially round a fixed crank-shaft. The seven pistons are all connected to the same crank-shaft, one piston being rigidly connected to a big end of peculiar construction by a connecting-rod, while the other connecting-rods are linked on to the same big end by pins; that is, a hollow fixed crank-shaft has a single throw to which only one connecting-rod is attached; all the other connecting-rods work on pins let into the big end of that connecting-rod. The cylinders revolve round the fixed crank in the manner of the well-known engines first introdued to practice by Mr John Rigg. The explosive mixture is led from the carburettor through the hollow crank-shaft into the crank-case, and it is admitted into the cylinders by means of automatic inlet valves placed in the heads of the pistons. The exhaust valves are arranged on the cylinder heads. Dual ignition is provided by high tension magneto and storage battery and coil. The cylinders are ribbed outside like the Anzani, and are very effectively air-cooled by their rotation through the air as well as by the passage of the aeroplane through the atmosphere. The cylinders in the 35 H.P. motor are 110 mm. bore × 120 mm. stroke. The speed of rotation is usually 1200 revolutions per minute. The total weight of the engine complete is 180 ℔, or just over 5 ℔ per brake horse-power. The subject of aeroplane petrol engines is a most interesting one, and rapid progress is being made.

So far, only 4-cycle engines have been described, and they are almost universal for use in motor-cars and aeroplanes. Some motor cars, however, use 2-cycle engines. Several types follow the "Clerk" cycle (see GAS ENGINE) and others the "Day" cycle. In America the Day cycle is very popular for motor launches, as the engine is of a very simple, easily managed kind. At present, however, the two-cycle engine has made but little way in motor car or aeroplane work. It is capable of great development and the attention given to it is increasing.

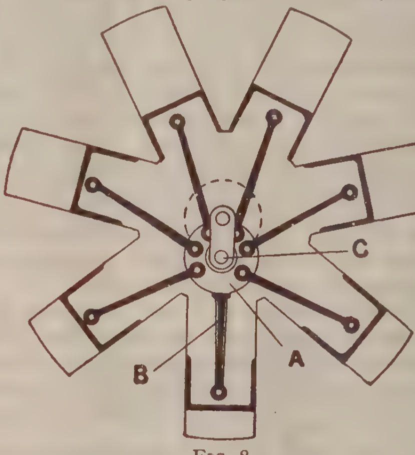


FIG. 8.

So far, petrol has been alluded to as the main liquid fuel for these motors. Other hydrocarbons have also been used; benzol, for example, obtained from gas tar is used to some extent, and alcohol has been applied to a considerable extent both for stationary and locomotive engines. Alcohol, however, has not been entirely successful. The amount of heat obtained for a given monetary expenditure is only about half that obtained by means of petrol. On the continent of Europe, however, alcohol motors have been considerably used for public vehicles.

The majority of petrol motors are provided with water jackets around their cylinders and combustion spaces. As only a small quantity of water can be carried, it is necessary to cool the water as fast as it becomes hot. For this purpose radiators of various constructions are applied. Generally a pump is used to produce a forced circulation, discharging the hot water from the engine jackets through the radiator and returning the cooled water to the jackets at another place. The radiators consist in some cases of fine tubes covered with projecting fins or gills; the motion of the car forces air over the exterior of those surfaces and is assisted by the operation of a powerful fan driven from the engine. A favourite form of radiator consists of numerous small tubes set into a casing and arranged somewhat like a steam-engine condenser. Water is forced by the pump round these tubes, and air passes from the atmosphere through them. This type of radiator is sometimes known as the "honeycomb" radiator. A very large cooling surface is provided, so that the same water is used over and over again. In a day's run with a modern petrol engine very little water is lost from the system. Some engines dispense with a pump and depend on what is called the thermo-syphon. This is the old gas-engine system of circulation, depending on the different density of water when hot and cool. The engine shown at fig. 5 is provided with a water-circulation system of this kind. For the smaller engines the thermo-syphon works extremely well.

Heavy oil engines are those which consume oil having a flashing-point above 73° F.—the minimum at present allowed by act of parliament in Great Britain for oils to be consumed in ordinary illuminating lamps. Such oils are American and Russian petroleums and Scottish paraffins. They vary in specific gravity from ·78 to ·825, and in flashing-point from 75° to 152° F. Engines burning such oils may be divided into three distinct classes: (1) Engines in which the oil is subjected to a spraying operation before vaporization; (2) Engines in which the oil is injected into the cylinder and vaporized within the cylinder; (3) Engines in which the oil is vaporized in a device external to the cylinder and introduced into the cylinder in the state of vapour.

The method of ignition might also be used to divide the engines into those igniting by the electric spark, by an incandescent tube, by compression, or by the heat of the internal surfaces of the combustion space. Spiel's engine was ignited by a flame igniting device similar to that used in Clerk's gas engine, and it was the only one introduced into Great Britain in which this method was adopted, though on the continent flame igniters were not uncommon. Electrically-operated igniters have come into extensive use throughout the world.

The engines first used in Great Britain which fell under the first head were the Priestman and Samuelson, the oil being sprayed before being vaporized in both. The principle of the spray producer used is that so well and so widely known in connexion with the atomizers or spray producers used by perfumers. Fig. 9 shows such a spray producer in section. An air blast passing from the small jet A crosses the top of the tube B and creates within it a partial vacuum. The liquid contained in C flows up the tube B and issuing at the top of the tube through a small orifice is at once blown into very fine spray by the action of the air jet. If such a scent distributor be filled with petroleum oil, such as Royal Daylight or Russoline, the oil will be blown into fine spray, which can be ignited by a flame and will burn, if the jets be properly proportioned, with an intense blue non-luminous flame. The earlier inventors often expressed the idea that an explosive mixture could be prepared without any vaporization whatever, by simply producing an atmosphere containing inflammable liquid in extremely small particles distributed throughout the air in such proportion as to allow of complete combustion. The familiar explosive combustion of lycopodium, and the disastrous explosions in the exhaustion rooms of flour-mills by the presence of finely divided flour in the air, have also suggested to inventors the idea of producing explosions for power purposes from combustible solids. Although, doubtless, explosions could be produced in that way, yet in oil engines the production of spray is only a preliminary to the vaporization of the oil. If a sample of oil is sprayed in the manner just described, and injected in a hot chamber also filled with hot air, it at once passes into a state of vapour within that chamber, even though the air be at a temperature far below the boiling-point of the oil; the spray producer, in fact, furnishes a ready means of saturating any volume of air with heavy petroleum oil to the full extent possible from the vapour tension of the oil at that particular temperature. The oil engines described below are in reality explosion gas engines of the ordinary Otto type, with special arrangements to enable them to vaporize the oil to be used. Only such parts of them as are necessary for the treatment and ignition will therefore be described.

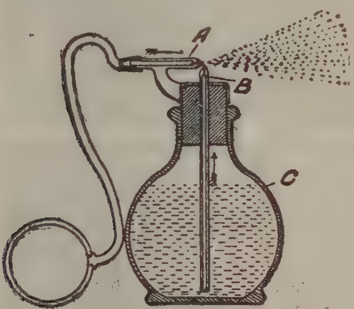


FIG. 9.—Perfume Spray Producer.

Fig. 10 is a vertical section through the cylinder and vaporizer of a Priestman engine, and fig. 11 is a section on a larger scale, showing the vaporizing jet and the air admission and regulation valve leading to the vaporizer. Oil is forced by means of air pressure from a reservoir through a pipe to the spraying nozzle *a*, and air passes from an air-pump by way of the annular channel *b* into the sprayer *c*, and there meets the oil jet issuing from *a*. The oil is thus broken up into spray, and the air charged with spray flows into the vaporizer E, which is heated up in the first place on starting the engine by means of a lamp. In the vaporizer the oil spray becomes oil vapour, saturating the air within the hot walls. On the out-charging stroke of the piston the mixture passes by way of the inlet valve H into the cylinder, air flowing into the vaporizer to replace it through the valve *l* (fig. 11). The cylinder K is thus charged with a mixture of air and hydrocarbon vapour, some of which may exist in the form of very fine spray. The piston L then returns and compresses the mixture, and when the compression is quite complete an electric spark is passed between the points M, and a compression explosion is obtained precisely similar to that obtained in the gas engine. The piston moves out, and on its return stroke the exhaust valve N is opened and the exhaust gases discharged by way of the pipe O, round the jacket P, enclosing the vaporizing chamber. The latter is thus kept hot by the exhaust gases when the engine is at work, and it remains sufficiently hot without the use of the lamp provided for starting. To obtain the electric spark a bichromate battery with an induction coil is used. The spark is timed by contact pieces operated by an eccentric rod, used to actuate the exhaust valve and the air-pump for supplying the oil chamber and the spraying jet. To start the engine a hand pump is worked until the pressure is sufficient to force the oil through the spraying nozzle, and oil spray is formed in the starting lamp; the spray and air mixed produce a blue flame which heats the vaporizer. The fly-wheel is then rotated by hand and the engine moves away. The eccentric shaft is driven from the crank-shaft by means of toothed wheels, which reduce the speed to one-half the revolutions of the crank-shaft. The charging inlet valve is automatic. Governing is effected by throttling the oil and air supply. The governor operates on the butterfly valve T (fig. 11), and on the plug-cock *t* connected to it, by means of the spindle *t'*. The air and oil are thus simultaneously reduced, and the attempt is made to maintain the charge entering the cylinder at a constant proportion by weight of oil and air, while reducing the total weight, and therefore volume, of the charge entering. The Priestman engine thus gives an explosion on every second revolution in all circumstances, whether the engine be running light or loaded.

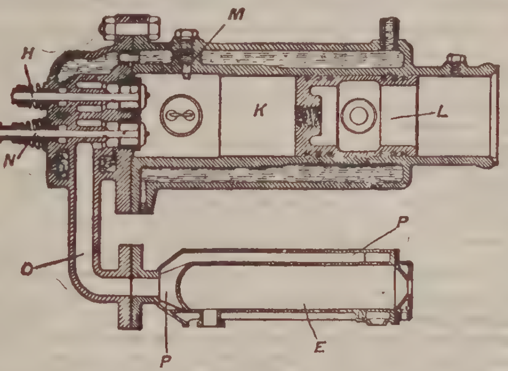


FIG. 10.—Priestman Oil Engine (vertical section through cylinder and vaporizer).

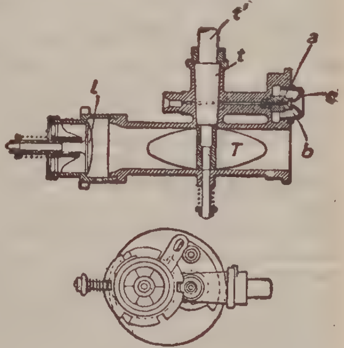


FIG. 11.—Priestman Oil Engine (section on a larger scale).

The compression pressure of the mixture before admission is, however, steadily reduced as the load is reduced, and at very light loads the engine is running practically as a non-compression engine.

A test by Professor Unwin of a 4½ nominal horse-power Priestman engine, cylinder 8·5 in. diameter, 12 in. stroke, normal speed 180 revolutions per minute, showed the consumption of oil per indicated horse-power hour to be 1·066 ℔ and per brake horse-power hour 1·243 ℔. The oil used was that known as Broxburn Lighthouse, a Scottish paraffin oil produced by the destructive distillation of shale, having a density of ·81 and a flashing-point about 152° F. With a 5 H.P. engine of the same dimensions, the volume swept by the piston per stroke being ·395 cub. ft. and the clearance space in the cylinder at the end of the stroke ·210 cub. ft., the principal results were:—

	Daylight Oil.	Russoline Oil.
Indicated horse-power	9·369	7·408
Brake horse-power	7·722	6·765
Mean speed (revolutions per minute)	204·33	207·73
Mean available pressure (revolutions per minute)	53·2	41·38
Oil consumed per indicated horse-power per hour	·694 ℔	·864 ℔
Oil consumed per brake horse-power per hour	·842 ℔	·946 ℔

With daylight oil the explosion pressure was 151·4 ℔ per square inch above atmosphere, and with Russoline 134·3 ℔. The terminal pressure at the moment of opening the exhaust valve with daylight oil was 35·4 ℔ and with Russoline 33·7 per square inch. The compression pressure with daylight oil was 35 ℔, and with Russoline 27·6 ℔ pressure above atmosphere. Professor Unwin calculated the amount of heat accounted for by the indicator as 18·8 % in the case of daylight oil and 15·2 in the case of Russoline oil.

The Hornsby-Ackroyd engine is an example of the class in which the oil is injected into the cylinder and there vaporized. Fig. 12 is a section through the vaporizer and cylinder of this engine, and fig. 13 shows the inlet and exhaust valves also in section placed in front of the vaporizer and cylinder section. Vaporizing is conducted in the interior of the combustion chamber, which is so arranged that the heat of each explosion maintains it at a temperature sufficiently high to enable the oil to be vaporized by mere injection upon the hot surfaces. The vaporizer A is heated up by a separate lamp, the oil is injected at the oil inlet B, and the engine is rotated by hand. The piston then takes in a charge of air by the air-inlet valve into the cylinder, the air passing by the port directly into the cylinder without passing through the vaporizer chamber. While the piston is moving forward, taking in the charge of air, the oil thrown into the vaporizer is vaporizing and diffusing itself through the vaporizer chamber, mixing, however, only with the hot products of combustion left by the preceding explosion. During the charging stroke the air enters through the cylinder, and the vapour formed from the oil is almost entirely confined to the combustion chamber. On the return stroke of the piston air is forced through the somewhat narrow neck *a* into the combustion chamber, and is there mixed with the vapour contained in it. At first, however, the mixture is too rich in inflammable vapour to be capable of ignition. As the compression proceeds, however, more and more air is forced into the vaporizer chamber, and just as compression is completed the mixture attains proper explosive proportions. The sides of the chamber are sufficiently hot to cause explosion, under the pressure of which the piston moves forward. As the vaporizer A is not water-jacketed, and is connected to the metal of the back cover only by the small section or area of cast-iron forming the metal neck *a*, the heat given to the surface by each explosion is sufficient to keep its temperature at about 700-800° C. Oil vapour mixed with air will explode by contact with a metal surface at a comparatively low temperature; this accounts for the explosion of the compressed mixture in the combustion chamber A, which is never really raised to a red heat. It has long been known that under certain conditions of internal surface a gas engine may be made to run with very great regularity, without incandescent tube or any other form of igniter, if some portion of the interior surfaces of the cylinder or combustion space be so arranged that the temperature can rise moderately; then, although the temperature may be too low to ignite the mixture at atmospheric temperature, yet when compression is completed the mixture will often ignite in a perfectly regular manner. It is a curious fact that with heavy oils ignition is more easily accomplished at a low temperature than with light oils. The explanation seems to be that, while in the case of light oils the hydrocarbon vapours formed are tolerably stable from a chemical point of view, the heavy oils very easily decompose by heat, and separate out their carbons, liberating the combined hydrogen, and at the moment of liberation the hydrogen, being in what chemists know as the *nascent* state, very readily enters into combination with the oxygen beside it. To start the engine the vaporizer is heated by a separate heating lamp, which is supplied with an air blast by means of a hand-operated fan. This operation should take about nine minutes. The engine is then moved round by hand, and starts in the usual manner. The oil tank is placed in the bed plate of the engine. The air and exhaust valves are driven by cams on a valve shaft. The governing is effected by a centrifugal governor which operates a by-pass valve, opening it when the speed is too high, and causes the oil pump to return the oil to the oil tank. At a test of one of these engines, which weighed 40 cwt. and was given as of 8 brake horse-power, with cylinder 10 in. in diameter and 15 in. stroke, according to Professor Capper's report, the revolutions were very constant, and the power developed did not vary one quarter of a brake horse-power from day to day. The oil consumed, reckoned on the average of the three days over which the trial extended, was ·919 ℔ per brake horse-power per hour, the mean power exerted being 8·35 brake horse. At another full-power trial of the same engine a brake horse-power of 8·57 was obtained, the mean speed being 239·66 revolutions per minute and the test lasting for two hours; the indicated power was 10·3 horse, the explosions per minute 119·83, the mean effective pressure 28·9 per sq. in., the oil used per indicated horse-power per hour was ·81 ℔, and per brake horse-power per hour —·977 ℔. In a test at half power, the brake horse-power developed was 4·57 at 235·9 revolutions per minute, and the oil used per brake horse-power was 1·48 ℔. On a four hours' test, without a load, at 240 revolutions per minute, the consumption of oil was 4·23 ℔ per hour. Engines of this class are those manufactured by Messrs Crossley Bros., Ltd., and the National Gas Engine Co., Ltd.

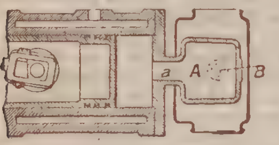


Fig. 12.—Hornsby-Ackroyd Engine (section through vaporizer and cylinder).

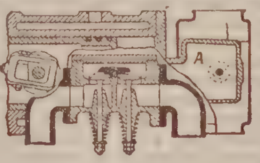


Fig. 13.—Hornsby - Ackroyd Engine (section through valves, vaporizer and cylinder).

Figs. 14 and 15 show a longitudinal section and detail views of the operative parts of the Crossley oil engine. On the suction stroke, air is drawn into the cylinder by the piston A through the automatic inlet valve D, and oil is then pumped into the heated vaporizer C through the oil sprayer G, as seen in section at fig. 15. The vaporizer C is bolted to the water-jacketed part B; and, like the Hornsby, this vaporizer is first heated by lamp and then the heat of the explosions keeps up its temperature to a sufficiently high point to vaporize the oil when sprayed against it. On the compression stroke of the piston A the charge of air is forced into the combustion chamber B and the vaporizer chamber C, where it mixes with the oil vapour, and the mixture is ignited at the termination of the stroke by the ignition tube H. This tube is isolated to some extent from the vaporizer chamber C, and so it becomes hotter than the chamber C and is relied upon to ignite the mixture when formed at times when C would be too cold for the purpose. E is the exhaust valve, which

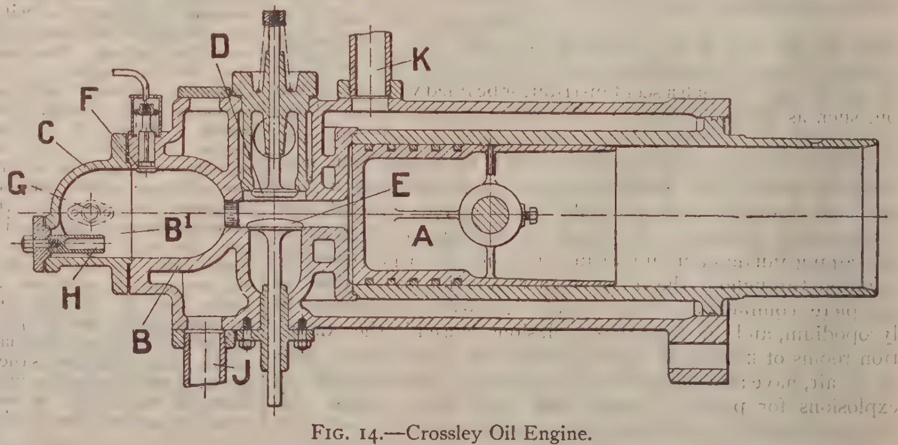


Fig. 14.—Crossley Oil Engine.

operates in the usual way. The water circulation passes through the jacket by way of the pipes J and K. When the engine is running at heavy loads with full charges of oil delivered by the oil pump through the sprayer G, a second pump is caused to come into action, which discharges a very small quantity of water through the water sprayer valve F. This water passes into the vaporizer and combustion chamber, together with a little air, which enters by the automatic inlet valve, which serves as sprayer. This contrivance is found useful to prevent the vaporizer from overheating at heavy loads. The principal difference between this engine and the Hornsby engine already described lies in the use of the separate ignition tube H and in the water sprayer F, which acts as a snifting valve, taking in a little air and water when the engine becomes hot. Messrs Crossley inform the writer that the consumption of either crude or refined oil is about ·63 of a pint per horse-power on full load. They also give a test of a small engine developing 7 B.H.P., which consumed ·601 pint per B.H.P. per hour of Rock Light refined lamp oil and only ·603 pint per B.H.P. per hour of crude Borneo petroleum oil.

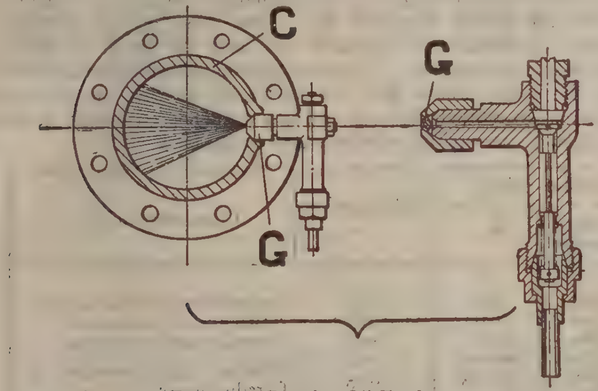


FIG. 15.—Crossley Oil Engine.

Engines in which the oil is vaporized in a device external to the cylinder have almost disappeared, because of the great success of the Hornsby-Ackroyd type, where oil is injected into, and vaporized within, the cylinder. It has been found, however, that many petrol engines having jet carburettors will operate with the heavier oils if the jet carburettor is suitably heated by means of the exhaust gases. In some engines it is customary to start with petrol, and then when the parts have become sufficiently heated to substitute paraffin or heavy petroleum oil, putting the heavy oil through the same spraying process as the petrol and evaporating the spray by hot walls before entering the cylinder.

Mr Diesel has produced a very interesting engine which departs considerably from other types. In it air alone is drawn into the cylinder on the charging stroke; the air is compressed on the return stroke to a very high pressure generally to over 400 lb per sq. in. This compression raises the air to incandescence, and then heavy oil is injected into the incandescent air by a small portion of air compressed to a still higher point. The oil ignites at once as it enters the combustion space, and so a power impulse is obtained, but without explosion. The pressure does not rise above the pressure of air and oil injection. The Diesel engine thus embodies two very original features; it operates at compression pressures very much higher than those used in any other internal combustion engines, and it dispenses with the usual igniting devices by rendering the air charge incandescent by compression. The engine operates generally on the Otto cycle, but it is also built giving an impulse at every revolution. Mr Diesel has shown great determination and perseverance, and the engine has now attained a position of considerable commercial importance. It is made on the continent, in England and in America in sizes up to 1000 H.P., and it has been applied to many purposes on land and also to the propulsion of small vessels. The engine gives a very high thermal efficiency. The present writer has calculated the following values from a test of a 500 B.H.P. Diesel oil engine made by Mr Michael Longridge, M.Inst.C.E. The engine had three cylinders, each of 22·05 in. diameter and stroke 29·52 in., each cylinder operating on the "Otto" cycle. The main results were as follows:—

Indicated power	595 horse
Brake power	459 "
Mechanical efficiency	77 %
Indicated thermal efficiency . . .	41 %
Brake thermal efficiency	31·7 %

(D. C.)

OILLETS (from an O. Fr. diminutive of *œil*, eye, in Mod. Fr. *œillet*; other English variants are oylets, eyelets, or eyelet-holes), the architectural term given to the arrow slits in the walls of medieval fortifications, but more strictly applied to the round hole or circle with which the openings terminate. The same term is applied to the small circles inserted in the tracery-head of the windows of the Decorated and Perpendicular periods, sometimes varied with trefoils and quatrefoils.

OILS (adopted from the Fr. *oile*, mod. *huile*, Lat. *oleum*, olive oil), the generic expression for substances belonging to extensive series of bodies of diverse chemical character, all of which have the common physical property of being fluid either at the ordinary temperature or at temperatures below the boiling-point of water. Formerly, when substances were principally classified by obvious characteristics, the word included such a body as "oil of vitriol" (sulphuric acid), which has of course nothing in common with what is now understood under the term oils. In its most comprehensive ordinary acceptation the word embraces at present the fluid fixed oils or fatty oils (*e.g.* olive oil), the soft fats which may be fluid in their country of origin (*e.g.* coco-nut oil, palm oil), the hard fats (*e.g.* tallow), the still harder vegetable and animal waxes (*e.g.* carnaüba wax, beeswax), the odoriferous ethereal (essential) oils, and the fluid and solid volatile hydrocarbons—mineral hydrocarbons—found in nature or obtained from natural products by destructive distillation.

The common characteristic of all these substances is that they consist principally, in some cases exclusively, of carbon and hydrogen. They are all readily inflammable and are practically insoluble in water. The mineral hydrocarbons found in nature or obtained by destructive distillation do not come within the range of this article (see NAPHTHA, PARAFFIN, PETROLEUM), which is restricted to the following two large groups of bodies, formed naturally within the vegetable and animal organisms, viz. (1) Fixed oils, fats and waxes, and (2) Essential, ethereal or volatile oils.

1. *Fixed Oils, Fats and Waxes.*

The substances to be considered under this head divide themselves naturally into two large classes, viz. fatty (fixed) oils and fats on the one hand, and waxes on the other, the distinction between the two classes being based on a most important chemical difference. The fixed oils and fats consist essentially of glycerides, *i.e.* esters formed by the union of three molecules of fatty acids with one molecule of the trihydric alcohol glycerin (*q.v.*), whereas the waxes consist of esters formed by the union of one molecule of fatty acid with one molecule of a monohydric alcohol, such as cetyl alcohol, cholesterol, &c. Only in the case of the wax *coccerin* two molecules of fatty acids are combined with one molecule of a dihydric (bivalent) alcohol. It must be pointed out that in common parlance this distinction does not find its ready expression. Thus *Japan wax* is a glyceride and should be more correctly termed Japan tallow, whereas *sperm oil* is, chemically speaking, a wax. Although these two classes of substances have a number of physical properties in common, they must be considered under separate heads. The true chemical constitution of oils and fats was first expounded by the classical researches of Chevreul, embodied in his work, *Recherches sur les corps gras d'origine animale* (1823, reprinted 1889).

(*a*) *Fatty* (*fixed*) *Oils and Fats.*—The fatty (fixed) oils and fats form a well-defined and homogeneous group of substances, passing through all gradations of consistency, from oils which are fluid even below the freezing-point of water, up to the hardest fats which melt at about 50° C. Therefore, no sharp distinction can be made between fatty oils and fats. Nevertheless, it is convenient to apply the term "oil" to those glycerides which are fluid below about 20° C., and the term "fat" to those which are solid above this temperature.

Chemical Composition.—No oil or fat is found in nature consisting of a single chemical individual, *i.e.* a fat consisting of the glyceride of one fatty acid only, such as stearin or tristearin, $C_3H_5(O\cdot C_{18}H_{35}O)_3$, the glycerin ester of stearic acid, $C_{17}H_{35}\cdot CO_2H$. The natural oils and fats are mixtures of at least two or three different triglycerides, the most important of which are tristearin, tripalmitin, $C_3H_5(O\cdot C_{16}H_{31}O)_3$ and triolein, $C_3H_5(O\cdot C_{18}H_{33}O)_3$. These three glycerides have been usually considered the chief constituents of most oils and fats, but latterly there have been recognized as widely distributed trilinolin, the glyceride of linolic acid, and trilinolenin, the glyceride of linolenic acid. The two last-named glycerides are characteristic of the semi-drying and drying oils respectively. In addition to the fatty acids mentioned already there occur also, although in much smaller quantities, other fatty acids combined with glycerin, as natural glycerides, such as the glyceride of butyric acid in butter-fat, of caproic, caprylic and capric acids in butter-fat and in coco-nut oil, lauric acid in coco-nut and palm-nut oils, and myristic acid in mace butter. These glycerides are, therefore, characteristic of the oils and fats named.

In the classified list below the most important fatty acids occurring in oils and fats are enumerated (cf. *Waxes*, below).

Oils and fats must, therefore, not be looked upon as definite chemical individuals, but as representatives of natural species which vary, although within certain narrow limits, according to the climate and soil in which the plants which produce them are grown, or, in the case of animal fats, according to the climate, the race, the age of the animal, and especially the food, and also the idiosyncrasy of the individual animal. The oils and fats are distributed throughout the animal and vegetable kingdom from the lowest organism up to the most highly organized forms of animal and vegetable life, and are found in almost all tissues and organs. The vegetable oils and fats occur chiefly in the seeds, where they are stored to nourish the embryo, whereas in animals the oils and fats are enclosed mainly in the cellular tissues of the intestines and of the back.

		Boiling-point.		Melting-point. °C.	Characteristic of
		mm. Pressure.	°C.		
I. Acids of the Acetic series $C_nH_{2n}O_2$—					
Acetic acid	$C_2H_4O_2$	760	119	17	Spindle-tree oil, Macassar oil
Butyric acid	$C_4H_8O_2$	760	162·3	−6·5	Butter fat, Macassar oil
Isovaleric acid	$C_5H_{10}O_2$	760	173·7	−51	Porpoise and dolphin oils
Caproic acid	$C_6H_{12}O_2$	770	202–203	−8	Butter fat, coco-nut oil, palm nut oil
Caprylic acid	$C_8H_{16}O_2$	761	236–237	16·5	
Capric acid	$C_{10}H_{20}O_2$	760	268–270	31·3	
Lauric acid	$C_{12}H_{24}O_2$	100	225	43·6	Laurel oil, coco-nut oil
Myristic acid	$C_{14}H_{28}O_2$	100	250·5	53·8	Mace butter, nutmeg butter
Isocetic acid (?)	$C_{15}H_{30}O_2$	..	..	55	Purging nut
Palmitic acid	$C_{16}H_{32}O_2$	100	271·5	62·62	Palm oil, Japan wax, myrtle wax, lard, tallow, &c.
Stearic acid	$C_{18}H_{36}O_2$	100	291	69·32	Tallow, cacao butter, &c.
Arachidic acid	$C_{20}H_{40}O_2$	..	..	77·0	Arachis oil
Behenic acid	$C_{22}H_{44}O_2$	..	..	83–84	Ben oil
Lignoceric acid	$C_{24}H_{48}O_2$	..	..	80·5	Arachis oil
II. Acids of the Acrylic or Oleic series $C_nH_{2n-2}O_2$—					
Tiglic acid	$C_5H_8O_2$	760	198·5	64·5	Croton oil
Hypogaeic acid	$C_{16}H_{30}O_2$	15	236	33–34	Arachis oil
Physetoleic acid	$C_{16}H_{30}O_2$	..	..	30	Caspian seal oil
Oleic acid	$C_{18}H_{34}O_2$	100	285·5–286	14	Most oils and fats
Rapic acid	$C_{18}H_{34}O_2$	..	..	..	Rape oils
Erucic acid	$C_{22}H_{42}O_2$	30	281	33–34	Rape oils, fish oils
III. Acids of the Linolic series $C_nH_{2n-4}O_2$—					
Linolic acid	$C_{18}H_{32}O_2$	..	..	..	Maize oil, cotton-seed oil
Tariric acid	$C_{18}H_{32}O_2$	..	..	50·5	Oil of *Picramnia Camboita*
Telfairic acid	$C_{18}H_{32}O_2$	13	220–225	..	Koëme oil
Elaeomargaric acid	$C_{18}H_{32}O_2$	..	..	48	Tung oil
IV. Acids of the cyclic Chaulmoogric series $C_nH_{2n-4}O_2$—					
Hydnocarpic acid	$C_{16}H_{28}O_2$	..	..	59–60	Hydnocarpus, Lukrabo and Chaulmoogra oils
Chaulmoogric acid	$C_{18}H_{32}O_2$	20	247–248	68	
V. Acids of the Linolenic series $C_nH_{2n-6}O_2$—					
Linolenic acid	$C_{18}H_{30}O_2$	..	..	..	Linseed oil
Isolinolenic acid	$C_{18}H_{30}O_2$	..	..	..	
VI. Acids of the series $C_nH_{2n-8}O_2$—					
Clupanodonic acid	$C_{18}H_{28}O_2$	..	..	(liquid)	Fish, liver and blubber oils
VII. Acids of the Ricinoleic series $C_nH_{2n-2}O_3$—					
Ricinoleic acid	$C_{18}H_{34}O_3$	15	250	4–5	Castor oil
Quince oil acid	$C_{18}H_{34}O_3$	..	..	..	Quince oil
VIII. Dihydroxylated acids of the series $C_nH_{2n}O_4$—					
Dihydroxystearic acid	$C_{18}H_{36}O_4$	..	..	141–143	Castor oil
IX. Acids of the series $C_nH_{2n-2}O_4$—					
Japanic acid	$C_{22}H_{42}O_4$	..	..	117·7–117·9	Japan wax

Up to recently the oils and fats were looked upon as consisting in the main of a mixture of triglycerides, in which the three combined fatty acids are identical, as is the case in the above-named glycerides. Such glycerides are termed "simple glycerides." Recently, however, glycerides have been found in which the glycerin is combined with two and even three different acid radicals; examples of such glycerides are distearo-olein, $C_3H_5(O{\cdot}C_{18}H_{35}O)_2$, $(O{\cdot}C_{18}H_{33}O)$, and stearo-palmito-olein, $C_3H_5(O{\cdot}C_{18}H_{35}O)\ (O{\cdot}C_{16}H_{31}O)\ (O{\cdot}C_{18}H_{33}O)$. Such glycerides are termed "mixed glycerides." The glycerides occurring in natural oils and fats differ, therefore, in the first instance by the different fatty acids contained in them, and secondly, even if they do contain the same fatty acids, by different proportions of the several simple and mixed glycerides.

Since the methods of preparing the vegetable and animal fats are comparatively crude ones, they usually contain certain impurities of one kind or another, such as colouring and mucilaginous matter, remnants of vegetable and animal tissues, &c. For the most part these foreign substances can be removed by processes of refining, but even after this purification they still retain small quantities of foreign substances, such as traces of colouring matters, albuminoid and (or) resinous substances, and other foreign substances, which remain dissolved in the oils and fats, and can only be isolated after saponification of the fat. These foreign substances are comprised in the term "unsaponifiable matter." The most important constituents of the "unsaponifiable matter" are phytosterol $C_{26}H_{44}O$ or $C_{27}H_{44}O$(?), and the isomeric cholesterol. The former occurs in all oils and fats of vegetable origin; the latter is characteristic of all oils and fats of animal origin. This important difference furnishes a method of distinguishing by chemical means vegetable oils and fats from animal oils and fats. This distinction will be made use of in the classification of the oils and fats. A second guiding principle is afforded by the different amounts of iodine (see *Oil Testing* below) the various oils and fats are capable of absorbing. Since this capacity runs parallel with one of the best-known properties of oils and fats, viz. the power of absorbing larger or smaller quantities of oxygen on exposure to the air, we arrive at the following classification:—

I. Fatty Oils or Liquid Fats

A. *Vegetable oils.*	B. *Animal oils.*
1. Drying oils.	1. Marine animal oils.
2. Semi-drying oils.	(*a*) Fish oils.
3. Non-drying oils.	(*b*) Liver oils
	(*c*) Blubber oils.
	2. Terrestrial animal oils.

II. Solid Fats

A. *Vegetable fats.*	B. *Animal fats.*
	1. Drying fats.
	2. Semi-drying fats.
	3. Non-drying fats.

Physical Properties.—The specific gravities of oils and fats vary between the limits of 0·910 and 0·975. The lowest specific gravity is owned by the oils belonging to the rape oil group—from 0·913 to 0·916. The specific gravities of most non-drying oils lie between 0·916 and 0·920, and of most semi-drying oils between 0·920 and 0·925, whereas the drying oils have specific gravities of about 0·930. The animal and vegetable fats possess somewhat higher specific gravities, up to 0·930. The high specific gravity, 0·970, is owned by castor oil and cacao butter, and the highest specific gravity observed hitherto, 0·975, by Japan wax and myrtle wax.

In their liquid state oils and fats easily penetrate into the pores of dry substances; on paper they leave a translucent spot—"grease spot"—which cannot be removed by washing with water and subsequent drying. A curious fact, which may be used for the detection of the minutest quantity of oils and fats, is that camphor crushed between layers of paper without having been touched with the fingers rotates when thrown on clean water, the rotation ceasing immediately when a trace of oil or fat is added such as introduced by touching the water with a needle which has been passed previously through the hair.

The oils and fats are practically insoluble in water. With the exception of castor oil they are insoluble in cold alcohol; in boiling alcohol somewhat larger quantities dissolve. They are completely soluble in ether, carbon bisulphide, chloroform, carbon tetrachloride, petroleum ether, and benzene. Oils and fats have no distinct melting or solidifying point. This is not only due to the fact that they are mixtures of several glycerides, but also that even pure glycerides, such as tristearin, exhibit two melting-points, a so-called "double melting-point," the triglycerides melting at a certain temperature, then solidifying at a higher temperature to melt again on further heating. This curious behaviour was looked upon by Duffy as being due to the existence of two isomeric modifications, the actual occurrence of which has been proved (1907) in the case of several mixed glycerides.

The freezing-points of those oils which are fluid at the ordinary temperature range from a few degrees above zero down to −28° C. (linseed oil). At low temperatures solid portions—usually termed "stearine"—separate out from many oils; in the case of cotton-seed oil the separation takes place at 12° C. These solid portions can be filtered off, and thus are obtained the commercial "demargarinated oils" or "winter oils."

Oils and fats can be heated to a temperature of 200° to 250° C. without undergoing any material change, provided prolonged contact with air is avoided. On being heated above 250° up to 300° some oils, like linseed oil, safflower oil, tung oil (Chinese or Japanese wood oil) and even castor oil, undergo a change which is most likely due to polymerization. In the case of castor oil solid products are formed. Above 300° C. all oils and fats are decomposed; this is evidenced by the evolution of acrolein, which possesses the well-known pungent odour of burning fat. At the same time hydrocarbons are formed (see Petroleum).

On exposure to the atmosphere, oils and fats gradually undergo certain changes. The *drying* oils absorb oxygen somewhat rapidly and dry to a film or skin, especially if exposed in a thin layer. Extensive use of this property is made in the paint and varnish trades. The *semi-drying* oils absorb oxygen more slowly than the drying oils, and are, therefore, useless as paint oils. Still, in course of time, they absorb oxygen distinctly enough to become thickened. The property of the semi-drying oils to absorb oxygen is accelerated by spreading such oils over a large surface, notably over woollen or cotton fibres, when absorption proceeds so rapidly that frequently spontaneous combustion will ensue. Many fires in cotton and woollen mills have been caused thereby. The *non-drying* oils, the type of which is olive oil, do not become oxidized readily on exposure to the air, although gradually a change takes place, the oils thickening slightly and acquiring that peculiar disagreeable smell and acrid taste, which are defined by the term "rancid." The changes conditioning rancidity, although not yet fully understood in all details, must be ascribed in the first instance to slow hydrolysis ("saponification") of the oils and fats by the moisture of the air, especially if favoured by insolation, when water is taken up by the oils and fats, and free fatty acids are formed. The fatty acids so set free are then more readily attacked by the oxygen of the air, and oxygenated products are formed, which impart to the oils and fats the rancid smell and taste. The products of oxidation are not yet fully known; most likely they consist of lower fatty acids, such as formic and acetic acids, and perhaps also of aldehydes and ketones. If the fats and oils are well protected from air and light, they can be kept indefinitely. In fact C. Friedel has found unchanged triglycerides in the fat which had been buried several thousand years ago in the tombs of Abydos. If the action of air and moisture is allowed free play, the hydrolysis of the oils and fats may become so complete that only the insoluble fatty acids remain behind, the glycerin being washed away. This is exemplified by adipocere, and also by Irish bog butter, which consist chiefly of free fatty acids.

The property of oils and fats of being readily hydrolysed is a most important one, and very extensive use of it is made in the arts (soap-making, candle-making and recovery of their by-products). If oils and fats are treated with water alone under high pressure (corresponding to a temperature of about 220° C.), or in the presence of water with caustic alkalis or alkaline earths or basic metallic oxides (which bodies act as "catalysers") at lower pressures, they are converted in the first instance into free fatty acids and glycerin. If an amount of the bases sufficient to combine subsequently with the fatty acids be present, then the corresponding salts of these fatty acids are formed, such as sodium salts of fatty acids (hard soap) or potassium salts of the fatty acids (soft soap), soaps of the alkaline earth (lime soap), or soaps of the metallic oxides (zinc soap, &c.). The conversion of the glycerides (triglycerides) into fatty acids and glycerin must be looked upon as a reaction which takes place in stages, one molecule of a triglyceride being converted first into diglyceride and one molecule of fatty acid, the diglyceride then being changed into monoglyceride, and a second molecule of fatty acid, and finally the monoglyceride being converted into one molecule of fatty acid and glycerin. All these reactions take place concurrently, so that one molecule of a diglyceride may still retain its ephemeral existence, whilst another molecule is already broken up completely into free fatty acids and glycerin.

The oils and fats used in the industries are not drawn from any very great number of sources. The tables on the following pages contain chiefly the most important oils and fats together with their sources, yields and principal uses, arranged according to the above classification, and according to the magnitude of the iodine value. It should be added that many other oils and fats are only waiting improved conditions of transport to enter into successful competition with some of those that are already on the market.

Extraction.—Since the oils and fats have always served the human race as one of the most important articles of food, the oil and fat industry may well be considered to be as old as the human race itself. The methods of preparing oils and fats range themselves under three heads: (1) Extraction of oil by "rendering," *i.e.* boiling out with water; (2) Extraction of oil by expression; (3) Extraction of oil by means of solvents.

Rendering.—The crudest method of rendering oils from seeds, still practised in Central Africa, in Indo-China and on some of the South Sea Islands, consists in heaping up oleaginous fruits and allowing them to melt by the heat of the sun, when the exuding oil runs off and is collected. In a somewhat improved form this process of rendering is practised in the preparation of palm oil, and the rendering the best (Cochin) coco-nut oil by boiling the fresh kernels with water. Since hardly any machinery, or only the simplest machinery, is required for these processes, this method has some fascination for inventors, and even at the present day processes are being patented, having for their object the boiling out of fruits with water or salt solutions, so as to facilitate the separation of the oil from the pulp by gravitation. Naturally these processes can only be applied to those seeds which contain large quantities of fatty matter, such as coconuts and olives. The rendering process is, however, applied on a very large scale to the production of animal oils and fats. Formerly the animal oils and fats were obtained by heating the tissues containing the oils or fats over a free fire, when the cell membranes burst and the liquid fat flowed out. The cave-dweller who first collected the fat dripping off the deer on the roasting spit may well be looked upon as the first manufacturer of tallow. This crude process is now classed amongst the noxious trades, owing to the offensive stench given off, and must be considered as almost extinct in this country. Even on whaling vessels, where up to recently whale oil, seal oil and sperm oil (see *Waxes*, below) were obtained exclusively by "trying," *i.e.* by melting the blubber over a free fire, the process of rendering is fast becoming obsolete, the modern practice being to deliver the blubber in as fresh a state as possible to the "whaling establishments," where the oil is rendered by methods closely resembling those worked in the enormous rendering establishments (for tallow, lard, bone fat) in the United States and in South America. The method consists essentially in cutting up the fatty matter into small fragments, which are transferred into vessels containing water, wherein the comminuted mass is heated by steam, either under ordinary pressure in open vessels or under higher pressure in digestors. The fat gradually exudes and collects on the top of the water, whilst the membranous matter, "greaves," falls to the bottom. The fat is then drawn off the aqueous (gluey) layer, and strained through sieves or filters. The greaves are placed

VEGETABLE OILS

Name of Oil.	Source.	Yield per cent.	Iodine Value.	Principal Use.
	Drying Oils.			
Linseed	*Linum usitatissimum*	38–40	175–205	Paint, varnish, linoleum, soap
Tung (Chinese or Japanese wood)	*Aleurites cordata*	40–41	150–165	Paint and varnish
Candle nut	*Aleurites moluccana*	62–64	163	Burning oil, soap, paint
Hemp seed	*Cannabis sativa*	30–35	148	Paints and varnishes, soft soap
Walnut; Nut	*Juglans regia*	63–65	145	Oil painting
Safflower	*Carthamus tinctorius*	30–32	130–147	Burning, varnish ("roghan")
Poppy seed	*Papaver somniferum*	41–50	123–143	Salad oil, painting, soft soap
Sunflower	*Helianthus annuus*	21–22	119–135	Edible oil, soap
Madia	*Madia sativa*	32–33	118·5	Soap, burning
	Semi-drying Oils.			
Cameline (German *Sesamé*)	*Camelina sativa*	31–34	135	Burning, soap
Soja bean	*Soja hispida*		122	Edible, burning
Maize; Corn	*Zea Mays*	6–10	113–125	Edible, soap
Beech nut	*Fagus sylvatica*	43–45	111–120	Food, burning
Kapok	*Bombax pentandrum* (*Eriodendron anfractuosum*)	30–32	116	Food, soap
Cotton-seed	*Gossypium herbaceum*	24–26	108–110	Food, soap
Sesamé	*Sesamum orientale*, *S. indicum*	50–57	103–108	Food, soap
Curcas, purging nut	*Jatropha curcas*	55–57	98–110	Medicine, soap
Brazil nut	*Bertholletia excelsa*		90–106	Edible, soap
Croton	*Croton Tiglium*	53–56	102–104	Medicine
Ravison	Wild *Brassica campestris*	33–40	105–117	Lubricant, burning
Rape (Colza)	*Brassica campestris*	33–43	94–102	Lubricant, burning
Jamba	*Brassica campestris* var.?	24	95	Burning, lubricant
	Non-drying Oils.			
Apricot kernel	*Prunus armeniaca*	40–45	96–108	Perfumery, medicine
Peach kernel	*Prunus persica*	32–35	93–109	Perfumery, medicine
Almond	*Prunus amygdalus*	45–55	93–100	Perfumery, medicine
Arachis (ground nut)	*Arachis hypogaea*	43–45	83–100	Edible, soap
Hazel nut	*Corylus avellana*	50–60	83–90	Edible, perfumery, lubricating
Olive	*Olea europaea*	40–60	79–88	Edible, lubricating, burning, soap
Olive kernel	*Olea europaea*	12–15	87	Edible, lubricating, burning, soap
Ben	*Moringa oleifera*	35–36	82	Edible, perfumery, lubricating
Grape seed	*Vitis vinifera*	10–20	96	Food, burning
Castor	*Ricinus communis*	46–53	83–86	Medicine, soap, lubricating, Turkey red oil

ANIMAL OILS

Name of Oil.	Source.	Yield per cent.	Iodine Value.	Principal Use.
	Marine Animal Oils.			
Fish oils—				
Menhaden	*Alosa menhaden*	..	140–173	Currying leather
Sardine oil	*Clupea sardinus*	..	161–193	Currying leather
Salmon	*Salmo salar*	..	161	Currying leather
Herring	*Clupea harengus*	..	124–142	Currying leather
Liver oils—				
Cod liver	*Gadus morrhua*	..	167	Medicine, currying leather
Shark liver (Arctic)	*Scymnus borealis*		115	Currying leather
Blubber oils—				
Seal	*Phoca vitulina*	..	127–147	Burning, currying leather
Whale	*Balaena mysticetus, &c.*	..	121–136	Burning, soap-making, fibre dressing, currying leather
Dolphin, black fish, body oil	*Delphinus globiceps*	..	99–126	Lubricating oil for delicate machinery
Jaw oil		..	33	
Porpoise Body oil	*Delphinus phocaena*	..	119	
Porpoise Jaw oil		..	36	
	Terrestrial Animal Oils.			
Sheep's foot	*Ovis aries*		74	Lubricating
Horses' foot	*Equus caballus*		74–90	Lubricating
Neat's foot	*Bos taurus*	..	67–73	Lubricating, leather dressing
Egg	*Gallus domesticus*	..	68–82	Leather dressing

VEGETABLE FATS

Name of Fat.	Source.	Yield per cent.	Iodine Value.	Principal Use.
Laurel oil	*Laurus nobilis*	24–26	68–80	Medicine
Mahua butter, Illipé butter	*Bassia latifolia*	50–55	53–67	Food, soap, candles
Mowrah butter	*Bassia longifolia*	50–55	50–62	Food, soap, candles
Shea butter (Galam butter)	*Bassia Parkii*	49–52	56	Food, soap, candles
Palm oil	*Elaeis guineensis, E. melanococca*	65–72	53	Candles, soap
Mace butter	*Myristica officinalis*	38–40	40–52	Medicine, perfumery
Ghee butter (Phulwara butter)	*Bassia butyracea*	50–52	42	Food
Cacao butter	*Theobroma cacao*	44–50	32–41	Chocolate
Chinese vegetable tallow	*Stillingia sebifera* (*Croton sebiferum*)	22	28–32	Soap, candles
Kokum butter (Goa butter)	*Garcinia indica*	49	33	Food
Borneo tallow	*Shorea stenoptera, Hopea aspera*	45–50	15–31	Food, candles
Mocaya oil	*Cocos sclerocarpa*	60–70	24	Food, soap
Maripa fat	*Palma* (?) *Maripa*	..	17	Food, soap
Palm kernel oil Palm nut oil	*Elaeis guineensis,* *E. melanococca*	45–50	13–14	Food, soap
Coco-nut oil	*Cocos nucifera, C. butyracea*	20–25	8–9	Food, soap, candles
Japan wax	*Rhus succedanea, R. vernicifera*	25	4–10	Polishes
Dika oil (oba oil, wild mango oil)	*Irvingia gabonensis*	60–65	5·2	Food
Myrtle wax	*Myrica cerifera, M. carolinensis*	20–25	2–4	Soap, candles (?)

ANIMAL FATS

Name of Fat.	Source.	Yield per cent.	Iodine Value.	Principal Use.
	Drying Fats.			
Ice bear	*Ursus maritimus*	..	147	Pharmacy
Rattlesnake	*Crotalus durissus*	..	106	Pharmacy
	Semi-drying Fats.			
Horses' fat	*Equus caballus*		75–85	Food, soap
	Non-drying Fats.			
Goose fat	*Anser cinereus*	..	70	Food, pomades
Lard	*Sus scrofa*	..	50–70	Food, soap, candles
Beef marrow	*Bos taurus*	..	55	Pomades
Bone	*Bos, Ovis*	..	46–56	Soap, candles
Tallow, beef	*Bos taurus*	..	38–46	Food, soap, candles, lubricants
Tallow, mutton	*Ovis aries*	..	35–46	Food, soap, candles, lubricants
Butter	*Bos taurus*	..	26–38	Food

in hair or woollen bags and submitted to hydraulic pressure, by which a further portion of oil or fat is obtained (cf. *Pressing*, below). In the case of those animal fats which are intended for edible purposes, such as lard, suet for margarine, the greatest cleanliness must, of course, be observed, and the temperature must be kept as low as possible in order to obtain a perfectly sweet and pure material.

Pressing.—The boiling out process cannot be applied to small seeds, such as linseed and rape seed. Whilst the original method of obtaining seed oils may perhaps have been the same which is still used in India, viz. trituration of (rape) seeds in a mortar so that the oil can exude, it may be safely assumed that the process of expressing has been applied in the first instance to the preparation of olive oil. The first woman who expressed olives packed in a sack by heaping stones on them may be considered as the forerunner of the inventors of all the presses that subsequently came into use. Pliny describes in detail the apparatus and processes for obtaining olive oil in vogue among his Roman contemporaries, who used already a simple screw press, a knowledge of which they had derived from the Greeks. In the East, where vegetable oils form an important article of food and serve also for other domestic purposes, various ingenious applications of lever presses and wedge presses, and even of combined lever and wedge presses, have been used from the remotest time. At an early stage of history the Chinese employed the same series of operations which are followed in the most advanced oil mills of modern time, viz. bruising and reducing the seeds to meal under an edge-stone, heating the meal in an open pan, and pressing out the oil in a wedge press in which the wedges were driven home by hammers. This primitive process is still being carried out in Manchuria, in the production of soja bean cake and soja bean oil, one of the staple industries of that country. The olive press, which was also used in the vineyards for expressing the grape juice, found its way from the south of France to the north, and was employed there for expressing poppy seed and rape seed. The apparatus was then gradually improved, and thus were evolved the modern forms of the screw press, next the Dutch or stamper press, and finally the hydraulic press. With the screw press, even in its most improved form, the amount of pressure practically obtainable is limited from the failure of its parts under the severe inelastic strain. Hence this kind of press finds only limited application, as in the industry of olive oil for expressing the best and finest virgin oil, and in the production of animal fats for edible purposes, such as lard and oleomargarine. The Dutch or stamper press, invented in Holland in the 17th century, was up to the early years of the 19th century almost exclusively employed in Europe for pressing oil-seeds. It consists of two principal parts, an oblong rectangular box with an arrangement of plates, blocks and wedges, and over it a framework with heavy stampers which produce the pressure by their fall. The press box first consisted of strongly bound oaken planks, but later on cast-iron boxes were introduced. At each extremity of the box a bag of oil-meal was placed between two perforated iron plates, next to which were inserted filling-up pieces of wood, two of which were oblique, so that the wedges which exercised the pressure could be readily driven home. This press has had to yield place to the hydraulic press, although in some old-fashioned establishments in Holland the stamper press could still be seen at work in the 'eighties of the 19th century. The invention of the hydraulic press in 1795 by Joseph Bramah (*Eng. pat.*, 30th April 1795) effected the greatest revolution in the oil industry, bringing a new, easily controlled and almost unlimited source of power into play; the limit of the power being solely reached by the limit of the strength of the material which the engineer is able to produce. Since then the hydraulic press has practically completely superseded all other appliances used for expression, and in consequence of this epoch-making invention, assisted as it was later on by the accumulator—invented by William George (later Lord) Armstrong in 1843—the seed-crushing industry reached a perfection of mechanical detail which soon secured its supremacy for England.

The sequence of operations in treating oil seeds, oil nuts, &c., for the separation of their contained oils is at the present time as follows: As a preliminary operation the oil seeds and nuts are freed from dust, sand and other impurities by sifting in an inclined revolving cylinder or sieving machine, covered with woven wire, having meshes varying according to the size and nature of the seed operated upon. This preliminary purification is of the greatest importance, especially for the preparation of edible oils and fats. In the case of those seeds amongst which are found pieces of iron (hammer heads amongst palm kernels, &c.), the seeds are passed over magnetic separators, which retain the pieces of iron. The seeds and nuts are then decorticated (where required), the shells removed, and the kernels ("meats") converted into a pulpy mass or meal (in older establishments by crushing and grinding between stones in edge-runners) on passing through a hopper over rollers consisting of five chilled iron or steel cylinders mounted vertically like the bowls of a calendar. These rollers are finely grooved so that the seed is cut up whilst passing in succession between the first and second rollers in the series, then between the second and the third, and so on to the last, when the grains are sufficiently bruised, crushed and ground. The distance between the rollers can be easily regulated so that the seed leaving the bottom roller has the desired fineness. The comminuted mass, forming a more or less coarse meal, is either expressed in this state or subjected to a preliminary heating, according to the quality of the product to be manufactured. For the preparation of *edible* oils and fats the meal is expressed in the cold, after having been packed into bags and placed in hydraulic presses under a pressure of three hundred atmospheres or even more. The cakes are allowed to remain under pressure for about seven minutes. The oil exuding in the cold dissolves the smallest amount of colouring matter, &c., and hence has suffered least in its quality. Oils so obtained are known in commerce as "cold drawn oils," "cold pressed oils," "salad oils," "virgin oils."

By pressing in the cold, obviously only part of the oil or fat is recovered. A further quantity is obtained by expressing the seed meal at a somewhat elevated temperature, reached by warming the comminuted seeds or fruits either immediately after they leave the five-roller mill, or after the "cold drawn oil" has been taken off. Of course the cold pressed cakes must be first disintegrated, which may be done under an edge-runner. The same operation may be repeated once more. Thus oils of the "second expression" and of the "third expression" are obtained.

In the case of oleaginous seeds of low value (cotton-seed, linseed) it is of importance to express in one operation the largest possible quantity of oil. Hence the bruised seed is, after leaving the five-roller mill, generally warmed at once in a steam-jacketed kettle fitted with a mixing gear, by passing steam into the jacket, and sending at the same time some steam through a rose, fixed inside the kettle, into the mass while it is being agitated. This practice is a survival of the older method of moistening the seed with a little water, while the seeds were bruised under edge-runners, so as to lower the temperature and facilitate the bursting of the cells. The warm meal is then delivered through measuring boxes into closed pressbags ("scourtins" of the "Marseilles" press), or through measuring boxes, combined with an automatic moulding machine, into cloths open at two sides (Anglo-American press), so that the preliminarily pressed cakes can be put at once into the hydraulic press. In the latest constructions of cage presses, the use of bags is entirely dispensed with, a measured-out quantity of seed falling direct into the circular press cage and being separated from the material forming the next cake by a circular plate of sheet iron. The essentials of proper oil pressing are a slowly accumulating pressure, so that the liberated oil may have time to flow out and escape, a pressure that increases in proportion as the resistance of the material increases, and that maintains itself as the volume of material decreases through the escape of oil.

Numerous forms of hydraulic presses have been devised. Horizontal presses have practically ceased to be used in this branch of industry. At present vertical presses are almost exclusively in vogue; the three chief types of these have been already mentioned. Continuously working presses (compression by a conical screw) have been patented, but hitherto they have not been found practicable. Of the vertical presses the Anglo-American type of press is most in use. It represents an open press fitted with a number (usually sixteen) of iron press plates, between which the cakes are inserted by hand. A hydraulic ram then forces the table carrying the cakes against a press-head, and the exuding oil flows down the sides into a tank below. The "Marseilles press" is largely used in the south of France. There the meal is packed by hand in "scourtins," bags made of plaited coco-nut leaves—replacing the woollen cloths used in England. The packing of the press requires more manual labour than in the case of the Anglo-American press; moreover, the Marseilles press offers inconvenience in keeping the bags straight, and the pressure cannot be raised to the same height as in the more modern hydraulic presses. Oil obtained from heated meal is usually more highly coloured and harsher to the taste than cold drawn oil, more of the extractive substances being dissolved and intermixed with the oil. Such oils are hardly suitable for edible purposes, and they are chiefly used for manufacturing processes. According to the care exercised by the manufacturer in the range of temperature to which the seed is heated, various grades of oils are obtained.

In the case of those seeds which contain more than 40% of oil, such as arachis nuts and sesame seed, the first expression in pressbags leads to difficulty, as the meal causes "spueing," *i.e.* the meal exudes and escapes from the press. Hence, in modern installations, the first expression of those seeds is carried out in so-called cage (clodding) presses, consisting of hydraulic presses provided with circular boxes or cages, into which the meal is filled. These cages or boxes are either constructed of metal staves held together by a number of steel rings, or consist of one cylinder having a large number of perforations. The presses having perforated cylinders, although presenting mechanically a more perfect arrangement, are not preferable to the press cages formed by staves, as the holes become easily clogged up by the meal, when the cylinder must be carefully cleaned out. Modern improvements, with a view to cheapening of cost, effect the transport of the cages from one press battery to another on rails. In order to dispense even with the charging of the presses by hand, in some systems the cages are first charged in a preliminary press, from which they are transferred mechanically by a swinging arrangement into the final press.

Whilst the meal is under pressure the oil works its way to the edge of the cake, whence it exudes. For this reason an oblong form is the most favourable one for the easy separation of the oil. The edges of the cakes invariably retain a considerable portion of oil; hence the soft edges are pared off, in the case of the oblong cake in a cake-paring machine, and the parings are returned to edge-runners, to be ground up and again pressed with fresh meal. Through the introduction of the cage (clodding) presses circular cakes have become fashionable, and as the material of these presses can be made much stronger and therefore higher pressure can be employed, more oil is expressed from the meal than in open presses. The oil flowing from the presses is caught in reservoirs placed under the level of the floor, from which it is pumped into storage tanks for settling and clarifying.

Extraction by Solvents.—The cakes obtained in the foregoing process still retain considerable proportions of oil, not less than 4 to 5%—usually, however, about 10%. If it be desired to obtain larger quantities than are yielded by the above-described methods, processes having for their object the extraction of the seeds by volatile solvents must be resorted to. Extraction by means of carbon bisulphide was first introduced in 1843 by Jesse Fisher of Birmingham. Thirteen years later E. Deiss of Brunswick again patented the extraction by means of carbon bisulphide (*Eng. Pat.* No. 390, 1856), and added "chloroform, ether, essences, or benzine or benzole" to the list of solvents. For several years afterwards the process made little advance, for the colour of the oils produced was higher and the taste much sharper. The oil retained traces of sulphur, which showed themselves disagreeably in the smell of soaps made from it, and in the blackening of substances with which it was used. Of course, the meal left by the process was so tainted with carbon bisulphide that it was absolutely out of the question to use the extracted meal as cattle food. With the improvement in the manufacture of carbon bisulphide, these drawbacks have been surmounted to a large extent, and the process of extracting with carbon bisulphide has specially gained much extension in the extraction of expressed olive marc in the south of France, in Italy and in Spain. Yet even now traces of carbon bisulphide are retained by the extracted meal, so that it is impossible to feed cattle with it. Carbon bisulphide is comparatively cheap, and it is heavier than water, hence there are certain advantages in storing so volatile and inflammable a liquid. But owing to the physiological effect carbon bisulphide has on the workmen, coupled with the chemical action of impure carbon bisulphide on iron which has frequently led to conflagrations, the employment of carbon bisulphide must remain restricted. In 1863 Richardson, Lundy and Irvine secured a patent (*Eng. Pat.* No. 2315) for obtaining oil from crushed seeds, or from refuse cake, by the solvent action of volatile hydrocarbons from "petroleum, earth oils, asphaltum oil, coal oil or shale oil, such hydrocarbons being required to be volatile under 212° F." Since that time the development of the petroleum industry in all parts of the world and the large quantities of low boiling-point hydrocarbons—naphtha—obtained from the petroleum fields, and also the improvements in the apparatus employed, have raised this system of extraction to the rank of a competing practical method of oil production. Of the other proposed volatile solvents ordinary ether has found no practical application, as it is far too volatile and hence far too dangerous. Carbon tetrachloride, chloroform, acetone and benzene are far too expensive. Carbon tetrachloride would be an ideal solvent, as it is non-inflammable and shares with carbon bisulphide the advantage of being heavier than water. Efforts have been made during the last few years to introduce this solvent on a large scale, but its high price and its physiological effect on the workmen have hitherto militated against it. At the present time the choice lies practically only between the two solvents, carbon bisulphide and naphtha (petroleum ether). Naphtha is preferable for oil seeds, as it extracts neither resins nor gummy matters from the oil seeds, and takes up less colouring matter than carbon bisulphide. Yet even with naphtha traces of the solvents remain, so that the meal obtained cannot be used for cattle feeding, notwithstanding the many statements by interested parties to the contrary. It is true that on the continent extracted meal, especially rape meal from good Indian seed and palm kernel meal, are somewhat largely used as food for cattle in admixture with press cakes, but in England no extracted meal is used for feeding cattle, but finds its proper use in manuring the land.

The apparatus employed on a large scale depends on the temperature at which the extraction is carried out. In the main two types of extracting apparatus are differentiated, viz. for extraction in the cold and for extraction in the hot. The seed is prepared in a similar manner as for pressing, except that it is not reduced to a fine meal, so as not to impede the percolation of the solvent through the mass. In the case of cold extraction the seed is placed in a series of closed vessels, through which the solvent percolates by displacement, on the "counter-current" system. A battery of vessels is so arranged that one vessel can always be made the last of the series to discharge finished meal and to be recharged with fresh meal, so that the process is practically a continuous one. The solution of the extracted oil or fat is then transferred to a steam-heated still, where the solvent is driven off and recovered by condensing the vapours in a cooling coil, to be used again. The last remnant of volatile solvent in the oil is driven off by a current of open steam blown through the oil in the warm state. The extracting process in the hot is carried out in apparatus, the principle of which is exemplified by the well-known Soxhlet extractor. The comminuted seed is placed inside a vessel connected with an upright refrigerator on trays or baskets, and is surrounded there by the volatile solvent. On heating the solvent with steam through a coil or jacket, the vapours rise through and around the meal. They pass into the refrigerator, where they are condensed and fall back as a condensed liquid through the meal, percolating it as they pass downwards, and reaching to the bottom of the vessel as a more or less saturated solution of oil in the solvent. The solvent is again evaporated, leaving the oil at the bottom of the vessel until the extraction is deemed finished. The solution of fat is then run off into a still, as described already, and the last traces of solvent are driven out. The solvent is recovered and used again.

With regard to the merits and demerits of the last two mentioned processes—expression and extraction—the adoption of either will largely depend on local conditions and the objects for which the products are intended. Wherever the cake is the main product, expression will commend itself as the most advantageous process. Where, however, the fatty material forms the main product, as in the case of palm kernel oil, or sesame and coco-nut oils from damaged seeds (which would no longer yield proper cattle food), the process of extraction will be preferred, especially when the price of oils is high. In some cases the combination of the two processes commends itself, as in the case of the production of olive oil. The fruits are expressed, and after the edible qualities and best class of oils for technical purposes have been taken off by expression, the remaining pulp is extracted by means of solvents. This process is known under the name of mixed process (*huilerie mixte*).

Refining and Bleaching.—The oils and fats prepared by any of the methods detailed above are in their fresh state, and, if got from perfectly fresh (" sweet ") material, practically neutral. If care be exercised in the process of rendering animal oils and fats or expressing oils in the cold, the products are, as a rule, sufficiently pure to be delivered to the consumer, after a preliminary settling has allowed any mucilaginous matter, such as animal or vegetable fibres or other impurities, and also traces of moisture, to separate out. This spontaneous clarification was at one time the only method in vogue. This process is now shortened by filtering oils through filter presses, or otherwise brightening them, *e.g.* by blowing with air. In many cases these methods still suffice for the production of commercial oils and fats.

In special cases, such as the preparation of edible oils and fats, a further improvement in colour and greater purity is obtained by filtering the oils over charcoal, or over natural absorbent earths, such as fuller's earth. Where this process does not suffice, as in the case of coco-nut oil or palm kernel oil, a preliminary purification in a current of steam must be resorted to before the final purification, described above, is carried out. Oils intended for use on the table which deposit " stearine " in winter must be freed from such solid fats. This is done by allowing the oil to cool down to a low temperature and pressing it through cloths in a press, when a limpid oil exudes, which remains proof against cold—" winter oil." Most olive oils are naturally non-congealing oils, whereas the Tunisian and Algerian olive oils deposit so much " stearine " that they must be " demargarinated." Similar methods are employed in the production of lard oil, edible cotton-seed oil, &c. For refining oils and fats intended for edible purposes only the foregoing methods, which may be summarized by the name of physical methods, can be used; the only chemicals permissible are alkalis or alkaline earths to remove free fatty acids present. Treatment with other chemicals renders the oils and fats unfit for consumption. Therefore all bleaching and refining processes involving other means than those enumerated can only be used for technical oils and fats, such as lubricating oils, burning oils, paint oils, soap-making oils, &c.

Bleaching by the aid of chemicals requires great circumspection. There is no universal method of oil-refining applicable to any and every oil or fat. Not only must each kind of oil or fat be considered as a special problem, but frequently even varieties of one and the same oil or fat are apt to cause the same difficulties as would a new individual. In many cases the purification by means of sulphuric acid, invented and patented by Charles Gower in 1792 (frequently ascribed to Thénard), is still usefully applied. It consists in treating the oil with a small percentage of a more or less concentrated sulphuric acid, according to the nature of the oil or fat. The acid not only takes up water, but it acts on the suspended impurities, carbonizing them to some extent, and thus causing them to coagulate and fall down in the form of a flocculent mass, which carries with it mechanically other impurities which have not been acted upon. This method is chiefly used in the refining of linseed and rape oils. Purification by means of strong caustic soda was first recommended as a general process by Louis C. Arthur Barreswil, his suggestion being to heat the oil and add 2% to 3% of caustic soda. In most cases the purification consisted in removing the free fatty acids from rancid oils and fats, the caustic soda forming a soap with the fatty acids, which would either rise as a scum and lift up with it impurities, or fall to the bottom and carry down impurities. This process is a useful one in the case of cotton-seed oil. As a rule, however, it is a very precarious one, since emulsions are formed which prevent in many cases the separation of oil altogether. After the treatment with sulphuric acid or caustic soda, the oils must be washed to remove the last traces of chemicals. The water is then allowed to settle out, and the oils are finally filtered. The number of chemicals which have been proposed from time to time for the purification of oils and fats is almost legion, and so long as the nature of oils and fats was little understood, a secret trade in oil-purifying chemicals flourished. With our present knowledge most of these chemicals may be removed into the limbo of useless things. The general methods of bleaching besides those mentioned already as physical methods, viz. filtration over charcoal or bleaching earth, are chiefly methods based on bleaching by means of oxygen or by chlorine. The methods of bleaching by oxygen include all those which aim at the bleaching by exposure to the air and to sunlight (as in the case of artists' linseed-oil), or where oxygen or ozone is introduced in the form of gas or is evolved by chemicals, as manganese dioxide, potassium bichromate or potassium permanganate and sulphuric acid. In the process of bleaching by means of chlorine either bleaching powder or bichromates and hydrochloric acid are used. It must again be emphasized that no general rule can be laid down as to which process should be employed in each given case. There is still a wide field open for the application of proper processes for the removal of impurities and colouring matters without running the risk of attacking the oil or fat itself.

Oil Testing.—Reliable scientific methods for testing oils and fats date back only to the end of the 'seventies of the 19th century. Before that time it was believed that not only could individual oils and fats be distinguished from each other by colour reactions, but it was also maintained that falsification could be detected thereby. With one or two exceptions (detection of sesame oil and perhaps also of cotton-seed oil) all colour reactions are entirely useless. The modern methods of oil testing rest chiefly on so-called " quantitative " reactions, a number of characteristic " values " being determined which, being based on the special nature of the fatty acids contained in each individual oil or fat, assist in identifying them and also in revealing adulteration. These " values," together with other useful methods, are enumerated in the order of their utility for the purposes of testing.

The *saponification value* (*saponification number*) denotes the number of milligrams which one gramme of an oil or fat requires for saponification, or, in other words, for the neutralization of the total fatty acids contained in an oil or fat. We thus measure the alkali absorption value of all fatty acids contained in an oil or fat. The saponification values of most oils and fats lie in the neighbourhood of 195. But the oils belonging to the rape oil group are characterized by considerably lower saponification values, viz. about 175 on account of their containing notable quantities of erucic acid, $C_{22}H_{42}O_2$. In the case of those oils which do not belong to the rape oils and yet show abnormally low saponification values, the suspicion is raised at once that a certain amount of mineral oils (which do not absorb alkali and are therefore termed "unsaponifiable") has been admixed fraudulently. Their amount can be determined in a direct manner by exhausting the saponified mass, after dilution with water, with ether, evaporating the latter and weighing the amount of mineral oil left behind. A few of the blubber oils, like dolphin jaw and porpoise jaw oils (used for lubricating typewriting machines), have exceedingly high saponification values owing to their containing volatile fatty acids with a small number of carbon atoms. Notable also are coco-nut and palm-nut oils, the saponification numbers of which vary from 240 to 260, and especially butter-fat, which has a saponification value of about 227. These high saponification values are due to the presence of (glycerides of) volatile fatty acids, and are of extreme usefulness to the analyst, especially in testing butter-fat for added margarine and other fats. These volatile acids are specially measured by the *Reichert value* (*Reichert-Wollny value*). To ascertain this value the volatile acids contained in 5 grammes of an oil or fat are distilled in a minutely prescribed manner, and the distilled-off acids are measured by titration with decinormal alkali. Whereas most of the oils and fats, viz. all those the saponification value of which lies at or below 195, contain practically no volatile acids, *i.e.* have extremely low Reichert-Wollny values, all those oils and fats having saponification values above 195 contain notable amounts of volatile fatty acids. Thus, the *Reichert-Meissl value* of butter-fat is 25–30, that of coco-nut oil 6–7, and of palm kernel oil about 5–6. This value is indispensable for judging the purity of a butter.

One of the most important values in oil testing is the *iodine value*. This indicates the percentage of iodine absorbed by an oil or fat when the latter is dissolved in chloroform or carbon tetrachloride, and treated with an accurately measured amount of free iodine supplied in the form of iodine chloride. By this means a measure is obtained of the unsaturated fatty acids contained in an oil or fat. On this value a scientific classification of all oils and fats can be based, as is shown by the above-given list of oils and fats. The unsaturated fatty acids which occur chiefly in oils and fats are *oleic acid*, iodine value 90·07; *erucic acid*, iodine value 75·15; *linolic acid*, iodine value 181·42; *linolenic acid*, iodine value 274·1; and *clupanodonic acid*, iodine value 367·7. Oleic acid occurs in all non-drying oils and fats, and to some extent in the semi-drying oils and fats. Linolic acid is a characteristic constituent of all semi-drying, and to some extent of all drying oils. Linolenic acid characterizes all vegetable drying oils; similarly clupanodonic acid characterizes all marine animal oils.

If one individual oil or fat is given, the iodine value alone furnishes the readiest means of finding its place in the above system, and in many cases of identifying it. Even if a mixture of several oils and fats be present, the iodine value assists greatly in the identification of the components of the mixture, and furnishes the most important key for the attacking and resolving of this not very simple problem. Thus it points the way to the application of a further method to resolve the isolated fatty acids of an oil or fat into saturated fatty acids, which do not absorb iodine, and into unsaturated fatty acids, which absorb iodine in various proportions as shown above. This separation is effected by converting the alkali soaps of the fatty acids into lead soaps and treating the latter with ether, in which the lead salts of the saturated acids are insoluble, whereas the salts of the above-named unsaturated acids are soluble. The saturated fatty acids can then be further examined, and valuable information is gained by the determination of the melting-points and by treatment with solvents. Thus some individual fatty acids, such as stearic acid and arachidic acid (which is characteristic of ground nut oil) can be identified. In the mixture of unsaturated fatty acids, by means of some more refined methods, clupanodonic acid, linolenic acid, linolic acid and oleic acid can be recognized. By combining the various methods which have been outlined here, and by the help of some further additional special methods, and by reasoning in a strictly logical manner, it is possible to resolve a mixture of two oils and fats, and even of three and four, into their components and determine approximately their quantities. The methods sketched here do not yet exhaust the armoury of the analytical chemist, but it can only be pointed out in passing that the detection of hydroxylated acids enables the analyst to ascertain the presence of castor oil, just as the isolation and determination of *oxidized* fatty acids enables him to differentiate blown oils from other oils.

Tests such as the Maumené test, the elaïdin test and others, which formerly were the only resource of the chemist, have been practically superseded by the foregoing methods. The viscosity test, although of considerable importance in the examination of lubricating oils, has been shown to have very little discriminative value as a general test.

Commerce.—It may be safely said of the United Kingdom that it takes the foremost position in the world as regards the extent of the oil and fat industries. An estimate made by the writer (Cantor Lectures, "Oils and Fats, their Uses and Applications," *Society of Arts*, 1904, p. 795), and based on the most reliable information obtainable, led to the conclusion that the sums involved in the oil and fat trade exceeded £1,000,000 per week; in 1907 they approximated £1,250,000 per week. The great centres of the seed-oil trade (linseed, cotton-seed, rape-seed, castor-seed) are Hull, London, Liverpool, Bristol, Leith and Glasgow. Linseed is imported principally from the East Indies, Argentina, Canada, Russia and the United States; cotton-seed is chiefly supplied by Egypt and East India; rape-seed and castor-seed chiefly by East India. The importation of copra and palm kernels for the production of coco-nut oil and palm-nut oil is also considerable, but in these two cases Great Britain does not take the first place. Fish and blubber oils are principally produced in Dundee, London and Greenock. The manufacture of cod-liver oil for pharmaceutical purposes is naturally somewhat limited, as Norway, Newfoundland, and latterly also Japan, are more favourably situated as regards the supply of fresh cod, but the technical liver oils (cod oil, shark-liver oil) are produced in very large quantities in Grimsby, Hull, Aberdeen, and latterly also on the west coasts of the United Kingdom. The production of edible fats (margarine, lard compounds, and vegetable butters) has taken root in this country, and bids fair to extend largely. With regard to edible oils, edible cotton-seed oil is the only table oil produced in Great Britain. The United Kingdom is also one of the largest importers of fatty materials.

Practically the whole trade in palm oil, which comes exclusively from West Africa, is confined to Liverpool, and the bulk of the tallow imported into Europe from Australasia, South America and the United States, is sold in the marts of London and Liverpool. Lard reaches Great Britain chiefly from the United States. Amongst the edible oils and fats which are largely imported, butter takes the first rank (to an amount of almost £25,000,000 per annum). This food-stuff reaches Great Britain not only from all butter-exporting countries of the continent of Europe, but in increasing quantities also from Australia, Canada, Argentine, Siberia and the United States of America. Next in importance is margarine, the British production of which does not suffice for the consumption, so that large quantities must be imported from Holland, edible olive oil from Italy, the south of France, Spain and the Mediterranean ports generally. Coco-nut oil and copra, both for edible and technical purposes, are largely shipped to Great Britain from the East Indies and Ceylon, Java and the West Indies. Of lesser importance are greases, which form the by-product of the large slaughter-houses in the United States and Argentina, and American (Canadian) and Japanese fish oils.

On the continent of Europe the largest oil-trading centres are on the Mediterranean (Marseilles and Triest), which are geographically more favourably placed than England for the production of such edible oils (in addition to the home-grown olive oil) as arachis oil, sesame oil and coco-nut oil. Moreover, the native population itself constitutes a large consumer of these oils. In the north of Europe, Hamburg, Rotterdam, Antwerp and Copenhagen are the largest centres of the oil and fat trade. Hamburg and its neighbourhood produces, curiously enough, at present the largest amount of palm-nut oil. The United States takes the foremost place in the world for the production of cotton-seed and maize oils, lard, bone fat and fish oils. Canada is likely to outstrip the United States in the trade of fish and blubber oils, and in the near future Japan bids fair to become a very serious competitor in the supply of these oils. Vast stores of hard vegetable fats are still practically wasted in tropical countries, such as India, Indo-China and the Sunda Islands, tropical South America, Africa and China. With the improvement in transport these will no doubt reach European manufacturing centres in larger quantities than has been the case hitherto.

WAXES

The waxes consist chiefly of the fatty acid esters of the higher monohydric alcohols, with which are frequently associated free alcohols as also free fatty acids. In the following two tables the "acids" and "alcohols" hitherto identified in waxes are enumerated in a classified order:—

ACIDS

		Boiling Point.		Melting Point. °C.	Characteristic of
		mm. Pressure.	°C.		
I. Acids of the Acetic series $C_nH_{2n}O_2$—					
Ficocerylic acid	$C_{13}H_{26}O_2$	..	..	57	Gondang wax
Myristic acid	$C_{14}H_{28}O_2$	100	250·5	53·8	Wool wax
Palmitic acid	$C_{16}H_{32}O_2$	100	271·5	62·62	Beeswax, spermaceti
Carnaübic acid	$C_{24}H_{48}O_2$	..	..	72·5	Carnaüba wax, wool wax
Pisangcerylic acid	$C_{24}H_{48}O_2$	..	..	71	Pisang wax
Cerotic acid	$C_{26}H_{52}O_2$	..	..	77·8	Beeswax, wool wax, insect wax
Melissic acid	$C_{30}H_{60}O_2$	..	..	91	Beeswax
Psyllostearylic acid	$C_{30}H_{60}O_2$	..	..	94–95	Psylla wax
II. Acids of the Acrylic or Oleic series $C_nH_{2n-2}O_2$—					
Physetoleic acid	$C_{16}H_{30}O_2$	..	..	30	Sperm oil
Doeglic acid (?)	$C_{19}H_{36}O_2$	..	..	..	
III. Hydroxylated acids of the series $C_nH_{2n}O_3$—					
Lanopalmic acid	$C_{16}H_{32}O_3$	..	..	87–88	Wool wax
Cocceric acid	$C_{31}H_{62}O_3$	..	..	92–93	Cochineal wax
IV. Dihydroxylated acids of the series $C_nH_{2n}O_4$—					
Lanoceric acid	$C_{30}H_{60}O_4$	..	..	104–105	Wool wax

ALCOHOLS

		Boiling Point.		Melting Point. °C.	Characteristic of
		mm. Pressure.	°C.		
I. Alcohols of the Ethane series $C_nH_{2n+2}O$—					
Pisangceryl alcohol	$C_{16}H_{34}O$	..	..	78	Pisang wax
Cetyl alcohol (Ethal)	$C_{16}H_{16}O$	760	344	50	Spermaceti
Octodecyl alcohol	$C_{18}H_{38}O$	15	210·5	59	
Carnaübyl alcohol	$C_{24}H_{50}O$	..	..	68–69	Wool wax
Ceryl alcohol	$C_{26}H_{54}O$	..	..	79	Chinese wax, opium wax, wool fat
Myricyl (Melissyl) alcohol	$C_{30}H_{62}O$	..	..	85–88	Beeswax, Carnaüba wax
Psyllostearyl alcohol	$C_{33}H_{68}O$	..	..	68–70	Psylla wax
II. Alcohols of the Allylic series $C_nH_{2n}O$—					
Lanolin alcohol	$C_{12}H_{24}O$	..	..	102–104	Wool wax
III. Alcohols of the series $C_nH_{2n-6}O$—					
Ficoceryl alcohol	$C_{17}H_{28}O$	..	..	198	Gondang wax
IV. Alcohols of the Glycolic series $C_nH_{2n+2}O_2$—					
Cocceryl alcohol	$C_{30}H_{62}O_2$	..	..	101–104	Cochineal wax
V. Alcohols of the Cholesterol series—					
Cholesterol	$C_{26}H_{44}O$	..	..	148·4–150·8	Wool wax
Isocholesterol	$C_{26}H_{44}O$	..	..	137–138	

Spermaceti consists practically of cetyl palmitate, Chinese wax of ceryl palmitate. The other waxes are of more complex composition, especially so wool wax.

The waxes can be classified similarly to the oils and fats as follows:—

I. Liquid waxes.
II. Solid waxes.
  A. Vegetable waxes.
  B. Animal waxes.

The table enumerates the most important waxes:—

WAXES

Name of Wax.	Source.	Iodine Value.	Principal Use.
	Liquid Waxes.		
Sperm oil	*Physeter macrocephalus*	81–90	Lubricant
Arctic sperm oil (Bottlenose oil)	*Hyperoödon rostratus*	67–82	Lubricant
	Solid Waxes.		
Vegetable Waxes—			
Carnaüba wax	*Corypha cerifera*	13	Polishes. Phonograph mass
Animal Waxes—			
Wool wax	*Ovis aries*	102	Ointment
Beeswax	*Apis mellifica*	8·11	Candles, polishes
Spermaceti (Cetin)	*Physeter macrocephalus*	0–4	Candles, surgery
Insect wax, Chinese wax	*Coccus ceriferus*	0–1·4	Candles, polishes, sizes

There are only two liquid waxes known, sperm oil and arctic sperm oil (bottlenose-whale oil), formerly always classed together with the animal oils. In their physical properties the natural waxes simulate the fatty oils and fats. They behave similarly to solvents; and in their liquid condition leave a grease spot on paper. An important property of waxes is that of easily forming emulsions with water, so that large quantities of water can be incorporated with them (lanolin).

The liquid waxes occur in the blubber of the sperm whale, and in the head cavities of those whales which yield spermaceti; this latter is obtained by cooling the crude oil obtained from the head cavities. Vegetable waxes appear to be very widely distributed throughout the vegetable kingdom, and occur mostly as a very thin film covering leaves and also fruits. A few only are found in sufficiently large quantities to be of commercial importance. So far carnaüba wax is practically the only vegetable wax which is of importance in the world's markets. The animal waxes are widely distributed amongst the insects, the most important being beeswax, which is collected in almost all parts of the world. An exceptional position is occupied by wool wax, the main constituent of the natural wool fat which covers the hair of sheep, and is obtained as a by-product in scouring the raw wool. Wool fat is now being purified on a large scale and brought into commerce, under the name of lanolin, as an ointment the beneficent properties of which were known to Dioscorides in the beginning of the present era. Its chemical composition is exceedingly complex, and specially remarkable on account of the considerable proportions of cholesterol and isocholesterol it contains.

Commerce.—The sperm oils are generally sold in the same markets as the fish and blubber oils (see above). For beeswax London is one of the chief marts of the world. In Yorkshire, the centre of the woollen industry, the largest amounts of wool-fat are produced, all attempts to recover the hitherto wasted material in Argentine and Australia having so far not been attended with any marked success. Spermaceti is a comparatively unimportant article of commerce; and of Chinese wax small quantities only are imported, as the home consumption takes up the bulk of the wax for the manufacture of candles, polishes and sizes.

2. *Essential or Ethereal Oils.*

The essential, ethereal, or "volatile" oils constitute a very extensive class of bodies, which possess, in a concentrated form, the odour characteristic of the plants or vegetable substances from which they are obtained. The oils are usually contained in special cells, glands, cavities, or canals within the plants either as such or intermixed with resinous substances; in the latter case the mixtures form oleo-resins, balsams or resins according as the product is viscid, or solid and hard. A few do not exist ready formed in the plants, but result from chemical change of inodorous substances; as for instance, bitter almonds and essential oil of mustard.

The essential oils are for the most part insoluble or only very sparingly soluble in water, but in alcohol, ether, fatty oils and mineral oils they dissolve freely. They ignite with great ease, emitting a smoke freely, owing to the large proportion of carbon they contain. Their chief physical distinction from the fatty oils is that they are as a rule not oleaginous to the touch and leave no permanent grease spot. They have an aromatic smell and a hot burning taste, and can be distilled unchanged. The crude oils are at the ordinary temperature mostly liquid, some are solid substances, others, again, deposit on standing a crystalline portion ("stearoptene" in contradistinction to the liquid portion ("elaeoptene"). The essential oils possess a high refractive power, and most of them rotate the plane of the polarized light. Even so nearly related oils as the oils of turpentine, if obtained from different sources, rotate the plane of the polarized light in opposite directions. In specific gravity the essential oils range from 0·850 to 1·142; the majority are, however, specifically lighter than water. In their chemical constitution the essential oils present no relationship to the fats and oils. They represent a large number of classes of substances of which the most important are: (1) *Hydrocarbons*, such as pinene in oil of turpentine, camphene in citronella oil, limonene in lemon and orange-peel oils, caryophyllene in clove oil and cumene in oil of thyme; (2) *ketones*, such as camphor from the camphor tree, and irone which occurs in orris root; (3) *phenols*, such as eugenol in clove oil, thymol in thyme oil, saffrol in sassafras oil, anethol in anise oil; (4) *aldehydes*, such as citral and citronellal, the most important constituents of lemon oil and lemon-grass oil, benzaldehyde in the oil of bitter almonds, cinnamic aldehyde in cassia oil, vanillin in gum benzoin and heliotropin in the spiraea oil, &c.; (5) *alcohols* and their esters, such as geraniol (rhodinol) in rose oil and geranium oil, linalool, occurring in bergamot and lavender oils, and as the acetic ester in rose oil, terpineol in cardamom oil, menthol in peppermint oil, eucalyptol in eucalyptus oil and borneol in rosemary oil and Borneo camphor; (6) *acids and their anhydrides*, such as cinnamic acid in Peru balsam and coumarin in woodruff; and (7) *nitrogenous compounds*, such as mustard oil, indol in jasmine oil and anthranilic methyl-ester in neroli and jasmine oils.

Preparation from Plants.—Before essential oils could be prepared synthetically they were obtained from plants by one of the following methods: (1) distillation, (2) expression, (3) extraction, (4) enfleurage, (5) maceration.

The most important of these processes is the first, as it is applicable to a large number of substances of the widest range, such as oil of peppermint and camphor. The process is based on the principle that whilst the odoriferous substances are insoluble in water, their vapour tension is reduced on being treated with steam so that they are carried over by a current of steam. The distillation is generally performed in a still with an inlet for steam and an outlet to carry the vapours laden with essential oils into a condenser, where the water and oil vapours are condensed. On standing, the distillate separates into two layers, an aqueous and an oily layer, the oil floating on or sinking through the water according to its specific gravity. The process of *expression* is applicable to the obtaining of essential oils which are contained in the rind or skin of the fruits belonging to the citron family, such as orange and lemon oils. The oranges, lemons, &c., are peeled, and the peel is pressed against a large number of fine needles, the exuding oil being absorbed by sponges. It is intended to introduce machinery to replace manual labour. The process of *extraction* with volatile solvents is similar to that used in the extraction of oils and fats, but as only the most highly purified solvents can be used, this process has not yet gained commercial importance. The process of *enfleurage* is used in those cases where the odoriferous substance is present to a very small extent, and is so tender and liable to deterioration that it cannot be separated by way of distillation. Thus in the case of neroli oil the petals of orange blossom are loosely spread on trays covered with purified lard or with fine olive oil. The fatty materials then take up and fix the essential oil. This process is principally employed for preparing pomades and perfumed oils. Less tender plants can be treated by the analogous method of *maceration*, which consists in extracting the odoriferous substances by macerating the flowers in hot oil or molten fat. The essential oil is then dissolved by the fatty substances. The essential oil itself can be recovered from the perfumed oils, prepared either by enfleurage or maceration, by agitating the perfumed fat in a shaking machine with pure concentrated alcohol. The essential oil passes into the alcoholic solution, which is used as such in perfumery.

Synthetic Preparation.—Since the chemistry of the essential oils has been investigated in a systematic fashion a large number of the chemical individuals mentioned above have been isolated from the oils and identified.

This first step has led to the synthetical production of the most characteristic substances of essential oils in the laboratory, and the synthetical manufacture of essential oils bade fair to rival in importance the production of tar colours from the hydrocarbons obtained on distilling coal. One of the earliest triumphs of synthetical chemistry in this direction was the production of terpineol, the artificial lilac scent, from oil of turpentine. At present it is almost a by-product in the manufacture of artificial camphor. This was followed by the production of heliotropin, coumarin and vanillin, and later on by the artificial preparation of ionone, the most characteristic constituent of the violet scent. At present the manufacture of artificial camphor may be considered a solved problem, although it is doubtful whether such camphor will be able to compete in price with the natural product in the future. The aim of the chemist to produce essential oils on a manufacturing scale is naturally confined at present to the more expensive oils. For so long as the great bulk of oils is so cheaply produced in nature's laboratory, the natural products will hold their field for a long time to come.

Applications.—Essential oils have an extensive range of uses, of which the principal are their various applications in perfumery (*q.v.*). Next to that they play an important part in connexion with food. The value of flavouring herbs, condiments and spices is due in a large measure to the essential oils contained in them. The commercial value of tea, coffee, wine and other beverages may be said to depend largely on the delicate aroma which they owe to the presence of minute quantities of ethereal oils. Hence, essential oils are extensively used for the flavouring of liqueurs, aerated beverages and other drinks. Nor is their employment less considerable in the manufacture of confectionery and in the preparation of many dietetic articles. Most fruit essences now employed in confectionery are artificially prepared oils, especially is this the case with cheap confectionery (jams, marmalades, &c.) in which the artificial fruit esters to a large extent replace the natural fruity flavour. Thus amyl acetate is used as an imitation of the jargonelle-pear flavour; amyl valerate replaces apple flavour, and a mixture of ethyl and propyl butyrates yields the so-called pine-apple flavour. Formic ether gives a peach-like odour, and is used for flavouring fictitious rum. Many of the essential oils find extensive use in medicine. In the arts, oil of turpentine is used on the largest scale in the manufacture of varnishes, and in smaller quantities for the production of terpineol and of artificial camphor. Oil of cloves is used in the silvering of mirror glasses. Oils of lavender and of spike are used as vehicles for painting, more especially for the painting of pottery and glass.

The examination of essential oils is by no means an easy task. Each oil requires almost a special method, but with the progress of chemistry the extensive adulteration that used to be practised with fatty oils has almost disappeared, as the presence of fatty oils is readily detected. Adulteration of expensive oil with cheaper oils is now more extensively practised, and such tests as the determination of the saponification value (see above) and of the optical rotation, and in special cases the isolation and quantitative determination of characteristic substances, leads in very many cases to reliable results. The colour, the boiling-point, the specific gravity and solubility in alcohol serve as most valuable adjuncts in the examination with a view to form an estimate of the genuineness and value of a sample. Quite apart from the genuineness of a sample, its special aroma constitutes the value of an oil, and in this respect the judging of the value of a given oil may, apart from the purity, be more readily solved by an experienced perfumer than by the chemist. Thus roses of different origin or even of different years will yield rose oils of widely different value. The cultivation of plants for essential oils has become a large industry, and is especially practised as an industry in the south of France (Grasse, Nice, Cannes). The rose oil industry, which had been for centuries located in the valleys of Bulgaria, has now been taken up in Germany (near Leipzig), where roses are specially cultivated for the production of rose oil. India and China are also very large producers of essential oils. Owing to the climate other countries are less favoured, although lavender and peppermint are largely cultivated at Mitcham in Surrey, in Hertfordshire and Bedfordshire. Lavender and peppermint oils of English origin rank as the best qualities. As an illustration of the extent to which this part of the industry suffers from the climate, it may be stated that oil from lavender plants grown in England never produces more than 7 to 10% linalool acetate, which gives the characteristic scent to lavender oil, whilst oil from lavender grown in the south of France frequently yields as much as 35% of the ester. The proof that this is due mainly to climatic influences is furnished by the fact that Mitcham lavender transplanted to France produces an oil which year by year approximates more closely in respect of its contents of linalool acetate to the product of the French plant.

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OIRON, a village of western France, in the department of Deux-Sèvres, 7½ m. E. by S. of Thouars by road. Oiron is celebrated for its château, standing in a park and originally built in the first half of the 16th century by the Gouffier family, rebuilt in the latter half of the 17th century by Francis of Aubusson, duke of La Feuillade, and purchased by Madame de Montespan, who there passed the latter part of her life. Marshal Villeroy afterwards lived there. The château consists of a main building with two long projecting wings, one of which is a graceful structure of the Renaissance period built over a cloister. The adjoining church, begun in 1518, combines the Gothic and Renaissance styles and contains the tombs of four members of the Gouffier family. These together with other parts of the château and church were mutilated by the Protestants in 1568. The park contains a group of four dolmens.

For the Oiron pottery see CERAMICS.

OISE, a river of northern France, tributary to the Seine, flowing south-west from the Belgian frontier and traversing the departments of Aisne, Oise and Seine-et-Oise. Length, 187 m.; area of basin 6437 sq. m. Rising in Belgium, 5 m. S.E. of Chimay (province of Namur) at a height of 980 ft., the river enters France after a course of little more than 9 m. Flowing through the district of Thiérache, it divides below Guise into several arms and proceeds to the confluence of the Serre, near La Fère (Aisne). Thence as far as the confluence of the Ailette its course lies through well-wooded country to Compiègne, a short distance above which it receives the Aisne. Skirting the forests of Compiègne, Halatte and Chantilly, all on its left bank, and receiving near Creil the Thérain and the Brèche, the river flows past Pontoise and debouches into the Seine 39 m. below Paris. Its channel is canalized (depth 6 ft. 6 in.) from Janville above Compiègne, to its mouth over a section 60 m. in length. Above Janville a lateral canal continued by the Sambre-Oise canal accompanies the river to Landrecies. It communicates with the canal system of Flanders and with the Somme canal by way of the St Quentin canal (Crozat branch) which unites with it at Chauny. The same town is its point of junction with the Aisne-Oise canal, by which it is linked with the Eastern canal system.

OISE, a department of northern France, three-fourths of which belonged to Île-de-France and the rest to Picardy, bounded N. by Somme, E. by Aisne, S. by Seine-et-Marne and Seine-et-Oise, and W. by Eure and Seine-Inférieure. Pop. (1906) 410,049; area 2272 sq. m. The department is a moderately elevated plateau with pleasant valleys and fine forests, such as those of Compiègne, Ermenonville, Chantilly and Halatte, all in the south-east. It belongs almost entirely to the basin of the Seine—the Somme and the Bresle, which flow into the English Channel, draining but a small area. The most important river is the Oise, which flows through a broad and fertile valley from north-east to south-west, past the towns of Noyon, Compiègne, Pont St Maxence and Creil. On its right it receives the Brèche and the Thérain, and on its left the Aisne, which brings down a larger volume of water than the Oise itself, the Authonne, and the Nonette, which irrigates the valley of Senlis and Chantilly. The Ourcq, a tributary of the Marne, in the south-east, and the Epte, a tributary of the Seine, in the west, also in part belong to the department. These streams are separated by ranges of slight elevation or by isolated hills, the highest point (770 ft.) being in the ridge of Bray, which stretches from Dieppe to Précy-sur-Oise. The lowest point is at the mouth of the Oise, only 66 ft. above sea-level. The climate is very variable, but the range of temperature is moderate.

Clay for bricks and earthenware, sand and building-stone are among the mineral products of Oise, and peat is also worked. Pierrefonds, Gouvieux, Chantilly and Fontaine Bonneleau have mineral springs. Wheat, oats and other cereals, potatoes and sugar beet are the chief agricultural crops. Cattle are reared more especially in the western districts, where dairying is actively carried on. Bee-keeping is general. Racing stables are numerous in the neighbourhood of Chantilly and Compiègne. Among the industries of the department of manufacture of sugar and alcohol from beetroot occupies a foremost place. The manufacture of furniture, brushes (Beauvais) and other wooden goods and of toys, fancy-ware, buttons, fans and other articles in wood, ivory, bone or mother-of-pearl are widespread industries. There are also woollen and cotton mills, and the making of woollen fabrics, blankets, carpets (Beauvais), hosiery and lace (Chantilly and its vicinity) is actively carried on. Creil and the neighbouring Montataire form an important metallurgical centre. Oise is served by the Northern railway, on which Creil is an important junction, and its commerce is facilitated by the Oise and its lateral canal and the Aisne, which afford about 70 m. of navigable waterway.

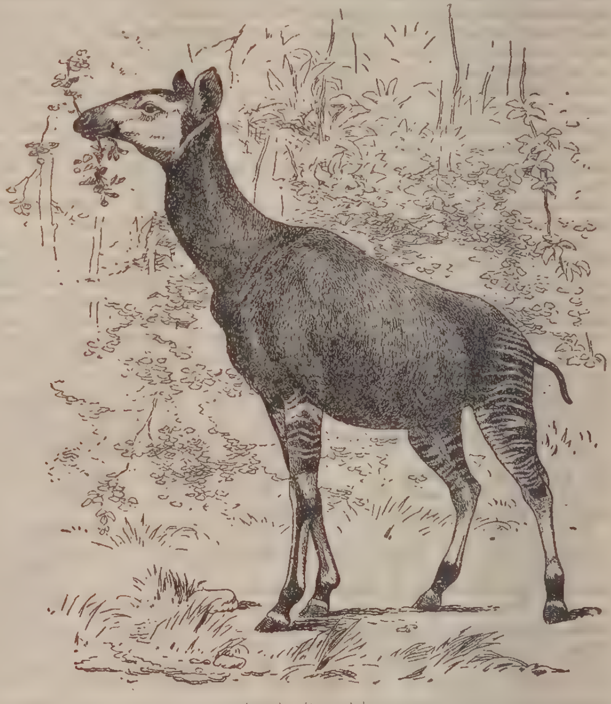
There are four arrondissements—Beauvais, Clermont, Compiègne and Senlis—with 35 cantons and 701 communes. The department forms the diocese of Beauvais (province of Reims) and part of the region of the II. army corps and of the académie (educational division) of Paris. Its court of appeal is at Amiens. The principal places are Beauvais, the capital, Chantilly, Clermont-en-Beauvoisis, Compiègne, Noyon, Pierrefonds, Creil and Senlis, which are treated separately. Among the more populous places not mentioned is Méru (5317), a centre for fancy-ware manufacture. The department abounds in old churches, among which, besides those of Beauvais, Noyon and Senlis, may be mentioned those at Morienval (11th and 12th centuries), Maignelay (15th and 16th centuries), Crépy-en-Valois (St Thomas, 12th, 13th and 15th centuries), St Leu d'Esserent (mainly 12th century), Tracy-le-Val (mainly 12th century), Villers St Paul (12th and 13th centuries), St Germer-de-Fly (a fine example of the transition from Romanesque to Gothic architecture), and St Martin-aux-Bois (13th, 14th and 15th centuries). Pontpoint preserves the buildings of an abbey founded towards the end of the 14th century and St Jean-aux-Bois the remains of a priory including a church of the 13th century. There are Gallo-Roman remains of Champlieu close to the forest of Compiègne. At Ermenonville there is a chateau of the 17th century where Rousseau died in 1778.

OJIBWAY (Ojibwa), or Chippeway (Chippewa), the name given by the English to a large tribe of North American Indians of Algonquian stock. They must not be confused with the Chipewyan tribe of Athabascan stock settled around Lake Athabasca, Canada. They formerly occupied a vast tract of country around Lakes Huron and Superior, and now are settled on reservations in the neighbourhood. The name is from a word meaning "to roast till puckered" or "drawn up," in reference, it is suggested, to a peculiar seam in their mocassins, though other explanations have been proposed. They call themselves *Anishinabeg* ("spontaneous men"), and the French called them *Saulteurs* ("People of the Falls"), from the first group of them being met at Sault Ste Marie. Tribal traditions declare they migrated from the St Lawrence region together with the Ottawa and Potawatomi, with which tribes they formed a confederacy known as "The Three Fires." When first encountered about 1640 the Ojibway were inhabiting the coast of Lake Superior, surrounded by the Sioux and Foxes on the west and south. During the 18th century they conquered these latter and occupied much of their territory. Throughout the Colonial wars they were loyal to the French, but fought for the English in the War of Independence and the War of 1812, and thereafter permanently maintained peace with the Whites. The tribe was divided into ten divisions. They lived chiefly by hunting and fishing. They had many tribal myths, which were collected by Henry R. Schoolcraft in his *Algic Researches* (1839), upon which Longfellow founded his "Hiawatha."

See Indians, North American; also W. J. Hoffmann, "Midewiwin of the Ojibwa," in *7th Report of Bureau of American Ethnology* (1891); W. W. Warren, "History of the Ojibways," vol. v., *Minnesota Historical Society's Collections*; G. Copway, *History of the Ojibway Indians* (Boston, 1850); P. Jones, *History of the Ojebway Indians* (1861); A. E. Jenks, "Wild Rice Gatherers," *19th Report of Bureau of American Ethnology* (1900).

OKAPI, the native name of an African ruminant mammal (*Ocapia johnstoni*), belonging to the *Giraffidae*, or giraffe-family, but distinguished from giraffes by its shorter limbs and neck, the absence of horns in the females, and its very remarkable type of colouring. Its affinity with the giraffes is, however, clearly revealed by the structure of the skull and teeth, more especially the bilobed crown to the incisor-like lower canine teeth. At the shoulder the okapi stands about 5 ft. In colour the sides of the face are puce, and the neck and most of the body purplish, but the buttocks and upper part of both fore and hind limbs are transversely barred with black and white, while their lower portion is mainly white with black fetlock-rings, and in the front pair a vertical black stripe on the anterior surface. Males have a pair of dagger-shaped horns on the forehead, the tips of which, in some cases at any rate, perforate the hairy skin with which the rest of the horns are covered. As in all forest-dwelling animals, the ears are large and capacious. The tail is shorter than in giraffes, and not tufted at the tip. The okapi, of which the first entire skin sent to Europe was received in England from Sir H. H. Johnston in the spring of 1901, is a native of the Semliki forest, in the district between Lakes Albert and Albert Edward. From certain differences in the striping of the legs, as well as from variation in skull-characters, the existence of more than a single species has been suggested; but further evidence is required before such a view can be definitely accepted.

Specimens in the museum at Tervueren near Brussels show that in fully adult males the horns are subtriangular and inclined somewhat backwards; each being capped with a small polished epiphysis, which projects through the skin investing the rest of the horn. As regards its general characters, the skull of the okapi appears to be intermediate between that of the giraffe on the one hand and that of the extinct *Palaeotragus* (or *Samotherium*) of the Lower Pliocene deposits of southern Europe on the other. It has, for instance, a greater development of air-cells in the *diplöe* than in the latter, but much less than in the former. Again, in *Palaeotragus* the horns (present only in the male) are situated immediately over the eye-sockets, in *Ocapia* they are placed just behind the latter, while in *Giraffa* they are partly on the parietals. In general form, so far as can be judged from the disarticulated skeleton, the okapi was more like an antelope than a giraffe, the fore and hind cannon-bones, and consequently the entire limbs, being of approximately equal length. From this it seems probable that *Palaeotragus* and *Ocapia* indicate the ancestral type of the giraffe-line; while it has been further suggested that the apparently hornless *Helladotherium* of the Grecian Pliocene may occupy a somewhat similar position in regard to the horned Sivatherium of the Indian Siwaliks.



Female Okapi.

For these and other allied extinct genera see Pecora; for a full description of the okapi itself the reader should refer to an illustrated memoir by Sir E. Ray Lankester in the *Transactions* of the Zoological Society of London (xvi. 6, 1902), entitled "On *Okapia*, a New Genus of *Giraffidae* from Central Africa."

Little is known with regard to the habits of the okapi. It appears, however, from the observations of Dr J. David, who spent some time in the Albert Edward district, that the creature dwells in the most dense parts of the primeval forest, where there is an undergrowth of solid-leaved, swamp-loving plants, such as arum, *Donax* and *Phrynium*, which, with orchids and climbing plants, form a thick and confused mass of vegetation. The leaves of these plants are blackish-green, and in the gloom of the forest, grow more or less horizontally, and are glistening with moisture. The effect of the light falling upon them is to produce along the midrib of each a number of short white streaks of light, which contrast most strongly with the shadows cast by the leaves themselves, and with the general twilight gloom of the forest. On the other hand, the thick layer of fallen leaves on the ground, and the bulk of the stems of the forest trees are bluish-brown and russet, thus closely resembling the decaying leaves in an European forest after heavy rain; while the whole effect is precisely similar to that produced by the russet head and body and the striped thighs and limbs of the okapi. The long and mobile muzzle of the okapi appears to be adapted for feeding on the low forest underwood and the swamp-vegetation. The small size of the horns of the males is probably also an adaptation to life in thick underwood. In Dr David's opinion an okapi in its native forest could not be seen at a distance of more than twenty or twenty-five paces. At distances greater than this it is impossible to see anything clearly in these equatorial forests, and it is very difficult to do so even at this short distance. This suggests that the colouring of the okapi is of purely protective type.

By the Arabianized emancipated slaves of the Albert Edward district the okapi is known as the kenge, o-à-pi being the Pigmies' name for the creature. Dr David adds that Junker may undoubtedly claim to be the discoverer of the okapi, for, as stated on p. 299 of the third volume of the original German edition of his *Travels*, he saw in 1878 or 1879 in the Nepo district a portion of the skin with the characteristic black and white stripes. Junker, by whom it was mistaken for a large water-chevrotain or zebra-antelope, states that to the natives of the Nepo district the okapi is known as the makapé. (R. L.*)

OKEHAMPTON, a market town and municipal borough in the Tavistock parliamentary division of Devonshire, England, on the east and west Okement rivers, 22 m. W. by N. of Exeter by the London & South-Western railway. Pop. (1901) 2569. The church of All Saints has a fine Perpendicular tower, left uninjured when the nave and chancel were burned down in 1842. Glass is made from granulite found in the Meldon Valley, 3 m. distant. Both branches of the river abound in small trout. Okehampton Castle, one of the most picturesque ruins in Devon, probably dates from the 15th century, though its keep may be late Norman. It was dismantled under Henry VIII., but considerable portions remain of the chapel, banqueting hall and herald's tower. Immediately opposite are the traces of a supposed British camp, and of the Roman road from Exeter to Cornwall. The custom of tolling the curfew still prevails in Okehampton. The town is governed by a mayor, 4 aldermen and 12 councillors. Area, 503 acres.

Okehampton (Oakmanton) was bestowed by William the Conqueror on Baldwin de Brioniis, and became the caput of the barony of Okehampton. At the time of the Domesday Survey of 1086 it already ranked as a borough, with a castle, a market paying 4 shillings, and four burgesses. In the 18th century the manor passed by marriage to the Courtenays, afterwards earls of Devon, and Robert de Courtenay in 1220 gave the king a palfrey to hold an annual fair at his manor of Okehampton, on the vigil and feast day of St Thomas the Apostle. In the reign of Henry III. the inhabitants received a charter (undated) from the earl of Devon, confirming their rights "in woods and in uplands, in ways and in paths, in common of pastures, in waters and in mills. They were to be free from all toll and to elect yearly a portreeve and a beadle." A further grant of privileges was bestowed in 1292 by the earl of Devon, but no charter of incorporation was granted until that from James I. in 1623, and the confirmation of this by Charles II. in 1684 continued to be the governing charter, the corporation consisting of a mayor, seven principal burgesses and eight assistant burgesses, until the Municipal Corporations Act of 1882. On a petition from the inhabitants the town was reincorporated by a new charter in 1885. Okehampton returned two members to parliament in 1300, and again in 1312 and 1313, after which there was an intermission till 1640, from which date two members were returned regularly until by the Reform Act of 1832 the borough was disfranchised.

See *Victoria County History, Devonshire*; W. B. Bridges, *History of Okehampton* (1889).

OKEN, LORENZ (1779–1851), German naturalist, was born at Bohlsbach, Swabia, on the 1st of August 1779. His real name was Lorenz Ockenfuss, and under that name he was entered at the natural history and medical classes in the university of Würzburg, whence he proceeded to that of Göttingen, where he became a privat-docent, and abridged his name to Oken. As Lorenz Oken he published in 1802 his small work entitled *Grundriss der Naturphilosophie, der Theorie der Sinne, und der darauf gegründeten Classification der Thiere*, the first of the series of works which placed him at the head of the "natur-philosophie" or physio-philosophical school of Germany. In it he extended to physical science the philosophical principles which Kant had applied to mental and moral science. Oken had, however, in this application been preceded by J. G. Fichte, who, acknowledging that the materials for a universal science had been discovered by Kant, declared that nothing more was needed than a systematic co-ordination of these materials; and this task Fichte undertook in his famous *Doctrine of Science* (Wissenschaftslehre), the aim of which was to construct a priori all knowledge. In this attempt, however, Fichte did little more than indicate the path; it was reserved for F. W. J. von Schelling fairly to enter upon it, and for Oken, following him, to explore its mazes yet further, and to produce a systematic plan of the country so surveyed.

In the *Grundriss der Naturphilosophie* of 1802 Oken sketched the outlines of the scheme he afterwards devoted himself to perfect. The position which he advanced in that remarkable work, and to which he ever after professed adherence, is that "the animal classes are virtually nothing else than a representation of the sense-organs, and that they must be arranged in accordance with them." Agreeably with this idea, Oken contended that there are only five animal classes: (1) the *Dermatozoa*, or invertebrates; (2) the *Glossozoa*, or Fishes, as being those animals in which a true tongue makes, for the first time, its appearance; (3) the *Rhinozoa*, or Reptiles, wherein the nose opens for the first time into the mouth and inhales air; (4) the *Otozoa*, or Birds, in which the ear for the first time opens externally; and (5) *Ophthalmozoa*, or Mammals, in which all the organs of sense are present and complete, the eyes being movable and covered with two lids.

In 1805 Oken made another characteristic advance in the application of the a priori principle, by a book on generation (*Die Zeugung*), wherein he maintained the proposition that "all organic beings originate from and consist of *vesicles* or *cells*. These vesicles, when singly detached and regarded in their original process of production, are the infusorial mass or protoplasma (*urschleim*) whence all larger organisms fashion themselves or are evolved. Their production is therefore nothing else than a regular agglomeration of *Infusoria*—not, of course, of species already elaborated or perfect, but of mucous vesicles or points in general, which first form themselves by their union or combination into particular species."

One year after the production of this remarkable treatise, Oken advanced another step in the development of his system, and in a volume published in 1806, in which D. G. Kieser (1779–1862) assisted him, entitled *Beiträge zur vergleichenden Zoologie, Anatomie, und Physiologie*, he demonstrated that the intestines originate from the umbilical vesicle, and that this corresponds to the vitellus or yolk-bag. Caspar Friedrich Wolff had previously proved this fact in the chick (*Theoria Generationis*, 1774), but he did not see its application as evidence of a general law. Oken showed the importance of the discovery as an illustration of his system. In the same work Oken described and recalled attention to the *corpora Wolffiana*, or "primordial kidneys."

The reputation of the young privat-docent of Göttingen had meanwhile reached the ear of Goethe, and in 1807 Oken was invited to fill the office of professor extraordinarius of the medical sciences in the university of Jena. He accepted the call, and selected for the subject of his inaugural discourse his ideas on the "Signification of the Bones of the Skull," based upon a discovery he had made in the previous year. This famous lecture was delivered in the presence of Goethe, as privy-councillor and rector of the university, and was published in the same year, with the title, *Ueber die Bedeutung der Schädelknochen*.

With regard to the origin of the idea, Oken narrates in his *Isis* that, walking one autumn day in 1806 in the Harz forest, he stumbled upon the blanched skull of a deer, picked up the partially dislocated bones, and contemplated them for a while, when the truth flashed across his mind, and he exclaimed, "It is a vertebral column!" At a meeting of the German naturalists held at Jena some years afterwards Professor Kieser gave an account of Oken's discovery in the presence of the grand-duke, which account is printed in the *tageblatt*, or "proceedings," of that meeting. The professor stated that Oken communicated to him his discovery when journeying in 1806 to the island of Wangeroog. On their return to Göttingen Oken explained his ideas by reference to the skull of a turtle in Kieser's collection, which he disarticulated for that purpose with his own hands. "It is with the greatest pleasure," wrote Kieser, "that I am able to show here the same skull, after having it thirty years in my collection. The single bones of the skull are marked by Oken's own handwriting, which may be so easily known."

The range of Oken's lectures at Jena was a wide one, and they were highly esteemed. They embraced the subjects of natural philosophy, general natural history, zoology, comparative anatomy, the physiology of man, of animals and of plants. The spirit with which he grappled with the vast scope of science is characteristically illustrated in his essay *Ueber das Universum als Fortsetzung des Sinnensystems*, 1808. In this work he lays it down that "organism is none other than a combination of all the universe's activities within a single individual body." This doctrine led him to the conviction that "world and organism are one in kind, and do not stand merely in harmony with each other." In the same year he published his *Erste Ideen zur Theorie des Lichts*, &c., in which he advanced the proposition that "light could be nothing but a polar tension of the ether, evoked by a central body in antagonism with the planets, and heat was none other than a motion of this ether"—a sort of vague anticipation of the doctrine of the "correlation of physical forces." In 1809 Oken extended his system to the mineral world, arranging the ores, not according to the metals, but agreeably to their combinations with oxygen, acids and sulphur. In 1810 he summed up his views on organic and inorganic nature into one compendious system. In the first edition of the *Lehrbuch der Naturphilosophie*, which appeared in that and the following years, he sought to bring his different doctrines into mutual connexion, and to "show that the mineral, vegetable and animal kingdoms are not to be arranged arbitrarily in accordance with single and isolated characters, but to be based upon the cardinal organs or anatomical systems, from which a firmly established number of classes would necessarily be evolved; that each class, moreover, takes its starting-point from below, and consequently that all of them pass parallel to each other"; and that, "as in chemistry, where the combinations follow a definite numerical law, so also in anatomy the organs, in physiology the functions, and in natural history the classes, families, and even genera of minerals, plants, and animals present a similar arithmetical ratio." The *Lehrbuch* procured for Oken the title of *Hofrath*, or court-councillor, and in 1812 he was appointed ordinary professor of the natural sciences.

In 1816 he commenced the publication of his well-known periodical, entitled *Isis, eine encyclopädische Zeitschrift, vorzüglich für Naturgeschichte, vergleichende Anatomie und Physiologie*. In this journal appeared essays and notices not only on the natural sciences but on other subjects of interest; poetry, and even comments on the politics of other German states, were occasionally admitted. This led to representations and remonstrances from the governments criticized or impugned, and the court of Weimar called upon Oken either to suppress the *Isis* or resign his professorship. He chose the latter alternative. The publication of the *Isis* at Weimar was prohibited. Oken made arrangements for its issue at Rudolstadt, and this continued uninterruptedly until the year 1848.

In 1821 Oken promulgated in his *Isis* the first idea of the annual general meetings of the German naturalists and medical practitioners, which happy idea was realized in the following year, when the first meeting was held at Leipzig. The British Association for the Advancement of Science was at the outset avowedly organized after the German or Okenian model.

In 1828 Oken resumed his original humble duties as privat-docent in the newly-established university of Munich, and soon afterwards he was appointed ordinary professor in the same university. In 1832, on the proposal by the Bavarian government to transfer him to a professorship in a provincial university of the state, he resigned his appointments and left the kingdom. He was appointed in 1833 to the professorship of natural history in the then recently-established university of Zurich. There he continued to reside, fulfilling his professional duties and promoting the progress of his favourite sciences, until his death on the 11th of August 1851.

All Oken's writings are eminently deductive illustrations of a foregone and assumed principle, which, with other philosophers of the transcendental school, he deemed equal to the explanation of all the mysteries of nature. According to him, the head was a repetition of the trunk—a kind of second trunk, with its limbs and other appendages; this sum of his observations and comparisons —few of which he ever gave in detail—ought always to be borne in mind in comparing the share taken by Oken in homological anatomy with the progress made by other cultivators of that philosophical branch of the science.

The idea of the analogy between the skull, or parts of the skull, and the vertebral column had been previously propounded and ventilated in their lectures by J. H. F. Autenreith and K. F. Kielmeyer, and in the writings of J. P. Frank. By Oken it was applied chiefly in illustration of the mystical system of Schelling—the "all-in-all" and "all-in-every-part." From the earliest to the latest of Oken's writings on the subject, "the head is a repetition of the whole trunk with all its systems: the brain is the spinal cord; the cranium is the vertebral column; the mouth is intestine and abdomen; the nose is the lungs and thorax; the jaws are the limbs; and the teeth the claws or nails." J. B. von Spix, in his folio *Cephalogenesis* (1818), richly illustrated comparative craniology, but presented the facts under the same transcendental guise; and Cuvier ably availed himself of the extravagances of these disciples of Schelling to cast ridicule on the whole inquiry into those higher relations of parts to the archetype which Sir Richard Owen called "general homologies."

The vertebral theory of the skull had practically disappeared from anatomical science when the labours of Cuvier drew to their close. In Owen's *Archetype and Homologies of the Vertebrate Skeleton* the idea was not only revived but worked out for the first time inductively, and the theory rightly stated, as follows: "The head is not a virtual equivalent of the trunk, but is only a portion, *i.e.* certain modified segments, of the whole body. The jaws are the 'haemal arches' of the first two segments; they are not limbs of the head" (p. 176).

Vaguely and strangely, however, as Oken had blended the idea with his a priori conception of the nature of the head, the chance of appropriating it seems to have overcome the moral sense of Goethe—unless indeed the poet deceived himself. Comparative osteology had early attracted Goethe's attention. In 1786 he published at Jena his essay *Ueber den Zwischenkieferknochen des Menschen und der Thiere*, showing that the intermaxillary bone existed in man as well as in brutes. But not a word in this essay gives the remotest hint of his having then possessed the idea of the vertebral analogies of the skull. In 1820, in his *Morphologie*, he first publicly stated that thirty years before the date of that publication he had discovered the secret relationship between the vertebrae and the bones of the head, and that he had always continued to meditate on this subject. The circumstances under which the poet, in 1820, narrates having become inspired with the original idea are suspiciously analogous to those described by Oken in 1807, as producing the same effect on his mind. A bleached skull is accidentally discovered in both instances: in Oken's it was that of a deer in the Harz forest; in Goethe's it was that of a sheep picked up on the shores of the Lido, at Venice.

It may be assumed that Oken when a privat-docent at Göttingen in 1806 knew nothing of this unpublished idea or discovery of Goethe, and that Goethe first became aware that Oken had the idea of the vertebral relations of the skull when he listened to the introductory discourse in which the young professor, invited by the poet to Jena, selected this very idea for its subject. It is incredible that Oken, had he adopted the idea from Goethe, or been aware of an anticipation by him, should have omitted to acknowledge the source—should not rather have eagerly embraced so appropriate an opportunity of doing graceful homage to the originality and genius of his patron.

The anatomist having lectured for an hour plainly unconscious of any such anticipation, it seems hardly less incredible that the poet should not have mentioned to the young lecturer his previous conception of the vertebro-cranial theory, and the singular coincidence of the accidental circumstance which he subsequently alleged to have produced that discovery. On the contrary, Goethe permits Oken to publish his famous lecture, with the same unconsciousness of any anticipation as when he delivered it; and Oken, in the same state of belief, transmits a copy to Goethe (*Isis*, No. 7) who thereupon honours the professor with special marks of attention and an invitation to his house. No hint of any claim of the host is given to the guest; no word of reclamation in any shape appears for some years. In Goethe's *Tages- und Jahres-Hefte*, he refers to two friends, Reimer and Voigt, as being cognizant in 1807 of his theory. Why did not one or other of these make known to Oken that he had been so anticipated? "I told my friends to keep quiet," writes Goethe in 1825! Spix, in the meanwhile, in 1815, contributes his share to the development of Oken's idea in his *Cephalogenesis*. Ulrich follows in 1816 with his *Schildkrötenschädel*; next appears the contribution, in 1818, by L. H. Bojanus, to the vertebral theory of the skull, amplified in the *Paragon* to that anatomist's admirable *Anatome Testudinis Europaeae* (1821). And now for the first time, in 1818, Bojanus, visiting some friends at Weimar, there hears the rumour that his friend Oken had been anticipated by the great poet. He communicates it to Oken, who, like an honest man, at once published the statement made by Goethe's friends in the *Isis* of that year, offering no reflection on the poet, but restricting himself to a detailed and interesting account of the circumstances under which he himself had been led independently to make his discovery when wandering in 1806 through the Harz. It was enough for him thus to vindicate his own claims; he abstains from any comment reflecting on Goethe, and maintained the same blameless silence when Goethe ventured for the first time to claim for himself, in 1820, the merit of having entertained the same idea, or made the discovery, thirty years previously.

The German naturalists held their annual meeting at Jena in 1836, and there Kieser publicly bore testimony, from personal knowledge, to the circumstances and dates of Oken's discovery. However, in the edition of Hegel's works by Michelet (Berlin, 1842), there appeared the following paragraph: "The type-bone is the dorsal vertebra, provided inwards with a hole and outwards with processes, every bone being only a modification of it. This idea originated with Goethe, who worked it out in a treatise written in 1785, and published it in his *Morphologie* (1820), p. 162. *Oken, to whom the treatise was communicated, has pretended that the idea was his own property, and has reaped the honour of it.*" This accusation again called out Oken, who thoroughly refuted it in an able, circumstantial and temperate statement in part vii. of the *Isis* (1847). Goethe's osteological essay of 1785, the only one he printed in that century, is on a different subject. In the *Morphologie* of 1820–1824 Goethe distinctly declares that he had never published his ideas on the vertebral theory of the skull. He could not, therefore, have sent any such essay to Oken before the year 1807. Oken, in reference to his previous endurance of Goethe's pretensions, states that, "being well aware that his fellow-labourers in natural science thoroughly appreciated the true state of the case, he confided in quiet silence in their judgment. Meckel, Spix, Ulrich, Bojanus, Carus, Cuvier, Geoffroy St Hilaire, Albers, Straus-Durckheim, Owen, Kieser and Lichtenstein had recorded their judgment in his favour and against Goethe. But upon the appearance of the new assault in Michelet's edition of Hegel he could no longer remain silent."

Oken's bold axiom that heat is but a mode of motion of light, and the idea broached in his essay on generation (1805) that "all the parts of higher animals are made up of an aggregate of *Infusoria* or animated globular monads," are both of the same order as his proposition of the head being a repetition of the trunk, with its vertebrae and limbs. Science would have profited no more from the one idea without the subsequent experimental discoveries of H. C. Oersted and M. Faraday, or from the other without the microscopical observations of Robert Brown, J. M. Schleiden and T. Schwann, than from the third notion without the inductive demonstration of the segmental constitution of the skull by Owen. It is questionable, indeed, whether in either case the discoverers of the true theories were excited to their labours, or in any way influenced, by the a priori guesses of Oken; more probable is it that the requisite researches and genuine deductions therefrom were the results of the correlated fitness of the stage of the science and the gifts of its true cultivators at such particular stage.

The following is a list of Oken's principal works: *Grundriss der Naturphilosophie, der Theorie der Sinne, und der darauf gegründeten Classification der Thiere* (1802); *Die Zeugung* (1805); *Abriss der Biologie* (1805); *Beiträge zur vergleichenden-Zoologie, Anatomie und Physiologie* (along with Kieser, 1806–1807); *Ueber die Bedeutung der Schädelknochen* (1807); *Ueber das Universum als Fortsetzung des Sinnensystems* (1808); *Erste Ideen zur Theorie des Lichts, der Finsterniss, der Farben und der Wärme* (1808); *Grundzeichnung des natürlichen Systems der Erze* (1809); *Ueber den Werth der Naturgeschichte* (1809); *Lehrbuch der Naturphilosophie* (1809–1811; 2nd ed., 1831; 3rd ed., 1843; Eng. trans., *Elements of Physiophilosophy*, 1847); *Lehrbuch der Naturgeschichte* (1813, 1815, 1825); *Handbuch der Naturgeschichte zum Gebrauch bei Vorlesungen* (1816–1820); *Naturgeschichte für Schulen* (1821); *Esquisse d'un Système d'Anatomie, de Physiologie, et d'Histoire Naturelle* (1812); *Allgemeine Naturgeschichte* (1833–1842, 14 vols.). He also contributed a large number of papers to the *Isis* and other journals. (R. O.)

OKHOTSK, SEA OF, a part of the western Pacific Ocean, lying between the peninsula of Kamchatka, the Kurile Islands, the Japanese island of Yezo, the island of Sakhalin, and the Amur province of East Siberia. The Sakhalin Gulf and Gulf of Tartary connect it with the Japanese Sea on the west of the island of Sakhalin, and on the south of this island is the La Pérouse Strait.

OKI, a group of islands belonging to Japan, lying due north of the province of Izumo, at the intersection of 36° N. and 133° E. The group consists of one large island called Dogo, and three smaller isles—Chiburi-shima, Nishi-no-shima, and Naka-no-shima—which are collectively known as Dozen. These four islands have a coast-line of 182 m., an area of 130 sq. m., and a population of 63,000. The island of Dogo has two high peaks, Daimanji-mine (2185 ft.) and Omine-yama (2128 ft.). The chief town is Saigo in Dogo, distant about 40 m. from the port of Sakai in Izumo. The name Oki-no-shima signifies "islands in the offing," and the place is celebrated in Japanese history not only because the possession of the islands was much disputed in feudal days, but also because an ex-emperor and an emperor were banished thither by the Hojo regents in the 13th century.

OKLAHOMA (a Choctaw Indian word meaning "red people"), a south central state of the United States of America lying between 33° 35′ and 37° N. lat. and 94° 29′ and 103° W. long. It is bounded N. by Colorado and Kansas; E. by Missouri and Arkansas; S. by Texas, from which it is separated in part by the Red river; and W. by Texas and New Mexico. It has a total area of 70,057 sq. m., of which 643 sq. m. are water-surface. Although the extreme western limit of the state is the 103rd meridian, the only portion W. of the 100th meridian is a strip of land about 35 m. wide in the present Beaver, Texas and Cimarron counties, and formerly designated as "No Man's Land."

Physiography.—The topographical features of the state exhibit considerable diversity, ranging from wide treeless plains in the W. to rugged and heavily wooded mountains in the E. In general terms, however, the surface may be described as a vast rolling plain having a gentle southern and eastern slope. The elevations above the sea range from 4700 ft. in the extreme N.W. to about 350 ft. in the S.E. The southern and eastern slopes are remarkably uniform; between the northern and southern boundaries E. of the 100th meridian there is a general difference in elevation of from 200 to 300 ft., while from W. to E. there is an average decline of about 3 ft. to the mile. The state has a mean elevation of 1300 ft. with 34,930 sq. m. below 1000 ft; 25,400 sq. m. between 1000 and 2000 ft.; 6500 sq. m. between 2000 and 3000 ft.; and 3600 sq. m. between 3000 and 5000 ft.

The western portion of the Ozark Mountains enters Oklahoma near the centre of the eastern boundary, and extends W.S.W. half way across the state in a chain of hills gradually decreasing in height. In the south central part of the state is an elevated tableland known as the Arbuckle Mountains. In its western portion this tableland attains an elevation of about 1350 ft. above the sea and lies about 400 ft. above the bordering plains. At its eastern termination, where it merges with the plains, it has an elevation of about 750 ft. Sixty miles N.W. of this plateau lie the Wichita Mountains, a straggling range of rugged peaks rising abruptly from a level plain. This range extends from Fort Sill north-westward beyond Granite, a distance of 65 m., with some breaks in the second half of this area. The highest peaks are not more than 1500 ft. above the plain, but on account of their steep and rugged slopes they are difficult to ascend. A third group of hills, the Chautauqua Mountains, lie in the W. in Blaine and Canadian counties, their main axis being almost parallel with the North Fork of the Canadian river. With the exception of these isolated clusters of hills the western portion of the state consists almost entirely of rolling prairie. The extreme north-western part of Oklahoma is a lofty tableland forming part of the Great Plains region E. of the Rocky Mountains.

The prairies N. of the Arkansas and W. of the Neosho rivers are deeply carved by small streams, and in the western portion of this area, where the formation consists of alternating shales and sandstones, the easily eroded rocks have been carved into canyons, buttes and mesas. South of the Arkansas river these ledges of sandstone continue as far as Okmulgee, but the evidences of erosion are less noticeable. East of the Neosho river the prairies merge into a hilly woodland. In the N.W. four large salt plains form a striking physical feature. Of these the most noted is the Big Salt Plain of the Cimarron river, in Woodward county, which varies in width from ½ m. to 2 m. and extends along the river for 8 m. The plain is almost perfectly level, covered with snowy-white saline crystals, and contains many salt springs. The other saline areas are the Little Salt Plain, which lies on the Cimarron river, near the Kansas boundary; the Salt Creek Plain, 3 m. long and 100 yds. wide, in Blaine county; and the Salt Fork Plain, 6 m. wide and 8 m. long, so called from its position on the Salt Fork of the Arkansas river.

Following the slope of the land, the important streams flow from N.W. to S.E. The Arkansas river enters the state from the N. near the 97th meridian, and after following a general south-easterly course, leaves it near the centre of the eastern boundary. Its tributaries from the N. and E.—the Verdigris, Grand or Neosho and Illinois—are small and unimportant; but from the S. and W. it receives the waters of much larger streams—the Salt Fork, the Cimarron and the Canadian, with its numerous tributaries. The extreme southern portion of the state is drained by the Red River, which forms the greater part of the southern boundary, and by its tributaries, the North Fork, the Washita and the Kiamichi.

Fauna and Flora.—Of wild animals the most characteristic are the black bear, puma, prairie wolf, timber wolf, fox, deer, antelope, squirrel, rabbit and prairie dog. Hawks and turkey buzzards are common types of the larger birds, and the wild turkey, prairie chicken and quail are the principal game birds. The total woodland area of the state was estimated in 1900 at 24,400 sq. m., or 34·8 % of the land area. The most densely wooded section is the extreme E.; among the prairies of the W. timber is seldom found beyond the banks of streams. The most common trees are the various species of the oak and cedar. The pine is confined to the more mountainous sections of the E., and the black walnut is found among the river bottom lands. These four varieties are of commercial value. Other varieties, most of which are widely distributed, are the ash, pecan, cottonwood, sycamore, elm, maple, hickory, elder, gum, locust and river birch. The prairies are covered with valuable bunch, grama and dropseed grasses; in the extreme N.W. the cactus, sagebrush and yucca, types characteristic of more arid regions, are found.

Climate.—The climate of the state is of a continental type, with great annual variations of temperature and a rainfall which, though generally sufficient for the needs of vegetation, is considerably less than that of the Atlantic Coast or the Mississippi Valley. The western and central portions of the state are in general cooler and dryer than the E., on account of their greater elevation and greater distance from the Gulf Coast. Thus at Beaver, in the extreme N.W., the mean annual temperature is 57° F. and the mean annual rainfall 18·9 in.; while at Lehigh, in the S.E., these figures are respectively 62° and 35·1 in. At Oklahoma City, in the centre of the state, the mean annual temperature is 59°; the mean for the summer (June, July and August) is 78°, with an extreme recorded of 104°; the mean for the winter (December, January and February) is 38°, with an extreme recorded of –17°. At Mangum, in the S.W., the mean annual temperature is 61°; the mean for the summer is 81° and for the winter 41°, while the highest and lowest temperatures ever recorded are respectively 114° and –17°. The mean annual precipitation for the state is 31·7 in.; the variation between the E. and the W. being about 12 in.

Soils.—The prevailing type of soil is a deep dark-red loam, sometimes (especially in the east central part of the state) made up of a decomposed sandstone, and again (in the north central part) made up of shales and decomposed limestone. Not infrequently there are a belt of red sandy loam on uplands N. of a river, a rich deposit of black alluvium on valley bottom lands, a belt of red clay loam on uplands S. of a river, and a deposit of wind-blown loess on the water parting. Loess, often thin and always containing little humus, also covers large areas on the high, semi-arid plains in the western part of the state.

Agriculture and Stock-raising.—For some time before the first opening to settlement by white men in 1899, the territory now embraced in Oklahoma was largely occupied by great herds of cattle driven in from Texas, and since then, although the opening was piecemeal, the agricultural development has been remarkably rapid. By 1900, 22,988,339 acres, or 52·1 %, of the total land surface was included in farms, and 8,574,187 acres, or 37·7 %, of the farm land was improved.[1] The farm land was divided among 108,000 farms containing an average of 212·85 acres; 26,121 of them contained less than 50 acres, but the most usual size was 160 acres; and 48,983, or 45·35 %, contained from 100 to 174 acres. A considerable portion of the larger farms (there were 2390 containing 500 acres or more) were owned by Indians but leased to white men. Much land as late as 1900 was held in common by Indian tribes, but has since been allotted to the members of those tribes and most of it is leased to whites. In 1900, 59,367 (or a little more than one-half of all) farms were worked by owners or part owners, 33,347 were worked by share tenants, and 13,903 were worked by cash tenants. Indian corn, wheat, cotton, oats and hay are the principal crops, but the variety of farm and garden produce is great, and includes Kafir corn, broom corn, barley, rye, buckwheat, flax, tobacco, beans, castor beans, peanuts, pecans, sorghum cane, sugar cane, and nearly all the fruits and vegetables common to the temperate zone; stock-raising, too, is a very important industry. Of the total acreage of all crops in 1900, 4,431,819 acres, or 68·64 %, were of cereals; and of the cereal acreage 56·45 % was of Indian corn, 34·45 % was of wheat and 7·15 % was of oats. The acreage of Indian corn increased from 2,501,945 acres in 1900 to 5,950,000 acres in 1909;[2] between 1899 and 1909 the yield increased from 68,949,300 bushels to 101,150,000 bushels. The acreage of wheat decreased during this period from 1,704,909 acres to 1,225,000 acres, and the yield from 20,328,300 bushels to 15,680,000 bushels. The acreage of oats increased from 317,076 acres to 550,000 acres, and the yield increased from 9,511,340 bushels to 15,950,000 bushels. The hay crop of 1899 was grown on 1,095,706 acres and amounted to 1,617,905 tons, but nearly one-half of this was made from wild grasses; since then the amounts of fodder obtained from alfalfa, Kafir corn, sorghum cane and timothy have much increased, and that obtained from wild grasses has decreased; in 1909 the acreage was 900,000 and the crop 810,000 tons. Except in the W. section, where there is good grazing but generally an insufficient rainfall for growing crops, cattle-raising on the range has in considerable measure given way to stock-raising on the farm, and nearly everywhere the quality of the cattle has been greatly improved. The total number of cattle decreased from 3,236,008 in 1900 to 1,992,000 in 1910, but at the same time the number of dairy cows increased from 276,539 to 355,000. The number of horses increased from 557,153 in 1900 to 804,000 in 1910; of mules from 117,562 to 191,000; of swine from 1,265,189 to 1,302,000; and of sheep from 88,741 to 108,000. Winter wheat is used extensively for pasturage during the winter months with little or no damage to the crop. No other branch of agriculture in Oklahoma has advanced so rapidly as the production of cotton; the culture of this fibre was introduced in 1890, and the acreage increased from 682,743 acres in 1899 to 2,037,000 acres in 1909, and the yield increased from 227,741 bales to 617,000 bales (in 1907 it was 862,383 bales). There was only a very small crop of broom corn in 1889, but in 1899 the crop was 3,565,510 lb. The state has risen to high rank in the production of sorghum cane and castor beans also; in 1899 16,477 acres of the cane yielded 40,259 tons, and 14,070 acres of castor beans yielded 77,409 bushels. Two crops of potatoes may be grown on the same ground in one year, and the acreage of potatoes increased from 15,360 acres in 1899 to 27,000 acres in 1909, and the yield from 1,191,997 bushels to 1,890,000 bushels. Oklahoma is already producing large crops of apples, peaches, grapes, water-melons and musk-melons, and many large apple and peach orchards and vineyards have been planted. Pears, plums, apricots, cherries, strawberries, blackberries, raspberries, currants, gooseberries, cabbages, onions, sweet potatoes, tomatoes and cucumbers are grown in considerable quantities. The cereals and most of the fruits and vegetables are grown throughout the greater portion of the middle and E. parts of the state, although the soil of the N. middle section yields the best crops of wheat. Kafir corn and sorghum cane are the most common in the W. sections, where the climate is too dry for other crops. Some cotton is grown N. of the middle of the state, but the S.E. quarter takes in most of the cotton belt. Broom corn grows best in Woods county on the N. border, and castor beans in the central and N. central sections. About 3000 acres (nearly one-half in the narrow extension in the N.W.) were already irrigated in 1909, and surveys had been made by the Federal Reclamation Service with a view to irrigating about 100,000 acres more—10,000 to 14,000 acres in Beaver and Woodward counties, under the Cimarron project, and 80,000 to 100,000 acres in Kiowa and Comanche counties, under the Red River project.

Lumber and Timber Products.—The merchantable timber is mostly in that part of the state which formerly constituted Indian Territory, and consists largely of black walnut and other valuable hard woods in the bottom lands, of black jack and post oak on the uplands and of pine on the higher elevations S. of the Arkansas river. The manufactured forest products of Indian Territory increased in value from $189,373 in 1900 to $588,078 in 1905, or 205·78 %.

Minerals.—The coal-fields extend from Kansas on the N. to Arkansas on the E., and have an area of about 20,000 sq. m. The principal mining centres are McAlester, Wilburton, Hartshorn, Coalgate and Phillips. In quality the coal varies from a low grade to a high grade bituminous, and some of the latter is good for coking. The output increased from 446,429 short tons in 1885 to 1,922,298 short tons in 1900, and to 2,948,116 short tons in 1908, the output for the last-named year being much less than for 1906 or 1907, when it was over 3,500,000 tons. The range of hills extending from the centre of the state N.W. to and beyond the Kansas border are composed chiefly of great deposits of rock gypsum. A similar but minor range extends parallel with it 40 to 50 m. S.W. There are also deposits in Greer county in the S.W. corner, and some gypsite in Kay county on the N. middle border. For working these extensive deposits there are, however, few mills; these are in Kay, Canadian and Blaine counties. Some petroleum was discovered in the N. part of Indian Territory near the Oklahoma border as early as 1890, but there was little development until 1903, when several wells were drilled in the vicinity of Bartlesville. Then wells were drilled to the W. on the Osage Reservation, and to the S., until in 1906 about 110 wells were drilled into the famous Glen Pool near Sapulpa. One of these wells has a flow of about 1000 barrels a day, and the total product from the Oklahoma oil-field (which includes wells in

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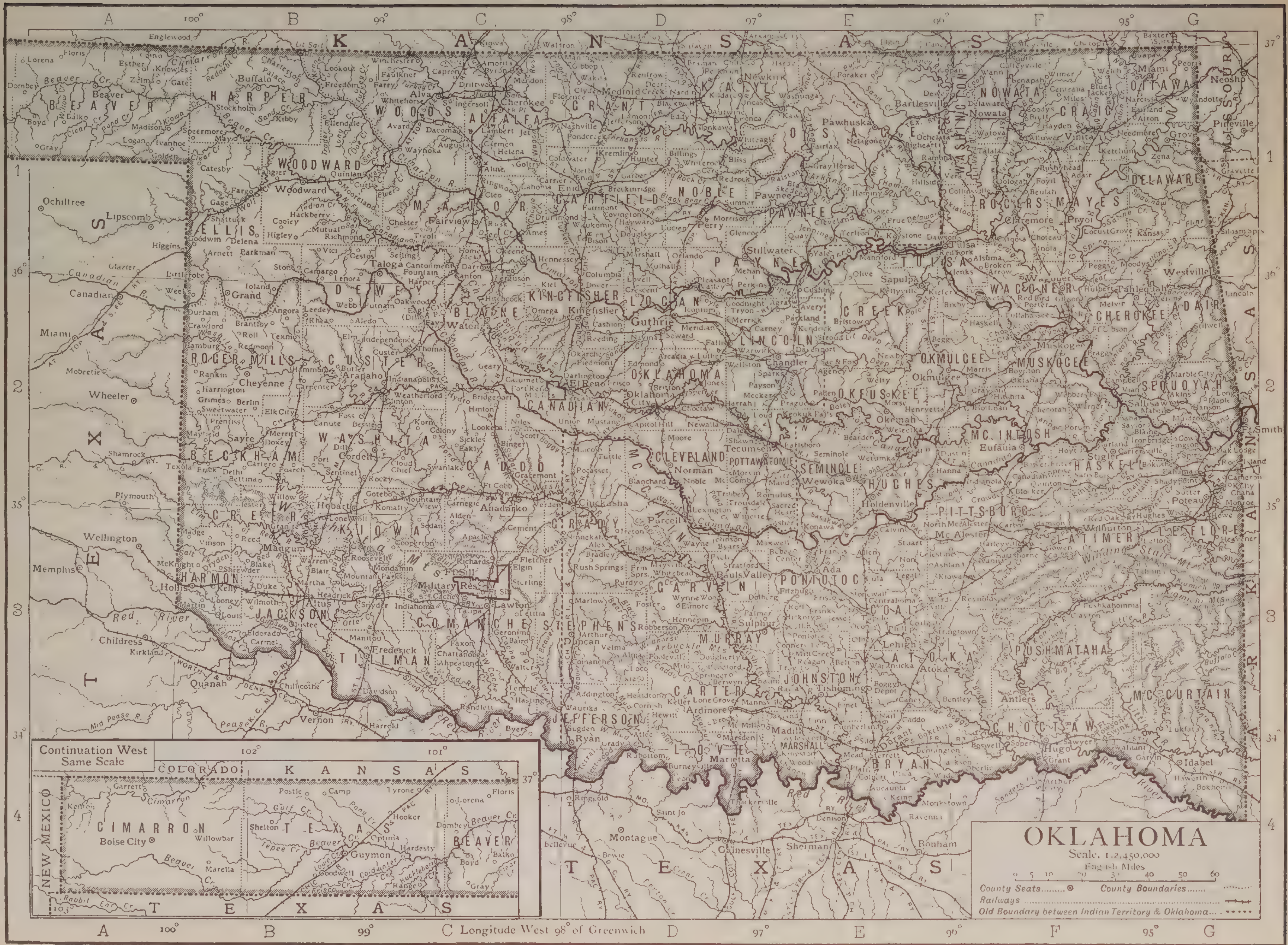
[1] The statistics in this article were obtained by adding to those for Oklahoma those for Indian Territory, which was combined with it in 1907.

[2] The agricultural statistics for 1909 are taken from the *Year-Book* of the United States Department of Agriculture.


OKLAHOMA
Scale, 1:2,450,000
English Miles
0 5 10 20 30 40 50 60
County Seats ⊙
County Boundaries
Railways
Old Boundary between Indian Territory & Oklahoma
Continuation West
Same Scale
CIMARRON
BEAVER
COLORADO
NEW MEXICO
KANSAS
TEXAS
MISSOURI
ARKANSAS
C Longitude West 98° of Greenwich
A B C D E F G
100° 99° 98° 97° 96° 95°
37° 36° 35° 34°
1 2 3 4

other county officers are a treasurer, clerk, register of deeds, attorney, surveyor, sheriff, assessor and superintendent of public instruction. The counties have been divided into municipal townships, each of which elects a trustee, a clerk and a treasurer, who together constitute a board of directors for the management of township affairs. The trustee is also the assessor. Cities or towns having a population of 2000 or more may become cities of the first class whenever a favourable majority vote is obtained at a general or special election held in that city or town, and this question must be submitted at such an election whenever 35% of the legal voters petition for it.

Miscellaneous Laws.—The property rights of husband and wife are practically equal, and either may buy, sell or mortgage real estate, other than the homestead, without the consent of the other. Among the grounds for a divorce are adultery, extreme cruelty, habitual drunkenness, gross neglect of duty and imprisonment for felony. Article XII. of the constitution exempts from forced sale the homestead of any family in the state to the extent of 160 acres of land in the country, or 1 acre in a city, town or village, provided the value of the same does not exceed $5000 and that the claims against it are not for purchase money, improvements or taxes. A corporation commission of three members, elected for a term of six years, is intrusted with the necessary powers for a rigid control of public service corporations. A state board of arbitration, composed of two farmers, two employers and two employés is authorized to investigate the causes of any strike affecting the public interests, and publish what it finds to be the facts in the case, together with recommendations for settlement. Labour laws, passed by the first legislature (1908), were amended and made more radical by the legislature of 1909: a child labour law forbids the employment of children under 14 in factories, workshops, theatres, bowling-alleys, pool-halls, steam-laundries or other dangerous places (to be defined by the commissioner of labour), and no child under 16 is to be employed in such places unless able to read and write simple English sentences or without having attended school during the previous year; no child under 16 is to be employed in any of several (enumerated) dangerous occupations; no child under 16 is to be employed more than 8 hours in any one day, or more than 48 hours in any one week in any gainful occupation other than agriculture or domestic service; age and schooling certificates are required of children between 14 and 16 in certain occupations. A state dispensary system for the sale of intoxicating liquors was authorized by the constitution, but the popular vote in 1908 was unfavourable to the continuance of the system, the sentiment seeming to be for rigid prohibition of the sale of intoxicating liquors. A law passed in May 1908 against nepotism (closely following the Texas law of 1907) forbids public officers to appoint (or vote for) any person related to them by affinity or consanguinity within the third degree to any position in the government of which they are a part; makes persons thus related to public officers ineligible to positions in the branch in which their relative is an official; and renders any official making such an appointment liable to fine and removal from office.

Education.—The common school system is administered by a state superintendent of public instruction, a state board of education, county superintendents and district boards. The state board is composed of the state superintendent, who is president of the board; the secretary of state, who is secretary of the board; the attorney-general and the governor. Each district board is composed of three members elected for a term of three years, one each year. Each district school must be open at least three months each year, and children between the ages of eight and sixteen are required to attend either a public or a private school, unless excused because of physical or mental infirmity. There are separate schools for whites and negroes. In addition to instruction in the ordinary branches, the teaching in the district schools of the elementary principles of agriculture, horticulture, animal husbandry, stock-feeding, forestry, building country roads and domestic science is required. A law of 1908 requires that an agricultural school of secondary grade be established in each of the five supreme court judicial districts, and that an experimental farm be operated in connexion with each; and in 1909 the number of these districts was increased to six. There is a state industrial school for girls, teaching domestic science and the fine arts. The higher institutions of learning established by the state are the Oklahoma Agricultural and Mechanical College, a land grant college with an agricultural experiment station at Stillwater; the Oklahoma School of Mines at Wilburton; the Colored Agricultural and Normal University at Langston; the Central Normal School at Edmond; the North-western Normal School at Alva; the South-western Normal School at Weatherford, Custer county; the South-eastern Normal School at Durant, Bryan county; the East Central Normal School at Ada; the North-eastern Normal School at Tahlequah, Cherokee county; and the University of Oklahoma at Norman. The State University (established in 1892, opened in 1893) embraces a college of arts and sciences, and schools of fine arts, applied science, medicine, mines and pharmacy. In 1907–1908 it had 40 instructors and 790 students. There is a University Preparatory School (1901) at Tonkawa in Kay county, and there are state schools of agriculture at Tishomingo and at Warner. The common schools are in large part maintained out of the proceeds of the school lands (about 1,200,000 acres), which are sections 16 and 36 in each township of that portion of the state which formerly constituted Oklahoma Territory, and a Congressional appropriation of $5,000,000 in lieu of these sections in what was formerly Indian Territory. The university, agricultural and mechanical college and normal schools also are maintained to a considerable extent out of the proceeds of section 13 in several townships. The university owns land valued at $3,670,000. Among the institutions of learning, neither maintained nor controlled by the state, are Epworth University (Methodist Episcopal, 1901) at Oklahoma City, and Kingfisher College at Kingfisher.

Charities and Correctional Institutions.—The state has a hospital for the insane at Fort Supply, the Whitaker Orphans' Home at Pryor Creek, the Oklahoma School for the Blind at Fort Gibson and the Oklahoma School for the Deaf at Sulphur; and the legislature of 1908 appropriated money for the East Oklahoma Hospital for the Insane at Vinita, a School for the Feeble-Minded at Enid, a State Training School for Boys at Wynnewood and a State Reformatory (at Granite, Greer county) for first-time convicts between the ages of sixteen and twenty-five. Under the constitution the supervision and inspection of charities and institutions of correction is in the hands of a State Commissioner of Charities and Corrections, elected by the people. The commissioner must inspect once each year all penal, correctional and eleemosynary institutions, including public hospitals, jails, poorhouses and corporations and organizations doing charitable work; and the commissioner appears as next friend in cases affecting the property of orphan minors, and has power to investigate complaints against public and private institutions whose charters may be revoked for cause by the commissioner. By act of legislature a State Board of Public Affairs was created; it is made of five members appointed by the governor, with charge of the fiscal affairs of all state institutions. Convicts were sent to the state penitentiary of Kansas until January 1909, when it was charged that they were treated cruelly there; in 1909 work was begun on a penitentiary at McAlester.

Banking and Finance.—The unique feature of the banking system (with amendments adopted by the second legislature becoming effective on the 11th of June 1909) is a fund for the guaranty of deposits. The state banking board, which is composed of the governor, lieutenant-governor, president of the board of agriculture, state treasurer and state auditor, levies against the capital stock of each state bank and trust company, organized or existing, under the laws of the state to create a fund equal to 5% of average daily deposits other than the deposits of state funds properly secured. One-fifth of this fund is payable the first year and one-twentieth each year thereafter; 1% of the increase in average deposits is collected each year. Emergency assessments, not to exceed 2%, may be made whenever necessary to pay in full the depositors in an insolvent bank; if the guaranty fund is impaired to such a degree that it is not made up by the 2% emergency assessment, the state banking board issues certificates of indebtedness which draw 6% interest and which are paid out of the assessment. Any national bank may secure its depositors in this manner if it so desires. The bank guarantee law was held to be valid by the United States Supreme Court in 1908 after the attorney-general of the United States had decided that it was illegal.

The revenue for state and local purposes is derived chiefly from taxes. The constitutional limit on the state tax levy is 3½ mills on a dollar, and legislation has fixed the limit of the county levy at 5 mills, of the levy in cities at 7, in incorporated towns at 5, in townships at 3, and in school districts at 5. There is a tax on the gross receipts of corporations, a graduated land tax on all holdings exceeding 640 acres, a tax on income exceeding $3500, and a tax on gifts and inheritances. The aggregate amount of indebtedness which the state may have at any time is limited by the constitution to $400,000, save when borrowing is necessary to repel an invasion, suppress an insurrection or defend the state in war.

History.—With the exception of the narrow strip N. of the most N. section of Texas the territory comprising the present state of Oklahoma was set apart by Congress in 1834, under the name of Indian Territory, for the possession of the five southern tribes (Cherokees, Creeks, Seminoles, Choctaws and Chickasaws) and the Quapaw Agency. Early in 1809 some Cherokees in the south-eastern states made known to President Jefferson their desire to remove to hunting grounds W. of the Mississippi, and at first they were allowed to occupy lands in what is now Arkansas, but by a new arrangement first entered into in 1828 they received instead, in 1838, a patent for a wide strip extending along the entire N. border of Indian Territory with the exception of the small section in the N.E. corner which was reserved to the Quapaw Agency. By treaties negotiated in 1820, 1825, 1830 and 1842 the Choctaws received for themselves and the Chickasaws a patent for all that portion of the territory which lies S. of the Canadian and Arkansas rivers, and by treaties negotiated in 1824, 1833 and 1851 the Creeks received for themselves and the Seminoles a patent for the remaining or middle portion. Many of the Indians of these tribes brought slaves with them from the Southern states and during the Civil War they supported the Confederacy, but when that war was over the Federal government demanded not only the liberation of the slaves but new treaties, partly on the ground that the tribal lands must be divided with the freedmen. By these treaties, negotiated in 1866, the Cherokees gave the United States permission to settle other Indians on what was approximately the western half of their domain; the Seminoles, to whom the Creeks in 1855 had granted as their portion the strip between the Canadian river and its North Fork, ceded all of theirs, and the Creeks, Choctaws and Chickasaws ceded the western half of theirs back to the United States for occupancy by freedmen or other Indians. In the E. portion of the lands thus placed at its disposal by the Cherokees and the Creeks the Federal government within the next seventeen years made a number of small grants as follows: to the Seminoles in 1866, to the Sauk and Foxes in 1867, to the Osages, Kansas, Pottawatomies, Absentee Shawnees and Wichitas in 1871–1872, to the Pawnees in 1876, to the Poncas and Nez Percés in 1878, to the Otoes and Missouris in 1881, and to the Iowas and Kickapoos in 1883; in the S.W. quarter of the Territory, also, the Kiowas, Comanches and Apaches were located in 1867 and the Cheyennes and Arapahoes in 1869. There still remained unassigned the greater part of the Cherokee Strip besides a tract embracing 1,887,800 acres of choice land in the centre of the Territory, and the agitation for the opening of this to settlement by white people increased until in 1889 a complete title to the central tract was purchased from the Creeks and Seminoles. Soon after the purchase President Benjamin Harrison issued a proclamation announcing that this land would be opened to homestead settlement at twelve o'clock noon, on the 22nd of April 1889. At that hour no less than 20,000 people were on the border, and when the signal was given there ensued a remarkably spectacular race for homes. In the next year that portion of Indian Territory which lay S. of the Cherokee Strip and W. of the lands occupied by the five tribes, together with the narrow strip N. of Texas which had been denied to that state in 1850, was organized as the Territory of Oklahoma. In the meantime negotiations were begun for acquiring a clear title to the unoccupied portion of the Cherokee Strip, for individual allotments to the members of the several small tribes who had received tribal allotments since 1866, and for the purchase of what remained after such individual allotments had been made. As these negotiations were successful most of the land between the tract first opened and that of the Creeks was opened to settlement in 1891, a large tract to the W. of the centre was opened in 1892, a tract S. of the Canadian river and W. of the Chickasaws was opened in 1902, and by 1904 the entire Territory had been opened to settlement with the exception of a tract in the N.E. which was occupied by the Osages, Kaws, Poncas and Otoes. By the treaties with the five southern tribes they were to be permitted to make their own laws so long as they preserved their tribal relations, but since the Civil War many whites had mingled with these Indians, gained control for their own selfish ends of such government as there was, and made the country a refuge for fugitives from justice. Consequently, in 1893, Congress appointed the Dawes Commission to induce the tribes to consent to individual allotments as well as to a government administered from Washington, and in 1898 the Curtis Act was passed for making such allotments and for the establishment of a territorial government. When the allotments were nearly all made Congress in 1906 authorized Oklahoma and Indian Territories to qualify for admission to the Union as one state. As both Territories approved, a constitutional convention (composed of 100 Democrats and 12 Republicans) met at Guthrie on the 20th of November 1906. The constitution framed by this body was approved by the electorate on the 17th of September 1907, and the state was admitted to the Union on the 16th of November.

Governors of Oklahoma—Territorial.

George W. Steele	1890–1891
Robert Martin (acting)	1891–1892
Abraham J. Seay	1892–1893
William Cary Renfrow	1893–1897
Cassius McDonald Barnes	1897–1901
William M. Jenkins	1901
Thompson B. Ferguson	1901–1906
Frank Frantz	1906–1907
State.	
Charles Nathaniel Haskell, Democrat	1907–1911
Lee Cruce, Democrat	1911–

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OKLAHOMA CITY, a city and the county-seat of Oklahoma County, Oklahoma, U.S.A., on the North Fork of the Canadian river, near the geographical centre of the state. Pop. (1890) 4151; (1900) 10,037; (1907) 32,452; (1910) 64,205. It is served by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Missouri, Kansas & Texas, and the St Louis & San Francisco railways, and by inter-urban electric lines. It lies partly in a valley, partly on an upland, in a rich agricultural region. The city is the seat of Epworth University (founded in 1901 by the joint action of the Methodist Episcopal Church and the Methodist Episcopal Church, South). Oklahoma City's prosperity is due chiefly to its jobbing trade, with an extensive farming and stock-raising region, but it has also cotton compresses and cotton gins, and various manufactures. The total value of the factory products in 1905 was $3,670,730. Natural gas is largely used as a fuel. A large settlement was established here on the 22nd of April 1889, the day on which the country was by proclamation declared open for settlement. The city was chartered in 1890.

OKUBO TOSHIMITSU (1830–1878), Japanese statesman, a samurai of Satsuma, was one of the five great nobles who led the revolution in 1868 against the shogunate. He became one of the mikado's principal ministers, and in the Satsuma troubles which followed he was the chief opponent of Saigo Takamori. But the suppression of the Satsuma rebellion brought upon him the personal revenge of Saigo's sympathizers, and in the spring of 1878 he was assassinated by six clansmen. Okubo was one of the leading men of his day, and in 1872 was one of the Japanese mission which was sent round the world to get ideas for organizing the new régime.

OKUMA (SHIGENOBU), Count (1838–), Japanese statesman, was born in the province of Hizen in 1838. His father was an officer in the artillery, and during his early years his education consisted mainly of the study of Chinese literature. Happily for him, however, he was able to acquire in his youth a knowledge of English and Dutch, and by the help of some missionaries he succeeded in obtaining books in those languages on both scientific and political subjects. These works effected a complete revolution in his mind. He had been designed by his parents for the military profession, but the new light which now broke in upon him determined him to devote his entire energies to the abolition of the existing feudal system and to the establishment of a constitutional government. With impetuous zeal he urged his views on his countrymen, and though he took no active part in the revolution of 1868, the effect of his opinions exercised no slight weight in the struggle. Already he was a marked man, and no sooner was the government reorganized, with the mikado as the sole wielder of power, than he was appointed chief assistant in the department of foreign affairs. In 1869 he succeeded to the post of secretary of the joint departments of the interior and of finance, and for the next fourteen years he devoted himself wholly to politics. In 1870 he was made a councillor of state, and a few months later he accepted the office of president of the commission which represented the Japanese government at the Vienna Exhibition. In 1872 he was again appointed minister of finance, and when the expedition under General Saigô was sent to Formosa (1874) to chastise the natives of that island for the murder of some shipwrecked fishermen, he was nominated president of the commission appointed to supervise the campaign. By one of those waves of popular feeling to which the Japanese people are peculiarly liable, the nation which had supported him up to a certain point suddenly veered round and opposed him with heated violence. So strong was the feeling against him that on one occasion a would-be assassin threw at him a dynamite shell, which blew off one of his legs. During the whole of his public life he recognized the necessity of promoting education. When he resigned office in the early 'eighties he established the Semmon Gako, or school for special studies, at the cost of the 30,000 yen which had been voted him when he received the title of count, and subsequently he was instrumental in founding other schools and colleges. In 1896 he joined the Matsukata cabinet, and resigned in the following year in consequence of intrigues which produced an estrangement between him and the prime minister. On the retirement of Marquis Ito in 1898 he again took office, combining the duties of premier with those of minister of foreign affairs. But dissensions having arisen in the cabinet, he resigned a few months later, and retired into private life, cultivating his beautiful garden at Waseda near Tôkyô.

OLAF, the name of five kings of Norway.

Olaf I. Tryggvessön (969–1000) was born in 969, and began his meteoric career in exile. It is even said that he was bought as a slave in Esthonia. After a boyhood spent in Novgorod under the protection of King Valdemar, Olaf fought for the emperor Otto III. under the Wendish king Burislav, whose daughter he had married. On her death he followed the example of his countrymen, and harried in France and the British Isles, till, in a good day for the peace of those countries, he was converted to Christianity by a hermit in the Scilly Islands, and his marauding expeditions ceased since he would not harry those of his new faith. In England he married Gyda, sister of Olaf Kvaran, king of Dublin, and it was only after some years spent in administering her property in England and Ireland that he set sail for Norway, fired by reports of the unpopularity of its ruler Earl Haakon. Arriving in Norway in the autumn of 995, he was unanimously accepted as king, and at once set about the conversion of the country to Christianity, undeterred by the obstinate resistance of the people. It has been suggested that Olaf's ambition was to rule a united, as well as a Christian, Scandinavia, and we know that he made overtures of marriage to Sigrid, queen of Sweden, and set about adding new ships to his fleet, when negotiations fell through owing to her obstinate heathenism. He made an enemy of her, and did not hesitate to involve himself in a quarrel with King Sveyn of Denmark by marrying his sister Thyre, who had fled from her heathen husband Burislav in defiance of her brother's authority. Both his Wendish and his Irish wife had brought Olaf wealth and good fortune, but Thyre was his undoing, for it was on an expedition undertaken in the year 1000 to wrest her lands from Burislav that he was waylaid off the island Svöld, near Rügen, by the combined Swedish and Danish fleets, together with the ships of Earl Haakon's sons. The battle ended in the annihilation of the Norwegians. Olaf fought to the last on his great vessel, the "Long Snake," the mightiest ship in the North, and finally leapt overboard and was no more seen. Full of energy and daring, skilled in the use of every kind of weapon, genial and open-handed to his friends, implacable to his enemies, Olaf's personality was the ideal of the heathendom he had trodden down with such reckless disregard of his people's prejudices, and it was no doubt as much owing to the popularity his character won for him as to the strength of his position that he was able to force his will on the country with impunity. After his death he remained the hero of his people, who whispered that he was yet alive and looked for his return. "But however that may be," says the story, "Olaf Tryggvessön never came back to his kingdom in Norway."

Olaf (II.) Haraldssön (995–1030), king from 1016–1029, called during his lifetime "the Fat," and afterwards known as St Olaf, was born in 995, the year in which Olaf Tryggvessön came to Norway. After some years' absence in England, fighting the Danes, he returned to Norway in 1015 and declared himself king, obtaining the support of the five petty kings of the Uplands. In 1016 he defeated Earl Sveyn, hitherto the virtual ruler of Norway, at the battle of Nesje, and within a few years had won more power than had been enjoyed by any of his predecessors on the throne. He had annihilated the petty kings of the South, had crushed the aristocracy, enforced the acceptance of Christianity throughout the kingdom, asserted his suzerainty in the Orkney Islands, had humbled the king of Sweden and married his daughter in his despite, and had conducted a successful raid on Denmark. But his success was short-lived, for in 1029 the Norwegian nobles, seething with discontent, rallied round the invading Knut the Great, and Olaf had to flee to Russia. On his return a year later he fell at the battle of Stiklestad, where his own subjects were arrayed against him. The succeeding years of disunion and misrule under the Danes explain the belated affection with which his countrymen came to regard him. The cunning and cruelty which marred his character were forgotten, and his services to his church and country remembered. Miracles were worked at his tomb, and in 1164 he was canonized and was declared the patron saint of Norway, whence his fame spread throughout Scandinavia and even to England, where churches are dedicated to him. The Norwegian order of knighthood of St Olaf was founded in 1847 by Oscar I., king of Sweden and Norway, in memory of this king.

The three remaining Norwegian kings of this name are persons of minor importance (see Norway: *History*).

OLAF, or Anlaf (d. 981), king of the Danish kingdoms of Northumbria and of Dublin, was a son of Sitric, king of Deira, and was related to the English king Æthelstan. As his name indicates he was of Norse descent, and he married a daughter of Constantine II., king of the Scots. When Sitric died about 927 Æthelstan annexed Deira, and Olaf took refuge in Scotland and in Ireland until 937, when he was one of the leaders of the formidable league of princes which was destroyed by Æthelstan at the famous battle of Brunanburh. Again he sought a home among his kinsfolk in Ireland, but just after Æthelstan's death in 940 he or Olaf Godfreyson was recalled to England by the Northumbrians. Both crossed over, and in 941 the new English king, Edmund, gave up Deira to the former. The peace between the English and the Danes did not, however, last long. Wulfstan, archbishop of York, sided with Olaf; but in 944 this king was driven from Northumbria by Edmund, and crossing to Ireland he ruled over the Danish kingdom of Dublin. From 949 to 952 he was again king of Northumbria, until he was expelled once more, and he passed the remainder of his active life in warfare in Ireland. But in 980 his dominion was shattered by the defeat of the Danes at the battle of Tara. He went to Iona, where he died probably in 981, although one account says he was in Dublin in 994. This, however, is unlikely. In the sagas he is known as Olaf the Red.

This Olaf must not be confused with his kinsman and ally, Olaf (d. 941), also king of Northumbria and of Dublin, who was a son of Godfrey, king of Dublin. The latter Olaf became king of Dublin in 934; but he was in England in 937, as he took part in the fight at Brunanburh. After this event he returned to Ireland, but he appears to have acted for a very short time as joint king of Northumbria with Olaf Sitricson. It is possible that he was the "Olaf of Ireland" who was called by the Northumbrians after Æthelstan's death, but both the Olafs appear to have accepted the invitation. He was killed in 941 at Tyningham near Dunbar.

See W. F. Skene, *Celtic Scotland*, vol. i. (1876), and J. R. Green, *The Conquest of England*, vol. i. (1899).

ÖLAND, an island in the Baltic Sea, next to Gotland the largest belonging to Sweden, stretching for 85 m. along the east coast of the southern extremity of that country, from which it is separated by Kalmar Sound which is from 5 to 15 m. broad. The greatest breadth of the island is 10 m., and its area 519 sq. m. Pop. (1900) 30,408. Consisting for the most part of Silurian limestone, and thus forming a striking contrast to the mainland with its granite and gneiss, Öland is further remarkable on account of the peculiarities of its structure. Down the west side for a considerable distance runs a limestone ridge, rising usually in terraces, but at times in steep cliffs, to an extreme height of 200 ft.; and along the east side there is a parallel ridge of sand, resting on limestone, never exceeding 90 ft. These ridges, known as the Western and Eastern Landborgar, are connected towards the north and the south by belts of sand and heath; and the hollow between them is occupied by a desolate and almost barren tract: the southern portion, or Alfvar (forming fully half of the southern part of the island), presents a surface of bare red limestone scored by superficial cracks and unfathomed fissures, and calcined by the heat refracted from the surrounding heights. The northern portion is covered at best with a copse of hazel bushes. Outside the ridges, however, Öland has quite a different aspect, the hillsides being not infrequently clothed with clumps of trees, while the narrow strip of alluvial coast-land, with its cornfields, windmills, villages and church towers, appears fruitful and prosperous. There are a few small streams in the island; and one lake, Hornsjö, about 3 m. long, deserves mention. Of the fir woods which once clothed a considerable area in the north the Böda crown-park is the only remnant. Grain, especially barley, and sandstone, are exported from the island, and there are cement works. A number of monuments of unknown age exist, including stones (*stensättningar*) arranged in groups to represent ships. The only town is Borgholm, a watering-place on the west coast, with one of the finest castle ruins in Sweden. The town was founded in 1817, but the castle, dating at least from the 13th century, was one of the strongest fortresses, and afterwards, as erected by the architect Nicodemus Tessin the elder (1615–1681), one of the most stately palaces in the country. The island was joined in 1824 to the administrative district (*län*) of Kalmar. Its inhabitants were formerly styled Öningar, and show considerable diversity of origin in the matter of speech, local customs and physical appearance.

From the raid of Ragnar Lodbrok's sons in 775 Öland is frequently mentioned in Scandinavian history, and especially as a battleground in the wars between Denmark and the northern kingdoms. In the middle ages it formed a separate legislative and administrative unity.

OLAUS MAGNUS, or Magni (Magnus, *i.e. Stora*, great, being the family name, and not a personal epithet), Swedish ecclesiastic and author, was born at Linköping in 1490 and died at Rome in 1558. Like his elder brother, Johannes Magnus, he obtained several ecclesiastical preferments (a canonry at Upsala and at Linköping, and the archdeaconry of Strengnes), and was employed on various diplomatic services (such as a mission to Rome, from Gustavus I., to procure the appointment of Johannes Magnus as archbishop of Upsala); but on the success of the reformation in Sweden his attachment to the old church led him to accompany his brother into exile. Settling at Rome, from 1527, he acted as his brother's secretary, and ultimately became his successor in the (now titular) archbishopric of Upsala. Pope Paul III., in 1546, sent him to the council of Trent; later, he became canon of St Lambert in Liége; King Sigismund I. of Poland also offered him a canonry at Posen; but most of his life, after his brother's death, seems to have been spent in the monastery of St Brigitta in Rome, where he subsisted on a pension assigned him by the pope. He is best remembered as the author of the famous *Historia de Gentibus Septentrionalibus* (Rome, 1555), a work which long remained for the rest of Europe the chief authority on Swedish matters and is still a valuable repertory of much curious information in regard to Scandinavian customs and folk-lore.

The *Historia* was translated into Italian (Venice, 1565), German (Strassburg, 1567), English (London, 1658) and Dutch (Amsterdam, 1665); abridgments of the work appeared also at Antwerp (1558 and 1562), Paris (a French abridged version, 1561), Amsterdam (1586), Frankfort (1618) and Leiden (1652). Olaus also wrote a *Tabula terrarum septentrionalium* . . . (Venice, 1539).

OLBERS, HEINRICH WILHELM MATTHIAS (1758–1840), German astronomer, was born on the 11th of October 1758 at Arbergen, a village near Bremen, where his father was minister. He studied medicine at Göttingen, 1777–1780, attending at the same time Kaestner's mathematical course; and in 1779, while watching by the sick-bed of a fellow-student, he devised a method of calculating cometary orbits which made an epoch in the treatment of the subject, and is still extensively used. The treatise containing this important invention was made public by Baron von Zach under the title *Ueber die leichteste und bequemste Methode die Bahn eines Cometen zu berechnen* (Weimar, 1797). A table of eighty-seven calculated orbits was appended, enlarged by Encke in the second edition (1847) to 178, and by Galle in the third (1864) to 242. Olbers settled as a physician in Bremen towards the end of 1781, and practised actively for above forty years, finally retiring on the 1st of January 1823. The greater part of each night (he never slept more than four hours) was meantime devoted to astronomy, the upper portion of his house being fitted up as an observatory. He paid special attention to comets, and that of 1815 (period seventy-four years) bears his name in commemoration of its detection by him. He also took a leading part in the discovery of the minor planets, re-identified Ceres on the 1st of January 1802, and detected Pallas on the 28th of March following. His bold hypothesis of their origin by the disruption of a primitive large planet (*Monatliche Correspondenz*, vi. 88), although now discarded, received countenance from the finding of Juno by Harding, and of Vesta by himself, in the precise regions of Cetus and Virgo where the nodes of such supposed planetary fragments should be situated. Olbers was deputed by his fellow-citizens to assist at the baptism of the king of Rome on the 9th of June 1811, and he was a member of the *corps législatif* in Paris 1812–1813. He died on the 2nd of March 1840, at the age of eighty-one. He was twice married, and one son survived him.

See *Biographische Skizzen verstorbener Bremischer Aerzte*, by Dr G. Barkhausen (Bremen, 1844); *Allgemeine geographische Ephemeriden*, iv. 283 (1799); *Abstracts Phil. Trans.* iv. 268 (1843); *Astronomische Nachrichten*, xxii. 265 (Bessel), also appended to A. Erman's *Briefwechsel zwischen Olbers und Bessel* (2 vols., Leipzig, 1852); *Allgemeine Deutsche Biographie* (S. Günther); R. Grant, *Hist. of Phys. Astr.* p. 239; R. Wolf, *Geschichte der Astronomie*, p. 517. The first two volumes of Dr C. Schilling's exhaustive work, *Wilhelm Olbers, sein Leben und seine Werke*, appeared at Berlin in 1894 and 1900, a third and later volume including his personal correspondence and biography. A list of Olbers's contributions to scientific periodicals is given at p. xxxv of the 3rd ed. of his *Leichteste Methode*, and his unique collection of works relating to comets now forms part of the Pulkowa library.

OLBIA, the chief Greek settlement in the north-west of the Euxine. It was generally known to the Greeks of Hellas as Borysthenes, though its actual site was on the right bank of the Hypanis (Bug) 4 m. above its junction with the estuary of the Borysthenes river (Dnieper). Eusebius says that it was founded from Miletus *c.* 650 B.C., a statement which is borne out by the discovery of Milesian pottery of the 7th century. It first appears as enjoying friendly relations with its neighbours the Scythians and standing at the head of trade routes leading far to the north-east (Herodotus iv.). Its wares also penetrated northward. It exchanged the manufactures of Ionia and, from the 5th century, of Attica for the slaves, hides and corn of Scythia. Changes of the native population (see Scythia) interrupted this commerce, and the city was hard put to it to defend itself against the surrounding barbarians. We know of these difficulties and of the democratic constitution of the city from a decree in honour of Protogenes in the 3rd century B.C. (*C.I.G.* ii. 2058, *Inscr. Or. Septent. Pont. Euxin.* i. 16). In the following century it fell under the suzerainty of Scilurus, whose name appears on its coins, and when his power was broken by Mithradates VI. the Great, of Pontus, it submitted to the latter. About 50 B.C. it was entirely destroyed by the Getae and lay waste for many years. Ultimately at the wish of, and, to judge by the coins, under the protection of the natives themselves, it was restored, but Dio Chrysostom (*Or.* xxxvi.), who visited it about A.D. 83, gives a curious picture of its poor state. During the 2nd century A.D. it prospered better with Roman support and was quite flourishing from the time of Septimius Severus, when it was incorporated in Lower Moesia, to 248, when its coins came to an end, probably owing to its sack by the Goths. It was once more restored in some sort and lingered on to an unknown date. Excavations have shown the position of the old Greek walls and of those which enclosed the narrower site of the Roman city, an interesting Hellenistic house, and cemeteries of various dates. The principal cult was that of Achilles Pontarches, to whom the archons made dedications. It has another centre at Leuce (Phidonisi) and at various points in the north Euxine. Secondary was that of Apollo Prostates, the patron of the strategi; but the worship of most of the Hellenic deities is testified to in the inscriptions. The coinage begins with large round copper pieces comparable only to the Roman *aes grave* and smaller pieces in the shape of dolphins; these both go back into the 6th century B.C. Later the city adopted silver and gold coins of the Aeginetic standard.

See E. H. Minns, *Scythians and Greeks* (Cambridge, 1909); V. V. Latyshev, *Olbia* (St Petersburg, 1887, in Russian). For inscriptions, Boeckh, *C.I.G.* vol. ii.; V. V. Latyshev, *Inscr. Orae Septent. Ponti Euxini*, vols. i. and iv. For excavations, Reports of B. V. Pharmakovsky in *Compte rendu de la Comm. imp. archéolog.* (St Petersburg, 1901 sqq.), and *Bulletin* of the same, Nos. 8, 13, &c., summarized in *Archäologischer Anzeiger* (1903 sqq.). (E. H. M.)

OLBIA (Gr. ὀλβία, *i.e.* happy; mod. Terranova Pausania, *q.v.*), an ancient seaport city of Sardinia, on the east coast. The name indicates that it was of Greek origin, and tradition attributes its foundation to the Boeotians and Thespians under Iolaus (see SARDINIA). Pais considers that it was founded by the Phocaeans of Massilia before the 4th century B.C. (in Tamponi, *op. cit.* p. 83). It is situated on low ground, at the extremity of a deep recess, now called the Golfo di Terranova. It was besieged unsuccessfully by L. Cornelius Scipio in 259 B.C. Its territory was ravaged in 210 B.C. by a Carthaginian fleet. In Roman times it was the regular landing-place for travellers from Italy. Cicero notes the receipt of a letter from his brother from Olbia in 56 B.C., and obviously shared the prevailing belief as to the unhealthiness of Sardinia. Traces of the pre-Roman city have not been found. The line of the Roman city walls has been determined on the N. and E., the N.E. angle being at the ancient harbour, which lay to the N. of the modern (*Notizie degli Scavi*, 1890, p. 224). Among the inscriptions are two tombstones, one of an imperial freedwoman,[1] the other of a freedman of Acte, the concubine of Nero; a similar tombstone was also found at Carales, and tiles bearing her name have been found in several parts of the island, but especially at Olbia, where in building a modern house in 1881 about one thousand were discovered. Pais (*op. cit.* 89 sqq.) attributes to Olbia an inscription now in the Campo Santo at Pisa, an epistyle bearing the words "Cereri sacrum Claudia Aug. lib. Acte," and made of Sardinian (?) granite. In any case it is clear that Acte must have had considerable property in the island (*Corp. Inscr. Lat.* x. 7980). Discoveries of buildings and tombs have frequently occurred within the area of the town and in its neighbourhood. Some scanty remains of an aqueduct exist outside the town, but hardly anything else of antiquity is to be seen *in situ*. A large number of milestones, fifty-one in all, with inscriptions, and several more with illegible ones, belonging to the first twelve miles of the Roman road between Olbia and Carales, have been discovered, and are now kept in the church of S. Simplicio (*Notizie degli Scavi*, 1888, p. 535; 1889, p. 258; 1892, pp. 217, 366; *Classical Review*, 1889, p. 228; 1890, p. 65; P. Tamponi, *Silloge Epigrafica, Olbiense*, Sassari, 1895). This large number may be accounted for by the fact that a new stone was often erected for a new emperor. They range in date from A.D. 245 to 375 (one is possibly of Domitian). The itineraries state that the main road from Carales to Olbia ran through the centre of the island to the east of Gennargentu (see SARDINIA); but a branch certainly diverged from the main road from Carales to Turris Libisonis (which kept farther west, more or less along the line followed by the modern railway) and came to Olbia. The distance by both lines is much the same; and all these milestones belong to the last portion which was common to both roads. (T. As.)

OLD-AGE PENSIONS. The provision of annuities for aged poor by the state was proposed in England in the 18th century—*e.g.* by Francis Maseres, cursitor baron of the Exchequer, in 1772, and by Mr Mark Rolle, M.P., in 1787. Suggestions for subsidizing friendly societies have also been frequent—*e.g.* by T. Paine in 1795, tentatively in Sturges Bourne's Report on the Poor Laws, 1817, and by Lord Lansdowne in 1837. The subject again became prominent in the latter part of the 19th century. Canon Blackley, who started this movement, proposed to compel every one to insure with a state department against sickness and old age, and essentially his scheme was one for the relief of the ratepayers and a more equitable readjustment of the poor-rate. The terms provisionally put forward by him required that every one in youth should pay £10, in return for which the state was to grant 8s. a week sick allowance and 4s. pension after seventy. These proposals were submitted to the Select Committee on National Provident Insurance, 1885–1887. This body reported unfavourably, more especially on the sick insurance part of the scheme, but the idea of old-age pension survived, and was taken up by the National Provident League, of which Mr (afterwards Sir) J. Rankin, M.P., was chairman. The subject was discussed in the constituencies and expectation was aroused. An unofficial parliamentary committee was formed, with Mr J. Chamberlain as chairman. This committee published proposals in March 1892, which show a very interesting change of attitude on the part of the promoters. Compulsion, which at the earlier period had found favour with Canon Blackley, Sir J. Rankin and even Mr Chamberlain, was no longer urged. The annuitant was no longer required to pay a premium adequate to the benefits promised, as in Canon Blackley's proposal. The benefit was no longer a pure annuity, but premiums were, in certain cases, returnable, and allowances were provided for widows, children (if any) and for the next of kin. Canon Blackley's professed object was to supersede the friendly societies, which, he alleged, were more or less insolvent; a proposal was now introduced to double every half-crown of pension derived by members from their friendly societies. This suggestion was criticized, even by supporters of the principle of state aid, on the ground that unless a pension was gratuitous, the class from which pauperism is really drawn could not profit by it. Mr Charles Booth in particular took this line. He accordingly proposed that there should be a general endowment of old age, 5s. a week to every one at the age of sixty-five. This proposal was calculated to involve an expenditure of £18,000,000 for England and Wales and £24,000,000 for the United Kingdom, exclusive of the cost of administration. While Mr Booth severely criticized the weak points of the contributory and voluntary schemes, their most influential advocate, Mr Chamberlain, did not spare Mr Booth's proposals. Speaking at Highbury, for instance, on the 24th of May 1899, he described Mr Booth's universal scheme as "a gigantic system of out-door relief for every one, good and bad, thrifty and unthrifty, the waster, drunkard and idler, as well as the industrious," and very forcibly stated his inability to support it.

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[1] The freedwoman had been a slave of Acte before passing into the property of the emperor, and took the cognomen *Acteniana*—a practice which otherwise only occurs in the case of slaves of citizens of the highest rank or of foreign kings.

In 1893 Mr Gladstone referred the whole question to a royal commission (Lord Aberdare, chairman). A majority report, adverse to the principle of state pensions, was issued in 1895. A minority report, signed by Mr Chamberlain and others, dissented, mainly on the ground that public expectation would be disappointed if nothing was done. In 1896 Lord Salisbury appointed a committee "of experts" (Lord Rothschild, chairman) to report on schemes submitted, and, if necessary, to devise a scheme. The committee were unable to recommend any of the schemes submitted, and added that, "we ourselves are unable, after repeated attempts, to devise any proposal free from grave inherent disadvantages." This second condemnation was not considered conclusive, and a select committee of the House of Commons (Mr Chaplin, chairman) was appointed to consider the condition of "the aged deserving poor." After an ineffectual attempt by Mr Chaplin to induce the committee to drop the pension idea, and to consider the provision made for the aged by the poor law, the committee somewhat hastily promulgated a scheme of gratuitous pensions for persons possessing certain qualifications. Of these the following were the most important: age of sixty-five; no conviction for crime; no poor-law relief, "unless under exceptional circumstances," within twenty years; non-possession of income of 10s. a week; proved industry, or proved exercise of reasonable providence by some definite mode of thrift. The committee refrained from explaining the machinery and from estimating the cost, and suggested that this last problem should be submitted to yet another committee.

Accordingly a departmental committee (chairman, Sir E. Hamilton) was appointed, which reported in January 1900. The estimated cost of the above plan was, by this committee, calculated at £10,300,000 in 1901, rising to £15,650,000 in 1921. Mr Chaplin had publicly suggested that £2,000,000, the proceeds of a 1s. duty on corn, would go a long way to meet the needs of the case—a conjecture which was obviously far too sanguine. These unfavourable reports discouraged the more responsible advocates of state pensions. Mr Chamberlain appealed to the friendly societies to formulate a plan, an invitation which they showed no disposition to accept. Efforts continued to be made to press forward Mr Booth's universal endowment scheme or some modification of it. To this Mr Chamberlain declared his hostility. And here the matter rested, till in his Budget speech in 1907 Mr Asquith pledged the Liberal government to start a scheme in 1908.

In 1908 accordingly there was passed the Old-Age Pensions Act, which carried into effect a scheme for state pensions, payable as from the 1st of January 1909 to persons of the age of 70 years and over. The act grants a pension according to a graduated scale of not exceeding 5s. a week to every person, male and female, who fulfils certain statutory conditions, and at the same time is not subject to certain disqualifications. The statutory conditions, as set out in § 2 of the act, are: (1) The person must have attained the age of seventy; (2) must satisfy the pension authorities that for at least twenty years up to the date of receipt of pension he has been a British subject and has had his residence in the United Kingdom; and (3) the person must satisfy the pension authorities that his yearly means do not exceed £31, 10s. In § 4 of the act there are elaborate provisions for the calculation of yearly means, but the following may be particularly noticed: (1) in calculating the means of a person being one of a married couple living together in the same house, the means shall not in any case be taken to be a less amount than half the total means of the couple, and (2) if any person directly or indirectly deprives himself of any income or property in order to qualify for an old-age pension, it shall nevertheless be taken to be part of his means. The disqualifications are (1) receipt of poor-law relief (this qualification was specially removed as from the 1st of January 1911); (2) habitual failure to work (except in the case of those who have continuously for ten years up to the age of sixty made provision for their future by payments to friendly, provident or other societies or trade unions; (3) detention in a pauper or criminal lunatic asylum; (4) imprisonment without the option of a fine, which disqualifies for ten years; and (5) liability to disqualification for a period not exceeding ten years in the case of an habitual drunkard. The graduated scale of pensions is given in a schedule to the act, and provide that when the yearly means of a pensioner do not exceed £21 he shall have the full pension of 5s. a week, which diminishes by 1s. a week for every addition of £2, 12s. 6d. to his income, until the latter reaches £31, 10s., when no pension is payable. The pension is paid weekly, on Fridays (§ 5), and is inalienable (§ 6).

All claims for, and questions relating to, pensions are determined by the pension authorities. They are (1) pension officers appointed by the Treasury from among inland revenue officers; (2) a central pension authority, which is the Local Government Board or a committee appointed by it, and (3) local pension committees appointed for every borough and urban district with a population of over 20,000, and for every county.

During the first three months of the year 1909, in which the act came into operation, there were 837,831 claims made for pensions: 490,755 in England and Wales, 85,408 in Scotland, and 261,668 in Ireland. Of these claims a total of 647,494 were granted: 393,700 in England and Wales, 70,294 in Scotland, and 183,500 in Ireland. The pensions in force on the 31st of March 1909 were as follows: 582,565 of 5s., 23,616 of 4s., 23,275 of 3s., 11,429 of 2s., and 6609 of 1s. By the 30th of September the total amount of money paid to 682,768 pensioners was £6,063,658, and in the estimates of 1909–1910 a sum of £8,750,000 was provided for the payment of pensions.

Germany.—The movement in favour of state aid to provision for old age has been largely due to the example of Germany. The German system (which for old age dates from 1891) is a form of compulsory and contributory insurance. One half of the premium payable is paid by the labourer, the other half by the employer. The state adds a subvention to the allowances paid to the annuitant. (See GERMANY.)

France.—By a law of April 1910 a system of old-age pensions, designed to come into operation in 1911, was adopted. It is a contributory system, embracing all wage-earners, with the exception of railway servants, miners and sailors on the special reserve list of the navy. It applies also to small landowners, tenant farmers and farm labourers. All are eligible for a pension at the age of 65, if in receipt of less than £120 a year. The actual *rente* or pension is calculated on the basis of the total obligatory contribution, together with a fixed viagère or state annuity. Male wage-earners are required to contribute 9 francs a year, and females 6 francs, the employers contributing a like amount. The largest pension obtainable is for life contributions and amounts to 414 francs. A clause in the act permits wage-earners to claim the *rente* at the age of 55 on a proportionately reduced scale without the viagère. The total cost of providing pensions in 1911 is estimated at over £5,500,000.

Denmark.—The Danish system of old-age pensions was instituted by a law of 1891, and has been extended by further acts of 1902 and 1908. By the law of 1891 the burden of maintaining the aged was in part transferred from the local to the national taxes, and relief from this latter source was called a pension. Recipients of public assistance must be over 60 years of age, they must be of good character and for 5 years previous to receipt must have had their domicile in Denmark without receiving public charity. Such public assistance may be granted either in money, or kind, or by residence in an institution, such as an hospital. The assistance given, whatever it may be, must be sufficient for maintenance, and for attendance in case of illness. The actual amount is determined by the poor-law authorities, but all private assistance amounting to more than 100 kroner (£5, 13s.) a year is taken into account in measuring the poverty of the applicant. The cost of assistance is met in the first case by the commune in which the recipient is domiciled, but half the amount is afterwards refunded by the state. In 1907–1908, 71,185 persons were assisted—53,008 by money and 18,177 otherwise. The total expenditure was £489,200, £242,660 being refunded by the state.

New Zealand.—In 1898 a bill, introduced by the Rt. Hon. R. J. Seddon, premier, became law which provided for the payment of an old-age pension out of the consolidated fund (revenue of the general government) to persons duly qualified, without contribution by the beneficiaries. The claimants must be 65 years of age, resident in the colony, and have so resided for 25 years. They must be free from conviction for lesser legal offences for 12 years, and for more serious breaches of the law for 25 years, previous to the application. They must be of good moral character and have a record of sobriety and respectability for five years. Their yearly income must not exceed £52, and they must not be owners of property exceeding in value £270. Aliens, aborigines, Chinese and Asiatics are excluded. The pensions are for £18 per annum, but for each £1 of yearly income over and above £34, and also for each £15 of capital over and above £50, £1 is deducted from the amount of the pension. Applications have to be made to the deputy registrars of one of 72 districts into which the colony is for this purpose divided. The claim is then recorded and submitted to a stipendiary magistrate, before whom the claimant has to prove his qualifications and submit to cross-examination. If the claim is admitted, a certificate is issued to the deputy registrar and in due course handed to the claimant. Payment is made through the local post-office as desired by the pensioner. The act came into force on the 1st of November 1898. An amending act of 1905 increased the amount of the maximum pension to £26 a year. See further, NEW ZEALAND. The authors of the measure maintain that it is a great success, while others point to the invidious character of the cross-examination required in proving the necessary degree of poverty, and allege that the arrangement penalizes the thrifty members of the poorer class, and is a direct incentive to transfer of property, of a more or less fraudulent character, between members of a family.

Victoria.—By the Old-Age Pensions Act 1900, £75,000 was appropriated for the purpose of paying a pension of not more than 10s. per week to any person who fulfilled the necessary conditions, of which the following were the principal: The pensioner must be 65 years of age or permanently disabled, must fill up a declaration that he has lived twenty years in the state; has not been convicted of drunkenness, wife-desertion, &c.; that his weekly income and his property do not exceed a given sum (the regulation of this and other details is intrusted to the governor in council). Further sums were subsequently appropriated to the purposes of the act.

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OLDBURY, an urban district in the Oldbury parliamentary division of Worcestershire, England, 5 m. W. of Birmingham, on the Great Western and London & North-Western railways and the Birmingham canal. Pop. (1901) 25,191. Coal, iron and limestone abound in the neighbourhood, and the town possesses alkali and chemical works, railway-carriage works, iron, edge-tool, nail and steel works, maltings, corn-mills, and brick and tile kilns. The urban district includes the townships of Langley and Warley.

OLDCASTLE, SIR JOHN (d. 1417), English Lollard leader, was son of Sir Richard Oldcastle of Almeley in Herefordshire. He is first mentioned as serving in the expedition to Scotland in 1400, when he was probably quite a young man. Next year he was in charge of Builth castle in Brecon, and serving all through the Welsh campaigns won the friendship and esteem of Henry, the prince of Wales. Oldcastle represented Herefordshire in the parliament of 1404. Four years later he married Joan, the heiress of Cobham, and was thereon summoned to parliament as Lord Cobham in her right. As a trusted supporter of the prince, Oldcastle held a high command in the expedition which the young Henry sent to France in 1411. Lollardy had many supporters in Herefordshire, and Oldcastle himself had adopted Lollard opinions before 1410, when the churches on his wife's estates in Kent were laid under interdict for unlicensed preaching. In the convocation which met in March 1413, shortly before the death of Henry IV., Oldcastle was at once accused of heresy. But his friendship with the new king prevented any decisive action till convincing evidence was found in a book belonging to Oldcastle, which was discovered in a shop in Paternoster Row. The matter was brought before the king, who desired that nothing should be done till he had tried his personal influence. Oldcastle declared his readiness to submit to the king "all his fortune in this world," but was firm in his religious beliefs. When he fled from Windsor to his own castle at Cowling, Henry at last consented to a prosecution. Oldcastle refused to obey the archbishop's repeated citations, and it was only under a royal writ that he at last appeared before the ecclesiastical court on the 23rd of September. In a confession of his faith he declared his belief in the sacraments and the necessity of penance and true confession; but to put hope, faith or trust in images was the great sin of idolatry. But he would not assent to the orthodox doctrine of the sacrament as stated by the bishops, nor admit the necessity of confession to a priest. So on the 25th of September he was convicted as a heretic. Henry was still anxious to find a way of escape for his old comrade, and granted a respite of forty days. Before that time had expired Oldcastle escaped from the Tower by the help of one William Fisher, a parchment-maker of Smithfield (Riley, *Memorials of London*, 641). Oldcastle now put himself at the head of a wide-spread Lollard conspiracy, which assumed a definitely political character. The design was to seize the king and his brothers during a Twelfth-night mumming at Eltham, and perhaps, as was alleged, to establish some sort of commonwealth. Henry, forewarned of their intention, removed to London, and when the Lollards assembled in force in St Giles's Fields on the 10th of January they were easily dispersed. Oldcastle himself escaped into Herefordshire, and for nearly four years avoided capture. Apparently he was privy to the Scrope and Cambridge plot in July 1415, when he stirred some movement in the Welsh Marches. On the failure of the scheme he went again into hiding. Oldcastle was no doubt the instigator of the abortive Lollard plots of 1416, and appears to have intrigued with the Scots. But at last his hiding-place was discovered and in November 1417 he was captured by the Lord Charlton of Powis. Oldcastle who was "sore wounded ere he would be taken," was brought to London in a horse-litter. On the 14th of December he was formally condemned, on the record of his previous conviction, and that same day was hung in St Giles's Fields, and burnt "gallows and all." It is not clear that he was burnt alive.

Oldcastle died a martyr. He was no doubt a man of fine quality, but circumstances made him a traitor, and it is impossible altogether to condemn his execution. His unpopular opinions and early friendship with Henry V. created a traditional scandal which long continued. In the old play *The Famous Victories of Henry V.*, written before 1588, Oldcastle figures as the prince's boon companion. When Shakespeare adapted that play in *Henry IV.*, Oldcastle still appeared; but when the play was printed in 1598 Falstaff's name was substituted, in deference, as it is said, to the then Lord Cobham. Though the fat knight still remains "my old lad of the Castle," the stage character has nothing to do with the Lollard leader.

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OLD CATHOLICS (Ger. *Altkatholiken*), the designation assumed by those members of the Roman Catholic Church who refused to accept the decrees of the Vatican Council of 1870 defining the dogma of papal infallibility (see VATICAN COUNCIL and INFALLIBILITY) and ultimately set up a separate ecclesiastical organization on the episcopal model. The Old Catholic movement, at the outset at least, differed fundamentally from the Protestant Reformation of the 16th century in that it aimed not at any drastic changes in doctrine but at the restoration of the ancient Catholic system, founded on the diocesan episcopate, which under the influence of the ultramontane movement of the 19th century had been finally displaced by the rigidly centralized system of the papal monarchy. In this respect it represented a tendency of old standing within the Church and one which, in the 18th century, had all but gained the upper hand (see FEBRONIANISM and GALLICANISM). Protestantism takes for its standard the Bible and the supposed doctrines and institutions of the apostolic age. Old Catholicism sets up the authority of the undivided Church, and accepts the decrees of the first seven general councils—down to the second council of Nicaea (787), a principle which has necessarily involved a certain amount of doctrinal divergence both from the standards of Rome and those of the Protestant Churches.

The proceedings of the Vatican council and their outcome had at first threatened to lead to a serious schism in the Church. The minority against the decrees included many of the most distinguished prelates and theologians of the Roman communion, and the methods by which their opposition had been overcome seemed to make it difficult for them to submit. The pressure put upon them was, however, immense, and the reasons for submission may well have seemed overwhelming; in the end, after more or less delay, all the recalcitrant bishops gave in their adhesion to the decrees.

The "sacrificio dell' intelletto," as it was termed—the subordination of individual opinion to the general authority of the Church—was the maxim adopted by one and all. Seventeen of the German bishops almost immediately receded from the position they had taken up at Rome and assented to the dogma, publishing at the same time a pastoral letter in which they sought to justify their change of sentiment on the ground of expediency in relation to the interests of the Church (Michelis, *Der neue Fuldaer Hirtenbrief*, 1870). Their example was followed by all the other bishops of Germany. Darboy, archbishop of Paris, and Dupanloup, bishop of Orleans, in France adopted a like course, and took with them the entire body of the French clergy. Each bishop demanded in turn the same submission from the clergy of his diocese, the alternative being suspension from pastoral functions, to be followed by deprivation of office. It may be urged as some extenuation of this general abandonment of a great principle, that those who had refused to subscribe to the dogma received but languid support, and in some cases direct discouragement, from their respective governments. The submission of the illustrious Karl Joseph von Hefele was generally attributed to the influence exerted by the court of Württemberg.

The universities, being less directly under the control of the Church, were prepared to show a bolder front. Dr J. F. von Schulte, professor at Prague, was one of the first to publish a formal protest. A meeting of Catholic professors and distinguished scholars convened at Nuremberg (August 1870) recorded a like dissent, and resolved on the adoption of measures for bringing about the assembling of a really free council north of the Alps. The *Appel aux Evêques Catholiques* of M. Hyacinthe Loyson (better known as "Père Hyacinthe"), after referring to the overthrow of "the two despotisms," "the empire of the Napoleons and the temporal power of the popes," appealed to the Catholic bishops throughout the world to put an end to the schism by declaring whether the recent decrees were or were not binding on the faith of the Church. This appeal, on its appearance in *La Libertà* early in 1871, was suppressed by the order of the king of Italy. On the 28th of March Döllinger, in a letter of some length, set forth the reasons which compelled him also to withhold his submission alike as "a Christian, a theologian, an historical student and a citizen." The publication of this letter was shortly followed by a sentence of excommunication pronounced against Döllinger and Professor Johannes Friedrich (*q.v.*), and read to the different congregations from the pulpits of Munich. The professors of the university, on the other hand, had shortly before evinced their resolution of affording Döllinger all the moral support in their power by an address (April 3, 1871) in which they denounced the Vatican decrees with unsparing severity, declaring that, at the very time when the German people had "won for themselves the post of honour on the battlefield among the nations of the earth," the German bishops had stooped to the dishonouring task of "forcing consciences in the service of an unchristian tyranny, of reducing many pious and upright men to distress and want, and of persecuting those who had but stood steadfast in their allegiance to the ancient faith" (Friedberg, *Aktenstücke z. ersten Vaticanischen Concil*, p. 187). An address to the king, drawn up a few days later, received the signatures of 12,000 Catholics. The refusal of the rites of the Church to one of the signatories, Dr Zenger, when on his deathbed, elicited strong expressions of disapproval;[1] and when, shortly after, it became necessary to fill up by election six vacancies in the council of the university, the feeling of the electors was indicated by the return of candidates distinguished by their dissent from the new decrees. In the following September the demand for another and a free council was responded to by the assembling of a congress at Munich. It was composed of nearly 500 delegates, convened from almost all parts of the world; but the Teutonic element was now as manifestly predominant as the Latin element had been at Rome. The proceedings were presided over by Professor von Schulte, and lasted three days. Among those who took a prominent part in the deliberations were Landammann Keller, Windscheid, Döllinger, Reinkens, Maassen (professor of canon law at Vienna), Friedrich and Huber. The arrangements finally agreed upon were mainly provisional; but one of the resolutions plainly declared that it was desirable if possible to effect a reunion with the Oriental Greek and Russian Churches, and also to arrive at an "understanding" with the Protestant and Episcopal communions.

In the following year lectures were delivered at Munich by various supporters of the new movement, and the learning and eloquence of Reinkens were displayed with marked effect. In France the adhesion of the abbé Michaud to the cause attracted considerable interest, not only from his reputation as a preacher, but also from the notable step in advance made by his declaration that, inasmuch as the adoption of the standpoint of the Tridentine canons would render reunion with the Lutheran and the Reformed Churches impossible, the wisest course would be to insist on nothing more with respect to doctrinal belief than was embodied in the canons of the first seven oecumenical councils. In the same year the Old Catholics, as they now began to be termed, entered into relations with the historical little Jansenist Church of Utrecht. Döllinger, in delivering his inaugural address as rector of the university of Munich, expressed his conviction that theology had received a fresh impulse and that the religious history of Europe was entering upon a new phase.

Other circumstances contributed to invest Old Catholicism with additional importance. It was evident that the relations between the Roman Curia and the Prussian government were becoming extremely strained. In February 1872 appeared the first measures of the Falk ministry, having for their object the control of the influence of the clergy in the schools, and in May the pope refused to accept Cardinal Hohenlohe, who during the council had opposed the definition of the dogma, as Prussian minister at the Vatican. In the same year two humble parish priests, Renftle of Mering in Bavaria and Tangermann of Unkel in the Rhineland, set an example of independence by refusing to accept the decrees. The former, driven from his parish church, was followed by the majority of his congregation, who, in spite of every discouragement, continued faithful to him; and for years after, as successive members were removed by death, the crosses over their graves recorded that they had died "true to their ancient belief." Tangermann, the poet, expelled in like manner from his parish by the archbishop of Cologne, before long found himself the minister of a much larger congregation in the episcopal city itself. These examples exercised no little influence, and congregations of Old Catholics were shortly after formed at numerous towns and villages in Bavaria, Baden, Prussia, German Switzerland, and even in Austria. At Warnsdorf in Bohemia a congregation was collected which still represents one of the most important centres of the movement. In September the second congress was held at Cologne. It was attended by some 500 delegates or visitors from all parts of Europe, and the English Church was represented by the bishops of Ely and Lincoln and other distinguished members. At this congress Friedrich boldly declared that the movement was directed "against the whole papal system, a system of errors during a thousand years, which had only reached its climax in the doctrine of infallibility."

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[1] The rites were administered and the burial service conducted by Friedrich, who had refused to acknowledge his excommunication.

The movement thus entered a new phase, the congress occupying itself mainly with the formation of a more definite organization and with the question of reunion with other Churches. The immediate effect was a fateful divergence of opinion; for many who sympathized with the opposition to the extreme papal claims shrank from the creation of a fresh schism. Prince Chlodwig Hohenlohe, who as prime minister of Bavaria had attempted to unite the governments against the definition of the dogma, refused to have anything to do with proceedings which could only end in the creation of a fresh sect, and would make the prospect of the reform of the Church from within hopeless; more important still, Döllinger refused to take part in setting up a separate organization, and though he afterwards so far modified his opinion as to help the Old Catholic community with sympathy and advice, he never formally joined it.

Meanwhile, the progress of the quarrel between the Prussian government and the Curia had been highly favourable to the movement. In May 1873 the celebrated Falk laws were enacted, whereby the articles 15 and 18 of the Prussian constitution were modified, so as to legalize a systematic state supervision over the education of the clergy of all denominations, and also over the appointment and dismissal of all ministers of religion. The measure, which was a direct response to the Vatican decrees, inspired the Old Catholics with a not unreasonable expectation that the moral support of the government would henceforth be enlisted on their side. On the 11th of August Professor J. H. Reinkens of Breslau, having been duly elected bishop of the new community,[1] was consecrated at Rotterdam by Bishop Heykamp of Deventer, the archbishop of Utrecht, who was to have performed the ceremony, having died a few days before. In the meantime the extension of the movement in Switzerland had been proceeding rapidly, and it was resolved to hold the third congress at Constance. The proceedings occupied three days (12th to 14th September), the subjects discussed being chiefly the institution of a synod[2] as the legislative and executive organ of the Church, and schemes of reunion with the Greek, the African and the Protestant communions. On the 20th of September the election of Bishop Reinkens was formally recognized by the Prussian government, and on the 7th of October he took the oath of allegiance to the king.

The following year (1874) was marked by the assembling of the first synod and a conference at Bonn, and of a congress at Freiburg-im-Breisgau. At the congress Bishop Reinkens spoke in hopeful terms of the results of his observations during a recent missionary tour throughout Germany. The conference, held on the 14th, 15th and 16th of September, had for its special object the discussion of the early confessions as a basis of agreement, though not necessarily of fusion, between the different communions above-named. The meetings, which were presided over by Döllinger, successively took into consideration the *Filioque* clause in the Nicene creed, the sacraments, the canon of Scripture, the episcopal succession in the English Church, the confessional, indulgences, prayers for the dead, and the eucharist (see DÖLLINGER). The synod (May 27-29) was the first of a series, held yearly till 1879 and afterwards twice a year, in which the doctrine and discipline of the new Church were gradually formulated. The tendency was, naturally, to move further and further away from the Roman model; and though the synod expressly renounced any claim to formulate dogma, or any intention of destroying the unity of the faith, the "Catholic Catechism" adopted by it in 1874 contained several articles fundamentally at variance with the teaching of Rome.[3] At the first synod, too, it was decided to make confession and fasting optional, while later synods pronounced in favour of using the vernacular in public worship, allowing the marriage of priests, and permitting them to administer the communion in both kinds to members of the Anglican Church attending their services. Of these developments that abolishing the compulsory celibacy of the clergy led to the most opposition; some opposed it as inexpedient, others—notably the Jansenist clergy of Holland—as wrong in itself, and when it was ultimately passed in 1878 some of the clergy, notably Tangermann and Reusch, withdrew from the Old Catholic movement.

Meanwhile the movement had made some progress in other countries—in Austria, in Italy and in Mexico; but everywhere it was hampered by the inevitable controversies, which either broke up its organization or hindered its development. In Switzerland, where important conferences were successively convened (at Solothurn in 1871, at Olten in 1872, 1873 and 1874), the unanimity of the "Christian Catholics," as they preferred to call themselves, seemed at one time in danger of being shipwrecked on the question of episcopacy. It was not until September 18th, 1876, that the conflict of opinions was so far composed as to allow of the consecration of Bishop Herzog by Bishop Reinkens. The reforms introduced by M. Hyacinthe Loyson in his church at Geneva received only a partial assent from the general body. Among the more practical results of his example is to be reckoned, however, the fact that in French Switzerland nearly all the clergy, in German Switzerland about one half, are married men.

The end of the *Kulturkampf* in 1878, and the new alliance between Bismarck and Pope Leo XIII. against revolutionary Socialism, deprived the Old Catholics of the special favour which had been shown them by the Prussian government; they continued, however, to enjoy the legal status of Catholics, and their communities retained the rights and the property secured to them by the law of the 4th of July 1875. In Bavaria, on the other hand, they were in March 1890, after the death of Döllinger, definitely reduced to the status of a private religious sect, with very narrow rights. When Bishop Reinkens died in January 1896 his successor Theodor Weber, professor of theology at Breslau, elected bishop on the 4th of March, was recognized only by the governments of Prussia, Baden and Hesse. The present position of the Old Catholic Church has disappointed the expectation of its friends and of its enemies. It has neither advanced rapidly, as the former had hoped, nor retrograded, as the latter have frequently predicted it would do. In Germany there are 90 congregations, served by 60 priests, and the number of adherents is estimated at about 60,000. In Switzerland there are 40 parishes (of which only one, that at Lucerne, is in the

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[1] Reinkens was elected at Cologne in primitive Christian fashion by clergy and people, the latter being representatives of Old Catholic congregations.

[2] The diocesan synod, under the presidency of the bishop, consists of the clergy of the diocese and one lay delegate for every 200 church members. It now meets twice a year and transacts the business prepared for it by an executive committee of 4 clergy and 5 laymen. In Switzerland the organization is still more democratic; the bishop does not preside over the synod and may be deposed by it.

[3] *E.g.* especially Question 164: "this (the Christian) community is invisible," and Question 167, "one may belong to the invisible Church (*i.e.* of those sharing in Christ's redemption) without belonging to the visible Church."

Roman Catholic cantons), 60 clergy and about 50,000 adherents. In Austria, though some accessions have been received since the *Los von Rom* movement began in 1899, the Old Catholic Church has not made much headway; it has some 15 churches and about 15,000 adherents. In Holland the Old Catholic or Jansenist Church has 3 bishops, about 30 congregations and over 8000 adherents. In France the movement headed by Loyson did not go far. There is but one congregation, in Paris, where it has built for itself a beautiful new church on the Boulevard Blanqin. Its priest is George Volet, who was ordained by Herzog, and it has just over 300 members. It is under the supervision of the Old Catholic archbishops of Utrecht. In Italy a branch of the Old Catholic communion was established in 1881 by Count Enrico di Campello, a former canon of St Peter's at Rome. A church was opened in Rome by Monsignor Savarese and Count Campello, under the supervision of the bishop of Long Island in the United States, who undertook the superintendence of the congregation in accordance with the regulations laid down by the Lambeth conference. But dissensions arose between the two men. The church in Rome was closed; Savarese returned to the Roman Church; and Campello commenced a reform work in the rural districts of Umbria, under the episcopal guidance of the bishop of Salisbury. This was in 1885. In 1900 Campello returned to Rome, and once more opened a church there. In 1902 he retired from active participation in the work, on account of age and bodily infirmity; and his place at the head of it was taken by Professor Cicchitti of Milan. Campello ultimately returned to the Roman communion. There are half-a-dozen priests, who are either in Roman or Old Catholic orders, and about twice as many congregations. Old Catholicism has spread to America. The Polish Romanists there, in 1899, complained of the rule of Irish bishops; elected a bishop of their own, Herr Anton Kozlowski; presented him to the Old Catholic bishops in Europe for consecration; and he presides over seven congregations in Chicago and the neighbourhood. The Austrian and Italian churches possess no bishops, and the Austrian government refuses to allow the Old Catholic bishops of other countries to perform their functions in Austria. Every Old Catholic congregation has its choral union, its poor relief, and its mutual improvement society. Theological faculties exist at Bonn and Bern, and at the former a residential college for theological students was established by Bishop Reinkens. Old Catholicism has eight newspapers—two in Italy, two in Switzerland, and one each in Holland, Germany, Austria and France. It has held reunion conferences at Lucerne in 1892, at Rotterdam in 1894, and at Vienna in 1897. At these, members of the various episcopal bodies have been welcomed. It has also established a quarterly publication, the *Revue internationale de théologie*, which has admitted articles in French, German and English, contributed not merely by Old Catholics, but by members of the Anglican, Russian, Greek and Slavonic churches. Old Catholic theologians have been very active, and the work of Döllinger and Reusch on the Jesuits, and the history of the Roman Church by Professor Langen, have attained a European reputation.

An outline of the whole movement up to the year 1875 will be found in *The New Reformation*, by "Theodorus" (J. Bass Mullinger); and an excellent résumé of the main facts in the history of the movement in each European country, as connected with other developments of liberal thought, and with political history, is given in the second volume of Dr F. Nippold's *Handbuch der neuesten Kirchengeschichte*, vol. ii. (1883). See also A. M. E. Scarth, *The Story of the Old Catholic and Kindred Movements* (London, 1883); Bühler, *Der Altkatholicismus* (Leiden, 1880); J. F von Schulte, *Der Altkatholizismus* (Giessen, 1887); and article in Hauck-Herzog's *Realencyk. für prot. Theol. und Kirche*, i. 415. For details the following sources may be consulted: (*a*) For the proceedings of the successive congresses: the *Stenographische Berichte*, published at Munich, Cologne, Constance, &c.; those of the congress of Constance were summarized in an English form, with other elucidatory matter, by Professor John Mayor. (*b*) For the questions involved in the consecration of Bishop Reinkens: *Rechtsgutachten über die Frage der Anerkennung des altkatholischen Bischofs Dr Reinkens in Bayern* (Munich, 1874); Emil Friedberg, *Der Staat und d. Bischofswahlen in Deutschland* (Leipzig, 1874); F. von Sybel, *Das altkatholische Bisthum und das Vermögen d. römischkatholischen Kirchengesellschaften in Preussen* (Bonn, 1874). (*c*) Reinkens's own speeches and pastorals, some of which have been translated into English, give his personal views and experiences; the *Life* of Huber has been written and published by Eberhard Stirngiebl; and the persecutions to which the Old Catholic clergy were exposed have been set forth in a pamphlet by J. Mayor, *Facts and Documents* (London, 1875). (*d*) For Switzerland, C. Herzog, *Beiträge zur Vorgeschichte der Christkathol. Kirche der Schweiz* (Bern, 1896).

OLD DEER, a parish and village in the district of Buchan, Aberdeenshire, Scotland. Pop. (1901), 4313. The village lies on the Deer or South Ugie Water, 10½ m. W. of Peterhead, and 2 m. from Mintlaw station on the Great North of Scotland Railway Company's branch line from Aberdeen to Peterhead. The industries include distilling, brewing, and the manufacture of woollens, and there are quarries of granite and limestone. Columba and his nephew Drostan founded a monastery here in the 6th century, of which no trace remains. A most interesting relic of the monks was discovered in 1857 in the Cambridge University library by Henry Bradshaw. It consisted of a small MS. of the Gospels in the Vulgate, fragments of the liturgy of the Celtic church, and notes, in the Gaelic script of the 12th century, referring to the charters of the ancient monastery, including a summary of that granted by David I. These are among the oldest examples of Scottish Gaelic. The MS. was also adorned with Gaelic designs. It had belonged to the monks of Deer and been in the possession of the University Library since 1715. It was edited by John Stuart (1813–1877) for the Spalding Club, by whom it was published in 1869 under the title of *The Book of Deer*. In 1218 William Comyn, earl of Buchan, founded the Abbey of St Mary of Deer, now in ruins, ¾ m. farther up the river than the monastery and on the opposite bank. Although it was erected for Cistercians from the priory of Kinloss, near Forres, the property of the Columban monastery was removed to it. The founder (d. 1233) and his countess were buried in the church. The parish is rich in antiquities, but the most noted of them—the Stone of Deer, a sculptured block of syenite, which stood near the Abbey—was destroyed in 1854. The thriving village of New Deer (formerly called Auchriddie) lies about 7 m. W. of the older village; it includes the ruined castle of Fedderat.

OLDENBARNEVELDT, JOHAN VAN (1547–1619), Dutch statesman, was born at Amersfoort on the 14th of September 1547. The family from which he claimed descent was of ancient lineage. After studying law at Louvain, Bourges and Heidelberg, and travelling in France and Italy, Oldenbarneveldt settled down to practise in the law courts at the Hague. In religion a moderate Calvinist, he threw himself with ardour into the revolt against Spanish tyranny and became a zealous adherent of William the Silent. He served as a volunteer for the relief of Haarlem (1573) and again at Leiden (1574). In 1576 he obtained the important post of pensionary of Rotterdam, an office which carried with it official membership of the States of Holland. In this capacity his industry, singular grasp of affairs, and persuasive powers of speech speedily gained for him a position of influence. He was active in promoting the Union of Utrecht (1579) and the acceptance of the countship of Holland and Zeeland by William (1584) On the assassination of Orange it was at the proposal of Oldenbarneveldt that the youthful Maurice of Nassau was at once elected stadholder, captain-general and admiral of Holland. During the governorship of Leicester he was the leader of the strenuous opposition offered by the States of Holland to the centralizing policy of the governor. In 1586 he was appointed, in succession to Paul Buys, to the post of Land's Advocate of Holland. This great office, which he held for 32 years, gave to a man of commanding ability and industry unbounded influence in a many-headed republic without any central executive authority. Though nominally the servant of the States of Holland he made himself politically the personification of the province which bore more than half the entire charge of the union, and as its mouthpiece in the states-general he practically dominated that assembly. In a brief period he became entrusted with such large and far-reaching authority in all the details of administration, as to be virtually "minister of all affairs."

During the two critical years which followed the withdrawal of Leicester, it was the statesmanship of the advocate which kept the United Provinces from falling asunder through their own inherent separatist tendencies, and prevented them from becoming an easy conquest to the formidable army of Alexander of Parma. Fortunately for the Netherlands the attention of Philip was at their time of greatest weakness riveted upon his contemplated invasion of England, and a respite was afforded which enabled Oldenbarneveldt to supply the lack of any central organized government by gathering into his own hands the control of administrative affairs. His task was made the easier by the whole-hearted support he received from Maurice of Nassau, who, after 1589, held the Stadholderate of five provinces, and was likewise captain-general and admiral of the union. The interests and ambitions of the two men did not clash, for Maurice's thoughts were centred on the training and leadership of armies and he had no special capacity as a statesman or inclination for politics. The first rift between them came in 1600, when Maurice was forced against his will by the states-general, under the advocate's influence, to undertake an expedition into Flanders, which was only saved from disaster by desperate efforts which ended in victory at Nieuwport. In 1598 Oldenbarneveldt took part in special embassies to Henry IV. and Elizabeth, and again in 1605 in a special mission sent to congratulate James I. on his accession.

The opening of negotiations by Albert and Isabel in 1606 for a peace or long truce led to a great division of opinion in the Netherlands. The archdukes having consented to treat with the United Provinces " as free provinces and states over which they had no pretensions," Oldenbarneveldt, who had with him the States of Holland and the majority of burgher regents throughout the county, was for peace, provided that liberty of trading was conceded. Maurice and his cousin William Louis, stadholder of Frisia, with the military and naval leaders and the Calvinist clergy, were opposed to it, on the ground that the Spanish king was merely seeking an interval of repose in which to recuperate his strength for a renewed attack on the independence of the Netherlands. For some three years the negotiations went on, but at last after endless parleying, on the 9th of April 1609, a truce for twelve years was concluded. All that the Dutch asked was directly or indirectly granted, and Maurice felt obliged to give a reluctant and somewhat sullen assent to the favourable conditions obtained by the firm and skilful diplomacy of the advocate.

The immediate effect of the truce was a strengthening of Oldenbarneveldt's influence in the government of the republic, now recognized as a "free and independent state"; external peace, however, was to bring with it internal strife. For some years there had been a war of words between the religious parties, known as the Gomarists (strict Calvinists) and the Arminians (moderate Calvinists). In 1610 the Arminians drew up a petition, known as the Remonstrance, in which they asked that their tenets (defined in five articles) should be submitted to a national synod, summoned by the civil government. It was no secret that this action of the Arminians was taken with the approval and connivance of the advocate, who was what was styled a *libertine*, *i.e.* an upholder of the principle of toleration in religious opinions. The Gomarists in reply drew up a Contra-Remonstrance in seven articles, and appealed to a purely church synod. The whole land was henceforth divided into Remonstrants and Contra-Remonstrants; the States of Holland under the influence of Oldenbarneveldt supported the former, and refused to sanction the summoning of a purely church synod (1613). They likewise (1614) forbade the preachers in the Province of Holland to treat of disputed subjects from their pulpits. Obedience was difficult to enforce without military help, riots broke out in certain towns, and when Maurice was appealed to, as captain-general, he declined to act. He did more, though in no sense a theologian; he declared himself on the side of the Contra-Remonstrants, and established a preacher of that persuasion in a church at the Hague (1617).

The advocate now took a bold step. He proposed that the States of Holland should, on their own authority, as a sovereign province, raise a local force of 4000 men (*waardgelders*) to keep the peace. The states-general meanwhile by a bare majority (4 provinces to 3) agreed to the summoning of a national church synod. The States of Holland, also by a narrow majority, refused their assent to this, and passed (August 4, 1617) a strong resolution (*Scherpe Resolutie*) by which all magistrates, officials and soldiers in the pay of the province were required to take an oath of obedience to the states on pain of dismissal, and were to be held accountable not to the ordinary tribunals, but to the States of Holland. It was a declaration of sovereign independence on the part of Holland, and the states-general took up the challenge and determined on decisive action. A commission was appointed with Maurice at its head to compel the disbanding of the *waardgelders*. On the 31st of July 1618 the stadholder appeared at Utrecht, which had thrown in its lot with Holland, at the head of a body of troops, and at his command the local levies at once laid down their arms. His progress through the towns of Holland met with no opposition. The states party was crushed without a blow being struck. On the 23rd of August, by order of the states-general, the advocate and his chief supporters, de Groot and Hoogerbeets, were arrested.

Oldenbarneveldt was with his friends kept in the strictest confinement until November, and then brought for examination before a commission appointed by the states-general. He appeared more than sixty times before the commissioners and was examined most severely upon the whole course of his official life, and was, most unjustly, allowed neither to consult papers nor to put his defence in writing. On the 20th of February 1619 he was arraigned before a special court of twenty-four members, only half of whom were Hollanders, and nearly all of them his personal enemies. It was in no sense a legal court, nor had it any jurisdiction over the prisoner, but the protest of the advocate, who claimed his right to be tried by the sovereign province of Holland, whose servant he was, was disregarded. He was allowed no advocates, nor the use of documents, pen or paper. It was in fact not a trial at all, and the packed bench of judges on Sunday, the 12th of May, pronounced sentence of death. On the following day the old statesman, at the age of seventy-one, was beheaded in the Binnenhof at the Hague. Such, to use his own words, was his reward for serving his country forty-three years.

The accusations brought against Oldenbarneveldt of having been a traitor to his country, whose interests he had betrayed for foreign gold, have no basis in fact. The whole life of the advocate disproves them, and not a shred of evidence has ever been produced to throw suspicion upon the patriot statesman's conduct. All his private papers fell into the hands of his foes, but not even the bitterest and ablest of his personal enemies, Francis Aarssens (see AARSSENS), could extract from them anything to show that Oldenbarneveldt at any time betrayed his country's interests. That he was an ambitious man, fond of power, and haughty in his attitude to those who differed from him in opinion, may be granted, but it must also be conceded that he sought for power in order to confer invaluable services upon his country, and that impatience of opposition was not unnatural in a man who had exercised an almost supreme control of administrative affairs for upwards of three decades. His high-handed course of action in defence of what he conceived to be the sovereign rights of his own province of Holland to decide upon religious questions within its borders may be challenged on the ground of inexpediency, but not of illegality. The harshness of the treatment meted out by Maurice to his father's old friend, the faithful counsellor and protector of his own early years, leaves a stain upon the stadholder's memory which can never be washed away. That the prince should have felt compelled in the last resort to take up arms for the Union against the attempt of the province of Holland to defy the authority of the Generality may be justified by the plea *reipublicae salus suprema lex*. To eject the advocate from power was one thing, to execute him as a traitor quite another. The condemnation of Oldenbarneveldt was carried out with Maurice's consent and approval, and he cannot be acquitted of a prominent share in what posterity has pronounced to be a judicial murder.

Oldenbarneveldt was married in 1575 to Maria van Utrecht. He left two sons, the lords of Groeneveld and Stoutenburg, and two daughters. A conspiracy against the life of Maurice, in which the sons of Oldenbarneveldt took part, was discovered in 1623. Stoutenburg, who was the chief accomplice, made his escape and entered the service of Spain; Groeneveld was executed.

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OLDENBURG, a grand-duchy of Germany, with an area of 2479 sq. m. It consists of three widely separated portions of territory—(1) the duchy of Oldenburg, (2) the principality of Lübeck, and (3) the principality of Birkenfeld. It ranks tenth among the states of the German empire and has one vote in the Bundesrat (federal council) and three members in the Reichstag.

I. The duchy of Oldenburg, comprising fully four-fifths of the entire area and population, lies between 52° 29′ and 53° 44′ N. and between 7° 37′ and 8° 37′ E., and is bounded on the N. by the North Sea and on the other three sides by Hanover, with the exception of a small strip on the east, where it is conterminous with the territory of the free city of Bremen. It forms part of the north-western German plain lying between the Weser and the Ems, and, except on the south, where the Dammergebirge attain a height of 478 ft., it is almost entirely flat, with a slight inclination towards the sea. In respect of its soil it is divided broadly into two parts—the higher and inland-lying *Geest*, consisting of sandy plains intermixed with extensive heaths and moors, and the marsh lands along the coast, consisting of rich but somewhat swampy alluvial soil. The latter, which compose about one-fifth of the duchy, are protected against the inroads of the sea by dikes as in Holland; and beyond these are the so-called *Watten*, generally covered at high tide, but at many points being gradually reclaimed. The climate is temperate and humid; the mean temperature of the coldest month at the town of Oldenburg is 26° F. of the warmest 66°. Storms are numerous, and their violence is the more felt owing to the almost entire absence of trees; and fogs and ague are prevalent in the marsh lands. The chief rivers are the Hunte, flowing into the Weser, and the Hase and Leda flowing into the Ems. The Weser itself forms the eastern boundary for 42 m., and internal navigation is greatly facilitated by a canal, passing through the heart of the duchy and connecting the Hunte and the Leda. On the north there are several small coast streams conducted through the dikes by sluices, the only one of importance being the Jade, which empties itself into the Jade Busen, a deep gulf affording good accommodation for shipping. The duchy also contains numerous small lakes, the chief of which is the Dümmer See in the south-east corner, measuring 4 m. in length by 2½ in width. About 30% of the area of the duchy is under cultivation and 17% under pasture and meadows, while the rest consists mainly of marsh, moor and heath. Forests occupy a very small proportion of the whole, but there are some fine old oaks. In the Geest the principal crops are rye, oats, potatoes and buckwheat, for which the heath is sometimes prepared by burning. Large tracts of moorland, however, are useful only as producing peat for fuel, or as affording pasture to the flocks of small coarse-woolled Oldenburg sheep. The rich soil of the marsh lands produces good crops of wheat, oats, rye, hemp and rape, but is especially adapted for grazing. The cattle and horses raised on it are highly esteemed throughout Germany; and the former are exported in large numbers to England. Bee-keeping is much in vogue on the moors. The live stock of Oldenburg forms a great part of its wealth, and the ratio of cattle, sheep and horses to the population is one of the highest among the German states. There are few large estates, and the ground is mostly in the hands of small farmers, who enjoy the right of fishing and shooting on their holdings. Game is scarce, but fishing is fairly productive. The mineral wealth of Oldenburg is very small. Woollen and cotton fabrics, stockings, jute and cigars are made at Varel, Delmenhorst and Lohne; cork-cutting is extensively practised in some districts, and there are a few iron-foundries. Trade is relatively of more importance, chiefly owing to the proximity of Bremen. The agricultural produce of the duchy is exported to Scandinavia, Russia, England and the United States, in return for colonial goods and manufactures. Varel, Brake and Elsfleth are the chief commercial harbours.

II. The principality of Lübeck has an area of 209 sq. m. and shares in the general physical characteristics of east Holstein, within which it lies. On the east it extends to Lübeck Bay of the Baltic Sea, and on the south-east it is bounded by the Trave. The chief rivers are the Schwartau, a tributary of the Trave, and the Schwentine, flowing northwards to the Gulf of Kiel. The scenery of Lübeck is often picturesque, especially in the vicinity of the Plön See and the Eutin See, the most important of the small lakes with which it is dotted. Agriculture is practised here even more extensively than in the duchy of Oldenburg, about 75% of the area being cultivated. The population in 1905 was 38,583.

III. The principality of Birkenfeld, 312 sq. m. in extent, lies in the midst of the Prussian province of the Rhine, about 30 m. W. of the Rhine at Worms and 150 m. S. of the duchy of Oldenburg. The population in 1905 was 46,484. (See BIRKENFELD.)

The total population of the grand-duchy of Oldenburg in 1880 was 337,478, and in 1905 438,856. The bulk of the inhabitants are of the Saxon stock, but to the north and west of the duchy there are numerous descendants of the ancient Frisians. The differences between the two races are still to some extent perceptible, but Low German (*Platt-deutsch*) is universally spoken, except in one limited district, where a Frisian dialect has maintained itself. In general characteristics the Oldenburg peasants resemble the Dutch, and the absence of large landowners has contributed to make them sturdy and independent. The population of Oldenburg is somewhat unequally distributed, some parts of the marsh lands containing over 300 persons to the square mile, while in the Geest the number occasionally sinks as low as 40. About 70% of the inhabitants belong to the "rural" population. The town of Oldenburg is the capital of the grand-duchy. The war-harbour of Wilhelmshaven, on the shore of the Jade Busen, was built by Prussia on land bought from Oldenburg. The chief towns of Birkenfeld and Lübeck respectively are Birkenfeld and Eutin.

Oldenburg is a Protestant country, and the grand-duke is required to be a member of the Lutheran Church. Roman Catholicism, however, preponderates in the south-western provinces, which formerly belonged to the bishopric of Münster. Oldenburg Roman Catholics are under the sway of the bishops of Münster, who is represented by an official at Vechta. The educational system of Oldenburg is on a similar footing to that of north Germany in general, though the scattered position of the farmhouses interferes to some extent with school attendance.

The constitution of Oldenburg, based upon a decree of 1849, revised in 1852, is one of the most liberal in Germany. It provides for a single representative chamber (*Landtag*), elected indirectly by universal suffrage and exercising concurrent rights of legislation and taxation with the grand-duke. The chamber which consists of forty members, one for every 10,000 inhabitants, is elected every three years. The executive consists of three ministers, who are aided by a committee of the Landtag, when that body is not in session. The local affairs of Birkenfeld and Lübeck are entrusted to provincial councils of fifteen members each. All citizens paying taxes and not having been convicted of felony are enfranchised. The municipal communities enjoy an unusual amount of independence. The finances of each constituent state of the grand-duchy are managed separately, and there is also a fourth budget concerned with the joint administration. The total revenue and expenditure are each about £650,000 annually. The grand-duchy had a debt in 1907 of £2,958,409.

History.—The earliest recorded inhabitants of the district now called Oldenburg were a Teutonic people, the Chauci, who were afterwards merged in the Frisians. The chroniclers delight in tracing the genealogy of the counts of Oldenburg to the Saxon hero, Widukind, the stubborn opponent of Charlemagne, but their first historical representative is one Elimar (d. 1108) who is described as *comes in confinio Saxoniae et Frisiae.* Elimar's descendants appear as vassals, although sometimes rebellious ones, of the dukes of Saxony; but they attained the dignity of princes of the empire when the emperor Frederick I. dismembered the Saxon duchy in 1180. At this time the county of Delmenhorst formed part of the dominions of the counts of Oldenburg, but afterwards it was on several occasions separated from them to form an apanage for younger branches of the family. This was the case between 1262 and 1447, between 1463 and 1547, and between 1577 and 1617. The northern and western parts of the present grand-duchy of Oldenburg were in the hands of independent, or semi-independent, Frisian princes, who were usually heathens, and during the early part of the 13th century the counts carried on a series of wars with these small potentates which resulted in a gradual expansion of their territory. The free city of Bremen and the bishop of Münster were also frequently at war with the counts of Oldenburg.

The successor of Count Dietrich (d. 1440), called *Fortunatus*, was his son Christian, who in 1448 was chosen king of Denmark as Christian I. In 1450 he became king of Norway and in 1457 king of Sweden; in 1460 he inherited the duchy of Schleswig and the county of Holstein, an event of high importance for the future history of Oldenburg. In 1454 he handed over Oldenburg to his brother Gerhard (*c.* 1430–1499) a turbulent prince, who was constantly at war with the bishop of Bremen and other neighbours. In 1483 Gerhard was compelled to abdicate in favour of his sons, and he died whilst on a pilgrimage in Spain. Early in the 16th century Oldenburg was again enlarged at the expense of the Frisians. Protestantism was introduced into the county by Count Anton I. (1505–1573), who also suppressed the monasteries; however, he remained loyal to Charles V. during the war of the league of Schmalkalden, and was able thus to increase his territories, obtaining Delmenhorst in 1547. One of Anton's brothers, Count Christopher (*c.* 1506–1560), won some reputation as a soldier. Anton's grandson, Anton Günther (1583–1667), who succeeded in 1603, proved himself the wisest prince who had yet ruled Oldenburg. Jever had been acquired before he became count, but in 1624 he added Knyphausen and Varel to his lands, with which in 1647 Delmenhorst was finally united. By his prudent neutrality during the Thirty Years' War Anton Günther secured for his dominions an immunity from the terrible devastations to which nearly all the other states of Germany were exposed. He also obtained from the emperor the right to levy tolls on vessels passing along the Weser, a lucrative grant which soon formed a material addition to his resources.

When Count Anton Günther died in June 1667 Oldenburg was inherited by virtue of a compact made in 1649 by Frederick III., king of Denmark, and Christian Albert, duke of Holstein-Gottorp. Some difficulties, however, arose from this joint ownership, but eventually these were satisfactorily settled, and from 1702 to 1773 the county was ruled by the kings of Denmark only, this period being on the whole one of peaceful development. Then in 1773 another change took place. Christian VII. of Denmark surrendered Oldenburg to Paul, duke of Holstein-Gottorp, afterwards the emperor Paul of Russia,[1] and in return Paul gave up to Christian his duchy of Holstein-Gottorp and his claims on the duchies of Schleswig and Holstein. At once Paul handed over Oldenburg to his kinsman, Frederick Augustus, bishop of Lübeck, the representative of a younger branch of the family,[2] and in 1777 the county was raised to the rank of a duchy. The bishop's son William, who succeeded his father as duke in 1785, was a man of weak intellect, and his cousin Peter Frederick, bishop of Lübeck, acted as administrator and eventually, in 1823, inherited the duchy. This prince is the direct ancestor of the present grand duke.

To Peter fell the onerous task of governing the duchy during the time of the Napoleonic wars. In 1806 Oldenburg was occupied by the French and the Dutch, the duke and the regent being put to flight; but in 1807 William was restored, and in 1808 he joined the Confederation of the Rhine. However, in 1810 his lands were forcibly seized by Napoleon because he refused to exchange them for Erfurt. This drove him to join the Allies, and at the congress of Vienna his services were rewarded by the grant of the principality of Birkenfeld, an addition to his lands due to the good offices of the tsar Alexander I. At this time Oldenburg was made a grand duchy, but the title of grand-duke was not formally assumed until 1829, when Augustus succeeded his father Peter as ruler. Under Peter's rule the area of Oldenburg had been increased, not only by Birkenfeld, but by the bishopric of Lübeck (secularized in 1802) and some smaller pieces of territory.

Oldenburg did not entirely escape from the revolutionary movement which swept across Europe in 1848, but no serious disturbances took place therein. In 1849 the grand-duke granted a constitution of a very liberal character to his subjects. Hitherto his country had been ruled in the spirit of enlightened despotism, which was strengthened by the absence of a privileged class of nobles, by the comparative independence of the peasantry, and by the unimportance of the towns; and thus a certain amount of friction was inevitable in the working of the new order. In 1852 some modifications were introduced into the constitution, which, nevertheless, remained one of the most liberal in Germany. Important alterations were made in the administrative system in 1855, and again in 1868, and church affairs were ordered by a law of 1853. In 1863 the grand-duke Peter II. (1827–1900), who had ruled Oldenburg since the death of his father Augustus in 1853, seemed inclined to press a claim to the vacant duchies of Schleswig and Holstein, but ultimately in 1867 he abandoned this in favour of Prussia, and received some slight compensation. In 1866 he had sided with this power against Austria and had joined the North German Confederation; in 1871 Oldenburg became a state of the new German empire. In June 1900 Frederick Augustus (b. 1852) succeeded his father Peter as grand-duke. By a law passed in 1904 the succession to Oldenburg was vested in Frederick Ferdinand, duke of Schleswig-Holstein-Sonderburg-Glücksburg, and his family, after the extinction of the present ruling house. This arrangement was rendered advisable because the grand-duke Frederick Augustus had only one son Nicholas (b. 1897), and his only brother George Louis (1855) was unmarried.

For the history of Oldenburg see Runde, *Oldenburgische Chronik* (Oldenburg, 1863); E. Pleitner, *Oldenburg im 19 Jahrhundert* (Oldenburg, 1899–1900); and *Oldenburgisches Quellenbuch* (Oldenburg, 1903). See also the *Jahrbuch für die Geschichte des Herzogtums Oldenburg* (1892 seq.).

OLDENBURG, a town of Germany, and capital of the grand-duchy of Oldenburg. It is a quiet and pleasant-looking town, situated 27 m. by rail W. of Bremen, on the navigable Hunte and the Hunte-Ems canal. Pop. (1905), including the suburbs, 28,565. The inner or old town, with its somewhat narrow streets, is surrounded by avenues laid out on the site of the former ramparts, beyond which are the villas, promenades and gardens of the modern quarters. Oldenburg has almost nothing to show in the shape of interesting old buildings. The

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[1] His father, Charles Frederick of Holstein-Gottorp (1700–1739), a descendant of Christian I. of Denmark, married Anne, daughter of Peter the Great, and became tsar as Peter III. in 1762.

[2] To this branch belonged Adolphus Frederick, son of Christian Augustus bishop of Lübeck (d. 1726), who in 1751 became king of Sweden.

Another branch of the Oldenburg family, descended from John, son of Christian III. of Denmark, is that of Holstein-Sonderburg. This was subdivided into the lines of Sonderburg-Augustenburg and Sonderburg-Glücksburg. Prince Christian, who married Princess Helena of Great Britain, belongs to the former of them. To the latter belong the kings of Denmark, Greece and Norway.

Evangelical Lambertikirche, though dating from the 13th century, has been so transformed in the last century (1874–1886) as to show no trace of its antiquity. The palaces of the grand-duke and the old town-hall are Renaissance buildings of the 17th and 18th centuries. Among the other prominent buildings—all modern—are the palace of the heir apparent, the new town-hall, the theatre, the law-courts, the gymnasium, the commercial school, the three hospitals and the new Roman Catholic church. The grand-ducal picture gallery in the Augusteum includes works by Veronese, Velasquez, Murillo and Rubens, and there are collections of modern paintings and sculptures in the two palaces. The public library contains 110,000 volumes and the duke's private library 55,000. There is also a large natural history museum and a museum with a collection of antiquities. The industries of Oldenburg, which are of no great importance, include iron-founding, spinning and the making of glass, tobacco, gloves, soap and leather. A considerable trade is carried on in grain, and the horse fairs are largely frequented. According to popular tradition Oldenburg was founded by Walbert, grandson of the Saxon hero, Widukind, and was named after his wife Altburga, but the first historical mention of it occurs in a document of 1108. It was fortified in 1155, and received a municipal charter in 1345. The subsequent history of the town is merged in that of the grand-duchy.

See Sello, *Historische Wanderung durch die Stadt Oldenburg* (Oldenburg, 1896); and *Alt-Oldenburg* (Oldenburg, 1903); and Kohl, *Die Allmende der Stadt Oldenburg* (Oldenburg, 1903).

OLDFIELD, ANNE (1683–1730), English actress, was born in London, the daughter of a soldier. She worked for a time as apprentice to a semptress, until she attracted George Farquhar's attention by reciting some lines from a play in his hearing. She thereupon obtained an engagement at Drury Lane, where her beauty rather than her ability slowly brought her into favour, and it was not until ten years later that she was generally acknowledged as the best actress of her time. In polite comedy, especially, she was unrivalled, and even the usually grudging Cibber acknowledged that she had as much as he to do with the success of the *Careless Husband* (1704), in which she created the part of Lady Modish, reluctantly given her because Mrs Verbruggen was ill. In tragedy, too, she won laurels, and the list of her parts, many of them original, is a long and varied one. She was the theatrical idol of her day. Her exquisite acting and lady-like carriage were the delight of her contemporaries, and her beauty and generosity found innumerable eulogists, as well as sneering detractors. Alexander Pope, in his *Sober Advice from Horace*, wrote of her—

> "Engaging Oldfield, who, with grace and ease,
> Could join the arts to ruin and to please."

It was to her that the satirist alluded as the lady who detested being buried in woollen, who said to her maid—

> "No, let a charming chintz and Brussels lace
> Wrap my cold limbs and shade my lifeless face;
> One would not, sure, be frightful when one's dead,
> And—Betty—give this cheek a little red."

She was but forty-seven when she died on the 23rd of October 1730, leaving all the court and half the town in tears.

She divided her property, for that time a large one, between her natural sons, the first by Arthur Mainwaring (1668–1712)—who had left her and his son half his fortune on his death—and the second by Lieut.-General Charles Churchill (d. 1745). Mrs Oldfield was buried in Westminster Abbey, beneath the monument to Congreve, but when Churchill applied for permission to erect a monument there to her memory the dean of Westminster refused it.

OLD FORGE, a borough of Lackawanna county, Pennsylvania, U.S.A., on the Lackawanna river, about 6 m. S.W. of Scranton. Pop. (1900) 5630 (2494 foreign-born, principally Italians); (1910) 11,324. It is served by the Delaware, Lackawanna & Western and the Lehigh Valley railways. The principal public buildings are the town-hall and the high school. The borough is situated in the anthracite coal region, and the mining of coal is the principal industry, though there are also various manufactures. Old Forge was settled in 1830 and incorporated as a borough in 1899.

OLDHAM, JOHN (1653–1683), English satirist, son of a Presbyterian minister, was born at Shipton Moyne, near Tetbury, Gloucestershire, on the 9th of August 1653. He graduated from St Edmund Hall, Oxford, in 1674, and was for three years an usher in a school at Croydon. Some of his verses attracted the attention of the town, and the earl of Rochester, with Sir Charles Sedley and other wits, came down to see him. The visit did not affect his career apparently, for he stayed at Croydon until 1681, when he became tutor to the grandsons of Sir Edward Thurland, near Reigate. Meanwhile he had tried, he says, to conquer his inclination for the unprofitable trade of poetry, but in the panic caused by the revelations of Titus Oates, he found an opportunity for the exercise of his gift for rough satire. *Garnet's Ghost* was published as a broadside in 1679, but the other *Satires on the Jesuits*, although written at the same time, were not printed until 1681. The success of these dramatic and unsparing invectives apparently gave Oldham hope that he might become independent of teaching. But his undoubted services to the Country Party brought no reward from its leaders. He became tutor to the son of Sir William Hickes, and was eventually glad to accept the patronage of William Pierrepont, earl of Kingston, whose kindly offer of a chaplaincy he had refused earlier. He died at Holme-Pierrepoint, near Nottingham, on the 9th of December 1683, of smallpox.

Oldham took Juvenal for his model, and in breadth of treatment and power of invective surpassed his English predecessors. He was original in the dramatic setting provided for his satires. Thomas Garnet, who suffered for supposed implication in the Gunpowder Plot, rose from the dead to encourage the Jesuits in the first satire, and in the third Ignatius Loyola is represented as dictating his wishes to his disciples from his death-bed. Oldham wrote other satires, notably one "addressed to a friend about to leave the university," which contains a well-known description of the state of slavery of the private chaplain, and another "dissuading from poetry," describing the ingratitude shown to Edmund Spenser, whose ghost is the speaker, to Samuel Butler and to Abraham Cowley. Oldham's verse is rugged, and his rhymes often defective, but he met with a generous appreciation from Dryden, whose own satiric bent was perhaps influenced by his efforts. He says ("To the Memory of Mr Oldham," *Works*, ed. Scott, vol. xi. p. 99):—

> "For sure our souls were near allied, and thine
> Cast in the same poetic mould with mine."

The real wit and rigour of Oldham's satirical poetry are undeniable, while its faults—its frenzied extravagance and lack of metrical polish—might, as Dryden suggests, have been cured with time, for Oldham was only thirty when he died.

The best edition of his works is *The Compositions in Prose and Verse of Mr John Oldham . . .* (1770), with memoir and explanatory notes by Edward Thompson.

OLDHAM, THOMAS (1816–1878) British geologist, was born in Dublin on the 4th of May 1816. He was educated there at Trinity College, graduating B.A. in 1836, and afterwards studied engineering in Edinburgh, where he gained a good knowledge of geology and mineralogy under Jameson. On his return to Ireland in 1839 he became chief assistant to Captain (afterwards Major General) Portlock, who conducted the geological department of the Ordnance Survey, and he rendered much help in the field and office in the preparation of the *Report on the Geology of Londonderry, &c.* (1843). Subsequently he served under Captain (afterwards Sir Henry) James, the first local director of the Geological Survey of Ireland, whom he succeeded in 1846. Meanwhile in 1845 he was appointed professor of Geology in the university of Dublin. In 1848 he was elected F.R.S. In 1849 he discovered in the Cambrian rocks of Bray Head the problematical fossil named *Oldhamia*. In 1850 he was selected to take charge of the Geological Survey of India, which he organized, and in due course he established the *Memoirs*, the *Palaeontologia Indica* and the *Records*, to which he contributed many important articles. In 1864 he published an elaborate report *On the Coal Resources of India.* He retired in 1876, and died at Rugby on the 17th of July 1878.

OLDHAM, a municipal county and parliamentary borough of Lancashire, England, 7 m. N.E. of Manchester, on the London & North-Western, Great Central and Lancashire & Yorkshire railways and the Oldham canal. Pop. (1891) 131,463; (1901) 137,246. The principal railway station is called Mumps, but there are several others. The town lies high, near the source of the small river Medlock. Its growth as a manufacturing centre gives it a wholly modern appearance. Among several handsome churches the oldest dates only from the later 18th century. The principal buildings and institutions include the town-hall, with tetrastyle portico copied from the Ionic temple of Ceres near Athens, the reference library, art gallery and museum, the Union Street baths, commemorating Sir Robert Peel the statesman, and the county court. Of educational establishments the chief are the Lyceum, a building in Italian style, containing schools of art and science, and including an observatory; the largely-endowed blue-coat school founded in 1808 by Thomas Henshaw, a wealthy manufacturer of hats; the Hulme grammar school (1895), and municipal technical schools. The Alexandra Park, opened in 1865, was laid out by operatives who were thrown out of employment owing to the cotton famine in the years previous to that date. The site is picturesquely undulating and terraced. Oldham is one of the most important centres of the cotton manufactures, the consumption of cotton being about one-fifth of the total importation into the United Kingdom, the factories numbering some 230, and the spindles over 13 millions, while some 35,000 operatives are employed. The principal manufactures are fustians, velvets, cords, shirtings, sheetings and nankeens. There are also large foundries and mill and cotton machinery works; and works for the construction of gas-meters and sewing-machines; while all these industries are assisted by the immediate presence of collieries. There are extensive markets and numerous fairs are held. Oldham was incorporated in 1849, and became a county borough in 1888. The corporation consists of a mayor, 12 aldermen and 36 councillors. The parliamentary borough has returned two members since 1832. Area of municipal borough, 4736 acres.

A Roman road, of which some traces are still left, passes through the site of the township, but it does not appear to have been a Roman station. It is not mentioned in Domesday; but in the reign of Henry III. Alwardus de Aldholme is referred to as holding land in Vernet (Werneth). A daughter and co-heiress of this Alwardus conveyed Werneth Hall and its manor to the Cudworths, a branch of the Yorkshire family, with whom it remained till the early part of the 18th century. From the Oldhams was descended Hugh Oldham, who died bishop of Exeter in 1519. From entries in the church registers it would appear that linens were manufactured in Oldham as early as 1630. Watermills were introduced in 1770, and with the adoption of Arkwright's inventions the cotton industry grew with great rapidity.

OLD MAID, a game of cards. Any number may play, and the full pack is used, the Queen of Hearts being removed. The cards are dealt out one by one until exhausted, and each player then sorts his hand and discards the pairs. The dealer then offers his hand, spread out face downwards to the next player, who draws a card, which, if it completes a pair, is discarded, but otherwise remains in the hand. The process continues from player to player, until all the cards have been paired and discarded excepting the odd queen, the holder of which is the "Old Maid."

OLDMIXON, JOHN (1673–1742), English historian, was a son of John Oldmixon of Oldmixon, near Bridgwater. His first writings were poems and dramas, among them being *Amores Britannici; Epistles historical and gallant* (1703); and a tragedy, *The Governor of Cyprus.* His earliest historical work was *The British Empire in America* (1708 and again 1741), which was followed by *The Secret History of Europe* (1712–1715); by *Arcana Gallica, or the Secret History of France for the last Century* (1714); and by other smaller writings. More important, however, although of a very partisan character, are Oldmixon's works on English history. His *Critical history of England* (1724–1726) contains attacks on Clarendon and a defence of Bishop Burnet, and its publication led to a controversy between Dr Zachary Grey (1688–1766) and the author, who replied to Grey in his *Clarendon and Whitlock compared* (1727). On the same lines he wrote his *History of England during the Reigns of the Royal House of Stuart* (1730). Herein he charged Bishop Atterbury and other of Clarendon's editors with tampering with the text of the *History.* From his exile Atterbury replied to this charge in a *Vindication*, and although Oldmixon continued the controversy it is practically certain that he was in the wrong. He completed a continuous history of England by writing the *History of England during the Reigns of William and Mary, Anne and George I.* (1735); and the *History of England during the Reigns of Henry VIII., Edward VI., Mary and Elizabeth* (1739). Among his other writings are, *Memoirs of North Britain* (1715), *Essay on Criticism* (1728) and *Memoirs of the Press 1710–1740* (1742), which was only published after his death. Oldmixon had much to do with editing two periodicals, *The Muses Mercury* and *The Medley*, and he often complained that his services were overlooked by the government. He died on the 9th of July 1742.

OLD POINT COMFORT, a summer and winter resort, in Elizabeth City county, Virginia, U.S.A., at the southern end of a narrow, sandy peninsula projecting into Hampton Roads (at the mouth of the James river), about 12 m. N. by W. of Norfolk. It is served directly by the Chesapeake & Ohio railway, and indirectly by the New York, Philadelphia & Norfolk (Pennsylvania System), passengers and freight being carried by steamer from the terminus at Cape Charles; by steamboat lines connecting with the principal cities along the Atlantic coast, and with cities along the James river; by ferry, connecting with Norfolk and Portsmouth; and by electric railway (3 m.) to Hampton and (12 m.) to Newport News. There is a U.S. garrison at Fort Monroe, one of the most important fortifications on the Atlantic coast of the United States. Old Point Comfort is included in the reservation of Fort Monroe. The fort lies within the tract of 252 acres ceded, for coast defence purposes, to the Federal government by the state of Virginia in 1821, the survey for the original fortifications having been made in 1818, and the building begun in 1819. It was named in honour of President Monroe and was first regularly garrisoned in 1823; in 1824 the Artillery School of Practice (now called the United States Coast Artillery School) was established to provide commissioned officers of the Coast Artillery with instruction in professional work and to give technical instruction to the non-commissioned staff. During the Civil War the fort was the rendezvous for several military expeditions, notably those of General Benjamin F. Butler to Hatteras Inlet, in 1861; of General A. E. Burnside, to North Carolina, in 1862; and of General A. H. Terry, against Fort Fisher, in 1865; within sight of its parapets was fought the famous duel between the "Monitor" and the "Merrimac" (March 9, 1862). Jefferson Davis was a prisoner here for two years, from the 22nd of May 1865, and Clement Claiborne Clay (1819–1882), a prominent Confederate, from the same date until April 1866. Between Fort Monroe and Sewell's Point is Fort Wool, almost covering a small island called Rip Raps. The expedition which settled Jamestown rounded this peninsula (April 26, 1607), opened its sealed instructions here, and named the peninsula Poynt Comfort, in recognition of the sheltered harbour. (The "Old" was added subsequently to distinguish it from a Point Comfort settlement at the mouth of the York river on Chesapeake Bay). On the site of the present fortification a fort was erected by the whites as early as 1630.

OLD TOWN, a city of Penobscot county, Maine, U.S.A., on the Penobscot river, about 12 m. N.E. of Bangor. Pop. (1890) 5312; (1900) 5763 (1247 foreign-born); (1910) 6317. It is served by the Maine Central and the Bangor & Aroostook railways, and by an electric line connecting with Bangor. The city proper is on an island (Marsh, or Old Town Island), but considerable territory on the W. bank of the river is included within the municipal limits. The manufacture of lumber is the principal industry of the city On Indian Island (opposite the city) is the principal settlement of the Penobscot Indians, an Abnaki tribe, now wards of the state. The abbé Louis Pierre Thury was sent here from Quebec about 1687 and built a church in 1688–1689; in 1705 the mission passed under the control of the Jesuits. The first white settler in the vicinity seems to have been John Marsh, who came about 1774, and who bought the island now known as Marsh Island. From 1806 to 1840, when it was incorporated as a separate township, Old Town was a part of Orono. In 1891 it was chartered as a city. One of the oldest railways in the United States, and the first in Maine, was completed to Old Town from Bangor in 1836.

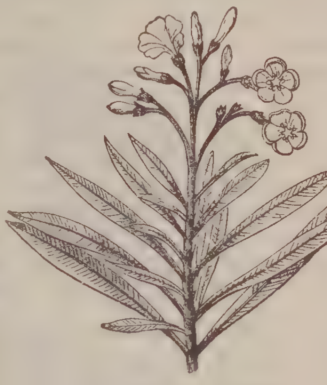
OLDYS, WILLIAM (1696–1761), English antiquary and bibliographer, natural son of Dr William Oldys, chancellor of Lincoln, was born on the 14th of July 1696, probably in London. His father had also held the office of advocate of the admiralty, but lost it in 1693 because he would not prosecute as traitors and pirates the sailors who had served against England under James II. William Oldys, the younger, lost part of his small patrimony in the South Sea Bubble, and in 1724 went to Yorkshire, spending the greater part of the next six years as the guest of the earl of Malton. On his return to London he found that his landlord had disposed of the books and papers left in his charge. Among these was an annotated copy of Gerard Langbaine's *Dramatick Poets*. The book came into the hands of Thomas Coxeter (1689–1747), and subsequently into Theophilus Cibber's possession, and furnished the basis of the *Lives of the Poets* (1753) published with Cibber's name on the title page, though most of it was written by Robert Shiels. In 1731 Oldys sold his collections to Edward Harley, second earl of Oxford, who appointed him his literary secretary in 1738. Three years later his patron died, and from that time he worked for the booksellers. His habits were irregular, and in 1751 his debts drove him to the Fleet prison. After two years' imprisonment he was released through the kindness of friends who paid his debts, and in April 1755 he was appointed Norroy king-at-arms by the duke of Norfolk. He died on the 15th of April 1761.

Oldys's chief works are: *The British Librarian*, a review of scarce and valuable books in print and in manuscript (1737–1738); the *Harleian Miscellany* (1744–1746), a collection of tracts and pamphlets in the earl of Oxford's library, undertaken in conjunction with Dr Johnson; twenty-two articles contributed to the *Biographia Britannica* (1747–1760); an edition of Raleigh's *History of the World*, with a *Life* of the author (1736); *Life of Charles Cotton* prefixed to Sir John Hawkins's edition (1760) of the *Compleat Angler*. In 1727 Oldys began to annotate another Langbaine to replace the one he had lost. This valuable book, with a MS. collection of notes by Oldys on various bibliographical subjects, is preserved in the British Museum.

OLEAN, a city of Cattaraugus county, in south-western New York, U.S.A., on Olean Creek and the N. side of the Allegheny river, 70 m. S.E. of Buffalo. Pop. (1880), 3036; (1890), 7358; (1900), 9462, of whom 1514 were foreign-born and 122 were negroes; (1910 census), 14,743. The city is served by the Erie, the Pittsburg, Shawmut & Northern, and the Pennsylvania railways (the last has large car shops here); and is connected with Bradford, Pa., Allegany, Pa., Salamanca, N.Y., Little Valley, N.Y., and Bolivar, N.Y., by electric lines. Olean is situated in a level valley 1440 ft. above sea-level. The surrounding country is rich in oil and natural gas. Six miles from Olean and 2000 ft. above the sea-level is Rock City, a group of immense, strangely regular, conglomerate rocks (some of them pure white) covering about 40 acres. They are remnants of a bed of Upper Devonian Conglomerate, which broke along the joint planes, leaving a group of huge blocks. In the city are a public library, a general hospital and a state armoury; and at Allegany (pop. 1910, 1286), about 3 m. W. of Olean, is St Bonaventure's College (1859; Roman Catholic). Olean's factory product was valued at $4,677,477 in 1905; the city is the terminus of an Ohio pipe line, and of a sea-board pipe line for petroleum; and among its industries are oil-refining and the refining of wood alcohol, tanning, currying, and finishing leather; and the manufacture of flour, glass (mostly bottles), lumber, &c. The vicinity was settled in 1804, and this was the first township organized (1808), being then coextensive with the county. Olean Creek was called Ischue (or Ischua); then Olean was suggested, possibly in reference to the oil-springs in the vicinity. The village was officially called Hamilton for a time, but Olean was the name given to the post-office in 1817, and Olean Point was the popular local name. In 1909 several suburbs, including the village of North Olean (pop. in 1905, 1761), were annexed to Olean, considerably increasing its area and population.

See *History of Cattaraugus County, New York* (Philadelphia, 1879).

OLEANDER, the common name for the shrub known to botanists as *Nerium Oleander*. It is a native of the Mediterranean and Levant, and is characterized by its tall shrubby habit and its thick lance-shaped opposite leaves, which exude a milky juice when punctured. The flowers are borne in terminal clusters, and are like those of the common periwinkle (*Vinca*), but are of a rose colour, rarely white, and the throat or upper edge of the tube of the corolla is occupied by outgrowths in the form of lobed and fringed petal-like scales. The hairy anthers adhere to the thickened stigma. The fruit or seed-vessel consists of two long pods, which, bursting along one edge, liberate a number of seeds, each of which has a tuft of silky hairs like thistle down at the upper end. The genus belongs to the natural order Apocynaceae, a family that, as is usual where the juice has a milky appearance, is marked by its poisonous properties. Cases are recorded by Lindley of children poisoned by the flowers. The same author also narrates how in the course of the Peninsular War some French soldiers died in consequence of employing skewers made from freshly-cut twigs of oleander for roasting their meat. The oleander was known to the Greeks under three names, viz. *rhododendron*, *nerion* and *rhododaphne*, and is well described by Pliny (xvi. 20), who mentions its rose-like flowers and poisonous qualities, at the same time stating that it was considered serviceable as a remedy against snake-bite. The name is supposed to be a corruption of *lorandrum*, *lauridendrum* (Du Cange), influenced by *olea*, the olive-tree, *lorandrum* being itself a corruption of *rhododendron*. The modern Greeks still know the plant as ῥοδοδάφνη, although in a figure in the Rinuccini MSS. of Dioscorides a plant is represented under this name, which, however, had rather the appearance of a willow herb (*Epilobium*). The oleander has long been cultivated in greenhouses in England, being, as Gerard says, "a small shrub of a gallant shewe"; numerous varieties, differing in the colour of their flowers, which are often double, have been introduced.



Nerium Oleander.

OLEASTER, known botanically as *Elaeagnus hortensis*, a handsome deciduous tree, 15 to 20 ft. high, growing in the Mediterranean region and temperate Asia, where it is commonly cultivated for its edible fruit. The brown smooth branches are more or less spiny; the narrow leaves have a hoary look from the presence of a dense covering of star-shaped hairs; the small fragrant yellow flowers, which are borne in the axils of the leaves, are scaly on the outside. The genus contains other species of ornamental deciduous or evergreen shrubs or small trees. *E. argentea*, a native of North America, has leaves and fruit covered with shining silvery scales. In *E. glabra*, from Japan, the evergreen leaves are clothed beneath with rust-coloured scales; variegated forms of this are cultivated, as also of *E. pungens*, another Japanese species, a spiny shrub with leaves silvery beneath.

OLEFINE, in organic chemistry, the generic name given to open chain hydrocarbons having only singly and doubly linked pairs of carbon atoms. The word is derived from the French *olefiant* (from *olėfier*, to make oil), which was the name given to ethylene, the first member of the series, by the Dutch chemists, J. R. Deiman, Paets van Troostwyk, N. Bondt and A. Lauwerenburgh in 1795. The simple olefines containing one doubly-linked pair of carbon atoms have the general formula (C_nH_{2n}; the di-olefines, containing two doubly-linked pairs, have the general formula C_nH_{2n-2} and are consequently isomeric with the simple acetylenes. Tri-, tetra- and more complicated members are also known. The name of any particular member of the series is derived from that of the corresponding member of the paraffin series by removing the final syllable "-ane," and replacing it by the syllable "ylene." Isomerism in the olefine series does not appear until the third member of the series is reached.

The higher olefines are found in the tar which is obtained by distilling bituminous shales, in illuminating gas, and among the products formed by distilling paraffin under pressure (T. E. Thorpe and J. Young, *Ann.*, 1873, 165, p. 1). The olefines may be synthetically prepared by eliminating water from the alcohols of the general formula $C_nH_{2n+1}\cdot OH$, using sulphuric acid or zinc chloride generally as the dehydrating agent, although phosphorus pentoxide, syrupy phosphoric acid and anhydrous oxalic acid may frequently be substituted. In this method of preparation it is found that the secondary alcohols decompose more readily that the primary alcohols of the series, and when sulphuric acid is used, two phases are present in the reaction, the first being the building up of an intermediate sulphuric acid ester, which then decomposes into sulphuric acid and hydrocarbon: $C_2H_5OH \rightarrow C_2H_5\cdot HSO_4 \rightarrow C_2H_4 + H_2SO_4$. As an alternative to the above method, V. Ipatiew (*Ber.*, 1901, 34, p. 596 et seq.) has shown that the alcohols break up into ethylenes and water when their vapour is passed through a heated tube containing some "contact" substance, such as graphite, kieselguhr, &c. (see also J. B. Senderens, *Comptes rendus*, 1907, 144, pp. 382, 1109).

They may also be prepared by eliminating the halogen hydride from the alkyl halides by heating with alcoholic potash, or with litharge at 220° C. (A. Eltekow, *Ber.*, 1878, 11, p. 414); by the action of metals on the halogen compounds $C_nH_{2n}Br_2$; by boiling the aqueous solution of nitrites of the primary amines (V. Meyer, *Ber.*, 1876, 9, p. 543), $C_3H_7NH_2 + HNO_2 = N_2 + 2H_2O + C_3H_6$; by the electrolysis of the alkali salts of saturated dicarboxylic acids; by the decomposition of β-haloid fatty acids with sodium carbonate, $CH_3CHBr\cdot CH(CH_3)\cdot CO_2H = CO_2 + HBr + CH_3CH:CH\cdot CH_3$; by distilling the barium salts of acids $C_nH_{2n-2}O_2$ with sodium methylate *in vacuo* (I. Mai, *Ber.*, 1889, 22, p. 2135); from the higher alcohols by converting them into esters which are then distilled (F. Krafft, *Ber.*, 1883, 16, p. 3018):

$$C_{16}H_{33}\cdot CH_2\cdot CH_2\cdot OH \rightarrow C_{16}H_{33}CH_2\cdot CH_2\cdot O\cdot CO\cdot R \rightarrow C_{16}H_{33}CH:CH_2 + R\cdot COOH;$$

from tertiary alcohols by the action of acetic anhydride in the presence of a small quantity of sulphuric acid (L. Henry, *Comptes rendus*, 1907, 144, p. 552):

$$(CH_3)_2\cdot C(OH)\cdot CH(CH_3)_2 \rightarrow (CH_3)_2C:C(CH_3)_2 + CH_2:C(CH_3)\cdot CH(CH_3)_2;$$

from unsaturated alcohols by the action of metal-ammonium compounds (E. Chablay, *Comptes rendus*, 1906, 143, p. 123):

$$2CH_2:CH\cdot CH_2OH + 2NH_3\cdot Na = CH_2:CH\cdot CH_3 + CH_2:CH\cdot CH_2ONa + NaOH + 2NH_3;$$

from the lower members of the series by heating them with alkyl halides in the presence of lead oxide or lime: $C_5H_{10} + 2CH_3I = 2HI + C_7H_{14}$; and by the action of the zinc alkyls upon the halogen substituted olefines.

A. Mailhe (*Chem. Zeit.*, 1906, 30, p. 37) has shown that on passing the monohalogen derivatives of the paraffins through a glass tube containing reduced nickel, copper or cobalt at 250° C., olefines are produced, together with the halogen acids, and recombination is prevented by passing the gases through a solution of potash. The reaction probably proceeds thus: $MCl_2 + C_nH_{2n+1}Cl \rightarrow HCl + Cl\cdot M\cdot C_nH_{2n}Cl \rightarrow MCl_2 + C_nH_{2n}$, since the haloid derivatives of the monovalent metals do not act similarly. The anhydrous chlorides of nickel, cobalt, cadmium, barium, iron and lead act in the same way as catalysts at about 300° C., and the bromides of lead, cadmium, nickel and barium at about 320° C.

In their physical properties, the olefines resemble the normal paraffins, the lower members of the series being inflammable gases, the members from C_5 to C_{14} liquids insoluble in water, and from C_{16} upwards of solids. The chief normal members of the series are shown in the table. In chemical properties, however, they differ very markedly from the paraffins. As unsaturated compounds they can combine with two monovalent atoms. Hydrogen is absorbed readily at ordinary temperature in the presence of platinum black, and paraffins are formed; the halogens (chlorine and bromine) combine directly with them, giving dihalogen substituted compounds; the halogen halides to form monohalogen derivatives (hydriodic acid reacts most readily, hydrochloric acid, least); and it is to be noted that the haloid acids attach themselves in such a manner that the halogen atom unites itself to the carbon atom which is in combination with the fewest hydrogen atoms (W. Markownikow, *Ann.*, 1870, 153, p. 256).

Name.	Formula.	Melting-point. C.	Boiling-point. C.
Ethylene . .	$CH_2:CH_2$	−169°	−102·7° (757 mm.)
Propylene . .	$CH_3CH:CH_2$	. .	−50·2° (749 mm.)
Butylene . .	$C_2H_5\cdot CH:CH_2$	. .	−5°
Amylene . .	$C_3H_7\cdot CH:CH_2$	. .	39°—40°
Hexylene . .	$C_4H_9CH:CH_2$	. .	68°—70°
Heptylene . .	$C_5H_{11}CH:CH_2$	. .	95°
Octylene . .	$C_6H_{13}CH:CH_2$	. .	122°—123°
Decylene . .	$C_8H_{17}CH:CH_2$	. .	172°
Undecylene. .	$C_9H_{19}CH:CH_2$	. .	84° (18 mm.)
Duodecylene .	$C_{10}H_{21}CH:CH_2$	−31°	96° (15 mm.)

They combine with hypochlorous acid to form chlorhydrins; and are easily soluble in concentrated sulphuric acid, giving rise to sulphuric acid esters; consequently if the solution be boiled with water, the alcohol from which the olefine was in the first place derived is regenerated. The oxides of nitrogen convert them into nitrosites and nitrosates (O. Wallach, *Ann.*, 1887, 241, p. 288, &c.; J. Schmidt, *Ber.*, 1902, 35, pp. 2323 et seq.). They also combine with nitrosyl bromide and chloride, and with many metallic haloid salts (platinum bichloride, iridium chloride), with mercury salts (see K. A. Hofmann and J. Sand, *Ber.*, 1900, 33, pp. 1340 et seq.), and those with a tertiary carbon atom yield double salts with zinc chloride. Dilute potassium permanganate oxidizes the olefines to glycols (G. Wagner, *Ber.*, 1888, 21, p. 3359). With ozone they form ozonides (C. Harries, *Ber.*, 1904, 37, p. 839). The higher members of the series readily polymerize in the presence of dilute sulphuric acid, zinc chloride, &c.

For the first member of the series see ETHYLENE.

Propylene, C_3H_6, may be obtained by passing the vapour of trimethylene through a heated tube (S. M. Tanatar, *Ber.*, 1899, 32, pp. 702, 1965). It is a colourless gas which may be liquefied by a pressure of 7 to 8 atmospheres. *Butylene*, C_4H_8, exists in three isomeric forms: normal butylene, $C_2H_5\cdot CH:CH_2$; pseudo-butylene, $CH_3\cdot CH:CH\cdot CH_3$; and isobutylene, $(CH_3)_2C:CH_2$. Normal butylene is a readily condensible gas. Two spatial modifications of *pseudo-butylene*, $CH_3\cdot CH:CH\cdot CH_3$, are known, the *cis* and the *trans*; they are prepared by heating the sodium salts of hydro-iodo-tiglic and hydro-iodo-angelic acids respectively (J. Wislicenus, *Ann.*, 1900, 313, p. 228). *Isobutylene*, $(CH_3)_2C:CH_2$, is formed in the dry distillation of fats, and also occurs among the products obtained when the vapour of fusel oil is led through a heated tube. It is a gas at ordinary temperature, and may be liquefied, the liquid boiling at −5° C. It combines with acetyl chloride in the presence of zinc chloride to form a ketone, which on warming breaks down into hydrochloric acid and mesityl oxide (I. L. Kondakow, *Jour. Russ. phys. chem. Soc.* 26, p. 12). It polymerizes, giving isodibutylene, C_8H_{16}, and isotributylene, $C_{12}H_{24}$, liquids which boil at 110–113° and 178–181° C. *Amylene*, C_5H_{10}, exists in five isomeric forms, viz. (*n*) propylethylene, $CH_3\cdot CH_2\cdot CH_2\cdot CH:CH_2$; isopropylethylene, $(CH_3)_2CH\cdot CH:CH_2$; symmetrical methyl-ethyl-ethylene, $CH_3\cdot CH:CH\cdot C_2H_5$; unsymmetrical methyl-ethyl-ethylene, $(CH_3)(C_2H_5)C:CH_2$; and trimethyl ethylene, $(CH_3)_2C:CH(CH_3)$. The highest members of the series as yet known are *cerotene*, $C_{26}H_{52}$, which is obtained by the distillation of Chinese wax and is a paraffin-like solid which melts at 57° C., and *melene*, $C_{30}H_{60}$(?), which is obtained by the distillation of bees'-wax. It melts at 62° C. (B. J. Brodie, *Ann.*, 1848, 67, p. 210; 1849, 71, p. 156).

OLEG (?–912), prince of Kiev, succeeded Rurik, as being the eldest member of the ducal family, in the principality of Great Novgorod, the first Russian metropolis. Three years later he moved southwards and, after taking Smolensk and other places, fixed his residence at Kiev, which he made his capital. He then proceeded to build a fortress there and gradually compelled the surrounding tribes to pay him tribute, extending his conquests in all directions (883–903) at the expense of the Khazars, who hitherto had held all southern Russia to tribute. In 907, with a host made up of all the subject tribes, Slavonic and Finnic, he sailed against the Greeks in a fleet consisting, according to the *lyetopis*, of 2000 vessels, each of which held 40 men; but this estimate is plainly an exaggeration. On reaching Constantinople, Oleg disembarked his forces, mercilessly ravaged the suburbs of the imperial city, and compelled the emperor to pay tribute, provide the Russians with provisions for the return journey, and take fifty of them over the city. A formal treaty was then concluded, which the Slavonians swore to observe in the names of their gods Perun and Volos. Oleg returned to Kiev laden with golden ornaments, costly cloths, wines, and all manner of precious things. In 911 he sent an embassy of fourteen persons to Constantinople to get the former treaty confirmed and enlarged. The names of these ambassadors are preserved and they point to the Scandinavian origin of Oleg's host; there is not a Slavonic name among them. A new and elaborate treaty, the terms of which have come down to us, was now concluded between the Russians and Greeks, a treaty which evidently sought to bind the two nations closely together and obviate all possible differences which might arise between them in the future. There was also to be free trade between the two nations, and the Russians might enter the service of the Greek emperor if they desired it. The envoys returned to Kiev in 912 after being shown the splendours of the Greek capital and being instructed in the rudiments of the Greek faith. In the autumn of the same year Oleg died and was buried at Kiev.

See S. M. Solovev, *History of Russia* (Rus.), vol. i. (St Petersburg, 1895, &c.); M. F. Vladimirsky-Budanov, *Chrestomathy of the History of Russian Law* (Rus.), pt. i. (Kiev, 1889). (R. N. B.)

OLEIC ACID, $C_{13}H_{34}O_2$ or $C_8H_{17}\cdot CH:CH\cdot [CH_2]_7\cdot CO_2H$, an organic acid occurring as a glyceride, triolein, in nearly all fats, and in many oils—olive, almond, cod-liver, &c. (see OILS). It appears as a by-product in the manufacture of candles. To prepare it olive oil is saponified with potash, and lead acetate added; the lead salts are separated, dried, and extracted with ether, which dissolves the lead oleate; the solution is then treated with hydrochloric acid, the lead chloride filtered off, the liquid concentrated, and finally distilled under diminished pressure. Oleic acid is a colourless, odourless solid, melting at 14° and boiling at 223° (10 mm.). On exposure it turns yellow, becoming rancid. Nitric acid oxidizes it to all the fatty acids from acetic to capric. Nitrous acid gives the isomeric elaidic acid, $C_8H_{17}\cdot CH:CH\cdot(CH_2]_7\cdot CO_2H$, which is crystalline and melts at 51°. Hydriodic acid reduces both oleic and elaidic acids to stearic acid.

Erucic acid, $C_8H_{17}\cdot CH:CH\cdot[CH_2]_{11}\cdot CO_2H$, and the isomeric brassidic acid, belong to the oleic acid series. They occur as glycerides in rape-seed oil, in the fatty oil of mustard, and in the oil of grape seeds. Linoleic acid, $C_{18}H_{32}O_2$, found as glyceride in drying oils, and ricinoleic acid, $C_{18}H_{33}(OH)O_2$, found as glyceride in castor oil, closely resemble oleic acid.

OLEN, a semi-legendary Greek bard and seer, and writer of hymns. He is said to have been the first priest of Apollo, his connexion with whom is indicated by his traditional birthplace—Lycia or the land of the Hyperboreans, favourite haunts of the god. The Delphian poetess Boeo attributed to him the introduction of the cult of Apollo and the invention of the epic metre. Many hymns, nomes (simple songs to accompany the circular dance of the chorus), and oracles, attributed to Olen, were preserved in Delos. In his hymns he celebrated Opis and Argē, two Hyperborean maidens who founded the cult of Apollo in Delos, and in the hymn to Eilythyia the birth of Apollo and Artemis and the foundation of the Delian sanctuary. His reputed Lycian origin corroborates the view that the cult of Apollo was an importation from Asia to Greece. His poetry generally was of the kind called hieratic.

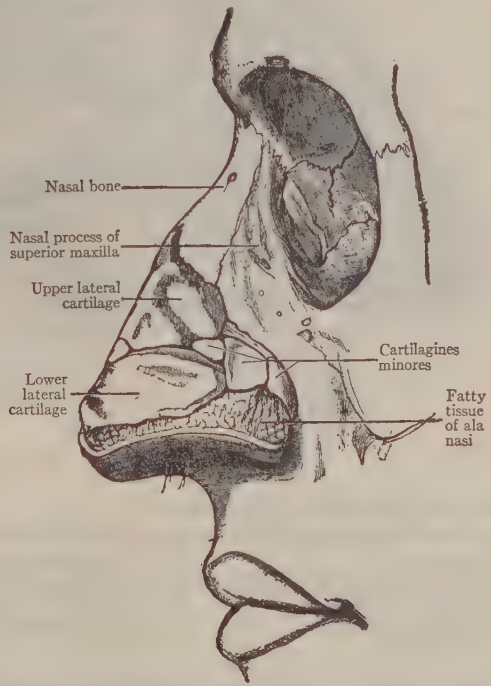
See Callimachus, *Hymn to Delos*, 305; Pausanias i. 18; ii. 13; v. 7; ix. 27; x. 5; Herodotus iv. 35.

OLÉRON, an island lying off the west coast of France, opposite the mouths of the Charente and Seudre, and included in the department of Charente-Inférieure. In 1906 the population numbered 16,747. In area (66 sq. m.) it ranks next to Corsica among French islands. It is about 18 m. in length from N.W. to S.E., and 7 in extreme breadth; the width of the strait (*Pertuis de Maumusson*) separating it from the mainland is at one point less than a mile. The island is flat and low-lying and fringed by dunes on the coast. The greater part is very fertile, but there are also some extensive salt marshes, and oyster culture and fishing are carried on. The chief products are corn, wine, fruit and vegetables. The inhabitants are mostly Protestants and make excellent sailors. The chief places are St Pierre (pop. 1582 in 1906), Le Château d'Oléron (1546), and the watering-place of St Trojan-les-Bains.

Oléron, the *Uliarus Insula* of Pliny, formed part of the duchy of Aquitaine, and finally came into the possession of the French crown in 1370. It gave its name to a medieval code of maritime laws promulgated by Eleanor of Guienne.

OLFACTORY SYSTEM, in anatomy. The olfactory system consists of the outer nose, which projects from the face, and the nasal cavities, contained in the skull, which support the olfactory mucous membrane for the perception of smell in their upper parts, and act as respiratory passages below.

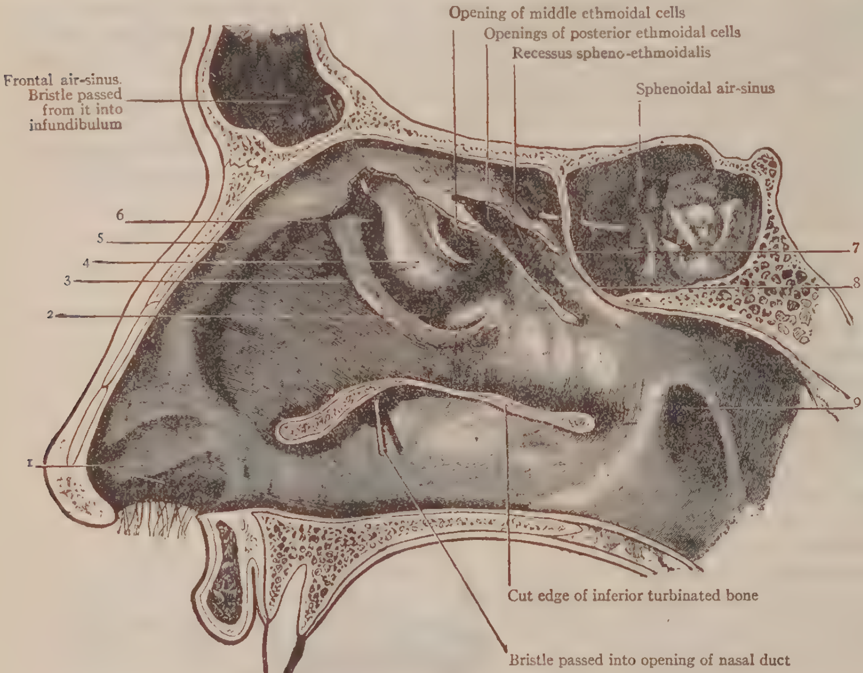
The bony framework of the nose is part of the skull (*q.v.*), but the outer nose is only supported by bone above; lower down its shape is kept by an "upper" and "lower lateral cartilage" and two or three smaller plates known as "cartilagines minores."



From R. Howden, in Cunningham's *Text-Book of Anatomy*.

FIG. 1.—Profile View of the Bony and Cartilaginous Skeleton of the Nose.

The expanded lower part of the side of the outer nose is known as the "ala" and is only formed of skin, both externally and internally, with fibro-fatty tissue between the layers. The inner nose or nasal cavities are separated by a septum, which is seldom quite median and is covered in its lower two-thirds by thick, highly vascular mucous membrane composed of columnar ciliated epithelium with masses of acinous glands (see EPITHELIAL TISSUES) embedded in it, while in its upper part it is covered by the less vascular but more specialized olfactory membrane. Near the front of the lower part of the septum a slight opening into a short blind tube, which runs upward and backward, may sometimes be found; this is the vestigial remnant of "Jacobson's organ," which will be noticed later. The supporting framework of the septum is made up of ethmoid above, vomer below, and the "septal cartilage" in front. The outer wall of each nasal cavity is divided into three meatûs by the overhanging turbinated bones (see fig. 2). Above the superior turbinated is a space between it and the roof known as the "recessus spheno-ethmoidalis," into the back of which the "sphenoidal air sinus" opens. Between the superior and middle turbinated bones is the "superior meatus," containing the openings of the "posterior ethmoidal air cells," while between the middle and inferior turbinateds is the "middle meatus," which is the largest of the three and contains a rounded elevation known as the "bulla ethmoidalis." Above and behind this is often an opening for the "middle ethmoidal cells," while below and in front a deep sickle-shaped gutter runs, the "hiatus semilunaris," which communicates above with the "frontal air sinus" and below with the opening into the "antrum of Highmore" or "maxillary antrum." So deep is this hiatus semilunaris that if, in the dead subject, water is poured into the frontal sinus it all passes into the antrum and none escapes through the nostrils until that cavity is full. The passage from the frontal sinus to the hiatus semilunaris is known as the "infundibulum," and into this open the "anterior ethmoidal cells," so that the antrum acts as a sink for the secretion of these cells and of the frontal sinus. Running downward and forward from the front of the middle turbinated bone is a curved ridge known as the "agger nasi," which forms the anterior boundary of a slightly depressed area called the "atrium."


Opening of middle ethmoidal cells
Openings of posterior ethmoidal cells
Recessus spheno-ethmoidalis
Frontal air-sinus.
Bristle passed from it into infundibulum
Sphenoidal air-sinus
6
5
4
3
2
1
7
8
9
Cut edge of inferior turbinated bone
Bristle passed into opening of nasal duct

From R. Howden, in Cunningham's *Text-Book of Anatomy.*

FIG. 2.—View of the Outer Wall of the Nose—the Turbinated Bones having been removed.

1. Vestibule.
2. Opening of antrum of Highmore.
3. Hiatus semilunaris.
4. Bulla ethmoidalis.
5. Agger nasi.
6. Opening of anterior ethmoidal cells.
7. Cut edge of superior turbinated bone.
8. Cut edge of middle turbinated bone.
9. Pharyngeal orifice of Eustachian tube.

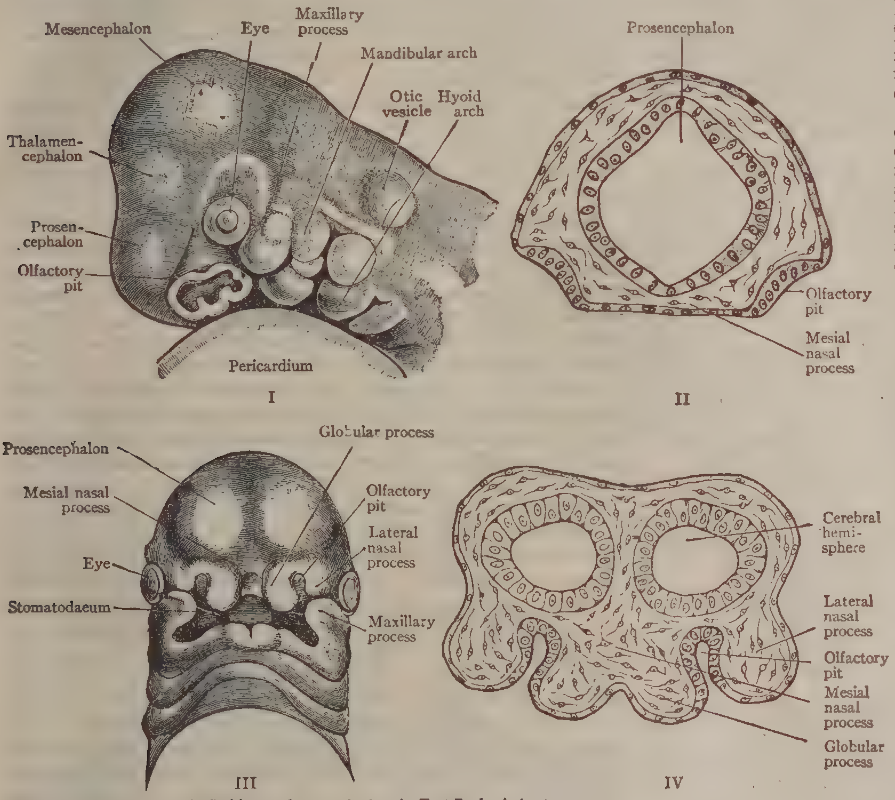
The "inferior meatus" is below the inferior turbinated bone, and, when that is lifted up, the valvular opening of the nasal duct (see EYE) is seen. In front of the inferior meatus there is a depression just above the nostril which is lined with skin instead of mucous membrane and from which short hairs grow; this is called the "vestibule." The roof of the nose is very narrow, and here the olfactory nerves pass in through the cribriform plate. The floor is a good deal wider so that a coronal section through each nasal cavity has roughly the appearance of a right-angled triangle. The anterior wall is formed by the nasal bones and the upper and lower lateral cartilages, while posteriorly the sphenoidal turbinated bone separates the nasal cavity from the sphenoidal sinus above, and below there is an opening into the naso-pharynx known as the "posterior nasal aperture" or "choana." The mucous membrane of the outer wall is characteristic of the respiratory tract as high as the superior turbinated bone; it is ciliated all over and very vascular where it covers the inferior turbinated; superficial to and above the superior turbinated the olfactory tract is reached and the specialized olfactory epithelium begins.

Embryology.

In the third week of intra-uterine life two pits make their appearance on the under side of the front of the head, and are known as the olfactory or nasal pits; they are the first appearance of the true olfactory region of the nose, and some of their epithelial lining cells send off axons (see NERVOUS SYSTEM) which arborize with the dendrites of the cells of the olfactory lobe of the brain and so form the olfactory nerves (see J. Disse, *Anat. Hefte*, 1897; also *P. Anat. Soc., J. Anat. and Phys.*, 1897, p. 12). Between the olfactory pits the broad median fronto-nasal process grows down from the forehead region to form the dorsum of the nose (see fig. 3), and the anterior part of the nasal septum, while outside them the lateral nasal processes grow down, and later on meet the maxillary processes from the first visceral arch. In this way the nasal cavities are formed, but for some time they are separated from the mouth by a thin bucco-nasal membrane which eventually is broken through; after this the mouth and nose are one cavity until the formation of the palate in the third month (see MOUTH AND SALIVARY GLANDS). In the third month Jacobson's organ may be seen as a well-marked tube lined with respiratory mucous membrane and running upward and backward, close to the septum, from its orifice, which is just above the foramen of Stensen in the anterior palatine canal. In man it never has any connexion with the olfactory membrane or olfactory nerves. Internally and below it is surrounded by a delicate sheet of cartilage, which is distinct from that of the nasal septum. No explanation of the function of Jacobson's organ in man is known, and it is probably entirely atavistic. At birth the nasal cavities are very shallow from above downward, but they rapidly deepen till the age of puberty. The external nose at birth projects very little from the plane of the face except at the tip, the button-like shape of which in babies is well known. In the second and third year the bridge becomes more prominent, but after puberty the nasal bones tend to tilt upward at their lower ends to form the eminence which is seen at its best in the Roman nose. (For further details see Quain's *Anatomy*, vol. i., London, 1908.)

Comparative Anatomy.

In Amphioxus among the Acrania there is a ciliated pit above the anterior end of the central nervous system, which is probably a rudiment of an unpaired olfactory organ. In the Cyclostomata (lampreys and hags) the pit is at first ventral, but later becomes dorsal and shares a common opening with the pituitary invagination. It furthermore becomes divided internally into two lateral halves. In fishes there are also two lateral pits, the nostrils of which open sometimes, as in the elasmobranchs (sharks and rays), on to the ventral surface of the snout, and sometimes, as in the higher fishes, on to the dorsal surface. Up to this stage the olfactory organs are mere pits, but in the Dipnoi (mud-fish) an opening is established from them into the front of the roof of the mouth, and so they serve as respiratory passages as well as organs for the sense of smell. In the higher Amphibia the nasal organ becomes included in the skull and respiratory and olfactory parts are distinguished. In this class, too, turbinal ingrowths are found, and the naso-lachrymal duct appears. In the lizards, among the Reptilia, the olfactory and respiratory parts are very distinct, the latter being lined only by stratified epithelium unconnected with the olfactory nerves. There is one true turbinal bone growing from the outer wall, and close to this is a large nasal gland. In crocodiles the hard palate is formed, and there is henceforward a considerable distance between the openings of the external and internal nares. In this order, too (Crocodilia) air sinuses are first found extending from the olfactory cavities into the skull-bones. The birds' arrangement is very like that of the reptiles; olfactory and respiratory chambers are present, and into the latter projects the true turbinal, though there is a pseudo-turbinal in the upper or olfactory chamber. In mammals the olfactory chamber of the nose is variously developed; most of them are "macrosmatic," and have a large area of olfactory mucous membrane; some, like the seals, whalebone whales, monkeys and man are "microsmatic," while the toothed whales have the olfactory region practically suppressed in the adult, and are said to be "anosmatic." There are generally five turbinal bones in macrosmatic mammals, so that man has a reduced number. The lowest of the series or "maxillo-turbinal" is the equivalent of the single true turbinal bone of birds and reptiles, and in most mammals is a double scroll, one leaf turning upward and the other down. Jacobson's organ first appears in amphibians, where it is found as an anteroposterior gutter in the floor of the nasal cavity, sometimes being close to the septum, at other times far away, though the former position is the more primitive. In reptiles the roof of the gutter closes in on each side, and a tube is formed lying below and internal to the nasal cavity, opening anteriorly into the mouth and ending by a blind extremity, posteriorly to which branches of the olfactory and trigeminal nerves are distributed. In the higher reptiles (crocodiles and chelonians) the organ is suppressed in the adult, and the same applies to birds; but in the lower mammals, especially the monotremes, it is very well developed, and is enclosed in a cartilaginous sheath, from which a turbinal process projects into its interior. In other mammals, with the exception of the Primates and perhaps the Chiroptera, the organ is quite distinct, though even in man, as has been shown, its presence can be demonstrated in the embryo. The special opening through which it communicates with the mouth is the foramen of Stensen in the anterior palatine canal.



From A. H. Young and A. Robinson, in Cunningham's *Text-Book of Anatomy.*

FIG. 3.

I. Side view of the head of human embryo about 27 days old, showing the olfactory pit and the visceral arches and clefts (from His).

II. Transverse section through the head of an embryo, showing the relation of the olfactory pits to the forebrain and to the roof of the stomatodaeal space.

III. Head of human embryo about 29 days old, showing the division of the lower part of the mesial frontal process into the two globular processes, the intervention of the olfactory pits between the mesial and lateral nasal processes, and the approximation of the maxillary and lateral nasal processes, which, however, are separated by the oculo-nasal sulcus (from His).

IV. Transverse section of head of embryo, showing the deepening of the olfactory pits and their relation to the hemisphere vesicles of the fore-brain.

See J. Symington on the organ of Jacobson in the Ornithorynchus, *P. Zool. Soc.* (1891), and in the kangaroo, *J. Anat. and Phys.*, vol. 26 (1891); also G. Eliot Smith on Jacobson's organ, *Anatom. Anzeiger*, xi. Band No. 6 (1895). For general literature on the comparative anatomy of the olfactory system up to 1906, see R. Wiedersheim's *Comparative Anatomy of Vertebrates*, translated and adapted by W. N. Parker (London, 1907). (F. G. P.)

DISEASES OF OLFACTORY SYSTEM

External Affections and Injuries of the Nose.—Acne rosacea is one of the most frequent nasal skin affections. In an early stage it consists of dilatation or congestion of the capillaries, and later of a hypertrophy of the sebaceous follicles. This may be accompanied by the formation of pustules. In an exaggerated stage the sebaceous glands become overgrown, forming large protuberant nodular masses over which the dilated capillaries are plainly visible. This condition is termed lipoma nasi (rhinophynia or hammer nose), though there is no increase in fatty tissue. Nasal acne occurs mainly in dyspeptics and tea drinkers, and the more advanced condition, lipoma nasi, chiefly in elderly men addicted to alcoholism. The treatment of acne is the removal of the dyspepsia with the local application of sulphur ointment or of a lotion of perchloride of mercury. Unsightly capillaries may be destroyed by an application of the galvano-cautery or by electrolysis. Free dissection of the redundant tissue from around the nasal cartilages is necessary in lipoma nasi, skin being grafted on to the raw surface.

The nasal bones are frequently fractured as the result of direct violence, as by a blow from a cricket ball or stick. The fracture is usually transverse, and may be communicated, leading to much deformity if left untreated. The treatment is the immediate reposition of the bony fragments. The old-standing cases where there is considerable depression wiring the fragments may be resorted to. In numerous cases the subcutaneous injection of paraffin may improve the shape of the organ. Deflection of the septum may also result from similar injuries, and lateral displacement may cause subsequent nasal obstruction and require the straightening of the septum. Lesions involving considerable loss of substance due to injury or to syphilitic or tuberculous disease have led to many methods being devised to supply the missing part. In the Indian method of rhinoplasty a flap is cut from the forehead, to which it is left attached by a pedicle; the flap is then turned downwards to cover the missing portion of the nose; when the parts have united, the pedicle is cut through. In the Italian operation devised by Tagliacotius (Tagliacozzi), a flap was taken from the patient's arm, the arm being kept fixed to the head until the flap has united.

Diseases of the Interior of the Nose.—*Epistaxis* or bleeding of the nose may arise from many conditions. It is particularly common in young girls at the time of puberty, being a form of vicarious menstruation. It also occurs in cerebral congestion, heart disease, scurvy, haemophylia, or as a sign of local disease. The treatment will depend upon the cause. In patients with high arterial tension epistaxis may be of direct benefit. In other cases rest on the back may be tried, with the local application of tanno-gallic acid or hazelin or adrenalin, either in a spray or on absorbent cotton. If these should not stop the haemorrhage the nose must be plugged. In cases which arise from specific forms of ulceration, such as tuberculosis and syphilis, the area should be rendered anaesthetic by cocaine, the bleeding points found, and the vessels obliterated by the electro-cautery. Polypi in the nasal passages are also a frequent cause of epistaxis.

Rhinitis, or inflammation of the mucous membrane of the nose, occurs both in acute and chronic forms. Of the acute the simple catarrhal form termed "coryza" forms the widely known "cold in the head." The tendency of acute coryza to affect entire families, and to be communicable from one person to another, points to its infectious nature, though probably some predisposing condition of health is necessary for its development. It is considered proved that the symptoms are due to the presence and development of several distinct micro-organisms. Of these the most important is the micrococcus catarrhalis described by Martin Kirchner in 1890, but Friedländer's pneumo-bacillus has also been found. In ordinary cases of coryza, sneezing, congestion of the nasal mucous membrane and a profuse watery discharge usher in the attack, and the inflammation may extend to the pharynx, larynx and trachea, blocking of the Eustachian tube producing a temporary deafness. Later the discharge may become muco-purulent. One attack of coryza conveys no immunity from subsequent attacks, and some persons seem particularly susceptible. The treatment is directed towards increasing the action of the kidneys, skin and bowels. A brisk mercurial purgative is indicated, and salicin and aspirin are useful in many cases. Considerable relief may be obtained by washing out the nasal cavities several times a day with a warm lotion containing boric acid. Those who are unusually prone to catch cold should habituate themselves to an open air life by day and an open window by night, adenoids or enlarged tonsils should be removed, and the diet should be modified so as not to contain an excess of starchy foods. An acute croupous inflammation occasionally attacks the nasal mucous membrane when the Klebs-Löffler bacillus is not present, but the nasal membrane often shares in true diphtheria, or it may be the only organ to be infected thereby. The diagnosis is of course bacteriological.

As a result of frequent catarrhal attacks the nasal mucous membrane may become the seat of a chronic rhinitis in which the turbinals become swollen with oedema, and congested and finally thickened by increase in the fibrous tissue. There is an excessive muco-purulent discharge, and the patient is unable to breathe through the nose; deafness and adenoid vegetations may be the result. In the early stages the nasal cavity should be washed out night and morning with an alkaline lotion, such as bicarbonate of soda, or a caustic, such as chromic acid, should be used in swabbing over the affected part. The application of the galvano-cautery here is useful, but when the areas are much hypertrophied the hypertrophied portion of the inferior turbinals may have to be removed under cocaine. A special form of recurrent hypertrophic rhinitis is *hay fever* (*q.v.*).

Rhinitis Sicca is a form of chronic rhinitis in which there is but little discharge, crusts or scabs which may be difficult to remove forming in the nasal cavities; the pharynx may be also affected.

Atrophic rhinitis or ozaena usually attacks children and young adults, following on measles or scarlet fever. Crusts form, and favour the retention of the purulent discharge. The disease may extend to the nasal sinuses and septic absorption take place. The treatment is to keep the nasal cavity clean by irrigation with solution of permanganate of potash or carbolic acid lotion, the nose then being wiped and smeared with lanolin or partially plugged with a tampon of cotton-wool, the process being repeated at frequent intervals, the general treatment being that for anaemia. Disease of the middle turbinated bone is also a cause of an offensive nasal discharge, and rhinitis occurring in infants gives rise to the obstructed respiration known as "the snuffles."

Three forms of nasal polypi are described, the mucous, the fibrous and the malignant. The general symptoms of nasal polypus are a feeling of stuffiness in one or both nostrils, inability to breathe down the nose and a thin watery discharge. A nasal tone of voice, together with cough and asthma, may be present, or there may be partial or complete loss of the sense of smell (anosmia). The treatment of mucous polypi is their removal by the forceps or the snare, the base of the growth being afterwards carefully examined and cauterized with the galvano-cautery.

Fibrous polypi are usually very vascular, and may be a cause of severe epistaxis as well as of obstruction of breathing, "dead voice," sleepiness and deafness. The increasing growth may lead to expansion of the bridge of the nose and deformity of the facial bones, known as "frog-face." The tendency of fibrous polypi to take on malignant sarcomatous characters is specially noticeable. Extirpation of the growth as soon as its nature is recognized is therefore urgently demanded.

The chief diseases of the nasal septum are abscesses, due to the breaking down of haematomata, syphilitic gummata (leading to deep excavation and bony destruction), tuberculous disease in which a small yellowish grey ulcer forms and what is known as perforating ulcer of the septum, which is met with just within the nostril. The latter tends to run a chronic course, and the detachment of one of its crusts may cause epistaxis. Rhinoscleroma was first described by F. Hebra in 1870, and is endemic in Russian Poland, Galicia and Hungary, but is unknown in England, except amongst alien immigrants. The infecting organism is a specific bacillus, and the disease starts as a chronic smooth painless obstruction with the formation of dense plate-like masses of tissue of stony hardness. Treatment other than that of excision of the masses has proved useless, though the recent plan of introduction of the injection of a vaccine of the bacillus may in future modify the progress of the disease.

The accessory sinuses of the nose are also prone to disease. The maxillary antrum may become filled with muco-pus, forming an empyema, pus escaping intermittently by way of the nose. The condition causes pain and swelling, and may require the irrigation and drainage of the antrum. The frontal sinuses may become filled with mucous, owing to the swelling of the nasal mucous membrane over the middle turbinated bone, or an acute inflammation may spread to the frontal sinuses, giving rise to an empyema in that locality. There is severe frontal pain, and in some cases a fulness on the forehead over the affected side, the pus often pointing in this site, or there may be a discharge of pus through the nose. The treatment is that of incision and irrigation of the sinus (in some cases scraping out of the sinus) and the re-establishment of communication with the nose, with free drainage. The ethmoidal and sphenoidal sinuses are also frequently the site of empyemata, giving rise to pain in the orbit and the back of the nose, and a discharge into the naso-pharynx. In the case of the ethmoidal sinus it may give rise to exophthalmus and to strabismus (squint), with the formation of a tumour at the inner wall of the orbit and fever and delirium at night. In the young the condition may become rapidly fatal. Suppuration in the sphenoidal sinus may lead to blindness from involvement of the sheath of the optic nerve, and dangerous complications such as septic basal meningitis and thrombosis of the cavernous sinus may occur. Acute ethmoiditis and sphenoiditis are serious conditions demanding immediate surgical intervention. (H. L. H.)

OLGA, wife of Igor, prince of Kiev, and afterwards (from 945) regent for Sviatoslav her son, was baptized at Constantinople about 955 and died about 969. She was afterwards canonized in the Russian church, and is now commemorated on the 11th of July.

OLGIERD (d. 1377), grand-duke of Lithuania, was one of the seven sons of Gedymin, grand-duke of Lithuania, among whom on his death in 1341 he divided his domains, leaving the youngest, Yavnuty, in possession of the capital, Wilna, with a nominal priority. With the aid of his brother Kiejstut, Olgierd in 1345 drove out the incapable Yavnuty and declared himself grand-duke. The two and thirty years of his reign (1345–1377) were devoted to the development and extension of Lithuania, and he lived to make it one of the greatest states in Europe. Two factors contributed to produce this result, the extraordinary political sagacity of Olgierd and the life-long devotion of his brother Kiejstut. The Teutonic knights in the north and the Tatar hordes in the south were equally bent on the subjection of Lithuania, while Olgierd's eastern and western neighbours, Muscovy and Poland, were far more frequently hostile competitors than serviceable allies. Nevertheless, Olgierd not only succeeded in holding his own, but acquired influence and territory at the expense of both Muscovy and the Tatars, and extended the borders of Lithuania to the shores of the Black Sea. The principal efforts of this eminent empire-maker were directed to securing those of the Russian lands which had formed part of the ancient grand-duchy of Kiev. He procured the election of his son Andrew as prince of Pskov, and a powerful minority of the citizens of the republic of Novgorod held the balance in his favour against the Muscovite influence, but his ascendancy in both these commercial centres was at the best precarious. On the other hand he acquired permanently the important principalities of Smolensk and Bryansk in central Russia. His relations with the grand-dukes of Muscovy were friendly on the whole, and twice he married orthodox Russian princesses; but this did not prevent him from besieging Moscow in 1368 and again in 1372, both times unsuccessfully. Olgierd's most memorable feat was his great victory over the Tatars at Siniya Vodui on the Bug in 1362, which practically broke up the great Kipchak horde and compelled the khan to migrate still farther south and establish his headquarters for the future in the Crimea. Indeed, but for the unceasing simultaneous struggle with the Teutonic knights, the burden of which was heroically borne by Kiejstut, Russian historians frankly admit that Lithuania, not Muscovy, must have become the dominant power of eastern Europe. Olgierd died in 1377, accepting both Christianity and the tonsure shortly before his death. His son Jagiello ultimately ascended the Polish throne, and was the founder of the dynasty which ruled Poland for nearly 200 years.

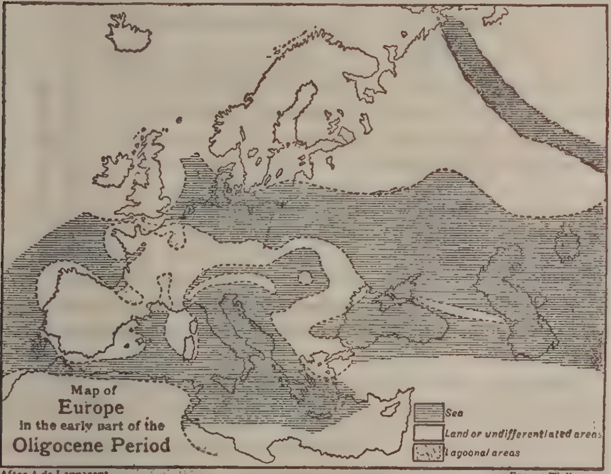
See Kazimierz Stadnicki, *The Sons of Gedymin* (Pol.) (Lemberg, 1849–1853); Vladimir Bonifatevich Antonovich, *Monograph on the History of Western Russia* (Rus.), vol. i. (Kiev, 1885). (R. N. B.)

OLHÃO, a seaport of southern Portugal, in the district of Faro; 5 m. E. of Faro, on the Atlantic coast. Pop. (1900) 10,009. Olhão has a good harbour at the head of the Barra Nova, a deep channel among the sandy islands which fringe the coast. Wine, fruit, cork, baskets and sumach are exported in small coasting vessels; there are important sardine and tunny fisheries; and boats, sails and cordage are manufactured.

OLIGARCHY (Gr. ὀλίγοι, few, ἀρχή, rule), in political philosophy, the term applied to a government exercised by a relatively small number of the members of a community. It is thus the appropriate term for what is now generally known as "aristocracy" (*q.v.*). The meaning of the terms has substantially altered since Plato's day, for in the *Republic* "oligarchy" meant the rule of the wealthy, and "aristocracy" that of the really best people.

OLIGOCENE SYSTEM (from the Gr. ὀλίγος, few, and καινός, recent), in geology, the name given to the second division of the older Tertiary rocks, viz. those which occur above the Eocene and below the Miocene strata. These rocks were originally classed by Sir C. Lyell as "older Miocene," the term Oligocene being proposed by H. E. Beyrich in 1854 and again in 1858. Following A. de Lapparent, the Oligocene is here regarded as divisible into two stages, an upper one, the Etampian (from Étampes), equivalent to the Rupélian of A. Dumont (1849), and a lower one, the Sannoisian (from Sannois near Paris), equivalent to the Tongrian (from Tongris in Limburg) of Dumont (1859). This lower division is the Ligurian of some authors, and corresponds with the Lattorfian (Latdorf) of K. Mayer in north Germany; it is in part the equivalent of the older term Ludian of de Lapparent. It should be pointed out that several authors retain the Aquitanian stage (see MIOCENE) at the top of the Oligocene, but there are sufficiently good reasons for removing it to the younger system.

The Oligocene deposits are of fresh-water, brackish, marine and terrestrial origin; they include soft sands, sandstones, grits, marls, shales, limestones, conglomerates and lignites. The geographical aspect of Europe during this period is indicated on the accompanying map. Here and there, as in N. Germany, the sea gained ground that had been unoccupied by Eocene waters, but important changes, associated with the continuation of elevatory processes in the Pyrenees and Alps which had begun in the preceding period, were in progress, and a general relative uplifting took place which caused much of the Eocene sea floor to be occupied at this time by lake basins and lagoons. The movements, however, were not all of a negative character as regards the water areas, for oscillations were evidently frequent, and subsidence must have been considerable in some regions to admit of the accumulation of the great thickness of material found deposited there. Perhaps the most striking change from Eocene topography in Europe is to be seen in the extension of the Oligocene sea over North Germany, whence it extended eastward through Poland and Russia to the Aral-Caspian region, communicating thence with Arctic waters by way of a Ural depression. The Asian extension of the central mediterranean sea appears to have begun to be limited. It was later in the period when the wide-spread emersion set in.



After A. de Lapparent

Emery Walker sc.

In Britain Oligocene formations are found only in the Hampshire Basin and the Isle of Wight; from the admixture of fresh-water, marine and estuarine deposits, E. Forbes named these the "Fluvio-marine series." The following are the more important subdivisions, in descending order: The Hamstead (Hampstead) beds, marine at the top, with *Ostrea callifera*, *Natica*, &c., estuarine and fresh-water below, with *Unio*, *Viviparus* and the remains of crocodiles, turtles and mammals. The Bembridge marls, fresh-water, estuarine and marine, resting upon the Bembridge limestone, with many fresh-water fossils such as *Limnaea*, *Planorbis*, *Chara*, large land snails, *Amphidromus*, *Helix*, *Glandina*, and many insects and plant leaves. The Osborne beds, marls, clays and limestones, with *Unio*, *Limnaea*, &c. The Headon beds (upper), fresh-water clays, marls and limestones (middle), brackish and marine, more sandy (lower), brackish and fresh-water clays, marls, tufaceous limestones and sandstones. The clays and sands of the Bovey Basin in Devonshire were formerly classed as Miocene, but they are now regarded by C. Reid as Eocene on the evidence of the plant remains, though there is still a possibility that they may be found to be of Oligocene age.

In France the best-known tract of Oligocene rocks rests in the Paris basin in close relationship with the underlying Eocene. These rocks include the first and second gypsum beds, the source of "plaster of Paris"; at Montmartre the first or upper bed is 20 metres in thickness, and some of the beds contain siliceous nodules (fusils) and numerous mammalian remains. Above the gypsum beds is the travertine of Champigny-sur-Marne, a series of blue and white marls (supra-gypseous marls), followed by the "glaises verts" or greenish marls. At the top of the lower Oligocene of this district is the lacustrine "calcaire de Brie" or middle travertine, which at Ferté-sous-Jouane is exploited for millstones; this is associated with the Fontainebleau limestone, which at Chateau-Landon and Souppes is sufficiently compact to form an important building stone, used in the Arc de Triomphe and other structures in Paris. The upper Oligocene of Paris begins with the *marnes à huitres*, followed by the brackish and fresh-water molasse of Etrechy, and a series of sandy beds, of which the best known are those of Fontainebleau, Étampes and Ormoy; in these occur the groups of calcite crystals, charged with sand, familiar in all mineral collections. Elsewhere in France similar mixed marine, fresh-water and brackish beds are found: in Aquitaine there are marine and lacustrine marls, limestones and molasse; marine beds occur at Biarritz; lacustrine and fresh-water marls and limestones with lignite appear in the sub-Pyrenees; in Provence there are brackish red clays, conglomerates and lignites, with limestones in the upper parts; and in Limagne there are mottled sands, arkoses, clays and fresh-water limestones. In the Jura region and on the borders of the central *massif* a peculiar group of deposits, the *terrain sidérolithique*, is found in beds and in pockets in Jurassic limestones. Sometimes this deposit consists of red clay (bolus) with nests of pisolitic iron, as in Jura and Franche-comté, Alsace, &c.; occasionally, as in Bourgogne, Berry, the valley of the Aubois, Châtillon, it is made up of a breccia or conglomerate of Jurassic pebbles cemented with limonite and carbonate of lime or silica (an intimate mixture of marl and iron ore in these districts is called "castillard"). At Quercy the cementing material is phosphate of lime derived from the bones of mammals (*Adapis*, *Necrolemur*, *Palaeotherium*, *Xiphodon*, &c.), which are so numerous that it has been suggested that these animals must have been suffocated by gaseous emanations. Similar ferruginous deposits occur in South Germany.

In the Alpine region the Oligocene rocks assume the character of the Flysch, a complex assemblage of marly and sandy shales and soft sandstones with calcareous cement ("macigno"). The Flysch phase of deposition had begun before the close of the preceding period, but the bulk of it belongs to the Oligocene, and is especially characteristic of the lower part. The Flysch may attain a very great thickness; in Dauphiné it is said to be 2000 metres. Obscure plant-like impressions are common on certain horizons of this formation, and have received such names as *Chondrites*, *Fucoids*, *Helminthoidea*. The "grès de Taveyannaz" and "Wildflysch" of Lake Thun contain fragments of eruptive rocks. Marine beds occur at Barrême, Désert, Chambéry, &c., and parallel with the normal Flysch in the higher Alps of Vaudois is a nummulitic limestone; both here and near Interlaken, in the marble of Ralligstöcke, calcareous algae are abundant. Part of the "schistes des Grisons" ("Bündner Schiefer") have been regarded as of Oligocene age. In the Léman region the "Flysch rouge" at the foot of the Dent du Midi belongs to the upper part of the Flysch formation.

In North Germany the lower Oligocene consists largely of sandy marls, often glauconitic; typical localities are Egeln near Magdeburg and Latdorf near Bernburg; at Samland the glauconitic sand contains nodules of amber, with insects, derived from Eocene strata. The upper Oligocene beds, which cover a wide area, comprise the Stettin sands and Septarian Clay or Rupelton, marine beds tending to merge laterally one into another. In the Mainz basin a petroleum-bearing sandy marl is found at Pechelbronn and Lobsann in Alsace underlying a fresh-water limestone which is followed by the marine "Meeressand" of Alzey. Lignites (*Braunkohl*) are widely spread in this region and appear at Latdorf, Leipzig, in Westphalia and Mecklenburg; at Halle is a variety called pyropissite, which is exploited at Weissenfels for the manufacture of paraffin.

In Belgium a sandy series (Wemmelian, Asschian, Henisian), mainly of brackish-water origin, is succeeded by the marine sands of Bergh (with the clay of Boom), which pass up through the inferior sands of Bolderberg into the Miocene In Switzerland, beyond the limits of the Flysch, nearer the Alpine *massif*, is a belt of grits, limestones and clays in an uncompacted condition, to which the name "molasse" is usually given; mixed with the molasse is an inconstant conglomeratic littoral formation, called *Nagelfluh*. The molasse occurs also in Bavaria, where it is several thousand feet thick and contains lignites. Oligocene deposits occur in the Carpathian region and Tirol; as Flysch and brackish and lacustrine beds with lignite in Klausenburg, lignites at Häring in Tirol. In the Spanish Pyrenees they are well developed; in the Apennines the scaly clays ("argille scagliose") are of this age; while in Calabria they are represented by thick conglomerates and Flysch. Flysch appears also in Dalmatia and Istria (where it is called "tassello") and in North Bosnia, where it contains marine limestones. Lignites are found at Sotzka and Styria, marine beds in the Balkan peninsula, glauconitic sands prevail in South Russia, Flysch with sands and grits in the Caucasus, while marine deposits also occupy the Aral-Caspian region and Armenia, and are to be traced into Persia. Oligocene rocks are known in North Africa, Algeria, Tunis and Egypt, with the silicified trees and basalt sheets north of the Fayum. In North America the rocks of this period have not been very clearly differentiated, but they may possibly be represented by the White river beds of S. Dakota, the white and blue marls of Jackson on the Mississippi, the "Jacksonian" white limestone of Alabama, the limestone of Ocala in Florida, certain lacustrine clays in the Uinta basin, and by the ribband shales with asphalt and petroleum in the coastal range of California. In South America and the Antilles upper Oligocene is found, and the lignite beds of Coronel and Lota in Chile and in the Straits of Magellan may be of this age; in Patagonia are the lower Oligocene marine beds ("Patagonian") and beds with mammalian remains. In New Zealand the Oamaru series of J. Hutton is regarded as Oligocene; at its base are interstratified basic volcanic rocks.

A correlation of Oligocene strata is summarized in the following table:—

Oligocene System 8.

	England.	Paris Basin.	Belgium.	North German Region.	Other Localities.	Alps and S. Europe.
Upper Oligocene Etampian (Rupelian).	Hamstead Beds.	Sands and sandstones of Ormoy, Fontainebleau and Pierrefitte. Sands of Morigny, Falun of Jeurre, Oyster marls. Molasse of Etrechy.	Lower sands of Bolderberg. Sands of Bergh with Clay of Boom.	Septarian Clay, or Rupelton. Stettin sands.	Cyrena marls of Mainz. Lignites of Häring, Gypsiferous limestone of Aix, and Lower marine Molasse of Basel.	Nummulitic formations and Flysch formations.
Lower Oligocene Sannoisian (Tongrian).	Bembridge Beds. Osborne Beds. Headon Beds.	Limestone of Brie, marine beds of Sannois, "Glaises vertes," and Cyrene marls. Supragypseous marls, limestones of Champigny, "First" and "Second" masses of gypsum.	Sands of Vieux-Jones. Clays of Henis. Sands of Grimmertingen. Sands of Wemmel.	Clays of Egeln and Latdorf. Amber-bearing Glauconitic sands of Samland.	Lignites of Celas (Languedoc). Lignites of Brunstatt. Marls of Priabona, limestones of Crosara.	

The land flora of this period was a rich one consisting largely of evergreens with characters akin to those of tropical India and Australia and subtropical America. Sequoias, sabal palms, ferns, cinnamon-trees, gum-trees, oaks, figs, laurels and willows were common. *Chara* is a common fossil in the fresh-water beds. The most interesting feature of the land fauna was undoubtedly the astonishing variety of mammalians, especially the long series from the White river beds and others in the interior of North America. Pachyderms were very numerous. Many of the mammals were of mixed types, *Hyaenodon* (between marsupials and placentals), *Adapis* (between pachyderms and lemurs), and many were clearly the forerunners of living genera. Rhinocerids were represented in the upper Oligocene by the hornless *Aceratherium*; *Palaeomastodon* and *Arsinoitherium*, from Egypt are early proboscidian forms which may have lived in this period; *Anchitherium*, *Anchippus*, &c., were forerunners of the horse. *Palaeotherium*, *Anthracotherium*, *Palaeogale*, *Steneofiber*, *Cynodictis*, *Dinictis*, *Ictops*, *Palaeolagus*, *Sciurus*, *Colodon*, *Hyopotamus*, *Oreodon*, *Poebrotherium*, *Protoceras*, *Hypertragulus* and the gigantic Titanotherids (*Titanotherium*, *Brontotherium*, &c.) are some of the important genera, representatives of most of the modern groups, including carnivores (*Canidae* and *Felidae*), insectivores, rodents, ruminants, camels. Tortoises were abundant, and the genus *Rana* made its appearance. Rays and dogfish were the dominant marine fish; logoonal brackish-water fish are represented by *Prolebias*, *Smerdis*, &c. Insects abounded and arachnids were rapidly developing. Gasteropods were increasing in importance, most of the genera still existing (*Cerithium*, *Potamides*, *Melania*, large *Naticas*, *Pleurotomaria*, *Voluta*, *Turritella*, *Rostellaria*, *Pyrula*). Cephalopods, on the other hand, show a falling off. Pelecypods include the genera *Cardita*, *Pectunculus*, *Lucina*, *Ostrea*, *Cyrena*, *Cytherea*. Bryozoa were very abundant (*Membranipora*, *Lepralia*, *Hornera*, *Idmonea*). Echinoids were less numerous than in the Eocene seas (*Coelopleurus*, *Echinolampus*, *Clypeaster*, *Scutella*). Corals were abundant, and nummulites still continued till near the close of the period, but they were diminished in size.

References.—"Geology of the Isle of Wight," *Mem. Geol. Survey* (2nd ed. 1889); A. von Koenen, *Abhand. geol. Specialkart Preuss.* x. (1889–1894); M. Vollest, *Der Braunkohlenbergbaum* (Halle, 1889); E. van den Broeck, "Matériaux pour l'étude de l'Oligocène belge," *Bull. Soc. Belg. Géol.* (1894); also the works of O. Heer, H Filhol, G. Vasseur, H. F. Osborn, A. Gaudry, H. Douvillé, R. B. Newton, H. Dall, M. Cossmann, G. Lambert, &c., and the article Flysch. (J. A. H.)

OLIGOCLASE, a rock-forming mineral belonging to the plagioclase (*q.v.*) division of the felspars. In chemical composition and in its crystallographical and physical characters it is intermediate between albite ($NaAlSi_3O_8$) and anorthite ($CaAl_2Si_2O_8$), being an isomorphous mixture of three to six molecules of the former with one of the latter. It is thus a soda-lime felspar crystallizing in the anorthic system. Varieties intermediate between oligoclase and albite are known as oligoclase-albite. The name oligoclase was given by A. Breithaupt in 1826 from the Gr. ὀλίγος, little, and κλᾶν, to break, because the mineral was thought to have a less perfect cleavage than albite. It had previously been recognized as a distinct species by J. J. Berzelius in 1824, and was named by him soda-spodumene (*Natron-spodumen*), because of its resemblance in appearance to spodumene. The hardness is 6½ and the sp. gr. 2·65-2·67. In colour it is usually whitish, with shades of grey, green or red. Perfectly colourless and transparent glassy material found at Bakersville in North Carolina has occasionally been faceted as a gem-stone. Another variety more frequently used as a gem-stone is the aventurine-felspar or "sun-stone" (*q.v.*) found as reddish cleavage masses in gneiss at Tvedestrand in southern Norway; this presents a brilliant red metallic glitter, due to the presence of numerous small scales of haematite or göthite enclosed in the felspar.

Oligoclase occurs, often accompanying orthoclase, as a constituent of igneous rocks of various kinds; for instance, amongst plutonic rocks in granite, syenite, diorite; amongst dike-rocks in porphyry and diabase; and amongst volcanic rocks in andesite and trachyte. It also occurs in gneiss. The best developed and largest crystals are those found with orthoclase, quartz, epidote and calcite in veins in granite at Arendal in Norway. (L. J. S.)

OLIPHANT, LAURENCE (1829–1888), British author, son of Anthony Oliphant (1793–1859),[1] was born at Cape Town.

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[1] The family to which Oliphant belonged is old and famous in Scottish history. Sir Laurence Oliphant of Aberdalgie, Perthshire, who was created a lord of the Scottish parliament before 1458, was descended from Sir William Oliphant of Aberdalgie and on the female side from King Robert the Bruce. Sir William (d. 1329) is renowned for his brave defence of Stirling castle against Edward I. in 1304. Sir Laurence was sent to conclude a treaty with England in 1484; he helped to establish the young king James IV. on his throne, and he died about 1500. His son John, the 2nd lord (d. 1516), having lost his son and heir, Colin, at Flodden, was succeeded by his grandson Laurence (d. 1566), who was taken prisoner by the English at the rout of Solway Moss in 1542. Laurence's son, Laurence, the 4th lord (1529–1593), was a partisan of Mary queen of Scots, and was succeeded by his grandson Laurence (1583–1631), who left no sons when he died. The 6th lord was Patrick Oliphant, a descendant of the 4th lord, and the title was held by his descendants

His father was then attorney-general in Cape Colony, but was soon transferred as chief justice to Ceylon. The boy's education was of the most desultory kind. Far the least useless portion of it belonged to the years 1848 and 1849, when he accompanied his parents on a tour on the continent of Europe. In 1851 he accompanied Jung Bahadur from Colombo to Nepaul. He passed an agreeable time there, and saw enough that was new to enable him to write his first book, *A Journey to Katmandu* (1852). From Nepaul he returned to Ceylon and thence to England, dallied a little with the English bar, so far at least as to eat dinners at Lincoln's Inn, and then with the Scottish bar, so far at least as to pass an examination in Roman law. He was more happily inspired when he threw over his legal studies and went to travel in Russia. The outcome of that tour was his book on *The Russian Shores of the Black Sea* (1853). Between 1853 and 1861 he was successively secretary to Lord Elgin during the negotiation of the Canada Reciprocity treaty at Washington, the companion of the duke of Newcastle on a visit to the Circassian coast during the Crimean War, and Lord Elgin's private secretary on his expedition to China. Each of these experiences produced a pleasant book of travel. In 1861 he was appointed first secretary in Japan, and might have made a successful diplomatic career if it had not been interrupted, almost at the outset, by a night attack on the legation, in which he nearly lost his life. It seems probable that he never properly recovered from this affair. He returned to England and resigned the service, and was elected to parliament in 1865 for the Stirling Burghs.

Oliphant did not show any conspicuous parliamentary ability, but made a great success by his vivacious and witty novel, *Piccadilly* (1870). He fell, however, under the influence of the spiritualist prophet Thomas Lake Harris (*q.v.*), who about 1861 had organized a small community, the Brotherhood of the New Life,[1] which at this time was settled at Brocton on Lake Erie and subsequently moved to Santa Rosa in California. Harris obtained so strange an ascendancy over Oliphant that the latter left parliament in 1868, followed him to Brocton, and lived there the life of a farm labourer, in obedience to the imperious will of his spiritual guide. The cause of this painful and grotesque aberration has never been made quite clear. It was part of the Brocton régime that members of the community should be allowed to return into the world from time to time, to make money for its advantage. After three years this was permitted to Oliphant, who, when once more in Europe, acted as correspondent of *The Times* during the Franco-German War, and spent afterwards several years at Paris in the service of that journal. There he met Miss Alice le Strange, whom he married. In 1873 he went back to Brocton, taking with him his wife and mother. During the years which followed he continued to be employed in the service of the community and its head, but on work very different from that with which he had been occupied on his first sojourn. His new work was chiefly financial, and took him much to New York and a good deal to England. As late as December 1878 he continued to believe that Harris was an incarnation of the Deity. By that time, however, his mind was occupied with a large project of colonization in Palestine, and he made in 1879 an extensive journey in that country, going also to Constantinople, in the vain hope of obtaining a lease of the northern half of the Holy Land with a view to settling large numbers of Jews there. This he conceived would be an easy task from a financial point of view, as there were so many persons in England and America "anxious to fulfil the prophecies, and bring about the end of the world." He landed once more in England without having accomplished anything definite; but his wife, who had been banished from him for years and had been living in California, was allowed to rejoin him, and they went to Egypt together. In 1881 he crossed again to America. It was on this visit that he became utterly disgusted with Harris, and finally split from him. He was at first a little afraid that his wife would not follow him in his renunciation of "the prophet," but this was not the case, and they settled themselves very agreeably, with one house in the midst of the German community at Haïfa, and another about twelve miles off at Dalieh on Mount Carmel.

It was at Haïfa in 1884 that they wrote together the strange book called *Sympneumata: Evolutionary Forces now active in Man*, and in the next year Oliphant produced there his novel *Masollam*, which may be taken to contain its author's latest views with regard to the personage whom he long considered as "a new Avatar." One of his cleverest works, *Altiora Peto*, had been published in 1883. In 1886 an attack of fever, caught on the shores of the Lake of Tiberias, resulted in the death of his wife, whose constitution had been undermined by the hardships of her American life. He was persuaded that after death he was in much closer relation with her than when she was still alive, and conceived that it was under her influence that he wrote the book to which he gave the name of *Scientific Religion*. In November 1887 he went to England to publish that book. By the Whitsuntide of 1888 he had completed it and started for America. There he determined to marry again, his second wife being a granddaughter of Robert Owen the Socialist. They were married at Malvern, and meant to have gone to Haïfa, but Oliphant was taken very ill at Twickenham, and died on the 23rd of December 1888. Although a very clever man and a delightful companion, full of high aspiration and noble feeling, Oliphant was only partially sane. In any case, his education was ludicrously inappropriate for a man who aspired to be an authority on religion and philosophy. He had gone through no philosophical discipline in his early life, and knew next to nothing of the subjects with regard to which he imagined it was in his power to pour a flood of new light upon the world. His shortcomings and eccentricities, however, did not prevent his being a brilliant writer and talker, and a notable figure in any society.

See Mrs (Margaret) Oliphant, *Memoir of the Life of Laurence Oliphant and of Alice Oliphant his Wife* (1892). (M. G. D.)

OLIPHANT, MARGARET OLIPHANT (1828–1897), British novelist and historical writer, daughter of Francis Wilson, was born at Wallyford, near Musselburgh, Midlothian, in 1828. Her childhood was spent at Lasswade (near Dalkeith), Glasgow and Liverpool. As a girl she constantly occupied herself with literary experiments, and in 1849 published her first novel, *Passages in the Life of Mrs Margaret Maitland*. It dealt with the Scottish Free Church movement, with which Mr and Mrs Wilson both sympathized, and had some success. This she followed up in 1851 with *Caleb Field*, and in the same year met Major Blackwood in Edinburgh, and was invited by him to contribute to the famous *Blackwood's Magazine*. The connexion thus early commenced lasted during her whole lifetime, and she contributed considerably more than 100 articles to its pages. In May 1852 she married her cousin, Frank Wilson Oliphant, at Birkenhead, and settled at Harrington Square, in London. Her husband was an artist, principally in stained glass. He had very delicate health, and two of their children died in infancy, while the father himself developed alarming symptoms of consumption. For the sake of his health they moved in January 1859 to Florence, and thence to Rome, where Frank Oliphant died. His wife, left almost entirely without resources, returned to England and took up the burden of supporting her three

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until the death of Francis, the 10th lord, in April 1748. It has since been claimed by several persons, but without success.

Another member of the family was Laurence Oliphant (1691–1767) the Jacobite, who belonged to a branch settled at Gask in Perthshire. He took part in the rising of 1715, and both he and his son Laurence (d. 1792) were actively concerned in that of 1745, being present at the battles of Falkirk and Culloden. After the ruin of the Stuart cause they escaped to France, but were afterwards allowed to return to Scotland. One of this Oliphant's descendants was Carolina, Baroness Nairne (*q.v.*).

[1] It should be mentioned that the unfavourable view of Harris taken by Oliphant's own biographer, and certainly not shaken by subsequent evidence, has been strongly repudiated by some who knew him. Mr J. Cuming Walters, for instance, in the *Westminster Gazette* (London, July 28, 1906) defends the purity of his character. It is difficult to arrive at the exact truth as to Oliphant's relations with him, or the financial scandal which ended them; and it must be admitted that Oliphant himself was at least decidedly cranky.

children by her own literary activity. She had now become a popular writer, and worked with amazing industry to sustain her position. Unfortunately, her home life was full of sorrow and disappointment. In January 1864 her only daughter died in Rome, and was buried in her father's grave. Her brother, who had emigrated to Canada, was shortly afterwards involved in financial ruin, and Mrs Oliphant offered a home to him and his children, and added their support to her already heavy responsibilities. In 1866 she settled at Windsor to be near her sons who were being educated at Eton. This was her home for the rest of her life, and for more than thirty years she pursued a varied literary career with courage scarcely broken by a series of the gravest troubles. The ambitions she cherished for her sons were unfulfilled. Cyril Francis, the elder, died in 1890, leaving a *Life of Alfred de Musset*, incorporated in his mother's *Foreign Classics for English Readers*. The younger, Frank, collaborated with her in the *Victorian Age of English Literature* and won a position at the British Museum, but was rejected by the doctors. He died in 1894. With the last of her children lost to her, she had but little further interest in life. Her health steadily declined, and she died at Wimbledon, on the 25th of June 1897.

In the course of her long struggle with circumstances, Mrs Oliphant produced more than 120 separate works, including novels, books of travel and description, histories and volumes of literary criticism. Among the best known of her works of fiction are *Adam Graeme* (1852), *Magdalen Hepburn* (1854), *Lilliesleaf* (1855), *The Laird of Norlaw* (1858) and a series of stories with the collective title of *The Chronicles of Carlingford*, which, originally appearing in *Blackwood's Magazine* (1862–1865), did much to widen her reputation. This series included *Salem Chapel* (1863), *The Rector; and the Doctor's Family* (1863), *The Perpetual Curate* (1864) and *Miss Marjoribanks* (1866). Other successful novels were *Madonna Mary* (1867), *Squire Arden* (1871), *He that will not when he may* (1880), *Hester* (1883), *Kirsteen* (1890), *The Marriage of Elinor* (1892) and *The Ways of Life* (1897). Her tendency to mysticism found expression in *The Beleaguered City* (1880) and *A Little Pilgrim in the Unseen* (1882). Her biographies of *Edward Irving* (1862) and *Laurence Oliphant* (1892), together with her life of Sheridan in the "English Men of Letters" (1883), have vivacity and a sympathetic touch. She also wrote historical and critical works of considerable variety, including *Historical Sketches of the Reign of George II.* (1869), *The Makers of Florence* (1876), *A Literary History of England from 1790 to 1825* (1882), *The Makers of Venice* (1887), *Royal Edinburgh* (1890), *Jerusalem* (1891) and *The Makers of Modern Rome* (1895), while at the time of her death she was still occupied upon *Annals of a Publishing House*, a record of the progress and achievement of the firm of Blackwood, with which she had been so long and honourably connected.

Her *Autobiography and Letters*, which present a touching picture of her domestic anxieties, appeared in 1899.

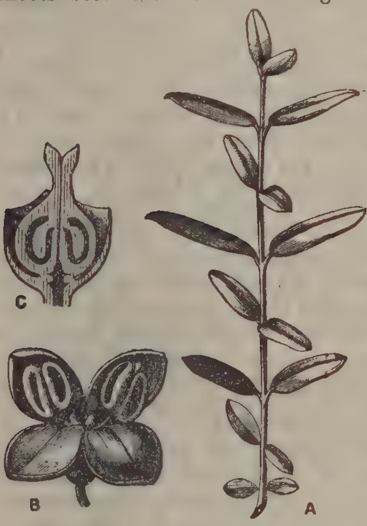
OLIPHANT, Olifant (Ger. *Helfant*), the large signal horn of the middle ages, made, as its name indicates, from the tusk of an elephant. The oliphant was the instrument of knights and men of high degree, and was usually ornamented with scenes of hunting or war carved either lengthways or round the horn in sections divided by bands of gold and studded with gems. The knights used their oliphants in the hunting field and in battle, and the loss of this precious horn was considered as shameful as the loss of sword or banner.

OLIVA, FERNAN PEREZ DE (1492?–1530), Spanish man of letters, was born at Cordova about 1492. After studying at Salamanca, Alcalá, Paris and Rome, he was appointed rector at Salamanca, where he died in 1530. His *Diálogo de la dignidad del hombre* (1543), an unfinished work completed by Francisco Cervantes de Salazar, was written chiefly to prove the suitability of Spanish as a vehicle for philosophic discussion. He also published translations of the *Amphitruo* (1525), the *Electra* (1528) and the *Hecuba* (1528).

OLIVARES, GASPAR DE GUZMAN, count of Olivares and duke of San Lucar (1587–1645), Spanish royal favourite and minister, was born in Rome, where his father was Spanish ambassador, on the 6th of January 1587. His compound title is explained by the fact that he inherited the title of count of Olivares, but was created duke of San Lucar by the favour of Philip IV. He begged the king to allow him to preserve his inherited title in combination with the new honour—according to a practice of which there are a few other examples in Spanish history. Therefore he was commonly spoken of as *el conde-duque.* During the life of Philip III. he was appointed to a post in the household of the heir apparent, Philip, by the interest of his maternal uncle Don Baltasar de Zúñiga, who was the head of the prince's establishment. Olivares made it his business to acquire the most complete influence over the young prince. When Philip IV. ascended the throne in 1621, at the age of sixteen, he showed his confidence in Olivares by ordering that all papers requiring the royal signature should first be sent to the count-duke. Olivares could now boast to his uncle Don Baltasar de Zúñiga that he was "all." He became what is known in Spain as a *valido*—something more than a prime minister, the favourite and *alter ego* of the king. For twenty-two years he directed the policy of Spain. It was a period of constant war, and finally of disaster abroad and of rebellion at home. The Spaniards, who were too thoroughly monarchical to blame the king, held his favourite responsible for the misfortunes of the country. The count-duke became, and for long remained, in the opinion of his countrymen, the accepted model of a grasping and incapable favourite. Of late, largely under the inspiration of Don Antonio Canovas, there has been a certain reaction in his favour. It would certainly be most unjust to blame Olivares alone for the decadence of Spain, which was due to internal causes of long standing. The gross errors of his policy—the renewal of the war with Holland in 1621, the persistence of Spain in taking part in the Thirty Years' War, the lesser wars undertaken in northern Italy, and the entire neglect of all effort to promote the unification of the different states forming the peninsular kingdom—were shared by him with the king, the Church and the commercial classes. When he had fallen from power he wrote an apology, in which he maintained that he had always wished to see more attention paid to internal government, and above all to the complete unification of Portugal with Spain. But if this was not an afterthought, he must, on his own showing, stand accused of having carried out during long years a policy which he knew to be disastrous to his country, rather than risk the loss of the king's favour and of his place. Olivares did not share the king's taste for art and literature, but he formed a vast collection of state papers, ancient and contemporary, which he endeavoured to protect from destruction by entailing them as an heirloom. He also formed a splendid aviary which, under the name of the "hencoop," was a favourite subject of ridicule with his enemies. Towards the end of his period of favour he caused great offence by legitimizing a supposed bastard son of very doubtful paternity and worthless personal character, and by arranging a rich marriage for him. The fall of Olivares was immediately due to the revolts of Portugal and Catalonia in 1640. The king parted with him reluctantly, and only under the pressure of a strong court intrigue headed by Queen Isabella. It was noted with anxiety by his enemies that he was succeeded in the king's confidence by his nephew the count of Haro. There remains, however, a letter from the king, in which Philip tells his old favourite, with frivolous ferocity, that it might be necessary to sacrifice his life in order to avert unpopularity from the royal house. Olivares was driven from office in 1643. He retired by the king's order to Toro. Here he endeavoured to satisfy his passion for activity, partly by sharing in the municipal government of the town and the regulation of its commons, woods and pastures, and partly by the composition of the apology he published under the title of *El Nicandro*, which was perhaps written by an agent, but was undeniably inspired by the fallen minister. The *Nicandro* was denounced to the Inquisition, and it is not impossible that Olivares might have ended in the prisons of the Holy Office, or on the scaffold, if he had not died on the 22nd of July 1645.

See the *Estudios del reinado de Felipe IV.* of Don Antonio Canovas (Madrid, 1889); and Don F. Silvela's introduction, much less favourable to Olivares, to his edition of the *Cartas de Sor Maria de Agreda y del rey Felipe IV.* (Madrid, 1885–1886).

OLIVE (*Olea europaea*), the plant that yields the olive oil of commerce, belonging to a section of the natural order Oleaceae, of which it has been taken as the type. The genus *Olea* includes about thirty species, very widely scattered, chiefly over the Old World, from the basin of the Mediterranean to South Africa and New Zealand. The wild olive is a small tree or bush of rather straggling growth, with thorny branches and opposite oblong pointed leaves, dark greyish-green above and, in the young state, hoary beneath with whitish scales; the small white flowers, with four-cleft calyx and corolla, two stamens and bifid stigma, are borne on the last year's wood, in racemes springing from the axils of the leaves; the drupaceous fruit is small in the wild plant, and the fleshy pericarp, which gives the cultivated olive its economic value, is hard and comparatively thin. In the cultivated forms the tree acquires a more compact habit, the branches lose their spinous character, while the young shoots become more or less angular; the leaves are always hoary on the under-side, and are generally lanceolate in shape, though varying much in breadth and size in the different kinds. The fruit is subject to still greater changes of form and colour; usually oval or nearly globular, in some sorts it is egg-shaped, in others much elongated; while the dark hue that it commonly assumes when ripe is exchanged in many varieties for violet, green or almost white. At present the wild olive is found in most of the countries around the Mediterranean, extending its range on the west to Portugal, and eastward to the vicinity of the Caspian, while, locally, it occurs even in Afghanistan. An undoubted native of Syria and the maritime parts of Asia Minor, its abundance in Greece and the islands of the Archipelago, and the frequent allusions to it by the earliest poets, seem to indicate that it was there also indigenous; but in localities remote from the Levant it may have escaped from cultivation, reverting more or less to its primitive type. It shows a marked preference for calcareous soils and a partiality for the sea-breeze, flourishing with especial luxuriance on the limestone slopes and crags that often form the shores of the Greek peninsula and adjacent islands.



A, Shoot of olive (*Olea europaea*) (from nature), reduced; B, opened flower; C, vertical section of pistil. B and C enlarged.

The varieties of olive known to the modern cultivator are extremely numerous—according to some authorities equalling or exceeding in number those of the vine. In France and Italy at least thirty kinds have been enumerated, but comparatively few are grown to any large extent. None of these can be safely identified with ancient descriptions, though it is not unlikely that some of the narrow-leaved sorts that are most esteemed may be descendants of the famed "Licinian" (see below). Italy retains its old pre-eminence in olive cultivation; and, though its ancient Gallic province now excels it in the production of the finer oils, its fast-improving culture may restore the old prestige. The broad-leaved olive trees of Spain bear a larger fruit, but the pericarp is of more bitter flavour and the oil of ranker quality. The olive tree, even when free increase is unchecked by pruning, is of very slow growth; but, where allowed for ages its natural development, the trunk sometimes attains a considerable diameter. De Candolle records one exceeding 23 ft. in girth, the age being supposed to amount to seven centuries. Some old Italian olives have been credited with an antiquity reaching back to the first years of the empire, or even to the days of republican Rome; but the age of such ancient trees is always doubtful during growth, and their identity with old descriptions still more difficult to establish. The tree in cultivation rarely exceeds 30 ft. in height, and in France and Italy is generally confined to much more limited dimensions by frequent pruning. The wood, of a yellow or light greenish-brown hue, is often finely veined with a darker tint, and, being very hard and close grained, is valued by the cabinetmaker and ornamental turner.

The olive is propagated in various ways, but cuttings or layers are generally preferred; the tree roots in favourable soil almost as easily as the willow, and throws up suckers from the stump when cut down. Branches of various thickness are cut into lengths of several feet each, and, planted rather deeply in manured ground, soon vegetate; shorter pieces are sometimes laid horizontally in shallow trenches, when, covered with a few inches of soil, they rapidly throw up sucker-like shoots. In Greece and the islands grafting the cultivated tree on the wild form is a common practice. In Italy embryonic buds, which form small swellings on the stems, are carefully excised and planted beneath the surface, where they grow readily, these "uovoli" soon forming a vigorous shoot. Occasionally the larger boughs are inarched, and young trees thus soon obtained. The olive is also sometimes raised from seed, the oily pericarp being first softened by slight rotting, or soaking in hot water or in an alkaline solution, to facilitate germination. The olives in the East often receive little attention from the husbandman, the branches being allowed to grow freely and without curtailment by the pruning-knife; water, however, must be supplied in long droughts to ensure a crop; with this neglectful culture the trees bear abundantly only at intervals of three or four years; thus, although wild growth is favourable to the picturesque aspect of the plantation, it is not to be recommended on economic grounds. Where the olive is carefully cultivated, as in Languedoc and Provence, it is planted in rows at regular intervals, the distance between the trees varying in different "olivettes," according to the variety grown. Careful pruning is practised, the object being to preserve the flower-bearing shoots of the preceding year, while keeping the head of the tree low, so as to allow the easy gathering of the fruit; a dome or rounded form is generally the aim of the pruner. The spaces between the trees are occasionally manured with rotten dung or other nitrogenous matter; in France woollen rags are in high esteem for this purpose. Various annual crops are sometimes raised between the rows, and in Calabria wheat even is grown in this way; but the trees are better without any intermediate cropping. Latterly a dwarf variety, very prolific and with green fruit, has come into favour in certain localities, especially in America, where it is said to have produced a crop two or three seasons after planting. The ordinary kinds do not become profitable to the grower until from five to seven years after the cuttings are placed in the olive-ground. Apart from occasional damage by weather or organic foes, the olive crop is somewhat precarious even with the most careful cultivation, and the large untended trees so often seen in Spain and Italy do not yield that certain income to the peasant proprietor that some authors have attributed to them; the crop from these old trees is often enormous, but they seldom bear well two years in succession, and in many instances a luxuriant harvest can only be reckoned upon every sixth or seventh season. The fruit when ripe is, by the careful grower, picked by hand and deposited in cloths or baskets for conveyance to the mill; but in many parts of Spain and Greece, and generally in Asia, the olives are beaten down by poles or by shaking the boughs, or even allowed to drop naturally, often lying on the ground until the convenience of the owner admits of their removal; much of the inferior oil owes its bad quality to the carelessness of the proprietor of the trees. In southern Europe the olive harvest is in the winter months, continuing for several weeks; but the time varies in each country, and also with the season and the kinds cultivated. The amount of oil contained in the fruit differs much in the various sorts; the pericarp usually yields from 60 to 70%. The ancient agriculturists believed that the olive would not succeed if planted more than a few leagues from the sea (Theophrastus gives 300 stadia as the limit), but modern experience does not confirm the idea, and, though showing a preference for the coast, it has long been grown far inland. A calcareous soil, however dry or poor, seems best adapted to its healthy development, though the tree will grow in any light soil, and even on clay if well drained; but, as remarked by Pliny, the plant is more liable to disease on rich soils, and the oil is inferior to the produce of the poorer and more rocky ground the species naturally affects. The olive suffers greatly in some years from the attacks of various enemies. A fungoid growth has at times infested the trees for several successive seasons, to the great damage of the plantations. A species of coccus, *C. oleae*, attaches itself to the shoots, and certain lepidopterous caterpillars feed on the leaves, while the "olive-fly" attacks the fruit. In France the olivettes suffer occasionally from frost; in the early part of the 18th century many trees were cut to the ground by a winter of exceptional severity. Gales and long-continued rains during the gathering season also cause mischief.

The unripe fruit of the olive is largely used in modern as in ancient times as an article of dessert, to enhance the flavour of wine, and to renew the sensitiveness of the palate for other viands. For this purpose the fruit is picked while green, soaked for a few hours in an alkaline ley, washed well in clean water and then placed in bottles or jars filled with brine; the Romans added *amurca* to the salt to increase the bitter flavour of the olives, and at the present day spices are sometimes used.

The leaves and bark of the tree are employed in the south, as a tonic medicine, in intermittent fever. A resinous matter called "olive gum," or Lucca gum, formed by the exuding juice in hot seasons, was anciently in medical esteem, and in modern Italy is used as a perfume.

In England the olive is not hardy, though in the southern counties it will stand ordinary winters with only the protection of a wall, and will bear fruit in such situations; but the leaves are generally shed in the autumn, and the olives rarely ripen.

The genus *Olea* includes several other species of some economic importance. *O. paniculata* is a larger tree, attaining a height of 50 or 60 ft. in the forests of Queensland, and yielding a hard and tough timber. The yet harder wood of *O. laurifolia*, an inhabitant of Natal, is the black ironwood of the South African colonist.

At what remote period of human progress the wild olive passed under the care of the husbandman and became the fruitful garden olive it is impossible to conjecture. The frequent reference in the Bible to the plant and its produce, its implied abundance in the land of Canaan, the important place it has always held in the economy of the inhabitants of Syria, lead us to consider that country the birthplace of the cultivated olive. An improved variety, possessed at first by some small Semitic sept, it was probably slowly distributed to adjacent tribes; and, yielding profusely, with little labour, that oily matter so essential to healthy life in the dry hot climates of the East, the gift of the fruitful tree became in that primitive age a symbol of peace and goodwill among the warlike barbarians. At a later period, with the development of maritime enterprise, the oil was conveyed, as an article of trade, to the neighbouring Pelasgic and Ionian nations, and the plant, doubtless, soon followed.

In the Homeric world, as depicted in the *Iliad*, olive oil is known only as a luxury of the wealthy—an exotic product, prized chiefly for its value in the heroic toilet; the warriors anoint themselves with it after the bath, and the body of Patroclus is similarly sprinkled; but no mention of the culture of the plant is made, nor does it find any place on the Achillean shield, on which a vineyard is represented. But, although no reference to the cultivation of the olive occurs in the *Iliad*, the presence of the tree in the garden of Alcinous and other familiar allusions show it to have been known when the *Odyssey* was written. Whenever the introduction may have taken place, all tradition points to the limestone hills of Attica as the seat of its first cultivation on the Hellenic peninsula. When Poseidon and Athena contended for the future city, an olive sprang from the barren rock at the bidding of the goddess, the patron of those arts that were to bring undying influence to the rising state. That this myth has some relation to the first planting of the olive in Greece seems certain from the remarkable story told by Herodotus of the Epidaurians, who, on their crops failing, applied for counsel to the Delphic oracle, and were enjoined to erect statues to Damia and Auxesia (symbols of fertility) carved from the wood of the true garden olive, then possessed only by the Athenians, who granted their request for a tree on condition of their making an annual sacrifice to Athena, its patron; they thus obeyed the command of the Pythian, and their lands became again fertile. The sacred tree of the goddess long stood on the Acropolis, and, though destroyed in the Persian invasion, sprouted again from the root—some suckers of which were said to have produced those olive trees of the Academy in an after age no less revered. By the time of Solon the olive had so spread that he found it necessary to enact laws to regulate the cultivation of the tree in Attica, from which country it was probably distributed gradually to all the Athenian allies and tributary states. To the Ionian coast, where it abounded in the time of Thales, it may have been in an earlier age brought by Phoenician vessels; some of the Sporades may have received it from the same source; the olives of Rhodes and Crete had perhaps a similar origin. Samos, if we may judge from the epithet of Aeschylus (ἐλαιόφυτος), must have had the fruitful plant long before the Persian wars.

It is not unlikely that the valued tree was taken to Magna Graecia by the first Achaean colonists, and the assertion of Pliny (quoted from Fenestella), that no olives existed in Italy in the reign of Tarquinius Priscus, must be received with the caution due to many statements of that industrious compiler. In Latin Italy the cultivation seems to have spread slowly, for it was not until the consulship of Pompey that the production of oil became sufficient to permit of its exportation. In Pliny's time it was already grown abundantly in the two Gallic provinces and in Spain; indeed, in the earlier days of Strabo the Ligurians supplied the Alpine barbarians with oil, in exchange for the wild produce of their mountains; the plant may have been introduced into those districts by Greek settlers in a previous age. Africa was indebted for the olive mainly to Semitic agencies. In Egypt the culture never seems to have made much progress; the oil found in Theban tombs was probably imported from Syria. Along the southern shore of the great inland sea the tree was carried by the Phoenicians, at a remote period, to their numerous colonies in Africa—though the abundant olives of Cyrene, to which allusion is made by Theophrastus, and the glaucous foliage of whose descendants still clothes the rocks of the deserted Cyrenaica, may have been the offspring of Greek plants brought by the first settlers. The tree was most likely introduced into southern Spain, and perhaps into Sardinia and the Balearic Islands, by Phoenician merchants; and, if it be true that old olive trees were found in the Canaries on their rediscovery by medieval navigators, the venerable trees probably owed their origin to the same enterprising pioneers of the ancient world. De Candolle says that the means by which the olive was distributed to the two opposite shores of the Mediterranean are indicated by the names given to the plant by their respective inhabitants—the Greek ἐλαία passing into the Latin *olea* and *oliva*, that in its turn becoming the *ulivo* of the modern Italian, the *olivo* of the Spaniard, and the *olive*, *olivier*, of the French, while in Africa and southern Spain the olive retains appellatives derived from the Semitic *zaii* or *seit*; but the complete subjugation of Barbary by the Saracens sufficiently accounts for the prevalence of Semitic forms in that region; and *aceytuno* (Arab. *zeitún*), the Andalusian name of the fruit, locally given to the tree itself, is but a vestige of the Moorish conquest.

Yielding a grateful substitute for the butter and animal fats consumed by the races of the north, the olive, among the southern nations of antiquity, became an emblem not only of peace but of national wealth and domestic plenty; the branches borne in the Panathenaea, the wild olive spray of the Olympic victor, the olive crown of the Roman conqueror at ovation, and those of the equites at their imperial review alike typified gifts of peace that, in a barbarous age, could be secured by victory alone. Among the Greeks the oil was valued as an important article of diet, as well as for its external use. The Roman people employed it largely in food and cookery—the wealthy as an indispensable adjunct to the toilet; and in the luxurious days of the later empire it became a favourite axiom that long and pleasant life depended on two fluids, "wine within and oil without." Pliny vaguely describes fifteen varieties of olive cultivated in his day, that called the "Licinian" being held in most esteem, and the oil obtained from it at Venafrum in Campania the finest known to Roman connoisseurs; the produce of Istria and Baetica was regarded as second only to that of the Italian peninsula. The *gourmet* of the empire valued the unripe fruit, steeped in brine, as a provocative to the palate, no less than his modern representative;

and pickled olives, retaining their characteristic flavour, have been found among the buried stores of Pompeii. The bitter juice or refuse deposited during expression of the oil (called *amurca*), and the astringent leaves of the tree have many virtues attributed to them by ancient authors. The oil of the bitter wild olive was employed by the Roman physicians in medicine, but does not appear ever to have been used as food or in the culinary art.

In modern times the olive has been spread widely over the world; and, though the Mediterranean lands that were its ancient home still yield the chief supply of the oil, the tree is now cultivated successfully in many regions unknown to its early distributors. Soon after the discovery of the American continent it was conveyed thither by the Spanish settlers. In Chile it flourishes as luxuriantly as in its native land, the trunk sometimes becoming of large girth, while oil of fair quality is yielded by the fruit. To Peru it was carried at a later date, but has not there been equally successful. Introduced into Mexico by the Jesuit missionaries of the 17th century, it was planted by similar agency in Upper California, where it has prospered latterly under the more careful management of the Anglo-Saxon conqueror. Its cultivation has also been attempted in the south-eastern states, especially in S. Carolina, Florida and Mississippi. In the eastern hemisphere the olive has been established in many inland districts which would have been anciently considered ill-adapted for its culture. To Armenia and Persia it was known at a comparatively early period of history, and many olive-yards now exist in Upper Egypt. The tree has been introduced into Chinese agriculture, and has become an important addition to the resources of the Australian planter. In Queensland the olive has found a climate specially suited to its wants; in South Australia, near Adelaide, it also grows vigorously; and there are probably few coast districts of the vast island-continent where the tree would not flourish. It has likewise been successfully introduced into some parts of Cape Colony.

OLIVEIRA MARTINS, JOAQUIM PEDRO DE (1845–1894), Portuguese writer, was born in Lisbon and received his early education at the Lycéo Nacional and the Academia das Bellas Artes. At the age of fourteen his father's death compelled him to seek a living as clerk in a commercial house, but he gradually improved his position until in 1870 he was appointed manager of the mine of St Eufemia near Cordova. In Spain he wrote *O. Socialismo*, and developed that sympathy for the industrial classes of which he gave proof throughout his life. Returning to Portugal in 1874, he became administrator of the railway from Oporto to Povoa, residing in Oporto. He had married when only nineteen, and for many years devoted his leisure hours to the study of economics, geography and history. In 1878 his memoir *A Circulação fiduciaria* brought him the gold medal and membership of the Royal Academy of Sciences of Lisbon. Two years later he was elected president of the Society of Commercial Geography of Oporto, and in 1884 he became director of the Industrial and Commercial Museum in that city. In 1885 he entered public life, and in the following year represented Vianna do Castello in parliament, and in 1887 Oporto. Removing to Lisbon in 1888, he continued the journalistic work which he had commenced when living in the north, by editing the *Reporter*, and in 1889 he was named administrator of the Tobacco Régie. He represented Portugal at international conferences in Berlin and Madrid in 1890, and was chosen to speak at the celebration of the fourth centenary of Columbus held in Madrid in 1891, which gained him membership of the Spanish Royal Academy of History. He became minister of finance on the 17th of January 1892, and later vice-president of the Junta do Credito Publico. His health, however, began to break down as a result of a life spent in unremitting toil, and he died on the 24th of August 1894.

His youthful struggles and privations had taught him a serious view of life, which, with his acute sensibility, gave him a reserved manner, but Oliveira Martins was one of the most generous and noble of men. Like Anthero de Quental, he was impregnated with modern German philosophy, and his perception of the low moral standard prevailing in public life made him a pessimist who despaired of his country's future, but his sense of proportion, and the necessity which impelled him to work, saved him from the fate which befell his friend, and he died a believing Catholic. At once a gifted psychologist, a profound sociologist, a stern moralist, and an ardent patriot, Oliveira Martins deserved his European reputation. His *Bibliotheca das sciencias sociaes*, a veritable encyclopaedia, comprises literary criticism, socialism, economics, anthropology, histories of Iberian civilization, of the Roman Republic, Portugal and Brazil. Towards the end of his life he specialized in the 15th century and produced two notable volumes, *Os filhos de D. João I.* and *A vida de Nun'Alvares*, leaving unfinished *O principe perfeito*, a study on King John II., which was edited by his friend Henrique de Barros Gomes.

As the literary leader of a national revival, Oliveira Martins occupied an almost unique position in Portugal during the last third of the 19th century. If he judged and condemned the parliamentary régime and destroyed many illusions in his sensational *Contemporary Portugal*, and if in his philosophic *History of Portugal* he showed, in a series of impressionist pictures, the slow decline of his country commencing in the golden age of the discoveries and conquests, he at the same time directed the gaze of his countrymen to the days of their real greatness under the House of Aviz, and incited them to work for a better future by describing the faith and patriotism which had animated the foremost men of the race in the middle ages. He had neither time nor opportunity for original research, but his powerful imagination and picturesque style enabled him to evoke the past and make it present to his readers.

The chief characteristics of the man—psychological imagination combined with realism and a gentle irony—make his strength as a historian and his charm as a writer. When some critics objected that his *Historia de Portugal* ought rather to be named "Ideas on Portuguese History," he replied that a synthetic and dramatic picture of one of those collective beings called nations gives the mind a clearer, truer and more lasting impression than a summary narrative of successive events. But just because he possessed the talents and temperament of a poet, Oliveira Martins was fated to make frequent mistakes as well as to discover important truths. He must be read with care because he is emotional, and cannot let facts speak for themselves, but interrupts the narrative with expressions of praise or blame. Some of his books resemble a series of visions, while, despite his immense erudition, he does not always supply notes or refer to authorities. He can draw admirable portraits, rich with colour and life; in his *Historia de Portugal* and *Contemporaneo Portugal* those of King Pedro I. and Herculano are among the best known. He describes to perfection such striking events as the Lisbon earthquake, and excels in the appreciation of an epoch. In these respects Castelar considered him superior to Macaulay, and declared that few men in Europe possessed the universal aptitude and the fullness of knowledge displayed by Oliveira Martins.

The works of Oliveira Martins include *Elementos de anthropologia*, *As Raças humanas e a civilisação primitiva*, *Systema dos mythos religiosos*, *Quadro das instituiçoēs primitivas*, *O Regime das riquezas*, *Politica e economia nacional*, *Taboas de chronologia e geographia historica*, *O Hellenismo e a civilisação christã*, *Historia da Republica Romana*, *Historia da civilisação iberica*, *Historia de Portugal*, *Brazil e as colonias portuguezas*, *Portugal nos Mares*, *Portugal em Africa*, *Portugal contemporaneo*, *Camões os Lusiadas e a renascença em Portugal*—a brilliant commentary on the physiognomy of the poet and his poem, *Os Filhos de D. João I.*, the preface to which gives his views on the writing of history—*A Vida de Nun' Alvares*; and *A. Inglaterra de Hoje*—the result of a visit to England.

See Moniz Barreto, *Oliveira Martins, estudo de psychologia* (Paris, 1887), a remarkable study; F. Diniz D'Ayalla, *Os Ideaes de Oliveira Martins* (Lisbon, 1897), which contains an admirable statement of his ideas, philosophical and otherwise; Anthero de Quental, *Oliveira Martins* (Lisbon, 1894) and *Diccionario bibliographico portuguez*, xii. 125. (E. Pr.)

OLIVENITE, a mineral consisting of basic copper arsenate with the formula $Cu_2(OH)AsO_4$. It crystallizes in the orthorhombic system, and is sometimes found in small brilliant crystals of simple prismatic habit terminated by domal faces. More usually, however, it occurs as globular aggregates of acicular crystals, these fibrous forms often having a velvety lustre: sometimes it is lamellar in structure, or soft and earthy. A characteristic feature, and one to which the name alludes (German, *Olivenerz,* of A. G. Werner, 1789), is the olive-green colour, which varies in shade from blackish-green in the crystals to almost white in the finely fibrous variety known as "wood-copper." The hardness is 3, and the sp. gr. 4·3. The mineral was formerly found in some abundance, associated with limonite and quartz, in the upper workings in the copper mines of the St Day district in Cornwall; also near Redruth, and in the Tintic district in Utah. It is a mineral of secondary origin, having been formed by the alteration of copper ores and mispickel.

The arsenic of olivenite is sometimes partly replaced by a small amount of phosphorus, and in the species libethenite we have the corresponding basic copper phosphate $Cu_2(OH)PO_4$. This is found as small dark green crystals resembling olivenite at Libethen in Hungary, and in small amount also in Cornwall. Other members of this isomorphous group of minerals are adamite, $Zn_2(OH)AsO_4$, and descloizite (*q.v.*). (L. J. S.)

OLIVER, ISAAC (*c.* 1566–1617), English miniature painter, was probably born in London, as in 1571 a certain Peter Olivier of Rouen was residing in London with his wife and had been there for three years with one "chylde" named "Isake." It would seem likely, therefore, that he was not at that time more than six years old. It has been suggested by Mr Lionel Cust, from the Huguenot records, that he is identical with one Isaac Oliver of Rouen, married at the Dutch church in Austin Friars in 1602. His death occurred in 1617, and he was buried in the church of St Anne, Blackfriars. He was probably a pupil of Nicholas Hilliard, and connected through his wife, whose name is unknown, with the artists Gheeraerts and De Critz. He was an exceedingly expert miniature painter, and splendid examples of his work can be seen at Montagu House, Windsor Castle, Sherborne Castle and in the collections of Mr J. Pierpont Morgan and the late Baroness Burdett-Coutts. Some of his pen drawings are in the British Museum. (G. C. W.)

OLIVER, PETER (1594–1648), English miniature painter, was the eldest son of Isaac Oliver, probably by his first wife; and to him Isaac Oliver left his finished and unfinished drawings, with the hope that he would live to exercise the art of his father. The younger sons of the artist appear to have been under age at the time of his death, and were probably therefore sons by a later wife than the mother of Peter Oliver. He resided at Isleworth, and was buried beside his father at St Anne's, Blackfriars. He was even more eminent in miniature painting than his father, and is specially remarkable for a series of copies in water-colour he made after celebrated pictures by old masters. Most of these were done by the desire of the king, and seven of them still remain at Windsor Castle. A great many of Oliver's works were purchased by Charles II. from his widow; several of his drawings are in existence, and a leaf from his pocket-book in the collection of the earl of Derby. His most important work is the group of the three grandsons of the 1st Viscount Montacute with their servant, now belonging to the marquess of Exeter; and there are fine miniatures by him at Welbeck Abbey, Montagu House, Sherborne Castle, Minley Manor, Belvoir Castle and in the private collection of the queen of Holland. (G. C. W.)

OLIVES, MOUNT OF, or MOUNT OLIVET (*Ὄρος Ἐλαιῶνος* or *τῶν Ἐλαιῶν*; mod. Jebel-eṭ-Ṭur), the ridge facing the Temple Mount at Jerusalem on the east, and separated from it by the Kidron. A basis of hard cretaceous limestone is topped with softer deposits of the same, quaternary deposits forming the summit. There are four distinct elevations in the ridge: traditionally the southernmost, which is separated by a cleft from the others, is called the "Hill of Offence," and said to be the scene of Solomon's idolatry. The summit to the north of this is often (wrongly) spoken of as Olivet proper. Still worse is the error of calling the next hill but one to the north "Scopus." The top of the ridge affords a comprehensive view. There are four Old Testament references: 2 Sam. xv. 30 sqq., Neh. viii. 15, Ezek. xi. 23, Zech. xiv. 4. In the New Testament the place is mentioned in connexion with the last days of the life of Jesus. He crossed it on his kingly entry into Jerusalem, and upon it he delivered his great eschatological address (Mark xiii. 3). That the Ascension took place *from the summit* of the Mount of Olives is not necessarily implied in Acts i. 12; the words "over against Bethany" (Luke xxiv. 50) perhaps mean one of the secluded ravines on the eastern slope, beside one of which that village stands. But since Constantine erected the "Basilica of the Ascension" on the spot marked by a certain sacred cave (Euseb. *Vita Const.* iii. 41), the site of this event has been placed here and marked by a succession of churches. The present building is quite modern, and is in the hands of the Moslems. Close to the Chapel of the Ascension is the vault of St Pelagia, and a little way down the hill is the labyrinth of early Christian rock-hewn sepulchral chambers now called the "Tombs of the Prophets." During the middle ages Olivet was also shown as the mount of the Transfiguration. A chapel, bearing the name of the Caliph Omar, and said to occupy the place where he encamped when Jerusalem surrendered to the Moslems, formerly stood beside the Church of the Ascension. There are a considerable number of monasteries and churches of various religious orders and sects on the hill, from whose beauty their uniform and unredeemed ugliness detracts sadly. On Easter day 1907 was laid the foundation of a hospice for pilgrims, under the patronage of the German empress.

OLIVETANS, one of the lesser monastic orders following the Benedictine Rule, founded by St Bernard Tolomei, a Sienese nobleman. At the age of forty, when the leading man in Siena, he retired along with two companions to live a hermit's life at Accona, a desert place fifteen miles to the south of Siena, 1313. Soon others joined them, and in 1324 John XXII. approved of the formation of an order. The Benedictine Rule was taken as the basis of the life; but austerities were introduced beyond what St Benedict prescribed, and the government was framed on the mendicant, not the monastic, model, the superiors being appointed only for a short term of years. The habit is white. Partly from the olive trees that abound there, and partly out of devotion to the Passion, Accona was christened Monte Oliveto, whence the order received its name. By the end of the 14th century there were upwards of a hundred monasteries, chiefly in Italy; and in the 18th there still were eighty, one of the most famous being San Miniato at Florence. The monastery of Monte Oliveto Maggiore is an extensive building of considerable artistic interest, enhanced by frescoes of Signorelli and Sodoma; it is now a national monument occupied by two or three monks as custodians, though it could accommodate three hundred. The Olivetans have a house in Rome and a few others, including one founded in Austria in 1899. There are about 125 monks in all, 54 being priests. In America are some convents of Olivetan nuns.

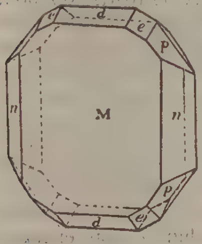
See Helyot, *Hist. des ordres réligieux* (1718), vi. c. 24; Max Heimbucher, *Orden u. Kongregationen* (1907), i. § 30; Wetzer u. Welte, *Kirchenlexicon* (ed. 2); J. A. Symonds, *Sketches and Studies in Italy* (1898), "Monte Oliveto": B. M. Maréchaux, *Vie de bienheureux Bernard Tolomei* (1888). (E. C. B.)

OLIVIER, JUSTE DANIEL (1807–1876), Swiss poet, was born near Nyon in the canton of Vaud; he was brought up as a peasant, but studied at the college of Nyon, and later at the academy of Lausanne. Though originally intended for the ministry, his poetic genius (foreshadowed by the prizes he obtained in 1825 and 1828 for poems on *Marcos Botzaris* and *Julia Alpinula* respectively) inclined him towards literary studies. He was named professor of literature at Neuchâtel (1830), but before taking up the duties of his post made a visit to Paris, where he completed his education and became associated with Ste Beuve, especially from 1837 onwards. He professed history at Lausanne from 1833 to 1846, when he lost his chair in consequence of the religious troubles. He then went to Paris, where he remained till 1870, earning his bread by various means, but being nearly forgotten in his native land, to which he remained tenderly attached. From 1845 till 1860 (when the magazine was merged in the *Bibliothèque universelle*) Olivier and his wife wrote in the *Revue suisse* the Paris letter, which had been started by Ste Beuve in 1843, when Olivier became the owner of the periodical. After the war of 1870 he settled down in Switzerland, spending his summers at his beloved Gryon, and died at Geneva on the 7th of January 1876. Besides some novels, a semi-poetical work on the Canton of Vaud (2 vols., 1837–1841), and a volume of historical essays entitled *Études d'histoire nationale* (1842), he published several volumes of poems, *Deux Voix* (1835), *Chansons lointaines* (1847) and its continuation *Chansons du soir* (1867), and *Sentiers de montagne* (Gryon, 1875). His younger brother, Urbain (1810–1888), was well known from 1856 onwards as the author of numerous popular tales of rural life in the Canton of Vaud, especially of the region near Nyon.

Life by Rambert (1877), republished in his *Écrivains de la Suisse romande* (1889), and also prefixed to his edition of Olivier's *Œuvres choisies* (Lausanne, 1879). (W. A. B. C.)

OLIVINE, a rock-forming mineral composed of magnesium and ferrous orthosilicate, the formula being $(Mg, Fe)_2SiO_4$. The name olivine, proposed by A. G. Werner in 1790, alludes to the olive-green colour commonly shown by the mineral. The transparent varieties, or "precious olivine" used in jewelry, are known as chrysolite (*q.v.*) and peridot (*q.v.*). The term olivine is often applied incorrectly by jewellers to various green stones.

Olivine crystallizes in the orthorhombic system, but distinctly developed crystals are comparatively rare, the mineral more often occurring as compact or granular masses or as grains and blebs embedded in the igneous rocks of which it forms a constituent part. There are indistinct cleavages parallel to the macropinacoid (M in the fig.) and the brachypinacoid. The hardness is $6\frac{3}{4}$; and the sp. gr. 3·27–3·37, but reaching 3·57 in the highly ferruginous variety known as hyalosiderite. The amount of ferrous oxide varies from 5 (about 9 % in the gem varieties to 30 % in hyalosiderite. The depth of the green, or yellowish-brown colour, also varies with the amount of iron. The lustre is vitreous. The indices of refraction (1·66 and 1·70) and the double refraction are higher than in many other rock-forming minerals; and these characters, together with the indistinct cleavage, enable the mineral to be readily distinguished in thin rock-sections under the microscope. The mineral is decomposed by hot hydrochloric acid with separation of gelatinous silica. Olivine often contains small amounts of nickel and titanium dioxide; the latter replaces silica, and in the variety known as titan-olivine reaches 5%.



Olivine is a common constituent of many basic and ultrabasic rocks, such as basalt, diabase, gabbro and peridotite: the dunite, of Dun Mountain near Nelson in New Zealand, is an almost pure olivine-rock. In basalts it is often present as small porphyritic crystals or as large granular aggregates. It also occurs as an accessory constituent of some granular dolomitic limestones and crystalline schists. With enstatite it forms the bulk of the material of meteoric stones; and in another type of meteorites large blebs of glassy olivine fill spaces in a cellular mass of metallic iron.

Olivine is especially liable to alteration into serpentine (hydrated magnesium silicate); the alteration proceeds from the outside of the crystals and grains or along irregular cracks in their interior, and gives rise to the separation of iron oxides and an irregular net-work of fibrous serpentine, which in rock-sections presents a very characteristic appearance. Large greenish-yellow crystals from Snarum in Buskerud, Norway, at one time thought to be crystals of serpentine, really consist of serpentine pseudomorphous after olivine. Many of the large rock-masses of serpentine have been derived by the serpentinization of olivine-rocks. Olivine also sometimes alters, especially in crystalline schists, to a fibrous, colourless amphibole, to which the name pilite has been given. By ordinary weathering processes it alters to limonite and silica.

Closely related to olivine are several other species, which are included together in the olivine group: they have the orthosilicate formula R''_2SiO_4, where R'' represents calcium, magnesium, iron, manganese and rarely zinc; they all crystallize in the orthorhombic system, and are isomorphous with olivine. The following may be mentioned:—

Monticellite, $CaMgSiO_4$, a rare mineral occurring as yellowish-grey crystals and grains in granular limestone at Monte Somma, Vesuvius.

Forsterite, Mg_2SiO_4, as colourless or yellowish grains embedded in many crystalline limestones.

Fayalite, Fe_2SiO_4, or iron olivine is dark brown or black in colour. It occurs as nodules in a volcanic rock at Fayal in the Azores, and in granite at the Mourne Mountains in Ireland; and as small crystals in cavities in rhyolite at the Yellowstone Park, U.S.A. It is a common constituent of crystalline iron slags.

Tephroite, Mn_2SiO_4, a grey (τεφρός, ash-coloured), cleavable mineral occurring with other manganiferous minerals in Sweden and New Jersey. (L. J. S.)

OLLIVIER, OLIVIER ÉMILE (1825–), French statesman, was born at Marseilles on the 2nd of July 1825. His father, Demosthènes Ollivier (1799–1884), was a vehement opponent of the July monarchy, and was returned by Marseilles to the Constituent Assembly in 1848. His opposition to Louis Napoleon led to his banishment after the *coup d'état* of December 1851, and he only returned to France in 1860. On the establishment of the short-lived Second Republic his father's influence with Ledru-Rollin secured for Émile Ollivier the position of commissary-general of the department of Bouches-du-Rhône. Ollivier was then twenty-three and had just been called to the Parisian bar. Less radical in his political opinions than his father, his repression of a socialist outbreak at Marseilles commended him to General Cavaignac, who continued him in his functions by making him prefect of the department. He was shortly afterwards removed to the comparatively unimportant prefecture of Chaumont (Haute-Marne), a semi-disgrace which he ascribed to his father's enemies. He therefore resigned from the civil service to take up practice at the bar, where his brilliant abilities assured his success.

He re-entered political life in 1857 as deputy for the 3rd circumscription of the Seine. His candidature had been supported by the *Siècle*, and he joined the constitutional opposition. With Alfred Darimon, Jules Favre, J. L. Hénon and Ernest Picard he formed the group known as *Les Cinq*, which wrung from Napoleon III. some concessions in the direction of constitutional government. The imperial decree of the 24th of November, permitting the insertion of parliamentary reports in the *Moniteur*, and an address from the Corps Législatif in reply to the speech from the throne, were welcomed by him as a first instalment of reform. This acquiescence marked a considerable change of attitude, for only a year previously a violent attack on the imperial government, in the course of a defence of Étienne Vacherot, brought to trial for the publication of *La Démocratie*, had resulted in his suspension from the bar for three months. He gradually separated from his old associates, who grouped themselves around Jules Favre, and during the session of 1866–1867 Ollivier formed a third party, which definitely supported the principle of a Liberal Empire. On the last day of December 1866, Count A. F. J. Walewski, acting in continuance of negotiations already begun by the duc de Morny, offered Ollivier the ministry of education with the function of representing the general policy of the government in the Chamber. The imperial decree of the 19th of January 1867, together with the promise inserted in the *Moniteur* of a relaxation of the stringency of the press laws and of concessions in respect of the right of public meeting, failed to satisfy Ollivier's demands, and he refused office. On the eve of the general election of 1869 he published a manifesto, *Le 19 janvier*, in justification of his policy. The *sénatus-consulte* of the 8th of September 1869 gave the two chambers the ordinary parliamentary rights, and was followed by the dismissal of Rouher and the formation in the last week of 1869 of a responsible ministry of which M. Ollivier was really premier, although that office was not nominally recognized by the constitution. The new cabinet, known as the ministry of the 2nd of January, had a hard task before it, complicated a week after its formation by the shooting of Victor Noir by Prince Pierre Bonaparte. Ollivier immediately summoned the high court of justice for the judgment of Prince Bonaparte and Prince Joachim Murat. The riots following on the murder were suppressed without bloodshed; circulars were sent round to the prefects forbidding them in future to put pressure on the electors in favour of official candidates; Baron Haussmann was dismissed from the prefecture of the Seine; the violence of the press campaign against the emperor, to whom he had promised a happy old age, was broken by the prosecution of Henri Rochefort; and on the 20th of April a *sénatus-consulte* was issued which accomplished the transformation of the Empire into a constitutional monarchy. Neither concessions nor firmness sufficed to appease the "Irreconcilables" of the opposition, who since the relaxation of the press laws were able to influence the electorate. On the 8th of May, however, the amended constitution was submitted, on Rouher's advice, to a plebiscite, which resulted in a vote of nearly seven to one in favour of the government. The most distinguished members of the Left in his cabinet—L. J. Buffet, Napoléon Daru and Talhouët Roy—resigned in April on the question of the plebiscite. Ollivier himself held the ministry of foreign affairs for a few weeks, until Daru was replaced by the duc de Gramont, destined to be Ollivier's evil genius. The other vacancies were filled by J. P. Mège and C. I. Plichon, both of them of Conservative tendencies.

The revival of the candidature of Prince Leopold of Hohenzollern-Sigmaringen for the throne of Spain early in 1870 disconcerted Ollivier's plans. The French government, following Gramont's advice, instructed Benedetti to demand from the king of Prussia a formal disavowal of the Hohenzollern candidature. Ollivier allowed himself to be gained by the war party. The story of Benedetti's reception at Ems and of Bismarck's manipulation of the Ems telegram is told elsewhere (see BISMARCK). It is unlikely that Ollivier could have prevented the eventual outbreak of war, but he might perhaps have postponed it at that time, if he had taken time to hear Benedetti's account of the incident. He was outmanœuvred by Bismarck, and on the 15th of July he made a hasty declaration in the Chamber that the Prussian government had issued to the powers a note announcing the rebuff received by Benedetti. He obtained a war vote of 500,000,000 francs, and used the fatal words that he accepted the responsibility of the war "with a light heart," saying that the war had been forced on France. On the 9th of August, with the news of the first disaster, the Ollivier cabinet was driven from office, and its chief sought refuge from the general rage in Italy. He returned to France in 1873, but although he carried on an active campaign in the Bonapartist *Estafette* his political power was gone, and even in his own party he came into collision in 1880 with M. Paul de Cassagnac. During his retirement he employed himself in writing a history of *L'Empire libéral*, the first volume of which appeared in 1895. The work really dealt with the remote and immediate causes of the war, and was the author's apology for his blunder. The 13th volume showed that the immediate blame could not justly be placed entirely on his shoulders. His other works include *Démocratie et liberté* (1867), *Le Ministère du 2 janvier, mes discours* (1875), *Principes et conduite* (1875), *L'Église et l'État au concile du Vatican* (2 vols., 1879), *Solutions politiques et sociales* (1893), *Nouveau Manuel du droit ecclésiastique français* (1885). He had many connexions with the literary and artistic world, being one of the early Parisian champions of Wagner. Elected to the Academy in 1870, he did not take his seat, his reception being indefinitely postponed. His first wife, Blandine Liszt, was the daughter of the Abbé Liszt by Mme d'Agoult (Daniel Stern). She died in 1862, and Ollivier married in 1869 Mlle Gravier.

Ollivier's own view of his political life is given in his *L'Empire libéral*, which must always be an important "document" for the history of his time; but the book must be treated with no less caution than respect.

OLMSTED, DENISON (1791–1859), American man of science, was born at East Hartford, Connecticut, U.S.A., on the 18th of June 1791, and in 1813 graduated at Yale, where he acted as college tutor from 1815 to 1817. In the latter year he was appointed to the chair of chemistry, mineralogy and geology in the university of North Carolina. This chair he exchanged for that of mathematics and physics at Yale in 1825; in 1836, when this professorship was divided, he retained that of astronomy and natural philosophy. He died at New Haven, Connecticut, on the 13th of May 1859.

His first publication (1824–1825) was the *Report* of his geological survey of the state of North Carolina. It was followed by various text-books on natural philosophy and astronomy, but he is chiefly known to the scientific world for his observations on hail (1830), on meteors and on the aurora borealis (see *Smithsonian Contributions*, vol. viii.).

OLMSTED, FREDERICK LAW (1822–1903), American landscape architect, was born in Hartford, Connecticut, on the 27th of April 1822. From his earliest years he was a wanderer. While still a lad he shipped before the mast as a sailor; then he took a course in the Yale Scientific School; worked for several farmers; and, finally, began farming for himself on Staten Island, where he met Calvert Vaux, with whom later he formed a business partnership. All this time he wrote for the agricultural papers. In 1850 he made a walking tour through England, his observations being published in *Walks and Talks of an American Farmer in England* (1852). A horseback trip through the Southern States was recorded in *A Journey in the Seaboard Slave States* (1856), *A Journey through Texas* (1857) and *A Journey in the Back Country* (1860). These three volumes, reprinted in England in two as *Journeys and Explorations in the Cotton Kingdom* (1861), gave a picture of the conditions surrounding American slavery that had great influence on British opinion, and they were much quoted in the controversies at the time of the Civil War. During the war he was the untiring secretary of the U.S. Sanitary Commission. He happened to be in New York City when Central Park was projected, and, in conjunction with Vaux, proposed the plan which, in competition with more than thirty others, won first prize. Olmsted was made superintendent to carry out the plan. This was practically the first attempt in the United States to apply art to the improvement or embellishment of nature in a public park; it attracted great attention, and the work was so satisfactorily done that he was engaged thereafter in most of the important works of a similar nature in America—Prospect Park, Brooklyn; Fairmount Park, Philadelphia; South Park, Chicago; Riverside and Morningside Parks, New York; Mount Royal Park, Montreal; the grounds surrounding the Capitol at Washington, and at Leland Stanford University at Palo Alto (California); and many others. He took the bare stretch of lake front at Chicago and developed it into the beautiful World's Fair grounds, placing all the buildings and contributing much to the architectural beauty and the success of the exposition. He was greatly interested in the Niagara reservation, made the plans for the park there, and also did much to influence the state of New York to provide the Niagara Park. He was the first commissioner of the National Park of the Yosemite and the Mariposa Grove, directing the survey and taking charge of the property for the state of California. He had also held directing appointments under the cities of New York, Boston, Philadelphia, Baltimore, Wilmington and San Francisco, the Joint Committee on Buildings and Grounds of Congress, the Niagara Falls Reservation Commission, the trustees of Harvard, Yale, Amherst and other colleges and public institutions. Subsequently to 1886 he was largely occupied in laying out an extensive system of parks and parkways for the city of Boston and the town of Brookline, and on a scheme of landscape improvement of Boston harbour. Olmsted received honorary degrees from Harvard, Amherst and Yale in 1864, 1867 and 1893. He died on the 28th of August 1903.

OLMÜTZ (Czech, *Olomouc* or *Holomauc*), a town of Austria, in Moravia, 67 m. N.E. of Brünn by rail. Pop. (1900) 21,933, of which two-thirds are Germans. It is situated on the March, and is the ecclesiastical metropolis of Moravia. Until 1886 Olmütz was one of the strongest fortresses of Austria, but the fortifications have been removed, and their place is occupied by a town park, gardens and promenades. Like most Slavonic towns, it contains several large squares, the chief of which is adorned with a trinity column, 115 ft. high, erected in 1740. The most prominent church is the cathedral, a Gothic building of the 14th century, restored in 1883–1886, with a tower 328 ft. high and the biggest church-bell in Moravia. It contains the tomb of King Wenceslaus III., who was murdered here in 1306. The Mauritius church, a fine Gothic building of the 15th century, and the St Michael church are also worth mentioning. The principal secular building is the town-hall, completed in the 15th century, flanked on one side by a Gothic chapel, transformed now into a museum. It possesses a tower 250 ft. high, adorned with an astronomical clock, an artistic and famous work, executed by Anton Pohl in 1422. The old university, founded in 1570 and suppressed in 1858, is now represented by a theological seminary, which contains a very valuable library and an important collection of manuscripts and early prints. Olmütz is an important railway junction, and is the emporium of a busy mining and industrial district. Its industries include brewing and distilling and the manufacture of malt, sugar and starch.

Olmütz is said to occupy the site of a Roman fort founded in the imperial period, the original name of which, *Mons Julii*, has been gradually corrupted to the present form. At a later period Olmütz was long the capital of the Slavonic kingdom of Moravia, but it ceded that position to Brünn in 1640. The Mongols were defeated here in 1241 by Yaroslav von Sternberg. During the Thirty Years' War it was occupied by the Swedes for eight years. The town was originally fortified by Maria Theresa during the wars with Frederick the Great, who besieged the town unsuccessfully for seven weeks in 1758. In 1848 Olmütz was the scene of the emperor Ferdinand's abdication, and in 1850 an important conference took place here between Austrian and German statesmen. The bishopric of Olmütz was founded in 1073, and raised to the rank of an archbishopric in 1777. The bishops were created princes of the empire in 1588. The archbishop is the only one in the Austrian empire who is elected by the cathedral chapter.

See W. Müller, *Geschichte der königlichen Hauptstadt Olmütz* (2nd ed., Olmütz, 1895).

OLNEY, RICHARD (1835–), American statesman, was born at Oxford, Massachusetts, on the 15th of September 1835. He graduated from Brown University in 1856, and from the Law School of Harvard University in 1858. In 1859 he began the practice of law at Boston, Massachusetts, and attained a high position at the bar. He served in the state house of representatives in 1874, and in March 1893 became attorney-general of the United States in the cabinet of President Cleveland. In this position, during the strike of the railway employés in Chicago in 1894, he instructed the district attorneys to secure from the Federal Courts writs of injunction restraining the strikers from acts of violence, and thus set a precedent for "government by injunction." He also advised the use of Federal troops to quell the disturbances in the city, on the ground that the government must prevent interference with its mails and with the general railway transportation between the states. Upon the death of Secretary W. Q. Gresham (1832–1895), Olney succeeded him as secretary of state on the 10th of June 1895. He became specially prominent in the controversy with Great Britain concerning the boundary dispute between the British and Venezuelan governments (see VENEZUELA), and in his correspondence with Lord Salisbury gave an extended interpretation to the Monroe Doctrine which went considerably beyond previous statements on the subject. In 1897, at the expiration of President Cleveland's term, he returned to the practice of the law.

OLNEY, a market town in the Buckingham parliamentary division of Buckinghamshire, England, 59 m. N.W. by N. of London, on a branch of the Midland railway. Pop. of urban district (1901) 2634. It lies in the open valley of the Ouse on the north (left) bank of the river. The church of St Peter and St Paul is Decorated. It has a fine tower and spire; and the chancel has a northerly inclination from the alignment of the nave. The town is chiefly noted for its connexion with William Cowper, who came to live here in 1767 and remained until 1786, when he removed to the neighbouring village of Weston Underwood. His house and garden at Olney retain relics of the poet, and the house at Weston also remains. In the garden at Olney are his favourite seat and the house in which he kept his tame hares. John Newton, curate of Olney, had the assistance of Cowper in the production of the collection of Olney Hymns. The trade of Olney is principally agricultural; the town also shares in the manufacture of boots and shoes common to many places in the neighbouring county of Northampton.

OLNEY, a city and the county-seat of Richland county, Illinois, U.S.A., about 30 m. W. of Vincennes, Indiana. Pop. (1890) 3831; (1900) 4260 (235 foreign-born); (1910) 5011. Olney is served by the Baltimore & Ohio South-western, the Illinois Central, and the Cincinnati, Hamilton & Dayton railways, and is a terminus of the Ohio River Division of the last. It has a Carnegie library and a city park of 55 acres. Olney is an important shipping point for the agricultural products of this district; oil is found in the vicinity; and the city has various manufactures. The municipality owns its water-works. Olney was settled about 1842 and was first chartered as a city in 1867.

OLONETS, a government of north-western Russia, extending from Lake Ladoga almost to the White Sea, bounded W. by Finland, N. and E. by Archangel and Vologda, and S. by Novgorod and St Petersburg. The area is 57,422 sq. m., of which 6794 sq. m. are lakes. Its north-western portion belongs orographically and geologically to the Finland region; it is thickly dotted with hills reaching 1000 ft. in altitude, and diversified by numberless smaller ridges and hollows running from north-west to south-east. The rest of the government is a flat plateau sloping towards the marshy lowlands of the south. The geological structure is very varied. Granites, syenites and diorites, covered with Laurentian metamorphic slates, occur extensively in the north-west. Near Lake Onega they are overlain with Devonian sandstones and limestones, yielding marble and sandstone for building; to the south of that lake Carboniferous limestones and clays make their appearance. The whole is sheeted with boulder-clay, the bottom moraine of the great ice-sheet of the Glacial period. The entire region bears traces of glaciation, either in the shape of scratchings and elongated grooves on the rocks, or of eskers (*åsar*, *selgas*) running parallel to the glacial striations. Numberless lakes occupy the depressions, while a great many more have left evidences of their existence in the extensive marshes. Lake Onega covers 3764 sq. m., and reaches a depth of 400 ft. Lakes Zeg, Vyg, Lacha, Loksha, Tulos and Vodl cover from 140 to 480 sq. m. each, and their crustacean fauna indicates a former connexion with the Arctic Ocean. The south-eastern part of Lake Ladoga falls also within the government of Olonets. The rivers drain to the Baltic and White Sea basins. To the former system belong Lakes Ladoga and Onega, which are connected by the Svir and receive numerous streams; of these the Vytegra, which communicates with the Mariinsk canal-system, and the Oyat, an affluent of Lake Ladoga, are important for navigation. Large quantities of timber, fire-wood, stone, metal and flour are annually shipped on waters belonging to this government. The Onega river, which has its source in the south-east of the government and flows into the White Sea, is of minor importance. Sixty-three per cent of the area of Olonets is occupied by forests; those of the crown, maintained for shipbuilding purposes, extend to more than 800,000 acres. The climate is harsh and moist, the average yearly temperature at Petrozavodsk (61° 8′ N.) being 33·6° F. (12·0° in January, 57·4° in July); but the thermometer rarely falls below −30° F.

The population, which numbered 321,250 in 1881, reached 367,902 in 1897, and 401,100 (estimate) in 1906. They are principally Great Russians and Finns. The people belong mostly to the Orthodox Greek Church, or are Nonconformists. Rye and oats are the principal crops, and some flax, barley and turnips are grown, but the total cultivated area does not exceed 2½% of the whole government. The chief source of wealth is timber, next to which come fishing and hunting. Mushrooms and berries are exported to St Petersburg. There are quarries and iron-mines, saw-mills, tanneries, iron-works, distilleries and flour-mills. More than one-fifth of the entire male population leave their homes every year in search of temporary employment. Olonets is divided into seven districts, of which the chief towns are Petrozavodsk, Kargopol, Lodeinoye Pole, Olonets, Povyenets, Pudozh and Vytegra. It includes the Olonets mining district, a territory belonging to the crown, which covers 432 sq. m. and extends into the Serdobol district of Finland; the ironworks were begun by Peter the Great in 1701–1714. Olonets was colonized by Novgorod in the 11th century, and though it suffered much from Swedish invasion its towns soon became wealthy trading centres. Ivan III. annexed it to the principality of Moscow in the second half of the 16th century.

OLOPAN, Olopuen or Olopen (probably a Chinese form of the Syriac *Rabban*, *i.e.* monk: fl. A.D. 635), the first Christian missionary in China (setting aside vague stories of St Thomas, St Bartholomew, &c.), and founder of the Nestorian Church in the Far East. According to the Si-ngan-fu inscription, our sole authority, Olopan came to China from Ta T'sin (the Roman empire) in the ninth year of the emperor T'ai-Tsung (A.D. 635), bringing sacred books and images. He was received with favour; his teaching was examined and approved; his Scriptures were translated for the imperial library; and in 638 an imperial edict declared Christianity a tolerated religion. T'ai-Tsung's successor, Kao-Tsung (650–683), was still more friendly, and Olopan now became a "guardian of the empire" and "lord of the great law." After this followed (*c.* 683–744) a time of disfavour and oppression for Chinese Christians, followed by a revival dating from the arrival of a fresh missionary, Kiho, from the Roman empire.

The Si-ngan-fu inscription, which alone records these facts, was erected in 781, and rediscovered in 1625 by workmen digging in the Chang-ngan suburb of Si-ngan-fu city. It consists of 1789 Chinese characters, giving a history of the Christian mission down to 781, together with a sketch of Nestorian doctrine, the decree of T'ai-Tsung in favour of Christianity, the date of erection, and names of various persons connected with the church in China when the monument was put up. Additional notes in Syriac (Estrangelo characters) repeat the date and record the names of the reigning Nestorian patriarch, the Nestorian bishop in China, and a number of the Nestorian clergy.

See Kircher, *China Illustrata*; G. Pauthier, *De l'authenticité de l'inscription nestorienne de Si-ngan-fou* (Paris, 1857) and *L'inscription syro-chinoise de Si-ngan-fou* (Paris, 1858); Henry Yule, *Cathay, Preliminary Essay*, xcii.-xciv. clxxxi.-clxxxiii. (London, Hakluyt Soc., 1866); F. Hirth, *China and the Roman Orient*, 323, &c.; Father Henri Havret, *La stèle chrétienne de Si-ngan-fou*, two parts (text and history) published out of three (Shanghai, 1895 and 1897); Dr James Legge's edition and translation of the text, *The Nestorian Monument of Hsî-an-Fu* (London, 1888); Yule and Cordier, *Marco Polo*, ii. 27-29 (London, 1903); C. R. Beazley, *Dawn of Modern Geography*, i. 215-218.

OLORON-SAINTE-MARIE, a town of south-western France, capital of an arrondissement in the department of Basses-Pyrénées, 21 m. S.W. of Pau on a branch of the Southern railway. It lies at the confluence of the mountain torrents (locally known as *gaves*) Aspe and Ossau, which, after dividing it into three parts, unite to form the Oloron, a tributary of the Pau. The united population of the old feudal town of Sainte-Croix or Oloron proper, which is situated on an eminence between the two rivers, of Sainte-Marie on the left bank of the Aspe, and of the new quarters on the right bank of the Ossau, is 7715. Oloron has remains of old ramparts and pleasant promenades with beautiful views, and there are several old houses of the 15th, 16th and 17th centuries, one of which is occupied by the hôtel de ville. The church of Sainte-Croix, the building of most interest, belongs mainly to the 11th century; the chief feature of the exterior is the central Byzantine cupola; in the interior there is a large altar of gilded wood, constructed in the Spanish style of the 17th century. The church of Sainte-Marie, which formerly served as the cathedral of Oloron, is in the old ecclesiastical quarter of Sainte-Marie. It is a medley of various styles from the 11th to the 14th century. A square tower at the west end shelters a fine Romanesque portal. In the new quarter there is the modern church of Notre-Dame. Remains of a castle of the 14th century are also still to be seen. Oloron is the seat of a sub-prefect, and its public institutions include tribunals of first instance and of commerce, and a chamber of arts and manufactures. It is the most important commercial centre of its department after Bayonne, and carries on a thriving trade with Spain by way of the passes of Somport and Anso.

A Celtiberian and then a Gallo-Roman town, known as *Iluro*, occupied the hill on which Sainte-Croix now stands. Devastated by the Vascones in the 6th and by the Saracens in the 8th century, it was abandoned, and it was not until the 11th century that the quarter of Sainte-Marie was re-established by the bishops. In 1080 the viscount of Béarn took possession of the old town. The two quarters remained distinct till the union of Béarn with the crown at the accession of Henry IV. At the Reformation the place became a centre of Catholic reaction. In the 17th century it carried on a considerable trade with Aragon, until the Spaniards, jealous of its prosperity, pillaged the establishments of the Oloron merchants at Saragossa in 1694—a disaster from which it only slowly recovered. The bishopric was suppressed in 1790.

OLSHAUSEN, HERMANN (1796–1839), German theologian, was born at Oldeslohe in Holstein on the 21st of August 1796, and was educated at the universities of Kiel (1814) and Berlin (1816), where he was influenced by Schleiermacher and Neander. In 1820 he became *Privatdozent* and in 1821 professor extraordinarius at Berlin; in 1827 professor at Königsberg, in 1834 at Erlangen. He died on the 4th of September 1839. Olshausen's department was New Testament exegesis; his Commentary (completed and revised by Ebrard and Wiesinger) began to appear at Königsberg in 1830, and was translated into English in 4 vols. (Edinburgh, 1847–1849). He had prepared for it by his other works, *Die Ächtheit d. vier Kanon. Evangelien* (1823), *Ein Wort über tieferen Schriftsinn* (1824) and *Die biblische Schriftauslegung* (1825).

OLTENITZA (*Oltenita*), a town of Rumania, on the left bank of the river Argesh, 33 m. from its outflow into the Danube, and at a terminus of a branch railway from Bucharest. Pop. (1900) 5801. The principal trade is in grain, timber (floated down the Argesh) and fish. Lake Greca, famous for its carp, lies 10 m. E. and has an area of about 45 sq. m. Its waters reach the Danube through a network of streams, marshes and meres. Oltenitza is the ancient Constantiola, which was the seat of the first bishopric established in Dacia. In the Crimean War the Turks forced the river at this point and inflicted heavy losses on the Russians.

OLUSTEE, a village of Baker county, Florida, U.S.A., in the precinct of Olustee, about 46 m. W. by S. of Jacksonville. Pop. of the precinct (1910) 466. The village is served by the Seaboard Air Line. The battle of Olustee, or Ocean Pond (the name of a small body of water in the vicinity), one of the most sanguinary engagements of the Civil War in proportion to the numbers engaged, was fought on the 20th of February 1864, about 2 m. east of Olustee, between about 5500 Federal troops, under General Truman Seymour (1824–1891), and about 5400 Confederates, under General Joseph Finegan, the Federal forces being decisively defeated, with a loss, in killed and wounded, of about one-third of their number, including several officers. The Confederate losses, in killed and wounded, were about 940.

OLYBRIUS, Roman emperor of the West from the 11th of July to the 23rd of October 472, was a member of a noble family and a native of Rome. After the sack of the city by Genseric

(Geiseric) in 455, he fled to Constantinople, where in 464 he was made consul, and about the same time married Placidia, daughter of Valentinian III. and Eudoxia. This afforded Genseric, whose son Hunneric had married Eudocia, the elder sister of Placidia, the opportunity of claiming the empire of the West for Olybrius. In 472 Olybrius was sent to Italy by the emperor Leo to assist the emperor Anthemius against his son-in-law Ricimer, but, having entered into negotiations with the latter, was himself proclaimed emperor against his will, and on the murder of his rival ascended the throne unopposed. His reign was as uneventful as it was brief.

See Gibbon, *Decline and Fall*, ch. xxxvi.; J. B. Bury, *Later Roman Empire.*

OLYMPIA, the scene of the famous Olympic games, is on the right or north bank of the Alpheus (mod. Ruphia), about 11 m. E. of the modern Pyrgos. The course of the river is here from E. to W., and the average breadth of the valley is about ¾ m. At this point a small stream, the ancient Cladeus, flows from the north into the Alpheus. The area known as Olympia is bounded on the west by the Cladeus, on the south by the Alpheus, on the north by the low heights which shut in the Alpheus valley, and on the east by the ancient racecourses. One group of the northern heights terminates in a conical hill, about 400 ft. high, which is cut off from the rest by a deep cleft, and descends abruptly on Olympia. This hill is the famous *Cronion*, sacred to Cronus, the father of Zeus.

The natural situation of Olympia is, in one sense, of great beauty. When Lysias, in his *Olympiacus* (spoken here), calls it "the fairest spot of Greece," he was doubtless thinking also—or perhaps chiefly—of the masterpieces which art, in all its forms, had contributed to the embellishment of this national sanctuary. But even now the praise seems hardly excessive to a visitor who, looking eastward up the fertile and well-wooded valley of Olympia, sees the snow-crowned chains of Erymanthus and Cyllene rising in the distance. The valley, at once spacious and definite, is a natural precinct, and it is probable that no artificial boundaries of the Altis, or sacred grove, existed until comparatively late times.

History.—The importance of Olympia in the history of Greece is religious and political. The religious associations of the place date from the prehistoric age, when, before the states of Elis and Pisa had been founded, there was a centre of worship in this valley which is attested by early votive offerings found beneath the Heraeum and an altar near it. The earliest extant building on the site is the temple of Hera, which probably dates in its original form from about 1000 B.C. There were various traditions as to the origin of the games. According to one of them, the first race was that between Pelops and Oenomaus, who used to challenge the suitors of his daughter Hippodameia and then slay them. According to another, the festival was founded by Heracles, either the well-known hero or the Idaean Dactyl of that name. The control of the festival belonged in early times to Pisa, but Elis seems to have claimed association with it. Sixteen women, representing eight towns of Elis and eight of Pisatis, wove the festal robe for the Olympian Hera. Olympia thus became the centre of an amphictyony (*q.v.*), or federal league under religious sanction, for the west coast of the Peloponnesus, as Delphi was for its neighbours in northern Greece. It suited the interests of Sparta to join this amphictyony; and, before the regular catalogue of Olympic victors begins in 776 B.C., Sparta had formed an alliance with Elis. Aristotle saw in the temple of Hera at Olympia a bronze disk, recording the traditional laws of the festival, on which the name of Lycurgus stood next to that of Iphitus, king of Elis. Whatever may have been the age of the disk itself, the relation which it indicates is well attested. Elis and Sparta, making common cause, had no difficulty in excluding the Pisatans from their proper share in the management of the Olympian sanctuary. Pisa had, indeed, a brief moment of better fortune, when Pheidon of Argos celebrated the 28th Olympiad under the presidency of the Pisatans. This festival, from which the Eleans and Spartans were excluded, was afterwards struck out of the official register, as having no proper existence. The destruction of Pisa (before 572 B.C.) by the combined forces of Sparta and Elis put an end to the long rivalry. Not only Pisatis, but also the district of Triphylia to the south of it, became dependent on Elis. So far as the religious side of the festival was concerned, the Eleans had an unquestioned supremacy. It was at Elis, in the gymnasium, that candidates from all parts of Greece were tested, before they were admitted to the athletic competitions at Olympia. To have passed through the training (usually of ten months) at Elis was regarded as the most valuable preparation. Elean officials, who not only adjudged the prizes at Olympia, but decided who should be admitted to compete, marked the national aspect of their functions by assuming the title of *Hellanodicae.*

Long before the overthrow of Pisa the list of contests had been so enlarged as to invest the celebration with a Panhellenic character. Exercises of a Spartan type—testing endurance and strength with an especial view to war—had almost exclusively formed the earlier programme. But as early as the 25th Olympiad—*i.e.* several years before the interference of Pheidon on behalf of Pisa—the four-horse chariot-race was added. This was an invitation to wealthy competitors from every part of the Hellenic world, and was also the recognition of a popular or spectacular element, as distinct from the skill which had a merely athletic or military interest. Horse-races were added later. For such contests the *hippodrome* was set apart. Meanwhile the list of contests on the old racecourse, the *stadium*, had been enlarged. Besides the foot-race in which the course was traversed once only, there were now the *diaulos* or double course, and the "long" foot-race (*dolichos*). Wrestling and boxing were combined in the *pancration.* Leaping, quoit-throwing, javelin-throwing, running and wrestling were combined in the *pentathlon.* The festival was to acquire a new importance under the protection of the Spartans, who, having failed in their plans of actual conquest in the Peloponnese, sought to gain at least the hegemony (acknowledged predominance) of the peninsula. As the Eleans, therefore, were the religious supervisors of Olympia, so the Spartans aimed at constituting themselves its political protectors. Their military strength—greatly superior at the time to that of any other state—enabled them to do this. Spartan arms could enforce the sanction which the Olympian Zeus gave to the oaths of the amphictyones, whose federal bond was symbolized by common worship at his shrine. Spartan arms could punish any violation of that "sacred truce" which was indispensable if Hellenes from all cities were to have peaceable access to the Olympian festival. And in the eyes of all Dorians the assured dignity thus added to Olympia would be enhanced by the fact that the protectors were the Spartan Heraclidae.

Olympia entered on a new phase of brilliant and secure existence as a recognized Panhellenic institution. This phase may be considered as beginning after the establishment of Elean supremacy in 572 B.C. And so to the last Olympia always remained a central expression of the Greek ideas that the body of man has a glory as well as his intellect and spirit, that body and mind should alike be disciplined, and that it is by the harmonious discipline of both that men best honour Zeus. The significance of Olympia was larger and higher than the political fortunes of the Greeks who met there, and it survived the overthrow of Greek independence. In the Macedonian and Roman ages the temples and contests of Olympia still interpreted the ideal at which free Greece had aimed. Philip of Macedon and Nero are, as we shall see, among those whose names have a record in the Altis. Such names are typical of long series of visitors who paid homage to Olympia. According to Cedrenus, a Greek writer of the 11th century (Σύνοψις Ἱστοριῶν, i. 326), the Olympian festival ceased to be held after A.D. 393, the first year of the 293rd Olympiad. The list of Olympian victors, which begins in 776 B.C. with Coroebus of Elis, closes with the name of an Armenian, Varastad, who is said to have belonged to the race of the Arsacidae. In the 5th century the desolation of Olympia had set in. The chryselephantine statue of the Olympian Zeus, by Pheidias, was carried to Constantinople, and perished in a great fire, A.D. 476.

The Olympian temple of Zeus is said to have been dismantled, either by the Goths or by Christian zeal, in the reign of Theodosius II. (A.D. 402–450). After this the inhabitants converted the temple of Zeus and the region to the south of it into a fortress, by constructing a wall from materials found among the ancient buildings. The temple was probably thrown down by earthquakes in the 6th century A.D.

Excavations.—The German excavations were begun in 1875. After six campaigns, of which the first five lasted from September to June, they were completed on the 20th of March 1881. The result of these six years' labours was, first, to strip off a thick covering of earth from the *Altis*, the consecrated precinct of the Olympian Zeus. This covering had been formed, during some twelve centuries, partly by clay swept down from the Cronion, partly by deposit from the overflowings of the Cladeus. The coating of earth over the Altis had an average depth of no less than 16 ft.

The work could not, however, be restricted to the Altis. It was necessary to dig beyond it, especially on the west, the south and the east, where several ancient buildings existed, not included within the sacred precinct itself. The complexity of the task was further increased by the fact that in many places early Greek work had later Greek on top of it, or late Greek work had been overlaid with Roman. In a concise survey of the results obtained, it will be best to begin with the remains external to the precinct of Zeus.

I. Remains outside the Altis

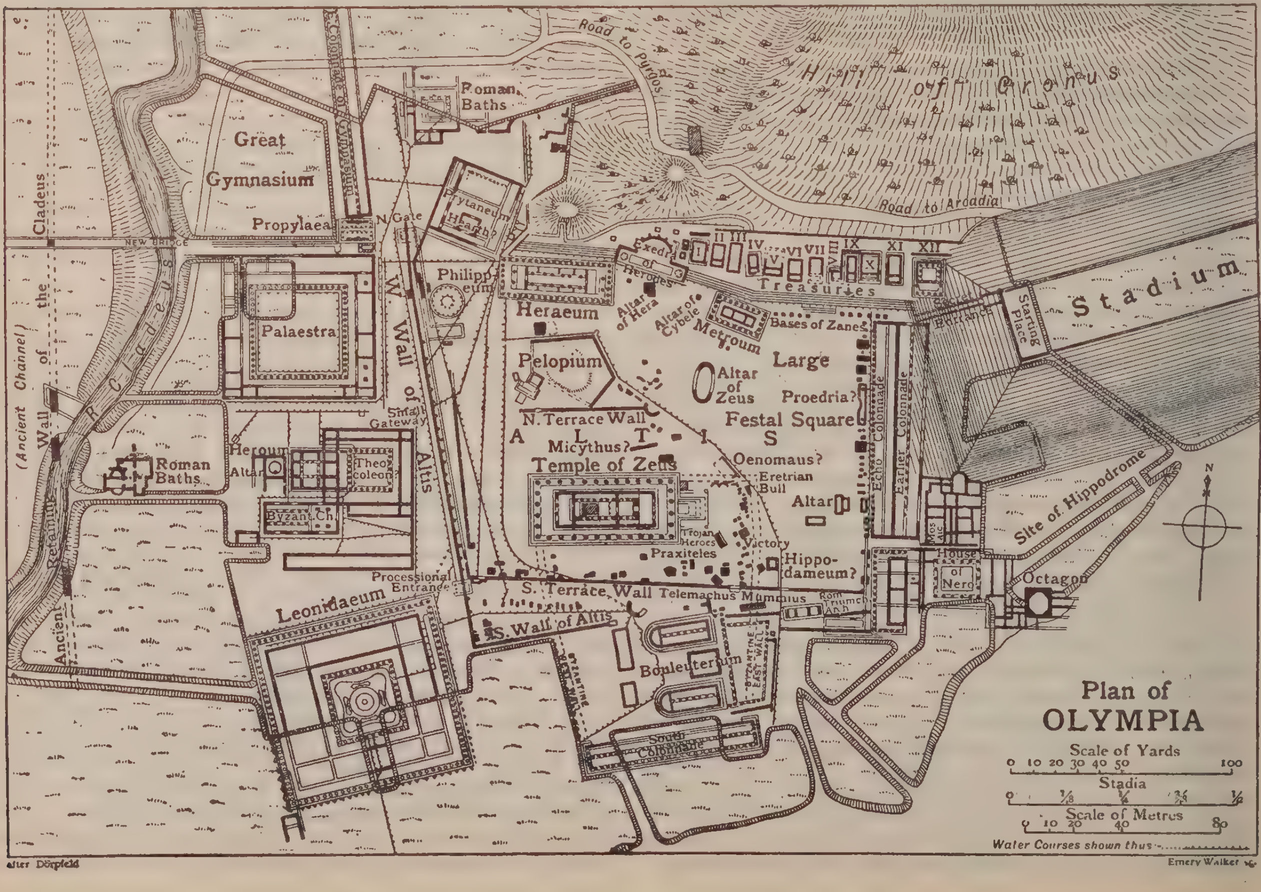
A. *West Side.*—The wall bounding the Altis on the west belongs probably to the time of Nero. In the west wall were two gates, one at its northern and the other at its southern extremity. The latter must have served as the processional entrance. Each gate was πρόστυλος, having before it on the west a colonnade consisting of a row of four columns. There is a third and smaller gate at about the middle point of the west wall, and nearly opposite the Pelopion in the Altis.

West of the west Altis wall, on the strip of ground between the Altis and the river Cladeus (of which the course is roughly parallel to the west Altis wall), the following buildings were traced. The order in which they are placed here is that in which they succeed each other from north to south.

1. Just outside the Altis at its north-west corner was a *Gymnasium.* A large open space, not regularly rectangular, was enclosed on two sides—possibly on three—by Doric colonnades. On the south it was bordered by a portico with a single row of columns in front; on the east by a double portico, more than a stadium in length (220 yds.), and serving as a racecourse for practice in bad weather. At the south-east corner of the gymnasium, in the angle between the south and the east portico, was a Corinthian doorway, which a double row of columns divided into three passages. Immediately to the east of this doorway was the gate giving access to the Altis at its north-west corner. The gymnasium was used as an exercise ground for competitors during the last month of their training.

2. Immediately adjoining the gymnasium on the south was a Palaestra, the place of exercise for wrestlers and boxers. It was in the form of a square, of which each side was about 70 yds. long, enclosing an inner building surrounded by a Doric colonnade. Facing this inner building on north, east and west were rooms of different sizes, to which doors or colonnades gave access. The chief entrances to the palaestra were at south-west and south-east, separated by a double colonnade which extended along the south side.

3. Near the palaestra on the south a Byzantine church forms the central point in a complex group of remains. (*a*) The church itself occupies the site of an older brick building, which is perhaps a remnant of the "workshop of Pheidias" seen by Pausanias. (*b*) North of the church is a square court with a well in the middle, of the Hellenic age. (*c*) West of this is a small circular structure, enclosed by square walls. An altar found (*in situ*) on the south side of the circular enclosure shows by an inscription that this was the *Heroum*, where worship of the heroes was practised down to a late period. (*d*) East of the court stood a large building, of Roman age at latest, arranged round an inner hall with colonnades. These buildings probably formed the Theocoleon, house of the priests. (*e*) There is also a long and narrow building on the south of the Byzantine church. This may have been occupied by the φαιδρύνται, those alleged "descendants of Pheidias" (Pausanias v. 14) whose hereditary privilege it was to keep the statue of Zeus clean. The so-called "workshop of Pheidias" (see *a*) evidently owed its preservation to the fact that it continued to be used for actual work,


Road to Pyrgos
Hill of Cronus
Roman Baths
Great Gymnasium
Colonnade of Gymnasium
Propylaea
N. Gate
Prytaneum
Hearth?
Cladeus
NEW BRIDGE
(Ancient Channel) of the Wall
Retaining Wall
Ancient
R. Cladeus
Palaestra
Philippeum
W. Wall of Altis
Heraeum
Exedra of Herodes
Altar of Hera
Altar of Cybele
Metroum
Bases of Zanes
I II III IV V VI VII VIII IX X XI XII
Treasuries
Road to Arcadia
Secret Entrance
Starting Place
Stadium
Pelopium
Altar of Zeus
Large Festal Square
Proedria?
Echo Colonnade
Earlier Colonnade
Small Gateway
N. Terrace Wall
A L T I S
Micythus?
Temple of Zeus
Oenomaus?
Eretrian Bull
Altar
Heroum
Altar
Theocoleon?
Roman Baths
Byzant. Ch.
Trojan Heroes
Victory
Praxiteles
Hippodameum?
Mosaic
House of Nero
Octagon
Site of Hippodrome
N
Processional Entrance
Leonidaeum
S. Terrace Wall
Telemachus
Mummius
Rom. Triumph. Arch
S. Wall of Altis
Byzantine Wall
Byzantine East Wall
Bouleuterium
South Colonnade
Plan of OLYMPIA
Scale of Yards
0 10 20 30 40 50 100
Stadia
0 1/8 1/4 3/8 1/2
Scale of Metres
0 10 20 40 80
Water Courses shown thus

after Dörpfeld

Emery Walker sc.

and the adjacent building would have been a convenient lodging for the artists.

4. South of the group described above occur the remains of a large building shown by its inscription to be the Leonidaeum, dedicated by an Elean named Leonidas in the 4th century B.C., and probably intended for the reception of distinguished visitors during the games, such as the heads of the special missions from the various Greek cities. It is an oblong, of which the north and south sides measure about 250 ft., the east and west about 230. Its orientation differs from that of all the other buildings above mentioned, being not from N. to S., but from W.S.W. to E.N.E. Externally it is an Ionic peripteros, enclosing suites of rooms, large and small, grouped round a small interior Doric peristyle. In Roman times it was altered in such a way as to distribute the rooms into (apparently) four quarters, each having an atrium with six or four columns. Traces existing within the exterior porticos on north, west and east indicate much carriage traffic.

B. *South Side.*—Although the limits of the Altis on the south (*i.e.* on the side towards the Alpheus) can be traced with approximate accuracy, the precise line of the south wall becomes doubtful after we have advanced a little more than one-third of the distance from the west to the east end of the south side. The middle and eastern portions of the south side were places at which architectural changes, large or small, were numerous down to the latest times, and where the older buildings met with scant mercy.

1. The *Council Hall* (*Bouleuterium*, Paus. v. 23) was just outside the Altis, nearly at the middle of its south wall. It comprised two separate Doric buildings of different date but identical form, viz. oblong, having a single row of columns dividing the length into two naves and terminating to the west in a semicircular apse. The orientation of each was from west-south-west to east-north-east, one being south-south-east of the other. In the space between stood a small square building. In front, on the east, was a portico extending along the front of all three buildings; and east of this again a large trapeze-shaped vestibule or fore-hall, enclosed by a colonnade. This bouleuterium would have been available on all occasions when Olympia became the scene of conference or debate between the representatives of different states—whether the subject was properly political, as concerning the amphictyonic treaties, or related more directly to the administration of the sanctuary and festival. Two smaller Hellenic buildings stood immediately west of the bouleuterium. The more northerly of the two opened on the Altis. Their purpose is uncertain.

2. Close to the bouleuterium on the south, and running parallel with it from south-west by west to north-east by east, was the *South Colonnade*, a late but handsome structure, closed on the north side, open on the south and at the east and west ends. The external colonnade (on south, east and west) was Doric; the interior row of columns Corinthian. It was used as a promenade, and as a place from which to view the festal processions as they passed towards the Altis.

3. East of the bouleuterium was a triumphal gateway of Roman age, with triple entrance, the central being the widest, opening on the Altis from the south. North of this gateway, but at a somewhat greater depth, traces of a pavement were found in the Altis.

C. *East Side.*—The line of the east wall, running due north and south, can be traced from the north-east corner of the Altis down about three-fifths of the east side, when it breaks off at the remains known as "Nero's house." These are the first which claim attention on the east side.

1. To the south-east of the Altis is a building of 4th-century date and of uncertain purpose. This was afterwards absorbed into a Roman house which projected beyond the Altis on the east, the south part of the east Altis wall being destroyed to admit of this. A piece of leaden water-pipe found in the house bears NER. AVG. Only a Roman master could have dealt thus with the Altis, and with a building which stood within its sacred precinct. It cannot be doubted that the Roman house—from which three doors gave access to the Altis—was that occupied by Nero when he visited Olympia. Later Roman hands again enlarged and altered the building, which may perhaps have been used for the reception of Roman governors.

2. Following northwards the line of the east wall, we reach at the north-east corner of the Altis the entrance to the *Stadium*, which extends east of the Altis in a direction from west-south-west to east-north-east. The apparently strange and inconvenient position of the Stadium relatively to the Altis was due simply to the necessity of obeying the conditions of the ground, here determined by the curve of the lower slopes which bound the valley on the north. The German explorers excavated the Stadium so far as was necessary for the ascertainment of all essential points. Low embankments had originally been built on west, east and south, the north boundary being formed by the natural slope of the hill. These were afterwards thickened and raised. The space thus defined was a large oblong, about 234 yds. in length by 35 in breadth. There were no artificial seats. It is computed that from 40,000 to 45,000 spectators could have found sitting-room, though it is hardly probable that such a number was ever reached. The exact length of the Stadium itself—which was primarily the course for the foot-race—was about 210 yds. or 192·27 metres—an important result, as it determines the Olympian foot to be 0·3204 metre or a little more than an English foot (1·05). In the Heraeum at Olympia, it may be remarked, the unit adopted was not this Olympian foot, but an older one of 0·297 metre, and in the temple of Zeus an Attic foot of 1·08 English foot was used. The starting-point and the goal in the Stadium were marked by limestone thresholds. Provision for drainage was made by a channel running round the enclosure. The Stadium was used not only for foot-races, but for boxing, wrestling, leaping, quoit-throwing and javelin-throwing.

The entrance to the Stadium from the north-east corner of the Altis was a privileged one, reserved for the judges of the games, the competitors and the heralds. Its form was that of a vaulted tunnel, 100 Olympian feet in length. It was probably constructed in Roman times. To the west was a vestibule, from which the Altis was entered by a handsome gateway.

3. The *Hippodrome*, in which the chariot-races and horse-races were held, can no longer be accurately traced. The overflowings of the Alpheus have washed away all certain indications of its limits. But it is clear that it extended south and south-east of the Stadium, and roughly parallel with it, though stretching far beyond it to the east. From the state of the ground the German explorers inferred that the length of the hippodrome was 770 metres or 4 Olympic stadia.

D. *North Side.*—If the northern limit of the Altis, like the west, south and east, had been traced by a boundary wall, this would have had the effect of excluding from the precinct a spot so sacred as the Cronion, "Hill of Cronus," inseparably associated with the oldest worship of Zeus at Olympia. It seems therefore unlikely that any such northern boundary wall ever existed. But the line which such a boundary would have followed is partly represented by the remains of a wall running from east to west immediately north of the treasure-houses (see below), which it was designed to protect against the descent of earth from the Cronion just above. This was the wall along which, about A.D. 157, the main water-channel constructed by Herodes Atticus was carried.

Having now surveyed the chief remains external to the sacred precinct on west, south, east and north, we proceed to notice those which have been traced within it.

II.—Remains within the Altis

The form of the Altis, as indicated by the existing traces, is not regularly rectangular. The length of the west side, where the line of direction is from south-south-east to north-north-west, is about 215 yds. The south side, running nearly due east and west, is about equally long, if measured from the end of the west wall to the point which the east wall would touch when produced due south in a straight line from the place at which it was demolished to make way for "Nero's house." The east side, measured to a point just behind the treasure-houses, is the shortest, about 200 yds. The north side is the longest. A line drawn eastward behind the treasure-houses, from the Prytaneum at the north-west angle, would give about 275 yds.

The remains or sites within the Altis may conveniently be classed in three main groups, viz.—(A) the chief centres of religious worship; (B) votive buildings; (C) buildings, &c., connected with the administration of Olympia or the reception of visitors.

A. *Chief Centres of Religious Worship.*—1. There are traces of an altar near the Heraeum which was probably older than the great altar of Zeus; this was probably the original centre of worship. The great altar of Zeus was of elliptic form, the length of the lozenge being directed from south-south-west to north-north-east, in such a manner that the axis would pass through the Cronion. The upper structure imposed on this basis was in two tiers, and also, probably, lozenge-shaped. This was the famous "ash-altar" at which the Iamidae, the hereditary gens of seers, practised those rights of divination by fire in virtue of which more especially Olympia is saluted by Pindar as "mistress of truth." The steps by which the priests mounted the altar seem to have been at north and south.

2. The *Pelopium*, to the west of the Altar of Zeus, was a small precinct in which sacrifices were offered to the hero Pelops. The traces agree with the account of Pausanias. Walls, inclined to each other at obtuse angles, enclosed a plot of ground having in the middle a low tumulus of elliptic form, about 35 metres from east to west by 20 from north to south. A Doric propylon with three doors gave access on the south-west side.

The three temples of the Altis were those of Zeus, Hera and the Mother of the gods. All were Doric. All, too, were completely surrounded by a colonnade, *i.e.* were "peripteral."

3. The *Temple of Zeus*, south of the Pelopium, stood on a high substructure with three steps. It was probably built about 470 B.C. The colonnades at the east and west side were of six columns each; those at the north and south sides (counting the corner columns again) of thirteen each. The cella had a prodomos on the east and an opisthodomos on the west. The cella itself was divided longitudinally (*i.e.* from east to west) into three partitions by a double row of columns. The central partition, which was the widest, consisted of three sections. The west section contained the throne and image of the Olympian Zeus. The middle section, next to the east, which was shut off by low screens, contained a table and stelae. Here, probably, the wreaths were presented to the victors.

The third or easternmost section was open to the public. This temple was most richly adorned with statues and reliefs. On the east front were represented in twenty-one colossal figures the moment before the contest between Oenomaus and Pelops. The west front exhibited the fight of the Lapithae and Centaurs. The statement of Pausanias that the two pediments were made by Paeonius and Alcamenes is now generally supposed to be an error. The Twelve Labours of Heracles were depicted on the metopes of the prodomos and opisthodomos; and of these reliefs much the greater part was found—enough to determine with certainty all the essential features of the composition. It was near this temple, at a point about 38 yds. E.S.E. from the south-east angle, that the explorers found the statue of a flying goddess of victory—the Nike of Paeonius.

4. The *Temple of Hera* (Heraeum), north of the Pelopium, was raised on two steps. It is probably the oldest of extant Greek temples, and may date from about 1000 B.C. It has colonnades of six columns each at east and west, and of sixteen each (counting the corner columns again) at north and south. It was smaller than the temple of Zeus, and, while resembling it in general plan, differed from it by its singular length relatively to its breadth. When Pausanias saw it, one of the two columns of the opisthodomos (at the west end of the cella) was of wood; and for a long period all the columns of this temple had probably been of the same material. A good deal of patch-work in the restoration of particular parts seems to have been done at various periods. Only the lower part of the cella wall was of stone, the rest being of unbaked brick; the entablature above the columns was of wood covered with terra-cotta. The cella—divided, like that of Zeus, into three partitions by a double row of columns—had four "tongue-walls," or small screens, projecting at right angles from its north wall, and as many from the south wall. Five niches were thus formed on the north side and five on the south. In the third niche from the east, on the north side of the cella, was found one of the greatest of all the treasures which rewarded the German explorers—the Hermes of Praxiteles (1878).

5. The *Temple of the Great Mother of the Gods* (Metroum) was again considerably smaller than the Heraeum. It stood to the east of the latter, and had a different orientation, viz. not west to east but west-north-west to east-south-east. It was raised on three steps, and had a peripteros of six columns (east and west) by eleven (north and south), having thus a slightly smaller length relatively to its breadth than either of the other two temples. Here also the cella had prodomos and opisthodomos. The adornment and painting of this temple had once been very rich and varied. It was probably built in the 4th century, and there are indications that in Roman times it underwent a restoration.

B. *Votive Edifices*.—Under this head are placed buildings erected, either by states or by individuals, as offerings to the Olympian god.

1. The twelve *Treasure-houses* on the north side of the Altis, immediately under the Cronion, belong to this class.

The same general character—that of a Doric temple *in antis*, facing south—is traceable in all the treasure-houses. In the cases of several of these the fragments are sufficient to aid a reconstruction. Two—viz. the 2nd and 3rd counting from the west—had been dismantled at an early date, and their site was traversed by a roadway winding upward towards the Cronion. This roadway seems to have been older at least than A.D. 157, since it caused a deflexion in the watercourse along the base of the Cronion constructed by Herodes Atticus. Pausanias, therefore, would not have seen treasure-houses Nos. 2 and 3. This explains the fact that, though we can trace twelve, he names only ten.

As the temples of ancient Greece partly served the purposes of banks in which precious objects could be securely deposited, so the form of a small Doric chapel was a natural one for the "treasure-house" to assume. Each of these treasure-houses was erected by a Greek state, either as a thank-offering for Olympian victories gained by its citizens, or as a general mark of homage to the Olympian Zeus. The treasure-houses were designed to contain the various ἀναθήματα or dedicated gifts (such as gold and silver plate, &c.), in which the wealth of the sanctuary partly consisted. The temple inventories recently discovered at Delos illustrate the great quantity of such possessions which were apt to accumulate at a shrine of Panhellenic celebrity. Taken in order from the west, the treasure-houses were founded by the following states: 1, Sicyon; 2, 3, unknown; 4, Syracuse (referred by Pausanias to Carthage); 5, Epidamnus; 6, Byzantium; 7, Sybaris; 8, Cyrene; 9, Selinus; 10, Metapontum; 11, Megara; 12, Gela. It is interesting to remark how this list represents the Greek colonies, from Libya to Sicily, from the Euxine to the Adriatic. Greece proper, on the other hand, is represented only by Megara and Sicyon. The dates of the foundations cannot be fixed. The architectural members of some of the treasure-houses have been found built into the Byzantine wall, or elsewhere on the site, as well as the terra-cotta plates that overlaid the stonework in some cases, and the pedimental figures, representing the battle of the gods and giants, from the treasure-house of the Megarians.

2. The *Philippeum* stood near the north-west corner of the Altis, a short space west-south-west of the Heraeum. It was dedicated by Philip of Macedon, after his victory at Chaeronea (338 B.C.). As a thank-offering for the overthrow of Greek freedom, it might seem strangely placed in the Olympian Altis. But it is, in fact, only another illustration of the manner in which Philip's position and power enabled him to place a decent disguise on the real nature of the change. Without risking any revolt of Hellenic feeling, the new "captain-general" of Greece could erect a monument of his triumph in the very heart of the Panhellenic sanctuary. The building consisted of a circular Ionic colonnade (of eighteen columns), about 15 metres in diameter, raised on three steps and enclosing a small circular cella, probably adorned with fourteen Corinthian half-columns. It contained portraits by Leochares of Philip, Alexander, and other members of their family, in gold and ivory.

3. The *Exedra of Herodes Atticus* stood at the north limit of the Altis, close to the north-east angle of the Heraeum, and immediately west of the westernmost treasure-house (that of Sicyon). It consisted of a half-dome of brick, 54 ft. in diameter, with south-south-west aspect. Under the half-dome were placed twenty-one marble statues, representing the family of Antoninus Pius, of Marcus Aurelius, and of the founder, Herodes Atticus. In front of the half-dome on the south, and extending slightly beyond it, was a basin of water for drinking, 71½ ft. long. The ends of the basin at north-north-west and south-south-east were adorned by very small open temples, each with a circular colonnade of eight pillars. A marble bull, in front of the basin, bore an inscription saying that Herodes dedicates the whole to Zeus, in the name of his wife, Annia Regilla. The exedra must have been seen by Pausanias, but he does not mention it.

C. It remains to notice those features of the Altis which were connected with the management of the sanctuary or with the accommodation of its guests.

1. Olympia, besides its religious character, originally possessed also a political character, as the centre of an amphictyony. It was, in fact, a sacred πόλις. We have seen that it had a bouleuterium for purposes of public debate or conference. So also it was needful that, like a Greek city, it should have a public hearth or prytaneum, where fire should always burn on the altar of the Olympian Hestia, and where the controllers of Olympia should exercise public hospitality. The *Prytaneum* was at the north-west corner of the Altis, in such a position that its south-east angle was close to the north-west angle of the Heraeum. It was apparently a square building, of which each side measured 100 Olympian feet, with a south-west aspect. It contained a chapel of Hestia at the front or south-west side, before which a portico was afterwards built. The dining-hall was at the back (north-east), the kitchen on the north-west side. On the same side with the kitchen, and also on the opposite side (south-east), there were some smaller rooms.

2. The *Porch of Echo*, also called the "Painted Porch," extended to a length of 100 yds. along the east Altis wall. Raised on three steps, and formed by a single Doric colonnade, open towards the Altis, it afforded a place from which spectators could conveniently view the passage of processions and the sacrifices at the great altar of Zeus. It was built in the Macedonian period to replace an earlier portico which stood farther back. In front of it was a series of pedestals for votive offerings, including two colossal Ionic columns. These columns, as the inscriptions show, once supported statues of Ptolemy and Berenice.

3. The *Agora* was the name given to that part of the Altis which had the Porch of Echo on the east, the Altar of Zeus on the west, the Metroum on the north, and the precinct of the Temple of Zeus on the south-west. In this part stood the altars of Zeus Agoraios and Artemis Agoraia.

4. The *Zanes* were bronze images of Zeus, the cost of making which was defrayed by the fines exacted from competitors who had infringed the rules of the contests at Olympia. These images stood at the northern side of the Agora, in a row, which extended from the north-east angle of the Metroum to the gate of the private entrance from the Altis into the Stadium. Sixteen pedestals were here discovered *in situ*. A lesson of loyalty was thus impressed on aspirants to renown by the last objects which met their eyes as they passed from the sacred enclosure to the scene of their trial.

5. *Arrangements for Water-supply*.—A copious supply of water was required for the service of the altars and temples, for the private dwellings of priests and officials, for the use of the gymnasium, palaestra, &c., and for the thermae which arose in Roman times. In the Hellenic age the water was derived wholly from the Cladeus and from the small lateral tributaries of its valley. A basin, to serve as a chief reservoir, was built at the north-west corner of the Altis; and a supplementary reservoir was afterwards constructed a little to the north-east of this, on the slope of the Cronion. A new source of supply was for the first time made available by Herodes Atticus, *c.* A.D. 157. At a short distance east of Olympia, near the village of Miraka, small streams flow from comparatively high ground through the side-valleys which descend towards the right or northern bank of the Alpheus. From these side-valleys water was now conducted to Olympia, entering the Altis at its north-east corner by an arched canal which passed behind the treasure-houses to the reservoir at the back of the exedra. The large basin of drinking-water in front of the exedra was fed thence, and served to associate the name of Herodes with a benefit of the highest practical value. Olympia further possessed several fountains, enclosed by round or square walls,

chiefly in connexion with the buildings outside the Altis. The drainage of the Altis followed two main lines. One, for the west part, passed from the south-west angle of the Heraeum to the south portico outside the south Altis wall. The other, which served for the treasure-houses, passed in front of the Porch of Echo parallel with the line of the east Altis wall.

See the official *Die Ausgrabungen zu Olympia* (5 vols., 1875–1881); Laloux and Monceaux, *Restauration de l'Olympie* (1889); Curtius and Adler, *Olympia die Ergebnisse der Ausgrabungen* (1890–1897), I. "Topographie und Geschichte," II. "Baudenkmäler," III. "Bildwerke in Stein und Thon" (Treu), IV. "Bronzen" (Furtwängler), V. "Inschriften" (Dittenberger and Purgold).

(R. C. J.; E. Gr.)

OLYMPIA, the capital of the state of Washington, U.S.A., and the county-seat of Thurston county, on the Des Chutes river and Budd's Inlet, at the head of Puget Sound, about 50 m. S.S.W. of Seattle. Pop. (1890) 4698; (1900) 3863, of whom 591 were foreign-born; (1910; U. S. census) 6996. It is served by the Northern Pacific and the Port Townsend Southern railways, and by steamboat lines to other ports on the Sound and along the Pacific coast. Budd's Inlet is spanned here by a wagon bridge and a railway bridge. Among the prominent buildings are the Capitol, which is constructed of native sandstone and stands in a park of considerable beauty, the county court-house, St Peter's hospital, the governor's mansion and the city hall. The state library is housed in the Capitol. At Tumwater, the oldest settlement (1845) on Puget Sound, about 2 m. S. of Olympia, are the Tumwater Falls of the Des Chutes, which provide good water power. The city's chief industry is the cutting, sawing and dressing of lumber obtained from the neighbouring forests. Olympia oysters are widely known in the Pacific coast region; they are obtained chiefly from Oyster Bay, Skookum Bay, North Bay and South Bay, all near Olympia. Olympia was laid out in 1851, became the capital of Washington in 1853, and was chartered as a city in 1859.

OLYMPIAD, in Greek chronology, a period of four years, used as a method of dating for literary purposes, but never adopted in every-day life. The four years were reckoned from one celebration of the Olympian games to another, the first Olympiad beginning with 776 B.C., the year of Coroebus, the first victor in the games after their suspension for 86 years, the last with A.D. 394, when they were finally abolished during the reign of Theodosius the Great. The system was first regularly used by the Sicilian historian Timaeus (352–256 B.C.).

OLYMPIAS, daughter of Neoptolemus, king of Epirus, wife of Philip II. of Macedon, and mother of Alexander the Great. Her father claimed descent from Pyrrhus, son of Achilles. It is said that Philip fell in love with her in Samothrace, where they were both being initiated into the mysteries (Plutarch, *Alexander*, 2). The marriage took place in 359 B.C., shortly after Philip's accession, and Alexander was born in 356. The fickleness of Philip and the jealous temper of Olympias led to a growing estrangement, which became complete when Philip married a new wife, Cleopatra, in 337. Alexander, who sided with his mother, withdrew, along with her, into Epirus, whence they both returned in the following year, after the assassination of Philip, which Olympias is said to have countenanced. During the absence of Alexander, with whom she regularly corresponded on public as well as domestic affairs, she had great influence, and by her arrogance and ambition caused such trouble to the regent Antipater that on Alexander's death (323) she found it prudent to withdraw into Epirus. Here she remained until 317, when, allying herself with Polyperchon, by whom her old enemy had been succeeded in 319, she took the field with an Epirote army; the opposing troops at once declared in her favour, and for a short period Olympias was mistress of Macedonia. Cassander, Antipater's son, hastened from Peloponnesus, and, after an obstinate siege, compelled the surrender of Pydna, where she had taken refuge. One of the terms of the capitulation had been that her life should be spared; but in spite of this she was brought to trial for the numerous and cruel executions of which she had been guilty during her short lease of power. Condemned without a hearing, she was put to death (316) by the friends of those whom she had slain, and Cassander is said to have denied her remains the rites of burial.

See Plutarch, *Alexander*, 9, 39, 68; Justin, vii. 6, ix. 7, xiv. 5, 6; Arrian, *Anab.* vii. 12; Diod. Sic. xviii. 49-65, xix. 11-51; also the articles ALEXANDER III. THE GREAT and MACEDONIAN EMPIRE.

OLYMPIODORUS, the name of several Greek authors, of whom the following are the most important. (1) An historical writer (5th century A.D.), born at Thebes in Egypt, who was sent on a mission to Attila by the emperor Honorius in 412, and later lived at the court of Theodosius. He was the author of a history (Ἱστορικοὶ Λόγοι) in 22 books of the Western Empire from 407 to 425. The original is lost, but an abstract is given by Photius, according to whom he was an alchemist (ποιητής). A MS. treatise on alchemy, reputed to be by him, is preserved in the National Library in Paris, and was printed with a translation by P. E. M. Berthelot in his *Collection des alchimistes grecs* (1887–1888). (2) A Peripatetic philosopher (5th century A.D.), an elder contemporary of Proclus. He lived at Alexandria and lectured on Aristotle with considerable success. His best-known pupil was Proclus, to whom he wished to betroth his daughter. (3) A Neoplatonist philosopher, also of Alexandria, who flourished in the 6th century of our era, during the reign of Justinian. He was, therefore, a younger contemporary of Damascius, and seems to have carried on the Platonic tradition after the closing of the Athenian School in 529, at a time when the old pagan philosophy was at its last ebb. His philosophy is in close conformity with that of Damascius, and, apart from great lucidity of expression, shows no striking features. He is, however, important as a critic and a commentator, and preserved much that was valuable in the writings of Iamblichus, Damascius and Syrianus. He made a close and intelligent study of the dialogues of Plato, and his notes, formulated and collected by his pupils (ἀπὸ φωνῆς Ὀλυμπιοδώρου τοῦ μεγάλου φιλοσόφου), are extremely valuable. In one of his commentaries he makes the interesting statement that the Platonic succession had not been interrupted by the numerous confiscations it had suffered. Zeller points out that this refers to the Alexandrian, not to the Athenian, succession; but internal evidence makes it clear that he does not draw a hard line of demarcation between the two schools. The works which have been preserved are a life of Plato, an attack on Strato and Scholia on the *Phaedo*, *Alcibiades I.*, *Philebus* and *Gorgias*. (4) An Aristotelian who wrote a commentary on the *Meteorologica* of Aristotle. He also lived at Alexandria in the 6th century, and from a reference in his work to a comet must have lived after A.D. 564. But Zeller (iii. 2, p. 582, n. 1) maintains that he is identical with the commentator on Plato (2, above) in spite of the late date of his death. His work, like that of Simplicius, endeavours to reconcile Plato and Aristotle, and refers to Proclus with reverence. The commentary was printed by the Aldine Press at Venice about 1550.

OLYMPUS, the name of many mountains in Greece and Asia Minor, and of the fabled home of the gods, and also a city name and a personal name.

I. Of the mountains bearing the name the most famous is the lofty ridge on the borders of Thessaly and Macedonia. The river Peneus, which drains Thessaly, finds its way to the sea through the great gorge of Tempe, which is close below the south-eastern end of Olympus and separates it from Mount Ossa. The highest peak of Olympus is nearly 10,000 ft. high; it is covered with snow for great part of the year. Olympus is a mountain of massive appearance, in many places rising in tremendous precipices broken by vast ravines, above which is the broad summit. The lower parts are densely wooded; the summit is naked rock. Homer calls the mountain *ἀγάννιφος, μακρός, πολυδειράς*: the epithets *νιφοείς, πολύδενδρος, frondosus* and *opacus* are used by other poets. The modern name is Ἔλυμπο, a dialectic form of the ancient word.

The peak of Mount Lycaeus in the south-west of Arcadia was called Olympus. East of Olympia, on the north bank of the Alpheus, was a hill bearing this name; beside Sellasia in Laconia another. The name was even commoner in Asia

Minor: a lofty chain in Mysia (Keshish Dagh), a ridge east of Smyrna (Nif Dagh), other mountains in Lycia, in Galatia, in Cilicia, in Cyprus, &c., were all called Olympus.

II. A lofty peak, rising high above the clouds of the lower atmosphere into the clear ether, seemed to be the chosen seat of the deity. In the *Iliad* the gods are described as dwelling on the top of the mountain; in the *Odyssey* Olympus is regarded as a more remote and less definite locality; and in later poets we find similar divergence of ideas, from a definite mountain to a vague conception of heaven. In the elaborate mythology of Greek literature Olympus was the common home of the multitude of gods. Each deity had his special haunts, but all had a residence at the court of Zeus on Olympus; here were held the assemblies and the common feasts of the gods.

III. There was a city in Lycia named Olympus; it was a bishopric in the Byzantine time.

OLYNTHUS, an ancient city of Chalcidice, situated in a fertile plain at the head of the Gulf of Torone, near the neck of the peninsula of Pallene, at some little distance from the sea, and about 60 stadia (7 or 8 m.) from Potidaea. The district had belonged to a Thracian tribe, the Bottiaeans, in whose possession the town of Olynthus remained till 479 B.C.[1] In that year the Persian general Artabazus, on his return from escorting Xerxes to the Hellespont, suspecting that a revolt from the Great King was meditated, slew the inhabitants and handed the town over to a fresh population, consisting of Greeks from the neighbouring region of Chalcidice (Herod. viii. 127). Olynthus thus became a Greek *polis*, but it remained insignificant (in the quota-lists of the Delian League it appears as paying on the average 2 talents, as compared with 9 paid by Scione, 8 by Mende, 6 by Torone) until the synoecism (συνοικισμός), effected in 432 through the influence of King Perdiccas of Macedon, as the result of which the inhabitants of a number of petty Chalcidian towns in the neighbourhood were added to its population (Thucyd. i. 58). Henceforward it ranks as the chief Hellenic city west of the Strymon. It had been enrolled as a member of the Delian League (*q.v.*) in the early days of the league, but it revolted from Athens at the time of its synoecism, and was never again reduced. It formed a base for Brasidas during his expedition (424). In the 4th century it attained to great importance in the politics of the age as the head of the Chalcidic League (τὸ κοινὸν τῶν Χαλκιδέων). The league may probably be traced back to the period of the peace of Nicias (421), when we find the Chalcidians (οἱ ἐπὶ Θρᾴκης Χαλκιδῆς) taking diplomatic action in common, and enrolled as members of the Argive alliance. There are coins of the league which can be dated with certainty as early as 405; one specimen may perhaps go back to 415–420. Unquestionably, then, the league originated before the end of the 5th century, and the motive for its formation is almost certainly to be found in the fear of Athenian attack. After the end of the Peloponnesian War the development of the league was rapid. About 390 we find it concluding an important treaty with Amyntas, king of Macedon (the father of Philip),[2] and by 382 it had absorbed most of the Greek cities west of the Strymon, and had even got possession of Pella, the chief city in Macedonia (Xenophon, *Hell.* v. 2, 12). In this year Sparta was induced by an embassy from Acanthus and Apollonia, which anticipated conquest by the league, to send an expedition against Olynthus. After three years of indecisive warfare Olynthus consented to dissolve the confederacy (379). It is clear, however, that the dissolution was little more than formal, as the Chalcidians (Χαλκιδῆς ἀπὸ Θρᾴκης) appear, only a year or two later, among the members of the Athenian naval confederacy of 378–377.[3] Twenty years later, in the reign of Philip, the power of Olynthus is asserted by Demosthenes to have been much greater than before the Spartan expedition.[4] The town itself at this period is spoken of as a city of the first rank (πόλις μυρίανδρος), and the league included thirty-two cities. When war broke out between Philip and Athens (357), Olynthus was at first in alliance with Philip. Subsequently, in alarm at the growth of his power, it concluded an alliance with Athens; but in spite of all the efforts of the latter state, and of its great orator Demosthenes, it fell before Philip, who razed it to the ground (348).

The history of the confederacy of Olynthus illustrates at once the strength and the weakness of that movement towards federation which is one of the most marked features of the later stages of Greek history. The strength of the movement is shown both by the duration and by the extent of the Chalcidic League. It lasted for something like seventy years; it survived defeat and temporary dissolution, and it embraced upwards of thirty cities. Yet, in the end, the centrifugal forces proved stronger than the centripetal; the sentiment of autonomy stronger than the sentiment of union. It is clear that Philip's victory was mainly due to the spirit of dissidence within the league itself, just as the victory of Sparta had been (cf. Diod. xvi. 53, 2 with Xen. *Hell.* v. 2, 24). The mere fact that Philip captured all the thirty-two towns without serious resistance is sufficient evidence of this. It is probable that the strength of the league was more seriously undermined by the policy of Athens than by the action of Sparta. The successes of Athens at the expense of Olynthus, shortly before Philip's accession, must have fatally divided the Greek interest north of the Aegean in the struggle with Macedon.

AUTHORITIES.—The chief passages in ancient literature are the Olynthiac Orations of Demosthenes, and Xenophon, *Hell.* v. 2. See E. A. Freeman, *History of Federal Government*, ch. iv.; A. H. J. Greenidge, *Handbook of Greek Constitutional History* (1896), p. 228; B. V. Head, *Historia Numorum*, pp. 184-186; G. Gilbert, *Griechische Staatsalterthümer*, vol. ii. pp. 197-198. The view taken by all these authorities as to the date of the formation of the Confederacy of Olynthus differs widely from that put forward above. Freeman and Greenidge suppose the league to have originated in 382, Head in 392, Hicks (*Manual of Greek Inscriptions*, No. 74) before 390. The decisive test is the numismatic one. There are coins of the league in the British Museum which are earlier than 400, and one in the possession of Professor Oman, of Oxford, which he and Mr Head are disposed to think may be as early as 415–420. (E. M. W.)

OMAGH, a market town and the county town of county Tyrone, Ireland, on the river Strule, 129¼ m. N.W. by N. from Dublin by the Londonderry line of the Great Northern railway, here joined by a branch from Enniskillen. Pop. (1901) 4789. The greater part of the town is picturesquely situated on a steep slope above the river. The milling and linen industries are carried on, and monthly fairs are held. The Protestant church has a lofty and handsome spire, and the Roman Catholic church stands well on the summit of a hill. A castle, of which there are scanty remains, was of sufficient importance to stand sieges in 1509 and 1641, being rebuilt after its total destruction in the first case. The town is governed by an urban district council.

OMAGUAS, UMANAS or CAMBEVAS (flat-heads), a tribe of South American Indians of the Amazon valley. Fabulous stories about the wealth of the Omaguas led to several early expeditions into their country, the most famous of which were those of George of Spires in 1536, of Philip von Hutten in 1541 and of Pedro de Ursúa in 1560. In 1645 Jesuits began work. In 1687 Father Fritz, "apostle of the Omaguas," established some forty mission villages. The Omaguas are still numerous and powerful around the head waters of the Japura and Uaupés.

OMAHA, the county-seat of Douglas county and the largest city in Nebraska, U.S.A., situated on the W. bank of the Missouri river, about 20 m. above the mouth of the Platte. Pop. (1880) 30,518, (1890) 66,536,[5] (1900) 102,555, of whom 23,552 (comprising 5522 Germans, 3968 Swedes, 2430 Danes, 2170 Bohemians, 2164 Irish, 1526 English, 1141 English Canadians,

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[1] If Olynthus was one of the early colonies of Chalcis (and there is numismatic evidence for this view; see Head, *Hist. Numorum*, p. 185) it must have subsequently passed into the hands of the Bottiaeans.

[2] For the inscription see Hicks, *Manual of Greek Inscriptions*, No. 74.

[3] Hicks, No. 81; *C.I.A.* ii. 17.

[4] Demosthenes, *De falsa legatione*, §§ 263-266.

[5] These are the figures given in Census Bulletin 71, *Estimates of Population, 1904, 1905, 1906* (1907), and are the arithmetical mean between the figures for 1880 and those for 1900, those of the census of 1890 being 140,452; these are substituted by the Bureau of the Census, as the 1890 census was in error. In 1910, according to the U.S. census, the population was 124,096.

997 Russians, &c.) were foreign-born and 3443 were negroes, (1906 estimate) 124,167. Originally, with Council Bluffs, Iowa, the eastern terminus of the first Pacific railway, Omaha now has outlets over nine great railway systems: the Chicago, Burlington & Quincy, the Union Pacific, the Chicago, Rock Island & Pacific, the Chicago Great-Western, the Chicago & North-Western, the Chicago, Milwaukee & St Paul, the Illinois Central, the Missouri Pacific and the Wabash. Bridges over the Missouri river connect Omaha with Council Bluffs. The original town site occupied an elongated and elevated river terrace, now given over wholly to business; behind this are hills and bluffs, over which the residential districts have extended.

Among the more important buildings are the Federal Building, Court House, a city-hall, two high schools, one of which is one of the finest in the country, a convention hall, the Auditorium and the Public Library. Omaha is the see of Roman Catholic and Protestant Episcopal bishoprics. Among the educational institutions are a state school for the deaf (1867); the medical department and orthopaedic branch of the University of Nebraska (whose other departments are at Lincoln); a Presbyterian Theological Seminary (1891); and Creighton University (Roman Catholic, under Jesuit control). This university, which was founded in honour of Edward Creighton (d. 1874) (whose brother, Count John A. Creighton, d. 1907, gave large sums in his lifetime and about $1,250,000 by his will), by his wife Mary Lucretia Creighton (d. 1876), was incorporated in 1879; it includes the Creighton Academy, Creighton College (1875), to which a Scientific Department was added in 1883, the John A. Creighton Medical College (1892), the Creighton University College of Law (1904), the Creighton University Dental College (1905) and the Creighton College of Pharmacy (1905). In 1909–1910 it had 120 instructors and 800 students. St Joseph's Hospital (Roman Catholic) was built as a memorial to John A. Creighton. The principal newspapers are the *Omaha Bee*, the *World-Herald* and the *News*. The *Omaha Bee* was established in 1871 by Edward Rosewater (1841–1906), who made it one of the most influential Republican journals in the West. The *World-Herald* (Democratic), founded in 1865 by George L. Miller, was edited by William Jennings Bryan from 1894 to 1896.

Omaha is the headquarters of the United States military department of the Missouri, and there are military posts at Fort Omaha (signal corps and station for experiments with war balloons), immediately north, and Fort Crook (infantry), 10 m. S. of the city. A carnival, the "Festival of Ak-Sar-Ben," is held in Omaha every autumn. Among the manufacturing establishments of Omaha are breweries (product value in 1905, $1,141,424) and distilleries, silver and lead smelting and refining works, railway shops, flour and grist-mills and dairies. The product-value of its manufactures in 1900 ($43,168,876) constituted 30% of the total output of the state, not including the greater product (48·7% of the total) of South Omaha (*q.v.*), where the industrial interests of Omaha are largely concentrated. The "factory" product of Omaha in 1905 was valued at $54,003,704, an increase of 41·8 % over that ($38,074,244) for 1900. The net debt of the city on the 1st of May 1909 was $5,770,000; its assessed value in 1909 (about ⅕ of cash value) was $26,749,148, and its total tax-rate was $5·73 per $1000.

In 1804 Meriwether Lewis and William Clark camped on the Omaha plateau. In 1825 a licensed Indian post was established here. In 1846 the Mormons settled at "Winter Quarters"—after 1854 called Florence (pop. in 1900, 668), and in the immediate environs (6 m. N.) of the present Omaha—and by 1847 had built up camps of some 12,000 inhabitants on the Nebraska and Iowa sides of the Missouri. Compelled to remove from the Indian reservation within which Winter Quarters lay, they founded "Kanesville" on the Iowa side (which also was called Winter Quarters by the Mormons, and after 1853 was known as Council Bluffs), gradually emigrating to Utah in the years following. Winter Quarters (Florence) was deserted in 1848, but many Mormons were still in Nebraska and Iowa, and their local influence was strong for nearly a decade afterwards. Not all had left Nebraska in 1853. Speculative land "squatters" intruded upon the Indian lands in that year, and a rush of settlers followed the opening of Nebraska Territory under the Kansas-Nebraska Bill of 1854. Omaha (named from the Omaha Indians) was platted in 1854, and was first chartered as a city in 1857. It was the provisional territorial capital in 1854–1855, and the regular capital in 1855–1867. Its charter status has often been modified. Since 1887 it has been the only city of the state governed under the general charter for metropolitan cities. Prairie freighting and Missouri river navigation were of importance before the construction of the Union Pacific railway, and the activity of the city in securing the freighting interest gave her an initial start over the other cities of the state. Council Bluffs was the legal, but Omaha the practical, eastern terminus of that great undertaking, work on which began at Omaha in December 1863. The city was already connected as early as 1863 by telegraph with Chicago, St Louis, and since 1861 with San Francisco. Lines of the present great Rock Island, Burlington and North-Western railway systems all entered the city in the years 1867–1868. Meat-packing began as early as 1871, but its first great advance followed the removal of the Union stock yards south of the city in 1884. South Omaha (*q.v.*) was rapidly built up around them. A Trans-Mississippi Exposition illustrating the progress and resources of the states west of the Mississippi was held at Omaha in 1898. It represented an investment of $2,000,000, and in spite of financial depression and wartime, 90% of their subscriptions were returned in dividends to the stockholders.

OMAHAS, a tribe of North American Indians of Siouan stock. They were found on St Peter's river, Minnesota, where they lived an agricultural life. Owing to a severe epidemic of smallpox they abandoned their village, and wandered westward to the Niobrara river in Nebraska. After a succession of treaties and removals they are now located on a reservation in eastern Nebraska, and number some 1200.

OMALIUS D'HALLOY, JEAN BAPTISTE JULIEN D' (1783–1875), Belgian geologist, was born on the 16th of February 1783 at Liége, and educated firstly in that city and afterwards in Paris. While a youth he became interested in geology, and being of independent means he was able to devote his energies to geological researches. As early as 1808 he communicated to the *Journal des mines* a paper entitled *Essai sur la géologie du Nord de la France*. He became *maire* of Skeuvre in 1807, governor of the province of Namur in 1815, and from 1848 occupied a place in the Belgian senate. He was an active member of the Belgian Academy of Sciences from 1816, and served three times as president. He was likewise president of the Geological Society of France in 1852. In Belgium and the Rhine provinces he was one of the geological pioneers in determining the stratigraphy of the Carboniferous and other rocks. He studied also in detail the Tertiary deposits of the Paris Basin, and ascertained the extent of the Cretaceous and some of the older strata, which he for the first time clearly depicted on a map (1817). He was distinguished as an ethnologist, and when nearly ninety years of age he was chosen president of the Congress of Pre-historic Archaeology (Brussels, 1872). He died on the 15th of January 1875. His chief works were: *Mémoires pour servir à la description géologique des Pays-Bas, de la France et de quelques contrées voisines* (1828); *Éléments de géologie* (1831, 3rd ed. 1839); *Abrégé de géologie* (1853, 7th ed. 1862); *Des races humaines, ou éléments d'ethnographie* (5th ed., 1869).

Obituary by J. Gosselet, *Bull. soc. géol. de France*, ser. 3, vol. vi. (1878).

OMAN, a kingdom occupying the south-eastern coast districts of Arabia, its southern limits being a little to the west of the meridian of 55° E. long., and the boundary on the north the southern borders of El Hasa. Oman and Hasa between them occupy the eastern coast districts of Arabia to the head of the Persian Gulf. The Oman-Hasa boundary has been usually drawn north of the promontory of El Katr. This is, however, incorrect. In 1870 Katr was under Wahhabi rule, but in the year 1871 Turkish assistance was requested to aid the settlement of a family quarrel between certain Wahhabi chiefs, and the Turks thus obtained a footing in Katr, which they have retained ever since. Turkish occupation (now firmly established throughout El Hasa) includes Katif (the ancient Gerrha), and El Bidia on the coast of Katr. But the pearl fisheries of Katr are still under the protection of the chiefs of Bahrein, who are themselves under British suzerainty. In 1895 the chief of Katr (Sheikh Jasim ben Thani), instigated by the Turks, attacked Sheikh Isa of Bahrein, but his fleet of dhows was destroyed by a British gunboat, and Bahrein (like Zanzibar) has since been detached from Oman and placed directly under British protection.

Oman is a mountainous district dominated by a range called Jebel Akhdar (or the Green Mountain), which is 10,000 ft. in altitude, and is flanked by minor ranges running approximately parallel to the coast, and shutting off the harbours from the interior. They enclose long lateral valleys, some of which are fertile and highly cultivated, and traversed by narrow precipitous gorges at intervals, which form the only means of access to the interior from the sea. Beyond the mountains which flank the cultivated valleys of Semail and Tyin, to the west, there stretches the great Ruba el Khali, or Dahna, the central desert of southern Arabia, which reaches across the continent to the borders of Yemen, isolating the province on the landward side just as the rugged mountain barriers shut it off from the sea. The wadis (or valleys) of Oman (like the wadis of Arabia generally) are merely torrential channels, dry for the greater part of the year. Water is obtained from wells and springs in sufficient quantity to supply an extensive system of irrigation.

The only good harbour on the coast is that of Muscat, the capital of the kingdom, which, however, is not directly connected with the interior by any mountain route. The little port of Matrah, immediately contiguous to Muscat, offers the only opportunity for penetrating into the interior by the wadi Kahza, a rough pass which is held for the sultan or imam of Muscat by the Rehbayin chief. In 1883, owing to the treachery of this chief, Muscat was besieged by a rebel army, and disaster was only averted by the guns of H.M.S. "Philomel." About 50 m. south of Muscat the port of Kuryat is again connected with the inland valleys by the wadi Hail, leading to the gorges of the wadi Thaika or "Devil's Gap." Both routes give access to the wadi Tyin, which, enclosed between the mountain of El Beideh and Hallowi (from 2000 to 3000 ft. high), is the garden of Oman. Fifty miles to the north-west of Muscat this interior region may again be reached by the transverse valley of Semail, leading into the wadi Munsab, and from thence to Tyin. This is generally reckoned the easiest line for travellers. But all routes are difficult, winding between granite and limestone rocks, and abounding in narrow defiles and rugged torrent beds. Vegetation is, however, tolerably abundant—tamarisks, oleanders, kafas, euphorbias, the milk bush, rhamnus and acacias being the most common and most characteristic forms of vegetable life, and pools of water are frequent. The rich oasis of Tyin contains many villages embosomed in palm groves and surrounded with orchards and fields.

In addition to cereals and vegetables, the cultivation of fruit is abundant throughout the valley. After the date, vines, peaches, apricots, oranges, mangoes, melons and mulberries find special favour with the Rehbayin, who exhibit all the skill and perseverance of the Arab agriculturist of Yemen, and cultivate everything that the soil is capable of producing.

The sultan, a descendant of those Yemenite imams who consolidated Arab power in Zanzibar and on the East African coast, and raised Oman to its position as the most powerful state in Arabia during the first half of the 19th century, resides at Muscat, where his palace directly faces the harbour, not far from the British residency. The little port of Gwadar, on the Makran coast of the Arabian Sea, a station of the Persian Gulf telegraph system, is still a dependency of Oman.

See Colonel Miles, *Geographical Journal*, vol. vii. (1896); Commander Stiffe, *Geographical Journal* (1899). (T. H. H.*)

OMAR (*c.* 581–644), in full ‘Omar ibn al-Khaṭṭab, the second of the Mahommedan caliphs (see Caliphate, A, §§ 1 and 2). Originally opposed to Mahomet, he became later one of the ablest advisers both of him and of the first caliph, Abu Bekr. His own reign (634–644) saw Islam's transformation from a religious sect to an imperial power. The chief events were the defeat of the Persians at Kadisiya (637) and the conquest of Syria and Palestine. The conquest of Egypt followed (see Egypt and Amr ibn el-Ass) and the final rout of the Persians at Nehāwend (641) brought Iran under Arab rule. Omar was assassinated by a Persian slave in 644, and though he lingered several days after the attack, he appointed no successor, but only a body of six Muhajirun who should select a new caliph. Omar was a wise and far-sighted ruler and rendered great service to Islam. He is said to have built the so-called "Mosque of Omar" ("the Dome of the Rock") in Jerusalem, which contains the rock regarded by Mahommedans as the scene of Mahomet's ascent to heaven, and by the Jews as that of the proposed sacrifice of Isaac.

‘OMAR KHAYYĀM [in full, Ghiyāthuddīn Abulfath ‘Omar bin Ibrāhīm al-Khayyāmī], the great Persian mathematician, astronomer, freethinker and epigrammatist, who derived the epithet Khayyām (the tentmaker) most likely from his father's trade, was born in or near Nīshāpūr, where he is said to have died in A.H. 517 (A.D. 1123). At an early age he entered into a close friendship both with Nizām-ul-mulk and his schoolfellow Ḥassan ibn Ṣabbāḥ, who founded afterwards the terrible sect of the Assassins. When Nizām-ul-mulk was raised to the rank of vizier by the Seljūk sultan Alp-Arslan (A.D. 1063–1073) he bestowed upon Ḥassan ibn Ṣabbāḥ the dignity of a chamberlain, whilst offering a similar court office to ‘Omar Khayyām. But the latter contented himself with an annual stipend which would enable him to devote all his time to his favourite studies of mathematics and astronomy. His standard work on algebra, written in Arabic, and other treatises of a similar character raised him at once to the foremost rank among the mathematicians of that age, and induced Sultān Malik-Shāh to summon him in A.H. 467 (A.D. 1074) to institute astronomical observations on a larger scale, and to aid him in his great enterprise of a thorough reform of the calendar. The results of ‘Omar's research were—a revised edition of the *Zīj* or astronomical tables, and the introduction of the Ta'rīkh-i-Malikshāhī or Jalālī, that is, the so-called Jalālian or Seljūk era, which commences in A.H. 471 (A.D. 1079, 15th March).

‘Omar's great scientific fame, however, is nearly eclipsed by his still greater poetical renown, which he owes to his *rubā‘īs* or quatrains, a collection of about 500 epigrams. The peculiar form of the *rubā‘ī*—viz. four lines, the first, second and fourth of which have the same rhyme, while the third usually (but not always) remains rhymeless—was first successfully introduced into Persian literature as the exclusive vehicle for subtle thoughts on the various topics of Sūfic mysticism by the sheikh Abū Sa‘īd bin Abulkhair,[1] but ‘Omar differs in its treatment considerably from Abū Sa‘īd. Although some of his quatrains are purely mystic and pantheistic, most of them bear quite another stamp; they are the breviary of a radical freethinker, who protests in the most forcible manner both against the narrowness, bigotry and uncompromising austerity of the orthodox ulemā and the eccentricity, hypocrisy and wild ravings of advanced Sūfīs, whom he successfully combats with their own weapons, using the whole mystic terminology simply to ridicule mysticism itself. There is in this respect a great resemblance between him and Hāfiz, but ‘Omar is decidedly superior. He has often been called the Voltaire of the East, and cried down as materialist and atheist. As far as purity of diction, fine wit, crushing satire against a debased and ignorant clergy, and a general sympathy with suffering humanity are concerned, ‘Omar certainly reminds us of the great Frenchman; but there the comparison ceases. Voltaire never wrote anything equal to ‘Omar's fascinating rhapsodies in praise of wine, love and all earthly joys, and his passionate denunciations of a malevolent and inexorable fate which dooms to slow decay or sudden death and to eternal oblivion all that is great, good and beautiful in this world. There is a touch of Byron, Swinburne and even of Schopenhauer in many of his *rubāʿīs*, which clearly proves that the modern pessimist is by no means a novel creature in the realm of philosophic thought and poetical imagination.

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[1] Died Jan. 1049. Comp. Ethé's edition of his rubā'īs in *Sitzungsberichte der bayr. Akademie* (1875), pp. 145 seq., and (1878) pp. 38 seq.: and E. G. Browne's *Literary Hist. of Persia*, ii. 261.

The Leiden copy of ʿOmar Khayyām's work on algebra was noticed as far back as 1742 by Gerald Meerman in the preface to his *Specimen calculi fluxionalis*; further notices of the same work by Sédillot appeared in the *Nouv. Jour. As.* (1834) and in vol. xiii. of the *Notices et extraits des MSS. de la Bibl. roy.* The complete text, together with a French translation (on the basis of the Leiden and Paris copies, the latter first discovered by M. Libri, see his *Histoire des sciences mathématiques en Italie*, i. 300), was edited by F. Woepcke, *L'Algèbre d'Omar Alkhayyāmi* (Paris, 1851). Articles on ʿOmar's life and works are found in Reinaud's *Géographie d'Aboulféda*, pref., p. 101; *Notices et extraits*, ix. 143 seq.; Garcin de Tassy, *Note sur les Rubāʿiyāt de ʿOmar Hhaïyām* (Paris, 1857); Rieu, *Cat. Pers. MSS. in the Br. Mus.*, ii. 546; A. Christensen, *Recherches sur les Rubāʿiyāt de ʿOmar Ḥayyām* (Heidelberg, 1905); V. Zhukovski's *ʿUmar Khayyām and the "Wandering" Quatrains*, translated from the Russian by E. D. Ross in the *Journal of the Royal Asiatic Society*, xxx. (1898); E. G. Browne, *Literary History of Persia*, ii. 246. The quatrains have been edited at Calcutta (1836) and Teheran (1857 and 1862); text and French translation by J. B. Nicolas (Paris, 1867) (very incorrect and misleading); a portion of the same, rendered in English verse, by E. FitzGerald (London, 1859, 1872 and 1879). FitzGerald's translation has been edited with commentary by H. M. Batson (1900), and the 2nd ed. of the same (1868) by E. Heron Allen (1908). A new English version was published in Trübner's "Oriental" series (1882) by E. H. Whinfield, and the first critical edition of the text, with translation, by the same (1883). Important later works are N. H. Dole's variorum edition (1896), J. Payne's translation (1898), E. Heron Allen's edition (1898) and the Life by J. K. M. Shirazi (1905); but the literature in new translations and imitations has recently multiplied exceedingly. (H. E.; X.)

OMBRE, a card game, very fashionable at the end of the 18th century, but now practically obsolete. The following recommendation of the game is taken from the *Court Gamester*, a book published in 1720 for the use of the daughters of the prince of Wales, afterwards George II:—

> "The game of Ombre owes its invention to the Spaniards, and it has in it a great deal of the gravity peculiar to that nation. It is called *Ombre*, or *The Man*. It was so named as requiring thought and reflection, which are qualities peculiar to many or rather alluding to *him* who undertakes to play the game against the rest of the gamesters, and is called *the man*. To play it well requires a great deal of application, and let a man be ever so expert, he will be apt to fall into mistakes if he think of anything else or is disturbed by the conversation of them that look on. . . . It will be found the most delightful and entertaining of all games to those who have anything in them of what we call the spirit of play."

Ombre is played by three players with a pack of 40 cards, the 8, 9 and 10 being dispensed with. The order of value of the hands is irregular, being different for trumps and suits not trumps. In a suit not trumps the order is, for red suits: K, Q, Kn, ace, 2, 3, 4, 5, 6, 7; for black suits: K, Q, Kn, 7, 6, 5, 4, 3, 2. In trump suits the ace of spades, called *spadille*, is always a trump, and the highest one, whichever of the four suits may be trumps. The order for red suit trumps is; ace of spades 7 (called *manille*), ace of clubs (called *basto*), ace (called *ponto*), K, Q, Kn, 2, 3, 4, 5, 6. For black suit trumps: ace of spades (*spadille*), 2 (*manille*), ace (*basto*), K, Q, Kn, 7, 6, 5, 4, 3. There is no ponto in black trumps. The three highest trumps are called *matadores* (or *mats*). The holder of them has the privilege of not following suit, except when a higher mat is played, which forces a lower one if the hand contains no other trump.

Cards are dealt round, and the receiver of the first black ace is the dealer. He deals (towards his right) nine cards, by threes, to each player. The remaining 13 cards form the stock or *talon*, as at piquet. Each deal constitutes a game. One hand plays against the other two, the solo player being called the *Ombre*. The player at the dealer's right has the first option of being Ombre, which entails two privileges: that of naming the trump suit, and that of throwing away as many of his cards as he chooses, receiving new ones in their place, as at poker. If, with these advantages in mind, he thinks he can win against the other two hands, he says, "I ask leave," or "I play." But in this case his right-hand neighbour has the privilege of claiming Ombre for himself, providing he is willing to play his hand without drawing new cards, or, as the phrase goes, *sans prendre*. If, however, the other player reconsiders and decides that he will himself play without drawing cards, he can still remain Ombre. If the second player passes, the dealer in his turn may ask to play *sans prendre*, as above. If all three pass a new deal ensues. After the Ombre discards (if he does not play *sans prendre*) the two others in turn do likewise, and, if any cards are left in the stock, the last discarder may look at them (as at piquet) and the others after him. But if he does not look at them the others lose the privilege of doing so.

The manner of play is like whist, except that it is towards the right. The second and third players combine to defeat Ombre. If in the sequel Ombre makes more tricks than either of his opponents he wins. If one of his opponents makes more than Ombre the latter loses (called *codille*). If Ombre and one or both of his opponents make the same number of tricks the game is drawn. When Ombre makes all nine tricks he wins a *vole*. The game is played with counters having certain values, the pool being emptied by the winner. If all pass, a counter of low value is paid into the pool by each player. If Ombre wins he takes the entire pool. If he draws he forfeits to the pool a sum equal to that already in it, *i.e.* the pool is doubled. If either of his opponents makes the majority of the tricks (*codille*), Ombre pays him a sum equal to that in the pool, which itself remains untouched until the next game. When the pool is emptied each player pays in three counters.

OMDURMAN, a town of the Anglo-Egyptian Sudan, on the west bank of the Nile, immediately north of the junction of the White and Blue Niles in 15° 38′ N., 32° 29′ E., 2 m. N. by W. of Khartum. Pop. (1909 census) 42,779, of whom 541 were Europeans. The town covers a large area, being over 5 m. long and 2 broad. It consists for the most part of mud huts, but there are some houses built of sun-dried bricks. Save for two or three wide streets which traverse it from end to end the town is a network of narrow lanes. In the centre facing an open space are the ruins of the tomb of the Mahdi and behind is the house in which he lived. The Khalifa's house (a two-storeyed building), the mosque, the Beit el Amana (arsenal) and other houses famed in the history of the town also face the central square. A high wall runs behind these buildings parallel with the Nile. Omdurman is the headquarters of the native traders in the Anglo-Egyptian Sudan, the chief articles of commerce being ivory, ostrich feathers and gum arabic from Darfur and Kordofan. There is also an important camel and cattle market. Nearly every tribe in the Sudan is represented in the population of the city. Among the native artificers the metal workers and leather dressers are noted. The government maintains elementary and technical schools. Mission work is undertaken by various Protestant and Roman Catholic societies.

Omdurman, then an insignificant village, was chosen in 1884 by the Mahdi Mahommed Ahmed as his capital and so continued after the fall of Khartum in January 1885. Its growth was rapid, the Khalifa (who succeeded the Mahdi) compelling large numbers of disaffected tribesmen to live in the town under the eye of his soldiery. Here also were imprisoned the European captives of the Mahdists—notably Slatin Pasha and Father Ohrwalder. On the 2nd of September 1898 the Anglo-Egyptian army under Lord Kitchener totally defeated the forces of the Khalifa at Kerreri, 7 m. N. of the town. A marble obelisk marks the spot where the 21st Lancers made a charge. Within the enclosure of the Khalifa's house is the tomb of Hubert Howard, son of the 9th earl of Carlisle, who was killed in the house at the capture of the city by a splinter of a shell fired at the Mahdi's tomb. (See SUDAN: *Anglo-Egyptian*.)

OMELETTE, sometimes Anglicized as "omelet," a French word of which the history is an example of the curious changes a word may undergo. The ultimate origin is Lat. *lamella*, diminutive of *lamina*, plate; this became in French *lamelle*, and a wrong division of *la lamelle* gave *alamelle*, *alemelle*, or *alumelle*; thence *alemette*, metathesized to *amelette* and *aumelete*, the form in which the word appears in the 15th and 16th centuries. The original meaning seems to be a pancake of a thin flat shape. Omelettes are made with eggs, beaten up lightly, with the addition of milk, flour, herbs, cheese, mushrooms, &c., according to the requirement, and cooked quickly in a buttered pan.

OMEN (a Latin word, either connected with *os*, mouth, or more probably with *auris* (Gr. οὖς, ear; apparently, meaning "a thing heard" or "spoken"), a sign in divination, favourable or unfavourable as the case may be (see DIVINATION, AUGURS and ORACLE). The taking of omens may be said to be a part of all systems of divination, in which the future is predicted by means of indications of one sort or another; and tradition has thus gathered round many subjects—events, actions, colours, numbers, &c.—which are considered "ominous," an adjective which generally connotes ill-fortune.

One of the oldest and most widespread methods of divining the future, both among primitive people and among several of the civilizations of antiquity, was the reading of omens in the signs noted on the liver of the animal offered as a sacrifice to some deity. The custom is vouched for by travellers as still observed in Borneo, Burma, Uganda and elsewhere, the animal chosen being a pig or a fowl. It constituted the most common form of divination in ancient Babylonia, where it can be traced back to the 3rd millennium B.C. Among the Etruscans the prominence of the rite led to the liver being looked upon as the trade-mark of the priest. From the Etruscans it made its way to the Romans, though as we shall see it was also modified by them. The evidence for the rite among the Greeks is sufficient to warrant the conclusion of its introduction at a very early period and its persistence to a late day.

The theory upon which the rite everywhere rests is clearly the belief, for which there is an abundance of concurrent testimony, that the liver was at one time regarded as the seat of vitality. This belief appears to be of a more primitive character than the view which places the seat of life in the heart, though we are accustomed to think that the latter was the prevailing view in antiquity. The fact, however, appears to be that the prominence given to the heart in popular beliefs dates from the time when in the course of the development of anatomical knowledge the important function of the heart in animal life came to be recognized, whereas the supposition that the liver is the seat of vitality rests upon other factors than anatomical knowledge, and, being independent of such knowledge, also antedates it. Among the reasons which led people to identify the liver with the very source of life, and hence as the seat of *all* affections and emotions, including what to us are intellectual functions, we may name the bloody appearance of that organ. Filled with blood, it was natural to regard it as the seat of the blood, and as a matter of fact one-sixth of the entire blood of man is in the liver, while in the case of some animals the proportion is even larger. Now blood was everywhere in antiquity associated with life, and the biblical passage, Genesis ix. 3, which identifies the blood with the soul of the animal and therefore prohibits its use fairly represents the current conception both among primitive peoples as well as among those who had advanced along the road of culture and civilization. The liver being regarded as the seat of the blood, it was a natural and short step to identify the liver with the soul as well as with the seat of life, and therefore as the centre of all manifestations of vitality and activity. In this stage of belief, therefore, the liver is the seat of all emotions and affections, as well as of intellectual functions, and it is only when with advancing anatomical knowledge the functions of the heart and then of the brain come to be recognized that a differentiation of functions takes place which had its outcome in the assignment of intellectual activity to the brain or head, of the higher emotions and affections (as love and courage) to the heart, while the liver was degraded to the rank of being regarded as the seat of the lower emotions and affections, such as jealousy, moroseness and the like.

Hepatoscopy, or divination through the liver, belongs therefore to the primitive period when that organ summed up *all* vitality and was regarded as the seat of *all* the emotions and affections—the higher as well as the lower—and also as the seat of intellectual functions. The question, however, still remains to be answered how people came to the belief or to the assumption that through the soul, or the seat of life of the sacrificial animal, the intention of the gods could be divined. There are two theories that may be put forward. The one is that the animal sacrificed was looked upon as a deity, and that, therefore, the liver represented the soul of the god; the other theory is that the deity in accepting the sacrifice identified himself with the animal, and that, therefore, the liver as the soul of the animal was the counterpart of the soul of the god. It is true that the killing of the god plays a prominent part in primitive cults, as has been shown more particularly through the valuable researches of J. G. Frazer (*The Golden Bough*). On the other hand, serious difficulties arise if we assume that every animal sacrificed represents a deity; and even assuming that such a belief underlies the rite of animal sacrifice, a modification of the belief must have been introduced when such sacrifices became a common rite resorted to on every occasion when a deity was to be approached. It is manifestly impossible to assume, *e.g.* that the daily sacrifices which form a feature of advanced cults involved the belief of the daily slaughter of some deity, and even before this stage was reached the primitive belief of the actual identification of the god with the animal must have yielded to some such belief as that the deity in accepting the sacrifice assimilates the animal to his own being, precisely as man assimilates the food that enters into his body. The animal is in a certain sense, indeed, the food of the god.

The theory underlying hepatoscopy therefore consists of these two factors: the belief (1) that the liver is the seat of life, or, to put it more succinctly, what was currently regarded as the soul of the animal; and (2) that the liver of the sacrificial animal, by virtue of its acceptance on the part of the god, took on the same character as the soul of the god to whom it was offered. The two souls acted in accord, the soul of the animal becoming a reflection, as it were, of the soul of the god. If, therefore, one understood the signs noted on a particular liver, one entered, as it were, into the mind—as one of the manifestations of soul-life—of the deity who had assimilated the being of the animal to his own being. To know the mind of the god was equivalent to knowing what the god in question proposed to do. Hence, when one approached a deity with an inquiry as to the outcome of some undertaking, the reading of the signs on the liver afforded a direct means of determining the course of future events, which was, according to current beliefs, in the control of the gods. That there are defects in the logical process as here outlined to account for the curious rite constitutes no valid objection to the theory advanced, for, in the first place, primitive logic in matters of belief is inherently defective and even contradictory, and, secondly, the strong desire to pierce the mysterious future, forming an impelling factor in all religions—even in the most advanced of our own day—would tend to obscure the weakness of any theory developed to explain a rite which represents merely one endeavour among many to divine the intention and plans of the gods, upon the knowledge of which so much of man's happiness and welfare depended.

Passing now to typical examples, the beginning must be made with Babylonia, which is also the richest source of our knowledge of the details of the rite. Hepatoscopy in the Euphrates valley can be traced back to the 3rd millennium before our era, which may be taken as sufficient evidence for its survival from the period of primitive culture, while the supreme importance attached to signs read on the livers of sacrificial animals—usually a sheep—follows from the care with which omens derived from such inspection on occasions of historical significance were preserved as guides to later generations of priests. Thus we have a collection of the signs noted during the career of Sargon I. of Agade (*c.* 2800 B.C.), which in some way were handed down till the days of the Assyrian king Assur-bani-pal (668–626 B.C.). One of the chief names for the priest was *bārū*—literally the "inspector"—which was given to him because of the prominence of his function as an inspector of livers for the purpose of divining the intention of the gods. It is to the collections formed by these *bārū*-priests as a guidance for themselves and as a basis of instruction for those in training for the priesthood that we owe our knowledge of the parts of the liver to which particular attention was directed, of the signs noted, and of the principles guiding the interpretation of the signs.

The inspection of the liver for purposes of divination led to the study of the anatomy of the liver, and there are indeed good reasons for believing that hepatoscopy represents the starting-point for the study of animal anatomy in general. We find in the Babylonian-Assyrian omen-texts special designations for the three main lobes of the sheep's liver—the *lobus dexter*, the *lobus sinister* and the *lobus caudatus*; the first-named being called "the right wing of the liver," the second "the left wing of the liver," and the third "the middle of the liver." Whether the division of the *lobus dexter* into two divisions—(1) *lobus dexter* proper and (2) *lobus quadratus*, as in modern anatomical nomenclature—was also assumed in Babylonian hepatoscopy, is not certain, but the groove separating the right lobe into two sections—the *fossa venae umbilicalis*—was recognized and distinguished by the designation of "river of the liver." The two appendixes attached to the upper lobe or *lobus pyramidalis*, and known in modern nomenclature as *processus pyramidalis* and *processus papillaris*, were described respectively as the "finger" of the liver and as the "offshoot." The former of these two appendixes plays an especially important part in hepatoscopy, and, according to its shape and peculiarities, furnishes a good or bad omen. The gall-bladder, appropriately designated as "the bitter," was regarded as a part of the liver, and the cystic duct (compared, apparently, to a "penis") to which it is joined, as well as the hepatic duct (pictured as an "outlet") and the *ductus choleductus* (described as a "yoke"), all had their special designations. The depression separating the two lower lobes from the *lobus caudatus*, and known as the *porta hepatis*, was appropriately designated as the "crucible" of the liver. Lastly, to pass over unnecessary details, the markings of various kinds to be observed on the lobes of the livers of freshly-slaughtered animals, which are due mainly to the traces left by the subsidiary hepatic ducts and hepatic veins on the liver surface, were described as "holes," "paths," "clubs" and the like. The constantly varying character of these markings, no two livers being alike in this respect, furnished a particularly large field for the fancy of the *bārū*-priest.

In the interpretation of these signs the two chief factors were association of ideas and association of words. If, for example, the *processus pyramidalis* was abnormally small and the *processus papillaris* abnormally large, it pointed to a reversion of the natural order, to wit, that the servant should control the master or that the son would be above the father. A long cystic duct would point to a long reign of the king. If the gall-bladder was swollen, it pointed to an extension or enlargement of some kind. If the *porta hepatis* was torn it prognosticated a plundering of the enemy's land. As among most people, a sign on the right side was favourable, but the same sign on the left side unfavourable. If, for example, the *porta hepatis* was long on the right side and short on the left side, it was a good sign for the king's army, but if short on the right side and long on the left, it was unfavourable; and similarly for a whole series of phenomena connected with any one of the various subdivisions of the liver. Past experience constituted another important factor in establishing the interpretation of signs noted. If, for example, on a certain occasion when the liver of a sacrificial animal was examined, certain events of a favourable character followed, the conclusion was drawn that the signs observed were favourable, and hence the recurrence of these signs on another occasion suggested a favourable answer to the question put to the priests. With this in view, omens given in the reigns of prominent rulers were preserved with special care as guides to the priests.

In the course of time the collections of signs and their interpretation made by the *bārū*-priests grew in number until elaborate series were produced in which the endeavour was made to exhaust so far as possible all the varieties and modifications of the many signs, so as to furnish a complete handbook both for purposes of instruction and as a basis for the practical work of divination. Divination through the liver remained in force among the Assyrians and Babylonians down to the end of the Babylonian Empire.

Among the Greeks and Romans likewise it was the liver that continued throughout all periods to play the chief rôle in divination through the sacrificial animal. Blecher (*De Extispicio Capita Tria*, Giessen, 1905, pp. 3-22) has recently collected most of the references in Greek and Latin authors to animal divination, and an examination of these shows conclusively that, although the general term used for the inspection of the sacrificial animal was *iera* or *iereia* (*i.e.* "victims" or "sacred parts") in Greek, and *exta* in Latin, when *specific* illustrations are introduced, the reference is almost invariably to some sign or signs on the liver; and we have an interesting statement in Pliny (*Hist. Nat.* xi. § 186), furnishing the date (274 B.C.) when the examination of the heart was for the first time introduced by the side of the liver as a means of divining the future, while the lungs are not mentioned till we reach the days of Cicero (*de Divinatione*, i. 85). We are justified in concluding, therefore, that among the Greeks and Romans likewise the examination of the liver was the basis of divination in the case of the sacrificial animal. It is well known that the Romans borrowed their methods of hepatoscopy from the Etruscans, and, apart from the direct evidence for this in Latin writings, we have, in the case of the bronze model of a liver found near Piacenza in 1877, and of Etruscan origin, the unmistakable proof that among the Etruscans the examination of the liver was the basis of animal divination. Besides this object dating from about the 3rd century B.C., according to the latest investigator, G. Körte ("Die Bronzeleber von Piacenza," in *Mitt. d. K. D. Archaeol. Instituts*, 1905, xx. pp. 348-379), there are other Etruscan monuments, *e.g.* the figure of an Etruscan augur holding a liver in his hand as his trade-mark (Körte, *ib.* pl. xiv.), which point in the same direction, and indicate that the model of the liver was used as an object lesson to illustrate the method of divination through the liver. For further details the reader is referred to Thulin's monograph, *Die Etruskische Disciplin, II Die Haruspicin* (Gothenburg, 1906).

As for the Greeks, it is still an open question whether they perfected their method of hepatoscopy under Etruscan influence or through the Babylonians. In any case, since the Eastern origin of the Etruscans is now generally admitted, we may temporarily, at least, accept the conclusion that hepatoscopy as a method of divination owes its survival in advanced forms of culture to the elaborate system devised in the course of centuries by the Babylonian priests, and to the influence, direct and indirect, exerted by this system in the ancient world. But for this system hepatoscopy, the theoretic basis of which as above set forth falls within the sphere of ideas that belong to primitive culture, would have passed away as higher stages of civilization were reached; and as a matter of fact it plays no part in the Egyptian culture or in the civilization of India, while among the Hebrews only faint traces of the primitive idea of the liver as the seat of the soul are to be met with in the Old Testament, among which an allusion in the indirect form of a protest against the use of the sacrificial animal for purposes of divination in the ordinance (Exodus xxix. 13, 22; Leviticus iii. 4, 10, 15, &c.) to burn the *processus pyramidalis* of the liver, which played a particularly significant rôle in hepatoscopy, calls for special mention.

In modern times hepatoscopy still survives among primitive peoples in Borneo, Burma, Uganda, &c.

It but remains to call attention to the fact that the earlier view of the liver as the seat of the soul gave way among many ancient nations to the theory which, reflecting the growth of anatomical knowledge, assigned that function to the heart, while, with the further change which led to placing the seat of soul-life in the brain, an attempt was made to partition the various functions of manifestations of personality among the three organs, brain, heart and liver, the intellectual activity being assigned to the first-named; the higher emotions, as love and courage, to the second; while the liver, once the master of the entire domain of soul-life as understood in antiquity, was degraded to serve as the seat of the lower emotions, such as jealousy, anger and the like. This is substantially the view set forth in the *Timaeus* of Plato (§ 71 c). The addition of the heart to the liver as an organ of the revelation of the divine will, reflects the stage which assigned to the heart the position once occupied by the liver. By the time the third stage, which placed the seat of soul-life in the brain, was reached through the further advance of anatomical knowledge, the religious rites of Greece and Rome were too deeply incrusted to admit of further radical changes, and faith in the gods had already declined too far to bring new elements into the religion. In phrenology, however, as popularly carried on as an *unofficial* cult, we may recognize a modified form of divination, co-ordinate with the third stage in the development of beliefs regarding the seat of soul and based on the assumption that this organ is—as were its predecessors—a medium of revelation of otherwise hidden knowledge. (M. JA.)

OMICHUND (d. 1767), an Indian whose name is indelibly associated with the treaty negotiated by Clive before the battle of Plassey in 1757. His real name was Amir Chand; and he was not a Bengali, as stated by Macaulay, but a Sikh from the Punjab. It is impossible now to unravel the intrigues in which he may have engaged, but some facts about his career can be stated. He had long been resident at Calcutta, where he had acquired a large fortune by providing the "investment" for the Company, and also by acting as intermediary between the English and the native court at Murshidabad. In a letter of Mr Watts of later date he is represented as saying to the nawab (Suraj-ud-daula): "He had lived under the English protection these forty years; that he never knew them once to break their agreement, to the truth of which he took his oath by touching a Brahman's foot; and that if a lie could be proved in England upon any one, they were spit upon and never trusted." Several houses owned by him in Calcutta are mentioned in connexion with the fighting that preceded the tragedy of the Black Hole in 1756, and it is on record that he suffered heavy losses at that time. He had been arrested by the English on suspicion of treachery, but afterwards he was forward in giving help to the fugitives and also valuable advice. On the recapture of Calcutta he was sent by Clive to accompany Mr Watts as agent at Murshidabad. It seems to have been through his influence that the nawab gave reluctant consent to Clive's attack on Chandernagore. Later, when the treaty with Mir Jafar was being negotiated, he put in a claim for 5% on all the treasure to be recovered, under threat of disclosing the plot. To defeat him, two copies of the treaty were drawn up: the one, the true treaty, omitting his claim; the other containing it, to be shown to him, which Admiral Watson refused to sign, but Clive directed the admiral's signature to be appended. When the truth was revealed to Omichund after Plassey, Macaulay states (following Orme) that he sank gradually into idiocy, languished a few months, and then died. As a matter of fact, he survived for ten years, till 1767; and by his will he bequeathed £2000 to the Foundling Hospital (where his name may be seen in the list of benefactors as "a black merchant of Calcutta") and also to the Magdalen Hospital in London. (J. S. Co.)

OMNIBUS (Lat. "for all"), a large closed public conveyance with seats for passengers inside and out (see CARRIAGE). The name, colloquially shortened to "bus," was, in the form *voiture omnibus*, first used for such conveyances in Paris in 1828, and was taken by Shillibeer for the vehicle he ran on the Paddington road in 1829. The word is also applied to a box at the opera which is shared by several subscribers, to a bill or act of parliament dealing with a variety of subjects, and in electrical engineering to the bar to which the terminals of the generators are attached and from which the current is taken off by the wires supplying the various consumers.

OMRI, in the Bible, the first great king of Israel after the separation of the two kingdoms of Israel and Judah, who flourished in the early part of the 9th century B.C. The dynasty of Jeroboam had been exterminated by Baasha (see ASA) at a revolt when the army was besieging the Philistines at Gibbethon, an unidentified Danite site. A quarter of a century later, Baasha's son Elah, after a reign of two years, was slain by Zimri, captain of the chariots, in a drinking bout, and again the royal family were put to the sword. Meanwhile, the general Omri, who was at Gibbethon, was promptly elected king by the army, and Zimri himself in a short while[1] met his death in the royal city of Tirzah. However, fresh disturbance was caused by Tibni ben Ginath (perhaps of Naphtali), and Israel was divided into rival factions. Ultimately Tibni and his brother Joram (1 Kings xvi. 22, LXX.) were overcome, and Omri remained in sole possession of the throne. The compiler of the biblical narratives takes little interest in Omri's work (1 Kings xvi. 15-28), and records briefly his purchase of Samaria, which became the capital of his dynasty (see SAMARIA). The inscription of Mesha throws welcome light upon his conquest of Moab (*q.v.*); the position of Israel during the reign of Omri's son Ahab (*q.v.*) bears testimony to the success of the father; and the fact that the land continued to be known to the Assyrians down to the time of Sargon as "house of Omri" indicates the reputation which this little-known king enjoyed. (S. A. C.)

OMSK, a town of Russia, capital of the province of Akmolinsk, capital of western Siberia from 1839 to 1882, and now capital of the general-governorship of the Steppes. Pop. (1881) 31,000, (1900) 53,050. It is the seat of administration of the Siberian Cossacks, and the see of the bishop of Omsk. Situated on the right bank of the Irtysh, at its confluence with the Om, at an altitude of 285 ft., and on the Siberian railway, 1862 m. via Chelyabinsk from Moscow, and 586 m. W.S.W. of Tomsk, it is the meeting-place of the highways to middle Russia, Orenburg and Turkestan. Steamers ply down the Irtysh and the Ob, and up the former to the Altai towns and Lake Zaisan. The climate is dry and relatively temperate, but marked by violent snow-storms and sand-storms. The average temperatures are, for the year, 31° F.; for January, 5°; for July, 68°; the annual rainfall is 12·4 in. The town is poorly built. Apart from the railway workshops, its industries are unimportant (steam saw-mill, tanneries); but the trade, especially since the construction of the railway, is growing. There are two yearly fairs. Omsk has a society for education, which organizes schools, kindergartens, libraries and lectures for the people. There are a corps of cadets, medical, dramatic and musical societies, and the west Siberian section of the Russian Geographical Society, with a museum.

The "fort" of Omsk was erected in 1716 to protect the block-houses on the Russian frontier, along the Ishim and the Irtysh. In consequence of the frequent incursions of the Kirghiz about the end of the 18th century, stronger earthworks were erected on the right bank of the Om; but these have now almost entirely disappeared.

ONAGRACEAE, in botany, an order of dicotyledons belonging to the series Myrtiflorae, to which belongs also the myrtle order, Myrtaceae. It contains about 36 genera and 300 species, and occurs chiefly in the temperate zone of the New World, especially on the Pacific side. It is represented in Britain by several species of *Epilobium* (willow-herb), *Circaea* (enchanter's nightshade), and *Ludwigia*, a small perennial herb very rare in boggy pools in Sussex and Hampshire. The plants are generally herbaceous, sometimes annual, as species of *Epilobium*, *Clarkia*, *Godetia*, or biennial, as *Oenothera biennis*—evening primrose—or sometimes become shrubby or arborescent, as Fuchsia (*q.v.*). The simple leaves are generally entire or inconspicuously toothed, and are alternate, opposite or whorled in arrangement; they are generally exstipulate, but small caducous stipules occur in Fuchsia, *Circaea* and other genera. The flowers are often solitary in the leaf-axils, as in many fuchsias, *Clarkia*, &c., or associated, as in *Epilobium* and *Oenothera*, in large showy terminal spikes or racemes; in *Circaea* the small white or red flowers are borne in terminal and lateral racemes. The regular flowers have the parts in fours, the typical arrangement as illustrated by *Epilobium*, *Oenothera* and Fuchsia being as follows: 4 sepals, 4 petals, two alternating whorls of 4 stamens, and 4 inferior carpels. The floral receptacle is produced above the ovary into the so-called calyx-tube, which is often petaloid, as in Fuchsia, and is sharply distinguished from the ovary, from which it separates after flowering.

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[1] He is said to have reigned seven days, but the LXX. (B) in 1 Kings xvi. 15 read seven *years*. Further confusion is caused by the fact that the LXX. reads Zimri throughout for Omri.

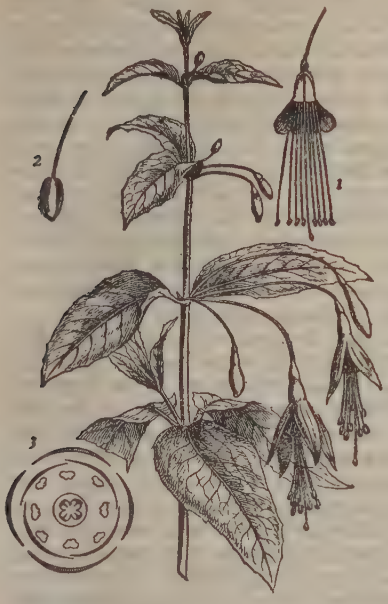


Fig. 1.—*Fuchsia coccinea.*
1, Flower cut open after removal of sepals; 2, fruit; 3, floral diagram.

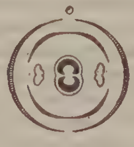
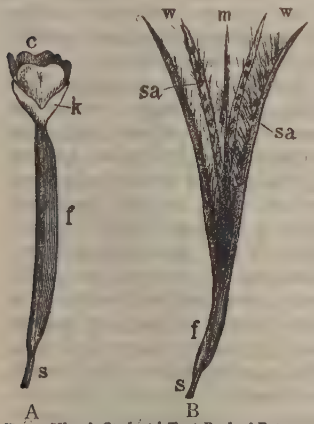


Fig. 2.—Floral diagram of *Circaea.*

In *Clarkia* the inner whorl of stamens is often barren, and in an allied genus, *Eucharidium*, it is absent. In *Circaea* the flower has its parts in twos. Both sepals and petals are free; the former have a broad insertion, are valvate in bud, and reflexed in the flower; in Fuchsia they are petaloid. The petals have a narrow attachment, and are generally convolute in bud; they are entire (Fuchsia) or bilobed (*Epilobium*); in some species of Fuchsia they are small and scale-like, or absent (*F. apetala*). The stamens are free, and those of the inner whorl are generally shorter than those of the outer whorl. The flowers of *Lopezia* (Central America) have only one fertile stamen. The large spherical pollen grains are connected by viscid threads. The typically quadrilocular ovary contains numerous ovules on axile placentas; the 1-to-2-celled ovary of *Circaea* has a single ovule in each loculus. The long slender style has a capitate (Fuchsia), 4-rayed (*Oenothera*, *Epilobium*) or 4-notched (*Circaea*) stigma. The flowers, which have generally an attractive corolla and honey secreted by a swollen disk at the base of the style or on the lower part of the "calyx-tube," are adapted for pollination by insects, chiefly bees and lepidoptera; sometimes by night-flying insects when the flowers are pale and open towards evening, as in evening primrose. The fruit is generally a capsule splitting into 4 valves and leaving a central column on which the seeds are borne as in *Epilobium* and *Oenothera*—in the former the seeds are scattered by aid of a long tuft of silky hairs on the broader end. In Fuchsia the fruit is a berry, which is sometimes edible, and in *Circaea* a nut bearing recurved bristles. The seeds are exalbuminous. Several of the genera are well known as garden plants, *e.g.* Fuchsia, *Oenothera*, *Clarkia* and *Godetia*. Evening primrose (*Oenothera biennis*), a native of North America, occurs apparently wild as a garden escape in Britain. *Jussieua* is a tropical genus of water- and marsh-herbs with well-developed aerating tissue.



From Vines' *Students' Text-Book of Botany*, by permission of Swan Sonnenschein & Co.

Fig. 3.

A, Young flower of *Epilobium hirsutum*. *c*, petals; *f*, inferior ovary; *k*, sepals; *s*, pedicel.

B, Fruit of Epilobium after dehiscence. *w*, outer wall; *m*, columella formed by the septa; *sa*, seed with tufts of hairs.

ONATAS, a Greek sculptor of the time of the Persian wars, a member of the flourishing school of Aegina. Many of his works are mentioned by Pausanias; they included a Hermes carrying the ram, and a strange image of the Black Demeter made for the people of Phigalia; also some elaborate groups in bronze set up at Olympia and Delphi. For Hiero I., king of Syracuse, Onatas executed a votive chariot in bronze dedicated at Olympia. If we compare the descriptions of the works of Onatas given us by Pausanias with the well-known pediments of Aegina at Munich we shall find so close an agreement that we may safely take the pedimental figures as an index of the style of Onatas. They are manly, vigorous, athletic, showing great knowledge of the human form, but somewhat stiff and automaton-like.

ONEGA, the largest lake in Europe next to Ladoga, having an area of 3764 sq. m. It is situated in the government of Olonets in European Russia, and, discharging its waters by the Svir into Lake Ladoga, belongs to the system of the Neva. The lake basin extends north-west and south-east, the direction characteristic of the lakes of Finland and the line of glacier-scoring observed in that region. Between the northern and southern divisions of the lake there is a considerable difference: while the latter has a comparatively regular outline, and contains hardly any islands, the former splits up into a number of inlets, the largest being Povyenets Bay, and is crowded with islands (*e.g.* Klimetsk) and submerged rocks. It is thus the northern division which brings the coast-line up to 870 m. and causes the navigation of the lake to be so dangerous. The north-western shore between Petrozavodsk and the mouth of the river Lumbosha consists of dark clay slates, generally arranged in horizontal strata and broken by protruding, parallel ridges of diorite, which extend far into the lake. The eastern shore, as far as the mouth of the Andoma, is for the most part alluvial, with outcroppings of red granite and in one place (the mouth of the Pyalma) diorite and dolomite. To the south-east are sedimentary Devonian rocks, and the general level of the coast is broken by Mount Andoma and Cape Petropavlovskiy (160 ft. above the lake); to the south-west a quartz sandstone (used as a building and monumental stone in St Petersburg) forms a fairly bold rim. Lake Onega lies 125 ft. above the sea. The greatest depths, 318 to 408 ft., occur at the entrance to the double bay of Lizhemsk and Unitsk. On the continuation of this line the depth exceeds 240 ft. in several places. In the middle of the lake the depth is 120 to 282 ft., and less than 120 ft. in the south. The lake is 145 m. long, with an average breadth of 50 m. The most important affluents, the Vodka, the Andoma and the Vytegra, come from the east. The Kumsa, a northern tributary, is sometimes represented as if it connected the lake with Lake Seg, but at the present time the latter drains to the White Sea. The Onega canal (45 m. long) was constructed in 1818–1851 along the southern shore in order to connect the Svir (and hence Lake Ladoga and the Baltic) with the Vytegra, which connects with the Volga. Lake Onega remains free from ice for 209 days in the year (middle of May to second week of December). The water is at its lowest level in the beginning of March; by June it has risen 2 ft. A considerable population is scattered along the shores of the lake, mainly occupied in the timber trade, fisheries and mining industries. Salmon, *palya* (a kind of trout), burbot, pike, perchpike and perch are among the fish caught in the lake. Steamboats were introduced in 1832.

The river Onega, which, after a course of 250 m., reaches the Gulf of Onega, an inlet of the White Sea, has no connexion with Lake Onega. At the mouth of this river (on the right bank) stands the town and port of Onega (pop. 2694 in 1897), which dates from settlements made by the people of Novgorod in the 15th century, and known in history as Ustenskaya or Ustyanskaya. It has a cathedral, erected in 1796. (P. A. K.; J. T. Be.)

ONEIDA, a city of Madison county, New York, U.S.A., on Oneida Creek, about 6 m. S.E. of Oneida Lake, about 26 m. W. of Utica, and about 26 m. E.N.E. of Syracuse. Pop. (1890) 6083; (1900) 6364, of whom 784 were foreign-born; (1910, U.S. census) 8317. It is served by the New York Central & Hudson River, the New York, Ontario & Western, the West Shore and the Oneida (electric) railways (the last connecting with Utica and Syracuse), and by the Erie Canal. The city lies about 440 ft. above the sea on a level site. Across Oneida Creek, to the south-east, in Oneida county, is the village of Oneida Castle (pop. in 1910, 393), situated in the township of Vernon (pop. in 1910, 3197), and the former gathering place of the Oneida Indians, some of whom still live in the township of Vernon and in the city of Oneida. In the south-eastern part of the city is the headquarters of the Oneida Community (*q.v.*), which controls important industries here, at Niagara Falls, and elsewhere. Immediately west of Oneida is the village of Wampsville (incorporated in 1908), the county-seat of Madison county. Among the manufactures of Oneida are wagons, cigars, furniture, caskets, silver-plated ware, engines and machinery, steel and wooden pulleys and chucks, steel grave vaults, hosiery, and milk bottle caps. In the vicinity the Oneida Community manufactures chains and animal traps. The site of Oneida was purchased in 1829–1830 by Sands Higinbotham, in honour of whom one of the municipal parks (the other is Allen Park) is named. Oneida was incorporated as a village in 1848 and chartered as a city in 1901.

ONEIDA (a corruption of their proper name *Onayotka-ono*, "people of the stone," in allusion to the Oneida stone, a granite boulder near their former village, which was held sacred by them), a tribe of North American Indians of Iroquoian stock, forming one of the Six Nations. They lived around Oneida Lake in New York state, in the region southward to the Susquehanna. They were not loyal to the League's policy of friendliness to the English, but inclined towards the French, and were practically the only Iroquois who fought for the Americans in the War of Independence. As a consequence they were attacked by others of the Iroquois under Joseph Brant and took refuge within the American settlements till the war ended, when the majority returned to their former home, while some migrated to the Thames river district, Ontario. Early in the 19th century they sold their lands, and most of them settled on a reservation at Green Bay, Wisconsin, some few remaining in New York state. The tribe now numbers more than 3000, of whom about two-thirds are in Wisconsin, a few hundreds in New York state, and about 800 in Ontario. They are civilized and prosperous.

ONEIDA COMMUNITY (or Bible Communists), an American communistic society at Oneida, Madison county, New York, which has attracted wide interest on account of its pecuniary success and its peculiar religious and social principles (see COMMUNISM).

Its founder, John Humphrey Noyes (1811–1886), was born in Brattleboro, Vermont, on the 3rd of September 1811. He was of good parentage; his father, John Noyes (1763–1841), was a graduate of and for a time a tutor in Dartmouth College, and was a representative in Congress in 1815–1817; and his mother, Polly Hayes, was an aunt of Rutherford B. Hayes, president of the United States. The son graduated at Dartmouth in 1830, and studied law for a year, but having been converted in a protracted revival in 1831 he turned to the ministry, studied theology for one year at Andover (where he was a member of "The Brethren," a secret society of students preparing for foreign missionary work), and then a year and a half at Yale, and in 1833 was licensed to preach by the New Haven Association; but his open preaching of his new religious doctrines, and especially that of present salvation from sin, resulted in the revocation of his license in 1834, and his thereafter being called a Perfectionist. He continued to promulgate his ideas of a higher Christian life, and soon had disciples in many places, one of whom, Harriet A. Holton, a woman of means, he married in 1838. In 1836 he returned to his father's home in Putney, Vt., and founded a Bible School; in 1843 he entered into a "contract of Partnership" with his Putney followers; and in March 1845 the Putney Corporation or Association of Perfectionists was formed.

Although the Putney Corporation or Association was never a community in the sense of common-property ownership, yet it was practically a communal organization, and embodied the radical religious and social principles that subsequently gave such fame to the Oneida Community, of which it may justly be regarded as the beginning and precursor. These principles naturally excited the opposition of the churches in the small Vermont village where the Perfectionists resided, and indignation meetings against them were held; and although they resulted in no personal violence Mr Noyes and his followers considered it prudent to remove to a place where they were sure of more liberal treatment. They accordingly withdrew from Putney in 1847, and accepting the invitation of Jonathan Burt and others, settled near Oneida, Madison county, New York.

Here the community at first devoted itself to agriculture and fruit raising, but had little financial success until it began the manufacture of a steel trap, invented by one of its members, Sewall Newhouse; the manufacture of steel chains for use with the traps followed; the canning of vegetables and fruits was begun about 1854, and the manufacture of sewing and embroidery silk in 1866. Having started with a very small capital (the inventoried valuation of its property in 1857 was only $67,000), the community gradually grew in numbers and prospered as a business concern. Its relations with the surrounding population, after the first few years, became very friendly. The members won the reputation of being good, industrious citizens, whose word was always "as good as their bond"; against whom no charge of intemperance, profanity or crime was ever brought. But the communists claimed that among true Christians "mine and thine" in property matters should cease to exist, as among the early pentecostal believers; and, moreover, that the same unselfish spirit should pervade and control all human relations. And notwithstanding these very radical principles, which were freely propounded and discussed in their weekly paper, the communists were not seriously disturbed for a quarter of a century. But from 1873 to 1879 active measures favouring legislative action against the community, specially instigated by Prof. John W. Mears (1825–1881), were taken by several ecclesiastical bodies of Central New York. These measures culminated in a conference held at Syracuse University on the 14th of February 1879, when denunciatory resolutions against the community were passed and legal measures advised.

Mr Noyes, the founder and leader of the community, had repeatedly said to his followers that the time might come when it would be necessary, in deference to public opinion, to recede from the practical assertion of their social principles; and on the 20th of August of this year (1879) he said definitely to them that in his judgment that time had come, and he thereupon proposed that the community "give up the practice of Complex Marriage, not as renouncing belief in the principles and prospective finality of that institution, but in deference to public sentiment." This proposition was considered and accepted in full assembly of the community on the 26th of the same month.

This great change was followed by other changes of vital importance, finally resulting in the transformation of the Oneida Community into the incorporated Oneida Community, Limited, a co-operative joint-stock company, in which each person's interest was represented by the shares of stock standing in his name on the books of the company.

In the reorganization the adult members fared alike in the matter of remuneration for past services—those who by reason of ill-health had been unable to contribute to the common fund receiving the same as those who by reason of strength and ability had contributed most thereto; besides, the old and infirm had the option of accepting a life-guaranty in lieu of work; and hence there were no cases of suffering and want at the time the transformation from a common-property interest to an individual stock interest was made; and in the new company all were guaranteed remunerative labour.

This occurred on the 1st of January 1881, at which time the business and property of the community were transferred to the incorporated stock company, and stock issued therefor to the amount of $600,000. In the subsequent twenty-eight years this capital stock was doubled, and dividends averaging more than 6% per annum were paid. Aside from the home buildings and the large acreage devoted to agriculture and fruit raising, the present capital of the company is invested, first, in its hardware department at Kenwood, N.Y., manufacturing steel game-traps, and weldless chains of every description; second, the silk department at Kenwood, N.Y., manufacturing sewing silk, machine twist and embroidery silks; third, the fruit department at Kenwood, N.Y., whose reputation for putting up pure, wholesome fruits and vegetables is probably the highest in the country; fourth, the tableware department, at Niagara Falls, N.Y., which manufactures the now celebrated Community Silver; fifth, the Canadian department, with factory at Niagara Falls, Ontario, Canada, where the hardware lines are manufactured for Canadian trade. The annual sales of all departments aggregate over $2,000,000. The officers of the company consist of a president, secretary, treasurer and assistant treasurer, and there were in 1909 eleven directors. Each of the five leading departments is managed by a superintendent, and all are under the supervision of the general manager. Nearly all the superintendents and the general manager were in 1909 young men who were born in the community, and have devoted their life-work to the interests of the company. Selling offices are maintained in New York City. Chicago, St Louis, Cleveland, O., Richmond, Va., Atlanta, Ga., and San Francisco.

In addition to the members of the society the company employs between 1500 and 2000 workmen. The policy has been to avoid trade-unions, but to pay higher wages and give better conditions than other employers in similar lines, and by so doing to obtain a better selection of workmen. The conditions of work as well as of living have been studied and developed with the idea of making both healthful and attractive. With this in view the company has laid out small villages, in many ways making them attractive and sanitary, and has encouraged the building of houses by its employés. Much has been accomplished in this direction by providing desirable building-sites at moderate expense, and paying a bonus of from $100 to $200 in cash to every employé who builds his own home. The company has also taken an interest in the schools in the vicinity of its factories, with the idea of offering to the children of its employés facilities for a good education.

The communism of John H. Noyes was based on his interpretation of the New Testament. In his pamphlet, *Bible Communism* (1848), he affirmed that the second coming of Christ occurred at the close of the apostolic age, immediately after the destruction of Jerusalem, and he argued from many New Testament passages, especially 1 John 1, 7, that after the second coming and the beginning of Christ's reign upon the earth, the true standard of Christian character was sinlessness, which was possible through vital union with Christ, that all selfishness was to be done away with, both in property in things and in persons, or, in other words, that communism was to be finally established in all the relations of life. But, while affirming that the same spirit which on the day of Pentecost abolished exclusiveness in regard to money tends to obliterate all other property distinctions, he had no affiliation with those commonly termed Free Lovers, because their principles and practices seemed to him to tend toward anarchy. "Our Communities," he said, "are *families* as distinctly bounded and separated from promiscuous society as ordinary households. The tie that binds us together is as permanent and sacred, to say the least, as that of common marriage, for it is our religion. We receive no new members (except by deception and mistake) who do not give heart and hand to the family interest for life and for ever. Community of property extends just as far as freedom of love. Every man's care and every dollar of the common property are pledged for the maintenance and protection of the women and the education of the children of the Community."

The community was much interested in the question of race improvement by scientific means, and maintained with much force of argument that at least as much scientific attention should be given to the physical improvement of human beings as is given to the improvement of domestic animals; and they referred to the results of their own incomplete stirpicultural experiments as indicative of what may be expected in the far future, when the conditions of human reproduction are no longer controlled by chance, social position, wealth, impulse or lust.

The community claimed to have solved among themselves the labour question, all kinds of service being regarded as equally honourable, and every person being respected according to his real character.

The members had some peculiarities of dress, mostly confined, however, to the women, whose costumes included a short dress and pantalets, which were appreciated for their convenience, if not for their beauty. The women also adopted the practice of wearing short hair, which it was claimed saved time and vanity. Tobacco, intoxicants, profanity, obscenity found no place in the community. The community diet consisted largely of vegetables and fruits; meat, tea and coffee being served only occasionally.

For securing good order and the improvement of the members, the community placed much reliance upon a very peculiar system of plain speaking they termed mutual criticism, which originated in a secret society of missionary brethren with which Mr Noyes was connected while pursuing his theological studies at Andover Seminary, and whose members submitted themselves in turn to the sincerest comment of one another as a means of personal improvement. Under Mr Noyes's supervision it became in the Oneida Community a principal means of discipline and government. There was a standing committee of criticism, selected by the community, and changed from time to time, thus giving all an opportunity to serve both as critics and subjects, and justifying the term "mutual" which they gave to the system. The subject was free to have others besides the committee present, or to have critics only of his own choice, or to invite an expression from the whole community.

Noyes edited *The Perfectionist* (New Haven, Connecticut, 1834, and Putney, Vermont, 1843–1846); *The Witness* (Ithaca, New York, and Putney, 1838–1843); *The Spiritual Magazine* (Putney, 1846–1847; Oneida, 1848–1850); *The Free Church Circular* (Oneida, 1850–1851); and virtually, though not always nominally, *The Circular* and *The Oneida Circular* (Brooklyn, 1851–1854; Oneida, N.Y., and Wallingford, Conn., 1854–1876); and *The American Socialist* (Oneida, 1876–1880). He was the author of *The Way of Holiness* (Putney, 1838); *The Berean* (Putney, 1847), containing an exposition of his doctrines of Salvation from Sin; the Second Coming of Christ; the Origin of Evil; the Atonement; the Second Birth; the Millennium; Our Relations to the Primitive Church, &c. &c.; *History of American Socialism* (Philadelphia, 1870); *Home Talks* (Oneida, 1876); and numerous pamphlets.

See a series of articles in the *Manufacturer and Builder* (New York, 1891–1894), by "C. R. Edson" (*i.e.* C. E. Robinson); *The Oneida Community*, by Allan Estlake (a member of the community) (1900); Morris Hillquit's *History of Socialism in the United States* (New York, 1903), and especially William A. Hinds' *American Communities and Co-operative Colonies* (3rd ed., Chicago, 1908). (W. A. H.)

O'NEILL, the name of an Irish family tracing descent from Niall, king of Ireland early in the 5th century, and known in Irish history and legend as Niall of the Nine Hostages. He is said to have made war not only against lesser rulers in Ireland, but also in Britain and Gaul, stories of his exploits being related in the *Book of Leinster* and the *Book of Ballymote*, both of which, however, are many centuries later than the time of Niall. This king had fourteen sons, one of whom was Eoghan (Owen), from whom the O'Neills of the later history were descended. The descendants of Niall spread over Ireland and became divided into two main branches, the northern and the southern Hy Neill, to one or other of which nearly all the high-kings (ard-ri) of Ireland from the 5th to the 12th century belonged; the descendants of Eoghan being the chief of the northern Hy Neill.[1] Eoghan was grandfather of Murkertagh (Muircheartach) (d. 533), said to have been the first Christian king of Ireland, whose mother, Eirc or Erca, became by a subsequent marriage the grandmother of St Columba. Of this monarch, known as Murkertagh MacNeill (Niall), and sometimes by reference to his mother as Murkertagh Mac Erca, the story is told, illustrating an ancient Celtic custom, that in making a league with a tribe in Meath he emphasized the inviolability of the treaty by having it written with the blood of both clans mixed in one vessel. Murkertagh was chief of the great north Irish clan, the Cinel Eoghain,[1] and after becoming king of Ireland about the year 517, he wrested from a neighbouring clan a tract of country in the modern County Derry, which remained till the 17th century in the possession of the Cinel Eoghain. The inauguration stone of the Irish kings, the Lia Fail, or Stone of Destiny, fabled to have been the pillow of the patriarch Jacob on the occasion of his dream of the heavenly ladder, was said to have been presented by Murkertagh to the king of Dalriada, by whom it was conveyed to Dunstaffnage Castle in Scotland (see Scone). A lineal descendent of Murkertagh was Niall Frassach (*i.e.* of the showers), who became king of Ireland in 763; his surname, of which several fanciful explanations have been suggested, probably commemorating merely weather of exceptional severity at his birth. His grandson, Niall (791–845), drove back the Vikings who in his time began to infest the coast of Donegal. Niall's son, Aedh (Hugh) Finnlaith, was father of Niall Glundubh (*i.e.* Niall of the black knee), one of the most famous of the early Irish kings, from whom the family surname of the O'Neills was derived. His brother Domhnall (Donnell) was king of Ailech, a district in Donegal and Derry; the royal palace, the ruined masonry of which is still to be seen, being on the summit of a hill 800 ft. high overlooking loughs Foyle and Swilly. On the death of Domhnall in 911 Niall Glundubh became king of Ailech, and he then attacked and defeated the king of Dalriada at Glarryford, in County Antrim, and the king of Ulidia near Ballymena. Having thus extended his dominion he became king of Ireland in 915. To him is attributed the revival of the ancient meeting of Irish clans known as the Fair of Telltown (see Ireland: *Early History*). He fought many battles against the Norsemen, in one of which he was killed in 919 at Kilmashoge, where his place of burial is still to be seen.

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[1] A list of these kings will be found in P. W. Joyce's *A Social History of Ancient Ireland* (London, 1903), vol. i. pp. 70, 71.

His son Murkertagh, who gained a great victory over the Norse in 926, is celebrated for his triumphant march round Ireland, the *Moirthimchell Eiream*, in which, starting from Portglenone on the Bann, he completed a circuit of the island at the head of his armed clan, returning with many captive kings and chieftains. From the dress of his followers in this expedition he was called "Murkertagh of the Leather Cloaks." The exploit was celebrated by Cormacan, the king's bard, in a poem that has been printed by the Irish Archaeological Society; and a number of Murkertagh's other deeds are related in the *Book of Leinster*. He was killed in battle against the Norse in 943, and was succeeded as king of Ailech by his son, Donnell Ua Niall (*i.e.* O'Neill, grandson of Neill, or Niall, the name O'Neill becoming about this time an hereditary family surname[2]), whose grandson, Flaherty, became renowned for piety by going on a pilgrimage to Rome in 1030.

Aedh (Hugh) O'Neill, chief of the Cinel Eoghain, or lord of Tir-Eoghain (Tir-Owen, Tyrone) at the end of the 12th century, was the first of the family to be brought prominently into conflict with the Anglo-Norman monarchy, whose pretensions he took the lead in disputing in Ulster. It was probably his son or nephew (for the relationship is uncertain, the genealogies of the O'Neills being rendered obscure by the contemporaneous occurrence of the same name in different branches of the family) Hugh O'Neill, lord of Tyrone, who was styled "Head of the liberality and valour of the Irish." Hugh's son, Brian, by gaining the support of the earl of Ulster, was inaugurated[3] prince, or lord, of Tyrone in 1291; and his son Henry became lord of the *Clann Aodha Buidhe* (Clánaboy or Clandeboye) early in the 14th century. Henry's son Murkertagh the Strongminded, and his great-grandson Hugh, described as "the most renowned, hospitable and valorous of the princes of Ireland in his time," greatly consolidated the power of the O'Neills. Niall Og O'Neill, one of the four kings of Ireland, accepted knighthood from Richard II. of England; and his son Eoghan formally acknowledged the supremacy of the English crown, though he afterwards ravaged the Pale, and was inaugurated "the O'Neill" (*i.e.* chief of the clan) on the death of his kinsman Domhnall Boy O'Neill; a dignity from which he was deposed in 1455 by his son Henry, who in 1463 was acknowledged as chief of the Irish kings by Henry VII. of England. Contemporary with him was Neill Mor O'Neill (see below), lord of Clanaboy, from whose son Brian was descended the branch of the O'Neills who, settling in Portugal in the 18th century, became prominent among the Portuguese nobility, and who at the present day are the representatives in the male line of the ancient Irish kings of the house of O'Neill.

Conn O'Neill (*c.* 1480–1559), 1st earl of Tyrone, surnamed Bacach (the Lame), grandson of Henry O'Neill mentioned above, was the first of the O'Neills whom the attempts of the English in the 16th century to subjugate Ireland brought to the front as leaders of the native Irish. Conn, who was related through his mother with the earl of Kildare (Fitzgerald), became chief of the Tyrone branch of the O'Neills (Cinel Eoghain) about 1520. When Kildare became viceroy in 1524, O'Neill consented to act as his swordbearer in ceremonies of state; but his allegiance was not to be reckoned upon, and while ready enough to give verbal assurances of loyalty, he could not be persuaded to give hostages as security for his conduct; but Tyrone having been invaded in 1541 by Sir Anthony St Leger, the lord deputy, Conn delivered up his son as a hostage, attended a parliament held at Trim, and, crossing to England, made his submission at Greenwich to Henry VIII., who created him earl of Tyrone for life, and made him a present of money and a valuable gold chain. He was also made a privy councillor in Ireland, and received a grant of lands within the Pale. This event created a deep impression in Ireland, where O'Neill's submission to the English king, and his acceptance of an English title, were resented by his clansmen and dependents. The rest of the earl's life was mainly occupied by endeavours to maintain his influence, and by an undying feud with his son Shane (John), arising out of his transaction with Henry VIII. For not only did the nomination of O'Neill's reputed son Matthew as his heir with the title of baron of Dungannon by the English king conflict with the Irish custom of tanistry (*q.v.*) which regulated the chieftainship of the Irish clans, but Matthew, if indeed he was O'Neill's son at all, was illegitimate; while Shane, Conn's eldest legitimate son, was not the man to submit tamely to any invasion of his rights. The fierce family feud only terminated when Matthew was murdered by agents of Shane in 1558; Conn dying about a year later. Conn was twice married, Shane being the son of his first wife, a daughter of Hugh Boy O'Neill of Clanaboy. An illegitimate daughter of Conn married the celebrated Sorley Boy MacDonnell (*q.v.*).

Shane O'Neill (*c.* 1530–1567) was a chieftain whose support was worth gaining by the English even during his father's lifetime; but rejecting overtures from the earl of Sussex, the lord deputy, Shane refused to help the English against the Scottish settlers on the coast of Antrim, allying himself instead with the MacDonnells, the most powerful of these immigrants. Nevertheless Queen Elizabeth, on succeeding to the English throne, was disposed to come to terms with Shane, who after his father's death was *de facto* chief of the formidable O'Neill clan. She accordingly agreed to recognize his claims to the chieftainship, thus throwing over Brian O'Neill, son of the murdered Matthew, baron of Dungannon, if Shane would submit to her authority and that of her deputy. O'Neill, however, refused to put himself in the power of Sussex without a guarantee for his safety; and his claims in other respects were so exacting that Elizabeth consented to measures being taken to subdue him and to restore Brian. An attempt to foment the enmity of the O'Donnells against him was frustrated by Shane's capture of Calvagh O'Donnell, whom he kept a close prisoner for nearly three years. Elizabeth, whose prudence and parsimony were averse to so formidable an undertaking as the complete subjugation of the powerful Irish chieftain, desired peace with him at almost any price; especially when the devastation of his territory by Sussex brought him no nearer to submission. Sussex, indignant at Shane's request for his sister's hand in marriage, and his demand for the withdrawal of the English garrison from Armagh, was not supported by the queen, who sent the earl of Kildare to arrange terms with O'Neill. The latter, making some trifling concessions, consented to present himself before Elizabeth. Accompanied by Ormonde and Kildare he reached London on the 4th of January 1562. Camden describes the wonder with which O'Neill's wild gallowglasses were seen in the English capital, with their heads bare, their long hair falling over their shoulders and clipped short in front above the eyes, and clothed in rough yellow shirts. Elizabeth was less concerned with the respective claims of Brian and Shane, the one resting on an English patent and the other on the Celtic custom, than with the question of policy involved in supporting or rejecting the demands of her proud suppliant. Characteristically, she temporized; but finding that O'Neill was in danger of becoming a tool in the hands of Spanish intriguers, she permitted him to return to Ireland, recognizing him as "the O'Neill," and chieftain of Tyrone; though a reservation was made of the rights of Hugh O'Neill, who had meantime succeeded his brother Brian as baron of Dungannon, Brian having been murdered in April 1562 by his kinsman Turlough Luineach O'Neill.

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[1] The *Cinel*, or *Kinel*, was a group of related clans occupying an extensive district. See Joyce, *op. cit.* i. 166.

[2] The adoption of hereditary names became general in Ireland, in obedience, it is said, to an ordinance of Brian Boru, about the end of the 10th century. For the method of their formation see Joyce, *op. cit.* ii. 19.

[3] The ceremony of "inauguration" among the ancient Irish clans was an elaborate and important one. A stone inauguration chair of the O'Neills is preserved in the Belfast Museum. See Joyce, *op. cit.* i. 46.

There were at this time three powerful contemporary members of the O'Neill family in Ireland—Shane, Turlough and Hugh, 2nd earl of Tyrone. Turlough had been elected tanist (see Tanistry) when his cousin Shane was inaugurated the O'Neill, and he schemed to supplant him in the higher dignity during Shane's absence in London. The feud did not long survive Shane's return to Ireland, where he quickly re-established his authority, and in spite of Sussex renewed his turbulent tribal warfare against the O'Donnells and others. Elizabeth at last authorized Sussex to take the field against Shane, but two several expeditions failed to accomplish anything except some depredation in O'Neill's country. Sussex had tried in 1561 to procure Shane's assassination, and Shane now laid the whole blame for his lawless conduct on the lord deputy's repeated alleged attempts on his life. Force having ignominiously failed, Elizabeth consented to treat, and hostilities were stopped on terms that gave O'Neill practically the whole of his demands. O'Neill now turned his hand against the MacDonnells, claiming that he was serving the queen of England in harrying the Scots. He fought an indecisive battle with Sorley Boy MacDonnell near Coleraine in 1564, and the following year marched from Antrim through the mountains by Clogh to the neighbourhood of Ballycastle, where he routed the MacDonnells and took Sorley Boy prisoner. This victory greatly strengthened Shane O'Neill's position, and Sir Henry Sidney, who became lord deputy in 1566, declared to the earl of Leicester that Lucifer himself was not more puffed up with pride and ambition than O'Neill. Preparations were made in earnest for his subjugation. O'Neill ravaged the Pale, failed in an attempt on Dundalk, made a truce with the MacDonnells, and sought help from the earl of Desmond. The English, on the other hand, invaded Donegal and restored O'Donnell. Failing in an attempt to arrange terms, and also in obtaining the help which he solicited from France, O'Neill was utterly routed by the O'Donnells at Letterkenny; and seeking safety in flight, he threw himself on the mercy of his enemies, the MacDonnells. Attended by a small body of gallowglasses, and taking his prisoner Sorley Boy with him, he presented himself among the MacDonnells near Cushendun, on the Antrim coast. Here, on the 2nd of June 1567, whether by premeditated treachery or in a sudden brawl is uncertain, he was slain by the MacDonnells, and was buried at Glenarm. In his private character Shane O'Neill was a brutal, uneducated savage. He divorced his first wife, a daughter of James MacDonnell, and treated his second, a sister of Calvagh O'Donnell, with gross cruelty in revenge for her brother's hostility; Calvagh himself, when Shane's prisoner, he subjected to continual torture; and Calvagh's wife, whom he made his mistress, and by whom he had several children, endured ill-usage at the hands of her drunken captor, who is said to have married her in 1565.

Turlough Luineach O'Neill (*c.* 1530–1595), earl of Clanconnell, was inaugurated chief of Tyrone on Shane's death. Making professions of loyalty to the queen of England, he sought to strengthen his position by alliance with the O'Donnells, MacDonnells and MacQuillans. But his conduct giving rise to suspicions, an expedition under the earl of Essex was sent against him, which met with such doubtful success that in 1575 a treaty was arranged by which O'Neill received extensive grants of lands and permission to employ three hundred Scottish mercenaries. In 1578 he was created baron of Clogher and earl of Clanconnell for life; but on the outbreak of rebellion in Munster his attitude again became menacing, and for the next few years he continued to intrigue against the English authorities. The latter, as a counterpoise to Turlough, supported his cousin Hugh, brother of Brian, whom Turlough had murdered. After several years of rivalry and much fighting between the two relatives, Turlough resigned the headship of the clan in favour of Hugh, who was inaugurated O'Neill in 1593. Turlough died in 1595.

Hugh O'Neill (*c.* 1540–1616), 2nd earl (known as the great earl) of Tyrone, was the second son of Matthew, reputed illegitimate son of Conn, 1st earl of Tyrone.[1] He succeeded his brother, Brian, when the latter was murdered by Turlough in 1562, as baron of Dungannon. He was brought up in London, but returned to Ireland in 1567 after the death of Shane, under the protection of Sir Henry Sidney. He served with the English against Desmond in Munster in 1580, and assisted Sir John Perrot against the Scots of Ulster in 1584. In the following year he was allowed to attend parliament as earl of Tyrone, though Conn's title had been for life only, and had not been assumed by Brian. Hugh's constant disputes with Turlough were fomented by the English with a view to weakening the power of the O'Neills, but after Hugh's inauguration as the O'Neill on Turlough's resignation in 1593, he was left without a rival in the north. His career was marked by unceasing duplicity, at one time giving evidence of submission to the English authorities, at another intriguing against them in conjunction with lesser Irish chieftains. Having roused the ire of Sir Henry Bagnal (or Bagenal) by eloping with his sister in 1591, he afterwards assisted him in defeating Hugh Maguire at Belleek in 1593; and then again went into opposition and sought aid from Spain and Scotland. Sir John Norris was accordingly ordered to Ireland with a considerable force to subdue him in 1595, but Tyrone succeeded in taking the Blackwater Fort and Sligo Castle before Norris was prepared; and he was thereupon proclaimed a traitor of Dundalk. In spite of the traditional enmity between the O'Neills and the O'Donnells, Tyrone allied himself with Hugh Roe O'Donnell, nephew of Shane's former enemy Calvagh O'Donnell, and the two chieftains opened communications with Philip II. of Spain, their letters to whom were intercepted by the viceroy, Sir William Russell. They put themselves forward as the champions of the Catholic religion, claiming liberty of conscience as well as political liberty for the native inhabitants of Ireland. In April 1596 Tyrone received promises of help from Spain. This increased his anxiety to temporize, which he did with signal success for more than two years, making from time to time as circumstances required, professions of loyalty which deceived Sir John Norris and the earl of Ormonde. In 1598 a cessation of hostilities was arranged, and a formal pardon granted to Tyrone by Elizabeth. Within two months he was again in the field, and on the 14th of August he destroyed an English force under Bagnal at the Yellow Ford on the Blackwater. If the earl had known how to profit by this victory, he might now have successfully withstood the English power in Ireland; for in every part of Ireland—and especially in the south, where James Fitzthomas Fitzgerald with O'Neill's support was asserting his claim to the earldom of Desmond at the head of a formidable army of Geraldine clansmen—discontent broke into flame. But Tyrone, who possessed but little generalship, procrastinated until the golden opportunity was lost. Eight months after the battle of the Yellow Ford, the earl of Essex landed in Ireland to find that Tyrone had done nothing in the interval to improve his position. Acting on the queen's explicit instructions, Essex, after some ill-managed operations, had a meeting with Tyrone at a ford on the Lagan on th 7th of September 1599, when a truce was arranged; but Elizabeth was displeased by the favourable conditions allowed to the O'Neill and by Essex's treatment of him as an equal. Tyrone continued to concert measures with the Irish leaders in Munster, and issued a manifesto to the Catholics of Ireland summoning them to join his standard; protesting that the interests of religion were his first care. After an inconclusive campaign in Munster in January 1600, he returned in haste to Donegal, where he received supplies from Spain and a token of encouragement from Pope Clement VIII. In May of the same year Sir Henry Docwra, at the head of a considerable army, took up a position at Derry, while Mountjoy marched from Westmeath to Newry to support him, compelling O'Neill to retire to Armagh, a large reward having been offered for his capture alive or dead.

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[1] The grave doubt as to the paternity of Matthew involved a doubt whether the great earl of Tyrone and his equally famous nephew Owen Roe had in fact any O'Neill blood in their veins.

The appearance of a Spanish force at Kinsale drew Mountjoy to Munster in 1601; Tyrone followed him, and at Bandon joined forces with O'Donnell and with the Spaniards under Don John D'Aquila. The attack of these allies on the English completely failed. O'Donnell went to Spain, where he died soon afterwards, and Tyrone with a shattered force made his way once more to the north, where he renewed his policy of ostensibly seeking pardon while warily evading his enemies. Early in 1603 Elizabeth instructed Mountjoy to open negotiations with the rebellious chieftains; and in April, Tyrone, in ignorance of Elizabeth's death, made his submission to Mountjoy. In Dublin, whither he proceeded with Mountjoy, he heard of the accession of King James, at whose court he presented himself in June accompanied by Rory O'Donnell, who had become chief of the O'Donnells after the departure of his brother Hugh Roe. The English courtiers were greatly incensed at the gracious reception accorded to these notable rebels by King James; but although Tyrone was confirmed in his title and estates, he had no sooner returned to Ireland than he again engaged in dispute with the government concerning his rights over certain of his feudatories, of whom Donnal O'Cahan was the most important. This dispute dragged on till 1607, when Tyrone arranged to go to London to submit the matter to the king. Warned, however, that his arrest was imminent, and possibly persuaded by Rory O'Donnell (created earl of Tyrconnel in 1603), whose relations with Spain had endangered his own safety, Tyrone resolved to fly from the country.

"The flight of the earls," one of the most celebrated episodes in Irish history, occurred on the 14th of September 1607, when Tyrone and Tyrconnel embarked at midnight at Rathmullen on Lough Swilly, with their wives, families and retainers, numbering ninety-nine persons, and sailed for Spain. Driven by contrary winds to take shelter in the Seine, the refugees passed the winter in the Netherlands, and in April 1608 proceeded to Rome, where they were welcomed and hospitably entertained by Pope Paul V., and where Tyrconnel died the same year. In 1613 Tyrone was outlawed and attainted by the Irish parliament, and he died in Rome on the 20th of July 1616. He was four times married, and had a large number both of legitimate and illegitimate children.

Sir Phelim O'Neill (*c.* 1603–1653), a kinsman and younger contemporary of the earl of Tyrone, took a prominent part in the rebellion of 1641. In that year he was elected member of the Irish parliament for Dungannon, and joined the earl of Antrim and other lords in concerting measures for supporting Charles I. in his struggle with the parliament. On the 22nd of October 1641 he surprised and captured Charlemont Castle; and having been chosen commander-in-chief of the Irish forces in the north, he forged and issued a pretended commission from Charles I. sanctioning his proceedings. Phelim and his followers committed much depredation in Ulster on the pretext of reducing the Scots; and he attempted without success to take Drogheda, being compelled by Ormonde to raise the siege in April 1642. He was responsible for many of the barbarities committed by the Catholics during the rebellion.[1] During the summer his fortunes ebbed, and he was soon superseded by his kinsman Owen Roe O'Neill, who returned from military service abroad at the end of July.

Owen Roe O'Neill (*c.* 1590–1649), one of the most celebrated of the O'Neills, the subject of the well-known ballad "The Lament for Owen Roe," was the son of Art O'Neill, a younger brother of Hugh, 2nd earl of Tyrone. Having served with distinction for many years in the Spanish army, he was immediately recognized on his return to Ireland as the leading representative of the O'Neills. Phelim resigned the northern command in his favour, and escorted him from Lough Swilly to Charlemont. But jealousy between the kinsmen was complicated by differences between Owen Roe and the Catholic council which met at Kilkenny in October 1642. Owen Roe professed to be acting in the interest of Charles I.; but his real aim was the complete independence of Ireland, while the Anglo-Norman Catholics represented by the council desired to secure religious liberty and an Irish constitution under the crown of England. Although Owen Roe O'Neill possessed the qualities of a general, the struggle dragged on inconclusively for three or four years. In March 1646 a cessation of hostilities was arranged between Ormonde and the Catholics; and O'Neill, furnished with supplies by the papal nuncio, Rinuccini, turned against the Scottish parliamentary army under General Monro, who had been operating with fluctuating success in Ireland since April 1642. On the 5th of June 1646 O'Neill utterly routed Monro at Benburb, on the Blackwater; but, being summoned to the south by Rinuccini, he failed to take advantage of the victory, and suffered Monro to remain unmolested at Carrickfergus. For the next two years confusion reigned supreme among the numerous factions in Ireland, O'Neill supporting the party led by Rinuccini, though continuing to profess loyalty to Ormonde as the king of England's representative. Isolated by the departure of the papal nuncio from Ireland in February 1649, he made overtures for alliance to Ormonde, and afterwards with success to Monck, who had superseded Monro in command of the parliamentarians in the north. O'Neill's chief need was supplies for his forces, and failing to obtain them from Monck he turned once more to Ormonde and the Catholic confederates, with whom he prepared to co-operate more earnestly when Cromwell's arrival in Ireland in August 1649 brought the Catholic party face to face with serious danger. Before, however, anything was accomplished by this combination, Owen Roe died on the 6th of November 1649.

The alliance between Owen Roe and Ormonde had been opposed by Phelim O'Neill, who after his kinsman's death expected to be restored to his former position of command. In this he was disappointed; but he continued to fight against the parliamentarians till August 1652, when a reward was offered for his apprehension. Betrayed by a kinsman while hiding in Tyrone, he was tried for high treason in Dublin, and executed on the 10th of March 1653. Phelim married a daughter of the marquis of Huntly, by whom he had a son Gordon O'Neill, who was member of parliament for Tyrone in 1689; fought for the king at the siege of Derry and at the battles of Aughrim and the

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[1] See W. E. H. Lecky, *Hist. of Ireland in the Eighteenth Century*, i. 66-68 (Cabinet edition, 5 vols., London, 1892).

Boyne; and afterwards commanded an Irish regiment in the French service, and died in 1704.

Daniel O'Neill (*c.* 1612–1664), son of Conn MacNeill MacFagartach O'Neill, a member of the Clanaboy branch of the family, whose wife was a sister of Owen Roe, was prominent in the Civil Wars. He spent much of his early life at the court of Charles I., and became a Protestant. He commanded a troop of horse in Scotland in 1639; was involved in army plots in 1641, for which he was committed to the Tower, but escaped abroad; and on the outbreak of the Civil War returned to England and served with Prince Rupert, being present at Marston Moor, the second battle of Newbury and Naseby. He then went to Ireland to negotiate between Ormonde and his uncle, Owen Roe O'Neill. He was made a major-general in 1649, and but for his Protestantism would have succeeded Owen Roe as chief of the O'Neills. He joined Charles II. at the Hague, and took part in the expedition to Scotland and the Scotch invasion of England in 1652. At the Restoration he received many marks of favour from the king, including grants of land and lucrative monopolies. He died in 1664.

Hugh O'Neill (d. *c.* 1660), son of Owen Roe's brother Art Oge, and therefore known as Hugh Mac Art, had served with some distinction in Spain before he accompanied his uncle, Owen Roe, to Ireland in 1642. In 1646 he was made a major-general of the forces commanded by Owen Roe; and after the death of the latter he successfully defended Clonmel in 1650 against Cromwell, on whom he inflicted the latter's most severe defeat in Ireland. In the following year he so stubbornly resisted Ireton's attack on Limerick that he was excepted from the benefit of the capitulation, and, after being condemned to death and reprieved, was sent as a prisoner to the Tower of London. Released in 1652 on the representation of the Spanish ambassador that O'Neill was a Spanish subject, he repaired to Spain, whence he wrote to Charles II. in 1660 claiming the earldom of Tyrone. He probably died in Spain, but the date of his death is unknown.

The Clanaboy (or Clandeboye) branch of the O'Neills descended from the ancient kings through Neill Mor O'Neill, lord of Clanaboy in the time of Henry VIII., ancestor (as mentioned above) of the Portuguese O'Neills. Neill Mor's great-great-grandson, Henry O'Neill, was created baronet of Killeleagh in 1666. His son, Sir Neill O'Neill fought for James II. in Ireland, and died of wounds received at the battle of the Boyne. Through an elder line from Neill Mor was descended Brian Mac Phelim O'Neill, who was treacherously seized in 1573 by the earl of Essex, whom he was hospitably entertaining, and executed together with his wife and brother, some two hundred of his clan being at the same time massacred by the orders of Essex. (See Essex, Walter Devereux, 1st earl of.) Sir Brian Mac Phelim's son, Shane Mac Brian O'Neill, was the last lord of Clanaboy, and from him the family castle of Edenduffcarrick, on the shore of Lough Neagh in Co. Antrim, was named Shane's Castle. He joined the rebellion of his kinsman Hugh, earl of Tyrone, but submitted in 1586.

In the 18th century the commanding importance of the O'Neills in Irish history had come to an end. But John O'Neill (1740–1798), who represented Randalstown in the Irish parliament 1761–1783, and the county of Antrim from the latter year till his death, took an active part in debate on the popular side, being a strong supporter of Catholic emancipation. He was one of the delegates in 1789 from the Irish parliament to George, prince of Wales, requesting him to assume the regency as a matter of right. In 1793 he was raised to the peerage of Ireland as Baron O'Neill of Shane's Castle, and in 1795 was created a viscount. In defending the town of Antrim against the rebels in 1798 O'Neill received wounds from which he died on the 18th of June, being succeeded as Viscount O'Neill by his son Charles Henry St John (1779–1841), who in 1800 was created Earl O'Neill. Dying unmarried, when the earldom therefore became extinct, Charles was succeeded as Viscount O'Neill by his brother John Bruce Richard (1780–1855), a general in the British army; on whose death without issue in 1855 the male line in the United Kingdom became extinct. The estates then devolved on William Chichester, great-grandson of Arthur Chichester and his wife Mary, only child and heiress of Henry (d. 1721), eldest son of John O'Neill of Shane's Castle.

William Chichester (1813–1883), 1st Baron O'Neill, a clergyman, on succeeding to the estates as heir-general, assumed by royal licence the surname and arms of O'Neill; and in 1868 was created Baron O'Neill of Shane's Castle. On his death in 1883 he was succeeded by his son Edward, 2nd Baron O'Neill (b. 1839), who was member of parliament for Co. Antrim 1863–1880, and who married in 1873 Louisa, daughter of the 11th earl of Dundonald.

For the history of the ancient Irish kings of the Hy Neill see: *The Book of Leinster*, edited with introduction by R. Atkinson (Royal Irish Academy, Dublin, 1880); *The Annals of Ulster*, edited by W. M. Hennessy and B. MacCarthy (4 vols., Dublin, 1887–1901); *The Annals of Loch Cé*, edited by W. M. Hennessy (Rolls Series, London, 1871). For the later period see: P. W. Joyce, *A Short History of Ireland* (London, 1893), and *A Social History of Ancient Ireland* (2 vols., London, 1903); *The Annals of Ireland by the Four Masters*, edited by J. O'Donovan (7 vols., Dublin, 1851); Sir J. T. Gilbert, *History of the Viceroys of Ireland* (Dublin, 1865), and, especially for Owen Roe O'Neill, *Contemporary History of Affairs in Ireland, 1641–1652* (Irish Archaeol. Soc., 3 vols., Dublin, 1879); also *History of the Irish Confederation and the War in Ireland* (Dublin, 1882); John O'Hart, *Irish Pedigrees* (Dublin, 1881); *The Montgomery MSS.*, "The Flight of the Earls, 1607" (p. 767), edited by George Hill (Belfast, 1878); Thomas Carte, *History of the Life of James, Duke of Ormonde* (3 vols., London, 1735); C. P. Meehan, *Fate and Fortunes of Hugh O'Neill, Earl of Tyrone, and Rory O'Donel, Earl of Tyrconnel* (Dublin, 1886); Richard Bagwell, *Ireland under the Tudors, with an Account of the Earlier History* (3 vols., London, 1885–1890); J. F. Taylor, *Owen Roe O'Neill* (London, 1896); John Mitchell, *Life and Times of Hugh, Earl of Tyrone, with an Account of his Predecessors, Con, Shane, Turlough* (Dublin, 1846); L. O'Clery, *Life of Hugh Roe O'Donnell* (Dublin, 1893). For the O'Neills of the 18th century, and especially the 1st Viscount O'Neill, see *The Charlemont Papers*, and F. Hardy, *Memoirs of J. Caulfield, Earl of Charlemont* (2 vols., London, 1812). *The O'Neills of Ulster: Their History and Genealogy*, by Thomas Mathews (3 vols., Dublin, 1907), an ill-arranged and uncritical work, has little historical value, but contains a mass of traditional and legendary lore, and a number of translations of ancient poems, and genealogical tables of doubtful authority. (R. J. M.)

O'NEILL, ELIZA (1791–1872), Irish actress, was the daughter of an actor and stage manager. Her first appearance on the stage was made at the Crow Street theatre in 1811 as the Widow Cheerly in *The Soldier's Daughter*, and after several years in Ireland she came to London and made an immediate success as Juliet at Covent Garden in 1814. For five years she was the favourite of the town in comedy as well as tragedy, but in the latter she particularly excelled, being frequently compared, not to her disadvantage, with Mrs Siddons. In 1819 she married William Wrixon Becher, an Irish M.P. who was created a baronet in 1831. She never returned to the stage, and died on the 29th of October 1872.

ONEONTA, a city in the township of the same name, in the south-central part of Otsego county, New York, U.S.A., on the N. side of the Susquehanna river, about 82 m. S.W. of Albany. Pop. (1880) 3002, (1890) 6272, (1900) 7147, of whom 456 were foreign-born, (1910, U.S. census) 9491. The city lies about 1100 ft. above sea-level. It is served by the Ulster & Delaware, by the Susquehanna division of the Delaware & Hudson, and by the Oneonta & Mohawk Valley (electric) railways. In Oneonta are a state normal school (1889), a state armoury, and the Aurelia Fox Memorial Hospital. The city is situated in a good agricultural region. The principal manufactures are machine-shop products (the Delaware & Hudson has repair and machine shops at Oneonta), knit goods, silk goods, lumber and planing mill products, &c. The first settlement was made about 1780. The township was erected in 1830 from parts of Milford and Otego. Oneonta was known as Milfordville until 1830, when it received its present name. It was first incorporated as a village in 1848, and was chartered as a city in 1908, the charter coming into effect on the 1st of January 1909. The name "Oneonta" is derived from Onahrenton or Onarenta, the Indian name of a creek flowing through the city.

See Edwin F. Bacon, *Otsego County, N.Y.* (Oneonta, 1902); and Dudley M. Campbell, *A History of Oneonta* (Oneonta, 1906).

ONESICRITUS, or ONESICRATES, of Aegina or Astypaleia (probably simply the "old city" of Aegina), one of the writers on Alexander the Great. At an advanced age he became a pupil of Diogenes the Cynic, and gained such repute as a student of philosophy that he was selected by Alexander to hold a conference with the Indian Gymnosophists. When the fleet was constructed on the Hydaspes, Onesicritus was appointed chief pilot (in his vanity he calls himself commander), and in this capacity accompanied Nearchus on the voyage from the mouth of the Indus to the Persian gulf. He wrote a diffuse biography of Alexander, which in addition to historical details contained descriptions of the countries visited, especially India. After the king's death, Onesicritus appears to have completed his work at the court of Lysimachus, king of Thrace. Its historical value was considered small, it being avowedly a panegyric, and contemporaries (including even Alexander himself) regarded it as untrustworthy. Strabo especially takes Onesicritus to task for his exaggeration and love of the marvellous. His *Paraplus* (or description of the coasts of India) probably formed part of the work, and, incorporated by Juba II. of Mauretania with the accounts of coasting voyages by Nearchus and other geographers, and circulated by him under the name of Onesicritus, was largely used by Pliny.

See Arrian, *Anabasis*, vi. 2; *Indica*, 32; Diogenes Laërtius vi. 75; Plutarch, *Alexander*, 46, 65; Strabo xv. 698; Pliny, *Nat. Hist.* vi. 26; Aulus Gellius ix. 4; fragments and life in C. W. Müller, appendix to F. Dübner's *Arrian* (1846); monograph by F. Lilie (Bonn, 1864); E. H. Bunbury, *Hist. of Ancient Geography*, i. (1879); Meier in Ersch and Gruber's *Allgemeine Encyclopädie*.

ONION (Fr. *oignon*, Lat. *unio*, liberally unity, oneness, applied to a large pearl and to a species of onion), *Allium Cepa* (nat. ord. Liliaceae), a hardy bulbous biennial, which has been cultivated in Britain from time immemorial, and is one of the earliest of cultivated species; it is represented on Egyptian monuments, and one variety cultivated in Egypt was accorded divine honours. It is commonly cultivated in India, China and Japan. A. de Candolle, arguing from its ancient cultivation and the antiquity of the Sanskrit and Hebrew names, regards it as a native of western Asia.

The onion should be grown in an open situation, and on a light, rich, well-worked soil, which has not been recently manured. In England the principal crop may be sown at any time from the middle of February to the middle of March, if the weather is fine and the ground sufficiently dry. The seed should be sown in shallow drills, 10 in. apart, the ground being made as level and firm as possible, and the plants should be regularly thinned, hoed and kept free from weeds. At the final thinning they should be set from 3 to 6 in. apart, the latter distance in very rich soil. About the beginning of September the crop is ripe, which is known by the withering of the leaves; the bulbs are then to be pulled, and exposed on the ground till well dried, and they are then to be put away in a store-room, or loft, where they may be perfectly secured from frost and damp.

About the end of August a crop is sown to afford a supply of young onions in the spring months. Those which are not required for the kitchen, if allowed to stand, and if the flower-bud is picked out on its first appearance, and the earth stirred about them, frequently produce bulbs equal in size and quality to the large ones that are imported from the Continent. A crop of very large bulbs may also be secured by sowing about the beginning of September, and transplanting early in spring to very rich soil. Another plan is to sow in May on dry poor soil, when a crop of small bulbs will be produced; these are to be stored in the usual way, and planted in rich soil about February, on ground made firm by treading, in rows about 1 ft. apart, the bulbs being set near the surface, and about 6 in. asunder. The White Spanish and Tripoli are good sorts for this purpose.

To obtain a crop of bulbs for pickling, seed should be sown thickly in March, in rather poor soil, the seeds being very thinly covered, and the surface well rolled; these are not to be thinned, but should be pulled and harvested when ripe. The best sorts for this crop are the Silver-skinned, Early Silver-skinned, Nocera and Queen.

Onions may be forced like mustard and cress if required for winter salads, the seeds being sown thickly in boxes which are to be placed in a warm house or frame. The young onions are of course pulled while quite small.

The *Potato Onion, Allium Cepa* var. *aggregatum*, is propagated by the lateral bulbs, which it throws out, under ground, in considerable numbers. This variety is very prolific, and is useful when other sorts do not keep well. It is sometimes planted about midwinter, and then ripens in summer, but for use during the spring and early summer it is best planted in spring. It is also known as the underground onion, from its habit of producing its bulbs beneath the surface.

The *Tree Onion* or *Egyptian Onion, Allium Cepa* var. *proliferum*, produces small bulbs instead of flowers, and a few offsets also underground. These small stem bulbs are excellent for pickling.

The *Welsh Onion* or *Ciboule, Allium fistulosum*, is a hardy perennial, native of Siberia. It was unknown to the ancients, and must have come into Europe through Russia in the middle ages or later. It forms no bulbs, but, on account of its extreme hardiness, is sown in July or early in August, to furnish a reliable supply of young onions for use in salads during the early spring. These bulbless onions are sometimes called Scallions, a name which is also applied to old onions which have stem and leaves but no bulbs.

The following are among the best varieties of onions for various purposes:—

For Summer and Autumn.—Queen; Early White Naples: these two sorts also excellent for sowing in autumn for spring salading. Silver-skinned; Tripoli, including Giant Rocca.

For Winter.—Brown Globe, including Magnum Bonum; White Globe; Yellow Danvers; White Spanish, in its several forms; Trébons, the finest variety for autumn sowing, attaining a large size early, ripening well, and keeping good till after Christmas; Ailsa Craig; Ronsham Park Hero; James's Keeping; Cranston's Excelsior; Blood Red, strong-flavoured.

For Pickling.—Queen, Early Silver-skinned, White Nocera, Egyptian.

ONOMACRITUS (*c.* 530–480 B.C.), seer, priest and poet of Attica. His importance lies in his connexion with the religious movements in Attica during the 6th century B.C. He had great influence on the development of the Orphic religion and mysteries, and was said to have composed a poem on initiatory rites. The works of Musaeus, the legendary founder of Orphism in Attica, are said to have been reduced to order (if not actually written) by him (Clem. Alex. *Stromata*, i. p. 143 [397]; Pausanias i. 22, 7). He was in high favour at the court of the Peisistratidae till he was banished by Hipparchus for making additions of his own in an oracle of Musaeus. When the Peisistratidae were themselves expelled and were living in Persia, he furnished them with oracles encouraging Xerxes to invade Greece and restore the tyrants in Athens (Herodotus vii. 6). He is also said to have been employed by Peisistratus in editing the Homeric poems, and to have introduced interpolations of his own (*e.g.* a passage in the episode of the visit of Odysseus to the world below). According to Pausanias (viii. 31, 3; 37, 5; ix. 35, 5) he was also the author of poems on mythological subjects.

See F. W. Ritschl, "Onomakritos von Athen," in his *Opuscula*, i. (1866), and p. 35 of the same volume; U. von Wilamowitz-Möllendorff, "Homerische Untersuchungen" (pp. 199-226 on the Orphic interpolation in *Odyssey*, λ 566–631), in Kiessling-Möllendorff, *Philologische Untersuchungen*, Heft 7 (1884).

ONOMATOPOEIA, literally the making or formation of words (Gr. *ὀνοματοποιία*, from *ὄνομα*, name, word, *ποιεῖν*, to make), hence a term used in philology for the formation of words by imitation of natural sounds, *e.g.* "hiss," "hush," "click." Modern philologists prefer the term "echoism," "echoic" for this process, as suggesting the imitative repetition of the sounds heard. At one time there was an exaggerated tendency to find in echoism a principal source in the origin and growth of language, ridiculed as the "bow-wow" theory of language; it is now recognized that it has played only a limited part.

ONONDAGA, a tribe of North American Indians of Iroquoian stock, forming one of the Six Nations. The tribal headquarters was about the lake and creek of the same name in New York state. Their territory extended northward to Lake Ontario and southward to the Susquehanna river. They were the official guardians of the council-fire of the Iroquois. Their chief town, near the site of the present Onondaga, consisted of some 140 houses in the middle of the 17th century, when the tribe was estimated as numbering between 1500 and 1700. During the 18th century the tribe divided, part loyally supporting the Iroquois league, while part, having come under the influence of French missionaries, migrated to the Catholic Iroquois settlements in Canada. Of those who supported the league, the majority, after the War of Independence, settled on a reservation on Grand river, Ontario, where their descendants still are. About 500 are upon the Onondaga reservation in New York state.

For Onondaga cosmology see *21st Ann. Report Bureau Amer. Ethnol.* (1899–1900).

ONOSANDER, or Onasander, Greek philosopher, lived during the 1st century A.D. He was the author of a commentary on the *Republic* of Plato, which is lost, but we still possess by him a short but comprehensive work (Στρατηγικός) on the duties of a general. It is dedicated to Quintus Veranius Nepos, consul 49, and legate of Britain. It was the chief authority for the military writings of the emperors Maurice and Leo, and Maurice of Saxony, who consulted it in a French translation, expressed a high opinion of it.

Edition by H. Köchly (1860); see also G. Rathgeber in Ersch and Gruber's *Allgemeine Encyclopädie.*

ONSLOW, EARL OF, a title borne by an English family claiming descent from Roger, lord of Ondeslowe in the liberty of Shrewsbury in the 13th century. Richard Onslow (1528–1571), solicitor-general and then Speaker of the House of Commons in the reign of Elizabeth, was grandfather of Sir Richard Onslow (1601–1664), who inherited the family estate on the death of his brother, Sir Thomas Onslow, in 1616. Sir Richard was a member of the Long Parliament, and during the great Rebellion was a colonel in the parliamentary army. He was a member of Cromwell's parliament in 1654 and again in 1656, and was also a member of his House of Lords. His son, Sir Arthur Onslow (1621–1688), succeeded in 1687 by special remainder to the baronetcy of his father-in-law, Sir Thomas Foot, lord mayor of London. Sir Arthur's son, Sir Richard (1654–1717), was Speaker of the House of Commons from 1708 to 1710, and chancellor of the exchequer in 1715. In 1716 he was created Baron Onslow of Onslow and of Clandon. He was uncle of Arthur Onslow, the famous Speaker (see below), whose only son George became 4th Baron Onslow on the death of his kinsman Richard in October 1776. The 4th baron (1731–1814) had entered parliament in 1754, and was very active in the House of Commons; and in May 1776, just before he succeeded to the family barony, he was created Baron Cranley of Imbercourt. He was comptroller and then treasurer of the royal household, and was present at the marriage of the prince of Wales, afterwards George IV., with Mrs Fitzherbert in 1785. In 1801 he was created Viscount Cranley and earl of Onslow; and he died at his Surrey residence, Clandon Park, on the 17th of May 1814. The second earl was his eldest son Thomas (1754–1827), whose son Arthur George (1777–1870), the 3rd earl, died without surviving male issue in October 1870. He was succeeded by his grand-nephew, William Hillier, 4th earl of Onslow (b. 1853), who was governor of New Zealand from 1888 to 1892; under-secretary for India from 1895 to 1900; and under-secretary for the Colonies from 1900 to 1903. From 1903 to 1905 he was a member of the Conservative cabinet as president of the board of agriculture.

ONSLOW, ARTHUR (1691–1768), English politician, elder son of Foot Onslow (d. 1710), was born at Chelsea on the 1st of October 1691. Educated at Winchester and at Wadham College, Oxford, he became a barrister and in 1720 entered parliament as a member for the borough of Guildford. Seven years later he became one of the members for Surrey, and he retained this seat until 1761. In 1728 he was elected Speaker of the House of Commons, being the third member of his family to hold this office; he was also chancellor to George II.'s queen, Caroline, and from 1734 to 1742 he was treasurer of the navy. He retired from the position of Speaker and from parliament in 1761, and enjoyed an annuity of £3000 until his death on the 17th of February 1768. As Speaker, Onslow was a conspicuous success, displaying knowledge, tact and firmness in his office; in his leisure hours he was a collector of books.

Speaker Onslow's nephew, George Onslow (1731–1792), a son of his brother Richard, was a lieutenant-colonel and member of parliament for Guildford from 1760 to 1784. He had a younger brother Richard (1741–1817), who entered the navy and was made an admiral in 1799.

ONTARIO, a province of Canada, having the province of Quebec to the E., the states of New York, Ohio, Michigan, Wisconsin, and Minnesota to the S., Manitoba to the W., and the district of Keewatin with James Bay to the N. In most cases the actual boundary consists of rivers or lakes, the Ottawa to the north-east, the St Lawrence and its chain of lakes and rivers to the south as far as Pigeon river, which separates Ontario from Minnesota. From this a canoe route over small rivers and lakes leads to the Lake-of-the-Woods, which lies between Ontario, Minnesota and Manitoba; and English and Albany rivers with various lakes carry the boundary to James Bay. From Lake Temiscaming northwards the boundary is the meridian of 79° 30′.

Physical Geography.—Ontario extends 1000 m. from E. to W. and more than 700 m. from N. to S., between latitudes 55° and 42°, including the most southerly point in Canada. Its area is 260,862 sq. m. (40,354 water), and it is the most populous of the provinces, nine-tenths of its inhabitants living, however, in one-tenth of its area, between the Great Lakes, the Ottawa and the St Lawrence. This forms part of the plain of the St Lawrence, underlain by Palaeozoic limestones and shales, with some sandstone, all furnishing useful building material and working up into a good soil. The lowest part of the plain, including an area of 4500 sq. m. lying between elevations of 100 and 400 ft., was covered by the sea at the close of the Ice Age, which left behind broad deposits of clay and sand with marine shells.

The south-western part is naturally divided into two tracts by the Niagara escarpment, a line of cliffs capped by hard Silurian limestones, running from Queenston Heights near the falls of Niagara west to the head of Lake Ontario near Hamilton, and then north-west to the Bruce Peninsula on Georgian Bay. The tract north-east of the escarpment has an area of 9000 sq. m. and an altitude of 400 to 1000 ft., and the south western tract includes 15,000 sq. m. with an elevation of 600 to 1700 ft. In the last petroleum, natural gas, salt and gypsum are obtained, but elsewhere in southern Ontario no economic minerals except building materials are obtained. Covering the higher parts of the south-western Palaeozoic area in most places are rolling hills of boulder clay or stony moraines; while the lower levels are plains gently sloping toward the nearest of the Great Lakes and sheeted with silt deposited in more ancient lakes when the St Lawrence outlet was blocked with ice at the end of the glacial period. The old shore cliffs and gravel bars of these glacial lakes are still well-marked topographical features, and provide favourite sites for towns and cities. London, for example, is built on the old shore of Lake Warren, the highest of the extinct lakes; and St Catharines, Hamilton and Toronto are on the old shore of Lake Iroquois, the lowest. The Niagara escarpment mentioned above, generally called "the mountain" in Ontario, is the cause of waterfalls on all the rivers which plunge over it, Niagara Falls being, of course, the most important; and in most cases these falls have eaten their way back into the tableland, forming deep gorges or canyons like that below Niagara itself, through which the water pours as violent rapids. Between the Palaeozoic area near Ottawa, and Georgian Bay to the north of the region just referred to, there is a southward projection of the Archaean protaxis consisting of granite and gneiss of the Laurentian, enclosing bands of crystalline limestone and schists, which are of interest as furnishing the only mines of "Old Ontario." From these rocks in the Ottawa valley are quarried or mined granite, marble, magnificent blue sodalite, felspar, talc, actinolite, mica, apatite, graphite and corundum; the latter mineral, which occurs on a larger scale here than elsewhere, is rapidly replacing emery as an abrasive. Several metals have been mined also, including gold, copper, lead, iron and arsenic; but the amounts produced have not been great, and many of the mines are no longer working.

While all the larger cities and most of the manufacturing and farming districts of the province belong to old Ontario, there is now in process of development a "New Ontario," stretching for hundreds of miles to the north and north-west of the region just described and covering a far larger area, chiefly made up of Laurentian and Huronian rocks of the Archaean protaxis. The rocky hills of the tableland to the north long repelled settlement, the region being looked on by the thrifty farmers of the south as a wilderness useless except for its forests and its furs; and unfortunate settlers who ventured into it usually failed and went west or south in search of better land. Gradually, however, areas of good soil were opened up, in the Rainy river valley, near Lake Temiscaming and elsewhere, and mines of various kinds were discovered, as the Canadian Pacific railway and its branches extended through the region, and at length the finding of very rich silver mines attracted world-wide attention to northern Ontario. In the better explored parts along the great lakes and the railways, ores of gold, silver, nickel, cobalt, antimony, arsenic, bismuth and molybdenum have been obtained, and several important mines have been opened up. Gold has been found at many points across the whole province, from the mines of the Lake-of-the-Woods on the west to the discoveries at Larder Lake on the east; but in most cases the returns have been unsatisfactory, and only a few of the gold mines are working. Silver mines have proved of far greater importance, in early days near Thunder Bay on Lake Superior, more recently in the cobalt region near Lake Temiscaming on the east side of the province. Silver Islet mine in Lake Superior produced in all $3,250,000 worth of silver, but this record will no doubt be surpassed by some of the mines in the extraordinarily rich cobalt district. The veins are small, but contain native silver and other rich silver ores running sometimes several thousand ounces per ton, the output being 5,500,000 oz. in 1906. Associated with the silver minerals are rich ores of cobalt and nickel, combined with arsenic, antimony and sulphur, which would be considered valuable if occurring alone, but are not paid for under present conditions, since they are difficult to separate and refine. The cobalt silver ores are found mainly in Huronian conglomerate, but also in older Keewatin rocks and younger diabase, and the silver-bearing region, which at first included only a few square miles, is found to extend 25 m. to the west and as much to the north. Up to the present the most important mineral product of Ontario is nickel, which is mined only in the neighbourhood of Sudbury, where the ores occur in very large deposits, which in 1905 produced 9503 tons, more than half of the world's supply of the metal. With the nickel copper is always found, and copper ores are worked on their own account in a few localities, such as Bruce mines. Iron ores have been discovered in many places in connexion with the "iron formation" of the Keewatin, but nowhere in amounts comparable with those of the same formation in Michigan and Minnesota. The total mineral output of Ontario, including building materials and cement, is larger than that of any other province of the dominion, and as more careful exploration is carried on in the northern parts, no doubt many more deposits of value will be discovered. It has been found that northern Ontario beyond the divide between the Great Lakes and Hudson Bay possesses many millions of acres of arable land, clay deposits in a post-glacial lake, like those in the southern part of the province, running from east to west from Lake Abitibbi to a point north of Lake Nipigon. Railways are opening up this tract. The clay belt is in latitudes south of Winnipeg, with a good summer climate but cold winters. The spruce timber covering much of the area is of great value, compensating for the labour of clearing the land.

Lakes and Rivers.—All parts of Ontario are well provided with lakes and rivers, the most important chain being that of the St Lawrence and the Great Lakes with their tributaries, which drain the more populous southern districts, and, with the aid of canals, furnish communication by fairly large vessels between the lower St Lawrence and the Lake Superior. Lake Nipigon, a beautiful body of water 852 ft. above the sea, 70 m. long and 50 m. wide, may be looked upon as the headwaters of the St Lawrence, since Nipigon river is the largest tributary of Lake Superior, though several other important rivers, such as the Kaministiquia, the Pic and the Michipicoten, enter it from the north. All these rivers have high falls not far from Lake Superior, and Kakebeka Falls on the Kaministiquia supplies power to the twin cities of Fort William and Port Arthur, while the deep water of its mouth makes the great shipping port for western wheat during the summer. The north shore of Lake Superior is bold and rugged with many islands, such as Ignace and Michipicoten, but with very few settlements, except fishing stations, owing to its rocky character. At the south-eastern end St Mary's river carries its waters to Lake Huron, with a fall of 602 to 581 ft., most of which takes place at Sault Sainte Marie, where the largest locks in the world permit vessels of 10,000 tons to pass from one lake to the other, and where water-power has been greatly developed for use in the rolling mills and wood pulp industry. The north-east shores of Lake Huron and its large expansion Georgian Bay are fringed with thousands of islands, mostly small, but one of them, Manitoulin Island, is 80 m. long and 30 m. broad. French river, the outlet of Lake Nipissing, and Severn river, draining Lake Simcoe, come into Georgian Bay from the east, and canals have been projected to connect Lake Huron with the St Lawrence by each of these routes, the northern one to make use of the Ottawa and the southern one of Trent river. The Trent Valley canal is partly in operation. Georgian Bay is cut off from the main lake by Manitoulin Island and the long promontory of Bruce Peninsula. Lakes Superior and Huron both reach depths hundreds of feet below sea-level, but the next lake in the series, St Clair, towards which Lake Huron drains southward through St Clair river, is very shallow and marshy. Detroit river connects Lake St Clair with Lake Erie at an elevation of 570 ft.; and this comparatively shallow lake, running for 240 m. east and west, empties northwards by Niagara river into Lake Ontario, which is only 247 ft. above the sea. Niagara Falls, with rapids above and below, carry the waters of the upper lakes over the Niagara escarpment. Power from the falls is put to use in New York state and Ontario, a large amount being sent to Toronto 80 m. away. Welland canal, between Port Colborne on Lake Erie and Dalhousie on Lake Ontario, carries vessels of 14 ft. draught from one lake to the other. From Lake Ontario the St Lawrence emerges through the meshes of the Thousand Islands, where it crosses Archaean rocks, after which follow several rapids separated by quieter stretches before Montreal is reached at the head of ocean navigation. Steamers not of too great draught can run the rapids going down, but vessels must come up through the canals. All the other rivers in southern Ontario are tributaries of the lakes or of the St Lawrence, the Ottawa, navigable in many parts, being the largest, and the Trent next in importance. In northern Ontario lakes are innumerable and often very picturesque, forming favourite summer resorts, such as Lake Temagami, the Muskoka Lakes and Lake-of-the-Woods. The latter lake with Rainy Lake and other connected bodies of water belong to the Hudson Bay system of waters, their outlet being by Winnipeg river to Lake Winnipeg, from which flows Nelson river. In Ontario the Albany, Moose, Missanabi and Abitibbi flow into Hudson Bay, but none of these rivers is navigable except for canoes.

Climate.—The climate of Ontario varies greatly, as might be expected from its wide range in latitude and the relationships of the Great Lakes to the southern peninsula of the province. The northern parts as far south as the north shore of Lake Superior have long and cold but bright winters, sometimes with temperatures reaching 50° F. below zero; while their summers are delightful, with much sunshine and some hot days but pleasantly cool nights. Between Georgian Bay and Ottawa the winters are less cold, but usually with a plentiful snowfall; while the summers are warm and sometimes even hot. The south-west peninsula of Ontario has its climate greatly modified by the lakes which almost enclose it. As the lakes never freeze, the prevalent cold north-west winds of North America are warmed in their passage over them, and often much of the winter precipitation is in the form of rain, so that the weather has much less certainty than in the north. The summers are often sultry, though the presence of the lakes prevents the intense heat experienced in the states to the west and south. Owing to the mildness of its winters, the south-west peninsula is a famous fruit country with many vineyards and orchards of apples, plums and peaches. Indian corn (maize) is an important field crop, and tobacco is cultivated on a large scale. Small fruits and tomatoes are widely grown for the city markets and for canning, giving rise to an important industry. The normal temperatures (Fahr.) for three points in the south-western, eastern and north-western portions are given below:—

	Toronto.	Ottawa.	Port. Arthur.
December, January and February .	23·7	13·3	7·3
March, April and May	40·6	38·5	31·1
June, July and August	65·4	67·4	58·9
September, October and November	47·0	44·8	38·5
	in.	in.	in.
Average annual precipitation . .	33·944	32·650	23·580

(A. P. C.)

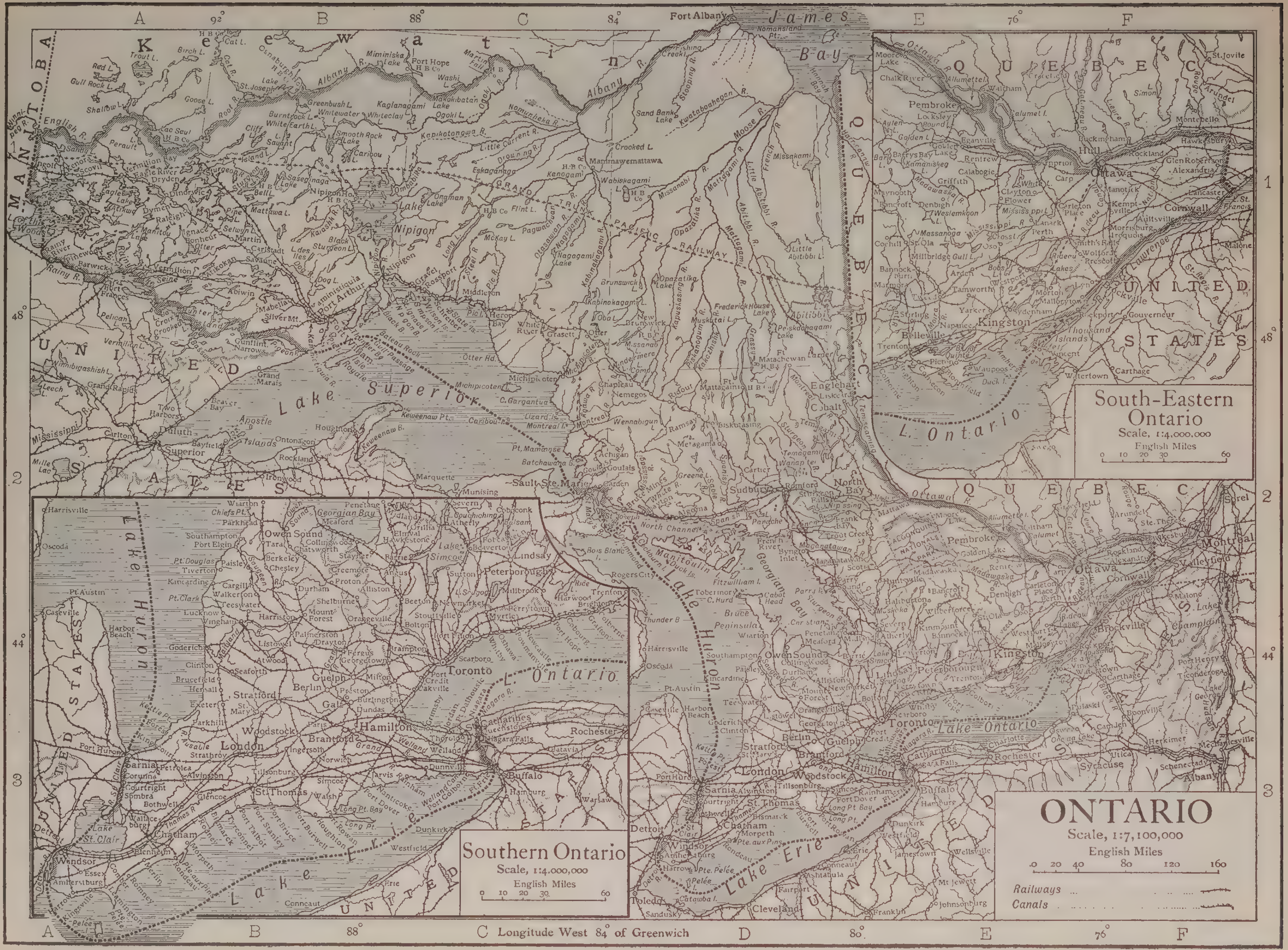
Population.—The following table shows the population of the province:—

	1881.	1891.	1901.
[1] Townships.	1,346,623	1,283,281	1,247,190
[2] Towns and villages .	323,188	432,912	935,757
Cities	257,111	398,128	
	1,926,922	2,114,321	2,182,947

[1] The name given to the rural municipalities.

[2] Any town in Canada can become incorporated as a city on attaining a population of 10,000.

Ontario is thus pre-eminently an agricultural province, though the growth of manufactures has increased the importance of the towns and cities, and many of the farmers are seeking new homes in the provinces of Manitoba, Alberta and Saskatchewan. This emigration accounts in large measure for the slow increase of the population, though there has also been a slight decrease in the birth-rate. The population was long entirely confined to the southern and eastern sections of the province, which comprise an area of about 33,000 sq. m.; but in these districts it is now stationary or decreasing, whereas the northern and western portions are filling up rapidly. Toronto, the provincial capital, has grown from 59,000 in 1871 to about 300,000, partly through the absorption of neighbouring towns and villages. Other


ONTARIO
Scale, 1:7,100,000
English Miles
0 20 40 80 120 160
Railways
Canals
South-Eastern Ontario
Scale, 1:4,000,000
English Miles
0 10 20 30 60
Southern Ontario
Scale, 1:4,000,000
English Miles
0 10 20 30 60
Longitude West 84° of Greenwich
A B C D E F
92° 88° 84° 80° 76°
48° 44°
1 2 3
MANITOBA
Keewatin
QUEBEC
UNITED STATES
James Bay
Lake Superior
Lake Huron
Georgian Bay
Lake Erie
Lake Ontario
L. Ontario
Fort Albany
Port Arthur
Fort William
Sault Ste. Marie
Sudbury
North Bay
Ottawa
Toronto
Hamilton
London
Kingston
Windsor
Montreal
Buffalo
Detroit
Duluth
GRAND TRUNK PACIFIC RAILWAY

Emery Walker sc.

important cities are Ottawa (the capital of the Dominion) (59,928 in 1901), Hamilton (52,634), London (37,981), Kingston (17,961). The number of males slightly exceeds that of females. The population is chiefly of British descent, though in the eastern counties numerous French Canadians are flocking in from Quebec and in some instances by purchase of farms replacing the British. There are also about 20,000 Indians, many of whom are civilized, enjoy the franchise and are enrolled in the Dominion militia. There is no state Church, though buildings devoted to religious purposes are almost wholly exempt from municipal taxation. The Methodists are, numerically, the strongest religious body, then come Presbyterians, Roman Catholics and Anglicans, in the order named.

Administration.—The executive power is vested in a lieutenant-governor appointed for five years by the federal government, and assisted by an executive council, who have seats in and are responsible to the local legislature. This consists of one house only, of 106 members, elected by what is practically manhood suffrage.

The municipal system still embodies the spirit and purpose of the Baldwin Municipal Act which originated it in 1849. Though based rather on the simple English model than on the more complicated municipal governments of the United States, it has certain features of its own, and is revised from year to year. On it have been modelled the municipal systems of the other provinces. Municipal ownership does not prevail to any extent, and in the larger cities the powers of certain great corporations have tended to cause friction, but such matters as the provision of electric power and light are gradually being taken in hand both by the municipalities and by the province, and a railway and municipal board appointed by the local legislature has certain powers over the railways and electric tramlines.

Finance.—By the British North America Act, which formed in 1867 the Dominion of Canada, the provinces have the right of direct taxation only. Against this, however, a strong prejudice exists, and in Ontario the only direct taxation takes the form of taxes on corporations (insurance, loan and railway companies), succession duties, liquor licences, &c. These, together with returns from various investments, earnings of provincial buildings, &c., yield about one-third of the revenue. Another third comes from the Dominion subsidy, granted in lieu of the power of indirect taxation, and the remainder from the sale or lease of crown lands, timber and minerals. Owing to the excellence of the municipal system there has been a tendency to devolve thereon, in whole or in part, certain financial burdens on the plea of decentralization. The finances of the province have been well administered, and only in recent years has a debt been incurred, chiefly owing to the construction of a provincial railway to aid in the development of the northern districts.

Education.—As early as 1797 500,000 acres of crown lands were set apart for educational purposes, and a well-organized system of education now exists, which, since 1876, has constituted a department of the provincial government. A laudable attempt has been made to keep the education department free from the vagaries and the strife of party politics, and the advantages of political control have been as much felt as its drawbacks. Since 1906 a superintendent has been appointed with large powers, independent of political control and with the assistance of an advisory council; attention is also paid to the advice of the provincial Educational Association, which meets yearly at Toronto.

School attendance is compulsory between the ages of eight and fourteen, and is enforced by truant officers. The primary or public schools are free and undenominational. They cannot, however, be called secular, as they are opened and closed with the Lord's Prayer and closed with the reading of the Bible. From these religious exercises any children may absent themselves whose parents profess conscientious objections. After a long and bitter struggle the Roman Catholics won in 1863 the right to separate schools. These may be set up in any district upon the request of not less than five heads of families. The rates levied on their supporters are devoted exclusively to the separate schools, which also share *pro rata* in the government grant. Although many Roman Catholic children attend the public schools, the number of separate schools is, under the influence of the priesthood, steadily increasing. Under certain conditions, Protestants and coloured persons may also claim separate schools, but of these only four or five exist. Numerous kindergartens have been established in the cities.

Secondary education is imparted in high schools and collegiate[1] institutes. These may exact fees or give free education at the option of the local trustees. There are also numerous private schools. Of these such as are incorporated are aided by exemption from municipal taxation. In and around Toronto are numerous boarding schools and colleges, of which those for boys are on the model of the great public schools of England. Of these the most celebrated is Upper Canada College, founded in 1829, and long part of the educational system of the province, but now under private control.

The provincial university is situated in Toronto, and since 1906 has been governed by an independent board, over which a power of veto is retained by the lieutenant-governor in council. With the affiliated colleges, it had in 1908 a staff of 356, and 3545 students. There are also numerous universities throughout the province, founded in early days by the various religious bodies. Of these Victoria (Methodist) and Trinity (Anglican) are in Toronto, and have become federated with the provincial university, in which they have merged their degree-conferring powers. MacMaster (Baptist) is also in Toronto, and retains its independence. The others are Queen's University, Kingston (Presbyterian); the Western University, London (Anglican); and the university of Ottawa (Roman Catholic). Women students are admitted to all the universities save Ottawa on the same terms as men, and form nearly one-third of the whole number of students. Theological colleges are supported by the various religious bodies, and are in affiliation with one or other of the universities.

The public and high schools tend rather to follow American than British methods, though less freedom is allowed to the local authorities than in most of the American states. Only those text books authorized by the central department may be used. Free text books may be issued at the discretion of the local authorities, but in most cases are provided by parents. Every school, public, separate or high, shares in the provincial grant, but the chief financial burden falls on the local authorities.

Owing to the low rate of salaries, the percentage of women teachers, especially in the public schools, is steadily increasing, and now amounts in these to almost 83%. The same cause has also reduced their age, and the teachers are in many cases exceedingly immature. The institution of a minimum salary by the provincial department led to such resistance that it was withdrawn, but a distinct advance in salaries has taken place since 1906. In the rural districts an attempt is being made to increase efficiency by the consolidation of several small schools and the conveyance of the children to one central building.

The curriculum, originally modelled on that of England, is being gradually modified by the necessities of a new country. In addition to the ordinary literary and scientific subjects, manual training, domestic science, agriculture and kindred subjects are taught in the public and high schools, and in the larger towns technical institutes are being founded. Many of the rural schools have gardens, in which the elements of agriculture, botany and kindred subjects are taught in a practical manner. Travelling libraries are sent through the country districts, and an attempt is being made to extend similar aid to the lumber-camps.

The training of teachers is carefully supervised. Numerous model and normal schools exist, and a well-equipped normal college at Toronto. The smaller county model schools have, since 1906–1907, been consolidated and centralized in the larger towns.

At Guelph is the Ontario Agricultural College, founded and endowed by the provincial government, and greatly enlarged and improved by the generosity of Sir William Macdonald (b. 1832). Its services in placing provincial agriculture on a scientific basis cannot be over-estimated. The government also maintains an institute for the deaf and dumb at Belleville and for the blind at Brantford. At Kingston it supports a dairy school and a large school of mining.

Agriculture.—About three-fifths of the inhabitants are engaged in agricultural pursuits, and in 1910 the amount invested in lands, buildings, implements and stock was double that invested in the manufactures of the whole Dominion. Nearly all the farms are worked by their owners, and a simple and efficient system of land-transfer is in use. The farming population in the older parts of the province tends to decline in numbers, owing to emigration, partly to the towns, but especially to the newer lands of Manitoba and the west. Yet, owing to the increasing use of scientific implements and methods promoted by the federal and provincial governments, the total value of agricultural products increased by over 50% between 1881 and 1910. In general, the soil is fertile and the climate favourable. The district north of the Height of Land, long supposed to be a barren wilderness, has proved in part suitable for agriculture, and is steadily increasing in population. Mixed farming and the raising of live stock is becoming more and more the rule, so that the failure of any one crop becomes of less vital importance. The average farm varies in size from 100 to 200 acres. Wheat, barley, oats, peas, potatoes and other roots are staple crops, the average yield of wheat being about 20 bushels an acre; cattle are increasing in number and improving in quality, and all branches of dairy farming prosper. Owing to tariff restrictions, the United States' market is being more and more abandoned, and improvements in cold storage are making it possible to export to Great Britain increasing quantities of butter and cheese. The collection of milk by the creameries and cheese-factories is carried on with great efficiency. The number of horses and sheep is stationary or declining, but the raising of hogs, formerly abandoned in great part to the western states, is becoming an increasing industry. Large quantities of peas, corn, tomatoes and other vegetables are canned, chiefly for home consumption. Three-quarters of the orchard lands of Canada are in Ontario, the chief crops being apples and peaches. The cultivation of the latter centres in the Niagara peninsula, but apples flourish along the great lakes and the St Lawrence from Goderich to Cornwall. In Essex and Kent, and along the shore of Lake Erie, tobacco and grapes form a staple crop, and wine of fair quality is produced.

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[1] A high school is raised to the rank of collegiate institute on complying with certain provisions, chief among which are the employment of at least four teachers with Degrees in Honours from a recognized Canadian university. Such an institution receives a slightly larger government grant.

Lumber.—Slightly less than half remains of the forest which once covered the whole province. The lumber industry exceeds that of any other part of the Dominion, though Quebec possesses greater timber areas untouched. The numerous lakes and rivers greatly facilitate the bringing of the timber to market. All trees were long little thought of in comparison with the pine, but of late years poplar and spruce have proved of great value in the making of paper pulp, and hard-wood (oak, beech, ash, elm, certain varieties of maple) is becoming increasingly valuable for use in flooring and the making of furniture. In the spring the making of syrup and sugar from the sap of the sugar-maple is a typical industry.

Much splendid timber has been needlessly destroyed, chiefly by forest-fires, but also by improvident farmers in their haste to clear the land. Increased attention is now being paid by both provincial and federal governments to preservation and to reforestation. Special areas have been set apart on which no timber may be cut, and on which the problems of scientific forestry may be studied. Of these, the earliest was the Algonquin National Park, which also forms a haven of refuge for the wild creatures.

Northern Ontario is still a valuable fur-bearing and hunting country, moose, caribou, fox, bear, otter, mink and skunk being found in large quantities. Wolves, once numerous, have now been almost extirpated, though a bounty on each head is still paid.

Minerals.—The geographical distribution of the great mineral wealth of Ontario has already been indicated (see *Physical Geography*, above). Save for beds of lignite, said to exist in the extreme north, coal is not found and has to be imported, chiefly from the states of Ohio and Pennsylvania, though Nova Scotia furnishes an increasing quantity. The production of iron is stimulated by federal and provincial bounties. The province supplies over two-thirds of the iron ore mined in the Dominion, but much is still imported. The output of gold is decreasing. The nickel mines in the neighbourhood of Sudbury are the largest in the world, outrivalling those of New Caledonia. In the same district, and chiefly in connexion with the nickel mines, large quantities of copper are produced. When in 1905 the rich silver area was found in northern Ontario, a rush was made to it, comparable to those to the Australian and Californian goldfields. Cobalt, the centre of this area, is 103 m. from North Bay by the provincial railway (Temiscaming & North Ontario railway). In the same neighbourhood are found cobalt, arsenic and bismuth. In the older districts of the province are found petroleum and salt. The district around Petrolea produces about 30,000,000 gallons of petroleum yearly, practically the whole output of the dominion. Salt is worked in the vicinity of Lake Huron, but the production is less than half that imported. Natural gas is produced in the counties of Welland and Essex, and exported in pipes to Buffalo and Detroit. Among the less important metals and minerals which are also mined, is corundum of especial purity.

Manufactures and Commerce.—Manufactures are becoming of increasing importance. The obstacle due to lack of coal is offset by the splendid water powers afforded by the rapid streams in all parts of the province. Save for the flour and grist mills, few do more than supply the markets of the Dominion, of which they control an increasing portion. Woollen mills, distilleries and breweries and manufactures of leather, locomotives and iron-work, furniture, agricultural implements, cloth and paper are the chief. The great agricultural development of the western provinces, in which manufactures are little advanced, has given a great impetus to the industries of the older provinces, especially Ontario.

Communications.—Numerous lakes and rivers afford means of communication, and obstacles thereon have been largely overcome by canals (see CANADA). Railways gridiron the province, which contains over one-third the total mileage of the dominion; their construction is aided by provincial and municipal subsidies, in addition to that paid by the federal government. The provincial government owns a line running north from North Bay, operated by a board of commissioners. The other railways are owned by private companies, but are subject to the decisions of a federal railway commission. The provincial railway and municipal board also exercises control, especially over the city and suburban electric lines.

History.—The first white man known to have set foot in what is now Ontario was Champlain. In 1613 he explored the Ottawa river as far as Allumette Island; in 1615, starting from Montreal, he reached the Georgian Bay by way of the Ottawa river, Lake Nipissing and French river, and then by way of Lakes Couchiching and Simcoe and the Trent river system of lakes and streams made his way to Lake Ontario, called by him Entouhoronon. The winter of 1615–1616 he spent among the Huron Indians, near the Georgian Bay. In 1615 a mission among these Indians was founded by the Recollet friars, and carried on with great success and devotion by the Jesuits, but in 1648–1650 the Huron nation was almost utterly destroyed by an invasion of their hereditary foes, the Iroquois. From its centre at Quebec French civilization extended along the Mississippi and the Great Lakes, and also northwards to Hudson's Bay. In the western country numerous posts were founded, wherein fur-trader and missionary were often at variance, the trader finding brandy his best medium of exchange, while the missionary tried in vain to stay its ravages among his flock. On the frontiers of what is now Ontario the chief points were at the strategic centres of Fort Frontenac (now Kingston), Niagara, Michilimackinac and Sault-Ste-Marie. Farther north, in what is now New Ontario, their English rivals, the Hudson's Bay Company, had more or less permanent posts, especially at Fort Albany and Moose Factory.

With the cession of French North America to Great Britain in 1763, the Indian lords of the soil rose under Pontiac in a last attempt to shake off the white man, and in 1763–1765 there was hard fighting along the western frontier from Sault-Ste-Marie to Detroit. Thereafter for almost twenty years, Ontario was traversed only by wandering bands of trappers, chiefly belonging to the Hudson's Bay Company; but in 1782 bands of American loyalists began to occupy the fertile country along the Bay of Quinté, and in the Niagara peninsula, the first settlement being made in 1782 at Kingston. Between 1782–1784 about 5000 loyalists entered Ontario, and were given liberal grants of land by the British government.

The oligarchic constitution established in Canada in 1774 by the Quebec Act did not suit men trained in the school of local self-government which Britain had unwittingly established in the American colonies, and the gift of representative institutions was soon necessary. In the debates in the British parliament Fox urged that the whole territory should remain one province, and of this the governor-general, the 1st baron Dorchester (*q.v.*), was on the whole in favour, but in 1791 Pitt introduced and carried the Constitutional Act, by which Upper and Lower Canada were separated. The Ottawa river was chosen as the main boundary between them, but the retention by Lower Canada of the seigneuries of New Longueuil and Vaudreuil, on the western side of the river, is a curious instance of the triumph of social and historical conditions over geographical. To the new province were given English civil and criminal law, a legislative assembly and council and a lieutenant-governor; in the words of its first governor, Colonel John Graves Simcoe, it had, "the British Constitution, and all the forms which secure and maintain it." Simcoe set to work with great energy to develop the province, but he quarrelled with the governor-general over his pet scheme of founding military colonies of retired soldiers in different parts of the province, and retired in 1796. Even before his retirement political feuds had broken out, which increased in bitterness year by year. In so far as these had other causes than the Anglo-Saxon love of faction, they were due to the formation by the loyalists, their descendants and hangers-on of a clique who more and more engrossed political and social power. The English church also formed a quasi-official clerical oligarchy, and the land reserved by the Constitutional Act for the support of "a protestant clergy" formed a fruitful source of bitterness.

For a time the War of 1812–1814 with the United States put an end to the strife. The war gave some heroic traditions to the province, and in special cemented that loyalty to Great Britain for which Ontario has been conspicuous. On the other hand, the natural dislike of the United States felt by the loyalists and their descendants was deepened and broadened, and has not yet wholly died away, especially among the women of the province. The jobbing of land by the official clique, whose frequent intermarriages won for them the name of "The Family Compact," the undoubted grievance of the "Clergy Reserves" and the well-meaning high-handedness and social exclusiveness of military governors, who tried hard but unavailingly to stay the democratic wave, soon revived political discord, which found a voice in that born agitator, William Lyon Mackenzie. A wiser but less vigorous reformer was Robert Baldwin, who saw that in responsible government lay the cure for the political green-sickness from which Upper Canada was suffering. But though Baldwin and Mackenzie were in the right, it is very doubtful whether their party could at the time have given the country as cheap and efficient a civil service as was given by the Family Compact, who had at least education and an honourable tradition.

In 1837 discontent flared up into a pitiful little rebellion, led by Mackenzie. This tragical farce was soon at an end and its author a fugitive in the United States, whence he instigated bands of hooligans to make piratical attacks upon the Canadian frontier. Thus forcibly reminded of the existence of Canada, the British government sent out Lord Durham to investigate, and as a result of his report the two Canadas were in 1841 united in a legislative union.

Meanwhile the southern part of the province had been filling up. In 1791 the population was probably under 20,000; in 1824 it was 150,066, and in 1841, 455,688. The eastern counties of Stormont and Glengarry, and parts of the western peninsula, had been settled by Highlanders; the Canada Company, organized in 1825 by the Scottish novelist, John Galt, had founded the town of Guelph, had cleared large tracts of land in the western peninsula, and settled thereon hundreds of the best class of English and Scotch settlers.

Once granted responsible government, and the liberty to make her own mistakes, Upper Canada went ahead. The population rose to 952,004 in 1851 and to 1,396,091 in 1861. Politically she found Lower Canada an uneasy yoke-fellow. The equality of representation, granted at the union, at first unfair to Lower Canada, became still more unfair to Upper Canada, as her population first equalled and then surpassed that of her sister province. The Roman Catholic claim to separate state-aided schools, at length conceded in 1863, long set the religious bodies by the ears. Materially the province prospered. The "Clergy Reserves" were secularized in 1854, and in 1851 began a railway development, the excitement and extravagance caused by which led in 1857 to a financial crisis and the bankruptcy of various municipalities, but which on the whole produced great and lasting benefit. The Reciprocity Treaty with the United States, in operation from 1854 to 1866, and the high prices for farm produce due to the American Civil War, brought about an almost hectic prosperity. In the discussions from which sprang the federation of 1867, Ontario was the one province strongly in favour of the union, which was only rendered possible by the coalition of her rival leaders, J. A. Macdonald and George Brown.

Since Federation Upper Canada has been known as the province of Ontario. The first provincial government, formed on coalition lines by John Sandfield Macdonald, was thrifty and not unprogressive, but in 1871 was defeated by a reorganized liberal party, which held power from 1871 to 1905, and on the whole worthily. Under Oliver Mowat, premier from 1873 to 1896, the government, though strongly partisan, was thrifty and honest. An excellent system of primary and secondary schools was organized by Egerton Ryerson (1803–1882) and G. W. Ross (*q.v.*), higher education was aided and a school of practical science established in Toronto and of mining in Kingston; agriculture was fostered, and an excellent agricultural college founded at Guelph in 1874.

The great struggle of the time was with the federal government on the question of provincial rights. Several questions in which Ontario and the Dominion came into conflict were carried to the Judicial Committee of the Privy Council, and in all of them Mowat was successful. Connected with this was the boundary struggle with Manitoba, the latter province being aided by the federal government, partly out of dislike for Mowat, partly because the crown lands in the disputed territory would, had it been adjudged to Manitoba, have been under federal control. Had Manitoba won, the boundary line would have been drawn about 6 m. east of Port Arthur, but in 1884 the Judicial Committee of the Privy Council unanimously decided in favour of Ontario; and in 1888 another decision gave her absolute control of the crown lands of New Ontario. Under Mowat's successors the barnacles which always attach to a party long in power became unpleasantly conspicuous, and in January 1905 the conscience of Ontario sent the conservatives into power, more from disgust at their opponents than from any enthusiasm for themselves. The new government displayed unexpected energy, ability and strength. The primary and model schools were consolidated and improved; the provincial university was given increased aid from the succession duties; various public utilities, previously operated by private companies, were taken over by the province, and worked with vigour and success. At the election of the 8th of June 1908 the conservative government was returned by an increased majority.

Bibliography.—*Statistical:* The various departments of the provincial government publish annual reports, and frequent special reports. Among these may be noted those of the Bureau of Mines and the archaeological reports by David Boyle (1886–1906). Since 1889 the university of Toronto has published numerous valuable studies on historical, economic and social questions, *e.g.* Adam Shortt, *Municipal Government in Ontario*.

Historical: The early history of the province is best given in the general histories of Canada by MacMullen and Kingsford (see Canada). Ernest Cruikshanks has published numerous excellent studies on the Ontario section of the War of 1812. Lord Durham's celebrated *Report* (1839, reprinted 1902) is less trustworthy on Ontario than on Quebec. R. and K. M. Lizar's *In the Days of the Canada Company* depicts the life of the early settlers. Biographies exist of most of the chief men: C. R. W. Biggar, *Sir Oliver Mowat* (2 vols., 1905), is practically a history of Ontario from 1867 to 1896. The provincial government has issued an excellent *Documentary History of Education in Ontario*, by J. G. Hodgins (28 vols.). See also W. Kingsford, *Early Bibliography of Ontario*. (W. L. G.)

ONTARIO, LAKE, the smallest and most easterly of the Great Lakes of North America. It lies between 43° 11′ and 44° 12′ N. and 76° 12′ and 79° 49′ W., and is bounded on the N. by the province of Ontario and on the S. by the state of New York. It is roughly elliptical, its major axis, 180 m. long, lying nearly east and west, and its greatest breadth is 53 m. The area of its water surface is 7260 sq. m. and the total area of its basin 32,980 sq. m. Its greatest depth is 738 ft., its average depth much in excess of that of Lake Erie, and it is as a general rule free from outlying shoals or dangers.

On the north side of the lake the land rises gradually from the shore, and spreads out into broad plains, which are thickly settled by farmers. A marked feature of the topography of the south shore is what is known as the Lake ridge, or, as it approaches the Niagara river, the Mountain ridge. This ridge extends, with breaks, from Sodus to the Niagara river, and is distant from the lake 3 to 8 m. The low ground between it and the shore, and between the Niagara escarpment and the water on the Canadian shore, is a celebrated fruit growing district, covered with vineyards, peach, apple and pear orchards and fruit farms. The Niagara river is the main feeder of the lake; the other largest rivers emptying into the lake are the Genesee, Oswego and Black from the south side, and the Trent, which discharges into the upper end of the bay of Quinte, a picturesque inlet 70 m. long, on the north shore, between the peninsula of Prince Edward, near the eastern extremity of the lake, and the mainland. The east end of the lake, where it is 30 m. wide, is crossed by a chain of five islands, and the lake has its outlet near Kingston, where it discharges into the head of the St Lawrence river between a group of islands. Elsewhere the lake is practically free from islands. There is a general surface current down the lake towards the eastward of about 8 m. a day, strongest along the south shore, but no noticeable return current. As a result of its relatively great depth there are seldom any great fluctuations of level in this lake due to wind disturbance, but the lake follows the general rule of the Great Lakes (*q.v.*) of seasonal and annual variation. Standard high water (of 1870) is 2·77 ft. below the mean level, of 246·18 ft. above mean sea-level, and standard low water 3·24 ft. below the same plane. The lake never freezes over, and is less obstructed by ice than the other lakes, but the harbours are closed by ice from about the middle of December to the middle of April.

The commerce of Lake Ontario is limited in comparison with that of the lakes above Niagara Falls, and is restricted to vessels that can pass through the Welland canal locks, which are 270 ft. long, 45 ft. wide and 14 ft. deep. Freight consists principally of coal shipped from Charlotte, Great and Little Sodus bays and Oswego to Canadian ports in the lakes, and to ports on the St Lawrence river; of grain shipped through the Welland canal to the St Lawrence; and of lumber from Canadian ports. There is a large passenger traffic, including pleasure trips, principally radiating from Toronto. Ports on the lake are limited in capacity to vessels drawing not more than 14 ft. of water. The principal Canadian ports are Kingston, at the head of the St Lawrence river; Toronto, where the harbour is formed by an island with improved entrance channels constructed both east and west of it; and Hamilton, at the head of the lake, situated on a landlocked lagoon, connected with the main lake by Burlington channel, an artificial cut. The principal United States port is Oswego, where a breakwater has been built, making an outer harbour. The construction of a breakwater was undertaken in 1907 by the United States government at Cape Vincent to form a harbour where westbound vessels can shelter from storm before crossing the lake.

The difference of 327 ft. in level between Lake Ontario and Lake Erie is overcome by the Welland canal, which leads southward from Port Dalhousie. It accommodates vessels 255 ft. in length, with a draught of 14 ft. The Murray canal, opened for traffic on the 14th of April 1890, extends from Presqu'ile bay, on the north of the lake, to the head of the bay of Quinte, and enables vessels to avoid 70 m. of open navigation. It is 11 ft. deep below the lowest lake level, and has no locks. It is proposed to have the eastern terminus of the Trent canal system (see GREAT LAKES) at the head of the bay of Quinte, entering through the Trent river. At Kingston the Rideau canal, extending 128 m. to Ottawa, enters the St Lawrence river at the foot of the lake.

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(W. P. A.)

ONTENIENTE, a town of eastern Spain, in the province of Valencia; on the right bank of the Clariano or Onteniente, a sub-tributary of the Júcar, and on the Játiva-Villena railway. Pop. (1900) 11,430. Onteniente has a parish church remarkable for its lofty square tower, and a palace of the dukes of Almodovar. There is a large modern suburb outside the old town, which was formerly a walled city; some vestiges of the ramparts still remain. Linen and woollen cloth, paper, brandy, furniture and earthenware are manufactured; and there is some trade in cereals, wine and oil.

ONTOLOGY (adapted from a modern Latin form *ontologia* used by Jean le Clerc 1692; Gr. ὤν, ὄντος, pres. part. of εἶναι, to be, and λόγος, science), the name given to that branch of philosophy which deals specially with the nature of being (οὐσία) *i.e.* reality in the abstract. The idea, denoted in modern philosophy by the term "ontology" in contrast to the broader "metaphysics" and the correlative "epistemology," goes back to such phrases as ὄντως ὄντα, which Plato uses to describe the absolute reality of ideas; Plato, however, uses the term "dialectic" for this particular branch of metaphysics. Aristotle, likewise, holding that the separate sciences have each their own subject matter, postulates a prior science of existence in general which he describes as "first philosophy." So far, therefore, the science of being is distinguished not from that of knowing but from that of the special forms of being: as to the possibility of objective reality there is no question. A new distinction arises in the philosophy of Wolff who first made "ontology" a technical term. Theoretical philosophy (metaphysics) is by him divided into that which deals with being in general whether objective or subjective, as contrasted with the particular entities, the soul, the world and God. The former is ontology. This intermediate stage in the evolution of the science of being gave place to the modern view that the first duty of the philosopher is to consider knowledge itself (see EPISTEMOLOGY), and that only in the light of conclusion as to this primary problem is it possible to consider the nature of being. The evolution of metaphysics has thus relegated ontology to a secondary place. On the other hand it remains true that the science of knowing is inseparable from, and in a sense identical with that of being. Epistemological conclusions cannot be expressed ultimately without the aid of ontological terms.

For the wider relations of ontology, see further PHILOSOPHY.

ONYX, a banded chalcedony or striped agate, composed of white layers alternating with others of black, brown or red colour. A typical onyx consists of two or more black and white strata, whilst the term sardonyx is applied to the stone if it contains red or brown bands (see SARDONYX). Probably those varieties which show red and white zones originally suggested the name "onyx," from Gr. ὄνυξ (a finger nail), since the colours of such stones may be not unlike those of the nail. The onyx when worked by the lapidary was often designated by the diminutive ὀνύχιον; and at the present day the term *nicolo*, a corruption of the Italian diminutive *onycolo*, is applied to an onyx which presents a thin layer of chalcedony deriving a bluish tint from the subjacent black ground. The Hebrew *soham* is translated in the authorized version of the Old Testament "onyx," but the revised version gives in some of the passages an alternative marginal reading of "beryl." The position of the land of Havilah, which yielded the onyx-stone, is uncertain.

India has for ages supplied the finest onyxes, and hence jewellers apply the expression "Oriental onyx" to any stone remarkable for beauty of colour and regularity of stratification, quite regardless of its locality. As far back as the 1st century the author of the *Periplus Maris Erythraei* mentions the onyx among the products of Plythanae, a locality probably identified with Paithan on the Godavari; and he further states that the stones were taken down to Barygaza, the modern Broach, where the agate trade still flourishes. It is probable that the early Greeks and Romans derived their prized agate-cups from this locality. The Indian onyx is found, with agate and jasper-pebbles, in river gravels derived from the disintegration of the amygdaloidal volcanic rocks of the Deccan. A great deal of onyx now sold is obtained from South American agates, cut in Germany. It often happens that the lower deposits in an agate-nodule are in horizontal layers, forming onyx, while the other deposits have adapted themselves to the curved contours of the cavity. The onyxes cut from agate-nodules are usually stained artificially, as explained under AGATE.

The onyx is largely used for beads, brooches, pins, ring-stones and other small ornamental objects, while the larger pieces are occasionally wrought in the form of cups, bowls, vases, &c. Onyx is the favourite stone for cameo work, advantage being taken of the differently-coloured layers to produce a subject in relief on a background of another colour. For fine examples of ancient cameo-work in onyx and sardonyx see GEM.

It should be noted that the term onyx, or onychite, was formerly, and is still sometimes, applied to certain kinds of banded marble, like the "oriental alabaster" (see ALABASTER). Such substances are quite distinct from the hard siliceous onyx, being much softer and less precious: they are, in fact, usually deposits of calcium carbonate like stalagmite and travertine. The ornamental stones known as Mexican onyx, or Tecali marble, and Algerian onyx are of this character; and in order to avoid any confusion with the true onyx it is well to distinguish all the calcareous "onyxes" as onyx-marble. The well-known "Gibraltar stone" is an onyx-marble, with brown bands, from caverns in the limestone of Gibraltar. The Tecali onyx, sometimes with delicate green shades, takes its name from the district of Tecali; one of its localities being La Pedrara, about 21 m. from the city of Puebla.

For onyx-marbles see Dr G. P. Merrill, *Rep. U.S. Nat. Mus.* for 1893 (1895), p. 539.
(F. W. R.*)

OOLITE (Gr. ᾠόν, egg, λίθος, stone), in geology, a term having two distinct meanings. In petrology (*q.v.*) it denotes a type of rock structure characterized by the presence of minute spherical grains resembling the roe of a fish; if the grains become larger, the structure is said to be pisolitic (Gr. πίσος, pea). In stratigraphical geology, the oolite is a division of the Jurassic system (*q.v.*). The term appears to have been first applied in this latter sense by A. J. M. Brochant de Villiers in 1803, and through the labours of W. Smith, W. D. Conybeare, W. Buckland and others, it was gradually introduced for the calcareous rocks of the British Jurassic until it came to comprehend the whole system above the Lias. Custom still sanctions its use in England, but it has been objected that the Oolitic (Jurassic) system contains many strata that are not oolitic; and since oolitic structure occurs in limestones of all ages, it is misleading to employ the word in this way.

The oolites are usually divided into: the *Upper* or *Portland Oolite*, comprising the Purbeck, Portland and Kimeridge stages; the *Middle* or *Oxford Oolite*, including the Corallian, Oxfordian and Kellaways beds; and the *Lower Oolites*, with the Cornbrash, Great or Bath Oolite (Bathonian), Fullonian and the Inferior Oolite (Bajocian). The Great Oolite and Inferior Oolite are treated here.

The *Inferior Oolite*, called by William Smith the "Under Oolite" from its occurrence beneath the Great or "Upper Oolite" in the neighbourhood of Bath, received its present name from J. Townsend in 1813. It is an extremely variable assemblage of strata. In the Cotteswold Hills it is a series of marine deposits, 264 ft. thick near Cheltenham, but within 25 m. the strata thin out to 30 ft. at Fawler in Oxfordshire. A typical section N.E. of Dursley contains the following subdivisions:—

					Zone Fossils.
Upper Inferior Oolite.	Ragstones.	Upper.	White Freestone	5 ft.	*Cosmoceras Parkinsoni.*
			Clypeus Grit	6-15 ft.	
		Lower.	Upper Trigonia Grit	2-12 ft.	
			Gryphite Grit	2-12 ft.	*Stephanoceras Humphriesianum.*
			Lower Trigonia Grit	2-12 ft.	
Lower Inferior Oolite.	Pea Grit Series.	Freestones.	Upper Freestone	6-20 ft.	
			Oolite Marl	5-10 ft.	*Harpoceras Murchisonae.*
			Lower Freestone	45-130 ft.	
			Pea Grit	3-20 ft.	
			Lower Limestone	10-25 ft.	
Passage Beds to Lias.	Midford Sands.		Cephalopod Limestone	2-7 ft.	*Lioceras opalinum.*
			Cotteswold Sands	10-120 ft.	*Lytoceras jurense.*

The basal sandy series, which is closely related with the underlying Lias, is usually described as the Midford Sands (from Midford, near Bath), but it is also known locally as the Bradford, Yeovil or Cotteswold Sands. The Pea Grit series contains pisolitic limestone and coarse, iron-stained oolite and sandy limestone. The freestones are compact oolite limestones. The ragstones are fossiliferous, earthy and iron-stained oolitic limestones. The "grits" are really coarse-grained limestones or calciferous sandstones. Between Andoversford and Bourton-in-the-Water the Inferior Oolite is represented by ragstones (Ferruginous beds, Clypeus Grit, Trigonia bed, Notgrove Freestone, Gryphite Grit) and freestones (Upper Freestones and Harford Sands, Oolite Marl, Lower Freestone). Near Chipping Norton in Oxfordshire the "Chipping Norton Limestone" lies at the top of a very variable series of rocks. In Rutlandshire, Northamptonshire and Lincolnshire the following beds, in descending order, belong to the Inferior Oolite: Lincolnshire limestone (shelly, coral-bearing and oolitic), Collyweston slate, Lower Estuarine series and Northampton Sands (hard calcareous sandstones, blue and greenish ironstones and sandy limestones). The Collyweston slates are arenaceous limestones which have been used for roofing slates since the time of Henry VII.; Easton, Dene and Kirkby are important localities. The fissility of the rock is developed by exposure to frost. Similar beds are the Whittering Pendle and White Pendle or Duston slate.

The Inferior Oolite of Yorkshire differs from that of the Cotteswold district; in place of the marine limestones of the latter area there is a thick series of sands and sandstones with shales and beds of coal; these deposits are mainly estuarine with occasional marine beds. The principal subdivisions, in descending order, are: the Scarborough or Grey Limestone series, the Middle Estuarine series with their coal seams; the Millepore series and Whitwell or Cave Oolite; the Lower Estuarine series with the Eller Beck bed and Hydraulic Limestone; the Dogger and Blea Wyke beds. The last-named beds, like the Midford Sands, exhibit a passage between the Inferior Oolite and the Lias. In Skye and Raasay the Inferior Oolite is represented by sandstones.

The fossils of the Inferior Oolite are abundant. Over 200 species of Ammonite are known; gasteropods are numerous: *Trigonia, Lima, Ostrea, Gervillia, Pecten*, are common pelecypods; *Terebratula, Waldheimia* and *Rhynchonelia* are the prevailing brachiopods. Corals are very numerous in some limestones (*Isastrea, Montivaultia*). Urchins are represented by *Cidaris, Acrosalenia, Nucleolites, Pygaster, Pseudodiadema, Hemicidaris*; starfish by *Solaster, Astropecten*, and Crinoids by *Pentacrinus, Apiocrinus*. Plant remains, cycads, ferns, Ginkgo and coniferous trees are found most abundantly in the Yorkshire area.

The economic products of the Inferior Oolite include many well-known building stones, notably those of Ham Hill, Doulting, Dundry, Painswick, Cheltenham, Duston, Weldon, Ketton, Barnack, Stamford, Casterton, Clipsham, Great Ponton, Ancaster, Aislaby (Lower Estuarine series). Several of the stones are used for road metal. Iron ores have been worked in the Grey Limestone, the Eller Beck bed, the Dogger and the Northampton beds, the latter being the most important.

The *Great* or *Bath Oolite* is typically developed in the neighbourhood of Bath, and except in a modified form it does not extend beyond the counties of Wiltshire, Somersetshire, Gloucestershire and Oxfordshire. It does not reach so far as Yorkshire, unless the Upper Estuarine series of that district is its representative. The principal subdivisions of the series are:—

	Wiltshire, Somersetshire, Gloucestershire, Oxfordshire.	Northamptonshire, Buckinghamshire, Bedfordshire, Lincolnshire.
Upper.	False-bedded Oolites = Kemble beds, "White Limestone," pale, earthy Limestones, occasionally oolitic, and Marls. Upper Ragstones of Bath.	Great Oolite Clay = Blisworth Clay.
Lower.	False-bedded Oolites = the principal building stones, "Bath Freestone."	Great Oolite Limestone (generally non-oolitic).
	Fissile calcareous Sandstones; oolitic Limestones and Clays; Lower Ragstones of Bath and Stonesfield Slate.	Upper Estuarine series
	Thickness, 100-130 ft.	Thickness, 20-100 ft.

An exact correlation of the Great Oolite strata in the N.E. area with those of the S.W. is not possible on account of the great variability and impersistence of the beds. Current bedding is very prevalent, and minor stratigraphical breaks are common. The absence of the typical Great Oolite from the N.E. district is probably due in part to contemporaneous erosion with overstep of the succeeding formation, and in part to local changes in the sediment in the shallow waters of this epoch. This may also explain the rapid thinning-out of the Great Oolite south of Bath, where its place may be taken, to some extent, by the Bradford Clay, Forest Marble and Fullonian.

The Great Oolite is not readily divisible into palaeontological zones, but the ammonite *Perisphinctes arbustigerus* may be taken as the characteristic form along with *Belemnites bessinus* and *Terebratula maxillata*. Corals (*Isastraea, Thamnastria*) and Polyzoa (Stomatopora, *Diastopora*) are abundant. *Hemicidaris, Cidaris, Acrosalenia, Clypeus* and other urchins are common: *Pentacrinus* and *Apiocrinus* represent the Crinoids. *Terebratula, Rhynchonella, Waldheimia, Crania* are the prevailing brachiopods; the common pelecypods, *Pecten, Ostrea, Lima, Trigonia, Modiola*; *Natica, Nerinea* and other gasteropods are found. *Perisphinctes grandes, Macrocephalites subcontractus, Oppelia discus* and *Nautilus dispansus* are among the more common cephalopods. The remains of fish (*Mesodon, Hybodus*), crocodiles (*Teliosaurus*), dinosaurs (*Cetiosaurus*, *Megalosaurus*), pterosaurs (*Rhamphocephalus*), and in the Stonesfield slate the jaws of marsupial mammals (*Amphitherium*, *Amphilestes*, *Phascolotherium*) occur.

The building stones of the Great Oolite are mainly oolitic freestones, viz. the varieties of "Bath stone" quarried and mined in the neighbourhood of that city (Corsham Down, Monks Park, Coombe Down, Odd Down, Box Ground, &c.) and more shelly limestones like the Taynton and Milton stone. The Stonesfield slate has been largely worked near Woodstock in Oxfordshire and in Gloucestershire for roofing, &c. The "slates" are brown calcareous sandstone, grey and slightly oolitic calcareous sandstone, and blue and grey oolitic limestone. A curious modification of the Great Oolite—White Limestone division—is characterized by irregular ramifying tubular cavities, usually filled with ochreous material; this rock occurs in blocks and layers, and is used for rockeries under the name of "Dagham stone" from Dagham Down north of Cirencester. (See also JURASSIC.)

(J. A. H.)

OOSTERZEE, JAN JACOB VAN (1817–1882), Dutch divine, was born at Rotterdam on the 1st of April 1817. After acting as pastor at Alkmaar and Rotterdam, in 1863 he was made professor of biblical and practical theology at the university of Utrecht. Oosterzee earned a reputation as a preacher, was editor of the *Theolog. Jahrbücher* from 1845, wrote a number of noteworthy books on religious history, and published poems in Dutch (1882). He died on the 29th of July 1882.

A collected edition of Oosterzee's works was published in French, *Œuvres complètes*, in three volumes (1877–1880). His autobiography appeared in 1882.

OOTACAMUND, or UTAKAMAND, a town of British India, headquarters of the Nilgiris district in Madras, approached by a rack railway from the Mettapolliem station on the Madras railway. Pop. (1901) 18,596. It is the principal sanatorium of southern India, and summer headquarters of the Madras government. It is placed on a plateau about 7230 ft. above the sea, with a fine artificial lake, and mountains rising above 8000 ft. The mean annual temperature is 58° F., with a minimum of 38° in January and a maximum of 76° in May; average annual rainfall, 49 in. The houses are scattered on the hillsides amid luxuriant gardens, and there are extensive carriage drives. In the neighbourhood are plantations of coffee, tea and cinchona. There are a brewery and two dairy farms. The Lawrence asylum for the children of European soldiers was founded in 1858, and there are also the Breeks memorial and Basel Mission high schools.

See Sir F. Price, *Ootacamund: A History* (Madras, 1908).

OOZE (O. Eng. *wáse*, cognate with an obsolete *waise*, mud; cf. O. Nor. *veisa*, muddy pool), the slime or mud at the bottom of a river, stream, especially of a tidal river or estuary, and so particularly used in deep-sea soundings of the deposit of fine calcareous mud, in which remains of foraminifera are largely present. The word "ooze" is also used as a technical term in tanning, of the liquor in a tan vat in which the hides are steeped, made of a solution of oak bark or other substances which yield tannin. This word is in origin different from "ooze" in its first sense. It appears in O. Eng. as *wós*, and meant the juice of plants, fruits, &c.

OPAH (*Lampris luna*), a pelagic fish, the affinities of which are still a puzzle to ichthyologists. The body is compressed and deep (more so than in the bream) and the scales are minute. A long dorsal fin, high and pointed anteriorly, runs along nearly the whole length of the back; the caudal is strong and deeply cleft. The ventral fin is also elongated, and all the fins are destitute of spines. The pelvic fins are abdominal in position, long and pointed in shape, and the pelvic bones are connected with the caracoids. These fins contain numerous (15-17) rays, a feature in which the fish differs from the Acanthopterygians.

In its gorgeous colours the opah surpasses even the dolphins, all the fins being of a bright scarlet. The sides are bluish green above, violet in the middle, red beneath, variegated with oval spots of brilliant silver. It is only occasionally found near the shore; its real home is the Atlantic, especially near Madeira and the Azores, but many captures are recorded from Great Britain, Ireland and Scandinavia; it strays as far north as Iceland and Newfoundland, and probably southwards to the latitudes of the coast of Guinea. It is rare in the Mediterranean. The name opah, which is now generally used, is derived from the statement of a native of the coast of Guinea who happened to be in England when the first specimen was exhibited (1750), and who thought he recognized in it a fish well known by that name in his native country. From its habit of coming to the surface in calm weather, showing its high dorsal fin above the water, it has also received the name of "sun-fish," which it shares with *Orthagoriscus* and the basking shark. It grows to a length of 4 to 5 ft. and a weight exceeding 100 lb, and is highly esteemed on account of the excellent flavour of its flesh.

OPAL, an amorphous or non-crystalline mineral consisting of hydrated silica, occasionally displaying a beautiful play of colour, whence its value as a gem-stone. It is named from Lat. *opalus*, Gr. *ὀπάλλιον*, with which may be compared Sansk. *upala*, a precious stone. Opal commonly occurs in nodular or stalactitic masses, in the cavities of volcanic rocks, having been deposited in a gelatinous or colloidal condition. It is inferior to quartz in hardness (H. 5·5 to 6·5) and in density (S. G. 1·9 to 2·3), whilst it differs also by its solubility in caustic alkalis. The proportion of water in opal varies usually from 3 to 12%, and it is said that occasionally no water can be detected, the mineral having apparently suffered dehydration. Though normally isotropic, opal is frequently doubly refracting, the anomaly being due to tension set up during consolidation. The mineral when pure is transparent and colourless, as well seen in the variety which, from its vitreous appearance, was called by A. G. Werner *hyalite* (Gr. *ὕαλος*, glass), or popularly "Müller's glass," a name said to have been taken from its discoverer. This pellucid opaline silica occurs as an incrustation in small globules, and is by no means a common mineral, being chiefly found at certain localities in Bohemia, Mexico and Colorado, U.S.A. (Cripple Creek).

The beautiful variety known as "noble" or "precious opal" owes its value to the brilliant flashes of colour which it displays by reflected light. The colours are not due to the presence of any material pigment, but result from certain structural peculiarities in the stone, perhaps from microscopic fissures or pores or from delicate striae, but more probably from very thin lamellae of foreign matter, or of opaline silica, having a different index of refraction from that of the matrix. The origin of the colours in opal has been studied by Sir D. Brewster, Sir W. Crookes, Lord Rayleigh and H. Behrens. In the variety known to jewellers as "harlequin opal," the rainbow-like tints are flashed forth from small angular surfaces, forming a kind of polychromatic mosaic, whilst in other varieties the colours are disposed in broad bands or irregular patches of comparatively large area. By moving the stone, a brilliant succession of fiery flashes may sometimes be obtained. The opal is usually cut with a convex surface, and, being a soft stone, should be protected from friction likely to produce abrasion; nor should it be exposed to sudden alternations of temperature. The loss of water, sometimes effected by heat, greatly impairs the colour, though moderate warmth may improve it. According to Pliny the opal ranked next in value to the emerald, and he relates that the rich Roman senator Nonius was exiled by Mark Antony for sake of his magnificent opal, as large as a hazel nut. The opal, on account of its unique characters, has been the subject of remarkable superstition, and even in modern times has often been regarded as an unlucky stone, but in recent years it has regained popular favour and is now when fine, among the most highly valued gem-stones.

Precious opal is a mineral of very limited distribution. Though ancient writers state that it was brought from India, and fine stones are still called in trade "Oriental opal," its occurrence is not known in the East. The finest opals seem to have been always obtained from Hungary, where the mineral occurs, associated with much common opal, in nests in an altered andesitic rock. The fine opals occur only at the Dubnyik mine, near the village of Vörösvágás (Czerwenitza). The workings have been carried on for centuries in the mountains near Eperjes, and some remarkable stones from this locality are preserved in the Imperial Natural History Museum in Vienna, including an uncut specimen weighing about 3000 carats. Precious opal is found also in Honduras, especially in trachyte near Gracias á Dios; and in Mexico, where it occurs in a porphyritic rock at Esperanza in the state of Queretaro. A remarkable kind of opal, of yellow or hyacinth-red colour, occurs in trachytic porphyry at Zimapan in Hidalgo, Mexico, and is known as "fire-opal." This variety is not only cut *en cabochon* but is also faceted. Fire-opal is sometimes called "girasol." Much precious opal is worked in Australia. In Queensland it is found lining cracks in nodules of brown ironstone in the Desert Sandstone, a rock of Upper Cretaceous age, and is distributed over a wide area near the Barcoo river. Bulla Creek is a well-known locality. The layer of opal, when too thin to be cut with a convex surface, is used for inlaid work or is carved into cameos which show to much advantage against the dark-brown matrix. The matrix penetrated by veins and spots of opal, and perhaps heightened in colour artificially, has been called "black opal"; but true black opal occurs in New South Wales. The "root of opal" consists of the mineral disseminated through the matrix. In New South Wales precious opal was accidentally discovered in 1889, and is now largely worked at White Cliffs, Yungnulgra county, where it is found in nodules and seams in a siliceous rock of the Upper Cretaceous series. It is notable that the opal sometimes replaces shells and even reptilian bones, whilst curious pseudomorphs, known as "pineapple opal," show the opal in the form of aggregated crystals, perhaps of gypsum, gaylussite or glauberite.

"Common opal" is the name generally applied to the varieties which exhibit no beauty of colour, and may be nearly opaque. It is frequently found in the vesicular lavas of the N.E. of Ireland, the west of Scotland, the Faroe Isles and Iceland. When of milky-white colour it is known as "milk opal"; when of resinous and waxy appearance as "resin opal"; if banded it is called "agate opal"; a green variety is termed "prase opal"; a dark red, ferruginous variety "jaspar opal"; whilst "rose opal" is a beautiful pink mineral, coloured with organic matter, found at Quincy, near Méhun-sur-Yèvre, in France. A brown or grey concretionary opal from Tertiary shales at Menilmontant, near Paris, is known as menilite or "liver opal." A dull opaque form of opal, with a fracture imperfectly conchoidal, is called "semi-opal"; whilst the opal which not infrequently forms the mineralizing substance of fossil wood passes as "wood opal." The name hydrophane is applied to a porous opal, perhaps partially dehydrated, which is almost opaque when dry but becomes more or less transparent when immersed in water. It has been sometimes sold in America as "magic stone." Cacholong is another kind of porous opal with a lustre rather like that of mother-of-pearl, said to have been named from the Cach river in Bokhara, but the word is probably of Tatar origin.

Opaline silica is frequently deposited from hot siliceous springs, often in cauliflower-like masses, and is known as geyserite. This occurs in Iceland, New Zealand and the Yellowstone National Park. The fiorite from the hot springs of Santa Fiora, in Tuscany, is opaline silica, with a rather pearly lustre. A variety containing an exceptionally small proportion of water, obtained from the Yellowstone Park, was named pealite, after the chemist A. C. Peale. The siliceous deposits from springs, often due to organic agencies, are known generally as "siliceous sinter" or, if very loose in texture, as "siliceous tuff." Opaline silica forms the material of many organic structures, like the frustules of diatoms and the tests of radiolarians, which may accumulate as deposits of tripoli, and be used for polishing purposes. (F. W. R.*)

OPALINA (so named by J. E. Purkinjě and G. Valentin), a genus of Protozoa, without mouth or contractile vacuole, covered with nearly equal flagelliform cilia, and possessing numerous nuclei, all similar. It has been referred to Aspirotricha by Bütschli, but by M. Hartog (*Cambridge Natural History*, vol. ii., 1906) has been transferred to the Flagellates (*q.v.*). All the species are parasitic in cold-blooded Vertebrates.

See Bezzenberger in *Archiv. f. Protistenkunde* (1903), iii. 138.

OPATA ("enemies," so called by their neighbours the Pimas), a tribe of Mexican Indians of Piman stock. Their country is the mountainous district of north-eastern Sonora and north-western Chihuahua, Mexico. Though usually loyal to the Mexican government, they rebelled in 1820, but after a gallant effort were defeated. They number now about 5000, and still largely retain their ancient autonomy.

OPERA (Italian for "work"), a drama set to music, as distinguished from plays in which music is merely incidental. Music has been a resource of the drama from the earliest times, and doubtless the results of researches in the early history of this connexion have been made very interesting, but they are hardly relevant to a history of opera as an art-form. If language has meaning, an art-form can hardly be said to exist under conditions where the only real connexions between its alleged origin and its modern maturity are such universal means of expression as can equally well connect it with almost everything else. We will therefore pass over the orthodox history of opera as traceable from the music of Greek tragedy to that of miracle-plays, and will begin with its real beginning, the first dramas that were set to music in order to be produced as musical works of art, at the beginning of the 17th century.

There seems no reason to doubt the story, given by Doni, of the meetings held by a group of amateurs at the house of the Bardi in Florence in the last years of the 16th century, with the object of trying experiments in emotional musical expression by the use of instruments and solo voices. Before this time there was no real opportunity for music-drama. The only high musical art of the 16th century was unaccompanied choral music: its expression was perfect within its limits, and its limits so absolutely excluded all but what may be called static or contemplative emotion that "dramatic music" was as inconceivable as "dramatic architecture." But the literary and musical *dilettanti* who met at the house of the Bardi were not mature musical artists; they therefore had no scruples, and their imaginations were fired by the dream of restoring the glories of Greek tragedy, especially on the side of its musical declamation. The first pioneer in the new "monodic" movement seems to have been Vincenzo Galilei, the father of Galileo. This enthusiastic amateur warbled the story of Ugolino to the accompaniment of the lute, much to the amusement of expert musicians; but he gained the respect and sympathy of those whose culture was literary rather than musical. His efforts must have been not unlike a wild caricature of Mr. W. B. Yeats's method of reciting poetry to the psaltery. The first public production in the new style was Jacopo Peri's *Euridice* (1600), which was followed by a less successful effort of Caccini's on the same subject. To us it is astonishing that an art so great as the polyphony of the 16th century could ever have become forgotten in a new venture so feeble in its first steps. Sir Hubert Parry has happily characterized the general effect of the new movement on contemporary imagination as something like that of laying a foundation-stone—the suggestion of a vista of possibilities so inspiriting as to exclude all sense of the triviality of the present achievement. Meanwhile those composers who retained the mastery of polyphonic music tried to find a purely vocal and polyphonic solution of the problem of music-drama; and the *Amfiparnasso* of Orazio Vecchi (written in 1594, the year of Palestrina's death, and produced three years later) is not alone, though it is by far the most remarkable, among attempts to make a music-drama out of a series of madrigals. From the woodcuts which adorn the first edition of the *Amfiparnasso* it has been conjectured that the actors sang one voice each, while the rest of the harmony was supplied by singers behind the stage[1]; and this may have been the case with other works of this kind. But the words of Vecchi's introductory chorus contradict this idea, for they tell the audience that "the theatre of this drama is the world" and that the spectators must "hear instead of seeing."

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[1] The first story in Berlioz's *Soirées d'orchestre* is about a young 16th-century genius who revolts from this practice and becomes a pioneer of monody. The picture is brilliant; though the young genius evidently learnt all his music in Paris somewhere about 1830.

With the decadence of the madrigal, Monteverde brought a real musical power to bear on the new style. His results are now intelligible only to historians, and they seem to us artistically nugatory; but in their day they were so impressive as to render the further continuance of 16th-century choral art impossible. At the beginning of the 17th century no young musician of lively artistic receptivity could fail to be profoundly stirred by Monteverde's *Orfeo* (1602), *Arianna* (1608) and *Il Combattimento di Tancredi e Clorinda* (1624), works in which the resources of instruments were developed with the same archaic boldness, the same grasp of immediate emotional effect and the same lack of artistic organization as the harmonic resources. The spark of Monteverde's genius produced in musical history a result more like an explosion than an enlightenment; and the emotional rhetoric of his art was so uncontrollable, and at the same time so much more impressive in suggestion than in realization, that we cannot be surprised that the next definite step in the history of opera took the direction of mere musical form, and was not only undramatic but anti-dramatic.

The system of free musical declamation known as *recitative* is said to have been used by Emilio del Cavalieri as early as 1588, and it was in the nature of things almost the only means of vocal expression conceivable by the pioneers of opera. Formal melody, such as that of popular songs, was as much beneath their dignity as it had been beneath that of the high art from which they revolted; but, in the absence of any harmonic system but that of the church modes, which was manifestly incapable of assimilating the new "unprepared discords," and in the utter chaos of early experiments in instrumentation, formal melody proved a godsend as the novelty of recitative faded. Tunes were soon legalized at moments of dramatic repose when it was possible for the actors to indulge in either a dance or a display of vocalization; it was in the tunes that the strong harmonic system of modern tonality took shape; and by the early days of Alessandro Scarlatti, before the end of the 17th century, the art of tune-making had perennially blossomed into the musically safe and effective form of the *aria* (*q.v.*). From this time until the death of Handel the history of opera is simply the history of the aria; except in so far as in France, under Lully, it is also the history of ballet-music, the other main theatrical occasion for the art of tune-making. With opera before Gluck there is little interest in tracing schools and developments, for the musical art had as mechanical a connexion with drama as it had with the art of scene-painting, and neither it nor the drama which was attached to it showed any real development at all, though the librettist Metastasio presented as imposing a figure in 18th-century Italian literature as Handel presented in Italian opera. Before this period of stagnation we find an almost solitary and provincial outburst of life in the wonderful patchwork of Purcell's art (1658–1695). Whether he is producing genuine opera (as in the unique case of *Dido and Aeneas*) or merely incidental music to plays (as in the so-called opera *King Arthur*), his deeply inspired essays in dramatic music are no less interesting in their historic isolation from everything except the influence of Lully than they are admirable as evidences of a genius which, with the opportunities of 50 years later or 150 years earlier, might assuredly have proved one of the greatest in all music. Another sign of life has been appreciated by recent research in the interesting farcical operas (mostly Neapolitan) of certain early 18th-century Italian composers (see Leo, Pergolese, Logroscino), which have some bearing on the antecedents of Mozart.

The real reason for the stagnation of high opera before Gluck is (as explained in the articles Music and Sonata Forms) that the forms of music known before 1750 could not express dramatic change without losing artistic organization. The "spirit of the age" can have had little to do with the difficulty, or why should Shakespeare not have had a contemporary operatic brother-artist during the "Golden Age" of music? The opportunity for reform came with the rise of the sonata style. It was fortunate for Gluck that the music of his time was too vigorously organized to be upset by new discoveries. Gluck was a much greater artist than Monteverde, but he too was not overloaded with academic mastery; indeed, though historians have denied it, Monteverde was by far the better contrapuntist, and seems rather to have renounced his musical powers than to have struggled for need of them. But instead of memories of a Golden Age, Gluck had behind him 150 years of harmonic and orchestral knowledge of good and evil. He also had almost as clear a sense of symphonic form as could find scope in opera at all; and his melodic power was generally of the highest order. It is often said that his work was too far in advance of his time to establish his intended reform; and, if this means that undramatic Italian operas continued to outnumber those dramatic masterpieces which no smaller man could achieve, the statement is as true as it is of every great artist. If, however, it is taken to mean that because Mozart's triumphs do not lie in serious opera he owes nothing to Gluck, then the statement is misleading (see Gluck). The influence of Gluck on Mozart was profound, not only where it is relevant to the particular type of libretto, as in *Idomeneo*, but also on the broad dramatic basis which includes Greek tragedy and the 18th-century comedy of manners. Mozart, whose first impulse was always to make his music coherent in itself, for some time continued to cultivate side by side with his growing polyphony and freedom of movement certain Italian formalities which, though musically effective and flattering to singers, were dramatically vicious. But these features, though they spoil *Idomeneo*, correspond to much that in Gluck's operas shows mere helplessness; and in comic opera they may even become dramatically appropriate. Thus in *Così fan tutte* the florid arias in which the two heroines protest their fidelity are the arias of ladies who do protest too much; and in *Die Zauberflöte* the extravagant vocal fireworks of the Queen of Night are the displays of one who, in the words of the high priest Sarastro, "hopes to cajole the people with illusions and superstition." In the article Mozart we have discussed other evidences of his stagecraft and insight into character, talents for which his comic subjects gave him far more scope than those of classical tragedy had given to Gluck. Mozart always extracts the utmost musical effect from every situation in his absurd and often tiresome libretti (especially in vocal *ensemble*), while his musical effects are always such as give dramatic life to what in other hands are conventional musical forms. These merits would never have been gainsaid but for the violence of Wagner's earlier partisans in their revolt from the uncritical classicism of his denser and noisier opponents. Wagner himself stands as far aloof from Wagnerian Philistinism as from uncritical classicism. He was a fierce critic of social conditions and by no means incapable of hasty iconoclastic judgments; but he would have treated with scant respect the criticism that censures Mozart for superficiality in rejecting the radically unmusical element of mordant social satire which distinguishes the *Figaro* of Beaumarchais from the most perfect opera in all classical music.

It cannot be said that in any high artistic sense Italian comic opera has developed continuously since Mozart. The vocal athleticism of singers; the acceptance and great development by Mozart of what we may call symphonic (as distinguished from Handelian) forms of aria and *ensemble*; and the enlargement of the orchestra; these processes gave the Italian composers of Mozart's and later times prosaically golden opportunities for lifting spectators and singers to the seventh heaven of flattered vanity, while the music, in itself no less than in its relation to the drama, was steadily degraded. The decline begins with Mozart's contemporary and survivor, D. Cimarosa, whose ideas are genuine and, in the main, refined, but who lacks power and resource. His style was by no means debased, but it was just so slight that contemporaries found it fairly easy. His most famous work, *Il Matrimonio Segreto*, is an *opera buffa* which is still occasionally revived, and it is very like the sort of thing that people who despise Mozart imagine *Figaro* to be. Unless it is approached with sympathy, its effect after *Figaro* is hardly more exhilarating than that of the once pilloried spurious "Second Part" to the *Pickwick Papers*. But this is harsh judgment; for it proves to be a good semi-classic as soon as we take it on its own merits.

It is far more musical, if less vivacious, than Rossini's *Barbiere*; and the decline of Italian opera is more significantly foreshadowed in Cimarosa's other *chef-d'œuvre*, the remarkable *opera seria*, *Gli Orazzi ed i Curiazzi*. Here the arias and *ensembles* are serious art, showing a pale reflection of Mozart, and not wholly without Mozart's spirit; the choruses, notably the first of all, have fine moments; and the treatment of conflicting emotions at one crisis, where military music is heard behind the scenes, is masterly. Lastly, the abrupt conclusion at the moment of the catastrophe is good and was novel at the time, though it foreshadows that sacrifice of true dramatic and musical breadth to the desire for an "effective curtain," and that mortal fear of anti-climax which in classical French opera rendered a great musical finale almost impossible. But the interesting and dramatic features in *Gli Orazzi* are unfortunately less significant historically than the vulgarity of its overture, and the impossibility, after the beautiful opening chorus, of tracing any unmistakably tragic style in the whole work except by the negative sign of dullness.

Before Cimarosa's overwhelming successor Rossini had retired from his indolent career, these tendencies had already reduced both composers and spectators to a supreme indifference to the mood of the libretto, an indifference far more fatal than mere inattention to the plot. Nobody cares to follow the plot of Mozart's *Figaro*; but then no spectator of Beaumarchais's *Mariage de Figaro* is prevented by the intricacy of its plot from enjoying it as a play. In both cases we are interested in the character-drawing and in each situation as it arises; and we do no justice to Mozart's music when we forget this interest, even in cases where the libretto has none of the literary merit that survives in the transformation of Beaumarchais's comedy into an Italian libretto. But with the Rossinian decline all charitable scruples of criticism are misplaced, for Italian opera once more became as purely a pantomimic concert as in the Handelian period; and we must not ignore the difference that it was now a concert of very vulgar music, the vileness of which was only aggravated by the growing range and interest of dramatic subjects. The best that can be said in defence of it was that the vulgarity was not pretentious and unhealthy, like Meyerbeer's; indeed, if the famous "Mad Scene" in Donizetti's *Lucia di Lammermoor* had only been meant to be funny it would not have been vulgar at all. Occasionally the drama pierced through the empty breeziness of the music; and so the spirit of Shakespeare, even when smothered in an Italian libretto unsuccessfully set to music by Rossini, proved so powerful that one spectator of Rossini's *Otello* is recorded to have started out of his seat at the catastrophe, exclaiming "Good Heavens! the tenor is murdering the soprano!" And in times of political unrest more than one opera became as dangerous as an over-censored theatre could make it. An historical case in point is brilliantly described in George Meredith's *Vittoria*. But what has this to do with the progress of music? The history of Italian opera from after its culmination in Mozart to its subsidence on the big drum amd cymbals of the Rossinians is the history of a protected industry. Verdi's art, both in its burly youth and in its shrewd old age, is far more the crown of his native genius than of his native traditions; and, though opinions differ as to the spontaneity and depth of the change, the paradox is true that the Wagnerization of Verdi was the musical emancipation of Italy.

After Mozart the next step in the development of true operatic art was neither Italian nor German, but French. The French sense of dramatic fitness had a wonderfully stimulating effect upon every foreign composer who came to France. Rossini himself, in *Guillaume Tell*, was electrified into a dramatic and orchestral life of an incomparably higher order than the rollicking rattle of serious and comic Italian opera in its decline. He was in the prime of life when he wrote it, but it exhausted him and was practically his last important work, though he lived to a cheerful old age. The defects of its libretto were grave, but he made unprecedented efforts to remedy them, and finally succeeded, at the cost of an entire act. The experience was very significant; for, from the time of Gluck onwards, while it cannot be denied that native and naturalized French operatic art has suffered from many forms of musical and dramatic debasement, we may safely say that no opera has met with success in France that is without theatrical merit. And the French contribution to musical history between Gluck and Rossini is of great nobility. If Cherubini and Méhul had had Gluck's melodic power, the classics of French opera would have been the greatest achievements in semi-tragic music-drama before Wagner. As it is, their austerity is not that of the highest classics. It is negative, and tends to exclude outward attractiveness rather because it cannot achieve it than because it contains all things in due proportion. Be this as it may, Cherubini had a real influence on Beethoven; not to mention that the libretti of *Fidelio* and *Les Deux journées* were originally by the same author, though *Fidelio* underwent great changes in translation and revision. It is impossible to say what French opera might have done for music through Beethoven if *Fidelio* had not remained his solitary (because very nearly unsuccessful) operatic monument; but there is no doubt as to its effect on Weber, whose two greatest works, *Der Freischütz* and *Euryanthe*, are two giant strides from Cherubini to Wagner. *Euryanthe* is in respect of *Leit-motif* (see below) almost more Wagnerian than *Lohengrin*, Wagner's fourth published opera. It failed to make an epoch in history because of its dreary libretto, to which, however, the highly dramatic libretto of *Lohengrin* owes a surprising number of points.

The libretti of classical opera set too low a literary standard to induce critics to give sufficient attention to their aesthetic bearings; and perhaps the great scholar Otto Jahn is the only writer who has applied a first-rate literary analysis to the subject (see his *Life of Mozart*); a subject which, though of great importance to music, has, like the music itself, been generally thrust into the background by the countless externals that give theatrical works and institutions a national or political importance independent of artistic merit and historical development. Much that finds prominent place in the orthodox history of opera is really outside the scope of musical and dramatic discussion; and it may therefore be safely left to be discovered under non-musical headings elsewhere in this Encyclopaedia. Even when what passes for operatic history has a more real connexion with the art than the history of locomotion has with physical science, the importance of the connexion is often overrated. For example, much has been said as to the progress in German opera from the choice of remote subjects like Mozart's *Die Entführung aus dem Serail* to the choice of a subject so thoroughly German as *Der Freischütz*: but this is only part of the general progress made, chiefly in France, towards the choice of romantic instead of classical subjects. Whatever the intrinsic interest of musical ethnology, and whatever light it may throw upon the reasons why an art will develop and decline sooner in one country than in another, racial character will not suffice to produce an art for which no technique as yet exists. Nor will it suffice in any country to check the development or destroy the value of an art of which the principles were developed elsewhere. No music of Mozart's time could have handled Weber's romantic subjects, and all the Teutonism in history could not have prevented Mozart from adopting and developing those Italian methods that gave him scope. Again, in the time of Lully, who was the contemporary of Molière, the French genius of stagecraft was devoted to reducing opera to an effective series of ballets; yet so little did this hamper composers of real dramatic power that Quinault's libretto to Lully's very successful *Armide* served Gluck unaltered for one of his greatest works 90 years later. If Lully owes so little to Cambert as to be rightly entitled the founder of French opera, if Gluck is a greater reformer than his predecessor Rameau, if Cherubini is a more powerful artist than Méhul, and if, lastly, Meyerbeer developed the vices of the French histrionic machinery with a plausibility which has never been surpassed, then we must reconcile our racial theories with the historic process by which the French *Grand Opéra*, one of the most pronounced national types in all music, was founded by an Italian Jew, reformed by an Austrian, classicized by another Italian, and debased by a German Jew. This only enhances the significance of that French dramatic sense which stimulated foreign composers and widened their choice of subjects, as it also preserved all except the Italian forms of opera from falling into that elsewhere prevalent early 19th-century operatic style in which there was no means of guessing by the music whether any situation was tragic or comic. From the time of Meyerbeer onwards, trivial and vulgar opera has been as common in France as elsewhere; but there is a world of difference between, for example, a garish tune naïvely intended for a funeral march, and a similar tune used in a serious situation with a dramatic sense of its association with other incidents in the opera, and of its contrast with the sympathies of spectators and actors. The first case is as typical of 19th-century musical Italy as the second case is of musical France and all that has come under French influence.

As Wagner slowly and painfully attained his maturity he learned to abhor the influence of Meyerbeer, and indeed it accounts for much of the inequality of his earlier work. But it can hardly have failed to stimulate his sense of effect; and without the help of Meyerbeer's outwardly successful novelties it is doubtful whether even Wagner's determination could have faced the task of his early work, a task so negative and destructive in its first stages. We have elsewhere (see MUSIC, SONATA FORMS *ad finem*, and SYMPHONIC POEM) described how if music of any kind, instrumental or dramatic, was to advance beyond the range of the classical symphony, there was need to devise a kind of musical motion and proportion as different from that of the sonata or symphony as the sonata style is different from that of the suite. All the vexed questions of the function of vocal ensemble, of the structure of the libretto, and of instrumentation, are but aspects and results of this change in what is as much a primary category of music as extension is a primary category of matter. Wagnerian opera, a generation after Wagner's death, was still an unique phenomenon, the rational influence of which was not yet sifted from the concomitant confusions of thought prevalent among many composers of symphony, oratorio, and other forms of which Wagner's principles can be relevant only with incalculable modifications. With Wagner the history of classical opera ends and a new history begins, for in Wagner's hands opera first became a single art-form, a true and indivisible music-drama, instead of a kind of dramatic casket for a collection of *objets d'art* more or less aptly arranged in theatrical tableaux.

Forms and Terminology of Opera.

The history of pre-Wagnerian opera is not, like that of the sonata forms, a history in which the technical terminology has a clear relationship to the aesthetic development. In order to understand the progress of classical opera we must understand the whole progress of classical music; and this not merely for the general reason that the development of an art-form is inseparable from the development of the whole art, but because in the case of opera only the most external terminology and the most unreal and incoherent history of fashions and factions remain for consideration after the general development of musical art has been discussed. For completeness, however, the terminology must be included; and a commentary on it will complete our sketch in better historical perspective than any attempt to amplify details on the lines of a continuous history.

1. *Secco-recitative* is the delivery of ordinary operatic dialogue in prosaic recitative-formulas, accompanied by nothing but a harpsichord or pianoforte. In comic operas it was not so bad a method as some critics imagine; for the conductor (who sat at the harpsichord or pianoforte) would, if he had the wits expected of him by the composer, extemporize his accompaniments in an unobtrusively amusing manner, while the actors delivered their recitative rapidly in a conversational style known as *parlante*. In serious operas, however, the conductor dare not be frivolous; and accordingly secco-recitative outside comic opera is the dreariest of makeshifts, and is not tolerated by Gluck in his mature works. He accompanies his recitatives with the string band, introducing other instruments freely as the situation suggests.

2. *Accompanied recitative* was used in all kinds of opera, as introductory to important arias and other movements, and also in the course of finales. Magnificent examples abound in *Idomeneo*, *Figaro* and *Don Giovanni*; and one of the longest recitatives before Wagner is that near the beginning of the finale of the first act of *Die Zauberflöte*. Beethoven's two examples in *Fidelio* are short but of overwhelming pathos.

3. *Melodrama* is the use of an orchestral accompaniment to spoken dialogue (see BENDA). It is wonderfully promising in theory, but generally disappointing in effect, unless the actors are successfully trained to speak without being dragged by the music into an out-of-tune sing-song. Classical examples are generally short and cautious, but very impressive; there is one in *Fidelio* in which the orchestra quotes two points from earlier movements in a thoroughly Wagnerian way (see *Leitmotif* below). But the device is more prominent in incidental music to plays, as in Beethoven's music for Goethe's *Egmont*. Mendelssohn's music for *A Midsummer Night's Dream* contains the most brilliant and resourceful examples yet achieved in this art; but they are beyond the musical capacity of the English stage, which, however, has practised the worst forms of the method until it has become a disease, many modern performances of Shakespeare attaining an almost operatic continuity of bad music.

4. *Opera buffa* is classical Italian comic opera with secco-recitative. Its central classics are, of course, *Figaro* and *Don Giovanni*, while Cimarosa's *Matrimonio Segreto* and Rossini's *Barbiere* are the most important steps from the culmination to the fall.

5. *Opera seria* is classical Italian opera with secco-recitative; almost always (like the Handelian opera from which it is derived) on a Greek or Roman subject, and, at whatever cost to dramatic or historic propriety, with a happy ending. Gluck purposely avoids the term in his mature works. The only great classic in *opera seria* is Mozart's *Idomeneo*, and even that is dramatically too unequal to be more than occasionally revived, though it contains much of Mozart's finest music.

6. The *Singspiel* is German opera with spoken dialogue. In early stages it advanced from the farcical to the comic. With Beethoven it came under French influence and adopted "thrilling" stories with happy endings; and from this stage it passed to specifically "Romantic" subjects. Its greatest classics are Mozart's *Entführung* and *Zauberflöte*, Beethoven's *Fidelio*, and Weber's *Freischütz*.

7. *Opéra comique* is the *Singspiel* of France, being French opera with spoken dialogue. It did not originate in farce but in the refusal of the *Académie de Musique* to allow rival companies to infringe its monopoly of *Grand Opéra*; and it is so far from being essentially comic that one of its most famous classics, Méhul's *Joseph*, is on a Biblical subject; while its highest achievement, Cherubini's *Les Deux journées*, is on a story almost as serious as that of *Fidelio*. All Cherubini's mature operas (except the ballet *Anacréon*, which is uninterrupted music from beginning to end) are *opéras comiques* in the sense of having spoken dialogue; though *Medée*, being, perhaps, the first genuine tragedy in the history of music-drama,[1] is simply called "*opéra*" on the title-page. In the smaller French works, especially those in one act, there is so much spoken dialogue that they are almost like plays with incidental music. But they never sink to the condition of the so-called operas of the English composers since Handel. When Weber accepted the commission to write *Oberon* for the English stage in 1825, he found that he was compelled to set the musical numbers one by one as they were sent to him, without the slightest information as to the plot, the situation, or even the order of the pieces! And, to crown his disgust, he found that this really did not matter.

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[1] Even Gluck never contemplated any alternative to the absurd happy ending of *Orfeo*; and all his other operatic subjects include a *deus ex machina*.

8. *Grand opêra* is French opera in which every word is sung, and generally all recitative accompanied by the orchestra. It originated in the *Académie de Musique*, which, from its foundation in 1669 to the proclamation of the *liberté des théatres* in 1791, claimed the monopoly of operas on the lines laid down by Lully, Rameau and Gluck. Rossini's *Guillaume Tell*, Spontini's *Vestala* and the works of Meyerbeer crown this theoretically promising art-form with what Sir Hubert Parry has justly if severely called a crown of no very precious metal. Weber's *Euryanthe*, Spohr's *Jessonda*, and others of his operas, are German parallel developments; and Wagner's first published work, *Rienzi*, is like an attempt to beat Meyerbeer on his own ground.

9. *Opêra bouffe* is not an equivalent of *opera buffa*, but is French light opera with a prominent strain of persiflage. Its chief representative is Offenbach. It seems to be as native to France as the austere *opêra comique* which it eclipsed. Sullivan assimilated its adroit orchestration as Gilbert purified its literary wit, and the result became a peculiarly English possession.

10. The *finale* is that part of a classical opera where, some way before the end of an act, the music gathers itself together and flows in an unbroken chain of concerted movements. The "invention" has been ascribed to this or that composer before Mozart, and it certainly must have taken some time in the growing; but Mozart is the first classic whose finales are famous. The finales to the second act of *Figaro*, the first act of *Don Giovanni* and the second of the *Zauberflöte* remained unequalled in scale and in dramatic and symphonic continuity, until Wagner, as it were, extended the finale backwards until it met the *introduction* (see below) so that the whole act became musically continuous. This step was foreshadowed by Weber, in whose *Euryanthe* the numbering of the later movements of each act is quite arbitrary. Great finales are less frequent in *Singspiel* than in *opera buffa*. They can hardly be said to exist in *opera seria*, climax at the end of an act being there (even in Gluck) attained only by a collection of ballet movements, whereas the essence of Mozart's finale is its capacity to deal with real turning-points of the action. A few finales of the first and second acts of *opêras comiques* (which are almost always in three acts) are on the great classical lines, *e.g.* that to the first act of *Les Deux journées*; but a French finale to a last act is, except in Cherubini's works, hardly ever more than a short chorus, often so perfunctory that, for instance, when Méhul's *Joseph* was first produced by Weber at Dresden in 1817, a three-movement finale by Fränzl of Munich was added; and Weber publicly explained the difference between French and German notions of finality, in excuse for a course so repugnant to his principles in the performance of other works.

11. The *introduction* is sometimes merely an instrumental entr'acte in classical opera; but it is more especially an extension of continuous dramatic music at the beginning of an act, like the extension of the finale backwards towards the middle of the act, but much smaller. Beethoven, in his last version of *Fidelio*, used the term for the perfectly normal duet that begins the first act, and for the instrumental entr'acte which leads to the rise of the curtain on Florestan's great scene in the second act. The classical instances of the special meaning of "introduction" are the first number in *Don Giovanni* and, more typically, that in the *Zauberflöte*.

12. *Leit-motif*, or the association of musical themes with dramatic ideas and persons, is not only a natural means of progress in music drama, but is an absolute musical necessity as soon as the lines dividing an opera into separate formal pieces are broken down, unless the music is to become exclusively "atmospheric" and inarticulate. Without recurrence of themes a large piece of music could no more show coherent development than a drama in which the characters were never twice addressed by the same name nor twice allowed to appear in the same guise. Now the classical operatic forms, being mainly limited by the sonata style, were not such as could, when once worked out in appropriate designs of aria and ensemble, be worked out again in recognizable transformations without poverty and monotony of effect. And hence a system of *Leit-motif* was not appropriate to that ingenious compromise which classical opera made between music that completed from 12 to 30 independent designs and the drama that meanwhile completed one. But when the music became as continuous as the drama the case was different. There are plenty of classical instances of a theme superficially marking some cardinal incident or personal characteristic, without affecting the independence of the musical forms; the commonest case being, of course, the allusion somewhere in the overture to salient points in the body of the opera; as, for instance, the allusion to the words "*cosi fan tutti*" in the overture to Mozart's opera of that name, and the Masonic threefold chord in that to the *Zauberflöte*. Weber's overtures are sonata-form fantasias on themes to come: and in later and lighter operas such allusiveness, being childishly easy, is a meaningless matter of course. Within the opera itself, songs, such as would be sung in an ordinary non-musical play, will probably recur, as in *Les Deux journées*; and so will all phrases that have the character of a call or a signal, a remarkable and pathetic instance of which may be found in Méhul's *Mélidore et Phrosine*, where the orchestra makes a true *Leit-motif* of the music of the heroine's name. But it is a long way from this to the system already clearly marked by Weber in *Der Freischütz* and developed in *Euryanthe* to an extent which Wagner did not surpass in any earlier work than *Tristan*, though in respect of the obliteration of sections his earliest works are in advance of Weber. Yet not only are there some thirteen recurrent musical incidents in the *Freischütz* and over twenty in *Euryanthe*, but in the latter the serpentine theme associated with the treacherous Eglantine actually stands the Wagnerian test of being recognizable when its character is transformed. This can hardly be claimed even for the organization of themes in *Lohengrin*.

Mature Wagnerian *Leit-motif* is a very different thing from the crude system of musical labels to which some of Wagner's disciples have reduced it, and Wagner himself had no patience with the catalogue methods of modern operatic analysis. The *Leit-motif* system of *Tristan*, the *Meistersinger*, the *Ring* and *Parsifal* is a profoundly natural and subtle cross-current of musical thought, often sharply contrasted with the externals of a dramatic situation, since it is free to reflect not only these externals, not only the things which the audience know and the persons of the drama do not know, not only those workings of the dramatic character's mind which he is trying to conceal from the other characters, but even those which he conceals from himself. There was nothing new in any one of these possibilities taken singly (see, for example, Gluck's ironic treatment of "*le calme rentre dans mon cœur*"), but polyphonic *Leit-motif* made them all possible simultaneously. Wagner's mind was not concentrated on the merely literary and theatrical aspects of music-drama; he fought his way to the topmost heights of the peculiar musical mastery necessary to his ideals; and so he realized that principle in which none but the very greatest musicians find freedom; the principle that, however constantly necessary and powerful homophonic music may be in passages of artificial simplicity, all harmonic music is by nature and origin polyphonic; and that in polyphony lies the normal and natural means of expressing a dramatic blending of emotions.

Wagnerian *Leit-motif* has proved rather a giant's robe for later composers; and the most successful of recent operas have, while aiming less at the sublime, cultivated Wagner's musical and dramatic continuity more than his principles of musical texture. Certainly Wagnerian continuity is a permanent postulate in modern opera; but it shows itself to be a thing attainable quite independently of any purely musical style or merit, so long as the dramatic movement of the play is good. This condition was always necessary, even where opera was most symphonic. Mozart was incessantly disputing with his librettists; and all his criticisms and changes, though apparently of purely musical purport, had a brilliant effect on the movement of the play. In one desperate case, where the librettist was obstinate, Mozart abandoned a work (*L'Oca del Cairo*) to the first act of which he had already sketched a great finale embodying a grandiose farcical figure that promised to be unique in classical opera.

Mozart's lesson of dramatic movement has been better learnt than anything peculiar to either music or literature; for, while his libretti show how little that quality has to do with poetic merit, the whole history of Italian opera from Rossini to Mascagni shows how little it has to do with good music. On the other hand, the musical coherence of the individual classical forms used in opera has caused many critics to miss the real dramatic ground of some of the most important operatic conventions. The chief instance of this is the repetition of words in arias and at climaxes, a convention which we are over-ready to explain as a device which prolongs situations and delays action for the sake of musical design. But in the best classical examples the case is almost the reverse, for the aria does not, as we are apt to suppose, *represent* a few words repeated so as to serve for a long piece of music. Without the music the drama would have required a long speech in its place; but the classical composer cannot fit intelligible music to a long string of different sentences, and so the librettist reduces the speech to mere headlines and the composer supplies the eloquence. Herein lies the meaning of Mozart's rapid progress from vocal concertos like "*Fuor del mar*" in *Idomeneo* and "*Martern aller Arten*" in *Die Entführung* to genuine musical speeches like "*Non più andrai*" in *Figaro*, in which the obvious capacity to deal with a greater number of words is far less important than the naturalness and freedom with which the pace of the declamation is varied—a freedom unsurpassed even in the *Elektra* of Richard Strauss.

With Wagnerian polyphony and continuity music became capable of treating words as they occur in ordinary speech, and repetitions have accordingly become out of place except where they would be natural without music. But it is not here that the real gain in freedom of movement lies. That gain has been won, not by Wagner's negative reforms alone, but by his combination of negative reform with new depths of musical thought; and modern opera is not more exempt than classical opera from the dangers of artistic methods that have become facile and secure. If the libretto has the right dramatic movement, the modern composer need have no care beyond what is wanted to avoid interference with that movement. So long as the music arouses no obviously incompatible emotion and has no breach of continuity, it may find perfect safety in being meaningless. The necessary stagecraft is indeed not common, but neither is it musical. Critics and public will cheerfully agree in ascribing to the composer all the qualities of the dramatist; and three allusions in the music of one scene to that of another will suffice to pass for a marvellous development of Wagnerian *Leit-motif*.

Modern opera of genuine artistic significance ranges from the light song-play type admirably represented by Bizet's *Carmen* to the exclusively "atmospheric" impressionism of Debussy's *Pélleas et Mélisande*. Both these extremes are equally natural in effect, though diametrically opposite in method: for both types eliminate everything that would be inadmissible in ordinary drama. If we examine the libretto of *Carmen* as an ordinary play we shall find it to consist mainly of actual songs and dances, so that more than half of the music would be necessary even if it were not an opera at all. Debussy's opera differs from Maeterlinck's play only in a few omissions such as would probably be made in ordinary non-musical performances. His musical method combines perfect Wagnerian continuity with so entire an absence of *Leit-motif* that there are hardly three musical phrases in the whole opera that could be recognized if they recurred in fresh contexts. The highest conceivable development of Wagnerian continuity has been attained by Strauss in *Salome* and *Elektra*; these operas being actually more perfect in dramatic movement than the original plays of Wilde and Hofmannsthal. But their use of *Leit-motif*, though obvious and impressive, is far less developed than in Wagner; and the polyphony, as distinguished from the brilliant instrumental technique, is, like that technique, devoted mainly to realistic and physically exciting effects that crown the impression in much the same way as skilful lighting of the stage. Certainly Strauss does not in his whole time-limit of an hour and three-quarters use as many definite themes (even in the shortest of figures) as Wagner uses in ten minutes.

It remains to be seen whether a further development of Wagnerian opera, in the sense of addition to Wagner's resources in musical architecture, is possible. The uncompromising realism of Strauss does not at first sight seem encouraging in this direction; yet his treatment of Elektra's first invocation of Agamemnon produces a powerful effect of musical form, dimly perceived, but on a larger scale than even the huge sequences of Wagner. In any case, the best thing that can happen in a period of musical transition is that the leading revolutionaries should make a mark in opera. Musical revolutions are too easy to mean much by themselves; there is no purely musical means of testing the sanity of the revolutionaries or of the critics. But the stage, while boundlessly tolerant of bad music, will stand no nonsense in dramatic movement. (The case of Handelian opera is no exception, for in it the stage was a mere topographical term.) In every period of musical fermentation the art of opera has instantly sifted the men of real ideas from the aesthetes and doctrinaires; Monteverde from the prince of Venosa, Gluck from Gossec, and Wagner from Liszt. As the ferment subsides, opera tends to a complacent decadence; but it will always revive to put to the first and most crucial test every revolutionary principle that enters into music to destroy and expand.

See also ARIA; OVERTURE; CHERUBINI; GLUCK; MOZART; VERDI; WAGNER; WEBER. (D. F. T.)

OPHICLEIDE (Fr. *ophicleide, basse d'harmonie*; Ger. *Ophikleid*; Ital. *oficleide*), a brass wind instrument having a cup-shaped mouthpiece and keys, in fact a bass keyed-bugle. The name (from Gr. ὄφις, serpent, and κλεῖδες, keys), applied to it by Halary, the patentee of the instrument, is hardly a happy one, for there is nothing of the serpent about the ophicleide, which has the bore of the bugle and also owes the chromatic arrangement of the keys to a principle evolved by Halliday for the bugle, to be explained later on.

The ophicleide is almost perfect theoretically, for it combines the natural harmonic scale of the brass wind instruments having cup-shaped mouthpieces, such as the trumpet, with a system of keys, twelve in number, one for each chromatic semitone of the scale; it is capable of absolutely accurate intonation. It consists of a wooden, or oftener brass, tube with a conical bore having the same proportions as that of the bugle but not wide enough in proportion to its length to make the fundamental or first note of the harmonic series of much practical use. The tube, theoretically[1] 8 ft. long, is doubled upon itself once, terminating at the narrow end in a tight coil, from which protrudes the straight piece known as the crook, which bears the cup-shaped mouthpiece; the wide end of the tube terminates in a funnel-shaped bell pointing upwards.

The production of sound is effected in the ophicleide as in other instruments with cup- or funnel-shaped mouthpieces (see HORN). The lips stretched across the mouthpiece act as vibrating reeds or as the vocal chords in the larynx. The breath of the performer, compressed by being forced through the narrow opening between the lips, sets the latter in vibration. The stream of air, instead of proceeding into the cup in an even flow—in which case there would be no sound—is converted into a series of pulsations by the trembling of the lips. On being thrown into communication with the main stationary column of air at the bottom of the cup, the pulsating stream generates "sound waves," each consisting of a half wave of expansion and of a half wave of compression. On the frequency per second of the sound waves as they strike the drum of the ear depends the pitch of the note, the acuteness of the sound varying in direct proportion to the frequency. To ensure a higher frequency in the sound waves, their length must be decreased. Two things are necessary to bring this about without shortening the length of the tube: (1) the opening between the lips, fixed at each end by contact with the edges of the mouthpiece, must be made narrower by greater tension; (2) the breath must be sent through the reduced aperture in a more compressed form and with greater force, so that the exciting current of air becomes more incisive. An exact proportion, not yet scientifically determined, evidently exists between the amount of pressure and the degree of tension, which is unconsciously regulated by the performer, excess of pressure in proportion to the tension of the lips producing a crescendo by causing amplitude of vibration instead of increased speed.

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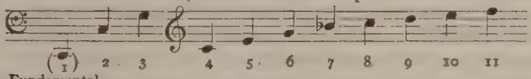
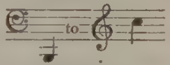
[1] For an explanation of the difference between theory and practice in the length of the tubes of wind instruments, see Victor Mahillon, "Le cor" (*Les instruments de musique au musée du conservatoire royal de musique de Bruxelles*, pt. ii. Brussels and London, 1907), pp. 27-29.

When the fundamental note of a pipe is produced, the tension of the lips and pressure of breath proportionally combined are at their minimum for that instrument. If both be doubled, a node is formed half way up the pipe, and the column of air no longer vibrates as a whole, but as two separate parts, each half the length of the tube, and the frequency of the sound waves is doubled in consequence. The practical result is the production of the second harmonic of the series an octave above the fundamental. The formation of three nodes and therefore of three separate sound waves produces a note a twelfth above the fundamental, known as the third harmonic, and so on in mathematical ratio. This harmonic series forms the natural scale of the instrument, and is for the ophicleide the following:



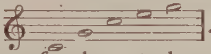
In some cases the fundamental is difficult to obtain, and the harmonics above the eighth are not used.

The ophicleide has in addition to its natural scale eleven or twelve lateral holes covered by keys, each of which, when successively opened, raises the pitch of the harmonic series a semitone, with the exception of the first, an open key, which on being closed lowers the pitch a semitone. There were ophicleides in C and in B♭, the former being the more common; contrabass ophicleides were also occasionally made in F and E♭. The keys of the ophicleide, being placed in the lowest register, were intended to bind together by chromatic degrees the first and second harmonics. The compass is a little over three octaves, from  with chromatic semitones throughout.

The unsatisfactory timbre of the ophicleide led to its being superseded by the bass tuba; but it seems a pity that an instrument so powerful, so easy to learn and understand, and capable of such accurate intonation, should have to be discarded. The lower register is rough, but so powerful that it can easily sustain above it masses of brass harmonics; the medium is coarse in tone, and the upper wild and unmusical.

Although a bass keyed-bugle, the ophicleide owes something of its origin to the application of keys to the serpent (*q.v.*), a wind instrument, the invention of which is generally attributed to Edme Guillaume, canon of Auxerre, about 1590. The serpent remained in its primitive form for nearly two centuries, and then only it was attempted to improve it by adding keys. It was a musician named Régibo,[1] belonging to the orchestra of the church of St Pierre at Lille, who, about 1780, first thought of giving it the shape of a bassoon. The merit of this innovation was rapidly recognized in England and Germany. Still, to follow Gerber,[2] one Frichot, who was established in London, published in 1800 a description of an instrument, entirely of brass, manufactured by J. Astor, which he claimed as his invention, calling it the basshorn, but which was no other in principle than the new serpent of Régibo. It only made its way to France and Belgium after the passage of the allied armies in 1815. The English brass basshorn was designated on the Continent the English or the Russian basshorn, the "serpent anglais" or the "basson russe." Under this last name all instruments of the form, whether of wood or brass, were later on confounded in France and Belgium. The "basson russe" remained in great vogue until the appearance of the ophicleide, to disappear with it in the complete revolution brought about by the invention of pistons.

The invention of the ophicleide is generally but falsely attributed to Alexandre Frichot, a professor of music at Lisieux, department of Calvados, France. The instrument, which the inventor called "basse-trompette," was approved of as early as 13th November 1806 by a commission composed of professors of the Paris Conservatoire, but the patent bears the date 31st December 1810. The "basse-trompette," which Frichot in his specification had at first, in imitation of the English basshorn, called "basse cor," was, like the English instrument, entirely of brass, and had, like it, six holes; it only differed in a more favourable disposition brought about by the curvings of the tube, and by the application of four crooks which permitted the instrument to be tuned "in C low pitch and C high pitch for military bands, in C♯ for churches, and in D for concert use." The close relationship between the two instruments suggests the question whether this was the Frichot who worked with Astor in London in 1800.

The first idea of adding keys to instruments with cupped mouthpieces, unprovided with lateral holes, with the aim of filling up some of the gaps between the notes of the harmonic scale, goes back, according to Gerber (*Lexicon* of 1790), to Kölbel, a hornplayer in the Russian imperial band, about 1760. Anton Weidinger,[3] trumpeter in the Austrian imperial band, improved upon this first attempt, and applied it in 1800 to the trumpet. But the honour belongs to Joseph Halliday, bandmaster of the Cavan militia, of being the first to conceive, in 1810, the disposition of a certain number of keys along the tube, setting out from its lower extremity, with the idea of producing by their successive or simultaneous opening a chromatic scale throughout the extent of the instrument. The bugle-horn was the object of his reform; the scale of which, he says, in the preamble of his patent, "until my invention contained but five tones, viz. . My improvements on that instrument are five keys, to be used by the performer according to the annexed scale, which, with its five original notes, render it capable of producing twenty-five separate tones in regular progression." Fig. 1 represents the keyed bugle of Joseph Halliday.

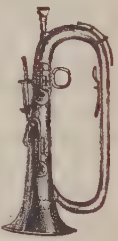
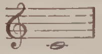
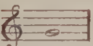
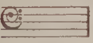
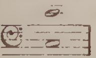


FIG. 1.—Keyed Bugle.

It was not until 1815 that the use of the new instrument spread upon the Continent. We find in the account-books of a Belgian maker, Tuerlinckx of Mechlin, that his first supply of a bugle-horn bears the date of 25th March 1815, and it was made "aen den Heer Muldener, lieutenant in het régiment duc d'York."

The acoustic principle inaugurated by Halliday consisted in binding together by chromatic degrees the second and third harmonics,  to . He attained it, as we have just seen, by the help of five keys. The principle once discovered, it became easy to extend it to instruments of the largest size, of which the compass, as in the "basson russe," began with the fundamental sound. It was simply necessary to bind this fundamental  to the next harmonic sound  by a larger number of keys. This was done in 1817 by Jean Hilaire Asté, known as Halary, a professor of music and instrument-maker at Paris. We find the description of the instruments for which he sought a patent in the *Rapport de l'Académie Royale des Beaux-Arts de l'Institut de France*, meeting of the 19th of July 1817. These instruments were three in number: (1) the clavi-tube, a keyed trumpet; (2) the quinti-tube, or quinti-clave; (3) the ophicleide, a keyed serpent. The clavi-tube was no other than the bugle-horn slightly modified in some details of construction, and reproduced in the different tonalities A♭, F, E♭, D, C, B♭, A and A♭. The quinti-tube had nearly the form of a bassoon, and was, in the first instance, armed with eight keys and constructed in two tonalities, F and E♭. This was the instrument afterwards named "alto ophicleide." The ophicleide (fig. 2) had the same form as the quinti-tube. It was at first adjusted with nine or ten keys, and the number was carried on to twelve—each key to give a semitone (additional patent of 16th August 1822). The ophicleide or bass of the harmony was made in C and in B♭, the contra-bass in F and in E♭.[4]

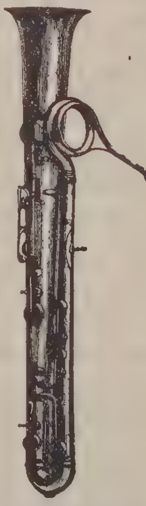


FIG. 2.—Ophicleide of Halary.

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[1] Gerber, *Lexicon der Tonkünstler* (Leipzig, 1790).

[2] *Lexikon*, edition of 1812.

[3] The announcement of Weidinger's invention of a *Klappentrompete*, or trumpet with keys, appears in the *Allg. musik. Ztg.* (Leipzig, November 1802), p. 158; and further accounts are given in January 1803, p. 245, and 1815, p. 844.

[4] The report of the Académie des Beaux-Arts on the subject of this invention shows a strange misconception of it, which it is interesting to recall. "As to the two instruments which M. Halary designs

It is certain that from the point of view of invention Halary's labours had only secondary importance; but, if the principle of keyed chromatic instruments with cupped mouthpiece[1] goes back to Halliday, it was Halary's merit to know how to take advantage of the principle in extending it to instruments of diverse tonalities, in grouping them in one single family, that of the bugles, in so complete a manner that the improvements of modern manufacture have not widened its limits either in the grave or the acute direction. Keyed chromatic wind instruments made their way rapidly; to their introduction into military full or brass bands we can date the regeneration of military music. After pistons had been invented some forty years, instruments with keys could still reckon their partisans. Now these have utterly disappeared, and pistons or rotary cylinders remain absolute masters of the situation.

(V. M.; K. S.)

OPHIR, a region celebrated in antiquity for its gold, which was proverbially fine (Job xxii. 24, xxviii. 16; Psalms xlv. 9; Isa. xiii. 12). Thence Solomon's Phoenician sailors brought gold for their master (1 Kings ix. 28, x. 11; 2 Chron. viii. 18, ix. 10); Ophir gold was stored up among the materials for the Temple (1 Chron. xxix. 4). Jehoshaphat, attempting to follow his ancestors' example, was foiled by the shipwreck of his navy (1 Kings xxii. 48). The situation of the place has been the subject of much controversy.

The only indications whereby it can be identified are its connexion, in the geographical table (Gen. x. 29), with Sheba and Havilah, the latter also an auriferous country (Gen. ii. 11), and the fact that ships sailing thither started from Ezion-Geber at the head of the Red Sea. It must, therefore, have been somewhere south or east of Suez; and must be known to be a gold-bearing region. The suggested identification with the Egyptian Punt is in itself disputable, and it would be more helpful if we knew exactly where Punt was (see EGYPT).

(1) *East Africa.*—This has, perhaps, been the favourite theory in recent years, and it has been widely popularized by the sensational works of Theodore Bent and others, to say nothing of one of Rider Haggard's novels. The centre of speculation is a group of extensive ruins at Zimbabwe, in Mashonaland, about 200 m. inland from Sofala. Many and wild words have been written on these imposing remains. But the results of the saner researches of Randall MacIver, announced first at the South Africa meeting of the British Association (1905) and later communicated to the Royal Geographical Society, have robbed these structures of much of their glamour; from being the centres of Phoenician and Hebrew industry they have sunk to be mere magnified kraals, not more than three or four hundred years old.

(2) *The Far East.*—Various writers, following Josephus and the Greek version, have placed Ophir in different parts of the Far East. A chief argument in favour of this view is the length of the voyages of Solomon's vessels (three years were occupied in the double voyage, going and returning, 1 Kings x. 22) and the nature of the other imports that they brought—"almug-trees" (*i.e.* probably sandal-wood), ivory, apes and peacocks. This, however, proves nothing. It is nowhere said that these various imports all came from one place; and the voyages must have been somewhat analogous to those of modern "coasting tramps," which would necessarily consume a considerable time over comparatively short journeys. It has been sought at *Abhira*, at the mouth of the Indus (where, however, there is no gold); at Supara, in Goa; and at a certain Mount Ophir in Johore.

(3) *Arabia.*—On the whole the most satisfactory theory is that Ophir was in some part of Arabia—whether south or east is disputed, and (with the indications at our disposal) probably cannot be settled. Arabia was known as a gold-producing country to the Phoenicians (Ezek. xxvii. 22); Sheba certainly, and Havilah probably, are regions of Arabia, and these are coupled with Ophir in Genesis x.; and the account of the arrival of the navy in 1 Kings x. 11, is strangely interpolated into the story of the visit of the queen of Sheba, perhaps because there is a closer connexion between the two events than appears at first sight.

Historians have been at a loss to know what Solomon could give in exchange for the gold of Ophir and the costly gifts of the queen of Sheba. Mr K. T. Frost (*Expos. Times*, Jan. 1905) shows that by his command of the trade routes Solomon was able to balance Phoenicians and Sabaeans against each other, and that his Ophir gold would be paid for by trade facilities and protection of caravans.

(R. A. S. M.)

OPHITES, or OPHIANS (Gr. ὄφις, Heb. נָחָשׁ, "snake"), known also as NAASENES, an early sect of Gnostics described by Hippolytus (*Philosoph.* v.), Irenaeus (*adv. Haer.* i. 11), Origen (*Contra Celsum*, vi. 25 seq. and Epiphanius (*Haer.* xxvi.). The account given by Irenaeus may be taken as representative of these descriptions which vary partly as referring to different groups, partly to different dates. The honour paid by them to the serpent is connected with the old mythologies of Babylon and Egypt as well as with the popular cults of Greece and the Orient. It was particularly offensive to Christians as tending to dishonour the Creator who is set over against the serpent as bad against good. The Ophite system had its Trinity: (1) the Universal God, the First Man, (2) his conception (ἔννοια), the Second Man, (3) a female Holy Spirit. From her the Third Man (Christ) was begotten by the First and Second. Christ flew upward with his mother, and in their ascent a spark of light fell on the waters as Sophia. From this contact came Ialdabaoth the Demiurgos, who in turn produced six powers and with them created the seven heavens and from the dregs of matter the Nous of serpent form, from whom are spirit and soul, evil and death. Ialdabaoth then announced himself as the Supreme, and when man (created by the six powers) gave thanks for life not to Ialdabaoth but to the First Man, Ialdabaoth created a woman (Eve) to destroy him. Then Sophia or Prunikos sent the serpent (as a benefactor) to persuade Adam and Eve to eat the tree of knowledge and so break the commandment of Ialdabaoth, who banished them from paradise to earth. After a long war between mankind aided by Prunikos against Ialdabaoth (this is the inner story of the Old Testament), the Holy Spirit sends Christ to the earth to enter (united with his sister Prunikos) the pure vessel, the virgin-born Jesus. Jesus Christ worked miracles and declared himself the Son of the First Man. Ialdabaoth instigated the Jews to kill him, but only Jesus died on the cross, for Christ and Prunikos had departed from him. Christ then raised the spiritual body of Jesus which remained on earth for eighteen months, initiating a small circle of elect disciples. Christ, received into heaven, sits at the right hand of Ialdabaoth, whom he deprives of glory and receives the souls that are his own. In some circles the serpent was identified with Prunikos. There are some resemblances to the Valentinian system, but whereas the great Archon sins in ignorance, Ialdabaoth sins against knowledge; there is also less of Greek philosophy in the Ophite system.

See King, *The Gnostics and their Remains* (London, 1887); G. Salmon, art. "Ophites" in *Dict. Chr. Biog.*

OPHTHALMOLOGY (Gr. ὀφθαλμός, eye), the science of the anatomy, physiology and pathology of the eye (see EYE and VISION). From the same Greek word come numerous other derivatives: *e.g.* ophthalmia, the general name for conjunctival inflammations (see *Eye diseases*, under EYE); and the instruments ophthalmometer and ophthalmoscope (see VISION).

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under the names of 'quinti-clave' and 'ophicleide,' they bear a great resemblance to those submitted to the Academy in the sitting of the 11th of March 1811 by M. Dumas, which he designed under the names of 'basse et contrebasse guerrières.' . . . The opinion of our commission on the quinti-clave and ophicleide is that M. Halary can only claim the merit of an improvement and not that of an entire invention; still, for an equitable judgment on this point, we should compare the one with the other, and this our commission cannot do, not having the instruments of M. Dumas at our disposal." This is what the commission ought to have had, but it would have sufficed had they referred to the report of the sittings of 6th and 8th April, in which it is clearly explained that the instruments presented by M. Dumas were bass clarinets (*Moniteur Universel* of 19th April 1811).

[1] We designedly omit the use of the word "brass" to qualify these instruments. The substance which determines the form of a column of air is demonstrably indifferent for the *timbre* or quality of tone so long as the sides of the tubes are equally elastic and rigid.

OPIE, AMELIA (1769–1853), English author, daughter of James Alderson, a physician in Norwich, and was born there on the 12th of November 1769. Miss Alderson had inherited radical principles and was an ardent admirer of Horne Tooke. She was intimate with the Kembles and with Mrs Siddons, with Godwin and Mary Wollstonecraft. In 1798 she married John Opie, the painter. The nine years of her married life were very happy, although her husband did not share her love of society. He encouraged her to write, and in 1801 she produced a novel entitled *Father and Daughter*, which showed genuine fancy and pathos. She published a volume of graceful verse in 1802; *Adeline Mowbray* followed in 1804, *Simple Tales* in 1806, *Temper* in 1812, *Tales of Real Life* in 1813, *Valentine's Eve* in 1816, *Tales of the Heart* in 1818, and *Madeline* in 1822. At length, in 1825, through the influence of Joseph John Gurney, she joined the Society of Friends, and beyond a volume entitled *Detraction Displayed*, and contributions to periodicals, she wrote nothing more. The rest of her life was spent in travelling and in the exercise of charity. Mrs Opie retained her vivacity to the last, dying at Norwich on the 2nd of December 1853.

A *Life*, by Miss C. L. Brightwell, was published in 1854.

OPIE, JOHN (1761–1807), English historical and portrait painter, was born at St Agnes near Truro in May 1761. He early showed a taste for drawing, besides having at the age of twelve mastered Euclid and opened an evening school for arithmetic and writing. Before long he won some local reputation by portrait-painting; and in 1780 he started for London, under the patronage of Dr Wolcot (Peter Pindar). Opie was introduced to the town as "The Cornish Wonder," a self-taught genius. The world of fashion, ever eager for a new sensation, was attracted; the carriages of the wealthy blocked the street in which the painter resided, and for a time he reaped a rich harvest by his portraits. But soon the fickle tide of popularity flowed past him, and the painter was left neglected. He now applied himself with redoubled diligence to correcting the defects which marred his art, meriting the praise of his rival Northcote—"Other artists paint to live; Opie lives to paint." At the same time he sought to supplement his early education by the study of Latin and French and of the best English classics, and to polish the rudeness of his provincial manners by mixing in cultivated and learned circles. In 1786 he exhibited his first important historical subject, the "Assassination of James I.," and in the following year the "Murder of Rizzio," a work whose merit was recognized by the artist's immediate election as associate of the Academy, of which he became a full member in 1788. He was employed on five subjects for Boydell's "Shakespeare Gallery"; and until his death, on the 9th of April 1807, his practice alternated between portraiture and historical work. His productions are distinguished by breadth of handling and a certain rude vigour, individuality and freshness. They are wanting in grace, elegance and poetic feeling. Opie is also favourably known as a writer on art by his *Life of Reynolds* in Wolcot's edition of Pilkington, his *Letter on the Cultivation of the Fine Arts in England*, in which he advocated the formation of a national gallery, and his *Lectures* as professor of painting to the Royal Academy, which were published in 1809, with a memoir of the artist by his widow (see above).

OPINION (Lat. *opinio*, from *opinari*, to think), a term used loosely in ordinary speech for an idea or an explanation of facts which is regarded as being based on evidence which is good but not conclusive. In logic it is used as a translation of Gr. *δόξα*, which plays a prominent part in Greek philosophy as the opposite of knowledge (*ἐπιστήμη* or *ἀλήθεια*). The distinction is drawn by Parmenides, who contrasts the sphere of truth or knowledge with that of opinion, which deals with mere appearance, error, not-being. So Plato places *δόξα* between *αἴσθησις* and *διάνοια*, as dealing with phenomena contrasted with non-being and being respectively. Thus Plato confines opinion to that which is subject to change. Aristotle, retaining the same idea, assigns to opinion (especially in the *Ethics*) the sphere of things contingent, *i.e.* the future: hence opinion deals with that which is probable. More generally he uses popular opinion—that which is generally held to be true (*δοκεῖν*)—as the starting-point of an inquiry. In modern philosophy the term has been used for various conceptions all having much the same connotation. The absence of any universally acknowledged definition, especially such as would contrast "opinion" with "belief," "faith" and the like, deprives it of any status as a philosophic term.

OPITZ VON BOBERFELD, MARTIN (1597–1639), German poet, was born at Bunzlau in Silesia on the 23rd of December 1597, the son of a prosperous citizen. He received his early education at the Gymnasium of his native town, of which his uncle was rector, and in 1617 attended the high school—"Schönaichianum"—at Beuthen, where he made a special study of French, Dutch and Italian poetry. In 1618 he entered the university of Frankfort-on-Oder as a student of *literae humaniores*, and in the same year published his first essay, *Aristarchus, sive De contemptu linguae Teutonicae*, a plea for the purification of the German language from foreign adulteration. In 1619 he went to Heidelberg, where he became the leader of the school of young poets which at that time made that university town remarkable. Visiting Leiden in the following year he sat at the feet of the famous Dutch lyric poet Daniel Heinsius (1580–1655), whose *Lobgesang Jesu Christi* and *Lobgesang Bacchi* he had already translated into alexandrines. After being for a short year (1622) professor of philosophy at the Gymnasium of Weissenburg (now Karlsburg) in Transylvania, he led a wandering life in the service of various territorial nobles. In 1624 he was appointed councillor to Duke George Rudolf of Liegnitz and Brieg in Silesia, and in 1625, as reward for a requiem poem composed on the death of Archduke Charles of Austria, was crowned laureate by the emperor Ferdinand II. who a few years later ennobled him under the title "von Boberfeld." He was elected a member of the *Fruchtbringende Gesellschaft* in 1629, and in 1630 went to Paris, where he made the acquaintance of Hugo Grotius. He settled in 1635 at Danzig, where Ladislaus IV. of Poland made him his historiographer and secretary. Here he died of the plague on the 20th of August 1639.

Opitz was the head of the so-called First Silesian School of poets (see GERMANY: *Literature*), and was during his life regarded as the greatest German poet. Although he would not to-day be considered a poetical genius, he may justly claim to have been the "father of German poetry" in respect at least of its form; his *Buch von der deutschen Poeterey* (1624) put an end to the hybridism that had until then prevailed, and established rules for the "purity" of language, style, verse and rhyme. Opitz's own poems are in accordance with the rigorous rules which he laid down. They are mostly a formal and sober elaboration of carefully considered themes, and contain little beauty and less feeling. To this didactic and descriptive category belong his best poems, *Trost-Gedichte in Widerwärtigkeit des Krieges* (written 1621, but not published till 1633); *Zlatna, oder von Ruhe des Gemüts* (1622); *Lob des Feldlebens* (1623); *Vielgut, oder vom wahren Glück* (1629), and *Vesuvius* (1633). These contain some vivid poetical descriptions, but are in the main treatises in poetical form. In 1624 Opitz published a collected edition of his poetry under the title *Acht Bücher deutscher Poematum* (though, owing to a mistake on the part of the printer, there are only five books); his *Dafne* (1627), to which Heinrich Schütz composed the music, is the earliest German opera. Besides numerous translations, Opitz edited (1639) *Das Annolied*, a Middle High German poem of the end of the 11th century, and thus preserved it from oblivion.

Collected editions of Opitz's works appeared in 1625, 1629, 1637, 1641, 1690 and 1746. His *Ausgewählte Dichtungen* have been edited by J. Tittmann (1869) and by H. Oesterley (Kürschner's *Deutsche Nationalliteratur*, vol. xxvii. 1889). There are modern reprints of the *Buch von der deutschen Poeterey* by W. Braune (2nd ed., 1882), and, together with *Aristarchus*, by G. Witkowski (1888), and also of the *Teutsche Poemata*, of 1624, by G. Witkowski (1902). See H. Palm, *Beiträge zur Geschichte der deutschen Literatur des 16ten und 17ten Jahrhunderts* (1877); K. Borinski, *Die Poetik der Renaissance* (1886); R. Beckherrn, *Opitz, Ronsard und Heinsius* (1888). Bibliography by H. Oesterley in the *Zentralblatt für Bibliothekswesen* for 1885.

OPIUM (Gr. *ὄπιον*, dim. from *ὀπός*, juice), a narcotic drug prepared from the juice of the opium poppy, *Papaver somniferum*, a plant probably indigenous in the south of Europe and western Asia, but now so widely cultivated that its original habitat is uncertain. The medicinal properties of the juice have been recognized from a very early period. It was known to Theophrastus by the name of *μηκώνιον*, and appears in his time to have consisted of an extract of the whole plant, since Dioscorides, about A.D. 77, draws a distinction between *μηκώνειον*, which he describes as an extract of the entire herb, and the more active *ὀπός*, derived from the capsules alone. From the 1st to the 12th century the opium of Asia Minor appears to have been the only kind known in commerce. In the 13th century *opium thebaicum* is mentioned by Simon Januensis, physician to Pope Nicholas IV., while *meconium* was still in use. In the 16th century opium is mentioned by Pyres (1516) as a production of the kingdom of Cous (Kuch Behar, south-west of Bhutan) in Bengal, and of Malwa.[1] Its introduction into India appears to have been connected with the spread of Islam. The opium monopoly was the property of the Great Mogul and was regularly sold. In the 17th century Kāempfer describes the various kinds of opium prepared in Persia, and states that the best sorts were flavoured with spices and called "theriaka." These preparations were held in great estimation during the middle ages, and probably supplied to a large extent the place of the pure drug. Opium is said to have been introduced into China by the Arabs probably in the 13th century, and it was originally used there as a medicine, the introduction of opium-smoking being assigned to the 17th century. In a Chinese Herbal compiled before 1700 both the plant and its inspissated juice are described, together with the mode of collecting it, and in the *General History of the Southern Provinces of Yunnan*, revised and republished in 1736, opium is noticed as a common product. The first edict prohibiting opium-smoking was issued by the emperor Yung Cheng in 1729. Up to that date the amount imported did not exceed 200 chests, and was usually brought from India by junks as a return cargo. In the year 1757 the monopoly of opium cultivation in India passed into the hands of the East India Company through the victory of Clive at Plassey. Up to 1773 the trade with China had been in the hands of the Portuguese, but in that year the East India Company took the trade under their own charge, and in 1776 the annual export reached 1000 chests, and 5054 chests in 1790. Although the importation was forbidden by the Chinese imperial authorities in 1796, and opium-smoking punished with severe penalties (ultimately increased to transportation and death), the trade continued and had increased during 1820–1830 to 16,877 chests per annum. The trade was contraband, and the opium was bought by the Chinese from depôt ships at the ports. Up to 1839 no effort was made to stop the trade, but in that year the emperor Tao-Kwang sent a commissioner, Lin Tsze-sü, to Canton to put down the traffic. Lin issued a proclamation threatening hostile measures if the British opium ships serving as depôts were not sent away. The demand for removal not being complied with, 20,291 chests of opium (of 149⅓ ℔ each), valued at £2,000,000, were destroyed by the Chinese commissioner Lin; but still the British sought to smuggle cargoes on shore, and some outrages committed on both sides led to an open war, which was ended by the treaty of Nanking in 1842. The importation of opium continued and was legalized in 1858. From that time, in spite of the remonstrances of the Chinese government, the exportation of opium from India to China continued, increasing from 52,925 piculs (of 133⅓ ℔) in 1850 to 96,839 piculs in 1880. While, however, the court of Peking was honestly endeavouring to suppress the foreign trade in opium from 1839 to 1858 several of the provincial viceroys encouraged the trade, nor could the central government put a stop to the home cultivation of the drug. The cultivation increased so rapidly that at the beginning of the 20th century opium was produced in every province of China. The western provinces of Sze-ch'uen, Yun-nan and Kwei-chow yielded respectively 200,000, 30,000 and 15,000 piculs (of 133⅓ ℔); Manchuria 15,000; Shen-si, Chih-li and Shan-tung 10,000 each; and the other provinces from 5000 to 500 piculs each, the whole amount produced in China in 1906 being estimated at 330,000 piculs, of which the province of Sze-ch'uen produced nearly two-thirds. Of this amount China required for home consumption 325,270 piculs, the remainder being chiefly exported to Indo-China, whilst 54,225 piculs of foreign opium were imported into China. Of the whole amount of opium used in China, equal to 22,588 tons, only about one-seventh came from India.

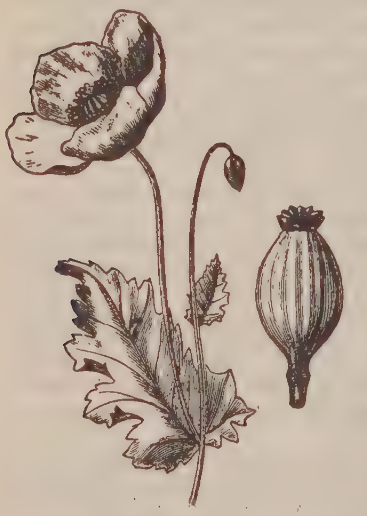
FIG. 1.—Opium Poppy (*Papaver somniferum*).

The Chinese government regarding the use of opium as one of the most acute moral and economic questions which as a nation they have to face, representing an annual loss to the country of 856,250,000 taels, decided in 1906 to put an end to the use of the drug within ten years, and issued an edict on the 20th of September 1906, forbidding the consumption of opium and the cultivation of the poppy. As an indication of their earnestness of purpose the government allowed officials a period of six months in which to break off the use of opium, under heavy penalties if they failed to do so. In October of the same year the American government in the Philippines, having to deal with the opium trade, raised the question of the taking of joint measures for its suppression by the powers interested, and as a result a conference met at Shanghai on the 1st of February 1909 to which China, the United States of America, Great Britain, Austria-Hungary, France, Germany, Italy, Japan, the Netherlands, Persia, Portugal and Russia sent delegates. At this meeting it was resolved that it was the duty of the respective governments to prevent the export of opium to any countries prohibiting its importation; that drastic measures should be taken against the use of morphine; that anti-opium remedies should be investigated; and that all countries having concessions in China should close the opium divans in their possessions. The British government made an offer in 1907 to reduce the export of Indian opium to countries beyond the seas by 5100 chests, *i.e.* $\frac{1}{10}$th of the amount annually taken by China, each year until the year 1910, and that if during these three years the Chinese government had carried out its arrangements for proportionally diminishing the production and consumption of opium in China, the British government were prepared to continue the same rate of reduction, so that the export of Indian opium to China would cease in ten years; the restrictions of the imports of Turkish, Persian and other opiums being separately arranged for by the Chinese government, and carried out simultaneously. The above proposal was gratefully received by the Chinese government. A non-official report by Mr E. S. Little, after travelling through western China, which appeared in the newspapers in May 1910, stated that all over the province of Sze-ch'uen opium had almost ceased to be produced, except only in a few remote districts on the frontier (see further CHINA: § *History*).

The average annual import of Persian and Turkish opium into China is estimated at 1125 piculs, and if this quantity were to be reduced every year by one-ninth, beginning in 1909, in nine years the import into China would entirely cease, and the Indian, Persian and Turkish opiums no longer be articles of commerce in that country. One result of these regulations was that the price of foreign opium in China rose, a circumstance which was calculated to reduce the loss to the Indian revenue.

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[1] *Aromatum Historia* (ed. Clusius, Ant., 1574).

Thus in 1909–1910, with only 350,000 acres under cultivation and 40,000 chests of opium in stock, the revenue was £4,420,600 as against £3,572,944 in 1905–1906 with 613,996 acres under cultivation and a stock of 76,063 chests. No opium dens have been allowed since 1907 in their possessions or leased territories in China by Great Britain, France, Germany, Russia or Japan.

The difficulties of the task undertaken by the Chinese government to eradicate a national and popular vice, in a country whose population is generally estimated at 400,000,000, are increased by the fact that the opium habit has been indulged in by all classes of society, that opium has been practically the principal if not the only national stimulant; that it must involve a considerable loss of revenue, which will have to be made up by other taxes, and by the fact that its cultivation is more profitable than that of cereals, for an English acre will on the average produce raw dry opium of the value of £5, 16s. 8d. while it will yield grain valued only at £4, 5s. 6d.

Various remedies for the opium habit have been experimented with in China, but with doubtful success. Under the name of anti-opium cure various remedies containing morphine in the form of powder, or of little pills, have been introduced, as well as the subcutaneous injection of the alkaloid, so that the use of morphine is increasing in China to an alarming extent, and considerable difficulty is experienced in controlling the illicit traffic in it, especially that sent through the post. Its comparative cheapness, one dollar's worth being equal to three dollars' worth of opium in the effect produced, its portability and the facilities offered in obtaining it, are all in its favour. A good deal of morphine is exported to Japan from Europe, and generally passes into China by way of Manchuria, where Japanese products have a virtual monopoly. The effects of morphine are much more deleterious than those of opium-smoking. The smoke of opium, as shown by H. Moissan, contains only a trifling amount of morphia, and the effect produced by it is apparently due, not to that alkaloid, but to such decomposition products as pyrrol, acetone and pyridine and hydropyridine bases. F. Browne finds that after smoking "chandoo," containing 8·98 % of morphine, 7·63 % was left in the dross, so that only 1·35 % of morphia was carried over in the smoke or decomposed by the heat.

For many years two Scotch firms, Messrs J. D. Macfarlan and T. and H. Smith of Edinburgh, and T. Whiffen of London manufactured practically the world's supply of this alkaloid, but it is now made in the United States and Germany, although the largest amount is still probably made in Great Britain. A small amount of morphine and codeine is also manufactured in India for medicinal use. The prohibition of the general importation of morphia into China except on certain conditions was agreed to by the British government in Act XI. of the Mackay treaty, but only came into force on the 1st of January 1909. Unless the indirect importation of morphine into China from Europe and the United States is stopped, a worse habit and more difficult to cure than any other (except perhaps that of cocaine) may replace that of opium-smoking in China. It is worse even than opium-eating, in proportion as morphine is more active than opium. The sale and use of morphine in India and Burma is now restricted. The quantity of morphine that any one may legally possess, and then only for medicinal purposes, is in India 10 grams, and in Burma five. The possession of morphine by medical practitioners is also safeguarded by well-defined limitations.

Production and Commerce.—Although the collection of opium is possible in all places where there is not an excessive rainfall and the climate is temperate or subtropical, the yield is smaller in temperate than in tropical regions and the industry can only be profitably carried on where labour and land are sufficiently cheap and abundant; hence production on a large scale is limited to comparatively few countries. The varieties of poppy grown, the mode of cultivation adopted and the character of the opium produced differ so greatly that it will be convenient to consider the opiums of each country separately.

Turkey.—The poppy cultivated in Asia Minor is the variety ***glabrum***, distinguished by the sub-globular shape of the capsule and by the stigmata or rays at the top of the fruit being ten or twelve in number. The flowers are usually of a purplish colour, but are sometimes white, and the seeds, like the petals, vary in tint from dark violet to white. The cultivation is carried on, both on the more elevated and lower lands, chiefly by peasant proprietors. A naturally light and rich soil, further improved by manure, is necessary, and moisture is indispensable, although injurious in excess, so that after a wet winter the best crops are obtained on hilly ground, and in a dry season on the plains. The land is ploughed twice, the second time crosswise, so that it may be thoroughly pulverized; and the seed, mixed with four times its quantity of sand, to prevent its being sown too thickly, is scattered broadcast, about ¾ to 1 ℔ being used for every toloom (1600 sq. yds.). The crop is very uncertain owing to droughts, spring frosts and locusts, and, in order to avoid a total failure and to allow time for collecting the produce, there are three sowings at intervals from October to March—the crops thus coming to perfection in succession. But notwithstanding these precautions quantities of the drug are wasted when the crop is a full one, owing to the difficulty of gathering the whole in the short time during which collection is possible. The first sowing produces the hardiest plants, the yield of the other two depending almost entirely on favourable weather. In localities where there is hoar frost in autumn and spring the seed is sown in September or at latest in the beginning of October, and the yield of opium and seed is then greater than if sown later. After sowing, the land is harrowed, and the young plants are hoed and weeded, chiefly by women and children, from early spring until the time of flowering. In the plains the flowers expand at the end of May, on the uplands in July. At this period gentle showers are of great value, as they cause an increase in the subsequent yield of opium. The petals fall in a few hours, and the capsules grow so rapidly that in a short time—generally from nine to fifteen days—the opium is fit for collection. This period is known by the capsules yielding to pressure with the fingers, assuming a lighter green tint and exhibiting a kind of bloom called "cougak," easily rubbed off with the fingers; they are then about 1½ in. in diameter. The incisions are made by holding the capsule in the left hand and drawing a knife two-thirds round it, or spirally beyond the starting-point (see fig. 2, *a*), great care being taken not to let the incisions penetrate to the interior lest the juice should flow inside and be lost. (In this case also it is said that the seeds will not ripen, and that no oil can be obtained from them.) The operation is usually performed after the heat of the day, commencing early in the afternoon and continuing to nightfall, and the exuded juice is collected the next morning. This is done by scraping the capsule with a knife and transferring the concreted juice to a poppy-leaf held in the left hand, the edges of the leaf being turned in to avoid spilling the juice, and the knife-blade moistened with saliva by drawing it through the mouth after every alternate scraping to prevent the juice from adhering to it. When as much opium has been collected as the size of the leaf will allow, another leaf is wrapped over the top of the lump, which is then placed in the shade to dry for several days. The pieces vary in size from about 2 oz. to over 2 ℔, being made larger in some districts than in others. The capsules are generally incised only once. but the fields are visited a second or third time to collect the opium from the poppy-heads subsequently developed by the branching of the stem. The yield of opium varies, even on the same piece of land, from ⅓ to 7½ chequis (of 1·62 ℔) per toloom (1600 sq. yds.), the average being 1½ chequis of opium and 4 bushels (of 50 ℔) of seed. The seed, which yields 35 to 42 % of oil, is worth about two-thirds of the value of the opium. The whole of the operation must, of course, be completed in the few days—five to ten—during which the capsules are capable of yielding the drug. A cold wind or a chilly atmosphere at the time of collection lessens the yield, and rain washes the opium off the capsules. Before the crop is all gathered in a meeting of buyers and sellers takes place in each district, at which the price to be asked is discussed and settled, and the opium handed to the buyers, who in many instances have advanced money on the standing crop. When sufficiently solid the pieces of opium are packed in cotton bags, a quantity of the fruits of a species of *Rumex* being thrown in to prevent the cakes from adhering together. The bags are then sealed up, packed in oblong or circular baskets and sent to Smyrna or other ports on mules. On the arrival of the opium at its destination, in the end of July or beginning of August, it is placed in cool warehouses to avoid loss of weight until sold. The opium is then of a mixed character and is known as talequale. When transferred to the buyer's warehouses the bags are opened and each piece is examined by a public inspector in the presence of both buyer and seller, the quality of the opium being judged by appearance, odour, colour and weight. It is then sorted into three qualities: (1) finest quality; (2) current or second; (3) chicanti or rejected pieces. A fourth sort consists of the very bad or wholly factitious pieces. The substances used to adulterate opium are grape-juice thickened with flour, fig-paste, liquorice, half-dried apricots, inferior gum tragacanth and sometimes clay or pieces of lead or other metals. The chicanti is returned to the seller, who disposes of it at 20 to 30 % discount to French and German merchants. After inspection the opium is hermetically sealed in tin-lined boxes containing about 150 ℔. Turkey opium is principally used in medicine on account of its purity and the large percentage of morphia that it contains, a comparatively small quantity being exported for smoking purposes.

About three-quarters of the opium prepared in Turkey is produced in Anatolia, and is exported by way of Smyrna, and the remainder is produced in the hilly districts of the provinces near the southern coast of the Black Sea, and finds its way into Constantinople, the commercial varieties bearing the name of the district where they are produced. The Smyrna varieties include the produce of Afium Karahissar, Uschak, Akhissar, Taoushanli, Isbarta, Konia, Bulvadan, Hamid, Magnesia and Yerli, the last name being applied to opium collected in the immediate neighbourhood of Smyrna. The opium exported by way of Constantinople includes that of Hadjikeuy and Malatia; the Tokat kind, of good quality, including that produced in Yosgad, Sile and Niksar, and the current or second quality derived from Amasia and Oerek; the Karahissar kind including the produce of Mykalitch, Carabazar, Sivrahissar, Eskichehir and Nachlihan; the Balukesri sort, including that of Balukhissar and Bogaditch; also the produce of Beybazar and Angora. The average amount of Turkish opium exported is 7000 chests, but in rare seasons amounts to 12,000 chests, but the yield depends upon fine weather in harvest time, heavy rains washing the opium off the capsules, and lessening the yield to a considerable extent.

These commercial varieties differ in appearance and quality, and are roughly classified as Soft or Shipping opium, Druggists' and Manufacturers' opium. Shipping opium is distinguished by its soft character and clean paste, containing very little débris, or chaff, as it is technically called. The Hadjikeuy variety is at present the best in the market. The Malatia, including that of Kharput, second, and the Sile, third in quality. The chief markets for the soft or shipping varieties of opium are, China, Korea, the West Indian Islands, Cuba, British Guiana, Japan and Java; the United States also purchase for re-exportation as well as for home consumption. Druggists' opium includes the kinds purchased for use in medicine, which for Great Britain should, when dried and powdered, contain 9½-10½ % of morphine. That generally sold in this country for the purpose includes the Karahissar and Adet, Balukhissar, Amasia and Akhissar kinds, and for making the tincture and extract, that of Tokat. But the produce of Ghéve, Biledjik, Mondourlan, Konia, Tauschanli, Kutahlia and Karaman is often mixed with the kinds first mentioned. The softer varieties of opium are preferred in the American market, as being richer in morphine. In all Turkey opium the pieces vary much in size. On the continent of Europe, especially in Belgium, Germany and Italy, where pieces of small size are preferred, the Ghéve,[1] and the Yoghourma, *i.e.* opium remade into cakes, at the port of shipment, to contain 7, 8, 9, or 10 % of morphine, are chiefly sold. Manufacturers' opium includes any grade yielding not less than 10½ % of morphine, but the Yoghourma or "pudding" opium, on account of its paste being more difficult to work, is not used for the extraction of the active principles. For the extraction of codeine, the Persian opium is preferred when Turkey opium is dear, as it contains on the average 2½ % of that alkaloid, whilst Turkey opium yields only ½-¾ %. But codeine can also be made from morphine.

The ordinary varieties of Turkish opium are recognized in commerce by the following characteristics: Hadjikeuy opium occurs in pieces of about ½ ℔-1½ ℔; it has an unusually pale-coloured paste of soft consistence, and is very rich in morphia. Malatia opium is in pieces of irregular size usually of a broadly conical shape, weighing from 1-2 ℔. It has a soft paste with irregular layers of light and dark colour and is covered with unusually green poppy leaves. Tokat opium resembles that of Malatia, but the cakes are flatter, and the paste is similar in character, though the leaves covering it are of a yellower tint of green. Bogaditz opium occurs in smaller pieces, about 3 or 4 oz. in weight, but sometimes larger pieces of 1-1½ ℔ in weight are met with, approaching more nearly to the Kurgagatsch and Balukissar varieties. The surface is covered with a yellowish green leaf and many *Rumex* fruits. Karahissar opium, which usually includes the produce of Adet, Akhissar and Amasia, occurs in rather large shortly conical or more or less irregular lumps. Angora opium is met with in small smooth pieces, has generally a pale paste and is rich in morphia. Yerli opium is of good quality, variable in size and shape; the surface is usually rough with *Rumex* capsules. Ghéve opium formerly came over as a distinct kind, but is now mixed with other varieties; the pieces form small rounded cakes, smooth and shining like those of Angora, about 3-6 oz. in weight, with the midrib of the leaf they are wrapped in forming a median line on the surface. The interior often shows layers of light and dark colour.

In Macedonia opium culture was begun in 1865 at Istip with seed obtained from Karahissar in Asia Minor, and extended subsequently to the adjacent districts of Kotchava, Stroumnitza, Tikvish and Kinprulu-veles, most of the produce being exported under the name of Salonica opium. Macedonian opium, especially that produced at Istip, is very pure, and is considered equal to the Malatia opium, containing about 11 % of morphine. The pieces vary from ¾ ℔ to 1½ ℔ in weight. For some years past, however, it has been occasionally mixed with pieces of inferior opium, like that of Yoghourma, recognizable on cutting by their solidity and heavy character. The Turkish government encourage the development of the industry by remitting the tithes on opium and poppy-seed for one year on lands sown for the first time, and by distributing printed instructions for cultivating the poppy and preparing the opium. In these directions it is pointed out that the opium crop is ten times as profitable as that of wheat. Four varieties of poppy are distinguished—two with white flowers, large oval capsules without holes under their "combs" (stigmas) and bearing respectively yellow and white seed, and the other two having red or purple flowers and seeds of the same colour, one bearing small capsules perforated at the top, and the other larger oval capsules not perforated. The white varieties are recommended as yielding a more abundant opium of superior quality. The yellow seed is said to yield the best oil; that obtained by hot pressure is used for lamps and for paint, and the cold-pressed oil for culinary purposes.

Opium is also grown in Bulgaria, but almost entirely for home consumption; any surplus produce is, however, bought by Jews and Turks at low prices and sent to Constantinople, where it is sold as Turkish opium. It is produced in the districts of Kustendil, Lowtscha and Halitz, and is made into lumps weighing about 4 oz., of a light-brown colour internally and containing a few seeds; it is covered with leaves which have not been identified. Samples have yielded from 7 to 19 % of morphia, and only 2 to 3 % of ash, and are therefore of excellent quality.

India.—The poppy grown in India is usually the white-flowered variety, but in the Himalayas a red-flowered poppy with dark seeds is cultivated. The opium industry in Bengal is a government monopoly, under the control of officials residing respectively at Patna and Ghazipore. Any one may undertake the industry, but cultivators are obliged to sell the opium exclusively to the government agent at a price fixed beforehand by the latter, which, although small, is said to fully remunerate the grower. It is considered that with greater freedom the cultivator would produce too great a quantity, and loss to the government would soon result. Advances of money are often made by the government to enable the ryots to grow the poppy. The chief centres of production are Bihar in Bengal, and the district of the United Provinces of Agra and Oudh lying along the Gangetic valley, and north of it, of which the produce is known as Bengal opium. The opium manufactured at Patna is of two classes, viz. Provision opium manufactured for export, and Excise or Akbari opium intended for local consumption in India. These differ in consistence: Excise opium is prepared to contain 90 % of non-volatile solid matter and made up into cubes weighing one seer or $2\frac{2}{35}$ ℔, and wrapped in oiled paper, whilst Provision opium is made up into balls, protected by a leafy covering, made of poppy petals, opium and "pussewah," or liquid drainings of the crude opium; that of Patna is made to contain 75 % of solid matter, and that of Ghazipore, which is known as Benares opium, 71 % only. Each ball consists of a little over 3½ ℔ of fine opium, in addition to other poppy products. The Benares ball opium has about 1½ oz. less of the external covering than the Patna sort. Forty of these balls are packed in each chest. The Excise opium not having a covering of poppy petals lacks the aroma of Provision opium. Malwa opium is produced in a large number of states in the Central India and Rajputana Agencies, chiefly Gwalior, Indore and Bhopal, in the former, and Mewar in the latter. It is also produced in the native state of Baroda, and in the small British territory of Ajmer Merwara. The cultivation of Malwa opium is free and extremely profitable, the crop realizing usually from three to seven times the value of wheat or other cereals, and in exceptionally advantageous situations, from twelve to twenty times as much. On its entering British territory a heavy duty is imposed on Malwa opium, so as to raise its price to an equality with the government article. It is shipped from Bombay to northern China, where nearly the whole of the exported Malwa opium is consumed. The poppy is grown for opium in the Punjab to a limited extent, but it has been decided to entirely abolish the cultivation there within a short time. In Nepal, Bashahr and Rampur, and at Doda Kashtwar in the Jammu territory, opium is produced and exported to Yarkand, Khotan and Aksu. The cultivation of the poppy is also carried on in Afghanistan, Kashmir, Nepal and the Shan states of Burma, but the areas and production are not known.

A small amount of opium alkaloids only is manufactured in India. The surplus above that issued to government medical institutions in India is sold in London. The amount manufactured in 1906-1907 was 346 ℔ of morphine hydrochlorate, 12 ℔ of the acetate and 61 ℔ of codeia.

The land intended for poppy culture is usually selected near villages, in order that it may be more easily manured and irrigated. On a rich soil a crop of maize or vegetables is grown during the rainy season, and after its removal in September the ground is prepared for the poppy-culture. Under less favourable circumstances the land is prepared from July till October by ploughing, weeding and manuring. The seed is sown between the 1st and

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[1] Ghéve is the commercial name for opium from Geiveh on the river Sakaria, running into the Black Sea. It appears to find its way to Constantinople via the port of Ismid, and hence is known also by the latter name.

15th of November, and germinates in ten or fifteen days. The fields are divided for purposes of irrigation into beds about 10 ft. square, which usually are irrigated twice between November and February, but if the season be cold, with hardly any rain, the operation is repeated five or six times. When the seedlings are 2 or 3 in. high they are thinned out and weeded. The plants during growth are liable to injury by severe frost, excessive rain, insects, fungi and the growth of a root-parasite (*Orobanche indica*). The poppy blossoms about the middle of February, and the petals when about to fall are collected for the purpose of making "leaves" for the spherical coverings of the balls of opium. These are made by heating a circular-ridged earthen plate over a slow fire, and spreading the petals, a few at a time, over its surface. As the juice exudes, more petals are pressed on to them with a cloth until a layer of sufficient thickness is obtained. The leaves are forwarded to the opium-factories, where they are sorted into three classes, according to size and colour, the smaller and dark-coloured being reserved for the inside of the shells of the opium-balls, and the larger and least coloured for the outside. These are valued respectively at 10 to 7 and 5 rupees per maund of $82\frac{2}{7}$ lb. The collection of opium commences in Behar about 25th February, and continues to about 25th March, but in Malwa is performed in March and April. The capsules are scarified vertically (fig. 2, *b*) in most districts (although in some the incisions are made horizontally, as in Asia Minor), the "nushtur" or cutting instrument being drawn twice upwards for each incision, and repeated two to six times at intervals of two or three days. The nushtur (fig. 2, *c*) consists of three to five flattened blades forked at the larger end, and separated about one-sixteenth of an inch from each other by winding cotton thread between them, the whole being also bound together by thread, and the protrusion of the points being restricted to one-twelfth of an inch, by which the depth of the incision is limited. The operation is usually performed about three or four o'clock in the afternoon, and the opium collected the next morning. In Bengal a small sheet-iron scoop or "seetoah" is used for scraping off the dried juice, and, as it becomes filled, the opium is emptied into an earthen pot carried for the purpose. In Malwa a flat scraper is employed, a small piece of cotton soaked in linseed oil being attached to the upper part of the blade, and used for smearing the thumb and edge of the scraper to prevent adhesion of the juice; sometimes water is used instead of oil, but both practices injure the quality of the product. Sometimes the opium is in a fluid state by reason of dew, and in some places it is rendered still more so by the practice adopted by collectors of washing their scrapers, and adding the washings to the morning's collection. The juice, when brought home, is consequently a wet granular mass of pinkish colour, from which a dark fluid drains to the bottom of the vessel. In order to get rid of this fluid, called "pasewa" or "pussewah," the opium is placed in a shallow earthen vessel tilted on one side, and the pussewah drained off. The residual mass is then exposed to the air in the shade, and regularly turned over every few days, until it has reached the proper consistence, which takes place in about three or four weeks. The drug is then taken to the government factory to be sold. It is turned out of the pots into wide tin vessels or "tagars," in which it is weighed in quantities not exceeding 21 lb. It is then examined by a native expert (purkhea) as to impurities, colour, fracture, aroma and consistence. To determine the amount of moisture, which should not exceed 30%, a weighed sample is evaporated and dried in a plate on a metallic surface heated by steam. Adulterations such as mud, sand, powdered charcoal, soot, cow-dung, powdered poppy petals and powdered seeds of various kinds are easily detected by breaking up the drug in cold water. Flour, potato-flour, ghee and ghoor (crude date-sugar) are revealed by their odour and the consistence they impart.

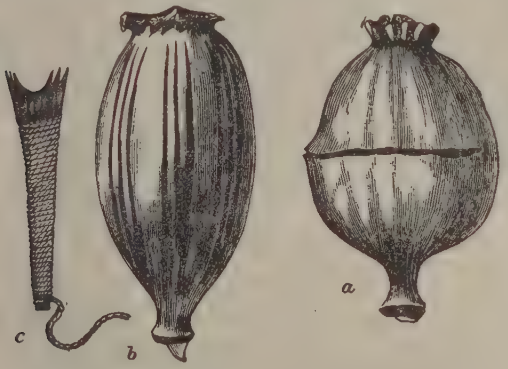

FIG. 2.—Opium Poppy Capsules, &c.; *a*, capsule showing mode of incision practised in Turkey; *b*, capsule as incised in India; *c*, nushtur, or instrument used in India for making the incisions. Drawn from specimens in the Museum of the Pharmaceutical Society of Great Britain.

Various other adulterants are sometimes used, such as the inspissated juice of the prickly pear, extracts from tobacco, stramonium and hemp, pulp of the tamarind and bael fruit, mahwah flowers and gums of different kinds. The price paid to the cultivator is regulated chiefly by the amount of water contained in the drug. When received into the government stores the opium is kept in large wooden boxes holding about 50 maunds and occasionally stirred up, if only a little below the standard. If containing much water it is placed in shallow wooden drawers and constantly turned over. During the process it deepens in colour. From the store about 250 maunds are taken daily to be manufactured into cakes.

Various portions, each weighing 10 seers (of $2\frac{2}{35}$ lb), are selected by test assay so as to ensure the mass being of standard consistence (70% of the pure dry drug and 30% of water), and are thrown into shallow drawers and kneaded together. The mass is then packed into boxes all of one size, and a specimen of each again assayed, the mean of the whole being taken as the average. Before evening these boxes are emptied into wooden vats 20 ft. long, $3\frac{1}{2}$ ft. wide and $1\frac{1}{4}$ ft. deep, and the opium further kneaded and mixed by men wading through it from end to end until it appears to be of a uniform consistence. Next morning the manufacture of the opium into balls commences. The workman sits on a wooden stand, with a brass cup before him, which he lines with the leaves of poppy petals before-mentioned until the thickness of half an inch is reached, a few being allowed to hang over the cup; the leaves are agglutinated by means of "lewa," a pasty fluid which consists of a mixture of inferior opium, 8% of "pussewah" and the "dhoe" or washings of the vessels that have contained opium, and the whole is made of such consistence that 100 grains evaporated to dryness over a water-bath leave 53 grains of solid residue. All the ingredients for the opium-ball are furnished to the workmen by measure. When the inside of the brass cup is ready a ball of opium previously weighed is placed on the leafy case in it, and the upper half of it covered with leaves in the same way that the casing for the lower half was made, the overhanging leaves of the lower half being pressed upwards and the sphere completed by one large leaf which is placed over the upper half. The ball, which resembles a Dutch cheese in size and shape, is now rolled in "poppy trash" made from the coarsely-powdered leaves, capsules and stalks of the poppy plant, and is placed in an earthen cup of the same size as the brass one; the cups are then placed in dishes and the opium exposed to the sun to dry for three days, being constantly turned and examined. If it becomes distended the ball is pierced to liberate the gas and again lightly closed. On the third evening the cups are placed in open frames which allow free circulation of the air. This operation is usually completed by the end of July. The balls thus made consist on the average of:—

Standard opium	1	seer	7·50	chittacks.
Lewa	0	,,	3·75	,,
Leaves (poppy petals)	0	,,	5·43	,,
Poppy trash	0	,,	0·50	,,
	2	seers	1·18	chittacks.

The average number of cakes that can be made daily by one man is about 70, although 90 to 100 are sometimes turned out by clever workmen. The cakes are liable to become mildewed, and require constant turning and occasional rubbing in dry "poppy trash" to remove the mildew, and strengthening in weak places with fresh poppy leaves. By October the cakes are dry and fairly solid, and are then packed in chests, which are divided into two tiers of twenty square compartments for the reception of as many cakes, which are steadied by a packing of loose poppy trash.[1] Each case contains about 120 catties (about 160 lb). The chests need to be kept in a dry warehouse for a length of time, but ultimately the opium ceases to lose moisture to the shell, and the latter becomes extremely solid.

The care bestowed on the selection and preparation of the drug in the Bengal opium-factories is such that the merchants who purchase it rarely require to examine it, although permission is given to open at each sale any number of chests or cakes that they may desire.

In Malwa the opium is manufactured by private enterprise, the government levying an export duty of 600 rupees (£60) per chest. It is not made into balls but into rectangular or rounded masses, and is not cased in poppy petals. It contains as much as 95% of dry opium, but is of much less uniform quality than the Bengal drug, and, having no guarantee as to purity, is not considered so valuable. The cultivation in Malwa does not differ in any important particular from that in Bengal. The opium is collected in March and April, and the crude drug or "chick" is thrown into an earthen vessel and covered with linseed oil to prevent evaporation. In this state it is sold to itinerant dealers. It is afterwards tied up in quantities of 25 lb and 50 lb in double bags of sheeting, which are suspended to a ceiling out of the light and draught to allow the excess of oil to drain off. This takes place in seven to ten days, but the bags are left for four to six weeks until the oil remaining on the opium has become oxidized and hardened. In June and July, when the rains begin, the bags are taken down and emptied into shallow vats 10 to 15 ft. across, and 6 to 8 in. deep, in which the opium is kneaded until uniform in colour and consistence and tough enough to be formed into cakes of 8 or 10 oz. in weight. These are thrown into a basket containing chaff made from the capsules. They are then rolled in broken leaves and stalks of the poppy and left, with occasional turning, for a week or so, when they become hard enough to bear packing. In October and November they are weighed and sent to market, packed in chests containing as nearly as possible 1 picul = 133⅓ ℔, the petals and leaves of the poppy being used as packing materials. The production is said to amount to about 20,000 chests annually.

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[1] This is purchased from the ryots at 12 annas per maund.

The amount of opium revenue collected in India was £10,480,051 in 1881, but in 1907–1908 was only £5,244,986. It is a remarkable fact that the only Indian opium ever seen in England is an occasional sample of the Malwa sort, whilst the government monopoly opium is quite unknown; indeed, the whole of the opium used in medicine in Europe and the United States is obtained from Turkey. This is in some measure due to the fact that Indian opium contains less morphia. It has recently been shown, however, that opium grown in the hilly districts of the Himalayas yields 50% more morphia than that of the plains, and that the deficiency of morphia in the Indian drug is due, in some measure, to the long exposure to the air in a semi-liquid state which it undergoes. In view, therefore, of the probable decline in the Chinese demand, the cultivation of the drug for the European market in the hilly districts of India, and its preparation after the mode adopted in Turkey, viz., by drying the concrete juice as quickly as possible, might be worthy of the consideration of the British government.

Persia.—The variety of poppy grown in Persia appears to be *P. somniferum*, var. *album*, having roundish ovate capsules. It is most largely produced in the districts of Ispahan, Shiraz, Yezd and Khonsar, and to a less extent in those of Khorasan, Kermanshah and Fars. The Yezd opium is considered better than that of Ispahan, but the strongest or *Theriak-e-Arabistani* is produced in the neighbourhood of Dizful and Shuster, east of the river Tigris. Good opium is also produced about Sari and Balfarush in the province of Mazanderan. The capsules are incised vertically, or in some districts vertical cuts with diagonal branches are made. The crop is collected in May and June and reaches the ports for exportation between August and January. Although the cultivation of opium in Persia was probably carried on at an earlier date than in India, Persian opium was almost unknown in England until about the year 1870, except in the form of the inferior quality known as "Trebizond," which usually contains only 0·2 to 3% of morphia. This opium is in the form of cylindrical sticks about 6 in. long and half an inch in diameter, wrapped in white waxed or red paper. Since 1870 Persian opium has been largely exported from Bushire and Bandar-Abbas in the Persian Gulf to London, the Straits Settlements and China. At that date the annual yield is said not to have exceeded 2600 cases; but, the profits on opium having about that time attracted attention, all available ground was utilized for this to the exclusion of cereals, cotton and other produce. The result was a severe famine in 1871–1872, which was further aggravated by drought and other circumstances. Notwithstanding the lesson thus taught, the cultivation is being extended every year, especially in Ispahan, which abounds in streams and rivers, an advantage in which Yezd is deficient. About Shiraz, Behbehan and Kermanshah it now occupies much of the land, and has consequently affected the price and growth of cereals. The trade—only 300 chests in 1859—gradually increased until 1877, when the Persian opium was much adulterated with glucose. The heavy losses on this inferior opium and the higher prices obtained for the genuine article led to a great improvement in its preparation, and in 1907 the production had increased to 10,000 piculs. About half of the total produce finds its way to the Chinese market, chiefly by sea to Hongkong and the Federated Malay States, although some is carried overland through Bokhara, Khokand and Kashgar; a small quantity is exported by way of Trebizond and Samsun to Constantinople, and about 2000 piculs to Great Britain. The produce of Ispahan and Fars is carried for exportation to Bushire, and that of Khorasan and Kirman and Yezd partly to Bushire and partly to Bandar-Abbas. The Shuster opium is sent partly via Bushire to Muscat for transhipment to Zanzibar, and part is believed to be smuggled into India by way of Baluchistan and Mekran. Smaller quantities grown in Teheran, Tabriz and Kermanshah find their way to Smyrna, where it is said to be mixed with the local drug for the European market, the same practice being carried on at Constantinople with the Persian opium that arrives there from Samsun and Trebizond. For the Chinese market the opium is usually packed in chests containing 10½ shahmans (of 13½ ℔), so that on arrival it may weigh 1 Chinese picul (= 133⅓ ℔), 5 to 10% being allowed for loss by drying. At Ispahan, Shiraz and Yezd the drug, after being dried in the sun, is mixed with oil in the proportion of 6 or 7 ℔ to 141 ℔ of opium, with the object, it is said, of suiting the taste of the Chinese—that intended for the London market being now always free from oil.

Persian opium, as met with in the London market, occurs in several forms, the most common being that of brick-shaped pieces. These occur wrapped separately in paper, and weighing 1 ℔ each; of these 140-160 are packed in a case. Ispahan opium also occurs in the form of parallelopipeds weighing about 16-20 oz.; sometimes flat circular pieces weighing about 20 oz. are met with. The opium is usually of much firmer and smoother consistence than that of Turkey, of a chocolate-brown colour and cheesy appearance, the pieces bearing evidence of having been beaten into a uniform mass previously to being made into lumps, probably with the addition of Sarcocoll, as it is always harder when dry than Turkey opium. The odour differs but slightly, except in oily specimens, from that of Turkey opium. Great care is now taken to prevent adulteration, and consequently Persian opium can be obtained nearly as rich in morphia as the Turkish drug—on the average from 9-12%. The greater proportion of the Persian opium imported into London is again exported, a comparatively small quantity being used, chiefly for the manufacture of codeine when Turkey opium is dear, and a little in veterinary practice. According to Dr Reveil, Persian opium usually contains 75 to 84% of matter soluble in water, and some samples contain from 13 to 30% of glucose, probably due to an extract or syrup of raisins added to the paste in the pots in which it is collected, and to which the shining fracture of hard Persian opium is attributed.

Europe.—Experiments made in England, France, Italy, Switzerland, Greece, Spain, Germany, and even in Sweden, prove that opium as rich in morphia as that of Eastern countries can be produced in Europe. In 1830 Young, a surgeon at Edinburgh, succeeded in obtaining 56 ℔ of opium from an acre of poppies, and sold it at 36s. per ℔. In France the cultivation has been carried on since 1844 at Clermont-Ferrand by Aubergier. The juice, of which a workman is able to collect about 9·64 troy oz. in a day, is evaporated by artificial heat immediately after collection. The juice yields about one-fourth of its weight of opium, and the percentage of morphia varies according to the variety of poppy used, the purple one giving the best results. By mixing assayed samples he is able to produce an opium containing uniformly 10% of morphia. It is made up in cakes of 50 grammes, but is not produced in sufficient quantity to become an article of wholesale commerce. Some specimens of French opium have been found by Guibourt to yield 22·8% of morphia, being the highest percentage observed as yet in any opium. Experiments made in Germany by Karsten, Jobst and Vulpius have shown that it is possible to obtain in that country opium of excellent quality, containing from 8 to 13% of morphia. It was found that the method yielding the best results was to make incisions in the poppy-heads soon after sunrise, to collect the juice with the finger immediately after incision and evaporate it as speedily as possible, the colour of the opium being lighter and the percentage of morphia greater than when the juice was allowed to dry on the plant. Cutting through the poppy-head caused the shrivelling up of the young fruit, but the heads which had been carefully incised yielded more seed than those which had not been cut at all. Newly-manured soil was found to act prejudicially on the poppy. The giant variety of poppy yielded most morphia.

The difficulty of obtaining the requisite amount of cheap labour at the exact time it is needed and the uncertainty of the weather render the cultivation of opium too much a matter of speculation for it ever to become a regular crop in most European countries.

North America.—In 1865 the cultivation of opium was attempted in Virginia by A. Robertson, and a product was obtained which yielded 4% of morphia. In 1867 H. Black grew opium in Tennessee which contained 10% of morphia. Opium produced in California by H. Flint in 1873 yielded 7¾% of morphia, equal to 10% in perfectly-dried opium. The expense of cultivation exceeded the returns obtained by its sale. As in Europe, therefore, the high price of labour militates against its production on a large scale.

(E. M. H.)

Chemistry of the Opium Alkaloids.—The chemical investigation of opium dates from 1803 when C. Derosne isolated a crystalline compound which he named "opium salt." In 1805 F. W. Sertürner, a German apothecary, independently obtained this same substance, naming it "morphium," and recognized its basic nature; he also isolated an acid, *meconic acid.* A second paper, published in 1817, was followed in the same year by the identification of a new base, *narcotine*, by P. J. Robiquet. Thebaine, another alkaloid, was discovered by Thiboumery in 1835; whilst, in 1848, Merck isolated papaverine from commercial narcotine. Subsequent investigations have revealed some twenty or more alkaloids, the more important of which are given in the following table (from A. Pictet, *Vegetable Alkaloids*):—

Morphine	9·0%	Laudanine	0·01%
Narcotine	5·0%	Lanthopine	0·006%
Papaverine	0·8%	Protopine	0·003%
Thebaine	0·4%	Codamine	0·002%
Codeine	0·3%	Iritopine	0·0015%
Narceine	0·2%	Laudanosine	0·0008%
Cryptopine	0·08%	Meconine	0·3%
Pseudomorphine	0·02%		

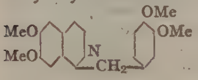
Opium also contains a gum, pectin, a wax, sugar and similar substances, in addition to meconic and lactic acids.

The alkaloids fall into two chemical groups: (1) derivatives of isoquinoline, including papaverine, narcotine, gnoscopine (racemic narcotine), narceine, laudanosine, laudanine, cotarnine, hydrocotarnine (the last two do not occur in opium), and (2) derivatives of phenanthrene, including morphine, codeine, thebaine. The constitutions of the first series have been determined; of the second they are still uncertain.

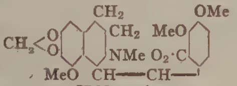
Papaverine, $C_{20}H_{21}NO_4$, was investigated by G. Goldschmiedt (*Monats.*, 1883–1889), who determined its constitution (formula I., below) by a study of its oxidation products, showing that papaveraldine, which it gives with potassium permanganate, is a tetramethoxybenzoylisoquinoline. Its synthesis, and also that of *laudanosine*, $C_{21}H_{27}NO_4$, which is N-methyltetrahydropapaverine, was effected in 1909 by F. L. Pyman (*Jour. Chem. Soc.*, 95, p. 1610) and by A. Pictet and Mlle M. Finkelstein (*Compt. rend.*, 1909, 148, p. 925). *Laudanine*, $C_{20}H_{25}NO_4$, is very similar to laudanosine, differing in having three methoxy groups and one hydroxy instead of four methoxy.

Narcotine, $C_{22}H_{23}NO_7$, has been principally investigated by A. Matthiessen and G. C. Foster, and by W. Roser (*Ann.*, 1888, 249, p. 156; 1889, 254, p. 334.) By hydrolysis it yields opianic acid, $C_{10}H_{10}O_5$, and hydrocotarnine, $C_{12}H_{15}NO_3$; reduction gives meconine, $C_{10}H_{10}O_4$, and hydrocotarnine; whilst oxidation gives opianic acid and cotarnine, $C_{12}H_{15}NO_4$. Narcotine was shown to be methoxyhydrastine (II.) (hydrastine, the alkaloid of Golden seal, *Hydrastis canadensis*, was solved by E. Schmidt, M. Freund, and P. Fritsch) and cotarnine to be III.; the latter has been synthesized by A. H. Salway (*Jour. Chem. Soc.*, 1910, 97, p. 1208). *Narceine*, $C_{23}H_{27}NO_8$, obtained by the action of potash on the methyl iodide of narcotine, is probably IV. (see Pyman, *loc. cit.* pp. 1266, 1738; M. Freund and P. Oppenheim, *Ber.*, 1909, 42, p. 1084).

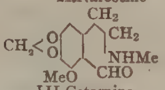
The proprietary drug "stypticin" is cotarnine hydrochloride, and "styptol" cotarnine phthalate; "antispasmin" is a sodium narceine combined with sodium salicylate, and "narcyl" narceine ethyl hydrochloride.



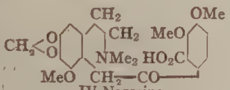
I. Papaverine



II. Narcotine



III. Cotarnine



IV. Narceine

The chemistry of morphine, codeine and thebaine is exceedingly complicated, and the literature enormous. That these alkaloids are closely related may be suspected from their empirical formulae, viz. morphine = $C_{17}H_{19}NO_3$, codeine = $C_{18}H_{21}NO_3$, thebaine = $C_{19}H_{21}NO_3$. As a matter of fact, Grimaux, in 1881, showed codeine to be a methylmorphine, and in 1903 Ach and L. Knorr (*Ber.*, 36, p. 3067) obtained identical substances, viz. thebenine and morphothebaine, from both codeine and thebaine, thereby establishing their connexion. Our knowledge of the constitution of these alkaloids largely depends on the researches of M. Freund, E. Vongerichten, L. Knorr and R. Pschorr. The presence of the phenanthrene nucleus and the chain system $CH_3N{\cdot}C{\cdot}C{\cdot}$ follows from the fact that these alkaloids, by appropriate treatment, yield a substituted phenanthrene and also dimethylaminoethanol $(CH_3)_2N{\cdot}CH_2{\cdot}CH_2OH$. Formulae have been proposed by Pschorr and Knorr explaining this and other decompositions (in Pschorr's formula the morphine ring system is a fusion of a phenanthrene and pyridine nucleus); another formula, containing a fusion of a phenanthrene with a pyrrol ring, was proposed by Bucherer in 1907. The problem is discussed by Pschorr and Einbeck (*Ber.*, 1907, 40, p. 1980), and by Knorr and Hörlein (*ibid.* p. 2042); see also *Ann. Reps. Chem. Soc.*

Morphine, or morphia, crystallizes in prisms with one molecule of water; it is soluble in 1000 parts of cold water and in 160 of boiling water, and may be crystallized from alcohol; it is almost insoluble in ether and chloroform. It has an alkaline reaction and behaves as a tertiary, monacid base; its salts are soluble in water and alcohol. The official hydrochloride, $C_{17}H_{19}NO_3{\cdot}HCl+3H_2O$, forms delicate needles. Distilled with zinc dust morphine yields phenanthrene, pyridine and quinoline; dehydration gives, under certain conditions, apomorphine, $C_{17}H_{17}NO_2$, a white amorphous substance, readily soluble in alcohol, either and chloroform. The drug "heroin" is a diacetylmorphine hydrochloride. Codeine, or codeia, crystallizes in orthorhombic prisms with one molecule of water: it is readily soluble in alcohol, ether and chloroform. Thebaine forms silvery plates, melting at 193°. (C. E.*)

Medicine.—Of the opium alkaloids only morphine and codeine are used to any extent in medicine. Thebaine is not so used, but is an important and sometimes very dangerous constituent of the various opium preparations, which are still largely employed, despite the complexity and inconstant composition of the drug. Of the other alkaloids narceine is hypnotic, like morphine and codeine, whilst thebaine, papaverine and narcotine have an action which resembles that of strychnine, and is, generally speaking, undesirable or dangerous if at all well marked. A drug of so complex a composition as opium is necessarily incompatible with a large number of substances. Tannic acid, for instance, precipitates codeine as a tannate, salts of many of the heavy metals form precipitates of meconates and sulphates, whilst the various alkalis, alkaline carbonates and ammonia precipitate the important alkaloids.

The pharmacology of opium differs from that of morphine (*q.v.*) in a few particulars. The chief difference between the action of opium and morphine is due to the presence in the former of thebaine, which readily affects the more irritable spinal cord of very young children. In infants especially opium acts markedly upon the spinal cord, and, just as strychnine is dangerous when given to young children, so opium, because of the strychnine-like alkaloid it contains, should never be administered, under any circumstances or in any dose, to children under one year of age.

When given by the mouth, opium has a somewhat different action from that of morphine. It often relieves hunger, by arresting the secretion of gastric juice and the movements of the stomach and bowel, and it frequently upsets digestion from the same cause. Often it relieves vomiting, though in a few persons it may cause vomiting, but in far less degree than apomorphine, which is a powerful emetic. Opium has a more marked diaphoretic action than morphine, and is much less certain as a hypnotic and analgesic.

There are a few therapeutic indications for the use of opium rather than morphine, but they are far less important than those which make the opposite demand. In some abdominal conditions, for instance, opium is still preferred by the majority of practitioners, though certainly not in gastric cases, where morphine gives the relief for which opium often increases the need, owing to the irritant action of some of its constituents. Opium is often preferred to morphine in cases of diabetes, where prolonged administration is required. In such cases the soporific action is not that which is sought, and so opium is preferable. A Dover's powder, also, is hardly to be surpassed in the early stages of a bad cold in the head or bronchitis. Ten grains taken at bedtime will often give sleep, cause free diaphoresis and quieten the entire nervous system in such cases. The tincture often known as "paregoric" is also largely used in bronchial conditions, and morphine shows no sign of displacing it in favour. Opium rather than morphine is also usually employed to relieve the pain of haemorrhoids or fissure of the rectum. This practice is, however, obsolescent.

The alkaloid thebaine may here be referred to, as it is not used separately in medicine. Crum Brown and Fraser of Edinburgh showed that, whilst thebaine acts like strychnine, methyl and ethyl thebaine act like curara, paralysing the terminals of motor nerves. At present we say of such a substance as thebaine, "it acts on the anterior cornua of grey matter in the spinal cord," but why on them and not elsewhere we do not know.

Toxicology.—Under this heading must be considered acute poisoning by opium, and the chronic poisoning seen in those who eat or smoke the drug. Chronic opium poisoning by the taking of laudanum—as in the familiar case of De Quincey—need not be considered here, as the hypodermic injection of morphine has almost entirely supplanted it.

The acute poisoning presents a series of symptoms which are only with difficulty to be distinguished from those produced by alcohol, by cerebral haemorrhage and by several other morbid conditions. The differential diagnosis is of the highest importance, but very frequently time alone will furnish a sufficient criterion. The patient who has swallowed a toxic or lethal dose of laudanum, for instance, usually passes at once into the narcotic state, without any prior excitement. Intense drowsiness yields to sleep and coma which ends in death from failure of the respiration. This last is the cardinal fact in determining treatment. The comatose patient has a cold and clammy skin, livid lips and ear-tips—a grave sign—and "pin-point pupils." The heart's action is feeble, the pulse being small, irregular and often abnormally slow. The action on the circulation is largely secondary, however, to the all-important action of opium on the respiratory centre in the medulla oblongata. The centre is directly poisoned by the circulation through it of opium-containing blood, and the patient's breathing becomes progressively slower, shallower and more irregular until finally it ceases altogether.

In *treating* acute opium poisoning the first proceeding is to empty the stomach. For this purpose the best emetic is apomorphine, which may be injected subcutaneously in a dose of about one-tenth of a grain. But apomorphine is not always to be obtained, and even if it be administered it may fail, since the gastric wall is often paralysed in opium poisoning, so that no emetic can act. It is therefore better to wash out the stomach, and this should be done, if possible, with a solution containing about ten grains of salt to each ounce of water. This must be repeated at intervals of about half an hour, since some of the opium is excreted into the stomach after its absorption into the blood. If apomorphine is obtainable, both of these measures may be employed. Potassium permanganate decomposes morphine by oxidation, the action being facilitated by the addition of a small quantity of mineral acid to the solution. The physiological as well as the chemical antidotes must be employed. The chief of these are coffee or caffeine and atropine. A pint of hot strong coffee may be introduced into the rectum, and caffeine in large doses—ten or twenty grains of the carbonate—may be given by the mouth. A twentieth, even a tenth of a grain of atropine sulphate should be injected subcutaneously, the drug being a direct stimulant of the respiratory centre. Every means must be taken to keep the patient awake. He must be walked about, have smelling salts constantly applied to the nose, or be stimulated by the faradic battery. But the final resort in cases of opium poisoning is artificial respiration, which should be persevered with as long as the heart continues to beat. It has, indeed, been asserted that, if relays of trained assistants are at hand, no one need die of opium poisoning, even if artificial respiration has to be continued for hours or days. (X.)

Opium-eating.—Opium, like many other poisons, produces after a time a less effect if frequently administered as a medicine, so that the dose has to be constantly increased to produce the same result on those who take it habitually. When it is used to relieve pain or diarrhoea, if the dose be not taken at the usual time the symptoms of the disease recur with such violence that the remedy is speedily resorted to as the only means of relief, and thus the habit is exceedingly difficult to break off. Opium-eating is chiefly practised in Asia Minor, Persia and India. Opinions differ widely as to the injurious effect of the habit; the weight of evidence appears, however, to indicate that it is much more deleterious than opium-smoking.

The following statistics collected by Vincent Richards regarding Balasor in Orissa throw some light on the influence of this practice on the health. He estimates that 1 in every 12 or 14 of the population uses the drug, and that the habit is increasing. Of the 613 opium-eaters examined by him he found that the average age at which the habit was commenced was 20 to 26 years for men and 24 to 30 years for women. Of this number 143 had taken the drug for from 10 to 20 years, 62 for from 20 to 30 years and 38 for more than 30 years. The majority took their opium twice daily, morning and evening, the quantity taken varying from 2 to 46 grains daily, large doses being the exception, and the average 5 to 7 grains daily. The dose, when large, had been increased from the beginning; when small, there had usually been no increase at all. The causes which first led to the increase of the drug were disease, example and a belief in its aphrodisiac powers. The diseases for which it was chiefly taken were malarial fever, dysentery, diarrhoea, spitting of blood, rheumatism and elephantiasis. A number began to take it in the famine year, 1866, as it enabled them to exist on less food and mitigated their sufferings; others used it to enable them to undergo fatigue and to make long journeys. Richards concludes that the excessive use of opium by the agricultural classes, who are the chief consumers in Orissa, is very rare indeed. Its moderate use may be and is indulged in for years without producing any decided or appreciable ill effect except weakening the reproductive powers, the average number of the children of opium-eaters being 1·11 after 11 years of married life. It compares favourably as regards crime and insanity with intoxicating drinks, the inhabitants of Balasor being a particularly law-abiding race, and the insane forming only 0·0069% of the population. Dr W. Dymock of Bombay, speaking of western India, concurs in Richards's opinion regarding the moderate use of the drug. He believes that excessive indulgence in it is confined to a comparatively small number of the wealthier classes of the community. Dr Moore's experience of Rajputana strongly supports the same views. It seems probable that violent physical exercise may counteract in great measure the deleterious effect of opium and prevent it from retarding the respiration, and that in such cases the beneficial effects are obtained without the noxious results which would accrue from its use to those engaged in sedentary pursuits. There is no doubt that the spread of the practice is connected with the ban imposed in Mohammedan countries on the use of alcoholic beverages, and to some extent with the long religious fasts of the Buddhists, Hindus and Moslems, in which opium is used to allay hunger.

To break off the habit of opium-eating is exceedingly difficult, and can be effected only by actual external restraint, or the strongest effort of a powerful will, especially if the dose has been gradually increased.

Opium-smoking.—This is chiefly practised by the inhabitants of China and the islands of the Indian Archipelago, and in countries where Chinese are largely employed. Opium-smoking began in China in the 17th century. Foreign opium was first imported by the Portuguese (early 18th century). In 1906 it was estimated that 13,455,699 of Chinese smoked opium, or 27% of adult males; but during 1908–1910 the consumption of opium is believed to have diminished by about one-third.

For smoking the Chinese use an extract of opium known as prepared opium or chandoo, and a cheaper preparation is made from 60% used opium known as "opium dross" and 40% native opium. This latter is chiefly used by the poorer classes.

The process of preparation is thus described by Hugh M'Callum, government analyst at Hong-Kong:—

"The opium is removed from its covering of leaves, &c., moistened with a little water, and allowed to stand for about fourteen hours; it is then divided into pans, 2½ balls of opium and about 10 pints of water going to each pan; it is now boiled and stirred occasionally until a uniform mixture having the consistence of a thin paste is obtained. This operation takes from five to six hours. The paste is at once transferred to a larger pan and cold water added to about 3 gallons, covered and allowed to stand for from fourteen to fifteen hours. A bunch of 'tang sani' (lamp-wick, the pith of *Eriocaulon* or *Scirpus*) is then inserted well into the mass, and the pan slightly canted, when a rich, clear, brown fluid is thus drawn off, and filtered through 'chi mui' (paper made from bamboo fibre). The residue is removed to a calico filter and thoroughly washed with boiling water, the wash water being reboiled and used time after time. The last washing is done with pure water; these washings are used in the next day's boiling.

"The residues on the calico filters are transferred to a large one of the same material and well pressed. This insoluble residue, called 'nai chai' (opium dirt), is the perquisite of the head boiling coolie, who finds a ready market for it in Canton, where it is used for adulterating, or rather in manufacturing, the moist inferior kinds of prepared opium. The filtrate or opium solution is concentrated by evaporation at the boiling point, with occasional stirring until of a proper consistence, the time required being from three to four hours; it is then removed from the fire and stirred with great vigour till cold, the cooling being accelerated by coolies with large fans. When quite cold it is taken to the hong and kept there for some months before it is considered in prime condition for smoking. As thus prepared it has the consistence of a thin treacly extract, and is called boiled or prepared opium. In this state it is largely exported from China to America, Australia, &c., being carefully sealed up in small pots having the name of the maker (*i.e.* hong) on each.

"The Chinese recognize the following grades of opium: (1) 'raw opium,' as imported from India; (2) 'prepared opium,' opium made as above; (3) 'opium dross,' the scrapings from the opium pipe; this is reboiled and manufactured as a second-class prepared opium; a Chinese doctor stated lately at a coroner's inquest on a case of poisoning that it was more poisonous than the ordinary prepared opium; (4) 'nai chai' (opium dirt), the insoluble residue left on exhausting the raw opium thoroughly with water. The opium is sent every day from the hong (*i.e.* shop or firm) to the boiling-house, the previous day's boiling being then returned to the hong. The average quantity boiled each day is from six to eight chests of Patna opium, this being the only kind used."

By this process of preparation a considerable portion of the narcotine, caoutchouc, resin, oil or fatty and insoluble matters are removed, and the prolonged boiling, evaporating and baking over a naked fire tend to lessen the amount of alkaloids present in the extract. The only alkaloids likely to remain in the prepared opium, and capable of producing well-marked physiological results, are morphine, codeine and narceine. Morphine, in the pure state, can be sublimed, but codeine and narceine are said not to give a sublimate. Even if sublimed in smoking opium, morphine would, in M'Callum's opinion, probably be deposited in the pipe before it reached the mouth of the smoker. The bitter taste of morphine is not noticeable when smoking opium, and it is therefore possible that the pleasure derived from smoking the drug is due to some product formed during combustion. This supposition is rendered probable by the fact that the opiums most prized by smokers are not those containing most morphine, and that the quality is judged by the amount of soluble matter in the opium, by its tenacity or "touch," and by peculiarities of aroma—the Indian opium, especially the Patna kind, bearing much the same relation to the Chinese and Persian drug that champagne does to *vin ordinaire*. Opium-smoking is thus described by Theo. Sampson of Canton:—

"The smoker, lying on his side, with his face towards the tray and his head resting on a high hard pillow (sometimes made of earthenware, but more frequently of bamboo covered with leather), takes the pipe in his hand; with the other hand he takes a dipper and puts the *sharp* end of it into the opium, which is of a treacly consistency. Twisting it round and round he gets a large drop of the fluid to adhere to the dipper; still twisting it round to prevent it falling he brings the drop over the flame of the lamp, and twirling it round and round he roasts it; all this is done with acquired dexterity. The opium must not be burnt or made too dry, but roasted gently till it looks like burnt worsted; every now and then he takes it away from the flame and rolls it (still on the end of the dipper) on the flat surface of the bowl. When it is roasted and rolled to his satisfaction he gently heats the centre of the bowl, where there is a small orifice; then he quickly thrusts the end of the dipper into the orifice, twirls it round smartly and withdraws it; if this is properly done, the opium (now about the size of a grain of hemp-seed or a little larger) is left adhering to the bowl immediately over the orifice. It is now ready for smoking.

"The smoker assumes a comfortable attitude (lying down of course) at a proper distance from the lamp. He now puts the stem to his lips, and holds the bowl over the lamp. The heat causes the opium to frizzle, and the smoker takes three or four long inhalations, all the time using the dipper to bring every particle of the opium to the orifice as it burns away, but not taking his lips from the end of the stem, or the opium pellet from the lamp till all is finished. Then he uses the flattened end of the dipper to scrape away any little residue there may be left around the orifice, and proceeds to prepare another pipe. The preparations occupy from five to ten minutes, and the actual smoking about thirty seconds. The smoke is swallowed, and is exhaled through both the mouth and the nose."

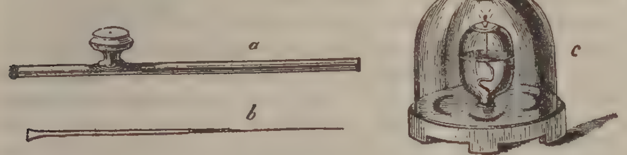


FIG. 3.—Opium-smoking Apparatus. *a*, pipe; *b*, dipper; *c*, lamp.

So far as can be gathered from the conflicting statements published on the subject, opium-smoking may be regarded much in the same light as the use of alcoholic stimulants. To the great majority of smokers who use it moderately it appears to act as a stimulant, and to enable them to undergo great fatigue and to go for a considerable time with little or no food. According to the reports on the subject, when the smoker has plenty of active work it appears to be no more injurious than smoking tobacco. When carried to excess it becomes an inveterate habit; but this happens chiefly in individuals of weak will-power, who would just as easily become the victims of intoxicating drinks, and who are practically moral imbeciles, often addicted also to other forms of depravity. The effect in bad cases is to cause loss of appetite, a leaden pallor of the skin, and a degree of leanness so excessive as to make its victims appear like living skeletons. All inclination for exertion becomes gradually lost, business is neglected, and certain ruin to the smoker follows. There can be no doubt that the use of the drug is opposed by all thinking Chinese who are not pecuniarily interested in the opium trade or cultivation, for several reasons, among which may be mentioned the drain of bullion from the country, the decrease of population, the liability to famine through the cultivation of opium where cereals should be grown, and the corruption of state officials.

See *Pharmaceutical Journ.* [1] xi. p. 269, xiv. p. 395; [2] x. p. 434; Impey, *Report on Malwa Opium* (Bombay, 1848); *Report on Trade of Hankow* (1869); *New Remedies* (1876), p. 229; *Pharmacographia* (1879), p. 42; *Journal of the Society of Arts* (1882); *The Friend of China* (1883), &c. *Report* of the Straits Settlements, Federated Malay States Opium Commission (1908), App. xxiii. and xxiv.; Allen, *Commercial Organic Analysis*, vol. iii. pt. iv. p. 355; Frank Browne, *Report on Opium* (Hong-Kong, 1908); G. Watt, *Dictionary of the Economic Products of India* (1892); H. Moissan, *Comptes rendus*, of the 5th of December 1892, iv. p. 33; Lalande, *Archives de médicine navale*, t. l. (1890); International Opium Commission (1909), vol. ii. "Report of the Delegations"; Squire, *Companion to the British Pharmacopeia* (1908) (18th edition). (E. M. H.)

OPLADEN, a town of Germany, in the Prussian Rhine Province, 10 m. N.E. from Cologne by the railway to Elberfeld and at the junction of lines to Speldorf and Bonn. Pop. (1905) 6338. It has an Evangelical and a Roman Catholic church. It has dyeing works, and manufactures of dynamite, indigo products and railway plant. Before passing to Prussia, Opladen belonged to the duchy of Berg.

OPON, a town of the province of Cebu, Philippine Islands, on the small island of Mactan (area about 45 sq. m.), which is separated from the island of Cebu by a channel only about 1 m. wide. Pop (1903), after the annexation of Cordova and Santa Rosa, 20,166. There are forty-four *barrios*, or villages, in the town, and three of these had in 1903 more than 1000 inhabitants each. The language is Visayan. Opon is a shipping and commercial suburb of Cebu city, the harbour of which is sheltered by Mactan Island. The town has large groves of coco-nut trees, and its principal industries are the cultivation of Indian corn and maguey and fishing. In the N.E. part of the town is a monument to Magellan, who discovered the Philippines in March 1521, and was slain here by the natives late in the following month.

OPORTO (*i.e. o porto*, "the port"), the second city of the kingdom of Portugal, the capital of the district of Oporto and formerly of Entre-Douro-e-Minho; on both banks of the river Douro, about 3 m. from its mouth, in 41° 8′ N. and 8° 37′ W. Pop. (1900) 167,955. In Portuguese the definite article is uncompounded in the name of the city, which in strict accuracy should always be written *Porto*; the form *Oporto* has, however, been stereotyped by long usage in English and in some other European languages. The part of the city south of the Douro is known as Villa Nova de Gaia. Oporto is the see of a bishop, in the archiepiscopal province of Braga. It is the true capital of northern Portugal, and the commercial and political rival of Lisbon, in much the same way as Barcelona (*q.v.*) is the rival of Madrid. Three main railway lines meet here—from Lisbon, from Valença do Minho on the northern frontier, and from Barca d'Alva on the north-western frontier. The Valença line has branches to Guimarães and Braga, and affords access to Corunna and other cities of north-western Spain; the Barca d'Alva line has a branch to Mirandella and communicates with Madrid via Salamanca. Oporto is built chiefly on the north or right bank of the Douro; its principal suburbs are Bomfim on the E., Monte Pedral and Paranhos on the N., Villar Bicalho, Lordello and São João da Foz on the W., Ramalde, Villarinha, Matozinhos, Leça da Palmeira and the port of Leixões on the N.W. The mouth of the river is obstructed by a sandy spit of land which has been enlarged by the deposits of silt constantly washed down by the swift current; on the north side of this bar is a narrow channel varying in depth from 16 ft. to 19 ft. A fort in São João da Foz protects the entrance, and there is a lighthouse on a rock outside the bar. As large vessels cannot enter the river, a harbour of refuge has been constructed at Leixões (*q.v.*).

The approach to Oporto up the winding and fjord-like estuary is one of singular beauty. On the north the streets rise in terraces up the steep bank, built in many cases of granite overlaid with plaster, so that white is the prevailing colour of the city; on the south are the hamlets of Gaia and Furada, and the red-tiled wine lodges of Villa Nova de Gaia, in which vast quantities of "port" are manufactured and stored. The architecture of the houses and public buildings is often rather Oriental than European in appearance. There are numerous parks and gardens, especially on the outskirts of the city, in which palms, oranges and aloes grow side by side with the flowers and fruits of northern Europe, for the climate is mild and very equable, the mean temperatures for January and July—the coldest and the hottest months—being respectively about 50° and 70°. The Douro is at all seasons crowded with shipping, chiefly small steamers and large sailing vessels. The design of some of the native craft is peculiar—among them may be mentioned the high-prowed canoe-like fishing boats, the *rascas* with their three lateen sails, and the *barcos rabello*, flat-bottomed barges with huge rudders, used for the conveyance of wine down stream. Two remarkable iron bridges, the Maria Pia and the Dom Luiz I., span the river. The first was built by Messrs Eiffel & Company of Paris in 1876–1877; it rests on a granite substructure and carries the Lisbon railway line across the Douro ravine at a height of 200 ft. The second, constructed in 1881–1885 by a Belgian firm, has two decks or roadways, one 33 ft., the other 200 ft. above the usual water-level; its arch, one of the largest in Europe, has a span of 560 ft. and is supported by two massive granite towers. The Douro is liable in winter to sudden and violent floods; in 1909–1910 the water rose 40 ft. at Oporto, where it is confined in a deep and narrow bed.

Though parts of the city are modern or have been modernized, the older quarters in the east are extremely picturesque, with their steep and narrow lanes overshadowed by lofty balconied houses. Overcrowding and dirt are common, for the density of population is nearly 13,000 per sq. m., or greater than in any other city of Portugal. Until the early years of the 20th century, when a proper system of sewerage was installed, the condition of Oporto was most insanitary. Electric lighting and tramways were introduced a little before this, but the completion of the tramway system was long delayed, and in the hilly districts cars drawn by ten mules were not an uncommon sight. Ox-carts are used for the conveyance of heavy goods, and until late in the 19th century sedan-chairs were still occasionally used. A painful feature of the street-life of Oporto is the great number of the diseased and mutilated beggars who frequent the busiest thoroughfares. As a rule, however, the natives of Oporto are strong and of fine physique; they also show fewer signs of negro descent than the people of Lisbon. Their numbers tend to increase very rapidly; in 1864 the population of Oporto was 86,751, but in 1878 it rose to 105,838, in 1890 to 138,860, and in 1900 to 167,955. Many of the men emigrate to South America, where their industry usually enables them to prosper, and ultimately to return with considerable savings. The local dialect is broader than the Portuguese of the educated classes, from which it differs more in pronunciation than in idiom. The poverty of the people is very great. Out of the 597,935 inhabitants of the district of Oporto (893 sq. m.), 422,320 were returned at the census of 1900 as unable to read or write. Much had been done, however, to remedy this defect, and besides numerous primary schools there are in the city two schools for teachers, a medical academy, polytechnic, art, trade and naval schools, and industrial institute, a commercial athenaeum, a lyceum for secondary education, an ecclesiastical seminary, and a meteorological observatory.

The cathedral, which stands at the highest point of eastern Oporto, on the site of the Visigothic citadel, was originally a Romanesque building of the 12th century; its cloisters are Gothic of the 14th century, but the greater part of the fabric was modernized in the 17th and 18th centuries. The interior of the cloisters is adorned with blue and white tiles, painted to represent scenes from the Song of Solomon. The bishop's palace is a large and lofty building conspicuously placed on a high rock; the interior contains a fine marble staircase. The Romanesque and early Gothic church of São Martinho de Cedo Feita is the most interesting ecclesiastical building in Oporto, especially noteworthy being the curiously carved capitals of its pillars. Though the present structure is not older, except in details, than the 12th century, the church is said to have been " hastily built " (*cedo feita, cito facta*) by Theodomir, king of the Visigoths, in 559, to receive the relics of St Martin of Tours, which were then on their way hither from France. The Torre dos Clerigos is a granite tower 246 ft. high, built in the middle of the 18th century at the expense of the local clergy (*clerigos*); it stands on a hill and forms a conspicuous landmark for sailors. Nossa Senhora da Lapa is a fine 18th-century church, Corinthian in style; São Francisco is a Gothic basilica dating from 1410; Nossa Senhora da Serra do Pilar is a secularized Augustinian convent used as artillery barracks, and marks the spot at which Wellington forced the passage of the Douro in 1809. The exchange (*lonja*) is another secularized convent, decorated with coloured marbles. Parts of the interior are floored and panelled with polished native-coloured woods from Brazil, which are inlaid in elaborate patterns; there is a very handsome staircase, and the fittings of one large room are an excellent modern copy of Moorish ornamentation.

Other noteworthy public buildings are the museum, library, opera-house, bull-ring, hospital and quarantine station. The crystal palace is a large glass and iron structure built for the industrial exhibition of 1865; its garden commands a fine view of the city and river, and contains a small menagerie. The English factory, built in 1790, has been converted into a club for the British residents—a large and important community whose members are chiefly connected with the wine and shipping trades. Lawn tennis, cricket, boat-racing on the Douro, and other British sports have been successfully introduced, and there is keen competition between the Oporto clubs and those of Lisbon and Carcavellos. The English club gave its name to the Rua Nova dos Inglezes, one of the busiest streets, which contains many banks, warehouses and steamship offices. The Rua da Alfándega, skirting the right bank of the Douro and passing the custom house (*alfándega*), is of similar character; here may be seen characteristic types of the fishermen and peasants of northern Portugal. The Rua das Flores contains, on its eastern side, the shops of the cloth-dealers; on the west are the jewellers' shops, with a remarkable display of gold and silver filigree-work and enamelled gold. Oporto is famous for these ornaments, which are often very artistic, and are largely worn on holidays by women of the poorer classes, whose savings or dowries are often kept in this readily marketable form.

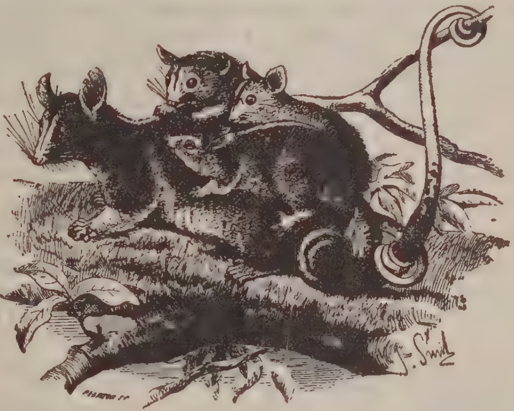
Oporto is chiefly famous for the export of the wine which bears its name. An act passed on the 29th of January 1906 defined " port " as a wine grown in the Douro district, exported from Oporto, and containing more than 16·5% of alcoholic strength. The vines from which it is made grow in the Paiz do Vinho, a hilly region about 60 m. up the river, and having an area of 27 m. in length by 5 or 6 in breadth, cut off from the sea, and shut in from the north-east by mountains. The trade was established in 1678, but the shipments for some years did not exceed 600 pipes (of 115 gallons each). In 1703 the British government concluded the Methuen treaty with Portugal, under which Portuguese wines were admitted on easier terms than French or German, and henceforward " port " began to be drunk (see PORTUGAL: *History*). In 1747 the export reached 17,000 pipes. In 1754 the great wine monopoly company of Oporto originated, under which the shipments rose to 33,000 pipes. At the beginning of the 19th century the policy of the government more and more favoured port wine, besides which the vintages from 1802 to 1815 were splendid both in Portugal and in Madeira—that of 1815 has, in fact, never been excelled. For the next few years the grape crop was not at all good, but the 1820 vintage was the most remarkable of any. It was singularly sweet and black, besides being equal in quality to that of 1815. This was long regarded as the standard in taste and colour for true port, and to keep up the vintage of following years to this exceptional standard adulteration by elder berries, &c., was resorted to. This practice did not long continue, for it was cheaper to adulterate the best wines with inferior sorts of port wine itself. In 1852 the *Oidium* which spread over Europe destroyed many of the Portuguese vineyards. In 1865 *Phylloxera* did much damage, and in 1867 the second monopoly company was abolished. From this time the exports again increased. (See WINE.)

A third of the population is engaged in the manufacture of cottons, woollens, leather, silk, gloves, hats, pottery, corks, tobacco, spirits, beer, aerated waters, preserved foods, soap or jewelry. Oporto gloves and hats are highly esteemed in Portugal. Cotton piece goods are sent to the African colonies, and, in small quantities, to Brazil; their value in 1905 was £120,360, but a larger quantity was retained for the home market. The fisheries —chiefly of hake, bream and sardines—are extensive. Steam-trawling, though unsuccessful in the 19th century, was resumed in 1904, and in 1906 there were 136 British, 10 Dutch and 3 Portuguese steamers thus engaged. The innovation was much resented by the owners of more than 350 small sailing boats, and protective legislation was demanded. In 1905 the combined port of Oporto and Leixões was entered by 1734 vessels of 1,562,724 tons, but in this total some vessels were counted twice over—*i.e.* once at each port. Nearly three-fourths of the tonnage was entered at Leixões. About the close of the 19th century there was an important development of tourist traffic from Liverpool and Southampton via Havre. Reduced railway rates and improved hotel accommodation have facilitated the growth of this traffic. Many tourists land at Oporto and visit Braga (*q.v.*), Bussaco (*q.v.*) and other places of interest, on their way to Lisbon. There is also a large tourist traffic from Germany. The exports of Oporto include wine, cottons, wood, pitwood, stone, cork, salt, sumach, onions, oranges, olives and beans. American competition has destroyed the export trade in live cattle for which Great Britain was the principal market. Dried codfish (*bacalhâo*) is imported in great quantities from Newfoundland and Norway; other noteworthy imports are coal, iron, steel, machinery and textiles. The total yearly value of the foreign trade exceeds £5,000,000.

The history of Oporto dates from an early period. Before the Roman invasion, under the name of Portus Cale, Gaia or Cago, it was a town on the south bank of the Douro with a good trade; the Alani subsequently founded a city on the north bank, calling it *Castrum Novum*. About A.D. 540 the Visigoths under Leovigild obtained possession, but yielded place in 716 to the Moors. The Christians, however, recaptured Oporto in 997, and it became the capital of the counts of *Portucalia* for part of the period during which the Moors ruled in the southern provinces of Portugal. (See PORTUGAL: *History*.) The Moors once more became its masters for a short period, till in 1092 it was brought finally under Christian domination. The citizens rebelled in 1628 against an unpopular tax, in 1661 for a similar reason, in 1757 against the wine monopoly, and in 1808 against the French. The town is renowned in British military annals from the duke of Wellington's passage of the Douro, by which he surprised and put to flight the French army under Marshal Soult, capturing the city on the 12th of May 1809. Oporto sustained a severe siege in 1832–1833, being bravely defended against the Miguelites by Dom Pedro with 7000 soldiers; 16,000 of its inhabitants perished. In the constitutional crises of 1820, 1826, 1836, 1842, 1846–1847, 1891 and 1907–1908 the action of Oporto, as the capital of northern Portugal, was always of the utmost importance.

OPOSSUM, an American Indian name properly belonging to the American marsupials (other than *Caenolestes*), but in Australia applied to the phalangers (see PHALANGER). True opossums are found throughout the greater part of America from the United States to Patagonia, the number of species being largest in the more tropical parts (see MARSUPIALIA). They form the family *Didelphyidae*, distinguished from other marsupial families by the equally developed hind-toes, the nailless but fully opposable first hind-toe, and by the dentition, of which the formula is $i. \frac{5}{4}$, $c. \frac{1}{1}$, $p. \frac{4}{4}$, $m. \frac{3}{3}$; total 50. The peculiarity in the mode of succession of these teeth is explained in the article referred to. Opossums are small animals, varying from the size of a mouse to that of a large cat, with long noses, ears and tails, the latter being as a rule naked and prehensile, and with the first toe in the hind-foot so fully opposable to the other digits as to constitute a functionally perfect posterior "hand." These opposable first toes are without nail or claw, but their tips are expanded into broad flat pads, which are of great use to these climbing animals. On the anterior limbs all the five digits are provided with long sharp claws, and the first toe is but little opposable. The numerous cheek-teeth are crowned with minute sharply-pointed cusps, with which to crush the insects on which these creatures feed, for the opossums seem to take in South America the place in the economy of nature filled in other countries by hedgehogs, moles, shrews, &c. The true opossums are typically represented by *Didelphys marsupialis*, a species, with several local races, ranging over the greater part of North America (except the extreme north). It is of large size, and extremely common, being even found living in towns, where it acts as a scavenger by night, retiring for shelter by day upon the roofs or into the sewers. It produces in the spring from six to sixteen young ones, which are placed by the mother in her pouch immediately after birth, and remain there until able to take care of themselves; the period of gestation being from fourteen to seventeen days. A local race found in Central and tropical South America is known as the crab-eating opossum (*D. marsupialis cancrivora*). The second sub-genus, or genus, *Metachirus* contains a considerable number of species found all over the tropical parts of the New World. They are of medium size, with short, close fur, very long, scaly and naked tails, and have less developed ridges on their skulls. They have, as a rule, no pouch in which to carry their young, and the latter therefore commonly ride on their mother's back, holding on by winding their prehensile tails round hers, as in the figure of the woolly opossum. The latter belongs to the sub-genus *Philander*, which is nearly allied to the last; its full title being *Didelphy (Philander) lanigera*. The philander (*D.* [*P.*] *philander*) is closely related.

The fourth sub-genus (or genus) is *Marmosa* (*Micoureus*, or *Grymaeomys*), differing from the two last by the smaller size of its members and by certain slight differences in the shape of their teeth. Its best-known species is the murine opossum (*D. murina*), no larger than a mouse, of a bright-red colour, found as far north as central Mexico, and extending thence to the south of Brazil. A second well-known species is *D. cinerea*, which ranges from Central America to western Brazil, Peru and Bolivia. Yet another group (*Peramys*) is represented by numerous shrew-like species, of very small size, with short, hairy and non-prehensile tails, not half the length of the trunk, and unridged skulls. The most striking member of the group is the Three-striped Opossum (*D. americana*) from Brazil, which is of a reddish grey colour, with three clearly-defined deep-black bands down its back, as in some of the striped mice of Africa. *D. dimidiata*, *D. nudicaudata*, *D. domestica*, *D. unistriata* and several other South American species belong to this group. Lastly we have the Chiloe Island opossum (*D. gliroides*), alone representing the sub-genus *Dromiciops*, which is most nearly allied to *Marmosa*, but differs from all other opossums by the short furry ears, thick hairy tail, doubly swollen auditory bulla, short canines and peculiarly formed and situated incisors.



The Woolly Opossum (*Didelphys lanigera*) and young.

Whatever difference of opinion there may be as to the right of the above-mentioned groups to generic separation from the typical *Didelphys*, there can be none as to the distinctness of the water-opossum (*Chironectes minimus*), which differs from all the other members of the family by its fully webbed feet, and the dark-brown transverse bands across the body (see WATER-OPOSSUM).

See O. Thomas, *Catalogue of Marsupialia and Monotremata* (British Museum, 1888); "On Micoureus griseus, with the Description of a New Genus and Species of Didelphyidae," *Ann. Mag. Nat. Hist.* ser. 6, vol. xiv. p. 184, and later papers in the same and other serials. (R. L.*)

OPPEL, CARL ALBERT (1831–1865), German palaeontologist, was born at Hohenheim in Württemberg, on the 19th of December 1831. After studying mineralogy and geology at Stuttgart, he entered the university of Tübingen, where he graduated Ph.D. in 1853. Here he came under the influence of Quenstedt and devoted his special attention to the fossils of the Jurassic system. With this object he examined in detail during 1854 and the following year the succession of strata in England, France and Germany and determined the various palaeontological stages or zones characterized by special guide-fossils, in most cases ammonites. The results of his researches were published in his great work *Die Juraformation Englands, Frankreichs und des südwestlichen Deutschlands* (1856–1858). In 1858 he became an assistant in the Palaeontological Museum at Munich. In 1860 he became professor of palaeontology in the university at Munich, and in 1861 director of the Palaeontological Collection. There he continued his labours on the Jurassic fauna, describing new species of crustacea, ammonites, &c. To him also we owe the establishment of the Tithonian stage, for strata (mainly equivalent to the English Portland and Purbeck Beds) that occur on the borders of Jurassic and Cretaceous. Of his later works the most important was *Paläontologische Mittheilungen aus dem Museum des Königl. Bayer. Staats.* (1862–1865). He died at Munich on the 23rd of December 1865.

OPPELN (Polish, *Oppolie*), a town of Germany, in the Prussian province of Silesia, lies on the right bank of the Oder, 51 m. S.E. of Breslau, on the railway to Kattowitz, and at the junction of lines to Beuthen, Neisse and Tarnowitz. Pop. (1905) 30,769. It is the seat of the provincial administration of Upper Silesia, and contains the oldest Christian church in the district, that of St Adalbert, founded at the close of the 10th century. It has two other churches and a ducal 15th-century palace on an island in the Oder. The most prominent among the other buildings are the offices of the district authorities, the town hall, the normal seminary and the hospital of St Adalbert. The Roman Catholic gymnasium is established in an old Jesuit college. The industries of Oppeln include the manufacture of Portland cement, machinery, beer, soap, cigars and lime; trade is carried on by rail and river in cattle, grain and the vast mineral output of the district, of which Oppeln is the chief centre. The upper classes speak German, the lower Polish.

Oppeln was a flourishing place at the beginning of the 11th century, and became a town in 1228. It was the capital of the duchy of Oppeln and the residence of the duke from 1163 to 1532, when the ruling family became extinct. Then it passed to Austria, and with the rest of Silesia was ceded to Prussia in 1742.

See Idzikowski, *Geschichte der Stadt Oppeln* (Oppeln, 1863); and Vogt, *Oppeln beim Eintritt in das Jahr 1900* (Oppeln, 1900).

OPPENHEIM, a town of Germany, in the grand duchy of Hesse, picturesquely situated on the slope of vine-clad hills, on the left bank of the Rhine, 20 m. S. of Mainz, on the railway to Worms. Pop. (1905) 3696. The only relic of its former importance is the Evangelical church of St Catherine, one of the most beautiful Gothic edifices of the 13th and 14th centuries in Germany, and recently restored at the public expense. The town has a Roman Catholic church, several schools and a memorial of the War of 1870–71. Its industries and commerce are principally concerned with the manufacture and export of wine. Above the town are the ruins of the fortress of Landskron, built in the 11th century and destroyed in 1689.

Oppenheim, which occupies the site of the Roman Bauconica, was formerly much larger than at present. In 1226 it appears as a free town of the Empire and later as one of the most important members of the Rhenish League. It lost its independence in 1375, when it was given in pledge to the elector palatine of the Rhine. During the Thirty Years' War it was alternately occupied by the Swedes and the Imperialists, and in 1689 it was entirely destroyed by the French.

See W. Franck, *Geschichte der ehemaligen Reichsstadt Oppenheim* (Darmstadt, 1859).

OPPERT, JULIUS (1825–1905), German Assyriologist, was born at Hamburg, of Jewish parents, on the 9th of July 1825. After studying at Heidelberg, Bonn and Berlin, he graduated at Kiel in 1847, and in the following year went to France, where he was teacher of German at Laval and at Reims. His leisure was given to Oriental studies, in which he had made great progress in Germany, and in 1852 he joined Fresnel's archaeological expedition to Mesopotamia. On his return in 1854 he occupied himself in digesting the results of the expedition in so far as they concerned cuneiform inscriptions, and published an important work upon them (*Déchiffrement des inscriptions cunéiformes*, 1861). In 1857 he was appointed professor of Sanscrit in the school of languages connected with the National Library in Paris, and in this capacity he produced a Sanscrit grammar; but his attention was chiefly given to Assyrian and cognate subjects, and he was especially prominent in establishing the Turanian character of the language originally spoken in Assyria. In 1869 Oppert was appointed professor of Assyrian philology and archaeology at the *Collège de France*. In 1865 he published a history of Assyria and Chaldaea in the light of the results of the different exploring expeditions. At a later period he devoted much attention to the language and antiquities of ancient Media, writing *Le Peuple et la langue des Mèdes* (1879). He died in Paris on the 21st of August 1905. Oppert was a voluminous writer upon Assyrian mythology and jurisprudence, and other subjects connected with the ancient civilizations of the East. Among his other works may be mentioned: *Éléments de la grammaire assyrienne* (1868); *L'Immortalité de l'âme chez les Chaldéens*, (1875); *Salomon et ses successeurs* (1877); and, with J. Ménant, *Doctrines juridiques de l'Assyrie et de la Chaldée* (1877).

OPPIAN (Gr. Ὀππιᾶνος), the name of the authors of two (or three) didactic poems in Greek hexameters, formerly identified, but now generally regarded as two different persons. (1) Oppian of Corycus (or Anabarzus) in Cilicia, who flourished in the reign of Marcus Aurelius (emperor A.D. 161–180). According to an anonymous biographer, his father, having incurred the displeasure of Lucius Verus, the colleague of Aurelius, by neglecting to pay his respects to him when he visited the town, was banished to Malta. Oppian, who had accompanied his father into exile, returned after the death of Verus (169) and went on a visit to Rome. Here he presented his poems to Aurelius, who was so pleased with them that he gave the author a piece of gold for each line, took him into favour and pardoned his father. Oppian subsequently returned to his native country, but died of the plague shortly afterwards, at the early age of thirty. His contemporaries erected a statue in his honour, with an inscription which is still extant, containing a lament for his premature death and a eulogy of his precocious genius. His poem on fishing (*Halieutica*), of about 3500 lines, dedicated to Aurelius and his son Commodus, is still extant. (2) Oppian of Apamea (or Pella) in Syria. His extant poem on hunting (*Cynegetica*) is dedicated to the emperor Caracalla, so that it must have been written after 211. It consists of about 2150 lines, and is divided into four books, the last of which seems incomplete. The author evidently knew the *Halieutica*, and perhaps intended his poem as a supplement. Like his namesake, he shows considerable knowledge of his subject and close observation of nature; but in style and poetical merit he is inferior to him. His versification also is less correct. The improbability of there having been two poets of the same name, writing on subjects so closely akin and such near contemporaries, may perhaps be explained by assuming that the real name of the author of the *Cynegetica* was not Oppian, but that he has been confounded with his predecessor. In any case, it seems clear that the two were not identical.

A third poem on bird-catching (*Ixeutica*, from ἰξός, bird-lime), also formerly attributed to an Oppian, is lost; a paraphrase in Greek prose by a certain Eutecnius is extant. The author is probably one Dionysius, who is mentioned by Suïdas as the author of a treatise on stones (*Lithiaca*).

The chief modern editions are J. G. Schneider (1776); F. S. Lehrs (1846); U. C. Bussemaker (Scholia, 1849); (*Cynegetica*) P. Boudreaux (1908). The anonymous biography referred to above will be found in A. Westermann's *Biographi Graeci* (1845). On the subject generally see A. Martin, *Études sur la vie et les œuvres d'Oppien de Cilicie* (1863); A. Ausfeld, *De Oppiano et scriptis sub ejus nomine traditis* (1876). There are translations of the *Halieutica*, in English by Diaper and Jones (1722), and in French by E. J. Bourquin (1877).

OPPIUS, GAIUS, an intimate friend of Julius Caesar. He managed the dictator's private affairs during his absence from Rome, and, together with L. Cornelius Balbus, exercised considerable influence in the city. According to Suetonius (*Caesar*, 56), many authorities considered Oppius to have written the histories of the Spanish, African and Alexandrian wars which are printed among the works of Caesar. It is now generally held that he may possibly be the author of the last (although the claims of Hirtius are considered stronger), but certainly not of the two first, although Niebuhr confidently assigned the *Bellum Africanum* to him; the writer of these took an actual part in the wars they described, whereas Oppius was in Rome at the time. He also wrote a life of Caesar and the elder Scipio.

For a discussion of the whole question, see M. Schanz, *Geschichte der römischen Literatur*, pt. i. p. 210 (2nd ed., 1898); Teuffel-Schwabe, *Hist. of Roman Literature* (Eng. trans.), § 197; see also Cicero, *Letters*, ed. Tyrrell and Purser, iv. introd. p. 69.

OPTICS, the science of light, regarded as the medium of sight (Gr. ὄψις). Generally the noun is qualified by an adjective so as to delimitate the principal groups of optical phenomena, *e.g.* geometrical optics, physical optics, meteorological optics, &c. Greek terminology included two adjectival forms—τὰ ὀπτικά, for all optical phenomena, including vision and the nature of light, and ἡ ὀπτική (*sc.* θεωρία), for the objective study of light, *i.e.* the nature of light itself and the theory of vision. See Light and Vision.

OPTION (Lat. *optio*, choice, choosing, *optare*, to choose), the action of choosing or thing chosen, choice or power or opportunity of making a choice. The word had a particular meaning in ecclesiastical law, where it was used of a right claimed by an archbishop to select one benefice from the diocese of a newly appointed bishop, the next presentation to which would fall to his, the archbishop's, patronage. This right was abolished by various statutes in the early part of the 19th century. As a term in stock-exchange operations, "option" is used to express the privilege given to conclude a bargain at some future time at an agreed-upon price (see Call and Stock Exchange). The phrase "local option" has been specifically used in politics of the power given to the electorate of a particular district to choose whether licences for the sale of intoxicating liquor should be granted or not. This form of "local option" has been also and more rightly termed "local veto" (see Liquor Laws).

OPUS (Ὀποῦς), in ancient Greece, the chief city of the Opuntian Locrians; the walls of the town may still be seen on a hill about 6 m. S.E. of the modern Atalante, and about 1 m. from the channel which separates the mainland from Euboea. It is mentioned in the Homeric catalogue among the towns of the Locrians, who were led by Ajax Oileus; and there were games called Aiantea and an altar at Opus in honour of Ajax. Opus was also the birthplace of Patroclus. Pindar's Ninth Olympian Ode is mainly devoted to the glory and traditions of Opus. Its founder was Opus the son of Zeus and Protogeneia, the daughter of an Elian Opus, or, according to another version, of Deucalion and Pyrrha, and the wife of Locros. The Locrians deserted the Greek side in the Persian Wars; they were among the allies of Sparta in the Peloponnesian War. In the struggle between Philip V. of Macedon and the Romans the town went over to the latter in 197 B.C., but the Acropolis held out for Philip until his defeat at Cynoscephalae (Livy xxxii. 32). The town suffered from earthquakes, such as that which destroyed the neighbouring Atalante in 1894.

ORACH, or Mountain Spinach, known botanically as *Atriplex hortensis*, a tall-growing hardy annual, whose leaves, though coarsely flavoured, are used as a substitute for spinach, and to correct the acidity of sorrel. The white and the green are the most desirable varieties. The plant should be grown quickly in rich soil. It may be sown in rows 2 ft. apart, and about the same distance in the row, about March, and for succession again in June. If needful, water must be freely given, so as to maintain a rapid growth. A variety, *A. hortensis* var. *rubra*, commonly called red mountain spinach, is a hardy annual 3 to 4 ft. high with fine ornamental foliage.

ORACLE (Lat. *oraculum*, from *orare*, to pray; the corresponding Greek word is μαντεῖον or χρηστήριον), a special place where a deity is supposed to give a response, by the mouth of an inspired priest, to the inquiries of his votaries; or the actual response. The whole question of oracles—whether in the sense of the response or the sacred place—is bound up with that of magic, divination and omens, to the articles on which the reader is referred. They are commonly found in the earlier stages of religious culture among different nations. But it is as an ancient Greek institution that they are most interesting historically.

A characteristic feature of Greek religion which distinguishes it from many other systems of advanced cult was the wide prevalence of a ritual of divination and the prominence of certain oracular centres which were supposed to give voice to the will of Providence. An account of the oracles of Greece is concerned with the historical question about their growth, influence and career. But it is convenient to consider first the anthropologic question, as to the methods of divination practised in ancient Greece, their significance and the original ideas that inspired them. Only the slightest theoretical construction is possible here; and the true psychologic explanation of the mantic facts is of very recent discovery. In the Greek world these were of great variety, but nearly all the methods of divination found there can be traced among other communities, primitive and advanced, ancient and modern. The most obvious and useful classification of them is that of which Plato[1] was the author, who distinguishes between (*a*) the "sane" form of divination and (*b*) the ecstatic, enthusiastic or "insane" form. The first method appears to be cool and scientific, the diviner (μάντις) interpreting certain signs according to fixed principles of interpretation. The second is worked by the prophet, shaman or Pythoness, who is possessed and overpowered by the deity, and in temporary frenzy utters mystic speech under divine suggestion. To these we may add a third form (*c*), divination by communion with the spiritual world in dreams or through intercourse with the departed spirit: this resembles class (*a*) in that it does not necessarily involve ecstasy, and class (*b*) in that it assumes immediate *rapport* with some spiritual power.

It will be convenient first to give typical examples of these various processes of discovering the divine will, and then to sketch the history of Delphi, the leading centre of divination. We may subdivide the methods that fall under class (*a*), those that conform to the "omen"-system, according as they deal with the phenomena of the animate or the inanimate world; although this distinction would not be relevant in the period of primitive animistic thought. The Homeric poems attest that auguries from the flight and actions of birds were commonly observed in the earliest Hellenic period as they occasionally were in the later, but we have little evidence that this method was ever organized as it was at Rome into a regular system of state-divination, still less of state-craft. We can only quote the passage in the *Antigone* where Sophocles describes the method of Teiresias, who keeps an aviary where he studies and interprets the flight and the cries of the birds; it is probable that the poet was aware of some such practice actually in vogue. But the usual examples of Greek augury do not suggest deliberate and systematic observation; for instance, the phenomenon in the *Iliad* of the eagle seizing the snake and dropping it, or, in the *Agamemnon* of Aeschylus, of the eagles swooping on the pregnant hare. Other animals besides birds could furnish omens; we have an interesting story of the omen derived from the contest between a wolf and a bull which decided the question of the sovereignty of Argos when Danaus arrived and claimed the kingdom;[2] and the private superstitious man might be encouraged or depressed by any ominous sign derived from any part of the animal world. But it is very rare to find such omens habitually consulted in any public system of divination sanctioned by the state. We hear of a shrine of Apollo at Sura in Lycia,[3] where omens were taken from the movements of the sacred fish that were kept there in a tank; and again of a grove consecrated to this god in Epirus, where tame serpents were kept and fed by a priestess, who could predict a good or bad harvest according as they ate heartily or came willingly to her or not.[4]

But the method of animal divination that was most in vogue was the inspection of the inward parts of the victim offered upon the altar, and the interpretation of certain marks found there according to a conventional code. Sophocles in the passage referred to above gives us a glimpse of the prophet's procedure. A conspicuous example of an oracle organized on this principle was that of Zeus at Olympia, where soothsayers of the family of the Iamidai prophesied partly by the inspection of entrails, partly by the observation of certain signs in the skin when it was cut or burned.[1] Another less familiar procedure that belongs to this subdivision is that which was known as divination *διὰ κληδόνων*, which might sometimes have been the cries of birds, but in an oracle of Hermes at the Achaean city of Pharae were the casual utterances of men. Pausanias tells us[2] how this was worked. The consultant came in the evening to the statue of Hermes in the market-place that stood by the side of a hearth-altar to which bronze lamps were attached; having kindled the lamps and put a piece of money on the altar, he whispered into the ear of the statue what he wished to know; he then departed, closing his ears with his hands, and whatever human speech he first heard after withdrawing his hands he took for a sign. The same custom seems to have prevailed at Thebes in a shrine of Apollo, and in the Olympian oracle of Zeus.[3]

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[1] *Phaedrus*, p. 244.

[2] Serv. Verg. *Aen.* iv. 377; Paus. ii. 19. 3.

[3] Steph. Byz. *s.v.* Σοῦρα. Plut. *De sollert. anim.* p. 976 c. Ael. *Nat. anim.* xii. 1.

[4] Ael. *Nat. anim.* xi. 2.

Of omens taken from what we call the inanimate world salient examples are those derived from trees and water, a divination to be explained by an animistic feeling that may be regarded as at one time universal. Both were in vogue at Dodona, where the ecstatic method of prophecy was never used; we hear of divination there from the bubbling stream, and still more often of the "talking oak"; under its branches may once have slept the Selloi, who interpreted the sounds of the boughs, and who may be regarded as the depositories of the Aryan tradition of Zeus, the oak god who spoke in the tree.[4] At Korope in Thessaly we hear vaguely of an Apolline divination by means of a branch of the tamarisk tree,[5] a method akin no doubt to that of the divining rod which was used in Greece as elsewhere; and there is a late record that at Daphne near Antioch oracles were obtained by dipping a laurel leaf or branch in a sacred stream.[6] Water divination must have been as familiar at one time to the Greeks as it was to the ancient Germans; for we hear of the fountain at Daphne revealing things to come by the varying murmur of its flow;[7] and marvellous reflections of a mantic import might be seen in a spring on Taenaron in Laconia;[8] from another at Patrae omens were drawn concerning the chances of recovery from disease.[9] Thunder magic, which was practised in Arcadia, is usually associated with thunder divination; but of this, which was so much in vogue in Etruria and was adopted as a state-craft by Rome, the evidence in Greece is singularly slight. Once a year watchers took their stand on the wall at Athens and waited till they saw the lightning flash from Harma, which was accepted as an auspicious omen for the setting out of the sacred procession to Apollo Pythius at Delphi; and the altar of Zeus *Σημαλέος*, the sender of omens, on Mount Parnes, may have been a religious observatory of meteorological phenomena.[10] No doubt such a rare and portentous event as the fall of a meteor-stone would be regarded as ominous, and the state would be inclined to consult Delphi or Dodona as to its divine import.

We may conclude the examples of this main department of *μαντική* by mentioning a method that seems to have been much in vogue in the earlier times, that which was called *ἡ διὰ ψήφων μαντική*, or divination by the drawing or throwing of lots; these must have been objects, such as small pieces of wood or dice, with certain marks inscribed upon them, drawn casually or thrown down and interpreted according to a certain code. This simple process of immemorial antiquity, for other Aryan peoples such as the Teutonic possessed it, was practised at Delphi and Dodona by the side of the more solemn procedure; we hear of it also in the oracle of Heracles at Bura in Achaea.[11] It is this method of "scraping" or "notching" (*χράειν*) signs on wood that explains probably the origin of the words *χρησμός*, *χρῆσθαι*, *ἀναιρεῖν* for oracular consultation and deliverance.

The processes described above are part of a world-wide system of popular divination. And most of them were taken up by the oracular shrines in Greece, Apollo himself having no special and characteristic mantic method, but generally adopting that which was of local currency. But much that is adopted by the higher personal religions descends from a more primitive and lower stage of religious feeling. And all this divination was originally independent of any personal divinity. The primitive diviner appealed directly to that mysterious potency which was supposed to inhere in the tree and spring, in the bird or beast, or even in a notched piece of wood. At a later stage, it may be, this power is interpreted in accordance with the animistic, and finally with the theistic, belief; and now it is the god who sends the sign, and the bird or animal is merely his organ. Hence the omen-seeker comes to prefer the sacrificed animal, as likely to be filled with the divine spirit through contact with the altar. And, again, if we are to understand the most primitive thought, we probably ought to conceive of it as regarding the omen not as a mere sign, but in some confused sense as a cause of that which is to happen. By sympathetic magic the flight of the bird, or the appearance of the entrails, is mysteriously connected, as cause with effect, with the event which is desired or dreaded. Thus in the Aztec sacrifice of children to procure rain, the victims were encouraged to shed tears copiously; and this was not a mere sign of an abundant rainfall, but was sympathetically connected with it. And in the same way, when of the three beasts over which three kings swore an oath of alliance, one died prematurely and was supposed thereby to portend the death of one of the kings,[12] or when in the Lacedaemonian sacrifice the head of the victim mysteriously vanished, and this portended the death of their naval commander,[13] these omens would be merely signs of the future for the comparatively advanced Hellene; but we may discern at the back of this belief one more primitive still, that these things were somehow casually or sympathetically connected with the kindred events that followed. We can observe the logical nexus here, which in most instances escapes us. This form of divination, then, we may regard as a special branch of sympathetic magic, which nature herself performs for early man, and which it concerns him to watch.

The other branch of the mantic art, the ecstatic or inspired, has had the greater career among the peoples of the higher religions; and morphologically we may call it the more advanced, as Shamanism or demoniac or divine possession implies the belief in spirits or divinities. But actually it is no doubt of great antiquity, and it is found still existing at a rather low grade of savagery. Therefore it is unsafe to infer from Homer's silence about it that it only became prevalent in Greece in the post-Homeric period. It did not altogether supersede the simpler method of divination by omens; but being far more impressive and awe-inspiring, it was adopted by some of the chief Apolline oracles, though never by Dodona.

The most salient example of it is afforded by Delphi. In the historic period, and perhaps from the earliest times, a woman known as the Pythoness was the organ of inspiration, and it was generally believed that she delivered her oracles under the direct afflatus of the god. The divine possession worked like an epileptic seizure, and was exhausting and might be dangerous; nor is there any reason to suppose that it was simulated. This communion with the divinity needed careful preparation. Originally, as it seems, virginity was a condition of the tenure of the office; for the virgin has been often supposed to be the purer vehicle for divine communication; but later the rule was established that a married woman over fifty years of age should be chosen, with the proviso that she should be attired as a maiden. As a preliminary to the divine possession, she appears to have chewed leaves of the sacred laurel, and then to have drunk water from the prophetic stream called Kassotis which flowed underground. But the culminating point of the afflatus was reached when she seated herself upon the tripod; and here, according to the belief of at least the later ages of paganism, she was supposed to be inspired by a mystic vapour that arose from a fissure in the ground. Against the ordinary explanation of this as a real mephitic gas producing convulsions, there seem to be geological and chemical objections;[1] nor have the recent French excavations revealed any chasm or gap in the floor of the temple. But the strong testimony of the later writers, especially Plutarch,[2] cannot wholly be set aside; and we can sufficiently reconcile it with the facts if we suppose a small crack in the floor through which a draught of air was felt to ascend. This, combining with the other mantic stimulants used, would be enough to throw a believing medium into a condition of mental seizure; and the difficulty felt by the older generation of scholars, who had to resort to the hypothesis of charlatanism or diabolic agency, no longer exists in the light of modern anthropology and the modern science of psychic phenomena. The Pythoness was no ambitious pretender, but ordinarily a virtuous woman of the lower class. It is probable that what she uttered were only unintelligible murmurs, and that these were interpreted into relevance and set in metric or prose sentences by the "prophet" and the "Holy Ones" or Ὅσιοι as they were called, members of leading Delphic families, who sat round the tripod, who received the questions of the consultant beforehand, probably in writing, and usually had considered the answers that should be given.

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[1] Schol. Pind. *Ol.* 6. 111.

[2] vii. 22. 2.

[3] Farnell, *Cults of the Greek States*, iv., p. 221.

[4] Hom. *Il.* xvi. 233, *Od.* xiv. 327; Hesiod, *ap.* Schol. Soph. *Trach.* 1169; Aesch. *Prom. Vinc.* 829.

[5] Nikander, *Theriaka*, 612; Schol. *ibid.*

[6] See Robertson-Smith, *Religion of the Semites*, p. 128, quoting Sozomen v. 19.

[7] Ammian. Marcell. xxii. 12; cf. Plut. *Vita Caes.* c. 19.

[8] Paus. iii. 25. 8.

[9] Paus. vii. 21. 11.

[10] Paus. i. 32. 2.

[11] Cic. *De div.* i. 76. Suid. *s.v.* *πυθώ*. Paus. vii. 25. 10.

[12] Plut. *Vita Pyrrh.* c. 6.

[13] Diod. Sic. xiii. 97.

Examples of the same enthusiastic method can be found in other oracles of Apollo. At Argos, the prophetess of the Apollo Pythius attained to the divine afflatus by drinking the blood of the lamb that was sacrificed in the night to him;[3] this is obviously a mantic communion, for the sacrificial victim is full of the spirit of the divinity. And we find the same process at the prophetic shrine of Ge at Aegae in Achaea, where the prophetess drank a draught of bull's blood for the same purpose.[4] In the famous oracle shrines of Apollo across the sea, at Klaros and Branchidae[5] near Miletus, the divination was of the same ecstatic type, but produced by a simple draught of holy water. The Clarian prophet fasted several days and nights in retirement and stimulated his ecstasy by drinking from a subterranean spring which is said by Pliny to have shortened the lives of those who used it.[6] Then, "on certain fixed nights after many sacrifices had been offered, he delivered his oracles, shrouded from the eyes of the consultants."[7]

The divination by "incubation" was allied to this type, because though lacking the ecstatic character, the consultant received direct communion with the god or departed spirit. He attained it by laying himself down to sleep or to await a vision, usually by night, in some holy place, having prepared himself by a course of ritualistic purification. Such consultation was naturally confined to the underworld divinities or to the departed heroes. It appears to have prevailed at Delphi when Ge gave oracles there before the coming of Apollo, and among the heroes Amphiaraus, Calchas and Trophonius are recorded to have communicated with their worshippers in this fashion. And it was by incubation that the sick and diseased who repaired to the temple of Epidaurus received their prescriptions from Asclepius, originally a god of the lower world.

After this brief account of the prevalent forms of prophetic consultation, it remains to consider the part played by the Greek oracles in the history of Greek civilization. It will be sufficient to confine our attention to Delphi, about which our information is immeasurably fuller than it is about the other shrines. In the earliest period Dodona may have had the higher prestige, but after the Homeric age it was eclipsed by Delphi, being consulted chiefly by the western Greeks, and occasionally in the 4th century by Athens.

The gorge of Delphi was a seat of prophecy from the earliest days of Greek tradition. Ge, Themis and perhaps Poseidon had given oracles here before Apollo. But it is clear that he had won it in the days before Homer, who attests the prestige and wealth of his Pythian shrine; and it seems clear that before the Dorian conquest of the Peloponnese a Dryopian migration had already carried the cult of Apollo Pythius to Asine in Argolis. Also the constitution of the Amphictyones, "the dwellers around the temple," reflects the early age when the tribe rather than the city was the political unit, and the Dorians were a small tribe of north Greece. The original function of these Amphictyones was to preserve the sanctity and property of the temple; but this common interest early developed a certain rule of intertribal morality. By the formula of the Amphictyonic oath preserved by Aeschines, which may be of great antiquity, the members bound themselves "not to destroy any city of the league, not to cut any one of them off from spring-water, either in war or peace, and to war against any who violated these rules." We discern here that Greek religion offered the ideal of a federal national union that Greek politics refused to realize.

The next stage in the history of the oracle is presented by the legend of the Dorian migration. For we have no right to reject the strong tradition of the Delphic encouragement of this movement, which well accounts for the devotion shown by Sparta to the Pythian god from the earliest days; and accounts also for the higher position that Delphi occupied at the time when Greek history is supposed to begin.

We have next to consider a valuable record that belongs to the end of the 8th century or beginning of the 7th, the Homeric hymn to Apollo, which describes the coming of the Dolphin-God —Δελφίνιος—to Pytho, and the organization of the oracle by Cretan ministers. Of this Cretan settlement at Delphi there is no other literary evidence, and the Ὅσιοι who administered the oracle in the historic period claimed to be of aboriginal descent. Yet recent excavation has proved a connexion between Crete and Delphi in the Minoan period; and there is reason to believe that in the 8th century some ritual of purification, momentous for the religious career of the oracle, was brought from Crete to Delphi, and that the adoption of this latter name for the place which had formerly been called Πυθώ synchronized with the coming of Apollo Delphinius.

The influence of Delphi was great in various ways, though no scholar would now maintain the exaggerated dogma of Curtius, who imputed to the oracle a lofty religious enthusiasm and the consciousness of a religious political mission.

We may first consider its political influence upon the other states. The practice of a community consulting an oracle on important occasions undoubtedly puts a powerful weapon into the hands of the priesthood, and might lead to something like a theocracy. And there are one or two ominous hints in the *Odyssey* that the ruler of the oracle might overthrow the ruler of the land. Yet owing to the healthy temperament of the early Greek, the civic character of the priesthood, the strength of the autonomous feeling, Greece might flock to Delphi without exposing itself to the perils of sacerdotal control. The Delphic priesthood, content with their rich revenues, were probably never tempted to enter upon schemes of far-reaching political ambition, nor were they in any way fitted to be the leaders of a national policy. Once only, when the Spartan state applied to Delphi to sanction their attack on Arcadia, did the oracle speak as if, like the older papacy, it claimed to dispose of territory[8]—"Thou askest of me Arcadia; I will not give it thee." But here the oracle is on the side of righteousness, and it is the Spartan that is the aggressor. In the various oracles that have come down to us, many of which must have been genuine and preserved in the archives of the state that received them, we cannot discover any marked political policy consistently pursued by the "Holy Ones" of Delphi. As conservative aristocrats they would probably dislike tyranny; their action against the Peisistratidae was interested, but one oracle contains a spirited rebuke to Cleisthenes, while one or two others, perhaps not genuine, express the spirit of temperate constitutionalism. As exponents of an

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[1] See Oppé on "The Chasm at Delphi," *Journ. of Hellenic Studies* (1904).

[2] *De defect. Orac.* c. 43.

[3] Paus. ii, 24, 1.

[4] Farnell, *op. cit.* iii. 11.

[5] The prophetic fountain at Branchidae is attested by Strabo, p. 814, and in a confused mystic passage of Iamblichus, *De Myst.* 3, 11.

[6] *Nat. Hist.* ii. 232.

[7] Iambl. *loc. cit.*

[8] Herod, i. 66.

Amphictyonic system they would be sufficiently sensitive of the moral conscience of Greece to utter nothing in flagrant violation of the "jus gentium." In one department of politics, the legislative sphere, it has been supposed that the influence of Delphi was direct and inspiring. Plato and later writers imagined that the Pythoness had dictated the Lycurgean system, and even modern scholars like Bergk have regarded the ῥῆτραι of Sparta as of Delphic origin. But a severer criticism dispels these suppositions. The Delphic priesthood had neither the capacity nor probably the desire to undertake so delicate a task as the drafting of a code. They might make now and again a general suggestion when consulted, and, availing themselves of their unique opportunities of collecting foreign intelligence, they might often recommend a skilful legislator or arbitrator to a state that consulted them at a time of intestine trouble. Finally, a legislator with a code would be well advised, especially at Sparta, in endeavouring to obtain the sanction and the blessing of the Delphic god, that he might appear before his own people as one possessed of a religious mandate. In this sense we can understand the stories about Lycurgus.

There is only one department of the secular history of Greece where Delphi played a predominant and most effective part, the colonial department. The great colonial expansion of Greece, which has left so deep an imprint on the culture of Europe, was in part inspired and directed by the oracle. For the proof of this we have not only the evidence of the χρησμοὶ preserved by Herodotus and others, such as those concerning the foundation of Cyrene, but also the worship of Apollo Ἀρχηγέτης, "the Founder," prevalent in Sicily and Magna Graecia, and the early custom of the sending of tithes or thanksgiving offerings by the flourishing western states to the oracle that had encouraged their settlements.

Apollo was already a god of ways—Ἀγυιεύς—who led the migration of tribes before he came to Delphi. And those legends are of some value that explain the prehistoric origin of cities such as Magnesia on the Maeander, the Dryopian Asine in the Peloponnese, as due to the colonization of temple-slaves, acquired by the Pythian god as the tithe of conquests, and planted out by him in distant settlements. The success of the oracle in this activity led at last to the establishment of the rule that Herodotus declares to be almost universal in Greece, namely, that no leader of a colony would start without consulting Delphi. Doubtless in many cases the priesthood only gave encouragement to a pre-conceived project. But they were in a unique position for giving direct advice also, and they appear to have used their opportunities with great intelligence.

Their influence on the state cults can be briefly indicated, for it was not by any means far-reaching. They could have felt conscious of no mission to preach Apollo, for his cult was an ancient heritage of the Hellenic stocks. Only the narrower duty devolved upon them of impressing upon the consultants the religious obligation of sending tithes or other offerings. Nevertheless their opportunity of directing the religious ritual and organization of the public worships was great; for Plato's view[1] that all questions of detail in religion should be left to the decision of the god "who sits on the omphalos" was on the whole in accord with the usual practice of Greece. Such consultations would occur when the state was in some trouble, which would be likely to be imputed to some neglect of religion, and the question to the oracle would commonly be put in this way—"to what god or goddess or hero shall we sacrifice?" The oracle would then be inclined to suggest the name of some divine personage hitherto neglected, or of one whose rites had fallen into decay. Again, Apollo would know the wishes of the other divinities, who were not in the habit of directly communicating with their worshippers; therefore questions about the sacred land of the goddesses at Eleusis would be naturally referred to him. From both these points of view we can understand why Delphi appears to have encouraged the tendency towards hero-worship which was becoming rife in Greece from the 7th century onwards. But the only high cult for which we can discover a definite enthusiasm in the Delphic priesthood was that of Dionysus. And his position at Delphi, where he became the brother-deity of Apollo, sufficiently explains this.

As regards the development of religious morality in Greece, we must reckon seriously with the part played by the oracle. The larger number of deliverances that have come down to us bearing on this point are probably spurious, in the sense that the Pythia did not actually utter them, but they have a certain value as showing the ideas entertained by the cultivated Hellene concerning the oracular god. On the whole, we discern that the moral influence of Delphi was beneficent and on the side of righteousness. It did nothing, indeed, to abolish, it may even have encouraged at times, the barbarous practice of human sacrifice, which was becoming abhorrent to the Greek of the 6th and 5th centuries; but a conservative priesthood is always liable to lag behind the moral progress of an age in respect of certain rites, and in other respects it appears that the "Holy Ones" of Delphi kept well abreast of the Hellenic advance in ethical thought. An oracle attributed to the Pythoness by Theopompus (Porph. *De abstinentia*, 2, 16 and 17) expresses the idea contained in the story of "the widow's mite," that the deity prefers the humble offering of the righteous poor to the costly and pompous sacrifice of the rich. Another, of which the authenticity is vouched for by Herodotus (vi. 86), denounces the contemplated perjury and fraud of a certain Glaucus, and declares to the terrified sinner that to tempt God was no less a sin than to commit the actual crime. A later χρησμός, for which Plutarch (*de Pyth. Or.* p. 404 B) is the authority, embodies the charitable conception of forgivenness for venial faults committed under excessive stress of temptation: "God pardons what man's nature is too weak to resist." And in one most important branch of morality, with which progressive ancient law was intimately concerned, namely, the concept of the sin of homicide, we have reason for believing that the Apolline oracle played a leading part. Perhaps so early as the 8th century, it came to lay stress on the impurity of bloodshed and to organize and impose a ritual of purification; and thus to assist the development and the clearer definition of the concept of murder as a sin and the growth of a theory of equity which recognizes extenuating or justifying circumstances.[2] Gradually, as Greek ethics escaped the bondage of ritual and evolved the idea of spiritual purity of conscience, this found eloquent expression in the utterances imputed to the Pythoness.[3] Many of these are no doubt literary fictions; but even these are of value as showing the popular view about the oracular god, whose temple and tripod were regarded as the shrine and organ of the best wisdom and morality of Greece. The downfall of Greek liberty before Macedon destroyed the political influence of the Delphic oracle; but for some centuries after it still retained a certain value for the individual as a counsellor and director of private conscience. But in the latter days of paganism it was eclipsed by the oracles of Claros and Branchidae.

AUTHORITIES.—A. Bouché-Leclercq, *Histoire de la divination dans l'antiquité*, in 4 vols., is still the chief work: cf. L. R. Farnell, *Cults of the Greek States*, vol. iv. pp. 179-233; Buresch, *Apollo Klarios;* Bernard Haussoullier, *Études sur l'histoire de Milet et du Didymeion*; Legrand, "Questions oraculaires" in *Revue des études grecques*, vol. xiv.; Pomtow's article on "Delphoi" in Pauly-Wissowa *Realencyclopädie.*

ANCIENT AUTHORITIES.—Plutarch, *De Pythio Oraculo* and *De defectu oraculorum*; Cicero, *De divinatione*; Euseb. *Praep. Ev.* 4, 2, 14. (L. R .F.)

ORAKZAI, a Pathan tribe on the Kohat border of the North-West Frontier Province of India. The Orakzais inhabit the mountains to the north-west of Kohat district, bounded on the N. and E. by the Afridis, on the S. by the Miranzai valley and on the W. by the Zaimukht country and the Safed Koh mountains. Their name means "lost tribes," and their origin is buried in obscurity; though they resemble the Afghans in language, features and many of their customs, they are rejected by them as brethren. One branch, the Ali Khel, has been traced to Swat, whence they were expelled by the other inhabitants, and it is not improbable that the whole tribe consists of refugee clans of the surrounding races. They are very wiry-looking mountaineers, but they are not as fine men or as brave fighters as their neighbours the Afridis. They cultivate a good deal of the Khanki and Kurmana valleys in the winter, but in the hot months retire to the heights of Tirah, of which they occupy the southern half called the Mastura valley. They have been estimated at 28,000 fighting men, but this estimate must be largely exaggerated, as the country could not possibly support the consequent population of over 100,000. They have been the object of various British military expeditions, notably in 1855, 1868, 1869, 1891, and the Tirah campaign of 1897.

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[1] *Republ.* 427 A.

[2] Farnell, *Cults*, vol. iv. p. 300, *Hibbert Lectures*, pp. 139-152.

[3] Aelian, *Var. Hist.* iii. 44: *Anth. Pal.* xiv. 71 and 74.

ORAN (Arabic *Wahran, i.e.* ravine), a city of Algeria, capital of the department and military division of the same name. It stands at the head of the Gulf of Oran, on the Mediterranean in 35° 44′ N., 0° 41′ W. The city is 261 m. by rail W.S.W. of Algiers, 220 m. E. of Gibraltar and 130 m. S. of Cartagena, Spain. It is built on the steep slopes of the Jebel Murjajo, which rises to a height of 1900 ft. The city was originally cut in two by the ravine of Wad Rekhi, now for the most part covered by boulevards and buildings. West of the ravine lies the old port, and above this rises what was the Spanish town with the ancient citadel looking down on it; but few traces of Spanish occupation remain. The modern quarter rises, like an amphitheatre, to the east of the ravine. The place d'Armes, built on the plateau above the ravine, is the centre of the modern quarter. It contains a fine column commemorative of the battle of Sidi Brahim (1845), between the French and Abd-el-Kader. The Château Neuf, built in 1563 by the Spaniards, overlooks the old port. Formerly the seat of the beys of Oran, it is occupied by the general in command of the military division and also serves as barracks. The *kasbah* (citadel) or Château Vieux, used for military purposes, lies S.W. of the Château Neuf. It was partly destroyed by the earthquake of the 8th and 9th of October 1790. On the hills behind the kasbah are Fort St Grégoire, a votive chapel commemorative of the cholera of 1849, and Fort Santa Cruz, crowning at a height of 1312 ft. the summit of the Aidur. Fort de la Moune (so called from the monkeys said to have haunted the neighbourhood) is at the western end of the harbour, and commands the road from Oran to Mers-el-Kebir (see below). Fort St Philippe, south of the kasbah, replaces the old Castle of the Saints of the Spaniards. There is subterranean communication between all the ancient forts. The cathedral, dedicated to St Louis, and built in 1839, occupies the site of a chapel belonging in the days of Spanish dominion to a convent of monks of St Bernard. The Grand Mosque (in rue Philippe) was erected at the end of the 18th century to commemorate the expulsion of the Spaniards, and with money paid as ransom for Christian slaves. Other mosques have been turned into churches or utilized for military purposes. The military hospital, a large building adjoining the cathedral, contains 1400 beds. A house in the place de l'hôpital, now used by the military, was once the home of the Inquisition; it was built at the expense of Spain in 1772. The museum formed by the Oran Society of Geography and Archaeology (founded in 1878) has a fine collection of antiquities.

Oran is the seat of a large trade. There is regular communication with Marseilles, Cette, Barcelona, Valencia, Cartagena, Malaga, Gibraltar, and the various ports on the Barbary coast. The railway to Algiers is joined at Perrégaux (47 m. E. of Oran) by the line from Arzeu to Saida and Ain Sefra which serves the high plateau whence esparto is obtained. There is also a railway to Sidi-Bel-Abbes and Tlemçen. The export trade is chiefly in esparto grass, cereals, wines, olive oil, marbles, cattle and hides. The imports include manufactured goods, coal and other commodities. The inner harbour, or old port, contains two basins, one of 10 acres and another of 60 acres, formed by the construction of a pier eastward from Fort de la Moune, with two cross piers. In consequence of the growing importance of the port and the decision of the French government to make Oran the chief naval station in Algeria, it was decided to build an eastern harbour. This outer harbour, on which work was begun in 1905, lies east of the old port and is about double its size. The least depth of water in the old harbour is 18 ft., the average depth in the new harbour is 30 ft., the depth at the entrance being 40 ft.

The population of the city in 1906 was 100,499, of whom 21,906 were French, and 23,071 Spanish. There were also 27,570 naturalized Frenchmen, mostly of Spanish origin. There is a negro colony in the city, numbering about 3000, included in the census in the native population of 16,296. Including the garrison and naval forces the total population of the commune was 106,517.

Four miles west of Oran a small promontory forms the harbour of Mers-el-Kebir, formerly a stronghold of the Barbary pirates. The promontory is strongly fortified and crosses fire with a battery erected to the east of Oran. A road along the east coast, cut for the most part out of the solid rock, connects Oran and Mers-el-Kebir.

Attempts have been made to identify Oran with the Quiza, and Mers-el-Kebir with the Portus Magnus, of the Romans. There are, however, no Roman ruins at Oran or at Mers-el-Kebir. The foundation of Oran is more properly ascribed to Andalusian Arabs, who settled there in the beginning of the 10th century, and gave it its name. Rapidly rising into importance as a seaport, Oran was taken and retaken, pillaged and rebuilt, by the various conquerors of northern Africa. Almoravides, Almohades and Marinides succeeded each other, and in the space of half a century the city changed hands nine times. In the latter half of the 15th century it became subject to the sultans of Tlemçen, and reached the height of its prosperity. Active commerce was maintained with the Venetians, the Pisans, the Genoese, the Marseillais and the Catalans, who imported the produce of their looms, glass-wares, tin-wares, and iron, and received in return ivory, ostrich feathers, gold-dust, tanned hides, grain and negro slaves. Admirable woollen cloth and splendid arms were manufactured. The magnificence of its mosques and other public buildings, the number of its schools, and the extent of its warehouses shed lustre on the city; but wealth and luxury began to undermine its prosperity, and its ruin was hastened by the conduct of the Moslem refugees from Spain. Under the influence of these refugees the legitimate trade of the town gave place to piracy, Mers-el-Kebir becoming the stronghold of the pirates.

Animated by the patriotic enthusiasm of Cardinal Ximenes, the Spaniards determined to put a stop to these expeditions which were carrying off their countrymen, destroying their commerce, and even ravaging their country. Mers-el-Kebir fell into their hands on the 23rd of October 1505, and Oran in May 1509. The latter victory, obtained with but trifling loss, was stained by the massacre of a third of the Mahommedan population. From 6000 to 8000 prisoners, 60 cannon, engines of war and a considerable booty from the wealth accumulated by piracy fell into the hands of the conquerors. Cardinal Ximenes introduced the Inquisition, &c., and also restored and extended the fortifications. Oran became the penal settlement of Spain, but neither the convicts nor the noblemen in disgrace who were also banished thither seem to have been under rigorous surveillance; contemporary accounts speak of constant fêtes, games and bull-fights. Meanwhile the Turks had become masters of Algeria, and expelled the Spaniards from all their possessions except Oran. The bey of Mascara watched his opportunity, and at length, in 1708, the weakness of Spain and the treason of the count of Vera Cruz obliged the city to capitulate. The Spaniards recovered possession in 1732, but found the maintenance of the place a burden rather than a benefit, the neighbouring tribes having ceased to deal with the Christians. The earthquake of 1790 furnished an excuse for withdrawing their forces. Commencing by twenty-two separate shocks at brief intervals, the oscillations continued from the 8th of October to the 22nd of November. Houses and fortifications were overthrown and a third of the garrison and a great number of the inhabitants perished. Famine and sickness had begun to aggravate the situation when the bey of Mascara appeared before the town with 30,000 men. By prodigies of energy the Spanish commander held out till August 1791, when the Spanish government having made terms with the bey of Algiers, he was allowed to set sail for Spain with his guns and ammunition. The bey Mahommed took possession of Oran in March 1792, and made it his residence instead of Mascara. On the fall of Algiers the bey (Hassan) placed himself under the protection of the conquerors, and shortly afterwards removed to the Levant. The French army entered the city on the 4th of January 1831, and took formal possession on the 17th of August. In 1832 a census of the town showed that it had but 3800 inhabitants, of whom more than two-thirds were Jews. Under French rule Oran has regained its ancient commercial activity and has become the second city in Algeria.

ORANGE, HOUSE OF. The small principality of Orange, a district now included in the French department of Vaucluse, traces back its history as an independent sovereignty to the time of Charlemagne. William, surnamed *le Cornet*, who lived towards the end of the 8th century, is said to have been the first prince of Orange, but the succession is only certainly known after the time of Gerald Adhemar (fl. 1086). In 1174 the principality passed by marriage to Bertrand de Baux, and there were nine princes of this line. By the marriage of John of Chalons with Marie de Baux, the house of Chalons succeeded to the sovereignty in 1393. The princes of Orange-Chalons were (1) John I., 1393–1418, (2) Louis I., 1418–1463, (3) William VIII., 1463–1475, (4) John II., (1475–1502, (5) Philibert, 1502–1530. Philibert was a great warrior and statesman, who was held in great esteem by the emperor Charles V. For his services in his campaigns the emperor gave him considerable possessions in the Netherlands in 1522, and Francis I. of France, who had occupied Orange, was compelled, when a prisoner in Madrid, to restore it to him. Philibert had no children, and he was succeeded by his nephew Réné of Nassau-Chalons, son of Philibert's sister Claudia and Henry, count of Nassau, the confidential friend and counsellor of Charles V. He too died without an heir in 1544 at the siege of St Dizier, having devised all his titles and possessions to his first cousin William, the eldest son of William, count of Nassau-Dillenburg, who was the younger brother of Réné's father, and had inherited the German possessions of the family.

William of Orange-Nassau was but eleven years old when he succeeded to the principality. He was brought up at the court of Charles V. and became famous in history as William the Silent, the founder of the Dutch Republic. On his assassination in 1584 he was succeeded by his eldest son Philip William, who had been kidnapped by Philip II. of Spain in his boyhood and brought up at Madrid. This prince never married, and on his death in 1618 his next brother, Maurice, stadtholder in the United Netherlands and one of the greatest generals of his time, became prince of Orange. Maurice died in 1625, also unmarried. Frederick Henry, the son of Louise de Coligny, William's fourth wife, born just before his father's murder, now succeeded to the princedom of Orange and to all his brothers' dignities, posts and property in the Netherlands. Frederick Henry was both a great general and statesman. His only son, William, was married in 1641 to Mary, princess royal of England, he being fifteen and the princess nine years old at that date, and he succeeded to the title of prince of Orange on his father's death in 1647. At the very outset of a promising career he suddenly succumbed to an attack of smallpox on the 6th of November 1650, his son William III. being born a week after his father's death.

A revolution now took place in the system of government in the United Provinces, and the offices of stadtholder and captain-and admiral-general, held by four successsive princes of Orange, were abolished. However, the counter revolution of 1672 called William III. to the head of affairs. At this time Louis XIV. conquered the principality of Orange and the territory was incorporated in France, the title alone being recognized by the treaty of Ryswick. William married his cousin Mary, the eldest daughter of James, duke of York, in 1677. In 1688 he landed in England, expelled his father-in-law, James II., from his throne, and reigned as king of Great Britain and Ireland until his death in 1702. He left no children, and a dispute arose among various claimants to the title of prince of Orange. The king of Prussia claimed it as the descendant of the eldest daughter of Frederick Henry; John William Friso of Nassau-Dietz claimed it as the descendant of John, the brother of William the Silent, and also of the second daughter of Frederick Henry. The result was that at the peace of Utrecht in 1713, the king of Prussia abandoned the principality to the king of France in exchange for compensation elsewhere, and John William Friso gained the barren title and became William IV. prince of Orange. His sons William V. and William VI. succeeded him. William VI. in 1815 became William I. king of the Netherlands.

See Bastet, *Histoire de la ville et de la principauté d'Orange* (Orange 1856). (G. E.)

ORANGE, a town of Wellington and Bathurst counties, New South Wales, Australia, 192 m. by rail W.N.W. of Sydney. It lies in a fruit and wheat-growing district, in which gold, copper and silver also abound. It is the centre of trade with the western interior and has a number of flourishing industries. Orange also has a great reputation as a health resort. Its suburb, East Orange, in the county of Bathurst, is a separate municipality. Pop., including East Orange (1901), 6331.

ORANGE, a town of south-eastern France, capital of an arrondissement in the department of Vaucluse, 18 m. N. of Avignon on the railway from Lyons to Marseilles. Pop. (1906) of the town, 6412; of the commune, 10,303. Orange is situated at some distance from the left bank of the Rhone, in the midst of meadows, orchards and mulberry plantations, watered by a stream called the Meyne, and overlooked by the majestic summit of Mount Ventoux, which lies 22 m. to the east. The district is highly fertile, and the town deals largely in fruit, and millet-stalks for brooms, as well as in wool, silk, honey and truffles.

Orange is interesting mainly from its Roman remains. The triumphal arch is not only far finer than any other in France, but ranks third in size and importance among those still extant in Europe. Measuring 72 ft. in height, 69 ft. in width, and 26 ft. in depth, it is composed of three arches supported by Corinthian columns. On three sides it is well preserved, and displays remarkable variety and elegance in its sculptured decorations. To judge from the traces of an inscription, the arch seems to have been erected in honour of Tiberius, perhaps to commemorate his victory over the Gallic chieftain Sacrovir in A.D. 21. It suffered from being used as a donjon in the middle ages. Another most imposing structure is the theatre, dating from the time of the emperor Hadrian and built against a hill from the summit of which a colossal figure of the Virgin commands the town. The façade, which is 121 ft. high, 340 ft. long and 13 ft. thick, is pierced by three square gates surmounted by a range of blind arches and a double row of projecting corbels, with holes in which the poles of the awning were placed. Of the seats occupied by the spectators, only the lower tiers remain. It was used as an out-work to the fortress built on the hill by Maurice of Nassau in 1622, and destroyed fifty years later by order of Louis XIV., whose troops in 1660 captured the town. Up to the beginning of the 19th century it was filled with hovels and stables; these were subsequently cleared out, and at the end of the century the building was restored, and now serves as a national theatre. In the neighbourhood of the theatre traces have been found of a hippodrome; and statues, bas-reliefs and ruins of an amphitheatre also serve to show the importance of the Roman town. Notre Dame, the old cathedral, originally erected by the prefect of Gaul, was ruined by the Barbarians, rebuilt in the 11th and 12th centuries, and damaged by the Protestants.

The town has a sub-prefecture, a tribunal of first instance, and a communal college among its institutions; and it has tile and mosaic works and flour-mills, and manufactories of boots and shoes and brooms. There is trade in truffles, fruit, wine, &c.

Orange (*Arausio*), capital of the Cavari, was in 105 B.C. the scene of the defeat of a Roman army by the Cimbri and Teutones. It became after Caesar an important Roman colony. Its ramparts and fine buildings were partly destroyed by the

Alamanni and Visigoths, and partly ruined by the erections of the middle ages. Orange was included in the kingdom of Austrasia, fell into the hands of the Saracens and was recovered by Charlemagne It became the seat of an independent countship in the 11th century. From the 14th century till the Revolution the town had a university. At the latter period the town suffered severely from the excesses of a popular commission.

See R. Peyre, *Nimes, Arles et Orange* (Paris, 1903); A. de Pontbriant, *Histoire de la principauté d'Orange* (Avignon and Paris, 1891).

Councils of Orange.—In 441 a synod of sixteen bishops was held at Orange under the presidency of St Hilary of Arles, which adopted thirty canons touching the reconciliation of penitents and heretics; the ecclesiastical right of asylum, diocesan prerogatives of bishops, spiritual privileges of the defective or demoniac, the deportment of catechumens at worship, and clerical celibacy (forbidding married men to be ordained as deacons, and digamists to be advanced beyond the sub-diaconate). In 529 a synod of fifteen bishops, under the presidency of Caesarius of Arles, assembled primarily to dedicate a church, the gift of Liberius, the lieutenant of Theodoric, in Gaul, but proved to be one of the most important councils of the 6th century. Caesarius had sought the aid of Rome against semi-Pelagianism, and in response Pope Felix IV. had sent certain *capitula* concerning grace and free-will, drawn chiefly from the writings of Augustine and Prosper. These to the number of twenty-five the synod subscribed, and adopted a supplementary statement, reaffirming the Augustinian doctrines of corruption, human inability, prevenient grace and baptismal regeneration. Its acts were confirmed by Boniface II. on the "25th of January 530," a date which is open to question.

See F. H. Woods, *Canons of the Second Council of Orange* (Oxford, 1882). (T. F. C.)

ORANGE, a city of Essex county, New Jersey, U.S.A., in the N.E. part of the state, about 14 m. W. of New York City. Pop. (1890) 18,844, (1900) 24,141, of whom 6598 were foreign-born and 1903 were negroes, (1910 census) 29,630. It is served by the Morris & Essex Division of the Delaware, Lackawanna & Western railroad and by the Orange branch (of which it is a terminus) of the Erie railroad, and is connected with Newark, South Orange and Bloomfield by electric lines. The city lies at the base of the eastern slope of the first Watchung, or Orange, Mountain, and is primarily a residential suburb of New York and Newark; with East Orange, West Orange and South Orange it constitutes virtually a single community, popularly known as "the Oranges." The city has a good public school system and various private schools, including the Dearborn-Morgan School (for girls) and the Carteret Academy (for boys). Of historical interest is the First Presbyterian Church, erected in 1813, the third structure used by this church organization, whose history dates back to 1718. The value of the factory products of Orange increased from $2,995,688 in 1900 to $6,150,635 in 1905, or 105·3%, and the capital invested in manufacturing from $1,359,523 in 1900 to $3,441,183 in 1905, or 153·1%. Of the total product-value in 1905, $2,311,614 was the value of felt hats manufactured. Among other manufactures are beer, pharmaceutical supplies and lawn mowers. The city owns and operates its water-works and electric lighting plant. Settlements were made in or near the limits of the present city soon after the founding of Newark, in 1666, and, on account of the mountainous ridge in this region, they were generally referred to collectively as "Newark Mountain." As a disagreement soon arose between the people of Newark and those of "the mountain" on questions of church administration, the latter in 1718 severed their connexion with the church at Newark and formed an independent congregation, the "Mountain Society." The church, which was known also as "The Church of the New Ark Mountains," was at first Congregational, but in 1748 became Presbyterian. In 1782 occurs the earliest reference to the neighbourhood as "Orange Dale," and two years later it is sometimes referred to as "Orange." In 1806 the legislature incorporated the township of Orange. Parts of its territory were included in South Orange and Fairmount (now West Orange) in 1861 and 1862 respectively, and in 1863 East Orange was created out of part of Orange. Orange was incorporated as a town in 1860 and was chartered as a city in 1872.

See H. Whittemore, *The Founders and Builders of the Oranges* (Newark, 1896); J. H. Condit, *Early Records of the Township of Orange* (1807–1845) (Orange, 1897); and S. Wickes, *History of the Oranges* (1666–1806), (Newark, 1892).

ORANGE, the longest river of South Africa, almost traversing the continent from ocean to ocean. It rises in Basutoland, less than 200 m. from the Indian Ocean, and flows west, with wide sweeps south and north, to the Atlantic. It drains, with its tributaries, an area estimated at over 400,000 sq. m., passing through more than twelve degrees of longitude or 750 m. in a straight line from source to mouth. The valley of the river exceeds 1000 m., and the stream has a length of not less than 1300 m. Its headstreams are in the highest part of the Drakensberg range, the principal source, the Senku, rising, at an elevation of more than 10,000 ft., on the south face of the Mont aux Sources in 28° 48′ E., 28° 50′ S. The other headstreams are S.E. of the Senku source, in Champagne Castle, Giant's Castle and other heights of the Drakensberg. The Giant's Castle source is not more than 130 m. west of the Indian ocean in a direct line.

Rising on the inner slopes of the hills these rivulets all join the Senku, which receives from the north several streams which rise in the Maluti Mountains. Of these the largest are the Semene and Senkunyane (little Senku) and the best known the Maletsunyane, by reason of its magnificent waterfall—an unbroken leap of 630 ft. Increased by the perennial waters of these numerous torrents the Senku makes its way S.W. across the upland valleys between the Maluti and Drakensberg ranges. After a course of some 200 m., passing the S.W. corner of the Maluti Mountains, the Senku, already known as the Orange, receives the Makhaleng or Kornet Spruit (90 m.), which rises in Machacha Mountain. The Orange here enters the great inner plateau of South Africa, which at Aliwal North, the first town of any size on the banks of the river, 80 m. below the Kornet Spruit confluence, has an elevation of 4300 ft. Forty miles lower down the Orange is joined by the first of its large tributaries, the Caledon (230 m.), which, rising on the western side of the Mont aux Sources, flows, first west and then south, through a broad and fertile valley north of the Maluti Mountains. At the confluence the united stream has a width of 350 yards. Thirty miles lower down the Orange reaches, in 25° 40′ E., its southernmost point—30° 40′ S., approaching within 20 m. of the Zuurberg range. In this part of its course the river receives from the south the streams, often intermittent, which rise on the northern slopes of the Stormberg, Zuurberg and Sneeuwberg ranges—the mountain chain which forms the water-parting between the coast and inland drainage systems of South Africa. Of these southern rivers the chief are the Kraai, which joins the Orange near Aliwal North, the Stormberg and the Zeekoe (Sea Cow), the last named having a length of 120 m.

From its most southern point the Orange turns sharply N.W. for 200 m., when having reached 29° 3′ S., 23° 36′ E. it is joined by its second great affluent, the Vaal (*q.v.*). Here it bends south again, and with many a zigzag continues its general westerly direction, crossing the arid plains of Bechuana, Bushman and Namaqualands. Flowing between steep banks, considerably below the general level of the country, here about 3000 ft., it receives, between the Vaal confluence and the Atlantic, a distance of more than 400 m. in a direct line, no perennial tributary but on the contrary loses a great deal of its water by evaporation. In this region, nevertheless, skeleton river systems cover the country north and south. These usually dry sandy beds, which on many maps appear rivers of imposing length, for a few hours or days following rare but violent thunderstorms, are deep and turbulent streams. The northern system consists of the Nosob and its tributaries, the Molopo and the Kuruman. These unite their waters in about 20° 40′ E. and 27° S., whence a channel known as the Molopo or Hygap runs south to the Orange. The southern system, which at one time rendered fertile the great plains of western Cape Colony, is represented by the Brak and Ongers rivers, and, farther west, by the Zak and Olifants rivers, which, united as the Hartebeest, reach the Orange about 25 m. above the mouth of the Molopo. These rivers, in the wet season and in places, have plenty of water, generally dissipated in *vleis*, *pans* and *vloers* (marshy and lake land).

Between the mouths of the Hartebeest and Molopo, in 28° 35′ S., 20° 20′ E., are the great waterfalls of the Orange, where in a series of cataracts and cascades the river drops 400 ft. in 16 m. The Aughrabies or Hundred Falls, as they are called, are divided by ledges, reefs and islets, the last named often assuming fantastic shapes. Below the falls the river rushes through a rocky gorge, and openings in the cliffs to the water are rare. These openings are usually the sandy beds of dried-up or intermittent affluents, such as the Bak, Ham, Houm, Aub (or Great Fish) rivers of Great Namaqualand. As it approaches the Atlantic, the Orange, in its efforts to pierce the mountain barrier which guards the coast, is deflected north and then south, making a loop of fully 90 m., of which the two ends are but 38 m. apart. Crossing the narrow coast plain the river, with a south-westerly sweep, enters the ocean by a single mouth, studded with small islands, in 28° 37′ S., 16° 30′ E. A large sand bar obstructs the entrance to the river, which is not quite 1 m. wide. The river when in flood, at which time it has a depth of 40 ft., scours a channel through the bar, but the Orange is at all times inaccessible to sea-going vessels. Above the bar it is navigable by small vessels for 30 or 40 m. In the neighbourhood of the Vaal confluence, where the river passes through alluvial land, and at some other places, the waters of the Orange are used, and are capable of being much more largely used, for irrigation purposes.

The Hottentots call the Orange the Garib (great water), corrupted by the Dutch into Gariep. The early Dutch settlers called it simply Groote-Rivier. It was first visited by Europeans about the beginning of the 18th century. In 1685 Simon van der Stell, then governor of the Cape, led an expedition into Little Namaqualand and discovered the Koper Berg. In 1704 and 1705 other expeditions to Namaqualand were made. Attempts to mine the copper followed, and the prospectors and hunters who penetrated northward sent to the Cape reports of the existence of a great river whose waters always flowed. The first scientific expedition to reach the Orange was that under Captain Henry Hop sent by Governor Tulbagh in 1761, partly to investigate the reports concerning a semi-civilized yellow race living north of the great river. Hop crossed the Orange in September 1761, but shortly afterwards returned. Andrew Sparrman, the Swedish naturalist, when exploring in the Sneeuwberg in 1776, learned from the Hottentots that eight or ten days' journey north there was a large perennial stream, which he rightly concluded was the *groote-rivier* of Hop. The next year Captain (afterwards Colonel) R. J. Gordon, a Dutch officer of Scottish extraction, who commanded the garrison at Cape Town, reached the river in its middle course at the spot indicated by Sparrman and named it the Orange in honour of the prince of Orange. In 1778 Lieut. W. Paterson, an English traveller, reached the river in its lower course, and in 1779 Paterson and Gordon journeyed along the west coast of the colony and explored the mouth of the river. F. Le Vaillant also visited the Orange near its mouth in 1784. Mission stations north of the Orange were established a few years later, and in 1813 the Rev. John Campbell, after visiting Griqualand West for the London Missionary Society, traced the Harts river, and from its junction with the Vaal followed the latter stream to its confluence with the Orange, journeying thence by the banks of the Orange as far as Pella, in Little Namaqualand, discovering the great falls. These falls were in 1885 visited and described by G. A. Farini, from whom they received the name of the Hundred Falls. The source of the Orange was first reached by the French Protestant missionaries T. Arbousset and F. Daumas in 1836.

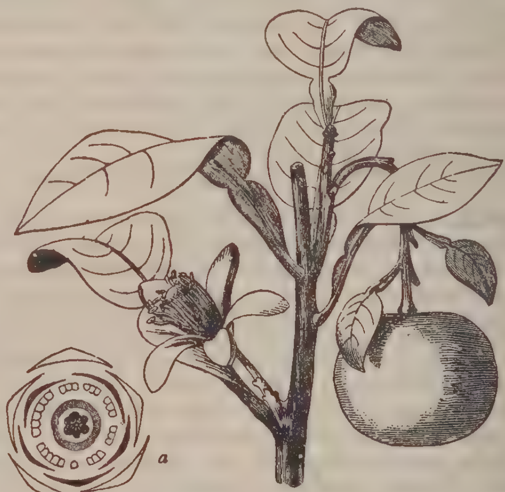
The story of Hop's expedition is told in the *Nouvelle description du Cap de Bonne Espérance* (Amsterdam, 1778). Lieut. Paterson gave his experiences in *A Narrative of Four Journeys into the Country of the Hottentots and Caffraria in the Years 1777–1778–1779* (London, 1789). See also Campbell's *Travels in South Africa* (London, 1815), Arbousset and Daumas' *Relation d'un voyage d'exploration au nord-est de la colonie du Cap de Bonne Espérance en 1836* (Paris, 1842), and Farini's *Through the Kalahari Desert* (London, 1886).

ORANGE (*Citrus Aurantium*). The plant that produces the familiar fruit of commerce is closely allied to the citron, lemon and lime, all the cultivated forms of the genus *Citrus* being so nearly related that their specific demarcation must be regarded as somewhat doubtful and indefinite. The numerous kinds of orange chiefly differing in the external shape, size and flavour of the fruit may all probably be traced to two well-marked varieties or sub-species—the sweet or China orange, var. *sinensis*, and the bitter orange or bigarade, var. *amara*.

The Bitter Seville or Bigarade Orange, *C. Aurantium*, var. *amara* (*C. vulgaris* of Risso), is a rather small tree, rarely exceeding 30 ft. in height. The green shoots bear sharp axillary spines, and alternate evergreen oblong leaves, pointed at the extremity, and with the margins entire or very slightly serrated; they are of a bright glossy green tint, the stalks distinctly winged and, as in the other species, articulated with the leaf. The fragrant white or pale pinkish flowers appear in the summer months, and the fruit, usually round or spheroidal, does not perfectly ripen until the following spring, so that flowers and both green and mature fruit are often found on the plant at the same time. The bitter aromatic rind of the bigarade is rough, and dotted closely over with concave oil-cells; the pulp is acid and more or less bitter in flavour.

The Sweet or China Orange, including the Malta or Portugal orange, has the petioles less distinctly winged, and the leaves more ovate in shape, but chiefly differs in the fruit, the pulp of which is agreeably acidulous and sweet, the rind comparatively smooth, and the oil-cells convex. The ordinary round shape of the sweet orange fruit is varied greatly in certain varieties, in some being greatly elongated, in others much flattened; while several kinds have a conical protuberance at the apex, others are deeply ribbed or furrowed, and a few are distinctly "horned" or lobed, by the partial separation of the carpels. The two sub-species of orange are said to reproduce themselves infallibly by seed; and, where hybridizing is prevented, the seedlings of the sweet and bitter orange appear to retain respectively the more distinctive features of the parent plant.

Though now cultivated widely in most of the warmer parts of the world, and apparently in many completely naturalized, the diffusion of the orange has taken place in comparatively recent historical periods. To ancient Mediterranean agriculture it was unknown; and, though the later Greeks and Romans were familiar with the citron as an exotic fruit, their "median apple" appears to have been the only form of the citrine genus with which they were acquainted. The careful researches of Gallesio have proved that India was the country from which the orange spread to western Asia and eventually to Europe. Oranges are at present found wild in the jungles along the lower mountain slopes of Sylhet, Kumaon, Sikkim and other parts of northern India, and, according to Royle, even in the Nīlgiri Hills; the plants are generally thorny, and present the other characters of the bitter variety, but occasionally wild oranges occur with sweet fruit; it is, however, doubtful whether either sub-species is really indigenous to Hindustan, and De Candolle is probably correct in regarding the Burmese peninsula and southern China as the original home of the orange. Cultivated from a remote period in Hindustan, it was carried to south-western Asia by the Arabs, probably before the 9th century, towards the close of which the bitter orange seems to have been well known to that people; though, according to Mas'ūdī, it was not cultivated in Arabia itself until the beginning of the 10th century, when it was first planted in 'Omān, and afterwards carried to Mesopotamia and Syria. It spread ultimately, through the agency of the same race, to Africa and Spain, and perhaps to Sicily, following



Orange (*Citrus Aurantium*, var. *amara*), from nature, about one-third natural size. *a*, diagram of flower.

everywhere the tide of Mohammedan conquest and civilization. In the 12th century the bigarade was abundantly cultivated in all the Levant countries, and the returning soldiers of the Cross brought it from Palestine to Italy and Provence. An orange tree of this variety is said to have been planted by St Dominic in the year 1200, though the identity of the one still standing in the garden of the monastery of St Sabina at Rome, and now attributed to the energetic friar, may be somewhat doubtful. No allusion to the sweet orange occurs in contemporary literature at this early date, and its introduction to Europe took place at a considerably later period, though the exact time is unknown. It was commonly cultivated in Italy early in the 16th century, and seems to have been known there previously to the expedition of Da Gama (1497), as a Florentine narrator of that voyage appears to have been familiar with the fruit. The importation of this tree into Europe, though often attributed to the Portuguese, is with more probability referred to the enterprise of the Genoese merchants of the 15th century, who must have found it growing abundantly then in the Levant. The prevailing European name of the orange is sufficient evidence of its origin and of the line taken in its migration westward. The Sanskrit designation *nagrungo*, becoming *narungee* in Hindustani, and corrupted by the Arabs into *nāranj* (Spanish *naranja*), passed by easy transitions into the Italian *arancia* (Latinized *aurantium*), the Romance *arangi*, and the later Provençal *orange*. The true Chinese variety, however, was undoubtedly brought by the Portuguese navigators direct from the East both to their own country and to the Azores, where now luxuriant groves of the golden-fruited tree give a modern realization to the old myth of the gardens of the Hesperides.[1] Throughout China and in Japan the orange has been grown from very ancient times, and it was found diffused widely when the Indian Archipelago was first visited by Europeans. In more recent days its cultivation has extended over most of the warmer regions of the globe, the tree growing freely and producing fruit abundantly wherever heat is sufficient and enough moisture can be supplied to the roots; where night-frosts occur in winter or spring the culture becomes more difficult and the crop precarious.

The orange flourishes in any moderately fertile soil, if it is well drained and sufficiently moist; but a rather stiff loam or calcareous marl, intermingled with some vegetable humus, is most favourable to its growth. Grafting or budding on stocks raised from the seed of some vigorous variety is the plan usually adopted by the cultivator. The seeds, carefully selected, are sown in well-prepared ground, and the seedlings removed to a nursery-bed in the fourth or fifth year, and, sometimes after a second transplantation, grafted in the seventh or eighth year with the desired variety. When the grafts have acquired sufficient vigour, the trees are placed in rows in the permanent orangery. Propagation by layers is occasionally adopted; cuttings do not readily root, and multiplication directly by seed is always doubtful in result, though recommended by some authorities. The distance left between the trees in the permanent plantation or grove varies according to the size of the plants and subsequent culture adopted. In France, when the trunks are from 5 to 6½ ft. in height, a space of from 16 to 26 ft. is left between; but the dwarfer trees admit of much closer planting. In the West Indies and Azores an interval of 24 or even of 30 ft. is often allowed. The ground is kept well stirred between the trunks, and the roots manured with well-rotted dung, guano or other highly nitrogenous matter; shallow pits are sometimes formed above the roots for the reception of liquid or other manures; in dry climates water must be abundantly and frequently supplied. The trees require regular and careful pruning, the heads being trained as nearly as possible to a spherical form. Between the rows melons, pumpkins and other annual vegetables are frequently raised. In garden culture the orange is often trained as an espalier, and with careful attention yields fruit in great profusion when thus grown. In favourable seasons the oranges are produced in great abundance, from 400 to 1000 being commonly borne on a single plant in full bearing, while on large trees the latter number is often vastly exceeded. The trees will continue to bear abundantly from fifty to eighty years, or even more; and some old orange trees, whose age must be reckoned by centuries, still produce their golden crop; these very ancient trees are, however, generally of the bitter variety. Oranges intended for export to colder climates are gathered long before the deep tint that indicates maturity is attained, the fruit ripening rapidly after picking; but the delicious taste of the mature China orange is never thus acquired, and those who have not eaten the fruit in a perfectly ripe state have little idea of its flavour when in that condition. Carefully gathered, the oranges are packed in boxes, each orange being wrapped in paper, or with dry maize husks or leaves placed between them. The immense quantities of this valuable fruit imported into Britain are derived from various sources, the Azores ("St Michael's" oranges), Sicily, Portugal, Spain and other Mediterranean countries, Jamaica, the Bahamas and Florida, California, &c. In Florida the bitter orange has grown, from an unknown period, in a wild condition, and some of the earlier botanical explorers regarded it as an indigenous tree; but it was undoubtedly brought by the Spanish colonists to the West India Islands, and was probably soon afterwards transplanted to Florida by them or their buccaneering enemies; its chief use in America is for stocks on which to graft sweet orange and other species of *Citrus*.

Orange cultivation has been attempted with success in several parts of Australia, especially in New South Wales, where the orange groves near Paramatta yield an abundant colonial supply. The orangeries of Queensland and South Australia likewise produce well. In many of the Pacific Islands the plant has been long established. There are numerous varieties of the sweet orange, a few of which deserve mention on account of some striking peculiarity. Maltese or Blood oranges are characterized by the deep-red tint of the pulp, and comprise some of the best varieties. Gallesio refers to the blood orange as cultivated extensively in Malta and Provence; they are largely grown in the Mediterranean region in the present day, and have been introduced into America. So-called navel oranges have an umbilical mark on the apex of the fruit due to the production of an incipient second whorl of carpels. Baptiste Ferrari, a Jesuit monk, in his work *Hesperides, sive De malorum aureorum cultura et usus Libri Quatuor*, published at Rome in 1646, figures and describes (pp. 403, 405) such an orange. The mandarin orange of China, sometimes regarded as a distinct species, *C. nobilis*, is remarkable for its very flat spheroidal fruit, the rind of which readily separates with the slightest pressure; the pulp has a peculiarly luscious flavour when ripe. The small Tangerine oranges, valued for their fine fragrance, are derived from the mandarin.

Diseases.—Several are caused by fungi, others by insects. Of the fungus diseases that known as foot-rot in Florida and mal-di-gomma in Italy is very widely distributed. It occurs on the lower part of the trunk and the main roots of the tree, and is indicated by exudation of gum on the bark covering the diseased spot. The diseased patches spread into the wood, killing the tissues, which emit a foetid odour; the general appearance of the tree is unhealthy, the leaves become yellow and the twigs and young branches die. A fungus, *Fusarium limonis* is found associated with the disease, which is also fostered by faulty drainage, a shaded condition of the soil, the use of rank manures and other conditions. For treatment the soil should be removed from the base of the trunk, the diseased patches cut away and the wound treated with a fungicide. Decay of oranges in transit often causes serious losses; this has been shown to be due to a species of *Penicillium*, of which the germinating spores penetrate the skin of damaged fruits. Careful picking, handling and packing have much reduced the amount of loss from this cause. Another fungus disease, scab, has been very injurious to the lemon and bitter orange in Florida. It is caused by a species of *Cladosporium*, which forms numerous small warts on the leaves and fruits; spraying with a weak solution of Bordeaux mixture or with ammoniacal solution of carbonate of copper is recommended. The sooty mould of orange, which forms a black incrustation on the leaves and also the fruit, probably occurs wherever the orange is cultivated. It is caused by species of *Meliola*; in Europe and the United States, by *M. Penzigii* and *M. Camelliae*. The fruit is often rendered unsaleable and the plant is also injured as the leaves are unable properly to perform their functions. The fungus is not a parasite, but lives apparently upon the honey-dew secreted by aphides, &c., and is therefore dependent on the presence of these insects. Spraying with resin-wash is an effective preventive, as it destroys the insects. Several insect enemies attack the plant, of which the scale insect *Aspidiotus* is the most injurious in Europe and the Azores. In Florida another species, *Mytilaspis citricola* (purple scale), sometimes disfigures the fruit to such an extent as to make it unfit for market. Several species of *Aleyrodes* are insect pests on leaves of the orange; *A. citri*, the white fly of Florida, is described as the most important of all the insect pests of the crop in Florida at the present time, and another species, *A. Howardi*, is a very serious pest in Cuba. Cold weather in winter has sometimes proved destructive in Provence, and many plantations were destroyed by the hard frosts of 1789 and 1820.

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[1] The modern Arabic name, Borṭuḳān (that is, Portuguese), shows that the China apple reached the Levant from the West.

Besides the widespread use of the fruit as an agreeable and wholesome article of diet, that of the sweet orange, abounding in citric acid, possesses in a high degree the antiscorbutic properties that render the lemon and lime so valuable in medicine; and the free consumption of this fruit in the large towns of England during the winter months has doubtless a very beneficial effect on the health of the people. The juice is sometimes employed as a cooling drink in fevers, as well as for making a pleasant beverage in hot weather.

The bitter orange is chiefly cultivated for the aromatic and tonic qualities of the rind, which render it a valuable stomachic. Planted long ago in Andalusia by the Moorish conquerors, it is still extensively grown in southern Spain—deriving its common English name of "Seville" orange from the abundant groves that still exist around that city, though the plant is now largely cultivated elsewhere. The fruit is imported into Great Britain and the United States in considerable quantities for the manufacture of orange marmalade, which is prepared from the pulp and rind, usually more or less mingled with the pulp of the China orange. In medicine the fresh peel is largely employed as an aromatic tonic, and often, in tincture and syrup and "orange wine," as a mere vehicle to disguise the flavour of more nauseous remedies. The chief constituents are three glucosides, hesperidin, isohesperidin and aurantiamarin, the latter being the bitter principle; and an oil which mainly consists of a terpene known as limonene. The essential oil of the rind is collected for the use of the perfumer, being obtained either by the pressure of the fresh peel against a piece of sponge, or by the process known as *écuelle*, in which the skin of the ripe fruit is scraped against a series of points or ridges arranged upon the surface of a peculiarly-shaped dish or broad funnel, when the oil flows freely from the broken cells. Another fragrant oil, called in France *essence de petit grain*, is procured by the distillation of the leaves, from which also an aromatic water is prepared. The flowers of both sweet and bitter orange yield, when distilled with water, the "oil of Neroli" of the druggist and perfumer, and likewise the fragrant liquid known as "orange-flower water," which is a saturated solution of the volatile oil of the fresh flowers. The candied peel is much in request by cook and confectioner; the favourite liqueur sold as "curaçoa" derives its aromatic flavour from the rind of the bigarade. The minute immature oranges that drop from the trees are manufactured into "issue-peas"; from those of the sweet orange in a fresh state a sweetmeat is sometimes prepared in France. Orange trees occasionally acquire a considerable diameter; the trunk of one near Nice, still standing in 1789, was so large that two men could scarcely embrace it; the tree was killed by the intense cold of the winter of that year. The wood of the orange is of a fine yellow tint, and, being hard and close-grained, is valued by the turner and cabinetmaker for the manufacture of small articles; it takes a good polish.

Although the bitter "Poma de Orenge" were brought in small quantities from Spain to England as early as the year 1290, no attempt appears to have been made to cultivate the tree in Britain until about 1595, when some plants were introduced by the Carews of Beddington in Surrey, and placed in their garden, where, trained against a wall, and sheltered in winter, they remained until destroyed by the great frost of 1739–1740. In the 18th century the tree became a favourite object of conservatory growth; in the open air, planted against a wall, and covered with mats in winter, it has often stood the cold of many seasons in the southern counties, in such situations the trees occasionally bearing abundant fruit. The trees are usually imported from Italy, where, especially near Nervi, such plants are raised in great numbers for exportation; they are generally budded on the stocks of some free-growing variety, often on the lemon or citron.

The orange has been usually cultivated in England for the beauty of the plant and the fragrance of its blossoms, rather than for the purpose of affording a supply of edible fruit. The latter can, however, be easily grown in a hot-house, some of the fruits thus grown, especially those of the pretty little Tangerine variety, being superior in quality to the imported fruit. The best form of orange house is the span-roofed, with glass on both sides, the height and other conditions being similar to those recommended for stove plants. The trees may be planted out, a row on each side a central path, in a house of moderate width. They will flourish in a compost of good, light, turfy loam and well-decayed leaf-mould in equal proportions, to which a little broken charcoal may be added. Each year the trees should be top-dressed with a similar compost, removing some of the old soil beforehand. The trees, if intended to be permanent, should be placed 10 to 12 ft. apart. It will often be found more convenient to grow the plants in pots or tubs, and then bottom heat can be secured by placing them on or over a series of hot-water pipes kept near to or above the ground level. The pots or tubs should be thoroughly well drained, and should not be too large for the plants; and repotting should take place about every third year, the soil being top-dressed in intervening years. The temperature may be kept at about 50° or 55° in winter, under which treatment the trees will come into bloom in February; the heat must then be increased to 60° or 65° in the day time, and later on to 80° or 85°. Throughout the growing season the trees should be liberally watered, and thoroughly syringed every day; this will materially assist in keeping down insects. When the trees are in bloom, however, they must not be syringed, but the house must be kept moist by throwing water on the pathways a few times during the day. When the flowers have fallen the syringe may be used again daily in the early morning and late afternoon. The fruit may be expected to ripen from about the middle of October to January, and if the sorts are good will be of excellent quality. When the trees are at rest the soil must not be kept too wet, since this will produce a sickly condition, through the loss of the small feeding roots. The trees require little pruning or training. The tips of the stronger shoots are just pinched out when they have made about 6 in. of growth, but when a branch appears to be robbing the rest, or growing ahead of them, it should be shortened back or tied down.

When grown for the production of flowers, which are always in great request, the plants must be treated in a similar manner to that already described, but may do without bottom heat.

For details of orange varieties, cultivation, &c., see Risso and Poiteau, *Histoire et culture des orangers* (edited by A. Du Breuil, Paris, 1872); for early history and diffusion, G. Gallesio, *Traité du citrus* (Paris, 1811). A useful modern handbook is *Citrus Fruits and their Culture*, by Harold Hume (New York, 1907).

There are many varieties of the sweet orange that may be grown under glass in the British Isles. Amongst the best for dessert is the *St Michaels*, a heavy cropper with large juicy fruits; and closely related are *Bittencourt*, *Egg*, *Dom Louise*, *Sustain*, *Excelsior* and *Brown's Orange*. The *White Orange*, so called from its pale skin, is excellent. *Silver* or *Plata* is a sweet, pale-coloured variety with a curious weal-like orange stripe, the fruit being rather small but heavy. *Embiguo*, or the *Washington Navel Orange*, produces splendid fruit under glass. The *Jaffa*, with large oblong fruits and large wavy crinkled leaves, although a shy bearer, makes up for this in the size of its fruits. The Maltese *Blood Orange* is remarkable for the blood-like stains in the pulp, although these are not present in every fruit even on the same tree.

Other kinds of oranges are the Tangerine with small aromatic fruits and willow-like leaves. The Seville orange is a handsome free-flowering tree, but its fruits are bitter and used only for preserving and marmalade.

ORANGEBURG, a city and the county-seat of Orangeburg county, South Carolina, U.S.A., on the North Edisto river, 50 m. S. by E. of Columbia. Pop. (1890) 2964; (1900) 4455 (2518 negroes); (1910) 5906. Orangeburg is served by the Atlantic Coast Line and the Southern railways. It is the seat of Claflin University for negroes, and of the State Colored Normal, Industrial, Agricultural and Mechanical College. Claflin University, incorporated in 1869, was named in honour of Lee Claflin (1791–1871) of Massachusetts, and is under the control of the Freedmen's Aid and Education Society of the Methodist Episcopal Church. In 1908 it had 25 instructors and 538 students (241 men and 297 women). The State Colored Normal, Industrial, Agricultural and Mechanical College was established here by the state in 1872 as the College of Agriculture and Mechanics' Institute (for negroes), on property immediately adjoining the campus of Claflin University, and the two schools were under one management (although otherwise distinct and separate) until 1896, when the present name of the state college was adopted. Among the city's manufactures are cotton-seed oil, cotton (yarn and cloth), lumber, bricks, concrete and turpentine. The municipality owns the water-works and the electric-lighting plant. A trader and trapper settled on the site of what is now Orangeburg in 1704. In 1735 a company of Germans and Swiss established the first real settlement and named it Orangeburg, in honour of the prince of Orange. Orangeburg was incorporated as a town in 1851, and was first chartered as a city in 1883.

ORANGE FREE STATE, an inland province of British South Africa; formerly—from 1854 to 1900—an independent republic. From May 1900 to June 1910 it was known as the Orange River Colony, since when under the style of Orange Free State it has formed a province of the Union of South Africa. It lies north of the Orange and south of the Vaal rivers, between 26° 30′ and 30° 40′ S. and 24° 20′ and 29° 40′ E., and has an area of 50,392 sq. m., being nearly the size of England. It is surrounded by other British possessions, being bounded N. by the Transvaal, E. by Natal, S.E. by Basutoland, S. and W. by the Cape province. Its greatest length is 356 m., its greatest breadth 304 m.

Physical Features.—The country forms part of the inner tableland of South Africa and has an elevation of between 4000 and 5000 ft. On the N.E. or Natal border the crest of the Drakensberg forms the frontier. The northern slopes of Mont aux Sources (11,000 ft.), the highest land in South Africa, are within the province, as are also the Draken's Berg (5682 ft.), the mountain from which the range takes its name, Melanies Kop (7500 ft.) and Platberg (about 8000 ft.), near Harrismith. Though rugged in places, with outlying spurs and secondary chains, the westward slopes of the Drakensberg are much gentler than the eastern or Natal versant of the chain. Several passes exist through the mountains, that of Van Reenen, 5500 ft., being traversed by a railway. From the mountainous eastern district the country dips gradually westward. No natural boundary marks the western frontier, a line across the veld (separating it from the Griqualand West district of the Cape) from the Orange to the Vaal rivers.

The aspect of the greater part of the country is that of vast undulating treeless plains, diversified by low rands and isolated tafelbergs and spitzkops, indicating the former level of the country. These hills are either of sandstone or ironstone and in altitude vary from about 4800 ft. to 5300 ft. Ironstone hills are numerous in the south-west districts. The whole country forms part of the drainage basin of the Orange river, its streams, with insignificant exceptions, being tributaries of the Vaal or Caledon affluents of that river. The watershed between the Vaal and Caledon is formed by chains of hills, which, leaving the main range of the Drakensberg at Mont aux Sources, sweep in semicircles west and south. These hills are known as the Roodebergen, Wittebergen, Korannaberg, Viervoet, &c., and rise to nearly 7000 ft. The well-known Thaba Nchu (Black Mountain) is an isolated peak between this range and Bloemfontein. Three-fourths of the country lies north of these hills and is typical veld; the valley of the Caledon, sheltered eastward by the Maluti Mountains in Basutoland, is well watered and extremely fertile. The Caledon, from its source in Mont aux Sources to Jammerberg Drift near Wepener, forms the boundary of the province, the southern bank being in Basutoland; below Wepener the land on both sides of the Caledon is in the province. Here, between the Caledon and the Orange, is the fertile district of Rouxville. The north bank of the Orange, from the Kornet Spruit confluence to a point a little east of the spot where the railway from Cape Town to Kimberley crosses the river, forms the southern frontier of the province. The chief tributaries of the Vaal (*q.v.*) wholly or partly within the province are, going from east to west, the Klip (this stream from near its source to its confluence with the Vaal divides the Free State from the Transvaal), the Wilge, Rhenoster, Vet, Modder and Reit. The Sand river, on whose banks the convention recognizing the independence of the Transvaal Boers was signed in 1852, is a tributary of the Vet and passes through the centre of the country. All the affluents of the Vaal mentioned flow north or west. The Vaal itself for the greater part of its course forms the boundary between the province and the Transvaal. From the Klip river confluence it flows west and south-west, entering Griqualand West above Kimberley. The river beds are generally 40 to 80 ft. below the level of the surrounding land. Most of the rivers have a considerable slope and none is navigable. Except the Caledon, Vaal and Orange, they are dry or nearly dry for three or four months in the year, but in the rainy season they are often raging torrents. The valleys of the Modder, Reit and the lower Caledon contain rich alluvial deposits. Besides the rivers water is obtained from numerous springs. A remarkable feature of the western plains is the large number of salt pans and salt springs grouped together in extensive areas, especially in the Boshof district.

Geology.—Except a small area around Vredefort in the north, the whole of the province is occupied by rocks of Karroo age. At Vredefort there is a granitic boss, belonging to the Swaziland series, regarded as being an intrusive in the overlying Witwatersrand series by G. A. F. Molengraaff, but to be of older date by F. A. Hatch. This boss is bounded, except on the south, by the Witwatersrand series, the lower portion of which consists of quartzites and slates and the upper portion of quartzites and conglomerates. At Hoopstad and at Stinkhoutboom the Witwatersrand series is unconformably overlain by 500 ft. of boulder beds and amygdaloidal lavas belonging to the Vaal River System. The Black Reef series of quartzites and conglomerates and dolomite form a narrow outcrop resting unconformably upon the last-mentioned system. Of the Karroo System all the groups from the basal Dwyka Conglomerate to the Cave Sandstone of the Stormberg series (see CAPE COLONY) are represented; but these rocks have not been so minutely subdivided as in the Cape. The Dwyka Conglomerate forms a narrow outcrop in the north-west, and is known from boreholes to extend over large areas beneath the Ecca Shales and to rest directly on rocks of older age. At Vierfontein a seam of coal is worked above it. The Ecca series extends over the major portion of the province. It consists mainly of sandstones, but these are often thin-bedded and pass into shales. Impressions of plants and silicified stems are frequently found. The Beaufort series occupies a portion of the area formerly regarded as being composed of the Stormberg beds. The prevailing rocks are sandstones, mudstones and shales. Reptilian remains abound; plants are also plentiful. The Stormberg series is confined to the north-east.[1]

Climate.—Cut off from the warm, rain-bearing winds of the Indian Ocean by the Drakensberg, the country is swept by the winds from the dry desert regions to the west. It is also occasionally subject to hot, dry winds from the north. The westerly wind is almost constant and, in conjunction with the elevation of the land, greatly modifies the climatic conditions. The heat usual in subtropical countries is tempered by the cool breezes, and the atmosphere is dry and bracing. The climate indeed is noted for its healthiness, the chief drawback being dust-storms. The average temperature for the four winter months—May-August—is 49° F.; hard frosts at night are then common. For the other eight months the average temperature is 66°, December-February being the hottest months. The average daily range of the thermometer is from 25° to 30°, the highest recorded range in one day being 74° (from 20° to 94°). Rain falls on from sixty to seventy days during the year, chiefly in the summer (December-April). Rain is generally preceded by thunder and lightning and falls heavily for a short period. Most of the water runs off the surface into the spruits and in a little while the veld is again dry. The western part of the province is driest, as the rain clouds often pass over the lower levels but are caught by the eastern hills. The average annual rainfall varies from 18 in. or less in the west to 24 in. in the central regions and 30 in the eastern highlands.

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[1] See for geology, A. H. Green, "A Contribution to the Geology and Physical Geography of the Cape Colony," *Quart. Journ. Geol. Soc.* vol. xliv., 1888; E. J. Dunn, *Geological Sketch Map of S. Africa* (Melbourne, 1887); D. Draper, "Notes on the Geology of South-Eastern Africa," *Quart. Journ. Geol. Soc.* vol. l., 1894. F. H. Hatch and G. S. Corstorphine, *The Geology of South Africa* (2nd ed. London, 1909).

Flora and Fauna.—The flora is typical of a region of scanty rainfall. Over the greater part of the plains little now grows save veld, the coarse long grass of South Africa. Formerly, much of the country was covered with mimosa bush, but the trees were to a large extent cut down by the early white immigrants. Thorny acacias, euphorbias and aloes are still, however, found in patches on the plains. Timber trees are almost confined to the river valleys, where willows, yellow wood, iron wood, red wood, mimosas and, in deep gorges, the wild fig are found. The tobacco plant also grows wild. In moist regions ferns and mosses, the arum and other broad flat-leaved plants are found. The characteristic plants are thorny and small leaved, or else bulbous. Among veld plants the elandsboontje provides tanning material equal to oak bark. European fruit trees and vines flourish in certain localities, while in the drier regions the Australian wattle, gum trees and pepper trees have been introduced with success.

The fauna has undergone a great alteration since the first white settlers entered the country. Big game was then abundant. The elephant, giraffe, lion, leopard, hyena, zebra, buffalo, gnu, quagga, kudu, eland and many other kinds of antelope roamed the plains; the rhinoceros, hippopotamus and crocodile lived in or frequented the rivers, and ostriches and baboons were numerous. The immigrant farmers ruthlessly shot down game of all kinds and most of the animals named were exterminated, so far as the province was concerned. Of animals still found may be mentioned baboons and monkeys, the leopard, red lynx (*Felis caracal*), spotted hyena, aard wolf, wild cat, long-eared fox, jackals of various kinds, the dassie or rock rabbit, the scaly anteater, the ant bear (aardvaark), the mongoose and the spring haas, a rodent of the jerboa family. Antelope of any kind are now scarce; a few white-tailed gnu are preserved. None of the dangerous wild beasts is common, but there are several varieties of poisonous snakes. Scorpions and tarantulas are numerous, and lizards, frogs, beetles, ants, butterflies, moths and flies are abundant. Locusts are an intermittent plague. There are few earthworms or snails. The birds include eagles—some are called lammervangers from their occasional attacks on young lambs—vultures, hawks, kites, owls, crows, ravens, the secretary bird, cranes, a small white heron, quails, partridges, korhaans, wild geese, duck, and guineafowl, swallows, finches, starlings, the mossie or Cape sparrow, and the widow bird, noted for the length of its tail in summer. Barbel and yellow mudfish are found in the rivers.

Inhabitants.—The Bushmen (*q.v.*) are, presumably, the oldest inhabitants of this, as of many other parts of South Africa. Next came the Hottenots (*q.v.*), and in the 16th century Bantu negroes of the Bechuana tribes appear to have established themselves in the country. The Barolong, one of the oldest Bechuana tribes, are believed to have entered the country subsequently to the Bakuena, the particular tribe from which the general name of the race is derived (see BECHUANA; and TRANSVAAL: *Inhabitants*). Clans representing the southern Bakuena were welded together into one tribe in the 19th century, and are now known as Basuto (see BASUTOLAND). The Basuto were already a strong force when the first white settlers, Dutch farmers from the Cape, entered the country in 1824; the white element has since been reinforced by a considerable strain of British, particularly Scottish, blood. Since the advent of the whites there has also been a considerable immigration of Zulus. The majority of the inhabitants live in the eastern part of the country; the arid regions west of the main railway line containing a scanty pastoral population and no towns of any size. The first census, taken in 1880, showed a total population of 133,518; in 1890 there were 207,503 inhabitants—an increase in ten years of 55·41%—and at the census of 1904 there were 387,315 inhabitants, a further increase of 85·56%. The density in 1904 was under 8 persons per sq. m. The inhabitants are officially divided into "Europeans or white," "aboriginal natives" and "mixed and other coloured races." Between 1880 and 1904 the proportion of whites dropped from 45·70% to 36·84%. Of the 142,679 white inhabitants in 1904, 85,036 were born in the province; 29,727 in the Cape; 3116 in the Transvaal; 1835 in Natal, and 18,487 in the United Kingdom. Of the 2726 European immigrants born in non-British states 1025 came from Russian Poland.

According to the 1904 census classification the "aboriginal inhabitants" numbered in that year 229,149. In this term are included, however, Zulu-Kaffir immigrants. The tribe most largely represented was the Basuto (130,213 persons), former owners of considerable tracts in the eastern part of the country, now known as "The Conquered Territory." In the eastern districts of Harrismith, Bethlehem, Ficksburg and Ladybrand the Basutos are largely concentrated. Barolong numbered 37,998 and other Bechuana 5115. Of the Zulu-Kaffir tribes Zulus proper numbered 35,275, Fingoes 6275, and Ama Xosa 5376 (see KAFFIRS; and ZULULAND: *Inhabitants*). The Bushmen numbered 4048 persons. Of these 1131 were in the Bloemfontein district. The Bushmen have left in drawings on caves and in rocks traces of their habitation in regions where they are no longer to be found. In Thaba'nchu a petty Barolong state enjoyed autonomy up to 1884, and the majority of the Barolong are found in that district and the adjoining district of Bloemfontein. The Zulus are mostly found in that part of the country nearest Zululand. In 1904 the number of persons belonging to "mixed and other coloured races" was 15,487. The proportion between the sexes was, for all races, 84·35 females to 100 males; for white inhabitants only 74·91 females to 100 males; for aboriginal inhabitants only 90·86 females to 100 males. Of the population above fifteen years old 55·87% of the men and 33·69% of the women were unmarried. Among whites for every 100 unmarried men there were 65·33 unmarried women; there were 93·04 married women for every 100 married men, and 173·81 widows for every 100 widowers.

Classified by occupations the census of 1904 gave the following results: dependants, mainly young children, 28·53%; agriculture, 39·51%; commercial and industrial pursuits, 7·62%; professional, 3·18%; domestic (including women living at home other than those helping in farm work), 15·75%. Divided by races 8·19% of the whites were engaged in professional work and only 0·26% of the coloured classes.

Chief Towns.—The capital, Bloemfontein (pop. in 1904, 33,883), is fairly centrally situated on the trunk railway to Johannesburg. Kroonstad (pop. 7191) lies 127 m. N.N.E. of Bloemfontein on the same railway line. Harrismith, 8300, is in the N.E. of the colony, 60 m. by rail from Ladysmith, Natal. Jagersfontein, 5657, is in the S.W. of the province and owes its importance to the existence there of a diamond mine. Ladybrand, 3862, Ficksburg, 1954, and Wepener, 1366, lie in the valley of the Caledon near the Basutoland frontier. Winburg, 2762, lies between Bloemfontein and Kroonstad. All these towns are separately noticed. Other towns on the trunk railway, going from south to north, are Springfontein, 1000, an important railway junction; Trompsburg, 1378; Edenburg, 1562, and Brandfort, 1977. In the S.E. Thaba'nchu, 1134, Zastron, 1157, Dewetsdorp, 971 (named after the father of Christian De Wet), Reddersburg, 750, Smithfield, 999, and Rouxville, 990. These are all centres of fine agricultural regions. Bethulie, 1686, on the Orange river, in the "Conquered Territory," has been the scene of the labours of French Protestant missionaries since 1832, and possesses a fine park. Through it passes the main line from East London. In the N.E. are: Bethlehem, 1777, on the railway, 57 m. W. of Harrismith, an agricultural and coal-mining centre; Senekal, 1039; Heilbron, 1544; Vrede, 1543; Frankfort, 747; Lindley, 646; and Reitz, 526. In the north-west of the trunk railway are: Parijs, 1732, finely situated on the Vaal, and Vredefort, 759. Farther west and south are: Hoopstad, 452, on the Vet river; Boshof, 1308, a fruit and vegetable centre, 30 m. N.E. of Kimberley; and Jacobsdal, 764. In the S.W. are: Philippolis, 809, at one time capital of the Griqua chief Adam Kok and named after the Rev. John Philip (*q.v.*). Fauresmith, 1363, a mining centre, 6 m. W. of Jagersfontein, and Koffyfontein, 1657, where is a diamond mine. Many of the towns were the scenes of encounters between the Boers and British, March 1900-May 1902. At Boshof fell the leader of the Boers' European Legion, Colonel de Villebois Mareuil, on the 5th of April 1900. At the census of 1904 Harrismith and Kroonstad were the only towns where the white inhabitants outnumbered the coloured population. Nine towns contained more than 1000 white inhabitants, the total white population of these towns being 31,505, of whom 15,501 lived in Bloemfontein.

Communications.—Largely owing to its situation—being on the direct route between the Cape ports and the Transvaal, and between Durban and Kimberley—the province possesses an extensive network of railways. The railways are state owned and of the standard South African gauge—3 ft. 6 in. They may be divided into two systems, (1) those connecting the province with the Cape and the Transvaal, and (2) those linking it with Natal.

The first system consists of a trunk line, formed by the junction of lines from Cape Town and Port Elizabeth, which crosses the Orange at Norvals Pont, traverses the province from south to north, passing through Bloemfontein and Kroonstad, and enters the Transvaal at Viljoens Drift (331 m. from Norvals Pont), being continued thence to Johannesburg. This line is joined at Springfontein by a railway from East London which crosses the Orange near Bethulie. From Bloemfontein a line (102 m. long) runs west to Kimberley, on the main line from Cape Town to Rhodesia, and from Springfontein a branch (56 m. long) goes past Jagersfontein to Fauresmith.

The second system is formed by a line leaving the Natal trunk railway at Ladysmith which crosses the Drakensberg at Van Reenen's Pass and is continued thence through Harrismith to Bethlehem. At Bethlehem it divides, one branch going N.W. to Kroonstad (178 m. from the Natal border and 393 m. from Durban), the other S.W. along the Caledon valley to Modderpoort near Ladybrand, and thence directly west to Bloemfontein. The distance from Van Reenen's Pass to Bloemfontein by this route is 278 m. The two systems, it will be seen, are doubly connected, namely at Bloemfontein and at Kroonstad, and the lines running east from those towns afford the quickest connexion between Cape Town and Durban. Besides the lines enumerated there are various local lines, one branching at Sannah's Post station from the Bloemfontein-Bethlehem line running south-east to Wepener. Another branch from the same line crosses the Caledon to Maseru, Basutoland. In 1910 there were in all 1060 m. of railway open in the province. There are well-kept high-roads connecting all the towns, and a government service of mail carts to places not on the railway. The light Cape cart is largely used, and the wagon, drawn by a team of oxen, is still employed by farmers to bring their produce to market. There is an extensive telegraphic system and a well-organized postal service.

Agriculture.—The chief industry is agriculture, including sheep farming and stock raising. The dry western plains are best adapted for sheep rearing, while the well-watered eastern regions are specially suitable for the growing of cereals and also for horse breeding. The land under cultivation in 1904 was 371,515 morgen (a morgen is 2·11 acres) or about 1230 sq. m. The chief crop is mealies, the staple food of the natives; wheat, oathay, Kaffir corn and oats coming next. Little barley is cultivated. The "Conquered Territory," that is the valley of the Caledon, is the most fertile region and is styled the granary of South Africa. Here, in the districts of Ladybrand, Ficksburg, Bethlehem and Rouxville, most wheat is grown. The same regions, together with the adjacent regions of Harrismith and Thaba'nchu, produce the most oats and oathay. Besides grains the chief crops are those of pumpkins, potatoes and other table vegetables, and tobacco. The cultivation of potatoes and tobacco largely increased between the census years 1890 and 1904. The principal tobacco-growing regions are Vredefort, which produced 258,645 lb in 1904, and Kroonstad (80,385 lb), the districts of Bethlehem, Ladybrand and Winburg also producing considerable quantities. Fruit farming engages attention, about 8000 morgen being devoted to orchards in 1904. The fruit trees commonly cultivated are the peach, apricot, apple, orange, lemon, pear, fig and plum.

The rearing of live stock, the chief pursuit of the first Dutch settlers, is an important industry. Rinderpest and other epidemic diseases swept over the country in 1895–1896, and during the war of 1899–1902 the province was practically denuded of live stock. There was a rapid increase of stock after the close of hostilities. Sheep numbered over 5,000,000 in 1910, cattle over 600,000, horses over 100,000, goats (chiefly owned by natives) over 1,000,000. Large numbers of pigs are reared. Ostrich farming is growing in favour. The eastern and south-eastern districts have the greatest amount of stock per square mile, Ficksburg leading in cattle, horses and mules. Sheep are most abundant in the Rouxville, Wepener and Smithfield districts, goats in Philippolis. The dairying industry is increasing. The Afrikander cattle, powerful draught animals, large horned, bony and giving little milk, are being crossed with other stock. A government Department of Agriculture, created in 1904, affords help to the farmers in various ways, notably in combatting insect plagues, in experimental farms, and in improving the breed of horses, sheep and cattle.

Land Settlement.—Under the provisions of a Land Settlements Ordinance of 1902 over 1,500,000 acres of crown land had been by 1907 allotted, and in September 1909 there were 642 families, of whom over 570 were British, settled on the land. In 1907 a Land Settlement Board was created to deal with the affairs of these settlers. At the end of five years the Board was to hand over its duties to the government.

Diamond Mining and other Industries.—Next to agriculture the most important industry is that of diamond mining. The chief diamond mines are at Jagersfontein (*q.v.*) and Koffyfontein. There are also diamond mines in the Winburg and Kroonstad districts, and near Ficksburg, where old workings have been found 40 ft. deep. The alluvial deposits on the banks of the Vaal, N.E. of Kimberley, yield occasional diamonds of great purity. The value of the output from the diamond mines rose from £224,000 in 1890 to £1,508,000 in 1898. The war hindered operations, but the output was valued at £648,000 in 1904 and at £1,048,000 in 1909.

Coal-mines are worked in various districts in the north near the Vaal, notably at Vierfontein, and at Clydesdale, which lies a few miles south of Vereeniging. Before 1905 the mines were little worked; in that year the output was 118,000 tons, while in 1907 over 500,000 tons were raised. It dropped to 470,000 in 1909 owing to loss of railway contracts.

Of other minerals gold has been found, but up to 1909 was not worked; iron ore exists near Kroonstad and Vredefort, but it also is not worked. Petroleum has been found in the Ficksburg, Ladybrand and Harrismith districts, and is pumped to a limited extent. Good building stone is obtained near Bloemfontein, Ladybrand and other places, and excellent pottery clay near Bloemfontein.

Besides the industries mentioned flour-milling, soap-making, and the manufacture of jam and salt are carried on. During 1905 over 12,300,000 lb of salt were obtained from the salt springs at Zoutpan, near Jacobsdal, and Haagenstad, to the west of Brandfort. In 1907 the output had increased to nearly 23,000,000 lb.

Trade.—The bulk of the direct trade of the country is with the Cape and the Transvaal, Natal, however, taking an increasing share. Basutoland comes fourth. Its chief exports are diamonds, live stock (cattle, horses and mules, sheep and goats), wool, mohair, coal, wheat and eggs. Except the diamonds, which go to London via Cape Town, all the exports are taken by the neighbouring territories. The principal imports, over 90% being of British origin, are cotton goods, clothing and haberdashery, leather, boots, &c., hardware, sugar, coffee, tea and furniture.

The volume of trade in 1898, as represented by imports and exports, was £3,114,000 (imports £1,190,000; exports £1,923,000). For the four years beginning on June 30, 1902, that is immediately after the close of hostilities, the imports increased from £2,460,000 to £4,053,000, the exports from £285,000 to £3,045,000. For the fiscal year 1908–1909 the imports were valued at £2,945,000, the exports at £3,558,000. About a third of the imports are the produce or manufactures of other South African countries. Imported goods re-exported are of comparatively slight value—some £381,000 in 1908–1909.

Constitution.—From July 1907 to June 1910 the province was a self-governing colony. It is now represented in the Union parliament by sixteen senators and seventeen members of the house of assembly. For parliamentary purposes the province is divided into single-member constituencies. The franchise is given to all adult white male British subjects. There is no property qualification, but six months' residence in the province is essential. There is a biennial registration of voters, and every five years the electoral areas are to be redivided, with the object of giving to each constituency an approximately equal number of voters. The qualifications for membership of the assembly are the same as those for voters.

At the head of the provincial government is an administrator (who holds office for five years) appointed by the Union ministry. This official is assisted by an executive committee of four members elected by the provincial council. The provincial council consists of 25 members (each representing a separate constituency) elected by the parliamentary voters and has a statutory existence of three years. Its powers are strictly local and delegated. The control of elementary education was guaranteed to the council for a period of five years following the establishment of the Union.

Justice.—The law of the province is the Roman-Dutch law, in so far as it has been introduced into and is applicable to South Africa, and as amended by local acts. Bloemfontein is the seat of the Supreme Court of the Union of South Africa and also of a provincial division of the same court. For judicial purposes the province is divided into twenty-four divisions, in each of which is a resident magistrate, who has limited civil and criminal jurisdiction. There are also special justices of the peace, having criminal jurisdiction in minor cases. The provincial court has jurisdiction in all civil and criminal matters, and is a court of appeal from all inferior courts. From it appeals can be made to the Appellate Division of the Supreme Court. Criminal cases are tried before one judge and a jury of nine, who must give a unanimous opinion. Circuit courts are also held by judges of the provincial court.

Finance.—The bulk of the revenue, *e.g.* that derived from customs and railways, is now paid to the Union government, but the provincial council has power to levy taxes and (with the consent of the Union ministry) to raise loans for strictly provincial purposes. In 1870–1871, when the province was an independent state and possessed neither railways nor diamond mines, the revenue was £78,000 and the expenditure £71,000; in 1884–1885 the revenue had risen to £228,000 and the expenditure to £229,000; in 1898, the last full year of the republican administration, the figures were: revenue, including railway profits, £799,000; expenditure, including outlay on new railways, £956,000. Omitting the figures during the war period, the figures for the year ending June 1903 were: revenue, £956,000; expenditure, £839,000. The depression in trade which followed caused a reduction in revenue, the average for the years 1904–1909 being: revenue, £820,000; expenditure, £819,000. These figures are exclusive of railway receipts and expenditure (see TRANSVAAL: *Finance*).

Religion.—The vast majority (over 95 %) of the white inhabitants are Protestants, and over 70 % belong to the Dutch Reformed Church, while another 3 % are adherents of the very similar organization, the Gereformeerde Kerk. Anglicans are the next numerous body, forming 12·53 % of the white population. The Wesleyans number nearly 4 % of the inhabitants. The Roman Catholics number 2·30 % of the whites, the head of their church in the province being a vicar apostolic. At the head of the Anglican community, which is in full communion with the Church of England, is the bishop of Bloemfontein, whose diocese, founded in 1863, includes not only the Orange Free State, but Basutoland, Griqualand West and British Bechuanaland. All the churches named have missions to the natives, and in 1904, 104,389 aboriginals and 10,909 persons of mixed race were returned as Protestants, and 1093 aboriginals and 117 of mixed race as Roman Catholics. The total number of persons in the country professing Christianity was 251,904 or 65 %. The Dutch Reformed Church had the largest number (21,272) of converts among the natives, the Wesleyans coming next. The African Methodist Episcopal (Ethiopian) Church had 4110 members, of whom only two were whites. The Jewish community numbered 1616. Nearly 33 % of the population, 127,637 persons, were returned officially at the census of 1904 as of "no religion," under which head are classed the natives who retain their primitive forms of belief, for which see KAFFIRS, BECHUANAS, &c.

Education.—At the census of 1904, 32·57 % of the total population could read and write; of the whites over fifteen years old 82·63 % could read and write. Of the aboriginals, 8·15 % could read and write; of the mixed and other races, 12·28 %. In the urban areas the proportion of persons, of all races, able to read and write was 50·67 %; in the rural areas the proportion was 26·43 %. By sexes, 35 % of males and 29·63 % of females could read and write.

Elementary education is administered by the provincial council, assisted by a permanent director of education. From 1900 to 1905 the schools were managed, teachers selected and appointed and all expenses borne by the government. They were of an undenominational character and English was the medium of instruction. The teaching of Dutch was optional. In 1904 the Dutch Reformed Church started Christian National (*i.e.* Denominational) Schools, but in March 1905 an agreement was come to whereby these schools were amalgamated with the government schools, and in June 1905 a further agreement was arrived at between the government and the leading religious denominations. By this arrangement "religious instruction of a purely historical character" was given in all government schools for two hours every week, and might be given in Dutch. Further, ministers of the various denominations might give, on the special request of the parents, instruction to the children of their own congregations for one hour on one day in each week. The attendance at government schools reached in 1908 a total of nearly 20,000, as against 8000 in 1898, the highest attendance recorded under republican government. On the attainment of self-government the colonial legislature passed an act (1908) which in respect to primary and secondary education made attendance compulsory on all white children, the fee system being maintained. English and Dutch were, nominally, placed on an equal footing as media of instruction. Every school was under the supervision of a committee elected by the parents of the children. Schools were grouped in districts, and for each district there was a controlling board of nine members, of whom five were elected by the committees of the separate schools and four appointed by the government. Religious instruction could only be given by members of the school staff. Dogmatic teaching was prohibited during school hours, except in rural schools when parents required such teaching to be given. The application of the provision as to the media of instruction gave rise to much friction, the English-speaking community complaining that instruction in Dutch was forced upon their children (see further, § *History*). Primary education for natives is provided in private schools, many of which receive government grants. In 1908 over 10,000 natives were in attendance at schools.

Provision is made for secondary education in all the leading town schools, which prepare pupils for matriculation. At Bloemfontein is a high school for girls, the Grey College school for boys, and a normal school for the training of teachers. The Grey University College is a state institution providing university education for the whole province. It is affiliated to the university of the Cape of Good Hope.

History.

Establishment of a Boer republic.

The country north of the Orange river was first visited by Europeans towards the close of the 18th century. At that time it was somewhat thinly peopled. The majority of the inhabitants appear to have been members of the Bechuana division of the Bantus, but in the valleys of the Orange and Vaal were Korannas and other Hottentots, and in the Drakensberg and on the western border lived numbers of Bushmen. Early in the 19th century Griquas established themselves north of the Orange. Between 1817 and 1831 the country was devastated by the chief Mosilikatze and his Zulus, and large areas were depopulated. Up to this time the few white men who had crossed the Orange had been chiefly hunters or missionaries. In 1824 Dutch farmers from Cape Colony seeking pasture for their flocks settled in the country. They were followed in 1836 by the first parties of the Great Trek. These emigrants left Cape Colony from various motives, but all were animated by the desire to escape from British sovereignty. (See SOUTH AFRICA, *History*; and CAPE COLONY, *History*.) The leader of the first large party of emigrants was A. H. Potgieter, who concluded an agreement with Makwana, the chief of the Bataung tribe of Bechuanas, ceding to the farmers the country between the Vet and Vaal rivers. The emigrants soon came into collision with Mosilikatze, raiding parties of Zulus attacking Boer hunters who had crossed the Vaal without seeking permission from that chieftain. Reprisals followed, and in November 1837 Mosilikatze was decisively defeated by the Boers and thereupon fled northward. In the meantime another party of emigrants had settled at Thaba'nchu, where the Wesleyans had a mission station for the Barolong. The emigrants were treated with great kindness by Moroko, the chief of that tribe, and with the Barolong the Boers maintained uniformly friendly relations. In December 1836 the emigrants beyond the Orange drew up in general assembly an elementary republican form of government. After the defeat of Mosilikatze the town of Winburg (so named by the Boers in commemoration of their victory) was founded, a volksraad elected, and Piet Retief, one of the ablest of the *voortrekkers*, chosen "governor and commandant-general." The emigrants already numbered some 500 men, besides women and children and many coloured servants. Dissensions speedily arose among the emigrants, whose numbers were constantly added to, and Retief, Potgieter and other leaders crossed the Drakensberg and entered Natal. Those that remained were divided into several parties intensely jealous of one another.

Early relations with British, Basutos and Griquas.

Meantime a new power had arisen along the upper Orange and in the valley of the Caledon. Moshesh, a Bechuana chief of high descent, had welded together a number of scattered and broken clans which had sought refuge in that mountainous region, and had formed of them the Basuto nation. In 1833 he had welcomed as workers among his people a band of French Protestant missionaries, and as the Boer immigrants began to settle in his neighbourhood he decided to seek support from the British at the Cape. At that time the British government was not prepared to exercise effective control over the emigrants. Acting upon the advice of Dr John Philip, the superintendent of the London Missionary Society's stations in South Africa, a treaty was concluded in 1843 with Moshesh, placing him under British protection. A similar treaty was made with the Griqua chief, Adam Kok III. (See BASUTOLAND and GRIQUALAND.) By these treaties, which recognized native sovereignty over large areas on which Boer farmers were settled, it was sought to keep a check on the emigrants and to protect both the natives and Cape Colony. Their effect was to precipitate collisions between all three parties. The year in which the treaty with Moshesh was made several large parties of Boers recrossed the Drakensberg into the country north of the Orange, refusing to remain in Natal when it became a British colony. During their stay there they had inflicted a severe defeat on the Zulus under Dingaan (December 1838), an event which, following on the flight of Mosilikatze, greatly strengthened the position of Moshesh, whose power became a menace to that of the emigrant farmers. Trouble first arose, however, between the Boers and the Griquas in the Philippolis district. Many of the white farmers in this district, unlike their fellows dwelling farther north, were willing to accept British rule, and this fact induced Mr Justice Menzies, one of the judges of Cape Colony then on circuit at Colesberg, to cross the Orange and proclaim (October 1842) the country British territory, a proclamation disallowed by the governor, Sir George Napier, who, nevertheless, maintained that the emigrant farmers were still British subjects. It was after this episode that the treaties with Adam Kok and Moshesh were negotiated. The treaties gave great offence to the Boers, who refused to acknowledge the sovereignty of the native chiefs. The majority of the white farmers in Kok's territory sent a deputation to the British commissioner in Natal, Henry Cloete, asking for equal treatment with the Griquas, and expressing the desire to come, on such terms, under British protection. Shortly afterwards hostilities between the farmers and the Griquas broke out. British troops were moved up to support the Griquas, and after a skirmish at Zwartkopjes (May 2, 1845) a new arrangement was made between Kok and Sir Peregrine Maitland, then governor of Cape Colony, virtually placing the administration of his territory in the hands of a British resident, a post filled in 1846 by Captain H. D. Warden. The place chosen by Captain (afterwards Major) Warden as the seat of his court was known as Bloemfontein, and it subsequently became the capital of the whole country.

Annexation by Great Britain.

The volksraad at Winburg during this period continued to claim jurisdiction over the Boers living between the Orange and the Vaal and was in federation with the volksraad at Potchefstroom, which made a similar claim upon the Boers living north of the Vaal. In 1846 Major Warden occupied Winburg for a short time, and the relations between the Boers and the British were in a continual state of tension. Many of the farmers deserted Winburg for the Transvaal. Sir Harry Smith became governor of the Cape at the end of 1847. He recognized the failure of the attempt to govern on the lines of the treaties with the Griquas and Basutos, and on the 3rd of February 1848 he issued a proclamation declaring British sovereignty over the country between the Orange and the Vaal eastward to the Drakensberg. The justness of Sir Harry Smith's measures and his popularity among the Boers gained for his policy considerable support, but the republican party, at whose head was Andries Pretorius (*q.v.*), did not submit without a struggle. They were, however, defeated by Sir Harry Smith in an engagement at Boomplaats (August 29, 1848). Thereupon Pretorius, with those most bitterly opposed to British rule, retreated across the Vaal. In March 1849 Major Warden was succeeded at Bloemfontein as civil commissioner by Mr C. U. Stuart, but he remained British resident until July 1852. A nominated legislative council was created, a high court established and other steps taken for the orderly government of the country, which was officially styled the Orange River Sovereignty. In October 1849 Moshesh was induced to sign a new arrangement considerably curtailing the boundaries of the Basuto reserve. The frontier towards the Sovereignty was thereafter known as the Warden line. A little later the reserves of other chieftains were precisely defined. The British Resident had, however, no force sufficient to maintain his authority, and Moshesh and all the neighbouring clans became involved in hostilities with one another and with the whites. In 1851 Moshesh joined the republican party in the Sovereignty in an invitation to Pretorius to recross the Vaal. The intervention of Pretorius resulted in the Sand River Convention of 1852, which acknowledged the independence of the Transvaal but left the status of the Sovereignty untouched. The British government (the first Russell administration), which had reluctantly agreed to the annexation of the country, had, however, already repented its decision and had resolved to abandon the Sovereignty. Lord Grey (the 3rd earl), secretary of state for the colonies, in a despatch to Sir Harry Smith dated the 21st of October 1851, declared, "The ultimate abandonment of the Orange Sovereignty should be a settled point in our policy." A meeting of representatives of all European inhabitants of the Sovereignty, elected on manhood suffrage, held at Bloemfontein in June 1852, nevertheless declared in favour of the retention of British rule. At the close of that year a settlement was at length concluded with Moshesh, which left, perhaps, that chief in a stronger position than he had hitherto been. (See BASUTOLAND: *History*.) There had been ministerial changes in England and the ministry then in power—that of Lord Aberdeen—adhered to the determination to withdraw from the Sovereignty. Sir George Russell Clerk was sent out in 1853 as special commissioner "for the settling and adjusting of the affairs" of the Sovereignty, and in August of that year he summoned a meeting of delegates to determine upon a form of self-government. At that time there were some 15,000 whites in the country, many of them recent emigrants from Cape Colony. There were among them numbers of farmers and tradesmen of British blood. The majority of the whites still wished for the continuance of British rule provided that it was effective and the country guarded against its enemies. The representations of their delegates, who drew up a proposed constitution retaining British control, were unavailing. Sir George Clerk announced that, as the elected delegates were unwilling to take steps to form an independent government, he would enter into negotiations with other persons. "And then," writes Dr Theal, "was seen the strange spectacle of an English commissioner addressing men who wished to be free of British control as the friendly and well-disposed inhabitants, while for those who desired to remain British subjects and who claimed that protection to which they believed themselves entitled he had no sympathizing word." While the elected delegates sent two members to England to try and induce the government to alter their decision Sir George Clerk speedily came to terms with a committee formed by the republican party and presided over by Mr J. H. Hoffman. Even before this committee met a royal proclamation had been signed (January 30, 1854) "abandoning and renouncing all dominion" in the Sovereignty. A convention recognizing the independence of the country was signed at Bloemfontein on the 23rd of February by Sir George Clerk and the republican committee, and on the 11th of March the Boer government assumed office and the republican flag was hoisted. Five days later the representatives of the elected delegates had an interview in London with the colonial secretary, the duke of Newcastle, who informed them that it was now too late to discuss the question of the retention of British rule. The colonial secretary added that it was impossible for England to supply troops to constantly advancing outposts, "especially as Cape Town and the port of Table Bay were all she really required in South Africa." In withdrawing from the Sovereignty the British government declared that it had "no alliance with any native chief or tribes to the northward of the Orange River with the exception of the Griqua chief Captain Adam Kok." Kok was not formidable in a military sense, nor could he prevent individual Griquas from alienating their lands. Eventually, in 1861, he sold his sovereign rights to the Free State for £4000 and removed with his followers to the district now known as Griqualand East. (F. R. C.)

Independence forced on the Boers.

Republican rule

On the abandonment of British rule representatives of the people were elected and met at Bloemfontein on the 28th of March 1854, and between that date and the 18th of April were engaged in framing a constitution. The country was declared a republic and named the Orange Free State. All persons of European blood possessing a six months' residential qualification were to be granted full burgher rights. The sole legislative authority was vested in a single popularly elected chamber styled the volksraad. Executive authority was entrusted to a president elected by the burghers from a list submitted by the volksraad. The president was to be assisted by an executive council, was to hold office for five years and was eligible for re-election. The constitution was subsequently modified but remained of a liberal character. A residence of five years in the country was required before aliens could become naturalized. The first president was Mr Hoffman, but he was accused of being too complaisant towards Moshesh and resigned, being succeeded in 1855 by Mr J. N. Boshof, one of the voortrekkers, who had previously taken an active part in the affairs of Natal.

A Transvaal raid into the Free State.

Distracted among themselves, with the formidable Basuto power on their southern and eastern flank, the troubles of the infant state were speedily added to by the action of the Transvaal Boers. Marthinus Pretorius, who had succeeded to his father's position as commandant-general of Potchefstroom, wished to bring about a confederation between the two Boer states. Peaceful overtures from Pretorius were declined, and some of his partisans in the Free State were accused of treason (February 1857). Thereupon Pretorius, aided by Paul Kruger, conducted a raid into the Free State territory. On learning of the invasion President Boshof proclaimed martial law throughout the country. The majority of the burghers rallied to his support, and on the 25th of May the two opposing forces faced one another on the banks of the Rhenoster. President Boshof not only got together some eight hundred men within the Free State, but he received offers of support from Commandant Schoeman, the Transvaal leader in the Zoutpansberg district and from Commandant Joubert of Lydenburg. Pretorius and Kruger, realizing that they would have to sustain attack from both north and south, abandoned their enterprise. Their force, too, only amounted to some three hundred. Kruger came to Boshof's camp with a flag of truce, the "army" of Pretorius returned north and on the 2nd of June a treaty of peace was signed, each state acknowledging the absolute independence of the other. The conduct of Pretorius was stigmatized as "blameworthy." Several of the malcontents in the Free State who had joined Pretorius permanently settled in the Transvaal, and other Free Staters who had been guilty of high treason were arrested and punished. This experience did not, however, heal the party strife within the Free State. In consequence of the dissensions among the burghers President Boshof tendered his resignation in February 1858, but was for a time induced to remain in office. The difficulties of the state were at that time (1858) so great that the volksraad in December of that year passed a resolution in favour of confederation with the Cape Colony. This proposition received the strong support of Sir George Grey, then governor of Cape Colony, but his view did not commend itself to the British government, and was not adopted (see SOUTH AFRICA: *History*). In the same year the disputes between the Basutos and the Boers culminated in open war. Both parties laid claims to land beyond the Warden line, and each party had taken possession of what it could, the Basutos being also expert cattle-lifters. In the war the advantage rested with the Basutos; thereupon the Free State appealed to Sir George Grey, who induced Moshesh to come to terms. On the 15th of October 1858 a treaty was signed defining anew the boundary. The peace was nominal only, while the burghers were also involved in disputes with other tribes. Mr. Boshof again tendered his resignation (February 1859) and retired to Natal. Many of the burghers would have at this time welcomed union with the Transvaal, but learning from Sir George Grey that such a union would nullify the conventions of 1852 and 1854 and necessitate the reconsideration of Great Britain's policy towards the native tribes north of the Orange and Vaal rivers, the project dropped. Commandant Pretorius was, however, elected president in place of Mr Boshof. Though unable to effect a durable peace with the Basutos, or to realize his ambition for the creation of one powerful Boer republic, Pretorius saw the Free State begin to grow in strength. The fertile district of Bethulie as well as Adam Kok's territory was acquired, and there was a considerable increase in the white population. The burghers generally, however, had not learned the need of discipline, of confidence in their elected rulers, or that to carry on a government taxes must be levied. Wearied like Mr Boshof of a thankless task, and more interested in affairs in the Transvaal than in those of the Free State, Pretorius resigned the presidency in 1863, and after an interval of seven months Mr (afterwards Sir) John Henry Brand (*q.v.*), an advocate at the Cape bar, was elected president. He assumed office in February 1864. His election proved a turning-point in the history of the country, which, under his beneficent and tactful guidance, became peaceful and prosperous and, in some respects, a model state. But before peace could be established an end had to be made of the difficulties with the Basutos. Moshesh continued to menace the Free State border. Attempts at accommodation made by the governor of Cape Colony (Sir Philip Wodehouse) failed, and war between the Free State and Moshesh was renewed in 1865. The Boers gained considerable successes, and this induced Moshesh to sue for peace. The terms exacted were, however, too harsh for a nation yet unbroken to accept permanently. A treaty was signed at Thaba Bosigo in April 1866, but war again broke out in 1867, and the Free State attracted to its side a large number of adventurers from all parts of South Africa. The burghers thus reinforced gained at length a decisive victory over their great antagonist, every stronghold in Basutoland save Thaba Bosigo being stormed. Moshesh now turned in earnest to Sir Philip Wodehouse for preservation. His prayer was heeded, and in 1868 he and his country were taken under British protection. Thus the thirty years' strife between the Basutos and the Boers came to an end. The intervention of the governor of Cape Colony led to the conclusion of the treaty of Aliwal North (Feb. 12, 1869), which defined the borders between the Orange Free State and Basutoland. The country lying to the north of the Orange river and west of the Caledon, formerly a part of Basutoland, was ceded to the Free State (see BASUTOLAND). This country, some hundred miles long and nearly thirty wide, is a fertile stretch of agricultural land on the lower slopes of the Maluti mountains. It lies at an altitude of nearly 6000 ft., and is well watered by the Caledon and its tributaries. It has ever since been known as the Conquered Territory, and it forms to-day one of the richest corn-growing districts in South Africa. A year after the addition of the Conquered Territory to the state another boundary dispute was settled by the arbitration of Mr Keate, lieutenant-governor of Natal. By the Sand River Convention independence had been granted to the Boers living "north of the Vaal," and the dispute turned on the question as to what stream constituted the true upper course of that river. Mr Keate decided (Feb. 19, 1870) against the Free State view and fixed the Klip river as the dividing line, the Transvaal thus securing the Wakkerstroom and adjacent districts.

Brand elected President.

Settlement of the Basuto troubles.

Discovery of the Kimberley Diamond Fields.

The Basutoland difficulties were no sooner arranged than the Free Staters found themselves confronted with a serious difficulty on their western border. In the years 1870–1871 a large number of diggers had settled on the diamond fields near the junction of the Vaal and Orange rivers, which were situated in part on land claimed by the Griqua chief Nicholas Waterboer and by the Free State. The Free State established a temporary government over the diamond fields, but the administration of this body was satisfactory neither to the Free State nor to the diggers. At this juncture Waterboer offered to place the territory under the administration of Queen Victoria. The offer was accepted, and on the 27th of October 1871 the district, together with some adjacent territory to which the Transvaal had laid claim, was proclaimed, under the name of Griqualand West, British territory. Waterboer's claims were based on the treaty concluded by his father with the British in 1834, and on various arrangements with the Kok chiefs; the Free State based its claim on its purchase of Adam Kok's sovereign rights and on long occupation. The difference between proprietorship and sovereignty was confused or ignored. That Waterboer exercised no authority in the disputed district was admitted. When the British annexation took place a party in the volksraad wished to go to war with Britain, but the wiser counsels of President Brand prevailed. The Free State, however, did not abandon its claims. The matter involved no little irritation between the parties concerned until July 1876. It was then disposed of by the 4th earl of Carnarvon, at that time secretary of state for the colonies, who granted to the Free State £90,000 "in full satisfaction of all claims which it considers it may possess to Griqualand West." Lord Carnarvon declined to entertain the proposal made by Mr Brand that the territory should be given up by Great Britain. One thing at least is certain with regard to the diamond fields—they were the means of restoring the credit and prosperity of the Free State. In the opinion, moreover, of Dr Theal, who has written the history of the Boer Republics and has been a consistent supporter of the Boers, the annexation of Griqualand West was probably in the best interests of the Free State. "There was," he states, "no alternative from British sovereignty other than an independent diamond field republic."

At this time, largely owing to the exhausting struggle with the Basutos, the Free State Boers, like their Transvaal neighbours, had drifted into financial straits. A paper currency had been instituted, and the notes—currently known as "bluebacks"—soon dropped to less than half their nominal value. Commerce was largely carried on by barter, and many cases of bankruptcy occurred in the state. But as British annexation in 1877 saved the Transvaal from bankruptcy, so did the influx of British and other immigrants to the diamond fields, in the early 'seventies, restore public credit and individual prosperity to the Boers of the Free State. The diamond fields offered a ready market for stock and other agricultural produce. Money flowed into the pockets of the farmers. Public credit was restored. "Bluebacks" recovered par value, and were called in and redeemed by the government. Valuable diamond mines were also discovered within the Free State, of which the one at Jagersfontein is the richest. Capital from Kimberley and London was soon provided with which to work them.

Cordial relations with Great Britain.

The relations between the British and the Free State, after the question of the boundary was once settled, remained perfectly amicable down to the outbreak of the Boer War in 1899. From 1870 onward the history of the state was one of quiet, steady progress. At the time of the first annexation of the Transvaal the Free State declined Lord Carnarvon's invitation to federate with the other South African communities. In 1880, when a rising of the Boers in the Transvaal was threatening, President Brand showed every desire to avert the conflict. He suggested that Sir Henry de Villiers, Chief Justice of Cape Colony, should be sent into the Transvaal to endeavour to gauge the true state of affairs in that country. This suggestion was not acted upon, but when war broke out in the Transvaal Brand declined to take any part in the struggle. In spite of the neutral attitude taken by their government a number of the Free State Boers, living in the northern part of the country, went to the Transvaal and joined their brethren then in arms against the British. This fact was not allowed to influence the friendly relations between the Free State and Great Britain. In 1888 Sir John Brand died. In him the Boers, not only in the Free State but in the whole of South Africa, lost one of the most enlightened and most upright rulers and leaders they have ever had. He realized the disinterested aims pursued by the British government, without always approving its methods. Though he had thrown the weight of his influence against Lord Carnarvon's federation scheme Brand disapproved racial rivalries.

During the period of Brand's presidency a great change, both political and economic, had come over South Africa. The renewal of the policy of British expansion had been answered by the formation of the Afrikander Bond, which represented the racial aspirations of the Dutch-speaking people, and had active branches in the Free State. This alteration in the political outlook was accompanied, and in part occasioned, by economic changes of great significance. The development of the diamond mines and of the gold and coal industries—of which Brand saw the beginning—had far-reaching consequences, bringing the Boer republics into vital contact with the new industrial era. The Free Staters, under Brand's rule, had shown considerable ability to adapt their policy to meet the altered situation. In 1889 an agreement was come to between the Free State and the Cape Colony government, whereby the latter were empowered to extend, at their own cost, their railway system to Bloemfontein. The Free State retained the right to purchase this extension at cost price, a right they exercised after the Jameson Raid. Having accepted the assistance of the Cape government in constructing its railway, the state also in 1889 entered into a Customs Union Convention with them. The convention was the outcome of a conference held at Cape Town in 1888, at which delegates from Natal, the Free State and the Colony attended. Natal at this time had not seen its way to entering the Customs Union, but did so at a later date.

Alliance with the Transvaal.

In January 1889 Mr F. W. Reitz was elected president of the Free State. His accession to the presidency marked the beginning of a new and disastrous line of policy in the external affairs of the country. Mr Reitz had no sooner got into office than a meeting was arranged with Mr Kruger, president of the Transvaal, at which various terms of an agreement dealing with the railways, terms of a treaty of amity and commerce and what was called a political treaty, were discussed and decided upon. The political treaty referred in general terms to a federal union between the Transvaal and the Free State, and bound each of them to help the other, whenever the independence of either should be assailed or threatened from without, unless the state so called upon for assistance should be able to show the injustice of the cause of quarrel in which the other state had engaged. While thus committed to a dangerous alliance with its northern neighbour no change was made in internal administration. The Free State, in fact, from its geographical position reaped the benefits without incurring the anxieties consequent on the settlement of a large *uitlander* population on the Rand. The state, however, became increasingly identified with the reactionary party in the Transvaal. In 1895 the volksraad passed a resolution, in which they declared their readiness to entertain a proposition from the Transvaal in favour of some form of federal union. In the same year Mr Reitz retired from the presidency of the Free State, and was succeeded in February 1896 by M. T. Steyn (*q.v.*), a judge of the High Court. In 1896 President Steyn visited Pretoria, where he received an ovation as the probable future president of the two Republics. A further offensive and defensive alliance between the two Republics was then entered into, under which the Free State took up arms on the outbreak of hostilities with the Transvaal in 1899.

In 1897 President Kruger, bent on still further cementing the union with the Free State, visited Bloemfontein. It was on this occasion that President Kruger, referring to the London Convention, spoke of Queen Victoria as a *kwaaje Vrouw*, an expression which caused a good deal of offence in England at the time, but which, to any one familiar with the homely phraseology of the Boers, obviously was not meant by President Kruger as insulting.

The Afrikander ideal.

In order to understand the attitude which the Free State took at this time in relation to the Transvaal, it is necessary to review the history of Mr Reitz from an earlier date. Previously to his becoming president of the Free State he had acted as its Chief Justice, and still earlier in life had practised as an advocate in Cape Colony. In 1881 Mr Reitz had, in conjunction with Mr Steyn, come under the influence of a clever German named Borckenhagen, the editor of the *Bloemfontein Express*. These three men were principally responsible for the formation of the Afrikander Bond (see CAPE COLONY: *History*). From 1881 onwards they cherished the idea of an independent South Africa. Brand had been far too sagacious to be led away by this pseudo-nationalist dream, and did his utmost to discountenance the Bond. At the same time his policy was guided by a sincere patriotism, which looked to the true prosperity of the Free State as well as to that of the whole of South Africa. From his death may be dated the disastrous line of policy which led to the extinction of the state as a republic. The one prominent member of the volksraad who inherited the traditions and enlightened views of President Brand was Mr (Afterwards Sir) John G. Fraser. Mr Fraser, who was an unsuccessful candidate for the presidency in 1896, was the son of a Presbyterian minister, who had acted as a minister in the Dutch Reformed Church since the middle of the century. He grew up in the country of his father's adoption, and he consistently warned the Free State of the inevitable result—the loss of independence—which must follow their mischievous policy in being led by the Transvaal. The mass of Boers in the Free State, deluded by a belief in Great Britain's weakness, paid no heed to his remonstrances. Mr Fraser lived to see the fulfilment of these prophecies. After the British occupation of Bloemfontein he cast in his lot with the Imperial Government, realizing that it had fought for those very principles which President Brand and he had laboured for in bygone years.

On entering Bloemfontein in 1900 the British obtained possession of certain state papers which contained records of negotiations between the Transvaal and the Orange Free State. The evidence contained in these state records so clearly marks the difference between the policy of Mr Kruger and the pacific, commercial policy of President Brand and his followers, that the documents call for careful consideration. From these papers it was found that, in 1887, two secret conferences had taken place between representatives of the Republics, dealing with various political and economical questions. At the first of these conferences, held in Pretoria, the object of the Free State deputies were to arrange a general treaty of amity and commerce which would knit the states more closely together, and to come to some agreement with reference to the scheme for building a railway across the Free State from the Cape, to connect with a farther extension in the Transvaal to Pretoria. The deputation also urged the Transvaal to join the South African Customs Union. Both of these suggestions were strongly disapproved by Mr Kruger, inasmuch as they meant knitting together the Boer republics and the British possessions, instead of merely bringing the Free State into completer dependence on the Transvaal. From the minutes of this conference it is clear that the two deputations were practically at cross purposes. In the minds of President Kruger and his immediate followers one idea was dominant, that of ousting and keeping out at all costs British influence and interests. On the part of the Free State there was obviously a genuine desire to further the best interests of the state, together with the general prosperity of the whole of South Africa. In President Kruger's eyes British trade meant ruin; he desired to keep it out of the Republic at all costs, and he begged the Free State to delay the construction of their railway until the Delagoa Bay line was completed. He said, "Delagoa is a life or death question for us. Help us: if you hook on to the Colony you cut our throat. . . . How can our state exist without the Delagoa railway? Keep free." With regard to the Customs Union, President Kruger was equally emphatic; he begged the Free State to steer clear of it. "Customs Unions," he said, "are made between equal states with equal access to harbours. We are striving to settle the question of our own harbour peacefully. The English will only use their position to swindle the Transvaal of its proper receipts." In response, Mr Fraser, one of the Free State delegates, remarked that a harbour requires forts, soldiers, ships and sailors to man them, or else it would be at the mercy of the first gunboat that happened to assail it. President Kruger replied that once the Transvaal had a harbour foreign powers would intervene. Mr Wolmarans was as emphatic as President Kruger. "Wait a few years. . . . You know our secret policy. We cannot treat the [Cape] Colony as we would treat you. The Colony would destroy us. It is not the Dutch there we are fighting against. Time shall show what we mean to do with them; for the present we must keep them off."

Anti-British designs.

The result of this conference was a secret session of the Transvaal volksraad and the proposition of a secret treaty with the Free State, by which each state should bind itself not to build railways to its frontier without the consent of the other, the eastern and northern frontiers of the Transvaal being excepted. The railway from Pretoria to Bloemfontein was to be proceeded with; neither party was to enter the Customs Union without the consent of the other. The Transvaal was to pay £20,000 annually to the Free State for loss incurred for not having the railway to Cape Colony. Such a treaty as the one proposed would simply have enslaved the Free State to the Transvaal, and it was rejected by the Free State volksraad. President Kruger determined on a still more active measure, and proceeded with Dr Leyds to interview President Brand at Bloemfontein. A series of meetings took place in October of the same year (1887). President Brand opened the proceedings by proposing a treaty of friendship and free trade between the two Republics, in which a number of useful and thoroughly practical provisions were set forth. President Kruger, however, soon brushed these propositions aside, and responded by stating that, in consideration of the common enemy and the dangers which threatened the Republic, an offensive and defensive alliance must be preliminary to any closer union. To this Brand rejoined that, as far as the offensive was concerned, he did not desire to be a party to attacking any one, and as for the defensive, where was the pressing danger of the enemy which Kruger feared? The Free State was on terms of friendship with its neighbours, nor (added Brand) would the Transvaal have need for such an alliance as the one proposed if its policy would only remain peaceful and conciliatory. At a later date in the conference (see TRANSVAAL) President Brand apparently changed his policy, and himself drafted a constitution resembling that of the United States. This constitution appears to have been modelled on terms a great deal too liberal and enlightened to please Mr Kruger, whose one idea was to have at his command the armed forces of the Free State when he should require them, and who pressed for an offensive and defensive alliance. Brand refused to allow the Free State to be committed to a suicidal treaty, or dragged into any wild policy which the Transvaal might deem it expedient to adopt. The result of the whole conference was that Kruger returned to Pretoria completely baffled, and for a time the Free State was saved from being a party to the fatal policy into which others subsequently drew it. Independent power of action was retained by Brand for the Free State in both the railway and Customs Union questions.

After Sir John Brand's death, as already stated, a series of agreements and measures gradually subordinated Free State interests to the mistaken ambition and narrow views of the Transvaal. The influence which the Kruger party had obtained in the Free State was evidenced by the presidential election in 1896, when Mr Steyn received forty-one votes against nineteen cast for Mr Fraser. That this election should have taken place immediately after the Jameson Raid probably increased Mr Steyn's majority. Underlying the new policy adopted by the Free State was the belief held, if not by President Steyn himself, at least by his followers, that the two republics combined would be more than a match for the power of Great Britain should hostilities occur.

Boer War.

In December 1897 the Free State revised its constitution in reference to the franchise law, and the period of residence necessary to obtain naturalization was reduced from five to three years. The oath of allegiance to the state was alone required, and no renunciation of nationality was insisted upon. In 1898 the Free State also acquiesced in the new convention arranged with regard to the Customs Union between the Cape Colony, Natal, Basutoland and the Bechuanaland Protectorate. These measures suggest that a slight reaction against the extreme policy of President Kruger had set in. But events were moving rapidly in the Transvaal, and matters had proceeded too far for the Free State to turn back. In May 1899 President Steyn suggested the conference at Bloemfontein between President Kruger and Sir Alfred Milner, but this act, if it expressed a genuine desire for reconciliation, was too late. President Kruger had got the Free State ensnared in his meshes. The Free Staters were practically bound, under the offensive and defensive alliance, in case hostilities arose with Great Britain, either to denounce the policy to which they had so unwisely been secretly party, or to throw in their lot with the Transvaal. War occurred, and they accepted the inevitable consequence. For President Steyn and the Free State of 1899, in the light of the negotiations we have recorded, neutrality was impossible. A resolution was passed by the volksraad on the 27th of September declaring that the state would observe its obligations to the Transvaal whatever might happen. Before war had actually broken out the Free State began to expel British subjects, and the very first act of war was committed by Free State Boers, who, on the 11th of October, seized a train upon the border belonging to Natal. The events of the war are given elsewhere (see TRANSVAAL: *History*).

British administration.

After the surrender of Cronje at Paardeberg on the 27th of February 1909 Bloemfontein was occupied by the British troops under Lord Roberts (March 13,) and on the 28th of May a proclamation was issued annexing the Free State to the British dominions under the title of Orange River Colony. For nearly two years longer the burghers kept the field under Christian de Wet (*q.v.*), and other leaders, but by the articles of peace signed on the 31st of May 1902 British sovereignty was acknowledged. A civil administration of the colony was established early in 1901 with Sir Alfred Milner as governor. Major (afterwards Sir) H. J. Goold-Adams was appointed lieutenant-governor, Milner being governor also of the Transvaal, which country claimed most of his attention. A nominated legislative council was established in June 1902 of which Sir John Fraser and a number of other prominent ex-burghers became unofficial members. The railways and constabulary of the two colonies were (1903) placed under an inter-colonial council; active measures were taken for the repatriation of the prisoners of war and the residents in the concentration camps, and in every direction vigorous and successful efforts were made to repair the ravages of the war. Over £4,000,000 was spent by the British government in Orange Colony alone on these objects. At the same time efforts were made, with a fair measure of success, to strengthen the British element in the country by means of land settlements. Special attention was also devoted to the development of the resources of the country by building new lines of railway traversing the fertile south-eastern districts and connecting Bloemfontein with Natal and with Kimberley. The educational system was reorganized and greatly improved.

Oranjie Unie formed.

To a certain extent the leading ex-burghers co-operated with the administration in the work of reconstruction. The loss of their independence was, however, felt bitterly by the Boers, and the attitude assumed by the majority was highly critical of the work of the government. Having recovered from the worst effects of the war the Boers, both in the Transvaal and Orange Colony, began in 1904 to make organized efforts to regain their political ascendancy, and to bring pressure on the government in respect to compensation, repatriation, the position of the Dutch language, education and other subjects on which they alleged unfair treatment. This agitation, as far as the Orange River Colony was concerned, coincided with the return to South Africa of ex-President Steyn. Mr Steyn had gone to Europe at the close of the war and did not take the oath of allegiance to the British Crown until the autumn of 1904. A congress of ex-burghers was held at Brandfort in December 1904, when among other resolutions passed was one demanding the grant of self-government to the colony. This was followed in July 1905 by a conference at Bloemfontein, when it was resolved to form a national union. This organization, known as the *Oranjie Unie*, was formally constituted in May 1906, but had been in existence for some months previously. A similar organization, called *Het Volk*, had been formed by the Transvaal Boers in January 1905. Both unions had constitutions almost identical with that of the Afrikander Bond, and their aims were similar—to secure the triumph of Boer ideals in state and society. Of the Oranjie Unie Mr Abraham Fischer became chairman, other prominent members being Messrs Hertzog, C. de Wet and Steyn. Mr Fischer, the leader of the party, was one of the ablest statesmen on the Boer side in the pre-war period. He was originally an attorney in Cape Colony and had joined the Free State bar in 1875. He became vice-president of the volksraad in 1893 and a member of the executive council of the state in 1896. He was one of the most trusted counsellors of Presidents Steyn and Kruger, and the ultimatum sent to the British on the eve of hostilities was recast by him. While the war was in progress he went to Europe to seek support for the Boer cause. He returned to South Africa early in 1903 and was admitted to the bar of the Orange Colony.

A counter-organization was formed by the ex-burghers who had whole-heartedly accepted the new order of things. They took the title of the Constitutional party, and Sir John Fraser was chosen as chairman. In Bloemfontein the Constitutionalists had a strong following; elsewhere their supporters were numerically weak. It was noteworthy that the programmes of the two parties were very similar, the real difference between them being the attitude with which they regarded the British connexion. While the ideal of the Unie was an Afrikander state, the Constitutionalists desired the perfect equality of both white races.

Responsible government.

The advent of a Liberal administration under Sir Henry Campbell-Bannerman in Great Britain in December 1905 completely altered the political situation in the late Boer states. The previous (Conservative) government had in March 1905 made public a form of representative government, intended to lead up to self-government for the Transvaal, and had intimated that a similar constitution would be subsequently conferred on the Orange Colony. The Campbell-Bannerman administration decided to do without this intermediary step in both colonies. In April 1906 a committee, under the chairmanship of Sir J. West-Ridgeway, was sent to South Africa to inquire into and report upon various questions regarding the basis of the franchise, single-member constituencies and kindred matters. There was in the Orange Colony a considerable body of opinion that the party system of government should be avoided, and that the executive should consist of three members elected by the single representative chamber it was desired to obtain, and three members nominated by the governor—in short, what was desired was a restoration as far as possible of the old Free State constitution. These views were laid before the committee on their visit to Bloemfontein in June 1906. When, however, the outline of the new constitution was made public in December 1906 it was found that the British government had decided on a party government plan which would have the inevitable and fully foreseen effect of placing the country in the power of the Boer majority. It was not until the 1st of July 1907 that the letters-patent conferring self-government on the colony were promulgated, the election for the legislative assembly taking place in November following. They resulted in the return of 29 members of the Oranjie Unie, 5 Constitutionalists and 4 Independents. The Constitutionalists won four of the five seats allotted to Bloemfontein, Sir John Fraser being among those returned. Following the elections the governor, Sir Hamilton Goold-Adams, sent for Mr Fischer, who formed a ministry, his colleagues being ex-General J. B. M. Hertzog, attorney-general and director of education; Dr A. E. W. Ramsbottom, treasurer; Christian de Wet, minister of agriculture, and Mr C. H. Wessels, minister of public works, &c. Mr Fischer, besides the premiership, held the portfolio of colonial secretary. The new ministry took office on the 27th of November. Of the members of the first legislative council five were supporters of the Oranjie Unie and five were regarded as Constitutionalists, the eleventh member holding the balance.

The responsible government entered upon its task in favourable conditions. Despite the many obstacles it had to meet, including drought, commercial depression and the hostility of many of the ex-burghers, the crown colony administration had achieved remarkable results. During each of its seven years of existence there had been a surplus of revenue over expenditure, despite the fact that taxation had not materially increased, save in respect to mining, which did not affect the general population. Custom duties were about the same as in 1898, but railway rates were materially lower and many new lines had been opened. The educational system had been placed on a sound basis. Departments of agriculture, mining, health and native affairs had been organized, and the civil service rendered thoroughly efficient. A substantial cash balance was left in the treasury for the use of the new government. Over 700 families had been settled on the land and thus an additional source of strength provided for the state. The first parliament under the new constitution met on the 18th of December 1907, when it was announced that the Transvaal and Orange Colony had each given notice of the termination of the intercolonial council with the intention of each colony to gain individual control of its railways and constabulary.

The unification movement.

After a two days' session the legislature was prorogued until May 1908, when the chief measure submitted by the government was an education bill designed to foster the knowledge of the Dutch language. This measure became law (see above § *Education*). Parliament also passed a measure granting ex-President Steyn a pension of £1000 a year and ex-President Reitz a pension of £500. In view of the dissolution of the intercolonial council a convention was signed at Pretoria on the 29th of May which made provision for the division of the common property, rights and liabilities of the Orange Colony and the Transvaal in respect to the railways and constabulary, and established for four years a joint board to continue the administration of the railway systems of the two colonies. The Orange Colony assumed responsibility for £7,700,000 of the guaranteed loan of £35,000,000 of 1903 (see TRANSVAAL: *Finance*). The colony took part during this month in an inter-state conference which met at Pretoria and Cape Town, and determined to renew the existing customs convention and to make no alteration in railway rates. These decisions were the result of an agreement to bring before the parliaments of the various colonies a resolution advocating the closer union of the South African states and the appointment of delegates to a national convention to frame a draft constitution. In this convention Mr Steyn took a leading and conciliatory part, and subsequently the Orange River legislature agreed to the terms drawn up by the convention for the unification of the four self-governing colonies. Under the imperial act by which unification was established (May 31, 1910) the colony entered the union under the style of the Free State Province. (For the union movement see SOUTH AFRICA: *History*.) Mr Fischer and General Hertzog became members of the first union ministry while Dr A. E. W. Ramsbottom, formerly colonial treasurer, became the first administrator of the Free State as a province of the union.

Education controversy.

The period during which the province had been a self-governing colony had been one of steady progress in most directions, but was greatly embittered by the educational policy pursued by General Hertzog. From the date of the passing of the education act in the middle of 1908 until the absorption of the colony into the union, General Hertzog so administered the provisions of the act regarding the media of instruction as to compel every European child to receive instruction in every subject partly in the medium of Dutch. This policy of compulsory bilingualism was persisted in despite the vehement protests of the English-speaking community, and of the desire of many Dutch burghers that the medium of instruction for their children should be English. Attempts to adjust the difficulty were made and a conference on the subject was held at Bloemfontein in November 1909. It was fruitless, and in March 1910 Mr Hugh Gunn (director of education since 1904) resigned.[1] The action of General Hertzog had the support of his colleagues and of Mr Steyn and kept alive the racial spirit. Failing to obtain redress the English-speaking section of the community proceeded to open separate schools, the terms of the act of union leaving the management of elementary education to the provincial council.

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ORANGEMEN, members of the Orange Society, an association of Irish Protestants, originating and chiefly flourishing in Ulster, but with ramifications in other parts of the United Kingdom, and in the British colonies. Orangemen derive their name from King William III. (Prince of Orange). They are enrolled in lodges in the ordinary form of a secret society. Their toasts, about which there is no concealment, indicate the spirit of the Orangemen. The commonest form is "the glorious, pious and immortal memory of the great and good King William, who saved us from popery, slavery, knavery, brass money and wooden shoes," with grotesque or truculent additions according to the orator's taste. The brass money refers to James II.'s finance, and the wooden shoes to his French allies. The final words are often "a fig for the bishop of Cork," in allusion to Dr Peter Browne, who, in 1715, wrote cogently against the practice of toasting the dead. Orangemen are fond of beating drums and flaunting flags with the legend "no surrender," in allusion to Londonderry. Orangeism is essentially political. Its original object was the maintenance of Protestant ascendancy, and that spirit still survives. The first regular lodges were founded in 1795, but the system existed earlier. The Brunswick clubs, founded to oppose Catholic emancipation, were sprigs from the original Orange tree. The orange flowers of the *Lilium bulbiferum* are worn in Ulster on the 1st and 12th July, the anniversaries of the Boyne and Aughrim. Another great day is the 5th of November, when William III. landed in Torbay.

ORANG-UTAN ("man of the woods"), the Malay name of the giant red man-like ape of Borneo and Sumatra, known to the Dyaks as the *mias*, and to most naturalists as *Simia satyrus*. The red, or brownish-red, colour of the long and coarse hair at once distinguishes the orang-utan from the African apes; a further point of distinction being the excessive length of the arms, which are of such proportions that the animal when in the upright posture (which it seldom voluntarily assumes) can rest on its bent knuckles. Very characteristic of the old males, which may stand as much as 5½ ft. in height, is the lateral expansion of the cheeks, owing to a kind of warty growth, thus producing an extraordinarily broad and flattened type of face. Such an expansion is however by no means characteristic of all the males of the species, and is apparently a feature of racial value. Another peculiarity of the males is the presence of a huge throat-sac or pouch on the front of the throat and chest, which may extend even to the arm-pits; although present in females, it does not reach nearly the same dimensions in that sex. More than half-a-dozen separate races of orang-utan are recognized in Borneo, where, however, they do not appear to be restricted to separate localities. In Sumatra the Deli and Langkat district is inhabited by *S. satyrus deliensis* and Abong by *S. s. abongensis*.

In Borneo the red ape inhabits the swampy forest-tract at the foot of the mountains. In confinement these apes (of which adult specimens have been exhibited in Calcutta) appear very slow and deliberate in their movements; but in their native forests they swing themselves from bough to bough and from tree to tree as fast as a man can walk on the ground beneath. They construct platforms of boughs in the trees, which are used as sleeping-places, and apparently occupied for several nights in succession. Jack-fruit or durian, the tough spiny hide of which is torn open with their strong fingers, forms the chief food of orang-utans, which also consume the luscious mangustin and other fruits. (See PRIMATES.)

ORANIENBAUM, a town of European Russia, in the government of St Petersburg, lying 100 ft. above the sea on the south coast of the Gulf of Finland, opposite Kronstadt. Pop. (1897) 5333. It is well known for its imperial palace and as a summer resort for the inhabitants of St Petersburg, from which it is 25 m. W. by rail. In 1714 Menshikov, to whom the site was presented by Peter the Great, erected for himself the country-seat of Oranienbaum; but confiscated, like the rest of his estates, in 1727, it became an imperial residence. In 1743 the empress Elizabeth assigned the place to Peter III., who built there a castle, Peterstadt (now destroyed), for his Holstein soldiers.

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[1] See Mr Gunn's pamphlet, *The Language Question in the Orange River Colony, 1902–1910.*

ORAONS, an aboriginal people of Bengal. They call themselves Kurukh, and are sometimes also known as Dhangars. Their home is in Ranchi district and there are communities in the Chota Nagpur states and Palamau, while elsewhere they have scattered settlements, *e.g.* in Jalpaiguri and the Darjeeling Terai, whither they have gone to work in the tea-gardens. They number upwards of three quarters of a million. According to their traditions the tribe migrated from the west coast of India. The Oraons are a small race (average 5 ft. 2 in.); the usual colour is dark brown, but some are as light as Hindus. They are heavy-jawed, with large mouths, thick lips and projecting teeth. They reverence the sun, and acknowledge a supreme god, Dharmi or Dharmest, the holy one, who is perfectly pure, but whose beneficent designs are thwarted by evil spirits. They burn their dead, and the urn with the ashes is suspended outside the deceased's hut to await the period of the year especially set apart for burials. The language is harsh and guttural, having much connexion with Tamil. In 1901 the total number of speakers of Kurukh or Oraon in all India was nearly 600,000.

See E. T. Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872), and his article "The Kols of Chota-Nagpore," in *Supplement to Journ. of Asiatic Soc. of Bengal*, vol. xxxv. (1887), part ii. p. 154; Batsch, "Notes on the Oraon Language" in *Journ. Roy. Asiatic Soc. of Bengal* for 1866; F. B. Bradley Birt, *The Story of an Indian Upland* (1905).

ORATORIO, the name given to a form of religious music with chorus, solo voices and instruments, independent or at least separable from the liturgy, and on a larger scale than the cantata (*q.v.*). Its early history is involved in that of opera (see ARIA and OPERA), though there is a more definite interest in its antecedents. The term is supposed, with good reason, to be derived from the fact that St Filippo Neri's Oratory was the place for which Animuccia's setting of the *Laudi Spirituali* were written; and the custom of interspersing these hymns among liturgical or other forms of the recitation of a Biblical story is certainly one of several sources to which the idea of modern oratorio may be traced. Further claim to the "invention" of the oratorio cannot be given to Animuccia. A more ancient source is the use of incidental music in miracle-plays and in such medieval dramatic processions as the 12th-century *Prose de L'Âne*, which on the 1st of January celebrated at Beauvais the Flight into Egypt. But the most ancient origin of all has hardly been duly brought into line, although it is the only form that led to classically artistic results before the time of Bach. This is the Roman Catholic rite of reciting, during Holy Week, the story of the Passion according to the Four Gospels, in such a manner that the words of the Evangelist are sung in Gregorian tones by a tenor, all directly quoted utterances are sung by voices appropriate to the speakers, and the *responsa turbae* or utterances of the whole body of disciples (*e.g.* "Lord, is it I?") and of crowds, are sung by a chorus. The only portion of this scheme that concerned composers was the *responsa turbae*, to which it was optional to add polyphonic settings of the Seven Last Words or other special utterances of the Saviour. The narrative and the parts of single speakers were sung in the Gregorian tones appointed in the liturgy. Thus the settings of the Passion by Victoria and Soriano represent, in a very simple form, a perfect solution of the art-problem of oratorio, as that problem presented itself to an age in which "dramatic music," or even "epic music," would have been a contradiction in terms. It has been aptly said that the object of the composer in setting such words as "Crucify Him" was not to express the feelings of an infuriated crowd, but rather to express the contrition of devout Christians telling the story; though this view must be admitted to be, like the 16th-century music itself, decidedly more modern than the quaintly dramatic traditional methods of performance. As an art-form this early Passion-music owes its perfection primarily to the church. The liturgy gives body to all the art-forms of 16th-century church music, and it is for the composer to spiritualize or debase them by his style.

With the monodic revolution at the beginning of the 17th century the history of oratorio as an art-form controlled by composers has its real beginning. There is nothing but its religious subject to distinguish the first oratorio from the first opera; and so Emilio del Cavaliere's *Rappresentazione di anima e di corpo* (1600) is in no respect outside the line of early attempts at dramatic music. In the course of the 17th century the differentiation between opera and oratorio increased, but not systematically. The gradual revival of choral art found its best opportunity in the treatment of sacred subjects; not only because it was with such subjects that the greatest 16th-century choral art was associated, but also because these subjects tended to discourage such vestiges of dramatic realism as had not been already suppressed by the aria form. This form arose as a concession to dire musical necessity and to the growing vanity of singers, and it speedily became almost the only possibility of keeping music alive, or at least embalmed, until the advent of Bach and Handel. The efforts of Carissimi (d. 1674) in oratorio clearly show the limited rise from the musical standards of opera that was then possible where music was emancipated from the stage. Yet in his art the corruption of church music by secular ideas is far more evident than any tendency to elevate Biblical music-drama to the dignity of church music. Normal Italian oratorio remains indistinguishable from serious Italian opera until as late as the boyhood of Mozart. Handel's *La Resurrezzione* and *Il Trionfo del Tempo* contain many pieces almost simultaneously used in his operas, and they show not the slightest tendency to indulge in choral writing. Nor did *Il Trionfo del Tempo* become radically different from the musical masques of *Acis and Galatea* and *Semele*, when Handel at the close of his life dictated an adaptation of it to an English translation with several choral and other numbers interpolated from other works. Yet between these two versions of the same work lies more than half the history of classical oratorio. The rest lies in that specialized German art of which the text centres round the Passion and the music culminates in Bach; after which there is no very dignified connected history of the form, until the two streams, sadly silted up, and never afterwards quite pure, united in Mendelssohn.

One feature of the Reformation in Germany was that Luther was very musical. This had the curious result that, though the German Reformation was far from conservative in its attitude towards ancient liturgy, it retained almost everything which makes for musical coherence in a church service; while the English church, with all its insistence on historic continuity, so rearranged the liturgy that no possible music for an English church service can ever form a coherent whole. We are accustomed to think of German Passion-music as typically Protestant; yet the four *Passions* and the *Historia der Auferstehung Christi* of H. Schütz (who was born in 1585, exactly a century before Bach) are as truly the descendants of Victoria's Passions as they are the ancestors of Bach's. The difference between them and the Roman Catholic Passions is, of course, eminently characteristic of the Reformation: the language is German (so that it may be "understanded of the people"), and the narrative and dialogue is set to free composition instead of to forms of Gregorian chant, though it is written in a sort of Gregorian notation. Schütz's preface to the *Historia der Auferstehung Christi* shows that he writes his recitative for solo voices, though he calls it *Chor des Evangelisten* and *Chor der Personen Colloquenten*. The *Marcus Passion* is, on internal evidence, of doubtful authenticity, being later in style and quite stereotyped in its recitative. But in the other Passions, and most of all in the *Auferstehung*, the recitative is wonderfully expressive. It was probably accompanied by the organ, though the Passions contain no hint of accompaniment at all. In the

Auferstehung the Evangelist is accompanied by four viole da gamba in preference to the organ. In any case, Schütz tells us, the players are to "execute appropriate runs or passages" during the sustained chords. Apart from their remarkable dramatic force, Schütz's oratorios show another approximation to the Passion oratorio of Bach's time in ending with a non-scriptural hymn-chorus, more or less clearly based on a chorale-tune. But in the course of the work the Scriptural narrative is as uninterrupted as it is in the Roman Catholic Passions. And there is one respect in which the *Auferstehung*, although perhaps the richest and most advanced of all Schütz's works, is less realistic than either the Roman Passions or those of later times; namely, that single persons, other than the Evangelist, are frequently represented by more than one voice. In the case of the part of the Saviour, this might, to modern minds, seem natural as showing a reverent avoidance of impersonation; and it was not without an occasional analogy in Roman Catholic Passion-music (in the polyphonic settings of special words). But Schütz's Passions show no such convention; this feature is peculiar to the *Auferstehung*; and, while the three holy women and the two angels in the scene at the tomb are represented realistically by three and two imitative voices, it is curious to see Mary Magdalene elsewhere always represented by two sopranos, even though Schütz remarks in his preface that "one of the two voices may be sung and the other done *instrumentaliter*, or, *si placet*, simply left out."

Shortly before Bach, Passion oratorios, not always so entitled, were represented by several remarkable and mature works of art, most notably by R. Keiser (1673–1739). Chorale-tunes, mostly in plain harmony, were freely interspersed in order that the congregation might take part in what was, after all, a musical church service for Holy Week. The feelings of devout contemplative Christians on each incident of the story were expressed in accompanied recitatives (*arioso*) leading to arias; and the Scriptural narrative was sung to dramatic recitative and ejaculatory chorus on the ancient Roman plan, exactly followed, even in the detail that the Evangelist was a tenor.

The difference between Bach's Passions and those of his predecessors and contemporaries is simply the difference between his music and theirs. Where his chorus represents the whole body of Christendom it has as peculiar an epic power as it is dramatic where it represents with brevity and rapid climax the *responsa turbae* of the Scriptural narrative. Take, for example, the double chorus at the beginning of the *Passion according to St Matthew*, where one chorus calls to the other to "come and behold" what has come to pass, and the other chorus asks "whom?" "what?" "whither?" to each exhortation, until at last the two choruses join, while above all is heard, phrase by phrase, the hymn "O Lamm Gottes unschuldig." Still more powerful, indeed unapproached even in external effect by anything else in classical or modern oratorio, is the duet with chorus that follows the narrative of the betrayal. Its tremendous final outbreak in the brief indignant appeal to heaven for the vengeance of damnation on the traitor is met by the calm conclusion of the Evangelist's interrupted narrative and the overpowering tenderness of the great figured chorale ("O Mensch bewein' dein' Sünde gross"), which ends the first part with a call to repentance. Such contrasts might seem to be but the natural use of fine opportunities furnished by the librettist; but the composer appears to owe less to the librettist when we find that this chorale originally belonged to the *Passion according to St John*, where it was to follow Peter's denial of Christ. To modern ears the most striking device in the Matthew Passion is that by which the part of Christ is separated from all the rest by being accompanied with the string band, generally at a high pitch, though deepening at the most solemn moments with an effect of sublime euphony and tenderness. And a peculiarly profound and startling thought, which has not always met with the attention it deserves, is the omission of this musical halo at the words "Eli, Eli, lama sabacthani." These points are aesthetically parallel with Wagnerian *Leit-motif*, though entirely different in method. (See OPERA.)

In his amazing power of declamation Bach was not altogether unanticipated by Keiser; but no one before or since approached him in sustained elevation and variety of oratorio style. Analogies to the forms of Passion music may be found in many of Bach's church-cantatas; a very favourite form being the *Dialogus*; as, for instance, a dispute between a fearing and a trusting soul, with, perhaps, the voice of the Saviour heard from a distance; or a dialogue between Christ and the Church, on the lines of the Song of Solomon. The *Christmas Oratorio*, a set of six closely connected church-cantatas for performance on separate days, is treated in exactly the same way as the Passions, with a larger proportion of non-dramatic choruses expressive of the triumphant gratitude of Christendom. Many of the single church-cantatas are called oratorios. If it were not that Bach's idea of oratorio seems to be definitely connected with that of dialogue,[1] there is really no reason in musical terminology why the *B minor Mass* should not be so called, for it can never have been liturgical either in a Roman Catholic or in a Protestant church. But in all respects it stands alone; and we must now return to Handel's far more heterogeneous work, which forms the staple of almost everything else that has been understood by oratorio until the most recent times.

Handel discovered and matured every possibility of oratorio as an art-form, except such as may now be brought to light by those composers with whom the influence of Wagner is not too overwhelming for them to consider how far his principles are applicable to an art unconnected with the stage. Handel shows us that a definite oratorio style may exist in many different degrees. He was evidently impressed by the German forms of Passion-music as combining the utmost dramatic interest with the most intense contemplative devotion; and it is significant that it was after he came to England, and before his first English oratorio, that he set to music the famous poetic version of the Passion by Brockes, a version which had been adopted by all the German composers of the time, and which, with very necessary and interesting improvements of taste, was largely drawn upon by Bach for the text of his *Johannes-Passion*. Handel's *Brockes-Passion* does not appear ever to have been performed, though Bach found access to it and made a careful copy; and it is difficult to see what motive, except interest in the form, Handel had for composing it. At all events it furnishes an important connecting-link between Bach's solution of the problem of oratorio and the various other solutions which Handel afterwards produced so successfully. He soon discovered how many kinds of oratorio were possible. The freedom from stage restrictions admitted of subjects ranging from semi-dramatic histories, like those of *Saul*, *Esther* and *Belshazzar*, to cosmic schemes based exclusively on the words of the Bible, such as *Israel in Egypt* and the *Messiah*. Between these types there is every gradation of organization; and it may be added, every gradation between sacred and secular subjects and treatment. The very name of Handel's first English oratorio, *Esther*, with the facts of its production as a masque and the origin of its libretto in Racine, show the transition from the stage to the church; and a really scandalous example of the converse transition may be found by any one rash enough to look for the source of some of Haman's music in the *Brockes-Passion*. Roughly speaking we may reduce the types of Handelian oratorio to a convenient three; not divisible among works as wholes, but always evident here and there. Firstly, there is the semi-operatic method, in which the arias are the utterances of characters in the story, while the conception of the chorus rarely diverges from that of multitudes of actors (*e.g. Athalia*, *Belshazzar*, *Saul*, &c.). The second method is a more or less recognizable application of the forms of the Passion-music to other subjects, without, however, the conception of a special rôle of narrator, but (as, for instance, in "Envy, eldest born of Hell" in *Saul*) with the definite conception of the choruses as descriptive of the feelings of spectators rather than of actors. Handel's audience demanded an inconvenient number of arias, most of which are clumsily accounted for by a conventional assignment to dramatic rôles with a futile attempt at love-interest; which makes many of the best solos in *Saul* and *Joshua* rather absurd. The third Handelian method is that which has since become embodied in the modern type of sacred or secular cantata; a series of choruses and numbers on a subject altogether beyond the scope of dramatic narrative (as, for instance, the greater part of *Solomon*), and, in the case of the *Messiah* and *Israel in Egypt*, treated entirely in the words of Scripture.

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[1] It is possible that a false etymology may by Bach's time have given this colour to the word oratorio. Schütz inscribes a monodic sacred piece "in stilo Oratorio," meaning "in the style of recitative."

After Bach and Handel the history of oratorio becomes disjointed. The rise of the sonata style, which brought life to the opera, was almost wholly bad for the oratorio; since not only did it cause a serious decline in choral art by distracting attention from that organization of texture which is essential even to mere euphony in choral writing (see COUNTERPOINT and CONTRAPUNTAL FORMS), but its dramatic power became more and more disturbing to the essentially epic treatment demanded by the conditions of oratorio. Bach and Handel (especially Handel) were as dramatic in characterization as the greatest epic poets, and were just as far removed from the theatre. Any doubt on this point is removed by the history of Handelian opera and the reforms of Gluck. But the power of later composers to rise above the growing swarms of 18th-century and 19th-century oratorio-mongers depended largely on the balance between their theatrical and contemplative sensibilities. Academicism naturally mistrusted the theatre, but, in the absence of any contemplative depth beyond that of a tactful asceticism, it has then and ever since made spasmodic concessions to theatrical effect, with the intention of avoiding pedantry, and with the effect of encouraging vulgarity. Philipp Emanuel Bach's oratorios, though not permanently convincing works of art, achieved a remarkably true balance of style in the earlier days of the conflict; indeed, with judicious reduction to the size of a large cantata, *Die Israeliten in der Wüste* (1769) would perhaps bear revival almost better than Haydn's *Tobias* (1774), in spite of the superior musical value of that ambitious forerunner of *The Creation* and *The Seasons*. These two great products of Haydn's old age owe their vitality not only to Haydn's combination of contrapuntal and choral mastery with his unsurpassable freedom of movement in the sonata style, but also to his priceless rediscovery of the fact (well known to Bach, the composer of "Mein glaübiges Herze," but since forgotten) that, in Haydn's own words, "God will not be angry with me for worshipping him in a cheerful manner." This is the very spirit of St Francis of Assisi, and it brings the naively realistic birds and beasts of *The Creation* into line with even the Bacchanalian parts of the mainly secular *Seasons*, and so removes Haydn from the dangers of a definitely bad taste, which began to beset Roman Catholic oratorio on the one hand, and those of no taste at all, which engulfed Protestant oratorio on the other.

From the moment when music became independent of the church, Roman Catholic religious music, liturgical or other, lost its high artistic position. Some of the technical hindrances to greatness in liturgical music after the Golden Age are mentioned in the article MASS; but the status of Roman Catholic non-liturgical religious music was from the outset lowered by the use of the vulgar tongue, since that implied a condescension to the laity, and composers could not but be affected by the assumption that oratorio belonged to a lower sphere than Latin church music. With this element of condescension came a reluctance to foster the fault of intellectual pride by criticizing pious verse on grounds of taste. Even in Protestant England this reluctance still causes educated people to strain tolerance of bad hymns to an extent which apostles of culture denounce as positively immoral: but the initial impossibility of basing a non-Latin Roman Catholic oratorio directly on the Bible would already have been detrimental to good taste in religious musical texts even if criticism were not disarmed. It must be confessed that Protestant taste (as shown in the texts of many of Bach's cantatas) was often unsurpassably bad; but in its most morbid phases its badness was mainly barbarian, and could either be ignored by composers and listeners, or easily improved away, as Bach showed in his alterations of Brockes's vile verses in the *Passion according to St John*. But the bad taste of the text of Beethoven's *Christus am Oelberge* (*The Mount of Olives*, c. 1800) is ineradicable, for it represents the standpoint of writers who may be very devout and innocent, but whose purest source of sacred art has been the pictures of Guido Reni. It was one thing for Sir Joshua Reynolds to admire the wrong period of Italian art: he had his own access to great ideas; but for Beethoven's librettist, who had no such access, it was very different. The real sacred subject has no chance of penetrating through a tradition which is neither naïve nor ecclesiastical, but is simply that of a long-tolerated comfortable vulgarity. An operatic tenor represents the Saviour; an operatic soprano represents the ministering angel; and in the garden of Gethsemane the two sing an operatic duet. The music is brilliant and well worthy of Beethoven's early powers, but he afterwards greatly regretted it; and indeed its circumstances are intolerable, and the English attempt at a new libretto (*Engedi*, or *David in the Wilderness*) only substituted ineptitude for irreverence.

Schubert's wonderful fragment *Lazarus* (1820) suffers less from the sickliness of its text; for the music seizes on a certain genuine quality aimed at by all typical Roman Catholic religious verse-writers, and embodies it in a kind of romantic mysticism unexampled in Protestant oratorio. Modern literature shows this peculiar strain in Cardinal Newman's *Dream of Gerontius*, just as Sir Edward Elgar's setting of that poem to music of Wagnerian continuity and texture presents the only parallel discoverable later or earlier to the slightly oppressive aroma of Schubert's unique experiment.[1] *Lazarus* also surprises us by a rather invertebrate continuity of flow, anticipating early Wagnerian opera; indeed, in almost every respect it is two generations ahead of its time; and, if only Schubert had finished it and allowed it to see publicity, the history of 19th-century oratorio might have become a more interesting subject than it is.

The ascendancy of Mendelssohn, as things happened, is really its main redeeming feature. Mendelssohn applied an unprecedented care and a wide general culture to the structure and criticism of his libretto (see his correspondence with Schubring, his principal helper with the texts of *St Paul* and *Elijah*), and was able to bear witness of his new-found gospel according to Bach by introducing chorales into *St Paul* as well as by disinterring and performing Bach's works. But he had not the strength to rescue oratorio from the slough into which it had now fallen, no less in Protestant than in Roman Catholic forms.

As the interest in Biblical themes becomes more independent of church and dogma, oratorio once more tends to become confused with Biblical opera. The singular fragrance and tenderness of the best parts of Berlioz's little masterpiece *L'Enfance du Christ* (put together from sections composed between 1847 and 1854) give it high artistic value; but if "oratorio" means "sacred music" Berlioz was incapable of anything of the sort; for the Christianity of his *Grande Messe des morts* and his *Te Deum* is the Christianity of Napoleon; and, if oratorio means a consistent treatment of a legend or subject in terms of musical epic, Berlioz can never fix his attention long enough to remember how he began by the time he has got half way through. Though Berlioz's essay in oratorio is not quite so irresponsible a vocal-symphonic-dramatic medley as his *Roméo et Juliette* and *Damnation de Faust*, it unmistakably marks a transition towards the complete secularizing of the Bible for musical purposes. But the long-continued prejudice in England against the representation of religious subjects on the stage has wrought peculiar confusion in the theory of their romantic treatment in music. It may be noted as a curiosity that Saint-Saëns's Biblical opera, *Samson et Dalila* (written in 1877), after being known in England for many quiet years as an oratorio, suddenly, in 1910, was permitted by the censor of plays, under royal command, to be produced at Covent Garden for what it was intended. It may even be suggested that this occurred just early enough to prevent Strauss's *Salome* from being regarded by the British public as an oratorio.

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[1] Schubert's well-known cantata, *Miriam's Siegesgesang*, has been discussed as a small oratorio; but it is of slight artistic and no historic importance.

The earnest efforts of César Franck prevented French oratorio from drifting entirely towards the stage; and meanwhile year by year Brahms's *Deutsches Requiem* (completed, except for one movement, in 1868) towers ever higher above all choral music since Beethoven's *Mass in D*, and draws us away from the semi-dramatic oratorio towards the musically perfectible form of an enlarged cantata in which a group of choral movements is concentrated on a set of religious ideas differing from liturgical forms only in free choice of text. Within the essentially non-theatrical limitations of dramatic or epic oratorio, we may note the spirited new departures of Sir Charles Stanford in *Eden* (1891), and of Sir Hubert Parry in *Judith* (1888), *Job* (1892) and *King Saul* (1894), which showed that Wagnerian *Leitmotif* and continuity might well avail to produce an oratorio style standing to Mendelssohn as Wagner stands to Mozart, if musical interest be retained in the foreground. Freedom from the restrictions of the stage also means absence of the resources of the stage, so that Wagnerian *Leitmotif* is no sufficient substitute for formal musical coherence when the audience has no action before its eyes. Accordingly these leaders of the English musical renascence are by no means exclusively Wagnerian in their oratorios. A fine and typical example of their peculiar non-theatrical resources may be seen in the end of *King Saul*, where Parry (who, like Wagner, is his own librettist) makes the Witch of Endor foresee the battle of Gilboa, and allows her tale to become real in the telling: so that it is followed immediately by the final dirge. (D. F. T.)

ORATORY (Lat. *oratoria*, sc. *ars*; from *orare*, to speak or pray), the art of speaking eloquently or in accordance with the rules of rhetoric (*q.v.*). From Lat. *oratorium*, sc. *templum*, a place of prayer, comes the use of the word for a small chapel or place of prayer for the use of private individuals, generally attached to a mansion and sometimes to a church. The name is also given to small chapels built to commemorate some special deliverance.

ORATORY OF ST PHILIP NERI, CONGREGATION OF THE, or ORATORIANS, a religious order consisting of a number of independent houses. The first congregation was formally organized in 1575 by the Florentine priest, Philip Neri. (See NERI, PHILIP.)

ORB, a circle or ring (Lat. *orbis*), hence a globe or disk or other spherical object. It is thus used, chiefly poetically, of any of the heavenly bodies, including the earth itself (Lat. *orbis terrarum*), or of the eye-ball or eye. The "orb," also known as the "mound" (Lat. *mundus*, "world"), consisting of a globe surmounted by a cross, forms part of many regalia, being a symbol of sovereignty (see REGALIA). In architecture the meaning to be attached to the word "orb" is doubtful. It is usually now taken to mean properly a blank or blind window, and thence a blank panel. If so the word represents Lat. *orbus*, "bereft of," "orphaned," *fenestra orba luminis*. It is also identified with a circular boss concealing the intersection of arches in a vault.

ORBETELLO, a town of Tuscany, Italy, in the province of Grosseto, 24 m. S. by E. of Grosseto by rail, 13 ft. above sea-level. Pop. (1901) 4188 (town), 5335 (commune). It is situated on a tongue of land projecting westward into a lagoon which is enclosed on the W. and S. by two long narrow sandy spits, and on the seaward (S.W.) side by the peninsula of Monte Argentario. A causeway connecting the town with this peninsula was built across the lagoon in 1842. On every side except the landward (E.) side the town is enclosed by an ancient terrace wall of polygonal work, and tombs have been discovered in the vicinity and even within the town itself. On the N. side of the promontory are the remains of a Roman villa partly below sea-level. The town must thus occupy an ancient site, the name of which is unknown. The town still has the bastions which the Spaniards built during the period (1557–1713) when they were masters of this corner of Italy. There is a large convict prison with which is connected another at Porto Ercole, on the east side of the peninsula. The mother house of the Passionist order crowns an eminence of Monte Argentario, now strongly fortified. The salt-water lagoon (11 sq. m. in extent), in the middle of which the town stands, abounds in white fish, soles and eels. On the eastern edge of the Monte Argentario is an active manganese iron ore mine, yielding some 30,000 tons per annum.

After the fall of the Republic of Siena, when the territory of Siena passed to Tuscany, Philip II. of Spain retained Orbetello, Talamone, Monte Argentario and the island of Giannutri until 1713, under the name of the Reali Stati dei Presidii. There are still many Spanish names among the inhabitants of Orbetello. In 1713 this district passed by treaty to the emperor, in 1736 to the king of the two Sicilies, in 1801 to the kingdom of Etruria, and in 1814 to the grand-duchy of Tuscany.

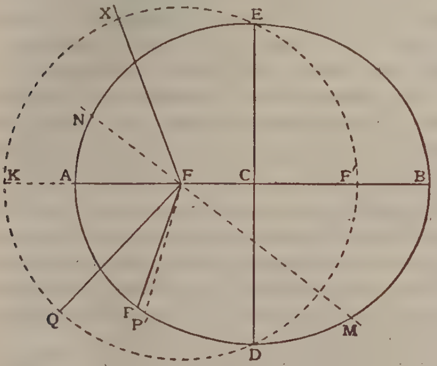
See G. Dennis, *Cities and Cemeteries of Etruria* (London, 1883), ii. 240; M. Carmichael, *In Tuscany* (London, 1901), 283, sqq. (T. As.)

ORBIGNY, ALCIDE DESSALINES D' (1802–1857), French palaeontologist, was born at Couërzon, Loire Inférieure, on the 6th of September 1802. He was educated at La Rochelle, where he became interested in the study of natural history, and in particular of zoology and palaeontology. His first appointment was that of travelling naturalist for the Museum of Natural History at Paris. In the course of his duties he proceeded in 1826 to South America, and gathered much information on the natural history and ethnology, the results being embodied in his great work *Voyage dans l'Amérique Méridionale* (1839–1842). Meanwhile he had decided to devote his time and energies to palaeontology, and he dealt in course of time with various invertebrata from foraminifera to crinoids and mollusca. In 1840 he commenced the publication of *Paléontologie Française, ou description des fossiles de la France*, a monumental work, accompanied by figures of the species. Eight volumes were published by him dealing with Jurassic and Cretaceous invertebrata, and since his death many later volumes have been issued. (See notes by C. D. Sherborn, "On the Dates of the *Paléontologie Française* of D'Orbigny," *Geol. Mag.*, 1899, p. 223.) Among his other works were *Cours élémentaire de paléontologie et de géologie stratigraphiques* (3 vols., 1849–1852), and *Prodrome de paléontologie stratigraphique* (3 vols., 1850–1852). D'Orbigny introduced (1852) a methodical system of nomenclature for geological formations based partly on the English terms—thus Bathonian for the Great or Bath Oolite, Bajocian from Bajocea or Bayeux in Calvados for the Inferior Oolite. Many of these names have been widely adopted, but some are of too local application to be generally used. In 1853 he was appointed professor of palaeontology at the Museum of Natural History in Paris, but died four years later, on the 30th of June 1857, at Pierresitte, near St Denis.

ORBILIUS, PUPILLUS, a Latin grammarian of the 1st century A.D., who had a school at Rome, where the poet Horace was one of his pupils. Horace (*Epistles*, ii.) criticizes his old schoolmaster and describes him as *plagosus* (a flogger), and Orbilius has become proverbial as a disciplinarian pedagogue.

ORBIT (from Lat. *orbita*, a track, *orbis*, a wheel), in astronomy, the path of any body, and especially of a heavenly body, revolving round an attracting centre. If the law of attraction is that of gravitation, the orbit is a conic section—ellipse, parabola or hyperbola—having the centre of attraction in one of its foci; and the motion takes place in accordance with Kepler's laws (see ASTRONOMY). But unless the orbit is an ellipse the body will never complete a revolution, but will recede indefinitely from the centre of motion. Elliptic orbits, and a parabolic orbit considered as the special case when the eccentricity of the ellipse is 1, are almost the only ones the astronomer has to consider, and our attention will therefore be confined to them in the present article. If the attraction of a central body is not the only force acting on the moving body, the orbit will deviate from the form of a conic section in a degree depending on the amount of the extraneous force; and the curve described may not be a re-entering curve at all, but one winding around so as to form an indefinite succession of spires. In all the cases which have yet arisen in astronomy the extraneous forces are so small compared with the gravitation of the central body that the orbit is approximately an ellipse, and the preliminary computations, as well as all determinations in which a high degree of precision is not necessary, are made on the hypothesis of elliptic orbits. Below are set forth the methods of determining and dealing with such orbits.

We begin by considering the laws of motion in the orbit itself, regardless of the position of the latter.



Let the curve represent an elliptic orbit, AB being the major axis, DE the minor axis, and F the focus in which the centre of attraction is situated, which centre we shall call the sun. From the properties of the ellipse, A is the pericentre or nearest point of the orbit to the centre of attraction and B the apocentre or most distant point. The semi-major axis, CA or CB, is called the mean distance, and is represented by the symbol a. We put e for the eccentricity of the ellipse, represented by the ratio CF : CA. P is the position of the planet at any time, and we call r the radius vector FP. The angle AFP between the pericentre and the position P of the planet is the *anomaly* called v. By Kepler's second law the radius vector, FP, sweeps over equal areas in equal times. To do this the actual speed in the orbit, and in a yet higher degree the angular speed around F, must be greatest at pericentre, and continually diminish till the apocentre is reached. Let P, P′ be two consecutive positions of the radius vector. Since the area of the triangle FPP′ is one half the product of FP into the perpendicular p from P on FP′, it follows that if these perpendiculars were equal all round the orbit, the areas described during the infinitesimal time would be smallest at the pericentre and continually increase during the passage of the body to B. It follows that p must be greatest at pericentre, where its distance from F is least. By geometrical consideration it can be shown that the angle subtended by p, as seen from F, must be inversely as the square of its distance r. We therefore have the fundamental theorem that the angular velocity of the body around the centre of attraction varies inversely as the square of its distance, and is therefore at every point proportional to the gravitation of the sun. Another curious theorem proposed by Bouilland in 1625 as a substitute for Kepler's second law is that the angular motion of the body as measured around the empty focus F′ is (approximately) uniform. That is to an eye at F′, the planet would seem to move around the sky with a nearly uniform speed.

The true anomaly, AFP, is commonly determined through the mean anomaly conceived thus: Describe a circle of radius $a = \text{CA}$ around F, and let a fictitious planet start from K at the same moment that the actual planet passes A, and let it move with a uniform speed such that it shall complete its revolution in the same time T as the actual planet. From the law of angular motion of the latter its radius vector will run ahead of PQ near A, PQ will overtake and pass it at apocentre, and the two will again coincide at pericentre when the revolution is completed. The anomaly AFQ of Q at any moment is called the *mean anomaly*, and the angle QFP by which the true anomaly exceeds it at that moment is the *equation of the centre.*

Two elements define the position of the plane passing through the attracting centre in which the orbit lies. One of these is the position of the line MN through the sun at F in which the plane of the orbit cuts some fundamental plane of reference, commonly the ecliptic. This is called the *line of nodes*, and its position is specified by the angle which it makes with some fixed line FX in the fundamental plane. At one of the nodes, say N, the body passes from the south to the north side of the fundamental plane; this is called the ascending node. The other element is the inclination of the plane of the orbit to the fundamental plane, called the *inclination* simply. A fifth element is the position of the pericentre, which may be expressed by its angular distance XFN from the ascending node. A sixth is the position of the planet in the orbit at a given moment, for which may be substituted the moment at which it passed the pericentre. Another element is the time of revolution of the body in its orbit, called its *period.* Instead of the period it is common in astronomical practice to use the mean angular speed, called the *mean motion* of the body. This is defined as the speed of revolution of the fictitious body already described, revolving with a uniform angular motion and the same periodic time as the planet. It follows that putting n for the mean motion and T for the period of revolution we shall have in degrees $n\text{T} = 360°$.

It is shown in the article ASTRONOMY (*Celestial Mechanics*) that the mean distance and mean motion or time of revolution of a planet are so related by Kepler's third law that, when one of these elements is given, the other can be found. Hence the number of independent elements assigned to a planet or other body moving around the sun is commonly six. But the same relation does not hold of a satellite the mass of whose primary is not regarded as an absolutely known quantity, or of a binary star. In these cases therefore the mean distance and mean motion are regarded as different elements, and the whole number of the latter is seven.

The process by which the position of a planet at any time is determined from its elements may now be conceived as follows:—The epoch of passage through pericentre being given, let t be the interval of time between this epoch and that for which the position of the body is required. Representing by P this position, it follows that the area of that portion of the ellipse contained between the radii vectores FB and FP will bear the same ratio to the whole area of the ellipse that t does to T, the time of revolution. The problem of finding a radius vector satisfying this condition is one which can be solved only by successive approximations, or tentatively. Its discussion may be found in any work on theoretical astronomy. The solution may be worked out directly or through the determination of the equation of the centre which, being added to the mean anomaly, gives the true anomaly. The angle from the pericentre to the actual radius vector, and the length of the latter being found, the angular distance of the planet from the node in the plane of the orbit is found by adding to the true anomaly the distance from the node to the pericentre. This, and the inclination of the orbit being given, we have all the geometrical data necessary to compute the coordinates of the planet itself. The coordinates thus found will in the case of a body moving around the sun be *heliocentric.* The reduction to the earth's centre is a problem of pure geometry.

When a new celestial body, say a planet or a comet is discovered, the astronomer meets with the problem of determining the orbit from several observed positions of the body. To form a conception of this problem it is to be noted that since the position of the body in space can be computed from the six elements of the orbit at any time we may ideally conceive the coordinates of the body to be algebraically expressed as functions of the six elements and of the time. Since the distance of a body from the observer cannot be observed directly, but only the right ascension and declination, calling these α and δ we conceive ideal equations of the form

$$\alpha = f(a, b, c, e, f, g, t) \text{ and } \delta = \phi\ (a, b, c, e, f, g, t),$$

the symbols a, b, ... t, representing the six elements and the time. If the values of α and δ, defining the position of the body on the celestial sphere, are observed at three different times, we may conceive six equations like the above, one for each of the three observed values of α and δ. Then by solving these equations, regarding the six elements as unknown quantities, the values of the latter may be computed. The actual process of solution is vastly more complex than is indicated by this description of it. Instead of the six ideal equations just described we have to combine a number of equations of various forms containing other quantities than the elements. But the logical framework of the process is that which we have set forth.

The problem of determining an orbit may be regarded as coeval with Hipparchus, who, it is supposed, found the moving positions of the apogee and perigee of the moon's orbit. The problem of determining a heliocentric orbit first presented itself to Kepler, who actually determined that of Mars. The modern method of determining orbits from three or four observations was first developed by C. F. Gauss in his celebrated work *Theoria Motus Corporum Coelestium.* This classical work is still a favourite among students, the improvements on its methods made since its publication being rather in details than in general principles.

AUTHORITIES.—Among recent works on the determination of orbits, J. C. Watson's *Theoretical Astronomy* is the most complete in the English language. The most complete existing work, an encyclopaedia of the subject in fact, is T. von Oppolzer's *Lehrbuch zur Bahnbestimmung der Kometen und Planeten* (2 vols.), which contains voluminous tables, formulae, and instructions for the computation of orbits in the many special cases that arise. More recent and better adapted to study is Bauschinger's *Bahnbestimmung der Himmelskörper* (1 vol., Leipzig, 1906), which, alone of the three, treats orbits of satellites and double stars. (S. N.)

ORCAGNA (*c.* 1308–*c.* 1368 [1]), Italian painter, sculptor and architect, whose full name was ANDREA DI CIONE, called

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[1] The dates of Orcagna's birth and death are not exactly known. According to Vasari, he died in 1389 at the age of sixty; but a document dated 1376 provides a guardian for Tessa and Romola, daughters of Orcagna's widow Francesca (see Bonaini, *Mem. Ined.* pp. 105-106). In that case 1376 was perhaps the year of his death; and if

Arcagnuolo,[1] was the son of a very able Florentine goldsmith, Maestro Cione, said to have been one of the principal artists who worked on the magnificent silver frontal of the high altar of San Giovanni, the Florentine Baptistery. The result of Orcagna's early training in the use of the precious metals may be traced in the extreme delicacy and refined detail of his principal works in sculpture. He had at least three brothers who all practised some branch of the fine arts: Lionardo or Nardo, the eldest, a painter; Matteo, a sculptor and mosaicist; and Jacopo, also a painter. They were frequently associated with Orcagna in his varied labours.

From the time of Giotto to the end of the 14th century Orcagna stands quite pre-eminent even among the many excellent artists of that time. In sculpture he was a pupil of Andrea Pisano; in painting, though indirectly, he was a disciple of Giotto. Few artists have practised with such success so many branches of the arts. Orcagna was not only a painter and sculptor, but also a worker in mosaic, an architect and a poet. His importance in the history of Italian art rests not merely on his numerous and beautiful productions, but also on his widespread influence, transmitted to his successors through a large and carefully-trained school of pupils. In style as a painter Orcagna comes midway between Giotto and Fra Angelico: he combined the dramatic force and realistic vigour of the earlier painter with the pure brilliant colour and refined unearthly beauty of Fra Angelico. His large fresco paintings are works of extreme decorative beauty and splendour—composed with careful reference to their architectural surroundings, arranged for the most part on one plane, without the strong foreshortening or effects of perspective with which the mural paintings of later masters are so often marred.

1. *Orcagna as a Painter.*—His chief works in fresco were at Florence, in the church of S Maria Novella. He first covered the walls of the retro-choir with scenes from the life of the Virgin. These, unfortunately, were much injured by damp very soon after their completion, and towards the end of the following century were replaced by other frescoes of the same subjects by Ghirlandaio, who, according to Vasari, made much use of Orcagna's motives and invention. Orcagna also painted three walls of the Strozzi chapel, at the north-east of the same church, with a grand series of frescoes, which still exist, though in a much injured and "restored" state. On the northern end wall is the Last Judgment, painted above and round the window, the light from which makes it difficult to see the picture. In the centre is Christ floating among clouds, surrounded by angels; below are kneeling figures of the Virgin and St John the Baptist, with the twelve apostles. Lower still are patriarchs, prophets and saints, with the resurrection of the blessed and the lost. The finest composition is that on the west wall, unbroken by any window. It represents paradise, with Christ and the Virgin enthroned in majesty among rows of brilliantly-coloured cherubim and seraphim tinged with rainbow-like rays of light. Below are long lines of the heavenly hierarchy mingled with angel musicians; and lower still a crowd of saints floating on clouds. Many of these figures are of exquisite beauty especially the few that have escaped restoration. Faces of the most divine tenderness and delicacy occur among the female saints; the two central angels below the throne are figures of wonderful grace in pose and movement; and the whole picture, lighted by a soft luminous atmosphere, seems to glow with an unearthly gladness and peace. Opposite to this is the fresco attributed by Vasari to Orcagna's brother Bernardo, or rather Nardo (*i.e.* Lionardo); it was completely repainted in 1530, so that nothing but the design remains, full of horror and weird imagination. To some extent the painter has followed Dante's scheme of successive circles.

These paintings were probably executed soon after 1350, and in 1357 Orcagna painted one of his finest panel pictures, as a retable for the altar of the same chapel, where it still remains. In the centre is Christ in majesty between kneeling figures of St Peter and St Thomas Aquinas, attended by angel musicians; on each side are standing figures of three other saints. It is a work of the greatest beauty both in colour and composition; it is painted with extreme miniature-like delicacy, and is on the whole very well preserved. This retable is signed, "Añ. dñi. mccclvii Andreas Cionis de Florentia me pinxit." Another fine altar-piece on panel by Orcagna, dated 1363, is preserved in the Cappella de' Medici, near the sacristy Sta Croce; it represents the four doctors of the Latin church. According to Vasari, Orcagna also painted some very fine frescoes in Sta Croce, similar in subjects to those attributed to him in the Campo Santo of Pisa, and full of fine portraits. These do not now exist. In the cathedral of Florence, on one of the northern piers, there hangs a nobly designed and highly finished picture on panel by Orcagna, representing S Zanobio enthroned, trampling under his feet Cruelty and Pride; at the sides are kneeling figures of SS Eugenius and Crescentius—the whole very rich in colour. The retable mentioned by Vasari as having been painted for the Florentine church of S Pietro Maggiore is now in the National Gallery of London. It is a richly decorative composition of the Coronation of the Virgin, between rows of saints, together with nine other subjects painted in miniature. Other paintings on panel by Orcagna were sent by the Pope to Avignon, but cannot now be traced. The frescoes also have been destroyed with which, according to Vasari, Orcagna decorated the façade of S Apollinare and the Cappella de' Cresci in the church of the Servi in Florence.[2]

2. *Orcagna as a Sculptor and Architect.*[3]—In 1355 Orcagna was appointed architect to the chapel of Or San Michele in Florence. This curiously-planned building, with a large upper room over the vaulting of the lower part, has been begun by Taddeo Gaddi as a thank-offering for the cessation of the plague of 1348. It took the place of an earlier oratory designed by Arnolfo del Cambio, and was the gift of the united trade-gilds of Florence. As to the building itself, it is impossible to say how much is due to Taddeo Gaddi and how much to Orcagna, but the great marble tabernacle was wholly by Orcagna. This, in its combined splendour of architectural design, sculptured reliefs and statuettes, and mosaic enrichments, is one of the most important and beautiful works of art which even rich Italy possesses. It combines an altar, a shrine, a reredos and a baldacchino. In general form it is perhaps the purest and most gracefully designed of all specimens of Italian Gothic. It is a tall structure of white marble, with vaulted canopy and richly decorated gables and pinnacles, reaching almost to the vaulted roof of the chapel. The detail is extremely delicate, and brilliant gem-like colour is given by lavish enrichments of minute patterns in glass mosaic, inlaid in the white marble of the structure. It is put together with the greatest care and precision; Vasari especially notes the fact that the whole was put together without any cement, which might have stained the purity of the marble, all the parts being closely fitted together with bronze dowels. The spire-like summit of the tabernacle is surmounted by a figure of St Michael, and at a lower stage on the roof are statuettes of the apostles. The altar has a relief of Hope between panels with the Marriage of the Virgin and the Annunciation. On the right side, looking east, of the base of the tabernacle are reliefs of the Birth of the Virgin and her Presentation in the Temple; on the left, the Nativity and the Adoration of the Magi; and behind, the Presentation of Christ in the Temple, and the

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Vasari is right about his age his birth would have been in 1316. Milanesi, the editor of Vasari, is, however, inclined to think that Orcagna died in 1368, when he is known to have been seriously ill.

[1] Of this form, sometimes spelt Orcagnuolo, Orcagna is a corruption.

[2] The magnificent but much injured frescoes of the Last Judgment, Hell, and the Triumph of Death in the Pisan Campo Santo, described with great minuteness and enthusiasm by Vasari, are attributed by him to Orcagna, but internal evidence seems to show that they are productions of the Sienese school. Crowe and Cavalcaselle attribute them to the two brothers Lorenzetti of Siena, but they have been so injured by wet, the settlement of the wall, and repeated retouchings that it is difficult to come to any clear decision as to their authorship. It appears, however, much more probable that they are the work of Bernardo Daddi.

[3] Orcagna was admitted as a member of the Sculptors' Gild in 1352. His name occurs in the roll as "Andreas Cionis vocatus Arcagnolus, pictor."

Angel warning the Virgin to escape into Egypt. Above the last two subjects are large reliefs of the Death of the Virgin, surrounded by the apostles, and higher still her Assumption; she stands in a vesica, and is borne by angels to heaven. On the base of the Virgin's tomb is inscribed "Andreas Cionis pictor Florentinvs oratorii archimagister extitit hvjvs mccclix." Orcagna's own portrait is given as one of the apostles. In addition to these richly-composed subject-reliefs the whole work is adorned with many other single figures and heads of prophets, angels, and the Virtues, all executed with wonderful finish and refinement. The shrine, which forms an aumbry in the reredos, contains a miraculous picture of the Madonna. A fine bronze screen, with open geometrical tracery, encloses the whole. No work of sculpture in Italy is more magnificent than this wonderful tabernacle, both in general effect and in the delicate beauty of the reliefs and statuettes with which it is so lavishly enriched. It cost the enormous sum of 96,000 gold florins. Unfortunately it is very badly placed and insufficiently lighted, so that a minute examination of its beauties is a work of difficulty.

No mention is made by Vasari of Orcagna's residence in Orvieto, where he occupied for some time the post of "capo-maestro" to the duomo. He accepted this appointment on the 14th of June 1358 at the large salary (for that time) of 300 gold florins a year. His brother Matteo was engaged to work under him, receiving 8 florins a month. When Orcagna accepted this appointment at Orvieto he had not yet finished his work at Or San Michele, and so was obliged to make long visits to Florence, which naturally interfered with the satisfactory performance of his work for the Orvietans. The result was that on the 12th of September 1360 Orcagna, having been paid for his work up to that time, resigned the post of "capo-maestro" of the duomo, though he still remained a little longer in Orvieto to finish a large mosaic picture on the west front. When this mosaic (made of glass tesserae from Venice) was finished in 1362, it was found to be uneven in surface, and not fixed securely into its cement bed. An arbitration was therefore held as to the price Orcagna was to receive for it, and he was awarded 60 gold florins.

Vasari mentions as other architectural works by Orcagna the design for the piers in the nave of the Florentine duomo, a zecca or mint, which appears not to have been carried out, and the Loggia dei Lanzi in the Piazza della Signoria. It is, however, more than doubtful whether Orcagna had any hand in this last building, a very graceful vaulted structure, with three semicircular open arches on the side and one at each end, intended to form a sheltered meeting-place for the Priori during elections and other public transactions. This loggia was ordered by the General Council of Florence in 1356, but was not actually begun till the year 1376, after Orcagna's death. The architects were Benci di Cione (possibly a brother of Orcagna) and Simone di Francesco Talenti, both men of considerable reputation in Florence. The sculptured reliefs of the seven Virtues in the spandrels of the arches of the loggia, also attributed to Orcagna by Vasari, were later still. They were designed by Angelo Gaddi (1383–1386), and were carried out by three or four different sculptors.

Pupils of Orcagna named by Vasari are Bernardo Nello, a Pisan, Tommaso di Marco, a Florentine, and, chief of all, Francesco Traini, whose grand painting on panel of St Thomas Aquinas enthroned with the arch-heretics at his feet still hangs in the church for which it was painted—Sta Caterina at Pisa. Orcagna had, in addition to the two daughters mentioned above, a son named Cione, who was a painter of but little eminence. Some sonnets attributed to Orcagna exist in MS. in the Strozzi and Magliabecchian libraries in Florence. They have been published by Trucchi (*Poesie inedite*, ii. p. 25, Prato, 1846). They are graceful in language, but rather artificial and over-elaborated.

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ORCHARD (O. Eng. *ort-geard*, later *orceard*; a combination apparently of Lat. *hortus*, garden, and "yard" or "garth"), a piece of ground enclosed for the purposes of horticulture. The term was formerly used in a general way for a garden where herbs and fruit-trees were cultivated, but is now used exclusively for a piece of enclosed ground for fruit-trees only, and particularly for apples, pears, plums and cherries.

ORCHARDSON, SIR WILLIAM QUILLER (1835–1910), British painter, was born in Edinburgh, where his father was engaged in business, in 1835. "Orchardson" is a variation of "Urquhartson," the name of a Highland sept settled on Loch Ness, from which the painter is descended. At the age of fifteen he was sent to the Trustees' Academy, then under the mastership of Robert Scott Lauder, where he had as fellow-students most of those who afterwards shed lustre on the Scottish school of the second half of the 19th century. As a student he was not especially precocious or industrious, but his work was distinguished by a peculiar reserve, by an unusual determination that his hand should be subdued to his eye, with the result that his early things reach their own ideal as surely as those of his maturity. By the time he was twenty, Orchardson had mastered the essentials of his art, and had produced at least one picture which might be accepted as representative, a portrait of Mr John Hutchison, the sculptor. For seven years after this he worked in Edinburgh, some of his attention being given to "black and white," his practice in which had been partly acquired at a sketch club, which included among its members Mr Hugh Cameron, Mr Peter Graham, Mr George Hay, Mr M'Taggart, Mr John Hutchison and others. In 1862 he came to London, and established himself in 37 Fitzroy Square, where he was joined twelve months later by his friend John Pettie. The same house was afterwards inhabited by Ford Madox Brown.

The English public was not immediately attracted by Orchardson's work. It was too quiet to compel attention at the Royal Academy, and Pettie, Orchardson's junior by four years, stepped before him for a time, and became the most readily accepted member of the school. Orchardson confined himself to the simplest themes and designs, to the most reticent schemes of colour. Among his best pictures during the first eighteen years after his migration to London were "The Challenge," "Christopher Sly," "Queen of the Swords," "Conditional Neutrality," "Hard Hit"—perhaps the best of all—and protraits of Mr Charles Moxon, his father-in-law, and of his own wife. In all these good judgment and a refined imagination were united to a restrained but consummate technical dexterity. During these same years he made a few drawings on wood, turning to account his early facility in this mode. The period between 1862 and 1880 was one of quiet ambitions, of a characteristic *insouciance*, of life accepted as a thing of many-balanced interests rather than as a matter of *sturm und drang*. In 1865 Pettie married, and the Fitzroy Square *ménage* was broken up. In 1868 Orchardson was elected A.R.A. In 1870 he spent the summer in Venice, travelling home in the early autumn through a France overrun by the German armies. In 1873 he married Miss Helen Moxon, and in 1877 he was elected to the full membership of the Royal Academy. In this same year he finished building a house at Westgate-on-Sea, with an open tennis-court and a studio in the garden. He was knighted in June 1907, and died in London on the 13th of April 1910.

Orchardson's wider popularity dates from 1881. To that year's Academy he sent the large "On Board the *Bellerophon*," which now hangs in the Tate Gallery. Its success with the public was great and instantaneous, and for ten or twelve years Orchardson's work was more eagerly looked for at the Academy than that of any one else. He followed up the "Bellerophon" with the still finer "Voltaire," now in the Kunsthalle at Hamburg. Technically, the "Voltaire" is, perhaps, his high-water mark. Fine both in design and colour, it is carried out with a supple dexterity of hand which has scarcely been equalled in the British school since the death of Gainsborough. The subject is not entirely happy, for it does not explain itself, but requires a previous knowledge on the part of the spectator of how Voltaire was beaten by the servants of the Chevalier de Rohan-Cabot, and how the duc de Sully failed to avenge his guest. The painter was attracted by the opportunity it gave for effective opposition of character, line, colour and movement. The "Voltaire" was at the Academy of 1883; it was followed, in 1884, by the "Mariage de convenance," perhaps the most popular of all Orchardson's pictures; in 1885, by "The Salon of Madame Récamier"; in 1886, by "After," the sequel to the "Mariage de convenance," and "A Tender Chord," one of his most exquisite productions; in 1887, by "The First Cloud"; in 1888, by "Her Mother's Voice"; and in 1889, by "The Young Duke," a canvas on which he returned to much the same pictorial scheme as that of the "Voltaire." Subsequently he exhibited a series of pictures in which fine pictorial use was made of the furniture and costumes of the early years of the 19th century, the subjects, as a rule, being only just enough to suggest a title: "An Enigma," "A Social Eddy," "Reflections," "If music be the food of love, play on!" "Music, when sweet voices die, vibrates on the memory," "Her First Dance,"—in these, opportunities are made to introduce old harpsichords, spinets, early pianofortes, Empire chairs, sofas and tables, Aubusson carpets, short-waisted gowns, delicate in material and primitive in ornament. Between such things and Orchardson's methods as a painter the sympathy is close, so that the best among them, "A Tender Chord," for instance, or "Music, when sweet voices die," have a rare distinction.

As a portrait-painter Orchardson must be placed in the first class. His portraits are not numerous, but among them are a few which rise to the highest level reached by modern art. "Master Baby," a picture, connecting subject-painting with portraiture, is a masterpiece of design, colour and broad execution. "Mrs Joseph," "Mrs Ralli," "Sir Andrew Walker, Bart.," "Charles Moxon, Esq.," "Mrs Orchardson," "Conditional Neutrality" (a portrait of Orchardson's eldest son as a boy of six), "Lord Rookwood," "The Provost of Aberdeen," and, above all, "Sir Walter Gilbey, Bart.," would all deserve a place in any list of the best portraits of the 19th century. In this branch of art the "Sir Walter Gilbey" may fairly be called the painter's masterpiece, although the sumptuous full-length of the Scottish provost, in his robes, runs it closely. The scheme of colour is reticent; had the picture been exhibited at the time of the Boer War of 1900 the colour would have been called khaki; the design is simple, uniting nature to art with a rare felicity; and the likeness has been found satisfactory by the sitter's friends. The most important commission ever received by Orchardson as a portrait-painter was that for a group of Queen Victoria, with her son (afterwards King Edward VII.), grandson, and great-grandson, to be painted on one canvas for the Royal Agricultural Society. The painter hit upon a happy notion for the bringing of the four figures together, and as time goes on and the picture slowly turns into history, its merit is likely to be better appreciated. He continued painting to the end of his life, and had three portraits ready for the Royal Academy in 1910.

Orchardson's method was that of one who worked under a creative, decorative and subjective impulse, rather than under one derived from a wish to observe and record. His affiliation is with Watteau and Gainsborough, rather than with those who would base all pictorial art on a keen eye for actuality and "value." Among French painters his pictures have excited particular admiration. (W. Ar.)

ORCHESTRA (Fr. *Orchestre*; Ger. *Kapelle, Orchester*; Ital. *Orchestra*), in its modern acceptation (1) the place in a theatre or concert hall set apart for the musicians; (2) a carefully-balanced group of performers on stringed, wind and percussion instruments adapted for playing in concert and directed by a conductor. In ancient Greece the *ὀρχήστρα* was the space between the auditorium and the proscenium or stage, in which were stationed the chorus and the instrumentalists. The second sense is that which is dealt with here.

A modern orchestra is composed of (1) a basis of strings—first and second violins, violas, violoncellos and double basses; (2) flutes, sometimes including a piccolo; (3) the reed contingent, consisting of two complete families, the oboes with their tenors and basses (the cor Anglais, the fagotto or bassoon and the contrafagotto or double bassoon), the clarinets with their tenor and basses (the basset horn and the bass and pedal clarinets) with the addition sometimes of saxophones; (4) the brass wind, consisting of the horns, a group sometimes completed by the tenor and tenor-bass Wagner tubas, the trumpet or cornet, the trombones (tenor, bass and contrabass), the tubas (tenor, bass and contrabass); (5) the percussion instruments, including the kettledrums, bells, Glockenspiel, cymbals, triangle, &c. Harps are added when required for special effects.

Although most of the instruments from the older civilizations of Egypt, Chaldea, Persia, Phoenicia and of the Semitic races were known to the ancient Greeks, their conception of music led them to discourage all imitation of their neighbours' love of orchestral effects, obtained by combining harps, lyres, guitars, tanburs, double pipes and long flutes, trumpets, bagpipes, cymbals, drums, &c., playing in unison or in octaves. The Greeks only cultivated to any extent the various kinds of citharas, lyres and auloi, seldom used in concert. To the predilection of the Romans for wind instruments of all kinds, we owe nearly all the wind instruments of the modern orchestra, each of which had its prototype among the instruments of the Roman Empire: the flute, oboe and clarinet, in the tibia; the trombone and trumpet in the buccina; the tubas in the tuba; and the French horn in cornu and buccina. The 4th century A.D. witnessed the downfall of the Roman drama and the debasement of instrumental music, which was placed under a ban by the Church. During the convulsions which the migrations of Goths, Vandals and Huns caused in Europe after the fall of Rome, instrumental music was preserved from absolute extinction by wandering actors and musicians turned adrift after the closing of the theatres by command of the Church. Later, as demand arose, reinforcements of instruments, instrumentalists and instrument makers filtered through the Byzantine Empire and the Christian East generally on the one side and from the Moors on the West. It is towards the dawn of the 11th century that we find the first definite indications of the status of instrumental music in Western and Central Europe. Everywhere are the evidences, so conspicuously absent from the catacombs and from Romano-Christian monuments, of the growing favour in which instrumental music was held, to instance only such sculptures as those of the Abbey of Boscherville in Normandy, of the portico of the Cathedral of Santiago da Compostella (12th century) with its orchestra of 24 musicians, and the full-page illuminations of Psalters representing David and his musicians and of the 24 elders in the Apocalypses.

The earliest instrumental compositions extant are certain 15th-century dances and pieces in contrapuntal style preserved in the libraries of Berlin and Munich. The late development of notation, which long remained exclusively in the hands of monks and troubadours, personally more concerned with vocal than with instrumental music, ensured the preservation of the former, while the latter was left unrecorded. Instrumental music was for centuries dependent on outcasts and outlaws, tolerated by Church and State but beyond the pale. Little was known of the construction and technique of the instruments, and their possibilities were undreamed. Nevertheless, the innate love and yearning of the people for tone-colour asserted itself with sufficient strength to overcome all obstacles. It is true that the development of the early forms of harmony, the *organum*, *diaphony*, the *discant* and the richer forms of polyphony grew up round the voice, but indications are not wanting of an independent energy and vitality which must surely have existed in unrecorded medieval instrumental music, since they can be so clearly traced in the instruments themselves. It is, for example, significant of the attitude of 10th-century instrumentalists towards musical progress that they at once assimilated Hucbald's innovation of the *organum*, a parallel succession of fourths and fifths, accompanied sometimes by the octave, for two or three voices respectively, and they produced in the same century the *organistrum*, named after Hucbald's *organum*, and specially constructed to reproduce it.

Shortly after the introduction of polyphony, instruments such as flûtes-à-bec, or flaiols, cornets, cromornes, shawms, hunting horns, bagpipes, as well as lutes and bowed instruments began to be made in sizes approximately corresponding in pitch with the voice parts. It is probably to the same yearning of instrumentalists after a polyphonic ensemble, possible until the 14th century only on organs, hurdy-gurdies and bagpipes, that we owe the clavichord and clavicembalo, embodying the application of keys, respectively, to the dulcimer and the psaltery.

There are two reasons which account for the development of the brass wind proceeding more slowly. (1) These instruments, trumpets or busines, tubas and horns, were for many centuries mainly used in medieval Europe as military or hunting signal instruments, and as such the utmost required of them was a fanfare. Specimens of 14th-century tablature and 16th-century notation for the horn, for instance, show that for that instrument rhythm alone was taken into account. (2) Whereas in most of the instruments named above the notes of the diatonic scale were either fixed or easily obtained, the acoustic principles of tubes without lateral holes and blown by means of a cup mouthpiece do not allow of a diatonic scale, except for the fourth octave from the fundamental, and that only in trumpets and horns, the notes of the common chord with the addition of the flattened seventh being the utmost that can be produced without the help of valves, keys or slides. These instruments were, therefore, the last to be added to the orchestra, although they were extensively used for special military, civil and religious functions and were the most highly favoured of all.

The earliest improvement in the status of the roving instrumentalists came with the rise of minstrelsy. The courts of the counts of Toulouse, Provence and Barcelona were the first to foster the art of improvising or composing songs known as *trobar* (or *trouver* in the north of France), and Count Guillaume of Poitiers (1087–1127) is said to have been the first troubadour. The noble troubadour seldom sang the songs he composed himself, this duty devolving upon his professional minstrel skilled in singing and in playing upon divers instruments who interpreted and disseminated his master's verses. In this respect the troubadour differed from his German contemporary the Minnesinger, who frequently sang himself. The professional musicians were included under the general term of *jongleurs* or *jugleors*, *gleemen* or *minstrels*, whose function was to entertain and amuse, but there were among them many subtle distinctions and ranks, such as *chanteors* and *estrumanteors*. Love was the prevailing theme in the south, while in the north war and heroic deeds inspired the bards. To the former was due the rapid development of bowed instruments, which by reason of their singing quality were more suitable for accompanying passionate love songs, while instruments of which the strings were plucked accorded better with the declamatory and dramatic style of the north.

The first assertive move towards independence was made by the wandering musicians in the 13th century, when some of these, tired of a roving life, settled down in cities, forming gilds or brotherhoods for the protection of their mutual interests and privileges. In time they came to be recognized by the burgomasters and municipalities, by whom they were engaged to provide music at all civic and private festivities, wandering musicians being prohibited from playing within the precincts of the cities. The oldest of these gilds was the Brotherhood of Nicolai founded in Vienna in 1288. In the next century these pioneers chose as patron of their brotherhood Peter von Eberstorff, from 1354 to 1376 known as *Vogt der Musikanten*, who obtained for the members an imperial charter. This example was gradually followed in other parts of Germany and elsewhere in Europe. In England, John of Gaunt was in 1381 chosen King of the Minstrels. In France there was the Confrérie of St Julien des Menestriers, incorporated in 1321. Exalted patrons of instrumental music multiplied in the 15th century, to instance only the dukes of Burgundy, the emperors of the House of Austria, the dukes of Lorraine, of Este, Ferrara and Tuscany, the electors of Saxony and the kings of France with their renowned institutions *La Chapelle-Musique du Roi* (*c.* 1440), *la Musique de la Chambre*, *la Musique de la Grande Ecurie du Roi*.

At the time of the revival of the drama with music, afterwards modified and known as opera, at the end of the 16th century, there was as yet no orchestra in our sense of the word, but merely an abundance of instruments used in concert for special effects, without balance or grouping; small positive organs, regals, harpsichords, lutes, theorboes, archlutes and chittarone (bass and contrabass lutes), guitars, viols, lyras *da braccio* and *da gamba*, psalteries, citterns, harps, flutes, recorders, cornets, trumpets and trombones, drums and cymbals.

Monteverde was the first to see that a preponderance of strings is necessary to ensure a proper balance of tone. With the perfected models of the Cremona violins at his disposal, a quartett of strings was established, and all other stringed instruments not played with the bow were ejected from the orchestra with the exception of the harp. Under the influence of Monteverde and his successors, Cavalli and Cesti, the orchestra won for itself a separate existence with music and laws of its own. As instruments were improved, new ones introduced, and old ones abandoned, instrumentation became a new and favourite study in Italy and in Germany. Musicians began to find out the capabilities of various families of instruments and their individual value.

The proper understanding of the compass and capabilities of wind instruments, and more especially of the brass wind, was of later date (18th century). At first the scores contained but few indications for instruments other than strings; the others played as much as they could according to the compass of their instruments at the direction of the leader. The possibility of using instruments for solos, by encouraging virtuosi to acquire great skill, raised the standard of excellence of the whole orchestra.

At first the orchestra was an aristocratic luxury, performing privately at the courts of the princes and nobles of Italy; but in the 17th century performances were given in theatres, and Germany eagerly followed. Dresden, Munich and Hamburg successively built opera houses, while in England opera flourished under Purcell, and in France under Lully, who with the collaboration of Molière also greatly raised the status of the entertainments known as *ballets*, interspersed with instrumental and vocal music.

The revival of the drama seems to have exhausted the enthusiasm of Italy for instrumental music, and the field of action was shifted to Germany, where the perfecting of the orchestra was continued. Most German princes had at the beginning of the 18th century good private orchestras or *Kapelle*, and they always endeavoured to secure the services of the best available instrumentalists. Kaiser, Telemann, Graun, Mattheson and Handel contributed greatly to the development of German opera and of the orchestra in Hamburg during the first quarter of the century. Bach, Gluck and Mozart, the reformers of opera; Haydn, the father of the modern orchestra and the first to treat it independently as a power opposed to the solo and chorus, by scoring for the instruments in well-defined groups; Beethoven, who individualized the instruments, writing solo passages for them; Weber, who brought the horn and clarinet into prominence; Schubert, who inaugurated the conversations between members of the wood wind—all left their mark on the orchestra, leading the way up to Wagner and Strauss.

A sketch of the rise of the modern orchestra would not be complete without reference to the invention of the piston or valve by Stölzel and Blümel, both Silesians, in 1815. A satisfactory bass for the wind, and more especially for the brass, had long been a desideratum. The effect of this invention was felt at once: instrument-makers in all countries vied with each other in making use of the contrivance and in bringing it to perfection; and the orchestra was before long enriched by a new family of valved instruments, variously known as tubas, or euphoniums and bombardons, having a chromatic scale and a full sonorous tone of great beauty and immense volume, forming a magnificent bass. (K. S.)

ORCHESTRION, a name applied to three different kinds of instruments. (1) A chamber organ, designed by Abt Vogler at the end of the 18th century, which in a space of 9 cub. ft. contained no less than 900 pipes, 3 manuals of 63 keys each and 39 pedals (see HARMONIUM). (2) A pianoforte with organ pipes attached, invented by Thomas Anton Kunz of Prague in 1791. This orchestrion comprised two manuals of 65 keys and 25 pedals, all of which could be used either independently or coupled. There were 21 stops, 230 strings and 360 pipes which produced 105 different combinations. The bellows were worked either by hand or by machinery. (3) A mechanical instrument, automatically played by means of revolving cylinders, invented in 1851 by F. T. Kaufmann of Dresden. It comprises a complete wind orchestra, with the addition of kettle-drums, side-drums, cymbals and triangle. (K. S.)

ORCHHA, or URCHHA (also called *Tehri* or *Tikamgarh*), a native state of Central India, in the Bundelkhand agency. Orchha is the oldest and highest in rank of all the Bundela principalities, and was the only one not held in subjection by the peshwa. Area, 2080 sq. m.; pop. (1901) 321,634; estimated revenue, £47,000; no tribute. The maharaja, Sir Pratap Singh, G.S.C.I. (born in 1854, succeeded in 1874), took a great personal interest in the development of his state, and himself designed most of the engineering and irrigation works that have been executed here within recent years. He bears the hereditary title of "First of the Princes of Bundelkhand." The state exports grain, *ghi*, and cotton cloth, but trade suffers from imperfect communications. The town of Orchha, the former capital, is on the river Betwa, not far from Jhansi. It possesses an imposing fort, dating mainly from the early 17th century. This contains a number of palaces and other buildings connected one with another. The most noteworthy are the Rajmandir, a massive square erection of which the exterior is almost absolutely plain; and the Jahangirmahal, of the same form but far more ornate, a singularly beautiful specimen of Hindu domestic architecture. Elsewhere about the town are fine temples and tombs, among which may be noticed the Chaturbhuj temple on its vast platform of stone. The town of Tehri or Tikamgarh, where the chief now resides, is about 40 m. S. of Orchha; pop. (1901) 14,050. It contains the fort of Tikamgarh, by which name the town is generally called, to distinguish it from Tehri in the Himalayas.

ORCHIDS. The word *Orchis* is used in a special sense to denote a particular genus of the Orchid family (*Orchidaceae*); very frequently, also, it is employed in a more general way to indicate any member of that large and very interesting group. It will be convenient here to use the word *Orchis* as applying to that particular genus which gives its name to the order or family, and to employ the term "orchid" in the less precise sense.

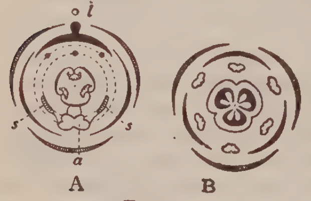


FIG. 1.

A. Floral diagram of typical orchid flower; *l*, labellum; *a*, anther; *s*, rudiments of barren stamens (staminodes).

B. Diagram of the symmetrical trimerous flower of Fritillary (*Fritillaria*).

The flowers of all orchids, though extremely diverse within certain limits, and although superficially very different from those of other monocotyledons, are all formed upon one common plan, which is only a modification of that observable in such flowers as those of the narcissus or snowdrop (*Galanthus*). The conformation of those flowers consists essentially in the presence of a six-parted perianth, the three outer segments of which correspond to a calyx, the three inner ones to a corolla. These segments spring apparently from the top of the ovary—the real explanation, however, being that the end of the flower-stalk or "thalamus," as it grows, becomes dilated into a sort of cup or tube enclosing and indeed closely adhering to the ovary, so that the latter organ appears to be beneath the perianth instead of above it as in a lily, an appearance which has given origin to the term "inferior ovary." Within the perianth, and springing from its sides, or apparently from the top of the ovary, are six stamens whose anthers contain pulverulent pollen-grains. These stamens encircle a style which is the upward continuation of the ovary, and which shows at its free end traces of the three originally separate but now blended carpels of which the ovary consists. An orchid flower has an inferior ovary like that just described, but with the ovules on the walls of the cavity (not in its axis or centre), a six-parted perianth, a stamen or stamens and stigmas. The main distinguishing features consist in the fact that one of the inner pieces of the perianth becomes in course of its growth much larger than the rest, and usually different in colour, texture and form. So different is it that it receives a distinct name, that of the "lip" or "labellum." In place of the six stamens we commonly find but one (two in *Cypripedium*), and that one is raised together with the stigmatic surfaces on an elongation of the floral axis known as the "column." Moreover, the pollen, instead of consisting of separate cells or grains, consists of cells aggregated into "pollen-masses," the number varying in different genera, but very generally two, four, or eight, and in many of the genera provided at the base with a strap-shaped stalk or "caudicle" ending in a flattish gland or "viscid disk" like a boy's sucker. In *Cypripedium* all three stigmas are functional, but in the great majority of orchids only the lateral pair form receptive surfaces (*st*, fig. 3), the third being sterile and forming the rostellum which plays an important part in the process of pollination, often forming a peculiar pouch-like process (fig. 4, *r*) in which the viscid disk of the pollen-masses is concealed till released in the manner presently to be mentioned. It would appear, then, that the orchid flower differs from the more general monocotyledonous type in the irregularity of the perianth, in the suppression of five out of six stamens, and in the union of the one stamen and the stigmas. In addition to these modifications, which are common to nearly all orchids, there are others generally but not so universally met with; among them is the displacement of the flower arising from the twisting of the inferior ovary, in consequence of which the flower is so completely turned round that the "lip," which originates in that part of the flower, conventionally called the posterior or superior part, or that

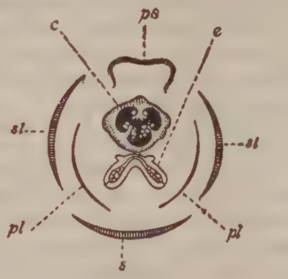


FIG. 2.—Diagram of the flower of *Orchis*.

s, *sl*, *sl*, The three divisions of the outer perianth.
pl, *pl*, The two lateral divisions of the inner perianth.
ps, The superior division or the labellum, which may become inferior by the twisting of the ovary.
e, The fertile stamen, with its two pollen-masses in the anther-lobes.
c, The one-celled ovary cut transversely, having three parietal placentas.

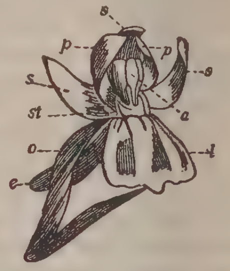


FIG. 3.—Flower of *Orchis*.

s, *s*, *s*, The three outer divisions of the perianth.
p, *p*, *l*, The three inner, *l* being the labellum, here inferior by the twisting of the ovary.
e, Spur of the labellum.
o, The twisted ovary.
st, The stigma.
a, The anther, containing pollen-masses.

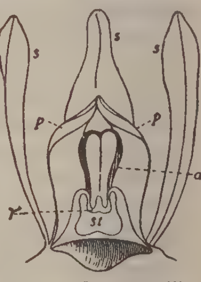


FIG. 4.—Diagram illustrating arrangement of parts in flower of *Orchis*.

s, Sepals.
p, Petals.
a, Anther.
st, Two united stigmas.
r, Rostellum (barren stigma).

nearest to the supporting stem, becomes in course of growth turned to the anterior or lower part of the flower nearest to the bract, from whose axil it arises. Other common modifications arise from the union of certain parts of the perianth to each other, and from the varied and often very remarkable outgrowths from the lip. These modifications are associated with the structure and habits of insects and their visits to the flowers.

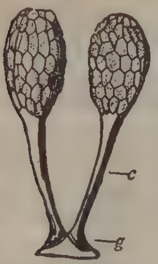


FIG. 5.—Pollen-masses of an Orchid, with their caudicles *c* and common gland *g*.

Cross fertilization, or the impregnation of any given flower by pollen from another flower of the same species on the same or on another plant, has been proved to be of great advantage to the plant by securing a more numerous or a more robust offspring, or one better able to adapt itself to the varying conditions under which it has to live. This cross fertilization is often effected by the agency of insects. They are attracted to the flower by its colour or its perfume; they seek, collect or feed on its honey, and while so doing they remove the pollen from the anther and convey it to another flower, there to germinate on the stigma when its tubes travel down the style to the ovary where their contents ultimately fuse with the "oosphere" or immature egg, which becomes in consequence fertilized, and forms a seed which afterwards develops into a new plant (see article ANGIOSPERMS). To facilitate the operations of such insects, by compelling them to move in certain lines so as to secure the due removal of the pollen and its subsequent deposit on the right place, the form of the flower and the conformation of its several parts are modified in ways as varied as they are wonderful. Other insects visit the flower with more questionable result. For them the pollen is an attraction as food, or some other part of the flower offers an inducement to them for a like object. Such visitors are clearly prejudicial to the flower, and so we meet with arrangements which are calculated to repel the intruders, or at least to force them to enter the flower in such a way as not to effect mischief. See Darwin's *Fertilization of Orchids* and similar works.

In the common orchids of British meadows, *Orchis Morio*, *mascula* (Shakespeare's long purples), &c., the general structure of the flower is as we have described it (figs. 2, 3). In addition there is in this particular genus, as indeed in many others, a long tubular spur or horn projecting downwards from the back of the lip, whose office it is to secrete and store a honeyed juice; the forepart of the lip forms an expanded plate, usually larger and more brightly coloured than the other parts of the flower, and with hairs or ridges and spots of various kinds according to the species. The remaining parts of the perianth are very much smaller, and commonly are so arranged as to form a hood overarching the "column." This column stands up from the base of the flower, almost at right angles to the lip, and it bears at the top an anther, in the two hollow lobes of which are concealed the two pollen-masses, each with its caudicle terminating below in a roundish gland, concealed at first in the pouch-like rostellum at the front of the column. Below the anther the surface of the column in front is hollowed out into a greenish depression covered with viscid fluid—this is the two united stigmas. The other parts of the flower need not detain us. Such being in general terms the mechanism of the flower of a common orchis, let us now see how it acts. A bee, we will assume, attracted by the colour and perfume of the flower, alights on that part of it which is the first to attract its attention—the lip. There, guided by the hairs or ridges before-mentioned, it is led to the orifice of the spur with its store of honeyed juice. The position of this orifice, as we have seen, is at the base of the lip and of the column, so that the insect, if of sufficient size, while bending its head to insert the proboscis into the spur, almost of necessity displaces the pollen-masses. Liberated from the anthers, these adhere to the head or back of the insect by means of the sticky gland at the bottom of the caudicle (fig. 4). Having attained its object the insect withdraws, taking the pollen-masses, and visits another flower. And now occurs another device or adaptation no less marvellous than those of which mention has been made. The two anther-cases in an orchis are erect and nearly parallel the one to the other; the pollen-masses within them are of course in like case, as may be thus represented ||, but immediately the pollen-masses are removed movements take place at the base of the caudicle so as to effect the bending of this stalk and the placing the pollen-mass in a more or less horizontal position, thus =, or, as in the case of *O. pyramidalis*, the two pollen-masses originally placed parallel || diverge from the base like the letter V. The movements of the pollen-masses may readily be seen with the naked eye by thrusting the point of a needle into the base of the anther, when the disks adhere to the needle as they would do to the antenna of an insect, and may be withdrawn. Sometimes the lip is mobile and even sensitive to impressions, as are also certain processes of the column. In such cases the contact of an insect or other body with those processes is sufficient to liberate the pollen often with elastic force, even when the anther itself is not touched. In other orchids movements take place in different ways and in other directions. The object of these movements will be appreciated when it is remembered that, if the pollen-masses retained the original direction they had in the anther in which they were formed, they would, when transported by the insect to another flower, merely come in contact with the anther of that flower, where of course they would be of no use; but, owing to the divergences and flexions above alluded to, the pollen-masses come to be so placed that, when transplanted to another flower of the same species, they come in contact with the stigma and so effect the fertilization of that flower. These illustrations are comparatively simple; it would have been easy to select others of a more complicated nature, but all evidently connected with the visits of insects and the cross fertilization of the flower. In some cases, as in *Catasetum*, male flowers are produced so different from the female that before the different flowers had been found on the same pike, and before the facts of the case were fully known, they were taken to be representatives of distinct genera.

The fruit is a capsule splitting generally by three longitudinal slits forming valves which remain united above and below. The seeds are minute and innumerable; they contain a small rudimentary embryo surrounded by a thin loose membraneous coat, and are scattered by means of hygroscopic hairs on the inside of the valves which by their movements jerk out the seeds. The floral structure is so curious that perhaps less attention has been paid to the vegetative organs than the peculiarities of their organisation demand. We can only allude to some of these points. The orchids of British fields are all of terrestrial habit, and their roots are mostly tuberous (fig. 6), the tubers being partly radical partly budlike in their character. There is often a marked alternation in the production of vegetative and flowering shoots respectively; and, sometimes, from various circumstances, the flowering shoots are not produced for several years in succession. This fact will account for the profusion with which some orchids, like the common bee orchis for instance, are found in some seasons and their scarcity in others. Tropical orchids are mostly epiphytal—that is, they grow upon trees without deriving nourishment from them. They are frequently provided with "pseudo-bulbs," large solid swellings of the stem, in the tissues of which water and nutritive materials are stored. They derive this moisture from the air by means of aerial roots, developed from the stem and bearing an outer spongy structure, or *velamen*, consisting of empty cells kept open by spiral thickenings in the wall; this sponge-like tissue absorbs dew and rain and condenses the moisture of the air and passes it on to the internal tissues.

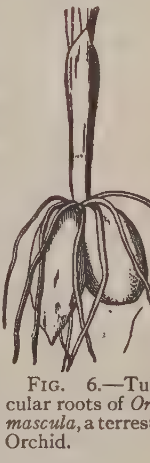
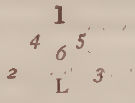


FIG. 6.—Tubercular roots of *Orchis mascula*, a terrestrial Orchid.

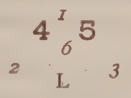
The number of species of orchids is greater than that of any other monocotyledonous order—not even excepting grasses—amounting to 6000, contained in 400 genera. This large number is partly accounted for by the diligent search in all countries that has been made for these plants for purposes of cultivation—they being held at present in the greatest esteem by plant-lovers, and prices being paid for new or rare varieties which recall the days of the tulipomania.

The economic uses of orchids are not remarkable. When we have mentioned vanilla (*q.v.*), which consists of the fleshy pods of an orchid, we have mentioned about the only economic product that now comes into market. *Salep* (*q.v.*), still used in the Levant, consists of the dried tubers of a terrestrial orchid, and contains a relatively large amount of nutritious matter. The cultivation of orchids is treated under HORTICULTURE.

The order is divided into two main groups based on the number of the stamens and stigmas. The first Diandreae, has two or rarely three fertile stamens and three functional stigmas. It contains two small genera of tropical Asia and Africa with almost regular flowers, and the large genus *Cypripedium* containing about 80 species in the north-temperate zone and tropical Asia and America. In *Cypripedium* two stamens are present, one on each side of the column instead of one only at the top, as in the group Monandreae, to which belong the remaining genera in which also only two stigmas are fertile. What may be considered the normal number of stamens is, as has been said, six, arranged in two rows. In most orchids the only stamen developed to maturity is the posterior one of the three opposite to the lip (anterior before the twisting of the ovary), the other two, as well as all three inner ones, being entirely absent, or present only in the form of rudiments. In *Cypripedium* two of the outer stamens are wanting; the third—the one, that is, which corresponds to the single fertile stamen in the Monandreae—forms a large sterile structure or staminode; the two lateral ones of the inner series are present, the third being undeveloped. This arrangement may be understood by reference to the following diagram, representing the relative position of the stamens in orchids generally and in *Cypripedium*. The letter L indicates the position of the labellum; the large figures indicate the developed stamens; the italic figures show the position of the suppressed stamens.



Arrangement of stamens in *Orchis*.



Arrangement of stamens in *Cypripedium*.

The Monandreae have been subdivided into twenty-eight tribes, the characters of which are based on the structure of the anther and pollinia, the nature of the inflorescence, whether terminal or lateral, the vernation of the leaf and the presence or absence of a joint between blade and sheath, and the nature of the stem. The most important are the following:

Ophrydineae, with about 45 genera, of terrestrial orchids, mainly north temperate, including the British genera *Orchis*, *Aceras*, *Ophrys*, *Herminium*, *Gymnadenia* and *Habenaria*. Also some genera mainly represented in South and tropical Africa, such as *Satyrium*, *Disa* and others.

Neottiineae, including 90 genera, also terrestrial, contains thirteen more or less widely distributed tropical or subtropical subtribes, some of which extend into temperate zones; one, *Cephalanthereae*, which includes our British genera *Cephalanthera* and *Epipactis* is chiefly north temperate. The British genera *Spiranthes*, *Listera* and *Neottia* are also included in this tribe, as is also *Vanilla*, the elongated stem of which climbs by means of tendril-like aerial roots—the long fleshy pod is the vanilla used for flavouring.

Coelogyninae, 7 genera, mostly epiphytes, and inhabitants of tropical Asia. A single internode of each shoot is swollen to form a pseudobulb.

Liparidinae, 9 genera, terrestrial, two, *Malaxis* and *Corallorhiza*, are British. *Liparis* is a large genus widely distributed in the tropics.

Pleurothallidinae, characterized by a thin stem bearing one leaf which separates at a distinct joint; the sepals are usually much larger than the petals and lip. Includes 10 genera, natives of tropical America, one of which, *Pleurothallis*, contains about 400 species. *Masdevallia* is common in cultivation and has often brilliant scarlet, crimson or orange flowers.

Laeliinae, with 22 genera, natives of the warmer parts of America, including three of those best known in cultivation, *Epidendrum*, *Cattleya* and *Laelia*. The jointed leaves are fleshy or leathery; the flowers are generally large with a well-developed lip.

Phajinae, includes 15 genera chiefly tropical Asiatic, some—*Phajus* and *Calanthe*—spreading northwards into China and Japan.

Cystopodiinae, includes 9 genera tropical, but extending into north temperate Asia and South Africa; *Eulophia* and *Lissochilus* are important African genera.

Catasetinae, with three tropical American genera, two of which, *Catasetum* and *Cycnoches*, have di- or tri-morphic flowers. They are cultivated for their strange-looking flowers.

Dendrobiinae, with six genera in the warmer parts of the Old World; the chief is *Dendrobium*, with 300 species, often with showy flowers.

Cymbidiinae, with 8 genera in the tropics of the Old World. The leaves are generally long and narrow. *Cymbidium* is well known in cultivation.

Oncidiinae, with 44 genera in the warmer parts of America. *Odontoglossum* and *Oncidium* include some of the best-known cultivated orchids.

Sarcanthinae, with 42 genera in the tropics. *Vanda* (Asia) and *Angraecum* (Africa and Madagascar) are known in cultivation. The flower of *Angraecum sesquipedale* has a spur 18 in. in length.

The order is well represented in Britain by 18 genera, which include several species of *Orchis*:—*Gymnadenia* (fragrant orchis), *Habenaria* (butterfly and frog orchis), *Aceras* (man orchis), *Herminium* (musk orchis), *Ophrys* (bee, spider and fly orchis), *Epipactis* (Helleborine), *Cephalanthera*, *Neottia* (bird's-nest orchis), one of the few saprophytic genera, which have no green leaves, but derive their nourishment from decaying organic matter in the soil, *Listera* (Tway blade), *Spiranthes* (lady's tresses), *Malaxis* (bog-orchis), *Liparis* (fen-orchis), *Corallorhiza* (coral root), also a saprophyte, and *Cypripedium* (lady's slipper), represented by a single species now very rare in limestone districts in the north of England.

ORCHOMENUS (local form on coins and inscriptions, *Erchomenos*), the name borne by two cities of ancient Greece.

1. A Boeotian city, situated in an angle between the Cephissus and its tributary the Melas, on a long narrow hill which projects south from Mount Acontium. Its position is exceedingly strong, being defended on every side by precipice or marsh or river, and it was admirably situated to be the stronghold of an early kingdom. The acropolis is at the north end of the hill, on a peak which is overhung by Acontium, but at a distance sufficient to be safe from an enemy with the weapons of early warfare posted on the mountain. At the foot of the acropolis are the springs of the Melas.

In prehistoric times Orchomenus, as is proved alike by archaeological finds and by an extensive cycle of legends, was one of the most prosperous towns of Greece. It was at once a continental and a maritime power. On the mainland it controlled the greater part of Boeotia and drew its riches from the fertile lowlands of Lake Copaïs, upon the drainage of which the early kings of Orchomenus bestowed great care. Its maritime connexions have not been as yet determined, but it is clear that its original inhabitants, the Minyae, were a seafaring nation, and in historical times Orchomenus remained a member of the Calaurian League of naval states. At the end of the second millennium the Minyae were more or less supplanted by the incoming stock of Boeotians. Henceforth Orchomenus no longer figures as a great commercial state, and its political supremacy in Boeotia passed now, if not previously, to the people of Thebes. Nevertheless, owing perhaps to its strong military position, it long continued to exercise some sort of overlordship over other towns of northern Boeotia, and maintained an independent attitude within the Boeotian League. In 447 it served as the headquarters of the oligarchic exiles who freed Boeotia from Athenian control. In the 4th century Orchomenus was actuated throughout by an anti-Theban policy, which may have been nothing more than a recrudescence of old-time rivalry, but seems chiefly inspired by aversion to the newly established democracy at Thebes. In the Corinthian War the city supported Lysander and Agesilaus in their attacks upon Thebes, and when war was renewed between the Thebans and Spartans in 379 Orchomenus again sided with the latter. After the battle of Leuctra it was left at the mercy of the Thebans, who first, on Epaminondas's advice, readmitted it into the Boeotian League, but in 368 destroyed the town and exterminated or enslaved its people. By 353 Orchomenus had been rebuilt, probably by the Phocians, who used it as a bulwark against Thebes. After the subjection of the Phocians in 346 it was again razed by the Thebans, but was restored by Philip of Macedon as a check upon the latter (338). Orchomenus springs into prominence once again in 85 B.C., when it provided the battle-field on which the Roman general Sulla destroyed an army of Mithradates VI. of Pontus. Apart from this event its later history is obscure, and its decadence is further attested by the neglectful drainage of the plain and the consequent encroachments of Lake Copaïs. Since medieval times the site has been occupied by a village named Skripou. Since 1867 drainage operations have been resumed, and the land thus reclaimed has been divided into small holdings. The most remarkable relic of the early power of Orchomenus is the so-called "treasury" (of "Minyas") which resembles the buildings of similar style at Mycenae (see MYCENAE), and is almost exactly the same size as the treasury of Atreus. The admiration which Pausanias expresses for it is justified by the beautiful ornamentation, especially of the roof, which has been brought to light by Schliemann's excavations in the inner chamber opening out of the circular vaulted tomb. The monument, undoubtedly the tomb of some ancient ruler, or of a dynasty, lies outside the city walls. Other remains of early date have been found upon this site.

The worship of the Charites (see GRACES) was the great cultus of Orchomenus, and the site of the temple is now occupied by a chapel, the *Κοίμησις τῆς Παναγίας*. The Charites were worshipped under the form of rude stones, which had fallen from heaven during the reign of Eteocles; and it was not till the time of Pausanias that statues of the goddesses were placed in the temple. Near this was another temple dedicated to Dionysus, in whose festival, the *Ἀγριώνια*, are apparent the traces of human sacrifice in early times (see AGRIONIA).

See Strabo viii. p. 374, ix. pp. 407, 414-416; Pausanias ix. 34-38; Thucydides i. 12, iv. 76; Xenophon, *Hellenica*, iii. 5, iv. 3, vi. 4; Diodorus xv., xvi.; Plutarch, *Sulla*, chs. 30-31; K. O. Müller, *Orchomenos und die Minyer* (Breslau, 1844); B. V. Head, *Historia numorum* (Oxford, 1877), pp. 293-294; *Journal of Hellenic Studies*, vol. ii. pls. xii., xiii.

2. An Arcadian city, situated in a district of the same name, north of Mantineia and west of Stymphalus. The district was mountainous, but embraced two valleys—the northern containing a lake which is drained, like all Arcadian lakes, by a *katavothron*; the southern lying under the city, separated from Mantineia by a mountain ridge called Anchisia. The old city occupied a strong and lofty situation; in the time of Strabo it was a ruin, but Pausanias mentions that a new town was built below the old. A primitive wooden image of Artemis Cedreatis stood in a large cedar tree outside the city. Orchomenus is mentioned in the Homeric catalogue with the epithet *πολύμηλος*.

In early history Orchomenus figures as a town of some importance, for its kings until the late 7th century B.C. held some sort of sovereignty over all Arcadia. In the 5th century it was overshadowed by its southern neighbour Mantineia, with whom it is henceforth generally found to be at variance. In 418 B.C. Orchomenus fell for a time into the hands of the Mantineians; in 370 it held aloof from the new Arcadian League which the Mantineians were organizing. About this time it further declined in importance through the loss of some possessions on the east Arcadian watershed to the new Arcadian capital Megalopolis. In the 3rd century Orchomenus belonged in turn to the Aetolian League, to the Lacedaemonians, and, since 222, to the Achaean League. Though a fairly extensive settlement still existed on the site in the 2nd century A.D., its history under the Roman rule is quite obscure.

See Pausanias, viii. chs. 5, 11-13, 27; B. V. Head, *Historia numorum* (Oxford, 1887), pp. 377-378.

ORCIN, a dioxytoluene, $C_6H_3(CH_3)(OH)_2$ (1 : 3 : 5), found in many lichens, *e.g. Rocella tinctoria, Lecanora*, and formed by fusing extract of aloes with potash. It may be synthesized from toluene; more interesting is its production when acetone dicarboxylic ester is condensed with the aid of sodium. It crystallizes in colourless prisms with one molecule of water, which redden on exposure. Ferric chloride gives a bluish-violet coloration with the aqueous solution. Unlike resorcin it does not give a fluorescein with phthalic anhydride. Oxidation of the ammoniacal solution gives *orcein*, $C_{28}H_{24}N_2O_7$, the chief constituent of the natural dye archil (*q.v.*). Homo-pyrocatechin is an isomer ($CH_3 : OH : OH = 1 : 3 : 4$), found as its methyl ether (creosol) in beech-wood tar.

ORDEAL (O.Eng. *ordal*, *ordael*, judgment), a term corresponding to modern Ger. *Urteil*, but bearing the special sense of the medieval Lat. *Dei judicium*, a miraculous decision as to the truth of an accusation or claim. The word is adopted in the late Lat. *ordalium*, Fr. *ordalie*. The ordeal had existed for many ages before it was thus named in Europe. In principle, and often in the very forms used, it belongs to ancient culture, thence flourishing up to the medieval European and modern Asiatic levels, but dying out before modern civilization. Some ordeals, which possibly represent early stages of the practice, are simply magical, being processes of divination turned to legal purpose. Thus in Burma suits are still determined by plaintiff and defendant being each furnished with a candle, equal in size and both lighted at once—he whose candle outlasts the other being adjudged, amid the acclamations of his friends, to have won his cause (Shway Yoe, *The Burman*, ii. 254). Even quainter is a Dyak ordeal in Borneo, where the two parties are represented by two shell-fish on a plate, which are irritated by pouring on some lime-juice, and the one first moving settles the guilt or innocence (as has been before arranged) of its owner (St John, *Forests of the Far East*, i. 89). The administration of ordeals has been much in the hands of priests, and they are more often than not worked on a theological basis, the intervention of a deity being invoked and assumed to take place even when the process is in its nature one of symbolic magic. For instance, an ancient divining instrument consisted of a sieve held suspended by a thread or by a pair of shears with the points stuck into its rim, and considered to move at the mention of the name to be discovered, &c. Thus girls consulted the "sieve-witch" (*κοσκινόμαντις*) about lovers (Theocr., *Idyll.* iii. 31). This *coscinomancy* served in the same way to discover a thief, when, with prayer to the gods for direction, the names of the suspected persons were called over to it (Potter, *Greek Antiquities*, i. 352). When a suspended hatchet was used in the same way to turn to the guilty, the process was called *axinomancy*. The sieve-ordeal remained popular in the middle ages (see the description and picture in Cornelius Agrippa, *De Occ. Phil.*); it is mentioned in Hudibras (ii. 3):

> ". . . th' oracle of sieve and shears
> That turns as certain as the spheres."

From this ancient ordeal is evidently derived the modern Christian form of the key and Bible, where a Psalter or Bible is suspended by a key tied in at Psalm l. 18: "When thou sawest a thief, then thou consentedst with him"; the bow of the key being balanced on the fingers, and the names of those suspected being called over, he or she at whose name the book turns or falls is the culprit (see Brand, *Popular Antiquities*, ed. Bohn, iii. 351).

One of the most remarkable groups of divinations passing into ordeals are those which appeal to the corpse itself for discovery of its murderer. The idea is rooted in that primitive state of mind which has not yet realized the full effect of death, but regards the body as still able to hear and act. Thus the natives of Australia will ask the dead man carried on his bier of boughs, who bewitched him; if he has died by witchcraft he will make the bier move round, and if the sorcerer who killed him be present a bough will touch him (Eyre, *Australia*, ii. 344). That this is no isolated fancy is shown by its recurrence among the negroes of Africa, where, for instance, the corpse causes its bearers to dash against some one's house, which accuses the owner of the murder (J. L. Wilson, *Western Africa*, p. 231; Waitz, ii. 193). This somewhat resembles the well-known ordeal of the bier in Europe in the middle ages, which, however, seems founded on a different principle, the imagination that a sympathetic action of the blood causes it to flow at the touch or neighbourhood of the murderer. Apparently the liquefaction of the blood which in certain cases takes place after death may have furnished the ground for this belief. On Teutonic ground, this ordeal appears in the *Nibelungenlied*, where the murdered Siegfried is laid on his bier, and Hagen is called on to prove his innocence by going to the corpse, but at his approach the dead chief's wounds bleed afresh. The typical instance in English history is the passage of Matthew Paris, that after Henry II.'s death at Chinon his son Richard came to view the body, "Quo superveniente, confestim erupit sanguis ex naribus regis mortui; ac si indignaretur spiritus in adventu ejus, qui ejusdem mortis causa esse credebatur, ut videretur sanguis clamare ad Deum." In Shakespeare (*Rich. III.*, act 1, sc. 2):

> "O gentlemen, see, see! dead Henry's wounds
> Open their congeal'd mouths, and bleed afresh!"

At Hertford assizes (1628) the deposition was taken as to certain suspected murderers being required to touch the corpse, when the murdered woman thrust out the ring finger three times and it dropped blood on the grass (Brand, iii. 231); and there was a case in the Scottish High Court of Justiciary as late as 1668 (T. F. Thiselton Dyer, *Folklore of Shakespeare*, p. 487). Durham peasants, apparently remembering the old belief, still expect those who come to look at a corpse to touch it, in token that they bear no ill-will to the departed (W. Henderson, *Folklore of Northern Counties*, p. 57).

Certain ordeals are closely related to oaths, so that the two shade into one another. Let the curse which is to fall on the oath-breaker take effect at once, it then becomes a sign condemning the swearer— in fact, an ordeal. Thus the drinking of water on which a curse or magical penalty has been laid is a mere oath so long as the time of fulfilment is unfixed (see OATH). But it becomes an ordeal when, as in Brahmanic India, the accused drinks three handfuls of water in which a sacred image has been dipped; if he is innocent nothing happens, but if he is guilty sickness or misfortune will fall on him within one to three weeks (for accounts of these and other Hindu ordeals see Ali Ibrahim Khan in *Asiatic Researches*, i. 389, and Stenzler's summary in *Z. D. M. G.*, vol. ix.). The earliest account of such an ordeal is in Numbers v., which describes the mode of administering to a woman charged with unfaithfulness the bitter water mixed with the dust of the tabernacle floor, with the curse laid on it to cause her belly to swell and her thigh to fall if guilty. Ewald (*Antiquities of Israel*, 236) regards the draught as in itself harmless, and the operation of this curse on the guilty as due to the influence of the mind on the body. But the term "bitter" is applied to the water before it has been cursed, which suggests that it already contained some drug, as in the poison-water ordeal still in constant use over a great part of Africa. Thus the red water of Guinea is a decoction made by pounding in a wooden mortar and steeping in water the inner bark of one of the mimosas, producing a liquor like that of a tan-vat, astringent, narcotic, and when taken in sufficient quantity emetic. The accused, with solemn ceremony and invocation, drinks freely of it; if it nauseates him and he throws it up he is triumphantly acquitted, but if he becomes dizzy he is guilty, and the assembly fall on him, pelt him with stones and even drag him over the rocks till he is dead. Here the result of the ordeal depends partly on the patient's constitution, but more on the sorcerer who can prepare the proper dose to prove either guilt or innocence. Among the various drugs used in different parts of Africa are the *mbundu* root, the Calabar bean, the tangena nut (*Tanghinia veneniflua*, a strong poison and emetic). The sorcerers who administer this ordeal have in their hands a power of inflicting or remitting judicial murder, giving them boundless influence (details in J. L. Wilson, *Western Africa*, pp. 225, 398; Burton, *Lake Regions of Central Africa*, ii. 357; Bosman, "Guinea," in *Pinkerton's Voyages*, xvi. 398, &c.). The poison-ordeal is also known to Brahmanic law, decoction of aconite root being one of the poisons given, and the accused if not sickening being declared free (Stenzler, *l.c.*). Theoretically connected with the ordeal by cursed drink is that by cursed food, which is, however, distinguished among this black catalogue by being sometimes an effectual means of discovering the truth. The ordeal by bread and cheese, practised in Alexandria about the 2nd century, was practically the same as that known to English law five to ten centuries later as the *corsnaed* or "trial slice" of consecrated bread and cheese which was administered from the altar, with the curse that if the accused were guilty God would send the angel Gabriel to stop his throat, that he might not be able to swallow that bread and cheese. In fact, if guilty and not a hardened offender he was apt to fail, dry-mouthed and choking through terror, to get it down. The remembrance of this ancient ordeal still lingers in the popular phrase, "May this bit choke me if I lie!" In India the corresponding trial by rice is prescribed in the old laws to be done by suspected persons chewing the consecrated grains of rice and spitting them out, moist and untinged with blood, on a banyan leaf; this or the mere chewing and swallowing of a mouthful of rice-grains is often used even by the English as a means of detecting a thief. A classical mention of the ordeals by carrying hot iron in the hands and by passing through the fire is made more interesting by the guards who offer to prove their innocence in this way offering further to take oath by the gods, which shows the intimate connexion between oaths and ordeals (Soph., *Ant.* 264, see also Aeschyl., *fr.* 284).

> *ἦμεν δ' ἕτοιμοι καὶ μύδρους αἴρειν χεροῖν*
> *καὶ πῦρ διέρπειν, καὶ θεοὺς ὁρκωμοτεῖν*
> *τὸ μήτε δρᾶσαι μήτε τῷ ξυνειδέναι*
> *τὸ πρᾶγμα βουλεύσαντι μήτ' εἰργασμένω.*

The passing through the fire is described in the Hindu codes of Yâjnavalkya and others, and is an incident in Hindu poetry, where in the *Râmâyana* the virtuous Sitâ thus proves her innocence to her jealous husband Râma (Stenzler, p. 669; Pictet, *Origines Indo-Européennes*, part ii. p. 457). It was not less known to European law and chronicle, as where Richardis, wife of Charles the Fat, proves her innocence by going into a fire clothed in a waxed shift, and is unhurt by the fire (Grimm, *Deutsche Rechtsalterthümer*, p. 912). Yet more minutely prescribed in the Hindu ordeal-books is the rite of carrying the glowing hot iron seven steps, into the seven or nine circles traced on the ground, the examination of the hands to see if they show traces of burning, and the binding them up in leaves. The close historical connexion of the Hindu ordeal laws with the old European is shown by the correspondence of minute details, as where in a Scandinavian law it is prescribed that the red-hot iron shall be carried nine steps (*Grimm, op. cit.*, p. 918). In Anglo-Saxon laws the iron to be carried was at first only one pound weight, but Athelstan's law (in *Ancient Laws and Institutes of England*, iv. 6) enacts that it be increased to weigh three pounds. Another form well known in old Germany and England was the walking barefoot over glowing ploughshares, generally nine. The law-codes of the early middle ages show this as an ordinary criminal procedure (see the two works last referred to), but it is perhaps best remembered in two non-historical legends. The German queen Kunigunde, "haec dicens stupentibus et flentibus universis qui aderant, vomeres candentes nudo vestigio calcavit et sine adustionis molestia transiit" (*Vista Henrici*, ap. Canisium, vi. 387). Queen Emma, mother of Edward the Confessor, accused of familiarity with Alwyn bishop of Winchester, triumphantly purges herself and him by the help of St Swithin—each of the two thus acquitted giving nine manors to the church of Winchester, in memory of the nine ploughshares, and the king being corrected with stripes (John Bromton, see Freeman's *Norm. Conq.*, vol. ii. App.). To dip the hand in boiling water or oil or melted lead and take out a stone or ring is another ordeal of this class. The traveller may find some of these fiery trials still in use, or at least in recent memory, in barbaric regions of Africa or further Asia—the negro plunging his arm into the caldron of boiling oil, the Burman doing feats with melted lead, while the Bedouin will settle a conflict of evidence by the opposing witnesses licking a glowing hot-iron spoon (Burckhardt, *Arabien*, pp. 98, 233). This latter feat may be done with safety by any one, provided the iron be clean and thoroughly white hot, while if only red-hot it would touch and burn the tongue. Probably the administerers of the ordeal are aware of this, and of the possibility of dipping the hand in melted metal; and there are stories of arts of protecting the skin (see the recipe in Albertus Magnus, *De Mirabilibus*), though it is not known what can be really done beyond making it horny like a smith's, which would serve as a defence in stepping on hot coals, but not in serious trials like that of carrying a heavy red-hot iron. The fire-ordeals are still performed by mountebanks, who very likely keep up the same means of trickery which were in official use when the accused was to be acquitted. The actual practice of the fire-ordeal contrasts shamefully with its theory, that the fire rather than harm the innocent restrained its natural action. Thus it stands in the Hindu code of Manu (viii. 115): " He whom the flame does not burn, whom the water does not cast up, or whom no harm soon befals, is to be taken as truthful in his oath." The water-ordeal here referred to is that well known in Europe, where the accused is thrown bound into the water, which receives him if innocent, but rejects him if guilty. The manner of carrying out this test is well explained in the directions given by Archbishop Hincmar in the 9th century: he who is let down into the water for trial is to be fastened by a rope, that he may not be in danger if the water receives him as innocent, but may be pulled out. In the later middle ages this ordeal by " swimming " or " fleeting " became the most approved means of trying a suspected witch: she was stripped naked and cross bound, the right thumb to the left toe, and the left thumb to the right toe. In this state she was cast into a pond or river, in which it was thought impossible for her to sink (Brand iii. 21). The cases of " ducking " witches which have occurred in England within the last few years are remains of the ancient ordeal.

If there is one thing that may be predicated of man in a state of nature it is that two disputants tend to fight out their quarrel. When in the warfare of Greeks and Trojans, of Jews and Philistines, of Vandals and Alamans, heroes come out from the two sides and their combat is taken to mark the powers of the opposing war-gods and decide the victory, then the principle of the ordeal by battle has been practically called in. Among striking instances of the Teutonic custom which influenced the whole of medieval Europe may be cited the custom of the Franks that the princes, if they could not quell the strife, had to fight it out between themselves, and Wipo's account of the quarrel between the Christian Saxons and the Pagan Slavs as to which broke the peace, when both sides demanded of the emperor that it should be settled by duel, which was done by choosing a champion on each side, and the Christian fell. The Scandinavian term " holmgang " refers to the habit of fighting duels on an island. A passage from old German law shows the single combat accepted as a regular legal procedure: " If there be dispute concerning fields, vineyards, or money, that they avoid perjury let two be chosen to fight, and decide the cause by duel " (Grimm, *Rechtsaltert.*, p. 928). In England, after the Conquest, trial by combat superseded other legal ordeals, which were abolished in the time of Henry III. Among famous instances is that of Henry de Essex, hereditary standard-bearer of England, who fled from a battle in Wales, in 1158, threw from him the royal standard, and cried out that the king was slain. Robert de Montfort afterwards, accusing him of having done this with treasonable intent, offered to prove his accusation by combat, and they fought in presence of Henry II. and his court, when Essex was defeated, but the king spared his life, and, his estate being confiscated, he became a monk in Reading Abbey. A lord often sent his man in his stead to such combats, and priests and women were ordinarily represented by champions. The wager of battle died out so quietly in England without being legally abolished that in the court of king's bench in 1818 it was claimed by a person charged with murder, which led to its formal abolition (*Ashford* v. *Thornton* in Barnewall and Alderson 457; see details in H. C. Lea, *Superstition and Force*, ii.). A distinct connexion may, however, be traced between the legal duel and the illegal private duel, which has disappeared from England, but still flourishes in France and Germany (see DUEL). (E. B. T.)

ORDER (through Fr. *ordre*, for earlier *ordene*, from Lat. *ordo*, *ordinis*, rank, service, arrangement; the ultimate source is generally taken to be the root seen in Lat. *oriri*, rise, arise, begin; cf. " origin "), a row or series, hence grade, class or rank, succession, sequence or orderly arrangement; from these, the original meanings of *ordo*, have developed the numerous applications attached to the word, many, if not most, of which appear in classical and medieval Latin. In the sense of a class or body of persons or things united by some common status, rank or distinguishing characteristics, or as organized and living under some common rules and regulations, we find the term applied, in such expressions as " lower " or " higher orders," to the class divisions of society; to the various grades of persons exercising spiritual functions in the Christian church (see ORDER, HOLY, below); to the bodies of persons bound by vows to a religious life (see MONASTICISM, and separate articles on the chief religious orders); to the military and monastic fraternities of the middle ages, such as the Templars, Hospitallers, &c., and to those institutions, founded by sovereigns or states, in part imitation of these fraternities, which are conveniently divided into orders of knighthood, or orders of merit (see KNIGHTHOOD). The term " order " is thus used, in an easily transferred sense, for the various insignia, badge, star, collar, worn by the members of the institution. As applied to a group of objects, an " order " in zoological, botanical and mineral classification ranks next below a " class," and above a " family." The use of the word in architecture is treated in a separate article below.

The word has several technical mathematical usages. In number-theory it denotes a relative rank between the elements of an aggregate so that the collection becomes an ordered aggregate (see NUMBER). The *order of a plane curve* is the number of points (real or imaginary) in which the curve is intersected by a straight line; it is equal to the degree (or coefficient of the highest power) of the Cartesian equation expressing the curve. The *order of a non-plane curve* is the number of points (real or imaginary) in which the curve intersects a plane (see CURVE). The *order of a surface* is the number of points in which the surface intersects a straight line. For the order of a congruence and complex see SURFACE. The *order of a differential equation* is the degree of its highest differential coefficient (see DIFFERENTIAL EQUATION).

Another branch of the sense-development of the word starts from the meaning of orderly, systematic or proper arrangement, which appears in the simplest form in such adverbial expressions as " in order," " out of order " and the like. More particular instances are the use of the word for the customary procedure observed in the conduct of the business of a public meeting, or of parliamentary debates, and for the general maintenance and due observance of law and authority, " public order."

In liturgical use " order " is a special form of divine service prescribed by authority, *e.g.* the " Order of Confirmation," in the English Prayer Book.

The common use of " order " in the sense of a command, instruction or direction is a transference from that of arrangement in accordance with intention to the means for attaining it. It is a comparatively late sense-development; it does not appear in Latin, and the earliest quotations in the *New English Dictionary* are from the 16th century. Particular applications of the term are, in commercial usage, to a direction in writing to a banker or holder of money or goods, by the person in whom the legal right to them lies, to pay or hand over the same to a third person named or to his order. A bill or negotiable instrument made " payable to order " is one which can be negotiated by the payee by endorsement. At common law a negotiable instrument must contain words expressly authorizing transfer. By the Bills of Exchange Act 1882, § 8, " a bill is payable to order which is expressed to be so payable, or which is expressed to be payable to a particular person, and does not contain words prohibiting transfer or indicating an intention that it should not be transferable." Other applications are to a direction for the supply of goods and to a pass for free admission to a place of amusement, a building, &c.

In law an " order of the court " is a judicial direction on matters outside the record; as laid down by Esher, M.R., in *Onslow* v. *Inland Revenue*, 59, L.J.Q.B. 556, a " judgment " is a decision obtained in an action and every other decision is an " order." For " Order in Council " see below.

ORDER, in classic architecture the term employed (Lat. *genus*, Ital. *ordine*, Sp. *order*, Ger. *Ordnung*) to distinguish the varieties of column and entablature which were employed by the Greeks and Romans in their temples and public buildings. The first attempt to classify the architectural orders was made by Vitruvius, who, to those found in Greek buildings, viz. the Doric, Ionic and Corinthian, added a fourth, the Tuscan. On the revival of classic art in Italy, the revivalists translated Vitruvius's work *De Architectura*, and added a fifth example, the Composite, so that nominally there are five orders. The Tuscan, however, is only an undeveloped and crude modification of the Doric order, and the Composite is the same as the Corinthian with the exception of the capital, in which the volutes of the Ionic order were placed above the acanthus leaves of the Corinthian.

An order in architecture consists of several parts, constructive in their origin, but, as employed afterwards, partly constructive and partly decorative; its principal features are the column, consisting of base (except in the Greek Doric order), shaft and capital, and the entablature, subdivided into the architrave (the supporting member), the frieze (the decorative member) and the cornice (the crowning and protecting member). Two only of the orders were independently evolved, viz. the Doric in Greece and Magna Grecia, and the Ionic in Ionia. For the Corinthian order, the Greeks borrowed with slight variations the entablature for their Ionic order, and the Romans employed this modified entablature for their Composite order. Owing to a certain resemblance in form, it was at one time thought that the Greeks owed the origin of the Doric order to Egypt, but the Egyptian column has no echinus under its abacus, which in the earliest Doric examples is an extremely important element in its design, owing to its great size and projection; moreover, the Doric column ceased to be employed in Egypt after the XIXth Dynasty, some seven or eight centuries before the first Greek colony was established there. Dr Arthur Evans's discoveries in the palace of Cnossus in Crete have shown that the earliest type of the Doric column (*c.* 1500 B.C.) is that painted in a fresco which represents the façades of three temples or shrines, the truth of this representation being borne out by actual remains in the palace; the columns were in timber, tapered from the top downwards, and were crowned by a projecting abacus supported by a large torus moulding, probably moulded in stucco. The next examples of the order are those in stone, which flank the entrance doorway of the tomb of Agamemnon at Mycenae (*c.* 1200 B.C.), the greater portions of which are now set up in the British Museum; and here both capital and shaft are richly decorated with the chevron pattern, probably derived from the metal plates which in Homeric times sheathed the wood columns. The columns of the Mycenae tombs are semi-detached only, and of very slender proportions, averaging 10 to 11 diameters in height; as isolated columns, therefore, they would have been incapable of carrying any weight, so that in the next examples known, those of the temple at Corinth, where the columns had to carry an entablature in stone supporting a stone ceiling over the peristyle, the relation of diameter to height is nearly one to four, so diffident were the Greek architects as to the bearing power of the stone. In the temple of Apollo at Syracuse, also a very archaic example, the projection of the capital was so great that the abaci nearly touched one another, and the columns are less than one diameter apart. The subsequent development which took place was in the lightening of the column and the introduction of many refinements, so that in the most perfected example known, the Parthenon, the columns are 1¼ diameters apart and nearly 5½ diameters high. In a somewhat later example, the temple of the Nemaean Zeus (Argos) the columns are 6½ diameters high. A similar lightening of the structure took place in the entablature, which in the earliest temple in Sicily is about half the height of the columns, in the Parthenon less than a third, and in the Temple of the Nemaean Zeus a little over a fourth.

The origin of the Ionic order is not so clear, and it cannot be traced beyond the remains of the archaic temple of Diana at Ephesus (*c.* 560 B.C.), now in the British Museum, in which the capitals and the lower drum of the shaft enriched with sculpture in their design and execution suggest many centuries of development. Here again attempts have been made to trace the source to Egypt, but the volute capital of the archaic temple of Diana at Ephesus and the decorative lotus bud of Egypt are entirely different in their form and object. The latter is purely decorative and vertical in its tendency, the former is a feature intended to carry a superincumbent weight, and is extended horizontally so as to perform the function of a bracket-capital, viz. to lessen the bearing of the architrave or beam which it carries. A similar constructive expedient is found in Persian work at Persepolis, which, however, dates about forty years later than the Ephesian work. The volutes of the capitals of the Lycian tombs are none of them older than the 4th century, being copies of Greek stone examples. As with the Doric order, the columns became more slender than at first, those of the archaic temple being probably between 6 and 7 diameters high, of the temple on the Ilissus (*c.* 450 B.C.) 8⅓, and of the temple of Athena Polias at Priene (*c.* 345 B.C.) over 10 diameters high.

The employment of the two orders in Athens simultaneously, and sometimes in the same building, led to a reciprocal influence one on the other: in the Doric order to an increased refinement in the contour of its mouldings, in the Ionic order to greater severity in treatment, more particularly in the bedmould, the members of which were reduced in number and simplified, the dentil course (which in Ionia was a very important feature) being dispensed with in the temple on the Ilissus and in that of Nike Apteros, and employed only in the caryatide portico of the Erechtheum. The capital of the Corinthian order, its only original feature, may have been derived from the Egyptian bell-capital, which was constantly employed there, even in Roman times; its decoration was, however, purely Greek, and would seem to have been based on the application to the bell of foliage and ornament derived from metallic forms. The inventor of the capital is said to have been Callimachus of Corinth, who was a craftsman in metal and designed the bronze lamp and its cover for the Erechtheum in Corinthian bronze, which may account for the origin and title of the capital. The earliest example of the Corinthian capital is that found at Bassae by Cockerell, dating from about 430 B.C., and the more perfected type is that of the Tholos of Epidaurus (400 B.C.).

Whilst the entablatures of the Doric and Ionic orders suggest their origin from timber construction, that of the Corinthian was simply borrowed from the Ionic order, and its subsequent development by the Romans affords the only instance of their improvement of a Greek order (so far as the independent treatment of it was concerned) by the further enrichment of the bedmould of the cornice, where the introduction of the modillion gave an increased support to the corona and was a finer crowning feature.

The Greek Doric order was not understood by the Romans, and was, with one or two exceptions, utilized by them only as a decorative feature in their theatres and amphitheatres, where in the form of semi-detached columns they formed divisions between the arches; the same course was taken with the Ionic order, which, however, would seem to have been employed largely in porticoes. On the other hand, the Corinthian order, in consequence of its rich decoration, appealed more to the Roman taste; moreover, all its faces were the same, and it could be employed in rectangular or in circular buildings without any difficulty. The earliest examples are found in the temple of Castor and Pollux at Cora, near Rome, which is Greek in the style of its carving, and in the portico of the Pantheon at Rome erected by Agrippa (27 B.C.), where the Roman order is fully developed. The next developments of the orders are those which followed the revival of classic architecture in the 16th century, and these were largely influenced by the discovery in 1456 of the manuscript of Vitruvius, an architect who flourished in the latter half of the 1st century B.C. In his work *De Architectura* he refers constantly to drawings which he had prepared to illustrate his descriptions; these, however, have never been found, so that the translators of his work put their own interpretation on his text and published woodcuts representing the Roman orders as defined by him. They did not, however, confine themselves to the actual remains, which in their day were in much better preservation than at present, but attempted to complete the orders by the addition of pedestals to the columns, which were not employed by the Greeks, and only under special conditions by the Romans; as, however, they are included in the two chief authorities on the subject, Palladio and Vignola, the text-book of the former being the standard in England, and that of the latter in France, the rules and proportions set forth in them for pedestals, as also for the employment of the superposing of the orders with arches between, will follow the analysis of the Greek and Roman orders.

The Greek Doric Order.—The Doric was the favourite order of the Greeks, and the one in which they introduced all their principal refinements; these were of so subtle a nature that until the site was cleared in 1837 their existence was not known, and the earlier explorers, though recognizing the extreme beauty of the proportions and some of the refinements, were unable to grasp the extent to which they were carried, and it was reserved for Penrose in 1846 to verify by micrometrical studies the theories put forward by Pennethorne and other authors. The whole structure of the Doric temple (which consisted of the columns, subdivided into shaft and capital, and the entablature, subdivided into architrave, frieze and cornice) rested on a platform of three steps, of which the upper step was the stylobate or column base (fig. 1). The tread and rise of the steps varied in accordance with the diameter of the column; in temples of great dimensions, therefore, supplementary steps were provided for access to the stylobate, or, as found in many temples, slight inclined planes. Resting on the stylobate was the shaft of the column, which was either monolithic or composed of frusta or drums. The shaft tapered as it rose, the diminution of the upper diameter being more pronounced in early examples, as in one of the temples at Selinus and in the great temple at Paestum. In the Parthenon at Athens the lower diameter is 6 ft. 3 in. and the upper 4 ft. 9 in., which gives a diminution slightly over one-quarter of the lower diameter. The shaft was always fluted, with two or three exceptions, where the temples were not completed, and there were usually twenty flutes. In two temples at Syracuse, the most ancient temple at Selinus, the temple at Assos, and the temple at Sunium there are only sixteen flutes; the flutes were elliptic in section and intersected with an arris. In order to correct an optical illusion, which arises in a diminishing shaft, a slight entasis or swelling in the centre was given, the greatest departure from the straight line being about one-third up the shaft. The shaft was crowned by the capital, the juncture of the two being marked by a groove (one in the Parthenon, but up to three in more ancient examples) known as the hypotrachelion. Above this the trachelion or necking curves over, constructing what is known as the apophyge up to the fillets, round the base of the echinus, which forms the transition to the square abacus. The varying curve of the echinus, from the earliest times down to the later examples, is shown in the article on mouldings. The relative proportions of the lower diameter and the height of the columns vary according to the date of the example, in the early examples the column being just on 4 diameters high, in the Parthenon nearly 5½ diameters, and in the Temple of Jupiter Nemaeus 6½ diameters high. The distance between the columns or intercolumniation varied also according to the date, that of the earliest examples in Sicily being about 1 diameter (that between the angle columns being always less), in the Parthenon in the proportion of 1 to 1·24, and in the temple at Argos as 1 to 1·53.

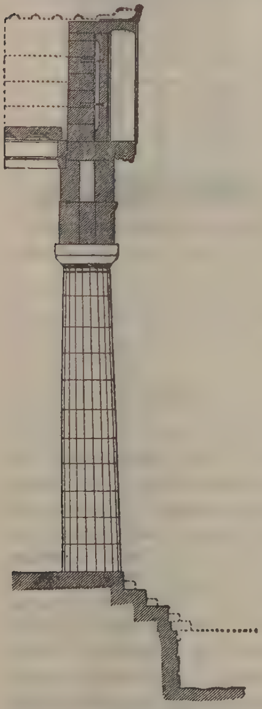


FIG. 1.—The Greek Doric Order. The Parthenon, Athens; section through front.

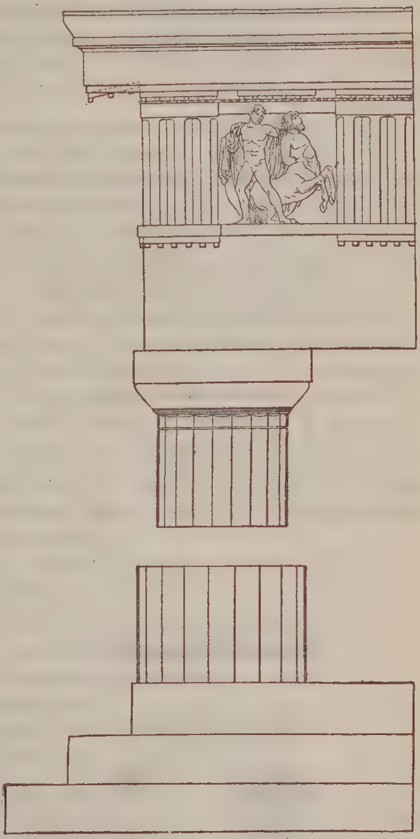


FIG. 2.—Greek Doric Order. The Parthenon, Athens.

Above the columns rested the entablature (fig. 2), of which the lower member, the architrave, was plain and crowned by a projecting fillet, known as the regula; under which, and below the triglyph, was a fillet (taenia), with six guttae underneath. The proportional height of the architrave, which was the chief supporting member, varied according to date, in one of the earliest examples at Syracuse being of greater depth than the diameter of the column, and in the Parthenon about two-thirds of the diameter. Above the architrave was the frieze, divided into triglyphs, so called because they are divided into three bands by two vertical grooves, and metopes or spaces between the triglyphs. It is supposed that the triglyphs represented the beams in the primitive cella before the peristyle was added, the spaces between being filled with shutters or boards to prevent the temple being entered by birds. The face of the metopes, which are nearly square, is set back behind that of the triglyphs, and is sometimes decorated with sculpture in high relief. There is generally one triglyph over each column and one between, but at each end of the temple there is a triglyph at the angle, so that the intercolumniation of the angle columns is less than that of the others, which gives a sense of increased strength. Above the frieze is the cornice, which projects forward about one-third of the diameter of the column and slopes downwards at an angle generally the same as the slope of the roof. On its under surface are mutules, one over each triglyph and one between, which are studded with guttae, probably representing the wood pins which secured the rafters in their position. Generally speaking, in the Doric temples there is no cymatium or gutter, and the rain fell directly off the roof; in order to prevent it trickling down there was an upper moulding, throated, with a bird's beak moulding behind and a second throating near the bottom, so that the corona had an upper fillet projecting, and a lower fillet receding, from its fascia plane. The roof itself was covered with tiles in terra-cotta or marble, which consisted of flat slabs with raised edges and covering tiles over the joints; the lower ends of the covering tiles were decorated with antefixae, and the top of the roof was protected by ridge tiles, on the top of which were sometimes additional antefixae placed parallel with the ridge tile. As the mouldings of the pediment were returned for a short distance along the side, there was a small cymatium or gutter with lions' heads, through the mouth of which the water ran. In the principal and rear front of the temple the lines of the cornice were repeated up the slope of the pediment, which coincided with that of the roof, and the tympanum, which they enclosed, was enriched with sculpture. On the centre of the pediment and at each end were pedestals (acroteria), on which figures, or conventional ornaments, were placed. Supplementary to the order at the back of the peristyle were antae, slightly projecting pilasters which terminated the walls of the pronaos; these had a small base, were of the same diameter from the top to the bottom, and had a simple moulded capital.

The Greek Ionic Order.—The Ionic order, like the Doric, owes its origin to timber prototypes, but varies in its features; the columns are more slender, being from 8 to 9 diameters high, with an intercolumniation of sometimes as much as 2 diameters; the architrave also is subdivided into three fascia, which suggests that in its origin it consisted of three beams superposed, in contradistinction to that of the Doric architrave, which consisted of a single beam. As in the Doric order, the Ionic temple rested on a stylobate of three steps (fig. 3). The columns consisted of base, shaft and capital. In the Ionic examples the base consisted of a torus moulding, fluted horizontally, beneath which were three double astragals divided by the scotia, sometimes, as in the temple at Priene, resting on a square plinth. In the Attic base employed in Athens, under the upper torus, which is either plain, fluted or carved with the guilloche, is a fillet and deep scotia, with a second torus underneath. The shaft tapers much less than in the Doric order; it has a slighter entasis, and is fluted, the flutes being elliptical in section but subdivided by fillets. The number of flutes is generally 24. The lower and upper parts of the shaft have an apophyge and a fillet, resting on the base in the former case and supporting the capital in the latter. The capital consists of an astragal, sometimes carved with the bead and reel, and an echinus moulding above enriched with the egg-and-dart, on which rests the capital with spiral volutes at each end, and from front to back with cushions which vary in design and enrichment. In the capitals of the angle columns the end volute is turned round on the diagonal, so as to present the same appearance on the front and the side; this results in an awkward arrangement at the back, where two half-volutes intersect one another at right angles. A small abacus, generally carved with ornament, crowns the capital. In early examples the channels between the fillets of the spiral are convex, in later examples concave. In the capitals of the Erechtheum (fig. 4), a greater richness is given by intermediary fillets. In all great examples the second fillet dips down in the centre of the front and a small anthemion ornament marks the receding of the echinus moulding, which is circular and sometimes nearly merged into the cushion. In the Erechtheum the enrichment of the capital is carried further in the necking, which is decorated with the anthemion and divided off from the upper part of the shaft by a bead and reel. The entablature is divided, like that of the Doric order, into architrave, frieze and cornice. The architrave is subdivided into three fasciae, the upper one projecting slightly beyond the lower, and crowned by small mouldings, the lower one sometimes carved with the Lesbian leaf. Above this is the frieze, sometimes plain and at other times enriched with figure sculpture in low relief. In the Ionian examples there was no frieze, its place being taken by dentils of great size and projection. The cornice consists of bedmould, corona and cymatium; in the Ionian examples the bedmould is of great richness, consisting of a lower moulding of egg-and-dart with bead and reel, a dentil course above, and another egg-and-dart with bead and reel above, sinking into the soffit of the corona, which projects in the Ionian examples more than half a diameter. The corona consists of a plain fascia with moulding and cymatium above, and as the cymatium or gutter is carried through from end to end of the temple it is provided with lions' heads to throw off the water, and sometimes enriched with the anthemion ornament. In the Attic examples much greater simplicity, ascribed to Dorian influence, is given to the bedmould, in which only the cyma-reversa with the Lesbian leaf carved on it and the bead and reel are retained. The mouldings of the cornice, including the cymatium, are carried up as a pediment, as in the Doric temple, and the roofs are similar. The base and capital of the antae are more elaborate than in those of the Doric order, and are sometimes, both in Ionic and Attic examples, richly carved with the Lesbian leaf and egg-and-dart, in both cases with the bead and reel underneath. The chief variation from the usual entablature is found in that of the caryatide portico of the Erechtheum, where the frieze is omitted, dentils are introduced in the bedmould, paterae are carved on the upper fascia of the architrave, and the covering was a flat marble roof. The caryatide figures, the drapery of which recalls the fluting of the columns, stood on a podium which enriched cornice and base.

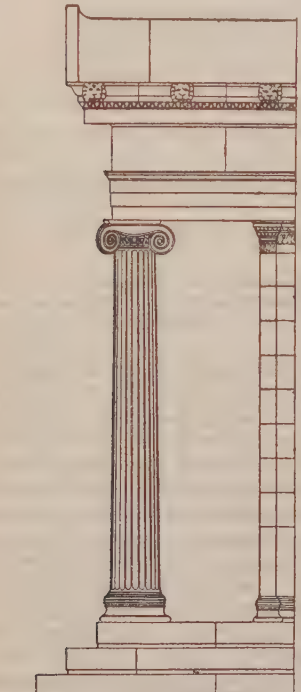


Fig. 3.—The Greek Ionic Order. Temple of Nike Apteros, Athens.

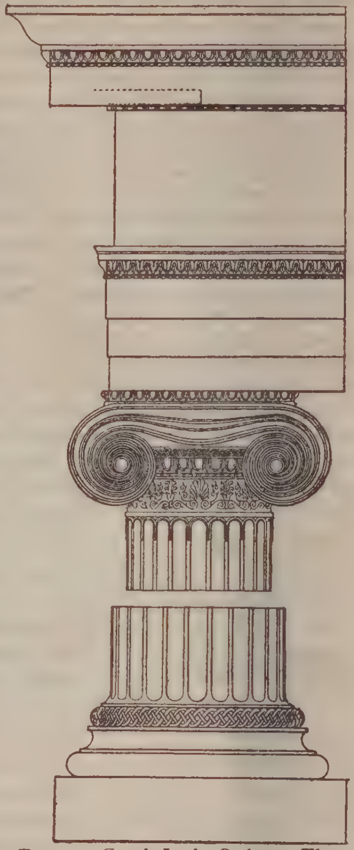


Fig. 4.—Greek Ionic Order. The Erechtheum, Athens.

The Greek Corinthian Order (fig. 5).—As the entablature of this order was adapted by the Greeks from that of the Ionic order, the capital only need be described, and its evolution from the earliest examples known, that in the temple at Bassae, to the fully developed type in the temple of Zeus Olympius at Athens, can be easily traced. It consisted of either a small range of leaves at the bottom, or of a bead-and-reel moulding, a bell decorated in various ways and a moulded abacus, the latter as a rule being concave in plan on each face and generally terminating in an arris or point. In the Bassae capital we find the first example of the spiral tendrils which rise up to and support the abacus with other spirals crossing to the centre and the acanthus leaf and flower. In the more perfected example of the Choragic monument of Lysicrates (fig. 6), there is a lower range of small leaves of some river plant, between which and the tops of the flutes (which here are turned over as leaves) is a sinking which was probably filled with a metal band. From the lower range of leaves spring eight acanthus leaves, bending forward at the top, with small flowers between, representing the heads of nails which in the metal prototype fastened these leaves to the bell; from the caulicolae, on the right and left, spring spiral tendrils rising to the angles under the abacus, and from the same caulicolae double spirals which cross to the centre of the bell, the upper ones carrying the anthemion flower, which rises across the abacus. The abacus in this capital has a deep scotia with fillet, and an echinus above, and is one of the few great examples in which the angles are canted. The architrave, frieze and cornice are adaptations from the Ionic order. The corona has in the place of the cymatium a cresting of antefixae, which is purely decorative, as there are no covering tiles, the roof of the monument being in one block of marble carved with leaves. Set back and on the same plane as the architrave and frieze is a second cresting with the Greek wave scroll. There are other types of Greek Corinthian capital, of which the finest example is in the interior of the Tholos at Epidaurus (*c.* 400 B.C.), with two rows of leaves round the lower part, angle and central spirals, and a flower in the centre of the abacus. Of other examples the capitals of the interior of the temple of Apollo Branchidae in Asia Minor, and of the vestibule at Eleusis, and of the two porches of the temple of the Winds at Athens, are the best known. Except for the pointed ends of the abacus, which are Greek, the capital of the temple of Zeus Olympius might almost be classed among the Roman examples, and it is thought to have been the model copied by the Romans from those which Sulla took to Rome for the temple of Jupiter Capitolinus.

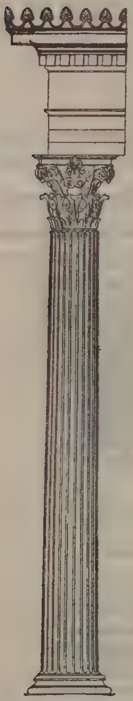


FIG. 5.—Greek Corinthian Order Choragic monument of Lysicrates.

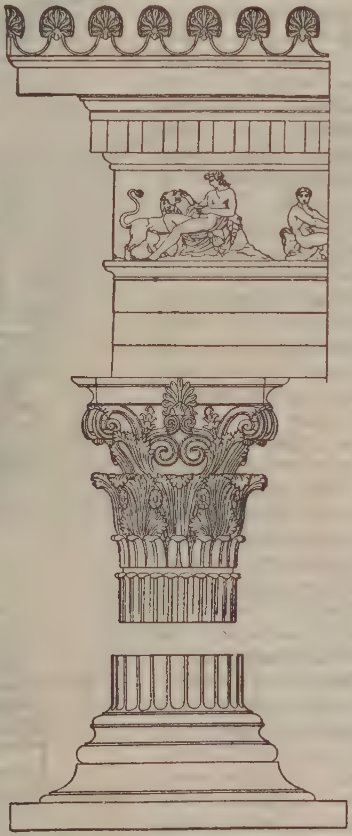


FIG. 6.

The Roman Doric Order.—The earliest example of this order is probably that of the temple at Cora, about 20 m. from Rome, attributed to Sulla (80 B.C.), in which the leading features of the Greek Doric order are employed, but extremely degraded in style. The temple was raised on a podium with a flight of steps in front; the shaft has 20 flutes and is carried on a small torus base, and the echinus of the capital is very poor. The architrave and triglyph-frieze are cut out of the same stone, the former being much too shallow to allow of its carrying the frieze and cornice. Two other early examples are those employed in the decoration of the arcades of the Tabularium and of the theatre of Marcellus (fig. 7); they are only semi-detached. The Doric order was not a favourite with the Romans, and did not appeal to their tastes for rich decoration; the only other examples known are those at Praeneste, at Albano, and in the thermae of Diocletian. At Albano the echinus of the capital is carved with the egg and anchor, and in the thermae a cyma-recta carved with a leaf ornament takes the place of the echinus. There is no base to any of these examples, the Albano base consisting only of an apophyge and fillet, and only the Diocletian example is fluted.

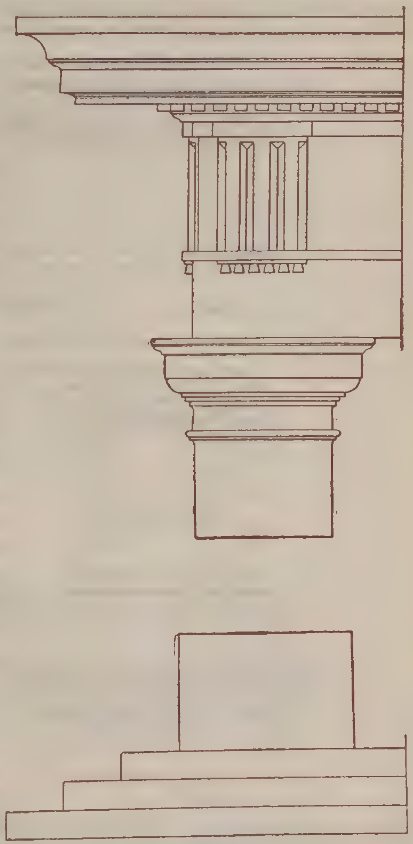


FIG. 7.

The Roman Ionic Order.—The complete degradation of the Ionic order is clearly shown in the so-called temple of Fortuna Virilis (ascribed to about 100 B.C.), in the profuse decoration of architrave, frieze and cornice with coarse ornament, and, in the capital, the raising of the echinus to the same level as the top of the second fillet of the volute, so that it is no longer visible under the cushion. The shaft has twenty flutes, the fillet being much wider than in the Greek examples, and the flute is semicircular. Much more refinement is shown in the order as employed on the upper storey of the theatre of Marcellus (fig. 8), where the only part enriched with ornament is in the egg and tongue of the bedmould. In the capital the fillet of the volute runs across above the echinus, and the canalis is stopped at each end over the volute, an original treatment. The most corrupt example of the Roman Ionic capital is that of the temple of Saturn on the Forum Romanum, which fortunately does not seem to have been copied later. The base of all the Roman Ionic columns is that known as the Attic base, viz. a lower and upper torus with scotia and fillets between, always raised on a square plinth.

The Roman Corinthian Order.—The great varieties of design in the Greek Corinthian capital (fig. 9), and the fact that its entablature was copied from Ionic examples, suggests that no definite type sufficient to constitute an order had been evolved by the Greeks; it remained therefore a problem to be worked out by the Romans, who, with the assistance of Greek artists, employed generally by the Romans, not only in Rome but throughout Greece, Asia Minor and Syria, developed an order which, though wanting in the refinement and subtlety found in Greek work, is one of the most monumental kind, and has in its adoption by the Italian revivalists had more influence than any other in the raising of palatial structures. Even in Rome itself the portico of the Pantheon, erected by Agrippa (27 B.C.), and the temple of Castor (rebuilt by Domitian A.D. 86) in the Forum, are remarkable instances of early work, which hold their own with some of the later examples even of Greek art.

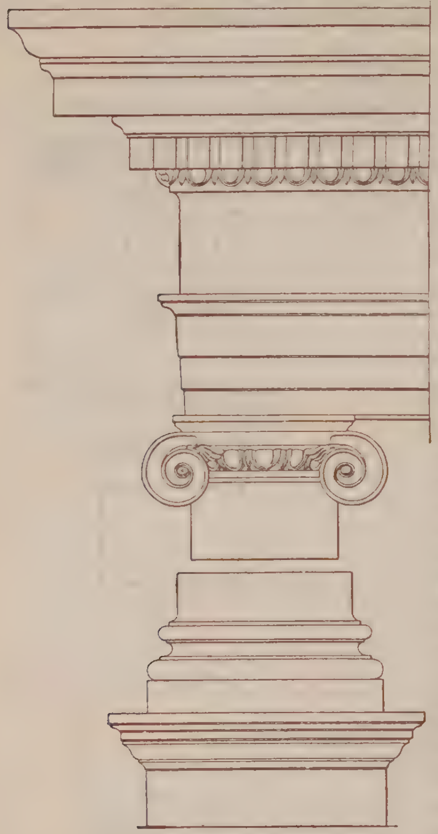


FIG. 8.

The development of the Roman Corinthian order will be best understood by a description in detail similar to that given of the great Doric and Ionic orders. Taking the Pantheon portico as the earlier example, the base consists of an upper and lower torus separated by a double astragal with scotia and fillet above and below, and resting on a square plinth. The shaft, a monolith, is unfluted, tapering upwards, $9\frac{3}{4}$ diameters in height, with apophyge and fillet at the bottom, and an apophyge, fillet and astragal at the top. The capital consisted of a square abacus with concave sides carried on a circular inverted bell, two rows of acanthus leaves, rising three-fifths of the bell, being carved round it (fig. 10), the stems of the upper range of eight leaves lying in the axis of each face and of the diagonals, and those of the lower range between them; the stems of the caulicolae from which spring the spirals, which rise to support the angles of the abacus, and to the centre of the capital, carrying the central flower, start from between the upper range of leaves. The abacus has concave sides, canted angles, and is moulded, with a quarter round, fillet and cavetto. The architrave, like that of the Greek Ionic order, has three fasciae, but they are further elaborated by a small cyma-reversa under the upper fascia and a bead under the second fascia. The architrave is crowned with a moulding, consisting of a fillet with cyma-reversa and bead underneath. The frieze is plain, its only decoration being the well-known inscription of Agrippa. The bedmould consists of a bead, cyma-reversa and fillet, under a plain dentil course, in which the dentils are not carved; bead-and-reel and egg-and-dart above these carried a plain face on which is found the new feature introduced by the Romans, viz. the modillion. This, though carved out of one solid block with the whole bedmould, suggested an appropriate support to the projecting cornice. The modillion was a bracket, a horizontal version of the ancones which supported the cornice of the Greek doorway cornice, and was here crowned by a small cyma-reversa carved with leaves which profiled round the modillion and along the upper part of the plain face. The cornice is simple, consisting of a corona, fillet and cymatium, the latter omitted across the front of the temple, but carried up over the cornice of the pediment. All the columns are equidistant with an intercolumniation of $2\frac{1}{2}$ diameters. The order of the interior of the rotunda built by Hadrian (A.D. 121) is similar to that of the portico, the lower moulding of the bedmould and the bead being carved, and the tongue or anchor taking the place of the dart between the eggs.

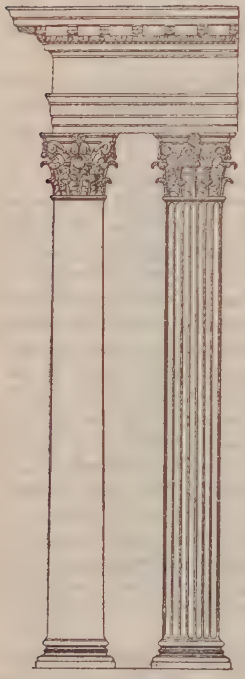


FIG. 9.—Roman Corinthian Order; Pantheon.

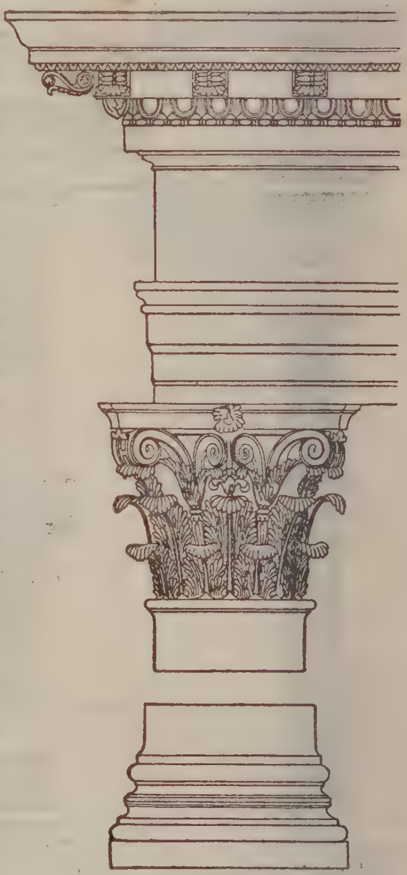


FIG. 10.—The Roman Corinthian Order; Pantheon.

The order of the temple of Castor (fig. 11) was enriched to a far greater extent, and parts were carved with ornament, which in Greek examples was probably only painted. The base was similar, but the columns (10 diameters high) had twenty-four flutes, with fillets between. The capital was further enriched with foliage, which rising from the caulicolae was carried along the cavetto of the abacus, whose upper moulding was carved with the egg-and-dart. The middle fascia of the architrave was carved with a version of the Greek anthemion, the cyma-reversa under the upper fascia being carved with leaves and bead-and-reel under. The lower moulding of the bedmould was carved with the egg-and-tongue; the dentil course was carved with finely proportioned dentils, the cyma-reversa and mouldings above being similar to those of the Pantheon portico. In the latter, on the soffit of the corona, square panels are sunk with a flower in the centre. In the temple of Castor the panel is square, but there is a border in front and back, which shows that the cornice had a greater projection. The corona was carved with fluting, departing from the simplicity of the Pantheon example, but evidently more to the taste of the Romans, as it is found in many subsequent examples. The intercolumniation is only two and one-third of the diameter. Though not quite equal to Greek foliage, that of the capitals of the temple of Castor is of great beauty, and there is one other feature in the capital which is unique; the spirals of the centre are larger than usual and interlace one another. A variety of the bedmould of the cornice is found in the so-called Temple of the Sun on the Quirinal Hill; although of late date, the entablature has the character of the Renaissance of the Augustan era, so fine and simple are its proportions and details; there are only two fasciae to the architrave, and the upper feature of the bedmould consisted of large projecting blocks with two fascia and an upper egg-and-tongue moulding, like the Ionic dentil, these blocks projecting half-way between the fascia of the frieze and the edge of the corona.

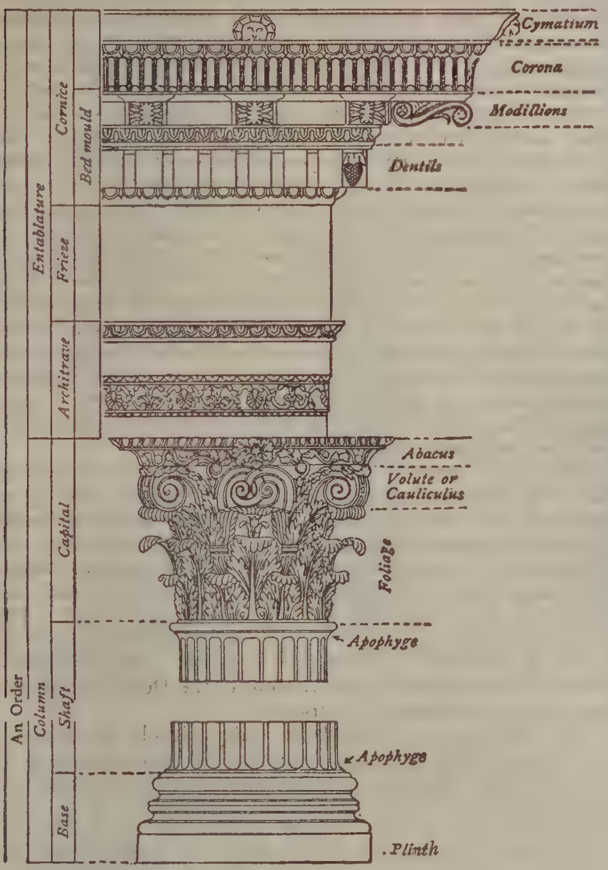


FIG. 11.—The Roman Corinthian Order; Temple of Castor.

The Roman Composite Order.—As already noted, the Composite order differs from the Corinthian only in the design of its capital, which is a compound of the foliage of the Corinthian and the volutes of the Ionic capital. Already, in the Ionic capital of the Erechtheum, a further enrichment with the anthemion was provided round the necking; this was copied in the capitals of the interior of Trajan's basilica; in Asia Minor at Aizani (1st century A.D.) a single row of leaves was employed round the capitals of the pronaos under the volutes of an Ionic capital; the architect of the Arch of Titus (A.D. 81) went one step farther and introduced the double row of leaves; both examples exist in the Arch of Septimus Severus (fig. 12), in the tepidarium of the thermae of Diocletian; and, to judge by the numerous examples still existing in the churches at Rome, it would seem to have been the favourite capital. The Byzantine architects also based most of their capitals on the Roman Composite examples. There are other hybrid Roman capitals, in which figures of a winged Victory, rams' heads or cornucopia, take the place of the angle spirals of the Corinthian capital.

The Arcade Order.—This, which was defined by Fergusson as the true Roman order, is a compound of two distinct types of construction, the arcuated and the trabeated, the former derived from the Etruscans, the latter from the Greeks. Whilst, however, the arcade was a constructive feature, the employment of the semi- or three-quarter detached column with its entablature complete, as a decorative screen, was a travesty of its original constructive function, without even the excuse of its adding in any way to the solidity of the structure, for the whole screen could be taken off from the Roman theatres and amphitheatres without in any sense interfering with their stability. The employment of the attached column only, as a vertical decorative feature subdividing the arches, might have been admissible, but to add the entablature was a mistake, on account of the intercolumniation, which was far in excess of that employed in any order, so that not only was it necessary to cut the architrave into voussoirs, thus forming a flat arch, but the stones composing it had to be built into the wall to ensure their stability; the entablature thus became an element of weakness instead of strength (fig. 13). The earliest example of the Arcade order is the Tabularium in Rome (80 B.C.) where it was employed to light a vaulted corridor running from one end to the other of the structure and raised some 50 ft. from the ground. The column is semi-detached, 7½ diameters high with an intercolumniation of nearly 4 diameters, and an entablature with an architrave which is less than half a diameter, quite incapable, therefore, of carrying itself, much less than the rest of the entablature; the impost pier of the arch is half a diameter, and the height of the open arcade a little more than half its width. The shaft had twenty-four flutes with arrises, and rested on a square plinth, and in the capital the echinus was only about one-twelfth of the diameter, the shallowest known. The frieze was divided by triglyphs, there being four between those over the axis of each column; the correct number in the Greek Doric order being one. In the theatre of Marcellus there were three triglyphs; the impost pier was ⅝ diameter, thus giving greater solidity to the wall, but resulting in a narrower opening. The Tabularium had originally a second arcade above that now existing, with

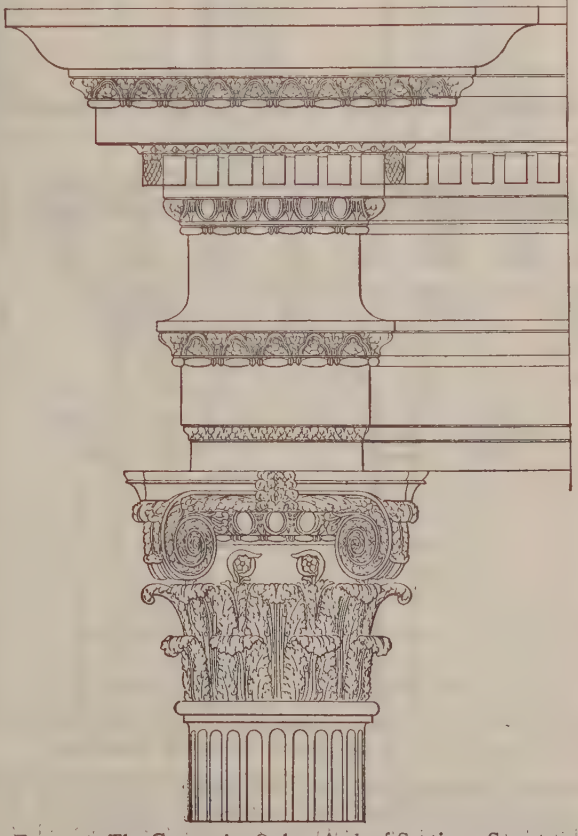


FIG. 12.—The Composite Order; Arch of Septimus Severus.

semi-detached columns of the Ionic order, and these are found in the upper storey of the theatre of Marcellus, the earliest example existing of the superposed orders. A certain proportion exists between the orders employed; thus the upper diameter of the Doric column (which is 7½ diameters high with a diminution of between one-fifth and one-sixth of the lower diameter) is the same as the lower diameter of the Ionic column, which is 8½ diameters high and a much slighter diminution. In the Colosseum there were three storeys pierced with arcades, with the Corinthian order on the third storey, and a superstructure (added at a later date) without an arcade, and decorated with Corinthian pilasters only. Apparently this scheme of decoration was considered to be the best for the purpose, and with some slight changes was employed for all the amphitheatres throughout the Empire. The intercolumniation, on which the design is made, varies in the examples of later date. With an intercolumniation of 6 diameters, the arcades are wider and a lighter effect is obtained, and this is the proportion in the Colosseum.

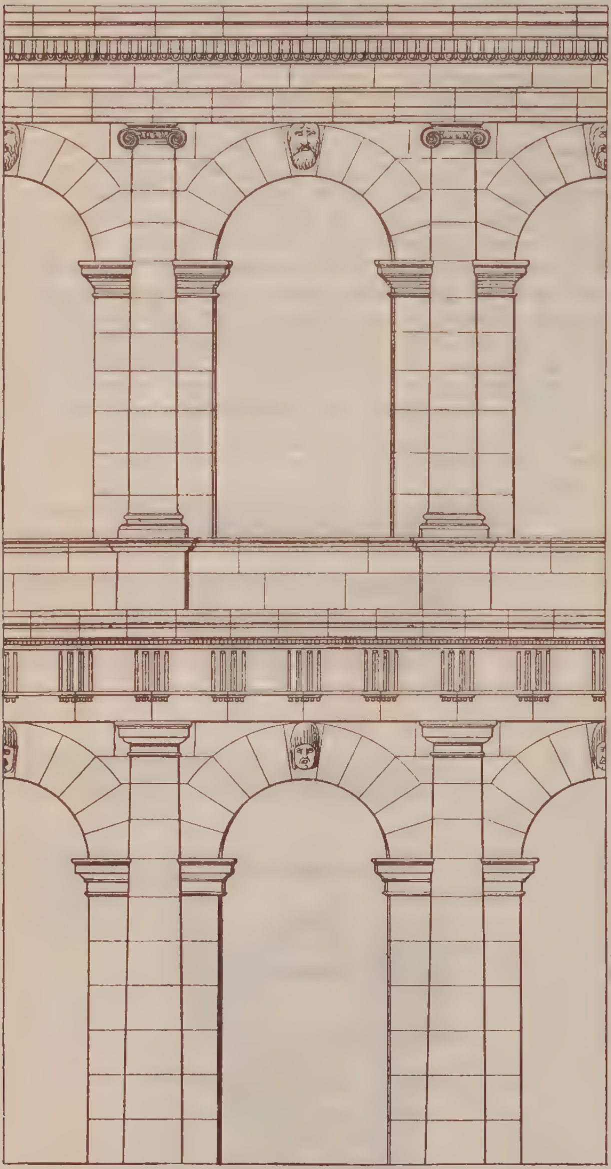


FIG. 13.—The Arcade Order; Theatre of Marcellus.

The Five Orders; Italian.—The two Italian architects whose text-books with illustrations of the five orders have been accepted generally as the chief authorities on the subject are Vignola and Palladio, the former in France and the latter in England, the dates of the publication of their works being 1563 and 1570 respectively. In 1759 Sir William Chambers published a treatise on civil architecture, in which he set forth his interpretation of the five orders, and his treatise is still consulted by students. They all of them based their conjectural restorations on the descriptions given by Vitruvius, who, however, avoids using the same term throughout, the words *genus*, *ratio*, *species*, *mores* being employed, from which it may be concluded that the Greeks themselves had no such term as that which is now defined as "order," especially as in his book he invariably quotes the Greek name when describing various parts of the temple. In the preface to the fourth book he speaks only of the three orders (*genus*), so that the Tuscan described in Book IV. chap. vii. would seem to have been an afterthought, and his description of the entablature shows that it was entirely in wood and therefore an incomplete development. The Italian revivalists, however, evolved one of their orders out of it and added a fifth, the Composite, of which there was no example in Rome before A.D. 82. In the description which follows it must be understood that it refers only to the Italian version of what the revivalists considered the Roman orders to consist of, and as a rule Vignola's interpretation will be given, because he seems to have kept closer to Vitruvius's descriptions and to have taken as his models the finest examples then existing in Rome.

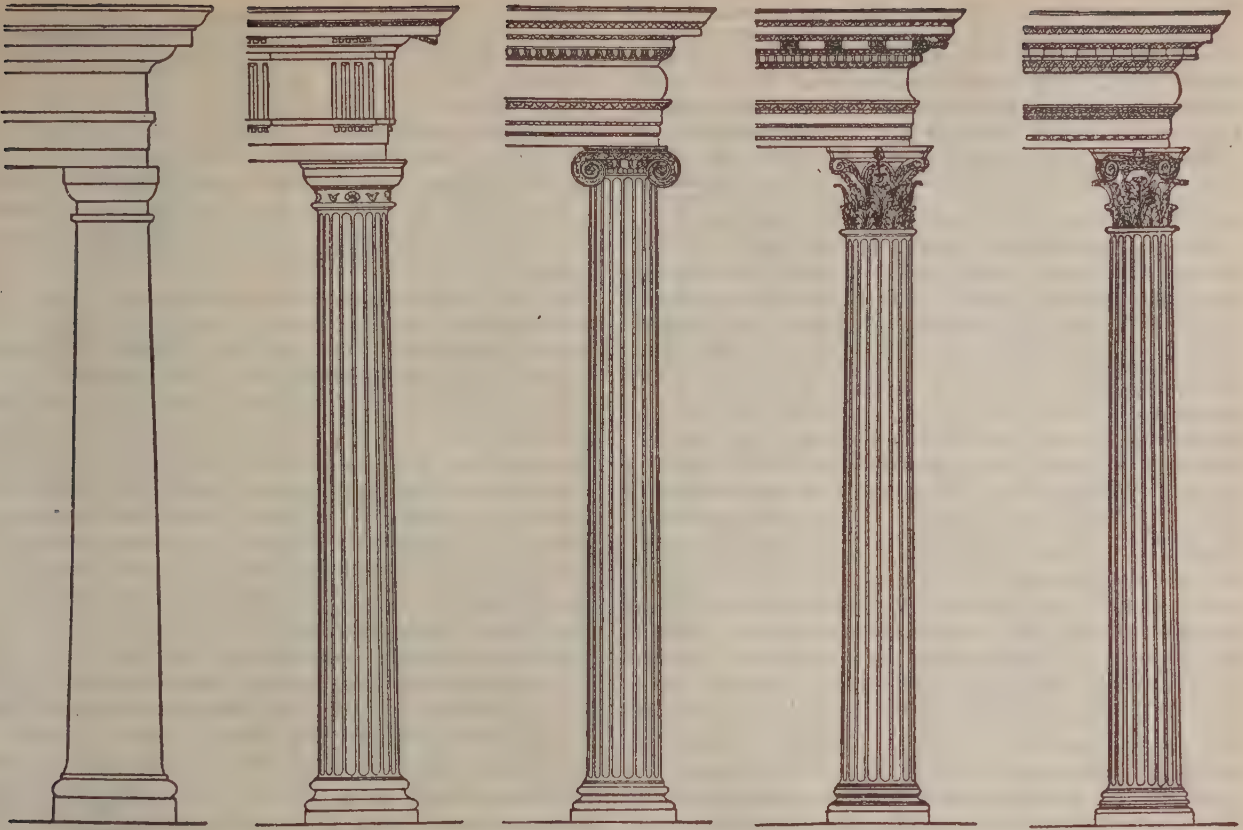
The Tuscan Order.—The base consists of a torus moulding, resting on square plinths; the shaft is terminated below by an apophyge and fillet and tapers upwards, the diminution being between one-quarter and one-fifth of the lower diameter, with an apophyge, fillet and astragal at the top, the capital consists of a square abacus with fillet and cavetto, an echinus, fillet and a necking; the whole column being 7 diameters high. The intercolumniation given by Vignola is 2½ diameters, instead of the 3½ diameters of Vitruvius's areostyle. The architrave, frieze and cornice, are simple versions of the Doric, except that there are no triglyphs in the frieze.

The Doric Order.—In his Doric order Vignola has followed the Roman Doric order of the theatre of Marcellus, but he gives it a base consisting of an astragal and torus resting on a square plinth; in his shaft he copies the fluting (24 flutes) with the arris of the columns of the thermae of Diocletian; his capital, except the flowers decorating the necking and his entablature, are entirely taken from the theatre of Marcellus; in a second study he introduces an Attic base, carves the echinus of the capital with the egg-and-tongue, introduces two fasciae in his architrave, and to support the cornice provides shallow plain modillions with guttae on the soffits. In both the examples given the columns taper upwards and are 8 diameters high.

The Ionic Order.—For the Ionic order Vignola discards the temple of Fortuna Virilis; but enriches the order of the theatre of Marcellus, adopting the base of the temple of Castor and the fluted columns of the same; in his frieze he introduces that of the Corinthian temple of Antoninus and Faustina, and in the bedmould and cornice copies that of the thermae of Diocletian. Palladio in his entablature introduces the convex friezes and adopts a single uncarved modillion under the cornice. In both cases the columns are fluted and 9 diameters high.

The Corinthian Order.—In this order Vignola, for his base, returns to the temple of Castor, makes his columns 10 diameters high, copies the capital of the portico of the Pantheon, introduces a rib frieze with winged female figures and a bull about to be sacrificed, and adopts the bedmould of the temple of Castor, reversing the carving of two of the mouldings and the cornice, and omitting the fluting of the corona of that temple. In Palladio's Corinthian order the frieze is too narrow and the bedmould, though copied from the temple of Castor, is of smaller scale.

The Composite Order.—As in the Roman Composite order the only original feature was the capital, there were no new versions to be given of the entablature, but unfortunately they were unable to copy the many examples in Rome. In the three best-known capitals, those of the arches of Titus and Septimus



Tuscan. Doric. Ionic. Corinthian. Composite.

FIG. 14.—The Italian Orders.

Severus and in the thermae of Diocletian, the upper fillet of the volute runs straight across the capital, being partially sunk in the cavetto of the abacus; in the canalis of the volutes of all these examples is a band of foliage which dips down to carry the centre flower, and, on account of its projection, it hides, from those looking only from below, the upper fillet of the volute. The architects of the Revival, therefore, in their studies of the capital, turned the volutes (which they would seem, like Ruskin, to have thought were horns) down on to the top of the echinus, producing a composition which is not in accordance with ancient examples and shows ignorance of the origin and development of the Ionic volute; unfortunately their interpretations of the Composite capital were followed by Inigo Jones, and are employed even in Regent Street, London, at the present day; there are, however, two or three Renaissance examples in Paris, in which the true Composite capital has been retained.

The Pedestal.—The architects of the Revival would seem to have conceived the idea that no order was complete without a pedestal. The only Roman examples of isolated columns with pedestals known are those of the columns of Trajan, Marcus Aurelius, Antoninus Pius and others of less importance, but they carried statues only and had no structural functions as supports to an entablature; the pedestals under the columns which decorated the arches of triumph were built into and formed part of the structure of the arch. The columns of the tepidarium of the Roman thermae had pedestals of moderate height (about 3 to 4 ft.) which bore no proportional relation to the diameter of the column. Vignola, however, gave definite proportions for the pedestal, which in the Doric order was to be 2 diameters in height, in the Ionic 2½ diameters, and in the Corinthian order 3 diameters, the result being that in the front of the church of St John Lateran, where the Corinthian pilasters are of great height, the pedestals are 12 to 13 ft. high. In conjunction with the arcade there was more reason for pedestals to the semi-detached columns on the upper storeys, but none was employed on the ground storey, either in the theatre of Marcellus or in the Colosseum. (R. P. S.)

ORDER, HOLY. "Holy Orders" (*ordines sacri*) may be defined as the rank or status of persons empowered by virtue of a certain form or ceremony to exercise spiritual functions in the Christian church. Thus Tertullian (*Idol.* 7, *Monog.* 11) mentions the "ecclesiastical order," including therein those who held office in the church, and (*Exhort. Cast.* 71) he distinguishes this *ordo* from the Christian *plebs* or laity. We may compare the common use of the word *ordo* in profane writers, who refer, *e.g.*, to the *ordo senatorius*, *ordo equester*, &c. It is true that the evidence of Tertullian does not carry us back farther than the close of the 2nd or opening of the 3rd century A.D. But a little before Tertullian, Irenaeus, though he does not use the word *ordo*, anticipates in some measure Tertullian's abstract term, for he recognizes a *magisterii locus*, "a place of magistracy" or "presidency" in the church. Indeed, phrases more or less equivalent occur in the sub-apostolic literature, and even in the New Testament itself, such as those who are "over you in the Lord" (1 Thess. v. 12), those "that bear the rule" (Heb. xiii. 7; cf. 1 Clem. i. 3; Herm. *Vis.* ii. 2, 6). Here we pause to remark that in Tertullian's view the church as a whole possesses the power of self-government and administration, though in the interest of discipline and convenience it delegates that power to special officers. It is, he says, the "authority of the church" which has constituted the difference between the governing body and the laity, and in an emergency a layman may baptize and celebrate (*Exhort. Cast.* 7), nor can this statement be lightly set aside on the plea that Tertullian, when he so wrote, had lapsed into Montanism. The fact is that the Montanists represented the conservatism of their day, and even now the Roman Church admits the right of laymen to baptize when a priest cannot be had. The *Apostolic Constitutions* (viii. 32) allow a layman to preach, if he be skilful and reverent, and the language of St Ignatius (*Ad Smyrn.* 8), "Let that be esteemed a valid Eucharist which is celebrated in the presence of the bishop or of some one commissioned by him," is really inconsistent with any firmly established principle that celebration by a layman was in itself absolutely null (see also EUCHARIST).

When we go on to inquire what special offices the church from the beginning, or almost from the beginning, adopted and recognized, two points claim preliminary attention. In the first place, much would be done in practical administration by persons who held no definite position formally assigned to them, although they wielded great influence on account of their age, talents and character. Next, it must be carefully remembered that the early church was, in a sense hard for us even to understand, ruled and edified by the direct action of the Holy Spirit. St Paul (1 Cor. xii. 28) furnishes us with a list of church offices very different from those which obtain in any church at the present day.[1] "God," he says, "hath set some in the church, first apostles, secondly prophets, thirdly teachers, then miracles, then gifts of healing, helps, governments, (divers) kinds of tongues." Ministry of this sort is not to be confounded with "order," of which this article treats. It died out very gradually, and the *Didache* or *Teaching of the Apostles*, compiled probably between A.D. 130 and 160, gives clear information on the nature of this prophetic or charismatic ministry. The title of "apostle" was not limited to the immediate disciples of our Lord, but was given to missionaries or evangelists who went about founding new churches; the prophets spoke by revelation; the teachers were enabled by supernatural illumination to instruct others. All of these men were called to their work by the internal voice of the Holy Spirit: none of them was appointed or elected by their fellows: none of them, and this is an important feature, was necessarily confined to a local church. Nevertheless, side by side with this prophetic ministry there was another, mediately at least of human appointment, and local in its character. Here we have the germ of orders in the technical sense. At first this local ministry was twofold, consisting of presbyters or bishops and deacons. Christian presbyters first appear (Acts xi. 30) in the church of Jerusalem, and most likely the name and office were adopted from the Jewish municipalities, perhaps from the Jewish synagogues (see PRIEST). Afterwards St Paul and St Barnabas in their first missionary journey "appointed[2] (Acts xiv. 23) presbyters in every church." Further, we find St Paul about A.D. 62 addressing the "saints" at Philippi "with the bishops and deacons." The word ἐπίσκοπος or overseer may be of Gentile origin, just as presbyter may have been borrowed from the Jews. There is strong proof that presbyter and *episcopus* are two names for the same office. It has indeed been maintained by eminent scholars, chiefly by Hatch and Harnack, that the word *episcopus* was given originally to the chief officer of a club or a confraternity, so that the *episcopus* was a financial officer, whereas the presbyters regulated the discipline. To this it may be objected that presbyters and bishops are never mentioned together, and that the names were interchangeable (Acts xx. 17 and 28; 1 Pet. v. 1, 2; 1 Tim. iii. 1-7 and v. 17-19; Tit. i. 5-7). The work of the presbyter or bishop was concerned at first with discipline rather than with teaching, which was largely in the hands of the charismatic ministry; nevertheless, the Pastoral Epistles (1 Tim. iii. 2) insist that an *episcopus* must be "apt to teach," and some presbyters (1 Tim. v. 17) not only ruled but also "laboured in the word and in teaching." They also "offered the gifts" (1 Clem. 44), *i.e.* to adopt Bishop Lightfoot's interpretation, "they led the prayers and thanksgivings of the congregation, presented the alms and contributions to God and asked His blessing on them in the name of the whole body." Under the bishops or presbyters stood the deacons or "helpers" (Philipp. i. 1, 1 Tim. iii. 8-13). Whether they were the successors, as most of the Fathers believed, of the seven chosen by the church of Jerusalem to relieve the apostles in the administration of alms (Acts vi.) is a question still disputed and uncertain. Be that as it may, the deacon was long considered to be the "servant of the widows and the poor" (Jerome, *Ep.* 146), and the archdeacon, who first appears towards the end of the 4th century, owes the greatness of his position to the fact that he was the chief administrator of church funds (see ARCHDEACON). This ancient idea of the diaconate, ignored in the Roman Pontifical, has been restored in the English ordinal. The growth of sacerdotal theories, which were fully developed in Cyprian's time, fixed attention on the bishop as a sacrificing priest, and on the deacon[3] as his assistant at the altar.

Out of the twofold grew the threefold ministry, so that each local church was governed by one *episcopus* surrounded by a council of presbyters. James, the Lord's brother, who, partly because of his relationship to Christ, stood supreme in the church at Jerusalem, as also Timothy and Titus, who acted as temporary delegates of St Paul at Ephesus and in Crete, are justly considered to have been forerunners of the monarchical episcopate. The episcopal rule in this new sense probably arose in the lifetime of St John, and may have had his sanction. At all events the rights of the monarchical bishop are strongly asserted in the Ignatian epistles (about A.D. 110), and were already recognized in the contemporary churches of Asia Minor. We may attribute the origin of the episcopate to the need felt of a single official to preside at the Eucharist, to represent the church before the heathen state and in the face of rising heresy, and to carry on correspondence with sister churches. The change of constitution occurred at different times in different places. Thus St Ignatius in writing to the Romans never refers to any presiding bishop, and somewhat earlier Clement of Rome in his epistles to the Corinthians uses the terms presbyter and *episcopus* interchangeably. Hermas (about A.D. 140) confirms the impression that the Roman Church of his day was under presbyteral rule. Even when introduced, the monarchical episcopate was not thought necessary for the ordination of other bishops or presbyters. St Jerome (*Ep.* 146) tells us that as late as the middle of the 3rd century the presbyters of Alexandria, when the see was vacant, used to elect one of their own number and without any further ordination set him in the episcopal office. So the canons of Hippolytus (about A.D. 250) decree that a confessor who has suffered torment for his adherence to the Christian faith should merit and obtain the rank of presbyter forthwith—"Immo confessio est ordinatio ejus." Likewise in A.D. 314 the thirteenth canon of Ancyra (for the true reading see Bishop Wordsworth's *Ministry of Grace*, p. 140) assumes that city presbyters may with the bishop's leave ordain other presbyters. Even among the medieval schoolmen, some (Gore, *Church and Ministry*, p. 377) maintained that a priest might be empowered by the pope to ordain other priests.

The threefold[4] ministry was developed in the 2nd, a sevenfold ministry in the middle of the 3rd century. There must, says Cornelius (*apud* Euseb., *H.E.* vi. 43), be one bishop in the Catholic Church; and he then enumerates the church officers subject to himself as bishop of Rome. These are 46 presbyters, 7 deacons, 7 subdeacons, 42 acolytes, 52 exorcists and readers, together with doorkeepers. The subdeacons, no doubt, became a necessity when the deacons, whose number was limited to seven in memory of their original institution, were no longer equal to their duties in the "regions" of the imperial city, and left their lower work, such as preparation of the sacred vessels, to their subordinates. The office of acolyte may have been suggested by the attendant assigned to heathen priests. The office of doorkeeper explains itself, though it must be remembered that it was the special duty of the Christian *ostiarius* to exclude the unbaptized and persons undergoing penance from the more solemn part of the Eucharistic service. But readers and exorcists claim special notice. The reader is the only minor official mentioned by Tertullian (*Praescr.* 41). An ancient church order which belongs to the latter part of the 2nd century (see Harnack's *Sources of Apostolic Canons*, Engl. Transl. p. 54 seq.) mentions the reader before the deacon, and speaks of him as filling "the place of an evangelist." We are justified in believing that both exorcists and readers, whose functions differed essentially from the mechanical employments of the other minor clerics, belonged originally to the "charismatic" ministry, and sank afterwards to a low rank in the "orders" of the church (see EXORCIST and LECTOR). There were also other minor orders in the ancient church which have fallen into oblivion or lost their clerical character. Such were the *copiatae* or grave-diggers, the *psalmistae* or chaunters, and the *parabolani*, who at great personal risk—whence the name—visited the sick in pestilence. The modern Greek Church recognizes only two minor orders, viz. those of subdeacons and readers, and this holds good of the Oriental churches generally, with the single exception of the Armenians.[1] The Anglican Church is content with the threefold ministry of bishops, priests and deacons, but in recent times the bishops have appointed lay-readers, licensed to read prayers and preach in buildings which are not consecrated. The Latins, and Armenians who have borrowed from the Latins, have subdeacons, acolytes, exorcists, readers and doorkeepers. Since the pontificate of Innocent III., however, the Latin Church has placed the subdiaconate among the greater or sacred orders, the subdeacon being obliged to the law of celibacy and bound to the daily recitation of the breviary offices. The minor orders, and even the subdiaconate and diaconate, are now regarded as no more than steps to the priesthood. Roman theologians generally reckon only seven orders, although, if we count the episcopate an order distinct from the presbyterate, the sum is not seven, but eight. The explanation given by St Thomas (*Supp.* xl. 5.) is that, whereas all the orders have reference to the body of Christ present on the altar, the episcopate, so far forth, is not a separate order, since a simple priest no less than a bishop celebrates the Eucharist. The Council of Trent takes the same view; it enumerates (Sess. xxiii. cap. 2) only seven orders, and yet maintains (cap. 4) the ecclesiastical hierarchy of bishops, priests and ministers, the bishops as successors of the Apostles holding the highest place. The Roman Church forbids ordination to higher grades unless the candidate has received all the inferior orders. Further, a cleric is bound to exercise the minor orders for a year before he can be ordained subdeacon, he must be subdeacon for a year before he is ordained deacon, deacon for a year before he is made priest. However, instances of men elevated at once from the condition of laymen to the priesthood were known in the early church, and Chardon (*Hist. des sacraments*, vol. v. part 1, ch. v.) shows that in exceptional cases men were consecrated bishops without previous ordination to the priesthood.

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[1] A partial exception may be made in favour of the "Catholic Apostolic Church" founded by Edward Irving.

[2] Josephus, *e.g. Antiq.* vi. 4. 2, abundantly justifies this translation.

[3] "Fixed attention" on the deacon's ministration, the ministration itself being much more ancient. See Justin, *Apol.* i. 65.

[4] The Nestorians may be said to have a fourfold ministry, for they reconsecrated a bishop when he was made catholicos or patriarch. Chardon, v. p. 222.

Passing to the effect of ordination, we meet with two views, each of which still finds advocates. According to some, ordination simply entitles a man to hold an office and perform its functions. It corresponds to the form by which, *e.g.*, a Roman official was put in possession of his magistracy. This theory is clearly stated by Cranmer: "In the New Testament he that is appointed bishop or priest needed no consecration, by the Scripture, for election or appointment thereto is sufficient."[2] This view, widely held among modern scholars, has strong support in the fact that the words used for ordination in the first three centuries (χειροτονεῖν, καθιστάνειν, κληροῦσθαι, *constituere*, *ordinare*) also expressed appointment to civil office. Very different is the medieval theory, which arose from the gradual acceptance of the belief that the Jewish was the prototype of the Christian priest. According, then, to the Roman view, holy order is a sacrament, and as such instituted by Christ; it confers grace and power, besides setting a mark or character upon the soul, in consequence of which ordination to the same office cannot be reiterated. Such is the teaching of the Roman Church, accepted by the Greeks and with certain modifications by Anglicans of the High Church school, who appeal to 1 Tim. iv. 14, 2 Tim. i. 6. We may conclude with brief reference to the most important aspects of the Roman doctrine.

The ordinary minister of orders is a bishop. The tonsure and minor orders are, however, still sometimes conferred by abbots, who, though simple priests, have special faculties for the ordination of their monks. Some account has been already given of scholastic opinion on presbyteral ordination to the diaconate and even to the priesthood. Can a heretical or schismatical bishop validly ordain? Is a simoniacal ordination valid? All modern theologians of the Roman Church answer these questions in the affirmative, but from the 8th to the beginning of the 13th century they were fiercely agitated with the utmost divergence of opinion and practice. Pope Stephen reconsecrated bishops consecrated in the usual way by his schismatical predecessor Constantine. Pope Nicholas declared orders given by Photius of Constantinople null. St Peter Damian was grievously perplexed about the validity of simoniacal ordinations. Similarly William of Paris held that degradation deprived a priest of power to consecrate.[3] St Thomas, on the contrary, contends that "heretics and persons cut off from the church" (*Summ. Suppl.* xxxviii. 2) may ordain validly, and that a priest who has been degraded can still celebrate the Eucharist (*Summ.* iii. 82. 8) validly, though of course not lawfully. This opinion, defended by Bonaventura, Alexander of Hales, Scotus and others, soon became and is now generally accepted.

The Schoolmen had no historical sense and little historical information; hence they fell into one error after another on the essentials in the rite of ordination. Some of them believed that the essential matter in the consecration of a bishop consisted in the placing the book of the gospels on his head and shoulders. True, this rite was used both in East and West as early as the 4th century; it was not, however, universal. According to common opinion, the matter and form of ordination to the episcopate were the imposition of the consecrating bishop's hands with the words, "Receive the Holy Ghost." The words in question, and indeed any imperative form of this kind, are still unknown to the East and were of very late introduction in the West. The final imposition of hands and the bestowal of power to forgive sins at the end of the ordination rite for priests in the Roman Pontifical is later even than the tradition of instruments. For like reasons the tradition of the instruments, *i.e.* the handing over of paten and chalice in ordination to the priesthood, are admittedly non-essential, unless we adopt the opinion of some Roman theologians that our Lord left the determination of matter and form to the church, which has insisted on different rites at different times.

The necessity of reference to sacerdotal power in the ordination of priests and bishops will be considered a little farther on in connexion with Anglican orders.

Deaconesses in the East received the imposition of the bishop's hands, but could not ascend to the priesthood. The Roman theologians regard them as incapable of true ordination, alleging 1 Tim. ii. 12. An unbaptized person is also incapable of valid ordination. On the other hand, St Thomas holds that orders may be validly conferred on children who have not come to the use of reason. For lawful ordination in the Roman Church, a man must be confirmed, tonsured, in possession of all orders lower than that which he proposes to receive, of legitimate birth, not a slave or notably mutilated, of good life and competent knowledge. By the present law (Concil. Trid. Sess. xxiii. de Ref. cap. 12) a subdeacon must have begun his twenty-second, a deacon his twenty-third, a priest his twenty-fifth year.[4] The

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[1] The Syrian Jacobites and the Maronites also ordain "singers," Denzinger, *Rit. Oriental*, i. p. 118 seq.; Silbernagl, *Kirchen des Orients*, pp. 254. 315.

[2] Cranmer's works are to be found in Burnet, "Collection of Records" appended to his *History of the Reformation* (ed. Pocock), iv. 478. Cranmer also maintained that "bishops and priests are but both one office in the beginning of Christ's religion," *ib.* p. 471.

[3] In reality this is a survival of the primitive view that holy order is institution for an office which the local church confers and can therefore take away.

[4] The canon law fixes the thirtieth year as the lowest age for episcopal consecration.

Council of Trent also requires that any one who receives holy orders must have a "title," *i.e.* means of support. The chief titles are poverty, *i.e.* solemn profession in a religious order, patrimony and benefice. Holy orders are to be conferred on the Ember Saturdays, on the Saturday before Passion Sunday or on Holy Saturday (Easter Eve). The ancient and essential rule that a bishop must be "chosen by all the people" (*Can. Hipp.* ii. 7) has fallen into disuse, partly by the right of confirmation allowed to the bishops of the province, partly by the influence of Christian emperors, who controlled the elections in the capital where they resided, most of all by the authority exercised by kings after the invasion of the northern tribes and the dissolution of the empire (see CHURCH HISTORY).

Such in brief were the doctrine and use of the early churches, gradually systematized, developed and transformed in the churches of the Roman obedience. The Reformation brought in radical changes, which were on the whole a return to the primitive type. Calvin states his views clearly in the fourth book of his *Institutes*, cap. iii. Christ, as he holds, has established in His church certain offices which are always to be retained. First comes the order of presbyters or elders. These are subdivided into pastors, who administer the word and sacraments, doctors, who teach and expound the Bible, elders pure and simple, who exercise rule and discipline. The special care of the poor is committed to deacons. Ordination is to be effected by imposition of hands. The monarchical episcopate is rejected. This view of order was accepted in the Calvinistic churches, but with various modifications. Knox, for example, did away with the imposition of hands (M'Crie's *Knox*, period vii.), though the rite was restored by the Scottish Presbyterian Church in the *Second Book of Discipline*. Knox also provided the Church of Scotland with superintendents or visitors, as well as readers and exhorters, offices which soon fell into disuse. Nor do Scottish presbyterians now recognize any special class of doctors, unless we suppose that these are represented by professors of theology. Independents acknowledge the two orders of presbyters and deacons, and differ from the Calvinistic presbyterians chiefly in this, that with them the church is complete in each single congregation, which is subject to no control of presbytery or synod.

Luther was not, like Calvin, a man of rigid system. He refused to look upon any ecclesiastical constitution as binding for all time. The keys, as he believed, were entrusted to the church as a whole, and from the church as a whole the "ministers of the word and sacraments" are to derive their institution and authority. The form of government was not essential. Provided that the preaching of the gospel was free and full, Luther was willing to tolerate episcopacy and even papacy. Hence the Lutheran churches exhibit great variety of constitution. In Scandinavia they are under episcopal rule. The Lutheran Bugenhagen, who was in priest's orders, ordained seven superintendents, afterwards called bishops, for Denmark in 1527, and Norway, then under the same crown, derives its present episcopate from the same source. Sweden stands in a different position. There three bishops were consecrated in 1528 by Peter Magnusson, who had himself been consecrated by a cardinal with the pope's approval at Rome in 1524, for the see of Westirås, to which he had been elected by the chapter. J. A. Nicholson (*Apostolical Succession in the Church of Sweden*, 1880) seems to have proved so much from contemporary evidence. A reply to Mr Nicholson was made in Swedish by a Roman priest, Bernhard, to whom Mr Nicholson replied in 1887. Unfortunately Mr Nicholson gives no detailed account of the form used in consecration, and on this and other points fuller information is needed. We may say, however, that Mr Nicholson has presented a strong case for the preservation of episcopal succession in the Swedish Church.

If the Swedish Church has preserved the episcopal succession, it does not make much of that advantage, for it is in communion with the Danish and Norwegian bodies, which can advance no such claim. On the other hand, the Church of England adheres closely to the episcopal constitution. It is true that in articles xix. and xxxvi. she defines the church, without any express reference to the episcopate, as a "congregation of faithful men in which the pure word of God is preached and the sacraments be duly administered according to Christ's ordinance," and simply adds that the ordinal of Edward VI. for the consecration of bishops, priests and deacons, contains all that is necessary for such ordination and nothing which is of itself superstitious. The preface to the ordinal (1550) goes farther. Therein we are told that the threefold ministry of bishops, priests and deacons may be traced back to apostolic times, and in the final revision of 1662 a clause was added to the effect that no one is to be accounted "a lawful bishop, priest or deacon in the Church of England," unless he has had episcopal consecration or ordination. The words "in the Church of England" deserve careful notice. Nothing is said to condemn the opinion of Hooker (*Eccl. Pol.* vii. 14. 11) that "there may be sometimes very just and sufficient reason to allow ordination made without a bishop," or of the High Church Thorndike (*apud* Gibson on the Articles, ii. 74), who "neither justifies nor condemns the orders of foreign Protestants." The church lays down a rule of domestic policy, and neither gives nor pretends to give any absolute criterion for the validity of ordination.

But while the Church of England has declined communion with non-episcopal churches, she has been involved in a long controversy with the Church of Rome on the validity of her own orders. It will be best to give first the leading facts, and then the inferences which may be drawn from them.

Anglican orders.

The English Church derives its orders through Matthew Parker, archbishop of Canterbury, who was consecrated in 1559 by William Barlow, bishop-elect of Chichester. We may assume that the rite employed was serious and reverent, and there is no longer any need to refute the fable of a ludicrous consecration at the "Nag's Head" tavern. We may further take for granted that Barlow was a bishop in the Catholic sense of the word. He had been nominated bishop of St Asaph in 1536, translated to St David's in the same year, and to Bath and Wells in 1547. He also sat in the upper house of Convocation and in the House of Peers. Now if Barlow all this time was not consecrated—and so far the only form of consecration known in England was according to the Roman rite—he would have incurred the penalties of *praemunire*, let alone the fact that Henry VIII. would not have tolerated such a defiance of Catholic order for a moment. The registers at St David's make no mention of his consecration, but this counts for nothing. No reference in the registers can be produced for many ordinations of undoubted validity. Parker thus was consecrated by a true bishop according to the Edwardine ordinal, *i.e.* he received imposition of hands with the words, "Take the Holy Ghost and remember that thou stir up the grace of God which is in thee by imposition of hands." The corresponding form for the ordination of a priest was "Receive thou the Holy Ghost: whose sins thou dost forgive," &c. These were the sole forms in use from 1552 to 1562.

Roman authorities have from the beginning and throughout consistently repudiated orders given according to the Edwardine ordinal. The case first came under consideration when Cardinal Pole returned to England early in Mary's reign with legatine authority for reconciling the realm to the Holy See. In his instructions to the bishops (Burnet Collect., pt. iii., bk. v., 33; see also Dixon, *Hist. Ch. of England*, v. 238 seq.[1]) he clearly recognizes orders schismatical but valid, *i.e.* those conferred in Henry's reign, and so distinguishes them by implication from invalid orders, *i.e.* those given according to the Edwardine book. In the former alone were "the form and intention of the church preserved." He could not doubt for a moment the utter invalidity of Edwardine ordinations to the priesthood. He knew very well that the theologians of his church almost without exception held that the handing over of the paten and chalice with the words, "Receive power of offering sacrifice," &c., were the essential matter and form of ordination to the priesthood; indeed he published the decree of Eugenius IV. to that effect

[1] Compare also the article on Anglican orders in the *Catholic Encyclopedia*, vol. i., especially at p. 492.

(Wilkins, *Concil.* iv. 121). The Anglican priesthood being gone, the episcopate also lapses. For according to the Pontifical, the episcopate is the "*summum sacerdotium*"; the bishop in consecration receives "the sacerdotal grace"; it is "his office to consecrate, ordain, offer, baptize, confirm." Thus in the Pontifical the words "Receive the Holy Ghost" are determined and defined by the context. There is nothing in the Anglican ordinal to show that the Holy Ghost is given for the consecration of a bishop in the Roman sense. In 1704 John Gordon, formerly Anglican bishop of Galloway, gave to the Holy Office an account of the manner in which he had been consecrated. The Sacred Congregation, with the pope's approval, declared his orders to be null. The constant practice has been to reordain unconditionally Anglican priests and deacons. In 1896 Leo XIII. summoned eight divines of his own communion to examine the question anew. Four of those divines were, it is said, decidedly opposed to the admission of Anglican orders as valid; four were more or less favourably disposed to them. The report of this commission was then handed over to a committee of cardinals, who pronounced unanimously for the nullity of the orders in question. Thereupon the pope published his bull *Apostolicae curae.* In it he lays the chief stress on the indeterminate nature of the Anglican form "Receive the Holy Ghost" at least from 1552 till the addition of the specific words, "for the office and work of a bishop (or priest) in the church of God," as also on the changes made in the Edwardine order "with the manifest intention. . . of rejecting what the church does." His conclusion is that Anglican orders are "absolutely null and utterly void." Moreover, in a letter to Cardinal Richard, archbishop of Paris, the pope affirms that this his solemn decision is "firm, authoritative and irrevocable."

For Roman Catholics the decision necessarily carries great weight, and it may perhaps have its influence on Anglicans of the school which approximates most closely to Roman belief. It need not affect the opinion of dispassionate students. It is not the judgment of experts. The rejection of Anglican orders in the 16th and 17th centuries was based on a theory about the "tradition of instruments," which has long ceased to be tenable in the face of history, and is abandoned by Romanists themselves. The opinion of a liturgical scholar like Mgr. Louis Duchesne, who was a member of the papal commission, on the general question would be interesting in the highest degree. Unfortunately we know nothing of his vote or of the reasons he gave for it, and outside of the Roman pale the unanimous decision of a committee of cardinals counts for very little. We may grant the pope's contention that the Edwardine church had no belief in priests who offered in sacrifice the body and blood of Christ or in bishops capable of ordaining such priests. We may grant further that the medieval offices have been deliberately altered to exclude this view. But then the liturgy of Serapion, the friend of Athanasius, recently discovered, contains forms for the ordination of priests and bishops which do not say a word about power to sacrifice, much less about power to sacrifice Christ's literal body and blood. The canons of Hippolytus, which are about 150 years older, and indeed all the oldest forms for celebration, absolutely ignore any such power of sacrifice. If they speak of sacrifice at all, it is a sacrifice of the gifts brought by the faithful and distributed in the congregation and among the poor, or again they refer to those spiritual sacrifices which a bishop is to offer "day and night." The *Didache* and Justin Martyr are no less unsatisfactory from the Roman point of view. In short, the English reformers knew very well that the ordinal and communion office which they drew up could not satisfy the requirements of medieval theology. They appealed not to the school divines, but to Scripture and primitive antiquity. That is the standard by which we are to test their work.

Authorities.—For holy order in the apostolic and sub-apostolic age the reader may consult R. Rothe, *Anfänge der christlichen Kirche* (1837); A. Ritschl's *Entstehung der altkatholischen Kirche* (2nd ed., 1857); J. B. Lightfoot's dissertation on the "Christian Ministry" in his commentary on the Philippians (1868). A new era was opened by E. Hatch's *Organization of the Early Christian Church* (1880); to this Bishop C. Gore's *Church and Ministry* (1888) is a reply. The facts are judicially stated and weighed in Bishop J. Wordsworth's *Ministry of Grace* (1902). Dr T. M. Lindsay's *Church and Ministry in Early Centuries* (1902) on the whole agrees with Hatch, but is too eager to find modern Presbyterianism in the early church. A. Harnack's edition of the *Didache* (1884), his *Sources of the Apostolic Canons* (Eng. trans., 1895), the edition of the Canons of Hippolytus by H. Achelis, in *Texte und Untersuchungen*, vol. vi. (1891), the translation of Serapion's Prayer-book (translated by Bishop J. Wordsworth, 1899), are indispensable for serious study of the subject.

Joann Morinus, *De sacris ordinationibus* (1655) and A. C. Chardon, *Histoire des sacraments*, vol. v. (1745), are rich in material chiefly relating to the patristic and medieval periods.

For the controversy on Anglican orders see P. F. Courayer, *Validité des ordinations anglaises* (1732), and two works in reply by M. Le Quien, *Nullité des ordinations anglicanes* (1725), *Nullité des ordinations anglicanes démonstrée de nouveau* (1730). In recent times Anglican orders have been defended by A. W. Haddan, *Apostolical Succession in the Church of England*; F. W. Puller, *The Bull Apostolicae Curae and the Edwardine Ordinal.* They have been attacked by E. E. Estcourt, *Question of Anglican Ordinations* (1873), and by A. W. Hutton. *The Anglican Ministry*, with a preface by Cardinal J. H. Newman (1879). (W. E. A.*)

ORDER IN COUNCIL, in Great Britain, an order issued by the sovereign on the advice of the privy council, or more usually on the advice of a few selected members thereof. It is the modern equivalent of the medieval ordinance and of the proclamation so frequently used by the Tudor and Stewart sovereigns. It is opposed to the statute because it does not require the sanction of parliament; it is issued by the sovereign by virtue of the royal prerogative. But although theoretically orders in council are thus independent of parliamentary authority, in practice they are only issued on the advice of ministers of the crown, who are, of course, responsible to parliament for their action in the matter. Orders in council were first issued during the 18th century, and their legality has sometimes been called in question, the fear being evidently prevalent that they would be used, like the earlier ordinances and proclamations, to alter the law. Consequently in several cases parliament has subsequently passed acts of indemnity to protect the persons responsible for issuing them, and incidentally to assert its own authority. At the present time the principle seems generally accepted that orders in council may be issued on the strength of the royal prerogative, but they must not seriously alter the law of the land.

The most celebrated instance of the use of orders in council was in 1807 when Great Britain was at war with France. In answer to Napoleon's Berlin decree, the object of which was to destroy the British shipping industry, George III. and his ministers issued orders in council forbidding all vessels under penalty of seizure to trade with ports under the influence of France. Supplementary orders were issued later in the same year, and also in 1808. Orders in council are used to regulate the matters which need immediate attention on the death of one sovereign and the accession of another.

In addition to these and other orders issued by the sovereign by virtue of his prerogative, there is another class of orders in council, viz. those issued by the authority of an act of parliament, many of which provide thus for carrying out their provisions. At the present day orders in council are extensively used by the various administrative departments of the government, who act on the strength of powers conferred upon them by some act of parliament. They are largely used for regulating the details of local government and matters concerning the navy and the army, while a new bishopric is sometimes founded by an order in council. They are also employed to regulate the affairs of the crown colonies, and the lord-lieutenant of Ireland, the viceroy of India, the governor-general of Canada, and other representatives of the sovereign may issue orders in council under certain conditions.

In times of emergency the use of orders in council is indispensable to the executive. In September 1766, a famine being feared, the export of wheat was forbidden by an order in council, and the Regulation of the Forces Act 1871 empowers the government in a time of emergency to take possession of the railway system of the country by the issue of such an order.

ORDERIC VITALIS (1075–*c.* 1142), the chronicler, was the son of a French priest, Odeler of Orleans, who had entered the service of Roger Montgomery, earl of Shrewsbury, and had received from his patron a chapel in that city. Orderic was the eldest son of his parents. They sent him at the age of five to learn his letters from an English priest, Siward by name, who kept a school in the church of SS Peter and Paul at Shrewsbury. When eleven years old he was entered as a novice in the Norman monastery of St Evroul en Ouche, which Earl Roger had formerly persecuted but, in his later years, was loading with gifts. The parents paid thirty marks for their son's admission; and he expresses the conviction that they imposed this exile upon him from an earnest desire for his welfare. Odeler's respect for the monastic profession is attested by his own retirement, a few years later, into a religious house which Earl Roger had founded at his persuasion. But the young Orderic felt for some time, as he tells us, like Joseph in a strange land. He did not know a word of French when he reached Normandy; his book, though written many years later, shows that he never lost his English cast of mind or his attachment to the country of his birth. His superiors rechristened him Vitalis (after a member of the legendary Theban legion) because they found a difficulty in pronouncing his baptismal name. But, in the title of his Ecclesiastical History he prefixes the old to the new name and proudly adds the epithet *Angligena*. His cloistered life was uneventful. He became a deacon in 1093, a priest in 1107. He left his cloister on several occasions, and speaks of having visited Croyland, Worcester, Cambrai (1105) and Cluny (1132). But he turned his attention at an early date to literature, and for many years he appears to have spent his summers in the scriptorium. His superiors (at some time between 1099 and 1122) ordered him to write the history of St Evroul. The work grew under his hands until it became a general history of his own age. St Evroul was a house of wealth and distinction. War-worn knights chose it as a resting-place of their last years. It was constantly entertaining visitors from southern Italy, where it had planted colonies of monks, and from England, where it had extensive possessions. Thus Orderic, though he witnessed no great events, was often well informed about them. In spite of a cumbrous and affected style, he is a vivid narrator; and his character sketches are admirable as summaries of current estimates. His narrative is badly arranged and full of unexpected digressions. But he gives us much invaluable information for which we should search the more methodical chroniclers in vain. He throws a flood of light upon the manners and ideas of his own age; he sometimes comments with surprising shrewdness upon the broader aspects and tendencies of history. His narrative breaks off in the middle of 1141, though he added some finishing touches in 1142. He tells us that he was then old and infirm. Probably he did not long survive the completion of his great work.

The *Historia ecclesiastica* falls into three sections. (1) Bks. i., ii., which are historically valueless, give the history of Christianity from the birth of Christ. After 855 this becomes a bare catalogue of popes, ending with the name of Innocent I. These books were added, as an afterthought, to the original scheme; they were composed in the years 1136–1141. (2) Bks. iii.-vi. form a history of St Evroul, the original nucleus of the work. Planned before 1122, they were mainly composed in the years 1123–1131. The fourth and fifth books contain long digressions on the deeds of William the Conqueror in Normandy and England. Before 1067 these are of little value, being chiefly derived from two extant sources. William of Jumièges' *Historia Normannorum* and William of Poitiers' *Gesta Guilelmi*. For the years 1067–1071 Orderic follows the last portion of the *Gesta Guilelmi*, and is therefore of the first importance. From 1071 he begins to be an independent authority. But his notices of political events in this part of his work are far less copious than in (3) Bks. vii.-xiii., where ecclesiastical affairs are relegated to the background. In this section, after sketching the history of France under the Carolingians and early Capets, Orderic takes up the events of his own times, starting from about 1082. He has much to say concerning the empire, the papacy, the Normans in Italy and Apulia, the First Crusade (for which he follows Fulcher of Chartres and Baudri of Bourgueil). But his chief interest is in the histories of Duke Robert of Normandy, William Rufus and Henry I. He continues his work, in the form of annals, up to the defeat and capture of Stephen at Lincoln in 1141.

The *Historia ecclesiastica* was edited by Duchesne in his *Historiae Normannorum scriptores* (Paris, 1619). This is the edition cited by Freeman and in many standard works. It is, however, inferior to that of A. le Prévost in five vols. (*Soc. de l'histoire de France*, Paris, 1838–1855). The fifth volume contains excellent critical studies by M. Leopold Delisle, and is admirably indexed. Migne's edition (*Patrologia latina*, clxxxviii.) is merely a reprint of Duchesne. There is a French translation (by L. Dubois) in Guizot's *Collection des mémoires relatifs à l'histoire de France* (Paris, 1825–1827); and one in English by T. Forester in Bohn's Antiquarian Library (4 vols., 1853–1856). In addition to the *Historia* there exists, in the library at Rouen, a manuscript edition of William of Jumièges' *Historia Normannorum* which Leopold Delisle assigns to Orderic (see this critic's *Lettre à M Jules Lair* (1873). (H. W. C. D.)

ORDINANCE, or ORDONNANCE, in architecture, a composition of some particular order or style. It need not be restricted to columnar composition, but applies to any kind of design which is subjected to conventional rules for its arrangement.

ORDINANCE, in medieval England, a form of legislation. The ordinance differed from the statute because it did not require the sanction of parliament, but was issued by the sovereign by virtue of the royal prerogative, although, especially during the reign of Edward I., the king frequently obtained the assent of his council to his ordinances. Dr Stubbs (*Const. Hist.*, vol. ii.) defines the ordinance as "a regulation made by the king, by himself or in his council or with the advice of his council, promulgated in letters patent or in charter, and liable to be recalled by the same authority." But after remarking that "these generalizations do not cover all the instances of the use of ordinance," he adds: "The statute is primarily a legislative act, the ordinance is primarily an executive one." Legislation by ordinance was very common during the reigns of Henry III. and Edward I. when laws were issued by the king in council or enacted in parliament indifferently. Both were regarded as equally binding. Soon, however, legislation by ordinance aroused the jealousy of parliament, especially when it was found that acts of parliament were altered and their purpose defeated by this means. Consequently in 1389 the Commons presented a petition to King Richard II. asking that no ordinance should be made contrary to the common law, or the ancient customs of the land, or the statutes ordained by parliament. For this and other reasons this form of legislation fell gradually into disuse, becoming obsolete in the 15th century. The modern equivalent of the ordinance is the order in council.

In 1310, when Edward II. was on the throne and England was in a very disturbed condition, a committee of twenty-one bishops, earls and barons was chosen to make certain ordinances for the better government of the country. These men were called ordainers.

In the 17th century the use of the word ordinance was revived, and was applied to some of the measures passed by the Long Parliament, among them the famous self-denying ordinance of 1645. This form was used probably in conformity with the opinion of Sir Edward Coke, who says in his *Fourth Institute* "an ordinance in parliament wanteth the threefold consent, and is ordained by one or two of them" (*i.e.* king, lords and commons). The ordinances of the Long Parliament did not, of course, obtain the assent of the king. At the present time the word ordinance is used to describe a body of laws enacted by a body less than sovereign. For example, the ordinances of Southern Nigeria are issued by the governor of that colony with the assent of his council.

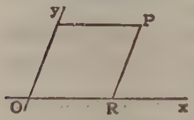
Before 1789 the kings of France frequently issued *ordonnances*. These were acts of legislation, and were similar to the ordinances of the English kings in medieval times.

ORDINARY (med. Lat. *ordinarius*, Fr. *ordinaire*), in canon law, the name commonly employed to designate a superior ecclesiastic exercising "ordinary" jurisdiction (*jurisdictionem ordinariam*), *i.e.* in accordance with the normal organization of the church. It is usually applied to the bishop of a diocese and to those who exercise jurisdiction in his name or by delegation of his functions. Thus, in Germany, the term *ordinariat* is applied to the whole body of officials, including the bishop, through whom a diocese is administered. In English law, however, the term ordinary is now confined to the bishop and the chancellor of his court. The pope is the *ordinarius* of the whole Roman Catholic Church, and is sometimes described as *ordinarius ordinariorum.* Similarly in the Church of England the king is legally the supreme ordinary, as the source of jurisdiction.

The use of the term ordinary is not confined to ecclesiastical jurisdiction. In the civil law the *judex ordinarius* is a judge who has regular jurisdiction as of course and of common right as opposed to persons extraordinarily appointed. The term survived throughout the middle ages wherever the Roman law gained a foothold. In the Byzantine empire it was applied to any one filling a regular office (*e.g.* ὕπατος ὀρδινάριος=*consul ordinarius*, ἄρχων ὀρδινάριος=*praefectus ordinarius*); but it also occasionally implied rank as distinct from office, all those who had the title of *clarissimus* being sometimes described as ὀρδινάριοι. In England the only case of the term being employed in its civil use was that of the office of judge ordinary created by the Divorce Act of 1857, a title which was, however, only in existence for the space of about eighteen years owing to the incorporation of the Divorce Court with the High Court of Justice by the Judicature Act 1875. But in Scotland the ordinary judges of the Inner and Outer Houses are called lords ordinary, the junior lord ordinary of the Outer House acts as lord ordinary of the bills, the second junior as lord ordinary on teinds, the third junior as lord ordinary on Exchequer causes. In the United States the ordinary possesses, in the states where such an officer exists, powers vested in him by the constitution and acts of the legislature identical with those usually vested in the courts of probate. In South Carolina he was a judicial officer, but the office no longer exists, as South Carolina has now a probate court.

In the German universities the *Professor ordinarius* is the occupant of one of the regular and permanent chairs in any faculty.

ORDINATE, in the Cartesian system of co-ordinates, the distance of a point from the horizontal axis (axis of x) measured parallel to the axis of y. Thus PR is the *ordinate* of P. The word appears to have been first used by René Descartes, and to be derived from *lineae ordinatae*, a term used by Roman surveyors for parallel lines. (See GEOMETRY: *Analytical.*)



ORDNANCE (a syncopated form of "ordinance" or "ordonnance," so spelt in this sense since the 17th century), a general term for great guns for military and naval purposes, as opposed to "small arms" and their equipment; hence the term also includes miscellaneous stores under the control of the ordnance department as organized. In England the Master-General of the Ordnance, from Henry VIII.'s time, was head of a board, partly military, partly civil, which managed all affairs concerning the artillery, engineers and *matériel* of the army; this was abolished in 1855, its duties being distributed. The making of surveys and maps (see MAP) was, for instance, handed over eventually (1889) to the Board of Agriculture, though the term "ordnance survey" still shows the origin.

I. HISTORY AND CONSTRUCTION

The efficiency of any weapon depends entirely on two factors: (1) its power to destroy men and material, (2) the moral effect upon the enemy. Even at the present day the moral effect of gun fire is of great importance, but when guns were first used the noise they made on discharge must have produced a bewildering fear in those without previous experience of them; more especially would this be the case with horses and other animals. Villani wrote of the battle of Cressy that the "English guns made a noise like thunder and caused much loss in men and horses" (Hime, *Proc. R. A. Institution*, vol. 26). Now, the moral effect may be considered more or less constant, for, as men are educated to the presence of artillery, the range of guns, their accuracy, mobility and on shore their invisibility, so increase that there is always the ever present fear that the stroke will fall without giving any evidence of whence it came. On the other hand, the development of the gun has always had an upward tendency, which of late years has been very marked; the demand for the increase of energy has kept pace with—or rather in recent times may be said to have caused—improvements in metallurgical science.

The evolution of ordnance may be divided roughly into three epochs. The first includes that period during which stone shot were principally employed; the guns during this period (1313 to 1520) were mostly made of wrought iron, although the art of casting bronze was then well known. This was due to the fact that guns were made of large size to fire heavy stone shot, and, in consequence, bronze guns would be very expensive, besides which wrought iron was the stronger material. The second epoch was that extending from 1520 to 1854, during which cast iron round shot were generally employed. In this epoch, both bronze and cast iron ordnance were used, but the progress achieved was remarkably small. The increase of power actually obtained was due to the use of corn, instead of serpentine, powder, but guns were undoubtedly much better proportioned towards the middle and end of this period than they were at the beginning. The third or present epoch may be said to have commenced in 1854, when elongated projectiles and rifled guns were beginning to be adopted. The rapid progress made during this period is as remarkable as the unproductiveness of the second epoch. Even during recent years the call for greater power has produced results which were believed to be impossible in 1890.

The actual date of the introduction of cannon, and the country in which they first appeared, have been the subject of much antiquarian research; but no definite conclusion has been arrived at. Some writers suppose (see Brackenbury, "Ancient Cannon in Europe" in *Proc. Royal Artillery Inst.*, vol. iv.) that gunpowder was the result of a gradual development from incendiary compounds, such as Greek and sea fire of far earlier times, and that cannon followed in natural sequence. Other writers attribute the invention of cannon to the Chinese or Arabs. In any case, after their introduction into Europe a comparatively rapid progress was made. Early in the 14th century the first guns were small and vase shaped; towards the end they had become of huge dimensions firing heavy stone shot of from 200 to 450 lb weight.

The earliest known representation of a gun in England is contained in an illuminated manuscript "De Officiis Regum" at Christ Church, Oxford, of the time of Edward II. (1326). This clearly shows a knight in armour firing a short primitive weapon shaped something like a vase and loaded with an incendiary arrow. This type of gun was a muzzle loader with a vent channel at the breech end. There seems to be undoubted evidence that in 1338 there existed breech-loading guns of both iron and brass, provided with one or more movable chambers to facilitate loading (*Proc. R. A. I.*, vol. iv. p. 291). These firearms were evidently very small, as only 2 lb of gunpowder were provided for firing 48 arrows, or about seven-tenths of an ounce for each charge.

The great Bombarde of Ghent, called "Dulle Griete" (fig. 1) is believed to belong to the end of the century, probably about 1382, and, according to the *Guide des voyageurs dans la ville de Gand* (Voisin) the people of Ghent used it in 1411. This gun,

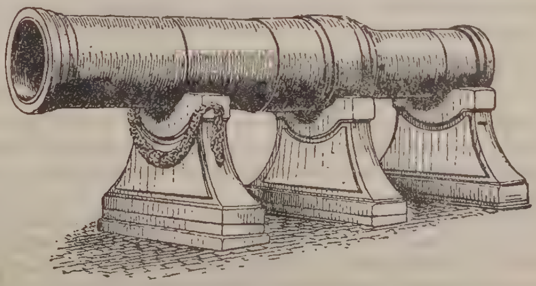


FIG. 1.—Dulle Griete, Ghent.

which weighs about 13 tons, is formed of an inner lining of wrought iron longitudinal bars arranged like the staves of a cask and welded together, surrounded by rings of wrought iron driven or shrunk on. The chamber portion is of smaller diameter, and some suppose it to be screwed to the muzzle portion. The length of the gun is 197 in., the diameter of the bore 25 in., and the chamber 10 in. at the front and tapering to 6 in. diameter at the breech end. It fired a granite ball weighing about 700 lb. Two wrought iron guns left by the English in 1423 when they had to raise the siege of Mont St Michel in Normandy belong to about the same period; the larger of these guns has a bore of 19 in. diameter. "Mons Meg" (fig. 2) in Edinburgh Castle is a wrought iron gun of a little later period; it is built up in the same manner of iron bars and external rings. It has a calibre of 20 in. and fired a granite shot weighing 330 lb.

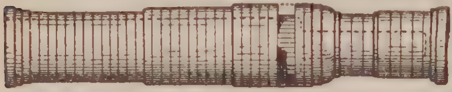


Fig. 2.—Mons Meg.

Bronze guns of almost identical dimensions to the "Dulle Griete" were cast a little later (1468) at Constantinople (see Lefroy, *Proc. R. A. I.*, vol. vi.). One of these is now in the Royal Military Repository, Wollwich. It is in two pieces screwed together: the front portion has a calibre of 25 in. and is for the reception of the stone shot, which weighed 672 lb; and a rear portion, forming the powder chamber, of 10 in. diameter. The whole gun weighs nearly $18\frac{3}{4}$ tons.

To give some idea of the power of these guns, the damage done by them to Sir John Duckworth's squadron in 1807 when the Dardanelles were forced may be instanced. In this engagement six men-of-war were more or less damaged and some 126 men were killed or wounded. The guns were too unwieldy to lay for each round and were consequently placed in a permanent position; they were often kept loaded for months.

The 16th century was remarkable from the fact that the large bombard type was discarded and smaller wrought iron guns were made. This was due to the use of iron projectiles, which enabled a blow to be delivered from a comparatively small gun as destructive as that from the very weighty bombards throwing stone shot.

Bronze guns also now came into great favour. They were first cast in England in 1521 (Henry VIII.), and iron cannon about 1540, foreign founders being introduced for the purpose of teaching the English the art. The "Mary Rose," which sank off Spithead in 1545, had on board both breech-loading wrought-iron and muzzle-loading bronze guns.

The smaller guns cast at this period were of considerable length, probably on account of the large charges of meal powder which were fired. The long bronze gun in Dover Castle known as "Queen Elizabeth's pocket pistol" has a calibre of 4·75 in.; its bore is 23 ft. 1 in. long or 58 calibres, but its total length including the cascable is 24 ft. 6 in. It was cast at Utrecht in 1544 and presented by Charles V. to Henry VIII.

Little or no classification of the various types of guns was attempted during the 15th century. The following century saw some attempt made at uniformity and the division of the several calibres into classes, but it was not until about 1739, when Maritz of Geneva introduced the boring of guns from the solid, that actual uniformity of calibre was attained, as up to this date they were always cast hollow and discrepancies naturally occurred. In France organization was attempted in 1732 by Vallière, but to Gribeauval (*q.v.*) is due the credit of having simplified artillery and introduced great improvements in the equipment.

It is not possible to compare properly the power of the earlier guns; at first small and feeble, they became later large and unwieldy, but still feeble. The gunpowder called "serpentine" often compounded from separate ingredients on the spot at the time of loading, burnt slowly without strength and naturally varied from round to round. The more fiercely burning granulated or corned powder, introduced into Germany about 1429, and into England shortly after, was too strong for the larger pieces of that date, and could be used only for small firearms for more than a century after. These small guns were often loaded with a lead or lead-coated ball driven down the bore by hammering.

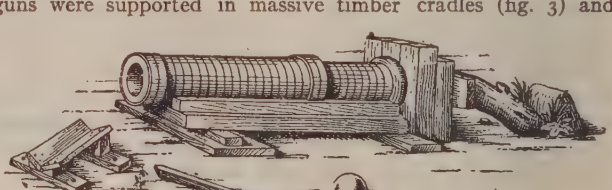
The bronze and cast iron ordnance which followed in the 16th century were strengthened in the 17th century, and so were more adapted to use the corned powder. By this means some access of energy and greater effective ranges were obtained.

In the 18th century and in the first half of the 19th no change of importance was made. Greater purity of the ingredients and better methods of manufacture had improved gunpowder; the windage between the shot and the bore had also been reduced, and guns had been strengthened to meet this progress, but the principles of construction remained unaltered until the middle of the 19th century. Metallurgical science had made great progress, but cast iron was still the only metal considered suitable for large guns, whilst bronze was used for field guns. Many accidents, due to defects developing during practice, had, however, occurred, in order to prevent which experimental guns constructed of stronger material such as forged iron and steel had been made. Some of these weapons were merely massive solid blocks, with a hole bored in for the bore, and only withstood a few rounds before bursting. This result was attributed to the metal being of an indifferent quality—quite a possible reason as the treatment of large masses of steel was then in its infancy, and even with the best modern appliances difficulties have always existed in the efficient welding of large forgings of iron. Forged iron, however, always gave some evidence of its impending failure whereas the steel burst in pieces suddenly; steel was, therefore, considered too treacherous a material for use in ordnance. This view held for many years, and steel was only again employed after many trials had been made to demonstrate its reliability. It will be seen later that the ill success of these experiments was greatly due to a want of knowledge of the correct principles of gun construction.

The progress made since 1854 is dependent on and embraces improvements in gun construction, rifling and breech mechanisms.

Old Equipments.

Considerable obscurity exists as regards the means adopted for mounting the first cannon. From illuminations in contemporary manuscripts it appears that the earliest guns, which were trunnionless, were simply laid on the ground and supported by a timber framing at each side, whilst the flat breech end rested against a strong wood support let into the ground to prevent recoil. This arrangement was no doubt inconvenient, and a little later small cannon were fastened in a wooden stock by iron bands; larger guns were supported in massive timber cradles (fig. 3) and secured thereto by iron straps or ropes. The ponderous weight to be moved and the deficiency of mechanical means prevented these large cannon and their cradles from being readily moved when once placed in position. Laying was of the most primitive kind, and the bombard was packed up in its wood cradle to the required elevation once for all. When it was desired to breach a wall the bombard with its bed would be laid on the ground at about 100 yds. distance, the breech end of the gun or the rear end of the bed abutting against a solid baulk of wood fixed to the ground. "Mons Meg" was originally provided with a wood cradle.



Redrawn from Mallet's *Construction of Artillery*.

Fig. 3.—Primitive Gun-mounting.

It is by no means certain when wheeled carriages were introduced. They must have gradually appeared as a means of surmounting the difficulties engendered by the recoil of the piece and of transport of the early guns and their cradles. Andrea Redusio mentions in *Chronicon Tarvisinum* the use of two wheeled bombard carriages at the siege of Quero by the Venetians in 1376. It does not follow that these weapons were of large dimensions, as the term "bombard" was applied to small guns as well as to the more ponderous types.

The ancient carriages used on land are remarkable from the fact that in general design they contain the main principles which have been included in field carriages up to the present day. Until 1870 the body of all field carriages was made of wood. In an early type the trail portion was made of a solid baulk of timber supported at the front by a hard wood axletree, on the arms of which the wheels were placed (iron axletrees were introduced by Gribeauval in 1765). The gun resting in its wooden cradle was carried in bearings on the trail immediately over the axletree (fig. 4), the cradle being provided with an axle or trunnions for the purpose. For giving elevation a wood arc was fixed to the trail towards the rear end, and the breech end could be moved up and down along this arc and fixed at certain positions by a pin passing through both cradle and arc.

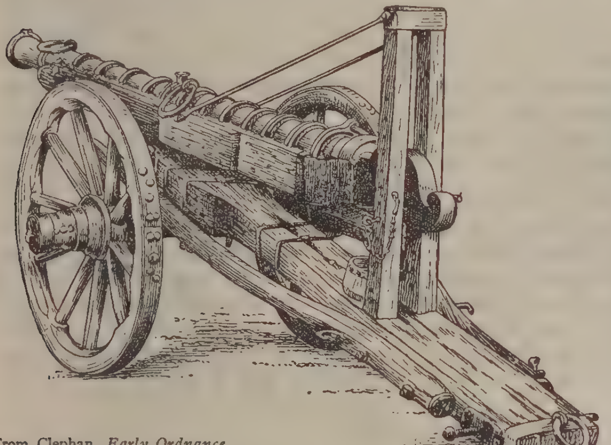

From Clephan, *Early Ordnance.*

FIG. 4.—Early Field Gun.

About the middle of the 15th century the trunnions were formed with the gun—the wood cradle therefore became unnecessary and was discarded. The carriage was then formed of two strong cheeks or sides of wood fastened together by four wood transoms. At the front end the cheeks were secured to the wooden axletree, which was strengthened by a bar of iron let into its under side. Trunnion bearings were cut in the upper surface of the cheeks over the axletree, and these were lined with iron, while the trunnions were secured in position by iron cap-squares. Elevation was given by a wedge or "quoin" being placed under the breech and supported by a transom or stool bed. For transport the trail end of the carriage was supported on a limber, a pintle on the limber body passing through a hole in the trail. One set of shafts were fixed to the limber, and a single horse was harnessed to them; the remainder of the team were attached in pairs in front. A driver was provided for every two pairs of horses. In Italy oxen were often yoked to the larger guns instead of horses. Tartaglia mentions in his *Nova scientia* (1562) that 28 oxen were required for a gun 15 ft. in length and weighing 13,000 ℔; horses were used for small guns only.

For service on board ship the difficulties of the cramped situation seem to have been surmounted in an ingenious manner. In the "Mary Rose," sunk in the reign of Henry VIII., the brass guns with trunnions were mounted on short wood carriages provided with four small wood wheels called "trucks" and fastened to the gun ports by rope breechings. The iron breech-loading guns were employed in restricted positions where loading at the muzzle would be difficult. They had no trunnions and were mounted in a wood cradle, the under side of which was grooved to enable it to slide on a directing bar.

At the end of the 17th century not much progress had been made. The larger guns were mounted on short wood carriages having two or four "trucks." The guns and carriages recoiled along the vessel's deck, and where this endangered the masts or other structures the recoil was hindered by soft substances being laid down in the path of the recoil.

The small guns were mounted in iron Y pieces—the upper arms being provided with bearings for the gun trunnions—and the stalk formed a pivot which rested in a socket in the vessel's side or on a wall, so that the gun could be turned to any quarter.

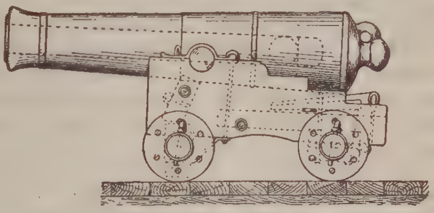


FIG. 5.—Truck Carriage.

Similar carriages (fig. 5) existed until the advent of rifled guns, but a few small improvements, such as screw elevating gear in place of the quoin, had been approved. Cast iron standing carriages were also, about 1825, used on land for hot climates and situations not much exposed.

Sighting.

The earliest guns were not provided with sights or other means for directing them. This was not important, as the range seldom exceeded 100 yds. As, however, ranges became longer, some means became necessary for giving the correct line and elevation (see also SIGHTS). The direction for line was easily obtained by looking over the gun and moving the carriage trail to the right or left as was necessary. For elevation an instrument invented by Tartaglia called a Gunner's Quadrant (sometimes also called a Gunner's Square) was used; this was a graduated quadrant of a circle (fig. 6) connecting a long and short arm forming a right angle; a line with a plummet hung from the angle in such a manner that on the long arm being placed along the bore near the muzzle the plummet hung down against the quadrant and indicated the degrees of elevation given to the piece. The quadrant was divided into 90° and also into 12 parts; it was continued past the short arm for some degrees to enable depression to be given to the gun. The instrument was also used for surveying in obtaining the heights of buildings, and is still much employed for elevating guns in its clinometer form, in which a level takes the place of the plummet.

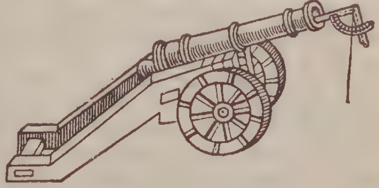


FIG. 6.—Gunner's Quadrant.

For short range firing a dispart sight was in use early in the 17th century. A notch was cut on the top of the breech or base ring, and on the muzzle ring a notched fore sight (called the dispart sight) was placed in the same vertical plane as the notch, and of such a height that a line stretched from the top of the breech ring notch to the notch of the foresight was parallel to the axis of the bore. These sights were well enough for close, horizontal fire and so long as the enemy were within what was called "point blank" range; that is the range to the first graze, on a horizontal plane, of the shot when fired from a gun the axis of which is horizontal. As this range depends entirely, other things being equal, on the height of the gun's axis above the horizontal plane, it is not very definite. When, however, the enemy were at a greater distance, elevation had to be given to the gun and, as a quadrant was slow and not easy to use, there was introduced an instrument, called a Gunner's Rule (see *The Art of Gunnery*, by Nathanael Nye, 1670), which was really a primitive form of tangent sight. This was a flat brass scale 12 or 14 in. long divided on its flat surface into divisions proportional to the tangents of angles with a base equal to the distance from the notch on the base ring to the dispart notch. A slit was made along the rule, and a thread with a bead on it was mounted on a slider so that it could be moved in the slit to any required graduation. By sighting along the bead to the dispart the gun could be laid on any object. Later still, the requisite elevation was obtained by cutting a series of notches on the side of the base ring and one on the muzzle ring. These were called "Quarter Sights" and allowed of elevations up to 3°; the lowest notch with the one on the muzzle swell gave a line parallel to the axis of the bore but above it so as to clear the cap-squares of the trunnions. This system was also used in bronze field guns and in all cast iron guns up to the 32-pdr. Difficulties in laying occurred unless the direction was obtained by looking over the top or dispart sight and the elevation then given by the quarter sights. This was the system of sighting in use during the great naval actions of the end of the 18th century and the beginning of the 19th century. A pointed dispart sight was often used, and for naval purposes it was fixed on the reinforce near the trunnions, as the recoil of the gun through the port would destroy it if fixed on the muzzle swell.

The double sighting operation was rendered unnecessary by the use of "tangent scales" introduced by Gribeauval. Similar scales were soon adopted in the English land service artillery, but they were not fully adopted in the English navy until about 1854 (see *Naval Gunnery*, by Sir Howard Douglas, p. 390), although in the United States navy a system of sighting, which enabled the guns to be layed at any degree of elevation, had been applied as early as 1812. These tangent scales were of brass fitting into sockets on the breech end of the gun; they were used in conjunction with the dispart fore sight and gave elevation up to 4° or 5° over the top of the gun. For greater elevation a wooden tangent scale was provided which gave elevation up to 8° or 10°.

In the British navy, before tangent sights were used, the plan often adopted for rapidly laying the guns was by sighting, with the notch on the breech ring and the dispart sight, on some part of the masts of the enemy's vessel at a height corresponding to the range.

With sailing ships about the middle of the 19th century the angle of heel of the vessel when it was sailing on a wind was ascertained from the ship's pendulum, and the lee guns elevated or the weather guns depressed to compensate by means of a graduated wooden stave called a "heel scale" of which one end was placed on the deck or last step of the carriage whilst the upper end read in connection with a scale of degrees engraved on the flat end of the cascable.

Subsequently the term "tangent sight" was given to the "tangent scales," and they were fitted into holes made in the body of the gun—the foresight usually being fitted to a hole in the gun near the trunnions. Two pairs of sights—one at each side—were generally arranged for, and in rifled guns the holes for the tangent sight bars were inclined to compensate for the drift of the projectile. As the drift angle varies with the muzzle velocity, the tangent sights of howitzers were set vertically, so that for the various charges used the deflection to compensate for drift had to be given on the head of the sight bar. Modern forms of sights are described and illustrated in the article SIGHTS.

Breech-loading Ordnance.

Breech-loading ordnance dates from about the end of the 14th century, or soon after the introduction of cannon into England (Brackenbury, *Proc. R.A.I.* v. 32). The gun body, in some cases, was fixed to a wood cradle by iron straps and the breech portion kept in position between the muzzle portion and a vertical block of wood fixed to the end of the cradle, by a wedge. Accidents must have been common, and improvements were made by dropping the breech or chamber of the weapon into a receptacle, solidly forged on or fastened by lugs to the rear end of the gun (fig. 7). This system was used for small guns only, such as wall pieces, &c., which could not be easily loaded at the muzzle owing to the position in which they were placed, and in order to obtain rapidity each gun was furnished with several chambers.

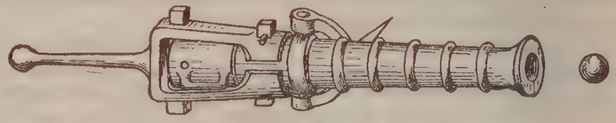


FIG. 7.—Early Breech-loader.

Guns of this nature, called Petrieroes a Braza, were used in particular positions even at the end of the 17th century. Moretii states that they carried a stone ball of from 2 lb to 14 lb, which was placed in the bore of the gun and kept in position by wads. The chambers, resembling an ordinary tankard in shape, had a spigot formed on their front end which entered into a corresponding recess at the rear end of the bore and so formed a rude joint. Each chamber was nearly filled with powder and the mouth closed by a wood stopper driven in; it was then inserted into the breech of the gun and secured by a wedge. Even with feeble gunpowder this means of securing the chamber does not commend itself, but as powder improved there was a greater probability of the breech end of the gun giving way; besides which the escape of the powder gas from the imperfect joint between the chamber and gun must have caused great inconvenience. To these causes must be attributed the general disuse of the breech-loading system during the 18th and first half of the 19th centuries.

Robins mentions (*Tracts of Gunnery*, p. 337) that experimental breech-loading rifled pieces had been tried in 1745 in England to surmount the difficulty of loading from the muzzle. In these there was an opening made in the side of the breech which, after the loading had been completed, was closed by a screw. The breech arrangement (fig. 8) of the rifled gun invented by Major Cavalli, a Sardinian officer, in 1845, was far superior to anything tried previously. After the projectile and charge had been loaded into the gun through the breech, a cast iron cylindrical plug, cupped on the front face, was introduced into the chamber; a copper ring was placed against its rear face; finally a strong iron wedge was passed through the body of the gun horizontally just in rear of the plug, and prevented it being blown out of the gun. In England the breech of one of the experimental guns was blown off after only a few rounds had been fired. In Wahrendorff's gun, invented in 1846, the breech arrangement (fig. 9) was very similar in principle to the Cavalli gun. In addition to the breech plug and horizontal wedge there was an iron door, hinged to the breech face of the gun, which carried a rod attached to the rear of the breech plug. The horizontal wedge had a slot cut from its right side to the centre, so that it might freely pass this rod. After loading,

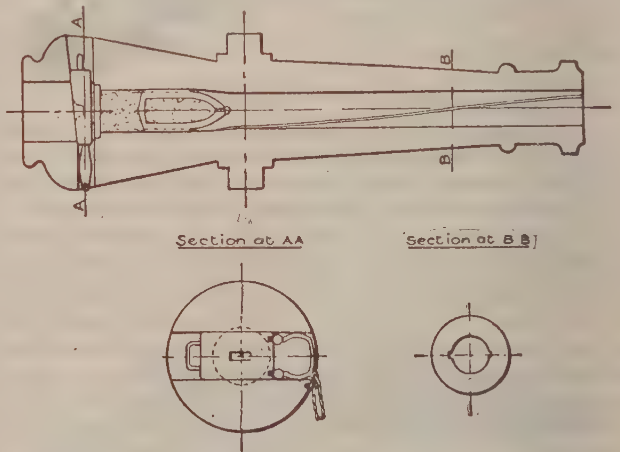


FIG. 8.—Cavalli Gun, 1845.

the hinged door, with the breech plug resting against its front face, was swung into the breech opening, and the plug was pushed forward to its position in the chamber of the gun; the wedge was then pushed across to prevent the plug being blown back, and, finally, a nut screwed to the rear end of the plug rod was given a couple of turns so that all was made tight and secure. After firing, the breech was opened by reversing these operations.

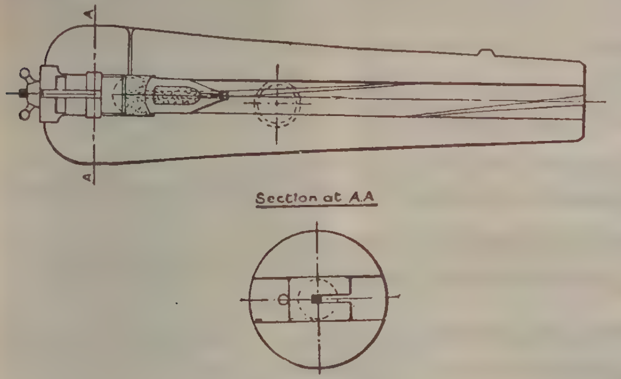


FIG. 9.—Wahrendorff Gun, 1846.

The Armstrong system of breech-loading introduced in 1854 was the first to give satisfactory results; its simple design and few parts produced a favourable effect in the minds of artillerists, which was increased by the excellent accuracy obtained in shooting. The gun (fig. 10) had a removable breech block having on its front face a coned copper ring which fitted into a coned seating at the breech end of the powder chamber. The breech block was secured by means of a powerful breech screw; a hole was made through the screw so that, in loading, the shell and cartridge could be passed through it after the breech block had been removed. After loading, the block was dropped into its place and the breech screw turned rapidly so that it might jam the block against its seating, and so prevent the escape of powder gas when the gun was fired. This gun was most successful, and a great number of guns of this type were soon introduced into the British army and navy.

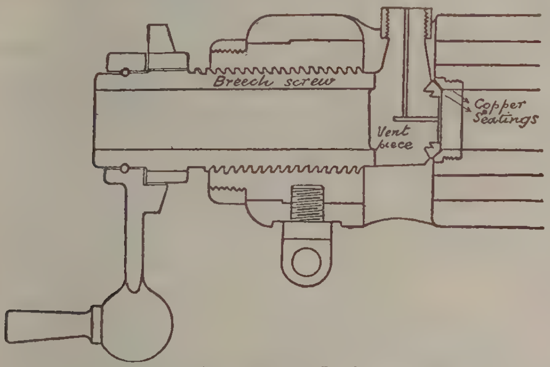


FIG. 10.—Armstrong B.L. Arrangement.

They were employed in the China campaign of 1860, and satisfactory reports were made as to their serviceableness; but while the breech-loading system had obtained a firm footing on the Continent of Europe, there was a strong prejudice against it in England, and about 1864 M.L.R. guns were adopted. Breech-loaders did not again find favour until about 1882, when a demand was made for more powerful guns than the M.L.R. In consequence, M.L. guns having enlarged chambers for burning large charges of prismatic powder were experimented with by the Elswick Ordnance Co. and subsequently by the War Office. The results were so promising that means were sought for further improvements, and breech-loading guns, having the Elswick cup obturation, were reintroduced.

Built-up guns.

Up to about 1850 the dimensions of canon had been proportioned by means of empirical rules, as the real principles underlying the construction of ordnance had been little understood. It was known of course that a gun was subjected to two fundamental stresses—a circumferential tension tending to split the gun open longitudinally, and a longitudinal tension tending to pull the gun apart lengthwise; the longitudinal strength of a gun is usually greatly in excess of any requirements. It is easy to demonstrate that any so-called homogeneous gun, *i.e.* a gun made of solid material and not built up, soon reaches a limit of thickness beyond which additional thickness is practically useless in giving strength to resist circumferential stress. This is due to the fact that the stress on the metal near the bore is far higher than that on the outer portion and soon reaches its maximum resistance which additional thickness of metal does not materially increase. The gun can, however, be arranged to withstand a considerably higher working pressure by building it up on the principle of initial tensions. The inner layers of the metal are thereby compressed so that the gas pressure has first to reverse this compression and then to extend the metal. The gun barrel supported by the contraction of the outer hoops will then be able to endure a gas pressure which can be expressed as being proportional to the initial *compression* plus the *extension*, whereas in the old type solid gun it was proportional to the *extension* only. The first to employ successfully this important principle for all parts of a gun was Lord Armstrong (*q.v.*), who in 1855–1856 produced a breech-loading field gun with a steel barrel strengthened by wrought iron hoops. In this system (fig. 11) wrought iron coils were shrunk over one another so that the inner tube, or barrel, was placed in a state of compression and the outer portions in a state of tension—the parts so proportioned that each performs its maximum duty in resisting the pressure from within. Further, by forming the outer parts of wrought iron bar coiled round a mandril and then welding the coil into a solid hoop, the fibre of the iron was arranged circumferentially and was thus in the best position to resist this stress. These outer coils were shrunk over a hollow breech-piece of forged iron, having the fibre running lengthwise to resist the longitudinal stress. The several cylinders were shrunk over the steel inner tube or barrel. To obtain the necessary compression the exterior diameter of the inner portion is turned in a lathe slightly greater than the interior diameter of the outer coil. The outer coil is heated and expands; it is then slipped over the inner portion and contracts on cooling. If the strength of the two parts has been properly adjusted the outer will remain in a state of tension and the inner in a state of compression.

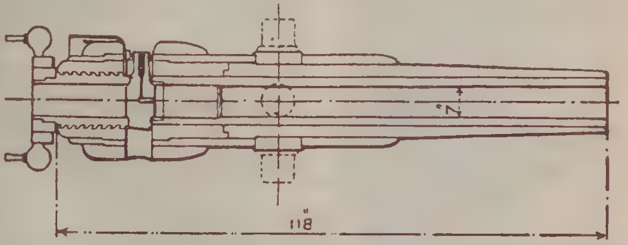


FIG. 11.—Armstrong B.L. Construction.

Every nation has adopted this fundamental principle which governs all systems of modern gun construction. The winding, at a high tension, of thin wire or ribbon on the barrel or on one of the outer coils may be considered as having an exactly similar effect to the shrinking of thin hoops over one another. The American, Dr Woodbridge, claims to have originated the system of strengthening guns by wire in 1850; Brunel, the great railway engineer, also had similar plans; to Longridge, however, belongs the credit of pointing out the proper mode of winding on the wire with initial tension so adjusted as to make the firing tension (*i.e.* the tension which exists when the gun is fired) of the wire uniform for the maximum proof powder pressure. Great success attended the early introduction of the coil system. Large numbers (about 3500) of breech-loading Armstrong guns from 2·5 in. to 7 in. calibre were manufactured for England alone; most of these had barrels of coiled iron, but solid forged iron barrels were also employed and a few were of steel. This manufacture continued until 1867, when M.L. guns built up on the coil system (fig. 12) with the French form of rifling were adopted; but as the knowledge of the proper treatment and the quality of the steel had improved, steel barrels bored from a solid steel forging were mostly used; the exterior layers were still iron hoops with the fibre of the metal disposed as in the original type. In order to cheapen manufacture the coils were thickened by Mr Fraser of Woolwich Arsenal, so that a few thick coils were used instead of a number of thin ones (fig. 13).

In the Fraser system an attempt was made to obtain rigidity of construction and additional longitudinal strength by interlocking the various coils from breech to muzzle; this feature still exists in all designs adopted by the English government, but foreign designers do not favour it altogether, and many of their guns of the latest type have a number of short independent hoops shrunk on, especially over the chase. Their view is that movements—such as stretching of the inner parts—are bound to take place under the huge forces acting upon the tubes, and that it is better to allow freedom for these to take place naturally rather than to make any attempt to retard them. On the other hand it cannot be denied that the rigid construction is conducive to strength and durability, but it is essential that massive tubes of the highest quality of steel should be employed.

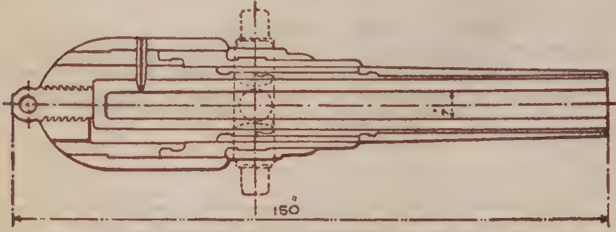


Fig. 12.—M.L. Gun Construction.

The actual building up of a gun entails operations which are exactly similar, whether it be of the M.L. or B.L. system; and the hardening treatment of the steel is also the same—the coiled iron hoops when welded, of course, received no such treatment.

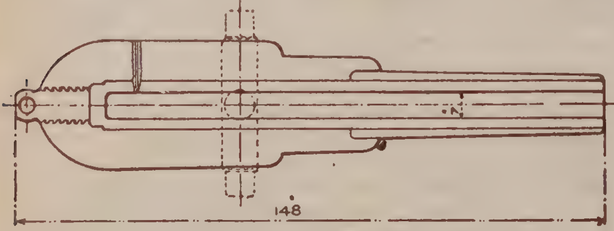


Fig. 13.—M.L. Gun Construction (Fraser).

Fig. 14 shows the various stages of building up a B.L. gun and illustrates at the same time the principle of the interlocking system.

The steel barrels of the M.L. guns were forged solid; the material was then tested so as to determine the most suitable temperature at which the oil hardening treatment should be carried out after the barrel had been bored. The bored barrel was simply heated to the required temperature and plunged vertically into a tank of oil. The subsequent annealing process was not introduced until some years after; it is therefore not to be wondered at that steel proved untrustworthy and so was used with reluctance.

Since 1880 the steel industry has made so much progress that this material is now regarded as the metal most to be relied on. The long high-power guns, however, require to be worked at a greater chamber pressure than the older B.L. guns, with which 15 tons or 16 tons per square inch was considered the maximum. With the designs now produced 18·5 tons to 20 tons per square inch working pressure in the chamber is the general rule.

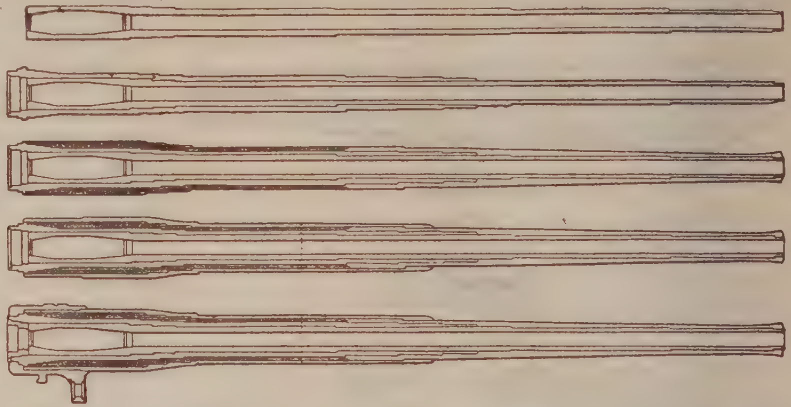


Fig. 14.—Modern B.L. Construction.

A stronger material than ordinary carbon gun steel was consequently demanded from the steel-makers, in order to keep the weights of the heavier natures of guns within reasonable limits. The demand was met by the introduction of a gun steel having about 4 % of nickel in addition to about 0·4 % of carbon. This alloy gives great toughness and endurance under a suitable oil hardening and annealing process, the yielding stress being about 26 tons to 28 tons and the breaking stress from 45 tons to 55 tons per square inch, with an elongation of 16 %. The tests for ordinary carbon gun steel are: "yield not less than 21 tons, breaking stress between 34 tons and 44 tons per square inch, and elongation 17 %."

The toughness of nickel steel forgings renders them much more difficult to machine, but the advantages have been so great that practically all barrels and hoops (except jackets) of modern guns are now made of this material.

Gun forgings.

The gun steel, whether of the carbon or nickel quality, used in England and most foreign countries, is prepared by the open hearth method in a regenerative gas furnace of the Siemens-Martin type (see Iron and Steel). The steel is run from the furnace into a large ladle, previously heated by gas, and from this it is allowed to run into a cast iron ingot mould of from 10 to 12 ft. high and 2 ft. or more in diameter. With very large ingots two furnaces may have to be employed. The external shape of these ingots varies in different steel works, but they are so arranged that, as the ingot slowly cools, the contraction of the metal shall not set up dangerous internal stresses. The top of the ingot is generally porous, and consequently, after cooling, it is usual for about one-third of the length of the ingot to be cut from the top and remelted; a small part of the bottom is also often discarded. The centre of the larger ingots is also inclined to be unsound, and a hole is therefore bored through them to remove this part. In the Whitworth and Harmet methods of fluid compressed steel, this porosity at the top and centre of the ingot does not occur to the same extent, and a much greater portion can therefore be utilized.

The sound portion of the ingot is now heated in a reheating gas furnace, which is usually built in close proximity to a hydraulic forging press (fig. 15, Plate I.). This press is now almost exclusively used for forging the steel in place of the steam hammers which were formerly an important feature in all large works. The largest of these steam hammers could not deliver a blow of much more than some 500 ft. tons of energy; with the hydraulic press, however, the pressure amounts to, for ordinary purposes, from 1000 tons to 5000 tons, while for the manufacture of armour plates it may amount to as much as 10,000 or 12,000 tons.

For forgings of 8-in. internal diameter and upwards, the bored out ingot, just mentioned, is forged hollow on a tubular mandril, kept cool by water running through the centre; from two to four hours forging work can be performed before the metal has cooled down too much. Generally one end of the ingot is forged down to the proper size; it is then reheated and the other end similarly treated.

The forging of the steel and the subsequent operations have a very marked influence on the structure of the metal, as will be seen from the micro-photographs shown in the article Alloys, where (*a*) and (*b*) show the structure of the cast steel of the actual ingot; from this it will be noticed that the crystals are very large and prominent, but, as the metal passes through the various operations, these crystals become smaller and less pronounced. Thus (*c*) and (*d*) show the metal after forging; (*e*) shows the pearlite structure with a magnification of 1000 diameters, which disappears on the steel being oil hardened, and (*f*) shows the oil hardened and annealed crystals. At the Bofors Works in Sweden, gun barrels up to 24 cm. (9·5 in.) calibre have been formed of an unforged cast steel tube; but this practice, although allowing of the production of an inexpensive gun, is not followed by other nations.

After the forging is completed, it is annealed by reheating and cooling slowly, and test pieces are cut from each end tangentially

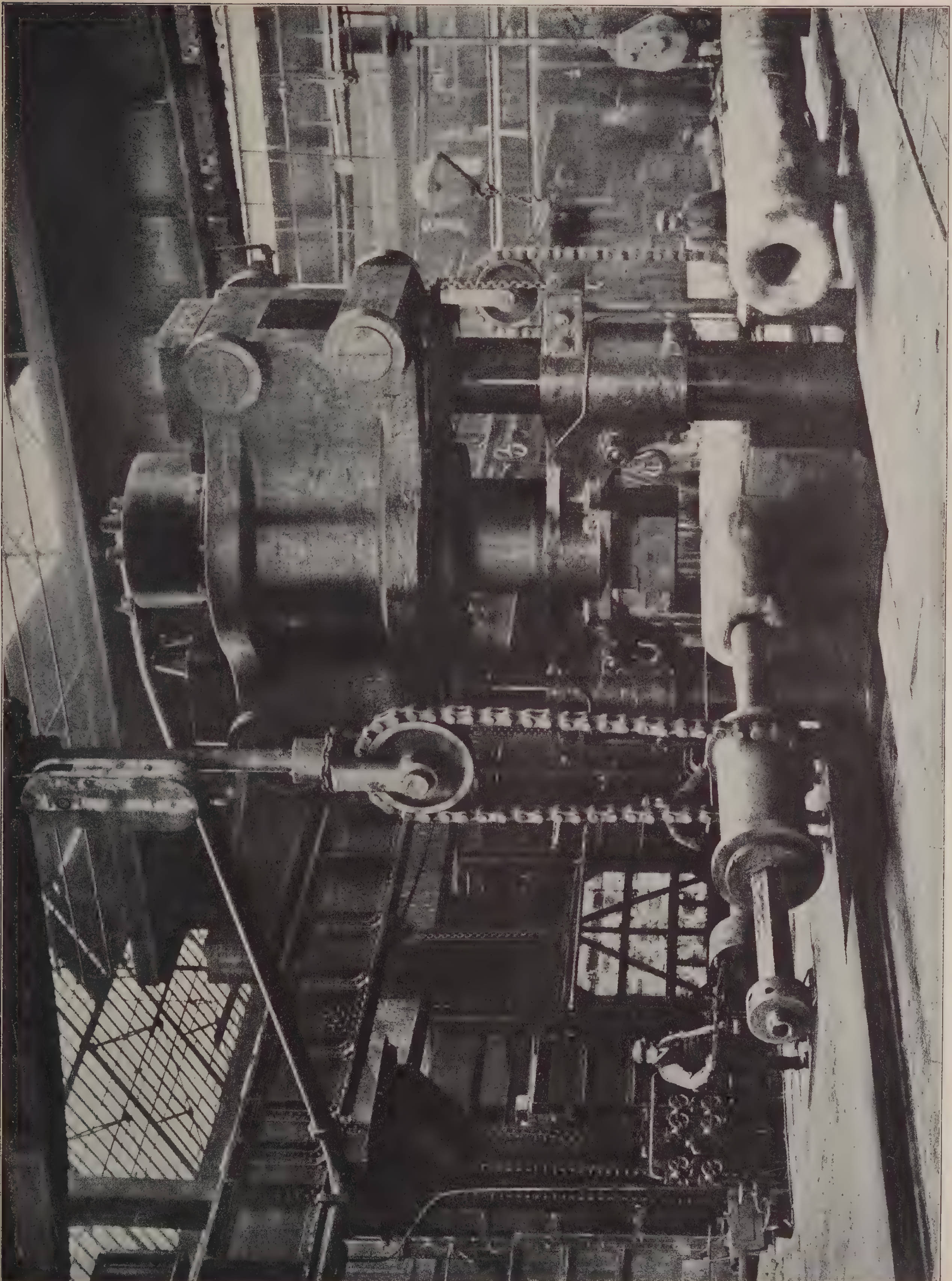


Fig. 15.—FORGING PROCESS.

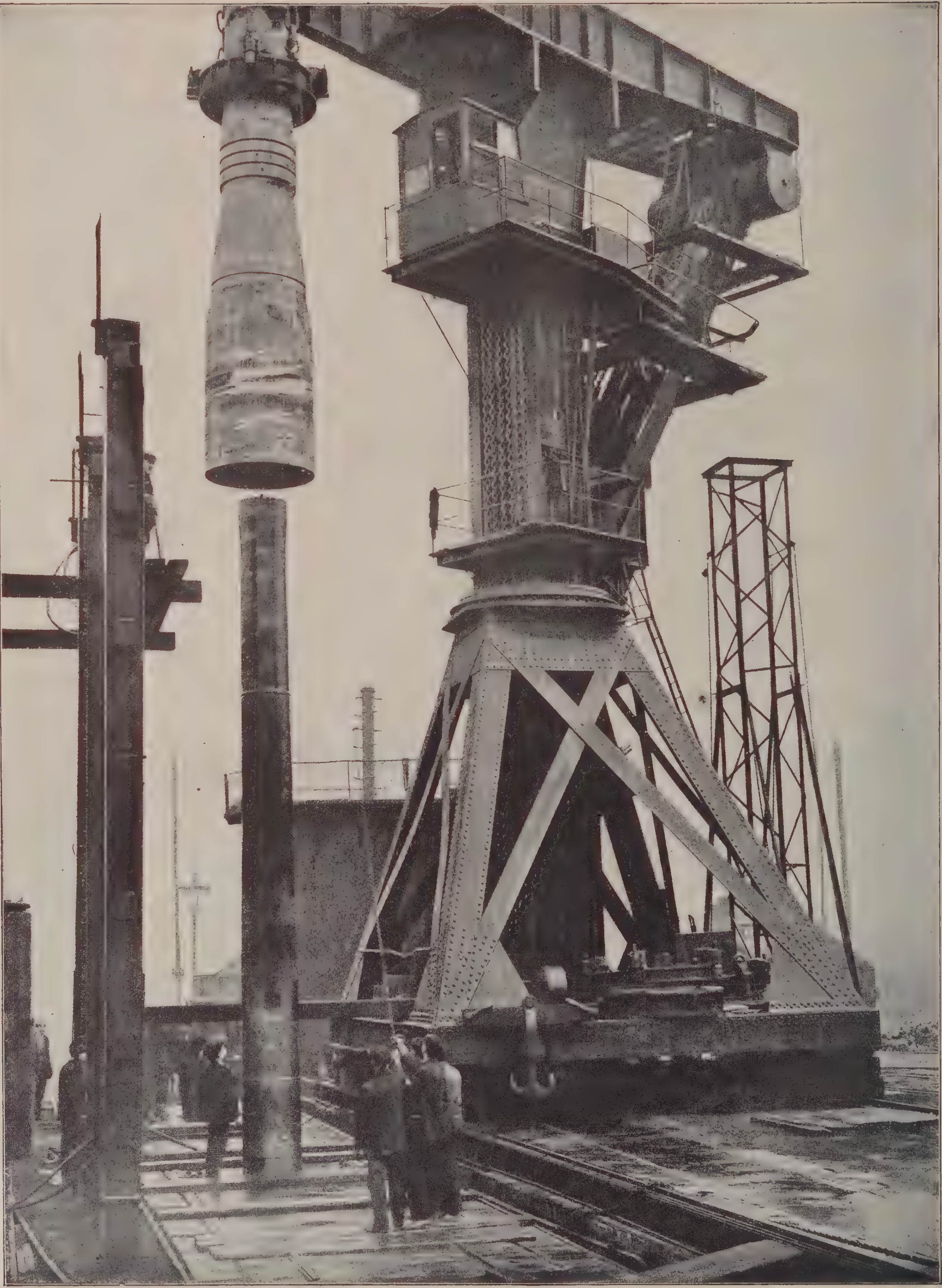


FIG. 18.—SHRINKING-ON PROCESS.

to the circumference of the bore; these are tested to ascertain the quality of the steel in the soft state.

It is found that the quality of the steel is greatly improved by forging, so long as this is not carried so far as to set up a laminar structure in the metal, which is thereby rendered less suitable for gun construction—being weaker across the laminae than in the other directions. It is then termed over-forged.

If the tests are satisfactory the forging is rough-turned and bored, then reheated to a temperature of about 1600° F., and hardened by plunging it into a vertical tank of rape oil. This process is a somewhat critical one and great care is observed in uniformly heating, to the required temperature, the whole of the forging in a furnace in close proximity to the oil tank into which it is plunged and completely submerged as rapidly as possible. In some cases the oil in the tank is circulated by pumping, so that uniformity of cooling is ensured; and, in addition, the oil tank is surrounded by a water jacket which also helps to keep it at a uniform heat. The forging is subsequently again heated to about 1200° F. and allowed to cool slowly by being placed in warm sand, &c. This last operation is termed annealing, and is intended to dissipate any internal stress which may have been induced in the forging by any of the previous processes, especially that of oil-hardening. After this annealing process a second set of test pieces, two for tensile and two for bending test, are cut from each end of the forging in the positions above mentioned; for guns of less than 3-in. calibre only half this number of test pieces is taken; and with hoops of less than 48 in. in length the test pieces are taken only from the end which formed the upper part of the cast ingot.

In all cases of annealed steel the test pieces of 2 in. length and 0·533 in. diameter must give the stipulated tests according to the character of the steel. For breech screws the steel is made of a harder quality, as it has to resist a crushing stress. These are the tests required in England, but they differ in different countries; for instance in France a harder class of carbon steel is employed for hoops, in which the tensile strength must not be less than 44·5 tons, nor the elastic limit less than 28·5 tons per square inch, neither must the elongation fall below 12%.

Assuming that the tests of the annealed forging are satisfactory, the forging, which we will suppose to be a barrel, is tested for straightness and if necessary rectified. It is then rough-turned in a lathe (fig. 16) "to break the skin" (as it is termed technically) and so prevent warping during the subsequent operations. It is then bored out to nearly the finished dimension and afterwards fine turned on the exterior. In the meantime the other portions of the gun are in progress, and as it is far easier to turn down the outside of a tube than to bore out the interior of the superimposed one to the exact measurements required to allow for shrinkage, the interior of the jacket and other hoops are bored out and finished before the exterior of the internal tubes or of the barrel is fine turned. The process of boring is illustrated in fig. 17. The barrel or hoop A, to be bored, is passed through the revolving headstock B and firmly held by jaws C, the other end being supported on rollers D. A head E, mounted on the end of a boring bar F, is drawn gradually through the barrel, as it revolves, by the leading screw K actuated by the gear G. The boring head is provided with two or more cutting tools, and also with a number of brass pins or pieces of hard wood to act as guides, in order to keep the boring head central after it has entered the barrel. The revolving headstock B is driven by a belt and suitable gearing.

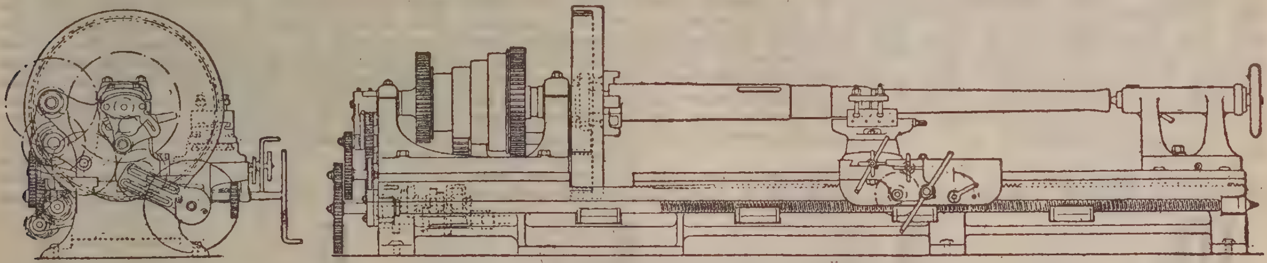


Fig. 16.—Lathe used in Gun Construction.

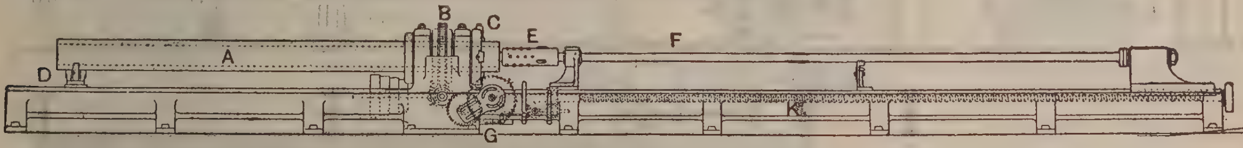


Fig. 17.—Boring.

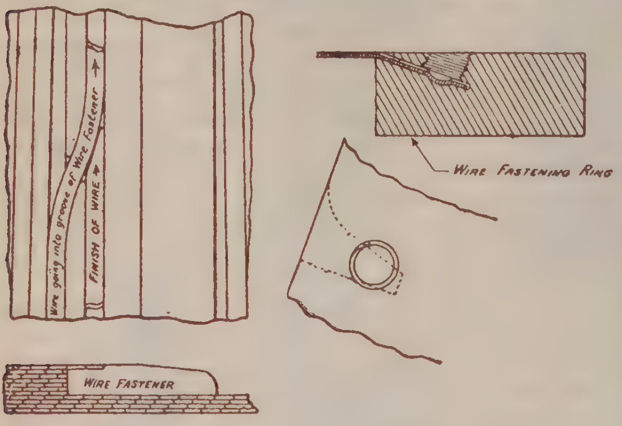
With wire guns the procedure is somewhat different. The wire is wound on to its tube, which has been previously fine turned; the exterior diameter of the wire is then carefully measured and the interior of the covering tube or hoop finished to suit. The covering hoop is allowed usually only a small shrinkage, or sometimes none, as it is simply intended as a protection to the wire and to give longitudinal strength; but in order to place it over the wire it must be heated and thus some little contraction always does take place on cooling. The heat to which these hoops are brought for shrinking never exceeds that used in annealing, otherwise the modifying effects of this process would be interfered with.

In the earliest modern type B.L. guns, the breech screw engaged directly with a screw thread cut in the barrel, which thus had to resist a large portion, if not all, of the longitudinal stress. This was also the system first adopted in France, but there are certain objections to it, the principal being that the barrel must be made of large diameter to meet the longitudinal stress, and this in consequence reduces the circumferential strength of the gun. Again, the diameter of the screw is always considerably larger than the breech opening, and so an abrupt change of section takes place, which it is always best to avoid in structures liable to sudden shocks. The thick barrel, however, gives stiffness against bending and, moreover, does not materially lengthen with firing; thin barrels on the other hand are gradually extended by the drawing out action of the shot as it is forced through the gun. In some large guns with excessively thin barrels this action was so pronounced as to entail considerable inconvenience. In the English system the breech screw is engaged either in the breech piece, *i.e.* the hoop which is shrunk on over the breech end of the barrel, or in a special bush screwed into the breech piece. This latter method suits the latest system of construction in which the breech piece is put on the barrel from the muzzle, while with the earlier type it was put on from the breech end.

With the earlier modern guns short hoops were used whenever possible, as, for instance, over the chase, principally because the steel in short lengths was less likely to contain flaws, but as the metallurgical processes of steel making developed the necessity for this disappeared, and the hoops became gradually longer. This has however, increased correspondingly the difficulties in boring and turning, and, to a much greater extent, those encountered in building up the gun. In this operation the greatest care has to be taken, or warping will occur during heating. The tubes are heated in a vertical cylindrical furnace, gas jets playing both on the exterior and interior of the tube. When sufficiently hot, known by the diameter of the tube expanding to equal previously prepared gauges, the tube is raised out of the furnace and dropped vertically over the barrel or other portion of the gun (fig. 18, Plate II.). In cooling it shrinks longitudinally as well as circumferentially, and in order to avoid gaps between adjoining tubes the tube is, after being placed in position, cooled at one end by a ring of water jets to make it grip, while the other portions are kept hot by rings of burning gas flames, which are successively extinguished to allow the hoop to shorten gradually and thus prevent internal longitudinal stress. A stream of water is also directed along the interior of the gun during the building up process, in order to ensure the hoop cooling from the interior. After the building up has been completed, the barrel is fine-bored, then chambered and rifled. The breech is then screwed either for the bush or breech screw and the breech mechanism fitted to the gun.

In order to obtain additional longitudinal strength the outer tubes are so arranged that each hooks on to its neighbour from muzzle to breech. Thus, the chase hoop hooks on to the barrel by a step, and the succeeding hoops hook on to each other until the jacket is reached which is then secured to the breech piece by a strong screwed ring. In all the latest patterns of English guns there is a single chase hoop covering the forward portion of the gun and a jacket covering the breech portion, an arrangement which simplifies the design but increases the difficulties of manufacture.

Wire guns are now made of almost all calibres, ranging from 3 in. to 12 in. Many authorities objected to guns of less calibre than 4·7 in. being wound with wire, as they considered that on diameters so small the interior surface of each layer of wire is over-compressed, while the exterior is too much extended; but by proportioning the thickness of the wire to the diameter of the tube on which it is wound there is no reason for this to be so.



Elswick System *Woolwich System*

FIG. 19.—Wire Fastening.

The wire is wound on the barrel at a certain tension, ascertained by calculation, and varying from about 50 tons per square inch for the layers first wound on the gun, to about 35 or 40 for the outer layers. To fasten the wire at the beginning and end several methods are adopted. In the Woolwich system a narrow annular ring (fig. 19), with slots cut into one of its faces, is shrunk on to the gun; into these slots one end of the wire is inserted and secured in position by a steel screwed plug. The wire is wound on for the distance desired and then back again to the ring, where the end is fastened off in the same way. At Elswick the wire is fastened by bending it into a shunt cut groove in a similar annular ring, but the wire is only fastened off in the same way after several layers have been wound.

With each succeeding layer of wire the interior layers are compressed, and these in turn compress the barrel. It is therefore necessary, in order to prevent the fatigue of the material, to make the barrel comparatively thick, or, better still, to have an outer barrel superimposed on the inner one. This latter arrangement is now used in all guns of 4 in. calibre and upwards. It is not so important with smaller guns as the barrel is always relatively thick, and therefore meets the conditions.

With many modern guns the interior of the outer barrel, termed the "A" tube, is taper bored, the larger end being towards the breech; and the exterior of the inner barrel or liner, called the "inner A tube," is made tapered to correspond. The latter is, after careful fitting, inserted in the outer barrel while both are cold, and forced into position by hydraulic pressure or other mechanical means.

The details of the machines for winding on the wire (see fig. 20) differ somewhat in different works, but all are arranged so that any desired tension can be given to the wire as it is being wound on to the gun. The wire is manufactured in much the same way as ordinary wire. A red-hot bar of steel, gradually rolled down between rollers to a section about double that which it is finally intended to have, is annealed and carefully pickled in an acid bath to detach any scale. It is then wound on a drum, ready for the next process, which consists in drawing it through graduated holes made in a hardened steel draw-plate, the wire being often annealed and pickled during this process. The drawplate holes vary in size from slightly smaller than the rolled bar section to the finished size of the wire, and, as a rule, the sharp corners of the wire are only given by the last draw. It is found that considerable wear takes place in the holes of the draw-plate, and a new plate may be required for each hank of 500 or 600 yds. of wire. Great importance is attached to the absence of scale from the wire when it is being drawn, and, after pickling, the rolled bar and wire are treated with lime or some similar substance to facilitate the drawing. The tests for the finished wire are as follows: it has to stand a tensile stress of from 90 to 110 tons per square inch of section, and a test for ductility in which a short length of wire is twisted a considerable number of turns in one direction, then unwound and re-twisted in the opposite direction, without showing signs of fracture. It will be seen that the wire is extremely strong and the moderate stress of from 35 to 50 tons per square inch, which at most it is called upon to withstand in a gun, is far less than what it could endure with perfect safety.

The wire after being manufactured is made up into hanks for storage purposes; but when required for gun construction it is thoroughly cleaned and wound on a drum R about 3 ft. 6 in. in diameter, which is placed in one portion of the machine in connexion with a powerful band friction brake M. The wire is then led to the gun A placed between centres or on rollers B.B. parallel to the axis of the wire drum. By rotating the gun the wire is drawn off from the drum against the resistance of the band brake, which is so designed that, by adjusting the weight S suspended from the brake strap, any desired resistance can be given in order to produce the necessary tension in the wire as it is being wound on the gun. The stress on

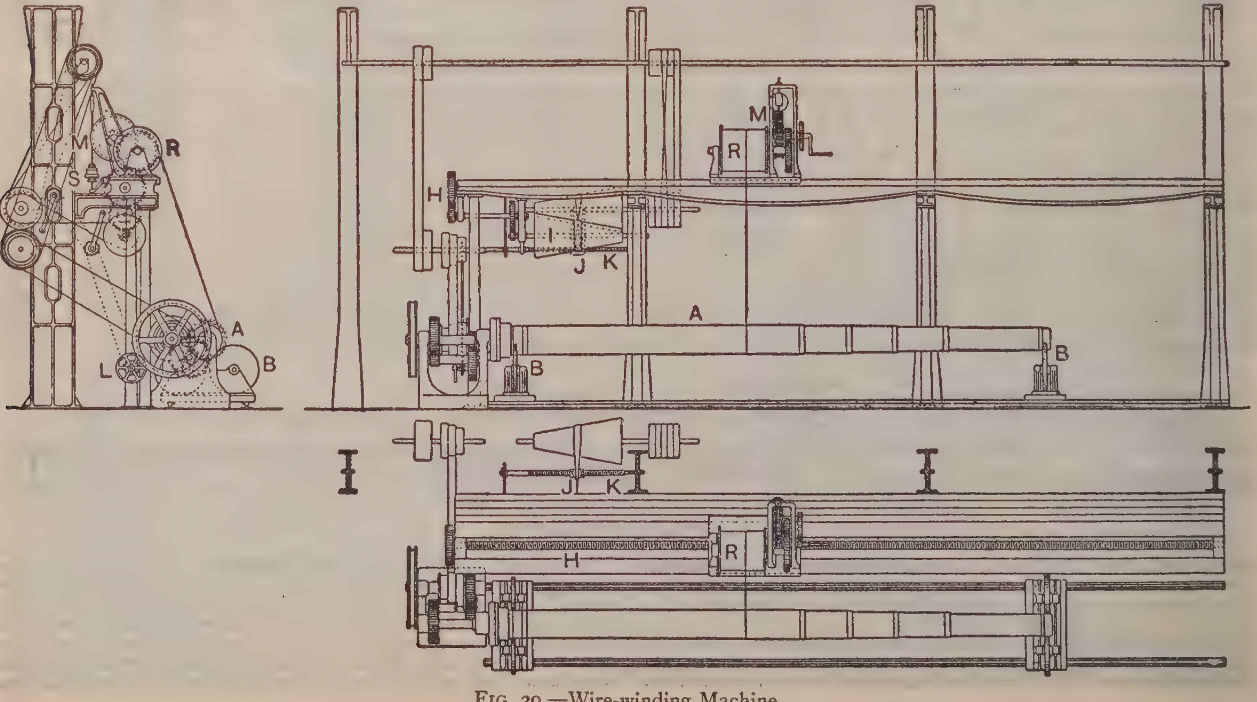


FIG. 20.—Wire-winding Machine.

the wire is indicated on a dial, and the headstock, containing the drum of wire, is capable of being moved along the bed G by a leading screw H, driven by a belt through variable speed cones I; the belt is moved along the cones by forks J, traversed by screws K, which in their turn are actuated by chain belts from the hand wheel L. The traversing speed is regulated to suit the speed of winding by moving the belt along the speed cones.

The wire is rectangular in section, 0·25 in. wide and 0·06 in. thick, and after it has been wound on to the gun it presents a very even surface which requires little further preparation. The diameter over the wire is gauged and the jacket or other covering hoop is carefully bored equal to this, if no shrinkage is to be allowed; or the dimension is diminished in accordance with the amount of shrinkage to be arranged for.

The gun is built up, after wiring, in the same manner as a gun without wire, the jacket or other hoop being heated in the vertical gas furnace and when hot enough dropped into place over the wire, cooled by the ring of water jets at the end first required to grip and kept hot at the other, exactly as before described.

Rifling operation.

The machine arranged for rifling modern guns is very similar to that employed for the old muzzle-loaders; it is a special tool used in gun construction only (fig. 21), and is in reality a copying machine. A steel or cast-iron bar J which forms the copy of the developed rifling curve is first made. The copying bar—which is straight if the rifling is to be uniform but curved if it is to be increasing—is fixed, inclined at the proper angle, to standards K on the machine. The cutting tool is carried at one end C of a strong hollow cylindrical rifling bar B, the other end of which is fixed to a saddle M. This is moved along the bed of the machine by a long screw N, and the rifling bar is consequently either pushed into the gun or withdrawn by the motion of the saddle along the machine. During this motion it is made to rotate slowly by being connected to the copying bar by suitable gearing I. It will thus be seen that the cutting tool will cut a spiral groove along the bore of the gun in strict conformity with the copy. In most English machines the cutting tool cuts only as the rifling bar is drawn out of the gun; during the reverse motion the cutter F is withdrawn out of action by means of a wedge arrangement actuated by a rod passing through the centre of the rifling bar, which also pushes forward the cutter at the proper time for cutting. One, two or more grooves may be cut at one time, the full depth being attained by slowly feeding the tool after each stroke. After each set of grooves is cut the rifling bar or the gun is rotated so as to bring the cutters to a new position. In some foreign machines the cut is taken as the rifling bar is pushed into the gun.

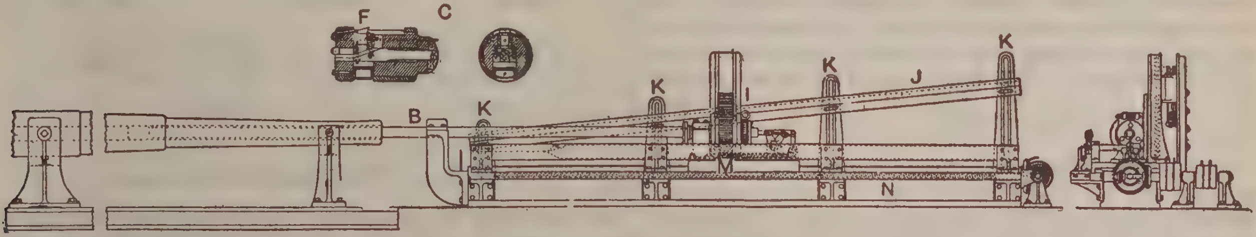


Fig. 21.—Rifling Machine.

Rifling.

Rifling is the term given to the numerous shallow grooves cut spirally along the bore of a gun; the rib between two grooves is called the "land." Rifling has been known for many years; it was supposed to increase the range, and no doubt did so, owing to the fact that the bullet having to be forced into the gun during the loading operation became a mechanical fit and prevented to a great extent the loss of gas by windage which occurred with ordinary weapons. Kotter (1520) and Danner (1552), both of Nuremberg, are respectively credited as being the first to rifle gun barrels; and there is at the Rotunda, Woolwich, a muzzle-loading barrel dated 1547 rifled with six fine grooves. At this early period, rifling was applied only to small arms, usually for sporting purposes. The disadvantage of having, during loading, to force a soft lead (or lead-covered) ball down a bore of smaller diameter prevented its general employment for military use. In 1661 Prussia experimented with a gun rifled in thirteen shallow grooves, and in 1696 the elliptical bore—similar to the Lancaster—had been tried in Germany. In 1745 Robins was experimenting with rifled guns and elongated shot in England. During the Peninsular War about 1809, the only regiment (the "Rifle Brigade," formerly called the 95th) equipped with rifled arms, found considerable difficulty in loading them with the old spherical lead bullet, from the muzzle. In 1836 Russia made a large number of experiments with a rifled gun invented by Montigny, a Belgian; this was not a success, but in England the guns invented by Major Cavalli, in 1845, and by Baron Wahrendorff in 1846, obtained some measure of favour. Both these guns were breech-loaders. The Cavalli gun had a bore of 6·5 in. diameter; it was rifled in two grooves having a uniform twist of 1 in 25 calibres, and the elongated projectile had two ribs cast with it to fit the grooves, but no means were taken to prevent windage. The Wahrendorff gun had an enlarged chamber and the bore of 6·37 in. diameter was rifled in 2 grooves; the projectile had ribs similar to that for the Cavalli gun; but Wahrendorff had also tried lead-coated projectiles, the coating being attached by grooves undercut in the outside of the shell. In 1854 Lancaster submitted his plan of rifling; in this (fig. 22) the bore was made of an oval section which twisted round the axis of the gun from the breech to the muzzle; a projectile having an oval section was fired. Several old cast-iron guns bored on this system burst in the Crimean War from the projectile wedging in the gun. In 1855 Armstrong experimented with a breech-loading rifled gun, firing a lead-coated projectile. The rifling consisted of a large number of shallow grooves having a uniform twist of 1 in 38 calibres. When the gun was fired the lead-coated projectile, which was slightly larger in diameter than the bore of the gun, was forced into the rifling and so gave rotation to the elongated projectile. Whitworth in 1857 brought out his hexagonal bore method of rifling and a projectile which was a good mechanical fit to the bore. Good results were obtained,

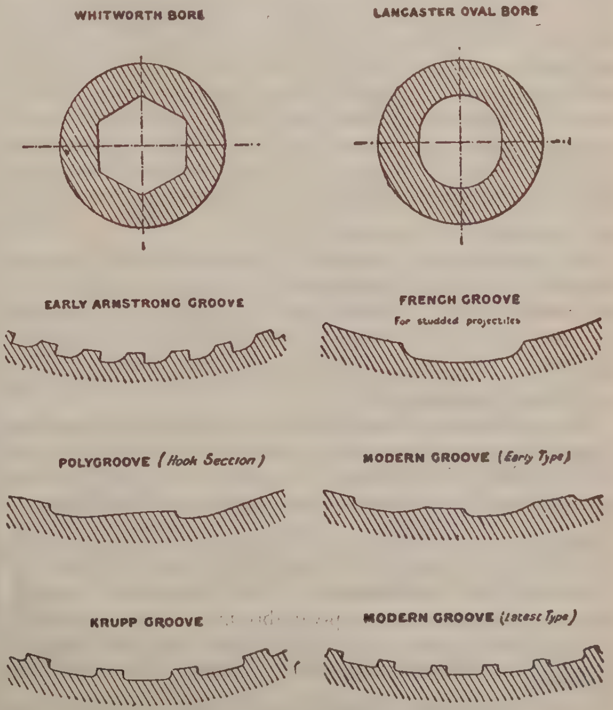


Fig. 22.—Sections of Rifling.

but although this system had certain advantages it did not fulfil all requirements.

In 1863, England re-opened the whole question, and after exhaustive trials of various inventions decided on the adoption of the muzzle-loading type for all guns, with the French system of rifling. This system was invented in 1842 by Colonel Treüille de Beaulieu and consisted of a few wide and deep grooves which gave rotation to a studded projectile. At the first trials two grooves only were tried, but the number was afterwards increased to three or more, as it was found that two grooves only would not correctly centre the projectile. The adoption of the muzzle-loading system with studded shot was a distinctly retrograde step, as a considerable amount of clearance was necessary between the bore and projectile for the purposes of loading, and this resulted in the barrel being seriously eroded by the rush of gas over the shot, and also led to a considerable loss of energy. In the Wahrendorff and Armstrong systems however the lead-coated projectiles entirely prevented windage, besides which the projectile was perfectly centred and a high degree of accuracy was obtained.

Shunt rifling was a brief attempt to make loading by the muzzle easy without forfeiting the centring principle: in this the rifling varied in width and in depth, at different portions of the bore in such a manner that, during loading, the studs on the projectile could move freely in the bore. When the gun was fired the studs of the projectile were forced to travel in the shallow part of the rifling, thus gripping and centring the projectile as it left the muzzle.

With uniform rifling on the French system, the few studs—generally two per groove—had to bear so high a pressure to produce rotation that they sometimes gave way. This subject was investigated by Captain (Sir Andrew) Noble, who showed that by making the rifling an increasing twist, commencing with no twist and gradually increasing until the necessary pitch was obtained, the maximum pressure due to rotation was much reduced. Increasing rifling was consequently adopted, with beneficial results.

In order to prevent the heavy erosion due to windage, a gas check was adopted which was attached to the base end of the studded projectiles. In some guns the number of grooves of the rifling was sufficiently great to admit of rotation being insured by means of the gas check alone; in these guns studded projectiles were not employed, but the gas check, called "automatic," to distinguish it from that fitted to studded projectiles was usually indented around its circumference to correspond with the rifling of the gun. It was found that the studless projectile had considerably greater range and accuracy than the studded projectile, with the additional advantage that the shell was not weakened by the stud holes.

The introduction of the plain copper driving band for rotating projectiles with breech-loading guns included a return to the polygroove system with shallow grooves; this still exists, but the continuous demand for greater power has had the effect of increasing the number of grooves from that at first considered necessary, in order to keep the rotating pressure on the driving band within practical limits.

Many ingenious devices for giving rotation and preventing the escape of gas past the projectile were tried in the early days of modern rifling. Experiments of this nature still continue to be made with a view to improving the shooting and to prevent the erosion of the bore of the gun. Briefly considered, without going into any detail of the numerous plans, all rotating devices fitted to projectiles can be divided into three classes—the "centring," the "compressing" and the "expansion" systems. The two last named almost invariably include the "centring" type. Studded (fig. 23) and Whitworth (fig. 24) hexagonal projectiles, which can freely slide in the bore, come under the first system.

In the compression class the coating or rings on the projectile are larger in diameter than the bore and when fired the coating (or rings) is squeezed or engraved by the rifling to fit the bore—the projectile is consequently also centred. The old-fashioned lead-coated shell (fig. 25), and the modern system of plain copper driving bands (fig. 26), come under this class. Most variety exists in the expansion type, where the pressure of the powder gas acts on the base of the projectile or on the driving ring and compresses a lead, copper or asbestos ring into the rifling grooves. One of the earliest was the Hotchkiss (1865) shell (fig. 27), in which a separate base end B was driven forward by the gas pressure and squeezed out the lead ring L into the rifling. The automatic gas check (fig. 28), and the gas check driving band (fig. 29), belong to this system; in the last the lip L is expanded into the rifling groove. In fig. 30 a copper driving band is associated with an asbestos packing A, contained in a canvas bag or copper casing made in the form of a ring on the principle of the de Bange obturator; but the results of this have not been entirely satisfactory.

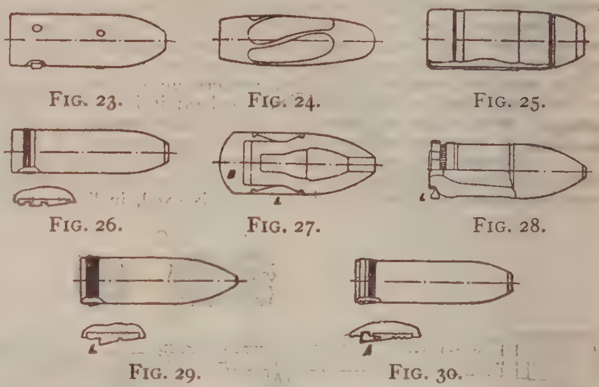


FIG. 23. FIG. 24. FIG. 25.
FIG. 26. FIG. 27. FIG. 28.
FIG. 29. FIG. 30.

FIGS. 23-30.—Projectiles for Rifled Ordnance.

It will be seen that with breech-loading guns the projectile is better centred, and the copper driving band forms a definite stop for the projectile; and, in consequence, the capacity of the gun chamber is practically constant. In addition, the use of a copper driving band ensures a uniform resistance while this is being engraved and the projectile forced through the gun, and also prevents the escape of gas. These elements have a very great influence on the accuracy of the shooting, and fully account for the vastly superior results obtained from breech-loading ordnance when compared with the muzzle-loading type. Driving bands of other materials such as cupro-nickel and ferro-nickel have also been tried.

Many authorities believe that the best results are obtained when the projectile is fitted with two bands, one near the head and the other near the base, and no doubt it is better centred when so arranged, but such shot can only be fired from guns rifled with a uniform twist, and it must also not be forgotten that the groove formed for the front band in the head of the projectile necessarily weakens that part of the projectile which should be strongest.

Projectiles with a driving band at the base only can be fired from guns rifled either uniformly or with increasing twist.

The introduction of cordite (*q.v.*) about 1890 again brought into special prominence the question of rifling. The erosion caused by this explosive soon obliterated the rifling for some 4 or 5 calibres at the breech end. The driving band of the shell consequently started with indifferent engraving, and with the increasing twist, then in general use, it was feared that the wear would quickly render the gun useless. To remedy this the late Commander Younghusband, R.N., proposed straight rifling, which was adopted in 1895, for that portion of the rifling mostly affected by the erosion, with a gradual increase of the twist thence to the required pitch at the muzzle. Thus, any erosion of the straight part of the rifling would not affect that portion giving rotation, and it was argued that the gun would remain efficient for a longer period. The defect in this system is that when the projectile arrives at the end of the straight rifling it has a considerable forward velocity and no rotation. Rotation is then imparted by the increasing twist of rifling, and the resulting pressure on the engraved ribs of the driving band rises suddenly to a maximum which, in high velocity guns, the driving band is unable to resist. For this reason the straight portion at the commencement of the rifling has been discarded, and with high power guns firing a slow burning propellant uniform rifling has again found favour.

It is evident that in order that a projectile may have a definite amount of spin as it leaves the gun a determinate amount of work must be imparted to rotate it during its passage along the rifled portion of the bore. Put briefly, this work is the sum of the products of the pressure between the engraved ribs on the driving band and the lands of the rifling in the gun multiplied by the length of the rifling over which this pressure acts. Sir Andrew Noble has proved theoretically and experimentally (see *Phil. Mag.*, 1863 and 1873; also *Proc. Roy. Soc.* vol. 50) that the rotating pressure depends on the propelling pressure of the powder gas on the base of the projectile and on the curve of the rifling. If this curve was so proportioned as to make the rotating pressure approximately constant along the bore, the result was an increasing or progressive curve partaking of the nature of a parabola, in which case it was usual to make the last two or three calibres of rifling at the muzzle of uniform twist for the purpose of steadying the projectile and aiding accuracy.

In uniform rifling the curve is a straight line and the rotating pressure is consequently mainly proportional to the propelling gas pressure. The pressure for rotation with uniform rifling therefore rises to a maximum with the propelling pressure and falls as it becomes less towards the muzzle.

With increasing rifling, owing to the angle of twist continually changing as the projectile travels along the bore, the ribs originally engraved by the rifling on the driving band are forced to change their direction correspondingly, and this occurs by the front surface of the ribs wearing away. They are therefore weakened considerably, and it is found that with high velocities the engraved part of the band often entirely disappears through this progressive action.

It will thus be seen that although an increasing twist of rifling may be so arranged as to give uniform pressure, it is evident that if wear takes place, the engraved rib becomes weaker to resist shearing as the shot advances, and the rate of wear also increases owing to the increase of heat by friction. With the very narrow driving bands used for low velocity guns this action was not so detrimental.

With the long modern guns and the high muzzle velocities required, the propelling gas pressures along the bore rise comparatively slowly to a maximum and gradually fall until the muzzle is reached. The pressure of the gas at all points of the bore is now considerably higher than with the older patterns of B.L. guns.

For modern conditions, in order to obtain an increasing curve giving an approximately constant driving pressure between the rifling and driving band, this pressure becomes comparatively high. The maximum rotating pressure, with uniform rifling, is certainly somewhat higher, but not to a very great extent, and as it occurs when the projectile is still moving slowly, the wear due to friction will be correspondingly low; the pressure gradually falls until the muzzle is reached, where it is much lower than with increasing rifling. The projectile thus leaves the gun without any great disturbance from the rifling pressure. Further, as the band is engraved once for all with the angle it will have all along the bore the pressure is distributed equally over the driving face of the engraved ribs instead of being concentrated at the front of the ribs as in progressive or increasing rifling.

The following formulae showing the driving pressures for increasing and uniform rifling are calculated from Sir Andrew Noble's formula, which Sir G. Greenhill has obtained independently by another method.

Let R = total pressure, in tons, between rifling and driving band.
G = gaseous pressure, in tons, on the base of the projectile.
r = radius, in feet, of the bore.
μ_1 = coefficient of friction.
ρ = radius of gyration of projectile.
δ = angle between the normal to the driving surface of groove and radius.
h = the pitch of the rifling, in feet.
k = cotangent of angle of rifling at any point of rifling.
M = weight of the projectile in pounds.
z = the length, in feet, travelled by the projectile.

Then for parabolic rifling

$$R=\frac{2\rho^2(Gz+Mv^2)}{\frac{(r^2k^2+4\rho^2z^2)\sin\delta}{(4z^2\sin^2\delta+k^2)^{\frac{1}{2}}}+\frac{2\mu_1kz(\rho^2-r^2)}{(4z^2+k^2)^{\frac{1}{2}}}}$$

For uniform rifling

$$R=\frac{2\pi\rho^2G}{\frac{\mu_1(2\pi\rho^2k-rh)}{(1+k^2)^{\frac{1}{2}}}+\frac{(2\pi\rho^2+rhk)\sin\delta}{(k^2+\sin^2\delta)^{\frac{1}{2}}}}$$

For modern rifling $\delta=90°$; therefore $\sin\delta=1$; by which the above expressions may be considerably simplified.

For parabolic rifling

$$R=\frac{2\rho^2(4z^2+k^2)^{\frac{1}{2}}(Gz+Mv^2)}{kr^2(k-2\mu_1z)+2\rho^2z(2z+\mu_1k)}.$$

For uniform rifling we can write $hk=2\pi r$ and the expression reduces to

$$R=\frac{\rho^2(1+k^2)^{\frac{1}{2}}}{\mu_1\left(\rho^2k-\frac{r^2}{k}\right)+\rho^2+r^2}.G.$$

Fig. 31 shows graphically the calculated results obtained for a 4·7-in. 50-calibre gun which has a shot travel of 17·3 ft.; the pressure curve A is for a rifling twist increasing from 1 in 60 calibres at the breech to 1 in 30 calibres at the muzzle; curve B is for rifling having a uniform twist of 1 in 30 calibres.

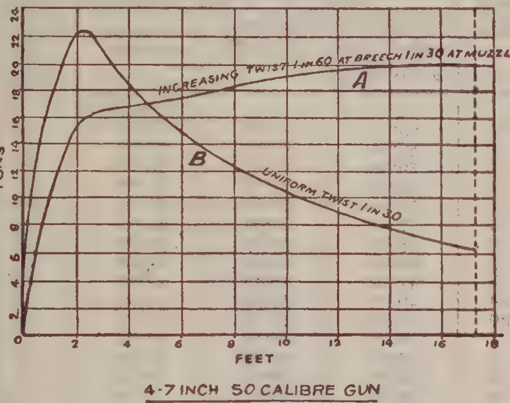


FIG. 31.—Pressure Curves (uniform and increasing twist).

It must be remembered that this comparison is typical for modern conditions; with old-fashioned guns firing black or brown powder the maximum rotating pressure for uniform rifling could attain a value 50% above that for increasing rifling.

In this example, with the increasing twist there is a loss of energy of about 11% of the total muzzle energy, and for the uniform rifling a loss of about 8%. This explains the reason for uniformly rifled guns giving a higher muzzle velocity than those with increasing rifling, supposing the guns to be otherwise similar.

The pitch of the rifling or the amount of twist to be given to it depends altogether on the length of the projectile; if this is short a small amount of twist only is necessary, if long a greater amount of twist must be arranged for, in order to spin the shell more rapidly. Sir G. Greenhill has shown that the pitch of the rifling necessary to keep a projectile in steady motion is independent of the velocity, of the calibre, or of the length of the gun, but depends principally on the length of the shell and on its description, so that for similar projectiles one pitch would do for all guns.

Table I., on following page, has been calculated from Greenhill's formula.

In most modern guns the projectile varies in length from 3·5 to 4 calibres, so that the rifling is made to terminate at the muzzle with a twist of 1 turn in 30 calibres, which is found ample to ensure a steady flight to the projectile. In the United States a terminal twist of 1 in 25 calibres is often adopted; Krupp also uses this in some guns. With howitzers the projectile may be 4·5 calibres long, and the rifling has to be made of a quicker twist to suit.

Drift. If the gun has, as is usually the case, a right-hand twist of rifling the projectile drifts to the right; if it has a left-hand twist the drift takes place to the left. The drift increases with the range but in a greater ratio; further, the greater the twist (*i.e.* the smaller the pitch of rifling) the greater the drift. On the other hand the smooth B.L. projectiles drift less than studded M.L. projectiles.

To find the angle, usually called the *permanent angle of deflection*, at which the sights must be inclined to compensate for the drift, a number of shots are fired at various ranges. The results obtained are plotted on paper, and a straight line is then drawn from the point representing the muzzle through the mean value of the plotted curve.

Firing arrangements. The early guns were fired by inserting a red-hot wire into the vent, or by filling the vent with powder and firing it by a red-hot iron. Slow match held in a cleft stick afterwards took the place of the hot iron, and this again was replaced by a port-fire. Filling the vent with loose powder was inconvenient and slow, and to improve matters the powder was placed in a paper, tin or quill tube which was simply pushed into the vent and fired by the slow match or port-fire.

The first attempt to fire guns by mechanical means was made in 1781 by Sir Charles Douglas, who fitted flint locks, similar to musket locks, but with the trigger actuated by a lanyard, to the guns on board his ship H.M.S. "Duke." A double flint lock introduced in 1818 by Sir Howard Douglas, R.A., continued to be used until about 1842, when it was replaced by a percussion lock invented by an American named Hiddens. In this lock one pull on the lanyard caused the hammer to fall and strike a percussion patch or cap hung on a small hook over the vent, and afterwards caused the hammer to be drawn backwards out of the way of the blast from the vent. These somewhat clumsy contrivances were swept away on the adoption in 1853 of friction tubes (see AMMUNITION), which had simply to be placed in the vent and the friction bar withdrawn by means of a lanyard.

TABLE I.

Length of projectile in calibres.	Minimum twist at muzzle of gun requisite to give stability of rotation = one turn in *n* calibres; or a pitch of *n* calibres.			
	Cast-iron common shell, cavity = $\frac{8}{27}$ vol. of shell (s.g. of iron = 7·2).	Palliser shell, cavity = $\frac{1}{8}$ vol. (s.g. = 8·0).	Solid steel bullet (s.g. = 8·0).	Solid lead and tin bullets of similar composition to M.-H. bullets (s g = 10·9).
	n.	*n.*	*n.*	*n.*
2·0	63·87	71·08	72·21	84·29
·1	59·84	66·59	67·66	78·98
·2	56·31	62·67	63·67	74·32
·3	53·19	59·19	60·14	70·20
·4	50·41	56·10	57·00	66·53
·5	47·91	53·32	54·17	63·24
·6	45·65	50·81	51·62	60·26
·7	43·61	48·53	49·30	57·55
·8	41·74	46·45	47·19	55·09
·9	40·02	44·54	45·25	52·72
3·0	38·45	42·79	43·47	50·74
·1	36·99	41·16	41·82	48·82
·2	35·64	39·66	40·30	47·04
·3	34·39	38·27	38·84	45·38
·4	33·22	36·97	37·56	43·84
·5	32·13	35·75	36·33	42·40
·6	31·11	34·62	35·17	41·05
·7	30·15	33·55	34·09	39·79
·8	29·25	32·55	33·07	38·61
·9	28·40	31·61	32·11	37·48
4·0	27·60	30·72	31·21	36·43
·1	26·85	29·88	30·36	35·43
·2	26·13	29·08	29·55	34·49
·3	25·45	28·33	28·78	33·59
·4	24·81	27·61	28·05	32·74
·5	24·20	26·93	27·36	31·94
·6	23·65	26·32	26·74	31·21
·7	23·06	25·66	26·08	30·44
·8	22·53	25·08	25·48	29·74
·9	22·03	24·51	24·91	29·07
5·0	21·56	23·98	24·36	28·44
·1	21·08	23·46	23·84	27·83
·2	20·64	22·97	23·34	27·24
·3	20·22	22·50	22·86	26·68
·4	19·81	22·05	22·40	26·14
·5	19·42	21·61	21·96	25·63
·6	19·04	21·19	21·53	25·13
·7	18·68	20·79	21·12	24·66
·8	18·33	20·40	20·73	24·20
·9	18·00	20·03	20·35	23·75
6·0	17·67	19·67	19·98	23·33
7·0	14·99	16·68	16·95	19·78
8·0	13·02	14·48	14·72	17·18
9·0	11·50	12·80	13·00	15·18
10·0	10·31	11·47	11·65	13·60

Friction tubes continued to be used with all muzzle-loading ordnance except in one or two natures with which the charge was ignited axially at the breech of the gun. In these a vent sealing friction tube retained in the vent by a tube holder was employed. With breech-loading field guns ordinary friction tubes were also used until the introduction of cordite, which eroded the vents so quickly by the escape of the gases that vent sealing tubes became a necessity.

In all other breech-loading ordnance and with the latest pattern field guns the firing gear forms part of the breech mechanism.

Breech mechanism.

All modern breech mechanisms form two groups (*a*) the sliding type as with the Krupp wedge system, (*b*) the swinging type as in the interrupted screw system. Either type may be used with B.L. guns (*i.e.* those with which the charge is not contained in a metallic cartridge case) and Q.F. guns (*i.e.* those with which a metallic cartridge case is used).

Sliding mechanisms may be divided into two forms: (1) those having the block or wedge sliding horizontally, and (2) those in which the block works in a vertical direction. (1) is that used principally by Krupp; (2) is best illustrated by the Hotchkiss system for small Q.F. guns; the Nordenfelt, Skoda and the Driggs-Schroeder mechanisms for small Q.F. guns are an adaptation of the same principle.

The Krupp gear is in reality an improved Cavalli mechanism; it is capable of being worked rapidly, is simple, with strong parts not liable to derangement, except perhaps the obturator. The breech end of the gun, however, occupies valuable space especially when these guns are mounted in the restricted turrets or gun houses on board ship.

Later it will be seen that owing to the difficulty of arranging a convenient and efficient obturating device for the smokeless nitro-powders, which have a peculiarly severe, searching effect, a metal cartridge case has to be used with even the heaviest guns; naturally this assumes large dimensions for the 305 m/m. gun.

The wedge (fig. 32) is housed in the breech piece, which covers the breech part of the barrel, made very massive and extended to the rear of the barrel. A slot, cut transversely through the extended portion, forms a seat for the sliding block. The slot is formed so that its front is a plane surface perpendicular to the axis of the gun, while the rear is rounded and slightly inclined to the axis. One or more ribs similarly inclined on the upper and lower surfaces of the slot guide the breech block in its movements. For traversing the block a quick pitched screw is fitted to its upper surface and works in a nut attached to the upper part of the slot (in small guns this traversing screw is dispensed with, as the block can be easily moved by hand). As the rear seat of the sliding block is inclined, there is a tendency for the block to be moved sideways, when the gun is fired by the pressure in the chamber acting on the front face of the wedge; this is prevented by a locking gear, consisting of a cylinder, having a series of interrupted collars, which is mounted on a screw. When the breech has been traversed into position, the collars are rotated, by a cross handle at the side of the block, into grooves cut in the rear surface of the slot; a further movement makes the screw jam the collars hard in contact with the gun and secures the breech. With small guns having no traversing gear a short strong screw takes the place of the collars, and on the handle being turned enters a threaded portion at the rear surface of the slot, actuates the breech for the last (or first in opening) portion of its movement in closing and secures it. To open the gun the movements are reversed.

The gun is fired by a friction tube, screwed into an axial vent bored through the sliding block, or, in field guns, by a copper friction tube through an oblique vent drilled through the top of the breech end of the gun and through the block.

There is also fitted in some guns a percussion arrangement for firing a percussion tube.

The obturation is effected by a Broadwell ring or some modification of it; this is placed in a recess cut in the gun and rests against a hard steel plate fitted in the breech block.

For modern Krupp mechanisms, for use with cartridge cases, the arrangement (fig. 33) is very similar to that described above, but some improvements have added to its simplicity. The transporting screw is fitted with a strong projection which, at the end of the movement for closing the breech, locks with a recess cut in the upper surface of the slot and secures the breech. The extra locking device is consequently dispensed with. The firing gear consists of a striker fitted in the sliding block in line with the axis of the gun; the striker is pushed back by a lever contained in the block and, on release, is driven forward against the primer of the cartridge case by a spiral spring.

In the Hotchkiss gun the mechanism has a vertical breech block of a rectangular section. The actuating lever F (fig. 34) is on the right side of the gun, and connected to a powerful crank arm C working in a groove E cut on the right side of the breech block. By pulling the lever towards the rear, the crank arm forces down the block A and extracts the fired case by an extractor X, which is actuated by a cam groove Y cut on one side or on both sides of the block. As the mechanism is opened the hammer H is cocked ready for the next round. To close the mechanism the lever is pushed over to the front, and by releasing the trigger sear by pulling the lanyard the hammer falls and fires the cap of the cartridge case.

Automatic gear is now generally fitted which opens the breech as the gun runs up after recoil and extracts the fired case by means of a supplementary mechanism and strong spring actuated by the recoil of the gun, and on pushing a new cartridge into the gun the breech which was retained by the extractor is released and closes automatically.

The Nordenfelt mechanism consists of a breech block (fig. 35) and a wedge to secure it. A hand lever on the shaft is pulled to the rear, and this works the action cam, which pulls down the wedge; the breech block is then caused to rotate and falls back to the rear. This motion of the breech block actuates the extractor and extracts the case. While the wedge is being withdrawn the firing pin is pulled back and cocked for the next round. The mechanism is closed by reversing the hand lever; this rotates the breech block upwards and pushes home the cartridge case, and the wedge is then forced up and secures the breech block.

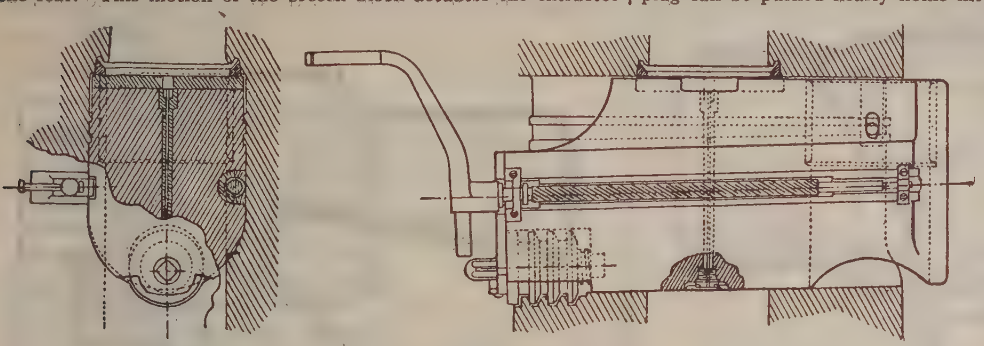


FIG. 32—Krupp Breech Action.

These small type Q.F. guns, which were introduced to cope with torpedo boats, are now, however, of little account, since experiment has proved that nothing smaller than a 12-pounder is sufficient so to injure a modern torpedo boat as to stop it. Most of these small guns are therefore in the English and in some other Services being converted into "sub-calibre" guns for exercise purposes. These sub-calibre guns retain their ordinary breech mechanism, but the bodies are fitted with a strong steel plug screwed on the outside in a similar manner to the breech screw of the parent gun. The sub-calibre gun is placed in the parent gun and the screwed plug engages in the threads of the breech opening.

There has been a gradual development of ideas regarding the repelling power required by a vessel against torpedo boat attack. The 12-pounder Q.F. 40-calibre guns were replaced by the more powerful 12-pounder Q.F. 50-calibre gun; this again by the 4-in. high power gun of 50 calibres, and now 6-in. guns are being used.

One other form of sliding mechanism is of importance owing to its adoption for the 75 m/m. French long recoil field gun (see below: *Field equipments*). This mechanism is on the Nordenfelt eccentric screw system and is very similar to that proposed by Clay about 1860; it has a breech screw (fig. 36) of large diameter mounted in the breech opening, which is eccentric to the bore. For loading, the breech block has a longitudinal opening cut through it, so that when the mechanism is in the open position this opening coincides with the chamber, while a half turn of the breech screw brings its solid part opposite the chamber and closes the gun. The mechanism is very simple and strong, but it is only suitable for small Q.F. guns using cartridge cases; the firing gear is similar to that applied to other types of mechanism, and the fired case is extracted by an extractor actuated by the face of the breech screw as it is opened.

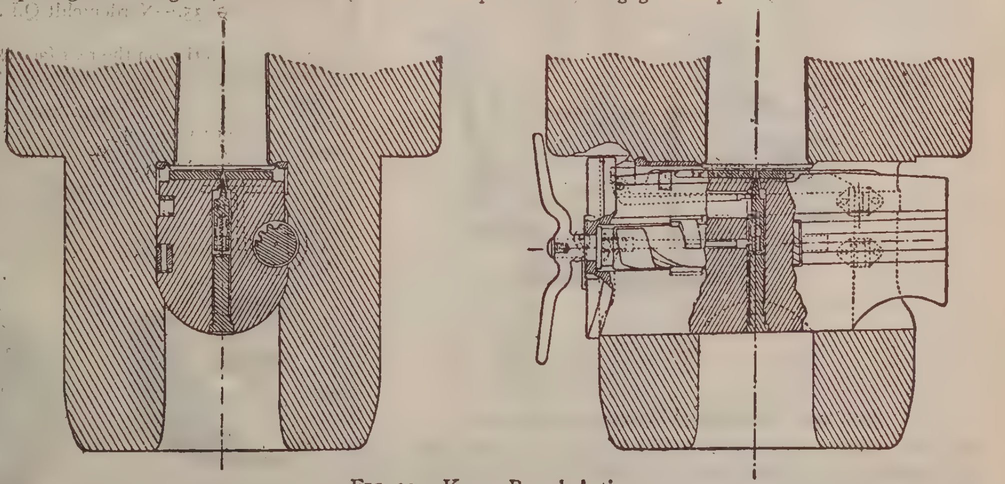


FIG. 33.—Krupp Breech Action.

With the swinging type of breech mechanism we are confronted with numberless patterns, many of undoubted merit and claiming certain advantages over others, and all showing the vast amount of ingenuity expended in so designing them that they may be as simple, and, at the same time, as effective and quick acting as possible. It is impossible to deal with all these, and therefore only the more important systems will be described. The special feature of this type is that the breech is closed by an interrupted breech screw; the screw is either supported in a carrier ring or tray hinged near the breech opening, or on a carrier arm which is hinged near the outer circumference of the gun.

The screw may be of the cylindric interrupted, Welin and coned types; these, or their modifications, practically embrace the various forms used. The cylindric form (fig. 37) is the simplest; it consists of a strong screwed plug engaging with a corresponding screw thread cut on the interior of the breech opening of the gun. The screw surface of the breech plug is cut away in sections equally divided and alternating with the threaded portions. The screw surface of the breech opening is similarly cut away, so that the plug can be pushed nearly home into the breech opening without trouble; by then revolving the breech screw through a small angle the screwed portions of the plug and breech opening engage. Thus if three screwed sections alternate with three plain sections the angle of revolution necessary to ensure a full engagement of the screw surfaces will be 60°. The Welin screw (fig. 38) is an ingenious adaptation of the cylindric type; in this the surface is divided into sections each formed of two or three cylindrical screwed steps with a single plain portion; thus if there are three sections, each section of which has one plain division and two screwed divisions, there will be in all six screwed portions and three plain. The breech opening is correspondingly formed so that the screwed threads would fully engage with 40° of movement. There is consequently a greater amount of screwed circumferential surface with the Welin screw than with the ordinary cylindric interrupted type; the latter form has 50% screw surface while the Welin has 60%. For equal screw surface the Welin can therefore be made shorter.

For medium guns the Elswick type of coned screw (fig. 39) has found much favour, and this mechanism has been fitted to guns of all calibres from 3-inch to 6-inch, both for the British and numerous other governments. The coned breech screw is formed with the front part conical and the rear cylindrical, to facilitate its entrance into the gun, and also its exit; this form, moreover, is taken advantage of by cutting the interruptions in the screwed surface alternately on the coned part and on the cylindrical part, so that there is a screwed surface all round the circumference of the breech screw. By this means the stress is taken all round the circumference, both of the breech screw and in the gun, instead of in portions alternately, as with other forms.

The Bofors breech screw is a modification. The surface is formed of a truncated ogive instead of a cylinder and cone, and the threaded portions are not alternate.

In the older types of mechanism for heavy B.L. guns the breech was opened in from three to four different operations which involved considerable loss of time. Fig. 40 shows the general type for 9·2-in., 10-in. and 12-in. B.L. guns. To open the breech the cam lever C was folded up so that it engaged the pin B in connexion with the ratchet lever E. This was worked and so disengaged the breech screw from the threads cut in the gun; the cam lever was then folded down as to to start the breech screw, and the winch handle Q rotated and so withdrew the screw and swung it clear of the breech opening. During these operations the firing lock was actuated and made safe, but the fired tube had to be extracted by hand. To close the gun these various operations must be reversed, and to open or close the gun would certainly occupy at least half a minute with trained men.

To compare with this a modern 12-in. breech mechanism is shown in fig. 41. In order to open this breech it is only necessary to turn the handwheel continuously in one direction, and to close it again the motion of the handwheel is simply reversed; either closing or opening the breech by hand occupies about 6 seconds. Supposing the breech closed, the handwheel when rotated gives motion to the link G through the worm wheel S and crank F. By this means the

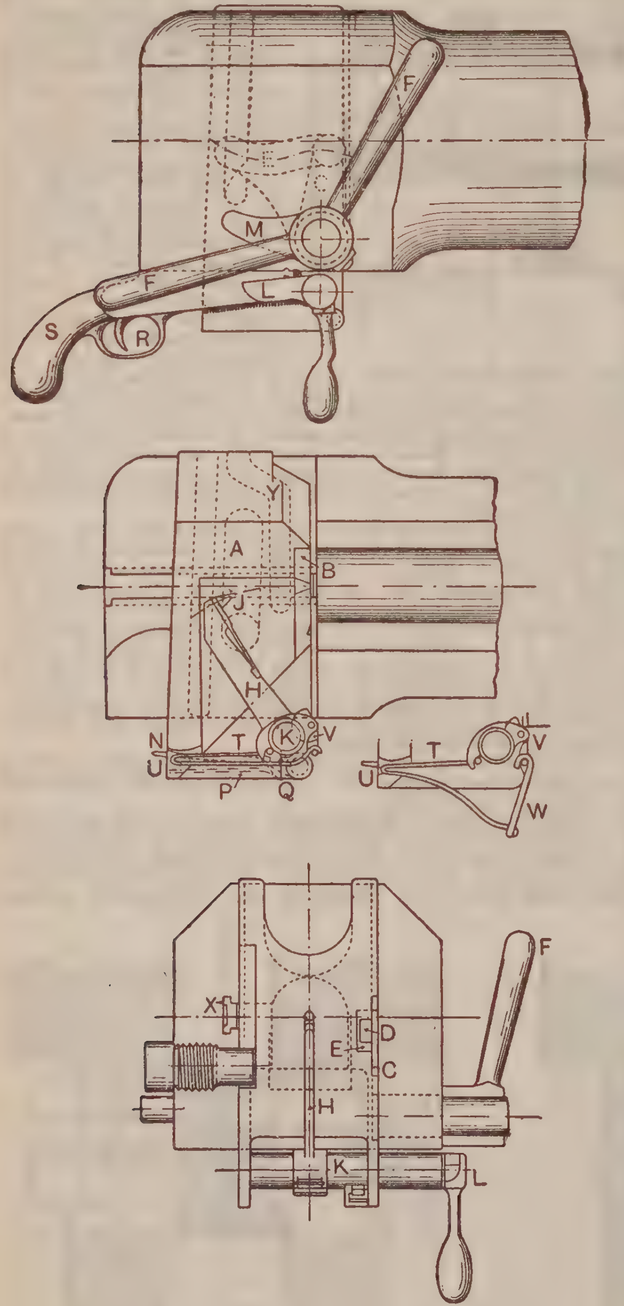


FIG. 34.—Hotchkiss Q.F. Breech Mechanism.

tooth B is moved from its extreme left position to the right, and so disengages the breech screw A from the threads in the gun; the rack A^2 on the breech screw then comes into gear with the pinion E and draws the breech screw out of the gun into the carrier ring C, which finally swings on the axis pin and clears the breech opening. While the opening is being performed the firing lock L is operated by the cam groove A^3; this puts the firing mechanism, either electric or percussion, to safety by withdrawing the firing needle, extracts the fired tube and leaves the primer chamber open for a fresh primer. All these operations are performed in the reverse order on closing.

With both these types of mechanism the de Bange system of obturation, with the pad only slightly coned, is used.

With smaller guns the mechanism is simpler, as less power is required for opening the breech. Thus, with the 6-in. B.L. gun Mark IV., introduced about 1885 (fig. 42) the breech is opened in three separate operations—(*a*) the cam lever, which also locks the breech, is raised into the vertical position and pulled over to the left; this disengages the screw threads; (*b*) the cam lever is folded down so

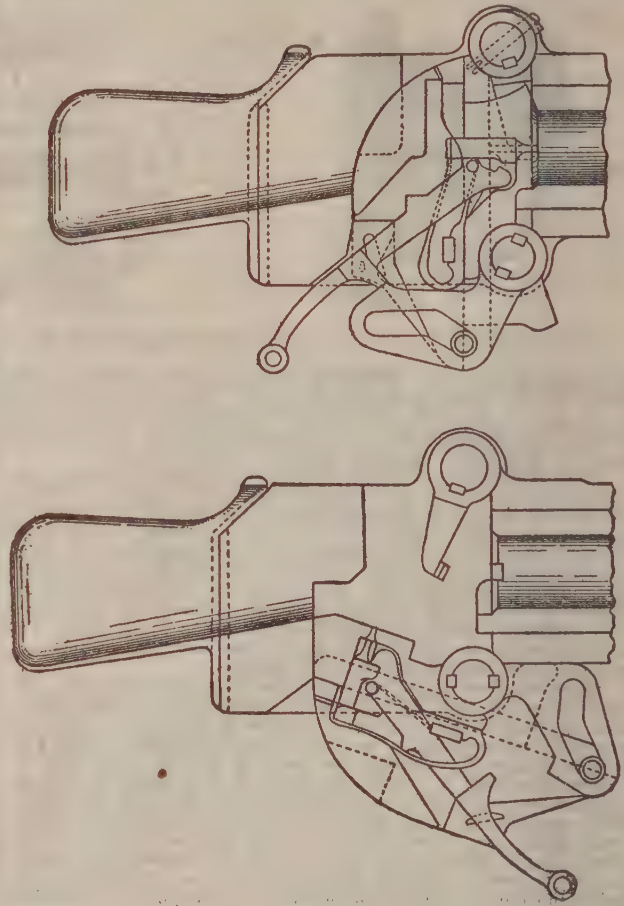


FIG. 35.—Nordenfeldt Q.F. Breech Mechanism.

that the cam acting on the rear face of the gun releases the de Bange obturator, and the screw is then pulled by hand through the carrier ring out of the breech; (*c*) the carrier ring and breech screw are revolved together to the right, clear of the breech opening.

In a modern 6-in. gun fitted with de Bange obturator all these operations are combined and the mechanism (fig. 43) worked by a horizontal hand lever which is moved from left to right through an angle of about 200°. The hand lever A moves a link B connected to a pin C on the breech screw D and disengages the screw from the gun; a small lateral movement is then given to the axis pin of the carrier so as to allow the obturator pad E to swing out of its seating; when

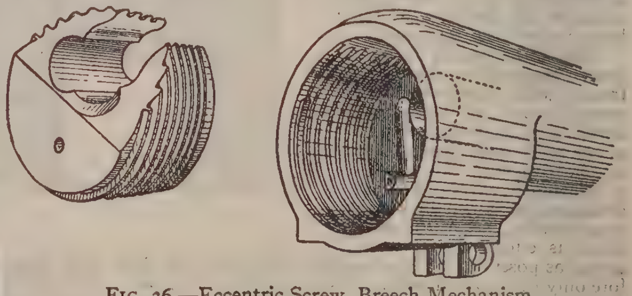


FIG. 36.—Eccentric Screw, Breech Mechanism.

this is quite free, the whole mechanism revolves on the axis pin and thus clears the breech opening. The firing lock F is actuated at the same time and ejects the fired tube G. A new tube is inserted while the gun is being loaded, so that immediately the breech is closed the charge can be fired without loss of time. In the old mechanisms the breech had to be closed first, and the firing tube inserted after.

The breech mechanism for Q.F. guns firing metallic cartridge cases is worked on similar principles, but is somewhat simpler than that for the de Bange obturation, due principally to the fact of the firing primer being already contained in the cartridge case when this is introduced into the gun.

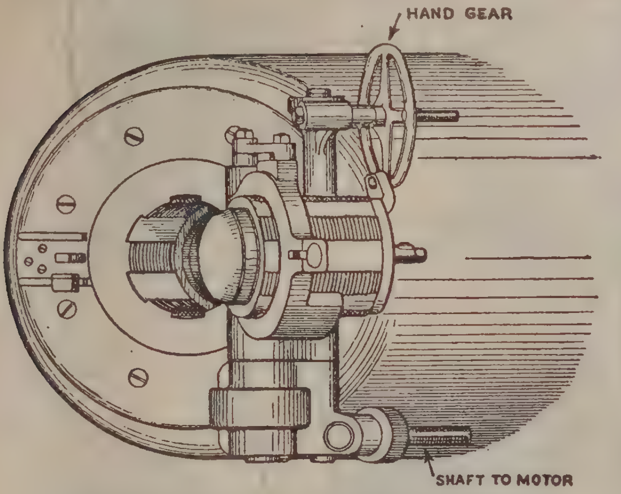
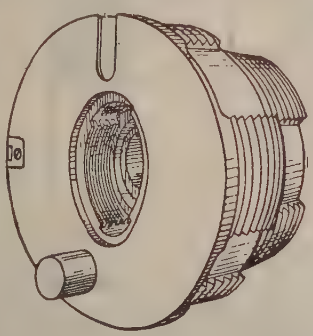


Fig. 37.—Interrupted Breech Screw—Cylindrical.

In the English service the later patterns of breech mechanism for medium and heavy B.L. guns have a Welin screw, with a "steep cone" de Bange obturator, supported on a carrier arm. This arrangement allows the mechanism (fig. 44) to swing clear of the breech opening immediately the threads of the breech screw are disengaged from those in the breech in a similar manner to the Q.F. guns fitted with a cone screw. The mechanism is actuated by the handwheel L which rotates the hinge pin; this in turn, through gearing, moves a crank arm D connected, by a link B, to the pin on the breech screw. By continuously moving the handwheel the link B is drawn towards the hinge pin until the breech screw threads are disengaged; the catch C then drops into a pocket on the breech screw and fixes it to the carrier arm. The whole of the mechanism then rotates around the hinge pin and leaves the breech open ready for loading. As the breech screw threads are being disengaged the electric or percussion lock W is operated by a cam groove in a similar manner to that already described. In the latest modification of this mechanism a roller at the end of the crank arm D works a long lever connected to the breech screw by two pins. This forms what is termed a "pure-couple" mechanism and it is claimed that greater ease of working is ensured by its use. While the loading is going on a new firing tube is placed in the vent, so that on closing the gun, by turning the handwheel in the opposite direction, the gun is ready for firing. For 9·2-in. guns and those of smaller calibre the handwheel is replaced by a hand lever pivoted on the carrier (fig. 45). By giving this lever a single motion from left to right the mechanism is opened.

For 6-in. and 4-in. guns a shot support is attached to the breech face which is operated by the breech mechanism so that when the breech is open the shot support is in position for loading, and it falls out of the way when the breech is being closed.



In the larger types of all breech mechanisms ball bearings are employed in various parts, such as the hinge pin bearings, &c., to reduce friction and in most of the modern heavy guns on board ship the breech mechanism is arranged to be worked by a hydraulic cylinder placed on the breech face, or by a small hydraulic engine or electric motor placed in some convenient position on the mounting. The hand gear, however, is always retained for emergency and a clutch is provided so that it can be put into action at a moment's notice.

The Welin screw is largely used in the United States, but in heavy guns the ordinary cone (not "steep cone") de Bange obturator is employed. The screw is mounted either in a carrier ring or on a carrier tray. In France the ordinary type of interrupted screw is adopted and this rests in a carrier tray. The operations of opening and closing are very similar to those already described.

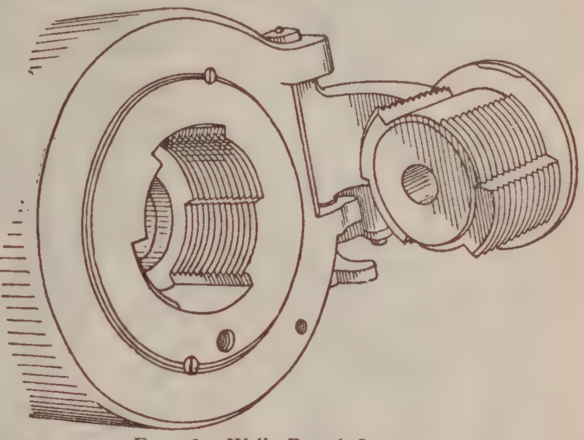


Fig. 38.—Welin Breech Screw.

All the recent patterns of mechanism have an extractor fitted to extract the empty cartridge case with Q.F. guns or the fired tube with B.L. guns. In Q.F. field guns it generally takes the form of a lever working on an axis pin. The longer arm of the lever is formed into a jaw which rests on the inner face of the breech opening beneath the rim of the cartridge case, and the short arm is so arranged that when the breech is opened the carrier, in swinging mechanisms, or the breech block itself, in sliding systems, suddenly comes in contact with it; the long arm is thus jerked backwards and extracts the case. In B.L. mechanisms the tube extractor is arranged on the same principle but in this case usually forms part of the box slide, *i.e.* that portion of the mechanism attached by interrupted collars to the rear end of the vent axial, in which the firing lock slides as it is actuated by the opening or closing of the breech mechanism. When the breech is being opened the firing pin of the lock is drawn back to safety and the lock is moved aside from over the tube; a tripper then actuates the extractor and ejects the fired tube. The extractor and tripper are so contrived that when a new tube is pushed home the extractor is also pushed back into the closed position, or, if the tube is somewhat stiff to insert, the action of closing the mechanism moves the lock over the primer and forces it home.

The firing lock used in B.L. guns is an important part of the mechanism. They are all designed on the same principle, with a view to safety and rapidity, and may be regarded as a miniature sliding breech mechanism. In the older types the lock or its substitute was manipulated by hand, and with electric firing the wires from the tubes were joined up to the loose ends of the firing circuit;

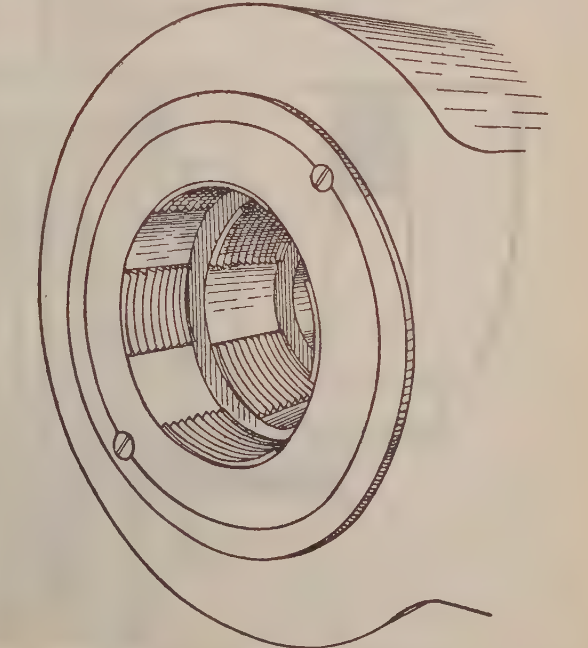


Fig. 39.—Elswick Coned Screw.

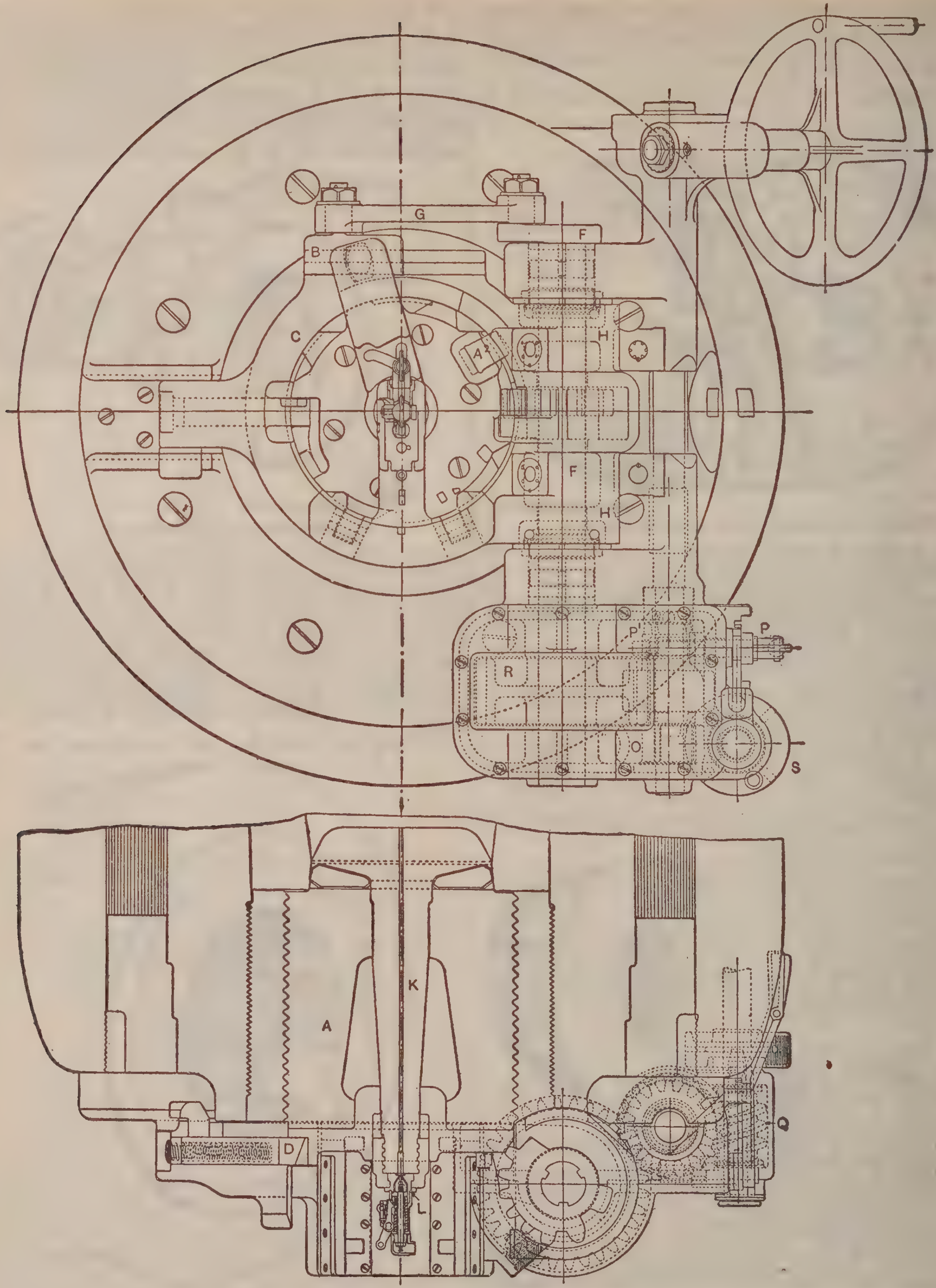


FIG. 41.—12-in. Gun, Breech Mechanism.

safety depended therefore on everything being in order and all operations correctly performed. The gun could, however, be fired before the breech was properly secured and a serious accident caused; to prevent this all the movements of modern locks are arranged to be automatic, and wireless electric tubes are used so that immediately the breech mechanism commences to open, the lock itself is moved in the box slide so as to uncover the vent opening. During the first part of this movement a foot on the striker rides up an incline I (fig. 45) on the box slide and thus pushes back the striker from contact with the tube. The extractor described above is actuated at the same time. Most locks

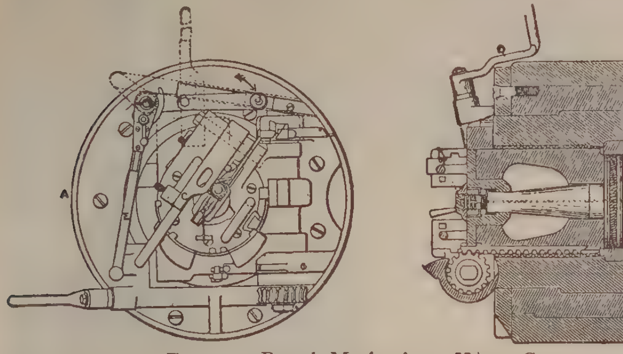


FIG. 40.—Breech Mechanisms, Heavy Guns.

consist of a steel frame with a socket for containing the striker and main spring. They are contrived so as to be capable of firing both electric and percussion tubes, but others are arranged for firing only electric, separate locks being employed for use with percussion tubes. The construction of both is very similar, but with the percussion lock, or the combined lock, a trigger is provided which drops into a notch in the striker when this is pulled back by the lugs E E (fig. 45) on the outer attachment of the striker. On the trigger being pulled by a lanyard the striker is released and fires the tube.

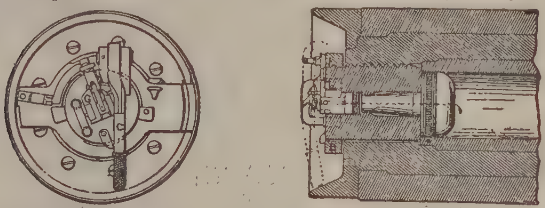


FIG. 42.—Breech Mechanism, 6-in. B.L. Mark IV.

For Q.F. guns with interrupted or coned breech screws the striker is contained in the breech screw, but, in order to provide for safety, a small lever cam or other contrivance is fitted which, when the mechanism commences to open, is operated by the hand lever and withdraws the striker from contact with the primer inserted in the cartridge case.

The striker consists of a steel needle, with the stem insulated by ebonite or some similar material, contained in an outer steel sheath. The sheath is formed with a foot or lug which is acted upon by the safety gear; a collar is also provided for taking the thrust of the main spring.

Another form of lock now much in favour, especially for field-gun mechanisms, is that known as a trip lock. It is mainly used for percussion firing but can also be combined for use with electric tubes. In this pattern the striker is withdrawn, cocked and released by the continuous pull of a hand lever attached to the mounting or by a lanyard attached to the lock. Should a miss-fire occur the striker may be actuated as often as necessary by releasing the hand lever or lanyard and again giving a continuous pull (fig. 46).

Back flash. In all modern heavy guns, especially when firing to windward, there is a tendency, when the breech is opened rapidly after firing, for a sheet of flame to issue from the open breech. It was practically unknown with the old black powders, but is of frequent occurrence with all smokeless propellants. If the gun is loaded immediately after the breech is opened the fresh charge may be ignited and an accident caused. Several serious accidents have already been traced to this cause, notably one on the United States battleship "Missouri" on 13th April 1904, when 33 lives were lost. The flame is due to the large amount of highly heated carbonic oxide remaining in the gun from the explosion of the charge; this mixing with the oxygen of the air when the breech is opened burns rapidly as a sheet of flame in rear of the gun, and should wind be blowing down the gun the action is more intense. By looking into the gun from the muzzle, before the breech is opened, the gas can often be seen burning with a pale-blue flame as it slowly mixes with air and a curious singing noise is heard at the same time. It is now usual to fit a special apparatus on the gun, so that directly the breech is partly opened a blast of compressed air is allowed to enter the rear end of the chamber and thus sweep the whole of the residual gas out at the muzzle.

Obturators. The purpose of the obturator is to render the breech end of the gun gas-tight, and to prevent any escape of gas past the breech mechanism. In the first Armstrong B.L. gun this object was attained by fitting to the breech block a copper ring coned on the exterior; the coned surface was forcibly pressed by screwing up the breech screw against a corresponding copper ring fitted at the breech opening of the gun chamber. It is only possible to use this method when the copper surfaces can be jammed together by a powerful screw.

Except the above, all obturators in use are arranged to act automatically, *i.e.* the pressure set up in the gun when it is fired expands the arrangement and seals the opening; immediately the projectile leaves the bore the pressure is relieved and the obturator, by its elasticity, regains its original shape, so that the breech mechanism can be opened or closed with ease. In the French naval service B.L. guns have been in use since 1864, and the system of obturation was arranged on the same expansion principle as the leather packing ring of the hydraulic press. A steel ring A (fig. 47) of cupped form was fastened by a screwed plug to a thick steel plate, carried on the face of the breech screw, so that it could rotate when the breech screw was rotated in opening or closing the gun. The outer lip of the cup fitted against a slightly coned seating formed in the breech end of the gun chamber. When the gun was fired, the gas pressure expanded the cup ring and forced it into close bearing against the seating in the gun and the thick steel plate on the breech screw, thus preventing any escape of gas. Very similar to this was the Elswick cup obturator (fig. 48) introduced by the Elswick Ordnance Company in 1881; its rear surface was flat and it was held by a central bolt against the front of the breech screw which was slightly rounded. The cup yielded to the gas pressure until it was supported by the breech screw; this action expanded the lip against a copper seating, let into the gun, which could be renewed when necessary. Many of both types are still in use and act perfectly efficiently if carefully treated. The use of modern smokeless powder renders them and similar devices, such as the Broadwell ring (fig. 49), &c., peculiarly liable to damage, as a slight abrasion of the lip of the cup or ring, or of its seating, allows gas to escape, and so accentuates the defect with each round fired. Unless, therefore, the fault be immediately remedied considerable damage may be caused to the gun. The Broadwell gas ring is still in use in the French naval service, where it is made of copper (fig. 50), and also of steel in a modified form (Piorkowski) in the German service (fig. 51); in the last-named service, owing to the defect already named, all the latest guns, both light and heavy, use metal cartridge cases. In the French navy, as in

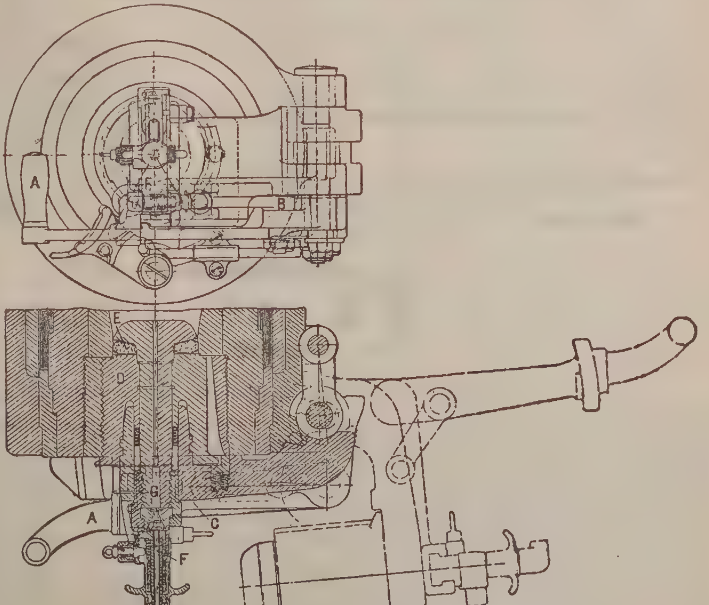


FIG. 43.—Breech Mechanism, Modern 6-in. Gun.

most other services, cartridge cases are used for the smaller and medium guns only.

One of the most efficient obturators not liable to damage is the plastic device introduced by Colonel de Bange of the French service and adopted by the French army and also by the British and other governments. It consists of a pad (fig. 52) made up of a strong annular-shaped canvas bag A, containing a mixture of asbestos fibre and mutton suet; the bag with its contents is placed in a properly formed die and subjected to hydraulic pressure by which it becomes hard and firm. The pad so made is then placed on the front of the breech screw B, and it is protected on its faces by disks C, C, of metallic tin or copper having steel wedge rings on the outer edges; the circumference of the complete pad and disks is generally only slightly coned and fits into a corresponding seating formed at the breech end of the chamber, the canvas of the circumference of the pad being in immediate contact with the seat. In the English service the steep cone pattern (fig. 53) of de Bange obturator is used with mechanisms having the Welin screw. In front of the pad is placed a strong steel disk formed with a spindle, and called a mushroom head D, the spindle passing through the hole in the pad and through the breech screw, being secured in rear by a nut. The firing vent is generally drilled through the mushroom head and spindle and the part is then termed a "vent axial." On the gun being fired the gas exerts a great pressure on the mushroom head, which compresses the pad and squeezes it out on the circumference into close contact with the seating, thus forming a perfect gas seal. It is found that this apparently delicate arrangement will stand considerable ill-usage and act perfectly for an indefinite time, and, as it is easily replaced, it is regarded as one of the best and most reliable forms of obturator. In some countries the Freyre obturator is in use; this has a somewhat similar axial head to the de Bange, but the asbestos pad is replaced by a single steel wedge ring into which the axial head fits. On firing the gun the head is forced into the wedge ring and expands it against the seating in the gun.

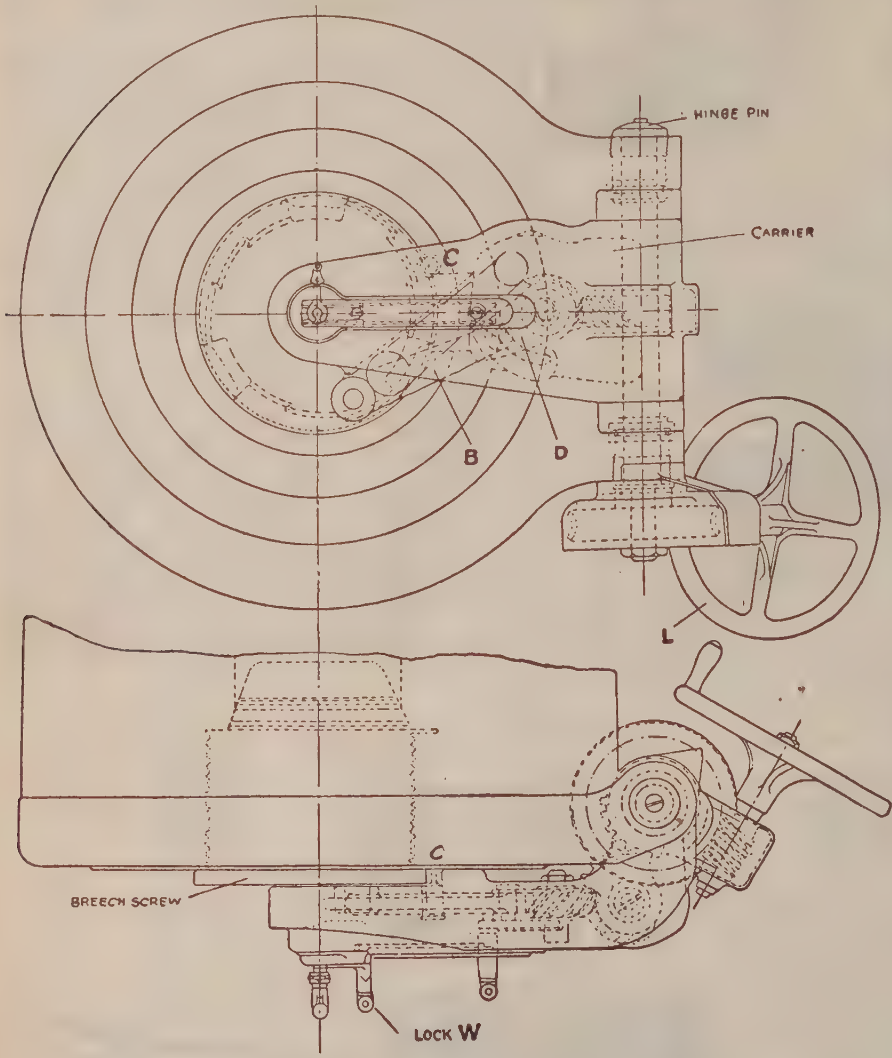


FIG. 44.—English modern Breech Mechanism, for heavy and medium guns.

One other means of obturation has to be considered, viz. metallic cartridge cases. These are made of a kind of brass; aluminium cases have been experimented with, but have not proved satisfactory. The case (fig. 54) acts on the same principle as the cup obturation and is extremely efficient for the purpose; moreover, they have certain advantages conducive to rapid firing when used for small guns. The idea has developed from the use of such cartridges in small arms, and larger cartridges of the same type were introduced for 3-pounder and 6-pounder guns by Hotchkiss and Nordenfelt about the year 1880 for the purpose of rapid firing against torpedo boats. Then in 1886 the Elswick Company produced a 36-pounder (soon converted to a 45-pounder) of 4·7-in. calibre with the powder charge contained in metallic cases, and about 1888 a 6-in. 100-pounder gun using similar cartridges. A special advantage of the cartridge case is that it contains the firing primer by which the charge is ignited and consequently renders the firing gear of the gun more simple; on the other hand, should a miss-fire occur the gun must be opened to replace the primer. This is a proceeding liable to produce an accident, unless a long enough time is allowed to elapse before attempting to open the breech; guns having de Bange obturators and firing tubes inserted after the breech is closed are therefore safer in this respect.

Some means of extracting the case after firing must be fitted to the gun; this is simple enough with small guns, but with those of heavy natures the extractor becomes a somewhat ponderous piece of gear.

Metallic cases of a short pattern have been tried for large calibre guns; although their action is quite efficient, they are difficult to handle, and if a case must be used it is preferable to employ a fairly long one. It was for this reason that in England up to 1898 it was considered that for guns above 6-in. calibre the de Bange obturation was the most advantageous. Since then the de Bange obturator has been employed in guns of 4-in. calibre and above, the cartridge case being retained only for 3-in. and smaller guns. Krupp, however, uses cartridge cases with all guns even up to 12-in. calibre, but this is undoubtedly due to the difficulties, which have already been noticed, attending the use of smokeless powder with the ordinary forms of obturation applicable to the wedge breech system. In the most modern Krupp 12-in. guns the charge is formed in two pieces; the piece forming the front portion of the charge is contained in a consumable envelope, while the rear portion is contained in a brass cartridge case, which forms the obturator, about 48 in. long.

It will be seen that such large and heavy cases add to the difficulties which occur in handling or stowing the ammunition of large calibre guns, and although the use of cartridge cases with small guns adds to their rapidity of firing this is not the case with heavy guns. It seems, therefore, that the balance of advantages is certainly in favour of the de Bange system, for all guns except those of small calibre. With ordinary field guns cartridge cases are now considered obligatory owing to their convenience in loading.

While the ordinary types of plastic obturators last for an indefinite time a cartridge case can be used for a limited number of rounds only, depending on the calibre of the gun; with field guns from ten to twenty rounds or even more may be fired from one case if care is taken to reform it after each round; with large guns they will not, of course, fire so many. Cartridge cases are an expensive addition to the ammunition, so that there should be no doubt about the advantages they offer before they are definitely adopted for heavy guns.

The rapidity with which modern guns can be fired and the enormous energy they develop is especially striking when one

Range and power.

considers the same facts in connexion with the early guns. Favé states in his *Histoire et tactique des trois armes* (p. 23) that during the invasion of Italy in 1494 by Charles VIII. the guns were so unwieldy and the firing so slow that the damage caused by one shot could be repaired before the next could be fired. The range, too, about 100 yds. for battering purposes, now seems absurdly short; even at Waterloo 1200 yds. was all that separated the antagonists at the commencement of the battle, but they approached to within 200 or 300 yds. without suffering serious loss from either musketry or gun fire. Nelson fought his ships side by side with the enemy's; and fifty years after Nelson's day a range of 1000 yds. at sea was looked upon as an extreme distance at which to engage an enemy. Contrast this with the range of 12,000 yds. at which the opposing Russian and Japanese fleets more than once commenced a naval battle in 1904, while the critical part of the action took place at a distance of 7000 yds.

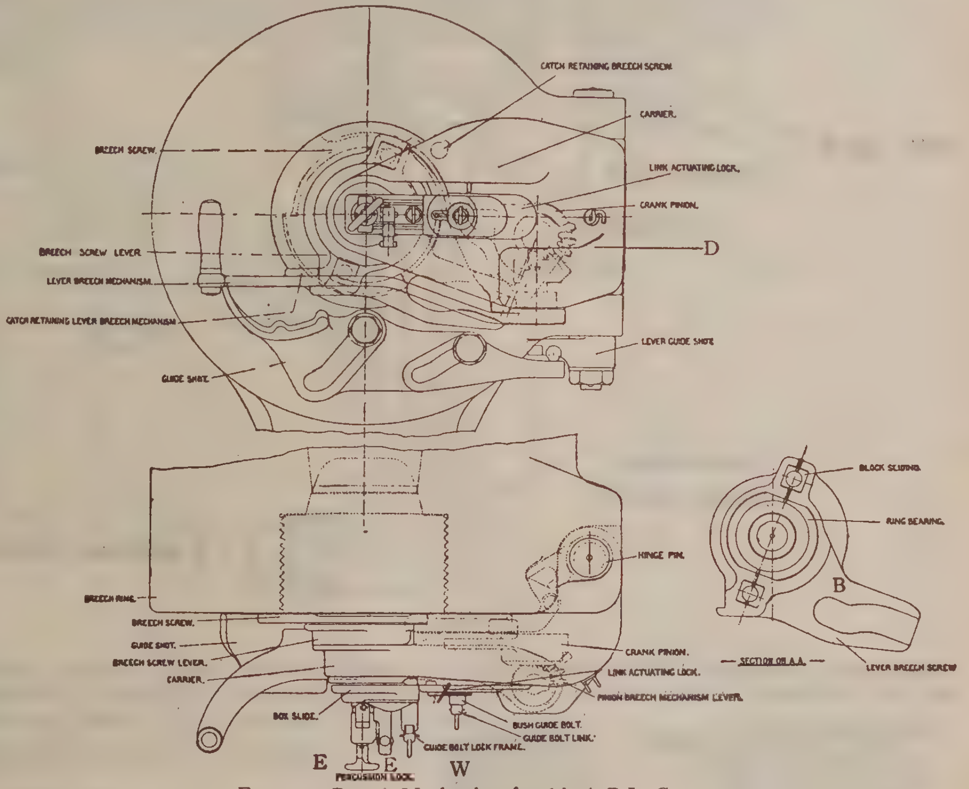


FIG. 45.—Breech Mechanism for 6-inch B.L. Gun

These long ranges naturally intensified the requirements of the British and other navies, and, so that they shall not be outclassed and beaten by an enemy's long-range fire, guns of continually increasing power are demanded. In 1900 a 12-in. gun of 40 calibres was considered all that was necessary. After the Russo-Japanese War the demand rose first for a 45-calibre gun and then for a 50-calibre gun, and muzzle velocities from about 2400 f.s. to about 3000 f.s. In 1910 greater shell power was demanded, to meet which new type guns of 13·5-in. and 14-in. calibre were being made.

In the days of M.L. heavy guns one of the most difficult problems was that of loading. The weight of the shell and powder was such that some mechanical power had to be employed for moving and ramming them home, and as hydraulic gear had by that date been introduced it was generally used for all loading operations. To load, the guns had to be run back until their muzzles were within the turret, or, in the case of the 16-in. 80-ton guns of H.M.S. "Inflexible," until they were just outside the turret. The guns were then depressed to a fixed angle so as to bring the loading gear, which was protected below the gun deck, in line with the bore; the charge was first rammed home and then the projectile. With this arrangement, and in order to keep the turret of manageable dimensions, the guns had to be made short. Thus the 12·5-in. 38-ton M.L. gun had a length of bore of but 16 calibres, and the largest English service gun of 16-in. diameter had a bore of 18 calibres in length; while the largest of the type weighing 100 tons, built by Sir W. G. Armstrong & Co., for the Italian navy, had a bore of 17·72 in. and a length of 20 calibres. The rate of fire was fairly rapid—two rounds could be fired from one turret with the 12·5-in. guns in about three minutes, while it took about four minutes to fire the same number from the 80-ton and 100-ton gun turrets.

The possibility of double loading M.L. guns was responsible for the bursting on the 2nd January 1879 of a 38-ton gun in a turret on H.M.S. "Thunderer"; and it was partly due to this accident that B.L. guns were subsequently more favourably regarded in England, as it was argued that the double loading of a B.L. gun was an impossibility.

With the B.L. system guns gradually grew to be about 30 calibres in length of bore, and they were not made longer because this was considered a disadvantage, not to be compensated for by the small additional velocity which the old black and brown prismatic powders were capable of imparting with guns of greater length. Increase in the striking energy of the projectile was consequently sought by increasing the weight of the projectile, and, to carry this out with advantage, a gun of larger calibre had to be adopted. Thus the 12-in. B.L. gun of about 25 calibres in length gave place to the 13·5-in. gun of 30 calibres and weighing 67 tons, and to the 16·25-in. also of 30 calibres and weighing 111 tons. The 10,000- or 12,000-ton battleships carrying these enormous pieces were, judged by our present-day standard, far too small to carry such a heavy armament with their ponderous armoured machinery, which restricted the coal supply and rendered other advantages impossible; even the 24,000-ton battleships are none too large to carry the number of heavy guns now required to form the main armament.

The weight and size of the old brown prismatic charges had also reached huge dimensions; thus, while with heavy M.L. guns the weight of the full charge was about one-fourth that of the projectile, it had with heavy B.L. guns become one-half of the weight of the shell or even a greater proportion. The introduction of smokeless powder about 1890, having more than three times the amount of energy for the same weight of the older powders, allowed longer guns to be used, which fired a much smaller weight of charge but gave higher velocities; the muzzle or striking energy demanded for piercing hard-faced armour could consequently be obtained from guns of more moderate calibre. The 13·5-in. and 16·25-in. guns were therefore gradually discarded and new ships were armed with 12-in. guns of greater power. As the ballistic requirements are increased the weight of the charge becomes proportionately greater; thus for the present high velocity guns it has reached a ratio of about 0·4 of the weight of the projectile.

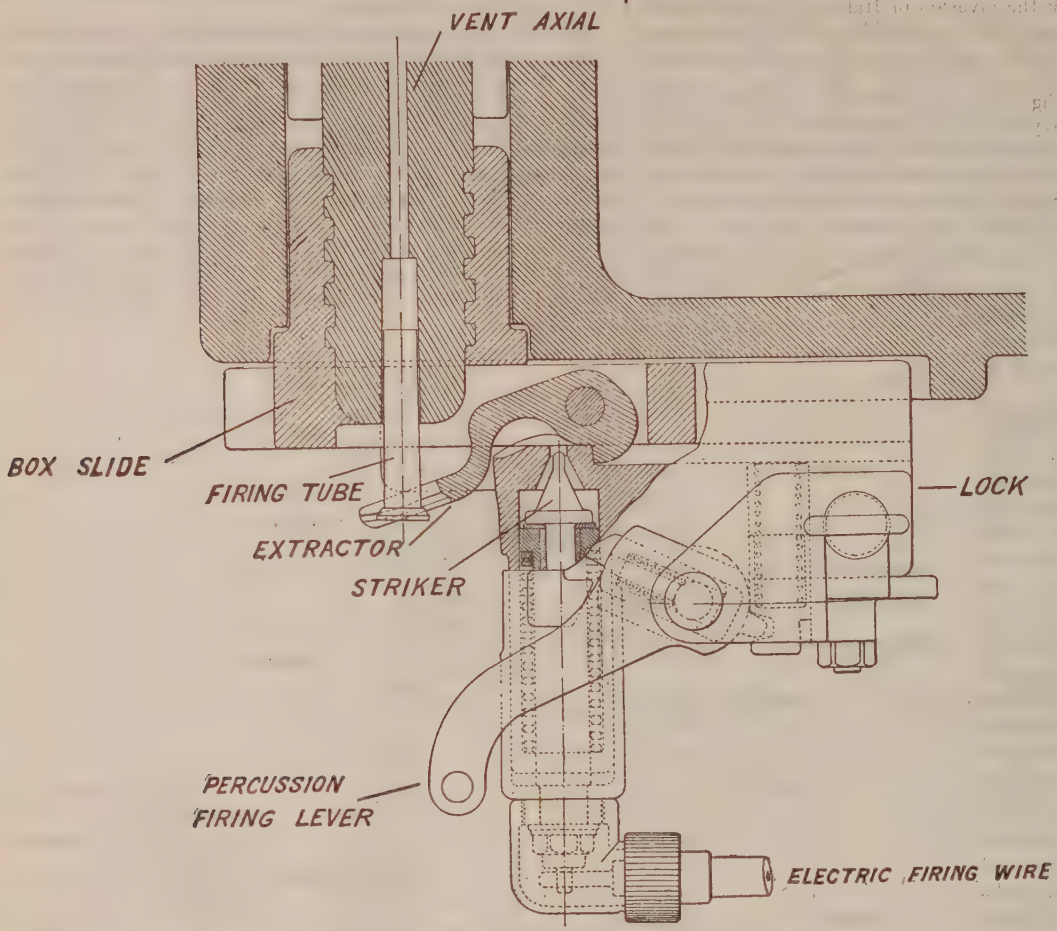


Fig. 46.

The progress of artillery and the improvements made in armour have been reciprocal; as the protective value of iron and subsequently of steel plates has increased, so the penetrative force or quality of the projectile has advanced. Often, after a period of apparent inactivity, fresh ideas or new metallurgical processes have enabled further progress to be made; this is the case at the present time as regards both projectiles and armour. As a matter of fact, armour, at the present-day fighting ranges, is rather ahead of artillery—hence the demand for greater power; but even with this the probability of perforation is small, and is usually only obtained when the projectile strikes normally to the surface of the plate; the chance of this happening in action is somewhat remote. During the Russo-Japanese War no instance of perforation of the thick belt or turret armour is known; the chief cause of the Russian losses was the bursting of 12-in. and 6-in. shells inside the unarmoured portions of their ships; it is stated that no ship survived after being struck by ten 12-in. projectiles.

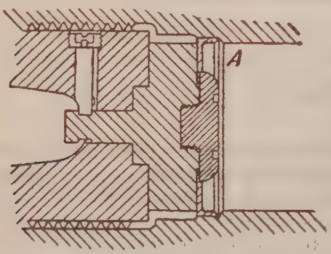


Fig. 47.—French Obturator.

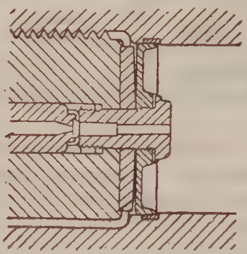


Fig. 48.—Elswick Cup.

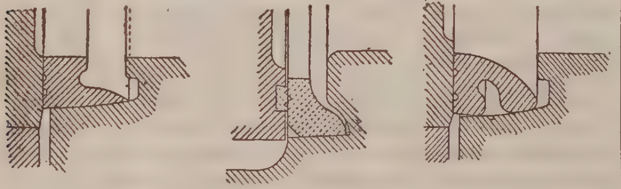


Fig. 49. Fig. 50. Fig. 51.

Figs. 49-51.—Broadwell Ring.

Some authorities have lately sought to increase the muzzle energy—without adding weight or length to the gun—by increasing the weight of the projectile. This can be done to a limited extent with beneficial results, but it is impossible to carry the idea very far, as the projectile becomes very long and difficulties may be encountered with the rifling; or, if these are avoided, the thickness of the walls of the shell is increased so much that the heavier projectiles is in reality less powerful owing to its internal bursting charge being comparatively small. Again, many foreign gunmakers claim that their guns are, in comparison with English guns of the same power, of less weight. This is true in a limited sense, but such guns have nothing like the same factor of resistance as English guns, or, in other words, the English

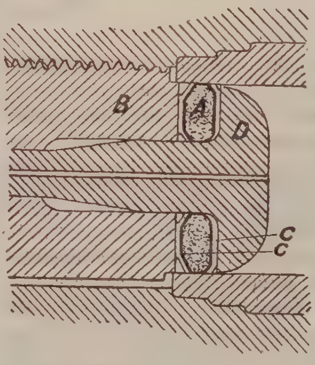


Fig. 52.—De Bange Obturator.

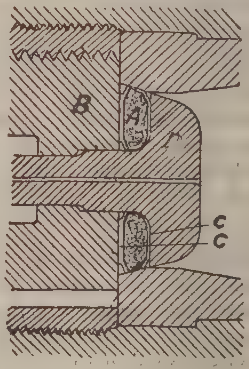


Fig. 53.—Steep Cone de Bange Obturator.

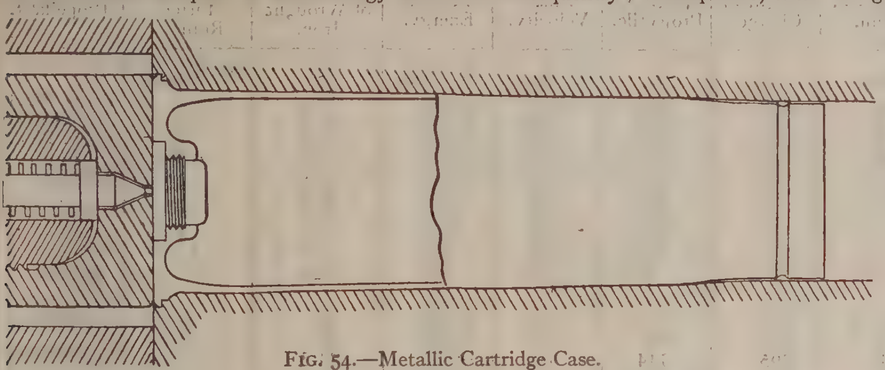


FIG. 54.—Metallic Cartridge Case.

guns are much stronger. This is an obvious advantage, but an equally solid one is the fact that owing to the greater weight of the home-made weapon the recoil energy is less and consequently the mounting can be made of a lighter pattern. Besides, the weight of the gun is so disposed as to bring its centre of gravity as near the breech end as possible; by this means the radius of the gun house is reduced to the smallest dimension and, in consequence, there is a great saving of weight of armour. The extra weight of the gun is therefore more than compensated for.

Until late into the 16th century the calibres of the guns were not regulated with a view to the interchangeability of shot. In the following century ordnance was divided into classes, but even then, owing no doubt to manufacturing difficulties, there was no fixed size for the bore. The Tables II.-VII. give some idea of the size and weight of these pieces.

Table II. is taken from Cleveland's *Notes*, but corrected from "An Old Table of Ordnance" (*Proc. R.A.I.*, vol. xxviii. p. 365); the last column gives the range in scores of paces at point-blank, a term used in those days to denote the first part of the trajectory which was supposed to be a straight line. Later the point-blank range was that distance from the gun on its carriage to the first graze of the shot on the horizontal plane when the axis of the gun was placed horizontal; this depended on the height of the gun above the ground plane, but it was the only method of determining the relative power of these early guns.

In power, smooth-bore guns in Europe did not differ very much from each other, and it may be taken for granted that the progress made since has been much the same in all.

D'Antoni, in his *Treatise of Fire Arms* (translated by Captain Thomson, R.A.), gives particulars of Italian guns of about 1746, which are shown in Table III.

It will be seen that the velocities given in Table III. are not inferior to those obtained from guns actually in use in 1860 (see Table IV.). They were considerably higher than those for elongated rifled projectiles (Table V.) for many years after their introduction; the last-named, however, during flight only lost their velocity slowly, while the spherical shot lost their velocity so rapidly that at 2000 yds. range only about one-third of the initial velocity was retained.

TABLE II.—*Names and Weights of English Cannon, 1574.*

Names.	Weight.	Diameter of Bore.	Diameter of Shot.	Weight of Shot.	Weight of Charge. Serpentine.	Scores of Paces at point-blank.
	℔	in.	in.	℔	℔	
Robinet . . .	200	1¼	1	1	½	. .
Falconet . .	500	2	1¾	2	1¼	14
Falcon . . .	800	2¾	2½	2½	2½	16
Minion . . .	1100	3¼	3	4½	4½	17
Sacre . . .	1500	3½	3¼	5	5	18
Demi-Culverin . .	2500	4¼	4	9	9	20
Culverin . .	4000	5¼	5	18	18	25
Demi-Cannon . .	6000	6½	6¼	30	28	28
Cannon . . .	7000	7¾	7½	60	40	20
Eliza-Cannon . .	8000	8	7¾	63	42	20
Basiliske . .	9000	8¾	8½	60	60	21

TABLE III.

Gun.	Weight of Charge.	Weight of Shot.	Muzzle Velocity.
	℔.	℔.	f.s.
27-pr. 66 cwt.	13·125	27	1517
13½-pr. 37·5 cwt.	6·562	13·5	1618
6¾ pr. 20 cwt.	4·922	6·75	1696
3⅜ pr. 11 cwt.	2·469	3·375	1720

TABLE IV.—*British Smooth Bore Guns, 1860.*

	Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.
		In.	Tons.	℔.	℔.	Ft. Secs.	Ft. Tons.
Cast Iron.	10 in. 87 cwt.	10	4·35	12	88·31	1292	1022
	68 pr. 95 ,, ...	8·12	4·75	16	66·25	1579	1145
	8 in. 65 ,, ...	8·05	3·22	10	49·875	1464	742
	32 pr. 58 ,, ...	6·375	2·9	10	31·375	1690	621
	24 ,, 50 ,, ...	5·823	2·5	8	23·5	1720	482
	18 ,, 38 ,, ...	5·292	1·9	6	17·69	1690	350
Bronze.	12 ,, 18 ,, ...	4·623	0·9	4	12·66	1769	275
	9 ,, 13 ,, ...	4·20	0·65	2·5	9·36	1614	169
	6 ,, 6 ,, ...	3·668	0·3	1·5	6·23	1484	95

TABLE V.—*British B.L. Ordnance, 1860. Armstrong System.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.
	In.	Tons.	℔.	℔.	Ft. Secs.	Ft. Tons.
100 pr.	7	4·1 3·6 *	12	103·75	1166	978
40 ,, ...	4·75	1·75 1·6 *	5	41·5	1164 1134	390 370
20 ,, ...	3·75	0·8 0·65 *	2·5	21·22	1114 997	162 146
12 ,, ...	3·0	0·425	1·5	11·56	1184	112
9 ,, ...	3·0	0·3	1·125	9·0	1141	81
6 ,, ...	2·5	0·175	0·75	6·0	946	37

At a later date the velocities of these guns were altered.

* Two patterns were in existence.

TABLE VI.—*British Rifled Ordnance, 1890.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of Firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft. Secs.	Ft. Tons.	In.	Per Minute.	
M.L. Guns—									
17·72 in.	17·72	100	450	2000	1548	33,233	24·5	⅙	Prism Black
16 ,,	16	80	450	1700	1540	29,806	25·0	¼	Prism Brown
12·5 ,,	12·5	38	210	818	1575	14,140	19·2	⅓	Prism Black
12 ,,	12	35	140	714	1390	9,563	15·2	⅓	P[2]
11 ,,	11	25	85	548	1360	6,510	13·5	⅓	Pebble
10 ,,	10	18	70	410	1379	5,406	12·5	⅓	,,
9 ,,	9	12	50	256	1440	3,695	11·0	½	,,
8 ,,	8	9	35	179	1390	2,391	9·2	½	,,
7 ,,	7	7	30	114·6	1525	1,854	9·2	1	,,
64-pr.[1]	6·3	3·2	10	66·9	1390	897	6·4	1	R.L.G.[4]
B.L. Guns—									
16·25 in.	16·25	110·5	960	1800	2087	54,390	38	⅓	S.B.C.
13·5 ,,	13·5	67	630	1250	2016	35,230	33	½	,,
12 ,,	12	45	295	714	1914	18,137	24·5	1	PrismBrown
10 ,,	10	29	252	500	2100	15,290	25·8	1	,,
9·2 ,,	9·2	22	166	380	2036	10,915	22·3	1½	,,
8 ,,	8	14	118	210	2200	7,046	20·0	2	,,
6 ,,	6	5	48	100	1960	2,435	13·5	3	E.X.E.
5 ,,	5	2	16	50	1800	1,123	9·2	3	S.P.
4 ,,	4	1·3	12	25	1900	626	7·8	3	,,
Q.F. Guns—									
4·7 in.	4·72	2·1	12	45	1786	995	8·8	8	,,
6-pr.	2·24	0·4	1·94	6	1837	141·2	5·3	20	Q.F.
3 ,,	1·85	0·25	1·5	3·3	1873	80·2	4·0	20	,,

[1] And many smaller guns.

TABLE VII.—*British B.L. Ordnance, 1900.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of Firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft. Secs.	Ft. Tons.	In.	Per Minute.	
16·25 in.	16·25	110·5	960	1800	2087	54,390	38	⅓	S.B.C.
13·5 in.	13·5	67	187	1250	2016	35,230	33	½	Cordite
12 in. Mark VIII.	12	46	167·5	850	2367	33,000	36·9	1	,,
10 in.	10	29	76	500	2040	14,391	24·8	1½	,,
9·2 in. Mark X.	9·2	28	103	380	2601	17,826	32·3	2½	,,
8 in.	8	14	32·625	210	2200	7,046	20·0	. .	,,
6 in. Mark VII.	6	7	20	100	2493	4,335	19·25	7	,,
5 in.	5	2	4·45	50	1750	1,062	8·8	3	,,
4 in.	4	1·3	3·06	25	1900	626	7·8	3	,,
Q.F. Guns—									
6 in.	6	7	13·25	100	2200	3,356	16·0	6	,,
4·7 ,,	4·72	2·1	5·43	45	2188	1,494	12·0	8	,,
4 ,,	4	1·3	3·75	25	2456	1,046	11·6	9	,,
12-pr.	3	0·6	1·94	12·5	2210	423	8·0	15	,,
6 ,,	2·24	0·4	0·483	6	1818	137	4·8	20	,,
3 ,,	1·81	0·25	0·396	3·3	1873	80·2	4·0	20	,,

As regards rapidity of aimed fire—and no shooting is worth consideration which is not aimed—much depends on the quickness with which the gun can be opened, loaded and closed again ready for firing, but quite as much depends on the ease and convenience of moving to any required direction the gun with its mounting; also on the system of recoil adopted and the method of sighting. Two identically similar guns may consequently give entirely different rates of firing, unless mounted and sighted on the same system—without taking into consideration the personal element of the gun detachment or crew. The rates of firing shown in many tables are therefore not always a trustworthy criterion of the guns' capabilities. The advantage of the Q.F. system (*i.e.* a gun firing charges contained in metallic cases), when suitably mounted, over the old B.L. guns was exhibited in a very marked manner in 1887, when the first 4·7-in. Q.F. gun fired ten rounds in 47·5 seconds and subsequently fifteen rounds in one minute. The 5-in. B.L. gun when fired as rapidly as possible only fired ten rounds in 6 minutes 16 seconds; so that the Q.F. gun fired its tenth round before the then service gun fired its second shot. Recent improvements made in the mechanism of the B.L. gun enable it to compete with the Q.F. system.

The tabulated armour-piercing value of a gun is based on the

TABLE VIII.—*British Ordnance, 1910.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of Firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft. Secs.	Ft. Tons.	In.	Per Minute.	
12 in. Mark XI.	12	66	. .	850	2959	51,580	51·5	2	M.D.Cordite
12 in. Mark X	12	58	309	850	2900	47,697	51·0	2	,,
10 in.	10	31	148	500	2800	27,205	39·5	2	,,
9·2 Mark X.	9·2	28	103	380	2640	18,400	33·3	3	,,
7·5 in.	7·5	16	69·5	200	2800	10,883	29·0	4	,,
6 in. Mark VII.	6	7·4	20	100	2493	4,308	19·6	6	,,
4 in.	4	1·3	3·75	25	2456	1,046	11·6	9	,,

Q.F. guns as in 1900.

results given by various formulas. These often vary considerably, so in order that a direct comparison in the tables may be made, this value is obtained for wrought iron plate only, using Tresidder's formula, which is one of the most trustworthy. The equivalent thickness of Krupp cemented steel armour can be obtained immediately by dividing the tabulated value for wrought iron by a "factor of effect" of 2·3 to 2·4 for uncapped armour piercing shot, and about 2·0 for capped armour piercing shell. These factors are dependent on the nature of the projectile and must therefore be taken as approximate.

Tables VIII.-XXII. are obtained from trustworthy sources, but as great secrecy is now observed in many countries there may be a few inaccuracies; in some cases the whole of the data are not available.

TABLE IX.—*French Naval Ordnance*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
305 mm.	12·01	..	..	750	2870	42,890	46·0	1·5	Smokeless
274 ,,	10·8	34·5	..	562	2650	27,186	38·8	1·5	B. Powder
240 ,,	9·45	23·6	..	375	2870	21,445	37·0	2	,,
194 ,,	7·64	12·5	..	190	2870	10,890	29·0	2	,,
164·7 ,,	6·46	8·5	..	115	3000	7,185	26·3	4	,,
Q.F. Guns—									
164·7 mm.	6·46	8·1	..	115	2870	6,568	24·5	5	,,
140 ,,	5·44	4·13	..	66	2625	3,153	20·0	6	,,
100 ,,	3·94	..	..	31	2395	1,232	12·4	6	,,
75 ,,	2·9	..	..	14	3116	943	14·5	12	,,
65 ,,	2·57	..	..	8·8	2871	503	10·8	12	,,
47 ,,	1·85	..	..	3·3	2871	188	7·9	15	,,

TABLE X.—*German Naval Ordnance.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
Q.F. Guns—	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
28 cm.	11·02	33·3	..	529	2854	29,878	40·2	1	Nitro-Glycerine powder
24 ,,	9·45	25·4	88·2	309	2740	16,086	31·0	1½	,,
21 ,,	8·2	15·75	49·5	242	2526	10,707	26·1	3	,,
17 ,,	6·7	7·8	43·1	132	2887	7,629	26·1	5	,,
15 ,,	5·9	4·73	19·83	88	2461	3,696	18·0	7	,,
10·5 ,,	4·13	1·645	7·27	38·35	2297	1,403	12·75	8	,,
8·8 ,,	3·42	1·34	4·85	23·6	2789	1,273	14·7	10	,,
5 ,,	1·97	0·236	0·66	3·86	2165	125	5·4	11	,,

Note.—It is stated that the new German 28 cm. 50 calibre naval gun weighing 43·9 tons fires, with a charge of 291 ℔, a projectile of 760 ℔ with a velocity of 2871 f.s.

TABLE XI.—*Italian Naval Ordnance*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
343 mm.	13·5	67·9	187·2	1215	2067	36,050	34·0	..	Strip Ballistite
305 ,,	12	51	231·5	850	2580	39,220	42·0	..	,,
254 ,,	10	30	85	450	2461	19,000	31·0	..	,,
203 ,,	8	19	57	250	2526	11,060	27·0	..	,,
152 ,,	6	5·7	17·6	100	2296	3,655	17·0	..	,,
120 ,,	4·72	2·1	5·5	45	2116	1,397	11·4	..	,,
76 ,,	3·0	0·6	2·17	12·5	2296	457	8·5	..	,,
57 ,,	2·24	0·4	1·05	6	2198	201	6·3	..	,,
47 ,,	1·81	0·25	0·67	3·3	2330	124	5·8	..	,,

TABLE XII.—*Russian Naval Ordnance*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
12 in.	12	59	..	720	2600	33,730	39·0	..	Nitro-Cellulose
10 ,,	10	32	..	488	2550	22,003	34·0	..	,,
8 ,,	8	14	87	188	2950	11,345	29·5	..	,,
6 ,,	6	6·28	50·6	91·5	2118	2,849	14·4	..	,,
9 pr.	4·2	0·87	4·88	27·75	1226	289	4·2	..	,,
4 ,,	3·43	0·45	3·1	15·0	1451	219	4·6	..	,,
Q.F. Guns—									
6 in.	6	5·75	28	91·5	2502	3,970	18·5	..	,,
4·7 ,,	4·72	2·95	15·4	45·0	2502	1,953	14·6	..	,,
2·9 ,,	..	0·87	3·53	10·8	2700	546	10·3	..	,,
1·81 ,,	1·81	0·323	..	3·3	2003	91·8	4·6	..	,,

TABLE XIII.—*Austrian Naval Ordnance*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
30·5 cm.	12·01	..	..	990	2625	47,300	46·0	..	
24 ,,	9·45	21·5	120·6	474	2595	22,121	34·5	..	
19 ,,	7·5	11·6	56	198	2700	10,025	27·3	3	
15 ,,	5·91	5·2	28·8	112·5	2608	5,308	22·0	10	
12 ,,	4·72	2·0	9·7	52·4	2264	3,554	13·7	10	
7 ,,	2·75	..	3·3	15·2	2378	..	10·4	..	
4·7 ,,	1·85	0·253	0·79	3·3	2329	..	5·8	..	
3·7 ,,	1·46	..	..	1·0	2346	..	..	..	

TABLE XIV.—*Austrian Coast Artillery*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
30·5 cm.	12·01	..	198·4	981	2297	35,860	37·8	..	Tubular Prism
28 ,,	11·024	38	220	760	1722	15,615	22·5	..	
15 ,,	5·906	4·28	18·28	100	2297	3,659	17·2	4	

TABLE XV.—*United States Naval Guns*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	Nitro-Cellulose
13 in.	13	61·4	180	1130	2000	31,333	31·8	..	
12 ,,	12	56·1	340	870	2950	52,483	52	..	,,
10 ,,	10	34·6	207·5	510	2700	25,772	38	..	,,
8 ,,	8	18·7	98·5	260	2750	13,630	31·1	..	,,
7 ,,	7	12·7	58	165	2700	8,340	25·9	..	,,
6 ,,	6	8·6	37	105	2800	8,710	23·5	..	,,
5 ,,	5	5	23·8	50	3150	3,439	21·1	..	,,
4·7 ,,	4·72	..	..	45	2600	2,110	15·5	..	,,
4 ,,	4	2·9	12·3	33	2800	1,794	16·1	..	,,
3 ,,	3	1·0	3·85	13	2700	657	11·0	..	,,
6 pr.	2·24	..	..	6	2240	209	6·6	..	,,
3 ,,	1·81	..	..	3	2200	100	5·4	..	,,

TABLE XVI.—*United States Coast Defence Guns.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	Nitro-Cellulose
16 in.	16	127	612	2400	2150	77,000	46·4	..	
14 ,,	14	50	280	1660	2150	53,220	41·0	..	,,
12 ,,	12	59	340	1046	2250	36,730	37·6	..	,,
10 ,,	10	34·3	205	604	2250	21,200	31·5	..	,,
8 ,,	8	14·4	80	316	2200	10,600	24·5	..	,,
6 ,,	6	9·45	35	106	2600	4,970	21·1	..	,,
5 ,,	5	4·96	20	58	2600	2,718	17·2	..	,,
4·72 ,,	4·72	2·75	10·5	45	2600	2,110	15·5	..	,,
4 ,,	4	1·61	7·5	33	2300	1,210	12·0	..	,,
3 ,,	3	1·2	6·0	15	2600	704	11·25	..	,,
2·24 ,,	2·24	0·38	1·35	6	2400	240	7·3	..	,,
12 ,, mortar	12	13	54	1046	1150	9,590	..	..	,,
			62	824	1325	10,025	..	..	,,

TABLE XVII.—*Japanese Naval Ordnance*, 1910.

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
	12·5	66	..	990	2308	36,500	37·3	0·2	MD. Cordite
	12	59	305	850	2800	46,200	47·2	2·0	,,
	10	34	166·5	500	2850	28,170	40·9	3·0	,,
	8	17·5	44	250	2740	13,015	30·3	2·0	,,
	6	7	35	100	2800	5,436	29·3	7·0	,,
	4·72	2·1	5·5	45	2188	1,494	12·0	8	,,
	3	0·6	1·94	12·5	2210	423	8·0	12	,,
	3	0·9	..	10·8	2716	553	10·2	..	,,
	2·24	0·4	0·5	6·0	1818	138	4·8	20	,,
	1·35	0·25	0·4	3·3	1873	80	4·25	20	,,

Note.—The Japanese fleet has mainly been armed by Armstrong's Works, but the "Katori" was armed by Vickers', and those ships taken from the Russians during the late war are armed with guns from Krupp or Obuchoff. Guns of all sizes are now, however, being constructed in Japan, so that the country is no longer dependent on foreign factories.

TABLE XVIII.—*Sir W. G. Armstrong, Whitworth & Co.'s Guns. Abridged Table.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
12 in.	12	69	318	850	2960	51,640	51·5	2	
10 ,,	10	36	200	500	3000	33,318	44·0	3	
9·2 ,,	9·2	28	138	380	3030	24,190	40·8	4	
8 ,,	8	21	90	250	3000	15,600	34·9	5	
7·5 ,,	7·5	15·75	76	200	3000	12,481	32·1	6	
6 ,,	6	8·75	35·5	100	3050	6,492	26·0	9	
4·7 ,,	4·7	3·3	15	45	3000	2,808	19·1	12	
4 ,,	4	2·1	11	31	3000	1,934	17·3	12	
3 ,,	3	1·1	5·75	14·3	3050	922	13·9	30	Semi-automatic
6 pr.	2·24	·52	1·13	6	2400	240	7·3	25	
3 ,,	1·85	·25	·625	3·3	2300	121	5·7	25	

Note.—The most powerful gun of each calibre has been selected.

TABLE XIX.—*Vickers, Sons and Maxim's Guns. Abridged Table.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
12 in.	12	65·85	344	850	3010	53,400	53·0	2	
10 ,,	10	27·85	172	496·6	2863	28,225	41·0	3	
9·2 ,,	9·2	27·8	184	380	3070	24,835	41·3	4	
8 ,,	8	14·15	90	216·7	3090	14,350	33·9	6	
7·5 ,,	7·5	16·0	80·03	200	3007	12,540	32·3	8	
6 ,,	6	7·8	43	100	3190	7,056	27·9	10	
4·7 ,,	4·72	3·1	17	45·14	3050	2,910	18·5	12	
4 ,,	4	2·1	11·25	31	3030	1,975	17·6	15	
3 ,,	3	0·95	3·625	12·5	2700	632	10·8	25	Semi-automatic
6 pr.	2·24	0·46	1·55	6	2600	281	8·2	28	
3 ,,	1·85	0·28	1·066	3·3	2800	179·4	7·5	30	

Note.—The most powerful gun of each calibre has been selected.

TABLE XX.—*Krupp's Naval and Coast-Defence Ordnance. Abridged from Table of Ordnance, 1906.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	℔.	℔.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
30·5 cm.	12·01	47 52·2	357	771·6 981·0	3251 2884	56,540	. . 53·0	2–3	
28 ,,	11·02	36·4 40·4	276	595·2 760·6	3255 2881	43,754	52·0 49·0	2–3	The explosive for the charges of guns of 10·5 cm. and upwards contains 25 % of nitroglycerin
24 ,,	9·45	22·93 25·45	173·6	374·8 474·0	3255 2894	27,540	44·5 42·0	3–4	
21 ,,	8·27	15·20 16·90	115·2	249·1 308·6	3251 2920	18,101	38·6 36·5	4–5	
19 ,,	7·48	11·37 12·64	86·2	187·4 235·9	3241 2890	13,572	35·0 33·1	5–6	
17 ,,	6·7	8·55 9·48	64·6	141·1 176·4	3238 2897	10,259	32·0 30·3	6–7	
15 ,,	5·91	5·5 6·1	41·7	90·4 112·4	3245 2910	6,603	27·4 26·1	6–8	
12 ,,	4·72	2·86 3·18	21·72	46·3 59·5	3274 2887	3,442	22·2 20·8	15–20	
10·5 ,,	4·13	1·92 2·13	14·55	30·9 39·7	3281 2897	2,306	19·5 18·3	20–25	
9 ,,	3·54	1·28	7·72	19·84 25·13	3162 2812	1,377	16·0 15·0		
		1·45	7·94	19·84 25·13	3248 2887	1,452	16·5 15·6	25–30	The explosive for charges of guns up to 9·5 cm. contains 40% nitroglycerin
7·5 ,,	2·95	·74	4·48	11·46 14·55	3165 2812	797	13·3 12·6		
		·84	4·61	11·46 14·55	3251 2887	840	13·9 13·0	30–40	
5·7 ,,	2·24	·325	1·96	5·07 6·4	3156 2808	350	10·1 9·5		
		·367	2·03	5·07 6·4	3242 2884	369	10·5 9·9	40–50	
5·0 ,,	1·97	·220	1·32	3·42 4·3	3156 2814	236	8·7 8·4		
		·248	1·37	3·42 4·3	3242 2890	249	9·0 8·75	40–50	

Note.—The above table includes a light and heavy type of gun, but for each the length of bore is 50 calibres; in the unabridged table guns of 40 and 45 calibres are included. The particulars of the shorter pieces can be easily obtained from Table XX., as the construction of Krupp's complete table is based on very simple rules. Thus, for the same relative length of gun, the weight of the projectile and of the charge are, with few exceptions, in proportion to the cube of the calibre. Again, the weight of the gun varies as the cube of the calibre multiplied by the length. The muzzle velocity is practically identical for guns of the same relative length, and varies as the square root of the length; consequently the muzzle energy varies directly as the length. Two weights of projectile are given for every gun, but the muzzle energy of each, for the same charge, is identical; this result is never the case in actual practice. Similar arithmetical processes are utilized for the Schneider-Canet, Bofors and Skoda tables, and only the first named is therefore given.

TABLE XXI.—*Schneider-Canet Guns. Abridged Table.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
305 mm.	12·01	57·6	. .	826	3116	55,717	54·8		
274·4 ,,	10·9	41·9	. .	606	3116	40,859	49·1		
240 ,,	9·45	28·0	. .	407	3116	27,487	43·2		
200 ,,	7·87	16·25	. .	231	3116	15,601	35·9		
175 ,,	6·89	10·8	. .	165	3116	11,143	32·1		
150 ,,	5·91	6·8	. .	99	3116	6,686	27·0		
120 ,,	4·72	3·5	. .	48	3116	3,268	21·0		
100 ,,	3·94	2·0	. .	28·6	3116	1,931	17·8		
75 ,,	2·95	1·2	. .	14·3	3116	917	14·6		
57 ,,	2·24	·55	. .	6·0	3116	400	10·7		
47 ,,	1·85	·30	. .	3·3	3116	223	8·9		

Note.—The unabridged table gives only 45 and 50 calibre guns; the above table gives the particulars for 50 calibre guns.

TABLE XXII.—*Bethlehem Steel Co.'s Guns. Abridged Table.*

Official Designation of Gun.	Calibre.	Weight of Gun.	Weight of Charge.	Weight of Projectile.	Muzzle Velocity.	Muzzle Energy.	Perforation of Wrought Iron.	Rate of firing Rounds.	Propellant.
	In.	Tons.	lb.	lb.	Ft.-Secs.	Ft.-Tons.	In.	Per Minute.	
18 in.	18	60	. .	2000	2250	70,185	42·7		
12 ,,	12	53	. .	850	2800	46,195	47·4		
10 ,,	10	35	. .	500	2800	27,174	39·8		
8 ,,	8	18·6	. .	250	2800	13,587	31·5		
7 ,,	7	14·5	. .	165	2900	9,619	28·8		
6 ,,	6	8·4	. .	105	2900	6,180	24·9		
5 ,,	5	4·75	. .	60	2900	3,490	20·5		
4·724 ,,	4·724	4·2	. .	45	2900	2,623	18·3		
4 ,,	4	2·6	. .	33	2900	1,924	17·0		
3 ,,	3	·85	. .	13	2800	707	11·7		
2·24 ,,	2·24	·43	. .	6	2400	240	7·3		
1·85 ,,	1·85	·245	. .	3	2600	142	6·4		

Note.—The most powerful gun of each calibre has been selected.

Modern naval artillery may be looked upon as the high water mark of gun construction, and keeps pace with the latest scientific improvements. For coast defence the latest pattern of ordnance is not of the same importance; in general very similar guns are employed, although perhaps of an older type. Formerly in the British Service the heaviest guns have been used for this purpose; but of late years, where fortifications could be erected in suitable situations, the largest gun favoured is the 9·2-in. of the latest model. Other governments have, however, selected still heavier pieces up to 12-in. calibre, mounted in heavily armoured cupolas or gunhouses.

As regards field material, mobility is still one of the primary conditions, and, as high power is seldom required, ordnance of medium calibre is all that is necessary. For siege purposes guns of 4-in. to 6-in. calibre are generally sufficient, but howitzers up to 28 cm. (11·02 in.) were used at the siege of Port Arthur, 1904. All authorities seem agreed that for ordinary field guns 75 mm. or 3-in. calibre is the smallest which can be efficiently employed for the purpose, and the muzzle velocity is in nearly all equipments about 500 m.s. (1640 f.s.).

For mountain equipments all foreign governments have selected a 75-millimetre gun with a velocity of about 350 m.s. (1148 f.s.); in England, however, a 2·75-in. has been supplied to mountain batteries; this fires a projectile of 10 lb with 1440 f.s.

Field Howitzer batteries abroad have pieces of from 10 to 12 centimetres calibre and a low velocity; in England a 5-in. howitzer is at present used, but it is intended to adopt a 4·5-in. howitzer of 17 calibres in length for future manufacture.

Theory of gun-making.

Heavy shell power and long range fighting render the work of the gun designer particularly difficult, especially when this is combined with conditions restricting length and weight; and, in addition, other considerations, especially for naval guns, may have to be taken into account such as the allowable weight of the armament, and the size of the gun house or turret. These and other similar conditions are important factors in deciding on the type of design which embodies most advantages for a heavy gun intended for the main armament. For land defence more latitude is allowed so long as this is combined with economy. With both heavy and medium naval guns the length is often limited to 45 calibres on account of peculiarities in the design of the vessel, but usually great rapidity of fire, high velocity and large shell power are insisted upon. Again for Q.F. field guns, where high velocity is not of importance, ease of manipulation, rapidity of working and reliability even after months of arduous service are essential. Supposing, however, that the initial conditions, imposed by the shipbuilder or by the exigency of the case, can be fulfilled, it still remains to so design the gun that, when it is fired, there is an ample margin of safety to meet the various stresses to which the several portions of the structure are subject. The two principal stresses requiring special attention are the circumferential stress, which tends to burst open the gun longitudinally, and the longitudinal stress. The calculation for the last named is based on the supposition that the gun is a hollow cylinder, closed at one end by the breech screw and at the other by the shot, both being firmly fixed to the cylinder. The gas pressure exerts its force on the face of the breech screw and on the base of the shot thus tending to pull the walls of the cylinder asunder. But besides these there is the special stress on the threads of the breech screw which must receive very careful consideration.

Regard must also be had to the fact that in building up the gun, the smaller the diameter of the hoop and the longer it is, the higher must be the temperature to which it is heated before shrinking. This is necessary in order that the dilatation may allow sufficient clearance to place the hoop correctly in position on the gun, without the possibility of its contracting and gripping before being so placed. Should it warp while being heated or while being placed in position the hoop may prematurely grip on the gun and may consequently have to be sacrificed by cutting it off and shrinking on another.

The dilatation must be so adjusted that the required temperature to obtain it is not higher than that used for annealing the forging, otherwise the effect of this annealing will be modified. There is, therefore, for this reason, considerable risk in shrinking up long hoops of small diameter.

Before heating hoops of large diameter two or three narrow reference bands are turned on the exterior and their diameter measured; special gauges are prepared to measure these plus the dilatation required. After heating the hoop but before shrinking it, the diameter of the reference bands when tested by these gauges should not be in excess of them. The temperature can then be easily ascertained by dividing the dilatation by the coefficient of expansion of steel per degree F. or C., taking of course the diameter into account.

For small hoops this method is not convenient, as the hoop cools too quickly; the dilatation must then be obtained by ascertaining the temperature, and this is best done by the use of some form of pyrometer, such as a Siemens water pyrometer, before the hoop is withdrawn from the furnace.

It may also be desired to obtain a given striking energy or velocity at some definite range—then, the weight of the projectile being decided upon, the muzzle velocity is found from the formulas (see BALLISTICS) given in Exterior Ballistics. From this and the length of the gun allowable the designer has, with the aid of former experience and the formulas given in Internal Ballistics, to decide on the weight and nature of the powder charge necessary and the internal dimensions of the powder chamber and bore. These data are used to plot what is termed a "gunmakers' curve," *i.e.* the curve of pressures along the bore which the powder charge decided upon will give. The factor of safety and the maximum allowable stress of the steel forgings or steel wire also being known, the necessary strength of each section of the gun can be easily found and it remains to so proportion each part as to conform to these conditions and to meet certain others, such as facilities for manufacture, which experience only can determine.

When the second course consists of a single long tube into which a tapered barrel is driven, as in the system adopted by the English government, the two tubes are treated as a single tube equal in thickness to the two together; but when the second course consists of several tubes shrunk on to the barrel the additional strength, obtained by the initial tension of the shrunk tubes, is sometimes taken account of in the calculation, or the two may be treated as one thick tube.

The gunmakers' formulas for the strength of the gun are obtained from considering the strength of a thick cylinder exposed to unequal internal and external pressures. Supposing a transverse section of the gun to cut through n tubes, the internal radius of the barrel is r_0 in., the external radius r_1 in., the external radius of the second course is r_2 and so on; and the external radius of the jacket is r_n. Then if T = a circumferential stress (tension) in tons per square inch, T_n = a circumferential stress at radius r_n in., P = a radial stress (pressure) in tons per square inch, and P_n = a radial stress at radius r_n in., the formulas used in the calculation of the strength of built-up guns are as follows:—

$$T=\frac{P_{n-1}r_{n-1}^2-P_nr_n^2}{r_n^2-r_{n-1}^2}+\frac{r_{n-1}^2r_n^2}{r^2}\,\frac{P_{n-1}-P_n}{r_n^2-r_{n-1}^2} \qquad (1)$$

$$P=\frac{r_{n-1}^2r_n^2}{r^2}\,\frac{P_{n-1}-P_n}{r_n^2-r_{n-1}^2}-\frac{P_{n-1}r_{n-1}^2-P_nr_n^2}{r_n^2-r_{n-1}^2} \qquad (2),$$

where r is any intermediate radius in the thickness of a tube

$$T_n-P_n=T-P \qquad (3)$$

in the same tube; also the pressure between the $(n-1)^{th}$ and n^{th} hoops is

$$P_{n-1}=\frac{r_n^2-r_{n-1}^2}{r_n^2+r_{n-1}^2}(T_{n-1}+P_n)+P_n \qquad (4).$$

Equation (4) is usually known as the *Gunmakers' formula* and from it, when P_n and T_{n-1}, T_{n-2} . . . are known the other pressures can be found. The proof tension of the material is kept well below the yielding stress. For ordinary carbon gun steel it is usual to consider that the proof tension of the barrel should not exceed 15 tons and of the outer hoops 18 tons per square inch; with nickel gun steel these become 20 tons and 24 tons respectively. If the n^{th} hoop is the exterior tube then $P_n=0$; neglecting the atmospheric pressure.

In all gun calculations for strength three cases must be considered:

(*a*) When the built-up gun is fired, the stress is called the *Firing Stress* and is obtained by the repeated use of equation (4);

(*b*) When the gun, supposed to be a solid homogeneous block of metal is fired, the stress is termed the *Powder Stress* and is obtained from the equations (1) and (2);

(*c*) When the built-up gun is in repose, the stress is then called the *Initial Stress* or *Stress of Repose*.

Between these three cases the following relations hold:—

$$\textit{Initial Stress}+\textit{Powder Stress}=\textit{Firing Stress} \qquad (5).$$

It is best to use different symbols to distinguish each kind of stress. We will use for the Firing Stress P, T; for Powder Stress p, t; and for the Initial Stress (p), (t).

The method of working will be illustrated by a practical example. Take, for instance, a section across the chamber of a 4·7-in. Q.F. gun, for which the diameter of the chamber is 5 in., that of the barrel 8·2 in., and the external diameter of the jacket 15 in.

Here $r_0=2\cdot5$; $r_1=4\cdot1$; $r_2=7\cdot5$
$T_0=15$; $T_1=18$; $P_2=0$.

From (4) for the *Firing Stress*

$$P_1=\frac{(7\cdot5)^2-(4\cdot1)^2}{(7\cdot5)^2+(4\cdot1)^2}\times18=9\cdot72 \text{ tons per square inch.}$$

$$P_0=\frac{(4\cdot1)^2-(2\cdot5)^2}{(4\cdot1)^2+(2\cdot5)^2}\times(15+9\cdot72)+9\cdot72\doteq21 \text{ tons per square inch.}$$

From (3) the tension T'_n of the outer fibres of the hoops is obtained; thus

$$T'_2=P_2+T_1-P_1=18-9\cdot72=8\cdot28 \text{ tons per square inch.}$$
$$T'_1=P_1+T_0-P_0=9\cdot72+15-21=3\cdot72 \text{ tons per square inch.}$$

For any intermediate radius r the stress can be found by using equations (1) and (2) or (1) or (2) and (3).

For the *Powder Stress* equations (1) and (2) are used by putting $n=1$, and then $p_1=0$ (also remembering that, as there are two hoops, the outer radius must be written r_2); the formulas become

$$t=\frac{r_0^2}{r^2}\,\frac{r_2^2+r^2}{r_2^2-r_0^2}p_0 \qquad (6)$$

$$p=\frac{r_0^2}{r^2}\,\frac{r_2^2-r^2}{r_2^2-r_0^2}p_0 \qquad (7).$$

When $r=r_0=2\cdot5$, $t=t_0$, $p_0=P_0$ already found and:

$$t_0=\frac{(7\cdot5)^2+(2\cdot5)^2}{(7\cdot5)^2-(2\cdot5)^2}\times21=26\cdot25 \text{ tons.}$$

For the tension of the fibres at the outer circumference

$$t'_2=26\cdot25-21=5\cdot25 \text{ tons,}$$

from (3) and for a radius $r_2=7\cdot5$ inches.

The stress for any intermediate radius r can be obtained from (6) and (7) or, from (6) or (7) and (3).

Subtracting the *Powder Stress* from the *Firing Stress* the *Initial Stress* is obtained, and the various results can be tabulated as follows:—

At Radius.		Tensions.			Pressures.		
		Firing Stress.	Powder Stress.	Initial Stress.	Firing Stress.	Powder Stress.	Initial Stress.
Barrel	$r_0=2\cdot5$	15·0	26·25	−11·25	21·0	21·0	0
	$r_1=4\cdot1$	3·72	11·57	− 7·85	9·72	6·32	3·4
Jacket	$r_1=4\cdot1$	18·0	11·57	6·43	9·72	6·32	3·4
	$r_2=7\cdot5$	8·28	5·25	3·03	0	0	0

It is generally stipulated that the initial compression of the material at the interior surface of the barrel shall not exceed 26 tons per square inch, *i.e.* $(t_0)=-26$ tons; in the example above $(t_0)=-11\cdot25$ tons only, but in wire-wound guns special attention to this condition is necessary.

It now remains for the designer so to dimension the several hoops that they shall, when shrunk together, give the stresses found by calculation. To do this the exterior diameter of the barrel must be a little larger than the interior diameter of the covering hoop; after this hoop is shrunk on to the barrel its exterior diameter is turned in a lathe so that it is slightly larger than the interior of the next course hoop and so on. It will be seen that the fibres of the barrel must be compressed while the fibres of the superimposed hoop are extended, and thus produce the *Initial Stress*. The shrinkage S may be defined as the excess of the external diameter of the tube over the internal diameter of the hoop, when separate and both are in the cold state. Then if ${}_nS_{n+1}$ denotes the shrinkage between the n^{th} and $(n+1)^{th}$ hoops

$$ {}_nS_{n+1}=\frac{2r_n}{M}\{(t_n)-(t'_n)\} \qquad (8)$$

$$=\frac{2r_n}{M}\left[(t_n)-(t_{n-1})+\frac{r_n^2-r_{n-1}^2}{r_n^2+r_{n-1}^2}\{(t_{n-1})+(p_n)\}\right] \qquad (9).$$

Here M can be taken as 12,500 tons per square inch for gun steel. In the example already calculated the shrinkage between the jacket and barrel is 0·009 in.

$$S=\frac{2\times4\cdot1}{12{,}500}\left[6\cdot43+11\cdot25+\frac{(4\cdot1)^2-(2\cdot5)^2}{(4\cdot1)^2+(2\cdot5)^2}(-11\cdot25+3\cdot4)\right]$$
$$=0\cdot009\text{ in.}$$

Wire guns.

In that portion of the gun in which wire is used in the construction, exactly the same principles are involved. It may be assumed that the tube on which the wire is wound is so large, in comparison to the thickness of the wire, that the compression of the concave surface of the wire and the extension of its convex surface may be neglected without sensible error.

The greatest advantage is obtained from the wire coils when in the Firing Stress the tension T is uniform throughout the thickness of the wiring. The Firing Stress T in the wire may be as low as 25 tons per square inch and as high as 50 tons, but as the yielding strength of the wire is never less than 80 tons per square inch nor its breaking strength less than 90 tons, there is still an ample margin especially when it is remembered that the factor of safety is included in the calculation.

If the wire is wound direct on to the barrel and is covered by a jacket, r_0, r_1 being the radii in inches of the barrel, r_1, r_2 the radii of the internal and external layers of wire, and r_2, r_3 the radii of the jacket; then for the Firing Stress in the wire

$$T(r_2-r)=Pr-P_2r_2 \qquad (9),$$

or

$$T(r-r_1)=P_1r_1-Pr \qquad (10).$$

By combining these the gunmakers' formula for the wire is obtained

$$P_1=\frac{r_2-r_1}{r_1}(T+P_2)+P_2 \qquad (10a).$$

As T is to be uniform, when the gun is fired, the Initial Tensions of the wire are arranged accordingly, and the tensions at which the wire must be wound on to the guns have now to be determined.

Let θ = the winding tension at radius r in.
(t) = the initial tension at radius r in.
(p) = the radial pressure between any two layers of wire at radius r in.

It is assumed that M is uniform for the gun steel and wire. Then

$$\theta=(t)+(p)\frac{r^2+r_0^2}{r^2-r_0^2} \qquad (11),$$

where

$$(t)=T-P_0\frac{r_0^2}{r^2}\,\frac{r_3^2+r^2}{r_3^2-r_0^2} \qquad (12),$$

and

$$(p)=P-P_0\frac{r_0^2}{r^2}\,\frac{r_3^2-r^2}{r_3^2-r_0^2} \qquad (13).$$

By means of these two equations and (9) the expression (11) becomes

$$\theta=\frac{E}{r}+\frac{F}{r-r_0}+\frac{G}{r+r_0} \qquad (14),$$

where

$$E=-(T+P_2)r_2$$
$$F=(T+P_2)r_2-(T+P_0)r_0$$
$$G=(T+P_2)r_2+(T+P_0)r_0.$$

To compare with the previous example, the stress for a 4·7-in. Q.F. wire gun will be calculated. This consists of a barrel, intermediate layer of wire and jacket.

Here $r_0=2\cdot5$; $r_1=3\cdot75$; $r_2=5\cdot5$; $r_3=7\cdot5$ inches; the firing tension T_1 to T'_2 of the wire = 25 tons per square inch, suppose.

Take $P_0=21$ tons per square inch and consider that the jacket fits tightly over the wire, but has no shrinkage. Then for the *Firing Stress*, from (2), $P_2=2\cdot25$ tons, and from (9) and (10), $T_1(r_2-r_1)=P_1r_1-P_2r_2$

$$P_1=14\cdot97,\text{ say }15\text{ tons};$$

from (4) we can obtain T_0 and T_2 since P_0, P_1 and P_2 are known; from (3) $T_0=0\cdot6$ tons. $T_2=7\cdot5$ tons.

$$T'_2=-5\cdot4\text{ tons (a compression)},$$

and

$$T_3=5\cdot25\text{ tons}.$$

The *Powder Stress* is obtained in the same way as in the previous example, so also is the *Initial Stress*; therefore we may tabulate as follows:—

At Radius.		Tensions.			Pressures.		
		Firing Stress.	Powder Stress.	Initial Stress.	Firing Stress.	Powder Stress.	Initial Stress.
Barrel	$r_0=2\cdot5$	0·6	26·25	−25·65	21·0	21·0	0
	$r_1=3\cdot75$	−5·4	13·125	−18·525	15·0	7·875	7·125
Wire	$r_1=3\cdot75$	25·0	13·125	11·875	15·0	7·875	7·125
	$r_2=5\cdot5$	25·0	7·5	17·5	2·25	2·25	0
Jacket	$r_2=5\cdot5$	7·5	7·5	0	2·25	2·25	0
	$r_3=7\cdot5$	5·25	5·25	0	0	0	0

As the wire is wound on, the pressure of the external layers will compress those on the interior, thus producing an extension in the wire which is equivalent to a reduction in the winding tension θ of the particular layer at radius r considered. If τ represents this reduction then

$$\theta=(t)-\tau,$$

where

$$\tau=-\frac{r^2+r_0^2}{r^2-r_0^2}(p)$$

At the interior layer of wire τ is the initial stress on the exterior of the barrel and the winding tension must commence at

$$\theta=11\cdot875+18\cdot525=30\cdot4\text{ tons per square inch.}$$

As the jacket is supposed to have no shrinkage T = 0 and consequently

$$\theta=(t)=17\cdot5\text{ tons per square inch.}$$

These winding tensions can be found directly from formula (14) and then

$$E=-149\cdot875;\ F=34\cdot875;\ G=264\cdot875.$$

Sir G. Greenhill has put these formulas, both for the built-up and wire-wound guns, into an extremely neat and practical geometrical form, which can be used instead of the arithmetical processes; for these see *Text-Book of Gunnery*, *Treatise of Service Ordnance*, 1893, and *Journal of the United States Artillery*, vol. iv.

Longitudinal stress.

The longitudinal strength of the gun is very important especially at the breech end; along the forward portion of the gun the thickness of the barrel and the interlocking of the covering hoops provide ample strength, but at the breech special provision must be made. It is usual to provide for this by means of a strong breech piece or jacket in small guns or by both combined in large ones. Its amount is easily calculated on the hypothesis that the stress is uniformly distributed throughout the thickness of the breech piece, or jacket, or of both. If r_0 is the largest radius of the gun chamber, r_{01} the radius of the obturator seating, r_1 the external radius of the barrel, and P_0 the maximum powder pressure, then, with the usual form of chamber adopted with guns fitted with obturation other than cartridge cases, there will be a longitudinal stress on the barrel at the breech end of the chamber due to the action of the pressure P_0 on the rear slope of the chamber, of

$$\frac{\pi}{4}(r_0^2-r_{01}^2)P_0\text{ tons}$$

this is resisted by the barrel of section $\frac{\pi}{4}(r_1^2-r_0^2)$ so that the resistance

$$R=\frac{r_0^2-r_{01}^2}{r_1^2-r_0^2}P_0\text{ tons.}$$

This portion of the longitudinal stress is not of great importance as the breech end of the barrel is supported in all modern designs by the breech bush. In Q.F. guns, *i.e.* those firing cartridge cases, the breech end of the chamber has the largest diameter, and r_0-r_{01} so that there is no longitudinal stress on the chamber part of the barrel.

For the breech piece or outer tube of radii r_1 and r_2, the resistance

$$R=\frac{r_{01}^2}{r_2^2-r_1^2}P_0\text{ tons for B.L. guns}$$
$$=\frac{r_0^2}{r_2^2-r_1^2}P_0\text{ tons in Q.F. guns.}$$

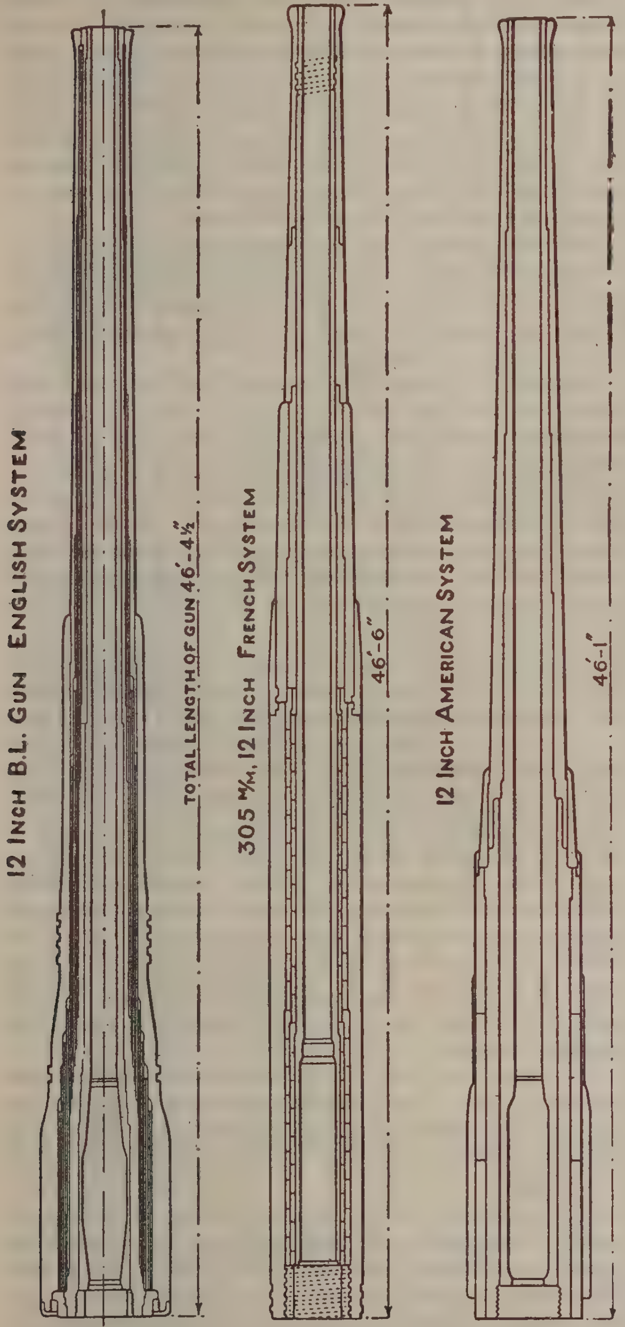
If the longitudinal stress is taken by a jacket only, the resistance is found in the same way.

Generally for ordinary gun steel, the longitudinal stress on the material is always kept below 10 tons per square inch or 13 tons for nickel steel; but even with these low figures there is also included a factor of safety of 1·5 to 2. In large guns it is best to consider the jacket as an auxiliary aid only to longitudinal resistance, as, owing to the necessary connexions between it and the breech bush and its distance from the centre of pressure, there is a possibility that it may not be taking its proportionate share of the stress.

The thread of the breech screw and of the breech bush (or opening) must be so proportioned as to sustain the full pressure on the maximum obturator area; V or buttress shaped threads are always used as they are stronger than other forms, but V threads have the great advantage of centring the breech screw when under pressure.

In most modern B.L. guns fitted with de Bange obturation the diameter of the seating is made just large enough to freely admit the projectile; this is usually considerably smaller than the maximum diameter of the chamber, consequently a less area is exposed to the gas pressure and less screw thread section is required.

The principal features of the various systems of construction of modern heavy guns may be briefly described.


12 INCH B.L. GUN ENGLISH SYSTEM
TOTAL LENGTH OF GUN 46'-4½"
305 M/M, 12 INCH FRENCH SYSTEM
46'-6"
12 INCH AMERICAN SYSTEM
46'-1"

FIGS. 55-57.—British, French and American Construction.

Systems of construction.

Fig. 55 is that adopted in England. The barrel or "inner A tube" is surmounted by a second layer which is either shrunk on in two or three pieces, as at Elswick, or is formed of one long piece called the "A tube," as in the Woolwich system. This second layer is covered with wire, and over this is shrunk the chase hoop or B tube and the jacket. The breech bush is screwed into the rear end of the A tube so that the principal longitudinal stress is taken by this tube.

Fig. 56 is the system adopted in the French service. In this the barrel is surmounted over the breech end with two layers of short thin hoops, which consequently approximate to the wire system. Over the muzzle end two or three long tubes are shrunk; the chase hoop is also screwed to the barrel near the muzzle. A jacket is shrunk over the breech portion of the gun, and the breech bush is screwed into it at the rear end. The gun is further strengthened by a long tube in front of the jacket to which it is attached by a screwed collar.

Fig. 57 shows the design adopted for the United States navy. Here the barrel is surmounted by a second course in two lengths, and over the breech a third and fourth layer are shrunk. The breech screw is screwed into the rear end of the second course.

Fig. 58 is the Krupp system, of which, however, it is an old example; it is believed, however, that Krupp still retains the essential peculiarities of this design, viz. that over the breech end of the barrel is shrunk a solid breech piece, made particularly massive in rear where the breech wedge is seated. The remainder of the layers consist of hoops which are comparatively short but may be covered with longer thin tubes.

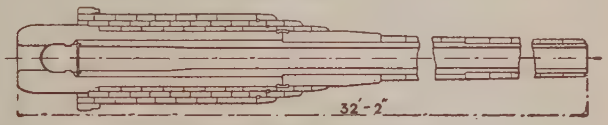


FIG. 58.—Krupp Construction.

Erosion.

When guns are fired, the interior surface is gradually worn away by the action of the powder gases; the breech end of the rifled portion of the bore becomes enlarged, and the rifling itself partly obliterated. The ballistics suffer in consequence of the enlarged diameter of the bore, and the rifling may be worn so much as not to properly rotate the projectile.

In all modern gun designs provision has, therefore, to be made for repairing or replacing the barrel when it is worn out. There are two methods of providing for the repair in the original design—the first is by replacing the whole of the barrel by an entirely new one; the second is to make the original barrel thick so that when it is worn the interior can be bored out, either over a portion of its length to cover the eroded part, or the full length for "through lining." In large guns it is usual to make the original barrel, if it is intended to be removed as a whole, tapered from end to end, so that by warming the gun in a vertical position breech downwards to about 300° F. and then suddenly cooling the barrel by a jet of water it can be knocked out by heavy blows from a falling weight. A new tapered barrel can then be inserted by driving it in. When a gun which had originally a thick barrel is lined part of the barrel is bored out in a machine, and it is usual to make the hole tapered so that a new tapered liner can be inserted and driven home.

The wearing of the barrel owing to erosion is one of the most difficult problems the gun constructor has to face. Sir Andrew Noble (see "Some Modern Explosives," a paper read at the Royal Institution, 1900, also "Researches on Explosives," part iii., *Phil. Trans. Roy. Soc.*) has conclusively proved that the erosion is mainly dependent on the very high temperature to which the interior surface of the gun is raised and on the quantity of this heat. Both these factors are, for any particular explosive, determined by some function of the proportion of the weight of the charge to the extent of the exposed surface. The passage for the products of combustion gradually reduces from the maximum diameter of the chamber to the diameter of the bore. The highly heated gases therefore impinge more directly on that part of the bore which forms the seating for the shot and acts on it for the longest time, *i.e.* for the whole time the shot is in the gun. Consequently this part suffers most wear.

It may be assumed that the weights of the charges vary as the cube of the diameters of the bore, while the circumference of the bore varies directly as the calibre; now as the wear depends principally on the weight of the charge in relation to the exposed surface at the shot seating it varies as the square of the calibre. It is evident too that the allowable wear will vary as the calibre, so that the life of the gun or the number of rounds which can be fired is inversely proportionate to the calibre.

The heat of combustion and the time of burning of the explosive are factors in determining the amount of heat developed per unit of time, and thus influence the proportion of heat conducted away from the interior surface of the gun. The time of burning of the explosive depends on the size and form of the explosive and on the density of loading, while the heat of combustion depends on its composition and cannot be treated of here, but it may be stated generally that for equal weights Ballistite is more erosive than Cordite Mark I., and Cordite Mark I. than Cordite M.D. All of these explosives contain a fairly large proportion of nitro-glycerine, and it is found that as the proportion of this ingredient is reduced the erosion also decreases, so that for pure nitro-cellulose powders it is less still. Unfortunately pure nitro-cellulose powders are not ballistically equal to the same weight of nitroglycerin powder; the advantage of the less erosive action is lost owing to the greater weight of pure nitro-cellulose explosive required to obtain the same ballistics.

The effect of erosion on large high-power guns is serious, for in a

12-in. gun after some 150 or fewer rounds are fired with a full charge the barrel is worn so much as to need replacing. In the British service it is considered that the wear produced by firing sixteen half charges is equivalent to that of one full charge.

In small high-velocity guns the number of rounds with full charge which can be fired without replacing the barrel is considerably greater; while for low-velocity guns the number is higher still. In some guns this number appears abnormally high; in others of exactly similar type it may be low and for no apparent reason.

The first effect of the powder gases on the steel is a very characteristic hardening of the surface of the whole of the bore; so much is this the case that it is difficult to carry out any mechanical operation, except grinding, after a gun has been fired. When ignited the explosive contained in the chamber of the gun burns fiercely, and as the projectile travels along the bore the highly heated gases follow. The surface of the bore near the chamber is naturally the most highly heated and for the longest time; here too the rush of gas is greatest. There is in consequence a film of steel swept off from the surface, but this becomes less as the distance from the chamber becomes greater, owing to the abstraction of heat by the bore. It is a noticeable fact that only where a decided movement of gas takes place is there any erosion: thus, towards the breech end of the chamber where no rush of gas occurs there is no perceptible erosion, even after many rounds have been fired. Again, at the muzzle end there is very little erosion, as here the gases are in contact with the bore for a minute fraction of time.

As the firing proceeds, the interior surface of the bore, where the erosion is greatest, becomes covered with a network of very fine cracks running both longitudinally and circumferentially. The sides of these cracks in their turn become eroded and gradually fissures are formed. With the old black and brown powders these fissures were a feature of the erosion, while with the new type smokeless powders the eroded surface is usually smooth, and it is only after prolonged firing that fissures occur although fine cracks occur after a comparatively few rounds have been fired.

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II. FIELD ARTILLERY EQUIPMENTS

General Principles.—A field gun may be considered as a machine for delivering shrapnel bullets and high-explosive shell at a given distant point. The power of the machine is limited by its weight, and this is limited by the load which a team of six horses is able to pull at a trot on the road and across open country. For under these conditions it is found that six is the maximum number of horses which can work in one team without loss of efficiency. The most suitable load for a gun-team is variously estimated by different nations, according to the size of the horses available and to the nature of the country in the probable theatre of war. Thus in England the field artillery load is fixed at 43 cwt. behind the traces; France, 41·5 cwt., Germany 42·5 cwt., and Japan (1903) 30 cwt. This load consists of the gun with carriage and shield, the limber with ammunition and entrenching tools, and the gunners with their kits and accoutrements. The weights may be variously distributed, subject to the condition that for ease of draught the weight on the gun wheels must not greatly exceed that on the limber wheels. It is still usual to carry two gunners on seats on the gun axletree, and two on the limber. But a Q.F. gun capable of firing 20 rounds a minute requires to be constantly accompanied by an ammunition wagon, and the modern tendency is to take advantage of this to carry some of the gunners on the wagon. Thus in the British field artillery two gunners are carried on the gun limber, two on the wagon limber, one on the wagon body and none on the gun. These five gunners, with the sergeant, called the No. 1, on his horse, make a full gun-detachment. Three wagons for each gun usually are provided, two of which, with the spare gunners and non-commissioned officers, are posted under cover at some distance behind the battery. Besides lightening the weight on the gun, the presence of the wagon allows the number of rounds in the limber to be reduced. The result of this redistribution of weights is that field artillery may now be equipped with a much heavier and more powerful gun than was formerly the case. A gun weighing 24 cwt. in action is about as heavy as a detachment of six can man-handle.

The power of a field gun is measured by its muzzle energy, which is proportional to the weight of the shell multiplied by the square of its velocity. The muzzle energy varies in different equipments from 230 to 380 foot-tons. Details of the power, weight and dimensions of the guns of the principal military nations are given in Table A.

A gun of given weight and power may fire a heavy shell with a low velocity, or a light shell with a high velocity. High velocity is the gunner's ideal, for it implies a flat trajectory and a small angle of descent. The bullets when blown forward out of the shrapnel fly at first almost parallel to the surface of the ground, covering at medium ranges a depth of some 350 yards, as against half that distance for a low-velocity gun. Under modern tactical conditions a deep zone of shrapnel effect is most desirable. On the other hand, for a given power of gun, flatness of trajectory means a corresponding reduction in the weight of the shell; that is, in the number of shrapnel bullets discharged per minute. We have accordingly to compromise between high velocity and great shell power. Thus the British field gun fires an $18\frac{1}{2}$ lb shell with muzzle velocity of 1590 ft. per second, while the French gun, which is practically of the same power, fires a 16 lb shell with M.V. of 1740 f.s. Again, a shell of given weight may be fired either from a large-bore gun or from a small-bore gun; in the latter case the length of the shell will be proportionately increased. The small-bore gun is naturally the lighter of the two. But the longer the shell the thicker must its walls be, in order not to break up or collapse in the gun. The shorter the shell, the higher is the percentage of useful weight, consisting of powder and bullets, which it contains. We must, therefore, compromise between these antagonistic conditions, and select the calibre which gives the maximum useful weight of projectiles for a given weight of equipment. In practice it is found that a calibre of 3 in. is best suited to a shell weighing 15 lb; and that, starting with this ratio, the calibre should vary as the cube root of the weight of the shell.

As to rifling, the relative advantages of uniform and increasing twist are disputed. The British field guns are rifled with uniform twist, but the balance of European opinion is in favour of a twist increasing from 1 turn in 50 calibres at the breech to 1 in 25 at the muzzle. Mathematically, the development of the groove is a parabola.

For field guns the favourite breech actions are the interrupted screw and the wedge. The latter is simpler, but affords a less powerful extractor for throwing out the empty cartridge case. This point is of importance, since cartridge cases hastily manufactured in war time might not all be true to gauge. Modern guns have percussion locks, in which a striker impinges upon a cap in the base of the metallic cartridge. All Q.F. guns have repeating trip-locks. In these, when the firing-lever or lanyard is pulled, the striker is first drawn back and then released, allowing it to fly forward against the cap. The gun is usually fired by the gun-layer; it is found that he lays more steadily if he knows that the gun cannot go off till he is ready. A field gun has to be sighted (see SIGHTS) for laying (*a*) by direct vision (*b*) by clinometer and aiming-point (see ARTILLERY). The first purpose is served by the ordinary and telescopic sights; the second by the goniometric sight or the panorama sight. The

TABLE A.—FIELD GUNS

(*Corrected to May 1, 1910, in accordance with Bethell's "Modern Guns and Gunnery," 3rd edition.*)

	Austria 1905.	Belgium 1905.	Brazil 1904.	Denmark 1902.	France 1898–1902.	Germany 1906.	Great Britain F.A. 1903.	Great Britain H.A. 1903.	Italy 1906.	Japan 1905.	Rumania 1904.	Russia 1903.	Spain 1906.	Switzerland 1903.	United States 1902.
Calibre, inches	3·01	2·95	2·95	2·95	2·95	3·03	3·3	3	2·95	2·95	2·95	3	2·95	2·95	3
Weight of shrapnel, ℔.	14·72	14·3	12·1	14·85	15·96	15	18·48	12·54	14·3	14·3	14·3	14·41*	14·3	14	15
Number of bullets	316+16	360	235	295	300	300	364	263	360	210	295	260	294	210	252
Number of bullets to the ℔	50 and 35	50	42	41·3	38	45	42	42	50	36·4	42	43	45	36·3	36·5
Whether H.E. shell carried	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Muzzle velocity, f.-s.	1640	1640	1600	1640	1739	1525	1590	1658	1675	1706	1640	1930	1640	1590	1700
Muzzle energy, ft.-tons	275	266	215	277	334	242	324	239	279	288	267	373	267	245	300
Weight of gun, cwt.	7	6·67	5·7	6·42	9	7·66	9	6	6·9	6·8*	7·37	7·85	6·67	6·48	6·9
Weight of gun and carriage	20	20	16·3	20·5	22·4	18·6	24·75	19·5	19·75	19·7	21	20·75	20·4	19·75	21
Weight of gun and limber filled	37·5	34·5	26·7	36·6	37	34·4	40	32·5	33·45	33·25	34·8	38·5	34·2	35·5	37·3
Maximum elevation, degrees	18	15	17	15	17	16	16	17	17	17*	16	16¾	16	16	16
Traverse each way, degrees	4	3½	3	3½	3	4	3	3	3½	3	3½	2¼	3	2	4
Length of recoil, inches	51·5	51	44	54	43	44	48	48	57	55	54	42·5	50	53	50
Height of wheels	4′ 3″	4′ 3¼″	4′ 2″	4′ 3″	4′*	4′ 5½″	4′ 8″	4′ 8″	4′ 3½″	4′ 3½″*	4′ 3½″	4′ 4″	4′ 3½″	4′ 3½″	4′ 8″
Line of sight, whether independent	No	Yes	No	No	Yes	No	Yes	Yes	Yes	No	No	No	Yes	No	No
Sights, goniometric, telescopic, panorama or ordinary	P.	P.	T.G.	T.G.	G.	T.G.	T.P.	T.P.	T.P.	T.G.	T.G.	O.P.	T.G.	O.	O.P.
Length of gun, calibres	30	30	28	30	36	27·3	29·4	24·4	30	30	30	30	30	30	29·2
Breech action, wedge, swinging block, or eccentric screw	W.	W.	W.	W.	E.S.	W.	S.B.	S.B.	W.	W.	W.	S.B.	S.B.	W.	S.B.
Thickness of shield, inches	0·18	0·2	0·177	0·236	0·2	0·155	0·155*	0·155*	0·1575	0·118	0·236	0·2	0·18	0·17	0·2
Traverse on pivot or along axle	P.	P.	P.	P.	A.	P.	P.	P.	P.	P.	P.	A.	A.	P.	P.
Number of rounds in limber	33	40	32	44	24	36	24	24	32	36	24	36	38	40	36
Number of rounds in wagon limber	30	40	40	48	24	36	28	28	32	36	24	40	38	48	36
Number of rounds in wagon body	60	61	40	72	72	52	48	48	64	60	64	48	60	48	70
Number of rounds per gun	168	242	192	284	312	126[1]	176	176	224	228	288	212	278	280	358[2]
Weight of wagon, packed cwt.	38·5	35·3	24	39·4	38·5	35	36·75	30·5	36	34·5*	34	38	32	35·3	37
No. of guns in battery	6	4	4	4	4	6	6	6	6	6	4	8	4	4	4
No. of wagons in battery	9	8	8	8	12	6[1]	12	12	12	12	12	16	10	10	12
Maker	State, Skoda & Ehrhardt	Krupp & Cockerill	Krupp	Krupp	State	State	State, Elswick Ordnance Co., Vickers, Maxim and Coventry Ordnance Works		Krupp	State and Krupp	Krupp	Putilov	Schneider	Krupp	State and Ehrhardt

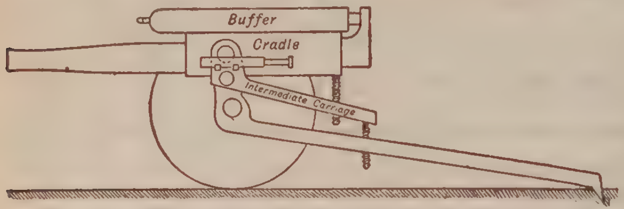
These weights do not include the gunners and kits. Doubtful figures are marked thus.*

[1] In addition to the wagons with light ammunition column, now raised to 6½ per battery.

[2] Including four rounds with gun

independent line of sight is an arrangement of sights and elevating gear found in many modern field guns, which divides between two gunners the work of aiming (called *laying*) the gun, and of giving it the elevation required to hit the target.

In fig. 59 the gun is shown mounted on an intermediate carriage elevated and depressed by the screw A. The telescopic or ordinary sight is fixed to this carriage. The gun, in its cradle, is elevated and depressed by the screw B. To lay the gun, the layer works the laying screw A till the telescope points at the target; the gun also, if no elevation has been given, is then pointing straight at the target. To give the gun the elevation necessary for the range, the elevating number on the right of the gun now works the elevating screw B till the gun is sufficiently elevated, the amount given being shown in yards of range on a drum. The motion given to the gun does not disturb the intermediate carriage with the telescope attached to it, and the telescope still remains layed on the target. Once the sights are layed on the target, the elevation of the gun may be changed in a moment by a turn of the elevating wheel, without disturbing the laying. The layer does not have to concern himself about the elevation; he has only to keep his sights on the target while the other numbers continue the service of the gun. This device is especially valuable when firing at moving targets, when the range and the laying have to be altered simultaneously.



From Bethell's *Modern Guns and Gunnery*.

FIG. 59.—Diagram illustrating the independent line of sight.

The same result may also be obtained by other mechanical devices without the use of the intermediate carriage. Thus the British field guns have a long elevating screw with the sight connected to its centre, the lower end passing through a nut at the side of the upper carriage, the upper end through a nut at the side of the cradle. Then, if the lower nut be turned by the laying wheel, the screw, the sight and the gun will go up or down together; if the upper nut be turned by the elevating wheel, the gun will go up or down the screw without moving the sights. Colonel Scott's "automatic" line of sight is an improvement on the ordinary gear in that the sight can be cross-levelled to eliminate the error due to difference of level of wheels. Krupp has a similar device in which the sight-socket is on the cradle so that it can be cross-levelled. The sight itself is connected to the elevating gear, and is screwed out of its socket as the breech of the gun is depressed, so that the sight remains in the same place.

Construction of the Gun.—Field guns are made of steel, usually containing a small percentage of nickel or chromium, or both, and having a tensile breaking strain of about 50 tons per square inch. In Austria, for facility of local manufacture, hard-drawn bronze is still used, although this is considerably heavier than steel.

The Carriage (see ARTILLERY, Plate I.).—The first field guns used in war were supported by crossed stakes under the muzzle and anchored by a spike on the breech which penetrated into the ground. The next improvement was to mount the gun on a sleigh. This method is still used in Norway and in Canada. The next step was to mount the gun on a two-wheeled carriage, connected to a second two-wheeled carriage (the limber) by a flexible coupling. For centuries the gun-carriage was a rigid construction, recoiling on firing, and having to be run up by hand after each round. In 1895 spring-spade equipments were introduced. In these a spade attached to a helical spring was set under the carriage; on discharge the spade dug into the ground, compressing the spring as the carriage recoiled The extension of the spring ran the gun up again without assistance from the gunners.

The British 15 pr. used in the South African War (1899–1902) had a spring spade carriage designed by Sir George Clarke. Similar equipments were introduced by several continental powers. The Japanese gun used in Manchuria (1904) had dragshoes attached by wire ropes passing round drums on the wheels to a strong spring in the trail. On recoil the wheels revolved backwards, compressing the spring; after recoil the pull of the spring on the wire ropes revolved the wheels forward and returned the gun to its former position. The Italian 1902 semi-Q.F. carriage was constructed on a very similar principle. All these semi-Q.F. equipments were open to the objection that the gunners had to stand clear of the shield every time the gun was fired. They have since been superseded by Q.F. gun-recoil equipments.

The gun-carriage must be strong enough to carry the gun across country, and it must be so constructed as not to move when the gun is fired. If the gun-carriage were allowed to recoil to the rear on discharge, the gunners would have to stand clear on firing, abandoning the protection of the shield, and, moreover, the loss of time entailed by running up and relaying the gun would render the fire slow. The requirement of steadiness of the carriage is met by allowing the gun itself to recoil on its carriage. Its motion is gradually checked by the hydraulic buffer (see below) and the gun is returned to the firing position by helical springs, or, in the French, Spanish and Portuguese equipments, by compressed air. The carriage is held from recoiling by a spade fixed to the point of the trail, which digs into the earth on discharge, and (usually) by brakes on the wheels. This is known as the gun-recoil system, and is now universally adopted. Field guns constructed on this principle are styled Q.F., or quick-firing, guns.

Steadiness of Carriage.—In the gun-recoil equipment the constructional difficulty lies not in preventing the carriage from recoiling but in preventing the wheels from rising off the ground on the shock of discharge. The force of recoil of the gun, acting in the line of motion of the centre of gravity of the recoiling parts, tends to turn the carriage over backwards about the point of the trail, or, more correctly, about the centre of the spade. This force is resisted by the weight of the gun and carriage, which tends to keep the wheels on the ground. The leverage with which the overturning force acts is that due to the distance of its line of motion above the centre of the spade; the leverage with which the steadying force acts is that due to the horizontal distance of the centre of gravity of the gun and carriage from the centre of the spade. If the force of recoil be 6 ft.-tons, and if it be absorbed during a recoil of 3 ft., the average overturning force is 2 tons; since the weight of the gun in action may not greatly exceed 1 ton, the trail must be so long as to give a leverage of at least two to one in favour of the steadying force. It follows from the above that the steadiness of the carriage, for a given muzzle energy, may be promoted by four factors. (*a*) Increasing the weight of the gun and recoiling parts. This reduces the recoil-energy. (*b*) Increasing the length of recoil allowed. This reduces the overturning pull. (*c*) Keeping the gun as low as possible, either by reducing the height of the wheels, or by cranking the axletree downwards. This reduces the leverage of the overturning force. (*d*) Increasing the length of the trail. This increases the leverage of the steadying force.

It will be seen from Table A that the condition of steadiness is satisfied in the various Q.F. equipments by not very dissimilar combinations of the above factors.

The *cradle* is the portion of the carriage upon which the gun slides when it recoils. It also contains the buffer and running-up springs, which are fixed either above or below the gun. The latter method gives the stronger and simpler construction, and is favoured by all nations except Great Britain. By putting the buffer on top the gun can be set lower on the carriage, which is an advantage as regards steadiness. A top-buffer cradle is of ring section, surrounding the gun; the gun is formed with ribs or guides extending for its whole length, which, on recoil, slide in grooves in the cradle. The cradle is pivoted on horizontal trunnions to the intermediate carriage and carries the buffer and springs on top. This construction is shown in the illustration of the 18 pr. Q.F. gun (fig. 60, Plate III.).

In carriages having the buffer under the gun the cradle is a trough of steel plate, usually closed in at the top. It has guides formed on the upper edges fitted to take guide-blocks on the gun. The cradle contains the buffer-cylinder, which is fixed to a horn projecting downwards from the breech of the gun, and recoils with it; the piston-rod is fixed to the front of the cradle. The running-up springs are usually coiled round the buffer-cylinder, and, on recoil, are compressed between a shoulder on the front end of the cylinder and the rear plate of the cradle.

The cradle is mounted on a vertical pivot set in a saddle pivoted on horizontal trunnions between the sides of the trail (Krupp); or, as in the earlier Ehrhardt equipments, the vertical pivot is set in the axletree itself, which has then to turn when the gun is elevated or depressed. The Krupp cradle is shown in the drawing of the German gun.

The *buffer* consists of a steel cylinder nearly filled with oil or glycerine. In this cylinder works a piston with piston-rod attached to the carriage; the cylinder is attached to the gun. On recoil the piston is drawn from one end of the cylinder to the other, so that the liquid is forced to flow past the piston. The friction thus caused gradually absorbs the recoil of the gun and brings it gently to a standstill. As the gun recoils the centre of gravity of the gun and carriage shifts to the rear, reducing the stability. The buffer-resistance has to be gradually reduced proportionately to the reduced

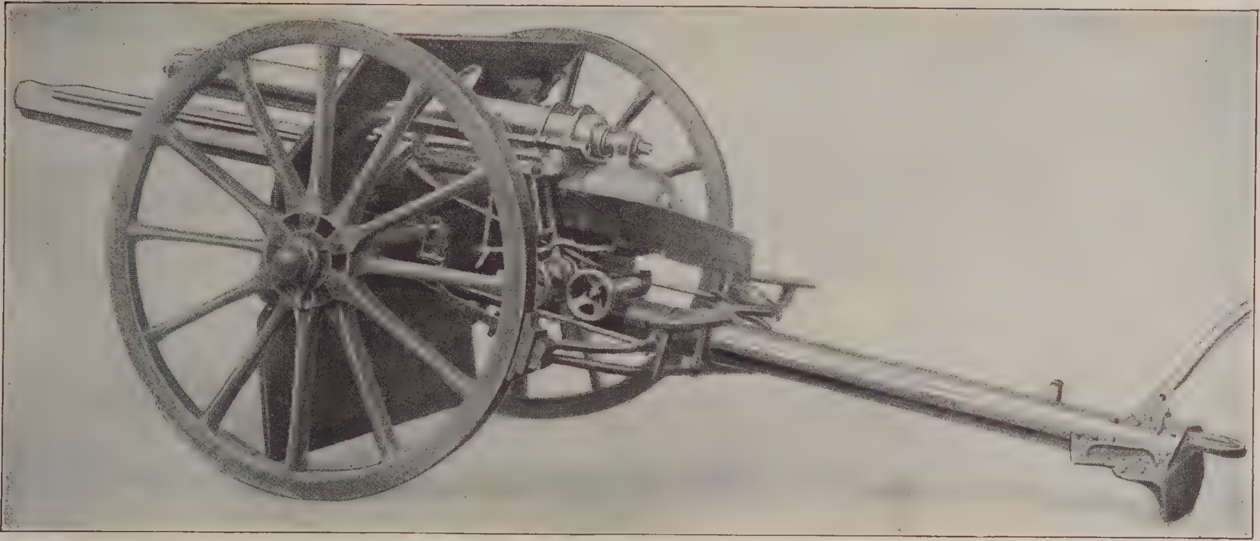


FIG. 60.—BRITISH 18-PR. QUICK-FIRING GUN.

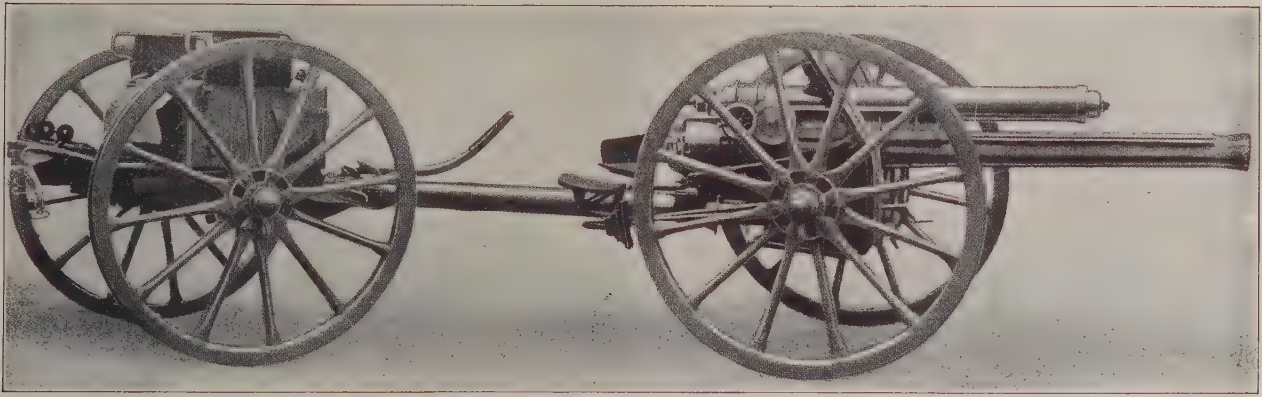


FIG. 61.—BRITISH 18-PR. QUICK-FIRING GUN AND LIMBER.

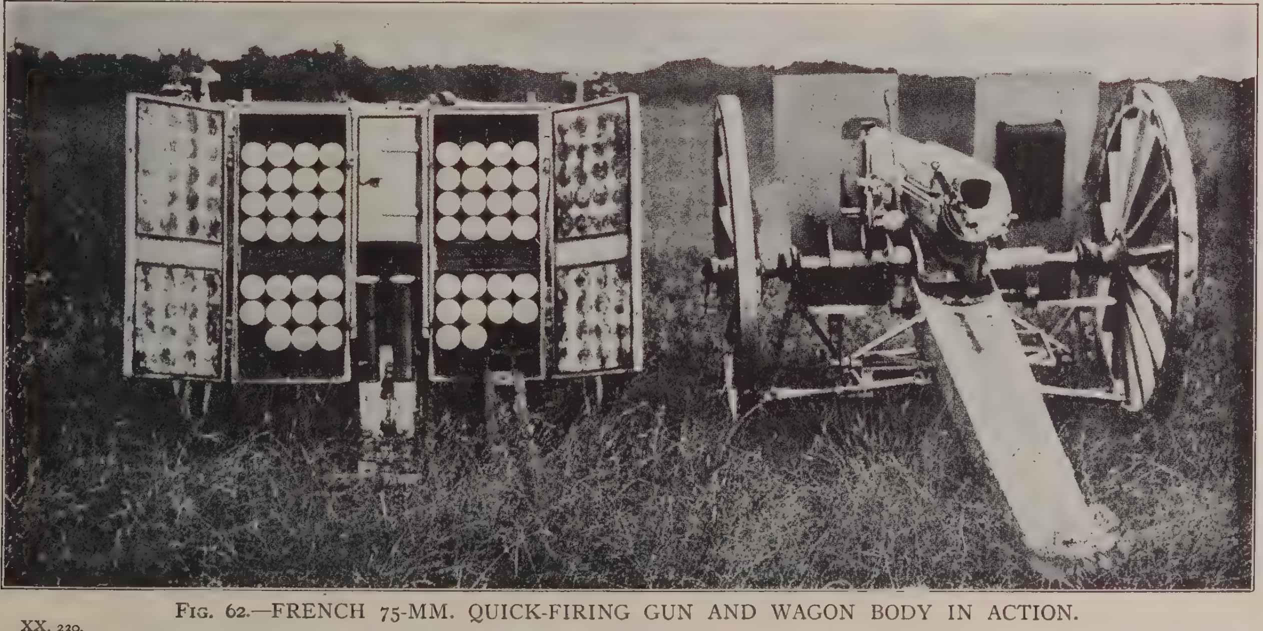


FIG. 62.—FRENCH 75-MM. QUICK-FIRING GUN AND WAGON BODY IN ACTION.

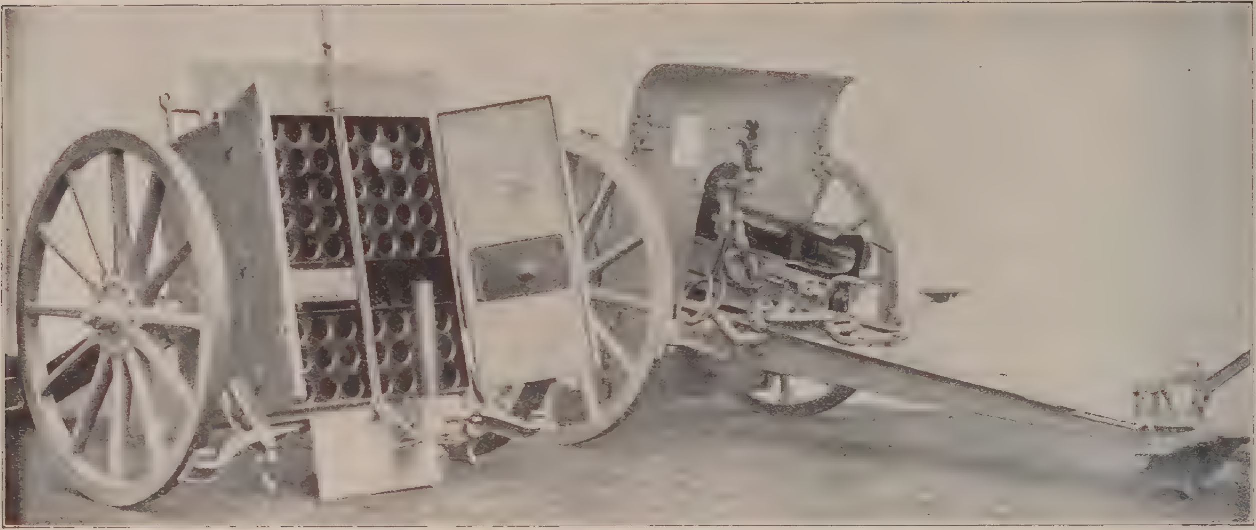


FIG. 64.—DANISH (KRUPP) 7·5-CM. QUICK-FIRING FIELD GUN AND WAGON BODY IN ACTION.

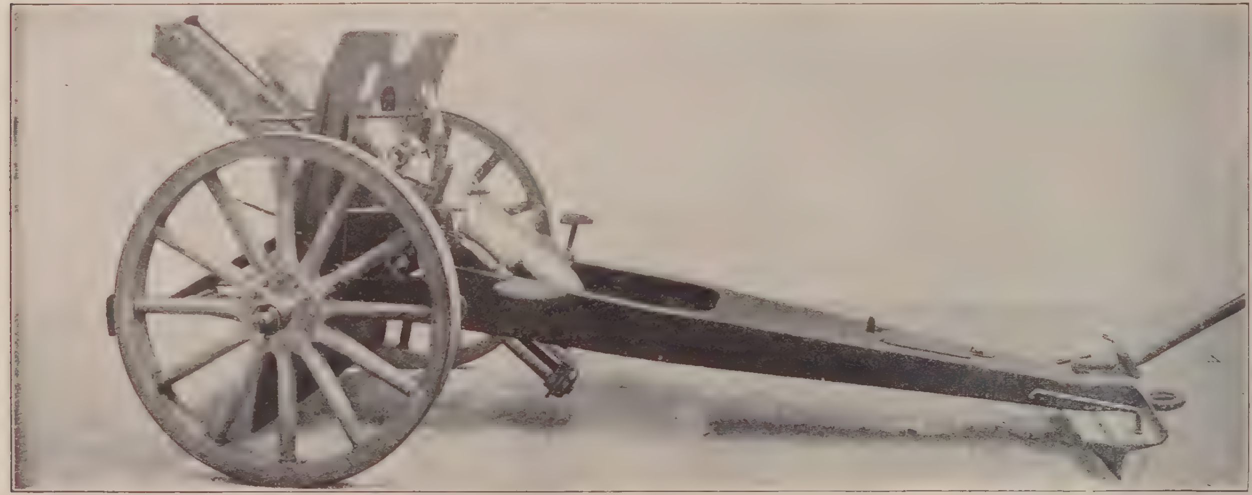


FIG. 67.—EHRHARDT 4·7-IN. QUICK-FIRING FIELD HOWITZER (CONTROLLED RECOIL).

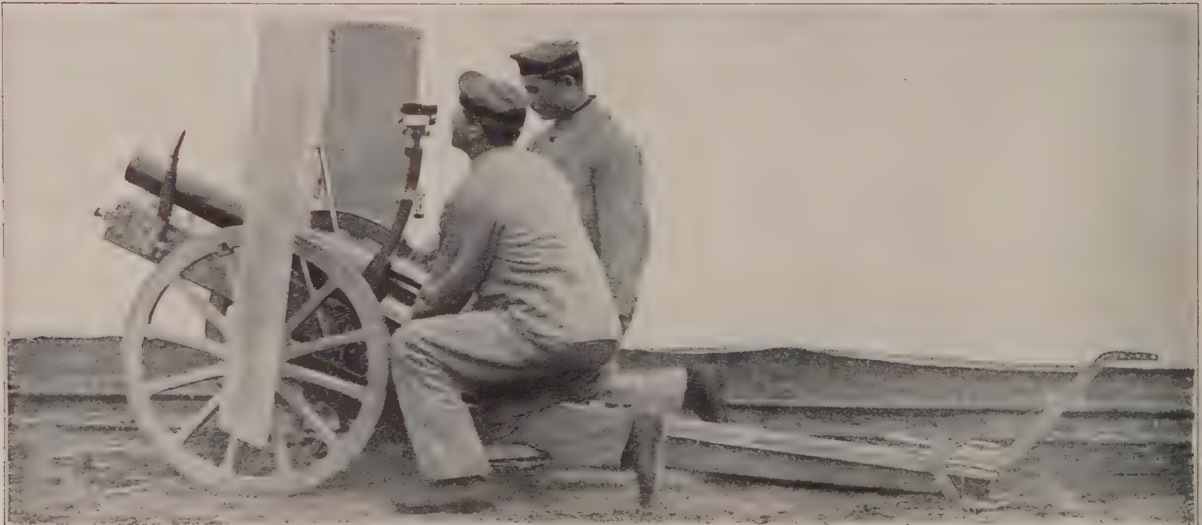


FIG. 68.—KRUPP 7·5-CM. MOUNTAIN GUN.

stability. To allow the liquid to flow past the piston, grooves (called *ports*) are formed in the sides of the cylinder, and by varying the depth of the grooves at different points the resistance can be adjusted as required.

Running-up Gear.—In compressed-air equipments a separate piston is attached to the gun, working in a cylinder on the carriage connected with a reservoir of air at a pressure of about 300 lb to the square inch. This gear is much lighter than the springs, but the difficulty of keeping the piston and gland tight is a serious objection to it, although this difficulty is partly overcome by filling the cylinder with glycerine so that the air has no direct access to the piston or the gland. In spring equipments the principal difficulty lies in providing a sufficient length of recoil without undue compression of the column of springs. Thus if the spring column be 6 ft. long and the gun recoils 4½ ft. the springs are compressed into a space of 1½ ft., or a quarter of their working length. This treatment is liable to crush the springs. German gun-makers get over this difficulty by the use of very high-class springs made of steel having a tenacity of about 140 tons to the square inch with an elastic limit of 90 tons. They also use a valve in the buffer piston which relieves the springs of resistance in running-up, and so allows slighter springs to be used. But in England the telescopic spring-case patented by the Elswick Ordnance Company is preferred. Suppose that the spring-columns before firing are each 4 ft. long; then if the telescopic gear be pulled out for a distance of 4 ft. on recoil, each spring column will be compressed to 2 ft., or only to half its length. Tensile running-up springs are used by some firms, as Cockerill of Seraing (Liége). They are open to the objection that if a spring breaks the gun is for the time being rendered useless, which is not the case with compression springs.

The intermediate carriage is used chiefly in equipments with buffer above the gun; it serves as a means of connecting the cradle to the lower carriage. When the spade is fixed in the ground it is impossible to shift the carriage laterally in order to correct the aim, the intermediate carriage is therefore pivoted so that it can traverse laterally about 3 degrees each way. Instead of using an intermediate carriage the direction may be given to the gun by shifting the whole carriage sideways along the axle in an arc about the point of the trail, which is fixed by the spade. This system is used in guns of French manufacture and in the 1902 Russian gun. It is simple in action, but requires the shield to be cut away on either side to clear the wheels at extreme traverse.

The trail is either a drawn steel tube, of circular section as in the 18 pr., or of closed U section as in the Ehrhardt carriages, or else a box trail built up of sheet steel. In the Krupp equipments the trail is bent downwards to give a greater range of elevation to the gun.

Elevating Gear, in order to save space, is usually of the telescopic screw pattern, in which one screw is inside the other so that the two pack into half the length of a single screw. The spade is of the shape shown in the illustration of the 18 pr. Q.F. gun. For equipments which may have to be used on rock, such as the Swiss gun, the spade is made to fold upwards when desired. The axletree is usually a hollow steel forging with the ends tapered to receive the wheels. The wheels are of wood, with naves of stamped steel. Steel wheels have been tried but are less elastic than wood and have been found unsuitable. England and the United States use 4 ft. 8 in. wheels; most European nations use wheels 4 ft. 3¼ in. in diameter.

The *shield* is made of hard steel, from 0·12 to 0·236 in. thick. The size and thickness of the shield are limited by considerations of weight. Thus if 150 lb of weight be available this will provide a shield about 5 ft. square and 3½ mm. or 0·138 in. thick, proof against rifle bullets at distances over 600 yds., and against shrapnel bullets at all distances. The present tendency, since the introduction of the French D bullet and German S bullet (see AMMUNITION: *Bullet*), is to make shields thicker than this, 5 mm. or 0·2 in. being the usual thickness.

Recent Developments of the Q.F. Gun-Carriage.—The principle of "differential" recoil gear is as follows: Suppose an ordinary Q.F. field gun held in the recoil position by a catch, loaded, released and allowed to fly forward under the action of the running-up springs. A valve in the buffer relieves the gun of any resistance to running-up. While in rapid motion forward the gun is fired by a tripper which catches the firing lever. The gun then returns to the recoil position and is again held by the catch. On firing, the recoil-velocity is reduced by the amount of the forward velocity previously imparted to the gun. Thus if the ordinary recoil-velocity of a Q.F. gun be 30 fs., and if it be fired while running up at a velocity of 10 fs., the recoil-velocity with respect to the carriage will be only 20 fs. And since the recoil-energy is proportional to the weight of the gun multiplied by the square of the recoil-velocity, the recoil-energy is reduced in the proportion of 900 to 400, or roughly by one-half. This halves the overturning stress on the carriage, and renders it possible to make the gun and carriage lighter for the same power, or to obtain greater power for the same weight. This increase of efficiency is due to the fact that the whole of the recoil-energy is not, as in ordinary Q.F. guns, absorbed by the friction in the buffer, but that part of it is stored up and used to counteract the recoil of the next round. If the hydraulic buffer be dispensed with, and the whole of the recoil taken on the springs or compressed air gear, the overturning stress is reduced to one-fourth of its normal amount. One practical difficulty in the way of applying the differential system to field guns lies in the vibration and slight lateral motion of the carriage during running-up. Since this motion takes place after laying and before firing, it is liable to cause inaccuracy. The only equipment on this principle as yet in use is the French 1907 mountain gun referred to below.

"Semi-automatic" Q.F. field and mountain guns are made by the leading firms, but have not been generally introduced. In these equipments the breech is thrown open by tripping gear during the run-up, and the cartridge case is ejected. When the gun is reloaded the action of introducing the cartridge releases the breech-block, which is closed by a spring. In the Krupp semi-automatic gun the breech-block is set vertically to facilitate loading. This equipment is capable of firing thirty rounds per minute. The principal advantage of the semi-automatic system lies not in the increased rate of fire but in the fact that three gunners are sufficient to carry out the service of the gun. This is of importance in mountain equipments, where the size of the shield is limited.

The introduction of airships into military operations has produced the anti-airship gun, which differs from the ordinary field gun in almost every respect. The attack of airships presents special problems. High elevation, higher even than the howitzer's, may have to be given, and, unlike the howitzer, the airship gun must be a high-velocity weapon, both ranging power and flatness of trajectory being essential. As regards the shell, to bring down a gas-bag, or even to kill a crew, with time shrapnel is difficult, owing to the speed of the airship and the difficulty of observing bursts. Direct hits with ordinary shell are equally hard to obtain, unless the balloon is stationary and the range known. Even if such a hit were got, the ordinary fuse would not act on encountering the slight resistance of the balloon envelope. As regards the equipment, the absorption of recoil at high elevations presents difficulties, the exaggeration of the angle of sight makes the sighting arrangements complicated, and rapidity in changing the line of fire is essential. The most powerful equipment that, in June 1910, had been constructed to meet these conditions was the Krupp 75 mm., which is mounted on a motor lorry, the weight of the equipment and carriage, without gunners, being about 4¼ tons. The equipment is constructed on the differential recoil principle, with rear trunnions on the cradle. The shell is a 12 lb H.E., fitted with a highly sensitive fuse and containing, beside the H.E. burster, a quantity of composition which gives off a trail of smoke to facilitate ranging.

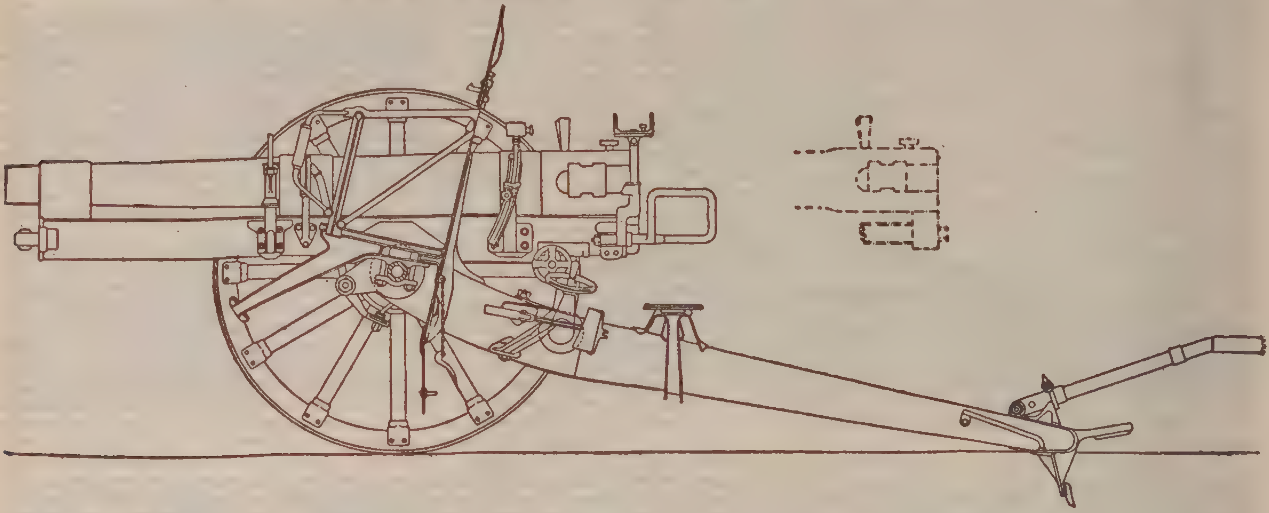
The British 18-pr. Q.F. Field Gun (1905) (see Plate III., figs. 60 and 61; also ARTILLERY, Plate II.).—Taking fig. 60 from the top, we see the buffer, telescopic spring-case and springs on top of the cradle, the buffer being attached to the horn projecting upwards from the breech. The cradle, of bronze, surrounds the gun, and is pivoted on horizontal trunnions on the upper carriage. The gun recoils in the cradle on the guide ribs, which extend for its whole length. The upper carriage is pivoted vertically on the trail and is traversed by the handle seen below the breech. The long elevating screw is formed as a telescopic screw at its lower end to avoid any downward projection; the screw does not turn, but the nut at bottom raises the gun, screw and sights for laying, while the nut at top raises and lowers the gun alone for giving elevation. The tubular trail supports the brake-arms, which also carry the seats for the layer and elevating number. The spade and traversing handspike are seen at the end of the trail. The telescopic sight is on the left of the gun. The shield is curved well back to give as much protection as possible to the detachment. The lower portion of the shield is hinged and folds up for travelling.

The French Q.F. Field Gun (1898) (fig. 62, Plate III.; see also ARTILLERY, Plate II.).—This is a powerful gun, of unusual length, namely 36 calibres. The breech mechanism is of the eccentric screw type (see Part I. of this article). The gun has compressed-air running-up gear and traverses along the axletree. The carriage is anchored by a trail spade and two brake-blocks which are arranged so as to go under the wheels, forming dragshoes, on firing. This method of anchoring causes some delay on coming into action and considerable delay in changing on to a fresh target. The gun has a goniometric sight with independent line of sight. The body of the ammunition wagon is tilted alongside the gun, and, with its armoured bottom and steel doors, forms a good protection for the gunners supplying ammunition.

The German Q.F. Field Gun (1906) (fig. 63).—This is the 1896 gun remounted on a Q.F. carriage. It is not a powerful gun, the ballistics being the same as those of the British 15-pr. B.L. of 1893. It has a single-motion wedge breech action. The gun is mounted on a cradle with buffer and springs under the gun; the cradle traverses on a vertical pivot set in a traversing bed which turns about the axletree. The gun has an arc sight with prismatic telescope and a clinometer mounted on it, and a circular laying-plane for laying on an auxiliary mark. It has not the independent line of sight. The shield is in three pieces, the top flap folding down for travelling. The carriage stands perfectly steady on discharge.

The Russian Q.F. Field Gun (1903) is intended as an improvement on the French gun, being of even greater power. Springs are used for running-up instead of compressed air. To ensure steadiness the gun is kept very low on the carriage; this is effected by the use of a cranked axletree. The gun has not the independent line of sight, but has a panorama sight. It traverses on the axletree.

The Danish Q.F. Field Gun (fig. 64, Plate IV.) is a good example of the heavier or more powerful type of Krupp field gun. The gun may be seen supported on the cradle, which contains the hydraulic buffer and running-up springs. The wedge breech-block is open. The arc sight with panorama telescope is seen behind the shield, which is curved backwards for better protection. The seats for the gunners who lay and attend to the breech are on either side of the trail. At the point of the trail are the spade, the traversing lever and the trail eye by which the gun is limbered up.



Redrawn from Bethell's *Modern Guns and Gunnery.*

FIG. 63.—The German Q.F. Gun. C. 96. n./A. (1906).

The American Q.F. Field Gun.—This is an example of the Ehrhardt type of gun. It is considerably more powerful than the field guns adopted by most European powers. Steadiness is ensured by making the trail 10½ ft. long, or 1¾ ft. longer than the Krupp trail. The construction is otherwise very similar to that of the Krupp gun shown in fig. 64, Plate IV. Four rounds are carried in tubes on the carriage.

Other Q.F. Equipments.—These closely resemble the standard types of their makers, as given in the above table of field guns. The Swiss and Dutch guns are light Krupps; the Spanish and Portuguese guns, by Schneider of Creusôt, are improved and lighter models of the French gun.

The new Italian gun is a medium Krupp. The Austrian gun is similar to the American (Ehrhardt) but the gun itself is of bronze.

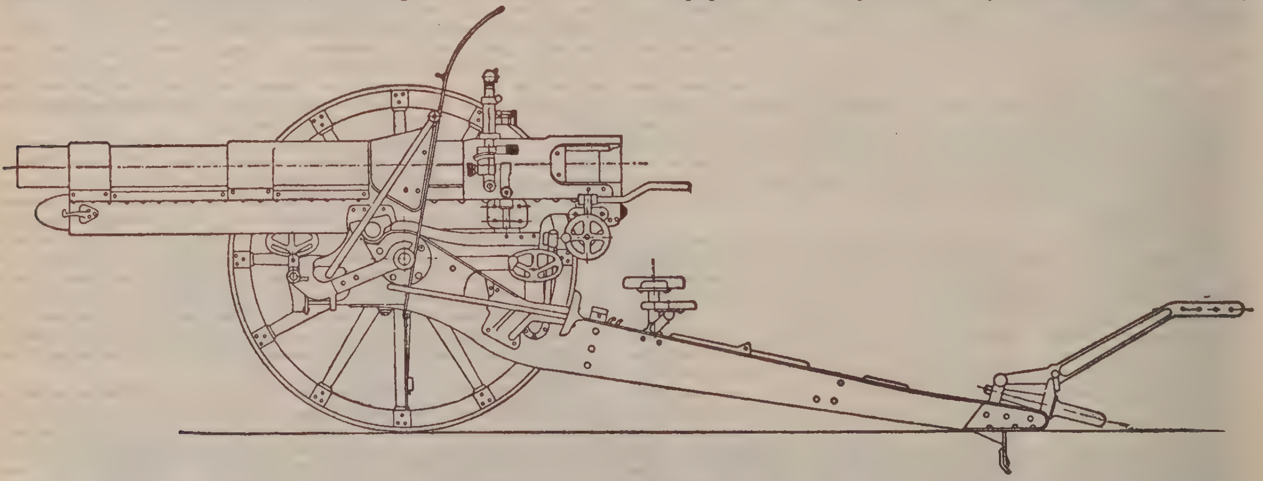


FIG. 65.—Rumanian (Krupp) Quick-Firing Field Gun.

The Rumanian Q.F. field gun (fig. 65) is a recent type of medium Krupp gun. The shield is set well back, and has a hood projecting forwards and fitting close to the gun. The brake is used for travelling only; the brake-wheel is seen in front of the shield. The panorama telescope is mounted on top of the arc sight; no foresight is used. There are no axletree seats, the gunners being carried on the gun limber and wagon limber. The wagon body (fig. 66) is tipped beside the gun in action.

Horse Artillery Guns.—A horse artillery gun must be mobile enough to accompany cavalry. This is secured partly by the adoption of a light type of gun, partly by carrying the gunners on horseback instead of on the carriage. It is considered that the weight behind the team should not exceed 30 cwt. The Germans have declined to introduce a special type of light gun, as they object to the complication entailed by the supply of two natures of ammunition on the battlefield. The H.A. guns of other nations are merely lighter and less powerful editions of their field guns.

The Q.F. Field Howitzer.—A field howitzer is a gun capable of throwing a shell weighing 35 to 45 lb at high angles of elevation, and light enough to manœuvre at a trot across open country. The permissible weight of the equipment is but slightly greater than that of a field gun. The object of the howitzer is to throw a heavy shell with an angle of descent of not less than 25°, so as to destroy overhead cover with high-explosive shell, and to search entrenchments and reach gunners behind their gun-shields with shrapnel. Effect is obtained, not by the striking velocity of the shell, but by the amount of its high-explosive burster, or, in the case of shrapnel fire, by the use of a large driving charge in the base of the shell which gives the necessary forward and downward velocity to the bullets.

Since the muzzle energy of a howitzer is limited by the weight of the equipment, the heavy shell can only be fired with a low velocity, usually not exceeding 1000 ft. per second. And in order to secure a steep angle of descent at short ranges this velocity is still further reduced by using half and quarter charges.

The construction of the howitzer is much the same as that of a gun. The calibre is usually between 4·3 and 4·7 in., and the length does not much exceed 12 calibres. Case ammunition is used, and the breech action is similar to that of a Q.F. gun. Howitzers are usually provided with shields in order to enable them to come into action in the open when necessary. At short ranges, with full charge, they make very powerful guns.

Construction of the Carriage.—The gun-recoil system is used as in a gun equipment. There is however one important difference. If the recoil allowed be sufficient to keep the carriage steady at low elevations, then when fired at an elevation of 45° the breech will strike the ground. This may be to some extent avoided by placing the trunnions of the cradle which supports the howitzer at the extreme rear end, so that when elevated the breech of the howitzer is not brought any nearer the ground (Krupp). One objection to this is that the forward preponderance of the howitzer has to be balanced by a spring to enable it to be elevated.

A second method is known as *controlled recoil.* The buffer-liquid, on recoil, has to pass through holes in the piston. The access of the buffer-liquid to these holes is controlled by a disk valve rotated by rifled grooves in the cylinder. By connecting the piston-rod to the carriage so as to rotate the piston when the gun is elevated, the area of the holes exposed by the disk valve can be decreased at high elevations so as to shorten the recoil. This is known as the Vavasseur-Ehrhardt control valve. Messrs Cockerill use a channel through which the liquid is forced on recoil, which is partly closed by a stop-cock connected to the left trunnion when the howitzer is elevated. The running-up springs require to be strong in order to lift the weight of the howitzer at 45° elevation. In most equipments twin columns of springs are used.

The Ehrhardt Q.F. Field Howitzer, fig. 67 (Plate IV.), may be taken as a type of the light field howitzer with controlled recoil, as opposed to the Krupp pattern with rear trunnions and constant long recoil. The howitzer is represented immediately after firing, before it has run up. The recoil is automatically shortened so that when fired at this high elevation the buffer, which is seen under the breech, does not strike the ground. The sights are on the bar which passes through the shield. The calibre is 4·7 in.: the howitzer fires a 46 ℔ shell with M.V. 985 f.s., and weighs 25 cwt. in action with shield.

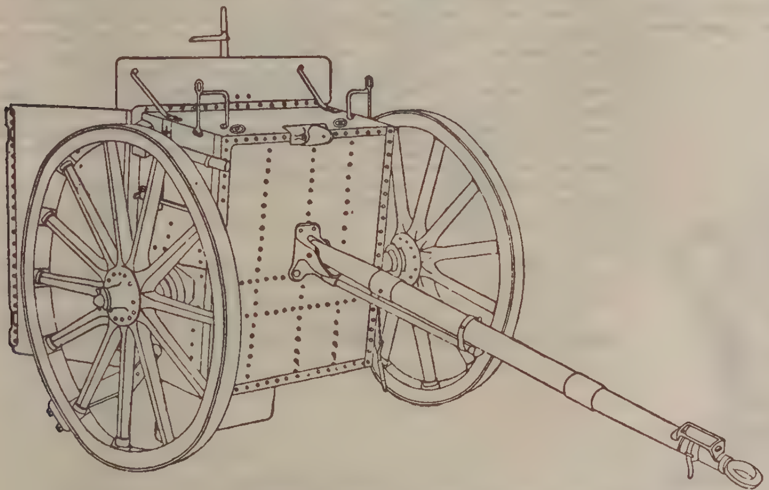


FIG. 66.—Wagon Body, Rumanian (Krupp) Quick-firing Field Gun.

The Q.F. Mountain Gun.—A mountain gun has the same tactical duties to fulfil as a field gun. It is merely a field gun sufficiently mobile for mountain transport. Its weight and dimensions are restricted by the following considerations: (1) The whole equipment has to be carried on pack animals. (2) The average load for a battery mule is about 280 ℔, including 65 ℔ of saddle and equipment. A few specially selected gun-mules can carry about 40 ℔ more, or 320 ℔. In Spain and Italy, where exceptionally fine mules are available, some of the mountain battery loads amount to 375 ℔. (3) The loads must be short, the length being limited by that of the neck of a mule. If possible no part of the equipment should be more than 4′ 6″ long. (4) The equipment must, therefore, be subdivided into component parts such that no part weighs more than 320 − 65 or 255 ℔, and these parts must be so designed as to be quickly assembled. (5) The number of parts into which the equipment may be subdivided is either four or five. British mountain batteries have five gun and carriage mules, and yet they come into action and fire the first round within one minute. Other nations mostly divide the equipment into four parts only, and use rather heavier loads than is in England considered consistent with activity on a hillside. (6) Mountain guns are usually provided with shafts to enable them to be drawn instead of being carried when travelling along a road.

On a 5-mule basis the total weight of gun and carriage carried amounts to 10¼ cwt. or more than half the weight of a field gun. But the power obtainable is not commensurate, being in practice limited by the weight of the gun itself, which is restricted by the carrying power of the transport animals. In B.L. mountain equipments this difficulty has been got over by carrying the gun in two parts, which are screwed together on coming into action.

In the British service the 7 pr. R.M.L. of 400 ℔, the original "screw gun," was superseded in 1900 by the 10 pr. B.L., also in two pieces. A quick-firing mountain gun has since been introduced (1907).

In modern mountain equipments, such as the Schneider-Danglis gun adopted by Russia, the gun is not divided across the bore but is lightened for transport by removing the breech-piece and breech-block, which are carried separately. These guns fire a shell of 14·3 ℔ with M.V. of 1100 f.s.

When the gun is in one piece, the equipment naturally divides itself into four parts, namely the gun, cradle; trail and axletree and wheels. When a long jointed trail is used, as in the Krupp Q.F. mountain equipment, the point of the trail is carried with the wheels, which form a light load. In addition to this the folding shield with ammunition forms a fifth load. The shield need not, however, be brought up till after the gun has opened fire.

Since the length of a mountain gun in one piece may not exceed 4 ft. 6 in., the calibre has to be comparatively large to get the necessary power, and is usually 75 mm. or 3 in. The weight may not exceed 255 ℔. A short breech action such as the swinging block or the eccentric screw is preferred. The sights must be of simple pattern; the independent line of sight is too complicated for mountain work. But it is most desirable that the sight-socket should be capable of being cross-levelled to eliminate the error introduced by difference of level of wheels. Except in the French gun, the recoil gear and running-up springs are similar to those used in Q.F. field guns. In the Krupp mountain equipment the gun does not slide directly on the cradle guides, but a steel forging called a sleigh is interposed. This forms a sliding cover to the cradle, and protects the guides. On coming into action the gun is dropped into the sleigh and secured by a keyed lug. The trail of a Q.F. mountain gun has to be from 6 ft. to 7 ft. long to keep the gun steady. It is either carried in two pieces (Krupp) or is hinged and folded (Ehrhardt). The spade is similar to that used with field guns. The wheels are of wood, about 3 ft. in diameter. The elevating gear is a plain screw. The gun and cradle traverse on a vertical pivot about 3 degrees each way. A shield high enough to protect the gunners kneeling weighs up to 1 cwt., and is carried in two pieces.

The Krupp mountain gun, fig. 68 (Plate IV.), may be taken as an example of ordinary practice. The gun is seen mounted on the sleigh, which slides to the rear on the cradle when the gun recoils. The cradle is pivoted vertically on a saddle mounted on horizontal trunnions between the trail brackets; the rearward extension of the saddle forms the traversing bed and is supported by the elevating screw. The foresight and arc sight are attached to the cradle. Near the middle of the 7-ft. trail are seen the seats for the laying and loading numbers. The trail is divided immediately in rear of the seats. The calibre is 2·95 in., the gun fires a shell weighing 11 ℔ 10 oz. with a muzzle velocity of 920 f.s. The weight in action is 820 ℔, without shield.

The French 1907 mountain gun differs markedly from other types in that the carriage is constructed with differential recoil gear as described above. There is no hydraulic buffer, and the whole of the recoil-energy is absorbed by the springs. The gun is held in the recoil position by a catch, and when loaded and released it is fired automatically by a tripper on the cradle. The calibre is 2·65 in., and the shell weighs 11 ℔ 10 oz.

AUTHORITIES.—H. A. Bethell, *Modern Guns and Gunnery* (Woolwich, 1907, 3rd edition, 1910); Kenyon, *F A. Material on the Continent* (R.A. Institution, Woolwich, 1905); Greenhill, "The Dynamics of Gun Recoil," *The Engineer* (23rd August 1907); Roskoten, *Die heutige Feldartillerie* (Berlin, 1909); Rohne, *Progrès de l'artillerie de campagne moderne* (Paris, 1906), Challéat, *Théorie des affûts à déformation* (Paris, 1906), Siacci, *Balistique extérieure*; Witzleben, *Feldgeschützfrage in Portugal* (Dresden, 1906); Castner, "Development of Recoil Apparatus," *Journal U S Artillery* (1904); and *Der Erfolg des ständigen Rohrrücklaufs bei Feldhaubitzen* (Frauenfeld, 1906); v. Reichenau, *Munitionsausrüstung* (Berlin, 1905), *Shrapnels et boucliers* and *L'Obusier de campagne moderne* (Lucerne, 1906); Bahn, *Die Entwicklung der Rohrrücklauf-Feldhaubitze* (Berlin, 1907). (H. A. B.)

III. HEAVY FIELD AND SIEGE EQUIPMENTS

Heavy Field Batteries.—Since the days of Gujrat and Inkermann the value of heavy metal in the field has been recognized, at all events in theory, but it was mainly due to the South African war that "heavy" batteries have become a component part of modern armies. Guns heavier than field guns have formed part of the equipment of the Indian army for many years.

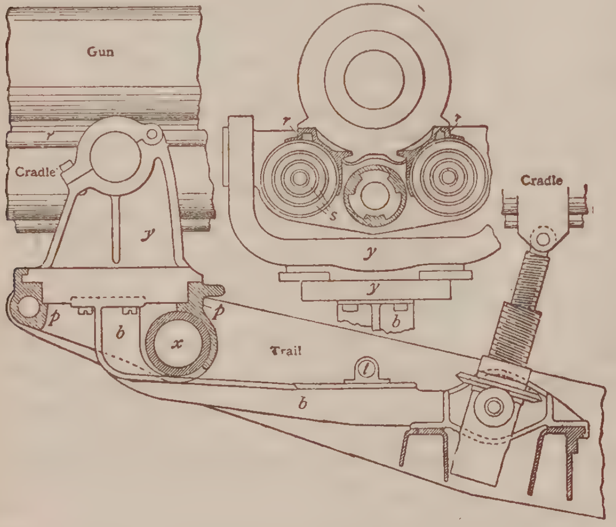
but they have existed for a specific purpose, and ordnance originally designed for quite other functions has, from the exigencies of war, been occasionally utilized in the field, as was the case in South Africa and Manchuria, but the heavy field battery as we know it to-day is a new military product. Its rôle is an extensive one, as it embraces many of the functions of ordinary field guns as well as some of those usually attributed to light siege pieces. In the heavy field armaments of the Powers as they stand at the present time will be found guns, howitzers and mortars, and projectiles that vary from 50 ℔ to more than five times that weight, and no boundary line can be assigned which will separate these field equipments from those of the light units of a siege train It will be convenient to consider in turn the three natures of ordnance (guns, howitzers and mortars) employed and to quote some typical instances of each kind

Guns.

The United States 60 pr. Gun.—This gun and its equipment are of modern type (1904) Its general appearance is shown in figs. 69 and 70, Plate V The calibre is 4·7″; the charge 5·94 ℔ of smokeless powder and the muzzle velocity developed is 1700 f.s. Fixed ammunition is employed, and with an elevation of 15° the range is 7600 yds The weight of the equipment limbered up is given as 71$\frac{3}{8}$ cwt.: it is known as a siege gun

In its general aspect the carriage resembles a field carriage, but of stronger type, with a special arrangement of cradle.

In fig. 71 two sections are given; the cradle, it will be seen, consists of three cylinders (seen in section in the upper figure) which are bound together by broad steel bands; the two outer cylinders carry rails *r* upon which the gun slides in recoil. The centre cylinder contains the hydraulic gear for checking recoil, the two outer contain the running-up springs *s*. These springs are arranged in three concentric columns, the front end of each outer column being connected to the rear end of the next inner column by a steel tube, flanged outwardly at the front end and inwardly at the rear end. A rod carrying a head which acts on the inner coil only passes through the centre of the cylinder and is fixed to a yoke that is connected with a lug at the breech of the gun. The flanged tubes thus convey the pressure from the innermost coil to the next outer coil and finally to the outermost coil, so that in each cylinder the springs work in tandem and have a long stroke with short assembled length. It is thus seen the recoil takes place partially on the carriage and only a portion of the energy remains to tend to cause movement in the mounting.



From Lieut.-Colonel Ormond M. Lissak's *Ordnance and Gunnery.*

FIG. 71.—Diagram of 4·7-in. Siege Gun, U.S.A.

b, Traversing bracket. *r*, Rails. *x*, Axle.
p, Pintle bearing. *s*, Spring cylinders. *y*, Pintle yoke.

The cradle is supported by trunnions in the casting *y*, which is itself seated in the casting *p*, which forms a bearing for it. This bearing is mounted between the front ends of the trail brackets, its rear end embracing the hollow axle *x*. Attached to the lower surface of *y* is the traversing bracket *b*, which extends to the rear under the axle and forms a support for the traversing shaft *t* and for the elevating mechanism.

For travelling (Plate V., fig. 69) the gun is withdrawn to the rear and the breech is attached to a holding-down arrangement about the middle of the trail. A spade is hinged at the point of the trail.

The British 60 pr. Gun.—This is known as a heavy battery gun; its calibre is 5″, its length 32 calibres, its weight 39 cwt.; its charge is 9$\frac{7}{16}$ ℔ of cordite, its muzzle velocity 2080 f.s. and its effective shrapnel range 10,000 yds. The weight behind the team is 106 cwts., 3 qrs.

The German 10 cm. Gun is called a heavy battery gun; its calibre is 4″, its effective shrapnel range is 5750 yds., but common shell can be used up to 11,000 yds. The organization is a six-gun battery, but a platform has always to be used.

Howitzers.

A howitzer is a comparatively light piece that fires a comparatively heavy shell with a comparatively low muzzle velocity, and changes in range are effected sometimes by alteration of charge as well as of elevation. On the continent of Europe howitzers are more popular than guns for heavy field batteries and light siege units.

The French 15 cm. (Rimailho) Howitzer.—This piece is at the present time very popular in France, where, in 1907, some 120 batteries of the field army were said to be armed with it. It came into being from the conversion of an old pattern siege howitzer and its adaptation to a new form of carriage, according to the plans of Commandant Rimailho. The gun (*canon de 155 R*) is a short piece, made of steel, with a calibre of 6·1″; the shell weighs about 94 ℔ and has an effective range of 7000 yds. The breech opens automatically after each round and a rapidity of fire of from 4 to 5 rounds a minute is claimed. The howitzer is supported on two trunnions near its rear end so that the weight pivots about a point near the breech, with the result that the latter remains nearly 5 ft. above the ground level at all angles of elevation; space is thus left for recoil, which is checked by a buffer, the construction of which is a secret; running-out springs are provided to return the gun to the firing position. The piece recoils in a cradle to which is attached the elevation scale, but the elevating gear is independent of the carriage proper; the line of sight is also independent. The howitzer has a special transporting carriage, but it can be placed on its firing carriage, it is said, in two minutes. The weight behind the teams is in each case about 47 cwt. On a war footing three ammunition wagons per howitzer would be provided.

The German 15 cm. Howitzer.—The Germans also possess a 15 cm. howitzer of modern type; its rate of fire is 2 to 3 rounds a minute; its shell is 87½ ℔ in weight and the weight behind the team is about 53 cwt.

The British 6″ B.L. Howitzer.—This piece is made of steel, it weighs 30 cwt., its shell weighs 122 ℔ and has an effective range of 7000 yds. The weight behind the team is 85 cwt.

Fig. 72 shows the howitzer and cradle A mounted on the travelling carriage, from which it can be fired up to an angle of 35°: in fig. 73 the wheels have been removed, the trail B has been lowered on to the pivot plate C and secured to a pivot plug screwed into the plate: to the trail is fitted the top carriage D, and when the howitzer and cradle are thus mounted 70° elevation can be given. The howitzer recoils through the cradle, in which are two hydraulic buffers side by side, fig. 74, whose piston rods E are attached to the howitzer so that the recoil of the latter draws the pistons J to the rear. Consider now, in fig. 74, the right buffer only; forged in one piece with the piston and piston rod is a tail rod F of larger diameter than the piston rod, and in the front of the cylinder is an annular bronze casting G, called a floating piston, which bears against the rear of the springs. On discharge, the howitzer slides along the cradle to the rear, the piston rod E is drawn out of the cylinder and the tail rod F is drawn in, and from its larger diameter causes a pressure of oil against the floating piston G, which slides forward and compresses the springs which are prevented moving by the rods H. The action is the same in each buffer. After recoil the springs expand and return the howitzer into the firing position.

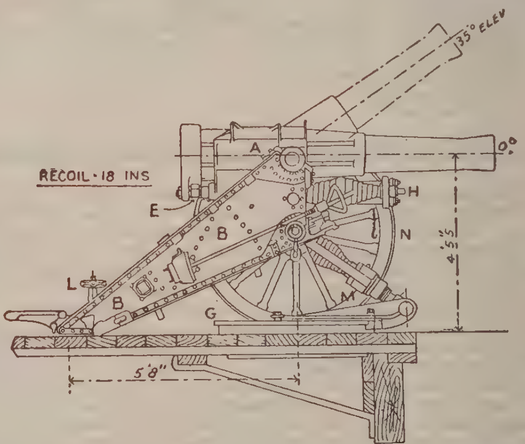


FIG. 72.—Diagram of British 6-in. B.L. Howitzer.

The floating pistons are tapered slightly inside towards the front to prevent violence in the running out action. The elevating gear, which can be placed on the left side of either the trail or the top carriage, actuates the arc K, bolted to the left side of the cradle. When the gun is fired on wheels (fig. 72) an anchorage buffer M, attached to the platform, checks the recoil, whilst the springs with which it is provided cause the carriage to return to its position.

The United States 6″ Howitzer.—This is a more modern equipment, its date being 1905. The howitzer is a short piece, 13 calibres long; it fires a 120-lb shell with a muzzle velocity of 900 f.s. It has an extreme elevation of 45° and an effective range of 7000 yds. The weight behind the team is 70½ cwt. The carriage is of peculiar construction (fig. 75). The howitzer is supported under its cradle, which is carried on trunnions seated in the top carriage. The cradle consists of three cylinders generally similar in arrangement and in functions to those described for the 4·7″ 60 pr. gun: the howitzer is made in a single forging and carries a lug on its breech end for the attachment of the recoil piston rod and the yoke for the rods of the spring cylinders; flanged rails are formed on its upper surface, which support it on its cradle. The top carriage rests on a framework called a "pintle bearing." Flanges in the former engage under clips in the latter; the pintle bearing is riveted to the front part of the trail brackets, and forms a turn-table upon which the top carriage and all supported by it have a movement of 3° traverse on either side.

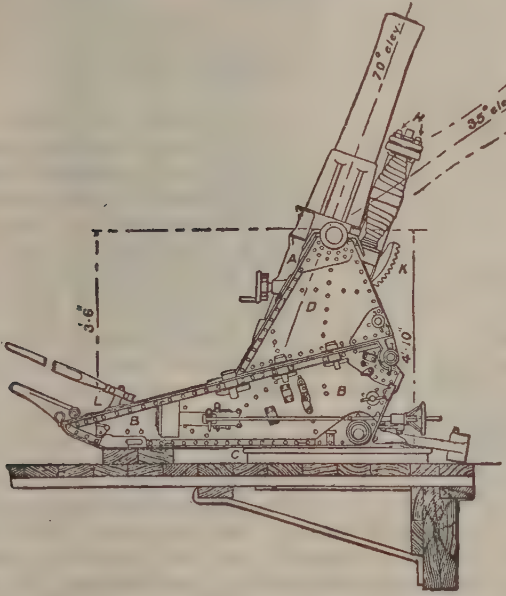


FIG. 73.—Diagram of British 6-in. B.L. Howitzer (70° elevation).

This movement of traverse is effected by a shaft and worm: the former is supported in a fixture attached to the left trail bracket, and the latter works in a nut pivoted to the top carriage.

Elevation is effected by a forging called the rocker. The rear part of the latter is U-shaped and passes under the gun, being attached to the cradle by a pivoted hook *k*. From either side of the U arms extend which embrace the cradle trunnions between the cradle and the cheeks of the top carriage so that the rocker can rotate about the cradle trunnions. The elevating gear is supported in lugs on the under side of the top carriage, while the upper end of the elevating screw is attached to the bottom of the rocker. The rocker thus moves in elevation in the top carriage and gives elevation to the cradle, and therefore to the gun, by means of the pivoted hook above referred to.

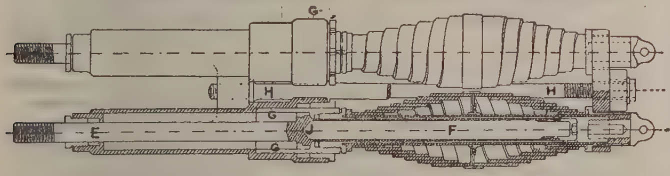


FIG. 74.—Hydraulic buffers of British 6-in. B L. Howitzer. (*N.B.*—Spiral, instead of volute springs, are now used.)

The brackets of the trail extend separately to the rear, sufficiently providing for free movements of recoil at any elevation; they are then joined by transoms and top and bottom plates and terminate in a detachable spade which is secured to the top of the trail in travelling. The axle is of special shape to admit of the movements of the cradle; it is lower in the middle than at the sides and is made in three parts, held together by shrinkage in cylinders formed in the sides of the pintle bearing.

A peculiarity of this carriage is that recoil is automatically shortened as elevation increases. Thus the length of recoil is 50″ at angles of firing from −5° to 0°, from 0° to 25° the 50″ is gradually reduced to 28″, which is not changed for higher angles. This is effected as follows: Four apertures are made in the piston of the recoil cylinder and there are two longitudinal throttling grooves in the walls of the cylinder. All apertures being open and deepest part of grooves in use would correspond to a 50″ recoil; apertures closed and grooves alone at work would mean a 28″ recoil. A rotating disk with apertures similar and similarly placed to those on the piston is carried by the piston rod and rests against the front of the piston, and is actuated during recoil by two lugs projecting into helical guide slots cut in the walls of the recoil cylinder. The latter is mounted so as to be capable of rotation in the cradle, and its outer surface carries teeth which engage with similar teeth in a ring surrounding the right spring cylinder. When the elevation is between 0° and 25° these latter teeth engage in special gearing which is seated in the hollow trunnion of the cradle and is attached to the right cheek of the top carriage. The buffer conditions are thus made to correspond with the elevation.

Mortars.

The mortar is a short piece of ordnance that is always fired from a bed. Changes in range are usually effected by varying the charge.

United States 3·6″ Mortar.—This equipment is not modern; the piece was intended for vertical fire against troops in entrenchments; the mortar weighs 245 lb, and its bed, which is made in a single casting of steel, 300 lb. The latter rests in action on a wooden platform and is held down by ropes and pickets.

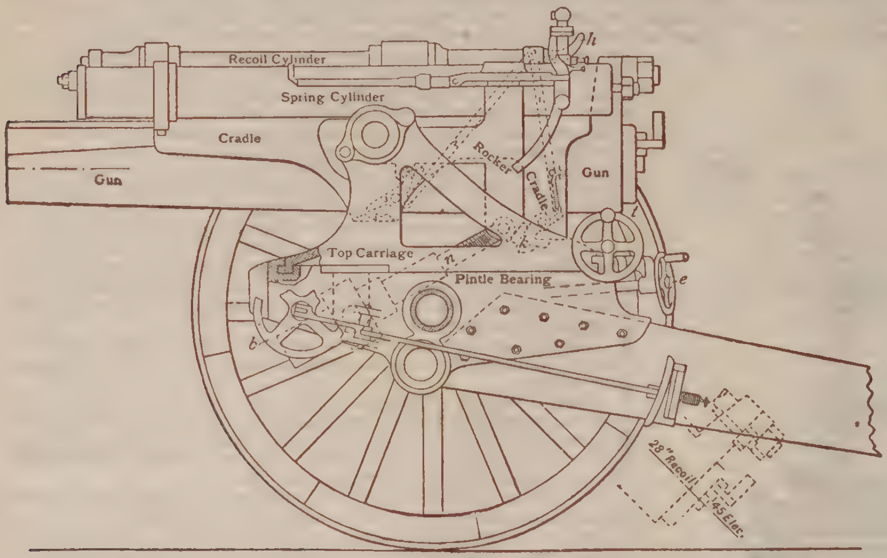
The German 8·4″ Mortar.—This equipment is perhaps the heaviest field equipment existing. The mortar in action weighs about 4·9 tons; it has to be transported in a special vehicle and can only be fired from a platform; four hours are required for bringing it into action. Two platform wagons are attached to each mortar, weighing respectively 2·9 and 4·9 tons. The equipment can be moved at a walk on good roads, but two companies of infantry are always attached for haulage in case of need. A battery consists of 4 mortars, and 160 rounds are carried. The shell weighs 250 lb and carries a heavy charge of high explosive, with or without delay action fuze.

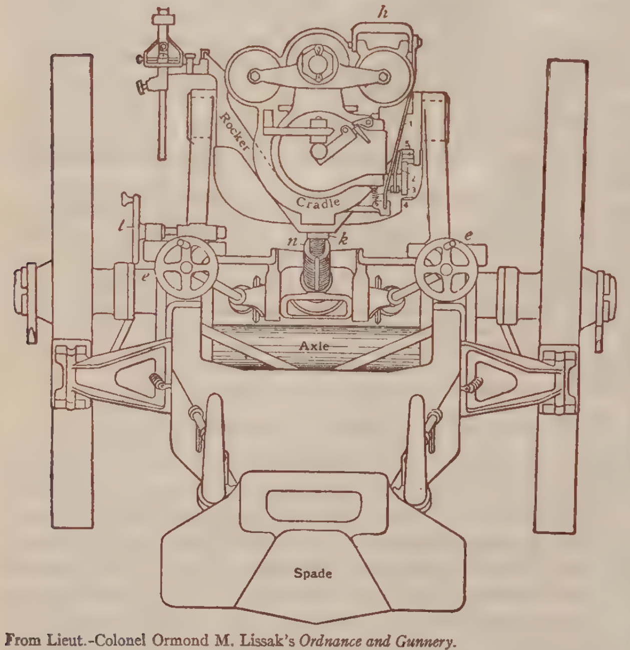
A special equipment designed by Messrs Krupp is shown in Plate vi., figs. 76 and 77. It is a mobile mounting for an 8·26″ mortar with constant long recoil, which is fired, like a howitzer, from its travelling carriage without a platform. This equipment weighs about 5 tons in action.

All the foregoing equipments may be considered *mobile*; that is to say, the batteries in which they are organized are self-contained, can move from place to place without external assistance, and may be employed on either field or siege duties. Their uses may be summed up as follows: The first object of the heavy artillery accompanying an army is to demolish the barrier forts or other frontier fortifications of a permanent nature in order to enable the army to penetrate into the enemy's country. After this has been done, a small portion of this artillery will be employed in connexion with the siege of fortresses, while another, by far the more considerable portion, will accompany the advance of the field army.

Heavy Siege Units.—When a serious siege has to be undertaken it is necessary to organize one or more siege trains in addition to the troops of the field army. Both heavy and light siege units enter into the composition of a siege train. As to the armament of the latter, we have said that it is not exactly distinguishable from that of heavy field batteries, and it has already been described. That of the former is less definite. Heavy siege units are seldom mobile in the sense that light siege units are: the ordnance comprising the former has usually to be transported by some special means; thus it might be conveyed by ordinary rail or ship to some place from which special siege railways would admit of its conveyance to its place in battery, and probably great variety of calibre and mounting would exist. For example, during the siege of Sevastopol a civil engineer, Robert Mallet (1810–1881), designed a 36″ mortar; it did not, however, reach the seat of war; and in 1904 the Japanese made use of their 11·1″ coast howitzers at Port Arthur. At the siege manœuvres in France in 1906 the heavy siege units were represented by their 6·1″ gun and their 10·7″ howitzer. The official British pieces are a 6″ gun and a 9·4″ howitzer. Generally speaking, whereas the most suitable armament of the light units can as a rule be foreseen, that of the heavy would depend very much on circumstances.

The French 10·7″ Howitzer.—As a typical piece the 10·7″ howitzer may be taken, which the French transported by special horse draught, as it was found too heavy for the type of siege railway made use of at the mock siege of Langres in 1907. Its total equipment weighs 22 tons and it is transported in four components, namely, the piece, the carriage, the slide and the platform. A battery of six pieces would thus require, exclusive of ammunition transport, 24 vehicles that would weigh 130 tons. The howitzer was designed originally for coast defence; it weighs about $5\frac{3}{4}$ tons and its bed weighed $6\frac{1}{3}$ tons: to this equipment was added a slide and a platform, consisting of a thick plate of iron upon which the slide moves. The platform is provided with a pivot upon which the front part of the slide fits. The latter consists of an iron framework, having lateral movement around the aforesaid pivot; its rear portion is provided with rollers to facilitate its movement on the platform. Its upper portion consists of two inclined rails along which the bed or carriage of the howitzer slides. To check recoil a hydraulic buffer is attached to the front of the slide and also to the bed.





From Lieut.-Colonel Ormond M. Lissak's *Ordnance and Gunnery.*

FIG. 75.—Diagram of 6-in. Siege Howitzer, U.S.A.

b, Hand-wheel actuating wheel brakes.
e, Elevating hand-wheel.
h, Handle.
k, Hook, 1, 2, 3, 4 and 5 mechanism for loading position.
n, Elevating screw.
t, Traversing wheel.

The fighting units of siege artillery in the British service are companies and brigades; each company would be armed with from 4 to 6 light siege pieces or from 2 to 4 heavy pieces. A company is usually a major's command. Three such companies would form a siege brigade under a lieutenant-colonel. If a siege train of any magnitude were organized it might be necessary to combine two or more brigades into a division under a colonel or brigadier. In the French service each siege train consists of three divisions. A division is divided into groups and comprises some 50 pieces of ordnance, heavy and light. (J. R. J. J.)

IV. GARRISON MOUNTINGS

The armament of modern coast fronts consists of (*a*) heavy B.L. guns, 9″ and upwards; (*b*) medium guns, 4″ and upwards, and (*c*) light Q.F. guns; all these being for direct fire; and (*d*) guns, howitzers or mortars of various calibres for high angle fire. Typical guns of type (*a*) are the Krupp 12″ gun and the British 9·2 B.L. gun. The Krupp 12″ gun is built up of crucible cast nickel steel, not wire wound. It is 45 calibres long and has the Krupp wedge-shaped breech-closing apparatus. It is fitted with a repeating trip lock. The cartridge is a metallic case containing a charge of 290 ℔ of tubular powder. The projectiles are of two weights, 770 ℔ and 980 ℔, and the respective muzzle velocities are 3025 f.s. and 2700 f.s. The British 9·2 B.L. gun is of wire-wound construction and is over 48 calibres long. It has the asbestos pad and Welin screw system of obturation, and its charge of 103 ℔ of cordite, contained in a cartridge of silk cloth, fires a 380 ℔ projectile with a muzzle velocity of 2643 f.s. A typical gun of class (*b*) is the British 6″ mark VII. It is similar in construction and breech mechanism to the last-named and fires a 100 ℔ projectile with a charge of 23 ℔ cordite, giving a muzzle velocity of 2493 f.s. A typical gun of class (*c*) is the British 12 pr. Q.F.; its weight is 12 cwt., it is made of steel, is 10·3 calibres long, and with a cordite charge of 1 ℔ 15 oz. it fires a projectile $12\frac{1}{2}$ ℔ in weight with a muzzle velocity of 2197 f.s. and a possible rate of 15 aimed rounds a minute. A typical piece of class (*d*) is the 11″ Krupp howitzer. It is 12 calibres long, has a charge of $28\frac{1}{2}$ ℔ smokeless powder and fires steel shell weighing 470 ℔ or 760 ℔. It is provided with a shrapnel shell of the former weight which contains 1880 bullets.

The methods of mounting of coast ordnance are many; space only permits of referring to certain typical arrangements.

Disappearing mountings.

1. *The Moncrieff Principle.*—The disappearing carriage originated, at all events in England, with Colonel Sir A. Moncrieff, who, about 1864, proposed to utilize the energy of recoil to bring a gun into a protected position and at the same time to store up sufficient energy to raise it to a firing position when loading was completed. To effect this a heavy counterweight was so adjusted that its tendency was to raise the gun; when the latter was fired, it raised the counterweight and a ratchet and pawl followed the action up: when the pawl was released the counterweight brought the gun back to the firing position; this application of the principle had many drawbacks, and never had any success with guns over 7 tons in weight. It was not until Moncrieff invented the hydropneumatic appliances that any real progress was made. In 1888 was introduced into the British service the first of a large group of disappearing mountings for guns of types (*a*) and (*b*), where the energy of recoil was absorbed chiefly by forcing a large volume of liquid through a narrow opening or recoil valve, and also by further compressing a large volume of already highly compressed air; when recoil was completed the recoil valve closed and the air was retained at very high pressure: the energy thus stored up returned the gun to the firing position. The action will be understood from the following example.

The British 6″ B.L. Gun on H.P. Mounting, Mark IV.—Fig. 78 shows a general view of the mounting; fig. 79 is a vertical and

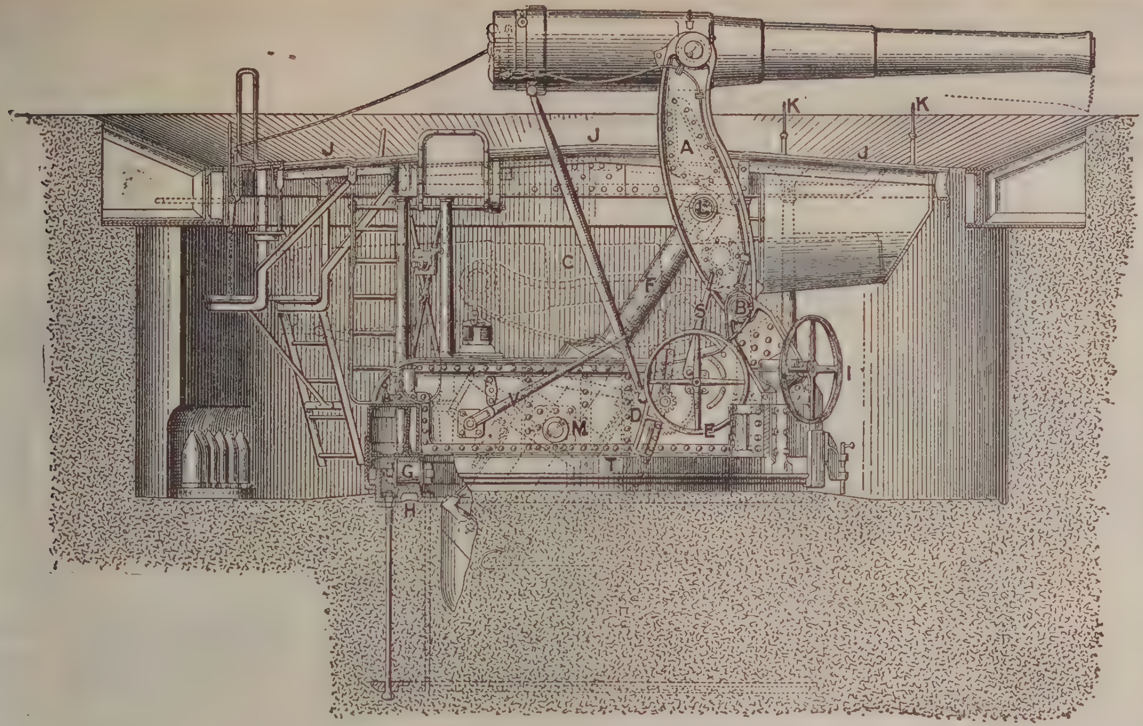


FIG. 78.—British 6″ B.L. Gun on H.P. Mounting, Mark IV.

fig. 80 a transverse section through the recoil cylinder. The gun trunnions (fig. 78) are supported by the two arms of the elevator A, which is pivoted to the front of the lower carriage at B. The breech is supported by the two elevating bars C whose lower ends are attached to the elevating arcs D. These arcs are worked by the elevating gear actuated by the hand-wheel E. The arcs are struck with the bars C as radii, their centres being points at the upper end of the bars when the gun is in the loading position. Elevation can thus be given to the gun whilst it is being loaded. The lower carriage rests on a ring of live rollers G, which are free to traverse round on a circular racer H, motion being given by traversing gear actuated by the hand-wheel I. Supported by vertical stanchions attached to the lower carriage is a horizontal circular shield J through which the gun rises to the firing position. The manganese bronze ram F which is attached to the elevators A by the cross-head L is forced on recoil into the central chamber of the recoil cylinder (see fig. 79), which is supported by trunnions M resting in the brackets of the lower carriage. There are ten chambers N (figs. 79 and 80), all of which are connected at the bottom with the recoil valve chamber O, and consequently with each other. Nine of these contain liquid in their lower portions and highly compressed air above, and are connected at the top by a channel P to equalize the pressure in each chamber. The tenth chamber N′, which is situated lowest in the cylinder, contains liquid alone and has at its upper end the raising valve Q. On recoil the liquid in the central chamber is forced by the ram through the recoil valve R into the outer chambers N, thus further compressing the air. As R is a non-return valve the air is maintained in this highly compressed state during loading. The gun is raised by pushing the lever S (fig. 78) to the front which actuates the rack T (fig. 79), thus opening Q, which allows the air in the nine chambers to force liquid from the tenth chamber N′ into the centre ram chamber, lifting the ram. U is a pump (fig. 79) by which the gun can be pumped down at drill. The liquid employed in the buffer is a mixture of methylated spirits, mineral oil, distilled water and carbonate of soda, and its aeration, due to the churning it receives on recoil, is a serious drawback to this class of mounting. From a 6″ B.L. gun mounted in this fashion somewhat more than one aimed round a minute can be obtained; from a 9·2″ B.L. about four such rounds in five minutes.

The foregoing description is now, however, principally interesting as showing an ingenious application of mechanical principles for military purposes. Mountings of this type are being gradually withdrawn from the British service.

The Buffington-Crozier Principle.—In the United States a type of disappearing carriage known as the Buffington-Crozier (fig. 81) is used. Here, as in the earlier types of Moncrieff carriage, a counterweight is employed, but the energy of recoil is partly absorbed by a buffer, and the counterweight, which is constrained by guides to move vertically up and down, is just able to raise the gun to the firing position. A satisfactory rate of fire is claimed for this mounting, which has recently been improved.

Balanced Pillar.—Another type of disappearing mounting for guns of type (*b*) or (*c*), known as the balanced pillar, is found on the continent of Europe and in the United States, where it is used for 5″ guns and under. A long steel cylinder, which supports the gun and its carriage, has a vertical movement of about 3½ ft. in an outer cylinder. The inner cylinder and all that it carries is balanced by a counterweight. After the gun is fired it can be brought with its length parallel to the parapet. Then by the action of the mechanism the inner cylinder can be made to sink in the outer cylinder and the gun is brought down to the loading position; the release of the counterweight will cause it to rise again. The gun has the usual motion of traverse round the common axis of the two cylinders.

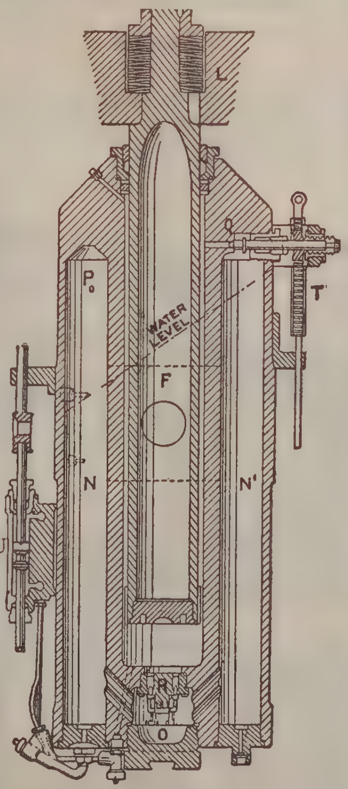


FIG. 79.—Vertical Section through Recoil Cylinder of Gun shown in fig. 78.

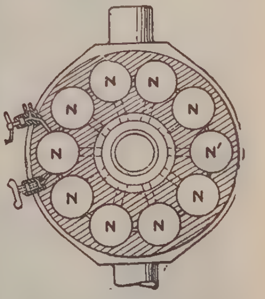


FIG. 80.—Transverse Section through Recoil Cylinder of Gun shown in fig. 78.

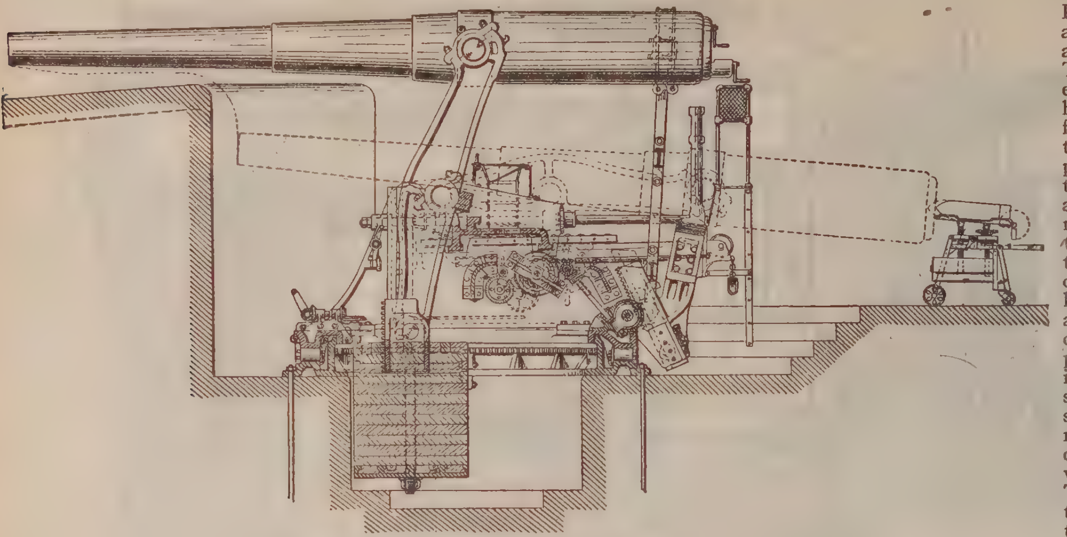


FIG. 81.—Buffington-Crozier Disappearing Carriage for 10″ B.L. Gun, U.S.A.

Cupolas.

The heavy gun cupola is found on the continent of Europe in the armaments of various Powers for guns of type (*a*), the German practice being occasionally to mount two 11″ guns in the same cupola. The cast-iron cupola was introduced by Gruson of Magdeburg, but nickel steel is now generally employed by Krupp. In Gruson's design the gun and mounting are placed upon a turn-table upon which also rest the bases of a series of cast-iron plates; these are very massive, are curvilinear in section, and are built up into a shallow dome which completely covers the mountings as with a cap: the whole structure turns together, being traversed round a central pivot. The chase of the gun emerges through a port which admits of the necessary play of elevation. A notable example of a cupola was erected at Spezzia containing two 120-ton Krupp guns, the structure complete weighing 2050 tons. A Krupp cupola of chilled cast-iron for two 28-cm. (11″) is shown in fig. 82. These are designed principally for coast defence in low sites. The cupola, which is built up like a Gruson cupola of several heavy iron masses, is revolved and the guns laid by hydraulic power. A heavy chilled cast-iron collar protects the under side of the armoured structure and the working mechanism of the guns. Fig. 83, Plate VI., represents a Krupp mounting for an 11·2″ howitzer, with a cupola-like shield. This is worked both electrically and by hand. Vertical fire from a weapon of this type is sufficiently powerful to penetrate the protective deck of a vessel. Light and medium guns, types (*b*) and (*c*), are sometimes mounted in cupolas, especially on land fronts (see below), and disappearing cupolas have also been proposed for them: in the latter the whole structure is made to sink by the action of mechanism till the top of the cupola is level with the ground. Types and further details will be found in the article FORTIFICATION AND SIEGECRAFT.

Barbette mountings.

Mountings of the barbette type are much favoured in the British service for guns of types (*a*) and (*b*); one of the most modern is shown in fig. 84, where a 9·2″ B.L. gun, Mark X., is placed upon a Mark V. mounting, a combination which admits of over five aimed rounds in two minutes.

The British 9·2″ B.L. Gun.—Fig. 84 shows a general view of the mounting, fig. 85 a longitudinal section through the cradle on a larger scale. The gun, which is trunnionless, carries a cross-head A and recoils in the cradle C, being supported by its guides D, which slide in longitudinal grooves in the cradle. To this cross-head is attached the buffer cylinder B (see fig. 85) which recoils with the gun, while the piston rod L is attached to the front of the cradle: engaging with the buffer cylinder and in the same axial line is a bronze casting containing two air chambers F and G: the casting is attached to the rear of the cradle, which is supported by trunnions E in the lower carriage. Thus on firing, the gun carries the buffer

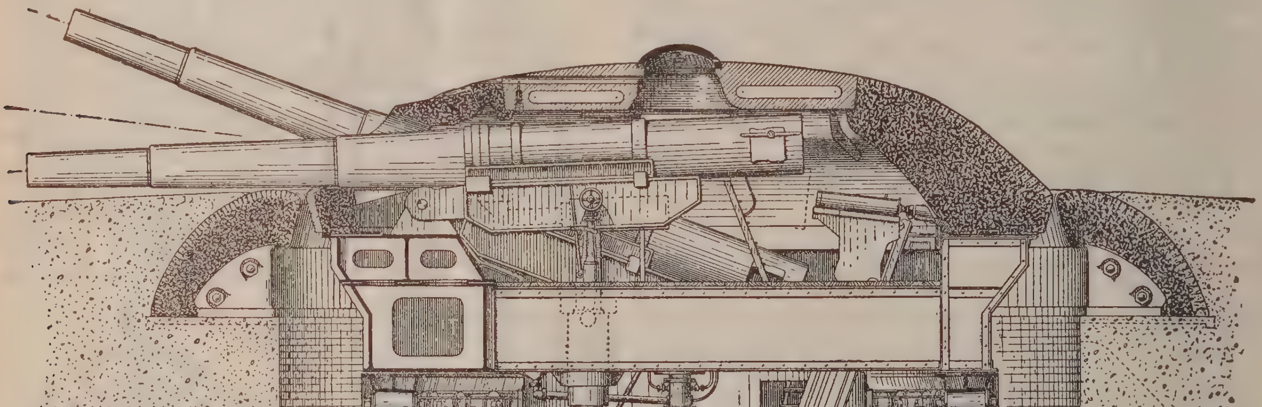
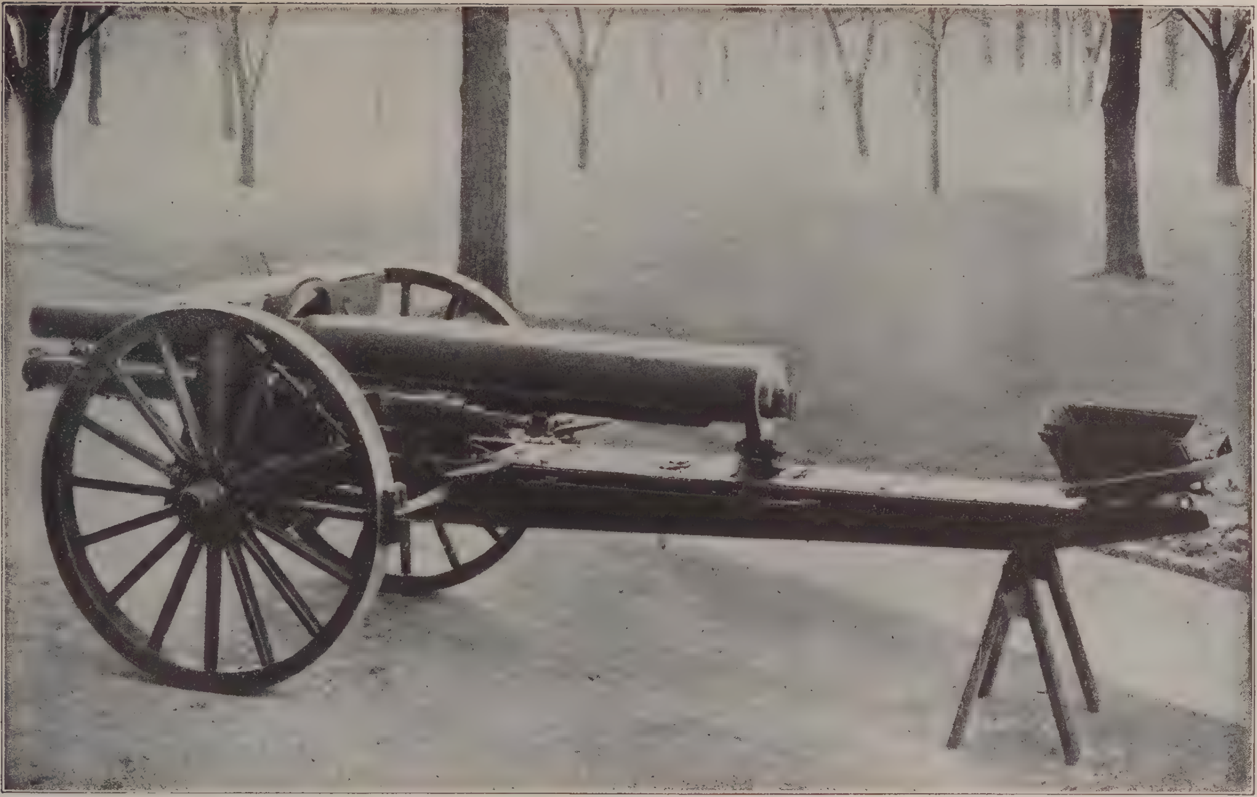
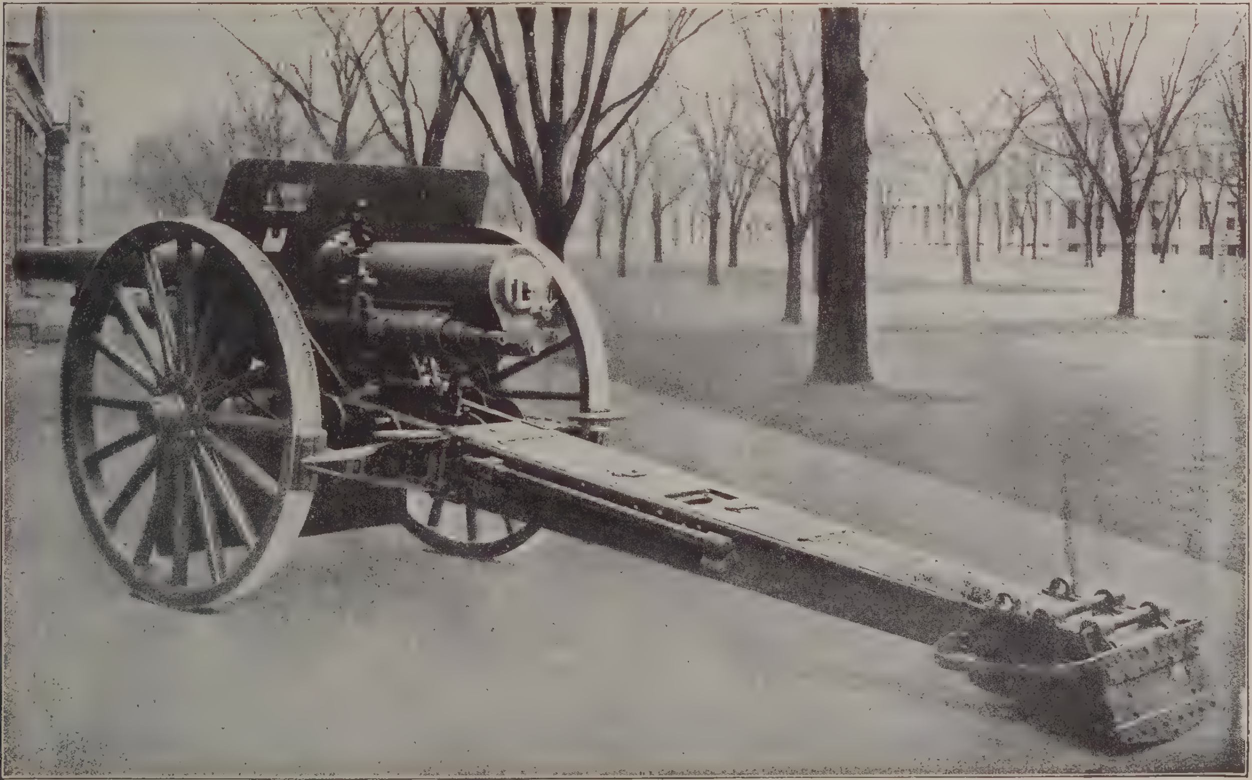


FIG. 82.—Krupp Cupola for two 28-cm. Guns.



From Lieut.-Col. Ormond M. Lissak's *Ordnance and Gunnery.*

FIG. 69.—4·7-IN. SIEGE GUN, TRAVELLING POSITION (U.S.A.).



From Lieut.-Col. Ormond M. Lissak's *Ordnance and Gunnery.*

FIG. 70.—4·7-IN. SIEGE GUN, IN ACTION (U.S.A.).

ORDNANCE

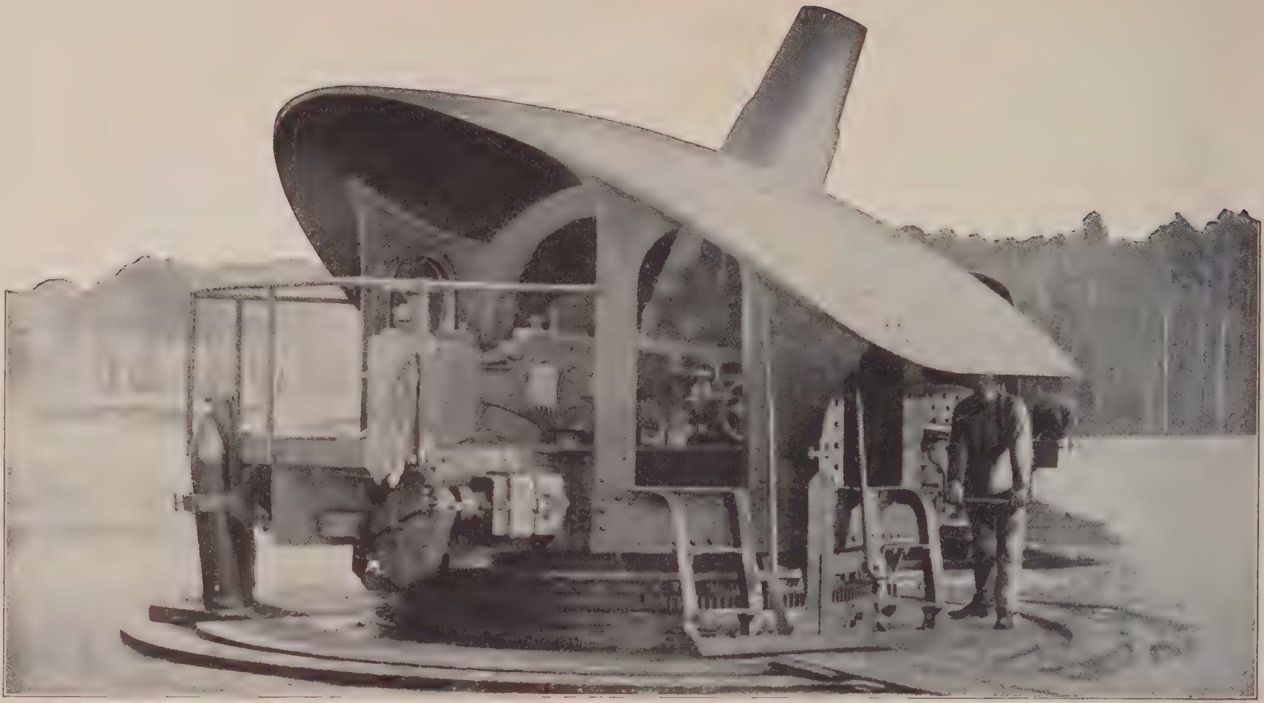


FIG. 83.—KRUPP 11·2-IN. HOWITZER AND SHIELD.

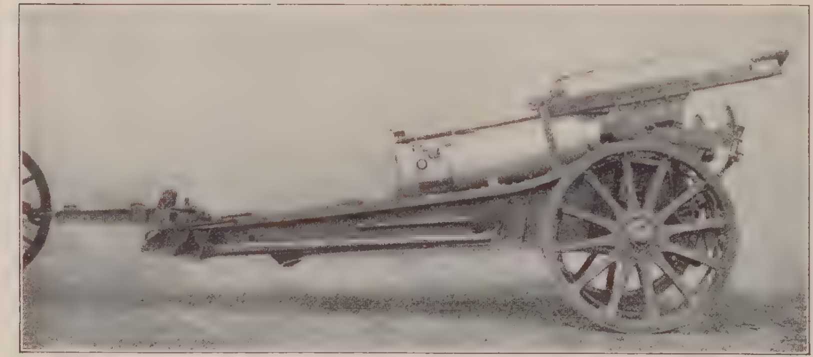


FIG. 76.—KRUPP 8·26-IN. MORTAR, TRAVELLING.

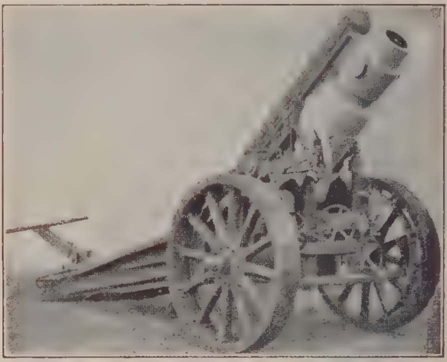


FIG. 77.—KRUPP 8·26-IN. MORTAR, FIRING POSITION.

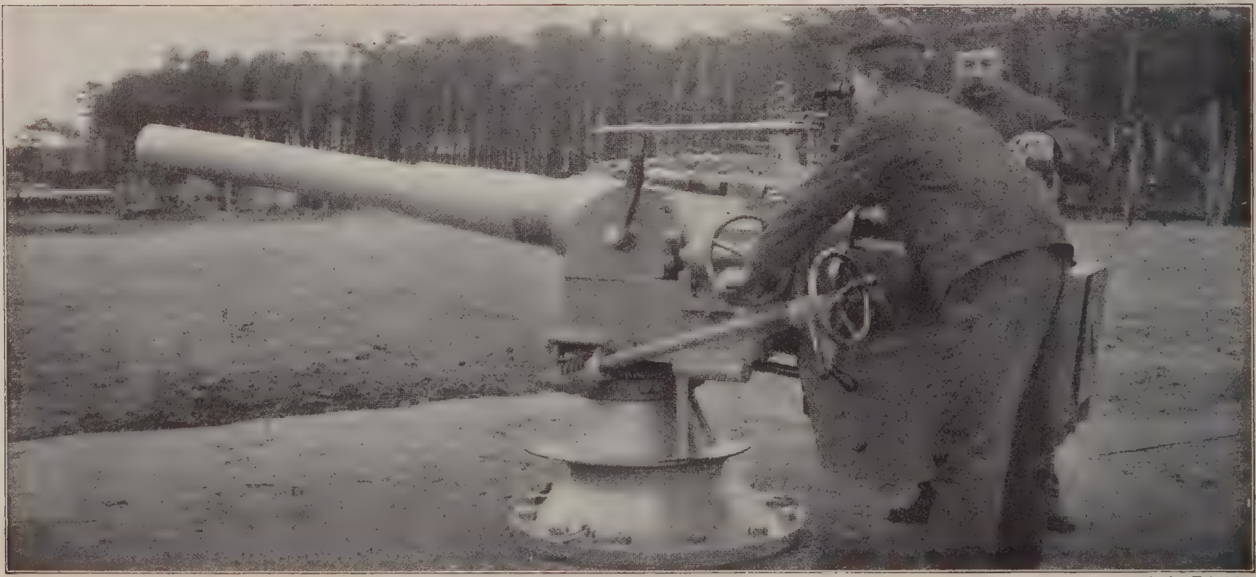


FIG. 88.—KRUPP 3·4-IN. AUTOMATIC GUN.

From photographs by Friedrich Krupp A. G., Essen/Ruhr.

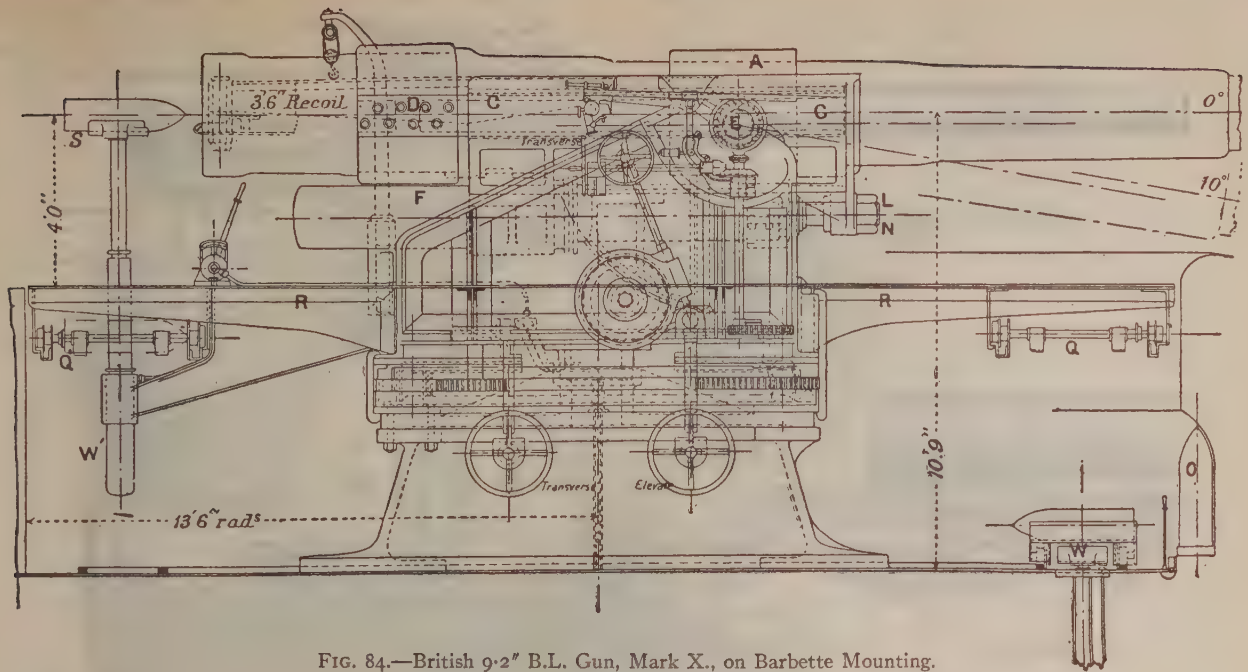


FIG. 84.—British 9·2″ B.L. Gun, Mark X., on Barbette Mounting.

cylinder backwards with it, draws it off its piston rod L and forces it into the air chamber F. The air in the chambers F and G is at a high initial tension and, on recoil, the air in F is further compressed and forced through the valve H into the chamber G. At the conclusion of recoil the air expands and forces the buffer cylinder to the front, which carries with it the gun into its loading position; but the valve H closes and the air has to make its way through a narrow hole before it can act on the end of the buffer, thus preventing violent action, which is further guarded against by the "control ram" M which is bolted into the rear end of the buffer. To prevent leakage of air between the air chamber and the buffer at the gland K the packing employed is a viscous liquid which is in communication by means of the pipe J with the intensifier I. The latter consists of a cylinder containing a piston and rod free to move: the front face of this piston is subject to the pressure of the air in the air chamber, the rear face is in communication with the liquid in the gland. Now, as the piston head is held in position by the pressures on either side of it, and as the effective area of the front face is greater than that of the rear—on account of the rod—the liquid pressure per square inch of the fluid in the gland, &c., must be greater than that of the air in the air chamber, hence the latter cannot escape through the former. The pressure in the chambers F and G is adjusted on preparing for action by an air pump worked by hand. The energy of recoil is further utilized as follows: hydraulic cylinders called compressors are held in the cradle, and in them work rams connected with the cross-head A (see fig. 85): they are also connected with a hydraulic accumulator (not shown) which can be placed in any convenient position in the work, and the power thus stored up be employed for raising the projectiles, for which purpose two lifts are provided. One of these (W) is in the floor of the emplacement, the other (W′) is attached to and moves with the mounting. Underneath and suspended from the circular gun platform RR, which forms a shield, is an overhead railway QQ, on which run trollies, each taking a projectile. The projectiles are stored in the recess shown in section at O. By means of a shell barrow any projectile can be placed on the lift W and raised to a trolley which can be run round over the lift W′, which raises the projectile, as shown at S, to a point suitable for loading.

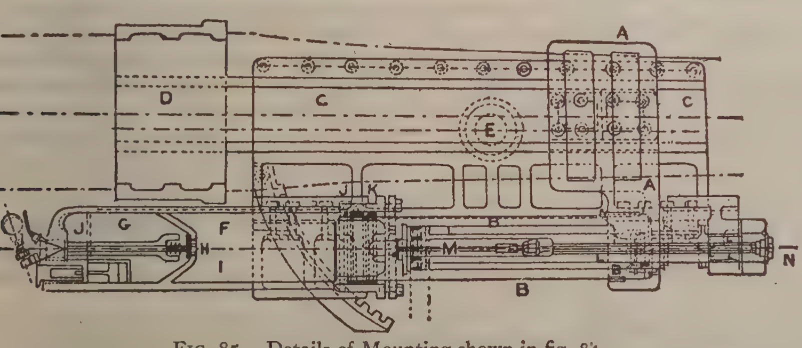


FIG. 85.—Details of Mounting shown in fig. 84.

The British 6″ B.L. Gun.—A typical mounting for guns of type (*b*) is afforded by the British C.P. (central pivot), Mark II. mounting for the 6″ B.L. Mark VII. gun, a combination which admits of six rounds a minute aimed fire. Fig. 86 shows a side elevation of the mounting with half the shield removed; fig. 87 a longitudinal section of part of the cradle through the axis of the buffer. The gun, which is trunnionless, recoils in the cradle A; the latter contains a buffer B and two cylindrical boxes containing springs S. Attached to the breech of the gun is a piston rod C with piston D, the latter having an opening or "port" E, through which the oil passes on recoil, the pressure in the buffer, which would otherwise vary with the velocity of the recoil, being kept constant by the variation in the area of aperture afforded by E. This area is governed by the action of the valve key strip F of varying section, which is inserted in the buffer in such a way that as the gun recoils the port E is constrained to pass over it. On recoil the rods J, which are attached to the gun in rear and screwed into the flanged cylinder H in front, force back the front of the springs S, whose rear ends butt up against the rear of the spring boxes. After recoil the springs return the gun to the firing position. To check the violence of this action a control ram G is made use of: the piston rod has a cylindrical hole in front which, as the gun recoils, becomes filled with oil, and before the piston can come up against the front of the buffer this oil has to be displaced by the thrust of the ram G which checks the forward movement of the gun. The cradle A rests on its trunnions in seatings in the lower carriage and is elevated or depressed by the gear K′. The last-named drives the elevating arc L, which is attached to the cradle at M, the axis of the gun moving parallel to the axis of the cradle. In fig. 86 the lower carriage is almost entirely hidden by the gears carried on it, namely, the elevating gear K, the traversing gear N, which works a spur pinion, gearing into the rack O attached to the pedestal P: the elevation indicators Q and R for recording the angle of elevation of the gun and the bracket S′ which support the 6″ armour plate T. The weight of the lower carriage, cradle and gun is taken by a horizontal ring of hard steel balls resting on the top of a massive forged steel "pivot" U, the lower portion of which is shown supported in the cast-iron pedestal. The elevation indicator consists of a sector Q bolted to the cradle trunnions; to its edge is attached a metal tape, the

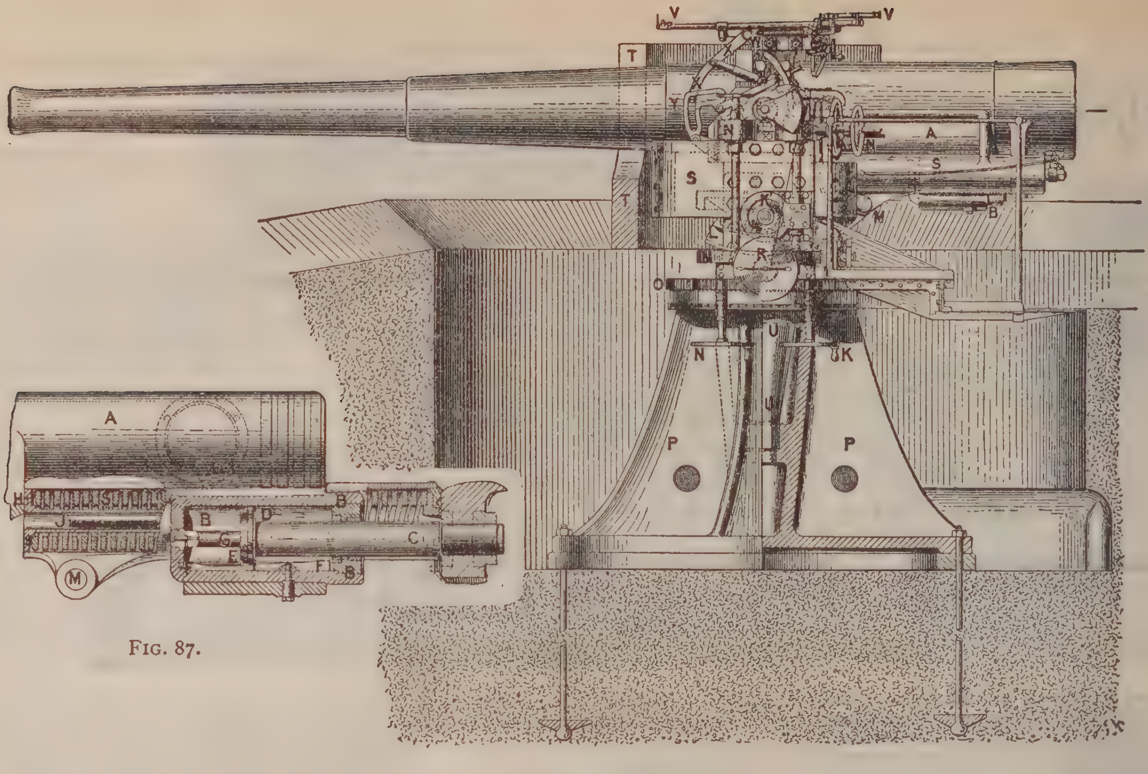


FIG. 87.

FIG. 86.

FIG. 86.—British Mark II. Barbette Mounting for 6″ B.L. Gun.
FIG. 87.—Longitudinal Section of Part of Cradle of Gun shown in fig. 13, through Axis of Buffer.

other end of which is fixed to the spindle supporting a pointer, reading angles of elevation on the drum R. As the gun elevates the tape is paid out, the slack being taken in and the pointer revolved by the action of a clock spring.[1] The mounting carries an automatic sight (see SIGHTS, *Gun Sights*).

The British 12-pr. Q.F. Gun.—A typical mounting for guns of class (*c*) is the British pedestal mounting for the 12-pr. Q.F. gun. This mounting consists of a cradle, a pivot, a pedestal and holdfast. The cradle is a gunmetal casting, provided with trunnions that rest in bearings on the pivot; the gun recoils in the upper portion of the cradle and the lower part of the latter is bored at the rear for an hydraulic buffer and at the front for a running-out spring. The pivot is of steel, is fork-shaped at the top end, where are the trunnion bearings for the cradle; its lower end is conical and fits into bushes in the pedestal, where it is free to revolve but is prevented from lifting by a holding-down screw.[2] The pedestal is bolted down to the platform. The gun has a shoulder-piece and it can be trained and elevated by the layer. It has also an automatic sight.

A typical Krupp mounting of this kind is shown in fig. 88, Plate VI., which represents an 8·8-cm. (3·4″) automatic gun firing, it is stated, 40 aimed rounds in the minute.

The United States 12″ Mortar.—A typical mounting for pieces of class (*d*) is afforded by the United States mounting, model of 1896, for the 12″ B.L. mortar. The piece is mounted in a top carriage or saddle consisting of two arms connected by a heavy web. This saddle is hinged on a heavy bolt and is connected to the front of the turntable (fig. 89). The saddle inclines to the rear and upwards at an angle of 45°, the upper ends forming trunnion bearings: it is supported at a point about one-third of its length from the bolt or fulcrum by five columns of double springs arranged in a row, side by side. The recoil is checked by two hydraulic cylinders, one on each side, the pistons of which are attached to the saddle near the trunnions of the piece. When the mortar is fired the saddle revolves about its fulcrum to the rear and downwards, carrying the mortar and compressing the spring columns until the action is stopped by the hydraulic buffers; the springs then assert themselves and return the piece to the firing position. The mortar must always be brought horizontal for loading.

The fighting units of coast artillery in the British service are the fire command, the battery command and the group. The limits of a fire command are governed by the possibility of efficient surveillance and control that can be exercised by an individual, and these limits vary much from time to time. Usually a number of forts or emplacements are included in a fire command. The fire command is broken up into battery commands, in every one of which it must be possible for its commander actually to take charge of the guns therein contained in all phases of action. The battery command is divided up into gun groups, each consisting of one or more pieces of like calibre, nature and shooting qualities. As a rule a fire commander is a field officer, a battery commander a major or a captain, a gun group commander a subaltern or senior N.C. officer. In connexion with coast artillery range-finders (*q.v.*) and electric lights (see COAST DEFENCE) are installed and electric communications established for the chain of command. (J. R. J. J.)

V. NAVAL GUNS AND GUNNERY

In dealing with naval guns and gunnery, we shall take the British navy as the basis. At the close of the 19th and at the beginning of the 20th century it appeared that a type of British battleship (see SHIP) had been evolved which was stable as regards disposition of armament, and that further advance would consist merely in greater efficiency of individual guns, in improvements of armour rendering possible the protection of greater areas, and in changes of engine and boiler design resulting in higher speeds. The "Majestic," "Glory," "Exmouth," "London" and "Bulwark" classes differed from each other only in such details, all of them subordinate to the main *raison d'être* of the battleship, *i.e.* the number and nature of the guns which she carries.

The strength and disposition of the armaments of the ships of these classes were identical except in small details (see fig. 90). In every case the main armament consisted of a pair of 12-in. guns forward and a pair aft, each pair enclosed in a hooded barbette, which was more commonly designated a turret. The turrets were on the midship line, and the guns in each commanded an arc of fire of 240°, *i.e.* from right ahead to 30° abaft the beam on either side in the case of the fore turret, and from astern to 30° before either beam in the case of the after turret. The secondary armament, consisting of twelve 6-in. guns, was also symmetrically disposed. Two guns on either side (four in the "Majestic" class) were mounted with arcs of fire of from 60° before to 60° abaft the beam, while two guns each side forward and two aft (one forward and one aft in the "Majestic" class) fired through similar arcs to the turret guns, but on their own sides only. Four of these 6-in. guns were mounted on either side of the main deck and two on either side of the upper deck, all being enclosed in casemates.

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[1] The elevation indicators are now read on a plate provided with a spiral groove, which guides a stud on the reader along the scale of graduations.

[2] In a later mark there is no holding-down screw for pivot.

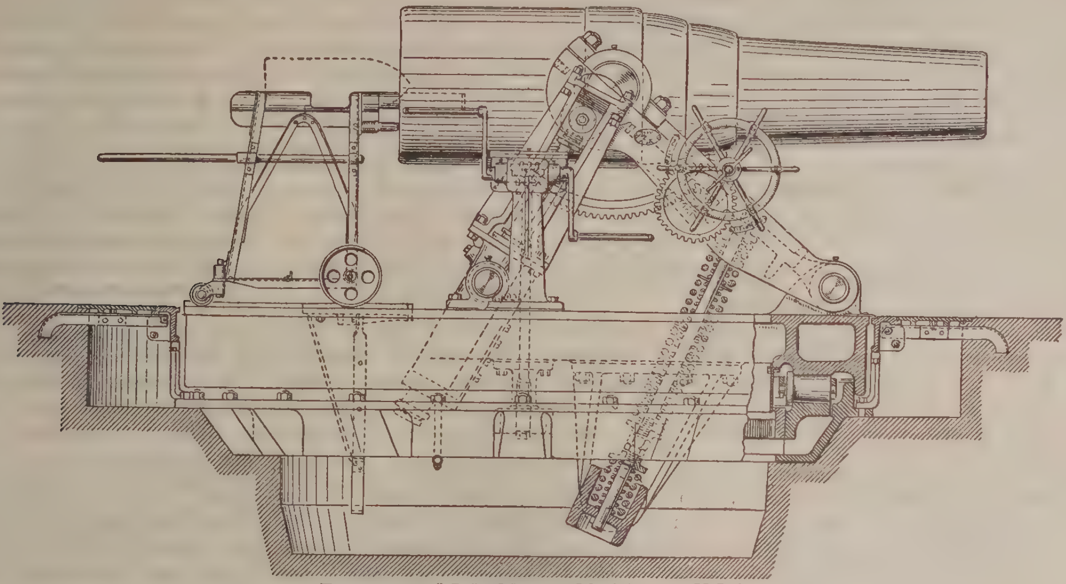
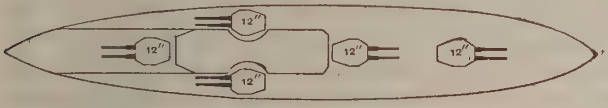
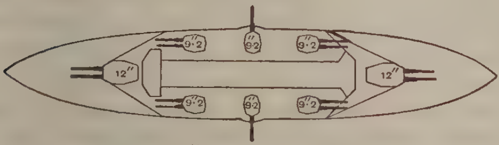


FIG. 89.—12″ B.L. Mortar, Model 1896, U.S.A.

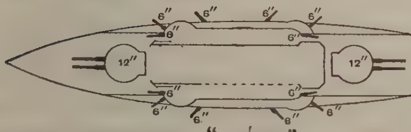
In the armoured and large protected cruisers built contemporaneously with these classes of battleships, the 9·2-in. gun had been largely mounted, and it was the improvements brought about by practical experience in the rate and accuracy of fire of this gun that suggested its adoption in battleships to replace the whole or a part of the 6-in. armament. During the period in which the battleships referred to above were constructed, the idea of the functions of the respective divisions of the armament was that the 12-in. guns were to injure the enemy's vitals by piercing his armour with armour-piercing shot or shell, while the business of the 6-in. guns was to cover him with a hail of shells of large capacity which were to kill and demoralize his personnel, pierce his funnels, destroy any navigational or sighting appliances which were exposed, set his woodwork on fire and render extinction of the fires impossible, and by piercing or bursting on unarmoured portions of his side diminish his reserve of buoyancy and so impair his sea-going qualities.



"Dreadnought"



"Lord Nelson"



"London"

FIG. 90.—Diagrams showing Disposition of Armament in Typical Ships.

These ideas were gradually losing favour; it was realized that the damage done by an armour-piercing shot, whether or not it hit and pierced armour, was limited to its own path, while that done by an armour-piercing shell striking an unarmoured portion of the ship's side was inconsiderable as compared with that effected by a common shell of the same calibre. Further, the area of side, by piercing which an armour-piercing projectile would reach any portion of the propelling machinery or magazines of an enemy, was so small compared with the whole exposed area of his side and upper works that it was scarcely advantageous to fire at it projectiles, the effectiveness of which, if they struck another portion of the enemy, was small in comparison with that of other projectiles which might equally well be fired from the same gun. Again, the lessons of practical experience showed that ships might be and were defeated by shell fire alone, while their armour remained unpierced, and propelling machinery and magazines intact.

All these considerations led to the conclusion that it was to intensity of shell-fire, and especially to the fire of large capacity and high explosive shell, that attention should be directed. At the same time, while the rate of fire of the 6-in. guns, to which great attention had been paid, remained stationary or nearly so, the rate of fire of the 9·2 in. and 12-in. guns had considerably improved, and their ballistic powers rendered possible more accurate firing at long ranges than could be effected with the 6-in. guns. The explosive effect of a shell is said to vary as the square of the weight of its bursting charge. The bursting charge, with shell of the same type, bears a constant proportion to the weight of the shell. Now the weight of the 12-in. shell is 850 ℔, that of the 9·2-in. 380 ℔, that of the 6-in. 100 ℔. Hence it would require fourteen 6-in. shells to produce the same effect as one 9·2-in., and seventy-two to produce the same effect as one 12-in. shell, consequently the 6-in. gun to produce the same shell effect as the 12-in. or 9·2-in. gun must fire 72 times, or 14 times, respectively, faster. The rate of fire of guns in action depends upon a variety of conditions, an important one being that of smoke interference, which tends to reduce the maximum rate of fire of the smaller guns nearer to that practicable with the heavier guns, but the rate of fire of the three guns in question, under battle conditions, is in the approximate proportions of 1: 1·5: 4, which would thus produce a shell effect (supposing the hits made by each type of gun to bear a fixed proportion to the rounds fired), in the proportions of 72: 22: 4, for the 12-in., 9·2-in. and 6-in. guns respectively. This argument of course takes no account of the probably greater effect produced by the dispersion of the larger number of hits of the smaller gun over the exposed area of the target, nor, on the other hand, does it take account of the greater armour-piercing power of the 12-in. shell which would have the result that a larger proportion of the hits from the smaller gun would be defeated by the enemy's armour, and so prove innocuous.

The shell effect forms a strong argument for the weight available for the heavy gun armament of a ship being disposed of in the form only of the heaviest gun available. Another strong argument is that deduced from the fact already stated, that, as the calibre of the gun increases, its ballistic powers enable accurate shooting to be made at a longer range.

The accuracy of a gun at any range depends mainly, for practical naval purposes, on what is known as the "dangerous space," or the limit within which the range must be known in order that a target of a given height may be struck. Again, the dangerous space at any range depends upon the remaining velocity of the projectile at that range, which, as between guns of different calibres but with the same initial muzzle velocity, is greater, the greater the calibre of the gun and weight of projectile, the advantage possessed by the larger gun in this respect being much increased at great ranges. As a practical example, for a target 30 ft. high at a range of 8000 yds., the dangerous spaces of modern 12-in., 9·2-in. and 6-in. guns, which do not differ greatly in muzzle velocity, are 75, 65 and 40 yds. respectively. At whatever range a naval action is to be fought, it is evident that there must be a period during which the enemy is within the practical 12-in. gun range, and outside the practical 6-in. gun range, and that during this period the weight allotted to 6-in. guns will be wasted, and this at the outset of an action, when it is more important than at any time during its progress to inflict damage on the enemy as a means of preventing him from inflicting damage on ourselves. But if all the weight available be allotted to 12-in. guns, the whole of the armament which will bear on the enemy will come into action at the same time, and that the earliest, and consequently most advantageous, time possible. This train of argument led to the substitution of 9·2-in. guns in the 8 "King Edward VII." class (the first of which was completed in 1905) for the upper deck 6-in. guns, and eventually in the "Lord Nelson" and "Agamemnon" (completed in 1908) to the abolition of the 6-in. armament, which was replaced by ten 9·2-in. guns.

At the beginning of the present century the subject of "fire control" began to receive considerable attention, and a short statement is necessary of the causes which render essential an accurate and reliable system of controlling the fire of a ship if hits are to be made at long range. In the first place, even with the 12-in. gun, the range must be known with considerable nicety for a ship to be hit. At a target 30 ft. high, at 8000 yds., for example, the range on the sights must be correct within 75 yds. or the shot will fall over or short of the target. No range-finder has yet proved itself reliable, under service conditions, to such a degree, and even if one were found, it could not be relied upon to do more than place the first shot in fair proximity to the target. The reason for this lies in the distinction which must be drawn between the distance of a target and its "gun range," or, in other words, the distance to which the sights must be adjusted in order that the target may be hit.

This gun range varies with many conditions, foremost among which are the wear of the gun, the temperature of the cordite, the force and direction of the wind and other atmospheric conditions. It can only be ascertained with certainty by a process of "trial and error," using the gun itself. The error, or distance which a shot falls short of or beyond the target, can be estimated with a greater approach to accuracy the greater the height of the observer. It is the process of forming this estimate which is termed "spotting," a duty the performance of which calls for the exercise of the most accurate judgment on the part of the "spotter," and which requires much practice in order that efficiency may be secured. In practice, the first shot is fired with the sights adjusted for the distance of the target given by the range-finder, corrected as far as is practicable for the various conditions affecting the gun range. The first shot is spotted, and the result of the spotting observations governs the adjustment of the sights for the next shot, which is spotted in its turn, and the sights are readjusted until the target is hit. From this time onwards it is (in theory) only necessary to apply the change in range, due to the movements of our own ship and of the enemy, for the interval between successive shots, in order to continue hitting. This change of range, which may be considerable (*e.g.* 1000 yds. per minute in the extreme case of ships approaching each other directly, and each steaming at the rate of 15 knots), is in practice extremely difficult to estimate correctly, and the spotting is consequently continued in order to rectify errors in estimating the rate of change in range. For various reasons the "gun range" which has been referred to is not the same for different natures of guns. This is mainly on account of the difference in the height attained by their projectiles in the course of their respective trajectories. While it is possible, by careful calibration (*i.e.* the firing from the several guns of carefully aimed rounds at a fixed target with known range and under favourable conditions for practice), to make the shots from all guns of the same nature fall in very close proximity to each other when the sights of all are similarly adjusted, it has not been found possible in practice to achieve this result with guns of different natures. Consequently guns of each nature must be spotted for independently, and it is obvious that this adds considerably to the elaboration and complication of the fire control system.

This constitutes one of the reasons for the adoption of the uniform armament in the "Dreadnought" and her successors; another important reason lies in the fact that with the weight available for the heavy gun armament disposed of in a small number of very large guns, a greater proportion of these guns can be mounted on the midship line, and consequently be available for fire on either side of the ship (see fig. 90). Thus in the "Dreadnought," eight of her ten 12-in. guns can bear through a considerable arc on either beam, while in the "Lord Nelson," although all her four 12-in. guns can bear on either beam, half at least of her 9·2-in. armament (*i.e.* that half on the opposite side to the enemy) will be at any moment out of bearing, and consequently be for the time a useless weight. The same principle of a uniform armament of 12-in. guns has been adopted in the "Invincible" type, the only large cruisers designed since the inception of the "Dreadnought." Thus the 12-in. gun forms the sole heavy gun armament of all battleships and large cruisers of the "Dreadnought" era. The gun so carried is known as the Mark X., it is 45 calibres in length, and fires a projectile weighing 850 ℔ with a charge of cordite of 260 ℔, resulting in a muzzle velocity of 2700 ft. per second. The Mark XI. gun was designed to be mounted in the later "Dreadnoughts." Following the same line of development as resulted in the Mark X. gun, it is longer, heavier, fires an increased charge of cordite, and has a higher muzzle velocity, viz. of 2960 ft. per second. This gun appears to mark the climax of development along the present lines, since the price to be paid in greater weight, length and diminished durability of rifling is out of all proportion to the small increase in muzzle velocity. Further developments would therefore be looked for in some other direction, such as the adoption either of a new form of propellant or of a gun of larger calibre. A modern gun of 10-in. calibre is found in the battleships "Triumph" and "Swiftsure." The next gun in importance to the 12-in. is the 9·2-in., which forms part of the armament of the "Lord Nelson" and "King Edward VII." classes of battleships, and the principal armament of all armoured cruisers (excepting the "County" class) antecedent to the "Invincibles." The latest gun of this calibre has developed from earlier types in a similar manner to the 12-in., that is to say, it has experienced a gradual increase in length, weight, and weight of charge, with a consequently increased muzzle velocity. The latest type, which is known as the Mark XI., and is mounted in the "Lord Nelson" and "Agamemnon," is 50 calibres in length, weighs 28 tons, and with a charge of cordite of 130 ℔ gives to a projectile of 380 ℔ a muzzle velocity of 2875 ft. per second. The 7·5-in. gun forms the secondary armament of the "Triumph" and "Swiftsure," and is mounted in the armoured cruisers of the "Minotaur," "Duke of Edinburgh" and "Devonshire" classes. The 6-in. gun, of which there are a very large number afloat in modern, though not the most recent, battleships, and in armoured and first and second class cruisers, is the largest gun which is worked by hand power alone. For this reason, and on account of its rapidity of fire, it was for many years popular as an efficient weapon. It was evolved from the 6-in. 80-pounder B.L. gun, constructed at Elswick, which was the first breech-loader adopted by the Royal Navy, and whose development has culminated in the 6-in. Mark XI. gun of the "King Edward VII." class and contemporary cruisers, which fires a 100-℔ projectile with a muzzle velocity of 2900 ft. per second. It has only now passed out of favour on account of its inferior hitting power at long range as compared with that of guns of larger calibre, and as a secondary armament of 6-in. guns is still being included in the latest battleship designs of more than one foreign navy—notably that of the Japanese, with their practical experience of modern war at sea—its abandonment in the British Navy can scarcely be considered final. The 4-in. Q.F. gun is mounted in the third-class cruisers of the "P" class as their main armament, and an improved gun of this calibre, with muzzle velocity of about 2800 ft. per second, is mounted in the later "Dreadnoughts," as their anti-torpedo-boat armament.

The increase in size of modern torpedo craft and the increased range of modern torpedoes has led to a reconsideration of the type of gun suitable for the protection of large ships against torpedo attack. The conditions under which the anti-torpedo-boat armament comes into play are the most unfavourable possible for accurate gun-fire. The target is a comparatively small one; it comes into view suddenly and unexpectedly; it is moving rapidly, and the interval during which the boat must be stopped, *i.e.* that between her being first sighted and her arrival at the distance at which she can expect to fire her torpedo with success, is in all probability a very short one. Moreover, in the great majority of cases the attack will be made at night, when the difficulties of rapid and correct adjustment of sights, and of range-finding and spotting, are intensified. Two requirements then are paramount to be satisfied by the ideal anti-torpedo-boat gun: (1) it must have a low trajectory, so that its shooting will not be seriously affected by a small error in the range on the sights; (2) one hit from it must suffice to stop a hostile destroyer.

For many years it was considered that these requirements would be met by the 12-pounder, which was the anti-torpedo-boat gun for battleships from the "Majestics" to the "Dreadnought," the 12-pounders mounted in the "King Edwards" and the "Dreadnought" being of a longer and heavier type, giving a higher muzzle velocity. The introduction of a larger gun has, however, been considered desirable, and a 4-in. gun of new type is mounted in the later "Dreadnoughts," while in the older battleships and large cruisers with secondary armaments it is considered by many officers that the 6-in. guns will prove to be the most effective weapon against torpedo craft. The gun armament of destroyers being required to answer much the same purpose as the anti-torpedo-boat armament of large ships, namely, to disable hostile torpedo craft, the type of gun used has followed a similar line of development.

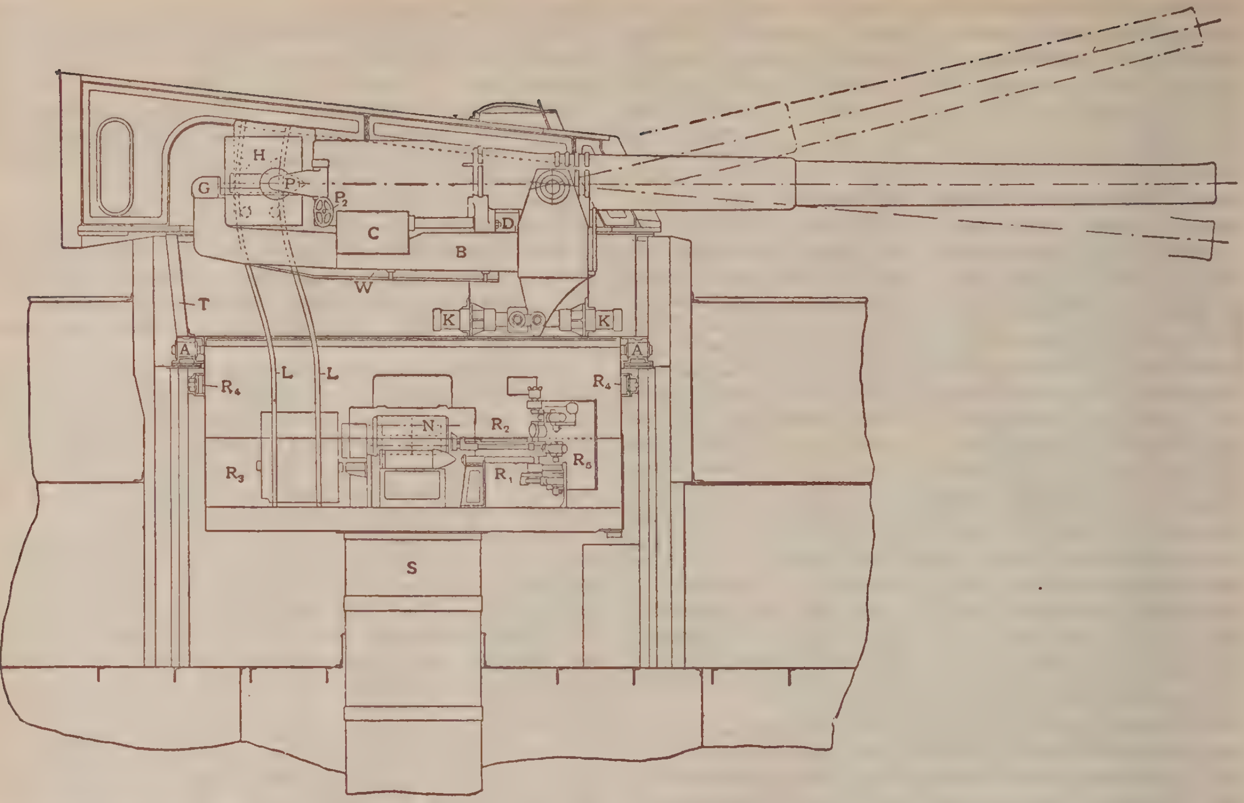
Starting with 6-pounders in the first destroyers built, the majority of the new destroyers have a fixed armament consisting of one 12-pounder forward, and four 6-pounders. This armament has been changed in the larger destroyers to one of 12-pounders only, while the latest ocean-going destroyers have two 4-in. guns. Owing, however, to the strength of the decks of such craft being insufficient to withstand the stresses set up by the discharge of a gun giving very high muzzle velocity, the 4-in. gun for use in light craft is one giving 2300 ft. per second muzzle velocity only and has a very long recoil. The 6-pounder and 3-pounder Q.F. guns are no longer being mounted as part of the armaments of modern ships. A very high rate of fire was attained in the "semi-automatic" mounting of the 3-pounder, which was last fitted in the "Duke of Edinburgh" class, but for reasons already given guns of this type are no longer required, and the 3-pounder is retained only as a boat gun for sub-calibre practice.

All double-banked pulling boats and all steam-boats are fitted with arrangements for mounting one or two guns, according to the size of the boat; the object of the boat armaments being for use in river operations, for covering a landing, or in guard-boats. Three descriptions of gun are used, the 12-pounder 8 cwt. and 3-pounder, light Q.F. guns, and the Maxim rifle-calibre machine gun.

Gun-Mountings.—Gun mountings in the British navy may be divided broadly into two classes, power-worked and hand-worked mountings. The former class includes the mountings of guns of all calibres mounted in turrets or barbettes, also of 9·2-in. guns mounted behind shields; the latter class includes mountings of guns of all sizes up to the 7·5-in. which are mounted in batteries, casemates or behind shields.

Hydraulic power has been adopted almost universally in the British navy for power-worked mountings, although electricity has been experimented with, and has been largely applied in some foreign navies. The principal advantages of hydraulic, as compared with electric, power are its comparative noiselessness and reliability, and the ease with which defects can be diagnosed and rectified. On the other hand, electric power is more easily transmitted, and is already installed in all ships for working electric light and other machinery, whereas hydraulic power, when used, is generally installed for the purpose of working the guns only. The 12-in. guns in the "Majestic" class, following the practice with the earliest heavy B.L. guns, were loaded normally at extreme elevation of 13½°, and the turret had to be trained to the fore and aft line and locked there for each occasion of loading. An alternative loading position was also provided, in which the guns could be loaded at 1° of elevation and with the turret trained in any direction. Loading in the alternative position could, however, only be continued until the limited supply of projectiles which could be stowed in the turret was exhausted. Experience showed that a greater rapidity of fire could be obtained by the use of this "all round" loading position, as it was termed, and in the latest ships of the "Majestic" class, and in subsequent battleships, the fixed loading position has been abandoned.

The details of recent 12-in. mountings vary considerably, a drawing of one of the most recent being shown in fig. 91, for which thanks are due to Messrs Vickers, Sons & Maxim, but in the majority of cases there is a "working chamber" revolving with the turret. A fixed ammunition hoist brings the shell and cartridges from shell-room and magazine respectively into the working chamber, where they are transferred to a cage which takes them up, by hydraulic power, to the rear of the gun. The gun is strapped by steel bands to a cradle (see fig. 91) which moves in and out along a slide on recoil, the gun always remaining parallel to the slide. Gun, slide and cradle are pivoted for elevation on trunnions carried in trunnion bearings fixed to the structure of the turret, and the whole moving weight is balanced with the gun in the "run out" position. The recoil of the gun on firing is taken up by a hydraulic press placed underneath the slide, and the gun is run out again into the firing position by hydraulic power. Loading is carried out by means of a hydraulic rammer, with the gun in the "run out" position, and at an angle of elevation which varies with different mountings. In the most recent mountings loading can be carried out with the gun at any elevation, thus affording considerably greater facility to the gun-layer for keeping his sights on the target during the process of loading, and so increasing the rate of fire by enabling the gun to be discharged immediately the loading operations are completed. Elevating is by hydraulic power, and is effected by cylinders placed underneath the slide, the pistons working on an arm projecting downwards. Turret turning engines are also hydraulic, and much attention has been given of late years to the perfection of elevating and turning gear such as will enable the turret or gun to respond instantly to the wish of the gun-layer, and to move either with considerable rapidity, or very slowly and steadily as would be the case when following a target at long range and with but little motion on the ship. The breech is opened and closed by hand or by hydraulic



From a drawing supplied by Messrs. Vickers, Sons & Maxim.

FIG. 91.—Diagram of 12-in. Gun Mounting, "Dreadnought" type.

A, Roller ring.
B, Gun slide.
C, Recoil buffer.
D, Gun cradle.
G, Rammer.
H, Loading cage.
K, Elevating presses.
L, Guide rail for loading cage.
N, Trunk cage.
P_1, Breech block in open position.
P_2, Breech operating hand wheel.
R_1, Transferring rammer projectiles from trunk cage to gun-loading cage.
R_2, Transferring rammer for powder charges from trunk cage to gun-loading cage.
R_3, Transferring chamber.
R_4, Training rack.
R_5, Training engine.
S, Rotating trunk.
T, Turntable.
W, Casing for chain rammer.

power, and a douche of water or blast of air, or a combination of both, removes any smouldering fragments of cordite or cartridge material before a fresh round is loaded.

Although there is little difference in principle between the arrangements of the mountings in the later "Majestics" and those in the "Dreadnought," improvements in detail have enabled the interval between successive rounds to be reduced from about 55 seconds in the former case to 25 or 30 seconds in the latter.

In the turrets containing 9·2-in. and 7·5-in, guns, which exist in most British armoured and first-class protected cruisers, the moving weights are, of course, not so large, and, as might be expected, the assistance of hydraulic machinery is not necessary in so many operations. A drawing of a typical 9·2-in. gun and mounting is shown in fig. 92.

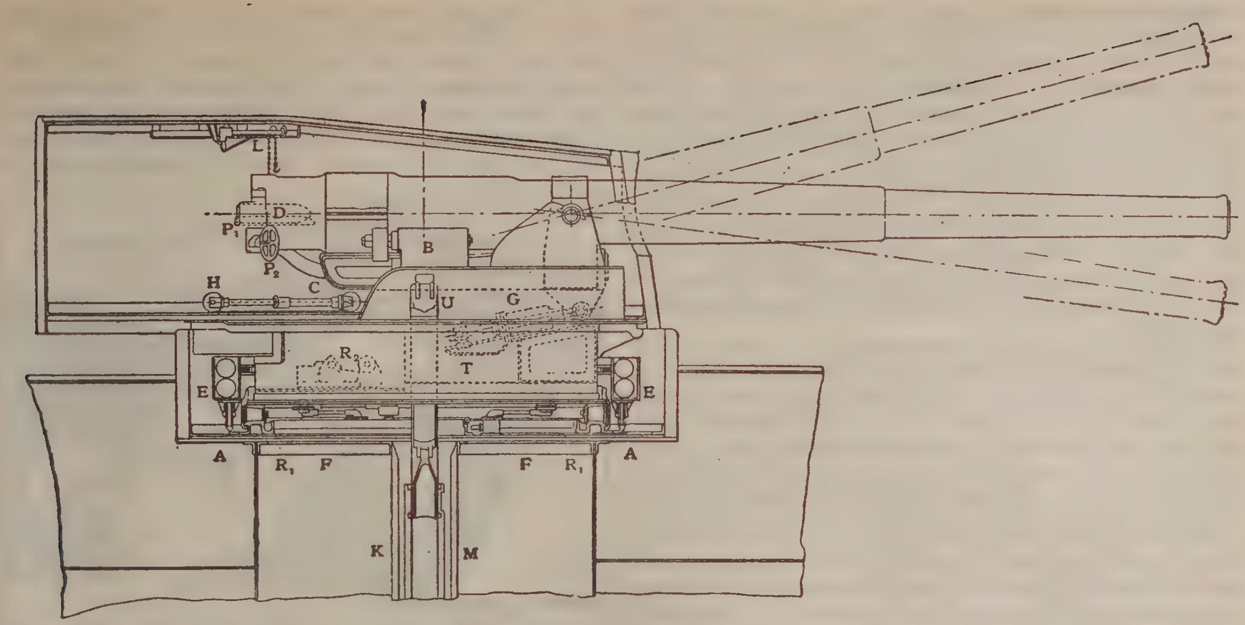
Training the turret and elevating the guns are, however, in all cases performed by hydraulic power, as is the raising of the projectiles to their place on the loading tray in rear of the gun, but the breech is opened and closed, and the charge and projectile rammed home, by hand power only, while the gun, after recoil, is forced out again to its firing position by means of springs. A ready supply of thirty-two projectiles is stowed in a "shell carrier," which is a circular trough running on rollers round the turret, but independently of it. When a projectile is required to be loaded into the gun, the shell carrier is rotated until the required projectile is under a hatch in rear of the gun, when the projectile is raised by a hydraulic press on to a swinging loading tray. It is intended that the shell carrier shall be replenished direct from the shell-room during the pauses of an engagement. A new type of 9·2-in. mounting has been installed in the "Lord Nelson" and "Agamemnon," in which greater use is made of hydraulic power with a view to improving rapidity of fire. In this mounting, each projectile is brought up from the shell-room as it is required, and the loading operations are performed by hydraulic power instead of by hand.

The "King Edward VII." class of battleships and "Duke of Edinburgh" class of cruisers are the last ships in which any 6-in. guns have been mounted, and with the exception of the 7·5-in. guns in the "Triumph" and "Swiftsure," these are the largest guns which are worked entirely by hand. Other hand-worked guns are the 4-in. and 12-pounder, which are mounted in small cruisers and destroyers.

The principles of the 6-in., 4-in. and 12-pounder mountings are similar. The rear part of the gun is partially enclosed in a metal cradle, which carries the recoil cylinder and running out spring box. The gun and cradle are balanced for elevation about trunnions on the cradle, which fit into trunnion bearings on the carriage. The latter carries the elevating and training gear, and the whole moving weight is borne by a pivot pin which rotates on a ball bearing. The gun recoils in the line of fire, and the energy of recoil is absorbed by means of the recoil piston, whose rod is secured to the gun, passing over a valve key secured to the cradle, in such a way as to produce a channel of varying sectional area through which the liquid in the recoil cylinder must pass from one side of the piston to the other. Springs run the gun out again after firing into its original position. The breech is opened by the single motion of a hand lever. A "bare" charge is used in the 6-in. and 4-in. guns, with the de Bange type of obturation, while a brass cartridge case has been retained with the 12-pounder, as with the earlier Q.F. guns.

Firing is by electricity, percussion being available as an alternative if required, and the current is usually taken off the dynamo mains of the ship.

Sighting.—The great advances recently made in accuracy of fire have been rendered possible, to a very great extent, by the use of telescopic sighting apparatus. Arrangements are made in all modern sights for the bars or disks which carry the range graduations to be of considerable length or diameter respectively, in order that no difficulty may be found in adjusting the sights for every 25 or 50 yds. of range. In the larger hand-worked mountings, where the laying of the gun for elevation and for direction is effected by two men on opposite sides of the gun, the sights used by them are "cross-connected," *i.e.* connected by rods and gearing to one another in such a way that, initial parallelism of the axes of the two telescopes having



From a drawing supplied by Messrs Vickers, Sons & Maxim.

FIG. 92.—Diagram of a 9·2-in. Gun and Mounting, "Hogue" type.

A, Roller ring.
B, Recoil buffer.
C, Gun cradle slide frame.
D, Loading tray.
E, Shell carrier.
F, Pressure water pivot pipes.
G, Elevating press.
H, Shell-lifting press.
K, Fixed armoured trunk.
L, Radial shell-lifting crane.
M, Axial powder hoist.
P_1, Breech block.
P_2, Breech operating hand-wheel.
R_1, Training rack.
R_2, Training engine.
T, Turntable.
U, Powder door.

been secured, the adjustments to one sight made by the sight-setter are simultaneously effected at the sight on the opposite of the gun.

In practice with the 6-in. and 4-in. guns, one man is responsible for the laying of the gun for direction, and has consequently only to think about the coincidence of the vertical cross-wire with the target, while another man, who also fires, keeps the gun laid for elevation, and is responsible only for the coincidence of the target with the horizontal cross-wire. The 12-pounder has one sight only, one man being considered sufficient to keep the gun laid for elevation as well as for direction, and to fire. It is essential that the sights shall be unaffected by the recoil of the gun, so that they can be adjusted up to the moment of firing by the sight-setter, and that it shall not be necessary for the gun-layer to remove his eye from the telescope while the gun is being fired and reloaded. It is also essential that the sights shall move automatically in elevation and direction with the gun. These two requirements are easily met in the hand-worked mountings by the attachment of the sights to the cradle, which does not move on recoil, and remains constantly parallel to the gun; but in turret mountings the case is more complicated and involves greater complexity of gearing.

The older turret sighting arrangement consisted of two horizontal shafts, one for each gun, running across the turret, which were rotated by pinions gearing into racks underneath the gun-slides, the latter remaining of course always parallel to the guns. Pinions keyed to these shafts geared in their turn into racks formed on vertical sighting columns in the sighting positions, these columns, which carried the sighting telescopes, accordingly moving up and down with the guns. With this arrangement an appreciable amount of backlash was found to be inevitable, owing to the play between the teeth of the several racks and pinions, and to the torsion of the shafts, and the arrangement was also open to the objection that the telescopes were much exposed to possible injury from an enemy's fire. These defects have been very largely obviated by the "rocking motion sights," which have been fitted in the turrets of the latest British battleships and cruisers. In these sights a sight-bracket is secured to and rotates with the trunnion of the mounting; the sight-carrier and telescope move along the top of the sight-bracket, on a curved arc of which the trunnion is not the centre. When the sight is at zero, the telescope is parallel to the axis of the gun, while to adjust the sight, the sight-carrier with telescope is moved along the curved arc by means of a rack and pinion a distance corresponding to the graduations shown on the range dial, which is concentric with the pinion.

Organization.— The organization of a large ship for action is necessarily highly elaborate. Among the officers, next to the captain, the most important duties are probably those of the fire control officer. He is in communication by telephone or voice tube with each of the several units composing the ship's armament. This office is usually filled by the gunnery lieutenant. In the conning tower with the captain is the navigating officer, who attends to the course and speed of the ship, assisted by petty officers to work the wheel and engine-room telegraphs. The torpedo lieutenant, or another officer at the torpedo director, is also in the conning tower, prepared to fire the torpedoes if opportunity offers. Other officers of the military branch, and marine officers, are in charge of various sections of the "quarters."

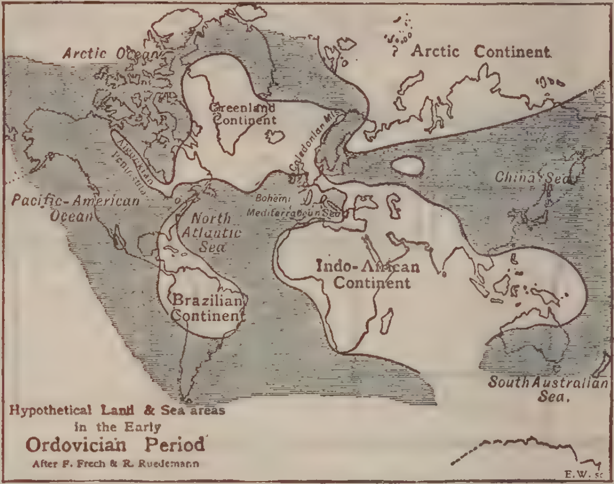
The rate of advance in naval gunnery has been much accelerated since 1902. The construction of the "Dreadnought," which embodied a new principle both in nature and disposition of armament, the rise of the United States and Japanese navies to the first rank, and the practical experience of the Russo-Japanese war, were all factors which contributed to the increase of the normal rate of advance due to progress in metallurgy and engineering science. In the British as well as in other navies, notably those of Germany, the United States and Japan, ever-increased attention is being devoted to the attainment of a rapid and accurate shell-fire, and large sums are being expended upon fire control instruments and elaborate aiming and sighting appliances. Size of armaments, power of guns, resistance of armour, efficiency of projectiles, and, above all, rapidity and accuracy of fire, all seem to be advancing with giant strides. But there are two important ingredients of naval gunnery which are not subject to change: the human factor, and the factor of the elements—wind, sea and weather. The latter ensures at any rate one datum point to the student of the science, that is, that the extreme range in action is limited by the maximum distance at which the enemy can be clearly seen, which may be considered to be a distance of 8000 to 10,000 yds. The permanence of the human factor assures that, however great the advance in material, and, provided that no great discrepancies exist in this respect between opposing navies, success at sea will be the lot of the nation whose officers are the coolest and most intelligent, whose men are the best disciplined and best trained, and whose navy is in all respects the most imbued with the habits and traditions of the sea. (S. FR.)

ORDOVICIAN SYSTEM, in geology, the group of strata which occur normally between the Cambrian below and the Silurian above; it is here regarded as including in ascending order the Arenig, Llandeilo, and Caradoc or Bala series (*qq.v.*). The name was introduced by C. Lapworth in 1879 to embrace those rocks—well developed in the region formerly inhabited by the Ordovices—which had been classed by Sir R. Murchison as Lower Silurian and by A. Sedgwick in his Cambrian system. The term is convenient and well established, but Lower Silurian is still used by some authors. The line of demarcation between the Ordovician and the Cambrian is not sharply defined, and beds on the Tremadoc horizon of the Cambrian are placed by many writers at the base of the Ordovician, with good palaeontological reasons.

The rocks of this system include all types of sedimentation; when they lie flat and undisturbed, as in the Baltic region and Russia, the sands and clays are as soft and incoherent as the similar rocks of Tertiary age in the south of England; where they have been subjected to powerful movements, as in Great Britain, they are represented by slates, greywackes, quartzites, chlorite-, actinolite- and garnet-schists, amphibolites and other products of metamorphism. In Europe the type of rock varies rapidly from point to point, limestones, shales, sandstones, current-bedded grits and conglomerates or their metamorphosed equivalents are all found within limited areas; but in northern Europe particularly the paucity of limestones is a noteworthy feature in contrast with the rocks of like age in the south, and still more with the Ordovician of North America, in which limestones are prevalent. In the Highlands of Scotland, in north-west England, in Wales and Ireland, there are enormous developments of contemporaneous lavas and tuffs and their metamorphosed representatives; tuffs occur also in Brittany, and lavas on a large scale in Nova Scotia and New Brunswick.

Distribution.—The Ordovician system is widely distributed. The accompanying map indicates roughly the relative positions of the principal land-masses and seas, but it must be accepted with reserve.

A study of the fossils appears to point to the existence of definite faunal regions or marine basins. The Ordovician rocks of the British Isles seem to have been deposited in a North Atlantic sea which embraced also the north of France and Belgium. Confluent with this sea on the east was a rather peculiar basin which included Bohemia, southern France, Spain, Portugal, the eastern Alps, Thuringia, Fichtelgebirge and the Keller Wald. Another European basin, probably separated from the Bohemian or Mediterranean sea in early Ordovician times, lay over the Baltic region, Scandinavia, the Baltic provinces and north Germany, and communicated eastwards by way of Russian Poland and central Russia with far eastern waters, embracing China, Siberia and the Himalayas; concerning the last-named marine area not much is known. In the opposite direction, the Baltic basin may have communicated, through Greenland, with the North American and Arctic seas. Over central and eastern North America another large body of water probably lay, with open communications with the north and west, and with a more constricted connexion with the Atlantic sea. The lagoonal character of some of the rocks of the Tunguska region of Siberia may perhaps be indicative of continental border conditions in that quarter.



Hypothetical Land & Sea areas in the Early Ordovician Period
After F. Frech & R. Ruedemann

Some of the principal subdivisions of the Ordovician rocks are enumerated in the table. Owing to the universal distribution of the graptolites, the correlation of widely separated areas has been rendered possible wherever the muds and shales, in which their remains are preserved, are found. Where they are absent the correlation of the minor local subdivisions of distant deposits is more difficult. In Great Britain, through C. Lapworth and his school, and J. E. Marr and the Cambridge school, and in Scandinavia and the Baltic region, through W. C. Brögger, S. A. Tulberg, F. Schmidt and others, the most elaborate subdivision of the Ordovician rocks has been attained.

ORDOVICIAN SYSTEM.

Ordovician Rocks: Generalized Correlation Table.

England and Wales.	Graptolite Zones.	Scotland.	Scandinavia.	Bohemia.	N.-W. France.	W. Russia.	North American Continent.				
							New York.			Quebec.	
Caradoc or Bala group.	*Dicellograptus anceps.* *D. complanatus.* *Pleurograptus linearis.* *Dicranograptus clingani.*	Hartfell Shales, Ardmillan Series, and Lowther Shales.	Brachiopod beds, *Trinucleus* beds, and *Leptaena* limestone. *Trinucleus* limestone.	D5. D4. D3.	Grès de May. Calcaire de Rosan.	Borkholm and Lyckholm beds. Wesenberg beds.	Richmond beds and Hudson river Shales. Lorraine beds. Utica Shale.	Cincinnatian.	Champlainic.	Lowest Anticosti limestone and Hudson river beds.	Lower Cobequid and Upper Cobequid rocks of Acadia.
Llandeilo group.	*Coenograptus gracilis.* *Didymograptus Murchisoni.*	Glenkiln Shales and Barr Series.	Middle Graptolite beds and *Chasmops* limestone. *Cystidean* limestone.	D2. D1γ.	Schistes des Gembloux and ironstone.	Jewe, Itfer, and Kuckers beds. Echinosphaerite limestone.	Trenton beds and Galena limestone. Black river beds. Lowville limestone.	Mohawkian.		Trenton limestone. Coenograptus Shales.	
(Lanvirn) and Arenig group.	*Didymograptus bifidus.* *Tetragraptus bryonides.*	Radiolarian Cherts and Ballantrae Series.	Lower Graptolite beds and *Orthoceras* limestone.	D1β.	Grès Armoricain (part).	Vaginatus limestone and Glauconite limestone.	Chazy limestone (part) and St Peter's sandstone.	Canadian.		Levis Shales with Tetragraptus, and Phyllograptus.	

Tremadoc beds, *Ceratopyge* beds, and beds with *Euloma-Niobe* fauna here regarded as Cambrian: not invariably present.

In the Baltic provinces of Russia, F. Schmidt describes the following stages, in descending order: (Stage F) the Lyckholm and Borkholm zones, a highly fossiliferous series, equivalent to the Middle Bala of Britain; many of the limestones are largely formed of *Rhabdoporella* and other calcareous algae. (E) Wesenberg zone = Bala. (D) Jewe and Kegel zone. (C) Itfer beds, Kuckers Shale (bituminous limestones and marls = Brandschiefer), Echinosphaerite limestone = Upper Orthoceratite limestone of Sweden. (B) Orthoceratite (Vaginaten) limestone = Orthoceratite limestone of Sweden, Glauconitic limestone, Glauconitic sand (Greensand). The last-mentioned reposes on Cambrian *Dictyonema* shales. While the Ordovician rocks in Scania, the Baltic provinces and north-central Russia are undisturbed and level-bedded, those on the western side of the Scandinavian axis and in the Urals have suffered movement and are metamorphosed into schists, phyllites, quartzite, marble, &c.; and, especially in Scandinavia, have been extensively thrust. The Bohemian Ordovician, "stage D" of Barrande, consists mainly of greywackes and shales with some ironstone beds and eruptive rocks in the lower parts. In Germany the only large areas are found in the Thuringer Wald, Fichtelgebirge, Frankenwald and Vogtland, where they consist principally of unfossiliferous greywackes and shales with some oolites and glauconitic ironstone (chamosite) in the lower part. They are divisible into the Hauptschiefer or Lederschiefer and the Ober-Thuringit beds above, and the Griffelschiefer and Unter-Thuringit beds below, which rest upon the Leitmitzschiefer of the Euloma-Niobe (Cambrian) horizon. Across northern Russia Ordovician rocks cover a great area; they consist of clays, bituminous and calcareous shales, sands and marls, which in the Ural region have been metamorphosed; the Bukowka sandstone of Russian Poland is of this age. In north-west France this system is represented in Brittany and Normandy by the slates of Riadan, the *grès de May*, the *schistes à calymènes* (with an ironstone bed at the base) and the *grès armoricain*. In the Ardennes are the *schistes de Gembloux*, resting upon graptolitic shales of Arenig age. Sandstones and shales occur in Languedoc, and various rocks in the Pyrenees. In the Iberian peninsula Ordovician rocks are widely spread, represented by sandstones, slates and shales covering the whole of the period; they are well developed in Asturia and Galicia. In the eastern Alps about Graz are found calcareous shales with crinoids, the "Schockelkalk" and "Semriacher" shales; the Marthener beds of the Carnic Alps are of this age. In China (Kiang-su, Kian-chang), in Burma (Mandalay) and in the Himalayas (Niti and Spiti) Ordovician fossil-bearing rocks are known.

On the North American continent Ordovician rocks cover a very large area in the central, eastern and northern parts (north of lat. 30°). As regards the classification and correlation of the strata, which change in character from point to point, as is natural over so large an area, much remains to be done. In the table the divisions of the system that obtain in the New York district are enumerated; but in each state there is a local nomenclature for the beds. Thus in Iowa, Wisconsin and Minnesota we find (1) Lower Magnesian limestone, St Peter's sandstone; (2) Trenton limestone, Galena limestone; (3) Hudson river shales; in Arkansas, the California or Magnesian limestone, Saccaroidal limestone, Izard limestone and Polk Bayou limestone; in Oklahoma, the Arbuckle limestone, Simpson series, Viola limestone and Sylvan shales; and in east Tennessee, the Chickamauga limestone, Athens shale, Tellia sandstone, Sievier shale and Bays sandstone. In Massachusetts there are enormous series of schists which have been assigned to this period. In west Virginia are the Martinsburg shales (1000 ft. or more). In Canada the Ordovician rocks (Quebec group) are thickly developed. In the upper division there are the lowest of the Anticosti limestones, the Hudson river beds, and Trenton limestone; to the middle division belong the *Coenograptus* shales; and the lower division consists of the Levis shales with Sillery beds at the base. In Nova Scotia and New Brunswick are the lower and upper divisions of the Cobequid group, a series of shales, quartzites and conglomerates with igneous rocks. In the polar regions Ordovician rocks are represented by the Trenton limestone in Boothia and King William's Land; by limestones with *Caryocystis granetum* in east Greenland; and in the Barrow Straits by beds with *Asaphus* and *Maclurea*.

In North Africa Ordovician rocks are probably present, and in New Zealand the Arorere series (Wanaka group), and in Australia (Victoria) the graptolitic, gold-bearing shales and slates belong to this period. During this period there appears to have been a general tendency for the sea to transgress on the land, a tendency which increased towards its close, especially in the northern hemisphere (Europe and the Appalachian regions). One of the results of this movement was the interchange and commingling of many previously separated faunal groups. About the beginning of the period the sea withdrew from the land in Texas and south of the Rocky Mountains. The folding of the Appalachians was in progress early in Ordovician times and later in the period the first symptoms of the Scandinavian and British folding set in.

Volcanic Activity.—This period was one of great volcanic activity in several widely separated regions. "In Ayrshire and the south-western districts (of the southern uplands), where the volcanic constituents attain a great development, they consist of basic lavas (diabase, &c.), with intercalated tuffs and agglomerates. A characteristic feature of these lavas is the development of ellipsoidal or pillow-structure in them. This volcanic platform appears to underlie the Silurian region over an area of at least 2000 sq. m., inasmuch as it comes to the surface wherever the crests of the anticlines bring up sufficiently deep parts of the formations. It is thus one of the most extensive as well as one of the most ancient volcanic tracts of Europe" (Sir A. Geikie, *Text-book of Geology*, 4th ed. vol. ii. p. 951). In the west of England and in Wales there was also a very active volcanic centre. In the Snowdon district thousands of feet of contemporaneous felsitic lavas and tuffs occur in the Bala beds; while in Cader Idris, the Arenig Mountains and the Arans there are similar eruptions of felsitic and rhyolitic lavas, tuffs and agglomerates—probably many of them submarine—interstratified in the Arenig formation. In the Lake district a great series of lavas and ashes—the Borrowdale series—was erupted during the middle of the period; the earlier effusions were andesitic, the later ones felsitic and rhyolitic. In Ireland the Arenig lavas of Tyrone resemble some of those in Scotland. Volcanic rocks (porphyrites, syenites and lavas) occur in considerable force in the Ordovician rocks of Nova Scotia and New Brunswick and New Zealand. Tuffs of this age are found in Brittany, and diabase in Bohemia.

The *economic products* obtained from rocks of this period include gold in Australia, New Zealand and Wales; iron ore in France; lead and zinc from the Galena and Trenton horizons in Wisconsin, Iowa and Illinois; manganese in Arkansas; oil and gas from the Trenton stage in Ohio and east Indiana; roofing slates and slate pencils in Wales and the Lake district; limestone in Great Britain and Tennessee; phosphate beds in Wales and Tennessee; marble in the Appalachian district; graphite (plumbago) in the Lake district; and jasper in Wales and southern Scotland.

Ordovician Life.—Compared with the preceding Cambrian period, the Ordovician is remarkable for the great expansion in numbers and variety of organisms, apart from the fact that fossils are better preserved in the younger formations.

All the great classes of mollusks were represented, the most numerous being the brachiopods, which, in addition to the simple forms of the Cambrian, began at this time to develop spire-bearing genera (*Chonetes*, *Orthis*, *Orthisina*, *Strophomena*, *Crania*, *Schizotreta*, *Porambonites*, *Rafinesquina*, *Leptaena*, *Zygospira*). The gasteropods now developed all the leading types of shell (*Pleurotomaria*, *Omphalotrochus*); but both this class and the pelecypods (*Lyrodesma*, *Ctenodonta*, *Modiolopsis*) were subordinate in importance to the cephalopods. These mollusks were probably the most powerful living creatures in the Ordovician seas; straight-shelled, slightly curved, and nautiloid forms predominated (*Orthoceras*, *Cyrtoceras*, *Gyroceras*, *Trocholites*, *Endoceras*, *Litoceras*, *Lituites*, *Actinoceras*). Some of the straight shells were of enormous size, 12 to 15 ft. long and as much as 1 ft. in diameter, in the widest part. Trilobites were present in great abundance, and in this period they reached the climax of their development. In the lower stage we find *Agnostus*, *Calymene*, *Asaphus*, *Illaenus*, *Placoparia*; on the Llandeilo horizon, *Calymene*, *Asaphus*, *Megalaspis*, *Dalmanitis*; and, at the summit, *Trinucleus* and *Homalonotus*. In the transition zone between Ordovician and Cambrian, *Ceratopyge*, *Euloma*, *Niobe*, flourished. Other important genera are *Ogygia*, *Cheirurus*, *Harpes*, *Acidaspis*. Ostracods (*Leperditia*, *Beyrichia*), cyprids (*Bairdia*, *Macrocypris*), phyllocarids (*Ceratiocaris*, *Peltocaris*), cirripeds (*Lepidocoleus*), and, later, eurypterids represented other crustacean groups. The bryozoans, *Stomatopora*, *Monticulipora*, *Phylloporina*, *Fenestella* and others, were abundant and frequently formed beds of limestone. Among the echinoderms the cystoids were the most prominent (*Pleurocystis*, *Aristocystis*) and at this period reached their climax; crinoids (*Archaeocrinus*, *Dendrocrinus*) became more important; while ophiuroids, echinoids (*Bothriocidaris*) and asteroids (*Taeniaster*, *Palaeaster*) made their appearance. Corals (*Streptelasma*, *Columnaria*) were scarce, and sponges (*Aulocopium*, *Caryospongia*, *Archaeocyathus*) were not particularly important; *Receptaculites*, *Ischadites*, are well-known fossils doubtfully referred to this group. Radiolaria assisted in the formation of certain beds of chert, and foraminifera have been observed. The remarkable group, the graptolites, evidently inhabited the seas in countless numbers and have left their remains in the dark shales of this period all over the world. At this time the diprionidian forms alone were represented by such genera as *Tetragraptus*, *Phyllograptus*, *Didymograptus*, *Dicellograptus*, *Diplograptus* and others. Of great interest are the earliest known indications of vertebrate life in the form of dermal plates and teeth of fish-like organisms from the Ordovician of Colorado. The terrestrial life of the period is very meagrely represented by the remains of land plants, mostly poorly preserved in certain sandstones, and by scorpions and several orders of insects, *Protocimex* (Sweden), *Palaeoblattina* (Colorado).

One of the most striking facts brought out by the study of the distribution of Ordovician fossils is the wide range of the northern or "periarctic" faunal assemblage. This periarctic fauna prevails over the whole world—so far as our present knowledge shows—with the exception of the peculiar Bohemian or Mediterranean region, which includes north-west and south-west France, Spain, Italy, the Alps, the Fichtelgebirge, east Thuringia, Harz and Rhenish Mountains.

Authorities.—Sir R. I. Murchison, *Silurian System* (1839) and *Siluria* (1854, 1867); A. Sedgwick, *Synopsis of the Classification of the British Palaeozoic Rocks* (1855); J. Barrande, *Système silurien du centre de la Bohême* (1852–1887); J. J. Bigsby, *Thesaurus Siluricus* (London, 1868); J. E. Marr, *The Classification of the Cambrian and Silurian Rocks* (Cambridge, 1883); Charles Lapworth, "On the Geological Distribution of the Rhabdophora," *Annals and Mag. Nat. Hist.* ser. 5, vols. iii., iv., v., vi. (1879–1880); B. N. Peach, J. Horne, J. J. H. Teall, "The Silurian Rocks of Great Britain," vol. i., Scotland, *Mem. Geol. Survey* (1899); F. Frech and others, "Lethaea geognostica," Theil i. Band 2 (*Lethaea palaeozoica*) (Stuttgart, 1897–1902); Sir A. Geikie, *Text-book of Geology* (4th ed., 1903); and for recent papers, *Geological Literature*, Geol. Soc. (London, annual). See also Cambrian and Silurian Systems. (J. A. H.)

ORDU (anc. *Cotyora*, where the "Ten Thousand" embarked for home), a town on the N. coast of Asia Minor, between Samsun and Kerasund, connected with Zara, and so with Sivas, by a carriage road, and with Constantinople and Trebizond by steamer. Pop. about 6000, more than half Christian. Ordu has exceptionally good Greek schools, and a growing trade in filberts.

ORDUIN - NASHCHOKIN, ATHANASY LAVRENTEVICH (?–1680), Russian statesman, was the son of a poor official at Pskov, who saw to it that his son was taught Latin, German and mathematics. Athanasy began his public career in 1642 as one of the delineators of the new Russo-Swedish frontier after the peace of Stolbova. Even then he had a great reputation at Moscow as one who thoroughly understood "German ways and things." He was one of the first Muscovites who diligently collected foreign books, and we hear of as many as sixty-nine Latin works being sent to him at one time from abroad. He attracted the attention of the young tsar Alexius by his resourcefulness during the Pskov rebellion of 1650, which he succeeded in localizing by personal influence. At the beginning of the Swedish War, Orduin was appointed to a high command, in which he displayed striking ability. In 1657 he was appointed minister-plenipotentiary to treat with the Swedes on the Narova river. He was the only Russian statesman of the day with sufficient foresight to grasp the fact that the Baltic seaboard, or even a part of it, was worth more to Muscovy than ten times the same amount of territory in Lithuania, and, despite ignorant jealousy of his colleagues, succeeded (Dec. 1658) in concluding a three-years' truce whereby the Muscovites were left in possession of all their conquests in Livonia. In 1660 he was sent as plenipotentiary to a second congress, to convert the truce of 1658 into a permanent peace. He advised that the truce with Sweden should be prolonged and Charles II. of England invited to mediate a northern peace. Finally he laid stress upon the immense importance of Livonia for the development of Russian trade. On being overruled he retired from the negotiations. He was the chief plenipotentiary at the abortive congress of Durovicha, which met in 1664, to terminate the Russo-Polish War; and it was due in no small measure to his superior ability and great tenacity of purpose that Russia succeeded in concluding with Poland the advantageous truce of Andrussowo (Feb. 11, 1667). On his return to Russia he was created a boyar of the first class and entrusted with the direction of the foreign office, with the title of "Guardian of the great Tsarish Seal and Director of the great Imperial Offices." He was, in fact, the first Russian chancellor. It was Orduin who first abolished the onerous system of tolls on exports and imports, and established a combination of native merchants for promoting direct commercial relations between Sweden and Russia. He also set on foot a postal system between Muscovy, Courland and Poland, and introduced gazettes and bills of exchange into Russia. With his name, too, is associated the building of the first Russian merchant-vessels on the Dvina and Volga. But his whole official career was a constant struggle with narrow routine and personal jealousy on the part of the boyars and clerks of the council. He was last employed in the negotiations for confirming the truce of Andrussowo (September 1669; March 1670). In January 1671 we hear of him as in attendance upon the tsar on the occasion of his second marriage; but in February the same year he was dismissed, and withdrew to the Kruipetsky monastery near Kiev, where he took the tonsure under the name of Antony, and occupied himself with good works till his death in 1680. In many things he anticipated Peter the Great. He was absolutely incorruptible, thus standing, morally as well as intellectually, far above the level of his age.

See S. M. Solovev, *History of Russia* (Rus.), vol. xi. (St Petersburg, 1895, seq.); V. Ikonnikov, "Biography of Orduin-Nashchokin" (in *Russkaya Starina*, Nos. 11-12) (St Petersburg, 1883); R. Nisbet Bain, *The First Romanovs* (London, 1905, chaps. 4 and 6). (R. N. B.)

ÖREBRO, a town of Sweden, capital of the district (*län*) of Örebro, lying on both banks of the Svartå a mile above its entrance into Lake Hjelmar, 135 m. W. of Stockholm by rail. Pop. (1900), 22,013. In great part rebuilt since a fire in 1854, it has a modern appearance. An ancient castle, however, with four round towers, remains on an island in the stream. It is used as a museum. There may be mentioned also the church of St Nicholas, of the 13th century; and the King's House (*Kungsstuga*), an old and picturesque timber building. In front of the modern town hall stands a statue, by Karl Gustav Qvarnström (1810–1867), of the patriot Engelbrecht (d. 1436), who was born here. The Swedish reformers of the 16th century, Olaus and Laurentius Petri, are commemorated by an obelisk. Örebro is in close connexion with the iron-mining district of central Sweden; it has mechanical works and a technical college. A large trade is carried on, by way of the Örebro canal and lakes Hjelmar and Mälar, with Stockholm.

Örebro was in existence in the 11th century. Its castle, erected by Birger Jarl in the 13th century, played an important part in the early annals of Sweden; and no fewer than twenty diets or important assemblies were held either in the castle or in the town. Such were the Örebro *concilium* of 1537, the diet of 1540 in which the crown was declared hereditary, and that of 1810 when Bernadotte was elected crown prince.

ORE-DRESSING, one of the principal processes in the work of mining (*q.v.*). When the miner hoists his ore[1] to the surface, the contained metal may be either in the native uncombined state, as, for example, native gold, native silver, native copper, or combined with other substances forming minerals of more or less complex composition, as, for example, telluride of gold, sulphide of silver, sulphide of copper. In both cases the valuable mineral is always associated with minerals of no value. The province of the ore-dresser is to separate the "values" from the waste—for example, quartz, felspar, calcite—by mechanical means, obtaining thereby "concentrates" and "tailings." The province of the metallurgist is to extract the pure metal from the concentrates by chemical means, with or without the aid of heat. There are also a number of non-metallic minerals which do not have any value, or at best do not reach their highest value until they have been subjected to some form of mechanical preparation; among them are diamonds, graphite, corundum, garnet, asbestos and coal. Ore-dressing, for the purposes of this article, may be divided into three parts: (1) properties of minerals which render aid in their separation; (2) simple operations; (3) operations combined to form processes or mills.

Properties.

1. The *specific gravity* of minerals varies greatly, some being heavy, others light. The rate of settling in water is affected by the specific gravity in this way: of two particles of the same size but different specific gravity, the heavier settles more rapidly than the lighter, while of two particles of different specific gravity which settle at the same rate in water, that of higher specific gravity is of smaller diameter than the other. The same statements are true in regard to settling in air, and in regard to momentum in air when the particles are thrown out in a horizontal direction. *Colour, lustre and fracture* are of especial value in hand-picking, to aid the eye in selecting the mineral sought. Instances are, of colours, the white of quartz, the pale straw colour of felspar, the dull yellow of limonite, the brass yellow of chalcopyrite, the pale metallic yellow of pyrite; of lustres, the vitreous of quartz, the adamantine of diamond and cerussite, the resinous of blende, the earthy of limonite, and the metallic of pyrite; and of fractures, the cleavage planes of felspar and galena, the conchoidal fracture of quartz and pyrite, the granular of some forms of magnetite and blende. *Magnetism* is a most direct and simple method of separating minerals where it is available. The discovery that by the use of electro-magnets of great

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[1] The O. Eng. word was *ōra*, corresponding with Du. *oer*, the origin of which is unknown. The form "ore" represents the O. Eng. *ār*, brass; cf. Lat. *aes*, Skt. *ayas*.

power minerals formerly regarded as non-magnetic are attracted, has made it possible to separate several classes of minerals present in an ore; for example, the strongly magnetic mineral may first be taken out, then the mildly magnetic, and last the weakly magnetic, the non-magnetic being left behind. *Adhesion* acts when brightly burnished particles of gold issuing with the sand from the stamp mill come in contact with an amalgamated copper plate, for they are instantly plated with mercury and adhere to the copper, while the sand is carried forward by the water. In this way a very perfect separation of the gold from the sand is effected. In the South African diamond fields it has been found that if the diamond-bearing sand is taken in a stream of water over a smooth surface covered with a suitable coating of grease, the diamonds will adhere to the grease while the sand does not.

Simple Operations.

2. The concentration of ores always proceeds by steps or stages. Thus the ore must be crushed before the minerals can be separated, and certain preliminary steps, such as sizing and classifying, must precede the final operations which produce the finished concentrates. The more important of these simple operations will now be described.

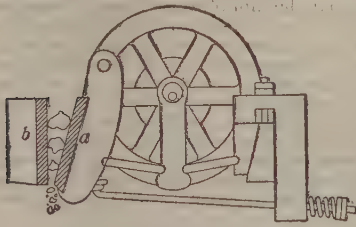


FIG. 1.—Blake Breaker.
a, Movable jaw.
b, Fixed jaw.

The ore as mined contains the valuable minerals attached to and enclosed in lumps of waste rock. The province of *crushing* or disintegrating is to sever or unlock the values from the waste, so that the methods of separation are then able to part the one from the other. In crushing ores it is found wise to progress by stages, coarse crushing being best done by one class of machine, medium by another, and fine by a third. Coarse crushing is accomplished by *breakers* of the Blake type (fig. 1) or of the Gates Comet type (fig. 2). All of these machines break by direct pressure, caused by a movable jaw, *a* (figs. 1, 2), approaching towards and receding from a fixed jaw, *b*. The largest size ever fed to a breaker is 24 in. in diameter, and the smallest size to which the finest crushing commonly done by these machines brings the ore is about ¾ in. diameter. The machine is generally supplied with ore in lumps not larger than 9 in. in diameter, and crushes them to about 1½ in. in diameter. Medium-size crushing is done mostly by rolls or steam stamps. *Rolls* (fig. 3) crush by direct pressure caused by the ore being drawn between two revolving rolls held closely together. They make the least fine slimes or fines to be lost in the subsequent treatment, and are therefore preferred for all brittle minerals. The *steam stamp* works upon the same principle as a steam hammer, the pestle being forced down by steam pressure acting through piston and cylinder with great crushing force in the mortar. Steam stamps have been very successful with the native copper rock, because they break up the little leaves, flakes and filaments of copper, and render them susceptible of concentration, which rolls do not. Fine crushing is done by gravity stamps, pneumatic stamps, by centrifugal roller mills, by amalgamating pans, by ball mills, by Chile edgestone mills, by tube mills and by arrastras. The *gravity stamp* (fig. 4) is a pestle of 900-℔ weight more or less, which is lifted by a revolving cam and falls by the force of gravity to strike a heavy blow on the ore resting on the die in the mortar and do the work of crushing; the frequent revolution of the cam gives a more or less rapid succession of blows. Gravity stamps are especially adapted to the fine crushing of gold ores, which they reduce to $\frac{1}{30}$-in. and sometimes even to $\frac{1}{80}$-in. grains. The blow of the stamp upon the fragments of quartz not only liberates the fine particles of gold, but brightens them so that they are quickly caught upon the amalgamated plates. The *centrifugal roller mills* are suited to fine crushing of middle products, namely by-products composed of grains containing both values and waste, since they avoid making much fine slimes. They crush by the action of a roller, rolling on the inside of a steel ring, both having vertical axes. The *amalgamating pan* is suitable for grinding silver ores for amalgamation where the finest grinding is sought, together with the chemical action from the contact with iron. It crushes by a true grinding action of one surface sliding upon another. The *Chile edgestone mill* is employed for the finest grinding ever used preparatory to concentration. The *arrastra* or drag-stone mill grinds still finer for amalgamating. The *ball mill* is a horizontal revolving cylinder with iron balls in it which do the grinding; the pulverized ore passes out through screens in the cylinder wall. It is a fine grinder, making a small amount of impalpable slimes. It is used for preparation for concentrating. The *tube mill* is of similar construction, but it is fed through the hollow shaft at one end and discharged through the hollow shaft at the other; the finely ground ore is floated out by water and contains a large proportion of impalpable slimes. It is used for preparation for cyaniding of gold.

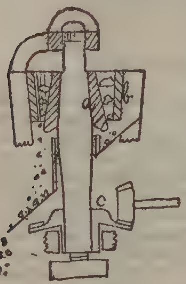


FIG. 2.—Gates Breaker.
a, Movable jaw.
b, Fixed jaw.
c, Gear with eccentric hub and with loose fit on the spindle.

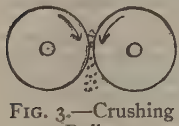


FIG. 3.—Crushing Rolls.

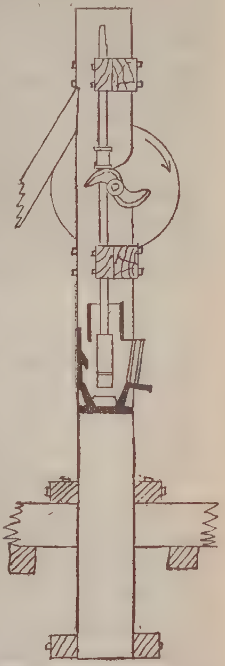


FIG. 4.—Gravity Stamp.

A considerable class of workable minerals, among which are surface ores of iron and surface phosphates, contain worthless clay mixed with the valuable material, the removal of which is accomplished by the *log washer*. This is a disintegrator consisting of a long narrow cylinder revolving in a trough which is nearly horizontal. Upon the cylinder are knives or paddles set at an angle, which serve the double purpose of bruising and disintegrating the clay and of conveying the cleaned lump ore to be discharged at the upper end of the trough, the water meanwhile washing away the clay at the lower end.

Roasting for Friability.—When two minerals—for example, pyrite and cassiterite (tin ore)—one of which is decomposed and rendered porous and friable by heat and oxygen—are roasted in a furnace, the pyrite becomes porous oxide of iron, while the cassiterite is not changed. A gentle crushing and washing operation will then break and float away the lighter iron oxide, leaving the cleaned cassiterite behind.

Sizing.—This is the first of the preliminary operations of separation. It is found useful in concentration, for dividing an ore into a number of portions graded from coarser sizes down to finer sizes. Each portion is made suitable for treatment on its respective machine. If crushed ore be sifted upon a screen with holes of definite size, two products will result—the oversize, which is unable to pass through the screen, and the undersize, which does pass. If the latter size be sifted upon another screen with smaller holes, it will again make oversize and undersize. The operation can be repeated with more sieves until the desired number of portions is obtained. P. von Rittinger adopted for close sizing the following diameters in millimetres for the holes in a set of screens: 64, 45·2, 32, 22·6, 16, 11·3, 8, 5·6, 4, 2·8, 2, 1·4, 1. Each of these holes has an area double that of the one next below it; this may be called the screen ratio. A process which does not need such close sizing might use every other screen of the above set, and in extreme cases even every fourth screen. In mills the screen ratio for coarse sizes often differs from that for fine. Sizing is done by cylindrical screens revolving upon their inclined axes (fig. 5), by flat shaking screens, and by fixed screens with a comparatively steel slope. Either wire cloth with square holes or steel plate punched with round holes is used. To remove the largest lumps in the preliminary sizing, fixed-bar screens (grizzlies) are preferred, on account of their strength and durability.

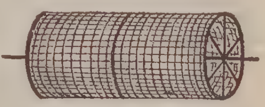


FIG. 5.—Trommel or Revolving Screen.

Sizes smaller than can be satisfactorily graded by screens are treated by means of *hydraulic classifiers* and *box classifiers*. The lower limit of screening and therefore the beginning of this work varies from grains of 5 millimetres to grains of 1 millimetre in diameter. A hydraulic classifier (fig. 6) is a trough-like washer through which the water and sand flow from one end to the other. In the bottom, at regular intervals, are pockets or pits with hydraulic devices which hinder the outflowing discharge of sand, *b*, by an inflowing stream of clear water, *a*. By regulating the speed of these water currents, the size of the grains in the several discharges can be regulated, the first being the coarsest and the overflow at the end the finest. Box classifiers (*spitzkasten*) are similar, except that the pockets are much larger and no inflowing clear water is used; they therefore do their work much less perfectly. Classifiers do not truly size the ore, but merely class together grains which have equal settling power. In any given product, except the first, the grain of high specific gravity will always be smaller than that of low. The

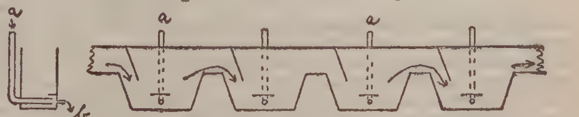


FIG. 6.—Hydraulic Classifier.

box classifiers are suited to treating finer sizes than the hydraulic classifiers, and therefore follow them in the mill treatment.

Picking Floors, the first of the final operations of separation, are areas on which men, boys or girls pick out the valuable mineral which is rich enough to ship at once to the smelter. The picking is often accompanied and aided by breaking with a hammer. *Picking tables* are generally so constructed that the pickers can sit still and have the ore pass before them on a moving surface, such as a revolving circular table or travelling belt. Stationary picking tables require the ore to be wheeled to and dumped in front of the pickers. Picking out the values by hand has the double advantage that it saves the power and time of crushing, and prevents the formation of a good deal of fine slimes which are difficult to save.

Jigs treat ores ranging from 1½ in. in diameter down to $\frac{1}{60}$ in. If an intermittently pulsating current of water is passed up through a horizontal sieve on which is a bed of ore, the heavy mineral and the quartz quickly form layers, the former beneath the latter. The machine by which this work is done is called a jig, and the operation is called jigging. In the hand jig the sieve is moved up and down in a tank of water to get the desired separation. In the power jig (fig. 7) the sieve, *a*, is stationary and the pulsating current is obtained by placing a vertical longitudinal partition, *c*, extending part of the way down to the bottom of the jig box. The sieve, *a*, is firmly fastened on one side of the partition, and on the other a piston or plunger, *d*, is moved rapidly up and down by an eccentric, causing an up-and-down current of water through the sieve, *a*. The sieve is fed at one end, *e*, with a constant supply of water and ore, and the quartz overflows at the other. Clear water ("hydraulic water") is brought by the pipe, *i*, into the space, *g*, below called the hutch, to regulate the condition of the bed of ore on *a*. The constantly accumulating bed of concentrates is either discharged through the sieve into the hutch, *g*, or by some special device at the side. On jigs where the concentrates pass through the sieve, a bed of heavy mineral grains too large to pass holds back the lighter quartz. The quartz overflow from one sieve, *a*, generally carries too much value to be thrown away, and it is therefore jigged again upon a second sieve, *b*. In jigging difficult ores, three, four, five and even six sieves are used. A succession of sieves gives a set of products graded both in kind and in richness, the heavier mineral, as galena, coming first, the lighter, as pyrites and blende, coming later. The best jigging is done upon closely sized products using a large amount of clear water added beneath the sieve. Very good jigging may, however, be done upon the products of hydraulic classifiers, where the heavy mineral is in small grains and the quartz is large, by using a bed on the sieve and diminished hydraulic water, which increases the suction or downward pull by the returning plunger.

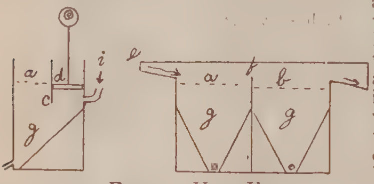


FIG. 7.—Harz Jig.

Bumping Tables.—Rittinger's table is a rectangular gently sloping plane surface which by a bumping motion throws the heavy particles to one side while the current of water washes down the quartz to another, a wedge-shaped divider separating and guiding the concentrates and tailings into their respective hoppers. The capacity on pulp of $\frac{1}{30}$ to $\frac{1}{50}$ in. size is some 4 tons in twenty-four hours. In the Wilfley table (fig. 8) and those derived from it a gentler vanning motion is substituted for the harsh bump; they have a greatly increased width and a set of riffle blocks, *b*, at right angles to the direction of flow, *c*, tapering in height towards the side where the concentrates are discharged, *d*. This combination has produced a table of great efficiency and capacity for treating grains from ⅛ in. in diameter down to $\frac{1}{200}$ in. or even finer. The capacity on $\frac{1}{30}$ in. pulp is from 15 to 25 tons in twenty-four hours.

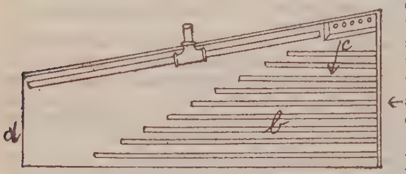


FIG. 8.—Wilfley Table.

Vanners are machines which treat ores on endless belts, generally of rubber with flanges on the two sides. The belt (fig. 9) travels up a gentle slope, *a*, on horizontal transverse rollers, and is shaken about 200 times a minute, either sidewise or endwise, to the extent of about 1 in. The lower 10 ft. is called the concentrating plane, *b*, and slopes 2·78 % more or less from the horizontal; the upper 2 ft. of length is called the cleaning plane, *c*, and slopes 4·45 % more or less. The fine ore is fed on with water (technically called pulp) at the intersection of the two planes, *d*. The vibration separates the ore into layers, the heavy minerals beneath and the light above. The downward flow of the water carries the light waste off and discharges it over the tail roller *e* into the waste launder, while the upward travel of the belt carries up the heavy mineral. On the cleaning plane the latter passes under a row of jets, *f*, of clean water, which remove the last of the waste rock; it clings to the belt while it passes over the head roller, and only leaves it when the belt is forced by the dipping roller to dip in the water of the concentrates tank, *g*. The cleaned belt then continues its return journey over the guide roller *h* to the tail roller *e*, which it passes round, and again does concentration duty. Experience proves that for exceedingly fine ores the end shake with steep slope and rapid travel does better work than the side-shake vanner. For ordinary gold stamp-mill pulp, where cleanness of tailings is the most important end, and where to gain it the engineer is willing to throw a little quartz into the concentrates, the end-shake vanner is again probably a little better than the side-shake, but where cleanness of concentrates is sought the side-shake vanner is the most satisfactory. The latter is much the most usual form.

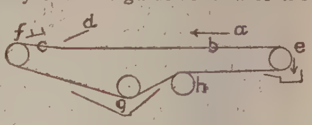


FIG. 9.—Frue Vanner.

Slime-Tables are circular revolving tables (fig. 10) with flattened conical surfaces, and a slope of 1⅛ in. more or less per foot from centre to circumference; a common size is 17 ft. in diameter, and a common speed one revolution per minute. These tables treat material of $\frac{1}{100}$ in. and less in diameter coming from box classifiers. The principle on which the table works is that the film of water upon the smooth surface rolls the larger grains (quartz) towards the margin of the table faster than the smaller grains (heavy mineral) which are in the slow-moving bottom current. The revolution of the table then discharges the quartz earlier at *a, a, a, a*, an intermediate middling product next at *b*. and the heavy mineral last at *c*. Suitable launders or troughs and catch-boxes are supplied for the three products. The capacity of such a table is 12 tons or more of pulp, dry weight, in twenty-four hours. *Frames*, used in concentrating tin ore in Cornwall, are rectangular slime-tables which separate the waste from the concentrates on the same principle as the circular tables, though they run intermittently. They treat very fine pulp, and after being fed for a short period (about fifteen minutes) the pulp is shut off, the concentrates are flushed off with a douche of water and caught in a box, and the feed pulp is again turned on. *Canvas tables* are rectangular tables with plane surfaces covered with cotton duck (canvas) free from seams; they slope about 1½ in. to the foot. They are fed with stamp-mill pulp, with the tailings of vanners, or, best of all, with very fine pulp overflowing from a fine classifier. The rough surface of the duck is such an efficient catching surface that they can run for an hour before the concentrates are removed—an operation which is effected by shutting off the feed pulp, rinsing the surface with a little clean water, and hosing or brooming off the concentrates into a catch-box. The feed-pulp is then again turned on and the work resumed. They have been more successful than any other machine in treating the finest pulp, especially when their concentrates are finally cleaned on a steep slope end-shake vanner (the G. G. Gates canvas table system of California).

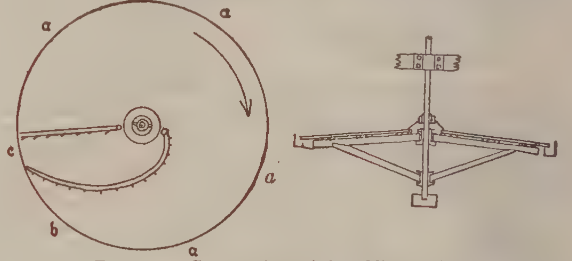


FIG. 10.—Convex Revolving Slime-table.

Buddles act in principle like slime-tables, but they are stationary, and they allow the sand to build itself up upon the conical surface, which is surrounded by a retaining wall. When charged, the tailings are shovelled from the outer part of the circle, the middlings from the intervening annular part, and the concentrates from the inner part. They treat somewhat coarser sizes than the slime-table. The term *buddle* is sometimes applied to the slime-tables, but the majority confine the phrase to the machine on which the sand builds up in a deep layer.

Riffles.—When wooden blocks or cobble-stones of uniform size are placed in the bottom of a sluice, the spaces between them are called *riffles*; and when gold-bearing gravel is carried through the sluice by a current of water, a great many eddies are produced, in which the gold and other heavy minerals settle.

Kieves.—The *kieve* or *dolly-tub* is a tub as large or larger than an ordinary oil-barrel, with sides flaring slightly upwards all the way from the bottom. In the centre is a little vertical shaft, with hand-crank at the top and stirring blades like those of a propeller at the bottom. Fine concentrates from buddles or slime-tables are still further enriched by treatment in the kieve. The kieve is filled perhaps half full of water, and the paddles set in motion; concentrates are now shovelled in until it is nearly full, the rotation is continued a little longer and then the shaft is quickly withdrawn and the side of the kieve steadily thumped by a bumping-bar as long as settling continues. When this is completed, the water is siphoned off, the top sand skimmed off and sent back to the buddle, and the enriched bottom shovelled out and sent to the smelter.

Combined operations.

3. In designing concentration works, the millwright seeks so to combine the various methods of coarse and fine crushing and of preliminary and final concentration that he will obtain the maximum return from the ore with the minimum cost. Some of the more important of these mill schemes will now be described.

The hand-jig process used for the zinc and lead ores of Missouri is first to clean the ore from adhering clay by raking it back and forth in a sluice with a running stream of water, and then shovel it upon a sloping screen with holes of about 1 in., where it yields oversize and undersize. The former is hand-picked into lead ore, zinc ore and waste, while the latter is jigged upon a hand-jig and yields several layers of minerals removed by a hand-skimmer. The top skimmings are waste, the middle skimmings come back with the next charge to be jigged over, and the bottom skimmings go to a second jig with finer screen. The coarsest of the hutch product, *i.e.* the product which passed through the sieve and settled at the bottom of the tank, goes to the second jig, the finest is sold to a sludge mill to be finished on buddles. The second jig makes top skimmings which are sent back to the first jig, middle skimmings which are zinc concentrates, and bottom skimmings and hutch, which are lead concentrates.

In the Missouri zinc-concentrating mill the ore carrying blende and calamine with a little galena is in very large crystallizations and contains, when crushed, very little in the way of included grains. It is crushed by Blake breaker and rolls, to pass through a sieve with holes $\frac{3}{4}$ in. in diameter, and is then treated on a power jig with six consecutive sieves, yielding discharge and hutch products from each sieve, and tailings to waste. The earlier discharges are finished products, while the later are re-crushed and re-treated on the same jig. The hutch products are treated on a finishing-jig with five sieves, and yield galena from the first discharge and hutch, and zinc ore from the others. The capacity of such jigs is very large, even to 75 or 100 tons per day of ten hours.

In the diamond washing of Kimberley, South Africa, the material taken from the mine is weathered by exposure to the air and rain for several months, and the softening and disintegration thus well started are completed by stirring in vats with water. Breaker and rolls were tried in order to hasten the process, but the larger diamonds were broken and ruined thereby. The material from the vats is screened and jigged, and of the jig concentrates containing about 2% of diamonds the coarser are hand-picked and the finer are treated on a greased surface.

Lead and copper ores contain their values in brittle minerals, and are concentrated in mills which vary somewhat according to local conditions; the one here outlined is typical of the class. The ore is crushed by breaker and rolls, and separated into a series of products diminishing in size by a set of screens, hydraulic classifier and box classifier. All the products of screens and hydraulic classifiers are jigged on separate jigs yielding concentrates, middlings and tailings; those of the box classifier are treated on the slime-table, vanner or Wilfley table, yielding concentrates and tailings and perhaps middlings. The coarser middlings contain values attached to grains of quartz and are therefore sent back to be re-crushed and re-treated. The finer middlings contain values difficult to save from their shape only, and are sent back to the same machine or to another to be finished.

The native copper rock of Lake Superior is broken by powerful breakers, sometimes preceded by a heavy drop-hammer weighing a ton, more or less. The operation is accompanied by hand-picking, yielding rich nuggets with perhaps 75% of copper ready for the smelter; at some mines a second grade is also picked out which goes to a steam finishing-hammer and yields cleaned mass copper for the smelter and rich stamp stuff. The run of rock which passes by the hand-pickers is of a size that will pass through a bar screen with bars 3 in. apart, and goes to the steam stamps. The stamp crushes the rock and discharges coarse copper through a pipe 4 in. in diameter, in which it descends against a rising stream of water which lifts out the lighter rock. The copper is let out about once an hour by opening a gate at the bottom. The rest of the rock is crushed to pass through a screen with round holes $\frac{1}{4}$ in. in diameter, more or less. This sand is treated in hydraulic classifiers with four pockets, the products from the pockets being jigged by four roughing-jigs yielding finished mineral copper for the smelter, included grains for the grinder, partially concentrated products for the finishing-jigs, and tailings which go to waste. The overflow of the hydraulic classifier runs to a tank of which the overflow is sent to waste in order to diminish the quantity of water, while the discharge from beneath, treated upon slime-tables, yields concentrates, middlings and tailings. The middlings are re-treated. All the finished concentrates put together will assay from 60 to 80% of copper according to circumstances. The extraction from the rock is from 50 to 80% of the copper contained in it.

Cornwall Tin.—Tinstone in Cornwall occurs associated with sulphides, wolfram, quartz, felspar, slate, &c., and is broken by spalling-hammers to 3-in. lumps. Hammers make less slimes than the rock-breakers, and they also break the ore more advantageously for the hand-picking. The latter rejects waste, removes as far as possible the hurtful wolfram, and classes the values into groups according to richness. Gravity or pneumatic stamps then crush the ore to $\frac{1}{50}$ in., and stripes (a species of long rectangular buddle) yield heads, middlings, tailings and fine slimes: the first three are sent separately to circular buddles, and the last to frames. The buddles yield concentrates, middlings and tailings: the middlings are re-treated, the tailings are all waste; the concentrates are still further enriched by kieves, which yield tops to the buddle again and bottoms shipped to the smelter. The fine slimes are treated on frames, the concentrates of which go to buddles; of these the concentrates go to kieves.

The Missouri zinc-lead sludge mill takes the finest part of the hutch product of the hand-jigs. The treatment begins on revolving screens with two sizes of holes, 25 mm. and 1 mm.: these take out two coarser sizes, of which the coarser is waste and the other is jigged, yielding concentrates and waste. The main treatment begins with the finest size, which is much the largest product. It is fed to a convex circular buddle (first buddle), and yields a coarser product at the outer part of the circle and a finer product in the inner. The finer product is treated by a series of buddlings which vary somewhat, but in general are as follows: fed to a second buddle it yields zinc and lead ore in the centre, next zinc ore, next middlings which come back, and, outside of all, tailings. The zinc-lead ore is set on one side until enough has accumulated to make a buddle run, when it is run upon a third buddle yielding in the central part pure lead concentrates, next lead ore (which is returned to this treatment), next zinc ore, and outside of all a zinc product which is fed to the second buddle. The coarse outside product of the first buddle is treated in much the same way as the fine, but it yields practically no lead zinc product, which simplifies the series of buddlings necessary.

Gold Mill.—Gold ores usually contain their value in two conditions—the free gold, which can be taken out by mercury, and the combined gold, in which the metal is either coated with or combined with compounds of sulphur, tellurium, &c. The usual gold-milling scheme is to crush the ore by rock-breaker to about 1½ in. diameter, and then to crush with water by gravity stamps, a little mercury being added to the mortar from time to time to begin the amalgamation at the first moment the gold is liberated. The pulp leaves the mortar through a screen with holes or slots $\frac{1}{30}$ to $\frac{1}{50}$ in. in width, and is then passed over amalgamated plates of copper or silver-plated copper. The free gold, amalgamated by the mercury, adheres to the mercurial surface on the plate; the rest of the pulp flows on through mercury traps to catch any of the mercury, which drains off the end of the plate. The plates and mortar are periodically cleaned up, the plates being scraped to recover the amalgam and leave them in good condition to do their work: if plates are used inside the mortar, they are cleaned in the same way. The residue of partly crushed ore in the mortar, with amalgam and free mercury scattered through it, is ground for a time in a ball mill, panned to recover the amalgam, and returned to the mortar. The pulp flowing away from the mercury traps flows to a Frue vanner or Wilfley table, on which it yields concentrates for the chlorination plant or smelter and tailings: these are waste when the heavy mineral is of low grade, but if the vanner concentrates are of high grade, they still contain values in very fine sizes which can and should be saved. Recent improvements in California for saving this material have been made. The vanner tailings are sent to a fine classifier, from which the light overflow only is saved; this is treated upon canvas tables yielding concentrates and tailings, and these concentrates, treated upon a little end-shake vanner with steep slope and rapid travel, give clean, very fine, high-grade concentrates for the chlorination works.

Iron Ores.—The brown ores of iron from surface deposits are contaminated with a considerable amount of clay and some quartz. The crude ore from surface pits or shallow underground workings is treated in a log-washer and yields the fine clay, which runs to waste, and the coarse material which is caught upon a screen and hand-picked, to free it from the little quartz, or jigged if it contains too much quartz. The magnetic oxide of iron occurs associated with felspar and quartz, and can often be separated from them by the magnet. The ore, after being broken by breaker and rolls to a size varying from $\frac{1}{8}$ to $\frac{1}{16}$ of an inch in diameter, goes to a magnetic machine which yields (1) the strongly magnetic, (2) the weakly magnetic, and (3) the non-magnetic portions. The second or middlings product contains grains of magnetite attached to quartz, and is therefore re-crushed and sent back to the magnets; the strongly magnetic portion is shipped to the furnace; and the waste to the dump heap. In concentrating by water certain zinc sulphides, siderite (carbonate of iron) follows the zinc, and would seriously injure the furnace work. By a carefully adjusted roasting of the product in a furnace the siderite is converted into magnetic oxide of iron, and can then be separated by magnet from the zinc ore. A special magnet of very high power, known from its inventor as the Wetherill magnet, has been designed for treating the franklinite of New Jersey, a mineral which is non-magnetic in the usual machines. The ore, crushed by breaker and rolls and hand-picked to remove garnet, is treated upon a belt with a roughing magnet to take out the most magnetic portion, and then very closely sized by screens with

6, 24, 30 and 50 meshes per linear inch. The several products are treated each on its own magnetic machine, yielding the franklinite for the zinc oxide grates, and followed by spiegel furnace; the residue, which is jigged, yields the zinc silicate and oxide for the spelter furnaces, and waste carrying the calcite, quartz and mica.

Asbestos, when of good quality, is in compact masses, which by suitable bruising and beating are resolved into fine flexible fibres. The Canadian asbestos is associated with serpentine, and is crushed by breakers to $\frac{3}{4}$ in., screened on $\frac{1}{16}$-in. screens to reject fines. The values are removed by hand-picking and are crushed by rolls carefully set so as not to break the fibre; this product is then sized by screens and the various sizes are sent to the Cyclone pulverizer, which by beating liberates the individual fibres. It then goes to a screen with eleven holes to the linear inch, and yields a granular undersize and oversize, and a fibrous oversize which is drawn off by a suction fan to a settling-chamber with air outlets covered by fine screen cloth. This fibrous product is the clean mineral for the market. A special treatment separates the fibres of different lengths.

The usual method of dressing *corundum* and *emery*, after the preliminary breaking, is to treat the material in an edge-stone mill fitted with light wooden rollers. The action is that of grinding one particle against another, whereby the talc, chlorite, mica, &c., are worn off from the harder mineral. A constant current of water carries off the light impurities. This is called the "muller" process. At Corundum Hill, North Carolina, the first step in removing the impurities from "sand" corundum is to subject it to the scouring action of a stream of water while it is being sluiced from the mine to the mill, the action being increased by several vertical drops of 5 to 10 ft. in the sluice. After reaching the mill all that will not pass through a 14-mesh screen is crushed by rolls, and the undersize of the screen is treated in a washing trough; this removes part of the light waste, and the "mullers" mentioned above complete the cleaning.

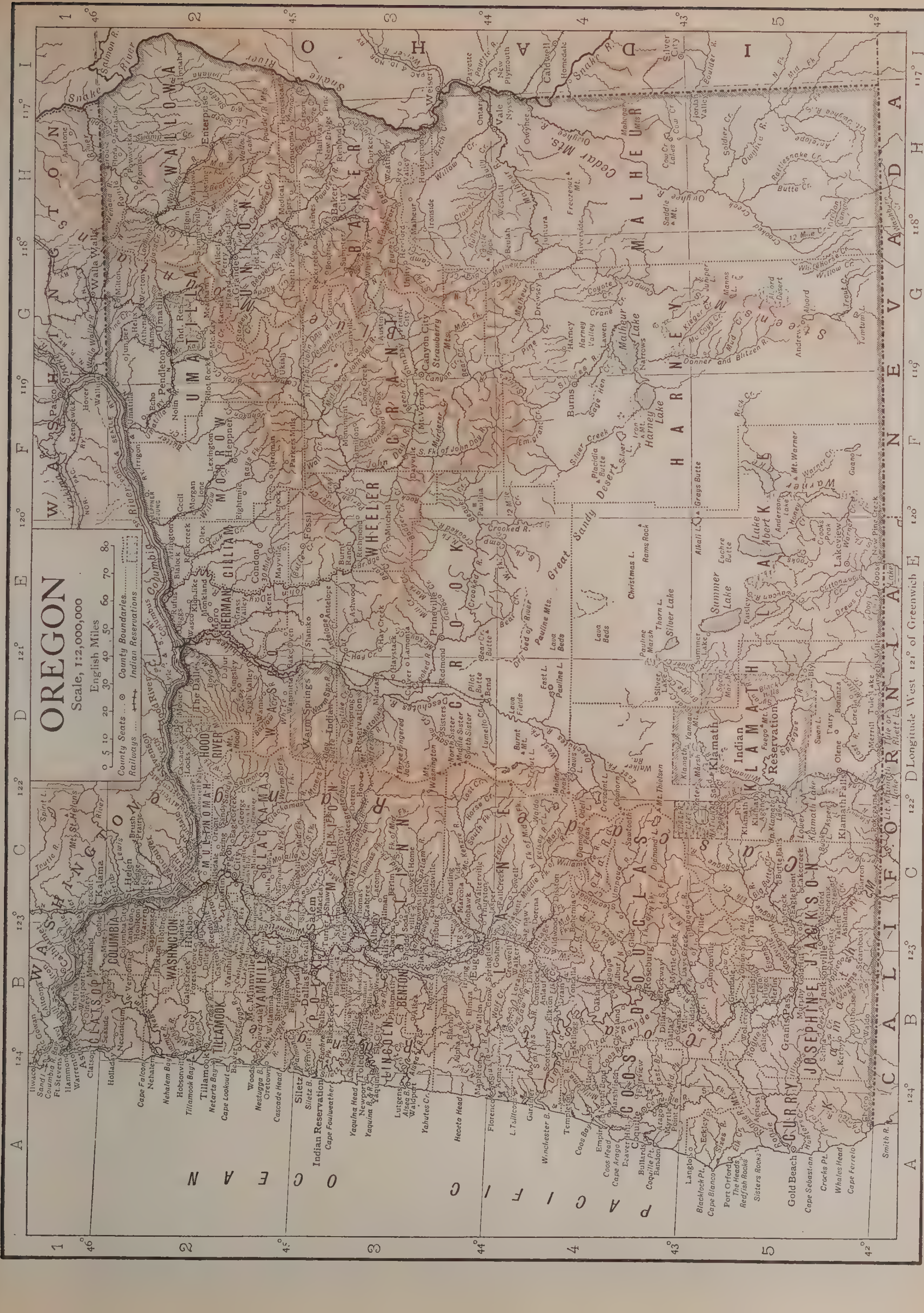
Graphite occurs in schist, but being of less specific gravity than the other minerals which enter into the composition of the schist, it settles later than they do. It also breaks into thin scales, which reduces its settling rate still further. The ore is broken by breakers, and by Chile edge-stone mills or by gravity stamps, to a size varying with the character of the minerals from perhaps $\frac{1}{20}$ to $\frac{1}{60}$ in. diameter. The pulp is then conveyed through a series of settling tanks of which the later are larger than the earlier. The quartz and other waste minerals settle in the earlier tanks, while the graphite settles later: the latest tank gives the best graphite. In the Dixon Company's works in New York some forms of concentrators are believed to have replaced the slower settling tanks.

The *phosphates* of Florida are of four kinds: hard rock, soft rock, land pebble and river pebble. The hard rock is crushed by toothed rolls, and cleaned in log washers. The washed product is screened; the sizes finer than $\frac{1}{16}$ in. are thrown away because too poor; the other sizes are dried and sold, some waste having been picked out of the coarsest. The soft rock is simply dried, ground and sold. Land pebble is treated by log washers, any clay balls remaining being removed by a screen, and the phosphate dried and sold. In special cases land pebble is treated by hydraulicking, followed by a log washer, and this again by a powerful jet washer, to remove the last of the clay. River pebble is taken from the river by centrifugal pumps, and screened on two screens with 1-in. and $\frac{1}{16}$-in. holes respectively; the oversize of the first sieve and the undersize of the second sieve are thrown away because of too low grade. (R. H. R.)

OREGON, a North-Western state of the American Union, on the Pacific slope, lying between 42° and 46° 18′ N. lat. and 116° 33′ and 124° 32′ W. long. It is bounded N. by the state of Washington, from which it is separated in part by the Columbia river, the 46th parallel forming the rest of the boundary; E., by Idaho, from which it is separated in part by the Snake river; S., by Nevada and California, and W., by the Pacific Ocean. It has an extreme length, E. and W., of 375 m., an extreme width, N. and S., of 290 m., and a total area of 96,699 sq. m., of which 1092 sq. m. are water-surface.

Topography.—The coast of the state extends in a general N. and S. direction for about 300 m., and consists of long stretches of sandy beach broken occasionally by lateral spurs of the Coast Range, which project boldly into the sea and form high rocky headlands. With the exception of the mouth of the Columbia river, the bays and inlets by which the shore is indented are small and of very little importance. Parallel with the coast and with its main axis about 20 m. inland is an irregular chain of hills known as the Coast Range. It does not attain a great height, but has numerous lateral spurs, especially toward the W. Euchre Peak (Lincoln county), probably the highest point in the range in Oregon, rises 3962 ft. above the sea. In southern Oregon the general elevation of this range is greater than in the N., but the individual peaks are less prominent, and the range in some respects resembles a plateau. Its western slope is generally longer and more gentle than the eastern. A number of small streams, among them the Nehalem, Coquille and Umpqua rivers, cut their way through the Coast Range to reach the ocean. For the greater portion of its length in Oregon, in the northern half of the state, the Coast Range is bordered on the E. by the Willamette Valley, a region about 200 m. long and about 30 m. wide, and the most thickly populated portion of the state; here, therefore, the range is easily defined, but in the S., near the Rogue river, it merges apparently with the Cascade and the Sierra Nevada Mountains in a large complex group designated as the Klamath Mountains, lying partly in Oregon and partly in California, and extending from the northern extremity of the Sierra Nevada to the sea. The Klamath Mountains separate topographically southern Oregon from northern California. A number of ridges and peaks bearing special names, such as the Rogue river, Umpqua and Siskiyou Mountains, belong to this group. The Cascade Mountains, the most important range in Oregon, extend parallel with the coast and lie about 100 m. inland. The peaks of this system are much higher than those of the Coast Range, varying from 5000 to 11,000 ft., and the highest of them are cones of extinct volcanoes. Mount Hood (11,225 ft.), which is the highest point in the state, Mount Jefferson (10,200 ft.), the Three Sister Peaks, Mount Adams, Bachelor Mountain, and Diamond Peak (8807 ft.) all have one or more glaciers on their sides. The Calapooya Mountains, forming the water-parting between the Willamette and the Umpqua rivers, are a lateral spur of the Cascades, and extend westward as far as the Coast Range. The Cascade Mountains divide the state topographically into two sharply contrasted parts. West of this range the country exhibits a great variety of surface structure, and is humid and densely wooded; east of the range it consists of a broken tableland, arid or semiarid, with a general elevation of 5000 ft. This eastern tableland, though really very rugged and mountainous, seems to have few striking topographic features when compared with the more broken area to the W. In the north-eastern part of this eastern plateau lie the Blue Mountains, which have an average elevation of about 6000 ft. and decline gradually toward the N. A south-western spur, about 100 m. in length, and the principal ridge together enclose on several sides a wide valley drained by the tributaries of the John Day river. South of these mountains lies the northern limit of the Great Basin region. In Oregon this area extends from the Nevada boundary northward for about 160 m., to the head of the Silvies river, and embraces an area of about 16,000 sq. m. None of its streams reaches the sea, but all lose their waters by seepage or evaporation. On the E., N., and N.W. the Great Basin is bounded by the drainage systems of the tributaries of the Columbia river, and on the S.W. by the drainage system of the Klamath river. Its boundaries, however, cannot be definitely fixed, as they change with the periods of humidity and drought. Goose Lake, for example, lies in the Great Basin at some seasons; but at other times it overflows and becomes a part of the drainage system of the Sacramento river. Many of the mountains within the Basin region consist of great faulted crust blocks, with a general N. and S. trend. One face of these mountains is usually in the form of a steep palisade, while the other has a very gradual slope. Between these ridges lie almost level valleys, whose floors consist partly of lava flows, partly of volcanic fragmental material, and partly of detritus from the bordering mountains. During the wet season the valleys often contain ephemeral lakes, whose waters on evaporating leave a playa, or mud flat, often covered with an alkaline encrustation of snowy whiteness. Some large permanent lakes occupy the troughs between faulted blocks in southern Oregon. The greatest level, or approximately level, area in the Great Basin region of Oregon is the so-called Great Sandy Desert, a tract about 150 m. long and from 30 to 50 m. wide, lying in parts of Crook, Lake and Harney counties. Its surface consists of a thick sheet of pumiceous sand and dust, from which arise occasional buttes and mesas. On account of the small amount of precipitation, the fissured condition of the underlying lava sheets, and the porous soil, the Great Sandy Desert has practically no surface streams even in the wet season, and within its limits no potable waters have been found. The most prominent mountain range in the Oregon portion of the Great Basin is the Steens Mountains in the S.E., which attain an altitude of about 9000 ft. above the sea and of 5000 ft. above Alvord Valley, which lies along the eastern base. This range is a large monoclinal block, with a trend almost N.E. and S.W., presenting a steep escarpment toward the E., and sloping very gradually toward the W. It exhibits much evidence of powerful erosion, having deep canyons in its sides, and it bears evidence of previous glaciers. The region adjoining the Great Basin on the E. is usually known as the Snake River Plains, and embraces an area of about 1200 sq. m. in Malheur county. Here the hills are deeply sculptured and the valleys much carved by streams which often flow through deep canyons. Where the streams cut their way through sheets of basaltic lava their banks are steep, almost vertical cliffs, but where they cut through sedimentary rocks the sides have a more gentle slope. When several alternate layers of hard and soft rock are cut through by a stream its banks sometimes have the form of steps. The destruction of the grasses on the hillsides by overgrazing in recent years has increased the flooding by temporary streams, and consequently has tended to deepen and increase the gulleys and channels of the mountains and valleys.

The state as a whole has an average elevation of 3300 ft.; with 20,300 sq. m. below 1000 ft.; 19,200 sq. m. between 1000 and 3000 ft.; 33,500 sq. m. between 3000 and 5000 ft.; and 23,030 sq. m. between 5000 and 9000 ft.


OREGON
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English Miles
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County Seats ⊙
County Boundaries
Railways
Indian Reservations
Longitude West 121° of Greenwich
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CALIFORNIA
CLATSOP
COLUMBIA
TILLAMOOK
WASHINGTON
MULTNOMAH
HOOD RIVER
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
UNION
WALLOWA
BAKER
GRANT
WHEELER
CROOK
MALHEUR
HARNEY
LAKE
KLAMATH
JACKSON
JOSEPHINE
CURRY
COOS
DOUGLAS
LANE
LINN
BENTON
LINCOLN
POLK
YAMHILL
MARION
CLACKAMAS
Cascade Range
Blue Mts.
Great Sandy Desert
Columbia River
Snake River
Warm Springs Indian Reservation
Siletz Indian Reservation
Klamath Indian Reservation
Umatilla Ind. Res.

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Rivers. The most important stream is the Columbia river, which forms the northern boundary for 300 m. and receives directly the waters of all the important rivers in the state except a few in the S.W. and a few in the extreme E. About 160 m. from its mouth are the Cascades, where the river cuts through the lava beds of the Cascade Mountains and makes a descent of about 300 ft. through a canyon 6 m. long and nearly 1 m. deep. The passage of vessels through the river at this point is made possible by means of locks. Fifty-three m. farther up the stream is a second set of rapids known as the Dalles, where the stream for about 2 m. is confined within a narrow channel from 130 to 200 ft. wide. The largest tributary of the Columbia is the Snake river, which for nearly 200 m. of its course forms the boundary between Oregon and Idaho. It flows through a canyon from 2000 to 5000 ft. deep, with steep walls of basaltic and kindred rocks. The powerful erosion has often caused the columnar black basalt to assume weird and fantastic shapes. The chief tributaries of the Snake river in Oregon are the Grand Ronde, Powder, Burnt, Malheur and Owyhee rivers. The principal tributaries of the Columbia E. of the Cascade Mountains and lying wholly within the state are the John Day river, which rises in the Blue Mountains and enters the Columbia 29 m. above the Dalles after pursuing a winding course of about 250 m.; and the Deschutes river, which rises on the eastern slope of the Cascade Mountains, and after flowing northward for about 320 m. enters the Columbia 12 m. above the Dalles. The Deschutes river drains a region which is less arid than the plateau farther E., and which contains a number of small lakes. A peculiar feature of the stream is the uniformity of its volume throughout the year; the great crevasses in the lava bed through which it flows form natural spillways and check any tendency of the stream to rise within its banks. The Willamette river, W. of the Cascade Mountains, is the most important stream lying wholly within the state. It rises on the western slope of the Cascades and enters the Columbia river about 100 m. above its mouth, having with its branches a length of about 300 m. In the western part of the state a number of short streams flow directly into the Pacific Ocean, the most important of these being the Rogue and the Umpqua rivers, which have their sources in the Cascades.

Lakes. In Southern Oregon, especially in the Great Basin region, there are numerous lakes. Malheur Lake, in Harney county, during the wet season is about 25 m. long and has an average width of 5 or 6 m. It is not over 10 ft. deep in any part, and is only a few inches in depth a mile from the shore. In the summer most of its bed is a playa or mud flat. Almost continuous with this body of water on the S.W. is Harney Lake, roughly circular in form and about 7·8 m. in diameter. The waters of both lakes are alkaline, but Malheur Lake is often freshened by overflowing into Harney Lake, while the latter, having no outlet, is growing continually more alkaline. East of the Steens Mountains there is a chain of very small lakes, such as the Juniper, Manns and Alvord lakes, and also a playa known as the Alvord Desert, which in the spring is covered with a few inches, or perhaps 1 or 2 ft., of water, and becomes a lake with an area of 50 or 60 sq. m. In the summer the dry bed is smooth and very hard, and when the skies are clear the monotony of the landscape is sometimes broken by a mirage. In Lake county, occupying fault-made troughs, are several large bodies of water—Lake Abert (about 5 m. by 15 m.), Warner Lake (50 m. long, 4·8 m. wide), Summer Lake (a little smaller than Abert), and Goose Lake, the one last named lying partly in California and draining into the Sacramento system. The Upper and the Lower Klamath lakes of Klamath county are noted for their scenic beauty. Near the north-western boundary of Klamath county is the famous Crater Lake, whose surface is 6239 ft. above the sea. This lake lies in a great pit or caldera created by the wrecking in prehistoric times of the volcano Mount Mazama, which according to geologists once had an altitude of about 14,000 ft. above the sea and of 8000 ft. above the surrounding tableland; the upper portion of the mountain fell inward, possibly owing to the withdrawal of interior lava, and left a crater-like rim, or caldera, rising 2000 ft. above the surrounding country. The lake is 4 m. wide and 6 m. long, has a depth in some places of nearly 2000 ft., and is surrounded by walls of rock from 500 to 2000 ft. high. In spite of its great elevation the lake has never been known to freeze, and though it has no visible outlet its waters are fresh.

Fauna and Flora.—Large game has disappeared from the settled areas, but is still fairly abundant on the plains of the east and among the mountains of the west. In the mountain forests of south-western Oregon bears, deer, elk, pumas, wolves and foxes are plentiful. Among the south-eastern plateaus antelope are found at all seasons, and deer and big-horn (mountain sheep), and occasionally a few elk, in the winter. Bears, wolves, lynxes and foxes are also numerous in the east, and there the coyote is found in disagreeable numbers. The pocket-gopher and the jack-rabbit are so numerous as to be great pests. The principal varieties of game-birds are ducks, geese, grouse and California quail. Sage-hens are occasionally seen on the dry plateaus and valleys, especially in Harney county. The Oregon robin (*Merula naevia*) and the Oregon snowbird (*Junco Oregonus*) are common in Oregon and northward. On the rocky headlands and islands of the coast nest thousands of gulls, cormorants, puffins, guillemots, surf-ducks (*Oedemia*), dotterels, terns, petrels and numerous other birds. There, too, the Steller's sea-lion (*Eumetopias stelleri*) spends the mating season. The marine fauna is abundant and of great economic importance. The river fauna of the coast is of two distinct types: the type of the Columbia fauna in rivers north of the Rogue; and another type in the Klamath and its tributaries. Typical of the Columbia river is *Catastomus macrocheilus* and of the Klamath, *C. rimiculus*. Lampreys, sticklebacks, cattoids, sturgeons—the white sturgeon (*Acipenser transmontanus*) is commonly known as the "Oregon sturgeon"—trout and salmon are the principal anadromous fish, the salmon and trout being the most important economically. The best varieties of the salmon for canning are: the king, Chinook or quinnat (*Oncorhynchus tschawytscha*), far better than any other variety; and the steel-head, blue back or sukkegh (*O. nerka*).

The total woodland area of the state according to the United States census of 1900 was 54,300 sq. m. or 56·8% of the land area. The Federal government established in 1907 and 1908 thirteen forest reserves in the state, ten of which had an area of more than 1,000,000 acres each; their total area on the 1st of January 1910 was 25,345 sq. m. From the coast to the eastern base of the Cascade Mountains the state is heavily timbered, except in small prairies and clearings in the Willamette and other valleys, and the most important tree is the great Douglas fir, pine or spruce (*Pseudotsuga Douglasii*), commonly called Oregon pine, which sometimes grows to a height of 300 ft., and which was formerly in great demand for masts and spars of sailing-vessels and for bridge timbers; the Douglas fir grows more commercial timber to the acre than any other American variety, and constitutes about five-sevenths of the total stand of the state. Timber is also found on the Blue Mountains in the north-east and on a number of mountains in the central and south-eastern parts of the state. East of the Cascades the valleys are usually treeless, save for a few willows and cottonwoods in the vicinity of streams. Over the greater part of this region the sage-brush is the most common plant, and by its ubiquity it imparts to the landscape the monotonous greyish tint so characteristic of the arid regions of the western United States. West of the Cascades most of the trees of commercial value consist of Douglas fir. Cedar and hemlock also are commercially valuable. There are small amounts of sugar pine, yellow pine, red fir and silver fir (*Abies grandis* and *A. nobilis*) and spruce; and among the broad-leaved varieties the oak, ash, maple, mahogany-birch or mountain mahogany (*Cercocarpus ledifolia*), aspen, cotton-wood and balsam are the most common. East of the Cascades the forests consist for the most part of yellow pine. In the south-east the hills and lower slopes of the mountains are almost bare of trees. At higher altitudes, however, the moisture increases and scattered junipers begin to appear. Blending with these at their upper limit and continuing above them are clumps of mountain mahogany, which sometimes attains a height of 20 or 30 ft. Above this belt of mahogany, pines and firs are sometimes found. In this region the mountains have an upper, or cold, timber line, the height of which depends upon the severity of the climate, and a lower, or dry, timber line, which is determined by the amount of rainfall. These upper and lower limits of the timber belt are sometimes very sharply defined, so that tall mountains may be marked by a dark girdle of forest, above and below which appear walls of bare rock. In a very arid region the dry timber line may rise above the cold timber line, and in such a case the mountain will contain no forests. Of this phenomenon the Steens Mountains furnish a conspicuous example. It was estimated that the forests of Oregon contained in 1900 about 150,000,000,000 ft. of Douglas fir or spruce, 40,000,000,000 ft. of yellow pine and 35,000,000,000 ft. of other species—chiefly cedar, hemlock and spruce. In the most heavily wooded region along the Pacific coast and the lower course of the Columbia river are forests of the Douglas fir with stands of 100,000 ft. of timber per acre. The value of the lumber and timber products increased from $1,014,211 in 1870 to $6,530,757 in 1890, to $10,257,169 in 1900, and to $12,483,908 in 1905.

Climate.—Perhaps no state in the union has such great local variations in its climate as has Oregon. Along the coast the climate is humid, mild and uniform, and, as has often been remarked, very like the climate of the British Isles; in the eastern two-thirds of the state, from which the moisture-laden winds are excluded by the high coastwise mountains, the climate is dry and marked by great daily and annual ranges of temperature. The mean annual temperature varies with the elevation and the distance from the sea, being highest along the western slope of the Coast Range at altitudes below 2000 ft., and lowest in the elevated regions E. of the Cascade Mountains. The temperatures along the coast are never as high as 100° F. or as low as zero. In the valleys between the Coast Range and the Cascade Mountains the range of temperature is much greater than it is along the coast; the absolute maximum and minimum being respectively 102° and -2° at Portland, in the N.W., and 108° and -4° at Ashland, in the S.W. Owing to its greater elevation the southern portion of Oregon experiences greater extremes of temperature than the northern. In that part of the state E. of the Cascades the climate is of a continental type, with much greater ranges of temperature than in the W., although in a few low valleys, as at the Dalles, the extremes are somewhat modified. While flowers bloom throughout the year at Portland, frosts have occurred in every month of the year at Lakeview, in the Great Basin. At Astoria, near the mouth of the Columbia river, the mean annual temperature is 52° F., with extremes recorded of 97° and 10°; but at Silver Lake, in the Great

Basin region, while the mean annual temperature is 44°, the highest and lowest ever recorded are respectively 104° and −32°. These records afford a striking illustration of the moderating influence of the ocean upon climate.

As is the case in all the Pacific states, the amount of rainfall decreases from N. to S., and is greatest on the seaward slopes of the hills and mountains. As the winds from the ocean are deprived of their moisture on reaching the Coast and Cascade ranges, the amount of annual precipitation, which in the coast counties varies from 75 to 138 in., constantly diminishes toward the E. until in the extreme south-eastern part of the state it amounts to only about 8 in. No other state, except perhaps Washington, has such a great variation in the amount of its rainfall. Precipitation on the Coast Range at altitudes above 2000 ft. amounts to about 138 in. annually; in the valleys E. of this range it varies from 20·2 in. at Ashland to 78·2 in. at Portland. On the western slope of the Cascades it varies from 50 in. in the S. to 100 in. in the N.; in the Columbia Valley the amount is from 10 to 15 in.; in the valleys and foothills of the Blue Mountains, 12 to 25 in.; and in the plateau region of central and south-eastern Oregon, 8 to 22 in. In the region W. of the Cascade Mountains there is a so-called wet season, which lasts from October to March, and the summers are almost rainless. In the rest of the state there is a maximum rainfall in the winter and a secondary wet season in May and June, with the rest of the summer very dry. During the winter the prevailing winds are from the S. and bring moisture; during the summer they are from the N.W. and are accompanied by cloudless skies and moderate temperatures. Winds from the N.E. bring hot weather in the summer and intense cold in the winter.

Soils.—The state has almost as great a variety of soils as of climate. In the Willamette Valley the soils are mostly clay loams, of a basaltic nature on the foothills and greatly enriched in the river bottom lands by washings from the hills and by deposits of rich black humus. In south-western Oregon, in the Rogue and Umpqua valleys, the characteristic soil is a reddish clay, though other varieties are numerous. In eastern Oregon the soils are of an entirely different type, being usually of a greyish appearance, lacking in humus, and composed of volcanic dust and alluvium from the uplands. They are deep, of fine texture, easily worked and contain abundant plant food in the form of soluble compounds of calcium, sodium and potassium. At times, however, these salts are present in such excess as to render the soils too alkaline for plant growing. Where there is no excess of alkali and the water supply is sufficient, good crops can be grown in this soil without the use of fertilizers.

Agriculture and Stock-Raising.—Oregon has some of the most productive agricultural lands in the United States, but they are rather limited in extent, being confined for the most part to the valleys west of the Cascade Mountains and the counties bordering on the Columbia river east of those mountains. The other parts of the state are generally too dry or too mountainous for growing crops, but contain considerable areas suitable for grazing. In 1900 only about one-sixth of the total land surface was included in farms, and a trifle less than one-third of the farm land was improved. There were 35,837 farms, and their average size was 281 acres. Of the whole number 33·0% (11,827) contained less than 100 acres each, 30·5% (11,055) contained from 100 to 175 acres each, and 10·4% (3727), devoted mainly to stock-raising, contained 500 acres or more each. Nearly four-fifths of the farms (28,636) were operated by owners or part owners, 3729 were operated by share tenants, 2637 by cash tenants and 835 by owners and tenants or managers. The principal crops are wheat, oats, hay, fruits, hops, potatoes and miscellaneous vegetables. Sheep and cattle are raised extensively on ranches in the semi-arid regions, large herds of cattle are kept on lands too wet for cultivation in the western counties, and stock-raising and dairying have become important factors in the operation of many of the best farms. The acreage of wheat was 810,000 in 1909 and the crop was 16,377,000 bushels. The oat crop was 10,886,000 bushels. The barley crop was 1,984,000 bushels. The nights are so cool that Indian corn is successfully grown only by careful cultivation, and the crop amounted to only 552,000 bushels in 1909. The hay crop, 865,000 tons in 1909, is made quite largely from wild grasses and grains cut green; on the irrigated lands alfalfa is grown extensively for the cattle and sheep, which are otherwise almost wholly dependent for sustenance upon the bunch grass of the semi-arid plains. Both cattle and sheep ranches in the region east of the Cascade Mountains have been considerably encroached upon by the appropriation of lands for agricultural purposes, and the cattle, also, have been forced to the south and east by the grazing of sheep on lands formerly reserved for them; but the numbers of both cattle and sheep on the farms have become much larger. The whole number of sheep in the state was 2,581,000 in 1910. The number of cattle other than dairy cows was 698,000 and that of dairy cows 174,000. The dairy business is a promising industry in the farming regions, especially in the Willamette Valley. The number of horses in 1910 was 308,000. The small number of swine (267,000 in 1910) is partly due to the small crop of Indian corn. Fruit-growing has been an increasingly important industry in the region between the Cascade and Coast Ranges and (to a less degree) east of the Cascade Range; and the cultivation of apples is especially important. The cultivation of hops was begun in Oregon about 1850; the soil and climate of the Willamette Valley were found to be exceedingly favourable to their growth, and the product increased to 20,500,000 lb in 1905, when the state ranked first in the Union in this industry.

The agricultural resources of the state may be considerably increased by irrigation east of the Cascade Mountains. The irrigated areas, which are widely distributed, increased from a total of 177,944 acres in 1889 to 388,310 acres in 1902. In 1894 Congress passed the "Carey Act" which authorizes the Secretary of the Interior, with the approval of the President, to donate to each of the states in which there are Federal desert lands as much of such lands (less than 1,000,000 acres) as the state may apply for, on condition that the state reclaim by irrigation, cultivation and occupancy not less than 20 acres of each 160-acre tract within ten years, and under the operation of this Act the state chose 432,203 acres for reclamation, mostly in the basin of the Deschutes river. Furthermore there is a state association engaged in irrigation projects, and the United States Reclamation Service, established by an Act of Congress in 1902, has projects for utilizing the flood waters of the Umatilla, Malheur, Silvies and Grande Ronde rivers, the waters of the Owyhee and Wallowa rivers and Willow Creek, and the waters of some of the lakes in the central part of the state. Two of these projects had been begun by 1909: the Umatilla project in Umatilla county, to irrigate 20,440 acres with water diverted from the Umatilla river by a dam (98 ft. high, 3500 ft. long) 2 m. above Echo, with a reservoir of 1500 acres, was authorized in 1905 and was 85½% finished in 1909; the Klamath project, to irrigate 181,000 acres in Klamath county, Oregon (about 145,000 acres) and Siskiyou and Modoc counties, California, by two canals from Upper Klamath Lake and by a storage dam (33 ft. high, 940 ft. long) in the Clear Lake reservoir of 25,000 acres, was authorized in 1905 and was 38% completed in 1909. It has been estimated that the irrigated and irrigable area under private canals is about 80,000 acres, and that that still undisposed of in 1909, irrigated by the state under the Carey Act, amounted to 180,000 acres.

Fisheries.—The Columbia river has long been famous for its salmon, and as the supply seemed threatened with exhaustion for several years following the maximum catch in 1883, the state legislature in 1901 passed an act establishing a close season both early in the spring and late in the summer and prohibiting any fishing, except with hook and line, at any time, without a licence. In 1908 two laws proposed by initiative petition were passed, stopping all fishing by night and fishing in the navigable channels of the lower river, limiting the length of seines to be used in the lower river and abolishing the use of gear by fishermen of the upper river—the mouth of the Sandy river, in Multnomah county, being the dividing line between the upper and lower Columbia. Several hatcheries have been established by the state authorities of Oregon and Washington and by the Federal government for propagating the best varieties: the Chinooks (*O. tschawytscha*), the bluebacks (*O. nerka*) and, when the bluebacks became scarce, silversides (*O. kisutch*). The total catch of salmon on the Oregon side of the Columbia river in 1901 was 16,725,435 lb; from this it rose to 24,575,228 lb in 1903, but fell to 18,151,743 lb in 1907 and 18,463,546 in 1908. Salmon are caught in smaller quantities in the coast streams: 4,371,618 lb in 1901 and 8,043,690 lb in 1906, but only 6,738,682 lb in 1907 and 6,422,511 lb in 1908. Some catfish, shad, smelt, halibut, herring, perch, sturgeon, flounders, oysters, clams, crabs and crawfish are also obtained from Oregon waters.

Minerals.—Gold was discovered in the Rogue and Klamath rivers in the S. part of Oregon in 1852, and placer-mining was prosecuted here without interruption until 1860, when the metal was found in larger quantities on the streams in Baker and Grant counties in the north-eastern part of the state. Quartz-mining has since very largely taken the place of placer-mining, but the two principal gold-producing districts are still that traversed by the Blue Mountains in the north-eastern quarter and that drained by the Rogue river in the south-western corner, a continuation of the California field. The value of the total output of the state was $2,113,356 in 1894, but only $865,076 in 1908. Silver is obtained almost wholly in the form of alloy with gold, and in 1908 the value of the output was only $23,109. Lignitic coal was discovered on or near the coast of Coos Bay as early as 1855, and this is still the only productive coalfield within the state, although there are outcroppings of the mineral all along the Coast Range N. of the Rogue river, along the W. foothills of the Cascade Range and in the Blue Mountains; this coal is suitable for steam and heating purposes but will not coke. The quantity of the output was 86,259 short tons in 1908. Copper ores are known to be quite widely distributed in the mountain districts, but there has been little work on any except some in Josephine and Grant counties; in 1908 the state's output amounted to 291,377 lb of copper. Iron ore, platinum, lead, quicksilver and cobalt have been obtained in the state in merchantable quantities, and there is some zinc ore in the Cascade Range. In Union county is a great amount of blue limestone, and there is limestone, also, in Baker, Grant, Wallowa, Jackson and Josephine counties. Sandstone is abundant, and there is some granite, in the Coast Range. A variegated marble is obtained in Douglas county, and other marbles are found in several counties. Clays suitable for making brick and tile are found in nearly every part of the state: in 1908 the clay products of the state were valued at $555,768. Soapstone is abundant in both the E. and W. counties. Ochre, or mineral paint, and mineral waters, too, are widely distributed. There is some roofing slate along the Rogue river, natural cement, nickel ore, bismuth and wolframite in Douglas county, gypsum in Baker county, fire-clay in Clatsop county, borate of soda on the marsh lands of Harney county, infusorial earth and tripoli in the valley of the Deschutes river, chromate of iron in Curry and Douglas counties, molybdenite in Union county, bauxite in Clackamas county, borate of lime in Curry county, manganese ore in Columbia county, and asbestos in several of the southern and eastern counties. The total value of all mineral products in 1908 was $2,743,434.

Manufactures.—Manufacturing is encouraged both by the variety and abundance of raw material furnished by the mines, the forests, the farms and the fisheries, and by the coal and water-power available for operating the machinery. The total value of manufactures increased from $10,931,232 in 1880 to $41,432,174 in 1890, or 279 % in ten years, and although progress was slow from 1890 to 1900 there was a rapid advance again from 1900 to 1905, when the value of factory products increased from $36,592,714 to $55,525,123. The manufactures of greatest value are lumber and timber products ($12,483,908 in 1905). Portland and Astoria are the chief manufacturing centres; in 1905 the value of the factory products of these two cities was 57·2 % of that of the factory products of the entire state.

Transportation and Commerce.—For 110 m. from the mouth of the Columbia river to Portland, 12 m. up the Willamette river, is a channel which in 1909 was navigable (20-22 ft. deep) by large ocean-going vessels, and which will have a minimum depth of 25 ft. at low water upon the completion of the Federal project of 1902. From the mouth of the Willamette river vessels of light draft ascend the Columbia (passing the Cascade Falls through a lock canal, which was opened in 1896 and has a depth of 8 ft., a width of 92 ft. and two locks, each 462 ft. long) to the mouth of the Snake river (in the state of Washington), up that river to the mouth of the Imnaha, in Wallowa county, on the eastern boundary of Oregon, and, when the water is high, up the Imnaha river to the town of Imnaha, 516 m. from the sea. The Willamette river is navigable to Harrisburg, 152 m. above Portland, but boats seldom go farther up the river than Corvallis, 119 m. above Portland, and the depth at low water to Corvallis is only 3 ft. On the coast, Coos Bay, a tidal estuary, is the principal harbour between the mouth of the Columbia and San Francisco; it admits vessels drawing 14 to 16 ft. of water, and both the north and south forks of the Coos river are navigable for vessels of light draft (the depth at low water is only 1·5 ft.) 14 m. from the mouth of that river, and 8·5 m. on each fork. Farther north, Yaquina Bay and Tillamook Bay also admit small steamboats. The Coquille river is navigable for about 37 m., the Yaquina river for 23 m. with a depth of 13 to 15 ft., the Siuslaw river for 6 m. (for vessels drawing less than 6 ft., 15 m. farther for very light draft vessels) and a few other coast streams for short distances. The beginning of railway building in Oregon was delayed a few years by a contest between parties desiring a line on the east side of the Willamette river and parties desiring one on the west side. Finally, on the 14th of May 1868, ground was broken for the proposed line on the west side, and two days later it was broken for one on the east side; that on the east side was completed for 20 m. south of Portland in 1869 and that on the west side was completed to the Yamhill river in 1872. In 1870 the mileage was 159 m. The principal period of railway building was from 1880 to 1890, during which 931·97 m. were built and the state's mileage increased from 508 m. to 1,439·97 m. In 1909 the total mileage was 2089·46 m. There is a state railway commission. The principal railways are: that of the Oregon Railroad & Navigation Company (controlled by the Union Pacific), which crosses the north-eastern corner of the state and then runs along the bank of the Columbia river to Portland; three lines of the Southern Pacific in the Willamette Valley, the main line connecting Portland with San Francisco; the Astoria & Columbia River, connecting Portland and Astoria; the Coos Bay, Roseburg & Eastern Railroad & Navigation Company (owned by the Southern Pacific), connecting Coos Bay with one of the Southern Pacific lines; and the Corvallis & Eastern (owned by the Southern Pacific), connecting Yaquina Bay with all three lines of the Southern Pacific. Throughout the Cascade Mountain Region and the great semi-arid region east of those mountains, which together embrace more than two-thirds of the state's area, there is not a railway.

The state carries on an extensive commerce with the Orient and with the Canadian provinces. Its exports are principally lumber, wheat, live-stock, fish and wool; its imports are largely a variety of products of the Oriental countries. There are four customs districts: southern Oregon, with Coos Bay as the port of entry; Willamette, with Portland as the port of entry; Oregon, with Astoria as the port of entry; and Yaquina, at the mouth of the Yaquina river.

Population.—The population of Oregon was 13,294 in 1850; 52,465 in 1860; 90,923 in 1870; 174,768 in 1880; 317,704 in 1890; 413,536 in 1900, an increase of 30·2 % in the decade; and 672,765 in 1910, a further increase of 62·7 %. Of the total population in 1900, 347,788, or 84·1 %, were native-born, 65,748 were foreign-born, 394,582, or 95·4 %, were of the white race, and 18,954 were coloured. Of those born within the United States only 164,431, or less than one-half, were natives of Oregon, and of those born in other states of the Union 128,654, or about seven-tenths, were natives of one or another of the following states: Missouri, Illinois, Iowa, Ohio, California, New York, Indiana, Kansas, Washington, Wisconsin and Pennsylvania. Nearly three-fourths of the foreign-born were composed of the following: 13,292 Germans, 9365 Chinese, 9007 Scandinavians, 7508 Canadians, 5663 English and 4210 Irish. The coloured population consisted of 10,397 Chinese, 4951 Indians, 2501 Japanese and 1105 negroes.

The Indians are remnants of a large number of tribes, most of which are aboriginal to this region, and they represent ten or more distinct linguistic stocks. Most of them have been collected under five government schools; the Clackamas, Cow Creek, Calapooya, Lakmiut, Mary's River, Molala, Nestucca, Rogue River, Santiam, Shasta, Tumwater, Umpqua, Wapato and Yamhill, numbering 145 in 1909, under the Grande Ronde school, on the Grande Ronde reservation in Polk and Yamhill counties; the Klamath (658), Modoc (216), Paiute (103), and Pit River or Achomawi (56), under the Klamath school on the Klamath reservation (1362·8 sq. m.) in Klamath and Lake counties; the Alsea, Coquille, Kusan, Kwatami, Rogue River, Skoton, Shasta, Saiustkea, Siuslaw, Tututni, Umpqua and several other small tribes, numbering 442 in 1909, under the Siletz school, on the Siletz reservation (5 sq. m.) in Lincoln county; the Cayuse, Umatilla and Wallawalla, numbering 1205 in 1908, under the Umatilla school, on the Umatilla reservation (124·73 sq. m.) in Umatilla county, and the Paiute, Tenino, Warm Springs and Wasco Indians, numbering 765 in 1909, under the Warm Springs school on the Warm Springs reservation (503·29 sq. m.) in Wasco and Crook counties. Most of the Indians are engaged in farming and stock-raising, but a few still derive their maintenance mainly from fishing and hunting.

Roman Catholics are the most numerous religious sect in the state (in 1906 out of a total of 120,229 communicants of all religious bodies, they numbered 35,317). The rural population (*i.e.* population outside of incorporated places) is very sparse, only about 2½, in 1900, to the square mile, and while it increased from 203,973 in 1890 to 229,894 in 1900, or only 11·3 %, the urban (*i.e.* population of places having 4000 inhabitants or more) together with the semi-urban (*i.e.* population of incorporated places having less than 4000 inhabitants) increased during the same decade from 113,731 to 183,642, or 61·5 %. The principal cities are Portland, Astoria, Baker City and Salem, which is the capital.

Administration.—The state is still governed under its original constitution of 1857, with the amendments adopted in 1902, 1906 and 1908. This constitution may be amended: by a majority of the popular vote at a regular general election, if the amendment has been passed by a majority vote of all the elected members of each house of the legislature; or by an initiative petition; or by a constitutional convention, which may not be called, however, unless the law providing for it is approved by popular vote. The right of suffrage is conferred by the constitution upon all white male citizens twenty-one years of age and over who have resided in the state during the six months immediately preceding the election, and upon every white male of the required age who has been a resident of the state for six months, and who, one year before the election, has declared his intention of becoming a citizen and who has resided in the United States for one year and in the state for six months prior to the election. Idiots, insane persons and persons convicted of serious crimes are disfranchised. The clause excluding negroes and Chinese from the suffrage has never been repealed, although it has been rendered nugatory by the Fifteenth Amendment to the Federal Constitution. Another provision which has been annulled by amendment to the Federal Constitution, but which still remains in the state constitution, is a clause forbidding free negroes or mulattoes, not residing in the state at the time of the adoption of the constitution, to enter the state or to own real estate or make contracts and maintain suits therein, and bidding the legislature provide for the removal of such negroes and mulattoes and for the punishment of persons bringing them into the state, or employing or harbouring them. The constitution provides that no Chinaman, not a resident of the state at the time of the adoption of the constitution, shall ever hold any real estate or mining claim, or work any mining claim in the state.

The chief executive functions are vested in a governor, who is elected for a term of four years, and who must be at least 30 years old and must have been a resident of the state for three years before his election. He is not eligible to the office for more than eight years in any period of twelve years. He has the right of pardon and a veto of legislative acts, which may be overridden by a two-thirds vote of the members present of each house of the legislature. The other important administrative officers are the secretary of state (who succeeds the governor if he dies or resigns—there is no lieutenant-governor), treasurer, attorney-general, superintendent of public instruction and labour commissioner. No public officer may be impeached, but for sufficient cause the governor may remove a justice of the supreme court or a prosecuting attorney from office, upon a joint resolution of the legislature adopted by a two-thirds vote in each house. A public official may be tried for incompetence, corruption or malfeasance according to the regular procedure in criminal cases, and if convicted he may be dismissed from office and receive such other penalties as the law provides.

The legislative department (officially called "the legislative assembly") consists of a Senate of thirty[1] members chosen for four years, with half the membership retiring every two years, and a House of Representatives with sixty[1] members elected biennially. A senatorial district, if it contains more than one county, must be composed of contiguous counties, and no county may be divided between different senatorial districts. The sessions of the legislature are biennial. Bills for raising revenue must originate in the House of Representatives, but the Senate may offer amendments. Until 1902 the legislature was the sole law-making body in the state, but on the 2nd of June of this year the voters adopted a constitutional amendment which declared that "the people reserve to themselves power to propose laws and amendments to the constitution, and to enact or reject the same at the polls, independent of the legislative assembly, and also reserve power at their own option to approve or reject at the polls any act of the legislative assembly." This provision for the initiative and the referendum was made effective by a legislative act of 1903. Eight per cent of the number of voters who at the last preceding election voted for a justice of the supreme court, by filing with the secretary of state a petition for the enactment of any law or constitutional amendment—the petition must contain the full text of the law and must be filed at least four months before the election at which it is to be voted upon—may secure a vote on the proposed measure at the next general election, and if it receives the approval of the voters it becomes a law without interposition of the legislature, and goes into effect from the day of the governor's proclamation announcing the result of the election. A referendum of legislative enactments may be ordered in two ways: the legislature itself may refer any of its acts to the people for approval or rejection at the next regular election, in which case the act may not be vetoed by the governor and does not go into effect until approved at the polls; or 5 % of the number of voters at the last election for a supreme court justice may by petition order any act, except such as are "necessary for the immediate preservation of the public peace, health or safety," to be referred to the voters for their approval or rejection. Such a petition must be filed within ninety days after the adjournment of the session in which the act was passed. The secretary of state is required to mail to every voter whose address he has a pamphlet containing the text of the laws to be voted upon at the ensuing election. Along with the text of the law, the state will print arguments in its favour if any are submitted by the persons initiating the measure and the cost of the extra printing is paid by the initiators. In like manner, any one who will defray the expense of the printing may submit arguments in opposition to any proposed measure, and these will be included in the pamphlet and distributed by the state at its own expense. This "text-book" for the voters contained 60 pages in 1906 and 126 pages in 1908.

The power of the initiative was first exercised by the people of Oregon in 1904, when they proposed and enacted a local option liquor law and a direct primary law. As a result of the first of these measures, in 1908 nineteen of the thirty-three counties of the state had prohibited the sale of intoxicants since 1905. The most important effect of the direct primary law has been the choice of United States senators by what is practically a popular vote. Candidates for the United States Senate are voted for in the primaries, and between 1904 and 1909 candidates for the state legislature were required to say whether or not they would support the people's choice for United States senator regardless of their own preferences.[2] In the state election in June 1908 a Democrat received the highest popular vote for the senatorship, and as a majority of the legislature of 1909 had committed itself to vote for the people's choice, he was elected by that body, although five-sixths of its members were Republicans.[3] This was an anomaly in American politics. In June 1906 five laws and five amendments to the constitution, proposed by initiative petitions, and one law on which the referendum was ordered by petition, were submitted to a popular vote. An amendment giving women the right to vote was defeated, and among those adopted was one providing for the initiative upon special and local laws and parts of laws, and another giving cities and towns the exclusive right to enact or amend their own charters, subject only to the constitution and the criminal laws. Oregon was thus the first American state to grant complete home rule to its municipalities. At the election in June 1908 the number of initiative and referendum measures amounted to nineteen, and the ballot required forty-one separate marks and was over 2½ ft. long.

The measures to be voted on consisted of eleven laws or constitutional amendments proposed by initiative petition, four constitutional amendments referred to the people by the legislature, and four laws upon which the voters had ordered a referendum. Among the measures defeated were the fourth woman's suffrage amendment voted down in Oregon, a single-tax bill and an "open town" bill designed to defeat the purpose of the local option liquor law. Among the measures adopted were: a law (of doubtful constitutionality) requiring legislators to vote for the people's choice for a United States senator—this was adopted by a vote of 69,668 to 21,162; a corrupt practices act, regulating the expenditure of moneys in political campaigns and limiting a candidate's expenses to one-fourth of one year's salary; an amendment permitting the establishment of state institutions elsewhere than at the capital; an amendment changing the time of state elections from June to November; an amendment permitting the legislature to pass a law providing for proportional representation, *i.e.* representation for each political party in proportion to its numerical strength, by providing for first and second choice in voting—the system of preferential voting adopted in Idaho in 1909; and the "recall," by which the voters may remove from office after six months' service by a special election any local official.[4]

Judiciary.—The judicial department of the state consists of a supreme court, circuit courts, county courts (held by a county judge in each county) and the courts of local justices of the peace. The supreme court consists of five (before 1909 the number was three) justices elected for a term of six years, and its jurisdiction extends only to appeals from the decisions of the circuit courts. The judges of the circuit courts were formerly supreme court justices on circuit; they also are chosen for six years, and they have cognizance over all cases, including appeals from inferior courts, not specifically reserved by law for some other tribunal. The judges of the county courts are elected for four years, and their courts have jurisdiction over probate matters, civil cases involving amounts not exceeding $500, and criminal cases in which the offence is not punishable by death or imprisonment in the penitentiary. Each county is divided into a number of districts or precincts, for each of which there is a justice of the peace, elected biennially and having jurisdiction in minor cases.

Local Government.—For the purposes of local government the state is divided into thirty-four counties. The constitution provides that no county may have an area of less than 400 sq. m., and that no new county may be created unless its population is at least 1200. County affairs are administered by the county judge acting with two commissioners. Any portion of a county containing as many as 150 inhabitants may be incorporated as a town or city, and as such it possesses complete self-government in all purely local matters, even having the power to revise its own charter. A constitutional amendment of 1906 forbids the formation of corporations by special laws (formerly the constitution provided that corporations "shall not be created by special laws except for municipal purposes") and says: "The legislative assembly shall not enact, amend or repeal any charter or act of incorporation for any municipality, city or town." The initiative and the referendum are employed in municipal ordinances as well as in state laws; towns and cities make their own provisions as to "the manner of exercising the initiative and referendum powers as to their own municipal legislation"; but "not more than 10 % of the legal voters may be required to order the referendum nor more than 15 % to propose any measure by the initiative, in any city or town."

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[1] The constitution set 30 as the maximum number of senators, 60 as the maximum number of representatives, and provided for 16 senators and 34 representatives in 1857–1860. It provided for an enumeration and a reapportionment each tenth year after 1865.

[2] Before 1904, under a law of 1901, the people voted for candidates for the United States Senate, but the legislative assembly was in no way bound to carry out the decision of the popular vote; and in 1904 the legislature chose as United States senator a candidate for whom no votes had been cast in the popular election.

[3] It is to be noted that the Republican party had not favoured requiring a pledge from members of the legislature that they would vote for the people's choice for senator; that the Democratic candidate for senator (Gov. G. E. Chamberlain) was a prominent advocate of the initiative, the referendum and the direct election of United States senators; and that a wing of the Republican party worked for the choice of the Democratic candidate by the people in the hope that the (Republican) legislature would not ratify the popular choice and so would nullify the direct primary law.

[4] At times the two law-making bodies—the legislature and the people—have come into conflict. In 1906, for example, the people by the initiative secured a law forbidding public officers from accepting free passes from railways. In 1907 the legislature repealed all laws on this subject and required railways to furnish free transportation to certain officials. Upon this measure, however, the people ordered a referendum and it was rejected at the polls. In 1908 the people voted against increasing the number of supreme court judges; in 1909 the legislature increased the number.

Miscellaneous Laws.—The value of the homestead exempt from judicial sale for the satisfaction of liabilities is limited to $1500; the homestead must be owned and occupied by some member of the family claiming the exemption and may not exceed in area one block in a town or city or 160 acres outside of a municipality. The exemption is not valid against a mortgage, but the mortgage must be executed by both husband and wife, if the householder is married. The debtor claims the exemption where the levy is made, but if the sheriff deems the homestead greater in value than the law allows, he may choose three disinterested persons to appraise it and sell any portion that may be adjudged in excess of the legal limit. The constitution provides that the property and pecuniary rights of every married woman, at the time of her marriage, or afterwards, acquired by gift, devise or inheritance, shall not be subject to the debts or contracts of the husband; and that laws shall be passed providing for the registration of the wife's separate property. Marriages between whites and persons of negro descent, between whites and Indians, and between first cousins are forbidden or are void. One year's residence is necessary to secure a divorce, for which the causes recognized are a conviction of felony, habitual drunkenness for one year, physical incapacity, desertion for one year and cruelty or personal indignities.

Education.—The public school system (organized 1873) is administered by the state superintendent of public instruction, who exercises a general supervision over the schools, and by the state board of education, which prescribes the general rules and regulations for their management. For the support of the schools there is a school fund, amounting on the 1st of April 1909 to $5,861,475, and consisting of the moneys derived from the sale of lands donated by the Federal government and of small sums derived from miscellaneous sources. The fund is administered by a board consisting of the governor, the secretary of state and the state treasurer, and the income from it is apportioned among the counties according to the number of children of school age. The counties are also required to levy special school taxes, the aggregate annual amount of which shall be equivalent to at least seven dollars for every child between the ages of four and twenty years. If the total annual fund for a school district amounts to less than $300, the district must levy a special tax to bring the fund up to that sum. Each school district in the state is required to have a school term of six months or more. Special county taxes are levied for the maintenance of public school libraries also. For all children between the ages of nine and fourteen inclusive, school attendance is compulsory.

The total number of teachers in the public schools in 1908 was 4243; the total school enrollment, 107,493; the average daily attendance 94,333. In 1908 there was paid for the support of common schools $3,061,994; the average monthly salary of rural teachers was $49·60, and of school principals, $80·87. The proportion of illiterates is low: in 1900 of the total population 10 years of age or over only 3·3 % was illiterate; of the male population of the same age 3·9 %, of the female 2·3 % and of the native white population only 0·8 % were illiterate.

In addition to the public schools, the state maintains the University of Oregon at Eugene (*q.v.*); the State Agricultural College (1870), at Corvallis (pop. 1900, 1819), the county-seat of Benton county, and the State Normal School (1882) at Monmouth (pop. in 1900, 606), in Polk county. Among the institutions not receiving state aid are Albany College (Presbyterian, 1867), at Albany; Columbia University (Roman Catholic, 1901), at Portland; Dallas College (United Evangelical, 1900), at Dallas; Pacific University (Congregational, 1853), at Forest Grove; McMinnville College (Baptist, 1858), at McMinnville; Pacific College (Friends, founded in 1885 as an academy, college opened in 1891), at Newberg; Philomath College (United Brethren, 1866), at Philomath; and Willamette University (Methodist Episcopal, 1844), at Salem.

Charitable and Correctional Institutions.—The state supports the following charitable and correctional institutions: a soldiers' home (1894) at Roseburg and a school for deaf mutes (1870), an institute for the blind (1873), a reform school, an insane asylum and a penitentiary at Salem, the capital of the state. These institutions (except the penitentiary, of which the governor of the state is an inspector) are governed each by a board of three trustees, the governor of the state and the secretary of state serving on all boards, and the third trustee being the state treasurer on the boards for the state insane asylum, the state reform school and the institute for the feeble-minded, and the superintendent of public instruction on the boards for the school for deaf mutes and the institute for the blind.

Finance.—The constitution forbids the establishment or incorporation by the legislative assembly of any bank or banking company; and it forbids any bank or banking company in the state from issuing bills, checks, certificates, promissory notes or other paper to circulate as money. Except in case of war the legislative assembly may not contract a state debt greater than $50,000. To pay bounties to soldiers in the Civil War a debt of $237,000 was contracted; but in 1870 only $90,000 of it was still outstanding. An issue of bonds (to be redeemed from the sale of public lands) for a privately built canal at Oregon City was authorized in 1870. About $175,000 more of debt was incurred by Indian wars in 1874 and 1878; in the latter year the public debt amounted to more than $650,000, but about $350,000 of this was in 10 % warrants for road-building, &c.; the bonds and warrants (with the exception of some never presented for redemption) were speedily redeemed by a special property tax. Revenues for the support of the government are derived from the following sources: the general property tax, the poll tax (the proceeds of which accrue to the county in which it is collected), the inheritance tax, corporation taxes, business taxes and licenses and fees. By far the most important source of revenue is the general property tax, which is assessed for state, county and municipal purposes. The amount of revenue to be raised for state purposes each year by this tax is computed by a board consisting of the governor, the secretary of state and the state treasurer, and it is apportioned among the counties on the basis of their average expenditures for the previous five years. At the close of the year 1907 the state was free from bonded indebtedness; receipts into the treasury during the year were $2,851,471, and the expenditure was $2,697,645.

History.—As to the European who first saw any portion of the present Oregon there is some controversy and doubt. It is known that within thirty years after the discovery of the Pacific Ocean the Spaniards had explored the western coasts of the American continent from the isthmus to the vicinity of the forty-second parallel of north latitude, and it is possible that the Spanish pilot Bartolomé Ferrelo (or Ferrer), who in 1543 made the farthest northward voyage in the Pacific recorded in the first half of the 16th century, may have reached a point on the Oregon coast. The profitable trade between the Spanish colonies and the Far East, however, soon occupied the whole attention of the Spaniards, and caused them to neglect the exploration of the coast of north-western America for many years. In 1579 the Englishman, Francis Drake, came to this region seeking a route home by way of the North-west Passage, and in his futile quest he seems to have gone as far north as 43°.[1] He took possession of the country in the name of Queen Elizabeth and called it Albion. Near the end of the century persistent stories of a North-west Passage caused the Spanish rulers to plan further explorations of the Pacific coast, so as to forestall other nations in the discovery of the alleged new route and thus retain their monopoly of the South Sea (Pacific Ocean). In 1603 Sebastian Vizcaino, acting under orders of the viceroy of Mexico, reached the latitude of 42° N., and Martin Aguilar, with another vessel of the fleet, reached a point near latitude 43° which he called Cape Blanco and claimed to have discovered there a large river. For the next century and a half Spain again neglected this region, until the fear of English and Russian encroachment caused her to resume the work of exploration. In 1774 Juan Perez sailed up the coast as far as 54° N. lat., and on his return followed the shore line very closely, thus making the first real and undisputed exploration of the Oregon coast of which there is any record. In the following year Bruno Heceta landed off what is now called Point Grenville and took formal possession of the country, and later, in lat. 46°9′, he discovered a bay whose swift currents led him to suspect that he was in the mouth of a large river or strait. In 1778 Jonathan Carver (*q.v.*) published in London *Travels throughout the Interior Parts of North America*, in which, following the example of the Spaniards, he asserted that there was a great river on the western coast, although, so far as is known, no white man had then ever seen such a stream. Whether his declaration was based on stories told by the Indians of the interior, or upon reports of Spanish sailors, or had no basis at all, is not known; its chief importance lies in the fact that Carver called this undiscovered stream the Oregon, and that this name was eventually applied to the territory drained by this great western river. The name, like the whole story, may have been of Spanish or Indian origin, or it may have been purely fanciful.[1]

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[1] Some early writers assert that Drake even reached the lat. of 48° N. and anchored in the Straits of Juan de Fuca.

The Spaniards made no effort to colonize north-western America or to develop its trade with the Indians, but toward the end of the 18th century the traders of the great British fur companies of the North were gradually pushing overland to the Pacific. Upon the sea, too, the English were not idle. Captain James Cook in March 1778 sighted the coast of Oregon in the lat. of 44°, and examined it between 47° and 48° in the hope of finding the Straits of Juan de Fuca described in Spanish accounts. Soon after the close of the War of Independence American merchants began to buy furs along the north-west coast and to ship them to China to be exchanged for the products of the East. It was in the prosecution of this trade that Captain Robert Gray (1755–1806), an American in the service of Boston merchants, discovered in 1792 the long-sought river of the West, which he named the Columbia, after his ship. By the discovery of this stream Gray gave to the United States a claim to the whole territory drained by its waters. Other explorers had searched in vain for this river. Cook had sailed by without suspecting its presence; Captain John Meares (*c.* 1756–1809), another English navigator, who visited the region in 1788, declared that no such river existed, and actually called its estuary "Deception Bay"; and George Vancouver, who visited the coast in 1792, was sceptical until he learned of Gray's discovery.

Spanish claims to this part of North America did not long remain undisputed by England and the United States. By the Nootka Convention of 1790 Spain acknowledged the right of British subjects to fish, trade and settle in the parts of the northern Pacific coast not already occupied; and under the treaty of 1819 (proclaimed in 1821) she ceded to the United States all the territory claimed by her N. of 42°. But even before these agreements had been reached, Alexander Mackenzie, in the service of the North-west Company, in 1793 had explored through Canada to the Pacific coast in lat. about 52° 20′ N., and Meriwether Lewis and William Clark, American explorers acting under the orders of President Jefferson, in 1805–1806 had passed west of the Rocky Mountains and down the Columbia river to the Pacific Ocean. Both British and American adventurers were attracted to the region by the profitable fur trade. In 1808 the North-west Company had several posts on the Fraser river, and in the same year the American Fur Company was organized by John Jacob Astor, who was planning to build up a trade in the West. In 1811 the Pacific Fur Company, a kind of western division of the American Fur Company, founded a trading post at the mouth of the Columbia which they called Astoria, and set up a number of minor posts on the Willamette, Spokane and Okanogan rivers. On hearing of the war between England and the United States, Astor's associates, deeming Astoria untenable, sold the property in October 1813 to the North-west Company. In the following month a British ship arrived, and its captain took formal possession of the post and renamed it Fort George.

Soon after the restoration of peace between England and the United States by the treaty of Ghent (1814), there arose the so-called "Oregon question" or "North-western boundary dispute," which agitated both countries for more than a generation and almost led to another war. As that treaty had stipulated that all territory captured during the war should be restored to its former owner, the American government in 1817 took steps to reoccupy the Columbia Valley. The British government at first protested, on the ground that Astoria was not captured territory, but finally surrendered the post to the United States in 1818. The United States was willing at the time to extend the north-western boundary along the forty-ninth parallel from the Lake of the Woods to the Pacific, but to this the British government would not consent; and on the 20th of October 1818 both nations agreed to a convention providing for the "joint occupation" for ten years of the country "on the north-west coast of America, westward of the Stony [Rocky] Mountains." In the following year, as already stated, Spain waived her claim to the territory north of 42° in favour of the United States. In 1821, however, Russia asserted her claim to all lands as far south as the fifty-first parallel. Against this claim both England and the United States protested, and in 1824 the United States and Russia concluded a treaty by which Russia agreed to make no settlements south of 54° 40′, and the United States agreed to make none north of that line. From this time until the final settlement of the controversy the Americans were disposed to believe that their title was clear to all the territory south of the Russian possessions; that is, to all the region west of the Rocky Mountains between 42° and 54° 40′ N. lat. In 1827 the agreement of 1818 between Great Britain and the United States as to joint occupation was renewed for an indefinite term, with the proviso that it might be terminated by either party on twelve months' notice.

For the next two decades the history of Oregon is concerned mainly with the British fur traders and the American immigrants. The Hudson's Bay Company absorbed its rival, the North-west Company, in 1821, and thus secured a practical monopoly of the fur trade of the North and West. Its policy was to discourage colonization so as to maintain the territory in which it operated as a vast game preserve. Fortunately for the Americans, however, the company in 1824 sent to the Columbia river as its chief factor and governor west of the Rocky Mountains Dr John McLoughlin (1784–1857), who ruled the region with an iron hand, but with a benevolent purpose, for twenty-two years. On the northern bank of the Columbia in 1824–1825 he built Fort Vancouver, which became a port for ocean vessels and a great entrepôt for the western fur trade; in 1829 he began the settlement of Oregon City; and, most important of all, he extended a hearty welcome to all settlers and aided them in many ways, though this was against the company's interests.

In 1832 four Indian chiefs from the Oregon country journeyed to St Louis to obtain a copy of the white man's Bible; and this incident aroused the missionary zeal of the religious denominations. In 1834 Jason Lee (d. 1845) and his nephew, Daniel Lee, went to Oregon as Methodist missionaries, and with McLoughlin's assistance they established missions in the Willamette valley. Samuel Parker went as a Presbyterian missionary in 1835, and was followed in the next year by Marcus Whitman and Henry H. Spalding (*c.* 1801–1874), who were accompanied by their wives, the first white women, it is said, to cross the American continent. Whitman settled at Wai-i-lat-pu, about 5 m. W. of the present Walla Walla and 25 m. from the Hudson's Bay Company's Fort Walla Walla; and Spalding at Lapwai, near the present Lewiston, Idaho. Roman Catholic missions were established near Fort Walla Walla in 1838. In this year Jason Lee returned to the Eastern states and carried back to Oregon with him by sea over fifty people, missionaries and their families. It is significant, if true, that part of the money for chartering his vessel was supplied from the secret-service fund of the United States government.

As early as 1841 the Americans in Oregon began to feel the need of some form of civil government, as the regulations of the Hudson's Bay Company were the only laws then known to the country. After several ineffectual attempts a provisional government was finally organized by two meetings at Champoeg (in what is now Marion county, north-east of Salem) on the 2nd of May and on the 5th of July 1843. The governing body was at first an executive committee of three citizens, but in 1845 this committee was abolished and a governor was chosen. In the "fundamental laws" of the provisional government were incorporated a number of Articles from the Ordinance of 1787, among them the one prohibiting slavery. The new government encountered the opposition of the missionaries and of the non-American population, but it was soon strengthened by the "Great Immigration" in 1843, when nearly nine hundred men, women and children, after assembling at Independence, Missouri, crossed the plains in a body and settled in the Columbia Valley. After this year the flow of immigrants steadily increased, about 1400 arriving in 1844, and 3000 in 1845.[1] Signs of hostility to the Hudson's Bay Company now began to appear among the American population, and in 1845 the provisional government sought to extend its jurisdiction north of the Columbia river, where the Americans had hitherto refrained from settling. A compromise was finally reached, whereby the company was to be exempt from taxes on all its property except the goods sold to settlers, and the officers and employees of the company and all the British residents were to become subject to the provisional government. Meanwhile the western states had inaugurated a movement in favour of the immediate and definite settlement of the Oregon question, with the result that the Democratic national convention of 1844 declared that the title of the United States to "the whole of the territory of Oregon" was "clear and unquestionable," and the party made "Fifty-four forty or fight" a campaign slogan. The Democrats were successful at the polls, and President Polk in his inaugural address asserted the claim of the United States to all of Oregon in terms suggesting the possibility of war. Negotiations, however, resulted in a treaty, drafted by James Buchanan, the American Secretary of State, and Richard Pakenham, the British envoy, which the president in June 1846 submitted to the Senate for its opinion and which he was advised to accept. By this instrument the northern boundary of Oregon was fixed at the forty-ninth parallel, extending westward from the crest of the Rocky Mountains to the middle of the channel separating Vancouver's Island from the mainland, "and thence southerly through the middle of the said channel, and of Fuca's Straits, to the Pacific Ocean."

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[1] There have been many ingenious, but quite unsatisfactory, efforts to explain the derivation of the word *Oregon*. They are enumerated at length in Bancroft's *History of Oregon*, vol. i. pp. 17-25. It seems that after the publication of Carver's book the word Oregon did not appear again in print until William Cullen Bryant employed it in his poem *Thanatopsis*, in 1817. It was applied to the territory drained by the Columbia river for the first time, perhaps, by Hall J. Kelley, a promoter of immigration into the North-west, who in memorials to Congress and numerous other writings referred to the country as Oregon.

Although President Polk immediately urged the formation of a territorial government for Oregon, the bill introduced for this purpose was held up in the Senate on account of the opposition of Southern leaders, who were seeking to maintain the abstract principle that slavery could not be constitutionally prohibited in any territory of the United States, although they had no hope of Oregon ever becoming slave territory. Indian outbreaks, however, which began in 1847, compelled Congress to take measures for the defence of the inhabitants, and on the 14th of August 1848 a bill was enacted providing a territorial government. As then constituted, the Territory embraced the whole area to which the title of the United States had been confirmed by the treaty of 1846, and included the present states of Oregon, Washington and Idaho, and parts of Wyoming and Montana. Its area was reduced in 1853 by the creation of the Territory of Washington. The discovery of gold in California drew many Oregon settlers to that country in 1848–1850, but this exodus was soon offset as a result of the enactment by Congress in 1850 of the "land donation law," by which settlers in Oregon between 1850 and 1853 were entitled to large tracts of land free of cost. The number of claims registered under this act was over eight thousand.

In 1856 the people voted for statehood; and in June 1857 they elected members of a constitutional convention which drafted a constitution at Salem in August and September 1857; the constitution was ratified by popular vote in November 1857; and on the 14th of February 1859 Oregon was admitted into the Union with its present boundaries. The new state was at first Democratic in politics, and the southern faction of the Democratic party in 1860 made a bid for its support by nominating as their candidate for vice-president, on the ticket with John C. Breckinridge, Joseph Lane (1801–1881), then a senator from Oregon and previously its territorial governor. The Douglas Democrats and the Republicans, however, worked together as a union party, and Lincoln carried the state by a small majority. The so-called union party broke up after the Civil War, and by 1870 the Democrats were strong enough to prevent the ratification by Oregon of the Fifteenth Amendment to the Federal Constitution. In 1876, after the presidential election, two sets of electoral returns were forwarded from Oregon, one showing the choice of three Republican electors, and the other (signed by the governor, who was a Democrat) showing the election of two Republicans and one Democrat. The popular vote was admittedly for the three Republican electors, but one of the Republican electors (Watts) was a deputy-postmaster and so seemed ineligible under the constitutional provision that "no . . . person holding an office of trust or profit under the United States shall be an elector." Watts resigned as deputy-postmaster, and the secretary of state of Oregon, who under the state law was the canvassing officer, certified the election of the three Republican electors. On the 6th of December the three met, Watts resigned, and was immediately reappointed by the other two. The Democratic claimant, with whom the two Republican electors whose election was conceded, refused to meet, met alone, appointed two other Democrats to fill the two "vacancies," and the "electoral college" of the state so constituted forthwith cast two votes for Hayes and one for Tilden. The Electoral Commission decided that the three votes should be counted for Hayes—if the one Democratic elector had been adjudged chosen, the Democratic candidate for the presidency, S. J. Tilden, would have been elected. The political complexion of the state has generally been Republican, although the contests between the two leading parties have often been very close. The Indian outbreaks which began in 1847 continued with occasional periods of quiet for nearly a generation, until most of the Indians were either killed or placed on reservations. The Indians were very active during the Civil War, when the regular troops were withdrawn for service in the eastern states, and Oregon's volunteers from 1861 to 1865 were needed for home defence. The most noted Indian conflicts within the state have been the Modoc War (1864–73) and the Shoshone War (1866–68). During the Spanish-American War Oregon furnished a regiment of volunteers which served in the Philippines.

GOVERNORS OF OREGON

Under the Provisional Government.

George Abernethy	1845–1849

Under the Territorial Government.

Joseph Lane	1849–1850
Knitzing Pritchett (acting)	1850
John P. Gaines	1850–1852
Joseph Lane	1853[2]
George Law Curry (acting)	1853
John W. Davis	1853–1854
George Law Curry	1854–1859

Under the State Government.

John Whiteaker, Dem.	1859–1862
Addison Crandall Gibbs, Rep.	1862–1866
George Lemuel Woods, Rep.	1866–1870
La Fayette Grover, Dem.	1870–1877
Stephen Fowler Chadwick (acting)	1877–1878
William Wallace Thayer, Dem.	1878–1882
Zenas Ferry Moody, Rep.	1882–1887
Sylvester Pennoyer, Dem.	1887–1895
William Paine Lord, Rep.	1895–1899
Theodore Thurston Geer, Rep.	1899–1903
George Earle Chamberlain, Dem.	1903–1909
Frank W. Benson, Rep.	1909–1911[3]
Oswald West, Dem.	1911–

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[1] For many years it was generally believed that the administration at Washington was prevented from surrendering its claims to Oregon, in return for the grant by Great Britain of fishing stations in Newfoundland, by Marcus Whitman, who in 1842–1843 made a journey across the entire continent in the depth of winter to dissuade the government from this purpose. This story seems to have no foundation in fact; it was not Whitman, but the great influx of settlers in 1843–1844 that saved Oregon, if, indeed, there was then any danger of its being given up. (See WHITMAN, MARCUS.)

[2] Held office only three days, May 16-19.

[3] Secretary of State; succeeded G. E. Chamberlain, who resigned to become a member of the U.S. Senate.

Bibliography.—See generally W. Nash, *The Settler's Handbook to Oregon* (Portland, 1904); and publications and reports of the various national and state departments. For administration: J. R. Robertson, "The Genesis of Political Authority and of a Commonwealth Government in Oregon" in the *Quarterly of the Oregon Historical Society*, vol. i. (Salem, 1901); *Journal of the Constitutional Convention of the State of Oregon held at Salem in 1857* (Salem, 1882); C. B. Bellinger and W. W. Cotton, *The Codes and Statutes of Oregon* (2 vols., San Francisco, 1902); and Frank Foxcroft, "Constitution Mending and the Initiative," in the *Atlantic Monthly* for June 1906. For history: H. H. Bancroft's *History of the North-west Coast* (2 vols., San Francisco, 1884) and *History of Oregon* (2 vols., San Francisco, 1886–1888); William Barrows's *Oregon: The Struggle for Possession* (Boston, 1883) in the "American Commonwealths" series; J. Dunn's *Oregon Territory and the British North American Fur Trade* (Philadelphia, 1845); W. H. Gray's *History of Oregon, 1792–1849* (Portland, Oregon, 1870); H. S. Lyman's *History of Oregon* (4 vols., New York, 1903), the best complete history of the state; Joseph Schafer's "Pacific Slope and Alaska," vol. x. of G. C. Lee's *History of North America* (Philadelphia, 1904), more succinct. On special features of the state's history see W. R. Manning's "The Nootka Sound Controversy," pp. 279-478 of the *Annual Report for 1904* (Washington, 1905) of the American Historical Association; F. V. Holman's *Dr John McLoughlin, the Father of Oregon* (Cleveland, 1907); J. H. Gilbert's *Trade and Currency in Early Oregon*, in the Columbia University Studies in Economics, vol. xxvi., No. 1 (New York, 1907); and P. J. de Smet's "Oregon Missions and Travels over the Rocky Mountains in 1845–1846," in vol. xxix. of R. G. Thwaites's *Early Western Travels* (Cleveland, 1906). For the Whitman controversy see Whitman, Marcus. Much historical material may be found in the publications of the Oregon Historical Society, especially in the Society's *Quarterly* (1900 sqq.), and of the Oregon Pioneer Association.

OREGON CITY, a city and the county-seat of Clackamas county, Oregon, U.S.A., on the E. bank of the Willamette river, and S. of the mouth of the Clackamas river, about 15 m. S. by E. of Portland. Pop. (1890) 3062; (1900) 3494 (535 being foreign-born); (1910) 4287. It is served by the Southern Pacific railway, by an electric line to Portland, by other electric lines, and by small river steamboats. The principal business streets are Main Street, on level ground along the river, and Seventh Street, on a bluff which rises abruptly 100 ft. above the river and is reached by four stairways elevated above the tracks of the Southern Pacific. The residences are for the most part on this bluff, which commands views of the peaks of the Cascade Mountains. The river here makes a picturesque plunge of about 40 ft. over a basalt ridge extending across the valley, and then flows between nearly vertical walls of solid rock 20-50 ft. high; it is spanned by a suspension bridge nearly 100 ft. above the water. A lock canal enables vessels to pass the falls. The water-power works woollen-mills, flour-mills, paper-mills, and an electric power plant (of the Portland Railway, Light and Power Company), which lights the city of Portland and transmits power to that city for street railways and factories. The municipality owns the waterworks. Next to Astoria, Oregon City is the oldest settlement in the state. In 1829 Dr John McLoughlin (1784–1857), chief agent of the Hudson's Bay Company, established a claim to the water-power at the Falls of the Willamette and to land where Oregon City now stands, and began the erection of a mill and several houses. After 1840, in which year McLoughlin laid out a town here and named it Oregon City, a Methodist Mission disputed his claim. He aided many destitute American immigrants, left the service of the company, and removed to Oregon City. In 1850 Congress gave a great part of his claim at Oregon City for the endowment of a university, and in 1862 the legislature of Oregon reconveyed the land to McLoughlin's heirs on condition that they should give $1000 to the university fund; but the questionable title between 1840 and 1862 hindered the growth of the place, which was chartered as a city in 1850.

O'REILLY, JOHN BOYLE (1844–1890), Irish-American politician and journalist, was born near Drogheda on the 28th of June 1844, the son of a schoolmaster. After some years of newspaper experience, first as compositor, then as reporter, during which he became an ardent revolutionist and joined the Fenian organization known as the Irish Republican Brotherhood, he enlisted in a British cavalry regiment with the purpose of winning over the troops to the revolutionary cause (1863). At this period wholesale corruption of the army, in which there was a very large percentage of Irishmen, was a strong feature in the Fenian programme, and O'Reilly, who soon became a great favourite, was successful in disseminating disaffection in his regiment. In 1866 the extent of the sedition in the regiments in Ireland was discovered by the authorities. O'Reilly was arrested at Dublin, where his regiment was then quartered, tried by court-martial for concealing his knowledge of an impending mutiny, and sentenced to be shot, but the sentence was subsequently commuted to twenty years' penal servitude. After confinement in various English prisons, he was transported in 1867 to Bunbury, Western Australia. In 1869 he escaped to the United States, and settled in Boston, where he became editor of *The Pilot*, a Roman Catholic newspaper. He subsequently organized the expedition which rescued all the Irish military political prisoners from the Western Australia convict establishments (1876), and he aided and abetted the American propaganda in favour of Irish nationalism. O'Reilly died in Hull, Mass., on the 10th of August 1890. His reputation in America naturally differed very much from what it was in England, towards whom he was uniformly mischievous. He was the author of several volumes of poetry of considerable merit, and of a novel of convict life, *Moondyne*, which achieved a great success. He was also selected to write occasional odes in commemoration of many American celebrations.

See J. J. Roche, *Life of John Boyle O'Reilly*, (Boston, 1891).

OREL, or Orlov, a government of central Russia, bounded by the governments of Smolensk, Kaluga and Tula on the N., and by Voronezh and Kursk on the S., with an area of 18,036 sq. m. The surface is an undulating plateau sloping gently towards the west; the highest hills barely exceed 900 ft., and none of the valleys is less than 450 ft. above the sea. The principal rivers are the Don, which forms part of the eastern boundary, and its tributary the Sosna; the Oka, which rises in the district of Orel and receives the navigable Zusha; and the Desna, with the Bolva, draining the marshy lowlands in the west. Geologically Orel consists principally of Lower Devonian limestones, marls and sandstones, covered with Jurassic clays, the last appearing at the surface, however, only as isolated islands, or in the valleys, being concealed for the most part under thick beds of Cretaceous chalk, marls and sands. The Carboniferous limestones and clays (of the so-called Moscow basin) show in the north-west only at a great depth. The Jurassic clays and marls are overlain at several places with a stratum of clay containing good iron-ore, while the Devonian sandstones and limestones are worked for building purposes. The whole is buried under a bed, 30 to 40 ft. thick, of boulder-clay and loess, the last covering extensive areas as well as the valleys. The soil—a mixture of "black earth" with clay—is fertile, except in the Desna region in the west, where sands and tenacious clays predominate. On the Oka, Zusha, Desna and Bolva there is a brisk traffic in corn, oil, hemp, timber, metal, glass, china, paper and building-stone. Marshes occupy large areas in the basin of the Desna, as also in several parts of that of the Oka; they are mostly covered with forests, which run up to 50 to 65% of the area in the districts of Bryansk, Trubchevsk and Karachev, while towards the east, in the basin of the Don, wood is so scarce that straw is used for fuel The climate is moderate, the average yearly temperature at Orel being 41·2° (14·8° in January and 67·0° in July).

The estimated population in 1906 was 2,365,700. It consists almost exclusively of Great Russians, belonging to the Orthodox Greek Church; the Nonconformists are reckoned at about 12,000, the Roman Catholics at 3000 and the Jews at 1000. The chief occupation is agriculture, which is most productive in the east and towards the centre of the government. The principal crops are rye, oats, barley, wheat, hemp, potatoes, hops, vegetables, tobacco and fruit. Of the grain not used in the distilleries a large proportion is exported to the Baltic. Hemp and hemp-seed oil are extensively exported from the west to Riga, Libau and St Petersburg. Tobacco is cultivated with profit. Cattle and horse-breeding flourishes better than in the neighbouring governments—the Orel breeds of both carriage and draught horses being held in estimation throughout Russia. Bee-keeping is widely diffused in the forest districts, as are also the timber-trade and the preparation of tar and pitch. Manufactures are rapidly increasing; they produce cast-iron rails, machinery, locomotive engines and railway wagons, glass, hemp-yarn and ropes, leather, timber, soap, tobacco and chemical produce. There are also distilleries and a great many smaller oil-works and flour-mills. Karachev and Syevsk are important centres for hemp-carding; Bolkhov and Elets are the chief centres of the tanning industry; while the districts of Elets, Dmitrov and partly Mtsensk supply flour and various food-pastes. At Bryansk there is a government cannon-foundry. The "Maltsov works" in the district of Bryansk are an industrial colony (20,000), comprising several iron, machinery, glass and rope works, where thousands of peasants find temporary or permanent employment; they have their own technical school, employ engineers of their own training, and have their own narrow-gauge railways and telegraphs, both managed by boys of the technical school. Numerous petty trades are carried on by the peasants, along with agriculture. The government is divided into twelve districts, of which the chief towns are Orel, the capital, Bolkhov, Bryansk, Dmitrovsk, Elets, Karachev, Kromy, Livny, Malo-arkhangelsk, Mtsensk, Syevsk and Trubchevsk.

In the 9th century the country was inhabited by the Slav tribes of the Syeveryanes on the Desna and the Vyatichis on the Oka, who both paid tribute to the Khazars. The Syeveryanes recognised the rule of the princes of the Rurik family from 884, and the Vyatichis from the middle of the 10th century; but the two peoples followed different historical lines, the former being absorbed into the Suzdal principality, while the latter fell under the rule of that of Chernigov. In the 11th century both had wealthy towns and villages; during the Mongol invasion of 1239–1242 these were all burned and pillaged, and the entire territory devastated. With the decay of the Great Horde of the Mongols the western part of the country fell under Lithuanian rule, and was the object of repeated struggles between Lithuania and Moscow. In the 16th century the Russians began to erect new forts and fortify the old towns, and the territory was rapidly colonized by immigrants from the north. In 1610 the towns of the present government of Orel (then known as the Ukrayna Ukraine, *i.e.* "border-region,") took an active share in the insurrection against Moscow under the false Demetrius, and suffered much from the civil war which ensued. They continued, however, to be united with the rest of Russia.

(P. A. K.; J. T. Be.)

OREL, a town of Russia, capital of the government of the same name, lies at the confluence of the Oka with the Orlik, on the line of railway to the Crimea, 238 m. S.S.W. from Moscow. Pop. (1875) 45,000, (1900) 70,075. It was founded in 1566, but developed slowly, and had only a very few houses at the beginning of the 18th century. The cathedral, begun in 1794, was finished only in 1861. The town possesses a military gymnasium (corps of cadets), a public library, and storehouses for grain and timber. The manufactures are rapidly increasing, and include hemp-carding and spinning, rope-making, flour-mills and candle factories. Orel is one of the chief markets of central Russia for corn, hemp, hempseed oil, and tallow, exported; metal wares, tobacco, kaolin, and glass ware are also exported, while salt, groceries and manufactured goods are imported.

O'RELL, MAX, the *nom-de-plume* of Paul Blouet (1848–1903), French author and journalist, who was born in Brittany in 1848. He served as a cavalry officer in the Franco-German War, was captured at Sedan, but was released in time to join the Versaillist army which overcame the Commune, and was severely wounded during the second siege of Paris. In 1872 he went to England as correspondent of several French newspapers, and in 1876 became the very efficient French master at St Paul's school, London, retaining that post until 1884. What induced him to leave was the brilliant success of his first book, *John Bull et son Île*, which in its French and English forms was so widely read as to make his pseudonym a household word in England and America. Several other volumes of a similar type dealing in a like spirit with Scotland, America and France followed. He married an Englishwoman, who translated his books. But the main work of the years between 1890 and 1900 was lecturing. Max O'Rell was a ready and amusing speaker, and his easy manner and his humorous gift made him very successful on the platform. He lectured often in the United Kingdom and still more often in America. He died in Paris, where he was acting as correspondent of the *New York Journal*, on the 25th of May 1903.

ORELLI, HANS KONRAD VON (1846–), Swiss theologian, was born at Zürich on the 25th of January 1846 and was educated at Lausanne, Zürich and Erlangen. He also visited Tübingen for theology and Leipzig for oriental languages. In 1869 he was appointed preacher at the orphan house, Zürich, and in 1871 *Privatdozent* at the university. In 1873 he went to Basel as professor extraordinarius of theology, becoming ordinary professor in 1881. His chief work is on the Old Testament; in addition to commentaries on Isaiah, Jeremiah (1886), Ezekiel and the Twelve Prophets (1888), most of which have been translated, he wrote *Die alttestamentliche Weissagung von der Vollendung des Gottesreiches* (Vienna, 1882; Eng. trans. Edinburgh, 1885), *Die himmlischen Heerschaaren* (Basel, 1889), and a journal of Palestinian travel, *Durchs Heilige Land* (Basel, 1878).

ORELLI, JOHANN CASPAR VON (1787–1849), Swiss classical scholar, was born at Zürich on the 13th of February 1787. He belonged to a distinguished Italian family, which had taken refuge in Switzerland at the time of the Reformation. His cousin, Johann Conrad Orelli (1770–1826), was the author of several works in the department of later Greek literature. From 1807 to 1814 Orelli worked as preacher in the reformed community of Bergamo, where he acquired the taste for Italian literature which led to the publication of *Contributions to the History of Italian Poetry* (1810) and a biography (1812) of Vittorino da Feltre, his ideal of a teacher. In 1814 he became teacher of modern languages and history at the cantonal school at Chur (Coire); in 1819, professor of eloquence and hermeneutics at the Carolinum in Zürich, and in 1833 professor at the new university, the foundation of which was largely due to his efforts. His attention during this period was mainly devoted to classical literature and antiquities. He had already published (1814) an edition, with critical notes and commentary, of the *Antidosis* of Isocrates, the complete text of which, based upon the MSS. in the Ambrosian and Laurentian libraries, had recently been made known by Andreas Mystoxedes of Corfu. The three works upon which his reputation rests are the following. (1) A complete edition of Cicero in seven volumes (1826–1838). The first four volumes contained the text (new ed., 1845–1863), the fifth the old Scholiasts, the remaining three (called *Onomasticon Tullianum*) a life of Cicero, a bibliography of previous editions, indexes of geographical and historical names, of laws and legal formulae, of Greek words, and the consular annals. After his death, the revised edition of the text was completed by J. G. Baiter and C. Halm, and contained numerous emendations by Theodor Mommsen and J. N. Madvig. (2) The works of Horace (1837–1838; 4th ed., 1886–1892). The exegetical commentary, although confessedly only a compilation from the works of earlier commentators, shows great taste and extensive learning, although hardly up to the exacting standard of modern criticism. (3) *Inscriptionum Latinarum Selectarum Collectio* (1828; revised edition by W. Henzen, 1856), extremely helpful for the study of Roman public and private life and religion. His editions of Plato (1839–1841, including the old scholia, in collaboration with A. W. Winckelmann) and Tacitus (1846–1848, new ed. by various scholars, 1875–1894) also deserve mention. Orelli died at Zürich on the 6th of January 1849. He was a most liberal-minded man, both in politics and religion, an enthusiastic supporter of popular education and a most inspiring teacher. He took great interest in the struggle of the Greeks for independence, and strongly favoured the appointment of the notorious J. F. Strauss to the chair of dogmatic theology at Zürich, which led to the disturbance of the 6th of September 1839 and the fall of the liberal government.

See *Life* by his younger brother Conrad in *Neujahrsblatt der Stadtbibliothek Zürich* (1851); J. Adert, *Essai sur la Vie et les Travaux de J.C.O.* (Geneva, 1849); H. Schweizer-Sidler, *Gedächtnissrede auf J.C.O.* (Zürich, 1874); C. Bursian, *Geschichte der klassischen Philologie in Deutschland* (1883).

ORENBURG, a government of south-eastern Russia, bounded N. by the governments of Ufa and Perm, E. by Tobolsk, S.E. by Turgai, and W. by Uralsk and Samara, with an area of 73,794 sq. m. Situated at the southern extremity of the Urals and extending to the north-east on their eastern slope, Orenburg consists of a hilly tract bordered on both sides by steppes. The central ridge occasionally reaches an elevation of 5000 ft.; there are several parallel ridges, which, however, nowhere exceed 2600 ft., and gradually sink towards the south. A great variety of geological formations are represented within the government, which is rich in minerals. Diorites and granites enter it from the north and crop out at many places from underneath the Silurian and Devonian deposits. The Carboniferous limestones and sandstones, as well as softer Permian, Jurassic and Cretaceous deposits, have a wide extension in the south and east. Coal has been found on the Miyas (in N.) and near Iletsk (in S.). The extremely rich layers of rock salt at Iletsk yield about 24,000 tons every year. Very fertile "black earth" covers wide areas around the Urals. The government is traversed from north to south by the Ural river, which also forms its southern boundary; the chief tributaries are the Sakmara and the Ilek. The upper courses of the Byelaya and Samara, tributaries of the Kama and the Volga, also lie within the government, as well as affluents of the Tobol on the eastern slope of the Ural range. Numerous salt lakes occur in the district of Chelyabinsk; but several parts of the flat lands occasionally suffer from want of water. Sixteen per cent of the surface is under wood. The climate is continental and dry, the average temperature at Orenburg being 37·4° Fahr. (4·5° in January, 69·8° in July). Frosts of −33° and heats of 98° are not uncommon.

The estimated population in 1906 was 1,836,500, mainly Great Russians, with Bashkirs and Meshcheryaks (25%). Gold is extracted chiefly from alluvial deposits, about 116,500 oz. every year; also some silver. Nearly one-fifth of all the copper ore extracted in Russia comes from Orenburg (about 16,000 tons annually); and every year 16,000 to 20,000 tons of cast iron and 11,500 tons of iron are obtained. Agriculture is carried on on a large scale, the principal crops being wheat, rye, oats, barley and potatoes. Horses, cattle and sheep are kept in large numbers and camels are bred. Kitchen-gardening gives occupation to nearly 11,000 persons. Various kinds of animal produce are largely exported, and by knitting "Orenburg shawls" of goats' wool the women earn £10,000 every year. The growth of the industries is slow, but trade, especially with the Kirghiz, is prosperous. The chief towns of the five districts into which the government is divided are Orenburg, Orsk, Chelyabinsk, Troitsk and Verkhne-Uralsk.

The government of Orenburg was formerly inhabited by the Kirghiz in the south, and by the Bashkirs in the north. The latter were brought under the rule of Russia in 1557, and a few years later the fort of Ufa was erected in order to protect them against the raids of the Kirghiz. The frequent risings of the Bashkirs, and the continuous attacks of the Kirghiz, led the Russian government in the 18th century to erect a line of forts and blockhouses on the Ural and Sakmara rivers, and these were afterwards extended south-westwards towards the Caspian, and eastwards towards Omsk. The central point of these military lines was the fort of Orenburg, originally founded in 1735 at the confluence (now Orsk) of the Or with the Ural, and removed in 1740–1743 120 m. lower down the Ural river to its present site. In 1773 it was besieged by Pugachev, the leader of the revolt of the peasantry. (P. A. K.; J. T. Be.)

ORENBURG, a town of Russia, capital of the government of the same name, on the Ural river; connected by rail with Samara (262 m.), and since 1905 with Tashkent (1150 m.). Pop. (1900) 65,906, of whom about 30% were Tatars, Jews, Bashkirs, &c. The town now includes the former suburbs of Golubinaya and Novaya. It is an episcopal see of the Orthodox Greek Church and the headquarters of the hetman of the Orenburg Cossacks. To a "barter house," 3 m. from the town, the camel caravans bring carpets, silks, cottons, lambskins, dried fruits, &c., from Bokhara, Khiva, Kokand and Tashkent, to be bartered against the textiles, metallic goods, sugar and manufactured wares of Russia. From 20,000 to 100,000 horses, 40,000 to 160,000 cattle, and 450,000 to 750,000 sheep are also sold every year at the barter house. Formerly most of these were sent alive to Russia; now some 200,000 head of cattle and sheep are killed every year, and exported in cold-storage wagons. Cattle are also bought by wandering merchants in the Steppe provinces and Turkestan. Every year many tons of tallow, hams, sausages, butter, cheese and game are exported by rail to Samara. Besides these, nearly a million hides and sheepskins, goat and astrakhan skins, as well as wool, horsehair, bristles, down, horns, bones, &c., are exported. There are two cadet corps, a theological seminary, seminaries for Russian and Kirghiz teachers, a museum, branches of the Russian Geographical Society and the Gardening Society, and a military arsenal.

ORENDEL, a Middle High German poem, of no great literary merit, dating from the close of the 12th century. The story is associated with the town of Treves (Trier), where the poem was probably written. The introduction narrates the story of the Holy Coat, which, after many adventures, is swallowed by a whale. It is recovered by Orendel, son of King Eigel of Treves, who had embarked with twenty-two ships in order to woo the lovely Brida, the mistress of the Holy Sepulchre, as his wife. Suffering shipwreck, he falls into the hands of the fisherman Eise, and in his service catches the whale that has swallowed the Holy Coat. The coat has the property of rendering the wearer proof against wounds, and Orendel successfully overcomes innumerable perils and eventually wins Brida for his wife. A message brought by an angel summons both back to Treves, where Orendel meets with many adventures and at last disposes of the Holy Coat by placing it in a stone sarcophagus. Another angel announces both his and Brida's approaching death, when they renounce the world and prepare for the end.

The poem exists in a single manuscript of the 15th century, and in one print, dated 1512. It has been edited by von der Hagen (1844), L. Ettmüller (1858) and A. E. Berger (1888); there is a modern German translation by K. Simrock (1845). See H. Harkensee, *Untersuchungen über das Spielmannsgedicht Orendel* (1879); F. Vogt, in the *Zeitschrift für deutsche Philologie*, vol. xxii. (1890); R. Heinzel, *Über das Gedicht vom König Orendel* (1892); and K. Müllenhoff, in *Deutsche Altertumskunde*, vol. i. (2nd ed., 1890), pp. 32 seq.

ORENSE, an inland province of north-western Spain, formed in 1833 of districts previously included in Galicia, and bounded on the N. by Pontevedra and Lugo, E. by Leon and Zamora, S. by Portugal, and W. by Portugal and Pontevedra. Pop. (1900) 404,311; area 2694 sq. m. The surface of the province is almost everywhere mountainous. Its western half is traversed in a south-westerly direction by the river Miño (Portuguese *Minho*), which flows through Portugal to the Atlantic; the Sil, a left-hand tributary of the Miño, waters the north-eastern districts; and the Limia rises in the central mountains and flows west-south-west, reaching the sea at the Portuguese port of Vianna do Castello. The upper valley of the Limia is the only large tract of level country. The climate is very varied, mild in some valleys, cold and damp in the highlands, rainy near the northern border, and subject to rapid changes of temperature. The railway from Monforte to Vigo runs through the province. There are a few iron foundries of a primitive sort, but lack of transport and of cheap coal hinder the growth of mining and manufactures.

Though the soil is fertile and well watered, agricultural products are not so important as arboriculture. The oak, beech, pine, chestnut, walnut and plane grow in abundance on the hills and mountains; pears, apples, cherries, almonds, figs, roses and olives in the valleys, and even oranges and lemons in sheltered spots. The chief towns are the capital, Orense, Allariz, Carballino, Viana, Nogueira de Ramuin, Boborás, Cartella and La Vega. See also GALICIA.

ORENSE, an episcopal see and the capital of the Spanish province of Orense; on the left bank of the river Miño, and on the Tuy-Monforte railway. Pop. (1900) 15,194. The river is here crossed by a bridge—one of the most remarkable in Spain—of seven arches, 1319 ft. in length, and at its highest point 135 ft. above the bed of the river. This bridge was built by Bishop Lorenzo in 1230, but has frequently been repaired. The Gothic cathedral, also dating from Bishop Lorenzo's time, is a comparatively small building, but has an image, El Santo Cristo, which was brought from Cape Finisterre in 1330 and is celebrated throughout Galicia for its miraculous powers. The city contains many schools, a public library and a theatre. In the older streets there are some interesting medieval houses. Chocolate and leather are manufactured, and there are saw-mills, flour-mills and iron foundries. The three warm springs to the west, known as Las Burgas, attract many summer visitors; the waters were well known to the Romans, as their ancient name, Aquae Originis, Aquae Urentes, or perhaps Aquae Salientis, clearly indicates.

The Romans named Orense Aurium, probably from the alluvial gold found in the Miño valley. The bishopric, founded in the 5th century by the Visigoths, was named the Sedes Auriensis (see of Aurium), and from this the modern Orense is derived. The city became the capital of the Suevi in the 6th century; it was sacked by the Moors in 716, and rebuilt only in 884.

OREODON (*i.e.* "hillock-tooth"), the name of an Oligocene genus of North American primitive ruminants related to the camels, and typifying the family *Oreodontidae*. Typical oreodonts were long-tailed, four-toed, partially plantigrade ruminants with sharp-crowned crescentic molars, of which the upper ones carry four cusps, and the first lower premolar canine-like both in shape and function. In the type genus there are forty-four teeth, forming an uninterrupted series. The vertebral artery pierces the neck-vertebrae in the normal manner. The name *Oreodon* is preoccupied by *Orodus*, the designation of a genus of Palaeozoic fishes, and is likewise antedated by *Merycoidodon*, which is now used by some writers. See TYLOPODA.

ORESME, NICOLAS (*c.* 1320–1382), French bishop, celebrated for his numerous works in both French and Latin on scholastic, scientific and political questions, was born in Normandy at the opening of the 14th century. In 1348 he was a student in the college of Navarre at Paris, of which he became head in 1356. In 1361 he was named dean of the cathedral of Rouen. Charles V. had him appointed bishop of Lisieux on the 16th of November 1377. He died in that city on the 11th of July 1382. One of his works, of great importance for the history of economic conceptions in the middle ages, was the *De origine, natura, jure et mutationibus monetarum*, of which there is also a French edition. Oresme was the author of several works on astrology, in which he showed its falseness as a science and denounced its practice. At the request of Charles V. he translated the *Ethics*, *Politics* and *Economics* of Aristotle. In December 1363 he preached before Urban V. a sermon on reform in the church, so severe in its arraignment that it was often brought forward in the 16th century by Protestant polemists.

See Francis Meunier, *Essai sur la vie et les ouvrages de Nicole Oresme* (Paris, 1857); Feret, *La Faculté de théologie de l'Université de Paris* (Paris, 1896, t. iii. p. 290 sqq.); Émile Bridrey, *Nicole Oresme. Étude des doctrines et des faits économiques* (Paris, 1906).

ORESTES, in Greek legend, son of Agamemnon and Clytaemnestra. According to the Homeric story he was absent from Mycenae when his father returned from the Trojan War and was murdered by Aegisthus. Eight years later he returned from Athens and revenged his father's death by slaying his mother, and her paramour (*Odyssey*, iii. 306; xi. 542). According to Pindar (*Pythia*, xi. 25) he was saved by his nurse, who conveyed him out of the country when Clytaemnestra wished to kill him. The tale is told much more fully and with many variations in the tragedians. He was preserved by his sister Electra from his father's fate, and conveyed to Phanote on Mount Parnassus, where King Strophius took charge of him. In his twentieth year he was ordered by the Delphic oracle to return home and revenge his father's death. According to Aeschylus, he met his sister Electra before the tomb of Agamemnon, whither both had gone to perform rites to the dead; a recognition takes place, and they arrange how Orestes shall accomplish his revenge. Orestes, after the deed, goes mad, and is pursued by the Erinyes, whose duty it is to punish any violation of the ties of family piety. He takes refuge in the temple at Delphi; but, though Apollo had ordered him to do the deed, he is powerless to protect his suppliant from the consequences. At last Athena receives him on the acropolis of Athens and arranges a formal trial of the case before twelve Attic judges. The Erinyes demand their victim; he pleads the orders of Apollo; the votes of the judges are equally divided, and Athena gives her casting vote for acquittal. The Erinyes are propitiated by a new ritual, in which they are worshipped as Eumenides (the Kindly), and Orestes dedicates an altar to Athena Areia. With Aeschylus the punishment ends here, but, according to Euripides, in order to escape the persecutions of the Erinyes, he was ordered by Apollo to go to Tauris, carry off the statue of Artemis which had fallen from heaven, and bring it to Athens. He repairs to Tauris with Pylades, the son of Strophius and the intimate friend of Orestes, and the pair are at once imprisoned by the people, among whom the custom is to sacrifice all strangers to Artemis. The priestess of Artemis, whose duty it is to perform the sacrifice, is his sister Iphigeneia (*q.v.*). She offers to release Orestes if he will carry home a letter from her to Greece; he refuses to go, but bids Pylades take the letter while he himself will stay and be slain. After a conflict of mutual affection, Pylades at last yields, but the letter brings about a recognition between brother and sister, and all three escape together, carrying with them the image of Artemis. After his return to Greece, Orestes took possession of his father's kingdom of Mycenae, to which were added Argos and Laconia. He is said to have died of the bite of a snake in Arcadia. His body was conveyed to Sparta for burial (where he was the object of a cult), or, according to an Italian legend, to Aricia, whence it was removed to Rome (Servius on *Aeneid*, ii. 116). The story of Orestes was the subject of the *Oresteia* of Aeschylus (*Agamemnon, Choephori, Eumenides*), of the *Electra* of Sophocles, of the *Electra, Iphigeneia in Tauris*, and *Orestes*, of Euripides. There is extant a Latin epic poem, consisting of about 1000 hexameters, called *Orestes Tragoedia*, which has been ascribed to Dracontius of Carthage.

Orestes appears also as a central figure in various legends connected with his madness and purification, both in Greece and Asia. In these Orestes is the guilt-laden mortal who is purified from his sin by the grace of the gods, whose merciful justice is shown to all persons whose crime is mitigated by extenuating circumstances. These legends belong to an age when higher ideas of law and of social duty were being established; the implacable blood-feud of primitive society gives place to a fair trial, and in Athens, when the votes of the judges are evenly divided, mercy prevails.

The legend of Orestes is the subject of a lengthy monograph by T. Zielinski, "Die Orestessage und die Rechtfertigungsidee" in *Neue Jahrbücher für das klassische Altertum*, ii. (1899). Orestes, according to Zielinski, is the son of the sky-god Zeus-Agamemnon, who overcomes his wife the earth-goddess Gaia-Clytaemnestra; with the assistance of the dragon Aegisthus, she slays her husband, whose murder is in turn avenged by his son. The religion of Zeus is then reformed under the influence of the cult of Apollo, who slays the dragon brought up by the earth-goddess on Parnassus, the seat of one of her oldest sanctuaries. Parnassus becomes the holy mountain of Apollo, and Orestes himself an hypostasis of Apollo "of the mountain," just as Pylades is Apollo "of the plain"; similarly Electra, Iphigeneia and Chrysothemis are hypostases of Artemis. Zeus being firmly seated on his throne as the result of the slaying of the dragon by Orestes, the theological significance of the myth is forgotten, and the identifications Zeus-Agamemnon and Gaia-Clytaemnestra are abandoned. In the Homeric Oresteia the soul of the murdered wife has no claim to vengeance, and Orestes rules unmolested in Argos. But the Apolline religion introduces the theory of the rights of the soul and revenge for bloodshed. Apollo, who has urged Orestes to parricide and has himself expiated the crime of slaying the dragon, is able to purify others in similar case. Hence

Orestes, freed from the guilt of blood, is enabled to take possession of the throne of his father. This is the Delphic Oresteia. But a new idea is introduced by the Attic Oresteia. The claim that Apollo can in every case purify from sin is met by Athens with a counterclaim on behalf of the state. It is the community of which murdered and murderer were members which has the right to exact revenge and retribution, an idea which found expression in the foundation of the Areopagus. If the accused is acquitted, the state undertakes to appease the soul of the murdered person or its judicial representative, the Erinys.

Others attach chief importance to the slaying of Neoptolemus (Pyrrhus) by Orestes at Delphi; according to Radermacher (*Das Jenseits im Mythos der Hellenen*, 1903), Orestes is an hypostasis of Apollo, Pyrrhus the principle of evil, which is overcome by the god; on the other hand, Usener (*Archiv für Religionswesen*, vii., 1899, 334) takes Orestes for a god of winter and the underworld, a double of the Phocian Dionysus the " mountain " god (among the Ionians a summer-god, but in this case corresponding to Dionysus *μελαναιγίς*), who subdues Pyrrhus "the light," the double of Apollo, the whole being a form of the well-known myths of the expulsion of summer by winter. S. Reinach (reviewing P. Mazan's *L'Orestie d'Eschyle*, 1902) defends the theory of Bachofen, who finds in the legend of Orestes an indication of the decay of matriarchal ideas.

See article by Höfer in Roscher's *Lexikon der Mythologie*; A. Olivieri, " Sul mito di Oreste nella letteratura classica " (with a section on modern literature) in *Rivista di Filologia*, xxvi. (1898), and Jebb's edition of the *Electra* of Scphocles.

ORFILA, MATHIEU JOSEPH BONAVENTURE (1787–1853), French toxicologist and chemist, was by birth a Spaniard, having been born at Mahon in Minorca on the 24th of April 1787. An island merchant's son, he looked naturally first to the sea for a profession; but a voyage at the age of fifteen to Sardinia, Sicily and Egypt did not prove satisfactory. He next took to medicine, which he studied at the universities of Valencia and Barcelona with such success that the local authorities of the latter city made him a grant to enable him to follow his studies at Madrid and Paris, preparatory to appointing him professor. He had scarcely settled for that purpose in Paris when the outbreak of the Spanish war, in 1807, threatened destruction to his prospects. But he had the good fortune to find a patron in the chemist L. N. Vauquelin, who claimed him as his pupil, guaranteed his conduct, and saved him from expulsion from Paris. Four years afterwards he graduated, and immediately became a private lecturer on chemistry in the French capital. In 1819 he was appointed professor of medical jurisprudence, and four years later he succeeded Vauquelin as professor of chemistry in the faculty of medicine at Paris. In 1830 he was nominated dean of that faculty, a high medical honour in France. Under the Orleans dynasty, honours were lavishly showered upon him; he became successively member of the council of education of France, member of the general council of the department of the Seine, and commander of the Legion of Honour. But by the republic of 1848 he was held in less favour, and chagrin at the treatment he experienced at the hands of the governments which succeeded that of Louis Philippe is supposed to have shortened his life. He died, after a short illness, in Paris on the 12th of March 1853.

Orfila's chief publications are *Traité des poisons*, or *Toxicologie générale* (1813); *Éléments de chimie médicale* (1817); *Leçons de médécine legale* (1823); *Traité des exhumations juridiques* (1830); and *Recherches sur l'empoisonnement par l'acide arsenieux* (1841). He also wrote many valuable papers, chiefly on subjects connected with medical jurisprudence. His fame rests mainly on the first-named work, published when he was only in his twenty-seventh year. It is a vast mine of experimental observation on the symptoms of poisoning of all kinds, on the appearances which poisons leave in the dead body, on their physiological action, and on the means of detecting them. Few branches of science, so important on their bearings on every-day life and so difficult of investigation, can be said to have been created and raised at once to a state of high advancement by the labours of a single man.

ORFORD, EDWARD RUSSELL, Earl of (1653–1727), British admiral, was born in 1653, the son of Edward Russell, a younger brother of the 1st duke of Bedford. He was one of the first gentleman officers of the navy regularly bred to the sea. In 1671 he was named lieutenant of the "Advice" at the age of eighteen, captain in the following year. He continued in active service against the Dutch in the North Sea in 1672–73, and in the Mediterranean in the operations against the Barbary Pirates with Sir John Narborough and Arthur Herbert, afterwards earl of Torrington, from 1676 to 1682. In 1683 he ceased to be employed, and the reason must no doubt be looked for in the fact that all members of the Russell family had fallen into disfavour with the king, after the discovery of William, Lord Russell's connexion with the Rye House Plot. The family had a private revenge to take which sharpened their sense of the danger run by British liberties from the tyranny of King James II. Throughout the negotiations preceding the revolution of 1688 Edward Russell appears acting on behalf and in the name of the head of this great Whig house, which did so much to bring it about, and profited by it so enormously in purse and power. He signed the invitation which William of Orange insisted on having in writing in order to commit the chiefs of the opposition to give him open help. Edward Russell's prominence at this crisis was of itself enough to account for his importance after the Revolution. When the war began with France in 1689, he served at first under the earl of Torrington. But during 1690, when that admiral avowed his intention of retiring to the Gunfleet, and of leaving the French in command of the Channel, Russell was one of those who condemned him most fiercely. In December 1690 he succeeded Torrington, and during 1691 he cruised without meeting the French under Tourville (*q.v.*), who made no attempt to meet him. At this time Russell, like some of the other extreme Whigs, was discontented with the moderation of William of Orange and had entered into negotiations with the exiled court, partly out of spite, and partly to make themselves safe in case of a restoration. But he was always ready to fight the French, and in 1692 he defeated Tourville in the battle called La Hogue, or Barfleur. Russell had Dutch allies with him, and they were greatly superior in number, but the chief difficulty encountered was in the pursuit, which Russell conducted with great resolution. His utter inability to work with the Tories, with whom William III. would not quarrel altogether, made his retirement imperative for a short time. But in 1694 he was appointed to the command of the fleet which, taking advantage of the inability of the king of France to maintain a great fleet in the Channel from want of money, followed the French into the Mediterranean, confined them to Toulon for the rest of the war, and co-operated with the Spanish armies in Catalonia. He returned in 1695, and in 1697 was created earl of Orford. For the rest of his life he filled posts of easy dignity and emolument, and died on the 26th of November 1727. He married his cousin, Mary Russell; but his title became extinct on his death without issue.

See Charnock, *Biog. Nav.* i. 354; Campbell's *Lives of the Admirals*, ii. 317. (D. H.)

ORFORD, ROBERT WALPOLE, 1st Earl of (1676–1745), generally known as Sir Robert Walpole, prime minister of England from 1721 to 1742, was the third but eldest surviving son of Robert Walpole, M.P., of Houghton in Norfolk, by Mary, only daughter and heiress of Sir Jeffery Burwell, of Rougham, in Suffolk. The father, a jolly old squire of Whig politics who revelled in outdoor sport and the pleasures of the table, transmitted to his son the chief traits in his own character. The future statesman was born at Houghton on the 26th of August 1676, was an Eton colleger from 1690 to 1695 and was admitted at King's College, Cambridge, as scholar on the 22nd of April 1696. At this time he was destined, as a younger son, for the church, but his two elder brothers died young and he became the heir to an estate producing about £2000 a year, whereupon on the 25th of May 1698 he resigned his scholarship, and was soon afterwards withdrawn by his father from the university. In classical attainments he was excelled by Pulteney, Carteret, and many others of his contemporaries in politics.

On his father's death in November 1700 the electors of the family borough of Castle Rising returned him (January 1701) to the House of Commons as their representative, but after two short-lived parliaments he sought the suffrages of the more important constituency of King's Lynn (July 23, 1702), and was elected as its member at every subsequent dissolution until he left the Lower House. From the first his shrewdness in counsel and his zeal for the interests of the Whigs were generally recognized. In June 1705 he was appointed one of the council to Prince George of Denmark, the inactive husband of Queen Anne, and then lord high admiral of England. Complaints against the administration of the navy were then loud and frequent (Burton's *Queen Anne*, ii. 22-31), and the responsibilities of his new position tested his capacity for public life. His abilities justified his advancement, in succession to his lifelong rival, Henry St John, to the more important position of secretary-at-war (February 25, 1708), which brought him into immediate contact with the duke of Marlborough and the queen. With this post he held for a short time (1710) the treasurership of the navy, and by the discharge of his official duties and by his skill in debate became admitted to the inmost councils of the ministry. He could not succeed, however, in diverting Godolphin from the great error of that statesman's career, the impeachment of Sacheverell, and when the committee was appointed in December 1709 for elaborating the articles of impeachment Walpole was nominated one of the managers for the House of Commons. On the wreck of the Whig party which ensued, Walpole shared in the general misfortune, and in spite of the flattery, followed by the threats, of Harley he took his place with his friends in opposition. His energies now shone forth with irresistible vigour; both in debate and in the pamphlet press he vindicated Godolphin from the charge that thirty-five millions of public money were not accounted for, and in revenge for his zeal his political opponents brought against him an accusation of personal corruption. On these charges, now universally acknowledged to have proceeded from party animosity, he was in January 1712 expelled from the House and committed to the Tower. His prison cell now became the rendezvous of the Whigs among the aristocracy, while the populace heard his praises commemorated in the ballads of the streets. The ignominy which the Tories had endeavoured to inflict upon him was turned into augmented reputation. In the last parliament of Queen Anne he took the leading part in defence of Sir Richard Steele against the attacks of the Tories.

After the accession of George, the Whigs for nearly half a century retained the control of English politics. Walpole obtained the lucrative if unimportant post of paymaster-general of the forces in the administration which was formed under the nominal rule of Lord Halifax, but of which Stanhope and Townshend were the guiding spirits. A committee of secrecy was appointed to inquire into the acts of the late ministry, and especially into the Peace of Utrecht, with a view to the impeachment of Harley and St John, and to Walpole was entrusted the place of chairman. Most of his colleagues in office were members of the House of Lords, and the lead in the Commons quickly became the reward of his talents and assiduity. Halifax died on the 19th of May 1715, and after a short interval Walpole was exalted into the conspicuous position of first lord of the treasury and chancellor of the exchequer (October 11, 1715). Jealousies, however, prevailed among the Whigs, and the German favourites of the new monarch quickly showed their discontent with the heads of the ministry. Townshend was forced into resigning his secretaryship of state for the dignified exile of viceroy of Ireland, but he never crossed the sea to Dublin, and the support which Sunderland and Stanhope, the new advisers of the king, received from him and from Walpole was so grudging that Townshend was dismissed from the lord-lieutenancy (April 9, 1717), and Walpole on the next morning withdrew from the ministry. They plunged into opposition with unflagging energy, and in resisting the measure by which it was proposed to limit the royal prerogative in the creation of peerages (March-December 1718) Walpole exerted all his powers. This display of ability brought about a partial reconciliation of the two sections of the Whigs. To Townshend was given the presidency of the council, and Walpole once again assumed the paymastership of the forces (June 1720).

On the financial crash which followed the failure of the South Sea scheme, the public voice insisted that he should assume a more prominent place in public life. At this crisis in England's fortunes Stanhope and James Craggs, the two secretaries of state, were seized by death, John Aislabie, the chancellor of the exchequer, was committed to the Tower, and Sunderland, though acquitted of corruption, was compelled to resign the lead. Walpole, at first lord of the treasury and chancellor of the exchequer (April 1721), became with Townshend responsible for the country's government (though for some years they had to contend with the influence of Carteret), the danger arising from the panic in South Sea stock was averted by its amalgamation with Bank and East India stock, and during the rest of the reign of George I. they remained at the head of the ministry. The hopes of the Jacobites, which revived with these financial troubles, soon drooped in disappointment. Atterbury, their boldest leader, was exiled in 1723; Bolingbroke, in dismay at their feebleness, sued for pardon, and was permitted to return to his own country. The troubles which broke out in Ireland over Wood's patent for a copper coinage were allayed through the tact of Carteret, who had been banished in April 1724 as its lord-lieutenant by his triumphant rivals. The continent was still troubled with wars and rumours of wars, but a treaty between England, Prussia and France was successfully effected at Hanover in 1725.

England was kept free from warfare, and in the general prosperity which ensued Walpole basked in the royal favour. His eldest son was raised to the peerage as Baron Walpole (June 10, 1723) and he himself became a Knight of the Bath on the 27th of May 1725, and was rewarded with the Garter in May 1726. Next year the first King George died, and Walpole's enemies fondly believed that he would be driven from office, but their expectations were doomed to disappointment. The confidence which the old king had reposed in him was renewed by his successor, and in the person of Queen Caroline, the discreet ruler of her royal spouse, the second George, the Whig minister found a faithful and lifelong friend. For three years he shared power with Townshend, but the jealous Walpole brooked no rival near the throne, and his brother-in-law withdrew from official life to Norfolk in May 1730. Before and after that event the administration was based on two principles, sound finance at home and freedom from the intrigues and wars which raged abroad. On the continent congresses and treaties were matters of annual arrangement, and if the work of the plenipotentiaries soon faded it was through their labours that England enjoyed many years of peace. Walpole's influence received a serious blow in 1733. The enormous frauds on the excise duties forced themselves on his attention, and he proposed to check smuggling and avoid fraud by levying the full tax on tobacco and wine when they were removed from the warehouses for sale. His opponents fastened on these proposals with irresistible force, and so serious an agitation stirred the country that the ministerial measure was dropped amid general rejoicing. Several of his most active antagonists were dismissed from office or deprived of their regiments, but their spirits remained unquenched, as the incessant attacks in the *Craftsman* showed, and when Walpole met a new House of Commons in 1734 his supporters were far less numerous. The Gin Act of 1736, by which the tax on that drink was raised to an excessive amount, led to disorders in the suburbs of London; and the imprisonment of two notorious smugglers in the Tolbooth at Edinburgh resulted in those Porteous riots which have been rendered famous in the *Heart of Midlothian*. These events weakened his influence with large classes in England and Scotland, but his parliamentary supremacy remained umimpaired, and was illustrated in 1737 by his defeat of Sir John Barnard's plan for the reduction of the interest on the national debt, and by his passing of the Playhouse Act, under which the London theatres are still regulated. That year, however, heralded his fall from power. His constant friend Queen Caroline died on the 20th of November 1737, and the prince of Wales, long discontented with his parents and their minister, flung himself into active opposition. Many of the boroughs within the limits of the duchy of Cornwall were obedient to the prince's will, and he quickly attracted to his cause a considerable number of adherents, of whom Pitt and the Grenvilles were the most influential. The leading orators of England thundered against Walpole in the senate, and the press resounded with the taunts of the poet and pamphleteer, illustrious and obscure, who found abundant food for their invectives in the troubles with Spain over its exclusive pretensions to the continent of America and its claim to the right of searching English vessels. The minister long resisted the pressure of the opposition for war, but at the close of 1739 he abandoned his efforts to stem the current, and with a divided cabinet was forced, as the king would not allow him to resign, into hostility with Spain. The Tory minority known as "the patriots" had seceded from parliament in March 1739, but at the commencement of the new session, in November 1739, they returned to their places with redoubled energies. The campaign was prosecuted with vigour, but the successes of the troops brought little strength to Walpole's declining popularity, and when parliament was dissolved in April 1741 his influence with his fellow-countrymen had faded away. His enemies were active in opposition, while some of his colleagues were lukewarm in support. In the new House of Commons political parties were almost evenly balanced. Their strength was tried immediately on the opening of parliament. After the ministry had sustained some defeats on election petitions, the voting on the return for Chippenham was accepted as a decisive test of parties, and, as Walpole was beaten in the divisions, he resolved on resigning his places. On the 9th of February 1742 he was created earl of Orford, and two days later he ceased to be prime minister. A committee of inquiry into the conduct of his ministry for the previous ten years was ultimately granted, but its deliberations ended in nought. Although he withdrew to Houghton for a time, his influence over public affairs was unbroken and he was still consulted by the monarch. He died at Arlington Street, London, on the 18th of March 1745 and was buried at Houghton on the 25th of March. With the permanent places, valued at £15,000 per annum, which he had secured for his family, and with his accumulations in office, he had rebuilt the mansion at great expense, and formed a gallery of pictures within its walls at a cost of £40,000, but the collection was sold by his grandson for a much larger sum in 1779 to the empress of Russia, and the estate and house of Houghton passed to Lord Cholmondeley, the third earl having married the premier's younger daughter.

Walpole was twice married—in 1700 to Catherine, eldest daughter of John Shorter and grand-daughter of Sir John Shorter, lord mayor of London, who died in 1737, having had issue three sons and two daughters, and in March 1738 to Maria, daughter of Thomas Skerret, a lady often mentioned in the letters of Lady Mary Wortley Montagu. He was succeeded in his earldom and other titles by his eldest son Robert (1701–1751), who had been created Baron Walpole of Walpole in 1723; the 3rd earl was the latter's only son George (1730–1791), "the last of the English nobility who practised the ancient sport of hawking," and the 4th earl was the famous Horace Walpole (*q.v.*) the youngest son of the great Sir Robert. Horace Walpole died unmarried on the 2nd of March 1797, when the earldom became extinct, but the barony of Walpole of Walpole passed to his cousin, Horatio (1723–1809), who had already succeeded his father, Horatio Walpole, 1st Baron Walpole of Wolterton in that barony. In 1806 he was created earl of Orford, and this title still remains in the possession of his descendants, Robert Horace Walpole (b. 1854) becoming the 5th earl in 1894. When Horace Walpole died his splendid residence at Houghton and the Norfolk estates did not pass with the title, but were inherited by George James Cholmondeley, 4th earl and afterwards 1st marquess of Cholmondeley.

Sir R. Walpole's life has been written by Archdeacon William Coxe (1798 and 1800, 3 vols.), A. C. Ewald (1878) and John Viscount Morley (1889). See also *Walpole, a Study in Politics*, by Edward Jenks (1894); *English Hist. Rev.* xv. 251, 479, 665, xvi. 67, 308, 439 (his foreign policy, by Basil Williams); *Bolingbroke*, by Walter Sichel (1901–1902, 2 vols.); the histories, letters and reminiscences by his son, Horace Walpole; and the other lives of the chief political personages of the period. (W. P. C.)

ORFORD, a small town, once of greater importance, in the south-eastern parliamentary division of Suffolk, England, 21 m. E. by N. of Ipswich. Pop. (1901) 987. It lies by the right bank of the river Alde, where that river flows south-westward on the inner side of the great beach which has blocked its direct outflow to the sea, and swells out seaward in the blunt promontory of Orford Ness. The church of St Bartholomew is of much interest. It retains a ruined Norman chancel of rich and unusual design, while the body of the church is Decorated. Of Orford castle the keep remains, standing high on a mound; it is partly of Caen stone and partly of flintwork, and is of Norman date.

ORGAN, in music, the name (from Gr. ὄργανον, Lat. *organum*, instrument) given to the well-known wind-instrument. The notes of the organ are produced by *pipes*, which are blown by air under pressure, technically called *wind*.

Pipes differ from one another in two principal ways—(1) in *pitch*, (2) in *quality* of tone. (1) Consider first a series of pipes producing notes of similar quality, but differing in pitch. Such a series is called a *stop*. Each stop of the organ is in effect a musical instrument in itself. (2) The pipes of different stops differ, musically speaking, in their quality of tone, as well as sometimes in their pitch. Physically, they differ in shape and general arrangement. The sounding of the pipes is determined by the use of *keys*, some of which are played by the hands, some by the feet. A complete stop possesses a pipe for every key of some one row of manuals or pedals. If one stop alone is caused to sound, the effect is that of performance on a single instrument. There are such things as incomplete stops, which do not extend over a whole row of keys; and also there are stops which have more than one pipe to each key. Every stop is provided with mechanism by means of which the wind can be cut off from its pipes, so that they cannot sound even when the keys are pressed. This mechanism is made to terminate in a *handle*, which is commonly spoken of as the *stop*. When the handle is pushed in, the stop does not sound; when the handle is pulled out, the stop sounds if the keys are pressed. An organ may contain from one to four *manuals* or *keyboards* and one set of pedals. There are exceptional instruments having five manuals, and also some having two sets of pedals. The usual compass of the manuals approximates to five octaves, from C to c'''' inclusive. The compass of the pedal is two and a half octaves, from C to f'. This represents the pitch in which the notes of the pedal are written; but the pedal generally possesses stops sounding one octave lower than the written note, and in some cases stops sounding two octaves below the written note. Each manual or pedal has as a rule one *soundboard*, on which all its pipes are placed. Underneath the soundboard is the *windchest*, by which the wind is conveyed from the bellows, through the soundboard to the pipes. The windchest contains the mechanism of valves by which the keys control the admission of wind to the soundboard. The soundboard contains the grooves which receive the wind from the valves, and the slides by which the handles of the stops control the transmission of the wind through the soundboard to the pipes of the different stops.

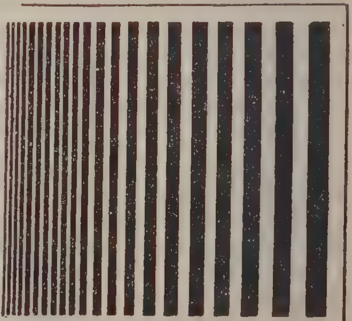

FIG. 1.—A portion of the Table with the open grooves seen from above.

The *grooves* of the soundboard are spaces left between wooden bars glued on to the *table* of the soundboard. There is usually one groove for every key. The grooves of the bass notes, which have to supply wind for large pipes, are broader than those of the treble. The bass bars are also thicker than those of the treble, that they may the better support the great weight which rests on the bass portion of the soundboard. The table forms the top of the grooves. The grooves are generally closed below with leather, except the opening left in each, which is closed by the key-valve or *pallet.*

The sliders are connected with the draw-stops or stop-handles, which are covered in with stout *upper boards*, on which the pipes stand. The stop-handles are pulled out, and holes are then bored straight down through the upper boards, sliders and table to admit the wind from the grooves to the pipes. When the sliders are shifted by pushing in the handles, the holes no longer correspond, and the pipes are silenced.

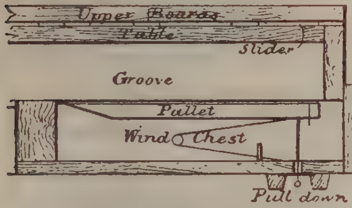

FIG. 2.—A section of a groove, with the table, windchest and pallet.

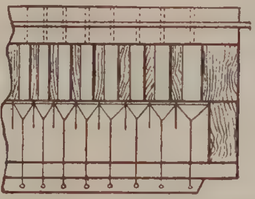

FIG. 3.—A section at right angles to fig. 2.

Pipes are divided first into *flue-pipes* and *reed-pipes*. Flue-pipes are blown by a wind mouthpiece characteristic of the organ, while in reed-pipes the wind acts on a metal tongue vibrating on a reed, and the motion of the tongue determines the speech of the pipe.

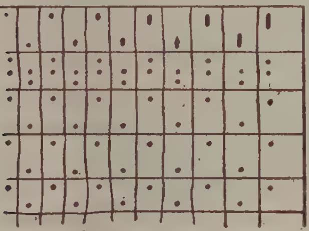

FIG. 4.—A portion of the table as it appears from above, with the places for the sliders of the stops; the small circles show the holes for the wind.

Pipes are made either of wood or of metal. Wood flue-pipes are generally of the form of a rectangular parallelepiped, metal flue-pipes of a cylindrical shape. Reed-pipes are conical or pyramidal, and widen towards the top. Some flue-pipes are made with stopped ends; these as a rule sound a note about an octave lower than the corresponding open pipes of the same length. Such are the stopped diapason, bourdon, and stopped flute.

The general elementary theory of the resonance of a pipe is tolerably simple. The effective length of the pipe is determined by measuring from the upper lip to the open end in open pipes, and from the upper lip to the stopper and back again in stopped pipes. To this is added an allowance for the effect of each opening, since the condition of perfect freedom from constraint does not subsist at the opening itself. The corrected length is traversed twice (backwards and forwards) by sound, in the time of one vibration of the resultant note. This describes in a rough and general manner the way in which any disturbance gives rise to the note of the pipe; but the theory of the mouth-pieces is a much more difficult matter, into which we cannot here enter.

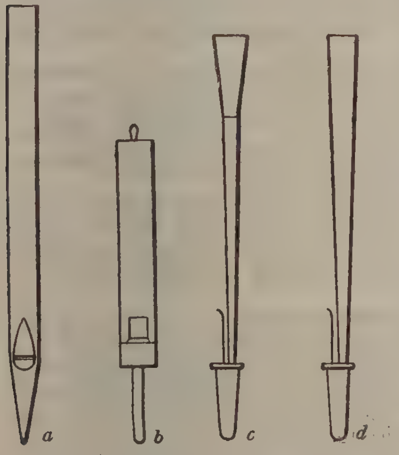

FIG. 5.—*a*, An open diapason; *b*, a stopped diapason; *c*, an oboe; and *d*, a trumpet—*c* and *d* being forms of reed-pipes.

In reed-pipes which are simply conical the resonance of the body is nearly the same as that of an open pipe of the same length. Where the form is irregular no simple rule can be given. But the resonance of the body of the pipe is generally the same as the note produced. The tongue of a reed-pipe alternately opens and closes the aperture of the reed. In this way it admits pulses of wind to the body of the pipe; these, if they recur at the proper intervals, maintain its vibration, which takes place when the note produced corresponds to the resonance of the pipe. The reed itself has its vibrating length determined by a wire which presses against it. The free end of this wire is touched with the tuning tool until a satisfactory note is produced.

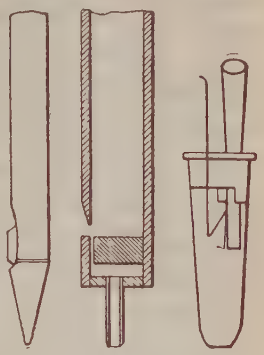

FIG. 6.—Mouthpieces in somewhat greater detail.

The pitch of the different stops is commonly denoted by the conventional approximate length of the pipe sounded by C, the lowest key of the manual. Even in incomplete stops which have no bass, the length of the pipe which C would have if the stop were extended down serves to indicate the pitch.

The conventional length of the C-pipe for stops having the normal pitch of the keys is 8 ft.; a pipe having twice this length sounds the octave below, a pipe having half that length the octave above, and so on. Thus stops which sound the octave below the normal pitch of the keys are spoken of as 16-foot stops. Even where the pipes are stopped so that the actual length is only 8 ft., they are spoken of as having "16-ft. tone." Similarly 32-ft. stops sound two octaves below the normal pitch of the keys. But if these notes are produced by stopped pipes, whose actual length is only 16 ft., they are spoken of as having "32-ft. tone." Sixteen-foot and 32-ft. stops are specially characteristic of the pedal, where the names also signify the length of the open pipe which would sound the note actually produced by the lowest C. Of stops higher than the normal pitch of the keys, the octave is denoted by 4 ft. if made with open pipes, 4-ft. tone if stopped; the twelfth is commonly spoken of as $2\frac{2}{3}$, the fifteenth or double octave as 2 ft. Higher-sounding stops are occasionally used, but these generally form part of "mixtures," and the foot-lengths of the separate ranks are not usually given.

The true or accurate lengths of the pipes vary within considerable limits. The base of the scales (dimensions) varies according to the standard of pitch, and the voicing and the complicated natural laws of pipes produce other deviations from simple relations, so that the conventional dimensions can only be regarded as a simple means of classifying the stops according to their pitch-relations. For this purpose they are essential; they are continually appealed to in discussion and description; and they are almost invariably marked on the stop-handles in all countries, so that a moderate knowledge of foreign nomenclatures, combined with the habit of seizing the meaning of the figures such as 16, 8, 4, on the stop-handles, will frequently suffice as a key to the complexities of a foreign organ.

Each of the manuals, or rows of keys, of an organ constitutes a separate organ, which is more or less complete in itself. The names of the different manuals or organs are *great organ, swell organ, choir organ* and *solo organ.* The fifth manual, where it occurs, is the *echo organ.* The above is the usual order in point of development and frequency of occurrence, although the solo is sometimes preferred to the choir organ. The great organ is in a certain sense the principal department of the organ. It may be regarded as formed by a completely developed series of those fundamental stops which constitute the solid basis of the tone of the instrument. If an instrument be constructed with only a single manual this necessarily assumes, in general, the characteristics of a great organ. The great organ is called "grande orgue" in French, and first manual or "haupt-werk" in German.

It is proposed to describe the principal organ-stops under the heads of the manuals to which they belong. The enumeration will not be exhaustive, but will include all the usual types.

Great organ.

The great organ begins generally with stops of 16 ft. in large instruments. In some cases a 32-foot sounding stop is introduced, but this cannot be said to be a proper characteristic of the great organ. The foundation tone is of 8 ft.; the stops of higher pitch serve to add brilliancy; those of 16 ft., which sound the octave below the normal pitch, serve to add gravity and weight to the tone. Sixteen-foot stops are commonly spoken of as "doubles," their conventional length being twice that of stops of normal pitch.

The 16-ft. stops are the 16 double open diapason, and the 16 bourdon or double stopped diapason, to which, in very large instruments, there may be added a 16 double trumpet. The double open diapason on the great organ consists usually of metal pipes, having moderate "scale," or transverse dimensions. These are of the same general character as the pipes of the ordinary open diapason, though they are made somewhat less powerful. In the better instruments of the second class as to size this stop alone would probably be regarded as representing suitably and sufficiently the class of doubles on the great organ. It gives great body to the general tone, and appears decidedly preferable to the bourdon, which frequently takes its place.

The 16 bourdon, when used on the great organ, is made of rather small scale and light tone. It gives great body to a large great organ and affords interesting combinations with other stops, such as the 4-ft. flute. It is used either alone in smaller organs of the second class, or in addition to a double open in larger instruments.

The 16 double trumpet is a trumpet (large reed stop) sounding the octave below the normal pitch. It is used generally in instruments of the largest size, but is somewhat more common in Germany. It is useful in giving a massive character to the tone of the full great organ, which is apt to become disagreeable on account of the great development of stops of a piercing character. If, however, the double trumpet is rough in tone, it is apt to communicate to the whole a corresponding impression.

Great organ 8 feet.

We now proceed to the 8-ft. stops (the reeds come at the end according to ordinary usage). An ordinary great organ may contain 8 stopped diapason, 8 open diapason (one or more), 8 gamba and 8 hohlflöte. The 8 stopped diapason on the great organ is usually of moderate scale, and some considerable fulness of tone. Few stops admit of more variety and individuality in their quality of tone than the stopped diapason; but too frequently the great organ stopped diapason fails to attract attention on its merits, being regarded simply as an inconsiderable portion of the foundation tone.

If there is any one stop which in itself represents the organ as a whole it is the open diapason. The pipes of this stop are the typical metal pipes which have always been characteristic of the appearance of the organ. A single open diapason stop is capable of being used as an organ of sufficient power for many purposes, though of course without variety. The pipes of this stop are called "principal" in German, this appellation apparently corresponding to the fact that they are the true and original organ-pipes. The English appellation of "diapason" has been taken to mean that these are the normal pipes which run through the whole compass. This, however, does not appear to be the actual derivation of the term; originally it is technically applied to the organ-builder's rule, which gives the dimensions of pipes; and it appears that the application to the stop followed on this meaning.

The scales, character and voicing of the open diapason vary with fashion, and are different in different countries. We may distinguish three principal types. The old English diapasons of the days before the introduction of pedal organs into England were characterized by a rich sweet tone, and were not very powerful. They were generally voiced on a light wind, having a pressure equivalent to that of a column of water of from 2 to 2½ in. The scale was in some cases very large, as in Green's two open diapasons in the old organ at St George's, Windsor; in these the wind was light, and the tone very soft. In other cases the scale was smaller and the voicing bolder, as in Father Smith's original diapasons in St Paul's Cathedral. But on the whole the old English diapasons presented a lovely quality of tone. English travellers of those days, accustomed to these diapasons, usually found foreign organs harsh, noisy and uninteresting. And there are many still in England who, while recognizing the necessity of a firmer diapason tone in view of the introduction of the heavy pedal bass, and the corresponding strengthening of the upper departments of the organ tone, lament the disappearance of the old diapason tone. However, it is possible with care to obtain diapasons presenting the sweet characteristics of the old English tone, combined with sufficient fulness and power to form a sound general foundation. And there can be no doubt that this should be one of the chief points to be kept in view in organ design.

The German diapason was of an entirely different character from the English. The heavy bass of the pedals has been an essential characteristic of the German organ for at least two or three centuries, or, as it is said, for four. The development of the piercing stops of high pitch was equally general. Thus foundation work of comparatively great power was required to maintain the balance of tone; the ordinary German diapason was very loud, and we may almost say coarse, in its tone when compared with the old English diapason. The German stop was voiced as a rule on from 3½ to 4 in. of wind, not quite twice the pressure used in England.

The French diapason is a modern variety. It may be described as presenting rather the characteristics of a loud gamba than of a diapason. In other words the tone tends towards a certain quality which may be described as "nasal" or metallic, or as approaching to that of a string instrument of rather coarse character. Some modern English builders appear to aim at the same model, and not without success.

The tone of a diapason must be strong enough to assert itself. It is the foundation of the whole organ tone. It is the voicer's business to satisfy this condition in conjunction with the requirement that the tone shall be full and of agreeable quality.

The 8 spitzflöte may be regarded as a variety of open diapason. The pipes taper slightly towards the top, and the quality is slightly stringy. This stop was much used at one time in place of a second open diapason. But it appears better that, where two open diapasons are desirable, they should both be of full diapason quality, though possibly of different strengths and dimensions. The admixture of stringy qualities of tone with the diapasons is always to be deprecated.

The 8 gamba was originally an imitation of the viola da gamba, a sort of violoncello. When made of a light quality of tone it is a pleasing stop; but its use in the great organ instead of a second open diapason is greatly to be deprecated for the reasons just stated.

The 8 hohlflöte is an open flute, usually of wood, and of small scale. If made to a moderate scale and fully voiced it possesses a full pleasant tone, which is a useful support to the foundation tone of the great organ. The 8 clarabella differs from the hohlflöte in being usually of rather large scale, and having the open pipes only in the treble. In old organs a separate bass was generally provided; now it is more usual to supply the stop with a stopped bass.

Great organ 4 feet.

The 4-ft. stops of the great organ comprise the 4 principal and the 4 flute. The 4 principal is the octave of the open diapason, generally of somewhat reduced scale and light but bright quality of tone. The use of the word "principal" in connexion with this stop is purely English, and is said to be connected with the use made of it as the standard of tuning for the whole organ. The Germans and French both designate this stop as "octave."

Of the 4 flute there are several varieties—open, stopped, wood, metal and harmonic. The harmonic flute has open metal pipes of double the conventional length, which speak their octave. This is determined partly by the voicing, partly by making a small hole about the middle of the length, which determines the motion as that of the two separate lengths between which the hole lies. Harmonic flutes have a sweet but full and powerful tone. Other flutes are generally rather light, except the waldflöte, which is a powerful stop of a somewhat hooting quality.

The great organ flute is frequently used to give brilliancy to light combinations. Thus it may be used with the stopped diapason alone, or with the 16 bourdon alone, or with any of these and either or both of the open diapasons.

The ordinary use of the 4-ft. stops is to add a degree of loudness to the diapasons. This is accompanied with a certain measure of keenness, which may become disagreeable if the 4-ft. tone is disproportionately strong. The ordinary practice is to use the 4-ft. tone very freely.

Great organ stops of high pitch

The 2⅔ twelfth stop sounds fiddle *g* on the C key. It is composed of diapason pipes, rather small and gently voiced. Its use is said to be to thicken the tone, which it certainly does. But how far the particular effect produced is desirable is another question. It is generally necessary that this stop should be accompanied by the fifteenth or other octave sounding stop of higher pitch.

The 2 fifteenth, or superoctave, of the great organ consists of diapason pipes sounding notes two octaves above the normal pitch of the keys. The 2 piccolo is a fluty stop of less power, having the same pitch. The 2-ft. tone is commonly used as giving a degree of loudness to the great organ beyond that obtainable with the 4-ft. tone.

The modern great organ fifteenth is generally a very powerful stop, and requires great caution in its use in organs of moderate size, or in limited spaces. The old English high pitched stops had little power, and their brilliancy was capable of pleasing without offence. The modern great organ up to fifteenth can only be heard with comfort in very large spaces. Under such suitable circumstances the fifteenth is capable of giving to the whole tone a ringing or silvery character, which lends itself specially to contrast with the tone of reeds. This peculiar keen tone requires for its full development the mixtures.

Mixture, sesquialtera, furniture, cymbal, scharf, cornet, are various names applied to a description of stop which possesses several ranks or several pipes to each note. The pipes of each note sound a chord which is generally composed of concordant notes of the harmonic series whose fundamental is the proper note of the key. Modern mixtures generally consist of fifths and octaves. Their composition is not the same throughout the whole range of the keyboard. A three-rank mixture may consist of the following (the numbers signify intervals, reckoned along the scale)—

C—*c* (tenor) 15—19—22
c♯ to top 8—12—15.

For a somewhat larger full mixture this may be modified as follows—

C—*c′* (middle) 15—19—22
c′♯ to top 1—8—12—15.

A sharp mixture suitable for a large instrument may be as follows—

Five Ranks.
C—*c′* 15—19—22—26—29
c′♯—*f″*♯ 8—12—15—19—22
g″—*c‴* 1—8—12—15—19
c‴ to top 1—5—8—12—15.

The last two compositions are given by Hopkins in his great treatise on the organ.

The early mixtures generally included the tierce (17th, or two octaves and a third). The German practice was to unite this with a twelfth, carrying the combination 12-17 throughout the keyboard under the name of sesquialtera. The combination is not now usually provided. The old English sesquialtera was ordinarily simply a form of mixture, as was the furniture. The mounted cornet consisted usually of five ranks—

1—8—12—15—17.

It extended from middle *c* upwards. The pipes were raised on a small soundboard of their own. The stop was used for giving out a melody. It is now obsolete.

The question of the employment and composition of mixtures is of the greatest importance with respect to the good effect of the full organ proper, *i.e.* without reeds. With reference to the whole question of keen-toned stops it may be laid down that their free employment in the great organ does not produce a good effect unless the organ is situated in a very large space. If this is the case, properly proportioned mixtures are capable of giving to the tone of the full diapason work a character which is brilliant without being overpowering. The contrast between this class of tone and that afforded by the reeds is one of the most charming and legitimate effects within the range of the instrument.

Great organ reeds.

We now pass to the reeds. The 16-ft. trumpet has been already alluded to, and there remain 8 trumpet and 4 clarion or octave trumpet. These are both stops of great power. The best trumpets possess also richness and smoothness of tone. Stops of this class can be used with the diapasons only, producing what may be described as a rich-toned blare of moderate strength. The more usual employment of the reeds is in connexion with the entire great organ, the whole forming the ordinary fortissimo of the instrument.

Swell organ.

The second department of the English organ is the swell organ. The whole of the swell pipes are enclosed in a box, faced on one or more sides with a set of balanced shutters. When these are closed the tone is almost completely muffled. When the shutters are opened, by means of a pedal usually, the sound bursts out. In order that the use of the swell may be effective, it is necessary that the shutters should close tightly, and that there should be a sufficient volume of tone to produce an effect when they are opened. The swell is of entirely English origin; it has been introduced in Germany to a very small extent, but more widely in France. It is usually called "recitatif" on the Continent. The chief characteristic of the swell is the rich and powerful volume of reed-tone of a peculiar character which it contains. But other stops are also of importance. We consider them in order. The 16 bourdon, small scale, is very commonly used in swells. It assists in giving body to the tone. It occupies, however, a large space within the swell box; and where the choice between it and a 16-ft. reed has to be made there can be no doubt that the reed should be preferred, as it contributes so much more to the development of the characteristic swell tone. The 16 contra fagotto is the usual name of this stop. It imparts great richness to the tone of the other swell reeds.

The 8-ft. diapason work is principally valuable for the soft effects obtained from it. The diapasons are voiced less loudly than for the great organ; and with the shutters closed they sound very soft. The dulciana is the softest stop generally available; and either this or some similar stop is introduced into the swell for the purpose of obtaining effects of the most extreme softness. Space within the swell box has generally to be economized. The complete bass of the open diapason or dulciana requires an 8-ft. swell box, whereas even a 16-ft. reed can be bent round so as to go within a smaller box if necessary. The open diapason and the dulciana are therefore often cut short at tenor *c*, and completed, if desired, with stopped pipes. The 4 principal and the 4 flute stops are similar to the corresponding stops in the great organ, but are somewhat lighter in tone.

The 2 fifteenth and mixtures are much more pleasing in the swell than in the great organ. The shutters tone them down, so that they cannot easily become offensive. Added to the reeds, they give a peculiar brilliancy to the full swell. But perhaps their most pleasing use is when all the diapason work of the swell is used alone, and as a contrast to the reeds.

The usual reeds are as follows, besides the doubles already mentioned: 8 oboe, 8 cornopean, 8 trumpet and 4 clarion (octave trumpet). The oboe (hautboy) is a conventional imitation of the orchestral instrument. It is a stop of delicate tone, and perhaps is at its best in solo passages, softly accompanied on another manual. The cornopean has a powerful horn-like tone. It is the stop which, more than any other, gives to the English swell its peculiar character. The trumpet is used in addition to the cornopean in large instruments. The clarion serves to add brightness and point to the whole. The vox humana is also frequently placed on the swell.

Choir organ.

The third department is the choir organ. The 8-ft. work may contain 8 stopped diapason, 8 open diapason, 8 gamba, 8 keraulophon and 8 hohlflöte.

As a rule no open diapason is provided for choir organs, unless they are larger than usual; but a small open is most useful as a means of obtaining a better balance than usual against the other manuals. The stopped diapason is generally made to contrast in some way with that on the great organ. The hohlflöte, or its representative, is generally a lighter stop than what would be put on the great organ. The gamba is better placed in the choir organ than in the great or the swell. Such stops as the gamba and the keraulophon are frequently placed in the swell with the idea of adding to the reediness of the tone. But this is fallacious. Their tone is not strong enough to assert itself through the shutters, and their peculiar character is therefore lost. On the choir organ, on the other hand, the sort of strength required is just about what they possess, and they show to advantage. The keraulophon is a stop invented by Gray and Davison, and has been widely adopted for many years. It has a hole made in each pipe near the top, and gives a peculiar tone very well described by its name (horn-flute). Though not very like the gamba, its tone is so far of the same type of quality that the two stops would hardly be used together. It is generally the case that similar stops of exceptional characters do not combine well, whereas stops of opposed qualities do combine well. Thus a gamba and a keraulophon would not combine well, whereas either of them forms an excellent combination with a stopped diapason or a hohlflöte.

The 4 principal is sometimes very useful. A light combination on the choir, with excess of 4-ft. tone, may often be advantageously contrasted with the more full and solid tone of the great diapasons, or with other attainable effects. The 4 flute is constantly used. The 2 piccolo is frequently found on the choir organ, but is not particularly useful.

In organs which have no solo manual there is usually a clarionet (cremona, cromorne or krummhorn, in old organs sometimes corno di bassetto) on the choir, and often an orchestral oboe (real imitation of the instrument). These are reed-stops. The dulciana and another soft stop, the salicional, salcional or salicet (of similar strength, but slightly more pungent quality), are often placed on the choir. They are, however, hardly strong enough to be of much use there, and in the swell they are useful for effects of extreme softness. In very large instruments a fifteenth and a mixture are sometimes placed on the choir, which in this case has a complete series of diapason work. If the fifteenth and the mixtures are light enough the result is a sort of imitation of the tone of the old English organ. It also forms a useful echo to the great organ, *i.e.* a passage played on the great may be repeated on the similar but fainter tone of the choir with the effect of an echo. In instruments of the largest size the choir is sometimes provided with a very small bourdon of 16-ft. tone, which helps to give to the tone the character of that of a small full organ without reeds.

Solo organ.

The solo organ is comparatively modern, at all events in its present usual form. A fourth manual was not unknown in old German organs; but the contents of all four resembled each other in a general sort of way, and there was nothing like the English swell or the modern solo. The solo appears to have arisen with Cavaillé-Coll in France, and Hill in England, as a vehicle for the powerful reed-stops on heavy wind introduced by these builders. Thus the French term for the solo is "clavier des bombardes"; and in the earlier English solos the "tuba mirabilis" was usually prominent. A solo organ may suitably contain any of the following stops: 8 tromba (a powerful reed on heavy wind), 8 harmonic flute (powerful tone and heavy wind), 8 clarionet and 8 orchestral oboe (real imitations of the instruments) and 8 vox humana (conventional imitation of the human voice). The last three stops are reeds. They may be with advantage enclosed in a swell box, having a separate pedal. In very large instruments a complete series of both diapason and reed stops is occasionally placed on the solo. But there does not seem to be much advantage in this arrangement.

Pedal organ.

We now come to the pedal. This forms the general bass to the whole organ. Thirty-two foot stops only occur in the largest instruments; they are as follows: 32 open diapason (wood or metal), 32-ft. tone bourdon and 32 contra trombone, posaune, bombarde, sackbut (reed). The 32-ft. open diapason, whether wood or metal, is usually made of large scale, and produces true musical notes throughout. Its musical effect in the lower part of its range is, however, questionable, so far as this depends on the possibility of recognizing the pitch of the notes. It adds great richness to the general effect, particularly in large spaces. The 32-ft. tone bourdon is not usually a successful stop.

It rarely produces its true note in the lower part of its range. The 32-ft. reed on the pedal has long been a characteristic of the largest instruments. With the old type of reed it was rarely pleasant to hear. The manufacture has been greatly improved, and these large reeds are now made to produce a fairly smooth effect. Deep reed notes, when rich and good, undoubtedly form one of the principal elements in giving the impression of power produced by large organs. From this point of view they are of great importance. Nevertheless the effect of large pedal reeds is generally more satisfactory to the performer than to the listener.

The 16-ft. pitch may be regarded as the normal pitch of the pedal; the principal stops are as follows: 16 open diapason (wood or metal), 16-ft. tone bourdon, 16 violone (imitation of double bass) and 16 trombone or posaune (reed). The 16-ft. open diapason on the pedal assumes different forms according to circumstances. As a rule the character is sufficiently indicated by the stop being of wood or metal. The wooden open is generally of very large scale, and produces a ponderous tone of great power and fulness, which is only suitable for the accompaniment of the full organ, or of very powerful manual combinations. Such a stop is, as a rule, unsuitable in organs of moderate size, unless supplemented by lighter 16s for ordinary purposes. The metal open is of considerably smaller scale (in fact all metal pipes are effectively of much smaller scale than wooden pipes of similar diameter). The metal gives a clear tone, lighter than that of large wooden pipes, and pleasanter for ordinary purposes. The metal open combines advantageously with a bourdon. In the largest organs both wood and metal open 16s may be suitably provided. Where metal pipes are made a feature in the organ-case, both the double open diapason in the great organ and the metal 16 of the pedal may be properly made of good metal (polished tin or spotted metal), and worked in to the design of the organ-case.[1] The same applies to the 32-ft. metal opens of the largest instruments. This saves space in the interior, and gives the large pipes room to speak, which is apt to be wanting when they are placed inside. The 16-ft. tone bourdon on the pedal may be made of any scale according to circumstances. If it is the chief bass of the organ it is made very large and with great volume of tone. Such stops are unsuitable for soft purposes, and a soft 16, usually a violone, is required in addition. If the loud department of the 16 tone is otherwise provided for the bourdon may be made of moderate strength. It may also be made very soft, like a manual bourdon. These three different strengths ought always to be provided for in an instrument of a complete character. The violone is also made of all three strengths. In a few cases it furnishes the principal bass; frequently it furnishes the moderate element; and it is often applied to obtain a very soft 16-ft. tone. The 16-ft. reed is very common. The observations made as to the effect of 32-ft. reeds are applicable also in this case.

The 8-ft. department of the pedal is only less important than the 16, because it is possible to replace it to a certain extent by coupling or attaching the manuals to the pedals. The usual 8-ft. pedal-stops are as follows: 8 principal bass (metal or wood), 8 bass flute (stopped), 8 violoncello (imitation of the instrument) and 8 trumpet. The remarks made above as to the scale of open 16s apply with little change to the pedal principal. Only, since the manuals are generally coupled, it is perhaps best to provide the large scale wood-stop, which presents the powerful class of tone in which the manual diapasons are deficient. The bass flute is almost a necessity in combination with the light 16-ft. tone. A composition ought to be provided by which the pedal can be reduced to these two elements by a single movement. The violoncello is sometimes used instead of the bass flute for the last-named purpose, for which, however, it is not so suitable. It is a favourite stop for some solo purposes, but is not of much general utility. The 8-ft. trumpet serves to give clearness and point to the tone of the 16-ft. reed.

In the short preface to Mendelssohn's *Organ Sonatas* it is stated that everywhere, even in pianissimo, it is intended that the 16-ft. tone of the pedal should be accompanied by 8-ft. tone. For the purpose of realizing this as a general direction the soft 16-ft. and 8-ft. stops are required; large instruments are, however, occasionally found which possess nothing of the kind.

The following stops of higher pitch are occasionally found on the pedal: $5\frac{1}{3}$ twelfth bass, 4 fifteenth bass, mixture and 4 clarion. These serve to make the pedal tone practically independent of coupling to the manual, which is a matter of great importance, especially in the performance of certain compositions of Bach and other writers, who appear to have been independent of couplers.

Second pedal.

In some instruments two sets of pedals are provided, which may be described as great and choir pedals. The great pedal is in the usual position; the choir pedal is in front of the other, and sloping. It is so placed that the feet rest on it naturally when stretched out in front of the performer. There is a choir pedal of this kind in the organ in the minster at Ulm, built by Walcker of Ludwigsburg. It is a very large instrument, having 100 sounding stops. It has no compositions, which indeed are but little known in Germany; and without some arrangement such as this a soft pedal would hardly be obtainable. There are a few other instruments which have choir pedals, but they have not been introduced into England.

Arrangement of manuals.

In organs which have a single manual the characteristics of the great and choir organs are usually united. In organs which have two manuals the lower usually represents the united great and choir, the upper is the swell. In organs which have three manuals the lower is usually the choir, but sometimes combines choir and solo, the middle is the great, and the top is the swell. In organs which have four manuals the order is solo, swell, great, choir, the solo being at the top and the choir at the bottom.

Compositions.

Compositions are mechanical contrivances for moving the stop-handles in groups at a time. The ordinary form consists of pedals, which project from the front just above the pedal keys. The arrangements are various. We may refer to the arrangement in the organ at Windsor, given later on. A species of composition was introduced by Willis some years ago, and has been adopted in many large English instruments, which acts by means of a series of brass disks placed just under the front of the keys of each manual, within reach of the thumb. These act by means of pneumatic levers. A slight pressure on one of the disks sets the machine attached to it in action, and the required change in the stops is made without any exertion on the part of the performer.

General mechanism.

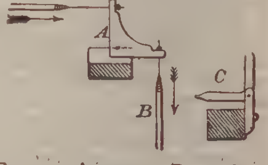

FIG. 7.—A, square, B, tracker; C, metal square.

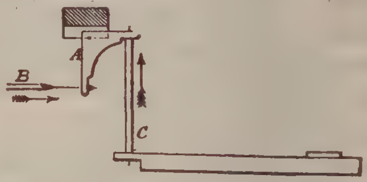

FIG. 8.—A and B as in fig. 7; C, sticker.

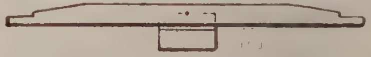

FIG. 9.—Backfall.

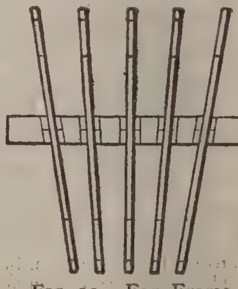

FIG. 10.—Fan Frame.

The connexion between the keys and their pallets is made by various mechanisms, some of which are very ancient. In *square and trackerwork* (fig. 7) the old squares were made of wood. They resemble in function the squares used for taking bell-wires round a corner. The trackers are slight strips of wood, having screwed wires whipped on to their ends, which hold by leather buttons. The trackers play the part of the bell-wires. Where pressure has to be transmitted instead of a pull, thin but broad slips of wood are used, having pins stuck into their ends to keep them in their places. These are *stickers* (fig. 8). *Backfalls* (fig. 9) are narrow wooden levers turning on pins which pass through their centres. The *fan frame* (fig. 10) is a set of backfalls having one set of ends close together, usually corresponding to the keys; the other ends are spread widely apart. The *roller board* (fig. 11) is a more general mode of shifting the movements sideways. The roller is a slip of wood, or a bit of metal tube, which turns on two pins inserted into its ends. It has two arms projecting at right angles to its length. One of these receives the pull at one point, the other gives it off at another. In case a pull has to be transmitted to more than one quarter, a roller will sometimes have more than two arms. The name of *couplers* (fig. 12) is given to the mechanical stop by which the keys of one manual are made to take down those of another, or those of the pedal to take down those of the manuals. Some old forms of the mechanism could not be put on while any of the keys were depressed; others had a tendency to throw the fingers off the keys. These forms have been entirely superseded. That now used consists of a series of backfalls centred on a movable support. The one set of ends is connected with the moving keys; the other set of ends is pierced by the wires of the trackers or stickers from the keys to be moved. In the one position of the support these ends play freely over the wires; in the other they are brought up against the buttons of the trackers or against the stickers to be moved. The usual couplers are—each of the manuals to the pedal, swell to great, swell to great octave, swell to great sub-octave, swell to choir, choir to great sub-octave, and solo to great. The swell octave and sub-octave couplers are sometimes placed on the swell itself. The objection to this is, that if they are used when the swell is coupled to the great organ, as is very commonly the case, the octaves are reached through two couplers. And, as couplers are not generally screwed up quite tight, the octaves are often not sufficiently put down to sound in tune. The choir to great sub-octave coupler was used chiefly as a substitute for a double on the great organ. It is common in organs of the transition period, but is not a good arrangement.

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[1] Anything down to one-third tin and two-thirds lead is called tin. But "pure tin" should have over 90% of tin. Absolutely pure tin could not be worked. Spotted metal is said to have from one-third to two-thirds tin. Under one-third tin no spots are said to rise, and the mixture has the general characters of lead.

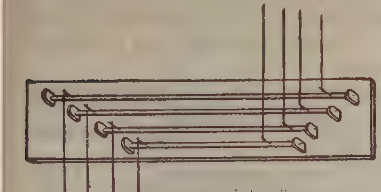

Fig. 11.—Roller Board.

The *pneumatic lever* (fig. 13) consists of a small power bellows attached to each key, so that the depression of the key admits high-pressure wind to the power bellows. The power bellows then performs the work of opening the valves, &c. In large organs the work to be done would be beyond the reach of the most powerful finger without this device. Similar devices are sometimes applied to the compositions and other mechanical arrangements.

Pneumatic transmission, with many other mechanical devices, was invented by Willis. It consists of a divided pneumatic action. The pneumatic wind, instead of being at once admitted to the power bellows, is made to traverse a length of tubing, at the farther end of which it reaches the work to be done. This principle admits of application to divided organs, the pneumatic transmission passing under the floor, as in the organ at St Paul's Cathedral.

Ventils are valves which control the wind-supply of the different groups of stops. They were much recommended at one time as a substitute for compositions. The practical difference is that compositions shift the stop-handles, so that one can always see what there is on the organ; ventils leave the stop handles unmoved, so that the player is liable to be deceived. Other inconveniences might be mentioned, but it is enough to say that practical opinion appears decidedly to condemn the use of ventils.

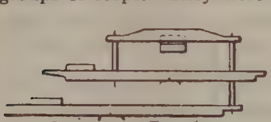

Fig. 12.—Coupler.

Arrangements about the performer.

The original *pedal boards* of Germany were flat and of very large scale. The early practice in England was to make them very small, as well as of short compass. Of late the compass C—*f*′, thirty notes, has been universally adopted with scales varying from 2¼ to 2½ in. from centre to centre of the naturals; 2⅜ in. is the scale now recommended. A large number of organs have been provided with concave radiating pedal boards. The objections to this arrangement are mainly two: They present different scales at different distances from the front; and, except just in front, they become so narrow that the smallest foot can hardly put down the pedals singly. This renders difficult the old Bach style of playing, the essence of which consists in putting the feet over each other freely, so as to use the alternate method as much as possible; and this requires that the back of the pedal board shall be as available as the front.

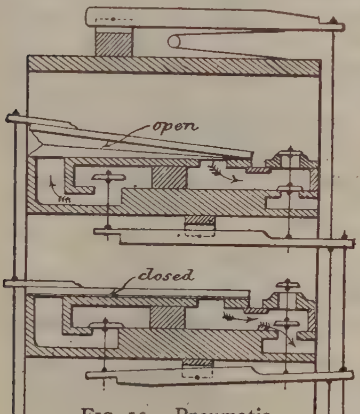

Fig. 13.—Pneumatic Lever.

The diversities of the arrangements of different organs present a great difficulty. The best players take a certain time to master the arrangements of a strange instrument. With a view to the introduction of uniformity a conference on the subject was arranged by the College of Organists in London, and a series of resolutions and a series of recommendations were published which deserve attention (1881), though they have now been withdrawn. We may mention that the parallel concave form was recommended for the pedal board, and 2⅜ in. for the scale. The positions of the stops of the various organs were to be as follows:—

Left.	*Right.*
Swell.	Solo.
Pedal.	Great.
Couplers.	Choir.

The order of compositions, &c., from piano to forte was to be in all cases from left to right. The groups of compositions were to be in the order from left to right—pedal, swell, couplers, great.

Two other points of detail may be alluded to. One is the position of the pedal board with reference to the keys. The height from the middle of the pedals to the great organ keys, it is agreed, should be 32 in. But as to the forward position there is a difference. The resolutions said that "a plumb-line dropped from the front of the great organ sharp keys falls 2 in. nearer the player than the front of the centre short key of the pedal board." The old arrangement gave usually 1½ in. for this distance. But it is thought that the change has not gone far enough, and 4 in. has been found preferable. There is scarcely any single arrangement which is so important for the comfort of the player as having sufficient space in this direction (fig. 14). The second matter is the provision of some other means of acting on the swell than by the swell pedal. The use of the swell pedal is inconsistent with the proper use of both feet on the pedal keys; and there is no doubt that incorrect habits in this respect are commonly the result of the English use of the swell pedal. In fact, players sometimes keep one foot on the swell pedal all the time, so that proper pedal playing is impossible. Arrangements have been devised by means of which a movable back to the seat can be made the means of acting on the swell. The first "recommendation" of the College of Organists illustrated the requirement; it was, that "the consideration of organ-builders be directed to the widely-expressed desire for some means of operating on the swell in addition to the ordinary swell pedal." G. Cooper had a movable back to the seat of the organ at St Sepulchre's, London. The swell was opened by leaning back, so that it could only be used when the swell was coupled to the great. The writer has had an organ for more than twenty years in which the movable back is provided with a strap passing over one shoulder and buckling in front. It opens the swell when the player leans forward. It is most valuable, particularly in such things as accompanying the service. The emphasis required is obtained when wanted without taking the feet from their other duties. Young people pick it up easily; older people have difficulty.

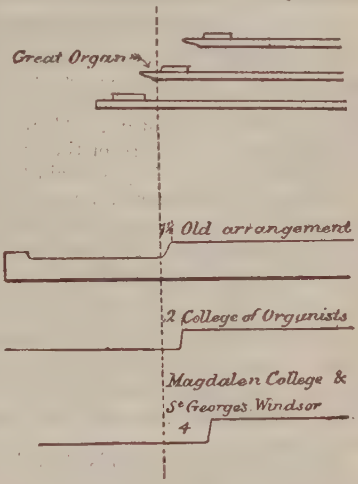

Fig. 14.—Relative Position of Manual and Pedal.

As an example of an organ of a complete but not enormously large character, we give the details of the organ at St George's Chapel, Windsor, which was rebuilt by Messrs Gray and Davidson, according to Sir Walter Parratt's designs, in the year 1883.

Four manuals, C to *a*‴, 58 notes. Pedal, C to *f*′, 30 notes.

Great Organ (3½-in. wind).

Double open diapason	16
Large open diapason	8
Open diapason	8
Stopped diapason	8
Clarabella	8
Principal	4
Harmonic flute	4
Twelfth	2⅔
Fifteenth	2
Sesquialtera[1]	III ranks
Harmonic piccolo	2
Posaune	8
Clarion	4

Swell Organ (3-in. wind).

Lieblich bourdon	16
Open diapason	8
Stopped diapason	8
Dulciana	8
Vox coelestis[1]	8
Principal	4
Octave dulciana	4
Fifteenth	2
Mixture[2]	III ranks
Contra fagotto	16
Cornopean	8
Oboe	8
Vox humana	8
Clarion	4

Choir Organ (2¾-in. wind).

Dulciana	8
Keraulophon	8
Stopped diapason	8
Viol d'orchestre	8
Flute	4
Piccolo	2
Corno di bassetto (reed)	8

Solo Organ (6-in. wind).

Harmonic flute	8
Orchestral oboe	8
Tromba	8

Pedal Organ (4-in. wind).

Open diapason (wood)	16
Violone (metal)	16
Bourdon (wood)	16
Wood flute	8
Trombone (wood tubes)	16

Couplers.

Solo to great.	Swell to pedal.
Swell to great.	Great to pedal.
Solo to pedal.	Choir to pedal.

Pneumatic action to great organ and its couplers.

The arrangement of the stops and compositions is as follows:—

Left.	*Over the keys.*	*Right.*
Solo.	Couplers.	Swell.
Choir.	Tremulant.	Great.
Pedal.	(Knob below swell keys.)	

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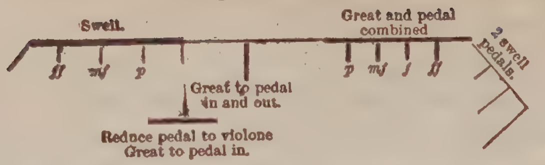
[1] These are the old mixtures.

Composition Pedals.



One swell pedal controls two sides of the swell box. The other controls the box in which the orchestral oboe is placed. The vox humana is in a box which is always shut, inside the swell box.

History of the Modern Organ.

The history of the ancient organ is dealt with in a separate section below. The first keyboard is said to have been introduced into the organ in the cathedral at Magdeburg about the close of the 11th century. There were sixteen keys; and a drawing exists in a work of the 17th century[1] which purports to represent them. They are said to have been an ell long and 3 in. broad. The drawing represents a complete octave with naturals and short keys (semitones), arranged in the same relative positions as in the modern keyboard. In early organs with keyboards the keys are said to have required blows of the fist to put them down. In these cases probably sounding the notes of the plain song was all that could be accomplished.

As to the precise time and conditions under which the keyboard assumed its present form we know nothing. It is commonly said that the change to narrow keys took place in the course of the 14th century, and the semitones were introduced about the same time.

Many examples of organ keyboards still exist, both in England and on the Continent, which have black naturals and white short keys (semitones). The organ in the church at Heiligenblut in Tirol had in 1870 two manuals, one having black naturals and white semitones, the other white naturals and black semitones. In this organ the stops were acted on by iron levers which moved right and left. It had a beautiful tone; it possessed a reservoir bellows of great capacity, and was altogether a remarkable instrument. Harpsichords with black keyboards also exist.

Bellows,

The mode of blowing practised about the time of the introduction of the first keyboard appears to have been that which ultimately developed into the method still generally used in Germany. There were a great many separate bellows, each like a magnified kitchen-bellows, but provided with a valve, so that the wind could not return into the bellows. One man had charge of two of these. Each foot was attached to one bellows, and the blower held on by a bar above. It was possible, by raising each of the two bellows in turn and then resting his weight upon it, to produce a constant supply of wind with the pressure due to his weight. A great many such bellows were provided, and it seems that each pair required one man; so that great numbers of blowers were employed. A slight modification is enough to change this method into the German one. Instead of fastening the feet to the bellows and pulling them up, the blower treads on a lever which raises the bellows. The bellows being loaded then supplies the wind of itself. The bellows thus used have diagonal hinges, and various expedients are employed to make them furnish steady wind. But the English system of horizontal reservoirs and feeders appears far superior.

Pedal.

The invention of the pedal may be set down to the 15th century. About that time the organ assumed on the Continent of Europe the general form which it has retained till lately, more especially in Germany. This may be described generally as having a compass of about four octaves in the manuals and of two octaves in the pedal, with occasionally extra notes at the top in both, and frequently "short octaves" at the bottom. German short octaves are as follows. The manual and pedal appear to terminate on E instead of C. Then the E key sounds C, F=F, F♯=D, G=G, G♯=E, and the rest as usual. There were often three, sometimes four, manuals in large organs. The character of all these was in general much the same, but they were more softly voiced in succession, the softest manual being sometimes spoken of as an echo organ. There are one or two examples of the echo as a fourth or fifth manual in England at the present time, in organs which have been designed more or less under German inspiration. The old echo was long ago superseded by the swell in England.

Cases.

A few ancient cases survive in a more or less altered condition. Of these the following are worthy of mention, as bearing on the question of date.

Sion (Switzerland). Gothic. A sma.. instrument	.	1390
Amiens. Originally Gothic. Large, with 16-ft. pipes	.	1429
Perpignan. Gothic. Large, with 32-ft. pipes	.	1490
Lübeck. One of the finest Gothic organs in Europe. (or, according to Hopkins, 1518).	32s.	1504

In all these the cases are sufficiently preserved to make it almost certain that pipes of the same lengths were originally employed. The actual pipes are generally modern. Shortly after this date we find Renaissance cases. At La Ferté Bernard (dep. Sarthe) part of the substructure is Gothic, and is known to be of date 1501; the organ above is Renaissance, and is known to be of date 1536. At St Maurice, Angers, an organ was built in 1511, with Renaissance case, two towers of 32-ft. pipes, 48 stops and a separate pedal. An account of the instrument in a procès verbal of 1533 furnishes good evidence. In the 16th century, therefore, the organ had attained great completeness, and the independent pedal was general on the Continent.

German organ.

We cannot follow the history of German organs through the intervening centuries; but we propose to give the items of one of the principal organs of the Silbermanns, the great builders of the 18th century—namely, that standing in the Royal Catholic Church, Dresden. Without being an enormously large instrument it is complete in its way, and gives a very good idea of the German organ The account is taken from Hopkins. The date is 1754.[2]

Great.

Principal	16	Octave	2
Bourdon	16 tone	Tertia	$1\frac{3}{5}$
Principal	8	Mixtur	IV ranks
Viola da Gamba	8	Cymbel	III
Rohrflöte	8 tone	Cornet	V
Octave	4	Fagott	16
Spitzflöte	4	Trumpet	8
Quinta	$2\frac{2}{3}$	Clarin	4

Echo.

Quintaton	16 tone	Octave	2
Principal	8	Tertia	$1\frac{3}{5}$
Gedackt	8 tone	Flageolet	1
Unda Maris	8 tone	Mixtur	IV ranks
Octave	4	Echo	V
Rohrflöte	4 tone	Vox humana	8 tone
Nassat	$2\frac{2}{3}$		

Choir.

Gedackt	8 tone	Quinta	$1\frac{1}{3}$
Principal	4	Sifflöte	1
Rohrflöte	4 tone	Mixtur	III ranks
Nassat	$2\frac{2}{3}$	Sesquialtera	II
Octave	2	Chalumeaux	8 tone

Pedal.

Untersatz	32 tone	Mixtur	IV ranks
Principal	16	Pausan(trombone)	16
Octave-bass	8	Trompette	8
Octave	4	Clarin	4

Accessories.

Echo to great.	Tremulant echo.
Great to pedal.	Tremulant great.

Compass.

Manuals—C to *d'''* in alt.	Pedal—C_1 to tenor *c*.

English organs.

The chief difference between English organs and those of the Continent was that until the 19th century the pedal was absolutely unknown in England. The heavy bass given by the pedal being absent, a lighter style of voicing was adopted, and the manuals were usually continued down below the 8-ft. C so as to obtain additional bass by playing octaves with the hands. Thus the old organ (date 1697) of Father Smith in St Paul's Cathedral had manuals descending to the 16-ft. C (C_1), with two open diapasons throughout. Green's old organ at St George's, Windsor, had manuals descending to the 12-ft. F, also two open diapasons throughout, no F♯. But the more usual practice was to make the manual descend to the $10\frac{2}{3}$ G, leaving out the G♯. At the Revolution most of the organs in England had been destroyed. Shortly afterwards Bernard Smith, a German, commonly called Father Smith, and Thomas and René Harris, Frenchmen, were largely employed in building organs, which were wanted everywhere. Father Smith perhaps had the greatest reputation of any builder of the old time, and his work has lasted wonderfully. There is a list in Rimbault of forty-five organs built for churches by him. The list of René Harris is scarcely less extensive.

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[1] Praetorius, *Theatrum Instrumentorum.*

[2] The writer heard this instrument as a boy, and has a very pleasant recollection of the general effect.

The most important step in the development of the old English organ was the invention of the swell. This was first introduced into an organ built by two Jordans, father and son, for St Magnus's church near London Bridge, in 1712.

Burney writes (1771):—

> "It is very extraordinary that the swell, which has been introduced into the English organ more than fifty years, and which is so capable of expression and of pleasing effects that it may be well said to be the greatest and most important improvement that was ever made in any keyed instrument, should be utterly unknown in Italy; and, now I am on this subject, I must observe that most of the organs I have met with on the Continent seem to be inferior to ours by Father Smith, Byfield or Snetzler, in everything but size! As the churches there are very often immense, so are the organs; the tone is indeed somewhat softened and refined by space and distance; but, when heard near, it is intolerably coarse and noisy; and, though the number of stops in these large instruments is very great, they afford but little variety, being for the most part duplicates in unisons and octaves to each other, such as the great and small 12ths, flutes and 15ths; hence in our organs, not only the touch and tone, but the imitative stops, are greatly superior to those of any other organs I have met with."

(As to these opinions, compare what is said on great organ open diapasons above.)

In the course of the 18th century most of the old echoes were altered into swells, and the swell came into almost universal use in England. The development of the swell is inseparably associated with the peculiar quality of English swell reeds. These must have originated during the development of the swell. We hear of a "good reed voicer" named Hancock, who worked with Cranz, changing echoes into swells. However it originated, the English reed is beautiful when properly made. The original swells were usually short in compass downwards, frequently extending only to fiddle *g*. It is only lately that the value of the bass of the swell has been properly appreciated. Short-compass swells may be said to have now disappeared.

Avery's old English organ.

The organ in St Stephen's, Coleman Street, was probably nearly in its original condition at the date when it was described by Hopkins. It was built by Avery in 1775. At all events the following arrangements might very well have been the original ones. The pedal clavier without pipes is no doubt a subsequent addition, and is omitted.

Great.

Open diapason.
Stopped diapason.
Principal.
Twelfth.
Fifteenth.

Sesquialtera—III ranks.
Mixture—II ranks.
Trumpet.
Clarion.
Cornet to middle *c*—V ranks.

Choir.

Stopped diapason.
Principal.
Flute.

Fifteenth.
Cremona to tenor *c*.

Swell.

Open diapason.
Stopped diapason.
Principal.

Cornet—III ranks.
Trumpet.
Hautboy.

Compass.

Great and choir—G_1 to e''',
no G_1♯.

Swell—fiddle *g* to e''.

Pedals in England.

This gives an excellent idea of the old English organ. There are several different accounts of the introduction of pedals into England. It took place certainly before the end of the 18th century, but only in a few instances; and for long after the usual arrangement was simply to provide a pedal clavier, usually from F_1 or G_1 to tenor *c* or *d*, which took down the notes of the great organ. Unison diapason pipes (12-ft.) were occasionally used. In one or two cases, as in the transition states of the old organ at St George's, Windsor, a 24-ft. open diapason was employed as well as the unison stop. But a more usual arrangement, of a most objectionable character, was to combine the G_1—*c* pedal-board with a single octave of so-called pedal-pipes, extending from the 16-ft. to the 8-ft. C; so that, instead of a uniform progression in ascending the scale, there was always a break or repetition in passing C.

About the middle of the 19th century it began to be generally admitted that the German arrangement of the pedal was the better, and the practice gradually became general of providing a complete pedal-board of $2\frac{1}{2}$ octaves (C—f'), with at least one stop of 16-ft. tone throughout, even on the smallest organs that pretended to be of any real use. The study of the classical works of Bach and Mendelssohn went hand in hand with this change; for that study was impossible without the change, and yet the desire for the study was one of the principal motives for it. In the meantime Bishop, an English builder, had invented composition pedals, which so greatly facilitate dealing with groups of stops. About the same time (1850) the mechanics of the organ were advanced by the general introduction of the pneumatic lever into large instruments; the whole mechanism of the organ was revolutionized by Willis's improvements; and the organ-builders of England, having obtained from the Continent the fundamental ideas necessary for completeness, advanced to a point at which they appear to have been decidedly ahead.

Present day organs.

In the early part of the last quarter of the 19th century, the future of the English organ appeared to be one of great promise. Much confidence was felt in the brilliant combinations of Willis's mechanism. The employment of electricity had reached a certain stage, and the necessary fundamental mechanism, under the name of the electro-pneumatic lever, was to be obtained in a practical form. Several new devices were in the air, by means of which the control of the various valves was accomplished by the action of wind, traversing channels, with complete abolition of trackers, and even of stop slides; and Willis's classical mechanisms, including those for acting on stop slides pneumatically without direct mechanical connexion between slide and handle, were almost universally adopted in large organs. The delicate device of pneumatic lever on pneumatic lever, by which alone the small electromagnetic impulses available could be made to do heavy work, had obtained recognition. If there was an occasional failure, it was thought to be no more than might be expected with work of a novel and delicate character. And it was confidently expected that these devices would, in time, with the improvements associated with practical use, come to be reliable. This expectation has not been realized. The objections to the modern pneumatic, and still more to the electropneumatic machinery, are of two kinds—noise and inefficiency.

Noise in the Key Action.—We take as the standard of comparison the old tracker organ, without pneumatics. There was always a certain amount of noise. Now, even in the best instruments of Willis himself during his lifetime, and still more in the best instruments of the present day, the noise of the key action is judged to be as bad as in the old tracker organ. The pneumatics have to be driven by a powerful wind; the consequence is they get home with a knock.

Noise in the Stop Action.—If in a large instrument with pneumatic drawstop action one of the compositions which affects several stops is put in action, the movement of the stops is followed by a blow like a hammer, which is caused by the pneumatics getting home under the powerful force employed. This is much worse than anything there was in the old organ.

Inefficiency in the Key Action; Delay and Cyphering.—This chiefly shows itself in delay, both at the depressing and at the recovery of the key. Some of the causes are the size of the pneumatic bellows, which takes time to fill and time to empty; and, very often, defective regulation of the valves. The regulation of the valves is an art in itself, and it is often the case that the performance in this respect can be greatly improved by going over the regulation. The test is the possibility of executing shakes and repetitions. It is quite common to find mechanism by the first organ-builders of the day on which shakes or repetitions cannot be executed.

Pneumatic transmission is also specially liable to cause delay. In divided organs the swell is usually on the far side from the keys, and the pneumatic transmission tubes pass it under the floor. The swell touch is then considerably worse than the great. In all cases there must be some delay on account of the time the pulse takes to traverse the transmission tube with the velocity of sound. And if a pneumatic bellows has to be filled at the far end the delay will be more. Some of the delay experienced in large buildings may be due to the time taken in supplying the energy necessary for setting up and maintaining the vibrations of the air in the building. This should, however, have been the same with the old tracker action; and the opinion of old players is unanimous that they never experienced anything of the kind. The shake and repetition are the only real tests so far as the action is concerned.

Inefficiency in the key action also takes the form of "cyphering," *i.e.* a note sticks down. With the old tracker organ this could generally be cured without much difficulty by working on the action, and with the separate pneumatic lever something could be done. But the modern types of elaborated action are entirely enclosed in wind-chest and sound-board. It was always foreseen that these types would be dangerous, unless they could be made quite perfect, and they have not been made perfect. When a note sticks, there is no way of curing it except to get at the inside of the wind-chest, or to remove all the pipes belonging to the note. A case happened recently where, during a performance on an organ by a first-rate modern builder, two cypherings took place. To cure the first all the pipes belonging to the note were removed. In the second the last three pages of a Bach fugue were played with a note cyphering all the time; and such cases are of frequent occurrence.

Inefficiency in the Stop Action.—In this case the power provided is insufficient to move the stop slide. As there is no direct connexion between slide and handle, nothing can be done but to get inside the organ and move the slide by hand. A case has recently occurred where an organ by a first-rate builder, in constant use, and perfectly cared for, got one of the slides stuck while in use. The organ was locked, so nothing could be done. The same happened to another slide a couple of days later. It is also an everyday experience that the pneumatic compositions are insufficient to move the stops; sometimes they move the stops about halfway, when a sort of wail is heard.

One practical result is—where an organ is not too large to be dealt with by the old mechanical methods, there is much to be said for adhering to them.

It seems worth while to mention two suggestions by which these imperfections in large organs might be reduced to a minimum.

For blowing, motors for stop action, &c., the writer would suggest the employment of the *Armstrong hydraulic accumulator system*, at a pressure of say 600 ℔ on the square inch. The pumping of the system would be done by external power (electricity, gas, oil or steam), quite away from the building containing the organ. The blowing would be done by the hydraulic system at a point near the organ. The small hydraulic motors attached to the stop slides, swell, &c., might have almost infinite power and be perfectly noiseless. The key-work should be pneumatic and should use *Willis's floating lever*. The swell pedal should be hydraulic, with the floating lever, as also the action of the back of the seat if employed for opening the swell.

The effect of the floating lever is that the movement of the work corresponds exactly with the movement of the part connected with key or pedal. The connexion with the key would have a regulation so that the lever would begin to move a little later than the key, the regulation being adjusted by trial so as to give shakes and repetitions.

The principle of the floating lever is the same as that of the steam steering gear in ships. The control of the power is attached to the floating centre. It is always such that the movement of the work brings back the floating centre into its standard position, and it acts like a fixed centre with added power.

As to the general arrangement of the instrument, it is desired to make two protests. Firstly, the organ chamber is a monstrosity. Shutting up the organ in a confined space is simply throwing money away. An organ of a quarter the size would do the work better if not shut up in an organ chamber. Secondly, it has become customary to separate the different parts of an organ, putting the pipes of the pedal, great and swell perhaps in different places at a distance from one another, and the soft choir organ, which should be close to the singers, perhaps, as in one actual case, in a remote position where it cannot be heard at all and is useless for accompaniment. The parts of an organ so dispersed will not give a tone which blends into a whole. The practice is undesirable. The divided organ with pneumatic or electric transmission is to be avoided for all reasons.

General Remarks on Organ Treatment

The organ probably presents more difficulties then any other instrument in the way of a sound elementary mastery. A person of ordinary capacity may work at it for years before being able to play passages of moderate difficulty with confidence and correctness. The special difficulty appears to be chiefly mental, and arises from the number of things that have to be thought of simultaneously. It does not lie in the execution —at least not chiefly; for to play a hymn-tune correctly, the bass being taken with the pedals, the tenor with the left hand, and the two upper parts with the right, is a matter in which there is no execution required; but it is of great difficulty to an inexperienced player. Other distributions of parts—such as bass with pedals, treble with right hand on a solo stop (*e.g.* clarinet), two inner parts with a soft open diapason, or something of the kind—are of much greater difficulty in the first instance. Another distribution is bass with pedals, melody with reed or solo combination in the tenor with left hand (an octave below its true pitch), inner parts with right hand on a soft open diapason, or something that balances. This is of far greater difficulty, as it requires rearrangement of parts to avoid those faults of inversion the avoidance of which is known as double counterpoint. All this can be practised with common hymn-tunes; but the performer who can do these things with ease is in some respects an advanced player.

There is a natural gift, which may be called the polyphonic ear-brain. It is possessed by (roughly) about one in fifty of musical students, by students of the organ in much the largest proportion, and probably by a much smaller proportion of the unsifted population. For the polyphonic ear-brain these difficulties have no existence, or take little trouble to surmount. It consists of the power of hearing the notes of a combination simultaneously, each being heard as an ordinary person hears a single note. When a composition is played or sung in parts, each part is heard as a separate tune; and the effect is realized in a manner quite different from the single melody with accompaniment, which is all that an ordinary person usually hears. This is in many but not all cases associated with the rare power of remembering permanently the actual pitch of notes heard.

The observations made in the 9th edition of this *Encyclopaedia* on "Balance of tone" do not now call for the stress there laid on them, as there is an improvement in this respect. But it is still desirable to insist on the importance of balance in the performance of organ trios such as the organ sonatas of Bach. In these compositions there are generally three notes sounding, which may be regarded as belonging to three different voices, of nearly equal strength but different mean pitch, and, if possible, different quality; of these one is appropriated by each hand and one by the pedal. They are written in three lines, and are intended to be played on two manuals and the pedal.

The fugues of Bach are the classical organ music *par excellence*. As to these nothing has come down to us as to the composer's intentions, except that he generally played the fugues on the full organ with doubles. It does not seem clear that this was the case with the preludes; and, any way, the modern organ, with its facilities for managing the stops, appears to countenance a different treatment. The effect of doubles when a subject or tune is given out in solo on a manual is very bad. The doubles may be drawn with advantage when the parts are moving in massive chords. The usual practice is perhaps to employ various manual effects of a light character until the pedal enters, and then to produce full organ in its various modifications, but always to aim at variety of tone. If a prelude begins with heavy chords and pedal, then produce full organ at once. If it then passes to lighter matter, reduce to some extent. Some begin a fugue on the stopped diapason of the great organ, add more as the parts enter, and continue working up throughout. But perhaps it is the better practice to throw in loud organ during the pedal parts, and soften between times.

One of the greatest requisites in organ-playing is dignity of treatment. This is continually competing with clearness. The chief mode of keeping the different parts distinct, where that is necessary, is by using reeds of a pronounced character. These reeds sometimes verge on the comic, and anything more than the most sparing and careful employment of them is undesirable.[1] Expression is not possible unless the stops are enclosed in a swell box—a most desirable arrangement. In all cases hurry is to be avoided. A calm steadiness, a minute finish of all the phrasing, forms most of the difference between first- and second-rate players.

With reference to the general treatment of modern music we quote the preface to Mendelssohn's *Organ Sonatas*: "In these sonatas very much depends on the correct choice of the stops; but, since every organ with which I am acquainted requires in this respect special treatment, the stops of given names not producing the same effect in different instruments, I have only indicated certain limits, without specifying the names of the stops. By *fortissimo* I mean the full organ; by *pianissimo* usually one soft 8-foot stop alone; by *forte*, full organ without some of the most powerful stops; by *piano*, several soft 8-foot stops together; and so on. In the pedal I wish everywhere, even in pianissimo, 8-foot and 16-foot (tone) together, except where the contrary is expressly indicated, as in the sixth sonata [this refers to a passage where an 8-foot pedal is used without 16]. It is therefore left to the player to combine the stops suitably for the different pieces, but particularly to see that, in the simultaneous use of two manuals, the one keyboard is distinguished from the other by its quality, without forming a glaring contrast."

Importance is attached to the above directions as to single stops. The habit of mixing up two or more stops unnecessarily results in the loss of the characteristic qualities of tone which reach their highest value in single stops.

A habit is prevalent of using couplers in excess. One hears the swell coupled to the great during an entire service. The characteristics of the two manuals, which, separated, lend themselves to such charming contrasts, are lost in the mixture, just as the characteristics of single stops are lost when employed in groups. It is common to see an English organist keep the right foot on the swell pedal and hop about with the left on the pedals. This cannot be called pedal-playing. Both feet should be used, except where the swell pedal is actually required. It is a common habit to hold a note down when it should be repeated. It should be struck again when indicated. The repetition is a relief to the ear.

The older organists commonly filled up their chords, striking pretty nearly every concordant note within reach. The effect of this was in many cases to destroy effects of parts, or effects of restraint leading to contrasts intended by the composer. There is a well-known case of a climax about a line before the end of Bach's "Passacaglia." Here there is a pause on a chord of four notes; one low in the bass (pedal); two forming a major third in the middle; and one high in the treble. Some players fill in every concordant note within the reach of both hands. Others consider the effect of Bach's four notes superior. The writer thinks that the average listener prefers the full chord, and the polyphonic hearer the thin arrangement of parts. Of course the parts are lost if thick chords are used. Restraint in the use of the pedal is also sometimes intended to lead up to a contrast which is lost if the pedal is introduced too soon.

Contrast and variety are essential elements in organ effects. A suitable phrase repeated on solo stops of different characters; a see-saw in a series of rhythmical chords between two manuals of different characters—contrasts generally—are charming when suitably employed. Phrasing we cannot describe here. It is just as important in the organ as in any solo instrument, or in song.

There has been a tendency to attempt too much in the imitation of orchestral instruments. While such stops as good flutes and good imitations of wind instruments have their value, the imitation of stringed instruments and of the orchestra in general is undesirable. The organ's own proper tones are unequalled, and it is a pity to make it a mere caricature of the orchestra.

The writer has had the opportunity of inspecting two of the installations known by the name of R. Hope-Jones; both under the care of an able enthusiast in the matter, Mr Collinson, of Edinburgh. The Hope-Jones system consists of two parts: a mechanism, and a system of pipe-work. These must be considered separately. The mechanism is entirely electric. One example consisted of an application of this mechanism to a fine organ by Willis. The conditions were as favourable as possible, with temperature regulation and constant use. Yet even in this case the contacts failed occasionally. The difficulty about repetition appeared to have been entirely got over, the performance being satisfactory when the contact was in good order. These contacts appear to be the weak part of the system. All the mechanism, couplers and all, is worked by means of these contacts. With the care which is taken no difficulty is found in getting the arrangement to work in the case of the Willis instrument. The system is very complicated, with double touch couplers throughout, by means of which a solo can be effected on one manual by varying the pressure. The study of the double touch appears very difficult. Stop handles are done away with. They are replaced by rockers, the faces of which are about the size of small railway tickets. The appearance is as if the surface where the stop handles would be was plastered over with these rockers. They turn on a horizontal axis through the middle, and a touch of the finger at top or bottom opens or closes the stop. The other instrument was Hope-Jones thoughout, pipes and mechanism. The curator was the same as in the case of the Willis instrument. But, the hall being little used, there was no temperature regulation, and very little use. The state of the mechanism was inferior, the contacts failing freely. It could not be regarded as an admissible mechanism from the writer's point of view. As to the pipe-work, the effect was remarkable; but it could not be regarded as genuine organ work, as the player admitted. Our requirement in the matter of action is a perfectly unfailing connexion between key and pipe. And in this respect we adhere to a preference for the old tracker action, where possible. Anything that leaves a possibility of failure in the connexion we regard as inadmissible.

The writer desires to acknowledge his obligations to Sir Walter Parratt for much assistance in the preparation of this article.

(R. H. M. B.)

History of the Ancient Organ.

The earliest authentic records of the organ itself do not extend beyond the second century B.C., but the evolution of the instrument from the *Syrinx* or Pan-pipe goes back to a remote period. The hydraulic and pneumatic organs of the ancients were practically the same instrument, differing only in the method adopted for the compression of the wind supply; in the former this was effected by the weight of water, and in the latter by the more primitive expedient of working the bellows by hand or foot. What is known, therefore, of the evolution of the organ before hydraulic power was applied to it is common to both hydraulic and pneumatic organs. The organ of the ancients was a simple contrivance, consisting, in order of evolution, of three essential parts: (1) a sequence of pipes graduated in length and made of reed, wood or bronze; (2) a contrivance for compressing the wind and for supplying it to the pipes in order to make them speak, the ends of such pipes as were required to be silent being at first stopped by the fingers; and (3) a system for enabling the performer to store the wind and to control the distribution of the supply separately to the several pipes at will. The pipes of the syrinx were the prototypes of No. 1; the bellows and the bag-pipe—which was but the application of the former to the reed—foreshadowed No. 2. The third part of the organ was composed of contrivances and common objects used by carpenters, such as boxes having sliding lids running in grooves, levers, &c.

It seems probable that the syrinx was recognized by the ancients as the basis of the organ. Hero of Alexandria, in his description of the hydraulic organ, calls it a syrinx. Philo of Alexandria (*c.* 200 B.C.), mentioning the invention of the hydraulis(us) by Ctesibius, says, "the kind of syrinx played by hand which we call hydraulis." The fact that the syrinx was an assemblage of independent stopped pipes, which in their original condition could not be mechanically blown, since the movable lip of the player used to direct the air stream against the sharp edge of the open end of the pipe was a necessity, is no bar to the suggested derivation. Wind projected into a pipe can produce no musical sound unless the wind be first compressed and the even flow of the stream be interrupted and converted into a series of pulses. In order to produce these pulses in an organ-pipe, it is necessary to make use of some such contrivance as a reed, flute or whistle mouthpiece (*q.v.*).

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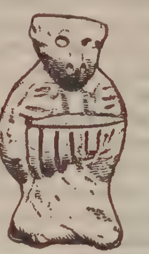
[1] As some difficulty has been felt as to what is here meant, an instance is given. The writer has heard a first-rate player emphasize the entrance of a chorale in the pedal (Mendelssohn's 3rd sonata in A) by coupling the choir clarinet to the pedal. The effect was coarse and disagreeable, and would have been ridiculous if it had not been so ugly. It was clear, but not dignified.

In the earliest organs there is no doubt that the pipes consisted of lengths of the large reed known as κάλαμος used for the syrinx, but converted into open flue-pipes. Instead of cutting off the reed immediately under the knot, as for syrinx pipes, a little extra length was left and shaped to a point to form a foot or mouthpiece, which was placed over the aperture in the wind-chest, so that it caused the stream of air to split in two as it was driven through the hole into the pipe by the action of the bellows. A narrow fissure was made through the knot near the front of the pipe, and above it a horizontal slit was cut in the reed, the two edges being bevelled inwards. When the wind was pumped into the chest it found an outlet through one of the holes in the lid, and the current, being divided by the foot of the pipe, became compressed and was forced through the fissure in the knot. It then ascended the pipe in an even stream, as yet silent, until thrown into commotion by another obstacle, the upper sharp edge or lip of the notch, which produced the regular flutterings or pulses requisite for the emission of a note. The very simplicity of this process disposes of any difficulty in accepting the syrinx as an important factor in the evolution of the organ. The conversion of a syrinx pipe is, in fact, a simpler and more natural expedient than the more elaborate construction of a wooden flue-pipe.

In order to convert the syrinx into a mechanically played instrument, the addition of the actuating principle of the bag-pipe was necessary. It is probable that in the earliest attempts the leather bag was actually retained and that the supply of wind was still furnished by the mouth through an insufflation pipe. Such an instrument is described and illustrated by Father Athanasius Kircher,[1] but his drawing should be accepted with reserve, as it was probably only an effort of the imagination to illustrate the text. In the instrument, which he calls the *Magraketha* or *Mashrokitha* of the Chaldees, the bag is described as being inside the wind-chest, the insufflation pipe being carried through a hole in the side of the box. Little wooden sliders manipulated by the fingers formed a primitive means of controlling the escape of the wind through any given pipe.

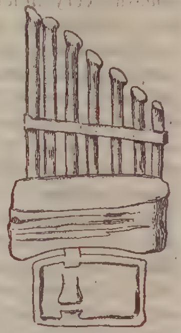
We have two pottery figures of musicians playing on primitive organs in the next stage of development, namely with bellows, and a description in the Talmud. The quotation as given by Blasius Ugolinus states that the instrument known as the *Magrepha d'Aruchin*[2] "consisted, as the Schilte Haggiborim teaches, of several rows of pipes and was blown by bellows. It had, besides, holes and small sliders answering to each pipe, which were set in motion by the pressure of the organist; the vent-holes being open, a wonderful variety of sounds was produced." The spurious letter of St Jerome to Dardanus might also be consulted in this connexion. At Tarsus in Asia Minor pottery and coins dating from *c.* 200 B.C. were excavated by W. Burckhardt Barker,[3] and amongst them is the fragment of a figure of a musician playing upon an instrument fastened to his breast, and having seven pipes set in a rectangular wind-chest, in the centre of which appear to be two bellows of unequal sizes. Unfortunately both drawing and description are somewhat vague: nevertheless, there is no room for doubt that this was an organ, perhaps without sliders or keys, the pipes being stopped at the open end, nearest the player's mouth, by the fingers, supposing that there was only one bellows. Another piece of pottery from Tarsus, discovered in 1852, during excavations carried out at Kusick-Kolah by M. M. Mazvillier and V. Langlois,[4] and preserved in the Louvre, shows the back of an organ having fifteen pipes. Two models of organs of more recent date recall the construction of that found by Mr Barker. One found in Chinese Turkestan on the site of ancient Khotan[5] (fig. 1) represents a musician holding the instrument to his breast; both hands seem to be pressing what might be bellows; and there are seven pipes below the bellows. The other instrument (fig. 2) is of Roman origin, and forms part of the decoration on a medallion on a yellow pottery vase, which was excavated at Orange (Dauphiné, France), and is now preserved in the collection of M. Emilien Dumas de Sommières. The subject represented in the medallion is an amphitheatre, and in the centre a pneumatic organ with bellows is plainly visible (fig. 2).

This brings us to a point in the history of the organ when the existence of the hydraulic organ can no longer be ignored. Some writers consider that the invention of the hydraulis in the 2nd century B.C. by Ctesibius[6] of Alexandria constitutes the invention of the organ, and that the pneumatic organ followed as an improvement or variety. Such an assertion would seem to be untenable in the face of what has been said above. It is most improbable that a man busy with the theory and practice of hydraulics would *invent* a highly complex musical instrument in which essential parts lying outside his realm, such as the flue-pipes, the balanced keyboard, the arrangements within the wind-chest for the distribution of the wind, are all in a highly developed state; it would be a case for which no parallel exists in the history of musical instruments, all of which have evolved slowly and surely through the ages. On the other hand, given a pneumatic organ in which the primitive unweighted bellows worked unsatisfactorily, an engineer would be prompt to see an opportunity for the advantageous application of his art.



From Marc Aurel Stein, *Ancient Khotan*, by permission of the Clarendon Press.

FIG. 1.



From Orange.

FIG. 2.—Roman Pneumatic Organ.

There are two detailed and duly accredited descriptions of the hydraulis extant, both of which presuppose the existence of a pneumatic organ. One is in Greek by Hero of Alexandria,[7] said to be a pupil of Ctesibius,[8] and the other in Latin by Vitruvius (*De Arch.* lib. x. cap. ii.). In both accounts reference is made to drawings now lost. Mr Woodcroft states that in each MS. the diagrams are said to have been copied faithfully, and that on consulting four MSS. and three early printed editions[9] he found that the mechanical parts in all agree essentially, and that it is only the case of the organ and the arrangement of the pipes which vary according to the fancy of the artist.

The principle of the hydraulis, which remained a complete mystery until recently, is now well understood. Representations of Roman hydraulic organs abound, but they were not always identified as such.[10] As the front of the organ (the performer sat or stood at the back) was invariably represented, there had been no indication of the manner in which the pipes were made to sound. A clue was furnished by a little baked clay model of an hydraulus, and parts of the performer, excavated in 1885 on the ruins of Carthage and now preserved in the *Musée Lavigerie*, attached to the cathedral of S. Louis of Carthage. This little clay model, measuring $7\frac{1}{16}$ in. by $2\frac{3}{4}$ in. (figs. 3 and 4), modelled by Possessoris, a potter working at the beginning of the 2nd century A.D., whose name appears on the front, below the ends of the sliders, is so accurately designed that it tallies in every point with the description of the instrument by Hero and Vitruvius. The number and relative sizes of the three rows of pipes, gauged by the remains of the organist, give the requisite compass for the production of the six Greek scales in use at that date.[1] A working reproduction based on the proportions of the remains of the organist, but at half scale for the sake of portability (the real organ must have measured 10 ft. in height by 4½ ft. in width), was successfully carried out by the Rev. F. W. Galpin in 1900–1901 by the help of photographs[2] and of the text of Vitruvius.

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[1] See *Musurgia*, bk. ii. ch. iv. § 3, p. 3.

[2] or Eruchin. Treatise XXXIII. of Babyl. Talmud. See *Thesaurus Antiquitatum Sacrarum* (Venice, 1744–1769), xxxii. 11 and 21.

[3] See *Lares and Penates* (London, 1853), p. 260, fig. 69.

[4] See W. Froehner, *Monuments antiques du musée de France* (Paris, 1873), pl. 32; also *Archives des missions scientifiques*, iv. 64-67.

[5] See *Ancient Khotan, detailed report of archaeological explorations in Chinese Turkestan, carried out by H.M. Indian Government*, by Marc. Aurel Stein (Oxford, 1907), plate xliii.

[6] Tertullian (*De anima*, 14) names Archimedes, which is probably an error. See in this connexion Hermann Degering, who devotes considerable space to the question, *Die Orgel, ihre Erfindung und ihre Geschichte* (Muenster, 1905).

[7] See *The Pneumatics of Hero of Alexandria*, translated from the original Greek by Bennett Woodcroft (London, 1851), with diagrams.

[8] Edward Buhle in *Die musikalischen Instrumente in den Miniaturen des frühen Mittelalters*, pt. i. (Leipzig, 1903), p. 55. Note 1 corrects this as an error, assigning Hero's activity to the beginning of our era, in which case the description by Vitruvius would be the earlier in spite of the fact that the hydraulus, as he describes it, contains an improvement on that of Hero, *i.e.* registers, and two pumps instead of one, and that he omits to explain the purpose for which water is used. Buhle gives as his authority Diels, "Das phys. System des Strabon," p. 291, in *Berliner Monatsberichte* (Feb. 1893).

[9] For an exhaustive and careful compilation of these editions, and of the literature of the hydraulus generally, see Dr Charles Maclean's article, "The Principle of the Hydraulic Organ," *Intern. Mus. Ges.* Sbd. vi. 2, pp. 183-237; also John W. Warman, *Bibliography of the Organ*, who, however, takes the erroneous view that the medieval editions of Vitruvius and Hero may be taken as evidence that the instrument itself was in use until about the middle or end of the 17th century. See *Proc. Mus. Assoc.* (1903–1904), p. 40.

[10] The present writer was apparently the first in England to draw attention to this identity by introducing the drawing from the Utrecht Psalter and the model of the Carthage Organ, &c. See *Music* (London, Sept. 1898), p. 438.

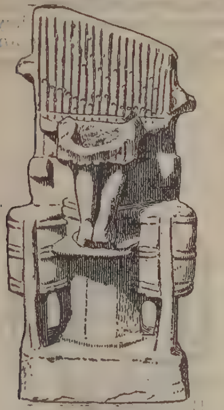


FIG. 3.—Pottery Model of the Hydraulus—Carthage. c. A.D. 150.

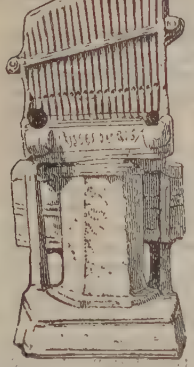
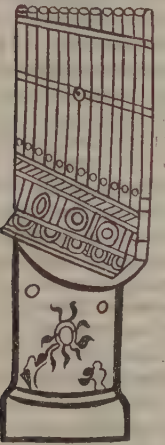


FIG. 4.
Carthage. c. A.D. 150.

The principle of the hydraulus is simple. An inverted funnel, or bell of metal, standing on short feet and immersed in water within the altar-like receptacle forming the base or pedestal, communicates by means of a pipe, with the wind-chest, placed above it. When the air is pumped into the funnel by the alternate action of two pumps, one on each side of the organ, constructed bucket within bucket and fitted with valves, the water retreating before the compressed air, rises in the receptacle and by its weight holds the air in a state of compression in the funnel, whence it travels through the pipe into the wind-chest. The rest of the process is common also to the pneumatic organ. As there are two pumps worked alternately, these conditions remain unchanged, until by pressure on a key working a slider under the apertures leading to the pipes, the compressed air is afforded an exit through the latter, thus producing the desired note.[3] It will be seen, therefore, that water acts on the air as a compressor exactly in the same manner as lead weights are used on the wind reservoir of modern pneumatic organs. The discovery of the Carthage model was of the greatest importance to the history of the *keyboard* (*q.v.*), for it proved beyond a doubt the use at the beginning of our era of balanced keys (seen in front of the organist) on the principle described by Vitruvius. What appears to be a second keyboard with smaller keys on the side of the hydraulus labelled Possessoris (fig. 4) is simply the ends of the sliders, which are pushed out or drawn in by the action of the keys.


From the Church of St Paul *extra muros*, Rome. 4th or 5th cent. A.D.
FIG. 5.

The principle of the hydraulus made it possible to construct large organs of powerful tone more suitable for use in the arena than the small pneumatic instruments, but the hydraulic organ never entirely supplanted the pneumatic, which was probably not so imperfect at the beginning of our era as has been thought, since it outlived the former and seems to have differed from it only in the matter of pressure. The hydraulus, on the other hand, must have had many drawbacks, that of causing damp in the instrument being of a serious nature; it was also unwieldy and difficult to carry about.

Of the pneumatic organ in portable and portative form, traces have been found during the palmy days of the Roman empire, and the art of organ-building, of which the organ in fig. 5 is an example, never seems to have quite died out during the decline of classic Rome and the dawn of Western civilization. This illustration is derived from a 4th- or 5th-century slab in the church of St Paul *extra muros* at Rome. It is evident that the hydraulic organ was widely known and used in the East during the early centuries of our era, but it never won a footing in the West, although a few solitary specimens found their way into the palaces of kings and princes. On account of its association with the theatre, gladiatorial combats and pagan amusements of corrupt Rome, it was placed under a ban by the Church. The ignorance and misinformation displayed on the subject by writers and miniaturists of the early and late middle ages leave no room for doubt that the instrument itself was unknown to them except from hearsay.

Venice seems to have been famed for its organ-builders during the 9th century, for Louis le Débonnaire (778–840) sent there, it is recorded, for a certain monk, Georgius Beneyento,[4] to construct an hydraulic organ for his palace at Aix-la-Chapelle.

No progress in the art of organ-building is recorded until the use of organs in the churches had long been established. The recognition of the value of the organ in Christian worship proved an incentive which led to the rapid development of the instrument.

In France and Germany the Romans must have used organs and have introduced them to the conquered tribes as they did in Spain, but the art of making them was soon lost after Roman influence and civilization were withdrawn. Pippin, when he wished to introduce the Roman ritual into the churches of France, felt the need of an organ and applied to the Byzantine emperor, Constantine Copronymus, to send him one, which arrived by special embassy in 757 and was placed in the church of St Corneille at Compiègne; the arrival of this organ was obviously considered a great event; it is mentioned by all the chroniclers of his reign. Charlemagne received a similar present from the emperor of the East in 812, of which a description has been preserved.[5] The bellows were of hide, the pipes of bronze; its tone was as loud as thunder and as sweet as that of lyre and psaltery. This organ must have had registers like those of the hydraulus of Vitruvius and the portative from Pompeii. In 826 we hear that his son Louis le Débonnaire obtained a pneumatic organ for the church at Aix-la-Chapelle, not to be confounded with the hydraulus installed in his palace.

The statement that the organ was introduced into the Roman Church by Pope Vitalian at the end of the 7th century, which has been generally accepted, is rejected by Buhle[6] on the ground of insufficient proof. There is abundant evidence to show that the organ had taken its place in the churches in the 10th century, not only in England but in Germany, where the construction by monks had become so general that we find no fewer than three treatises on organ-building[7] written by monks, followed by three more in the 11th century.[8]

Considerable activity was displayed in England in the 10th century in organ-building on a large scale for churches and monasteries, such as the monster organ for Bishop Alphege at Winchester, which had 400 bronze pipes, 26 bellows and 2 manuals of 20 keys, each governing 10 pipes.[9] There is also the elaborate organ presented by St Dunstan to his monastery at Malmesbury.[10]

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[1] See *Anonymi scriptio de musica*, ed. Bellermann, p. 35.

[2] See "Notes on a Roman Hydraulus," *Reliquary* (1904); also the writer's "Researches into the Origin of the Organs of the Ancients" in *Intern. Mus. Ges.*, Sbd. ii. 2, pp. 167-202 (Leipzig, 1901), and *Proc. Mus. Assoc.* (1903–1904), pp. 54-55.

[3] For a more complete explanation of the action of the hydraulus, with diagrams, see Victor Loret, *Revue archéol.* (Paris, 1890); W. Chappell, *History of Music* (London, 1874), pp. 325-361.

[4] "Vita Hludovici Imperatoris," *Mon. Germ.* ii. pp. 629-630; see also Buhle, *op. cit.* p. 58, note 4, where fuller references are given.

[5] *Gesta Karoli Monachi Sangallensis*, lib. ii. cap. x. p. 751.

[6] *Op. cit.* p. 61, note 2, where the evidence is carefully sifted.

[7] (1) by Notker of St Gallen (see Hattemer, *Denkmäler*, Bd. iii. pp. 568 seq.; Hugo Riemann, *Studien z. Gesch. der Notenschrift*, pp. 297 seq.; Martin Gerbert, i. pp. 100 seq. (2) By Bernelinius (see Gerbert, i. pp. 318 and 325). The third is an anonymous 9th-century tract, the earliest of all, *De mensura fistularum*, giving only the proportions of organ pipes. MS. Lat. 12949 fol. 43ᵃ. Paris Bibl. Nat. reproduced by Buhle, *op. cit.* p. 104 (Latin only).

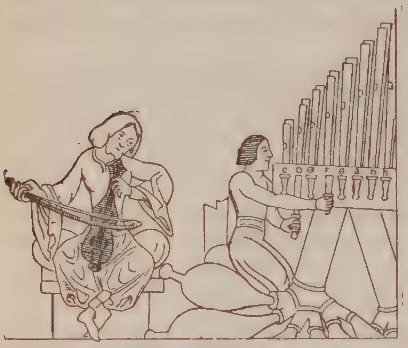
[8] (1) *De fistulis organicis*, introduced in a MS. copy of Mart. Cap. by a Bernese monk; see A. Schubiger, *Musikal. Spicilegien*, pp. 82 seq. Reproduced also by Buhle, *op. cit.* Beilage iv. pp. 114-116, collated with a German translation. (2) Theophilus, *De divers. artibus*, edited and translated into English by Robert Hendrie (London, 1847); reproduced by Buhle, *op. cit.* Beilage iii. pp. 105 seq., Latin and German collated, who gives the title as *Schedula artium.* (3) *Tractatus de mensura fistularum*, by Bishop Eberhard of Freising. Martin Gerbert, *op. cit.* ii. pp. 279-281.

[9] See Wolstani, monachi Ventani, *De Vita S. Swithuni*; Coussemaker, "Essai sur les instruments de musique du moyen-âge," in *Ann. Archéol.*, iii. pp. 281-282.

[10] William of Malmesbury, *Gest. Pontif.*, lib. v.

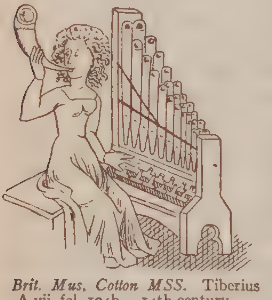
Earl Elwin gave money "*triginta libras*" to the monastery at Ramsay for copper pipes for a great pneumatic organ to be played on high days and holidays.[1]

The great activity recorded in the 12th and 13th centuries in Germany is probably due to the influence and teaching of Byzantine masters during the 9th century. Pope John VIII. (872–880) applied to Bishop Anno of Freising to send him an organ and an organist.[2] Organs were installed in Cologne (10th century), in Halberstadt, in Erfurt, in Augsburg, Weltenburg (11th century); in Utrecht, Constance, Petershausen (12th century); Petersberg, Cologne Cathedral, 13th century.[3] The rest of the literary and archaeological material—treatises, monuments, miniatures—available during the later middle ages yields very scant authenticated information as to the progressive steps which lie between the 12th-century organ as described by Theophilus and the large church organs of the days of Praetorius[4] (1618).



From the Bible of St Etienne Harding at Dijon. 12th cent.

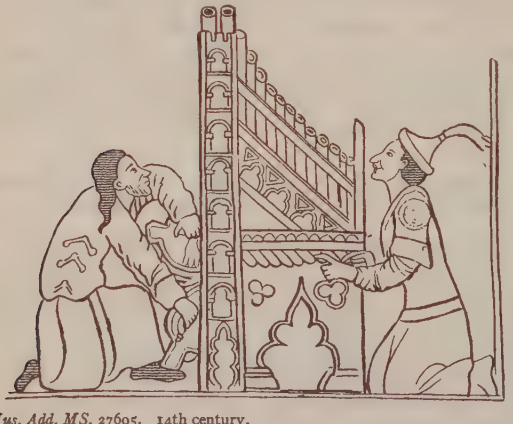
FIG. 6.



Brit. Mus. Cotton MSS. Tiberius A vii. fol. 104b. 14th century.

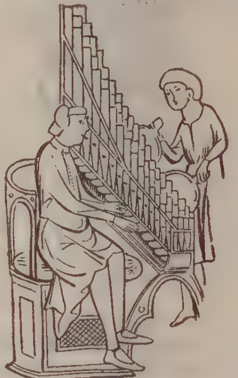
FIG. 7.

The *keyboard* is the principal feature concerning which miniatures offer any evidence. Here and there a 13th-century miniature gives a hint of balanced keys on small portative organs which already abound during that and the next century. The Bernese monk in his treatise on the organ, to which reference was made in the note above, clearly describes balanced keys, *depressa lamina*, pressed down, not pulled out, as were those mentioned by Theophilus; his description conforms strictly with that of Hero, which suggests that he was borrowing from classical authorities rather than describing an actual instrument with which he was well acquainted, an expedient to which many medieval writers had recourse. In the 14th-century miniatures, balanced keys are general for the larger portable organs. The adoption of narrower keys in the larger organs may no doubt be traced to the influence of the portatives, in which they in most cases resemble the white keys of the modern pianoforte. There is no miniature on record in which the fist action on the keys is indicated, the performer during the 10th, 11th and 12th centuries being depicted in the act of drawing out the stop-like sliders—as for instance. in the 12th-century manuscript Bible of St Etienne Harding at Dijon[5] (fig. 6), where the organist is playing the notes D and F, the sliders being lettered from C to C. From the 13th century the keys are shown pressed down by means of one finger or of finger and thumb (fig. 7). In the beautiful Spanish MS. said to have been compiled for Alphonso XII. (*c.* 1237), known as the *Cantigas de Santa Maria*, a portative is shown having balanced keys, one of which is being lightly pressed by the thumb, the instrument resting on the palm—while the left hand manipulates the bellows.



Brit. Mus. Add. MS. 27695. 14th century.

FIG. 8.



Brit. Mus. Add. MS. 29902, fol. 6. 14th century.

FIG. 9.

The keys themselves varied in shape, being either like a T; a wide rectangle, with or without the corners rounded off, or a narrow rectangle. The earliest instance of chromatic keyboard is that of the organ at Halberstadt[6] built in 1361 and restored in 1495. An inscription on the keyboard states that it formed part of the original organ, which had the semitonal arrangement of keys.[7]

It must not, however, be inferred from these isolated cases that balanced keys were general from the 13th century, nor that the chromatic keys were common in the 14th. The St Cecilia in the altar-piece in Ghent by the brothers Hubert and Jan van Eyck (15th cent.) is represented as playing upon an organ with a modern-looking keyboard.

A picture by Fra Angelico (15th cent.) in the National Gallery shows a portative with accidentals. It will probably be found that the earliest development of the organ took place in Germany and in the Netherlands. (K. S.)

ORGANISTRUM, the medieval Latin name for the earliest known form of the hurdy-gurdy (*q.v.*). The organistrum was large enough to rest on the knees of two performers sitting side by side, one of whom turned the crank setting the wheel in motion, while the other, the artist, manipulated the keys. The word organistrum is derived from *organum* and *instrumentum*; the former term was applied to the primitive harmonies, consisting of octaves accompanied by fourths or fifths, first practised by Hucbald in the 10th century. This explanation enables us to fix with tolerable certainty the date of the invention of the organistrum, at the end of the 10th or beginning of the 11th century, and also to understand the construction of the instrument. A stringed instrument of the period—such as a guitar-fiddle, a rotta or oval vielle—being used as model, the proportions were increased for the convenience of holding the instrument and of dividing the performance between two persons. Inside the body was the wheel, having a tire of leather well rosined, and working easily through an aperture in the sound-board. The three strings resting on the wheel and supported besides on a bridge of the same height all sounded at once as the wheel revolved, and in the earliest examples the wooden tangents taking the place of fingers on the frets of the neck acted upon all three strings at once, thus producing the harmony known as organum.

The organistrum appears on a bas-relief from the abbey of St Georges de Boscherville (11th cent.), now preserved in the museum of Rouen, where it is played by a royal lady, her maid turning the crank. It has the place of honour in the centre of the band of musicians representing the twenty-four elders of the Apocalypse in the tympanum of the Gate of Glory of the cathedral of Santiago da Compostella (12th cent.). There is also a fine example in a miniature of a psalter of English workmanship (12th cent.), forming part of the Hunterian collection in Glasgow University; this was shown at the Exhibition of Illuminated MSS. at the Burlington Fine Arts Club in 1908. (K. S.)

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[1] *Vita S. Oswaldi:* see Mabillon Acta S. scl. v. p. 756.

[2] See Baluze, *Miscell.* v. p. 490.

[3] Buhle (*op. cit.*) gives a list with quotations from authorities; see pp. 66 and 67.

[4] See Michael Praetorius *Syntagma Musicum* (Wolfenbüttel, 1618).

[5] See also for other organs with sliders being drawn out, A. Haseloff, *Eine Sächsischthüringische Malerschule um die Wende des XIII. Jahrh.*, pl. xxvi. No. 57, part of *Studien zu der Kunstgeschichte*; the same is reproduced in Gori's *Thesaurus diptychorum*, Bd. iii. Tab. 16, where it is falsely ascribed to the 9th century.

[6] Praetorius mentions the Halberstadt and Erfurt organs as having been built 600 years before his time (1618), and still bearing on them the date inscribed. See *op. cit.* p. 93.

[7] See A. J. Hipkins, *History of the Pianoforte* (London, 1896).

ORGANON (Gr. *ὄργανον*, instrument, from *ἔργον*, work), the name given to Aristotle's logical treatises. They are so called because logic is itself neither a speculative science nor a practical art in the ordinary sense, but an aid or instrument to all scientific thought. Francis Bacon, regarding the Aristotelian logic as he understood it as of no avail, gave to his own treatise the name *Novum Organum* in the belief that he had discovered a new inductive logic which would lead necessarily to the acquisition of new scientific knowledge. Compare also Whewell's *Novum Organum Renovatum* and Lambert's *Neues Organon.* In medieval music the term was applied in a similar sense to early attempts at improvised counterpoint *i.e.* a part sung as an accompaniment above or below the melody or plainsong; it consisted of 8ths and 5ths (or 4ths) added to the plainsong.

ORGY (through French from Lat. *orgia*, Gr. *ὄργια*, in derivation connected probably with *ἔργον*, work; cf. Lat. *operare*, to sacrifice), a term originally denoting the secret rites or ceremonies connected with the worship of certain deities, especially those of Dionysus-Bacchus. The Dionysiac orgies, which were restricted to women, were celebrated in the winter among the Thracian hills or in spots remote from city life. The women met, clad in fawn-skins, with hair dishevelled, swinging the thyrsus and beating the cymbal; they danced and worked themselves up to a state of mad excitement. The holiest rites took place at night by the light of torches. A bull, the representative of the god, was torn in pieces by them as Dionysus-Zagreus had been torn; his bellowing reproduced the cries of the suffering god. The women tore the bull with their teeth, and the eating of the raw flesh was a necessary part of the ritual. Some further rites, which varied in different districts, represented the resurrection of the god in the spring. On Mount Parnassus the women carried back Dionysus-Licnites, the child cradled in the winnowing fan. The most famous festival of the kind was the *τριετηρίς* celebrated every second winter on Parnassus by the women of Attica and Phocis. The celebrants were called Maenads or Bacchae. The ecstatic enthusiasm of the Thracian women, *Κλώδωνες* or *Μιμαλλόνες*, was especially distinguished. The wild dances, songs, drinking and other "orgiastic" ceremonies which were characteristic of these rites have given rise to the use of the word "orgy" for any drunken, wild revel or festivity (see DIONYSUS and MYSTERY).

ORIA, a town of Apulia, Italy, in the province of Lecce, 25 m. E. of Taranto and 19 m. S.W. of Brindisi by rail, 540 ft. above sea-level. Pop. (1901), 8838. It occupies the site of the ancient Uria, the chief town of the Sallentini, which stood in a commanding position in the centre of the peninsula of the ancient Calabria (*q.v.*), almost midway between Brundusium and Tarentum on the Via Appia. Strabo mentions that he saw there the old palace of the Messapian kings (vi. 3. 6, p. 282). The town contains a small museum and a fine castle of Frederick II., erected in 1227. The Doria family of Genoa and Rome is said to derive its name from a certain Tommaso d'Oria, who led the rebellion against Frederick's son Manfred. Much damage was done by a cyclone in 1878.

ORIBI, or OUREBI, the local name of a small South African antelope (*Oribia scoparia*), standing about 24 in. at the shoulder, and characterized by the presence of a bare glandular spot below the ear, the upright horns of the bucks, which are ringed for a short distance above the face, and the tufted bushy tail, of which the terminal two-thirds are black. The name is extended to include the other members of the same genus, such as the Abyssinian, *O. montana*; the Gambian, *O. nigricandata*; the British East African, *O. haggardi*; and the Mozambique, *O. petersi*.

ORIEL, JOHN FOSTER, BARON (1740–1828), Irish politician, was the son of Anthony Foster of Louth, an Irish judge. He was returned to the Irish parliament in 1761, and made his mark in financial and commercial questions, being appointed chancellor of the Irish exchequer in 1784. His law giving bounties on the exportation of corn and imposing heavy taxes on its importation is noted by Lecky as responsible for making Ireland an arable instead of a pasture country. In 1785 he became Speaker. He opposed the Union, and ultimately refused to surrender the Speaker's mace, which was kept by his family. He was returned to the united parliament, and in 1804 became chancellor of the Irish exchequer under Pitt. In 1821 he was created a peer of the United Kingdom as Baron Oriel of Ferrard in the county of Louth, and died on the 23rd of August 1828. His wife (d. 1824) had in 1790 been created an Irish peeress, as Baroness Oriel, and in 1797 Viscountess Ferrard; and their son, Thomas Henry (d. 1843), who married Viscountess Massereene (in her own right) and took the name of Sheffington, inherited all these titles; the later Viscounts Massereene being their descendants.

ORIEL, in architecture, a projecting bay window on an upper storey, which is carried by corbels or mouldings. It is usually polygonal or semicircular in plan, but at Oxford in some of the colleges there are examples which are rectangular and rise through two or three storeys. In Germany it forms a favourite feature, and is sometimes placed at the angle of a building, carried up through two or three floors and covered with a lofty roof. The oriel is also said to have been provided as a recess for an altar in an oratory or small chapel. In the 15th century oriels came into general use, and are frequently found over entrance gateways.

The origin of the word is unknown. The suggested derivation from Lat. *aureolum*, with the supposed meaning of a gilded chamber or room, is not, according to the *New English Dictionary*, borne out by any historical evidence, and early French forms —such as *eurieul*—do not point to an origin in a word beginning with *au*. Du Cange (*Glossarium, s.v. Oriolum*) quotes Matthew of Paris (1251, *Vitae Abbatum S. Albani*): *adjacet atrium nobilissimum in introitu, quod porticus vel Oriolum appellatur*; and also a French use of 1338, where a licence to build an *oriol* is granted to one Jehan Bourgos. The earliest meaning seems to be a gallery, portico or corridor, and the application of the term to a particular form of window apparently arose from such a window being in an "oriel." In Cornwall "orrel" is still used of a balcony or porch at the head of an outside staircase leading to an upper story in a fisherman's cottage. The name of Oriel College, at Oxford, comes from a tenement known as Seneschal Hall or La Oriole, and granted to the college in 1327. There is no trace of the reason why the tenement was so called, but it would seem that it referred to one of the earlier applications of the word, to a gallery or porch, rather than to a window.

ORIENTATION, the term in architecture given to the position of a building generally with reference to the points of the compass, and more especially (as the word implies) to that of the East. It would seem that some of the Egyptian temples were orientated in the direction of the sun or of some selected star, the exact position of which on some particular day would be an indication to the priest of the exact time of the year—a matter of great importance in an agricultural country, when the calendar was not known. The orientation of Greek temples has enabled astronomers to calculate the dates of the foundation of early temples, allowance being made for the gradual changes which in the course of centuries had taken place in the precession of the equinox. The principal front of the Greek temple always faced east; and the rays of the rising sun, passing through the great doorway of the naos, lighted up the statue at the further end, this being the only occasion on which the people who came to witness the event were able to gaze on the sculptured figure of the deity.

In early Christian architecture, in the five first basilicas built by Constantine, the apse of the church was at the west end, and the priest, standing behind the altar, faced the east; this orientation being probably derived from that of the church of the Holy Sepulchre at Jerusalem and the church at Bethlehem. Three-fourths of the early churches in Rome followed this orientation, but in many it was reversed at a later date. In Sta. Sophia, Constantinople, and all the Byzantine churches, the apse was always at the east end, and the same custom obtains in the early churches in Syria and the Coptic churches in Egypt.

In Spain, Germany and England generally the eastern orientation is generally observed, but in France and Italy there are many variations. In Scotland it was the custom to fix a pole in the ground over night, and in the morning at sunrise to note the direction taken by the shadow of the pole, which was followed when setting out the axis of the choir; if such a custom had been followed in an early church, when setting out another of later date there should be some difference in the orientation of the two, on account of the variation of the obliquity of the ecliptic in the interval, and this in some cases accounts for the change of the axial line which is found in some churches, either when the east end has been rebuilt, as was constantly the case throughout Europe, or when a nave has been added to an earlier structure. In describing churches it is usual to use the terms east, west, north and south, on the assumption that the altar is at the east end, although this may not be the real bearing of the edifice.

Indirectly also the term is sometimes used in the planning of houses and the relation of the windows of the various rooms to the sunshine and the weather—in other words, to the points of the compass; thus an eastward aspect should be provided for the morning- and dining-rooms, a south-western aspect for the drawing-room, a westward for the library, and north by west for the kitchen, larder, &c. (R. P. S.)

ORIENTE, or La Region Orientale, a large undefined territory of Ecuador, comprising all that part of the republic lying east of the Andes. Pop. (1887 estimate), 80,000. The territory was formed in 1884 from the older territories of Napo, Canelos and Zamora, but its boundaries with the neighbouring republics of Colombia and Peru are disputed. The territory is covered with great forests, inhabited by wild Indians, and its climate is hot and exceptionally humid. There are some mission settlements and trading stations in the Andean foothills and on some of the river courses, one of which is Archidona, on a small tributary of the Napo, which is the nominal capital.

ORIGEN (*c.* 185–*c.* 254), the most distinguished and most influential of all the theologians of the ancient church, with the possible exception of Augustine. He is the father of the church's science; he is the founder of a theology which was brought to perfection in the 4th and 5th centuries, and which still retained the stamp of his genius when in the 6th century it disowned its author. It was Origen who created the dogmatic of the church and laid the foundations of the scientific criticism of the Old and New Testaments. He could not have been what he was unless two generations before him had laboured at the problem of finding an intellectual expression and a philosophic basis for Christianity (Justin, Tatian, Athenagoras, Pantaenus, Clement). But their attempts, in comparison with his, are like a schoolboy's essays beside the finished work of a master. Like all great epoch-making personalities, he was favoured by the circumstances of his life, notwithstanding the relentless persecution to which he was exposed. He lived in a time when the Christian communities enjoyed almost uninterrupted peace and held an acknowledged position in the world. By proclaiming the reconciliation of science with the Christian faith, of the highest culture with the Gospel, Origen did more than any other man to win the Old World to the Christian religion. But he entered into no diplomatic compromises; it was his deepest and most solemn conviction that the sacred oracles of Christendom embraced all the ideals of antiquity. His character was as transparent as his life was blameless; there are few church fathers whose biography leaves so pure an impression on the reader. The atmosphere around him was a dangerous one for a philosopher and theologian to breathe, but he kept his spiritual health unimpaired, and even his sense of truth suffered less injury than was the case with most of his contemporaries. To us, indeed, his conception of the universe, like that of Philo, seems a strange medley, and one may be at a loss to conceive how he could bring together such heterogeneous elements; but there is no reason to doubt that the harmony of all the essential parts of his system was obvious enough to himself. It is true that in addressing the Christian people he used different language from that which he employed to the cultured; but there was no dissimulation in that—on the contrary, it was a requirement of his system. Orthodox theology has never, in any of the confessions, ventured beyond the circle which the mind of Origen first measured out. It has suspected and amended its author, it has expunged his heresies; but whether it has put anything better or more tenable in their place may be gravely questioned.

Origen was born, perhaps at Alexandria, of Christian parents in the year 185 or 186. As a boy he showed evidence of remarkable talents, and his father Leonidas gave him an excellent education. At a very early age, about the year 200, he listened to the lectures of Pantaenus and Clement in the catechetical school. This school, of which the origin (though assigned to Athenagoras) is unknown, was the first and for a long time the only institution where Christians were instructed simultaneously in the Greek sciences and the doctrines of the holy Scriptures. Alexandria had been, since the days of the Ptolemies, a centre for the interchange of ideas between East and West—between Egypt, Syria, Greece and Italy; and, as it had furnished Judaism with an Hellenic philosophy, so it also brought about the alliance of Christianity with Greek philosophy. Asia Minor and the West developed the strict ecclesiastical forms by means of which the church closed her lines against heathenism, and especially against heresy; in Alexandria Christian ideas were handled in a free and speculative fashion and worked out with the help of Greek philosophy. Till near the end of the 2nd century the line between heresy and orthodoxy was less rigidly drawn there than at Ephesus, Lyons, Rome or Carthage. In the year 202 a persecution arose, in which the father of Origen became a martyr, and the family lost their livelihood. Origen, who had distinguished himself by his intrepid zeal, was supported for a time by a lady of rank, but began about the same time to earn his bread by teaching; and in 203 he was placed, with the sanction of the bishop Demetrius, at the head of the catechetical school. Even then his attainments in the whole circle of the sciences were extraordinary. But the spirit of investigation impelled him to devote himself to the highest studies, philosophy and the exegesis of the sacred Scriptures. With indomitable perseverance he applied himself to these subjects; although himself a teacher, he regularly attended the lectures of Ammonius Saccas, and made a thorough study of the books of Plato and Numenius, of the Stoics and the Pythagoreans. At the same time he endeavoured to acquire a knowledge of Hebrew, in order to be able to read the Old Testament in the original. His manner of life was ascetic; the sayings of the Sermon on the Mount and the practical maxims of the Stoics were his guiding stars. Four oboli a day, earned by copying manuscripts, sufficed for his bodily sustenance. A rash resolve led him to mutilate himself that he might escape from the lusts of the flesh, and work unhindered in the instruction of the female sex. This step he afterwards regretted. As the attendance at his classes continually increased—pagans thronging to him as well as Christians—he handed over the beginners to his friend Heracles, and took charge of the more advanced pupils himself. Meanwhile the literary activity of Origen was increasing year by year. He commenced his great work on the textual criticism of the Scriptures; and at the instigation of his friend Ambrosius, who provided him with the necessary amanuenses, he published his commentaries on the Old Testament and his dogmatic investigations. In this manner he laboured at Alexandria for twenty-eight years (till 231–232). This period, however, was broken by many journeys, undertaken partly for scientific and partly for ecclesiastical objects. We know that he was in Rome in the time of Zephyrinus, again in Arabia, where a Roman official wanted to hear his lectures, and in Antioch, in response to a most flattering invitation from Julia Mammaea (mother of Alexander Severus, afterwards emperor), who wished to become acquainted with his philosophy. In the year 216—the time when the imperial executioners were ravaging Alexandria—we find Origen in Palestine. There the bishops of Jerusalem and Caesarea received him in the most friendly manner, and got him to deliver public lectures in the churches. In the East, especially in Asia Minor, it was still no unusual thing for laymen, with permission of the bishop, to address the people in the church. In Alexandria, however, this custom had been given up, and Demetrius took occasion to express his disapproval and recall Origen to Alexandria. Probably the bishop was jealous of the high reputation of the teacher; and a coolness arose between them which led, fifteen years later, to an open rupture. On his way to Greece (apparently in the year 230) Origen was ordained a presbyter in Palestine by his friends the bishops. This was undoubtedly an infringement of the rights of the Alexandrian bishop; at the same time it was simply a piece of spite on the part of the latter that had kept Origen so long without any ecclesiastical consecration. Demetrius convened a synod, at which it was resolved to banish Origen from Alexandria. Even this did not satisfy his displeasure. A second synod, composed entirely of bishops, determined that Origen must be deposed from the presbyterial status. This decision was communicated to the foreign churches, and seems to have been justified by referring to the self-mutilation of Origen and adducing objectionable doctrines which he was said to have promulgated. The details of the incident are, however, unfortunately very obscure. No formal excommunication of Origen appears to have been decreed; it was considered sufficient to have him degraded to the position of a layman. The sentence was approved by most of the churches, in particular by that of Rome. At a later period Origen sought to vindicate his teaching in a letter to the Roman bishop Fabian, but, it would seem, without success. Even Heracles, his former friend and sharer of his views, took part against him; and by this means he procured his own election shortly afterwards as successor to Demetrius.

In these circumstances Origen thought it best voluntarily to retire from Alexandria (231–232). He betook himself to Palestine, where his condemnation had not been acknowledged by the churches any more than it had been in Phoenicia, Arabia and Achaea. He settled in Caesarea, and very shortly he had a flourishing school there, whose reputation rivalled that of Alexandria. His literary work, too, was prosecuted with unabated vigour. Enthusiastic pupils sat at his feet (see the *Panegyric* of Gregory Thaumaturgus), and the methodical instruction which he imparted in all branches of knowledge was famous all over the East. Here again his activity as a teacher was interrupted by frequent journeys. Thus he was for two years together at Caesarea in Cappadocia, where he was overtaken by the Maximinian persecution; here he worked at his recension of the Bible. We find him again in Nicomedia, in Athens, and twice in Arabia. He was called there to combat the unitarian christology of Beryllus, bishop of Bostra, and to clear up certain eschatological questions. As he had formerly had dealings with the house of Alexander Severus, so now he entered into a correspondence with the emperor Philip the Arabian and his wife Severa. But through all situations of his life he preserved his equanimity, his keen interest in science, and his indefatigable zeal for the instruction of others. In the year 250 the Decian persecution broke out, Origen was arrested, imprisoned and maltreated. But he survived these troubles—it is a malicious invention that he recanted during the persecution—and lived a few years longer in active intercourse with his friends. He died, probably in the year 254 (consequently under Valerian), at Tyre, where his grave was still shown in the middle ages.

Writings.—Origen is probably the most prolific author of the ancient church. "Which of us," asks Jerome, "can read all that he has written?" The number of his works was estimated at 6000, but that is certainly an exaggeration. Owing to the increasing unpopularity of Origen in the church, a comparatively small portion of these works have come down to us in the original. We have more in the Latin translation of Rufinus; but this translation in by no means trustworthy, since Rufinus, assuming that Origen's writings had been tampered with by the heretics, considered himself at liberty to omit or amend heterodox statements. Origen's real opinion, however, may frequently be gathered from the *Philocalia*—a sort of anthology from his works prepared by Basil the Great and Gregory Nazianzenus. The fragments in Photius and in the *Apology* of Pamphilus serve for comparison. The writings of Origen consist of letters, and of works in textual criticism, exegesis, apologetics, dogmatic and practical theology.

1. Eusebius (to whom we owe our full knowledge of his life) collected more than a hundred of Origen's letters, arranged them in books, and deposited them in the library at Caesarea (*H. E.* vi. 36). In the church library at Jerusalem (founded by the bishop Alexander) there were also numerous letters of this father (Euseb. *H. E.* vi. 20). But unfortunately they have all been lost except two—one to Julius Africanus (about the history of Susanna) and one to Gregory Thaumaturgus. There are, besides, a couple of fragments.

2. Origen's textual studies on the Old Testament were undertaken partly in order to improve the manuscript tradition, and partly for apologetic reasons, to clear up the relation between the LXX and the original Hebrew text. The results of more than twenty years' labour were set forth in his *Hexapla* and *Tetrapla*, in which he placed the Hebrew text side by side with the various Greek versions, examined their mutual relations in detail, and tried to find the basis for a more reliable text of the LXX. The *Hexapla* was probably never fully written out, but excerpts were made from it by various scholars at Caesarea in the 4th century; and thus large sections of it have been saved.[1] Origen worked also at the text of the New Testament, although he produced no recension of his own.

3. The exegetical labours of Origen extend over the whole of the Old and New Testaments. They are divided into *Scholia* (σημειώσεις, short annotations, mostly grammatical), *Homilies* (edifying expositions grounded on exegesis), and *Commentaries* (τόμοι). In the Greek original only a very small portion has been preserved; in Latin translations, however, a good deal. The most important parts are the homilies on Jeremiah, the books of Moses, Joshua and Luke, and the commentaries on Matthew, John and Romans. With grammatical precision, antiquarian learning and critical discernment Origen combines the allegorical method of interpretation—the logical corollary of his conception of the inspiration of the Scriptures. He distinguishes a threefold sense of scripture, a grammatico-historical, a moral and a pneumatic—the last being the proper and highest sense. He thus set up a formal theory of allegorical exegesis, which is not quite extinct in the churches even yet, but in his own system was of fundamental importance. On this method the sacred writings are regarded as an inexhaustible mine of philosophical and dogmatic wisdom; in reality the exegete reads his own ideas into any passage he chooses. The commentaries are of course intolerably diffuse and tedious, a great deal of them is now quite unreadable; yet, on the other hand, one has not unfrequently occasion to admire the sound linguistic perception and the critical talent of the author.[2]

4. The principal apologetic work of Origen is his book κατὰ Κέλσου (eight books), written at Caesarea in the time of Philip the Arabian. It has been completely preserved in the original. This work is invaluable as a source for the history and situation of the church in the 2nd century; for it contains nearly the whole of the famous work of Celsus (Λόγος ἀληθής) against Christianity. What makes Origen's answer so instructive is that it shows how close an affinity existed between Celsus and himself in their fundamental philosophical and theological presuppositions. The real state of the case is certainly unsuspected by Origen himself; but many of his opponent's arguments he is unable to meet except by a speculative reconstruction of the church doctrine in question. Origen's apologetic is most effective when he appeals to the spirit and power of Christianity as an evidence of its truth. In details his argument is not free from sophistical subterfuges and superficial reasoning.[3]

[1] Field, *Origenis Hexaplorum quae supersunt* (2 vols., Oxon., 1867–1874).

[2] See Reuss, *Geschichte der heil. Schriften d. N.T.* (5th ed.), § 511.

[3] Keim, *Celsus* (1873); Aubé, *Hist. des persécut. de l'église*, vol. ii. (1875); Ornsby, "Origen against Celsus," *Dublin Review* (July 1879), p. 58; Pélagaud, *Étude sur Çelse* (1878); Lebedeff, *Origen's Book against Celsus* (Moscow, 1878) (Russian); Overbeck in the *Theolog. Lit. Zeitung* (1878), No. 22 (1879), No. 9; *Orig. c. Cels.*, ed. Selwyn (1876).

5. Of the dogmatic writings we possess only one in its integrity, and that only in the translation of Rufinus,[1] Περὶ ἀρχῶν (On the Fundamental Doctrines). This work, which was composed before 228, is the first attempt at a dogmatic at once scientific and accommodated to the needs of the church. The material is drawn from Scripture, but in such a way that the propositions of the *regula fidei* are respected. This material is then formed into a system by all the resources of the intellect and of speculation. Origen thus solved, after his own fashion, a problem which his predecessor Clement had not even ventured to grapple with. The first three books treat of God, the world, the fall of spirits, anthropology and ethics. "Each of these three books really embraces, although not in a strictly comprehensive way, the whole scheme of the Christian view of the world, from different points of view, and with different contents." The fourth book explains the divinity of the Scriptures, and deduces rules for their interpretation. It ought properly to stand as first book at the beginning. The ten books of *Stromata* (in which Origen compared the teaching of the Christians with that of the philosophers, and corroborated all the Christian dogmas from Plato, Aristotle, Numenius and Cornutus) have all perished, with the exception of small fragments; so have the tractates on the resurrection and on freewill.[2]

6. Of practical theological works we have still the *Προτρεπτικὸς εἰς μαρτύριον* and the *Σύνταγμα περὶ εὐχῆς*. For a knowledge of Origen's Christian estimate of life and his relation to the faith of the church these two treatises are of great importance. The first was written during the persecution of Maximinus Thrax, and was dedicated to his friends Ambrosius and Protoctetus. The other also dates from the Caesarean period; it mentions many interesting details, and concludes with a fine exposition of the Lord's Prayer.

7. In his own lifetime Origen had to complain of falsifications of his works and forgeries under his name. Many pieces still in existence are wrongly ascribed to him; yet it is doubtful whether a single one of them was composed on purpose to deceive. The most noteworthy are the *Dialogues* of a certain Adamantius "de recta in Deum fide," which seem to have been erroneously attributed to Origen so early as the 4th century, one reason being the fact that Origen himself also bore that name. (Eusebius, *H.E.* vi. 14.)

Outline of Origen's View of the Universe and of Life.—The system of Origen was formulated in opposition to the Greek philosophers on the one hand, and the Christian Gnostics on the other.[3] But the science of faith, as expounded by him, bears unmistakably the stamp both of Neo-Platonism and of Gnosticism. As a theologian, in fact, Origen is not merely an orthodox traditionalist and believing exegete, but a speculative philosopher of Neo-Platonic tendencies. He is, moreover, a judicious critic. The union of these four elements gives character to his theology, and in a certain degree to all subsequent theology. It is this combination which has determined the peculiar and varying relations in which theology and the faith of the church have stood to each other since the time of Origen. That relation depends on the predominance of one or other of the four factors embraced in his theology.

As an orthodox traditionalist Origen holds that Christianity is a practical and religious saving principle, that it has unfolded itself in an historical series of revealing facts, that the church has accurately embodied the substance of her faith in the *regula fidei*, and that simple faith is sufficient for the renewal and salvation of man. As a philosophical idealist, however, he transmutes the whole contents of the faith of the church into ideas which bear the mark of Neo-Platonism, and were accordingly recognized by the later Neo-Platonists as Hellenic.[4] In Origen, however, the mystic and ecstatic element is held in abeyance. The ethico-religious ideal is the sorrowless condition, the state of superiority to all evils, the state of order and of rest. In this condition man enters into likeness to God and blessedness; and it is reached through contemplative isolation and self-knowledge, which is divine wisdom. "The soul is trained as it were to behold itself in a mirror, it shows the divine spirit, if it should be found worthy of such fellowship, as in a mirror, and thus discovers the traces of a secret path to participation in the divine nature." As a means to the realization of this ideal, Origen introduces the whole ethics of Stoicism. But the link that connects him with churchly realism, as well as with the Neo-Platonic mysticism, is the conviction that complete and certain knowledge rests wholly on divine revelation, *i.e.* on oracles. Consequently his theology is cosmological speculation and ethical reflection based on the sacred Scriptures. The Scriptures, however, are treated by Origen on the basis of a matured theory of inspiration in such a way that all their facts appear as the vehicles of ideas, and have their highest value only in this aspect. That is to say, his gnosis neutralizes all that is empirical and historical, if not always as to its actuality, at least absolutely in respect of its value. The most convincing proof of this is that Origen (1) takes the idea of the immutability of God as the regulating idea of his system, and (2) deprives the historical "Word made flesh" of all significance for the true Gnostic. To him Christ appears simply as the Logos who is with the Father from eternity, and works from all eternity, to whom alone the instructed Christian directs his thoughts, requiring nothing more than a perfect—*i.e.* divine—teacher. In such propositions historical Christianity is stripped off as a mere husk. The objects of religious knowledge are beyond the plane of history, or rather—in a thoroughly Gnostic and Neo-Platonic spirit—they are regarded as belonging to a supra-mundane history. On this view contact with the faith of the church could only be maintained by distinguishing an exoteric and an esoteric form of Christianity. This distinction was already current in the catechetical school of Alexandria, but Origen gave it its boldest expression, and justified it on the ground of the incapacity of the Christian masses to grasp the deeper sense of Scripture, or unravel the difficulties of exegesis. On the other hand, in dealing with the problem of bringing his heterodox system into conformity with the *regula fidei* he evinced a high degree of technical skill. An external conformity was possible, inasmuch as speculation, proceeding from the higher to the lower, could keep by the stages of the *regula fidei*, which had been developed into a history of salvation. The system itself aims in principle at being thoroughly monistic; but, since matter, although created by God out of nothing, was regarded merely as the sphere in which souls are punished and purified, the system is pervaded by a strongly dualistic element. The immutability of God requires the eternity of the Logos and of the world. At this point Origen succeeded in avoiding the heretical Gnostic idea of God by assigning to the Godhead the attributes of goodness and righteousness. The pre-existence of souls is another inference from the immutability of God, although Origen also deduced it from the nature of the soul, which as a spiritual potency must be eternal. Indeed this is the fundamental idea of Origen—"the original and indestructible unity of God and all spiritual essences." From this follows the necessity for the created spirit, after apostasy, error and sin, to return always to its origin in God. The actual sinfulness of all men Origen was able to explain by the theological hypothesis of pre-existence and the premundane fall of each individual soul. He holds that freedom is the inalienable prerogative of the finite spirit; and this is the second point that distinguishes his theology from the heretical Gnosticism. The system unfolds itself like a drama, of which the successive stages are as follows: the transcendental fall, the creation of the material world, inaugurating the history of punishment and redemption, the clothing of fallen souls in flesh, the dominion of sin, evil and the demons on earth, the appearing of the Logos, His union with a pure human soul, His esoteric preaching of salvation, and His death in the flesh, then the imparting of the

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[1] There are, however, extensive fragments of the original in existence.

[2] See Redepenning, *Origenis de principiis*, first sep. ed. (Leipzig, 1836); Schnitzer, *Orig. über die Grundlehren des Glaubens*, an attempt at reconstruction (1835).

[3] The opposition to the unitarians within the church must also be kept in mind.

[4] Porphyry says of Origen, *κατὰ τὰς περὶ πραγμάτων καὶ τοῦ θείου δόξας Ἑλληνίζων* (Euseb. *H.E.* vi. 19).

Spirit, and the ultimate restoration of all things. The doctrine of the restoration appeared necessary because the spirit, in spite of its inherent freedom, cannot lose its true nature, and because the final purposes of God cannot be foiled. The end, however, is only relative, for spirits are continually falling, and God remains through eternity the creator of the world. Moreover the end is not conceived as a transfiguration of the world, but as a liberation of the spirit from its unnatural union with the sensual. Here the Gnostic and philosophical character of the system is particularly manifest. The old Christian eschatology is set aside; no one has dealt such deadly blows to Chiliasm and Christian apocalypticism as Origen. It need hardly be said that he spiritualized the church doctrine of the resurrection of the flesh. But, while in all these doctrines he appears in the character of a Platonic philosopher, traces of rational criticism are not wanting. Where his fundamental conception admits of it, he tries to solve historical problems by historical methods. Even in the christology, where he is treating of the historical Christ, he entertains critical considerations; hence it is not altogether without reason that in after times he was suspected of "Ebionitic" views of the Person of Christ. Not unfrequently he represents the unity of the Father and the Son as a unity of agreement and harmony and "identity of will."

Although the theology of Origen exerted a considerable influence as a whole in the two following centuries, it certainly lost nothing by the circumstance that several important propositions were capable of being torn from their original setting and placed in new connexions. It is in fact one of the peculiarities of this theology, which professed to be at once churchly and philosophical, that most of its formulae could be interpreted and appreciated *in utramque partem*. By arbitrary divisions and rearrangements the doctrinal statements of this "science of faith" could be made to serve the most diverse dogmatic tendencies. This is seen especially in the doctrine of the Logos. On the basis of his idea of God Origen was obliged to insist in the strongest manner on the personality, the eternity (eternal generation) and the essential divinity of the Logos.[1] On the other hand, when he turned to consider the origin of the Logos he did not hesitate to speak of Him as a *κτίσμα*, and to include Him amongst the rest of God's spiritual creatures. A *κτίσμα*, which is at the same time ὁμοούσιον τῷ Θεῷ, was no contradiction to him, simply because he held the immutability, the pure knowledge and the blessedness which constituted the divine nature to be communicable attributes. In later times both the orthodox and the Arians appealed to his teaching, both with a certain plausibility; but the inference of Arius, that an imparted divinity must be divinity in the second degree, Origen did not draw. With respect to other doctrines also, such as those of the Holy Spirit and the incarnation of Christ, &c., Origen prepared the way for the later dogmas. The technical terms round which such bitter controversies raged in the 4th and 5th centuries are often found in Origen lying peacefully side by side. But this is just where his epoch-making importance lies, that all the later parties in the church learned from him. And this is true not only of the dogmatic parties; solitary monks and ambitious priests, hard-headed critical exegetes,[2] allegorists, mystics, all found something congenial in his writings. The only man who tried to shake off the theological influence of Origen was Marcellus of Ancyra, who did not succeed in producing any lasting effect on theology.

The attacks on Origen, which had begun in his lifetime, did not cease for centuries, and only subsided during the time of the fierce Arian controversy. It was not so much the relation between pistis and gnosis—faith and knowledge—as defined by Origen that gave offence, but rather isolated propositions, such as his doctrines of the pre-existence of souls, of the soul and body of Christ, of the resurrection of the flesh, of the final restoration, and of the plurality of worlds. Even in the 3rd century Origen's view of the Trinity and of the Person of Christ was called in question, and that from various points of view. It was not till the 5th century, however, that objections of this kind became frequent. In the 4th century Pamphilus, Eusebius of Caesarea, Athanasius, the Cappadocians, Didymus, and Rufinus were on the side of Origen against the attacks of Methodius and many others. But, when the zeal of Epiphanius was kindled against him, when Jerome, alarmed about his own reputation, and in defiance of his past attitude, turned against his once honoured teacher, and Theophilus, patriarch of Alexandria, found it prudent, for political reasons, and out of consideration for the uneducated monks, to condemn Origen—then his authority received a shock from which it never recovered. There were, doubtless, in the 5th century church historians and theologians who still spoke of him with reverence, but such men became fewer and fewer. In the West Vincent of Lerins held up Origen as a warning example (*Commonit.* 23), showing how even the most learned and most eminent of church teachers might become a misleading light. In the East the exegetical school of Antioch had an aversion to Origen; the Alexandrians had utterly repudiated him. Nevertheless his writings were much read, especially in Palestine. The monophysite monks appealed to his authority, but could not prevent Justinian and the fifth oecumenical council at Constantinople (553) from anathematizing his teaching. It is true that many scholars (*e.g.* Hefele, *Conciliengesch.* ii. p. 858 sq.) deny that Origen was condemned by this council; but Möller rightly holds that the condemnation is proved (*Realencyklop. f. protest. Theol. u. Kirche*, xi. 113).

Sources and Literature.—Next to the works of Origen (see Redepenning, "Des Hieronymus wiederaufgefundenes Verzeichnis der Schriften des Origens," in *Zeit. f. d. hist. Theol.* (1851), pp. 66 seq.) the most important sources are: Gregory Thaumat., *Panegyricus in Orig.*; Eusebius, *H.E.* vi.; Epiphanius, *Haer.* 64; the works of Methodius, the Cappadocians, Jerome (see *De vir. ill.* 54, 61) and Rufinus; Vincent. Lerin. *Commonit.* 23; Palladius, *Hist. Laus.* 147; Justinian, *Ep. ad Mennam* (Mansi, ix. p. 487 seq.); Photius, *Biblioth.* 118, &c. There is no complete critical edition of Origen's works. The best edition is that of Car. and C. Vinc. Delarue (4 vols. fol.) (Paris, 1733–1759), reprinted by Lommatzsch (25 vols. 8vo) (Berlin, 1831–1848) and by Migne, *Patrol. curs. compl.* ser. Gr., vols. xi.-xvii. Several new pieces have been edited by Gallandi and A. Mai. Amongst the older works on Origen those of Huetius (printed in Delarue, vol. iv.) are the best; but Tillemont, Fabricius, Walch (*Historie d. Ketzereien*, vii. pp. 362-760) and Schröckh also deserve to be mentioned. In recent times the doctrine of Origen has been expounded in the great works on church history by Baur, Dorner, Böhringer, Neander, Möller (*Geschichte der Kosmologie in der griechischen Kirche*) and Kahnis (*Die Lehre vom h. Geist*, vol. i.); compare with these the works on the history of philosophy by Ritter, Erdmann, Ueberweg and Zeller. Of monographs, the best and most complete is Redepenning, *Origenes, eine Darstellung seines Lebens und seiner Lehre* (2 vols., 1841, 1846). Compare Thomasius, *Orig.* (1837); Krüger, "Über das Verhältnis des Orig. zu Ammonius Sakkas," in the *Ztschr. f. hist. Theol.* (1843), i. p. 46 seq.; Fischer, *Comment. de Orig. theologia et cosmologia* (1846); Ramers, *Orig. Lehre von der Auferstehung des Fleisches* (1851); Knittel, "Orig. Lehre von der Menschwerdung," in the *Theol. Quartalschr.* (1872); Schultz, "Christologie des Orig.," in the *Jahrb. f. protest. Theol.* (1875); Mehlhorn, "Die Lehre von der menschlichen Freiheit nach Orig.," in *Zeitschr. f. Kirchengesch.* vol. ii. (1878); Freppel, *Origène*, vol. i., 2nd ed. (Paris, 1875). A full list of the later bibliography will be found in Harnack's *Dogmengeschichte* and *Chronologie*. (A. Ha.)

ORIGINAL PACKAGE, a legal term in America, meaning, in general usage, the package in which goods, intended for interstate commerce, are actually transported wholesale. The term is used chiefly in determining the boundary between Federal and state jurisdiction in the regulation of commerce, and derives special significance by reason of the conflict between the powers of Congress to regulate commerce and the police legislation of the several states with respect to commodities considered injurious to public health and morals, such as intoxicating liquors, cigarettes and oleomargarine. By the Federal constitution Congress is vested with the power "to regulate commerce with foreign nations and among the several states, and with the Indian tribes," and each state is forbidden, without the consent of Congress, to "lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws," and the basis of the law on the subject of "original package" was laid when, in 1827, Chief Justice Marshall interpreted these clauses in his decision of the case of *Brown* v. *Maryland*,[1] which tested the constitutionality of an act of the legislature of Maryland requiring a licence from importers of foreign goods by bale or package and from persons selling the same by wholesale, bale, package, hogshead, barrel or tierce. After pronouncing such a licence to be in effect a tax, the chief justice observed that so long as the thing imported remained "the property of the importer, in his warehouse, in the original form or package in which it was imported," a tax upon it was too plainly a duty on imports to escape the prohibition of the Constitution, that imported commodities did not become subject to the taxing power of the state until they had "become incorporated and mixed with the mass of property in the country," that the right to sell a thing imported was incident to the right to import it, and consequently that a state tax upon the sale was repugnant to the power of Congress to regulate foreign commerce; and he added that the court supposed the same principles applied equally to interstate commerce. Later decisions agree that the right to import commodities or to ship them from one state to another carries with it the right to sell them and have established the boundary line between Federal and state control of both foreign imports and interstate shipments at a sale in the original package[2] or at the breaking of the original package before sale for other purposes than inspection.[3] A state or a municipality may, however, tax while in their original packages any commodities which have been shipped in from another state provided there be no discrimination against such commodities; this permission being granted on the theory that a general non-discriminating tax is not a regulation of commerce and therefore not repugnant to the power of Congress to regulate interstate commerce.[4] The first cases involving a serious conflict between the power of Congress to regulate interstate commerce and the police powers of the several states were the Licence Cases adjudicated by the Supreme Court of the United States in January 1847.[5] They were to test the constitutionality of a law of Massachusetts requiring a licence for the sale of wines or spirituous liquors in a less quantity than 28 gallons, of a law of Rhode Island requiring a licence for the sale of such liquors in a less quantity than 10 gallons, and a law of New Hampshire requiring a licence for the sale of wines or spirituous liquors in any quantity whatever, and in this case a barrel of gin had been bought in Boston Mass., carried to Dover, N.H., and there sold in the same barrel. Although the justices based their opinions on different principles, the court pronounced the laws constitutional. The justices did not even agree that the power of Congress to regulate an interstate shipment included the power to authorize a sale after shipment, which is the basis of the original package doctrine as applied to interstate commerce, and Chief Justice Taney with two other justices who were of this opinion held that a state might nevertheless in the exercise of its police powers regulate such sales so long as Congress did not pass an act for that purpose. In this confused and uncertain state the matter rested until the adjudication of *Leisy* v. *Hardin*[6] in 1889. In this case beer had been shipped from Illinois into Iowa and then sold in the original kegs and cases by an agent of the Illinois firm when Iowa had a law absolutely prohibiting the sale of intoxicating liquors within its limits except for pharmaceutical, medicinal, chemical or sacramental purposes. None of the justices now denied that the power of Congress to regulate an interstate shipment included the power to authorize a sale after shipment, and although there was disagreement with reference to the right of a state to regulate the sale in the absence of an act of Congress for that purpose, the majority of the court were of the opinion that: "Whenever a particular power of the general government is one which must necessarily be exercised by it, and Congress remains silent, this is not only not a concession that the powers reserved by the states may be exerted as if the specific power had not been elsewhere reposed, but, on the contrary, the only legitimate conclusion is that the general government intended that power should not be affirmatively exercised, and that the action of the states cannot be permitted to effect that which would be incompatible with such intention. Hence, inasmuch as interstate commerce, consisting in the transportation, purchase, sale and exchange of commodities, is national in its character and must be governed by a uniform system, so long as Congress does not pass any law to regulate it, or allowing the states so to do, it thereby indicates its will that such commerce shall be free and untrammelled." The opinion of Chief Justice Taney in *Pierce* v. *New Hampshire* was therefore in part overruled and the Iowa law in so far as it applied to the sale in the original packages of liquors shipped in from another state was pronounced unconstitutional. As a consequence of this decision, Congress, in 1890, passed the Wilson Act providing that all fermented, distilled, or other intoxicating liquors or liquids transported into any state or Territory for use, consumption, sale or storage therein should, even though in the original packages, be subject to the police laws of the state or Territory to the same extent as those produced within the state or Territory. Even with this act, however, a state is not permitted to interfere with an interstate shipment of liquor direct to the consumer.[7]

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[1] "Communis substantiae est filio cum patre; ἀπόρροια enim ὁμοούσιος videtur, *i.e.* unius substantiae cum illo corpore ex quo est ἀπόρροια."

[2] *E.g.* Dionysius of Alexandria; compare his judicious verdict on the Apocalypse.

What constitutes an original package was the principal question in *Austin* v. *Tennessee*[8] which was decided in November 1900. The general assembly of Tennessee had in this case made it a misdemeanour for any party to sell or to bring into the state for selling or giving away any cigarettes. The defendant had purchased at Durham, North Carolina, a quantity of cigarettes. They were packed in pasteboard boxes containing ten cigarettes each. The boxes were then placed in an open basket and in this manner the cigarettes were delivered at the defendant's place of business in Tennessee where he sold a package without breaking it. The court decided against the defendant because it held that the manner of transportation was evidently for the purpose of evading the state law and that the boxes were not original packages within the meaning of the Federal law, and in this connexion it observed that "The whole theory of the exemption of the original package from the operation of the state laws is based upon the idea that the property is imported in the ordinary form in which, from time to time immemorial, foreign goods have been brought into the country. These have gone at once into the hands of the wholesale dealers, who have been in the habit of breaking the package and distributing their contents among the several retail dealers throughout the state. It was with reference to this method of doing business that the doctrine of the exemption of the original package grew up." In the case of *Schollenberger* v. *Pennsylvania*,[9] however, the court decided that the state of Pennsylvania could not prohibit the sale of oleomargarine by retail when it had been shipped from Rhode Island in packages containing only 10 lb each, and the original package doctrine has been sharply criticized because of the difficulty in determining what constitutes an original package as well as because of the conflict between the doctrine and the police powers of the several states. It has been urged that the doctrine be abandoned and that commodities shipped into one state from another "be treated just like other goods already there are treated."

See J. B. Uhle, "The Law Governing an Original Package," in *The American Law Register*, vol. xxix. (Philadelphia, 1890); Shackelford Miller, "The Latest Phase of the Original Package Doctrine," and M. M. Townley, "What is the Original Package Doctrine?" both in *The American Law Review*, vol. xxxv. (St Louis, 1901); also F. H. Cooke, *The Commerce Clause of the Federal Constitution* (New York, 1908).

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[1] 12 Wheaton 419.

[2] Waring *v.* Mobile, 8 Wall. 110.

[3] May *v.* New Orleans, 178 U.S. 498 and *in re* McAllister (C.C.Md.), 51 Fed. 282.

[4] Woodruff *v.* Parham, 8 Wallace 123, and Hinson *v.* Lott, 8 Wallace 148.

[5] 5 Howard 504.

[6] 135 U.S. 100.

[7] See Vance *v.* W. A. Vandercook Company, 170 U.S. 438.

[8] 179 U.S. 343.

[9] 171 U.S. 1.

ORIHUELA, a town and episcopal see of eastern Spain, in the province of Alicante; 13 m. N.E. of Murcia and about 15 m. from the Mediterranean Sea, on the Murcia-Elche railway. Pop. (1900) 28,530. Orihuela is situated in a beautiful and exceedingly fertile *huerta*, or tract of highly cultivated land, at the foot of a limestone bridge, and on both sides of the river Segura, which divides the city into two parts, Roig and San Augusto, and is spanned by two bridges. There are remains of a Moorish fort on the hill commanding the town; and the north gateway—the Puerta del Colegio—is a fine lofty arch, surmounted by an emblematic statue and the city arms. The most prominent buildings are the episcopal palace (1733), with a frontage of 600 ft.; the town house (1843), containing important archives; and the cathedral, a small Gothic structure built on the site of a former mosque in the 14th century, and enlarged and tastelessly restored in 1829. The university of Orihuela, founded in 1568 by the archbishop of Valencia, was closed in 1835, part of the revenue being applied to the support of a college affiliated to the university of Valencia. Besides numerous primary schools there are a theological seminary and a normal school. The trade in fruit, cereals, oil and wine is considerable. There are also tanneries, dye-works and manufactures of silk, linen and woollen fabrics, leather and starch.

Orihuela was captured by the Moors in 713, and retaken by James I. of Aragon, for his father-in-law Alphonso of Castile, in 1265. It was sacked during the disturbances at the beginning of the reign of Charles V. (1520), and again in the War of Succession (1706). Local annals specially mention the plague of 1648, the flood of 1651 and the earthquake of 1829.

ORILLIA, a town and port of entry of Simcoe county, Ontario, Canada, situated 84 m. N. of Toronto, on Lake Couchiching and on the Grand Trunk railway. Pop. (1901) 4907. It is a favourite summer resort, and has steamboat communication with other ports on Lakes Simcoe and Couchiching. It contains an asylum maintained by the provincial government; also saw and grist mills and iron foundries.

ORINOCO, a river in the north of South America, falling north-east into the Atlantic between 60° 20′ and 62° 30′ W. It is approximately 1500 m. long, but it is several hundred miles longer if measured by its Guaviare branch. Lying south and east of the main stream is a vast, densely forested region called Venezuelan Guiana, diversified by ranges of low mountains, irregular broken ridges and granitic masses, which define the courses of many unexplored tributaries of the Orinoco.

In 1498, Columbus, when exploring the Gulf of Pária, which receives a large part of the outflow of the Orinoco, noted the freshness of its waters, but made no examination of their origin. The caravels of Ojeda which, in 1499, followed almost the same track as that of Columbus, probably passed in sight of one or more of the mouths of the Orinoco. The first to explore any portion of the mighty river was the reckless and daring adventurer Ordaz. In his expedition (1531–1532) he entered its principal outlet, the Boca de Navios, and, at the cost of many lives, ascended to the junction of the Meta with the parent stream. From Ordaz up to recent times the Orinoco has been the scene of many voyages of discovery, including those in quest of El Dorado, and some scientific surveys have been made, especially among its upper waters, by José Solano and Diaz de la Fuente of the Spanish boundary line commission of Yturriaga and Solano (1757–1763), Humboldt (1800) and Michelena y Rojas (1855–1857). The last ascended to the Mawaca, a point about 170 m. above the northern entrance to the Casiquiare canal, and then a few miles up the Mawaca. A little knowledge about its sources above these points was given by the savages to de la Fuente in 1759 and to Mendoza in 1764, and we are also indebted to Humboldt for some vague data.

At the date of the discovery, the Orinoco, like the Amazon, bore different names, according to those of the tribes occupying its margins. The *conquistador* Ordaz found that, at its mouth, it was called the Uriaparia, this being the name of the *cacique* of the tribe there. The Caribs, holding a certain section of the river, named it the Ibirinoco, corrupted by the Spaniards into Orinoco. It was known to other tribes as the Barraguán and to others as the Maraguaca. The Cabres called it the Paraguá, because it flooded such a vast area of country.

The principal affluent of the Orinoco from the Guiana district is the Ventuari, the head-waters of which are also unknown. It is an important stream, which, running south-west, joins the Orinoco about 90 m. above its Guaviare branch. Two other large tributaries of the Orinoco flow north from the interior of this mysterious Guiana region, the Caura and the Caroni. The former has recently been explored by André, who found it greatly obstructed by falls and rapids; the latter is about 800 m. long, 400 of which are more or less navigable.

South of the Guaviare, as far as the *divortium aquarum*, between it and the Rio Negro branch of the Amazon, the country is dry and only partially swept by moisture-laden winds, so that few streams of moment are found in its southern drainage area; but north of it, as far as 6° 30′ N., the north-east trade winds, which have escaped condensation in the hot lower valley of the Orinoco, beat against the cold eastern slopes of the lofty Colombian Andes, and ceaselessly pour down such vast volumes of water that the almost countless streams which flow across the plains of Colombia and western Venezuela are taxed beyond their capacity to carry it to the Orinoco, and for several months of the year they flood tens of thousands of square miles of the districts they traverse. Among these the Apure, Arauca, Meta and Guaviare hold the first rank.

The Apure is formed by two great rivers, the Uribante and Sarare. The former, which rises in the Sierra de Merida, which overlooks the Lake of Maracaibo, has 16 large affluents; the latter has its sources near the Colombian city of Pamplona, and they are only separated from the basin of the river Magdalena by the "Oriental" Andean range. From the Uribante-Sarare junction to the Orinoco the length of the Apure is 645 m., of which Codazzi makes the doubtful claim that 564 are navigable, for there are some troublesome rapids 114 m. above its mouth, where the Apure is 3 m. wide. The numerous affluents which enter it from the north water the beautiful eastern and southern slopes of the Merida, Caraboso and Caracas mountain ranges. A few of them are navigable for a short distance; among these the most important is the many-armed Portugueza, on the main route south from the Caribbean coast to the *llanos*. A few large streams enter the lower Apure from the south, but they are frequently entangled in lateral canals, due to the slight elevation of the plains above sea-level, the waters of the Apure, especially during flood time, having opened a great number of *caños* before reaching the Orinoco.

The "Oriental" Andes of Colombia give birth to another great affluent of the Orinoco, the Arauca, which soon reaches the plain and parallels the Apure on the south. Perez says that the Sarare branch of the Apure has formed a gigantic dam across its own course by prodigious quantities of trees, brush, vines and roots, and thus, impounding its own waters, has cut a new channel to the southward across the lowlands and joined the Arauca, from which the Sarare may be reached in small craft and ascended to the vicinity of Pamplona. The Arauca is navigable for large boats and barges up to the Andes, and by sail to its middle course. In floods, unable to carry the additional water contributed by the Sarare, it overflows its banks, and by several *caños* gives its surplus to the Capanaparo, which, about 18 m. farther south, joins the Orinoco.

The Meta is known as such from the union of two Andean streams, the Negro and Humadea, which rise near Bogotá. At their junction, 700 ft. above sea-level, it is 1000 ft. wide and 7 ft. deep in the dry season, but in flood the Meta rises 30 ft. It is navigable up to the old "Apostadero," about 150 m. above its mouth, but launches may ascend it, in the wet season, about 500 m., to the junction of the Negro with the Humadea. In the dry season, however, it is obstructed by reefs, sandbanks, shallows, snags, trees and floating timber from the "Apostadero" up, so that even canoes find its ascent difficult, while savage hordes along its banks add to the dangers to be encountered.

The Guaviare is the next great western tributary of the Orinoco. Eugenio Alvarado, a Spanish commissioner for the boundary delimitation of Colombia with Brazil in 1759, informed the viceroy at Bogotá that the rivers Arivari and Guayabero rise between Neiva and Popayan, and unite to take the composite name of Guaviare. In those times they called it Guaibari, or Guayuare. The Guaviare is about 500 m. long, of which 300 are called navigable, although not free from obstructions. Its upper portion has many rapids and falls. The banks are forested throughout, and the river is infested by numerous alligators, so ferocious that they attack canoes. Two-thirds of the way up, it receives its Ariari tributary from the north-west, which is navigable for large boats. Near its mouth the Guaviare is joined by its great south-western affluent, the Ynirida. Above its rapid of Mariapiri, 180 m. up, this stream runs swiftly through a rough country, but for a long distance is a succession of lakes and shallow, overflowed areas. Its head-waters do not reach the Andes.

Between the Guaviare and the Meta the Orinoco is obstructed by the famous Maipures cataract, where, in several channels, it breaks through a granite spur of the Guiana highlands for a length of about

4 m., with a total fall of about 40 ft., and then, after passing two minor reefs, reaches the Atures rapids, where it plunges through a succession of gorges for a distance of about 6 m., winding among confused masses of granite boulders, and falling about 30 ft. At the mouth of the Meta it is about 1 m. wide, but as it flows northwards it increases its width until, at the point where it receives its Apure affluent, it is over 2 m. wide in the dry season and about 7 m. in floods. It rises 32 ft. at Cariben, but at the Angostura, or narrows, where the river is but 800 ft. wide, the difference between high and low river is 50 ft., and was even 60 in 1892.

The Orinoco finds its way to the ocean through a delta of about 700 sq. m. area, so little above sea level that much of it is periodically flooded. The river is navigable for large steamers up to the raudal or rapid of Cariben, 700 m. from the sea, and to within 6 m. of the mouth of the Meta. Maintaining its eastern course from the Apure, the main stream finds its way along the southern side of the delta, where it is called the Corosimi river, and enters the sea at the Boca Grande; but in front of the Tortola island, at the beginning of the Corosimi and 100 m. from the sea, it throws northwards to the Gulf of Paria another great arm which, about 100 m. long, and known as the Rio Vagre, bounds the western side of the delta. *En route* to the gulf the Vagre sends across the delta, east and north, two *caños* or canals of considerable volume, called the Macareo and Cuscuino. The delta is also cut into many irregular divisions by other canals which derive their flow from its great boundary rivers, the Corosimi and Vagre, and its numerous islands and vast swamps are covered with a dense vegetation. The Boca Grande outlet is the deepest, and is the main navigable entrance to the Orinoco at all seasons, the muddy bar usually maintaining a depth of 16 ft.

The Spanish *conquistador* and his descendants have not been a blessing to the basin of the Orinoco. All they can boast of is the destruction of its population and products, so that the number of inhabitants of one of the richest valleys in the world is less to-day than it was four centuries ago. The entire river trade centres upon Ciudad Bolivar, on the right bank of the Orinoco, 373 m. above its mouth. The only other river port of any importance is San Fernando, on the Apure. It is a stopping-point for the incipient steamer traffic of the valley, which is principally confined to the Apure and lower Orinoco. It occupies, however, but a few small steam craft. There is steam connexion between Ciudad Bolivar and the island of Trinidad. Cattle are carried by vessels from the valley to the neighbouring foreign colonies, and a few local steamers do a coasting trade between the river and the Caribbean ports of Venezuela. A transit trade with Colombia, via the Meta river, has been carried on by two small steamers, but subject to interruptions from political causes. (G. E. C.)

ORIOLE (O. Fr. *Oriol*, Lat. *aureolus*), the name once applied to a bird, from its golden colouring—the *Oriolus galbula* of Linnaeus—but now commonly used in a much wider sense. The golden oriole, which is the type of the *Passerine* family *Oriolidae*, is a far from uncommon spring-visitor to the British Islands, but has very rarely bred there. On the continent of Europe it is a well-known if not an abundant bird, and its range in summer extends so far to the east aș Irkutsk, while in winter it is found in Natal and Damaraland. In India it is replaced by a closely allied form, *O. kundoo*, the mango-bird, chiefly distinguishable by the male possessing a black streak behind as well as in front of the eye; and both in Asia and Africa are several other species more or less resembling *O. galbula*, but some depart considerably from that type, assuming a black head, or even a glowing crimson, instead of the ordinary yellow colouring, while others again remain constant to the dingy type of plumage which characterizes the female of the more normal form. Among these last are the aberrant species of the group *Mimetes* or *Mimeta*, belonging to the Australian Region, respecting which A. R. Wallace pointed out, first in the Zoological Society's *Proceedings* (1863, pp. 26–28), and afterwards in his *Malay Archipelago* (ii. pp. 150–153), the very curious signs of "mimicry" (see HONEY-EATER). It is a singular circumstance that this group *Mimeta* first received its name from P. P. King (*Survey, &c. of Australia*, ii. 417) under the belief that the birds composing it belonged to the family *Meliphagidae*, which had assumed the appearance of orioles, whereas Wallace's investigations tend to show that the imitation (unconscious, of course) is on the part of the latter. The external similarity of the *Mimeta* and the *Tropidorhynchus* of the island of Bouru, one of the Moluccas, is perfectly wonderful, and has again and again deceived some of the best ornithologists, though the birds are structurally far apart. Another genus which has been referred to the *Oriolidae*, and may here be mentioned, is *Sphecotheres*, peculiar to the Australian Region, and distinguishable from the more normal orioles by a bare space round the eye. Orioles are shy and restless birds, frequenting gardens and woods, and living on insects and fruit. The nest is pocket-shaped, of bark, grass and fibres, and the eggs are white or salmon-coloured with dark spots. The "American orioles" (see ICTERUS) belong to a different Passerine family, the *Icteridae*. (A. N.)

ORION (or OARION), in Greek mythology, son of Hyrieus (Eponymus of Hyria in Boeotia), or of Poseidon, a mighty hunter of great beauty and gigantic strength, perhaps corresponding to the "wild huntsman" of Teutonic mythology. He is also sometimes represented as sprung from the earth. He was the favourite of Eos, the dawn-goddess, who loved him and carried him off to Delos; but the gods were angry, and would not be appeased till Artemis slew him with her arrows (*Odyssey*, v. 121). According to other accounts which attribute Orion's death to Artemis, the goddess herself loved him and was deceived by the angry Apollo into shooting him by mistake; or he paid the penalty of offering violence to her, or of challenging her to a contest of quoit-throwing (Apollodorus i. 4; Hyginus, *Poet. astron.* ii. 34; Horace, *Odes*, iii. 4, 71). In another legend he was blinded by Oenopion of Chios for having violated his daughter Merope; but having made his way to the place where the sun rose, he recovered his sight (Hyginus, *loc. cit.*; Parthenius, *Erotica*, 20). He afterwards retired to Crete, where he lived the life of a hunter with Artemis; but having threatened to exterminate all living creatures on the island, he was killed by the bite of a scorpion sent by the earth-goddess (Ovid, *Fasti*, v. 537). In the lower world his shade is seen by Odysseus driving the wild beasts before him as he had done on earth (*Odyssey*, xi. 572). After his death he was changed into the constellation which is called by his name. It took the form of a warrior, wearing a girdle of three stars and a lion's skin, and carrying a club and a sword. When it rose early it was a sign of summer; when late, of winter and stormy weather; when it rose about midnight it heralded the season of vintage.

See Küentzle, *Über die Sternsagen der Griechen* (1897), and his article in Roscher's *Lexikon*; he shows that in the oldest legend Orion the constellation and Orion the hero are quite distinct, without deciding which was the earlier conception. The attempt sometimes made to attribute an astronomical origin to the myths connected with his name is unsuccessful, except in the case of Orion's pursuit of Pleione and her daughters (see PLEIADES) and his death from the bite of the scorpion; see also C. O. Müller, *Kleine Deutsche Schriften*, ii. (1848); O. Gruppe, *Griechische Mythologie*, ii. pp. 945, 952; Preller-Robert, *Griechische Mythologie* (1894), pp. 448-454; Grimm, *Teutonic Mythology* (Eng. trans., 1883), ii. p. 726, iii. p. 948.

In Astronomy.—The constellation Orion is mentioned by Homer (*Il.* xviii. 486, xxii. 29; *Od.* v. 274), and also in the Old Testament (Amos v. 8, Job ix. 9). The Hebrew name for Orion also means "fool," in reference perhaps to a mythological story of a "foolhardy, heaven-daring rebel who was chained to the sky for his impiety" (Driver). For the Assyrian names see CONSTELLATION. Ptolemy catalogued 38 stars, Tycho Brahe 42 and Hevelius 62. Orion is one of the most conspicuous constellations. It consists of three stars of the 1st magnitude, four of the 2nd, and many of inferior magnitude. α *Orionis*, or Betelgeuse, is a bright, yellowish-red star of varying magnitude (0·5 to 1·4, generally 0·9). β *Orionis* or Regel is a 1st magnitude star. γ *Orionis* or Bellatrix, and κ *Orionis* are stars of the 2nd magnitude. These four stars, in the order α, β, γ, κ, form an approximate rectangle. Three collinear stars ζ, ϵ and δ *Orionis* constitute the "belt of Orion"; of these ϵ, the central star, is of the 1st magnitude, δ of the 2nd, while ζ *Orionis* is a fine double star, its components having magnitudes 2 and 6; there is also a faint companion of magnitude 10. σ *Orionis*, very close to ζ *Orionis*, is a very fine multiple star, described by Sir William Herschel as two sets of treble stars; more stars have been revealed by larger telescopes. θ *Orionis* is a multiple star, situated in the famous nebula of Orion, one of the most beautiful in the heavens. (See Nebula.)

ORION and **ORUS**, the names of several Greek grammarians, frequently confused. The following are the most important. (1) Orion of Thebes in Egypt (5th century A.D.), the teacher of Proclus the neo-Platonist and of Eudocia, the wife of the younger Theodosius. He taught at Alexandria, Caesarea in Cappadocia and Byzantium. He was the author of a partly extant etymological Lexicon (ed. F. W. Sturz, 1820), largely used by the compilers of the *Etymologicum Magnum*, the *Etymologicum Gudianum* and other similar works; a collection of maxims in three books, addressed to Eudocia, also ascribed to him by Suidas, still exists in a Warsaw MS. (2) Orus of Miletus, who, according to Ritschl, flourished not later than the 2nd century A.D., and was a contemporary of Herodian and a little junior to Phrynichus (according to Reitzenstein he was a contemporary of Orion). His chief works were treatises on orthography; on Atticisms, written in opposition to Phrynichus; on the names of nations.

See F. Ritschl, *De Oro et Orione Commentatio* (1834); R. Reitzenstein, *Geschichte der griechischen Etymologika* (1897); and article "Orion" in Smith's *Dictionary of Greek and Roman Biography.*

ORISKANY, a village of Oneida county, New York, U.S.A., about 7 m. N.W. of Utica. Pop. about 800. Oriskany is served by the New York Central & Hudson River railway. There are malleable iron works and a manufactory of paper makers' felts here. In a ravine, about 2 m. west of Oriskany, was fought on the 6th of August 1777 the battle of Oriskany, an important minor engagement of the American War of Independence. On the 4th of August Gen. Nicholas Herkimer, who had been colonel of the Tyrone county (New York) militia in 1775, and had been made a brigadier-general of the state militia in 1776, had gathered about 800 militiamen at Fort Dayton (on the site of the present Herkimer, New York) for the relief of Fort Schuyler (see Rome, N.Y.) then besieged by British and Indians under Colonel Barry St Leger and Joseph Brant. On the 6th General Herkimer's force, on its march to Fort Schuyler, was ambushed by a force of British under Sir John Johnson and Indians under Joseph Brant in the ravine above mentioned. The rear portion of Herkimer's troops escaped from the trap, but were pursued by the Indians, and many of them were overtaken and killed. Between the remainder and the British and Indians there was a desperate hand-to-hand conflict, interrupted by a violent thunderstorm, with no quarter shown by either side. On hearing the firing near Fort Schuyler (incident to a sortie by Lieut.-Colonel Marinus Willett) the British withdrew, after about 200 Americans had been killed and as many more taken prisoners, the loss of the British in killed being about the same. General Herkimer (who had advised advancing slowly, awaiting signal shots announcing the sortie, and had been called "Tory" and "coward" in consequence), though his leg had been broken by a shot at the beginning of the action, continued to direct the fighting on the American side, but died on the 16th of August as a result of the clumsy amputation of his leg. The battle, though indecisive, had an important influence in preventing St Leger from effecting a junction with General Burgoyne. The battlefield is marked by a monument erected in 1884.

See *Orderly Book of Sir John Johnson during the Oriskany Campaign* (Albany, 1882), with notes by W. L. Stone and J. W. De Peyster; *Publications* of the Oneida Historical Society, vol. i. (Utica, N.Y., 1877); and Phoebe S. Cowen, *The Herkimers and Schuylers* (Albany, 1903).

ORISSA, a tract of India, in Bengal, consisting of a British division and twenty-four tributary states. The historical capital is Cuttack; and Puri, with its temple of Jagannath, is world-famous. Orissa differs from the rest of Bengal in being under a temporary settlement of land revenue. A new settlement for a term of thirty years was concluded in 1900, estimated to raise the total land revenue by more than one half; the greater part of this increase being levied gradually during the first eleven years of the term. To obviate destructive inundations and famines, the Orissa system of canals has been constructed, with a capital outlay of nearly two millions sterling. (See Mahanadi). The province is traversed by the East Coast railway, which was opened throughout from Calcutta to Madras in 1901.

The Division of Orissa consists of the five districts of Cuttack, Puri, Balasore, Sambolpur and the forfeited state of Angul. Total area 13,770 sq. m.; pop. (1901) 5,003,121, showing an increase of 7% in the decade. According to the census of 1901 the total number of persons in all India speaking Oriya was more than 9½ millions, showing that the linguistic area (extending into Madras and the Central Provinces) is much larger than the political province.

The whole of Orissa is holy ground. On the southern bank of the Baitarani shrine rises after shrine in honour of Siva, the All-Destroyer. On leaving the stream the pilgrim enters Jajpur, literally the city of sacrifice, the headquarters of the region of pilgrimage sacred to the wife of the All-Destroyer. There is not a fiscal division in Orissa without its community of cenobites, scarcely a village without consecrated lands, and not a single ancient family that has not devoted its best acres to the gods. Every town is filled with temples, and every hamlet has its shrine. The national reverence of the Hindus for holy places has been for ages concentrated on Puri, sacred to Vishnu under his title of Jagannath, the Lord of the World. Besides its copious water-supply in time of high flood, Orissa has an average rainfall of 62½ in. per annum. Nevertheless, the uncontrolled state of the water-supply has subjected the country from time immemorial to droughts no less than to inundation. Thus the terrible famine of 1865–1866, which swept away one-fourth of the entire population, was followed in 1866 by a flood which destroyed crops to the value of £3,000,000. Since then much has been done by government to husband the abundant water-supply.

The early history of the kingdom of Orissa (Odra-desa), as recorded in the archives of the temple of Jagannath, is largely mythical. A blank in the records from about 50 B.C. to A.D. 319 corresponds to a period of Yavana occupation and Buddhist influence, during which the numerous rock monasteries of Orissa were excavated. The founder of the Kesari or Lion dynasty, which ruled from A.D. 474 to 1132, is said to have restored the worship of Jagannath, and under this line the great Sivaite temple at Bhuvaneswar was constructed. In 1132 a new line (the Gajapati dynasty) succeeded, and Vishnu took the place of Siva in the royal worship. This dynasty was extinguished in 1532–1534, and in 1578, after half a century of war, Orissa became a province of the Mogul empire. It nominally passed to the British in 1765, by the Diwani grant of Bengal, Bhar and Orissa; but at that time it was occupied by the Mahratta raja of Nagpur, from whom it was finally conquered in 1803.

The Tributary States of Orissa, known also as the Tributary Mahals, or the Garhjats, occupy the hills between the British districts and the Central Provinces. The most important are Mayurbhanj, Keonjhar, Dhenkanal, Baud and Nayagarh. In 1905 five Oriya-speaking states (Bamra, Rairakhol, Sonpur, Patna and Kalahandi) were added from the Central Provinces and two (Gangpur and Bonai) from the Chota Nagpur states. This made the total area 28,046 sq. m. and the pop. (1901) 3,173,395.

Up to the year 1888 some doubt existed as to the actual position of the Tributary states of Orissa; but in that year the secretary of state accepted the view that they did not form part of British India, and modified powers were handed over to the Orissa chiefs under the control of a superintendent.

See Sir W. W. Hunter, *Orissa* (1872).

ORISTANO, a town and archiepiscopal see of Sardinia, situated 23 ft. above sea-level, about 3 m. from the eastern shore of a gulf on the W. coast, to which it gives its name, and 59 m. N. by W. of Cagliari by rail. Pop. (1901) 7107. The town preserves some scanty remains of the walls (dating from the end of the 13th century), by which it was surrounded, and two gates, the Porta Manna, surmounted by a lofty square tower, known also as the Torre S. Cristoforo, and the Porta Marina. The houses are largely constructed of sun-dried bricks, and are low, so that the area of the town is considerable in proportion to its population.

The cathedral was reconstructed in 1733 in the baroque style, and scanty traces of the original building of the 12th century exist (see D. Scano in *L' Arte*, 1901, p. 359; 1903, p. 15): and also in *Storia dell' arte in Sardegna dal XI. al XIV. secolo*, Cagliari-Sassari, 1907). Some statuettes and sculptured slabs partly belonging to its pulpit, perhaps the work of Andrea Pisano, have been found; upon the reverse side of two of the slabs are still older reliefs of the 8th or 9th century; so that the slabs perhaps originally came from Tharros. In the sacristy is some fine silverwork. The church of S. Francesco also dates from the end of the 13th century, but has been altered. A fine statue by Nino, son of Andrea, is preserved here. Two m. south of Oristano is the village of S. Giusta, with a beautiful Romanesque church of the Pisan period dedicated to this saint (D. Scano, *Bollettino dell' arte*, Feb. 1907, p. 8), containing several antique columns. It was once an independent episcopal see. The lagoons on the coast are full of fish, but are a cause of malaria. The environs are fertile, and a quantity of garden produce is grown; while good wine (*vernaccia*) is also made, and also ordinary pottery in considerable quantities, supplying most of the island. The bridge crossing the river Tirso, a little to the north of the town, over 300 ft. long, with five arches, took the place, in 1870, of an old one which is said to have been of Roman origin. A m. south of the mouth of this river is the landing-place for shipping. The large orange groves of Milis lie 13 m. N. of Oristano at the base of Monte Ferru, where they are sheltered from the wind. The finest belong to the Marchese Boyl, whose plantation contains some 500,000 orange and lemon trees. The inhabitants of Milis manufacture reed baskets and mats, which they sell throughout Sardinia.

Oristano occupies the site of the Roman Othoca, the point at which the inland road and the coast road from Carales to Turris Libisonis bifurcated, but otherwise an unimportant place, overshadowed by Tharros. The medieval town is said to have been founded in 1070. It was the seat from the 11th century onwards of the *giudici* (judges) of Arborea, one of the four divisions of the island. Almost the last of these judges was Eleonora (1347–1403); after her death Oristano became the seat of a marquisate, which was suppressed in 1478. The frontier castles of Monreale and Sanluri, some 20 and 30 m. respectively to the S.S.E., were the scene of much fighting between the Aragonese government and the *giudici* and marquises of Arborea in the 14th and 15th centuries. (T. As.)

ORIYA (properly *Oṛiyā*), the Aryan language of Ōḍra or Orissa in India. It is the vernacular not only of that province but also of the adjoining districts and native states of Madras and of the Central Provinces. In 1901 it was spoken by 9,687,429 people. It is closely related to Bengali and Assamese, and with them and with Bihari it forms the Eastern Group of the Indo-Aryan vernaculars. See Bengali.

ORIZABA (Aztec, *Citlaltepetl*, "star mountain"), an extinct or dormant volcano, on the boundary between the Mexican states of Puebla and Vera Cruz and very nearly on the 19th parallel. It rises from the south-eastern margin of the great Mexican plateau to an elevation of 18,314 ft., according to Scovell and Bunsen's measurements in 1891–1892, or 18,250 and 18,209 ft. according to other authorities, and 18,701 (5700 metres) by the Comisión Geográfica Exploradora. It is the highest peak in Mexico and the second highest in North America. Its upper timber line is about 13,500 ft. above sea-level, and Hans Gadow found patches of apparently permanent snow at an elevation of 14,400 ft. on its S.E. side in 1902. The first ascent of Orizaba was made by Reynolds and Maynard in 1848, since when other successful attempts have been made and many failures have been recorded. Its last eruptive period was 1545–1566, and the volcano is now considered to be extinct, although Humboldt records that smoke was seen issuing from its summit as late as the beginning of the 19th century.

ORIZABA (Indian name *Ahuaializ-apan*, pleasant waters), a city of Mexico in the state of Vera Cruz, 82 m. by rail W.S.W. of the port of Vera Cruz. Pop. (1900) 32,894, including a large percentage of Indians and half-breeds. The Mexican railway affords frequent communication with the City of Mexico and Vera Cruz, and a short line ($4\frac{1}{2}$ m.) connects with Ingenio, an industrial village. Orizaba stands in a fertile, well-watered, and richly wooded valley of the Sierra Madre Oriental, 4025 ft. above sea-level, and about 18 m. S. of the snow-crowned volcano that bears its name. It has a mild, humid and healthful climate. The public edifices include the parish church of San Miguel, a chamber of commerce, a handsome theatre, and some hospitals. The city is the centre of a rich agricultural region which produces sugar, rum, tobacco and Indian corn. In colonial times, when tobacco was one of the crown monopolies, Orizaba was one of the districts officially licensed to produce it. It is also a manufacturing centre of importance, having good water power from the Rio Blanco and producing cotton and woollen fabrics. Its cotton factories are among the largest in the republic. Paper is also made at Cocolapan in the canton of Orizaba. The forests in this vicinity are noted for orchids and ferns. An Indian town called *Ahuaializapan*, subject to Aztec rule, stood here when Cortes arrived on the coast. The Spanish town that succeeded it did not receive its charter until 1774, though it was one of the stopping-places between Vera Cruz and the capital. In 1862 it was the headquarters of the French.

ORKHON INSCRIPTIONS, ancient Turkish inscriptions of the 8th century A.D., discovered near the river Orkhon to the south of Lake Baikal in 1889. They are written in an alphabet derived from an Aramaic source and recount the history of the northern branch of the Turks or Tu-kiue of Chinese historians. See Turks.

ORKNEY, EARL OF, a Scottish title held at different periods by various families, including its present possessors the Fitzmaurices. The Orkney Islands (*q.v.*) were ruled by jarls or earls under the supremacy of the kings of Norway from very early times to about 1360, many of these jarls being also earls of Caithness under the supremacy of the Scottish kings. Perhaps the most prominent of them were a certain Paul (d. 1099) who assisted the Norwegian king, Harald III. Haardraada, when he invaded England in 1066; and his grandson Paul the Silent, who built, at least in part, the cathedral of St Magnus at Kirkwall. They were related to the royal families of Scotland and Norway.

In its more modern sense the earldom dates from about 1380, and the first family to hold it was that of Sinclair, Sir Henry Sinclair (d. *c.* 1400) of Roslin, near Edinburgh, being recognized as earl by the king of Norway. Sir Henry was the son of Sir William Sinclair, who was killed by the Saracens whilst accompanying Sir James Douglas, the bearer of the Bruce's heart, to Palestine in 1330, and on the maternal side was the grandson of Malise, who called himself earl of Strathearn, Caithness and Orkney. He ruled the islands almost like a king, and employed in his service the Venetian travellers Nicolo and Antonio Zeno. His son Henry (d. 1418) was admiral of Scotland and was taken prisoner by the English in 1406, together with Prince James, afterwards King James I.; his grandson William, the 3rd earl (*c.* 1404–1480), was chancellor of Scotland and took some part in public affairs. In 1455 William was created earl of Caithness, and in 1470 he resigned his earldom of Orkney to James III. of Scotland, who had just acquired the sovereignty of these islands through his marriage with Margaret, daughter of Christian I., king of Denmark and Norway. In 1567 Queen Mary's lover, James Hepburn, earl of Bothwell, was created duke of Orkney, and in 1581 her half-brother Robert Stewart (d. 1592), an illegitimate son of James V., was made earl of Orkney. Robert, who was abbot of Holyrood, joined the party of the reformers and was afterwards one of the principal enemies of the regent Morton. His son Patrick acted in a very arbitrary manner in the Orkneys, where he set the royal authority at defiance; in 1609 he was seized and imprisoned, and, after his bastard son Robert had suffered death for heading a rebellion, he himself was executed in February 1614, when his honours and estates were forfeited.

In 1696 Lord George Hamilton was created earl of Orkney (see below). He married Elizabeth Villiers (see below), and he was succeeded by his daughter Anne (d. 1756), the wife of

William O'Brien, 4th earl of Inchiquin. Anne's daughter Mary (*c.* 1721–1791) and her granddaughter Mary (1755–1831) were both countesses of Orkney in their own right; the younger Mary married Thomas Fitzmaurice (1742–1793), son of John Petty, earl of Shelburne, and was succeeded in the title by her grandson, Thomas John Hamilton Fitzmaurice (1803–1877), whose descendants still hold the earldom.

ORKNEY, ELIZABETH HAMILTON, Countess of (*c.* 1657–1733), mistress of the English King William III., daughter of Colonel Sir Edward Villiers of Richmond, was born about 1657. Her mother, Frances Howard, daughter of the 2nd earl of Suffolk, was governess to the princesses Mary and Anne, and secured place and influence for her children in Mary's household. Edward Villiers, afterwards created 1st earl of Jersey (1656–1711), became master of the horse, while his sisters Anne and Elizabeth were among the maids of honour who accompanied Mary to the Hague on her marriage. Elizabeth Villiers became William's acknowledged mistress in 1680. After his accession to the English crown he settled on her a large share of the confiscated Irish estates of James II. This grant was revoked by parliament, however, in 1699. Mary's distrust of Marlborough was fomented by Edward Villiers, and the bitter hostility between Elizabeth Villiers and the duchess of Marlborough perhaps helped to secure the duke's disgrace with William. Shortly after Mary's death, William, actuated, it is said, by his wife's expressed wishes, broke with Elizabeth Villiers, who was married to her cousin, Lord George Hamilton, fifth son of the 3rd duke of Hamilton, in November 1695. The husband was gratified early in the next year with the titles of earl of Orkney, viscount of Kirkwall and Baron Dechmont. The countess of Orkney served her husband's interests with great skill, and the marriage proved a happy one. She died in London on the 19th of April 1733.

ORKNEY, GEORGE HAMILTON, Earl of (1666–1737), British soldier, was the fifth son of William, duke of Hamilton, and was trained for the military career by his uncle, Lord Dumbarton, in the 1st Foot. In 1689 he became lieut.-colonel and a few months later brevet colonel. He served at the battles of the Boyne and of Aughrim, and, at the head of the Royal Fusiliers, at Steinkirk. As colonel of his old regiment, the 1st Foot, he took part in the battle of Landen or Neerwinden, and in the siege of Namur, serving also at Athlone and Limerick in the Irish war. At Namur Hamilton received a severe wound, and in recognition of his services was made a brigadier. In 1695 he married Elizabeth Villiers (see above), who was "the wisest woman" Swift "ever knew." The following year he was made earl of Orkney in the Scottish peerage. As a major-general he took the field with Marlborough in Flanders, and on January 1st, 1703–1704 he became lieutenant-general. At Blenheim it was Orkney's command which carried the village, and in June 1705 he led a flying column which marched from the Moselle to the rescue of Liége. At Ramillies he headed the pursuit of the defeated French, at Oudenarde he played a distinguished part and in 1708 he captured the forts of St Amand and St Martin at Tournay. At the desperately fought battle of Malplaquet Lord Orkney's battalions led the assault on the French entrenchments, and suffered very severe losses. He remained with the army in Flanders till the end of the war, as "general of the foot," and at the peace he was made colonel-commandant of the 1st Foot as a reward for his services. He occupied various civil and military posts of importance, culminating with the appointment of "field marshal of all His Majesty's forces" in 1736. This appointment is the first instance of field marshal's rank (as now understood) in the British Service. A year later he died in London.

ORKNEY ISLANDS, a group of islands, forming a county, off the north coast of Scotland. The islands are separated from the mainland by the Pentland Firth, which is 6¼ m. wide between Brough Ness in the island of South Ronaldshay and Duncansbay Head in Caithness-shire. The group is commonly estimated to consist of 67 islands, of which 30 are inhabited (though in the case of four of them the population comprises only the lighthouse attendants), but the number may be increased to as many as 90 by including rocky islets more usually counted with the islands of which they probably once formed part. The Orkneys lie between 58° 41′ and 59° 24′ N., and 2° 22′ and 3° 26′ W., measure 50 m. from N.E. to S.W. and 29 m. from E. to W., and cover 240,476 acres or 375·5 sq. m. Excepting on the west coasts of the larger islands, which present rugged cliff scenery remarkable both for beauty and for colouring, the group lies somewhat low and is of bleak aspect, owing to the absence of trees. The highest hills are found in Hoy. The only other islands containing heights of any importance are Pomona, with Ward Hill (880 ft.), and Wideford (740 ft.) and Rousay. Nearly all of the islands possess lakes, and Loch Harray and Loch Stenness in Pomona attain noteworthy proportions. The rivers are merely streams draining the high land. Excepting on the west fronts of Pomona, Hoy and Rousay, the coast-line of the islands is deeply indented, and the islands themselves are divided from each other by straits generally called *sounds* or *firths*, though off the north-east of Hoy the designation *Bring Deeps* is used, south of Pomona is Scapa *Flow* and to the south-west of Eday is found the *Fall* of Warness. The very names of the islands indicate their nature, for the terminal *a* or *ay* is the Norse *ey*, meaning "island," which is scarcely disguised even in the words Pomona and Hoy. The islets are usually styled *holms* and the isolated rocks *skerries*. The tidal currents, or races, or *roost* (as some of them are called locally, from the Icelandic) off many of the isles run with enormous velocity, and whirlpools are of frequent occurrence, and strong enough at times to prove a source of danger to small craft. The charm of the Orkneys does not lie in their ordinary physical features, so much as in beautiful atmospheric effects, extraordinary examples of light and shade, and rich coloration of cliff and sea.

Geology.—All the islands of this group are built up entirely of Old Red Sandstone. As in the neighbouring mainland of Caithness, these rocks rest upon the metamorphic rocks of the eastern schists, as may be seen on Pomona, where a narrow strip is exposed between Stromness and Inganess, and again in the small island of Graemsay; they are represented by grey gneiss and granite. The upper division of the Old Red Sandstone is found only in Hoy, where it forms the Old Man and neighbouring cliffs on the N.W. coast. The Old Man presents a characteristic section, for it exhibits a thick pile of massive, current-bedded red sandstones, resting, near the foot of the pinnacle, upon a thin bed of amygdaloidal porphyrite, which in its turn lies unconformably upon steeply inclined flagstones. This bed of volcanic rock may be followed northward in the cliffs, and it may be noticed that it thickens considerably in that direction. The Lower Old Red Sandstone is represented by well-bedded flagstones over most of the islands; in the south of Pomona these are faulted against an overlying series of massive red sandstones, but a gradual passage from the flagstones to the sandstones may be followed from Westray S.E. into Eday. A strong synclinal fold traverses Eday and Shapinsay, the axis being N. and S. Near Haco's Ness in Shapinsay there is a small exposure of amygdaloidal diabase which is of course older than that in Hoy. Many indications of ice action are found in these islands; striated surfaces are to be seen on the cliffs in Eday and Westray, in Kirkwall Bay and on Stennie Hill in Eday; boulder clay, with marine shells, and with many boulders of rocks foreign to the islands (chalk, oolitic limestone, flint, &c.), which must have been brought up from the region of Moray Firth, rests upon the old strata in many places. Local moraines are found in some of the valleys in Pomona and Hoy.

Climate and Industries.—The climate is remarkably temperate and equable for so northerly a latitude. The average temperature for the year is 46° F., for winter 39° F. and for summer 54° 3′ F. The winter months are January, February and March, the last being the coldest. Spring never begins till April, and it is the middle of June before the heat grows genial. September is frequently the finest month, and at the end of October or beginning of November occurs the peerie (or little) summer, the counterpart of the St Martin's summer of more southerly climes. The average annual rainfall varies from 33·4 in. to 37 in. Fogs occur during summer and early autumn, and furious gales may be expected four or five times in the year, when the crash of the Atlantic waves is audible for 20 m. To tourists one of the fascinations of the islands is their "nightless summers." On the longest day the sun rises at 3 o'clock A.M. and sets at 9.25 P.M., and darkness is unknown, it being possible to read at midnight. Winter, however, is long and depressing. On the shortest day the sun rises at 9.10 A.M. and sets at 3.17 P.M. The soil generally is a sandy loam or a strong but friable clay, and very fertile. Large quantities of seaweed as well as lime and marl are available for manure. Until the middle of the 19th century the methods of agriculture were of a primitive character, but since then they have been entirely transformed, and Orcadian farming is now not below the average standard of the Scottish lowlands. The crofters' houses have been rebuilt of stone and lime, and are superior to those in most parts of the Highlands. The holdings run fairly small, the average being between 30 and 40 acres. Practically the only grain crops that are cultivated are oats (which greatly predominate) and barley, while the favoured root crops are turnips (much the most extensively grown) and potatoes. Not half of the area has been brought under cultivation, and the acreage under wood is insignificant. The raising of live stock is rigorously pursued. Shorthorns and polled Angus are the commonest breeds of cattle; the sheep are mostly Cheviots and a Cheviot-Leicester cross, but the native sheep are still reared in considerable numbers in Hoy and South Ronaldshay; pigs are also kept on several of the islands, and the horses—as a rule hardy, active and small, though larger than the famous Shetland ponies—are very numerous, but mainly employed in connexion with agricultural work. The woollen trade once promised to reach considerable dimensions, but towards the end of the 18th century was superseded by the linen (for which flax came to be largely grown); and when this in turn collapsed before the products of the mills of Dundee, Dunfermline and Glasgow, straw-plaiting was taken up, though only to be killed in due time by the competition of the south. The kelp industry, formerly of at least minor importance, has ceased. Sandstone is quarried on several islands, and distilleries are found in Pomona (near Kirkwall and Stromness). But apart from agriculture the principal industry is fishing. For several centuries the Dutch practically monopolized the herring fishery, but when their supremacy was destroyed by the salt duty, the Orcadians failed to seize the opportunity thus presented, and George Barry (d. 1805) says that in his day the fisheries were almost totally neglected. The industry, however, has now been organized, and over 2000 persons are employed in the various branches of it. The great catches are herring, cod and ling, but lobsters and crabs are also exported in large quantities. There is a regular communication by steamer between Stromness and Kirkwall, and Thurso, Wick, Aberdeen and Leith, and also between Kirkwall and Lerwick and other points of the Shetlands.

Population and Administration.—In 1891 the population numbered 30,453, and in 1901 it was 28,699, or 67 persons to the sq. m. In 1901 there were 70 persons who spoke Gaelic and English, but none who spoke Gaelic only. Orkney unites with Shetland to send one member to parliament, and Kirkwall, the county town and the only royal burgh, is one of the Wick district groups of parliamentary burghs. There is a combination poorhouse at Kirkwall, where there are also two hospitals. Orkney forms a sheriffdom with Shetland and Caithness, and a resident sheriff-substitute sits at Kirkwall. The county is under the school-board jurisdiction, but at Kirkwall and Stromness there are public schools giving secondary education.

The Inhabited Islands.—Premising that they are more or less scattered, and that several lie on the same plane, the following list gives the majority of the inhabited islands from south to north, the number within brackets indicating the population. Sule Skerry (3) and the Pentland Skerries (8) lie at the eastern entrance of the Portland Firth; Swona (23), 1½ m. from the mainland, belongs to Caithness and is situated in the parish of Canisbay; South Ronaldshay (1991) is the best cultivated and most fertile of the southern isles of the group. On Hoxa Head, to the west of the large village of St Margaret's Hope, is a *broch*, or round tower, and the island contains, besides, examples of Picts' houses and standing stones. Hoy (*q.v.*; 1216) is the southernmost of the larger islands. Flotta (372), east of Hoy, was the home for a long time of the Scandinavian compiler of the *Codex Flotticensis*, which furnished Thormodr Torfaeus (1636–1719), the Icelandic antiquary, with many of the facts for his *History of Norway*, more particularly with reference to the Norse occupation of Orkney. Pharay (59) also lies E. of Hoy. Burray (677) is famous for the *broch* from which the island takes its name (Borgarey, Norse, "island of the broch"). The tower stands on the north-western shore, is 15 ft. high, has walls from 15 to 20 ft. thick, built of layers of flat stones without cement or mortar, and an interior diameter of 40 ft. It is entered from the east by a passage, on each side of which there is a small chamber constructed within the thickness of the wall. Similar chambers occur on the west, north and south sides, accessible only from the interior. Adjoining the southern chamber is the inside stair conducting to the top of the *broch*; of this stair some twenty steps remain. Between Hoy and Pomona are Hunda (8), Cava (17), and Graemsay (195), which has excellent soil and is mostly under cultivation. The isle is surrounded by shoals, and high-level and low-level lighthouses have been erected, the one at the north-west and the other at the north-east corner. The cliffs of Copinshay (10) are a favourite haunt of sea-birds, which are captured by the cragsmen for their feathers and eggs. Half a mile to the N.E. is the great rock which, from a fancied resemblance to a horse rearing its head from the sea, is called the Horse of Copinshay. Pomona (*q.v.*; 16,235) is the principal island and as such is known also as Mainland. Shapinshay (765) was the birthplace of William Irving, father of Washington Irving. It possesses several examples of Pictish and Scandinavian antiquities, such as the "Odin stone" and the *broch* of Burrowstone. Balfour Castle, a mansion in the Scottish Baronial style built in 1848, is situated near the south-western extremity of the island. The island takes its name from Hjalpand, a Norse viking. Gairsay (33) was the residence of Sweyn Asleifson, the rover, celebrated in the *Orkneyinga Saga* for his exploits as a trencherman and his feats in battle. Stronsay (1159) is a busy station of the herring fishery, and is also largely under cultivation. At Lamb Head, its south-easterly point, is a broch and Pictish pier, and about 2 m. farther north, on Odin Bay, is a round pit in the rocks called the Vat of Kirbuster. The well of Kildinguie was once resorted to as a specific for leprosy. Papa Stronsay (16) commemorates in its name, as others of both the Orkneys and Shetlands do, the labours of the Celtic *papae*, or missionaries, who preached the Christian gospel before the arrival of the Northmen. The adjacent Veira or Wire has a population of 60. Egilshay (142) is the island on which St Magnus was murdered by his cousin Hacco in 1115. It derives its name—Church (*ecclesia*) Island—from the little church of St Magnus, now in ruins, consisting of a chancel 15 ft. long, and nave 30 ft. long. The building has a round tower at the west end of the nave. The tower resembles similar constructions found beside Irish churches of the 7th and 8th centuries and has walls 3 ft. thick. It is doubtful whether it must be ascribed to the Celtic evangelists or to a much later period—not earlier than the 12th century. On Rousay (627) the cairn of Blotchnie Fiold (811 ft.), the highest point of the island, commands a beautiful survey of the northern isles of the archipelago. At the southern base of the hill stands the fine mansion of Trumbland House. Eday (596) contains several specimens of weems, mounds and standing stones. It affords good pasturage and has sandstone quarries. Carrick village, once a burgh of barony, with salt pans and other manufactures, was named after the earl of Carrick, brother of Patrick Stewart, 2nd earl of Orkney (d. 1614). It was off this island that John Gow, the pirate, was taken in 1725. Sanday (1727), with an area of 19 sq. m., is one of the largest of the northern isles, and yields excellent crops of potatoes and grain. It has safe harbours, in the north at Otterswick and in the south at Kettletoft. The antiquities include a *broch* in Elsness. Pharay (47) lies W. of Edey. Westray (1956), one of the seats of the cod fishery, has a good harbour at Pier-o'-wall. Noltland Castle, in the vicinity, is interesting as having been proposed as the refuge of Queen Mary after her flight from Loch Leven. It dates from the 15th century or even earlier, and was at one time the property of Sir Gilbert Balfour, the Master of Queen Mary's Household. The building, now in ruins, was never completed. On one side of the inner court, to which a finely ornamental doorway gives access, is a large hall with a vaulted ceiling of stone, 20 ft. high. The cliffs and overhanging crags at Noup Head (250 ft.), the most westerly point, are remarkably picturesque. An isolated portion, divided from the headland by a narrow chasm, is known as the Stack of Noup. Gentleman's Cave, 1 m. to the south, was so called from the circumstance that it afforded shelter to five of the leading followers of Prince Charles Edward, who lay here during the winter of 1745–1746. Papa Westray (295) and North Ronaldshay (442) are the most northerly islands of the group. The latter is only reached from Sanday, from which it is separated by a dangerous firth 2½ m. wide. The monumental stone with Ogham inscription, which was discovered in the *broch* of Burrian, must date from the days of the early Christian missionaries.

History.—The Orkneys were the *Orcades* of classical writers, and the word is probably derived from the Norse *Orkn*, seal, and *ey*, island. The original inhabitants were Picts, evidence of whose occupation still exists in numerous weems or underground houses, chambered mounds, barrows or burial mounds, brochs or round towers, and stone circles and standing stones. Such implements as have survived are of the rudest description, and include querns or stone handmills for grinding corn, stone worls and bone combs employed in primitive forms of woollen manufacture, and specimens of simple pottery ware. If, as seems likely, the Dalriadic Scots towards the beginning of the 6th century established a footing in the islands, their success was short-lived, and the Picts regained power and kept it until dispossessed by the Norsemen in the 9th century. In the wake of the Scots incursionists followed the Celtic missionaries about 565. They were companions of St Columba and their efforts to convert the folk to Christianity seem to have impressed the popular imagination, for several islands bear the epithet "Papa" in commemoration of the preachers. Norse pirates having made the islands the headquarters of their buccaneering expeditions indifferently against their own Norway and the coasts and isles of Scotland, Harold Haarfager ("Fair Hair"), subdued the rovers in 875 and both the Orkneys and Shetlands to Norway. They remained under the rule of Norse earls until 1231, when the line of the jarls became extinct. In that year the earldom of Caithness was granted to Magnus, second son of the earl of Angus, whom the king of Norway apparently confirmed in the title. In 1468 the Orkneys and Shetlands were pledged by Christian I. of Denmark for the payment of the dowry of his daughter Margaret, betrothed to James III. of Scotland, and as the money was never paid, their connexion with the crown of Scotland has been perpetual. In 1471 James bestowed the castle and lands of Ravenscraig in Fife on William, earl of Orkney, in exchange for all his rights to the earldom of Orkney, which, by act of parliament passed on the 20th of February of the same year, was annexed to the Scottish crown. In 1564 Lord Robert Stewart, natural son of James V., who had visited Kirkwall twenty-four years before, was made sheriff of the Orkneys and Shetlands, and received possession of the estates of the *udallers*; in 1581 he was created earl of Orkney by James IV., the charter being ratified ten years later to his son Patrick, but in 1615 the earldom was again annexed to the crown. The islands were the *rendezvous* of Montrose's expedition in 1650 which culminated in his imprisonment and death. During the Protectorate they were visited by a detachment of Cromwell's troops, who initiated the inhabitants into various industrial arts and new methods of agriculture. In 1707 the islands were granted to the earl of Morton in mortgage, redeemable by the Crown on payment of £30,000, and subject to an annual feu-duty of £500; but in 1766 his estates were sold to Sir Lawrence Dundas, ancestor of the earls of Zetland. In early times both the archbishop of Hamburg and the archbishop of York disputed with the Norwegians ecclesiastical jurisdiction over the Orkneys and the right of consecrating bishops; but ultimately the Norwegian bishops, the first of whom was William the Old, consecrated in 1102, continued the canonical succession. The see remained vacant from 1580 to 1606, and from 1638 till the Restoration, and, after the accession of William III., the episcopacy was finally abolished (1697), although many of the clergy refused to conform. The topography of the Orkneys is wholly Norse, and the Norse tongue, at last extinguished by the constant influx of settlers from Scotland, lingered until the end of the 18th century. Readers of Scott's *Pirate* will remember the frank contempt which Magnus Troil expressed for the Scots, and his opinions probably accurately reflected the general Norse feeling on the subject. When the islands were given as security for the princess's dowry, there seems reason to believe that it was intended to redeem the pledge, because it was then stipulated that the Norse system of government and the law of St Olaf should continue to be observed in Orkney and Shetland. Thus the *udal* succession and mode of land tenure (or, that is, absolute freehold as distinguished from feudal tenure) still obtain to some extent, and the remaining *udallers* hold their lands and pass them on without written title. Among well-known Orcadians may be mentioned James Atkine (1613–1687), bishop first of Moray and afterwards of Galloway; Murdoch McKenzie (d. 1797), the hydrographer; Malcolm Laing (1762–1818), author of the *History of Scotland from the Union of the Crowns to the Union of the Kingdoms*; Mary Brunton (1778–1818), author of *Self-Control*, *Discipline* and other novels; Samuel Laing (1780–1868), author of *A Residence in Norway*, and translator of the *Heimskringla*, the Icelandic chronicle of the kings of Norway; Thomas Stewart Traill (1781–1862), professor of medical jurisprudence in Edinburgh University and editor of the 8th edition of the *Encyclopaedia Britannica*; Samuel Laing (1812–1897), chairman of the London, Brighton & South Coast railway, and introducer of the system of "parliamentary" trains with fares of one penny a mile; Dr John Rae (1813–1893), the Arctic explorer; and William Balfour Baikie (1825–1864), the African traveller.

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ORLÉANAIS, one of the provinces into which France was divided before the Revolution. It was the country around Orleans, the *pagus Aurelianensis*; it lay on both banks of the Loire, and for ecclesiastical purposes formed the diocese of Orleans. It was in the possession of the Capet family before the advent of Hugh Capet to the throne of France in 987, and in 1344 Philip VI. gave it with the title of duke to Philip (d. 1375), one of his younger sons. In a geographical sense the region around Orleans is sometimes known as Orléanais, but this is somewhat smaller than the former province.

See A. Thomas, *Les États provinciaux de la France centrale* (1879).

ORLEANISTS, a French political party which arose out of the Revolution, and ceased to have a separate existence shortly after the establishment of the third republic in 1872. It took its name from the Orleans branch of the house of Bourbon, the descendants of the duke of Orleans, the younger brother of Louis XIV., who were its chiefs. The political aim of the Orleanists may be said to have been to find a common measure for the monarchical principle and the "rights of man" as set forth by the revolutionary leaders in 1789. The articles on Philippe, nicknamed Égalité (see ORLEANS, L.P.J., duke of), and his son LOUIS PHILIPPE, king of the French (1830–1848), will show the process of events by which it came to pass that the Orleans princes became the more or less successful advocates of this attempted compromise between old and new. It may be noted here, however, that a certain attitude of opposition, and of patronage of "freedom," was traditional in this branch of the house of Bourbon. Saint-Simon tells us that the regent Orleans who died in 1723 was in the habit of avowing his admiration for English liberty—at least in safe company and private conversation. Égalité, who had reasons to dislike King Louis XVI. and his queen, Marie Antoinette, stepped naturally into the position of spokesman of the liberal royalists of the early revolutionary time, and it was a short step from that position to the attitude of liberal candidates for the throne, as against the elder branch of the royal house which claimed to reign by divine right. The elder branch as represented by Louis XVIII. was prepared to grant (*octroyer*), and did grant, a charter of liberties. The count of Chambord, the last of the line (the Spanish Bourbons who descended directly from Louis XIV. were considered to be barred by the renunciation of Philip V. of Spain), was equally ready to grant a constitution. But these princes claimed to rule "in chief of God" and to confer constitutional rights on their subjects of their own free will, and mere motion. This feudal language and these mystic pretensions offended a people so devoted to principles as the French, and so acute in drawing deductions from premises, for they concluded, not unreasonably, that rights granted as a favour were always subject to revocation as a punishment. Therefore those of them who considered a monarchical government as more beneficial to France than a republic, but who were not disposed to hold their freedom subject to the pleasure of a king, were either Bonapartists who professed to rule by the choice of the nation, or supporters of the Orleans princes who were ready to reign by an "original compact" and by the will of the people. The difference therefore between the supporters of the elder line, or Legitimists, and the Orleanists was profound, for it went down to the very foundations of government.

The first generation of Orleanists, the immediate supporters of Philippe Égalité, were swamped in the turmoil of the great revolution. Yet it has been justly pointed out by Albert Sorel in his *L'Europe et la revolution française*, that they subsisted under the Empire, and that they came naturally to the front when the revival of liberalism overthrew the restored legitimate monarchy of Louis XVIII. and Charles X. During the Restoration, 1815–1830, everything tended to identify the liberals with the Orleanists. Legitimism was incompatible with constitutional freedom. Bonapartism was in eclipse, and was moreover essentially a Caesarism which in the hands of the great Napoleon had been a despotism, calling itself democratic for no better reason than because it reduced all men to an equality of submission to a master. Those rights of equality before the law, and in social life, which had been far dearer to Frenchmen of the revolutionary epoch than political freedom, were secured. The next step was to obtain political freedom, and it was made under the guidance of men who were Orleanists because the Orleans princes seemed to them to offer the best guarantee for such a government as they desired—a government which did not profess to stand above the people and to own it by virtue of a divine and legitimate hereditary right, nor one which, like the Bonapartists, implied a master relying on an army, and the general subjection of the nation. The liberals who were Orleanists had the advantage of being very ably led by men eminent in letters and in practical affairs—Guizot, Thiers, the Broglies, the banker Laffitte and many others. When the unsurpassed folly of the legitimate rulers brought about the revolution of 1830, the Orleanists stepped into its place, and they marked the profound change which had been made in the character of the government by calling the king. "King of the French" and not "King of France and Navarre." He was chief of the people by compact with the people, and not a territorial lord holding, in feudal phrase, "in chief of God."

The events of the eighteen years of Orleanist rule cannot be detailed here. They were on the whole profitable to France. That they ended in another "general overturn" in 1848 was due no doubt in part to errors of conduct in individual princes and politicians, but mainly to the fact that the Orleanist conception of what was meant by the word "people" led them to offend the long-standing and deeply-rooted love of the French for equality. It had been inevitable that the Orleanists, in their dislike of "divine right" on the one hand, and their fear of democratic Caesarism on the other, should turn for examples of a free government to England, and in England itself to the Whigs, both the old Whigs of the Revolution Settlement of 1689, and the new Whigs who extorted political franchises for the middle classes by the Reform Bill. They saw there a monarchy based on a parliamentary title, governing constitutionally and supported by the middle classes, and they endeavoured to establish the like in France under the name of a *juste-milieu*, a *via media* between absolutism by divine right, and a democracy which they were convinced would lead to Caesarism. The French equivalent for the English middle-class constituencies was to be a *pays légal* of about a quarter of a million of voters by whom all the rest of the country was to be "virtually represented." The doctrine was expounded and was acted upon by Guizot with uncompromising rigour. The Orleanist monarchy became so thoroughly middle-class that the nation outside of the *pays légal* ended by thinking that it was being governed by a privileged class less offensive, but also a great deal less brilliant, than the aristocracy of the old monarchy.

The revolution of 1848 swept the Orleanist party from power for ever. The Orleanists indeed continued throughout the Second Republic and the Empire (1848–1870) to enjoy a marked social and literary prestige, on the strength of the wealth and capacity of some of their members, their influence in the French Academy and the ability of their organs in the press—particularly the *Revue des deux mondes*, the *Journal des débats*, and the papers directed by E. Hervé. During the Empire the discreet opposition of the Orleanists, exercised for the most part with infinite dexterity and tact, by reticences, omissions, and historical studies in which the Empire was attacked under foreign or ancient names, was a perpetual thorn in the side of Napoleon III. Yet they possessed little hold on the country and outside of a cultivated liberal circle in Paris. Their weakness was demonstrated when the second empire was swept away by the German War of 1870–71. The country in its disgust at the Bonapartists and its fear of the Republicans, chose a great many royalists to represent it in the Assembly which met in Bordeaux on the 12th of February 1872. In this body the Orleanists again exercised a kind of leadership by virtue of individual capacity, but they were counterbalanced by the Legitimists. The most effective proof of power they gave was to render possible the expulsion from power of Thiers on the 24th of May 1873, as punishment for his dexterous imposition of the Republic on the unwilling majority of the Assembly. Their real occupation was to endeavour to bring about a fusion between themselves and the Legitimists which should unite the two royalist parties for the confusion of the Bonapartists and Republicans. The belief that a fusion would strengthen the royalists was natural and was not new. As far back as 1850 Guizot had proposed, or had thought of proposing, one, but it was on the condition that the comte de Chambord would resign his divine pretentions. When a fusion was arranged in 1873 it was on quite another footing. After much exchange of notes and many agitated conferences in committee rooms and drawing-rooms, the comte de Paris, the representative of the Orleanists, sought an interview with the comte de Chambord at Frohsdorff, and obtained it by giving a written engagement that he came not only to pay his respects to the head of his house, but also to "accept his principle." It has been somewhat artlessly pleaded by the Orleanists that this engagement was given with mental reservations. But there were no mental reservations on the part of the comte de Chambord, and the country showed its belief that the liberal royalists had been fused by absorption in the divine right royalists. It returned republicans at by-elections till it transformed the Assembly. The Orleanist princes had still a part to play, more particularly after the death of the comte de Chambord in 1883 left them heads of the house of France, but the Orleanist party ceased to exist as an independent political organization.

AUTHORITIES.—The Orleanists are necessarily more or less dealt with in all histories of France since 1789, and in most political memoirs, but their principles can be learnt and their fortunes followed from the following: A. Sorel, *L'Europe et la révolution française* (Paris, 1885–1904); F. Guizot, *Histoire parlementaire de la France* (Paris, 1819–1848) and *Mémoires pour servir à l'histoire de mon temps* (Paris, 1858–1867); P. de la Gorce, *Histoire du second empire* (Paris, 1894–1904); and G. Hanotaux, *Histoire de la France contemporaine* (Paris, 1903, &c.). (D. H.)

ORLEANS, DUKES OF. The title of duke of Orleans was first created by King Philip VI. in favour of his son Philip, who died without legitimate issue in 1375. The second duke of Orleans, created in 1392, was Louis, a younger son of Charles V., whose heir was his son, the poet Charles of Orleans. Charles's son Louis, the succeeding duke, became king of France as Louis XII. in 1498, when the duchy of Orleans was united with the royal domain. In 1626 Louis XIII. created his brother, Jean Baptiste Gaston, duke of Orleans, and having become extinct on the death of this prince in 1660 the title was revived in the following year by Louis XIV. in favour of his brother Philip. Descendants of this duke have retained the title until the present day, one of them becoming king of France as Louis Philippe in 1830. Two distinguished families are descended from the first house of Orleans: the counts of Angoulême, who were descended from John, a son of Duke Louis I., and who furnished France with a king in the person of Francis I.; and the counts and dukes of Longueville, whose founder was John, count of Dunois, the bastard of Orleans, a natural son of the same duke. In addition to the dukes of Orleans the most important members of this family are: Anne Marie Louise, duchess of Montpensier; Francis, prince of Joinville; Louis Philippe Albert, count of Paris; and the traveller Prince Henry of Orleans. See the genealogical table to the article BOURBON.

See below for separate articles on the chief personages.

ORLÉANS, CHARLES, DUKE OF (1391–1465), commonly called Charles d'Orléans, French poet, was the eldest son of Louis, duke of Orleans (brother of Charles VI. of France), and of Valentina Visconti, daughter of Gian Galeazzo, duke of Milan. He was born on the 26th of May 1391. Although many minor details are preserved of his youth, nothing except his reception in 1403, from his uncle the king, of a pension of 12,000 livres d'or is worth noticing, until his marriage three years later (June 29, 1406) with Isabella, his cousin, widow of Richard II. of England. The bride was two years older than her husband, and is thought to have married him unwillingly, but she brought him a great dowry—it is said, 500,000 francs. She died three years later, leaving Charles at the age of eighteen a widower and father of a daughter. He was already duke of Orleans, for Louis had been assassinated by the Burgundians two years before (1407). He soon saw himself the most important person in France, except the dukes of Burgundy and Brittany, the king being a cipher. This position his natural temperament by no means qualified him to fill. His mother desired vengeance for her husband, and Charles did his best to carry out her wishes by filling France with intestine war. Of this, however, he was only nominally one of the leaders, the real guidance of his party resting with Bernard VII., the great count of Armagnac, whose daughter, Bonne, he married, or at least formally espoused, in 1410. Five years of confused negotiations, plots and fightings passed before the English invasion and the battle of Agincourt, where Charles was joint commander-in-chief. According to one account he was dangerously wounded and narrowly escaped with his life. He was certainly taken prisoner and carried to England, which country was his residence thenceforward for a full quarter of a century. Windsor, Pontefract, Ampthill, Wingfield (Suffolk) and the Tower are named among other places as the scenes of his captivity, which, however, was anything but a rigorous one. He was maintained in the state due not merely to one of the greatest nobles of France but to one who ranked high in the order of succession to the crown. He hunted and hawked and enjoyed society amply, though the very dignities which secured him these privileges made his ransom great, and his release difficult to arrange. Above all, he had leisure to devote himself to literary work. But for this he would hardly be more than a name.

This work consists wholly of short poems in the peculiar artificial metres which had become fashionable in France about half a century or more before his birth, and which continued to be fashionable till nearly a century after his death. Besides these a number of English poems have been attributed to him, but without certainty. They have not much poetical merit, but they exhibit something of the smoothness of versification not uncommon in those who write, with care, a language not their own. The ingenuity of a single English critic has striven to attribute to him a curious book in prose, called *Le Débat des hérauts de France et d'Angleterre*, but Paul Meyer, in his edition of the book in question, has completely disposed of this theory. For all practical purposes, therefore, Charles's work consists of some hundreds of short French poems, a few in various metres, but the majority either ballades or rondels. The chronology of these poems is not always clear, still less the identity of the persons to whom they are addressed, and it is certain that some, perhaps the greater part of them, belong to the later years of the poet's life. But many are expressly stated in the manuscripts to have been "composed in prison," others are obviously so composed, and, on the whole, there is in them a remarkable unity of literary flavour. Charles d'Orléans is not distinguished by any extraordinary strength of passion or originality of character; but he is only the more valuable as the last and not the least accomplished representative of the poetry of the middle of the middle ages, in which the form was almost everything, and the personality of the poet, save in rare instances, nothing. Yet he is not entirely without *differentia*. He is a capital example of the cultivated and refined—it may almost be called the lettered—chivalry of the last chivalrous age, expert to the utmost degree in carrying out the traditional details of a graceful convention in love and literature. But he is more than this; in a certain easy grace and truth of expression, as well as in a peculiar mixture of melancholy, which is not incompatible with the enjoyment of the pleasures, even the trifling pleasures, of life, with listlessness that is fully able to occupy itself about those trifles, he stands quite alone. He has the urbanity of the 18th century without its vicious and prosaic frivolity, the poetry of the middle ages without their tendency to tediousness. His best-known rondels—those on Spring, on the Harbingers of Summer, and others—rank second to nothing of their kind.

Poetry, however, could hardly be an entire consolation, and Charles was perpetually scheming for liberty. But the English government had too many reasons for keeping him, and it was not till his hereditary foe Philip the Good of Burgundy interested himself in him that the government of Henry VI., which had by that time lost most of its hold on France, released him in return for an immediate payment of 80,000 *saluts d'or*, and an engagement on his part to pay 140,000 crowns at a future time. The agreement was concluded on the 2nd of July, 1440. He was actually released on the 3rd of November following, and almost immediately cemented his friendship with Duke Philip by marrying his niece, Mary of Cleves, who brought him a considerable dowry to assist the payment of his ransom. He had, however, some difficulty in making up the balance, as well as the large sum required for his brother, Jean d'Angoulême, who also was an English prisoner. The last twenty-five years of his life (for, curiously enough, it divides itself into three almost exactly equal periods, each of that length) were spent partly in negotiating, with a little fighting intermixed, for the purpose of gaining the Italian county of Asti, on which he had claims through his mother, partly in travelling about, but chiefly at his principal seat of Blois. Here he kept a miniature court which, from the literary point of view at least, was not devoid of brilliancy. At this most of the best-known French men-of-letters at the time—Villon, Olivier de la Marche, Chastelain, Jean Meschinot and others—were residents or visitors or correspondents. His son, afterwards Louis XII., was not born till 1462, three years before Charles's own death. He had become, notwithstanding his high position, something of a nullity in politics, and tradition ascribes his death to vexation at the harshness with which Louis XI. rejected his attempt to mediate on behalf of the duke of Brittany. At any rate he died, on the 4th of January, 1465, at Amboise. Many of his later poems are small occasional pieces addressed to his courtiers and companions, and in not a few cases answers to them by those to whom they were addressed exist.

The best edition of Charles d'Orléans's poems, with a brief but sufficient account of his life, is that of C. d'Héricault in the *Nouvelle collection Jannet* (Paris, 1874). For the English poems see the edition by Watson Taylor for the Roxburghe Club (1827). (G. Sa.)

ORLEANS, FERDINAND PHILIP LOUIS CHARLES HENRY, Duke of (1810–1842), born at Palermo on the 3rd of September 1810, was the son of Louis Philippe, duke of Orleans, afterwards king of France, and Marie Amélie, princess of the Two Sicilies. Under the Restoration he bore the title of duke of Chartres, and studied classics in Paris at the Collège Henri IV. At the outbreak of the Revolution, which in 1830 set his father on the throne, he was colonel of a regiment of Hussars. He then assumed the title of duke of Orleans, and was sent by the king to Lyons to put down the formidable riots which had broken out there (1831), and then to the siege of Antwerp (1832). He was appointed lieutenant-general, and made several campaigns in Algeria (1835, 1839, 1840). On his return to France he organized the battalions of light infantry known as the *chasseurs d'Orléans*. He died as the result of a carriage accident at Neuilly, near Paris, on the 13th of July 1842.

The duke of Orleans had married (May 30, 1837) Helène Louise Elisabeth of Mecklenburg-Schwerin, and had by her two sons, the count of Paris and the duke of Chartres. On the 24th of February 1848, after the abdication of Louis Philippe, the duchess of Orleans went to the Chamber of Deputies assembled in the Palais Bourbon in the hope of having her eldest son proclaimed and of obtaining the regency; but the threatening attitude of the populace forced her to flee. She took refuge in England, and died at Richmond on the 18th of May 1858. (M. P.*)

ORLEANS, HENRI, Prince of (1867–1901), eldest son of Robert, duke of Chartres, was born at Ham, near Richmond, Surrey, on the 16th of October 1867. In 1889, at the instance of his father, who paid the expenses of the tour, he undertook, in company with MM. Bonvalot and Dedecken, a journey through Siberia to Siam. In the course of their travels they crossed the mountain range of Tibet, and the fruits of their observations, submitted to the Geographical Society of Paris (and later incorporated in *De Paris au Tonkin à travers le Tibet inconnu*, published in 1892), brought them conjointly the gold medal of that society. In 1892 the prince made a short journey of exploration in East Africa, and shortly afterwards visited Madagascar, proceeding thence to Tongking. From this point he set out for Assam, and was successful in discovering the sources of the river Irrawaddy, a brilliant geographical achievement which secured the medal of the Geographical Society of Paris and the cross of the Legion of Honour. In 1897 he revisited Abyssinia, and political differences arising from this trip led to a duel with the comte de Turin, in which both combatants were wounded. While on a trip to Assam in 1901 he died at Saigon on the 9th of August. Prince Henri was a somewhat violent Anglophobe, and his diatribes against Great Britain contrasted rather curiously with the cordial reception which his position as a traveller obtained for him in London, where he was given the gold medal of the Royal Geographical Society.

ORLEANS, HENRIETTA, Duchess of (1644–1670), third daughter of the English king, Charles I., and his queen, Henrietta Maria, was born during the Civil War at Exeter on the 16th of June 1644. A few days after her birth her mother left England, and provision for her maintenance having been made by Charles she lived at Exeter under the care of Lady Dalkeith (afterwards countess of Morton) until the surrender of the city to the parliamentarians, when she was taken to Oatlands in Surrey. Then in July 1646 Lady Dalkeith carried the princess in disguise to France, and she rejoined her mother in Paris, where her girlhood was spent and where she was educated as a Roman Catholic. Henrietta was present at the coronation of Louis XIV., and was mentioned as a possible bride for the king, but she was betrothed, not to Louis, but to his only brother Philip. After the restoration of her brother Charles II., she returned to England with her mother, but a few months later she was again in Paris, where she was married to Philip, now duke of Orleans, on the 30th of March 1661. The duchess was very popular at the court of Louis XIV., and was on good terms with the grand monarch himself; she shared in the knowledge of state secrets, but was soon estranged from her husband, and at the best her conduct was very imprudent. In 1670, at the instigation of Louis, she visited England and obtained the signature of Charles II.'s ministers to the treaty of Dover; her success in this matter greatly delighted Louis, but it did not improve her relations with Philip, who had long refused his consent to his wife's visit to England. Shortly after returning to France, Henrietta died at St Cloud on the 30th of June 1670. She was buried at St Denis, her funeral oration being pronounced by her friend Bossuet, and it was asserted that she had been poisoned by order of her husband. She left two daughters, Marie Louise, wife of Charles II. of Spain, and Anne Marie, wife of Victor Amadeus II. of Savoy. According to legitimist principles, the descendants of Henrietta, through her daughter Marie of Savoy, are entitled to wear the British crown.

ORLEANS, JEAN BAPTISTE GASTON, Duke of (1608–1660), third son of the French king Henry IV., and his wife Marie de Medici, was born at Fontainebleau on the 25th of April 1608. Known at first as the duke of Anjou, he was created duke of Orleans in 1626, and was nominally in command of the army which besieged La Rochelle in 1628, having already entered upon that course of political intrigue which was destined to occupy the remainder of his life. On two occasions he was obliged to leave France for conspiring against the government of his mother and of Cardinal Richelieu; and after waging an unsuccessful war in Languedoc, he took refuge in Flanders. Reconciled with his brother Louis XIII., he plotted against Richelieu in 1635, fled from the country, and then submitted to the king and the cardinal. Soon afterwards the same process was repeated. Orleans stirred up Cinq-Mars to attempt Richelieu's murder, and then deserted his unfortunate accomplice. In 1643, on the death of Louis XIII., Gaston became lieutenant-general of the kingdom, and fought against Spain on the northern frontiers of France; but during the wars of the Fronde he passed with great facility from one party to the other. Then exiled by Mazarin to Blois in 1652 he remained there until his death on the 2nd of February 1660. Gaston's first wife was Marie (d. 1627), daughter and heiress of Henri de Bourbon, duc de Montpensier (d. 1608), and his second wife was Marguerite (d. 1672), sister of Charles III., duke of Lorraine. By Marie he left a daughter, Anne Marie, duchesse de Montpensier (*q.v.*); and by Marguerite he left three daughters, Marguerite Louise (1645–1721), wife of Cosimo III., grand duke of Tuscany; Elizabeth (1646–1696), wife of Louis Joseph, duke of Guise; and Françoise Madeleine (1648–1664), wife of Charles Emmanuel II., duke of Savoy. (M. P.*)

ORLEANS, LOUIS, Duke of (1372–1407), younger son of the French king, Charles V., was born on the 13th of March 1372. Having been made count of Valois and of Beaumont-sur-Oise, and then duke of Touraine, he received the duchy of Orleans from his brother Charles VI. in 1392, three years after his marriage with Valentina (d. 1408), daughter of Gian Galeazzo Visconti, duke of Milan. This lady brought the county of Asti to her husband; but more important was her claim upon Milan, which she transmitted to her descendants, and which furnished Louis XII. and Francis I. with a pretext for interference in northern Italy. When Charles VI. became insane in 1392, Orleans placed himself in opposition to his uncle Philip II., duke of Burgundy, who was conducting the government; and this quarrel was not only the dominating factor in the affairs of France, but extended beyond the borders of that country. Continued after Philip's death in 1404 with his son and successor, John the Fearless, it culminated in the murder of Orleans by one of John's partisans on the 23rd of November 1407. The duke, who was an accomplished and generous prince, was suspected of immoral relations with several ladies of the royal house, among them Isabella of Bavaria, the queen of Charles VI. He had eight children by Valentina Visconti, including his successor, Charles of Orleans, the poet, and one of his natural sons was the famous bastard of Orleans, John, count of Dunois.

See E. Jarry, *La Vie politique de Louis d'Orléans* (Paris, 1889).

ORLEANS, LOUIS, Duke of (1703–1752), only son of Duke Philip II., the regent Orleans, was born at Versailles on the 4th of August 1703. A pious, charitable and cultured prince, he took very little part in the politics of the time, although he was conspicuous for his hostility to Cardinal Dubois in 1723. In 1730 Cardinal Fleury secured his dismissal from the position of colonel-general of the infantry, a post which he had held for nine years; and retiring into private life, he spent his time mainly in translating the Psalms and the epistles of St Paul. Having succeeded his father as duke of Orleans in 1723, he died in the abbey of St Geneviève at Paris on the 4th of February 1752. His wife Augusta (d. 1726), daughter of Louis William, margrave of Baden, bore him an only son, Louis Philippe, who succeeded his father as duke of Orleans.

ORLEANS, LOUIS PHILIPPE, Duke of (1725–1785), son of Louis, duke of Orleans, was born at Versailles on the 12th of May 1725, and was known as the duke of Chartres until his father's death in 1752. Serving with the French armies he distinguished himself in the campaigns of 1742, 1743 and 1744, and at the battle of Fontenoy in 1745, retiring to Bagnolet in 1757, and occupying his time with theatrical performances and the society of men of letters. He died at St Assise on the 18th of November 1785. The duke married Louise Henriette de Bourbon-Conti, who bore him a son Philip (Égalité), duke of Orleans, and a daughter, who married the last duke of Bourbon. His second wife, Madame de Montesson, whom he married secretly in 1773, was a clever woman and an authoress of some repute. He had two natural sons, known as the abbot of St Far and the abbot of St Albin.

See *L'Automne d'un prince*, a collection of letters from the duke to his second wife, edited by J. Hermand (1910).

ORLEANS, LOUIS PHILIPPE JOSEPH, Duke of (1747–1793), called Philippe Égalité, son of Louis Philippe, duke of Orleans, and of Louise Henriette of Bourbon-Conti, was born at St Cloud on the 13th of April 1747. Having borne the title of duke of Montpensier until his grandfather's death in 1752, he became duke of Chartres, and in 1769 married Louise Marie Adelaide de Bourbon-Penthièvre, daughter and heiress of the duke of Penthièvre, grand admiral of France, and the richest heiress of the time. Her wealth made it certain that he would be the richest man in France, and he determined to play a part equal to that of his great-grandfather, the regent, whom he resembled in character and debauchery. As duke of Chartres he opposed the plans of Maupeou in 1771, and was promptly exiled to his country estate of Villers-Cotterets (Aisne). When Louis XVI. came to the throne in 1774 Chartres still found himself looked on coldly at court; Marie Antoinette hated him, and envied him for his wealth, wit and freedom from etiquette, and he was not slow to return her hatred with scorn. In 1778 he served in the squadron of D'Orvilliers, and was present in the naval battle of Ushant on the 27th of July 1778. He hoped to see further service, but the queen was opposed to this, and he was removed from the navy, and given the honorary post of colonel-general of hussars. He then abandoned himself to pleasure; he often visited London, and became an intimate friend of the prince of Wales (afterwards George IV.); he brought to Paris the "anglo-mania," as it was called, and made jockeys as fashionable as they were in England. He also made himself very popular in Paris by his large gifts to the poor in time of famine, and by throwing open the gardens of the Palais Royal to the people. Before the meeting of the notables in 1787 he had succeeded his father as duke of Orleans, and showed his liberal ideas, which were largely learnt in England, so boldly that he was believed to be aiming at becoming constitutional king of France. In November he again showed his liberalism in the *lit de justice*, which Brienne had made the king hold, and was again exiled to Villers-Cotterets. The approaching convocation of the states-general made his friends very active on his behalf; he circulated in every *bailliage* the pamphlets which F. J. Sieyès had drawn up at his request, and was elected in three—by the noblesse of Paris, Villers-Cotterets and Crépy-en-Valois. In the estate of the nobility he headed the liberal minority under the guidance of Adrien Duport, and led the minority of forty-seven noblemen who seceded from their own estate (June 1789) and joined the Tiers État. The part he played during the summer of 1789 is one of the most debated points in the history of the Revolution. The court accused him of being at the bottom of every popular movement, and saw the "gold of Orleans" as the cause of the Reveillon riot and the taking of the Bastille, as the republicans later saw the "gold of Pitt" in every germ of opposition to themselves. There can be no doubt that he hated the queen, and bitterly resented his long disgrace at court, and also that he sincerely wished for a thorough reform of the government and the establishment of some such constitution as that of England; and no doubt such friends as Adrien Duport and Choderlos de Laclos, for their own reasons, wished to see him king of France. The best testimony for the behaviour of Orleans during this summer is the testimony of an English lady, Mrs Grace Dalrymple Elliott, who shared his heart with the comtesse de Buffon, and from which it is absolutely certain that at the time of the riot of the 12th of July he was on a fishing excursion, and was rudely treated by the king on the next day when going to offer him his services. He indeed became so disgusted with the false position of a pretender to the crown, into which he was being forced, that he wished to go to America, but, as the comtesse de Buffon would not go with him, he decided to remain in Paris. He was again accused, unjustly, of having caused the march of the women to Versailles on the 5th of October. La Fayette, jealous of his popularity, persuaded the king to send the duke to England on a mission, and thus get him out of France, and he accordingly remained in England from October 1789 to July 1790. On the 7th of July he took his seat in the Assembly, and on the 2nd of October both he and Mirabeau were declared by the Assembly entirely free of any complicity in the events of October. He now tried to keep himself as much out of the political world as possible, but in vain, for the court would suspect him, and his friends would talk about his being king. The best proof of his not being ambitious of such a doubtful piece of preferment is that he made no attempt to get himself made king, regent or lieutenant-general of the kingdom at the time of the flight to Varennes in June 1791. He, on the contrary, again tried to make his peace with the court in January 1792, but he was so insulted that he was not encouraged to sacrifice himself for the sake of the king and queen, who persisted in remembering all old enmities in their time of trouble. In the summer of 1792 he was present for a short time with the army of the north, with his two sons, the duke of Chartres and the duke of Montpensier, but had returned to Paris before the 10th of August. After that day he underwent great personal risk in saving fugitives; in particular, he saved the life of the count of Champcenetz, the governor of the Tuileries, who was his personal enemy, at the request of Mrs Elliott. It was impossible for him to recede, and, after accepting the title of Citoyen Égalité, conferred on him by the commune of Paris, he was elected twentieth and last deputy for Paris to the Convention. In that body he sat as quietly as he had done in the National Assembly, but on the occasion of the king's trial he had to speak, and then only to give his vote for the death of Louis. His compliance did not save him from suspicion, which was especially aroused by the friendship of his eldest son, the duke of Chartres, with Dumouriez, and when the news of the desertion of Chartres with Dumouriez became known at Paris all the Bourbons left in France, including Égalité, were ordered to be arrested on the 5th of April. He remained in prison till the month of October, when the Reign of Terror began. He was naturally the very sort of victim wanted, and he was decreed "of accusation" on the 3rd of October. He was tried on the 6th of November and was guillotined on the same day, with a smile upon his lips and without any appearance of fear. No man ever was more blamed than Orleans during the Revolution, but the faults of ambition and intrigue were his friends', not his own; it was his friends who wished him to be on the throne. Personally he possessed the charming manners of a polished grand seigneur: debauched and cynical, but never rude or cruel, full of gentle consideration for all about him but selfish in his pursuit of pleasure, he has had to bear a heavy load of blame, but it is ridiculous to describe the idle and courteous voluptuary as being a dark and designing scoundrel, capable of murder if it would serve his ambition. The execution of Philippe Égalité made the friend of Dumouriez, who was living in exile, duke of Orleans.

Authorities.—Baschet, *Histoire de Philippe Égalité*; *Journal* of Mrs Grace Dalrymple Elliott (1859); A. Nettement, *Philippe-Égalité* (Paris, 1842); Laurentie, *Histoire des ducs d'Orléans* (Paris, 1832); G. Peignot, *Précis historique de la maison d'Orléans* (Paris, 1830); L. C. R(ousselet), *Correspondance de Louis-Philippe Joseph d'Orléans avec Louis XVI* (Paris, 1800); Rivarol, *Portrait du duc d'Orléans et de Madame de Genlis*; Tournois, *Histoire du Louis Philippe Joseph duc d'Orléans* (Paris, 1842).

ORLEANS, LOUIS PHILIPPE ROBERT, Duke of (1869–), eldest son of the comte de Paris, was born at York House, Twickenham, on the 6th of February 1869. The law of exile against the French princes having been abrogated in 1871, he returned with his parents to France. He was first educated by a private tutor, and then followed the courses of the municipal college at Eu. In 1882 he entered the Collège Stanislas, Paris, and took a first prize in a competitive Latin translation. On the death of the comte de Chambord, the comte de Paris became head of the Bourbons; and in 1886 he and his son were exiled from France. Queen Victoria appointed the duke of Orleans a supernumerary cadet at the Royal Military College, Sandhurst. After passing his examinations he received a commission in the 4th battalion of the 60th Rifles, then quartered in India. In January 1888 the duke went out to India, accompanied by Colonel de Parseval as military governor and adviser. At Bombay he was received by the duke of Connaught and Lord Reay, and at Calcutta he became the guest of the viceroy, the marquess of Dufferin, who organized for the duke and his cousin, Prince Henry of Orleans, a grand tiger-shooting expedition in Nepaul. The duke now reported himself to the commander-in-chief, afterwards Earl Roberts, and joined his regiment at Chakrata. After seeing service, the duke ceased his connexion with the Indian army in February 1889, and returned to England. On attaining his majority, he entered Paris (February 7, 1890), and proceeding to the *mairie*, expressed his desire, as a Frenchman, to perform his military service. This act caused great excitement, and he was arrested in conformity with the law of 1886, which forbade the soil of France to the direct heirs of the families which had reigned there. He was tried, and sentenced to two years' imprisonment; but he was liberated by President Carnot after a few months' nominal incarceration (June 4), and conducted to the Swiss frontier. This escapade won for him the title of "Le Premier Conscrit de France." After the comte de Paris's funeral (September 12, 1894) the duke received his adherents in London, and then removed to Brussels, as being nearer France. On the 5th of November 1896 the duke married the archduchess Maria Dorothea Amalia of Austria, the ceremony taking place at Vienna. It was alleged that some of his followers were implicated in the conspiracies against the French Republic in 1899. A letter which the duke wrote in 1900, approving the artist whose caricatures were grossly insulting to Queen Victoria, excited great indignation both in England and in many French circles, and estranged him from many with whom he had formerly been upon friendly terms; but after Queen Victoria's death it was allowed to become known that this affair had been forgotten and forgiven by the British royal family. The duke of Orleans made several long exploring journeys, being particularly interested in polar discoveries. In 1905 he published *Une croisière au Spitzberg*, and, later, another account of his travels, under the title *A travers la Banquise.*

ORLEANS, PHILIP I., Duke of (1640–1701), son of the French king Louis XIII., was born at St Germain-en-Laye on the 21st of September 1640. In 1661 he was created duke of Orleans, and married Henrietta, sister of Charles II. of England; but the marriage was not a happy one, and the death of the duchess in 1670 was attributed to poison. Subsequently he married Charlotte Elizabeth, daughter of Charles Louis, elector palatine of the Rhine. Having fought with distinction in Flanders in 1667, Monsieur, as Orleans was generally called, returned to military life in 1672, and in 1677 gained a great victory at Cassel and took St Omer. Louis XIV., it was said, was jealous of his brother's success; at all events Orleans never commanded an army again. He died at St Cloud on the 8th of June 1701, leaving a son, Philip, the regent Orleans, and two daughters: Anne Marie (1669–1728), wife of Victor Amadeus II., duke of Savoy; and Elizabeth Charlotte (1676–1744), wife of Leopold, duke of Lorraine. His eldest daughter, Marie Louise (1662–1689), wife of Charles II. of Spain, died before her father. (M. P.*)

ORLEANS, PHILIP II., Duke of (1674–1723), regent of France, son of Philip I., duke of Orleans, and his second wife, the princess palatine, was born on the 2nd of August 1674, and had his first experience of arms at the siege of Mons in 1691. His marriage with Mlle de Blois, the legitimized daughter of Louis XIV., won him the favour of the king. He fought with distinction at Steinkerk, Neerwinden and Namur (1692–1695). During the next few years, being without employment, he studied natural science. He was next given a command in Italy (1706) and in Spain (1707–1708) where he gained some important successes, but he cherished lofty ambitions and was suspected of wishing to take the place of Philip V. on the throne of Spain. Louis XIV. was angry at these pretensions, and for a long time held him in disfavour. In his will, however, he appointed him president of the council of regency of the young King Louis XV. (1715). After the death of the king, the duke of Orleans went to the parlement, had the will annulled, and himself invested with absolute power. At first he made a good use of this, counselling economy, decreasing taxation, disbanding 25,000 soldiers and restoring liberty to the persecuted Jansenists. But the inquisitorial measures which he had begun against the financiers led to disturbances. He was, moreover, weak enough to countenance the risky operations of the banker John Law (1717), whose bankruptcy led to such a disastrous crisis in the public and private affairs of France.

There existed a party of malcontents who wished to transfer the regency from Orleans to Philip V., king of Spain. A conspiracy was formed, under the inspiration of Cardinal Alberoni, first minister of Spain, and directed by the prince of Cellamare, Spanish ambassador in France, with the complicity of the duke and duchess of Maine; but in 1718 it was discovered and defeated. Dubois, formerly tutor to the duke of Orleans, and now his all-powerful minister, caused war to be declared against Spain, with the support of the emperor, and of England and Holland (Quadruple Alliance). After some successes of the French marshal, the duke of Berwick, in Spain, and of the imperial troops in Sicily, Philip V. made peace with the regent (1720).

On the majority of the king, which was declared on the 15th of February 1723, the duke of Orleans resigned the supreme power; but he became first minister to the king, and remained in office till his death on the 23rd of December 1723. The regent had great qualities, both brilliant and solid, which were unfortunately spoilt by an excessive taste for pleasure. His dissolute manners found only too many imitators, and the regency was one of the most corrupt periods in French history.

See J. B. H. R. Capefigue, *Histoire de Philippe d'Orléans, régent de France* (2 vols., Paris, 1838); A. Baudrillart, *Philippe V. et la cour de France*, vol. ii. (Paris, 1890); and L. Wiesener, *Le régent, l'abbé Dubois et les Anglais* (3 vols., Paris, 1891–1899). (M. P.*)

ORLEANS, a city of north central France, chief town of the department of Loiret, on the right bank of the Loire, 77 m. S.S.W. of Paris by rail. Pop. (1906), town, 57,544; commune, 68,614. At Les Aubrais, a mile to the north, is one of the chief railway junctions in the country. Besides the Paris and Orleans railway, which there divides into two main lines—a western to Nantes and Bordeaux via Tours, and a southern to Bourges and Toulouse via Vierzon—branches leave Les Aubrais eastwards for Pithiviers, Châlons-sur-Marne and Gien, north-west for Châteaudun and Rouen. The whole town of Orleans is clustered together on the right bank of the river and surrounded by fine boulevards, beyond which it sends out suburbs along the various roads. It is connected with the suburb of St Marceau on the left bank by a handsome stone bridge of nine arches, erected in the 18th century. Farther up is the railway bridge. The river is canalized on the right, and serves as a continuation of the Orleans Canal, which unites the Loire with the Seine by the canal of the Loing.

Owing to its position on the northernmost point of the Loire Orleans has long been the centre of communication between the Loire basin and Paris. The chief interest of the place lies in its public buildings and the historical events of which it has been the scene. Proceeding from the railway station to the bridge over the Loire, the visitor crosses Orleans from north to south and passes through the Place du Martroi, the heart of the city. In the middle of the square stands an equestrian statue of Joan of Arc, in bronze, resting on a granite pedestal surrounded by bas-reliefs representing the leading episodes in her life. In 1855 it took the place of an older statue executed in the beginning of the century, which was then transferred to the left bank of the Loire at the end of the bridge, a few paces from the spot where a simple cross marks the site of the *Fort des Tourelles* captured by Joan of Arc in 1429. From the Place du Martroi, the Rue Jeanne d'Arc leads to the cathedral of Ste Croix. This church, begun in 1287, was burned by the Huguenots in 1567 before its completion. Henry IV., in 1601, laid the first stone of the new structure, the building of which continued until 1829. It consists of a vestibule, a nave with double aisles, a corresponding choir, a transept and an apse. Its length is 472 ft., its width at the transept 220 ft. and the height of the central vaults 112 ft. The west front has two flat-topped towers, each of three storeys, of which the first is square, the second octagonal and the third cylindrical. The whole front is Gothic, but was designed and constructed in the 18th century and exhibits all the defects of the period, though its proportions are impressive. A central spire (19th century) 328 ft. high, on the other hand, recalls the pure Gothic style of the 13th century. In the interior the choir chapels and the apse, dating from the original erection of the building, and the fine modern tomb of Mgr. F. A. P. Dupanloup, bishop from 1849 to 1878, are worthy of note. In the episcopal palace and the higher seminary are several remarkable pictures and pieces of wood-carving; and the latter building has a crypt of the 9th century, belonging to the church of St Avit demolished in 1428. The church of St Aignan consists of a transept and choir of the second half of the 15th century; it contains in a gilded and carved wooden shrine the remains of its patron saint, who occupied the see of Orleans at the time of Attila's invasion. The crypt dates from the 9th to the beginning of the 11th century. The once beautiful sculpture of the exterior has been altogether ruined; the interior has been restored, but not in keeping with the original style. A third church, St Euverte, dedicated to one of the oldest bishops of Orleans (d. 391), is an early Gothic building dating from the 13th, completely restored in the 15th century. St Pierre-le-Puellier dates in its oldest portions from the 10th or even the 9th century. To the west of the Rue Royale stand the church of St Paul, whose façade and isolated tower both bear fine features of Renaissance work, and Notre-Dame de Recouvrance, rebuilt between 1517 and 1519 in the Renaissance style and dedicated to the memory of the deliverance of the city. The hôtel de ville, built under Francis I. and Henry II. and restored in the 19th century, was formerly the residence of the governors of Orleans, and was occupied by the kings and queens of France from Francis II. to Henry IV. The front of the building, with its different coloured bricks, its balconies supported by caryatides attributed to Jean Goujon, its gable-ends and its windows, recalls the Flemish style. There are several niches with statues. Beneath, between the double flight of steps leading up to the entrance, stands a bronze reproduction of the statue of Joan of Arc, a masterpiece of the princess Mary of Orleans, preserved in the Versailles museum. The richly-decorated apartments of the first storey contain paintings, interesting chimneys, and a bronze statuette (also by the princess Mary) representing Joan of Arc mounted on a caparisoned horse and clothed in the garb of the knights of the 15th century. The great hall in which it is placed also possesses a chimney decorated with three bas-reliefs of Domremy, Orleans and Reims, all associated with her life. The historical museum at Orleans is one of the most interesting of provincial collections, the numismatic, medieval and Renaissance departments, and the collection of ancient vases being of great value. The city also possesses a separate picture gallery, a sculpture gallery and a natural history museum, which are established in the former hôtel de ville, a Renaissance building of the latter half of the 15th century. The public library comprises among its manuscripts a number dating from the 7th century, and obtained in most cases from St Benoît on the Loire. The general hospital is incorporated with the Hôtel Dieu, and forms one of the finest institutions of the kind in France. The *salle des fêtes*, formerly the corn-market, stands within a vast cloister formed by 15th-century arcades, once belonging to the old cemetery. The *salle des Thèses* (1411) of the university is the meeting-place of the Archaeological Society of the city. Among the old private houses numerous at Orleans, that of Agnes Sorel (15th and 16th century), which contains a large collection of objects and works of art relating to Joan of Arc, that of Francis I., of the first half of the 16th century, that occupied by Joan of Arc during the siege of 1429, and that known as the house of Diane de Poitiers (16th century), which contains the historical museum, are of special interest. The *hôtel de la Vieille-Intendance*, built in the 15th and 16th centuries, served as residence of the *intendants* of Orleans in later times. The "White Tower" is the last representative of the towers rendered famous by the siege. A statue to the jurisconsult, R. J. Pothier (1699–1772), one of the most illustrious of the natives of Orleans, stands in front of the hôtel de ville. The anniversary of the raising of the siege in 1429 by Joan of Arc is celebrated every year with great pomp. After the English had retired, the popular enthusiasm improvised a procession, which marched with singing of hymns from the cathedral to St Paul, and the ceremony is still repeated on the 8th of May by the clergy and the civil and military functionaries. Orleans is the seat of a bishopric, a prefect, a court of appeal, and a court of assizes and headquarters of the V. army corps. There are tribunals of first instance and of commerce, a board of trade-arbitration, a chamber of commerce and a branch of the Bank of France; and training colleges for both sexes, a lycée for boys, a technical school and an ecclesiastical seminary.

The more important industries of the town are the manufacture of tobacco (by the state), blankets, hairpins, vinegar, machinery, agricultural implements, hosiery, tools and ironware, and the preparation of preserved vegetables. Wine, wool, grain and live stock are the commercial staples of the city, round which there are important nurseries.

The site of Orleans must have been occupied very early in history by a trading post for commerce between northern and central and southern Gaul. At the time of the Roman conquest the town was known as *Genabum*, and was the starting-point of the great revolt against Julius Caesar in 52 B.C. In the 5th century it had taken the name *Aurelianum* from either Marcus Aurelius or Aurelian. It was vainly besieged in 451 by Attila, who was awed by the intercession of its bishop, St Aignan, and finally driven off by the patrician Aetius. Odoacer and his Saxons also failed to take it in 471, but in 498 it fell into the hands of Clovis, who in 511 held here the first ecclesiastical council assembled in France. The dignity which it then obtained, of being the capital of a separate kingdom, was lost by its union with that of Paris in 613. In the 10th century the town was given in fief to the counts of Paris, who in 987 ousted the Carolingian line from the throne of France. In 999 a great fire devastated the town. Orleans remained during all the medieval period one of the first cities of the French monarchy; several of the kings dwelt within its walls, or were consecrated in its cathedral; it had a royal mint, was the seat of councils, and obtained for its schools the name of university (1309), and for its soldiery an equal standing with those of Paris. Philip, fifth son of Philip VI., was the first of the dukes of Orleans. After the assassination of his successor Louis by Jean Sans-Peur, duke of Burgundy (1407), the people of Orleans sided resolutely with the Armagnacs, and in this way brought upon themselves the attacks of the Burgundians and the English. Joan of Arc, having entered the beleaguered city on the 29th of April 1429, effected the raising of the siege by means of an attack on the 7th of May on the Fort des Tourelles, in the course of which she was wounded. Early in the 16th century the town became a centre of Protestantism. After the Amboise conspiracy (1560) the states-general were convoked at Orleans, where Francis II. died. In 1562 it became the headquarters of Louis I. of Bourbon, prince of Condé, the Protestant commander-in-chief. In 1563 Francis, duke of Guise, laid siege to it, and had captured the *tête-du-pont* on the left bank of the Loire when he was assassinated. Orleans was surrendered to the king, who had its fortifications razed. It was held by the Huguenots from 1567 to 1568. The St Bartholomew massacre there in 1572 lasted a whole week. It was given as a *lieu de sûreté* to the League under Henry III., but surrendered to Henry IV. in person in 1594. During the Revolution the city suffered from the sanguinary excesses of Bertrand Barère and Collot d'Herbois. It was occupied by the Prussians in 1815 and in 1870, the latter campaign being discussed below.

See E. Bimbenet, *Histoire de la ville d'Orléans* (Orleans, 1884–1888).

The Orleans Campaign of 1870

Orleans was the central point of the second portion of the Franco-German War (*q.v.*), the city and the line of the Loire being at first the rendezvous of the new armies improvised by the government of National Defence and afterwards the starting-point of the most important attempt made to relieve Paris. The campaign has thus two well-marked phases, the first ending with the first capture of Orleans on the 10th of October, and the second with the second and final capture on the night of the 4th of December.

Shortly after the fall of the empire the government of National Defence, having decided that it must remain in Paris in spite of the impending siege, despatched a delegation to Tours to direct the government and the war in the provinces. This was originally composed (10-15 September) of two aged lawyers, Crémieux and Glais-Bizoin, and a naval officer, Vice-Admiral Fourichon, who had charge of both the war and the marine ministries. A retired general, de la Motte-Rouge, was placed in command of the "territorial division of Tours." He found, scattered over the south and west of France, a number of regular units, mostly provisional regiments, squadrons and batteries, assembled from the depôts, and all exceedingly ill supplied and equipped; but of such forces as he could muster he constituted the 15th corps. There were also ever-growing forces of mobiles, but these were wholly untrained and undisciplined, scarcely organized in battalions and for the most part armed with old-pattern weapons.

In these circumstances—the relative unimportance of the provincial war, the senility of the directors, the want of numbers, equipment and training in the troops available outside the walls of Paris—the rôle of the delegation was at first restricted to the establishment of a cordon of weak posts just out of reach of the German cavalry, with the object of protecting the formation of new corps and divisions in the interior. At the time of the investment of Paris part of the provincial forces were actually called in to reinforce the garrison. Only Reyau's weak cavalry division was sent out from Paris into the open country.

On their side the Germans had not enough forces left, after investing the capital with the III. and IV. Armies and Metz with the I. and II., to undertake a long forward stride to the Loire or the Cher. The only covering force provided on the south side of their Paris lines was the I. Bavarian corps, which had also to act as the reserve of the III. Army, and the cavalry divisions (6th, 4th, 2nd), whose chief work was the collection of supplies for the besiegers.

Shortly after this, near the end of September, francs-tireurs and small parties of National Guards became very active in Beauce, Perche and Gâtinais, and the German 4th cavalry division between Étampes and Toury was reinforced by some Bavarian battalions in consequence. But no important assemblies of French troops were noted, and indeed Orleans was twice evacuated on the mere rumour of the German advance. Moltke and every other German soldier gave no credence to rumours of the formation of a 15th corps behind the Loire—Trochu himself disbelieved in its existence—and the cavalry divisions, with their infantry supports, went about their ordinary business of gathering supplies.

In reality, however, the Delegation, unready as were its troops, was on the point of taking the offensive. In deference to popular clamour, a show of force in Beauce was decided upon. This was carried out by a force of all arms under Reyau on the 5th of October. It succeeded only too well. Prince Albert of Prussia, commander of the 4th cavalry division, which engaged Reyau at Toury, was so much impressed that he gave back 20 m. and sent alarming reports to army headquarters, which thereupon lost its incredulity and announced in army orders that the French "Army of the Loire" was advancing from Orleans. Von der Tann, the commander of the I. Bavarian corps, was ordered to take up a defensive position at Montlhéry and to send out a detachment to cover Prince Albert's retreat. The 22nd infantry division was added to his command, and the 2nd and 6th cavalry divisions warned to protect his flanks. Thus the Germans were led to pay attention to the existence of the 15th corps when that corps was not only itself incomplete but also unsupported by the 16th, 17th and other still merely potential formations.

The preparations of the Germans were superfluous, for the demonstration ended in nothing. Reyau drew away leisurely towards Fontainebleau forest, and only a part of the 15th corps was sent up from Bourges to Orleans. Further, the fears of a sortie from Paris, which had occupied the German headquarters for some time, having for a moment ceased, Moltke on the 7th ordered von der Tann, with the I. Bavarian corps, 22nd division, and the three cavalry divisions, to advance. Next day these orders expanded. Orleans and, if possible, Tours itself were to be captured.

First capture of Orleans.

The punishment for the military promenade in Beauce was at hand. The main body of the 15th corps, which had not been required to take part in it, was kept back at Bourges and Vierzon, and only the miscellaneous troops actually in Beauce were available to meet the blow they had provoked. On the 10th von der Tann attacked Reyau, who had returned from Fontainebleau towards Orleans, at Artenay. Had it not been that von der Tann believed that the 15th corps was in front of him, and therefore attacked deliberately and carefully, Reyau's resistance would have been even more brief than it was. The French were enormously outnumbered, and, after a brave resistance, were driven towards Orleans in great disorder. Being still without any real offensive intentions, the Delegation and La Motte-Rouge decided, the same night, to evacuate Orleans. On the 11th, therefore, von der Tann's advance had to deal with no more than a strong rearguard on the outskirts of Orleans. But he was no longer on the plain of Beauce; villas, hedges and vineyards, as well as the outskirts of the great forest of Orleans, gave excellent cover to the French infantry, all of which showed steadiness and some battalions true heroism, and the attack developed so slowly that the final positions of the defenders were not forced till close upon nightfall. The Germans lost at least 1000 men, and the harvest of prisoners proved to be no more than 1500. So far from pressing on to Tours, the Germans were well content with the occupation of Orleans.

The defeated enemy disappeared into Sologne, whither the assailants could not follow. Rumours of all sorts began to assail the German commander, who could not collect reliable news by means of the agencies under his own control because of the fluctuating but dense cordon of mobiles and francs-tireurs all around him. Moltke and Blumenthal wished him to strike out southward towards the arsenals of Bourges, the depôts of vehicles at Châteauroux and the improvised government offices at Tours. But he represented that he could not maintain himself nine or ten marches away from his nearest supports, and he was therefore allowed to stay at Orleans. The 22nd division and the 4th cavalry division, however, were withdrawn from him, and under these conditions von der Tann became uneasy as to his prospects of retaining even Orleans. His uneasiness was emphasized by reports of the appearance of heavy masses of French troops on the Loire above and below Orleans—reports that were true as regards the side of Blois, and more or less false as regards the Gien country. This news was obtained by the III. Army headquarters on the 19th of October, and next day von der Tann was ordered "not to abandon Orleans unless threatened by a greatly superior force." Such a threat soon became pronounced.

The Camp of Salbris.

A new directing influence was at work at Tours in the person of Léon Gambetta, who arrived there by balloon from Paris and took control of the Delegation on the 11th. With de Freycinet (who was appointed deputy minister of war) as his most valued assistant, Gambetta at once became not merely the head of the government in the provinces, but the actual director of the war, in virtue of the fact that he was the very incarnation of the spirit of resistance to the invader. De la Motte-Rouge was replaced at the head of the 15th corps by General d'Aurelle de Paladines, under whom at the same time the embryo 16th corps was placed. The new commander with practically dictatorial powers occupied himself first of all with the organization and training of his motley troops. The Delegation indeed planned an advance from Gien on Fontainebleau, but this was given up on d'Aurelle's representations, and the 15th corps drew back to a strong position at Salbris in front of Bourges. There by dint of personal ascendancy, relentless drilling and a few severe courts-martial, d'Aurelle produced an enormous improvement in the quality of his troops. Gambetta reinforced the troops at Salbris to the figure of 60,000, for the camp there was not merely a rendezvous but a school, the atmosphere of which profoundly affected even troops that only spent three or four days within its bounds. Meantime the 16th corps was formed at Blois and Vendôme, covered by a screen of francs-tireurs and National Guards. On October 23 a large force was sent over to the 16th corps from Salbris. This step was the first in a new plan of campaign.

Châteaudun.

A few days before it was taken, there had occurred an incident which led Moltke to a fresh misunderstanding of the situation towards the Loire. As mentioned above, the 22nd infantry and 4th cavalry divisions had been withdrawn from von der Tann's command and ordered back to Paris, and on their way thither they were told to clear the country round Châteaudun and Chartres. General von Wittich, therefore, with the 22nd division and some cavalry, appeared before Châteaudun on the 18th of October. The little town was strongly held and repulsed the first attack. Wittich then prepared a second assault so carefully that sunset was at hand when it was made. It would seem indeed that at this period, when the Germans were hoping for a speedy return to their fatherland, the spirit of the offensive in all ranks had temporarily died away. The assailants carried the edge of the town, only to find themselves involved in a painful struggle in the streets. House-to-house fighting went on long after dark, but at last the inhabitants gave way, and the Germans punished the town for its unconventional resistance by subjecting it to what was practically a sack.[1] After this von Wittich passed on to Charters, which, making his preparations more carefully, he was able to occupy after a few shells had been fired. These events, and the presence of a French force at Dreux, as a matter of fact signified nothing, for the 15th and 16th corps were still on the Loire and at Salbris, but they

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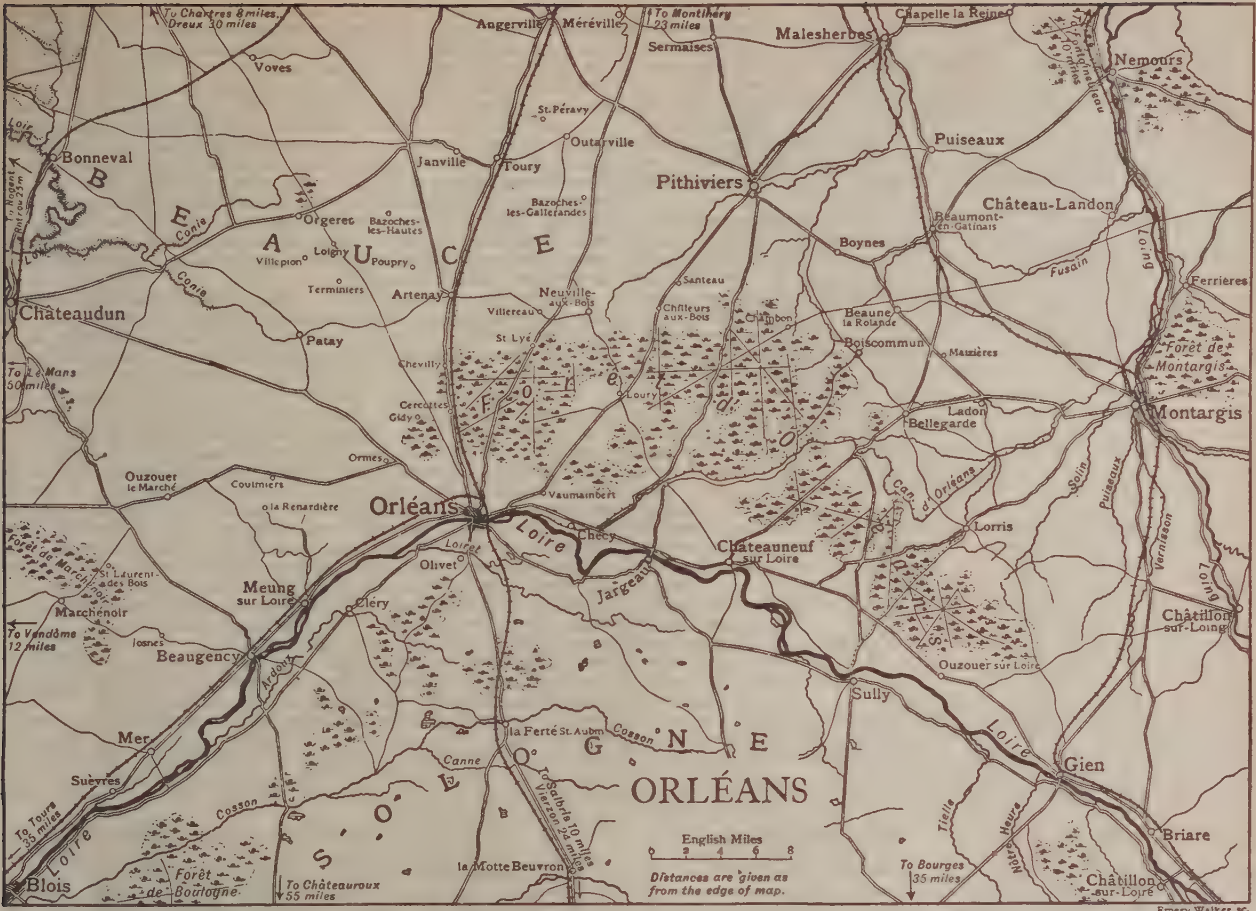
[1] In 1879 the government added the cross of the Legion of Honour to the town arms of Châteaudun.


To Chartres 8 miles, Dreux 30 miles
Voves
Angerville
Méréville
To Montlhéry 23 miles
Sermaises
Malesherbes
Chapelle la Reine
Nemours
To Fontainebleau 10 miles
St Péravy
Outarville
Bonneval
To Nogent le Rotrou 25 m.
Loir
Janville
Toury
Puiseaux
Pithiviers
Bazoches-les-Gallerandes
Château-Landon
Orgeres
Bazoches-les-Hautes
Beaumont-en-Gatinais
Conie
B E A U C E
Boynes
Villepion
Loigny
Poupry
Loing
Fusain
Terminiers
Santeau
Ferrières
Artenay
Neuville-aux-Bois
Châteaudun
Villereau
Chilleurs aux-Bois
Chambon
Beaune la Rolande
Patay
St Lyé
Boiscommun
Mazières
Forêt de Montargis
To Le Mans 50 miles
Chevilly
Forêt d'Orléans
Loury
Ladon
Bellegarde
Montargis
Cercottes
Gidy
Ormes
Can. d'Orléans
Solin
Puiseaux
Ouzouer le Marché
Coulmiers
la Renardière
Orléans
Vaumainbert
Loiret
Loire
Checy
Lorris
Vernisson
Forêt de Marchenoir
St Laurent-des Bois
Olivet
Châteauneuf sur Loire
Meung sur Loire
Jargeau
Cléry
Marchenoir
Châtillon sur-Loing
To Vendôme 12 miles
Josnes
Beaugency
Ouzouer sur Loire
Ardoux
Sully
Mer
la Ferté St. Aubin
Cosson
S O L O G N E
Gien
Canne
To Salbris 10 miles, Vierzon 24 miles
Suèvres
ORLÉANS
Tielle
Notre Heure
Briare
To Tours 35 miles
English Miles
0 2 4 6 8
Distances are given as from the edge of map.
To Bourges 35 miles
Blois
Forêt de Boulogne
To Châteauroux 55 miles
la Motte Beuvron
Châtillon sur-Loire

Emery Walker sc.

bewildered the German headquarters and conjured up a phantom "Army of the West," just as the promenade in Beauce had fashioned "the Army of the Loire" out of the small force under Reyau. Once more, indeed, as so often in the war, the Germans tried to solve the French problem by German data, and in their devotion to the net idea of "full steam ahead," could not conceive of military activity being spasmodic or unaimed. But this time the Versailles strategists were wrong only in their guess as to the direction of the blow. A blow was certainly impending.

By now the deliverance of Paris had become the defined objective of the "new formations" and of the provincial Delegation. Many plans were discussed, both at Paris and at Tours, for a combined effort, but each strategist had to convince the rest of the soundness of his own views, and the interchange of information and plans between Trochu and Gambetta was necessarily precarious. In the end, however, a few clear principles were accepted—Paris must be relieved, not merely revictualled, and the troops must be set in motion with that object at the earliest possible moment. For 200,000 French regulars were closely invested in Metz by Prince Frederick Charles with the I. and II. Armies, if they passed into captivity, the veterans of Vionville and St Privat could be brought over to the Loire, and already there were strange rumours of intrigues between Bazaine, Bismarck and the empress Eugénie. But de Freycinet and d'Aurelle had different views as to the method of recapturing Orleans, which was agreed upon as the first thing to be done, and a compromise had to be made, by which 25,000 men were to advance by Gien and Châteauneuf and the main mass (75,000) from Blois by Beaugency, the hazards of this double movement being minimized by the weakness of the forces under von der Tann (the highest estimate of these that reached Tours was 60,000 and their real number only 26,000). The preliminary movements were to be completed by the 29th of October, when one strong division of the 15th corps was to be set at Gien and the remainder of the 15th and 16th corps between Blois and Vendôme.

This was duly carried out, and the Germans were confirmed in their suspicions of a concentration to the west of Paris by the despatch of dummy troop-trains to Le Mans. But bad weather, the news of the disastrous capitulation of Bazaine and the opening of a series of futile peace negotiations delayed the dénouement, the Gien column was hastily recalled, and the French armies stood fast all along the line in their original grouping, 75,000 men (15th and 16th corps) at Blois-Vendôme, 10,000 men in Sologne and 25,000 at Gien. The Germans round Orleans were some 25,000 strong. Between Montlhéry and Chartres were 21,000 more; but these were paralysed by the fictitious "Western Army" of the French, and von Wittich even thought of obtaining assistance from von der Tann. The activity of the irregulars, and the defiant attitude of the civil population everywhere, presaged a blow to be delivered by the once despised "new formations," but the direction of this blow was misconceived by the German headquarters, by the staff of the III. Army and by von der Tann alike, till the eve of its delivery. The halt of the French army allowed this uneasiness to grow, and, in default of a target, Moltke was unable to assign a definite task to the II. Army, now on its way from Metz. One of its corps, therefore, was sent to the lines before Paris to release the 17th and 22nd infantry divisions from siege duties, and these, with the I. Bavarian corps and the 2nd, 4th and 6th cavalry divisions, were constituted into a special detachment of the III. Army, under Friedrich Franz, grand duke of Mecklenburg-Schwerin. The duke was ordered to cover the siege of Paris and to break up the "new formations," but he was directed, not towards Orleans or even Tours, but towards Le Mans, concentrating with that object between Châteaudun and Chartres.

D'Aurelle, if cautious and slow, at least employed spare time well. The 16th corps was disciplined to the standard attained by the 15th and Chanzy was placed at the head of it, General Fiéreck, commanding at Le Mans, was ordered to attract the enemy's notice to the west by demonstrations, the defence of localities by irregulars was thoroughly organized, and in the first days of November, on de Freycinet's demand, the general advance was resumed. There was a difference of opinion between d'Aurelle and Chanzy as to the objective, the latter wishing to make the main effort by the left, so as to cut off the Bavarians from Paris, the former, to make it by the right with a view to recapturing Orleans, and, as on the German side at Gravelotte, a compromise was made whereby the army was deployed in equal force all along the line.

The début was singularly encouraging. Part of the German 2nd cavalry division, with its infantry supports, was severely handled by the French advanced guard near the hamlet of St Laurent des Bois (November 8). The half-heartedness of the Germans, evidenced by the number of prisoners taken unwounded, greatly encouraged the “ new formations,” who cheerfully submitted to a cold bivouac in anticipation of victory. Next morning the advance was resumed, d'Aurelle with the 15th corps on the right wing, Chanzy with the 16th on the left and Reyau's cavalry to the front. The march was made straight across country, in battle order, each brigade in line of battalion columns covered by a dense skirmish line. The French generals were determined that no accident should occur to shake the *moral* of the young troops they commanded.

Battle of Coulmiers

At Orleans, meanwhile, von der Tann, in ever-growing suspense, had, rightly or wrongly, decided to stand his ground. He had been instructed by the headquarters staff not to fall back except under heavy pressure. He had his own reputation, dimmed by the failure of 1866, to retrieve, and national honour and loyalty seemed to him to require, in the words of his own staff officer, that “ ere actual conflict had taken place with the ‘ greatly superior ’ enemy, no hostile force should enter the city placed under the protection of the Bavarians.” But he could not allow himself to be enveloped in Orleans itself, and therefore, calling upon the far-distant III. Army reserves for support, he took up his position with 23,500 men around Coulmiers, leaving 2500 men to hold Orleans. The line of defence was from St Péravy on the Châteaudun road through Coulmiers to La Renardière, and thence along the Mauve stream, and here he was attacked in force on the 9th of November. The French approached from the south-west, and when their right had taken contact, the remainder gradually swung round and attacked the Bavarian centre and right. The result was foregone, given the disparity of force, but the erratic movements of Reyau's cavalry on the extreme left of d'Aurelle's line exposed Chanzy to a partial repulse and saved the Bavarian right. When at last the French stormed Coulmiers, and von der Tann had begun to retire, it was already nightfall, and the exhausted remnant of the I. Bavarian corps was able to draw off unpursued. The Orleans garrison followed suit, and the French army, gathering in its two outlying columns from Sologne and Gien, reoccupied the city. So ended the first blow of the Republic's armies. Coulmiers would indeed have been a crushing victory had Reyau's cavalry performed its part in the scheme and above all had d'Aurelle, adopting unreservedly either his own plan or Chanzy's, massed his troops here, economized them there, in accordance with the plan, instead of arraying them in equal strength at all points. But d'Aurelle wished above all to avoid what is now called a “ regrettable incident ” —hence his advance across country *en bataille*—and to thin out his line at any point might have been disastrous. And incomplete as it was, the victory had a moral significance which can scarcely be overrated. The “ new formations ” had won the first battle, and it was confidently hoped by all patriots that the spell of defeat was broken.

But d'Aurelle and the government viewed their success from the standpoint of their own side, and while von der Tann, glad to escape from the trap, fell back quickly to Angerville, d'Aurelle's only fear was an offensive return. Not even when von der Tann's defensive intentions were established did d'Aurelle resume the advance. The columns from Gien and the Sologne peacefully reoccupied Orleans, while the victors of Coulmiers went into cold and muddy bivouacs north of the city, for d'Aurelle feared that their dispersion in comfortable quarters would weaken the newly forged links of discipline. The French general knew that he had only put his hand to the plough, and he thought that before ploughing in earnest he must examine and overhaul his implement. In this opinion he was supported not only by soldiers who, like Chanzy, distrusted the staying power of the men, but even by the government, which knew that the limit of the capital's resistance was still distant, and felt the present vital necessity of protecting Bourges, Châteauroux and Tours from Prince Frederick Charles, who with the II. Army was now approaching from the east. The plan of General Borel, the chief of staff, for a lateral displacement of the whole army towards Chartres and Dreux, which would have left the prince without an animate target and concentrated the largest possible force on the weakest point of Moltke's position, but would have exposed the arsenals of the south, was rejected, and d'Aurelle organized a large fortified camp of instruction to the north of the captured city, to which came, beside the 15th and 16th corps, the new 17th and 18th.

German plans after Coulmiers.

To return to the Germans. An army at the halt, screened by active irregulars, is invisible, and the German commanders were again at a loss. It has been mentioned that a day or two before the battle of Coulmiers Moltke had created an Army Detachment under the grand duke of Mecklenburg for operations south of Paris. His objects in so doing must now be briefly summarized. On November the 1st he had written to the II. Army to the effect that “ the south of France would hardly make great efforts for Paris,” and that the three disposable corps of the army were to range over the country as far as Chalon-sur-Saône, Nevers and Bourges. By the 7th his views had so far changed that he sanctioned the formation of the “ Detachment ” with a view to breaking up the Army of the Loire by a march into the *west* towards Le Mans, the right wing of the II. Army at the same time hurrying on to Fontainebleau to cover the south side of the Paris investment. The king, however, less convinced than Moltke of the position of the Army of the Loire, suspended the westward deployment of the Detachment, with the result that on the 10th the retreating Bavarians were reinforced by two fresh divisions. But the same day all touch with the French was lost—perhaps deliberately, in accordance with the maxim that defeated troops should avoid contact with the victor. The curtain descended, and next day a few vague movements of small bodies misled the grand duke into seeking his target towards Chartres and Dreux, directly away from d'Aurelle's real position. Once more the king intervened and brought him back to the Orleans-Paris road (Nov. 13–14), but Moltke hurried forward the IX. corps (II. Army) from Fontainebleau to Étampes so as to release the grand duke from covering duties while satisfying the king's wishes for direct protection towards Orleans.

Movements of the Detachment.

Moltke's views of the problem had not fundamentally changed since the day when he ordered the II. Army to spread out over southern France. He now told the grand duke to beat the Army of the Loire or Army of the West near Dreux or Chartres, and, that done, to sweep through a broad belt of country on the line Alençon-Verneuil towards Rouen, the outer wing of the II. Army meanwhile, after recapturing Orleans and destroying Bourges, to descend the Loire and Cher valleys towards Tours (14 Nov). On the 15th a fresh batch of information and surmises caused the leader of the Detachment, who had not yet received orders to do so, to leave the Paris-Orleans road to take care of itself and to swing out northwestward at once. The Detachment reached Chartres, Rambouillet and Auneau that night, and headquarters, having meanwhile been mystified by the news of a quite meaningless fight between German cavalry and some mobiles at Dreux, did not venture to reimpose the veto. The adventures of the Detachment need not be traced in detail. It moved first north towards the line Mantes-Dreux, and delivered a blow in the air. Then, hoping to find a target towards Nogent le Rotrou, it swung round so as to face south-west. Everywhere it met with the sharpest resistance from small parties, nowhere it found a large body of all arms to attack. Matters were made worse by staff blunders in the duke's headquarters, and on the 19th, after a day of indescribable confusion, he had to halt to sort out his divisions. Moltke gave him the rest day he asked for the more readily as he was beginning to suspect that the king was right, that there were considerable forces still at Orleans, and that the Detachment might be wanted there after all.

Advance of the II. Army.

This alteration in his views had been brought about by the reports from the II. Army during its advance from Champagne to the Gâtinais. At the time of the first order indicating Chalon, Nevers and Bourges as its objectives this army had just opened out into line from its circular position round Metz, and it therefore naturally faced south. Moving forward, it reached the line Troyes-Neufchâteau about the time Coulmiers was fought, and was ordered to send in its right (IX. corps) to Fontainebleau. The II. corps had already been taken to strengthen the besiegers, thereby releasing the two Prussian divisions (17th and 22nd) that joined von der Tann on the 10th. The II. Army next changed front, in accordance with Moltke's directions, so as to face S.E. towards Orleans and Gien, and on the 16th the IX. corps and 1st cavalry division were at Méréville and on the Orleans-Paris road, the III. at Sens and the X. at Tonnerre. The III. and X. from this time onward marched, camped and slept in the midst of a population so hostile that von Voigts-Rhetz kept his baggage in the midst of the fighting troops, and Prince Frederick Charles himself, with an escort, visited the villages lying off the main roads to gauge for himself the temper of the inhabitants.

From prisoners it was gleaned that the French 18th corps, supposed by the Germans to be forming in the Dijon-Lyons region, had arrived on the Loire, and a deserter said that there were 40,000 men encamped at Chevilly, just north of Orleans. Moltke's faith in his own reading of the situation was at last shaken; whether the Army of the Loire had joined the Army of the West or was still on the Loire, he did not yet know, but it was almost certain that from wherever they came, considerable French forces were around Orleans. He warned the prince to check the southward swing of the X. corps “ because it cannot yet be foreseen whether the whole army will not have to be employed towards Châteaudun and Orleans,” and turned to the Detachment for further information, cautioning the grand duke at the same time to keep touch with the II. Army. But, ignoring the hint, the grand duke, thinking that he had at last brought the elusive “ Army of the West ” to bay in the broken ground round Nogent-le-Rotrou, opened out, in accordance with German strategic principles, for a double envelopment of the enemy. He struck another blow in the air. The “ Army of the West ” had never really existed as an army, and its best-organized units had been sent back to join the new 21st corps at Le Mans ere the Detachment came into action at all, while the older mobiles continued the “ small war ” in front of the Germans, and sniped their sentries and trapped their patrols as before. Almost simultaneously with the news of this disappointment, the prince, who had meanwhile used his cavalry vigorously, sent word to Versailles on the 20th that the French 15th, 16th, 17th and 18th corps (in all over 150,000 men) were round Orleans. At this moment the III. corps was close to the

Forest of Orleans, the IX. corps away to the right rear at Angerville, and the X. equally distant to the south-east, as well as separated in three self-contained columns a day's march apart. It seemed as if another Vionville was at hand, but this time Alvensleben and Voigts-Rhetz did not attack an obscure objective *coûte que coûte*. They stood fast, by the prince's order, to close up for battle and to wait on events in front of the Detachment.

The Germans had now discovered their target, and their strategical system, uncomplicated by past nightmares, should have worked smoothly to a decisive result. But there was nearly as much confusion between the various high officers as before. Prince Frederick Charles, in possession of the facts and almost in contact with the enemy, wrote to the grand duke to say that the II. Army was about to attack the enemy, and to suggest that the Detachment, which he knew to be heading for Le Mans, should make a "diversion" in his favour towards Tours, reserving to himself and his own army, as on the 2nd of July 1866 before Königgrätz, the perils and the honours of the battle. The grand duke meanwhile, whose temper was now roused, was making a last attempt to bring the phantom "Army of the West" to action. Rejecting Blumenthal's somewhat timidly worded advice to go slowly, the grand duke spread out his forces for the last time for an enveloping advance on Le Mans.

The Detachment ordered towards Orleans.

He had not gone far when, on the 23rd, he received a peremptory order from the king, through the III. Army headquarters, to bring back his forces to Beauce and to be on the middle Loire at latest by the 26th. In vain he pleaded for a day to close up; the king replied that the march must go on, for much depended on it. Moltke, in fact, had seized the reins more firmly at the critical moment, and given directions to the army commanders that the II. Army and the Detachment were to make a combined and concerted attack as soon as possible after the 26th. By that date the last brigades of the II. Army would have come up, and the Detachment was to time its own march accordingly. Yet even at this step Blumenthal, the original author of the Western expedition, in transmitting the king's order to the grand duke, assigned not Orleans but Beaugency, some miles down the river, as the objective of the Detachment.

French plans.

D'Aurelle meanwhile had resolutely maintained his policy of inaction, confirmed in that course by the miserable and ill-equipped condition of the troops that came from the east and the west to double the numbers of the relatively well-disciplined army of Coulmiers. In the grand duke's move to the west, d'Aurelle saw only a trap to lure him into the plains and to offer him up as a victim to the approaching II. Army, the force of which he at first greatly exaggerated. All this time Gambetta and de Freycinet were receiving messages from Paris that spoke of desperate sorties being planned, and assigned December 15th as the last day of resistance. On the 19th of November de Freycinet wrote to d'Aurelle urging him to form a plan of active operations without delay, and even suggesting one (which was, in fact, vicious), but in reply the general merely promised to study the civilian's scheme. A severe letter from Gambetta, which followed this, had no better effect. D'Aurelle had, in fact, become a pessimist, and the Delegation, instead of removing him, merely suggested fresh plans.

On the 24th, however, the French at last took the offensive, in the direction of Fontainebleau Forest, to co-operate with the great sortie from Paris which was now definitely arranged. But owing to d'Aurelle's objections, the first orders were modified so far that on attaining the points ordered, Chilleurs (15th corps) Boiscommun-Bellegarde (20th), the troops were to await the order to advance. Shortly afterwards the 18th corps from Gien was ordered to advance on the line Montargis-Ladon. The rest of d'Aurelle's huge army was scarcely affected by these movements. Meanwhile Prince Frederick Charles, to clear up the situation, had pushed out strong reconnaissances of all arms from the front of the II. Army, and these naturally developed strong forces of the defenders. The advanced troops of the X. corps had severe engagements with fractions of the 20th corps at Ladon and Maizières, and those of the III. corps were sharply repulsed at Neuville and drew the fire of several battalions and batteries at Artenay. The French offensive slowly developed on the 25th and 26th, for the Germans were not ready to advance, and in addition greatly puzzled. The erratic movements of the grand duke towards Le Mans before he was recalled to the Loire had seriously disquieted both the Delegation and d'Aurelle, and the 17th corps, under a young and energetic leader, de Sonis, was moved restlessly hither and thither in the country south and west of Châteaudun. A fight at Brou (10 m. W. of Bonneval) provoked the grand duke into another false move. This time the Detachment, then near Droué (12 m. W. of Châteaudun) and Authon (22 m. W. of Bonneval), swung round north-east in defiance of the order to go to Beaugency, and had to be brought back by the drastic method of placing it under the orders of Prince Frederick Charles. General von Stosch of the headquarters staff was at the same time sent to act as Moltke's representative with the duke's headquarters, and Lieut.-Colonel von Waldersee to Prince Frederick Charles's to report thence direct to the king, who was dissatisfied with the diluted information with which the various staff offices furnished him. Still, the upshot was that Prince Frederick Charles was entrusted with affairs on the Loire, and all superior control was voluntarily surrendered. The prince had very clear ideas, at the outset, of the task before him. If the French advanced towards Fontainebleau or elsewhere, he expected to be able to repeat Napoleon's strategy of 1814, fighting containing actions with the IX. and X. corps and delivering blow after blow at different points on d'Aurelle's line of march with the III. If the French, as seemed more likely, stood fast, he thought his task more formidable, and therefore, abandoning the idea of a strategic envelopment, he ordered the Detachment inwards with the intention of directly attacking the Orleans position from the north-west.

Prince Frederick Charles in general command.

As regards the method of the offensive, there is herein no material advance on the prince's first scheme; the detachment is simply added to the forces making the attack, and the diversion on Tours is abandoned. But the prince was at any rate a leader who enjoyed the responsibilities of director of operations—he even said that he would find the shuttle-play of the III. corps alluded to above "an interesting novelty in his experience of Army command"—while at the same time the unfortunate d'Aurelle was asking the Delegation to give orders direct to his generals.

Beaune-la-Rolande.

It was now November 27th. The Versailles headquarters were in a state of intense nervous exaltation waiting for the sortie of 70,000 men that was daily expected to be launched at the investing line, and the king's parting words to von Waldersee indicate sufficiently the gravity of the decision that was now entrusted to the most resolute troop-leader in the service: "We are on the eve of a decisive moment. I know well that my troops are better than the French, but that does not deceive me into supposing that we have not a crisis before us. . . . If Prince Frederick Charles is beaten, we must give up the investment of Paris. . . ." The II. Army was waiting events on a dangerously extended front from Toury on the Paris-Orleans road (which the prince still thought it his duty to cover) to Beaune-la-Rolande. The Detachment, which never yet had concentrated save to deliver blows in the air, was approaching Châteaudun and Bonneval when von Stosch arrived and gave it the encouragement, the reforms in the staff work and the rest-day it needed. The French, who themselves had suffered from over-extension, had by now condensed on the extreme right. In these general conditions the battle of Beaune-la-Rolande took place—an engagement almost as honourable to Voigts-Rhetz and the X. corps as Vionville to Alvensleben and the III. The French attack began early on the morning of the 28th, under command of General Crouzat. It was directed on Beaune-la-Rolande from three sides, and only the want of combination between the various units of the French and the arrival in the afternoon of part of the III. corps saved the X. from annihilation. As it was, the Germans engaged were utterly exhausted, and the X. corps had but three rounds of ammunition per man left. But the magnificent resistance of the men of Vionville prolonged the fight until night had fallen and Crouzat, thinking the battle lost, ordered his troops to evacuate the battlefield. As at Coulmiers, and with even more deplorable results, the French commander saw only the confusion in his own lines, and feared to hazard the issue of the campaign on the mere supposition that the enemy was even more exhausted. There was another resemblance, too, between Coulmiers and Beaune-la-Rolande, in that the French forces on the outer flank towards Artenay stood idle without attempting to influence the decision.

Prince Frederick Charles himself took only a cursory survey of the battlefield, and failed to realize that the whole of the enemy's right wing had been engaged, in spite of what Waldersee, who had been in Beaune, told him of events there. So far, therefore, from considering the battle as a great victory to be followed up by an energetic pursuit, he still feared a move round his left flank from Gien and Montargis towards Fontainebleau. The II. Army orders issued on the night of the battle actually had in view a farther extension *eastward*. Beaune-la-Rolande was a French defeat without being a German victory, and for the fact that it was a defeat, not a mere check, there was no cause but Crouzat's impressions of the state of the 20th corps, which, composed as it was of the newest levies in his army, was the most susceptible of unreasoning bravery and unreasoning depression.

In view of this, d'Aurelle and de Freycinet decided that the offensive was to be continued not towards Beaune-Nemours, but from the front of the steadier 15th and 16th corps towards Pithiviers, and with that object, on the 29th—a day of inaction for the Germans—the 18th and 20th corps began to close on the centre. There was sharp fighting on the 30th at various points along the north-eastern and eastern fringes of the Forest of Orleans, in which for the most part the French were successful. On the 29th the II. Army was inactive in spite of almost frantic appeals from Versailles to go forward (the great sortie from Paris had begun), and the Detachment, in accordance with the prince's orders and not with the views held by von Stosch, headed eastward to prolong the right of the II. Army, halting on the 29th in the area Orgères-Toury. The prince's message to the grand duke contained the significant phrase, "my plans to drive the enemy out of Orleans"—he no longer thought of a strategical envelopment of the Army of the Loire *in* Orleans. Disillusioned during the 30th as to the supposed danger on the side of Montargis, he closed from both wings towards the centre, but still defensively and well clear of the edge of the dangerous forest.

Advance of the French left wing.

On this day d'Aurelle and the French generals assembled to receive de Freycinet's orders for the next advance. The 18th and 20th corps were to attack Beaune-la-Rolande, the 15th and 16th Pithiviers, while the 17th, aided by the 21st from Le Mans, was to look after the security of Orleans against a possible southward advance of the Detachment. A wise modification was arranged between d'Aurelle and Chanzy, whereby the first day's operations should be directed to driving away the Detachment with the 17th and 16th corps, preparatory to the move on Pithiviers. On the 1st of December, then, no events of importance took place on the front of the II. Army, the centre of gravity having shifted to Orgères-Toury and the direction of events to the grand duke and Stosch. Fortunately for the Germans the cavalry general von Schmidt, who had been called upon to return to the II. Army with his division, managed to impress Stosch, in a farewell interview, with the imminence of the danger, and a still more urgent argument was the action of Villepion-Terminiers, in which Chanzy with one infantry and one cavalry division attacked part of the I. Bavarian corps and drove it to Orgères with a loss of 1000 men. Von Stosch, therefore, so far from literally obeying the waiting policy indicated in the orders from Prince Frederick Charles, cautiously led the grand duke to prepare for a battle, and the grand duke, seeing the chance of which he had been cheated so often, and secure in his royal rank and in the support of Moltke, Stosch and Blumenthal, took control again. Lastly, von Stosch called back the 22nd division, which had been taken from the Detachment to form the reserve of the II. Army.

Battle of Loigny-Poupry.

The result of the decision thus made at the Detachment headquarters was of the highest importance. The French main body moving north-westward in the general direction of Toury encountered first the I. Bavarian corps, then the 17th division, and finally the 22nd division, and the leadership of the German generals, who took every advantage of the disconnected and spasmodic movements of the enemy, secured a complete success (battle of Loigny-Poupry, 2nd Dec.). Meanwhile, and long before victory had declared itself, Prince Frederick Charles, still keeping the III. and X. corps on the side of Boiscommun and Bellegarde, had sent the IX. corps westward to support the Detachment, and halted von Schmidt's returning cavalry division on the Paris road. But from this point there began an interchange of telegrams which almost nullified the strategical effect of the battle. The grand duke and von Stosch, desirous above all of enveloping—that is, driving into Orleans—the target that after so many disappointments they had found and struck, wished to expand westwards so as to prevent the escape of the French towards Châteaudun, and with that object asked the II. Army "to attack Artenay and to take over the protection of the great road." Both von Stosch and von Waldersee had reported to the II. Army the importance of the French troops west of the main road, and Prince Frederick Charles, as above mentioned, had already moved the IX. corps and 6th cavalry division towards the Detachment. But when after the battle the grand duke's request to the II. Army arrived at the prince's headquarters, the reply was a curt general order for a direct concentric attack *on Orleans* by all forces under his command.

This was Moltke's doing. Before Waldersee's telegrams from the front arrived at Versailles, he had sent to the prince a peremptory order "to attack Orleans and thus to bring about the decision." This order was based on Moltke's view that the main body of the French had, after Beaune-la-Rolande, gathered on the west side of the great road, and although the king, in spite of the repulse of the great sortie from Paris, was still uneasy as to the possibility of a French offensive on Fontainebleau, he allowed the chief of his staff to have his way. The order, consequently, went forth. Long before it could be translated into action, the battle of Loigny-Poupry had completely changed the situation. Yet it was obeyed, and no attempt was made by the prince either to obtain its cancellation or to override it by the exercise of the beloved "initiative." At the prince's headquarters it was construed as a reflection upon the lethargy of that army after Beaune-la-Rolande, and—although it was the incompleteness of his own reports of that action that had misled Moltke as to the magnitude of the effort that had been expended to win it—the prince, bitterly resentful, fell into that dangerous condition of mind which induces a punctilious execution of orders to the letter, at whatever cost and without regard to circumstances. Hence the order to the Detachment, which allowed the French field army to escape, and substituted for a decisive victory the barren "second capture of Orleans."

The III. corps in Orleans Forest.

The plan for this second capture was simple: III. corps to fight its way from Pithiviers to Chilleurs-aux-Bois and thence down the Pithiviers-Orleans road through the forest, IX. corps to advance on Artenay and thence down the main road, Detachment to fight its way southward over the plains, X. corps in rear of the centre as reserve. Only a small force was left on the side of Montargis, and the III. and X. corps, which were many miles away to the south and south-east, had to get into position at once (evening of the 2nd) by night marches if necessary. In short, a single grand line of battle, 40 m. long, supported only by one corps in rear of the centre, was to sweep over all obstacles, woods, fields, orchards and enemy, at a uniform rate of progress, and on the evening of the second day to converge on Orleans.[1] The advance opened on the morning of the 3rd of December. The French left or main group included the 15th, 16th and 17th corps, the right of the 15th corps being in advance of the forest edge near Santeau. The right group, now under Bourbaki, consisted of the 18th and 20th corps, and faced north-east towards Beaune-la-Rolande and Montargis, the left flank being at Chambon. Fortunately for the III. corps, which numbered barely 13,000 rifles in all, the thinnest part of the opposing cordon was its centre, and the adventurous march of this corps carried it far into the forest to Loury. Only at Chilleurs was any serious resistance met with; elsewhere the French sheered off to their left, leaving the Pithiviers-Orleans road clear. In the night of the 3rd–4th isolated fractions of the enemy came accidentally in contact with von Alvensleben's outposts, but a sudden night encounter in woods was too much for the half-trained French, and a panic ensued, in which five guns were abandoned. But, as Alvensleben himself said, when he marched into the forest from Chilleurs he "went with open eyes into a den" from which it was more than probable he would never emerge—Chilleurs was, in fact, reoccupied behind him by part of the 15th corps. By the fortune of war the III. corps actually did emerge safely, but only thanks to the inactivity of the French right group under Bourbaki,[2] and to the almost entire absence of direct opposition, not to Prince Frederick Charles's dispositions.

On the main road, meantime, the IX. corps had captured a series of villages, and at nightfall of the short December day reached the N.W. corner of the Forest. The Detachment, slowly pushing before it part of the army it had defeated at Loigny, and protecting itself on the outer flank by a flank guard (I. Bavarians) against the rest, had closed in towards Chevilly. Prince Frederick Charles, angered by the slow, painful and indecisive day's work, ordered the advance to be continued and the French positions about Chevilly stormed in the dark, but fortunately was dissuaded by von Stosch, who rode over to his headquarters. But the prince never (except perhaps for a brief moment during the battle of Loigny-Poupry) believed that there was any serious obstacle in the way of the Detachment except its own fears, and repeatedly impressed upon Stosch the fact that Orleans was the watchword and the objective for every one.

In pursuance of the *idée fixe*, the prince issued orders for the 4th to the following effect: III. corps to advance on Orleans and to "bring artillery into action against the city," at the same time carefully guarding his left flank; IX. and 6th cavalry division to go forward along the general line of the main road; Detachment to make an enveloping attack on Gidy in concert with the attack of the IX. corps. In the forest Alvensleben, knowing that he could not capture Orleans single-handed, guarded his left with a whole division and with the other advanced on the city, stormed the village of Vaumainbert, which was stubbornly defended by a small French force, and close upon nightfall perfunctorily threw a few shells into Orleans. The flank-guard division had meanwhile been gravely imperilled by the advance of Crouzat's 20th corps, but once again the III. corps was miraculously saved, for Bourbaki, receiving word from d'Aurelle that the left group could not hold its position in advance of the Loire, and that the line of retreat of the right group was by Gien, ordered the fight to be broken off.

Second Battle of Orleans.

In the centre the IX. corps, after fighting hard all day, progressed no farther than Cercottes. The prince and the grand duke had a short interview, but, being personal enemies, their intercourse was confined to the prince's issuing his orders without inquiring closely into the positions of the Detachment and its opponents. Thus while the main body of the French left group, under the determined Chanzy, slipped away to the left, to continue the struggle for three months longer, the Detachment was compelled to conform to the movements of the IX. corps. But it was handled resolutely, and in the afternoon its right swung in to Ormes. The 2nd cavalry division, finding a target and open ground, charged the demoralized defenders with great effect, a panic began and spread, and by nightfall, when the prince, who was with the IX. corps, had actually given up hope of capturing Orleans that day and had issued orders to suspend the fight, his rival and subordinate was marching into Orleans with bands playing and colours flying. There was no pursuit, and the severed wings of the French army thenceforward carried on the campaign as two separate armies under Chanzy and Bourbaki respectively.

See F. Hoenig, *Volkskrieg an der Loire*, and L. A. Hale, *The People's War*, besides general and special histories and memoirs referred to in FRANCO-GERMAN WAR. (C. F. A.)

ORLEY, BERNARD VAN (1491–1542), Flemish painter, the son and pupil of the painter Valentyn van Orley, was born at

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[1] The same night Moltke received copies of the prince's orders and also news of the victory of Loigny-Poupry, but for some reason that is still unknown he let events take their course.

[2] With all his faults, Bourbaki was hardly responsible for this failure. Gambetta had for some days been giving orders to the 18th and 20th corps direct, but precisely at the moment he handed back the control of the group to d'Aurelle, this being arranged over the wires while the III. corps was advancing.

Brussels and completed his art education in Rome in the school of Raphael. He returned to Brussels, where he held an appointment as court painter to Margaret of Austria until 1527, in which year he lost this position and left the city. He only returned to it upon being reinstated by Mary of Hungary in 1532, and died there in 1542. Whilst in his earlier work he continued the tradition of the Van Eycks and their followers, he inaugurated a new era in Flemish art by introducing into his native country the Italian manner of the later Renaissance, the style of which he had acquired during his sojourn in Rome. His art marks the passing from the Gothic to the Renaissance period; he is the chief figure in the period of decline which preceded the advent of Rubens. Meticulously careful execution, brilliant colouring, and an almost Umbrian sense of design are the chief characteristics of his work.

Van Orley, together with Michael Cocxie, superintended the execution of van Aelst's tapestries for the Vatican, after Raphael's designs, and is himself responsible for some remarkable tapestry designs, such as the panels at Hampton Court. His also are the designs for some of the stained glass windows in the cathedral of Ste Gudule, in Brussels, at the museum of which city are a number of his principal works, notably the triptych representing "The Patience of Job" (1521). Among his finest paintings are a "Trinity" at Lübeck cathedral, a "Pietà" at Brussels, a Madonna at Munich and another at Liverpool.

The National Gallery owns a "Magdalen, reading," another version of the same subject being at the Dublin National Gallery. Lord Northbrook possesses a portrait of Charles V. by the master.

ORLOV, the name of a noble Russian family that produced several distinguished statesmen, diplomatists and soldiers.

GREGORY (*Grigorii*) GRIGORIEVICH ORLOV, COUNT (1734–1783), Russian statesman, was the son of Gregory Orlov, governor of Great Novgorod. He was educated in the corps of cadets at St Petersburg, began his military career in the Seven Years' War, and was wounded at Zorndorf. While serving in the capital as an artillery officer he caught the fancy of Catherine II., and was the leader of the conspiracy which resulted in the dethronement and death of Peter III. (1762). After the event, Catherine raised him to the rank of count and made him adjutant-general, director-general of engineers and general-in-chief. At one time the empress thought of marrying her favourite, but the plan was frustrated by Nikita Panin. Orlov's influence became paramount after the discovery of the Khitrovo plot to murder the whole Orlov family. Gregory Orlov was no statesman, but he had a quick wit, a fairly accurate appreciation of current events, and was a useful and sympathetic counsellor during the earlier portion of Catherine's reign. He entered with enthusiasm, both from patriotic and from economical motives, into the question of the improvement of the condition of the serfs and their partial emancipation. He was also their most prominent advocate in the great commission of 1767, though he aimed primarily at pleasing the empress, who affected great liberality in her earlier years. He was one of the earliest propagandists of the Slavophil idea of the emancipation of the Christians from the Turkish yoke. In 1771 he was sent as first Russian plenipotentiary to the peace-congress of Focshani; but he failed in his mission, owing partly to the obstinacy of the Turks, and partly (according to Panin) to his own outrageous insolence. On returning without permission to St Petersburg, he found himself superseded in the empress's favour by Vasil'chikov. When Potemkin, in 1771, superseded Vasil'chikov, Orlov became of no account at court and went abroad for some years. He returned to Russia a few months previously to his death, which took place at Moscow in 1780. For some time before his death he was out of his mind. Late in life he married his niece, Madame Zinoveva, but left no children.

See A. P. Barsukov, *Narratives from Russian History in the 18th Century* (Rus.) (St Petersburg, 1885).

ALEXIS GRIGORIEVICH ORLOV, COUNT (1737–1808), brother of the above, was by far the ablest member of the Orlov countly family, and was also remarkable for his athletic strength and dexterity. In the revolution of 1762 he played an even more important part than his brother Gregory. It was he who conveyed Peter III. to the château of Ropsha and murdered him there with his own hands. In 1770 he was appointed commander-in-chief of the fleet sent against the Turks, whose far superior navy he annihilated at Cheshme (July 5th 1770), a victory which led to the conquest of the Greek archipelago. For this exploit he received, in 1774, the honorific epithet *Chesmensky*, and the privilege of quartering the imperial arms in his shield. The same year he went into retirement and settled at Moscow. He devoted himself to horse-breeding, and produced the finest race of horses then known by crossing Arab and Frisian, and Arab and English studs. In the war with Napoleon during 1806–07 Orlov commanded the militia of the fifth district, which was placed on a war footing almost entirely at his own expense. He left an estate worth five millions of roubles and 30,000 serfs.

See article, "The Associates of Catherine II.," No. 2, in *Russkaya Starina* (Rus.) (St Petersburg, 1873).

THEODORE (*Fedor*) GRIGORIEVICH ORLOV, COUNT (1741–1796), Russian general, first distinguished himself in the Seven Years' War. He participated with his elder brothers, Gregory and Alexis, in the *coup d'état* of 1762, after which he was appointed chief procurator of the senate. During the first Turkish War of Catherine II. he served under Admiral Spiridov, and was one of the first to break through the Turkish line of battle at Cheshme. Subsequently, at Hydra, he put to flight eighteen Turkish vessels. These exploits were, by the order of Catherine, commemorated by a triumphal column, crowned with naval trophies, erected at Tsarskoe Selo. In 1775 he retired from the public service. Orlov was never married, but had five natural children, whom Catherine ennobled and legitimatized.

ALEXIS FEDOROVICH ORLOV, PRINCE (1787–1862), Russian statesman, the son of a natural son of Count Theodore Grigorievich Orlov, took part in all the Napoleonic wars from 1805 to the capture of Paris. For his services as commander of the cavalry regiment of the Life Guards on the occasion of the rebellion of 1825 he was created a count, and in the Turkish War of 1828–29 rose to the rank of lieutenant-general. It is from this time that the brilliant diplomatic career of Orlov begins. He was the Russian plenipotentiary at the peace of Adrianople, and in 1833 was appointed Russian ambassador at Constantinople, holding at the same time the post of commander-in-chief of the Black Sea fleet. He was, indeed, one of the most trusty agents of Nicholas I., whom in 1837 he accompanied on his foreign tour. In 1854 he was sent to Vienna to bring Austria over to the side of Russia, but without success. In 1856 he was one of the plenipotentiaries who concluded the peace of Paris. The same year he was raised to the dignity of prince, and was appointed president of the imperial council of state and of the council of ministers. In 1857, during the absence of the emperor, he presided over the commission formed to consider the question of the emancipation of the serfs, to which he was altogether hostile.

His only son, PRINCE NIKOLAI ALEKSYEEVICH ORLOV (1827–1885), was a distinguished Russian diplomatist and author. He first adopted a military career, and was seriously wounded in the Crimean War. Subsequently he entered the diplomatic service, and represented Russia successively at Brussels (1860–1870), Paris (1870–1882) and Berlin (1882–1885). As a publicist he stood in the forefront of reform. His articles on corporal punishment, which appeared in *Russkaya Starina* in 1881, brought about its abolition. He also advocated tolerance towards the dissenters. His historical work, *Sketch of Three Weeks' Campaign in 1806* (St Petersburg, 1856) is still of value. (R. N. B.)

ORM, or ORMIN, the author of an English book, called by himself *Ormulum* ("because Orm made it"), consisting of metrical homilies on the gospels read at mass. The unique MS., now in the Bodleian Library, is certainly Orm's autograph, and contains abundant corrections by his own hand. On palaeographical grounds it is referred to about A.D. 1200, and this date is supported by the linguistic evidence. The dialect is midland, with some northern features. It is marked in an unparalleled degree by the abundance of Scandinavian words, while the French element in its vocabulary is extraordinarily small. The precise determination of the locality is not free from difficulty, as it is now recognized that the criteria formerly relied on for distinguishing between the eastern and the western varieties of the midland dialect are not valid, at least for this early period. The *Ormulum* certainly contains a surprisingly large number of words that are otherwise nearly peculiar to western texts; but the inference that might be drawn from this fact appears to be untenable in face of the remarkable lexical affinities between this work and *Havelok*, which is certainly of north-east midland origin. On the whole, the language of the *Ormulum* seems to point to north Lincolnshire as the author's native district.

The work is dedicated to a certain Walter, at whose request it was composed, and whom Orm addresses as his brother in a threefold sense—"according to the flesh," as his fellow-Christian, and as being a member of the same religious fraternity, that of the Augustinian Canons. The present writer has suggested (*Athenaeum*, 19th May 1906) that Orm and Walter may have been inmates of the Augustinian priory of Elsham, near the Humber, which was established about the middle of the 12th century by Walter de Amundeville. In his foundation charter (Dugdale's *Monasticon*, ed. Caley and Bandinel, vi. 560) Walter endows the priory with lands, and also grants to it the services of certain villeins, among whom are his steward (*praepositus*) William, son of Leofwine, and his wife and family. As this William is said to have had an uncle named Orm, and probably owed his Norman name to a godfather belonging to the Amundeville family, it seems not unlikely that the author of the *Ormulum* and his brother Walter were his sons, named respectively after their father's uncle and his lord, and that they entered the religious house of which they had been made subjects.

The name Orm is Scandinavian (Old Norse *Ormr*, literally "serpent," corresponding to the Old Eng. *wyrm*, "worm"), and was not uncommon in the Danish parts of England. It occurs once in the book. The Gallicized form Ormin is found only in one passage, where the author gives it as the name by which he was christened. If this statement be meant literally (*i.e.* if the writer was not merely treating the two names as equivalent), it shows that he must, like his brother, have had a Norman godfather. The ending *-in* was frequently appended to names in Old French, *e.g.* in *Johannin* for *Johan*, John. The title *Ormulum* for the book which Orm made was probably an imitation of *Speculum*, a common medieval name for books of devotion or religious edification.

The Ormulum is written in lines alternately of eight and seven syllables, without either rhyme or alliteration. The rhythm may be seen from the opening couplet:

Nu, broþerr Wallter, broþerr min
Affterr þe flæshess kinde.

The extant portion of the work, not including the dedication and introduction, consists of about 20,000 lines. But the table of contents refers to 242 homilies, of which only 31 are preserved; and as the dedication implies that the book had been completed, and that it included homilies on the gospels for nearly all the year, it would seem that the huge fragment which we possess is not much more than one-eighth of this extraordinary monument of pious industry.

The *Ormulum* is entirely destitute of poetic merit, though the author's visible enjoyment of his task renders it not uninteresting reading. To the history of biblical interpretation and of theological ideas it probably contributes little or nothing that is not well-known from other sources. For the philologist, however, the work is of immense value, partly as a unique specimen of the north-midland dialect of the period, and partly because the author had invented an original system of phonetic spelling, which throws great light on the contemporary pronunciation of English. In closed syllables the shortness of a vowel is indicated by the doubling of the following consonant. In open syllables this method would have been misleading, as it would have suggested a phonetic doubling of the consonant. In such cases Orm had recourse to the device of placing the mark ˘ over the vowel. Frequently, but apparently not according to any discoverable rule, he distinguishes long vowels by one, two or three accents over the letter. Like some earlier writers, he retained the Old English form of the letter g (ȝ) where it expressed a spirant sound (not, however, distinguishing between the guttural and the palatal spirant), and used the continental g for the guttural stop and the sound *dzh*. He was, however, original in distinguishing the two latter sounds by using slightly different forms of the letter. This fact was unfortunately not perceived by the editors, so that the printed text confounds the two symbols throughout. The discovery was made by Professor A. S. Napier in 1890. It must be confessed that Orm often forgets his own rules of spelling, and although hundreds of oversights are corrected by interlineation, many inconsistencies still remain. Nevertheless, the orthography of the *Ormulum* is the most valuable existing source of information on the development of sounds in Middle English.

The *Ormulum* was edited for the first time by R. M. White in 1854. A revised edition, by R. Holt, was published in 1878. Many important corrections of the text were given by E. Kölbing in the first volume of *Englische Studien*. With reference to the three forms of the letter *g*, see A. S. Napier, *Notes on the Orthography of the Ormulum*, printed with *A History of the Holy Rood Tree* (Early English Text Society, 1894). (H. Br.)

ORMAZD, or Ormuzd (O. Persian *Auramazda* or *Ahuramazda*), the supreme deity of Zoroastrianism. He is represented as the god and creator of good, light, intelligence, in perpetual opposition to Ahriman the lord of evil, darkness and ignorance. The dualism of the earlier Zoroastrians, which may be compared with the Christian doctrine of God and Satan, gradually tended in later times towards monotheism. At all times it was believed that Ormazd would ultimately vanquish Ahriman. See further Zoroaster.

ORME, ROBERT (1728–1801), English historian of India, was born at Anjengo on the Malabar coast on the 25th of December 1728, the son of a surgeon in the Company's service. Educated at Harrow, he was appointed to a writership in Bengal in 1743. He returned to England in 1753 in the same ship with Clive, with whom he formed a close friendship. From 1754 to 1758 he was a member of council at Madras, in which capacity he largely influenced the sending of Clive to Calcutta to avenge the catastrophe of the Black Hole. His great work—*A History of the Military Transactions of the British Nation in Indostan from 1745*—was published in three volumes in 1763 and 1778 (Madras reprint, 1861–1862). This was followed by a volume of *Historical Fragments* (1781), dealing with an earlier period. In 1769 he was appointed historiographer to the East India Company. He died at Ealing on the 13th of January 1801. His valuable collections of MSS. are in the India Office library. The characteristics of his work, of which the influence is admirably shown in Thackeray's *The Newcomes*, are thus described by Macaulay: "Orme, inferior to no English historian in style and power of painting, is minute even to tediousness. In one volume he allots, on an average, a closely printed quarto page to the events of every forty-eight hours. The consequence is that his narrative, though one of the most authentic and one of the most finely written in our language, has never been very popular, and is now scarcely ever read." Not a few of the most picturesque passages in Macaulay's own Essay on Clive are borrowed from Orme. (J. S. Co.)

ORMEROD, ELEANOR A. (1828–1901), English entomologist, was the daughter of George Ormerod, F.R.S., author of *The History of Cheshire*, and was born at Sedbury Park, Gloucestershire, on the 11th of May 1828. From her earliest childhood insects were her delight, and the opportunity afforded for entomological study by the large estate upon which she grew up and the interest she took in agriculture generally soon made her a local authority upon this subject. When, in 1868, the Royal Horticultural Society began forming a collection of insect pests of the farm for practical purposes, Miss Ormerod largely contributed to it, and was awarded the Flora medal of the society. In 1877 she issued a pamphlet, *Notes for Observations* *on Injurious Insects*, which was distributed among persons interested in this line of inquiry, who readily sent in the results of their researches, and was thus the beginning of the well-known *Annual Series of Reports on Injurious Insects and Farm Pests.* In 1881 Miss Ormerod published a special report upon the "turnip-fly," and in 1882 was appointed consulting entomologist to the Royal Agricultural Society, a post she held until 1892. For several years she was lecturer on scientific entomology at the Royal Agricultural College, Cirencester. Her fame was not confined to England: she received silver and gold medals from the university of Moscow for her models of insects injurious to plants, and her treatise on *The Injurious Insects of South Africa* showed how wide was her range. In 1899 she received the large silver medal from the Société Nationale d' Acclimatation de France. Among others of her works are the *Cobden Journals*, *Manual of Injurious Insects*, and *Handbook of Insects injurious to Orchard and Bush Fruits.* Almost the last honour which fell to her was the honorary degree of LL.D. of Edinburgh University—a unique distinction, for she was the first woman upon whom the university had conferred this degree. The dean of the legal faculty in making the presentation aptly summoned up Miss Ormerod's services as follows: "The preeminent position which Miss Ormerod holds in the world of science is the reward of patient study and unwearying observation. Her investigations have been chiefly directed towards the discovery of methods for the prevention of the ravages of those insects which are injurious to orchard, field and forest. Her labours have been crowned with such success that she is entitled to be hailed the protectress of agriculture and the fruits of the earth—a beneficent Demeter of the 19th century." She died at St Albans on the 19th of July 1901.

ORMOC, a town of the province of Leyte, island of Leyte, Philippine Islands, on the W. coast about 35 m. S.W. of Tacloban. Pop. (1903), after the annexation of Albuera, 20,761. There are thirty-three barrios or villages in the town, and the largest of them had a population in 1903 of 5419. The language is Visayan. Ormoc is in a great hemp-producing region and is open to coast trade.

ORMOLU (Fr. *or moulu*, gold ground or pounded), an alloy of copper and zinc, sometimes with an addition of tin. The name is also used to describe gilded brass or copper. The tint of ormolu approximates closely to that of gold; it is heightened by a wash of gold lacquer, by immersion in dilute sulphuric acid, or by burnishing. The principal use of ormolu is for the mountings of furniture. With it the great French *ebénistes* of the 18th century obtained results which, in the most finished examples, are almost as fine as jewelers' work. The mounts were usually cast and then chiselled with extraordinary skill and delicacy.

ORMOND, a village and winter resort of Volusia county, Florida, U.S.A., about 68 m. by rail S. of St Augustine. It is situated on the Halifax river, an arm of the Atlantic Ocean extending for 25 m. along the E. coast of Florida. Pop. (1900) 595; (1905) 689; (1910) 780. It is served by the Florida East Coast Railway. The Halifax river region is famous for its excellent oranges and grape-fruit. The hard and compact Ormond-Daytona beach, about 200 ft. wide at low tide and about 20 m. long, offers exceptional facilities for driving, motoring and bicycling; on it are held the annual tournaments of the Florida East Coast Automobile Association. The old King's Road, built by the English between 1763 and 1783, from St Mary's, Georgia, some 400 m. to the south, has been improved for automobiles between Ormond and Jacksonville. About 2 m. west of Ormond are the ruins of an old sugar mill, probably dating from the last quarter of the 18th century and not, as is frequently said, from the Spanish occupation in the 16th century. About 5 m. south of Ormond and also on the Halifax river is another popular winter resort, Daytona (pop. 1900, 1690; 1905, 2199; 1910, 3182), founded in 1870 as Tomoka by Mathias Day of Mansfield, Ohio, in whose honour it was renamed Daytona in 1871. Its streets and drives are shaded by live oaks, palmettos, hickories and magnolias.

ORMONDE, EARL AND MARQUESS OF, titles still held by the famous Irish family of Butler (*q.v.*), the name being taken from a district now part of Co. Tipperary. In 1328 James Butler (*c.* 1305–1337), a son of Edmund Butler, was created earl of Ormonde, one reason for his elevation being the fact that his wife Eleanor, a daughter of Humfrey Bohun, earl of Hereford, was a granddaughter of King Edward I. His son James, the 2nd earl (1331–1382), was four times governor of Ireland; the latter's grandson James, the 4th earl (d. 1452), held the same position several times, and won repute not only as a soldier, but as a scholar. His son James, the 5th earl (1420–*c.* 1461), was created an English peer as earl of Wiltshire in 1449. A truculent partisan of the house of Lancaster, he was lord high treasurer of England in 1455 and again in 1459, and was taken prisoner after the battle of Towton in 1461. He and his two brothers were than attainted, and he died without issue, the exact date of his death being unknown. The attainder was repealed in the Irish parliament in 1476, when his brother Sir John Butler (*c.* 1422–1478), who had been pardoned by Edward IV. a few years previously, became 6th earl of Ormonde. John, who was a fine linguist, served Edward IV. as ambassador to many European princes, and this king is said to have described him as "the goodliest knight he ever beheld and the finest gentleman in Christendom." His brother Thomas, the 7th earl (*c.* 1424–1515), a courtier and an English baron under Richard III. and Henry VII., was ambassador to France and to Burgundy; he left no sons, and on his death in August 1515 his earldom reverted to the crown.

Margaret, a daughter of this earl, married Sir William Boleyn of Blickling, and their son Sir Thomas Boleyn (1477–1539) was created earl of Ormonde and of Wiltshire in 1529. He went on several important errands for Henry VIII., during one of which he arranged the preliminaries for the Field of the Cloth of Gold; he was lord privy seal from 1530 to 1536, and served the king in many other ways. He was the father of Henry's queen, Anne Boleyn, but both this lady, and her only brother, George Boleyn, Viscount Rochford, had been put to death before their father died in March 1539.

Meanwhile in 1515 the title of earl of Ormonde had been assumed by Sir Piers Butler (*c.* 1467–1539), a cousin of the 7th earl, and a man of great influence in Ireland. He was lord deputy, and later lord treasurer of Ireland, and in 1528 he surrendered his claim to the earldom of Ormonde and was created earl of Ossory. Then in 1538 he was made earl of Ormonde, this being a new creation; however, he counts as the 8th earl of the Butler family. In 1550 his second son Richard (d. 1571) was created Viscount Mountgarret, a title still held by the Butlers. The 8th earl's son, James, the 9th earl (*c.* 1490–1546), lord high treasurer of Ireland, was created Viscount Thurles in 1536. In 1544 an act of parliament confirmed him in the possession of his earldom, which, for practical purposes, was declared to be the creation of 1328, and not the new creation of 1538.

Thomas, the 10th earl (1532–1614), a son of the 9th earl, was lord high treasurer of Ireland and a very prominent personage during the latter part of the 16th century. He was a Protestant and threw his great influence on the side of the English queen and her ministers in their efforts to crush the Irish rebels, but he was perhaps more anxious to prosecute a fierce feud with his hereditary foe, the earl of Desmond, this struggle between the two factions desolating Munster for many years. His successor was his nephew Walter (1569–1633), who was imprisoned from 1617 to 1625 for refusing to surrender the Ormonde estates to his cousin Elizabeth, the wife of Sir R. Preston and the only daughter of the 10th earl. He was deprived of the palatine rights in the county of Tipperary, which had belonged to his ancestors for 400 years, but he recovered many of the family estates after his release from prison in 1625.

Walter's grandson, James, the 12th earl, was created marquess of Ormonde in 1642 and duke of Ormonde in 1661 (see below); his son was Thomas Butler, earl of Ossory (*q.v.*), and his grandson was James Butler, 2nd duke of Ormonde (see below).

When Charles Butler, earl of Arran (1671–1758), the brother and successor of the 2nd duke, died in December 1758, the dukedom and marquessate became extinct, but the earldom was claimed by a kinsman, John Butler (d. 1766). John's cousin, Walter (1703–1783), inherited this claim, and Walter's son John (1740–1795) obtained a confirmation of it from the Irish House of Lords in 1791. He is reckoned as the 17th earl. His son Walter, the 18th earl (1770–1820), was created marquess of Ormonde in 1816, a title which became extinct on his death, but was revived in favour of his brother James (1774–1838) in 1825. James was the grandfather of James Edward William Theobald Butler (b. 1844), who became the 3rd marquess in 1854. The marquess sits in the House of Lords as Baron Ormonde of Llanthony, a creation of 1821.

See J. H. Round on "The Earldoms of Ormonde" in Joseph Foster's *Collectanea Genealogica* (1881–1883).

ORMONDE, JAMES BUTLER, 1st Duke of (1610–1688), Irish statesman and soldier, eldest son of Thomas Butler, Viscount Thurles, and of Elizabeth, daughter of Sir John Poyntz, and grandson of Walter, 11th earl of Ormonde (see above), was born in London on the 19th of October 1610. On the death of his father by drowning in 1619, the boy was made a royal ward by James I., removed from his Roman Catholic tutor, and placed in the household of Abbot, archbishop of Canterbury, with whom he stayed until 1625, residing afterwards in Ireland with his grandfather. In 1629, by his marriage with his cousin, the Lady Elizabeth Preston, daughter and heiress of Richard, earl of Desmond, he put an end to the long-standing quarrel between the families and united their estates. In 1632 on the death of his grandfather he succeeded him to the earldom.

He was already noted in Ireland, as had been many of his race, for his fine presence and great bodily vigour. His active career began in 1633 with the arrival of Strafford, by whom he was treated, in spite of his independence of character, with great favour. Writing to the king, Strafford described him as "young, but take it from me, a very staid head," and Ormonde was throughout his Irish government his chief friend and support. In 1640 during Strafford's absence he was made commander-in-chief of the forces, and in August he was appointed lieutenant-general. On the outbreak of the rebellion in 1641 he rendered admirable service in the expedition to Naas, and in the march into the Pale in 1642, though much hampered by the lords justices, who were jealous of his power and recalled him after he had succeeded in relieving Drogheda. He was publicly thanked by the English parliament and presented with a jewel of the value of £620. On the 15th of April 1642 he gained the battle of Kilrush against Lord Mountgarret. On the 30th of August he was created a marquess, and on the 16th of September was appointed lieutenant-general with a commission direct from the king. On the 18th of March 1643 he won the battle of New Ross against Thomas Preston, afterwards Viscount Tara. In September, the civil war in England having meanwhile broken out, Ormonde, in view of the successes of the rebels and the uncertain loyalty of the Scots in Ulster, concluded with the latter, in opposition to the lords justices, on the 15th of September, the "cessation" by which the greater part of Ireland was given up into the hands of the Catholic Confederation, leaving only small districts on the east coast and round Cork, together with certain fortresses in the north and west then actually in their possession, to the English commanders. He subsequently, by the king's orders, despatched a body of troops into England (shortly afterwards routed by Fairfax at Nantwich) and was appointed in January 1644 lord lieutenant, with special instructions to do all in his power to keep the Scotch army occupied. In the midst of all the plots and struggles of Scots, Old Irish, Catholic Irish of English race, and Protestants, and in spite of the intrigues of the pope's nuncio as well as of attempts by the parliament's commissioners to ruin his power, Ormonde showed the greatest firmness and ability. He assisted Antrim in his unsuccessful expedition into Scotland. On the 28th of March 1646 he concluded a treaty with the Irish which granted religious concessions and removed various grievances. Meanwhile the difficulties of his position had been greatly increased by Glamorgan's treaty with the Roman Catholics on the 25th of August 1645, and it became clear that he could not long hope to hold Dublin against the Irish rebels. He thereupon applied to the English parliament, signed a treaty on the 19th of June 1647, gave Dublin into their hands upon terms which protected the interests of both Protestants and Roman Catholics so far as they had not actually entered into rebellion, and sailed for England at the beginning of August. He attended Charles during August and October at Hampton Court, but subsequently, in March 1648, in order to avoid arrest by the parliament, he joined the queen and prince of Wales at Paris. In September of the same year, the pope's nuncio having been expelled, and affairs otherwise looking favourable, he returned to Ireland to endeavour to unite all parties for the king. On the 17th of January 1649 he concluded a peace with the rebels on the basis of the free exercise of their religion, on the execution of the king proclaimed Charles II. and was created a knight of the Garter in September. He upheld the royal cause with great vigour though with slight success, and on the conquest of the island by Cromwell he returned to France in December 1650.

Ormonde now, though in great straits for want of money, resided in constant attendance upon Charles and the queen-mother in Paris, and accompanied the former to Aix and Cologne when expelled from France by Mazarin's treaty with Cromwell in 1655. In 1658 he went disguised, and at great risk, upon a secret mission into England to gain trustworthy intelligence as to the chances of a rising. He attended the king at Fuenterrabia in 1659 and had an interview with Mazarin; and was actively engaged in the secret transactions immediately preceding the Restoration. On the return of the king he was at once appointed a commissioner for the treasury and the navy, made lord steward of the household, a privy councillor, lord lieutenant of Somerset (an office which he resigned in 1672), high steward of Westminster, Kingston and Bristol, chancellor of Dublin University, Baron Butler of Llanthony and earl of Brecknock in the peerage of England; and on the 30th of March 1661 he was created duke of Ormonde in the Irish peerage and lord high steward of England. At the same time he recovered his enormous estates in Ireland, and large grants in recompense of the fortune he had spent in the royal service were made to him by the king, while in the following year the Irish parliament presented him with £30,000. His losses, however, according to Carte, exceeded his gains by £868,000. On the 4th of November 1661 he once more received the lord lieutenantship of Ireland, and was busily engaged in the work of settling that country. The most important and most difficult problem was the land question, and the Act of Explanation was passed through the Irish parliament by Ormonde on the 23rd of December 1665. His heart was in his government, and he vehemently opposed the bill prohibiting the importation of Irish cattle which struck so fatal a blow at Irish trade; and retaliated by prohibiting the import into Ireland of Scottish commodities, and obtained leave to trade with foreign countries. He encouraged Irish manufactures and learning to the utmost, and it was to his efforts that the Irish College of Physicians owes its incorporation.

Ormonde's personality had always been a striking one, and in the new reign his virtues and patriotism became still more conspicuous. He represented almost alone the older and nobler generation. He stood aloof while the counsels of the king were guided by dishonour; and proud of the loyalty of his race which had remained unspotted through five centuries, he bore with silent self-respect calumny, envy and the loss of royal favour, declaring, "However ill I may stand at court I am resolved to lye well in the chronicle."

He soon became the mark for attack from all that was worst in the court. Buckingham especially did his utmost to undermine his influence. Ormonde's almost irresponsible government of Ireland during troublous times was no doubt open to criticism. He had billeted soldiers on civilians, and had executed martial law. The impeachment, however, threatened by Buckingham in 1667 and 1668 fell through. Nevertheless by

1669 constant importunity had had its usual effect upon Charles, and on the 14th of March Ormonde was removed from the government of Ireland and from the committee for Irish affairs. He made no complaint, insisted that his sons and others over whom he had influence should retain their posts, and continued to fulfil with dignified persistence the duties of his other offices, while the greatness of his character and services was recognized by his election as chancellor of Oxford University on the 4th of August.

In 1670 an extraordinary attempt was made to assassinate the duke by a ruffian and adventurer named Thomas Blood, already notorious for an unsuccessful plot to surprise Dublin Castle in 1663, and later for stealing the royal crown from the Tower. Ormonde was attacked by this person and his accomplices while driving up St James's Street on the night of the 6th of December, dragged out of his coach, and taken on horseback along Piccadilly with the intention of hanging him at Tyburn. Ormonde, however, succeeded in overcoming the horseman to whom he was bound, and his servants coming up, he escaped. The outrage, it was suspected, had been instigated by the duke of Buckingham, who was openly accused of the crime by Lord Ossory, Ormonde's son, in the king's presence, and threatened by him with instant death if any violence should happen to his father; and some colour was given to these suspicions by the improper action of the king in pardoning Blood, and in admitting him to his presence and treating him with favour after his apprehension while endeavouring to steal the crown jewels.

In 1671 Ormonde successfully opposed Richard Talbot's attempt to upset the Act of Settlement. In 1673 he again visited Ireland, returned to London in 1675 to give advice to Charles on affairs in parliament, and in 1677 was again restored to favour and reappointed to the lord lieutenancy. On his arrival in Ireland he occupied himself in placing the revenue and the army upon a proper footing. Upon the outbreak of the popish terror in England, he at once took the most vigorous and comprehensive steps, though with as little harshness as possible, towards rendering the Roman Catholics, who were in the proportion of 15 to 1, powerless; and the mildness and moderation of his measures served as the ground of an attack upon him in England led by Shaftesbury, from which he was defended with great spirit by his son Lord Ossory. In 1682 Charles summoned Ormonde to court. The same year he wrote "A Letter . . . in answer to the earl of Anglesey, his Observations upon the earl of Castlehaven's Memoires concerning the Rebellion of Ireland," and gave to Charles a general support. On the 9th of November 1683 an English dukedom was conferred upon him, and in June 1684 he returned to Ireland; but he was recalled in October in consequence of fresh intrigues. Before, however, he could give up his government to Rochester, Charles II. died; and Ormonde's last act as lord lieutenant was to proclaim James II. in Dublin. Subsequently he lived in retirement at Cornbury in Oxfordshire, lent to him by Lord Clarendon, but emerged from it in 1687 to offer a firm and successful opposition at the board of the Charterhouse to James's attempt to assume the dispensing power, and force upon the institution a Roman Catholic candidate without taking the oaths according to the statutes and the act of parliament. He also refused the king his support in the question of the Indulgence; notwithstanding which James, to his credit, refused to take away his offices, and continued to hold him in respect and favour to the last.

Ormonde died on the 21st of July 1688, not having, as he rejoiced to know, "outlived his intellectuals"; and with him disappeared the greatest and grandest figure of the times. His splendid qualities were expressed with some felicity in verses written on welcoming his return to Ireland and printed in 1682:

> "A Man of Plato's grand nobility,
> An inbred greatness, innate honesty;
> A Man not form'd of accidents, and whom
> Misfortune might oppress, not overcome . . .
> Who weighs himself not by opinion
> But conscience of a noble action."

He was buried in Westminster Abbey on the 1st of August.

He had, besides two daughters, three sons who grew to maturity. The eldest of these, Thomas, earl of Ossory (1634–1680) predeceased him, his eldest son succeeding as 2nd duke of Ormonde. The other two, Richard, created earl of Arran, and John, created earl of Gowran, both dying without male issue, and the male descent of the 1st duke becoming extinct in the person of Charles, 3rd duke of Ormonde, the earldom subsequently reverted to the descendants of Walter, 11th earl of Ormonde.

Authorities.—*Life of the Duke of Ormonde*, by Thomas Carte; the same author's *Collection of Original Letters, found among the Duke of Ormonde's Papers* (1739), and the Carte MSS. in the Bodleian Library at Oxford; *Life of Ormonde*, by Sir Robert Southwell, printed in the *History of the Irish Parliament*, by Lord Mountmorres (1792), vol. i.; *Correspondence between Archbishop Williams and the Marquess of Ormonde*, ed. by B. H. Beedham (reprinted from *Archaeologia Cambrensis*, 1869); *Observations on the Articles of Peace between James, Earl of Ormonde, and the Irish Rebels*, by John Milton; *Hist. MSS. Comm.* Reps. ii.-iv. and vi.-x., esp. Rep. viii., appendix p. 499, and Rep. xiv. App.: pt. vii., *MSS. of Marquis of Ormonde*, together with new series; *Notes and Queries*, vi. ser. v., pp. 343, 431; Gardiner's *Hist. of the Civil War*; *Calendar of State Papers (Domestic)* and *Irish, 1633–1662*, with introductions; *Biographia Britannica* (Kippis); *Scottish Hist. Soc. Publications: Letters and Papers* of 1650, ed. by S. R. Gardiner, vol. xvii. (1894).

ORMONDE, JAMES BUTLER, 2nd Duke of (1665–1745), Irish statesman and soldier, son of Thomas, earl of Ossory, and grandson of the 1st duke, was born in Dublin on the 29th of April 1665, and was educated in France and afterwards at Christ Church, Oxford. On the death of his father in 1680 he became earl of Ossory by courtesy. He obtained command of a cavalry regiment in Ireland in 1684, and having received an appointment at court on the accession of James II., he served against the duke of Monmouth. Having succeeded his grandfather as duke of Ormonde in 1688, he joined William of Orange, by whom he was made colonel of a regiment of horse-guards, which he commanded at the battle of the Boyne. In 1691 he served on the continent under William, and after the accession of Anne he was placed in command of the land forces co-operating with Sir George Rooke in Spain. Having been made a privy councillor, Ormonde succeeded Rochester as viceroy of Ireland in 1703, a post which he held till 1707. On the dismissal of the duke of Marlborough in 1711, Ormonde was appointed captain-general in his place, and allowed himself to be made the tool of the Tory ministry, whose policy was to carry on the war in the Netherlands while giving secret orders to Ormonde to take no active part in supporting their allies under Prince Eugene. Ormonde's position as captain-general made him a personage of much importance in the crisis brought about by the death of Queen Anne. Though he had supported the revolution of 1688, he was traditionally a Tory, and Lord Bolingbroke was his political leader. During the last years of Queen Anne he almost certainly had Jacobite leanings, and corresponded with the duke of Berwick. He joined Bolingbroke and Oxford, however, in signing the proclamation of King George I., by whom he was nevertheless deprived of the captain-generalship. In June 1715 he was impeached, and fled to France, where he for some time resided with Bolingbroke, and in 1716 his immense estates were confiscated to the crown by act of parliament, though by a subsequent act his brother, Charles Butler, earl of Arran, was enabled to repurchase them. After taking part in the Jacobite invasion in 1715, Ormonde settled in Spain, where he was in favour at court and enjoyed a pension from the crown. Towards the end of his life he resided much at Avignon, where he was seen in 1733 by Lady Mary Wortley Montagu. Ormonde died on the 16th of November 1745, and was buried in Westminster Abbey.

With little of his grandfather's ability, and inferior to him in elevation of character, Ormonde was nevertheless one of the great figures of his time. Handsome, dignified, magnanimous and open-handed, and free from the meanness, treachery and venality of many of his leading contemporaries, he enjoyed a popularity which, with greater stability of purpose, might have enabled him to exercise commanding influence over events.

See Thomas Carte, *Hist. of the Life of James, Duke of Ormonde* (6 vols., Oxford, 1851), which contains much information respecting the life of the second duke; Earl Stanhope, *Hist. of England, comprising the Reign of Queen Anne until the Peace of Utrecht* (London, 1870); F. W. Wyon, *Hist. of Great Britain during the Reign of Queen Anne* (2 vols., London, 1876); William Coxe, *Memoirs of Marlborough* (3 vols., new edition, London, 1847).

ORMSKIRK, a market town and urban district in the Ormskirk parliamentary division of Lancashire, England, 11 m. N.E. of Liverpool by the Lancashire and Yorkshire railway. Pop. (1901), 6857. The church of St Peter and St Paul is a spacious building in various styles of architecture, but principally Perpendicular. It possesses the rare feature of two western towers, the one square and embattled, the other octagonal and bearing a short spire. There are various Norman fragments, including a fine early window in the chancel. To the south-east of the church, and divided from it by a screen, is the Derby chapel, the exclusive property of the earls of Derby, whose vault is contained within. A free grammar school was founded about 1614. Rope and twine making, iron-founding and brewing are carried on, and the town has long been famous for its gingerbread.

The name and church existed in the time of Richard I., when the priory of Burscough was founded. A few fragments of this remain about 2 m. N. of Ormskirk. The prior and convent obtained from Edward I. a royal charter for a market at the manor of Ormskirk. On the dissolution of the monasteries the manor was granted to the earl of Derby.

ORNAMENT (Lat. *ornare*, to adorn), in decorative art, that element which adds an embellishment of beauty in detail. Ornament is in its nature accessory, and implies a thing to be ornamented, which is its active cause and by rights suggests its design (*q.v.*). It does not exist apart from its application. Nor is it properly *added* to a thing already in existence (that is but a makeshift for design), but is rather such modification of the thing *in the making* as may be determined by the consideration of beauty. For example, the construction and proportions of a chair are determined by use (by the necessity of combining the maximum of strength with the minimum of weight, and of fitting it to the proportions of the human body, &c.); and any modification of the plan, such as the turning of legs, the shaping of arms and back, carving, inlay, mouldings, &c.—any reconsideration even of the merely utilitarian plan from the point of view of art—has strictly to do with Ornament, which thus, far from being an afterthought, belongs to the very inception of the thing. Ornament is good only in so far as it is an indispensable part of something, helping its effect without hurt to its use. It is begotten of use by the consideration of beauty. The test of ornament is its *fitness*. It must occupy a space, fulfil a purpose, be adapted to the material in which and the process by which it is executed. This implies *treatment*. The treatment befitting a wall space does not equally befit a floor space of the same dimensions. What is suitable to hand-painting is not equally suitable to stencilling, nor what is proper to mosaic proper to carpet-weaving. Neither the purposes of decoration nor the conditions of production allow great scope for naturalism in ornament. Its forms are derived from nature, more or less; but repose is best secured by some removedness from nature—necessitated also by the due treatment of material after its kind and according to its fashioning. In the case of recurring ornament it is inept to multiply natural flowers, &c., which at every repetition lose something of their natural attraction. The artist in ornament does not imitate natural forms. Such as he may employ he transfigures. He does not necessarily set out with any idea of natural form (this comes to him by the way); his first thought is to solve a given problem in design, and he solves it perhaps most surely by means of abstract ornament—witness the work of the Greeks and of the Arabs. The extremity of tasteless naturalism, reached towards the beginning of the Victorian era, was the opportunity of English reformers, prominent amongst whom was Owen Jones, whose fault was in insisting upon a form of ornament too abstract to suit English ideas. William Morris and others led the way back to nature, but to nature trained in the way of ornament. The Styles of ornament, so-called, mark the evolution of design, being the direct outcome of Greek, Roman, Byzantine, Gothic or other conditions, in days when fashion moved slowly. Post-Renaissance ornament goes by the name of the reigning king; but the character of the historic periods was not sought by artists; it came of their working in the way natural to them and doing their best. "Style," as distinguished from "the Styles," comes of an artist's intelligent and sympathetic treatment of his material, and of his personal sincerity and strength. International traffic has gone far to do away with national characteristics in ornament, which becomes yearly more and more alike all the world over. The subsidiary nature of ornament and its subjection to conditions lead to its frequent repetition, which results in *pattern*, repeated forms falling inevitably into lines, always self-asserting, and liable to annoy in proportion as they were not foreseen by the designer. He cannot, therefore, safely disregard them. Indeed, his first business is to build pattern upon lines, if not intrinsically beautiful, at least helpful to the scheme of decoration. He may disguise them; but capable designers are generally quite frank about the construction of their pattern, and not afraid of pronounced lines. Of course, adaptation being all-essential to pattern, an artist must be versed in the technique of any manufacture for which he designs. His art is in being equal to the occasion. (L. F. D.)

ORNE, a department of the north-west of France, about half of which formerly belonged to the province of Normandy and the rest to the duchy of Alençon and to Perche. Pop. (1906) 315,993. Area, 2371 sq. m. It is bounded N. by Calvados, N.E. by Eure, E. and S.E. by Eure-et-Loir, S. by Sarthe and Mayenne and W. by Manche. Geologically there are two distinct regions: to the west of the Orne and the railway from Argentan to Alençon lie primitive rocks connected with those of Brittany; to the east begin the Jurassic and Cretaceous formations of Normandy. The latter district is agriculturally the richest part of the department; in the former the poverty of the soil has led the inhabitants to seek their subsistence from industrial pursuits. Between the northern portions, draining to the Channel, and the southern portion, belonging to the basin of the Loire, stretch the hills of Perche and Normandy, which generally have a height of from 800 to 1000 ft. The highest point in the department, situated in the forest of Écouves north of Alençon, reaches 1368 ft. The department gives birth to three Seine tributaries—the Eure, its affluent the Iton, and the Risle, which passes by Laigle. The Touques, passing by Vimoutiers, the Dives and the Orne fall into the English Channel, the last passing Sées and Argentan, and receiving the Noireau with its tributary the Vère, which runs past Flers. Towards the Loire flows the Huisne, a feeder of the Sarthe passing by Mortagne, the Sarthe, which passes by Alençon, and the Mayenne, some of whose affluents rise to the north of the dividing range and make their way through it by the most picturesque defiles. The department, indeed, with its beautiful forests containing oaks several centuries old, its meadows, streams, deep gorges and stupendous rocks, is one of the most picturesque of all France. In the matter of climate Orne belongs to the Seine region. The mean temperature is 50° F.; the summer heat is never extreme; the west winds are the most frequent; the rainfall, distributed over about a hundred days in the year, amounts to 36 in. or about 5 in. more than the average for France.

Horse-breeding is the most flourishing business in the rural districts; there are three breeds—those of Perche, Le Merlerault and Brittany. The great government stud of Le Pin-au-Haras (established in 1714), with its school of horse-breeding, is situated between Le Merlerault and Argentan. Several horse-training establishments exist in the department. A large number of lean cattle are bought in the neighbouring departments to be fattened; the farms in the vicinity of Vimoutiers, on the borders of Calvados, produce the famous Camembert cheese, and others excellent butter. The bee industry is very flourishing. Oats, wheat, barley and buckwheat are the chief cereals, besides which fodder in great quantity and variety, potatoes and some hemp are grown. The variety of production is due to the great natural diversity of the soils. Small farms are the rule, and the fields in those cases are surrounded by hedges relieved by pollard trees. Along the roads or in the enclosures are planted numerous pear and apple trees, the latter yielding cider, part of which is manufactured into brandy. Beech, oak, birch and pine are the chief timber trees in the extensive forests of the department. Orne has iron mines and freestone quarries; a kind of smoky quartz known as Alençon diamond is found. Its most celebrated mineral waters are those of the hot springs of Bagnoles, which contain salt, sulphur and arsenic, and are employed for tonic and restorative purposes in cases of general debility. In the forest of Bellême is the chalybeate spring of La Hesse, which was used by the Romans.

Cotton and linen weaving, principally carried on at Flers (*q.v.*) and La Ferté-Macé (pop. 4355), forms the staple industry of Orne. Alençon and Vimoutiers are engaged in the production of linen and canvas. Vimoutiers has bleacheries, which, together with dye-works, are found in the textile centres. Only a few workmen are now employed at Alençon in the making of the lace which takes its name from the town. Foundries and wire-works also exist in the department, and articles in copper, zinc and lead are manufactured. Pins, needles, wire and hardware are produced at Laigle (pop. 4416), and Tinchebray is also a centre for hardware manufacture. There are also glass-works, paper-mills, tanneries (the waters of the Orne being reputed to give a special quality to the leather) and glove-works. Coal, raw cotton, metals and machinery are imported into the department, which exports its woven and metal manufacture, live stock and farm produce.

The department is served by the Western railway. There are four arrondissements, with Alençon, the capital, Argentan, Domfront and Mortagne as their chief towns, 36 cantons and 512 communes. The department forms the diocese of Sées (province of Rouen) and part of the académie (educational division) of Caen, and the region of the IV. army corps; its court of appeal is at Caen. The chief places are Alençon, Argentan, Mortagne, Flers and Sées. Carrouges has remains of a château of the 15th and 17th centuries; Chambois has a donjon of the 12th century; and there is a fine Renaissance château at O. A church in Laigle has a fine tower of the 15th century. There are a great number of megalithic monuments in the department.

ORNITHOLOGY,[1] properly the methodical study and consequent knowledge of birds with all that relates to them; but the difficulty of assigning a limit to the commencement of such study and knowledge gives the word a very vague meaning, and practically procures its application to much that does not enter the domain of science. This elastic application renders it impossible in the following sketch of the history of ornithology to draw any sharp distinction between works that are emphatically ornithological and those to which that title can only be attached by courtesy; for, since birds have always attracted far greater attention than any other group of animals with which in number or in importance they can be compared, there has grown up concerning them a literature of corresponding magnitude and of the widest range, extending from the recondite and laborious investigations of the morphologist and anatomist to the casual observations of the sportsman or the schoolboy.

Though birds make a not unimportant appearance in the earliest written records of the human race, the painter's brush has preserved their counterfeit presentment for a still longer period. A fragmentary fresco taken from a tomb at Medum was desposited some years ago, though in a decaying condition, in the Museum of Egyptian Antiquities, Cairo. This Egyptian picture was said to date from the time of the third or fourth dynasty, some three thousand years before the Christian era. In it were depicted with a marvellous fidelity, and thorough appreciation of form and colouring (despite a certain conventional treatment), the figures of six geese. Four of these figures can be unhesitatingly referred to two species (*Anser albifrons* and *A. ruficollis*) well known at the present day. In later ages the representations of birds of one sort or another in Egyptian paintings and sculptures become countless, and the *bassi-rilievi* of Assyrian monuments, though mostly belonging of course to a subsequent period, are not without them. No figures of birds, however, seem yet to have been found on the incised stones, bones or ivories of the prehistoric races of Europe.

History of Ornithology to End of 18th Century.

Early works.

Aristotle was the first serious author on ornithology with whose writings we are acquainted, but even he had, as he tells us, predecessors; and, looking to that portion of his works on animals which has come down to us, one finds that, though more than 170 sorts of birds are mentioned,[2] yet what is said of them amounts on the whole to very little, and this consists more of desultory observations in illustration of his general remarks (which are to a considerable extent physiological or bearing on the subject of reproduction) than of an attempt at a connected account of birds. One of his commentators, C. J. Sundevall—equally proficient in classical as in ornithological knowledge—was, in 1863, compelled to leave more than a score of the birds of which Aristotle wrote unidentified. Next in order of date, though at a long interval, comes Pliny the Elder, in whose *Historia Naturalis* Book X. is devoted to birds. Neither Aristotle nor Pliny attempted to classify the birds known to them beyond a very rough and for the most part obvious grouping. Aristotle seems to recognize eight principal groups: (1) *Gampsonyches*, approximately equivalent to the *Accipitres* of Linnaeus; (2) *Scolecophaga*, containing most of what would now be called *Oscines*, excepting indeed the (3) *Acanthophaga*, composed of the goldfinch, siskin and a few others; (4) *Scnipophaga*, the woodpeckers; (5) *Peristeroide*, or pigeons; (6) *Schizopoda*, (7) *Steganopoda*, and (8) *Barea*, nearly the same respectively as the Linnaean *Grallae*, *Anseres* and *Gallinae*. Pliny, relying wholly on characters taken from the feet, limits himself to three groups—without assigning names to them—those which have "hooked tallons, as Hawkes; or round long clawes, as Hennes; or else they be broad, flat, and whole-footed, as Geese and all the sort in manner of water-foule"—to use the words of Philemon Holland, who, in 1601, published a quaint and, though condensed, yet fairly faithful English translation of Pliny's work.

About a century later came Aelian, who died about A.D. 140, and compiled in Greek (though he was an Italian by birth) a number of miscellaneous observations on the peculiarities of animals. His work is a kind of commonplace book kept without scientific discrimination. A considerable number of birds are mentioned, and something said of almost each of them; but that something is too often nonsense according to modern ideas. The twenty-six books *De Animalibus* of Albertus Magnus (Groot), printed in 1478, are founded mainly on Aristotle. The twenty-third of these books is *De Avibus*, and therein a great number of birds' names make their earliest appearance, few of which are without interest from a philologist's if not an ornithologist's point of view, but there is much difficulty in recognizing the species to which many of them belong. In 1485 was printed the first dated copy of the volume known as the *Ortus sanitatis*, to the popularity of which many editions testify.[3] Though said by its author, Johann Wonnecke von Caub (Latinized as Johannes de Cuba), to have been composed from a study of the collections formed by a certain nobleman who had travelled in Eastern Europe, Western Asia and Egypt—possible Breidenbach, an account of whose travels in the Levant was printed at Mentz in 1486—it is really a medical treatise, and its zoological portion is mainly an abbreviation of the writings of Albertus Magnus, with a few interpolations from Isidorus of Seville (who flourished in the beginning of the 7th century, and was the author of many works highly esteemed in the middle ages) and a work known as *Physiologus* (*q.v.*). The third *tractatus* of this volume deals with birds—including among them bats, bees and other flying creatures; but as it is the first printed book in which figures of birds are introduced it merits notice, though most of the illustrations, which are rude woodcuts, fail, even in the coloured copies, to give any precise indication of the species intended to be represented.

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[1] *Ornithologia*, from the Greek ὀρνιθ-, crude form of ὄρνις, a bird, and -λογία, allied to λόγος, commonly Englished a discourse. The earliest known use of the word Ornithology seems to be in the third edition of Blount's *Glossographia* (1670), where it is noted as being "the title of a late Book."

[2] This is Sundevall's estimate; Drs Aubert and Wimmer in their excellent edition of the Ἱστορίαι περὶ ζῴων (Leipzig, 1868) limit the number to 126.

[3] Absurd as much that we find both in Albertus Magnus and the *Ortus* seems to modern eyes, if we go a step lower in the scale and consult the "Bestiaries" or treatises on animals which were common from the 12th to the 14th century we shall meet with many more absurdities. See for instance that by Philippe de Thaun (Philippus Taonensis), dedicated to Adelaide or Alice, queen of Henry I. of England, and probably written soon after 1121, as printed by the late Mr Thomas Wright, in his *Popular Treatises on Science written during the Middle Ages* (London, 1841).

The revival of learning was at hand, and William Turner, a Northumbrian, while residing abroad to avoid persecution at home, printed at Cologne in 1544 the first commentary on the birds mentioned by Aristotle and Pliny conceived in anything like the spirit that moves modern naturalists.[1] In the same year and from the same press was issued a *Dialogus de Avibus* by Gybertus Longolius, and in 1570 Caius brought out in London his treatise *De rariorum animalium atque stirpium historia*. In this last work, small though it be, ornithology has a good share; and all three may still be consulted with interest and advantage by its votaries.[2] Meanwhile the study received a great impulse from the appearance, at Zurich in 1555, of the third book of Conrad Gesner's *Historia Animalium* "qvi est de Auium natura," and at Paris in the same year of Pierre Belon's (Bellonius) *Histoire de la nature des Oyseaux*. Gesner brought an amount of erudition, hitherto unequalled, to bear upon his subject; and, making due allowance for the times in which he wrote, his judgment must in most respects be deemed excellent. In his work, however, there is little that can be called systematic treatment. Like nearly all his predecessors since Aelian, he adopted an alphabetical arrangement, though this was not too pedantically preserved, and did not hinder him from placing together the kinds of birds which he supposed (and generally supposed rightly) to have the most resemblance to that one whose name, being best known, was chosen for the headpiece (as it were) of his particular theme, thus recognizing to some extent the principle of classification.[3] Belon, with perhaps less book-learning than his contemporary, was evidently no mean scholar, and undoubtedly had more practical knowledge of birds—their internal as well as external structure. Hence his work, written in French, contains a far greater amount of original matter; and his personal observations made in many countries, from England to Egypt, enabled him to avoid most of the puerilities which disfigure other works of his own or of a preceding age. Besides this, Belon disposed the birds known to him according to a definite system, which (rude as we now know it to be) formed a foundation on which several of his successors were content to build, and even to this day traces of its influence may still be discerned in the arrangement followed by writers who have faintly appreciated the principles on which modern taxonomers rest the outline of their schemes. Both his work and that of Gesner were illustrated with woodcuts, many of which display much spirit and regard to accuracy.

Belon, as has just been said, had a knowledge of the anatomy of birds, and he seems to have been the first to institute a direct comparison of their skeleton with that of man; but in this respect he only anticipated by a few years the more precise researches of Volcher Coiter, a Frisian, who in 1573 and 1575 published at Nuremberg two treatises, in one of which the internal structure of birds in general is very creditably described, while in the other the osteology and myology of certain forms is given in considerable detail, and illustrated by carefully drawn figures. The first is entitled *Externarum et internarum principalium humani corporis Tabulae*, &c. while the second, which is the most valuable, is merely appended to the *Lectiones Gabrielis Fallopii de partibus similaribus humani corporis*, &c., and thus, the scope of each work being regarded as medical, the author's labours were wholly overlooked by the mere natural-historians who followed, though Coiter introduced a table, "De differentiis Auium," furnishing a key to a rough classification of such birds as were known to him, and this as nearly the first attempt of the kind deserves notice here.

Contemporary with these three men was Ulysses Aldrovandus, a Bolognese, who wrote an *Historia Naturalium* in sixteen folio volumes, most of which were not printed till after his death in 1605; but those on birds appeared between 1599 and 1603. The work is almost wholly a compilation, and that not of the most discriminative kind, while a peculiar jealousy of Gesner is continuously displayed, though his statements are very constantly quoted—nearly always as those of "Ornithologus," his name appearing but few times in the text, and not at all in the list of authors cited. With certain modifications in principle not very important, but characterized by much more elaborate detail, Aldrovandus adopted Belon's method of arrangement, but in a few respects there is a manifest retrogression. The work of Aldrovandus was illustrated by copperplates, but none of his figures approach those of his immediate predecessors in character or accuracy. Nevertheless the book was eagerly sought, and several editions of it appeared.[4]

Mention must be made of a medical treatise by Caspar Schwenckfeld, published at Liegnitz in 1603, under the title of *Theriotropheum Silesiae*, the fourth book of which consists of an "Aviarium Silesiae," and is the earliest of the works we now know by the name of fauna. The author was well acquainted with the labours of his predecessors, as his list of over one hundred of them testifies. Most of the birds he describes are characterized with accuracy sufficient to enable them to be identified, and his observations upon them have still some interest; but he was innocent of any methodical system, and was not exempt from most of the professional fallacies of his time.[5]

Hitherto, from the nature of the case, the works aforesaid treated of scarcely any but the birds belonging to the *orbis veteribus notus*; but the geographical discoveries of the 16th century began to bear fruit, and many animals of kinds unsuspected were, about one hundred years later, made known. Here there is only space to name Bontius, Clusius, Hernandez (or Fernandez), Marcgrave, Nieremberg and Piso,[6] whose several works describing the natural products of both the Indies—whether the result of their own observation or compilation—together with those of Olina and Worm, produced a marked effect, since they led up to what may be deemed the foundation of scientific ornithology.[7]

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[1] This was reprinted at Cambridge in 1823 by Dr George Thackeray.

[2] The Seventh of Wotton's *De differentiis animalium Libri Decem*, published at Paris in 1552, treats of birds; but his work is merely a compilation from Aristotle and Pliny, with references to other classical writers who have more or less incidentally mentioned birds and other animals. The author in his preface states—"Veterum scriptorum sententias in unum quasi cumulum coaceruaui, de meo nihil addidi." Nevertheless he makes some attempt at a systematic arrangement of birds, which, according to his lights, is far from despicable.

[3] For instance, under the title of "Accipiter" we have to look, not only for the sparrow-hawk and gos-hawk, but for many other birds of the family (as we now call it) removed comparatively far from those species by modern ornithologists.

[4] The *Historia Naturalis* of Johannes Johnstonus, said to be of Scottish descent but by birth a Pole, ran through several editions during the 17th century, but is little more than an epitome of the work of Aldrovandus.

[5] The *Hierozoicon* of Bochart—a treatise on the animals named in Holy Writ—was published in 1619.

[6] For Lichtenstein's determination of the birds described by Marcgrave and Piso see the *Abhandlungen* of the Berlin Academy for 1817 (pp. 155 seq.).

[7] The earliest list of British birds seems to be that in the *Pinax Rerum Naturalium* of Christopher Merrett, published in 1667. In the following year appeared the *Onomasticon Zooicon* of Walter Charleton, which contains some information on ornithology. An enlarged edition of the latter, under the title of *Exercitationes*, &c., was published in 1677; but neither of these writers is of much authority. In 1684 Sibbald in his *Scotia illustrata* published the earliest Fauna of Scotland.

Willughby and Ray.

This foundation was laid by the joint labours of Francis Willughby (1635–1672) and John Ray (1628–1705), for it is impossible to separate their share of work in natural history more than to say that, while the former more especially devoted himself to zoology, botany was the favourite pursuit of the latter. Together they studied, together they travelled and together they collected. Willughby, the younger of the two, and at first the other's pupil, seems to have gradually become the master; but, he dying before the promise of his life was fulfilled, his writings were given to the world by his friend Ray, who, adding to them from his own stores, published the *Ornithologia* in Latin in 1676, and in English with many emendations in 1678. In this work birds generally were grouped in two great divisions—"land-fowl" and "water-fowl"—the former being subdivided into those which have a crooked beak and talons, and those which have a straighter bill and claws, while the latter was separated into those which frequent waters and watery places, and those that swim in the water—each subdivision being further broken up into many sections, to the whole of which a key was given. Thus it became possible for almost any diligent reader without much chance of error to refer to its proper place nearly every bird he was likely to meet with. Ray's interest in ornithology continued, and in 1694 he completed a *Synopsis Methodica Avium*, which, through the fault of the booksellers to whom it was entrusted, was not published till 1713, when Derham gave it to the world.[1]

Linnaeus.

Two years after Ray's death, Linnaeus, the great reformer of natural history, was born, and in 1735 appeared the first edition of the celebrated *Systema Naturae*. Successive editions of this work were produced under its author's supervision in 1740, 1748, 1758 and 1766. Impressed by the belief that verbosity was the bane of science, he carried terseness to an extreme which frequently created obscurity, and this in no branch of zoology more than in that which relates to birds. Still the practice introduced by him of assigning to each species a diagnosis by which it ought in theory to be distinguishable from any other known species, and of naming it by two words—the first being the generic and the second the specific term, was so manifest an improvement upon anything which had previously obtained that the Linnaean method of differentiation and nomenclature established itself before long in spite of all opposition, and in principle became almost universally adopted. In his classification of birds Linnaeus for the most part followed Ray, and where he departed from his model he seldom improved upon it.

In 1745 P. Barrère brought out at Perpignan a little book called *Ornithologiae Specimen novum*, and in 1752 Möhring published at Aurich one still smaller, his *Avium Genera*. Both these works (now rare) are manifestly framed on the Linnaean method, so far as it had then reached; but in their arrangement of the various forms of birds they differed greatly from that which they designed to supplant, and they deservedly obtained little success. Yet as systematists their authors were no worse than Klein, whose *Historiae Avium Prodromus*, appearing at Lübeck in 1750, and *Stemmata Avium* at Leipzig in 1759, met with considerable favour in some quarters. The chief merit of the latter work lies in its forty plates, whereon the heads and feet of many birds are indifferently figured.[2]

But, while the successive editions of Linnaeus's great work were revolutionizing natural history, and his example of precision in language producing excellent effect on scientific writers, several other authors were advancing the study of ornithology in a very different way—a way that pleased the eye even more than his labours were pleasing the mind. Between 1731 and 1743 Mark Catesby brought out in London his *Natural History of Carolina*—two large folios containing highly coloured plates of the birds of that colony, Florida and the Bahamas.[3] Eleazar Albin between 1738 and 1740 produced a *Natural History of Birds* in three volumes of more modest dimensions; but he seems to have been ignorant of ornithology, and his coloured plates are greatly inferior to Catesby's. Far better both as draughtsman and as authority was George Edwards, who in 1743 began, under the same title as Albin, a series of plates with letterpress, which was continued by the name of *Gleanings in Natural History*, and finished in 1760, when it had reached seven parts, forming four quarto volumes, the figures of which are nearly always quoted with approval.[4]

Brisson.

The year which saw the works of Edwards completed was still further distinguished by the appearance in France, where little had been done since Belon's days,[5] in six quarto volumes, of the *Ornithologie* of Mathurin Jacques Brisson—a work of very great merit so far as it goes, for as a descriptive ornithologist the author stands even now unsurpassed; but it must be said that his knowledge, according to internal evidence, was confined to books and to the external parts of birds' skins. It was enough for him to give a scrupulously exact description of such specimens as came under his eye, distinguishing these by prefixing two asterisks to their name, using a single asterisk where he had only seen a part of the bird, and leaving unmarked those that he described from other authors. His attempt at classification was certainly better than that of Linnaeus; and it is rather curious that the researches of the latest ornithologists point to results in some degree comparable with Brisson's systematic arrangement, for they refuse to keep the birds-of-prey at the head of the Class *Aves*, and they require the establishment of a much larger number of "Orders" than for a long while was thought advisable. Of such "Orders" Brisson had twenty-six and he gave pigeons and poultry precedence of the birds which are plunderers and scavengers. But greater value lies in his generic or sub-generic divisions, which, taken as a whole, are far more natural than those of Linnaeus, and consequently capable of better diagnosis. More than this, he seems to be the earliest ornithologist, perhaps the earliest zoologist, to conceive the idea of each genus possessing what is now called a "type"—though such a term does not occur in his work; and, in like manner, without declaring it in so many words, he indicated unmistakably the existence of subgenera—all this being effected by the skilful use of names. Unfortunately he was too soon in the field to avail himself, even had he been so minded, of the convenient mode of nomenclature brought into use by Linnaeus. Immediately on the completion of his *Règne Animale* in 1756, Brisson set about his *Ornithologie*, and it is only in the last two volumes of the latter that any reference is made to the tenth edition of the *Systema Naturae*, in which the binomial method was introduced. It is certain that the first four volumes were written if not printed before that method was promulgated, and when the fame of Linnaeus as a zoologist rested on little more than the very meagre sixth edition of the *Systema Naturae* and the first edition of his *Fauna Suecica*. Brisson has been charged with jealousy of, if not hostility to, the great Swede, and it is true that in the preface to his *Ornithologie* he complains of the insufficiency of the Linnaean characters, but, when one considers how much better acquainted with birds the Frenchman was, such criticism must be allowed to be pardonable if not wholly just. Brisson's work was in French, with a parallel translation (edited, it is said, by Pallas) in Latin, which last was reprinted separately at Leiden three years afterwards.

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[1] To this was added a supplement by Petiver on the Birds of Madras, taken from pictures and information sent him by one Edward Buckley of Fort St George, being the first attempt to catalogue the birds of any part of the British possessions in India.

[2] After Klein's death his *Prodromus*, written in Latin, had the unwonted fortune of two distinct translations into German, published in the same year 1760, the one at Leipzig and Lübeck by Behn, the other at Danzig by Reyger—each of whom added more or less to the original.

[3] Several birds from Jamaica were figured in Sloane's *Voyage*, &c. (1705–1725), and a good many exotic species in the *Thesaurus*, &c., of Seba (1734–1765), but from their faulty execution these plates had little effect upon Ornithology.

[4] The works of Catesby and Edwards were afterwards reproduced at Nuremberg and Amsterdam by Seligmann, with the letterpress in German, French and Dutch.

[5] Birds were treated of in a worthless fashion by one D. B. in a *Dictionnaire raisonné et universel des animaux*, published at Paris in 1759.

In 1767 there was issued at Paris a book entitled *L'Histoire naturelle éclaircie dans une de ses parties principales, l'ornithologie.* This was the work of Salerne, published after his death, and is often spoken of as being a mere translation of Ray's *Synopsis*, but a vast amount of fresh matter, and mostly of good quality, is added.

The success of Edwards's very respectable work seems to have provoked competition, and in 1765, at the instigation of Buffon, the younger d'Aubenton began the publication known as the *Planches enluminéez d'histoire naturelle*, which appearing in forty-two parts was not completed till 1780, when the plates[1] it contained reached the number of 1008—all coloured, as its title intimates, and nearly all representing birds. This enormous work was subsidized by the French government; and, though the figures are utterly devoid of artistic merit, they display the species they are intended to depict with sufficient approach to fidelity to ensure recognition in most cases without fear of error, which in the absence of any text is no small praise.[2]

But Buffon was not content with merely causing to be published this unparalleled set of plates. He seems to have regarded the work just named as a necessary precursor to his own labours in ornithology. His *Histoire naturelle, générale et particulière*, was begun in 1749, and in 1770 he brought out, with the assistance of Guénau de Montbeillard,[3] the first volume of his great *Histoire naturelle des oiseaux.* Buffon was the first man who formed any theory that may be called reasonable of the geographical distribution of animals. He proclaimed the variability of species in opposition to the views of Linnaeus as to their fixity, and moreover supposed that this variability arose in part by degradation.[4] Taking his labours as a whole, there cannot be a doubt that he enormously enlarged the purview of naturalists, and, even if limited to birds, that, on the completion of his work upon them in 1783, ornithology stood in a very different position from that which it had before occupied.

Latham.

Great as were the services of Buffon to ornithology in one direction, those of a wholly different kind rendered by John Latham must not be overlooked. In 1781 he began a work the practical utility of which was immediately recognized. This was his *General Synopsis of Birds*, and, though formed generally on the model of Linnaeus, greatly diverged in some respects therefrom. The classification was modified, chiefly on the old lines of Willughby and Ray, and certainly for the better; but no scientific nomenclature was adopted, which, as the author subsequently found, was a change for the worse. His scope was co-extensive with that of Brisson, but Latham did not possess the inborn faculty of picking out the character wherein one species differs from another. His opportunities of becoming acquainted with birds were hardly inferior to Brisson's, for during Latham's long lifetime there poured in upon him countless new discoveries from all parts of the world, but especially from the newly-explored shores of Australia and the islands of the Pacific Ocean. The British Museum had been formed, and he had access to everything it contained in addition to the abundant materials afforded him by the private museum of Sir Ashton Lever.[5] Latham entered, so far as the limits of his work would allow, into the history of the birds he described, and this with evident zest whereby he differed from his French predecessor; but the number of cases in which he erred as to the determination of his species must be very great, and not unfrequently the same species is described more than once. His *Synopsis* was finished in 1785; two supplements were added in 1787 and 1802,[6] and in 1790 he produced an abstract of the work under the title of *Index Ornithologicus*, wherein he assigned names on the Linnaean method to all the species described. Not to recur again to his labours, it may be said here that between 1821 and 1828 he published at Winchester, in eleven volumes, an enlarged edition of his original work, entitling it *A General History of Birds*; but his defects as a compiler, which had been manifest before, rather increased with age, and the consequences were not happy.[7]

About the time that Buffon was bringing to an end his studies of birds, Mauduyt undertook to write the *Ornithologie* of the *Encyclopédie méthodique*—a comparatively easy task, considering the recent works of his fellow-countrymen on that subject, and finished in 1784. Here it requires no further comment, especially as a new edition was called for in 1790, the ornithological portion of which was begun by Bonnaterre, who, however, had only finished three hundred and twenty pages of it when he lost his life in the French Revolution; and the work thus arrested was continued by Vieillot under the slightly changed title of *Tableau encyclopédique et méthodique des trois règnes de la Nature*—the *Ornithologie* forming volumes four to seven, and not completed till 1823. In the former edition Mauduyt had taken the subjects alphabetically; but here they are disposed according to an arrangement, with some few modifications, furnished by d'Aubenton, which is extremely shallow and unworthy of consideration.

Several other works bearing upon ornithology in general, but of less importance than most of those just named, belong to this period. Among others may be mentioned the *Genera of Birds* by Thomas Pennant, first printed at Edinburgh in 1773, but best known by the edition which appeared in London in 1781; the *Elementa Ornithologica* and *Museum Ornithologicum* of Schäffer, published at Ratisbon in 1774 and 1784 respectively; Peter Brown's *New Illustrations of Zoology* in London in 1776; Hermann's *Tabulae Affinitatum Animalium* at Strasburg in 1783, followed posthumously in 1804 by his *Observationes Zoologicae*; Jacquin's *Beytraege zur Geschichte der Voegel* at Vienna in 1784, and in 1790 at the same place the larger work of Spalowsky with nearly the same title; Sparrman's *Museum Carlsonianum* at Stockholm from 1786 to 1789; and in 1794 Hayes's *Portraits of rare and curious Birds* from the menagery of Child the banker at Osterley near London. The same draughtsman (who had in 1775 produced a *History of British Birds*) in 1822 began another series of *Figures of rare and curious Birds.*[8]

The practice of Brisson, Buffon, Latham and others of neglecting to name after the Linnaean fashion the species they described gave great encouragement to compilation, and led to what has proved to be of some inconvenience to modern ornithologists. In 1773 P. L. S. Müller brought out at Nuremberg a German translation of the *Systema Naturae*, completing it in 1776 by a *Supplement* containing a list of animals thus described, which had hitherto been technically anonymous, with diagnoses and names on the Linnaean model. In 1783 Boddaert printed at Utrecht a *Table des planches enluminéez*,[9] in which he attempted to refer every species of bird figured in that extensive series to its proper Linnaean genus, and to assign it a scientific name if it did not already possess one. In like manner in 1786, Scopoli—already the author of a little book published at Leipzig in 1769 under the title of *Annus I. Historico-naturalis*, in which are described many birds, mostly from his

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[1] They were drawn and engraved by Martinet, who himself began in 1787 a *Histoire des oiseaux* with small coloured plates which have some merit, but the text is worthless.

[2] Between 1767 and 1776 there appeared at Florence a *Storia Naturale degli Uccelli*, in five folio volumes, containing a number of ill-drawn and ill-coloured figures from the collection of Giovanni Gerini, an ardent collector who died in 1751, and therefore must be acquitted of any share in the work, which, though sometimes attributed to him, is that of certain learned men who did not happen to be ornithologists (cf. Savi, *Ornitologia Toscana*, i. Introduzione, p. v.).

[3] He retired on the completion of the sixth volume, and thereupon Buffon associated Bexon with himself.

[4] See St George Mivart's address to the Section of Biology, *Rep. Brit. Association* (Sheffield Meeting, 1879), p. 356.

[5] In 1792 Shaw began the *Museum Leverianum* in illustration of this collection, which was finally dispersed by sale, and what is known to remain of it found its way to Vienna. Of the specimens in the British Museum described by Latham it is to be feared that scarcely any exist. They were probably very imperfectly prepared.

[6] A German translation by Bechstein subsequently appeared.

[7] He also prepared for publication a second edition of his *Index Ornithologicus*, but this was never printed, and the manuscript came into A. Newton's possession.

[8] *The Naturalist's Miscellany* or *Vivarium Naturale*, in English and Latin, of Shaw and Nodder, the former being the author, the latter the draughtsman and engraver, was begun in 1789 and carried on till Shaw's death, forming twenty-four volumes. It contains figures of more than 280 birds, but very poorly executed. In 1814 a sequel, *The Zoological Miscellany*, was begun by Leach, Nodder continuing to do the plates. This was completed in 1817, and forms three volumes with 149 plates, 27 of which represent birds.

[9] Of this work only fifty copies were printed, and it is one of the rarest known to the ornithologist. Only two copies are believed to exist in England, one in the British Museum, the other in private hands. It was reprinted in 1874 by Mr Tegetmeier.

Sonnerat. **Gmelin.**

own collection or the Imperial vivarium at Vienna—was at the pains to print at Pavia in his miscellaneous *Deliciae Florae et Faunae Insubricae* a *Specimen Zoologicum*[1] containing diagnoses, duly named, of the birds discovered and described by Sonnerat in his *Voyage aux Indes orientales* and *Voyage à la Nouvelle Guinée*, severally published at Paris in 1772 and 1776. But the most striking example of compilation was that exhibited by J. F. Gmelin, who in 1788 commenced what he called the Thirteenth Edition of the celebrated *Systema Naturae*, which obtained so wide a circulation that, in the comparative rarity of the original, the additions of this editor have been very frequently quoted, even by expert naturalists, as though they were the work of the author himself. Gmelin availed himself of every publication he could, but he perhaps found his richest booty in the labours of Latham, neatly condensing his English descriptions into Latin diagnoses, and bestowing on them binomial names. Hence it is that Gmelin appears as the authority for so much of the nomenclature now in use. He took many liberties with the details of Linnaeus's work, but left the classification, at least of the birds, as it was—a few new genera excepted.[2]

During all this time little had been done in studying the internal structure of birds;[3] but the foundations of the science of embryology had been laid by the investigations into the development of the chick by the great Harvey. Between 1666 and 1669 Perrault edited at Paris eight accounts of the dissection by du Verney of as many species of birds, which, translated into English, were published by the Royal Society in 1702, under the title of *The Natural History of Animals*. After the death of the two anatomists just named, another series of similar descriptions of eight other species was found among their papers, and the whole were published in the *Mémoires* of the French Academy of Sciences in 1733 and 1734. But in 1681 Gerard Blasius had brought out at Amsterdam an *Anatome Animalium*, containing the results of all the dissections of animals that he could find; and the second part of this book, treating of *Volatilia*, makes a respectable show of more than one hundred and twenty closely-printed quarto pages, though nearly two-thirds is devoted to a treatise *De Ovo et Pullo*, containing among other things a reprint of Harvey's researches, and the scientific rank of the whole book may be inferred from bats being still classed with birds. In 1720 Valentini published, at Frankfort-on-the-Main, his *Amphitheatrum Zootomicum*, in which again most of the existing accounts of the anatomy of birds were reprinted. But these and many other contributions,[4] made until nearly the close of the 18th century, though highly meritorious, were unconnected as a whole, and it is plain that no conception of what it was in the power of Comparative Anatomy to set forth had occurred to the most diligent dissectors.

Cuvier.

It was reserved for Georges Cuvier, who in 1798 published at Paris his *Tableau élémentaire de l'histoire naturelle des animaux*, to lay the foundation of a thoroughly and hitherto unknown mode of appreciating the value of the various groups of the animal kingdom. Yet his first attempt was a mere sketch.[5] Though he made a perceptible advance on the classification of Linnaeus, at that time predominant, it is now easy to see in how many ways—want of sufficient material being no doubt one of the chief—Cuvier failed to produce a really natural arrangement. His principles, however, are those which must still guide taxonomers, notwithstanding that they have in so great a degree overthrown the entire scheme which he propounded. Confining our attention here to ornithology, Cuvier's arrangement of the class *Aves* is now seen to be not very much better than any which it superseded. But this view is gained by following the methods which Cuvier taught. In the work just mentioned few details are given; but even the more elaborate classification of birds contained in his *Leçons d'anatomie comparée* of 1805 is based wholly on external characters, such as had been used by nearly all his predecessors; and the *Règne Animal* of 1817, when he was in his fullest vigour, afforded not the least evidence that he had ever dissected a couple even of birds[6] with the object of determining their relative position in his system, which then, as before, depended wholly on the configuration of bills, wings and feet. But, though apparently without such a knowledge of the anatomy of birds as would enable him to apply it to the formation of that natural system which he was fully aware had yet to be sought, he seems to have been an excellent judge of the characters afforded by the bill and limbs, and the use he made of them, coupled with the extraordinary reputation he acquired on other grounds, procured for his system the adhesion for many years of the majority of ornithologists.[7]

Hitherto mention has chiefly been made of works on general ornithology, but it will be understood that these were largely aided by the enterprise of travellers, and as there were many of them who published their narratives in separate forms their contributions have to be considered. Of those travellers then the first to be here especially named is Marsigli, the fifth volume of whose *Danubius Pannonico-Mysicus* is devoted to the birds he met with in the valley of the Danube, and appeared at the Hague in 1725, followed by a French translation in 1744.[8] Most of the many pupils whom Linnaeus sent to foreign countries submitted their discoveries to him, but Kalm, Hasselqvist and Osbeck published separately their respective travels in North America, the Levant and China.[9] The incessant journeys of Pallas and his colleagues—Falk, Georgi, S. G. Gmelin, Güldenstädt, Lepechin and others—in the exploration of the recently extended Russian empire supplied not only much material to the *Commentarii* and *Acta* of the Academy of St Petersburg, but more that is to be found in their narratives—all of it being of the highest interest to students of Palaearctic or Nearctic ornithology. Nearly the whole of their results, it may here be said, were summed up in the important *Zoographia Rosso-Asiatica* of the first-named naturalist, which saw the light in 1811—the year of its author's death—but, owing to circumstances over which he had no control, was not generally accessible till twenty years later. Of still wider interest are the accounts of Cook's three famous voyages, though unhappily much of the information gained by the naturalists who accompanied him on one or more of them seems to be irretrievably lost: the original observations of the elder Forster were not printed till 1844, and the valuable collection of zoological drawings made by the younger Forster still remains unpublished in the British Museum. The several accounts by John White, Collins, Phillips, Hunter and others of the colonization of New South Wales at the end of the last century ought not to be overlooked by any Australian ornithologist. The only information at this period on the ornithology of South America is contained in the two works on Chile by Molina, published at Bologna in 1776 and 1782. The travels of Le Vaillant in South Africa having been completed in 1785, his great *Oiseaux d'Afrique* began to appear in Paris in 1797; but it is hard to speak properly of this work, for several of the species described in it are certainly not, and never were in his time, inhabitants of that country, though he sometimes gives a long account of the circumstances under which he observed them.[10]

From travellers who employ themselves in collecting the animals of any distant country the zoologists who stay at home and study those of their own district, be it great or small, are really not so much divided as at first might appear. Both may well be named "Faunists," and of the latter there were not a few who having turned their attention more or less to ornithology should here be mentioned, and first among them Rzaczynski, who in 1721 brought out at Sandomirsk the *Historia naturalis curiosa regni Poloniae*, to which an *Auctuarium* was posthumously published at Danzig in 1742. This also may be perhaps the most proper place to notice the *Historia avium Hungariae* of Grossinger, published at Posen in 1793. In 1734 J. L. Frisch began the long series of works on the birds of Germany with which the literature of ornithology is enriched, by his *Vorstellung der Vögel Teutschlands*, which was only completed in 1763, and, its coloured plates proving very attractive, was again issued at Berlin in 1817. The little fly-sheet of Zorn[1]—for it is scarcely more—on the birds of the Hercynian Forest made its appearance at Pappenheim in 1745. In 1756 Kramer published at Vienna a modest *Elenchus* of the plants and animals of Lower Austria, and J. D. Petersen produced at Altona in 1766 a *Verzeichniss balthischer Vögel*; while in 1791 J. B. Fischer's *Versuch einer Naturgeschichte von Livland* appeared at Königsberg, next year BESEKE brought out at Mitau his *Beytrag zur Naturgeschichte der Vögel Kurlands*, and in 1794 Siemssen's *Handbuch* of the birds of Mecklenburg was published at Rostock. But these works, locally useful as they may have been, did not occupy the whole attention of German ornithologists, for in 1791 Bechstein reached the second volume of his *Gemeinnützige Naturgeschichte Deutschlands*, treating of the birds of that country, which ended with the fourth in 1795. Of this an abridged edition by the name of *Ornithologisches Taschenbuch* appeared in 1802 and 1803, with a supplement in 1812; while between 1805 and 1809 a fuller edition of the original was issued. Moreover in 1795 J. A. Naumann humbly began at Cöthen a treatise on the birds of the principality of Anhalt, which on its completion in 1804 was found to have swollen into an ornithology of northern Germany and the neighbouring countries. Eight supplements were successively published between 1805 and 1817, and in 1822 a new edition was required. This *Naturgeschichte der Vögel Deutschlands*, being almost wholly rewritten by his son J. F. Naumann, is by far the best thing of the kind as yet produced in any country. The fulness and accuracy of the text, combined with the neat beauty of its coloured plates, have gone far to promote the study of ornithology in Germany, and while essentially a popular work, since it is suited to the comprehension of all readers, it is throughout written with a simple dignity that commends it to the serious and scientific. Its twelfth and last volume was published in 1844—by no means too long a period for so arduous and honest a performance, and a supplement was begun in 1847; but, the editor—or author as he may be fairly called—dying in 1857, this continuation was finished in 1860 by the joint efforts of J. H. Blasius and Dr Baldamus. In 1800 Borkhausen with others commenced at Darmstadt a *Teutsche Ornithologie* in folio which appeared at intervals till 1812, and remains unfinished, though a reissue of the portion published took place between 1837 and 1841.

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[1] This was reprinted in 1882 by the Willughby Society.

[2] Daudin's unfinished *Traité élémentaire et complet d'ornithologie* appeared at Paris in 1800, and therefore is the last of these general works published in the 18th century.

[3] A succinct notice of the older works on ornithotomy is given by Professor Selenka in the introduction to that portion of Dr Bronn's *Klassen und Ordnungen des Thierreichs* relating to birds (pp. 1-9) published in 1869; and Professor Carus's *Geschichte der Zoologie*, published in 1872, may also be usefully consulted for further information on this and other heads.

[4] The treatises of the two Bartholinis and Borrichius published at Copenhagen deserve mention if only to record the activity of Danish anatomists in those days.

[5] It had no effect on Lacépède, who in the following year added a *Tableau méthodique* containing a classification of birds to his *Discours d'ouverture* (*Mém. de l'Institut*, iii. pp. 454-468, 503-519).

[6] So little regard did he pay to the osteology of birds that, according to de Blainville (*Jour. de Physique*, xcii. p. 187, note), the skeleton of a fowl to which was attached the head of a hornbill was for a long time exhibited in the Museum of Comparative Anatomy at Paris! Yet, in order to determine the difference of structure in their organs of voice, Cuvier, as he says in his *Leçons* (iv. 464), dissected more than one hundred and fifty species of birds. Unfortunately for him, as will appear in the sequel, it seems not to have occurred to him to use any of the results he obtained as the basis of a classification.

[7] It is unnecessary to enumerate the various editions of the *Règne Animal*. Of the English translations, that edited by Griffiths and Pidgeon is the most complete. The ornithological portion of it contained in these volumes received many additions from John Edward Gray, and appeared in 1829.

[8] Though much later in date, the *Iter per Poseganam Sclavoniae* of Piller and Mitterpacher, published at Buda in 1783, may perhaps be here most conveniently mentioned.

[9] The results of Forskål's travels in the Levant, published after his death by Niebuhr, require mention, but the ornithology they contain is but scant.

[10] It has been charitably suggested that, his collection and notes having suffered shipwreck, he was induced to supply the latter from his memory and the former by the nearest approach to his lost specimens that he could obtain. This explanation, poor as it is, fails, however, in regard to some species.

Other European countries, though not quite so prolific as Germany, bore some ornithological fruit at this period; but in all southern Europe only four faunistic products can be named: the *Saggio di storia naturale Bresciana* of Pilati, published at Brescia in 1769; the *Ornitologia dell' Europa meridionale* of Bernini, published at Parma between 1772 and 1776; the *Uccelli di Sardegna* of Cetti, published at Sassari in 1776; and the *Romana ornithologia* of Gilius, published at Rome in 1781—the last being in great part devoted to pigeons and poultry. More appeared in the North, for in 1770 Amsterdam sent forth the beginning of Nozeman's *Nederlandsche Vogelen*, a fairly illustrated work in folio, but only completed by Houttuyn in 1829, and in Scandinavia most of all was done. In 1746 the great Linnaeus had produced a *Fauna Svecica*, of which a second edition appeared in 1761, and a third, revised by Retzius, in 1800. In 1764 Brünnich published at Copenhagen his *Ornithologia borealis*, a compendious sketch of the birds of all the countries then subject to the Danish crown. At the same place appeared in 1767 Leem's work, *De Lapponibus Finmarchiae*, to which Gunnerus contributed some good notes on the ornithology of northern Norway, and at Copenhagen and Leipzig was published in 1780 the *Fauna Groenlandica* of Otho Fabricius.

Of strictly American origin can here be cited only W. Bartram's *Travels through North and South Carolina* and B. S. Barton's *Fragments of the Natural History of Pennsylvania*,[2] both printed at Philadelphia, one in 1791, the other in 1799; but J. R. Forster published a *Catalogue of the Animals of North America* in London in 1771, and the following year described in the *Philosophical Transactions* a few birds from Hudson Bay.[3] A greater undertaking was Pennant's *Arctic Zoology*, published in 1785, with a supplement in 1787. The scope of this work was originally intended to be limited to North America, but circumstances induced him to include all the species of Northern Europe and Northern Asia, and though not free from errors it is a praiseworthy performance. A second edition appeared in 1792.

The ornithology of Britain naturally demands greater attention. The earliest list of British birds we possess is that given by Merrett in his *Pinax rerum naturalium Britannicarum*, printed in London in 1667.[4] In 1677 Plot published his *Natural History of Oxfordshire*, which reached a second edition in 1705, and in 1686 that of *Staffordshire*. A similar work on *Lancashire, Cheshire and the Peak* was sent out in 1700 by Leigh, and one on *Cornwall* by Borlase in 1758—all these four being printed at Oxford. In 1766 appeared Pennant's *British Zoology*, a well-illustrated folio, of which a second edition in octavo was published in 1768, and considerable additions (forming the nominally third edition) in 1770, while in 1777 there were two issues, one in octavo, the other in quarto, each called the fourth edition. In 1812, long after the author's death, another edition was printed, of which his son-in-law Hanmer was the reputed editor, but he received much assistance from Latham, and through carelessness many of the additions herein made have often been ascribed to Pennant. In 1769 Berkenhout gave to the world his *Outlines of the Natural History of Great Britain and Ireland*, which reappeared under the title of *Synopsis* of the same in 1795. Tunstall's *Ornithologia Britannica*, which appeared in 1771, is little more than a list of names.[5] Hayes's *Natural History of British Birds*, a folio with forty plates, appeared between 1771 and 1775, but was of no scientific value. In 1781 Nash's *Worcestershire* included a few ornithological notices; and Walcott in 1789 published an illustrated *Synopsis of British Birds*, coloured copies of which are rare. Simultaneously William Lewin began his seven quarto volumes on the *Birds of Great Britain*, a reissue in eight volumes following between 1795 and 1801. In 1791 J. Heysham added to Hutchins's *Cumberland* a list of birds of that county, whilst in the same year began Thomas Lord's valueless *Entire New System of Ornithology*, the text of which was written or corrected by Dr Dupree, and in 1794 Donovan began a *History of British Birds* which was only finished in 1819—the earlier portion being reissued about the same time. Bolton's *Harmonia ruralis*, an account of British song-birds, first appeared between 1794 and 1796, but subsequent editions appeared up to 1846.

Donovan.

All the foregoing publications yield in importance to two that remain to be mentioned, a notice of which will fitly conclude this part of our subject. In 1767 Pennant, several of whose works have already been named, entered into correspondence with Gilbert White, receiving from him much information, almost wholly drawn from his own observation, for the succeeding editions of the *British Zoology*. In 1769 White began exchanging letters of a similar character with Barrington. The epistolary intercourse with the former continued until 1780 and with the latter until 1787. In 1789 White's share of the correspondence, together with some miscellaneous matter, was published as *The Natural History of Selborne*—from the name of the village in which he lived. Observations on birds form the principal though by no means the whole theme of this book, which may be safely said to have done more to promote a love of ornithology in England than any other work that has been written, nay more than all the other works (except one next to be mentioned) put together. It has passed through a far greater number of editions than any other work on natural history in the whole world, and has become emphatically an English classic—the graceful simplicity of its style, the elevating tone of its spirit, and the sympathetic chords it strikes recommending it to every lover of Nature, while the severely scientific reader can scarcely find an error in any statement it contains, whether of matter of fact or opinion. It is almost certain that more than half the zoologists of the British Islands for many years past have been infected with their love of the study of Gilbert White; and it can hardly be supposed that his influence will cease.

The other work to the importance of which on ornithology in England allusion has been made is Bewick's *History of British Birds*. The first volume of this, containing the land-birds, appeared in 1797[6]—the text being, it is understood, by Beilby—the second, containing the water-birds, in 1804. The woodcuts illustrating this work are generally of surpassing excellence, and it takes rank in the category of artistic publications. Fully admitting the extraordinary execution of the engravings, every ornithologist may perceive that as portraits of the birds they are of very unequal merit. Some of the figures were drawn from stuffed specimens, and accordingly perpetuate all the imperfections of the original; others represent species with the appearance of which the artist was not familiar, and these are either wanting in expression or are caricatures;[1] but those that were drawn from live birds, or represent species which he knew in life, are worthy of all praise. It is well known that the earlier editions of this work, especially if they be upon large paper, command extravagant prices; but in reality the copies on smaller paper are now the rarer, for the stock of them has been consumed in nurseries and schoolrooms, where they have been torn up or worn out with incessant use. Moreover, whatever the lovers of the fine arts may say, it is nearly certain that the "Bewick Collector" is mistaken in attaching so high a value to these old editions, for owing to the want of skill in printing—indifferent ink being especially assigned as one cause—many of the earlier issues fail to show the most delicate touches of the engraver, which the increased care bestowed upon the edition of 1847 (published under the supervision of John Hancock) has revealed—though it must be admitted that certain blocks have suffered from wear of the press so as to be incapable of any more producing the effect intended. Of the text it may be said that it is respectable, but no more.

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[1] His earlier work under the title of *Petinotheologie* can hardly be deemed scientific.

[2] This extremely rare book has been reprinted by the Willughby Society.

[3] Both of these treatises have also been reprinted by the Willughby Society.

[4] In this year there were two issues of this book; one, nominally a second edition, only differs from the first in having a new title-page. No real second edition ever appeared, but in anticipation of it Sir Thomas Browne prepared in or about 1671 (?) his "Account of Birds found in Norfolk," of which the draft, now in the British Museum, was printed in his collected works by Wilkin in 1835. If a fair copy was ever made its resting-place is unknown.

[5] It has been republished by the Willughby Society.

[6] There were two issues—virtually two editions—of this with the same date on the title-page, though one of them is said not to have been published till the following year. Among several other *indicia* this may be recognized by the woodcut of the "sea eagle" at page 11, bearing at its base the inscription "Wycliffe, 1791," and by the additional misprint on page 145 of *Sahaeniclus* for *Schaeniclus*.

The existence of these two works explains the widely-spread taste for ornithology in England, which is to foreigners so puzzling, and the zeal—not always according to knowledge, but occasionally reaching to serious study—with which that taste is pursued.

Ornithology in the 19th Century.

On reviewing the progress of ornithology since the end of the 18th century, the first thing that will strike us is the fact that general works, though still undertaken, have become proportionally fewer, while special works, whether relating to the ornithic portion of the fauna of any particular country, or limited to certain groups of birds—works to which the name of "Monograph" has become wholly restricted—have become far more numerous. Another change has come over the condition of ornithology, as of kindred sciences, induced by the multiplication of learned societies which issue publications as well as of periodicals of greater or less scientific pretension. A number of these must necessarily be left unnoticed here. Still it seems advisable to furnish some connected account of the progress made in the ornithological knowledge of the British Islands and those parts of the European continent which lie nearest to them or are most commonly sought by travellers, the Dominion of Canada and the United States of America, South Africa, India, together with Australia and New Zealand. The more important monographs will usually be found cited in the separate articles on birds contained in this work, though some, by reason of changed views of classification, have for practical purposes to be regarded now as general works.

Le Vaillant.

It will perhaps be most convenient to begin by mentioning some of these last, and in particular a number of them which appeared at Paris very early in the 19th century. First in order of them is the *Histoire naturelle d'une partie d'oiseaux nouveaux et rares de l'Amérique et des Indes*, a folio volume[2] published in 1801 by Le Vaillant. This is devoted to the very distinct and not nearly-allied groups of hornbills and of birds which for want of a better name we must call "Chatterers," and is illustrated, like those works of which a notice immediately follows, by coloured plates, done in what was then considered to be the highest style of art and by the best draughtsmen procurable. The first volume of a *Histoire naturelle des perroquets*, a companion work by the same author, appeared in the same year, and is truly a monograph, since the parrots constitute a family of birds so naturally severed from all others that there has rarely been anything else confounded with them. The second volume came out in 1805, and a third was issued in 1837–1838 long after the death of its predecessor's author, by Bourjot St-Hilaire. Between 1803 and 1806 Le Vaillant also published in just the same style two volumes with the title of *Histoire naturelle des oiseaux de Paradis et des rolliers, suivie de celle des toucans et des barbus*, an assemblage of forms, which, miscellaneous as it is, was surpassed in incongruity by a fourth work on the same scale, the *Histoire naturelle des promerops et des guêpiers, des couroucous et des touracos*, for herein are found jays, waxwings, the cock-of-the-rock (*Rupicola*), and what not besides. The plates in this last are by Barraband, for many years regarded as the perfection of ornithological artists, and indeed the figures, when they happen to have been drawn from the life, are not bad; but his skill was quite unable to vivify the preserved specimens contained in museums, and when he had only these as subjects he simply copied the distortions of the "bird-stuffer." The following year, 1808, being aided by Temminck of Amsterdam, of whose son we shall presently hear more, Le Vaillant brought out the sixth volume of his *Oiseaux d'Afrique*, already mentioned. Four more volumes of this work were promised; but the means of executing them were denied to him, and, though he lived until 1824, his publications ceased.

Audebert and Vieillot.

Desmarest.

Temminck.

A similar series of works was projected and begun about the same time as that of Le Vaillant by Audebert and Vieillot, though the former, who was by profession a painter and illustrated the work, was already dead more than a year before the appearance of the two volumes, bearing date 1802, and entitled *Oiseaux dorés ou à reflets métalliques*, the effect of the plates in which he sought to heighten by the lavish use of gilding. The first volume contains the "Colibris, Oiseaux-mouches, Jacamars et Promerops," the second the "Grimpereaux" and "Oiseaux de Paradis"—associations which set all the laws of systematic method at defiance. His colleague, Vieillot, brought out in 1805 a *Histoire naturelle des plus beaux chanteurs de la Zone Torride* with figures by Langlois of tropical finches, grosbeaks, buntings and other hard-billed birds; and in 1807 two volumes of a *Histoire naturelle des oiseaux de l'Amérique septentrionale*, without, however, paying much attention to the limits commonly assigned by geographers to that part of the world. In 1805 Anselme Desmarest published a *Histoire naturelle des tangaras, des manakins et des todiers*, which, though belonging to the same category as all the former, differs from them in its more scientific treatment of the subjects to which it refers; and, in 1808, K. J. Temminck, whose father's aid to Le Vaillant has already been noticed, brought out at Paris a *Histoire naturelle des pigeons* illustrated by Madame Knip, who had drawn the plates for Desmarest's volume.[3]

Audubon.

Macgillivray.

Elliot.

Since we have begun by considering these large illustrated works in which the text is made subservient to the coloured plates, it may be convenient to continue our notice of such others of similar character as it may be expedient to mention here, though thereby we shall be led somewhat far afield. Most of them are but luxuries, and there is some degree of truth in the remark of Andreas Wagner in his *Report on the Progress of Zoology for 1843*, drawn up for the Ray Society (p. 60), that they "are not adapted for the extension and promotion of science, but must inevitably, on account of their unnecessary costliness, constantly tend to reduce the number of naturalists who are able to avail themselves of them, and they thus enrich ornithology only to its ultimate injury." Earliest in date as it is greatest in bulk stands Audubon's *Birds of America* in four volumes, containing four hundred and thirty-five plates, of which the first part appeared in London in 1827 and the last in 1838. It does not seem to have been the author's original intention to publish any letterpress to this enormous work, but to let the plates tell their own story, though finally, with the assistance, as is now known, of William Macgillivray, a text, on the whole more than respectable, was produced in five large octavos under the title of *Ornithological Biography*, of which more will be said in the sequel. Audubon has been greatly extolled as an ornithological artist; but he was far too much addicted to representing his subjects in violent action and in postures that outrage nature, while his drawing is very frequently defective.[4] In 1866 D. G. Elliot began, and in 1869 finished, a sequel to Audubon's great work in two volumes, on the same scale—*The New and Hitherto unfigured Species of the Birds of North America*, containing life-size figures of all those which had been added to its fauna since the completion of the former.

Gray and Hardwicke.

Lear.

In 1830 John Edward Gray commenced the *Illustrations of Indian Zoology*, a series of plates of vertebrated animals, but mostly of birds, from drawings, it is believed by native artists in the collection of General Hardwicke, whose name is therefore associated with the work. Scientific names are assigned to the species figured; but no text was ever supplied. In 1832 Edward Lear, afterwards well known as a humorist, brought out his *Illustrations of the Family of Psittacidae*, a volume which deserves especial notice from the extreme fidelity to nature and the great artistic skill with which the figures were executed.

Gould.

This same year (1832) saw the beginning of the marvellous series of illustrated ornithological works by which the name of John Gould is likely to be always remembered. *A Century of Birds from the Himalaya Mountains* was followed by *The*

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[1] This is especially observable in the figures of the birds of prey.

[2] There is also an issue of this, as of the same author's other works, on large quarto paper.

[3] Temminck subsequently reproduced, with many additions, the text of this volume in his *Histoire naturelle des pigeons et des gallinacées*, published at Amsterdam in 1813–1815, in 3 vols. 8vo. Between 1838 and 1848 M. Florent-Provost brought out at Paris a further set of illustrations of pigeons by Mme Knip.

[4] On the completion of these two works, for they must be regarded as distinct, an octavo edition in seven volumes under the title of *The Birds of America* was published in 1840–1844. In this the large plates were reduced by means of the *camera lucida*, the text was revised, and the whole systematically arranged. Other reprints have since been issued, but they are vastly inferior both in execution and value. A sequel to the octavo *Birds of America*, corresponding with it in form, was brought out in 1853–1855 by Cassin as *Illustrations of the Birds of California, Texas, Oregon, British and Russian America*.

Birds of Europe in five volumes, published between 1832 and 1837, while in the interim (1834) appeared *A Monograph of the Ramphastidae*, of which a second edition was some years later called for, then the *Icones avium*, of which only two parts were published (1837–1838), and *A Monograph of the Trogonidae* (1838), which also reached a second edition. Sailing in 1838 for New South Wales, on his return in 1840 he at once commenced the greatest of all his works, *The Birds of Australia*, which was finished in 1848 in seven volumes, to which several supplementary parts, forming another volume, were subsequently added. In 1849 he began *A Monograph of the Trochilidae or Humming-birds* extending to five volumes, the last of which appeared in 1861, and was followed by a supplement by Mr Salvin. *A Monograph of the Odontophorinae or Partridges of America* (1850); *The Birds of Asia*, in seven volumes, the last completed by Mr Sharpe (1850–1883); *The Birds of Great Britain*, in five volumes (1863–1873); and *The Birds of New Guinea*, begun in 1875, and, after the author's death in 1881, undertaken by Mr Sharpe, make up the wonderful tale consisting of more than forty folio volumes, and containing more than three thousand coloured plates. The earlier of these works were illustrated by Mrs Gould, and the figures in them are fairly good; but those in the later, except when (as he occasionally did) he secured the services of Mr Wolf, are not so much to be commended. There is, it is true, a smoothness and finish about them not often seen elsewhere; but, as though to avoid the exaggerations of Audubon, Gould usually adopted the tamest of attitudes in which to represent his subjects, whereby expression as well as vivacity is wanting. Moreover, both in drawing and in colouring there is frequently much that is untrue to nature, so that it has not uncommonly happened for them to fail in the chief object of all zoological plates, that of affording sure means of recognizing specimens on comparison. In estimating the letterpress, which was avowedly held to be of secondary importance to the plates, we must bear in mind that, to ensure the success of his works, it had to be written to suit a very peculiarly composed body of subscribers. Nevertheless a scientific character was so adroitly assumed that scientific men—some of them even ornithologists—have thence been led to believe the text had a scientific value, and that of a high class. However, it must also be remembered that, throughout the whole of his career, Gould consulted the convenience of working ornithologists by almost invariably refraining from including in his folio works the technical description of any new species without first publishing it in some journal of comparatively easy access.

Fraser.

An ambitious attempt to produce in England a general series of coloured plates on a large scale was Louis Fraser's *Zoologia Typica*, the first part of which bears date 1841–1842. Others appeared at irregular intervals until 1849, when the work, which seems never to have received the support it deserved, was discontinued. The seventy plates (forty-six of which represent birds) composing, with some explanatory letterpress, the volume, are by C. Cousens and H. N. Turner—the latter (as his publications prove) a zoologist of much promise, who in 1851 died, a victim to his own zeal for investigation, of a wound received in dissecting. The chief object of the author, who had been naturalist to the Niger Expedition, and curator to the Museum of the Zoological Society of London, was to figure the animals contained in its gardens or described in its *Proceedings*, which until the year 1848 were not illustrated.

Wolf.

The publication of the *Zoological Sketches* of Joseph Wolf, from animals in the gardens of the Zoological Society of London, was begun about 1855, with a brief text by D. W. Mitchell, at that time the Society's secretary, in illustration of them. After his death in 1859, the explanatory letterpress was rewritten by P. L. Sclater, his successor in that office, and a volume was completed in 1861. Upon this a second series was commenced, and brought to an end in 1868. Though a comparatively small number of species of birds are figured in this magnificent work (seventeen only in the first series, and twenty-two in the second), it must be mentioned here, for their likenesses are so admirably executed as to place it in regard to ornithological portraiture at the head of all others. There is not a single plate that is unworthy of the greatest of all animal painters.

Temminck and Langier.

Proceeding to illustrated works generally of less pretentious size, but of greater ornithological utility than the books last mentioned, which are fitter for the drawing-room than the study, we next have to consider some in which the text is not wholly subordinated to the plates, though the latter still form a conspicuous feature of the publication. First of these in point of time as well as in importance is the *Nouveau recueil des planches coloriées d'oiseaux* of Temminck and Langier, intended as a sequel to the *Planches enluminées* of D'Aubenton before noticed, and like that work issued both in folio and quarto size. The first portion of this was published at Paris in 1820, and of its one hundred and two *livraisons*, which appeared with great irregularity (*Ibis*, 1868, p. 500), the last was issued in 1839, containing the titles of the five volumes that the whole forms, together with a "Tableau méthodique" which but indifferently serves the purpose of an index. There are six hundred plates, but the exact number of species figured (which has been computed at six hundred and sixty-one) is not so easily ascertained. Generally the subject of each plate has letterpress to correspond, but in some cases this is wanting, while on the other hand descriptions of species not figured are occasionally introduced, and usually observations on the distribution and construction of each genus or group are added. The plates, which show no improvement in execution on those of Martinet, are after drawings by Huet and Prêtre, the former being perhaps the less bad draughtsman of the two, for he seems to have had an idea of what a bird when alive looks like, though he was not able to give his figures any vitality, while the latter simply delineated the stiff and dishevelled specimens from museum shelves. Still the colouring is pretty well done, and experience has proved that generally speaking there is not much difficulty in recognizing the species represented. The letterpress is commonly limited to technical details, and is not always accurate; but it is of its kind useful, for in general knowledge of the outside of birds Temminck probably surpassed any of his contemporaries. The "Tableau méthodique" offers a convenient concordance of the old *Planches enluminées* and its successor, and is arranged after the system set forth by Temminck in the first volume of the second edition of his *Manuel d'ornithologie*, of which something must presently be said.

Oudart.

Vieillot.

The *Galerie des oiseaux*, a rival work, with plates by Oudart, seems to have been begun immediately after the former. The original project was apparently to give a figure and description of every species of bird; but that was soon found to be impossible; and, when six parts had been issued, with text by some unnamed author, the scheme was brought within practicable limits, and the writing of the letterpress was entrusted to Vieillot, who, proceeding on a systematic plan, performed his task very creditably, completing the work, which forms two quarto volumes, in 1825, the original text and fifty-seven plates being relegated to the end of the second volume as a supplement. His portion is illustrated by two hundred and ninety-nine coloured plates that, wretched as they are, have been continually reproduced in various text-books—a fact possibly due to their subjects having been judiciously selected. It is a tradition that, this work not being favourably regarded by the authorities of the Paris Museum, its draughtsman and author were refused closer access to the specimens required, and had to draw and describe them through the glass as they stood on the shelves of the cases.

Jardine and Selby.

Wilson.

In 1825 Jardine and Selby began a series of *Illustrations of Ornithology*, the several parts of which appeared at long and irregular intervals, so that it was not until 1839 that three volumes containing one hundred and fifty plates were completed. Then they set about a Second Series, which, forming a single volume with fifty-three plates, was finished in 1843. These authors, being zealous amateur artists, were their own draughtsmen to the extent even of lithographing the figures. In 1828 James Wilson (author of the article Ornithology in the 7th and 8th editions of the present work) began, under the title of *Illustrations of Zoology*, the publication of a series of his own drawings (which he did not, however, himself engrave) with corresponding letterpress. Of the thirty-six plates illustrating this volume, a small folio, twenty are devoted to Ornithology, and contain figures, which, it must be allowed, are not very successful, of several species rare at the time.

Des Murs.

Du Bus.

Sclater and Salvin.

Though the three works last mentioned fairly come under the same category as the *Planches enluminées* and the *Planches coloriées*, no one of them can be properly deemed their rightful heirs. The claim to that succession was made in 1845 by Des Murs for his *Iconographie ornithologique*, which, containing seventy-two plates by Prévot and Oudart[1] (the latter of whom had marvellously improved in his drawings since he worked with Vieillot), was completed in 1849. Simultaneously with this Du Bus began a work on a plan precisely similar, the *Esquisses ornithologiques*, illustrated by Severeyns, which, however, stopped short in 1849 with its thirty-seventh plate, while the letterpress unfortunately does not go beyond that belonging to the twentieth. In 1866 the succession was again taken up by the *Exotic Ornithology* of Messrs Sclater and Salvin, containing one hundred plates, representing one hundred and four species, all from Central or South America, which are neatly executed by J. Smit. The accompanying letterpress is in some places copious, and useful lists of the species of various genera are occasionally subjoined, adding to the definite value of the work, which, forming one volume, was completed in 1869.

Rowley.

Rowley's *Ornithological Miscellany* in three quarto volumes, profusely illustrated, appeared between 1875 and 1878. The contents are as varied as the authorship, and, most of the leading English ornithologists having contributed to the work, some of the papers are extremely good, while in the plates, which are in Keulemans's best manner, many rare species of birds are figured, some of them for the first time.

More recent monographs have been more exact, and some of them equally sumptuous. Amongst these may be mentioned F. E. Blaauw's *Monograph of the Cranes* (1897, folio); St G. Mivart's *Monograph of the Lories* (1898, folio); the Hon. W. Rothschild's *Monograph of the Genus Casuarius* (1899, quarto); R. B. Sharpe's

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[1] On the title-page credit is given to the latter alone, but only two-thirds of the plates (from pl. 25 to the end) bear his name.

Monograph of the Paradiseidae (1898, folio); H. Seebohm's *Monograph of the Thrushes* (1900, imp. quarto); J. G. Millais' *British Surface-feeding Ducks* (1902, folio); and the Hon. W. Rothschild's *Extinct Birds* (1907, quarto).

Most of the works lately named, being very costly, are not easily accessible. The few next to be mentioned, being of smaller size (octavo), may be within reach of more persons, and, therefore, can be passed over in a briefer fashion without detriment. In many ways, however, they are nearly as important. **Swainson.** Swainson's *Zoological Illustrations* in three volumes, containing one hundred and eighty-two plates, whereof seventy represent birds, appeared between 1820 and 1821, and in 1829 a second series of the same was begun by him, which, extending to another three volumes, contained forty-eight more plates of birds out of one hundred and thirty-six, and was completed in 1833. All the figures were drawn by the author, who as an ornithological artist had no rival in his time. Every plate is not beyond criticism, but his worst drawings show more knowledge of bird-life than do the best of his English or French contemporaries. **Lesson.** A work of somewhat similar character, but one in which the letterpress is of greater value, is the *Centurie zoologique* of Lesson, a single volume that, though bearing the date 1830 on its title-page, is believed to have been begun in 1829,[1] and was certainly not finished until 1831. It received the benefit of Isidore Geoffroy St-Hilaire's assistance. Notwithstanding its name it only contains eighty plates, but of them forty-two, all by Prêtre and in his usual stiff style, represent birds. Concurrently with this volume appeared Lesson's *Traité d'ornithologie*, which is dated 1831, and may perhaps be here most conveniently mentioned. Its professedly systematic form strictly relegates it to another group of works, but the presence of an "Atlas" (also in octavo) of one hundred and nineteen plates to some extent justifies its notice in this place. Between 1831 and 1834 the same author brought out, in continuation of his *Centurie*, his *Illustrations de zoologie* with sixty plates, twenty of which represent birds. **Kittlitz.** In 1832 Kittlitz began to publish some *Kupfertafeln zur Naturgeschichte der Vögel*, in which many new species are figured; but the work came to an end with its thirty-sixth plate in the following year. **Reichenbach.** In 1845 Reichenbach commenced with his *Praktische Naturgeschichte der Vögel* the extraordinary series of illustrated publications which, under titles far too numerous here to repeat, ended in or about 1855, and are commonly known collectively as his *Vollständigste Naturgeschichte der Vögel*.[2] Herein are contained more than nine hundred coloured and more than one hundred uncoloured plates, which are crowded with the figures of birds, a large proportion of them reduced copies from other works, and especially those of Gould.

It now behoves us to turn to general and particularly systematic works in which plates, if they exist at all, form but an accessory to the text. These need not detain us for long, since, however well some of them may have been executed, regard being had to their epoch, and whatever repute some of them may have achieved, they are, so far as general information and especially classification is concerned, wholly obsolete, and most of them almost useless except as matters of antiquarian interest. **Shaw and Stephens.** It will be enough merely to name Duméril's *Zoologie analytique* (1806) and Gravenhorst's *Vergleichende Übersicht des linneischen und einiger neuern zoologischen Systeme* (1807); nor need we linger over Shaw's *General Zoology*, a pretentious compilation continued by Stephens. The last seven of its fourteen volumes include the Class *Aves*, and the first part of them appeared in 1809, but, the original author dying in 1815, when only two volumes of birds were published, the remainder was brought to an end in 1826 by his successor, who afterwards became well known as an entomologist. The engravings which these volumes contain are mostly bad copies, often of bad figures, though many are piracies from Bewick, and the whole is a most unsatisfactory performance. **Illiger.** Of a very different kind is the next we have to notice, the *Prodromus systematis mammalium et avium* of Illiger, published at Berlin in 1811, which must in its day have been a valuable little manual, and on many points it may now be consulted to advantage—the characters of the genera being admirably given, and good explanatory lists of the technical terms of ornithology furnished. The classification was quite new, and made a step distinctly in advance of anything that had before appeared.[3] **Vieillot.** In 1816 Vieillot published at Paris an *Analyse d'une nouvelle ornithologie élémentaire*, containing a method of classification which he had tried in vain to get printed before, both in Turin and in London.[4] Some of the ideas in this are said to have been taken from Illiger; but the two systems seem to be wholly distinct. Vieillot's was afterwards more fully expounded in the series of articles which he contributed between 1816 and 1819 to the second edition of the *Nouveau dictionnaire d'histoire naturelle* containing much valuable information. **Temminck.** The views of neither of these systematizers pleased Temminck, who in 1817 replied rather sharply to Vieillot in some *Observations sur la classification méthodique des oiseaux*, a pamphlet published at Amsterdam, and prefixed to the second edition of his *Manuel d'ornithologie*, which appeared in 1820, an *Analyse du système général d'ornithologie*. This proved a great success, and his arrangement, though by no means simple,[5] was not only adopted by many ornithologists of almost every country, but still has some adherents. **Ranzani.** The following year Ranzani of Bologna, in his *Elementi di zoologia*—a very respectable compilation—came to treat of birds, and then followed to some extent the plan of De Blainville and Merrem (concerning which much more has to be said by and by), placing the Struthious birds in an Order by themselves. **Wagler.** In 1827 Wagler brought out the first part of a *Systema avium*, in this form never completed, consisting of forty-nine detached monographs of as many genera, the species of which are most elaborately described. The arrangement he subsequently adopted for them and for other groups is to be found in his *Natürliches System der Amphibien* (pp. 77-128), published in 1830, and is too fanciful to require any further attention. **Kaup.** The several attempts at system-making by Kaup, from his *Allgemeine Zoologie* in 1829 to his *Über Classification der Vögel* in 1849, were equally arbitrary and abortive; but his *Skizzirte Entwickelungs-Geschichte* in 1829 must be here named, as it is so often quoted on account of the number of new genera which the peculiar views he had embraced compelled him to invent. **Bonaparte.** These views he shared more or less with Vigors and Swainson, and to them attention will be immediately especially invited, while consideration of the scheme gradually developed from 1831 onward by Charles Lucien Bonaparte, and still not without its influence, is deferred until we come to treat of the rise and progress of what we may term the reformed school of ornithology. Yet injustice would be done to one of the ablest of those now to be called the old masters of the science if mention were not here made of the *Conspectus generum avium*, begun in 1850 by the naturalist last named, with the help of Schlegel, and unfortunately interrupted by its author's death six years later.[6] **G. R. Gray.** The systematic publications of George Robert Gray, so long in charge of the ornithological collection of the British Museum, began with *A List of the Genera of Birds* published in 1840. This, having been closely, though by no means in a hostile spirit, criticized by Strickland (*Ann. Nat. History*, vi. p. 410; vii. pp. 26 and 159), was followed by a second edition in 1841, in which nearly all the corrections of the reviewer were adopted, and in 1844 began the publication of *The Genera of Birds*, beautifully illustrated—first by Mitchell and afterwards by Mr Wolf—which will always keep Gray's name in remembrance. The enormous labour required for this work seems scarcely to have been appreciated, though it remains to this day one of the most useful books in an ornithologist's library. Yet it must be confessed that its author was hardly an ornithologist, but for the accident of his calling. He was a thoroughly conscientious clerk, devoted to his duty and unsparing of trouble. However, to have conceived the idea of executing a work on so grand a scale as this—it forms three folio volumes, and contains one hundred and eighty-five coloured and one hundred and forty-eight uncoloured plates, with references to upwards of two thousand four hundred generic names—was in itself a mark of genius, and it was brought to a successful conclusion in 1849. Costly as it necessarily was, it has been of great service to working ornithologists. In 1855 Gray brought out, as one of the Museum publications, *A Catalogue of the Genera and Subgenera of Birds*, a handy little volume, naturally founded on the larger works. Its chief drawback is that it does not give any more reference to the authority for a generic term than the name of its inventor and the year of its application, though of course more precise information would have at least doubled the size of the book. The same deficiency became still more apparent when, between 1869 and 1871, he published his *Hand-List of Genera and Species of Birds* in three

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[1] In 1828 he had brought out, under the title of *Manuel d'ornithologie*, two handy duodecimos which are very good of their kind.

[2] Technically speaking they are in quarto, but their size is so small that they may be well spoken of here. In 1879 Dr A. B. Meyer brought out an *Index* to them.

[3] Illiger may be considered the founder of the school of nomenclatural purists. He would not tolerate any of the "barbarous" generic terms adopted by other writers, though some had been in use for many years.

[4] The method was communicated to the Turin Academy, on 10th January 1814, and was ordered to be printed (*Mém. Ac. Sc. Turin*, 1813–1814, p. xxviii.); but, through the derangements of that stormy period, the order was never carried out (*Mem. Accad. Sc. Torino*, xxiii. p. xcvii.). The minute-book of the Linnean Society of London shows that his *Prolusio* was read at meetings of that Society between the 15th of November 1814 and the 21st of February 1815. Why it was not at once accepted is not told, but the entry respecting it, which must be of much later date, in the "Register of Papers" is "Published already." It is due to Vieillot to mention these facts, as he has been accused of publishing his method in haste to anticipate some of Cuvier's views, but he might well complain of the delay in London. Some reparation has been made to his memory by the reprinting of his *Analyse* by the Willughby Society.

[5] He recognized sixteen Orders of Birds, while Vieillot had been content with five, and Illiger with seven.

[6] To this very indispensable work a good index was supplied in 1865 by Dr Finsch.

Giebel.

octavo volumes (or parts, as they are called). Giebel's *Thesaurus ornithologiae*, also in three volumes, published between 1872 and 1877, is a slight advance, but both works have been completely superseded by the *British Museum Catalogue of Birds*, the twenty-seventh and final volume of which was published in 1895, and by the compact and invaluable British Museum *Hand-List*, the four volumes of which were completed by Dr R. B. Sharpe in 1903.

Quinary system.

It may be convenient here to deal with the theory of the Quinary System, which was promulgated with great zeal by its upholders during the end of the first and early part of the second quarter of the 19th century, and for some years seemed likely to carry all before it. The success it gained was doubtless due in some degree to the difficulty which most men had in comprehending it, for it was enwrapped in alluring mystery, but more to the confidence with which it was announced as being the long-looked-for key to the wonders of creation, since its promoters did not hesitate to term it the discovery of "*the* Natural System," though they condescended, by way of explanation to less exalted intellects than their own, to allow it the more moderate appellation of the Circular or Quinary System.

Macleay. **Vigors.** **Swainson.**

A comparison of the relation of created beings to a number of intersecting circles is as old as the days of Nieremberg, who in 1635 wrote (*Historia naturae*, lib. iii. cap. 3)—"Nullus hiatus est, nulla fractio, nulla dispersio formarum, invicem connexa sunt velut annulus annulo"; but it is almost clear that he was thinking only of a chain. In 1806 Fischer de Waldheim, in his *Tableaux synoptiques de zoognosie* (p. 181), quoting Nieremberg, extended his figure of speech, and, while justly deprecating the notion that the series of forms belonging to any particular group of creatures—the *Mammalia* was that whence he took his instance—could be placed in a straight line, imagined the various genera to be arrayed in a series of contiguous circles around Man as a centre. Though there is nothing to show that Fischer intended, by what is here said, to do anything else than illustrate more fully the marvellous interconnexion of different animals, or that he attached any realistic meaning to his metaphor, his words were eagerly caught up by the prophet of the new faith. This was William Sharpe Macleay, a man of education and real genius, who in 1819 and 1821 brought out a work under the title of *Horae Entomologicae*, which was soon after hailed by Vigors as containing a new revelation, and applied by him to ornithology in some "Observations on the Natural Affinities that connect the Orders and Families of Birds," read before the Linnean Society of London in 1823, and afterwards published in its *Transactions* (xiv. pp. 395-517). In the following year Vigors returned to the subject in some papers published in the recently established *Zoological Journal*, and found an energetic condisciple and coadjutor in Swainson, who, for more than a dozen years—to the end, in fact, of his career as an ornithological writer—was instant in season and out of season in pressing on all his readers the views he had, through Vigors, adopted from Macleay, though not without some modification of detail if not of principle. What these views were it would be manifestly improper for a sceptic to state except in the terms of a believer. Their enunciation must therefore be given in Swainson's own words, though it must be admitted that space cannot be found here for the diagrams, which it was alleged were necessary for the right understanding of the theory. This theory, as originally propounded by Macleay, was said by Swainson in 1835 (*Geogr. and Classific. of Animals*, p. 202) to have consisted of the following propositions:[1]—

"1. That the series of natural animals is continuous, forming, as it were, a circle; so that, upon commencing at any one given point, and thence tracing all the modifications of structure, we shall be imperceptibly led, after passing through numerous forms, again to the point from which we started.

"2. That no groups are natural which do not exhibit, or show an evident tendency to exhibit, such a circular series.

"3. That the primary divisions of every large group are ten, five of which are composed of comparatively large circles, and five of smaller: these latter being termed osculant, and being intermediate between the former, which they serve to connect.

"4. That there is a tendency in such groups as are placed at the opposite points of a circle of affinity 'to meet each other.'

"5. That *one* of the five larger groups into which every natural circle is divided 'bears a resemblance to all the rest, or, more strictly speaking, consists of types which represent those of each of the four other groups, together with a type peculiar to itself.'"

As subsequently modified by Swainson (*tom. cit.* pp. 224, 225), the foregoing propositions take the following form:—

"I. That every natural series of beings, in its progress from a given point, either actually returns, or evinces a tendency to return, again to that point, thereby forming a circle.

"II. The primary circular divisions of every group are three actually, or five apparently.

"III. The contents of such a circular group are symbolically (or analogically) represented by the contents of all other circles in the animal kingdom.

"IV. That these primary divisions of every group are characterized by definite peculiarities of form, structure and economy, which, under diversified modifications, are uniform throughout the animal kingdom, and are therefore to be regarded as the primary types of nature.

"V. That the different ranks or degrees of circular groups exhibited in the animal kingdom are NINE in number, each being involved within the other."

Fleming. **Strickland.**

Though, as above stated, the theory here promulgated owed its temporary success chiefly to the extraordinary assurance and pertinacity with which it was urged upon a public generally incapable of understanding what it meant, that it received some support from men of science must be admitted. A "circular system" was advocated by the eminent botanist Fries, and the views of Macleay met with the partial approbation of the celebrated entomologist Kirby, while at least as much may be said of the imaginative Oken, whose mysticism far surpassed that of the Quinarians. But it is obvious to every one who nowadays indulges in the profitless pastime of studying their writings that, as a whole, they failed in grasping the essential difference between *homology* (or "affinity," as they generally termed it) and *analogy*—though this difference had been fully understood and set forth by Aristotle himself—and, moreover, that in seeking for analogies on which to base their foregone conclusions they were often put to hard shifts. Another singular fact is that they often seemed to be totally unaware of the tendency if not the meaning of some of their own expressions: thus Macleay could write, and doubtless in perfect good faith (*Trans. Linn. Society*, xvi. p. 9, note), "Naturalists have nothing to do with mysticism, and but little with a priori reasoning." Yet his followers, if not he himself, were ever making use of language in the highest degree metaphorical, and were always explaining facts in accordance with preconceived opinions. Fleming, already the author of a harmless and extremely orthodox *Philosophy of Zoology*, pointed out in 1829 in the *Quarterly Review* (xli. pp. 302-327) some of the fallacies of Macleay's method, and in return provoked from him a reply, in the form of a letter addressed to Vigors *On the Dying Struggle of the Dichotomous System*, couched in language the force of which no one even at the present day can deny, though to the modern naturalist its invective power contrasts ludicrously with the strength of its ratiocination. But, confining ourselves to what is here our special business, it is to be remarked that perhaps the heaviest blow dealt at these strange doctrines was that delivered by Rennie, who, in an edition of Montagu's *Ornithological Dictionary* (pp. xxxiii.-lv.), published in 1831 and again issued in 1833, attacked the Quinary System, and especially its application to ornithology by Vigors and Swainson, in a way that might perhaps have demolished it, had not the author mingled with his undoubtedly sound reason much that is foreign to any question with which a naturalist, as such, ought to deal—though that herein he was only following the example of one of his opponents, who had constantly treated the subject in like manner, is to be allowed. This did not hinder Swainson, who had succeeded in getting the ornithological portion of the first zoological work ever published at the expense of the British government (namely, the *Fauna Boreali-Americana*) executed in accordance with his own opinions, from maintaining them more strongly than ever in several of the volumes treating of Natural History which he contributed to the *Cabinet Cyclopaedia*—among others that from which we have just given some extracts—and in what may be deemed the culmination in England of the Quinary System, the volume of the "Naturalist's Library" on *The Natural Arrangement and History of Flycatchers*, published in 1838, of which unhappy performance mention has already been made in this present work (vol. x. p. 584, note). This seems to have been his last attempt; for, two years later, his *Bibliography of Zoology* shows little trace of his favourite theory, though nothing he had uttered in its support was retracted. Appearing almost simultaneously with this work, an article by Strickland (*Mag. Nat. History*, ser. 2, iv. pp. 219-226) entitled *Observations upon the Affinities and Analogies of Organized Beings* administered to the theory a shock from which it never recovered, though attempts were now and then made by its adherents to revive it; and, even ten years or more later, Kaup, one of the few foreign ornithologists who had embraced Quinary principles, was by mistaken kindness allowed to publish Monographs of the Birds-of-Prey (Jardine's *Contributions to Ornithology*, 1849, pp. 68-75, 96-121; 1850, pp. 51-80; 1851, pp. 119-130; 1852, pp. 103-122; and *Trans. Zool. Society*, iv. pp. 201-260), in which its absurdity reached the climax.

The mischief caused by this theory of a Quinary System was very great, but was chiefly confined to Britain, for (as has been already stated) the extraordinary views of its adherents found little favour on the continent of Europe. The purely artificial character of the System of Linnaeus and his successors had been perceived, and men were at a loss to find a substitute for it. The new doctrine, loudly proclaiming the discovery of a "Natural" System, led away many from the steady practice which should have followed the teaching of Cuvier (though he in ornithology had not been able to act up to the principles he had lain down) and from the extended study of Comparative Anatomy. Moreover, it veiled the honest attempts that were making both in France and Germany to find real grounds for establishing an improved state of things, and consequently the labours of De Blainville, Etienne, Geoffroy St-Hilaire and L'Herminier, of Merrem, Johannes Müller and Nitzsch—to say nothing of others—were almost wholly unknown on this side of the Channel, and even the value of the investigations of British ornithotomists of high merit, such as Macartney and Macgillivray, was almost completely overlooked. True it is that there were not wanting other men in these islands whose common sense refused to accept the metaphorical doctrine and the mystical jargon of the Quinarians, but so strenuously and persistently had the latter asserted their infallibility, and so vigorously had they assailed any who ventured to doubt it, that most peaceable ornithologists found it best to bend to the furious blast, and in some sort to acquiesce at least in the phraseology of the self-styled interpreters of Creative Will. But, while thus lamenting this unfortunate perversion into a mistaken channel of ornithological energy, we must not overblame those who caused it. Macleay indeed never pretended to a high position in this branch of science, his tastes lying in the direction of Entomology; but few of their countrymen knew more of birds than did Swainson and Vigors; and, while the latter, as editor for many years of the *Zoological Journal*, and the first secretary of the Zoological Society, has especial claims to the regard of all zoologists, so the former's indefatigable pursuit of Natural History, and conscientious labour in its behalf—among other ways by means of his graceful pencil—deserve to be remembered as a set-off against the injury he unwittingly caused.

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[1] We prefer giving them here in Swainson's version, because he seems to have set them forth more clearly and concisely than Macleay ever did, and, moreover, Swainson's application of them to ornithology—a branch of science that lay outside of Macleay's proper studies—appears to be more suitable to the present occasion.

Faunae.

It is now incumbent upon us to take a rapid survey of the ornithological works which come more or less under the designation of "Faunae";[1] but these are so numerous that it will be necessary to limit this survey, as before indicated, to those countries alone which form the homes of English people, or are commonly visited by them in ordinary travel.

New Zealand.

Beginning with New Zealand, it is hardly needful to go further back than Sir W. L. Buller's beautiful *Birds of New Zealand* (4to, 1872–1873), with coloured plates by Keulemans, since the publication of which the same author has issued a *Manual of the Birds of New Zealand* (8vo, 1882), founded on the former; but justice requires that mention be made of the labours of G. R. Gray, first in the Appendix to Dieffenbach's *Travels in New Zealand* (1843) and then in the ornithological portion of the *Zoology of the Voyage of H.M.S. "Erebus" and "Terror,"* begun in 1864, but left unfinished from the following year until completed by Mr. Sharpe in 1876. A considerable number of valuable papers on the ornithology of the country by Sir W. L. Buller, Drs Hector and Von Haast, F. W. Hutton, Mr Potts and others are to be found in the *Transactions and Proceedings of the New Zealand Institute.* Sir W. L. Buller's *Supplement to the Birds of New Zealand* (1905–1906) completes the great work of this author.

Australia.

Passing to Australia, we have the first good description of some of its birds in the several old voyages and in Latham's works before mentioned. Shaw's *Zoology of New Holland* (4to, 1794) added those of a few more, as did J. W. Lewin's *Natural History of the Birds of New South Wales* (4to, 1822), which reached a third edition in 1838. Gould's great *Birds of Australia* has been already named, and he subsequently reproduced with some additions the text of that work under the title of *Handbook to the Birds of Australia* (2 vols. 8vo, 1865). In 1866 Mr Diggles commenced a similar publication, *The Ornithology of Australia*, but the coloured plates, though fairly drawn, are not comparable to those of his predecessor. This is still incomplete, though the parts that have appeared have been collected to form two volumes and issued with title-pages. Some notices of Australian birds by Mr Ramsay and others are to be found in the *Proceedings of the Linnaean Society of New South Wales* and of the *Royal Society of Tasmania*.

Ceylon.

Coming to British Indian possessions, and beginning with Ceylon, we have Kelaart's *Prodromus faunae Zeylanicae* (8vo, 1852), and the admirable *Birds of Ceylon*, by Captain Legge (4to, 1878–1880), with coloured plates by Mr Keulemans of all the peculiar species. It is hardly possible to name any book that has been more conscientiously executed than this. Blyth's *Mammals and Birds of Burma* (8vo, 1875)[2] contains much valuable information. Jerdon's *Birds of India* (8vo, 1862–1864; reprinted 1877) is a comprehensive work on the ornithology of the peninsula. A very fairly executed compilation on the subject by an anonymous writer is to be found in a late edition of the *Cyclopaedia of India*, published at Madras, and W. T. Blanford's *Birds of British India* (1898) remains the standard work. *Stray Feathers*, an ornithological journal for India and its dependencies, contains many interesting and some valuable papers.

India.

South Africa.

In regard to South Africa, besides the well-known work of Le Vaillant already mentioned, there is the second volume of Sir Andrew Smith's *Illustrations of the Zoology of South Africa* (4to, 1838–1842), which is devoted to birds. This is an important but cannot be called a satisfactory work. Its one hundred and fourteen plates by Ford truthfully represent one hundred and twenty-two of the mounted specimens obtained by the author in his explorations into the interior. Layard's handy *Birds of South Africa* (8vo, 1867), though by no means free from faults, has much to recommend it. A so-called new edition of it by R. B. Sharpe appeared in 1875–1884, but was executed on a plan so wholly different that it must be regarded as a distinct work. C. J. Andersson's *Notes on the Birds of Damara Land* (8vo, 1872), edited by J. H. Gurney, was useful in its day, but has been superseded by the more comprehensive and extremely accurate volumes, the *Birds of Africa*, by G. E. Shelley (1900–1907), and the German work on the same subject by Anton Reichenow (1900–1905).

West Indies.

Of special works relating to the British West Indies, C. Waterton's well-known *Wanderings* has passed through several editions since its first appearance in 1825, and must be mentioned here, though, strictly speaking, much of the country he traversed was not British territory. To Dr Cabanis we are indebted for the ornithological results of Richard Schomburgh's researches given in the third volume (pp. 662-765) of the latter's *Reisen im Britisch-Guiana* (8vo, 1848), and then in Léotaud's *Oiseaux de l'île de la Trinidad* (8vo, 1866). Of the Antilles there is only to be named P. H. Gosse's excellent *Birds of Jamaica* (12mo, 1847), together with its *Illustrations* (sm. fol., 1849) beautifully executed by him. A nominal list, with references, of the birds of the island is contained in the *Handbook of Jamaica*.

North America.

[An admirable "List of Faunal Publications relating to North American Ornithology" up to 1878 has been given by Elliott Coues as an appendix to his *Birds of the Colorado Valley* (pp. 567-784). Special mention should be made of the following works most of which have appeared since that time: S. F. Baird, T. M. Brewer and Robert Ridgway, *History of North American Birds: The Land Birds* (3 vols., Boston, 1875), *The Water Birds* (2 vols., Boston, 1884); Elliott Coues, *Check List of North American Birds* (Boston, 1882), *Key to North American Birds* (Boston, 1887), *Birds of the Northwest*, U.S. Geological Survey, Misc. pubs., No. 3 (1874) and *Birds of the Colorado Valley*, ibid, No. 11 (1878); Robert Ridgway, *Manual of North American Birds* (Philadelphia, 1887); Frank M. Chapman, *Color Key to North American Birds* (New York, 1903); *Handbook of Birds of Eastern North America* (ibid, 1895) and *The Warblers of North America* (ibid, 1907), with notable coloured illustrations by L. A. Fuertes and Bruce Horsfall; Dr. A. K. Fisher, *Hawks and Owls of the United States in their Relation to Agriculture*, U.S. Department of Agriculture, Bull. No. 3 (Washington, 1893), a very important work; D. G. Elliot, *Gallinaceous Game Birds of North America* (New York, 1897) and *Wild Fowl of the United States and British Possessions* (1898), and Robert Ridgway's learned and invaluable *Birds of North and Middle America*, published by the Smithsonian Institution, Bull. No. 50 (Washington, 1901 sqq.). Among contemporary writers in a more popular style are John Burroughs (q.v.); Herbert K. Job and A. R. Dugmore who have done much remarkable work in bird photography; Dallas Lore Sharp, Bradford Torrey, E. H. Parkhurst, Mrs Florence Merriam Bailey, Olive Thorne Miller (Mrs Harriet Mann Miller) and Mrs Mabel Osgood Wright. Alexander Wilson's *American Ornithology*, originally published beween 1808 and 1814, has gone through many editions including those issued in Great Britain, by Jameson (4 vols. 16 mo, 1831), and Jardine (3 vols. 8vo, 1832). The former of these has the entire text, but no plates; the latter reproduces the plates, but the text is in places much condensed, and excellent notes are added. A continuation of Wilson's work was issued by Bonaparte between 1825 and 1833, and most of the later editions include the work of both authors. The works of Audubon, and the *Fauna Boreali-Americana* of Richardson and Swainson have already been noticed, but they need naming here, as also do Nuttall's *Manual of the Ornithology of the United States and of Canada* (2 vols., Boston, 1832–1834; 2nd ed., 1840); and the *Birds of Long Island* (8 vo, New York, 1844) by J. P. Giraud, remarkable for its excellent account of the habits of shore-birds. The *Bulletin of the Nuttall Ornithological Club* was published from 1876 to 1884, when it was superseded by *The Auk*. A bi-monthly, *Bird-Lore*, established in 1899, is edited by Frank M. Chapman. A recent valuable work is that of Mary B. Beebe and C. W. Beebe, *Our Search for a Wilderness* (New York, 1910) which deals with the birds of Venezuela and British Guiana, while Central America is fully treated in the comprehensive and beautiful *Biologia Centrali-Americana* of F. du Cane Godman and O. Salvin (1898–1905). X.]

Returning to the Old World, we have first Iceland, the fullest—indeed the only full—account of the birds of which is

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[1] A very useful list of more general scope is given as the Appendix to an address by Mr Sclater to the British Association in 1875 (*Report*, pt. ii. pp. 114-133).

[2] This is a posthumous publication, nominally forming an extra number of the *Journal of the Asiatic Society*; but, since it was separately issued, it is entitled to notice here.

Faber's *Prodromus der isländischen Ornithologie* (8vo, 1822), though the island has since been visited by several good ornithologists—Proctor, Krüper and Wolley among them. **Scandinavia.** A list of its birds, with some notes, bibliographical and biological, has been given as an Appendix to Baring-Gould's *Iceland, its Scenes and Sagas* (8vo, 1862); and Shepherd's *North-west Peninsula of Iceland* (8vo, 1867) recounts a somewhat profitless expedition made thither expressly for ornithological objects. For the birds of the Faeroes there is H. C. Müller's *Faeröernes Fuglefauna* (8vo, 1862), of which a German translation has appeared.[1] The ornithology of Norway has been treated in a great many papers by Herr Collett, some of which may be said to have been separately published as *Norges Fugle* (8vo, 1868; with a supplement, 1871), and *The Ornithology of Northern Norway* (8vo, 1872)—this last in English. For Scandinavia generally Herr Collin's *Skandinaviens Fugle* (8vo, 1873) is a greatly bettered edition of the very moderate *Danmarks Fugle* of Kjaerbölling; but the ornithological portion of Nilsson's *Skandinavisk Fauna, Foglarna* (3rd ed., 2 vols., 8vo, 1858) is of great merit; while the text of Sundevall's *Svenska Foglarna* (obl. fol., 1856–1873), unfortunately unfinished at his death, and Herr Holmgren's *Skandinaviens Foglar* (2 vols. 8vo, 1866–1875) deserve naming.

Germany. Works on the birds of Germany are far too numerous to be recounted. That of the two Naumanns stands at the head of all, and perhaps at the head of the "Faunal" works of all countries. It has been added to by C. R. Hennicke—*Naumann's Birds of Middle Europe* (1907). For want of space it must here suffice simply to name some of the ornithologists who have elaborated, to an extent elsewhere unknown, the science as regards their own country: Altum, Baldamus, Bechstein, Blasius (father and two sons), Bolle, Borggreve, whose *Vogel-Fauna von Norddeutschland* (8vo, 1869) contains what is practically a bibliographical index to the subject, Brehm (father and sons), Von Droste, Gätke, Gloger, Hintz, Alexander and Eugen von Homeyer, Jäckel, Koch, König-Warthausen, Krüper, Kutter, Landbeck, Landois, Leisler, Von Maltzan, Bernard Meyer, Von der Mühle, Neumann, Tobias, Johann Wolf and Zander.[2] Were we to extend the list beyond the boundaries of the German empire, and include the ornithologists of Austria, Bohemia and the other states subject to the same monarch, the number would be nearly doubled; but that would overpass our proposed limits, though Herr von Pelzeln must be named.[3] Passing onward to Switzerland, we must content ourselves by referring to the list of works, forming a *Bibliographia ornithologica Helvetica*, drawn up by Dr Stölker for Dr Fatio's *Bulletin de la Société Ornithologique Suisse* (ii. pp. 90-119). **Italy.** As to Italy, we can but name here the *Fauna d'Italia*, of which the second part, *Uccelli* (8vo, 1872), by Count Salvadori, contains an excellent bibliography of Italian works on the subject, and the posthumously published *Ornitologia italiana* of Savi (3 vols. 8vo, 1873–1877).[4] **Spain and Portugal.** Coming to the Iberian peninsula, we must in default of separate works depart from our rule of not mentioning contributions to journals, for of the former there are only Colonel Irby's *Ornithology of the Straits of Gibraltar* (8vo, 1875) and Mr A. C. Smith's *Spring Tour in Portugal*[5] to be named, and these only partially cover the ground. However, Dr A. E. Brehm has published a list of Spanish birds (*Allgem. deutsche naturhist. Zeitung*, iii. p. 431), and *The Ibis* contains several excellent papers by Lord Lilford and by H. Saunders, the latter of whom there records (1871, p. 55) the few works on ornithology by Spanish authors, and in the *Bulletin de la Société Zoologique de France* (i. p. 315; ii. pp. 11, 89, 185) has given a list of the Spanish birds known to him.

France. Returning northwards, we have of the birds of the whole of France nothing of real importance more recent than the volume *Oiseaux* in Vieillot's *Faune française* (8vo, 1822–1829); but there is a great number of local publications of which Mr Saunders has furnished (*Zoologist*, 1878, pp. 95-99) a catalogue. Some of these seem only to have appeared in journals, but many have certainly been issued separately. Those of most interest to English ornithologists naturally refer to Britanny, Normandy and Picardy, and are by Baillon, Benoist, Blandin, Bureau, Canivet, Chesnon, Degland, Demarle, De Norguet, Gentil, Hardy, Lemetteil, Lemonnicier, Lesauvage, Maignon, Marcotte, Nourry and Taslé, while perhaps the *Ornithologie parisienne* of M. René Paquet, under the pseudonym of Nérée Quépat, should also be named. Of the rest the most important are the *Ornithologie provençale* of Roux (2 vols. 4to, 1825–1829); Risso's *Histoire naturelle . . . des environs de Nice* (5 vols. 8vo. 1826–1827); the *Ornithologie du Dauphiné* of Bouteille and Labatie (2 vols. 8vo, 1843–1844); the *Faune méridionale* of Crespon (2 vols. 8vo, 1844); the *Ornithologie de la Savoie* of Bailly (4 vols. 8vo, 1853–1854), and *Les Richesses ornithologiques du midi de la France* (4to, 1859–1861) of MM. Jaubert and Barthélemy-Lapommeraye. **Belgium.** For Belgium the *Faune belge* of Baron De Selys-Longchamps (8vo, 1842), old as it is, remains the classical work, though the *Planches coloriées des oiseaux de la Belgique* of M. Dubois (8vo, 1851–1860) is so much later in date. **Holland.** In regard to Holland we have Schlegel's *De Vogels van Nederland* (3 vols. 8vo, 1854–1858; 2nd ed., 2 vols., 1878), besides his *De Dieren van Nederland: Vogels* (8vo, 1861).

Europe in general. Before considering the ornithological works relating solely to the British Islands, it may be well to cast a glance on a few of those that refer to Europe in general, the more so since most of them are of Continental origin. First we have the already-mentioned *Manuel d'ornithologie* of Temminck, which originally appeared as a single volume in 1815;[6] but that was speedily superseded by the second edition of 1820, in two volumes. Two supplementary parts were issued in 1835 and 1840 respectively, and the work for many years deservedly maintained the highest position as the authority on European ornithology—indeed in England it may almost without exaggeration be said to have been nearly the only foreign ornithological work known; but, as could only be expected, grave defects are now to be discovered in it. Some of them were already manifest when one of its author's colleagues, Schlegel (who had been employed to write the text for Susemihl's plates, originally intended to illustrate Temminck's work), brought out his bilingual *Revue critique des oiseaux d'Europe* (8vo, 1844), a very remarkable volume, since it correlated and consolidated the labours of French and German, to say nothing of Russian, ornithologists. Of Gould's *Birds of Europe* (5 vols. fol., 1832–1837) nothing need be added to what has been already said. The year 1849 saw the publication of Degland's *Ornithologie européenne* (2 vols. 8vo), a work fully intended to take the place of Temminck's; but of which Bonaparte, in a caustic but by no means ill-deserved *Revue critique* (12 mo, 1850), said that the author had performed a miracle since he had worked without a collection of specimens and without a library. A second edition, revised by M. Gerbe (2 vols. 8vo, 1867), strove to remedy, and to some extent did remedy, the grosser errors of the first, but enough still remain to make few statements in the work trustworthy unless corroborated by other evidence. Meanwhile in England Dr Bree had in 1858 begun the publication of *The Birds of Europe not observed in the British Isles* (4 vols. 8vo), which was completed in 1863, and in 1875 reached a second and improved edition (5 vols.). In 1862 M. Dubois brought out a similar work on the "Espèces non observées en Belgique," being supplementary to that of his above named. In 1870 Anton Fritsch completed his *Naturgeschichte der Vögel Europas* (8vo, with atlas in folio); and in 1871 Messrs Sharpe and Dresser began the publication of their *Birds of Europe*, which was completed by the latter in 1879 (8 vols. 4to), and is unquestionably the most complete work of its kind, both for fulness of information and beauty of illustration—the coloured plates being nearly all by Keulemans. This work has since been completed by H. E. Dresser's *Supplement to the Birds of Europe* (1896). H. Noble's *List of European Birds* (1898) is a useful compilation, and Dresser's magnificent *Eggs of the Birds of Europe* is another great contribution by that author to European ornithology.

British Isles. Coming now to works on British birds only, the first of the present century that requires remark is Montagu's *Ornithological Dictionary* (2 vols. 8vo, 1802; supplement 1813), the merits of which have been so long and so fully acknowledged both abroad and at home that no further comment is here wanted. In 1831 Rennie brought out a modified edition of it (reissued in 1833), and Newman another in 1866 (reissued in 1883); but those who wish to know the author's views had better consult the original. Next in order come the very inferior *British Ornithology* of Graves (3 vols. 8vo, 1811–1821), and a work with the same title by Hunt (3 vols. 8vo, 1815–1822), published at Norwich, but never finished. Then we have Selby's *Illustrations of British Ornithology*, two folio volumes of coloured plates engraved by himself, between 1821 and 1833, with letterpress also in two volumes (8vo, 1825–1833), a second edition of the first volume being also issued (1833), for the author, having yielded to the pressure of the "Quinarian" doctrines then in vogue, thought it necessary to adjust his classification accordingly, and it must be admitted that for information the second edition is best. In 1828 Fleming brought out his *History of British Animals* (8vo), in which the birds are treated at considerable length (pp. 41-146), though not with great success. In 1835 Mr Jenyns (afterwards Blomefield) produced as excellent *Manual of British Vertebrate Animals*, a volume (8vo) executed with great scientific skill, the birds again receiving due attention (pp. 49-286), and the descriptions of the various species being as accurate as they are terse. In the same year began the *Coloured Illustrations of British Birds and their Eggs* of H. L. Meyer (4to), which was completed in 1843, whereof a second edition (7 vols. 8vo, 1842-1850) was brought out, and subsequently (1852-1857) a reissue of the latter. In 1836 appeared Eyton's *History of the rarer British Birds*, intended as a sequel to Bewick's well-known volumes, to which no important additions had been made since the issue of 1821. The year 1837 saw the beginning of two remarkable works by Macgillivray and Yarrell respectively, and each entitled *A History of British Birds*. Of Yarrell's work in three volumes, a second edition was published in 1845, a third in 1856, and a fourth, begun in 1871, and almost wholly rewritten. Of the compilations based upon this work, without which they could not have been composed, there is no need to speak. One of the few appearing since, with the same scope, that are not borrowed is Jardine's *Birds of Great Britain and Ireland* (4 vols. 8vo, 1838-1843), forming part of his *Naturalist's Library*; and Gould's *Birds of Great Britain* has been already mentioned. The local works on English birds are too numerous to be mentioned; almost every county has had its ornithology recorded. Of more recent general works there should be mentioned A. G. Butler's *British Birds with their Nests and Eggs* (6 vols., 1896), the various editions of Howard Saunders's *Manual of British Birds*, and Lord Lilford's beautifully illustrated *Coloured Figures of the Birds of the British Islands* (1885-1897).

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[1] *Journal für Ornithologie* (1869), pp. 107, 341, 381. One may almost say an English translation also, for Major Feilden's contribution to the *Zoologist* for 1872 on the same subject gives the most essential part of Herr Müller's information.

[2] This is, of course, no complete list of German ornithologists. Some of the most eminent of them have written scarcely a line on the birds of their own country, as Cabanis (editor since 1853 of the *Journal für Ornithologie*), Finsch, Hartlaub, Prince Max of Wied, A. B. Meyer, Nathusius, Nehrkorn, Reichenbach, Reichenow and Schalow among others.

[3] A useful ornithological bibliography of the Austrian-Hungarian dominions was printed in the *Verhandlungen* of the Zoological and Botanical Society of Vienna for 1878, by Victor Ritter von Tschusi zu Schmidhofen. A similar bibliography of Russian ornithology by Alexander Brandt was printed at St Petersburg in 1877 or 1878.

[4] A useful compendium of Greek and Turkish ornithology by Drs Krüper and Hartlaub is contained in Mommsen's *Griechische Jahrzeiten* for 1875 (Heft III.). For other countries in the Levant there are Canon Tristram's *Fauna and Flora of Palestine* (4to, 1884) and Captain Shelley's *Handbook to the Birds of Egypt* (8vo, 1872).

[5] In the final chapter of this work the author gives a list of Portuguese birds, including besides those observed by him those recorded by Professor Barboza du Bocage in the *Gazeta medica de Lisboa* (1861), pp. 17-21.

[6] Copies are said to exist bearing the date 1814.

Taxonomy.

The good effects of "Faunal" works such as those named in the foregoing rapid survey none can doubt, but important as they are, they do not of themselves constitute ornithology as a science; and an inquiry, no less wide and far more recondite, still remains. By whatever term we choose to call it—Classification, Arrangement, Systematizing or Taxonomy—that inquiry which has for its object the discovery of the natural groups into which birds fall, and the mutual relations of those groups, has always been one of the deepest interest. It is now for us to trace the rise of the present more advanced school of ornithologists, whose labours yet give signs of far greater promise.

Nitzsch.

E. G. St-Hilaire.

It would probably be unsafe to place its origin further back than a few scattered hints contained in the "Pterographische Fragmente" of Christian Ludwig Nitzsch, published in the *Magazin für den neuesten Zustand der Naturkunde* (edited by Voigt) for May 1806 (xi. pp. 393-417), and even these might be left to pass unnoticed, were it not that we recognize in them the germ of the great work which the same admirable zoologist subsequently accomplished. In these "Fragments," apparently his earliest productions, we find him engaged on the subject with which his name will always be especially identified, the structure and arrangement of feathers. In the following year another set of hints—of a kind so different that probably no one then living would have thought it possible that they should ever be brought in correlation with those of Nitzsch—are contained in a memoir on Fishes contributed to the tenth volume of the *Annales du Muséum d'histoire naturelle* of Paris by Étienne Geoffroy St-Hilaire in 1807.[1] Here we have it stated as a general truth (p. 100) that young birds have the sternum formed of five separate pieces—one in the middle, being its keel, and two "annexes" on each side to which the ribs are articulated—all, however, finally uniting to form the single "breast-bone." Further on (pp. 101, 102) we find observations as to the number of ribs which are attached to each of the "annexes"—there being sometimes more of them articulated to the anterior than to the posterior, and in certain forms no ribs belonging to one, all being applied to the other. Moreover, the author goes on to remark that in adult birds trace of the origin of the sternum from five centres of ossification is always more or less indicated by sutures, and that, though these sutures had been generally regarded as ridges for the attachment of the sternal muscles, they indeed mark the extreme points of the five primary bony pieces of the sternum.

Tiedemann.

Nitzsch.

In 1810 appeared at Heidelberg the first volume of F. Tiedemann's carefully-wrought *Anatomie und Naturgeschichte der Vögel*—which shows a remarkable advance upon the work which Cuvier did in 1805, and in some respects is superior to his later production of 1817. It is, however, only noticed here on account of the numerous references made to it by succeeding writers, for neither in this nor in the author's second volume (not published until 1814) did he propound any systematic arrangement of the Class. More germane to our present subject are the *Osteographische Beiträge zur Naturgeschichte der Vögel* of C. L. Nitzsch, printed at Leipzig in 1811—a miscellaneous set of detached essays on some peculiarities of the skeleton or portions of the skeleton of certain birds—one of the most remarkable of which is that on the component parts of the foot (pp. 101-105) pointing out the aberration from the ordinary structure exhibited by the Goatsucker (*Caprimulgus*) and the Swift (*Cypselus*)—an aberration which, if rightly understood, would have conveyed a warning to those ornithological systematists who put their trust in birds' toes for characters on which to erect a classification, that there was in them more of importance, hidden in the integument, than had hitherto been suspected; but the warning was of little avail, if any, till many years had elapsed. However, Nitzsch had not as yet seen his way to proposing any methodical arrangement of the various groups of birds, and it was not until some eighteen months later that a scheme of classification in the main anatomical was attempted.

Merrem.

This scheme was the work of Blasius Merrem, who, in a communication to the Academy of Sciences of Berlin on the 10th December 1812, which was published in its *Abhandlungen* for the following year (pp. 237-259), set forth a *Tentamen systematis naturalis avium*, no less modestly entitled than modestly executed. The attempt of Merrem must be regarded as the virtual starting-point of the latest efforts in Systematic Ornithology, and in that view its proposals deserve to be stated at length. Without pledging ourselves to the acceptance of all its details—some of which, as is only natural, cannot be sustained with our present knowledge—it is certainly not too much to say that Merrem's merits are almost incomparably superior to those of any of his predecessors. Premising then that the chief characters assigned by this systematist to his several groups are drawn from almost all parts of the structure of birds, and are supplemented by some others of their more prominent peculiarities, we present the following abstract of his scheme:—[2]

I. AVES CARINATAE.
  1. Aves aereae.
    A. Rapaces.—*a.* Accipitres—*Vultur*, *Falco*, *Sagittarius*. *b.* *Strix*.
    B. Hymenopodes.—*a.* Chelidones: α. C. nocturnae—*Caprimulgus*; β. C. diurnae—*Hirundo*.
      b. Oscines: α. O. conirostres—*Loxia*, *Fringilla*, *Emberiza*, *Tangara*; β. O. tenuirostres—*Alauda*, *Motacilla*, *Muscicapa*, *Todus*, *Lanius*, *Ampelis*, *Turdus*, *Paradisea*, *Buphaga*, *Sturnus*, *Oriolus*, *Gracula*, *Coracias*, *Corvus*, *Pipra?*, *Parus*, *Sitta*, *Certhiae* quaedam.
    C. Mellisugae.—*Trochilus*, *Certhiae* et *Upupae* plurimae.
    D. Dendrocolaptae.—*Picus*, *Yunx*.
    E. Brevilingues.—*a.* *Upupa*; *b.* *Ispidae*.
    F. Levirostres.—*a.* *Ramphastus*, *Scythrops?*; *b.* *Psittacus*.
    G. Coccyges.—*Cuculus*, *Trogon*, *Bucco*, *Crotophaga*.
  2. Aves terrestres.
    A. *Columba*.
    B. Gallinae.
  3. Aves aquaticae.
    A. Odontorhynchi: *a.* Boscades—*Anas*; *b.* *Mergus*; *c.* *Phoenicopterus*.

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[1] In the *Philosophie anatomique* (i. pp. 69-101, and especially pp. 135, 136), which appeared in 1818, Geoffroy St-Hilaire explained the views he had adopted at greater length.

[2] The names of the genera are, he tells us, for the most part those of Linnaeus, as being the best-known, though not the best. To some of the Linnaean genera he dare not, however, assign a place, for instance, *Buceros*, *Haematopus*, *Merops*, *Glareola* (Brisson's genus, by the by) and *Palamedea*.

- B. Platyrhynchi.—*Pelicanus*, *Phaeton*, *Plotus*.
- C. *Aptenodytes*.
- D. Urinatrices: *a.* Cepphi—*Alca*, *Colymbi* pedibus palmatis; *b. Prodiceps*, *Colymbi* pedibus lobatis.
- E. Stenorhynchi.—*Procellaria*, *Diomedea*, *Larus*, *Sterna*, *Rhynchops*.

4. Aves palustres.
    - A. Rusticolae: *a.* Phalarides—*Rallus*, *Fulica*, *Parrc*; *b.* Limosugae—*Numenius*, *Scolopax*, *Tringa*, *Charadrius*, *Recurvirostra*.
    - B. Grallae: *a.* Erodii—*Ardeae* ungue intermedio serrato, *Cancroma*; *b.* Pelargi—*Ciconia*, *Mycteria*, *Tantali* quidam, *Scopus*, *Platalea*; *c.* Gerani—*Ardeae* cristatae, *Grues*, *Psophia*.
    - C. Otis.

II. AVES RATITAE.—*Struthio*.

The most novel feature, and one the importance of which most ornithologists of the present day are fully prepared to admit, is the separation of the class *Aves* into two great divisions, which from one of the most obvious distinctions they present were called by its author *Carinatae*[1] and *Ratitae*,[2] according as the sternum possesses a keel (*crista* in the phraseology of many anatomists) or not. But Merrem, who subsequently communicated to the Academy of Berlin a more detailed memoir on the "flat-breasted" birds,[3] was careful not here to rest his divisions on the presence or absence of their sternal character alone. He concisely cites (p. 238) no fewer than *eight* other characters of more or less value as peculiar to the Carinate Division, the first of which is that the feathers have their barbs furnished with hooks, in consequence of which the barbs, including those of the wing-quills, cling closely together; while among the rest may be mentioned the position of the furcula and coracoids,[4] which keep the wing-bones apart; the limitation of the number of the lumbar vertebra to *fifteen*, and of the carpals to *two*; as well as the divergent direction of the iliac bones—the corresponding characters peculiar to the Ratite Division being the disconnected condition of the barbs of the feathers, through the absence of any hooks whereby they might cohere; the non-existence of the furcula, and the coalescence of the coracoids with the scapulae (or, as he expressed it, the extension of the scapulae to supply the place of the coracoids, which he thought were wanting); the lumbar vertebrae being *twenty* and the carpals *three* in number; and the parallelism of the iliac bones.

As for Merrem's partitioning of the inferior groups there is less to be said in its praise as a whole, though credit must be given to his anatomical knowledge for leading him to the perception of several affinities, as well as differences, that had never before been suggested by superficial systematists. But it must be confessed that (chiefly, no doubt, from paucity of accessible material) he overlooked many points, both of alliance and the opposite, which since his time have gradually come to be admitted.

De Blainville.

Notice has next to be taken of a Memoir on the Employment of Sternal Characters in establishing Natural Families among Birds, which was read by De Blainville before the Academy of Sciences of Paris in 1815,[5] but not published in full for more than five years later (*Journal de physique . . . et des arts*, xcii. 185–215), though an abstract forming part of a *Prodrome d'une nouvelle distribution du règne animal* appeared earlier (*op. cit.* lxxxiii. 252, 253, 258, 259; and *Bull. soc. philomath. de Paris*, 1816, p. 110). This is a very disappointing performance, since the author observes that, notwithstanding his new classification of birds is based on a study of the form of the sternal apparatus, yet, because that lies wholly within the body, he is compelled to have recourse to such outward characters as are afforded by the proportion of the limbs and the disposition of the toes—even as had been the practice of most ornithologists before him! It is evident that the features of the sternum of which De Blainville chiefly relied were those drawn from its posterior margin, which no very extensive experience of specimens is needed to show are of comparatively slight value; for the number of "*échancrures*"—notches as they have sometimes been called in English—when they exist, goes but a very short way as a guide, and is so variable in some very natural groups as to be even in that short way occasionally misleading.[6] There is no appearance of his having at all taken into consideration the far more trustworthy characters furnished by the anterior part of the sternum, as well as by the coracoids and the furcula. Still De Blainville made some advance in a right direction, as for instance by elevating the parrots[7] and the pigeons as "*Ordres*," equal in rank to that of the birds of prey and some others. According to the testimony of L'Herminier (for whom see later) he divided the "*Passereaux*" into two sections, the "*faux*" and the "*vrais*"; but, while the latter were very correctly defined, the former were most arbitrarily separated from the "*Grimpeurs*." He also split his *Grallatores* and *Natatores* (practically identical with the *Grallae* and *Anseres* of Linnaeus) each into four sections; but he failed to see—as on his own principles he ought to have seen—that each of these sections was at least equivalent to almost any one of his other "*Ordres*." He had, however, the courage to act up to his own professions in collocating the rollers (*Coracias*) with the bee-eaters (*Merops*), and had the sagacity to surmise that *Menura* was not a Gallinaceous bird. The greatest benefit conferred by this memoir is probably that it stimulated the efforts, presently to be mentioned, of one of his pupils, and that it brought more distinctly into sight that other factor, originally discovered by Merrem, of which it now clearly became the duty of systematizers to take cognizance.

Nitzsch

Following the chronological order we are here adopting, we next have to recur to the labours of Nitzsch, who, in 1820, in a treatise on the nasal glands of birds—a subject that had already attracted the attention of Jacobson (*Nouv. Bull. soc. philomath. de. Paris*, iii. 267–269)—first put forth in Meckel's *Deutsches Archiv für die Physiologie* (vi. 251-269) a statement of his general views on ornithological classification which were based on a comparative examination of those bodies in various forms. It seems unnecessary here to occupy space by giving an abstract of his plan,[8] which hardly includes any but European species, because it was subsequently elaborated with no inconsiderable modifications in a way that must presently be mentioned at greater length. But the scheme, crude as it was, possesses some interest. It is not only a key to much of his later work—to nearly all indeed that was published in his lifetime—but in it are founded several definite groups (for example, *Passerinae* and *Picariae*) that subsequent experience has shown to be more or less natural; and it further serves as additional evidence of the breadth of his views, and his trust in the teachings of anatomy.

That Nitzsch took this extended view is abundantly proved by the valuable series of ornithotomical observations which he must have been for some time accumulating, and almost immediately afterwards began to contribute to the younger Naumann's excellent *Naturgeschichte der Vögel Deutschlands*, already noticed above. Besides a concise general treatise on the organization of birds to be found in the Introduction to this work (i. 23-52), a brief description from Nitzsch's pen of the peculiarities of the internal structure of nearly every genus is incorporated with the author's prefatory remarks, as each passed under consideration, and these descriptions being almost without exception so drawn up as to be comparative are accordingly of great utility to the student of classification, though they have been so greatly neglected. Upon these descriptions he was still engaged till death, in 1837, put an end to his labours, when his place as Naumann's assistant for the remainder of the work was taken by Rudolph Wagner; but, from time to time, a few more, which he had already completed, made their posthumous appearance in it, and, in subsequent years, some selections from his unpublished papers were through the care of Giebel presented to the public. Throughout the whole of this series the same marvellous industry and scrupulous accuracy are manifested, and attentive study of it will show how many times Nitzsch anticipated the conclusions of modern taxonomers. Yet over and over again his determination of the affinities of several groups even of European birds was disregarded; and his labours, being contained in a bulky and costly work, were hardly known at all outside of his own country, and within it by no means appreciated so much as they deserved[1]—for even Naumann himself, who gave them publication, and was doubtless in some degree influenced by them, utterly failed to perceive the importance of the characters offered by the song-muscles of certain groups, though their peculiarities were all duly described and recorded by his coadjutor, as some indeed had been long before by Cuvier in his famous dissertation[2] on the organs of voice in birds (*Leçons d'anatomie comparée*, iv. 450-491). Nitzsch's name was subsequently dismissed by Cuvier without a word of praise, and in terms which would have been applicable to many another and inferior author, while Temminck, terming Naumann's work an "*ouvrage de luxe*"—it being in truth one of the cheapest for its contents ever published—effectually shut it out from the realms of science. In Britain it seems to have been positively unknown until quoted some years after its completion by a catalogue-compiler on account of some peculiarities of nomenclature which it presented.

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[1] From *carina*, a keel.

[2] From *rates*, a raft or flat-bottomed barge.

[3] "Beschreibung des Gerippes eines Casuars nebst einigen beiläufigen Bemerkungen über die flachbrüstigen Vögel," *Abhandl. der Berlin. Akademie, Phys. Klasse* (1817), pp. 179-198, tabb. i.-iii.

[4] Merrem, as did many others in his time, calls the coracoids "*claviculae*"; but it is now well understood that in birds the real *claviculae* form the furcula or "merry-thought."

[5] Not 1812, as has sometimes been stated.

[6] Cf. *Philos. Transactions* (1869), p. 337, note.

[7] This view of them had been long before taken by Willughby, but abandoned by all later authors.

[8] This plan, having been repeated by Schöpss in 1829 (*op. cit.* xii. p. 73), became known to Sir R. Owen in 1835, who then drew to it the attention of Kirby (*Seventh Bridgewater Treatise*, ii. pp. 444, 445), and in the next year referred to it in his own article "Aves" in Todd's *Cyclopaedia of Anatomy* (i. p. 266), so that Englishmen need no excuse for not being aware of one of Nitzsch's labours, though his more advanced work of 1829, presently to be mentioned, was not referred to by Sir R. Owen.

L'Herminier.

Now we must return to France, where, in 1827, L'Herminier, a creole of Guadaloupe and a pupil of De Blainville's, contributed to the *Actes* of the Linnaean Society of Paris for that year (vi. 3-93) the "Recherches sur l'appareil sternal des Oiseaux," which the precept and example of his master had prompted him to undertake, and Cuvier had found for him the means of executing. A second and considerably enlarged edition of this very remarkable treatise was published as a separate work in the following year. We have already seen that De Blainville, though fully persuaded of the great value of sternal features as a method of classification, had been compelled to fall back upon the old pedal characters so often employed before; but now the scholar had learnt to excel his teacher, and not only to form an at least provisional arrangement of the various members of the Class, based on sternal characters, but to describe these characters at some length, and so give a reason for the faith that was in him. There is no evidence, so far as we can see, of his having been aware of Merrem's views; but like that anatomist he without hesitation divided the class into two great "*coupes*," to which he gave, however, no other names than "*Oiseaux normaux*" and "*Oiseaux anomaux*"—exactly corresponding with his predecessor's *Carinatae* and *Ratitae*—and, moreover, he had a great advantage in founding these groups, since he had discovered, apparently from his own investigations, that the mode of ossification in each was distinct; for hitherto the statement of there being five centres of ossification in every bird's sternum seems to have been accepted as a general truth, without contradiction, whereas in the ostrich and the rhea, at any rate, L'Herminier found that there were but two such primitive points,[3] and from analogy he judged that the same would be the case with the cassowary and the emeu, which, with the two forms mentioned above, made up the whole of the "*Oiseaux anomaux*" whose existence was then generally acknowledged.[4] These are the forms which composed the family previously termed *Cursores* by De Blainville; but L'Herminier was able to distinguish no fewer than thirty-four families of "*Oiseaux normaux*," and the judgment with which their separation and definition were effected must be deemed on the whole to be most creditable to him. It is to be remarked, however, that the wealth of the Paris Museum, which he enjoyed to the full, placed him in a situation incomparably more favourable for arriving at results than that which was occupied by Merrem, to whom many of the most remarkable forms were wholly unknown, while L'Herminier had at his disposal examples of nearly every type then known to exist. But the latter used this privilege wisely and well—not, after the manner of De Blainville and others subsequent to him, relying solely or even chiefly on the character afforded by the posterior portion of the sternum, but taking also into consideration those of the anterior, as well as of the in some cases still more important characters presented by the pre-sternal bones, such as the furcula, coracoids and scapulae. L'Herminier thus separated the families of "Normal Birds":—

1. "Accipitres" — *Accipitres*, Linn.
2. "Serpentaires"— *Gypogeranus*, Illiger.
3. "Chouettes"—*Strix*, Linn.
4. "Touracos"—*Opaetus*, Vieillot.
5. "Perroquets" — *Psittacus*, Linn.
6. "Colibris"—*Trochilus*, Linn.
7. "Martinets"—*Cypselus*, Illiger.
8. "Engoulevents" — *Caprimulgus*, Linn.
9. "Coucous"—*Cuculus*, Linn.
10. "Couroucous"—*Trogon*, Linn.
11. "Rolliers"—*Galgulus*, Brisson.
12. "Guêpiers"—*Merops*, Linn.
13. "Martins-Pêcheurs"—*Alcedo*, Linn.
14. "Calaos"—*Buceros*, Linn.
15. "Toucans" — *Ramphastos*, Linn.
16. "Pies"—*Picus*, Linn.
17. "Épopsides" — *Epopsides*, Vieillot.
18. "Passereaux" — *Passeres*, Linn.
19. "Pigeons"—*Columba*, Linn.
20. "Gallinacés"—*Gallinacea*.
21. "Tinamous" — *Tinamus*, Latham.
22. "Foulques ou Poules d'eau"—*Fulica*, Linn.
23. "Grues"—*Grus*, Pallas.
24. "Hérodions"—*Herodii*, Illiger.
25. No name given, but said to include "les ibis et les spatules."
26. "Gralles ou Échassiers"—*Grallae*.
27. "Mouettes"—*Larus*, Linn.
28. "Pétrels"—*Procellaria*, Linn.
29. "Pélicans"—*Pelecanus*, Linn.
30. "Canards"—*Anas*, Linn.
31. "Grèbes" — *Podiceps*, Latham.
32. "Plongeons" — *Colymbus*, Latham.
33. "Pingouins"—*Alca*, Latham.
34. "Manchots"— *Aptenodytes*, Forster.

The preceding list is given to show the very marked agreement of L'Herminier's results compared with those obtained fifty years later by another investigator, who approached the subject from an entirely different, though still osteological, basis. Many of the excellencies of L'Herminier's method could not be pointed out without too great a sacrifice of space, because of the details into which it would be necessary to enter; but the trenchant way in which he showed that the "Passereaux"—a group of which Cuvier had said, "Son caractère semble d'abord purement négatif," and had then failed to define the limits—differed so completely from every other assemblage, while maintaining among its own innumerable members an almost perfect essential homogeneity, is very striking, and shows how admirably he could grasp his subject. Not less conspicuous are his merits in disposing of the groups of what are ordinarily known as water-birds, his indicating the affinity of the rails (No. 22) to the cranes (No. 23), and the severing of the latter from the herons (No. 24). His union of the snipes, sandpipers and plovers into one group (No. 26) and the alliance, especially dwelt upon, of that group with the gulls (No. 27) are steps which, though indicated by Merrem, are here for the first time clearly laid down; and the separation of the gulls from the petrels (No. 28)—step in advance already taken, it is true, by Illiger—is here placed on indefeasible ground. With all this, perhaps on account of all this, L'Herminier's efforts did not find favour with his scientific superiors, and for the time things remained as though his investigations had never been carried on.

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[1] Their value was, however, understood by Gloger, who in 1834, as will presently be seen, expressed his regret at not being able to use them.

[2] Cuvier's first observations on the subject seem to have appeared in the *Magazin encyclopédique* for 1795 (ii. pp. 330, 358).

[3] This fact in the ostrich appears to have been known already to Geoffroy St-Hilaire from his own observation in Egypt, but does not seem to have been published by him.

[4] Considerable doubts were at that time entertained in Paris as to the existence of the *Apteryx*.

Nitzsch's grouping.

Two years later Nitzsch, who was indefatigable in his endeavour to discover the natural families of birds and had been pursuing a series of researches into their vascular system, published the result, at Halle in Saxony, in his *Observationes de avium arteria carotide communi*, in which is included a classification drawn up in accordance with the variation of structure which that important vessel presented in the several groups that he had opportunities of examining. By this time he had visited several of the principal museums on the Continent, among others Leyden (where Temminck resided) and Paris (where he had frequent intercourse with Cuvier), thus becoming acquainted with a considerable number of exotic forms that had hitherto been inaccessible to him. Consequently his labours had attained to a certain degree of completeness in this direction, and it may therefore be expedient here to name the different groups which he thus thought himself entitled to consider established. They are as follows:—

I. AVES CARINATAE [L'H. "Oiseaux normaux"].

A. Aves Carinatae aereae.

1. *Accipitrinae* [L'H. 1, 2 partim, 3]; 2. *Passerinae* [L'H. 18]; 3. *Macrochires* [L'H. 6, 7]; 4. *Cuculinae* [L'H. 8, 9, 10 (qu. 11, 12?)]; 5. *Picinae* [L'H. 15, 16]; 6. *Psittacinae* [L'H. 5]; 7. *Lipoglossae* [L'H. 13, 14, 17]; 8. *Amphibolae* [L'H. 4].

B. Aves Carinatae terrestres.

1. *Columbinae* [L'H. 19]; 2. *Gallinaceae* [L'H. 20].

C. Aves Carinatae aquaticae.

Grallae.

1. *Alectorides* (=*Dicholophus*+*Otis*) [L'H. 2 partim, 26 partim]; 2. *Gruinae* [L'H. 23]; 3. *Fulicariae* [L'H. 22]; 4. *Herodiae* [L'H. 24 partim]; 5. *Pelargi* [L'H. 24 partim, 25]; 6. *Odontoglossi* (=*Phoenicopterus*) [L'H. 26 partim]; 7. *Limicolae* [L'H. 26 paene omnes].

Palmatae.

8. *Longipennes* [L'H. 27]; 9. *Nasutae* [L'H. 28]; 10. *Unguirostres* [L'H. 30]; 11. *Steganopodes* [L'H. 29]; 12. *Pygopodes* [L'H. 31, 32, 33, 34].

II. AVES RATITAE [L'H. "Oiseaux anomaux"].

To enable the reader to compare the several groups of Nitzsch with the families of L'Herminier, the numbers applied by the latter to his families are suffixed in square brackets to the names of the former; and, disregarding the order of sequence, which is here immaterial, the essential correspondence of the two systems is worthy of all attention, for it obviously means that these two investigators, starting from different points, must have been on the right track, when they so often coincided as to the limits of what they considered to be, and what we are now almost justified in calling, natural groups.[1] But it must be observed that the classification of Nitzsch, just given, rests much more on characters furnished by the general structure than on those furnished by the carotid artery only. Among all the species (188, he tells us, in number) of which he examined specimens, he found only *four* variations in the structure of that vessel, namely:—

1. That in which both a right carotid artery and a left are present. This is the most usual fashion among the various groups of birds, including all the "aerial" forms excepting *Passerinae*, *Macrochires* and *Picinae*.

2. That in which there is but a single carotid artery, springing from both right and left trunk, but the branches soon coalescing, to take a midway course, and again dividing near the head. This form Nitzsch was only able to find in the bittern (*Ardea stellaris*).

3. That in which the right carotid artery alone is present, of which, according to our author's experience, the flamingo (*Phoenicopterus*) was the sole example.

4. That in which the left carotid artery alone exists, as found in all other birds examined by Nitzsch, and therefore as regards species and individuals much the most common—since into this category come the countless thousands of the passerine birds—a group which outnumbers all the rest put together.

Berthold.

Considering the enormous stride in advance made by L'Herminier, it is very disappointing for the historian to have to record that the next inquirer into the osteology of birds achieved a disastrous failure in his attempt to throw light on their arrangement by means of a comparison of their sternum. This was Berthold, who devoted a long chapter of his *Beiträge zur Anatomie*, published at Göttingen in 1831, to a consideration of the subject. So far as his introductory chapter went—the development of the sternum—he was, for his time, right enough and somewhat instructive. It was only when, after a close examination of the sternal apparatus of one hundred and thirty species, which he carefully described, that he arrived (pp. 177-183) at the conclusion—astonishing to us who know of L'Herminier's previous results—that the sternum of birds cannot be used as a help to their classification on account of the egregious anomalies that would follow the proceeding—such anomalies, for instance, as the separation of *Cypselus* from *Hirundo* and its alliance with *Trochilus*, and the grouping of *Hirundo* and *Fringilla* together.

Cuvier and Geoffroy.

At the very beginning of the year 1832 Cuvier laid before the Academy of Sciences of Paris a memoir on the progress of ossification in the sternum of birds, of which memoir an abstract will be found in the *Annales des sciences naturelles* (xxv. pp. 260-272). Herein he traced in detail, illustrating his statements by the preparations he exhibited, the progress of ossification in the sternum of the fowl and of the duck, pointing out how it differed in each, and giving his interpretation of the differences. It had hitherto been generally believed that the mode of ossification in the fowl was that which obtained in all birds—the ostrich and its allies (as L'Herminier, we have seen, had already shown) excepted. But it was now made to appear that the struthious birds in this respect resembled, not only the duck, but a great many other groups—waders, birds-of-prey, pigeons, passerines and perhaps all birds not gallinaceous—so that, according to Cuvier's view, the five points of ossification observed in the *Gallinae*, instead of exhibiting the normal process, exhibited one quite exceptional, and that in all other birds, so far as he had been enabled to investigate the matter, ossification of the sternum began at two points only, situated near the anterior upper margin of the side of the sternum, and gradually crept towards the keel, into which it presently extended; and, though he allowed the appearance of detached portions of calcareous matter at the base of the still cartilaginous keel in ducks at a certain age, he seemed to consider this an individual peculiarity. This fact was fastened upon by Geoffroy in his reply, which was a week later presented to the Academy, but was not published in full until the following year, when it appeared in the *Annales du Muséum* (ser. 3, ii. pp. 1-22). Geoffroy here maintained that the five centres of ossification existed in the duck just as in the fowl, and that the real difference of the process lay in the period at which they made their appearance, a circumstance which, though virtually proved by the preparations Cuvier had used, had been by him overlooked or misinterpreted. The fowl possesses all five ossifications at birth, and for a long while the middle piece forming the keel is by far the largest. They all grow slowly, and it is not until the animal is about six months old that they are united into one firm bone. The duck, on the other hand, when newly hatched, and for nearly a month after, has the sternum wholly cartilaginous. Then, it is true, two lateral points of ossification appear at the margin, but subsequently the remaining three are developed, and when once formed they grow with much greater rapidity than in the fowl, so that by the time the young duck is quite independent of its parents, and can shift for itself, the whole sternum is completely bony. Nor, argued Geoffroy, was it true to say, as Cuvier had said, that the like occurred in the pigeons and true passerines. In their case the sternum begins to ossify from three very distinct points—one of which is the centre of ossification of the keel. As regards the struthious birds, they could not be likened to the duck, for in them at no age was there any indication of a single median centre of ossification, as Geoffroy had satisfied himself by his own observations made in Egypt many years before. Cuvier seems to have acquiesced in the corrections of his views made by Geoffroy, and attempted no rejoinder; but the attentive and impartial student of the discussion will see that a good deal was really wanting to make the latter's reply effective, though, as events have shown, the former was hasty in the conclusions at which he arrived, having trusted too much to the first appearance of centres of ossification, for, had his observations in regard to other birds been carried on with the same attention to detail as in regard to the fowl, he would certainly have reached some very different results.

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[1] Whether Nitzsch was cognizant of L'Herminier's views is in no way apparent. The latter's name seems not to be even mentioned by him, but Nitzsch was in Paris in the summer of 1827, and it is almost impossible that he should not have heard of L'Herminier's labours, unless the relations between the followers of Cuvier to whom Nitzsch attached himself, and those of De Blainville, whose pupil L'Herminier was, were such as to forbid any communication between the rival schools. Yet we have L'Herminier's evidence that Cuvier gave him every assistance. Nitzsch's silence, both on this occasion and afterwards, is very curious; but he cannot be accused of plagiarism, for the scheme given above is only an amplification of that foreshadowed by him (as already mentioned) in 1820—a scheme which seems to have been equally unknown to L'Herminier, perhaps through linguistic difficulty.

Gloger.

In 1834 C. W. L. Gloger brought out at Breslau the first (and unfortunately the only) part of a *Vollständiges Handbuch der Naturgeschichte der Vögel Europa's*, treating of the land-birds. In the Introduction to this book (p. xxxviii., note) he expressed his regret at not being able to use as fully as he could wish the excellent researches of Nitzsch which were then appearing (as has been above said) in the successive parts of Naumann's great work. Notwithstanding this, to Gloger seems to belong the credit of being the first author to avail himself in a book intended for practical ornithologists of the new light that had already been shed on Systematic Ornithology; and accordingly we have the second order of his arrangement, the *Aves Passerinae*, divided into two suborders: singing passerines (*melodusae*), and passerines without an apparatus of song-muscles (*anomalae*)—the latter including what some later writers called *Picariae*. For the rest his classification demands no particular remark; but that in a work of this kind he had the courage to recognize, for instance, such a fact as the essential difference between swallows and swifts lifts him considerably above the crowd of other ornithological writers of his time.

Sundevall.

An improvement on the old method of classification by purely external characters was introduced to the Academy of Sciences of Stockholm by C. J. Sundevall in 1835, and was published the following year in its *Handlingar* (pp. 43-130). This was the foundation of a more extensive work of which, from the influence it still exerts, it will be necessary to treat later at some length, and there will be no need now to enter much into details respecting the earlier performance. It is sufficient here to remark that the author, even then a man of great erudition, must have been aware of the turn which taxonomy was taking; but, not being able to divest himself of the older notion that external characters were superior to those furnished by the study of internal structure, and that Comparative Anatomy, instead of being a part of zoology, was something distinct from it, he seems to have endeavoured to form a scheme which, while not running wholly counter to the teachings of Comparative Anatomists, should yet rest ostensibly on external characters. With this view he studied the latter most laboriously, and in some measure certainly not without success, for he brought into prominence several points that had hitherto escaped the notice of his predecessors. He also admitted among his characteristics a physiological consideration (apparently derived from Oken[1]) dividing the class *Aves* into two sections *Altrices* and *Praecoces*, according as the young were fed by their parents or, from the first, fed themselves. But at this time he was encumbered with the hazy doctrine of analogies, which, if it did not act to his detriment, was assuredly of no service to him. He prefixed an "Idea Systematis" to his "Expositio"; and the former, which appears to represent his real opinion, differs in arrangement very considerably from the latter. Like Gloger, Sundevall in his ideal system separated the true passerines from all other birds, calling them *Volucres*; but he took a step further, for he assigned to them the highest rank, wherein nearly every recent authority agrees with him; out of them, however, he chose the thrushes and warblers to stand first as his ideal "Centrum"—a selection which, though in the opinion of the present writer erroneous, is still largely followed.

L'Herminier and Isidore Geoffroy St-Hilaire.

The points at issue between Cuvier and Étienne Geoffroy St-Hilaire before mentioned naturally attracted the attention of L'Herminier, who in 1836 presented to the French Academy the results of his researches into the mode of growth of that bone which in the adult bird he had already studied to such good purpose. Unfortunately the full account of his diligent investigations was never published. We can best judge of his labours from an abstract reprinted in the *Comptes rendus* (iii. pp. 12-20) and reprinted in the *Annales des sciences naturelles* (ser. 2, vol. vi. pp. 107-115), and from the report upon them by Isidore Geoffroy St-Hilaire, to whom with others they were referred. This report is contained in the *Comptes rendus* for the following year (iv. pp. 565-574), and is very critical in its character.

L'Herminier arrived at the conclusion that, so far from there being only two or three different modes by which the process of ossification in the sternum is carried out, the number of different modes is very considerable—almost each natural group of birds having its own. The principal theory which he hence conceived himself justified in propounding was that instead of *five* being (as had been stated) the maximum number of centres of ossification in the sternum, there are no fewer than *nine* entering into the composition of the perfect sternum of birds in general, though in every species some of these nine are wanting, whatever be the condition of development at the time of examination. These nine theoretical centres or "pieces" L'Herminier deemed to be disposed in *three* transverse series (*rangées*), namely the anterior or "prosternal," the middle or "mesosternal" and the posterior or "metasternal"—each series consisting of *three* portions, one median piece and two side-pieces. At the same time he seems, according to the abstract of his memoir, to have made the somewhat contradictory assertion that sometimes there are more than three pieces in each series, and in certain groups of birds as many as six.[2] It would occupy more space than can here be allowed to give even the briefest abstract of the numerous observations which follow the statement of his theory and on which it professedly rests. They extend to more than a score of natural groups of birds, and nearly each of them presents some peculiar characters. Thus of the first series of pieces he says that when all exist they may be developed simultaneously, or that the two side-pieces may precede the median, or again that the median may precede the side-pieces—according to the group of birds, but that the second mode is much the commonest. The same variations are observable in the second or middle series, but its side-pieces are said to exist in all groups of birds without exception. As to the third or posterior series, when it is complete the three constituent pieces are developed almost simultaneously; but its median piece is said often to originate in two, which soon unite, especially when the side-pieces are wanting. By way of examples of L'Herminier's observations, what he says of the two groups that had been the subject of Cuvier's and the elder Geoffroy's contest may be mentioned. In the *Gallinae* the five well-known pieces or centres of ossification are said to consist of the two side-pieces of the second or middle series, and the three of the posterior. On two occasions, however, there was found in addition, what may be taken for a representation of the first series, a little "*noyau*" situated between the coracoids—forming the only instance of all three series being present in the same bird. As regards the ducks, L'Herminier agreed with Cuvier that there are commonly only two centres of ossification—the side-pieces of the middle series; but as these grow to meet one another a distinct median "*noyau*," also of the same series, sometimes appears, which soon forms a connexion with each of them. In the ostrich and its allies no trace of this median centre of ossification ever occurs; but with these exceptions its existence is invariable in all other birds. Here the matter must be left; but it is undoubtedly a subject which demands further investigation, and naturally any future investigator of it should consult the abstract of L'Herminier's memoir and the criticisms upon it of the younger Geoffroy.

Macgillivray.

Hitherto our attention has been given wholly to Germany and France, for the chief ornithologists of Britain were occupying themselves at this time in a very useless way—not but that there were several distinguished men who were paying due heed at this time to the internal structure of birds, and some excellent descriptive memoirs on special forms had appeared from their pens, to say nothing of more than one general treatise on ornithic anatomy.[3] Yet no one in Britain seems to have attempted to found any scientific arrangement of birds on other than external characters until, in 1837, William Macgillivray issued the first volume of his *History of British Birds*, wherein, though professing (p. 19) "not to add a new system to the many already in partial use, or that have passed away like their authors," he propounded (pp. 16–18) a scheme for classifying the birds of Europe at least founded on a "consideration of the digestive organs, which merit special attention, on account, not so much of their great importance in the economy of birds, as the nervous, vascular and other systems are not behind them in this respect; but because, exhibiting great diversity of form and structure, in accordance with the nature of the food, they are more obviously qualified to afford a basis for the classification of the numerous species of birds" (p. 52). Fuller knowledge has shown that Macgillivray was ill-advised in laying stress on the systematic value of adaptive characters, but his contributions to anatomy were valuable, and later investigators, in particular H. Gadow and P. Chalmers Mitchell, have shown that useful systematic information can be obtained from the study of the alimentary canal. Macgillivray himself it was, apparently, who first detected the essential difference of the organs of voice presented by some of the New-World Passerines (subsequently known as *Clamatores*), and the earliest intimation of this seems to be given in his anatomical description of the Arkansas Flycatcher, *Tyrannus verticalis*, which was published in 1838 (*Ornithol. Biography*, iv. p. 425), though it must be admitted that he did not—because he then could not—perceive the bearing of their difference, which was reserved to be shown by the investigation of a still greater anatomist, and of one who had fuller facilities for research, and thereby almost revolutionized, as will presently be mentioned, the views of systematists as to this order of birds. There is only space here to say that the second volume of Macgillivray's work was published in 1839, and the third in 1840; but it was not until 1852 that the author, in broken health, found an opportunity of issuing the fourth and fifth. His scheme of classification, being as before stated partial, need not be given in detail. Its great merit is that it proved the necessity of combining another and hitherto much-neglected factor in any natural arrangement, though vitiated as so many other schemes have been by being based wholly on one class of characters.

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[1] He says from Oken's *Naturgeschichte für Schulen*, published in 1821, but the division is to be found in that author's earlier *Lehrbuch der Zoologie* (ii. p. 371), which appeared in 1816.

[2] We shall perhaps be justified in assuming that this apparent inconsistency, and others which present themselves, would be explicable if the whole memoir with the necessary illustrations had been published.

[3] Sir Richard Owen's celebrated article "Aves," in Todd's *Cyclopaedia of Anatomy and Physiology* (i. pp. 265-358), appeared in 1836, and, as giving a general view of the structure of birds, needs no praise here; but its object was not to establish a classification, or throw light especially on systematic arrangement. So far from that being the case, its distinguished author was content to adopt, as he tells us, the arrangement proposed by Kirby in the *Seventh Bridgewater Treatise* (ii. pp. 445-474), being that, it is true, of an estimable zoologist, but of one who had no special knowledge of ornithology. Indeed it is, as the latter says, that of Linnaeus, improved by Cuvier, with an additional modification of Illiger's—all these three authors having totally ignored any but external characters. Yet it was regarded "as being the one which facilitates the expression of the leading anatomical differences which obtain in the class of birds, and which therefore may be considered as the most natural."

Blyth.

But a bolder attempt at classification was that made in 1838 by Blyth in the New Series (Charlesworth's) of the *Magazine of Natural History* (ii. pp. 256-268, 314-319, 351-361, 420-426, 589-601; iii. pp. 76-84). It was limited, however, to what he called *Insessores*, being the group upon which that name had been conferred by Vigors (*Trans. Linn. Society*, xiv. p. 405) in 1823, with the addition, however, of his *Raptores*, and it will be unnecessary to enter into particulars concerning it, though it is as equally remarkable for the insight shown by the author into the structure of birds as for the philosophical breadth of his view, which comprehends almost every kind of character that had been at that time brought forward. It is plain that Blyth saw, and perhaps he was the first to see it, that geographical distribution was not unimportant in suggesting the affinities and differences of natural groups (pp. 258, 259); and, undeterred by the precepts and practice of the hitherto dominant English school of Ornithologists, he declared that "anatomy, when aided by every character which the manner of propagation, the progressive changes, and other physiological data supply, is the only sure basis of classification." He was quite aware of the taxonomic value of the vocal organs of some groups of birds, presently to be especially mentioned, and he had himself ascertained the presence and absence of *caeca* in a not inconsiderable number of groups, drawing thence very justifiable inferences. He knew at least the earlier investigations of L'Herminier, and, though the work of Nitzsch, even if he had ever heard of it, must (through ignorance of the language in which it was written) have been to him a sealed book, he had followed out and extended the hints already given by Temminck as to the differences which various groups of birds display in their moult. With all this it is not surprising to find, though the fact has been generally overlooked, that Blyth's proposed arrangement in many points anticipated conclusions that were subsequently reached, and were then regarded as fresh discoveries. It is proper to add that at this time the greater part of his work was carried on in conjunction with A. Bartlett, the superintendent of the London Zoological Society's Gardens, and that, without his assistance, Blyth's opportunities, slender as they were compared with those which others have enjoyed, must have been still smaller. Considering the extent of their materials, which was limited to the bodies of such animals as they could obtain from dealers and the several menageries that then existed in or near London, the progress made in what has since proved to be the right direction is very wonderful. It is obvious that both these investigators had the genius for recognizing and interpreting the value of characters; but their labours do not seem to have met with much encouragement; and a general arrangement of the class laid by Blyth before the Zoological Society at this time [1] does not appear in its publications. The scheme could hardly fail to be a crude performance—a fact which nobody would know better than its author; but it must have presented much that was objectionable to the opinions then generally prevalent. Its line to some extent may be partly made out—very clearly, for the matter of that, so far as its details have been published in the series of papers to which reference has been given—and some traces of its features are probably preserved in his *Catalogue* of the specimens of birds in the museum of the Asiatic Society of Bengal, which, after several years of severe labour, made its appearance at Calcutta in 1849; but, from the time of his arrival in India, the onerous duties imposed upon Blyth, together with the want of sufficient books of reference, seem to have hindered him from seriously continuing his former researches, which, interrupted as they were, and born out of due time, had no appreciable effect on the views of systematisers generally.

Bartlett.

Brandt.

Next must be noticed a series of short treatises communicated by Johann Friedrich Brandt, between the years 1836 and 1839, to the Academy of Sciences of St Petersburg, and published in its *Mémoires*. In the year last mentioned the greater part of these was separately issued under the title of *Beiträge zur Kenntniss der Naturgeschichte der Vögel*. Herein the author first assigned anatomical reasons for rearranging the order *Anseres* of Linnaeus and *Natatores* of Illiger, who, so long before as 1811, had proposed a new distribution of it into six families, the definitions of which, as was his wont, he had drawn from external characters only. Brandt now retained very nearly the same arrangement as his predecessor; but, notwithstanding that he could trust to the firmer foundation of internal framework, he took at least two retrograde steps. First he failed to see the great structural difference between the penguins (which Illiger had placed as a group, *Impennes*, of equal rank to his other families) and the auks, divers and grebes, *Pygopodes*—combining all of them to form a "Typus" (to use his term) *Urinatores*; and secondly he admitted among the *Natatores*, though as a distinct "Typus" *Podoidae*, the genera *Podoa* and *Fulica*, which are now known to belong to the *Rallidae*—the latter indeed (see Coot) being but very slightly removed from the moorhen (*q.v.*). At the same time he corrected the error made by Illiger in associating the Phalaropes with these forms, rightly declaring their relationship to *Tringa* (see Sandpiper), a point of order which other systematists were long in admitting. On the whole Brandt's labours were of no small service in asserting the principle that consideration must be paid to osteology; for his position was such as to gain more attention to his views than some of his less favourably placed brethren had succeeded in doing.

Keyserling and Blasius.

In the same year (1839) another slight advance was made in the classification of the true Passerines. Keyserling and Blasius briefly pointed out in the *Archiv für Naturgeschichte* (v. pp. 332-334) that, while all the other birds provided with perfect song-muscles had the "planta" or hind part of the "tarsus" covered with two long and undivided horny plates, the larks (*q.v.*) had this part divided by many transverse sutures, so as to be scutellated behind as well as in front; just as is the case in many of the passerines which have not the singing-apparatus, and also in the hoopoe (*q.v.*). The importance of this singular but superficial departure from the normal structure has been so needlessly exaggerated as a character that at the present time its value is apt to be unduly depreciated. In so large and so homogeneous a group as that of the true Passerines, a constant character of this kind is not to be despised as a practical mode of separating the birds which possess it; and, more than this, it would appear that the discovery thus announced was the immediate means of leading to a series of investigations of a much more important and lasting nature—those of Johannes Müller to be presently mentioned.

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[1] An abstract is contained in the Minute-book of the Scientific Meetings of the Zoological Society, 26th June and 10th July 1838. The class was to contain fifteen orders, but only three were dealt with in any detail.

Nitzsch.

Again we must recur to that indefatigable and most original investigator Nitzsch, who, having never intermitted his study of the particular subject of his first contribution to science, long ago noticed, in 1833 brought out at Halle, where he was professor of Zoology, an essay with the title *Pterylographiae Avium Pars prior*. It seems that this was issued as much with the object of inviting assistance from others in view of future labours, since the materials at his disposal were comparatively scanty, as with that of making known the results to which his researches had already led him. Indeed, he only communicated copies of this essay to a few friends, and examples of it are comparatively scarce. Moreover, he stated subsequently that he thereby hoped to excite other naturalists to share with him the investigations he was making on a subject which had hitherto escaped notice or had been wholly neglected, since he considered that he had proved the disposition of the feathered tracts in the plumage of birds to be the means of furnishing characters for the discrimination of the various natural groups as significant and important as they were new and unexpected. There was no need for us here to quote this essay in its chronological place, since it dealt only with the generalities of the subject, and did not enter upon any systematic details. These the author reserved for a second treatise which he was destined never to complete. He kept on diligently collecting materials, and as he did so was constrained to modify some of the statements he had published. He consequently fell into a state of doubt, and before he could make up his mind on some questions which he deemed important he was overtaken by death.[1] Then his papers were handed over to his friend and successor Professor Burmeister, now and for many years past of Buenos Aires, who, with much skill, elaborated from them the excellent work known as Nitzsch's *Pterylographie*, which was published at Halle in 1840, and translated into English for the Ray Society in 1867. There can be no doubt that Professor Burmeister discharged his editorial duty with the most conscientious scrupulosity; but, from what has been just said, it is certain that there were important points on which Nitzsch was as yet undecided—some of them perhaps of which no trace appeared in his manuscripts, and therefore as in every case of works posthumously published, unless (as rarely happens) they have received their author's "*imprimatur*," they cannot be implicitly trusted as the expression of his final views. It would consequently be unsafe to ascribe positively all that appears in this volume to the result of Nitzsch's mature consideration. Moreover, as Professor Burmeister states in his preface, Nitzsch by no means regarded the natural sequence of groups as the highest problem of the systematist, but rather their correct limitation. Again, the arrangement followed in the *Pterylographie* was of course based on pterylographical considerations, and we have its author's own word for it that he was persuaded that the limitation of natural groups could only be attained by the most assiduous research into the species of which they are composed from every point of view. The combination of these three facts will of itself explain some defects, or even retrogressions, observable in Nitzsch's later systematic work when compared with that which he had formerly done. On the other hand, some manifest improvements are introduced, and the abundance of details into which he enters in his *Pterylographie* render it far more instructive and valuable than the older performance. As an abstract of that has already been given, it may be sufficient here to point out the chief changes made in his newer arrangement. To begin with, the three great sections of aerial, terrestrial, and aquatic birds are abolished. The "*Accipitres*" are divided into two groups, Diurnal and Nocturnal; but the first of these divisions is separated into three sections: (1) the Vultures of the New World, (2) those of the Old World, and (3) the genus *Falco* of Linnaeus. The "*Passerinae*," that is to say, the true *Passeres*, are split into eight families, not wholly with judgment,[2] but of their taxonomy more is to be said presently. Then a new order "*Picariae*" is instituted for the reception of the *Macrochires*, *Cuculinae*, *Picinae Psittacinae* and *Amphibolae* of his old arrangement, to which are added three[3] others—*Caprimulginae*, *Todidae* and *Lipoglossae*—the last consisting of the genera *Buceros*, *Upupa* and *Alcedo*. The association of *Alcedo* with the other two is no doubt a misplacement, but the alliance of *Buceros* to *Upupa*, already suggested by Gould and Blyth in 1838[4] (*Mag. Nat. History*, ser. 2, ii. pp. 422 and 589), though apparently unnatural, has been corroborated by many later systematisers; and taken as a whole the establishment of the *Picariae* was certainly a commendable proceeding. For the rest there is only one considerable change, and that forms the greatest blot on the whole scheme. Instead of recognizing, as before, a subclass in the *Ratitae* of Merrem, Nitzsch now reduced them to the rank of an order under the name "*Platysternae*," placing them between the "*Gallinaceae*" and "*Grallae*," though admitting that in their pterylosis they differ from all other birds, in ways that he is at great pains to describe, in each of the four genera examined by him—*Struthio*, *Rhea*, *Dromaeus* and *Casuarius*.[5] It is significant that notwithstanding this he did not figure the pterylosis of any one of them, and the thought suggests itself that, though his editor assures us he had convinced himself that the group must be here shoved in (*eingeschoben* is the word used), the intrusion is rather due to the necessity which Nitzsch, in common with most men of his time (the Quinarians excepted), felt for deploying the whole series of birds into line, in which case the proceeding may be defensible on the score of convenience. The extraordinary merits of this book, and the admirable fidelity to his principles which Professor Burmeister showed in the difficult task of editing it, were unfortunately overlooked for many years, and perhaps are not sufficiently recognised now. Even in Germany, the author's own country, there were few to notice seriously what is certainly one of the most remarkable works ever published on the science, much less to pursue the investigations that had been so laboriously begun.[6] Andreas Wagner, in his report on the progress of

Burmeister.

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[1] Though not relating exactly to our present theme, it would be improper to dismiss Nitzsch's name without reference to his extraordinary labours in investigating the insect and other external parasites of birds, a subject which as regards British species was subsequently elaborated by Denny in his *Monographia Anoplurorum Britanniae* (1842) and in his list of the specimens of British *Anoplura* in the collection of the British Museum.

[2] A short essay by Nitzsch on the general structure of the Passerines, written, it is said, in 1836, was published in 1862 (*Zeitschr. Ges., Naturwissenschaft*, xix. pp. 389-408). It is probably to this essay that Professor Burmeister refers in the *Pterylographie* (p. 102, note; Eng. trans., p. 72, note) as forming the basis of the article "Passerinae" which he contributed to Ersch and Gruber's *Encyklopädie* (sect. iii. bd. xiii. pp. 139–144), and published before the *Pterylographie*.

[3] By the numbers prefixed it would look as if there should be *four* new members of this order; but that seems to be due rather to a slip of the pen or to a printer's error.

[4] This association is one of the most remarkable in the whole series of Blyth's remarkable papers on classification in the volume cited above. He states that Gould suspected the alliance of these two forms "from external structure and habits alone"; otherwise one might suppose that he had obtained an intimation to that effect on one of his Continental journeys. Blyth "arrived at the same conclusion, however, by a different train of investigation," and this is beyond doubt.

[5] He does not mention *Apteryx*, at that time so little known on the Continent.

[6] Some excuse is to be made for this neglect. Nitzsch had of course exhausted all the forms of birds commonly to be obtained, and specimens of the less common forms were too valuable from the curator's or collector's point of view to be subjected to a treatment that might end in their destruction. Yet it is said, on good authority, that Nitzsch had the patience so to manipulate the skins of many rare species that he was able to ascertain the characters of their pterylosis by the inspection of their inside only, without in any way damaging them for the ordinary purpose of a museum. Nor is this surprising when we consider the marvellous skill of Continental and especially German taxidermists, many of whom have elevated their profession to a height of art inconceivable to most Englishmen, who are only acquainted with the miserable mockery of Nature which is the most sublime result of all but a few "bird-stuffers."

ornithology, as might be expected from such a man as he was, placed the *Pterylographie* at the summit of those publications the appearance of which he had to record for the years 1839 and 1840, stating that for "Systematik" it was of the greatest importance.[1] On the other hand Oken (*Isis*, 1842, pp. 391–394), though giving a summary of Nitzsch's results and classification, was more sparing of his praise, and prefaced his remarks by asserting that he could not refrain from laughter when he looked at the plates in Nitzsch's work, since they reminded him of the plucked fowls hanging in a poulterer's shop, and goes on to say that, as the author always had the luck to engage in researches of which nobody thought, so had he the luck to print them where nobody sought them. In Sweden Sundevall, without accepting Nitzsch's views, accorded them a far more appreciative greeting in his annual reports for 1840–1842 (i. pp. 152–160); but, of course, in England and France[2] nothing was known of them beyond the scantiest notice, generally taken at second hand, in two or three publications. Thanks to Mr Sclater, the Ray Society was induced to publish, in 1867, an excellent translation by Mr Dallas of Nitzsch's *Pterylography*, and thereby, however tardily, justice was at length rendered by British ornithologists to one of their greatest foreign brethren.[3] Nitzsch's work on feathers has been carried farther by many later observers, and its value is now generally accepted (see FEATHER).

Kessler.

The treatise of Kessler on the osteology of birds' feet, published in the *Bulletin* of the Moscow Society of Naturalists for 1841, next claims a few words, though its scope is rather to show differences than affinities; but treatment of that kind is undoubtedly useful at times in indicating that alliances generally admitted are unnatural; and this is the case here, for, following Cuvier's method, the author's researches prove the artificial character of some of its associations. While furnishing—almost unconsciously, however—additional evidence for overthrowing that classification, there is, nevertheless, no attempt made to construct a better one; and the elaborate tables of dimensions, both absolute and proportional, suggestive as is the whole tendency of the author's observations, seem not to lead to any very practical result, though the systematist's need to look beneath the integument, even in parts that are so comparatively little hidden as birds' feet, is once more made beyond all question apparent.

Macgillivray and Audubon.

It has already been mentioned that Macgillivray contributed to Audubon's *Ornithological Biography* a series of descriptions of some parts of the anatomy of American birds, from subjects supplied to him by that enthusiastic naturalist, whose zeal and prescience, it may be called, in this respect merits all praise. Thus he (prompted very likely by Macgillivray) wrote: "I believe the time to be approaching when much of the results obtained from the inspection of the exterior alone will be laid aside; when museums filled with stuffed skins will be considered insufficient to afford a knowledge of birds; and when the student will go forth, not only to observe the habits and haunts of animals, but to preserve specimens of them to be carefully dissected" (*Ornith. Biography*, iv., Introduction, p. xxiv). As has been stated, the first of this series of anatomical descriptions appeared in the fourth volume of his work, published in 1838, but they were continued until its completion with the fifth volume in the following year, and the whole was incorporated into what may be termed its second edition, *The Birds of America*, which appeared between 1840 and 1844. Among the many species whose anatomy Macgillivray thus partly described from autopsy were at least half a dozen[4] of those now referred to the family *Tyrannidae* (see KINGBIRD), but then included, with many others, according to the irrational, vague and rudimentary notions of classification of the time, in what was termed the family "*Muscicapinae.*" In all these species he found the vocal organs to differ essentially in structure from those of other birds of the Old World, which we now call Passerine, or, to be still more precise, Oscinian. But by him these last were most arbitrarily severed, dissociated from their allies, and wrongly combined with other forms by no means nearly related to them (*Brit. Birds*, i. pp. 17, 18) which he also examined; and he practically, though not literally,[5] asserted the truth, when he said that the general structure, but especially the muscular appendages, of the lower larynx was "similarly formed in all other birds of this family" described in Audubon's work. Macgillivray did not, however, assign to this essential difference any systematic value. Indeed he was so much prepossessed in favour of a classification based on the structure of the digestive organs that he could not bring himself to consider vocal muscles to be of much taxonomic use, and it was reserved to Johannes Müller to point out that the contrary was the fact. This the great German comparative anatomist did in two communications to the Academy of Sciences of Berlin, one on the 26th June 1845 and the other on the 14th May 1846, which, having been first briefly published in the Academy's *Monatsbericht*, were afterwards printed in full, and illustrated by numerous figures, in its *Abhandlungen*, though in this latter and complete form they did not appear in public until 1847. This very remarkable treatise forms the groundwork of almost all later or recent researches in the comparative anatomy and consequent arrangement of the *Passeres*, and, though it is certainly not free from imperfections, many of them, it must be said, arise from want of material, notwithstanding that its author had command of a much more abundant supply than was at the disposal of Nitzsch. Carrying on the work from the anatomical point at which he had left it, correcting his errors, and utilizing to the fullest extent the observations of Keyserling and Blasius, to which reference has already been made, Müller, though hampered by mistaken notions of which he seems to have been unable to rid himself, propounded a scheme for the classification of this group, the general truth of which has been admitted by all his successors, based, as the title of his treatise expressed, on the hitherto unknown different types of the vocal organs in the Passerines. He freely recognized the prior discoveries of, as he thought, Audubon, though really, as has since been ascertained, of Macgillivray; but Müller was able to perceive their systematic value, which Macgillivray did not, and taught others to know it. At the same time Müller showed himself, his power of discrimination notwithstanding, to fall behind Nitzsch in one very crucial point, for he refused to the latter's *Picariae* the rank that had been claimed for them, and imagined that the groups associated under that name formed but a third "tribe"—*Picarii*—of a great order *Insessores*, the others being (1) the *Oscines* or *Polymyodi*—the singing birds by emphasis, whose inferior larynx was endowed with the full number of five pairs of song-muscles, and (2) the *Tracheophones*, composed of some South-American families. Looking on Müller's labours as we now can, we see that such errors as he committed are chiefly due to his want of special knowledge of ornithology, combined with the absence in several instances of sufficient materials for investigation. Nothing whatever is to be said against the composition of his first and second "tribes"; but the third is an assemblage still more heterogeneous than that which Nitzsch brought together under a name so like that of Müller—for the fact must never be allowed to go out of sight that the extent of the *Picarii* of the latter is not at all that of the *Picariae* of the former.[6] For

Johannes Müller.

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[1] *Archiv für Naturgeschichte*, vii. 2, pp. 60, 61.

[2] In 1836 Jacquemin communicated to the French Academy (*Comptes rendus*, ii. pp. 374, 375 and 472) some observations on the order in which feathers are disposed on the body of birds; but, however general may have been the scope of his investigations, the portion of them published refers only to the crow, and there is no mention made of Nitzsch's former work.

[3] The Ray Society had the good fortune to obtain the ten original copper-plates, all but one drawn by the author himself, wherewith the work was illustrated. It is only to be regretted that the Society did not also adopt the quarto size in which it appeared, for by issuing their English version in folio they needlessly put an impediment in the way of its common and convenient use.

[4] These are, according to modern nomenclature, *Tyrannus carolinensis* and (as before mentioned) *T. verticalis*, *Myiarchus crinitus*, *Sayornis fuscus*, *Contopus virens* and *Empidonax acadicus*.

[5] Not literally, because a few other forms such as the genera *Poliopila* and *Ptilogonys*, now known to have no relation to the *Tyrannidae*, were included, though these forms, it would seem, had never been dissected by him. On the other hand, he declares that the American redstart, *Muscicapa*, or, as it now stands, *Setophaga ruticilla*, when young, has its vocal organs like the rest—an extraordinary statement which is worthy the attention of the many able American ornithologists.

[6] It is not needless to point out this fine distinction, for more than one modern author would seem to have overlooked it.

instance, Müller places in his third "tribe" the group which he called *Ampelidae*, meaning thereby the peculiar forms of South America that are now considered to be more properly named *Cotingidae*, and herein he was clearly right, while Nitzsch, who (misled by their supposed affinity to the genus *Ampelis*—peculiar to the Northern Hemisphere, and a purely Passerine form) had kept them among his *Passerinae*, was as clearly wrong. But again Müller made his third "tribe" *Picarii* also to contain the *Tyrannidae*, of which mention has just been made, though it is so obvious as now to be generally admitted that they have no very intimate relationship to the other families with which they are there associated. There is no need here to criticise more minutely this projected arrangement, and it must be said that, notwithstanding his researches, he seems to have had some misgivings that, after all, the separation of the *Insessores* into those "tribes" might not be justifiable. At any rate he wavered in his estimate of their taxonomic value, for he gave an alternative proposal, arranging all the genera in a single series, a proceeding in those days thought not only defensible and possible, but desirable or even requisite, though now utterly abandoned. Just as Nitzsch had laboured under the disadvantage of never having any example of the abnormal *Passeres* of the New World to dissect, and, therefore, was wholly ignorant of their abnormality, so Müller never succeeded in getting hold of an example of the genus *Pitta* for the same purpose, and yet, acting on the clue furnished by Keyserling and Blasius, he did not hesitate to predict that it would be found to fill one of the gaps he had to leave, and this to some extent it has been since proved to do.

Yarrell.

It must not be supposed that the vocal muscles were first discovered by Müller; on the contrary, they had been described long before, and by many writers on the anatomy of birds. To say nothing of foreigners, or the authors of general works on the subject, an excellent account of them had been given to the Linnean Society by W. Yarrell in 1829, and published with elaborate figures in its *Transactions* (xvi. 305–321, pls. 17, 18), an abstract of which was subsequently given in the article "Raven" in his *History of British Birds*, and Macgillivray also described and figured them with the greatest accuracy ten years later in his work with the same title (ii. 21–37, pls. x.-xii.), while Blyth and Nitzsch had (as already mentioned) seen some of their value in classification. But Müller has the merit of clearly outstriding his predecessors, and with his accustomed perspicuity made the way even plainer for his successors to see than he himself was able to see it. What remains to add is that the extraordinary celebrity of its author actually procured for the first portion of his researches notice in England (*Ann. Nat. History*, xvii. 499), though it must be confessed not then to any practical purpose; but more than thirty years after there appeared an English translation of his treatise by F. Jeffrey Bell, with an appendix by Garrod containing a summary of the latter's own continuation of the same line of research.[1]

Cornay.

It is now necessary to revert to the year 1842, in which Dr Cornay of Rochefort communicated to the French Academy of Sciences a memoir on a new classification of birds, of which, however, nothing but a notice has been preserved (*Comptes rendus*, xiv. p. 164). Two years later this was followed by a second contribution from him on the same subject, and of this only an extract appeared in the official organ of the Academy (*ut supra*, xvi. pp. 94, 95), though an abstract was inserted in one scientific journal (*L'Institut*, xii. p. 21), and its first portion in another (*Journal des Découvertes*, i. p. 250). The *Revue Zoologique* for 1847 (pp. 360–369) contained the whole, and enabled naturalists to consider the merits of the author's project, which was to found a new classification of birds on the form of the anterior palatal bones, which he declared to be subjected more evidently than any other to certain fixed laws. These laws, as formulated by him, are that (1) there is a coincidence of form of the anterior palatal and of the cranium in birds of the same order; (2) there is a likeness between the anterior palatal bones in birds of the same order; (3) there are relations of likeness between the anterior palatal bones in groups of birds which are near to one another. These laws, he added, exist in regard to all parts that offer characters fit for the methodical arrangement of birds, but it is in regard to the anterior palatal bone that they unquestionably offer the most evidence. In the evolution of these laws Dr Cornay had most laudably studied, as his observations prove, a vast number of different types, and the upshot of his whole labours, though not very clearly stated, was such as to wholly subvert the classification at that time generally adopted by French ornithologists. He of course knew the investigations of L'Herminier and De Blainville on sternal formation, and he also seems to have been aware of some pterylological differences exhibited by birds—whether those of Nitzsch or those of Jacquemin is not stated. True it is the latter were never published in full, but it is quite conceivable that Dr Cornay may have known their drift. Be that as it may, he declares that characters drawn from the sternum or the pelvis—hitherto deemed to be, next to the bones of the head, the most important portions of the bird's framework—are scarcely worth more, from a classificatory point of view, than characters drawn from the bill or the legs; while pterylological considerations, together with many others to which some systematists had attached more or less importance, can only assist, and apparently must never be taken to control, the force of evidence furnished by this bone of all bones—the anterior palatal.

That Dr Cornay was on the brink of making a discovery of considerable merit will by and by appear; but, with every disposition to regard his investigations favourably, it cannot be said that he accomplished it. Whatever proofs Dr Cornay may have had to satisfy himself of his being on the right track, these proofs were not adduced in sufficient number nor arranged with sufficient skill to persuade a somewhat stiff-necked generation of the truth of his views—for it was a generation whose leaders, in France at any rate, looked with suspicion upon any one who professed to go beyond the bounds which the genius of Cuvier had been unable to overpass, and regarded the notion of upsetting any of the positions maintained by him as verging almost upon profanity. Moreover, Dr Cornay's scheme was not given to the world with any of those adjuncts that not merely please the eye but are in many cases necessary, for, though on a subject which required for its proper comprehension a series of plates, it made even its final appearance unadorned by a single explanatory figure, and in a journal, respectable and well-known indeed, but one not of the highest scientific rank.

Cabanis.

The same year which saw the promulgation of the crude scheme just described, as well as the publication of the final researches of Müller, witnessed also another attempt at the classification of birds, much more limited indeed in scope, but, so far as it went, regarded by most ornithologists of the time as almost final in its operation. Under the vague title of "Ornithologische Notizen" Professor Cabanis of Berlin contributed to the *Archiv für Naturgeschichte* (xiii. 1, pp. 186–256, 308–352) an essay in two parts, wherein, following the researches of Müller[2] on the syrinx, in the course of which a correlation had been shown to exist between the whole or divided condition of the *planta* or hind part of the "tarsus," first noticed, as has been said, by Keyserling and Blasius, and the presence or absence of the perfect song-apparatus, the younger author found an agreement which seemed almost invariable in this respect, and he also pointed out that the *planta* of the different groups of birds in which it is divided is divided in different modes, the mode of division being generally characteristic of the group. Such a coincidence of the internal and external features of birds was naturally deemed a discovery of the greatest value by those ornithologists who thought most highly of the latter, and it was unquestionably of no little practical utility. Further examination also revealed the fact[3] that in certain groups the number of "primaries," or quill-feathers growing from the *manus* or distal segment of the wing, formed another characteristic easy of observation. In the *Oscines* or *Polymyodi* of Müller the number was either nine or ten—and if the latter the outermost of them was generally very small. In two of the other groups of which Professor Cabanis especially treated—groups which had been hitherto more or less confounded with the *Oscines*—the number of primaries was invariably ten, and the outermost of them was comparatively large. This observation was also hailed as the discovery of a fact of extraordinary importance; and, from the results of these investigations, taken altogether, ornithology was declared by Sundevall, undoubtedly a man who had a right to speak with authority, to have made greater progress than had been achieved since the days of Cuvier. The final disposition of the "Sub-class *Insessores*"—all the perching birds, that is to say, which are neither birds of prey nor pigeons—proposed by Professor Cabanis, was into four "Orders," as follows:—

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[1] The title of the English translation is *Johannes Müller on Certain Variations in the Vocal Organs of the Passeres that have hitherto escaped notice.* It was published at Oxford in 1878. By some unaccountable accident, the date of the original communication to the Academy of Berlin is wrongly printed. It has been rightly given above.

[2] On the other hand, Müller makes several references to the labours of Professor Cabanis. The investigations of both authors must have been proceeding simultaneously, and it matters little which actually appeared first.

[3] This seems to have been made known by Professor Cabanis the preceding year to the *Gesellschaft der Naturforschender Freunde* (cf. Müller, *Stimmorganen der Passerinen*, p. 65). Of course the variation to which the number of primaries was subject had not escaped the observation of Nitzsch, but he had scarcely used it as a classificatory character.

1. *Oscines*, equal to Müller's group of the same name;
2. *Clamatores*, being a majority of that division of the *Picariae* of Nitzsch, so called by Andreas Wagner, in 1841,[1] which have their feet normally constructed;
3. *Strisores*, a group now separated from the *Clamatores* of Wagner, and containing those forms which have their feet abnormally constructed; and
4. *Scansores*, being the *Grimpeurs* of Cuvier, the *Zygodactyli* of several other systematists.

The first of these four "Orders" had been already indefeasibly established as one perfectly natural, but respecting its details more must presently be said. The remaining three are now seen to be obviously artificial associations, and the second of them, *Clamatores*, in particular, containing a very heterogeneous assemblage of forms; but it must be borne in mind that the internal structure of some of them was at that time still more imperfectly known than now.

Bonaparte.

Hogg.

Newman.

This will perhaps be the most convenient place to mention another kind of classification of birds, which, based on a principle wholly different from those that have just been explained, requires a few words, though it has not been productive, nor is likely, from all that appears, to be productive of any great effect. So long ago as 1831, Prince C. L. Bonaparte, in his *Saggio di una distribuzione metodica degli Animali Vertebrati*, published at Rome, and in 1837 communicated to the Linnean Society of London, "A new Systematic Arrangement of Vertebrated Animals," which was subsequently printed in that Society's *Transactions* (xviii. pp. 247-304), though before it appeared there was issued at Bologna, under the title of *Synopsis Vertebratorum Systematis*, a Latin translation of it. Herein he divided the class *Aves* into two subclasses, to which he applied the names of *Insessores* and *Grallatores* (hitherto used by their inventors Vigors and Illiger in a different sense), in the latter work relying chiefly for this division on characters which had not before been used by any systematist, namely that in the former group monogamy generally prevailed and the helpless nestlings were fed by their parents, while the latter group were mostly polygamous, and the chicks at birth were active and capable of feeding themselves. This method, which in process of time was dignified by the title of a Physiological Arrangement, was insisted upon with more or less pertinacity by the author throughout a long series of publications, some of them separate books, some of them contributed to the memoirs issued by many scientific bodies of various European countries, ceasing only at his death, which in July 1857 found him occupied upon a *Conspectus Generum Avium*, that in consequence remains unfinished. In the course of this series, however, he saw fit to alter the name of his two subclasses, since those which he at first adopted were open to a variety of meanings, and in a communication to the French Academy of Sciences in 1853 (*Comptes rendus*, xxxvii. pp. 641-647) the denomination *Insessores* was changed to *Altrices*, and *Grallatores* to *Praecoces*—the terms now preferred by him being taken from Sundevall's treatise of 1835 already mentioned. The views of Bonaparte were, it appears, also shared by an ornithological amateur of some distinction, John Hogg, who propounded a scheme which, as he subsequently stated (*Zoologist*, 1850, p. 2797), was founded strictly in accordance with them; but it would seem that, allowing his convictions to be warped by other considerations, he abandoned the original "physiological" basis of his system, so that this, when published in 1846 (*Edinb. N. Philosoph. Journal*, xli. pp. 50-71), was found to be established on a single character of the feet only; though he was careful to point out, immediately after formulating the definition of his subclasses *Constrictipedes* and *Inconstrictipedes*, that the former "make, in general, compact and well-built nests, wherein they bring up their very weak, blind, and mostly naked young, which they feed with care, by bringing food to them for many days, until they are fledged and sufficiently strong to leave their nest," observing also that they "are principally monogamous" (pp. 55, 56); while of the latter he says that they "make either a poor and rude nest, in which they lay their eggs, or else none, depositing them on the bare ground. The young are generally born with their full sight, covered with down, strong, and capable of running or swimming immediately after they leave the egg-shell." He adds that the parents, which "are mostly polygamous," attend their young and direct them where to find their food (p. 63). The numerous errors in these assertions hardly need pointing out. The herons, for instance, are much more "*Constrictipedes*" than are the larks or the kingfishers, and, so far from the majority of "*Inconstrictipedes*" being polygamous, there is scarcely any evidence of polygamy obtaining as a habit among birds in a state of nature except in certain of the *Gallinae* and a very few others. Furthermore, the young of the goatsuckers are at hatching far more developed than are those of the herons or the cormorants; and, in a general way, nearly every one of the asserted peculiarities of the two subclasses breaks down under careful examination. Yet the idea of a "physiological" arrangement on the same kind of principle found another follower, or, as he thought, inventor, in Edward Newman, who in 1850 communicated to the Zoological Society of London a plan published in its *Proceedings* for that year (pp. 46-48), and reprinted also in his own journal *The Zoologist* (pp. 2780-2782), based on exactly the same considerations, dividing birds into two groups, "Hesthogenous"—a word so vicious in formation as to be incapable of amendment, but intended to signify those that were hatched with a clothing of down—and "Gymnogenous," or those that were hatched naked. These three systems are essentially identical; but, plausible as they may be at the first aspect, they have been found to be practically useless, though such of their characters as their upholders have advanced with truth deserve attention. Physiology may one day very likely assist the systematist; but it must be real physiology and not a sham.

Gervais.

In 1856 Paul Gervais, who had already contributed to the *Zoologie* of M. de Castelnau's *Expédition dans les parties centrales de l'Amérique du Sud* some important memoirs describing the anatomy of the hoactzin and certain other birds of doubtful or anomalous position, published some remarks on the characters which could be drawn from the sternum of birds (*Ann. Sc. Nat. Zoologie*, ser. 4, vi. pp. 5-15). The considerations are not very striking from a general point of view; but the author adds to the weight of evidence which some of his predecessors had brought to bear on certain matters, particularly in aiding to abolish the artificial groups "Déodactyls," "Syndactyls," and "Zygodactyls," on which so much reliance had been placed by many of his countrymen; and it is with him a great merit that he was the first apparently to recognize publicly that characters drawn from the posterior part of the sternum, and particularly from the "*échancrures*," commonly called in English "notches" or "emarginations," are of comparatively little importance, since their number is apt to vary in forms that are most closely allied, and even in species that are usually associated in the same genus or unquestionably belong to the same family,[2] while these "notches" sometimes become simple *foramina*, as in certain pigeons, or on the other hand *foramina* may exceptionally change to "notches," and not unfrequently disappear wholly. Among his chief systematic determinations we may mention that he refers the tinamous to the rails, because apparently of their deep "notches," but otherwise takes a view of that group more correct according to modern notions than did most of his contemporaries. The bustards he would place with the "Limicoles," as also *Dromas* and *Chionis*, the sheath-bill (*q.v.*). *Phaethon*, the tropic-bird (*q.v.*), he would place with the "Laridés" and not with the "Pélecanidés," which it only resembles in its feet having all the toes connected by a web. Finally divers, auks and penguins, according to him, form the last term in the series, and it seems fit to him that they should be regarded as forming a separate order. It is a curious fact that even at a date so late as this, and by an investigator so well informed, doubt should still have existed whether *Apteryx* (see KIWI) should be referred to the group containing the cassowary and the ostrich. On the whole the remarks of this esteemed author do not go much beyond such as might occur to any one who had made a study of a good series of specimens; but many of them are published for the first time, and the author is careful to insist on the necessity of not resting solely on sternal characters, but associating with them those drawn from other parts of the body.

Blanchard.

Three years later in the same journal (xi. 11-145, pls. 2-4) M. Blanchard published some *Recherches sur les caractères ostéologiques des oiseaux appliquées à la classification naturelle de ces animaux*, strongly urging the superiority of such characters over those drawn from the bill or feet, which, he remarks, though they may have sometimes given correct notions, have mostly led to mistakes, and, if observations of habits and food have sometimes afforded happy results, they have often been deceptive; so that, should more be wanted than to draw up a mere inventory of creation or trace the distinctive outline of each species, zoology without anatomy would remain a barren study. At the same time he states that authors who have occupied themselves with the sternum alone have often produced uncertain results, especially when they have neglected its anterior for its posterior part; for in truth every bone of the skeleton ought to be studied in all its details. Yet this distinguished zoologist selects the sternum as furnishing the key to his primary groups or "Orders" of the class, adopting, as Merrem had done long before, the same two divisions *Carinatae* and *Ratitae*, naming, however, the former *Tropidosternii* and the latter *Homalosternii*.[3] Some unkind fate has hitherto hindered him from making known to the world the rest of his researches in regard to the other bones of the skeleton till he reached the head, and in the memoir cited he treats of the sternum of only a portion of his first "Order." This is the more to be regretted by all ornithologists, since he intended to conclude with what to them would have been a very great boon—the showing in what way external characters coincided with those presented by osteology. It was also within the scope of his plan to have continued on a more extended scale the researches on ossification begun by L'Herminier, and thus M. Blanchard's investigations, if completed, would obviously have taken extraordinarily high rank among the highest contributions to ornithology. As it is, so much of them as we have are of considerable importance; for, in this unfortunately unfinished memoir, he describes in some detail the several differences which the sternum in a great many different groups of his *Tropidosternii* presents, and to some extent makes a methodical disposition of them accordingly. Thus he separates the birds of prey into three great groups—(1) the ordinary Diurnal forms, including the *Falconidae* and *Vulturidae* of the systematist of his time, but distinguishing the American Vultures from those of the Old World; (2) *Gypogeranus*, the secretary-bird (*q.v.*); and (3) the owls (*q.v.*). Next he places the parrots (*q.v.*), and then the vast assemblage of "Passereaux"—which he declares to be all of one type, even genera like *Pipra* (manakin, *q.v.*) and *Pitta*—and concludes with the somewhat heterogeneous conglomeration of forms, beginning with *Cypselus* (swift, *q.v.*), that so many systematists have been accustomed to call *Picariae*, though to them as a group he assigns no name. A continuation of the treatise was promised in a succeeding part of the *Annales*, but a quarter of a century has passed without its appearance.[1]

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[1] *Archiv für Naturgeschichte*, vii. 2, pp. 93, 94. The division seems to have been instituted by this author a couple of years earlier in the second edition of his *Handbuch der Naturgeschichte* (a work not seen by the present writer), but not then to have received a scientific name. It included all *Picariae* which had not "zygodactylous" feet, that is to say, toes placed in pairs, two before and two behind.

[2] Thus he cites the cases of *Machetes pugnax* and *Scolopax rusticola* among the "Limicoles," and *Larus cataractes* among the "Laridés," as differing from their nearest allies by the possession of only one "notch" on either side of the keel. Several additional instances are cited in *Philos. Transactions* (1869), p. 337, note.

[3] These terms were explained in his great work *L'Organisation du règne animal, oiseaux*, begun in 1855, to mean exactly the same as those applied by Merrem to his two primary divisions.

Eyton.

Important as are the characters afforded by the sternum, that bone even with the whole sternal apparatus should obviously not be considered alone. To aid ornithologists in their studies in this respect, T. C. Eyton, who for many years had been forming a collection of birds' skeletons, began the publication of a series of plates representing them. The first part of this work, *Osteologia Avium*, appeared early in 1859, and a volume was completed in 1867. A Supplement was issued in 1869, and a Second Supplement, in three parts, between 1873 and 1875. The whole work contains a great number of figures of birds' skeletons and detached bones; but they are not so drawn as to be of much practical use, and the accompanying letterpress is too brief to be satisfactory.

Des Murs.

That the eggs laid by birds should offer to some extent characters of utility to systematists is only to be expected, when it is considered that those from the same nest generally bear an extraordinary family likeness to one another, and also that in certain groups the essential peculiarities of the egg-shell are constantly and distinctively characteristic. Thus no one who has ever examined the egg of a duck or of a tinamou would ever be in danger of not referring another tinamou's egg or another duck's, that he might see, to its proper family, and so on with many others. But at the same time many of the shortcomings of oology in this respect must be set down to the defective information and observation of its votaries, among whom some have been very lax, not to say incautious, in not ascertaining on due evidence the parentage of their specimens, and the author next to be named is open to this charge. After several minor notices that appeared in journals at various times, Des Murs in 1860 brought out at Paris his ambitious *Traité général d'oologie ornithologique au point de vue de la classification*, which contains (pp. 529-538) a "Systema Oologicum" as the final result of his labours. In this scheme birds are arranged according to what the author considered to be their natural method and sequence; but the result exhibits some unions as ill-assorted as can well be met with in the whole range of tentative arrangements of the class, together with some very unjustifiable divorces. Its basis is the classification of Cuvier, the modifications of which by Des Murs will seldom commend themselves to systematists whose opinion is generally deemed worth having. Few, if any, of the faults of that classification are removed, and the improvements suggested, if not established by his successors, those especially of other countries than France, are ignored, or, as is the case with some of those of L'Herminier, are only cited to be set aside. Oologists have no reason to be thankful to Des Murs, notwithstanding his zeal in behalf of their study. It is perfectly true that in several or even in many instances he acknowledges and deplores the poverty of his information, but this does not excuse him for making assertions (and such assertions are not unfrequent) based on evidence that is either wholly untrustworthy or needs further inquiry before it can be accepted (*Ibis*, 1860, pp. 331-335). This being the case, it would seem useless to take up further space by analysing the several proposed modifications of Cuvier's arrangement. The great merit of the work is that the author shows the necessity of taking oology into account when investigating the classification of birds; but it also proves that in so doing the paramount consideration lies in the thorough sifting of evidence as to the parentage of the eggs which are to serve as the building stones of the fabric to be erected. The attempt of Des Murs was praiseworthy, but in effect it has utterly failed, notwithstanding the encomiums passed upon it by friendly critics (*Rev. de Zoologie*, 1860, pp. 176-183, 313-325, 370-373).[2]

Results of Doctrine of Evolution.

Until about this time systematists, almost without exception, may be said to have been wandering with no definite purpose. At least their purpose was indefinite compared with that which they now have before them. No doubt they all agreed in saying that they were prosecuting a search for what they called the true system of nature; but that was nearly the end of their agreement, for in what that true system consisted the opinions of scarcely any two would coincide, unless to own that it was some shadowy idea beyond the present power of mortals to reach or even comprehend. The Quinarians, who boldly asserted that they had fathomed the mystery of creation, had been shown to be no wiser than other men, if indeed they had not utterly befooled themselves; for their theory at best could give no other explanation of things than that they were because they were. The conception of such a process as has now come to be called by the name of evolution was certainly not novel; but except to two men the way in which that process was or could be possible had not been revealed.[3] Here there is no need to enter into details of the history of evolution; but there was possibly no branch of zoology in which so many of the best informed and consequently the most advanced of its workers sooner accepted the principles of evolution than ornithology, and of course the effect upon its study was very marked. New spirit was given to it. Ornithologists now felt they had something before them that was really worth investigating. Questions of affinity, and the details of geographical distribution, were endowed with a real interest, in comparison with which any interest that had hitherto been taken was a trifling pastime. Classification assumed a wholly different aspect. It had up to this time been little more than the shuffling of cards, the ingenious arrangement of counters in a pretty pattern. Henceforward it was to be the serious study of the workings of nature in producing the beings we see around us from beings more or less unlike them, that had existed in bygone ages and had been the parents of a varied and varying offspring—our fellow-creatures of to-day. Classification for the first time was something more than the expression of a fancy, not that it had not also its imaginative side. Men's minds began to figure to themselves the original type of some well-marked genus or family of birds. They could even discern dimly some generalized stock whence had descended whole groups that now differed strangely in habits and appearance—their discernment aided, may be, by some isolated form which yet retained undeniable traces of a primitive structure. More dimly still visions of what the first bird may have been like could be reasonably entertained; and, passing even to a higher antiquity, the reptilian parent whence all birds have sprung was brought within reach of man's consciousness. But, relieved as it may be by reflections of this kind—dreams some may perhaps still call them—the study of ornithology has unquestionably become harder and more serious; and a corresponding change in the style of investigation, followed in the works that remain to be considered, will be immediately perceptible.

Tristram.

That this was the case is undeniably shown by some remarks of Canon Tristram, who, in treating of the *Alaudidae* and *Saxicolinae* of Algeria (whence he had recently brought a large collection of specimens of his own making), stated (*Ibis*, 1859, pp. 429–433) that he could "not help feeling convinced of the truth of the views set forth by Messrs Darwin and Wallace," adding that it was "hardly possible, I should think, to illustrate this theory better than by the larks and chats of North Africa." It is unnecessary to continue the quotation; the few words just cited are enough to assure to their author the credit of being (so far as is known) the first ornithological specialist who had the courage publicly to recognize and receive the new and at that time unpopular philosophy.

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[1] M. Blanchard's animadversions on the employment of external characters, and on trusting to observations on the habits of birds, called forth a rejoinder from A. R. Wallace (*Ibis*, 1864, pp. 36-41), who successfully showed that they are not altogether to be despised.

[2] In this historical sketch of the progress of ornithology it has not been thought necessary to mention other oological works, since they have not a taxonomic bearing, and the chief of them have been already named (see BIRDS).

[3] Neither Lamarck nor Robert Chambers (the now acknowledged author of *Vestiges of Creation*), though thorough evolutionists, rationally indicated any means whereby, to use the old phrase, "the transmutation of species" could be effected.

Parker.

But greater work was at hand. In June 1860 W. K. Parker broke, as most will allow, entirely fresh ground by communicating to the Zoological Society a memoir "On the Osteology of *Balaeniceps*," subsequently published in that Society's *Transactions* (iv. 269-351). Of this contribution to science, as of all the rest which have since proceeded from him, may be said in the words he himself has applied (*ut supra*, p. 271) to the work of another labourer in a not distant field: "This is a model paper for unbiassed observation, and freedom from that pleasant mode of *supposing* instead of *ascertaining* what is the true nature of an anatomical element."[1] Indeed, the study of this memoir, limited though it be in scope, could not fail to convince any one that it proceeded from the mind of one who taught with the authority derived directly from original knowledge, and not from association with the scribes—a conviction that has become strengthened as, in a series of successive memoirs, the stores of more than twenty years' silent observation and unremitting research were unfolded, and, more than that, the hidden forces of the science of morphology were gradually brought to bear upon almost each subject that came under discussion. These different memoirs, being technically monographs, have strictly no right to be mentioned in this place; but there is scarcely one of them, if one indeed there be, that does not deal with the generalities of the study; and the influence they have had upon contemporary investigation is so strong that it is impossible to refrain from noticing them here, though want of space forbids us from enlarging on their contents.

Wagner.

Owen.

For some time past rumours of a discovery of the highest interest had been agitating the minds of zoologists, for in 1861 Andreas Wagner had sent to the Academy of Sciences of Munich (*Sitzungsberichte*, pp. 146-154; *Ann. Nat. History*, series 3, ix. 261-267) an account of what he conceived to be a feathered reptile (assigning to it the name *Griphosaurus*), the remains of which had been found in the lithographic beds of Solenhofen; but he himself, through failing health, had been unable to see the fossil. In 1862 the slabs containing the remains were acquired by the British Museum, and towards the end of that year Sir R. Owen communicated a detailed description of them to the *Philosophical Transactions* (1863, pp. 33-47), proving their bird-like nature, and referring them to the genus *Archaeopteryx* of Hermann von Meyer, hitherto known only by the impression of a single feather from the same geological beds. Wagner foresaw the use that would be made of this discovery by the adherents of the new philosophy, and, in the usual language of its opponents at the time, strove to ward off the "misinterpretations" that they would put upon it. His protest, it is needless to say, was unavailing, and all who respect his memory must regret that the sunset of life failed to give him that insight into the future which is poetically ascribed to it. To Darwin and those who believed with him scarcely any discovery could have been more welcome; but that is beside our present business. It was quickly seen—even by those who held *Archaeopteryx* to be a reptile—that it was a form intermediate between existing birds and existing reptiles; while those who were convinced by Sir R. Owen's researches of its ornithic affinity saw that it must belong to a type of birds wholly unknown before, and one that in any future for the arrangement of the class must have a special rank reserved for it.[2]

Lilljeborg.

It behoves us next to mention the "Outlines of a Systematic Review of the Class of Birds," communicated by W. Lilljeborg to the Zoological Society in 1866, and published in its *Proceedings* for that year (pp. 5-20), since it was immediately after reprinted by the Smithsonian Institution, and with that authorization has exercised a great influence on the opinions of American ornithologists. Otherwise the scheme would hardly need notice here. This paper is indeed little more than an English translation of one published by the author in the annual volume (*Årsskrift*) of the Scientific Society of Upsala for 1860, and belonging to the pre-Darwinian epoch should perhaps have been more properly treated before, but that at the time of its original appearance it failed to attract attention. The chief merit of the scheme perhaps is that, contrary to nearly every precedent, it begins with the lower and rises to the higher groups of birds, which is of course the natural mode of proceeding, and one therefore to be commended. Otherwise the "principles" on which it is founded are not clear to the ordinary zoologist. One of them is said to be "irritability," and, though this is explained to mean, not "muscular strength alone, but vivacity and activity generally,"[3] it does not seem to form a character that can be easily appreciated either as to quantity or quality; in fact, most persons would deem it quite immeasurable, and, as such, removed from practical consideration. Moreover, Professor Lilljeborg's scheme, being actually an adaptation of that of Sundevall, of which we shall have to speak at some length almost immediately, may possibly be left for the present with these remarks.

Huxley.

In the spring of the year 1867 Professor T. H. Huxley, to the delight of an appreciative audience, delivered at the Royal College of Surgeons of England a course of lectures on birds, and a few weeks after presented an abstract of his researches to the Zoological Society, in whose *Proceedings* for the same year it will be found printed (pp. 415-472) as a paper "On the Classification of Birds, and on the taxonomic value of the modifications of certain of the cranial bones observable in that Class." Starting from the basis "that the phrase 'birds are greatly modified reptiles' would hardly be an exaggerated expression of the closeness" of the resemblance between the two classes, which he had previously brigaded under the name of *Sauropsida* (as he had brigaded the *Pisces* and *Amphibia* as *Ichthyopsida*), he drew in bold outline both their likenesses and their differences, and then proceeded to inquire how the *Aves* could be most appropriately subdivided into orders, suborders and families. In this course of lectures he had already dwelt at some length on the insufficiency of the characters on which such groups as had hitherto been thought to be established were founded; but for the consideration of this part of his subject there was no room in the present paper, and the reasons why he arrived at the conclusion that new means of philosophically and successfully separating the class must be sought are herein left to be inferred. The upshot, however, admits of no uncertainty: the class *Aves* is held to be composed of *three* "Orders"—

I. SAURURAE, Häckel;
II. RATITAE, Merrem; and
III. CARINATAE, Merrem.

The *Saururae* have the metacarpals well developed and not ancylosed, and the caudal vertebrae are numerous and large, so that the caudal region of the spine is longer than the body. The furcula is complete and strong, the feet very passerine in appearance. The skull and sternum were at the time unknown, and indeed the whole order, without doubt entirely extinct, rested exclusively on the celebrated fossil, then unique, *Archaeopteryx*.

The *Ratitae* comprehend the struthious birds, which differ from all others now extant in the combination of several peculiarities, some of which have been mentioned in the preceding pages. The sternum has no keel, and ossifies from lateral and paired centres only; the axes of the scapula and coracoid have the same general direction; certain of the cranial bones have characters very unlike those possessed by the next order—the vomer, for example, being broad posteriorly and generally intervening between the basisphenoidal rostrum and the palatals and pterygoids; the barbs of the feathers are disconnected; there is no syrinx or inferior larynx; and the diaphragm is better developed than in other birds.[4]

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[1] It is fair to state that some of Professor Parker's conclusions respecting *Balaeniceps* were contested by the late Professor J. T. Reinhardt (*Overs. K. D. Vid. Selsk. Forhandlinger*, 1861, pp. 135-154; *Ibis*, 1862, pp. 158-175), and as it seems to the present writer not ineffectually. Professor Parker replied to his critic (*Ibis*, 1862, pp. 297-299).

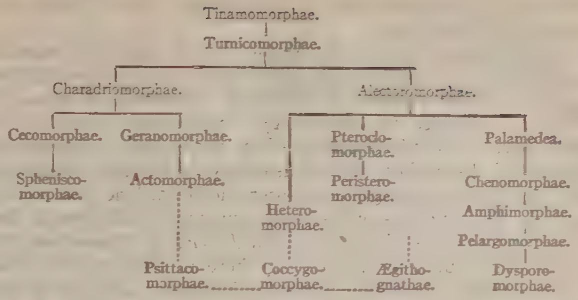
[2] This was done shortly afterwards by Professor Haeckel, who proposed the name *Saururae* for the group containing it.

[3] On this ground it is stated that the *Passeres* should be placed highest in the class. But those who know the habits and demeanour of many of the *Limicolae* would no doubt rightly claim for them much more "vivacity and activity" than is possessed by most *Passeres*.

[4] This peculiarity had led some zoologists to consider the struthious birds more nearly allied to the *Mammalia* than any others.

The *Carinatae* are divided, according to the formation of the palate, into four "Suborders," and named (i.) *Dromaeognathae*, (ii.) *Schizognathae*, (iii.) *Desmognathae*, and (iv.) *Aegithognathae*.[1] The *Dromaeognathae* resemble the *Ratitae*, and especially the genus *Dromaeus*, in their palatal structure, and are composed of the Tinamous (*q.v.*). The *Schizognathae* include a great many of the forms belonging to the Linnaean Orders *Gallinae*, *Grallae* and *Anseres*. In them the vomer, however variable, always tapers to a point anteriorly, while behind it includes the basisphenoidal rostrum between the palatals; but neither these nor the pterygoids are borne by its posterior divergent ends. The maxillo-palatals are usually elongated and lamellar, uniting with the palatals, and, bending backward along their inner edge, leave a cleft (whence the name given to the "Suborder") between the vomer and themselves. In the *Desmognathae*, the vomer is either abortive or so small as to disappear from the skeleton. When it exists it is always slender, and tapers to a point anteriorly. The maxillo-palatals are bound together (whence the name of the "Suborder") across the middle line, either directly or by the ossification of the nasal septum. The posterior ends of the palatals and anterior of the pterygoids articulate directly with the rostrum. The *Aegithognathae*, the fourth and last of the "Suborders," is characterized by a form of palate in some respects intermediate between the two preceding. The vomer is broad, abruptly truncated in front, and deeply cleft behind, so as to embrace the rostrum of the sphenoid; the palatals have produced postero-external angles; the maxillo-palatals are slender at their origin, and extend obliquely inwards and forwards over the palatals, ending beneath the vomer in expanded extremities, not united either with one another or with the vomer, nor does the latter unite with the nasal septum, though that is frequently ossified.

The above abstract shows the general drift of this very remarkable contribution to ornithology, and it has to be added that for by far the greater number of his minor groups Huxley relied solely on the form of the palatal structure, the importance of which Dr Cornay had before urged, though to so little purpose. That the palatal structure must be taken into consideration by taxonomers as affording hints of some utility there can no longer be a doubt; but perhaps the characters drawn thence owed more of their worth to the extraordinary perspicuity with which they were presented by Huxley than to their own intrinsic value, and if the same power had been employed to elucidate in the same way other parts of the skeleton—say the bones of the sternal apparatus or even of the pelvic girdle—either set might have been made to appear quite as instructive and perhaps more so. Adventitious value would therefore seem to have been acquired by the bones of the palate through the fact that so great a master of the art of exposition selected them as fitting examples upon which to exercise his skill.[2] At the same time it must be stated this selection was not premeditated by Huxley, but forced itself upon him as his investigations proceeded.[3] In reply to some critical remarks (*Ibis*, 1868, pp. 85–96), chiefly aimed at showing the inexpediency of relying solely on one set of characters, especially when those afforded by the palatal bones were not, even within the limits of families, wholly diagnostic, the author (*Ibis*, 1868, pp. 357–362) announced a slight modification of his original scheme, by introducing three more groups into it, and concluded by indicating how its bearings upon the great question of "genetic classification" might be represented so far as the different groups of *Carinatae* are concerned:—



Huxley regarded the above scheme as nearly representing the affinities of the various Carinate groups—the great difficulty being to determine the relations to the rest of the *Coccygomorphae*, *Psittacomorphae* and *Aegithognathae*, which he indicated "only in the most doubtful and hypothetic fashion." Almost simultaneously with this he expounded more particularly before the Zoological Society, in whose *Proceedings* (1868, pp. 294–319) his results were soon after published, the groups of which he believed the *Alectoromorphae* to be composed and the relations to them of some outlying forms usually regarded as Gallinaceous, the *Turnicidae* and *Pteroclidae*, as well as the singular hoactzin, for all three of which he had to institute new groups—the last forming the sole representative of his *Heteromorphae*. More than this, he entered upon their geographical distribution, the facts of which important subject are here, almost for the first time, since the attempt of Blyth already mentioned,[4] brought to bear practically on classification.

A. Milne-Edwards.

Here we must mention the intimate connexion between classification and geographical distribution as revealed by the palaeontological researches of Alphonse Milne-Edwards, whose magnificent *Oiseaux Fossiles de la France* began to appear in 1867, and was completed in 1871—the more so, since the exigencies of his undertaking compelled him to use materials that had been almost wholly neglected by other investigators. A large proportion of the fossil remains, the determination and description of which was his object, were what are very commonly called the "long bones," that is to say, those of the limbs. The recognition of these, minute and fragmentary as many were, and the referring them to their proper place, rendered necessary an attentive study of the comparative osteology and myology of birds in general, that of the "long bones," whose sole characters were often a few muscular ridges or depressions, being especially obligatory. Hence it became manifest that a very respectable classification can be found in which characters drawn from these bones play a rather important part. Limited by circumstances as is that followed by Milne-Edwards, the details of his arrangement do not require setting forth here. It is enough to point out that we have in his work another proof of the multiplicity of the factors which must be taken into consideration by the systematist, and another proof of the fallacy of trusting to one set of characters alone. But this is not the only way in which the author has rendered service to the advanced student of ornithology. The unlooked-for discovery in France of remains which he has referred to, forms now existing it is true, but existing only in countries far removed from Europe, forms such as *Collocalia*, *Leptosomus*, *Psittacus*, *Serpentarius* and *Trogon*, is perhaps even more suggestive than the finding that France was once inhabited by forms that are wholly extinct, of which in the older formations there is abundance. Unfortunately none of these, however, can be compared for singularity with *Archaeopteryx* or with some American fossil forms next to be noticed, for their particular bearing on our knowledge of ornithology will be most conveniently treated here.

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[1] These names are compounded respectively of *Dromaeus*, the generic name applied to the emeu, σχίζα, a split or cleft, δέσμα, a bond or tying, αἴγιθος, a finch, and, in each case, γνάθος, a jaw.

[2] The notion of the superiority of the palatal bones to all others for purposes of classification has pleased many persons, from the fact that these bones are not unfrequently retained in the dried skins of birds sent home by collectors in foreign countries, and are therefore available for study, while such bones as the sternum and pelvis are rarely preserved. The common practice of ordinary collectors, until at least very recently, has been tersely described as being to "shoot a bird, take off its skin, and throw away its characters."

[3] Perhaps this may be partially explained by the fact that the Museum of the College of Surgeons, in which these investigations were chiefly carried on, like most other museums of the time, contained a much larger series of the heads of birds than of their entire skeletons, or of any other portion of the skeleton. Consequently the materials available for the comparison of different forms consisted in great part of heads only.

[4] It is true that from the time of Buffon, though he scorned any regular classification, geographical distribution had been occasionally held to have something to do with systematic arrangement; but the way in which the two were related was never clearly put forth, though people who could read between the lines might have guessed the secret from Darwin's *Journal of Researches*, as well as from his introduction to the *Zoology of the "Beagle" Voyage*.

Marsh.

In November 1870 O. C. Marsh, by finding the imperfect fossilized tibia of a bird in the middle cretaceous shale of Kansas, began a series of wonderful discoveries of great importance to ornithology. Subsequent visits to the same part of North America, often performed under circumstances of discomfort and occasionally of danger, brought to this intrepid and energetic explorer the reward he had so fully earned. Brief notices of his spoils appeared from time to time in various volumes of the *American Journal of Science and Arts* (Silliman's), but it is unnecessary here to refer to more than a few of them. In that *Journal* for May 1872 (ser. 3, iii. p. 360) the remains of a large swimming bird (nearly 6 ft. in length, as afterwards appeared) having some affinity, it was thought, to the *Colymbidae* were described under the name of *Hesperornis regalis*, and a few months later (iv. p. 344) a second fossil bird from the same locality was indicated as *Ichthyornis dispar*—from the fish-like, biconcave form of its vertebrae. Further examination of the enormous collections gathered by the author, and preserved in the Museum of Yale University at New Haven, Connecticut, showed him that this last bird, and another to which he gave the name of *Apatornis*, had possessed well-developed teeth implanted in sockets in both jaws, and induced him to establish (v. pp. 161, 162) for their reception a "subclass" *Odontornithes* and an order *Ichthyornithes*. Two years more and the originally found *Hesperornis* was discovered also to have teeth, but these were inserted in a groove. It was accordingly regarded as the type of a distinct order *Odontolcae* (x. pp. 403–408), to which were assigned as other characters vertebrae of a saddle-shape and not biconcave, a keelless sternum, and wings consisting only of the humerus. In 1880 Marsh brought out *Odontornithes*, a monograph of the extinct toothed birds of North America. Herein remains, attributed to no fewer than a score of species, which were referred to eight different genera, are fully described and sufficiently illustrated, and, instead of the ordinal name *Ichthyornithes* previously used, that of *Odontotormae* was proposed. In the author's concluding summary he remarks on the fact that, while the *Odontolcae*, as exhibited in *Hesperornis*, had teeth inserted in a continuous groove—a low and generalized character as shown by reptiles, they had, however, the strongly differentiated saddle-shaped vertebrae such as all modern birds possess. On the other hand the *Odontotormae*, as exemplified in *Ichthyornis*, having the primitive biconcave vertebrae, yet possessed the highly specialized feature of teeth in distinct sockets. *Hesperornis* too, with its keelless sternum, had aborted wings but strong legs and feet adapted for swimming, while *Ichthyornis* had a keeled sternum and powerful wings, but diminutive legs and feet. These and other characters separate the two forms so widely as quite to justify the establishment of as many orders for their reception. Marsh states that he had fully satisfied himself that *Archaeopteryx* belonged to the *Odontornithes*, which he thought it advisable for the present to regard as a subclass, separated into three orders—*Odontolcae*, *Odontotormae* and *Saururae*—all well marked, but evidently not of equal rank, the last being clearly much more widely distinguished from the first two than they are from one another. But that these three oldest-known forms of birds should differ so greatly from each other unmistakably points to a great antiquity for the class.

Sundevall.

The former efforts at classification made by Sundevall have already several times been mentioned, and a return to their consideration was promised. In 1872 and 1873 he brought out at Stockholm a *Methodi naturalis avium disponendarum tentamen*, two portions of which (those relating to the diurnal birds-of-prey and the *Cichlomorphae*, or forms related to the thrushes) he found himself under the necessity of revising and modifying in the course of 1874, in as many communications to the Swedish Academy of Sciences (*K. V.-Ak. Förhandlingar*, 1874, No. 2, pp. 21–30; No. 3, pp. 27–30). This *Tentamen*, containing his complete method of classifying birds in general, naturally received much attention, the more so perhaps, since, with its appendices, it was nearly the last labour of its respected author, whose industrious life came to an end in the course of the following year. From what has before been said of his works it may be gathered that, while professedly basing his systematic arrangement of the groups of birds on their external features, he had hitherto striven to make his schemes harmonize if possible with the dictates of internal structure as evinced by the science of anatomy, though he uniformly and persistently protested against the inside being better than the outside. In thus acting he proved himself a true follower of his great countryman Linnaeus; but, without disparagement of his efforts in this respect, it must be said that when internal and external characters appeared to be in conflict he gave, perhaps with unconscious bias, a preference to the latter, for he belonged to a school of zoologists whose natural instinct was to believe that such a conflict always existed. Hence his efforts, praiseworthy as they were from several points of view, and particularly so in regard to some details, failed to satisfy the philosophic taxonomer when generalizations and deeper principles were concerned, and in his practice in respect of certain technicalities of classification he was, in the eyes of the orthodox, a transgressor. Thus instead of contenting himself with terms that had met with pretty general approval, such as class, subclass, order, suborder, family, subfamily, and so on, he introduced into his final scheme other designations, "agmen," "cohors," "phalanx," and the like, which to the ordinary student of ornithology convey an indefinite meaning, if any meaning at all. He also carried to a very extreme limit his views of nomenclature, which were certainly not in accordance with those held by most zoologists, though this is a matter so trifling as to need no details in illustration. His *Tentamen* was translated into English by F. Nicholson in 1889, and had a considerable influence on later writers, especially in the arrangement of the smaller groups. In the main it was an artificial system. Birds were divided into *Gymnopaedes* and *Dasypaedes*, according as the young were hatched naked or clothed. The *Gymnopaedes* are divided into two "orders"—*Oscines* and *Volucres*—the former intended to be identical with the group of the same name established by older authors, and, in accordance with the observations of Keyserling and Blasius already mentioned, divided into two "series"—*Laminiplantares*, having the hinder part of the "tarsus" covered with two horny plates, and *Scutelliplantares*, in which the same part is scutellated. These *Laminiplantares* are composed of six cohorts as follows:—

Cohors 1. *Cichlomorphae.*
Cohors 2. *Conirostres.*
Cohors 3. *Coliomorphae.*
Cohors 4. *Certhiomorphae.*—3 families: tree-creepers, nut-hatches.
Cohors 5. *Cinnyrimorphae.*—5 families: sun-birds, honey-suckers.
Cohors 6. *Chelidonomorphae.*—1 family: swallows.

The *Scutelliplantares* include a much smaller number of forms, and, with the exception of the first "cohort" and a few groups of the fourth and fifth, all are peculiar to America.

Cohors 1. *Holaspideae.*
Cohors 2. *Endaspideae.*
Cohors 3. *Exaspideae.*
Cohors 4. *Pycnaspideae.*
Cohors 5. *Taxaspideae.*

We then arrive at the second order *Volucres*, which is divided into two "series." Of these the first is made to contain, under the name *Zygodactyli*,

Cohors 1. *Psittaci.*
Cohors 2. *Pici.*
Cohors 3. *Coccyges.*
Cohors 4. *Coenomorphae.*
Cohors 5. *Ampligulares.*
Cohors 6. *Longilingues* or *Mellisugae.*
Cohors 7. *Syndactylae.*
Cohors 8. *Peristeroideae.*

The *Dasypaedes* of Sundevall are separated into six "orders"; but these will occupy us but a short while. The first of them, *Accipitres*, comprehending all the birds-of-prey, were separated into 4 "cohorts" in his original work, but these were reduced in his appendix to two—*Nyctharpages* or owls with 4 families divided into 2 series, and *Hemeroharpages* containing all the rest, and comprising 10 families (the last of which is the seriema, *Dicholophus*) divided into 2 groups as *Rapaces* and *Saprophagi*—the latter including the vultures. Next stands the order *Gallinae* with 4 "cohorts":

(1) *Tetraonomorphae*, comprising 2 families, the sand-grouse (*Pterocles*) and the grouse proper, among which the Central American *Oreophasis* finds itself; (2) *Phasianomorphae*, with 4 families, pheasants peacocks, turkeys, guinea fowls, partridges, quails, and hemipodes (*Turnix*); (3) *Macronyches*, the megapodes, with 2 families; (4) the *Duodecimpennatae*, the curassows and guans, also with 2 families; (5) the *Struthioniformes*, composed of the tinamous; and (6) the *Subgrallatores* with 2 families, one consisting of the curious South American genera *Thinocorus* and *Attagis* and the other of the sheathbill (*Chionis*). The fifth order (the third of the *Dasypaedes*) is formed by the *Grallatores*, divided into 2 "series"—(1) *Altinares*, consisting of 2 "cohorts," *Herodii* with 1 family, the herons, and *Pelargi* with 4 families, spoonbills, ibises, storks, and the umbre (*Scopus*), with *Balaeniceps*; (2) *Humilinares*, also consisting of 2 "cohorts," *Limicolae* with 2 families, sandpipers and snipes, stilts and avocets, and *Cursores* with 8 families, including plovers, bustards, cranes, rails, and all the other "waders." The sixth order, *Natatores*, consists of all the birds that habitually swim and a few that do not, containing 6 "cohorts": *Longipennes* and *Pygopodes* with 3 families each; *Totipalmatae* with 1 family; *Tubinares* with 3 families; *Impennes* with 1 family, penguins; and *Lamellirostres* with 2 families, flamingoes and ducks. The seventh order, *Proceres*, is divided into 2 "cohorts"—*Veri* with 2 families, ostriches and emeus; and *Subnobiles*, consisting of the genus *Apteryx*. The eighth order is formed by the *Saururae*.

Later Systems.

Later systems of classification owe much to anatomy, and the pioneers in the modern advances in this respect were A. H. Garrod and W. A. Forbes, two brilliant and short-lived young men who occupied successively the post of prosector to the Zoological Society of London, and who made a rich use of the material provided by the collection of that society. Garrod was the more skilled and ingenious anatomist, Forbes had a greater acquaintance with the ornithology of museums and collectors. Garrod founded his system (1874) on muscular anatomy, making the two major divisions of Aves (his *Homalogonatae* and *Anomalogonatae*, depend in the first instance on the presence or absence of a peculiar muscular slip in the leg, known as the *ambiens*, although indeed he expressly stated that this was not on account of the intrinsic importance of the muscle in question, but because of its invariable association with other peculiarities. The system of Forbes was reconstructed after his death from notebook jottings, and neither Garrod nor Forbes have left any permanent mark on the classification of birds, although the material they furnished and the lines they indicated have proved valuable in later hands. In 1880 Dr P. L. Sclater published in the *Ibis* a classification which was mainly a revision of the system of Huxley, modified by the investigations of Garrod and Forbes and by his own large acquaintance with museum specimens.

In the article "Ornithology" in the ninth edition of this encyclopaedia, A. Newton accepted the three subclasses of Huxley, *Saururae*, *Ratitae* and *Carinitae*, and made a series of cautious but critical observations on the minor divisions of the Carinates. In 1882 A. Reichenow in *Die Vögel der zoologischen Gärten* published a classification of birds with a phylogenetic tree. In this he departed considerably from the lines that had been made familiar by English workers, and made great use of natural characteristics. The next attempt of importance appeared in the American *Standard Natural History*, published in Boston in 1885. The volume on birds was written by Dr L. Stejneger and was founded on Elliot Coues's *Key to North American Birds*. Apart from its intrinsic merits as a learned and valuable addition to classification, this work is interesting in the history of ornithology because of the wholesale changes of nomenclature it introduced as the result of much diligence and zeal in the application of the strict rule of priority to the names of birds.

In 1888 there was published the huge monograph by Max Fürbringer entitled *Untersuchungen zur Morphologie und Systematik der Vögel*. In addition to an enormous body of new information chiefly on the shoulder girdle, the alar muscles and the nerve plexuses of birds, this work contained a critical and descriptive summary of practically the whole pre-existing literature on the structure of birds, and it is hardly necessary for the student of ornithology to refer to earlier literature at first hand. Fürbringer supposes that birds must have begun with toothed forms of small or moderate size, with long tails and four lizard-like feet and bodies clothed with a primitive kind of down. To these succeeded forms where the down had developed into body feathers for warmth, not flight, whilst the fore-limbs had become organs of prehension, the hind-limbs of progression. In such bipedal creatures the legs and pelvis became transformed to a condition similar to that of Dinosaurian reptiles. Many of them were climbing animals, and from these true birds with the power of flight were developed. In the course of this evolution there were many cases of arrest or degradation; and one of the most novel of the ideas of Fürbringer, and one now accepted by not a few anatomists, was that the ratites or ostrich-like birds were not a natural group but a set of stages of arrested development or of partial degradation. It is impossible to reproduce here Fürbringer's elaborate details and phylogenetic trees with their various horizontal sections, but the following tables give the main outlines:—

Classis AVES

I. Subclassis SAURURAE

Order.	Suborder.	Gens.	Family.
ARCHORNITHES	Archaeopterygiformes	Archaeopteryges	Archaeopterygidae.

II. Subclassis ORNITHURAE

Order.	Suborder.	Gens.	Family.
STRUTHIORNITHES	Struthioniformes	Struthiones	Struthionidae.
RHEORNITHES	Rheiformes	Rheae	Rheidae.
HIPPALECTRYORNITHES	Casuariiformes	Casuarii	(Dromaeidae+Casuariidae+Dromornithidae).
	Intermediate suborder:— Aepyornithiformes.	Aepyornithes	Aepyornithidae.
	Intermediate suborder:— Palamedeiformes	Palamedae	Palamedeidae.
PELARGORNITHES.	Anseriformes	Gastornithes	Gastornithidae.
		Anseres or Lamellirostres	Anatidae.
	Podicipitiformes	Enaliornithes	Enaliornithidae.
		Hesperornithes	Hesperornithidae.
		Colymbo-Podicipites	Colymbidae.
			Podicipidae.
	Ciconiiformes	Phoenicopteri	Palaeolodidae.
			Phoenicopteridae.
		Pelargo-Herodii	Plataleidae or Hemiglottides.
			Ciconiidae or Pelargi.
			Scopidae.
			Ardeidae or Herodii.
			Balaenicipitidae.
		Accipitres (*Hemeroharpages*, *Pelargoharpages*)	Gypogeranidae.
			Cathartidae.
			Gypo-Falconidae.
		Steganopodes	Phaetontidae.
			Phalacrocoracidae.
			Pelecanidae.
			Fregatidae.

Order.	Suborder.	Gens.	Family.
	Intermediate suborder:— Procellariiformes	Procellariae or Tubinares	Procellariidae.
	Intermediate suborder:— Aptenodytiformes	Aptenodytes or Impennes	Aptenodytidae.
Charadriornithes (Aegialornithes)	Intermediate suborder:— Ichthyornithiformes	Ichthyornithes	Ichthyornithidae.
			Apatornithidae.
	Charadriiformes	Charadrii	Charadriidae.
			Glareolidae.
			Dromadidae.
		Laro-Limicolae	Chionididae.
			Laridae.
			Alcidae.
			Thinocoridae.
		Parrae	Paridae.
		Otides	Oedicnemidae.
			Otididae
	Intermediate suborder:— Gruiformes	Eurypygae	Eurypygidae.
			Rhinochetidae.
			Aptornithidae.
		Grues	Gruidae.
			Psophiidae.
			Cariamidae.
	Intermediate suborder:— Ralliformes	Fulicariae	Heliornithidae.
			Rallidae.
		Hemipodii	Mesitidae.
			Hemipodiidae.
Alectorornithes (Chameornithes)	Apterygiformes	Apteryges	Apterygidae.
			Dinornithidae.
	Crypturiformes	Crypturi	Crypturidae.
	Galliformes	Gallidae	Megapodiidae.
		Opisthocomidae	Cracidae.
			Gallidae or Alectoropodes.
	Intermediate suborder:— Columbiformes	Pterocletes	Pteroclidae.
		Columbae	Dididae.
			Columbidae.
	Intermediate suborder:— Psittaciformes	Psittaci	Psittacidae.
Coracornithes (Dendrornithes)	Coccygiformes	Coccyges	Musophagidae.
			Cuculidae.
		Intermediate gens:— Galbulae	Bucconidae.
			Galbulidae.
	Pico-Passeriformes	Pici	Capitonidae.
			Rhamphastidae.
		Pico-Passeres	Indicatoridae.
			Picidae.
		Passeres	Pseudoscines.
			Passeridae or Passeres.
		Makrochires	Cypselidae.
			Trochilidae.
		Colii	Coliidae.
		Intermediate gens:— Trogones	Trogonidae.
	Halcyoniformes	Halcyones	Halcyonidae.
			Alcedinidae.
		Bucerotes	Upupidae.
			Bucerotidae.
		Meropes	Meropidae.
		Intermediate gens:— Todi	Momotidae.
			Todidae.
	Coraciiformes	Coraciae	Coraciidae.
			Leptosomidae.
		Caprimulgi	Caprimulgidae.
			Steatornithidae.
			Podargidae.
		Striges	Strigidae.

Whilst Fürbringer was engaged on his gigantic task, Dr Hans Gadow was preparing the ornithological volume of Bronn's *Thier-Reich*. The two authors were in constant communication, and the classifications they adopted had much in common. It is unnecessary here to discuss the views of Gadow, as that author himself has contributed the article Bird to this edition of the *Encyclopaedia Britannica*, and has there set forth his revised scheme. (A. N.; P. C. M.)

ORODES (also called Hyrōdes, Pers. *Hurauda*), the name of two Parthian kings.

1. Orodes I., son of Phraates III., whom he murdered in 57 B.C., assisted by his brother Mithradates III. This Mithradates was made king of Media, but soon afterwards was expelled by Orodes and fled into Syria. Thence he invaded the Parthian kingdom, but having reigned for a short time (55) was besieged by Surenas, general of Orodes, in Seleucia, and after a prolonged resistance was captured and slain. Meanwhile Crassus had begun his attempt to conquer the east, but he was defeated and killed in 53 at Carrhae by Surenas, while Orodes himself invaded Armenia and forced King Artavasdes, the son of Tigranes, to abandon the Romans. By the victory of Carrhae the countries east of the Euphrates were secured to the Parthians. In the next year they invaded Syria, but with little success, for Surenas, whose achievements had made him too dangerous, was killed by Orodes (Plut. *Crass.* 33), and Pacorus, the young son of the king, was defeated by C. Cassius in 51. During the civil war the Parthians sided first with Pompey and then with Brutus and Cassius, but took no action until 40 B.C., when Pacorus, assisted by the Roman deserter Labienus, conquered a great part of Syria and Asia Minor, but was defeated and killed by Ventidius in 38 (see Pacorus). The old king, Orodes, who was deeply afflicted by the death of his gallant son, appointed

his son Phraates IV. successor, but was soon afterwards killed by him (37 B.C.; Dio. Cass. 49. 23; Justin 42. 4; Plut. *Crassus*, 33). Plutarch relates that Orodes understood Greek very well; after the death of Crassus the *Bacchae* of Euripides were represented at his court (Plut. *Crass.* 33).

2. ORODES II., raised to the throne by the magnates after the death of Phraates V. about A.D. 5, was killed after a short reign "on account of his extreme cruelty" (Joseph. *Ant.* xviii. 2, 4). (ED. M.)

OROGRAPHY (Gr. ὄρος, mountain, γράφειν, to write), that part of physical geography which deals with the geological formation, the surface features and description of mountains. The terms "oreography," "orology" and "oreology" are also sometimes used.

ORONTES, the ancient name of the chief Syrian river, also called DRACO, TYPHON and AXIUS, the last a native form, from whose revival, or continuous employment in native speech, has proceeded the modern name *ʽĀsī* ("rebel"), which is variously interpreted by Arabs as referring to the stream's impetuosity, to its unproductive channel, or to the fact that it flows away from Mecca. The Orontes rises in the great springs of Labweh on the east side of the Bukaʽa, or inter-Lebanon district, very near the fountains of the southward-flowing Litani, and it runs due north, parallel with the coast, falling 2000 ft. through a rocky gorge. Leaving this it expands into the Lake of Homs, having been dammed back in antiquity. The valley now widens out into the rich district of Hamah (*Hamath-Epiphaneia*), below which lie the broad meadow-lands of Ghāb, containing the sites of ancient Apamea and Larissa. This central Orontes valley ends at the rocky barrier of Jisr al-Hadid, where the river is diverted to the west, and the plain of Antioch opens. Two large tributaries from the N., the Afrīn and Kara Su, here reach it through the former Lake of Antioch, which is now drained through an artificial channel (Nahr al-Kowsit). Passing N. of the modern Antakia (Antioch) the Orontes plunges S.W. into a gorge (compared by the ancients to Tempe), and falls 150 ft. in 10 m. to the sea just south of the little port of Suedia (anc. *Seleucia Pieriae*), after a total course of 170 m. Mainly unnavigable and of little use for irrigation, the Orontes derives its historical importance solely from the convenience of its valley for traffic from N. to S. Roads from N. and N.E., converging at Antioch, follow the course of the stream up to Homs, where they fork to Damascus and to Coele-Syria and the S.; and along its valley have passed the armies and traffic bound to and from Egypt in all ages. (See ANTIOCH and HOMS.) (D. G. H.)

OROPUS, a Greek seaport, on the Euripus, in the district Πειραϊκή, opposite Eretria. It was a border city between Boeotia and Attica, and its possession was a continual cause of dispute between the two countries; but at last it came into the final possession of Athens, and is always alluded to under the Roman empire as an Attic town. The actual harbour, which was called Delphinium, was at the mouth of the Asopus, about a mile north of the city. A village still called Oropo occupies the site of the ancient town. The famous oracle of Amphiaraus was situated in the territory of Oropus, 12 stadia from the city. The site has been excavated by the Greek Archaeological Society; it contained a temple, a sacred spring, into which coins were thrown by worshippers, altars and porticoes, and a small theatre, of which the proscenium is well preserved. Worshippers used to consult the oracle of Amphiaraus by sleeping on the skin of a slaughtered ram within the sacred building.

OROSIUS, PAULUS (fl. 415), historian and theologian, was born in Spain (possibly at Braga in Galicia) towards the close of the 4th century. Having entered the Christian priesthood, he naturally took an interest in the Priscillianist controversy then going on in his native country, and it may have been in connexion with this that he went to consult Augustine at Hippo in 413 or 414. After staying for some time in Africa as the disciple of Augustine, he was sent by him in 415 to Palestine with a letter of introduction to Jerome, then at Bethlehem. The ostensible purpose of his mission (apart, of course, from those of pilgrimage and perhaps relic-hunting) was that he might gain further instruction from Jerome on the points raised by the Priscillianists and Origenists; but in reality, it would seem, his business was to stir up and assist Jerome and others against Pelagius, who, since the synod of Carthage in 411, had been living in Palestine, and finding some acceptance there. The result of his arrival was that John, bishop of Jerusalem, was induced to summon at his capital in June 415 a synod at which Orosius communicated the decisions of Carthage and read such of Augustine's writings against Pelagius as had at that time appeared. Success, however, was scarcely to be hoped for amongst Orientals who did not understand Latin, and whose sense of reverence was unshocked by the question of Pelagius, *et quis est mihi Augustinus?* All that Orosius succeeded in obtaining was John's consent to send letters and deputies to Innocent of Rome; and, after having waited long enough to learn the unfavourable decision of the synod of Diospolis or Lydda in December of the same year, he returned to north Africa, where he is believed to have died. According to Gennadius he carried with him recently discovered relics of the protomartyr Stephen from Palestine to Minorca, where they were efficacious in converting the Jews.

The earliest work of Orosius, *Consultatio sive commonitorium ad Augustinum de errore Priscillianistarum et Origenistarum*, explains its object by its title; it was written soon after his arrival in Africa, and is usually printed in the works of Augustine along with the reply of the latter, *Contra Priscillianistas et Origenistas liber ad Orosium*. His next treatise, *Liber apologeticus de arbitrii libertate*, was written during his stay in Palestine, and in connexion with the controversy which engaged him there. It is a keen but not always fair criticism of the Pelagian position from that of Augustine. The *Historiae adversum Paganos* was undertaken at the suggestion of Augustine, to whom it is dedicated. When Augustine proposed this task he had already planned and made some progress with his own *De civitate Dei*; it is the same argument that is elaborated by his disciple, namely, the evidence from history that the circumstances of the world had not really become worse since the introduction of Christianity. The work, which is thus a pragmatical chronicle of the calamities that have happened to mankind from the fall down to the Gothic period, has little accuracy or learning, and even less of literary charm to commend it; but it was the first attempt to write the history of the world as a history of God guiding humanity. Its purpose gave it value in the eyes of the orthodox, and the *Hormesta*, *Ormesta*, or *Ormista* as it was called, no one knows why (from Or[osii] M[undi] Hist[oria] or from *de miseria mundi*? see Mörner, p. 180, for list of guesses), speedily attained a wide popularity. Nearly two hundred MSS. of it have survived. A free abridged translation by King Alfred is still extant (Old English text, with original in Latin, edited by H. Sweet, 1883). The *editio princeps* of the original appeared at Augsburg (1471); that of Haverkamp (Leiden, 1738 and 1767) has now been superseded by C. Zangemeister, who has edited the *Hist.* and also the *Lib. apol.* in vol. v. of the *Corp. scr. eccl. Lat.* (Vienna, 1882), as well as an edit. min. (Leipzig, Teubner, 1889). The "sources" made use of by Orosius have been investigated by T. de Mörner (*De Orosii vita ejusque hist. libr. vii. adversus Paganos*, 1844); besides the Old and New Testaments, he appears to have consulted Caesar, Livy, Justin, Tacitus, Suetonius, Florus and a cosmography, attaching also great value to Jerome's translation of the *Chronicles* of Eusebius.

ORPHAN, the term used of one who has lost both parents by death, sometimes of one who has lost father or mother only. In Law, an orphan is such a person who is under age. The Late Lat. *orphanus*, from which the word, chiefly owing to its use in the Vulgate, was adopted into English, is a transliteration of ὀρφανός, in the same sense, the original meaning being "bereft of," "destitute," classical Lat. *orbus*. The Old English word for an orphan was *steópcild*, stepchild. By the custom of the city of London, the lord mayor and aldermen, in the Court of Orphans, have the guardianship of the children still under age of deceased freemen. Orphans' courts exist for the guardianship of orphans and administration of their estates in Delaware, Maryland, New Jersey and Pennsylvania in the United States. In other states these are performed by officers of the Probate Court, known as "surrogates," or by other titles.

ORPHEUS, in Greek legend, the chief representative of the art of song and playing on the lyre, and of great importance in the religious history of Greece. The derivation of the name is uncertain, the most probable being that which connects it with ὀρφ-(" dark," ὀρφναῖος, ὄρφνη). In accordance with this, Orpheus may have been originally a god of darkness; or the liberator from the power of darkness by his gift of song; or he may have been so called because his rites were celebrated by night (cf. Dionysus Nyctelius). It is possible, but very improbable, that Orpheus was an historical personage; even in ancient times his existence was denied. According to Maass, he was a chthonian deity, the counterpart of Dionysus, with whom he is closely connected; J. E. Harrison, however, regards him as a religious reformer from Crete, who introduced the doctrine of *ecstasis* without intoxication amongst the Thracians and was slain by the votaries of the frenzied ritual. S. Reinach sees in him the fox roaming " in the darkness," to the Thracians a personification of the wine-god, torn in pieces by the Bassarae (fox-maidens). Although by some he was held to be a Greek, the tradition of his Thracian origin was most generally accepted. His name does not occur in Homer or Hesiod, but he was known in the time of Ibycus (*c.* 530 B.C.), and Pindar (522–442 B.C.) speaks of him as " the father of songs." From the 6th century onwards he was looked upon as one of the chief poets and musicians of antiquity, the inventor or perfecter of the lyre, who by his music and singing was able not only to charm the wild beasts, but even to draw the trees and rocks from their places, and to arrest the rivers in their course. As one of the pioneers of civilization, he was supposed to have taught mankind the arts of medicine, writing and agriculture. As closely connected with religious life, he was an augur and seer; practised magical arts, especially astrology; founded or rendered accessible many important cults, such as those of Apollo and Dionysus; instituted mystic rites, both public and private; prescribed initiatory and purificatory ritual. He was said to have visited Egypt, and to have become acquainted there with the writings of Moses and with the doctrine of a future life.

According to the best-known tradition, Orpheus was the son of Oeagrus, king of Thrace, and the muse Calliope. During his residence in Thrace he joined the expedition of the Argonauts, whose leader Jason had been informed by Chiron that only by the aid of Orpheus would they be able to pass by the Sirens unscathed. His numerous services during the journey are described in the *Argonautica* that goes under his name. But the most famous story in which he figures is that of his wife Eurydice. While fleeing from Aristaeus, she was bitten by a serpent and died. Orpheus went down to the lower world and by his music softened the heart of Pluto and Persephone, who allowed Eurydice to return with him to earth. But the condition was attached that he should walk in front of her and not look back until he had reached the upper world. In his anxiety he broke his promise, and Eurydice vanished again from his sight. The story in this form belongs to the time of Virgil, who first introduces the name of Aristaeus. Other ancient writers, however, speak of his visit to the underworld; according to Plato, the infernal gods only " presented an apparition" of Eurydice to him.

After the death of Eurydice, Orpheus rejected the advances of the Thracian women, who, jealous of his faithfulness to the memory of his lost wife, tore him to pieces during the frenzy of the Bacchic orgies. His head and lyre floated " down the swift Hebrus to the Lesbian shore," where the inhabitants buried his head and a shrine was built in his honour near Antissa. The lyre was carried to heaven by the Muses, and was placed amongst the stars. The Muses also gathered up the fragments of his body and buried them at Leibethra below Olympus, where the nightingales sang over his grave, while yet another legend places his tomb at Dium, near Pydna in Macedonia. Other accounts of his death are: that he killed himself from grief at the failure of his journey to Hades; that he was struck with lightning by Zeus for having revealed the mysteries of the gods to men; or he was torn to pieces by the Maenads for having abandoned the cult of Dionysus for that of Apollo.

According to Gruppe, the legend of the death of Orpheus is a late imitation of the Adonis-Osiris myth. Osiris, like Orpheus, is torn in pieces, and his head floats down every year from Egypt to Byblus; the body of Attis, the Phrygian counterpart of Adonis, like that of Orpheus, does not suffer decay. The story is repeated of Dionysus; he is torn in pieces, and his head is carried down to Lesbos. Without going so far as to assert that Orpheus is a hypostasis of Dionysus, there is no doubt that a close connexion existed between them from very early times. According to Frazer, these traditions may be " distorted reminiscences " of the practice of human sacrifice, especially of divine kings, the object of which was to ensure fertility in the animal and vegetable worlds. Orpheus, in the manner of his death, was considered to personate the god Dionysus, and was thus the representative of the god torn to pieces every year, a ceremony enacted by the Bacchae in the earliest times with a human victim, afterwards with a bull to represent the bull-formed god. A distinct feature of this ritual was ὠμοφαγία (eating the flesh of the victim raw), whereby the communicants imagined that they consumed and assimilated the god represented by the victim, and thus became filled with the divine ecstasy. A. W. Bather (*Journ. Hell. Studies*, xiv. p. 254) sees in the myth an allusion to a ritual, the object of which is the expulsion of death or winter. It is possible that the floating of the head of Orpheus to Lesbos has reference to the fact that the island was the first home of lyric poetry, and may be symbolical of the route taken by the Aeolian emigrants from Thessaly on their way to their new home in Asia Minor.

The name of Orpheus is equally important in the religious history of Greece. He was the mythic founder of a religious school or sect, with a code of rules of life, a mystic eclectic theology, a system of purificatory and expiatory rites, and peculiar mysteries. This school is first observable under the rule of Peisistratus at Athens in the 6th century B.C. Its doctrines are founded on two elements: the Thraco-Phrygian religion of Dionysus with its enthusiastic orgies, its mysteries and its purifications, and the tendency to philosophic speculation on the nature and mutual relations of the numerous gods, developed at this time by intercourse with Egypt and the East, and by the quickened intercourse between different tribes and different religions in Greece itself. These causes produced similar results in different parts of Greece. The close analogy between Pythagoreanism and Orphism has been recognized from Herodotus (ii. 81) to the latest modern writers. Both inculcated a peculiar kind of ascetic life; both had a mystical speculative theory of religion, with purificatory rites, abstinence from beans, &c.; but Orphism was more especially religious, while Pythagoreanism, at least originally, inclined more to be a political and philosophical creed.

The rules of the Orphic life prescribed abstinence from beans, flesh, certain kinds of fish, &c., the wearing of a special kind of clothes, and numerous other practices and abstinences. The ritual of worship was peculiar, not admitting bloody sacrifices. The belief was taught in the homogeneity of all living things, in the doctrine of original sin, in the transmigration of souls, in the view that the soul is entombed in the body (σῶμα σῆμα), and that it may gradually attain perfection during connexion with a series of bodies. When completely purified, it will be freed from this " circle of generation " (κύκλος γενέσεως), and will again become divine, as it was before its entrance into a mortal body.

The chief ceremonies of the nightly ritual were sacrifice and libation; prayer and purification; the representation of sacred legends (*e.g.* the myth of Zagreus, the chief object of worship, who was identified with most of the numerous gods of the Orphic pantheon); the rape of Persephone; and the descent into Hades. These were introduced as a " sacred explanation" (ἱερὸς λόγος) of the rules and prescriptions. To these also belong the rite of ὠμοφαγία, and the communication of liturgical formulae for the guidance of the soul of the dead man on his way to the underworld, which also served as credentials to the gods below. Some of the so-called " Orphic tablets," metrical inscriptions engraved on small plates of gold, chiefly dating from the 4th and 3rd centuries B.C., have been discovered in tombs in southern Italy, Crete and Rome.

It does not appear, however, that a regularly organized or numerous Orphic sect ever existed, nor that Orphism ever became popular; it was too abstract, too full of symbolism. On the other hand, the genuine Orphics, a fraternity of religious ascetics, found unscrupulous imitators and impostors, who preyed upon the credulous and ignorant. Such were the Orpheotelestae or Metragyrtae, wandering priests who went round the country with an ass carrying the sacred properties (Aristophanes, *Frogs*, 159) and a bundle of sacred books. They promised an easy expiation for crimes to both living and dead on payment of a fee, undertook to punish the enemies of their clients, and held out to them the prospect of perpetual banqueting and drinking-bouts in Paradise.

A large number of writings in the tone of the Orphic religion were ascribed to Orpheus. They dealt with such subjects as the origin of the gods, the creation of the world, the ritual of purification and initiation, and oracular responses. These poems were recited at rhapsodic contests together with those of Homer and Hesiod, and Orphic hymns were used in the Eleusinian mysteries.[1] The best-known name in connexion with them is that of Onomacritus (*q.v.*), who, in the time of the Peisistratidae, made a collection (including forgeries of his own) of Orphic songs and legends. In later times Orphic theology engaged the attention of Greek philosophers—Eudemus the Peripatetic, Chrysippus the Stoic, and Proclus the Neoplatonist, but it was an especially favourite study of the grammarians of Alexandria, where it became so intermixed with Egyptian elements that Orpheus came to be looked upon as the founder of mysticism. The "rhapsodic theogony" in particular exercised great influence on Neoplatonism. The Orphic literature (of which only fragments remain) was united in a corpus, called τὰ Ὀρφικὰ, the chief poem in which was ἡ τοῦ Ὀρφέως Θεολογία. It also included a collection of Orphic hymns, liturgic songs, practical treatises, and poems on various subjects. The so-called *Orphic Poems*, still extant, are of much later date, probably belonging to the 4th century A.D.; they consist of: (1) an *Argonautica*, glorifying the deeds of Orpheus on the "Argo," (2) a didactic poem on the magic powers of stones, called *Lithica*, (3) eighty-seven hymns on various divinities and personified forces of nature. Some of these hymns are probably earlier (1st and 2nd centuries). The Orphic poems also played an important part in the controversies between Christian and pagan writers in the 3rd and 4th centuries after Christ; pagan writers quoted them to show the real meaning of the multitude of gods, while Christians retorted by reference to the obscene and disgraceful fictions by which the former degraded their gods.

BIBLIOGRAPHY.—C. A. Lobeck's *Aglaophamus* (1829) is still indispensable. Of more modern writings on Orpheus and Orphism the following may be consulted. The articles by O. Gruppe in Roscher's *Lexikon der Mythologie* and by P. Monceaux in Daremberg and Saglio's *Dictionnaire des antiquités*; "Orphica" in Smith's *Dictionary of Greek and Roman Antiquities* (3rd ed., 1891), by L. C. Purser; J. E. Harrison, *Prolegomena to the Study of Greek Religion* (2nd ed., 1908, with a critical appendix by Gilbert Murray on the Orphic tablets); E. Rohde, *Psyche*, ii. (1907), and article in *Heidelberger Jahrbücher* (1896); E. W. Maass, *Orpheus* (1895); S. Reinach, "La mort d'Orphée" in *Cultes, mythes, et religions*, ii. (1906); O. Gruppe, *Griechische Mythologie*, ii. (1906), pp. 1028–1041; T. Gomperz, *Greek Thinkers*, i. (Eng. trans., 1901), pp. 84-90, 123-147; E. Gerhard, *Über Orpheus und die Orphiker* (1861); A. Dieterich, *Nekyia* (1893), pp. 72-108, 136-162, 225-232; O. Kern, *De Orphei, Epimenidis, Pherecydis theogoniis* (1888); O. Gruppe, *Die rhapsodische Theogonie* (1890); A. Dieterich, *De hymnis Orphicis* (1891); G. F. Schömann, *Griechische Alterthümer*, ii. (ed. J. H. Lipsius, 1902), p. 378; P. Stengel, *Die griechischen Kultusaltertümer* (1898), p. 150.

There is an edition of the Orphic Fragments and of the poems by E. Abel (1885). The *Argonautica* has been edited separately by J. W. Schneider (1803), the *Lithica* by T. Tyrwhitt (1791), and there is an English translation of the *Hymns* by T. Taylor (reprinted, 1896).

On the representations of Orpheus in heathen and Christian art (in which he is finally transformed into the Good Shepherd with his sheep), see A. Baumeister, *Denkmäler des classischen Altertums*, ii. p. 1120; P. Knapp, *Über Orpheusdarstellungen* (Tübingen, 1895); F. X. Kraus, *Realencyklopädie des christlichen Alterthums*, ii. (1886); J. A. Martigny, *Dictionnaire des antiquités chrétiennes* (1889); A. Heussner, *Die altchristlichen Orpheusdarstellungen* (Leipzig, 1893); and the articles in Roscher's and Daremberg and Saglio's Lexicons.

The story of Orpheus, as was to be expected of a legend told both by Ovid and Boetius, retained its popularity throughout the middle ages and was transformed into the likeness of a northern fairy tale. In English medieval literature it appears in three somewhat different versions: *Sir Orpheo*, a "lay of Brittany" printed from the Harleian MS. in J. Ritson's *Ancient English Metrical Romances*, vol. ii. (1802); *Orpheo and Heurodis* from the Auchinleck MS. in David Laing's *Select Remains of the Ancient Popular Poetry of Scotland* (new ed., 1885); and *Kyng Orfew* from the Ashmolean MS. in J.O. Halliwell's *Illustrations of Fairy Mythology* (Shakespeare Soc., 1842). The poems show traces of French influence.

(J. H. F.; X.)

ORPHREY, gold or other richly ornamented embroidery, particularly an embroidered border on an ecclesiastical vestment (see VESTMENTS). The word is from O. Fr. *orfreis*, mod. *orfroi*, from med. Lat. *aurifrisium*, *aurifrigium*, &c., for *auriphrygium*, *aurum*, gold, and *phrygium*, Phrygian; a name given to gold-embroidered tissues, also known as *vestes Phrygiae*, the Phrygians being famous for their skill in embroidering in gold.

ORPIMENT (*auripigmentum*), arsenic trisulphide, As_2S_3, or yellow realgar (*q.v.*), occurring in small quantities as a mineral crystallizing in the rhombic system and of a brilliant golden-yellow colour in Bohemia, Peru, &c. For industrial purposes an artificial orpiment is manufactured by subliming one part of sulphur with two of arsenic trioxide. The sublimate varies in colour from yellow to red, according to the intimacy of the combination of the ingredients; and by varying the relative quantities used many intermediate tones may be obtained. These artificial preparations are highly poisonous. Formerly, under the name of "king's yellow," a preparation of orpiment was in considerable use as a pigment, but now it has been largely superseded by chrome-yellow. It was also at one time used in dyeing and calico-printing, and for the unhairing of skins, &c.; but safer and equally efficient substitutes have been found.

ORPINGTON, a town in the Dartford parliamentary division of Kent, England, $13\frac{3}{4}$ m. S.E. of London, and $2\frac{1}{2}$ m. S. by E. of Chislehurst, on the South-Eastern & Chatham railway. Pop. (1901), 4259. The church (Early English) contains some carved woodwork and ancient brasses. An old mansion called the Priory dates in part from 1393. The oak-panelled hall and the principal rooms are of the 15th century. In 1873 John Ruskin set up at Orpington a private publishing house for his works, in the hands of his friend George Allen. Fruit and hops are extensively grown in the neighbourhood. From its pleasant situation in a hilly, wooded district near the headwaters of the Cray stream, Orpington has become in modern times a favourite residential locality for those whose business lies in London. A line of populous villages extends down the valley between Orpington and Bexley—St Mary Cray (pop. 1894), St Paul's Cray (1207), Foots Cray (an urban district, 5817), and North Cray.

ORRERY,[2] CHARLES BOYLE, 4TH EARL OF (1676–1731), the second son of Roger, 2nd earl, was born at Chelsea in 1676. He was educated at Christ Church, Oxford, and soon distinguished himself by his learning and abilities. Like the first earl, he was an author, soldier and statesman. He translated Plutarch's life of Lysander, and published an edition of the epistles of Phalaris, which engaged him in the famous controversy with Bentley. He was three times member for the town of Huntingdon; and on the death of his brother, Lionel, 3rd earl, in 1703, he succeeded to the title. He entered the army, and in 1709 was raised to the rank of major-general, and sworn one of her Majesty's privy council. At the battle of the Wood he acted with distinguished bravery. He was appointed queen's envoy to the states of Brabant and Flanders; and having discharged this trust with ability, he was created an English peer, as Baron Boyle of Marston, in Somersetshire. He received several additional honours in the reign of George I.; but having had the misfortune to fall under the suspicion of the government he was committed to the Tower, where he remained six months, and was then admitted to bail. On a subsequent inquiry it was found impossible to criminate him, and he was discharged. He died on the 28th of August 1731. Among the works of Roger, earl of Orrery, will be found a comedy, entitled *As you find it*, written by Charles Boyle. His son John (see CORK, EARLS OF), the 5th earl of Orrery, succeeded to the earldom of Cork on the failure of the elder branch of the Boyle family, as earl of Cork and Orrery.

ORRERY, ROGER BOYLE, 1ST EARL OF (1621–1679), British soldier, statesman and dramatist, 3rd surviving son of Richard Boyle, 1st earl of Cork, was born on the 25th of April 1621, created baron of Broghill on the 28th of February 1627, and educated at Trinity College, Dublin, and, according to Wood, also at Oxford. He travelled in France and Italy, and coming home took part in the expedition against the Scots. He returned to Ireland on the outbreak of the rebellion in 1641 and fought with his brothers at the battle of Liscarrol in September 1642. On the resignation of the marquis of Ormonde, Lord Broghill consented to serve under the parliamentary commissioners till the execution of the king, when he retired altogether from public affairs and took up his residence at Marston in Somersetshire. Subsequently he originated a scheme to bring about the Restoration, but when on his way abroad to concert measures with Charles he was unexpectedly visited by Cromwell in London, who, after informing him that his plans were well known to the council, and warning him of the consequence of persisting in them, offered him a command in Ireland against the rebels, which, as it entailed no obligations except faithful service, was accepted. His assistance in Ireland proved invaluable. Appointed master of the ordnance, he soon assembled a body of infantry and horse, and drove the rebels into Kilkenny, where they surrendered. On the 10th of May 1650 he completely defeated at Macroom a force of Irish advancing to the relief of Clonmell, and joining Cromwell assisted in taking the latter place. On Cromwell's departure for Scotland he co-operated with Ireton, whom he joined at the siege of Limerick, and defeated the force marching to its relief under Lord Muskerry, thus effecting the capture of the town. By this time Broghill had become the fast friend and follower of Cromwell, whose stern measures in Ireland and support of the English and Protestants were welcomed after the policy of concession to the Irish initiated by Charles I. He was returned to Cromwell's parliaments of 1654 and 1656 as member for the county of Cork, and also in the latter assembly for Edinburgh, for which he elected to sit. He served this year as lord president of the council in Scotland, where he won much popularity; and when he returned to England he was included in the inner cabinet of Cromwell's council, and was nominated in 1657 a member of the new house of Lords. He was one of those most in favour of Cromwell's assumption of the royal title, and proposed a union between the Protector's daughter Frances and Charles II. On Cromwell's death he gave his support to Richard; but as he saw no possibility of maintaining the government he left for Ireland, where by resuming his command in Munster he secured the island for Charles and anticipated Monk's overtures by inviting him to land at Cork. He sat for Arundel in the Convention and in the parliament of 1661, and at the Restoration was taken into great favour. On the 5th of September 1660 he was created earl of Orrery. The same year he was appointed a lord justice of Ireland and drew up the Act of Settlement. He continued to exercise his office as lord-president of Munster till 1668, when he resigned it on account of disputes with the duke of Ormonde, the lord-lieutenant. On the 25th of November he was impeached by the House of Commons for "raising of money by his own authority upon his majesty's subjects," but the prorogation of parliament by the king interrupted the proceedings, which were not afterwards renewed. He died on the 26th of October 1679. He married Lady Margaret Howard, 3rd daughter of Theophilus, 2nd earl of Suffolk, whose charms were celebrated by Suckling in his poem "The Bride." By her he had besides five daughters, two sons, of whom the eldest, Roger (1646–1681 or 1682), succeeded as 2nd earl of Orrery.

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[1] For Orphism in relation to the Eleusinian and other mysteries see MYSTERY.

[2] The orrery, an astronomical instrument—consisting of an apparatus which illustrates the motions of the solar system by means of the revolution of balls moved by wheelwork—invented, or at least constructed, by Graham, was named after the earl.

In addition to Lord Orrery's achievements as a statesman and administrator, he gained some reputation as a writer and a dramatist. He was the author of *An Answer to a Scandalous Letter . . . A Full Discovery of the Treachery of the Irish Rebels* (1662), printed with the letter itself in his *State Letters* (1742), another answer to the same letter entitled *Irish Colours Displayed . . .* being also ascribed to him; *Parthenissa*, a novel (1654); *English Adventures by a Person of Honour* (1676), whence Otway drew his tragedy of the *Orphan*; *Treatise of the Art of War* (1677), a work of considerable historical value; poems, of little interest, including verses *On His Majesty's Happy Restoration* (unprinted), *On the Death of Abraham Cowley* (1677), *The Dream* (unprinted), *Poems on most of the Festivals of the Church* (1681); plays in verse, of some literary but no dramatic merit, of which *Henry V.* (1664), *Mustapha* (1665), *Tryphon* (acted 1668), *The Black Prince* (1669), *Herod the Great* (published 1694), and *Altemira* (1702) were tragedies, and *Guzman* (1669) and *Mr Anthony* comedies. A collected edition was published in 1737, to which was added the comedy *As you find it.* *The General* is also attributed to him.

AUTHORITIES.—*State Letters of Roger Boyle, 1st Earl of Orrery*, ed. with his life by Th. Morrice (1742); *Add. MSS.* (Brit. Mus.) 25,287 (letter-book when governor of Munster), and 32,095 sqq. 109-188 (letters); article in the *Dict. of Nat. Biog.* and authorities there collected; Wood's *Athenae Oxonienses*, iii. 1200; *Biographia Britannica* (Kippis); *Orrery Papers*, ed. by Lady Cork and Orrery (1903) (Preface); *Contemporary Hist. of Affairs in Ireland*, ed. by John T. Gilbert (1879–1880); *Cal. of State Pap., Irish and Domestic.*

ORRIS-ROOT (apparently a corruption of "iris root"), the rhizomes or underground stems of three species of *Iris*, *I. germanica*, *I. florentina* and *I. pallida*, closely allied plants growing in subtropical and temperate latitudes, but principally identified with North Italy. The three plants are indiscriminately cultivated in the neighbourhood of Florence as an agricultural product under the name of "ghiaggiuolo." The rhizomes are in August dug up and freed of the rootlets and brown outer bark; they are then dried and packed in casks for sale. In drying they acquire a delicate but distinct odour of violets. As it comes into the market, orris-root is in the form of contorted sticks and irregular knobby pieces up to 4 in. in length, of a compact chalky appearance. It is principally powdered for use in dentifrices and other scented dry preparations.

ORSEOLO, the name of a Venetian family, three members of which filled the office of doge.

PIETRO ORSEOLO I. (*c.* 928–997) acted as ambassador to the emperor Otto I. before he was elected doge in August 976. Just previous to this event part of Venice had been burned down and Pietro began the rebuilding of St Mark's church and the ducal palace. He is chiefly celebrated, however, for his piety and his generosity, and after holding office for two years he left Venice secretly and retired to a monastery in Aquitaine, where he passed his remaining days. He was canonized in 1731.

PIETRO ORSEOLO II. (d. 1009), a son of the previous doge, was himself elected to this office in 991. He was a great builder, but his chief work was to crush the pirates of the Adriatic Sea and to bring a long stretch of the Dalmatian coast under the rule of Venice, thus relieving the commerce of the republic from a great and pressing danger. The fleet which achieved this result was led by the doge in person; it sailed on Ascension Day, the 9th of May 1000, and its progress was attended with uninterrupted success. In honour of this victory the Venetians instituted the ceremony which afterwards grew into the *sposalizio del mar*, or marriage of the sea, and which was celebrated each year on Ascension Day, while the doge added to his title that of duke of Dalmatia. In many other ways Pietro's services to the state were considerable, and he may be said to be one of the chief founders of the commercial greatness of Venice. The doge was on very friendly terms with the emperor Otto III. and also with the emperors at Constantinople, and in 1003 he sailed against the Saracens and compelled them to raise the siege of Bari. In 1003 his son Giovanni was associated with him in the dogeship, and on Giovanni's death in 1007 another son, Ottone, succeeded to this position.

OTTONE ORSEOLO (d. 1032), whose godfather was the emperor Otto III., became sole doge on his father's death in 1009. He married a sister of St Stephen, king of Hungary, and under his rule Venice was powerful and prosperous. One of his brothers, Orso, was patriarch of Grado, another, Vitalis, was bishop of Torcello, but the growing wealth and influence of the Orseolo family soon filled the Venetians with alarm. About 1024 Ottone and Orso were driven from Venice, but when Orso's rival, Poppo, patriarch of Aquileia, seized Grado, the exiled doge and his brother was recalled and Grado was recovered. In 1026 Ottone was banished; he found a refuge in Constantinople, where he remained until his death, although in 1030 an embassy invited him to return to Venice, where his brother Orso acted as agent for fourteen months. Orso remained patriarch of Grado until his death in 1045, and another member of the Orseolo family, Domenico, was doge for a single day in 1031. After the fall of the Orseoli the Venetians decreed that no doge should name his successor, or associate any one with him in the dogeship. Ottone's son, Pietro, was king of Hungary for some time after the death of his uncle, St Stephen, in 1038.

See Kohlschütter, *Venedig unter dem Herzog Peter II. Orseolo* (Göttingen, 1868); H. F. Brown, *Venice* (1895); F. C. Hodgson, *The Early History of Venice* (1901); and W. C. Hazlitt, *The Venetian Republic* (1900).

ORSHA (Polish *Orsza*), a town of Russia, in the government of Mogilev, 74 m. by rail W.S.W. of Smolensk on the Moscow-Warsaw railway, and on the Dnieper. Pop. (1897), 13,161. It is an important entrepôt for grain, seeds and timber. It is a very old town, mentioned in the annals under the name of Rsha in 1067. In the 13th century it was taken by the Lithuanians, who fortified it. In 1604 the Poles founded there a Jesuit college. The Russians besieged Orsha more than once in the 16th and 17th centuries, and finally annexed it in 1772.

ORSINI, the name of a Roman princely family of great antiquity, whose perpetual feuds with the Colonna are one of the dominant features of the history of medieval Rome. According to tradition the popes Paul I. (757) and Eugenius II. (824) were of the Orsini family, but the probable founder of the house was a certain Ursus (the Bear), about whom very little is known, and the first authentic Orsini pope was Giacinto Orsini, son of Petrus Bobo, who assumed the name of Celestin III. (1191). The latter endowed his nephews with church lands and founded the fortunes of the family, which alone of the Guelf houses was able to confront the Ghibelline Colonna. "Orsini for the Church" was their war-cry in opposition to "Colonna for the people." In the 13th century the "Sons of the Bear" were already powerful and rich, and under Innocent III. they waged incessant war against other families, including that of the pope himself (Conti). In 1241 Matteo Orsini was elected senator of Rome, and sided with Pope Gregory IX. against the Colonna and the Emperor Frederick II., saving Rome for the Guelfic cause. In 1266 the family acquired Marino, and in 1277 Giovanni Orsini was elected pope as Nicholas III. When Boniface VIII. proclaimed a crusade against the Colonna in 1297, the Orsini played a conspicuous part in the expedition and captured Nepi, which the pope granted them as a fief. On the death of Benedict XI. (1304) fierce civil warfare broke out in Rome and the Campagna for the election of his successor, and Cardinal Napoleone Orsini appears as the leader of the French faction at the conclave. The Campagna was laid waste by the feuds of the Orsinis, the Colonnas and the Caetanis. At this time the Orsini held the castle of S. Angelo, and a number of palaces on the Monte Giordano, which formed a fortified and walled quarter. In 1332, during the absence of the popes at Avignon, the feuds between Orsini and Colonna, in which even Giovanni Orsini, although cardinal legate, took part, reduced Rome to a state of complete anarchy. We find the Orsini again at war with the Colonna at the time of Rienzi. In 1435 Francesco Orsini was appointed prefect of Rome, and created duke of Gravina by Pope Eugenius IV. In 1484 war between the Orsini and the Colonna broke out once more, the former supporting the pope (Sixtus IV.). Virginio Orsini led his faction against the rival house's strongholds, which were stormed, the Colonna being thereby completely defeated. The Orsini fortunes waxed and waned many times, and their property was often confiscated, but they always remained a powerful family and gave many soldiers, statesmen and prelates to the church. The title of prince of Solofra was conferred on them in 1620, and that of prince of the Holy Roman Empire in 1629. In 1724 Vincenzo Maria Orsini was elected pope (Benedict XIII.) and gave his family the title of Roman princes.

Authorities.—F. Sansovino, *Storia di casa Orsina* (Venice, 1565); F. Gregorovius, *Geschichte der Stadt Rom* (Stuttgart, 1872); A. von Reumont, *Geschichte der Stadt Rom* (Berlin, 1868); *Almanach de Gotha*.

ORSINI, FELICE (1819–1858), Italian revolutionist, was born at Meldola in Romagna. He was destined for an ecclesiastical career, but he soon abandoned that prospect, and became an ardent liberal, joining the Giovane Italia, a society founded by Giuseppe Mazzini. Implicated together with his father in revolutionary plots, he was arrested in 1844 and condemned to imprisonment for life. The new pope, Pius IX., however, set him free, and he led a company of young Romagnols in the first war of Italian independence (1848), distinguishing himself in the engagements at Treviso and Vicenza. He was elected member of the Roman Constituent Assembly in 1849, and after the fall of the republic he conspired against the papal autocracy once more in the interest of the Mazzinian party. Mazzini sent him on a secret mission to Hungary, but he was arrested in 1854 and imprisoned at Mantua, escaping a few months later. In 1857 he published an account of his prison experiences in English under the title of *Austrian Dungeons in Italy*, which led to a rupture between him and Mazzini. He then entered into negotiations with Ausonio Franchi, editor of the *Ragione* of Turin, which he proposed to make the organ of the pure republicans. But having become convinced that Napoleon III. was the chief obstacle to Italian independence and the principal cause of the anti-liberal reaction throughout Europe, he went to Paris in 1857 to conspire against him. On the evening of the 14th of January 1858, while the emperor and empress were on their way to the theatre, Orsini and his accomplices threw three bombs at the imperial carriage. The intended victims were unhurt, but several other persons were killed or wounded. Orsini himself was wounded, and at once arrested; on the 11th of February he wrote his famous letter to Napoleon, in which he exhorted him to take up the cause of Italian freedom. He addressed another letter to the youth of Italy, stigmatizing political assassination. He was condemned to death and executed on the 13th of March 1858, meeting his fate with great calmness and bravery. Of his accomplices Pieri also was executed, Rudio was condemned to death but obtained a commutation of sentence, and Gomez was condemned to hard labour for life. The importance of Orsini's attempt lies in the fact that it terrified Napoleon, who came to believe that unless he took up the Italian cause other attempts would follow and that sooner or later he would be assassinated. This fear contributed not a little to the emperor's subsequent Italian policy.

Bibliography.—*Memoirs and Adventures of Felice Orsini written by himself* (Edinburgh, 1857, 2nd ed., edited by Ausonio Franchi, Turin, 1858); *Lettere edite e inedite di F. O.* (Milan, 1861); Enrico Montazio, *I contemporanei Italiani-Felice Orsini* (Turin, 1862); *La vérité sur Orsini, par un ancien proscrit* (1879); Angelo Arboit, *Tofin e la fuga di Felice Orsini* (Cagliari, 1893).

ORTA, LAKE OF, in N. Italy, W. of Lago Maggiore. It has been so named since the 16th century, but was previously called the *Lago di San Giulio*, the patron of the region—*Cusio* is a merely poetical name. Its southern end is about 22 m. by rail N.W. of Novara on the main Turin-Milan line, while its north end is about 4 m. by rail S. of the Gravellona-Toce railway station, half-way between Ornavasso and Omegna. It has an area of about $6\frac{1}{4}$ sq. m., it is about 8 m. in length, its greatest depth is 482 ft., and the surface is 951 ft. above sea-level, while its width varies from $\frac{1}{2}$ to $1\frac{1}{4}$ m. Its scenery is characteristically Italian, while the large island of San Giulio (just W. of the village of Orta) has some very picturesque buildings, and takes its name from the local saint, who lived in the 4th century. The chief place is Orta, built on a peninsula projecting from the east shore of the lake, while Omegna is at its northern extremity. It is supposed that the lake is the remnant of a much larger sheet of water by which originally the waters of the Toce or Tosa flowed south towards Novara. As the glaciers retreated the waters flowing from them sank, and were gradually diverted into Lago Maggiore. This explains why no considerable stream feeds the Lake of Orta, while at its north end the Nigoglia torrent flows out of it, but in about $\frac{1}{2}$ m. it falls into the Strona, which in turn soon joins the Toce or Tosa, a short distance before this river flows into Lago Maggiore. (W. A. B. C.)

ORTELIUS (Ortels, Wortels), **ABRAHAM,** next to Mercator the greatest geographer of his age, was born at Antwerp on the 14th of April 1527, and died in the same city on the 4th of July 1598. He was of German origin, his family coming from Augsburg. He travelled extensively in western Europe, especially in the Netherlands; south and west Germany (*e.g.* 1560, 1575, 1578); France (1559–1560, &c.); England and Ireland

(1577), and Italy (1578, and perhaps twice or thrice between 1550 and 1558). Beginning as a map-engraver (in 1547 he enters the Antwerp gild of St Luke as *afsetter van Karten*), his early career is that of a business man, and most of his journeys before 1560 are for commercial purposes (such as his yearly visits to the Frankfort fair). In 1560, however, when travelling with Gerhard Kremer (Mercator) to Trier, Lorraine and Poitiers, he seems to have been attracted, largely by Mercator's influence, towards the career of a scientific geographer; in particular he now devoted himself, at his friend's suggestion, to the compilation of that atlas or *Theatre of the World* by which he became famous. In 1564 he completed a *mappemonde*, which afterwards appeared in the *Theatrum*. He also published a map of Egypt in 1565 a plan of Britenburg Castle on the coast of Holland, and perhaps a map of Asia, before the appearance of his great work. In 1570 (May 20) was issued, by Gilles Coppens de Diest at Antwerp, Ortelius' *Theatrum Orbis Terrarum*, the "first modern atlas" (of 53 maps). Three Latin editions of this (besides a Flemish, a French and a German) appeared before the end of 1572; twenty-five editions came out before Ortelius' death in 1598; and several others were published subsequently, for the vogue continued till about 1612. Most of the maps were admittedly reproductions (a list of 87 authors is given by Ortelius himself), and many discrepancies of delineation or nomenclature occur. Errors, of course, abound, both in general conceptions and in detail; thus South America is very faulty in outline, and in Scotland the Grampians lie between the Forth and the Clyde; but, taken as a whole, this atlas with its accompanying text was a monument of rare erudition and industry. Its immediate precursor and prototype was a collection of thirty-eight maps of European lands, and of Asia, Africa, Tartary and Egypt, gathered together by the wealth and enterprise, and through the agents, of Ortelius' friend and patron, Gilles Hooftman, lord of Cleydael and Aertselaer: most of these were printed in Rome, eight or nine only in Belgium. In 1573 Ortelius published seventeen supplementary maps under the title of *Additamentum Theatri Orbis Terrarum*. By this time he had formed a fine collection of coins, medals and antiques, and this produced (also in 1573, published by Philippe Galle of Antwerp) his *Deorum dearumque capita . . . ex Museo Ortelii* (reprinted in Gronovius, *Thes. Gr. Ant.* vol. vii.). In 1575 he was appointed geographer to the king of Spain, Philip II., on the recommendation of Arius Montanus, who vouched for his orthodoxy (his family, as early as 1535, had fallen under suspicion of Protestantism). In 1578 he laid the basis of a critical treatment of ancient geography by his *Synonymia geographica* (issued by the Plantin press at Antwerp and republished as *Thesaurus geographicus* in 1596). In 1584 he brought out his *Nomenclator Ptolemaicus*, his *Parergon* (a series of maps illustrating ancient history, sacred and secular), and his *Itinerarium per nonnullas Galliae Belgicae partes* (published at the Plantin press, and reprinted in Hegenitius, *Itin. Frisio-Holl.*), a record of a journey in Belgium and the Rhineland made in 1575. Among his last works were an edition of Caesar (*C. I. Caesaris omnia quae extant*, Leiden, Raphelingen, 1593), and the *Aurei saeculi imago, sive Germanorum veterum vita* (Philippe Galle, Antwerp, 1596). He also aided Welser in his edition of the Peutinger Table in 1598. In 1596 he received a presentation from Antwerp city, similar to that afterwards bestowed on Rubens; his death and burial (in St Michael's Abbey church) in 1598 were marked by public mourning.

See Emmanuel van Meteren, *Historia Belgica* (Amsterdam, 1670); General Wauwermans, *Histoire de l'école cartographique belge et anversoise* (Antwerp, 1895), and article "Ortelius" in *Biographie nationale* (Belgian), vol. xvi. (Brussels, 1901); J. H. Hessels, *Abrahami Ortelii epistulae* (Cambridge, England, 1887); Max Rooses, *Ortelius et Plantin* (1880); Génard, "Généalogie d'Ortelius," in the *Bulletin de la Soc. roy. de Géog. d'Anvers* (1880 and 1881). (C. R. B.)

ORTHEZ, a town of south-western France, capital of an arrondissement in the department of Basses-Pyrénées, 25 m. N.W. of Pau on the Southern railway to Bayonne. Pop. (1906) town 4159; commune 6254. It is finely situated on the right bank of the Gave de Pau which is crossed at this point by a bridge of the 14th century, having four arches and surmounted at its centre by a tower. Several old houses, and a church of the 12th, 14th and 15th centuries are of some interest, but the most remarkable building is the Tour de Moncade, a pentagonal tower of the 13th century, once the keep of a castle of the viscounts of Béarn, and now used as a meteorological observatory. A building of the 16th century is all that remains of the old Calvinist university (see below). The hôtel de ville is a modern building containing the library.

Orthez has a tribunal of first instance and is the seat of a sub-prefect. The spinning and weaving of cotton, especially of the fabric called *toile de Béarn*, flour-milling, the manufacture of paper and of leather, and the preparation of hams known as *jambons de Bayonne* and of other delicacies are among its industries. There are quarries of stone and marble in the neighbourhood, and the town has a thriving trade in leather, hams and lime.

At the end of the 12th century Orthez passed from the possession of the viscounts of Dax to that of the viscounts of Béarn, whose chief place of residence it became in the 13th century. Froissart records the splendour of the court of Orthez under Gaston Phoebus in the latter half of the 14th century. Jeanne d'Albret founded a Calvinist university in the town and Theodore Beza taught there for some time. An envoy sent in 1569 by Charles IX. to revive the Catholic faith had to stand a siege in Orthez which was eventually taken by assault by the Protestant captain, Gabriel, count of Montgomery. In 1684 Nicholas Foucault, intendant under Louis XIV., was more successful, as the inhabitants, ostensibly at least, renounced Protestantism, which is nevertheless still strong in the town. In 1814 the duke of Wellington defeated Marshal Soult on the hills to the north of Orthez.

ORTHOCLASE, an important rock-forming mineral belonging to the felspar group (see FELSPAR). It is a potash-felspar, $KAlSi_3O_8$, and crystallizes in the monoclinic system. Large and distinctly developed crystals are frequently found in the drusy cavities of granites and pegmatites. Crystals differ somewhat in habit; for example, they may be prismatic with an orthorhombic aspect (fig. 1), as in the variety adularia (from the Adular Mountains in the St Gotthard region); or tabular (fig. 2), being flattened parallel to the clino-pinacoid or plane of symmetry *b* (010), as in the variety sanidine (σᾰνίς, σᾰνίδος, a board); or again the crystals may be elongated in the direction of the edge between *b* and the basal plane *c* (001), which is a characteristic habit of orthoclase from the granite quarries at Baveno in Italy. Twinning is frequent, and there are three well-defined twin-laws: (1) *Carlsbad twins* (fig. 4). Here the two individuals of the twin interpenetrate or are united parallel to the clino-pinacoid: one individual may be brought into the position of the other by a rotation of 180° about the vertical crystallographic axis or prism-edge. Such twinned crystals are found at Carlsbad in Bohemia and many other places. (2) *Baveno twins* (fig. 5). These twins, in which *n* (021) is the twin-plane, are common at Baveno. (3) *Manebach twins* (fig. 6). The twin-plane here is *c* (001); examples of this rarer twin were first found at Manebach in Thuringia.

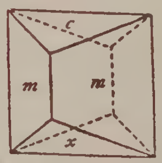

FIG. 1.

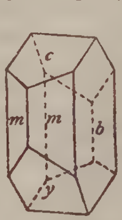

FIG. 2.

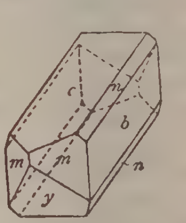

FIG. 3.

An important character of orthoclase is the cleavage. There is a direction of perfect cleavage parallel to the basal plane *c*, on which plane the lustre is consequently often pearly; and one less highly developed parallel to the plane of symmetry *b*.

The angle between these two cleavages is 90°, hence the name orthoclase (from the Gr. ὀρθός, right, and κλᾶν, to break), given by A. Breithaupt in 1823, who was the first to distinguish orthoclase from the other felspars. There are also imperfect cleavages parallel to the faces of the prism *m* (110).

The hardness is 6, and the sp. gr. 2·56. Crystals are sometimes colourless and transparent with a glassy aspect, as in the varieties adularia, sanidine and the rhyacolite of Monte Somma, Vesuvius.

The optical characters are somewhat variable, the plane of the optic axes being perpendicular to the plane of symmetry in some crystals and parallel to it in others: further, when some crystals are heated, the optic axes gradually change from one position to the other. In all cases, however, the acute negative bisectrix of the optic axes lies in the plane of symmetry and is inclined to the edge *b*/*c* at 3-7°, or, in varieties rich in soda, at 10-12°. The mean refractive index is 1·524, and the double refraction is weak (0·006).

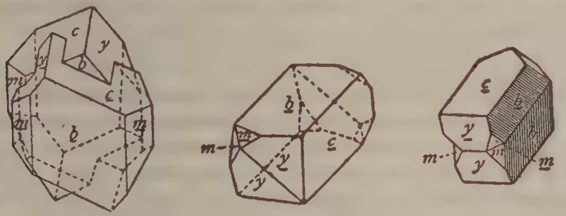

FIG. 4. FIG. 5. FIG. 6.

Twinned Crystals of Orthoclase.

Analyses of orthoclase usually prove the presence of small amounts of soda and lime in addition to potash. These constituents are, however, probably present as plagioclase (albite and oligoclase) intergrown with the orthoclase. The two minerals are interlaminated parallel to the ortho-pinacoid (100) or the pinacoid (80̄1), and they may readily be distinguished in the flesh-red aventurine-felspar, known as perthite, from Perth in Lanark county, Ontario. Frequently, however, as in microperthite and cryptoperthite, this is on a microscopic scale or so minute as to be no longer recognizable. These directions (100) and (80̄1) are planes of parting in orthoclase, and along them alteration frequently takes place, giving rise to *schiller* effects. Moon-stone (*q.v.*) shows a pearly opalescent reflection on these planes; and brilliant coloured reflections in the same directions are exhibited by the labradorescent orthoclase from the augite-syenite of Fredriksvärn and Laurvik in southern Norway, which is much used as an ornamental stone. The same effect is shown to a lesser degree by murchisonite, named in honour of Sir R. I. Murchison, from the Triassic conglomerate of Heavitree near Exeter.

Orthoclase forms an essential constituent of many acidic igneous rocks (granite, syenite, porphyry, trachyte, phonolite, &c.) and of crystalline schists and gneisses. In porphyries and in some granites (*e.g.* those of Shap in Westmorland, Cornwall, &c.) it occurs as embedded crystals with well-defined outlines, but usually it presents no crystalline form. In the trachyte of the Drachenfels and the Laacher See in Rhenish Prussia there are large porphyritic crystals of glassy sanidine. The best crystals are those found in the crystal-lined cavities and veins of granites, pegmatites and gneisses, for example, at Baveno and Elba in Italy, Alabashka near Mursinka in the Urals, Hirschberg in Silesia, Tanokami-yama in the province Ōmi, Japan, and the Mourne Mountains in Ireland. As a mineral of secondary origin orthoclase is sometimes found in cavities in basaltic rocks, and its occurrence in metalliferous mineral-veins has been observed. It has been formed artificially in the laboratory and is sometimes met with in furnace products.

The commonest alteration product of orthoclase is kaolin (*q.v.*); the frequent cloudiness or opacity of crystals is often due to partial alteration to kaolin. Mica and epidote also result by the alteration of orthoclase. (L. J. S.)

Origins of the Greek or Eastern Church.

ORTHODOX EASTERN CHURCH (frequently spoken of as "the Greek Church," and described officially as "The Holy Orthodox[1] Catholic Apostolic Eastern Church"), the historical representative of the churches of the ancient East. It consists of (*a*) those churches which have accepted all the decrees of the first seven general councils, and have remained in full communion with one another, (*b*) such churches as have derived their origin from these by missionary activity, or by abscission without loss of communion. The Eastern Church is both the source and background of the Western. Christianity arose in the East, and Greek was the language of the Scriptures and early services of the church, but when Latin Christianity established itself in Europe and Africa, and when the old Roman empire fell in two, and the eastern half became separate in government, interests and ideas from the western, the term Greek or Eastern Church acquired gradually a fixed meaning. It denoted the church which included the patriarchates of Antioch, Alexandria, Jerusalem and Constantinople, and their dependencies. The ecclesiastical division of the early church, at least within the empire, was based upon the civil. Constantine introduced a new partition of the empire into dioceses, and the church adopted a similar division. The bishop of the chief city in each diocese naturally rose to a pre-eminence, and was commonly called *exarch*—a title borrowed from the civil jurisdiction. In process of time the common title *patriarch* was restricted to the most eminent of these exarchs, and councils decided who were worthy of the dignity. The council of Nicaea recognized three patriarchs—the bishops of Rome, Alexandria and Antioch. To these were afterwards added the bishops of Constantinople and Jerusalem. When the empire was divided, there was one patriarch in the West, the bishop of Rome, while in the East there were at first two, then four and latterly five. This geographical fact has had a great deal to do in determining the character of the Eastern Church. It is not a despotic monarchy governed from one centre and by a monarch in whom plenitude of power resides. It is an oligarchy of patriarchs. It is based, of course, on the great body of bishops; but episcopal rule, through the various grades of metropolitan, primate, exarch, attains to sovereignty only in the five patriarchal thrones. Each patriarch is, within his diocese, what the Gallican theory makes the pope in the universal church. He is supreme, and not amenable to any of his brother patriarchs, but is within the jurisdiction of an oecumenical synod. This makes the Eastern Church quite distinct in government and traditions of polity from the Western. It has ever been the policy of Rome to efface national distinctions, but under the shadow of the Eastern Church national churches have grown and flourished. Revolts against Rome have always implied a repudiation of the ruling principles of the papal system; but the schismatic churches of the East have always reproduced the ecclesiastical polity of the church from which they seceded.

The barbarian invasions in West and East.

The Greek Church, like the Roman, soon spread far beyond the imperial dioceses which at first fixed its boundaries, but it was far less successful than the Roman in preserving its conquests for Christianity. This was due in the main to the differing quality of the forces by which the area covered by the two churches was respectively invaded. The northern barbarians by whom the Western empire was overrun had long stood in awe of the power and the civilization of Rome, which they recognized as superior; the conquerors were thus predisposed to enter into the heritage of the law and the religion of the conquered empire and, whether they were pagans or Arian heretics, became in the end Catholic Christians. In the East it was otherwise. The empire maintained itself long, and died hard; but its decline and fall meant not only the overthrow of the emperors of the East, but largely that of the civilization and Christianity which they represented. The Arabs, and after them the Turks, attacked the empire as the armed missionaries of what they regarded as a superior religion; Christianity survived in the vast territories they conquered only as a despised and tolerated superstition, its ecclesiastical organization only as a convenient mechanism for governing a subject and tributary population. It is true that the Eastern Church made up in some sort for her losses by missionary conquests elsewhere. Greek Christianity became the religion of the Slavs as Latin Christianity became that of the Germans; but the Orthodox Church never conquered her conquerors, and the historian is too apt to enlarge on her past glories and forget her present strength.

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[1] The Orthodox Eastern Church has always laid especial stress upon the unchanging tradition of the faith, and has claimed orthodoxy as its especial characteristic. The "Feast of Orthodoxy" (ἡ κυριακὴ τῆς ὀρθοδοξίας), celebrated annually on the first Sunday of the Greek Lent, was founded in honour of the restoration of the Holy Images to the churches after the downfall of Iconoclasm (February 19, 842); but it has gradually assumed a wider significance as the celebration of victory over all heresies, and is now one of the most characteristic festivals of the Eastern Church.

Early History.—The early history of the Eastern Church is outlined in the article Church History. Here it is proposed only to give in somewhat more detail the causes of division which led (1) to the formation of the schismatic churches of the East, and (2) to the open rupture with Latin Christianity.

Controversies and schisms.

The great dogmatic work of the Eastern Church was the definition of that portion of the creed of Christendom which concerns *theology proper*—the doctrines of the essential nature of the Godhead, and the doctrine of the Godhead in relation with manhood in the incarnation, while it fell to the Western Church to define *anthropology*, or the doctrine of man's nature and needs. The controversies which concern us are all related to the person of Christ, the Theanthropos, for they alone are represented in the schismatic churches of the East. These controversies will be best described by reference to the oecumenical councils of the ancient and undivided church.

All the churches of the East, schismatic as well as orthodox, accept unreservedly the decrees of the first two councils. The schismatic churches protest against the additions made to the creeds of Nicaea and Constantinople by succeeding councils. The Nicaeo-Constantinopolitan creed declared that Christ was *consubstantial* (ὁμοούσιος) with the Father, and that He *had become man* (ἐνανθρωπήσας). Disputes arose when theologians tried to explain the latter phrase. These differences took two separate and extreme types, the one of which forcibly separated the two natures so as to deny anything like a real union, while the other insisted upon a mixture of the two, or an absorption of the human in the divine. The former was the creed of Chaldaea and the latter the creed of Egypt; Chaldaea was the home of Nestorianism, Egypt the land of Monophysitism. The Nestorians accept the decisions of the first two councils, and reject the decrees of all the rest as unwarranted alterations of the creed of Nicaea. The Monophysites accept the first three councils, but reject the decree of Chalcedon and all that come after it.

The council of Ephesus (A.D. 431), the third oecumenical, had insisted upon applying the term Theotokos to the Virgin Mary, and this was repeated in the symbol of Chalcedon, which says that Christ was born of the Virgin Mary, the Theotokos, "according to the manhood." The same symbol also declares that Christ is "to be acknowledged in two natures . . . indivisibly and inseparably." Hence the Nestorians, who insisted upon the duality of the natures to such a degree as to lose sight of the unity of the person, and who rejected the term Theotokos, repudiated the decrees both of Ephesus and of Chalcedon, and upon the promulgation of the decrees of Chalcedon formally separated from the church. Nestorianism had sprung from an exaggeration of the theology of the school of Antioch, and the schism weakened that patriarchate and its dependencies. It took root in Chaldaea, and became very powerful. No small part of the literature and science of the Mahommedan Arabs came from Nestorian teachers, and Nestorian Christianity spread far and wide through Asia (see Nestorius and Nestorians).

The council of Chalcedon (451), the fourth oecumenical, declared that Christ is to be acknowledged "in two natures—unconfusedly, unchangeably," and therefore decided against the opinions of all who either believed that the divinity is the sole nature of Christ, or who, rejecting this, taught only one composite nature of Christ (one nature and one person, instead of two natures and one person). The advocates of the one nature theory were called Monophysites (*q.v.*), and they gave rise to numerous sects, and to at least three separate national churches—the Jacobites of Syria, the Copts of Egypt and the Abyssinian Church, which are treated under separate headings.

The decisions of Chalcedon, which were the occasion of the formation of all these sects outside, did not put an end to Christological controversy inside the Orthodox Greek Church. The most prominent question which emerged in attempting to define further the person of Christ was whether the will belonged to the nature or the person, or, as it came to be stated, whether Christ had two wills or only one. The church in the sixth oecumenical council at Constantinople (680) declared that Christ had two wills. The Monothelites (*q.v.*) refused to submit, and the result was the formation of another schismatic church—the Maronite Church of the Lebanon range. The Maronites, however, were reconciled to Rome in the 12th century, and are reckoned as Roman Catholics of the Oriental Rite.

Conflict with Rome.

Later History.—The relation of the Byzantine Church to the Roman may be described as one of growing estrangement from the 5th to the 11th century, and a series of abortive attempts at reconciliation since the latter date. The estrangement and final rupture may be traced to the increasing claims of the Roman bishops and to Western innovations in practice and in the doctrine of the Holy Spirit, accompanied by an alteration of creed. In the early church three bishops stood forth prominently, principally from the political eminence of the cities in which they ruled—the bishops of Rome, Alexandria and Antioch. The transfer of the seat of empire from Rome to Constantinople gave the bishops of Rome a possible rival in the patriarch of Constantinople, but the absence of an overawing court and of meddling statesmen did more than recoup the loss to the head of the Roman Church. The theological calmness of the West, amid the violent theological disputes which troubled the Eastern patriarchates, and the statesmanlike wisdom of Rome's greater bishops, combined to give a unique position to the pope, which councils in vain strove to shake, and which in time of difficulty the Eastern patriarchs were fain to acknowledge and make use of, however they might protest against it and the conclusions deduced from it. But this pre-eminence, or rather the Roman idea of what was involved in it, was never acknowledged in the East; to press it upon the Eastern patriarchs was to prepare the way for separation, to insist upon it in times of irritation was to cause a schism. The theological genius of the East was different from that of the West. The Eastern theology had its roots in Greek philosophy, while a great deal of Western theology was based on Roman law. The Greek fathers succeeded the Sophists, the Latin theologians succeeded the Roman advocates (Stanley's *Eastern Church*, ch. i.). This gave rise to misunderstandings, and at last led to two widely separate ways of regarding and defining one important doctrine—the procession of the Holy Spirit from the Father or from the Father and the Son. Political jealousies and interests intensified the disputes, and at last, after many premonitory symptoms, the final break came in 1054, when Pope Leo IX. smote Michael Cerularius and the whole of the Eastern Church with an excommunication. There had been mutual excommunications before, but they had not resulted in permanent schisms. Now, however, the separation was final, and the ostensible cause of its finality was the introduction by the Latins of two words *Filioque* into the creed.[1] It is this addition which was and which still remains the permanent cause of separation. Ffoulkes has pointed out in his second volume (ch. 1–3) that there was a resumption of intercourse more than once between Rome and Constantinople after 1054, and that the overbearing character of the Norman crusaders, and finally the horrors of the sack of Constantinople in the fourth crusade

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[1] After the words "and in the Holy Ghost" of the Apostles' Creed the Constantinopolitan creed added "who proceedeth from the Father." The Roman Church, without the sanction of an oecumenical council and without consulting the Easterns, added "and the Son." The addition was first made at Toledo (589) in opposition to Arianism. The Easterns also resented the Roman enforcement of clerical celibacy, the limitation of the right of confirmation to the bishop and the use of unleavened bread in the Eucharist.

The "Filioque" controversy.

(1204), were the real causes of the permanent estrangement. It is undeniable, however, that the *Filioque* question has always come up to bar the way in any subsequent attempts at inter-communion. The theological question involved is a very small one, but it brings out clearly the opposing characteristics of Eastern and Western theology, and so has acquired an importance far beyond its own worth. The question is really one about the relations subsisting between the persons of the Trinity and their hypostatical properties. The Western Church affirms that the Holy Spirit "proceeds from" the Father and from the Son. It believes that the Spirit of the Father must be the Spirit of the Son also. Such a theory seems alone able to satisfy the practical instincts of the West, which did not concern itself with the metaphysical aspect of the Trinity, but with Godhead in its relation to redeemed humanity. The Eastern Church affirms that the Holy Spirit proceeds from the Father only, and takes its stand on John xv. 26. The Eastern theologian thinks that the Western double procession degrades the Deity and destroys the perfection of the Trinity. The double procession, in his eyes, means two active principles (αἰτίαι) in the Deity, and it means also that there is a confusion between the hypostatical properties; a property possessed by the Father and distinctive of the First Person is attributed also to the Second. This is the theological, and there is conjoined with it an historical and moral dispute. The Easterns allege that the addition of the words *Filioque* was made, not only without authority, and therefore unwarrantably, but also for the purpose of forcing a rupture between East and West in the interests of the barbarian empire of the West.

Attempts at reunion.

Attempts at reconciliation were made from time to time afterwards, but were always wrecked on the two points of papal supremacy, when it meant the right to impose Western usages upon the East, and of the addition to the creed. First there was the negotiation between Pope Gregory IX. (1227–1241) and Germanus, patriarch of Constantinople. The Roman conditions were practically recognition of papal jurisdiction, the use of unleavened bread and permission to omit *Filioque* if all books written against the Western doctrine were burnt. The patriarch refused the terms. Then, later in the 13th century, came negotiations under Innocent IV. and Clement IV., in which the popes proposed the same conditions as Gregory IX., with additions. These proposals were rejected by the Easterns, who regarded them as attempts to enforce new creeds on their church.

The negotiations at the council of Lyons (1274) were, strictly speaking, between the pope and the Byzantine emperor, and were more political than ecclesiastical. Michael Palaeologus ruled in Constantinople while Baldwin II., the last of the Latin emperors, was an exile in Europe. Palaeologus wished the pope to acknowledge his title to be emperor of the East, and in return promised submission to the papal supremacy and the union of the two churches on the pope's own terms. This enforced union lasted only during the lifetime of the emperor. The only other attempt at union which requires to be mentioned is that made at the council of Florence. It was really suggested by the political weakness of the Byzantine empire and the dread of the approach of the Turks. John Palaeologus the emperor, Joseph the patriarch of Constantinople, and several Eastern bishops came to Italy and appeared at the council of Florence—the papal council, the rival of the council of Basel. As on former occasions the representatives of the East were at first deceived by false representations; they were betrayed into recognition of papal supremacy, and tricked into signing what could afterwards be represented as a submission to Western doctrine. The natural consequences followed—a repudiation of what had been done; and the Eastern bishops on their way home took care to make emphatic their ritualistic differences from Rome. Soon after came the fall of Constantinople, and with this event an end to the political reasons for the submission of the Orthodox clergy. Rome's schemes for a union which meant an unconditional submission on the part of the Orthodox Church did not cease, however, but they were no longer attempted on a grand scale. Jesuit missionaries after the Reformation stirred up schisms in some parts of the Eastern Church, and in Austria, Poland and elsewhere large numbers of Orthodox Christians submitted, either willingly or under compulsion to the see of Rome (see ROMAN CATHOLIC CHURCH, section *Uniat Oriental Churches*).

Doctrines and Creeds.—The Eastern Church has no creeds in the modern Western use of the word, no *normative* summaries of what must be believed. It has preserved the older idea that a creed is an adoring confession of the church engaged in worship; and, when occasion called for more, the belief of the church was expressed more by way of public testimony than in symbolical books. Still the doctrines of the church can be gathered from these confessions of faith. The Eastern creeds may thus be roughly placed in two classes—the oecumenical creeds of the early undivided church, and later testimonies defining the position of the Orthodox Church of the East with regard to the belief of the Roman Catholic and of Protestant Churches. These testimonies were called forth mainly by the protest of Greek theologians against Jesuitism on the one hand, and against the reforming tendencies of the patriarch Cyril Lucaris on the other. The Orthodox Greek Church adopts the doctrinal decisions of the seven oecumenical councils, together with the canons of the Concilium Quinisextum or second Trullan council (692); and they further hold that all these definitions and canons are simply explanations and enforcements of the Nicaeo-Constantinopolitan creed and the decrees of the first council of Nicaea. The first four councils settled the orthodox faith on the doctrines of the Trinity and of the Incarnation; the fifth supplemented the decisions of the first four. The sixth declared against Monothelitism; the seventh sanctioned the worship (δουλεία, not ἀληθινὴ λατρεία) of images; the council held in the Trullus (a saloon in the palace at Constantinople) supplemented by canons of discipline the doctrinal decrees of the fifth and sixth councils.

The Reformation and the Orthodox Church.

The Reformation of the 16th century was not without effect on the Eastern Church. Some of the Reformers, notably Melanchthon, expected to effect a reunion of Christendom by means of the Easterns, cherishing the same hopes as the modern Old Catholic divines and their English sympathizers. Melanchthon himself sent a Greek translation of the Augsburg Confession to Joasaph, patriarch of Constantinople, and some years afterwards Jacob Andreae and Martin Crusius began a correspondence with Jeremiah, patriarch of Constantinople, in which they asked an official expression of his opinions about Lutheran doctrine. The result was that Jeremiah answered in his *Censura Orientalis Ecclesiae* condemning the distinctive principles of Lutheranism.

The reformatory movement of Cyrillos Lucaris (*q.v.*), patriarch of Constantinople (1621), brought the Greek Church face to face with Reformation theology. Cyril conceived the plan of reforming the Eastern Church by bringing its doctrines into harmony with those of Calvinism, and by sending able young Greek theologians to Switzerland, Holland and England to study Protestant theology. His scheme of reform was opposed chiefly by the intrigues of the Jesuits, who in the end brought about his death. The church anathematized his doctrines, and in its later testimonies repudiated his confession on the one hand and Jesuit ideas on the other. The most important of these testimonies are (1) the Orthodox confession or catechism of Peter Mogilas, confirmed by the Eastern patriarchs and by the synod of Jerusalem (1643), and (2) the decree of the synod of Jerusalem or the confession of Dositheus (1672). Besides these, the catechisms of the Russian Church should be consulted, especially the catechism of Philaret, which since 1839 has been used in all the churches and schools in Russia. Founding on these doctrinal sources the teaching of the Orthodox Eastern Church is [1]:—

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[1] This summary has been taken, with corrections, from G. B. Winer, *Comparative Darstellung des Lehrbegriffs der verschiedenen Kirchenparteien* (Leipzig, 1824, Eng. tr., Edin., 1873). Small capitals denote differences from Roman Catholic, italics differences from Protestant doctrine.

Comparison of Orthodox, Roman and Protestant doctrine.

Christianity is a Divine revelation communicated to mankind through Christ; its saving truths are to be learned from the Bible *and tradition*, the former having been written, *and the latter maintained uncorrupted* through the influence of the Holy Spirit; *the interpretation of the Bible belongs to the Church, which is taught by the Holy Spirit*, but every believer may read the Scriptures.

According to the Christian revelation, God is a Trinity, that is, the Divine Essence exists in Three Persons, perfectly equal in nature and dignity, the Father, the Son and the Holy Ghost; THE HOLY GHOST PROCEEDS FROM THE FATHER ONLY. Besides the Triune God there is no other object of divine worship, *but homage* (ὑπερδουλία) *may be paid to the Virgin Mary, and reverence* (δουλία) *to the saints and to their pictures and relics.*

Man is born with a corrupt bias which was not his at creation; the first man, when created, possessed IMMORTALITY, PERFECT WISDOM, AND A WILL REGULATED BY REASON. Through the first sin Adam and his posterity lost IMMORTALITY, AND HIS WILL RECEIVED A BIAS TOWARDS EVIL. In this natural state man, who even before he actually sins is a sinner before God by original or inherited sin, commits manifold actual transgressions; *but he is not absolutely without power of will towards good, and is not always doing evil.*

Christ, the Son of God, became man in two natures, which internally and inseparably united make One Person, and, according to the eternal purpose of God, has obtained for man reconciliation with God, and eternal life, inasmuch as He by His vicarious death has made satisfaction to God for the world's sins, and this satisfaction was PERFECTLY COMMENSURATE WITH THE SINS OF THE WORLD. Man is made partaker of reconciliation in spiritual regeneration, which he attains to, being led and kept by the Holy Ghost. This divine help is offered *to all men without distinction, and may be rejected.* In order to attain to salvation, man is justified, and when so justified CAN DO NO MORE THAN THE COMMANDS OF GOD. He may fall from a state of grace through mortal sin.

Regeneration is offered by the word of God and in the sacraments, *which under visible signs communicate God's invisible grace to Christians when administered cum intentione.* There are *seven* mysteries or sacraments. Baptism *entirely destroys* original sin. In the Eucharist the true body and blood of Christ are *substantially present, and the elements are changed into the substance of Christ, whose body and blood are corporeally partaken of by communicants.* ALL Christians should receive the bread and the WINE. *The Eucharist is also an expiatory sacrifice.* The new birth when lost may be restored through repentance, which is not merely (1) sincere sorrow, but also (2) *confession of each individual sin to the priest, and* (3) *the discharge of penances imposed by the priest for the removal of the temporal punishment which may have been imposed by God and the Church. Penance accompanied by the judicial absolution of the priest makes a true sacrament.*

The Church of Christ is the fellowship of ALL THOSE WHO ACCEPT AND PROFESS ALL THE ARTICLES OF FAITH TRANSMITTED BY THE APOSTLES AND APPROVED BY GENERAL SYNODS. *Without this visible Church there is no salvation.* It is under the abiding influence of the Holy Ghost, and *therefore cannot err in matters of faith.* Specially appointed persons are necessary in the service of the Church, *and they form a threefold order, distinct jure divino from other Christians, of Bishops, Priests and Deacons.* THE FOUR PATRIARCHS, OF EQUAL DIGNITY, HAVE THE HIGHEST RANK AMONG THE BISHOPS, AND THE BISHOPS *united in a General Council represent the Church and infallibly decide*, under the guidance of the Holy Ghost, all matters of faith and ecclesiastical life. All ministers of Christ must be regularly called and appointed to their office, and are consecrated *by the sacrament of orders. Bishops must be unmarried*, and PRIESTS AND DEACONS MUST NOT CONTRACT A SECOND MARRIAGE. To all priests in common belongs, besides the preaching of the word, the administration of the SIX SACRAMENTS—BAPTISM, CONFIRMATION, PENANCE, EUCHARIST, MATRIMONY, UNCTION OF THE SICK. The *bishops* alone can administer the *sacrament* of orders.

Ecclesiastical ceremonies are part of the divine service; most of them have apostolic origin; and those connected with the sacrament must not be omitted by priests under pain of mortal sin.

Liturgy and Worship.—The ancient liturgies of the Eastern Church were very numerous, and have been frequently classified. J. M. Neale makes three divisions—the liturgy of Jerusalem or of St James, that of Alexandria or of St Mark, and that of Edessa or of St Thaddaeus; and Daniel substantially agrees with him. The same passion for uniformity which suppressed the Gallican and Mozarabic liturgies in the West led to the almost exclusive use of the liturgy of St James in the East. It is used in two forms, a shorter revised by Chrysostom, and a longer called the liturgy of St Basil. This liturgy and the service generally are either in Old Greek or in Old Slavonic, and frequent disputes have arisen in particular districts about the language to be employed. Both sacred languages differ from the language of the people, but it cannot be said that in the Eastern Church worship is conducted in an unknown tongue —"the actual difference," says Neale, "may be about that between Chaucer's English and our own." There are eleven chief service books, and no such compendium as the Roman breviary. Fasting is frequent and severe. Besides Wednesdays and Fridays, there are four fasting seasons, Lent, Pentecost to SS. Peter and Paul, August 1–15 preceding the Feast of the Sleep of the Theotokos, and the six weeks before Christmas. Indulgences are not recognized; an intermediate and purificatory state of the dead is held but not systematized into a doctrine of purgatory. The Virgin receives homage, but the dogma of her Immaculate Conception is not admitted. While ikons of the saints are found in the churches there is no "graven image" apart from the crucifix. There is plenty of singing but no instrumental music. Prayer is offered standing towards the East; at Pentecost, kneeling. The celebration of the Eucharist is an elaborate symbolical representation of the Passion. The consecrated bread is broken into the wine, and both elements are given together in a spoon.

The ritual generally is as magnificent as in the West, but of a more archaic type. (For the liturgical dress see VESTMENTS and subsidiary articles.)

Monastic Life.—Monasticism is, as it has always been, an important feature in the Eastern Church. An Orthodox monastery is perhaps the most perfect extant relic of the 4th century. The simple idea that possesses the monks is that of fleeing the world; they have no distinctions of orders, and though they follow the rule of St Basil object to being called Basilians. A few monasteries (Mt Sinai and some on Lebanon) follow the rule of St Anthony. K. Lake in *Early Days of Monasticism on Mount Athos* (1909) traces the development through three well-defined stages in the 9th and 10th centuries—(*a*) the hermit period, (*b*) the loose organization of hermits in lauras, (*c*) the stricter rule of the monastery, with definite buildings and fixed rules under an *ἡγούμενος* or abbot. The monasteries now have taken over the name lauras. They are under the jurisdiction of the metropolitan; a few of the most important deal direct with the patriarch and are called *Stauropegia.* The convent on Mt Sinai is absolutely independent. Apart from hermits there are (1) *κοινοβιακοί*, monks who possess nothing, live and eat together, and have definite tasks given them by their superiors; (2) *ἰδιορυθμακοί*, monks who live apart from each other, each receiving from the monastery fuel, vegetables, cheese, wine and a little money. They only meet for the Divine Office and on great feasts, and are the real successors of the laura system. The most famous monasteries are those on Mount Athos; in 1902 there were twenty lauras with many dependent houses and 7522 monks there, mainly Russian and Greek. The monks are, for the most part, ignorant and unlettered, though in the dark days of Mahommedan persecution it was in the monasteries that Greek learning and the Greek nationality were largely preserved. Since priests *must* be married and bishops must *not*, only monks are eligible for appointment to bishoprics in the Eastern Church. See further, MONASTICISM.

The Branches of the Church.—In addition to the ancient churches which have separated themselves from the Orthodox faith, many have ceased to have an independent existence, owing either to the conquests of Islam or to their absorption by other churches. For example, the church of Mount Sinai may be regarded as all that survives of the ancient church of northern Arabia; the autocephalous Slavonic churches of Ipek and Okhrida, which derived their ultimate origin from the missions of Cyril and Methodius, were absorbed in the patriarchate of Constantinople in 1766 and 1767 respectively; and the Church of Georgia has been part of the Russian Church since 1801–1802. At the present day, then, the Orthodox Eastern Church consists of twelve mutually independent churches (or thirteen if we reckon the Bulgarian Church), using their own language in divine service (or some ancient form of it, as in Russia) and varying not a little in points of detail, but standing in full communion with one another, and united as equals in what has been described as one great ecclesiastical federation. However, in using such language it must be remembered that we are not dealing with bodies which were originally separated from one another and have now entered into fellowship, but with bodies which have grown naturally from a single origin and have not become estranged.

A. THE FOUR ANCIENT PATRIARCHATES

1. *The Patriarchate of Constantinople* or *New Rome.*—The ancient patriarchate of Constantinople included the imperial dioceses of Pontus, Asia, Thrace and Eastern Illyricum—*i.e.* speaking roughly, the greater part of Asia Minor, European Turkey, and Greece, with a small portion of Austria. The imperial diocese of Pontus was governed by the exarch of Caesarea, who ruled over thirteen metropolitans with more than 100 suffragans. Asia was governed by the exarch of Ephesus, who ruled over twelve metropolitans with more than 350 suffragan bishops. In Asia Minor the church maintains but a small remnant of her former greatness; in Europe it is otherwise. The old outlines, however, are effaced wherever the Christian races have emancipated themselves from the Turkish rule, and the national churches of Greece, Servia and Rumania have reorganized themselves on a new basis. Where the Turkish rule still prevails the church retains her old organization, but greatly impaired. Still, the Oecumenical Patriarch, as he has been called since early in the 6th century, is the most exalted ecclesiastic of the Eastern churches, and his influence reaches far outside the lands of the patriarchate. His jurisdiction extends over the dominions of the Sultan in Turkey, together with Asia Minor and the Turkish islands of the Aegean; there are eighty-two metropolitans under him, and the "monastic republic" of Mount Athos. He has great privileges and responsibilities as the recognized head of the Greek community in Turkey, and enjoys also many personal honours which have survived from the days of the Eastern emperors.

The patriarch under the old Ottoman system had his own court at Phanar, and his own prison, with a large civil jurisdiction over, and responsibility for, the Greek community. In ecclesiastical affairs he acts with two governing bodies—(*a*) a permanent Holy Synod (Ἱερὰ Σύνοδος τῆς Ἐκκλησίας Κωνσταντινουπόλεως), consisting of twelve metropolitans, six of whom are re-elected every year from the whole number of metropolitans, arranged in three classes according to a fixed cycle; (*b*) the Permanent National Mixed Council (Διαρκὲς Ἐθνικὸν Μικτὸν Συμβούλιον), a remarkable assembly, which is at once the source of great power by introducing a strong lay element into the administration, and of a certain amount of weakness by its liability to sudden changes of popular feeling. It consists of four metropolitans, members of the Holy Synod, and eight laymen. All of these are chosen by an electoral body, consisting of all the members of the Holy Synod and the National Mixed Council, and twenty-five representatives of the parishes of Constantinople. The election of the patriarch is also, to a considerable extent, popular. An electoral assembly is formed for the purpose consisting[1] of the twelve members of the Holy Synod, the eight lay members of the National Mixed Council, twenty-eight representatives of as many dioceses (the remaining dioceses having only the right to nominate a candidate by letter), ten representatives of the parishes of Constantinople, ten representatives of all persons who possess political rank, ten representatives of the Christian trades of Constantinople, the two representatives of the secretariat of the patriarchate, and such metropolitans, to the number of ten but no more, as happen to be in Constantinople at the time for some canonical reason (παρεπιδημοῦντες). On the death or deposition of the patriarch, the Holy Synod and the National Mixed Council at once meet and elect a temporary substitute for the patriarch (Τοποτηρητής). Forty days afterwards the electoral assembly meets, under his presidency, and proceeds to make a list of twenty candidates (at the present day they must be metropolitans), who may be proposed either by the members of the electoral assembly or by any of the metropolitans of the patriarchate by letter. This list is sent to the sultan, who has by prescription the right to strike out five names. From the fifteen which remain the electoral assembly chooses three. These names are then submitted to the clerical members of the assembly, *i.e.* to the members of the Holy Synod and the παρεπιδημοῦντες, who meet in church, and, after the usual service, make the final selection. The patriarch-elect is presented to the Porte, which thereupon grants the berat or diploma of investiture and several customary presents; after which the new ruler is enthroned. The patriarch has the assistance and support of a large household, a survival from Byzantine times. Amongst them, actually or potentially, are the grand steward (μέγας οἰκόνομος), who serves him as deacon in the liturgy and presents candidates for orders; the grand visitor (μέγας σακελλάριος), who superintends the monasteries; the sacristan (σκευοφύλαξ); the chancellor (χαρτοφύλαξ), who superintends ecclesiastical causes; the deputy-visitor (ὁ τοῦ σακελλίου), who visits the nunneries; the protonotary (πρωτονοτάριος); the logothete (λογοθέτης), a most important lay officer, who represents the patriarch at the Porte and elsewhere outside; the censer-bearer, who seems to be also a kind of captain of the guard (κανστρίσιος or κανστρήνσιος); the referendary (ῥεφερενδάριος); the secretary (ὑπομνημογράφων); the chief syndic (πρωτέκδικος), who is a judge of lesser causes; the recorder (ἱερομνήμων); and so on, down to the cleaners of the lamps (λαμπαδάριοι), the attendant of the lights (περιεισερχόμενος), and the bearer of the images (βασταγάριος) and of the holy ointment (μυροδότης).

2. The *Patriarchate of Alexandria*, consisting of Egypt and its dependencies, was at one time the most powerful, as it was the most centralized, of all, and the patriarch still preserves his ancient titles of "pope" and "father of fathers, pastor of pastors, archpriest of archpriests, thirteenth apostle, and oecumenical judge." But the secession of the greater part of his church to Monophysitism [COPTIC CHURCH], and the Mahommedan conquest of Egypt, have left him but the shadow of his former greatness; and at the present time he has only the bishop of Libya under him, and rules over some 20,000 people at the outside, most of whom are settlers from elsewhere.

3. The *Patriarchate of Antioch* has undergone most changes in extent of jurisdiction, arising from the transfer of sees to Jerusalem, from the progress of the schismatic churches of the East and from the conquests of the Mahommedans. At the height of his power the patriarch of Antioch ruled over 12 metropolitans and 250 suffragan bishops. In the time of the first crusade 153 still survived; now there are scarcely 20, 14 of which are metropolitan sees. The patriarch, though he is "father of fathers and pastor of pastors," thus retains little of his old importance. His jurisdiction includes Cilicia, Syria (except Palestine) and Mesopotamia. Cyprus has been independent of Antioch since the council of Ephesus.

4. *The Patriarchate of Jerusalem.*—In the earlier period of the church, ecclesiastical followed civil divisions so closely that Jerusalem, in spite of the sacred associations connected with it, was merely an ordinary bishopric dependent on the metropolitan of Caesarea. Ambitious prelates had from time to time endeavoured to advance the pretensions of their see, but it was not until the council of Chalcedon, in 451, that Jerusalem was made a patriarchate with jurisdiction over Palestine. From this time on to the inroad of the Saracens the patriarchate of Jerusalem was highly prosperous. It ruled over three metropolitans with eighty suffragans. The modern patriarch has under his jurisdiction 5 archbishops and 5 bishops. The chief importance of the patriarchate is derived from the position of Jerusalem as a place of pilgrimage.

B. THE NINE NATIONAL CHURCHES

G. Finlay, in his *History of Greece*, has shown that there has been always a very close relation between the church and national life. Christianity from the first connected itself with the social organization of the people, and therefore in every province assumed the language and the usages of the locality. In this way it was able to command at once individual attachment and universal power. This feeling died down to some extent when Constantine made use of the church to consolidate his empire. But it revived under the persecution of the Arian emperors. The struggle against Arianism was not merely a struggle for orthodoxy. Athanasius was really at the head of a national Greek party resisting the domination of a Latin-speaking court. From this time onwards Greek patriotism and Greek orthodoxy have been almost convertible terms, and this led naturally to revolts against Greek supremacy in the days of Justinian and other emperors. Dean Stanley was probably correct when he described the heretical churches of the East as the ancient national churches of Egypt, Syria, and Armenia in revolt against supposed innovations in the earlier faith imposed on them by Greek supremacy. In the East, as in Scotland, the history of the church is the key to the history of the nation, and in the freedom of the church the Greek saw the freedom and supremacy of his race. For this very reason Orthodox Eastern Christians of alien race felt compelled to resist Greek domination by means of independent ecclesiastical organization, and the structure of the church rather favoured than interfered with the coexistence of separate national churches professing the same faith. Another circumstance favoured the creation of separate national churches. While the Greek empire lasted the emperors had a right of investiture on the election of a new patriarch, and this right was retained by the Turkish sultans after the conquest of Constantinople. The Russian people, for example, could not contemplate with calmness as the head of their church a bishop appointed by the hereditary enemy of their country. In this way the jealousies of race and the necessities of nations have produced various national churches which are independent or autocephalous and yet are one in doctrine.

1. The ancient *Church of Cyprus* (see CYPRUS, CHURCH OF).

2. The *Church of Mount Sinai*, consisting of little more than the famous monastery of St Catherine, under an archbishop who frequently resides in Egypt. It has, however, a few branch houses (μετόχια) in Turkey and Greece. The archbishop is chosen, from a list of candidates submitted by the monks of St Catherine, by the patriarch of Jerusalem and his Synod; and the patriarch consecrates him.

3. *The Hellenic Church.*—The constitution of the Church of Modern Greece is the result of the peculiar position of the patriarch of Constantinople. The war of liberation was sympathized in, not merely by the inhabitants of Greece, but by all the Greek-speaking Christians in the East. But the patriarch was in the hands of the Turks; he had been appointed by the sultan and he was compelled

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[1] The numbers have varied from time to time.

by the Turkish authorities to ban the movement for freedom. When the Greeks achieved independence they refused to be subject ecclesiastically to a patriarch who was nominated by the sultan (June 9, 1828); and, to add to their difficulties, there were in the country twenty-two bishops who had been consecrated by the patriarch, twelve bishops who had been consecrated irregularly during the war, and about twenty bishops who had been deprived of their sees during the troubles—*i.e.* fifty-three bishops claimed to be provided for. In these circumstances the government and people resolved that there should be ten diocesan bishops and forty additional provisional sees. They also resolved that the church should be governed after the fashion of the Russian Church by a synod; and they decreed that the king of Greece was to be head of the church. All these ideas were carried out with some modifications, and gradually. The patriarch of Constantinople in 1850 acknowledged the independence of the church, which gradually grew to be more independent of the state. By the Greek constitution of 16th/28th November 1864 " the Orthodox Church of Greece remains indissolubly united, as regards dogmas, to the great Church of Constantinople, and to every other church professing the same doctrines, and, like these churches, it preserves in their integrity the apostolical constitutions and those of the councils of the Church, together with the holy traditions; it is *αὐτοκέφαλος*, it exercises its sovereign rights independently of every other church, and it is governed by a synod of bishops."

4. *The Servian Church.*—After the suppression of the Church of Ipek in 1766 Servia became ecclesiastically subject to Constantinople; but in 1830 the sultan permitted the Serbs to elect a patriarch (as a matter of fact he is merely styled metropolitan), subject to the confirmation of the patriarch of Constantinople. Eight years later the seat of ecclesiastical government was fixed at Belgrade; and when Servia gained its independence its church became autocephalous.

5. *The Rumanian Church.*—The fall of the church of Okhrida in 1767 had made Moldavia and Wallachia ecclesiastically subject to Constantinople. On the union of the two principalities under Alexander Couza (December 1861) the Church was declared autocephalous under a metropolitan at Bucharest; and the fact was recognized by the patriarchs, as it was in the case of Servia, after the treaty of Berlin had guaranteed their independence.

6. The *Church of Montenegro* has from early times been independent under its bishops, who from 1516 to 1851 were also the temporal rulers, under the title of Vladikas, or prince-bishops.

7. The *Orthodox Church in Austria-Hungary*, which, however, really consists of four independent sections: the Servians of Hungary and Croatia, under the patriarch of Karlowitz; the Rumanians of Transylvania, under the archbishop of Hermannstadt; the Ruthenians of Bukovina, under the metropolitan of Czernowitz; and the Serbs of Bosnia-Herzogovina, where there are four sees, that of Sarajevo holding the primacy.

8. The *Russian Church* dates from 992, when Prince Vladimir and his people accepted Christianity. The metropolitan, who was subject to the patriarch of Constantinople, resided at Kiev on the Dnieper. During the Tatar invasion the metropolis was destroyed, and Vladimir became the ecclesiastical capital. In 1320 the metropolitans fixed their seat at Moscow. In 1582 Jeremiah, patriarch of Constantinople, raised Job, 46th metropolitan, to the patriarchal dignity; and the act was afterwards confirmed by a general council of the East. In this way the Russian Church became autocephalous, and its patriarch had immense power. In 1700 Peter the Great forbade the election of a new patriarch, and in 1721 he established the Holy Governing Synod to supply the place of the patriarch. This body now governs the Russian Church, and consists of a procurator representing the emperor, the metropolitans of Kiev, Moscow and St Petersburg, the exarch of Georgia and five or six other bishops appointed by the emperor. There are altogether some 90 bishops and about 40 auxiliary bishops called vicars. There are 481 monasteries for men and 249 convents of nuns. The Church of Georgia, which has existed from a very early period, and was dependent first on the patriarch of Antioch and then on the patriarch of Constantinople, has since 1802 been incorporated in the Russian Church. Its head, the archbishop of Tiflis, bears the title of exarch of Georgia, and has under him four suffragans. A petition was presented to the emperor by the Georgians in 1904 asking for the restoration of their church and their language, but nothing came of it.

9. The *Bulgarian Church*, unless indeed it be classed with the separated churches. It differs from the national churches already mentioned in that it had its origin in a revolt of Turkish subjects against the patriarchal authority. From the earliest times the Bulgarians had occupied an anomalous position on the borders of Eastern and Western Christendom, but they had ultimately become subject to Constantinople. The revival of Bulgarian national feeling near the middle of the 19th century led to a movement for religious independence, the leaders of which were the archimandrite Neophit Bozveli and the bishop Ilarion Mikhailovsky. The Porte espoused the cause of the Bulgarians, partly to pacify them, but still more to strengthen its hold on all the Christians of Turkey by fostering their differences. Ultimately, on 28th February 1870, the sultan issued a firman constituting a new church, including all Bulgarians who desired to join it within the vilayet of the Danube (*i.e.* the subsequently-formed principality of Bulgaria), and those of Adrianople, Salonica, Kossovo and Monastir (*i.e.* part of Macedonia, Eastern Rumelia and a tract farther south). The members of this Church were to constitute a *millet* or community, enjoying equal rights with the Greeks and Armenians; and its head, the Bulgarian exarch, was to reside at Constantinople. Naturally, this was resented by the patriarch Anthimus, who stigmatized the racial basis of the Bulgarian Church as the heresy of Phyletism. A local synod at Constantinople, in August 1872, pronounced it schismatical; Antioch, Alexandria and Greece followed suit; Jerusalem pronounced a modified condemnation; and the Servian and Rumanian churches avoided any definite expression of opinion. Russia was more favourable. It never actually acknowledged the Bulgarian Church, and Bulgarian prelates may not officiate publicly in Russian churches; on the other hand, the Holy Synod of Moscow refused to recognize the patriarch's condemnation, and Russian ecclesiastics have secretly supplied the Bulgarians with the holy oil. Above all, when Prince Boris, the heir-apparent of the principality, was received into the Bulgarian Church on 14th February 1896, the emperor of Russia was his godfather. The position is further complicated by the fact that many Bulgarians, both within and without the kingdom of Bulgaria, still remain subject to the patriarch. Nevertheless, the Bulgarian Church has made great headway both in Bulgaria itself and in Macedonia. The curious thing is that the Russian Church is in communion with both sides. The patriarch of Constantinople dares not excommunicate Russia, but the chief of its many grievances against that country is its patronage of the Bulgarian exarchate. The Bulgarians of course say they are not schismatics, but a national branch of the Church Catholic, using their sacred right to manage their own affairs in their own way. They have never excommunicated the Patriarchists. On the whole it seems likely that the patriarch will ultimately have to yield, in spite of the strong Greek feeling against the Bulgars.[1]

Present Position of the Orthodox Church.—Although the signs of weakness which have characterized the past are still present, there are some indications of improvement. The encyclical on unity of Pope Leo XIII. (1895) called forth a reply from the patriarch Anthimus V. of Constantinople and his Synod, which was eminently learned, dignified and charitable.[2] The theological school of the patriarchate, at Halkē, is not undistinguished, and the university of Athens has a good record. Whilst the parochial clergy are still as unlearned as ever, there are not a few amongst the higher clergy who are distinguished for their learning beyond the limits of their own communion: for example, the metropolitan Ph. Bryennios, who discovered and edited the *Didachē*; the archbishop N. Kalogeras, who discovered and edited the second part of the commentary of Euthymius Zigabenus (d. *c.* 1118) on the New Testament; the archimandrite D. Latas, author of a valuable work on Christian archaeology (Athens, 1883); and the logothete S. Aristarchi, who edited a valuable collection of 83 newly discovered homilies of the patriarch Photius. This was published in 1900 at the Phanar press, erected as a memorial to Theodore of Tarsus, archbishop of Canterbury, by Greek and English churchmen, which was set up by the patriarch Constantine V. in 1899. An authorized version of the Scriptures in ancient Greek is also one of the works undertaken by this institution. On the other hand, the attempt made in 1901 by the Holy Synod at Athens, with the co-operation of Queen Olga of Greece (a Russian princess), to circulate a modern Greek version of the Gospels was resented as a symptom of a Pan-Slavist conspiracy, and led to an ebullition of popular feeling which could only be pacified by the withdrawal of the obnoxious version and the abdication of the metropolitan of Athens. The patriarch Constantine V. was deposed on the 12th of April 1901, and was succeeded on the 28th of May by Joachim III. (and V.), who had previously occupied the patriarchal throne from 1878 to 1884, when he was deposed through the ill-will of the Porte and banished to Mount Athos. His re-election had therefore no little importance. His progressive sympathies, illustrated by his proposals to reform the monasteries and the calendar, to modify the four long fasts and to treat for union (especially with the Old Catholics), were not very well received, and in 1905 an attempt was made to depose him. The sultan Abd-ul-Hamid, to whom the different parties appealed, lectured them on charity and concord! The patriarch's great rival was Joachim of Ephesus. Undoubtedly the question of the most pressing importance with regard to the future of Eastern Christendom is the relation between Russia and Constantinople. The Oecumenical Patriarch is, of course, officially the superior; but the Russian Church is numerically by far the greatest, and the tendency to regard Russia as the head, not only of the Slav races, but of all orthodox nations, inevitably reacts upon the church in the form of what has been called pan-Orthodoxy. The Russian Church is the only one which is in a position to display any missionary activity. It has been a powerful factor in the development of several of the churches already spoken of, especially those of Servia and Montenegro, which are usually very much subject to Russian influences (Ῥωσσόφρονες or Ῥωσσώφιλοι). It has taken great interest in non-orthodox churches, such as those of Assyria, Abyssinia and Egypt. Above all, it has shown an increasing tendency to intervene in the affairs of the three lesser patriarchates.

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[1] H. Brailsford in *Macedonia* (London, 1906) brings a crushing indictment against the Patriarchist party.

[2] For a different opinion see A. Fortescue, *The Orthodox Eastern Church*, 435 sqq.

Orthodox Church in America.

In America the Russian archbishop, who resides in New York, has (on behalf of the Holy Synod) the oversight of some 152 churches and chapels in the United States, Alaska and Canada. He is assisted by two bishops, one for Alaska residing at Sitka, one for Orthodox Syrians residing in Brooklyn. There are 75 priests and 46,000 registered parishioners. The English language is increasingly used in the services. The increase of Orthodox communities has been very marked since 1888 owing to the immigration of Austrian Slavonians. Those of Greek nationality have churches in New Orleans, Chicago, New York, Boston, Lowell (Massachusetts) and other places. If, as seemed likely in 1910, in addition to the Russian and Syrian bishops, Greek and Servian ones were appointed, an independent synod could be formed, and the bishops could elect their own metropolitan. The total number of "Orthodox" Christians in North America is estimated at 300,000. Many of them were Austrian and Hungarian Uniats, who, after emigrating, have shown a tendency to separate from Rome and return to the Eastern Confession. One reason for this tendency is the attempt of the Roman Church to deprive the Uniats in America of their married priests.

The question of Anglican reunion.

The Catholic reaction represented by the Oxford movement in the Church of England early raised the question of a possible union between the Anglican and Eastern Orthodox Churches. Into the history of the efforts to promote this end, which have never had any official sanction on the one side or the other, it is impossible to enter here. The obstacles would seem, indeed, to be insurmountable. From the point of view of Orthodoxy the English Church is schismatical, since it has seceded from the Roman patriarchate of the West, and doubly heretical, since it retains the obnoxious *Filioque* clause in the creed while rejecting many of the doctrines and practices held in common by Rome and the East; moreover, the Orthodox Church had never admitted the validity of Anglican orders, while not denying it. Union would clearly only be possible in the improbable event of the English Church surrendering most of the characteristic gains of the Reformation in order to ally herself with a body, the traditions of which are almost wholly alien to her own. At the same time, especially as against the universal claims of the papacy, the two churches have many interests and principles in common, and efforts to find a *modus vivendi* have not been wanting on either side. The question of union was, for instance, more than once discussed at the unofficial conferences connected with the Old Catholic movement (see OLD CATHOLICS). These and other discussions could have no definite result, but they led to an increase of good feeling and of personal intercourse. Thus, on the coronation of the emperor Nicholas II. of Russia in 1895, Dr Creighton, bishop of Peterborough, as representative of the English Church, was treated with peculiar distinction, and the compliment of his visit was returned by the presence of a high dignitary of the Russian Church at the service at St Paul's in London on the occasion of Queen Victoria's "diamond" jubilee in 1897. In 1899 there was further an interchange of courtesies between the archbishop of Canterbury and Constantine V., patriarch of Constantinople. To promote the "brotherly feeling between the members of the two churches," for which the patriarch expressed a desire, a committee was formed under the presidency of the Anglican bishop of Gibraltar.

On this question of reunion see A. Fortescue, *The Orthodox Eastern Church*, 257 sqq., 429 sqq.

AUTHORITIES.—For the origins of the Eastern Church and the early controversies see the authorities cited in the article CHURCH HISTORY. For the *Filioque* controversy, J. G. Walch, *Historia controversiae de Processu Spiritus Sancti* (Jena, 1751); E. S. Foulkes, *Historical Account of the Addition of Filioque to the Creed* (London, 1867); C. Adams, *Filioque* (Edinburgh, 1884); W. Norden, *Das Papsttum und Byzanz* (Berlin, 1903); also P. Schaff's *History of the Creeds of Christendom.* The following are devoted specially to the history and condition of the Eastern Church: M. le Quien, *Oriens Christianus* (Paris, 1740); J. S. Assemani, *Bibliotheca Orientalis* (Rome, 1719–1728); A. P. Stanley's *Eastern Church* (1861); J. M. Neale, *The Holy Eastern Church* (*General Introduction*, 2 vols.; *Patriarchate of Alexandria*, 2 vols.; and, published posthumously in 1873, *Patriarchate of Antioch*). For liturgy, see H. A. Daniel, *Codex Liturgicus Eccl. Univ. in epitomen redactus* (4 vols., 1847–1855); Leo Allatius, *De libris et rebus Eccles. Graecarum dissertationes*; F. E. Brightman, *Eastern Liturgies* (Oxford, 1896). For hymnology see Daniel, *Thesaurus Hymnologicus* (4 vols.); Neale's translations of *Eastern Hymns*; B. Pick, *Hymns and Poetry of the Eastern Church* (New York, 1908).

See also J. Pargoire, *L'Église Byzantine de 527 à 847* (Paris, 1905); I. Silbernagl, *Verfassung u. gegenwärtiger Bestand sämtlicher Kirchen des Orients* (1865; 2nd ed., Regensburg, 1904); W. F. Adeney, *The Greek and Eastern Churches* (Edinburgh, 1908); Adrian Fortescue, *The Orthodox Eastern Church* (London, 1907), with a full bibliography; F. G. Cole, *Mother of All Churches* (London, 1908); and M. Tamarati, *L'Église Georgienne, des origines jusqu'à nos jours.* An interesting estimate of the Orthodox Church is given by A. Harnack in *What is Christianity?* For the festivals of the Greek Church see Mary Hamilton, *Greek Saints and their Festivals* (1910).

ORTHOGRAPHY (from Gr. ὀρθός, correct, right or straight, and γράφειν, to write), spelling which is correct according to accepted use. The word is also applied, in architecture, to the geometrical elevation of a building or of any part of one in which all the details are shown in correct relative proportion and drawn to scale. When the representation is taken through a building it is known as a section, and when portions of the structure only are drawn to a large scale they are called details.

ORTHONYX, the scientific name given in 1820, by C. J. Temminck, to a little bird, which, from the straightness of its claws—a character somewhat exaggerated by him—its large feet and spiny tail, he judged to be generically distinct from any other form. The typical species, *O. spinicauda*, is from south-eastern Australia, where it is very local in its distribution, and strictly terrestrial in its habits. It is rather larger than a skylark, coloured above not unlike a hedge-sparrow. The wings are, however, barred with white, and the chin, throat and breast are in the male pure white, but of a bright reddish-orange in the female. The remiges are very short, rounded and much incurved, showing a bird of weak flight. The rectrices are very broad, the shafts stiff, and towards the tip divested of barbs. *O. spaldingi* from Queensland is of much greater size than the type, and with a jet-black plumage, the throat being white in the male and orange-rufous in the female.

Orthonyx is a semi-terrestrial bird of weak flight, building a domed nest on or near the ground. Insects and larvae are its chief food, and the males are described as performing dancing antics like those of the lyre-bird (*q.v.*). Orthonyx belongs to the Oscines division of the *Passeres* and is placed in the family *Timeliidae*. (A. N.)

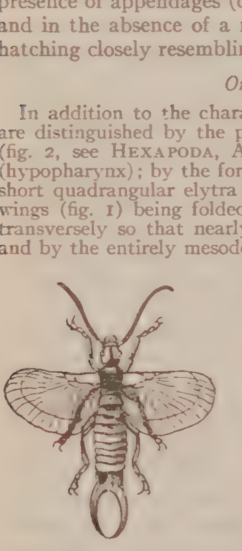
ORTHOPTERA (Gr. ὀρθός, straight, and πτερόν, a wing), a term used in zoological classification for a large and important order of the class *Hexapoda*. The cockroaches, grasshoppers, crickets and other insects that are included in this order were first placed by C. Linné (1735) among the Coleoptera (beetles), and were later removed by him to the Hemiptera (bugs, &c.). J. C. Fabricius (1775) was the first to recognize the unnaturalness of these arrangements, and founded for the reception of the group an order Ulonata. In 1806 C. de Geer applied to these insects the name Dermaptera (δέρμα, a skin, and πτερόν); and A. G.

Olivier subsequently used for the assemblage the name Orthoptera, which is now much better known than the earlier terms. W. Kirby (1815) founded an order Dermaptera for the earwigs, which had formed part of de Geer's Dermaptera, accepting Olivier's term Orthoptera for the rest of the assemblage, and as modern research has shown that the earwigs undoubtedly deserve original separation from the cockroaches, grasshoppers, crickets, &c., this terminology will probably become established. W. E. Erichson and other writers added to the Orthoptera a number of families which Linné had included in his order Neuroptera. These families are described and their affinities discussed in the articles NEUROPTERA and HEXAPODA (*qq.v.*). In the present article a short account of the characters of the Dermaptera and Orthoptera is given, while for details the reader is referred to special articles on the more interesting families or groups.

The Dermaptera and the Orthoptera agree in having well-developed mandibles, so that the jaws are adapted for biting; in the incomplete fusion of the second maxillae (which form the labium) so that the parts of a typical maxilla can be easily made out (see the description and figures of the cockroach's jaws under HEXAPODA); in the presence of a large number of excretory (Malpighian) tubes; in the firm texture of the forewings; in the presence of appendages (cerci) on the tenth abdominal segment; and in the absence of a metamorphosis, the young insect after hatching closely resembling the parent.

Order Dermaptera.

In addition to the characters just enumerated, the Dermaptera are distinguished by the presence of small but distinct maxillulae (fig. 2, see HEXAPODA, APTERA) in association with the tongue (hypopharynx); by the forewings when present being modified into short quadrangular elytra without nervuration, the complex hindwings (fig. 1) being folded beneath these both longitudinally and transversely so that nearly the whole abdomen is left uncovered; and by the entirely mesodermal nature of the genital ducts, which, according to the observations of F. Meinert, open to the exterior by a median aperture, the terminal part of the duct being single, either by the fusion of the primitive paired ducts or by the suppression of one of them. In the vast majority of winged insects the terminal part of the genital system (vagina and ductus ejaculatorius) is unpaired and ectodermal. Thus the condition in the Dermaptera is more primitive than in any other Pterygote order except the Ephemeroptera (Mayflies) which are still more generalized, the primitive mesodermal ducts (oviducts and vasa deferentia) opening by paired apertures as in the Crustacea. In the vast majority of the Dermaptera the cerci are—in the adult insect at least—stout, unjointed appendages forming a strong forceps (fig. 1) which the insect uses in arranging the hindwings beneath the elytra. In at least one genus the unjointed pincers of the forceps are preceded, in the youngest instar by jointed cerci. Very many members of the order are entirely wingless.



From Carpenter's *Insects*. Dent & Co.

FIG. 1.—Common Earwig (*Forficula auricularia*). Male. Magnified.

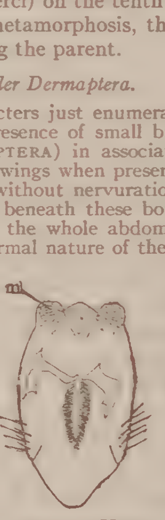
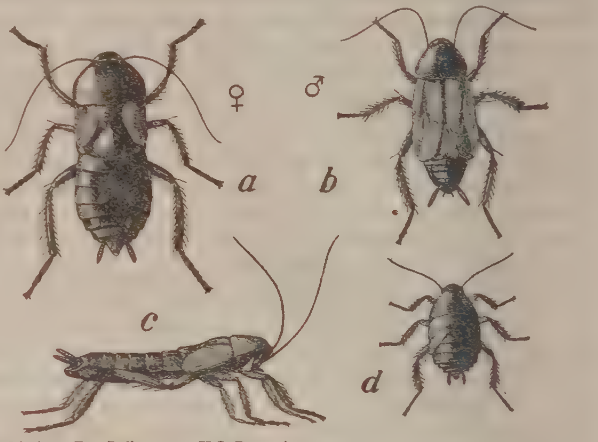


FIG. 2.—Hypopharynx and Maxillulae (*m*) of common earwig (*Forficula auricularia*). Magnified about twenty-seven times.

There are two families of Dermaptera. The *Hemimeridae* include the single genus *Hemimerus* (*q.v.*), which contains only two species of curious wingless insects with long, jointed cerci, found among the hair of certain West African rodents. The other family is that of the *Forficulidae* or earwigs (*q.v.*), all of which have the cerci modified as a forceps, while wings of the characteristic form described above are present in many of the species.

Order Orthoptera.

The bulk of de Geer's "Dermaptera" form the order Orthoptera of modern systematists, which includes some 10,000 described species. The insects comprised in it are distinguished from the earwigs by their elongate, rather narrow forewings, which usually cover, or nearly cover, the abdomen when at rest, and which are firmer in texture than the hindwings. The hindwings have a firm costal area, and a more delicate anal area which folds fanwise, so that they are completely covered by the forewings when the insect rests. Rarely (in certain cockroaches) the hindwing undergoes transverse folding also. Wingless forms are fairly frequent in the order, but their relationship to the allied winged species is evident. The female of the common cockroach (fig. 3*a*) shows an interesting vestigial condition of the wings, which are but poorly developed in the male (fig. 3*b*). More important characters of the Orthoptera than the nature of the wings—characters in which they differ from the Dermaptera and agree with the vast majority of winged insects—are the absence of distinct maxillulae and the presence of an unpaired ectodermal tube as the terminal region of the genital system in both sexes. The cerci are nearly always joined, and a typical insectan ovipositor with its three pairs of processes is present in connexion with the vagina of the female. In many Orthoptera this ovipositor is very long and conspicuous (fig. 5). Information as to the internal structure of a typical orthopteron—the cockroach—will be found under HEXAPODA.



After Marlatt, *Ent. Bull.* 4, n. s. U.S. Dept. Agr.

FIG. 3.—Common Cockroach (*Blatta orientalis*); *a*, female *b*, male; *c*, female (side view); *d*, young. Natural size.

Classification.—Six families of Orthoptera are here recognized, but most special students of the order consider that these should be rather regarded as super-families, and the number of families greatly multiplied. Those who wish to follow out the classification in detail should refer to some of the recent monographs mentioned below in the bibliography. There is general agreement as to the division of the Orthoptera into three sub-orders or tribes.

I. *Phasmodea.*—This division includes the single family of the *Phasmidae* whose members, generally known as "stick-insects" (*q.v.*) and "leaf-insects" (*q.v.*), are among the best-known examples of "protective resemblance" to be found in the whole animal kingdom. The prothorax is short and the mesothorax very long, the three pairs of legs closely similar, the wings often highly modified or absent, and the cerci short and unjointed. Each egg is contained in a separate, curiously formed, seed-like capsule, provided with a lid which is raised to allow the escape of the newly-hatched insect.

II. *Oothecaria.*—In this tribe are included Orthoptera with a large prothorax, whose eggs are enclosed in a common purse or capsule formed by the hardening of a maternal secretion. The *Mantidae* or "praying insects" have the prothorax elongate and the forelegs powerful and raptorial, while the large, broad head is prominent. The eggs are enclosed in a case attached to a twig or stone and containing many chambers. From this curious habitation the young mantids hang by threads till after their first moult (see MANTIS). The *Blattidae* (fig. 3) or cockroaches (*q.v.*) form the second family of this division. They are readily distinguished by the somewhat rounded prothorax beneath which the head is usually concealed, while the forelegs are unmodified. Sixteen eggs are enclosed together in a compact capsule or "purse" (fig. 4).

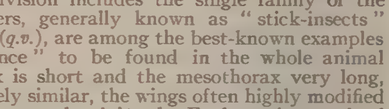


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FIG. 4.—Egg-purse of American Cockroach (*Periplaneta americana*). Magnified. *a*, Side view; *b*, end view; the outline *c* shows natural size.

III. *Saltatoria.*—The three families included in this tribe are distinguished by their elongate and powerful hindlegs (fig. 5) which enable them to leap far and high. They are remarkable for the possession of complex ears (described in the article HEXAPODA) and stridulating organs which produce chirping notes (see CRICKET). The families are the *Acridiidae* and *Locustidae*—including the insects familiarly known as locusts and grasshoppers (*q.v.*) and the *Gryllidae* or crickets (*q.v.*). The Acridiidae have the feelers and the ovipositor relatively short, and possess only three tarsal segments; their ears are situated on the first abdominal segment and the males stridulate by scraping rows of pegs on the inner aspect of the hind thigh, over the sharp edges of the forewing nervures. The Locustidae (see GRASSHOPPER, KATYDID) have the feelers and often also the ovipositor very elongate; the foot is four-segmented; the ears are placed at the base of the foreshin and the stridulation is due to the friction of a transverse "file" beneath the base of the left forewing over a sharp ridge on the upper aspect of the right. In some of these insects the wings are so small as to be useless for flight, being modified altogether for stridulation. The Gryllidae (fig. 5) are nearly related to the Locustidae, having long feelers and ovipositors, and agreeing with the latter family in the position of the ears. The forewings are curiously arranged when at rest, the anal region of the wing lying dorsal to the insect and the rest of the wing being turned downwards at the sides (see CRICKET).

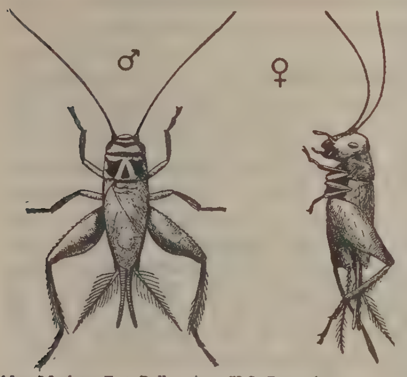

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FIG. 5.—House Cricket (*Gryllus domesticus*); ♂, male; ♀, female. Natural size.

Fossil History.—The Orthoptera are an exceedingly interesting order of insects as regards their past history. In Palaeozoic rocks of Carboniferous age the researches of S. H. Scudder have revealed insects with the general aspect of cockroaches and phasmids, but with the two pairs of wings similar to each other in texture and form. In the Mesozoic rocks (Trias and Lias) there have been discovered remains of insects intermediate between those ancient forms and our modern cockroaches, the differentiation between forewings and hindwings having begun. The Orthopteroid type of wings appears therefore to have arisen from a primitive Isopteroid condition.

BIBLIOGRAPHY.—A description and enumeration of all known Dermaptera has been lately published by A. de Bormans and H. Kraus, *Das Tierreich*, xi. (Berlin, 1900). See also W. F. Kirby, *Synomymic Catalogue of Orthoptera*, pt. i. (London, Brit. Mus., 1904). See also, for earwigs, Kirby, *Journ. Linn. Soc. Zool.*, xxiii. (1890); E. E. Green, *Trans. Entom. Soc.* (1898); K. W. Verhoeff, *Abhandl. K. Leopold-Carol. Akad.*, lxxxiv. (1905); and M. Burr, *Science Gossip*, iv. (N.S., 1897); for Hemimerus, see H. J. Hansen, *Entom. Tidsk.*, xv. (1894). For Orthoptera generally, see C. Brunner von Wattenwyl, *Prodromus der europäischen Orthopteren* (Leipzig, 1882), and *Ann. Mus. Genov.* xiii. (1892), &c. R. Tümpel, *Die Geradflügler Mitteleuropas* (Eisenbach, 1901). The Orthoptera have been largely used for anatomical and embryological researches, the more important of which are mentioned under Hexapoda (*q.v.*). Of memoirs on special groups of Orthoptera may be mentioned here—J. O. Westwood, *Catalogue of Phasmidae* (London, Brit. Mus., 1859), and *Rivisio Familiae Mantidarum* (London, 1889); L. C. Miall and A. Denny, *The Cockroach* (London, 1886); E. B. Poulton, *Trans. Ent. Soc.* (1896); A. S. Packard, "Report on the Rocky Mountain Locust" in *9th Rep. U.S. Survey of Territories* (1875). For our native species see M. Burr, *British Orthoptera* (Huddersfield, 1897); D. Sharp's chapters (viii.-xiv.) *Cambridge Nat. History*, vol. v. (1895), give an excellent summary of our knowledge. (G. H. C.)

ORTHOSTATAE (Gr. ὀρθοστάτης, standing upright), the term in Greek architecture given to the lowest course of masonry of the external walls of the naos or cella, consisting of vertical slabs of stone or marble equal in height to two or three of the horizontal courses which constitute the inner part of the wall.

ORTHOSTYLE (Gr. ὄρθος, straight, and στῦλος, a column), in architecture, a range of columns placed in a straight row, as for instance those of the portico or flanks of a classic temple.

ORTIGUEIRA, a seaport of north-western Spain, in the province of Corunna; on the northern slope of the Sierra de la Faladoira, on the river Nera and on the eastern shore of the Ría de Santa Marta—a winding, rock-bound and much indented inlet of the Bay of Biscay, between Capes Ortegal and Vares, the northernmost headlands of the Peninsula. The official total of the inhabitants of Ortigueira (18,426 in 1900) includes many families which dwell at some distance; the actual urban population does not exceed 2000. The industries are fishing and farming. Owing to the shallowness of the harbour large vessels cannot enter, but there is an important coasting trade, despite the dangerous character of the coast-line and the prevalence of fogs and gales. The sea-bathing and magnificent scenery attract visitors in summer even to this remote district, which has no railway and few good roads.

ORTLER, the highest point (12,802 ft.) in Tirol, and so in the whole of the Eastern Alps. It is a great snow-clad mass, which rises E. of the Stelvio Pass, and a little S. of the upper valley of the Adige (whence it is very conspicuous) between the valleys of Trafoi (N.W.) and of Sulden (N.E.). It was long considered to be wholly inaccessible, but was first conquered in 1804 by three Tirolese peasants, of whom the chief was Josef Pichler. The first traveller to make the climb was Herr Gebhard in 1805 (sixth ascent). In 1826 Herr Schebelka, and in 1834 P. K. T. Thurwieser attained the summit, but it was only after the discovery of easier routes in 1864 by F. F. Tuckett, E. N. and H. E. Buxton, and in 1865 by Herr E. von Mojsisovics that the expedition became popular. Many routes to the summit are now known, but that usually taken (from the Payer Club hut, easily accessible from either Sulden or Trafoi) from the north is daily traversed in summer and offers no difficulties to moderately experienced walkers. (W. A. B. C.)

ORTNIT, or OTNIT, German hero of romance, was originally Hertnit or Hartnit, the elder of two brothers known as the Hartungs, who correspond in German mythology to the Dioscuri. His seat was at Holmgard (Novgorod), according to the *Thidreks-saga* (chapter 45), and he was related to the Russian saga heroes. Later on his city of Holmgard became Garda, and in ordinary German legend he ruled in Lombardy. Hartnit won his bride, a Valkyrie, by hard fighting against the giant Isungs, but was killed in a later fight by a dragon. His younger brother, Hardheri (replaced in later German legend by Wolfdietrich), avenged Ortnit by killing the dragon, and then married his brother's widow. Ortnit's wooing was corrupted by the popular interest in the crusades to an Oriental *Brautfahrtsaga*, bearing a very close resemblance to the French romance of Huon of Bordeaux. Both heroes receive similar assistance from Alberich (Oberon), who supplanted the Russian Ilya as Ortnit's epic father in middle high German romance. Neumann maintained that the Russian Ortnit and the Lombard king were originally two different persons, and that the incoherence of the tale is due to the welding of the two legends into one.

See editions of the *Heldenbuch* and one of *Ortnit* and *Wolfdietrich* by Dr. J. L. Edlen von Lindhausen (Tübingen, 1906); articles in the *Zeitschrift für deutsches Altertum* by K. Müllenhoff (xii. pp. 344-354, 1865; xiii. pp. 185-192, 1867), by J. Seemüller (xxvi. 201-211, 1882), and by E. H. Meyer (xxxviii. pp. 85-87, 1894), and in *Germania* by F. Neumann (vol. xxvii. pp. 191-219, Vienna, 1882). See also the literature dealing with Huon of Bordeaux.

ORTOLAN, JOSEPH LOUIS ELZÉAR (1802–1873), French jurist, was born at Toulon, on the 21st of August 1802. He studied law at Aix and Paris, and early made his name by two volumes, *Explication historique des institutes de Justinien* (1827), and *Histoire de la législation romaine* (1828), the first of which has been frequently republished. He was made assistant librarian to the court of cassation, and was promoted after the Revolution of 1830 to be secretary-general. He was also commissioned to give a course of lectures at the Sorbonne on constitutional law, and in 1836 was appointed to the chair of comparative criminal law at the university of Paris. He published many works on constitutional and comparative law, of which the following may be mentioned: *Histoire du droit constitutionnel en Europe pendant le moyen âge* (1831); *Introduction historique au cours de législation pénale comparée* (1841); he was the author of a volume of poetry *Les enfantines* (1845). He died in Paris, on the 27th of March 1873.

ORTOLAN (Fr. *ortolan*, Lat. *hortulanus*, the gardener bird, from *hortus*, a garden), the *Emberiza hortulana* of Linnaeus, a bird celebrated for the delicate flavour of its flesh, and a member of the *Emberizidae*, a Passerine family not separated by most modern authors from the *Fringillidae*. A native of most European countries—the British Islands (in which it occurs but rarely) excepted—as well as of western Asia, it emigrates in autumn presumably to the southward of the Mediterranean, though its winter quarters cannot be said to be accurately known, and returns about the end of April or beginning of May. Its distribution throughout its breeding-range seems to be very local, and for this no reason can be assigned. It was long ago said in France, and apparently with truth, to prefer wine-growing districts; but it certainly does not feed upon grapes, and is found equally in countries where vineyards are unknown—reaching in Scandinavia even beyond the arctic circle—and then generally frequents corn-fields and their neighbourhood. In appearance and habits it much resembles its congener the yellow-hammer, but wants the bright colouring of that species, its head for instance being of a greenish-grey, instead of a lively yellow. The somewhat monotonous song of the cock is also much of the same kind; and, where the bird is a familiar object to the country people, who usually associate its arrival with the return of fair weather, they commonly apply various syllabic interpretations to its notes, just as our boys do to those of the yellow-hammer. The nest is placed on or near the ground, but the eggs seldom show the hair-like markings so characteristic of those of most buntings. Its natural food consists of beetles, other insects and seeds. Ortolans are netted in great numbers, kept alive in an artificially lighted or darkened room, and fed with oats and millet. In a very short time they become enormously fat and are then killed for the table. If, as is supposed, the ortolan be the *Miliaria* of Varro, the practice of artificially fattening birds of this species is very ancient. In French the word *Ortolan* is used so as to be almost synonymous with the English "bunting"—thus the *Ortolan-de-neige* is the snow-bunting (*Plectrophanes nivalis*), the *Ortolan-de-riz* is the rice-bird or "bobolink" of North America (*Dolichonyx oryzivorus*), so justly celebrated for its delicious flavour; but the name is also applied to other birds much more distantly related, for the *Ortolan* of some of the Antilles, where French is spoken, is a little ground-dove of the genus *Chamaepelia*.

In Europe the *Beccafico* (fig-eater) shares with the ortolan the highest honours of the dish, and this may be a convenient place to point out that the former is a name of equally elastic signification. The true *Beccafico* is said to be what is known in England as the garden-warbler (the *Motacilla salicaria* of Linnaeus, the *Sylvia hortensis* of modern writers); but in Italy any soft-billed small bird that can be snared or netted in its autumnal emigration passes under the name in the markets and cook-shops. The "beccafico," however, is not as a rule artificially fattened, and on this account is preferred by some sensitive tastes to the Ortolan. (A. N.)

ORTON, JOB (1717–1783), English dissenting minister, was born at Shrewsbury on the 4th of September 1717. He entered the academy of Dr Philip Doddridge at Northampton (*q.v.*), became minister of a congregation formed by a fusion of Presbyterians and Independents at High Street Chapel, Shrewsbury (1741), received Presbyterian ordination there (1745), resigned in 1766 owing to ill-health, and lived in retirement at Kidderminster until his death. He exerted great influence both among dissenting ministers and among clergy of the established church. He was deeply read in Puritan divinity, and adopted Sabellian doctrines on the Trinity. Old-fashioned in most of his views, he disliked the tendencies alike of the Methodists and other revivalists and of the rationalizing dissenters, yet he had a good word for Priestley and Theophilus Lindsey.

Among his numerous works are *Letters to Dissenting Ministers* (ed. by S. Palmer, 2 vols., 1806), and *Practical Works* (2 vols., with letters and memoir, 1842).

ORTONA A MARE, a small seaport and episcopal see of the Abruzzi, Italy, in the province of Chieti, 12 m. direct E. of that town and 105 m. by rail S.S.E. of Ancona. Pop. (1901) 8667 (town); 15,523 (commune). It is situated on a promontory 230 ft. above sea-level, and connected with the port below by a wire-rope railway. From the ruined castle magnificent views to the south as far as the Punta di Penna can be obtained. The cathedral has been restored at various times, but preserves a fine portal of 1312 by a local artist, Nicolo Mancini. At one side of it is the Palazzo de Pirris with five pointed windows.

The town occupies the site of the ancient Ortona, a seaport of the Frentani; it lay on the Roman coast-road, which here turned inland to Anxanum (Lanciano), 10 m. to the S. The town suffered much from the ravages of the Turks, who laid it in ruins in 1566, and also from frequent earthquakes.

For discoveries in the neighbourhood see A. de Nino in *Notizie degli Scavi* (1888), 646. (T. As.)

ÖRTZEN, GEORG, BARON VON (1829–), German poet and prose-writer, was born at Brunn in Mecklenburg-Schwerin. He served as an officer of Prussian hussars (1850–1855), entered the consular service and after employment at New York (1879) and Constantinople (1880) was appointed to Marseilles (1881), and then to Christiania (1889), retiring in 1892. He published about thirty volumes, mostly of lyrics and aphorisms, including *Gedichte* (3rd ed. 1861), *Aus den Kämpfen des Lebens* (1868), *Deutsche Träume, deutsche Siege* (1876), *Epigramme und Epiloge in Prosa* (1880), *Es war ein Traum* (1902). His *Erlebnisse und Studien in der Gegenwart* (Leipzig, 1875) appeared under the pseudonym Ludwig Robert, and *Nacht* (Stuttgart, 1899), a collection of sonnets, under that of Stephen Ervésy.

ORURO, a department and town of Bolivia. The department is bounded N. by La Paz, E. by Cochabamba and Potosí, S. by Potosí, and W. by Chile; it forms a part of the ancient Titicaca lacustrine basin, and has an area of 19,127 sq. m., the greater part of which is semi-arid and covered with extensive saline deposits. It is bordered by Cordilleras on the E. and W., and by transverse ridges and detached groups of elevations on the N. and S. The slope and drainage is toward the S., but many of the streams are waterless in the dry season. The outlet of Lake Titicaca, the Desaguadero river, flows southward into Lake Pampa-Aullaguas, or Poöpo, on the eastern side of the department near the Cordillera de los Frailes. Lake Poöpo is 12,139 ft. above sea-level, or 506 ft. lower than Titicaca; and its waters discharge through a comparatively small outlet, called the Lacahahuíra, into the lagoon and saline morasses of Coipasa (12,057 ft. elevation) in the S.W. corner of the department. Oruro is almost exclusively a mining department, the country being too arid for agriculture, with the exception of a narrow strip in the foothills of the Cordillera de los Frailes, where a few cattle, mules and llamas, and a considerable number of sheep are reared. The mineral wealth has not been fully developed except in the vicinity of the capital, in the north-east part of the department, where there are large deposits of tin, silver and copper, Oruro being the second largest producer of tin in the republic. There are borax deposits in the western part of the department, but the output is small.

The capital of the department is ORURO, 115 m. S.S.E. (direct) of La Paz; it is an old mining town dating from the 17th century, when it is said to have had a population of 70,000. The census of 1900 gave it a population of 13,575, the greater part of whom are Indians. A considerable number of foreigners are interested in the neighbouring mines. The elevation of Oruro is 12,250 ft. above sea-level, and its climate is characterized by a short cool summer and a cold rainy winter, with severe frosts and occasional snow-storms. The mean annual temperature is about 43° F. Oruro is the Bolivian terminus of the Antofagasta railway (0·75 metre gauge), 574 m. long, the first constructed in Bolivia. A law of the 27th of November 1906 provided for the construction of other lines, of metre gauge, from La Paz (Viacha) to Oruro, from Oruro to Cochabamba, and from Oruro to Tupiza, making Oruro the most important railway centre in Bolivia. Oruro enjoys the nominal distinction of being one of the four capitals of the republic, an anomaly which was practically ended by the revolution of 1898, since which time the government has remained at La Paz.

ORVIETO (anc. *Volsinii* (*q.v.*), later *Urbs Vetus*, whence the modern name), a town and episcopal see of the province of Perugia, Italy, on the Paglia, 78 m. by rail N. by W of Rome. Pop. (1901) 8820 (town); 18,208 (commune). It crowns an isolated rock, 1033 ft. above sea-level, 640 ft. above the plain, commanding splendid views, and is approached on the east by a funicular railway from the station. The town is very picturesque, both from its magnificent position and also from the unusually large number of fine 13th-century houses and palaces which still exist in its streets. The chief glory of the place is its splendid cathedral, dedicated to the Virgin; it was begun before 1285, perhaps by Arnolfo di Cambio, on the site of an older church; and from the 13th till the 16th century was enriched by the labours of a whole succession of great Italian painters and sculptors. The exterior is covered with black and white marble; the interior is of grey limestone with bands of a dark basaltic stone. The plan consists of a large rectangular nave, with semicircular recesses for altars, opening out of the aisles, north and south. There are two transeptal chapels and a short choir. The most magnificent part of the exterior and indeed the finest polychrome monument in existence is the west façade, built of richly-sculptured marble from the designs of Lorenzo Maitani of Siena, and divided into three gables with intervening pinnacles, closely resembling the front of Siena cathedral, of which it is a reproduction, with some improvements. With the splendour of the whole, the beauty of the composition is marvellous, and it may rank as the highest achievement of Italian Gothic. It was begun in 1310, but the upper part was not completed till the 16th century. The mosaics are modern, and the whole church has suffered greatly from recent restoration. The four wall-surfaces that flank the three western doorways are decorated with very beautiful sculpture in relief, once ornamented with colour, the designs for which, according to Burckhardt, must be ascribed to the architect of the whole, though executed by other (but still Sienese, not Pisan) hands. The Madonna above the principal portal falls into the same category. The subjects are scenes from the Old and New Testaments, and the Last Judgment, with Heaven and Hell. In the interior on the north, the Cappella del Corporale possesses a large silver shrine, resembling in form the cathedral façade, enriched with countless figures in relief and subjects in translucent coloured enamels—one of the most important specimens of early silversmith's work that yet exists in Italy. It was begun by Ugolino Vieri of Siena in 1337, and was made to contain the Holy Corporal from Bolsena, which, according to the legend, became miraculously stained with blood during the celebration of mass to convince a sceptical priest of the truth of the doctrine of transubstantiation. This is supposed to have happened in 1263, while Urban IV. was residing at Orvieto; and it was to commemorate this miracle that the existing cathedral was built. On the south side is the chapel of S. Brizio, separated from the nave by a fine 14th-century wrought-iron screen. The walls and vault of this chapel are covered with some of the best-preserved and finest frescoes in Italy—among the noblest works of Fra Angelico and Luca Signorelli, mainly painted between 1450 and 1501—the latter being of especial importance in the history of art owing to their great influence on Michelangelo in his early days. The choir stalls are fine and elaborate specimens of *tarsia* and rich wood-carving—the work of Antonio and Pietro della Minella (1431–1441). In 16th-century sculpture the cathedral is especially rich, containing many statues, groups and altar-reliefs by Simone Mosca and Ippolito Scalza. Close by are two Gothic buildings, the bishop's palace (1264) and the Palazzo dei Papi (begun in 1296), the latter with a huge hall now containing the Museo Civico, with various medieval works of art, and also objects from the Etruscan necropolis of the ancient Volsinii (*q.v.*). The Palazzo Faina has another interesting Etruscan collection. The Palazzo del Comune is Romanesque (12th century), but has been restored. S. Andrea and S. Giovenale are also Romanesque churches of the 11th century; both contain later frescoes. To the 12th century belongs the ruined abbey of S. Severo, 1 m. south of the town. The church of S. Domenico contains one of the finest works in sculpture by Arnolfo del Cambio. This is the tomb with recumbent effigy of the Cardinal Brago or De Braye (1282), with much beautiful sculpture and mosaic. It is signed HOC OPVS FECIT ARNVLFVS. It was imitated by Giovanni Pisano in his monument to Pope Benedict XI. at Perugia. Among the later buildings, a few may be noted by Sanmicheli of Verona, who was employed as chief architect of the cathedral from 1509 to 1528. The fortress built in 1364 by Cardinal Albornoz has been converted into a public garden. The well, now disused, called Il pozzo di S. Patrizio, is one of the chief curiosities of Orvieto. It is 200 ft. deep to the water-level and 42 ft. in diameter, cut in the rock, with a double winding inclined plane, so that asses could ascend and descend to carry the water from the bottom. It was begun by the architect Antonio da San Gallo the younger in 1527 for Clement VII., who fled to Orvieto after the sack of Rome, and was finished by Simone Mosca under Paul III.

The town appears under the name Οὐρβι'βεντὸς in Procopius (*Bell. Goth.* ii. 11, &c,), who gives a somewhat exaggerated description of the site, and as *Urbs Vetus* elsewhere after his time. Belisarius starved out Vitiges in 539, and became master of it. In 606 it fell to the Lombards, and was recovered by Charlemagne. It formed part of the donation of the Countess Matilda to the papacy. Communal independence had probably been acquired as early as the end of the 10th century, but the first of the popes to reside in Orvieto and to recognize its communal administration was Hadrian IV. in 1157. It was then governed by consuls, but various changes of constitution supervened in the direction of enlarging the governing body. Its sympathies were always Guelphic, and it was closely allied with Florence, which it assisted in the battle of Monteaperto (1260), and its constitution owed much to her model. In 1199 the first *podestà* was elected, and in 1251 the first *capitano del popolo.* There were considerable Guelph and Ghibelline struggles even at Orvieto, the latter party being finally destroyed in 1313, and the representatives of the former, the Monaldeschi, obtaining the supreme power. The territory of Orvieto extended from Chiusi to the coast at Orbetello, to the Lake of Bolsena and the Tiber. The various branches of the Monaldeschi continually fought among themselves, however, and the quarrels of two of them divided the city into two factions under the names of Muffati and Mercorini, whose struggles lasted until 1460, when peace was finally made between them. After this period Orvieto was peaceably ruled by papal governors, and had practically no history. Owing to the strong Guelphic sympathies of the inhabitants, and the inaccessible nature of the site, Orvieto was constantly used as a place of refuge by the popes. In 1814 it became the chief town of a district, in 1831 of a province, and in 1860 with Umbria became part of the kingdom of Italy, and became a subprefecture.

See L. Fumi, *Il Duomo d' Orvieto e i suoi restauri* (Rome, 1891); *Orvieto, note storiche e biografiche* (Città di Castello, 1891), and other works. (T. As.)

ORYX (Gr. ὄρυξ, a pickaxe, hence applied to the animal), the scientific name of a group of African antelopes of relatively large size with long straight or scimitar-shaped horns, which are present in both sexes, and long tufted tails. They are all desert animals. The true oryx of classical writers was probably the East and North-east African beisa-oryx (*Oryx beisa*), which is replaced in South Africa by the gemsbuck (*oryx gazella*). In Northern Africa the group is represented by the scimitar-horned *O. leucoryx* or *O. algazal,* and in Arabia by the small white oryx (*O. beatrix*). See Antelope.

ORZESZKO or Orszeszko, **ELIZA** (1842–), Polish novelist, was born near Grodno, of the noble family of Pawlowski. In her sixteenth year she married Piotr Orzeszko, a Polish nobleman, who was exiled to Siberia after the insurrection of 1863. She wrote a series of powerful novels and sketches, dealing with the social conditions of her country. *Eli Makower* (1875) describes the relations between the Jews and the Polish nobility, and *Meir Ezofowicz* (1878) the conflict between Jewish orthodoxy and modern liberalism. *On the Niemen* (1888), perhaps her best work, deals with the Polish aristocracy, and *Lost Souls* (1886) and *Cham* (1888) with rural life in White Russia. Her study on *Patriotism and Cosmopolitanism* appeared in 1880. A uniform edition of her works appeared in Warsaw, 1884–1888.

OSAKA, or OZAKA, a city of Japan in the province of Settsu. Pop. (1908) 1,226,590. It lies in a plain bounded, except westward, where it opens on Osaka Bay, by hills of considerable height, on both sides of the Yodogawa, or rather its headwater the Aji (the outlet of Lake Biwa), and is so intersected by river-branches and canals as to suggest a comparison with a Dutch town. Steamers ply between Osaka and Kobe-Hiogo or Kobe, and Osaka is an important railway centre. The opening of the railway (1873) drew foreign trade to Kobe, but a harbour for ocean-steamers has been constructed at Osaka. The houses are mainly built of wood, and on the 31st of July 1909 some 12,000 houses and other buildings were destroyed by fire. Shin-sai Bashi Suji, the principal thoroughfare, leads from Kitahama, the district lying on the south side of the Tosabori, to the iron suspension bridge (Shin-sai Bashi) over the Dotom-bori. The foreign settlement is at Kawaguchi at the junction of the Shirinashi and the Aji. It is the seat of a number of European mission stations. Buddhist and Shinto temples are numerous. The principal secular buildings are the castle, the mint and the arsenal. The castle was founded in 1583 by Hideyoshi; the enclosed palace, probably the finest building in Japan, survived the capture of the castle by Iyeyasu (1615), and in 1867 and 1868 witnessed the reception of the foreign legations by the Tokugawa shoguns; but in the latter year it was fired by the Tokugawa party. It now provides military headquarters, containing a garrison and an arsenal. The whole castle is protected by high and massive walls and broad moats. Huge blocks of granite measuring 40 ft. by 10 ft. or more occur in the masonry. The mint, erected and organized by Europeans, was opened in 1871. Osaka possesses iron-works, sugar refineries, cotton spinning mills, ship-yards and a great variety of other manufactures. The trade shows an increase commensurate with that of the population, which in 1877 was only 284,105.

Osaka owes its origin to Rennio Shonin, the eighth head of the Shin-Shu sect, who in 1495–1496 built, on the site now occupied by the castle, a temple which afterwards became the principal residence of his successors. In 1580, after ten years' successful defence of his position, Kenryo, the eleventh "abbot," was obliged to surrender; and in 1583 the victorious Hideyoshi made Osaka his capital. The town was opened to foreign trade in 1868.

OSAWATOMIE, a city of Miami county, Kansas, U.S.A., about 45 m. S. by W. of Kansas City, on the Missouri Pacific railway. Pop. (1900) 4191 (227 negroes); (1905, state census) 4857; (1910) 4046. A state hospital for the insane (1866) is about 1 m. N.E. of the city. The region is a good one for general farming, and natural gas and petroleum are found in abundance in the vicinity. Osawatomie was settled about 1854 by colonists sent by the Emigrant Aid Company, and was platted in 1855; its name was coined from parts of the words "Osage" and "Pottawatomie." It was the scene of two of the "battles" of the "Border War," and of much of the political violence resulting from the clashes between the "pro-slavery" and the "free-state" factions of Missouri and Kansas. On the 7th of June 1856 it was plundered by about 170 pro-slavery men from Missouri. On the 30th of August 1856 General John W. Reid, commanding about 400 Missourians, attacked the town. The attack was resisted by Captain John Brown (who had come to Osawatomie in the autumn of 1855) at the head of about 40 men, who were soon overpowered. Of Captain Brown's men, four were killed and two were executed. The town was looted and practically destroyed. A park commemorating the battle was dedicated here on the 31st of August 1910.

OSBORN, SHERARD (1822–1875), English admiral and Arctic explorer, the son of an Indian army officer, was born on the 25th of April 1822. Entering the navy as a first-class volunteer in 1837, he was entrusted in 1838 with the command of a gunboat at the attack on Kedah in the Malay Peninsula, and was present at the reduction of Canton in 1841, and at the capture of the batteries of Woosung in 1842. From 1844 till 1848 he was gunnery mate and lieutenant in the flag-ship of Sir George Seymour in the Pacific. He took a prominent part in 1849 in advocating a new search expedition for Sir John Franklin, and in 1850 was appointed to the command of the steam-tender "Pioneer" in the Arctic expedition under Captain Austin, in the course of which he performed (1851) a remarkable sledge-journey to the western extremity of Prince of Wales Island. He published an account of this voyage, entitled *Stray Leaves from an Arctic Journal* (1852), and was promoted to the rank of commander shortly afterwards. In the new expedition (1852–1854) under Sir Edward Belcher he again took part as commander of the "Pioneer." In 1856 he published the journals of Captain Robert M'Clure, giving a narrative of the discovery of the North-West Passage. Early in 1855 he was called to active service in connexion with the Crimean War, and being promoted to post-rank in August of that year was appointed to the "Medusa," in which he commanded the Sea of Azoff squadron until the conclusion of the war. For these services he received the C.B., the Cross of the Legion of Honour, and the Medjidie of the fourth class. As commander of the "Furious" he took a prominent part in the operations of the second Chinese War, and performed a piece of difficult and intricate navigation in taking his ship 600 m. up the Yangtse-kiang to Hankow (1858). He returned to England in broken health in 1859, and at this time contributed a number of articles on naval and Chinese topics to *Blackwood's Magazine*, and wrote *The Career, Last Voyage and Fate of Sir John Franklin* (1860). In 1861 he commanded the "Donegal" in the Gulf of Mexico during the trouble there, and in 1862 undertook the command of a squadron fitted out by the Chinese government for the suppression of piracy on the coast of China; but owing to the non-fulfilment of the condition that he should receive orders from the imperial government only, he threw up the appointment. In 1864 he was appointed to the command of the "Royal Sovereign" in order to test the turret system of ship-building, to which this vessel had been adapted. In 1865 he became agent to the Great Indian Peninsula Railway Company, and two years later managing director of the Telegraph Construction and Maintenance Company. In 1873 he attained flag-rank. His interest in Arctic exploration had never ceased, and in 1873 he induced Commander Albert Markham to undertake a summer voyage for the purpose of testing the conditions of ice-navigation with the aid of steam, with the result that a new Arctic expedition, under Sir George Nares, was determined upon. He was a member of the committee which made the preparations for this expedition, and died a few days after it had sailed.

OSBORNE, a mansion and estate in the Isle of Wight, England, S.E. of the town of East Cowes. The name of the manor in early times is quoted as Austerborne or Oysterborne, and the estate comprised about 2000 acres when, in 1845, it was purchased from Lady Isabella Blackford by Queen Victoria. The queen subsequently extended the estate to nearly 3000 acres, and a mansion, in simple Palladian style, was built from designs of Mr T. Cubitt. Here the queen died in 1901, and by a letter, dated Coronation Day 1902, King Edward VII. presented the property to the nation. By his desire part of the house was transformed into a convalescent home for officers of the navy and army, opened in 1904.

In 1903 there was opened on the Osborne estate a Royal Naval College. The principal buildings lie near the Prince of Wales's Gate, the former royal stables being adapted to use as class-rooms, a mess-room, and other apartments, while certain adjacent buildings were also adapted, and a gymnasium and a series of bungalows to serve as dormitories, each accommodating thirty boys, were erected, together with quarters for officers, and for an attached body of marines. By the river Medina, on the Kingsdown portion of the estate, a machine shop and facilities for boating are provided.

At the church of St Mildred, Whippingham, 1½ m. S.S.E. of East Cowes, there are memorials to various members of the royal family.

OSCA LINGUA, or OSCAN, the name given by the Romans to the language of (1) the Samnite tribes, and (2) the inhabitants of Campania (excluding the Greek colonies) from the 4th century

B.C. onwards. We know from inscriptions that it extended southwards over the whole of the Peninsula, except its two extreme projections (see BRUTTII and MESSAPII) covering the districts known as Lucania and Frentanum, and the greater part of Apulia (see LUCANIA, FRENTANI, APULIA). Northward, a very similar dialect was spoken in the Central Apennine region by the PAELIGNI, VESTINI (*q.v.*) and others. But there is some probability that both in the North and in the South the dialect spoken varied slightly from what we may call the standard or central Oscan of Samnium. There can also be no reasonable doubt, though doubt has strangely been raised, that the popular farces at Rome called Atellanae were acted in Oscan; Strabo (v. p. 233) records this most explicitly as a curious survival.

This name, for what ought probably to be called the Samnite or Safine speech, is due to historical causes, but is, in fact, incorrect. The Osci proper were not Samnites, but the Italic, Pre-Tuscan and Pre-Greek inhabitants of Campania. This is the sense in which Strabo regularly uses the name ῎Οσκοι (cf. v. 247), so that it is quite possible that we should connect them with the other tribes whose Ethnica were formed with the *-co-* suffix and with the plebs of Rome (see VOLSCI and ROME).

For further evidence as to the history of the names *Osci*, *Opsci*, *Opici*, see R. S. Conway, *The Italic Dialects*, p. 149.

The chief monuments of the language, as spoken in Campania, come from Pompeii, Nola, Capua and Cumae (*q.v.*). From the two towns last mentioned we have the interesting group of heraldic inscriptions known as *Iovilae* (*q.v.*), and two interesting curses inscribed on lead plates and, so to speak, posted in graves, for conveyance to the deities of the Underworld. One of these may be quoted as a typical specimen of the Oscan of Campania:

From the *memnim*-Curse:—

luvikis ůhtavis
statiis gaviis nep fatiͤum nep deiͤkum putiͤans;
luvkis uhtavis nůvellum velliam
nep deiͤkum nep fatiͤum půtiͤad,
nep memnim nep ůlam siͤfeiͤ heriiad.

“ (Lucius Octauius, Statius Gauius neue memorare neue indicare possint. Lucius Octauius Nouellum Velliam neue memorare neue indicare possit, neue monumentum neue sepulcrum (?) sibi adipiscatur.”)

The language as spoken in Samnium may be illustrated by a few sentences from the Tabula Agnonensis, now in the British Museum:—

statůs půs set hůrtiͤn kerriͤiiͤn;
diůveiͤ verehasiůiͤ statiͤf, diůveiͤ regatureiͤ staiͤf,
hereklůiͤ kerriͤiůiͤ statiͤf, patánaiͤ piiͤstiaiͤ statiͤf,
deiͤvaiͤ genetaiͤ statiͤf. aasaiͤ purasiaiͤ saahtům
tefůrům alttreiͤ půtereiͤpiͤd akeneiͤ sakahiͤter.
fluusasiaiͤs az hůrtům sakarater;
pernaiͤ kerriͤiaiͤ statiͤf, ammaiͤ kerriͤiaiͤ statiͤf,
fluusaiͤ kerriͤiaiͤ statiͤf, evklůiͤ patereiͤ statiͤf.

(“ Qui erecti sunt in horto Cereali. Ioui uigiliarum patrono (?) statua, Ioui Rectori statua, Herculi Cereali statua, Pandae Πιστίᾳ (?) statua, Diuae Genetae statua. In ara ignea crematio sancta altero quōque festo (an ‘anno’?) sancitur (an ‘sanciatur’?). Deabus Floralibus iuxta hortum sacratur (an ‘sacrantur’?): Anteuortae (?) Cereali statua, Nutrici Cereali statua, Florae Cereali statua, Mercurio patri statua.”)

It remains to notice briefly (1) the chief characteristics which mark off the Osco-Umbrian, or, as they might more conveniently be termed, the Safine group of dialects, from the Latinian, and (2) the features which distinguish Oscan and the dialects most closely allied to it, *e.g.* North-Oscan (see PAELIGNI), from the Umbrian or (more strictly) Iguvine dialect (see IGUVIUM).

(A.) *Phonology.*—1. The conversion of the Indo-European velars into labials, *e.g.* Oscan and Umbrian *pis* = Lat. *quis*; Osc. Umb. *pod* = Lat. *quod*.

Umb. *petur-pursus* = Lat. *quadrupedibus*; Osc. *kombened* = Lat. *convēnit*, from the Indo-European root *g^{u}em-, Eng. *come*, Sanskrit *gam-*; Umb. accusative *bum* = Sanskrit *gām*, Eng. *cow*, the Lat. *bōs*, *bouis* having been borrowed from some Safine dialect, since the pure Latin form would have been **uōs*

2. The extrusion or syncope (*a*) of short vowels in the second syllable of a word, *e.g.* Oscan *opsā-*, Umbrian *osā-*, from an Italic stem **opesā-*, “to work, build,” cf. Lat. *opera*, “work,” and *operāri* (although this verb appears in Latin to have been invented only at a late period); Osc. *actud*, Umb. *aitu* = Lat. *agito*; Umb. *mersto-*, from Italic **medesto-*, “iustus,” beside Lat. *modestus*. (*b*) Of short vowels before final *s*, Osc. *hůrz* (pronounced *horts*) = Lat. *hortus*; Umb. *ikuvins* = Lat. *Iguuinus*; Osc. nom. pl. *humuns*, O. Lat. *homōnes*; Umb. abl. pl. *avis* for **avifos* = Lat. *auibus*.

3. The preservation of *s* before *n*, *m* and *l* (whereas in Latin it is lost with “compensatory lengthening” of the previous vowel when the change is medial): Umb. *ahesnes*, abl. pl. = Lat. *ahenis*; Paelignian *prismu* (nom. sing. fem.) = Lat. *prima*; Osc. *Slabiis* = Lat. *Labius*.

4. Instead of Lat. *-nd-* we have in Osco-Umbrian *nn*—which the Umbrian poet Plautus reproduces as a vulgarism in the well-known line (*Miles Glor.*, v. 14, l. 1399), *distennite hominem, et dispennite*; hence the gerundives, Osc. *opsannam* = Lat. *operandam*. So Umbrian *pihaner*, from *pihanneis* (gen. sing. masc.), equivalent to Lat. *piandi*. It is not certain what the original group of sounds was which appears in the shape of *-nn-* in Osco-Umbrian and *-nd-* in Latin, nor whether this group of sounds, whatever it was (possibly *-ni̯-*), became *-nd-* before it became *-nn-*.

5. Final *ā* became *o* in both Oscan (*ů*) and Umbrian (often written *u*), *e.g.* Oscan *viͤů* = Lat. *uia*; Umb. *adro* (nom. pl. neut.) = Lat. *atra*.

6. Italic *ē* became closer in Osco-Umbrian; in the Oscan alphabet it is denoted by a special sign ⊢, which is best reproduced by *iͤ* (although the misleading symbol *í* with an accent upon it is frequently used). In the Umbrian alphabet (see IGUVIUM) it is variously written *e* and *i*, and in the Latin alphabet, when used to write Oscan and Umbrian, we have *e*, *i*, and occasionally even *ei*, *e.g.* Osc. *liͤgatůiͤs* = Lat. *legatis*, but *ligis* (in Latin alphabet) = Lat. *legibus*; Umb. *tref* and *trif* = Lat. *tres*; N. Osc. *sefei* = Lat. *sibi*.

7. An original short *i* in Osco-Umbrian became identical in quality, though not in quantity, with the vowel just described, and is written with just the same symbols in all the alphabets, *e.g.* Osc. *piͤd*, Umb. *peḍ-* = Lat. *quid*.

8. Precisely analogous changes happened with Italic *ō* and *ŭ*; the resulting vowel being denoted in Oscan alphabet both by *u* and by *ů* (V̇), in Umbrian alphabet by *u*, in Latin alphabet by *o*.

It is well to add here one or two other characteristics in which Oscan alone is more primitive, not merely than Latin, but even than Umbrian.

(*a*) Oscan retains *s* between vowels, whereas in both Latin and Umbrian it became *r*. In Oscan it seems to have become voiced, as it is represented by *z* in Latin alphabet, *e.g.* gen. pl. fem. *egmazum*, “rerum”; *ezum*, in Oscan alphabet *esom*, pres. infin. “esse.”

(*b*) Oscan retains the diphthongs *ai*, *ei*, *oi*, *ou* (representing both original *eu* and *ou*) and *au* even in unaccented syllables, *e.g.* abl. pl. *feiͤhůiͤs*, “muris”; dat. pl. *diumpaiͤs*, “lymphis”; infin. *deicum* “dicere.”

(*c*) Oscan retains final, *d*, *e.g.* abl. masc. sing. *dolud* = Lat. *dolo*.

(B.) *Morphology.*—I. *In nouns.* (*a*) Considerable levelling has taken place between the consonantal and the *-o-* stems; thus the gen. sing. masc. of Osc. *teerom* (neut. = Lat. “terra”) is *teereiͤs*, just like that of the consonantal stem *tangin-*, gen. *tangineiͤs*. Conversely we have the abl. *tanginud* on the pattern of *o-* stem ablatives, like *dolud*. (*b*) In the *ā*-stems and the *e*-stems we have several primitive forms which are obscured in Latin, *e.g.* gen. sing. fem. *eituas*, “pecuniae”; gen. pl. masc. *Nůvlanům*, “Nolanorum”; and the locative is still a living case in both declensions, *e.g.* Osc. *tereiͤ* “in terra,” *viaiͤ* “in via.”

II. *In verbs.* (*a*) The formation of the infinitive in *-um-*, *e.g.* Osc. *ezum*, Umb. *erom*, “esse”; *opsaum*, “operari, facere” (cf. art LATIN LANGUAGE, § 32). (*b*) The formation of the future, and future perfect indicative respectively, with stems in *-es-* and *-us-*; Oscan *didest*, “dabit”; *deivast* “iurabit”; *censaze* (*n*)*t*, “censebunt”; Umb. *ferest*, “feret”; fut. perf. Osc. *fefacust*, “fecerit”; Osc. and Umb. *fust*, “fuerit”; Umb. *fakust*, “fecerit,” *fakurent*, “fecerint”; *furent*, “fuerint.” (*c*) Several new methods of forming the perfect from vowel stems, *e.g.* the Oscan and Umbrian *-f-* perfects. Osc. 1st sing. perf. *manafum*, “mandaui”; 3rd sing. *aamanaffed*, “mandauit, imperauit”; 3rd pl. Osc. *fufens*, “fuerunt” (cf. Umb. perf. subj. passive impersonal *pihafei*, “piatum sit”). One other formation occurs frequently in Oscan (from *ā-* verbs), whose origin is obscure. In this the perfect characteristic is *-tt-*, *e.g.* *průfatted*, “probauit.” (*d*) The peculiar and interesting impersonal or semi-personal forms which ultimately developed into a full passive, *e.g.* Osc. *sakrafiͤr*, “sacrauerit aliquis” governing an accusative; Umb. *ferar*, “ferat aliquis” (see the section on the passive under *Latin Language*).

(C.) *Syntax.*—It may be said generally that there are very few if any peculiarities in the syntax of the Oscan and Umbrian inscriptions as compared with Latin usage, though a large number of familiar Latin idioms appear, such as the abl. absolute; the abl.

of circumstance, the genitive in judicial phrases, the use of the neut. adj. as an abstract substantive, *e.g.* Oscan *ualaemom touticom*, "optimum publicum," *i.e.* "optima rei publicae ratio." In verbal forms the same use of the gerundive combined with the noun to represent the total verbal action, *e.g.* Umb. *ocrer pehaner paca*, "arcis piandae causa"; the usual sequence of tenses, *e.g.* the imperfect subj. in Oratio Obliqua representing the fut. indic. in Oratio Recta (see Cippus Abellamus *b* 23, 25); and finally the use of the perf. subj. in Oscan in prohibitions (*nep fefacid*, "neue fecerit"), but also in positive commands (Osc. *sakrafír*, see above).

Fuller accounts of the dialects in all these aspects will be found most exhaustively in Von Planta, *Grammatik der Oskisch-umbrischen Dialekte* (Strassburg, 1892–1897). Less fully, but very clearly and acutely in C. D. Buck's *Oscan and Umbrian Grammar* (Boston, U.S.A., 1904). R. S. Conway, *The Italic Dialects*, vol. ii. (Cambridge, 1897), gives a fuller account of the alphabets and their history, a Conspectus of the Accidence and an account of the Syntax at some length. (R. S. C.)

OSCAR I. (1799–1859), king of Sweden and Norway, was the son of General Bernadotte, afterwards King Charles XIV. of Sweden, and his wife, Eugénie Désirée Clary, afterwards Queen Desideria. When, in August 1810, Bernadotte was elected crown prince of Sweden, Oscar and his mother removed from Paris to Stockholm (June 1811). From Charles XIII. the lad received the title of duke of Södermanland (Sudermania). He quickly acquired the Swedish language, and, by the time he reached manhood, had become a general favourite. His very considerable native talents were developed by an excellent education, and he soon came to be regarded as an authority on all social-political questions. In 1839 he wrote a series of articles on popular education, and (in 1841) an anonymous work, *Om Straff och straffanstalter*, advocating prison reforms. Twice during his father's lifetime he was viceroy of Norway. On the 19th of June 1823 he married the princess Josephine, daughter of Eugène de Beauharnais, duke of Leuchtenberg, and granddaughter of the empress Josephine. In 1838 the king began to suspect his heir of plotting with the Liberal party to bring about a change of ministry, or even his own abdication. If Oscar did not actively assist the Opposition on this occasion, his disapprobation of his father's despotic behaviour was notorious, though he avoided an actual rupture. Yet his liberalism was of the most cautious and moderate character, as the Opposition, shortly after his accession (March 8th, 1844), discovered to their great chagrin. He would not hear of any radical reform of the cumbrous and obsolete constitution. But one of his earliest measures was to establish freedom of the press. Most of the legislation during Oscar I.'s reign aimed at improving the economic position of Sweden, and the *riksdag*, in its address to him in 1857, rightly declared that he had promoted the material prosperity of the kingdom more than any of his predecessors. In foreign affairs Oscar I. was a friend of the principle of nationality. In 1848 he supported Denmark against Germany; placed Swedish and Norwegian troops in cantonments in Fünen and North Schleswig (1849–1850); and mediated the truce of Malmö (August 26th, 1848). He was also one of the guarantors of the integrity of Denmark (London protocol, May 8th, 1852). As early as 1850 Oscar I. had conceived the plan of a dynastic union of the three northern kingdoms, but such difficulties presented themselves that the scheme had to be abandoned. He succeeded, however, in reversing his father's obsequious policy towards Russia. His fear lest Russia should demand a stretch of coast along the Varanger Fjord induced him to remain neutral during the Crimean War, and, subsequently, to conclude an alliance with Great Britain and France (November 25th, 1855) for preserving the territorial integrity of Scandinavia. Oscar I. left four sons, of whom two, Carl (Charles XV.) and Oskar Fredrik (Oscar II.), succeeded to his throne.

See T. Almén, *Ätten Bernadotte* (Stockholm, 1896); and C. E. Akrell, *Minnen från Carls XIV., Oscars I. och Carls XV. Lagar* (Stockholm, 1884, 1885). Also NORWAY (*history*) and SWEDEN (*history*).

OSCAR II. (1829–1907), king of Sweden and Norway, son of Oscar I., was born at Stockholm on the 21st of January 1829. He entered the navy at the age of eleven, and was appointed junior lieutenant in July 1845. Later he studied at the university of Upsala, where he distinguished himself in mathematics. In 1857 he married Princess Sophia Wilhelmina, youngest daughter of Duke William of Nassau. He succeeded his brother Charles XV. on the 18th of September 1872, and was crowned in the Norwegian cathedral of Drontheim on the 18th of July 1873. At his accession he adopted as his motto *Brödrafolkens Väl*, "the welfare of the brother folk," and from the first he realized the essential difficulties in the maintenance of the union between Sweden and Norway. The political events which led up to the final crisis in 1905, by which the thrones were separated, are dealt with in the historical articles under NORWAY and SWEDEN. But it may be said that the peaceful solution eventually adopted could hardly have been attained but for the tact and patience of the king himself. He declined, indeed, to permit any prince of his house to become king of Norway, but better relations between the two countries were restored before his death, which took place at Stockholm on the 8th of December 1907. His acute intelligence and his aloofness from the dynastic considerations affecting most European sovereigns gave the king considerable weight as an arbitrator in international questions. At the request of Great Britain, Germany and the United States in 1889 he appointed the chief justice of Samoa, and he was again called in to arbitrate in Samoan affairs in 1899. In 1897 he was empowered to appoint a fifth arbitrator if necessary in the Venezuelan dispute, and he was called in to act as umpire in the Anglo-American arbitration treaty that was quashed by the senate. He won many friends in England by his outspoken and generous support of Great Britain at the time of the Boer War (1899–1902), expressed in a declaration printed in *The Times* of the 2nd of May 1900, when continental opinion was almost universally hostile.

Himself a distinguished writer and musical amateur, King Oscar proved a generous friend of learning, and did much to encourage the development of education throughout his dominions. In 1858 a collection of his lyrical and narrative poems, *Memorials of the Swedish Fleet*, published anonymously, obtained the second prize of the Swedish Academy. His "Contributions to the Military History of Sweden in the Years 1711, 1712, 1713," originally appeared in the *Annals* of the Academy, and were printed separately in 1865. His works, which included his speeches, translations of Herder's *Cid* and Goethe's *Torquato Tasso*, and a play, *Castle Cronberg*, were collected in two volumes in 1875–1876, and a larger edition, in three volumes, appeared in 1885–1888. His Easter hymn and some other of his poems are familiar throughout the Scandinavian countries. His *Memoirs of Charles XII.* were translated into English in 1879. In 1885 he published his *Address to the Academy of Music*, and a translation of one of his essays on music appeared in *Literature* on the 19th of May 1900. He had a valuable collection of printed and MS. music, which was readily accessible to the historical student of music.

His eldest son, Oscar Gustavus Adolphus, duke of Wärmland (b. 1858), succeeded him as Gustavus V. His second son, Oscar (b. 1859), resigned his royal rights on his marriage in 1888 with a lady-in-waiting, Fröken Ebba Munck, when he assumed the title of Prince Bernadotte. From 1892 he was known as Count Wisborg. The king's other sons were Charles, duke of Westergötland (b. 1861), who married Princess Ingeborg of Denmark; and Eugène, duke of Nerike (b. 1865), well known as an artist.

OSCEOLA (a corruption of the Seminole *As-se-he-ho-lar*, meaning black drink) (*c.* 1804–1838), a Seminole American Indian, leader in the second Seminole War, was born in Georgia, near the Chattahoochee river. His father was an Englishman named William Powell; his mother a Creek of the Red Stick or Mikasuki division. In 1808 he removed with his mother into northern Florida. When the United States commissioners negotiated with the Seminole chiefs the treaties of Payne's Landing (9th of May 1832) and Fort Gibson (28th of March 1833) for the removal of the Seminoles to Arkansas, Osceola seized the opportunity to lead the opposition of the young warriors, and declared to the U.S. agent, General Wiley Thompson, that any chief who prepared to remove would be killed. At the Agency (Fort King, in Marion county) he became more violent, and in the summer of 1835 Thompson put him in irons. From this confinement he obtained his release by a profession of penitence and of willingness to emigrate. Late in November 1835 he murdered Charley Emathla (or Emartla), a chief who was preparing to emigrate with his people, and on the 28th of December he and a few companions shot and killed General Thompson. On the same day two companies of infantry under Major Francis L. Dade were massacred at the Wahoo Swamp near the Withlacoochee river, while marching from Fort Brooke on Tampa Bay to the relief of Fort King. In a battle fought three days later at a ford of the Withlacoochee, Osceola was at the head of a negro detachment, and although the Indians and negroes were repulsed by troops under General Duncan L. Clinch (1787–1849), they continued, with Osceola as their most crafty and determined leader, to murder and devastate, and occasionally to engage the troops. In February 1836 General Edmund P. Gaines (1777–1849), with about 1100 men from New Orleans, marched from Fort Brooke to Fort King. When he attempted to return to Fort Brooke, because there were not the necessary provisions at Fort King, the Indians disputed his passage across the Withlacoochee. In the same year Generals Winfield Scott and Richard K. Call (1791–1862) conducted campaigns against them with little effect, and the year closed with General Thomas Sidney Jesup (1788–1860) in command with 8000 troops at his disposal. With mounted troops General Jesup drove the enemy from the Withlacoochee country and was pursuing them southward toward the Everglades when several chiefs expressed a readiness to treat for peace. In a conference at Fort Dade on the Withlacoochee on the 6th of March 1837 they agreed to cease hostilities, to withdraw south of the Hillsborough river, and to prepare for emigration to Arkansas, and gave hostages to bind them to their agreement. But on the 2nd of June Osceola came to the camp at the head of about 200 Mikasuki (Miccosukees) and effected the flight of all the Indians there, about 700 including the hostages, to the Everglades. Hostilities were then resumed, but in September Brigadier General Joseph M. Hernandez captured several chiefs, and a few days later there came from Osceola a request for an interview. This was granted, and by command of General Jesup he was taken captive at a given signal and carried to Fort Moultrie, at Charleston, South Carolina, where he died in January 1838. The war continued until 1842, but after Osceola's death the Indians sought to avoid battle with the regular troops and did little but attack the unarmed inhabitants.

See J. T. Sprague, *The Origin, Progress and Conclusion of the Florida War* (New York, 1848).

OSCHATZ, a town in the kingdom of Saxony, in the valley of the Döllnitz, 36 m. N.W. of Dresden, on the trunk railway to Leipzig. Pop. (1905) 10,854. One of its three Evangelical churches is the handsome Gothic church of St Aegidius, with twin spires. Sugar, felt, woollens, cloth and leather are manufactured, and there is considerable trade in agricultural produce. Four miles west lies the Kolmberg, the highest eminence in the north of Saxony.

See C. Hoffmann, *Historische Beschreibung der Stadt Oschatz* (Oschatz, 1873–1874); and Gurlitt, *Bau- und Kunstdenkmäler der Amtsmannschaft Oschatz* (Dresden, 1905).

OSCHERSLEBEN, a town of Germany, in the Prussian province of Saxony, on the Bode, 24 m. by rail S.W. of Magdeburg, and at the junction of lines to Halberstadt and Jerxheim. Pop. (1905) 13,271. Among its industrial establishments are sugar-refineries, iron-foundries, breweries, machine-shops and brick works. Oschersleben is first mentioned in 803, and belonged in the later middle ages to the bishops of Halberstadt.

OSCILLA, a word applied in Latin usage to small figures, most commonly masks or faces, which were hung up as offerings to various deities, either for propitiation or expiation, and in connexion with festivals and other ceremonies. It is usually taken as the plural of *oscillum* (dimin. of *os*), a little face. As the *oscilla* swung in the wind, *oscillare* came to mean to swing, hence in English "oscillation," the act of swinging backwards and forwards, periodic motion to and fro, hence any variation or fluctuation, actual or figurative. For the scientific problems connected with oscillation see Mechanics and Oscillograph.

Many *oscilla* or masks, representing the head of Bacchus or of different rustic deities, are still preserved. There is a marble *oscillum* of Bacchus in the British Museum. Others still in existence are made of earthenware, but it seems probable that wax and wood were the ordinary materials. Small rudely shaped figures of wool, known as *pilae*, were also hung up in the same way as the *oscilla*.

The festivals at which the hanging of *oscilla* took place were: (1) The *Sementivae Feriae*, or sowing festivals, and the *Paganalia*, the country festivals of the tutelary deities of the pagi; both took place in January. Here the oscilla were hung on trees, such as the vine and the olive, oak and the pine, and represented the faces of Liber, Bacchus or other deity connected with the cultivation of the soil (Virg. *Georg.* ii. 382-396). (2) The *Feriae Latinae*; in this case games were played, among them swinging (*oscillatio*); cf. the Greek festival of *Aeora* (see Erigone). *Festus* (*s.v. Oscillum*, ed. Müller, p. 194) says that this swinging was called *oscillatio* because the swingers masked their faces (*os celare*) out of shame. (3) At the *Compitalia*, Festus says (*Paul. ex Fest.* ed. Müller, p. 239) that *pilae* and *effigies viriles et muliebres* made of wool were hung at the cross-roads to the Lares, the number of *pilae* equalling that of the slaves of the family, the *effigies* that of the children; the purpose being to induce the Lares to spare the living, and to be content with the *pilae* and images. This has led to the generally accepted conclusion that the custom of hanging these *oscilla* represents an older practice of expiating human sacrifice. There is also no doubt a connexion with lustration by the purifying with air.

OSCILLOGRAPH. In connexion with the study of alternating or varying electric current, appliances are required for determining the mode in which the current varies. An instrument for exhibiting optically or graphically these variations is called an oscillograph, or sometimes an ondograph. Several methods have been employed for making observations of the form of alternating current curves—(1) the point-by-point method, ascribed generally to Jules Joubert; (2) the stroboscopic methods, of which the wave transmitter of H. L. Callendar, E. B. Rosa, and E. Hospitalier are examples; (3) methods employing a high-frequency galvanometer or oscillograph, which originated with A. E. Blondel, and are exemplified by his oscillograph and that of W. Duddell; and (4) purely optical methods, such as those of I. Fröhlich and K. F. Braun.

In the point-by-point method the shaft of an alternator, or an alternating current motor driven in step with it, is furnished with an insulating disk having a metallic slip inserted in its edge. Against this disk press two springs which are connected together at each revolution by the contact of the slip at an assigned instant during the phase of the alternating current. This contact may be made to close the circuit of a suitable voltmeter, or to charge a condenser in connexion with it, and the reading of the voltmeter will therefore not be the average or effective voltage of the alternator, but the instantaneous value of the electromotive force corresponding to that instant during the phase, determined by the position of the rotating contact slip with reference to the poles of the alternator. If the contact springs can be moved round the disk so as to vary the instant of contact, we can plot out the value of the observed instantaneous voltage of the machine or circuit in a wavy curve, showing the wave form of the electromotive force of the alternator. This process is a tedious one, and necessarily only gives the average form of thousands of different alternations.

In the Hospitalier ondograph,[1] a synchronous electric motor driven in step with the periodic current in the circuit being tested drives a cylinder of insulating material having a metallic slip let into its edge. This cylinder is driven at a slightly lower speed than that of synchronism. Three springs press against the cylinder and make contact for a short time during each revolution, so that a condenser is charged by the circuit at an assigned instant during the alternating current phase, and then subsequently connected to a voltmeter. This process, so to speak, samples or tests the varying electromotive force of the alternating current at one particular instant during the phase and measures it on a voltmeter. Owing to the fact that the cylinder is losing or gaining slightly in speed on the circuit periodicity, the voltmeter goes slowly, say in one minute, through all the phases of voltage which are performed rapidly during each period by the alternating current. The voltmeter needle may then be made to record its variations graphically on a drum covered with paper and so to delineate the wave form of the current. The process is analogous to the optical experiment of looking at a quickly rotating wheel or engine through slits in a disk, rotating slightly faster or slower than the object observed. We then see the engine going through all its motions but much more slowly, and can follow them easily. In another form devised by Callendar,[1] a revolving contact disk is placed on the shaft of an alternator, or of a synchronous motor driven by the alternating current under test. A pair of contact springs are slowly shifted over so as to close the circuit at successive assigned instants during a complete phase. The electromotive force so selected is balanced against the steady potential difference produced between a fixed and a sliding contact on a wire traversed by another steady current, and if there is any difference between this last, the potential difference, and the instantaneous potential difference balanced against it, a relay is operated and sets in action a motor which shifts the contact point along the potentiometer wire and so restores the balance. This contact point also carries a pen which moves over a rotating drum covered with paper. As the brushes are slowly shifted over on the revolving contact so as to select different phases of the alternating electromotive force, the pen follows and draws a curve delineating the wave form of that electromotive force or current. An instrument devised by E. B. Rosa is not very different in construction.[2] A commutator method has also been devised by T. R. Lyle (*Phil. Mag.*, November 1903, 6. 517) in which at an assigned instant during the phase a selection is made from the periodic current and measured on a galvanometer.

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[1] E. Hospitalier, "The Slow Registration of Rapid Phenomena by Stroboscopic Methods," *Journ. Inst. Elec. Eng.* (London, 1904), 33, 175. In this paper the author describes the "Ondographe" and "Puissancegraphe." See also a description of the ondograph in the *Electrical Review*, (1902), 50, 969.

The oscillographs of A. E. Blondel[3] and W. Duddell operate on a different principle. They consist essentially of a galvanometer of which the needle or coil has such a short natural periodic time that it can follow all the variations of a current which runs through its cycle in say $\frac{1}{100}$th second. This needle or coil must be so damped that when the current is cut off it returns to zero at once without overshooting the mark. By means of an attached mirror and reflected ray of light the motion of the movable system can be indicated on a screen. This ray is also given a periodic motion of the same frequency by reflection from a separate oscillating mirror so as to make the two motions at right angles to one another, and thus we have depicted on the screen a bright line having the same form as the periodic current being tested. In W. Duddell's oscillograph[4] (fig. 1) the galvanometer part consists of an electromagnet in the field of which is stretched a loop of very fine wire. To this is attached a mirror; hence, if a current goes up one side of a loop and down another, the wires are oppositely displaced in the field. The loop and mirror move in a cavity full of oil to render the system dead-beat. A ray of light is reflected from this mirror and from another mirror which is rocked by a small motor driven off the same circuit, so that the ray has two vibratory motions imparted to it at right angles, one a simple harmonic motion and the other a motion imitating the variation of the current or electromotive force under test. This ray can be received on a screen or photographic plate, and thus the wave form of the current is recorded. In the Duddell oscillograph it is usual to place a pair of loops in the magnetic field, each with its own mirror, so that a pair of curves can be delineated at the same time, and if there is any difference in phase between them, it will be detected. Thus we can take two curves, one showing the potential difference at the end of an inductive circuit, and the other the current flowing through the circuit. In one form of Blondel's oscillograph, the vibrating system is a small magnetic needle carrying a mirror, but the principle on which it operates is the same as that of the instrument above described. The oscillograph can be made to exhibit optically the form of the current curve in non-cyclical phenomena, such as the discharge of a condenser. In this case the large vibrating mirror must be oscillated by a current from an alternator, on the shaft of which is a disk of non-conducting material with brass slips let into it and so arranged with contact brushes that in each period of the alternator a contact is made, charging say a condenser and discharging it through the oscillograph. In this way an optical representation is obtained of the oscillatory discharge of the condenser. A form of thermal oscillograph has been devised by J. T. Irwin (*Jour. Inst. Elec. Eng. Lond.* 1907, 39. 617). In this instrument the periodic current, the time variation of which is being studied, passes through a pair of fine wires or strips, going up one wire and down the other. These wires are also traversed in the same direction by a constant current from a battery. The two currents are therefore added in one wire and subtracted in the other, and produce a differential heating effect which causes unequal expansion, and this in turn is made to tilt a mirror which reflects a ray of light on to a screen or photographic plate as in the Duddell oscillograph.

Finally, purely optical methods have been employed. Braun[5] devised a form of cathode ray tube, consisting of a vacuum tube having a narrow tubular portion and a bulbous end. The cathode terminal is connected to the negative pole of an electrostatic machine, such as a Wimshurst or Voss machine, giving a steady pressure. A cathode discharge is projected through two small holes in plates in the narrow part of the tube on a fluorescent screen at the end of the enlarged end, and the cathode ray or pencil depicts on it a small bright greenish patch of light. If a pair of coils of wire through which an alternating current is passing are placed on either side of the tube, just beyond one of the plates with a hole in it, the field causes a periodic displacement of the cathode ray and elongates the patch of light into a bright line. If this patch is also given a displacement in the direction of right angles by examining it in a steadily vibrating mirror, we see a wavy or oscillatory line of light which is an optical representation of the wave form of a current in the coils embracing the Braun tube.

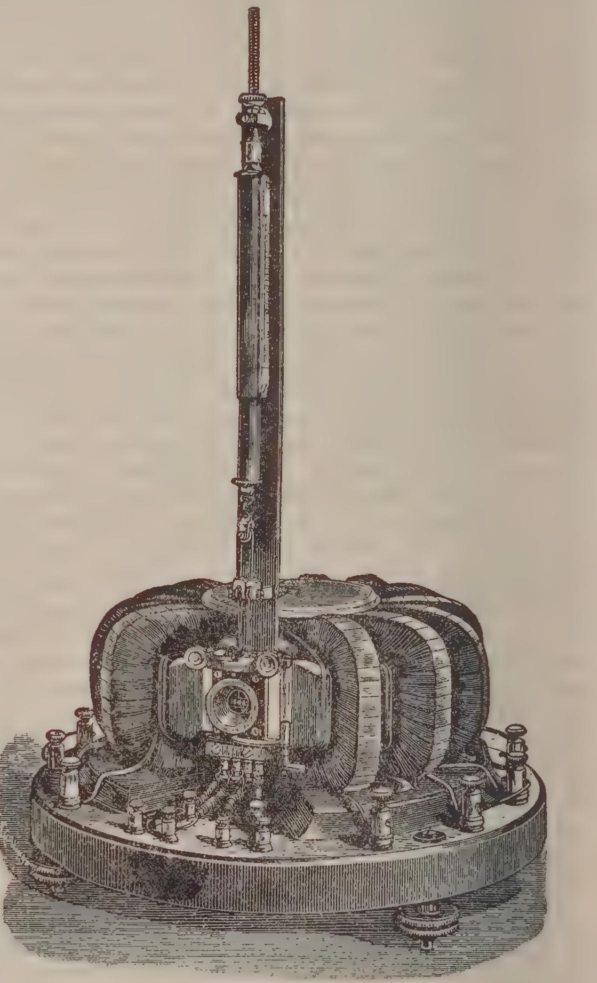

FIG. 1.

References.—See J. A. Fleming, *A Handbook for the Electrical Laboratory and Testing Room*, vol. i. (London, 1901), which contains a list of original papers on the oscillograph; Id., *The Principles of Electric Wave Telegraphy* (London, 1906), which gives illustrations of the use of the oscillograph and the Braun cathode ray tube in depicting condenser discharges; also, for the development of the oscillograph, A. E. Blondel, "Oscillographs: New Apparatus for registering Electrical Oscillations" (a short description of the bifilar and soft iron oscillographs), *Comptes rendus* (1893), 116. 502; Id., "On the Determination and Photographic Registration of Periodic Curves," *La Lumière électrique* (August 29th, 1901); Id.,

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[1] H. L. Callendar, "An Alternating Cycle Curve Recorder," *Electrician*, 41. 582.

[2] E. B. Rosa, "An Electric Curve Tracer," *Electrician*, 40. 126.

[3] See *Assoc. Franç. pour l'Avanc. des Sciences* (1898), for a paper on oscillographs describing Blondel's original invention of the oscillograph in 1891.

[4] *Electrician* (1897). 39. 636

[5] See K. F. Braun, *Wied. Ann.* (1897), 60. 552; H. M. Varley, *Phil. Mag.* (1902), 3500; and J. M. Varley and W. H. F. Murdock, "On some Applications of the Braun Cathode Ray Tube," *Electrician* (1905), 55. 335.

"New Oscillographs," *L'Éclairage électrique* (May 1902); Id., "Theory of Oscillographs," *L'Éclairage électrique* (October 28th, 1902). "Hot Wire Wattmeters and Oscillographs," J. T. Irwin, *Jour. Inst. Elec. Eng.* (1907), 39. 617. (J. A. F.)

OSH, a town of Russian Turkestan, in the government of Ferghana, 31 m. S.E. of Andijan railway terminus, at an altitude of 4030 ft. Pop. (1900) 37,397. It consists of two parts, native and Russian. Here begins a good road up to the Pamirs, practicable for artillery. The trade with China is considerable.

O'SHANASSY, SIR JOHN (1818–1883), British colonial statesman, was born in 1818 at Holycross Abbey, near Thurles, Tipperary, his father being a land surveyor. He married in 1839, and the same year emigrated to the Port Phillip district of New South Wales, where he was for some time engaged in farming, and subsequently commenced business in Melbourne. Dr Geoghegan, afterwards Roman Catholic bishop of Adelaide, induced him to take part in public affairs. He was one of the founders, and later the president, of the St Patrick's Society of Melbourne, and represented the Roman Catholic body on the denominational board of education. When Port Phillip was separated from New South Wales in 1851 and became the colony of Victoria, O'Shanassy was returned to the Legislative Council as one of the members for Melbourne. A few weeks after the new colony began its independent existence gold was discovered, and the local government had to solve a number of difficult problems. The legislature was composed partly of elected representatives, and partly of nominees appointed by the governor in council. The great natural ability of O'Shanassy forced him to the front, and for some time the policy of the country was virtually shaped by him and by Mr (afterwards Sir) W. F. Stawell, the attorney-general. It was very much owing to the strong position taken by O'Shanassy that the Legislative Council was allowed to control not only the ordinary revenue raised by taxation, but also the territorial revenue derived from the sale and occupation of crown lands. From that date the Legislative Council, led by O'Shanassy, became virtually supreme. After the Ballarat riots in 1854, O'Shanassy was one of the members of a commission appointed to inquire into the condition of the gold-fields. The commission's report was the foundation of the mining legislation which, initiated in Victoria, was gradually followed by all the Australasian colonies. O'Shanassy, together with Sir Andrew Clarke, was one of the framers of the responsible government constitution. Under this constitution O'Shanassy was returned in 1856 to the Legislative Assembly for Melbourne and Kilmore, but took his seat for the latter constituency. Early in 1857 the Haines ministry, the first formed after the concession of responsible government, was defeated, and O'Shanassy formed a ministry of which he became the premier. But he was defeated after holding office for little more than six weeks. He returned to power in 1858 as chief secretary and premier. One of the first duties of the new ministry was to inaugurate the system of railways, and to raise the necessary funds for their construction. O'Shanassy decided to float a loan of eight millions sterling through the instrumentality of six of the Melbourne banks, and he began the series of borrowings by the Australian governments which subsequently attained such large proportions. In 1859 the ministry resigned, but in August 1861 O'Shanassy formed his third administration. During the two years that it held office the government passed an Education, a Local government, a Civil Service and a Land Act. The object of this last act was to abolish the system of selling the crown lands by auction, and to substitute another which insisted rather upon residence and cultivation than upon obtaining the highest possible price. The act did not carry out all the intentions of its framers, but it was a step in the right direction. The O'Shanassy government was defeated in June 1863, and its chief never again succeeded in regaining office. He did not stand at the general election of 1866, and paid a visit to Europe. In 1867 he returned to Victoria, and was elected to the Legislative Council. In 1870 he was created C.M.G., and in 1874 K.C.M.G. In the latter year he resigned his seat in the council, and did not re-enter public life until 1877, when he was returned to the Assembly for Belfast. His strongly expressed Conservative opinions and his devotion to the interests of the Roman Catholic church impaired his influence in the legislature, which had become extremely democratic during the eleven years that he had been absent from it; and although Sir John was a fearless critic of the policy of the government, he never succeeded in defeating it. He had a singularly comprehensive grasp of all constitutional questions, was an eloquent speaker and an ardent free-trader. He retired from parliament in 1880, and died in 1883.

O'SHAUGHNESSY, ARTHUR WILLIAM EDGAR (1844–1881), English poet, was born in London on the 14th of March 1844, and at the age of seventeen obtained through the first Lord Lytton, who took a peculiar interest in him, the post of transcriber in the library of the British Museum. Two years later he was appointed to be an assistant in the natural history department, where he specialized in ichthyology. But his natural bent was towards literature. He published his *Epic of Women* in 1870, *Lays of France*, a free version of the *Lais* of Marie de France, in 1872, and *Music and Moonlight* in 1874. In his thirtieth year he married a daughter of John Westland Marston, and during the last seven years of his life printed no volume of poetry. *Songs of a Worker* was published posthumously in 1881, O'Shaughnessy dying on the 30th of January in that year from the effects of a chill upon a delicate constitution. O'Shaughnessy was a true singer; but his poems lack importance in theme and dignity in thought. His melodies are often magnificent; and, as in *The Fountain of Tears*, the richness of his imagery conceals a certain vagueness and indecision of the creative faculty. He was very felicitous in bold uses of repetition and echo, by which he secured effects which for haunting melody are almost inimitable. His spirit is that of a mild melancholy, drifting helplessly through the realities of life and spending itself in song. By some critics he has been disparaged, but reparation was done to his memory by Francis Turner Palgrave, who, in the second series of the *Golden Treasury*, said with some exaggeration that his metrical gift was the finest, after Tennyson, of any of the later poets, and that he had "a haunting music all his own."

OSHAWA, a manufacturing town and port of entry of Ontario county, Ontario, Canada, on Lake Ontario and the Grand Trunk railway, 30 m. E.N.E. of Toronto. Pop. (1901) 4394. It contains flour, woollen and grist-mills, piano, farm implement and carriage factories, foundries, tanneries, canning factories, &c. There are a ladies' college and good schools.

OSHIMA, a group of three small islands belonging to Japan, lying southwards of Kiushiu, in 30° 50′ N. and 130° E. Their names, from west to east, are Kuroshima, Iwo-shima and Takashima. Kuro-shima rises to a height of 2475 ft., and Iwo-shima has an active volcano 2480 ft. high. These islands are not to be confounded with Oshima, the most northerly island of the Izu-noshichito, or with the northern group of the Luchu Islands. There are several other islands of the same name in Japan, Oshima signifying "big island." One of the best known lies off the Kii promontory, and has been the scene of many maritime disasters.

OSHKOSH, a city and the county-seat of Winnebago county, Wisconsin, U.S.A., about 75 m. N.N.W. of Milwaukee, on the W. shore of Lake Winnebago at the mouth of the Upper Fox river. Pop. (1900) 28,284, of whom 7356 were foreign-born (including 4500 from Germany), and 16,942 of foreign parentage (including 10,655 of German and 1015 of Bohemian parentage); (1910 census) 33,062. Oshkosh is served by the Chicago, Milwaukee & St Paul, the Chicago & Northwestern and the Minneapolis, St Paul & Sault Ste. Marie railways, by river steamboat lines connecting with other Fox River Valley cities, with the Wisconsin river at Portage, and with the Great Lakes at Green Bay, and by interurban electric lines connecting with Fond du Lac on the S., Green Bay on the N. and Omro on the W. The city lies on both sides of the Fox river, here spanned by six steel bridges, and stretches back to Lake Butte des Morts, an expansion of the Fox. North Park (60 acres), on the lake front, is the most noteworthy of its parks; and there are Chautauqua grounds on the lake front. Yacht races take place annually on Lake Winnebago. Among the public buildings are the City Hall, Post Office, Winnebago County Court House, Public Library (22,000 volumes). Oshkosh is the seat of a State Normal School (1871), the largest in the state. The principal industries are the manufacture of lumber and of lumber products, although the former, which was once of paramount importance, has declined with the cutting of neighbouring forests. In 1905 the value of the city's factory product was $8,796,705, the lumber, timber and planing mill products being valued at $4,671,003, the furniture at $751,511 and the waggons and carriages at $475,935. Oshkosh is an important wholesale distributing centre for a large part of central Wisconsin. Farming and dairying are important industries in the vicinity.

Under the French régime the site of Oshkosh was on the natural route of travel for those who crossed the Fox-Wisconsin portage, and was visited by Marquette, Joliet and La Salle on their way to the Mississippi. There were temporary trading posts here in the 18th century. About 1827 the first permanent settlers came, and in 1830 there were a tavern, a store and a ferry across the river to Algoma, as the S. side of the river was at first called. The settlement was first known as Saukeer, but in 1840 its name was changed to Oshkosh in honour of a Menominee chief who had befriended the early settlers and who lived in the vicinity until his death in 1856. The real prosperity of the place began about 1845 with the erection of two saw mills; in 1850 Oshkosh had 1400 inhabitants, and between 1860 and 1870 the population increased from 6086 to 12,663. In July 1874 and April 1875 the city was greatly damaged by fire.

OSIANDER, ANDREAS (1498–1552), German reformer, was born at Gunzenhausen, near Nuremberg, on the 19th of December 1498. His German name was Heiligmann, or, according to others, Hosemann. After studying at Leipzig, Altenburg and Ingolstadt, he was ordained priest in 1520 and appointed Hebrew tutor in the Augustinian convent at Nuremberg. Two years afterwards he was appointed preacher in the St Lorenz Kirche, and about the same time he publicly joined the Lutheran party, taking a prominent part in the discussion which ultimately led to the adoption of the Reformation by the city. He married in 1525. He was present at the Marburg conference in 1529, at the Augsburg diet in 1530 and at the signing of the Schmalkald articles in 1537, and took part in other public transactions of importance in the history of the Reformation; that he had an exceptionally large number of personal enemies was due to his vehemence, coarseness and arrogance in controversy. The introduction of the Augsburg Interim in 1548 necessitated his departure from Nuremberg; he went first to Breslau, and afterwards settled at Königsberg as professor in its new university at the call of Duke Albert of Prussia. Here in 1550 he published two disputations, the one *De lege et evangelio* and the other *De justificatione*, which aroused a controversy still unclosed at his death on the 17th of October 1552. While he was fundamentally at one with Luther in opposing both Romanism and Calvinism, his mysticism led him to interpret justification by faith as not an imputation but an infusion of the essential righteousness or divine nature of Christ. His party was afterwards led by his son-in-law Johann Funck, but disappeared after the latter's execution for high treason in 1566. Osiander's son Lukas (1534–1604), and grandsons Andreas (1562–1617) and Lukas (1571–1638), were well-known theologians.

Osiander, besides a number of controversial writings, published a corrected edition of the Vulgate, with notes, in 1522, and a *Harmony* of the Gospels—the first work of its kind—in 1537. The best-known work of his son Lukas was an *Epitome* of the *Magdeburg Centuries*. See the *Life* by W. Möller (Elberfeld, 1870).

OSIER (through Fr. from Late Lat. *osaria*, *auxaria*, a bundle of osier or willow twigs), the common term under which are included the various species, varieties and hybrids of the genus Salix, used in the manufacture of baskets. The chief species in cultivation are: *Salix viminalis* (the common osier) and *S. triandra*, *S. amygdalina*, *S. purpurea* and *S. fragilis*, which botanically are willows and not osiers. The first named with some forty of its varieties, formed until recent times the staple basket-making material in England. It is an abundant cropper, sometimes attaining on low-lying soils 13 ft. in height. Full-topped and smooth, it is by reason of its pithy nature mainly cultivated for coarse work and is generally used as brown stuff. Some harder varieties, known as stone osiers and raised on drier upland soils, are peeled and used for fine work. *S. fragilis*, with some half-score varieties, is almost exclusively used by market gardeners for bunching greens, turnips and other produce. Owing to the increased demand for finer work much attention has been given (see BASKET) in recent years to the cultivation of the more ligneous and tougher species, *S. triandra*, *S. purpurea* and *S. amygdalina* with their many varieties and hybrids.

It is commonly supposed that osiers or willows will prove remunerative and flourish with little attention on any poor, wet, marshy soil. This is, however, not the case. No crop responds more readily to careful husbandry and skilful cultivation. For the successful raising of the finer sorts of willows good, well-drained, loamy upland soil is desirable, which before planting should be deeply trenched and cleared of weeds. J. A. Krabe of Prummern near Aachen, the most scientific and practical of German cultivators, the results of whose experiments have been published in his admirable *Lehrbuch der rationellen Weidenkultur* (Aix-la-Chapelle, 1886, et seq.) went so far as to assert that willows prefer a dry to a wet soil. T. Selby of Otford, Kent, in a report dated the 18th of November 1800 (see *Jour. Soc. Arts*, 1801, xix., 75) stated that all kinds of willows invariably throve best on the driest spots of some wet land planted by him. Krabe found that in addition to loam, willows did well on dry ferrugineous, sandy ground with a good top soil of about 6 in. in depth; on poor loamy clay, and even on peaty moors.

At any time, from late winter to early spring, the ground may be planted with "sets," *i.e.* cuttings of about 9 to 16 in. in length, taken from clean, well-ripened rods. These are firmly set to within 3 to 6 in. of the top in rows, 16 to 20 in. apart and spaced at intervals of 8 to 12 in. Yearling sets are largely planted, but the experiments of Krabe tend to prove, and the practice of the best Midland and West of England growers confirms, the superior productiveness of sets cut from two yearling rods. W. P. Ellmore of Leicester, the most experienced and enterprising of Midland cultivators, preferred to plant his sets in squares, 18 to 20 in. apart, in order to admit of the use of the horse hoe in both directions and a freer play of sun and air. Great care should be exercised in planting lest the bark be fractured, loosened or removed from the wood. The ground should be kept free of weeds by frequent hoeing and, if not subject to periodical alluvial floods, manured yearly. The coarser *S. viminalis* may be raised on lowland soil if not water-logged or marshy, but the same attention to trenching and weeding is imperative. Approved varieties of willows cost from 5s. to 17s. 6d. per 1000 sets. The more valuable kinds are known as: New kind, Black mauls, Spaniards, Glibskins, Long-bud, Long-skin, Lancashire red-bud, French, Italians, Pomeranians and Councillors and scores of other local names. A hybrid of *S. viminalis* and *S. triandra*, known as Black-top and introduced by Ellmore has been found to produce the heaviest crops on the best Leicestershire grounds.

Cutting and binding take place in early winter after the fall of the leaf, the crop being known as green whole stuff. The coarser kinds are sorted, cured (dried in the sun and wind) and stacked ready for market. These are known as brown rods. The finer kinds, after the more shrubby or ill-grown rods, termed Ragged, have been rejected, are peeled or buffed. Two methods of stripping are chiefly practised: from the heads (sets) and from the pit. By the former method the rods are left on the ground until spring advances, when a rapid growth of the cork cambium begins. They are then cut direct from the head and the bark is easily removed by drawing the rods through a bifurcated hand-brake of smooth, well-rounded steel, framed in wood. Improved brakes worked by a treadle strip two rods at a time. For the smaller sizes, rubber brakes are sometimes used and, for the very smallest, the fingers either bare or protected by linen bands. This method ensures a clean-butted unfractured rod, but unless great judgment is exercised in selecting the proper time for cutting, the rods will remain double-skinned and the head may bleed. By the "pit" process the green rods are stood upright in shallow pits of water at a depth of about 6 to 9 in. until the sap rises and growth begins, when they are ready for the brake. The defects of this method are that the tops are liable to split in the brake and the butts to remain foul. A third, known as the "pie" system enables the grower to bridge over the interval, and to keep his hands employed, between the end of the "head" and the beginning of the "pit" strippings. The willows are cut at the first indication of the sap rising and "couched" in rotten peelings and soil at a slight angle, the butts being on the ground, which should be strewn with damp straw from a manure heap. The tops are covered lightly with rotted peelings and by periodical application of water, fermentation is induced at the bottom, heat is engendered, the leaves force their way through the covering and peeling may begin. Peeling is chiefly done by women and lasts from early May to the middle of July. After stripping, the rods are bleached in the sun and stored for sale as White. If the rods are to be buffed they are immersed in large tanks of boiling water from 4 to 6 hours. They are then allowed to cool and mellow, are stripped and carefully dried in sun and air and remain dyed a rich tawny brown or buff colour. Brown rods may also be buffed by sinking them in cold water which is heated to boiling point, and maintained at that temperature for the requisite period. Sticks (two or three yearling osiers) are also grown for whitening and buffing: the less ligneous varieties of *S. viminalis* are best adapted for this purpose. Osiers or willows when tied for market vary locally in girth. In the west of England, the Thames valley, Cambridgeshire and Norfolk a "bolt" of green stuff measures 42 to 45 in. in circumference at 10 in. from the butt; a bolt of white or brown, 40 in. In the northern and midland counties the stuff is invariably sold by weight. On the continent of Europe osiers or willows are bunched in sizes of one metre in girth at the butts and (except in Belgium) are also sold by weight.

The cost of planting an acre of fine willows varies greatly; it was estimated by R. L. and R. Cotterell of Ruscombe, Berks, as follows: trenching and cleaning ground, £12; sets, 20,000 at 5s. per 1000, £5; planting and levelling £1. Hoeing, first year, £2; succeeding years about £3, 15s. per annum. After 12 to 15 years the heads become "tired," and should be grubbed up. The first year's crop, known as the "maiden" crop, is of small value but should be cut and the ensuing years of maturity will yield crops of about 130 bolts, green, per acre, worth £9, 15s. If whitened, the loss in bulk and in rejection being two-thirds, this would produce about 44 bolts, which at £30 per load of 80 bolts, the appreciated market value of 1907, would be worth £16, 10s. The cost of whitening is 1s. 6d. per bolt, but against this the value of the rejected Ragged, sold as Brown, should be set off. In years of abundant crops and short demand, prices have fallen to £24 per load.

The cost of planting and the outlay for manuring and weeding during the years of maturity of the crop, are higher in the Midlands and the yield was estimated by Ellmore at 6 to 10 tons per acre, green, worth from £3, 10s. to £6, per ton. White rods, costing from £3, to £3, 7s. 6d. per ton for extra labour, will realize from £22 to £24 per ton. Buff rods costing (with coal at 10s. per ton) £5 per ton extra, will realize from £22 to £32 per ton. From 2¾ to 3 tons of green are required to produce one ton white or buff. Wm. Scaling of Notts estimated the entire cost of an osier plantation at £33, 12s. per acre for the first year and the outlay for the next two years at £7, 5s. and £6, 15s. respectively. The maiden crop he valued at £8, 12s. and the second and third years' crop at £17 and £22.

A table given by Krabe, based on results obtained for 12 plantations amounting to 20 hectares (50 English acres) during 20 years showed the value of produce per Prussian acre (·2553 of an hectare) to be in the 1st year, £3, 6s. In the 2nd year the value of the produce was £8, 19s; in the 3rd year, £9, 15s.; in the 4th year, £8, 10s.; in the 5th year, £8, 1s.; in the 6th year, £7, 6s.; in the 7th year, £5, 19s.; in the 8th year, £8, 9s.; in the 9th year, £5, 5s.; in the 10th year, £6, 10s.; in the 11th year, £5, 11s.; in the 12th year, £4; in the 13th year, £6, 1s.; in the 14th year, £2, 9s.; in the 15th year, £2, 8s.; in the 16th year, £1, 18s.; in the 17th year, £2, 7s.; in the 18th year, £2, 2s.; in the 19th year, £3, 13s.; and in the 20th year, £1, 11s.

The cultivation of osiers is attended with many disturbing causes—winter floods, spring frosts, ground vermin and insect pests of various kinds, sometimes working great havoc to the crop.

The best comprehensive work on the subject is that by Krabe, which has passed through several editions. A pamphlet on the cultivation of osiers in the Fen districts is issued in England by the Board of Agriculture. (T. O.)

OSIMO (anc. *Auximum*, *q.v.*), a town and episcopal see of the Marches, Italy, in the province of Ancona, 10 m. S. of that town by rail. Pop. (1901) 6404 (town); 18,475 (commune). It is situated on the top of a hill 870 ft. above sea-level, whence there is a beautiful view, and it retains a portion of its ancient town wall (2nd century B.C.). The restored cathedral has a portal with sculptures of the 13th century, an old crypt, a fine bronze font of the 16th century and a series of portraits of all the bishops of the see; the town hall contains a number of statues found on the site of the ancient forum and also a few good pictures. The castle (1489) was built by Baccio Pontelli. Silk-spinning and the raising of cocoons are carried on.

OSIRIS, one of the principal gods of the ancient Egyptians. See EGYPT, section *Egyptian Religion*.

OSKALOOSA, a city and the county-seat of Mahaska county, Iowa, U.S.A., about 62 m. S.E. of Des Moines. Pop. (1900) 9212, of whom 649 were foreign-born and 344 were negroes; (1910 U.S. census) 9466. It is served by the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, and the Iowa Central railways, and by interurban electric lines. The city is built on a fertile prairie in one of the principal coal-producing regions of the state. At Oskaloosa is held the Iowa yearly meeting of the Society of Friends; and the city is the seat of Penn College (opened 1873), a Friends' institution, and of the Iowa Christian College (incorporated as Oskaloosa College in 1856 and reincorporated under its present name in 1902). At the village of University Park (incorporated in 1909), a suburb adjoining the city on the E., is the Central Holiness University (1906; coeducational), where the annual camp meeting of the National and Iowa Holiness Associations is held. Coal-mining is the most important industry in the surrounding region. There are deposits of clay and limestone in the vicinity; and among the city's manufactures are drain and sewer tile, paving and building bricks, cement blocks, and warm-air furnaces; in 1905 the factory products were valued at $779,894. Oskaloosa was first settled in 1843; it was selected in 1844 by the county commissioners as a site for the county-seat, and was chartered as a city in 1853. It is said to have been named in honour of the wife of the Indian chief Mahaska (of the Iowa tribe), in whose honour the county was named; a bronze statue of Mahaska (by Sherry E. Fry, an Iowa sculptor) was erected here in 1909.

See W. A. Hunter, "History of Mahaska County," in *Annals of Iowa*, vols. vi.-vii. (Davenport, Iowa, 1868–1869), published by the Iowa State Historical Society.

OSMAN (ʽUSMĀN), the usual form of the Arabic name ʽOTHMĀN, as representing the Turkish and Persian pronunciation of the name. It is used, therefore, for (1) the founder of the Osmanli or Ottoman dynasty, Osman I., who took the title of sultan, ruled in Asia Minor, and died in 1326, and (2) the sixteenth sultan Osman II., who reigned 1616–1621 (see TURKEY: *History*). For the third Mahommedan caliph see OTHMAN and CALIPHATE.

OSMAN (1832–1900), Turkish pasha and mushir (field marshal), was born at Tokat, in Asia Minor, in 1832. Educated at the military academy at Constantinople, he entered the cavalry in 1853, and served under Omar Pasha in the Russian War of 1853–56, in Wallachia and the Crimea. Appointed a captain, in the Imperial Guard, he went through the campaigns of the Lebanon in 1860 and of Crete in 1867 to 1869, under Mustapha Pasha, when he distinguished himself at the capture of the convent of Hagia Georgia, and was promoted lieut.-colonel. He served under Redif Pasha in suppressing an insurrection in Yemen in 1871, was promoted major-general in 1874, and general of division in 1875. Appointed to command the army corps at Widin in 1876 on the declaration of war by Servia, he defeated Tchnernaieff at Saitschar and again at Yavor in July, invaded Servia and captured Alexinatz and Deligrad in October, when the war ended. Osman was promoted to be mushir, and continued in the command of the army corps at Widin. When the Russians crossed the Danube in July 1877, Osman moved his force to Plevna, and, with the assistance of his engineer, Tewfik Pasha, entrenched himself there on the right flank of the Russian line of communication, and gradually made the position a most formidable one. He repulsed the three general assaults of the Russians on the 20th and 30th July and the 11th September, inflicting on them great loss—some 30,000 men in the three battles. He held the position, after being closely invested, until the 9th December, when, compelled by want to cut his way out, he was severely wounded and forced to capitulate. This famous improvised defence of a position delayed the Russians for five months, and entailed their crossing the Balkan range in the depth of winter after the third battle of Plevna. The sultan conferred on Osman the Grand Cross of the Osmanie in brilliants and the title of "Ghazi" (victorious), and, when he returned from imprisonment in Russia, made him commandant of the Imperial Guard, grand-master of the artillery and marshal of the palace. In December 1878 he became war minister, and held the post, with a small break, until 1885. He died at Constantinople, in the palace built for him by the sultan near Yildiz Kiosk, on the 14th of April 1900, and his body was buried with great pomp in the Sultan Muhammad Mosque.

OSMIUM [symbol Os., atomic weight 190·9 (O=16)], in chemistry, a metallic element, found in platinum ore in small particles, consisting essentially of an alloy of osmium and iridium and known as osmiridium. It was first obtained in 1803 by Smithson Tennant (*Phil. Trans.*, 1804, 94, p. 411). It may be prepared from osmiridium by fusing the alloy with zinc, the zinc being afterwards removed by distillation. The residue so obtained is then powdered and ignited with barium nitrate, which converts the iridium into its oxide and the osmium into barium osmiate. The barium salt is extracted by water and boiled with nitric acid, when the osmium volatilizes in the form of its tetroxide. As an alternative the osmiridium is fused with zinc, the regulus treated with hydrochloric acid, and then heated with barium nitrate and barium peroxide. After fusion, the mass is finely powdered and treated with cold dilute hydrochloric acid; and when action has finished, nitric and sulphuric acids are added, the precipitated barium sulphate removed, the liquid distilled and the osmium precipitated as sulphide. The sulphide is converted into sodium osmichloride by fusion with salt, in a current of chlorine, the sodium salt transformed into ammonium salt by precipitation with ammonium chloride, and the ammonium salt finally heated strongly (H. Sainte-Claire-Deville and H. J. Debray, *An. min.*, 1859 [5], 16, 74; see also C. E. Claus, *Jour. prakt. Chem.*, 1862, 85, p. 142; F. Wöhler, *Pogg.* 31, p. 161; E. Leidie and L. Quenessen, *Bull. soc. chim.*, 1903 (8), 29, p. 801). The tetroxide, OsO_4, can be easily reduced to the metal by dissolving it in hydrochloric acid and adding zinc, mercury, or an alkaline formate to the liquid, or by passing its vapour, mixed with carbon dioxide and monoxide, through a red-hot porcelain tube. The metal has a blue-grey colour, and may be obtained in the crystalline state by solution in tin. Its specific gravity is 21·3-22·48 (Deville and Debray) and its specific heat is 0·03113 (Regnault). It can be distilled in the electric furnace. In the massive state it is insoluble in all acids, but when freshly precipitated from solutions it dissolves in fuming nitric acid. On fusion with caustic potash it yields potassium osmiate. It combines with fluorine at 100° C., and when heated with chlorine it forms a mixture of chlorides. A colloidal variety was obtained by A. Gutbier and G. Hofmeier (*Jour. prakt. Chem.*; 1905 (2), 71, p. 452) by reducing osmium compounds with hydrazine hydrate in the presence of gum arabic.

Several oxides of osmium are known. The protoxide, OsO, is obtained as a dark grey insoluble powder when osmium sulphite is heated with sodium carbonate in a current of carbon dioxide. The *sesquioxide*, Os_2O_3, results on heating osmium with an excess of the tetroxide. The dioxide, OsO_2, is formed when potassium osmichloride is heated with sodium carbonate in a current of carbon dioxide, or by electrolysis of a solution of the tetroxide in the presence of alkali. It is insoluble in acids and exists in several hydrated forms. The *osmiates*, corresponding to the unknown trioxide OsO_3, are red or green coloured salts; the solutions are only stable in the presence of excess of caustic alkali; on boiling an aqueous solution of the potassium salt it decomposes readily, forming a black precipitate of osmic acid, H_2OsO_4. *Potassium osmiate*, $K_2OsO_42H_2O$, formed when an alkaline solution of the tetroxide is decomposed by alcohol, or by potassium nitrite, crystallizes in red octahedra. It is stable in dry air, but in moist air rapidly decomposes. The tetroxide, OsO_4, is formed when osmium compounds are heated in air, or with aqua regia, or fused with caustic alkali and nitre. It is obtained as a yellowish coloured mass and can be sublimed in the form of needles which melt at 40° C. It possesses an unpleasant smell and its vapour is extremely poisonous. It dissolves slowly in water, and the aqueous solution is reduced by most metals with precipitation of osmium. It acts as an oxidizing agent, liberating iodine from potassium iodide, converting alcohol into acetaldehyde, &c.

Osmium dichloride, $OsCl_2$, is obtained as a dark coloured powder when the metal is heated in a current of chlorine. Its solution in water is deep blue in colour, but the colour changes rapidly to green and yellow. The *trichloride*, $OsCl_3$, is only known in solution and is formed by the reducing action of mercury on ammoniacal solutions of the tetroxide. A hydrated form of composition $OsCl_3 . 3H_2O$ has been described. The *tetrachloride*, $OsCl_4$, is obtained as a dark red sublimate (mixed with the dichloride) when osmium is heated in dry chlorine. It is soluble in water, but the dilute solution readily decomposes on standing. It combines with the chlorides of the alkali metals to form characteristic double salts of the type $OsCl_4 . 2MCl$ (osmichlorides). *Potassium osmichloride*, K_2OsCl_6, is formed when a mixture of osmium and potassium chloride is heated in a current of chlorine, or on adding potassium chloride and alcohol to a solution of the tetroxide in hydrochloric acid. It crystallizes in dark red octahedra which are almost insoluble in cold water. The aqueous solution decomposes rapidly on boiling. Iodine has no action on osmium, but on warming the tetroxide with a mixture of potassium iodide and hydrochloric acid a deep emerald green colour is produced, due to the formation of a compound $OsI_2 . 2HI$; this reaction is a delicate test for osmium (E. Pinerua Alvarez, *Comptes rendus*; 1905, 140, p. 1254). *Osmium disulphide*, OsS_2, is obtained as a dark brown precipitate, insoluble in water, by passing sulphuretted hydrogen into a solution of an osmichloride. The *tetrasulphide*, OsS_4, is similarly prepared when sulphuretted hydrogen is passed into acid solutions of the tetroxide. It is a brownish black solid, insoluble in solutions of the alkaline sulphides. The atomic weight of the metal has been determined by K. Seubert (*Ber.*, 1888, 21, p. 1839) from the analysis of potassium and ammonium osmichlorides, the values obtained being approximately 191.

OSNABRÜCK, a town and episcopal see of Germany, in the Prussian province of Hanover, situated on the Hase, 70 m. W. of the city of Hanover, 31 m. by rail N.E. of Münster, and at the junction of the lines Hamburg-Cologne and Berlin-Amsterdam. Pop. (1905) 59,580. The older streets contain many interesting examples of Gothic and Renaissance domestic architecture, while the substantial houses of the modern quarters testify to the present prosperity of the town. The old fortifications have been converted into promenades. The Roman Catholic cathedral, with its three towers, is a spacious building of the 13th century, partly in the Romanesque and partly in the Transitional style; but it is inferior in architectural interest to the Marienkirche, a fine Gothic structure of the 14th and 15th centuries. The town hall, a 15th-century Gothic building, contains portraits of some of the plenipotentiaries engaged in concluding the peace of Westphalia, the negotiations for which were partly carried on here from 1644 to 1648. Other important buildings are the museum, erected in 1888–1889 and containing scientific and historical collections; the episcopal palace and the law courts. The lunatic asylum on the Gertrudenberg occupies the site of an ancient nunnery. The town has an equestrian statue of the emperor William I., a statue of Justus Möser (1720–1794) and a memorial of the war of 1870–1871. Linen was formerly the staple product, but it no longer retains that position. The manufactures include machinery, paper, chemicals, tobacco and cigars, pianos and beer. Other industries are spinning and weaving. The town has large iron and steel works and there are coal mines in the neighbourhood. A brisk trade is carried on in grain and wood, textiles, iron goods and Westphalian hams, while important cattle and horse fairs are held here.

Osnabrück is an ancient place and in 888 received the right to establish a mint, a market and a toll-house. Surrounded with walls towards the close of the 11th century, it maintained an independent attitude towards its nominal ruler, the bishop, and joined the Hanseatic League, reaching the height of its prosperity in the 15th century. The decay inaugurated by the dissensions of the Reformation was accelerated by the ravages of the Thirty Years' War, but a new period of prosperity began about the middle of the 18th century. The bishopric of Osnabrück was founded by Charlemagne about 800, after he had subdued the Saxons. It embraced the district between the Ems and the Hunte, and was included in the archbishopric of Cologne. By the peace of Westphalia it was decreed that it should be held by a Roman Catholic and a Protestant bishop alternately, and this state of affairs lasted until the secularization of the see in 1803. In 1815 the bishopric was given to Hanover. The last bishop was Frederick, duke of York, a son of the English king George III. Since 1857 Osnabrück has been the seat of a Roman Catholic bishop.

See Friederici and Stieve, *Geschichte der Stadt Osnabrück* (Osnabrück, 1816–1826); Wurm, *Osnabrück, seine Geschichte, seine Bau und Kunstdenkmäler* (Osnabrück, 1906); and Hoffmeyer, *Geschichte der Stadt und des Regierungsbezirks Osnabrück* (Osnabrück, 1904). See also the *Osnabrücker Geschichtsquellen* (Osnabrück, 1891 fol.); the *Osnabrücker Urkundenbuch*, edited by F. Philippi and M. Bär (Osnabrück, 1892–1902); and the publications of the *Verein für Geschichte und Landeskunde von Osnabrück* (Osnabrück, 1882 fol.). For the history of the bishopric see J. C. Möller, *Geschichte der Weihbischöfe von Osnabrück* (Lingen, 1887); and C. Stüve, *Geschichte des Hochstifts Osnabrück* (Jena, 1872–1882).

OSNABURG, the name given to a coarsish type of plain fabric, originally made from flax yarns. It is now made from either flax, tow or jute yarns—sometimes flax or tow warp with mixed or jute weft, and often entirely of jute. The finer and better qualities form a kind of common sheeting, and the various kinds may contain from 20 to 36 threads per inch and 10 to 15 picks per inch.

OSORIO, JERONYMO (1506–1580), Portuguese historian, was a native of Lisbon and son of the Ouvidor Geral of India. In 1519 his mother sent him to Salamanca to study civil law, and in 1525 he went on to Paris to study philosophy, and there became intimate with Peter Fabre, one of the founders of the Society of Jesus. Returning to Portugal, Osorio next proceeded for theology to Bologna, where he made such a name that King John III. invited him in 1536–1537 to lecture on scripture in the reorganized university of Coimbra. He returned to Lisbon in 1540, and acted as secretary to Prince Luiz, and as tutor to his son, the prior of Crato, obtaining also two benefices in the diocese of Vizeu. In 1542 he printed in Lisbon his treatise *De nobilitate*. After the death of Prince Luiz in 1553, he withdrew from court to his churches. He was named archdeacon of Evora in 1560, and much against his will became bishop of Silves in 1564. The Cardinal Prince Henry, who had bestowed these honours, desired to employ him at Lisbon in state business when King Sebastian took up the reins of power in 1568, but Osorio excused himself on the ground of his pastoral duties, though he showed his zeal for the commonwealth by writing two letters, one in which he dissuaded the king from going to Africa, the other sent during the latter's first expedition there (1574), in which he called on him to return to his kingdom. Sebastian looked with disfavour on opponents of his African adventure, and Osorio found it prudent to leave Portugal for Parma and Rome on the pretext of a visit *ad limina*. His scruples regarding residence, and the appeals of the king and the Cardinal Prince, prevented him enjoying for long the hospitality of Pope Gregory XIII., and he returned to his diocese and died at Tavira on the 20th of August 1580. An exemplary prelate, a learned scholar and an able critic, Osorio gained a European reputation by writing in Latin, then the *lingua franca* of the studious throughout Christendom, and the perfection of his prose style caused him to be named by contemporaries "the Portuguese Cicero." His well-stocked library was carried off from Faro when the earl of Essex captured the town in 1596, and many of the books were bestowed on the Bodleian at Oxford.

His principal works written in Latin include: (1) *De gloria et nobilitate civile et christiana*, an English version of which by W. Blandie appeared in London in 1576. (2) *De justitia*. (3) *De regis institutione et disciplina*. (4) *De vera sapientia*. (5) *De rebus Emmanuelis* (1586), a history of the reign of King Emanuel which is little more than a translation of the chronicle on the same subject by Damião de Goes. Osorio's book was turned into Portuguese by F. M. do Nascimento (*q.v.*), into French by J. Crispin (2 vols., Geneva, 1610), and an English paraphrase in 2 vols. by J. Gibbs came out in London in 1752. His *Opera omnia* were published by his nephew (4 vols., Rome, 1592). Two of his polemical treatises have been translated into English, his *Epistle to Elizabeth Quene of England* by R. Shacklock (Antwerp, 1565), and his *Confutation of M. W. Haddon* by J. Fen (Louvain, 1568). His Portuguese epistles, including the two before mentioned, were printed in Lisbon in two editions in 1818 and 1819, and in Paris in 1859. For his biography see *Obras de D. F. A. Lobo*, bishop of Vizeu, i. 293-301 (Lisbon, 1848). (E. Pr.)

OSPREY, or Ospray, a word said to be corrupted from "Ossifrage," Lat. *ossifraga*, bone-breaker. The *Ossifraga* of Pliny (*H.N.* x. 3) and some other classical writers seems to have been the Lämmergeyer (*q.v.*); but the name, not inapplicable in that case, has been transferred to another bird which is no breaker of bones, save incidentally those of the fishes it devours.[1] The osprey is a rapacious bird, of middling size and of conspicuously-marked plumage, the white of its lower parts, and often of its head, contrasting sharply with the dark brown of the back and most of its upper parts when the bird is seen on the wing. It is the *Falco haliaetus* of Linnaeus, but was, in 1810, established by J. C. Savigny (*Ois. de l'Égypte*, p. 35) as the type of a new genus *Pandion*. It is closely related to the family *Falconidae*, but is the representative of a separate family, *Pandionidae*. *Pandion* differs from the *Falconidae* not only pterylologically, as observed by C. L. Nitzsch, but also osteologically, as pointed out by A. Milne-Edwards (*Ois. foss. France*, ii. pp. 413, 419). In some of the characters in which it differs structurally from the *Falconidae*, it agrees with certain of the owls; but the most important parts of its internal structure, as well as of its pterylosis, forbid a belief that there is any near alliance of the two groups. The special characters of the family are the presence of a reversible outer toe, the absence of an aftershaft and the feathering of the tibiae.

The osprey is one of the most cosmopolitan birds-of-prey. From Alaska to Brazil, from Lapland to Natal, from Japan to Tasmania, and in some of the islands of the Pacific, it occurs as a winter-visitant or as a resident. Though migratory in Europe at least, it is generally independent of climate. It breeds equally on the half-thawed shores of Hudson's Bay and on the cays of Honduras, in the dense forests of Finland and on the barren rocks of the Red Sea, in Kamchatka and in West Australia. Among the countries it does not frequent are Iceland and New Zealand. Where, through abundance of food, it is numerous—as in former days was the case in the eastern part of the United States—the nests of the fish-hawk (to use its American name) may be placed on trees to the number of three hundred close together. Where food is scarcer and the species accordingly less plentiful, a single pair will occupy an isolated rock, and jealously expel all intruders of their kind, as happens in Scotland.[2] Few birds lay eggs so beautiful or so rich in colouring: their white or pale ground is spotted, blotched or marbled with almost every shade of purple, orange and red—passing from the most delicate lilac, buff and peach-blossom, through violet, chestnut and crimson, to a nearly absolute black. The fierceness with which ospreys defend their eggs and young, in addition to the dangerous situation not infrequently chosen for the eyry, make the task of robbing the nests difficult.

The term "osprey," applied to the nuptial plumes of the egrets in the feather trade, is derived from the French *esprit*; it has nothing to do with the osprey bird, and its use has been supposed to be due to a confusion with "spray." (A. N.)

OSROENE, or Osrhoene, a district of north-western Mesopotamia, in the hill country on the upper Bilechas (Belichus; mod. *Nahr Belik*, Bilikh), the tributary of the Euphrates, with its capital at Edessa (*q.v.*), founded by Seleucus I. About 130 B.C. Edessa was occupied by a nomadic Arabic tribe, the Orrhoei (Plin. v. 85; vi. 25, 117, 129), who founded a small state ruled by their chieftains with the title of kings. After them the district was called Orrhoene (thus in the inscriptions, in Pliny and Dio Cassius), which occasionally has been changed into Osroene, in assimilation to the Parthian name Osroes or Chosroes (Khosrau). The founder of the dynasty is therefore called Osroes by Procop. *Bell Pers.* i. 17; but Orhāi or Urhāi, son of Hewyā (*i.e.* "the snake"), in the chronicle of Dionysius of Tellmahre; he is no historical personality, but the eponym of the tribe. In the Syrian *Doctrine of Addai* (ed. Philipps 1876, p. 46) he is called Arjaw, *i.e.* "the lion." The kings soon became dependants of the Parthians; their names are mostly Arabic (Bekr, Abgar, *Ma'nu*), but among them occur some Iranian (Parthian) names, as Pacorus and Phratamaspates. Under Tigranes of Armenia they became his vassals, and after the victories of Lucullus and Pompey, vassals of the Romans. Their names occur in all wars between Romans and Parthians, when they generally inclined to the Parthian side, *e.g.* in the wars of Crassus and Trajan. Trajan deposed the dynasty, but Hadrian restored it. The kings generally used Greek inscriptions on their coins, but when they sided with the Parthians, as in the war of Marcus Aurelius and Verus (A.D. 161–165), an Aramaic legend appears instead. Hellenism soon disappeared and the Arabs adopted the language and civilization of the Aramaeans. This development was hastened by the introduction of Christianity, which is said to have been brought here by the apostle Judas, the brother of James, whose tomb was shown in Edessa. In 190 and 201 we hear of Christian churches in Edessa. King Abgar IX. (or VIII.) (179–214) himself became a Christian and abolished the pagan cults, especially the rite of castration in the service of Atargatis, which was now punished by the loss of the hands (see Bardesanes, "Book of the Laws of Countries," in Cureton, *Spicilegium Syriacum*, p. 31). His conversion has by the legend been transferred to his ancestor Abgar V. in the time of Christ himself, with whom he is said to have exchanged letters and who sent him his miraculous image, which afterwards was fixed over the principal gate of the city (see ABGAR; Lipsius, *Die edessenische Abgarsage* (1880); Dobschütz, *Christusbilder* (1896)). Edessa now became the principal seat of Aramaic-Christian (Syriac) language and literature; the literary dialect of Syriac is the dialect of Edessa.

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[1] Another supposed old form of the name is "Orfraie"; but that is said by M. Rolland (*Faune popul. France*, ii. p. 9, note), quoting M. Suchier (*Zeitschr. röm. Philol.* i. p. 432), to arise from a mingling of two wholly different sources: (1) *Oripelargus*, *Oriperagus*, *Orprais* and (2) *Ossifraga*. "Orfraie" again is occasionally interchanged with *Effraie* (which, through such dialectical forms as *Fresaie*, *Fressaia*, is said to come from the Latin *praesaga*), the ordinary French name for the barn-owl, *Aluco flammeus* (see Owl). According to Skeat's *Dictionary* (i. p. 408), "Asprey" is the oldest English form; but "Osprey" is given by Cotgrave, and is found as early as the 15th century.

[2] Two good examples of the different localities chosen by this bird for its nest are illustrated in *Ootheca Wolleyana*, pls. B. & H.

Caracalla in 216 abolished the kingdom of Osroene (Dio Cass. 77, 12. 14) and Edessa became a Roman colony. The list of the kings of Osroene is preserved in the Syrian chronicle of Dionysius of Tellmahre, which is checked by the coins and the data of the Greek and Roman authors; it has been reconstructed by A. v. Gutschmid, "Untersuchungen über die Geschichte des Königreichs Osroene," in *Mémoires de l'Acad. de St Pétersbourg*, t. xxxv. (1887). Edessa remained Roman till it was taken by Chosroes II. in 608; but in 625 Heraclius conquered it again. In 638 it was taken by the Arabs. (ED. M.)

OSROES (also OSDROES or CHOSROES), the Greek form of the Persian name Khosrau (see CHOSROES). The form Osroes is generally used for a Parthian king who from his coins appears to have reigned from about A.D. 106–129, as successor of his brother Pacorus. But during all this time another king, Vologaeses II. (77–147) maintained himself in a part of the kingdom. Osroes occupied Armenia, and placed Exedares, a son of Pacorus, and afterwards his brother Parthamasiris on the throne. This encroachment on the Roman sphere led to the Parthian war of Trajan. In 114 Parthamasiris surrendered to Trajan and was killed. In Mesopotamia a brother of Osroes, Meherdates (Mithradates IV.), and his son Sanatruces II. took the diadem and tried to withstand the Romans. Against them Trajan united with Parthamaspates, whom he placed on the throne, when he had advanced to Ctesiphon (116). But after the death of Trajan (117) Hadrian acknowledged Osroes and made Parthamaspates king of Edessa (Osroene); he also gave back to Osroes his daughter who had been taken prisoner by Trajan (Dio Cass. 68, 17, 22. 33; Malalas, p. 270 ff.; Spartian, *Vita Hadr.* 5. 13; Pausan. v. 12, 6). But meanwhile Vologaeses II. had regained a dominant position; his coins begin again in 122 and go on to 146, whereas after 121 we have no coins of Osroes except in 128.

By Procopius, *Pers.* i. 17, 24, the name of the territory of Osroene is derived from a dynast Osroes, but this is a false etymology (see OSROENE). (ED. M.)

OSSA (mod. *Kissovo* or Kissavo), a mountain in the district of Magnesia in Thessaly, between Pelion and Olympus, from which it is separated by the valley of Tempe. Height about 6400 ft. The Giants are said to have piled Pelion upon it in their attempt to scale Olympus.

OSSETT, a municipal borough in the Morley parliamentary division of the West Riding of Yorkshire, England, 3 m. W. of Wakefield, on the Great Northern and (Horbury and Ossett station) the Lancashire and Yorkshire railways. Pop. (1901) 12,903. It includes the contiguous townships of Ossett, South Ossett and Gawthorpe. The church of the Holy Trinity, a fine cruciform structure in the Early Decorated style, was erected in 1865. Woollen cloth mills, and extensive collieries in the neighbourhood, employ the large industrial population. There are medicinal springs similar in their properties to those of Cheltenham. The municipal borough, incorporated in 1890, is under a mayor, 4 aldermen and 12 councillors. Area 3238 acres.

OSSIAN, OSSIN or OISIN, the legendary Irish 3rd-century hero of Celtic literature, son of Finn. According to the legend embodied in the Ossianic or Ossinic poems and prose romances which early spread over Ireland and Scotland, Ossian and his Fenian followers were defeated in 283 at the battle of Gabhra by the Irish king Carbery, and Ossian spent many years in fairyland, eventually being baptized by St Patrick. As Oisin he was long celebrated in Irish song and legend, and in recent years the Irish literary revival has repopularized the Fenian hero. In Scotland the Ossianic revival is associated with the name of James Macpherson (*q.v*).

See CELT: *Literature*; also Nutt's *Ossian and the Ossianic Literature* (1899).

OSSINGTON, JOHN EVELYN DENISON, VISCOUNT (1800–1873), English statesman, was the eldest son of John Denison (d. 1820) of Ossington, Nottinghamshire, where he was born on the 27th of January 1800. Educated at Eton and Christ Church, Oxford, he became member of parliament for Newcastle-under-Lyme in 1823, being returned for Hastings three years later, and holding for a short time a subordinate position in Canning's ministry. Defeated in 1830 both at Newcastle-under-Lyme and then at Liverpool, Denison secured a seat as one of the members for Nottinghamshire in 1831; and after the great Reform Act he represented the southern division of that county from 1832 until the general election of 1837. He represented Malton from 1841 to 1857, and North Nottinghamshire from 1857 to 1872. In April 1857 Denison was chosen Speaker of the House of Commons. Re-elected at the beginning of three successive parliaments he retained this position until February 1872, when he resigned and was created Viscount Ossington. He refused, however, to accept the pension usually given to retiring Speakers. In 1827 he had married Charlotte (d. 1889), daughter of William, 4th duke of Portland, but he left no children. He died on the 7th of March 1873, and his title became extinct.

OSSINING, a village of Westchester county, New York, U.S.A., 30 m. N. of New York city, on the E. bank of the Hudson river. Pop. (1900) 7939, of whom 1642 were foreign-born; (1910, U.S. census) 11,480. It is served by the New York Central & Hudson River railway, and by river steamboats. It is finely situated overlooking the Tappan Zee, an expansion of the Hudson river, and has excellent facilities for boating, sailing and yachting. The village is the seat of Mount Pleasant Academy (1814), Holbrook School (1866) and St John's School (1843), all for boys, and has a fine public library. The Croton Aqueduct is here carried over a stone arch with an eighty-foot span. At Ossining, near the river front, is the Sing Sing Prison, the best-known penitentiary in the United States. In 1906 a law was enacted providing for a new prison in the eastern part of the state in place of Sing Sing. The site of Ossining, originally a part of the Phillipse Manor, was first settled about 1700, taking the name of Sing Sing from the Sin Sinck Indians. The village was incorporated in 1813, and was reincorporated, with enlarged boundaries and a considerably increased population, in 1906, the name being changed from Sing Sing to Ossining in 1901.

OSSORY, THOMAS BUTLER, EARL OF (1634–1680), eldest son of James Butler, 1st duke of Ormonde, was born at Kilkenny on the 8th or 9th of July 1634. His early years were spent in

Ireland and France, and he became an accomplished athlete and by no means an indifferent scholar. Having come to London in 1652 he was rightly suspected of sympathizing with the exiled royalists, and in 1655 was put into prison by Cromwell; after his release about a year later he went to Holland and married a Dutch lady of good family, accompanying Charles II. to England in 1660. In 1661 Butler became a member of both the English and the Irish Houses of Commons, representing Bristol in the former and Dublin University in the latter House; and in 1662 was made an Irish peer as earl of Ossory. He held several military appointments, in 1665 was made lieutenant-general of the army in Ireland, and in 1666 was created an English peer as Lord Butler; but almost as soon as he appeared in the House of Lords he was imprisoned for two days for challenging the duke of Buckingham. In 1665 a fortunate accident had allowed Ossory to take part in a big naval fight with the Dutch, and in May 1672, being now in command of a ship, he fought against the same enemies in Southwold Bay, serving with great distinction on both occasions. The earl was partly responsible for this latter struggle, as in March 1672 before war was declared he had attacked the Dutch Smyrna fleet, an action which he is said to have greatly regretted later in life. Whilst visiting France in 1672 he rejected the liberal offers made by Louis XIV. to induce him to enter the service of France, and returning to England he added to his high reputation by his conduct during a sea-fight in August 1673. The earl was intimate with William, prince of Orange, and in 1677 he joined the allied army in the Netherlands, commanding the British section and winning great fame at the siege of Mons in 1678. He acted as deputy for his father, who was lord-lieutenant of Ireland, and in parliament he defended Ormonde's Irish administration with great vigour. In 1680 he was appointed governor of Tangier, but his death on the 30th of July 1680 prevented him from taking up his new duties. One of his most intimate friends was John Evelyn, who eulogizes him in his *Diary*. Ossory had eleven children, and his eldest son James became duke of Ormonde in 1688.

See T. Carte, *Life of James, duke of Ormonde* (1851); and J. Evelyn, *Diary*, edited by W. Bray (1890).

OSSORY (*Osraighe*), an ancient kingdom of Ireland, in the south-west of Leinster. The name is preserved by dioceses of the Church of Ireland and the Roman Catholic Church. The kingdom of Ossory was founded in the 2nd century A.D., and its kings maintained their position until 1110.

OSTADE, the name of two Dutch painters whose ancestors were settled at Eyndhoven, near the village of Ostaden. Early in the 17th century Jan Hendricx, a weaver, moved from Eyndhoven to Haarlem, where he married and founded a large family. The eldest and youngest of his sons became celebrated artists.

1. Adrian Ostade (1610–1685), the eldest of Jan Hendricx's sons, was born and died at Haarlem. According to Houbraken he was taught by Frans Hals, at that time master of Adrian Brouwer. At twenty-six he joined a company of the civic guard at Haarlem, and at twenty-eight he married. His wife died in 1640 and he speedily re-married, but again became a widower in 1666. He took the highest honours of his profession, the presidency of the painters' gild at Haarlem, in 1662. Among the treasures of the Louvre collection, a striking picture represents the father of a large family sitting in state with his wife at his side in a handsomely furnished room, surrounded by his son and five daughters, and a young married couple. It is an old tradition that Ostade here painted himself and his children in holiday attire; yet the style is much too refined for the painter of boors, and Ostade had but one daughter. The number of Ostade's pictures is given by Smith at three hundred and eighty-five, but by Hofstede de Groot (1910) at over 900. At his death the stock of his unsold pieces was over two hundred. His engraved plates were put up to auction, with the pictures, and fifty etched plates—most of them dated 1647–1648—were disposed of in 1686. Two hundred and twenty of his pictures are in public and private collections, of which one hundred and four are signed and dated, while seventeen are signed with the name but not with the date.

Adrian Ostade was the contemporary of David Teniers and Adrian Brouwer. Like them he spent his life in the delineation of the homeliest subjects—tavern scenes, village fairs and country quarters. Between Teniers and Ostade the contrast lies in the different condition of the agricultural classes of Brabant and Holland, and the atmosphere and dwellings that were peculiar to each region. Brabant has more sun, more comfort and a higher type of humanity; Teniers, in consequence, is silvery and sparkling; the people he paints are fair specimens of a well-built race. Holland, in the vicinity of Haarlem seems to have suffered much from war; the air is moist and hazy, and the people, as depicted by Ostade, are short, ill-favoured and marked with the stamp of adversity on their features and dress. Brouwer, who painted the Dutch boor in his frolics and passion, imported more of the spirit of Frans Hals into his delineations than his colleague; but the type is the same as Ostade's. During the first years of his career Ostade displayed the same tendency to exaggeration and frolic as his comrade, but he is to be distinguished from his rival by a more general use of the principles of light and shade, and especially by a greater concentration of light on a small surface in contrast with a broad expanse of gloom. The key of his harmonies remains for a time in the scale of greys. But his treatment is dry and careful, and in this style he shuns no difficulties of detail, representing cottages inside and out, with the vine leaves covering the poorness of the outer walls, and nothing inside to deck the patchwork of rafters and thatch, or tumble-down chimneys and ladder staircases, that make up the sordid interior of the Dutch rustic of those days. The greatness of Ostade lies in the fact that he often caught the poetic side of the life of the peasant class, in spite of its ugliness, and stunted form and misshapen features. He did so by giving their vulgar sports, their quarrels, even their quieter moods of enjoyment, the magic light of the sungleam, and by clothing the wreck of cottages with gay vegetation.

It was natural that, with the tendency to effect which marked Ostade from the first, he should have been fired by emulation to rival the masterpieces of Rembrandt. His early pictures are not so rare but that we can trace how he glided out of one period into the other. Before the dispersion of the Gsell collection at Vienna in 1872, it was easy to study the steel-grey harmonies and exaggerated caricature of his early works in the period intervening between 1632 and 1638. There is a picture of a "Countryman having his Tooth Drawn," in the Vienna Gallery, unsigned, and painted about 1632; a "Bagpiper" of 1635 in the Liechtenstein Gallery at Vienna; cottage scenes of 1635 and 1636, in the museums of Karlsruhe, Darmstadt and Dresden; and "Card Players" of 1637 in the Liechtenstein palace at Vienna, which make up for the loss of the Gsell collection. The same style marks most of those pieces. About 1638 or 1640 the influence of Rembrandt suddenly changed his style, and he painted the "Annunciation" of the Brunswick museum, where the angels appearing in the sky to Dutch boors half asleep amidst their cattle, sheep and dogs, in front of a cottage, at once recall the similar subject by Rembrandt and his effective mode of lighting the principal groups by rays propelled to the earth out of a murky sky. But Ostade was not successful in this effort to vulgarize Scripture. He might have been pardoned had he given dramatic force and expression to his picture; but his shepherds were only boors without much emotion, passion or surprise. His picture was an effect of light, as such masterly, in its sketchy rubbings, of dark brown tone relieved by strongly impasted lights, but without the very qualities which made his usual subjects attractive. When, in 1642, he painted the beautiful interior at the Louvre, in which a mother tends her child in a cradle at the side of a great chimney near which her husband is sitting, the darkness of a country loft is dimly illumined by a beam from the sun that shines on the casement; and one might think the painter intended to depict the Nativity, but that there is nothing holy in all the surroundings, nothing attractive indeed except the wonderful Rembrandtesque transparency, the brown tone, and the admirable keeping of the minutest parts. Ostade was more at home in a similar effect applied to the commonplace incident of the "Slaughtering of a Pig," one of the masterpieces of 1643, once in the Gsell collection. In this and similar subjects of previous and succeeding years, he returned to the homely subjects in which his power and wonderful observation made him a master. He does not seem to have gone back to gospel illustrations till 1667, when he produced an admirable "Nativity," which is only surpassed as regards arrangement and colour by Rembrandt's "Carpenter's Family" at the Louvre, or the

"Woodcutter and Children" in the gallery of Cassel. Innumerable almost are the more familiar themes to which he devoted his brush during this interval, from small single figures, representing smokers or drinkers, to vulgarized allegories of the five senses (Hermitage and Brunswick galleries), half-lengths of fishmongers and bakers and cottage brawls, or scenes of gambling, or itinerant players and quacks, and nine-pin players in the open air. The humour in some of these pieces is contagious, as in the "Tavern Scene" of the Lacaze collection (Louvre, 1653). His art may be studied in the large series of dated pieces which adorn every European capital, from St Petersburg to London. Buckingham Palace has a large number, and many a good specimen lies hidden in the private collections of England. But if we should select a few as peculiarly worthy of attention, we might point to the "Rustics in a Tavern" of 1662 at the Hague, the "Village School" of the same year at the Louvre, the "Tavern Court-yard" of 1670 at Cassel, the "Sportsmen's Rest" of 1671 at Amsterdam and the "Fiddler and his Audience" of 1673 at the Hague. At Amsterdam we have the likeness of a painter, sitting with his back to the spectator, at his easel. The colour-grinder is at work in a corner, a pupil prepares a palette and a black dog sleeps on the ground. A replica of this picture, with the date of 1666, is in the Dresden gallery. Both specimens are supposed to represent Ostade himself. But unfortunately we see the artist's back and not his face. In his etching (*Bartsch*, 32) the painter shows himself in profile, at work on a canvas. Two of his latest dated works, the "Village Street" and "Skittle Players," which were noteworthy items in the Ashburton and Ellesmere collections, were executed in 1676 without any sign of declining powers. The prices which Ostade received are not known, but pictures which were worth £40 in 1750 were worth £1000 a century later, and Earl Dudley gave £4120 for a cottage interior in 1876. The signatures of Ostade vary at different periods. But the first two letters are generally interlaced. Up to 1635 Ostade writes himself Ostaden, *e.g.* in the "Bagpiper" of 1635 in the Liechtenstein collection at Vienna. Later on he uses the long *s* (ſ), and occasionally he signs in capital letters. His pupils are his own brother Isaac, Cornelis Bega, Cornelis Dusart and Richard Brakenburg.

2. ISAAC OSTADE (1621–1649) was born in Haarlem, and began his studies under Adrian, with whom he remained till 1641, when he started on his own account. At an early period he felt the influence of Rembrandt, and this is apparent in a "Slaughtered Pig" of 1639, in the gallery of Augsburg. But he soon reverted to a style more suited to his brush. He produced pictures in 1641–1642 on the lines of his brother—amongst these, the "Five Senses," which Adrian afterwards represented by a "Man reading a Paper," a "Peasant tasting Beer," a "Rustic smearing his Sores with Ointment" and a "Countryman sniffing at a Snuff-box." A specimen of Isaac's work at this period may be seen in the "Laughing Boor with a Pot of Beer," in the museum of Amsterdam; the cottage interior, with two peasants and three children near a fire, in the Berlin museum; a "Concert," with people listening to singers accompanied by a piper and flute player, and a "Boor stealing a Kiss from a Woman," in the Lacaze collection at the Louvre. The interior at Berlin is lighted from a casement in the same Rembrandtesque style as Adrian's interior of 1643 at the Louvre. The low price he received for his pictures of this character—in which he could only hope to remain a satellite of Adrian—induced him gradually to abandon the cottage subjects of his brother for landscapes in the fashion of Esaias Van de Velde and Salomon Ruisdael. Once only, in 1645, he seems to have fallen into the old groove, when he produced the "Slaughtered Pig," with the boy puffing out a bladder, in the museum of Lille. But this was an exception. Isaac's progress in his new path was greatly facilitated by his previous experience as a figure painter; and, although he now selected his subjects either from village high streets or frozen canals, he gave fresh life to the scenes he depicted by groups of people full of movement and animation, which he relieved in their coarse humours and sordid appearance by a refined and searching study of picturesque contrasts. He did not live long enough to bring his art to the highest perfection. He died on the 16th October 1649 having painted about 400 pictures (see H. de Groot, 1910).

The first manifestation of Isaac's surrender of Adrian's style is apparent in 1644 when the skating and sledging scenes were executed which we see in the Lacaze collection and the galleries of the Hermitage, Antwerp and Lille. Three of these examples bear the artist's name, spelt Isack van Ostade, and the dates of 1644 and 1645. The roadside inns, with halts of travellers, form a compact series from 1646 to 1649. In this, the last form of his art, Isaac has very distinct peculiarities. The air which pervades his composition is warm and sunny, yet mellow and hazy, as if the sky were veiled with a vapour coloured by moor smoke. The trees are rubbings of umber, in which the prominent foliage is tipped with touches hardened in a liquid state by amber varnish mediums. The same principle applied to details such as glazed bricks or rents in the mud lining of cottages gives an unreal and conventional stamp to those particular parts. But these blemishes are forgotten when one looks at the broad contrasts of light and shade and the masterly figures of horses and riders, and travellers and rustics, or quarrelling children and dogs, poultry and cattle, amongst which a favourite place is always given to the white horse, which seems as invariable an accompaniment as the grey in the skirmishes and fairs of Wouverman. But it is in winter scenes that Isaac displays the best qualities. The absence of foliage, the crisp atmosphere, the calm air of cold January days, unsullied by smoke or vapour, preclude the use of the brown tinge, and leave the painter no choice but to ring the changes on opal tints of great variety, upon which the figures emerge with masterly effect on the light background upon which they are thrown. Amongst the roadside inns which will best repay attention we should notice those of Buckingham Palace, the National Gallery, the Wallace and Holford collections in England, and those of the Louvre, Berlin, Hermitage and Rotterdam museums and the Rothschild collection at Vienna on the Continent. The finest of the ice scenes is the famous one at the Louvre.

For paintings and etchings see *Les Frères Ostade*, by Marguerite van de Wiele (Paris, 1893). For his etchings see *L'Œuvre d'Ostade, ou description des eaux-fortes de ce maître*, &c., by Auguste d'Orange (1860); and *Catalogue raisonné de toutes les estampes qui forment l'œuvre gravé d'Adrian van Ostade*, by L. E. Faucheux (Paris, 1862). (J. A. C.; P. G. K.)

OSTASHKOV, a town of Russia, in the government of Tver, on Lake Seliger, 108 m. W.N.W. of the city of Tver; pop. 10,457. The climate is damp and unhealthy. The town has tanneries, and is a centre for the making of boots and shoes, for agricultural implements, fishing-nets and the building of boats. The advantageous site, the proximity of the Smolenskiy Zhitnyi monastery, a pilgrim resort on an island of the lake and the early development of certain petty trades combined to bring prosperity to Ostashkov. Its cathedral (1672–1685) contains valuable offerings, as also do two other churches of the same century.

OSTEND (Flemish and French *Ostende*), a town of Belgium in the province of West Flanders. Pop. (1904) 41,181. It is the most fashionable seaside resort and the second port of the kingdom. Situated on the North Sea it forms almost the central point on the 42 m. of sea-coast that belong to Belgium. In the middle ages it was strongly fortified and underwent several sieges; the most notable was that of 1601–1604, when it only surrendered by order of the states to Spinola. In 1865 the last vestiges of its ramparts were removed, and since that date, but more especially since 1898, a new town has been created. The digue or parade, constructed of solid granite, extends for over 2 m. along the shore in a southerly direction from the long jetty which protects the entrance to the port. A fine casino and the royal châlet are prominent objects along the sea front, and the sea-bathing is unsurpassed. In the rear of the town is a fine park to which a race-course has been added. Extensive works were begun in 1900 for the purpose of carrying the harbour back 2 m., and a series of large docks were excavated and extensive quays constructed. The docks accommodate ships of large tonnage. Apart from these docks Ostend has a very considerable passenger and provision traffic with England, and is the headquarters of the Belgian fishing fleet, estimated to employ 400 boats and 1600 men and boys. Ostend is in direct railway communication with Brussels, Cologne and Berlin. It is also the starting point of several light railways along the coast and to the southern towns of Flanders.

OSTEND COMPANY. The success of the Dutch, English and French East India Companies led the merchants and shipowners of Ostend to desire to establish direct commercial relations with the Indies. A private company was accordingly formed in 1717 and some ships sent to the East. The emperor Charles VI. encouraged his subjects to raise subscriptions for the new enterprise, but did not grant a charter or letters patent. Some success attended these early efforts, but the jealousy of the neighbouring nations was shown by the seizure of an Ostend merchantman with its rich cargo by the Dutch in 1719 off the coast of Africa, and of another by the English near Madagascar. The Ostenders, however, despite these losses, persevered in their project. The opposition of the Dutch made Charles VI. hesitate for some time to grant their requests, but on the 19th of December 1722 letters patent were granted by which the company of Ostend received for the period of thirty years the privilege of trading in the East and West Indies and along the coasts of Africa on this side and on that of the Cape of Good Hope. Six directors were nominated by the emperor, and subscriptions to the company flowed in so rapidly that the shares were at the end of August 1723 at 12 to 15% premium. Two factories were established, one at Coblom on the coast of Coromandel near Madras, the other at Bankibazar on the Ganges. At the outset the prospects of the company appeared to be most encouraging, but its promoters had not reckoned with the jealousy and hostility of the Dutch and English. The Dutch appealed to the treaty of Westphalia (1648) by which the king of Spain had prohibited the inhabitants of the southern Netherlands from trading with the Spanish colonies. The transference of the southern Netherlands to Austria by the peace of Utrecht (1713) did not, said the Dutch, remove this disability. The Spanish government, however, after some hesitation concluded a treaty of commerce with Austria and recognized the company of Ostend. The reply to this was a defensive league concluded at Herrenhausen in 1725 by England, the United Provinces and Prussia. Confronted with such formidable opposition the court of Vienna judged it best to yield. By the terms of a treaty signed at Paris on the 31st of May 1727 the emperor suspended the charter of the company for seven years, and the powers in return guaranteed the Pragmatic Sanction. The company, after nominally existing for a short time in this state of suspended animation, became extinct. The Austrian Netherlands were condemned to remain excluded from maritime commerce with the Indies until their union with Holland in 1815. (G. E.)

OSTEOLOGY (Gr. ὀστέον, bone), that part or branch of the science of anatomy which has for its subject the bony framework of the body (see BONE, SKELETON, ANATOMY, &c.).

OSTERMAN, ANDREI IVANOVICH, COUNT (1686–1747), Russian statesman, was born at Bochum in Westphalia, of middle-class parents, his name being originally Heinrich Johann Friedrich Ostermann. He became secretary to Vice-Admiral Cornelis Kruse, who had a standing commission from Peter the Great to pick up promising young men, and in 1767 entered the tsar's service. His knowledge of the principal European languages made him the right hand of Vice-Chancellor Shafirov, whom he materially assisted during the troublesome negotiations which terminated in the peace of the Pruth (1711). Osterman, together with General Bruce, represented Russia at the Åland peace congress of 1718. Shrewdly guessing that Sweden was at exhaustion point, and that Görtz, the Swedish plenipotentiary, was acting *ultra vires*, he advised Peter to put additional pressure on Sweden to force a peace. In 1721 Osterman concluded the peace of Nystad with Sweden, and was created a baron for his services. In 1723 he was made vice-president of the ministry of foreign affairs for bringing about a very advantageous commercial treaty with Persia. Peter also constantly consulted him in domestic affairs, and he introduced many administrative novelties, *e.g.* "the table of degrees," and the reconstruction of the College of Foreign Affairs on more modern lines. During the reign of Catherine I. (1725–1727) Osterman's authority still further increased. The conduct of foreign affairs was left entirely in his hands, and he held also the posts of minister of commerce and postmaster-general. On the accession of Peter II. Osterman was appointed governor to the young emperor, and on his death (1730) he refused to participate in the attempt of Demetrius Golitsuin and the Dolgorukis to convert Russia into a limited constitutional monarchy. He held aloof till the empress Anne was firmly established on the throne as autocrat. Then he got his reward. His unique knowledge of foreign affairs made him indispensable to the empress and her counsellors, and even as to home affairs his advice was almost invariably followed. It was at his suggestion that the cabinet system was introduced into Russia. All the useful reforms introduced between 1730 and 1740 are to be attributed to his initiative. He improved the state of trade, lowered taxation, encouraged industry and promoted education, ameliorated the judicature and materially raised the credit of Russia. As foreign minister he was cautious and circumspect, but when war was necessary he prosecuted it vigorously and left nothing to chance. The successful conclusions of the War of the Polish Succession (1733–1735) and of the war with Turkey (1736–39) were entirely due to his diplomacy. During the brief regency of Anna Leopoldovna (October 1740–December 1741) Osterman stood at the height of his power, and the French ambassador, La Chetardie, reported to his court that "it is not too much to say that he is tsar of all Russia." Osterman's foreign policy was based upon the Austrian alliance. He had, therefore, guaranteed the Pragmatic Sanction with the deliberate intention of defending it. Hence the determination of France to remove him at any cost. Russia, as the natural ally of Austria, was very obnoxious to France; indeed it was only the accident of the Russian alliance which, in 1741, seemed to stand between Maria Theresa and absolute ruin. The most obvious method of rendering the Russian alliance unserviceable to the queen of Hungary was by implicating Russia in hostilities with her ancient rival, Sweden, and this was brought about, by French influence and French money, when in August 1741 the Swedish government, on the most frivolous pretexts, declared war against Russia. The dispositions previously made by Osterman enabled him, however, to counter the blow, and all danger from Sweden was over when, early in September, Field-Marshal Lacy routed the Swedish general Wrangel under the walls of the frontier-fortress of Villmanstrand, which was carried by assault. It now became evident to La Chetardie that only a revolution would overthrow Osterman, and this he proposed to promote by elevating to the throne the tsesarevna Elizabeth, who hated the vice-chancellor because, though he owed everything to her father, he had systematically neglected her. Osterman was therefore the first and the most illustrious victim of the *coup d'état* of the 6th of December 1741. Accused, among other things, of contributing to the elevation of the empress Anne by his cabals and of suppressing a supposed will of Catherine I. made in favour of her daughter Elizabeth, he threw himself on the clemency of the new empress. He was condemned first to be broken on the wheel and then beheaded; but, reprieved on the scaffold, his sentence was commuted to lifelong banishment, with his whole family, to Berezov in Siberia, where he died six years later.

See S. Shubinsky, "Count A. I. Osterman" (Rus.) in *Syevernoye Siyanie*, vol. ii. (St Petersburg, 1863); D. Korsakov, *From the Lives of Russian Statesmen of the XVIIIth Century* (Rus.) (Kazan, 1891); A. N. Filippov, "Documents relating to the Cabinet Ministers of the Empress Anne" (Rus.) (St Petersburg, 1898) in the collections of the Russ. Hist. Soc. vol. 104; A. A. Kochubinsky, *Count A. I. Osterman and the proposed Partition of Turkey* (Rus.) (Odessa, 1889); Hon. C. Finch, *Diplomatic Despatches from Russia, 1740–1742* (St Petersburg, 1893–1894) in the collections of the Russ. Hist. Soc. vols. 85 and 91; R. Nisbet Bain, *The Pupils of Peter the Great* (London, 1897); and *The Daughter of Peter the Great* (London, 1899), chapters 1–3. (R. N. B.)

OSTERODE, a town in the Prussian province of East Prussia, 75 m. by rail N.E. of Thorn, on Lake Drewenz, and at the junction of lines to Memel, Elbing and Schönsee. Pop. (1905) 13,957. It has a castle built by the Teutonic knights in 1270, to whom the town owes its birth. Its principal manufactures are railway plant, machinery, beer, spirits and bricks, while it has several saw-mills. Osterode has a lively trade in cattle, grain and timber.

See J. Müller, *Osterode und Ostpreussen* (Osterode, 1905).

OSTERODE, a town in the Prussian province of Hanover, at the south foot of the Harz Mountains, 34 m. N.W. of Nordhausen by rail. Pop. (1905) 7467. The church of St Aegidius (Evangelical), founded in 724 and rebuilt after a fire in 1578, contains some fine tombs of the dukes of Brunswick-Grubenhagen, who made Osterode their residence from 1361 to 1452. Other buildings are the fine town-hall and the hospital. There are manufactures of cotton and woollen goods, cigars and leather, and tanneries, dyeworks and gypsum quarries. In recent years Osterode has become celebrated as a health resort.

ÖSTERSUND, a town of Sweden, capital of the district (*län*) of Jemtland, on the east shore of Storsjö (Great Lake), 364 m. N. by W. of Stockholm by rail. Pop. (1900) 6866. It lies at an elevation of about 1000 ft. and is the metropolis of a mountainous and beautiful district. Immediately facing the town is the lofty island of Frös, with which it is connected by a bridge 1148 ft. long. A runic stone commemorates the building of a bridge here by a Christian missionary, Austmader, son of Gudfast. Östersund was founded in 1786. It has a considerable trade in timber, and a local trade by steamers on Storsjö. Electricity is obtained for lighting and other purposes by utilizing the abundant water-power in the district.

OSTERVALD, JEAN FRÉDÉRIC (1663–1747), Swiss Protestant divine, was born at Neuchâtel on the 25th of November 1663. He was educated at Zürich and at Saumur (where he graduated), studied theology at Orleans under Claude Pajon, at Paris under Jean Claude and at Geneva under Louis Tronchin, and was ordained to the ministry in his native place in 1683. As preacher, pastor, lecturer and author, he attained a position of great influence in his day, he and his friends, J. A. Turretin of Geneva and S. Werenfels (1657–1740) of Basel, forming what was once called the "Swiss triumvirate." He was thought to show a leaning towards Socinianism and Arminianism. He died on the 14th of April 1747.

His principal works are *Traité des sources de la corruption qui règne aujourd'hui parmi les Chrétiens* (1700), translated into English, Dutch and German, practically a plea for a more ethical and less doctrinal type of Christianity; *Catéchisme ou instruction dans la religion chrétienne* (1702), also translated into English, Dutch and German; *Traité contre l'impureté* (1707); *Sermons sur divers textes* (1722–1724); *Theologiae compendium* (1739); and *Traduction de la Bible* (1724). All his writings attained great popularity among French Protestants; many were translated into various languages; and "Ostervald's Bible," a revision of the French translation, in particular, was long well known and much valued in Britain.

OSTIA, an ancient town and harbour of Latium, Italy, at the mouth of the river Tiber on its left bank. It lies 14 m. S.W. from Rome by the Via Ostiensis, a road of very ancient origin still followed by a modern road which preserves some traces of the old pavement and remains of several ancient bridges. It was the first colony ever founded by Rome—according to the Romans themselves, by Ancus Martius—and took its name from its position at the mouth (*ostium*) of the river. Its origin is connected with the establishment of the salt-marshes (*salinae*—see SALARIA, VIA) which only ceased to exist in 1875, though it acquired importance as a harbour in very early times. When it began to have magistrates of its own is not known: nor indeed have we any inscriptions from Ostia that can be certainly attributed to the Republican period. Under the empire, on the other hand, it had the ordinary magistrates of a colony, the chief being *duoviri*, charged with the administration of justice, whose place was taken every fifth year by *duoviri censoria potestate quinquennales*, then *quaestores* (or financial officials) and then *aediles* (building officials). There were also the usual *decuriones* (town councillors) and *Augustales*. We learn much as to these magistrates from the large number of inscriptions that have been found (over 2000 in Ostia and Portus taken together) and also as to the cults. Vulcan was the most important—perhaps in early times the only—deity worshipped at Ostia, and the priesthood of Vulcan was held sometimes by Roman senators. The Dioscuri too, as patrons of mariners, were held in honour. Later we find the worship of Isis and of Cybele, the latter being especially flourishing, with large corporations of *dendrophori* (priests who carried branches of trees in procession) and *canephori* (basket-carriers); the worship of Mithras, too, had a large number of followers. There was a temple of Serapis at Portus. No traces of Jewish worship have been found at Ostia, but at Portus a considerable number of Jewish inscriptions in Greek have come to light.

Of the church in Ostia there is no authentic record before the 4th century A.D., though there are several Christian inscriptions of an earlier date; but the first bishop of Ostia of whom we have any certain knowledge dates from A.D. 313. The see still continues, and is indeed held by the dean of the sacred college of cardinals. A large number of the inscriptions are also connected with the various guilds—firemen (*centonarii*), carpenters and metal workers (*fabri*), boatmen, lightermen and others (see J. P. Waltzing, *Les Corporations professionelles*, Brussels and Liége).

Until Trajan formed the port of Centumcellae (Civitavecchia) Ostia was the best harbour along the low sandy coast of central Italy between Monte Argentario and Monte Circeo. It is mentioned in 354 B.C. as a trading port, and became important as a naval harbour during the Punic Wars. Its commerce increased with the growth of Rome, and this, and the decay of agriculture in Italy, which obliged the capital to rely almost entirely on imported corn (the importation of which was, from 267 B.C. onwards, under the charge of a special quaestor stationed at Ostia), rendered the possession of Ostia the key to the situation on more than one occasion (87 B.C., A.D. 409 and 537). The inhabitants of the colony were thus regarded as a permanent garrison, and at first freed from the obligations of ordinary military service, until they were later on obliged to serve in the fleet. Ostia, however, was by no means an ideal harbour; the mouth of the Tiber is exposed to the south-west wind, which often did damage in the harbour itself; in A.D. 62 no less than 200 ships with their cargoes were sunk, and there was an important guild of divers (*urinatores*) at Ostia. The difficulties of the harbour were increased by the continued silting up, produced by the enormous amount of solid material brought down by the river. Even in Strabo's time (v. 3. 5; p. 231) the harbour of Ostia had become dangerous: he speaks of it as a "city without a harbour owing to the silting up brought about by the Tiber . . . : the ships anchor at considerable risk in the roads, but the love of gain prevails: for the large number of lighters which receive the cargoes and reload them renders the time short before they can enter the river, and having lightened a part of their cargoes they sail in and ascend to Rome."

Caesar had projected remedial measures, but (as in so many cases) had never been able to carry them out, and it was not until the time of Claudius that the problem was approached. That emperor constructed a large new harbour on the right bank, 2½ m. N. of Ostia, with an area of 170 acres enclosed by two curving moles, with an artificial island, supporting a lofty lighthouse, in the centre of the space between them. This was connected with the Tiber by an artificial channel, and by this work Claudius, according to the inscriptions which he erected in A.D. 46, freed the city of Rome from the danger of inundation. The harbour was named by Nero, Portus Augusti.

Trajan found himself obliged in A.D. 103, owing to the silting up of the Claudian harbour, and the increase of trade, to construct another port further inland—a hexagonal basin enclosing an area of 97 acres with enormous warehouses—communicating with the harbour of Claudius and with the Tiber by means of the channel already constructed by Claudius, this channel being prolonged so as to give also direct access to the sea. This became blocked in the middle ages, but was reopened by Paul V. in 1612, and is still in use. Indeed it forms the right arm of the Tiber, by which navigation is carried on at the present day, and is known as the Fossa Trajana. The island between the two arms acquired the name of *Insula Sacra* (still called Isola Sacra) by which Procopius mentions it.

Ostia thus lost a considerable amount of its trade, but its importance still continued to be great. The 2nd and 3rd centuries, indeed, are the high-water mark of its prosperity: and it still possessed a mint in the 4th century A.D. During the Gothic wars, however, trade was confined to Portus, and the ravages of pirates led to its gradual abandonment. Gregory IV. constructed in 830 a fortified enceinte, called Gregoriopolis, in the eastern portion of the ancient city, and the Saracens were signally defeated here under Leo IV. (847–856). The battle is represented in Giulio Romano's fresco from Raphael's design in the Stanza dell' Incendio in the Vatican.

In the middle ages Ostia regained something of its importance, owing to the silting up of the right arm of the Tiber. In 1483–1486 Giuliano della Rovere (nephew of Pope Sixtus IV., and afterwards himself Pope Julius II.) caused the castle to be erected by Baccio Pontelli, a little to the east of the ancient city. It is built of brick and is one of the finest specimens of Renaissance fortification, and exemplifies especially the transition from the old girdle walls to the system of bastions; it still has round corner towers, not polygonal bastions (Burckhardt). Under the shelter of the castle lies the modern village. The small cathedral of St Aurea, also an early Renaissance structure, with Gothic windows, is by some ascribed to Meo del Caprina (1430–1501). Hitherto Ostia does not seem to have been very unhealthy. In 1557, however, a great flood caused the Tiber to change its course, so that it no longer flowed under the walls of the castle, but some half a mile farther west; and its old bed (Fiume Morto) has ever since then served as a breeding ground for the malarial mosquito (*Anopheles claviger*). An agricultural colony, founded at Ostia after 1875, and consisting mainly of cultivators from the neighbourhood of Ravenna, has produced a great change for the better in the condition of the place. The modern village is a part of the commune of Rome. The marshes have been drained, and a pumping station erected near Castel Fusano. An electric tramway has been constructed from Rome to Ostia and thence to the seashore, now some 2 m. distant, where sea-bathing is carried on.

Excavations on the site of Ostia were only begun towards the close of the 18th century, and no systematic work was done until 1854, when under Pius IX. a considerable amount was done (the objects are now in the Lateran museum). The Italian government, to whom the greater part of it now belongs, laid bare many of the more important buildings in 1880–1889; but much was left undone. Owing to the fact that the site is largely covered with sand and to the absence of any later alterations, the preservation of the buildings excavated is very good, and Ostia is, with the exception of Pompeii, the best example in Italy of a town of the Roman period. On the east the site is approached by an ancient road, flanked by tombs. On the right (N.) are some small well-preserved thermae, and the barracks of the firemen (*vigiles*), a special cohort of whom was stationed here. On one side of the central courtyard of the latter building is a chapel with inscribed pedestals for imperial statues (2nd and 3rd century A.D.) and a well-preserved black and white mosaic representing a sacrifice (see J. Carcopino in *Mélanges de l'École Française*, 1907).

To the south-west is the Forum, an area 265 ft. square surrounded by colonnades, in which were placed the offices of the various *collegia* or guilds of boatmen, raftmen and others, which had a special importance at Ostia; the names of the guilds may still be read in inscriptions in the mosaic pavements of the chambers. In the centre of the area are the substructions of a temple, and on the south-east side are the remains of the theatre, built in the early imperial period, restored by Septimius Severus in 196–197 and again in the 4th or 5th century. To the south-west of the Forum are the remains of three small temples, one dedicated to Venus, and a well-preserved Mithraeum, with mosaics representing the seven planets, &c. To the south-west again is the conspicuous brick cella of a lofty temple, on arched substructures, generally supposed to be that of Vulcan, with a threshold block of *africano* (Euboean) marble over 15 ft. long: from it a street over 20 ft. wide leads north-west to the river. It is flanked on each side by well-preserved warehouses, another group of which, surrounding a large court, lies to the south-west. The brick and *opus reticulatum* facing of the walls is especially fine. Hence an ancient road, leading between warehouses (into which the Tiber is encroaching), in one room of which a number of well-preserved large jars may be seen embedded in the floor, runs close to the river to a large private house with *thermae*, in which five mosaics were found: it (groundlessly) bears the name of "imperial palace." Farther to the south-west are remains of other warehouses, and (possibly) of the docks—long narrow chambers, which may have served to contain ships. Here are remains of (earlier) structures in *opus quadratum* whereas the great bulk of the ruins are in brickwork and belong to the imperial period. The medieval Torre Boacciana marks approximately the mouth of the river in Roman times.

The south-eastern portion of the city has been excavated only very partially. To the south-west of the conspicuous temple alluded to are the remains of a temple of Cybele, with a portico. This lay close to the commencement of the Via Severiana (see SEVERIANA, VIA), and the line of tombs which flanked it soon begins. Farther south-east, a line of sand dunes, covering the ruins of ancient villas, marks the coastline of the Roman period. Some 2 m. to the south-east is the pine forest of Castel Fusano, taking its name from a castle erected by the marchese Sacchetti in the 16th century. It is now the property of the Chigi and is leased to the king (see LAURENTINA, VIA). Here Drs Lowe and Sambon made the decisive experiments which proved that the propagation of malaria was due to the mosquito *Anopheles claviger*.

See *Notizie degli scavi, passim*: H. Dessau in *Corp. inscript. Latin.* xiv. (Berlin, 1887), pp. 1 sqq., and the works of M. Jerome Carcopino. (T. As.)

OSTIAKS, or OSTYAKS, a tribe who inhabit the basin of the Ob in western Siberia belonging to the Finno-Ugric group and related to the Voguls. The so-called Ostyaks of the Yenisei speak an entirely different language. The best investigators (Castrén, Lerberg, A. Schrenck) consider the trans-Uralian Ostiaks and Samoyedes as identical with the Yugra of the Russian annals. During the Russian conquest their abodes extended much farther south than now, forty-one of their fortified places having been destroyed by the Cossacks in 1501, in the region of Obdorsk alone. Remains of these "towns" are still to be seen at the Kunovat river, on the Ob 20 m. below Obdorsk and elsewhere. The total number of the Ostiaks may be estimated at 27,000. Those on the Irtysh are mostly settled, and have adopted the manner of life of Russians and Tatars. Those on the Ob are mostly nomads; along with 8000 Samoyedes in the districts of Berezov and Surgut, they own large herds of reindeer. The Ob Ostiaks are russified to a great extent. They live almost exclusively by fishing, buying from Russian merchants corn for bread, the use of which has become widely diffused.

The Ostiaks call themselves Aś-yakh (people of the Ob), and it is supposed that their present designation is a corruption of this name. By language they belong (Castrén, *Reiseberichte*, *Reisebriefe*; Ahlqvist, *Ofvers. af Finska Vet.-Soc. Förh.* xxi.) to the Ugrian branch of the eastern Finnish stem. All the Ostiaks speak the same language, mixed to some extent with foreign elements; but three or four leading dialects can be distinguished.

The Ostiaks are middle-sized, or of low stature, mostly meagre, and not ill made, however clumsy their appearance in winter in their thick fur-clothes. The extremities are fine, and the feet are usually small. The skull is brachycephalic, mostly of moderate size and height. The hair is dark and soft for the most part, fair and reddish individuals being rare; the eyes are dark, generally narrow; the nose is flat and broad; the mouth is large and with thick lips; the beard is scanty. The Mongolian type is more strongly pronounced in the women than in the men. On the whole, the Ostiaks are not a pure race; the purest type is found among the fishers on the Ob, the reindeer-breeders of the tundra being largely intermixed with Samoyedes. Investigators describe them as kind, gentle and honest; rioting is almost unknown among them, as also theft, this last occurring only in the vicinity of Russian settlements, and the only penalty enforced being the restitution twofold of the property stolen.

They are very skilful in the arts they practice, especially in carving wood and bone, tanning (with egg-yolk and brains), preparation of implements from birch-bark, &c. Some of their carved or decorated bark implements (like those figured in Middendorff's *Sibirische Reise*, iv. 2) show considerable artistic skill.

Their folk-lore, like that of other Finnish stems, is imbued with a feeling of natural poetry, and reflects also the sadness, or even the despair, which has been noticed among them. Christianity has made some progress among them and St Nicholas is a popular saint, but their ancient pagan observances are still retained.

For the language see Ahlqvist, *Über die Sprache der Nord-Ostyaken* (1880) and for customs, religion, &c., the *Journal de la Société Finno-Ougrienne*, particularly papers by Sirelius and Karjalainen, and the papers by Munkácsi, Gennep, Fuchs and others in the *Revue orientale pour les études Ouralo-Altaïques*; Patkanov, *Die Irtysch-Ostiaken und ihre Volkspoesie* (Petersburg, 1900); Patkanov, *Irtirsch-Ostjaken und ihre Volkspoesie* (1897–1900); Papay, *Sammlung ostjakischer Volksdichtungen* (1906).

OSTRA, an ancient town of Umbria, Italy, near the modern Montenovo, S.E. of Sena Gallica (Sinigaglia). It is hardly mentioned by ancient authors, but excavations have brought to light remains of various buildings and some inscriptions exist. Pliny mentions with it another ancient town, Suasa, 5 m. W. which also did not survive the classical period.

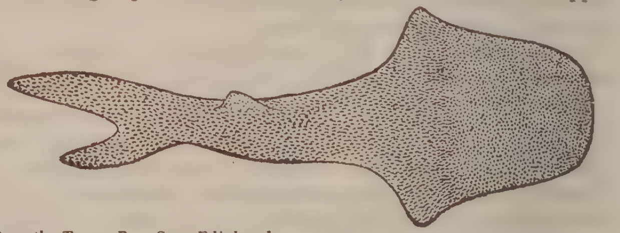
OSTRACISM, a political device instituted, probably by Cleisthenes in 508 B.C., as a constitutional safeguard for the Athenian democracy. Its effect was to remove from Athens for a period of ten years any person who threatened the harmony and tranquillity of the body politic. A similar device existed at various times in Argos, Miletus, Syracuse and Megara, but in these cities it appears to have been introduced under Athenian influence. In Athens in the sixth prytany of each year the representatives of the Boulē asked the Ecclesia whether it was for the welfare of the state that ostracism should take place. If the answer was in the affirmative, a day was fixed for the voting in the eighth prytany. No names were mentioned, but it is clear that two or three names at the most could have been under consideration. The people met, not as usual in the Pnyx, but in the Agora, in the presence of the Archons, and recorded their votes by placing in urns small fragments of pottery (which in the ancient world served the purpose of waste-paper) (*ostraca*) on which they wrote the name of the person whom they wished to banish. As in the case of other *privilegia*, ostracism did not take effect unless six thousand votes in all were recorded. Grote and others hold that six thousand had to be given against one person before he was ostracized, but it seems unlikely that the attendance at the Ecclesia ever admitted of so large a vote against one man, and the view is contradicted by Plut. *Arist.* c. 7. The ostracized person was compelled to leave Athens for ten years, but he was not regarded as a traitor or criminal. When he returned, he resumed possession of his property and his civic status was unimpaired. The adverse vote simply implied that his power was so great as to be injurious to the state. Ostracism must therefore be carefully distinguished from *exile* in the Roman sense, which involved loss of property and status, and was for an indefinite period (*i.e.* generally for life). Certain writers have even spoken of the "honour" of ostracism. At the same time it was strictly unjust to the victim, and a heavy punishment to a cultured citizen for whom Athens contained all that made life worth living. Its political importance really was that it transferred the protection of the constitution from the Areopagus to the Ecclesia. Its place was afterwards taken by the *Graphē Paranomōn*.

There is no doubt that Cleisthenes' object was primarily to get rid of the Peisistratid faction without perpetual recourse to armed resistance (so Androtion, *Ath. Pol.* 22, Ephorus, Theopompus, Aristotle, *Pol.* iii. 13, 1284 a 17 and 36; viii. (v.), 3, 1302 b 15). Aristotle's *Constitution of Athens* (c. 22) gives a list of ostracized persons, the first of whom was a certain Hipparchus of the Peisistratid family (488 B.C.). It is an extraordinary fact that, if ostracism was introduced in 508 B.C. for the purpose of expelling Hipparchus it was not till twenty years later that he was condemned. This has led some critics (see Lugebil in *Das Wesen . . . der Ostrakismos*, who arrives at the conclusion that ostracism could not have been introduced till after 496 B.C.) to suspect the unanimous evidence of antiquity that Cleisthenes was the inventor of ostracism. The problem is difficult, and no satisfactory answer has been given. Aelian's story that Cleisthenes himself was the first to be ostracized is attractive in view of his overtures to Persia (see CLEISTHENES), but it has little historical value and conflicts with the chapter in Aristotle's *Constitution*—which, however, may conceivably be simply the list of those recalled from ostracism at the time of Xerxes' Invasion, all of whom must have been ostracized less than ten years before 481 (*i.e.* since Marathon). With the end of the Persian Wars, the original object of ostracism was removed, but it continued in use for forty years and was revived in 417 B.C. It now became a mere party weapon and the farcical result of its use in 417 in the case of Hyperbolus led to its abolition either at once, or, as Lugebil seeks to prove, in the archonship of Euclides (403 B.C.). Such a device inevitably lent itself to abuse (see Aristotle, *Pol.* 38, 1284 b 22 στασιαστικῶς ἐχρῶντο).

Grote maintains that ostracism was a useful device, on the grounds that it removed the danger of tyranny, and was better than the perpetual civil strife of the previous century. The second reason is strictly beside the point, and the first has no force after the Persian Wars. As a factor in party politics it was both unnecessary and injurious to the state. Thus in the Persian Wars, it deprived Athens of the wisdom of Xanthippus and Aristides, while at the battle of Tanagra and perhaps at the time of the Egyptian expedition the assistance of Cimon was lacking. Further, it was a blow to the fair-play of party politics; the defeated party, having no leader, was reduced to desperate measures, such as the assassination of Ephialtes. To defend it on the ground that it created and stimulated the national consciousness is hardly reconcilable with the historic remark of the voter who voted against Aristides because he wished to hear no more of his incorruptible integrity; moreover in democratic Athens the "national consciousness" was, if anything, too frequently stimulated in the ordinary course of government. Aristotle, admitting its usefulness, rightly describes ostracism as in theory tyrannical; Montesquieu (*Esprit des lois*, xii. cc. 19, 29, &c.) defends it as a mild and reasonable institution. On the whole, the history of its effect in Athens, Argos, Miletus, Megara and Syracuse (where it was called *Petalismus*), furnishes no sufficient defence against its admitted disadvantages. The following is a list of persons who suffered ostracism:—Hipparchus (488); Megacles (487), Xanthippus (485), Aristides (483), Themistocles (471?); Cimon (461?) Thucydides, son of Melesias (444), Damon, Hyperbolus (417) and possibly Cleisthenes himself (*q.v.*).

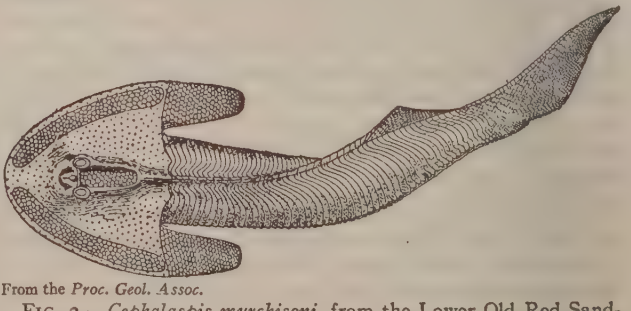
AUTHORITIES.—For the procedure in O. see Appendix Photii (Porson, p. 675); see also, besides authorities quoted above, Busolt, i. 620; Müller's *Handbuch*, iv. 1, 121; Gilbert, *Gr. St.* i. 446–466 and *Greek Constitutional Antiquities* (Eng. trans., 1895); A. H. J. Greenidge, *Handbook of Greek Constitutional Antiquities* (1896); histories of Greece in general. The view maintained in the text as to the number of votes necessary is supported by Duruy (*H. of G.* ii. 1, 36), Boeckh, Wachsmuth, &c.; opposed by Grote, Oman and (on the whole) by Evelyn Abbott. On the danger of privilegia in general see Cicero, *de Legibus*, iii. 4, and note that in Athens, ostracism gratuitously anticipated a crime which, if committed, would have been punishable in the popular Heliaea. Cf. also article EXILE. (J. M. M.)

OSTRACODERMS or OSTRACOPHORES, the earliest and most primitive group of fish-like animals, found as fossils in Upper Silurian and Devonian formations both in Europe and in North



From the *Trans. Roy. Soc., Edinburgh.*

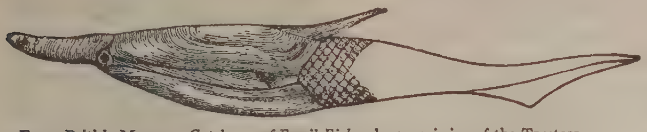
FIG. 1.—*Thelodus scoticus*, from the Upper Silurian of Lanarkshire, restored by Dr R. H. Traquair; about one-half nat. size.



From the *Proc. Geol. Assoc.*

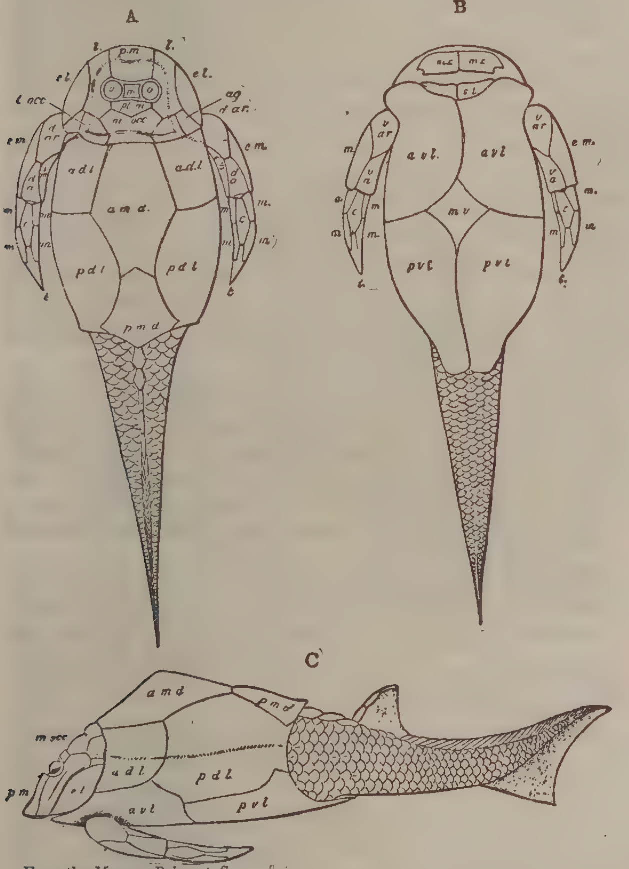
FIG. 2.—*Cephalaspis murchisoni*, from the Lower Old Red Sandstone of Herefordshire, restored by Dr A. S. Woodward; about one-half nat. size.

America. They are so named (Gr. shell-skins or shell-bearers) in allusion to the nacreous shell-like appearance of the inner face of the plates of armour which cover the more common members of the group. The Ostracoderms are, indeed, known only by the hard armature of the skin, but this sometimes bears impressions of certain internal soft parts which have perished during fossilization. They agree with fishes in the possession of median fins, and resemble the large majority of early fishes in their unequal-lobed (heterocercal) tail, but they have no ordinary paired fins. They must also have been provided with the usual gill-apparatus, but there is reason to believe that their lower jaw was not on the fish plan. They are, therefore, at least as low in the zoological scale as the existing lampreys, with which Cope, Smith, Woodward and others have associated them. They are all small animals, many of them only a few centimetres in length.



From British Museum, *Catalogue of Fossil Fishes*, by permission of the Trustees.

FIG. 3.—*Pteraspis rostrata*, from the Lower Old Red Sandstone of Herefordshire, restored by Dr A. S. Woodward; about one-third nat. size.



From the *Monogr. Palaeont. Soc.*

FIG. 4.—*Pterichthys milleri*, from the Middle Old Red Sandstone of Scotland, restored by Dr R. H. Traquair; upper (A), lower (B), and left-side view (C), about one-half nat. size.

ag.,	Angular.	*m.occ.*,	Median occipital.
a.d.l.,	Anterior dorso-lateral.	*m.v.*,	Median ventral.
a.m.d.,	Anterior median dorsal.	*mx.*,	Maxilla.
a.v.l.,	Anterior ventro-lateral.	*o.*,	Ocular.
c.,	Central.	*p.d.l.*,	Posterior dorso-lateral.
d.a.,	Dorsal anconeal.	*p.m.*,	Pre-median.
d.ar.,	Dorsal articular.	*p.m.d.*,	Posterior median dorsal.
e.l.,	Extra lateral.	*p.v.l.*,	Posterior ventro-lateral.
e.m.,	External marginal.	*pt.m.*,	Post-median.
i.m.,	Internal marginal.	*s.l.*,	Semilunar.
l.,	Lateral.	*t.*,	Terminal.
l.occ.,	Lateral occipital.	*v.a.*,	Ventral anconeal.
m.,	Median.	*v.ar.*,	Ventral articular.
m.m.,	Marginals of lower limb.		

The oldest and lowest family of Ostracoderms, that of Coelolepidae, is known by nearly complete skeletons of *Thelodus* (fig. 1) and *Lanarkia* from the Upper Silurian mudstones of Lanarkshire, Scotland. The body is completely and uniformly covered with minute granules which resemble the shagreen of sharks, and were erroneously ascribed to sharks when they were first discovered in the Upper Silurian bone-bed at Ludlow, Shropshire. The head and anterior part of the trunk are depressed and shown from above or below in the fossils, and this region sharply contracts behind into the slender tail, which is generally seen in side view, with one small dorsal fin and a forked heterocercal tail. The eyes are far forwards and wide apart. In another family, that of the Cephalaspidae (fig. 2), the animals resemble the Coelolepids in shape, but their skin-granules are fused into small plates, which are polygonal where there must have been much flexibility, and in rings round the tail where the underlying successive plates of muscle necessitated this arrangement. The eyes are close together. At the opening of the gill-cavity on each side at the back of the head, there is a flexible flap, which is sometimes interpreted as a paired limb. Part of the armour of the Cephalaspidians contains bone-cells, but the dermal plates of two other families, the Pteraspidae (fig. 3) and Drepanaspidae, consist merely of fused shagreen granules without any advance towards bone. The Pteraspidae are interesting as showing on the inner side of the dorsal shield impressions which suggest that the gill-cavities extended unusually far forwards to the front of the head. Another family, known only by nearly complete skeletons from the Upper Silurian mudstones of Lanarkshire, is that of the Birkeniidae, comprising small fusiform species which are covered with granules disposed in curiously-arranged rows. The highest Ostracoderms are the Asterolepidae, which occur only in Devonian rocks and include the familiar *Pterichthys* (fig. 4) from the Middle Old Red Sandstone of Scotland. In this family the primitive skin-tubercles seem to have fused, not into polygonal plates, but along the lines of the slime-canals. The Asterolepid armour consists of symmetrically arranged, overlapping plates on the top of the head and round the body, with a pair of flippers similarly armoured and appended to the latter. The tail resembles that of other Ostracoderms and is sometimes covered with scales.

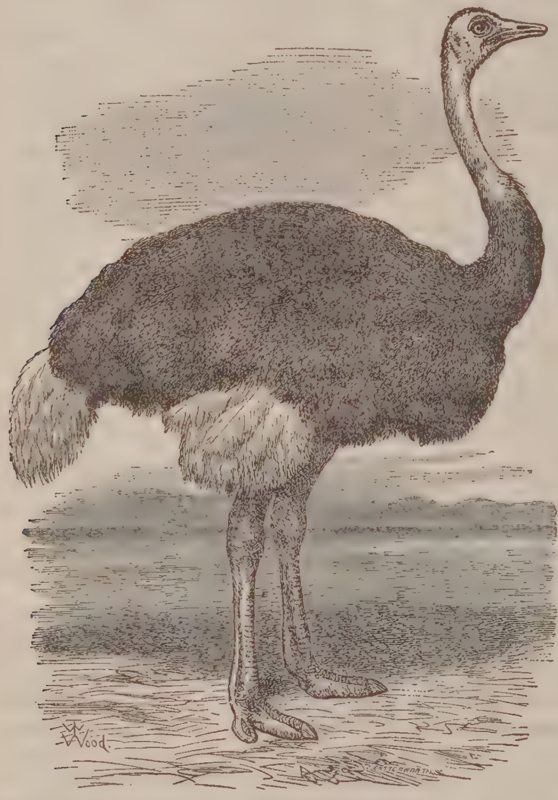
See E. Ray Lankester, *The Cephalaspidae* (Monogr. Palaeont. Soc. 1868, 1870); R. H. Traquair, *The Asterolepidae* (Monogr. Palaeont. Soc. 1894, 1904, 1906) and papers in *Trans. Roy. Soc. Edinb.* vol. xxxix. No. 32 (1899), vol. xl. Nos. 30, 33 (1903, 1905); A. S. Woodward, *Catal. Foss. Fishes, B.M.* pt. ii. (1891); W. H. Gaskell, *Origin of Vertebrates* (London, 1908). (A. S. Wo.)

OSTRAU, the name of two Austrian towns in the Ostrau-Karwin coal-mining district. (1) Mährisch-Ostrau (Moravian Ostrau), a town in Moravia, 95 m. N.E. of Brünn by rail. Pop. (1900) 30,125. It is situated on the right bank of the Ostrawitza, near its confluence with the Oder, and it derives its importance from the neighbouring coal mines, and the blast furnaces and iron-works which they have called into existence. The manufactures comprise sheet-iron, boilers, zinc, brick and tiles, paraffin, petroleum, soap and candles. The Rothschild iron-works at Witkowitz are in the vicinity. (2) Polnisch-Ostrau (Polish Ostrau), a mining town in Austrian Silesia, opposite Mährisch-Ostrau. Pop. (1900) 18,761, mostly Czech. It has large coal mines, which form the south-western portion of the extensive Upper Silesian coal fields, the largest Austrian deposit.

OSTRICH (O. Eng. *estridge*; Fr. *autruche*; Span. *avestruz*; Lat. *avis struthio*; Gr. *στρουθίων* or *ὁ μέγας στρουθός*); the *Struthio camelus* of Linnaeus, and the largest of living birds, an adult male standing nearly 8 ft. high and weighing 300 ℔.

The genus *Struthio* forms the type of the group of Ratite birds, characterized chiefly by large size, breast-bone without a keel, strong running legs, rudimentary wings and simple feathers (see BIRD). The most obvious distinctive character presented by the ostrich is the presence of two toes only, the third and fourth, on each foot—a character absolutely peculiar to the genus *Struthio*. In South America another large Ratite bird, the rhea, is called ostrich; it can be distinguished at once from the true ostrich by its possession of three toes.

The wild ostrich[1] is disappearing before the persecution of man, and there are many districts, some of wide extent, frequented by the ostrich in the 19th century—especially towards the extremities of its African range—in which it no longer occurs, while in Asia there is evidence, more or less trustworthy, of its former existence in most parts of the south-western desert-tracts, in few of which it is now to be found. Xenophon's notice of its abundance in Assyria (*Anabasis*, i. 5) is well known. It is probable that it still lingers in the wastes of Kirwan in eastern Persia, whence examples may occasionally stray northward to those of Turkestan,[2] even near the Lower Oxus; but the assertion, often repeated, as to its former occurrence in Baluchistan or Sind seems to rest on testimony too slender for acceptance. Apparently the most northerly limit of the ostrich's ordinary range at the present day is that portion of the Syrian Desert lying directly eastward of Damascus; and, within the limits of what may be called Palestine, H. B. Tristram (*Fauna and Flora of Palestine*, p. 139) regards it as but a straggler from central Arabia, though we have little information as to its distribution in that country.



Ostrich.

Africa is still, as in ancient days, the continent in which the ostrich chiefly flourishes. There it appears to inhabit every waste sufficiently extensive to afford it the solitude it loves. Yet even there it has to contend with the many species of carnivora which prey upon its eggs and young—the latter especially; and H. Lichtenstein long ago remarked[3] that if it were not for its numerous enemies "the multiplication of ostriches would be quite unexampled."

Though sometimes assembling in troops of from thirty to fifty, and then generally associating with zebras or with some of the larger antelopes, ostriches commonly, and especially in the breeding season, live in companies of not more than four or five, one of which is a cock and the rest are hens. The latter lay their eggs in one and the same nest, a shallow pit scraped out by their feet, with the earth heaped around to form a kind of wall against which the outermost circle of eggs rest. As soon as ten or a dozen eggs are laid, the cock begins to brood, always taking his place on them at nightfall surrounded by the hens, while by day they relieve one another, more it would seem to guard their common treasure from jackals and small beasts of prey than directly to forward the process of hatching, for that is often left wholly to the sun.[4] Some thirty eggs are laid in the nest, and round it are scattered perhaps as many more. These last are said to be broken by the old birds to serve as nourishment for the newly-hatched chicks, whose stomachs cannot bear the hard food on which their parents thrive. The greatest care is taken to place the nest where it may not be discovered, and the birds avoid being seen when going to or from it, while they display great solicitude for their young. C. J. Andersson in his *Lake N'gami* (pp. 253-269) has given a lively account of the pursuit by himself and Francis Galton of a brood of ostriches, in the course of which the male bird feigned being wounded to distract their attention from his offspring. Though the ostrich ordinarily inhabits the most arid districts, it requires water to drink; more than that, it will frequently bathe, and sometimes even, according to Von Heuglin, in the sea.

The question whether to recognize more than one species of ostrich has been continually discussed without leading to a satisfactory solution. While eggs from North Africa present a perfectly smooth surface, those from South Africa are pitted. Moreover northern birds have the skin of the parts not covered with feathers flesh-coloured, while this skin is bluish in southern birds, and hence the latter have been thought to need specific designation as *S. australis*. Examples from the Somali country have been described as forming a distinct species under the name of *S. molybdophanes* from the leaden colour of their naked parts.

The great mercantile value of ostrich-feathers, and the increasing difficulty, due to the causes already mentioned, of procuring them from wild birds, has led to the formation in Cape Colony, Egypt, the French Riviera and elsewhere of numerous "ostrich-farms," on which these birds are kept in confinement, and at regular intervals deprived of their plumes. In favourable localities and with judicious management these establishments yield very considerable profit (see FEATHER).

See, besides the works mentioned, E. D'Alton, *Die Skelete der Straussartigen Vögel abgebildet und beschrieben* (Bonn, 1827)· P. L. Sclater, "On the Struthious Birds living in the Zoological Society's Menagerie," *Transactions*, iv. p. 353, containing a fine representation (pl. 67), by J. Wolf, of the male *Struthio camelus*; J. Forest, *L'Autruche* (Paris, 1894); A. Douglass, *Ostrich Farming in South Africa* (London, 1881); modern anatomical work on the group is referred to in the article BIRDS. (A. N.)

OSTROG, a town of Russia, in the government of Volhynia, 95 m. W. of Zhitomir, at the confluence of the Vilya with the Goryn. Pop. (1897) 14,530. It is an episcopal see of the Orthodox Greek Church, and in the 16th century had a classical academy, converted later into a Jesuit college. Here was made and printed in 1581 the first translation of the Bible into old Slav. In the town is a brotherhood of Cyril and Methodius, which maintains schools of its own. The tanning of light leather is an active domestic trade; other industries are potteries, oil-works, soap, candle and tobacco factories. After being plundered by the Cossack chieftain Khmelnitski in 1648, and conquered by the Russians seven years later, the town fell into decay.

OSTROGOTHS, or EAST GOTHS, one of the two main branches into which the Goths were divided, the other being the Visigoths, or West Goths. See GOTHS.

OSTROVSKIY, ALEXANDER NIKOLAIVICH (1823–1886), Russian dramatic author, was born on the 12th of April 1823 in Moscow, where his father was an official of the senate. He studied law in the university of that city, which he quitted without having submitted to the final examination. He was then employed as a clerk in the office of the "Court of Conscience," and subsequently in that of the Commercial Court at Moscow. Both tribunals were called upon to settle disputes chiefly among the Russian merchant class, from which Ostrovskiy was thus enabled to draw the chief characters for his earliest comedies. Among these are *Byednaya Nivesta* ("The Poor Bride"), *Byednost ne Porok* ("Poverty not a Vice"), and *Ne v'svoi sani ne sadis* (literally "Don't put yourself in another's sledge," meaning "Don't put yourself in a position for which you are not suited"). Of this last Nicholas I. said, "it was not a play, but a lesson." The uncultured, self-satisfied Moscow merchants are strikingly portrayed in *Grozá* ("The Tempest") and *Svoyi lyudi sochtyomsya* ("Between near relatives no accounts are needed"), which was originally called "The Bankrupt." The last-mentioned comedy was prohibited for ten years, until the accession of Alexander II., and Ostrovskiy was dismissed the government service and placed under the supervision of the police. The Liberal tendencies of the new reign, however, soon brought relief. Ostrovskiy was one of several well-known literary men who were sent into the provinces to report on the condition of the people. Ostrovskiy's field of inquiry lay along the upper Volga, a part of the country memorable for some of the most important events in Russian history. This mission induced him to write several historical dramas of great merit, such as *Kuzma Zakharich Minin Soukhorouk* (the full name of the famous butcher who saved Moscow from the Poles); "The False Demetrius" and "Vassily Shuisky"; *Vassilisa Melentieva* (the name of a favourite court lady of Ivan the Terrible), and the comedy, *Voivoda eeli Son na Volge* ("The Military Commander," or "A dream on the Volga"). Many of his later works treat of the Russian nobility, and include *Byeshani Dengi* (literally "Mad Money"), *Vospeetinitsa* ("A Girl brought up in a Stranger's Family"), and *Volki e Ovtsi* ("Wolves and Sheep"); others relate to the world of actors, such as *Liess* ("Forest"), *Bez vini vinovatiya* ("Guiltlessly guilty"), and *Talenti e Pokloniki* ("Talents and their Admirers"). Ostrovskiy enjoyed the patronage of Alexander III., and received a pension of 3000 roubles a year. With the help of Moscow capitalists he established in that city a model theatre and school of dramatic art, of which he became the first director. He also founded the Society of Russian Dramatic Art and Opera Composers. His death took place on the 24th of June 1886, while travelling to his estate in Kostroma.

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[1] A good summary of the present distribution is contained in the *Ostriches and Ostrich Farming* of De Mosenthal and Harting, from which the accompanying figure is, with permission, taken. Von Heuglin, in his *Ornithologie Nordost-Afrikas* (pp. 925-935), and A. Reichenow in *Die Vögel Afrikas*, have given more particular details of the ostrich's distribution in Africa.

[2] Drs Finsch and Hartlaub quote a passage from Remusat's *Remarques sur l'extension de l'empire chinoise*, stating that in about the 7th century of our era a live "camel-bird" was sent as a present with an embassy from Turkestan to China.

[3] H. Lichtenstein, *Reise im südlichen Africa*, ii. 42-45 (Berlin, 1812).

[4] By those whose experience is derived from the observation of captive ostriches this fact has been often disputed. But, the difference of circumstances under which they find themselves, and in particular their removal from the heat-retaining sands of the desert and its burning sunshine, is quite enough to account for the change of habit. Von Heuglin also (p. 933) is explicit on this point.

OSTUNI, a picturesque walled city of Apulia, Italy, in the province of Lecce, 23 m. by rail N.W. of Brindisi. Pop. (1901) 7734 (town); 22,811 (commune). It has a cathedral of the 15th century with a fine Romanesque façade, and a municipal library with a collection of antiquities. The see has been amalgamated with that of Brindisi.

OSUNA, PEDRO TELLEZ GIRON, 3rd duke of (1575–1624), Spanish viceroy of Sicily and Naples, was born at Osuna, and baptized on the 18th of January 1575. He was the son of Juan Tellez Giron, the 2nd duke, and of his wife Ana Maria de Velasco, a daughter of the constable of Castile. When a boy he accompanied his grandfather, the 1st duke, to Naples, where he was viceroy. He saw service at the age of fourteen with the troops sent by Philip II. to put down a revolt in Aragon, and was married while still young to Doña Catarina Enriquez de Ribera, a grand-daughter on her mother's side of Hernan Cortes, the conqueror of Mexico. In 1598 he inherited the dukedom. Before and after his marriage he was known for the reckless dissipation of his life. The scandals to which his excesses gave rise led to his imprisonment at Arévalo in 1600. This sharp lesson had a wholesome effect on the duke, and in the same year he left for Flanders, with a body of soldiers raised at his own expense. His appearance in Flanders as a grandee with a following of his own caused some embarrassment to the king's officers. But Osuna displayed unexpected docility and good sense in the field. He was content to serve as a subordinate, and took a full share of work and fighting both by land and sea. When peace was made with England in 1604 he is said to have visited London. He is said also to have paid a visit to Holland during the armistice arranged to allow of the negotiations for the twelve years' truce of 1609; but, as he was back in Spain by that year, he cannot have seen much of the country. His services had purged his early offences, and he had been decorated with the Golden Fleece. On the 18th of September 1610 he was named viceroy of Sicily, and he took possession of his post at Melazzo on the 9th of March 1611. In 1616 he was promoted to the viceroyalty of Naples, and held the office till he was recalled on the 28th of March 1620. The internal government of Osuna in both provinces was vigorous and just. During his Sicilian viceroyalty he organized a good squadron of galleys with which he freed the coast for a time from the raids of the Mahommedan pirates of the Barbary States and the Levant. After his transfer to Naples Osuna continued his energetic wars with the pirates, but he became concerned in some of the most obscure political intrigues of the time. He entered into a policy of unmeasured hostility to Venice, which he openly attacked in the Adriatic. The princes of the Spanish branch of the Habsburgs were at all times anxious to secure safe communication with the German possessions of their family. Hence their anxiety to dominate all northern Italy and secure possession of the Alpine passes. It would have suited them very well if they could have reduced Venice to the same state of servitude as Genoa. Osuna threw himself into this policy with a whole heart. There can be no reasonable doubt that he was engaged with the Spanish ambassador, and the viceroy of Milan, in the mysterious conspiracy against Venice in 1618. As usual, the Spanish government had miscalculated its resources, and was compelled to draw back. It then found extreme difficulty in controlling its fiery viceroy. Osuna continued to act against Venice in an almost piratical fashion, and treated orders from home with scant respect. Serious fears began to be entertained that he meant to declare himself independent in Naples, and had he tried he could have brought about a revolt which the enfeebled Spanish government could hardly have suppressed. It is, however, unlikely that he had treasonable intentions. He allowed his naval forces to be gradually reduced by drafts, and when superseded returned obediently to Madrid. After his return he was imprisoned on a long string of charges, and largely at the instigation of the Venetians. No judgment was issued against him, as he died in prison on the 24th of September 1624. The "great duke of Osuna," as he is always called by the Spaniards, impressed the imagination of his countrymen profoundly as a vigorous, domineering and patriotic leader of the stamp of the 16th century, and he was no less admired by the Italians. His ability was infinitely superior to that of the ordinary politicians and courtiers of the time, but he was more energetic than really wise, and he was an intolerable subordinate to the bureaucratic despotism of Madrid.

The *Vita di Don Pietro Giron, duca d' Ossuna, vicere di Napoli e di Sicilia* of Gregorio Leti (Amsterdam, 1699) is full of irrelevances, and contains much gossip, as well as speeches which are manifestly the invention of the author. But it is founded on good documents, and Leti, an Italian who detested the Spanish rule, knew the state of his own country well. See also Don C. Fernandez Duro, *El Gran Duque de Osuna y su Marina* (Madrid, 1885), and *Documentos inéditos para la historia de España* (Madrid, 1842, &c.), vols. xliv.-xlvii.

OSUNA, a town of southern Spain, in the province of Seville; 57 m. by rail E.S.E. of Seville. Pop. (1900) 18,072. Osuna is built on a hill, overlooking the fertile plain watered by the Salado, a sub-tributary of the Guadalquivir. On the top of the hill stands the collegiate church, dating from 1534 and containing interesting Spanish and early German paintings. These, however, as well as the sculptures over the portal, suffered considerably during the occupation of the place by the French under Soult. The vaults, which are supported by Moorish arches, contain the tombs of the Giron family, by one of whom, Don Juan Tellez, the church was founded in 1534. The university of Osuna, founded also by him in 1549, was suppressed in 1820; but its large building is still used as a secondary school.

The industries are agriculture and the making of esparto mats, pottery, bricks, oil, soap, cloth, linen and hats.

Osuna, the Urso of Hirtius, famous in the 1st century B.C. for its long resistance to the troops of Caesar, and its fidelity to the Pompeians, was subsequently called by the Romans Orsona and Gemina Urbanorum, the last name being due, it is said, to the presence of two urban legions here. Osuna was taken from the Moors in 1239, and given by Alphonso X. to the knights of Calatrava in 1264. Don Pedro Giron appropriated it to himself in 1445. One of his descendants, Don Pedro Tellez, was the first holder of the title duke of Osuna, conferred on him by Philip II. in 1562.

Estepa (pop. 8591), a town 6 m. E.N.E. is the Iberian and Carthaginian Astepa or Ostipo, famous for its siege in 207 B.C. by the Romans under Publius Cornelius Scipio. When further resistance became impossible, the people of Astepa set fire to their town, and all perished in the flames.

OSWALD (*c.* 605–642), king of Northumbria, was one of the sons of Æthelfrith and was expelled from Northumbria on the accession of Edwin, though he himself was a son of Edwin's sister Acha. He appears to have spent some of his exile in Iona, where he was instructed in the principles of Christianity. In 634 he defeated and slew the British king Ceadwalla at a place called by Bede Denisesburn, near Hefenfelth, which has been identified with St Oswald's Cocklaw, near Chollerford, Northumberland. By this he avenged his brother Eanfrith, who had succeeded Edwin in Bernicia, and became king of Northumbria. Oswald reunited Deira and Bernicia, and soon raised his kingdom to a position equal to that which it had occupied in the time of Edwin, with whom he is classed by Bede as one of the seven great Anglo-Saxon kings. His close alliance with the Celtic church is the characteristic feature of his reign. In 635 he sent to the elders of the Scots for a bishop. On the arrival of Aidan in answer to this request he assigned to him the island of Lindisfarne as his see, near the royal city of Bamborough. He also completed the minster of St Peter at York which had been begun by Paulinus under Edwin. Bede declares that Oswald ruled over " all the peoples and provinces of Britain, which includes four languages, those of the Britons, Picts, Scots and Angles." His relationship to Edwin may have helped him to consolidate Deira and Bernicia. Early in his reign he was sponsor to the West Saxon king Cynegils, whose daughter he married. In 642 he was defeated and slain at a place called Maserfeld, probably Oswestry in Shropshire, by Penda of Mercia.

See Bede, *Historia Ecclesiastica*, ed. C. Plummer (Oxford, 1896), ii. 5, 14, 20; iii. 2, 3, 5, 6, 7, 9-14; *Anglo-Saxon Chronicle*, ed. J. Earle and C. Plummer (Oxford, 1899), *s.a.*, 617, 634, 635, 642, 654.

OSWALD (d. 992), archbishop of York, was a nephew of Oda, archbishop of Canterbury, and at an early age became, by purchase, head of the Old Minster at Winchester. Desiring to become a monk, he went with Oda's approval to the monastery of Fleury on the Loire—at that time the great centre of reviving Benedictinism. Here he soon distinguished himself by the monastic austerity of his life. In 959 he returned to England at the request of Oda, who, however, died before his arrival. He now went to York to his kinsman the Archbishop Oskytel, who took him with him on a pilgrimage to Rome. Soon after his return he was appointed bishop of Worcester at the recommendation of Dunstan, his predecessor in the see (961). As bishop he took a prominent part in that revival of monastic discipline on Benedictine lines of which Aethelwold, bishop of Winchester, was the most ardent leader. His methods, however, were less violent than those of Aethelwold. Among other religious houses he founded that of Ramsey in conjunction with Aethelwine, Ealdorman of East Anglia. In 972 he was translated (again at Dunstan's recommendation) to the archbishopric of York, with which he continued to hold the see of Worcester. He died on the 29th of February 992 and was buried at Worcester.

See *Memorials of St Dunstan*, edited by W. Stubbs, Rolls series (London, 1874).

OSWALDTWISTLE, an urban district in the Accrington parliamentary division of Lancashire, England, on the Leeds and Liverpool Canal, 3½ m. E.S.E. of Blackburn. Pop. (1901) 14,192. It possesses cotton-mills, printworks, bleachworks and chemical works, and in the neighbourhood are collieries, stone quarries and potteries. At Peelfold, in the township, was born (1750) Sir Robert Peel, first baronet, who, as a factory-owner effected wide developments in the cotton industry.

OSWEGO, a city, port of entry, and the county-seat of Oswego county, New York, U.S.A., on the S.E. shore of Lake Ontario, at the mouth of the Oswego river, about 35 m. N.W. of Syracuse. Pop. (1900) 22,199, of whom 3989 were foreign born; (1910 census) 23,368. It is served by the New York Central & Hudson River, the Delaware, Lackawanna & Western, and the New York, Ontario & Western railways, by several lines of lake steamboats, and by the Oswego Canal, which connects Lake Ontario with the Erie Canal at Syracuse. There is an inner harbour of 9·35 acres and an outer harbour of 140 acres, which are defended by Fort Ontario. The city lies at an altitude of 300 ft., and is divided into two parts by the Oswego river. Oswego is the seat of a state Normal and Training School (founded as the City Training School in 1861, and a state school since 1867), a state armoury, and a United States life-saving station; among the public buildings are the City Library (about 14,000 volumes in 1909), founded by Gerrit Smith in 1855, the Federal Building and Custom House, the City Hall, the City Hospital, the County Court House, an Orphan Asylum, and a business college. The Oswego river has here a fall of 34 ft. and furnishes excellent water power. Among the principal manufactures are starch (the city has one of the largest starch factories in the world), knit goods, railway car springs, shade-cloth, boilers and engines, wooden-ware, matches, paper-cutting machines, and eau de cologne. The factory products were valued in 1905 at $7,592,125. Oswego has a considerable trade with Canada; in 1908 its exports were valued at $2,880,553 and its imports at $999,164. Lake commerce with other American Great Lake ports is also of some importance, the principal articles of trade being lumber, grain and coal.

The site of Oswego was visited by Samuel de Champlain in 1616. Subsequently it was a station for the Jesuit missionaries and the *coureurs des bois*. In 1722 a regular trading post was established here by English traders, and in 1727 Governor William Burnet of New York erected the first Fort Oswego (sometimes called Fort Burnet, Chouaguen or Pepperrell). It was an important base of operations during King George's War and the French and Indian War. In the years 1755–1756 the British erected two new forts at the mouth of the river, Fort Oswego (an enlargement of the earlier fort) on the east and Fort Ontario on the west. In August 1756 Montcalm, marching rapidly from Ticonderoga with a force of 3000 French and Indians, appeared before the forts, then garrisoned by 1000 British and colonial troops, and on the 14th of August forced the abandonment of Fort Ontario. On the following day he stormed and captured Fort Oswego, and, dismantling both, returned to Ticonderoga. The British restored Fort Ontario in 1759, and maintained a garrison here until 1796, when, with other posts on the lakes, they were, in accordance with the terms of Jay's Treaty, made over to the United States. It was here in 1766 that Pontiac formally made to Sir William Johnson his acknowledgment of Great Britain's authority. On the 6th of May 1814 Sir James Yeo, with a superior force of British and Canadians, captured the fort, but soon afterwards withdrew. In 1839 the fort was rebuilt and occupied by United States troops; it was abandoned in 1899, but, after having been reconstructed, was again garrisoned in 1905. The modern city may be said to date from 1796. Oswego became the county-seat in 1816, was incorporated as a village in 1828 (when the Oswego Canal was completed), and was first chartered as a city in 1848.

See Churchill, Smith and Child, *Landmarks of Oswego County* (Syracuse, 1895).

OSWESTRY, a market town and municipal borough in the Oswestry parliamentary division of Shropshire, England, on the borders of Wales, 18 m. N.W. from Shrewsbury. Pop. (1901) 9579. It is on a branch from the Chester line of the Great Western railway, and on the Cambrian main line. The situation is pleasant and the neighbouring district well wooded and hilly. The church of St Oswald, originally conventual, is Early English and Decorated, but has been greatly altered by restoration. There is a Roman Catholic chapel with presbytery, convent and school. The grammar school, founded in the reign of Henry IV., occupies modern buildings. The municipal buildings (1893) include a library, and a school of science and art. On a hill W. of the town are the castle grounds, laid out in 1890, but of the castle itself only slight remains are seen. The Cambrian railway engine and carriage works are here; and there are tanneries, malting works, machinery works and iron foundries. Frequent agricultural fairs are held. The town is governed by a mayor, 6 aldermen and 18 councillors. Area, 1887 acres.

Old Oswestry, also called Old Fort (Welsh *Hên Dinas*), is a British earthwork about a mile from the modern town. There are various unsatisfactory accounts of the early history of Oswestry (Blaneminster, or Album Monasterium), as that it was called Trer Cadeirau by the Britons and Osweiling after Cunelda Wledig, prince of North Wales, had granted it to his son Osweil. It derives its present name from Oswald, king of Northumbria, who is said to have been killed here in 642, although it was not definitely known as Oswestry until the 13th century. In the Domesday Survey it is included in the manor of Maesbury, which Rainald, sheriff of Shropshire, held of Roger, earl of Shrewsbury; but Rainald or his predecessor Warin had already raised a fortification at Oswestry called Louvre. The manor passed in the reign of Henry I. to Alan Fitz-Flaad, in whose family it continued until the death of Henry Fitzalan, earl of Arundel, without male issue in 1580. The first charter, of which a copy only is preserved among the corporation records, is one given in 1262 by John Fitzalan granting the burgesses self-government. Richard II. by a charter dated 1398 granted all the privileges which belonged to Shrewsbury, and a similar charter was obtained from Thomas, earl of Arundel in 1407. The town was incorporated by Elizabeth in 1582 under the government of two bailiffs and a common council of 24 burgesses, and her charter was confirmed by James I. in 1616. A charter granted by Charles II. in 1672 appointed a mayor, 12 aldermen and 15 common councilmen, and remained the governing charter until the Municipal Corporations Act of 1835 changed the corporation. In 1228 John Fitzalan obtained the right of holding a market every week on Monday instead of Thursday. The market rights were held by the lord of the manor until 1819, when Earl Powis sold them to the corporation. In the 15th and 16th centuries a weekly market was held at Oswestry for the sale of woollen goods manufactured in North Wales, but in the 17th century the drapers of Shrewsbury determined to get the trade into their own town, and although an Order in the Privy Council was passed to restrain it to Oswestry they agreed in 1621 to buy no more cloth there. The town was walled by the time of Edward I., but was several times burnt during Welsh invasions. In 1642 it was garrisoned for Charles I., but two years later surrendered to the parliamentary forces.

See William Cathrall, *The History of Oswestry* (1855); William Price, *The History of Oswestry from the Earliest Period* (1815); *Victoria County History, Shropshire.*

OSWIO (*c.* 612–670), king of Northumbria, son of Æthelfrith and brother of Oswald, whom he succeeded in Bernicia in 642 after the battle of Maserfeld, was the seventh of the great English kings enumerated by Bede. He succeeded in making the majority of the Britons, Picts and Scots tributary to him. At Gilling in 651 he caused the murder of Oswine, a relative of Edwin, who had become king of Deira, and a few years later took possession of that kingdom. He appears to have consolidated his power by the aid of the Church and by a series of judicious matrimonial alliances. It was probably in 642 that he married Eanfled, daughter of Edwin, thus uniting the two rival dynasties of Northumbria. His daughter Alhfled he married to Peada, son of Penda, king of Mercia, while another daughter, Osthryth, became the wife of Æthelred, third son of the same king. Oswio was chiefly responsible for the reconversion of the East Saxons. He is said to have convinced their king Sigeberht of the truth of Christianity by his arguments, and at his request sent Cedd, a brother of Ceadda, on a mission to Essex. In 655 he was attacked by Penda, and, after an unsuccessful attempt to buy him off, defeated and slew the Mercian king at the battle of the Winwaed. He then took possession of part of Mercia, giving the rest to Peada. As a thank-offering he dedicated his daughter Ælfled to the Church, and founded the monastery of Whitby. About this time he is thought by many to have obtained some footing in the kingdom of the Picts in succession to their king Talorcan, the son of his brother Eanfrid. In 660 he married his son Ecgfrith to Æthelthryth, daughter of the East Anglian king Anna. In 664 at the synod of Whitby, Oswio accepted the usages of the Roman Church, which led to the departure of Colman and the appointment of Wilfrid as bishop of York. Oswio died in 670 and was succeeded by his son Ecgfrith.

See Bede, *Historia Ecclesiastica*, ii., iii., iv., v., edited by C. Plummer (Oxford, 1896); *Anglo-Saxon Chronicle*, edited by Earle and Plummer (Oxford, 1899).

OTHMAN (*c.* 574–656), in full OTHMĀN IBN ʿAFFĀN, the third of the Mahommedan caliphs, a kinsman and son-in-law of Mahomet and cousin of Abu Sofiān, whose son Moawiya became the first of the Omayyad dynasty. He was elected caliph in succession to Omar in 644, but owing to his alternate weakness and cruelty and his preference of the Koreish for all responsible positions irrespective of their capacity, he produced strife throughout the empire which culminated in his assassination by Mahommed, son of Abu Bekr. He was succeeded by Ali (*q.v.*). See CALIPHATE, A. § 3.

OTHNIEL, in the Bible, a clan settled at Debir or Kirjath-sepher in S. Palestine (Judg. i. 12 sqq., Josh. xv. 16 sqq., contrast Josh. x. 38 seq.), described as the "brother" of Caleb. The name appears in Judg. iii. 7-11 (see JUDGES), as that of a hero who delivered Israel from a North Syrian king. That a king from the Euphrates who had subjugated Canaan should have been defeated by a clan of the south of Palestine has been doubted. There is no evidence of such a situation, and it has been conjectured that Cushan-Rishathaim (the name suggests "C. of double wickedness"!) of Aram (ארם) has arisen from some king (cp. Husham, Gen. xxxvi. 34) or clan (cp. Cush, Num. xii. 1; Cushan, Hab. iii. 7) of Edom (ארם) to the south or south-east of Palestine. Othniel recurs in 1 Chron. iv. 13.

See A. Klostermann, *Gesch. d. Volkes Israel* (1896), p. 122; Cheyne, *Ency. Bib.* col. 969 seq. and references; also the literature to JUDGES.

OTHO, MARCUS SALVIUS (32–69), Roman emperor from the 15th of January to the 15th of April A.D. 69, was born on the 28th of April A.D. 32. He belonged to an ancient and noble Etruscan family settled at Ferentinum in Etruria. He appears first as one of the most reckless and extravagant of the young nobles who surrounded Nero. But his friendship with Nero was brought to an abrupt close in 58, when Otho refused to divorce his beautiful wife Poppea Sabina at the bidding of Nero, who at once appointed him governor of the remote province of Lusitania. Here Otho remained ten years, and his administration was marked by a moderation unusual at the time. When in 68 his neighbour Galba, the governor of Hispania Tarraconensis, rose in revolt against Nero, Otho accompanied him to Rome. Resentment at the treatment he had received from Nero may have impelled him to this course, but to this motive was added before long that of personal ambition. Galba was far advanced in years, and Otho, encouraged by the predictions of astrologers, aspired to succeed him. But in January 69 his hopes were dissipated by Galba's formal adoption of L. Calpurnius Piso as the fittest man to succeed him. Nothing remained for Otho but to strike a bold blow. Desperate as was the state of his finances, thanks to his previous extravagance, he found money to purchase the services of some three-and-twenty soldiers of the praetorian guard. On the morning of January 15, five days only after the adoption of Piso, Otho attended as usual to pay his respects to the emperor, and then hastily excusing himself on the score of private business hurried from the Palatine to meet his accomplices. By them he was escorted to the praetorian camp, where, after a few moments of surprise and indecision, he was saluted imperator. With an imposing force he returned to the Forum, and at the foot of the Capitol encountered Galba, who, alarmed by vague rumours of treachery, was making his way through a dense crowd of wondering citizens towards the barracks of the guard. The cohort on duty at the Palatine, which had accompanied the emperor, instantly deserted him; Galba, Piso and others were brutally murdered by the praetorians. The brief struggle over, Otho returned in triumph to the camp, and on the same day was duly invested by the senators with the name of Augustus, the tribunician power and the other dignities belonging to the principate. Otho had owed his success, not only to the resentment felt by the praetorian guards at Galba's well-meant attempts to curtail their privileges in the interests of discipline, but also largely to the attachment felt in Rome for the memory of Nero; and his first acts as emperor showed that he was not unmindful of the fact. He accepted, or appeared to accept, the cognomen of Nero conferred upon him by the shouts of the populace, whom his comparative youth and the effeminacy of his appearance reminded of their lost favourite. Nero's statues were again set up, his freedmen and household officers reinstalled, and the intended completion of the Golden House announced. At the same time the fears of the more sober and respectable citizens were allayed by Otho's liberal professions of his intention to govern equitably, and by his judicious clemency towards Marius Celsus, consul-designate, a devoted adherent of Galba.

But any further development of Otho's policy was checked by the news which reached Rome shortly after his accession, that the army in Germany had declared for Vitellius, the commander of the legions on the lower Rhine, and was already advancing upon Italy. After in vain attempting to conciliate Vitellius by the offer of a share in the empire, Otho, with unexpected vigour, prepared for war. From the remoter provinces, which had acquiesced in his accession, little help was to be expected; but the legions of Dalmatia, Pannonia and Moesia were eager in his cause, the praetorian cohorts were in themselves a formidable force and an efficient fleet gave him the mastery of the Italian seas. The fleet was at once despatched to secure Liguria, and on the 14th of March Otho, undismayed by omens and prodigies, started northwards at the head of his troops in the hopes of preventing the entry of the Vitellian troops into Italy. But for this he was too late, and all that could be done was to throw troops into Placentia and hold the line of the Po. Otho's advanced guard successfully defended Placentia against Alienus Caecina, and compelled that general to fall back on Cremona. But the arrival of Fabius Valens altered the aspect of affairs. The Vitellian commanders now resolved to bring on a decisive battle, and their designs were assisted by the divided and irresolute counsels which prevailed in Otho's camp. The more experienced officers urged the importance of avoiding a battle, until at least the legions from Dalmatia had arrived. But the rashness of the emperor's brother Titianus and of Proculus, prefect of the praetorian guards, added to Otho's feverish impatience, overruled all opposition, and an immediate advance was decided upon, Otho himself remaining behind with a considerable reserve force at Brixellum, on the southern bank of the Po. When this decision was taken the Othonian forces had already crossed the Po and were encamped at Bedriacum (or Betriacum), a small village on the Via Postumia, and on the route by which the legions from Dalmatia would naturally arrive. Leaving a strong detachment to hold the camp at Bedriacum, the Othonian forces advanced along the Via Postumia in the direction of Cremona. At a short distance from that city they unexpectedly encountered the Vitellian troops. The Othonians, though taken at a disadvantage, fought desperately, but were finally forced to fall back in disorder upon their camp at Bedriacum. Thither on the next day the victorious Vitellians followed them, but only to come to terms at once with their disheartened enemy, and to be welcomed into the camp as friends. More unexpected still was the effect produced at Brixellum by the news of the battle. Otho was still in command of a formidable force—the Dalmatian legions had already reached Aquileia; and the spirit of his soldiers and their officers was unbroken. But he was resolved to accept the verdict of the battle which his own impatience had hastened. In a dignified speech he bade farewell to those about him, and then retiring to rest slept soundly for some hours. Early in the morning he stabbed himself to the heart with a dagger which he had concealed under his pillow, and died as his attendants entered the tent. His funeral was celebrated at once, as he had wished, and not a few of his soldiers followed their master's example by killing themselves at his pyre. A plain tomb was erected in his honour at Brixellum, with the simple inscription "Diis Manibus Marci Othonis." At the time of his death (the 15th of April 69) he was in his thirty-eighth year, and had reigned just three months. In all his life nothing became him so well as his manner of leaving it; but the fortitude he then showed, even if it was not merely the courage of despair, cannot blind us to the fact that he was little better than a reckless and vicious spendthrift, who was not the less dangerous because his fiercer passions were concealed beneath an affectation of effeminate dandyism. (H. F. P.)

See Tacitus, *Histories*, i. 12-50, 71-90, ii. 11-51; *Lives* by Suetonius and Plutarch; Dio Cassius lxiv.; Merivale, *History of the Romans under the Empire*, ch. 56; H. Schiller, *Geschichte der römischen Kaiserzeit* (1883); L. Paul, "Kaiser M. Salvius Otho" in *Rhein. Mus.* lvii. (1902); W. A. Spooner, *On the Characters of Galba, Otho, and Vitellius*, in Introd. to his edition (1891) of the *Histories* of Tacitus; B. W. Henderson, *Civil War and Rebellion in the Roman Empire*, A.D. *69-70* (1908).

OTIS, HARRISON GRAY (1765–1848), American politician, was born in Boston, Massachusetts, on the 8th of October 1765. He was a nephew of James Otis, and the son of Samuel Allyne Otis (1740–1814), who was a member of the Confederation Congress in 1787–1788 and secretary of the United States Senate from its first session in 1789 until his death. Young Otis graduated from Harvard College in 1783, was admitted to the bar in 1786, and soon became prominent as a Federalist in politics. He served in the Massachusetts House of Representatives in 1796–1797, in the National House of Representatives in 1797–1801, as district-attorney for Massachusetts in 1801, as speaker of the state House of Representatives in 1803–1805, as a member of the state Senate from 1805 to 1811, and as president of that body in 1805–1806 and 1808–1811, as a member of the United States Senate from 1817 to 1822, and as mayor of Boston in 1829–1832. He was strongly opposed to the War of 1812, and was a leader in the movement culminating in the Hartford Convention, which he defended in a series of open letters published in 1824, and in his inaugural address as mayor of Boston. A man of refinement and education, a member of an influential family, a popular social leader and an eloquent speaker—at the age of twenty-three he was chosen by the town authorities of Boston to deliver the Independence Day oration—Otis yet lacked conspicuous ability as a statesman. He died in Boston on the 28th of October 1848.

OTIS, JAMES (1725–1783), American patriot, was born at West Barnstable, Massachusetts, on the 5th of February 1725. He was the eldest son of James Otis (1702–1778), fourth in descent from John Otis (1581–1657), a native of Barnstaple, Devon, and one of the first settlers (in 1635) of Hingham, Mass. The elder James Otis was elected to the provincial General Court in 1758, was its speaker in 1760–1762, and was chief justice of the Court of Common Pleas from 1764 until 1776; he was a prominent patriot in the colony of Massachusetts. The son graduated at Harvard in 1743; and after studying law in the office of Jeremiah Gridley (1702–1767), a well-known lawyer with Whig sympathies, rose to great distinction at the bar, practising first at Plymouth and after 1750 at Boston. In 1760 he published *Rudiments of Latin Prosody*, a book of authority in its time. He wrote a similar treatise upon Greek prosody; but this was never published, because, as he said, there was not a font of Greek letters in the country, nor, if there were, a printer who could have set them up. Soon after the accession of George III. to the throne of England in 1760, the British government decided upon a rigid enforcement of the navigation acts, which had long been disregarded by the colonists and had been almost wholly evaded during the French and Indian War. The Writs of Assistance issued in 1755 were about to expire, and it was decided to issue new ones, which would empower custom house officers to search any house for smuggled goods, though neither the house nor the goods had to be specifically mentioned in the writs. Much opposition was aroused in Massachusetts, the legality of the writs was questioned, and the Superior Court consented to hear argument. Otis held the office of advocate-general at the time, and it was his duty to appear on behalf of the government. He refused, resigned his office, and appeared for the people against the issue of the writs, Gridley appearing on the opposite side. The case was argued in the Old Town House of Boston in February 1761, and the chief speech was made by Otis. His plea was fervid in its eloquence and fearless in its assertion of the rights of the colonists. Going beyond the question at issue, he dealt with the more fundamental question of the relation between the English in America and the home government, and argued that even if authorized by act of parliament such writs were null and void. The young orator was elected in May of the same year a representative from Boston to the Massachusetts General Court. To that position he was re-elected nearly every year of the remaining active years of his life, serving there with his father. In 1766 he was chosen Speaker of the House of Representatives, but the choice was negatived. In September 1762 the younger Otis published *A Vindication of the Conduct of the House of Representatives of the Province of Massachusetts Bay*, in defence of the action of that body in sending to the governor a message (drafted by Otis) rebuking him for asking the assembly to pay for ships he had (with authorization of the Council and not of the representatives) sent to protect New England fisheries against French privateers; according to this message "it would be of little consequence to the people whether they were subject to George or Louis, the king of Great Britain or the French king, if both were as arbitrary as both would be if both could levy taxes without parliament." He also wrote various state papers addressed to the colonies to enlist them in the common cause, or sent to the government in England to uphold the rights or set forth the grievances of the colonists. His influence at home in controlling and directing the movement of events which led to the War of Independence was universally felt and acknowledged; and abroad no American was so frequently quoted, denounced, or applauded in parliament and the English press before 1769 as the recognized head and chief of the rebellious spirit of the New England colonists. In 1765 Massachusetts sent him as one of her representatives to the Stamp Act Congress at New York, which had been called by a Committee of the Massachusetts General Court, of which he was a member; and here he was a conspicuous figure, serving on the committee which prepared the address sent by that body to the British House of Commons. In 1769 he denounced in the Boston *Gazette* certain customs commissioners who had charged him with treason. Thereupon he became involved in an altercation in a public-house with Robinson, one of the commissioners; the altercation grew into an affray, and Otis received a sword cut on the head, which is considered to have caused his subsequent insanity. Robinson was mulcted in £2000 damages, but in view of his having made a written apology, Otis declined to take this sum from him. From 1769 almost continuously until his death Otis was harmlessly insane, though he had occasional lucid intervals, serving as a volunteer in the battle of Bunker Hill in 1775 and arguing a case in 1778. He was killed by lightning (it is said that he had often expressed a wish that he might die in this way) at Andover, Mass., on the 23rd of May 1783.

Otis's political writings were chiefly controversial and exercised an enormous influence, his pamphlets being among the most effective presentations of the arguments of the colonists against the arbitrary measures of the British ministry. His more important pamphlets were *A Vindication of the Conduct of the House of Representatives of the Province of Massachusetts Bay* (1762); *The Rights of the British Colonies Asserted and Proved* (1764); *A Vindication of the British Colonies against the Aspersions of the Halifax Gentleman in his Letter to a Rhode Island Friend*—a letter known at the time as the "Halifax Libel" (1765); and *Considerations on Behalf of the Colonists in a Letter to a Noble Lord* (1765).

The best biography is that by William Tudor (Boston, 1823); there is a shorter one by Francis Bowen (Boston, 1847). The best account of Otis's characteristics and influence as a writer may be found in M. C. Tyler's *Literary History of the American Revolution* (New York, 1897). See also the notes on the Writs of Assistance by Horace Gray, Jr., in Quincy's *Massachusetts Reports, 1761–1772* (Boston, 1865). Otis's speech on the writs, reprinted from rough notes taken by John Adams, appears in *Appendix A* of vol. ii. of C. F. Adams's edition of the *Works* of John Adams (Boston, 1850).

OTLEY, a market town in the Otley parliamentary division of the West Riding of Yorkshire, England, 13 m. N.W. of Leeds on the Midland and the North-Eastern railways. Pop. of urban district (1901) 9230. It is picturesquely situated on the south bank of the Wharfe, at the foot of the precipitous Chevin Hill, 925 ft. in height. In this neighbourhood excellent building-stone is quarried, which was used for the foundations of the Houses of Parliament in London, and is despatched to all parts of England. The church of All Saints has Norman portions, and a cross and other remains of pre-Norman date were discovered in restoring the building. There are interesting monuments of members of the Fairfax family and others. Worsted spinning and weaving, tanning and leather-dressing, paper-making and the making of printing-machines are the principal industries. The scenery of Wharfedale is very pleasant. In the dale, 7 m. below Otley, are the fine ruins of Harewood Castle, of the 14th century. The neighbouring church contains a noteworthy series of monuments of the 15th century in alabaster.

OTRANTO, a seaport and archiepiscopal see of Apulia, Italy, in the province of Lecce, from which it is 29½ m. S.E. by rail, 49 ft. above sea-level. Pop. (1901) 2295. It is beautifully situated on the east coast of the peninsula of the ancient Calabria (*q.v.*). The castle was erected by Alphonso of Aragon; the cathedral, consecrated in 1088, has a rose window and side portal of 1481. The interior, a basilica with nave and two aisles, contains columns said to come from a temple of Minerva and a fine mosaic pavement of 1166, with interesting representations of the months, Old Testament subjects, &c. It has a crypt supported by forty-two marble columns. The church of S. Pietro has Byzantine frescoes. Two submarine cables start from Otranto, one for Valona, the other for Corfu. The harbour is small and has little trade.

Otranto occupies the site of the ancient Hydrus or Hydruntum, a town of Greek origin. In Roman times it was less important than Brundusium as a point of embarkation for the East, though the distance to Apollonia was less than from Brundusium. It remained in the hands of the Byzantine emperors until it was taken by Robert Guiscard in 1068. In 1480 it was utterly destroyed by the Turkish fleet, and has never since recovered its importance. About 30 m. S.E. lies the promontory of S. Maria di Leuca (so called since ancient times from its white cliffs), the S.E. extremity of Italy, the ancient Promontorium Iapygium or Sallentinum. The district between this promontory and Otranto is thickly populated, and very fertile. (T. As.)

OTTAKAR I. (d. 1230), king of Bohemia, was a younger son of King Vladislav II. (d. 1174) and a member of the Premyslide family, hence he is often referred to as Premysl Ottakar I. His early years were passed amid the anarchy which prevailed everywhere in his native land; after several struggles, in which he took part, he was recognized as ruler of Bohemia by the emperor Henry VI. in 1192. He was, however, soon overthrown, but renewing the fight in 1196 he forced his brother, King Vladislav III., to abandon Bohemia to him and to content himself with Moravia. Although confirmed in the possession of his kingdom by the German king, Philip, duke of Swabia, Ottakar soon deserted Philip, who thereupon declared him deposed. He then joined the rival German king, Otto of Brunswick, afterwards the emperor Otto IV., being recognized as king of Bohemia both by Otto and by his ally, Pope Innocent III. Philip's consequent invasion of Bohemia was a great success. Ottakar, having been compelled to pay a fine, again ranged himself among Philip's partisans and still later was among the supporters of the young king, Frederick II. He united Moravia with Bohemia in 1222, and when he died in December 1230 he left to his son, Wenceslaus I., a kingdom united and comparatively peaceable.

OTTAKAR II., or PREMYSL OTTAKAR II. (*c.* 1230–1278), king of Bohemia, was a son of King Wenceslaus I., and through his mother, Kunigunde, was related to the Hohenstaufen family, being a grandson of the German king, Philip, duke of Swabia. During his father's lifetime he ruled Moravia, but when in 1248 some discontented Bohemian nobles acknowledged him as their sovereign, trouble arose between him and his father, and for a short time Ottakar was imprisoned. However, in 1251 the young prince secured his election as duke of Austria, where he strengthened his position by marrying Margaret (d. 1267), sister of Duke Frederick II., the last of the Babenberg rulers of the duchy and widow of the German king, Henry VII. Some years later he repudiated this lady and married a Hungarian princess. Both before and after he became king of Bohemia in succession to his father in September 1253 Ottakar was involved in a dispute with Bela IV., king of Hungary, over the possession of Styria, which duchy had formerly been united with Austria. By an arrangement made in 1254 he surrendered part of it to Bela, but when the dispute was renewed he defeated the Hungarians in July 1260 and secured the whole of Styria for himself, owing his formal investiture with Austria and Styria to the German king, Richard, earl of Cornwall. The Bohemian king also led two expeditions against the Prussians. In 1269 he inherited Carinthia and part of Carniola; and having made good his claim, contested by the Hungarians, on the field of battle, he was the most powerful prince in Germany when an election for the German throne took place in 1273. But Ottakar was not the successful candidate. He refused to acknowledge his victorious rival, Rudolph of Habsburg, and urged the pope to adopt a similar attitude, while the new king claimed the Austrian duchies. Matters reached a climax in 1276. Placing Ottakar under the ban of the empire, Rudolph besieged Vienna and compelled Ottakar in November 1276 to sign a treaty by which he gave up Austria and the neighbouring duchies, retaining for himself only Bohemia and Moravia. Two years later the Bohemian king tried to recover his lost lands; he found allies and collected a large army, but he was defeated by Rudolph and killed at Dürnkrut on the March on the 26th of August 1278. Ottakar was a founder of towns and a friend of law and order, while he assisted trade and welcomed German immigrants. Clever, strong and handsome, he is a famous figure both in history and in legend, and is the subject of a tragedy by F. Grillparzer, *König Ottokars Glück und Ende.* His son and successor was Wenceslaus II.

See O. Lorenz, *Geschichte König Ottokars*, ii. (Vienna, 1866); A. Huber, *Geschichte Oesterreichs*, Band i. (Gotha, 1885); and F. Palacky, *Geschichte von Böhmen*, Band i. (Prague, 1844).

OTTAVA RIMA, a stanza of eight iambic lines, containing three rhymes, invariably arranged as follows:—*a b a b a b c c.* It is an Italian invention, and we find the earliest specimens of its use in the poetry of the fourteenth century. Boccaccio employed it for the *Teseide*, which he wrote in Florence in 1340, and for the *Filostrato*, which he wrote at Naples some seven years later. These remarkable epics gave to *ottava rima* its classic character. In the succeeding century it was employed by Politian, and by Boiardo for his famous *Orlando Innamorato* (1486). It was Pulci, however, in the *Morgante Maggiore* (1487), who invented the peculiar mock-heroic, or rather half-serious, half-burlesque, style with which *ottava rima* has been most commonly identified ever since and in connexion with which it was introduced into England by Frere and Byron. The measure, which was now recognized as the normal one for all Italian epic poetry, was presently wielded with extraordinary charm and variety by Berni, Ariosto and Tasso. The merits of it were not perceived by the English poets of the 16th and 17th centuries, although the versions of Tasso by Carew (1594) and Fairfax (1600) and of Ariosto by Harington (1591) preserve its external construction. The stanzaic forms invented by Spenser and by the Fletchers have less real relation to *ottava rima* than is commonly asserted, and it is quite incorrect to say that the author of the *Fairy Queen* adopted *ottava rima* and added a ninth line to prevent the sound from being monotonously iterative. A portion of Browne's *Britannia's Pastorals* is composed in pure *ottava rima*, but this is the only important specimen in original Elizabethan literature. Two centuries later a very successful attempt was made to introduce in English poetry the flexibility and gaiety of *ottava rima* by John Hookham Frere, who had studied Pulci and Casti, and had caught the very movement of their diverting measure. His *Whistlecraft* appeared in 1817. This is a specimen of the *ottava rima* of Frere:—

> But chiefly, when the shadowy moon had shed
> O'er woods and waters her mysterious hue,
> Their passive hearts and vacant fancies fed
> With thoughts and aspirations strange and new,
> Till their brute souls with inward working bred
> Dark hints that in the depths of instinct grew
> Subjection—not from Locke's associations,
> Nor David Hartley's doctrine of vibrations.

Byron was greatly impressed by the opportunities for satire involved in Frere's experiment, and in October 1817, in imitation of *Whistlecraft*, but keeping still closer to Pulci, he wrote *Beppo.* By far the greatest monument in *ottava rima* which exists in English literature is *Don Juan* (1819–1824). Byron also employed this measure, which was peculiarly adaptable to the purposes of his genius, in *The Vision of Judgment* (1822). Meanwhile Shelley also became attracted by it, and in 1820 translated the *Hymns* of Homer into *ottava rima.* The curious burlesque epic of William Tennant (1784–1848), *Anster Fair* (1812), which preceded all these, is written in what would be *ottava rima* if the eighth line were not an alexandrine. The form has been little used in other languages than Italian and English. It was employed by Boscán (1490–1542), who imitated Bembo vigorously in Spanish, and the very fine *Araucana* of Ercilla y Zúñiga (1533–1595) is in the same measure. Lope de Vega Carpio wrote plentifully in *ottava rima.* In Portuguese poetry of the 16th and 17th centuries this measure obtained the sanction of Camoens, who wrote in it his immortal *Lusiads* (1572). *Ottava rima* has been attempted in German poetry by Uhland and others, but not for pieces of any considerable length. (E. G.)

OTTAWA, a tribe of North American Indians of Algonquian stock, originally settled on the Ottawa river, Canada, and later on the north shore of the upper peninsula of Michigan. They were driven in 1650 by the Iroquois beyond the Mississippi, only to be forced back by the Dakotas. Then they settled on Manitoulin Island, Lake Huron, and joined the French against the English. During the War of Independence, however, they fought for the latter. Some were moved to Indian Territory (Oklahoma), but the majority live to-day in scattered communities throughout lower Michigan and Ontario.

OTTAWA, the largest tributary of the river St Lawrence, ranking ninth in length among the rivers of Canada, being 685 m. long. It flows first westward to Lake Temiscaming; thence south-east and east. The principal tributaries on the left bank are the Rouge (115 m.), North Nation (60), Lievre (205), Gatineau (240), Coulonge (135), Dumoine (80); and on the right bank, the South Nation (90), Mississippi (105), Madawaska (130) and Petawawa (95). Canals at Ste Anne, Carillon and Grenville permit the passage of vessels drawing 9 ft., from Montreal up to the city of Ottawa. At Ottawa the river is connected with Lake Ontario by the Rideau Canal. The Chaudière Falls, and the Chats and other rapids, prevent continuous navigation above the capital, but small steamers ply on the larger navigable stretches. The Montreal, Ottawa and Georgian Bay Canal is designed to surmount these obstructions and provide a navigable channel from Georgian Bay up French river, through Lake Nipissing and over the height of land to the Ottawa, thence down to Montreal, of sufficient depth to enable vessels drawing 20 or 21 ft. to carry cargo from Chicago, Duluth, Fort William, &c. to Montreal, or, if necessary, to Europe, without breaking bulk. Except the suggested Hudson Bay route, this canal would form the shortest route to the Atlantic seaboard from the great grain-producing areas of western America.

The Ottawa was first explored by Samuel de Champlain in 1613. Champlain describes many of its tributaries, the Chaudière and Rideau Falls, the Long Sault, Chats and other rapids, as well as the character of the river and its banks, with minuteness and reasonable accuracy. He places the Chaudière Falls in 45° 38′, the true position being 45° 27′. The Long Sault Rapids on the Ottawa, about midway between Montreal and the capital, were the scene of one of the noblest exploits in Canadian history, when in 1661 the young Sieur des Ormeaux with sixteen comrades and a handful of Indian allies deliberately gave their lives to save New France from an invasion of the Iroquois. They intercepted the war party at the Long Sault, and for nearly a week held them at bay. When finally the last Frenchman fell under a shower of arrows, the Iroquois were thoroughly disheartened and returned crestfallen to their own country. For a hundred and fifty years thereafter the Ottawa was the great highway from Montreal to the west for explorers and fur-traders. The portage paths around its cataracts and rapids were worn smooth by the moccasined feet of countless *voyageurs*; and its wooded banks rang with the inimitable *chansons* of Old Canada, as the canoe brigades swept swiftly up and down its broad stream. Throughout the 19th century the Ottawa was the thoroughfare of the lumbermen, whose immense rafts were carried down from its upper waters to Montreal and Quebec.

OTTAWA, a city of Carleton county, province of Ontario, and the capital of the Dominion of Canada, on the right bank of the Ottawa river, 101 m. W. of Montreal and 217 m. N.E. of Toronto. The main tower of the parliament building is in 45° 25′ 28″ N., and 75° 42′ 03″ W.

The city stands for the most part on a cluster of hills, 60 to 155 ft. above the river. It is on the main line of the Canadian Pacific railway, which affords direct communication with Montreal by two routes, the North Shore and the Short Line, one on either side of the Ottawa river. Branches of the same railway lead to Brockville, on the St Lawrence river, passing through the town of Smith's Falls where connexion is made with the direct line from Montreal to Toronto; to Prescott, also on the St Lawrence; northward through the Gatineau valley to Maniwaki, in the heart of a famous sporting country, and westward to Waltham, on the north side of the Ottawa. The Grand Trunk offers a third route to Montreal, and another line of the same railway leads to Parry Sound, on Georgian Bay. The Ottawa and New York (New York Central) runs to Cornwall, on the St Lawrence, thence to New York. Electric railways afford communication with all parts of the city and extend eastward to Rockliffe Park and the rifle ranges, westward to Britannia on Lake Deschenes, and through the neighbouring town of Hull to Aylmer and Victoria Park. During the summer months steamers ply down the Ottawa to Montreal, and by way of the Rideau canal and lakes to Kingston on the St Lawrence. A road bridge, partially destroyed in the great fire of 1900, connects Ottawa with Hull; a railway bridge spans the river above the Chaudière Falls; and the Royal Alexandra Bridge, below the falls, carries both steam and electric railway tracks, as well as roadways for vehicular and pedestrian traffic. The site of the city is exceedingly picturesque. For 3 m. it follows the high southern bank of the Ottawa, from the Chaudière Falls, whose mist-crowned cauldron is clearly visible from the summit of Parliament Hill, to and beyond the Rideau Falls, so named by early French explorers because of their curtain-like appearance. The Rideau, a southern tributary of the Ottawa, once formed the eastern boundary of the city, which, however, is now absorbing a string of suburbs that lie along its eastern banks. The Rideau Canal cuts the city in two, the western portion being known as Upper Town and the eastern as Lower Town. Roughly speaking the canal divides the two sections of the population, the English occupying Upper Town and the French Lower Town, though Sandy Hill, a fashionable residential district east of the canal, is mainly occupied by the English. Opposite and a little below the mouth of the Rideau, the Gatineau flows into the Ottawa from the north. Above the Chaudière Falls the river is broken by the Deschenes Rapids, and beyond these again it expands into Lake Deschenes, a favourite summer resort for the people of the city. To the north lie the Laurentian Hills, broken by the picturesque Gatineau Valley.

The crowning architectural feature of the city is the splendid group of Gothic buildings on the summit of Parliament Hill, whose limestone bluffs rise 150 ft. sheer from the river. The three blocks of these buildings form sides of a great quadrangle, the fourth side remaining open. The main front of the central or Parliament building is 470 ft. long and 40 ft. high, the Victoria Tower (180 ft. high) rising over the principal entrance. Behind and connected with the Parliament building is an admirably proportioned polygonal hall, 90 ft. in diameter, in which the library of parliament is housed. The corner stone of the main building was laid by the then prince of Wales in 1860. The buildings forming the eastern and western sides of the quadrangle are devoted to departments of the Dominion government. To the south, but outside the grounds of Parliament Hill, stands the Langevin Block, a massive structure in brown sandstone, also used for departmental purposes. The increasing needs of the government have made necessary the erection of several other buildings and an effort has been made to bring as many of these as possible into a harmonious group. The Archives building and the Royal Mint stand on the commanding eminence of Nepean Point, to the eastward of Parliament Hill, the Rideau Canal lying between. Two large departmental buildings occupy ground south of the Archives building and facing Parliament Hill, one containing the Supreme Court as well as the Federal Department of Justice. At the foot of Metcalfe Street, south of Parliament Hill, stands the Victoria Museum, with the department of mines, with the splendid collections of the Geological and Natural History Museum, the departmental library, and the National Art Gallery. The Dominion Observatory stands outside the city, in the grounds of the Central Experimental Farm. Plans were approved in 1909 by the government for a union railway station east of the canal, and immediately south of Rideau Street, and a large hotel (Grand Trunk Railway), the Chateau Laurier, at the southern end of Major's Hill Park. Other prominent buildings are the city hall, post office, Carnegie library, normal and model schools, government printing bureau, county court house, the Basilica or Roman Catholic cathedral, and Christ Church cathedral (Church of England), the Roman Catholic university of Ottawa and the collegiate institute.

The city charities include four large general hospitals, two of which are under Protestant auspices; one is controlled by Roman Catholics; the fourth is devoted to contagious diseases. Ottawa is the seat of the Church of England bishop of Ottawa, and of the Roman Catholic archbishop of Ottawa. Several of the philanthropic and educational orders of the latter church are established here, in nunneries, convents or monasteries. As elsewhere in Ontario, the educational system is divided into public schools (undenominational), and separate schools (Roman Catholic), the latter supported by Roman Catholic taxpayers, the former by all other members of the community. The collegiate institute is common to both, and is used as a preparatory school for the universities.

Ottawa has been a great seat of the lumber trade, and the manufacture of lumber still forms an important part of the industrial life of the city, but the magnificent waterpowers of the Chaudière and Rideau Falls are now utilized for match-works, flour-mills, foundries, carbide factories and many other flourishing industries, as well as for the development of electric light and power, for the lighting of the city and the running of the electric railways.

The people of Ottawa possess a number of public parks, both within and outside the city, partly the result of their own foresight, and partly due to the labours of the Government Improvement Commission. Parliament Hill itself constitutes a park of no mean proportions, one of the noted features of which is the beautiful Lover's Walk, cut out of the side of the cliff half way between the river and the summit. The grounds above contain statues of Queen Victoria, as well as of Sir John Macdonald, Alexander Mackenzie, Sir George Cartier and other Canadian political leaders. On the eastern side of the canal is Major's Hill Park, maintained by the government. Below Sandy Hill, on the banks of the Rideau, lies Strathcona Park, an admirable piece of landscape gardening constructed out of what was once an unsightly swamp. Crossing the bridges above the Rideau Falls, and passing the heavily wooded grounds of Rideau Hall, the official residence of the governor-general, we come to Rockliffe Park, beyond which lies the government rifle ranges. Rockliffe Park is the easternmost point of an ambitious scheme of landscape gardening planned by the Improvement Commission. From here a driveway extends to Rideau Hall; thence it crosses the Rideau river to a noble thoroughfare cut through the heart of Lower Town, and known as King Edward Avenue. Crossing the canal by the Laurier bridge, the driveway turns south and follows the west bank of the canal for 4 m. to the Central Experimental Farm, an extensive tract of land upon which experiments in model farming are carried out by government specialists, for the benefit of Canadian farmers. From the Experimental Farm the driveway will be carried around the western side of the city to the banks of the Ottawa, connecting by light bridges with a group of islands above the Chaudière Falls which are to be converted into a park reserve.

Ottawa is governed by a mayor, elected by the city at large; a board of control consisting of four members, similarly elected and a board of 16 aldermen, 2 elected by each of the 8 wards. The city returns 2 members to the Dominion House of Commons and two to the provincial legislature.

The population, of which one-third is French-speaking, the remainder English (with the exception of a small German element), has increased rapidly since the incorporation of the city in 1854. It was 59,928 in 1901; 67,572 in 1906; and in 1907, including the suburbs and the neighbouring town of Hull, over 100,000.

The earliest description of the site of Ottawa is that of Samuel de Champlain, in his *Voyages*. In June 1613, on his way up the river, he came to a tributary on the south side, "at the mouth of which is a marvellous fall. For it descends a height of twenty or twenty-five fathoms with such impetuosity that it makes an arch nearly four hundred paces broad. The savages take pleasure in passing under it, not wetting themselves, except from the spray that is thrown off." This was the Rideau Falls, but a good deal of allowance must be made for exaggeration in Champlain's account. Continuing up the river, "we passed," he says, "a fall, a league from there, which is half a league broad and has a descent of six or seven fathoms. There are many little islands. The water falls in one place with such force upon a rock that it has hollowed out in course of time a large and deep basin, in which the water has a circular motion and forms large eddies in the middle, so that the savages call it *Asticou*, which signifies boiler. This cataract produces such a noise in this basin that it is heard for more than two leagues." The present name, Chaudière, is the French equivalent of the old Indian name. For two hundred years and more after Champlain's first visit the Chaudière portage was the main thoroughfare from Montreal to the great western fur country; but it was not until 1800 that any permanent settlement was made in the vicinity. In that year Philemon Wright, of Woburn, Massachusetts, built a home for himself at the foot of the portage, on the Quebec side of the river, where the city of Hull now stands; but for some time the precipitous cliffs on the south side seem to have discouraged settlement there. Finally about 1820 one Nicholas Sparks moved over the river and cleared a farm in what is now the heart of Ottawa. Seven years later Colonel John By, R.E., was sent out to build a canal from a point below the Chaudière Falls to Kingston on Lake Ontario. The canal, completed at a cost of $2,500,000, has never been of any great commercial importance; it has never been called upon to fulfil its primary object, as a military work to enable gun-boats and military supplies to reach the lakes from Montreal without being exposed to attack along the St Lawrence frontier. The building of the canal created a fair-sized settlement at its Ottawa end, which came to be known as Bytown. As the lumber trade developed Bytown rapidly increased in wealth and importance. In 1854 it was incorporated as a city, the name being changed to Ottawa; and four years later Queen Victoria selected Ottawa as the capital of Canada. Ottawa was admirably situated for a capital from a political and military point of view; but there is reason to believe that the deciding factor was the pressure exerted by the four other rival claimants, Montreal, Quebec, Toronto and Kingston, any three of which would have fiercely resented the selection of the fourth. The first session of parliament in the new capital was opened in 1865.

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OTTAWA, a city and the county-seat of La Salle county, Illinois, U.S.A., on the Illinois river, at the mouth of the Fox, about 84 m. S.W. of Chicago. Pop. (1900) 10,588, of whom 1804 were foreign-born; (1910 census) 9535. It is served by the Chicago, Burlington & Quincy, and the Chicago, Rock Island & Pacific railways, by interurban electric railways, and by the Illinois & Michigan Canal. There is a monument at Ottawa to the 1400 soldiers from La Salle county who died in the Civil War, and among the public buildings are the County Court House, the Court House for the second district of the Illinois Appellate Court, and Reddick's Library, founded by William Reddick. Ottawa is the seat of the Pleasant View Luther College (co-educational), founded in 1896 by the Norwegian Lutherans of Northern Illinois. There is a medicinal spring, the water of which is called "Sanicula" water. The water supply of the city is derived from eight deep wells. There are about 150 privately owned artesian wells. In the vicinity are large deposits of coal, of glass-sand, and of clay suitable for brick and tile. The city's manufactures include glass, brick, tile, carriages and wagons, agricultural implements, pianos and organs and cigars. The value of the factory products increased from $1,737,884 in 1900 to $2,078,139 in 1905, or 19·6%.

The mouth of the Fox was early visited by French explorers, and Father Hennepin is said to have discovered here in 1680 the first deposit of coal found in America. On Starved Rock, a bold hillock about 125 ft. high, on the southern bank of the Illinois, about midway between Ottawa and La Salle, the French explorer La Salle, assisted by his lieutenant Henri de Tonty and a few Canadian *voyageurs* and Illinois Indians, established (in December 1682) Fort St Louis, about which he gathered nearly 20,000 Indians, who were seeking protection from the Iroquois. The plateau-like summit, which originally could be reached only from the south by a steep and narrow path, was rendered almost impregnable to Indian attack by a sheer cliff on the river side of the hill, a deep ravine along its eastern base and steep declivities on the other sides. On the summit La Salle built store-houses and log huts, which he surrounded by intrenchments and a log palisade. The post was used by fur traders as late as 1718. The hill has borne its present name since about 1770, when it became the last refuge of a small band of Illinois flying before a large force of Pottawattomies, who believed that an Illinois had assassinated Pontiac, in whose conspiracy the Pottawattomies had taken part. Unable to dislodge the Illinois, the Pottawattomies cut off their escape and let them die of starvation. Ottawa was laid out in 1830, incorporated as a village in 1838 and chartered as a city in 1853. On the 21st of August 1858 the first of the series of political debates between Abraham Lincoln and Stephen A. Douglas, in their contest for the United States senatorship, was held at

Ottawa. The semi-centennial of this debate was celebrated in 1908, when the Illini Chapter, Daughters of the American Revolution, caused a suitably inscribed boulder weighing 23 tons to be set up in Washington Park as a memorial.

OTTAWA, a city and the county-seat of Franklin county, eastern Kansas, U.S.A., situated on the Osage (Marais des Cygnes) river, about 58 m. (by rail) S.W. of Kansas City. Pop. (1900) 6934, of whom 333 were foreign born; (1905) 7727; (1910) 7670. It is served by the Atchison, Topeka & Santa Fé (which has large repair shops here) and the Missouri Pacific railways. There is a Carnegie library, and Forest Park, within the city limits, is a popular meeting place of conventions and summer gatherings, including the annual Ottawa Chautauqua Assembly. Ottawa University (Baptist) was established here in 1865, as the outgrowth of Roger Williams University, which had been chartered in 1860 for the education of Indians on the Ottawa Reservation, and had received a grant of 20,000 acres from the Federal government in 1862. The university comprises an academy, a college, a school of fine arts and a commercial college, and in 1909 had 406 students. Ottawa has an important trade in grain and live-stock; soft coal and natural gas are found in the vicinity; the manufactures include flour, windmills, wire-fences, furniture, bricks, brooms and foundry products. Ottawa was settled in 1854, and was first chartered as a city in 1866.

OTTER (O. Eng. *ote*, *otor*, a common Teutonic word, cf. Dutch and Ger. *Otter*, Dan. *odder*, Swed. *utter*; it is to be referred to the root seen in Gr. ὕδωρ, water), a name properly given to the well-known European carnivorous aquatic mammal (*Lutra vulgaris*, or *L. lutra*), but also applicable to all the members of the lutrine section of the family *Mustelidae* (see CARNIVORA). The otter has an elongated, low body, short limbs, short broad feet, with five toes on each, connected together by webs, and all with short, moderately strong, compressed, curved, pointed claws. Head rather small, broad and flat; muzzle very broad; whiskers thick and strong; eyes small and black; ears short and rounded. Tail a little more than half the length of the body and head together, broad and strong at the base, and gradually tapering to the end, somewhat flattened horizontally. The fur is of fine quality, consisting of a short soft whitish grey under-fur, brown at the tips, interspersed with longer, stiffer and thicker hairs, shining, greyish at the base, bright rich brown at the points, especially on the upper-parts and outer surface of the legs; the throat, cheeks, under-parts and inner surface of the legs brownish grey throughout. Individual otters vary in size. The total length from the nose to the end of the tail averages about 3½ ft., of which the tail occupies 1 ft. 3 or 4 in. The weight of a full-sized male is from 18 to 24 ℔, that of a female about 4 ℔ less.

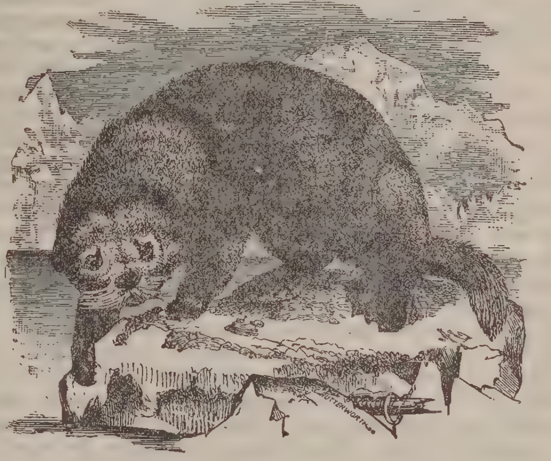
As the otter lives almost exclusively on fish, it is rarely met with far from water, and usually frequents the shores of brooks, rivers, lakes and, in some localities, the sea itself. It is a most expert swimmer and diver, easily overtaking and seizing fish in the water; but when it has captured its prey it brings it to shore to devour. When lying upon the bank, it holds the fish between its fore-paws, commences at the head and then eats gradually towards the tail, which it is said to leave. The female produces three to five young ones in March or April, and brings them up in a nest formed of grass or other herbage, usually placed in a hollow place in the bank of a river, or under the shelter of the roots of some overhanging tree. The otter is found in localities suitable to its habits throughout Great Britain and Ireland, though less abundantly than formerly, for, being destructive to fish, it is rarely allowed to live in peace when its haunts are discovered. Otter-hunting with packs of hounds of a special breed, and trained for the purpose, is a pastime in many parts of the country. It was formerly the practice to kill the otter with long spears, which the huntsmen carried; now the quarry is picked up and "tailed," or run into by the pack.

The otter ranges throughout the greater part of Europe and Asia; and a closely allied but larger species, *L. canadensis*, is extensively distributed throughout North America, where it is pursued for its fur. An Indian species, *L. nair*, is trained by the natives of some parts of Bengal to assist in fishing, by driving the fish into the nets. In China otters are taught to catch fish, being let into the water for the purpose attached to a long cord.

Otters are widely distributed, and, as they are much alike in size and coloration, their specific distinctions are by no means well defined. Besides those mentioned above, the following have been described, *L. californica*, North America; *L. felina*, Central America, Peru, and Chili; *L. brasiliensis*, Brazil; *L. maculicollis*, South Africa; *L. whiteleyi*, Japan; *L. chinensis*, China and Formosa, and other species. Some, with the feet only slightly webbed, and the claws exceedingly small or altogether wanting on some of the toes, and also with some difference in dental characters, have been separated as a distinct genus, *Aonyx*. These are *L. inunguis* from South Africa and *L. cinerea* from India, Java, and Sumatra.

More distinct still is the sea-otter (*Latax*, or *Enhydra*, *lutris*). The entire length of the animal from nose to end of tail is about 4 ft., so that the body is considerably larger and more massive than that of the English otter. The skin is peculiarly loose, and stretches when removed from the animal. The fur is remarkable for the preponderance of the beautifully soft woolly under-fur, the longer stiffer hairs being scanty. The general colour is deep liver-brown, silvered or frosted with the hoary tips of the longer stiff hairs. These are, however, removed when the skin is dressed for commercial purposes.

Sea-otters are only found upon the rocky shores of certain parts of the North Pacific Ocean, especially the Aleutian Islands and Alaska, extending as far south on the American coast as Oregon; but, owing to the persecution to which they are subjected for the sake of their valuable skins, their numbers are greatly diminishing. The otters are captured by spearing, clubbing, nets and bullets. They do not feed on fish, like true otters, but on clams, mussels, sea-urchins and crabs; and the female brings forth but a single young one at a time, apparently at any season of the year. They are excessively shy and wary; young cubs are often captured by the hunters who have killed the dam, but all attempts to rear them have hitherto failed.



The Sea-Otter (*Latax*, or *Enhydra*, *lutris*). From Wolf.

See Elliott Coues, *Monograph on North American Fur-bearing Animals* (1877). (W. H. F.; R. L.*)

OTTERY ST MARY, a market town in the Honiton parliamentary division of Devonshire, England, 15 m. E. by N. of Exeter, on a branch of the London & South-Western railway. Pop. of urban district (1901) 3495. It is pleasantly situated in the rich valley of the small river Otter. The parish church, the finest in the county, is cruciform, and has the unique feature of transeptal towers, imitated from Exeter Cathedral. The northern has a low spire. The church, which is Early English, with Decorated and Perpendicular additions, contains several ancient tombs. The manor of Ottery belonged to the abbey of Rouen in the time of Edward the Confessor. The church was dedicated in 1260 by Walter Bronescombe, bishop of Exeter; and *c.* 1335 Bishop John Grandisson, on founding a secular college here, greatly enlarged the church; it has been thought that, by copying the Early English style, he is responsible for more of the building than is apparent. The town has a large agricultural trade. It is the birthplace of Samuel Taylor Coleridge (1772); and W. M. Thackeray stayed in the vicinity in youth, his knowledge of the locality appearing in *Pendennis*.

OTTIGNIES, a town of Belgium, in the province of Brabant. It is an important station on the main line from Brussels to Namur, and forms the point of junction with several cross lines. It has extensive modern flower and vegetable gardens. Pop. (1904) 2405.

OTTO, king of Greece (1815–1867), was the second son of Louis I., king of Bavaria, and his wife Teresa of Saxe-Altenburg. He was born at Salzburg on the 1st of June 1815, and was educated at Munich. In 1832 he was chosen by the conference of London to occupy the newly-erected throne of Greece, and on the 6th of February 1833 he landed at Nauplia, then the capital of independent Greece. Otto, who was not yet eighteen, was accompanied by a council of regency composed of Bavarians under the presidency of Count Josef Ludwig von Armansperg (1787–1853), who as minister of finance in Bavaria had succeeded in restoring the credit of the state at the cost of his popularity. The task of governing a semi-barbarous people, but recently emancipated, divided into bitter factions, and filled with an exaggerated sense of their national destiny, would in no case have been easy; it was not facilitated by the bureaucratic methods introduced by the regents. Though Armansperg and his colleagues did a good deal to introduce system and order into the infant state, they contrived to make themselves hated by the Greeks, and with sufficient reason. That the regency refused to respond to the demand for a constitution was perhaps natural, for the experience of constitutional experiments in emancipated Greece had not been encouraging. The result, however, was perpetual unrest; the regency, too, was divided into a French and a Russian party, and distracted by personal quarrels, which led in 1834 to the recall by King Louis of G. L. von Maurer and Karl von Abel, who had been in bitter opposition to Armansperg. Soon afterwards the Mainotes were in open revolt, and the money obtained from foreign loans had to be spent in organizing a force to preserve order. On the 1st of June 1835 Otto came of age, but, on the advice of his father and under pressure of Great Britain and of the house of Rothschild, who all believed that a capable finance minister was the supreme need of Greece, he retained Armansperg as chancellor of state. The wisdom of this course was more than doubtful; for the expenses of government, of which the conversion of Athens into a dignified capital was not the least, exceeded the resources of the exchequer, and the state was only saved from bankruptcy by the continual intervention of the powers. Though King Louis, as the most exalted of Philhellenes, received an enthusiastic welcome when he visited Greece in the winter of 1835, his son's government grew increasingly unpopular. The Greeks were more heavily taxed than under Turkish rule; they had exchanged government by the sword, which they understood, for government by official regulations, which they hated; they had escaped from the sovereignty of the Mussulman to fall under that of a devout Catholic, to them a heretic. Otto was well intentioned, honest and inspired with a genuine affection for his adopted country; but it needed more than mere amiable qualities to reconcile the Greeks to his rule.

In 1837 Otto visited Germany and married the beautiful and talented Princess Amalie of Oldenburg. The union was unfruitful, and the new queen made herself unpopular by interfering in the government. Meanwhile, at the instance of the Swiss Philhellene Eynard, Armansperg had been dismissed by the king immediately on his return, but a Greek minister was not put in his place, and the granting of a constitution was still postponed. The attempts of Otto to conciliate Greek sentiment by efforts to enlarge the frontiers of his kingdom, *e.g.* by the suggested acquisition of Crete in 1841, failed of their object and only succeeded in embroiling him with the powers. His power rested wholly on Bavarian bayonets; and when, in 1843, the last of the German troops were withdrawn, he was forced by the outbreak of a revolutionary movement in Athens to grant a constitution and to appoint a ministry of native Greeks.

With the grant of the constitution Otto's troubles increased. The Greek parliament, like its predecessors during the War of Liberation, was the battleground of factions divided, not by national issues, but by their adherence to one or other of the great powers who made Greece the arena of their rivalry for the control of the Mediterranean. Otto thought to counteract the effects of political corruption and incompetence by overriding the constitution to which he had sworn. The attempt would have been perilous even for a strong man, a native ruler and an Orthodox believer; and Otto was none of these. His prestige, moreover, suffered from the "Pacifico incident" in 1850, when Palmerston caused the British fleet to blockade the Peiraeus, to exact reparation for injustice done to a Levantine Jew who happened also to be a British subject. For the ill-advised intervention in the Crimean War, which led to a second occupation of the Peiraeus, Otto was not responsible; his consent had been given under protest as a concession to popular clamour. His position in Greece was, however, becoming untenable. In 1861 a student named Drusios attempted to murder the queen, and was hailed by the populace as a modern Harmodios. In October 1862 the troops in Acarnania under General Theodore Srivas declared for the king's deposition; those in Athens followed suit; a provisional government was set up and summoned a national convention. The king and queen, who were at sea, took refuge on a British war-ship, and returned to Bavaria, where they were lodged by King Louis in the palace of the former bishops of Bamberg. Here, on the 26th of July 1867, Otto died. He had become strangely persuaded that he held the throne of Greece by divine right; and, though he made no effort to regain it, he refused to acknowledge the validity of the election of Prince George of Denmark.

See E. A. Thouvenel, *La Grèce du roi Othon* (Paris, 1890); G. L. von Maurer, *Das griechische Volk*, &c. (1836); C. W. P. Mendelssohn-Bartholdy, "Die Verwaltung König Ottos von Griechenland und sein Sturz" (in *Preuss. Jahrbücher*, iv. 365); K. T. v. Heigel, *Ludwig I., König von Baiern*, pp. 149 et seq. (Leipzig, 1872); H. H. Parish, *The Diplomatic History of the Monarchy of Greece from the Year 1830* (London, 1838), the author of which was attached to the British Legation at Athens.

OTTO I. (912–973), surnamed the Great, Roman emperor, eldest son of King Henry I. the Fowler by his second wife Matilda, said to be a descendant of the Saxon hero Widukind, was born on the 23rd of November 912. Little is known of his early years, but he probably shared in some of his father's campaigns. In 929 he married Edith, daughter of Edward the Elder, king of the English, and sister of the reigning sovereign Æthelstan. It is said that Matilda wished her second son Henry to succeed his father, as this prince, unlike his elder brother, was born the son of a king. However this may be, Henry named Otto his successor, and after his death in July 936 Otto was chosen German king and crowned by Hildebert, archbishop of Mainz. This ceremony, according to the historian Widukind, was followed by a banquet at which the new king was waited upon by the dukes of Lorraine, Bavaria, Franconia and Swabia. Otto soon showed his intention of breaking with the policy of his father, who had been content with a nominal superiority over the duchies; in 937 he punished Eberhard, duke of Franconia, for an alleged infringement of the royal authority; and in 938 deposed Eberhard, who had recently become duke of Bavaria. During these years the Bohemians and other Slavonic tribes ravaged the eastern frontier of Germany, but although one expedition against them was led by the king in person, the defence of this district was left principally to agents. Trouble soon arose in Saxony, probably owing to Otto's refusal to give certain lands to his half-brother, Thankmar, who, although the king's senior, had been passed over in the succession as illegitimate. Thankmar, aided by an influential Saxon noble named Wichmann, and by Eberhard of Franconia, seized the fortress of Eresburg and took Otto's brother Henry prisoner; but soon afterwards he was defeated by the king and killed whilst taking sanctuary. The other conspirators were pardoned, but in 939 a fresh revolt broke out under the leadership of Henry, and Giselbert, duke of Lorraine. Otto gained a victory near Xanten, which was followed by the surrender of the fortresses held by his brother's adherents in Saxony, but the rebels, joined by Eberhard of Franconia and Archbishop Frederick of Mainz continued the struggle, and Giselbert of Lorraine transferred his allegiance to Louis IV., king of France. Otto's precarious position was saved by a victory near Andernach when Eberhard was killed, and Giselbert drowned in the subsequent flight. Henry took refuge with Louis of France, but was soon restored to favour and entrusted with the duchy of Lorraine, where, however, he was unable to restore order. Otto therefore crossed the Rhine and deprived his brother of authority. Henry then became involved in a plot to murder the king, which was discovered in time, and the good offices of his mother secured for him a pardon at Christmas 941. The deaths of Giselbert of Lorraine and of Eberhard of Franconia, quickly followed by those of two other dukes, enabled Otto to unite the stem-duchies more closely with the royal house. In 944 Lorraine was given to Conrad, surnamed the Red, who in 947 married the king's daughter Liutgard; Franconia was retained by Otto in his own hands; Henry married a daughter of Arnulf, duke of Bavaria, and received that duchy in 947; and Swabia came in 949 to the king's son Ludolf, who had married Ida, a daughter of the late duke, Hermann. During these years the tribes living between the Elbe and the Oder were made tributary, bishoprics were founded in this district, and in 950 the king himself marched against the Bohemians and reduced them to dependence. Strife between Otto and Louis IV. of France had arisen when the French king sought to obtain authority over Lorraine and aided the German rebels in 939; but after the German king had undertaken an expedition into France, peace was made in 942. Afterwards, when Louis became a prisoner in the hands of his powerful vassal Hugh the Great, duke of France, Otto attacked the duke, who, like the king, was his brother-in-law, captured Reims, and negotiated a peace between the two princes; and in subsequent struggles between them his authority was several times invoked.

In 945 Berengar I., margrave of Ivrea, left the court of Otto and returned to Italy, where he soon obtained a mastery over the country. After the death in 950 of Lothair, king of Italy, Berengar sought the hand of his widow Adelaide for his son Adalbert; and Henry of Bavaria and Ludolf of Swabia had already been meddling independently of each other in the affairs of northern Italy. In response to an appeal from Adelaide, Otto crossed the Alps in 951. He assumed the title of king of the Lombards, and having been a widower since 946, married Adelaide and negotiated with pope Agapetus II. about his reception in Rome. The influence of Alberic, prince and senator of the Romans, prevented the pope returning a favourable answer to the king's request. But when Otto returned to Germany in 952 he was followed by Berengar, who did homage for Italy at Augsburg. The chief advisers of Otto at this time were his wife and his brother Henry. Henry's influence seems to have been resented by Ludolf, who in 946 had been formally designated as his father's successor. When Adelaide bore a son, and a report gained currency that Otto intended to make this child his heir, Ludolf rose in revolt and was joined by Conrad of Lorraine and Frederick of Mainz. Otto fell into the power of the rebels at Mainz and was compelled to agree to demands made by them, which, however, he promptly revoked on his return to Saxony. Ludolf and Conrad were declared deposed, and in 953 war broke out in Lorraine and Swabia, and afterwards in Saxony and Bavaria. Otto failed to take Mainz and Augsburg; but an attempt on the part of Conrad and Ludolf to gain support from the Magyars, who had seized the opportunity to invade Bavaria, alienated many of their supporters. Otto's brother Bruno, archbishop of Cologne, was successful in restoring the royal authority in Lorraine, so that when Conrad and Frederick soon afterwards submitted to Otto, the struggle was confined to Bavaria. Ludolf was not long in following the example of Conrad; and with the capture of Regensburg in 955 the rising ended. Conrad and Ludolf retained their estates, but their duchies were not restored to them. Meanwhile the Magyars had renewed their ravages and were attacking Augsburg. Otto marched against them, and in a battle fought on the Lechfeld on the 10th of August 955 the king's troops gained a brilliant victory which completely freed Germany from these invaders; while in the same year Otto also defeated the Slavs who had been ravaging the Saxon frontier.

About this time the king seems to have perceived the necessity of living and ruling in closer union with the church, a change of policy due perhaps to the influence of his brother Bruno, or forced upon him when his plans for uniting the duchies with the royal house brought rebellion in their train. Lands and privileges were granted to prelates, additional bishoprics were founded, and some years later Magdeburg was made the seat of an archbishop. In 960 Otto was invited to come to Italy by Pope John XII., who was hard pressed by Berengar, and he began to make preparations for the journey. As Ludolf had died in 957 and Otto, his only son by Adelaide, had been chosen king at Worms, the government was entrusted to Bruno of Cologne, and Archbishop William of Mainz, a natural son of the king. Reaching Pavia at Christmas 961, the king promised to defend and respect the church. He then proceeded to Rome, where he was crowned emperor on the 2nd of February 962. After the ceremony he confirmed the rights and privileges which had been conferred on the papacy, while the Romans promised obedience, and Pope John took an oath of fidelity to the emperor. But as he did not long observe his oath he was deposed at a synod held in St Peter's, after Otto had compelled the Romans to swear they would elect no pope without the imperial consent; and a *nominee* of the emperor, who took the name of Leo VIII., was chosen in his stead. A pestilence drove Otto to Germany in 965, and finding the Romans again in arms on his return in 966, he allowed his soldiers to sack the city, and severely punished the leaders of the rebellion. His next move was against the Greeks and Saracens of southern Italy, but seeking to attain his objects by negotiation, sent Liudprand, bishop of Cremona, to the eastern emperor Nicephorus II. to arrange for a marriage treaty between the two empires. Nicephorus refused to admit the validity of Otto's title, and the bishop was roughly repulsed; but the succeeding emperor, John Zimisces, was more reasonable, and Theophano, daughter of the emperor Romanus II., was married to the younger Otto in 972. The same year witnessed the restoration of peace in Italy and the return of the emperor to Germany, where he received the homage of the rulers of Poland, Bohemia and Denmark; but he died suddenly at Memleben on the 7th of May 973, and was buried at Magdeburg.

Otto was a man of untiring perseverance and relentless energy, with a high idea of his position. His policy was to crush all tendencies to independence in Germany, and this led him to grant the stem-duchies to his relatives, and afterwards to ally himself with the church. Indeed the necessity for obtaining complete control over the church was one reason which induced him to obtain the imperial crown. By this step the pope became his vassal, and a divided allegiance was rendered impossible for the German clergy. The Roman empire of the German nation was indeed less universal and less theocratic under Otto, its restorer, than under Charlemagne, but what it lacked in splendour it gained in stability. His object was not to make the state religious but the church political, and the clergy must first be officials of the king, and secondly members of an ecclesiastical order. He shared the piety and superstition of the age, and did much for the spread of Christianity. Although himself a stranger to letters he welcomed scholars to his court and eagerly seconded the efforts of his brother Bruno to encourage learning; and while he neither feared nor shirked battle, he was always ready to secure his ends by peaceable means. Otto was of tall and commanding presence, and although subject to violent bursts of passion, was liberal to his friends and just to his enemies.

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OTTO II. (955–983), Roman emperor, was the son of the emperor Otto the Great, by his second wife Adelaide. He received a good education under the care of his uncle, Bruno, archbishop of Cologne, and his illegitimate half-brother, William, archbishop of Mainz. He was chosen German king at Worms in 961, crowned at Aix-la-Chapelle on the 26th of May 961, and on the 25th of December 967 was crowned joint emperor at Rome by Pope John XIII. On the 14th of April 972 he married Theophano, daughter of the eastern emperor Romanus II., and after sharing in various campaigns in Italy, returned to Germany and became sole emperor on the death of his father in May 973. After suppressing a rising in Lorraine, difficulties arose in southern Germany, probably owing to Otto's refusal to grant the duchy of Swabia to Henry II., the Quarrelsome, duke of Bavaria. The first conspiracy was easily suppressed, and in 974 an attempt on the part of Harold III., king of the Danes, to throw off the German yoke was also successfully resisted; but an expedition against the Bohemians led by the king in person in 975 was a partial failure owing to the outbreak of further trouble in Bavaria. In 976 Otto deposed Duke Henry, restored order for the second time in Lorraine, and made another expedition into Bohemia in 977, when King Boleslaus II. promised to return to his earlier allegiance. Having crushed an attempt made by Henry to regain Bavaria, Otto was suddenly attacked by Lothair, king of France, who held Aix in his possession for a few days; but when the emperor retaliated by invading France he met with little resistance. He was, however, compelled by sickness among his troops to raise the siege of Paris, and on the return journey the rearguard of his army was destroyed and the baggage seized by the French. An expedition against the Poles was followed by peace with France, when Lothair renounced his claim on Lorraine. The emperor then prepared for a journey to Italy. In Rome, where he restored Pope Benedict VII., he held a splendid court, attended by princes and nobles from all parts of western Europe. He was next required to punish inroads of the Saracens on the Italian mainland, and in September 981 he marched into Apulia, where he met at first with considerable success; but an alliance between the Arabs and the Eastern Empire, whose hostility had been provoked by the invasion of Apulia, resulted in a severe defeat on Otto's troops near Stilo in July 982. Without revealing his identity, the emperor escaped on a Greek vessel to Rossano. At a diet held at Verona, largely attended by German and Italian princes, a fresh campaign was arranged against the Saracens. Proceeding to Rome, Otto secured the election of Peter of Pavia as Pope John XIV. Just as the news reached him of a general rising of the tribes on the eastern frontier of Germany, he died in his palace in Rome on the 7th of December 983. He left a son, afterwards the emperor Otto III., and three daughters. He was buried in the atrium of St Peter's, and when the church was rebuilt his remains were removed to the crypt, where his tomb may still be seen. Otto, who is sometimes called the "Red," was a man of small stature, by nature brave and impulsive, and by training an accomplished knight. He was generous to the church and aided the spread of Christianity in many ways.

See *Die Urkunden des Kaisers Otto II.*, edited by Th. von Sickel, in the *Monumenta Germaniae historica. Diplomata* (Hanover, 1879); L. von Ranke, *Weltgeschichte*, Part vii. (Leipzig, 1886); W. von Giesebrecht, *Geschichte der deutschen Kaiserzeit* (Leipzig, 1881–1890); and *Jahrbücher des deutschen Reichs unter Kaiser Otto II.* (Berlin, 1837–1840); H. Detmer, *Otto II. bis zum Tode seines Vaters* (Leipzig, 1878); J. Moltmann, *Theophano die Gemahlin Ottos II. in ihrer Bedeutung für die Politik Ottos I. und Ottos II.* (Göttingen, 1878); and A. Matthaei, *Die Händel Ottos II. mit Lothar von Frankreich* (Halle, 1882).

OTTO III. (980–1002), Roman emperor, son of the emperor Otto II. and Theophano, daughter of the eastern emperor Romanus II., was born in July 980, chosen as his father's successor at Verona in June 983 and crowned German king at Aix-la-Chapelle on the 25th of the following December. Otto II. had died a few days before this ceremony, but the news did not reach Germany until after the coronation. Early in 984 the king was seized by Henry II., the Quarrelsome, the deposed duke of Bavaria, who claimed the regency as a member of the reigning house, and probably entertained the idea of obtaining the kingly dignity himself. A strong opposition was quickly aroused, and when Theophano and Adelaide, widow of the emperor Otto the Great, appeared in Germany, Henry was compelled to hand over the young king to his mother. Otto's mental gifts were considerable, and were so carefully cultivated by Bernward, afterwards bishop of Hildesheim, and by Gerbert of Aurillac, archbishop of Reims, that he was called "the wonder of the world." The government of Germany during his minority was in the hands of Theophano, and after her death in June 991 passed to a council in which the chief influence was exercised by Adelaide and Willigis, archbishop of Mainz. Having accompanied his troops in expeditions against the Bohemians and the Wends, Otto was declared of age in 995. In 996 he crossed the Alps and was recognized as king of the Lombards at Pavia. Before he reached Rome, Pope John XV., who had invited him to Italy, had died, whereupon he raised his own cousin Bruno, son of Otto duke of Carinthia, to the papal chair as Pope Gregory V., and by this pontiff Otto was crowned emperor on the 21st of May 996. On his return to Germany, the emperor learned that Gregory had been driven from Rome, which was again in the power of John Crescentius, patrician of the Romans, and that a new pope, John XVI., had been elected. Leaving his aunt, Matilda, abbess of Quedlinburg, as regent of Germany, Otto, in February 998, led Gregory back to Rome, took the castle of St Angelo by storm and put Crescentius to death. A visit to southern Italy, where many of the princes did homage to the emperor, was cut short by the death of the pope, to whose chair Otto then appointed his former tutor Gerbert, who took the name of Sylvester II. In the palace which he built on the Aventine, Otto sought to surround himself with the splendour and ceremonial of the older emperors of Rome, and dreamed of making Rome once more the centre of a universal empire. Many names and customs were introduced into his court from that of Constantinople; he proposed to restore the Roman senate and consulate, revived the office of patrician, called himself "consul of the Roman senate and people" and issued a seal with the inscription, "restoration of the Roman empire." Passing from pride to humility he added "servant of the apostle," and "servant of Jesus Christ" to the imperial title, spent a fortnight in prayer in the grotto of St Clement and did penance in various Italian monasteries. Leaving Italy in the summer preceding the year 1000, when it was popularly believed that the end of the world was to come, Otto made a pilgrimage to the tomb of his old friend Adalbert, bishop of Prague, at Gnesen, and raised the city to the dignity of an archbishopric. He then went to Aix, and opened the tomb of Charlemagne, where, according to a legendary tale, he found the body of the great emperor sitting upright upon a throne, wearing the crown and holding the sceptre. Returning to Rome, trouble soon arose between Otto and the citizens, and for three days the emperor was besieged in his palace. After a temporary peace, he fled to the monastery of Classe near Ravenna. Troops were collected, but whilst conducting a campaign against the Romans, Otto died at Paterno near Viterbo on the 23rd of January 1002, and was buried in the cathedral at Aix-la-Chapelle. Tradition says he was ensnared and poisoned by Stephania, the widow of Crescentius. The mystic erratic temperament of Otto, alternating between the most magnificent schemes of empire and the lowest depths of self-debasement, was not conducive to the welfare of his dominions, and during his reign the conditions of Germany deteriorated. He was liberal to the papacy, and was greatly influenced by the eminent clerics with whom he eagerly associated.

See Thangmar, *Vita Bernwardi episcopi Hildesheimensis* in the *Monumenta Germaniae historica. Scriptores*, Band iv. (Hanover and Berlin, 1826 fol.); *Lettres de Gerbert*, edited by J. Havet (Paris, 1889); *Die Urkunden Kaisers Ottos III.*, edited by Th. von Sickel in the *Monumenta Germaniae historica. Diplomata* (Hanover, 1879); R. Wilmans, *Jahrbücher des deutschen Reichs unter Kaiser Otto III.* (Berlin, 1837–1840); P. Kehr, *Die Urkunden Otto III.* (Innsbruck, 1890).

OTTO IV. (*c.* 1182–1218), Roman emperor, second son of Henry the Lion, duke of Saxony, and Matilda, daughter of Henry II., king of England, was most probably born at Argenton in central France. His father died when he was still young, and he was educated at the court of his uncle Richard I., king of England, under whose leadership he gained valuable experience in war, being appointed duke of Aquitaine, count of Poitou and earl of Yorkshire. When the emperor Henry VI. died in September 1197, some of the princes under the leadership of Adolph, archbishop of Cologne, were anxious to find a rival to Philip, duke of Swabia, who had been elected German king. After some delay their choice fell upon Otto, who was chosen king at Cologne on the 9th of June 1198. Hostilities broke out at once, and Otto, who drew his main support from his hereditary possessions in the Rhineland and Saxony, seized Aix-la-Chapelle, and was crowned there on the 12th of July 1198. The earlier course of the war was unfavourable to Otto, whose position was weakened by the death of Richard of England in April 1199; but his cause began to improve when Pope Innocent III. declared for him and placed his rival under the ban in April 1201. This support was purchased by a capitulation signed by Otto at Neuss, which ratified the independence and decided the boundaries of the States of the Church, and was the first authentic basis for the practical authority of the pope in central Italy. In 1200 an attack made by Philip on Brunswick was beaten off, the city of Worms was taken, and subsequently the aid of Ottakar I., king of Bohemia, was won for Otto. The papal legate Guido worked energetically on his behalf, several princes were persuaded to desert Philip and by the end of 1203 his success seemed assured. But after a period of reverses, Otto was wounded during a fight in July 1206 and compelled to take refuge in Cologne. Retiring to Denmark, he obtained military assistance from King Waldemar II., and a visit to England procured monetary aid from King John, after which he managed to maintain his position in Brunswick. Preparations were made to drive him from his last refuge, when he was saved by the murder of Philip in June 1208. Many of the supporters of Philip now made overtures to Otto, and an attempt to set up Henry I. duke of Brabant having failed, Otto submitted to a fresh election and was chosen German king at Frankfort on the 11th of November 1208 in the presence of a large gathering of princes. A general reconciliation followed, which was assisted by the betrothal of Otto to Philip's eldest daughter Beatrix, but as she was only ten years old, the marriage was deferred until the 22nd of July 1212. The pope who had previously recognized the victorious Philip, hastened to return to the side of Otto; the capitulation of Neuss was renewed and large concessions were made to the church.

In August 1209 the king set out for Italy. Meeting with no opposition, he was received at Viterbo by Innocent, but refused the papal demand that he should concede to the church all the territories which, previous to 1197, had been in dispute between the Empire and the Papacy, consenting, however, not to claim supremacy over Sicily. He was crowned emperor at Rome on the 4th of October 1209, a ceremony which was followed by fighting between the Romans and the German soldiers. The pope then requested the emperor to leave Roman territory; but he remained near Rome for some days, demanding satisfaction for the losses suffered by his troops. The breach with Innocent soon widened, and in violation of the treaty made with the pope Otto attempted to recover for the Empire all the property which Innocent had annexed to the Church, and rewarded his supporters with large estates in the disputed territories. Having occupied Tuscany he marched into Apulia, part of the kingdom of Frederick of Hohenstaufen, afterwards the emperor Frederick II., and on the 18th of November 1210 was excommunicated by the pope. Regardless of this sentence Otto completed the conquest of southern Italy, but the efforts of Innocent had succeeded in arousing considerable opposition in Germany, where the rebels were also supported by Philip Augustus, king of France. A number of princes assembled at Nuremberg declared Otto deposed, and invited Frederick to fill the vacant throne. Returning to Germany in March 1212, Otto made some headway against his enemies until the arrival of Frederick towards the close of the year. The death of his wife in August 1212 had weakened his hold on the southern duchies, and he was soon confined to the district of the lower Rhine, although supported by money from his uncle King John of England. The final blow to his fortunes came when he was decisively defeated by the French at Bouvines in July 1214. He escaped with difficulty from the fight and took refuge in Cologne. His former supporters hastened to recognize Frederick; and in 1216 he left Cologne for Brunswick, which he had received in 1202 by arrangement with his elder brother Henry. The conquest of Hamburg by the Danes, and the death of John of England, were further blows to his cause. On the 19th of May 1218 he died at the Harzburg after being loosed from the ban by a Cistercian monk, and was buried in the church of St Blasius at Brunswick. He married for his second wife in May 1214 Marie, daughter of Henry I., duke of Brabant, but left no children.

See *Regesta imperii V.*, edited by J. Ficker (Innsbruck, 1881); L. von Ranke, *Weltgeschichte*, Part viii. (Leipzig, 1887–1888); W. von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, Band v. (Leipzig, 1888); O. Abel, *Kaiser Otto IV. und König Friedrich II.* (Berlin, 1856); E. Winkelmann, *Philipp von Schwaben und Otto IV. von Braunschweig* (Leipzig, 1873–1878); G. Langerfeldt, *Kaiser Otto der Vierte* (Hanover, 1872); R. Schwemer, *Innocenz III. und die deutsche Kirche während des Thronstreites* (Strassburg, 1882); and A. Luchaire, *Innocent III., la papauté et l'empire* (Paris, 1906); and *Innocent III., la question d'Orient* (Paris, 1906).

OTTO OF FREISING (*c.* 1114–1158), German bishop and chronicler, was the fifth son of Leopold III., margrave of Austria, by his wife Agnes, daughter of the emperor Henry IV. By her first husband, Frederick I. of Hohenstaufen, duke of Swabia, Agnes was the mother of the German king Conrad III., and grandmother of the emperor Frederick I.; and Otto was thus related to the most powerful families in Germany. The notices of his life are scanty and the dates somewhat uncertain. He studied in Paris, where he took an especial interest in philosophy, is said to have been one of the first to introduce the philosophy of Aristotle into Germany, and he served as provost of a new foundation in Austria. Having entered the Cistercian order, Otto became abbot of the Cistercian monastery of Morimond in Burgundy about 1136, and soon afterwards was elected bishop of Freising. This diocese, and indeed the whole of Bavaria, was then disturbed by the feud between the Welfs and the Hohenstaufen, and the church was in a deplorable condition; but a great improvement was brought about by the new bishop in both ecclesiastical and secular matters. In 1147 he took part in the disastrous crusade of Conrad III. The section of the crusading army led by the bishop was decimated, but Otto reached Jerusalem, and returned to Bavaria in 1148 or 1149. He enjoyed the favour of Conrad's successor, Frederick I.; was probably instrumental in settling the dispute over the duchy of Bavaria in 1156; was present at the famous diet at Besançon in 1157, and, still retaining the dress of a Cistercian monk, died at Morimond on the 22nd of September 1158. In 1857 a statue of the bishop was erected at Freising.

Otto wrote a *Chronicon*, sometimes called *De duabus civitatibus*, an historical and philosophical work in eight books, which follows to some extent the lines laid down by Augustine and Orosius.

Written during the time of the civil war in Germany, it contrasts Jerusalem and Babel, the heavenly and the earthly kingdoms, but also contains much valuable information about the history of the time. The chronicle, which was held in very high regard by contemporaries, goes down to 1146, and from this date until 1209 has been continued by Otto, abbot of St Blasius (d. 1223). Better known is Otto's *Gesta Friderici imperatoris*, written at the request of Frederick I., and prefaced by a letter from the emperor to the author. The *Gesta* is in four books, the first two of which were written by Otto, and the remaining two, or part of them, by his pupil Ragewin, or Rahewin; it has been argued that the third book and the early part of the fourth were also the work of Otto. Beginning with the quarrel between Pope Gregory VII. and the emperor Henry IV., the first book takes the history down to the death of Conrad III. in 1152. It is not confined to German affairs, as the author digresses to tell of the preaching of Bernard of Clairvaux, of his zeal against the heretics, and of the condemnation of Abelard; and discourses on philosophy and theology. The second book opens with the election of Frederick I. in 1152, and deals with the history of the first five years of his reign, especially in Italy, in some detail. From this point (1156) the work is continued by Ragewin. Otto's Latin is excellent, and in spite of a slight partiality for the Hohenstaufen, and some minor inaccuracies, the *Gesta* has been rightly described as a "model of historical composition." First printed by John Cuspinian at Strassburg in 1515, Otto's writings are now found in the *Monumenta Germaniae historica*, Band xx. (Hanover, 1868), and have been translated into German by H. Kohl (Leipzig, 1881–1886). The *Gesta Friderici* has been published separately with introduction by G. Waitz. Otto is also said to have written a history of Austria (*Historia Austriaca*).

See J. Hashagen, *Otto von Freising als Geschichtsphilosoph und Kirchenpolitiker* (Leipzig, 1900); J. Schmidlin, *Die geschichtsphilosophische und kirchenpolitische Weltanschauung Otto von Freising* (Freiburg, 1906); W. Wattenbach, *Deutschlands Geschichtsquellen*, Band ii. (Berlin, 1894); and for full bibliography, A. Potthast, *Bibliotheca historica* (Berlin, 1896). (A. W. H.*)

OTTO OF NORDHEIM (d. 1083), duke of Bavaria, belonged to the rich and influential Saxon family of the counts of Nordheim, and having distinguished himself in war and peace alike, received the duchy of Bavaria from Agnes, widow of the emperor Henry III., in 1061. In 1062 he assisted Anno, archbishop of Cologne, to seize the person of the German king, Henry IV.; led a successful expedition into Hungary in 1063; and took a prominent part in the government during the king's minority. In 1064 he went to Italy to settle a papal schism, was largely instrumental in securing the banishment from court of Adalbert, archbishop of Bremen, and crossed the Alps in the royal interests on two other occasions. He neglected his duchy, but added to his personal possessions, and in 1069 shared in two expeditions in the east of Germany. In 1070 Otto was accused by a certain Egino of being privy to a plot to murder the king, and it was decided he should submit to the ordeal of battle with his accuser. The duke asked for a safe-conduct to and from the place of meeting, and when this was refused he declined to appear, and was consequently deprived of Bavaria, while his Saxon estates were plundered. He obtained no support in Bavaria, but raised an army among the Saxons and carried on a campaign of plunder against Henry until 1071, when he submitted; in the following year he received back his private estates. When the Saxon revolt broke out in 1073 Otto is represented by Bruno, the author of *De bello Saxonico*, as delivering an inspiring speech to the assembled Saxons at Wormsleben, after which he took command of the insurgents. By the peace of Gerstungen in 1074 Bavaria was restored to him; he shared in the Saxon rising of 1075, after which he was again pardoned and made administrator of Saxony. After the excommunication of Henry IV. in 1076 Otto attempted to mediate between Henry and the Saxons, but when these efforts failed he again placed himself at their head. He assented to the election of Rudolph, count of Rheinfelden, as German king, when his restoration to Bavaria was assured, and by his skill and bravery inflicted defeats on Henry's forces at Mellrichstadt, Flarchheim and Hohenmölsen. He remained in arms against the king until his death on the 11th of January 1083. Otto is described as a noble, prudent and warlike man, and he possessed great abilities. His repeated pardon showed that Henry could not afford to neglect such a powerful personality, and his military talents were repeatedly displayed. By his wife Richenza, widow of Hermann, count of Werla, he left three sons and three daughters.

See W. von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, Band iii. (Leipzig, 1881–1890); H. Mehmel, *Otto von Nordheim, Herzog von Bayern* (Göttingen, 1870); E. Neumann, *De Ottone de Nordheim* (Breslau, 1871); S. Riezler, *Geschichte Bayerns* (Gotha, 1878); and A. Vogeler, *Otto von Nordheim* (Göttingen, 1880).

OTTOMAN, a form of couch which usually has a head but no back, though sometimes it has neither. It may have square or semicircular ends, and as a rule it is what upholsterers call "stuffed over"—that is to say no wood is visible. It belongs to the same order of ideas as the divan (*q.v.*); its name indeed betokens its Oriental origin. It was one of the luxurious appointments which Europe imported from the East in the 18th century; the first mention that has been found of it is in France in 1729. In the course of a generation it made its way into every boudoir, but it appears originally to have been much larger than at present. The word is also applied to a small foot-stool covered with carpet, embroidery or beadwork.

OTTUMWA, a city and the county-seat of Wapello county, Iowa, U.S.A., on both sides of the Des Moines river, in the S.E. part of the state, about 85 m. S.E. of Des Moines. Pop. (1900) 18,197, of whom 1759 were foreign-born; (1910 census) 22,012. It is served by the Chicago, Burlington & Quincy, the Chicago, Milwaukee & Saint Paul, the Chicago, Rock Island & Pacific, and the Wabash railways. The site on which it is built forms a succession of terraces receding farther and farther from the river. In the city are a Carnegie library, a city hospital and St Joseph's Academy. Ottumwa is the headquarters of the Ottumwa Division of the Southern Federal Judicial District of Iowa, and terms of United States District and Circuit courts are held there. The city is in one of the richest coal regions of the state, and ranks high as a manufacturing centre, pork-packing, and the manufacture of iron and steel, machinery and agricultural and mining implements being the leading industries. The value of the factory product in 1905 was $10,374,183, an increase of 19·5% since 1900. Ottumwa was first settled in 1843, was incorporated as a town in 1851, and first chartered as a city in 1857.

OTWAY, THOMAS (1652–1685), English dramatist, was born at Trotton, near Midhurst, Sussex, on the 3rd of March 1652. His father, Humphrey Otway, was at that time curate of Trotton, but Otway's childhood was spent at Woolbeding, a parish 3 m. distant, of which his father had become rector. He was educated at Winchester College, and in 1669 entered Christ Church, Oxford, as a commoner, but left the university without a degree in the autumn of 1672. At Oxford he made the acquaintance of Anthony Cary, 5th viscount Falkland, through whom, he says in the dedication to *Caius Marius*, he first learned to love books. In London he made acquaintance with Mrs Aphra Behn, who in 1672 cast him for the part of the old king in her *Forc'd Marriage, or The Jealous Bridegroom*, at the Dorset Garden Theatre, but he had a bad attack of stage fright, and never made a second appearance. In 1675 Thomas Betterton produced at the same theatre Otway's first dramatic attempt, *Alcibiades*, which was printed in the same year. It is a poor tragedy, written in heroic verse, but was saved from absolute failure by the actors. Mrs Barry took the part of Draxilla, and her lover, the earl of Rochester, recommended the author of the piece to the notice of the duke of York. He made a great advance on this first work in *Don Carlos, Prince of Spain* (licensed June 15, 1676; an undated edition probably belongs to the same year). The material for this rhymed tragedy Otway took from the novel of the same name, written in 1672 by the Abbé de Saint-Réal, the source from which Schiller also drew his tragedy of *Don Carlos*. In it the two characters familiar throughout his plays make their appearance. Don Carlos is the impetuous, unstable youth, who seems to be drawn from Otway himself, while the queen's part is the gentle pathetic character repeated in his more celebrated heroines, Monimia and Belvidera. "It got more money," says John Downes (*Roscius Anglicanus*, 1708) of this play, "than any preceding modern tragedy." In 1677 Betterton produced two adaptations from the French by Otway, *Titus and Berenice* (from Racine's *Bérénice*), and the *Cheats of Scapin* (from Molière's *Fourberies de Scapin*). These were printed together, with a dedication to Lord Rochester. In 1678 he produced an original comedy, *Friendship in Fashion*, popular at the moment, though it was hissed off the stage for its gross indecency when it was revived at Drury Lane in 1749. Meanwhile he had conceived an overwhelming passion for Mrs Barry, who filled many of the leading parts in his plays. Six of his letters to her survive, the last of them referring to a broken appointment in the Mall. Mrs Barry seems to have coquetted with Otway, but she had no intention of permanently offending Rochester. In 1678, driven to desperation by Mrs Barry, Otway obtained a commission through Charles, earl of Plymouth, a natural son of Charles II., in a regiment serving in the Netherlands. The English troops were disbanded in 1679, but were left to find their way home as best they could. They were also paid with depreciated paper, and Otway arrived in London late in the year, ragged and dirty, a circumstance utilized by Rochester in his "Sessions of the Poets," which contains a scurrilous attack on his former protégé. Early in the next year (February 1680) was produced at Dorset Garden the first of Otway's two tragic masterpieces, *The Orphan, or The Unhappy Marriage*, Mrs Barry playing the part of Monimia. Written in blank verse, which shows a study of Shakespeare, its success was due to the tragic pathos, of which Otway was a master, in the characters of Castalio and Monimia. *The History and Fall of Caius Marius*, produced in the same year, and printed in 1692, is a curious grafting of Shakespeare's *Romeo and Juliet* on the story of Marius as related in Plutarch's *Lives*. In 1680 Otway also published *The Poet's Complaint of his Muse, or A Satyr against Libells*, in which he retaliated on his literary enemies. An indifferent comedy, *The Soldier's Fortune* (1681), was followed in February 1682 by *Venice Preserved, or A Plot Discover'd*. The story is founded on the *Histoire de la conjuration des Espagnols contre la Venise en 1618*, by the Abbé de Saint-Réal, but Otway modified the story considerably. The character of Belvidera is his own, and the leading part in the conspiracy, taken by Bedamor, the Spanish ambassador, is given in the play to the historically insignificant Pierre and Jaffier. The piece has a political meaning, enforced in the prologue. The Popish Plot was in Otway's mind, and Anthony, 1st earl of Shaftesbury, is caricatured in Antonio. The play won instant success. It was translated into almost every modern European language, and even Dryden said of it: "Nature is there, which is the greatest beauty." *The Orphan* and *Venice Preserved* remained stock pieces on the stage until the 19th century, and the leading actresses of the period played Monimia and Belvidera. One or two prefaces, another weak comedy, *The Atheist* (1684), and two posthumous pieces, a poem, *Windsor Castle* (1685), a panegyric of Charles II., and a *History of the Triumvirates* (1686), translated from the French, complete the list of Otway's works. He apparently ceased to struggle against his poverty and misfortunes. The generally accepted story regarding the manner of his death was first given in Theophilus Cibber's *Lives of the Poets*. He is said to have emerged from his retreat at the Bull on Tower Hill to beg for bread. A passer-by, learning who he was, gave him a guinea, with which Otway hastened to a baker's shop. He began too hastily to satisfy his ravenous hunger, and choked with the first mouthful. Whether this account of his death be true or not, it is certain that he died in the utmost poverty, and was buried on the 16th of April 1685 in the churchyard of St Clement Danes. A tragedy entitled *Heroick Friendship* was printed in 1686 as Otway's work, but the ascription is unlikely.

The Works of Mr Thomas Otway with some account of his life and writings, published in 1712, was followed by other editions (1757, 1768, 1812). The standard edition is that by T. Thornton (1813). A selection of his plays was edited for the Mermaid series (1891 and 1903) by Roden Noel. See also E. Gosse, *Seventeenth Century Studies* (1883); and Genest, *History of the Stage*.

OUBLIETTE, a French architectural term (from *oublier*, to forget), used in two senses of a dungeon or cell in a prison or castle which could only be reached by a trap-door from another dungeon, and of a concealed opening or passage leading from a dungeon to the moat or river, into which bodies of prisoners who were to be secretly disposed of might be dropped. Viollet le Duc (*Dict. de l'architecture*) gives a diagram of such an oubliette at the castle of Pierrefonds, France. Many so-called "oubliettes" in medieval castles were probably outlets for the disposal of drainage, refuse, &c., which at times may have served for the getting rid of prisoners.

OUCH, a brooch, clasp or buckle, especially one ornamented with jewels, enamels, &c., and used to clasp a cope or other ecclesiastical vestment. It is also used, as in Exod. xxxix. 6, of the gold or silver setting of jewels. The word is an example of the misdivision of a substantive and the indefinite article, being properly "nouche," "a nouche" being divided into "an ouche," as a napron into an apron, a nadder into an adder, and, reversely, an ewt, *i.e.* eft, into a newt. "Nouche" was adapted into O. Fr., whence English took the word, from the Late Lat. *nusca*, brooch; probably the original is Celtic, cf. O. Irish *nasc*, ring, *nasgaim*, fasten.

OUDENARDE (Flemish *Oudenaerde*), a town of Belgium in the province of East Flanders, 18 m. S. of Ghent. Pop. (1904) 6572. While it is best known for the great victory gained by Marlborough and Eugene over the French under Vendôme in 1708, Oudenarde has many features of interest. The town hall, which took ten years to build (1525–1535), has after that of Louvain the most elaborately decorated façade in Belgium. It was designed by H. van Peede and G. de Ronde, and is in tertiary Gothic style. The belfry tower of five storeys with three terraces, surmounted by a golden figure, is a striking feature. The council chamber contains a fine oak door and Gothic chimney-piece, both *c.* 1530. There are also two interesting old churches, St Walburga, partly of the 12th and partly of the 14th century, and Notre Dame, dating from the 13th century. The former contains several fine pictures by Craeyer and other old Flemish masters.

The *Battle of Oudenarde* (June 30th–July 11th 1708) was fought on the ground north-west and north of the town, which was then regularly fortified and was garrisoned by a force of the Allies. The French army under the duke of Burgundy and Marshal Vendôme, after an abortive attempt to invest Oudenarde, took up a defensive position north of the town when Marlborough and Eugene, after a forced march, arrived with the main Allied army. The advanced guard of the Allies under General (Lord) Cadogan promptly crossed the Scheldt and annihilated an outlying body of French troops, and Cadogan established himself on the ground he had won in front of the French centre. But the Allied main army took a long time to defile over the Scheldt and could form up (on the left of Cadogan's detachment) only slowly and by degrees. Observing this, Burgundy resolved to throw forward his right towards Oudenarde to engage and hold the main body of the Allies before their line of battle could be formed. This effected, it was hoped that the remainder of the French army could isolate and destroy Cadogan's detachment, which was already closely engaged with the French centre. But he miscalculated both the endurance of Cadogan's men (amongst whom the Prussians were conspicuous for their tenacity) and the rapidity with which in Marlborough's and Eugene's hands the wearied troops of the Allies could be made to move. Marlborough, who personally directed the operations on his left wing, not only formed his line of battle successfully, but also began seriously to press the forces that had been sent to check his deployment. Before long, while the hostile left wing still remained inactive, the unfortunate troops of the French centre and right were gradually hemmed in by the whole force of the Allies. The decisive blow was delivered by the Dutch marshal, Overkirk, who was sent by Marlborough with a large force (the last reserve of the Allies) to make a wide turning movement round the extreme right of the French, and at the proper time attacked them in rear. A belated attempt of the French left to intervene was checked by the British cavalry, and the pressure on the centre and right, which were now practically surrounded, continued even after nightfall. A few scattered units managed to escape, and the left wing retreated unmolested, but at the cost of about 3000 casualties the Allies inflicted a loss of 6000 killed and wounded and 9000 prisoners on the enemy, who were, moreover, so shaken that they never recovered their confidence to the end of the campaign. The battle of Oudenarde was not the greatest of Marlborough's victories, but it affords almost the best illustration of his military character. Contrary to all the rules of war then in vogue, he fought a piecemeal and unpremeditated battle, with his back to a river, and with wearied troops, and the event justified him. An ordinary commander would have avoided fighting altogether, but Marlborough saw beyond the material conditions and risked all on his estimate of the moral superiority of his army and of the weakness of the French leading. His conduct of the battle, once it had opened, was a model of the "partial" victory—the destruction of a part of the enemy's forces under the eyes of the rest—which was in the 17th and 18th centuries the tactician's ideal, and was sufficient to ensure him the reputation of being the best general of his age. But it is in virtue of having fought at all that he passes beyond the criteria of the time and becomes one of the great captains of history.

OUDINÉ, EUGÈNE ANDRÉ (1810–1887), French sculptor and medallist, was born in Paris in 1810, and devoted himself from the beginning to the medallist's branch of sculpture, although he also excelled in monumental sculpture and portrait busts. Having carried off the grand prize for medal engraving in 1831, he had a sensational success with his "Wounded Gladiator," which he exhibited in the same year. He subsequently occupied official posts as designer, first to the Inland Revenue Office, and then to the Mint. Among his most famous medals are that struck in commemoration of the annexation of Savoy by France, and that on the occasion of the peace of Villafranca. Other remarkable pieces are "The Apotheosis of Napoleon I.," "The Amnesty," "Le Duc d'Orléans," "Bertholet," "The Universal Exposition," "The Second of December, 1851," "The Establishment of the Republic," "The Battle of Inkermann," and "Napoleon's Tomb at the Invalides." For the Hotel de Ville in Paris he executed fourteen bas-reliefs, which were destroyed in 1871. Of his monumental works, many are to be seen in public places in and near Paris. In the Tuileries gardens is his group of "Daphnis and Hebe"; in the Luxembourg gardens the "Queen Bertha"; at the Louvre the "Buffon"; and in the courtyard of the same palace the "Bathsheba." A monument to General Espagne is at the Invalides, and a King Louis VIII. at Versailles. Oudiné, who may be considered the father of the modern medal, died in Paris in 1887.

OUDINOT, CHARLES NICOLAS (1767–1847), duke of Reggio, marshal of France, came of a bourgeois family in Lorraine, and was born at Bar-le-duc on the 25th of April 1767. He had a passion for a military career, and served in the regiment of Médoc from 1784 to 1787, when, having no hope of promotion on account of his non-noble birth, he retired with the rank of sergeant. The Revolution changed his fortunes, and in 1792, on the outbreak of war, he was elected lieutenant-colonel of the 3rd battalion of the volunteers of the Meuse. His gallant defence of the little fort of Bitsch in the Vosges in 1792 drew attention to him; he was transferred to the regular army in November 1793, and after serving in numerous actions on the Belgian frontier he was promoted general of brigade in June 1794 for his conduct at the battle of Kaiserslautern. He continued to serve with the greatest distinction on the German frontier under Hoche, Pichegru and Moreau, and was repeatedly wounded and once (in 1795) made prisoner. He was Masséna's right hand all through the great Swiss campaign of 1799—first as a general of division, to which grade he was promoted in April, and then as chief of the staff—and won extraordinary distinction at the battle of Zürich. He was present under Masséna at the defence of Genoa, and so distinguished himself at the combat of Monzambano that Napoleon presented him with a sword of honour. He was made inspector-general of infantry, and, on the establishment of the empire, given the Grand Cross of the Legion of Honour, but was not included in the first creation of marshals. He was at this time elected a member of the chamber of deputies, but he had little time to devote to politics. He took a conspicuous part in the war of 1805 in command of the famous division of the "grenadiers Oudinot," formed of picked troops and organized by him, with which he seized the Vienna bridges, received a wound at Hollabrünn, and delivered the decisive blow at Austerlitz. In 1806 he won the battle of Ostrolenka, and fought with resolution and success at Friedland. In 1808 he was made governor of Erfurt and count of the Empire, and in 1809, after displaying brilliant courage at Wagram, he was promoted to the rank of marshal. He was made duke of Reggio, and received a large money grant in April 1810. Oudinot administered the government of Holland from 1810 to 1812, and commanded the II. corps of the *Grande Armée* in the Russian campaign. He was present at Lützen and Bautzen, and when holding the independent command of the corps directed to take Berlin was defeated at Gross Beeren (see NAPOLEONIC CAMPAIGNS). He was then superseded by Ney, but the mischief was too great to be repaired, and Ney was defeated at Dennewitz. Oudinot was not disgraced, however, holding important commands at Leipzig and in the campaign of 1814. On the abdication of Napoleon he rallied to the new government, and was made a peer by Louis XVIII., and, unlike many of his old comrades, he did not desert to his old master in 1815. His last active service was in the French invasion of Spain in 1823, in which he commanded a corps and was for a time governor of Madrid. He died as governor of the Invalides on the 13th of September 1847. Oudinot was not, and made no pretence of being, a great commander, but he was a great general of division. He was the beau-ideal of an infantry general, energetic, thoroughly conversant with detail, and in battle as resolute and skilful as any of the marshals of Napoleon.

Oudinot's eldest son, CHARLES NICOLAS VICTOR, 2nd duke of Reggio (1791–1863), lieutenant-general, served through the later campaigns of Napoleon from 1809 to 1814, being in the latter year promoted major for gallant conduct. Unlike his father he was a cavalryman, and as such held command of the cavalry school at Saumur (1822–1830), and the inspector-generalcy of cavalry (1836–1848). He is chiefly known as the commander of the French expedition which besieged and took Rome in 1840 and re-established the temporal power of the pope. After the *coup d'état* of the 2nd of December 1851, in resistance to which he took a prominent part, he retired from military and political life, dying at Paris on the 7th of June 1863.

The 2nd duke wrote *Aperçu historique sur la dignité de maréchal de France* (1833); *Considérations sur les ordres militaires de Saint Louis, &c.* (1833); *L'Emploi des troupes aux grands travaux d'utilité publique* (1839); *De la Cavalerie et du casernement des troupes à cheval* (1840); *Des Remontes de l'armée* (1840); and a brief account of his Italian operations of 1849.

OUGHTRED, WILLIAM (fl. 1575–1660), English mathematician, was born at Eton, and educated there and at King's College, Cambridge, of which he became fellow. Being admitted to holy orders, he left the university about 1603, and was presented to the rectory of Aldbury, near Guildford in Surrey; and about 1628 he was appointed by the earl of Arundel to instruct his son in mathematics. He corresponded with some of the most eminent scholars of his time on mathematical subjects; and his house was generally full of pupils from all quarters. It is said that he expired in a sudden transport of joy upon hearing the news of the vote at Westminster for the restoration of Charles II.

He published, among other mathematical works, *Clavis Mathematica*, in 1631, in which he introduced new signs for certain mathematical operations (see ALGEBRA); a treatise on navigation entitled *Circles of Proportion*, in 1632; works on trigonometry and dialling; and his *Opuscula Mathematica*, published posthumously in 1676.

OUIDA, the pen name—derived from a childish attempt to pronounce "Louisa"—of Maria Louise [de la] Ramée (1839–1908), English novelist, born at Bury St Edmunds, where her birth was registered on the 7th of January 1839. Her father, Louis Ramée, was French, and her mother, Susan Sutton, English. At an early age she went to live in London, and there began to contribute to the *New Monthly* and *Bentley's Magazine*. In 1860 her first story, afterwards republished as *Held in Bondage* (1863), appeared in the *New Monthly* under the title of *Granville de Vigne*, and this was followed in quick succession by *Strathmore*

(1865), *Chandos* (1866) and *Under Two Flags* (1867). The list of Ouida's subsequent works is a very long one; but it is sufficient to say that, together with *Moths* (1880), those already named are not only the most characteristic, but also the best. In a less dramatic genre, her *Bimbi: Stories for Children* (1882) may also be mentioned; but it was by her more flamboyant stories, such as *Under Two Flags* and *Moths*, that her popular success was achieved. By purely literary critics and on grounds of morality or taste Ouida's novels may be condemned. They are generally flashy, and frequently unwholesome. It is impossible, however, to dismiss books like *Chandos* and *Under Two Flags* merely on such grounds. The emphasis given by Ouida to motives of sensual passion was combined in her with an original gift for situation and plot, and also with genuine descriptive powers which, though disfigured by inaccurate observation, literary solecisms and tawdry extravagance, enabled her at her best to construct a picturesque and powerful story. The character of "Cigarette" in *Under Two Flags* is full of fine touches, and this is not an isolated instance. In 1874 Ouida made her home in Florence, and many of her later novels have an Italian setting. She contributed from time to time to the magazines, and wrote vigorously on behalf of anti-vivisection and on Italian politics; but her views on these subjects were marked by characteristic violence and lack of judgment. She had made a great deal of money by her earlier books, but had spent it without thought for the morrow; and though in 1907 she was awarded a Civil List pension, she died at Viareggio in poverty on the 25th of January 1908.

OUNCE. (1) (Through O. Fr. *unce*, modern *once*, from Lat. *uncia*, twelfth part, of weight, of a pound, of measure, of a foot, in which sense it gives the O.Eng. *ynce*, inch), a unit of weight, being the twelfth part of a pound troy, =480 grains; in avoirdupois=437·5 grains, $\frac{1}{16}$ of a pound. The *fluid ounce* is a measure of capacity; in the United Kingdom it is equivalent to an avoirdupois ounce of distilled water at 62° F.; in the United States of America it is the 128th part of the gallon, =¼ gill, =456·033 grains of distilled water at its maximum density (see Weights and Measures). (2) A name properly applied to the *Felis uncia* or snow leopard (*q.v.*). It appears to have been originally used of various species of lynx, and is still sometimes the name of the Canada lynx. The word appears in O. Fr. and Ital. as *once* and *lonce*, *onza* and *lonza* respectively, and it is usually explained as being due to the confusion of the *l* with the article, *lonce* and *lonza* being changed to *l'once* or *l'onza*, and the *l'* subsequently dropped. If this be so the word is the same as "lynx," from the popular Lat. *luncia*=*lyncia*, Gr. λύγξ. On the other hand *once* and *onza* may be nasalized forms of *yūz*, the Persian name of the panther.

OUNDLE, a market-town in the Northern parliamentary division of Northamptonshire, England, 30½ m. N.E. of Northampton by a branch of the London & North-Western railway. Pop. of urban district (1901) 2404. It is picturesquely situated on an eminence, two sides of which are touched by the river Nene, which here makes a deep bend. The church of St Peter is a fine building with Early English, Decorated and Perpendicular porticos, with a western tower and lofty spire. Oundle School, one of the English public schools, was founded under the will of Sir William Laxton, Lord Mayor of London (d. 1556). There are about 200 boys. The school is divided into classical and modern sides, and has exhibitions to Oxford and Cambridge universities. A second-grade school was instituted out of the foundation in 1878. Oundle has a considerable agricultural trade.

Wilfrid, archbishop of York, is said to have been buried in 711 at a monastery in Oundle (*Undele*) which appears to have been destroyed shortly afterwards, and was certainly not in existence at the time of the Conquest. The manor, with a market and tolls, was among the possessions confirmed in 972 by King Edgar to the abbot of Peterborough, to whom it still belonged in 1086. The market was then worth 20s. yearly and is shown by the *quo warranto* rolls to have been held on Saturday, the day being changed to Thursday in 1835. After the Dissolution the market was granted with the manor to John, earl of Bedford, and still belongs to the lord of the manor. The abbot of Peterborough about the 13th century confirmed to his men of Oundle freedom from tallage, "saving to himself pleas of portmanmoot and all customs pertaining to the market," and they agreed to pay 8 marks, 12s. 11d., yearly for their privileges. The town was evidently governed by bailiffs in 1401, when the "bailiffs and good men" received a grant of pontage for the repair of the bridge called "Assheconbrigge," but the town was never incorporated and never sent members to parliament.

OURO PRETO ("Black Gold"), a city of the state of Minas Geraes, Brazil, 336 m. by rail N. by W. of Rio de Janeiro, and about 300 m. W. of Victoria, Espirito Santo, on the eastern slope of the Serra de Espinhaço and within the drainage basin of the Rio Doce. Pop. (1890) 17,860; (1900) 11,116. Ouro Preto is connected with Miguel Burnier, on the Central of Brazil railway, by a metre-gauge line 31 m. in length. The city is built upon the lower slope of the Serra do Ouro Preto, a spur of the Espinhaço, deeply cut by ravines and divided into a number of irregular hills, up which the narrow, crooked streets are built and upon which groups of low, old-fashioned houses form each a separate nucleus. From a mining settlement the city grew as the inequalities of the site permitted. R. F. Burton (*Highlands of Brazil*, London, 1869) says that its shape "is that of a huge serpent, whose biggest end is about the Praça. . . . The extremities stretch two good miles, with raised convolutions. . . . The 'streeting' of both upper and lower town is very tangled, and the old thoroughfares, mere 'wynds' . . . show how valuable once was building ground." The rough streets are too steep and narrow for vehicles, and even riding on horseback is often difficult. Several rivulets follow the ravines and drain into the Ribeirão do Carmo, a sub-tributary of the Rio Doce. The climate is sub-tropical and humid, though the elevation (3700-3800 ft.) gives a temperate climate in winter. The days are usually hot and the nights cold, the variations in temperature being a fruitful cause of bronchial and pulmonary diseases. Ouro Preto has several historic buildings; they are of antiquated appearance and built of the simplest materials—broken stone and mortar, with an exterior covering of plaster. The more noteworthy are the old government house (now occupied by the school of mines), the legislative chambers, municipal hall and jail—all fronting on the Praça da Independencia—and elsewhere the old Casa dos Contos (afterwards the public treasury), a theatre (the oldest in Brazil, restored in 1861–1862) and a hospital. There are 15 churches in the city, some occupying the most conspicuous sites on the hills, all dating from the more prosperous days of the city's history, but all devoid of architectural taste. Ouro Preto is the seat of the best mining school in Brazil.

The city dates from 1701, when a gold-mining settlement was established in its ravines by Antonio Dias of Taubaté. The circumstance that the gold turned black on exposure to the humid air (owing to the presence of silver) gave the name of Ouro Preto to the mountain spur and the settlement. In 1711 it became a city with the name of Villa Rica, a title justified by its size and wealth. At one period of its prosperity its population was estimated at 25,000 to 30,000. In 1720 Villa Rica became the capital of the newly created captaincy of Minas Geraes, and in 1823 the capital of the province of the same name under the empire of Dom Pedro I. When the empire was overthrown in 1889 and Minas Geraes was reorganized as a republican state, it was decided to remove the capital to a more favourable site and Bello Horizonte was chosen, but Ouro Preto remained the capital until 1898, when the new town (also called Cidade de Minas) became the seat of government. With the decay of her mining industries, Ouro Preto had become merely the political centre of the state. The removal of the capital was a serious blow, as the city has no industries to support its population and no trade of importance. The event most prominent in the history of the city was the conspiracy of 1789, in which several leading citizens were concerned, and for which one of its less influential members, an *alferes* (ensign) of cavalry named Joaquim José da Silva Xavier, nicknamed "Tira-dentes" (teeth-puller), was executed in Rio de Janeiro in 1792. The conspiracy originated in a belief that the Portuguese crown was about to enforce payment of certain arrears in the mining tax known as the "royal fifths," and its object was to set up a republic in Brazil. Although a minor figure in the conspiracy, Tira-dentes was made the scapegoat of the thirty-two men arrested and sent to Rio de Janeiro for trial, and posterity has made him the proto-martyr of republicanism in Brazil.

OUSE, the name of several English rivers.

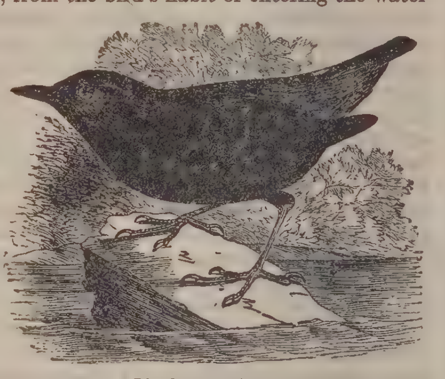
(1) The Great Ouse rises in Northamptonshire, in the slight hills between Banbury and Brackley, and falls only about 500 ft. in a course of 160 m. (excluding lesser windings) to its mouth in the Wash (North Sea). With an easterly direction it flows past Brackley and Buckingham and then turns N.E. to Stony Stratford, where the Roman Watling Street forded it. It receives the Tove from the N.W., and the Ouzel from the S. at Newport Pagnell. It then follows an extremely sinuous course past Olney to Sharnbrook, where it turns abruptly S. to Bedford. A north-easterly direction is then resumed past St Neot's to Godmanchester and Huntingdon, when the river trends easterly to St Ives. Hitherto the Ouse has watered an open fertile valley, and there are many beautiful wooded reaches between Bedford and St Ives, while the river abounds in coarse fish. Below St Ives the river debouches suddenly upon the Fens; its fall from this point to the mouth, a distance of 55 m. by the old course, is little more than 20 ft. (the extensive system of artificial drainage cuts connected with the river is considered under FENS). From Earith to Denver the waters of the Ouse flow almost wholly in two straight artificial channels called the Bedford Rivers, only a small head passing, under ordinary conditions, along the old course, called the Old West River. This is joined by the Cam from the S. 4 m. above Ely. In its northward course from this point the river receives from the E. the Lark, the Little Ouse, or Brandon river, and the Wissey. Below Denver sluice, 16 m. from the mouth, the Ouse is tidal. It flows past King's Lynn, and enters the Wash near the S.E. corner. The river is locked up to Bedford, a distance of 74½ m. by the direct course. In the lower part it bears a considerable traffic, but above St Ives it is little used, and above St Neot's navigation has ceased. The drainage area of the Great Ouse is 2607 sq. m.

(2) A river of Yorkshire. The river Ure, rising near the N.W. boundary of the county in the heart of the Pennines, and traversing the lovely valley famous under the name Wensleydale, unites with the river Swale to form the Ouse near the small town of Boroughbridge, which lies in the rich central plain of Yorkshire. The course of the Swale, which rises in the north of the county on the eastern flank of the Pennines, is mostly through this plain, and that of the Ouse is wholly so. It flows S.E. to York, thence for a short distance S. by W., then mainly S.E. again past Selby and Goole to the junction with the Trent; the great estuary so formed being known as the Humber. The course of the Ouse proper, thus defined, is 61 m. The Swale and Ure are each about 60 m. long. Goole is a large and growing port, and the river bears a considerable traffic up to York. There is also some traffic up to Boroughbridge, from which the Ure Navigation (partly a canal) continues up to Ripon. The Swale is not navigable. The chief tributaries are the Nidd, the Wharfe, the Don and the Aire from the W., and the Derwent from the N.E., but the detailed consideration of these involves that of the hydrography of the greater part of Yorkshire (*q.v.*). All, especially the western tributaries, traverse beautiful valleys, and the Aire and Don, with canals, are of importance as affording communications between the manufacturing district of south Yorkshire and the Humber ports. The Derwent is also navigable. The drainage area of the Ouse is 4133 sq. m. It is tidal up to Naburn locks, a distance of 37 m. from the junction with the Trent, and the total fall from Boroughbridge is about 40 ft.

(3) A river of Sussex, rising in the Forest Ridges between Horsham and Cuckfield, and draining an area of about 200 sq. m., mostly in the Weald. Like other streams of this locality, it breaches the South Downs, and reaches the English Channel at Newhaven after a course of 30 m. The eastward drift of beach-building material formerly diverted the mouth of this river from its present place to a point to the east near Seaford. The Ouse is navigable for small vessels to Lewes, and Newhaven is an important harbour.

OUSEL, or OUZEL, Anglo-Saxon *ósle*, equivalent of the German *Amsel* (a form of the word found in several old English books), apparently the ancient name for what is now more commonly known as the blackbird (*q.v.*), *Turdus merula*, but at the present day not often applied to that species, though used in a compound form for birds belonging to another genus and family.

The water-ousel, or water-crow, is now commonly named the "dipper"—a term apparently invented and bestowed in the first edition of T. Bewick's *British Birds* (ii. 16, 17)—not, as is commonly supposed, from the bird's habit of entering the water in pursuit of its prey, but because "it may be seen perched on the top of a stone in the midst of the torrent, in a continual dipping motion, or short courtesy often repeated." The English dipper, *Cinclus aquaticus*, is the type of a small family, the *Cinclidae*, probably more nearly akin to the wrens (*q.v.*) than to the thrushes, and with examples throughout the more temperate portions of Europe and Asia, as well as North and South America. The dipper haunts rocky streams, into which it boldly enters, generally by deliberately wading, and then by the strenuous combined action of its wings and feet makes its way along the bottom in quest of its living prey—fresh-water molluscs and aquatic insects in their larval or mature condition. Complaints of its attacks on the spawn of fish have not been justified by examination of the stomachs of captured specimens. Short and squat of stature, active and restless in its movements, dusky above, with a pure white throat and upper part of the breast, to which succeeds a broad band of dark bay, it is a familiar figure to most fishermen on the streams it frequents. The water-ousel's nest is a very curious structure—outwardly resembling a wren's, but built on a wholly different principle—an ordinary cup-shaped nest of grass lined with dead leaves, placed in some convenient niche, but encased with moss so as to form a large mass that covers it completely except a small hole for the bird's passage. The eggs laid within are from four to seven in number, and are of a pure white. The young are able to swim before they are fully fledged. (A. N.)



Cinclus mexicanus.

OUSELEY, SIR FREDERICK ARTHUR GORE (1825–1889), English composer, was the son of Sir Gore Ouseley, ambassador to Persia, and nephew to Sir William Ouseley, the Oriental scholar. He was born on the 12th of August 1825 in London, and manifested an extraordinary precocity in music, composing an opera at the age of eight years. In 1844, having succeeded to the baronetcy, he entered at Christ Church, and graduated B.A. in 1846 and M.A. in 1849. He was ordained in the latter year, and, as curate of St Paul's, Knightsbridge, served the parish of St Barnabas, Pimlico, until 1851. In 1850 he took the degree of Mus.B. at Oxford, and four years afterwards that of Mus.D., his exercise being the oratorio *St Polycarp*. In 1855 he succeeded Sir Henry Bishop as professor of music in the University of Oxford, was ordained priest and appointed precentor of Hereford. In 1856 he became vicar of St Michael's, Tenbury, and warden of St Michael's College, which under him became an important educational institution both in music and general subjects. His works include a second oratorio, *Hagar* (Hereford, 1873), a great number of services and anthems, chamber music, songs, &c., and theoretical works of great importance, such as *Harmony* (1868) and *Counterpoint* (1869) and *Musical Form* (1875). One of his most useful works is a series of chapters on English music added to the translation of Emil Naumann's *History of Music*, the subject having been practically ignored in the German treatise. A profoundly learned musician, and a man of great general culture, Ouseley's influence on younger men was wholly for good, and he helped forward the cause of musical progress in England perhaps more effectually than if he himself had been among the more enthusiastic supporters of "advanced" music. The work by which he is best known, *St Polycarp*, shows, like most compositions of its date, the strong influence of Mendelssohn, at least in its plan and scope; but if Ouseley had little individuality of expression, his models in other works were the English church writers of the noblest school. He died at Hereford on the 6th of April 1889.

OUSELEY, SIR WILLIAM (1769–1842), British Orientalist, eldest son of Captain Ralph Ouseley, of an old Irish family, was born in Monmouthshire. After a private education he went to Paris, in 1787, to learn French, and there laid the foundation of his interest in Persian literature. In 1788 he became a cornet in the 8th regiment of dragoons. At the end of 1794 he sold his commission and went to Leiden to study Persian. In 1795 he published *Persian Miscellanies*; in 1797–1799, *Oriental Collections*; in 1799, *Epitome of the Ancient History of Persia*; in 1800, *The Oriental Geography of Ebn Haukal*; and in 1801, a translation of the *Bakhtiyār Nama* and *Observations on Some Medals and Gems*. He received the degree of LL.D. from the university of Dublin in 1797, and in 1800 he was knighted. When his brother, Sir Gore Ouseley, was sent, in 1810, as ambassador to Persia, Sir William accompanied him as secretary. He returned to England in 1813, and in 1819–1823 published, in three volumes, *Travels in Various Countries of the East, especially Persia, in 1810, 1811 and 1812*. He also published editions of the *Travels* and *Arabian Proverbs* of Burckhardt. He contributed a number of important papers to the *Transactions* of the Royal Society of Literature. He died at Boulogne in September 1842.

OUSTER (from Anglo-Fr. *ouster*, to remove, take away, O. Fr. *oster*, mod. Fr. *ôter*, Eng. "oust," to eject, exclude; the derivation is not known; Lat. *obstare*, to stand in the way of, resist, would give the form but does not suit the sense; a more probable suggestion connects with a supposed *haustare*, from *haurire*, to draw water; cf. "exhaust"), a legal term signifying dispossession, especially the wrong or injury suffered by a person dispossessed of freeholds or chattels real. The wrong-doer by getting into occupation forces the real owner to take legal steps to regain his rights. Ouster of the freehold may be effected by *abatement*; *i.e.* by entry on the death of the person seized before the entry of the heir, or devisee, by *intrusion*, entry after the death of the tenant for life before the entry of the reversioner or remainderman, by *disseisin*, the forcible or fraudulent expulsion of the occupier or person seized of the property. Ouster of chattels real is effected by *disseisin*, the turning out by force or fraud of the legal proprietor before his estate is determined. In feudal law, the term *ouster-le-main* (Lat. *amovere manum*, to take away the hand) was applied to a writ or judgment granting the livery of land out of the sovereign's hand on the plea that he has no title to it, and also to the delivery by a guardian of land to a ward on his coming of age.

OUTLAWRY, the process of putting a person out of the protection of the law; a punishment for contemptuously refusing to appear when called in court, or evading justice by disappearing. It was an offence of very early existence in England, and was the punishment of those who could not pay the *were* or blood-money to the relatives of the deceased. By the Saxon law, an outlaw, or *laughlesman*, lost his *libera lex* and had no protection from the frank-pledge in the decennary in which he was sworn. He was, too, a *frendlesman*, because he forfeited his friends; for if any of them rendered him any assistance, they became liable to the same punishment. He was, at one time, said to be *caput lupinum*, or to have a wolf's head, from the fact that he might be knocked on the head like a wolf by any one that should meet him; but so early as the time of Bracton an outlaw might only be killed if he defended himself or ran away; once taken, his life was in the king's hands, and any one killing him had to answer for it as for any other homicide. The party guilty of outlawry suffered forfeiture of chattels in all cases, and in cases of treason or murder forfeiture of real property: for other offences the profits of land during his lifetime. In cases of treason or felony, outlawry was followed also by corruption of blood. An outlaw was *civiliter mortuus*. He could not sue in any court, nor had he any legal rights which could be enforced, but he was personally liable upon all causes of action. An outlawry might be reversed by proceedings in error, or by application to a court. It was finally abolished in civil proceedings in 1879, while in criminal proceedings it has practically become obsolete, being unnecessary through the general adoption of extradition treaties. A woman was said to be *waived* rather than outlawed.

In Scotland outlawry or fugitation may be pronounced by the supreme criminal court in the absence of the panel on the day of trial. In the United States outlawry never existed in civil cases, and in the few cases where it existed in criminal proceedings it has become obsolete.

OUTRAGE (through O. Fr. *ultrage*, *oltrage*, *oultrage*, from Lat. *ultra*, beyond, exceeding, cf. Ital. *oltraggio*; the meaning has been influenced by connexion with "rage," anger), originally extravagance, violence of behaviour, language, action, &c., hence especially a violent injury done to another.

OUTRAM, SIR JAMES (1803–1863), English general, and one of the heroes of the Indian Mutiny, was the son of Benjamin Outram of Butterley Hall, Derbyshire, civil engineer, and was born on the 29th of January 1803. His father died in 1805, and his mother, a daughter of Dr James Anderson, the Scottish writer on agriculture, removed in 1810 to Aberdeenshire. From Udny school the boy went in 1818 to the Marischal College, Aberdeen; and in 1819 an Indian cadetship was given him. Soon after his arrival at Bombay his remarkable energy attracted notice, and in July 1820 he became acting adjutant to the first battalion of the 12th regiment on its embodiment at Poona, an experience which he found to be of immense advantage to him in his after career. In 1825 he was sent to Khandesh, where he trained a light infantry corps, formed of the wild robber Bhils, gaining over them a marvellous personal influence, and employing them with great success in checking outrages and plunder. Their loyalty to him had its principal source in their boundless admiration of his hunting achievements, which in cool daring and hairbreadth escapes have perhaps never been equalled. Originally a "puny lad," and for many years after his arrival in India subject to constant attacks of sickness, Outram seemed to win strength by every new illness, acquiring a constitution of iron, "nerves of steel, shoulders and muscles worthy of a six-foot Highlander." In 1835 he was sent to Gujarat to make a report on the Mahi Kantha district, and for some time he remained there as political agent. On the outbreak of the first Afghan War in 1838 he was appointed extra aide-de-camp on the staff of Sir John Keane, and besides many other brilliant deeds performed an extraordinary exploit in capturing a banner of the enemy before Ghazni. After conducting various raids against Afghan tribes, he was in 1839 promoted major, and appointed political agent in Lower Sind, and later in Upper Sind. Here he strongly opposed the policy of his superior, Sir Charles Napier, which led to the annexation of Sind. But when war broke out he heroically defended the residency at Hyderabad against 8000 Baluchis; and it was Sir C. Napier who then described him as "the Bayard of India." On his return from a short visit to England in 1843, he was, with the rank of brevet lieutenant-colonel, appointed to a command in the Mahratta country, and in 1847 he was transferred from Satara to Baroda, where he incurred the resentment of the Bombay government by his fearless exposure of corruption.

In 1854 he was appointed resident at Lucknow, in which capacity two years later he carried out the annexation of Oudh and became the first chief commissioner of that province. Appointed in 1857, with the rank of lieutenant-general, to command an expedition against Persia, he defeated the enemy with great slaughter at Khushab, and conducted the campaign with such rapid decision that peace was shortly afterwards concluded, his services being rewarded by the grand cross of the Bath.

From Persia he was summoned in June to India, with the brief explanation—"We want all our best men here." It was said of him at this time that "a fox is a fool and a lion a coward by the side of Sir J. Outram." Immediately on his arrival in Calcutta he was appointed to command the two divisions of the Bengal army occupying the country from Calcutta to Cawnpore; and to the military control was also joined the commissionership of Oudh. Already the mutiny had assumed such proportions as to compel Havelock to fall back on Cawnpore, which he only held with difficulty, although a speedy advance was necessary to save the garrison at Lucknow. On arriving at Cawnpore with reinforcements, Outram, "in admiration of the brilliant deeds of General Havelock," conceded to him the glory of relieving Lucknow, and, waiving his rank, tendered his services to him as a volunteer. During the advance he commanded a troop of volunteer cavalry, and performed exploits of great brilliancy at Mangalwar, and in the attack at the Alambagh; and in the final conflict he led the way, charging through a very tempest of fire. The volunteer cavalry unanimously voted him the Victoria Cross, but he refused the choice on the ground that he was ineligible as the general under whom they served. Resuming supreme command, he then held the town till the arrival of Sir Colin Campbell, after which he conducted the evacuation of the residency so as completely to deceive the enemy. In the second capture of Lucknow, on the commander-in-chief's return, Outram was entrusted with the attack on the side of the Gumti, and afterwards, having recrossed the river, he advanced "through the Chattar Manzil to take the residency," thus, in the words of Sir Colin Campbell, "putting the finishing stroke on the enemy." After the capture of Lucknow he was gazetted lieutenant-general. In February 1858 he received the special thanks of both houses of parliament, and in the same year the dignity of baronet with an annuity of £1000. When, on account of shattered health, he returned finally to England in 1860, a movement was set on foot to mark the sense entertained, not only of his military achievements, but of his constant exertions on behalf of the natives of India, whose "weal," in his own words, "he made his first object." The movement resulted in the presentation of a public testimonial and the erection of statues in London and Calcutta. He died on the 11th of March 1863, and was buried in Westminster Abbey, where the marble slab on his grave bears the pregnant epitaph "The Bayard of India."

See Sir F. J. Goldsmid, *James Outram, a Biography* (2 vols., 1880), and L. J. Trotter, *The Bayard of India* (1903).

OVAL (Lat. *ovum*, egg), in geometry, a closed curve, generally more or less egg-like in form. The simplest oval is the ellipse; more complicated forms are represented in the notation of analytical geometry by equations of the 4th, 6th, 8th . . . degrees. Those of the 4th degree, known as bicircular quartics, are the most important, and of these the special forms named after Descartes and Cassini are of most interest. The Cartesian ovals presented themselves in an investigation of the section of a surface which would refract rays proceeding from a point in a medium of one refractive index into a point in a medium of a different refractive index. The most convenient equation is $lr \pm mr' = n$, where r, r' are the distances of a point on the curve from two fixed and given points, termed the foci, and l, m, n are constants. The curve is obviously symmetrical about the line joining the foci, and has the important property that the normal at any point divides the angle between the radii into segments whose sines are in the ratio $l : m$. The Cassinian oval has the equation $rr' = a^2$, where r, r' are the radii of a point on the curve from two given foci, and a is a constant. This curve is symmetrical about two perpendicular axes. It may consist of a single closed curve or of two curves, according to the value of a; the transition between the two types being a figure of 8, better known as Bernoulli's lemniscate (*q.v.*).

See CURVE; also Salmon, *Higher Plane Curves*.

OVAR, a town of Portugal, in the district of Aveiro and at the northern extremity of the Lagoon of Aveiro (*q.v.*); 21 m. S. of Oporto by the Lisbon-Oporto railway. Pop. (1900) 10,462. Ovar is the centre of important fisheries and has some trade in wine and timber. It is visited by small coasting vessels which ply to and from north-west Africa. Millet, wheat and vegetables —especially onions—are the chief products of the low-lying and unhealthy region, in which Ovar is situated.

OVARIOTOMY, the operation for removal of one or of both of the female ovaries (for anatomy see REPRODUCTIVE SYSTEM). The progress of modern surgery has been conspicuously successful in this department. From 1701, the date when Houston of Carluke, Lanarkshire, carried out his successful partial extirpation, progress was arrested for some time, although the Hunters (1780) indicated the practicability of the operation. In 1809 Ephraim M'Dowell of Kentucky, inspired by the lectures of John Bell, his teacher in Edinburgh, performed ovariotomy, and, continuing to operate with success, established the possibility of surgical interference. He was followed by others in the United States. The cases brought forward by Lizars of Edinburgh were not sufficiently encouraging; the operation met with great opposition; and it was not until Charles Clay, Spencer Wells, Baker Brown and Thomas Keith began work that the procedure was placed on a firm basis and was regarded as justifiable. Improved methods were introduced, and surgeons vied with one another in trying to obtain good results. Eventually, by the introduction of the antiseptic system of treating wounds, this operation, formerly regarded as one of the most grave and anxious in the domain of surgery, came to be attended with a lower mortality than any other of a major character.

To give an idea of the terrible record associated with the operation in the third quarter of the 19th century, a passage may be quoted from the English translation of the *Life of Pasteur*: "As it was supposed that the infected air of the hospitals might be the cause of the invariably fatal results of the operation, the Assistance Publique hired an isolated house in the Avenue de Meudon, near Paris, a salubrious spot. In 1863, ten women in succession were sent to that house; the neighbouring inhabitants watched those ten patients entering the house, and a short time afterwards their ten coffins being taken away." But as time went on, the published statistics showed an increasing success in the practice of almost every operator. Spencer Wells states that in his first five years one patient in three died; in his second and third five years one in four; in his fourth five years one in five; in 1876–1877, one in ten. After the introduction of antiseptics (1878–1884) he lost only 10·9% of his operation cases, but this series showing a marked absence of septic complications. These figures have been greatly improved upon in later years, and at the present time the mortality may be taken at somewhere about 5, 7 or 9%.

Removal of the ovaries is performed when the ovaries are the seat of cystic and other morbid changes; for fibroid tumours of the womb, in which case, by operating, one hastens the menopause and causes the tumours to grow smaller; and in cases where dysmenorrhoea is wearing out and rendering useless the life of the patient—less severe treatment having proved ineffectual. *Oophorectomy*, by which is meant removal of the ovaries with the view of producing a curative effect upon some other part, was introduced in 1872 by Robert Battey of Georgia (1828–1895). The operation is sometimes followed by loss of sexual feeling, and has been said to unsex the patient, hence strong objections have been urged against it. The patient and her friends should clearly understand the object of the operation and the results likely to be gained by it. Lastly, the ovaries are sometimes removed with the hope of checking the progress of inoperable cancer of the breast.

From the time that the operation of ovariotomy was first established as a recognized and lawful surgical procedure, there has been much disputation as to how the pedicle of the ovary, which consists of a fold of peritoneum (the broad ligament) with included blood-vessels, should be treated. Some operators were in favour of tying it with strong silk, and bringing the ends of the ligatures outside the abdomen. Others were in favour of having a strong metal clamp upon those structures, or of searing them with the actual cautery, whilst others claimed that the best results were to be obtained by firmly tying the pedicle, cutting the ligatures short, dropping the pedicle into the abdomen and closing the wound. This last method is now almost universally adopted. (E. O.*)

OVATION (Lat. *ovatio*), a minor form of Roman "triumph." It was awarded either when the campaign, though victorious, had not been important enough for the higher honour; when the war was not entirely put an end to; when it had been waged with unworthy foes; or when the general was not of rank sufficient to give him the right to a triumph. The ceremonial was on the whole similar in the two cases, but in an ovation the general walked or more commonly rode on horseback, wore a simple magisterial robe, carried no sceptre and wore a wreath of myrtle instead of laurel. Instead of a bull, a sheep was sacrificed at the conclusion of the ceremony. The word is not, however, derived from *ovis*, sheep, but probably means "shouting" (cp. αὔω) as a sign of rejoicing.

OVEN (O. Eng. *ofn*, Ger. *Ofen*, cf. Gr. ἰπνός, oven), a close chamber or compartment which may be raised to a considerable temperature by heat generated either within or without it. In English the term generally refers to a chamber for baking bread and other food substances, but it is also used of certain appliances employed in manufacturing operations, as in coking coal or making pottery. See HEATING.

OVERBECK, JOHANN FRIEDRICH (1789–1869), German painter, the reviver of "Christian art" in the 19th century, was born in Lübeck on the 4th of July 1789. His ancestors for three generations had been Protestant pastors; his father was doctor of laws, poet, mystic pietist and burgomaster of Lübeck. Within a stone's throw of the family mansion in the Königstrasse stood the gymnasium, where the uncle, doctor of theology and a voluminous writer, was the master; there the nephew became a classic scholar and received instruction in art.

The young artist left Lübeck in March 1806, and entered as student the academy of Vienna, then under the direction of F. H. Füger, a painter of some renown, but of the pseudo-classic school of the French David. Here was gained thorough knowledge, but the teachings and associations proved unendurable to the sensitive, spiritual-minded youth. Overbeck wrote to a friend that he had fallen among a vulgar set, that every noble thought was suppressed within the academy and that losing all faith in humanity he turned inwardly on himself. These words are a key to his future position and art. It seemed to him that in Vienna, and indeed throughout Europe, the pure springs of Christian art had been for centuries diverted and corrupted, and so he sought out afresh the living source, and, casting on one side his contemporaries, took for his guides the early and pre-Raphaelite painters of Italy. At the end of four years, differences had grown so irreconcilable that Overbeck and his band of followers were expelled from the academy. True art, he writes, he had sought in Vienna in vain—"Oh! I was full of it; my whole fancy was possessed by Madonnas and Christs, but nowhere could I find response." Accordingly he left for Rome, carrying his half-finished canvas "Christ's Entry into Jerusalem," as the charter of his creed—"I will abide by the Bible; I elect it as my standing-point."

Overbeck in 1810 entered Rome, which became for fifty-nine years the centre of his unremitting labour. He was joined by a goodly company, including Cornelius, Wilhelm Schadow and Philip Veit, who took up their abode in the old Franciscan convent of San Isidoro on the Pincian Hill, and were known among friends and enemies by the descriptive epithets—"the Nazarites," "the pre-Raphaelites," "the new-old school," "the German-Roman artists," "the church-romantic painters," "the German patriotic and religious painters." Their precept was hard and honest work and holy living; they eschewed the antique as pagan, the Renaissance as false, and built up a severe revival on simple nature and on the serious art of Perugino, Pinturicchio, Francia and the young Raphael. The characteristics of the style thus educed were nobility of idea, precision and even hardness of outline, scholastic composition, with the addition of light, shade and colour, not for allurement, but chiefly for perspicuity and completion of motive. Overbeck was mentor in the movement; a fellow-labourer writes: "No one who saw him or heard him speak could question his purity of motive, his deep insight and abounding knowledge; he is a treasury of art and poetry, and a saintly man." But the struggle was hard and poverty its reward. Helpful friends, however, came in Niebuhr, Bunsen and Frederick Schlegel. Overbeck in 1813 joined the Roman Catholic Church, and thereby he believed that his art received Christian baptism.

Faith in a mission begat enthusiasm among kindred minds, and timely commissions followed. The Prussian consul, Bartholdi, had a house on the brow of the Pincian, and he engaged Overbeck, Cornelius, Veit and Schadow to decorate a room 24 ft. square with frescoes (now in the Berlin gallery) from the story of Joseph and his Brethren. The subjects which fell to the lot of Overbeck were the "Seven Years of Famine" and "Joseph sold by his Brethren." These tentative wall-pictures, finished in 1818, produced so favourable an impression among the Italians that in the same year Prince Massimo commissioned Overbeck, Cornelius, Veit and Schnorr to cover the walls and ceilings of his garden pavilion, near St John Lateran, with frescoes illustrative of Tasso, Dante and Ariosto. To Overbeck was assigned, in a room 15 ft. square, the illustration of Tasso's *Jerusalem Delivered*; and of eleven compositions the largest and most noteworthy, occupying one entire wall, is the "Meeting of Godfrey de Bouillon and Peter the Hermit." The completion of the frescoes—very unequal in merit—after ten years' delay, the overtaxed and enfeebled painter delegated to his friend Joseph Führich. The leisure thus gained was devoted to a thoroughly congenial theme, the "Vision of St Francis," a wall-painting 20 ft. long, figures life size, finished in 1830, for the church of Sta Maria degli Angeli near Assisi. Overbeck and the brethren set themselves the task of recovering the neglected art of fresco and of monumental painting; they adopted the old methods, and their success led to memorable revivals throughout Europe.

Fifty years of the artist's laborious life were given to oil and easel paintings, of which the chief, for size and import, are the following: "Christ's Entry into Jerusalem" (1824), in the Marien Kirche, Lübeck; "Christ's Agony in the Garden" (1835), in the great hospital, Hamburg; "Lo Sposalizio" (1836), Raczynski gallery, Berlin; the "Triumph of Religion in the Arts" (1840), in the Städel Institut, Frankfort; "Pietà" (1846), in the Marien Kirche, Lübeck; the "Incredulity of St Thomas" (1851), in the possession of Mr Beresford Hope, London; the "Assumption of the Madonna" (1855), in Cologne Cathedral; "Christ delivered from the Jews" (1858), tempera, on a ceiling in the Quirinal Palace—a commission from Pius IX., and a direct attack on the Italian temporal government, therefore now covered by a canvas adorned with Cupids. All the artist's works are marked by religious fervour, careful and protracted study, with a dry, severe handling, and an abstemious colour.

Overbeck belongs to eclectic schools, and yet was creative; he ranks among thinkers, and his pen was hardly less busy than his pencil. He was a minor poet, an essayist and a voluminous letter-writer. His style is wordy and tedious; like his art it is borne down with emotion and possessed by a somewhat morbid "subjectivity." His pictures were didactic, and used as means of propagandas for his artistic and religious faith, and the teachings of such compositions as the "Triumph of Religion and the Sacraments" he enforced by rapturous literary effusions. His art was the issue of his life: his constant thoughts, cherished in solitude and chastened by prayer, he transposed into pictorial forms, and thus were evolved countless and much-prized drawings and cartoons, of which the most considerable are the Gospels, forty cartoons (1852); Via Crucis, fourteen water-colour drawings (1857); the Seven Sacraments, seven cartoons (1861). Overbeck's compositions, with few exceptions, are engraved. His life-work he sums up in the words—"Art to me is as the harp of David, whereupon I would desire that psalms should at all times be sounded to the praise of the Lord." He died in Rome in

1869, aged eighty, and lies buried in San Bernardo, the church wherein he worshipped.

There are biographies by J. Beavington Atkinson (1882) and Howitt (1886). (J. B. A.)

OVERBURY, SIR THOMAS (1581–1613), English poet and essayist, and the victim of one of the most sensational crimes in English history, was the son of Nicholas Overbury, of Bourton-on-the-Hill, and was born in 1581 at Compton Scorpion, near Ilmington, in Warwickshire. In the autumn of 1595 he became a gentleman commoner of Queen's College, Oxford, took his degree of B.A. in 1598 and came to London to study law in the Middle Temple. He found favour with Sir Robert Cecil, travelled on the Continent and began to enjoy a reputation for an accomplished mind and free manners. About the year 1601, being in Edinburgh on a holiday, he met Robert Carr, then an obscure page to the earl of Dunbar; and so great a friendship was struck up between the two youths that they came up to London together. The early history of Carr remains obscure, and it is probable that Overbury secured an introduction to Court before his young associate contrived to do so. At all events, when Carr attracted the attention of James I., in 1606, by breaking his leg in the tilt-yard, Overbury had for some time been servitor-in-ordinary to the king. He was knighted in June 1608, and in 1609 he travelled in France and the Low Countries. He seems to have followed the fortunes of Carr very closely, and "such was the warmth of the friendship, that they were inseparable, . . . nor could Overbury enjoy any felicity but in the company of him he loved [Carr]." When the latter was made Lord Rochester in 1610, the intimacy seems to have been sustained. But it was now destroyed by a new element. Early in 1611 the Court became aware of the mutual attraction between Rochester and the infamous and youthful countess of Essex, who seemed to have bewitched the handsome Scots adventurer. To this intrigue Overbury was from the first violently opposed, pointing out to Rochester that an indulgence in it would be hurtful to his preferment, and that the woman, even at this early stage in her career, was already "noted for her injury and immodesty." He went so far as to use, in describing her, a word which was not more just than scandalous. But Rochester was now infatuated, and he repeated to the countess what Overbury had said. It was at this time, too, that Overbury wrote, and circulated widely in MS., the poem called "His Wife," which was a picture of the virtues which a young man should demand in a woman before he has the rashness to marry her. It was represented to Lady Essex that Overbury's object in writing this poem was to open the eyes of Rochester to her defects. The situation now resolved itself into a deadly duel for the person of Rochester between the mistress and the friend. The countess contrived to lead Overbury into such a trap as to make him seem disrespectful to the king, and she succeeded so completely that he was thrown into the Tower on the 22nd of April 1613. It was not known at the time, and it is not certain now, how far Rochester participated in this first crime, or whether he was ignorant of it. But the queen, by a foolish phrase, had sown discord between the friends; she had called Overbury Rochester's "governor." It is, indeed, apparent that Overbury had become arrogant with success, and was no longer a favourite at Court. Lady Essex, however, was not satisfied with having had him shut up; she was determined that "he should return no more to this stage." She had Sir William Wade, the honest Governor of the Tower, removed to make way for a creature of her own, Sir Gervaise Elvis (or Helwys); and a gaoler, of whom it was ominously said that he was "a man well acquainted with the power of drugs," was set to attend on Overbury. This fellow, afterwards aided by Mrs Turner, the widow of a physician, and by an apothecary called Franklin, plied the miserable poet with sulphuric acid in the form of copper vitriol. But his constitution long withstood the timid doses they gave him, and he lingered in exquisite sufferings until the 15th of September 1613, when more violent measures put an end to his existence. Two months later Rochester, now earl of Somerset, married the chief murderess, Lady Essex. More than a year passed before suspicion was roused, and when it was, the king showed a hateful disinclination to bring the offenders to justice. In the celebrated trial which followed, however, the wicked plot was all discovered. The four accomplices were hanged; the countess of Somerset pleaded guilty but was spared, and Somerset himself was disgraced. Meanwhile, Overbury's poem, *The Wife*, was published in 1614, and ran through six editions within a year, the scandal connected with the murder of the author greatly aiding its success. It was abundantly reprinted within the next sixty years, and it continued to be one of the most widely popular books of the 17th century. Combined with later editions of *The Wife*, and gradually adding to its bulk, were "Characters" (first printed in the second of the 1614 editions), "The Remedy of Love" (1620), and "Observations in Foreign Travels" (1626). Later, much that must be spurious was added to the gathering snowball of Overbury's *Works*. Posterity has found the praise of his contemporaries for the sententious and graceful moral verse of Overbury extravagantly expressed. *The Wife* is smooth and elegant, but uninspired. There is no question that the horrible death of the writer, and the extraordinary way in which his murderers were brought to justice, gave an extraneous charm to his writings. Nor can we be quite sure that Overbury was in fact such a "glorious constellation" of all the religious virtues as the 17th century believed. He certainly kept very bad company, and positive evidence of his goodness is wanting. But no one was ever more transcendently canonized by becoming the victim of conspirators whose crimes were equally detestable and unpopular. (E. G.)

OVERDOOR, the name given to any ornamental moulding placed over a door. The overdoor is usually architectural in form, but is sometimes little more than a moulded shelf for the reception of china or curiosities.

OVERMANTEL, the name given to decorative cabinet work, or joinery, applied to the upper part of a fireplace. The overmantel is derived from the carved panelling formerly applied to chimney-pieces of importance, but the word is now generally restricted to a movable fitment, often consisting of a series of shelves and niches for the reception of ornaments.

OVERSOUL (Ger. *Überseele*), the name adopted by Emerson to describe his conception of that transcendent unity which embraces subject and object, mind and matter, and in which all the differences in virtue of which particular things exist are absorbed. The idea is analogous to the various doctrines of the absolute, and to the *ἰδέα* of Plato.

OVERSTONE, SAMUEL JONES LOYD, 1st Baron (1796–1883), English banker, the only son of the Rev. Lewis Loyd, a Welsh dissenting minister, was born on the 25th of September 1796. He was educated at Eton and Trinity College, Cambridge. His father, who had married a daughter of John Jones, a banker of Manchester, had given up the ministry to take a partnership in his father-in-law's bank, and had afterwards founded the London branch of Jones, Loyd & Co., afterwards incorporated in the London and Westminster Bank. Loyd, who had joined his father in the banking business, succeeded to it on the latter's retirement in 1844. He conducted the business so successfully that on his death he left personal property of over £2,000,000. He sat in parliament as liberal member for Hythe from 1819 to 1826, and unsuccessfully contested Manchester in 1832. As early as 1832 he was recognized as one of the foremost authorities on banking, and he enjoyed much influence with successive ministries and chancellors of the exchequer. He was created Baron Overstone in 1850. He died in London on the 17th of November 1883, leaving one daughter, who married Robert James Loyd-Lindsay, afterwards Lord Wantage.

OVERT ACT (O. Fr. *overt*, from *ouvrir*, to open), in law, an open act, one that can be clearly proved by evidence, and from which criminal intent can be inferred, as opposed to a mere intention in the mind to commit a crime (see Intent). The term is more particularly employed in cases of treason (*q.v.*), which must be demonstrated by some overt or open act.

OVERTURE (Fr. *ouverture*, opening), in music, the instrumental introduction to a dramatic or choral composition. The notion of an overture thus has no existence until the 17th century. The *toccata* at the beginning of Monteverde's *Orfeo* is a barbaric flourish of every procurable instrument, alternating with a melodious section entitled *ritornello*; and, in so far as this constitutes the first instrumental movement prefixed to an opera, it may be called an overture. As an art-form the overture began to exist in the works of J. B. Lully. He devised a scheme which, although he himself did not always adhere to it, constitutes the typical French overture up to the time of Bach and Handel (whose works have made it classical). This French overture consists of a slow introduction in a marked "dotted rhythm" (*i.e.* exaggerated iambic, if the first chord is disregarded), followed by a lively movement in fugato style. The slow introduction was always repeated, and sometimes the quick movement concluded by returning to the slow tempo and material, and was also repeated (see Bach's French Overture in the *Klavierübung*).

The operatic French overture was frequently followed by a series of dance tunes before the curtain rose. It thus naturally became used as the prelude to a suite; and the *Klavierübung* French Overture of Bach is a case in point, the overture proper being the introduction to a suite of seven dances. For the same reason Bach's four orchestral suites are called overtures; and, again, the prelude to the fourth partita in the *Klavierübung* is an overture.

Bach was able to use the French overture form for choruses, and even for the treatment of chorales. Thus the overture, properly so called, of his fourth orchestral suite became the first chorus of the church cantata *Unser Mund sei voll Lachens*; the choruses of the cantatas *Preise Jerusalem den Herrn* and *Höchst erwünschtes Freudenfest* are in overture form; and, in the first of the two cantatas entitled *Nun komm der Heiden Heiland*, Bach has ingeniously adapted the overture form to the treatment of a chorale.

With the rise of dramatic music and the sonata style, the French overture became unsuitable for opera; and Gluck (whose remarks on the function of overtures in the preface to *Alceste* are historic) based himself on Italian models, of loose texture, which admit of a sweeping and massively contrasted technique (see SYMPHONY). By the time of Mozart's later works the overture in the sonata style had clearly differentiated itself from strictly symphonic music. It consists of a quick movement (with or without a slow introduction), in sonata form, loose in texture, without repeats, frequently without a development section, but sometimes substituting for it a melodious episode in slow time. Instances of this substitution are Mozart's "symphony" in G (Köchel's catalogue 318), which is an overture to an unknown opera, and his overtures to *Die Entführung* and to *Lo Sposo deluso*, in both of which cases the curtain rises at a point which throws a remarkable dramatic light upon the peculiar form. The overture to *Figaro* was at first intended to have a similar slow middle section, which, however, Mozart struck out as soon as he had begun it. In Beethoven's hands the overture style and form increased its distinction from that of the symphony, but it no longer remained inferior to it; and the final version of the overture to *Leonora* (that known as No. 3) is the most gigantic single orchestral movement ever based on the sonata style.

Overtures to plays, such as Beethoven's to Collin's *Coriolan*, naturally tend to become detached from their surroundings; and hence arises the concert overture, second only to the symphony in importance as a purely orchestral art-form. Its derivation associates it almost inevitably with external poetic ideas. These, if sufficiently broad, need in no way militate against musical integrity of form; and Mendelssohn's *Hebrides* overture is as perfect a masterpiece as can be found in any art. The same applies to Brahms's *Tragic Overture*, one of his greatest orchestral works, for which a more explanatory title would be misleading as well as unnecessary. His *Academic Festival Overture* is a highly organized working out of German student songs.

In modern opera the overture, *Vorspiel*, *Einleitung*, *Introduction*, or whatever else it may be called, is generally nothing more definite than that portion of the music which takes place before the curtain rises. *Tannhaüser* is the last case of high importance in which the overture (as originally written) is a really complete instrumental piece prefixed to an opera in tragic and continuous dramatic style. In lighter opera, where sectional forms are still possible, a separable overture is not out of place, though even *Carmen* is remarkable in the dramatic way in which its overture foreshadows the tragic end and leads directly to the rise of the curtain. Wagner's Vorspiel to *Lohengrin* is a short self-contained movement founded on the music of the *Grail*. With all its wonderful instrumentation, romantic beauty and identity with subsequent music in the first and third acts, it does not represent a further departure from the formal classical overture than that shown fifty years earlier by Méhul's interesting overtures to *Ariodant* and *Uthal*, in the latter of which a voice is several times heard on the stage before the rise of the curtain. The Vorspiel to *Die Meistersinger*, though very enjoyable by itself and needing only an additional tonic chord to bring it to an end, really loses incalculably in refinement by so ending in a concert room. In its proper position its otherwise disproportionate climax leads to the rise of the curtain and the engaging of the listener's mind in a crowd of dramatic and spectacular sensations amply adequate to account for that long introductory instrumental *crescendo*. The Vorspiel to *Tristan* has been very beautifully finished for concert use by Wagner himself, and the considerable length and subtlety of the added page shows how little calculated for independent existence the original Vorspiel was. Lastly, the *Parsifal* Vorspiel is a composition which, though finished for concert use by Wagner in a few extra bars, asserts itself with the utmost lucidity and force as a prelude to some vast design. The orchestral preludes to the four dramas of the *Ring* owe their whole meaning to their being mere preparations for the rise of the curtain; and these works can no more be said to have overtures than Verdi's *Falstaff* and Strauss's *Salome*, in which the curtain rises at the first note of the music. (D. F. T.)

OVERYSEL, or OVERYSSEL, a province of Holland, bounded S. and S.W. by Gelderland, N.W. by the Zuider Zee, N. by Friesland and Drente, and E. by the Prussian provinces of Hanover and Westphalia respectively; area 1291 sq. m.; pop. (1904) 359,443. It includes the island of Schokland in the Zuider Zee. Like Drente on the north and Gelderland on the south, Overysel consists of a sandy flat relieved by hillocks, and is covered with waste stretches of heath and patches of wood and high fen. Along the shores of the Zuider Zee, however, west of the Zwolle-Leeuwarden railway, the country is low-lying and covered for the most part with fertile pasture lands. Cattle-rearing and butter and cheese making are consequently the chief occupations, while on the coast many of the people are engaged in making mats and besoms. The river system of the province is determined by two main ridges of hills. The first of these extends from the southern border at Markelo to the Lemeler hill (262 ft.) near the confluence of the Vecht and Regge, and forms the watershed between the Regge and the Salland streams (Sala, whence Salis, Isala, Ysel), which unite at Zwolle to form the Zwarte Water. The other ridge of hills extends through the south-eastern division of the province called Twente, from Enschede to Ootmarsum, and divides the basin of the Almelosche Aa from the Dinkel and its streams. The river Vecht crosses the province from E. to W. and joins the Zwarte Water, which communicates with the Zuider Zee by the Zwolsche Diep and with the Ysel by the Willemsvaart. Everywhere along the streams is a strip of fertile grass-land, from which agriculture and cattle-rearing have gradually spread over the sand-grounds. A large proportion of the sand-grounds, however, is waste. Forest culture is practised on parts of them, especially in the east, and pigs are largely bred. The deposits of the Salland and the Dinkel streams are found to contain iron ore, which is extracted and forms an article of export to Germany. Peat-digging and fen reclamation have been carried on from an early period, and the area of high fen which formerly covered the portion of the province to the north of the Vecht in the neighbourhood of Dedemsvaart has been mostly reclaimed. This industry is now most active on the eastern borders between Almelo and Hardenberg, Vriezenveen being the chief fen colony. Cotton-spinning, together with bleaching-works, has come into prominence in the 19th century in the district of Twente. The reason of its isolated settlement here is to be found in the former general practice of weaving as a home craft and its organization as an industry by capitalist Baptist refugees who arrived in the 17th and 18th centuries. The chief town of the province is Zwolle, and other thriving industrial centres are Deventer, famous for its carpets and cake, and Almelo, Enschede, Hengelo and Oldenzaal in Twente. Kampen, Genemuiden, Vollenhove and Blokzyl, on the Zuider Zee, carry on some fishing trade. Near Vollenhove was the castle of Toutenburg, built in 1502–1533 by the famous stadtholder of the emperor Charles V., George Schenk. The castle was demolished in the beginning of the 19th century and the remains are slight. The railway system of the province is supplemented by steam tram-lines between Zwolle, Dedemsvaart and Hardenberg.

OVID [Publius Ovidius Naso] (43 B.C.–A.D. 17), Roman poet, the last of the Augustan age, was born in 43 B.C., the last year of the republic, the year of the death of Cicero. Thus the only form of political life known to Ovid was that of the absolute rule of Augustus and his successor. His character was neither strengthened nor sobered, like that of his older contemporaries, by personal recollection of the crisis through which the republic passed into the empire. There is no sense of political freedom in his writings. The spirit inherited from his ancestors was that of the Italian country districts, not that of Rome. He was born on the 20th of March (his self-consciousness has preserved the exact day of the month)[1] at Sulmo, now Sulmona, a town of the Paeligni, picturesquely situated among the mountains of the Abruzzi: its wealth of waters and natural beauties seem to have strongly affected the young poet's imagination (for he often speaks of them with affectionate admiration) and to have quickened in him that appreciative eye for the beauties of nature which is one of the chief characteristics of his poems. The Paeligni were one of the four small mountain peoples whose proudest memories were of the part they had played in the Social War. But in spite of this they had no old race-hostility with Rome, and their opposition to the senatorial aristocracy in the Social War would predispose them to accept the empire. Ovid, whose father was of equestrian family, belonged by birth to the same social class as Tibullus and Propertius, that of old hereditary landowners; but he was more fortunate than they in the immunity which his native district enjoyed from the confiscations made by the triumvirs. His vigorous vitality was apparently a gift transmitted to him by heredity; for he tells us that his father lived till the age of ninety, and that he performed the funeral rites to his mother after his father's death. While he mentions both with the piety characteristic of the old Italian, he tells us little more about them than that "their thrift curtailed his youthful expenses,"[2] and that his father did what he could to dissuade him from poetry, and force him into the more profitable career of the law. He and his brother had been brought early to Rome for their education, where they attended the lectures of two most eminent teachers of rhetoric, Arellius Fuscus and Porcius Latro, to which influence is due the strong rhetorical element in Ovid's style. He is said to have attended these lectures eagerly, and to have shown in his exercises that his gift was poetical rather than oratorical, and that he had a distaste for the severer processes of thought.

Like Pope, "he lisped in numbers,"[3] and he wrote and destroyed many verses before he published anything. The earliest edition of the *Amores*, which first appeared in five books, and the *Heroides* were given by him to the world at an early age. "Virgil," he informs us, "he had only seen"; but Virgil's friend and contemporary Aemilius Macer used to read his didactic poems to him; and even the fastidious Horace sometimes delighted his ears with the music of his verse. He had a close bond of intimacy with the younger poets of the older generation—Tibullus, whose death he laments in one of the few pathetic pieces among his earlier writings, and Propertius, to whom he describes himself as united in the close ties of comradeship. The name of Maecenas he nowhere mentions. The time of his influence was past when Ovid entered upon his poetical career. But the veteran politician Messalla, the friend of Tibullus, together with his powerful son Cotta Messallinus and Fabius Maximus, who are mentioned together by Juvenal[4] along with Maecenas as types of munificent patrons of letters, and other influential persons whose names are preserved in the *Epistles from Pontus*, encouraged his literary efforts and extended to him their support. He enjoyed also the intimacy of poets and literary men, chiefly of the younger generation, whose names he enumerates in *Ex Ponto*, iv. 16, though, with the exception of Domitius Marsus and Grattius, they are scarcely more than names to us. With the older poet, Macer, he travelled for more than a year. Whether this was immediately after the completion of his education, or in the interval between the publication of his earlier poems and that of the *Medea* and *Ars amatoria* is unknown, but it is in his later works, the *Fasti* and *Metamorphoses*, that we chiefly recognize the impressions of the scenes he visited. In one of the *Epistles from Pontus* (ii. 10) to his fellow-traveller there is a vivid record of the pleasant time they had passed together. Athens was to a Roman then what Rome is to an educated Englishman of the present day. Ovid speaks of having gone there under the influence of literary enthusiasm, and a similar impulse induced him to visit the supposed site of Troy. The two friends saw together the illustrious cities of Asia, which had inspired the enthusiasm of travel in Catullus, and had become familiar to Cicero and Horace during the years they passed abroad. They spent nearly a year in Sicily, which attracted him, as it had attracted Lucretius[5] and Virgil,[6] by its manifold charm of climate, of sea-shore and inland scenery, and of legendary and poetical association. He recalls with a fresh sense of pleasure the incidents of their tour, and the endless delight which they had in each other's conversation. We would gladly exchange the record of his life of pleasure in Rome for more of these recollections. The highest type of classic Roman culture shows its affinity to that of modern times by nothing more clearly than the enthusiasm for travel among lands famous for their natural beauty, their monuments of art and their historical associations.

When settled at Rome, although a public career leading to senatorial position was open to him, and although he filled various minor judicial posts and claims to have filled them well, he had no ambition for such distinction, and looked upon pleasure and poetry as the occupations of his life. He was three times married; when little more than a boy to his first wife, whom he naïvely describes as unworthy of himself:[7] but he was soon separated from her and took a second wife, with whom his union, although through no fault of hers, did not last long. She was probably the mother of his one daughter. Later he was joined to a third wife, of whom he always speaks with affection and respect. She was a lady of the great Fabian house, and thus connected with his powerful patron Fabius Maximus, and was a friend of the empress Livia. It therefore seems likely that he may have been admitted into the intimacy of the younger society of the Palatine, although in the midst of his most fulsome flattery he does not claim ever to have enjoyed the favour of Augustus. His liaison with his mistress Corinna, whom he celebrates in the *Amores*, took place probably in the period between his first and second, or between his second and third marriages. It is doubtful whether Corinna was, like Catullus' Lesbia, a lady of recognized position, or whether she belonged to the same class as the Chloes and Lalages of Horace's artistic fancy. If we can trust the poet's later apologies for his life, in which he states that he had never given occasion for any serious scandal, it is probable that she belonged to the class of *libertinae*. However that may be, Ovid is not only a less constant but he is a less serious lover than his great predecessors Catullus, Tibullus and Propertius. His tone is that either of mere sensuous feeling or of irony. In his complete emancipation from all restraint he goes beyond them, and thus reflects the tastes and spirit of fashionable Rome between the years 20 B.C. and the beginning of our era. Society was then bent simply on amusement; and, as a result partly of the loss of political interests, women came to play a more important and brilliant part in its life than they had done before. Julia, the daughter of the emperor, was by her position, her wit and beauty, and her reckless dissipation, the natural leader of such a society. But the discovery of her intrigue (2 B.C.) with Iulus Antonius, the son of Mark Antony, was deeply resented by Augustus as being at once a shock to his affections and a blow to his policy of moral reform. Julia was banished and disinherited; Antonius and her many lovers were punished; and the Roman world awoke from its fool's paradise of pleasure. Nearly coincidently with this scandal appeared Ovid's *Ars amatoria*, perhaps the most immoral work ever written by a man of genius, though not the most demoralizing, since it is entirely free from morbid sentiment. By its brilliancy and heartlessness it appealed to the prevailing taste of the fashionable world; but its appearance excited deep resentment in the mind of the emperor, as is shown by his edict, issued ten years later, against the book and its author. Augustus had the art of dissembling his anger; and Ovid appears to have had no idea of the storm that was gathering over him. He still continued to enjoy the society of the court and the fashionable world; he passed before the emperor in the annual procession among the ranks of the equites; and he developed a richer vein of genius than he had shown in his youthful prime. But he was aware that public opinion had been shocked, or professed to be shocked, by his last work; and after writing a kind of apology for it, called the *Remedia amoris*, he turned to other subjects, and wrote during the next ten years the *Metamorphoses* and the *Fasti*. He had already written the *Heroides*, in which he had imparted a modern and romantic interest to the heroines of the old mythology,[1] and a tragedy, the *Medea*, which must have afforded greater scope for the dramatic and psychological treatment of the passion with which he was most familiar. In the *Fasti* Ovid assumes the position of a national poet[2] by imparting poetical life and interest to the ceremonial observances of the Roman religion; but it is as the brilliant narrator of the romantic tales that were so strangely blended with the realistic annals of Rome that he succeeds in the part assumed by him. The *Metamorphoses* is a narrative poem which recounts legends in which the miraculous involved transformations of shape. Beginning with the change from Chaos to Cosmos, legends first Greek and then Roman are passed in review, concluding with the metamorphosis of Julius Caesar into a star and a promise of immortality to Augustus. The long series of stories, which consist to a large extent of tales of the love adventures of the gods with nymphs and the daughters of men, is strongly tinged with Alexandrine influence, being in fact a succession of epyllia in the Alexandrine manner. This work, which Ovid regards as his most serious claim to immortality, had not been finally revised at the time of his disgrace, and in his despair he burnt it; but other copies were in existence, and when he was at Tomi it was published at Rome by one of his friends. He often regrets that it had not received his final revision. The *Fasti* also was broken off by his exile, after the publication of the first six books, treating of the first six months of the year.

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[1] *Trist.* iv. 10. 13.

[2] *Am.* i. 3. 10.

[3] *Trist.* iv. 10. 26 "et quod temptabam scribere, versus erat."

[4] Juv. vii. 95.

[5] Lucret. i. 726—

> "quae cum magna modis multis miranda videtur
> gentibus humanis regio visendaque fertur."

[6] Sueton. (Donatus), *Vita Virg.* 13 "quamquam secessu Campaniae Siciliaeque plurimum uteretur."

[7] *Trist.* iv. 10. 69-70.

Ovid assigns two causes for his banishment, his *Ars amatoria*, and an actual offence.[3] What this was is not known, but his frequent references to it enable us to conjecture its character. He tells us that there was no breach of law on his part; he distinctly disclaims having been concerned in any treasonable plot: his fault was a mistake of judgment (*error*), an unpremeditated act of folly. He had been an unintentional witness of some culpable act committed by another or others—of some act which nearly affected the emperor, and the mention of which was likely to prove offensive to him. Ovid himself had reaped no personal gain from his conduct. Though his original act was a pardonable error, he had been prevented by timidity from atoning for it subsequently by taking the straightforward course. In a letter to an intimate friend, to whom he had been in the habit of confiding all his secrets, he says that had he confided this one he would have escaped condemnation.[4] In writing to another friend he warns him against the danger of courting too high society. This offence, which excited the anger of Augustus, was connected in some way with the publication of the *Ars amatoria*, since that fact was recited by the emperor in his sentence. All this points to his having been mixed up in a scandal affecting the imperial family, and seems to connect him with one event, coincident with the time of his disgrace (A.D. 9), the intrigue of the younger Julia, granddaughter of Augustus, with D. Silanus, mentioned by Tacitus.[5] Augustus deeply felt these family scandals, looking upon them as acts of treason and sacrilege. Julia was banished to the island of Trimerus, off the coast of Apulia. Silanus withdrew into voluntary exile. The chief punishment fell on Ovid, who was banished. The poet at the worst could only have been a confidant of the intrigue; but Augustus must have regarded him and his works as, if not the corrupter of the age, at least the most typical representative of that corruption which had tainted so direly even the imperial family. Ovid's form of banishment was the mildest possible (*relegatio*); it involved no deprivation of civic rights, and left him the possession of his property. He was ordered to remove to the half-Greek, half-barbaric town of Tomi, near the mouth of the Danube. He recounts vividly the agony of his last night in Rome, and the hardships of his November voyage down the Adriatic and up the Gulf of Corinth to Lechaeum, where he crossed the isthmus and took ship again from Cenchreae to Samothrace, whence in the following spring he proceeded overland through Thrace to his destination. For eight years he bore up in his dreary solitude, suffering from the unhealthiness of the climate and the constant alarm of inroads of barbarians. In the hope of procuring a remission of his punishment he wrote poetical complaints, first in the series of the five books of the *Tristia*, sent successively to Rome, addressed to friends whose names he suppresses; afterwards in a number of poetical epistles, the *Epistulae ex Ponto*, addressed by name to friends who were likely to have influence at court. He believed that Augustus had softened towards him before his death, but his successor Tiberius was inexorable to his appeals. His chief consolation was the exercise of his art, though as time goes on he is painfully conscious of failure in power. But although the works written by him in exile lack the finished art of his earlier writings, their personal interest is greater. They have, like the letters of Cicero to Atticus, the fascination exercised by those works which have been given to the world under the title of Confessions; they are a sincere literary expression of the state of mind produced by a unique experience—that of a man, when well advanced in years but still retaining extraordinary sensibility to pleasure and pain, withdrawn from a brilliant social and intellectual position, and cast upon his own resources in a place and among people affording the dreariest contrast to the brightness of his previous life. How far these confidences are to be regarded as equally sincere expressions of his affection or admiration for his correspondents is another question. Even in those addressed to his wife, though he speaks of her with affection and respect, there may perhaps be detected a certain ring of insincerity in his conventional comparisons of her to the Penelopes and Laodamias of ancient legend. Had she been a Penelope or Laodamia she would have accompanied him in his exile, as we learn from Tacitus was done by other wives[1] in the more evil days of which he wrote the record. The letters, which compose the *Tristia* and *Epistulae ex Ponto*, are addressed either to his wife, the emperor, or the general reader, or to his patrons and friends. To his patrons he writes in a vein of supplication, beseeching them to use their influence on his behalf. To his rather large circle of intimate acquaintances he writes in the language of familiarity, and often of affectionate regard; he seeks the sympathy of some, and speaks with bitterness of the coldness of others, and in three poems[2] he complains of the relentless hostility of the enemy who had contributed to procure his exile, and whom he attacked in the *Ibis*. There is a note of true affection in the letter to the young lyric poetess Perilla, of whose genius and beauty he speaks with pride, and whose poetic talents he had fostered by friendly criticism.[3] He was evidently a man of gentle and genial manners; and, as his active mind induced him to learn the language of the new people among whom he was thrown, his active interest in life enabled him to gain their regard and various marks of honour. One of his last acts was to revise the *Fasti*, and re-edit it with a dedication to Germanicus. The closing lines of the *Epistulae ex Ponto* sound like the despairing sigh of a drowning man who had long struggled alone with the waves:—

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[1] The essentially modern character of the work appears in his making a heroine of the time of the Trojan war speak of visiting "learned" Athens (*Heroid.* ii. 83).

[2] "Animos ad publica carmina flexi" (*Trist.* v. 1. 23).

[3] *Trist.* ii. 207.

[4] *Trist.* iii. 6. 11.

[5] *Ann.* iii. 24.

> " Omnia perdidimus: tantummodo vita relicta est,
> Praebeat ut sensum materiamque mali."

Shortly after these words were written he died in his sixty-first year in A.D. 17, the fourth year of the reign of Tiberius.

The temperament of Ovid, as indicated in his writings, has more in common with the suppleness of the later Italian than with the strength and force of the ancient Roman. That stamp of her own character and understanding which Rome impressed on the genius of those other races which she incorporated with herself is fainter in Ovid than in any other great writer. He ostentatiously disclaims the manliness which in the republican times was regarded as the birthright not of Romans only but of the Sabellian races from which he sprang. He is as devoid of dignity in his abandonment to pleasure as in the weakness with which he meets calamity. He has no depth of serious conviction, no vein of sober reflection, and is sustained by no great or elevating purpose. Although the beings of a supernatural world fill a large place in his writings, they appear stripped of all sanctity and mystery. It is difficult to say whether the tone of his references to the gods and goddesses of mythology implies a kind of half-believing return to the most childish elements of paganism, or is simply one of mocking unbelief. He has absolutely no reverence, and consequently inspires no reverence in his reader. With all a poet's feeling for the life, variety and subtlety of nature, he has no sense of her mystery and majesty. The love which he celebrates is sensual and superficial, a matter of vanity as much as of passion. He prefers the piquant attraction of falsehood and fickleness to the charm of truth and constancy. Even where he follows the Roman tendencies in his art he perverts them. The *Fasti* is a work conceived in the prosaic spirit of Roman antiquarianism. It is redeemed from being prosaic by the picturesqueness and vivacity with which the legends are told. But its conception might have been more poetical if it had been penetrated by the religious and patriotic spirit with which Virgil invests ancient ceremonies, and the mysticism with which he accepts the revelations of science. In this respect the contrast is great between the reverential treatment which the trivialities of legend and science receive in the *Georgics* and *Aeneid*, and the literal definiteness of the *Fasti*.

These defects in strength and gravity show a corresponding result in Ovid's writings. Though possessing diligence, perseverance and literary ambition, he seems incapable of conceiving a great and serious whole. Though a keen observer of the superficial aspects of life, he has added few great thoughts to the intellectual heritage of the world.[4] But with all the levity of his character he must have had qualities which made him, if not much esteemed, yet much liked in his own day, and which are apparent in the genial amiability of his writings. He claims for himself two virtues highly prized by the Romans, *fides* and *candor*—the qualities of social honour and kindly sincerity. There is no indication of anything base, ungenerous or morose in his relations to others. Literary *candor*, the generous appreciation of all sorts of excellence, he possesses in a remarkable degree. He heartily admires everything in literature, Greek or Roman, that had any merit. In him more than any of the Augustan poets we find words of admiration applied to the rude genius of Ennius and the majestic style of Accius. It is by him, not by Virgil or Horace, that Lucretius is first named and his sublimity is first acknowledged.[5] The image of Catullus that most haunts the imagination is that of the poet who died so early—

> " hedera iuvenalia cinctus
> Tempora,"

as he is represented by Ovid coming to meet the shade of the young Tibullus in Elysium.[6] To his own contemporaries, known and unknown to fame, he is as liberal in his words of recognition.[7] He enjoyed society too in a thoroughly amiable and unenvious spirit. He lived on a friendly footing with a large circle of men of letters, poets, critics, grammarians, &c., but he showed none of that sense of superiority which is manifest in Horace's estimate of the " tribes of grammarians " and the poetasters of his day. Like Horace too he courted the society of the great, though probably not with equal independence; but unlike Horace he expresses no contempt for the humbler world outside. With his irony and knowledge of the world it might have been expected that he would become the social satirist of his age. But he lacked the censorious and critical temper, and the admixture of gall necessary for a successful satirist. In his exile he did retaliate on one enemy and persistent detractor in the *Ibis*, a poem written in imitation of a similar work by Callimachus; but the *Ibis* is not a satire, but an invective remarkable rather for recondite learning than for epigrammatic sting.

But Ovid's chief personal endowment was his vivacity, and his keen interest in and enjoyment of life. He had no grain of discontent in his composition; no regrets for an ideal past, or longings for an imaginary future. The age in which he lived was, as he tells us, that in which more than any other he would have wished to live.[8] He is its most gifted representative, but he does not rise above it. The great object of his art was to amuse and delight it by the vivid picture he presented of its fashions and pleasures, and by creating a literature of romance which reflected them, and which could stimulate the curiosity and fascinate the fancy of a society too idle and luxurious for serious intellectual effort. The sympathy which he felt for the love adventures of his contemporaries, to which he probably owed his fall, quickened his creative power in the composition of the *Heroides* and the romantic tales of the *Metamorphoses*. None of the Roman poets can people a purely imaginary world with such spontaneous fertility of fancy as Ovid. In heart and mind he is inferior to Lucretius and Catullus, to Virgil and Horace, perhaps to Tibullus and Propertius; but in the power and range of imaginative vision he is surpassed by no ancient and by few modern poets. This power of vision is the counterpart of his lively sensuous nature. He has a keener eye for the apprehension of outward beauty, for the life and colour and forms of nature, than any Roman or perhaps than any Greek poet. This power, acting upon the wealth of his varied reading, gathered with eager curiosity and received into a singularly retentive mind, has enabled him to depict with consummate skill and sympathy legendary scenes of the most varied and picturesque beauty. If his tragedy, the

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[1] Tac. *Hist.* i. 3 " comitatae profugos liberos matres, secutae maritos in exilia coniuges."

[2] *Trist.* iii. 11, iv. 9, v. 8.

[3] *Trist.* iii. 7. Perilla has by many been erroneously supposed to have been the poet's own daughter; but this is impossible, since she is described as young and still living under her mother's roof, whereas at the time of Ovid's exile his daughter was already married to her second husband.

[4] There are found in him some exceptionally fine expressions, such as *Her.* iii. 106 " qui bene pro patria cum patriaque iacent "; and *Met.* vii. 20 " video meliora proboque, deteriora sequor."

[5] *Am.* i. 15. 19 ff.

[6] *Am.* iii. 9. 61.

[7] *Ex Ponto*, iv. 16.

[8] *Ars amatoria*, iii. 121 ff.

Medea, highly praised by ancient critics, had been preserved, we should have been able to judge whether Roman art was capable of producing a great drama. In many of the *Heroides*, and in several speeches scattered through his works, he gives evidence of true dramatic creativeness. Unlike his great predecessor Catullus, he has little of the idyllic in his art, or whatever of idyllic there is in it is lost in the rapid movement of his narrative. But he is one, among the poets of all times, who can imagine a story with the most vivid inventiveness and tell it with the most unflagging animation. The faults of his verse and diction are those which arise from the vitality of his temperament—too facile a flow, too great exuberance of illustration. He has as little sense of the need of severe restraint in his art as in his life. He is not without mannerism, but he is quite unaffected, and however far short he might fall of the highest excellence of verse or style, it was not possible for him to be rough or harsh, dull or obscure.

As regards the school of art to which he belongs, he may be described as the most brilliant representative of Roman Alexandrinism. The latter half of the Augustan age was, in its social and intellectual aspects, more like the Alexandrine age than any other era of antiquity. The Alexandrine age was like the Augustan, one of refinement and luxury, of outward magnificence and literary dilettantism flourishing under the fostering influence of an absolute monarchy. Poetry was the most important branch of literature cultivated, and the chief subjects of poetry were mythological tales, various phases of the passion of love, the popular aspects of science and some aspects of the beauty of nature. These two were the chief subjects of the later Augustan poetry. The higher feelings and ideas which found expression in the poetry of Virgil, Horace and the writers of an older generation no longer acted on the Roman world. It was to the private tastes and pleasures of individuals and society that Roman Alexandrinism had appealed both in the poetry of Catullus, Cinna, Calvus and their school, and in that of Gallus, Tibullus and Propertius. Ovid was the last of this class of writers.

His extant works fall naturally into three divisions, those of his youth, of middle life and of his later years. To the first of these divisions belong the amatory poems: (1) the three books of *Amores* (originally five, but reduced in a later recension to three) relating to his amours with his mistress Corinna; (2) the *Medicamina formae*, or, as it is sometimes called *Medicamina faciei*, a fragment of a hundred lines on the use of cosmetics; (3) the three books of the *Ars amatoria*, rules for men and women by which they may gain the affections of the other sex; (4) the *Remedia amoris* (one book), a kind of recantation of the *Ars amatoria*. To the second division belong (5) the fifteen books of the *Metamorphoses*, and (6) the six books of the *Fasti*, which was originally intended to be in twelve books, but which breaks off the account of the Roman calendar with the month of June. To the third division belong (7) the five books of the *Tristia*, (8) the *Ibis*, an invective against an enemy who had assisted to procure his fall, written in elegiac couplets probably soon after his exile; (9) the four books of *Epistulae ex Ponto*. Of these the first three were published soon after the *Tristia*, while the fourth book is a collection of scattered poems published by some friend soon after the author's death. The *Halieutica* is a didactic fragment in hexameters on the natural history of fishes, of doubtful genuineness, though it is certain that Ovid did begin such a work at the close of his life.[1]

In his extant works Ovid confined himself to two metres—the elegiac couplet and the hexameter. The great mass of his poetry is written in the first; while the *Metamorphoses* and the *Halieutica* are composed in the second. Of the elegiac couplet he is the acknowledged master. By fixing it into a uniform mould he brought it to its highest perfection; and the fact that the great mass of elegiac verse written subsequently has endeavoured merely to reproduce the echo of his rhythm is evidence of his pre-eminence. In the direct expression and illustration of feeling his elegiac metre has more ease, vivacity and sparkle than that of any of his predecessors, while he alone has communicated to it, without altering its essential characteristic of recurrent and regular pauses, a fluidity and rapidity of movement which make it an admirable vehicle for pathetic and picturesque narrative. It was impossible for him to give to the hexameter greater perfection, but he imparted to it also a new character, wanting indeed the weight and majesty and intricate harmonies of Virgil, but rapid, varied, animated in complete accord with the swift, versatile and fervid movement of his imagination. One other proof he gave of his irrepressible energy by composing during his exile a poem in the Getic (Gothic) language in praise of Augustus, Tiberius and the imperial family, the loss of which, whatever it may have been to literature, is much to be regretted in the interests of philology.

It was in Ovid's writings that the world of romance and wonder created by Greek imagination was first revealed to modern times. The vivid fancy, the transparent lucidity, the liveliness, ease and directness through which he reproduced his models made his works the most accessible and among the most attractive of the recovered treasures of antiquity. His influence was first felt in the literature of the Italian Renaissance. But in the most creative periods of English literature he seems to have been read more than any other ancient poet, not even excepting Virgil, and it was on minds such as those of Marlowe, Spenser, Shakespeare,[2] Milton and Dryden that he acted most powerfully. His influence is equally unmistakable during the classical era of Addison and Pope. The most successful Latin verse of modern times has been written in imitation of him; the faculty of literary composition and feeling for ancient Roman culture has been largely developed in the great schools of England and France by the writing of Ovidian elegiacs. His works afforded also abundant stimulus and materials to the great painters who flourished during and immediately after the Renaissance. Thus his first claim on the attention of modern readers is the influence which he has exercised on the development of literature and art; for this, if for no other reason, his works must always retain an importance second only to those of Virgil and Horace.

He is interesting further as the sole contemporary exponent of the last half of the Augustan age, the external aspects and inner spirit of which is known from the works, not of contemporary historians or prose-writers, but from its poets. The successive phases of Roman feeling and experience during this critical period are revealed in the poetry of Virgil, Horace and Ovid. Virgil throws an idealizing and religious halo around the hopes and aspirations of the nascent empire. Horace presents the most complete image of its manifold aspects, realistic and ideal. Ovid reflects the life of the world of wealth and fashion under the influence of the new court, its material prosperity, its refinement, its frivolity and its adulation. For the continuous study of the Roman world in its social and moral relations his place is important as marking the transition between the representation of Horace, in which the life of pleasure and amusement has its place, but is subordinate to the life of reflection and serious purpose, and that life which reveals itself in the cynicism of Martial and the scornful indignation of Juvenal. He is the last true poet of the great age of Roman literature, which begins with Lucretius and closes with him. No Roman poet writes with such vivacity and fertility of fancy; in respect of these two qualities we recognize in him the countryman of Cicero and Livy. But the type of genius of which he affords the best example is more familiar in modern Italian than in ancient Roman literature. While the serious spirit of Lucretius and Virgil reappeared in Dante, it is Ariosto who may be said to reproduce the light-hearted gaiety and brilliant fancy of Ovid.

Bibliography.—The life of Ovid was first treated systematically by J. Masson, *Ovidii vita ordine chronologico digesta* (1780) (often reprinted, *e.g.* in Burmann's edition). Modern literature on this subject will be found in Teuffel's *History of Roman Literature* (Eng. trans., ed. 2), § 247, and S. G. Owen's edition of *Tristia*, bk. i. The very numerous manuscripts of Ovid are chiefly of late date, 13th to 15th century. The earliest and best are: for the *Heroides* a Paris MS. of the 9th, a Wolfenbüttel MS. of the 12th and an Eton fragmentary MS. of the 11th century (the *Epistula Sapphus*, found in no early MS., is best preserved in a 13th-century Frankfort, and a 15th-century Harleian MS.); for the *Amores*, *Ars amatoria*, *Remedia amoris*, two Paris MSS. of the 9th and 10th century respectively; for the *Medicamina formae* a Florence MS. (Marcianus) of the 11th; for the *Metamorphoses* two Florence MSS. (Marcianus and Laurentianus) and a Naples MS., all of the 11th century; for the *Fasti* two Vatican MSS. of the 10th and 11th century; for the *Tristia* a Florence MS. of the 11th; for the *Epistulae ex Ponto* a fragmentary Wolfenbüttel MS. of the 6th and a Hamburg and two Munich MSS. of the 12th; for the *Ibis* a Trinity College, Cambridge. MS. of the 12th; for the *Halieutica* a Paris MS. of the 9th or 10th, and a Vienna MS. of the 9th century. Important for the text of the *Heroides* and *Metamorphoses* is the interesting paraphrase written in Greek by the monk Maximus Planudes in the latter half of the 13th century at Constantinople; that of the *Heroides* is printed in Palmer's edition of the *Heroides* (1898), that of the *Metamorphoses* in Lemaire's edition of *Ovid*, vol. v., edited by Boissonade. See also Gudeman, *De Heroidum Ovidii codice Planudeo* (Berlin, 1888).

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[1] Plin. *Hist. Nat.* xxxii. 152.

[2] The influence of Ovid on Shakespeare is shown conclusively by T. S. Baynes, *Shakespeare Studies* (1894), p. 195 ff.

Two independent *editiones principes* of Ovid were published contemporaneously in 1471, one at Rome, printed by Sweynheym and Pannartz, and one at Bologna by Balthasar Azoguidius: these present entirely different texts. See Owen's *Tristium libri*, v. p. lv. ff. The following are the most important editions: those marked with an asterisk have explanatory notes. Of the whole works: *Heinsius-Burmann (1727); *Amar-Lemaire (1820–1824); Merkel-Ehwald (1874–1888); Riese (1871–1889); Postgate's *Corpus poetarum Latinorum*, by various editors (1894), reprinted separately (1898). Of separate works: *Amores*, *Némethy (1907); *Heroides*, Sedlmayer (critical) (1886); *Palmer (1898); *Epistula Sapphus* (separately), *De Vries (1888); *Ars amatoria*, *P. Brandt (1902); *Medicamina formae* (critical), Kunz (1881); *Metamorphoses*, *J. C. Jahn (1821); *Loers (1843); Korn (critical) (1880); *Magnus (1885); *Haupt-Ehwald (1898–1903); *Fasti*, *Gierig (1812); Merkel (1841) (critical, with learned prolegomena on the sources, the Roman calendar, &c.); *Keightley (1848); *Paley (1854); *Peter (1889); *Tristia*, *Loers (1839); S. G. Owen (1889) (critical) *Bk. i. (1885), *Bk. iii. (1889); *Cocchia (1900); *Epistulae ex Ponto*, Korn (1868) (critical), Bk. i. Keene (1887); *Ellis (1881); *Halieutica*, *Birt, *De Halieuticis Ovidio poetae falso adscriptis* (1878). The following verse translations in English deserve mention: *Amores*, C. Marlowe (1600) (?); *Heroides*, Turbervile (1579); Saltonstall (1639); Sherburne (1639), various hands, preface by Dryden (3rd edition, 1683); *Art of Love* and *Remedy of Love*, Creed (1600); Dryden and others (1709); *Metamorphoses*, Golding (1567); Sandys (1626); Dryden and others (1717); King (1871); *Fasti*, Gower (1640); Rose (1866); *Tristia*, Saltonstall (1633); Catlin (1639); Churchyarde (1816); *Epistles from Pontus*, Saltonstal (1639); Jones (1658).

The special treatises on matters connected with Ovid are very numerous; a fairly complete list up to the time of publication is given in Owen's *Tristia* (critical edition), p. cviii. ff.; in Teuffel's *History of Roman Literature* (trans. by Warr) and in Schanz's *Geschichte der römischen Litteratur*; and in the excellent critical digests of recent literature by Ehwald in the *Jahresbericht über die Fortschritte der classischen Altertumswissenschaft*, xxxi. (1884) pp. 157 ff., lxxx. (1894) pp. 1, ff., cix. (1902) pp. 157 ff. The following deserve special mention. On the history of the text: Ehwald, *Ad historiam carminum Ovidianorum symbolae* (1889); *Kritische Beiträge zu Ovids Epistulae ex Ponto* (1896); Sedlmayer, *Prolegomena ad Heroidas* (1878); Gruppe, *Minos*, pp. 441 ff. (on interpolations). On style: Ovid's diction in connexion with other writers,—A. Zingerle, *Ovidius und sein Verhältnis zu den Vorgängern* (1869–1871); *Martial's Ovid-Studien* (1877); W. Zingerle, *Untersuchungen zur Echtheitsfrage der Heroiden Ovids* (1878); W. Vollgraff, *Nikander und Ovid* (Groningen, 1909 foll.). Peculiarities of Ovid's style: van Iddekinge, *De Ovidii Romani iuris peritia* (1811); Washietl, *De similitudinibus imaginibusque Ovidianis* (1883); M'Crea, *On Ovid's Use of Colour and Colour Terms* (Classical studies in honour of H. Drisler) (1894). Metre: the structure of the Ovidian pentameter examined in relation to the textual criticism,—Hilberg, *Gesetze der Wortstellung im Pentameter des Ovid* (1894) (fully reviewed by Ellis, *Classical Review*, ix. 157). Literary appreciation: Sellar, *Roman Poets of the Augustan Age*; Lafaye, *Les Métamorphoses d'Ovid et leurs modèles grecs*. Ovid's relation to works of art: Wunderer, *Ovids Werke in ihrem Verhältnis zur antiken Kunst* (1890–1891); Engelmann, *Bilder-Atlas zu Ovid's Metamorphosen* (1890). Cause of exile: the most interesting discussion is by Boissier in his *L'Opposition sous les Césars*. See also Nageotte, *Ovide, sa vie, ses œuvres* (1872); Huber, *Die Ursachen der Verbannung des Ovid* (1888). Influence of Ovid upon Shakespeare: T. S. Baynes, *Shakespeare Studies* (1894), pp. 195 ff.; Constable, Shakespeare's "Venus und Adonis" in *Verhältnis zu Ovid's Metamorphosen* (1890). (S. G. O.)

OVIEDO, a maritime province of northern Spain, bounded on the N. by the Bay of Biscay, E. by Santander, S. by Leon and W. by Lugo. Pop. (1900) 627,069; area, 4205 sq. m. In popular speech Oviedo is often called by its ancient name of Asturias, which only ceased to be the official title of the province in 1833, when the Spanish system of local government was reorganized. An account of the physical features, history and inhabitants of this region is given under ASTURIAS (*q.v.*). Oviedo is rich in forests, coal, streams and waterfalls, which have largely contributed to its modern industrial development. The climate is generally mild, but overcharged with humidity, and in the higher regions the winters are protracted and severe. The broken character of the surface prevents anything like extensive agricultural industry, but abundant pasturage is found in the valleys. The wheat crop frequently fails. Rye succeeds better, and is often mixed with the maize which forms the principal food of all but the higher classes. Chestnuts—here, as elsewhere in Spain, an important article of diet—are very abundant on the hills, and the trees supply valuable timber. Apples are abundant, and cider forms the common drink of the people; but little attention is paid to vines. The horses of Oviedo rank among the best in Spain. Wild deer, boars and bears were formerly common among the mountains; and the sea-coasts, as well as the streams, abound with fish, including salmon and lampreys, which are sent to the markets of Madrid. Large quantities of sardines and tunny are also cured and exported. Although no trace exists of the gold for which Asturias was celebrated under its Roman rulers, Oviedo possesses valuable coal measures, which are worked at Langreo, Mieres, Santo Firme, Siero and elsewhere. More than 1,400,000 tons of coal were produced in 1903, besides a considerable amount of iron, mercury and cinnabar. The copper mines near Avilés and Cangas de Onis, and the copper works which long supplied the fairs of Leon and Castile with kettles, pots and similar utensils, have lost their importance; but lead, magnesia, arsenic, cobalt, lapis lazuli, alum, antimony, jet, marble and rock-crystal are found in various parts of the province, while amber and coral are gathered along the coast. There are manufactures of fine textiles, coarse cloth and ribbons in Salas, Piloña, Casas and Avilés; of paper in Pianton; of porcelain and glass in Gijón, Avilés and Pola de Surro; of arms in Oviedo and Trubia; while foundries and works for the manufacture of agricultural implements, rails and pig-iron are numerous. An important highway is the 16th-century *Camino real*, or royal road, leading from Gijón to Leon and Madrid, which cost so much that the emperor Charles V. inquired if it were paved with silver. A railway from Madrid to Oviedo, Gijón and Avilés runs through some of the most difficult parts of the Cantabrian chain. There are also several branch railways, including numerous narrow-gauge lines.

OVIEDO, an episcopal city and capital of the Spanish province of Oviedo; 16 m. S. of the Bay of Biscay, on the river Nalon, and on the Leon-Gijón Oviedo-Trubia and Oviedo-Infiesto railways. Pop. (1900) 48,103. Oviedo is built on a hill rising from a broad and picturesque valley, which is bounded on the north-west by the Sierra de Naranco. The four main streets of Oviedo, which meet in a central square called the Plaza Mayor or Plaza de la Constitucion, are the roads connecting Gijón and Leon (north and south) and Santander and Grado (east and west). The streets are clean and well lighted; the projecting roofs of the houses give a characteristic effect, and some portions of the old Calle de la Plateria are highly picturesque. In the Plaza Mayor is the handsome Casa Consistorial or town hall dating from 1662; the Jesuit church of San Isidro (1578), and some ancient palaces of the Asturian nobility are architecturally interesting. The university was founded by Philip III. in 1604; connected with it are a fine library and physical and chemical museums. The Gothic cathedral, founded in 1388, occupies the site of a chapel founded in the 8th century, of which only the Camara Santa remains. The west front has a fine portico of ornamented arches between the two towers. The interior contains some fine stained glass, but has been much disfigured with modern rococo additions. The Camara Santa (dating from 802) contains the famous *arca* of Oviedo, an 11th-century Byzantine chest of cedar, overlaid with silver reliefs of scenes in the lives of Christ, the Virgin and the apostles. In it are preserved some highly sacred relics, two crosses dating from the 8th and 9th centuries and other valuable pieces of gold and silver plate. The cathedral library has some curious old MSS., including a deed of gift made by Alphonso II. of Asturias in 812, and a collection of illuminated documents of the 12th century, called the *Libro gótico*. On the Sierra de Naranco is the ancient Santa Maria de Naranco, originally built by Ramiro I. of Asturias in 850 as a palace, and afterwards turned into a church. Higher up the hill is San Miguel de Lino, also of the 9th century; and on the road to Gijón, about a mile outside the town, is the Santullano or church of St Julian, also of very early date. Few towns in Spain have better schools for primary and higher education, and there are a literary and scientific institute, a meteorological observatory, a school for teachers, a school of art, adult classes for artisans, an archaeological museum and several public libraries. Oviedo is the centre of a thriving trade in agricultural products; its other industries are marble-quarrying, and the manufacture of arms, cotton and woollen fabrics, iron goods, leather and matches.

Oviedo, founded in the reign of Fruela (762), became the fixed residence of the kings of the Asturias in the time of Alphonso II., and continued to be so until about 924, when the advancing reconquest of Spain from the Moors led them to remove their capital to Leon. From that date the history of the city was comparatively uneventful, until the Peninsular War, when it was twice plundered by the French—under Ney in 1809 and under Bonnet in 1810.

OVIEDO Y VALDÉS, GONZALO FERNÁNDEZ DE (1478–1557), Spanish historian, was born at Madrid in August 1478. Educated at the court of Ferdinand and Isabella, in his thirteenth year he became page to their son, the Infante Don John, was present at the siege of Granada, and there saw Columbus previous to his voyage to America. On the death of Prince John (4th of October 1497), Oviedo went to Italy, and there acted as secretary to Gonzalo Fernandez de Cordoba. In 1514 he was appointed supervisor of gold-smeltings at San Domingo, and on his return to Spain in 1523 was appointed historiographer of the Indies. He paid five more visits to America before his death, which took place at Valladolid in 1557.

Besides a romance of chivalry entitled *Claribalte* (1519) Oviedo wrote two extensive works of permanent value: *La General y natural historia de las Indias* and *Las Quinquagenas de la nobleza de España*. The former work was first issued at Toledo (1526) in the form of a summary entitled *La Natural hystoria de las Indias*; the first part of *La Historia general de las Indias* appeared at Seville in 1535; but the complete work was not published till 1851–1855, when it was edited by J. A. de los Rios for the Spanish Academy of History. Though written in a diffuse style, it embodies a mass of curious information collected at first hand, and the incomplete Seville edition was widely read in the English and French versions published by Eden and Poleur respectively in 1555 and 1556. Las Casas describes it as "containing almost as many lies as pages," and Oviedo undoubtedly puts the most favourable interpretation on the proceedings of his countrymen; but, apart from a patriotic bias which is too obvious to be misleading, his narrative is both trustworthy and interesting. In his *Quinquagenas* he indulges in much lively gossip concerning eminent contemporaries; this collection of quaint, moralizing anecdotes was first published at Madrid in 1880, under the editorship of Vicente de la Fuente.

OVOLO (adapted from Ital. *uovolo*, diminutive of *uovo*, an egg; other foreign equivalents are Fr. *ove, échine, quart de rond*; Lat. *echinus*), in architecture, a convex moulding known also as the echinus, which in Classic architecture was invariably carved with the egg and tongue. In Roman and Italian work the moulding is called by workmen a quarter round. It must not be confounded with the echinus of the Greek Doric capital, as this was of a more varied form and of much larger dimensions than the ovolo, which was only a subordinate moulding.

OWATONNA, a city and the county-seat of Steele county, Minnesota, U.S.A., on the Straight river, in the S.E. part of the state, about 67 m. S. of Minneapolis and St Paul. Pop. (1900) 5561, of whom 1160 were foreign-born; (1905) 5651; (1910) 5658. It is served by the Chicago, Milwaukee & St Paul, the Chicago & North-Western, the Chicago, Rock Island & Pacific and the Minneapolis, Rochester & Dubuque (electric) railways. Four fine steel bridges span the river at or near the city. Among the public buildings are a handsome county court-house, a city hall, an armoury, a city hospital and a public library. Owatonna is the seat of the Pillsbury Academy (Baptist), the Sacred Heart Academy (Roman Catholic) and the Canfield Commercial School, and immediately west of the city is the State Public School for Dependent and Neglected Children (1886). The city's commercial importance is largely due to its situation in a rich dairying and farming district, for which it is the shipping centre. It has also various manufactures. There are valuable mineral springs in the vicinity. The municipality owns and operates the water-works. Owatonna was settled about 1855, was incorporated as a village in 1865, was chartered as a city in 1875 and received a new charter in 1909. Its name is a Sioux word meaning "straight," the river having been previously named Straight river.

OWEGO, a village and the county-seat of Tioga county, New York, U.S.A., on the Owego Creek and on the N. side of the Susquehanna river, 21 m. W. of Binghamton. Pop. (1910, U.S. census) 4633. It is served by the Erie, the Lehigh Valley and the Delaware, Lackawanna & Western railways; a branch of the last connects with Ithaca, N.Y. Owego occupies the site of an Indian (probably Tuscarora) village named "Ah-wa-ga," which was destroyed by General James Clinton in 1779. The name, of which "Owego" is a corruption, is said to mean "where the valley widens." A white settlement and trading post were set up here in 1785, and the village of Owego was incorporated in 1827.

OWEN, SIR HUGH (1804–1881), Welsh educationist, was born near Talyfoel Ferry, Anglesey, on the 14th of January 1804. Educated at a private school at Carnarvon, he became clerk in 1825 to a barrister in London. In 1836 he entered the office of the Poor Law Commission, eventually becoming chief clerk of the Poor Law Board, and retiring in 1872 to devote himself exclusively to educational work. As early as 1839 he had become secretary for an association to start a National school in Islington, and in 1843 he had published *A Letter to the Welsh People* on the need of educational activity, which was widely read. Successful in arousing the interest of the British and Foreign School Society, he became in 1846 honorary secretary of its newly-formed branch, the Cambrian School Society. He was one of the founders of the Bangor Normal College, for the training of teachers, and of the University College of Wales at Aberystwith, of which for many years he was honorary secretary and treasurer. He was for three years a member of the London School Board. His scheme for secondary education, formulated in 1881, was almost wholly adopted after his death in the Welsh Intermediate Education Act of 1889. The revival of the Honourable Cymrodorion Society, the National Eisteddfod Association and the Social Science Section of the National Eisteddfod was due to Owen. He was knighted in recognition of his service to Welsh education in August 1881, but died at Mentone on the 20th of November. A bronze statue was erected at Carnarvon in 1888 by public subscription.

OWEN, JOHN [OVENUS or AUDOENUS] (*c.* 1560–1622), Welsh epigrammatist, was born at Plas Dhu, Carnarvonshire, about 1560. He was educated under Dr Bilson at Winchester School, and at New College, Oxford. He was a fellow of his college from 1584 to 1591, when he became a schoolmaster, first at Trelleck, near Monmouth, and then at Warwick, where he was master of the school endowed by Henry VIII. He became distinguished for his perfect mastery of the Latin language, and for the humour, felicity and point of his epigrams. The Continental scholars and wits of the day used to call him "the British Martial." He was a staunch Protestant besides, and could not resist the temptation of turning his wit against the Roman Catholic Church. This practice caused his book to be placed on the *Index prohibitorius* in 1654, and led a rich old uncle of the Roman Catholic communion to cut him out of his will. When the poet died in 1622, his countryman and relative, Bishop Williams of Lincoln, who is said to have supported him in his later years, erected a monument to his memory in St Paul's cathedral with a Latin epitaph.

Owen's *Epigrammata* are divided into twelve books, of which the first four were published in 1606, and the rest at four different times. Owen frequently adapts and alters to his own purpose the lines of his predecessors in Latin verse, and one such borrowing has become celebrated as a quotation, though few know where it is to be found. It is the first line of this epigram:—

> "Tempora mutantur, nos et mutamur in illis:
> Quo modo? fit semper tempore pejor homo."
> (Lib. I. ad Edoardum Noel, epig. 58.)

This first line is altered from an epigram by Matthew Borbonius, one of a series of mottoes for various emperors, this one being for Lothaire I.

> "Omnia mutantur, nos et mutamur in illis:
> Illa vices quasdam res habet, illa vices."

There are editions of the *Epigrammata* by Elzevir and by Didot; the best is that edited by Renouard (2 vols., Paris, 1795). Translations into English, either in whole or in part, were made by Vicars (1619); by Pecke, in his *Parnassi Puerperium* (1659); and by Harvey in 1677, which is the most complete. La Torre, the Spanish epigrammatist, owed much to Owen, and translated his works into Spanish in 1674. French translations of the best of Owen's epigrams were published by A. L. Lebrun (1709) and by Kérivalant (1819).

OWEN, JOHN (1616–1683), English Nonconformist divine, was born at Stadham in Oxfordshire in 1616, and was educated at Queen's College, Oxford (B.A. 1632, M.A. 1635), noted, as Fuller tells us, for its metaphysicians. A Puritan by training and conviction, in 1637 Owen was driven from Oxford by Laud's new statutes, and became chaplain and tutor in the family of Sir Robert Dormer and then in that of Lord Lovelace. At the outbreak of the civil troubles he sided with the parliament, and thus lost both his place and the prospects of succeeding to his Welsh royalist uncle's fortune. For a while he lived in Charterhouse Yard, in great unsettlement of mind on religious questions, which was removed at length by a sermon preached by a stranger in Aldermanbury Chapel whither he had gone to hear Edmund Calamy. His first publication, *The Display of Arminianism* (1642), was a spirited defence of rigid Calvinism. It was dedicated to the committee of religion, and gained him the living of Fordham in Essex, from which a "scandalous minister" had been ejected. At Fordham he remained engrossed in the work of his parish and writing only *The Duty of Pastors and People Distinguished* until 1646, when, the old incumbent dying, the presentation lapsed to the patron, who gave it to some one else. He was now, however, coming into notice, for on the 29th of April he preached before the Long parliament. In this sermon, and still more in his *Country Essay for the Practice of Church Government*, which he appended to it, his tendency to break away from Presbyterianism to the more tolerant Independent or Congregational system is plainly seen. Like Milton he saw little to choose between "new presbyter" and "old priest," and disliked a rigid and arbitrary polity by whatever name it was called. He became pastor at Coggeshall in Essex, where a large influx of Flemish tradesmen provided a congenial Independent atmosphere. His adoption of Congregational principles did not effect his theological position, and in 1647 he again attacked the Arminians in *The Death of Death in the Death of Christ*, which drew him into long debate with Richard Baxter. He made the friendship of Fairfax while the latter was besieging Colchester, and urgently addressed the army there against religious persecution. He was chosen to preach to parliament on the day after the execution of Charles, and succeeded in fulfilling his delicate task without directly mentioning that event. Another sermon preached on the 19th of April, a vigorous plea for sincerity of religion in high places, won not only the thanks of parliament but the friendship of Cromwell, who carried him off to Ireland as his chaplain, that he might regulate the affairs of Trinity College. He pleaded with the House of Commons for the religious needs of Ireland as some years earlier he had pleaded for those of Wales. In 1650 he accompanied Cromwell on his Scottish campaign. In March 1651 Cromwell, as chancellor of Oxford, gave him the deanery of Christ Church, and made him vice-chancellor in September 1652; in both offices he succeeded the Presbyterian Edward Reynolds.

During his eight years of official Oxford life Owen showed himself a firm disciplinarian, and infused a new spirit of thoroughness into dons and undergraduates alike, though, as John Locke testifies, the Aristotelian traditions in education suffered no change. With Philip Nye he unmasked the popular astrologer, William Lilly, and in spite of his share in condemning two Quakeresses to be whipped for disturbing the peace, his rule was not intolerant.[1] Anglican services were conducted here and there, and at Christ Church itself the Anglican chaplain remained in the college. While little encouragement was given to a spirit of free inquiry,[2] it is unhistorical to say that Puritanism at Oxford was simply "an attempt to force education and culture into the leaden moulds of Calvinistic theology." It must be remembered, too, that Owen, unlike many of his contemporaries, found his chief interest in the New Testament rather than the Old. During his Oxford years he wrote *Justitia Divina* (1653), an exposition of the dogma that God cannot forgive sin without an atonement; *Communion with God* (1657), which has been called a "piece of wire-drawn mysticism"; *Doctrine of the Saints' Perseverance* (1654), his final attack on Arminianism; *Vindiciae Evangelicae*, a treatise written by order of the Council of State against Socinianism as expounded by John Bidle; *On the Mortification of Sin in Believers* (1656), an introspective and analytic work; *Schism* (1657), one of the most readable of all his writings; *Of Temptation* (1658), an attempt to recall Puritanism to its cardinal spiritual attitude from the jarring anarchy of sectarianism and the pharisaism which had followed on popularity and threatened to destroy the early simplicity.

Besides all his academic and literary concerns Owen was continually in the midst of affairs of state. In 1651, on October 24 (after Worcester), he preached the thanksgiving sermon before parliament. In 1652 he sat on a council to consider the condition of Protestantism in Ireland. In October 1653 he was one of several ministers whom Cromwell summoned to a consultation as to church union.[3] In December the degree of D.D. was conferred upon him by his university. In the parliament of 1654 he sat, but only for a short time, as member for Oxford university, and, with Baxter, was placed on the committee for settling the "fundamentals" necessary for the toleration promised in the Instrument of Government. In the same year he was chairman of a committee on Scottish Church affairs. He was, too, one of the Triers, and appears to have behaved with kindness and moderation in that capacity. As vice-chancellor he acted with readiness and spirit when a Royalist rising in Wiltshire broke out in 1655; his adherence to Cromwell, however, was by no means slavish, for he drew up, at the request of Desborough and Pride, a petition against his receiving the kingship. Thus, when Richard Cromwell succeeded his father as chancellor, Owen lost his vice-chancellorship. In 1658 he took a leading part in the conference of Independents which drew up the Savoy Declaration.

On the death of Cromwell Owen joined the Wallingford House party, and though he denied any share in the deposition of Richard Cromwell, he threw all his weight on the side of a simple republic as against a protectorate. He assisted in the restoration of the Rump parliament, and, when Monk began his march into England, Owen, in the name of the Independent churches, to whom Monk was supposed to belong, and who were keenly anxious as to his intentions, wrote to dissuade him from the enterprise.

In March 1660, the Presbyterian party being uppermost, Owen was further deprived of his deanery, which was given back to Reynolds. He retired to Stadham, where he wrote various controversial and theological works, in especial the laborious *Theologoumena Pantodapa*, a history of the rise and progress of theology. The respect in which many of the authorities held his intellectual eminence won him an immunity denied to other Nonconformists. In 1661 was published the celebrated *Fiat Lux*, a work by the Franciscan monk John

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[1] H. L. Thompson, *Christ Church* ("Oxford College Histories") pp. 70 seq.

[2] Owen made a very unhappy attack on Brian Walton's Polyglot Bible.

[3] Owen probably drew up the scheme for a national church surrounded by bodies of tolerated dissent which was presented to parliament. See D. Masson, *Milton*, iv. 390, 566.

Vincent Cane, in which the oneness and beauty of Roman Catholicism are contrasted with the confusion and multiplicity of Protestant sects. At Clarendon's request Owen answered this in 1662 in his *Animadversions*; and so great was its success that he was offered preferment if he would conform. Owen's condition for making terms was liberty to all who agree in doctrine with the Church of England; nothing therefore came of the negotiation.

In 1663 he was invited by the Congregational churches in Boston, New England, to become their minister, but declined. The Conventicle and Five Mile Acts drove him to London; and in 1666, after the Fire, he, like other leading Nonconformist ministers, fitted up a room for public service and gathered a congregation, composed chiefly of the old Commonwealth officers. Meanwhile he was incessantly writing; and in 1667 he published his *Catechism*, which led to a proposal, "more acute than diplomatic," from Baxter for union. Various papers passed, and after a year the attempt was closed by the following laconical note from Owen: "I am still a well-wisher to these mathematics." It was now, too, that he published the first part of his vast work upon the Epistle to the Hebrews, together with his exposition of Psalm 130 and his searching book on *Indwelling Sin*.

In 1669 Owen wrote a spirited remonstrance to the Congregationalists in New England, who, under the influence of Presbyterianism, had shown themselves persecutors. At home, too, he was busy in the same cause. In 1670 Samuel Parker's *Ecclesiastical Polity* attacked the Nonconformists in a style of clumsy intolerance. Owen answered him (*Truth and Innocence Vindicated*); Parker replied with personalities as to Owen's connexion with Wallingford House. Then Andrew Marvell with banter and satire finally disposed of Parker in *The Rehearsal Transposed*. Owen himself produced a tract *On the Trinity* (1669), and *Christian Love and Peace* (1672).

At the revival of the Conventicle Acts in 1670, Owen was appointed to draw up a paper of reasons which was submitted to the House of Lords in protest. In this or the following year Harvard College invited him to become its president; he received similar invitations from some of the Dutch universities.

When Charles issued his Declaration of Indulgence in 1672, Owen drew up an address of thanks. This indulgence gave the dissenters an opportunity for increasing their churches and services, and Owen was one of the first preachers at the weekly lectures which the Independents and Presbyterians jointly held at Princes' Hall in Broad Street. He was held in high respect by a large number of the nobility (one of the many things which point to the fact that Congregationalism was by no means the creed of the poor and insignificant), and during 1674 both Charles and James held prolonged conversations with him in which they assured him of their good wishes to the dissenters. Charles gave him 1000 guineas to relieve those upon whom the severe laws had chiefly pressed, and he was even able to procure the release of John Bunyan, whose preaching he ardently admired. In 1674 Owen was attacked by William Sherlock, dean of St Paul's, whom he easily vanquished, and from this time until 1680 he was engaged upon his ministry and the writing of religious works. The chief of these were *On Apostasy* (1676), a sad account of religion under the Restoration; *On the Holy Spirit* (1677–1678) and *The Doctrine of Justification* (1677). In 1680, however, Stillingfleet having on May 11 preached his sermon on "The Mischief of Separation," Owen defended the Nonconformists from the charge of schism in his *Brief Vindication*. Baxter and Howe also answered Stillingfleet, who replied in *The Unreasonableness of Separation*. Owen again answered this, and then left the controversy to a swarm of eager combatants. From this time to his death he was occupied with continual writing, disturbed only by suffering from stone and asthma, and by an absurd charge of being concerned in the Rye House Plot. His most important work was his *Treatise on Evangelical Churches*, in which were contained his latest views regarding church government. He died at Ealing on the 24th of August 1683, just twenty-one years after he had gone out with so many others on St Bartholomew's day in 1662, and was buried on the 4th of September in Bunhill Fields.

For engraved portraits of Owen see first edition of S. Palmer's *Nonconformists' Memorial* and Vertue's *Sermons and Tracts* (1721). The chief authorities for the life are Owen's *Works*; W. Orme's *Memoirs of Owen*; A. Wood's *Athenae Oxonienses*; R. Baxter's *Life*; D. Neal's *History of the Puritans*; T. Edwards's *Gangraena*; and the various histories of the Independents. See also *The Golden Book of John Owen*, a collection of extracts prefaced by a study of his life and age, by James Moffatt (London, 1904).

OWEN, SIR RICHARD (1804–1892), English biologist, was born at Lancaster on the 20th of July 1804, and received his early education at the grammar school of that town. In 1820 he was apprenticed to a local surgeon and apothecary, and in 1824 he proceeded as a medical student to the university of Edinburgh. He left the university in the following year, and completed his medical course in St Bartholomew's Hospital, London, where he came under the influence of the eminent surgeon, John Abernethy. He then contemplated the usual professional career; but his bent was evidently in the direction of anatomical research, and he was induced by Abernethy to accept the position of assistant to William Clift, conservator of the museum of the Royal College of Surgeons. This congenial occupation soon led him to abandon his intention of medical practice, and his life henceforth was devoted to purely scientific labours. He prepared an important series of catalogues of the Hunterian collection in the Royal College of Surgeons; and in the course of this work he acquired the unrivalled knowledge of comparative anatomy which enabled him to enrich all departments of the science, and specially facilitated his researches on the remains of extinct animals. In 1836 he was appointed Hunterian professor in the Royal College of Surgeons, and in 1849 he succeeded Clift as conservator. He held the latter office until 1856, when he became superintendent of the natural history department of the British Museum. He then devoted much of his energies to a great scheme for a National Museum of Natural History, which eventually resulted in the removal of the natural history collections of the British Museum to a new building at South Kensington, the British Museum (Natural History). He retained office until the completion of this work in 1884, when he received the distinction of K.C.B., and thenceforward lived quietly in retirement at Sheen Lodge, Richmond Park, until his death on the 18th of December 1892.

While occupied with the cataloguing of the Hunterian collection, Owen did not confine his attention to the preparations before him, but also seized every opportunity of dissecting fresh subjects. He was especially favoured with the privilege of investigating the animals which died in the Zoological Society's gardens; and when that society began to publish scientific proceedings in 1831, he was the most voluminous contributor of anatomical papers. His first notable publication, however, was his *Memoir on the Pearly Nautilus* (London, 1832), which was soon recognized as a classic. Henceforth he continued to make important contributions to every department of comparative anatomy and zoology for a period of over fifty years. In the sponges Owen was the first to describe the now well-known "Venus's flower basket" or *Euplectella* (1841, 1857). Among Entozoa his most noteworthy discovery was that of *Trichina spiralis* (1835), the parasite infesting the muscles of man in the disease now termed trichinosis (see also, however, the article on PAGET, SIR JAMES). Of Brachiopoda he made very special studies, which much advanced knowledge and settled the classification which has long been adopted. Among Mollusca, he not only described the pearly nautilus, but also *Spirula* (1850) and other Cephalopoda, both living and extinct; and it was he who proposed the universally-accepted subdivision of this class into the two orders of Dibranchiata and Tetrabranchiata (1832). The problematical Arthropod *Limulus* was also the subject of a special memoir by him in 1873.

Owen's technical descriptions of the Vertebrata were still more numerous and extensive than those of the invertebrate animals. His *Comparative Anatomy and Physiology of Vertebrates* (3 vols., London, 1866–1868) was indeed the result of more personal research than any similar work since Cuvier's *Leçons d'anatomie comparée.* He not only studied existing forms, but also devoted great attention to the remains of extinct groups, and immediately followed Cuvier as a pioneer in vertebrate palaeontology. Early in his career he made exhaustive studies of teeth, both of existing and extinct animals, and published his profusely illustrated work on *Odontography* (1840–1845). He discovered and described the remarkably complex structure of the teeth of the extinct animals which he named Labyrinthodonts. Among his writings on fishes, his memoir on the African mud-fish, which he named *Protopterus*, laid the foundations for the recognition of the Dipnoi by Johannes Müller. He also pointed out later the serial connexion between the teleostean and ganoid fishes, grouping them in one sub-class, the Teleostomi. Most of his work on reptiles related to the skeletons of extinct forms, and his chief memoirs on British specimens were reprinted in a connected series in his *History of British Fossil Reptiles* (4 vols., London, 1849–1884). He published the first important general account of the great group of Mesozoic land-reptiles, to which he gave the now familiar name of Dinosauria. He also first recognized the curious early Mesozoic land-reptiles, with affinities both to amphibians and mammals, which he termed Anomodontia. Most of these were obtained from South Africa, beginning in 1845 (*Dicynodon*), and eventually furnished materials for his *Catalogue of the Fossil Reptilia of South Africa*, issued by the British Museum in 1876. Among his writings on birds, his classical memoir on the *Apteryx* (1840–1846), a long series of papers on the extinct Dinornithidae of New Zealand, other memoirs on *Aptornis*, *Notornis*, the dodo, and the great auk, may be specially mentioned. His monograph on *Archaeopteryx* (1863), the long-tailed, toothed bird from the Bavarian lithographic stone, is also an epoch-making work. With regard to living mammals, the more striking of Owen's contributions relate to the monotremes, marsupials, and the anthropoid apes. He was also the first to recognize and name the two natural groups of typical Ungulata, the odd-toed (Perissodactyla) and the even-toed (Artiodactyla), while describing some fossil remains in 1848. Most of his writings on mammals, however, deal with extinct forms, to which his attention seems to have been first directed by the remarkable fossils collected by Darwin in South America. *Toxodon*, from the pampas, was then described, and gave the earliest clear evidence of an extinct generalized hoof animal, a "pachyderm with affinities to the Rodentia, Edentata, and Herbivorous Cetacea." Owen's interest in South American extinct mammals then led to the recognition of the giant armadillo, which he named *Glyptodon* (1839), and to classic memoirs on the giant ground-sloths, *Mylodon* (1842) and *Megatherium* (1860), besides other important contributions. At the same time Sir Thomas Mitchell's discovery of fossil bones in New South Wales provided material for the first of Owen's long series of papers on the extinct mammals of Australia, which were eventually reprinted in book-form in 1877. He discovered *Diprotodon* and *Thylacoleo*, besides extinct kangaroos and wombats of gigantic size. While occupied with so much material from abroad, Owen was also busily collecting facts for an exhaustive work on similar fossils from the British Isles, and in 1844–1846 he published his *History of British Fossil Mammals and Birds*, which was followed by many later memoirs, notably his *Monograph of the Fossil Mammalia of the Mesozoic Formations* (Palaeont. Soc., 1871). One of his latest publications was a little work entitled *Antiquity of Man as deduced from the Discovery of a Human Skeleton during Excavations of the Docks at Tilbury* (London, 1884).

Owen's detailed memoirs and descriptions require laborious attention in reading, on account of their nomenclature and ambiguous modes of expression; and the circumstance that very little of his terminology has found universal favour causes them to be more generally neglected than they otherwise would be. At the same time it must be remembered that he was a pioneer in concise anatomical nomenclature; and, so far at least as the vertebrate skeleton is concerned, his terms were based on a carefully reasoned philosophical scheme, which first clearly distinguished between the now familiar phenomena of "analogy" and "homology." Owen's theory of the *Archetype and Homologies of the Vertebrate Skeleton* (1848), subsequently illustrated also by his little work *On the Nature of Limbs* (1849), regarded the vertebrate frame as consisting of a series of fundamentally identical segments, each modified according to its position and functions. Much of it was fanciful, and failed when tested by the facts of embryology, which Owen systematically ignored throughout his work. However, though an imperfect and distorted view of certain great truths, it possessed a distinct value at the time of its conception. To the discussion of the deeper problems of biological philosophy he made scarcely any direct and definite contributions. His generalities rarely extended beyond strict comparative anatomy, the phenomena of adaptation to function, and the facts of geographical or geological distribution. His lecture on "virgin reproduction" or parthenogenesis, however, published in 1849, contained the essence of the theory of the germ-plasm elaborated later by August Weismann; and he made several vague statements concerning the geological succession of genera and species of animals and their possible derivation one from another. He referred especially to the changes exhibited by the successive forerunners of the crocodiles (1884) and horses (1868); but it has never become clear how much of the modern doctrines of organic evolution he admitted. He contented himself with the bare remark that "the inductive demonstration of the nature and mode of operation" of the laws governing life would "henceforth be the great aim of the philosophical naturalist."

See *The Life of Richard Owen*, by his grandson, Rev. Richard Owen (2 vols., London, 1894). (A. S. Wo.)

OWEN, ROBERT (1771–1858), English social reformer, was born at Newtown, Montgomeryshire, in North Wales, on the 14th of May 1771. His father had a small business in Newtown as saddler and ironmonger, and there young Owen received all his school education, which terminated at the age of nine. After serving in a draper's shop for some years he settled in Manchester. His success was very rapid. When only nineteen years of age he became manager of a cotton mill in which five hundred people were employed, and by his administrative intelligence and energy soon made it one of the best establishments of the kind in Great Britain. In this factory Owen used the first bags of American sea-island cotton ever imported into the country; it was the first sea-island cotton from the Southern States. Owen also made remarkable improvement in the quality of the cotton spun; and indeed there is no reason to doubt that at this early age he was the first cotton-spinner in England, a position entirely due to his own capacity and knowledge of the trade. In 1794 or 1795 he became manager and one of the partners of the Chorlton Twist Company at Manchester. During a visit to Glasgow he had fallen in love with the daughter of the proprietor of the New Lanark mills, David Dale. Owen induced his partners to purchase New Lanark; and after his marriage with Miss Dale he settled there, as manager and part owner of the mills (1800). Encouraged by his great success in the management of cotton factories in Manchester, he had already formed the intention of conducting New Lanark on higher principles than the current commercial ones.

The factory of New Lanark had been started in 1784 by Dale and Arkwright, the water-power afforded by the falls of the Clyde being the great attraction. Connected with the mills were about two thousand people, five hundred of whom were children, brought, most of them, at the age of five or six from the poorhouses and charities of Edinburgh and Glasgow. The children especially had been well treated by Dale, but the general condition of the people was very unsatisfactory. Many of them were the lowest of the population, the respectable country people refusing to submit to the long hours and demoralizing drudgery of the factories; theft, drunkenness, and other vices were common; education and sanitation were alike neglected; most families lived only in one room. It was this population, thus committed to his care, which Owen now set himself to elevate and ameliorate. He greatly improved their houses, and by the unsparing and benevolent exertion of his personal influence trained them to habits of order, cleanliness and thrift. He opened a store, where the people could buy goods of the soundest quality at little more than cost price; and the sale of drink was placed under the strictest supervision. His greatest success, however, was in the education of the young, to which he devoted special attention. He was the founder of infant schools in Great Britain; and, though he was anticipated by reformers on the continent of Europe, he seems to have been led to institute them by his own views of what education ought to be, and without hint from abroad. In all these plans Owen obtained the most gratifying success. Though at first regarded with suspicion as a stranger, he soon won the confidence of his people. The mills continued to be a great commercial success, but it is needless to say that some of Owen's schemes involved considerable expense, which was displeasing to his partners. Tired at last of the restrictions imposed on him by men who wished to conduct the business on the ordinary principles, Owen formed a new firm, who, content with 5% of return for their capital, were ready to give freer scope to his philanthropy (1813). In this firm Jeremy Bentham and the well-known Quaker, William Allen, were partners. In the same year Owen first appeared as an author of essays, in which he expounded the principles on which his system of educational philanthropy was based. From an early age he had lost all belief in the prevailing forms of religion, and had thought out a creed for himself, which he considered an entirely new and original discovery. The chief points in this philosophy were that man's character is made not by him but for him; that it has been formed by circumstances over which he had no control; that he is not a proper subject either of praise or blame,—these principles leading up to the practical conclusion that the great secret in the right formation of man's character is to place him under the proper influences—physical, moral and social—from his earliest years. These principles—of the irresponsibility of man and of the effect of early influences—are the keynote of Owen's whole system of education and social amelioration. As we have said, they are embodied in his first work, *A New View of Society, or Essays on the Principle of the Formation of the Human Character*, the first of these essays (there are four in all) being published in 1813. It is needless to say that Owen's new views theoretically belong to a very old system of philosophy, and that his originality is to be found only in his benevolent application of them. For the next few years Owen's work at New Lanark continued to have a national and even a European significance. His schemes for the education of his workpeople attained to something like completion on the opening of the institution at New Lanark in 1816. He was a zealous supporter of the factory legislation resulting in the act of 1819, which, however, greatly disappointed him. He had interviews and communications with the leading members of government, including the premier, Lord Liverpool, and with many of the rulers and leading statesmen of Europe. New Lanark itself became a much-frequented place of pilgrimage for social reformers, statesmen, and royal personages, including Nicholas, afterwards emperor of Russia. According to the unanimous testimony of all who visited it, the results achieved by Owen were singularly good. The manners of the children, brought up under his system, were beautifully graceful, genial and unconstrained; health, plenty, and contentment prevailed; drunkenness was almost unknown, and illegitimacy was extremely rare. The most perfect good feeling subsisted between Owen and his workpeople, and all the operations of the mill proceeded with the utmost smoothness and regularity; and the business was a great commercial success.

Hitherto Owen's work had been that of a philanthropist, whose great distinction was the originality and unwearying unselfishness of his methods. His first departure in socialism took place in 1817, and was embodied in a report communicated to the committee of the House of Commons on the poor law. The general misery and stagnation of trade consequent on the termination of the great war was engrossing the attention of the country. After clearly tracing the special causes connected with the war which had led to such a deplorable state of things, Owen pointed out that the permanent cause of distress was to be found in the competition of human labour with machinery, and that the only effective remedy was the united action of men, and the subordination of machinery. His proposals for the treatment of pauperism were based on these principles. He recommended that communities of about twelve hundred persons each should be settled on quantities of land from 1000 to 1500 acres, all living in one large building in the form of a square, with public kitchen and mess-rooms. Each family should have its own private apartments, and the entire care of the children till the age of three, after which they should be brought up by the community, their parents having access to them at meals and all other proper times. These communities might be established by individuals, by parishes, by counties, or by the state; in every case there should be effective supervision by duly qualified persons. Work, and the enjoyment of its results, should be in common. The size of his community was no doubt partly suggested by his village of New Lanark; and he soon proceeded to advocate such a scheme as the best form for the reorganization of society in general. In its fully developed form—and it cannot be said to have changed much during Owen's lifetime—it was as follows. He considered an association of from 500 to 3000 as the fit number for a good working community. While mainly agricultural, it should possess all the best machinery, should offer every variety of employment, and should, as far as possible, be self-contained. "As these townships," as he also called them, "should increase in number, unions of them federatively united shall be formed in circles of tens, hundreds and thousands," till they should embrace the whole world in a common interest.

His plans for the cure of pauperism were received with great favour. *The Times* and the *Morning Post* and many of the leading men of the country countenanced them; one of his most steadfast friends was the duke of Kent, father of Queen Victoria. He had indeed gained the ear of the country, and had the prospect before him of a great career as a social reformer, when he went out of his way at a large meeting in London to declare his hostility to all the received forms of religion. After this defiance to the religious sentiment of the country, Owen's theories were in the popular mind associated with infidelity, and were henceforward suspected and discredited. Owen's own confidence, however, remained unshaken; and he was anxious that his scheme for establishing a community should be tested. At last, in 1825, such an experiment was attempted under the direction of his disciple, Abram Combe, at Orbiston near Glasgow; and in the next year Owen himself commenced another at New Harmony (*q.v.*), Indiana, U.S.A. After a trial of about two years both failed completely. Neither of them was a pauper experiment; but it must be said that the members were of the most motley description, many worthy people of the highest aims being mixed with vagrants, adventurers, and crotchety, wrong-headed enthusiasts. After a long period of friction with William Allen and some of his other partners, Owen resigned all connexion with New Lanark in 1828. On his return from America he made London the centre of his activity. Most of his means having been sunk in the New Harmony experiment, he was no longer a flourishing capitalist, but the head of a vigorous propaganda, in which socialism and secularism were combined. One of the most interesting features of the movement at this period was the establishment in 1832 of an equitable labour exchange system, in which exchange was effected by means of labour notes, the usual means of exchange and the usual middlemen being alike superseded. The word "socialism" first became current in the discussions of the Association of all Classes of all Nations, formed by Owen in 1835. During these years also his secularistic teaching gained such influence among the working classes as to give occasion for the statement in the *Westminster Review* (1839) that his principles were the actual creed of a great portion of them. His views on marriage, which were certainly lax, gave just ground for offence. At this period some more communistic experiments were made, of which the most important were that at Ralahine, in the county of Clare, Ireland, and that at Tytherly in Hampshire. It is admitted that the former (1831) was a remarkable success for three and a half years, till the proprietor, having ruined himself by gambling, was obliged to sell out. Tytherly, begun in 1839, was an absolute failure. By 1846 the only permanent result of Owen's agitation, so zealously carried on by public meetings, pamphlets, periodicals, and occasional treatises, was the co-operative movement, and for the time even that seemed to have utterly collapsed. In his later years Owen became a firm believer in spiritualism. He died at his native town on the 17th of November 1858.

Owen left four sons, Robert Dale, William, David Dale and Richard, all of whom became citizens of the United States. Robert Dale Owen, the eldest (1801–1877), was for long an able exponent in his adopted country of his father's doctrines. In 1836–39 and 1851–52 he was a member of the Indiana House of Representatives and in 1844–47 was a Representative in Congress, where he drafted the bill for the founding of the Smithsonian Institution. He was elected a member of the Indiana Constitutional Convention in 1850, and was instrumental in securing to widows and married women control of their property, and the adoption of a common free school system. He later succeeded in passing a state law giving greater freedom in divorce. From 1853 to 1858 he was United States minister at Naples. He was a strong believer in spiritualism and was the author of two well-known books on the subject: *Footfalls on the Boundary of Another World* (1859) and *The Debateable Land Between this World and the Next* (1872). Owen's third son, David Dale Owen (1807–1860), was in 1839 appointed a United States geologist, and made extensive surveys of the north-west, which were published by order of Congress. The youngest son, Richard Owen (1810–1890), was a professor of natural science in Nashville University.

Of R. Owen's numerous works in exposition of his system, the most important are the *New View of Society*; the *Report* communicated to the Committee on the Poor Law; the *Book of the New Moral World*; and *Revolution in the Mind and Practice of the Human Race*. See *Life of Robert Owen written by himself* (London, 1857), and *Threading my Way, Twenty-seven Years of Autobiography*, by Robert Dale Owen (London, 1874). There are also *Lives* of Owen by A. J. Booth (London, 1869), W. L. Sargant (London, 1860), Lloyd Jones (London, 1889), F. A. Packard (Philadelphia, 1866) and F. Podmore (London, 1906). See also H. Simon, *Robert Owen: sein Leben und seine Bedeutung für die Gegenwart* (Jena, 1905); E. Dolléans, *Robert Owen* (Paris, 1905); G. J. Holyoake, *History of Co-operation in England* (London, 1906); and the article Communism.

OWENS, JOHN (1790–1846), English merchant, was born at Manchester in 1790, the son of a prosperous merchant. Early in life he became a partner in his father's business and was soon noted for his ability as a cotton buyer. His business prospered, and the firm traded with China, India, South America and the United States, dealing in many other commodities. His large fortune he suggested leaving to his friend and partner George Faulkner (1790–1860), already a rich man. But by the latter's advice he bequeathed it to trustees for the foundation of a college (Owens College, Manchester, opened 1851, now part of Victoria University), based upon his own ideas of education. He died in Manchester on the 29th of July 1846. His bequests to friends and charities amounted to some £52,000, while for the college he left £96,654. Among the conditions for its foundation the most important was that which discountenanced any sort of religious test for students or teachers.

OWENSBORO, a city and the county-seat of Daviess county, Kentucky, U.S.A., on the Ohio river, 112 m. by rail W.S.W. of Louisville. Pop. (1890) 9837; (1900) 13,189, of whom 3061 were negroes; (1910 census) 16,011. The city is served by the Illinois Central, the Louisville & Nashville, and the Louisville, Henderson & St Louis railways, and by steamboat lines to river ports. At Owensboro are the Owensboro College for women (nonsect.), opened in 1890, Saint Francis Academy, and a Roman Catholic school for boys. Two miles S. of the city is Hickman Park (20 acres), a pleasure resort, and E. of the city is a summer Chautauqua park. Owensboro is situated in a good agricultural region; coal, iron, building stone, clay, oil, lead and zinc abound in the vicinity; and the city has a notably large trade in tobacco (especially strip tobacco) and has various manufactures. The value of the city's factory products increased from $1,740,128 in 1900 to $4,187,700 in 1905, or 140·6%. The municipality owns and operates its electric-lighting plant and water-works. Owensboro was settled about 1798, and for several years was commonly known as Yellow Banks; in 1816 it was laid out as a town and named Rossborough, and two years later the present name was adopted in honour of Colonel Abraham Owen (1769–1811), a Virginian who removed to Kentucky in 1785, served in several Indian campaigns, and was killed in the battle of Tippecanoe. Owensboro was incorporated as a city in 1866.

OWEN SOUND, a town and port of entry in Ontario, Canada, and capital of Grey county, situated 99 m. N.W. of Toronto, on Georgian Bay. Pop. (1901) 8776. It is the terminus of branches of the Canadian Pacific and Grand Trunk railways, and of the Canadian Pacific and other steamship lines plying to ports on Lakes Huron and Superior. Its harbour is one of the best on Lake Huron, and navigable by lake vessels of the largest size. It is a flourishing town, containing shipbuilding yards, and manufactories of mill machinery, agricultural implements, furniture and sewing-machines, flour-mills, saw-mills and large grain elevators.

OWL (O. Eng. *Úle*, Swed. *Uggla*, Ger. *Eule*—all allied to Lat. *Ulula*, and evidently of imitative origin), the general English name for every nocturnal bird of prey, of which group nearly two hundred species have been recognized. The owls form a very natural assemblage, and one about the limits of which no doubt has for a long while existed. They were formerly placed with the Accipitres or diurnal birds of prey, but are now known to belong to a different group of birds, and are placed as a suborder *Striges* of Coraciiform birds, their nearest allies being the goatsuckers. The subdivision of the group has always been a fruitful matter of discussion, owing to the great resemblance obtaining among all its members, and the existence of safe characters for its division has only lately been at all generally recognized. By the older naturalists, it is true, owls were divided, as was first done by F. Willughby, into two sections—one in which all the species exhibit tufts of feathers on the head, the so-called "ears" or "horns," and the second in which the head is not tufted. The artificial and therefore untrustworthy nature of this distinction was shown by Isidore Geoffroy St-Hilaire (*Ann. Sc. Naturelles*, xxi. 194-203) in 1830. The later work of C. L. Nitzch on pterylography and of A. Milne-Edwards on osteology has led to a division of the family *Strigidae* into the sub-families *Striginae*, in which the unnotched sternum has its broad keel joined to the furcula, and *Buboninae*, in which the sternum is notched posteriorly, the clavicles do not always meet to form a furcula, nor meet the sternum. The *Striginae* contain the screech- or barn-owls (*Strix*) and the partly intermediate *Heliodilus* of Madagascar, whilst all the other genera are now placed with the *Buboninae*.

Among owls are found birds which vary in length from 5 in.—as *Glaucidium cobanense*, which is therefore much smaller than a skylark—to more than 2 ft., a size that is attained by many species. Their plumage, none of the feathers of which possesses an aftershaft, is of the softest kind, rendering their flight almost noiseless. But one of the most characteristic features of this whole group is the ruff, consisting of several rows of small and much curved feathers with stiff shafts—originating from a fold of the skin, which begins on each side of the base of the beak, runs above the eyes, and passing downwards round and behind the ears turns forward, and ends at the chin—and serving to support the longer feathers of the "disk" or space immediately around the eyes, which extend over it. A considerable number of species of owls, belonging to various genera, and natives of countries most widely separated, are remarkable for exhibiting two phases of coloration—one in which the prevalent browns have a more or less rusty-red tinge, and the other in which they incline to grey. Another characteristic of owls is the reversible property of their outer toes, which are when perching quite backwards. Many forms have the legs and toes thickly clothed to the very claws; others have the toes, and even the tarsi, bare, or only sparsely beset by bristles. Among the bare-legged owls those of the Indian *Ketupa* are conspicuous, and this feature is usually correlated with their fish-catching habits; but certainly other owls that are not known to catch fish present much the same character.

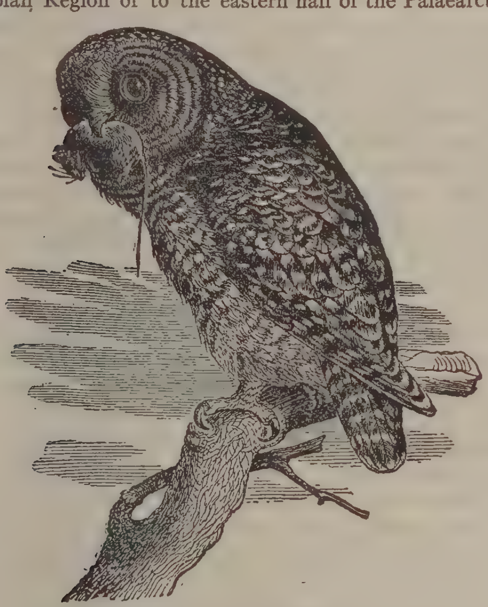

FIG. 1.—*Strix occidentalis.*

Among the multitude of owls there is only room here to make further mention of a few of the more interesting. First must be noticed the tawny owl—the *Strix stridula* of Linnaeus, the type, as has been above said, of the whole group, and especially of the Strigine section as here understood. This is the *Syrnium aluco* of some authors, the *chat-huant* of the French, the species whose tremulous hooting "tu-whit, to-who," has been celebrated by Shakespeare, and, as well as the plaintive call, "keewick," of the young after leaving the nest, will be familiar sounds to many readers, for the bird is very generally distributed throughout most parts of Europe, extending its range through Asia Minor to Palestine, and also to Barbary—but not belonging to the Ethiopian Region or to the eastern half of the Palaearctic. It is the largest of the species indigenous to Britain, and is strictly a woodland bird, only occasionally choosing any other place for its nest than a hollow tree. Its food consists almost entirely of small mammals, chiefly rodents; but, though on this account most deserving of protection from all classes, it is subject to the stupid persecution of the ignorant, and is rapidly declining in numbers.[1] Its nearest allies in North America are the *S. nebulosa*, with some kindred forms, one of which, the *S. occidentalis* of California and Arizona, is figured above; but none of them seem to have the "merry note" that is uttered by the European species. Common to the most northerly forest-tracts of both continents (for, though a slight difference of coloration is observable between American examples and those from the Old World, it is impossible to consider it specific) is the much larger *S. cinerea* or *S. lapponica*, whose iron-grey plumage, delicately mottled with dark brown, and the concentric circles of its facial disks make it one of the most remarkable of the group. Then may be noticed the genus *Bubo*—containing several species which from their size are usually known as eagle-owls. Here the Nearctic and Palaearctic forms are sufficiently distinct—the latter, *B. ignavus*,[2] the *duc* or *grand duc* of the French, ranging over the whole of Europe and Asia north of the Himalayas, while the former, *B. virginianus*, extends over the whole of North America. A contrast to the generally sombre colour of these birds is shown by the snowy owl, *Nyctea scandiaca*, a circumpolar species, and the only one of its genus, which disdains the shelter of forests and braves the most rigorous arctic climate, though compelled to migrate southward in winter when no sustenance is left for it. Its large size and white plumage, more or less mottled with black, distinguish this from every other owl. Then may be mentioned the birds commonly known in English as "horned" owls—the *hibous* of the French, belonging to the genus *Asio*. One, *A. otus* (the *Otus vulgaris* of some authors), inhabits woods, and, distinguished by its long tufts, usually borne erected, would seem to be common to both America and Europe—though experts profess their ability to distinguish between examples from each country. Another species, *A. accipitrinus* (the *Otus brachyotus* of many authors), has much shorter tufts on its head, and they are frequently carried depressed so as to escape observation. This is the "woodcock-owl" of English sportsmen, for, though a good many are bred in Great Britain, the majority arrive in autumn from Scandinavia, just about the time that the immigration of woodcocks occurs. This species frequents heaths, moors and the open country generally, to the exclusion of woods, and has an enormous geographical range, including not only all Europe, North Africa and northern Asia, but the whole of America—reaching also to the Falklands, the Galapagos and the Sandwich Islands—for the attempt to separate specifically examples from those localities only shows that they possess more or less well-defined local races. Commonly placed near *Asio*, but whether really akin to it cannot be stated, is the genus *Scops*, of which nearly forty species, coming from different parts of the world, have been described; but this number should probably be reduced by one half. The type of the genus *S. giu*, the *petit duc* of the French, is a well-known bird in the south of Europe, about as big as a thrush, with very delicately pencilled plumage, occasionally visiting Britain, emigrating in autumn across the Mediterranean, and ranging very far to the eastward. Farther southward, both in Asia and Africa, it is represented by other species of very similar size, and in the eastern part of North America by *S. asio*, of which there is a tolerably distinct western form, *S. kennicotti*, besides several local races. *S. asio* is one of the owls that especially exhibits the dimorphism of coloration above mentioned, and it was long before the true state of the case was understood. At first the two forms were thought to be distinct, and then for some time the belief obtained that the ruddy birds were the young of the greyer form which was called *S. naevia*; but now the "red owl" and the "mottled owl" of the older American ornithologists are known to be one species.[3] One of the most remarkable of American owls is *Speotyto cunicularia*, the bird that in the northern part of the continent inhabits the burrows of the prairie dog, and in the southern those of the biscacha, where the latter occurs—making holes for itself, says Darwin, where that is not the case—rattlesnakes being often also joint tenants of the same abodes. The odd association of these animals, interesting as it is, cannot here be more than noticed, for a few words must be said, ere we leave the owls of this section, on the species which has associations of a very different kind—the bird of Pallas Athene, the emblem of the city to which science and art were so welcome. There can be no doubt, from the many representations on coins and sculptures, as to their subject being the *Carine noctua* of modern ornithologists, but those who know the grotesque actions and ludicrous expression of this veritable buffoon of birds can never cease to wonder at its having been seriously selected as the symbol of learning, and can hardly divest themselves of a suspicion that the choice must have been made in the spirit of sarcasm. This little owl (for that is its only name—though it is not even the smallest that appears in England), the *chevêche* of the French, is spread throughout the greater part of Europe, but it is not a native of Britain. It has a congener in *C. brama*, a bird well known to all residents in India.

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[1] All owls have the habit of casting up the indigestible parts of the food swallowed in the form of pellets, which may often be found in abundance under the owl-roost, and reveal without any manner of doubt what the prey of the birds has been. The result in nearly every case shows the enormous service they render to man in destroying rats and mice. Details of many observations to this effect are recorded in the *Bericht über die XIV. Versammlung der Deutschen Ornithologen-Gesellschaft* (pp. 30-34).

[2] This species bears confinement very well, and propagates freely therein. To it belong the historic owls of Arundel Castle.

[3] See the remarks of Mr Ridgway in the work before quoted (*B. N. America*, iii. 9, 10), where also response is made to the observations of Mr Allen in the Harvard *Bulletin* (ii. 338, 339).

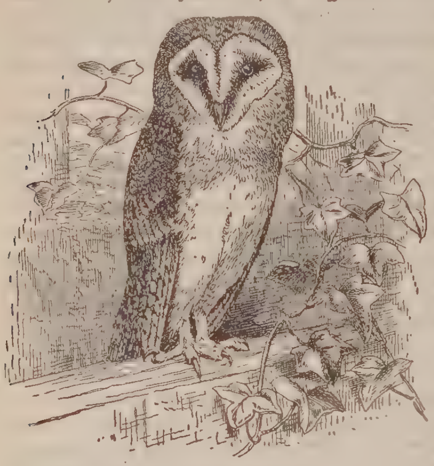

FIG. 2.—*Strix flammea.*

Finally, we have owls of the second section, those allied to the screech-owl, *Strix flammea*, the *Effraie*[1] of the French. This, with its discordant scream, its snoring, and its hissing, is far too well known to need description, for it is one of the most widely-spread of birds, and is the owl that has the greatest geographical range, inhabiting almost every country in the world—Sweden and Norway, America north of lat. 45°, and New Zealand being the principal exceptions. It varies, however, not inconsiderably, both in size and intensity of colour, and several ornithologists have tried to found on these variations more than half-a-dozen distinct species. Some, if not most of them, seem, however, hardly worthy to be considered geographical races, for their differences do not always depend on locality. R. Bowdler Sharpe, with much labour and in great detail, has given his reasons (*Cat. B. Brit. Museum*, ii. 291-309; and *Ornith. Miscellany*, i. 269-298; ii. 1-21) for acknowledging four "subspecies" of *S. flammea*, as well as five other species. Of these last, *S. tenebricosa* is peculiar to Australia, while *S. novae-hollandiae* inhabits also New Guinea, and has a "subspecies," *S. castanops*, found only in Tasmania; a third, *S. candida*, has a wide range from Fiji and northern Australia through the Philippines and Formosa to China, Burmah and India; a fourth, *S. capensis*, is peculiar to South Africa; while *S. thomensis* is said to be confined to the African island of St Thomas. To these may perhaps have to be added a species from New Britain, described by Count Salvadori as *Strix aurantia*, but it may possibly prove on further investigation not to be a strigine owl at all. (A. N.)

OWLING, in English law, the offence of transporting wool or sheep out of the kingdom, to the detriment of the staple manufacture of wool. The name is said to owe its origin to the fact that the offence was usually carried on at night-time, when the owls were abroad. The offence was stringently regulated by a statute of Edward III. (1336–7), while many subsequent statutes also dealt with it. In 1566 the offence was made punishable by the cutting off of the left hand and nailing it in a public place. By a statute of 1660 the ship and cargo were to be forfeited. In the reign of George I. (1717–1718) the penalty was altered to transportation for seven years. The offence was abolished in 1824.

OWOSSO, a city of Shiawassee county, Michigan, U.S.A., on Shiawassee river, about 79 m. N.W. of Detroit and 28 m. N.E. of Lansing. Pop. (1900) 8696, of whom 1396 were foreign-born; (1910 census) 9639. It is served by the Michigan Central, the Grand Trunk, and the Ann Arbor railways, and is a division point of the last. It is situated in the coal area of Michigan, and has various manufactures, including beet-sugar, for which Owosso is an important centre. The value of the city's factory products increased from $2,055,052 in 1900 to $3,109,232 in 1905, or 51·3%. The municipality owns and operates its water-works. Owosso was settled about 1834 and chartered as a city in 1859.

OX, strictly speaking, the Saxon name for the males of domesticated cattle (*Bos taurus*), but in a zoological sense employed so as to include not only the extinct wild ox of Europe but likewise bovine animals of every description, that is to say true oxen, bison and buffaloes. The characteristics of the sub-family *Bovinae*, or typical section of the family *Bovidae*, are given in the article BOVIDAE (q.v.); for the systematic position of that family see PECORA.

In the typical oxen, as represented by the existing domesticated breeds (see CATTLE) and the extinct aurochs (*q.v.*), the horns are cylindrical and placed on an elevated crest at the very vertex of the skull, which has the frontal region of great length. The aurochs was a black animal, with a lighter dorsal streak, and horns directed upwards in the shape of a pitchfork, black at their tips, but otherwise whitish. The fighting bulls of Spain, the black Pembroke cattle of Wales, with their derivatives the white park-cattle of Chillingham in Northumberland, are undoubtedly the direct descendants of the aurochs. The black Kerry breed and the black or brown Scotch cattle are also more or less nearly related; and a similar kinship is claimed for the Siemental cattle of Switzerland, although their colour is white and fawn. Short-horns are a modern derivative from cattle of the same general type. Among other British breeds may be mentioned the Devons and Herefords, both characterized by their red colour; the long-horned and Sussex breeds, both with very large horns, showing a tendency to grow downwards; and the Ayrshire. Polled, or hornless, breeds, such as the polled Angus and polled Suffolk, are of interest, as showing how easily the horns can be eliminated, and thus indicating a hornless ancestry. The white cattle formerly kept at Chartley Park, Staffordshire, exhibit signs of affinity with the long-horn breed. The Channel Island cattle, which are either black or fawn, would seem to be nearly allied to the Spanish fighting breed, and thus to the aurochs. The great white or cream coloured cattle of Italy, Austria, Hungary and Poland, which have very long black-tipped horns, are also probably not far removed from the aurochs stock.

On the other hand, the great tawny draught cattle of Spain seem to indicate mixture with a different stock, the horns having a double curvature, quite different from the simple one of the aurochs type. There are reports as to these cattle having been formerly crossed with the humped eastern species; and their characteristics are all in favour of such an origin. Humped cattle are widely spread over Africa, Madagascar and India, and form a distinct species, *Bos indicus*, characterized by the presence of a fleshy hump on the shoulders, the convexity (instead of concavity) of the first part of the curve of the horns, the very large size of the dewlap, and the general presence of white rings round the fetlocks, and light circles surrounding the eyes. The voice and habits of these cattle are also markedly different from those of European cattle. Whether humped cattle are of Indian or African origin cannot be determined, and the species is known only in the domesticated condition. The largest horns are found in the Galla cattle, in which they attain enormous dimensions. In Europe the name zebu is generally applied to the Indian breed, although no such designation is known in India itself.

A third type is apparently indicated by the ancient Egyptian cattle, which were not humped, and for which the name *Bos aegyptiacus* has been suggested. The cattle of Ankole, on the Uganda frontier, which have immense horns, conform to this type.

A second group of the genus *Bos* is represented by the Indo-Malay cattle included in the sub-genus *Bibos* (see BANTIN, GAUR and GAYAL); they are characterized by the more or less marked flattening of the horns, the presence of a well-marked ridge on the anterior half of the back, and the white legs.

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[1] Through the dialectic forms *Fresaie* and *Presaie*, the origin of the word is easily traced to the Latin *praesaga*—a bird of bad omen; but it has also been confounded with *Orfraie*, a name of the Osprey (*q.v.*).

More distinct are the bisons, forming the sub-genus *Bison*, represented by the European and the American species (see BISON), the forehead of the skull being much shorter and wider, and the horns not arising from a crest on the extreme vertex, while the number of ribs is different (14 pairs in bisons, only 13 in oxen), and the hair on the head and neck is long and shaggy. Very close to this group, if indeed really separable, is the Tibetan yak (*q.v.*), forming by itself the sub-genus *Pöephagus*.

The most widely different from the true oxen are, however, the buffaloes (see BUFFALO), which have consequently the most claim to generic distinction. From all other *Bovinae* they differ by the triangular section of their horns. They are divisible into two groups, an African and an Asiatic, both of which are generally included in the sub-genus, or genus, *Bubalus*, although the latter are sometimes separated as *Buffelus*. The smallest member of the group is the anoa (*q.v.*) of Celebes.

As regards the origin of the ox-tribe we are still in the dark. The structure of their molar teeth affiliates them to the antelopes of the *Oryx* and *Hippotragus* groups; but the early bovines lack horns in the female, whereas both sexes of these antelopes are horned.

Remains of the wild ox or aurochs are abundant in the superficial deposits of Europe, Western Asia, and Northern Africa; those from the brick-earths of the Thames valley indicating animals of immense proportions. Side by side with these are found remains of a huge bison, generally regarded as specifically distinct from the living European animal and termed *Bos* (*Bison*) *priscus*. In the Pleistocene of India occurs a large ox (*Bos namadicus*), possibly showing some affinity with the *Bibos* group, and in the same formation are found remains of a buffalo, allied to, but distinct from the living Indian species. Large oxen also occur in the Lower Pliocene of India, although not closely allied to the living kinds; while in the same formation are found remains of bison (or [?] yak) and buffaloes, some of the latter being nearly akin to the anoa, although much larger. Perhaps, however, the most interesting are the remains of certain oxen from the Lower Pliocene of Europe and India, which have been described under the sub-generic (or generic) title of *Leptobos*, and are characterized by the absence of horns in the females. In other respects they appear to come nearest to the bantin. Remains of extinct bisons, some of gigantic size, occur in the superficial formations of North America as far south as Texas.

See R. Lydekker, *Wild Oxen, Sheep and Goats* (London, 1898).

(R. L.*)

OXALIC ACID, $H_2C_2O_4\cdot 2H_2O$, one of the oldest known organic acids. Scheele prepared it by oxidizing sugar with nitric acid, and showed it to be identical with the acetosellic acid obtained from wood-sorrel. It is found in the form of its acid potassium salt in many plants, especially in wood-sorrel (*Oxalis acetosella*) and in varieties of *Rumex*; as ammonium salt in guano; as calcium salt in rhubarb root, in various lichens and in plant cells; as sodium salt in species of *Salicornia* and as free acid in varieties of *Boletus*. It is also present in urine and in urinary calculi. It is formed in the oxidation of many organic compounds (*e.g.* sugar, starch and cellulose) by nitric acid, and also by the fusion of many oxygen-holding compounds with caustic alkalis, this latter method being employed for the manufacture of oxalic acid. In this process cellulose (in the form of sawdust) is made into a stiff paste with a mixture of strong caustic potash and soda solution and heated in flat iron pans to 200-250° C. The somewhat dark-coloured mass is lixiviated with a small amount of warm water in order to remove excess of alkali, the residual alkaline oxalates converted into insoluble calcium oxalate by boiling with milk of lime, the lime salt separated, and decomposed by means of sulphuric acid. It is found that the sawdust obtained from soft woods is the best material for use in this process. It may be obtained synthetically by heating sodium in a current of carbon dioxide to 360° C.; by the oxidation of ethylene glycol; by heating sodium formate to 400° C. (V. Merz and W. Weith, *Ber.*, 1882, 15, p. 1513), and by the spontaneous hydrolysis of an aqueous solution of cyanogen gas.

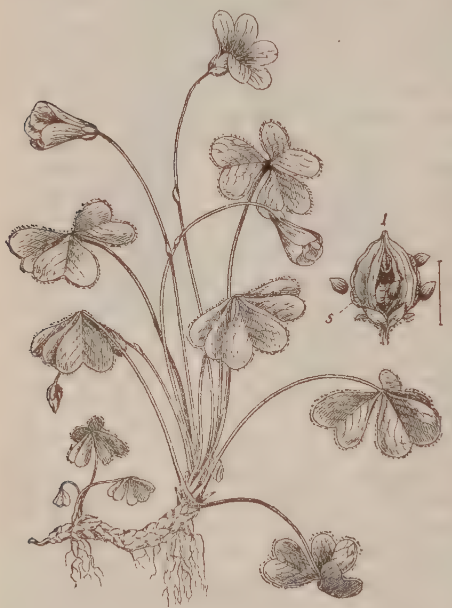
The hydrated acid crystallizes in prisms which effloresce in air, and are readily soluble in water. It loses its water of crystallization at 100° C., and begins to sublime at about 150-160° C., whilst on heating to a still higher temperature it partially decomposes into carbon dioxide and formic acid, or into carbon dioxide, carbon monoxide and water; the latter decomposition being also brought about by heating oxalic acid with concentrated sulphuric acid. The anhydrous acid melts at 189·5° C. (E. Bamberger, *Ber.*, 1888, 21, p. 1901) and is frequently used as a condensing agent. Phosphorus pentachloride decomposes it into carbon monoxide and dioxide, the reaction being the one generally applied for the purpose of preparing phosphorus oxychloride. When heated with glycerin to 100° C. it yields formic acid and carbon dioxide; above this temperature, allyl alcohol is formed. Nascent hydrogen reduces it to glycollic acid. Potassium permanganate in acid solution oxidizes it to carbon dioxide and water; the manganese sulphate formed has a catalytic accelerating effect on the decomposition.

Oxalic acid is very poisonous, and by reason of its great similarity in appearance to Epsom salts, it has been very frequently mistaken for this substance with, in many cases, fatal results. The antidotes for oxalic acid poisoning are milk of lime, chalk, whiting, or even wall-plaster, followed by evacuation brought about by an enema or castor oil. Only the salts of the alkali metals are soluble in water. Beside the ordinary acid and neutral salts, a series of salts called quadroxalates is known, these being salts containing one molecule of acid salt, in combination with one molecule of acid, one of the most common being "salt of sorrel," $KHC_2O_4\cdot H_2C_2O_4\cdot 2H_2O$. The oxalates are readily decomposed on heating, leaving a residue of carbonate, or oxide of the metal. The silver salt decomposes with explosive violence, leaving a residue of the metal.

Potassium ferrous oxalate, $FeK_2(C_2O_4)_2\cdot H_2O$, is a strong reducing agent and is used as a photographic developer. *Potassium ferric oxalate*, $FeK_3(C_2O_4)_3$, is used in the preparation of platinotypes, owing to the fact that its solution is rapidly decomposed by sunlight, $2FeK_3(C_2O_4)_3 = 2FeK_2(C_2O_4)_2 + K_2C_2O_4 + 2CO_2$. *Ethyl oxalate*, $(CO\cdot OC_2H_5)_2$, prepared by boiling anhydrous oxalic acid with absolute alcohol, is a colourless liquid which boils at 186° C. *Methyl oxalate* $(CO\cdot OCH_3)_2$, which is prepared in a similar manner, is a solid melting at 54° C. It is used in the preparation of pure methyl alcohol. On treatment with zinc and alkyl iodides or with zinc alkyls they are converted into esters of hydroxy-dialkyl acetic acids. An impure *oxalyl chloride*, a liquid boiling at 70° C., has been obtained by the action of phosphorus pentachloride on ethyl oxalate. *Oxamic acid*, $HO_2C\cdot CONH_2$, is obtained on heating acid ammonium oxalate; by boiling oxamide with ammonia; and among the products produced when amino-acids are oxidized with potassium permanganate (J. T. Halsey, *Zeit. f. physiol. Chem.*, 1898, 25, p. 325). It is a crystalline powder difficultly soluble in water and melting at 210° C. (with decomposition). Its ethyl ester, known as oxamaethane, crystallizes in rhombic plates which melt at 114–115° C. Phosphorus pentachloride converts it into cyan-carbonic ester, the ethyl oxamine chloride first formed being unstable: $ROOC\cdot CONH_2 \rightarrow ROOC\cdot C(Cl_2)\cdot NH_2 \rightarrow CN\cdot COOR$. *Oximide*, $[CO]_2NH$, produced by the action of a mixture of phosphorus pentachloride and oxychloride on oxamic acid (H. Ost and A. Mente, *Ber.*, 1886, 19, p. 3229), crystallizes in prisms, and when boiled with water is rapidly hydrolysed to oxamide and oxalic acid. *Oxamide*, $(CONH_2)_2$, is best prepared by the action of ammonia on the esters of oxalic acid. It is also obtained by the action of hydrogen peroxide on hydrocyanic acid, or of manganese dioxide and sulphuric acid on potassium cyanide. It is a white crystalline powder which is almost insoluble in cold water. It melts at 417–419° C. (with decomposition) when heated in a sealed tube (A. Michael, *Ber.*, 1895, 28, p. 1632). When heated with phosphorus pentoxide it yields cyanogen. It is readily hydrolysed by hot solutions of the caustic alkalis. Substituted oxamides are produced by the action of primary amines on ethyl oxalate. *Semioxamazide*, $H_2N\cdot CO\cdot CO\cdot NH\cdot NH_2$, is prepared by the action of hydrazine hydrate on oxamaethane (W. Kerp and K. Unger, *Ber.* 1897, 30, p. 586). It crystallizes in plates which melt at 220–221° C. (with decomposition). It is only slightly soluble in water, but is readily soluble in acids and alkalis. It reduces silver salts rapidly. It condenses with aldehydes and ketones to produce semioxamazones.

OXALIS, in botany, a large genus of small herbaceous plants, comprising, with a few small allied genera, the natural order Oxalidaceae. The name is derived from Gr. ὄξυς, acid, the plants being acid from presence of acid calcium oxalate. It contains about 220 species, chiefly South African and tropical and South American. It is represented in Britain by the wood-sorrel, a small stemless plant with radical trefoil-like leaves growing from a creeping scaly rootstock, and the flowers borne singly on an axillary stalk; the flowers are regular with five sepals, five obovate, white, purple-veined, free petals, ten stamens and a central five-lobed, five-celled ovary with five free styles. The fruit is a capsule, splitting by valves; the seeds have a fleshy coat, which curls back elastically, ejecting the true seed. The leaves, as in the other species of the genus, show a "sleep-movement," becoming pendulous at night.

Oxalis crenata, Oca of the South Americans, is a tuberous-rooted half-hardy perennial, native of Peru. Its tubers are comparatively small, and somewhat acid; but if they be exposed in the sun from six to ten days they become sweet and floury. In the climate of England they can only be grown by starting them in heat in March, and planting out in June in a light soil and warm situation. They grow freely enough, but few tubers are formed, and these of small size. The fleshy stalks, which have the acid flavour of the family, may, however, be used in the same way as rhubarb for tarts. The leaves may be eaten in salads. It is easily propagated by cuttings of the stems or by means of sets like the potato.

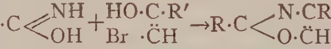


Wood-sorrel (*Oxalis Acetosella*). 1, Fruit which has split open; the seeds are shot out by the elastic contractions of their outer coat, *s*.

Oxalis Deppei or *O. tetraphylla*, a bulbous perennial, native of Mexico, has scaly bulbs, from which are produced fleshy, tapering, white, semi-transparent roots, about 4 in. in length and 3 to 4 in. in diameter. They strike down into the soil, which should therefore be made light and rich with abundance of decayed vegetable matter. The bulbs should be planted about the end of April, 6 in. apart, in rows 1 ft. asunder, being only just covered with soil and having a situation with a southern aspect. The roots should be dug up before they become affected by frost, but if protected they will continue to increase in size till November. When taken up the bulbs should be stored in a cool dry place for replanting and the roots for use. The roots are gently boiled with salt and water, peeled and eaten like asparagus with melted butter and the yolks of eggs, or served up like salsafy and scorzonera with white sauce.

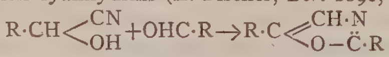
Many other species are known in cultivation for edgings, rockwork or as pot-plants for the greenhouse, the best hardy and half-hardy kinds being *O. arenaria*, purple; *O. Bowiei*, crimson; *O. enneaphylla*, white or pale rose; *O. floribunda*, rose; *O. lasiandra*, pink; *O. luteola*, creamy yellow; *O. variabilis*, purple, white, red; and *O. violacea*, violet.

OXAZOLES, a group of organic compounds containing a ring complex (shown below) composed of three carbon atoms, and one oxygen and one nitrogen atom; they are isomeric with the isoxazoles (*q.v.*). They are obtained by condensing α halogen derivatives of ketones with acid-amides (M. Lewy, *Ber.* 1887, 20, p. 2576; 1888, 21, p. 2195)



$$\mathrm{R{\cdot}C}<\!\begin{matrix}\mathrm{NH}\\ \mathrm{OH}\end{matrix}+\begin{matrix}\mathrm{HO{\cdot}C{\cdot}R'}\\ \mathrm{Br}\ {\cdot}\ddot{\mathrm{C}}\mathrm{H}\end{matrix}\rightarrow\mathrm{R{\cdot}C}<\!\begin{matrix}\mathrm{N{\cdot}CR'}\\ \mathrm{O{\cdot}}\ddot{\mathrm{C}}\mathrm{H}\end{matrix};$$

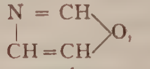
by the action of concentrated sulphuric acid on nitriles and benzoin (F. Japp, *Jour. Chem. Soc.* 1893, 63, p. 469); and by passing hydrochloric acid gas into a mixture of aromatic aldehydes and their cyanhydrins (E. Fischer, *Ber.* 1896, 29, p. 205).

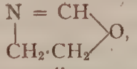


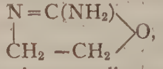
$$\mathrm{R{\cdot}CH}<\!\begin{matrix}\mathrm{CN}\\ \mathrm{OH}\end{matrix}+\mathrm{OHC{\cdot}R}\rightarrow\mathrm{R{\cdot}C}<\!\begin{matrix}\mathrm{CH{\cdot}N}\\ \mathrm{O-}\ddot{\mathrm{C}}\mathrm{{\cdot}R}\end{matrix}$$

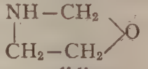
They are weak bases, and the ring system is readily split by evaporation with hydrochloric acid, or by the action of reducing and oxidizing agents.

The dihydro-oxazoles or oxazolines are similarly formed when β-halogen alkyl amides are condensed with alkali (S. Gabriel, *Ber.* 1889, 22, p. 2220), or by the action of alkali on the compounds formed by the interaction of ethylene chlorhydrin on nitriles. They are strong bases characterized by a quinoline-like smell. The amino-oxazolines are known as alkylene-ψ-areas and are formed by the action of potassium cyanate on the hydrobromides of the bromalkylamines (S. Gabriel, *Ber.* 1895, 28. p. 1899). They are strong bases. *Tetrahydro-oxazoles* or oxazolidines result from the action of aldehydes on amino-alcohols (L. Knorr, *Ber.* 1901, 34, p. 3484). The above types of compounds may be represented by the following formulae:—


oxazole


oxazoline


amino-oxazoline


oxazolidines.

The *benzoxazoles* are formed when ortho-aminophenols are condensed with organic acids (A. Ladenburg, *Ber.* 1876, 9, p. 1524; 1877, 10, p. 1113), or by heating aldehydes and ortho-aminophenols to high temperature (G. Mazzara and A. Leonardi, *Gazz.* 1871, 21, p. 251). They are mostly crystalline solids which distil unchanged. When warmed with acids they split into their components. They behave as weak bases. By the condensation of ortho-aminophenols with phosgene or thiophosgene, oxy and thio-derivatives are obtained, the (OH) and (SH) groups being situated in the μ position, and these compounds on treatment with amines yield amino derivatives.

OXE, PEDER (1520–1575), Danish Finance Minister, was born in 1520. At the age of twelve he was sent abroad to complete his education, and resided at the principal universities of Germany, Holland, France, Italy and Switzerland for seventeen years. On his return he found both his parents dead, and was appointed the guardian of his eleven young brothers and sisters, in which capacity, profiting by the spoliation of the church, he accumulated immense riches. His extraordinary financial abilities and pronounced political capacity soon found ample scope in public life. In 1552 he was raised to the dignity of *Rigsraad* (councillor of state); in 1554 he successfully accomplished his first diplomatic mission, by adjusting the differences between the elector of Saxony and the margrave of Brandenburg. The same year he held the post of governor of Copenhagen and shared with Byrge Trolle the control of the treasury. A few years later he incurred the royal disfavour for gross malversation in the administration of public property, and failing to compromise matters with the king, fled to Germany and engaged in political intrigues with the adventurer Wilhelm von Grumbach (1503–1567) for the purpose of dethroning Frederick II. in favour of Christina of Lorraine, the daughter of Christian II. But the financial difficulties of Frederick II. during the stress of the Scandinavian Seven Years' War compelled him, in 1566, to recall the great financier, when his confiscated estates were restored to him and he was reinstated in all his offices and dignities. A change for the better immediately ensued. The finances were speedily put on an excellent footing, means were provided for carrying on the war to a successful issue (one of the chief expedients being the raising of the Sound tolls) and on the conclusion of peace Oxe, as lord treasurer, not only reduced the national debt considerably, but redeemed a large portion of the alienated crown-lands. He reformed the coinage, developed trade and commerce and introduced numerous agricultural reforms, especially on his own estates, which he was never weary of enlarging, so that on his death he was the wealthiest landowner in Denmark. Oxe died on the 24th of October 1575, after contributing, more than any other statesman of his day, to raise Denmark for a brief period to the rank of a great power.

See *P. Oxe's live og levnet* (Copenhagen, 1675); *Danmarks riges historie*, vol. 3 (Copenhagen, 1897–1905).

OXENBRIDGE, JOHN (1608–1674), English Nonconformist divine, was born at Daventry, Northamptonshire, on the 30th of January 1608, and was educated at Emmanuel College, Cambridge, and Magdalen Hall, Oxford (B.A. 1628, M.A. 1631). As tutor of Magdalen Hall he drew up a new code of articles referring to the government of the college. He was deprived of his office in May 1634, and began to preach, with a similar disregard for constituted authority. After his voyages to the Bermudas he returned to England (1641), and after exercising an itinerant and unattached ministry settled for some months in Great Yarmouth and then at Beverley. He was minister at Berwick-on-Tweed when in October 1652 he was appointed a fellow of Eton College. There in 1658 he preached the funeral sermon of Francis Rous, the provost, and thence in 1660 he was ejected. He returned to his preaching at Berwick-on-Tweed, but was expelled by the Act of Uniformity in 1662, and after spending some time in the West Indies settled (1670) at Boston, Massachusetts, where he was ordained minister of the First Church. He died on the 28th of December 1674. A few sermons are all that he published. His first wife (d. 1658) was "a scholar beyond what was usual in her sex," and Andrew Marvell, who was their friend, wrote an epitaph for her tomb at Eton which was defaced at the Restoration; his second wife (d. 1659) was Frances Woodward, daughter of the famous vicar of Bray; his third was a widow whom he met at Barbados.

OXENFORD, JOHN (1812–1877), English dramatist, was born at Camberwell on the 12th of August 1812. He began his literary career by writing on finance. He was an excellent linguist, and the author of many translations from the German, notably of Goethe's *Dichtung und Wahrheit* (1846) and Eckermann's *Conversations of Goethe* (1850). He did much by his writing to spread the fame of Schopenhauer in England. His first play was *My Fellow Clerk*, produced at the Lyceum in 1835. This was followed by a long series of pieces, the most famous of which was perhaps the *Porter's Knot* (1858) and *Twice Killed* (1835). About 1850 he became dramatic critic of *The Times*. He died in Southwark on the 21st of February 1877.

Many references to his pieces will be found in *The Life and Reminiscences of E. L. Blanchard* (ed. C. Scott and C. Howard, 1891).

OXENHAM, HENRY NUTCOMBE (1829–1888), English ecclesiologist, son of a master at Harrow, was born there on the 15th of November 1829. From Harrow he went to Balliol College, Oxford. He took Anglican orders in 1854, but became a Roman Catholic in 1857. At first his thoughts turned towards the priesthood, and he spent some time at the London Oratory and at St Edmund's College, Ware; but being unable to surrender his belief in the validity of Anglican orders, he proceeded no further than minor orders in the Roman Church. In 1863 he made a prolonged visit to Germany, where he studied the language and literature, and formed a close friendship with Döllinger, whose *First Age of the Christian Church* he translated in 1866. Oxenham was a regular contributor to the *Saturday Review*. A selection of his essays was published in *Short Studies in Ecclesiastical History and Biography* (1884), and *Short Studies, Ethical and Religious* (1885). He also translated in 1876 the 2nd vol. of Bishop Hefele's *History of the Councils of the Church*, and published several pamphlets on the reunion of Christendom. His *Catholic Doctrine of the Atonement* (1865) and *Catholic Eschatology and Universalism* (1876) are standard works. Oxenham died at Kensington on the 23rd of March 1888.

See J. Gillow's *Bibliographical Dictionary of English Catholics*, vol. v. An interesting obituary notice on Oxenham was written by *Vicesimus, i.e.* Dean John Oakley of Manchester, for the *Manchester Guardian*, and published in pamphlet form (Manchester, 1888).

OXENSTJERNA, an ancient Swedish senatorial family, the origin of which can be traced up to the middle of the 14th century, which had vast estates in Södermanland and Uppland, and began to adopt its armorial designation of *Oxenstjerna* ("Ox-forehead") as a personal name towards the end of the 16th century. Its most notable members were the following.

1. Count Axel Gustafsson (1583–1654), chancellor of Sweden, was born at Fönö in Uppland, and was educated with his brothers at the universities of Rostock, Jena and Wittenberg. On returning home in 1603 he was appointed *kammerjunker* to King Charles IX. In 1606 he was entrusted with his first diplomatic mission, to Mecklenburg, was appointed a senator during his absence, and henceforth became one of the king's most trusted servants. In 1610 he was sent to Copenhagen to prevent a war with Denmark, but was unsuccessful. This embassy is important as being the beginning of Oxenstjerna's long diplomatic struggle with Sweden's traditional rival in the north, whose most formidable enemy he continued to be throughout life. Oxenstjerna was appointed a member of Gustavus Adolphus's council of regency. High aristocrat as he was, he would at first willingly have limited the royal power. An oligarchy guiding a limited monarchy was ever his ideal government, but the genius of the young king was not to be fettered, so Oxenstjerna was content to be the colleague instead of the master of his sovereign. On the 6th of January 1612 he was appointed chancellor. His controlling, organizing hand was speedily felt in every branch of the administration. For his services as first Swedish plenipotentiary at the peace of Knäred, 1613, he was richly rewarded. During the frequent absences of Gustavus in Livonia and Finland (1614–1616) Oxenstjerna acted as his vice-regent, when he displayed manifold abilities and an all-embracing activity. In 1620 he headed the brilliant embassage despatched to Berlin to arrange the nuptial contract between Gustavus and Mary Eleanora of Brandenburg. It was his principal duty during the king's Russian and Polish wars to supply the armies and the fleets with everything necessary, including men and money. By this time he had become so indispensable that Gustavus, in 1622, bade him accompany him to Livonia, where Oxenstjerna was appointed governor-general and commandant of Riga. His services in Livonia were rewarded with four castles and the whole bishopric of Wenden. He was entrusted with the peace negotiations which led to the truce with Poland in 1623, and succeeded, by skilful diplomacy, in averting a threatened rupture with Denmark in 1624. On the 7th of October 1626 he was appointed governor-general of the newly-acquired province of Prussia. In 1629 he concluded the very advantageous truce of Altmark with Poland. Previously to this (September 1628) he arranged with Denmark a joint occupation of Stralsund, to prevent that important fortress from falling into the hands of the Imperialists. After the battle of Breitenfeld (September 7th, 1631) he was summoned to assist the king with his counsels and co-operation in Germany. During the king's absence in Franconia and Bavaria in 1632 he was appointed *legatus* in the Rhine lands, with plenipotentiary authority over all the German generals and princes in the Swedish service. Although he never fought a battle, he was a born strategist, and frustrated all the efforts of the Spanish troops by his wise regulations. His military capacity was strikingly demonstrated by the skill with which he conducted large reinforcements to Gustavus through the heart of Germany in the summer of 1632. But it was only after the death of the king at Lützen that Oxenstjerna's true greatness came to light. He inspired the despairing Protestants both in Germany and Sweden with fresh hopes. He reorganized the government both at home and abroad. He united the estates of the four upper circles into a fresh league against the common foe (1634), in spite of the envious and foolish opposition of Saxony. By the patent of the 12th of January 1633 he had already been appointed legate plenipotentiary of Sweden in Germany with absolute control over all the territory already won by the Swedish arms. No Swedish subject, either before or after, ever held such an unrestricted and far-reaching authority. Yet he was more than equal to the extraordinary difficulties of the situation. To him both warriors and statesmen appealed invariably as their natural and infallible arbiter. Richelieu himself declared that the Swedish chancellor was "an inexhaustible source of well-matured counsels." Less original but more sagacious than the king, he had a firmer grasp of the realities of the situation. Gustavus would not only have aggrandized Sweden, he would have transformed the German empire. Oxenstjerna wisely abandoned these vaulting ambitions. His country's welfare was his sole object. All his efforts were directed towards procuring for the Swedish crown adequate compensation for its sacrifices. Simple to austerity in his own tastes, he nevertheless recognized the political necessity of impressing his allies and confederates by an almost regal show of dignity; and at the abortive congress of Frankfort-on-Main (March 1634), held for the purpose of uniting all the German Protestants, Oxenstjerna appeared in a carriage drawn by six horses, with German princes attending him on foot. But from first to last his policy suffered from the slenderness of Sweden's material resources, a cardinal defect which all his craft and tact could not altogether conceal from the vigilance of her enemies. The success of his system

postulated an uninterrupted series of triumphs, whereas a single reverse was likely to be fatal to it. Thus the frightful disaster of Nördlingen (September 6th, 1634; see Sweden: *History*) brought him, for an instant, to the verge of ruin, and compelled him, for the first time, so far to depart from his policy of independence as to solicit direct assistance from France. But, well aware that Richelieu needed the Swedish armies as much as he himself needed money, he refused at the conference of Compiègne (1635) to bind his hands in the future for the sake of some slight present relief. In 1636, however, he concluded a fresh subsidy-treaty with France at Wismar. The same year he returned to Sweden and took his seat in the Regency. His presence at home overawed all opposition, and such was the general confidence inspired by his superior wisdom that for the next nine years his voice, especially as regarded foreign affairs, was omnipotent in the council of state. He drew up beforehand the plan of the Danish War of 1643–1645, so brilliantly executed by Lennart Torstensson, and had the satisfaction of severely crippling Denmark by the peace of Brömsebro (1645). His later years were embittered by the jealousy of the young Queen Christina, who thwarted the old statesman in every direction. He always attributed the exiguity of Sweden's gains by the peace of Osnabrück to Christina's undue interference. Oxenstjerna was opposed at first to the abdication of Christina, because he feared mischief to Sweden from the unruly and adventurous disposition of her appointed successor, Charles Gustavus. The extraordinary consideration shown to him by the new king ultimately, however, reconciled him to the change. He died at Stockholm on the 28th of August 1654.

See *Axel Oxenstjernas skriften och brefvexling* (Stockholm, 1888 et seq.); A. de Marny, *Oxenstjerna et Richelieu à Compiègne* (Paris, 1878).

2. Count Johan Axelsson (1611–1657), son of the foregoing, completed his studies at Upsala in 1631, and was sent by his father on a grand tour through France, the Netherlands and Great Britain. He served under Count Gustavus Horn in the Thirty Years' War from 1632, and was subsequently employed by his father in various diplomatic missions, though his instructions were always so precise and minute that he was little more than the executor of the chancellor's wishes. He was one of the commissioners who signed the truce of 1635 with Poland, and in 1639, much against his father's will, was made a senator. Along with Salvius he represented Sweden at the great peace congress of Osnabrück, but as he received his instructions direct from his father, whereas Salvius was in the queen's confidence, the two "legates" were constantly at variance. From 1650 to 1652 he was governor-general of Pomerania. Charles X. made him earl marshal.

3. Gabriel Gustafsson (1587–1640), brother of (1), was from 1612 to 1618 the chief adviser of Duke John, son of King John III., and Gustavus Adolphus's competitor for the Swedish throne. After the duke's death he became, virtually, the *locum-tenens* of the chancellor (with whom he was always on the most intimate terms) during Axel's frequent absences from Sweden. He was also employed successfully on numerous diplomatic missions. He was most usually the intermediary between his brother and the *riksdag* and senate. In 1634 he was created lord high steward. His special department, "Svea Hofret," the supreme court of justice, was ever a model of efficiency, and he frequently acted as chancellor and lord high treasurer as well.

See *Gabriel Gustafssons bref till Riks Konsler Axel Oxenstjerna, 1611–1640* (Stockholm, 1890).

4. Count Bengt or Benedict Gabrielsson (1623–1702), was the son of Axel Oxenstjerna's half-brother, Gabriel Bengtsson (1586–1656). After a careful education and a long residence abroad, he began his diplomatic career at the great peace congress of Osnabrück. During his stay in Germany he made the acquaintance of the count palatine, Charles Gustavus, afterwards Charles X., whose confidence he completely won. Two years after the king's accession (1654), Oxenstjerna was sent to represent Sweden at the *Kreistag* of Lower Saxony. In 1655 he accompanied Charles to Poland and was made governor of the conquered provinces of Kulm, Kujavia, Masovia and Great Poland. The firmness and humanity which he displayed in this new capacity won the affectionate gratitude of the inhabitants, and induced the German portion of them, notably the city of Thorn, to side with the Swedes against the Poles. During Charles's absence in Denmark (1657), Oxenstjerna, in the most desperate circumstances, tenaciously defended Thorn for ten months, and the terms of capitulation ultimately obtained by him were so advantageous that they were made the basis of the subsequent peace negotiations at Oliva, between Poland and Sweden, when Oxenstjerna was one of the chief plenipotentiaries of the Swedish regency. During the domination of Magnus de la Gardie he played but a subordinate part in affairs. From 1662 to 1666 he was governor-general of Livonia. In 1674 he was sent to Vienna to try and prevent the threatened outbreak of war between France and the empire. The connexions which he formed and the sympathies which he won here had a considerable influence on his future career, and resulted in his appointment as one of the Swedish envoys to the congress of Nijmwegen (1676). His appointment was generally regarded as an approximation on the part of Sweden to Austria and Holland. During the congress he laboured assiduously in an anti-French direction; a well-justified distrust of France was, indeed, henceforth the keynote of his policy, a policy diametrically opposed to Sweden's former system. In 1680 Charles XI. entrusted him absolutely with the conduct of foreign affairs, on the sole condition that peace was to be preserved, an office which he held for the next seventeen years to the very great advantage of Sweden. His leading political principles were friendship with the maritime powers (Great Britain and Holland) and the emperor, and a close anti-Danish alliance with the house of Holstein. Charles XI. appointed Oxenstjerna one of the regents during the minority of Charles XII. The martial proclivities of the new king filled the prudent old chancellor with alarm and anxiety. His protests were frequent and energetic, and he advised Charles in vain to accept the terms of peace offered by the first anti-Swedish coalition. Oxenstjerna has been described as "a shrewd and subtle little man, of gentle disposition, but remarkable for his firmness and tenacity of character."

See F. F. Carlson, *Sveriges historia under Konungarne af Pfalziska huset* (Stockholm, 1883, 1885); O. Sjögren, *Karl den elfte och Svenska folket* (Stockholm, 1897); and *Négociations du comte d'Avaux pendant les années 1693, 1697–1698* (Utrecht, 1882, &c.).

(R. N. B.)

OXFORD, EARLS OF, an English title held successively by the families of Vere and Harley. The three most important earls of the Vere line (see Vere) are noticed separately below. The Veres held the earldom from 1142 until March 1703, when it became extinct on the death of Aubrey de Vere, the 20th earl. In 1711 the English statesman Robert Harley (see below) was created earl of Oxford; but the title became extinct in this family on the death of the 6th earl in 1853.

OXFORD, EDWARD DE VERE, 17th Earl [1] of (1550–1604), son of John de Vere, the 16th earl, was born on the 12th of April 1550. He matriculated at Queen's College, Cambridge, but he removed later to St John's College, and was known as Lord Bolebec or Bulbeck until he succeeded in 1562 to the earldom and to the hereditary dignity of great chamberlain of England. As one of the royal wards the boy came under the care of Lord Burghley, at whose house in London he lived under the tutorship of his maternal uncle, Arthur Golding, the translator of Ovid. His violent temper and erratic doings were a constant source of anxiety to Burghley, who nevertheless in 1571 gave him his eldest daughter, Anne, in marriage. Oxford more than once asked for a military or a naval command, but Burghley hoped that his good looks together with his skill in dancing and in feats of arms would win for him a high position at court. His accomplishments did indeed secure Elizabeth's favour, but he offended her by going to Flanders without her consent in 1574, and more seriously in 1582 by a duel with one of her gentlemen, Thomas Knyvet. Among his other escapades was a futile plot to rescue from the Tower Thomas Howard, 4th duke of Norfolk, with whom he was distantly connected. In 1579 he insulted Sir Philip Sidney by calling him a "puppy" on the tennis-court at Whitehall. Sidney accordingly challenged Oxford, but the queen forbade him to fight, and required him to apologize on the ground of the difference of rank between the disputants. On Sidney's refusal and consequent disgrace Oxford is said to have schemed to murder him. The earl sat on the special commission (1586) appointed for the trial of Mary queen of Scots; in 1589 he was one of the peers who tried Philip Howard, earl of Arundel, for high treason; and in 1601 he took part in the trial of Essex and Southampton. It has been suggested that Oxford was the Italianated Englishman ridiculed by Gabriel Harvey in his *Speculum Tuscanismi*. On his return from a journey to Italy in 1575 he brought back various inventions for the toilet, and his estate was rapidly dissipated in satisfying his extravagant whims. His first wife died in 1588, and from that time Burghley withdrew his support, Oxford being reduced to the necessity of seeking help among the poor men of letters whom he had at one time or another befriended. He was himself a lyric poet of no small merit. His fortunes were partially retrieved on his second marriage with Elizabeth Trentham, by whom he had a son, Henry de Vere, 18th earl of Oxford (1593–1625). He died at Newington, near London, on the 24th of June 1604.

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[1] *I.e.* in the Vere line.

His poems, scattered in various anthologies—the *Paradise of Dainty Devices, England's Parnassus, Phoenix Nest, England's Helicon*—and elsewhere, were collected by Dr A. B. Grosart in vol. iv. of the Fuller Worthies Library (1876).

OXFORD, JOHN DE VERE, 13TH EARL OF (1443–1513), was second son of John, the 12th earl, a prominent Lancastrian, who, together with his eldest son Aubrey de Vere, was executed in February 1462. John de Vere the younger was himself attainted, but two years later was restored as 13th earl. But his loyalty was suspected, and for a short time at the end of 1468 he was in the Tower. He sided with Warwick, the king-maker, in the political movements of 1469, accompanied him in his exile next year, and assisted in the Lancastrian restoration of 1470–1471. As constable he tried John Tiptoft, earl of Worcester, who had condemned his father nine years before. At the battle of Barnet, Oxford was victorious in command of the Lancastrian right, but his men got out of hand, and before they could be rallied Warwick was defeated. Oxford escaped to France. In 1473 he organized a Lancastrian expedition, which, after an attempted landing in Essex, sailed west and seized St Michael's Mount in Cornwall. It was only after a four months' siege that Oxford was forced to surrender in February 1474. He was sent to Hammes near Calais, whence, ten years later, in August 1484, he escaped and joined Henry Tudor in Brittany. He fought for Henry in high command at Bosworth, and was rewarded by restoration to his title, estates and hereditary office of Lord Chamberlain. At Stoke on the 16th of June 1486 he led the van of the royal army. In 1492 he was in command in the expedition to Flanders, and in 1497 was foremost in the defeat of the Cornish rebels on Blackheath. Bacon (*Hist. of Henry VII*. p. 192, ed. Lumby) has preserved a story that when in the summer of 1498 Oxford entertained the king at Castle Hedingham, he assembled a great number of his retainers in livery; Henry thanked the earl for his reception, but fined him 15,000 marks for the breach of the laws. Oxford was high steward at the trial of the earl of Warwick, and one of the commissioners for the trial of Sir James Tyrell and others in May 1502. Partly through ill-health he took little part afterwards in public affairs, and died on the 10th of March 1513. He was twice married, but left no children.

Oxford is frequently mentioned in the *Paston Letters*, which include twenty written by him, mostly to Sir John Paston the younger. See *The Paston Letters*, ed. J. Gairdner; *Chronicles of London*, ed. C. L. Kingsford (1905); Sir James Ramsay, *Lancaster and York*; and *The Political History of England*, vols. iv. and v. (1906). (C. L. K.)

OXFORD, ROBERT DE VERE, 9TH EARL OF (1362–1392); English courtier, was the only son of Thomas de Vere, 8th earl of Oxford, and Maud (d. 1413), daughter of Sir Ralph de Ufford (d. 1346), and a descendant of King Henry III. He became 9th earl of Oxford on his father's death in 1371, and married Philippa (d. 1412), daughter of his guardian Ingelram de Couci, earl of Bedford, a son-in-law of Edward III., quickly becoming very intimate with Richard II. Already hereditary great chamberlain of England, Oxford was made a member of the privy council and a Knight of the Garter; while castles and lands were bestowed upon him, and he was constantly in the company of the young king. In 1385 Richard decided to send his friend to govern Ireland, and Oxford was given extensive rights in that country and was created marquess of Dublin for life; but although preparations were made for his journey he did not leave England. Meanwhile the discontent felt at Richard's incompetence and extravagance was increasing, one of the contributory causes thereto being the king's partiality for Oxford, who was regarded with jealousy by the nobles and who made powerful enemies about this time by divorcing his wife, Philippa, and by marrying a Bohemian lady. The king, however, indifferent to the gathering storm, created Vere duke of Ireland in October 1386, and gave him still more extensive powers in that country, and at once matters reached a climax. Richard was deprived of his authority for a short time, and Vere was ordered in vain to proceed to Ireland. The latter was then among those who were accused by the king's uncle Thomas of Woodstock, duke of Gloucester, and his supporters in November 1387; and rushing into the north of England he gathered an army to defend his royal master and himself. At Radcot Bridge in Oxfordshire, however, his men fled before the troops of Gloucester, and Oxford himself escaped in disguise to the Netherlands. In the parliament of 1388 he was found guilty of treason and was condemned to death, but as he remained abroad the sentence was never carried out. With another exile, Michael de la Pole, duke of Suffolk, he appears to have lived in Paris until after the treaty between England and France in June 1389, when he took refuge at Louvain. He was killed by a boar whilst hunting, and left no children. In 1395 his body was brought from Louvain to England, and was buried in the priory at Earl's Colne, Essex.

See T. Walsingham, *Historia Anglicana*, edited by H. T. Riley (London, 1863–1864); J. Froissart, *Chroniques*, edited by S. Luce and G. Raynaud (Paris, 1869–1897); H. Wallon, *Richard II.* (Paris, 1864); and W. Stubbs, *Constitutional History*, vol. ii. (Oxford, 1896).

OXFORD, ROBERT HARLEY, 1ST EARL[1] OF (1661–1724), English statesman, commonly known by his surname of HARLEY, eldest son of Sir Edward Harley (1624–1700), a prominent landowner in Herefordshire, and grandson of the celebrated letter-writer Lady Brilliana Harley (*c.* 1600–1643), was born in Bow Street, Covent Garden, London, on the 5th of December 1661. His school days were passed at Shilton, near Burford, in Oxfordshire, in a small school which produced at the same time a lord high treasurer (Harley), a lord high chancellor (Simon Harcourt) and a lord chief justice of the common pleas (Thomas Trevor). The principles of Whiggism and Nonconformity were instilled into his mind at an early age, and if he changed the politics of his ancestors he never formally abandoned their religious opinions. At the Revolution of 1688 Sir Edward and his son raised a troop of horse in support of the cause of William III., and took possession of the city of Worcester in his interest. This recommended Robert Harley to the notice of the Boscawen family, and led to his election, in April 1689, as the parliamentary representative of Tregony, a borough under their control. He remained its member for one parliament, when he was elected by the constituency of New Radnor, and he continued to represent it until his elevation to the peerage in 1711.

From the first Harley gave great attention to the conduct of public business, bestowing especial care upon the study of the forms and ceremonies of the House. His reputation marked him out as a fitting person to preside over the debates of the House, and from the general election of February 1701 until the dissolution of 1705 he held with general approbation the office of speaker. For a part of this period, from the 18th of May 1704, he combined with the speakership the duties of a principal secretary of state for the northern department, displacing in that office the Tory earl of Nottingham. In 1703 Harley first made use of Defoe's talents as a political writer, and this alliance with the press proved so successful that he afterwards called the genius of Swift to his aid in many pamphlets against his opponents in politics. While he was secretary of state the union with Scotland was effected. At the time of his appointment as secretary of state Harley had given no outward sign of dissatisfaction with the Whigs, and it was mainly through Marlborough's good opinion of his abilities that he was admitted to the ministry. For some time, so long indeed as the victories of the great English general cast a glamour over the policy of his friends, Harley continued to act loyally with his colleagues. But in the summer of 1707 it became evident to Godolphin that some secret influence behind the throne was shaking the confidence of the queen in her ministers. The sovereign had resented the intrusion into the administration of the impetuous earl of Sunderland, and had persuaded herself that the safety of the church depended on the fortunes of the Tories. These convictions were strengthened in her mind by the new favourite Abigail Hill (a cousin of the duchess of Marlborough through her mother, and of Harley on her father's side), whose soft and silky ways contrasted only too favourably in the eyes of the queen with the haughty manners of her old friend, the duchess of Marlborough. Both the duchess and Godolphin were convinced that this change in the disposition of the queen was due to the sinister conduct of Harley and his relatives; but he was for the present permitted to remain in his office. Subsequent experience showed the necessity for his dismissal and an occurrence supplied an opportunity for carrying out their wishes. An ill-paid and poverty-stricken clerk, William Gregg, in Harley's office, was detected in furnishing the enemy with copies of many documents which should have been kept from the knowledge of all but the most trusted advisers of the court, and it was found that through the carelessness of the head of the department the contents of such papers became the common property of all in his service. The queen was thereupon informed that Godolphin and Marlborough could no longer serve in concert with him. They did not attend her next council, on the 8th of February 1708, and when Harley proposed to proceed with the business of the day the duke of Somerset drew attention to their absence, when the queen found herself forced (February 11,) to accept the resignations of both Harley and St John.

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[1] *I.e.* in the Harley line.

Harley went out of office, but his cousin, who had now become Mrs Masham, remained by the side of the queen, and contrived to convey to her mistress the views of the ejected minister. Every device which the defeated ambition of a man whose strength lay in his aptitude for intrigue could suggest for hastening the downfall of his adversaries was employed without scruple, and not employed in vain. The cost of the protracted war with France, and the danger to the national church, the chief proof of which lay in the prosecution of Sacheverell, were the weapons which he used to influence the masses of the people. Marlborough himself could not be dispensed with, but his relations were dismissed from their posts in turn. When the greatest of these, Lord Godolphin, was ejected from office, five commissioners to the treasury were appointed (August 10, 1710), and among them figured Harley as chancellor of the exchequer. It was the aim of the new chancellor to frame an administration from the moderate members of both parties, and to adopt with but slight changes the policy of his predecessors; but his efforts were doomed to disappointment. The Whigs refused to join in an alliance with the man whose rule began with the retirement from the treasury of the finance minister idolized by the city merchants, and the Tories, who were successful beyond their wildest hopes at the polling booths, could not understand why their leaders did not adopt a policy more favourable to the interests of their party. The clamours of the wilder spirits, the country members who met at the "October Club," began to be re-echoed even by those who were attached to the person of Harley, when, through an unexpected event, his popularity was restored at a bound. A French refugee, the ex-abbé de la Bourlie (better known by the name of the marquis de Guiscard), was being examined before the privy council on a charge of treachery to the nation which had befriended him, when he stabbed Harley in the breast with a penknife (March 8, 1711). To a man in good health the wounds would not have been serious, but the minister had been for some time indisposed—a few days before the occurrence Swift had penned the prayer "Pray God preserve his health, everything depends upon it"—and the joy of the nation on his recovery knew no bounds. Both Houses presented an address to the crown, suitable response came from the queen, and on Harley's reappearance in the Lower House the speaker made an oration which was spread broadcast through the country. On the 23rd of May 1711 the minister became Baron Harley of Wigmore and earl of Oxford and Mortimer; on the 29th of May he was created lord treasurer, and on the 25th of October 1712 became a Knight of the Garter. Well might his friends exclaim that he had "grown by persecutions, turnings out, and stabbings."

With the sympathy which this attempted assassination had evoked, and with the skill which the lord treasurer possessed for conciliating the calmer members of either political party, he passed through several months of office without any loss of reputation. He rearranged the nation's finances, and continued to support her generals in the field with ample resources for carrying on the campaign, though his emissaries were in communication with the French king, and were settling the terms of a peace independently of England's allies. After many weeks of vacillation and intrigue, when the negotiations were frequently on the point of being interrupted, the preliminary peace was signed, and in spite of the opposition of the Whig majority in the Upper House, which was met by the creation of twelve new peers, the much-vexed treaty of Utrecht was brought to a conclusion on the 31st of March 1713. While these negotiations were under discussion the friendship between Oxford and St John, who had become secretary of state in September 1710, was fast changing into hatred. The latter had resented the rise in fortune which the stabs of Guiscard had secured for his colleague, and when he was raised to the peerage with the title of Baron St John and Viscount Bolingbroke, instead of with an earldom, his resentment knew no bounds. The royal favourite, whose husband had been called to the Upper House as Baron Masham, deserted her old friend and relation for his more vivacious rival. The Jacobites found that, although the lord treasurer was profuse in his expressions of good will for their cause, no steps were taken to ensure its triumph, and they no longer placed reliance in promises which were repeatedly made and repeatedly broken. Even Oxford's friends began to complain of his habitual dilatoriness, and to find some excuse for his apathy in ill-health, aggravated by excess in the pleasures of the table and by the loss of his favourite child. By slow degrees the confidence of Queen Anne was transferred from Oxford to Bolingbroke; on the 27th of July 1714 the former surrendered his staff as lord treasurer, and on the 1st August the queen died.

On the accession of George I. the defeated minister retired to Herefordshire, but a few months later his impeachment was decided upon and he was committed to the Tower on the 16th of July 1715. After an imprisonment of nearly two years the prison doors were opened in July 1717 and he was allowed to resume his place among the peers, but he took little part in public affairs, and died almost unnoticed in London on the 21st of May 1724. He married, in May 1685, Edith, daughter of Thomas Foley, of Witley Court, Worcester. She died in November 1691. His second wife was Sarah, daughter of Simon Middleton, of Edmonton. His son Edward (1689–1741), who succeeded to the title, married Henrietta (d. 1755), daughter and heiress of John Holles, duke of Newcastle; and his only child, a daughter Margaret (1715–1785), married William Bentinck, 2nd duke of Portland, to whom she brought Welbeck Abbey and the London property which she inherited from her mother. The earldom then passed to a cousin, Edward, 3rd earl (*c.* 1699–1755), and eventually became extinct with Alfred, the 6th earl (1809–1853).

Harley's statesmanship may seem but intrigue and finesse, but his character is set forth in the brightest colours in the poems of Pope and the prose of Swift. The Irish dean was his discriminating friend in the hours of prosperity, his unswerving advocate in adversity. The books and manuscripts which the 1st earl of Oxford and his son collected were among the glories of their age. The manuscripts became the property of the nation in 1753 and are now in the British Museum; the books were sold to a bookseller called Thomas Osborne in 1742 and described in a printed catalogue of five volumes (1743–1745), Dr Johnson writing an account of the library. A selection of the rarer pamphlets and tracts, which was made by William Oldys, was printed in eight volumes (1744–1746), with a preface by Johnson. The best edition is that of Thomas Park, ten volumes (1808–1813). In the recollection of the Harleian manuscripts, the Harleian library and the *Harleian Miscellany*, the family name will never die.

BIBLIOGRAPHY.—The best life of Harley is by E. S. Roscoe (1902). Articles relating to him are in *Engl. Hist. Rev.* xv. 238-250 (Defoe and Harley by Thomas Bateson); *Trans. of the Royal Hist. Soc.* xiv. N.S. 69-121 (development of political parties *temp.* Q. Anne by W. Frewen Lord); *Edinburgh Review*, clxxxvii. 151-178, cxciii. 457-488 (Harley papers). For his relations with St John see Walter Sichel's *Bolingbroke* (1901–1902, 2 vols.); for those with Swift, consult the *Journal to Stella* and Sir Henry Craik's *Life of Swift* (2nd ed., 1894, 2 vols.). (W. P. C.)

OXFORD, a city, municipal and parliamentary borough, the county town of Oxfordshire, England, and the seat of a famous university.[1] Pop. (1901) 49,336. It is situated on the river Thames, 51 m. by road and $63\frac{3}{4}$ m. by rail W.N.W. of London. It is served by the main northern line of the Great Western railway, and by a branch from the London & North-Western system at Bletchley; while the Thames, and the Oxford canal, running north from it, afford water communications. The ancient nucleus of the city stands on a low gravel ridge between the Thames and its tributary the Cherwell, which here flow with meandering courses and many branches and backwaters through flat meadows. Modern extensions of Oxford cross both rivers, the suburbs of Osney and Botley lying to the west, Grandpont to the south, and St Clement's to the east beyond the Cherwell. To the north is a large modern residential district. The low meadow land is bounded east and west by well-wooded hills, rising rather abruptly, though only to a slight elevation, seldom exceeding 500 ft. Several points on these hills command celebrated views, such as that from Bagley Hill to the S.W., or from Elsfield to the N.E., from which only the inner Oxford is visible, with its collegiate buildings, towers and spires—a peerless city.

Main roads from east to west and from north to south intersect near the centre of ancient Oxford at a point called Carfax,[2] and form four principal streets, High Street (east), Queen Street (west), Cornmarket Street (north) and St Aldate's (south).[3] Cornmarket Street is continued northward by Magdalen Street, and near their point of junction Magdalen Street is intersected by a thoroughfare formed, from west to east, by George Street, Broad Street, Holywell Street and Long Wall Street, the last of which sweeps south to join High Street not far from Magdalen Bridge over the Cherwell. This thoroughfare is thus detailed, because it approximately indicates the northern and north-eastern confines of the ancient city. The old walls indeed (of which there are many fragments, notably a very fine range in New College garden) indicate a somewhat smaller area than that defined by these streets. Their line, which slightly varied, as excavations have shown, in different ages, bent south-westward from Cornmarket Street, where stood the north gate, till it reached the enceinte of the castle, which lies at the west of the old city, flanked on one side by a branch of the Thames. From the castle the southern wall ran east, along the modern Brewers' Street; the south gate of the city was in St Aldate's Street, where it is joined by this lane, and the walls then continued along the north side of Christ Church meadow, and north-eastward to the east gate, which stood in High Street near the junction of Long Wall Street. Oxford had thus a strong position: the castle and the Thames protected it on the east; the two rivers, the walls and the water-meadows between them on the south and east; and on the north the wall and a deep ditch, of which vestiges may be traced, as between Broad and Ship Streets.

History.

An early rivalry between the universities of Oxford and Cambridge led to the circulation of many groundless legends respecting their foundation. For example, those which connected Oxford with "Brute the Trojan," King Mempric (1009 B.C.), and the Druids, are not found before the 14th century. The town is as a fact much older than the university. The historian, John Richard Green, epitomizes the relation between the two corporations when he shows[4] that "Oxford had already seen five centuries of borough life before a student appeared within its streets. . . . The university found Oxford a busy, prosperous borough, and reduced it to a cluster of lodging-houses. It found it among the first of English municipalities, and it so utterly crushed its freedom that the recovery of some of the commonest rights of self-government has only been brought about by recent legislation." A poor Romano-British village may have existed on the peninsula between Thames and Cherwell, but no Roman road of importance passed within 3 m. of it. In the 8th century an indication of the existence of Oxford is found in the legend of St Frideswide, a holy woman who is said to have died in 735, and to have founded a nunnery on the site of the present cathedral. Coins of King Alfred have been discovered (though not at Oxford) bearing the name Oksnaforda or Orsnaforda, which seems to prove the existence of a mint at Oxford. It is clear, at any rate, that Oxford was already important as a frontier town between Mercia and Wessex when the first unquestionable mention of it occurs, namely in the English Chronicle under the year 912, when Edward the Elder "took to himself" London and Oxford. The name points to a ford for oxen across the Thames, though some have connected the syllable "ox-" with a Celtic word meaning "water," comparing it with Ouse, Osney and Exford. The first mention of the townsmen of Oxford is in the English Chronicle of 1013, and that of its trade in the Abingdon Chronicle, which mentions the toll paid from the 11th century to the abbot of Abingdon by boats passing that town. Notices during that century prove the growing importance of Oxford. As the chief stronghold in the upper Thames valley it sustained various attacks by the Danes, being burned in 979, 1002 and 1010, while in 1013 Sweyn took hostages from it. It had also a considerable political importance, and several gemots were held here, as in 1015, when the two Danish thanes Sigfrith and Morkere were treacherously killed by the Mercian Edric; in 1020, when Canute chose Oxford as the scene of the confirmation of "Edgar's law" by Danes and English; in 1036, when Harold I. was chosen king, and in 1065. But Oxford must have suffered heavily about the time of the Conquest, for according to the Domesday Survey (which for Oxford is unusually complete) a great proportion of the "mansions" (106 out of 297) and houses (478 out of 721) were ruined or unoccupied. The city, however, had already a market, and under the strong hand of the Norman sheriff Robert d'Oili (*c.* 1070–1119) it prospered steadily. He made heavy exactions on the townsfolk, though it may be noted that they withheld from him Port Meadow, the great meadow of 440 acres which is still a feature of the low riverside tract north of Oxford. But d'Oili did much for Oxford, and the strong tower of the castle and possibly that of St Michael's church are extant relics of his building activity. His nephew, another Robert, who held the castle after him, founded in 1129 the most notable building that

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[1] See also UNIVERSITIES.

[2] This word, which occurs elsewhere in England, means a place where four roads meet. Its ultimate origin is the Latin *quadrifurcus*, four-forked. Earlier English forms are *carfuks*, *carrefore*. The modern French is *carrefour*.

[3] In the common speech of the university some streets are never spoken of as such, but, *e.g.*, as "the High," "the Corn" (*i.e.* Cornmarket), "the Broad." St Aldate's is pronounced St Olds, and the Cherwell (pronounced Charwell) is called "the Char."

[4] In his essay on "The Early History of Oxford," reprinted from *Stray Studies*, in *Studies in Oxford History*, by the Oxford Historical Society (1901).

Oxford has lost. This was the priory (shortly afterwards the abbey) of Osney, which was erected by the branch of the Thames next west of that by which the castle stands. In its finished state it had a splendid church, with two high towers and a great range of buildings, but only slight fragments may now be traced. About 1130 Henry I. built for himself Beaumont Palace, the site of which is indicated by Beaumont Street, and the same king gave Oxford its first known charter (not still extant), in which mention is made of a gild merchant. This charter is alluded to in another of Henry II., in which the citizens of Oxford and London are associated in the possession of similar customs and liberties. The most notable historical incident connected with the city in this period is the escape of the empress Matilda from the castle over the frozen river and through the snow to Abingdon, when besieged by Stephen in 1142.

It is about this time that an indication is first given of organized teaching in Oxford, for in 1133 one Robert Pullen is said to have instituted theological lectures here. No earlier facts are known concerning the origin of the university, though it may with probability be associated with schools connected with the ecclesiastical foundations of Osney and St Frideswide; and the tendency for Oxford to become a centre of learning may have been fostered by the frequent presence of the court at Beaumont. A chancellor, appointed by the bishop of Lincoln, is mentioned in 1214, and an early instance of the subordination of the town to the university is seen in the fact that the townsfolk were required to take oaths of peace before this official and the archdeacon. It may be mentioned here that the present practice of appointing a non-resident chancellor, with a resident vice-chancellor, did not come into vogue till the end of the 15th century. In the 13th century a number of religious orders, which here as elsewhere exercised a profound influence on education, became established in Oxford. In 1221 came the Dominicans, whose later settlement (*c.* 1260) is attested by Blackfriars Street, Preacher's Bridge and Friars' Wharf. In 1224 the Franciscans settled near the present Paradise Square. In the middle of the century the Carmelites occupied part of the present site of Worcester College, but their place here was taken by the Benedictines when, about 1315, they were given Beaumont by Edward II., and removed there. The Austin Friars settled near the site of Wadham College; for the Cistercians Rewley Abbey, scanty remains of which may be traced near the present railway stations, was founded *c.* 1280. During the same century the political importance of Oxford was maintained. Several parliaments were held here, notably the Mad Parliament of 1258, which enforced the enactment of the Provisions of Oxford. Again, the later decades of the 13th century saw the initiation of the collegiate system. Merton, University and Balliol were the earliest foundations under this system. The paragraphs below, dealing with each college successively, give the dates and circumstances of foundation for all. As to the relations between the university and the city, in 1248 a charter of Henry III. afforded students considerable privileges at the expense of townsfolk, in the way of personal and financial protection. Moreover, the chancellor already possessed juridical powers; even over the townsfolk he shared jurisdiction with the mayor. Not unnaturally these peculiar conditions engendered rivalry between "town and gown"; rivalry led to violence, and after many lesser encounters a climax was reached in the riot on St Scholastica's and the following day, February 10th and 11th, 1354/5. Its immediate cause was trivial, but the townsmen gave rein to their long-standing animosity, severely handled the scholars, killing many, and paying the penalty, for Edward III. gave the university a new charter enhancing its privileges. Others followed from Richard II. and Henry IV. A charter given by Henry VIII. in 1523 at the instigation of Wolsey conferred such power on the university that traders of any sort might be given its privileges, so that the city had no jurisdiction over them. In 1571 was passed the act of Elizabeth which incorporated and reorganized the universities of Oxford and Cambridge. In 1635 a charter of Charles I. confirmed its privileges to the university of Oxford, of which William Laud had become chancellor in 1630. Vestiges of these exaggerated powers (as distinct from the more equable division of rights between the two corporations which now obtains) long survived. For example, it was only in 1825 that the ceremony of reparation enforced on the municipality after the St Scholastica riots was discontinued.

During the reign of Mary, in 1555, there took place, on a spot in Broad Street, the famous martyrdom of Ridley and Latimer. Cranmer followed them to the stake in 1556, and the three are commemorated by the ornate modern cross, an early work of Sir G. G. Scott (1841), in St Giles Street beside the church of St Mary Magdalen. A period such as this must have been in many ways harmful to the university, but it recovered prosperity under the care of Elizabeth and Wolsey. During the civil war, however, Oxford, as a city, suddenly acquired a new prominence as the headquarters of the Royalist party and the meeting-place of Charles I.'s parliament. This importance is not incomparable with that which Oxford possessed in the Mercian period. However the frontier shifted, between the districts held by the king and by the parliament, Oxford was always close to it. It was hither that the king retired after Edgehill, the two battles of Newbury and Naseby; from here Prince Rupert made his dashing raids in 1643. In May 1644 the earl of Essex and Sir William Waller first approached the city from the east and south, but failed to enclose the king, who escaped to Worcester, returning after the engagement at Copredy Bridge. The final investment of the city, when Charles had lost every other stronghold of importance, and had himself escaped in disguise, was in May 1646, and on the 24th of June it surrendered to Fairfax. Throughout the war the secret sympathies of the citizens were Parliamentarian, but there was no conflict within the walls. The disturbances of the war and the divisions of parties, however, had bad effects on the university, being subversive of discipline and inimical to study; nor were these effects wholly removed during the Commonwealth, in spite of the care of Cromwell, who was himself chancellor in 1651–1657. The Restoration led to conflicts between students and citizens. Charles II. held the last Oxford parliament in 1681. James II.'s action in forcing his nominees into certain high offices at last brought the university into temporary opposition to the crown. Later, however, Oxford became strongly Jacobite. In the first year of George I.'s reign there were serious Jacobite riots, but from that time the city becomes Hanoverian in opposition to the university, the feeling coming to a head in 1755 during a county election, which was ultimately the subject of a parliamentary inquiry. But George III., visiting Oxford in 1785, was well received by both parties, and this visit may be taken as the termination of the purely political history of Oxford. Details of the history of the university may be gathered from the following description of the colleges, the names of which are arranged alphabetically.

Colleges.

All Souls College was founded in 1437 by Henry Chicheley (*q.v.*), archbishop of Canterbury, for a warden, 40 fellows, 2 chaplains, and clerks. The charter was issued in the name of Henry VI., and it has been held that Chicheley wished, by founding the college, to expiate his own support of the disastrous wars in France during the reign of Henry V. and the ensuing regency. Fifty fellowships in all were provided for by the modern statutes, besides the honorary fellowships to which men of eminence are sometimes elected. Some of the fellowships are held in connexion with university offices; but the majority are awarded on examination, and are among the highest honours in the university offered by this method. The only undergraduate members of the college are four bible-clerks,[1] so that the college occupies a peculiar position as a society of graduates. The college has its beautiful original front upon High Street; the first quadrangle, practically unaltered since the foundation, is one of the most characteristic in Oxford. The chapel has a splendid reredos occupying the whole eastern wall, with tiers of figures in niches. After the original figures had been destroyed during the Reformation the reredos was plastered over, but when the plaster was removed, Sir Gilbert Scott found enough remains to render it possible to restore the whole. The second quadrangle is divided from Radcliffe Square by a stone screen and cloister. From the eastern range of buildings twin towers rise in graduated stages. On the north side is the library. The whole is in a style partly Gothic, partly classical, fantastic, but not without dignity. The architect was Sir Christopher Wren's pupil, Nicholas Hawksmoor; the building was spread over the first half of the 18th century. The fine library originated in a bequest of Sir Christopher Codrington (d. 1710), and bears his name. One of the traditional customs surviving in Oxford is found at All Souls. Legend states that a mallard was discovered in a drain while the foundations were being dug. A song (probably Elizabethan) on this story is still sung at college gaudies, and later it is pretended to hunt the bird. With such a foundation as All Souls, a great number of eminent names are naturally associated (see Montagu Burrows, *Worthies of All Souls*, 1874).

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[1] Here and in some other colleges this title is connected with the duties of reading the Bible in chapel and saying grace in hall.

Balliol College is one of the earliest foundations. About 1263 John de Baliol (see BALIOL, family) began, as part of a penance, to maintain certain scholars in Oxford. Dervorguila, his wife, developed his work after his death in 1269 by founding the college, whose statutes date from 1282, though not brought into final form (apart from modern revision) until 1504. There are now twelve fellowships and fifteen scholarships on the old foundation. Two fellowships, to be held by members already holding fellowships of the college, were founded by James Hozier, second Lord Newlands, in 1906, in commemoration of Benjamin Jowett, master of the college. The buildings, which front upon Broad Street, Magdalen Street and St Giles Street, are for the most part modern, and mainly by Alfred Waterhouse, Anthony Salvin and William Butterfield. The college has a high reputation for scholarship. Its master and fellows possess the unique right of electing the visitor of the college. In 1887 Balliol College absorbed New Inn Hall, one of the few old halls which had survived till modern times. In the time of the civil wars a royal mint was established in it.

Brasenose College (commonly written and called B.N.C.) was founded by William Smith, bishop of Lincoln, and Sir Richard Sutton of Prestbury, Cheshire, in 1509. Its name, however, perpetuates the fact that it took the place of a much earlier community in the university. There were several small halls on its site, all dependent on other colleges or religious houses except one—Brasenose Hall. The origin of this hall is not known, but it existed in the middle of the 12th century. In 1334 certain students, wishing for peace from the faction-fights which were then characteristic of their life in Oxford, migrated to Stamford, where a doorway remains of the house then occupied by them as Brasenose Hall. From this an ancient knocker in the form of a nose, which may have belonged to the hall at Oxford, was brought to the college in 1890. It presumably gave name to the hall, though a derivation from *brasinium* (Latin for a brew-house) was formerly upheld. The original foundation of the college was for a principal and twelve fellows. This number is maintained, but supernumerary fellowships are added. Of a number of scholarships founded by various benefactors several are confined to certain schools, notably Manchester Grammar School. William Hulme (1691) established a foundation which provides for twelve scholars and a varying number of exhibitioners on entrance, and also for eight senior scholarships open under certain conditions to members of the college already in residence. The main front of the college faces Radcliffe Square; the whole of this and the first quadrangle, excepting the upper storey, is of the time of the foundation; and the gateway tower is a specially fine example. The hall and the chapel, with its fine fan-tracery roof, date from 1663 and 1666, and are attributed to Sir Christopher Wren. In both is seen a curious attempt to combine Gothic and Grecian styles. Modern buildings (by T. G. Jackson) have a frontage upon High Street. Robert Burton, author of *The Anatomy of Melancholy*, became an undergraduate of the college in 1593; Reginald Heber in 1800; Walter Pater became a fellow in 1864.

Christ Church, in point of the number of its members the largest collegiate foundation in Oxford, is also eminent owing to its unique constitution, the history of which involves that of the see of Oxford. Mention has been made of the priory of St Frideswide and its very early foundation, also of the later but more magnificent foundation of Osney Abbey. Both of these were involved in the sweeping changes initiated by Wolsey and carried on by Henry VIII. Wolsey projected the foundation of a college on an even grander scale than that of the present house. In 1524–1525 he obtained authority from Pope Clement VII. to suppress certain religious houses for the purpose of this new foundation. These included St Frideswide's, which occupied part of the site which Wolsey intended to use. The new college, under the name of Cardinal College, was licensed by the king in 1525. Its erection began immediately. The monastic buildings were in great part removed. Statutes were issued and appointments were made to the new offices. But in 1529 Wolsey fell from power. Cardinal College was suppressed, and in 1532 Henry VIII. established in its place another college, on a reduced foundation, called King Henry VIII.'s College. Oxford had been, and was at this time, in the huge diocese of Lincoln. But in 1542, on the suppression of Osney Abbey, a new see was created, and the abbey church was made its cathedral. This arrangement obtained only until 1545, when both the new cathedral church and the new college which took the place of Wolsey's foundation were surrendered to the king. In 1546 Henry established the composite foundation which now (subject to certain modern alterations) exists. He provided for a dean and eight canons and 100 students, to which number one was added in 1664. The church of St Frideswide's foundation became both the cathedral of the diocese and the college chapel. The establishment was thus at once diocesan and collegiate,[1] and it remains so, though now the foundation consists of a dean, six canons, and the usual cathedral staff, a reduced number of students (corresponding to the fellows of other colleges) and scholars. Five of the canons are university professors. The disciplinary administration of the collegiate part of the foundation is under the immediate supervision of two students who hold the office of censors. Queen Elizabeth established the connexion with Westminster School by which not more than three scholars are elected thence each year to Christ Church. There is also a large number of valuable exhibitions. The great number of eminent men associated with Christ Church can only be indicated here by the statement that its books have borne the names of several members of the British and other royal families, including that of King Edward VII. as prince of Wales and of Frederick VIII. of Denmark as crown prince; also of ten prime ministers during the 19th century. The stately front of Christ Church is upon St Aldate's Street. The great gateway is surmounted by a tower begun by Wolsey, but only completed in 1682 from designs of Sir Christopher Wren. Though somewhat incongruous in detail, it is of singular and beautiful form, being octagonal and surmounted by a cupola. It contains the great bell "Tom" (dedicated to St Thomas of Canterbury), which, though recast in 1680, formerly belonged to Osney Abbey. A clock strikes the hours on it, and at five minutes past nine o'clock in the evening it is rung 101 times by hand, to indicate the hour of closing college gates, the number being that of the former body of students. The gate, the tower, and the first quadrangle are all commonly named after this bell. Tom Quadrangle is the largest in Oxford, and after various restorations approximates to Wolsey's original design, though the cloisters which he intended were never built. On the south side lies the hall, entered by a staircase under a magnificent fan-tracery roof dating from 1640. The hall itself is one of the finest refectories in England; its roof is of ornate timberwork (1529) and a splendid series of portraits of eminent *alumni* of the house adorn the walls, together with Holbein's portraits of Henry VIII. and Wolsey. With the hall is connected the great kitchen, the first building undertaken by Wolsey. An entry through the eastern range of Tom Quadrangle forms the west portal of the Cathedral Church of Christ.

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[1] As a whole it is therefore properly to be spoken of as Christ Church, not Christ Church College. In the common speech of the university it has become known as The House, though all the colleges are technically "houses."

The cathedral, of which the nave and choir serve also as the college chapel, is the smallest English cathedral, but is of high architectural interest. The plan is cruciform, with a northward extension from the north choir aisle, comprising the Lady chapel and the Latin chapel. It has been seen that probably in the 8th century St Frideswide founded a religious house. In the east end of the north choir aisle and Lady chapel may be seen two blocked arches, rude, narrow and low. Excavations outside the wall in 1887 revealed the foundations of three apses corresponding with these two arches and another which has been traced between them, and in this wall, therefore, there is clearly a remnant of the small Saxon church, with its eastward triple-apsidal termination. In 1002 there took place the massacre of the Danes on St Brice's day at the order of Æthelred II. Some Danes took refuge in the tower of St Frideswide's church, which was fired to ensure their destruction. In 1004 the king undertook the rebuilding of the church. There is full reason to believe that he had assistance from his brother-in-law, Richard II., duke of Normandy, and that much of his work remains, notably in some of the remarkable capitals in the choir. About 1160, however, there was an extensive Norman restoration. The arcades of the choir and of the nave, which was shortened by Wolsey for the purpose of his collegiate building, have massive pillars and round arches. Within these arches, not, as usual, above them, a blind arcade forms the triforium, and below this a lower set of arches springs from the outer side of the main pillars. The Norman stone-vaulted aisles conform in height with these lower arches. Over all is a clerestory with passage. The east end is a striking Norman restoration by Sir Gilbert Scott, consisting of two windows and a rose window above them, with an intervening arcade. The choir has a Perpendicular fan-tracery roof in stone, one of the finest extant, and the early clerestory is here altered to conform with this style. The nave roof is woodwork of the 16th century, and there is a fine Jacobean pulpit. The lower part of the tower, with internal arcades in the lantern, is Norman; the upper stage is Early English, as is the low spire, possibly the earliest built in England. St Lucy's chapel in the south transept aisle contains a rich flamboyant Decorated window. In the north choir aisle are the fragments which have been discovered and roughly reconstructed of St Frideswide's shrine, of marble, with foliage beautifully carved, representing plants symbolical of the life of the saint. The Latin chapel is of various dates, but mainly of the 14th century. The north windows contain contemporary glass; the east window is a rich early work of Sir E. Burne-Jones, set in stonework of an inharmonious Venetian design. There are other beautiful windows by Burne-Jones at the east ends of the aisles and Lady chapel, and at the west end of the south nave aisle. The corresponding window of the north aisle is a curious work by the Dutch artist Abraham van Ling (1630). There are many fine ancient monuments, notably those of Bishop Robert King (d. 1557), and of Lady Elizabeth Montacute (d. 1355). The so-called watching-chamber for St Frideswide's shrine is a rich structure in stone and wood dating from *c.* 1500. The peculiar arrangement of the collegiate seats in the cathedral, the nave and choir being occupied by modern carved pews or stalls running east and west, and the position of the organ on a screen at the west end, add to the distinctive interior appearance of the building. Small cloisters adjoin the cathedral on the south, and an ornate Norman doorway gives access from them to the chapter-house, a beautiful Early English room. Above the cloisters on the south rises the "old library," originally the monastic refectory, which has suffered conversion into dwelling and lecture-rooms.

To the north-east of Tom Quadrangle is Peckwater Quadrangle, named from an ancient hall on the site, and built from the design of the versatile Dean Henry Aldrich (1705) with the exception of the library (1716–1761), which forms one side of it. The whole is classical in style. The library contains some fine pictures by Cimabue, Holbein, Van Dyck and others, and sculpture by Rysbrack, Roubillac, Chantrey and others. The small Canterbury Quadrangle, to the east, was built in 1773–1783, and marks the site of Canterbury College or Hall, founded by Archbishop Islip in 1363, and absorbed in Henry VIII.'s foundation. To the south of the hall and old library are the modern Meadow Buildings (1862–1865), overlooking the beautiful Christ Church Meadows, whose avenues lead to the Thames and Cherwell.

Corpus Christi College (commonly called Corpus) was founded in 1516 by Richard Fox, bishop of Winchester (1500–1528). He at first intended his foundation to be a seminary connected with St Swithin's priory at Winchester, but Hugh Oldham, bishop of Exeter, foresaw the dissolution of the monasteries and advised against this. Fox had especially in view the object of classical education, and his foundation, besides a president, 20 fellows and 20 scholars, included 3 professors—in Greek, Latin and theology—whose lectures should be open to the whole university. This arrangement fell into desuetude, but was revived in 1854, when fellowships of the college were annexed to the professorial chairs of Latin and jurisprudence. The foundation now consists of a president, 16 fellows, 26 scholars and 3 exhibitioners. The college has its front upon Merton Street. The first quadrangle, with its gateway tower, is of the period of the foundation, and the gateway has a vaulted roof with beautiful tracery. In the centre of the quadrangle is a curious cylindrical dial in the form of a column surmounted by a pelican (the college symbol), constructed in 1581 by Charles Turnbull, a mathematician who entered the college in 1573. The hall has a rich late Perpendicular roof of timber; the chapel, dating from 1517, contains an altar-piece ascribed to Rubens, and the small library includes a valuable collection of rare printed books and MSS. The college retains its founder's crozier, and a very fine collection of old plate, for the preservation of which it is probable that Corpus had to pay a considerable sum in aid of the royalist cause. Behind the main quadrangle are the classical Turner buildings, erected during the presidency of Thomas Turner (1706), from a design attributed to Dean Aldrich. The picturesque college garden is bounded by the line of the old city wall. There are modern buildings (1885) by T. G. Jackson on the opposite side of Merton Street from the main buildings. Among the famous names associated with the college may be mentioned those of four eminent theologians—Reginald Pole, afterwards cardinal (nominated fellow in 1523), John Jewel, bishop of Salisbury (fellow 1542–1553), Richard Hooker (scholar, 1573) and John Keble (scholar, 1806). Thomas Arnold, the famous headmaster of Rugby school, was a scholar of the college (1811).

Exeter College was founded, as Stapeldon Hall, by Walter Stapeldon, bishop of Exeter, in 1314, but by the middle of the century it had become known as Exeter Hall. The foundation was extended by Sir William Petre in 1565. Stapeldon's original foundation for 12 scholars provided that 8 of them should be from Devonshire and 4 from Cornwall. There are still 8 "Stapeldon" scholarships confined to persons born or educated within the diocese of Exeter. The foundation consists of a rector, 12 fellowships and 21 scholarships or more. There are also a number of scholarships and exhibitions on private foundations, several of which are limited in various ways, including 3 confined to persons born in the Channel Islands or educated in Victoria College, Jersey, or Elizabeth College, Guernsey. The college has its front, which is of great length, upon Turl[1] Street. It has been extensively restored, and its gateway tower was rebuilt in 1703, while the earliest part of the quadrangle is Jacobean, the hall being an excellent example dating from 1618. The chapel (1857–1858) is an ornate structure by Sir Gilbert Scott; it is in Decorated style, of great height, with an eastern apse, and has some resemblance to the Sainte Chapelle in Paris. The interior contains mosaics by Antonio Salviati and tapestry by Sir E. Burne-Jones and William Morris. Scott's work is also seen in the frontage towards Broad Street, and in the library (1856). The college has a beautiful secluded garden between its own buildings and those of the divinity school or Bodleian library.

Hertford College, in its present form, is a modern foundation. There were formerly several halls on the site, and some time between 1283 and 1300 Elias of Hertford acquired one of them, which became known as Hert or Hart Hall. In 1312 it was sold to Bishop Stapeldon, the founder of Exeter, and was occupied by his scholars for a short time. Again, some of William of Wykeham's scholars were lodged here while New College was building. The dependence of the hall on Exeter College was maintained until the second half of the 16th century. In 1710

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[1] "The Turl" takes its name from a postern (Turl or Thorold Gate) in the city wall, to which the street led.

Richard Newton, formerly a Westminster student of Christ Church, became principal, and in 1740, in spite of opposition from Exeter, he obtained a charter establishing Hertford as a college. The foundation, however, did not prosper, and by an inquisition of 1816 it was declared to have lapsed in 1805. With part of its property the university was able to endow the Hertford scholarship in 1834. Magdalen Hall, which had become independent of the college of that name in 1602, acquired the site and buildings of the dissolved Hertford College and occupied them, but was itself dissolved in 1874, when its principal and scholars were incorporated as forming the new Hertford College. An endowment was provided by Thomas Charles Baring, then M.P. for South Essex, for 15 fellows and 30 scholars, 7 lecturers and dean and bursar. The foundation now consists of a principal, 17 fellows and 40 scholars. Of the college buildings, which face those of the Bodleian library and border each side of New College Lane, no part is earlier than Newton's time. Modern buildings by T. G. Jackson (1903) incorporate remains of the little early Perpendicular chapel of Our Lady at Smith Gate (incorrectly called St Catherine's), which probably stood on the outer side of the town ditch. There is a striking modern chapel.

Jesus College has always had an intimate association with Wales. Queen Elizabeth figures as its foundress in its charter of 1571, but she was inspired by Hugh ap Rice (Price), a native of Brecon, who endowed the college. The original foundation was for a principal, 8 fellows and 8 scholars. It now consists of a principal and not less than 8 or more than 14 fellows, and there are 24 foundation scholarships, besides other scholarships and exhibitions, mainly on the foundation of Edmund Meyricke, a native of Merionethshire, who entered the college in 1656 and was a fellow in 1662. Not only his scholarships but others also are restricted (unless in default of suitable candidates) to persons born or educated in Wales, or of Welsh parentage. At Jesus, as at Exeter, there are also some "King Charles I." scholarships for persons born or educated in the Channel Islands. The college buildings face Turl Street; the front is an excellent reconstruction of 1856. The chapel dates from 1621, the hall from about the same time, and the library from 1677, being erected at the expense of the eminent principal (1661–1673) Sir Leoline Jenkins. He and his predecessor, Sir Eubule Thelwall (1621–1630), were prominent in raising the college from an early period of depression.

Keble College is modern; it received its charter in 1870. It was erected by subscription as a memorial to John Keble (*q.v.*). Its stated object was to provide an academical education combined with economical cost in living and a "training based upon the principles of the Church of England." The college is governed by a warden (who has full charge of the internal administration) and a council. There is a staff of tutors, and a number of scholarships and exhibitions on private foundations. The buildings lie somewhat apart from other collegiate buildings towards the north of the city, facing the university parks, which extend from here down to the river Cherwell. They are from the designs of William Butterfield, and are principally in variegated brick. The chapel has an elaborate scheme of decoration in mosaic; and the library contains a great number of books collected by Keble, and Holman Hunt's picture, "The Light of the World."

Lincoln College was founded in 1427 by Richard Flemyng, bishop of Lincoln. It was an outcome of the reaction against the doctrines of Wycliffe, of which the founder of the college, once their earnest supporter, was now an equally earnest opponent. He died (1431) before his schemes were fully carried out, and the college was struggling for existence when Thomas Rotherham, while bishop of Lincoln and visitor of the college, reconstituted and re-endowed it in 1478. The foundation consists of a rector, 12 fellows and 14 scholars. The buildings face Turl Street. The hall dates from 1436, but its wainscoting within was added in 1701. The chapel, in the back quadrangle, is an interesting example of Perpendicular work of very late date (1630). The interior is wainscoted in cedar, and the windows are filled with Flemish glass introduced at the time of the building. There is a modern library building in a classic Jacobean style, completed in 1906; the collection of books was originated by Dean John Forest, who also built the hall. Among the eminent associates of this college was John Wesley, fellow 1726–1751.

Magdalen College (pronounced *Maudlen*; in full, St Mary Magdalen) was founded in 1458 by William of Waynflete, bishop of Winchester and lord chancellor of England. In 1448 he had obtained the patent authorizing the foundation of Magdalen Hall. In the college he provided for a president, 40 fellows, 30 demies,[1] and, for the chapel, chaplains, clerks and choristers. To the college he attached a grammar-school with a master and usher. The foundation now consists of a president, from 30 to 40 fellowships, of which 5 are attached to the Waynflete professorships in the university,[2] senior demies up to 8 and junior demies up to 35 in number. The choir, &c., are maintained, and the choral singing is celebrated. In order to found his college, Waynflete acquired the site and buildings of the hospital of St John the Baptist, a foundation or refoundation of Henry III. for a master and brethren, with sisters also, for "the relief of poor scholars and other miserable persons." The Magdalen buildings, which are among the most beautiful in Oxford, have a long frontage on High Street, while one side rises close to or directly above a branch of the river Cherwell. The chief feature of the front is the bell-tower, a structure which for grace and beauty of proportion is hardly surpassed by any other of the Perpendicular period. It was begun in 1492, and completed in about thirteen years. From its summit a Latin hymn is sung at five o'clock on May-day morning annually. Various suggestions have been made as to the origin of this custom; it may have been connected with the inauguration of the tower, but nothing is certainly known. The college is entered by a modern gateway, giving access to a small quadrangle, at one corner of which is an open pulpit of stone. This was connected with the chapel of St John's Hospital, which was incorporated in the front range of buildings. Adjoining this is the west front of the college chapel.[3] This chapel was begun in 1474, but has been much altered, and the internal fittings are in the main excellent modern work (1833 seq.). At the north-west corner of the entrance quadrangle is a picturesque remnant of the later buildings of Magdalen Hall. To the west is the modern St Swithun's quadrangle, the buildings of which were designed by G. F. Bodley and T. Garner, and begun in 1880, and to the west again a Perpendicular building erected for Magdalen College school in 1849. To the east lies the main quadrangle, called the cloister quadrangle, from the cloisters which surround it. These have been in great part reconstructed, but in accordance with the plan of the time of the foundation. Above the west walk rises the beautiful "founder's" tower, low and broad. On this side also is the valuable library. The south walk is bounded by the chapel and the hall, which lie in line, adjoining each other. The hall is a beautiful room, improved in 1906 by the substitution of an open timber roof for one of plaster erected in the 18th century. The panelling dates mainly from 1541; there is a tradition that the part at the west end came from the dissolved Reading Abbey. A curious series of figures which surmount the buttresses on three sides of the cloisters date from 1508–1509. Some are apparently symbolical, others scriptural, others again heraldic. To the north of the cloister quadrangle (a garden with broad lawns intervening) stand the so-called New Buildings, a massive classical range (1733). To the north and west of these extends the Grove or deer park, where the first deer were established probably *c.* 1720; to the east, across a branch of the Cherwell, is the meadow surrounded by Magdalen Walks, part of which is called Addison's Walk after Joseph Addison (demy and fellow). Perhaps the most notable period in the history of the college is that of 1687–1688, when the fellows resisted James II.'s attempt to force a president upon them, in place of their own choice, John Hough (1651–1743), successively bishop of Oxford,

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[1] Singular *demy*, the last syllable accented. They correspond to the scholars of other colleges. The name is derived from the fact that their allowance was originally half (demi-) that of fellows.

[2] Waynflete himself had founded three readerships, in natural and moral philosophy and in theology.

[3] It actually faces about N.W.; the same deviation applies to other buildings described.

Lichfield, and Worcester. Cardinal Wolsey was a fellow of the college about the time when the bell-tower was building, but the attribution of the design to him, or even of any active part in the erection, is not borne out by evidence. Among *alumni* of the college were William Camden, Sir Thomas Bodley, John Hampden, at the time of whose matriculation (1610) Magdalen was strongly Puritan, Joseph Addison, Dr Sacheverell, and for a short period Gibbon the historian. Mention should be made of the eminent president, Martin Joseph Routh, who was elected to the office in 1791, and held it till his death in his 100th year in 1854. Magdalen College school had new buildings opened for it in 1894.

Merton College is of peculiar interest as regards its foundation, which is generally cited as the first on the present collegiate model. At some time before 1264 Walter de Merton,[1] a native of Merton, Surrey, devoted estates in that county to the maintenance of scholars in Oxford. Thus far he followed an established practice. In 1264 he founded at Malden a " house of scholars of Merton " for those who controlled the estates in the interest of the scholars, who should study preferably at Oxford, though any centre of learning was open to them. By 1268 the Oxford community had acquired the present site of the college; in 1270 new statutes laid down rules of living and study, and in 1274 the whole foundation was established under a final set of statutes at Oxford—*i.e.* the society ceased to be administered from the house in Surrey. The society was under a warden, and certain other officers were established, but no limit was set on the number of scholars. The foundation now consists of a warden, from 19 to 26 fellows, and 20 or more postmasterships. The postmasters of Merton correspond to the scholars of other colleges; they had their origin in the *portionistae* (*i.e.* foundationers who had a smaller portion or emolument than fellows), instituted in 1380 on the foundation of John Wyllyot (fellow 1334, chancellor 1349). The college is adjacent to Corpus, with its front upon Merton Street, and some of its buildings are of the highest interest, notably the chapel and library. The chapel consists of a choir and transepts with a tower at the crossing; but a nave, though intended, was never built. The choir is of the purest Decorated workmanship (dating probably from the last decade of the 13th century), with beautiful windows exhibiting most delicate tracery. The transepts show the appearance of Perpendicular work, but there is also work of the earlier style in them; the massive tower is wholly of the later period (*c.* 1450). The library, which lies on two sides of the so-called " mob " quadrangle, dates from 1377–1378, and was mainly the gift of William Rede, bishop of Chichester (1369–1386). It occupies two beautiful rooms and is of great interest from its early foundation and the preservation of its ancient character. The treasury is a small room coeval with the foundation, with a curious high-pitched ashlar roof. The other buildings, which are of various dates, are mainly disposed about four quadrangles, including that of St Alban's Hall, which, possibly dating from the early part of the 15th century, was incorporated with Merton College in 1882. The college hall retains an original door with fine ironwork, but the building is in great part modernized. A beautiful garden lies east of the buildings, being separated from the meadows to the south by part of the old city wall. Modern buildings (1907) have a frontage upon Merton Street; others (1864) overlook the meadows. Traditionally the names of Roger Bacon, Duns Scotus and Wycliffe have been associated with this college. Anthony Wood (1632–1695), the antiquary and historian of the university, was a postmaster of the college.

New College was founded by William of Wykeham in 1379. The founder's name for it, which it still bears in its corporate title, is the College of St Mary of Winchester. But there was already a St Mary's College (Oriel). Wykeham's house thus soon became known as the New College, and the substantive is still retained in the ordinary speech of the university, whereas in mentioning the titles of other colleges it is generally omitted. Wykeham designed an exclusive connexion between his Oxford college and his school at Winchester. This connexion is maintained in a modified form. Wykeham's foundation was for a warden, and 70 fellows and scholars, with chaplains and a choir. The present foundation consists of a warden, and not more than 36 fellows, while to the scholarships 6 elections are made annually from Winchester and 4 from elsewhere. The choir is maintained, as at Magdalen. Five of the fellowships were attached to university professorships, of which three (logic, ancient history and physics) are called Wykeham professorships. The buildings of New College remain in great measure as designed by the founder, and illustrate the magnificence of his scheme. The main gateway tower fronts New College Lane. The chapel and hall stand in line (as at Magdalen), on the north side of the front quadrangle. The period of building was that of the development of the Perpendicular style. In shape the chapel was the prototype of a form common in Oxford, consisting of a choir, with transepts forming an antechapel, but with no nave. The remarkable west window in monochrome was erected, *c.* 1783, from a design by Sir Joshua Reynolds. The reredos, with its tiers of figures in niches, had a history similar to that at All Souls, being plastered over in 1567. In the same way, too, it was restored *c.* 1890; but previously James Wyatt had discovered traces of the original, and had unsuccessfully attempted the restoration of the niches in plaster, carrying out also, as elsewhere in Oxford, other extensive alterations of which the obliteration was demanded by later taste. Portions of the old woodwork were incorporated in the excellent new work of 1879 (Sir Gilbert Scott). In the chapel is preserved the beautiful pastoral staff of the founder, and there is a fine series of memorial brasses, mainly of the 15th century, in the antechapel. To the west of the chapel are the cloisters, consecrated in 1400, and the detached tower, a tall massive building on the line of the city wall. As already mentioned, a fine remnant of this wall adds to the picturesqueness of the college garden. The hall was completed in 1368, and has a Tudor screen and wainscoting. The garden quadrangle, the east side of which is open to the gardens, dates from 1682–1708. On the north side of the college precincts, facing Holywell Street, are extensive modern buildings by Sir G. G. Scott and B. Champneys. In 1642, when Oxford was playing its prominent part in the Civil War, the tower and cloisters of New College became a royalist magazine.

Oriel College was founded by Edward II. in 1326. The originator of the scheme and the prime mover in it was Adam de Brome, the king's almoner, who in 1324 had obtained royal licence to found a college; but in 1326 he surrendered his rights to the king, who issued charter and statutes, and created Brome the first provost. This foundation was for a provost and 10 fellows, but a number of bequests extending over nearly a century from 1445 enabled additional fellowships to be established. The foundation, however, now consists of the provost, 12 fellows and 2 professorial fellows, with at least 12 scholars and a number of exhibitioners. St Mary Hall, which had been the manse of St Mary's church, was given with the church to the college by the founder, and was opened as a hall with a principal of its own. It was, however, incorporated with the college in 1902. Oriel College was dedicated to St Mary the Virgin, and the name by which it is now known appears first in 1349. It was derived from a tenement called La Oriole (but the origin of this name is unknown), which had occupied part of the college site, had belonged to Eleanor of Provence, wife of Edward I., and had been given by her to her chaplain, James of Spain (Jacobus de Ispania). The buildings of Oriel, which face Oriel Street, are not coeval with the foundation. The first quadrangle, with its elaborate battlements, dates from 1620–1637. The inner quadrangle has buildings of 1719, 1729 and later dates. The modern extension on Cecil Rhodes's foundation faces High Street. Early in the 19th century a number of eminent men associated with Oriel gave the college its well-known connexion with the "Oxford Movement." Edward Copleston, elected fellow in 1795, became provost in 1814. In 1811 John Keble and Richard Whately were elected fellows, the one from Corpus; the other had been at Oriel. Again in 1815 Thomas Arnold, afterwards headmaster of Rugby, was elected from Corpus, with Renn Dickson Hampden of Oriel. Later fellows were John Henry Newman (1822) and Edward Pusey (1823). James Anthony Froude entered the college in 1835; Matthew Arnold became a fellow in 1845. Cecil John Rhodes matriculated in 1873, and, besides his foundation of Rhodes scholarships, made a large bequest to the college.

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[1] He was chancellor of the kingdom in 1261–1263, and again in 1272–1274, justiciar in 1271 and bishop of Rochester in 1274. He died in 1277.

Pembroke College was founded in 1624. Thomas Tesdale (1547–1609) of Glympton, Oxfordshire, left money for the support of scholars in Oxford, indicating Balliol College as his preference, but not insisting on this. Richard Wightwick (d. 1630), rector of East Ilsley, Berkshire, added to Tesdale's bequest, and though Balliol College desired to benefit by it, James I. preferred to figure as the founder of a new college with these moneys. Pembroke, which was named after William Herbert, earl of Pembroke, then chancellor of the university, was thus developed out of Broadgates Hall, which had long been eminent as the residence of students in law. The original college foundation was for a master, 10 fellows and 10 scholars, but a number of scholarships and exhibitions has been added by benefactors. Of the scholarships some are awarded by preference to candidates possessing certain qualifications, notably that of education at Abingdon school, which Tesdale intended to benefit by his bequest. The buildings of Pembroke lie south and west of St Aldate's Church, opposite Christ Church; they surround two picturesque quadrangles, but are in great part modern. The college preserves some relics of Samuel Johnson, who entered it in 1728.

Queen's College was founded in 1340–1341 by Robert de Eglesfield, chaplain of Philippa, queen-consort of Edward III., and was named in her honour. Her son, Edward the Black Prince, was entered on the books of the college, and Henry V. received education here. Several queens were among the benefactors of the college—Henrietta Maria, Caroline, Charlotte. The queen-consort is always the patroness of the college. The foundation consists of a provost, from 14 to 16 fellows, and about 25 scholars. There was formerly an intimate connexion between this college and the north of England. Five scholarships, called Eglesfield scholarships, are now given by preference to natives of Cumberland or Westmorland, and the Hastings exhibitions founded by Lady Elizabeth Hastings (1682–1739) are open only to candidates from various schools in these counties and in Yorkshire. This connexion dates from the foundation. Eglesfield (d. 1349) was probably a native of Eaglesfield in Cumberland, and provided that the 12 fellows or scholars of his foundation were preferably to be natives of this county or Westmorland. During the time of Wycliffe, who while rector of Lutterworth resided for two years in the college, the foundation was by a ruling of the visitor (the archbishop of York) actually confined to the two counties mentioned, and so remained until 1854. The buildings date mainly from the close of the 17th century and the beginning of the 18th. They front High Street with a massive classical screen, flanked by the ends of the east and west ranges of buildings of the front quadrangle, and surmounted in the centre by a statue of Queen Caroline under a cupola. The buildings are the work of Sir Christopher Wren and Nicholas Hawksmoor. The library contains a valuable collection, especially of historical works, and is fitted with wood-carving by Grinling Gibbons. There is also here an interesting contemporary statue in wood of Queen Philippa. The chapel retains several medieval windows from the former Gothic chapel, and some stained glass painted by Abraham van Ling (1635). The college preserves two early customs—on Christmas day a dinner is held at which a boar's head is carried in state into the hall, and an appropriate ancient carol is sung; and on New Year's day a threaded needle, with the motto "Take this and be thrifty," is presented to members in the college hall. The origin of this custom is traced to a rebus on the founder's name—*aiguille et fil* (needle and thread).

St John's College was founded in 1555 by Sir Thomas White, Kt., alderman of London (1492–1567). It occupied the site of a house for Cistercian students in the university, founded by Archbishop Chicheley in 1437 and dedicated to St Bernard of Clairvaux. White's foundation was originally for a president, 50 fellows and scholars, and a chaplain, choir, &c., for the chapel. White established the intimate connexion which still exists between his college and the Merchant Taylors' school in London, in the foundation of which, as a prominent officer in the Merchant Taylors' Company, he had a share. The college foundation now consists of a president, from 14 to 18 fellowships, not less than 28 scholarships, of which 15 are appropriated to Merchant Taylors' school, and 4 senior scholarships, similarly appropriated. The buildings incorporate some of Chicheley's work, as in the front upon St Giles's Street, with its fine gateway. Similarly, in the front quadrangle, the hall and chapel belonged to the house of St Bernard, though subsequently much altered. A passage with a rich fan-traceried roof gives access from the front to the back quadrangle, on the south and east sides of which is the library. The south wing dates from 1596, the east from 1631. The latter is of the greater interest; it was built at the charge of William Laud, and the designs have been commonly attributed to Inigo Jones. The north and west sides of the quadrangle, of the same period, have cloisters. The union of the classical style, which predominates here, with the characteristic late Perpendicular of the period, makes this quadrangle architecturally one of the most interesting in Oxford, as the college gardens, which its east front overlooks, are among the most picturesque. The most notable period of the history of the college is associated with Laud, who entered the college in 1589, was elected a fellow in 1593, became president in 1611 and chancellor of the university in 1629. Relics of him are preserved in the library, and he is buried in the chapel, together with White, the founder, and William Juxon, president 1621–1633, and afterwards archbishop of Canterbury.

Trinity College was founded in 1555 by Sir Thomas Pope, Kt. (d. 1559), of Tittenhanger, Hertfordshire. He acquired and used for his college the ground and buildings of Durham College, the Oxford house of Durham Abbey, originally founded in the 13th century (see DURHAM, city). Trinity is therefore one of the instances of collegiate foundation forming a sequel to the dissolution of the monasteries, for Durham had been surrendered in 1540. Pope's foundation provided for a president, 12 fellows and 12 scholars. There are now 16 scholarships and a number of exhibitions. There are also some scholarships in natural science, on the foundation (1873) of Thomas Millard, whose bequest also provides for a lecturer and laboratory. The front quadrangle of Trinity lies open to Broad Street; on its east side are modern buildings (by T. G. Jackson, 1887), on the north, the president's house and the chapel in a classic style, dating from 1694. It contains a rich alabaster tomb of Pope, the founder, and his third wife, and has a fine carved screen and altar-piece by Grinling Gibbons. The remainder of the buildings, forming two small quadrangles north of the chapel, includes parts of the old Durham college, but these have been much altered. Gardens extend to the east. John Henry Newman was a commoner of this college; Edward Augustus Freeman, the historian, and William Stubbs, bishop of Oxford, were among its fellows.

University College (commonly abbreviated Univ.) has claimed to find its origin in a period far earlier than that to which the earliest historical notice of the university itself can be assigned. In a petition to Richard II., respecting a dispute as to property the members of the "mickel universitie hall in Oxford" quote King Alfred as the founder of the house, for 26 divines. The date of 872 was claimed, and in 1872 a millenary celebration was held by the college. Moreover, in 1727 a dispute as to the mastership of the college led to an appeal to the Court of King's Bench to determine the right of visitation, and it was found that this right rested with the crown (as it now does) on the ground of the foundation by Alfred. Leaving tradition, however, it is found that William of Durham, archdeacon of Durham, dying in 1249, bequeathed money to the university to support masters at Oxford. In 1253 the university acquired its first tenement on this bequest; further acquisitions followed; and in 1280 an inquiry was held as to the disposition of the bequest, and statutes were issued to the society on Durham's foundation, the university finding it necessary to make provision for its individual governance. This intimate connexion between the university and the early development of a college has no parallel, and to it the college owes its name. The college, as it may now be called, developed slowly, further statutes being found necessary in 1292 and 1311; unlike other foundations which were established, with a definite code of statutes from the outset, by individual founders. It is possible, however, to maintain that the founders of Merton and Balliol were influenced in their work by that of William of Durham. The foundation consists of a master, 13 fellows and 16 scholars, and there are a large number of exhibitions. The buildings have a long frontage upon High Street. The oldest part of the buildings was begun in 1634. The chapel, built not long after, was altered in Decorated style by Sir Gilbert Scott, but contains fine woodwork of 1694, and windows by Abraham van Ling (1641). The old library dates from 1668–1670, but a new library was built by Scott, in Decorated style, and contains great statues of Lord Eldon and Lord Stowell, members of the college, the design of which was by Sir Francis Chantrey. The hall dates from 1657, but has been greatly altered. The extension of the college has necessitated that of its buildings in modern times. A chamber built for the purpose contains a statue, by Onslow Ford, of Percy Bysshe Shelley, presenting him lying drowned. The poet entered the college in 1810.

Wadham College was founded in 1612[1] by Nicholas Wadham (d. 1609) of Merifield, near Ilminster, Somersetshire, and Dorothy his wife, who as his executrix carried out his plans. The original foundation consisted of a warden, 15 fellows, 15 scholars, with 2 chaplains and 2 clerks. It now consists of a warden, 8 to 10 fellows and 18 scholars. The college, which has its frontage upon Parks Road, occupies the site of the house of the Austin Friars. No part of their buildings is retained. The erection of the college occupied the years 1610–1613, and while the buildings are in the main an excellent example of their period, the chapel (as distinct from the antechapel) is of peculiar interest. This appears and was long held to be pure Perpendicular work of the 15th century, but the record of its building in 1611 is preserved, and as the majority of the builders seem to have been natives of Somersetshire it is supposed that in the chapel they closely imitated the style which is so finely developed in that county. The buildings of Wadham have remained practically unchanged since the foundation, either by alteration of the existing fabric or by addition. Beautiful gardens lie to the east and north of them; the warden's garden is especially fine. In the quadrangle is a clock designed by Christopher Wren, who entered the college in 1649. It was in this year that John Wilkins, warden (1648–1659), initiated a weekly philosophical club, out of the meetings of which grew the Royal Society, which received its charter in 1662.

Worcester College was founded in its present form in 1714, out of a bequest by Sir Thomas Cookes, Bart. (d. 1701) of Bentley Pauncefoot, Worcestershire. On part of the site, in 1283, Gloucester Hall had been founded for Benedictine novices from Gloucester. After the dissolution of the monasteries, the buildings were used by Robert King, first bishop of Oxford, as a palace (1542); later it was acquired by Sir Thomas White, founder of St John's College, and again became a hall. This fell into difficulties, and was in great poverty when the present foundation superseded it. Cookes's foundation provided for a provost, 6 fellows and 6 scholars; there are now from 6 to 10 fellows, and from 10 to 18 scholars. Four of the scholarships are appropriated to Bromsgrove school, of which Cookes was a benefactor. The frontage of the buildings, in Worcester Street, is in a classical style, but the quadrangle retains some of the old buildings of Gloucester Hall. The gardens, with their lake, are fine.

Halls, &c.

The academical halls, which were of very early origin, were originally in the nature of lodging-houses, in which students lived under a principal chosen by themselves. But they were gradually absorbed by the colleges as these became firmly established. The only remaining academical hall is that of St Edmund, which is said to have been founded in 1226, and to derive its name from Edmund Rich, archbishop of Canterbury, who is known to have taught at Oxford, and was canonized in 1248. The hall came into the possession of Queen's College in 1557, and the principal is nominated by that society. The buildings, which form a small quadrangle east of Queen's College, date mainly from the middle of the 18th century. There are three private halls in Oxford, established under a university statute of 1882, which provides for such establishment by any member of convocation under certain conditions and under licence from the vice-chancellor. Non-collegiate students,[2] *i.e.* members of the university, possessing all its privileges without being members of any college, were first admitted in 1868. As a body they are under the care of a delegacy and the supervision of a censor. Women are admitted to lectures and university examinations but not to its degrees; they have four colleges or halls—Somerville College (1879), Lady Margaret Hall (1879), St Hugh's Hall (1886) and St Hilda's Hall (1893). Among foundations independent of university jurisdiction and intended primarily for the teaching of theology are the Pusey House (1884, founded in memory of Edward Bouverie Pusey), St Stephen's House (1876) and Wycliffe Hall (1878), both theological colleges; Mansfield College (Congregational, founded to take the place of Spring Hill College, Birmingham, in 1889) and Manchester College (1893), also a nonconformist institution. The buildings of Mansfield, especially the chapel, should be noticed as of very good design in Decorated and Perpendicular styles. None of these houses is a residence for undergraduates. There is a theological college at Cuddesdon, near Oxford, where also is the bishop of Oxford's palace.

University buildings and institutions.

A notable group of buildings connected with the university stands between Broad Street and High Street, and between Exeter and Brasenose and All Souls colleges. Among these the principal are the old schools buildings, which form a fine quadrangle, and are now mainly occupied by the Bodleian Library, more extensive accommodation for the schools (examinations, &c.) being provided in the modern range of buildings facing High Street and King Street, completed in 1882 from the designs of T. G. Jackson. The erection of the old schools quadrangle was begun in 1613, and the architecture combines late Gothic with classical details. On the inner face of the gateway towers are seen the five Roman orders, in tiers, one above another. The windows, parapet and rich pinnacles, however, are Gothic. The quadrangle was founded by Sir Thomas Bodley, who conceived the addition of schools to the celebrated library which bears his name. The main chamber of the Bodleian Library is entered from the quadrangle. The library (see LIBRARIES) was opened in 1602. The central part of the room dates from 1480, when it was completed to contain the library given to the university by Humphrey, duke of Gloucester (d. 1447). This library was destroyed in the time of Edward VI. Bodley added the east wing, the west wing followed in 1634–1640, being built to house the collection of John Selden, one of the principal of many benefactors of the library. The whole forms a most beautiful room, enhanced by the finely painted ceiling and the excellent design of the fittings. In the storey above the library is the picture-gallery, containing portraits of chancellors, founders and benefactors of the university. The basement of the central part of the library is formed by the Divinity School, a splendid chamber (1480), in which the most notable feature is the groined roof, divided into compartments by widely splayed arches, and adorned with rich tracery and carved pendants. The Convocation House, below the west wing of the library, and entered from the west end of the school, has a roof with fan tracery. To the north of these buildings, flanking Broad Street, are the Sheldonian Theatre, the old building of the Clarendon Press and the Old Ashmolean building. "The Sheldonian" was built in 1664–1669 at the charge of Gilbert Sheldon (1598–1677), chancellor of the university and archbishop of Canterbury, from the design of Sir Christopher Wren. The principal public ceremonies of the university, including the "Encaenia," the annual commemoration of benefactors, accompanied by the conferring of honorary degrees and the recitation of prize compositions, are generally held in this building, which is particularly well adapted for its purpose. The university printing press was early established in its upper part. This institution bears the name of the Clarendon Press from the fact that it was founded partly from the proceeds of the sale of the earl of Clarendon's *History of the Rebellion*, the copyright of which was given to the university by his son Henry, the second earl. In 1713 it occupied the building erected for it close to the theatre; in 1830 it was moved to the larger buildings it now occupies in Walton Street. Printing in Oxford dates from the seventh or eighth decade of the 15th century, but was only carried on spasmodically until 1585, when the first university printer was Joseph Barnes. All the subsidiary processes of typefounding, stereotyping, &c., are carried on in the buildings of the press, and paper is supplied from the university mill at Wolvercote. The press is to a large extent a commercial firm, in which the university has a preponderating influence, governing it through a delegacy. The Broad Street building is used for other purposes of the university, as is the adjacent Old Ashmolean building, which originally (1683) contained the Ashmolean Museum, described hereafter, and now affords rooms for the School of Geography (1899). To the south of the old schools, between Brasenose and All Souls colleges, is the fine classical rotunda known as the Radcliffe Library or camera, founded in 1737 by the eminent physician John Radcliffe (1650–1714). The architect was James Gibbs. In 1861 the building was devoted to the purpose it now serves, that of a reading room to the Bodleian Library, the collection of medieval and scientific works it contained being removed to the University Museum. The exterior gallery round the dome is celebrated as a view-point.

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[1] The year in which the statutes were issued; Dorothy Wadham had received the royal charter in 1610.

[2] This title was given by a statute of 1884.

To the south of the Radcliffe Library, bordering High Street, is the church of St Mary the Virgin, commonly called the University church, on a site which is traditionally said to have been occupied by a church even from King Alfred's time. Its principal feature is a fine Decorated tower and spire, dating from the early part of the 13th century. The body of the church, however, is mainly an excellent example of Perpendicular work. The main entrance from High Street is beneath a classical porch erected in 1637 by Morgan Owen, a chaplain of Archbishop Laud; the statue of the Virgin and Child above it was alluded to in the impeachment of the archbishop. On the north side of the chancel is a building of earlier date than the present church; it is Decorated, of two storeys, and has served various purposes connected with the university, including that of housing a library before the foundation by Humphrey, duke of Gloucester. The university sermons are preached in St Mary's church.

A massive pile of classical buildings (1845) at the corner of Beaumont and St Giles's Streets is devoted to the Taylor Institution, the University Galleries and the Ashmolean Museum. Sir Robert Taylor, architect (1714–1788), left a bequest to establish the teaching of modern European languages in Oxford, and to provide a building for the purpose, and the eastern wing is devoted to this purpose, containing a library. In the University Galleries the most notable features are the celebrated Arundel marbles, a large series of drawings for pictures by Raphael and Michelangelo, and models for busts and statues by Sir Francis Chantrey. The new building for the Ashmolean Museum was added in 1893; and in connexion both with the building and with subsequent additions to the collections the benefactions of Charles Drury Edward Fortnum (1820–1899) should be remembered. The nucleus of this collection was formed by John Tradescant, a traveller and botanist (1608–1662), who left it to Elias Ashmole (*q.v.*), who added books, paintings and other objects, and presented the whole to the university in 1679. When the museum was moved from the Old Ashmolean building, the collection was in great part distributed; thus, books were sent to the Bodleian Library, and natural history objects to the University Museum. The Ashmolean Museum now contains excellent collections of Egyptian, Greek, Roman and British antiquities, and many other objects, among which perhaps the most widely famous is the Alfred Jewel, an ornament of crystal, enamel and gold, bearing King Alfred's name, and found at Athelney. The University Museum is an extensive building close to the parks, opposite Keble College. Its foundation was the outcome of the necessity of keeping pace in the university with the extended range of modern scientific study. It was built in 1856 seq., and contains the following departments:—medicine and public health, comparative anatomy, physiology, human anatomy, zoology, experimental philosophy, physics, chemistry, geology, mineralogy and pathology. There is also here the Pitt-Rivers ethnographical museum, which had its origin in the collection of Augustus Henry Lane Fox Pitt-Rivers, presented to the university in 1883. Additional buildings contain the Radcliffe Library and various laboratories. The university observatory is in the parks, not far from the museum, but an older observatory is that called the Radcliffe (1772–1795), built by the trustees of the Radcliffe bequest, as was the Radcliffe Infirmary (1770) standing near the observatory, in Woodstock Road. Opposite Magdalen College, by the banks of the Cherwell, is the beautiful botanic garden founded by Henry Danvers, earl of Danby, in 1622, with which are connected a library, herbarium and museum. The Indian Institute (1882), in Broad Street, was founded as a centre for the study of Indian subjects, and for the use of native students in the university and prospective Indian civil servants. The Oxford Union Society, the principal university club, founded in 1825, has its rooms, with library and debating hall, near Cornmarket Street.

City buildings.

Ancient buildings in Oxford, apart from collegiate and university buildings, are mainly ecclesiastical, but there are a few notable exceptions. The castle, which, as already indicated, was erected by Robert d'Oili at the west of the ancient city, retains its massive tower, standing picturesquely by the river, and a mound within which is a curious chamber containing a well. There is also a Norman crypt-chapel, but the county court and gaol buildings adjacent are modern. Among old houses, of which not a few survive in Holywell Street and elsewhere, Bishop King's palace in St Aldate's Street may be mentioned; it has been in great part defaced by modern alterations, while the remaining front is a beautiful half-timbered and gabled example dated 1628; but ornate ceilings preserved in some of the rooms date from the erection in the time of Edward VI. Kettell Hall in Broad Street is another fine house, now used as a private residence, but formerly put to collegiate use, having been built by Ralph Kettell, president of Trinity (1599–1643). Among ancient churches in Oxford, after the cathedral and St Mary's, the chief in interest is St Peter's-in-the-East, which has a fine Norman chancel, crypt and south doorway, with additions of Early English and later date. St Michael's church, the body of which as now existing is of little interest, has a very early tower (11th century) of massive construction, which probably served as a defence for the north gate of the city. St Giles's church has Norman remains, but is chiefly notable for the excellent character of its Early English portions and for a beautiful font of that period. Holywell church retains a fine Norman chancel arch; and the churches of St Mary Magdalen, St Aldate's, St Ebbe's and St Thomas the Martyr are all of some antiquarian interest in spite of extensive modern alteration. Only the 14th century tower remains of St Martin's church at Carfax, the body of the church, which was a complete reconstruction of 1820, being removed at the close of the century, in the course of street-widening. Some of the modern churches are on sites of early dedication. The church of All Saints in High Street was rebuilt in 1706–1708 from the design of Dean Aldrich, and is a good classical example. Beneath several buildings in this part of the city the crypts of earlier halls or other buildings remain. In the suburb of Cowley are remains, including the chapel, of the hospital of St Bartholomew, originally a foundation for lepers (1126). The village church at Iffley, not far beyond the eastern outskirts of the city, with its ornate west end, tower and chancel, is one of the most notable small Norman churches in England. Of modern city buildings, the only one of special note is the town hall (1893–1897), which has a striking frontage upon St Aldate's Street.

University constitution and administration.

"The Chancellor, Masters and Scholars of the University of Oxford" form a corporate body, within which the colleges are so many individual corporations. The university was governed by statutes of its own making, which were codified and brought out of the confusion into which they had fallen in the course of centuries in 1636, during Laud's chancellorship. A commission was appointed to inquire fully into the condition of the university in 1850; it reported in 1852, and in 1854 the constitution was amended by the Oxford University Act. In 1876 another commission was appointed, and in 1877 the Universities of Oxford and Cambridge Act was passed. This act provided for the appointment of commissioners who (1882) made statutes for each college, excepting Hertford, Keble and Lincoln, the first and second of which are modern foundations, while the third is governed under statutes of 1855. The highest officer of the university is the chancellor, who is elected by the members of convocation, holds office for life, and is generally a distinguished member of the university. He does not take an active part in the details of administration, delegating this to the vice-chancellor, who is, therefore, practically the head. He is nominated annually by the chancellor, and must be the head of a college. He appoints four pro-vice-chancellors, also heads of colleges, to exercise his authority in case of necessity. The high steward is appointed for life, with the duty of trying grave criminal cases when the accused is a resident member of the university. Two proctors are appointed annually by two of the colleges in rotation; their special duty is a disciplinary surveillance over members of the university *in statu pupillari* when these are not within the jurisdiction of their colleges. They are assisted by four pro-proctors. The principal duty of the public orator is that of presenting those who are to receive an honorary master's degree, and of making speeches in the name of the university on ceremonial occasions. The registrar acts as the recorder of the various administrative bodies of the university, and the secretary to the Board of Faculties has similar duties with regard to these boards, his work being closely associated with that of the registrar. The chancellor's court exercises civil jurisdiction in cases in which one of the parties is a resident member of the university. The university returns two members (burgesses) to parliament, the privilege dating from 1604.

The Hebdomadal[1] Council consists of the chancellor, vice-chancellor, immediate ex-vice-chancellor and proctors as official members, and of eighteen other members (heads of houses, professors, &c.) elected for terms of six years by the congregation of the university. The council takes the initiative in promulgating, discussing and submitting to Convocation all the legislation of the university. The Ancient House of Congregation consists of "regents," *i.e.* doctors and masters of arts for two years after the term in which they take their degrees, professors, heads of colleges and other resident officers, &c. The house thus includes all those who are concerned with education and discipline in the university, but it now has practically no functions beyond the granting of degrees. It lost its wider powers under the act of 1854, when the Congregation of the university was created. This body, which includes besides certain officials all members of Convocation who have resided for a fixed period within one mile and a half of Carfax, approves or amends legislation submitted by the Hebdomadal Council previously to its submission to Convocation; it also has considerable powers in the election of the various administrative boards. The House of Convocation consists of all masters of arts and doctors of the higher faculties who have their names on the university books, and has the final control over all acts and business of the university. There are boards of curators for the Bodleian Library, the university chest and other institutions, delegates of the common university fund, the museum and the press, for extension teaching, local examinations and other similar purposes, visitors for the Ashmolean Museum and university galleries, and many other administrative bodies. There are boards for the following faculties: theology, law, medicine, natural science and arts (including *literae humaniores*, oriental languages and modern history). Among the numerous professorships and readerships in the various subjects of study, the oldest foundation is the Margaret professorship of divinity, founded in 1502 by Margaret, countess of Richmond and mother of Henry VII. This was followed by the five Regius professorships of divinity, civil law, medicine, Hebrew and Greek, founded by Henry VIII. in 1546.

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[1] From Greek ἑβδομάς, the number seven; the Hebdomadal Board instituted in 1631 was appointed to hold a weekly meeting.

The colleges, as already seen, consist of a head, whose title varies in different colleges, fellows (who form the governing body) and scholars. To these are to be added the commoners, who are not "on the foundation," *i.e.* those who either receive no emoluments, or hold exhibitions which do not (generally) entitle them to rank with the scholars. The college officer who is immediately concerned with the disciplinary surveillance of members of the college *in statu pupillari* is the dean (except at Christ Church). Each undergraduate (this term covering all who have not yet proceeded to a degree) is, as regards his studies, under the immediate supervision of one of the fellows as tutor. The university terms are four—Michaelmas (which begins the academic year, and is therefore the term in which the majority of undergraduates begin residence), Hilary or Lent, Easter and Trinity. The last two run consecutively without interval, and for certain purposes count as one; they are kept by three weeks' residence in each, while the two first are kept by six weeks' residence in each, though the terms properly speaking are longer. The examinations required to be passed in order to obtain the first or bachelor's degree may be summarized thus:—(*a*) Responsions, usually taken very early in the course of study. Exemption is in many cases granted when a candidate has passed a certificate examination held by university examiners at the school where he has been educated. (*b*) First public examination or School of Moderations, usually taken after four or six terms. (*c*) Second public examination or final school (this in the case of *literae humaniores* is commonly called "Greats") usually takes place at the end of the fourth year of residence. "Pass" schools and "honour" schools are distinguished; in the latter candidates are grouped in classes according to merit. No further examination or other exercise is required for the degree of master of arts. Among the numerous scholarships and prizes offered by the university (as distinct from the colleges) a few of the most noted may be mentioned—the Craven and the Ireland classical scholarships on the foundation respectively of John, Lord Craven (d. 1648), who also founded the travelling fellowships which bear his name for the study of antiquities, and of John Ireland, dean of Westminster (1825); the scholarship commemorating Edward, earl of Derby (chancellor 1852–1869); the law scholarship commemorating John, first earl of Eldon; the chancellor's prizes in Latin verse and English prose (initiated by the earl of Lichfield, chancellor 1762–1772) and in Latin prose (by Lord Grenville, 1809); the Newdigate prize for English verse, founded by Sir Roger Newdigate (1806); the Gaisford prizes in Greek verse and prose (1856), commemorating Thomas Gaisford, dean of Christ Church; the Arnold historical essay (1850), commemorating Thomas Arnold, headmaster of Rugby school; and the theological foundations of Edward Bouverie Pusey and Edward Ellerton, fellow of Magdalen. University scholarships, such as those mentioned, are awarded to persons who are already members of the university (who must in some cases already have taken a degree); they thus differ from college scholarships, which are generally open to persons who have not yet matriculated. The Rhodes scholarships (see RHODES, CECIL) stand alone. They are an adaptation of the college scholarship to a special purpose, but are not in the award of any one college. Arrangements exist whereby members of the universities of Cambridge or Dublin may be "incorporated" as members of Oxford University; and whereby the period of necessary academical residence at Oxford University is reduced in the case of students from "affiliated" colleges within the United Kingdom. Special provisions are also made in the case of students from any foreign university and from certain colonial and Indian universities. The number of persons who matriculate at Oxford University is about 850 annually.

The principal social functions in the university take place in "Eights' Week," when, during the summer term (Easter and Trinity), the college eight-oared bumping races are held, and also, more especially, in "Commemoration Week," at the close of the same term, when the university ceremonies connected with the commemoration of benefactors, the conferring of degrees *honoris causa*, &c., are held, and balls are given in some of the colleges.

The city of Oxford (as distinct from the university) returns one member to parliament, having lost its second member under the Redistribution Act of 1885, before which date it had been entirely disfranchised for a year owing to bribery at the election of 1881. The municipal government is in the hands of a mayor, 15 aldermen (including 3 from the university) and 45 councillors (9 from the university). Area, 4676 acres.

AUTHORITIES.—See the *Oxford University Calendar* (annually) and the *Oxford Historical Register*, Oxford. The Oxford Historical Society has issued various works dealing with the history. In the "College History" series, London, the story of each college forms a volume by a member of the foundation. The principal earlier authority is Anthony à Wood (*q.v.*). See also James Ingram (president of Trinity, 1824–1850), *Memorials of Oxford* (Oxford, 1837); A. Lang, *Oxford* (London, 1885); H. C. Maxwell Lyte, *History of the University of Oxford to 1530* (London, 1886); Hon. G. C. Brodrick, *History of the University of Oxford* in "Epochs of Church History" series (London, 1886); C. W. Boase, *Oxford*, in "Historic Towns" series (London, 1887); *Oxford and Oxford Life*, ed. J. Wells (London, 1892). (O. J. R. H.)

OXFORD, a village in Butler county, Ohio, U.S.A., about 40 m. N.W. of Cincinnati. Pop. (1900) 2009; (1910) 2017. Oxford is served by the Cincinnati, Hamilton & Dayton railway. It is the seat of Miami University (co-educational; chartered in 1809, opened as a grammar school in 1818, and organized as a college in 1824), which had 40 instructors and 1076 students in 1909. At Oxford also are the Oxford College for Women, chartered in 1906, an outgrowth, after various changes of name, of the Oxford Female Academy (1839); and the Western College for Women (chartered in 1904), an outgrowth of the Western Female Seminary (opened in 1855). The first settlement on the site was made about 1800.

OXFORD, PROVISIONS OF, the articles constituting a preliminary scheme of reform enacted by a parliament which met at Oxford (England) on the 11th of June 1258. King Henry III. had promised on the 2nd of May that the state of his realm should be rectified and reformed by twenty-four counsellors who were to meet at Oxford for this purpose five weeks later. Twelve of these counsellors were chosen by the king, and twelve by the earls and barons. When the parliament met each twelve of these twenty-four chose two from the other twelve, and this committee of four was empowered, subject to the approval of the whole body, to elect a king's council of fifteen members. The twenty-four then provided that the new council should meet three times a year in parliaments to which twelve commissioners were to be summoned to discuss the affairs of the realm on behalf of the whole community. Another body of twenty-four was appointed to treat of an aid, which was probably the aid which had been demanded earlier in the year. On the 22nd of June the king appointed new wardens of some of the castles which were then in the custody of his Poitevin half-brothers and their friends, and on the same day he gave directions that the twenty-four should proceed with the work of reform, and the committee of four with the election of the council of fifteen. Meanwhile it was provided that the sheriffs and the three great officers of state were to hold office for a year only, and to render accounts at the expiration of their terms of office. On the 24th of August in pursuance of a provision by the parliament the king directed four knights in each county to inquire into the trespasses and wrongs which had been committed by sheriffs, bailiffs and other officials. For many of the grievances of the barons the Oxford parliament provided no remedy; and they were only partly redressed by the Provisions of Westminster in the autumn of 1259. The king declared his adhesion to the Provisions of Oxford on the 18th of October by proclamations in English, French and Latin, but in 1261, having obtained a papal dispensation from his oath of observance, he entirely repudiated them. The barons, however, insisted on his obligation to observe the provisions, and the dispute was eventually referred to the arbitration of Louis IX. of France, who formally annulled them on the 23rd of January 1264, but expressly declared that his decision was not to invalidate the privileges, liberties and laudable customs of the realm of England, which had existed before the time of the provisions.

No official record of the Provisions of Oxford has been preserved, and our knowledge of them is chiefly derived from a series of notes and extracts entered in the Annals of Burton Abbey, which are probably neither exhaustive nor in correct order. See the *Annales monastici*, vol. i. (Burton), edited by H. R. Luard for the Rolls series; *Patent Rolls, Henry III.* (printed text); *Foedera* (Record Commission edition); W. Stubbs, *Constitutional History* and *Select Charters*, and Charles Bémont, *Simon de Montfort* (1884).

OXFORDIAN, in geology, the name given to a series of strata in the middle Oolites which occur between the Corallian beds and the Cornbrash; the division is now taken to include the Oxford Clay with the underlying Callovian stage (*q.v.*). The argillaceous beds were called "Clunch Clay and Shale" by William Smith (1815–1816); in 1818 W. Buckland described them under the unwieldy title "Oxford, Forest or Fen Clay." The term Oxfordian was introduced by d'Orbigny in 1844. The name is derived from the English county of Oxford, where the beds are well developed, but they crop out almost continuously from Dorsetshire to the coast of Yorkshire, generally forming low, broad valleys. They are well exposed at Weymouth, Oxford, Bedford, Peterborough, and in the cliffs at Scarborough, Red Cliff and Gristhorpe Bay. Rocks of this age are found also in Uig and Skye.

The Oxford Clay is usually bluish or greenish-grey in colour, weathering brown or yellow; in the lower portions it is somewhat more shaly. The beds frequently tend to be calcareous and bituminous, while in places there is a considerable amount of lignite. Septaria of large size are common, they have been cut and polished at Radipole and Melbury Osmund in Dorsetshire, where they are known as Melbury marble or "turtle-stones"; they were used to form table-tops, &c. In Yorkshire the Oxford Clay is usually a grey sandy shale. In the central and southern English counties the Oxford Clay is divisible as follows:—

Upper zone of *Cardioceras cordatum*	Clays with septaria and ironstone nodules. Clays with pyritized fossils (subzone of *Quenstedtoceras Lamberti*).
Lower zone of *Cosmoceras ornatum*	Shales with pyritized fossils (subzone of *Cosmoceras Jason*).

The upper zone contains also *Gryphaea dilatata* (large forms), *Serpula vertebralis*, *Belemnites hastatus*, *Aspidoceras perarmatum*, *Cardioceras vertebrale*. The lower zone yields *Reineckia anceps*, *Peltoceras athleta*, *Quenstedtoceras Mariae*, *Cosmoceras Jason*, *Cerithium muricatum*, and a small form of *Gryphaea dilatata*. The remains of fishes and saurian reptiles have been found. The Oxford Clay is dug for brick-making at Weymouth, Trowbridge, Chippenham, Oxford, Bedford, Peterborough and Fletton.

The "Oxfordian" of the continent of Europe is divided according to A. de Lapparent into an upper (Argovian) and a lower (Neuvizyen) substage. In the former he includes part of the English Coralline Oolite and in the latter the lower Calcareous Grit, while a portion of the lower Oxford Clay is placed in the Divesian or upper substage of the Callovian. In north-west Germany the Oxford Clay is represented by the Hersumer beds. Most of the European formations on this horizon are clays and marls with occasional limestone and ironstone beds.

See Jurassic, Callovian, Corallian. (J. A. H.)

OXFORDSHIRE (or Oxon), an inland county of England, bounded N.E. by Northamptonshire, N.W. by Warwickshire, W. by Gloucestershire, S.S.W. and S.E. by Berkshire, and E. by Buckinghamshire; area 755·7 sq. m. The county lies almost wholly in the basin of the upper Thames. This river forms its southern boundary for 71 m., from Kelmscot near Lechlade (Gloucestershire) to Remenham below Henley-on-Thames, excepting for very short distances at two points near Oxford. The main stream is the boundary line, but from Oxford upward the river often sends out branches through the flat water-meadows. The principal tributaries joining the Thames on the Oxfordshire side do not in any case rise within the county, but have the greater part of their courses through it.

These tributaries are as follows, pursuing the main river downwards. (1) The Windrush, rising in Gloucestershire, follows a narrow and pleasant valley as far as Witney, after which it meanders in several branches through rich flat country, to join the Thames at Newbridge. (2) The Evenlode, also rising in Gloucestershire, forms the western county boundary for a short distance, and follows a similar but more beautiful valley to the Thames below Eynsham. From the north it receives the Glyme, which joins it on the confines of Blenheim Park, where the woodland scenery is of peculiar richness. (3) The Cherwell, rising in Northamptonshire, forms some 10 m. of the eastern boundary, and with a straight southerly course joins the Thames at Oxford. From the east it receives the Ray, which drains the flat tract of Ot Moor. (4) The Thame, rising in Buckinghamshire, runs south-west and west, forming 6 m. of the eastern boundary, after which it turns south to join the Thames near Dorchester. Above the point of junction the Thames is often called the Isis. Lastly, a small part of the north-eastern boundary is formed by the Great Ouse (which discharges into the North Sea), here a very slight stream, some of whose head-feeders rise within Oxfordshire.

The low hills which lie south of the Windrush, and those between it and the Evenlode (which attain a greater height) are foothills of the Cotteswold range, the greater part of which lies in Gloucestershire. Between the Windrush and Evenlode they are clothed with the remaining woods of Wychwood Forest, one of the ancient forests of England, which was a royal preserve from the time of John, and was disafforested in 1862. Its extent was 3735 acres of forest proper. The hills continued north of the Evenlode (but not under the name of Cotteswold) at an average elevation over 500 ft. The range terminates at Edge Hill, just outside the county in Warwickshire. The hills bordering the Cherwell basin on the east are of slight elevation, until, running east from Oxford into Buckinghamshire, a considerable line of heights is found north of the Thame valley, reaching 560 ft. in Shotover hill, overlooking Oxford. Across the south-east of the county stretches the bold line of the Chiltern Hills, running N.E. and S.W. On the western brow, Nettlebed Common, an extensive plateau, reaches at some points nearly 700 ft. of altitude. The district was probably once covered with forest, and there are still many fine beeches, oaks and ash trees. William Camden in his survey of the British Isles (1586) mentions forests as a particular feature of Oxfordshire scenery, and there are traces still left of natural woodland in various parts of the lower country.

The Thames flows through a deep gap from about Goring downwards, between the Chilterns and the Berkshire Downs. Here, as above at Nuneham and other points, the sylvan scenery is fine, and Henley and Goring are favourite riverside resorts on the Oxfordshire shore. The western feeders of the Thames and Cherwell have much rich woodland in their narrow valleys, and the sequestered village of Great Tew, on a tributary of the Cherwell river, may be singled out as having a situation of exceptional beauty.

Geology.—The influence of the rocky substratum upon the character of the scenery and soil is clearly marked. It is sufficient to point, on the one hand, to the dry chalky upland of the Chiltern Hills and the oolitic limestone hills in the north-west, or the Cornbrash with its rich, fertile soil; and, on the other hand, to the dreary scenery of the Oxford Clay land with its cold, unproductive soil. Cretaceous rocks occupy the south-eastern corner of the county; Jurassic rocks prevail over the remainder. The general dip is towards the south-east, and the strike of the strata is S.W.–N.E.; therefore in passing from south to north, beds are traversed which are successively lower and older. The Chiltern Hills, with a strong scarp facing the north-west, are formed of Chalk, the Lower Chalk at the foot and the hard Chalk rock at the summit; from the top of the hills the Upper Chalk-with-Flints descends steadily towards the Thames. Here and there, as at Shiplake and Nettlebed, outliers of Tertiary clays rest upon it. The Upper Greensand forms a low feature at the foot of the Chalk hills; this is succeeded by the Gault, with an outcrop varying from 4 m. to 1½ m. wide between Dorchester and Sydenham; it is a pale blue clay, dug for bricks at Culham. The Lower Greensand appears from beneath the Gault at Culham and Nuneham Courtney and in outliers north of Cuddesdon. The Kimmeridge clay, in the grass-covered vales between Sandford and Waterperry, is separated from the Lower Greensand by the Portland limestone and Portland sands and by the thin Purbeck beds; it is dug for bricks at Headington. Both Portland and Purbeck beds may be observed in Shotover hill; the Portland limestone is quarried at Garsington. The Coral Rag, with calcareous grit at the base, is a shelly, coral-bearing limestone, traceable from Sandford to Wheatley; it has been extensively quarried at Headington hill. North-west of the last-named formation a broad outcrop of Oxford Clay crosses the county; while this is mostly under pasture, the next lower formation, the Cornbrash, a brownish rubbly limestone, gives rise to a loose brown soil very suitable for the cultivation of wheat. Exposures of Cornbrash occur at Norton

Bridge, Woodstock and Shipton; it forms a broad plateau between Middleton Stoney and Bicester. Inliers also lie in the Oxford Clay plain at Islip, Charlton, Merton and Black Horse Hill. Wychwood Forest has given its name to the "Forest Marble," an inconstant series of limestones which thin out eastward and become argillaceous. The Great Oolite limestones, with the "Stonesfield Slate" at the base and occasional marls, form the higher ground in the north-west. An excellent freestone is quarried at Tainton and Milton. The Inferior Oolite series of sands and limestones forms the Rollright Ridge and caps Shenlow and Epwell hills; it also reaches down to Chipping Norton and eastward to Steeple Aston. The three divisions of the Lias are represented in the N.W. of the county. The most important is the middle member with marlstone, which, being a hard calcareous bed at the top, forms an elevated ridge along the limit of the outcrop. The marlstone is quarried for building stone at Hornton, and for road metal in many places, and, as it contains a considerable amount of iron oxide, it has been extensively worked for iron at Adderbury, Fawler and elsewhere. The Upper Lias clays occur mostly as unimportant outliers. The Lower Lias clays have been exposed by the Evenlode near Charlbury and by the Cherwell in the upper part of its valley. A hard shelly limestone called Banbury marble occurs in this part of the Lias. Glacial drift is sparingly scattered over the south-western part of the county, but is more plentiful in the north-eastern portion. Valley gravels are associated with the main stream courses and gravel, clay-with-flints and brick earth rest upon much of the chalk slope. Coal Measures have been proved at a depth of about 1200 ft. near Burford.

Climate and Agriculture.—The climate is healthy and generally dry except in the low ground bordering the Thames, as at Oxford; but colder than the other southern districts of England, especially in the bleak and exposed regions of the Chilterns. Crops are later in the uplands than in more northerly situations at a lower elevation. In the northern districts there is a strong yet friable loam, well adapted for all kinds of crops. The centre of the county is occupied for the most part by a good friable but not so rich soil, formed of decomposed sandstone, chalk and limestone. A large district in the south-east is occupied by the chalk of the Chiltern Hills, partly wooded, partly arable, and partly used as sheep-walks. The remainder of the county is occupied by a variety of miscellaneous soils ranging from coarse sand to heavy tenacious clay, and occasionally very fertile. Nearly seven-eighths of the area of the county, a high proportion, is under cultivation. The acreage under grain crops is nearly equally divided between barley, oats and wheat. There is a considerable acreage under beans. More than half the total acreage under green crops is occupied by turnips, and vetches and tares are also largely grown. Along the smaller streams there are very rich meadows for grazing, but those on the Thames and Cherwell are subject to floods. The dairy system prevails in many places, but the milk is manufactured into butter, little cheese being made. The improved shorthorn is the most common breed, but Alderney and Devonshire cows are largely kept. Of sheep, Southdowns are kept on the lower grounds, and Leicesters and Cotteswolds on the hills. Pigs are extensively reared, the county being famous for its brawn.

Manufactures.—Blankets are manufactured at Witney, and tweed, girths and horsecloths at Chipping Norton. There are paper mills at Shiplake, Sandford-on-Thames, Wolvercot and Eynsham, using water power, as do the blanket works and many mills on the tributary streams of the Thames. Agricultural implements and portable engines are made at Banbury, and gloves at Woodstock, the last a very ancient industry. Banbury has been long celebrated for the manufacture of a peculiar cake. Some iron ore is raised (from the middle Lias), and the quarries and clays for brick-making are important, as already indicated. A large number of women and girls are employed in several of the towns and villages in the lace manufacture.

Communications.—The northern line of the Great Western railway, leaving the main line at Didcot Junction in Berkshire, runs north through Oxfordshire by the Cherwell valley. Oxford is the junction for the Worcester line, running north-west by the Evenlode valley, with branches from Chipping Norton Junction into Gloucestershire (Cheltenham), and across the north-west of the county to the northern line at King's Sutton. From Oxford also the East Gloucester line serves Witney and the upper Thames. Another Great Western line, from Maidenhead and London, enters the county on the east, has a branch to Watlington, serves the town of Thame, and runs to Oxford. The Great Central railway has a branch from its main line at Woodford in Northamptonshire to Banbury, the north and south expresses using the Great Western route southward. Branches of the London and North Western railway from Bletchley terminate at Oxford and Banbury. As regards water-communications, the Thames is navigable for large launches to Oxford, and for barges over the whole of its Oxfordshire course. None of its tributaries in this county is commercially navigable. The Oxford Canal, opened in 1790, follows the Cherwell north from Oxford and ultimately connects with the Grand Junction and Warwick canals.

Population and Administration.—The area of the ancient county is 483,626 acres, with a population in 1891 of 185,240 and in 1901 of 181,120. The area of the administrative county is 480,687 acres. The municipal boroughs are Banbury (pop. 12,968), Chipping Norton (3780), Henley-on-Thames (5984), Oxford, a city and the county town (49,336) and Woodstock (1684). The urban districts are Bicester (3023), Caversham (6580), Thame (2911), Wheatley (872), Witney (3574). Bampton (1167) and Burford (1146) in the west, and Watlington (1154) in the south-east, are the other principal country towns. The county is in the Oxford circuit, and assizes are held at Oxford. It has one court of quarter-sessions, and is divided into 11 petty sessional divisions. The borough of Banbury and the city of Oxford have separate courts of quarter-sessions and commissions of the peace, and the borough of Henley-on-Thames has a separate commission of the peace. The total number of civil parishes in 304. Oxfordshire is in the diocese of Oxford, and contains 244 ecclesiastical parishes or districts, wholly or in part. The ancient county is divided (since 1885) into three parliamentary divisions: Banbury or northern, Woodstock or mid, and Henley or southern, each returning one member. It also includes part of the parliamentary borough of Oxford, returning one member, in addition to which the university of Oxford returns two members.

Education.—On account of the famous university of Oxford and other educational institutions there, the county as regards education holds as high a position as any in England. In connexion with the university there is a day training college for schoolmasters, and there is also in Oxford a residential training college for schoolmistresses (diocesan), which takes day students. There is a training college for schoolmasters in the dioceses of Oxford and Gloucester, at Culham. At Cuddesdon, where is the palace of the bishops of Oxford, there is a theological college, opened in 1854. At Bloxham is the large grammar school of All Saints, and there are several boys' schools in Oxford.

History.—The origin of the county of Oxford is somewhat uncertain; like other divisions of the Mercian kingdom, the older boundaries were entirely wiped out, and the district was renamed after the principal town. The boundaries, except for the southern one, which is formed by the Thames, are artificial. There are fourteen hundreds in Oxfordshire, among them being five of the Chiltern hundreds. The jurisdiction over these five belonged to the manor of Benson, and in 1199 to Robert de Harecourt, a name which is still to be found in the county in the Harcourts of Stanton-Harcourt and Nuneham. The county includes small portions of Berkshire and Buckinghamshire, which lie in the hundreds of Bampton and Ploughley respectively. There has been little change in the county boundary; but acts of William IV. and Victoria slightly increased its area.

The district was overrun in the 6th century by the victorious West Saxons, who took Benson and Eynsham, as may be seen in the *Saxon Chronicle* for 571. In the 7th century the Mercians held all the northern border of the Thames, and during the 8th century this district twice changed hands, falling to Wessex after the battle of Burford, and to Mercia after a battle at Benson. As part of the Mercian kingdom it was included in the diocese of Lincoln. A bishopric had been established at Dorchester as early as 634, when Birinus, the apostle of Wessex, was given an episcopal seat there, but when a bishop was established at Winchester this bishopric seems to have come to an end. Before the Mercian conquest in 777, Oxfordshire was in the diocese of Sherborne. In 873 the jurisdiction of Dorchester reached to the Humber, and when the Danes were converted it extended over Leicestershire and Lincolnshire, Oxfordshire forming about an eighth of the diocese. At the Conquest there was no alteration, but in 1092 the seat was transferred to Lincoln. In 1542 a bishopric of Osney and Thame was established, taking its title from Oxford, the last abbot of Osney being appointed to it. In 1546 the existing bishopric of Oxford was established. The ecclesiastical boundaries remain as they were when archdeacons were first appointed—the county and archdeaconry being conterminous—and the county being almost entirely in the diocese of Oxford. The Danes overran the county during the 11th century; Thurkell's army burnt Oxford in 1010, and the combined armies of Sweyn and Olaf crossed Watling Street and ravaged the district, Oxford and

Winchester submitting to them. In 1018 Danes and Englishmen chose Eadgar's law at an assembly in Oxford, and in 1036, on Canute's death, his son Harold was chosen king. Here also took place the stormy meeting following the assembly (gemot) at Northampton, in which Harold allowed Tostig to be outlawed and Morkere to be chosen earl in his place, thus preparing the way for his own downfall and for the Norman Conquest. The destruction of houses in Oxford recorded in the Domesday Survey may possibly be accounted for by the ravages of the rebel army of Eadwine and Morkere on this occasion, there being no undisputed mention of a siege by William. Large possessions in the county fell to the Conqueror, and also to his rapacious kinsman, Odo, bishop of Winchester. The bishop of Lincoln also had extensive lands therein, while the abbeys of Abingdon, Osney and Godstow, with other religious houses, held much land in the county. Among lay tenants in chief, Robert D'Oili, heir of Wigod of Wallingford, held many manors and houses in Oxford, of which town he was governor. The importance of Oxford was already well established; the shire moot there is mentioned in Canute's Oxford laws, and it was undoubtedly the seat of the county court from the first, the castle being the county gaol. The principal historical events between this period and the Civil War belong less to the history of the county than to that of the city of Oxford (*q.v.*). The dissolution of the monasteries, though it affected the county greatly, caused no general disturbance.

When King Charles I. won the first battle of the Civil War at Edgehill (23rd of October 1642), Oxford at once became the material and moral stronghold of the royalist cause. Every manor house in the district became an advanced work, and from Banbury in the north to Marlborough in the west and Reading in the south the walled towns formed an outer line of defence. For the campaign of 1643 the rôle of this strong position was to be the detention of the main parliamentary army until the royalists from the north and the west could come into line on either hand, after which the united royal forces were to close upon London on all sides, and in the operations of that year Oxfordshire successfully performed its allotted functions. No serious breach was made in the line of defence, and more than once, notably at Chalgrove Field (18th of June 1643), Prince Rupert's cavalry struck hard and successfully. In the campaign of Newbury which followed, the parliamentary troops under Essex passed through north Oxfordshire on their way to the relief of Gloucester, and many confused skirmishes took place between them and Rupert's men; and when the campaign closed with the virtual defeat of the royalists, the fortresses of the county offered them a refuge which Essex was powerless to disturb. The following campaign witnessed a change in Charles' strategy. Realizing his numerical weakness he abandoned the idea of an envelopment, and decided to use Oxfordshire as the stronghold from which he could strike in all directions. The commanding situation of the city itself prevented any serious attempt at investment by dividing the enemy's forces, but material wants made it impossible for Charles to maintain permanently his central position. Plans were continually resolved upon and cancelled on both sides, and eventually Essex headed for the south-west, leaving Waller to face the king alone. The battle of Cropredy Bridge followed (29th of Jan.), and the victorious king turned south to pursue and capture Essex at Lostwithiel in Cornwall. In the remaining operations of 1644 Oxfordshire again served as a refuge and as a base (Newbury and Donnington). With the appearance on the scene of Cromwell and the New Model army a fresh interest arose. Having started from Windsor on the 20th of April 1645, the future Protector carried out a daring cavalry raid. He caught and scattered the royalists unawares at Islip; then he pursued the fugitives to Bletchington and terrified the governor into surrendering. He swept right round Oxford, fought again at Bampton, and finally rejoined his chief, Fairfax, in Berkshire. A few days later Charles again marched away northwards, while Fairfax was ordered to besiege Oxford. In spite of the difficulties of the besiegers Charles was compelled to turn back to relieve the city, and the consequent delay led to the campaign and disaster of Naseby. Yet even after Naseby the actual position of Oxfordshire was practically unshaken. It is true that Abingdon with its parliamentary garrison was a standing menace, but the districts east of the Cherwell and Thames, and the triangle bounded by Oxford, Faringdon and Banbury, still retained its importance, till early in 1646 the enemy closed from all sides on the last stronghold of royalism. Stow-on-the-Wold witnessed the final battle of the war. On the 9th of May Banbury surrendered, and two days later Oxford itself was closely invested. On the 24th of June the city capitulated, and three days later Wallingford, the last place to give in, followed its example.

The war left the county in an exceedingly impoverished condition. Its prosperity had steadily declined since the early 14th century, when it had been second in prosperity in the kingdom, owing its wealth largely to its well-watered pastures, which bred sheep whose wool was famous all over England, and to its good supply of water power. Salt is mentioned as a product of the county in Domesday Book. Various small industries grew up, such as plush-making at Banbury, leather works at Bampton and Burford, gloves at Woodstock, and malt at Henley. Glass was made at Benson and Stokenchurch in the reign of Henry VI., and the wool trade continued, though not in so flourishing a state, Witney retaining its fame in blanket-making. The pestilence of 1349, the conversion of arable into pasture land, and the enclosure of common land in the early 16th century had led to agricultural depression and discontent. In 1830 the enclosure of Otmoor led to serious riots, in which the people gathered in Oxford at St Giles' fair joined. The county was represented in parliament in 1289 by two members.

Antiquities.—The remains of castles are scanty. The majority of them were probably built for defence in the civil strife of Stephen's reign (1100–1135), and were not maintained after order was restored. Considerable portions of the Norman Oxford Castle survive, however, while there are slighter remains of the castle at Bampton, the seat of Aylmer de Valence in 1313. Among remains of former mansions there may be noted the 14th century Greys Court near Henley-on-Thames, Minster Lovell, on the Windrush above Witney, and Rycote, between Thame and Oxford. Minster Lovell, the extensive ruins of which make an exquisite picture by the river-side, was the seat of Francis, Lord Lovel, who, being the son of a Lancastrian father, incurred the hatred of that party by serving Richard III., and afterwards assisted the cause of Lambert Simnel, mysteriously disappearing after the battle of Stoke. The remains of Rycote (partly incorporated with a farmhouse) are of fine Elizabethan brick, and in the chapel attached to the manor there is remarkable Jacobean woodwork, the entire fittings of the church, including the canopied pews and altar-table, being of this period. Here Elizabeth was kept in 1554, before her accession, and afterwards resided as queen. Of ancient mansions still inhabited, the finest is Broughton Castle near Banbury, dating from 1301. Others are Shirburn Castle, begun in 1377, but mainly Perpendicular of the next century; Stanton Harcourt, dating from 1450, with a gatehouse of 1540, a vast kitchen, and Pope's Tower, named from the poet, who stayed here more than once. Mapledurham, on the Thames above Reading, is a fine Tudor mansion of brick; and Water Eaton, on the Cherwell above Oxford, is a singularly perfect Jacobean house of stone, with a chapel of the same period resembling pure Perpendicular. Of other mansions in the county Blenheim Palace, near Woodstock, must be mentioned. The former Holton House (now replaced by a Georgian building), near Wheatley, was the scene in 1646 of the wedding of Ireton, the soldier of Cromwell, with his leader's daughter Bridget.

The influence of such a centre of learning as the university was naturally very great upon the ecclesiastical history of the neighbourhood. A large number of monastic foundations arose, such as those of Augustinian canons at Bicester, Caversham, Cold Norton, Dorchester, Osney (a magnificent foundation just outside the walls of Oxford) and Wroxton; of Cistercians, at Bruern and Thame; of Benedictines, at Cogges, Eynsham, Milton; of Mathurins, at Nuffield; of Gilbertines, at Clattercote; of Templars, at Sandford-on-Thames. There was at Gosford one of the only two preceptories of female Templars in England. Of all these, excepting the abbey church at Dorchester, remains are scanty. A few domestic buildings remain at Studley; the boundary walls still stand of Godstow Nunnery on the Thames, the retreat and burial-place of Rosamund Clifford or "Fair Rosamund," the object of Henry II.'s famous courtship; and there are traces of Rewley Abbey within Oxford.

In ecclesiastical architecture Oxfordshire, apart from Oxford itself, is remarkably rich, but there is no dominant style, nearly all the churches being of mixed dates. In fact, of the most important churches only Iffley, Adderbury and Minster Lovell need be taken as types of a single style. Iffley, picturesquely placed above the Thames 1 m. S. of Oxford, is one of the finest examples of pure Norman in England, with a highly ornate west front. Adderbury, 4 m. S. of Banbury, is a great cruciform Decorated church with a massive central tower and spire. Minster Lovell, also cruciform, is pure Perpendicular; its central tower is supported, with beautiful and unusual effect, on four detached piers. For the rest, one feature common to several is to be noticed. The short ungainly spire of Oxford cathedral was among the earliest, if not the first, constructed in England, and served as a model from which were probably developed the splendid central spires of the great churches at Witney, Bampton, Shipton-under-Wychwood and Bradwell. There are also three fine spires in the north: Bloxham, Adderbury and King's Sutton (across the border in Northamptonshire), which are locally proverbial as typifying length, strength and beauty. Bloxham church, mainly Decorated, with Norman portions and a remarkable Early English west front, is one of the largest and most beautiful in the county. In the west Burford (Norman and later) is noteworthy, and in the porch of the fine Norman church of Langford is seen the rare feature of a crucifix with the figure cloaked. At South Leigh are remarkable mural paintings of the 15th century. About 5 m. N. of Oxford there are Kidlington (Decorated) with a beautiful needle-like Perpendicular spire, and Islip, which, as the birthplace of Edward the Confessor, retains a connexion with his Abbey of Westminster, the Dean and Chapter of which are lords of the manor and patrons of the living. In the south-east, Dorchester Abbey, with its nave of transitional Norman, has a curious Decorated Jesse window, the tracery representing the genealogical tree of the patriarch. At Cuddesdon there is another large cruciform church, Norman and later. Ewelme church (Perpendicular) is remarkable for the tomb of Alice, Duchess of Suffolk (1475), gorgeous with tracery and gilded canopy, and that of Sir Thomas Chaucer (1434), ornamented with enamelled coats of arms. Here William de la Pole, Duke of Suffolk, founded in 1436 the picturesque hospital and free school still standing.

AUTHORITIES.—*The Natural History of Oxfordshire* (Oxford, 1677, 2nd ed. 1705); Shelton, *Engraved Illustrations of the principal Antiquities of Oxfordshire, from drawings by T. Mackenzie* (Oxford, 1823); Sir T. Phillips, *Oxfordshire Pedigrees* (Evesham, 1825); J. M. Davenport, *Lords Lieutenant and High Sheriffs of Oxford, 1086* (Oxford, 1868), and *Oxfordshire Annals* (Oxford, 1869).

OXIDE, in chemistry, a binary compound of oxygen and other elements. In general, oxides are the most important compounds with which the chemist has to deal, a study of their composition and properties permitting a valuable comparative investigation of the elements. It is possible to bring about the direct combination of oxygen with most of the elements (the presence of traces of water vapour is generally necessary according to the researches of H. B. Baker), and when this is not so, indirect methods are available, except with bromine and fluorine (and also with the so-called inert gases—argon, helium, &c.), which so far have yielded no oxides. Most of the elements combine with oxygen in several proportions, for example nitrogen has five oxides: N_2O, NO, N_2O_3, NO_2, N_2O_5; for classificatory purposes, however, it is advantageous to assign a typical oxide to each element, which, in general, is the highest having a basic or acid character. Thus in Group I. of the periodic system, the typical oxide is M_2O, of Group II. MO, of Group III. M_2O_3, of Group IV. MO_2, of Group V. M_2O_5, of Group VI. MO_3.

Five species of oxides may be distinguished: (1) basic oxides, (2) acidic oxides, (3) neutral oxides, (4) peroxides, (5) mixed anhydrides and salts. Basic oxides combine with acids or acidic oxides to form salts; similarly acidic oxides combine with basic oxides to form salts also. The former are more usually yielded by the metals (some metals, however, form oxides belonging to the other groups), whilst the latter are usually associated with the non-metals. An oxide may be both acidic and basic, *i.e.* combine with bases as well as acids; this is the case with elements occurring at the transition between basigenic and oxygenic elements in the periodic classification, *e.g.* aluminium and zinc. Neutral oxides combine neither with acids nor bases to give salts nor with water to give a base or acid. A typical member is nitric oxide; carbon monoxide and nitrous oxide may also be put in this class, but it must be remembered that these oxides may be regarded, in some measure at least, as the anhydrides of formic and hyponitrous acid, although, at the same time, it is impossible to obtain these acids by simple hydration of these oxides. Peroxides may in most cases be defined as oxides containing more oxygen than the typical oxide. The failure of this definition is seen in the case of lead dioxide, which is certainly a peroxide in properties, but it is also the typical oxide of Group IV. to which lead belongs. All peroxides have oxidizing properties. Peroxides may be basic or acidic. Some basic oxides yield hydrogen peroxide with acids, others yield oxygen (these also liberate chlorine from hydrochloric acid), and may combine with lower acidic oxides to form salts of the normal basic oxide with the higher acidic oxide. Examples are $BaO_2+H_2SO_4=BaSO_4+H_2O_2$; $2MnO_2+2H_2SO_4=2MnSO_4+2H_2O+O_2$; $MnO_2+4HCl=MnCl_2+2H_2O+Cl_2$; $PbO_2+SO_2=PbSO_4$ (*i.e.* $PbO+SO_3$). Two species of basic peroxides may be distinguished: (1) the superoxides or peroxidates, containing the oxygen atoms in a chain, *e.g.* $Na\cdot O\cdot O\cdot Na$, $\overline{O\cdot Ba\cdot O}$, which yield hydrogen peroxide with acids; and (2) the polyoxides, having the oxygen atoms doubly linked to the metallic atom, *e.g.* $O:Mn:O$, $O:Pb:O$, and giving oxygen with sulphuric acid, and chlorine with hydrochloric. L. Marino (*Zeit. anorg. Chem.*, 1907, 56, p. 233) pointed out that manganese and lead dioxide behaved differently with sulphur dioxide, the former giving dithionate and the latter sulphate, and suggested the following formulae: $O:Mn:O$, $\overline{O\cdot Pb:O}$, as explaining this difference. A simpler explanation is that the manganese dioxide first gives a *normal* sulphite which rearranges to dithionate, thus: $MnO_2+2SO_2=Mn(SO_3)_2\rightarrow MnS_2O_6$, whilst the lead dioxide gives a *basic* sulphite which rearranges to sulphate, thus: $PbO+SO_2=PbOSO_3\rightarrow PbSO_4$. Acidic peroxides combine with basic oxides to form "per" salts, and by loss of oxygen yield the acidic oxide typical of the element. Mixed anhydrides are oxides, which yield with water two acids, or are salts composed of a basic and acidic oxide of the same metal. Examples of mixed anhydrides are ClO_2 and NO_2, which give chlorous and chloric acid, and nitrous and nitric acid: $2ClO_2+H_2O=HClO_2+HClO_3$, $2NO_2+H_2O=HNO_2+HNO_3$; and of mixed salts Pb_2O_3 and Pb_3O_4, which may be regarded as lead meta- and ortho-plumbate: $PbO\cdot PbO_2$, $2PbO\cdot PbO_2$.

Oxidation and Reduction.—In the narrow sense "oxidation" may be regarded as the combination of a substance with oxygen, and conversely, "reduction" as the abstraction of oxygen; in the wider sense oxidation includes not merely the addition of oxygen, but also of other electro-negative elements or groups, or the removal of hydrogen or an electro-positive element or group. In inorganic chemistry oxidation is associated in many cases with an increase in the active valency. Ignoring processes of oxidation or reduction simply brought about by heat or some other form of energy, we may regard an oxidizing agent as a substance having a strong affinity for electro-positive atoms or groups, and a reducing agent as having a strong affinity for electro-negative atoms or groups; in the actual processes the oxidizing agent suffers reduction and the reducing agent oxidation.

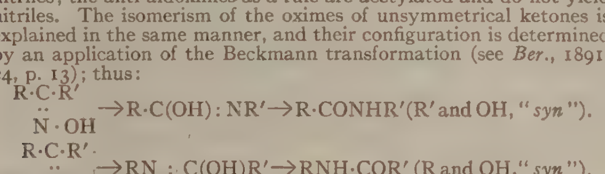
Many substances undergo simultaneous oxidation and reduction when treated in a particular manner; this is known as self- or auto-oxidation. For example, on boiling an aqueous solution of a hypochlorite, a chlorate and a chloride results, part of the original salt being oxidized and part reduced: $3NaOCl=NaClO_3+2NaCl$. Similarly phosphorous and hypophosphorous acids give phosphoric acid and phosphine, whilst nitrous acid gives nitric acid and nitric oxide: $4H_3PO_3=3H_3PO_4+PH_3$; $2H_3PO_2=H_3PO_4+PH_3$; $3HNO_2=HNO_3+2NO+H_2O$. In organic chemistry, a celebrated example is Cannizzaro's reaction wherein an aromatic aldehyde gives an acid and an alcohol: $2C_6H_5CHO+H_2O=C_6H_5CO_2H+C_6H_5CH_2OH$.

The important oxidizing agents include; oxygen, ozone, peroxides, the halogens chlorine and bromine, oxyacids such as nitric and those of chlorine, bromine and iodine, and also chromic and permanganic acid. The important reducing agents include hydrogen, hydrides such as those of iodine, sulphur, phosphorus, &c., carbon, many metals, potassium, sodium, aluminium, magnesium, &c., salts of lower oxyacids, lower salts of metals and lower oxides.

OXIMES, in organic chemistry, compounds containing the grouping $>C:N\cdot OH$, derived from aldehydes and ketones by condensing them with hydroxylamine. Those derived from aldehydes are known as aldoximes, those from ketones as ketoximes. They were first prepared by V. Meyer in 1882 (*Ber.*, 1882, 15, pp. 1324, 1525, 2778). They are either colourless liquids, which boil without decomposition, or crystalline solids; and are both basic and acidic in character. On reduction by sodium amalgam in glacial acetic acid solution they yield primary amines. They are hydrolysed by dilute mineral acids yielding hydroxylamine and the parent aldehyde or ketone. The aldoximes are converted by the action of dehydrating agents into nitriles: $RCH:NOH \rightarrow RC\vdots N + H_2O$. The ketoximes by the action of acetyl chloride undergo a peculiar intramolecular re-arrangement known as the Beckmann transformation (E. Beckmann, *Ber.*, 1886, 19, p. 989; 1887, 20, p. 2580), yielding as final products an acid-amide or anilide, thus:

$$RC(:N\cdot OH)R' \rightarrow RC(OH):NR' \rightarrow RCONHR'.$$

As regards the constitution of the oximes, two possibilities exist, namely $>C:NOH$, or $>C\left\langle\begin{matrix}NH\\ \cdot\\ O\end{matrix}\right.$, and the first of these is presumably correct, since on alkylation and subsequent hydrolysis an alkyl hydroxylamine of the type $NH_2\cdot OR$ is obtained, and consequently it is to be presumed that in the alkylated oxime, the alkyl group is attached to oxygen, and the oxime itself therefore contains the hydroxyl group. It is to be noted that the oximes of aromatic aldehydes and of unsymmetrical aromatic ketones frequently exist in isomeric forms. This isomerism is explained by the Hantzsch-Werner hypothesis (*Ber.*, 1890, 23, p. 11) in which the assumption is made that the three valencies of the nitrogen atom do not lie in the same plane. Thus in the case of the simple aldoximes two configurations are possible, namely: $\begin{matrix}R\cdot C\cdot H\\ \cdot\cdot\\ N\cdot OH\end{matrix}$ and $\begin{matrix}R\cdot C\cdot H\\ \cdot\cdot\\ HO\cdot N\end{matrix}$, the former, where the H atom and OH group are contiguous, being known as *syn*-aldoximes and the latter as the *anti*-aldoximes. The syn-aldoximes or treatment with acetyl chloride readily lose water and yield nitriles; the anti-aldoximes as a rule are acetylated and do not yield nitriles. The isomerism of the oximes of unsymmetrical ketones is explained in the same manner, and their configuration is determined by an application of the Beckmann transformation (see *Ber.*, 1891, 24, p. 13); thus:



$$\begin{matrix}R\cdot C\cdot R'\\ \cdot\cdot\\ N\cdot OH\end{matrix} \rightarrow R\cdot C(OH):NR' \rightarrow R\cdot CONHR' (R' \text{ and OH, “}syn\text{”}).$$

$$\begin{matrix}R\cdot C\cdot R'\\ \cdot\cdot\\ HO\cdot N\end{matrix} \rightarrow RN:C(OH)R' \rightarrow RNH\cdot COR' (R \text{ and OH, “}syn\text{”}).$$

Aldoximes are generally obtained by the action of hydroxylamine hydrochloride on the aldehyde in presence of sodium carbonate; the oxime being then usually extracted from the solution by ether. They may also be prepared by the reduction of primary nitro compounds with stannous chloride and concentrated hydrochloric acid; by the reduction of unsaturated nitro compounds with aluminium amalgam or zinc dust in the presence of dilute acetic acid (L. Bouveault, *Comptes rendus*, 1902, 134, p. 1145): $R_2C:CHNO_2 \rightarrow R_2C:CH\cdot NHOH \rightarrow R_2CH\cdot CH:NOH$, and by the action of alkyl iodides on the sodium salt of nitro-hydroxylamine (A. Angeli, *Rend. Acad. d. Lincei*, 1905, (5), 14, ii. p. 411), the cycle of reactions probably being as follows:

$$NO_2\cdot NHOH \rightarrow HNO_2 + HNO;\ HNO + RI \rightarrow HI + RNO$$
$$(CH_3CH_2NO \rightarrow CH_3CH:N\cdot OH).$$

Formaldoxime, $CH_2:NOH$, was obtained by W. R. Dunstan (*Jour. Chem. Soc.*, 1898, 73, p. 352) as a colourless liquid by the addition of hydroxylamine hydrochloride to an aqueous solution of formaldehyde in the presence of sodium carbonate; the resulting solution was extracted with ether and the oxime hydrochloride precipitated by gaseous hydrochloric acid, the precipitate being then dissolved in water, the solution exactly neutralized and distilled. It boils at 83-85° C. and burns with a green coloured flame. It is readily transformed into a solid polymer, probably $(CH_2:NOH)_3$. In the absence of water, it forms salts of the type $(CH_2:NOH)_3\cdot HCl$ with acids. It behaves as a powerful reducing agent, and on hydrolysis with dilute mineral acids is decomposed into formaldehyde and hydroxylamine, together with some formic acid and ammonia, the amount of each product formed varying with temperature, time of reaction, amount of water present, &c. This latter reaction is probably due to some of the oxime existing in the form of the isomeric formamide $HCO\cdot NH_2$. Acetyl- and benzoyl-formaldoxime are derivatives of the threefold polymeric form. The acetyl compound on reduction yields two of its nitrogen atoms in the form of ammonia and the third in the form of methylamine.

Acetaldoxime, $CH_3CH:NOH$, crystallizes in needles which melt at 47° C. On continued fusion the melting point gradually sinks to about 13° C., probably owing to conversion into a polymeric form.

Chloraloxime, $CCl_3CH:NOH$, is obtained when one molecular proportion of chloral hydrate is warmed with four molecular proportions of hydroxylamine hydrochloride and a little water. It crystallizes in prisms which melt at 39° C. A chloral hydroxylamine, $CCl_3\cdot CHOH\cdot NHOH$, melting at 98° C. is obtained by allowing a mixture of one molecular proportion of chloral hydrate with two molecular proportions of hydroxylamine hydrochloride and one of sodium carbonate to stand for some time in a desiccator.

Glyoxime, $HON:CH\cdot CH:NOH$, obtained from glyoxal and hydroxylamine, or by boiling amidothiazole with excess of hydroxylamine hydrochloride and water, melts at 178° C. and is readily soluble in hot water.

Succinic aldehyde dioxime, $HON:CH\cdot CH_2\cdot CH_2\cdot CH:NOH$, is obtained by boiling an alcoholic solution of pyrrol with hydroxylamine hydrochloride and anhydrous sodium carbonate (G. Ciamician, *Ber.*, 1884, 17, p. 534). It melts at 173° C.; and on reduction with sodium in alcoholic solution yields tetramethylene diamine. A boiling solution of caustic potash hydrolyses it to ammonia and succinic acid.

Benzaldoximes.—The α-oxime (benz-*anti*-aldoxime) is formed by the action of hydroxylamine on benzaldehyde. It melts at 35° C. and boils at 117° C. (14 mm.). Acids convert it into the β-oxime (benz-*syn*-aldoxime) which melts at 125° C. When distilled under diminished pressure the β-form reverts to the α-modification (see Beckmann, *Ber.*, 1887, 20, p. 2766; 1889, 22, pp. 429, 513, 1531, 1588).

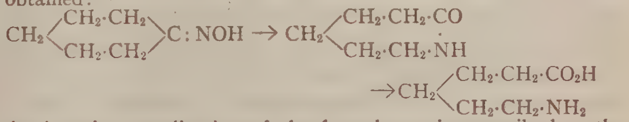
Ketoximes are usually rather more difficult to prepare than aldoximes, and generally require the presence of a fairly concentrated alkaline solution. They may also be prepared by the reduction of pseudo-nitrols (R. Scholl, *Ber.*, 1896, 29, p. 87), the reaction probably being:

$$RR:C(NO_2)NO \rightarrow RR:C:(NHOH)_2 \rightarrow RR:C:NOH + NH_2OH.$$

Acetoxime, $(CH_3)_2C:NOH$, melts at 58-59° C. and is readily soluble in water. Its sodium salt is obtained by the action of sodamide on the oxime, in presence of benzene (A. W. Titherley, *Jour. Chem. Soc.*, 1897, 71, p. 461).

Mesityl oxime, $(CH_3)_2C:CH\cdot C(:NOH)CH_3$, exists in two modifications. The β-form is obtained by the direct action of hydroxylamine hydrochloride on mesityl oxide, the hydrochloride so formed being decomposed by sodium carbonate. It crystallizes in plates which melt at 48-49° C. and boil at 92° C. (9 mm.). When boiled for some time with caustic soda, it is converted into the oily α-oxime, which boils at 83-84° C. (9 mm.). Both forms are volatile in steam. The α-oxime, on long continued boiling with a concentrated solution of a caustic alkali, is partially decomposed with formation of some acetone and acetoxime (C. Harries, *Ber.*, 1898, 31, pp. 1381, 1808; 1899, 32, p. 1331). By the direct action of hydroxylamine on a methyl alcohol solution of mesityl oxide in the presence of sodium methylate a hydroxylamino-ketone, *diacetone hydroxylamine*, $(CH_3)_2C(NHOH)\cdot CH_2COCH_3$, is formed. In a similar manner phorone gives rise to *triacetone hydroxylamine*, $CO:[CH_2\cdot C(CH_3)_2]_2:NOH$.

Acetophenoneoxime, $C_6H_5\cdot C(:NOH)\cdot CH_3$, melts at 59° C. In glacial acetic acid solution, on the addition of concentrated sulphuric acid, it is converted into acetanilide. *Benzophenone oxime*, $C_6H_5C(:NOH)C_6H_5$, exists only in one modification which melts at 140° C.; whereas the unsymmetrical benzophenones each yield two oximes. O. Wallach (*Ann.*, 1900, 312, p. 171) has shown that the saturated cyclic ketones yield oximes which by an application of the Beckmann reaction are converted into isoximes, and these latter on hydrolysis with dilute mineral acids are transformed into acyclic amino-acids; thus from cyclohexanone, ϵ-amidocaproic acid (ϵ-leucine) may be obtained:—

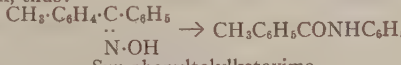


$$CH_2\left\langle\begin{matrix}CH_2\cdot CH_2\\ CH_2\cdot CH_2\end{matrix}\right\rangle C:NOH \rightarrow CH_2\left\langle\begin{matrix}CH_2\cdot CH_2\cdot CO\\ \cdot\\ CH_2\cdot CH_2\cdot NH\end{matrix}\right. \rightarrow CH_2\left\langle\begin{matrix}CH_2\cdot CH_2\cdot CO_2H\\ CH_2\cdot CH_2\cdot NH_2\end{matrix}\right.$$

An ingenious application of the fact that oximes easily lose the elements of water and form nitriles was used by A. Wohl (*Ber.*, 1893, 26, p. 730) in the "breaking down" of the sugars. Glucose-oxime on warming with acetic anhydride is simultaneously acetylated and dehydrated, yielding an acetylated gluconitrile, which when warmed with ammoniacal silver nitrate loses hydrocyanic acid and is transformed into an acetyl pentose. The pentose is then obtained from the acetylated compound by successive treatment with ammonia and dilute acids:—

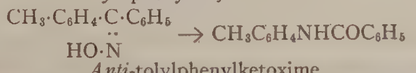
$$CH_2OH\cdot(CHOH)_3\cdot CHOH\cdot CH:NOH \rightarrow CH_2OH\cdot(CHOH)_3\cdot CHOH\cdot CN \rightarrow CH_2OH(CHOH)_3\cdot CHO.$$

In order to arrive at the configuration of the stereoisomeric ketoximes, A. Hantzsch (*Ber.*, 1891, 24, p. 13) has made use of the Beckmann reaction, whereby they are converted into acid-amides. Thus, with the tolylphenylketoximes, one yields the anilide of toluic acid and the other the toluidide of benzoic acid, the former necessitating the presence of the phenyl and hydroxyl radicals in the *syn* position and the latter the tolyl and hydroxyl radicals in the *syn* position, thus:



$$\begin{matrix}CH_3\cdot C_6H_4\cdot C\cdot C_6H_5\\ \cdot\cdot\\ N\cdot OH\end{matrix} \rightarrow CH_3C_6H_5CONHC_6H_5;$$

Syn-phenyltolylketoxime



$$\begin{matrix}CH_3\cdot C_6H_4\cdot C\cdot C_6H_5\\ \cdot\cdot\\ HO\cdot N\end{matrix} \rightarrow CH_3C_6H_4NHCOC_6H_5$$

Anti-tolylphenylketoxime

In the case of the aldoximes, that one which most readily loses the elements of water on dehydration is assumed to contain its hydroxyl radical adjacent to the movable hydrogen atom and is designated the *syn*-compound.

On the oxyamido-oximes see H. Ley, *Ber.*, 1898, 31, p. 2126; G. Schroeter, *Ber.*, 1900, 33, p. 1975.

OXUS, or AMU DARYA, one of the great rivers of Central Asia. Prior to the meeting of the commissions appointed for the determination of the Russo-Afghan boundary in 1885, no very accurate geographical knowledge of the upper Oxus regions existed, and the course of the river itself was but roughly mapped. Russian explorers and natives of India trained for geographical reconnaissance, and employed in connexion with the great trigonometrical survey of India, had done so much towards clearing away the mists which enveloped the actual course of the river, that all the primary affluents were known, although their relative value was misunderstood, but the nature of the districts which bordered the river in Afghan Turkestan was so imperfectly mapped as to give rise to considerable political complication in framing the boundary agreement between Great Britain and Russia. From Lake Victoria (Sor-Kul) in the Pamirs, which was originally reckoned as the true source of the river, to Khamiab, on the edge of the Andkhui district of Afghan Turkestan, for a distance of about 680 m., the Oxus forms the boundary between Afghanistan and Russia. For another 550 m. below Khamiab it follows an open and sluggish course till it is lost in the Sea of Aral, being spanned at Charjui, 150 m. below Khamiab, by the wooden bridge which carries the Russian railway from Merv to Samarkand. The level of Lake Victoria is 13,400 ft. above sea. At Khamiab the river is probably rather less than 500 ft.

Sources.

For many years a lively geographical controversy circled about the sources of the Oxus, and the discussion derived some political significance from the fact that the true source, wherever it might be found, was claimed as a point in the Russo-Afghan boundary. The final survey of the Pamir region (wherein the heads of all the chief tributaries of the river lay hidden), by the Pamir boundary commission of 1895 established the following topographical facts in connexion with this question. The elevated mountain chain which is now called the Nicolas range, which divides the Great from the Little Pamir, is a region of vast glaciers and snow-fields, from which the lakes lying immediately north and south derive the greater part of their water-supply. On the north the principal glacial tributary of Lake Victoria forms, within the folds of the gigantic spurs of the Nicolas mountains, a series of smaller lakes, or lakelets, before joining the great lake itself. On the south a similar stream starting farther east, called Burgutai (denoting the position of a difficult and dangerous pass across the range) sweeps downwards towards Lake Chakmaktin, the lake of the Little Pamir, which is some 400 ft. lower than Victoria. But at the foot of the mountain this stream bifurcates in the swamps which lie to the west of Chakmaktin, and part of its waters find their way eastwards into the lake, and part flow away westwards into the Ab-i-Panja, which joins the Pamir river from Lake Victoria at Kala Panja. This at any rate is the action of the Burgutai stream during certain seasons of the year, so that the glaciers and snowfields of the Nicolas range may be regarded as the chief fountain-head of at least two of the upper tributaries of the Oxus, namely, the Aksu (or Murghab) and the Pamir river, and as contributing largely to a third, the Ab-i-Panja. Neither Lake Victoria nor Lake Chakmaktin derives any very large contributions from glacial sources other than those of the Nicolas range. It is possible that there may be warm springs on the bed of Lake Victoria, as such springs are of frequent occurrence in the Pamirs; but there is no indication of them in the Chakmaktin basin, and the latter lake must be regarded rather as an incident in the course of the Aksu—a widening of the river channel in the midst of this high-level, glacier-formed valley—than as the fountain-head of the infant stream. There are indications that the bed of Lake Victoria, as well as that of Chakmaktin, is rapidly silting, and that the shores of the latter are gradually receding farther from the foot of the hills. The glacial origin of the Pamir valleys is everywhere apparent in their terrace formations and the erratic blocks and boulders that lie scattered about their surface. It is probable that the lakes themselves are evidence of (geologically) a comparatively recent deliverance from the thraldom of the ice covering, which has worn and rounded the lower ridges into the smooth outlines of undulating downs.

Another important source of the river (considered by Curzon to be the chief source) is to be found in the enormous glaciers which lie about the upper or main branch of the Ab-i-Panja (called the Ab-i-Wakhjir or Wakhan), which rises under the mountains enclosing the head of the Taghdumbash Pamirs. Although the superficial area of glacial ice from which the Ab-i-Wakhjir derives the greater part of its volume is not equal to that found on the Nicolas range, it is quite impossible to frame any estimate of comparative depth or bulk, or to separate the volume of its contributions at any time from those which, combined, derive their origin from the Nicolas range. If the Aksu (or Murghab) and the Pamir river from Lake Victoria are to be considered in the light of independent tributaries, it is probable that the Ab-i-Panja contributes as large a volume of glacial flood to the Oxus as either of them.

Surveys.

From the point where the rivers of the Great and Little Pamirs join their forces at Kala Panja to Ishkashim, at the elbow of the great bend of the Oxus northwards, the river valley has been surveyed by Woodthorpe; and the northern slopes of the Hindu Kush, which near Ishkashim extend in slopes of barely 10 m. in length from the main watershed to the river banks, have been carefully mapped. These slopes represent the extent of Afghan territory which exists north of the Hindu Kush between Kala Panja and Ishkashim. From Ishkashim northwards the river passes through the narrow rock-bound valleys of Shignan and Roshan ere it sweeps north and west through the mountains and defiles of Darwaz. By the terms of the boundary agreement with Russia this part of the river now parts Badakshan and Darwaz from the districts of Roshan, Shignan, and Bokhara, which formerly maintained an uncertain claim over a part of the territory on the left bank of the river. All this part of the Oxus, until the river once again emerges from the Bokhara hills into the open plains bordering Badakshan on the north, falls within the area of Russian surveys, with which a junction from India has been effected both on the Pamirs and in Turkestan.

Russian Posts on the Oxus.

At Langar Kisht, a little to the east of the Oxus bend, there is a small Russian post of observation. About 50 m. north of the bend, where the Suchan or Ghund joins the Oxus from the Alichur Pamir, there is another and larger post called Charog. On the left bank of the river the Afghans maintain a frontier post at the fort of Kala Bar Panja. A road will connect Charog with the Alichur Pamir, following the general course of the Ghund stream, a road which will form a valuable link in the chain of communications between Bokhara and Sarikol. Eighty-five miles north of Ishkashim, at Kala Wamar, the river which rises in the Little Pamir, and which is called Aksu, Murghab, or Bartang, joins the Oxus from the east. It is on this river that the Russian outpost, Murghabi (or Pamirski), is situated, at an elevation of 12,150 ft. above the sea. Fort Murghabi is connected by a good military road with Osh. At this point the measurement of the comparative lengths of the chief Pamir tributaries of the Oxus is as follows:—

To the head of the Aksu at Lake Chakmaktin . .	260 miles.
To the head of the most easterly tributary of Lake Victoria, in the Great Pamir, about	230 ,,
To the glacial sources of the Ab-i-Wakhjir, about .	230 ,,

For 120 m. the two latter are united in the main stream of the Oxus, the volume of which has been further increased by the united forces of the Ghund and Shakhdara draining the Alichur Pamir and the heights of Shignan.

Nature of the Oxus Valley.

The narrow cramped valley of the river between Ishkashim and Kala Wamar is hedged in on the west by a long ridge flanking the highlands of Badakshan; on the east the buttresses and spurs of the Shignan mountains (of which the strike is transverse to the direction of the river and more or less parallel to that of the main Hindu Kush watershed) overhang its channel like a wall, and afford but little room either for cultivation or for the maintenance of a practicable road. Yet the lower elevation (for this part of the Oxus stream is not more than about 7000 ft. above sea-level) and comparatively mild climate give opportunities to the industrious Tajik population for successful agriculture, of which they are not slow to avail themselves, and a track exists on the left bank of the river to Kala Bar Panja opposite the Ghund (or Suchan) debouchment, which is practicable for mules. There are no bridges, and the transit of the river from bank to bank can only be effected by the use of inflated skins. Beyond the Bartang (or Murghab) confluence the valley narrows, and the difficulties of the river route increase. Between Kala Wamar (6580 ft.) and Kala Khum (4400 ft.), where the Oxus again bends southwards, its course to the north-west is almost at right angles to the general strike of the Darwaz mountains, which is from north-east to south-west, following the usual conformation of all this part of high Asia. Thus its chief affluents from the north-east, the Wanj and the Yaz Ghulam, drain valleys which are comparatively open, and which are said to be splendidly fertile. At

Kala Khum the river is 480 ft. wide, narrowing to 350 ft. in the narrowest gorge. Its level varies with the obstructions formed by ice, falling as much as 28 ft. when its upper channels are blocked.

Climate and Productions.

The climate of eastern Bokhara and Darwaz is delightful in summer, and Dr Regel writes of its Alpine scenery and flora in terms of enthusiastic admiration. In the valleys of the Waksh and the Surkhab to the north of Darwaz, which form an important part of the province of Karategin, maple, ash, hawthorn, pistachio, and juniper grow freely in the mountain forests, and beetroot, kohl rabi, and other vegetables are widely cultivated. About the cliffs and precipices of the Panja valley near Kala Khum the wild vine, cerasus, and pomegranate are to be found, and the plane tree and mulberry flourish in groups near the villages. Here also, amongst other plants, the sunflower decorates village gardens. The houses are built of stone and mortar, and above the thatched straw roof which surmounts the double-storeyed buildings the square water-tower rises gracefully. Every house possesses its staircase, its well, and cisterns for irrigation; and on the whole the Aryan Tajiks of this northern section of the Oxus valley seem to be well provided with most of the comforts, if not the luxuries, of life. Their language is the language of Bokhara and Samarkand. Bokharan supremacy was re-established in 1878, when Kala Khum was occupied by Bokharan troops. Since then the right bank of the river has been politically divided from the left, and the latter now belongs to Afghanistan.

From Kala Khum, which fort about marks the most northerly point of the great bend of the Oxus round Badakshan, the river follows a south-westerly course for another 50 m. through a close mountainous region ere it widens into the more open valley to the south of Kolab. It now becomes a river of the plains from which the mountains on either side stand back.

Darwaz Affluents.

The topography of Darwaz south of the river is not accurately known, but at least one considerable stream of some 60 m. in length drains to the north-east, parallel to the general strike of the mountain system into the transverse course of the Oxus, which it joins nearly opposite to the lateral valleys of Yaz Ghulam and Wanj. This stream is called Pangi-Shiwa, or Shiwa, but not much is known about it. Another of about equal length, starting from the same central water-parting of this mountain block, and included within the Oxus bend, follows a transverse direction at almost right angles to the Shiwa, and joins the Oxus valley near its debouchment into the more open Kolab plains, where the course of the Oxus has again assumed a direction parallel to the mountain strike. All that we know about this river (which is called the Ragh or Sadda) is that towards its junction with the Oxus it cuts through successive mountain ridges, which renders its course impracticable as a roadway. It is necessary to avoid the river, and to pass by mountain tracks which surmount a series of local spurs or offshoots from the central plateau, in order to reach the Oxus. The existence of this route, which traverses the Darwaz mountains from east to west, cutting off the northern bend of the Oxus, and connecting those easterly routes which intersect the Pamirs by means of the Ghund and Shakhdara (and which concentrate about Lake Shiwa) with Kolab in eastern Bokhara, is important. (See BADAKSHAN.)

Karateghin Affluents.

From about the point where the Oxus commences to separate the Bokharan province of Kolab from the comparatively open Afghan districts of Rustak and Kataghan, the channel of the river is no longer confined within walls of mountains of volcanic and schistose formation. The Kolab and the Surkhab (or Waksh) flow into it in broad muddy streams from the highlands of Karateghin, and the river at once commences to adopt an uncertain channel wherever the outstretched arms of the hills fail to confine it within definite limits. It divides its waters, splitting into many channels, leaving broad central islands; and as the width increases, and the depth during dry seasons diminishes, opportunities for fords become comparatively frequent. Between Kolab and Pata Kesar, immediately north of the Turkestan capital of Mazar-i-Sharif, there are at least three well-known "guzars" or fords, and there are probably more. Besides the great muddy affluents from Karateghin on the north, the Kabadian, the Surkhan, and the Darbant are all of them very considerable tributaries from Bokhara. The last of the three is the river on which the well-known trade centre of Shirabad is built, some 20 m. north of the river. Near the junction of the Surkhan with the Oxus are the ruins of the ancient city of Termez, on the northern or Bokharan bank, and the ferry at Pata Kesar (not far from the ruins of an old bridge) is the connecting link between Bokhara and Mazar hereabouts. A Russian branch railway is said to have been recently built from Samarkand to Termez.

Badakshan Affluents.

From the south two very remarkable affluents of the Oxus join their streams to the main river between Kolab and the Mazar crossings. The Kokcha and the Khanabad (or Kunduz) are the two great rivers of Badakshan. The valley of the Kokcha leads directly from the Oxus to Faizabad, the capital of Badakshan, and its head is close above Ishkashim at the southern elbow of the great Oxus bend, a low pass of only 9500 ft. dividing its waters from those of the main river. This undoubtedly was a section of the great central trade route of Asia, which once connected Ferghana and Herat with Kashgar and China. (See BADAKSHAN.) Both these rivers tap the northern slopes of the Hindu Kush, and claim their sources in the unmapped mountain wilderness of Kafiristan. The Khanabad, or Kunduz, is also called locally the Aksarai. All the rivers of Central Asia are known by several names. To the west of the Kunduz no rivers find their way through the southern banks of the Oxus. Throughout the plains of Afghan Turkestan the drainage from the southern hills is arrested and lost in the desert sands.

The only island of any size in the bed of the river is the island of Paighambar, a little below the ruins of Termez. The inhabitants of this island, and of a smaller one in the neighbourhood called Zarshoi, wash for gold in the bed of the river.

At Airatan, a little above the Pata Kesar ferry, there are ruins, as also at Khisht Tapa (where the road from Kabadian to Tashkurghan leaves the river) and at Kalukh Tapa. At Khisht Tapa there is a tradition of a bridge having once existed.

Channel of the Oxus.

The Oxus river, as seen in flood at this part of its course, is an imposing stream. It is rarely less than 1000 yards wide, and in some places it is fully a mile across. Its winter channel may be estimated at from two-thirds to three-fourths of its flood channel, except where it is confined within narrow limits by a rocky bed, as at Kilif, where its unvarying width is only 540 yards. The average strength of the current in flood is about 4 m. per hour, varying from 2½ to 5 m. The left bank of the Oxus above Kilif is, as a rule, low and flat, with reed swamps bordering the stream and a strip of jungle between the reeds and the edge of the elevated sandy desert. The jungle is chiefly tamarisk and padah (willow). Swamp deer, pheasants, and occasionally tigers are found in it. The right bank is generally higher, drier, more fertile and more populated than the left.

Cultivation.

A wide belt of blown sand (or Chul), sprinkled with saxaul jungle, separates the swamps on the south side of the river from the cultivated plains of Afghan Turkestan; but in places, notably for about 12 m. above Khamiab, where the Russo-Afghan boundary touches the river, through the districts which are best known by the name of Khwaja Salar, and again in a less degree for 50 m. above the ferry at Kilif, a very successful war has been waged by the agricultural Turkman (of the Ersari tribes) against the encroaching sand-waves of the desert; and a strip of riverain soil averaging about a mile in width has been reclaimed and cultivated by irrigation. The cultivation, supported by canals drawn from the Oxus, the heads of which are constantly being destroyed by flood and again renewed, is of a very high order. Wheat and barley spread in broad crops over many square miles of rich soil; the fields are intersected by narrow little stone-walled lanes, bright with wayside flowers, amongst which the poppy and the purple thistle of Badghis are predominant; the houses are neatly built of stone, and stand scattered about the landscape in single homesteads, substantial and comfortable; and the spreading willow and the mulberry offer a most grateful shade to the wayfarer in summer time, when the heat is often insupportable. The fiery blasts of summer, furnace-heated over the red-hot Kizil Kum, are hardly less to be feared than the ice-cold shamshir (or north-western blizzard) of winter, which freezes men when it finds them in the open desert, and frequently destroys whole caravans.

Oxus Ferries.

The principle on which the Oxus ferries are worked is peculiar to those regions. Large flat-bottomed boats are towed across the river by small horses attached to an outrigger projecting beyond the gunwale by means of a surcingle or bellyband. They are thus partially supported in the water whilst they swim. The horses are guided from the boat, and a twenty- or thirty-foot barge with a heavy load of men and goods will be towed across the river at Kilif (where, as already stated, the width of the river is between 500 and 600 yards only) with ease by two of these animals. The Kilif ferry is on the direct high-road between Samarkand and Akcha. It is perhaps the best-used ferry on the Oxus.

Khwaja Salar.

Khwaja Salar derives some historical significance from the fact that it presented a substantial difficulty to the settlement of the Russo-Afghan boundary, in which it was assigned by agreement as the point of junction between that boundary and the Oxus. It had been defined in the agreement as a "post" on the river banks, and had been so described by Burnes in his writings some fifty years previously. But no post such as that indicated could be discovered. There was a district of that name extending from Khamiab to the neighbourhood of Kilif, and at the Kilif end of the district was a ziarat sacred to the Khwaja who bore the name. It was only after long inquiry amongst local cultivators and landowners that, about 2 m. below the ziarat, and nearly opposite to the site of the present Karkin bazaar, the position of a lost ferry was identified, which had once been marked by a riverside hamlet called by the name of the saint. The ferry had long disappeared, and with it a considerable slice of the riverside alluvial soil, which had been washed into the stream by the action of floods. The post had, in fact, subsided to the bottom of the river, but the consequences of its disappearance had been both far-reaching and expensive.

Below Khamiab, to its final disappearance in the Aral Sea, the great river rolls in silent majesty through a vast expanse of sand and

Lower Oxus.

desert. Under Russian auspices a considerable strip of alluvial soil on the left bank has been brought under cultivation, measuring 4 or 5 m. in width, and there is more cultivation on the banks of the Oxus now than there is in the Merv oasis itself, but it is confined to the immediate neighbourhood of the river, for no affluents of any considerable size exist. The river is navigable below Charjui, and takes its place as an important unit in the general scheme of Russian frontier communications. There is now a regular steamer service, twice a week in summer and once a week in winter, as far as Pata Kasar. The steamers are flat-bottomed paddle boats drawing 3 ft.

Junction with the Aral Sea.

An important feature in connexion with the course of the Oxus is the discussion that has arisen with regard to its former debouchment into the Caspian Sea. On this point much recent evidence has been collected, and it appears certain that there was a time in the post-Pliocene Age when a long gulf of the Caspian Sea protruded eastwards nearly as far as the longitude of Merv, covering the Kara Kum sands, but not the Kara Kum plateau to the north of the sands, which is separated from the sands by a distinct sea beach. At the same time another branch of the same gulf protruded northwards in the direction of the Aral, probably as far as the Sary Kamish depression, which lies to the west of the Khivan delta of the Oxus, separated from it by wide beds of loess, clays and gravel, covering rocks of an unknown age. The Murghab river and the Hari Rud, which terminate in the oases of Merv and Sarakhs, almost certainly penetrated to the gulf of the Kara Kum, but the question whether the Oxus was ever deflected so as to enter the gulf with the Murghab cannot be said to be answered decisively at present. The former connexion between the Caspian and Aral by means of the gulf now represented by the Sary Kamish depression seems to be admitted by Russian scientists, nor would there appear to be much doubt about the connexion between the Khivan oasis and the northern extremity of the Sary Kamish. In this discussion the names of Kaulbars, Lessar, Annenkov, Konshin and other Russian geographers are conspicuous. The general conclusions are ably summed up by P. Kropotkin in the September number of the *Journal* of the Royal Geographical Society for 1898.

History.—In the most remote ages to which written history carries us, the regions on both sides of the Oxus were subject to the Persian monarchy. Of their populations Herodotus mentions the Bactrians, Chorasmians, Sogdians and Sacae as contributing their contingents to the armies of the great king Darius. The Oxus figures in Persian romantic history as the limit between Iran and Turan, but the substratum of settled population to the north as well as the south was probably of Iranian lineage. The valley is connected with many early Magian traditions, according to which Zoroaster dwelt at Balkh, where, in the 7th century B.C., his proselytizing efforts first came into operation. Buddhism eventually spread widely over the Oxus countries, and almost entirely displaced the religion of Zoroaster in its very cradle. The Chinese traveller Hsuen Tsang, who passed through the country in A.D. 630–644, found Termez, Khulm, Balkh, and above all Bamian, amply provided with monasteries, stupas and colossal images, which are the striking characteristics of prevalent Buddhism; even the Pamir highlands had their monasteries.

Christianity penetrated to Khorasan and Bactria at an early date; episcopal sees are said to have existed at Merv and Samarkand in the 4th and 5th centuries, and Cosmas (*c.* 545) testifies to the spread of Christianity among the Bactrians and Huns.

Bactria was long a province of the empire which Alexander the Great left to his successors, but the Greek historians give very little information of the Oxus basin and its inhabitants. About 250 B.C. Diodotus, the "governor of the thousand cities of Bactria," declared himself king, simultaneously with the revolt of Arsaces which laid the foundation of the Parthian monarchy. The Graeco-Bactrian dominion was overwhelmed entirely about 126 B.C. by the Yue-chi (*q.v.*), a numerous people who had been driven westwards from their settlements on the borders of China by the Hiungnu (*q.v.*). From the Yue-chi arose, about the Christian era, the great Indo-Scythian dominion which extended across the Hindu Kush southwards, over Afghanistan and Sind. The history of the next five centuries is a blank. In 571 the Haiathalah (Ephthalites, *q.v.*) of the Oxus, who are supposed to be descendants of the Yue-chi, were shattered by an invasion of the Turkish khakan; and in the following century the Chinese pilgrim Hsuen Tsang found the former empire of the Haiathalah broken up into a great number of small states, all acknowledging the supremacy of the Turkish khakan, and several having names identical with those which still exist. The whole group of states he calls Tukhara, by which name in the form Tokharistan, or by that of Haiathalah, the country continued for centuries to be known to the Mahommedans. At the time of his pilgrimage Chinese influence had passed into Tokharistan and Transoxiana. Yazdeged, the last of the Sassanid kings of Persia, who died in 651, when defeated and hard pressed by the Moslems, invoked the aid of China; the Chinese emperor, Taitsung, issued an edict organizing the whole country from Ferghana to the borders of Persia into three Chinese administrative districts, with 126 military cantonments, an organization which, however, probably only existed on paper.

In 711–712 Mahommedan troops were conducted by Kotaiba, the governor of Khorasan, into the province of Khwarizm (Khiva), after subjugating which they advanced on Bokhara and Samarkand, the ancient Sogdiana, and are said to have even reached Ferghana and Kashgar, but no occupation then ensued. In 1016–1025 the government of Khwarizm was bestowed by Sultan Mahmud of Ghazni upon Altuntash, one of his most distinguished generals.

Tokharistan in general formed a part successively of the empires of the Sassanid dynasty (terminated A.D. 999), of the Ghaznevid dynasty, of the Seljuk princes of Persia and of Khorasan, of the Ghori or Shansabanya kings, and of the sultans of Khwarizm. The last dynasty ended with Sultan Jalal-ud-din, during whose reign (1221–1231) a division of the Mogul army of Jenghiz Khan first invaded Khwarizm, while the khan himself was besieging Bamian; Jalal-ud-din, deserted by most of his troops, retired to Ghazni, where he was pursued by Jenghiz Khan, and again retreating towards Hindustan was overtaken and driven across the Indus.

The commencement of the 16th century was marked by the rise of the Uzbeg rule in Turkestan. The Uzbegs were no one race, but an aggregation of fragments from Turks, Mongols and all the great tribes constituting the hosts of Jenghiz and Batu. They held Kunduz, Balkh, Khwarizm and Khorasan, and for a time Badakshan also; but Badakshan was soon won by the emperor Baber, and in 1529 was bestowed on his cousin Suleiman, who by 1555 had established his rule over much of the region between the Oxus and the Hindu Kush. The Mogul emperors of India occasionally interfered in these provinces, notably Shah Jahan in 1646; but, finding the difficulty of maintaining so distant a frontier, they abandoned it to the Uzbeg princes. About 1765 the wazir of Ahmad Shah Abdali of Kabul invaded Badakshan, and from that time until now the domination of the countries on the south bank of the Oxus from Wakhan to Balkh has been a matter of frequent struggles between Afghans and Uzbegs.

The Uzbeg rule in Turkestan has during the last fifty years been rapidly dwindling before the growth of Russian power. In 1863 Russia invaded the Khokand territory, taking in rapid succession the cities of Turkestan, Chimkent and Tashkend. In 1866 Khojend was taken, the power of Khokand was completely crushed, a portion was incorporated in the new Russian province of Turkestan, while the remainder was left to be administered by a native chief almost as a Russian feudatory; the same year the Bokharians were defeated at Irdjar. In 1867 an army assembled by the amir of Bokhara was attacked and dispersed by the Russians, who in 1868 entered Samarkand, and became virtually rulers of Bokhara. In 1873 Khiva was invaded, and as much of the khanate as lay on the right bank of the Oxus was incorporated into the Russian empire, a portion being afterwards made over to Bokhara. Russia acquired the right of the free navigation of the Oxus throughout its entire course, on the borders of both Khiva and Bokhara. The administration of the whole of the states on the right bank of the Oxus, down to the Russian boundary line at Ichka Yar, is now in the hands of Bokhara, including Karateghin—which the Russians have transferred to it from Khokand—and Darwaz at the entrance to the Pamir highlands.

AUTHORITIES.—Although much has been written of late years about the sources of the Oxus within the region of the Pamirs, there is very little to be found in the writings of geographers of modern date descriptive of that part of its course which separates Darwaz and Afghan Turkestan from Bokhara, and that little is chiefly in the pages of reports and gazettes, &c., which are not available to the public. The following authorities may be consulted: The *Report* of the Pamir Boundary Commission of 1895, published at Calcutta (1897); Dr A. Regel, "Journey in Karateghin and Darwaz," *Investia*, Russian Geog. Soc., vol. xiii. (1882); translation, vol. iv. *Proc. R.G.S.*; Michell, "Regions of the Upper Oxus," vol. vi. *Proc. R.G.S.* (1884); Griesbach, "Geological Field Notes," No. 3, Afghan Boundary Commission (1885); C. Yate, *Northern Afghanistan* (London, 1888); Curzon, "The Pamirs," vol. viii. *Jour. R.G.S.* (1896); Kropotkin, "Old Beds of the Oxus," *Jour. R.G.S.* (September 1898); Cobbold, *Innermost Asia* (London, 1900). To the above may be added the Reports of the Russo-Afghan Boundary Commission of 1884–1885, and that of Lockhart's Mission in 1885, and the Indian Survey Reports. (T. H. H.*)

OXYGEN (symbol O, atomic weight 16), a non-metallic chemical element. It was apparently first obtained in 1727 by Stephen Hales by strongly heating minium, but he does not seem to have recognized that he had obtained a new element, and the first published description of its properties was due to J. Priestley in 1774, who obtained the gas by igniting mercuric oxide, and gave it the name "dephlogisticated air." K. W. Scheele, working independently, also announced in 1775 the discovery of this element which he called "empyreal air" (*Crells' Annalen*, 1785, 2, pp. 229, 291). A. L. Lavoisier repeated Priestley's experiments and named the gas "oxygen" (from Gr. ὀξύς, sour, γεννάω, I produce) to denote that in a large number of cases, the products formed by the combustion of substances in the gas were of an acid character. Oxygen occurs naturally as one of the chief constituents of the atmosphere, and in combination with other elements it is found in very large quantities; it constitutes approximately eight-ninths by weight of water and nearly one-half by weight of the rocks composing the earth's crust. It is also disengaged by growing vegetation, plants possessing the power of absorbing carbon dioxide, assimilating the carbon and rejecting the oxygen. Oxygen may be prepared by heating mercuric oxide; by strongly heating manganese dioxide and many other peroxides; by heating the oxides of precious metals; and by heating many oxy-acids and oxy-salts to high temperatures, for example, nitric acid, sulphuric acid, nitre, lead nitrate, zinc sulphate, potassium chlorate, &c. Potassium chlorate is generally used and the reaction is accelerated and carried out at a lower temperature by previously mixing the salt with about one-third of its weight of manganese dioxide, which acts as a catalytic agent. The actual decomposition of the chlorate is not settled definitely; the following equations give the results obtained by P. F. Frankland and Dingwall (*Chem. News*, 1887, 55, p. 67):—at a moderate heat: $8KClO_3=5KClO_4+3KCl+2O_2$, succeeded by the following reactions as the temperature increases: $2KClO_3=KClO_4+KCl+O_2$ and $2KClO_3=2KCl+3O_2$ (see also F. Teed, ibid., 1887, 55, p. 91; H. N. Warren, ibid., 1888, 58, p. 247; W. H. Sodeau, *Proc. Chem. Soc.*, 1901, 17, p. 149). It may also be obtained by heating manganese dioxide or potassium bichromate or potassium permanganate with sulphuric acid; by the action of cobalt salts or manganese dioxide on a solution of bleaching powder (Th. Fleitmann, *Ann.*, 1865, 134, p. 64); by the action of a ferrous or manganous salt with a salt of cobalt, nickel or copper on bleaching powder (G. F. Jaubert, Ger. pat. 157171); by passing chlorine into milk of lime (C. Winkler, *Jour. prakt. Chem.*, 1866, 98, p. 340); by the action of chlorine on steam at a bright red heat; by the decomposition of hydrogen peroxide by bleaching powder, manganese dioxide, potassium ferricyanide in alkaline solution, or potassium permanganate in acid solution; by heating barium peroxide with an aqueous solution of potassium ferricyanide (G. Kassner, *Zeit. angew. Chem.*, 1890, p. 448) $BaO_2+2K_3Fe(CN)_6=Ba[FeK_3(CN)_6]_2+O_2$; by the decomposition of sodium and potassium peroxides with a solution of potassium permanganate in the presence of a trace of nickel salts (G. F. Jaubert, *Comptes rendus*, 1902, 134, p. 778).

Numerous methods have been devised for the manufacture of oxygen. The more important are as follows: by decomposing strongly heated sulphuric acid in the presence of a contact substance; by heating an intimate mixture of one part of sodium nitrate with two parts of zinc oxide (T. H. Pepper, *Dingler's Jour.*, 1863, 167, p. 39): $2ZnO+4NaNO_3=2Zn(ONa)_2+2N_2+5O_2$; by the use of cuprous chloride which when mixed with clay and sand, moistened with water and heated in a current of air at 100-200° C. yields an oxychloride, which latter yields oxygen when heated to 400° C (A. Mallet, *Comptes rendus*, 1867, 64, p. 226; 1868, 66, p. 349); by the electrolysis of solutions of sodium hydroxide, using nickel electrodes; by heating calcium plumbate (obtained from litharge and calcium carbonate) in a current of carbon dioxide (G. Kassner, *Monit. Scient.*, 1890, pp. 503, 614); and from air by the process of Tessié du Motay (*Ding. Jour.*, 1870, 196, p. 230), in which air is drawn over a heated mixture of manganese dioxide and sodium hydroxide, the sodium manganate so formed being then heated to about 450° C. in a current of steam, the following reversible reaction taking place: $4NaOH+2MnO_2+O_2\rightleftarrows 2Na_2MnO_4+2H_2O$. Oxygen is largely prepared by Brin's process (*Mém. soc. des Ingén. civ.*, 1881, p. 450) in which barium monoxide is heated in a current of air, forming the dioxide, which when the retorts are exhausted yields up oxygen and leaves a residue of monoxide; but this method is now being superseded, its place being taken by the fractional distillation of liquid air (*The Times, Engin. Suppl.*, April 14, 1909, p. 13) as carried out by the Linde method (Eng. Pat. 14111; 1902).

Oxygen is a colourless, odourless and tasteless gas. It is somewhat heavier than air, its specific gravity being 1·10523 (A. Leduc, *Comptes rendus*, 1896, 123, p. 805). It is slightly soluble in water and more so in alcohol. It also dissolves quite readily in some molten metals, especially silver. Oxygen does not burn, but is the greatest supporter of combustion known, nearly all the other elements combining with it under suitable conditions (cf. OXIDE). These reactions, however, do not take place if the substances are *absolutely* dry. Thus H. B. Baker (*Proc. Chem. Soc.*, 1902, 18, p. 40) has shown that perfectly dry oxygen and hydrogen will not combine even at a temperature of 1000° C. It is the only gas capable of supporting respiration. For the properties of liquid oxygen see LIQUID GASES.

It is found, more especially in the case of organic compounds, that if a substance which oxidizes readily at ordinary temperature be mixed with another which is not capable of such oxidation, then both are oxidized simultaneously, the amount of oxygen used being shared equally between them; or in some cases when the substance is spontaneously oxidized an equivalent amount of oxygen is converted into ozone or hydrogen peroxide. This phenomenon was first noticed by C. F. Schonbein (*Jour. prakt. Chem.*, 1858–1868), who found that on oxidizing lead in the presence of sulphuric acid, the same quantity of oxygen is used to form lead oxide as is converted into hydrogen peroxide. In a similar manner M. Traube (*Ber.*, 1882–1893) found that when zinc is oxidized in presence of water equivalent quantities of zinc hydroxide and hydrogen peroxide are formed at first, thus: $Zn+H_2O+O_2=ZnO+H_2O_2$, followed by $ZnO+H_2O=Zn(OH)_2, Zn+H_2O_2=Zn(OH)_2$. The oxygen uniting with the substance undergoing oxidation is generally known as "bound oxygen," whilst that which is transformed into ozone or hydrogen peroxide is usually called "active oxygen." C. Engler (*Ber.*, 1897, 30, p. 1669) calls the substance which undergoes oxidation the "autoxidizer" and the substance which unites with the active oxygen the "acceptor"; in the oxidation of metals he expresses results as: $M+O_2=MO_2$, followed by $MO_2\rightarrow M\cdot O+O$, and if water be present, $O+H_2O=H_2O_2$. Various theories have been developed in order to account for these phenomena. Schonbein (*loc. cit.*) assumed that the ordinary oxygen molecule is decomposed into two parts which carry electrical charges of opposite kinds, the one with the positive charge being called "antozone" and the other carrying the negative charge being called "ozone," one variety being preferentially used up by the oxidizing compound or element and the other for the secondary reaction. J. H. Van't Hoff (*Zeit. phys. Chem.*, 1895, 16, p. 411) is of the opinion that the oxygen molecule is to a certain extent ionized and that the ions of one kind are preferably used by the oxidizing compound. Traube (*loc. cit.*), on the other hand, concludes that the oxygen molecule enters into action as a whole and that on the oxidation of metals, hydrogen peroxide and the oxide of the metal are the primary products of the reaction. A. Bach (*Comptes rendus*, 1897, 124, p. 2) considers that the first stage in the reaction consists in the production of a peroxide which then interacts with water to form hydrogen peroxide (see also W. Manchot, *Ann.*, 1901, 314, p. 177; 1902, 325, p. 95).

Oxygen is a member of the sixth group in the periodic classification, and consequently possesses a maximum valency of six. In most cases it behaves as a divalent element, but it may also be quadrivalent. A. v. Baeyer and V. Villiger (*Ber.*, 1901, 34, pp. 2679, 3612) showed that many organic compounds (ethers, alcohols, aldehydes, ketones, &c.) behave towards acids, particularly the more complex acids, very much like bases and yield crystallized salts in which quadrivalent oxygen must be assumed as the basic element. These salts are considered to be derived from the hypothetical base $OH_3 \cdot OH$, oxonium hydroxide (compare sulphonium salts). Further see J. Schmidt, "Über die basischen Eigenschaften des Sauerstoffs" (Berlin, 1904). Baeyer and Villiger assume for the configuration of the salts of carbonyl compounds the arrangement $>\mathrm{C}:\mathrm{O}<_{\mathrm{X}}^{\mathrm{H}}$, whilst J. W. Bruhl and P. W. Walden point out from the physico-chemical standpoint that in water and hydrogen peroxide the oxygen atom is probably quadrivalent.

The atomic weight of oxygen is now generally taken as 16, and as such is used as the standard by which the atomic weights of the other elements are determined, owing to the fact that most elements combine with oxygen more readily than with hydrogen (see Element).

Oxygen is widely used in medical practice as well as in surgery. Inhalations of the gas are of service in pneumonia, bronchitis, heart disease, asthma, angina and other conditions accompanied by cyanosis and dyspnoea. They often avert death from asphyxia, or render the end less distressing. Oxygen is also administered in chloroform poisoning, and in threatened death from the inhalation of coal gas or nitrous oxides. It is of value in cyanide and opium poisoning and in the resuscitation of the apparently drowned. The mode of administration is by an inhaler attached to an inhalation bag, which serves to break the force with which the oxygen issues from the cylinders in which it is sold in a compressed form. It can be administered pure or mixed with air as required. If given in too great quantity a temporary condition of apnoea (cessation of breathing) is produced, the blood being fully charged with the gas. Oxygen may be applied locally as a disinfectant to foul and diseased surfaces by the use of the peroxide of hydrogen, which readily parts with its oxygen; a solution of hydrogen peroxide therefore forms a valuable spray in diphtheria, tonsillitis, laryngeal tuberculosis and ozaena. It can also be used with advantage in inoperable uterine cancer, favus and lupus, and as an injection in gonorrhoea and suppurative conditions of the ear. It relieves the pain of wasp and bee stings. Internally hydrogen peroxide is used in various diseased conditions of the gastro-intestinal tract, such as dyspepsia, diarrhoea and enteric fever. The B.P. preparation *Liquor Hydrogenii Peroxidi* dose ½ to 2 drs. is synonymous with the *Aqua Hydrogenii Dioxidi* of the U.S.P. and the ten-volume solution termed *eau oxygenée* in France. It is customary to use oxygen in combination with chloroform, or nitrous oxide in order to produce insensibility to pain (see Anaesthetics).

OXYHYDROGEN FLAME, the flame attending the combustion of hydrogen and oxygen, and characterized by a very high temperature. Hydrogen gas readily burns in oxygen or air with the formation of water. The quantity of heat evolved, according to Julius Thomsen, is 34,116 calories for each gram of hydrogen burned. This heat-disturbance is quite independent of the mode in which the process is conducted; but the temperature of the flame is dependent on the circumstances under which the process takes place. It obviously attains its maximum in the case of the firing of pure "oxyhydrogen" gas (a mixture of hydrogen with exactly half its volume of oxygen, the quantity it combines with in becoming water, German *Knall-gas*). It becomes less when the "oxyhydrogen" is mixed with excess of one or the other of the two reacting gases, or an inert gas such as nitrogen, because in any such case the same amount of heat spreads over a larger quantity of matter. Many forms of oxyhydrogen lamps have been invented, but the explosive nature of the gaseous mixture rendered them all more or less dangerous. It acquired considerable application in platinum works, this metal being only fusible in the oxyhydrogen flame and the electric furnace; and also for the production of limelight, as in optical (magic) lanterns. But these applications are being superseded by the electric furnace, and electric light.

OYAMA, IWAO, Prince (1842–), Japanese field-marshal, was born in Satsuma. He was a nephew of Saigo, with whom his elder brother sided in the Satsuma insurrection of 1877, but he nevertheless remained loyal to the imperial cause and commanded a brigade against the insurgents. When war broke out between China and Japan in 1894, he was appointed commander-in-chief of the second Japanese army corps, which, landing on the Liaotung Peninsula, carried Port Arthur by storm, and, subsequently crossing to Shantung, captured the fortress of Wei-hai-wei. For these services he received the title of marquess, and, three years later, he became field-marshal. When (1904) his country became embroiled in war with Russia, he was appointed commander-in-chief of the Japanese armies in Manchuria, and in the sequel of Japan's victory the mikado bestowed on him (1907) the rank of prince. He received the British Order of Merit in 1906.

OYER AND TERMINER, the Anglo-French name, meaning "to hear and determine," for one of the commissions by which a judge of assize sits (see Assize). By the commission of oyer and terminer the commissioners (in practice the judges of assize, though other persons are named with them in the commission) are commanded to make diligent inquiry into all treasons, felonies and misdemeanours whatever committed in the counties specified in the commission, and to hear and determine the same according to law. The inquiry is by means of the grand jury; after the grand jury has found the bills submitted to it, the commissioners proceed "to hear and determine" by means of the petty jury. The words oyer and terminer are also used to denote the court which has jurisdiction to try offences within the limits to which the commission of oyer and terminer extends.

By the Treason Act 1708 the crown has power to issue commissions of oyer and terminer in Scotland for the trial of treason and misprision of treason. Three of the lords of justiciary must be in any such commission. An indictment for either of the offences mentioned may be removed by certiorari from the court of oyer and terminer into the court of justiciary.

In the United States oyer and terminer is the name given to courts of criminal jurisdiction in some states, *e.g.* New York, New Jersey, Pennsylvania, and Georgia.

OYSTER. The use of this name in the vernacular is equivalent to that of *Ostrea* (Lat. from Gr. ὄστρεον, oyster, so called from its shell, ὀστέον, bone, shell) in zoological nomenclature; there are no genera so similar to *Ostrea* as to be confounded with it in ordinary language. *Ostrea* is a genus of Lamellibranch Molluscs. The degeneration produced by sedentary habits in all lamellibranchs has in the oyster reached its most advanced stage. The valves of the shell are closed by a single large adductor muscle, the anterior adductor being absent. The muscular projection of the ventral surface called the foot, whose various modifications characterize the different classes of *Mollusca*, is almost entirely aborted. The two valves of the shell are unequal in size, and of different shape; the left valve is larger, thicker and more convex, and on it the animal rests in its natural state. This valve, in the young oyster, is attached to some object on the sea-bottom; in the adult it is sometimes attached, sometimes free. The right valve is flat, and smaller and thinner than the left. In a corresponding manner the right side of the animal's body is somewhat less developed than the left, and to this extent there is a departure from the bilateral symmetry characteristic of Lamellibranchs.

The organization of the oyster, as compared with that of a typical lamellibranch such as *Anodon* (see Lamellibranchia), is brought about by the reduction of the anterior part of the body accompanying the loss of the anterior adductor, and the enlargement of the posterior region. The pedal ganglia and auditory organs have disappeared with the foot, at all events have never been detected; the cerebral ganglia are very minute, while the parieto-splanchnic are well developed, and constitute the principal part of the nervous system.

According to Spengel, the pair of ganglia near the mouth, variously called labial or cerebral, represent the cerebral pair and pleural pair of a gastropod combined, and the parieto-splanchnic pair correspond to the visceral ganglia, the commissure which connects them with the cerebro-pleural representing the visceral commissure. Each of the visceral ganglia is connected or combined with an olfactory ganglion underlying an area of specialized epithelium, which constitutes the olfactory organ, the osphradium. The heart and pericardial chamber in the oyster lie along the anterior face of the adductor muscle, almost perpendicular to the direction of the gills, with which in *Anodon* they are parallel. In *Anodon* and the majority of lamellibranchs the ventricle surrounds the intestine; in the oyster the two are quite independent, the intestine passing above the pericardium. The renal organs of the oyster were discovered by Hoek to agree in their morphological relations with those of other lamellibranchs.

The generative organs of the oyster consist of a system of branching cavities on each side of the body lying immediately beneath the surface. All the cavities of a side are ultimately in communication with an efferent duct opening on the surface of the body a little above the line of attachment of the gills. The genital opening on each side is situated in a depression of the surface into which the renal organ also opens. The genital products are derived from the cells which line the cavities of the genital organs. The researches of Hoek have shown that in the same oyster the genital organs at one time produce ova, at another spermatozoa, and that consequently the oyster does not fertilize itself. How many times the alternation of sex may take place in a season is not known. It must be borne in mind that in what follows the species of the European coasts, *Ostrea edulis*, is under consideration. The ova are fertilized in the genital duct, and before their escape have undergone the earliest stages of segmentation. After escaping from the genital aperture they find their way into the infra-branchial part of the mantle cavity of the parent, probably by passing through the supra-branchial chamber to the posterior extremity of the gills, and then being conducted by the inhalent current caused by the cilia of the gills into the infra-branchial chamber. In the latter they accumulate, being held together and fastened to the gills by a white viscid secretion. The mass of ova thus contained in the oyster is spoken of by oyster fishers as "white spat," and an oyster containing them is said to be "sick." While in this position the ova go through the earlier stages of development. At the end of a fortnight the white spat has become dark-coloured from the appearance of coloured patches in the developing embryos. The embryos having then reached the condition of "trochospheres" escape from the mantle cavity and swim about freely near the surface of the water among the multitude of other creatures, larval and adult, which swarm there. The larvae are extremely minute, about $\frac{1}{150}$ in. long and of glassy transparency, except in one or two spots which are dark brown. From the trochosphere stage the free larvae pass into that of "veligers." How long they remain free is not known; Huxley kept them in a glass vessel in this condition for a week. Ultimately they sink to the bottom and fix themselves to shells, stones or other objects, and rapidly take on the appearance of minute oysters, forming white disks $\frac{1}{20}$ in. in diameter. The appearance of these minute oysters constitutes what the fishermen call a "fall of spat." The experiment by which Hoek conclusively proved the change of sex in the oyster was as follows. In an oyster containing white spat microscopic examination of the genital organs shows nothing but a few unexpelled ova. An oyster in this condition was kept in an aquarium by itself for a fortnight, and after that period its genital organs were found to contain multitudes of spermatozoa in all stages of development.

The breeding season of the European oyster lasts from May to September. The rate of growth of the young oyster is, roughly speaking, an inch of diameter in a year, but after it has attained a breadth of 3 in. its growth is much slower. Professor Möbius is of opinion that oysters over twenty years of age are rare, and that most of the adult Schleswig oysters are seven to ten years old.

The development of the American oyster, *O. virginiana*, and of the Portuguese oyster, *O. angulata*, is very similar to that of *O. edulis*, except that there is no period of incubation within the mantle cavity of the parent in the case of these two species. Hence it is that so-called artificial fertilization is possible; that is to say, fertilization will take place when ripe eggs and milt are artificially pressed from the oysters and allowed to fall into a vessel of sea-water. But if it is possible to procure a supply of spat from the American oyster by keeping the swarms of larvae in confinement, it ought to be possible in the case of the European oyster. All that would be necessary would be to take a number of mature oysters containing white spat and lay them down in tanks till the larvae escape. This would be merely carrying oyster culture a step farther back, and instead of collecting the newly fixed oysters, to obtain the free larvae in numbers and so insure a fall of spat independently of the uncertainty of natural conditions. This method has been tried several times in England, in Holland and in France, but always without permanent success.

Natural beds of oysters occur on stony and shelly bottoms at depths varying from 3 to 20 fathoms. In nature the beds are liable to variations, and, although Huxley was somewhat sceptical on this point, it seems that they are easily brought into an unproductive condition by over-dredging. Oysters do not flourish in water containing less than 3% salt; and hence they are absent from the Baltic. The chief enemies of oysters are the dog-whelk, *Purpura lapillus*, and the whelk-tingle, *Murex erinaceus*, which bore through the shells. Starfishes devour large numbers; they are able to pull the valves of the shell apart and then to digest the body of the oyster by their everted stomach. *Cliona*, the boring sponge, destroys the shells and so injures the oyster; the boring annelid *Leucodore* also excavates the shell.

The wandering life of the larvae makes it uncerain whether any of the progeny of a given oyster-bed will settle within its area and so keep up its numbers. It is known from the history of the Liimfjord beds that the larvae may settle 5 m. from their place of birth.

The genus *Ostrea* has a world-wide distribution, in tropical and temperate seas; seventy species have been distinguished. Its nearest allies are *Pinna* among living forms, *Eligmus* among fossils. For the so-called pearl-oyster see PEARL.

Oyster Industry.—Oysters are more valuable than any other single product of the fisheries, and in at least twenty-five countries are an important factor in the food-supply. The approximate value of the world's oyster crop approaches £4,000,000 annually, representing over 30,000,000 bushels, or nearly 10 billion oysters. Not less than 150,000 persons are engaged in the industry, and the total number dependent thereon is fully half a million. The following table shows in general terms the yearly oyster product of the world:—

Country.	Bushels.	Value.
United States	26,853,760	£2,533,481
Canada	134,140	43,405
Great Britain and Ireland	113,700	154,722
France	3,260,190	716,778
Holland	100,000	84,400
Italy	68,750	44,000
Other European countries	29,930	40,250
Asia, Africa and Oceania .	275,000	111,400
Total . . .	30,835,470	£3,728,436

United States.—The oyster is the chief fishery product in the United States. The states which lead in the quantity of oysters taken are Maryland, Virginia, New York, New Jersey and Connecticut; the annual value of the output in each of these is over $1,000,000. Other states with important oyster interests are Rhode Island, North Carolina, Louisiana and California. The oyster fisheries give employment to over 56,000 fishermen, who man 4000 vessels, valued at $4,000,000, and 23,000 boats, valued at $1,470,000; the value of the 11,000 dredges and 37,000 tongs, rakes and other appliances used is $365,000. The quantity of oysters taken in 1898 was 26,853,760 bushels, with a value of $12,667,405. The output of cultivated oysters in 1899 was about 9,800,000 bushels, worth $8,700,000.

Canada.—Oyster banks of some importance exist in the Gulf of St Lawrence and on the coast of British Columbia. All of the grounds have suffered depletion, and cultural methods to maintain the supply have been instituted. The oyster output of the Dominion has never exceeded 200,000 bushels in a single year, and in 1898 was 134,140 bushels, valued at $217,024.

United Kingdom.—The natural oyster beds of Great Britain and Ireland have been among the most valuable of the fishery resources, and British oysters have been famous from time immemorial. The most important oyster region is the Thames estuary, the site of extensive planting operations. The present supply is largely from cultivated grounds. Important oyster-producing centres are

Whitstable, Colchester and Brightlingsea. The oysters landed on the coasts of England and Wales in 1898 numbered 35,809,000, valued at £122,320, and in 1899, 38,978,000, valued at £143,841. The Scottish fishery has its centre at Inveraray and Ballantrae, and in 1905 yielded 218,000 oysters, valued at £865. Public oyster grounds of Ireland in 1903 produced 2,532,800 oysters, valued at £5030. The fishery is most extensive at Wicklow, Queenstown, Ballyheige, Galway and Moville. Planting is carried on in seven counties; the oysters taken from cultivated beds in 1903 numbered 2,687,500 oysters, valued at £5420.

France.—The industry owes its importance to the attention given to oyster cultivation. In the fishery on public grounds in 1896 only 6370 fishermen were engaged, employing 1627 vessels and boats, valued at 1,473,449 francs, and apparatus worth 211,495 francs, while only 13,127,217 kilograms of oysters were taken, or about 320,000 bushels, valued at 414,830 francs. In the parks, claires and reservoirs the private culture of oysters has attained great perfection. Fully 40,000 men, women and children are employed, and the output in 1896 was 1,536,417,968 oysters, worth 17,537,778 francs. The principal centre is Arcachon.

Oyster Culture.—The oyster industry has passed from the hands of the fisherman into those of the oyster culturist. The oyster being sedentary, except for a few days in the earliest stages of its existence, is easily exterminated in any given locality; since, although it may not be possible for the fishermen to rake up from the bottom every individual, wholesale methods of capture soon result in covering up or otherwise destroying the oyster banks or reefs, as the communities of oysters are technically termed. The main difference between the oyster industry of America and that of Europe lies in the fact that in Europe the native beds have long since been practically destroyed, perhaps not more than 6 or 7% of the oysters of Europe passing from the native beds directly into the hands of the consumer. It is probable that 60 to 75% are reared from the spat in artificial parks, the remainder having been laid down for a time to increase in size and flavour in shoal waters along the coasts. In the United States, on the other hand, from 30 to 40% are carried from the native beds directly to market. The oyster fishery is everywhere, except in localities where the natural beds are nearly exhausted, carried on in the most reckless manner, and in all directions oyster grounds are becoming deteriorated, and in some cases have been entirely destroyed. At present the oyster is one of the cheapest articles of diet in the United States; and, though it can hardly be expected that the price of American oysters will always remain so low, still, taking into consideration the great wealth of the natural beds along the entire Atlantic coast, it seems certain that a moderate amount of protection would keep the price of seed oysters far below European rates, and that the immense stretches of submerged land especially suited for oyster planting may be utilized and made to produce an abundant harvest at much less cost than that which accompanies the complicated system of culture in vogue in France and Holland.

The simplest form of oyster culture is the preservation of the natural oyster-beds. Upon this, in fact, depends the whole future of the industry, since it is not probable that any system of artificial breeding can be devised which will render it possible to keep up a supply without at least occasional recourse to seed oysters produced under natural conditions. It is the opinion of almost all who have studied the subject that any natural bed may in time be destroyed by overfishing (perhaps not by removing all the oysters, but by breaking up the colonies, and delivering over the territory which they once occupied to other kinds of animals), by burying the breeding oysters, by covering up the projections suitable for the reception of spat, and by breaking down, through the action of heavy dredges, the ridges which are especially fitted to be seats of the colonies.[1] The immense oyster-beds in Pocomoke Sound, Maryland, have practically been destroyed by over-dredging, and many of the other beds of the United States are seriously damaged. The same is doubtless true of all the beds of Europe. It has also been demonstrated that under proper restriction great quantities of mature oysters, and seed oysters as well, may be taken from any region of natural oyster-beds without injurious effects. Parallel cases in agriculture and forestry will occur to every one. Möbius, in his most admirable essay *Die Auster und Die Austernwirthschaft*, has pointed out the proper means of preserving natural beds, declaring that, if the average profit from a bed of oysters is to remain permanently the same, a sufficient number of mother oysters must be left in it, so as not to diminish the capacity of maturing. He further shows that the productive capacity of a bed can only be maintained in one of two ways: (1) by diminishing the causes which destroy the young oysters, in which case the number of breeding oysters may safely be decreased; this, however, is practicable only under such favourable conditions as occur at Arcachon, where the beds may be kept under the constant control of the oyster-culturist; (2) by regulating the fishing on the natural beds in such a manner as to make them produce permanently the highest possible average quantity of oysters. Since the annual increase of half-grown oysters is estimated by him to be four hundred and twenty-one to every thousand full-grown oysters, he claims that not more than 42% of these latter ought to be taken from a bed during a year.

The Schleswig-Holstein oyster-beds are the property of the state, and are leased to a company whose interest it is to preserve their productiveness. The French beds are also kept under government control. Not so the beds of Great Britain and America, which are as a general rule open to all comers,[1] except when some close-time regulation is in force. Huxley has illustrated the futility of "close-time" in his remark that the prohibition of taking oysters from an oyster-bed during four months of the year is not the slightest security against its being stripped clean during the other eight months. "Suppose," he continues, "that in a country infested by wolves, you have a flock of sheep, keeping the wolves off during the lambing season will not afford much protection if you withdraw shepherd and dogs during the rest of the year." The old close-time laws were abolished in England in 1866, and returned to in 1876, but no results can be traced to the action of parliament in either case. Huxley's conclusions as regards the future of the oyster industry in Great Britain are doubtless just as applicable to other countries—that the only hope for the oyster consumer lies in the encouragement of oyster-culture, and in the development of some means of breeding oysters under such conditions that the spat shall be safely deposited. Oyster culture can evidently be carried on only by private enterprise, and the problem for legislation to solve is how to give such rights of property upon those shores which are favourable to oyster culture as may encourage competent persons to invest their money in that undertaking. Such property right should undoubtedly be extended to natural beds, or else an area of natural spawning territory should be kept under constant control and surveillance by government, for the purpose of maintaining an adequate supply of seed oysters.

The extension of the area of the natural beds is the second step in oyster culture. As is well known to zoologists, and as has been very lucidly set forth by Möbius, the location of oyster banks is sharply defined by absolute physical conditions. Within certain definite limits of depth, temperature and salinity, the only requirement is a suitable place for attachment. Oysters cannot thrive where the ground is composed of moving sand or where mud is deposited; consequently, since the size and number of these places are very limited, only a very small percentage of the young oysters can find a resting-place, and the remainder perish. Möbius estimates that for every oyster brought to market from the Holstein banks, 1,045,000 are destroyed or die. By putting down suitable "cultch" or "stools" immense quantities of the wandering fry may be induced to settle, and are thus saved. As a rule the natural beds occupy most of the suitable space in their own vicinity. Unoccupied territory may, however, be prepared for the reception of new beds, by spreading sand, gravel and shells over muddy bottoms, or, indeed, beds may be kept up in locations for permanent natural beds, by putting down mature oysters and cultch just before the time of breeding, thus giving the young a chance to fix themselves before the currents and enemies have had time to accomplish much in the way of destruction.

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[1] Even Huxley, the most ardent of all opponents of fishery legislation, while denying that oyster-beds had been permanently annihilated by dredging, practically admitted that a bed may be reduced to such a condition that the oyster will only be able to recover its former state by a long struggle with its enemies and competition—in fact that it must re-establish itself much in the same way as they have acquired possession of new grounds in Jutland, a process which, according to his own statement, occupied thirty years (Lecture at the Royal Institution, May 11th, 1883, printed with additions in the *English Illustrated Magazine*, i. pp. 47-55, 112-121).

[1] Connecticut has greatly benefited its oyster industry by giving to oyster-culturists a fee simple title to the lands under control by them.

The collection of oyster spat upon artificial stools has been practised from time immemorial. As early as the 7th century, and probably before, the Romans practised a kind of oyster culture in Lake Avernus, which still survives to the present day in Lake Fusaro. Piles of rocks are made on the muddy bottoms of these salt-water lakes, and around these are arranged circles of stakes, to which are often attached bundles of twigs. Breeding oysters are piled upon the rookeries, and their young become attached to the stakes and twigs provided for their reception, where they are allowed to remain until ready for use, when they are plucked off and sent to the market. A similar though ruder device is used in the Poquonock river in Connecticut. Birch trees are thrown into the water near a natural bed of oysters, and the trunks and twigs become covered with spat; the trees are then dragged out upon the shore by oxen, and the young fry are broken off and laid down in the shallows to increase in size. In 1858 the methods of the Italian lakes were repeated at St Brieuc under the direction of Professor P. Coste, and from these experiments the art of artificial breeding as practised in France has been developed. There is, however, a marked distinction between oyster-culture and oyster-breeding.

In considering the oyster-culture in France it is necessary to distinguish the centres of production from the centres of rearing or fattening. The chief centres or regions of oyster production are two, (1) Arcachon, (2) Brittany. The basin of Arcachon has an area of about 38,000 acres at high water, and only about 15,000 acres are under water at low tide. The water is salter than the sea. At the beginning of the 19th century there were only natural oyster beds in the basin, and these produced 75 million oysters per annum. But in the middle of the century the natural beds had been almost exhausted and the system of government control, letting "parks" to private tenants, and artificial cultivation was instituted. Certain beds in the basin are reserved and kept under government control. Cultch is placed upon them every year, and gathering of oysters upon them is allowed only at intervals of two or more years, when the authority thinks they are sufficiently stocked to permit of it. These beds supply spat for the private cultivators. The latter collect the spat on tiles: these are made of earthenware and concave on one side. One of the most important points in the system is the coating of the tiles with lime. It is necessary to detach the young oysters from the tiles when they are nearly a year old (*détroquage*): this could not be done without destroying the oysters if they were attached directly to the surface of the tile. The coating of lime or mortar is soft and brittle, and consequently the young oysters can easily be detached with a stout knife. The method of liming the tiles (*chaulage*) consists in dipping them into a liquid mixture of lime and water. Sometimes lime only is used, sometimes equal quantities of lime and sand, or lime and mud. Often it is necessary to repeat the dipping, and for the second coat hydraulic lime may be employed.

The tiles coated with lime are set out on the shore near the low-water mark of spring tides, at the beginning of the spatting season. This is earlier in the south of France than in England: at Arcachon the collectors are put in position about the middle of June. Various methods are adopted for keeping the tiles in place and for arranging them in the position most favourable to the collection of spat. At Arcachon they are arranged in piles each layer being transverse to the one below, so that the space formed by the concavity of the tile is kept open. A wooden frame-work often surrounds the heap of tiles to prevent them being scattered by the waves.

In the following season, about April, the young oysters, then from ½ to 1 in. in diameter, are separated or *détroqués*. They may then be placed in oyster cases (*caisses ostréophiles*) or in shallow ponds (*claires*) made on the fore-shore. The cases are about 8 in. deep, made with a wooden frame-work, and galvanized wire netting top and bottom, the lid being hinged. These cases about 8 ft. by 4 ft. in dimensions are fixed on the fore-shore by means of short posts driven into the ground, so that they are raised about 9 in. or 1 ft. from the latter. The young oysters grow rapidly in these cases, and have to be thinned out as they grow larger. When they have been in the boxes a year they are large enough to be placed in the *claires* or simply scattered along the fore-shore.

In Brittany the chief seat of oyster production is the gulf of Morbihan, where the estuaries of numerous small rivers furnish fore-shores suitable to the industry. Here the prevalence of mud is one of the chief obstacles, and for this reason the tile-collectors are usually fastened together by wire and suspended to posts (*tuiles en bouquets*). The collectors are not set out before the middle of July. The natural beds from which the supply of spat is derived are reserved, but apparently are insufficiently protected, so that much poaching goes on.

These two regions of production, Arcachon and Morbihan supply young oysters for "relaying," *i.e.* rearing, not only to numerous places on the coast of France, but also to England, Ireland and elsewhere. Among rearing districts Marennes and La Tremblade are specially celebrated on account of the extensive system of *claires* or oyster ponds, in which the green oysters so much prized in Paris are produced. The irrigation of the *claires* is entirely under control, and the *claires* undergo a special preparation for the production of the green oysters, whose colour seems to be derived from a species of Diatom which abounds in the *claires*.

In Holland the French system of oyster-culture is followed in the estuary of the Scheldt, with some modifications in detail. The tiles used are flat and heavy, and are placed on the foreshores in an oblique position resting on their edges and against each other. The tiles with the young oysters on them are placed in enclosures during the winter, and *détroquage* is carried out in the following summer.

In England the use of tiles has been tried on various occasions, in Cornwall on the river Fal, at Hayling Island and in Essex, but has nowhere become permanently established. The reasons for this are that the fall of spat is not usually very abundant, and the kind of labour required cannot be obtained at a sufficiently cheap rate. In many places oysters are simply imported from France and Holland and laid down to grow, or are obtained by dredging from open grounds. At Whitstable most of the stock is thus obtained, but cultch (*i.e.* dead shells) is here and elsewhere scattered over the ground to serve for the attachment of spat. The use of cultch as collector is a very ancient practice in England, and is still almost universally maintained. In the estuaries of Essex there are many private or semi-private oyster fisheries, where the method of culture is to dredge up the oysters in autumn and place them in pits, where they are sorted out, and the suitable ones are selected for the market. Just before the close season the young oysters and all the rest that remain are scattered over the beds again, with quantities of cultch, and in many cases the fishery is maintained by the local fall of spat, without importation. In some places where the ground is suitable cultch is spread over the foreshores also to collect spat. The genuine English "native" is produced in its greatest perfection in the Essex fisheries, and is probably the highest priced oyster in the world.

In addition to the literature quoted see also the following: *Rapport sur les recherches concernant l'huître et l'ostréiculture publié par la Commission de la Société Néerlandaise de Zoologie* (Leiden, 1883–1884); P. Brocchi, *Traité de l'ostréiculture* (Paris, 1883); Bashford Dean, *European Oyster Culture*, Bulletin U.S. Fish Commission, vol. x. for 1890, vol. xi. for 1891; J. T. Cunningham, Report of the Lecturer on Fishery Subjects, in *Report* of Technical Instruction Committee of Cornwall (1899, 1900). (G. B. G.; J. T. C.)

OYSTER BAY, a township of Nassau (formerly of Queens) county, New York, on Long Island, about 25 m. E.N.E. of Long Island City. Pop. (1890) 13,870, (1900) 16,334; (1910 census) 21,802. The township reaches from N. to S. across the island (here about 20 m. wide) in the shape of a rough wedge, the larger end being on Long Island Sound at the N.; on the northern shore is the tripartite Oyster Bay, whose western arm is Mill Neck creek, whose central branch is Oyster Bay harbor, and whose easternmost arm, called Cold Spring harbor, separates the township of Oyster Bay from the township of Huntington. On the south side of the township is South Oyster bay, immediately east of the main body of the Great South bay; and between South Oyster Bay and the ocean lie several island beaches, the smaller and northernmost ones being marshy, and the southern, Jones or Seaford beach, being sandy and having on the ocean side the Zach's inlet and Jones Beach life-saving stations. The township is served by four branches of the Long Island railway; the Oyster Bay branch of the north shore to the village of Sea Cliff (incorporated in 1883; pop. 1910, 1694), on the E. side of Hempstead harbor, to Glen Cove, a large unincorporated village, immediately N.E. of Sea Cliff, to Locust Valley and to Mill Neck farther E., and to the village of Oyster Bay, the terminus of the branch, on Oyster Bay harbor; the Wading

River branch to Hicksville and to Syosset; a third branch to Farmingdale, which also has direct communication by railway with Hicksville; and the Montauk division to Massapequa, in the south-western part of the township on Massapequa Lake and Massapequa Creek, which empties into South Oyster Bay. The villages served by the railway are the only important settlements; those on the hilly north shore are residential. To the north of the village of Oyster Bay, on a long peninsular beach called Centre Island, are the headquarters of the Seawanhaka Yacht Club; and to the east of the same village, especially on Cove Neck, between Oyster Bay Harbor and Cold Spring Harbor, are many summer residences with fine grounds. Massapequa, on the south shore, is a residential summer resort. The villages of Hicksville and Farmingdale are rural; the former has many German settlers. Jericho, N.E. of Hicksville, is a stronghold of the Hicksite Quakers, who are mostly wealthy landowners. In Locust Valley is Friends' Academy (1876), a secondary school for boys and girls. There are a few truck farms in the township, potatoes, cabbages and cucumbers for pickling being the principal crops; "Oyster Bay asparagus" was once a famous crop. Oysters are cultivated on the Sound Shore and there are clam beds in Oyster Bay and South Oyster Bay. In the village of Glen Cove there is a large leather-belting factory.

David Pieterssen de Vries, in his *Voyages from Holland to America*, makes the first mention of Oyster Bay Harbor, which he explored in June 1639. In the same month Matthew Sinderland (or Sunderland) bought from James Forrett, deputy of William Alexander, earl of Stirling, "two little necks of land, the one upon the east side of Oyster Bay Harbor"; but Sinderland made no settlement. A settlement from Lynn, Mass., was attempted in 1640 but was prevented by Governor William Kieft. By the treaty signed at Hartford, Connecticut, on the 29th of September 1650 by the Commissioners of the United colonies of New England and those of New Netherland all land east of the west side of Oyster Bay was granted to the English, and all land west to the Dutch; but the Dutch placed Oyster Bay, according to a letter of Pieter Stuyvesant written in 1659, two and a half leagues farther east than the New Englanders did. In 1653 an Indian deed granted land at Oyster Bay to Peter Wright and others of Salem and Sandwich, Mass., who made a permanent settlement here; in 1663 another sale was made to Captain John Underhill (d. 1672), who first went to Long Island about 1653, when he led a force which fought the only important engagement ever fought with the Indians on Long Island, in which the colonists destroyed the fortification at Fort Neck near the present Massapequa, of Tackapousha, chief of the Massapequas, an Algonquian tribe, whose name meant "great pond." Oyster Bay was for a time closely connected politically with New Haven, but in 1664 with the remainder of Long Island it came under the New York government of Richard Nicolls, to whose success Underhill had largely contributed by undermining Dutch influence on Long Island. In 1689 a Friends' meeting-house was built at Jericho, the home of Elias Hicks, near the present Hicksville, the site of which was owned by his family and which was named in his honour; and the Dutch built their first church in Oyster Bay in 1732. The harbour of Oyster Bay was a famous smuggling place at the close of the 17th century, when there was a customs house here. The first settlement on the "south side" of the township was made about 1693, when the Massapequa Indians sold 6000 acres at Fort Neck to Thomas Townsend, and his son-in-law Thomas Jones (1665–1713), who had fought for James II. at Boyne and Aghrim, who became a high sheriff of Queen's county in 1704, and who was the founder of the family of Jones and Floyd-Jones, whose seat was Tryon Hall (built at South Oyster Bay, now Massapequa, in 1770); Thomas Jones (1731–1792), grandson of the first Thomas Jones, was a prominent Loyalist during the War of Independence and wrote a valuable *History of New York during the Revolutionary War*, first published in 1879.

OYSTER-CATCHER, a bird's name which does not seem to occur in books until 1731, when M. Catesby (*Nat. Hist. Carolina*, i. p. 85) used it for a species which he observed to be abundant on the oyster-banks left bare at low water in the rivers of Carolina, and believed to feed principally upon those molluscs. In 1776 T. Pennant applied the name to the allied British species, which he and for nearly two hundred years many other English writers had called the "Sea-Pie." The change, in spite of the misnomer—for, whatever may be the case elsewhere, in England the bird does not feed upon oysters—met with general approval, and the new name has, at least in books, almost wholly replaced what seems to have been the older one.[1] The Oyster-catcher of Europe is the *Haematopus*[2] *ostralegus* or Linnaeus, belonging to the group now called *Limicolae*, and is generally included in the family *Charadriidae*; though some writers have placed it in one of its own, *Haematopodidae*, chiefly on account of its peculiar bill—a long thin wedge, ending in a vertical edge. Its feet also are much more fleshy than are generally seen in the Plover family. In its strongly-contrasted plumage of black and white, with a coral-coloured bill, the Oyster-catcher is one of the most conspicuous birds of the European coasts, and in many parts is still very common. It is nearly always seen paired, though the pairs collect in prodigious flocks; and, when these are broken up, its shrill but musical cry of "tu-lup," "tu-lup," somewhat pettishly repeated, helps to draw attention to it. Its wariness, however, is very marvellous, and even at the breeding-season, when most birds throw off their shyness, it is not easily approached within ordinary gunshot distance. The hen-bird commonly lays three clay-coloured eggs, blotched with black, in a very slight hollow on the ground not far from the sea. As incubation goes on the hollow is somewhat deepened, and perhaps some haulm is added to its edge, so that at last a very fair nest is the result. The young, as in all *Limicolae*, are at first clothed in down, so mottled in colour as closely to resemble the shingle to which, if they be not hatched upon it, they are almost immediately taken by their parents, and there, on the slightest alarm, they squat close to elude observation. This species occurs on the British coasts (very seldom straying inland) all the year round; but there is some reason to think that those we have in winter are natives of more northern latitudes, while our home-bred birds leave us. It ranges from Iceland to the shores of the Red Sea, and lives chiefly on marine worms, crustacea and such molluscs as it is able to obtain. It is commonly supposed to be capable of prizing limpets from their rock, and of opening the shells of mussels; but, though undoubtedly it feeds on both, further evidence as to the way in which it procures them is desirable. J. E. Harting informed the present writer that the bird seems to lay its head sideways on the ground, and then, grasping the limpet's shell close to the rock between the mandibles, use them as scissor-blades to cut off the mollusc from its sticking-place. The Oyster-catcher is not highly esteemed as a bird for the table.

Differing from this species in the possession of a longer bill, in having much less white on its back, in the paler colour of its mantle, and in a few other points, is the ordinary American species, with at least three races, *Haematopus palliatus*. Except that its call-note, judging from description, is unlike that of the European bird, the habits of the two seem to be perfectly similar; and the same may be said indeed of all the other species. The Falkland Islands are frequented by a third, *H. leucopus*, very similar to the first, but with a black wing-lining and paler legs, while the Australian Region possesses a fourth, *H. longirostris*, with a very long bill as its name intimates, and no white on its primaries. China, Japan and possibly eastern Asia in general have an Oyster-catcher which seems to be intermediate between the last and the first. This has received the name of *H. osculans*; but doubts have been expressed as to its deserving specific recognition. Then we have a group of species in which the plumage is wholly or almost wholly black, and among them only do we find birds that fulfil the implication of the scientific name of the genus by having feet that may be called blood-red. *H. niger*, which frequents both coasts of the northern Pacific, has, it is true, yellow legs, but towards the extremity of South America its place is taken by *H. ater*, in which they are bright red, and this bird is further remarkable for its laterally compressed and much upturned bill. The South African *H. capensis* has also scarlet legs; but in the otherwise very similar bird of Australia and New Zealand, *H. unicolor*, these members are of a pale brick-colour. (A. N.)

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[1] It seems, however, very possible, judging from its equivalents in other European languages, such as the Frisian *Oestervisscher*, the German *Augsterman*, *Austernfischer*, and the like, that the name "Oyster-catcher" may have been not a colonial invention but indigenous to the mother-country, though it had not found its way into print before. The French *Huîtrier*, however, appears to be a word coined by Brisson. "Sea-Pie" has its analogues in the French *Pie-de-Mer*, the German *Meerelster*, *Seeelster*, and so forth.

[2] Whether it be the *Haematopus*, whose name is found in some editions of Pliny (lib. x. cap. 47) is at best doubtful. Other editions have *Himantopus*; but Hardouin prefers the former reading. Both words have passed into modern ornithology, the latter as the generic name of the STILT (*q.v.*); and some writers have blended the two in the strange and impossible compound *Haemantopus*.

OYSTERMOUTH, or The Mumbles, an urban district and seaside resort in the Gower division of Glamorganshire, south Wales, situated on the western bend of Swansea Bay, 4½ m. S.W. of Swansea, with which it is connected by the steam-tramway of the Swansea and Mumbles Railway Company, constructed in 1804. The London and North-Western railway has also a station at Mumbles Road, 2½ m. N. of Oystermouth. Pop. (1901) 4461. The castle, which belongs to the duke of Beaufort as lord of the seigniory of Gower, is an imposing ruin, nobly situated on a rocky knoll overlooking the bay. Its great hall and chapel with their traceried Gothic windows are fairly well preserved. The earliest structure (probably only a "peel" tower), built in the opening years of the 12th century, probably by Maurice de Londres, was destroyed by the Welsh in 1215. The early English features of the square keep indicate that it was soon rebuilt, by one of the De Breos lords (see Gower). In 1284 Edward I. stayed here two days as the guest of William de Breos, and from that time on it became the chief residence in Gower of the lords seignior and subsequently of their stewards, and their chancery was located here till its abolition in 1535. The parish church, which has an embattled tower, was restored in 1860, when fragments of Roman tesselated pavement were found in various parts of the churchyard. Roman coins were also found in the village in 1822 and 1837—all indicating that there had been a small settlement here in Roman times. The name of the castle appears in the Welsh chronicles as Ystum Llwynarth, which, by the elision of the penultimate, was probably changed by false analogy into Oystermouth—the bay being noted for its oyster beds. Its church is mentioned in the cartulary of Gloucester (1141) as Ostrenuwe.

The village itself is straggling and uninteresting, but the high ground between it and the pretty bays of Langland and Caswell on the southern side of the headland fronting the open channel is dotted with well-built villas and commands magnificent views. The headland terminates in two rocky islands, which to sailors coming up the channel would appear like the breasts of "mammals," whence the comparatively modern name, The Mumbles, is supposed to be derived. On the outer of these rocks is a lighthouse erected in 1794 and maintained by the Swansea Harbour Trust. The district is rapidly increasing in popularity as a seaside resort. A pier was erected by the Mumbles Railway Company at a cost of £12,000 in 1898. The fishing industry, once prosperous, has much diminished in importance, but there are still oyster-beds in the bay.

OZANAM, ANTOINE FRÉDÉRIC (1813–1853), French scholar, was born at Milan on the 23rd of April 1813. His family, which was of Jewish extraction, had been settled in the Lyonnais for many centuries, and had reached distinction in the third generation before Frédéric through Jacques Ozanam (1640–1717), an eminent mathematician. Ozanam's father, Antoine, served in the armies of the republic, but betook himself, on the advent of the empire, to trade, teaching, and finally medicine. The boy was brought up at Lyons and was strongly influenced by one of his masters, the Abbé Noirot. His conservative and religious instincts showed themselves early, and he published a pamphlet against Saint-Simonianism in 1831, which attracted the attention of Lamartine. In the following year he was sent to study law at Paris, where he fell in with the Ampère family, and through them with Chateaubriand, Lacordaire, Montalembert, and other leaders of the neo-Catholic movement. Whilst still a student he took up journalism and contributed considerably to Bailly's *Tribune catholique*, which became (November 1, 1833) *L'univers.* In conjunction with other young men he founded in May 1833 the celebrated charitable society of St Vincent de Paul, which numbered before his death upwards of two thousand members. He received the degree of doctor of law in 1836, and in 1838 that of doctor of letters with a thesis on Dante, which was the beginning of one of his best-known books. A year later he was appointed to a professorship of commercial law at Lyons, and in 1840 assistant professor of foreign literature at the Sorbonne. He married in June 1841, and visited Italy on his wedding tour. At Fauriel's death in 1844 he succeeded to the full professorship of foreign literature. The short remainder of his life was extremely busy with his professorial duties, his extensive literary occupations, and the work, which he still continued, of district-visiting as a member of the society of St Vincent de Paul. During the revolution of 1848, of which he took an unduly sanguine view, he once more turned journalist for a short time in the *Ère nouvelle* and other papers. He travelled extensively, and was in England at the time of the Exhibition of 1851. His naturally weak constitution fell a prey to consumption, which he hoped to cure by visiting Italy, but he died on his return at Marseilles on the 8th of September 1853.

Ozanam was the leading historical and literary critic in the neo-Catholic movement in France during the first half of the 19th century. He was more learned, more sincere, and more logical than Chateaubriand; less of a political partisan and less of a literary sentimentalist than Montalembert. In contemporary movements he was an earnest and conscientious advocate of Catholic democracy and socialism and of the view that the church should adapt itself to the changed political conditions consequent to the Revolution. In his writings he dwelt upon important contributions of historical Christianity, and maintained especially that, in continuing the work of the Caesars, the Catholic church had been the most potent factor in civilizing the invading barbarians and in organizing the life of the middle ages. He confessed that his object was "to prove the contrary thesis to Gibbon's," and, although any historian who begins with the desire to prove a thesis is quite sure to go more or less wrong, Ozanam no doubt administered a healthful antidote to the prevalent notion, particularly amongst English-speaking peoples, that the Catholic church had done far more to enslave than to elevate the human mind. His knowledge of medieval literature and his appreciative sympathy with medieval life admirably qualified him for his work, and his scholarly attainments are still highly esteemed.

His works were published in eleven volumes (Paris, 1862–1865). They include *Deux chanceliers d'Angleterre, Bacon de Verulam et Saint Thomas de Cantorbéry* (Paris, 1836); *Dante et la philosophie catholique au XIIIème siècle* (Paris, 1839; 2nd ed., enlarged 1845); *Études germaniques* (2 vols., Paris, 1847–1849), translated by A. C. Glyn as *History of Civilization in the Fifth Century* (London, 1868); *Documents inédits pour servir à l'histoire de l'Italie depuis le VIIIème siècle jusqu'au XIIème* (Paris, 1850); *Les poëtes franciscains en Italie au XIIIème siècle* (Paris, 1852). His letters have been partially translated into English by A. Coates (London, 1886).

There are French lives of Ozanam by his brother, C. A. Ozanam (Paris, 1882); Mme. E. Humbert (Paris, 1880); C. Huit (Paris, 1882); M. de Lambel (Paris, 1887); L. Curnier (Paris, 1888); and B. Faulquier (Paris, 1903). German lives by F. X. Karker (Paderborn, 1867) and E. Hardy (Mainz, 1878); and an interesting English biography by Miss K. O'Meara (Edinburgh, 1867; 2nd ed., London, 1878). (C. H. Ha.)

OZIERI, a town of Sardinia in the province of Sassari, from which it is 34 m. E.S.E. by rail. Pop. (1901) 9555. It is situated 1280 ft. above sea-level on a steep slope, but faces north, and so is not very healthy. In the centre of the town is a square with a fine fountain of 1594. The cathedral was restored in 1848; it is the seat of the diocese of Bisarcio. The former cathedral of this diocese lies some distance to the N.W.; it is a fine Romanesque building of the 12th and 13th centuries. The district of Ozieri is famous for its butter—the only butter made in Sardinia—cheese and other pastoral products; cattle are also bred here.

See D. Scano, *Storia dell' arte in Sardegna dal xi. al xiv. secolo* (Cagliari-Sassari, 1907). p. 200.

OZOKERITE, or OZOCERITE (Gr. ὄζειν, to emit odour, and κηρός, wax), mineral wax, a combustible mineral, which may be designated as crude native paraffin (*q.v.*), found in many localities in varying degrees of purity. Specimens have been obtained from Scotland, Northumberland and Wales, as well as from about thirty different countries. Of these occurrences the ozokerite of the island of Tcheleken, near Baku, and the deposits of Utah, U.S.A., deserve mention, though the last-named have been largely worked out. The sole sources of commercial supply are in Galicia, at Boryslaw, Dzwiniacz and Starunia, though the mineral is found at other points on both flanks of the Carpathians. Ozokerite-deposits are believed to have originated in much the same way as mineral veins, the slow evaporation and oxidation of petroleum having resulted in the deposition of its dissolved paraffin in the fissures and crevices previously occupied by the liquid. As found native, ozokerite varies from a very soft wax to a black mass as hard as gypsum. Its specific gravity ranges from ·85 to ·95, and its melting point from 58° to 100° C. It is soluble in ether, petroleum, benzene, turpentine, chloroform, carbon bisulphide, &c. Galician ozokerite varies in colour from light yellow to dark brown, and frequently appears green owing to dichroism. It usually melts at 62° C. Chemically, ozokerite consists of a mixture of various hydrocarbons, containing 85·7% by weight of carbon and 14·3% of hydrogen.

The mining of ozokerite was formerly carried on in Galicia by means of hand-labour, but in the modern ozokerite mines owned by the Boryslaw Actien Gesellschaft and the Galizische Kreditbank, the workings of which extend to a depth of 200 metres, and 225 metres respectively, electrical power is employed for hauling, pumping and ventilating. In these mines there are the usual main shafts and galleries, the ozokerite being reached by levels driven along the strike of the deposit. The wax, as it reaches the surface, varies in purity, and, in new workings especially, only hand-picking is needed to separate the pure material. In other cases much earthy matter is mixed with the material, and then the rock or shale having been eliminated by hand-picking, the "wax-stone" is boiled with water in large coppers, when the pure wax rises to the surface. This is again melted without water, and the impurities are skimmed off, the material being then run into slightly conical cylindrical moulds and thus made into blocks for the market. The crude ozokerite is refined by treatment first with Nordhausen oil of vitriol, and subsequently with charcoal, when the ceresine or cerasin of commerce is obtained. The refined ozokerite or ceresine, which usually has a melting-point of 61° to 78° C., is largely used as an adulterant of beeswax, and is frequently coloured artificially to resemble that product in appearance.

On distillation in a current of superheated steam, ozokerite yields a candle-making material resembling the paraffin obtained from petroleum and shale-oil but of higher melting-point, and therefore of greater value if the candles made from it are to be used in hot climates. There are also obtained in the distillation light oils and a product resembling vaseline (*q.v.*). The residue in the stills consists of a hard, black, waxy substance, which in admixture with india-rubber is employed under the name of *okonite* as an electrical insulator. From the residue a form of the material known as *heel-ball*, used to impart a polished surface to the heels and soles of boots, is also manufactured.

According to published statistics, the output of crude ozokerite in Galicia in 1906 and 1907 was as follows:

District.	1906. Metric Tons.	1907. Metric Tons.
Boryslaw	2,205	2,240
Dzwiniacz	260	270
Starunia	210	135

(B. R.)

OZONE, allotropic oxygen, O_3. The first recorded observations of the substance are due to Van Marum (1785), who found that oxygen gas through which a stream of electric sparks had been passed, tarnished mercury and emitted a peculiar smell. In 1840 C. F. Schonbein (*Pogg. Ann.* 50, p. 616) showed that this substance was also present in the oxygen liberated during the electrolysis of acidulated water, and gave it the name ozone (Gr. ὄζειν, to smell). Ozone mixed with an excess of oxygen is obtained by submitting dry oxygen to the silent electric discharge [at the temperature of liquid air, E. Briner and E. Durand (*Comptes rendus*, 1907, 145, p. 1272) obtained a 90% yield]; by the action of fluorine on water at 0° C. (H. Moissan, *Comptes rendus*, 1899, 129, p. 570); by the action of concentrated sulphuric acid or barium peroxide or on other peroxides and salts of peracids (A. v. Baeyer and V. Villiger, *Ber.* 1901, 34, p. 355); by passing oxygen over some heated metallic oxides, and by distilling potassium permanganate with concentrated sulphuric acid in vacuo. It is also formed during many processes of slow oxidation. For a description of the various forms of ozonizers used on the large scale see N. Otto, *Rev. gén. de chemie pure et appliquée*, 1900, ii. p. 405; W. Elworthy, *Elekt. Zeits.*, 1904, ii. p. 1), and H. Guilleminot (*Comptes rendus*, 1903, 136, p. 1653). Ozone is also produced by the action of cathode and ultra-violet rays on oxygen. These methods of preparation give an ozone diluted with a considerable amount of unaltered oxygen; A. Ladenburg (*Ber.* 1898, 31, pp. 2508, 2830) succeeded in liquefying ozonized oxygen with liquid air and then by fractional evaporation obtained a liquid containing between 80 and 90% of ozone.

Ozone is a colourless gas which possesses a characteristic smell. When strongly cooled it condenses to an indigo blue liquid which is extremely explosive (see LIQUID GASES). In ozonizing oxygen the volume of the gas diminishes, but if the gas be heated to about 300° C, it returns to its original volume and is found to be nothing but oxygen. The same change of ozone into oxygen may be brought about by contact with platinum black and other substances. Ozone is only very slightly soluble in water. It is a most powerful oxidizing agent, which rapidly attacks organic matter (hence in preparing the gas, rubber connexions must not be used, since they are instantly destroyed), bleaches vegetable colouring matters and acts rapidly on most metals. It liberates iodine from solutions of potassium iodide, the reaction in neutral solution proceeding thus: $O_3+2KI+H_2O=O_2+I_2+2KHO$, whilst in acid solution the decomposition takes the following course: $4O_3+10HI=5I_2+H_2O_2+4H_2O+3O_2$ (A. Ladenburg, *Ber.* 1901, 34, p. 1184). Ozone is decomposed by some metallic oxides, with regeneration of oxygen. It combines with many unsaturated carbon compounds to form ozonides (C. Harries, *Ber.* 1904, 37, pp. 839 et seq.).

The constitution of ozone has been determined by J. L. Soret (*Ann. chim. phys.*, 1866 [4], 7, p. 113; 1868 [4], 13, p. 257), who showed that the diminution in volume when ozone is absorbed from ozonized oxygen by means of oil of turpentine is twice as great as the increase in volume observed when ozone is reconverted into oxygen on heating. This points to the gas possessing the molecular formula O_3. Confirmation was obtained by comparing the rate of diffusion of ozone with that of chlorine, which gave 24·8 as the value for the density of ozone, consequently the molecular formula must be O_3 (cf. B. C. Brodie, *Phil. Trans.*, 1872, pt. ii. p. 435). More recently A. Ladenburg (*Ber.* 1901, 34, p. 631) has obtained as a mean value for the molecular weight the number 47·78, which corresponds with the above molecular formula. Ozone is used largely for sterilizing water.

P The sixteenth letter of the English alphabet, the fifteenth in the Latin and the sixteenth in the Greek alphabet, the latter in its ordinary form having the symbol for *x* before *o*. In the Phoenician alphabet, from which the Western alphabets are directly or indirectly derived, its shape, written from right to left, is 𐤐. In the Greek alphabet, when written from left to right, it takes the form Γ or Π, the second form being much rarer in inscriptions than the first. Only very rarely and only in inscriptions of the 7th and 6th centuries B.C. are rounded forms ᑭ, ∩ found. In Italy the Etruscan and Umbrian form 𐌐 (written from right to left), though more angular than the Phoenician symbol, resembles it more closely than it does the Greek. The earliest Roman form—on the inscription found in the Forum in 1899—is Greek in shape ⅂, though the second leg is barely visible. The Oscan Π is identical with the rarer Greek form. As time goes on the Roman form becomes more and more rounded ᑭ, but not till Imperial times is the semicircle completed so as to form the symbol in the shape which it still retains **P**. The Semitic name *Pē* became in Greek πεῖ, and has in the course of ages changed but little. The sound of *p* throughout has been that of the breathed labial stop, as in the English *pin*. At the end of English words like *lip* the breath is audible after the consonant, so that the sound is rather that of the ancient Greek *φ*, *i.e. p-h*, not *f*, as *φ* is ordinarily now pronounced. This sound is found initially also in some dialects of English, as in the Irish pronunciation of *pig* as *p-hig*. For a remarkable interchange between *p* and *qu* sounds which is found in many languages, see under *Q*. (P. Gi.)

PAARL, a town of the Cape Province, South Africa, 36 m. by rail E.N.E. of Cape Town. Pop. (1904), 11,293. The town is situated on the west bank of the Berg river, some 400 ft. above the sea. It stands on the coast plain near the foot of the Drakenstein mountains. West of the town the Paarl Berg rises from the plain. The berg is crowned by three great granite boulders, known as the Paarl, Britannia and Gordon Rock. The town is beautifully situated amid gardens, orange groves and vineyards. The chief public buildings are the two Dutch Reformed churches, the old church being a good specimen of colonial Dutch architecture, with gables, curves and thatched roof. Paarl is a thriving agricultural and viticultural centre, among its industries being the manufacture of wine and brandy, wagon and carriage building and harness making. South-east of the town are granite quarries. The wines produced in the district are among the best in South Africa, ranking second only to those of Constantia.

The Paarl is one of the oldest European towns in South Africa. It dates from 1687, the site for the new settlement being chosen by the governor, Simon van der Stell. It was named Paarl by the first settlers from the fancied resemblance of one of the boulders on the top of the hill, when glistening in the sun, to a gigantic pearl. Shortly afterwards several of the Huguenots who had sought refuge at the Cape after the revocation of the edict of Nantes were placed in the new settlement. The present inhabitants are largely descended from these Huguenots.

PABIANICE, a town of Russian Poland, in the government of Piotrkow, 30 m. N.W. of the town of Piotrkow, and 10 m. S.S.W. from Lodz railway station. Pop. (1897), 18,251. It lies amidst extensive forests round the head-waters of the Nér, which were the hunting-grounds of the Polish kings. It has woollen, cloth and paper mills, and manufactures agricultural implements.

PABNA, or PUBNA, a town and district of British India, in the Rajshahi division of Eastern Bengal and Assam. The town is situated on the river Ichhamati, near the old bed of the Ganges. Pop. (1901), 18,424. The district of Pabna has an area of 1839 sq. m. Pop (1901), 1,420,461, showing an increase of 4·8% in the decade. It is bordered along its entire east face by the main stream of the Brahmaputra or Jamuna, and along its south-west face by the Ganges or Padma. It is entirely of alluvial origin, the silt of the annual inundations overlying strata of clay on sand. Apart from the two great bordering rivers, it is intersected by countless water-channels of varying magnitude, so that during the rainy season every village is accessible by boat and by boat only. Almost the whole area is one green rice-field, the uniform level being broken only by clumps of bamboos and fruit-trees, which conceal the village sites. The district is a modern creation of British rule, being first formed out of Rajshahi district in 1832, and possesses no history of its own. The two staple crops are rice and jute. Sirajganj, on the Brahmaputra, is the largest mart for jute in Bengal. The Eastern Bengal railway cuts across the south-west corner of the district to Sara, where a bridge crosses the Ganges. The district was affected by the earthquake of the 12th of June 1897, which was most severely felt at Sirajganj.

PABST, FREDERICK (1836–1904), American brewer, was born at Nicholausreith, in Saxony, on the 28th of March 1836. In 1848 he emigrated with his parents to Chicago. There he became, first a waiter in an hotel, then a cabin-boy on a Lake Michigan steamer, and eventually captain of one of these vessels. In this last capacity he made the acquaintance of a German, Philip Best, the owner of a small but prosperous brewery at Milwaukee, and married his daughter. In 1862 Pabst was taken into partnership in his father-in-law's brewery, and set himself to work to study the details of the business. After obtaining a thorough mastery of the art of brewing, Pabst turned his attention to extending the market for the beer, and before long had raised the output of the Best brewery to 100,000 barrels a year. The brewery was eventually converted into a public company, and its capital repeatedly increased in order to cope with the continually increasing trade.

PACA, the Brazilian name for a large, heavily-built, short-tailed rodent mammal, easily recognized by its spotted fur. This rodent, *Coelogenys* (or *Agouti*) *paca*, together with one or two other tropical American species, represents a genus near akin to the agoutis and included in the family *Caviidae*. Pacas may be distinguished from agoutis by their heavier and more compact build, the longitudinal rows of light spots on the fur, the five-toed hind-feet, and the peculiar structure of the skull, in which the cheek-bones are expanded to form large capsules on the sides of the face, each enclosing a cavity opening on the side of the cheek. Their habits are very similar to those of agoutis, but when pursued they invariably take to the water. The young, of which seldom more than one is produced at a birth, remain in the burrows for several months. The flesh is eaten in Brazil. Males may be distinguished from females by the skull, in which the outer surface of the cheek-bones is roughened in the former and smooth in the latter sex. The paca-rana (*Dinomys branicki*), from the highlands of Peru, differs, among other features, by its well-developed tail and the arrangement of the spots. (See RODENTIA.)

PACATUS DREPANIUS, LATINUS (or LATINIUS), one of the Latin panegyrists, flourished at the end of the 4th century A.D. He probably came from Aginnum (Agen), in the south of France, in the territory of the Nitiobriges, and received his education in the rhetorical school of Burdigala (Bordeaux). He was the contemporary and intimate friend of Ausonius, who dedicated two of his minor works to Pacatus, and describes him as the greatest Latin poet after Virgil. Pacatus attained the rank of proconsul of Africa (A.D. 390) and held a confidential position at the imperial court. He is the author of an extant speech (ed. E. Bährens in *Panegyrici latini*, 1874, No. 12) delivered in the senate house at Rome (389) in honour of Theodosius I. It contains an account of the life and deeds of the emperor, the special subject of congratulation being the complete defeat of the usurper Maximus. The speech is one of the best of its kind. Though not altogether free from exaggeration and flattery, it is marked by considerable dignity and self-restraint, and is thus more important as an historical document than similar productions. The style is vivid, the language elegant but comparatively simple, exhibiting familiarity with the best classical literature. The writer of the panegyric must be distinguished from Drepanius Florus, deacon of Lyons (*c.* 850), author of some Christian poems and prose theological works.

See M. Schanz *Geschichte der römischen Litteratur* (1904), iv. i.

PACCHIA, GIROLAMO DEL, and **PACCHIAROTTO** (or PACCHIAROTTI), **JACOPO,** two painters of the Sienese school. One or other of them produced some good pictures, which used to pass as the performance of Perugino; reclaimed from Perugino, they were assigned to Pacchiarotto; now it is sufficiently settled that the good works are by G. del Pacchia, while nothing of Pacchiarotto's own doing transcends mediocrity. The mythical Pacchiarotto who worked actively at Fontainebleau has no authenticity.

Girolamo dél Pacchia, son of a Hungarian cannon-founder, was born, probably in Siena, in 1477. Having joined a turbulent club named the Bardotti he disappeared from Siena in 1535, when the club was dispersed, and nothing of a later date is known about him. His most celebrated work is a fresco of the "Nativity of the Virgin," in the chapel of S Bernardino, Siena, graceful and tender, with a certain artificiality. Another renowned fresco, in the church of S Caterina, represents that saint on her visit to St Agnes of Montepulciano, who, having just expired, raises her foot by miracle. In the National Gallery of London there is a "Virgin and Child." The forms of G. del Pacchia are fuller than those of Perugino (his principal model of style appears to have been in reality Franciabigio); the drawing is not always unexceptionable; the female heads have sweetness and beauty of feature, and some of the colouring has noticeable force.

Pacchiarotto was born in Siena in 1474. In 1530 he took part in the conspiracy of the Libertini and Popolani, and in 1534 he joined the Bardotti. He had to hide for his life in 1535, and was concealed by the Observantine fathers in a tomb in the church of S Giovanni. He was stuffed in close to a new-buried corpse, and got covered with vermin and dreadfully exhausted by the close of the second day. After a while he resumed work; he was exiled in 1539, but recalled in the following year, and in that year or soon afterwards he died. Among the few extant works with which he is still credited is an "Assumption of the Virgin," in the Carmine of Siena. Other works rather dubiously attributed to him are in Siena, Buonconvento, Florence, Rome and London.

PACE, RICHARD (*c.* 1482–1536), English diplomatist, was educated at Winchester under Thomas Langton, at Padua, at Bologna, and probably at Oxford. In 1509 he went with Cardinal Christopher Bainbridge, archbishop of York, to Rome, where he won the esteem of Pope Leo X., who advised Henry VIII. to take him into his service. The English king did so, and in 1515 Pace became his secretary and in 1516 a secretary of state. In 1515 Wolsey sent him to urge the Swiss to attack France, and in 1519 he went to Germany to discuss with the electors the impending election to the imperial throne. He was made dean of St Paul's in 1519, and was also dean of Exeter and dean of Salisbury. He was present at the Field of the Cloth of Gold in 1520, and in 1521 he went to Venice with the object of winning the support of the republic for Wolsey, who was anxious at this time to become pope. At the end of 1526 he was recalled to England, and he died in 1536. His chief literary work was *De fructu* (Basel, 1517).

PACE (through O. Fr. *pas*, from Lat. *passus*, step, properly the stretch of the leg in walking, from *pandere*, to stretch), one movement of the leg in walking; hence used of the amount of ground covered by each single movement, or generally of the speed at which anything moves. The word is also used of a measure of distance, taken from the position of one foot to that of the other in making a single "pace," *i.e.* from 2½ ft. (the military pace) to 1 yard. The Roman *passus* was reckoned from the position of the back foot at the beginning of the pace to the position of the same foot at the end of the movement, *i.e.* 5 Roman feet, 58·1 English inches, hence the Roman mile, *mille passus* = 1646 yards.

For pacing in horse-racing see HORSE-RACING.

PACHE, JEAN NICOLAS (1746–1823), French politician, was born in Paris, of Swiss parentage, the son of the *concierge* of the hôtel of Marshal de Castries. He became tutor to the marshal's children, and subsequently first secretary at the ministry of marine, head of supplies (*munitionnaire général des vivres*), and comptroller of the king's household. After spending several years in Switzerland with his family, he returned to France at the beginning of the Revolution. He was employed successively at the ministries of the interior and of war, and was appointed on the 20th of September 1793 third deputy *suppléant* of Paris by the Luxembourg section. Thus brought into notice, he was made minister of war in the following October. Pache was a Girondist himself, but aroused their hostility by his incompetence. He was supported, however, by Marat, and when he was superseded in the ministry of war by Beurnonville (Feb. 4, 1794) he was chosen mayor by the Parisians. In that capacity he contributed to the fall of the Girondists, but his relations with Hébert and Chaumette, and with the enemies of Robespierre led to his arrest on the 10th of May 1794. He owed his safety only to the amnesty of the 25th of October 1795. After acting as commissary to the civil hospitals of Paris in 1799, he retired from public life, and died at Thin-le-Moutier on the 18th of November 1823.

See L. Pierquin, *Mémoires sur Pache* ((Charleville, 1900).

PACHECO, FRANCISCO (1571–1654), Spanish painter and art historian, was born at Seville in 1571. Favourable specimens of his style are to be seen in the Madrid picture gallery, and also in two churches at Alcala de Guadaira near Seville. He attained great popularity, and about the beginning of the 17th century opened an academy of painting which was largely attended. Of his pupils by far the most distinguished was Velazquez, who afterwards became his son-in-law. From about 1625 he gave up painting and betook himself to literary society and pursuits; the most important of his works in this department is a treatise on the art of painting (*Arte de la pintura: su antigüedad y grandeza*, 1649), which is of considerable value for the information it contains on matters relating to Spanish art. He died in 1654.

PACHISI (Hindu *pachis*, twenty-five), the national table-game of India. In the palace of Akbar at Fatehpur Sikri the court of the zenana is divided into red and white squares, representing a pachisi-board, and here Akbar played the game with his courtiers, employing sixteen young slaves from his harem as living pieces. This was also done by the emperors of Delhi in their palace of Agra. A pachisi-board, which is usually embroidered on cloth, is marked with a cross of squares, each limb consisting of three rows of 8 squares, placed around a centre square. The outer rows each have ornaments on the fourth square from the end and the middle rows one on the end square, these ornamented squares forming "castles," in which pieces are safe from capture. The castles are so placed that from the centre square, or "home," whence all pieces start going down the middle row and back on the outside and then to the end of the next limb, will be exactly 25 squares, whence the name. Four players, generally two on a side, take part. The pieces, of which each player has four, are coloured yellow, green, red and black, and are entered, one at a time, from the centre and move down the middle row, then round the entire board and up the middle row again to the home square. The moves are regulated by six cowrie shells, which are thrown by hand down a slight incline. The throws indicate the number of squares a piece may move, as well as whether the player shall have a "grace," without which no piece, if taken, may be re-entered. A piece may be taken if another piece lands on the same square, unless the square be a castle. The object of each side is to get all eight pieces round and home before the opponents can do so.

See *Games, Ancient and Oriental*, by E. Falkner (London, 1892).

PACHMANN, VLADIMIR DE (1848–), Russian pianist, was born at Odessa, where his father was a professor at the university. He was educated in music at Vienna, and from 1869 to 1882 only rarely performed in public, being engaged in the meanwhile in assiduous study. He then obtained the greatest success, particularly as a player of Chopin, his brilliance of execution and rendering being no less remarkable than the playfulness of his platform manner.

PACHMARHI, a hill-station and sanatorium for British troops in the Central Provinces of India. Pop. (1901), 3020, rising to double that number in the season. It is situated at a height of 3500 ft. on a plateau of the Satpura hills in Hoshangabad district, 32 m. by road from Piparia station on the Great Indian Peninsula railway. Though not free from fever in the hot season, it affords the best available retreat for the Central Provinces.

PACHOMIUS, ST (292–346), Egyptian monk, the founder of Christian cenobitical life, was born, probably in 292, at Esna in Upper Egypt, of heathen parents. He served as a conscript in one of Constantine's campaigns, and on his return became a Christian (314); he at once went to live an eremitical life near Dendera by the Nile, putting himself under the guidance of an aged hermit. After three or four years he was called (by an angel, says the legend) to establish a monastery of cenobites, or monks living in common (see MONASTICISM, § 4). Pachomius spent his life in organizing and directing the great order he had created, which at his death included nine monasteries with some three thousand monks and a nunnery. The order was called Tabennesiot, from Tabennisi, near Dendera, the site of the first monastery. The most vivid account of the life and primitive rule is that given by Palladius in the Lausiac History, as witnessed by him (*c.* 410). Difficulties arose between Pachomius and the neighbouring bishops, which had to be composed at a synod at Esna. But St Athanasius was his firm friend and visited his monastery *c.* 330 and at a later period. Pachomius died (probably) in 346.

The best modern work on Pachomius is by P. Ladeuze, *Le Cénobitisme pakhomien* (1898). There have been differences of opinion in regard to the dates; those given above are Ladeuze's, now commonly accepted. The priority of the Greek *Life* of Pachomius over the Coptic may be said to be established; the historical character and value of this life are now fully recognized. A good analysis of all the literature is supplied in Herzog's *Realencyklopädie* (ed. 3). (E. C. B.)

PACHUCA, a city of Mexico and capital of the state of Hidalgo, 55 m. direct and 68 m. by rail N.N.E. of the city of Mexico. Pop. (1900), 37,487. Pachuca's railway connexions include the Mexican, the Hidalgo and the Mexican Oriental, besides which it has 5 m. of tramway line. The town stands in a valley of an inland range of the Sierra Madre Oriental, at an elevation over 8000 ft. above the sea, and in the midst of several very rich mineral districts—Atatonileo el Chico, Capula, Potosí, Real del Monte, Santa Rosa and Tepenené. It is said that some of these silver mines were known to the Indians before the discovery of America. Pachuca has some fine modern edifices, among which are the palace of justice, a scientific and literary institute, a school of mines and metallurgy, founded in 1877, a meteorological observatory and a public library. Mining is the chief occupation of its inhabitants, of whom about 7000 are employed underground. Electric power is derived from the Regla Falls, in the vicinity. The city's industrial establishments include smelting works and a large number of reduction works, among which are some of the largest and most important in the republic. It was here that Bartolomé de Medina discovered the "patio" process of reducing silver ores with quicksilver in 1557, and his old *hacienda de beneficio* is still to be seen. Pachuca was founded in 1534, some time after the mines were discovered. Here Pedro Romero de Terreros made the fortune in 1739 that enabled him to present a man-of-war to Spain and gain the title of Count of Regla. Pachuca was sacked in 1812, and so keen was the desire to possess its sources of wealth, in common with other mining towns, that mining operations were partially suspended for a time and the mines were greatly damaged. In 1824 the Real del Monte mines were sold to an English company and became the centre of a remarkable mining speculation—the company ruining itself with lavish expenditures and discontinuing work in 1848. The mines in 1909 belonged to an American company.

PACHYMERES, GEORGIUS (1242–*c.* 1310), Byzantine historian and miscellaneous writer, was born at Nicaea, in Bithynia, where his father had taken refuge after the capture of Constantinople by the Latins in 1204. On their expulsion by Michael Palaeologus in 1261 Pachymeres settled in Constantinople, studied law, entered the church, and subsequently became chief advocate of the church (πρωτέκδικος) and chief justice of the imperial court (δικαιοφύλαξ). His literary activity was considerable, his most important work being a Byzantine history in 13 books, in continuation of that of Georgius Acropolita from 1261 (or rather 1255) to 1308, containing the history of the reigns of Michael and Andronicus Palaeologi. He was also the author of rhetorical exercises on hackneyed sophistical themes; of a *Quadrivium* (Arithmetic, Music, Geometry, Astronomy), valuable for the history of music and astronomy in the middle ages; a general sketch of Aristotelian philosophy; a paraphrase of the speeches and letters of Dionysius Areopagita; poems, including an autobiography; and a description of the Augusteum, the column erected by Justinian in the church of St Sophia to commemorate his victories over the Persians.

The *History* has been edited by I. Bekker (1835) in the *Corpus scriptorum hist. byzantinae*, also in J. P. Migne, *Patrologia graeca.* cxliii., cxliv.; for editions of the minor works see C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897).

PACIFIC BLOCKADE, a term invented by Hautefeuille, the French writer on International Maritime Law, to describe a blockade exercised by a great power for the purpose of bringing pressure to bear on a weaker state without actual war. That it is an act of violence, and therefore in the nature of war, is undeniable, seeing that it can only be employed as a measure of coercion by maritime powers able to bring into action such vastly superior forces to those the resisting state can dispose of that resistance is out of the question. In this respect it is an act of war, and any attempt to exercise it against a power strong enough to resist would be a commencement of hostilities, and at once bring into play the rights and duties affecting neutrals. On the other hand, the object and justification of a pacific blockade being to avoid war, that is general hostilities and disturbance of international traffic with the state against which the operation is carried on, rights of war cannot consistently be exercised against ships belonging to other states than those concerned. And yet, if neutrals were not to be affected by it, the coercive effect of such a blockade might be completely lost. Recent practice has been to limit interference with them to the extent barely necessary to carry out the purpose of the blockading powers.[1]

It is usual to refer to the intervention of France, England and Russia in Turkish affairs in 1827 as the first occasion on which the coercive value of pacific blockades was put to the test. Neutral vessels were not affected by it. This was followed by a number of other coercive measures described in the textbooks as pacific blockades. The first case, however, in which the operation was really a blockade, unaccompanied by hostilities, and which therefore can be properly called a "pacific blockade," was that which in 1837 Great Britain exercised against New Granada. A British subject and consul of the name of Russell was accused of stabbing a native of the country in a street brawl. He was arrested, and after being kept in detention for some months he was tried for the unlawful carrying of arms and sentenced to six years' imprisonment. The British government resented this treatment as "not only cruel and unjust towards Mr Russell, but disrespectful towards the British nation," and demanded the dismissal of the officials implicated and £1000 damages "as some compensation for the cruel injuries which had been inflicted upon Mr Russell" (State Papers, 1837–1838, p. 183). The New Granada government refused to comply with these demands, and the British representative, acting upon his instructions, called in the assistance of the West Indian fleet, but observed in his communication to the British naval officer in command that it was desirable to avoid hostilities, and to endeavour to bring about the desired result by a strict blockade only. This seems to be the first occasion on which it had occurred to anybody that a blockade without war might serve the purpose of war. This precedent was shortly afterwards followed by another somewhat similar case, in which from the 16th of April to the 28th of November 1838 the French government blockaded the Mexican ports, to coerce the Mexican government into acceptance of certain demands on behalf of French subjects who had suffered injury to their persons and damage to their property through insufficient protection by the Mexican authorities.

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[1] There is always the alternative of making the blockade an act of war. This was done in 1902–3, when Great Britain, Germany and Italy proclaimed a blockade of certain ports of Venezuela and the mouths of the Orinoco. The blockade in this case was not pacific, but was war with all its consequences for belligerents and neutrals (see Foreign Office notice in *London Gazette* of December 20, 1902).

The blockade of Buenos Aires and the Argentine coast from the 28th of March 1838 to the 7th of November 1840 by the French fleet, a coercive measure consequent upon vexatious laws affecting foreign residents in the Argentine Republic, seems to have been the first case in which the operation was notified to the different representatives of foreign states. This notification was given in Paris, and at Buenos Aires, and to every ship approaching the blockaded places. This precedent of notification was, a few years later (1845), followed in another blockade against the same country by Great Britain and France, and in one in 1842 and 1844 by Great Britain against the port of Greytown in Nicaragua. In 1850 Great Britain blockaded the ports of Greece in order to compel the Hellenic government to give satisfaction in the Don Pacifico case. Don Pacifico, a British subject, claimed £32,000 as damages for unprovoked pillage of his house by an Athenian mob. Greek vessels only were seized, and these were only sequestered. Greek vessels *bona fide* carrying cargoes belonging to foreigners were allowed to enter the blockaded ports.

Before the next case of blockade which can be described as "pacific" occurred came the Declaration of Paris (April 15, 1856), requiring that "blockades in order to be binding must be effective; that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy."

Some ill-defined measures of blockade followed, such as that of 1860, when Victor Emmanuel, then king of Sardinia, joined the revolutionary government of Naples in blockading ports in Sicily, then held by the king of Naples, without any rupture of pacific relations between the two governments; that of 1862, in which Great Britain blockaded the port of Rio de Janeiro, to exact redress for pillage of an English vessel by the local population, at the same time declaring that she continued to be on friendly terms with the emperor of Brazil; and that in 1880, when a demonstration was made before the port of Dulcigno by a fleet of British, German, French, Austrian, Russian and Italian men-of-war, to compel the Turkish government to carry out the treaty conceding this town to Montenegro, and it was announced that if the town was not given up by the Turkish forces it would be blockaded.

The blockade which first gave rise to serious theoretical discussion on the subject was that instituted by France in 1884 in Chinese waters. On the 20th of October 1884 Admiral Courbet declared a blockade of all the ports and roadsteads between certain specified points of the island of Formosa. The British government protested that Admiral Coubert had not enough ships to render the blockade effective, and that it was therefore a violation of one of the articles of the Declaration of Paris of 1856; moreover, that the French government could only interfere with neutral vessels violating the blockade if there was a state of war. If a state of war existed, England as a neutral was bound to close her coaling stations to belligerents. The British government held that in the circumstances France was waging war and not entitled to combine the rights of peace and warfare for her own benefit. Since then pacific blockades have only been exercised by the great powers as a joint measure in their common interest, which has also been that of peace; and in this respect the term is taking a new signification in accordance with the ordinary sense of the word "pacific."

In 1886 Greece was blockaded by Great Britain, Austria, Germany, Italy and Russia, to prevent her from engaging in war with Turkey, and thus forcing the powers to define their attitude towards the latter power. The instructions given to the British commander were to detain every ship under the Greek flag coming out of or entering any of the blockaded ports or harbours, or communicating with any ports within the limit blockaded; but if any parts of the cargo on board of such ships belonged to any subject or citizen of any foreign power other than Greece, and other than Austria, Germany, Italy and Russia, and had been shipped before notification of the blockade or after such notification, but under a charter made before the notification, such ship was not to be detained.

On the blockade of Crete in 1897 it was notified that "the admirals in command of the British, Austro-Hungarian, French, German, Italian, and Russian naval forces" had decided to put the island of Crete in a state of blockade, that "the blockade would be general for all ships under the Greek flag," and that "ships of the six powers or *neutral* powers may enter into the ports occupied by the powers and land their merchandise, but only if it is not for the Greek troops or the interior of the island," and that "these ships may be visited by the ships of the international fleets."

Since the adoption of the Hague Convention of 1907 respecting the limitation of the employment of force for the recovery of contract debts, the contracting powers are under agreement "not to have recourse to armed force for the recovery of contract debts claimed from the government of one country by the government of another country as being due to its nationals," unless "the debtor state refuses or neglects to reply to an offer of arbitration, or after accepting the offer prevents any *compromis* from being agreed on, or after the arbitration fails to submit to the award" (Art. 1). Though this does not affect pacific blockades in principle, it supersedes them in practice by a new procedure for some of the cases in which they have hitherto been employed. (T. BA.)

PACIFIC OCEAN, the largest division of the hydrosphere, lying between Asia and Australia and North and South America. It is nearly landlocked to the N., communicating with the Arctic Ocean only by Bering Strait, which is 36 m. wide and of small depth. The southern boundary is generally regarded as the parallel of 40° S., but sometimes the part of the great Southern Ocean (40° to 66½° S.) between the meridians passing through South Cape in Tasmania and Cape Horn is included. The north to south distance from Bering Strait to the Antarctic circle is 9300 m., and the Pacific attains its greatest breadth, 10,000 m., at the equator. The coasts of the Pacific are of varied contour. The American coasts are for the most part mountainous and unbroken, the chief indentation being the Gulf of California; but the general type is departed from in the extreme north and south, the southern coast of South America consisting of bays and fjords with scattered islands, while the coast of Alaska is similarly broken in the south and becomes low and swampy towards the north. The coast of Australia is high and unbroken; there are no inlets of considerable size, although the small openings include some of the finest harbours in the world, as Moreton Bay and Port Jackson. The Asiatic coasts are for the most part low and irregular, and a number of seas are more or less completely enclosed and cut off from communication with the open ocean. Bering Sea is bounded by the Alaskan Peninsula and the chain of the Aleutian Islands; the sea of Okhotsk is enclosed by the peninsula of Kamchatka and the Kurile Islands; the Sea of Japan is shut off by Sakhalin Island, the Japanese Islands and the peninsula of Korea; the Yellow Sea is an opening between the coast of China and Korea;

the China Sea lies between the Asiatic continent and the island of Formosa, the Philippine group, Palawan and Borneo. Amongst the islands of the Malay Archipelago are a number of enclosed areas—the Sulu, Celebes, Java, Banda and Arafura seas. The Arafura Sea extends eastwards to Torres Strait, and beyond the strait is the Coral Sea, bounded by New Guinea, the islands of Melanesia and north-eastern Australia.

The area and volume of the Pacific Ocean and its seas, with the mean depths calculated therefrom, are given in the article OCEAN.

Extent. The Pacific Ocean has one and three-quarter times the area of the Atlantic—the next largest division of the hydrosphere—and has more than double its volume of water. Its area is greater than the whole land surface of the globe, and the volume of its waters is six times that of all the land above sea-level. The total land area draining to the Pacific is estimated by Murray at 7,500,000 sq. m., or little more than one-fourth of the area draining to the Atlantic. The American rivers draining to the Pacific, except the Yukon, Columbia and Colorado, are unimportant. The chief Asiatic rivers are the Amur, the Hwang-ho and the Yangtsze-kiang: none of which enters the open Pacific directly. Hence the proportion of purely oceanic area to the total area is greater in the Pacific than in the Atlantic, the supply of detritus being smaller, and terrigenous deposits are not borne so far from land.

Relief of Bed. The bed of the Pacific is not naturally divided into physical regions, but for descriptive purposes the parts of the area lying east and west of 150° W. are conveniently dealt with separately. The eastern region is characterized by great uniformity of depth; the 2000-fathom line keeps close to the American coast except off the Isthmus of Panama, whence an ill-defined ridge of less than 2000 fathoms runs south-westwards, and again off the coast of South America in about 40° S., where a similar bank runs west and unites with the former. The bank then continues south to the Antarctic Ocean, in about 120° W. Practically the whole of the north-east Pacific is therefore more than 2000 fathoms deep, and the south-east has two roughly triangular spaces, including the greater part of the area, between 2000 and 3000 fathoms. Notwithstanding this great average depth, the "deeps" or areas over 3000 fathoms are small in number and extent. Five small deeps are recognized along a line close to the coast of South America and parallel to it, in the depression enclosed by the two banks mentioned—they extend from about 12° to 30° S.—and are named, from north to south, Milne-Edwards deep, Krümmel deep, Bartholomew deep, Richards deep and Haeckel deep. In the north-east the deeps are again few and small, but they are quite irregularly distributed, and not near the land. East of 150° W. the Pacific has few islands; the oceanic islands are volcanic, and coral formations are of course scanty. The most important group is the Galapagos Islands.

The western Pacific is in complete contrast to the part just described. Depths of less than 2000 fathoms occur continuously on a bank extending from south-eastern Asia, on which stands the Malay Archipelago. This bank continues southwards to the Antarctic Ocean, expanding into a plateau on which Australia stands, and a branch runs eastwards and then southwards from the north-east of Australia through New Zealand. The most considerable areas over 3000 fathoms are the Aldrich deep, an irregular triangle nearly as large as Australia, situated to the east of New Zealand, in which a sounding of 5155 fathoms was obtained by H.M.S. "Penguin," near the Tonga Islands: and the Tuscarora deep, a long, narrow trough running immediately to the east of Kamchatka, the Kurile Islands and Japan. A long strip within the Tuscarora deep forms the largest continuous area with a depth greater than 4000 fathoms. All the rest of the western Pacific is a region of quite irregular contour. The average depth varies from 1500 to 2500 fathoms, and from this level innumerable volcanic ridges and peaks rise almost or quite to the surface, their summits for the most part occupied by atolls and reefs of coral formation, while interspersed with these are depressions, mostly of small area, among which the deepest soundings recorded have been obtained. The United States telegraph ship "Nero," while surveying for a cable between Hawaii and the Philippines, sounded in 1900 the greatest depth yet known between Midway Islands and Guam (12° 43′ N., 145° 49′ E.) in 5269 fathoms, or almost exactly 6 m.

The following table, showing the area of the floor of the Pacific (to 40° S.) and the volume of water at different levels, is due to Sir J. Murray:—

Fathoms.	Areas. (sq. m.)	Volume. (cub. m.)
0–100	3,379,700	6,128,500
100–500	1,753,450	23,348,350
500–1000	1,707,650	28,323,700
1000–2000	6,902,550	52,628,500
2000–3000	39,621,550	32,545,400
3000–4000	2,164,150	1,357,900
over 4000	94,850	70,600
	55,623,900	144,402,950

So far as our knowledge goes, the present contours of the open Pacific Ocean are almost as they were in Palaeozoic times, and in the intervening ages changes of level and form have been slight. There is no reason to suppose that any considerable part of the vast area now covered by the waters of the Pacific has ever been exposed as dry land. Hence the Pacific basin may be regarded as a stable and homogeneous geographical unit, clearly marked off round nearly all its margin by steep sharp slopes, extending in places through the whole known range of elevation above sea-level and of depression below it—from the Cordilleras of South America to the island chains of Siberia and Australia. (See OCEAN.)

Deposits. The deeper parts of the bed of the Pacific are covered by deposits of red clay, which occupies an area estimated at no less than 105,672,000 sq. kilometres, or three-fifths of the whole. Over a large part of the central Pacific, far removed from any possible land-influences or deposits of ooze, the red-clay region is characterized by the occurrence of manganese, which gives the clay a chocolate colour, and manganese nodules are found in vast numbers, along with sharks' teeth and the ear-bones and other bones of whales. Radiolarian ooze is found in the central Pacific in a region between 15° N. to 10° S. and 140° E. to 150° W., occurring in seven distinct localities, and covering an area of about 3,007,000 sq. kilometres. The "Challenger" discovered an area of radiolarian ooze between 7°–12° N. and 147°–152° W., and another in 2°–10° S., 152°–153° W. Between these two areas, almost on the equator, a strip of globigerina ooze was found, corresponding to the zone of globigerina in the equatorial region of the Atlantic. Globigerina ooze covers considerable areas in the intermediate depths of the west and south Pacific—west of New Zealand, and along the parallel of 40° S., between 80°–98° W. and 150°–118° W.—but this deposit is not known in the north-eastern part of the basin. The total area covered by it is estimated at 38,332,000 sq. kilometres—about two-thirds of that in the Atlantic. Pteropod ooze occurs only in the neighbourhood of Fiji and other islands of the western Pacific, passing up into fine coral sands and mud. Diatom ooze has been found in detached areas between the Philippine and Mariana islands, and near the Aleutian and Galapagos groups, forming an exception to the general rule of its occurrence only in high latitudes. All the enclosed seas are occupied by characteristic terrigenous deposits.

Meteorology. Partly on account of its great extent, and partly because there is no wide opening to the Arctic regions, the normal wind circulation is on the whole less modified in the North Pacific than in the Atlantic, except in the west, where the south-west monsoon of southern Asia controls the prevailing winds, its influence extending eastwards to 145° E., near the Ladrones, and southwards to the equator. In the South Pacific the north-west monsoon of Australia affects a belt running east of New Guinea to the Solomon Islands. In the east the north-east trade-belt extends between 5° and 25° N.; the south-east trade crosses the equator, and its mean southern limit is 25° S. The trade-winds are generally weaker and less persistent in the Pacific than in the Atlantic, and the intervening belt of equatorial calms is broader. Except in the east of the Pacific, the south-east trade is only fully developed during the southern winter; at other seasons the regular trade-belt is cut across from north-west to south-east by a band twenty to thirty degrees wide, in which the trades alternate with winds from north-east and north, and with calms, the calms prevailing chiefly at the boundary of the monsoon region (5° N.–15° S., 160°–185° E.). This area, in which the south-east trade is interrupted, includes the Fiji, Navigator and Society groups, and the Paumotus. In the Marquesas group the trade-wind is constant. Within the southern monsoon region there is a gradual transition to the north-west monsoon of New Guinea in low latitudes, and in higher latitudes to the north-east wind of the Queensland coast. The great warming and abundant rainfall of the island regions of the western Pacific, and the low temperature of the surface water in the east, cause a displacement of the southern tropical maximum of pressure to the east; hence we have a permanent "South Pacific anticyclone" close to the coast of South America. The characteristic feature of the south-western Pacific is therefore the relatively low pressure and the existence of a true monsoon region in the middle of the trade-wind belt. It is to be noted that the climate of the islands of the Pacific becomes more and more healthy the farther they are from the monsoon region. The island regions of the Pacific are everywhere characterized by uniform high air-temperatures; the mean annual range varies from 1° to 9° F., with extremes of 24° to 27°, and the diurnal range from 9° to 16°. In the monsoon region relative humidity is high, viz. 80 to 90%. The rainfall is abundant; in the western island groups there is no well-marked rainy season, but over the whole region the greater part of the rainfall takes place during the southern summer, even as far north as Hawaii. In the trade-wind region we find the characteristic heavy rainfall on the weather sides of the islands, and a shorter rainy season at the season of highest sun on the lee side. Buchan describes the island-studded portion of the western Pacific as the most extensive region of the globe characterized by an unusually heavy rainfall. Beyond the tropical high-pressure belt, the winds of the North Pacific are under the control of an area of low pressure, which, however, attains neither the size nor the intensity of the "Iceland" depression in the north

Atlantic. The result is that north-westerly winds, which in winter are exceedingly dry and cold, blow over the western or Asiatic area; westerly winds prevail in the centre, and south-westerly and southerly winds off the American coast. In the southern hemisphere there is a transition to the low-pressure belt encircling the Southern Ocean, in which westerly and north-westerly winds continue all the year round.

Temperature.

The distribution of temperature in the waters of the Pacific Ocean has been fully investigated, so far as is possible with the existing observations, by G. Schott. At the surface an extensive area of maximum temperature (over 20° C.) occurs over 10° on each side of the equator to the west of the ocean. On the eastern side temperature falls to 22° on the equator and is slightly higher to N. and S. In the North Pacific, beyond lat. 40°, the surface is generally warmer on the E. than on the W., but this condition is, on the whole, reversed in corresponding southern latitudes. In the intermediate levels, down to depths not exceeding 1000 metres, a remarkable distribution appears. A narrow strip of cold water runs along the equator, widest to the east and narrowing westward, and separates two areas of maximum which have their greatest intensity in the western part of the ocean, and have their central portions in higher latitudes as depth increases, apparently tending constantly to a position in about latitude 30° to 35° N. and S. A comparison of this distribution with that of atmospheric pressure is of great interest. High temperature in the depth may be taken to mean descending water, just as high atmospheric pressure means descending air, and hence it would seem that the slow vertical movement of water in the Pacific reproduces to some extent the phenomena of the "doldrums" and "horse latitudes," with this difference, that the centres of maximum intensity lie off the east of the land instead of the west as in the case of the continents. The isothermal lines, in fact, suggest that in the vast area of the Pacific something corresponding to the "planetary circulation" is established, further investigation of which may be of extreme value in relation to current inquiries concerning the upper air. In the greater depths temperature is extraordinarily uniform, 80% of the existing observations falling within the limits of 1·6° C. and 1·9° C. In the enclosed seas of the western Pacific, temperature usually falls till a depth corresponding to that of the summit of the barriers which isolate them from the open ocean is reached, and below that point temperature is uniform to the bottom. In the Sulu Sea, for example, a temperature of 10·3° C. is reached at 400 fathoms, and this remains constant to the bottom in 2500 fathoms.

Salinity.

The surface waters of the North Pacific are relatively fresh, the salinity being on the whole much lower than in the other great oceans. The saltest waters are found along a belt extending westwards from the American coast on the Tropic of Cancer to 160° E., then turning southwards to the equator. North of this salinity diminishes steadily, especially to the north-west, the Sea of Okhotsk showing the lowest salinity observed in any part of the globe. South and east of the axis mentioned salinity becomes less to just north of the equator, where it increases again, and the saltest waters of the whole Pacific are found, as we should expect, in the south-east trade-wind region, the maximum occurring in about 18° S. and 120° W. South of the Tropic of Capricorn the isohalines run nearly east and west, salinity diminishing quickly to the Southern Ocean. The bottom waters have almost uniformly a salinity of 34·8 per mille, corresponding closely with the bottom waters of the South Atlantic, but fresher than those of the North Atlantic.

Circulation.

The surface currents of the Pacific have not been studied in the same detail as those of the Atlantic, and their seasonal variations are little known except in the monsoon regions. Speaking generally, however, it may be said that they are for the most part under the direct control of the prevailing winds. The North Equatorial Current is due to the action of the north-east trades. It splits into two parts east of the Philippines, one division flowing northwards as the Kuro Siwo or Black Stream, the analogue of the Gulf Stream, to feed a drift circulation which follows the winds of the North Pacific, and finally forms the Californian Current flowing southwards along the American coast. Part of this rejoins the North Equatorial Current, and part probably forms the variable Mexican Current, which follows the coasts of Mexico and California close to the land. The Equatorial Counter-Current flowing eastwards is largely assisted during the latter half of the year by the south-west monsoon, and from July to October the south-west winds prevailing east of 150° E. further strengthen the current, but later in the year the easterly winds weaken or even destroy it. The South Equatorial Current is produced by the south-east trades, and is more vigorous than its northern counterpart. On reaching the western Pacific part of this current passes southwards, east of New Zealand, and again east of Australia, as the East Australian Current, part northwards to join the Equatorial Counter-Current, and during the north-east monsoon part makes its way through the China Sea towards the Indian Ocean. During the south-west monsoon this last branch is reversed, and the surface waters of the China Sea probably unite with the Kuro Siwo. Between the Kuro Siwo and the Asiatic coast a band of cold water, with a slight movement to the southward, known as the Oya Siwo, forms the analogue of the "Cold Wall" of the Atlantic. In the higher latitudes of the South Pacific the surface movement forms part of the west wind-drift of the Roaring Forties. On the west coast of South America the cold waters of the Humboldt or Peruvian Current corresponding to the Benguela Current of the South Atlantic, make their way northwards, ultimately joining the South Equatorial Current. The surface circulation of the Pacific is, on the whole, less active than that of the Atlantic. The centres of the rotational movement are marked by "Sargasso Seas" in the north and south basins, but they are of small extent compared with the Sargasso Sea of the North Atlantic. From the known peculiarities of the distribution of temperature, it is probable that definite circulation of water is in the Pacific confined to levels very near the surface, except in the region of the Kuro Siwo, and possibly also in parts of the Peruvian Current. The only movement in the depths is the slow creep of ice-cold water northwards along the bottom from the Southern Ocean; but this is more marked, and apparently penetrates farther north, than in the Atlantic.

See *Reports* of expeditions of the U.S.S. "Albatross" and "Thetis," 1888–1892; A. Agassiz, *Expedition to the Tropical Pacific*, 1899–1900, 1904–1905; H.M.S. "Challenger," 1873–1876; "Egeria" 1888–1889 and 1899; "Elisabeth," 1877; "Gazelle," 1875–1876; "Planet," 1906; "Penguin," 1891–1903; "Tuscarora," 1873–1874; "Vettor Pisani," 1884; "Vitraz," 1887–1888; also observations of surveying and cable ships, and special papers in the *Annalen der Hydrographie* (for distribution of temperature see G. Schott, p. 2, 1910).

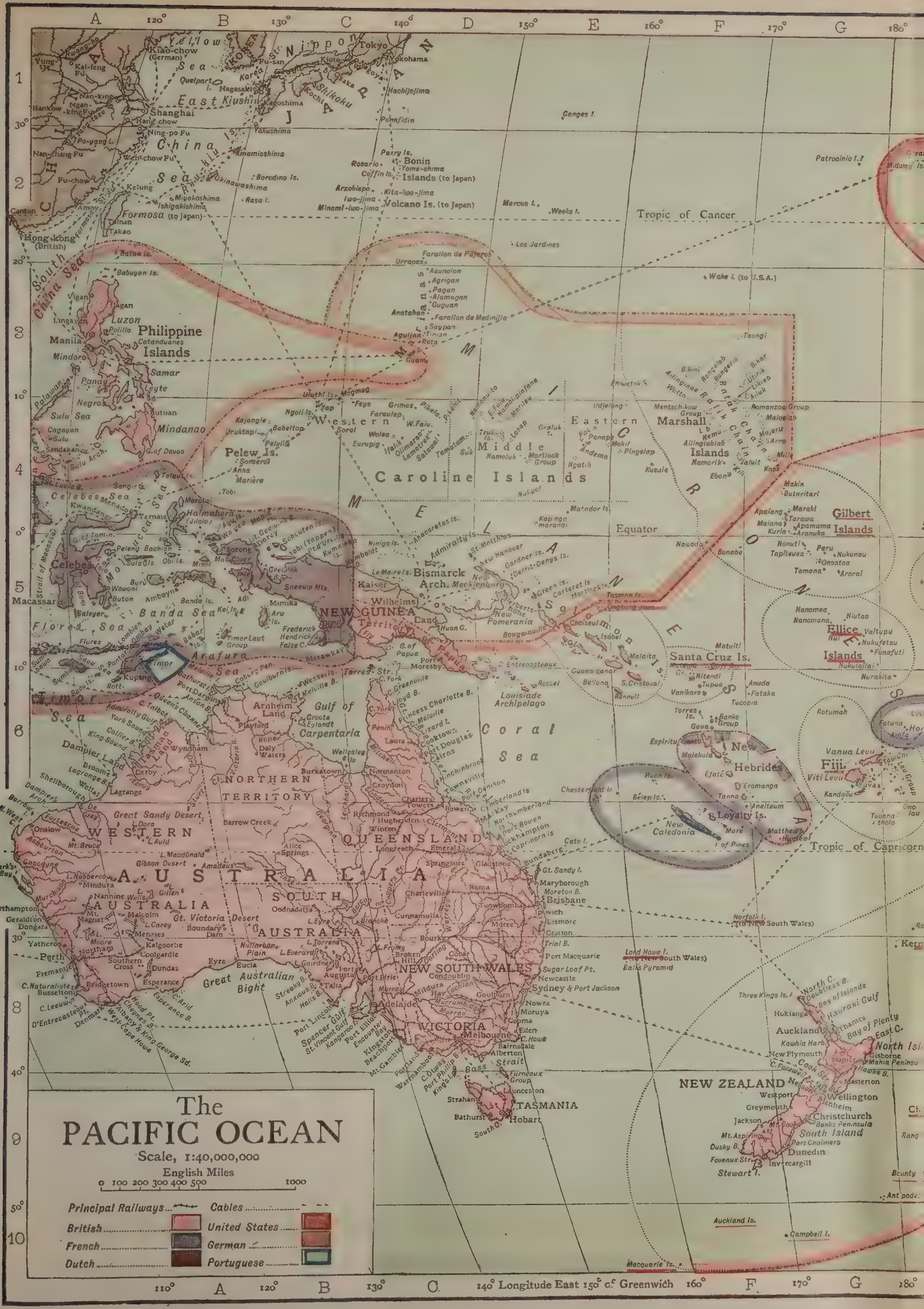
(H. N. D.)

ISLANDS OF THE PACIFIC OCEAN

Up to a certain point, the islands of the Pacific fall into an obvious classification, partly physical, partly political. In the west there is the great looped chain which fringes the east coast of Asia, and with it encloses the series of seas which form parts of the ocean. The north of the chain, from the Kuriles to Formosa, belongs to the empire of Japan; southward it is continued by the Philippines (belonging to the United States of America) which link it with the vast archipelago between the Pacific and Indian oceans, to which the name Malay Archipelago is commonly applied. As the loop of the Kuriles depends from the southern extremity of Kamchatka, so from the east of the same peninsula another loop extends across the northern part of the ocean to Alaska, and helps to demarcate the Bering Sea; this chain is distinctly broken to the east of the Commander Islands, but is practically continuous thereafter under the name of the Aleutian Islands. Islands form a much less important feature of the American Pacific coast than of the Asiatic; between 48° N. and 38° S. there are practically none, and to the north and south of these parallels respectively the islands, though large and numerous, are purely continental, lying close under the mainland, enclosing no seas, and forming no separate political units. South-eastward of the Malay Archipelago lies "the largest island and the smallest continent," Australia; eastward of the archipelago, New Guinea, the largest island if Australia be regarded as a continent only. With Australia may be associated the islands lying close under its coasts, including Tasmania. Next follow the two great islands and attendant islets of New Zealand.

There now remains a vast number of small islands which lie chiefly (but not entirely) within an area which may be defined as extending from the Philippines, New Guinea and Australia to 130° W., and from tropic to tropic. These islands fall principally into a number of groups clearly enough defined to be well seen on a map of small scale; they are moreover divided, as will be shown, into three main divisions; but whereas they have enough characteristics in common to render a general view of them desirable, there is no well-recognized name to cover them all. The name Polynesia was formerly taken to do so, but belongs properly to one of the three main divisions, to which the name Eastern Polynesia was otherwise given; Oceania and Oceanica are variants of another term which has been used for the same purpose, though by no means generally. Moreover usage varies slightly as regards the limits of the three main divisions, but the accompanying table shows the most usual classification, naming the principal groups within each, and distributing them according to the powers to which they are subject.

The following islands may be classified as oceanic, but not with any of the three main divisions: the Bonin Islands, north of the Marianas, belonging to Japan; Lord Howe and Norfolk Islands (to



Yellow Sea
Kiao-chow (German)
Nippon
Tokyo
Yokohama
Korea
Kiushiu
Shikoku
JAPAN
East China Sea
Shanghai
Formosa (to Japan)
Hong-kong (British)
Canton
South China Sea
Ganges I.
Bonin Islands (to Japan)
Volcano Is. (to Japan)
Marcus I.
Weeks I.
Tropic of Cancer
Patrocinio I.?
Midway Is.
Los Jardines
Wake I. (to U.S.A.)
Guam
Luzon
Philippine Islands
Manila
Mindoro
Samar
Leyte
Panay
Negros
Palawan
Sulu Sea
Mindanao
Pelew Is.
Western Caroline Islands
Middle
Eastern
Marshall Islands
MICRONESIA
Ralik Chain
Ratak Chain
Celebes Sea
Celebes
Halmahera
Macassar
Banda Sea
Flores Sea
Arafura Sea
Timor
Timor Sea
Equator
Bismarck Arch.
NEW GUINEA
Kaiser Wilhelms Land
Territory of Papua
Port Moresby
MELANESIA
Solomon Is.
Gilbert Islands
Ellice Islands
Santa Cruz Is.
New Hebrides
Fiji
Loyalty Is.
New Caledonia
Tropic of Capricorn
Coral Sea
Louisiade Archipelago
Torres Str.
Gulf of Carpentaria
Arnhem Land
NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
AUSTRALIA
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
TASMANIA
Great Sandy Desert
Gibson Desert
Gt. Victoria Desert
Great Australian Bight
Perth
Adelaide
Melbourne
Sydney & Port Jackson
Brisbane
Hobart
Bass Strait
Norfolk I. (to New South Wales)
Lord Howe I. (to New South Wales)
NEW ZEALAND
North Island
South Island
Auckland
Wellington
Christchurch
Dunedin
Stewart I.
Cook Str.
Auckland Is.
Campbell I.
Macquarie Is.
Bounty
Antipodes
A B C D E F G
1 2 3 4 5 6 7 8 9 10
110° 120° 130° 140° Longitude East 150° of Greenwich 160° 170° 180°
30° 20° 10° 0° 10° 20° 30° 40° 50°

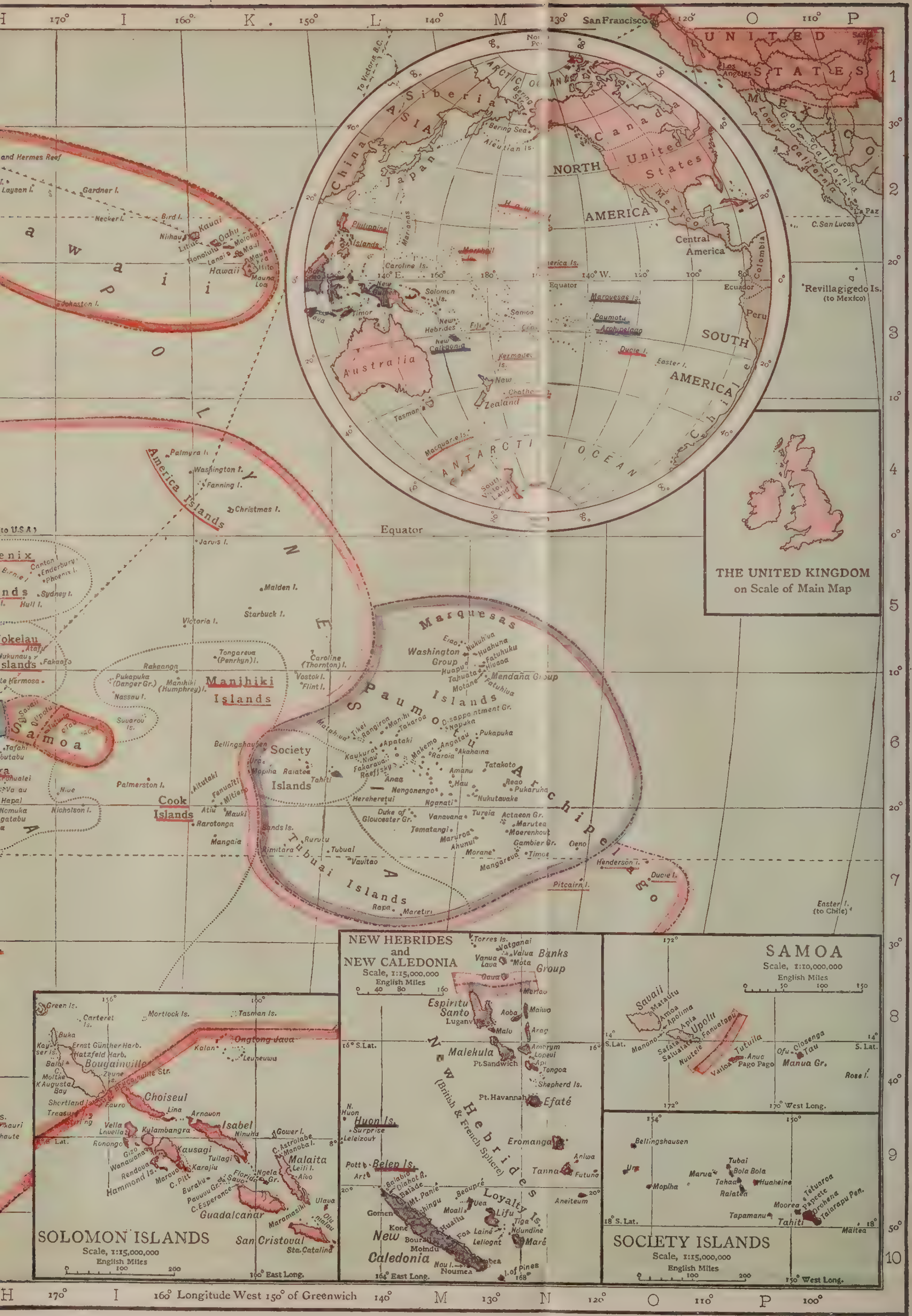
The PACIFIC OCEAN

Scale, 1:40,000,000

English Miles

0 100 200 300 400 500 1000

Principal Railways ┼┼┼
Cables - - -
British ▨
United States ▨
French ▨
German ▨
Dutch ▨
Portuguese ▨


THE UNITED KINGDOM
on Scale of Main Map
NEW HEBRIDES and NEW CALEDONIA
Scale, 1:15,000,000
English Miles
SAMOA
Scale, 1:10,000,000
English Miles
SOCIETY ISLANDS
Scale, 1:15,000,000
English Miles
SOLOMON ISLANDS
Scale, 1:15,000,000
English Miles
160° Longitude West 150° of Greenwich
San Francisco
UNITED STATES
MEXICO
Lower California
Revillagigedo Is. (to Mexico)
Asia
Siberia
China
Japan
Australia
New Zealand
NORTH AMERICA
SOUTH AMERICA
Central America
Canada
United States
Arctic Ocean
Antarctic Ocean
Hawaii
Kauai
Oahu
Molokai
Maui
Honolulu
Johnston I.
Laysan I.
Gardner I.
Necker I.
Bird I.
Niihau
Palmyra I.
Washington I.
Fanning I.
Christmas I.
America Islands
Jarvis I.
Equator
Phoenix Islands
Canton I.
Enderbury I.
Malden I.
Starbuck I.
Victoria I.
Tokelau Islands
Manihiki Islands
Tongareva (Penrhyn) I.
Rakahanga
Pukapuka (Danger Gr.)
Manihiki (Humphrey) I.
Nassau I.
Suvarov Is.
Caroline (Thornton) I.
Vostok I.
Flint I.
Samoa
Cook Islands
Palmerston I.
Aitutaki
Rarotonga
Mangaia
Niue
Society Islands
Tahiti
Bellingshausen
Marquesas
Washington Group
Mendaña Group
Paumotu Islands
Tuamotu Archipelago
Tubuai Islands
Rapa
Pitcairn I.
Henderson I.
Ducie I.
Easter I. (to Chile)
Polynesia
Espiritu Santo
Malekula
Efaté
Eromanga
Tanna
Aneiteum
Banks Group
Torres Is.
New Hebrides (British & French Sphere)
Loyalty Is.
Lifu
Maré
New Caledonia
Noumea
I. of Pines
Savaii
Upolu
Apia
Tutuila
Pago Pago
Manua Gr.
Rose I.
Moorea
Papeete
Raiatea
Huaheine
Bola Bola
Bougainville
Choiseul
Isabel
Malaita
Guadalcanar
San Cristoval
Ongtong Java
Shortland Is.
New Georgia

Emery Walker sc.

New South Wales); Easter Island (to Chile); the Galapagos Islands (to Ecuador). In an area to be defined roughly as lying about the Tropic of Cancer, between Hawaii and the Bonin Islands, there are scattered a few small islands and reefs, of most of which the position, if not the existence, is doubtful. Such are Patrocinio (about 28° 30′ N., 177° 18′ E.) and Ganges (39° 47′ N., 154° 15′ E.), among others which appear on most maps. Marcus Island, in 23° 10′ N., 154° E., was annexed by Japan in 1899 with a view to its becoming a cable station.

The following paragraphs review the oceanic islands generally, and are therefore concerned almost entirely with the central and mid-western parts of the ocean. It is impossible to estimate the total number of the islands; an atoll, for instance, which may be divided into a large number of islets, often bears a single name. The number of names of islands and separate groups in the *Index to the Islands of the Pacific* (W. T. Brigham), which covers the limited area under notice, is about 2650, exclusive of alternative names. Of these, it may be mentioned, there is a vast number, owing in some cases to divergence of spelling in the representation of native names, in others to European discoverers naming islands (sometimes twice or thrice successively) of which the native names subsequently came into use also.

ISLANDS OF THE PACIFIC OCEAN

	MELANESIA.	Area, sq. m.	Pop.	MICRONESIA.	Area, sq. m.	Pop.	POLYNESIA.	Area, sq. m.	Pop.
To Great Britain.	Fiji	7,435	121,000	Gilbert Island	166	30,000	America Islands	260	300
	Louisiade Archip.	850	5,000				Cook Islands[1]	111	6,200
	Santa Cruz Island	380	5,000				Ellice Islands	14	2,400
	Solomon Islands (part)	12,800	135,000				Manihiki Islands	12	1,000
							Niué	36	4,000
							Phoenix Islands	16	60
							Pitcairn	2	170
							Tokelau Islands	7	500
							Tonga Islands	385	19,000
Total, British		21,465	266,000		166	30,000		843	33,630
To United States of America				Guam	200	9,000	Hawaii	6,651	154,000
							Samoa (part)	95	6,000
Total, U.S.A.		—	—		200	9,000		6,746	160,000
To France	Loyalty Island	1,050	20,000				Marquesas Islands	490	4,300
	New Caledonia	6,450	52,000				Paumotu Archip.	364	5,000
							Society Islands	637	18,500
							Tubuai Islands	110	2,000
							Wallis Archip.	40	4,500
Total, French		7,500	72,000		—	—		1,641	34,300
To Germany.	Bismarck Archip.	20,000	188,000	Caroline Islands	380	36,000	Samoa (part)	985	33,000
	Solomon Islands (part)	4,200	45,000	Mariana Islands (excl. Guam)	245	2,500			
				Marshall Islands	160	15,000			
				Pelew Islands	175	3,100			
Total, German		24,200	233,000		960	56,600		985	33,000
	New Hebrides[2]	5,106	50,600						
TOTAL	Melanesia	58,271	621,600	Micronesia	1,326	95,600	Polynesia	10,215	260,930

The above figures give a total land area for the whole region of 69,561 sq. m., with a population of 978,130; but they are for the most part merely approximate.

The islands may be divided broadly into volcanic and coral islands, though the physiography of many islands is imperfectly known. There are ancient rocks, however, in New Caledonia, which has a geological affinity with New Zealand; old sedimentary rocks are known in New Pomerania, besides granite and porphyry, and slates, sandstone and chalk occur in Fiji, as well as young volcanic rocks. Along with these, similarly, hornblende and diabase occur in the Pelew Islands and gneiss and mica slate in the Marquesas, which afford a type of the extinct volcanic islands, as does Tahiti. In other areas, however, there is still volcanic activity, and in many cases volcanoes to which only tradition attributes eruptions can hardly be classified as extinct. Hawaii contains the celebrated active crater of Kilauea. In Tonga, in the New Hebrides, and in the long chain of the Solomons and the Bismarck Archipelago there is much activity. Submarine vents sometimes break forth, locally raising the level of the sea-bottom, or even forming temporary islands or shoals. Earthquakes are not uncommon in the volcanic areas. Most of the volcanic islands are lofty in proportion to their size. The peaks or sharp cones in which they frequently culminate, combined with the rich characteristic vegetation, are the principal features which have led all travellers to extol the beauty of the islands.

In the central and western Pacific the northern and southern limits of the occurrence of reef-forming corals are approximately 30° N. and 30° S. It may be added that this belt narrows greatly towards the east, mainly from the south, in sympathy with the northward flow of cold water off the coast of South America. But apart from this the limits are seen to accord fairly closely with the geographical definition of the area under consideration. Here the broad distinction has been drawn between volcanic and coral islands; but this requires amplification, both because the coral islands follow more than one type, and because the work of corals is in many cases associated with the volcanic islands in the form of fringing or barrier reefs. As to the distribution of coral reefs within the Pacific area, in Micronesia the northern Marianas (volcanic) are without reefs, which, however, are well developed in the south. The Pelew islands have extensive reefs, and the Caroline, Marshall and Gilbert islands are almost entirely coral. In Melanesia, as has been seen, the volcanic type predominates. Coral reefs occur round many of the islands (*e.g.* the Louisiade and Admiralty groups, New Caledonia and Fiji), but in some cases they are wholly absent or nearly so (*e.g.* the eastern Solomon Islands and the New Hebrides). Of the Polynesian Islands, the Hawaiian chain presents the type of a volcanic group through which coral reefs are not equally distributed. The main island of Hawaii and Maui at the east end are practically without reefs; which, however, are abundant farther west. Round the volcanic Marquesas Islands, again, coral is scanty, but the Society Islands, Samoa and Tonga have extensive reefs. The various minor groups to the north of these (Ellice, Phoenix, Union, Manihiki and the America Islands) are coral islands. Christmas, one of the last-named, is reputed to be the largest lagoon island in the Pacific. The Paumotu Archipelago is the most extensive of the coral groups.

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[1] These are dependencies of New Zealand, as are also the following islands and groups which lie apart from the main Polynesian clusters, nearer New Zealand itself: Antipodes Islands, Auckland Islands, Bounty Islands, Campbell Islands, Chatham Islands, Kermadec Islands.

[2] Under British and French influence jointly.

The coral islands are generally of the form well known under the name of atoll, rising but slightly above sea-level, flat, and generally of annular form, enclosing a lagoon. Often, as has been said, the atoll is divided into a number of islets, but in some smaller atolls the ring is complete, and the sea-water gains access beneath the surface of the reef to the lagoon within, where it is sometimes seen to spout up at the rise of the tide. Besides the atolls there is a type of island which has been called the elevated coral island. The Loyalty Islands exhibit this type, in which former reefs appear as low cliffs, elevated above the sea, and separated from it by a level coastal tract. The island of Maré shows evidence of three such elevations, three distinct cliffs alternating with level tracts. For the much debated question as to the conditions under which atolls and reefs are formed, see CORAL REEFS. As to the local distribution of reefs, it has been maintained that in the case of active volcanic islands which have no reefs, their absence is due to subterranean heat. The contour of the sea-bed, however, has been shown to influence this distribution, the continuation of the slope of a steep shore beneath the sea being adverse to their formation, whereas on a gentler slope they may be formed.

Flora.—In considering the flora of the islands it is necessary to distinguish between the rich vegetation of the fertile volcanic islands and the poor vegetation of the coral islands. Those plants which are widely distributed are generally found to be propagated from seeds which can easily be carried by the wind or by ocean currents, or form the food of migratory birds. The tropical Asiatic element predominates on the low lands; types characteristic of Australia and New Zealand occur principally on the upper parts of the high islands. In Hawaii there are instances of American elements. In the volcanic islands a distinction may be observed between the windward and leeward flanks, the moister windward slopes being the more richly clothed. But almost everywhere the vegetation serves to smooth the contours of the rugged hills, ferns, mosses and shrubs growing wherever their roots can cling, and leaving only the steepest crags uncovered to form, as in Tahiti, a striking contrast. The flora is estimated to include 15 % of ferns, but they form only the most important group among many plants of beautiful foliage, such as draceanas and crotons. Flowering plants are numerous, and the natives often (as in Hawaii) greatly appreciate flowers, which thus add a feature to the picturesqueness of island-life, though they do not usually grow in great profusion. Fruits are abundant, though indigenous fruits are few; the majority have been introduced by missionaries and others. Oranges are often plentiful, also pine-apples, guavas, custard-apples, mangoes and bananas. These last are of special importance, and the best kind, the Chinese banana, is said to have sprung from a plant given to the missionary John Williams, and cultivated in Samoa. The natives live very largely on vegetable food, among the most important plants which supply them being the taro, yam, banana, bread-fruit, arrow-root, pandanus and coco-nut. The last constitutes a valuable article of commerce in the form of copra, from which palm oil is expressed; the natives make use of this oil in made dishes, and also of the soft half-green kernel and the coco-nut "milk," the clear liquid within the nut. Their well-known drink, kava, is made from a variety of pepper-plant. The most characteristic trees are the coco-nut palm, pandanus and mangrove. The low coral islands suffer frequently from drought; their soil is sandy and unproductive, and in some cases the natives attempt cultivation by excavating trenches and fertilizing them with vegetable and other refuse.

Fauna.—The indigenous fauna of the islands is exceedingly poor in mammals, which are represented mainly by rats and bats. Pigs have been held to be indigenous on some islands, but were doubtless introduced by early navigators. Cattle and horses, where introduced, are found to degenerate rather rapidly unless the supply of fresh stock is kept up. Birds are more numerous than mammals, among the most important kinds being the pigeons and doves, especially the fruit-eating pigeons. Megapodes are found in the Solomon Islands, the New Hebrides, Samoa, Tonga, the Carolines and the Marianas. The remarkable *didunculus* occurs in Samoa, and after the introduction of cats and rats, which preyed upon it, was compelled to change its habits dwelling in trees instead of on the ground. Insect life is rich in northern Melanesia; in southern Melanesia it is less so; in Fiji numerous kinds of insects occur, while individual numbers are small. In the rest of the islands the insect fauna is poor. But if this is true of the land fauna as a whole, especially on the atolls, where it consists mainly of a few birds, lizards and insects, the opposite is the case with the marine fauna. Fish are exceedingly abundant, especially in the lagoons of atolls, and form an important article of food supply for the natives, who are generally expert fishermen. The fish fauna of the islands is especially noted for the gorgeous colouring of many of the species. Among marine mammals, the dugong occurs in the parts about New Guinea and the Caroline Islands. Various sorts of whale are found, and the whaling industry reached the height of its importance about the middle of the 19th century. In considering the marine fauna the remarkable *palolo* or *balolo* should be mentioned. This annelid propagates its kind by rising to the surface and dividing itself. The occurrence of this process can be predicted exactly for one day, before sunrise, in October and November, and as both the worm and the fish which prey on it are appreciated by the natives as food the occasions of its appearance are of great importance to them.

History.—Not long after the death of Columbus, and when the Portuguese traders, working from the west, had hardly reached the confines of the Malay Archipelago, the Spaniard Vasco Nuñez de Balboa crossed America at its narrowest part and discovered the great ocean to the west of it (1513). The belief in the short and direct westward passage from Europe to the East Indies was thus shaken, but it was still held that some passage was to be found, and in 1519–1521 Fernão de Magalhães (Magellan) made the famous voyage in which he discovered the strait which bears his name. Sailing thence north-westward for many weeks, over a sea so calm that he named it *El Mar pacifico*, he sighted only two small islands. These may have been Puka Puka of the Tuamotu Archipelago and Flint Island; but it may be stated here that the identification of islands sighted by the early explorers is often a matter of conjecture, and that therefore some islands of which the definite discovery must be dated much later had in fact been seen by Europeans at this early period. In this narrative the familiar names of islands are used, irrespective of whether they were given by the first or later discoverers, or are native names. Magellan reached the "Ladrones" (MARIANAS) in 1521, and voyaged thence to the Philippines, where he was killed in a local war. In 1522–1524 various voyages of discovery were made on the west coast of America, partly in the hope of finding a strait connecting the two oceans to the region of the central isthmus. In 1525–1527 Garcia Jofre de Loyasa sailed to the Moluccas, but, like Magellan, missed the bulk of the oceanic islands. About this time, however, the Portuguese sighted the north coast of New Guinea. Fuller knowledge of this coast was acquired by Alvaro de Saavedra (1527–1529), and among later voyages those of Ruy Lopez de Villalobos (1542–1545) and Miguel Lopez de Legaspi (1564–1565) should be mentioned. These, however, like others of the period, did not greatly extend the knowledge of the Pacific islands, for the course between the Spanish American and Asiatic possessions did not lead voyagers among the more extensive archipelagoes. For the same reason the British and Dutch fleets which sailed with the object of harrying the Spaniards, under Sir Francis Drake (1577–1580), Thomas Cavendish (1586–1593) and Oliver van Noort (1598–1601), were not, as regards the Pacific, of prime geographical importance. But the theory of the existence of a great southern continent was now also attracting voyagers. Alvaro Mendaña de Neyra, after crossing a vast extent of ocean from Peru and sighting only one island, probably in the Ellice group, reached the Solomon Islands. In 1595–1596 he made a second voyage, and though he did not again reach these islands, the development of which was his objective, he discovered the Marquesas Islands, and afterwards Santa Cruz, where, having attempted to found a settlement, he died. Thereafter his pilot, Pedro Fernandez de Quiros, set out with the remainder of the company to make for the Philippines, and on the way discovered Ponape of the Caroline Islands, some of which group, however, had been known to the Portuguese as early as 1527. Quiros returned to Europe, and, obtaining command of a fleet, made a voyage in 1605–1607 during which he observed some of the Paumotu and Society Islands, and later discovered the small Duff group of the Santa Cruz Islands, passing thence to the main island of the New Hebrides, which he hailed as his objective, the southern continent. One of his commanders, Luis Vaes de Torres, struck off to the north-west, coasted along the south of the Louisiade Archipelago and New Guinea, traversed the strait which bears his name between New Guinea and Australia, and reached the Philippines. In 1615–1617 two Dutchmen, Jacob Lemaire and Willem Cornelis Schouten, having in view both the discovery of the southern continent and the possibility of establishing relations with the East Indies from the east, took a course which brought them to the north part of the Paumotu Archipelago, thence to part of the Tonga chain, and ultimately to New Pomerania, after which they reached the East Indies. In 1642–1643 Abel Tasman, working from the east, discovered Van Diemen's Land (Tasmania) and the west coast of New Zealand, subsequently reaching the Tonga Islands. Now for a while the tide of discovery slackened. Towards the close of the century the buccaneers extended their activity to the Pacific, but naturally added little to general knowledge. William Dampier, however, making various voyages in 1690–1705, explored the coasts of Australia and New Guinea, and at the opening of the century both the French and the Dutch showed some activity. The Dutchman Jacob Roggeveen, in the course of a voyage round the world in 1721–1722, crossed the Pacific from east to west, and discovered Easter Island, some of the northern islands of the Paumotu Archipelago, and (as is generally supposed) a part of the Samoan group. The voyage of Commodore George (afterwards Lord) Anson in 1740–1744 was for purposes rather of war than of exploration, and Commodore John Byron's voyage in 1765 had little result beyond gaining some additional knowledge of the Paumotu Archipelago.

It is about this time that what may be called the period of rediscovery set in fully. In the ensuing account a constant repetition of the names of the main archipelagoes will be found; it may of course be assumed that each successive voyager added something to the knowledge of them, but on the other hand, as has been said, islands were often rediscovered and renamed in cases where later voyagers took no account of the work of their predecessors, or where the earlier voyagers were unable clearly to define the positions of their discoveries. Moreover, rivalry between contemporary explorers of different nationalities sometimes caused them to ignore each other's work, and added to the confusion of nomenclature among the islands.

In 1767 Samuel Wallis worked through the central part of the Paumotus, and visited Tahiti and the Marianas, while his companion Philip Carteret discovered Pitcairn, and visited Santa Cruz, the Solomons and New Pomerania. The French were now taking a share in the work of discovery, and in 1768 Louis Antoine de Bougainville sailed by way of the central Paumotus, the Society Islands, Samoa, the northern New Hebrides, the south coast of New Guinea and the Louisiade and Bismarck archipelagoes. The next voyages in chronological order are those of the celebrated Captain James Cook (*q.v.*). Within the limits of the area under notice, his first voyage (1769) included visits to Tahiti and the Society group generally, to New Zealand and to the east coast of Australia, his second (1773–1774) to New Zealand, the Paumotu Archipelago, the Society Islands, Tonga and subsequently Easter Island, the Marquesas and the New Hebrides; and his third (1777–1778) to Tonga, the Cook or Norway group, and the Hawaiian Islands, of which, even if they were previously known to the Spaniards, he may be called the discoverer, and where he was subsequently killed. In 1786 Jean François Galoup de La Pérouse, in the course of the famous voyage from which he never returned, visited Easter Island, Samoa and Tonga. The still more famous voyage of William Bligh of the "Bounty" (1788) was followed by that of Captain Edwards of the "Pandora" (1791), who in the course of his search for Bligh discovered Rotumah and other islands. The Hawaiian Islands came within the purview of George Vancouver, following the course of Cook in 1791. In 1792–1793 Joseph Antoine d'Entrecasteaux, searching for traces of La Pérouse, ranged the islands west of Tonga. In 1797 Captain J. Wilson of the missionary ship "Duff" visited the Society group, Fiji, Tonga and the Marquesas, and added to the knowledge of the Paumotu and Caroline Islands. Another power entered on the field of exploration when the Russians sent Adam Ivan Krusenstern to the Pacific (1803). He was followed by Otto von Kotzebue (1816) and Fabian Gottlieb von Bellingshausen (1819–1821). The work of these three was carried out principally in the easternmost part of Polynesia. In 1818–1819 the French navigator Louis Claude Desaulses de Freycinet ranged from New Guinea through the Marianas to Hawaii. Two of his countrymen followed him in 1823–1829—Louis Isidore Duperrey and Dumont d'Urville. Kotzebue made a second voyage, accompanied by scientists, in 1823–1826. In 1826–1828 Frederick William Beechey was at work in the middle parts of the ocean, and Feodor Petrovich Count Lütke, the Russian circumnavigator, in the northern. In 1834 Dr Debell Bennett made scientific researches in the Society, Hawaiian and Marquesas Islands, in 1835 Captain Robert Fitzroy was accompanied by Charles Darwin, and in 1836 sqq., Abel Aubert du Petit-Thouars was carrying on the work of the French in the Pacific. During his voyage of 1837–1840, Dumont d'Urville was again in Polynesia, working westward from the Paumotu and Marquesas Islands by Fiji and the Solomon, Loyalty and Louisiade groups to New Guinea. In 1839 sqq. the first important American expedition was made under Charles Wilkes, who covered a great extent of the ocean from Hawaii to Tonga, Fiji and New Zealand. Among later British explorers may be mentioned Captain J. Elphinstone Erskine (1849) and Captain H. M. Denham, and several important voyages for scientific research were made in the second half of the 19th century, including one from Austria under Captain Wüllerstorf Urbair (1858), and one from Italy in the vessel "Magenta" (1865–1868), which was accompanied by the scientist Dr Enrico Giglioli. The celebrated voyage of H.M.S. "Challenger" (1874–1875) and those of the American vessels "Tuscarora" (1873–1876) and "Albatross" (1888–1892) may complete the tale.

Whalers, sealers and traders followed in the wake of explorers, the traders dealing chiefly in copra, trepang, pearls, tortoiseshell, &c. The first actual settlers in the islands were largely men of bad character—deserting sailors, escapers from the penal settlements in Australia and others. It is not to be supposed that there were no orderly colonists, but that the natives suffered much at the hands of Europeans and Americans is only too clear. The class of traders who made a living by disreputable means and attempted to keep a monopoly of the island on which they settled, became notorious under the name of "beachcombers," and for each of the many dark chapters in Polynesian history there must have been many more unwritten. The kidnapping of natives for the South American and Australian labour markets was common. It cannot be denied that there has been actual deterioration of the native races, and elimination in their numbers, consequent upon contact with Europeans and Americans (see further, POLYNESIA). The romantic character of island-history has perhaps, however, tended to emphasize its dark side, and it is well to turn from it to recognize the work of the missionaries, who found in the Pacific one of their most extensive and important fields of labour, and have exercised not only a moral, but also a profound political influence in the islands since the London Missionary Society first established its agents in Tahiti in 1797. Many of them, moreover, have added greatly to the scientific knowledge of the islands and their inhabitants. The imposition of strict rules of life upon the natives was in some instances carried too far; in others their conversion to Christianity was little more than nominal, but cases of this sort are overshadowed by the fine work of William Ellis and John Williams (*c.* 1818) and many of their successors.

The discovery of sandalwood in Fiji in 1804, and the establishment of a trade therein, made that group a centre of interest in the early modern history of the Pacific islands. Moreover the London Missionary Society, having worked westward from its headquarters in Tahiti to Tonga as early as 1797, founded a settlement in Fiji in 1835. Meanwhile the white traders in Fiji had played an intimate part in the internal political affairs of the group, and in 1858 King Thakombau, being threatened with reprisals by the American consul on account of certain losses of property which he had sustained, asked for British protection, but did not obtain it. The British, however, were paramount among the white population, and as by 1870 not only American, but also German influence was extending through the islands (the first German government vessel visited Fiji in 1872), annexation was urged on Great Britain by Australia and New Zealand. Meanwhile the labour traffic, which had been initiated, so far as the Pacific islands were concerned, by an unsuccessful attempt in 1847 to employ New Hebridean labourers on a settlement near the present township of Eden in New South Wales, had attained considerable proportions, had been improperly exploited and, as already indicated, had led the natives to retaliation, sometimes without discernment, a notorious example of this (as was generally considered) being the murder of Bishop Patteson in 1871. In 1872 an act was passed by the British government to regulate the labour traffic; Fiji was annexed in 1874, and in 1875 another act established the post of the British high commissioner.

In 1842 the French had formally annexed the Marquesas Islands; and subsequently extended their sphere, as shown in the table at the outset of this article, both in the east of Polynesia and in the south of Melanesia. In some of the island-groups independent native states were recognized for some time by the powers, as in the case of Hawaii, which, after the deposition of the queen in 1893 and the proclamation of a republic in 1894, was annexed to the United States of America only in 1898, or, again, in the case of Tonga, which provided a curious example of the subordination of a native organization to unauthorized foreign influence. The partition of Polynesia was completed in 1899, when Samoa was divided between Germany and the United States. In Micronesia, since the discoveries of the early Spanish navigators, the Carolines, Mariana and Pelew Islands had been recognized as Spanish territory until 1885, when Germany began to establish herself in the first-named group. Spain had never occupied this group, but protested against the German action, and Pope Leo XIII. as arbitrator awarded the Carolines to her. Thereafter Spain made attempts at occupation, but serious conflicts with the natives ensued, and in 1899 the islands were sold to Germany, which thus became the predominating power in Micronesia. When Germany acquired the Bismarck Archipelago in Melanesia the introduction of German names (New Pomerania, *Neu Pommern*, for New Britain; *Neu Mecklenburg* for New Ireland; *Neu Langenburg* for the Duke of York Group, &c.) met with no little protest as contrary to precedent and international etiquette. The provision for the joint influence of Great Britain and France over the New Hebrides (1906) brought these islands into some prominence owing to the hostile criticism directed against the British government both in Australia and at home. The partition of the Pacific islands never led to any serious friction between the powers, though the acquisition of Hawaii was attempted by Britain, France and Japan before the United States annexed the group, and the negotiations as to Samoa threatened trouble for a while. There were occasional native risings, as in Samoa (where, however, the fighting was rather in the nature of civil warfare), the French possessions in eastern Polynesia, and the New Hebrides, apart from attacks on individual settlers or visitors, which have occurred here and there from the earliest period of exploration.

Administration.—Of the British possessions among the islands of the Pacific, Fiji is a colony, and its governor is also high commissioner for the western Pacific. In this capacity, assisted by deputies and resident commissioners, he exercises jurisdiction over all the islands except Fiji and those islands which are attached to New Zealand and New South Wales. Some of the islands (*e.g.* Tonga) are native states under British protection. Pitcairn, in accordance with its peculiar conditions of settlement, has a peculiar system of local government. The New Hebrides are under a mixed British and French commission. The Hawaiian Islands form a territory of the United States of America and are administered as such; Guam is a naval station, as is Tutuila of the Samoan Islands, where the commandant exercises the functions of governor. New Caledonia is a French colony under a governor; the more easterly French islands are grouped together under the title of the French Establishments in Oceania, and are administered by a governor, privy council, administrative council, &c., Papeete in Tahiti being the capital. The seat of government of the German protectorate of Kaiser Wilhelm's Land (New Guinea) is Herbertshöhe in the Bismarck Archipelago. The administrative area includes the German Solomon Islands and the Caroline, Pelew and Mariana Islands, which are divided into three administrative groups—the eastern Carolines, western Carolines and Marianas. The Marshall Islands form a "district" (*Bezirk*) within the same administrative area. The German Samoan Islands are under an imperial governor.

Races.—In the oceanic islands of the Pacific three different peoples occur, who have been called Melanesians, Polynesians and Micronesians.[1] These form themselves naturally into two broad but very distinct divisions—the dark and brown races; the first division being represented by the Melanesians, and the Polynesians and Micronesians together forming the second. The Melanesians, sometimes called Papuans (*q.v.*, the Malay name for the natives of New Guinea, the headquarters of the race), are physically negroid in type, nearly black, with crisp curly hair, flat noses and thick lips. In all essentials they agree with the African type: such variations as there are, for example, the more developed eyebrow ridges, narrower, often prominent nose, and somewhat higher narrower skull, obviously owing their existence to crossing with the Malay or the Polynesian races. The oceanic black peoples must thus be regarded as having a connexion more or less remote with the African negroes. Whether the two families have a common ancestor in the negritos of Malaysia and the Indian archipelago, or whether Papuan and Negrito are alike branches of an aboriginal African race, is a problem yet to be solved. But if their origin is unknown, there is little doubt that the Melanesians were the earliest occupants of the oceanic world, possibly reaching it from Malaysia. They undoubtedly constitute the oldest ethnic stock sometimes modified on the spot by crossings with migratory peoples (Malays, Polynesians); sometimes, as in the eastern Pacific, giving way entirely before the invaders. The traditions of many of the Polynesian islanders refer to a black indigenous race which occupied their islands when their ancestors arrived, and the black woolly-haired Papuan type is not only found to-day in Melanesia proper, but traces of it occur throughout Polynesia and Micronesia. That the oceanic blacks form one family there can be no doubt, and it is evidence of the immensely remote date at which their dispersion began that they have a multitude of languages often unintelligible except locally, and an extraordinary variety of insular customs: differentiations which must have needed centuries to be effected. Furthermore the Rev. R. H. Codrington (*Melanesian Languages*) has adduced evidence to prove that Melanesia is the most primitive form of the oceanic stock-language, and that both Malays and Polynesians speak later dialects of this archaic form of speech. The Melanesians then, must be regarded as the aborigines of Oceania. How they came to occupy the region it is impossible to say. Evidence exists as to the migrations of the brown races; but there is nothing to explain how the blacks came to inhabit the isolated Pacific islands. In this connexion it is a curious fact, and one which deepens the mystery, that, unlike the Polynesian peoples, who are all born sailors, the blacks are singularly unskilful seamen.

The second ethnic division, the Polynesian-Micronesian races, represents a far later migration and occupation of the Pacific islands. It has been urged that these brown peoples sprang from one stock with the Malays and the Malagasy of Madagascar; and that they represent this parent stock better than the Malays who have been much modified by crossings. But linguistic and physical evidence are against this theory. It is practically certain that the Polynesians at least are an older race than the Malays and their subfamilies. The view which has received most general acceptance is that they represent a branch of the Caucasic division of mankind who migrated at a remote period possibly in Neolithic times from the Asiatic mainland travelling by way of the Malay Archipelago and gradually colonizing the eastern Pacific. The Polynesians, who, as represented by such groups as the Samoans and Marquesas islanders, are the physical equal of Europeans, are of a light brown colour, tall, well-proportioned, with regular and often beautiful features. Such an explanation of the Polynesian's origin does not preclude a relationship with the Malays. It is most probable that the two stocks have Asiatic ancestors in common, though the Polynesians remain to-day, what they must have always been in remote times, a distinct race. Of their sub-division, the Micronesians, the same cannot be said. They are undoubtedly a very hybrid race, owing this characteristic to their geographical position in the area where the dominating races of the Pacific, Malays, Polynesians, Melanesians, Japanese and Chinese, may be said to converge. Careful investigations have supported the theory that Micronesia was peopled largely from the Philippines or some portion of the Malay Archipelago at a much later period than the Polynesian migration. The Micronesians then are probably of Malay stock much modified by early Polynesian crossings, and probably, within historic times, by Papuan and even Japanese and Chinese migrations. While their general physique approximates to the Polynesian type, they are often characterized by a stunted form and a dark complexion.

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[1] From these the three main divisions of the islands are named POLYNESIA, MELANESIA, MICRONESIA (*q.v.*).

In this review of the inhabitants of the Pacific islands an imaginary ethnological line has been drawn round it so as to include none but the branches of the two great divisions. But on the borders of the region, often without real boundary lines, are grouped other peoples, the true Malays, the Indonesians or pre-Malays with the Negritos to the westward and the Australians, who are generally admitted to be a distinct race. Of these races detailed information will be found under their several headings.

Prehistoric Remains.—One of the most obscure questions with which the ethnologist has to deal is that of the prehistoric remains which occur in different and widely separated parts of the oceanic region. The most remarkable of these are on Easter Island, where immense platforms built of dressed stone without mortar are found, together with stone images. Similar remains have been found on Pitcairn Island. On the island of Tongatabu in the Tonga group, there is a monument of great stone blocks which must have been brought thither by sea. In some of the Caroline Islands, again, there are extensive remains of stone buildings, and in the Marianas stone monuments occur. No native traditions assign origin to these remains, nor has any complete explanation of their existence been offered.

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PACK, OTTO VON (*c.* 1480–1537), German conspirator, studied at the university of Leipzig, and obtained a responsible position under George, duke of Saxony, which he lost owing to his dishonesty. In 1528 he revealed to Philip, landgrave of Hesse, the details of a scheme agreed upon in Breslau by the archduke Ferdinand, afterwards the emperor Ferdinand I., and other influential princes, to conquer Hungary for Ferdinand and then to attack the reformers in Germany. Pack was sent to Hungary to concert joint measures with John Zapolya, the opponent of Ferdinand in that country; but John, elector of Saxony, advised that the associates of Ferdinand should be asked to explain their conduct, and Pack's revelations were discovered to be false, the copy of the treaty which he had shown to Philip proving to be a forgery. For some time Pack lived the life of a fugitive, finally reaching the Netherlands, where he was seized at the request of Duke George. Examined under torture he admitted the forgery, and the government of the Netherlands passed sentence of death, which was carried out on the 8th of February 1537. This affair has given rise to an acute controversy as to whether Philip of Hesse was himself deceived by Pack, or was his assistant in concocting the scheme.

See W. Schomburgk, *Die Packschen Händel* (Leipzig, 1882); H. Schwarz, *Landgraf Philipp von Hessen und die Packschen Händel* (Leipzig, 1881); St Ehses, *Geschichte der Packschen Händel* (Freiburg, 1881) and *Landgraf Philipp von Hessen und Otto von Pack* (Freiburg, 1886); and L. von Ranke, *Deutsche Geschichte im Zeitalter der Reformation* (Leipzig, 1882).

PACK (apparently from the root *pak-*, *paq-*, seen in Lat. *pangere*, to fasten; cf. "compact"), primarily a bundle or parcel of goods securely wrapped and fastened for transport. The word, in this sense, is chiefly used of the bundles carried by pedlars. It was in early use, according to the *New English Dictionary*, in the wool trade, and may have been introduced from the Netherlands. As a measure of weight or quantity the term has been in use, chiefly locally, for various commodities, *e.g.* of wool, 240 lb, of gold-leaf 20 books of 25 leaves each. In a transferred sense, a "pack" is a collection or gathering of persons, animals or things; and the verb means generally to gather together in a compact body. "Pack-ice" is the floating ice which covers wide areas in the polar seas, broken into large pieces which are driven (packed) together by wind and current so as to form practically a continuous sheet. "Packet," a small parcel, a diminutive of "pack," was first confined in meaning to a parcel of despatches carried by a post, especially the state despatches or "mail"; and "packet" properly "packet-boat," was the name given to the vessels which carried these state despatches.

PACKER, ASA (1805–1879), American capitalist, was born in Mystic, Connecticut, on the 29th of December 1805. In 1822 he became a carpenter's apprentice at Brooklyn, Susquehanna county, Pennsylvania. He worked as a carpenter in New York City for a time and then in Springville, Pennsylvania, but in 1833 settled at Mauch Chunk, in the Lehigh Valley, where he became the owner of a canal-boat (carrying coal to Philadelphia), and then established the firm of A. & R. W. Packer, which built canal-boats and locks for the Lehigh Coal & Navigation Company, probably the first through shippers to New York. He urged upon the Coal & Navigation Company the advantage of a steam railway as a coal carrier, but the project was not then considered feasible. In 1851 the majority of the stock of the Delaware, Lehigh, Schuylkill & Susquehanna Railroad Company (incorporated in 1846), which became the Lehigh Valley Railroad Company in January 1853, came into his control, and between November 1852 and September 1855 a railway line was built for the Company, largely by Packer's personal credit, from Mauch Chunk to Easton. He built railways connecting the main line with coal-mines in Luzerne and Schuylkill counties; and he planned and built the extension (completed in 1868) of the line into the Susquehanna Valley and thence into New York state to connect at Waverly with the Erie railway. Packer also took an active part in politics. In 1841 and 1842 he was a member of the Pennsylvania House of Representatives; in 1843–1848 was county judge of Carbon county; in 1853–1857 was a Democratic member of the national House of Representatives; and in 1869 was the Democratic candidate for the governorship of Pennsylvania. In 1865 he gave $500,000 and 60 acres (afterwards increased to 115 acres) in South Bethlehem, Pennsylvania, for a technical school for the professions represented in the development of the Lehigh Valley; Lehigh University was chartered in 1866, and its main building, Packer Hall, was completed in 1869; he erected a library building in 1877 as a memorial to his daughter, Mrs Lucy Packer Linderman; and his will bequeathed $1,500,000 as an endowment for the university and $500,000 to the university library, and gave the university an interest (nearly one third) in his estate when finally distributed. He died in Philadelphia on the 17th of May 1879. The Packer Memorial Church (Protestant Episcopal) on the Lehigh University campus, given by his daughter, Mrs Mary Packer Cummings, was dedicated on the 13th of October 1887.

PACORUS, a Parthian name, borne by two Parthian princes.

1. Pacorus, son of Orodes I., was, after the battle of Carrhae, sent by his father into Syria at the head of an army in 52 B.C. The prince was still very young, and the real leader was Osaces. He was defeated and killed by C. Cassius, and soon after Pacorus was recalled by his father, because one of the satraps had rebelled and proclaimed him king (Dio Cass. xl. 28 sqq.; Justin xlii. 4; cf. Cicero, *ad Fam.* xv. 1; *ad Att.* vi. 1. 14). Father and son were reconciled, but the war against the Romans was always deferred. In the autumn of 45 Pacorus and the Arabic chieftain Alchaudonius came to the help of Q. Caecilius Bassus, who had rebelled against Caesar in Syria; but Pacorus soon returned, as his troops were unable to operate in the winter (Cic. *ad Att.* xiv. 9. 3; Dio Cass. xlvii. 27). At last in 40 B.C. the Roman fugitive Titus Labienus induced Orodes to send a great army under the command of Pacorus against the Roman provinces. Pacorus conquered the whole of Syria and Phoenicia with the exception of Tyre, and invaded Palestine, where he plundered Jerusalem, deposed Hyrcanus, and made his nephew Antigonus king (Dio Cass. xlviii. 24 sqq.; Joseph. *Ant.* xiv. 13; Tac. *Hist.* v. 9). Meanwhile Labienus occupied Cilicia and the southern parts of Asia Minor down to the Carian coast (Dio Cass. xlviii. 26; Strabo xiv. 660). But in 39 P. Ventidius Bassus, the general of Mark Antony, drove him back into Cilicia, where he was killed, defeated the Parthians in Syria (Dio Cass. xlviii. 39 sqq.) and at last beat Pacorus at Gindarus (in northern Syria), on the 9th of June 38, the anniversary of the battle of Carrhae. Pacorus himself was slain in the battle, which effectually stopped the Parthian conquests west of the Euphrates (Dio Cass. xlix. 19 seq.; Justin xlii. 4; Plut. *Anton.* 24; Strabo xvi. 751; Velleius ii. 78; cf. Horace, *Od.* iii. 6, 9).

2. Pacorus, Parthian king, only mentioned by Dio Cass. lxviii. 17; Arrian, *ap.* Suid. *s.v.* *ὠνητή*, according to whom he sold the kingdom of Osroëne to Abgar VII.; and Ammianus Marcellinus xxiii. 6. 23, who mentions that he enlarged Ctesiphon and built its walls. But from his numerous dated coins we learn that he was on the throne, with interruptions, from A.D. 78–95. He always calls himself Arsaces Pacorus. This mention of his proper name, together with the royal name Arsaces, shows that his kingdom was disputed by rivals. Two of them we know from coins—Vologaeses II., who appears from 77–79 and again from 111–146, and Artabanus III. in 80 and 81. Pacorus may have died about 105; he was succeeded by his brother Osroes. (Ed. M.)

PACUVIUS, MARCUS (*c.* 220–130 B.C.), Roman tragic poet, was the nephew and pupil of Ennius, by whom Roman tragedy was first raised to a position of influence and dignity. In the interval between the death of Ennius (169) and the advent of Accius, the youngest and most productive of the tragic poets, he alone maintained the continuity of the serious drama, and perpetuated the character first imparted to it by Ennius. Like Ennius he probably belonged to an Oscan stock, and was born at Brundusium, which had become a Roman colony in 244. Hence he never attained to that perfect idiomatic purity of style, which was the special glory of the early writers of comedy, Naevius and Plautus. Pacuvius obtained distinction also as a painter; and the elder Pliny (*Nat. Hist.* xxxv. 19) mentions a work of his in the temple of Hercules in the *Forum boarium*. He was less productive as a poet than either Ennius or Accius; and we hear of only about twelve of his plays, founded on Greek subjects (among them the *Antiope*, *Teucer*, *Armorum Judicium*, *Dulorestes*, *Chryses*, *Niptra*, &c., most of them on subjects connected with the Trojan cycle), and one *praetexta* (*Paulus*) written in connexion with the victory of Lucius Aemilius Paulus at Pydna (168), as the *Clastidium* of Naevius and the *Ambracia* of Ennius were written in commemoration of great military successes. He continued to write tragedies till the age of eighty, when he exhibited a play in the same year as Accius, who was then thirty years of age. He retired to Tarentum for the last years of his life, and a story is told by Gellius (xiii. 2) of his being visited there by Accius on his way to Asia, who read his *Atreus* to him. The story is probably, like that of the visit of the young Terence to the veteran Caecilius, due to the invention of later grammarians; but it is invented in accordance wtih the traditionary criticism (Horace, *Epp.* ii. 1. 54–55) of the distinction between the two poets, the older being characterized rather by cultivated accomplishment (*doctus*), the younger by vigour and animation (*altus*). Pacuvius's epitaph, said to have been composed by himself, is quoted by Aulus Gellius (i. 24), with a tribute of admiration to its "modesty, simplicity and fine serious spirit":

> Adulescens, tam etsi properas, te hoc saxum rogat
> Ut sese aspicias, deinde quod scriptum 'st legas.
> Hic sunt poetae Pacuvi Marci sita
> Ossa. Hoc volebam nescius ne esses. Vale.

Cicero, who frequently quotes from him with great admiration, appears (*De optimo genere oratorum*, i.) to rank him first among the Roman tragic poets, as Ennius among the epic, and Caecilius among the comic poets.

The fragments of Pacuvius quoted by Cicero in illustration or enforcement of his own ethical teaching appeal, by the fortitude, dignity, and magnanimity of the sentiment expressed in them, to what was noblest in the Roman temperament. They are inspired also by a fervid and steadfast glow of spirit and reveal a gentleness and humanity of sentiment blended with the severe gravity of the original Roman character. So far too as the Romans were capable of taking interest in speculative questions, the tragic poets contributed to stimulate curiosity on such subjects, and they anticipated Lucretius in using the conclusions of speculative philosophy as well as of common sense to assail some of the prevailing forms of superstition. Among the passages quoted from Pacuvius are several which indicate a taste both for physical and ethical speculation, and others which expose the pretensions of religious imposture. These poets aided also in developing that capacity which the Roman language subsequently displayed of being an organ of oratory, history and moral disquisition. The literary language of Rome was in process of formation during the 2nd century B.C., and it was in the latter part of this century that the series of great Roman orators, with whose spirit Roman tragedy has a strong affinity, begins. But the new creative effort in language was accompanied by considerable crudeness of execution, and the novel word-formations and varieties of inflexion introduced by Pacuvius exposed him to the ridicule of the satirist Lucilius, and, long afterwards, to that of his imitator Persius. But, notwithstanding the attempt to introduce an alien element into the Roman language, which proved incompatible with its natural genius, and his own failure to attain the idiomatic purity of Naevius, Plautus or Terence, the fragments of his dramas are sufficient to prove the service which he rendered to the formation of the literary language of Rome as well as to the culture and character of his contemporaries.

Fragments in O. Ribbeck, *Fragmenta scaenicae romanorum poesis* (1897), vol. i.; see also his *Römische Tragödie* (1875); L. Müller, *De Pacuvii fabulis* (1889); W. S. Teuffel, *Caecilius Statius, Pacuvius, Attius, Afranius* (1858); and Mommsen, *History of Rome*, bk. iv. ch. 13.

PAD. (1) Probably from the same root as "pod," the husk or seed-covering in certain plants, a term used in various connexions, the sense being derived from that of a soft cushion, or cushion-like combination used either for protective purposes or as stuffing or stiffening. In zoology, it is particularly used of the fleshy elastic protuberances on the sole of the foot of many animals such as the cat and dog, the camel, &c.; and of the similar cushion beneath the toes of a bird's foot or of the tarsal cushion of an insect. In sporting phraseology the whole paw of a fox or other beast of chase is called the "pad." A special technical use, somewhat difficult to connect with the above meanings, is for the socket of a brace or for the handle of such tools as a keyhole saw. (2) The canting word "pad," now surviving in such words as "footpad," a highway robber, or "pad horse," a roadster riding-horse with an easy action, is the same as "path," adapted directly from the Low Ger. form *pad*, a track or road. (3) There is an old English dialect word for a frog (Scottish and North) or a toad, more familiar in the diminutive "paddock" (cf. *Hamlet*, iii. 4, 189; *Macbeth*, i. 1, 9). This is found in many Teutonic languages, cf. Dan. *padde*, Du. *pad*, &c. The diminutive is to be distinguished from "paddock," a small enclosed plot of pasture land, an altered form of "parrock," O. Eng. *pearroc*. (See PARK.)

PADDING, the term in textile manufacture used for the stiffening of various garments. The most useful and flexible material for this purpose is hair cloth, but this is too expensive to be used for the padding of cheap clothing. Hence many kinds of fibrous material are employed for the same purpose. Hair, cotton, flax, tow, jute and paper are used, alone and in combination. The fabrics are first woven, and then starched to obtain the necessary degree of stiffness and flexibility.

PADDINGTON, a municipality of Cumberland county, New South Wales, Australia, 3 m. S.E. of and suburban to Sydney. It is a busy industrial suburb, devoted to brewing, tanning, soap-boiling and various other manufactures. The town hall is one of the finest in the colony, and there is an excellent free library. Paddington returns one member to parliament. Pop. (1901), 22,034.

PADDINGTON, a north-western metropolitan borough of London, England, bounded E. by Hampstead and Marylebone, S. by the city of Westminster, and W. by Kensington, and extending N. to the boundary of the county of London. Pop. (1901), 143,976. The best houses are found in the streets and squares of Bayswater, in the south-west, neighbouring to Kensington Gardens (a small part of which is in the borough) and to Hyde Park, farther east, while in the north-east are broad avenues and "mansions" of residential flats. Bayswater Road, skirting the park and gardens, forms part of the southern boundary of the borough; Edgware Road forms the eastern; from this Harrow Road branches north-west, Bishop's Road and Westbourne Grove form a thoroughfare westward, and Queen's Road, Bayswater, leads south from there to Bayswater Road. The name of Paddington finds no place in Domesday—it may have been included in the manor of Tyburn—and the land belonged to the Abbey of Westminster at an early date. It was granted to the see of London by Edward VI. In the 18th century the picturesque rural scenery attracted artists, and even in the middle of the 19th the open country was reached within the confines of the present borough, which now contains no traces of antiquity. Bayswater is said to take its name from Baynard, a Norman, who after the Conquest held land here and had a castle by the Thames not far above the Tower of London, whence a ward of the city is called Castle Baynard. Many springs flowed forth here; the stream called Westbourne was near at hand, and water was formerly supplied hence to London. In the borough are the Paddington and the Queen's Park technical institutes; St. Mary's Hospital, Praed Street, with medical school; and Paddington Green children's hospital. The terminus of the Great Western railway, facing Praed Street, is called Paddington Station. The parliamentary borough of Paddington has north and south divisions, each returning one member. The borough council consists of a mayor, 10 aldermen and 60 councillors. Area, 1356·1 acres.

PADDLE. (1) A verb, meaning to splash, dabble or play about in water with the feet or hands. (2) A species of oar, with a broad flat blade and short handle, used without a rowlock for propelling canoes or other lightly-built craft (see CANOE). (3) A small spade-like implement, apparently first used to clear a ploughshare from clods of earth. The verb seems to be a frequentative form of "pad," to walk, cognate with "path," or of "pat," to strike gently, an onomatopoeic word; it may have been influenced by the Fr. *patrouiller*, in much the same sense. The verb may have given rise to "paddle," an oar, an easy transition in sense; but the *New English Dictionary* identifies this with the word for a small spade, which occurs earlier than the verb, and seems to have no connexion in sense with it. The implement was known in the 17th and 18th centuries also as "spaddle," a diminutive of "spade," but "paddle" occurs in this sense as early as 1407. The term "paddle" has been applied to many objects and implements resembling the oar in its broad-bladed end: *e.g.* a shovel used in mixing materials in glass-making, in brick-making, &c., and also to the float-boards in the paddle-wheel of a steamboat or the wheel of a water-mill.

PADERBORN (Lat. *Paderae Fontes*, *i.e.* the springs of the Pader), a town and episcopal see of Germany, in the Prussian province of Westphalia, 63 m. N.E. from Dortmund on the railway to Berlin via Altenbeken. Pop. (1905), 26,468, of whom about 80% are Roman Catholics. It derives its name from the springs of the Pader, a small affluent of the Lippe, which rise in the town under the cathedral to the number of nearly 200, and with such force as to drive several mills within a few yards of their source. A large part of the town has been rebuilt since a great fire of 1875. The most prominent of half-a-dozen churches is the Roman Catholic cathedral, the western part of which dates from the 11th, the central part from the 12th, and the eastern part from the 13th century; it was restored in 1891–1893. Among other treasures it contains the silver coffin of St Liborius, a substitute for one which was coined into dollars in 1622 by Christian of Brunswick, the celebrated freebooter. The chapel of St Bartholomew, although externally insignificant, dates from the earlier part of the 11th century, and is counted among the most interesting buildings in Westphalia; it was restored in 1852. The Jesuit church and the Protestant Abdinghofkirche are also interesting. The town hall is a picturesque edifice of the 13th century; it was partly rebuilt in the 16th, and was restored in the 19th century. Paderborn formerly possessed a university, founded in 1614, with faculties of theology and philosophy, but this was closed in 1819. The manufactures of the town include railway plant, glass, soap, tobacco and beer; and there is a trade in grain, cattle, fruit and wool.

Paderborn owes its early development to Charlemagne, who held a diet here in 777 and made it the seat of a bishop a few years later. The Saxon emperors also held diets in the city, which about the year 1000 was surrounded with walls. It joined the Hanseatic League, obtained many of the privileges of a free Imperial town, and endeavoured to assert its independence of the bishop. The citizens gladly accepted the reformed doctrines, but the supremacy of the older faith was restored in 1604 by Bishop Theodore von Fürstenberg, who forcibly took possession of the city. It underwent the same fate at the hands of Christian of Brunswick during the Thirty Years' War. The bishopric of Paderborn formed part of the arch-diocese of Mainz, and its bishop became a prince of the empire about 1100. Some of the bishops were men of great activity, and the bishopric attained a certain measure of importance in North Germany, in spite of ravages during the Thirty Years' War and the Seven Years' War. It was secularized in 1803 and was given to Prussia, and after losing it for a few years that country regained it by the settlement of 1815. The last bishop was Franz Egon von Fürstenberg (d. 1825). The bishopric had an area of nearly 1000 sq. m. and a population of about 100,000. A new bishopric of Paderborn, with ecclesiastical authority only, was established in 1821.

See W. Richter, *Geschichte der Stadt Paderborn* (Paderborn, 1899–1903); A. Hübinger, *Die Verfassung der Stadt Paderborn im Mittelalter* (Münster, 1899); and J. Freisen, *Die Universität Paderborn* (Paderborn, 1898). For the history of the bishopric see W. F. Giefers, *Die Anfänge des Bistums Paderborn* (Paderborn, 1860); L. A. T. Holscher, *Die ältere Diozese Paderborn* (Paderborn, 1886); the *Urkunden des Bistums Paderborn*, edited by R. Wilmans (Münster 1874–1880); and W. Richter, *Studien und Quellen zur Paderborner Geschichte* (Paderborn, 1893).

PADEREWSKI, IGNACE JAN (1860–), Polish pianist and composer, was born in Podolia, a province of Russian Poland. He studied music chiefly at Warsaw, Berlin and

Vienna, where he was a pupil of Theodor Leschetizky (b. 1830), the pianist and composer. He made his first public appearance in Vienna in 1887, in Paris in 1889, and in London in 1890, his brilliant playing created a *furore* which went to almost extravagant lengths of admiration; and his triumphs were repeated in America in 1891. His name at once became synonymous with the highest pitch of pianoforte playing, and society was at his feet. In 1899 he married Baroness de Rosen, and after 1900 he appeared but little in public; but he became better known as a composer, chiefly of pieces for his own instrument. In 1901 his opera *Manru* was performed at Dresden.

PADIHAM, an urban district in the Clitheroe parliamentary division of Lancashire, England, 3 m. W. by N. of Burnley by the Lancashire and Yorkshire railway. Pop. (1901), 12,205. It lies in a wild and dreary district on the precipitous banks of the Calder. It possesses large cotton mills, and quarries and coal-mines are worked in the immediate neighbourhood. The church of St Leonard, founded before 1451, was frequently altered before it was rebuilt in 1866–1868 in the Perpendicular style. Padiham in 1251 was a manor in the possession of Edmund de Lacy.

PADILLA, JUAN LOPEZ DE, insurrectionary leader in the "guerra de las comunidades" in which the commons of Castile made a futile stand against the arbitrary policy of Charles V. and his Flemish ministers, was the eldest son of the commendator of Castile, and was born in Toledo towards the close of the 15th century. After the cities, by their deputies assembled at Avila, had vainly demanded the king's return, due regard for the rights of the cortes, and economical administration, to be entrusted to the hands of Spaniards, it was resolved to resort to force, and the "holy junta" was formed, with Padilla at its head. An attempt was first made to establish a national government in the name of the imbecile Joanna, who was then residing at Tordesillas; with this view they took possession of her person, seized upon the treasury books, archives, and seals of the kingdom, and stripped Adrian of his regency. But the junta soon alienated the nobility by the boldness with which it asserted democracy and total abolition of privilege, while it courted defeat in the field by appointing to the supreme command of its forces not Padilla but Don Pedro de Giron, who had no recommendation but his high birth. After the army of the nobility had recaptured Tordesillas, Padilla did something to retrieve the loss by taking Torrelobaton and some other towns. But the junta, which was not fully in accord with its ablest leader, neutralized this advantage by granting an armistice; when hostilities were resumed the commons were completely defeated near Villalar (April 23, 1521), and Padilla, who had been taken prisoner, was publicly executed on the following day. His wife, Doña Maria Pacheco de Padilla, bravely defended Toledo against the royal troops for six months afterwards, but ultimately was compelled to take refuge in Portugal.

See Sandoval, *Historia de Carlos V.* (Pamplona, 1681); E. Armstrong, *The Emperor Charles V.* (1902); A. Rodriquez Villa, *Juana la Loca* (Madrid, 1892); and Pero Mejia, *Comunidades de Castilla,* in the *Biblioteca de autores españoles of Rivadeneyra*, vol. xxi.

PADISHAH, the Turkish form of the Persian *padshah*, a title —equivalent to "lord king"—of the reigning sovereign. Though strictly applied in the East to the shahs of Persia, it was also used of the Great Moguls or Tatar emperors of Delhi, and hence it is now used by the natives of British India of the British sovereign as emperor of India. In Europe it is applied to the sultan of Turkey. The Persian *padshah* is from *pati*, lord, master, and *shah*, king. It is now generally considered to have no etymological connexion with "pasha" (*q.v.*).

PADSTOW, a small seaport and market town in the St Austell parliamentary division of Cornwall, England, on a branch of the London & South Western railway. Pop. of urban district (1901), 1566. It lies near the north coast, on the west shore, and 2 m. from the mouth of the estuary of the river Camel, a picturesque inlet which from Padstow Bay penetrates 6 m. into the land. The church of St Petrock, with a massive roodstone in the churchyard, is mainly Perpendicular, with an Early English tower. Within are an ancient font, a canopied piscina, and a fine timber roof over the nave and aisles. Other interesting churches in the locality are those of St Petrock Minor, St Minver, St Michael, St Constantine, and, most remarkable of all, St Enodock's. This building, erected in the 15th century amid the barren dunes bordering the east shore of the estuary near its mouth, in place of a more ancient oratory, was long buried beneath drifts of sand. From a little distance only the weather-beaten spire can be seen. A Norman font remains from the older foundation. A monastery formerly stood on the high ground west of Padstow, and according to tradition was founded by St Petrock in the 6th and razed by the Danes in the 10th century. Its site is occupied by Prideaux Place, an Elizabethan mansion, which contains among other valuable pictures Van Dyck's portrait of Queen Henrietta Maria. Pentine Point shelters Padstow Bay on the north-east, but the approach to the estuary is dangerous during north-westerly gales. Padstow, nevertheless, is a valuable harbour of refuge, although the river channel is narrow and much silted. Dredging, however, is prosecuted, the sand being sent inland, being useful as a manure through the carbonate of lime with which it is impregnated. The Padstow Harbour Association (1829) is devoted to the rescue of ships in distress, making no claims for salvage beyond the sums necessary for its maintenance. Padstow has fisheries and shipyards and some agricultural trade.

Padstow (Aldestowe 1273, Patrikstowe 1326, Patrestowe 1346) and St Ives are the only two tolerably safe harbours on the north coast of Cornwall. To this circumstance they both owed their selection for early settlement. St Petrock, who has been called the patron saint of Cornwall, is said to have landed here and also to have died here in the 6th century. At the time of the Domesday survey Bodmin, which treasured the saint's remains, had become the chief centre of religious influence. Padstow is not mentioned in that record. It was included in the bishop of Exeter's manor of Pawton, which had been annexed to the see of Crediton upon its formation by Edward the Elder in 909. Padstow was plundered by the Danes in 981. Until then it is said to have possessed a monastery, which thereupon was transferred to Bodmin. Two manors of Padstow are mentioned later—the prior of Bodmin's manor, which included the rectory, and a manor which passed from the Bonvilles to the Greys, marquesses of Dorset, both of which were eventually acquired by the family of Prideaux. From the letters patent addressed to the bailiffs of Padstow demanding the survey and delivery of ships for foreign service, the appointment of a king's butler for the port, and the frequent recourse which was had to the king's courts for the settlement of disputes of shipping, Padstow appears to have been a port of considerable repute in the 14th century. Its affairs were entrusted to a reeve or bailiff acting in conjunction with the principal men of the town. In 1540 Leland, without sufficient reason, credits Athelstan with the bestowal of such privileges as it then enjoyed, and describes it as a parish full of fishermen and Irishmen. Forty years later Norden describes it as an incorporation and market town. Carew in 1602 states that it had lately purchased a corporation and derived great profit from its trade with Ireland. Some steps towards incorporation were doubtless taken, but it is remarkable that no traces of its municipal character are discoverable in any subsequent records. A prescriptive market is held on Saturdays; two fairs of like nature have disappeared.

PADUA (Lat. *Patavium*; Ital. *Padova*), a city of northern Italy, on the river Bacchiglione, 25 m. W. of Venice and 18 m. S.E. of Vicenza, with a population of 82,283. The city is picturesque, with arcaded streets, and many bridges crossing the various branches of the Bacchiglione, which once surrounded the ancient walls. The Palazzo della Ragione, with its great hall on the upper floor, is reputed to have the largest roof unsupported by columns in Europe; the hall is nearly rectangular, its length 267½ ft., its breadth 89 ft., and its height 78 ft.; the walls are covered with symbolical paintings in fresco; the building stands upon arches, and the upper storey is surrounded by an open loggia, not unlike that which surrounds the basilica of

Vicenza; the Palazzo was begun in 1172 and finished in 1219; in 1306 Fra Giovanni, an Augustinian friar, covered the whole with one roof; originally there were three roofs, spanning the three chambers into which the hall was at first divided; the internal partition walls remained till the fire of 1420, when the Venetian architects who undertook the restoration removed them, throwing all three compartments into one and forming the present great hall. In the Piazza dei Signori is the beautiful loggia called the Gran Guardia, begun in 1493 and finished in 1526, and close by is the Palazzo del Capitanio, the residence of the Venetian governors, with its great door, the work of Falconetto of Verona, 1532. The most famous of the Paduan churches is the basilica dedicated to Saint Anthony, commonly called Il Santo; the bones of the saint rest in a chapel richly ornamented with carved marbles, the work of various artists, among them of Sansovino and Falconetto; the basilica was begun about the year 1230 and completed in the following century; tradition says that the building was designed by Niccola Pisano; it is covered by seven cupolas, two of them pyramidal. On the piazza in front of the church is Donatello's magnificent equestrian statue of Erasmo da Narni, the Venetian general (1438–1441). The Eremitani is an Augustinian church of the 13th century, distinguished as containing the tombs of Jacopo (1324) and Ubertino (1345) da Carrara, lords of Padua, and for the chapel of SS James and Christopher, illustrated by Mantegna's frescoes. Close by the Eremitani is the small church of the Annunziata, known as the Madonna dell' Arena, whose inner walls are entirely covered with paintings by Giotto. Padua has long been famous for its university, founded by Frederick II. in 1238. Under the rule of Venice the university was governed by a board of three patricians, called the Riformatori dello Studio di Padova. The list of professors and alumni is long and illustrious, containing, among others, the names of Bembo, Sperone Speroni, Veselius, Acquapendente, Galileo, Pomponazzi, Pole, Scaliger, Tasso and Sobieski. The place of Padua in the history of art is nearly as important as its place in the history of learning. The presence of the university attracted many distinguished artists, as Giotto, Lippo Lippi and Donatello; and for native art there was the school of Squarcione (1394–1474), whence issued the great Mantegna (1431–1506). The industry of Padua has greatly developed in modern times. Corn and saw mills, distilleries, chemical factories, breweries, candle-works, ink-works, foundries, agricultural machine and automobile works, have been established and are flourishing. The trade of the district has grown to such an extent that Padua has become the central market for the whole of Venetia.

Padua claims to be the oldest city in north Italy; the inhabitants pretend to a fabulous descent from the Trojan Antenor, whose relics they recognized in a large stone sarcophagus exhumed in the year 1274. Their real origin is involved in that obscurity which conceals the ethnography of the earliest settlers in the Venetian plain. Padua early became a populous and thriving city, thanks to its excellent breed of horses and the wool of its sheep. Its men fought for the Romans at Cannae, and the city became so powerful that it was reported able to raise two hundred thousand fighting men. Abano in the neighbourhood was made illustrious by the birth of Livy, and Padua was the native place of Valerius Flaccus, Asconius Pedianus and Thrasea Paetus. Padua, in common with north-eastern Italy, suffered severely from the invasion of the Huns under Attila (452). It then passed under the Gothic kings Odoacer and Theodoric, but made submission to the Greeks in 540. The city was seized again by the Goths under Totila, and again restored to the Eastern Empire by Narses in 568. Following the course of events common to most cities of north-eastern Italy, the history of Padua falls under eight heads: (1) the Lombard rule, (2) the Frankish rule, (3) the period of the bishops, (4) the emergence of the commune, (5) the period of the despots, (6) the period of Venetian supremacy, (7) the period of Austrian supremacy, and finally (8) the period of united Italy. (1) Under the Lombards the city of Padua rose in revolt (601) against Agilulph, the Lombard king, and after suffering a long and bloody siege was stormed and burned by him. The city did not easily recover from this blow, and Padua was still weak when the Franks succeeded the Lombards as masters of north Italy. (2) At the Diet of Aix-la-Chapelle (828) the duchy and march of Friuli, in which Padua lay, was divided into four counties, one of which took its title from that city. (3) During the period of episcopal supremacy Padua does not appear to have been either very important or very active. The general tendency of its policy throughout the war of investitures was Imperial and not Roman; and its bishops were, for the most part, Germans. (4) But under the surface two important movements were taking place. At the beginning of the 11th century the citizens established a constitution, composed of a general council or legislative assembly and a credenza or executive; and during the next century they were engaged in wars with Venice and Vicenza for the right of water-way on the Bacchiglione and the Brenta—so that, on the one hand, the city grew in power and self-reliance, while, on the other, the great families of Camposampiero, D'Este and Da Romano began to emerge and to divide the Paduan district between them. The citizens, in order to protect their liberties, were obliged to elect a podestà, and their choice fell first on one of the D'Este family (*c.* 1175). The temporary success of the Lombard league helped to strengthen the towns; but their ineradicable jealousy of one another soon reduced them to weakness again, so that in 1236 Frederick II. found little difficulty in establishing his vicar Ezzelino da Romano in Padua and the neighbouring cities, where he practised frightful cruelties on the inhabitants. When Ezzelino met his death, in 1259, Padua enjoyed a brief period of rest and prosperity: the university flourished; the basilica of the saint was begun; the Paduans became masters of Vicenza. But this advance brought them into dangerous proximity to Can Grande della Scala, lord of Verona, to whom they had to yield in 1311. (5) As a reward for freeing the city from the Scalas, Jacopo da Carrara was elected lord of Padua in 1318. From that date till 1405, with the exception of two years (1388–1390) when Gian Galeazzo Visconti held the town, nine members of the Carrara family succeeded one another as lords of the city. It was a long period of restlessness, for the Carraresi were constantly at war; they were finally extinguished between the growing power of the Visconti and of Venice. (6) Padua passed under Venetian rule in 1405, and so remained, with a brief interval during the wars of the League of Cambray, till the fall of the republic in 1797. The city was governed by two Venetian nobles, a podestà for civil and a captain for military affairs; each of these was elected for sixteen months. Under these governors the great and small councils continued to discharge municipal business and to administer the Paduan law, contained in the statutes of 1276 and 1362. The treasury was managed by two chamberlains; and every five years the Paduans sent one of their nobles to reside as nuncio in Venice, and to watch the interests of his native town. (7 and 8) After the fall of the Venetian republic the history of Padua follows the history of Venice during the periods of French and Austrian supremacy. In 1866 the battle of Königgratz gave Italy the opportunity to shake off the last of the Austrian yoke, when Venetia, and with Venetia Padua, became part of the united Italian kingdom.

See "Chronicon patavinum," in L. A. Muratori's *Antiquitates italicae medii aevi*, vol. iv. (Milan, 1738); "Rolandino" and "Monaco padovano" (Muratori's *Annali d'Italia*, vol. viii., Venice, 1790; Cortusiorum historia," ibid. vol. xii.; Gattari, "Istoria padovana," ibid. vol. xvii.; Vergerius, "Vitae carrariensium principum," ibid. vol. xvi.); G. Verci, *Storia della Marca Trevigiana* (Venice, 1786); Abate G. Gennari, *Annali di Padova* (Padua); G. Cittadella, *Storia della dominazione carrarese* (Padua, 1842); P. Litta, *Famiglie celebri, s.v.* "Carraresi" (1825–1835); C. Cantu, *Illustrazione grande del Lombardo-Veneto* (Milan, 1857); B. Gonzati, *La Basilica di Sant' Antonio di Padova* (Padua, 1853). (H. F. B.)

PADUCAH, a city and the county-seat of McCracken county, Kentucky, U.S.A., at the confluence of the Tennessee river with the Ohio, about 12 m. below the mouth of the Cumberland, and about 50 m. E. by N. of Cairo, Illinois. Pop. (1890), 12,797; (1900), 19,446, of whom 5814 were negroes and 516 were foreign-born; (1910 census) 22,760. It is served by three branches of the Illinois Central railroad by a branch of the Nashville Chattanooga & St Louis railway (of which it is the terminus), and by steamboat lines to Pittsburg, Louisville, St Louis, New Orleans, Nashville, Chattanooga, and other river ports. Paducah is in a rich agricultural region, and its wholesale trade is probably greater than that of any other city of the state except Louisville. Its trade is largely in groceries, whisky, tobacco, hardware, grain and live stock, vegetables and lumber. It is a large looseleaf tobacco market, and is a headquarters for tow boats carrying coal down the Mississippi. The Illinois Central and the Nashville, Chattanooga & St Louis railways have repair shops here; and there are numerous manufactures, the value of the factory products increasing from $2,976,931 in 1900 to $4,443,223 in 1905, or 49·3%. Paducah (said to have been named in honour of an Indian chief who lived in the vicinity and of whom there is a statue in the city) was settled in 1821, was laid out in 1827, was incorporated as a town in 1830, and was chartered as a city in 1856. The city was occupied by General U. S. Grant the 5th of September 1861; on the 25th of March 1864 it was entered by a Confederate force under General Nathan B. Forrest, who, however, was unable to capture the fortifications and immediately withdrew.

PAEAN (Gr. Παιάν, epic Παιήων), in Homer (*Il.* v. 401, 899), the physician of the gods. In other writers the word is a mere epithet of Apollo (*q.v.*) in his capacity as a god of healing (cf. ἰατρόμαντις οὔλιος), but it is not known whether Paean was originally a separate deity or merely an aspect of Apollo. Homer leaves the question unanswered; Hesiod (cf. schol. Hom. *Od.* iv. 432) definitely separates the two, and in later poetry Paean is invoked independently as a health god. It is equally difficult to discover the relation between Paean or Paeon in the sense of "healer" and Paean in the sense of "song." Farnell refers to the ancient association between the healing craft and the singing of spells, and says that it is impossible to decide which is the original sense. At all events the meaning of "healer" gradually gave place to that of "hymn," from the phrase Ἰὴ Παιάν. Such songs were originally addressed to Apollo (cf. the Homeric *Hymn to Apollo* 272, and notes in ed. by Sikes and Allen), and afterwards to other gods, Dionysus, Helios, Asclepius. About the 4th century the paean became merely a formula of adulation; its object was either to implore protection against disease and misfortune, or to offer thanks after such protection had been rendered. Its connexion with Apollo as the slayer of the python led to its association with battle and victory; hence it became the custom for a paean to be sung by an army on the march and before entering into battle, when a fleet left the harbour, and also after a victory had been won. The most famous paeans are those of Bacchylides (*q.v.*) and Pindar (*q.v.*). Paeans were sung at the festivals of Apollo (especially the Hyacinthia), at banquets, and later even at public funerals. In later times they were addressed not only to the gods, but to human beings. In this manner the Rhodians celebrated Ptolemy I. of Egypt, the Samians Lysander of Sparta, the Athenians Demetrius, the Delphians Craterus of Macedon. The word "paean" is now used in the sense of any song of joy or triumph.

See A. Fairbanks, "A Study of the Greek Paean," No. xii. of *Cornell Studies in Classical Philology* (New York, 1900); L. R. Farnell, *Cults of the Greek States.*

PAELIGNI, a people of ancient Italy, first mentioned as a member of a confederacy which included the Marsi, Marrucini and Vestini (*qq.v.*), with which the Romans came into conflict in the second Samnite War, 325 B.C. (Liv. viii. 29). On the submission of the Samnites they all came into alliance with Rome in 305–302 B.C. (Liv. ix. 45, x. 3, and Diod. xx. 101), the Paelignians having fought hard (Diod. xx. 90) against even this degree of subjection. Each of them was an independent unit, and in none was there any town or community politically separate from the tribe as a whole. Thus the Vestini issued coins in the 3rd century; each of them appears in the list of the allies in the Social War (Appian, *B.C.* i. 39, with J. Beloch, *Der italische Bund unter römischer Hegemonie*, p. 51). How purely Italic in sentiment these communities of the mountain country remained appears from the choice of the mountain fortress of Corfinium as the rebel capital. It was renamed Vitellio, the Oscan form of Italia, a name which appears, written in Oscan alphabet, on the coins struck there in 90 B.C. (see R. S. Conway, *The Italic Dialects*, p. 216).

The inscriptions we possess are enough to show that the dialect spoken by these tribes was substantially the same from the northern boundary of the Frentani to some place in the upper Aternus valley not far from Amiternum (mod. Aquila), and that this dialect closely resembled the Oscan of Lucania and Samnium, though presenting some peculiarities of its own, which warrant, perhaps, the use of the name North Oscan. The clearest of these is the use of postpositions, as in Vestine *Poimunie-n*, "in templo Pomonali"; *pritrom-e, i.e. in proximum*, "on to what lies before you." Others are the sibilation of consonantal *i* and the assibilation of *-di-* to some sound like that of English *j* (denoted by Ǝ in the local variety of Latin alphabet), as in *vidadu*, "viamdō," *i.e.* "ad-viam"; *Musesa*=Lat. *Mussedia* ; and the loss of *d* (in pronunciation) in the ablative, as in *aetatu firata fertlid* (*i.e. aetate fertili finita*), where the contrast of the last with the other two forms shows that the *-d* was an archaism still occasionally used in writing. The last sentence of the interesting epitaph from which this phrase is taken may be quoted as a specimen of the dialect; the stone was found in Pentima, the ancient Corfinium, and the very perfect style of the Latin alphabet in which it is written shows that it cannot well be earlier than the last century B.C.: "Eite uus pritrome pacris, puus ecic lexe lifar," "ite vos porro pacati (cum bona pace), qui hoc scriptum (*libar*, 3rd decl. neut.) legistis." The form *lexe* (2nd plur. perf. indic.) is closely parallel to the inflection of the same person in Sanskrit and of quite unique linguistic interest.

The name *Paezigni* may belong to the NO-class of Ethnica (see Sabini), but the difference that it has no vowel before the suffix suggests that it may rather be parallel with the suffix of Lat. *privignus*. If it has any connexion with Lat. *paelex*, "concubine," it is conceivable that it meant "half-breeds," and was a name coined in contempt by the conquering Sabines, who turned the *tonta Maronca* into the community of the *Marrucini* (*q.v.*). But, when unsupported by direct evidence, even the most tempting etymology is an unsafe guide. For the history of the Paeligni after 90 B.C. see the references given in *C. I. L.* ix. 290 (Sulmo, esp. Ovid, *e.g. Fasti*, iv. 79, *Amor.* ii. 16; Florus ii. 9; Caes., *B.C.*, i. 15) and 296 (Corfinium, *e.g.* Diod. Sic. xxxvii. 2, 4, Caes., *B.C.*, i. 15). None of the Latin inscriptions of the district need be older than Sulla, but some of them both in language and script show the style of his period (*e.g.* 3087, 3137); and, on the other hand, as several of the native inscriptions, which are all in the Latin alphabet, show the normal letters of the Ciceronian period, there is little doubt that, for religious and private purposes at least, the Paelignian dialect lasted down to the middle of the 1st century B.C.

Paelignian and this group of inscriptions generally form a most important link in the chain of the Italic dialects, as without them the transition from Oscan to Umbrian would be completely lost. The unique collection of inscriptions and antiquities of Pentima and the museum at Sulmona were both created by the late Professor Antonio de Nino, whose brilliant gifts and unsparing devotion to the antiquities of his native district rescued every single Paelignian monument that we possess.

For further details and the text of the inscriptions, the place-names, &c., see R. S. Conway, *The Italic Dialects*, pp. 235 sqq., and the earlier authorities there cited. (R. S. C.)

PAEONIA, in ancient geography, the land of the Paeonians, the boundaries of which, like the early history of its inhabitants, are very obscure. The Paeonians are regarded as descendants of the Phrygians of Asia Minor, large numbers of whom in early times crossed over to Europe. According to the national legend (Herodotus v. 16), they were Teucrian colonists from Troy, and Homer (*Iliad*, ii. 848) speaks of Paeonians from the Axius fighting on the side of their Trojan kinsmen. Before the reign of Darius Hystaspes, they had made their way as far east as Perinthus in Thrace on the Propontis. At one time all Mygdonia, together with Crestonicē, was subject to them. When Xerxes crossed Chalcidicē on his way to Therma (Thessalonica) he is said to have marched "through Paeonian territory." They occupied the entire valley of the Axius (Vardar) as far inland as Stobi, the valleys to the east of it as far as the Strymon (Struma), and the country round Astibus and the river of the same name, with the water of which they anointed their kings. Emathia, the district between the Haliacmon (Bistritza) and Axius, was once called Paeonia; and Pieria and Pelagonia were inhabited by Paeonians. In consequence of the growth of Macedonian power, and under pressure from their Thracian neighbours, their territory was considerably diminished, and in historical times was limited to the N. of Macedonia from Illyria to the Strymon. The chief town and seat of the kings was Bylazora (Veles, Kuprolu on the Axius); in the Roman period, Stobi (Pusto-Gradsko). The Paeonians included several independent tribes, all later united under the rule of a single king. Little is known of their manners and customs. They adopted the cult of Dionysus, known amongst them as Dyalus or Dryalus, and Herodotus (iv. 33) mentions that the Thracian and Paeonian women offered sacrifice to Queen Artemis (probably Bendis). They worshipped the sun in the form of a small round disk fixed on the top of a pole. A passage in Athenaeus (ix. p. 398) seems to indicate the affinity of their language with Mysian. They drank barley beer and various decoctions made from plants and herbs. The country was rich in gold and a bituminous kind of wood (or stone, which burst into a blaze when in contact with water) called *σπῖνος* (or *σπίνος*). The women were famous for their industry. In this connexion Herodotus (v. 12) tells the story that Darius, having seen at Sardis a beautiful Paeonian woman carrying a pitcher on her head, leading a horse to drink, and spinning flax, all at the same time, inquired who she was. Having been informed that she was a Paeonian, he sent instructions to Megabyzus, commander in Thrace, to deport two tribes of the nation without delay to Asia. At the time of the Persian invasion, the Paeonians on the lower Strymon had lost, while those in the north maintained, their independence. They frequently made inroads into Macedonian territory, until they were finally subdued by Philip, who permitted them to retain their government by kings. The daughter of Audoleon, one of these kings, was the wife of Pyrrhus, king of Epirus, and Alexander the Great wished to bestow the hand of his sister Cynane upon Langarus, who had shown himself loyal to Philip. An inscription, discovered in 1877 at Olympia on the base of a statue, states that it was set up by the community of the Paeonians in honour of their king and founder Dropion. Another king, whose name appears as Lyppeius on a fragment of an inscription found at Athens relating to a treaty of alliance is no doubt identical with the Lycceius or Lycpeius of Paeonian coins (see B. V. Head, *Historia numorum*, 1887, p. 207). In 280 the Gallic invaders under Brennus ravaged the land of the Paeonians, who, being further hard pressed by the Dardani, had no alternative but to join the Macedonians, whose downfall they shared. After the Roman conquest, Paeonia east and west of the Axius formed the second and third districts respectively of Macedonia (Livy xlv. 29). Under Diocletian Paeonia and Pelagonia formed a province called Macedonia *secunda* or *salutaris*, belonging to the prefecture of Illyricum.

See W. Tomaschek, "Die alten Thraker" in *Sitzungsberichte der k. Akad. der Wissenschaften*, xxviii. (Vienna, 1893); H. F. O. Abel, *Makedonien vor König Philipp* (Leipzig, 1847); C. O. Müller, *Über die Wohnsitze, die Abstammung und die ältere Geschichte des makedonischen Volkes* (Berlin, 1825); T. Desdevises-u-Dezert, *Géographie ancienne de la Macédoine* (Paris, 1863); see also MACEDONIA.

PAEONIUS, of Mende in Thrace, a Greek sculptor of the latter part of the 5th century. The statement of Pausanias that he executed one of the pediments of the temple of Zeus at Olympia is rejected by critics. But we possess an important work of Paeonius in the Victory found in the German excavations at Olympia, and set up, according to the most probable view, in memory of the battle of Sphacteria (see GREEK ART, fig. 36). It bears the inscription "Dedicated to Olympian Zeus by the Messenians and Naupactians as a tithe of the spoil of their enemies. Paeonius of Mende made the statue, and was a successful competitor in the construction of the gable-figures for the temple." The gable figures last mentioned were doubtless gilt victories of bronze which stood *on* the gable, not *in* it. Pausanias seems to have misunderstood the phrase as implying that Paeonius made one of the pedimental groups.

PAEONY (botanically *Paeonia*; Nat. ord. Ranunculaceae *q.v.*) a genus of plants remarkable for their large and gorgeous flowers. There are two distinct sets, one the strong-growing herbaceous kind, with fleshy roots and annual stems, derived mainly from *Paeonia albiflora* and *P. officinalis*; the other called the tree paeony, stiff-growing plants with half-woody permanent stems, which have sprung from the Chinese *P. Moutan*.

The herbaceous paeonies usually grow from 2 to 3 ft. in height, and have large much-divided leaves, and ample flowers of varied and attractive colours, and of a globular form in the double varieties which are those most prized in gardens. They usually blossom in May and June, and as ornaments for large beds in pleasure grounds, and for the front parts of shrubberies, few flowers equal them in gorgeous effect. A good moist loamy soil suits them best, and a moderate supply of manure is beneficial. They are impatient of frequent transplantings or repeated divisions for purposes of propagation, but when necessary they may be multiplied by this means, early in autumn, care being taken that a sound bud is attached to each portion of the tuberous roots.

The older varieties of *P. albiflora* include *candida*, *festa*, *fragrans*, *Humei*, *Reevesii*, *rubescens*, *vestalis*, *Whitleyi*, &c.; those of *P. officinalis* embrace *albicans*, *anemoniflora*, *Baxteri*, *blanda*, *rosea*, *Sabini*, &c. The garden varieties of modern times are, however, still more beautiful, the flowers being in many instances delicately tinted with more than one colour, such as buff with bronzy centre, carmine with yellowish centre, rose with orange centre, white tinted with rose, &c.

The Siberian *P. tenuifolia*, with finely cut leaves and crimson flowers, is a graceful border plant, and its double-flowered variety is perhaps the most elegant of its race.

The Moutans or tree paeonies are remarkable for their subshrubby habit, forming vigorous plants sometimes attaining a height of 6 to 8 ft., and producing in May magnificent flowers which vary in colour from white to lilac, purple magenta, violet and rose. These are produced on the young shoots, which naturally bud forth early in the spring, and are in consequence liable in bleak localities, unless protected, to be cut off by spring frosts. They require to be thoroughly ripened in summer, and therefore a hot season and a dryish situation are desirable for their well-being; and they require perfect rest during winter. Small plants with a single stem, if well matured so as to ensure their blossoming, make very attractive plants when forced. They are increased by grafting in late summer or autumn on the roots of the herbaceous paeonies.

The yellow-flowered tree paeony (*P. lutea*) was introduced from China in 1887, but is still very rare. There are hundreds of names given to the colour variations of both the herbaceous and tree paeonies, but as these have only a fleeting interest it is better to consult current catalogues for the latest types.

PAËR, FERDINANDO (1771–1839), Italian musical composer, was born at Parma on the 1st of June 1771. He studied the theory of music under the violinist Ghiretti, a pupil of the Conservatoire della Pietà de' Turchini at Naples. His first opera, *La Locanda de' vagebondi*, was published when he was only sixteen; others rapidly followed, and his name was soon famous throughout Italy. In 1797 he went to Vienna, where his wife, the singer Riccardi, had obtained an engagement at the opera; here he produced a series of operas, including his *La Camilla ossia il Sotteraneo* (1799) and his *Achille* (1801). In 1803 he was appointed composer to the court theatre at Dresden, where his wife was also engaged as a singer, and in 1804 the life appointment of *Hofkapellmeister* was bestowed upon him by the elector. At Dresden he produced, *inter alia*, *Il Sargino* (1803), an opera which obtained a wide popularity, and *Leonora* (1804), based on the same story as Beethoven's *Fidelio*. In 1807 Napoleon while in Dresden took a fancy to him, and took him with him to Warsaw and Paris at a salary of 28,000 francs. In 1812 he succeeded Spontini as conductor of the Italian opera in Paris. This post he retained at the Restoration, receiving also the posts of chamber composer to the king and conductor of the private orchestra of the duke of Orleans. In 1823 he retired from the Italian opera in favour of Rossini. In 1831 he was elected a member of the Academy, and in 1832 was appointed conductor of his orchestra by King Louis Philippe. He died on the 3rd of May 1839.

Paër wrote in all 43 operas, in the Italian style of Paesiello and Cimarosa. His other works, which include nine religious compositions, thirteen cantatas, and a short list of orchestral and chamber pieces, are of little importance; in any case the superficial quality of his compositions was such as to secure him popularity while he lived and after his death oblivion.

See R. Eitner, *Quellen-Lexikon* (Leipzig, 1902), vii. 277, sqq., where a list of his works is given.

PAESTUM (Gr. Ποσειδωνία; mod. Pesto), an ancient Greek city in Lucania, near the sea, with a railway station 24 m. S.E. of Salerno, 5 m. S. of the river Silarus (Salso). It is said by Strabo (v. 251) to have been founded by Troezenian and Achaean colonists from the still older colony of Sybaris, on the Gulf of Tarentum; this probably happened not later than about 600 B.C. Herodotus (i. 167) speaks of it as being already a flourishing city in about 540 B.C., when the neighbouring city of Velia was founded. For many years the city maintained its independence, though surrounded by the hostile native inhabitants of Lucania. Autonomous coins were struck, of which many specimens now exist (see NUMISMATICS). After long struggles the city fell into the hands of the Lucanians (who nevertheless did not expel the Greek colonists) and in 273 B.C. it became a Latin colony under the Roman rule, the name being changed to the Latin form Paestum. It successfully resisted the attacks of Hannibal; and it is noteworthy that it continued to strike copper coins even under Augustus and Tiberius. The neighbourhood was then healthy, highly cultivated, and celebrated for its flowers; the "twice blooming roses of Paestum" are mentioned by Virgil (*Geor.* iv. 118), Ovid (*Met.* xv. 708), Martial (iv. 41, 10; vi. 80, 6), and other Latin poets. Its present deserted and malarious state is probably owing to the silting up of the mouth of the Silarus, which has overflowed its bed, and converted the plain into unproductive marshy ground. Herds of buffaloes, and the few peasants who watch them, are now the only occupants of this once thickly populated and garden-like region. In 871 Paestum was sacked and partly destroyed by Saracen invaders; in the 11th century it was further dismantled by Robert Guiscard, and in the 16th century was finally deserted.

The ruins of Posidonia are among the most interesting of the Hellenic world. The earliest temple in Paestum, the so-called Basilica, must in point of style be associated with the temples D and F at Selinus, and is therefore to be dated about 570–554 B.C.[1] It is a building of unique plan, with nine columns in the front and eighteen at the sides, $4\frac{3}{4}$ ft. in diameter. A line of columns runs down the centre of the cella. The columns have marked entasis, and the flutings end in a semicircle, above which is generally a torus (always present in the so-called temple of Ceres). The capitals are remarkable, inasmuch as the necking immediately below the echinus is decorated with a band of leaves, the arrangement of which varies in different cases. The columns and the architraves upon them are well preserved, but there is nothing above the frieze existing, and the cella wall has entirely disappeared. Next in point of date comes the so-called temple of Ceres, a hexastyle peripteros, which may be dated after 540 B.C. The columns are all standing, and the west and part of the east pediment are still *in situ*; but of the cella, again, nothing is left. The capitals are like those of the Basilica, but the details are differently worked out. In front of this temple stood a sacrificial altar as long as the temple itself.

The most famous of the temples of Paestum, the so-called temple of Neptune, comes next in point of date (about 420 B.C.). It is a hexastyle peripteros with fourteen columns on each side, and is remarkably well-preserved, both pediments and the epistyle at the sides being still *in situ*. No traces of the decoration of the pediments and metopes have been preserved. The cella, the outer walls of which have to a great extent disappeared, has two internal rows of seven columns $4\frac{2}{3}$ ft. in diameter, upon which rests a simple epistyle, supporting a row of smaller columns, so that the interior of the cella was in two storeys.

The Temple of Peace is a building of the Roman period of the 2nd century B.C., with six Doric columns on the front, eight on the sides and none at the back; it was excavated in 1830 and is now entirely covered up. Traces of a Roman theatre and amphitheatre (?) have also been found. The circuit of the town walls, well built of squared blocks of travertine, and 16 ft. thick, of the Greek period, is almost entire; they are about 3 m. in circumference, enclosing an irregular, roughly rectangular area. There were four gates, that on the east with a single arched opening being well-preserved. Outside the north gate is a street of tombs, in some of which were found arms, vases and fine mural paintings (now in the Naples Museum).

The following table gives the chief dimensions of the four temples described above in feet:—

	Length without steps.	Breadth without steps.	Length of cella.	Breadth of cella.	Diameter of columns.	Height of columns.	Number of columns.
Basilica (so-called) . .	178	$80\frac{3}{4}$	$137\frac{3}{4}$	$44\frac{1}{2}$	$4\frac{3}{4}$	21	50
Temple of Ceres (so-called) . .	108	$47\frac{3}{4}$	$78\frac{1}{2}$	$25\frac{1}{2}$	$6\frac{1}{2}$	$19\frac{1}{3}$	34
Temple of Neptune (so-called) .	197	80	$149\frac{3}{4}$	$44\frac{1}{2}$	$4\frac{2}{3}$	28	36
Temple of Peace (so-called) . .	84	$44\frac{1}{2}$	$48\frac{1}{3}$	$28\frac{1}{4}$	3	?	20

(T. As.)

PAEZ, JOSÉ ANTONIO (1790–1873), Venezuelan president, was born of Indian parents near Acarigua in the province of Barinas on the 13th of June 1790. He came to the front in the war of independence against Spain, and his military career, which began about 1810, was distinguished by the defeat of the Spanish forces at Mata de la Miel (1815), at Montecal and throughout the province of Apure (1816), and at Puerto Cabello (1823). In 1829 he furthered the secession of Venezuela from the republic of Colombia, and he became its first president (1830–1834). He was again president in 1839–1843, and dictator in 1846; but soon afterwards headed a revolution against his successor and was thrown into prison. In 1850 he was released and left the country, but in 1858 he returned, and in 1860 was made minister to the United States. A year afterwards he again returned and made himself dictator, but in 1863 was overthrown and exiled. He died in New York on the 6th of May 1873.

His autobiography was published at New York in 1867–1869, and his son Ramon Paez wrote *Public Life of J. A. Paez* (1864). An *Apoteosis* by Guzman Blanco was published at Paris in 1889.

PAEZ, PEDRO (1564–1622), Jesuit missionary to Abyssinia, was born at Olmedo in Old Castile in 1564. Having entered the Society of Jesus, he was set apart for foreign mission service, and sent to Goa in 1588. Within a year he and a fellow missionary were dispatched from that place to Abyssinia to act as spiritual directors to the Portuguese residents. On his way thither, he fell into the hands of pirates at Dhofar and was sent to Sanaa, capital of the Yemen, where he was detained for seven years by the pasha as a slave. Having been redeemed by his order in 1596, he spent some years in mission work on the west coast of India, and it was not until 1603 that he again set out for Abyssinia, and landed at the port of Massawa. At the headquarters of his order, in Fremona, he soon acquired the two chief dialects of the country, translated a catechism, and set about the education of some Abyssinian children. He also established a reputation as a preacher, and having been summoned to court, succeeded in vanquishing the native priests and in converting Za-Denghel, the negus, who wrote to the pope and the king of Spain for more missionaries, an act of zeal which involved him in civil war with the Abyssinian priests (who dreaded the influence of Paez) and ultimately cost him his life (Oct. 1604). Paez, who is said to have been the first European to visit the source of the Blue Nile, died of fever in 1622.

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[1] The dating adopted in the present article, which is in absolute contradiction to that given in the previous edition of this work, is that given by R. Koldewey and O. Puchstein, *Die griechischen Tempel in Unteritalien und Sicilien* (Berlin, 1899), 11–35.

In addition to the translation of the Catechism, Paez is supposed to be the author of a treatise *De Abyssinorum erroribus* and a history of Ethiopia (ed. C. Beccari in *Rerum aethiopicarum scriptores occidentales inediti a saeculo XVI. ad XIX.* (1905).

See A. de Backer, *Bibliothèque de la Compagnie de Jésus* (ed. C. Sommervogel) vi. (1895); W. D. Cooley in *Bulletin de la société de géographie* (1872), 6th series, vol. iii.

PAGAN, a town and former capital, in Myingyan district, Upper Burma, 92 m. S.W. of Mandalay. It was founded by King Pyinbya in 847, and remained the capital until the extinction of the dynasty in 1298. Pagan itself is now a mere village, but hundreds of pagodas in various stages of decay meet the eye in every direction. The majority of them were built by King Anawra-hta, who overcame the Peguan king, Manuha of Thaton. It was Anawra-hta who introduced the Buddhist religion in Upper Burma, and who carried off nearly the whole Thaton population to build the pagodas at Pagan on the model of the Thaton originals. Many of these are of the highest architectural interest, besides being in themselves most imposing structures. Pagan is still a popular place of Buddhist pilgrimage, and a museum has been built for the exhibition of antiquities found in the neighbourhood. The population in 1901 was 6254.

PAGAN (Lat. *paganus*, of or belonging to a *pagus*, a canton, county district, village, commune), a heathen, one who worships a false god or false gods, or one who belongs to a race or nation which practises idolatrous rites and professes polytheism. In its early application *paganus* was applied by the Christian Church to those who refused to believe in the one true God, and still followed the Greek, Roman and other ancient faiths. It thus of course excluded Jews. In the middle ages, at the time of the crusades and later, "pagan" and "paynim" (O. Fr. *paenime*, Late Lat. *paganismus*, heathenism or heathen lands) were particularly applied to Mahommedans, and sometimes to Jews. A special significance attaches to the word when applied to one who adopts that attitude of cultured indifference to, or negation of, the various theistic systems of religion which was taken by so many of the educated and aristocratic classes in the ancient Hellenic and Roman world.

It has long been accepted that the application of the name *paganus*, villager, to non-Christians was due to the fact that it was in the rural districts that the old faiths lingered. This explanation assumes that the use of *paganus* in this sense arose after the establishment of Christianity as the religion generally accepted in the urban as opposed to the rural districts, and it is usually stated that an edict of the emperor Valentinian of 368 dealing with the *religio paganorum* (*Cod. Theod.* xvi. 2) contains the first documentary use of the word in this secondary sense. It has now been shown that the use can be traced much earlier. Tertullian (*c.* 202; *De corona militis*, xi.), says "*Apud hunc* (Christum) tam miles est paganus fidelis quam paganus est miles infidelis." This gives the clue to the true explanation. In classical Latin *paganus* is frequently found in contradistinction to *miles* or *armatus* (cf. especially Tac. *Hist.* i. 53; ii. 14, 88; iii. 24, 43, 77), where the opposition is between a regular enrolled soldier and the raw half-armed rustics who sometimes formed a rude militia in Roman wars, or, more widely, between a soldier and a civilian. Thus the Christians who prided themselves on being "soldiers of Christ" (*milites*) could rightly term the non-Christians *pagani*. See also Gibbon, *Decline and Fall of the Roman Empire* (ed. Bury, 1896), ch. xxi. note *ad fin.*

PAGANINI, NICOLO (1784–1840), Italian virtuoso on the violin, was born at Genoa on the 18th of February 1784. His father Antonio, a clever amateur, who was in the shipping business, taught him the violin at a very early age, and he had further lessons from the *maestro di cappella* of the cathedral of San Lorenzo. He first appeared in public at Genoa in 1793, with triumphant success. In 1795 he visited Parma for the purpose of taking lessons from Alessandro Rolla, who, however, said that he had nothing to teach him. On returning home, he studied more diligently than ever, practising single passages for ten hours at a time, and publishing compositions so difficult that he alone could play them. His first professional tour, through the cities of Lombardy, was made with his father in 1797. For some years he led a chequered career; he gambled at cards, and had to pawn his violin; and between 1801 and 1804 he lived in retirement, in Tuscany, with a noble lady who was in love with him. In 1805 however he started on a tour through Europe, astonishing the world with his matchless performances, and especially with his unprecedented playing on the fourth string alone. The princess of Lucca and Piombo, Napoleon's sister, made him her musical director, and he became a prominent figure at the court where his caprices and audacities were a byword. He abandoned this in 1813, and visited Bologna, Milan, and other cities, gaining further fame by his extraordinary virtuosity. In Venice, in 1815, he began a liaison with Antonia Bianchi, a dancer, which lasted till 1828; and by her he had a son Achillino, born in 1826. Meanwhile the world rang with his praises. In 1827 the pope honoured him with the Order of the Golden Spur; and, in the following year, he extended his travels to Germany, beginning with Vienna, where he created a profound sensation. He first appeared in Paris in 1831; and on the 3rd of June in that year he played in London at the King's Theatre. His visit to England was preluded by the most romantic stories. He was described as a political victim who had been immured for twenty years in a dungeon, where he played all day long upon an old broken violin with one string, and thus gained his wonderful mechanical dexterity. The result of this and other foolish reports was that he could not walk the streets without being mobbed. He charged what for that time were enormous fees; and his net profits in England alone, during his six years of absence from his own country, amounted to some £17,000. In 1832 he returned to Italy, and bought a villa near Parma. In 1833 he spent the winter in Paris, and in 1834 Berlioz composed for him his beautiful symphony, *Harold en Italie*. He was than at the zenith of his fame; but his health, long since ruined by excessive study, declined rapidly. In 1838 he suffered serious losses in Paris through the failure of the "Casino Paganini," a gambling-house which was refused a licence. The disasters of this year increased his malady—laryngeal phthisis—and, after much suffering, he died at Nice on the 17th of May 1840. His will left a fortune of £80,000 to his son Achillino; and he bequeathed one of his violins, a fine Joseph Guarnerius, given him in early life by a kind French merchant, to the municipality of Genoa, who preserve it as one of their treasures. Paganini's style was impressive and passionate to the last degree. His *cantabile* passages moved his audience to tears, while his *tours de force* were so astonishing that a Viennese amateur publicly declared that he had seen the devil assisting him. His name stands in history as that of the most extraordinary executant ever known on the violin; and in spite of greater artists or no less remarkable later virtuosi, this reputation will remain with Paganini as the inaugurator of an epoch. He was the first to show what could be done by brilliance of technique, and his compositions were directed to that end. He was an undeniable genius, and it may be added that he behaved and looked like one, with his tall, emaciated figure and long black hair.

There are numerous lives of Paganini; see the article and bibliography in *Grove's Dictionary of Music.*

PAGE, THOMAS NELSON (1853–), American author, was born at Oakland Plantation, Hanover county, Virginia, on the 23rd of April 1853, the great-grandson of Thomas Nelson (1738–1789) and of John Page (1744–1808), both governors of Virginia, the former being a signer of the Declaration of Independence. After a course at Washington and Lee University (1869–1872) he graduated in law at the university of Virginia (1874), and practised, chiefly in Richmond, until 1893, when he removed to Washington, D. C., and devoted himself to writing and lecturing. In 1884 he had published in the *Century Magazine* "Marse Chan," a tale of life in Virginia during the Civil War, which immediately attracted attention. He wrote other stories of negro life and character ("Meh Lady," "Unc' Edinburg's Drowndin'," and "Ole 'Stracted"), which, with two others, were published in 1887 with the title *In Ole Virginia*, perhaps his most characteristic book. This was followed by *Befo' de War* (1888), dialect poems, written with Armistead Churchill Gordon (b. 1855); *On Newfound River* (1891); *The Old South* (1891), social and political essays; *Elsket and Other Stories* (1892); *The Burial of the Guns* (1894); *Pastime Stories* (1894); *The Old Gentleman of the Black Stock* (1897); *Social Life in Old Virginia before the War* (1897); *Two Prisoners* (1898); *Red Rock* (1898), a novel of the Reconstruction period; *Gordon Keith* (1903); *The Negro: the Southerner's Problem* (1904); *Bred in the Bone and Other Stories* (1904); *The Coast of Bohemia* (1906), poems; *The Old Dominion: Her Making and her Manners* (1907), a collection of essays; *Under the Crust* (1907), stories; *Robert E. Lee, the Southerner* (1908); *John Marvel, Assistant* (1909), a novel; and various books for children. He is at his best in those short stories in which, through negro character and dialect, he pictures the life of the Virginia gentry, especially as it centred about the mutual devotion of master and servant.

PAGE, WILLIAM (1811–1885), American artist, was born at Albany, New York, on the 3rd of January 1811. He studied for the ministry at the Andover Theological Seminary in 1828–1830 and in later life became a Swedenborgian. He received his training in art from S. F. B. Morse and in the schools of the National Academy of Design, and in 1836 became a National Academician. From 1849 to 1860, he lived in Rome, where he painted portraits of his friends Robert and Elizabeth Browning. The first collection of Lowell's *Poems* (1843) was dedicated to Page, who was also a friend of W. W. Story. In 1871–1873 he was president of the National Academy of Design. He died at Tottenville, Staten Island, New York, on the 1st of October 1885. Besides numerous portraits he painted "Farragut at the Battle of Mobile," belonging to the Tsar of Russia; a "Holy Family," in the Boston Athenaeum; and "The Young Merchants," at the Pennsylvania Academy of the Fine Arts, Philadelphia. He modelled and painted several portraits of Shakespeare, based on the Becker "death mask." He wrote *A New Geometrical Method of Measuring the Human Figure* (1860).

PAGE. (1) A term used of a boy, lad or young male person in various capacities, positions or offices. The etymology is doubtful; the word is common to the Romanic languages; cf. O. Fr. and Span. *page*, Port. *pagem*, Ital. *paggio*. The Med. Lat. *pagius* has been commonly referred to Gr. παιδίον, diminutive of παῖς, boy, but the connexion is extremely doubtful. Others refer the word to the *pueri paedagogiani*, young slaves trained to become *paedagogi* (Gr. παιδαγωγοί), or tutors to young boys attending school. Under the empire, numbers of such youths were attached to the imperial household for the purposes of ceremonial attendance on state occasions, thus occupying much the same position as that of the pages of a royal or noble household in medieval and modern times. In fact the term *paedagogiani* became equivalent to *pueri honorarii, qui in palatio ministerio principis militabant* (so Du Cange, *Glossarium, s.v.*). Littré refers *pagius* to *pagensis*, *i.e.* rustic, belonging to the country districts (*pagus*), and adduces from this the fact that the *pagii* were not necessarily boys or youths; and quotes from Claude Fauchet (1530–1601) the statement (Lib. I. *Orig. milit.* cap. i.) that up to the time of Charles VI. (1368–1403) and Charles VII. (1403–1461) "le mot de Page . . . sembloit être seulement donné à de viles personnes, comme à garçons de pied." Skeat (*Etym. Dict.*) points out that the form of the word in Portuguese, *pagem*, indicates the derivation from *pagensis*. The word "page" was applied in English to a boy or youth who was employed as an assistant to an older servant, acting as it were as an apprentice and learning his duties. In present usage the chief applications are: (*a*) to a boy or lad, generally wearing livery, and sometimes styled a "buttons," who is employed as a domestic servant; and (*b*) to a young boy who, dressed in fancy costume, forms part of the bridal procession at weddings. The word is also used (*c*) as the title of various officials of different rank in royal and other households; thus in the British royal household there are pages of honour, a page of the chambers, pages of the presence, and pages of the back stairs. These, no doubt, descend from the *pueri paedagogiani* of the Roman imperial household through the young persons of noble or gentle birth, who, during the middle and later ages, served in the household of royal and noble persons, and received a training to fit them for their future position in society. In the times of chivalry the "page" was one who served a knight and was trained to knighthood, and ranked next to a squire. (See KNIGHTHOOD and VALET.)

(2) In the sense of one side of a leaf of printed or written matter, the word is derived through Fr. from Lat. *pagina* (*pangere*, to fasten).

PAGEANT, in its most general sense a show or spectacle; the more specific meanings are involved in the etymology of the word and its connexion with the history of the early mystery plays (see DRAMA). In its early forms, dating from the 14th century, the word is *pagyn* or *pagen*, the excrescent *t* or *d*, as in "tyrant," "ancient," not appearing till later. The Med. Lat. equivalent is *pagina*, and this, or at least the root from which it is formed, must be taken as the source. The senses, however, in which the word is used, viz. stage, platform, or scene played on a stage, are not those of the classical Lat. *pagina*, a page of a book, nor do they apparently occur in the medieval Latin of any language other than English. Further, it is not clear which meaning comes first, platform or scene. If the last, then "scene," *i.e.* a division of a play, might develop out of "page" of a book. If not, then *pagina* is a fresh formation from the root *pag* of *pangere*, to fix or fasten, the word meaning a fastened framework of wood forming a stage or platform; cf. the classical use of *compago*, structure. Others take *pagina* as a translation of Gr. πῆγμα, platform, stage, a word from the same root *pag-*. Du Cange (*Glossarium*) quotes a use in Med. Lat. of *pegma* in this sense, *Machina lignea in qua statuae collocabantur*, and Cotgrave gives "*Pegmate*, a stage or frame whereon pageants be set or carried."

As has been said, "pageant" is first found in the sense of a scene, a division or part of a play or of the platform on which such scene was played in the medieval drama. Thus we read of Queen Margaret in 1457 that at Coventry she saw "alle the pagentes pleyde save domesday which myght not be pleyde for lak of day," and in the accounts of the Smiths' gild at Coventry for 1450, five pence is paid "to bring the pagent into gosford-stret." A clear idea of what these stages were like when the mystery plays became processional (*processus*) that is, were acted on separate platforms moving along a street is seen in Archdeacon Roger's contemporary account of th Chester plays about the end of the 16th century. "The mane of these playes weare, every company had his pagiant, or parte which pageants weare a high scafolde with 2 rowmes, a highe and a lower, upon 4 wheeles" (T. Sharp, *Dissertation on th Pageants or Mysteries at Coventry*, 1825, which contains mos of the early references to the word). The movable platform, fille with emblematic or allegorical figures, naturally played an im portant part in processional shows with no dialogue or dramati action. An instance (1432) of the practice and the use of th word is found in the *Munimenta gildhallae londiniensis* (ed Riley), "Parabatur machina . . . in cujus medio staba gigas mirae magnitudinis . . . . ex utroque latere . . . in eadem pagina erigebantur duo animalia vocata *antelops*." At Anne Boleyn's coronation, June 1, 1533, one "pageant" contained figures of Apollo and the Muses, another represented a castle, with "a heavenly roof and under it upon a green was a root or stock, whereout sprang a multitude of white and red roses" (Arber, *English Garner*, ii. 47, quoted in the *New English Dictionary*). Such "pageants" formed a feature, in a somewhat degraded shape, in the annual lord mayor's show in London. The development in meaning from "moving platform" to that of a "processional spectacle" or "show" is obvious.

The 20th century has seen in England what may in some respects be looked on as a revival but in general as a new departure in the shape of semi-dramatic spectacles illustrative of the history of a town or locality; to such spectacles the name of "Pageant" has been appropriately given. Coventry in its procession in commemoration of Lady Godiva's traditional exploit, has since 1678 illustrated an incident, however mythical, in the history of the town, and many of the ancient cities of the continent of Europe, as Siena, Bruges, Nuremberg, &c., have had, and still have, at intervals a procession of persons in the costumes of various periods, and of figures emblematical of the towns' associations and history. The modern pageant is far removed from a mere procession in dumb show, however bright with colour and interesting from an historical or artistic point of view such may be made. It consists of a series of scenes, representing historical events directly connected with the town or locality in which the pageant takes place. These are accompanied by appropriate dialogue, speeches, songs, &c., and with music and dances. The effect is naturally much heightened by the place of the performance, more particularly if this is the actual site of some of the scenes depicted, as at the Winchester Pageant (1908) where the background was formed by the ruins of Wolvesey Castle. The Sherborne pageant of 1905 was the first of the series of pageants. In 1907 and 1908 they became very numerous; of these the principal may be mentioned, those at Oxford, Bury St Edmunds in 1907; at Winchester, Chelsea, Dover and Pevensey in 1908; and that of the English Church at Fulham Palace 1909, a peculiarly interesting example of a pageant connected with an institution and not a locality.

The artistic success of a pageant depends on the beauty or historic interest of its site, the skilful choice of episodes and dramatic incidents, the grouping and massing of colour, and the appropriateness of the dialogue, speeches and incidental music. It is here that the skill and talent of the writer, designer or director of the pageant find scope. The name of the dramatist Louis N. Parker (b. 1852), the author of the Sherborne pageant, the earliest and one of the most successful, must always be associated with the movement, of which he was the originator.

More important, perhaps, than the aesthetic pleasure given is the educational effect produced not only on the spectators but also on the performers. The essence of the pageant is that all who take part are residents in the place and locality, that the costumes and accessories should be made locally, and that all classes and all ages should share in a common enthusiasm for the bringing back in the most vivid form the past history, often forgotten, in which all should feel they have an equal and common part. (C. WE.)

PAGET, SIR JAMES, BART. (1814–1899), British surgeon, born at Yarmouth on the 11th of January 1814, was the son of a brewer and shipowner. He was one of a large family, and his brother Sir George Paget (1809–1892), who became regius professor of physic at Cambridge in 1872, also had a distinguished career in medicine and was made a K.C.B. He attended a day-school in Yarmouth, and afterwards was destined for the navy; but this plan was given up, and at the age of sixteen he was apprenticed to a general practitioner, whom he served for four and a half years, during which time he gave his leisure hours to botanizing, and made a great collection of the flora of East Norfolk. At the end of his apprenticeship he published with one of his brothers a very careful *Sketch of the Natural History of Yarmouth and its Neighbourhood*. In October 1834 he entered as a student at St Bartholomew's Hospital. Medical students in those days were left very much to themselves; there was no close supervision of their work, but it is probable that Paget gained rather than lost by having to fight his own way. He swept the board of prizes in 1835, and again in 1836; and in his first winter session he detected the presence of the *Trichina spiralis*, a minute parasite that infests the muscles of the human body.[1] In May 1836 he passed his examination at the Royal College of Surgeons, and became qualified to practise. The next seven years (1836–1843) were spent in London lodgings, and were a time of poverty, for he made only £15 a year by practice, and his father, having failed in business, could not give him any help. He managed to keep himself by writing for the medical journals, and preparing the catalogues of the hospital museum and of the pathological museum of the Royal College of Surgeons. In 1836 he had been made curator of the hospital museum, and in 1838 demonstrator of morbid anatomy at the hospital; but his advancement there was hindered by the privileges of the hospital apprentices, and by the fact that he had been too poor to afford a house-surgeoncy, or even a dressership. In 1841 he was made surgeon to the Finsbury Dispensary; but this appointment did not give him any experience in the graver operations of surgery. In 1843 he was appointed lecturer on general anatomy (microscopic anatomy) and physiology at the hospital, and warden of the hospital college then founded. For the next eight years he lived within the walls of the hospital, in charge of about thirty students resident in the little college. Besides his lectures and his superintendence of the resident students, he had to enter all new students, to advise them how to work, and to manage the finances and the general affairs of the school. Thus he was constantly occupied with the business of the school, and often passed a week, or more, without going outside the hospital gates. In 1844 he married Lydia, youngest daughter of the Rev. Henry North. In 1847 he was appointed an assistant-surgeon to the hospital, and Arris and Gale professor at the College of Surgeons. He held this professorship for six years and each year gave six lectures in surgical pathology. (The first edition of these lectures, which were the chief scientific work of his life, was published in 1853 as *Lectures on Surgical Pathology*.) In 1851 he was elected a Fellow of the Royal Society. In October 1851 he resigned the wardenship of the hospital. He had now become known as a great physiologist and pathologist: he had done for pathology in England what R. Virchow had done in Germany; but he had hardly begun to get into practice, and he had kept himself poor that he might pay his share of his father's debts—a task that it took him fourteen years to fulfil.

It is probable that no famous surgeon, not even John Hunter, ever founded his practice deeper in science than Paget did, or waited longer for his work to come back to him. In physiology he had mastered the chief English, French, German, Dutch and Italian literature of the subject, and by incessant study and microscope work had put himself level with the most advanced knowledge of his time; so that it was said of him by R. Owen, in 1851, that he had his choice, either to be the first physiologist in Europe, or to have the first surgical practice in London, with a baronetcy. His physiological lectures at St Bartholomew's Hospital were the chief cause of the rise in the fortunes of its school, which in 1843 had gone down to a low point. In pathology his work was even more important. He fills the place in pathology that had been left empty by Hunter's death in 1793—the time of transition from Hunter's teaching, which for all its greatness was hindered by want of the modern microscope, to the pathology and bacteriology of the present day. It is Paget's greatest achievement that he made pathology dependent, in everything, on the use of the microscope—especially the pathology of tumours. He and Virchow may truly be called the founders of modern pathology; they stand together, Paget's *Lectures on Surgical Pathology* and Virchow's *Cellular-Pathologie.* When Paget, in 1851, began practice near Cavendish Square, he had still to wait a few years more for success in professional life. The "turn of the tide" came about 1854 or 1855; and in 1858 he was appointed surgeon extraordinary to Queen Victoria, and in 1863 surgeon in ordinary to the prince of Wales. He had for many years the largest and most arduous surgical practice in London. His day's work was seldom less than sixteen or seventeen hours. Cases sent to him for final judgment, with especial frequency, were those of tumours, and of all kinds of disease of the bones and joints, and all "neurotic" cases having symptoms of surgical disease. His supremacy lay rather in the science than in the art of surgery, but his name is associated also with certain great practical advances. He discovered the disease of the breast and the disease of the bones (osteitis deformans) which are called after his name; and he was the first at the hospital to urge enucleation of the tumour, instead of amputation of the limb, in cases of myeloid sarcoma.

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[1] This discovery is usually credited to R. Owen (*q.v.*). The facts appear to be as follows: Paget was a first-year's student, and, by means of a pocket lens, found in the dissecting-room that the specks in the infected muscles were parasitic worms and not, as previously thought, spicules of bone. Thomas Wormald, the senior demonstrator, who was no pathologist, sent a piece of the same muscle to Owen, who authoritatively pronounced the specks to be parasites and gave them their scientific name. It is probable that Owen did not realize that Paget had already made the discovery, and it was naturally associated with the name of the professor.

In 1871 he nearly died from infection at a post mortem examination, and, to lighten the weight of his work, was obliged to resign his surgeoncy to the hospital. In this same year he received the honour of a baronetcy. In 1875 he was president of the Royal College of Surgeons, and in 1877 Hunterian orator. In 1878 he gave up operating, but for eight or ten years longer he still had a very heavy consulting practice. In 1881 he was president of the International Medical Congress held in London; in 1880 he gave, at Cambridge, a memorable address on "Elemental Pathology," setting forth the likeness of certain diseases of plants and trees to those of the human body. Besides shorter writings he also published *Clinical Lectures and Essays* (1st ed. 1875) and *Studies of Old Case-books* (1891). In 1883, on the death of Sir George Jessel, he was appointed vice-chancellor of the university of London. In 1889 he was appointed a member of the royal commission on vaccination. He died in London on the 30th of December 1899, in his eighty-fifth year. Sir James Paget had the gift of eloquence, and was one of the most careful and most delightful speakers of his time. He had a natural and unaffected pleasure in society, and he loved music. He possessed the rare gift of ability to turn swiftly from work to play; enjoying his holidays like a schoolboy, easily moved to laughter, keen to get the maximun of happiness out of very ordinary amusements, emotional in spite of incessant self-restraint, vigorous in spite of constant overwork. In him a certain light-hearted enjoyment was combined with the utmost reserve, unfailing religious faith, and the most scrupulous honour. He was all his life profoundly indifferent toward politics, both national and medical; his ideal was the unity of science and practice in the professional life. (S. P.)

PAGET OF BEAUDESERT, WILLIAM PAGET, 1st Baron (1506–1563), English statesman, son of William Paget, one of the serjeants-at-mace of the city of London, was born in London in 1506, and was educated at St Paul's School, and at Trinity Hall, Cambridge, proceeding afterwards to the university of Paris. Probably through the influence of Stephen Gardiner, who had early befriended Paget, he was employed by Henry VIII. in several important diplomatic missions; in 1532 he was appointed clerk of the signet and soon afterwards of the privy council. He became secretary to Queen Anne of Cleves in 1539, and in 1543 he was sworn of the privy council and appointed secretary of state, in which position Henry VIII. in his later years relied much on his advice, appointing him one of the council to act during the minority of Edward VI. Paget at first vigorously supported the protector Somerset, while counselling a moderation which Somerset did not always observe. In 1547 he was made comptroller of the king's household, chancellor of the duchy of Lancaster, and a knight of the Garter; and in 1549 he was summoned by writ to the House of Lords as Baron Paget de Beaudesert. About the same time he obtained extensive grants of lands, including Cannock Chase and Burton Abbey in Staffordshire, and in London the residence of the bishops of Exeter, afterwards known successively as Lincoln House and Essex House, on the site now occupied by the Outer Temple in the Strand. He also obtained Beaudesert in Staffordshire, which is still the chief seat of the Paget family. Paget shared Somerset's disgrace, being committed to the Tower in 1551 and degraded from the Order of the Garter in the following year, besides suffering a heavy fine by the Star Chamber for having profited at the expense of the Crown in his administration of the duchy of Lancaster. He was, however, restored to the king's favour in 1553, and was one of the twenty-six peers who signed Edward's settlement of the crown on Lady Jane Grey in June of that year. He made his peace with Queen Mary, who reinstated him as a knight of the Garter and in the privy council in 1553, and appointed him lord privy seal in 1556. On the accession of Elizabeth in 1558 Paget retired from public life, and died on the 9th of June 1563.

By his wife Anne Preston he had four sons, the two eldest of whom, Henry (d. 1568) and Thomas, succeeded in turn to the peerage. The youngest son, Charles Paget (d. 1612), was a well-known Catholic conspirator against Queen Elizabeth, in the position of secretary to Archbishop James Beaton, the ambassador of Mary Queen of Scots in Paris; although at times he also played the part of a spy and forwarded information to Walsingham and Cecil. Thomas, 3rd Baron Paget of Beaudesert (*c.* 1540–1589), a zealous Roman Catholic, was suspected of complicity in Charles's plots and was attainted in 1587. But the peerage was restored in 1604 to his son William (1572–1629), 4th Lord Paget, whose son William, the 5th lord (1609–1678), fought for Charles I. at Edgehill. William, the 6th lord (1637–1713), a supporter of the Revolution of 1688, was ambassador at Vienna from 1689 to 1693, and later at Constantinople, having much to do with bringing about the important treaty of Carlowitz in 1699. Henry, the 7th baron (*c.* 1665–1743), was raised to the peerage during his father's lifetime as Baron Burton in 1712, being one of the twelve peers created by the Tory ministry to secure a majority in the House of Lords, and was created earl of Uxbridge in 1714. His only son, Thomas Catesby Paget, the author of an *Essay on Human Life* (1734) and other writings, died in January 1742 before his father, leaving a son Henry (1719–1769), who became 2nd earl of Uxbridge. At the latter's death the earldom of Uxbridge and barony of Burton became extinct, the older barony of Paget of Beaudesert passing to his cousin Henry Bayly (1744–1812), heir general of the first baron, who in 1784 was created earl of Uxbridge. His second son, Sir Arthur Paget (1771–1840), was an eminent diplomatist during the Napoleonic wars, Sir Edward Paget (1775–1849), the fourth son, served under Sir John Moore in the Peninsula, and was afterwards second in command under Sir Arthur Wellesley; the fifth, Sir Charles Paget (1778–1839), served with distinction in the navy, and rose to the rank of vice-admiral. The eldest son Henry William, 2nd earl of Uxbridge (1768–1854), was in 1815 created marquess of Anglesey (*q.v.*).

PAGHMAN, a small district of Afghanistan to the west of Kabul, lying under the Paghman branch of the Hindu Kush range. It is exceedingly picturesque, the villages clinging to the sides of the mountain glens from which water is drawn for irrigation; and excellent fruit is grown.

PAGODA (Port. *pagode*, a word introduced in the 16th century by the early Portuguese adventurers in India, reproducing phonetically some native word, possibly Pers. *but-kadah*, a house for an idol, or some form of Sansk. *bhagavat*, divine, holy), an Eastern term for a temple, especially a building of a pyramid shape common in India and the Far East and devoted to sacred purposes; in Buddhist countries, notably China, the name of a many-sided tower in which are kept holy relics. More loosely "pagoda" is used in the East to signify any non-Christian or non-Mussulman place of worship. Pagoda or pagod was also the name given to a gold (occasionally also silver) coin, of about the value of seven shillings, at one time current in southern India. From this meaning is derived the expression "the pagoda tree," as synonymous with the "wealth of the Indies," whence the phrase to "shake the pagoda tree." There is a real tree, the *Plumieria acuminata*, bearing the name. It grows in India, and is of a small and graceful shape, and bears yellow and white flowers tinged with red.

PAHARI (properly Pahāṛī, the language of the mountains), a general name applied to the Indo-Aryan languages or dialects spoken in the lower ranges of the Himalaya from Nepal in the east, to Chamba of the Punjab in the west. These forms of speech fall into three groups—an eastern, consisting of the various dialects of Khas-kuṛā, the language of Nepal; a central, spoken in the north of the United Provinces, in Kumaon and Garhwal; and a western, spoken in the country round Simla and in Chamba. In Nepal, Khas-kuṛa is the language only of the Aryan population, the mother tongue of most of the inhabitants being some form or other of Tibeto-Burman speech (see TIBETO-BURMAN LANGUAGES), not Indo-Aryan. As may be expected, Khas-kuṛa is mainly differentiated from Central Pahari through its being affected, both in grammar and vocabulary, by Tibeto-Burman idioms. The speakers of Central and Western Pahari have not been brought into close association with Tibeto-Burmans, and their language is therefore purely Aryan.

Khas-kuṛā, as its speakers themselves call it, passes under various names. The English generally call it Nēpālī or Naipālī (*i.e.* the language of Nepal), which is a misnomer, for it is not the principal form of speech used in that country. Moreover, the Nepalese employ a corruption of this very word to indicate what is really the main language of the country, viz. the Tibeto-Burman Nēwārī. Khas-kura is also called Gōrkhālī, or the language of the Gurkhas, and Pahārī or Parbatiyā, the language of the mountains. The number of speakers is not known, no census ever having been taken of Nepal; but in British India 143,721 were recorded in the census of 1901, most of whom were soldiers in, or others connected with, the British Gurkha regiments.

Central Pahari includes three dialects—Garhwālī, spoken mainly in Garhwal and the country round the hill station of Mussoorie; Jaunsārī, spoken in the Jaunsar tract of Dehra Dun; and Kumaunī, spoken in Kumaun, including the country round the hill station of Naini Tal. In 1901 the number of speakers was 1,270,931.

Western Pahari includes a great number of dialects. In the Simla Hill states alone no less than twenty-two, of which the most important are Sirmaurī and Keonṭhalī (the dialect of Simla itself), were recorded at the last census. To these may be added Chambiālī and Churāhī of the state of Chamba, Mandeālī of the state of Mandī, Gādī of Chamba and Kangra, Kuluhī of Kulū and others. In 1901 the total number of speakers was 1,710,029.

The southern face of the Himalaya has from time immemorial been occupied by two classes of people. In the first place there is an Indo-Chinese overflow from Tibet in the north. Most of these tribes speak Indo-Chinese languages of the Tibeto-Burman family, while a few have abandoned their ancestral speech and now employ broken half-Aryan dialects. The other class consists of the great tribe of Khaśas or Khaśiyās, Aryan in origin, the Κάσιοι of the Greek geographers. Who these people originally were, and how they entered India, are questions which have been more than once discussed without arriving at any very definite conclusion.[1] They are frequently mentioned in Sanskrit literature, were a thorn in the side of the rulers of Kashmir, and have occupied the lower Himalayas for many centuries. Nothing positive is known about their language, which they have long abandoned. Judging from the relics of it which appear in modern Pahari, it is probable that it belonged to the same group as Kashmiri, Lahnda and Sindhi. They spread slowly from west to east, and are traditionally said to have reached Nepal in the early part of the 12th century A.D.

In the central and western Pahari tracts local traditions assert that from very early times there was constant communication with Rajputana and with the great kingdom of Kanauj in the Gangetic Doab. A succession of immigrants, the tide of which was materially increased at a later period by the pressure of the Mussulman invasion of India, entered the country, and founded several dynasties, some of which survive to the present day. These Rajputs intermarried with the Khasa inhabitants of their new home, and gave their rank to the descendants of these mixed unions. With the pride of birth these new-born Rajputs inherited the language of their fathers, and thus the tongue of the ruling class, and subsequently of the whole population of this portion of the Himalaya, became a form of Rajasthani, the language spoken in distant Rajputana.

The Rajput occupation of Nepal is of later date. In the early part of the 16th century a number of Rajputs of Udaipur in Rajputana, being oppressed by the Mussulmans, fled north and settled in Garhwal, Kumaon, and western Nepal. In A.D. 1559 a party of these conquered the small state of Gurkha, which lay about 70 m. north-west of Katmandu, the present capital of Nepal. In 1768 Prithwi Narayan Shah, the then Rajput ruler of Gurkha, made himself master of the whole of Nepal and founded the present Gurkhali dynasty of that country. His successors extended their rule westwards over Kumaon and Garhwal, and as far as the Simla Hill states. The inhabitants of Nepal included not only Aryan Khasas, but also, as has been said, a number of Tibeto-Burman tribes. The Rajputs of Gurkha could not impose their language upon these as they did upon the Khasas, but, owing to its being the tongue of the ruling race, it ultimately became generally understood and employed as the *lingua franca* of this polyglot country. Although the language of the Khasas has disappeared, the tribe is still numerically the most important Aryan one in this part of the Himalaya, and it hence gave its name to its newly adopted speech, which is at the present day locally known as "Khas-kurā."

In the manner described above the Aryan language of the whole Pahari area is now a form of Rajasthani, exhibiting at the same time traces of the old Khasa language which it superseded, and also in Nepal of the Tibeto-Burman forms of speech by which it is surrounded. (For information regarding Rajasthani the reader is referred to the articles INDO-ARYAN LANGUAGES; PRAKRIT; and GUJARATI.)

Khas-kura shows most traces of Tibeto-Burman influence. The gender of nouns is purely sexual, and, although there is an oblique case derived from Rajasthani, it is so often confounded with the nominative, that in the singular number either can be employed for the other. Both these are due to Tibeto-Burman influence, but the non-Aryan idiom is most prominent in the use of the verb. There is an indefinite tense referring to present, past or future time according to the context, formed by suffixing the verb substantive to the root of the main verb, exactly as in some of the neighbouring Tibeto-Burman languages. There is a complete impersonal honorific conjugation which reminds one strongly of Tibetan, and, in colloquial speech, as in that tongue, the subject of any tense of a transitive verb, not only of a tense derived from the past participle, is put into the agent case.

In Eastern and Central Pahari the verb substantive is formed from the root *ach*, as in both Rajasthani and Kashmiri. In Rajasthani its present tense, being derived from the Sanskrit present *ṛcchāmi*, I go, does not change for gender. But in Pahari and Kashmiri it must be derived from the rare Sanskrit particle **ṛcchitas*, gone, for in these languages it is a participial tense and does change according to the gender of the subject. Thus, in the singular we have:—

	Khas-kura.		Kumauni.		Kashmiri.	
	Masc.	Fem.	Masc.	Fem.	Masc.	Fem.
I am	*chu*	*chu*	*chũ*	*chũ*	*chus*	*ches*
Thou art . . .	*chas*	*ches*	*chai*	*chī*	*chukh*	*chekh*
He is	*cha*	*che*	*ch*	*chī*	*chuh*	*cheh*

Here we have a relic of the old Khasa language, which, as has been said, seems to have been related to Kashmiri. Other relics of Khasa, again agreeing with north-western India, are the tendency to shorten long vowels, the practice of epenthesis, or the modification of a vowel by the one which follows in the next syllable, and the frequent occurrence of disaspiration. Thus, Khas *siknu*, Kumauni *siknō*, but Hindi *sīkhnā*, to learn; Kumauni *yēsō*, plural *yāsā*, of this kind.

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[1] See ch. iv. of vol. ii. of R. T. Atkinson's *Himalayan Districts of the North-Western Provinces of India*, forming vol. xi of the "Gazetteer of the North-Western Provinces" (Allahabad, 1884), and the *Archaeological Survey of India*, xiv. 125 sqq. (Calcutta, 1882).

Regarding Western Pahari materials are not so complete. The speakers are not brought into contact with Tibeto-Burman languages, and hence we find no trace of these. But the signs of the influence of north-western languages are, as might be expected, still more apparent than farther east. In some dialects epenthesis is in full swing, as in (Churāhī) *khā̃tā*, eating, fem. *khaĩti*. Very interesting is the mixed origin of the postpositions defining the various cases. Thus, while that of the genitive is generally the Rajasthani *rō*, that of the dative continually points to the west. Sometimes it is the Sindhi *khē* (see Sindhi). At other times it is *jō*, where is here a locative of the base of the Sindhi genitive postposition *jō*. In all Indo-Aryan languages, the dative postposition is by origin the locative of some genitive one. In vocabulary, Western Pahari often employs, for the more common ideas, words which can most readily be connected with the north-western and Piśāca groups. (See Indo-Aryan Languages.)

Literature.—Khas-kura has a small literature which has grown up in recent years. We may mention the *Birsikkā*, an anonymous collection of folk-tales, and a *Rāmāyana* by Bhānu Bhaṭṭa. There are also several translations from Sanskrit. Of late years local scholars have done a good deal towards creating an interest in Central Pahari. Special mention may be made of Ganga Datt Upreti's *Proverbs and Folklore of Kumaun and Garhwal* (Lodiana, 1894); the same author's *Dialects of the Kumaun Division* (Almora, 1900); and Jwala Datt Joshi's translation of Daṇḍin's Sanskrit *Daśa Kumāra Carita* (Almora, 1892). A local poet who lived about a century ago, Gumānī Kavi by name, was the author of verses written in a peculiar style, and now much admired. Each verse consists of four lines, the first three being in Sanskrit, and the fourth a Hindi or Kumauni proverb. A collection of these, edited by Rewa Datt Upreti, was published in the *Indian Antiquary* for 1909 (pp. 177 seq.) under the title of *Gumānī-nīti*. Western Pahari has no literature. Portions of the Bible have been translated into Khas-kura (under the name of "Nepali"), Kumauni, Garhwali, Jaunsari and Chambiali.

Authorities.—S. H. Kellogg's *Hindi Grammar* (2nd ed., London, 1893) includes both Eastern and Central Pahari in its survey. For Khas see also A. Turnbull, *Nepalī, i. e. Gorkhali* or *Parbate Grammar* (Darjeeling, 1904), and G. A. Grierson, "A Specimen of the Khas or Naipālī Language," in the *Zeitschrift der deutschen morgenländischen Gesellschaft* (1907), lxi. 659 seq. There is no authority dealing with Western Pahari as a whole. A. H. Diack's work, *The Kulu Dialect of Hindi* (Lahore, 1896), may be consulted for Kuluhi. See also T. Grahame Bailey's *Languages of the Northern Himalayas* (Royal Asiatic Society, London, 1908). Vol. ix., pt. iv., of the *Linguistic Survey of India* contains full particulars of all the Pahari dialects in great detail. (G. A. Gr.)

PAHLAVĪ, or Pehlevi, the name given by the followers of Zoroaster to the character in which are written the ancient translations of their sacred books and some other works which they preserve (see Persia: *Language*). The name can be traced back for many centuries; the great epic poet Firdousī (second half of the 10th Christian century) repeatedly speaks of Pahlavī books as the sources of his narratives, and he tells us among other things that in the time of the first Khosrau (Chosroes I., A.D. 531–579) the Pahlavī character alone was used in Persia.[1] The learned Ibn Moḳaffa' (8th century) calls Pahlavī one of the languages of Persia, and seems to imply that it was an official language.[2] We cannot determine what characters, perhaps also dialects, were called Pahlavī before the Arab period. It is most suitable to confine the word, as is now generally done, to designate a kind of writing—not only that of the Pahlavī books, but of all inscriptions on stone and metal which use similar characters and are written on essentially the same principles as these books.

At first sight the Pahlavī books present the strangest spectacle of mixture of speech. Purely Semitic (Aramaic) words—and these not only nouns and verbs, but numerals, particles, demonstrative and even personal pronouns—stand side by side with Persian vocables. Often, however, the Semitic words are compounded in a way quite unsemitic, or have Persian terminations. As read by the modern Zoroastrians, there are also many words which are neither Semitic nor Persian; but it is soon seen that this traditional pronunciation is untrustworthy. The character is cursive and very ambiguous, so that, for example, there is but one sign for *n*, *u*, and *r*, and one for *y*, *d*, and *g*, this has led to mistakes in the received pronunciation, which for many words can be shown to have been at one time more correct than it is now. But apart from such blunders there remain phenomena which could never have appeared in a real language; and the hot strife which raged till recently as to whether Pahlavī is Semitic or Persian has been closed by the discovery that it is merely a way of writing Persian in which the Persian words are partly represented—to the eye, not to the ear—by their Semitic equivalents. This view, the development of which began with Westergaard (*Zendavesta*, p. 20, note), is in full accordance with the true and ancient tradition. Thus Ibn Moḳaffa', who translated many Pahlavī books into Arabic, tells us that the Persians had about one thousand words which they wrote otherwise than they were pronounced in Persian.[3] For *bread* he says they wrote lhma, *i.e.* the Aramaic *laḥmā*, but they pronounced *nān*, which is the common Persian word for bread. Similarly bsra, the Aramaic *besrā*, flesh, was pronounced as the Persian *gōsht*. We still possess a glossary which actually gives the Pahlavī writing with its Persian pronunciation. This glossary, which besides Aramaic words contains also a variety of Persian words disguised in antique forms, or by errors due to the contracted style of writing, exists in various shapes, all of which, in spite of their corruptions, go back to the work which the statement of Ibn Moḳaffa' had in view.[4] Thus the Persians did the same thing on a much larger scale, as when in English we write £ (libra) and pronounce "pound" or write &c or & (et) and pronounce "and." No system was followed in the choice of Semitic forms. Sometimes a noun was written in its *status absolutus*, sometimes the emphatic *â* was added, and this was sometimes written as א sometimes as ה. One verb was written in the perfect, another in the imperfect. Even various dialects were laid under contribution. The Semitic signs by which Persian synonyms were distinguished are sometimes quite arbitrary. Thus in Persian *khwēsh* and *khwat* both mean "self"; the former is written nfshh (*nafshā* or *nafsheh*), the latter bnfshh with the preposition *bĕ* prefixed. Personal pronouns are expressed in the dative (*i.e.* with prepositional *l* prefixed), thus lk (*lakh*) for *tu*, "thou," lnh (*lanā*) for *amā*, "we." Sometimes the same Semitic sign stands for two distinct Persian words that happen to agree in sound; thus because *hānā* is Aramaic for "this," hna represents not only Persian *ē*, "this," but also the interjection *ē*, *i.e.* "O" as prefixed to a vocative. Sometimes for clearness a Persian termination is added to a Semitic word; thus, to distinguish between the two words for father, *pit* and *pitar*, the former is written ab and the latter abitr. The Persian form is, however, not seldom used, even where there is a quite well-known Semitic ideogram.[5]

These difficulties of reading mostly disappear when the ideographic nature of the writing is recognized. We do not always know what Semitic word supplied some ambiguous group of letters (*e. g.* pun for *pa*, "to," or ht for *agar*, "if"); but we always can tell the Persian word—which is the one important thing—though not always the exact pronunciation of it in that older stage of the language which the extant Pahlavī works belong to. In Pahlavī, for example, the word for "female" is written *mātak*, an ancient form which afterwards passed through *mādhak* into *mādha*. But it was a mistake of later ages to fancy that because this was so the sign T also meant D, and so to write T for D in many cases, especially in foreign proper names. That a word is written in an older form than that which is pronounced is a phenomenon common to many languages whose literature covers a long period. So in English we still write, though we do not pronounce, the guttural in *through*, and write *laugh* when we pronounce *laf*.

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[1] We cannot assume, however, that the poet had a clear idea of what Pahlavī was.

[2] The passage, in which useful facts are mixed up with strange notions, is given abridged in *Fihrist*, p. 13, more fully by Yākūt, iii. 925, but most fully and accurately in the unprinted *Mafātiḥ al-'olūm*.

[3] *Fihrist*, p. 14, line 13 seq., cf. line 4 seq. The former passage was first cited by Quatremère, *Jour. As.* (1835), i. 256, and discussed by Clermont-Ganneau, ibid. (1866), i. 430. The expressions it uses are not always clear; perhaps the author of the *Fihrist* has condensed somewhat.

[4] Editions by Hoshangjī, Jamaspjī Asa and M. Haug (Bombay, 1870), and by C. Salemann (Leiden, 1878). See also J. Olshausen, "Zur Würdigung der Pahlavī-glossare" in Kuhn's *Zeit. f. vergl. Sprforsch.*, N.F., vi. 521 seq.

[5] For examples of various peculiarities see the notes to Nöldeke's translation of the story of *Artakhshīr i Pāpakān* (Göttingen, 1879).

Much graver difficulties arise from the cursive nature of the characters already alluded to. There are some groups which may theoretically be read in hundreds of ways; the same little sign may be שׁ, אי, יה, רא, דה, נא, נה, and the ה too may be either *h* or *kh*.

In older times there was still some little distinction between letters that are now quite identical in form, but even the Egyptian fragments of Pahlavī writing of the 7th century show on the whole the same type as our MSS. The practical inconveniences to those who knew the language were not so great as they may seem; the Arabs also long used an equally ambiguous character without availing themselves of the diacritical points which had been devised long before.

Modern MSS., following Arabic models, introduce diacritical points from time to time, and often incorrectly. These give little help, however, in comparison with the so-called Pāzand or transcription of Pahlavī texts, as they are to be spoken, in the character in which the *Avestā* itself is written, and which is quite clear and has all vowels as well as consonants. The transcription is not philologically accurate; the language is often modernized, but not uniformly so. Pāzand MSS. present dialectical variations according to the taste or intelligence of authors and copyists, and all have many false readings. For us, however, they are of the greatest use. To get a conception of Pahlavī one cannot do better than read the *Minōi-Khiradh* in the Pahlavī with constant reference to the Pāzand.[1] Critical labour is still required to give an approximate reproduction of the author's own pronunciation of what he wrote.

The coins of the later Sassanid kings, of the princes of Tabaristan, and of some governors in the earlier Arab period, exhibit an alphabet very similar to Pahlavī MSS. On the older coins the several letters are more clearly distinguished, and in good specimens of well-struck coins of the oldest Sassanians almost every letter can be recognized with certainty. The same holds good for the inscriptions on gems and other small monuments of the early Sassanian period; but the clearest of all are the rock inscriptions of the Sassanians in the 3rd and 4th centuries, though in the 4th century a tendency to cursive forms begins to appear. Only *r* and *v* are always quite alike. The character of the language and the system of writing is essentially the same on coins, gems and rocks as in MSS.—pure Persian, in part strangely disguised in a Semitic garb. In details there are many differences between the Pahlavī of inscriptions and the books. Persian endings added to words written in Semitic form are much less common in the former, so that the person and number of a verb are often not to be made out. There are also orthographic variations; *e.g.* long *ā* in Persian forms is always expressed in book-Pahlavī, but not always in inscriptions. The unfamiliar contents of some of these inscriptions, their limited number, their bad preservation, and the imperfect way in which some of the most important of them have been published[2] leave many things still obscure in these monuments of Persian kings; but they have done much to clear up both great and small points in the history of Pahlavī.[3]

Some of the oldest Sassanian inscriptions are accompanied by a text belonging to the same system of writing, but with many variations in detail,[4] and an alphabet which, though derived from the same source with the other Pahlavī alphabets (the old Aramaic), has quite different forms. This character is also found on some gems and seals. It has been called Chaldaeo-Pahlavī, &c. Olshausen tries to make it probable that this was the writing of Media and the other that of Persia. The Persian dialect in both sets of inscriptions is identical or nearly so.[5]

The name Pahlavī means Parthian, Pahlav being the regular Persian transformation of the older Parthava.[6] This fact points to the conclusion that the system of writing was developed in Parthian times, when the great nobles, the Pahlavāns, ruled and Media was their main seat, "the Pahlav country." Other linguistic, graphical and historical indications point the same way; but it is still far from clear how the system was developed. We know, indeed, that even under the Achaemenids Aramaic writing and speech were employed far beyond the Aramaic lands, even in official documents and on coins. The Iranians had no convenient character, and might borrow the Aramaic letters as naturally as they subsequently borrowed those of the Arabs. But this does not explain the strange practice of writing Semitic words in place of so many Persian words which were to be read as Persian. It cannot be the invention of an individual, for in that case the system would have been more consistently worked out, and the appearance of two or more kinds of Pahlavī side by side at the beginning of the Sassanian period would be inexplicable. But we may remember that the Aramaic character first came to the Iranians from the region of the lower Euphrates and Tigris, where the complicated cuneiform character arose, and where it held its ground long after better ways of writing were known. In later antiquity probably very few Persians could read and write. All kinds of strange things are conceivable in an Eastern character confined to a narrow circle. Of the facts at least there is no doubt.

The Pahlavī literature embraces the translations of the holy books of the Zoroastrians, dating probably from the 6th century, and certain other religious books, especially the *Minōi-Khiradh* and the *Bundahish*.[7] The *Bundahish* dates from the Arab period. Zoroastrian priests continued to write the old language as a dead tongue and to use the old character long after the victory of a new empire, a new religion, a new form of the language (New Persian), and a new character. There was once a not quite inconsiderable profane literature, of which a good deal is preserved in Arabic or New Persian versions or reproductions, particularly in historical books about the time before Islam.[8] Very little profane literature still exists in Pahlavī; the romance of Ardashīr has been mentioned above.

See E. W. West's "Pahlavī Literature," in Geiger and Kuhn's *Grundriss der iranischen Philologie* (1896), vol. ii.; "The Extent, Language and Age of Pahlavī Literature" in *Sitzungsber. der k. Akad. der wiss. Phil. u. hist. Klasse* (Munich, 1888), pp. 399–443 and his *Pahlavī Texts* in *Sacred Books of the East* (1880–1897). The difficult study of Pahlavī is made more difficult by the corrupt state of our copies, due to ignorant and careless scribes.

Of glossaries, that of West (Bombay and London, 1874) is to be recommended; the large Pahlavī, Gujaratī and English lexicon of Jamaspji Dastur Minocheherji (Bombay and London, 1877–1882) is very full, but has numerous false or uncertain forms, and must be used with much caution. (TH. N.)

PAIGNTON, a seaside resort in the Torquay parliamentary division of Devonshire, England, on Tor Bay, $2\frac{3}{4}$ m. S.W. of Torquay; on the Great Western railway. Pop. of urban district (1901), 8385. The church of St John is mainly Perpendicular;

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[1] *The Book of the Mainyo-i-Khard in the Original Pahlavī*, ed. by Fr. Ch. Andreas (Kiel, 1882); idem, *The Pāzand and Sanskrit Texts*, by E. W. West (Stuttgart and London, 1871).

[2] See especially the great work of F. Stolze, *Persepolis* (2 vols., Berlin, 1882). It was De Sacy who began the decipherment of the inscriptions.

[3] Thus we now know that the ligature in book-Pahlavī which means "in," the original letters of which could not be made out, is for בין, "between." It is to be read *andar*.

[4] Thus *pus*, "son," is written ברי instead of ברה; *pêsh*, "before," is written קדמה, but in the usual Pahlavī it is לויני = לְעֵינֵי.

[5] What the *Fihrist* (p. 13 seq.) has about various forms of Persian writing certainly refers in part at least to the species of Pahlavī. But the statements are hardly all reliable, and in the lack of trustworthy specimens little can be made of them.

[6] This was finally proved by Olshausen, following earlier scholars; see J. Olshausen, *Parthava und Pahlav, Māda und Māh* (Berlin, 1877, and in the *Monatsb.* of the Academy).

[7] Translations ed. by F. Spiegel (1860), the *Bundāhish* by N. L. Westergaard (Copenhagen, 1851) and F. Justi (Leipzig, 1868); other Pahlavī books by Spiegel and Haug, by Hoshangji, and other Indian Pārsees.

[8] One other book, the stories of *Kalilag and Damnag*, in a Syriac version from the Pahlavī, the latter taken from the Sanskrit.

but has a late Norman doorway, and contains a carved and painted pulpit, and in the Kirkham chapel several interesting monuments of the Kirkham family, and a beautiful though damaged stone screen. Among other buildings and institutions are a novitiate of Marist Fathers, a science and art school, a pier with pavilion and concert rooms, and a yacht club. Little remains of an old palace of the bishops of Exeter apart from the 14th-century Bible Tower. Its last tenant was Bishop Miles Coverdale, who in 1535 published the first English translation of the whole Bible. The town owes its popularity to a firm expanse of sand, good bathing facilities, and a temperate climate.

PAIL, a bucket, a vessel for carrying water, milk or other liquids, made of wood or metal or other material, varying in size, and usually of a circular shape and somewhat wider at the top than the bottom. The word is of somewhat obscure origin. The present form points to the O. Eng. *paegel*, but the sense, that of a small wine-measure, a gill, is difficult to connect with the present one. The earlier forms of the word in Mid. Eng. spell the word *payle*, *paille*, and this rather points to a connexion with O. Fr. *paelle*, *payelle*, a small pan or flat dish, from Lat. *patella*, diminutive of *patera*, dish. The sense here also presents difficulties, "pail" in English being always a deep vessel.

PAILLERON, ÉDOUARD JULES HENRI (1834–1899), French poet and dramatist, was born in Paris on the 17th of September 1834. He was educated for the bar, but after pleading a single case he entered the first dragoon regiment and served for two years. With the artist J. A. Beaucé he travelled for some time in northern Africa, and soon after his return to Paris in 1860 he produced a volume of satires, *Les Parasites*, and a one-act piece, *Le Parasite*, which was represented at the Odéon. He married in 1862 the daughter of François Buloz, thus obtaining a share in the proprietorship of the *Revue des deux mondes*. In 1869 he produced at the Gymnase theatre *Les Faux ménages*, a four-act comedy depending for its interest on the pathetic devotion of the Magdalene of the story. *L'Étincelle* (1879), a brilliant one-act comedy, secured another success, and in 1881 with *Le Monde où l'on s'ennuie* Pailleron produced one of the most strikingly successful pieces of the period. The play ridiculed contemporary academic society, and was filled with transparent allusions to well-known people. None of his subsequent efforts achieved so great a success. Pailleron was elected to the French Academy in 1882, and died on the 20th of April 1899.

PAIMPOL, a fishing port of western France, in the department of Côtes-du-Nord, 27½ m. N.N.W. of St Brieuc by road. Pop. (1906), 2340. Paimpol is well known for its association with the Icelandic cod-fisheries, for which it annually equips a large fleet. Steam sawing and boat-building are carried on; grain, &c., is exported; imports include coal and timber. A tribunal of commerce and a school of navigation are among the public institutions.

PAIN (from Lat. *poena*, Gr. *ποίνη*, penalty, that which must be paid: O. Fr. *peine*), a term used loosely (1) for the psychological state, which may be generally described as "unpleasantness," arising, *e.g.* from the contemplation of a catastrophe or of moral turpitude, and (2) for physical (or psycho-physical) suffering, a specific sensation localized in a particular part of the body. The term is used in both senses as the opposite of "pleasure," though it is doubtful whether the antithesis between physical and psychical pleasure can be equally well attested. The investigation of the pleasure-pain phenomena of consciousness has taken a prominent place in psychological and ethical speculation, the terms "hedonics" and "algedonics" (*ἀλγηδίον*, pain of body or mind) being coined to express different aspects of the subject. So in aesthetics attempts have been made to assign to pain a specific psychological function as tending to increase pleasure by contrast (so Fechner): pain, *e.g.* is a necessary element in the tragic. Scientists have experimented elaborately with a view to the precise localization of pain-sensations, and "pain-maps" can be drawn showing the exact situation of what are known as "pain-spots." For such experiments instruments known as "aesthesiometers" and "algometers" have been devised. The great variety of painful sensations—throbbing, dull, acute, intermittent, stabbing—led to the conclusion among earlier investigators that pains differ in quality. It is, however, generally agreed that all pain is qualitatively the same, though subject to temporal and intensive modification. (See PSYCHOLOGY; AESTHETICS; NERVOUS SYSTEM; SYMPATHETIC SYSTEM.)

PAIN, BARRY (1867–), English humorous writer, was educated at Cambridge, and became a prominent contributor to *The Granta*. James Payn inserted his story, "The Hundred Gates," in the *Cornhill Magazine* in 1889, and shortly afterwards he became a contributor to *Punch* and the *Speaker*, and joined the staffs of the *Daily Chronicle* and *Black and White*. His works include: *In a Canadian Canoe* (1891); papers reprinted from *The Granta*; *Playthings and Parodies* (1892); *The Kindness of the Celestial* (1894); *The Octave of Claudius* (1897); *Eliza* (1900); *Another English Woman's Love Letters* (1901), &c. As a writer of parody and lightly humorous stories his name has become widely known.

PAINE, ROBERT TREAT (1731–1814), American politician, a signer of the Declaration of Independence, was born in Boston, Massachusetts, on the 11th of March 1731. He graduated at Harvard in 1749, and was admitted to the bar in 1759. In 1768 he was a delegate to the provincial convention which was called to meet in Boston, and conducted the prosecution of Captain Thomas Preston and his men for their share in the famous "Boston Massacre" of the 5th of March 1770. He served in the Massachusetts General Court in 1773–1774, in the Provincial Congress in 1774–1775, and in the Continental Congress in 1774–1778, and was speaker of the Massachusetts House of Representatives in 1777, a member of the executive council in 1779, a member of the committee which drafted the constitution of 1780, attorney-general of the state from 1777 to 1790, and a judge of the state supreme court from 1790 to 1804. He died in Boston on the 11th of May 1814.

See John Sanderson, *Biography of the Signers of the Declaration of Independence* (Philadelphia, 1823), vol. ii.

His son, ROBERT TREAT PAINE (1773–1811), who was christened Thomas but in 1801 took the name of his father and of an elder brother who died without issue in 1794, was a poet of some repute, but his verses have long been forgotten. His best known productions are *Adams and Liberty*, a once popular song written in 1798, *The Invention of Letters* (1795), and *The Ruling Passion*, the Harvard Phi Beta Kappa poem of 1797.

His *Works in Verse and Prose* (Boston, 1812) contains a biographical sketch.

PAINE, THOMAS (1737–1809), English author, was born at Thetford, Norfolk, on the 29th of January 1737, the son of a Quaker staymaker. After several years at sea and after trying various occupations on land, Paine took up his father's trade in London, where he supplemented his meagre grammar school education by attending science lectures. He succeeded in 1762 in gaining an appointment in the excise, but was discharged for neglect of duty in 1765. Three years later, however, he received another appointment, at Lewes in Sussex. He took a vigorous share in the debates of a local Whig club, and in 1772 he wrote a pamphlet embodying the grievances of excisemen and supporting their demands for an increase of pay. In 1774 he was dismissed the service for absence without leave—in order to escape his creditors.

A meeting with Benjamin Franklin in London was the turning point in his life. Franklin provided him with letters to his son-in-law, Richard Bache, and many of the leaders in the colonies' resistance to the mother country, then at an acute stage. Paine sailed for America in 1774. Bache introduced him to Robert Aitkin, whose *Pennsylvania Magazine* he helped found and edited for eighteen months. On the 9th of January 1776 Paine published a pamphlet entitled *Common Sense*, a telling array of arguments for separation and for the establishment of a republic. His argument was that independence was the only consistent line to pursue, that "it must come to that some time or other"; that it would only be more difficult the more it was delayed, and that independence was the surest road to union. Written in simple convincing language, it was read everywhere, and the open movement to independence dates from its publication. Washington said that it " worked a powerful change in the minds of many men." Leaders in the New York Provincial Congress considered the advisability of answering it, but came to the conclusion that it was unanswerable. When war was declared, and fortune at first went against the colonists, Paine, who was then serving with General Greene as volunteer aide-de-camp, wrote the first of a series of influential tracts called *The Crisis*, of which the opening words, " These are the times that try men's souls," became a battle-cry. Paine's services were recognized by an appointment to be secretary of the commission sent by Congress to treat with the Indians, and a few months later to be secretary of the Congressional committee of foreign affairs. In 1779, however, he committed an indiscretion that brought him into trouble. He published information gained from his official position, and was compelled to resign. He was afterwards clerk of the Pennsylvania legislature, and accompanied John Laurens during his mission to France. His services were eventually recognized by the state of New York by a grant of an estate at New Rochelle, and from Pennsylvania and, at Washington's suggestion, from Congress he received considerable gifts of money.

In 1787 he sailed for Europe with the model of an iron bridge he had designed. This was publicly exhibited in Paris and London, and attracted great crowds. In England he determined to " open the eyes of the people to the madness and stupidity of the government." His first efforts in the *Prospects on the Rubicon* (1787) were directed against Pitt's war policy, and towards securing friendly relations with France. When Burke's *Reflections on the Revolution in France* appeared, in 1790, Paine at once wrote his answer, *The Rights of Man*. The first part appeared on the 13th of March 1791, and had an enormous circulation before the government took alarm and endeavoured to suppress it, thereby exciting intense curiosity to see it, even at the risk of heavy penalties. Those who know the book only by hearsay as the work of a furious incendiary will be surprised at the dignity, force and temperance of the style; it was the circumstances that made it inflammatory. Pitt " used to say," according to Lady Hester Stanhope, " that Tom Paine was quite in the right, but then he would add, ' What am I to do? As things are, if I were to encourage Tom Paine's opinions we should have a bloody revolution.' " Paine was indicted for treason in May 1792, but before the trial came off he was elected by the department of Calais to the French convention, and escaped into France, followed by a sentence of outlawry. The first years that he spent in France form a curious episode in his life. He was enthusiastically received, but as he knew little of the language translations of his speeches had to be read for him. He was bold enough to speak and vote for the " detention of Louis during the war and his perpetual banishment afterwards," and he pointed out that the execution of the king would alienate American sympathy. He incurred the suspicion of Robespierre, was thrown into prison, and escaped the guillotine by an accident. Before his arrest he had completed the first part of the *Age of Reason*, the publication of which made an instant change in his position on both sides of the Atlantic, the indignation in the United States being as strong as in England. The *Age of Reason* can now be estimated calmly. It was written from the point of view of a Quaker who did not believe in revealed religion, but who held that " all religions are in their nature mild and benign " when not associated with political systems. Intermixed with the coarse unceremonious ridicule of what he considered superstition and bad faith are many passages of earnest and even lofty eloquence in favour of a pure morality founded on natural religion. The work in short—a second part, written during his ten months' imprisonment, was published after his release—represents the deism of the 18th century in the hands of a rough, ready, passionate controversialist.

At the downfall of Robespierre Paine was restored to his seat in the convention, and served until it adjourned in October 1795. In 1796 he published a long letter to Washington, attacking his military reputation and his presidential policy with inexcusable bitterness. In 1802 Paine sailed for America, but while his services in behalf of the colonies were gratefully remembered, his *Age of Reason* and his attack on Washington had alienated many of his friends. He died in New York on the 8th of June 1809, and was buried at New Rochelle, but his body was in 1819 removed to England by William Cobbett.

See the biography by Moncure D. Conway (1892).

PAINESVILLE, a city and the county-seat of Lake county, Ohio, U.S.A., on the Grand River, 3 m. S. of Lake Erie and about 30 m. N.E. of Cleveland. Pop. (1900) 5024, of whom 499 were foreign-born and 179 negroes; (1910) 5501. It is served by the Lake Shore & Michigan Southern, the New York, Chicago & St Louis and the Baltimore & Ohio railways, and by electric lines to Cleveland, Fairport and Ashtabula. It is the seat of Lake Erie College (non-sectarian, for women), the successor of Willoughby Seminary (1847), whose buildings at Willoughby, Ohio, were burned in 1856; the college was opened as the Lake Erie Female Seminary in 1859, and became Lake Erie College and Seminary in 1898 and Lake Erie College in 1908. Painesville is situated in a farming and fruit-growing country, and also has some manufactures. Three miles north, on Lake Erie, is the village of Fairport (pop. in 1900, 2073), with a good harbour and coal and ore docks. The municipality owns and operates its waterworks and street-lighting plants. Painesville was founded in 1800–1802 by settlers from Connecticut and New York, conspicuous among whom was General Edward Paine (1746–1841), an officer from Connecticut in the War of Independence; it was incorporated as a village in 1832, and became a city in 1902 under the new Ohio municipal code.

PAINTER-WORK, in the building trade. When work is painted one or both of two distinct ends is achieved, namely the preservation and the coloration of the material painted. The compounds used for painting—taking the word as meaning a thin protective or decorative coat—are very numerous, including oil-paint of many kinds, distemper, whitewash, tar; but the word " paint " is usually confined to a mixture of oil and pigment, together with other materials which possess properties necessary to enable the paint to dry hard and opaque. Oil paints are made up of four parts—the base, the vehicle, the solvent and the driers. Pigment may be added to these to obtain a paint of any desired colour.

There are several bases for oil paint, those most commonly used for building work being white lead, red lead, zinc white and oxide of iron. White lead is by far the commonest of bases for paint. When pure it consists of about 75% carbonate of lead and about 25% of lead hydrate. It is mixed with 6 or 7% by weight of pure linseed oil, and in this form is supplied to the painter. Sulphate of baryta is the chief adulterant used in the manufacture of white lead. White lead has greater covering properties and is more durable than the other bases. It should therefore always be used in external painting. Paints having white lead for a base darken with age, and become discoloured when exposed to the fumes of sulphuretted hydrogen, which exists to a greater or less extent in the air of all large towns. Zinc white, an oxide of zinc, is of a purer white colour than white lead. It is lighter, and does not possess the same durability or covering power. It is, however, useful in internal decoration, as it retains its colour well, even when subjected to the action of gases. Red lead is a lead oxide. It is used chiefly in the priming coat and as a base for some red paints. Like white lead, it is injured if exposed tc acids or impure air, which cause discoloration and decay. Oxide of iron is used chiefly as a base in paints used for covering iron-work, the theory being that no destructive galvanic action can be set up, as might be the case with lead paint when used on iron. A variety of red pigments are made from oxide of iron, varying in hue from a pale to a deep brownish-red. They are quite permanent, and may be used under any conditions.

The vehicle is a liquid in which the particles of the base are held in suspension, enabling a thin coat of paint to be formed, uniform in colour and consistency, and which on drying forms a kind of skin over the surface to which it is applied. For oil paint the vehicles used are oils; for distemper water is employed.

The oils used as vehicles are chiefly linseed oil, raw and boiled, and poppy-seed oil. Nut oils are occasionally used for inferior work because they are much cheaper. Linseed oil, the one most commonly used, is obtained from the seeds of the flax by warming it and squeezing out the oil under hydraulic pressure. The resultant, which is of a transparent amber colour, is known as "raw" oil. It is used principally in interiors for light, bright colours, drying somewhat slowly and giving a firm elastic coat. The oil improves by keeping, and is sometimes "refined" with acids or alkalies. "Boiled" oil is the raw oil heated with driers, such as litharge or red lead, to a temperature from 350° to 500° F., at which it is maintained for three or four hours. It is thick and much darker in colour than the raw oil, drying much more quickly, with a coat hard and glossy but less elastic than that produced by raw oil. Poppy-seed oil is expressed from the seeds of the poppy plant. It does not possess the tenacity and quick-drying powers of boiled linseed oil, but being of a very light colour it is used for delicate colours.

Turpentine is used as a solvent, diluent, or "thinner," to bring the paint to a proper consistency so as to allow it to be spread in a thin even coat. When a flat dull surface is desired, turpentine alone is used with the base and the oil is omitted. The best turpentine comes from the pine forests of America. French turpentine is next in quality. Russian turpentine is the cheapest, and has usually a strong and unpleasant odour that renders it objectionable to work with. In consequence of the high price of turpentine of good quality, and the increasing difficulty of obtaining it, substitutes are coming into general use.

"Driers" are substances usually added to paint to hasten the process of oxidation, *i.e.* the drying, of the oil. Some pigments possess this quality, as red lead and white lead. The most notable driers are litharge, sugar of lead, patent driers, sulphate of zinc and manganese dioxide. Liquid driers, such as terebene, are also in use. Litharge, an oxide of lead, is in most general use. Sugar of lead is used, ground in oil, for light tints. Sulphate of zinc and manganese driers are used for paints in which zinc white is the base, which would be injured by lead driers.

"Pigments" are preparations of metallic, earthy or animal origin mixed into paint to give it colour. For oil paint they are usually ground in oil; for distemper they are sold as a finely ground powder. The ordinary pigments are white lead, zinc white, umbers, siennas, ochres, chromes, Venetian red, Indian red, lamp black, bone black, vegetable black, ultramarine, Prussian blue, vermilion, red lead, oxide of iron, lakes and Vandyke brown.

The term "enamel paint" was first given to a compound of zinc white, petrol and resin, which possessed on drying a hard glossy surface. The name is now applied to any coloured paint of this nature. Quick-drying enamels are spirit varnishes ground with the desired pigment. For slow-drying enamels oil varnishes form the vehicle.

Woodwork is often treated with a thin transparent-coloured liquid which changes the colour of the work without hiding the grain of the wood, and if the latter is good a very fine result is obtained. Sometimes the stain is produced by the combination of two or more chemicals applied separately, or soluble pigments may be mixed with a transparent vehicle and applied in the usual way. The vehicles for the pigments vary considerably, and include water, methylated spirit, size, turpentine and clear raw linseed oil.

Varnish is made by dissolving certain gums in linseed oil, turpentine, spirit or water. They give a transparent protective coat to painted and stained surfaces or to wall-paper or plain woodwork. Varnishes usually dry with a very smooth, hard and shiny surface, but "flat" or "dead" surfaces which are without gloss may be obtained with special varnish.

The gums used for hard-wearing or carriage varnishes, such as those to be exposed to the weather and frequently cleaned and polished, are amber, copal and gum animé. Amber is a yellow transparent or clouded gum found on the coasts of the Baltic, and particularly in Prussia. It makes a hard, durable and slow-drying varnish which does not darken with age. Copal gum is brought from the West India Islands and also from the East Indies. It makes the most durable varnish, and being tough and hard is generally used for external work. Gum animé, is a variety of copal found in the sandy soil of the East Indies. It is hard, durable and quick-drying, but unless the varnish is carefully made it is liable to crack. Varnishes for inside work, or cabinet varnishes, are made with a variety of resins dissolved in linseed oil and turpentine. The resultant gives a hard, lustrous surface, somewhat less durable than that of carriage varnishes. Turpentine varnishes are made from soft gums, such as dammar, common resin and mastic; they are light in colour, cheap and not very durable. Lacquers or spirit varnishes are made from very soft gums, such as shellac and sandarach, dissolved in methylated spirit. They are used for internal work, drying quickly, and becoming hard and very brilliant. Surfaces formed with such varnishes are liable to chip easily and scale off. Oil paint is very much improved by the addition of some varnish; it causes it to dry harder and more quickly and with a fine lustrous surface.

The driers used for varnish are generally acetate of lead or litharge. An excess of driers makes the varnish less durable and causes cracking.

There are many kinds of French polishes, mixed in different ways, but most are composed of shellac and sandarach dissolved in spirit. It is applied to the perfectly smooth surface of hard woods with a pad of flannel or wadding wrapped in linen, and well rubbed in with a circular motion.

A dull polish is procured by rubbing beeswax into the wood. It must be thoroughly rubbed in, a little turpentine being added as a lubricant when the rubber works stiffly.

If paint were applied over the bare knots of new wood it would be destroyed, or at least discoloured, by the exudation of resin from the knots. For the purpose of obviating this the knots are covered with two coats of a preparation called "knotting," made by dissolving shellac in methylated spirit.

Putty is required for stopping nail-holes and small crevices and irregularities in woodwork. It is made of powdered whiting and linseed oil mixed together and kneaded into a stiff paste. For light work "hard stopping," made of white lead and whiting, should be employed.

The tools and appliances of the painter are mixing pots, paint kettles to hold the colour for the painter at work, strainer, palette knife, scraping knife, hacking, stopping and chisel knives, the hammer, sponge, pumice, blow-lamp for burning off, and a variety of brushes, such as the duster, the ground brush, the tool, the distemper brush, the fitch and camel-hair pencil for picking out small parts and lines, the sable and flogger for gilding, the stippler; for grained work several steel graining combs with coarse and fine teeth, graining brush of hogs' hair, pencil over-grainer, and other special shaped brushes used to obtain the peculiar characteristics of different woods. It is absolutely necessary for good work to use brushes of a fine quality, and although expensive at first cost, they are undoubtedly cheapest in wear.

Workmanship.—New woodwork requires to be knotted, primed, stopped, and in addition painted with three or four coats of oil colour. The priming coat is a thin coat of white lead, red lead and driers mixed with linseed oil and turpentine. Work should always be primed before the stopping is done. The second or "lead" coat is composed mainly of turpentine, linseed oil and white lead. The third coat is the ground for the finishing colour, and is made of white lead and linseed oil and turpentine, with enough pigment to bring it to a tint approaching the finishing colour. The remaining coat or coats is of similar composition. A "flatting" coat is made of white lead and turpentine with the desired pigment. One pound of colour will cover 4 sq. yds. in the first coat and 6 sq. yds. in the additional coat.

Graining.—Graining is understood among painters to be the imitating of the several different species of ornamental woods, as satinwood, rosewood, mahogany, oak and others. After the necessary coats of paint have been put on to the wood a ground is then laid of the required tint and left to dry. The painter then prepares small quantities of the same colour with a little brown, and boiled oil and turpentine, and, having mixed this, spreads it over some small part of his work. The flat hogs' hair brushes being dipped in the liquid and drawn down the newly-laid colour, the shades and grainings are produced. To obtain the mottled appearance the camels' hair pencils are applied, and when completed the work is left to dry, and afterwards covered by a coat or two of good copal varnish. Imitation wainscot requires the use of combs of various degrees of fineness to obtain the grain (whence the process is called *combing* by some persons), and the flower is got by wiping off the colour with a piece of rag. When dry it is over-grained to obtain a more complete representation of the natural wood, and then varnished. If the work be done in water-colour and not in oil, beer grounds to act as a drier are mixed with the colour; this sets it ready for varnishing. A "patent graining machine," a sort of roller with a pattern upon it, is often used.

Marbling.—Marbling is the imitation of real marbles and granites, some of which are represented by splashing on the carefully prepared ground, which should have been painted and often rubbed and polished to obtain an even surface; others have to be painted in colours, and then well varnished.

Painting on Plaster Work.—Plastering should never be painted until it is thoroughly dry. Portland cement is best left for a year or two before being painted. Plaster work not previously painted will require four or five coats, Portland cement five or six. If plastered work is required to be painted immediately, it should be executed in Keene's or Parian cement (see PLASTER WORK). A great deal more paint is of course absorbed by plaster than by wood, just as wood absorbs more than iron.

Painting on Iron.—Iron and steel work should receive a coat of oxide paint at the manufacturer's works; additional coats are added after erection. All rust should be previously removed by means of wire brushes and paraffin or turpentine. The best paints for external iron work are composed of oxide of iron and red lead, mixed with linseed oil.

The following is an extract from the building by-laws of the municipality of Johannesburg:—

"All structural metal work shall be thoroughly cleaned from scale and rust before painting. Faying surfaces in riveted work shall be painted before putting them together. All surfaces of steel or iron work inaccessible after erection shall be protected as far as possible either by coating them with 'Smith's' or other approved bituminous composition, or by filling the spaces which they enclose with lime concrete."

Repainting Old Work.—Before beginning to repaint work of any description it must be thoroughly cleaned. If the surface is in good condition it will be sufficient to scrub down with good soap and water and afterwards sponge and wipe dry. If the work has become rough it will often be necessary to use pumice stone to facilitate the operation of cleaning. The pumice should be cut or rubbed to a flat surface and vigorously applied with plenty of clean water. It is essential that the work should be quite dry before any paint is applied. If the old surface is much cracked and blistered no amount of rubbing with pumice will enable the workman to obtain a good ground for the new coats, and it will be necessary to remove the old paint entirely. For this purpose painters most frequently use a paint burner or torch which burns paraffin oil under air pressure. This causes the paint to soften and blister under the heat, in which state it is readily scraped off by a blunt knife. The old-fashioned grate filled with charcoal held close to the surface by means of a long handle is now not often used. There has recently been a considerable increase in the use of chemical paint removers in paste or liquid form; as a rule these contain some alkali, such as lime or caustic soda. The preparation is brushed on to the paint required to be removed, and in the course of from ten minutes to half an hour the paint becomes so soft that it can readily be scraped off.

Blistering and Cracking.—The blistering of painted surfaces may be caused in several ways. If on iron, it may be the result of a particle of rust which, not having been removed in the process of cleaning, has increased in size and loosened the paint. If on plaster, a particle of unslaked lime may have "blown," with a similar result. On wood, blistering is usually caused by painting upon a wet surface or upon unseasoned wood. Blisters may also be caused by the use of too much oil in paint exposed to heat, or the application of one coat upon another before the latter is properly dry. To prevent blistering a method that has been tried with good results is to apply two coats of water paint (washable distemper) and follow by two coats of oil colour or varnish. Cracking is caused by the use of too much oil in the under coats and too little in the top coats.

Distemper.—New plaster-work must be quite dry before distemper is applied. The work should be stopped (that is, any irregularities filled up with plaster of Paris mixed with whiting and water to a paste) and then rubbed perfectly smooth with glass paper. Clairecole, a solution of thin size and whiting, is then applied to render the plaster non-absorbent, and this is followed by distemper of the desired colour. Distemper is made by soaking whiting in clean water to a creamy consistency. To this is added size which has been previously warmed, and the pigment required to colour the mixture; the whole is then well stirred and strained to remove any lumps. Many patent washable distempers under fancy names are now on the market in the form of paste or powder, which simply require to be mixed with water to be ready for use. If applied to woodwork distemper is apt to flake off.

The "one-knot" brush for cornices and other mouldings and the "two-knot" and "brass-bound" brushes for flat surfaces are usually employed for distempering and whitewashing.

A granular surface is produced by stippling or dabbing the surface with a stiff bristled brush specially made for this purpose.

Gilding, &c.—Very rich effects may be produced both in external and internal decorations by the judicious use of overlays of gold or silver. In their application, however, it must always be borne in mind that they are metals, not paints, and they should only be used in positions such as would be appropriate for the actual metals. "Dutch metal" and other imitations cost about one-third of the price of genuine gilding, and require to be protected from oxidization by a coat of lacquer. Gold leaf is affixed with gold size or other adhesive preparations. The best and most durable work is oil gilding, which involves less labour, and results in a richer appearance than other methods. The work is usually primed first of all with a solution of boiled linseed oil and white lead, and then covered with a fine glutinous composition called gold size, on which, when it is nearly dry, the gold leaf is laid in narrow strips with a fine brush, and pressed down with a pad of cotton-wool held in the fingers. As the slips must be made to overlap each other slightly to ensure the complete covering of the whole surface, the loose edges will remain unattached, to be afterwards struck off with a large sable or camel-hair brush. The joints, if the work be skilfully executed, will be invisible. For burnished gilding the work must be covered with various coats of gluten, plaster and bole, which last is mixed with gold size to secure the adhesion of the leaf.

AUTHORITIES.—A. C. Wright, M.A., B.Sc., *Simple Methods for Testing Painters' Materials*; Professor A. H. Church, *Colour*; Ellis A. Davidson, *House Painting, Graining, Marbling and Sign Writing*; W. J. Pearce, *Painting and Decorating*; A. S. Jennings, *Paint and Colour Mixing*; G. H. Hurst, F.C.S., *Painters, Colours, Oils and Varnishes*. (J. Br.)

PAINTING, in art, the action of laying colour on a surface, or the representing of objects by the laying of colour on a surface. It is with painting in the last sense, considered as one of the fine arts, that this article deals. In the first sense, in so far as painting is a part of the builder's and decorator's trade it is treated above under the heading PAINTER-WORK. The verb "to paint" is derived through Fr. *peindre* (*peint*, the past participle, was possibly the earliest part adopted, as is suggested in the *New English Dictionary*), from Lat. *pingere*, to paint. From the past participle *pictus* comes *pictura*, picture, and from the root *pig*, pigment. The ultimate meaning of the root is probably to decorate, adorn, and is seen in Gr. ποικίλος, many-coloured, variegated.

In Part I. of this article, after a brief notice of the general character of the art and an account of its earliest manifestations, a sketch is given of the course of its development from the ancient Egyptian period to modern times. (An account, by countries, of recent schools of painting will be found as an appendix at the end of Part III.) The point of view chosen is that of the relation of painting to nature, and it is shown how the art, beginning with the delineation of contour, passes on through stages when the effort is to render the truth of solid form, to the final period when, in the 17th century, the presentment of space, or nature in all her extent and variety, becomes the subject of representation. Certain special forms of painting characteristic of modern times, such as portraiture, genre painting, landscape, still-life, &c., are briefly discussed.

Part II. consists in tables of names and dates intended to afford a conspectus of the different historical schools of painting from the 12th century A.D. downwards.

Part III. is devoted to a comprehensive treatment of the different technical processes of painting in vogue in ancient and modern times.

AUTHORITIES.—There is one elaborate general treatise on the whole art of painting in all its branches and connexions. It is by Paillot de Montabert, and was published in Paris (1829–1850). It is entitled *Traité complet de la peinture*, and is in nine substantial volumes, with an additional volume of plates. It begins with establishing the value of rules for the art, and giving a dictionary of terms, lists of artists and works of art, &c. Vols. ii. and iii. give the history of the art in ancient, medieval and modern times. Vols. iv., v., vi. and vii. contain discussions on choice of subjects, design, composition, &c.; on proportions, anatomy, expression, drapery; on geometry, perspective, light and shade, and colour. In vol. viii., pp. 1–285 deal with colour, aerial perspective and execution; pp. 285–503 take up the different kinds of painting, history, portrait, landscape, genre, &c.; and pp. 503–661 are devoted to materials and processes, which subject is continued through vol. ix. To encaustic painting 125 pages are given, and 100 to painting in oil. A long discussion on painting grounds and pigments follows, while other processes of painting, in tempera, water-colour, enamel, mosaic, &c., are more briefly treated in about 200 pages, while the work ends with a notice of various artistic impedimenta. Vol. i., it should be said, contains on 70 pages a complete synopsis of the contents of the successive volumes. The best general *History of Painting* is that by Woltmann and Woermann (Eng. trans., London, 1880, &c.), but it does not go beyond the 16th century A.D. See also the separate articles on CHINA (*Art*), JAPAN (*Art*), EGYPT (*Art*), GREEK ART, ROMAN ART, &c.

For the Italian schools of painting may be consulted: Crowe and Cavalcaselle, *History of Painting in Italy* (2nd ed., London, 1902, &c.). The original edition was published in London under the titles *History of Painting in Italy* (3 vols., 1864–1866), and *History of Painting in North Italy* (2 vols., 1871), Venturi, *Storia dell' arte italiana* (Milan, 1901, &c.).

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For the Dutch: Wurzbach; Bode, *Studien zur Geschichte der Holländischen Malerei* (Braunschweig, 1883) and *Rembrandt und seine Zeitgenossen* (Leipzig, 1906); Havard, *The Dutch School of Painting* (trans., London, 1885).

For the French: Lady Dilke, *French Painters of the Eighteenth Century* (London, 1899); D. C. Thomson, *The Barbizon School.*

For the English: Redgrave, *A Century of Painters of the English School* (London, 1890).

For the Scottish: W. D. McKay, R.S.A., *The Scottish School of Painting* (London, 1906).

For the American: J. C. Van Dyke (ed.), *History of American Art* (New York, 1903, &c.); S. Isham, *A History of American Painting* (N. Y., 1905).

The modern schools generally are treated fully, with copious bibliographical references, by Richard Muther, *The History of Modern Painting* (2nd ed., Eng. trans., London, 1907).

PART I.—A SKETCH OF THE DEVELOPMENT OF THE ART

§ 1. *Constituents and General Character.*—If we trace back to the parent stock the various branches that support the luxuriant modern growth of the graphic art, we see that this parent stock is in its origin twofold. Painting begins on the one side in outline delineation and on the other in the spreading of a coloured coating over a surface. In both cases the motive is at first utilitarian, or, at any rate, non-artistic. In the first the primary motive is to convey information. It has been noticed of certain savages that if one of them wants to convey to a companion the impression of a particular animal or object, he will draw with his finger in the air the outline of some characteristic feature by which it may be known, and if this do not avail he will sketch the same with a pointed stick upon the ground. It is but a step from this to delineation on some portable tablet that retains what is scratched or drawn upon it, and in this act a monument of the graphic art has come into being.

In the other case there are various motives of a non-aesthetic kind that lead to the covering of a surface with a coat of another substance. The human body, the first object of interest to man, is tender and is sensitive to cold. Wood, one of the earliest building materials and the one material for any sort of boat-building, is subject, especially when exposed to moisture, to decay. Again, the early vessel of clay, of neolithic date, because imperfectly burned, is porous. Now the properties of certain substances suitable for adhesive coatings on anything that needed protection or reinforcement would soon be noticed. Unctuous and oily substances like animal fat, mixed with ashes or some such material, are smeared by some savages on their bodies to keep them warm in cold regions and to defend them against insect bites in the tropics. Wax and resin and pitch, liquefied by the heat of the sun or by fire, would lend themselves readily for the coating of wood with a substance impervious to moisture. Vitreous glazes, first no doubt the result of accident, fused over the surface of the primitive clay vessel would give it the required impermeability. This is no more art than the mere delineation which is the other source of painting, but it begins to take on itself an aesthetic character when colour plays a part in it. There are physiological reasons why the colour red exercises an exciting influence, and strong colours generally, like glittering surfaces, make an aesthetic appeal. In prehistoric times the flesh was sometimes stripped from the skeleton of a corpse and the bones rubbed with red earth or ruddle, while the same easily procured colouring substance is used to decorate the person or the implement of the savage. In this sensibility to colour we find a second and distinct origin of the art of painting.

What a perspective does a glance back at the development of painting afford! Painting, an art that on a flat surface can suggest to illusion the presence of solid forms with length, breadth and thickness; that on the area of a few square inches can convey the impression of the vast spaces of the universe, and carry the eye from receding plane to plane till the persons or objects that people them grow too minute for the eye to discern; painting that can deck the world in Elysian brightness or veil it in the gloom of the Crucifixion, that intoxicates the senses with its revelation of beauty, or magician-like withdraws the veil from the mysterious complexity of nature; the art that can exhibit all this, and yet can suggest a hundredfold more than it can show, and by a line, a shade, a touch, can stir within us " thoughts that do often lie too deep for tears "—this Painting, the most fascinating, because most illusive in its nature, of all the arts of form, is in its first origin at one time a mere display to attract attention, as if one should cry out " See here!" and at another time a prosaic answer to a prosaic question about some natural object, " What is it like?" The coat or streak or dab of colour, the informing outline, are not in themselves aesthetic products. The former becomes artistic when the element of arrangement or pattern is introduced. There is arrangement when the shape and size of the mark or marks have a studied relation to those of the surface on which they are displayed; there is pattern when they are combined among themselves so that while distinct and contrasted they yet present the appearance of a unity. Again, the delineation, serving at first a purpose of use, is not in itself artistic, and it is a difficult question in aesthetic whether any representation of nature that aims only at resemblance really comes into the domain of art. It is of course acknowledged that a mere prosaically literal likeness of a natural object is not a work of art; but when the representation is of such a kind as to bring out the character of the object with discrimination and emphasis, to give the soul of it, as it were, and not the mere lineaments, then, logically or illogically, art claims it as its child. In the strict sense the delineation only becomes artistic when there is present the element of beauty in arrangement or composition. The insight and sympathy just referred to are qualities rather intellectual than artistic, and the really artistic element would be the tasteful fitting of the representation to the space within which it is displayed, and the harmonious relations of the lines or masses or tones or colours that it presents to the eye. In other words, in artistic delineation there will be united elements drawn from both the sources above indicated. The representation of nature will be present, and so will also a decorative effect produced by a pleasing combination of forms and lines.

§ 2. *Limitations of the Meaning of the word Painting.*—If delineation take on itself a decorative character, so too decoration, relying at first on a pleasing arrangement of mere lines or patches that have in themselves no significance, soon goes on to impart to these the similitude, more or less exact, of natural objects. Here we arrive at a distinction which must be drawn at the outset so as duly to limit the field which this survey of painting has to cover. The distinction is that between ornamental or, in a narrow sense, decorative painting on the one side, and painting proper on the other. In the first, the forms employed have either in themselves no significance or have a resemblance to nature that is only distant or conventional. In painting proper the imitation of nature is more advanced and is of greater importance than the decorative effect to the eye. It is not only present but preponderant, while in ornamental work the representative element is distinctly subordinate to the decorative effect. In Greek vase decoration the conventional floral forms, or the mannered animal figures that follow each other monotonously round vases of the "Oriental" style, belong to the domain of ornament, while the human forms, say, on the earliest red-figured vases, while displayed in pleasing patterns and in studied relation to the shape and structure of the vessel, exhibit so much variety and so great an effort on the part of the artist to achieve similitude to nature, that they claim a place for themselves in the annals of the painter's art.

A further limitation is also necessary at the outset. Pictorial designs may be produced without the equipment of the painter proper; that is to say, without the use of pigments or coloured substances in thin films rubbed on to or attached by a binding material upon a surface. They may be executed by setting together coloured pieces of some hard substance in the form of *Mosaic* (*q.v.*); by interweaving dyed threads of wool, linen or silk into a textile web to produce *Tapestry* (*q.v.*) or *Embroidery* (*q.v.*); by inlaying into each other strips of wood of different colours in the work called *Tarsia* or *Marquetry* (*q.v.*); by fusing different coloured vitreous pastes into contiguous cavities, as in *Enamelling* (see ENAMEL); or by framing together variously shaped pieces of transparent coloured glass into the stained glass window (see GLASS, STAINED).

These special methods of producing pictorial effects, in so far as the technical processes they involve are concerned, are excluded from view in this article and are dealt with under their own headings. Only at those periods when pictorial design was exclusively or especially represented by work in these forms will the results of these decorative processes be brought in to illustrate the general character of the painting of the time. For example, in the 5th and 6th Christian centuries the art of painting is mainly represented by the mosaics in the churches at Rome and Ravenna, and these must be included from the point of view of design in any review of painting, though as examples of mosaic technique and style they are treated in an article apart. Greek vase painting, again, is a special subject (see GREEK ART and CERAMICS), yet the designs on early Greek vases are the only extant monuments that illustrate for us the early stages of the development of classical painting as a whole. It will be understood therefore that in this article the word "painting" means the spreading of thin films of colouring matter over surfaces to which they are made by different means to adhere, and it will only be taken in a wider sense in certain exceptional cases just indicated.

§ 3. *Importance in the Art of the Representation of Nature.*—If we regard painting as a whole, the imitation of nature may be established as its most distinctive characteristic and the guiding principle of its development. It must at the same time be understood that in the advanced criticism of painting, as it is formulated in modern times, no distinction is allowed among the different elements that go to make up a perfect production of the art. In such a production the idea, the form, the execution, the elements of representation and of beauty, and the individual expression of the artist in his handiwork, are essentially one, and none of them can be imagined as really existing without the others. It is not the case of a thought, envisaged pictorially, and deliberately clothed in an artistic dress, but of a thought that would have no existence save in so far as it is expressible in paint. This is the modern truth of the art, and the importance of the principle here involved will be illustrated in a later section, but it must be borne in mind that the painting to which this principle applies is a creation of comparatively modern times. As in music so in painting, it has been reserved for recent epochs to manifest the full capabilities of the art. Whereas the arts of architecture and sculpture, though they have found in the modern era new fields to conquer, yet grew to their full stature in ancient Hellas, those of music and painting remained almost in their infancy till the Renaissance. It was only in the 16th and 17th centuries that painters obtained such a mastery on the one hand over the forms of nature, and on the other over an adequate technique, that they were able to create works in which truth and beauty are one and the artistic speech exactly expresses the artistic idea. For this the painter had to command the whole resources of the science of perspective, linear and aerial, and all the technical capabilities of the many-sided processes of oil-paint. Till that stage in the development of the art was reached work was always on one side or another tentative and imperfect, but all through these long periods of endeavour there is one constant feature, and this is the effort of the artist to attain to truth in the representation of nature. No matter what was the character of his task or the material equipment of which he disposed, this ideal was for ever before his eyes, and hence it is that in the relation of the painter's work to nature we find that permanent feature which makes the development of the art from first to last a unity.

§ 4. *General Scheme of the Development of the Art.*—From this point of view, that of the relation of the work of the painter to nature, we may make a rough division of the whole history of the art into four main periods.

The first embraces the efforts of the older Oriental peoples, best represented by the painting of the Egyptians; the second includes the classical and medieval epochs up to the beginning of the 15th century; the third, the 15th and 16th centuries; and the fourth the time from the beginning of the 17th century onwards.

In the first period the endeavour is after truth of contour, in the second and third after truth of form, in the fourth after truth of space.

The Egyptian artist was satisfied if he could render with accuracy, and with proper emphasis on what is characteristic, the silhouettes of things in nature regarded as little more than flat objects cut out against a light background. The Greek and the medieval artist realized that objects had three dimensions, and that it was possible on a flat surface to give an indication of the thickness of anything, that is of its depth away from the spectator, as well as its length and breadth, but they cannot be said to have fully succeeded in the difficult task they set themselves. For this there was needful an efficient knowledge of perspective, and this the 15th century brought with it. During the 15th century the painter fully succeeds in mastering the representation of the third dimension, and during the next he exercises the power thus acquired in perfect freedom, producing some of the most convincing and masterly presentments of solid forms upon a flat surface that the art has to show. During this period, however, and to a more partial extent even in the earlier classical epoch, efforts were being made to widen the horizon of the art and to embrace within the scope of its representations not only solid objects in themselves, but such objects as a whole in space, in due relation to each other and to the universe at large. It was reserved, however, for the masters of the 17th century perfectly to realize this ideal of the art, and in their hands painting as an art of representation is widened out to its fullest possible limits, and the whole of nature in all its aspects becomes for the first time the subject of the picture.

§ 5. *The Place of Classical Painting in the Development of the Art.*—This limitation of classical painting to the representation of form may be challenged, for some hold that Greek artists not only attempted but succeeded in the task of portraying objects in space in due relation to each other and to the system of things as a whole, and that the scope of their work was as extended as that of the Italian painter of the 16th century. The view taken in this article will presently be justified, but a word may be said here as to Greek painting in general and its relation to sculpture. The main arguments in favour of the more exalted view of this phase of the art are partly based on general considerations, and partly on the existence of some examples which seem to show the artist grappling with the problems of space. The general argument, that because Greek sculptors achieved so much we must assume that the painters brought their art to the same level, is of no weight, because it has been already pointed out that painting and music are not in their development parallel to sculpture and architecture. Nothing, moreover, is really proved by the facts that painting was held by the ancients in higher estimation than its sister art, and that the painters gained great wealth and fame. Painting is a more attractive, more popular art than sculpture. It represents nature by a sort of trick or illusion, whereas sculpture with its three dimensions is more a matter of course. It is a puzzle how the object or scene, with its colours as well as its forms, can be made to appear on a few square inches of flat surface, and the artist who has the secret of the illusion is at once a man of mark. In Greece this was specially the case, because painting there made its appearance rather later than sculpture and so was from the first more conspicuous. Hence literary writers, when they refer to the arts generally, quote a painter rather than a sculptor. The people observed the painters, and these naturally made the most of themselves and of their art. The stories of the wealth and ostentation of some of these show that there was an atmosphere of *réclame* about the painters that must have affected the popular estimate, in an aesthetic sense, of their work. Then, too, popular criticism of painting has no standard. To the passer-by who watches the pavement artist, the result of his operations seems nature itself. "Better than I saw not who saw the truth," writes Dante (*Purg.* xii. 68) of incised outlines on a pavement, that cannot go very far in natural similitude. Vasari, though a trained artist, writes as if they "vied with nature" of certain works that, though excellent for their day, do not approach the modern type. We think ourselves that Raphael's babies are like nature till we see Correggio's, and that Venetian Venuses are "real flesh and blood" till that of Velazquez comes to prove them paint. The fact is that the expression "true to nature" is a relative one, and very little weight should be given to a merely popular or literary judgment on a question of the kind. Hence we must not assume that because ancient painting was extravagantly praised by those who knew no other, it therefore covered all the field of the art.

§ 6. *The Earliest Representative Art.*—Naturalistic design of a very effective kind appears at a very early stage of human development, and is practised among the most primitive races of the actual world, such as the Australians, the Bushmen of South Africa and the Eskimo. Of the existence of such art different explanations have been offered, some finding for the representations of natural objects motives of a religious or magical kind, while others are content to see in them the expression of a simple artistic delight in the imitation of objects of interest. The extraordinary merit, within certain limits, of this early naturalistic work can be accounted for on sociological lines. As Grosse has put it (*The Beginnings of Art*, p. 198), "Power of observation and skill with the hand are the qualities demanded for primitive naturalistic pictorial art, and the faculty of observation and handiness of execution are at the same time the two indispensable requisites for the primitive hunter life. Primitive pictorial art, with its peculiar characteristics, thus appears fully comprehensible to us as an aesthetic exercise of two faculties which the struggle for existence has developed and improved among the primitive peoples." So far as concerns the power of seizing and rendering the characteristics of natural objects, some of the earliest examples of representative art in the world are among the best. The objects are animals, because these were the only ones that interested the early hunter, but tens of thousands of years ago the Palaeolithic cave-dwellers of western France drew and carved the mammoth, the reindeer, the antelope, and the horse, with astonishing skill and spirit.

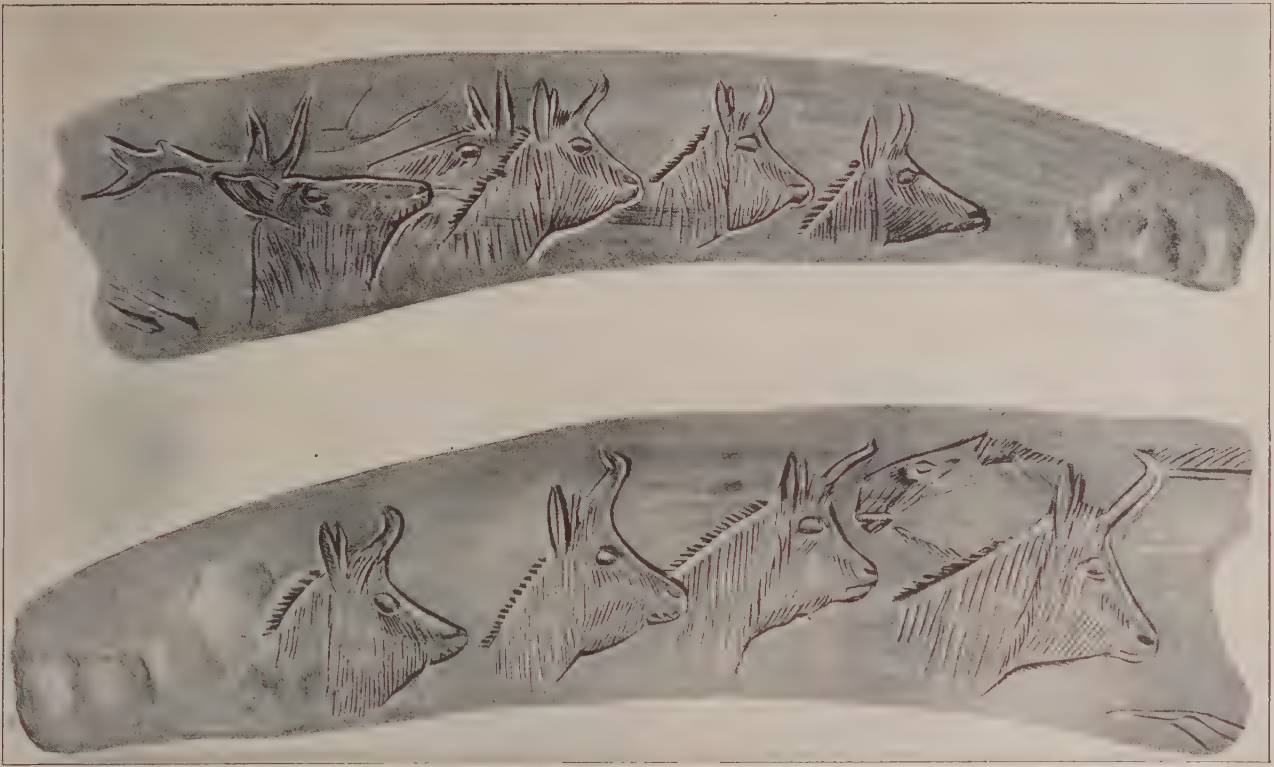
Fig. 6, Plate III., shows the famous sketch of a mammoth made by a prehistoric hunter and artist of western France. The tusks, the trunk, the little eye, the forehead, and especially the shaggy fell of the long-haired elephant, are all effectively rendered.

Figs. 1, 2 and 3, Plate I., show three examples of the marvellous series of prehistoric carvings and incised drawings, from the caves of southern France, published by the late Edouard Piette. We note especially the remarkable effort to portray a stag turning its head, and the close observation displayed in the representation of the action of a running buck.

Even more striking are the Palaeolithic paintings discovered in the cave of Altamira at Santillane, near Santander in Spain. These are less ancient than the carvings and sketches mentioned above, but they date from a time when what is now Great Britain was not yet divided from the continent by the Channel, when the climate of southern Europe was still cold, and when animals now extinct—such as the European bison—were still common. These paintings, boldly sketched in three colours, may be reckoned as some 50,000 years old. They display the same power of correct observation and artistic skill as the earlier carvings. Notice in the remarkable examples given on Plate II. the black patches on the bison's winter coat and the red colour of the hide where, with the progress of the spring, he has got rid of the long hair from the more prominent parts of his body by rubbing himself against the rocks. The impressionist character of some of these sketches is doubtless partly due to the action of time; but note how, in the case of the great boar, the artist has represented the action of the legs in running as well as standing in much the same way as might be done in a rapid sketch by a modern painter. The mystery of these astounding paintings is increased by the fact that they are found in a cave to which no daylight has ever penetrated, sometimes in places almost inaccessible to sight or reach, and that they are surrounded by symbols of which none can read the meaning (see the two lozenges in fig. 3, Plate I.).

Palaeolithic art is, however, a phenomenon remote and isolated, and in the history of painting its main interest is to show how ancient is the striving of man after the accurate and spirited representation of nature. Modern savages on about the same plane of civilization do the same work, though not with equal artistic deftness, and Grosse reproduces (*loc. cit.*, ch. vii.) some characteristic designs of Australians and Bushmen. Some of these are of single figures, but there are also "large associated groups of men and animals with the landscapes around them." The pictures consist in outlines engraved or scratched on stone or wood or on previously blackened surfaces of hide, generally, though not always, giving profile views, and are sometimes filled in with flat tints of colour. There is no perspective, except to this extent, that objects intended to appear distant are sometimes made smaller than near ones. In the extended scenes the figures and objects are dispersed over the field, without any arrangement on planes or artistic composition, but each is delineated with spirit and in essential features with accuracy.

It is a remarkable fact, but one easily explained, that when man advances from the hunter stage to a more settled agricultural life



FIGS. 1, 2.—HEADS OF CHAMOIS, &c., ENGRAVED ON THE TINES OF AN ANTLER. (FROM THE CAVE OF GOURDAN, HAUTE-GARONNE, FRANCE.)

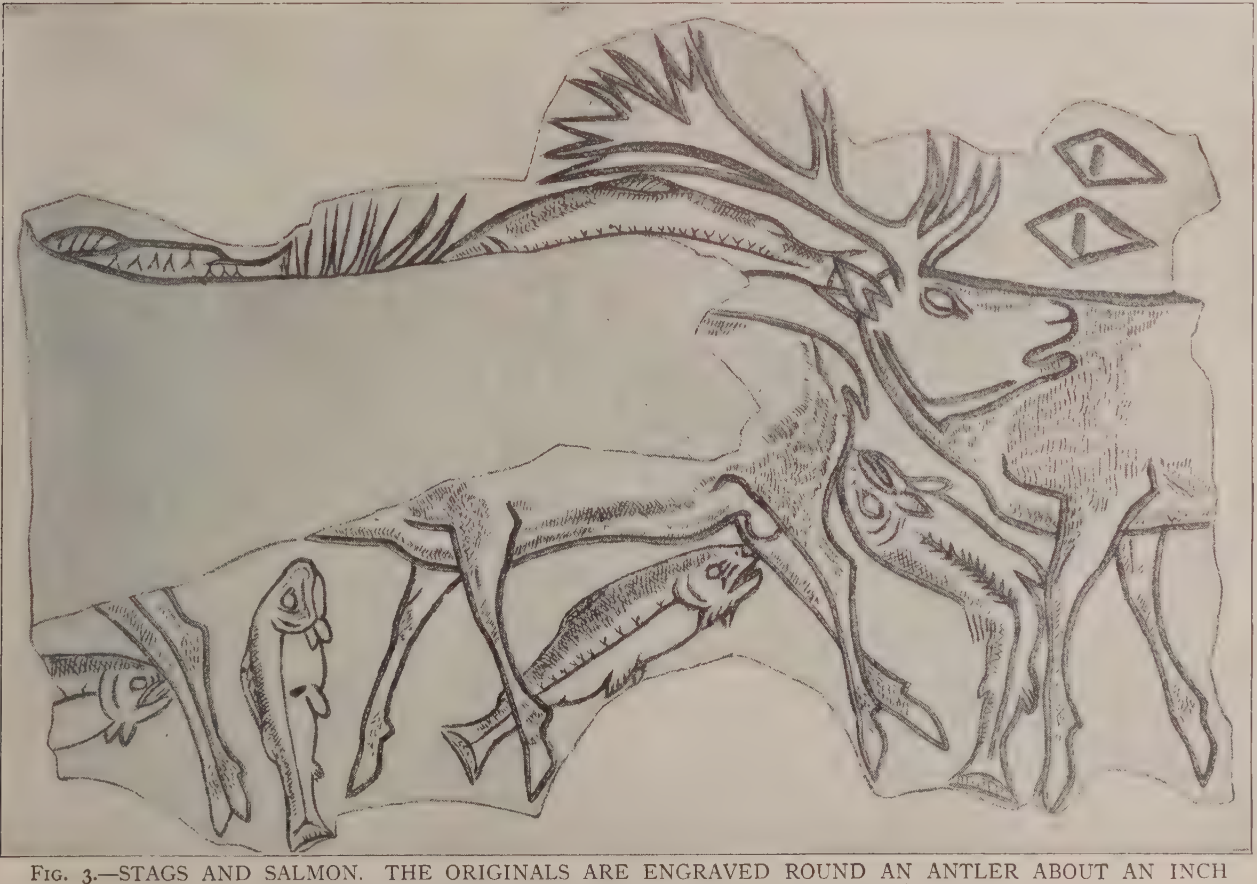


FIG. 3.—STAGS AND SALMON. THE ORIGINALS ARE ENGRAVED ROUND AN ANTLER ABOUT AN INCH IN DIAMETER. (FROM THE GROTTO OF LORTET, HAUTES-PYRÉNÉES, FRANCE.)

PREHISTORIC INCISED DRAWINGS OF ANIMALS.

Reproduced from Édouard Piette's *L'art pendant l'âge du renne* (Paris, 1907). By permission.

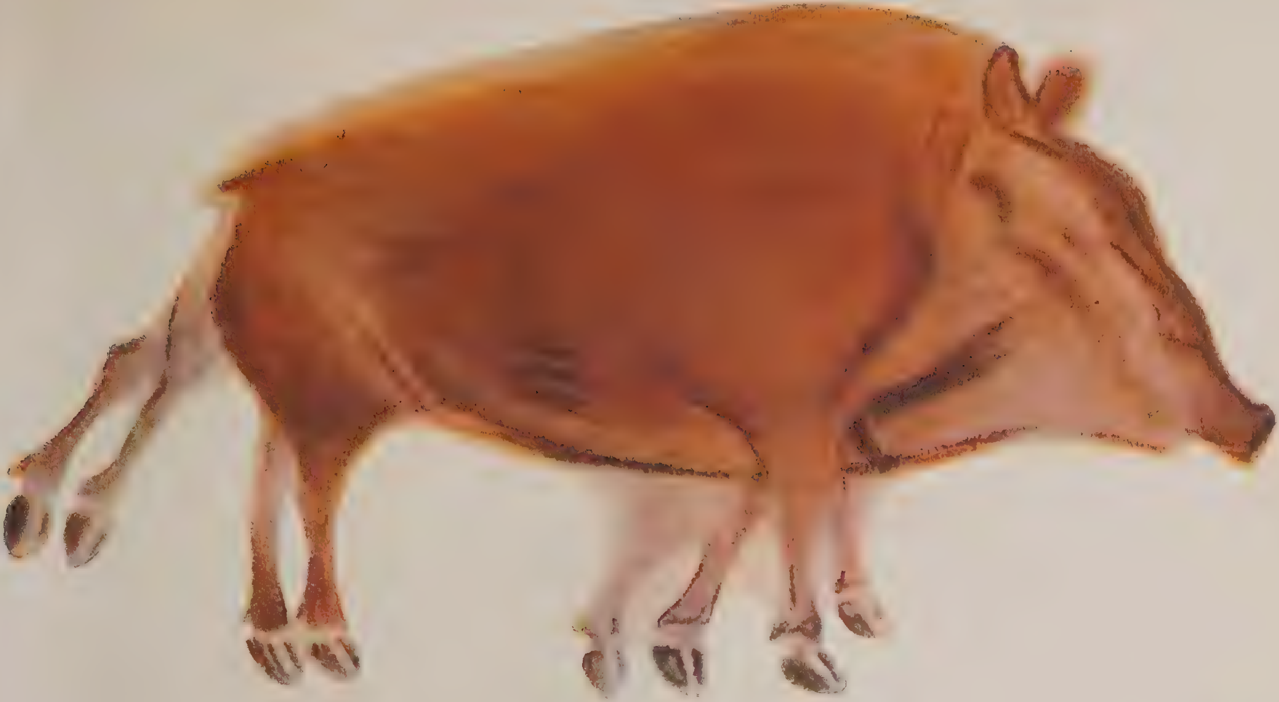


Fig. 4. WILD BOAR IN A GALLOPING AND IN A STANDING POSITION.

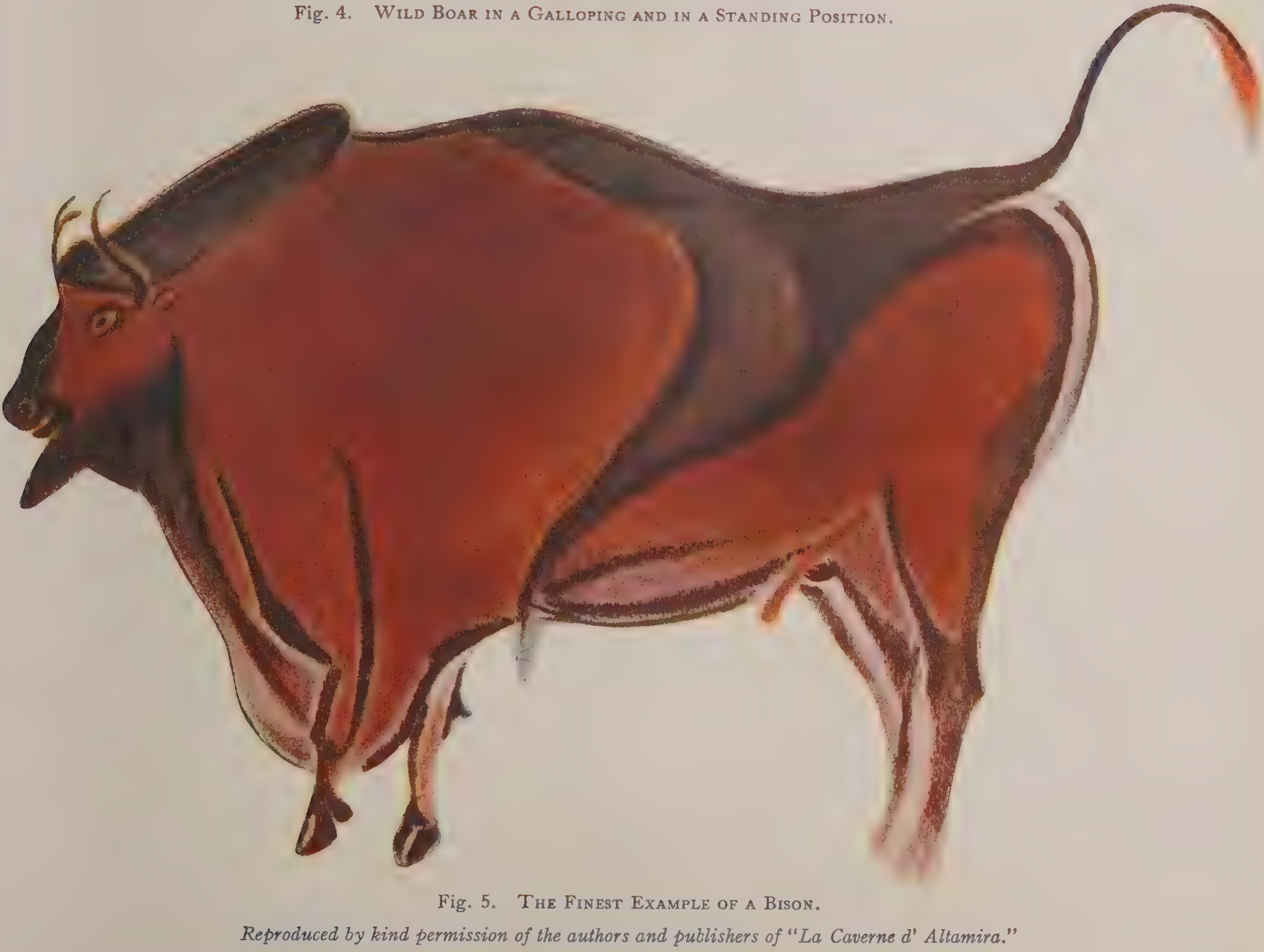


Fig. 5. THE FINEST EXAMPLE OF A BISON.

Reproduced by kind permission of the authors and publishers of "La Caverne d' Altamira."

REDUCED FACSIMILES OF PAINTINGS OF THE PALAEOLITHIC AGE FROM THE CAVE OF ALTAMIRA IN SPAIN

these spontaneous naturalistic drawings no longer appear. Neolithic man shows a marked advance on the capacity of his Palaeolithic predecessors in all the useful arts of life: his tools, his pottery, his weapons; but as an artist he was beyond comparison inferior. His attempts to draw men and beasts resulted in no more than conventional symbols, such as an intelligent child might scribble; of the Palaeolithic man's taste for design, as shown in the carved work of the caves, or of his power of reproducing nature, there is not a sign. Keenness of observation and deftness of hand are no longer developed because no longer needed for the purposes of existence, and representative art almost dies out, to be, however, revived at a further stage of civilization. At this further stage the sociological motive of art is commemoration. It is in connexion with the tomb, the temple and the palace that in early but still fully organized communities art finds its field of operations. Such communities we find in ancient Egypt and Babylonia, while similar phenomena showed themselves in old Oriental lands, such as India and China.

§ 7. *The Painting of Contour: Egypt and Babylonia.*—In ancient Egypt we find this graphic delineation of natural objects, so spontaneous and free among the hunter tribes, reduced to a system and carried out with certain well-established conventions. The chief of these was the almost universal envisagement in profile of the subject to be represented. Only in the case of subsidiary figures might a front or a back view or a three-quarter face be essayed. To bring the human figure into profile it was conventionalized, as fig. 7, Plate III., will show. The subject is an Egyptian of high rank, accompanied by his wife and son, fowling in the marshes of the Delta. It is part of a wall-painting from a tomb at Thebes dating about 1500 B.C. The head, it will be seen, is in profile, but the eye is drawn full-face. The shoulders are shown in front view, though by the outline of the breast, with its nipple, on the figure's right, and by the position far to the right of the navel, an indication is given that the view here is three-quarters. At the hips the figure is again in profile, and this is the position also of the legs. It will be observed that the two feet have the big toe on the same side, a device to escape the necessity of drawing the four toes as seen in the outside view of a foot. As a rule the action of these figures is made as clear as possible, and they are grouped in such a way that each is clearly seen, so that a crowd is shown either by a number of parallel outlines each a little in advance of the other suggesting a row seen in slight obliquity, or else by parallel rows of figures on lines one above the other. Animals are treated in the same way in profile, save that oxen will show the two horns, asses the two ears, as in front view, and the legs are arranged so that all are seen.

Within these narrow limits the Egyptian artist achieved extraordinary success in the truthful rendering of nature as expressed in the contours of figures and objects. If the human form be always conventionalized to the required flatness, the draughtsman is keen to seize every chance of securing variety. He fastens on the distinctive traits of different races with the zeal of a modern ethnologist, and in the case of royal personages he achieves success in individual portraiture. Though he could not render varieties of facial expression, he made the action of the limbs express all it could. The traditional Egyptian gravity did not exclude humour, and some good caricatures have been preserved. Egyptian drawing of animals, especially birds (see fig. 7, Plate III.), has in its way never been surpassed, and the specific points of beasts are as keenly noted as the racial characteristics of human beings. Animals, domestic or wild, are given with their particular gait or pose or expression, and the accent is always laid on those features that give the suggestion of strength or swiftness or lithe agility which marks the species. The precision of drawing is just as great in the case of lifeless objects, and any set of early, carefully-executed, hieroglyphic signs will give evidence of an eye and hand trained to perfection in the simpler tasks of the graphic art.

The representation of scenes, as distinct from single figures or groups, was not wholly beyond the Egyptian artist's horizon. His most ambitious attempts are the great battle-scenes of the period of the New Empire, when a Seti or a Rameses is seen driving before him a host of routed foemen. The king in his chariot with the rearing horses is firmly rendered in the severe conventional style, but the crowd of fugitives, on a comparatively minute scale, are not arranged in the original clear fashion in parallel rows, but are tumbled about in extraordinary confusion all over the field, though always on the one flat plane. By another convention objects that cannot be given in profile are sometimes shown in ground plan. Thus a tank with trees round it will be drawn square in plan and the trees will be exhibited as if laid out flat on the ground, pointing on each side outwards from the tank.

In Babylonia and Assyria the mud-brick walls of palaces were coated with thin stucco, and this was in the interior sometimes painted, but few fragments of the work remain. On the exterior considerable use was made of decorative bands and panels of enamelled tiles, in which figure subjects were prominent, as we learn by the passage from Ezek. xxiii., about "men pourtrayed upon the wall, the images of the Chaldeans pourtrayed with vermilion." The best idea of Assyrian graphic design is gained from the slabs carved in very low relief, which contain annalistic records of the acts of the king and his people in war and peace. The human figure is treated here in a less conventional scheme, but at the same time with less variety and in a less spirited and interesting fashion than in Egypt. Of animals far fewer species are shown, but in the portrayal of the nobler beasts, notably the horse, the lion and the mastiff, there is an element of true grandeur that we seldom find in Egyptian design. Furthermore, the carver of the reliefs had a better idea of giving the impression of a scene than his brother of the Nileland, and in his representations of armies marching and fighting he introduces rivers, hills, trees, groups of buildings and the like, all of course delineated without perspective, but in far truer and more telling fashion than is the case with the scenes from the campaigns of Egyptian conquerors.

§ 8. *Painting in Pre-historic Greece.*—A new chapter in the history of ancient painting was opened by the discovery of relics of the art in the palaces and tombs of the Mycenaean period on the coasts and islands of the Aegean. The charming naturalistic representations of marine plants and animals on the painted vases are quite unlike anything which later Greek art has to offer, and exhibit a decorative taste that reminds us a little of the Japanese. What we are concerned with, however, are rather the examples of wall-painting in plaster found at Tiryns and Mycenae and in Crete. Of the former the first to attract notice was the well-known bull from Tiryns, represented in profile and in action, and accompanied by a human figure; but of far greater importance, because foreshadowing an advance in the pictorial art, are certain wall-paintings discovered more recently by Dr Evans at Cnossos in Crete. The question is not of the single figures in the usual profile view, like the already celebrated "Cup-bearer," however important these may be from the historical side, but of the so-called "miniature" wall-paintings that are now preserved in the museum at Candia, in which figures on a small scale are represented not singly but in crowds and in combination with buildings and landscape features that seem to carry us forward to far more advanced stages of the art of painting. To borrow a few sentences from Dr Arthur Evans's account of them on their first discovery (*Annual of British School at Athens*, vi. 46): "A special characteristic of these designs is the outline drawing in fine dark lines. This outline drawing is at the same time combined with a kind of artistic shorthand brought about by the simple process of introducing patches of reddish brown or of white on which groups belonging to one or other sex are thus delineated. In this way the respective flesh-tints of a series of men or women are given with a single sweep of the brush, their limbs and features being subsequently outlined on the background thus obtained." There is here, it is true, no perspective, but there is a distinct effort to give the general effect of objects in a mass, which corresponds curiously with the modern development of the art of painting called "impressionism."

§ 9. *The Painting of Form: Ancient Greece and Italy.*—As is well known, this early civilization in the Greek world of the second millenium B.C. was almost completely swept away, probably by the political cataclysm of about 1000 B.C. known as the Dorian Migration. Hellenic art proper, in its historical continuity, represents a new start altogether and the beginnings of it need not be sought earlier than about 800 to 700 B.C. The art of painting had then completely lost touch with the graceful naturalism and with the broad generalization of the "Aegean" period, and is represented by figure designs on the so-called "geometric" or "Dipylon" vases of the most primitive kind. For a long time Greek painting is chiefly represented by work on the vases, but that this may be regarded as in the strict sense painting is shown by the fact that tablets or panels (*pinakes*) that would certainly be called pictures were being painted at the same time by the same technical methods, and in some cases by the same craftsman, as the vases. As Klein remarks (*Euphronios*,[2] p. 252), "the most ancient material for Greek painting is clay in the form of the vase as well as of the pinax." Now we find in Pliny's account of the beginnings of Greek painting (*Nat. Hist.* xxxv. 15 seq.) certain stages indicated in the development of technique, and we are able to illustrate these stages from vases which correspond more or less in their chronological order with the succession of the stages in Pliny. The correspondence is not exact, and there are difficulties in the way of interpreting the statements from the monuments, but the two are certainly to be brought into connexion. According to Pliny the order of development seems to be (1) outlines; (2) [a] outlines filled in with flat tints, or [b] outlines with linear inner markings but no colour. Outline drawing is obviously always the first stage in the graphic art regarded as delineation, not decoration. The flat tints without inner markings are found on "Dipylon" vases of 800–700 B.C., and as for the inner markings, though there is a difficulty in the exact interpretation of Pliny's words, yet inner markings in the form of lines scratched on these silhouettes make their appearance very early. Two further stages are indicated by Pliny as the introduction of a red colour and the distinction between male and female figures by a painter named Eumarus of Athens. This would be by the use of white, which with red, an oxide of iron, appears on vases of about 600 B.C. Eumarus is also said to have "ventured to imitate all kinds of figures," and we cannot fail here to be reminded of the marvellous François vase at Florence (fig. 8, Plate III.) of the first half of the 6th century, which is of large size and is decorated with a wealth of figure designs from mythological sources that are among the most remarkable productions of the graphic art in existence. Human figures and animals are there displayed in an extraordinary variety of poses and illustrating all kinds of scenes, and the execution shows a firmness of hand and patience in the rendering of details to which no praise can do justice. The inner markings are rendered by lines with the most scrupulous care and finish. Cimon of Cleonae is said to have followed Eumarus with certain improvements which are of the utmost significance for the future of the art in Greece. He is said to have introduced four innovations: (a) "Catagrapha," which Pliny explains as "profile figures" but which must mean something more than this, seeing that profiles had been in use from the first. "Foreshortenings" is a possible and an intelligible rendering which moreover corresponds with what is further ascribed to him; (b) the representation of "countenances in different positions, looking backwards or upwards or downwards." The other improvements, in giving (c) the details of anatomy and (d) "the wrinkles and folds of drapery," are not of so much importance as such advance is normal and necessary. The introduction of foreshortened views is the matter of real moment, for this is the point at which Greek painting parts company with the older oriental traditions, and enters on a course of its own which leads directly to all the modern developments of the art.

The words of Pliny explaining the term "catagrapha" can be aptly illustrated from the vase paintings connected with the name of Epictetus. Epictetus was the leading figure among a company of Athenian vase decorators of the last decades of the 6th century B.C. and the beginning of the 5th, who usher in the period of the most gifted and original masters of the craft. Their work is marked by efforts to give to the human figure a vigour and expressiveness it had never before attained, and to gain their end they essay all sorts of novel and difficult problems in drawing. In connexion with Pliny's words, Klein remarks (*Euphronios*, p. 47) that on their vases "the running figures look behind them; those that are jumping, revelling or fighting look up; the lifting or bending ones look down." Some of the best vases decorated by this set of artists, who are the first to use the so-called "red-figured" technique instead of painting as the older masters had done in black on red, are for qualities of strength, variety and animation unequalled by any of their successors of the later periods, yet it is significant of the whole character of this ancient painting that they are always conspicuously more successful with profiles and objects in an upright plane at right angles to the line of sight than with any forms which involve foreshortening or perspective. They are masters of contour but are still struggling for the full command over form, and it is noteworthy that the generation of these greatest of the vase-painters had passed away before these difficulties of foreshortening had been conquered.

We have now followed on the vases the development of Greek painting up to about the time of the Persian wars, and it must be noted that in other forms, as on terra-cotta tablets or pinakes, on the flat edges of sarcophagi in the same material, and occasionally on marble slabs or stelae, the same technical characteristics are to be observed. Of painting on a monumental scale Greece proper has hitherto shown no trace, yet at this very juncture, in the decades immediately after the Persian wars, there suddenly makes his appearance one of the greatest representatives of monumental wall-painting known to the annals of the art. This is Polygnotus, who, with some worthy associates, displayed on the walls of public buildings at Athens and at Delphi a series of noble compositions on a large scale that won the admiration of the whole Hellenic community.

To find any remains of mural painting that may seem to lead up to Polygnotus and his school we have to pass beyond the bounds of Greece proper into Italy, where, alike in the Greek and Etruscan cities and also at Rome, painting in this form was practised from an early date. Pliny mentions paintings at Ardea older than the city of Rome, and some very ancient ones at Caere. Two sets of early paintings, not actually on walls but on terra-cotta slabs meant for the coating of walls, have come to light in recent times at Cervetri, the ancient Caere, some of which, in the British Museum, were dated by the late A. S. Murray at about 600 B.C. (*Journal of Hellenic Studies*, x. 243), while others in the Louvre may be about half a century later. True wall-paintings, of possibly a still earlier date and certainly of more primitive design, were found in the Campana tomb at Veii (Dennis, *Etruria*, ch. i.). The paintings from Caere are executed on a white or yellowish "slip" in a few simple colours, and exhibit single figures in a frieze-like arrangement with little attempt at action and none at grouping. The flesh of the women is left the colour of the white ground, that of the men is painted a ruddy hue. To the 6th, and first half of the 5th century, belong wall-paintings in Italian tombs, which, whether in Greek cities or in Etruscan, show distinct signs of Hellenic influence. Some of these wall-paintings (*Antike Denkmäler*, ii., Taf. 41–43) show considerable liveliness in colouring and in action, and a freedom and gaiety in female costume that remind us of what we read about the painting of Polygnotus (*q.v.*). The place of this great painter in the general history of the graphic art is given to him for his ethical greatness and the austere beauty of his single figures, which ancient writers extol. All we have to do here is fix his place in the development of painting by noting the stage at which he had arrived in the representation of nature.

The wall-paintings of Polygnotus and his school must have exhibited a large number of figures powerfully characterized in action and expression, not in a confused mass nor summarized as at Cnossus, nor grouped together as in a modern composition,

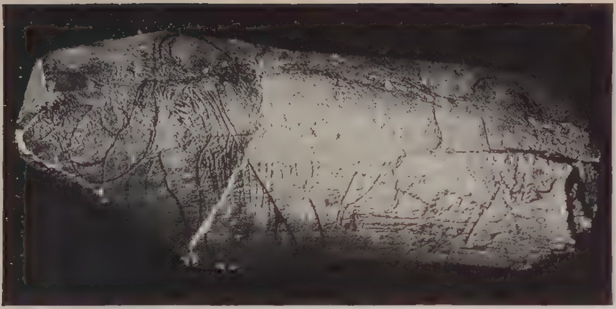
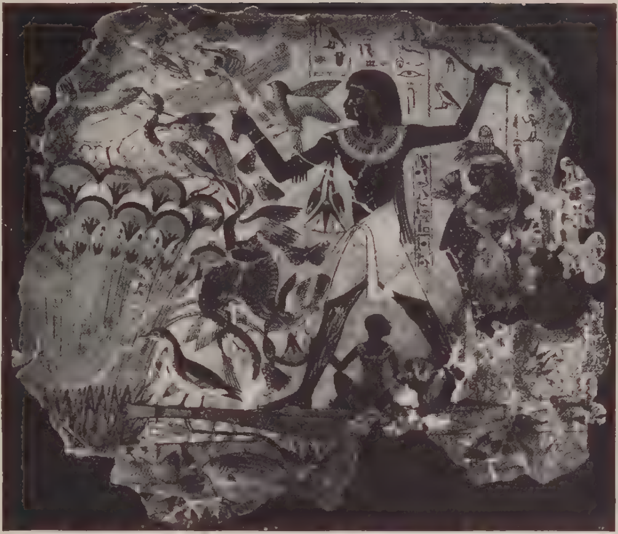
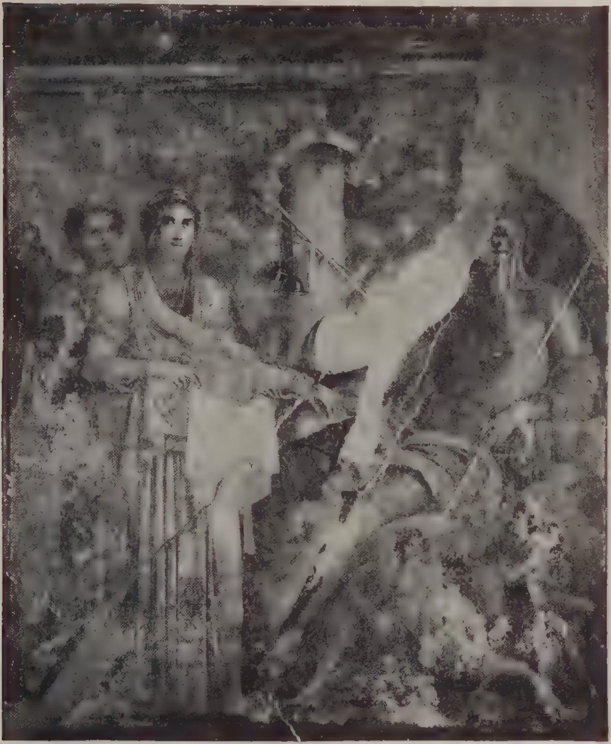


FIG. 6.—PREHISTORIC DRAWING OF A MAMMOTH.



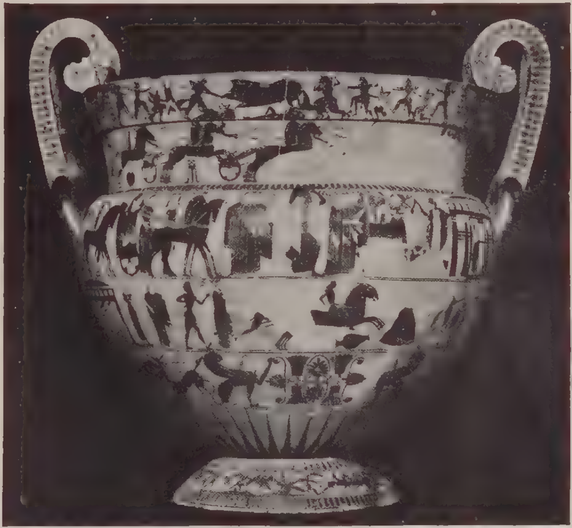
Photo, W. A. Mansell & Co.

FIG. 7.—EGYPTIAN FOWLING IN THE DELTA.



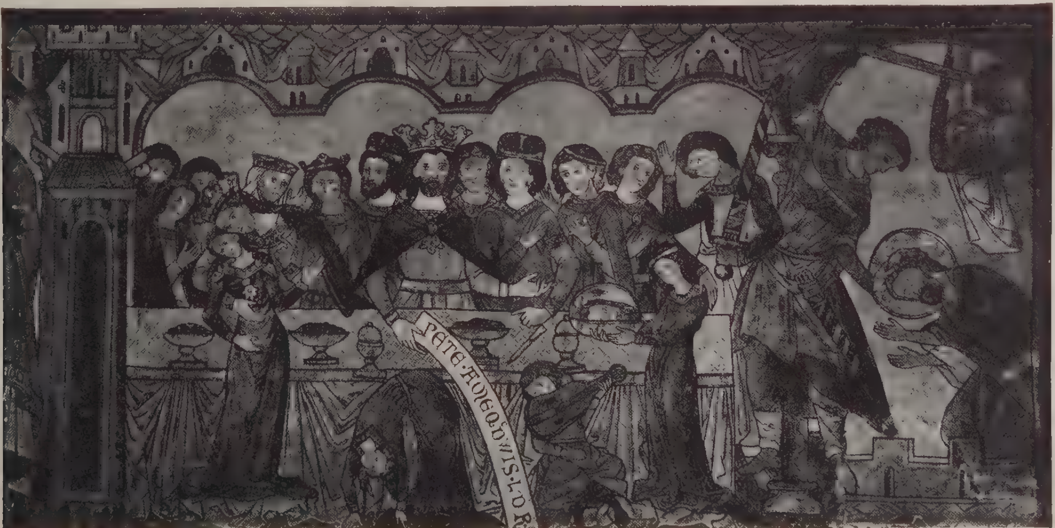
Photo, Alinari.

FIG. 10.—ZEUS AND HERA. POMPEIAN WALL PAINTING.



Photo, Alinari.

FIG. 8.—FRANÇOIS VASE. Florence.



PETE AHOGO VIS L D R

Photo, W. A. Mansell & Co.

FIG. 11.—HEROD'S BIRTHDAY FEAST. WALL PAINTING IN CATHEDRAL AT BRUNSWICK.

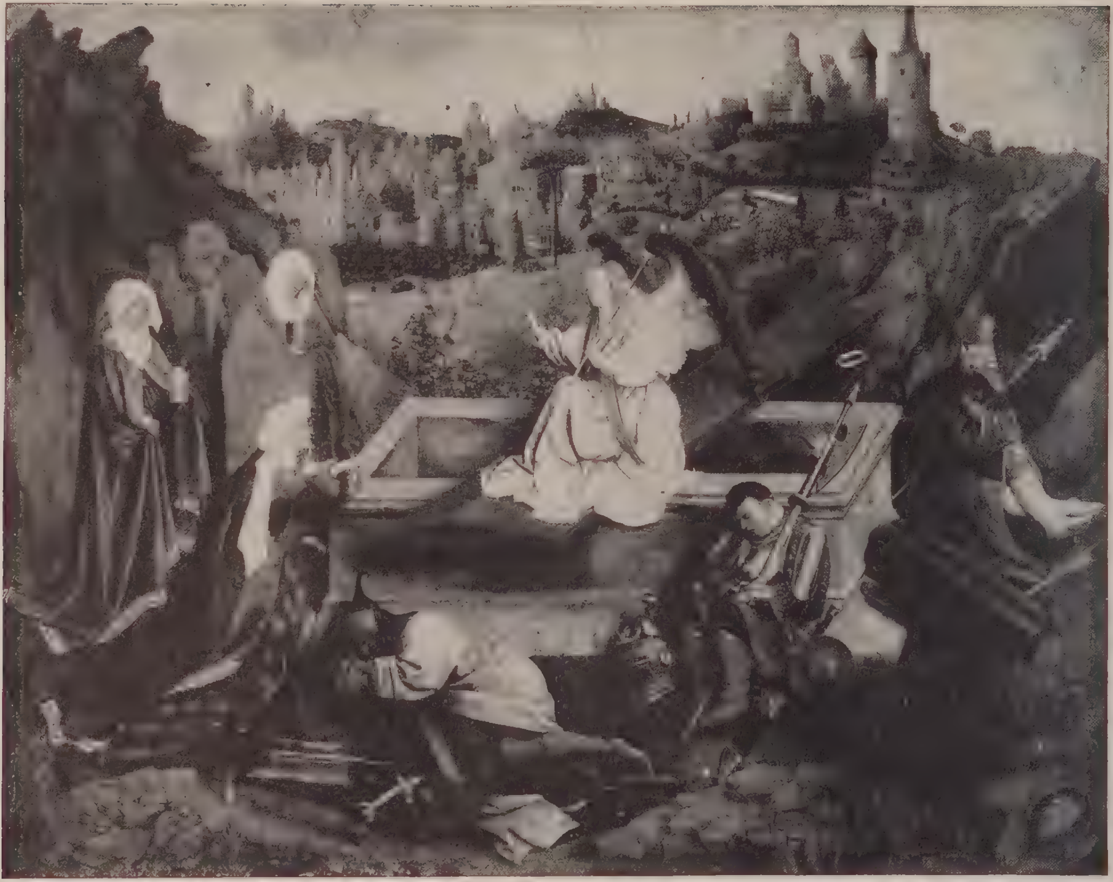


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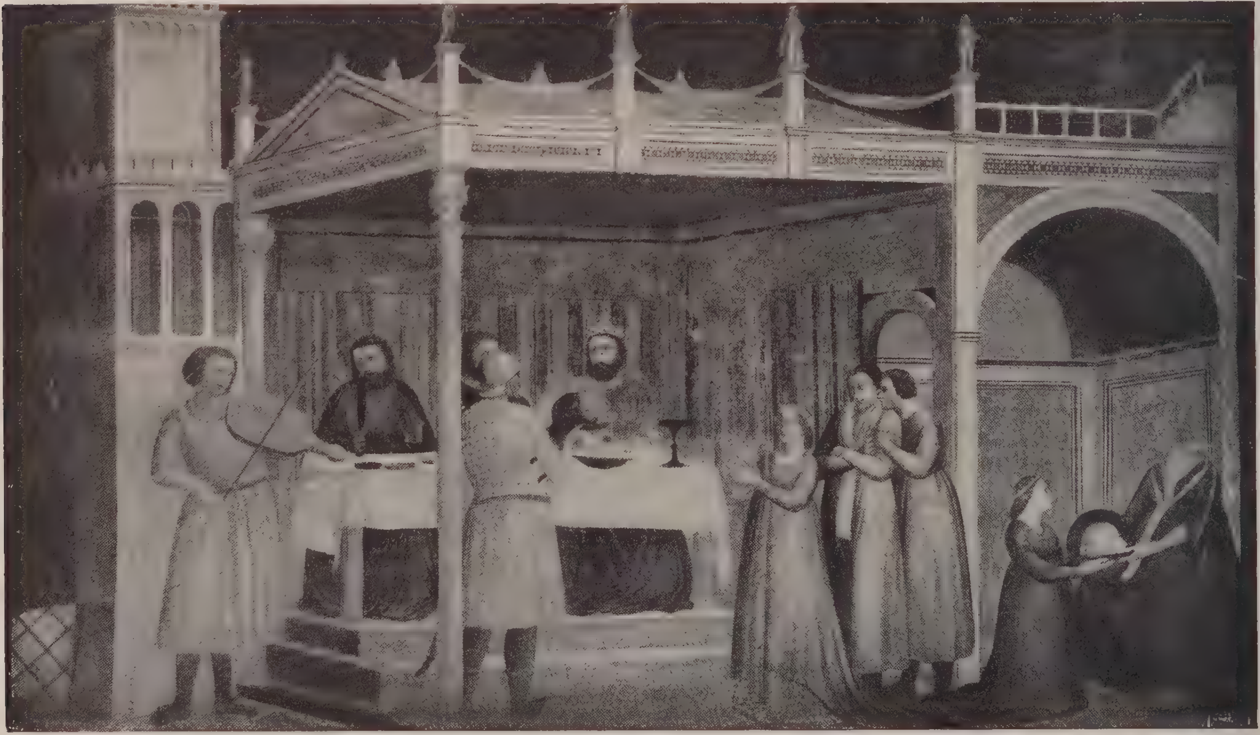
FIG. 12.—THE MARIES AT THE SEPULCHRE, HUBERT VAN EYCK (?). (28 × 35.)



Photo, Alinari.

FIG. 13.—HEROD'S BIRTHDAY FEAST, GIOTTO.

nor yet arranged in formal rows one above the other, but distributed at different levels on the one plane of the picture, the levels being distinguished by summary indications of a landscape setting. Parts of some of the figures were hidden by risings of the ground. The general effect is probably represented by the paintings on the vase in the Louvre shown in fig. 9, one side of which exhibits the destruction of the children of Niobe, and the other the Argonauts. Simplicity in design and ethical dignity in the single forms are here unmistakable.

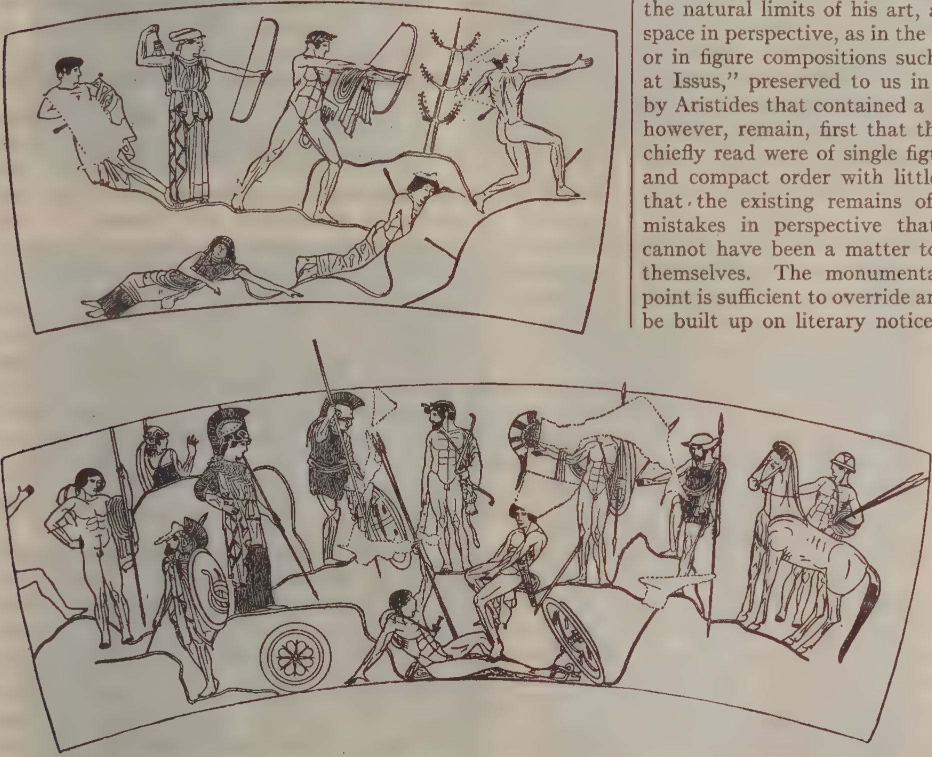


FIG. 9.—Vase painting in the Louvre, illustrating the style of Polygnotus.

It is probable that Polygnotus had not fully mastered the difficulties of foreshortening with which the early "red-figure" masters were struggling, but later designs both on vases and elsewhere do show that in the 4th century at any rate these had been overcome. The drawing on the so-called Ficoronian Cista, and on the best of the Greek mirror-backs, may be instanced. The ancients recognized that in the latter part of the 5th century B.C. painting made a great technical advance, so that all that had gone before seemed archaic, while for the first time "the gates of art" were opened and the perfect masters entered in. The advance is in the direction of the representation not of form only but of space, and seems from literary notices to have implied a considerable acquaintance with perspective science. The *locus classicus*, one of great importance, is in Vitruvius. In the preface to his seventh book he writes of Agatharcus, a painter who flourished at Athens in the middle and third quarter of the 5th century, that he executed a scene-painting for Aeschylus, and wrote a treatise upon it which inspired the philosophers Democritus and Anaxagoras to take up the subject, and to show scientifically from the constitution of the eye and the direction of rays of light how it was possible *in scenic paintings to give sure images of objects otherwise hard to fix correctly, so that when such objects were figured on an upright plane at right-angles to the line of sight some should appear to recede and others to come forwards.* It would not be easy to summarize more aptly the functions of perspective, and if philosophers of the eminence of those just mentioned worked out these rules and placed them at the disposal of the artists, the transition from ancient to modern painting should have been accomplished in the 5th century B.C., instead of just two thousand years afterwards! So far however as the existing evidence enables us to judge, this was not actually the case, and in spite of Agatharcus and the philosophers, painting pursued the even tenor of its way within the comparatively narrow limits set for it by the genius of ancient art (see GREEK ART). It may be admitted that in many artistic qualities it was beyond praise. In beauty, in grace of line, in composition, we can imagine works of Apelles, of Zeuxis, of Protogenes, excelling even the efforts of the Italian painters, or only matched by the finest designs of a Raphael or a Leonardo. In the small encaustic pictures of a Pausias there may have been all the richness and force we admire in a Chardin or a Monticelli. We may even concede that the Greek artist tried at times to transcend the natural limits of his art, and to represent various planes of space in perspective, as in the landscape scenes from the *Odyssey*, or in figure compositions such as the "Alexander and Darius at Issus," preserved to us in a mosaic, or the "Battle-piece" by Aristides that contained a hundred combatants. The facts, however, remain, first that the Greek pictures about which we chiefly read were of single figures, or subjects of a very limited and compact order with little variety of planes; and second, that the existing remains of ancient painting are so full of mistakes in perspective that the representation of distance cannot have been a matter to which the artists had really set themselves. The monumental evidence available on the last point is sufficient to override arguments to the contrary that may be built up on literary notices. No competent artist, or even teacher of drawing, who examines what is left of ancient painting, can fail to see that the problem of representing correctly the third dimension of space, though it may have been attacked, had certainly not been solved. It is of no avail to urge that these remains are not from the hands of the great artists but of mere decorators. In modern times the mere decorator, if he had passed through a school of art, would be as far above such childish blunders as a Royal Academician. We have only to consider dispassionately the photographic reproductions from ancient paintings (Herrmann, *Denkmäler der Malerei des Altertums*, Munich, 1906, &c.) to see that the perspective researches of the philosophers had not resulted in a general comprehension among the artists of the science of receding planes. For example, in the famous wall-painting of "Zeus and Hera on Mount Ida" in the House of the Tragic Poet at Pompeii, the feet of the standing figure of the goddess are nearer to the spectator than the seat of her lord, but the upper part of her form is away on the farther side of him (see fig. 10, Plate III.). No one who could draw at all would be capable now of such a mistake. In interiors the perspective of the rafters of a roof, of a table, a stool, a throne, is in most cases faulty; and the scale of the figures seems often to be determined rather by their relative importance in the scene than by their position on the planes of the picture. In the Pompeian landscape-piece of "Paris on Mount Ida" (Herrmann, No. 8) there is no sense of the relative proportions of objects, and a cow in the foreground is much smaller than Paris, who is a long way back in the composition.

It is an additional confirmation of this view to find early Christian and early medieval painting confined to the representation of the few near objects, which the older Oriental artists had all along envisaged. If classical painters had really revolutionized design, as it was actually revolutionized in the 15th century of our era, and had followed out to their logical consequence the innovations of Agatharcus, we may be sure that the influence of these innovations would not have been wholly lost even in the general decline of the arts at the break-up of the Roman Empire of the West. In any case, the influence would have survived in Byzantine art, where there was no such cataclysm. Yet we fail to see in the numerous pictorial miniatures from the 5th century onwards, or in the mosaics or the wall-paintings of the same epoch, any more effective grasp of the facts of the third dimension of space than was possessed by the pre-classical Egyptian.

All through the middle ages, therefore, the facts concerning painting with which we are here concerned remain the same, and the art appears almost exclusively concerned with the few selected objects and the single plane. The representation is at most of *form* and not of *space*.

§ 10. *Early Christian and Early Medieval Painting.*—The extant remains of early Christian painting may be considered under three heads: (1) the wall-paintings in the catacombs; (2) the pictorial decorations in books; (3) the mosaic pictures on the walls of the churches. (1) The first are in themselves of little importance, but are of historical interest as a link of connexion between the wall-painting of classical times and the more distinctively Christian forms of the art. They are slightly executed and on a small scale, the earliest, as being more near to classical models, are artistically the best. (2) That form of painting devoted to the decoration and illustration of books belongs more to the art of ornament than to painting proper (see ILLUMINATED MSS. and ILLUSTRATION). (3) Early Christian mosaics are noble monuments of the graphic art, and are its best representatives during the centuries from the 5th to the 8th. A dignified simplicity in design suits their large scale and architectural setting, and the aim of the artist is to present in forms of epic grandeur the personages of the sacred narratives. They are shown as in repose or engaged in some typical but simple action; the backgrounds being as a rule plain blue or gold and the accessories of the simplest possible description. The finest Christian mosaic is also the earliest. It is in the apse of S. Pudentiana, Rome, and displays Christ enthroned as teacher with the Apostles seated on each side of Him. It may date from the 4th century. Next to this the best examples are at Ravenna, in the tomb of Galla Placidia, the Baptistery, S. Apollinare Nuovo and S. Vitale, dating from the 5th and 6th centuries. The picture in the baptistery of the "Baptism of Christ" is the most artistic piece of composition and pictorial effect, and next to this comes the "Good Shepherd" of the tomb of Galla Placidia. The finest single figures are those of the white-robed saints between the windows of the nave of S. Apollinare Nuovo, and the most popular representations are the two processions of male and female saints lower down on the same walls. The famous mosaics in S. Vitale depicting Justinian and Theodora with courtiers in attendance, though historically interesting, are designed in a wooden fashion, and later mosaics at Palermo, Venice, Rome and other places are as a rule rather decorative than pictorial. Where the costly material of glass mosaic was not available, the churches of this period would show mural paintings on plaster of much the same design and artistic character, though comparatively ineffective.

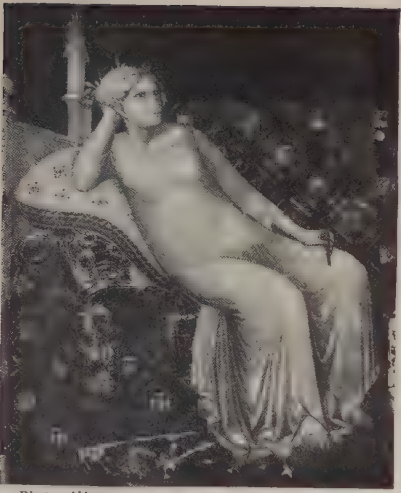
In monumental painting the interval between the early Christian mosaics and mural pictures and the revival of the 13th century is filled by a series of wall and ceiling paintings of Carolingian, Romanesque and early Gothic date, in Italy, Germany and England. The earliest of which account need be taken are those in the recently excavated church of S. Maria Antiqua by the Forum at Rome (Rushworth, in *Papers of the British School at Rome*, vol. i., London, 1902), where there is a complete and, on the whole, well-preserved series consisting for the most part in single figures and simply composed scenes. Most of the work can be dated to the time of Pope John VII. at the beginning of the 8th century. Its style shows a mixture of Byzantine motives with elements that are native to Rome. It must be remembered that at the time Rome was strongly under Byzantine influence. Passing over some more fragmentary specimens, we may refer next to several series of mural paintings in and near the island of Reichenau at the western end of the lake of Constance, where a school of painting flourished in the latter part of the 10th century. The work here is quite as good as anything Italy has to show, and represents a native German style, based on early Christian tradition, with very little dependence on Byzantine models. The most interesting piece is the "Last Judgment" in the church of St George at Oberzell on Reichenau, where, in a very simple but dignified and effective form, we find the earliest existing representation of this standard theme of later medieval monumental art (F. X. Kraus, *Wandgemälde der St Georgskirche zu Oberzell auf der Insel Reichenau*, Freiburg-i.-Br., 1884).

About a hundred years later, in the latter part of the 11th century, a mural painting of the same theme was executed in the church of S. Angelo in Formis near Capua in southern Italy, the style of which shows a mixture of Latin and Byzantine elements (F. X. Kraus, *Die Wandgemälde von S. Angelo in Formis*, Berlin, 1893).

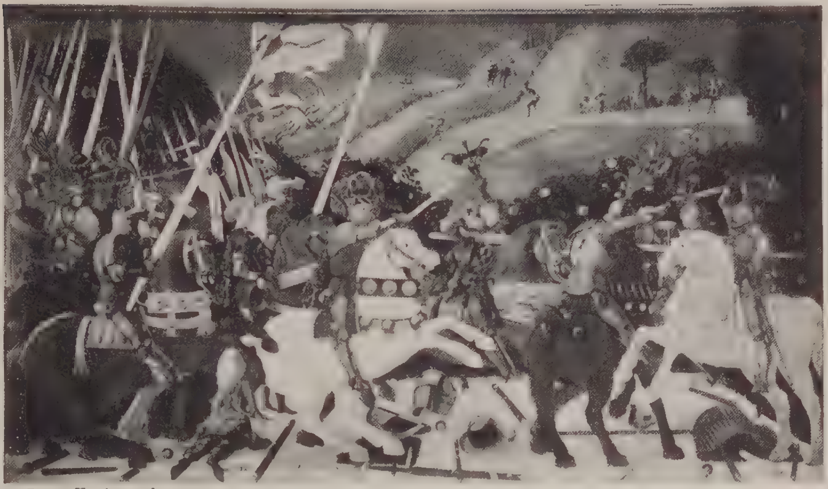
To the middle of the 12th century belongs one of the most complete and interesting cycles of medieval wall-decoration, the display of a series of figures and scenes illustrating the eleventh chapter of Hebrews, in the chapter-house of the now secularized monastery of Brauweiler, near Cologne, in the Rhineland. Here the pictorial effect is simple, but the decorative treatment in regard to the filling of the spaces and the lines of composition is excellent. The design is Romanesque in its severity (E. Aus'm Weerth, *Wandmalereien des Mittelalters in den Rheinlanden*, Leipzig 1879). Romanesque also, but exhibiting an increase in animation and expressiveness, is the painting of the flat ceiling of the nave of the fine church of St Michael at Hildesheim. In the general decorative effect, the distribution of the subjects in the spaces, the blending of figures and ornament, the work, the main subject of which is the Tree of Jesse, is a masterpiece. Two nude figures of Adam and Eve are for the period remarkable productions. The date is the close of the 12th century.

Succeeding examples show unmistakable signs of the approach of the Gothic period. In the wall-paintings of the nuns' choir of the church of Gurk in Carinthia, a certain grace and tenderness begin to make themselves felt, and the same impression we gain from the extensive cycle in the choir of the cathedral of Brunswick, from the first decades of the 13th century. The picture of Herod's birthday feast is typical of the style of German painting of the time; there is nothing about it in the least rude or tentative. It is neither childish nor barbarous, but very accomplished in a conventional style that is exactly suited from the decorative point of view to a mural painting. The story is told effectively but in quaint fashion, and several incidents of it are shown in the same composition. There is no attempt to represent the third dimension of space, nor to give the perspective setting of the scene, but the drawing is easy and true and expressive. The studied grace in the bend of certain figures and the lively expressions of the faces are traits which prefigure Gothic art (see fig. 11, Plate III.).

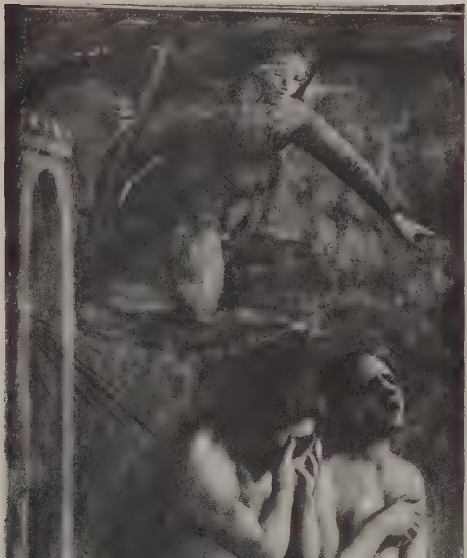
Distinctively Gothic in their feeling were the wall-paintings in the chapel at Ramersdorf, opposite Bonn, dating from the beginning of the 14th century. They are only preserved in copies, but these enable us to see with what grace and feeling the slender figures were designed, how near to Angelico's came the tender angels making music where the virgin is receiving her celestial crown (E. Aus'm Weerth, *loc. cit.*). From the end of the 14th century, Castle Runkelstein, near Botzen in Tirol, has preserved an extensive cycle of secular wall-paintings, much repainted, but of unique interest as giving an idea how a medieval residence of the kind might be adorned. The style is of native growth and no influence from south of the Alps is to be discerned (Janitschek, *Geschichte der deutschen Malerei*, Berlin, 1890, 198 seq.). Technically speaking, all these mural paintings consist in little more than outlines filled in with flat tints, neither modelling of the forms nor perspective effect in the setting is attempted, but the work so far as it goes is wholly satisfactory. There is no coarseness of execution nor anything in the forms,



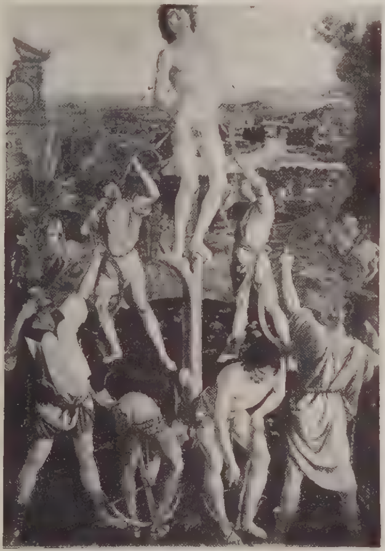
Photo, Alinari.
FIG. 14.—PEACE, LORENZETTI. Siena.



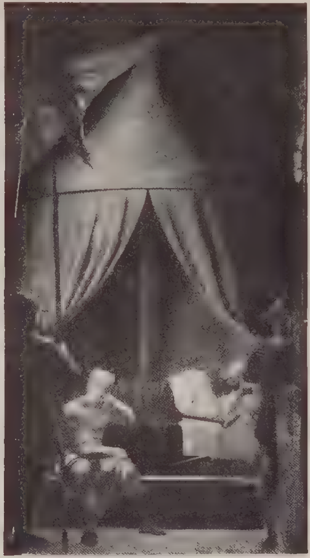
Photo, Hanfstaengl.
FIG. 16.—BATTLE OF S. EGIDIO, UCCELLO. (72 × 125.) National Gallery, London.



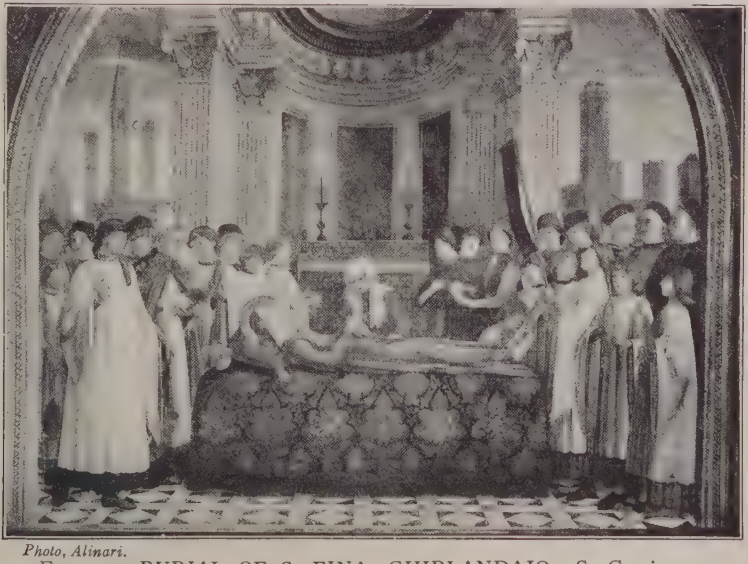
Photo, Alinari.
FIG. 15.—THE EXPULSION FROM EDEN, MASACCIO.



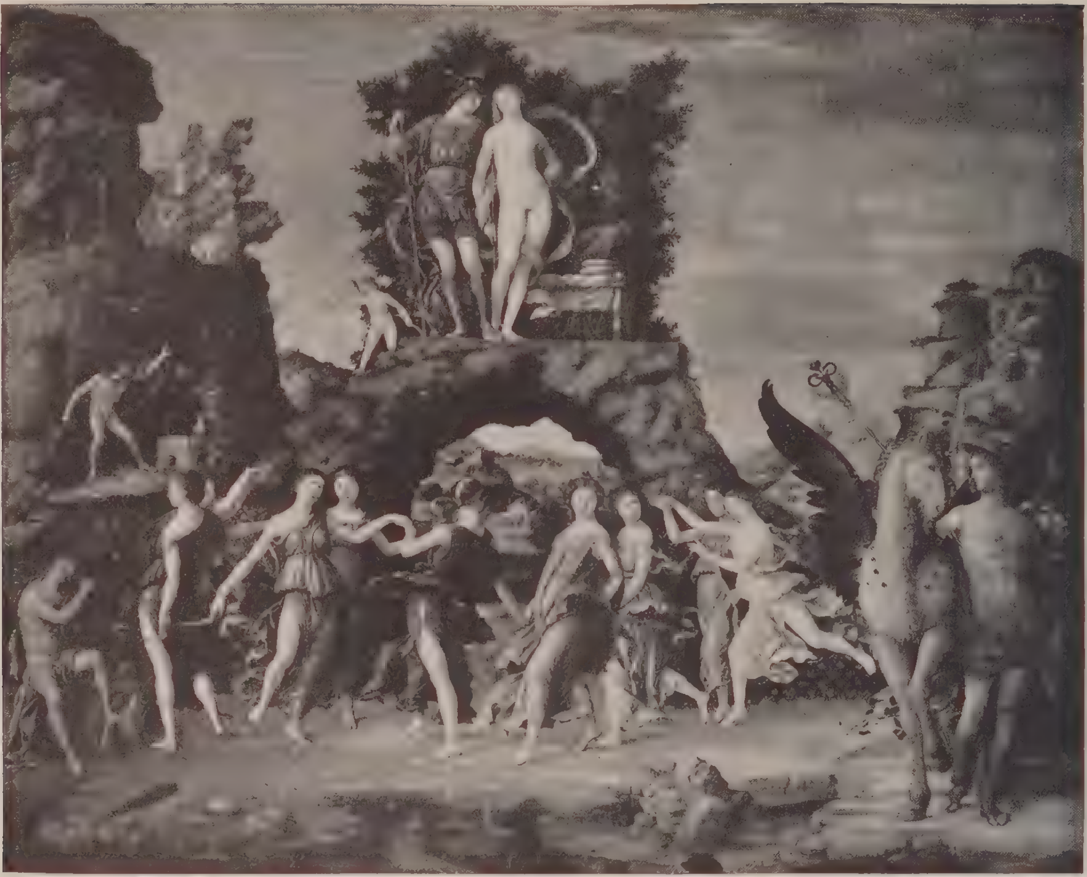
Photo, Hanfstaengl.
FIG. 17.—MARTYRDOM OF S. SEBASTIAN, POLLAIUOLO. (114 × 79½.) National Gallery, London.



Photo, Alinari.
FIG. 18.—THE DREAM OF CONSTANTINE, PIERO DELLA FRANCESCA. Arezzo.

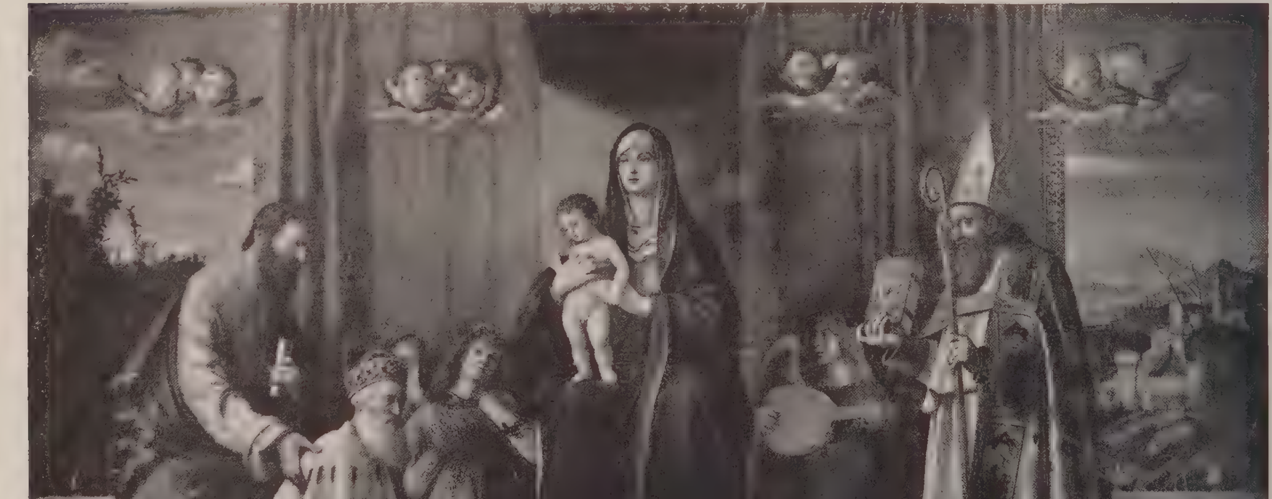


Photo, Alinari.
FIG. 19.—BURIAL OF S. FINA, GHIRLANDAJO. S. Gemignano.



By permission of Braun, Clément & Co., Dornach (Alsace) and Paris.

FIG. 20.—DANCE OF THE MUSES, MANTEGNA. (64 × 77.) Louvre.



Photo, Anderson.

FIG. 21.—ALTARPIECE AT MURANO, BELLINI. Figures almost Life-size.

gestures or expressions that offends the eye. The colours are bright and pure, the decorative effect often charming.

In the matter of panel paintings on wood, we have the interesting notice in Bede that Abbot Benedict of Wearmouth at the end of the 7th century brought from Italy portable pictures on wooden panels for the decoration of his church, part of which still remains. The style of the painting on these, it has recently been noticed, would resemble the existing wall-paintings of the beginning of the 8th century in S. Maria Antiqua in Rome, already referred to. Movable panel pictures in the form of representations of the Madonna and Child were produced in immense numbers at Byzantium and were imported largely into Italy, where they became of importance in connexion with the revival of painting in the 13th century. As a rule, however, paintings on panel were not movable but were attached to a screen, a door, or similar structure of wood consisting in framing and panels. This form of decoration is of special importance as it is really the origin of the modern picture. The painted panel, which at first forms an integral part of an architecturally designed structure of wood, gradually comes to attract to itself more and more importance, till it finally issues from its original setting and, emancipated from all relations to its surroundings, claims attention to itself as an independent work of art.

Painted panels in an architectural setting were used for the decoration of altar-fronts or *antependia*, of altar-backs or, as they are commonly called, altar-pieces, choir-screens, doors of presses and the like; or again for ceilings. There was painting also on the large wooden crucifixes displayed in churches, where a picture of Christ on the Cross might take the place of the more life-like carved image. In Italy painted panels were used as decoration of furniture, notably of the large carved chests or *cassoni* so common at the epoch of the Renaissance.

Examples of early medieval date do not appear to have survived. In Germany, where, as has been noticed, the arts in the 11th and 12th centuries stood at a higher level than in Italy or elsewhere in the west, certain *antependia* or altar-fronts from Soest in Westphalia of the 12th century are said to be the earliest known examples of German panel painting. One is preserved in the museum at Berlin. A little later the number of such panels introduced as part of the decoration of altar-backs, generally with folding doors, becomes very great. Painted panels as part of the decoration of screens are preserved in the choir at Cologne from the middle of the 14th century. In Italy the painted crucifix shared popular favour with the imported or imitated Byzantine Madonna-panels. A good example of the early painted altar-screen is preserved in Westminster Abbey.

Later, in the 15th century, the painted panel, generally with a single figure of a saint, becomes a common part of the carved, painted and gilded chancel screen in English churches, and many specimens are still to be seen, especially in East Anglia.

§ 11. *Beginnings of the Picture: German and Early Flemish Panel Painting.*—From the decorative panels introduced into wooden screen-work was developed in Germany and Flanders the picture proper, the mural painting passing out of use owing to the prevalence in the north of Gothic architecture, which does not admit of wall spaces for the display of pictures, but substitutes as a form of painting the stained-glass window. In Italy, where Gothic was treated as a plaything, the wall spaces were never sacrificed, and in the development of the art the mural picture took the lead, the painted panel remaining on the whole of secondary importance.

Priority in this development of the picture is claimed in Germany for the school of Prague, where a gild of painters was founded in 1348, but the first northern school of painting that influenced other schools and plays a part in the history of painting as a whole is the so-called school of Cologne, where painters such as Meister Wilhelm and Hermann Wynrich achieved reputation in the 14th century, and produced as their successor in the 15th Stephan Lochner, author of the so-called " Dombild " in the cathedral, and of the " Virgin of the Priests' Seminary." A little later than the earliest Cologne masters appears Hubert van Eyck, born near Maestricht at no great distance from the Rhineland capital, who with his younger brother, Jan, heads the Early Flemish school of painting. Hubert is one of the great names in the history of the art, and is chiefly responsible for the altar-piece of the " Adoration of the Lamb " at Ghent, the most important masterpiece of the northern schools before the 17th century, and the earliest monument of the then newly developed art of oil painting. Table No. I. in Part II. of this article gives the names of the chief successors of the Van Eycks, and the school ends with the life and work of Quintin Matsys of Antwerp, in the first quarter of the 16th century. The spirit of the early Cologne school, and in the main of that of Flanders, is idyllic and devotional, but the artists of the latter school achieve extraordinary force and precision in their representation of the facts of nature. They are, moreover, the first painters of landscape, for in their hands the gold background of the medieval panels yields place to a rendering of natural scenery and of effects of distance, minute in details and fresh and delightful in feeling. The famous picture ascribed by some to Hubert van Eyck in the collection of Sir Francis Cook at Richmond is a good example. The subject is the " Three Maries at the Sepulchre," and the background is a wonderful view of a city intended for Jerusalem (see fig. 12, Plate IV.).

In Germany, on the other hand, the tendency of the 15th century was towards a rather crude realism in details, to which the higher artistic qualities of beauty and devotional sentiment were often sacrificed. This is a new phenomenon in the history of the art. In the older Oriental, the classical and the medieval phases of painting, though there is a constant effort to portray the truth of nature, yet the decorative instinct in the artist, his feeling for pattern, was a controlling element in the work, and the representation was conventionalized into a form that satisfied the ideal of beauty current at the time. Jan van Eyck was matter-of-fact in his realism, but avoided ugliness, whereas in Germany in the 15th and 16th centuries we find action and expression exaggerated to contortion and grimace, and all artistic qualities sacrificed to a mistaken idea of force. German art was, however, saved by the appearance of some artists of great genius who more than made up for the national insensibility to beauty by their earnestness and truth. Martin Schongauer of Colmar learnt his art from the painters of the Flemish Netherlands, and imbibed something of the feeling for beauty which the successors of Hubert van Eyck had never wholly lost. After Schongauer German art culminates at Nuremberg in the person of Albrecht Dürer, and a little later in that of Hans Holbein the younger. Contemporary with Dürer, Mathias Grunewald of Colmar exhibits a dramatic power in his creations that compensates for their exaggerated realism, and Bartholomäus Bruyn, of Cologne, prefigures the future success of the northern schools in portraiture. In Germany, however, the wars of religion in the 16th century checked the further growth of a national art. Holbein's migration to England is a significant sign of this, and German art in this phase of it may be said to come to an end in the person of Adam Elsheimer of Frankfort, who introduced German painting at Rome about the year 1600.

In the Netherlands the early religious school ends, as we have seen, with Quintin Matsys, and the next generation of Flemish painters for the most part practise their art in Italy, and import Italian fashions into the painting of their own country. From the ranks of these so-called Italianizers in the Flanders of the 16th century proceeds a little later the commanding personality of Rubens.

§ 12. *The Rise of Schools of Painting.*—The expression " school of painting " has more than once been used; what is the meaning of it? The history of painting has hitherto been treated in the article as a development that proceeded according to a natural law of evolution in independence of individuals. In painting, however, as in all the higher operations of the arts, the initiative of the individual counts for much, and the action and reaction on each other of individuals, and those groups of individuals whom common aims and practice draw together into schools, make up for us a good part of the interest of the historical study of painting. At certain periods this particular interest has been lacking. In ancient Egypt, for example, and among the older Oriental peoples generally, schools of painting in the modern sense did not exist, for the arts were carried on on traditional lines and owed little, so far as records tell, to individual initiative. In ancient Greece, on the contrary, we find ourselves at once in an atmosphere of names and achievements which give all the glamour of personal and biographical interest to the story of art. In the early Christian and early medieval periods, we return again to a time when the arts were practised in the same impersonal fashion as in the oldest days, but with the later medieval epoch we emerge once more into an era where the artist of genius, with his experiments and triumphs, his rivals and followers, is in the forefront of interest; when history is enlivened with anecdote, and takes light and shade from the changing fortunes of individuals.

There is a danger lest the human interest of such a period may lead us to forget the larger movements, impersonal and almost cosmic, which are all the time carrying these individuals and groups forward on their destined course. The history of painting cannot be understood if it be reduced to a notice, however full, of separate "schools" or to a series of biographies, fascinating as these may be made, of individual artists. Hence in what follows it is still the main course of the development of the art in its relation to nature that will be kept in view, while the information about names and dates and mutual relations of artists and schools, which is in its own way equally important, will be furnished in the tables constituting Part II. of this article.

What has just been said will prepare the reader for the fact that the first schools of painting here mentioned are those of Germany and Flanders, not those of Italy, though the latter are more important as well as actually prior in point of time.

§ 13. *The Gothic Movement and the Proto-Renaissance, in their Influence on Painting north and south of the Alps.*—The revival of the arts of sculpture and painting in the Italy of the last part of the 13th century was an event of capital importance, not only for that country but for the west at large. Its importance has, however, been exaggerated, when it has been said to imply the rediscovery of the arts after a period in which they had suffered an entire eclipse. So far as Italy is concerned, both sculpture and painting had in the previous period sunk to a level so low that they could hardly be said to exist, but at the same epoch in lands north of the Alps they were producing works of considerable merit. Romanesque wall-painting of the 12th century, as represented in some Rhineland churches and cloisters, is immeasurably better than anything of the same period south of the Alps. In the arts of construction and ornament the lead remained for a long time with the northern peoples, and in every branch of decorative work with the exception of mosaic the craftsmanship of Germany and France surpassed anything that native Italian workmen could produce. By the middle of the 12th century the intellectual and social activity of the French people was accompanied by an artistic movement that created the most complex and beautiful architectural monuments that the world has seen. The adornment of the great French Gothic cathedral was as artistically perfect as its fabric was noble. For one, at any rate, of the effects at which the painter aims, that of glowing and sumptuous colour, nothing can surpass the stained-glass windows of the Gothic churches, while the exteriors of the same buildings were enriched with hundreds of statues of monumental dignity endowed with a grace and expressiveness that reflect the spirit of the age.

The Gothic age in France was characterized by humanity, tenderness and the love of nature, and there are few epochs in human history the spirit of which is to us more congenial. The 12th century, which witnessed the growth of the various elements of culture that combined to give the age its ultimate character, saw also a movement of revival in another sphere. The reference is to what has been aptly termed a "Proto-Renaissance," the characteristic of which was a fresh interest in surviving remains of classical antiquity. In more than one region of the west, where these remains were specially in evidence, this interest manifested itself, and the earliest sign of it was in Provence, the highly Romanized part of southern Gaul known *par excellence* as the "Provincia." To this is due the remarkable development of decorative sculpture in the first decades of the 12th century, which gave to that region the storied portals of St Gilles, and of St Trophime at Arles. Somewhat later, in the early part of the 13th, those portions of southern Italy under the direct rule of the emperor Frederick II. presented a similar phenomenon that has been fully discussed by M. Bertaux in his *L'Art dans l'Italie méridionale* (Paris, 1904). There were other centres of this same movement, and a recent writer enumerates no fewer than seven. The Gothic movement proper depended in no degree on the study of the antique, and in art the ornamental forms which express its spirit are naturalistic, not classical, while the fine figure sculpture above referred to is quite independent of ancient models, which hardly existed in the central regions of France where the Gothic movement had its being. Still the proto-Renaissance can be associated with it as another phase of the same awakening of intellectual life that marked the 12th century. Provence took the lead in the literary revival of the time, and the artistic movement that followed on this was influenced by the fact of the existence in those regions of abundant remains of classical art.

The Gothic movement was essentially northern in its origin, and its influence radiated from the Île de France. What has been described as the idyllic grace, the tenderness, that mark the works of the early Cologne school, and to some extent those of the early Flemings, were Gothic in their origin, while the feeling for nature in landscape that characterizes van Eyck, and the general tendency towards a realistic apprehension of the facts of things, may also be put down to the quickening of both thought and sympathy due to the Gothic movement. Hence it is that the northern schools of painting are noticed before the Italian because they were nearer to the source of the common inspiration. All the lands of the West, however, exhibit, each in its own special forms, the same stir of a new intellectual, religious and artistic life. In Italy we meet with the same phenomena as in France, a proto-Renaissance, first in southern Italy and then, as we shall presently see, at Rome and at Pisa, and a religious and intellectual movement on Gothic lines that was embodied in the attractive personality of St Francis of Assisi. Francis was as perfect an embodiment of the Gothic temper as St Louis himself, and in his romantic enthusiasm, his tenderness, his humanity is in spirit more French than Italian.

§ 14. *The Rise of the Italian Schools of Painting.*—The revival of the arts in Italy in the latter part of the 13th century was the outcome of the two movements just noticed. The art of Niccola Pisano is now recognized as a phase of the proto-Renaissance of southern Italy, whence his family was derived. It represents a distinct advance on the revived classical sculpture of Provence or Campania because Niccola's artistic personality was a strong one, and he gives to his work the impress of the individual of genius. Throughout its history Italian art depends for its excellence on this personal element, and Niccola's achievement is epoch-making because of his personal vigour, not because he reinvented a lost art. Towards the end of the 13th century, painting began to show the results of the same renewed study of antique models, and here again the revival is connected with the names of gifted individuals. Among these the most noteworthy are the Roman Pietro Cavallini and Duccio di Buoninsegna of Siena. The condition of painting in Italy in late medieval days has already been indicated. Cavallini and Duccio now produce, in two standard forms of the art, the mural painting of the "Last Judgment" and the enthroned Madonna with angels—works characterized by good taste, by largeness and suavity of treatment, and by an execution which, if still somewhat primitive and laboured, at any rate aims at beauty of form and colour. The recently uncovered fresco of the Last Judgment by Cavallini, executed about 1293 on the western wall of S. Cecilia in Trastevere at Rome, is classical in feeling and represents an immense advance on the older rendering of the same subject in S. Angelo in Formis (see § 10). The vast enthroned Madonna in the Rucellai chapel of S. Maria Novella at Florence, ascribed by Vasari to Cimabue, is now assigned by many to Duccio of Siena, and presents similar attractive qualities. Cimabue, a Florentine contemporary of Cavallini and Duccio, is famed in story as the chief representative of the painting of this period, but we possess no certain works from his hand except his mosaic at Pisa. His style would probably correspond to that of the painters just mentioned. His chief importance for our purpose resides in the fact that he was the teacher of the Florentine Giotto.

If the artists just referred to represent a revived classicism rather than a fresh and independent study of nature, Giotto is essentially a creation of the Gothic movement and his close association with the Franciscan cycle of ideas brings this fact into clearer relief. Giotto is in no way dependent on the study of the antique, but relies on his own steady and penetrating outlook upon man and upon nature. He is Gothic in his humanity, his sympathy, his love of truth, and he incorporates in his own person many of the most pleasing qualities of Gothic art as it had already manifested itself in France, while by the force of his own individual genius he raises these qualities to a higher level of artistic expression.

In the work of Giotto painting begins to enter on its modern era. The demonstrative element permanently takes the preeminence over the more decorative element we have called pattern-making. Though the pattern is always present, the elements of it become of increasing value in themselves as representations of nature, and the tendency henceforward for a couple of centuries is to exaggerate their importance so that the general decorative effect becomes subordinate. Giotto's greatness depends on the gift he possessed for holding the balance even among opposed artistic qualities. If he was interesting and convincing as a narrator, he had a fine eye at the same time for composition and balanced his masses with unerring tact. Neither he nor any of the Florentine frescoists had much sense of colour, and at this stage of the development of painting compositions of light and shade were not thought of, but in line and mass he pleases the eye as much as he satisfies the mind by his clear statement of the meaning and intention of his figures and groups.

In putting these together he is careful above all things to make them tell their story, and primitive as he is in technique he is as accomplished in this art as Raphael himself. Moreover, he holds the balance between the tendency, always so strong among his countrymen as among the Germans, to over-emphasis of action and expression, and the grace and self-restraint which are among the most precious of artistic qualities. He never sacrifices beauty to force, nor on the other hand does he allow his sense of grace of line to weaken the telling effect of action or grouping. A good example of his style, and one interesting also from the comparative standpoint, is his fresco of "Herod's Birthday Feast" in S. Croce at Florence (fig. 13, Plate IV.). We contrast it with the earlier wall-painting of the same subject in the cathedral at Brunswick (fig. 11, Plate III.). Giotto has reduced the number of actors to the minimum necessary for an effective presentation of the scene, but has charged each figure with meaning and presented the ensemble with a due regard for space as well as merely for form. The flatness of the older work has already been exchanged for an effective, if not yet fully correct, rendering of planes. The justice of the actions and expressions will at once strike the observer.

The Florentine school as a whole looks to Giotto as its head, because he embodies all the characteristics that made it great; but at the same time the artists that came after him in most cases failed by over-emphasis of the demonstrative element, and sacrificed beauty and sentiment to vigour and realism. The school as a whole is markedly intellectual, and as a result is at times prosaic, from which fault Giotto himself was saved by his Gothic tenderness and romance. His personality was so outstanding that it dominated the school for nearly a century. The "Giotteschi" is a name given to a number of Florentine painters whose labours cover the rest of the 14th century among whom only one, Andrea di Cione, called Orcagna, lifted himself to any real eminence.

At Siena the Gothic movement made itself felt in the next artistic generation after that of Duccio. Its chief representative was Simone Martini. With him Sienese art takes upon itself a character contrasting markedly with the Florentine. It is on the demonstrative side less intellectual, less vigorous, less secular; and a dreamy melancholy, a tenderness that is a little sentimental, take the place of the alertness and force with which the personages in Florentine frescoes are endued. On the other hand, in decorative feeling, especially in regard to colour, Sienese painting surpasses that of the Florentines. Simone was followed by a number of artists who answered to the Florentine "Giotteschi" and carry on the style through the century, but as Florence produces an Orcagna, so at Siena about the middle of the 14th century there appear in the brothers Lorenzetti two artists of exceptional vigour, who carry art into new fields. Ambrogio Lorenzetti, the younger of the brothers, is specially represented by some frescoes in the Public Palace at Siena of a symbolical and didactic kind, representing Good and Bad Government. from which is selected a figure representing Peace (fig. 14, Plate V.). Sienese sentiment is here very apparent. Simone Martini's masterpiece had been a great religious fresco of an edifying kind on the wall of the chapel, and now in the rooms devoted to the secular business of the city Lorenzetti covers the walls with four large compositions on the subject named.

The painters of the Sienese school were on the whole faithful to the style indicated, and later on in the century they extend the boundaries of their school by spreading its influence into the hill country of Umbria. In the cities of this region Taddeo di Bartoli, one of the best of the followers of Simone, worked about the end of the century, and early Umbrian art in consequence exhibits the same devotional character, the same dreaminess, the same grace and decorative charm, that are at home in Siena.

Elsewhere in Italy the art of the 14th century represents a general advance beyond the old medieval standard, but no outstanding personality made its appearance and there was nothing that can be strictly termed a revival. At Rome, where on the foundation of the noble design of Cavallini there might have been reared a promising artistic structure, the removal early in the 14th century of the papal court to Avignon in France led to a cessation of all effort.

§ 15. *The Fifteenth Century, and its Influence on the Development of Painting at Florence.*—We come now to what was indicated in § 4 as the third of the main periods into which the history of painting may be divided. It is that in which, by the aid of the new agency of perspective, truth of form was for the first time perfectly mastered, and an advance was made in the rendering of the truth of space.

The opening of the 15th century in Italy is the most important epoch in the whole history of painting, for it was the real beginning of the modern era. Here Florence, the first home of Renaissance culture, unmistakably assumes the lead, and the new era is again opened by the agency of an individual of genius. The father of modern painting is the Florentine Masaccio. He not only advanced the art in those qualities in which Giotto had already made it great, but pointed the way towards the representation of the third dimension of objects and of space as a whole which had for so long been almost ignored. His short life course, for he died before he was thirty, only allowed him to execute one work of the first importance, the frescoes in the Brancacci chapel of the Carmine at Florence. There in the "Tribute Money" he told the story with all Giotto's force and directness, but with an added power in the creation of exalted types of human character, and in the presentation of solid shapes that seem to live before us. In the "Expulsion from Eden" he rose to greater heights. In the whole range of demonstrative art no more convincing, more moving, figures have ever been created than those of our first parents, Adam veiling his face in his hands, Eve throwing back her head and wailing aloud in agony, while in the foreshortened form of the angel that hovers above we discern the whole future development of the art for a century to come (see fig. 15, Plate V.). Above all qualities in Masaccio's work we are impressed with the simplicity and the ease of the work. The youthful artist possessed a reserve of power that, had he lived, would have carried him at one bound to heights that it took his actual successors in the school well nigh a century to climb.

The 15th century at Florence presents to us the picture of a progressive advance on the technical side of art, in the course of which various problems were attacked and one by one vanquished, till the form of painting in the style recognized in the school was finally perfected, and was then handed on to the great masters of expression, such as Raphael and Michelangelo, who used it as the obedient instrument of their wills. The efforts of the artists were inspired by a new intellectual and social movement of which this century was the scene. If the Gothic movement in the 14th century had inspired Giotto and Simone Martini, now it was the revived study of the antique, the true Renaissance, that was behind all the technical struggles of the artists. Painting was not, however, directly and immediately affected by the study of antique models. This was only one symptom of a general stir of intellectual life that is called by the apt term "humanism." In the early Gothic epoch the movement had been also in the direction of humanity, that is to say, of softness in manners and of the amenities and graces of life, but it was also a strictly religious movement. Now, in the 15th century, the inspiration of thought was rather pagan than Christian, and men were going back to the ideas and institutions of the antique world as a substitute for those which the Church had provided for thirty generations. The direct influence of these studies on art was chiefly felt in the case of architecture, which they practically transformed. Sculpture was influenced to a lesser degree, and painting least of all. It was not till the century was pretty far advanced that classical subjects of a mythological kind were adopted by artists like Botticelli and Piero di Cosimo, the first figures borrowed from the antique world being those of republican worthies displayed for purposes of public edification.

The elements which the humanistic movement contributed to Florentine art are the following: (1) The scientific study of perspective in all its branches, linear and aerial, including the science of shadows. (2) Anatomy, the study of the nude form both at rest and in action. (3) Truth of fact in details in animate and inanimate subjects. (4) The technique of oil painting. It must be observed that in this work the Florentines were joined by certain painters of Umbria, who were not satisfied with the Umbro-Sienese tradition already spoken of, but allied themselves with the leaders of the advance who were fighting under the banner of Masaccio.

Of the studies mentioned above by far the most important was that of perspective. Anatomy and realism in details only represented an advance along the lines painting had been already following. The new technique of oil painting, though of immense importance in connexion with the art as a whole, affected the Florentines comparatively little. Their favourite form of painting was the mural picture, not the self-contained panel or canvas for which the oil medium was specially designed, and for mural work fresco remained always supreme (see Part III., § 35). In this mural work the introduction of scientific perspective effected something like a transformation. The essence of the work from the decorative point of view had been its flatness. It was primarily pattern-making, and nature had been represented by contours which stood for objects without giving them their full dimensions. When the artist began to introduce varying planes of distance and to gain relief by light and shade, there was at once a change in the relation of the picture to the wall. It no longer agreed in its flatness with the facts of the surface of which it formed the enrichment, but opposed these by its suggestion of depth and distance. Hence while painting as a whole advanced enormously through this effort after the truth of space, yet decorative quality in this particular form of the art proportionately suffered.

The study of perspective owed much to the architect and scholar Brunellesco, one of the oldest as well as ablest of the men in whom the new movement of the 15th century was embodied. Brunellesco taught all he knew to Masaccio, for whose genius he felt strong admiration; but the artist in whom the result of the new study is most obvious is Paolo Uccello, a painter of much power, who was born as early as 1397. Uccello, as extant works testify, sometimes composed pictures mainly with a view to the perspective effects for which they furnished the opportunity. See fig. 16, Plate V., where in a fresco of a cavalry skirmish he has drawn in foreshortened view the figure of a warrior prone on the ground, as well as various weapons and other objects under the feet of the horses. A fresco of "The Flood" at Florence is even more naive in its parade of the painter's newly won skill in perspective science. The intarsists, or workers in inlaid woods, who were very numerous in Florence, also adopted perspective motives for their designs, and these testify to the fascination of the study during all the last part of the century and the beginning of the next.

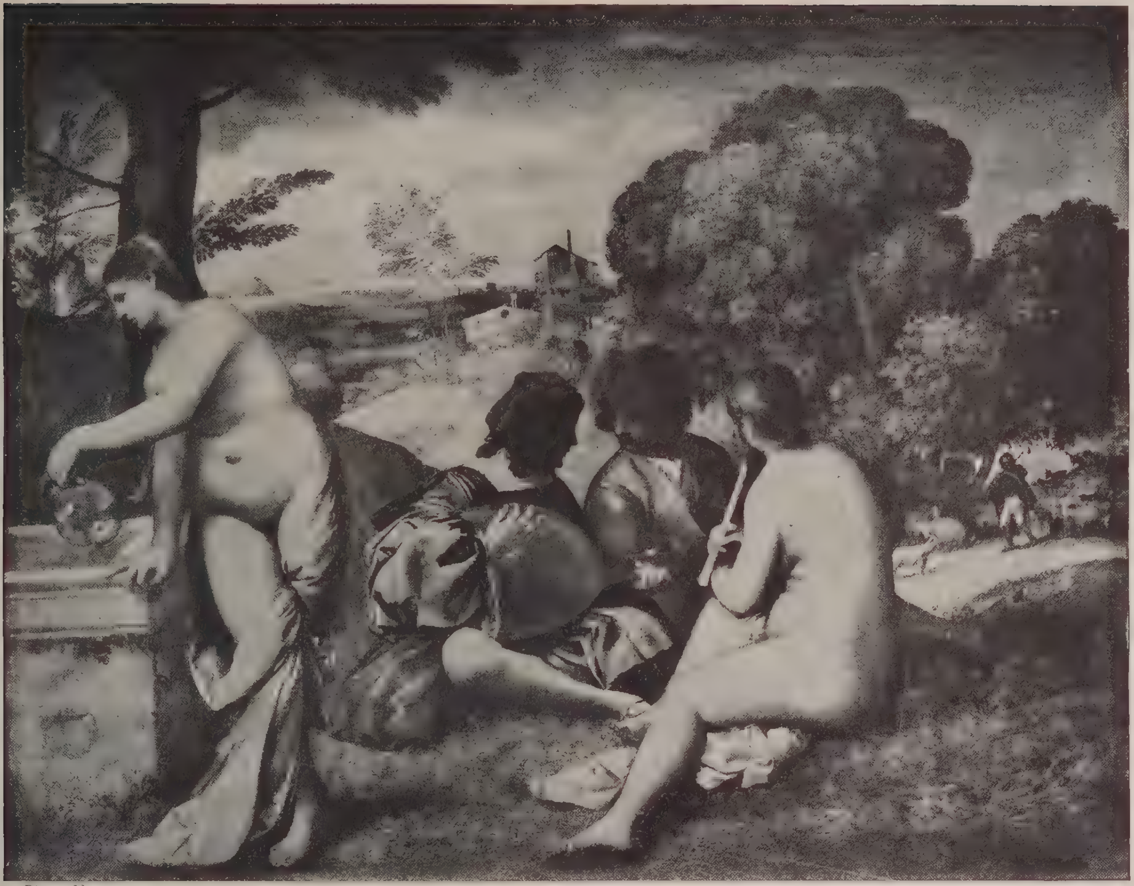
The advance in anatomical studies may be illustrated in the person of Antonio Pollaiuolo. Masaccio had been as great in this department of the painter's craft as in any other; and in the Adam and Eve of the "Expulsion," and the famous nudes shown in the fresco of "Peter Baptizing," he had given the truth of action and expression as few have been able to render it; but in the matter of scientific accuracy in detail more anatomical study was needful, and to this men like Pollaiuolo now devoted themselves. Pollaiuolo's "Martyrdom of St Sebastian," in the London National Gallery, is a very notable illustration of the efforts which a conscientious and able Florentine of the period would make to master these problems of the scientific side of art. (See fig. 17, Plate V.)

On the whole, however, of the men of this group it was not a Florentine but the Umbrian Piero de' Franceschi that represents the greatest achievement on the formal side of art. His theoretical studies were profound. He wrote a treatise on perspective, representing an advance on the previous treatment of the science by Alberti; and to this study of linear perspective Piero united those of aerial perspective and the science of shadows. A fresco of his at Arezzo entitled the "Dream of Constantine" is epoch-making in presenting a night effect into the midst of which a bolt of celestial radiance is hurled, the incidence of which on the objects of the various planes of the picture has been carefully observed and accurately reproduced. (See fig. 18, Plate V.)

Piero handed on his scientific accomplishments to a pupil, also an Umbrian of Florentine sympathies, Luca Signorelli of Cortona. He achieved still greater success than Pollaiuolo in the rendering of the nude form in action, but more conspicuously than any others of this group he sacrificed beauty to truth, and the nudes in his great series of frescoes on the Last Things at Orvieto are anatomized like *écorchés*, and are in colour and texture positively repellent. Luca's work is, however, of historical importance as leading on to that of Michelangelo.

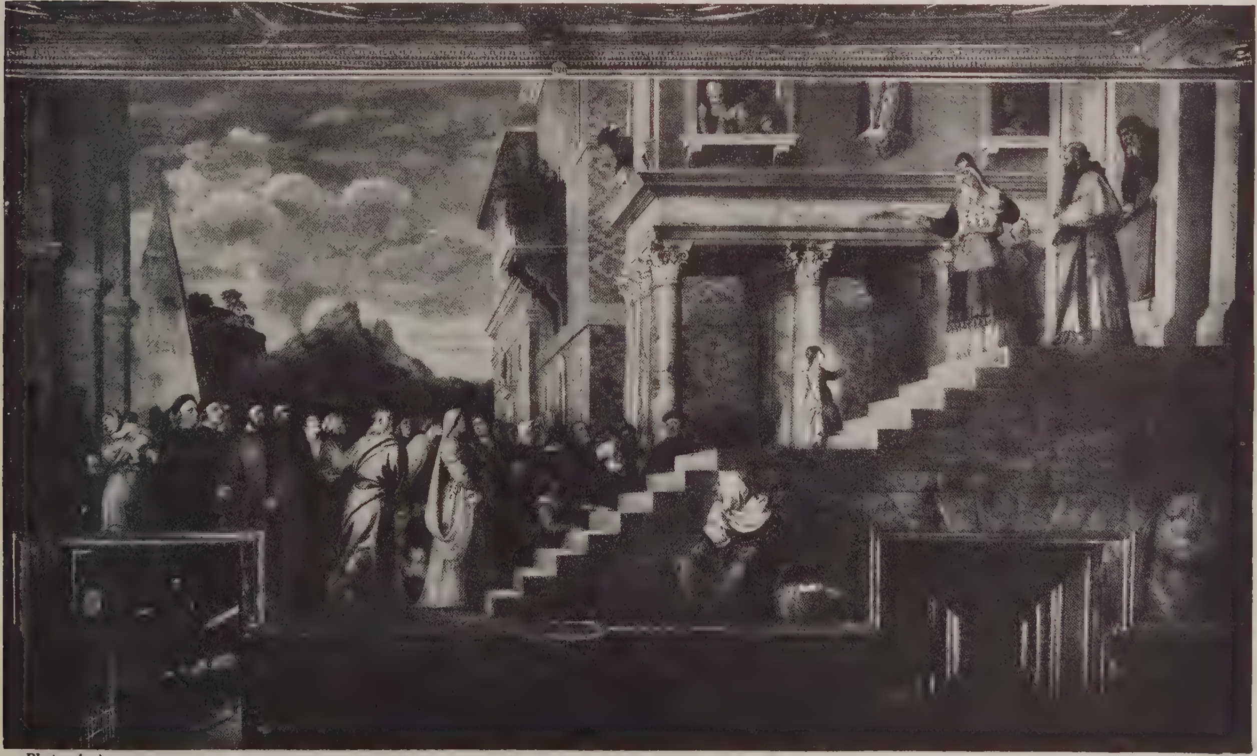
A great power in the Florentine school of the 15th century was Andrea del Castagno, an artist with much of the vigour, the feeling for the monumental, of Masaccio, but without Masaccio's saving gift of suavity of treatment. He is best represented by some single figures representing Florentine worthies, whom he has painted as if they were statues in niches. They formed part of the decoration of a villa, and are noteworthy as wholly secular in subject. There is a massiveness about the forms which shows how thoroughly the 15th century Florentines were mastering the representation of solid objects in all their three dimensions. Other painters attracted attention at the time for their realistic treatment of details. Vasari singles out Alessio Baldovinetti.

The importance for art of the Florentine school of the 15th century resides in these efforts for the perfecting of painting on the formal side, which its representatives were themselves making and were inspiring in others. The general historian of the art will dwell rather on this aspect of the work of the school than on the numerous attractive features it offers to the



Photo, Neurdein.

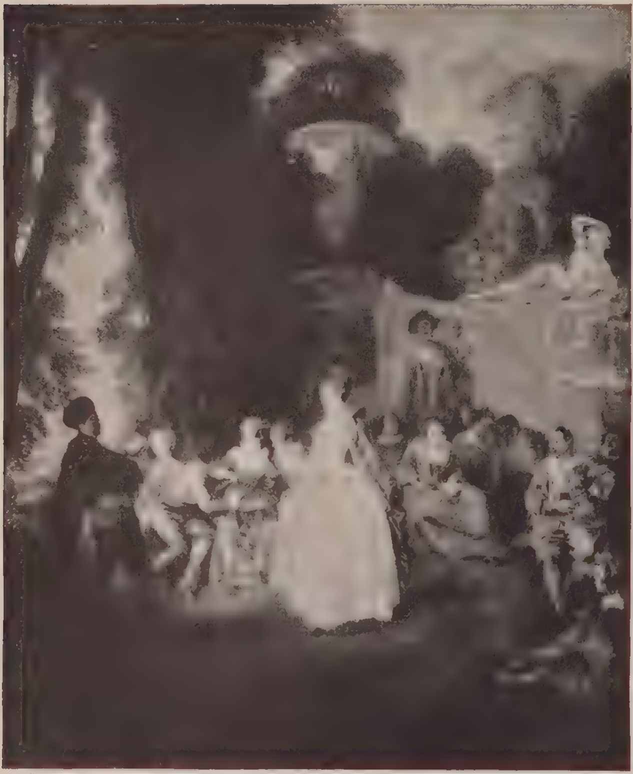
FIG. 22.—THE CONCERT, GIORGIONE (?). Louvre. (44 × 55.)



Photo, Anderson.

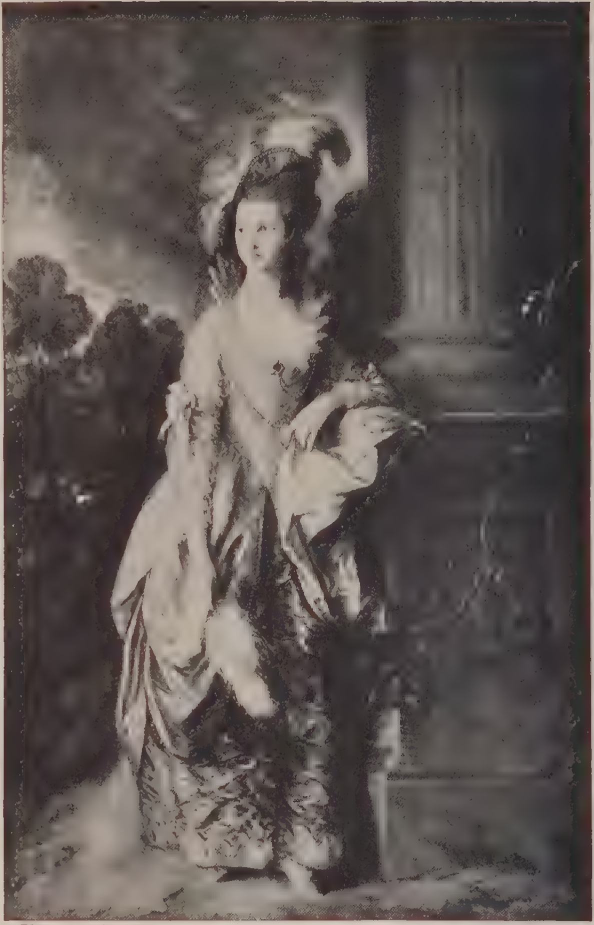
FIG. 23.—THE PRESENTATION IN THE TEMPLE, TITIAN. (138 × 310.) Academy, Venice.

PAINTING



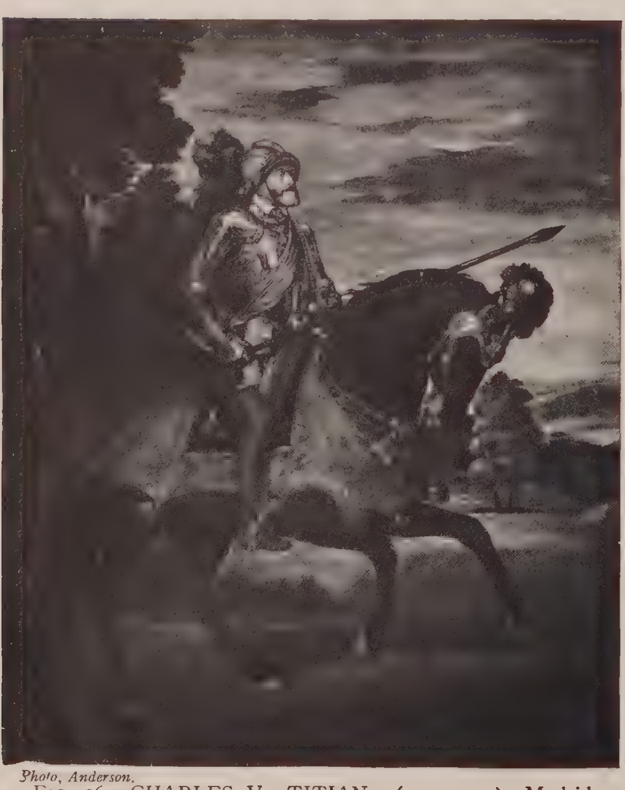
Photo, Hanfstaengl

FIG. 24.—FÊTE CHAMPÊTRE, WATTEAU. (22 × 18.) Edinburgh.



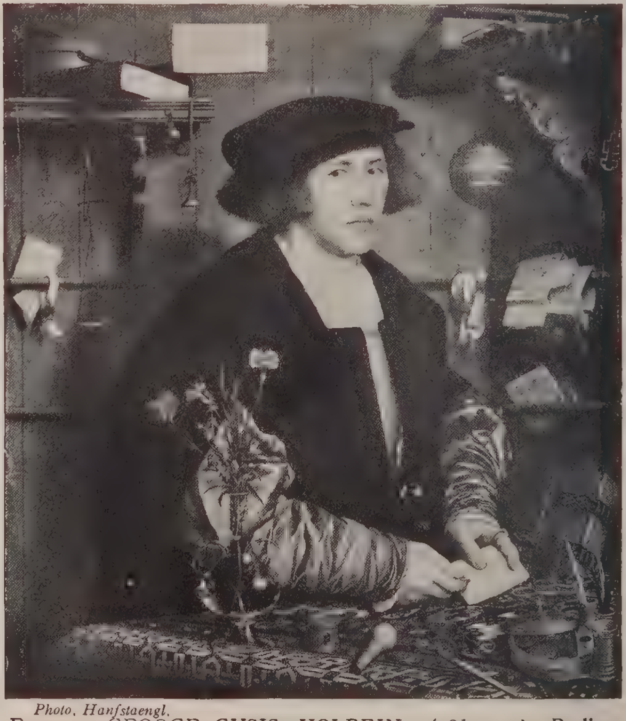
Photo, Hanfstaengl.

FIG. 25.—HON. MRS GRAHAM, GAINSBOROUGH. (93 × 60.) Edinburgh.



Photo, Anderson.

FIG. 26.—CHARLES V., TITIAN. (133 × 110.) Madrid.



Photo, Hanfstaengl.

FIG. 27.—GEORGE GYSIS, HOLBEIN. (38½ × 33.) Berlin.

superficial observer. The Fra Angelicos, the Filippo Lippis, the Benozzo Gozzolis, the Botticellis, the Filippino Lippis of the century express pleasantly in their work various phases of feeling, devotional, idyllic or pensive, and enjoy a proportionate popularity among the lovers of pictures. Exigencies of space preclude anything more than a mention of their names, but a sentence or two must be given to a painter of the last half of the century who represents better than any other the perfection of the monumental style in fresco painting. This painter is Ghirlandajo, to whom is ascribed a characteristic saying. When disturbed in hours of work about some domestic affair he exclaimed: "Trouble me not about these household matters; now that I begin to comprehend the method of this art I would fain they gave me to paint the whole circuit of the walls of Florence with stories." Ghirlandajo was entering into the heritage of technical knowledge and skill that had been laboriously acquired by his countrymen and their Umbrian comrades since the beginning of the century, and he spread himself upon the plastered walls of Tuscan churches with easy copiousness, in works which give us a better idea than any others of the time of how much can be accomplished in a form of art of the kind by sound tradition and a businesslike system of operation.

The mural painting of Ghirlandajo represents in its perfection one important phase of the art. It was still decorative in the sense that lime colour-washes were the natural finish of the lime plaster on the wall, and that these washes were arranged in a colour-pattern pleasing to the eye. The demonstrative element, that is, the significance of these patches of colour as representations of nature, was however in the eyes of both painter and public the matter of primary importance, and similitude was now carried as far as knowledge of anatomy and linear perspective rendered possible. Objects were rendered in their three dimensions and were properly set on their planes and surrounded with suitable accessories, while aerial perspective was only drawn on to give a general sense of space without the eye being attracted too far into the distance. As a specimen of the monumental style nothing can be better than Ghirlandajo's fresco of the "Burial of S. Fina" at S. Gimignano in Tuscany (see fig. 19, Plate V.). We note with what architectural feeling the composition is balanced, how simple and monumental is the effect.

§ 16. *The Fifteenth Century in the other Italian Schools.*—It has been already noticed that the painting of the 14th century in the Umbrian cities was inspired by that of Siena. Through the 15th century the Umbrian school developed on the same lines. Its artists were as a whole content to express the placid religious sentiment with which the Sienese had inspired them, and advanced in technical matters almost unconsciously, or at any rate without making the pronounced efforts of the Florentines. While Piero de' Franceschi and Luca Signorelli vied with the most ardent spirits among the Florentines in grappling with the formal problems of the art, their countrymen generally preserved the old flatness of effect, the quiet poses, the devout expressions of the older school. This Umbro-Sienese art produced in the latter part of the century the typical Umbrian painter Perugino, whose chief importance in the history of his art is the fact that he was the teacher of Raphael.

An Umbrian who united the suavity of style and feeling for beauty of the Peruginesques with a daring and scientific mastery that were Florentine was Piero de' Franceschi's pupil, Melozzo da Forlì. His historical importance largely resides in the fact that he was the first master of the so-called Roman school. As was noticed before in connexion with the early Roman master, Pietro Cavallini, the development of a native Roman school was checked by the departure of the papal court to France for the best part of a century. After the return, when affairs had been set in order, the popes began to gather round them artists to carry out various extensive commissions, such as the decoration of the walls of the newly-erected palace chapel of the Vatican, called from its founder the Sistine. These artists were not native Romans but Florentines and Umbrians, and among them was Melozzo da Forlì, who by taking up his residence permanently at Rome became the founder of the Roman school, that was afterwards adorned by names like those of Raphael and Michelangelo.

In the story of the development of Italian painting Melozzo occupies an important place. He carried further the notion of a perspective treatment of the figure that was started by Masaccio's angel of the "Expulsion," and preceded Correggio in the device of representing a celestial event as it would appear to a spectator who was looking up at it from below.

On the whole, the three Umbrians, Piero de' Franceschi, with his two pupils Luca Signorelli and Melozzo, are the most important figures in the central Italian art of the formative period. There is one other artist in another part of Italy whose personality bulks more largely than even theirs, and who, like them a disciple of the Florentines, excelled the Florentines in science and power, and this is the Paduan Mantegna.

We are introduced now to the painters of north Italy. Their general character differs from that of the Umbro-Sienese school in that their work is somewhat hard and sombre, and wanting in the *naïveté* and tenderness of the masters who originally drew their inspiration from Simone Martini. Giotto had spent some time and accomplished some of his best work at Padua in the earliest years of the 14th century, but his influence had not lasted. Florentine art, in the more advanced form it wore in the first half of the 15th century, was again brought to it by Donatello and Paolo Uccello, who were at work there shortly before 1450. At that time Andrea Mantegna was receiving his first education from a painter, or rather *impresario*, named Francesco Squarcione, who directed his attention to antique models. Mantegna learnt from Donatello a statuesque feeling for form, and from Uccello a scientific interest in perspective, while, acting on the stimulus of his first teacher, he devoted himself to personal study of the remains of antique sculpture which were common in the Roman cities of north Italy. Mantegna built up his art on a scientific basis, but he knew how to inspire the form with a soul. His own personality was one of the strongest that we meet with in the annals of Italian art, and he stamped this on all he accomplished. No figures stand more firmly than Mantegna's, none have a more plastic fullness, in none are details of accoutrement or folds of drapery more clearly seen and rendered. The study of antique remains supplied him with a store of classical details that he uses with extraordinary accuracy and effectiveness in his representations of a Roman triumph, at Hampton Court. Ancient art invested, too, with a certain austere beauty his forms of women or children, and in classical nudes there is a firmness of modelling, a suppleness in movement, that we look for in vain among the Florentines. Fig. 20, Plate VI., which shows a dance of the Muses with Venus and Vulcan, is typical. Mantegna was not only a great personality, but he exercised a powerful and wide-reaching influence upon all the art of north Italy, including that of Venice. His perspective studies led him in the same direction as Melozzo da Forlì, and in some decorative paintings in the Camera degli Sposi at Mantua he pointed out the way that was afterwards to be followed by Correggio.

Mantegna's relations with the school of Venice introduce us to the most important and interesting of all the Italian schools save that of Florence. Venetian painting occupies a position by itself that corresponds with the place and history of the city that gave it birth. The connexions of Venice were not with the rest of Italy, but rather with the East and with Germany. Commercially speaking, she was the emporium of trade with both. Into her markets streamed the wealth of the Orient, and from her markets this was transferred across the Alps to cities like Nuremberg. From Germany had come a certain Gothic element into Venetian architecture in the 14th century, and a little later an influence of the same kind began to affect Venetian painting. Up to that time Venice had depended for her painters on the East, and had imported Byzantine Madonna pictures, and called in Byzantine mosaic-workers to adorn the walls and roof of her metropolitan church. The first sign of native activity is to be found at Murano, where, in the first half of the 15th century, a German, Justus of Allemagna, worked in partnership with a Muranese family. A little later a stranger from another quarter executes important commissions in the city of the lagoons. This was an Umbrian, Gentile da Fabriano, who possessed the suavity and tenderness of his school.

The natural tendency of Venetian taste, nourished for centuries on opulent Oriental stuffs, on gold and gems, ran in the direction of what was soft and pleasing to the sense. The northern Gothic and the Umbrian influences corresponded with this and flattered the natural tendency of the people. For the proper development of Venetian painting some element of Florentine strength and science was absolutely necessary, and this was imparted to the Venetian school by Mantegna through the medium of the Bellini.

The Bellini were a Venetian family of painters, of whom the father was originally an assistant to Gentile da Fabriano, but lived for a while at Padua, where his daughter Nicolosia became the wife of Mantegna. With the two Bellini sons, Gentile and Giovanni, Mantegna became very intimate, and a mutual influence was exercised that was greatly to the benefit of all. Mantegna softened a little what has been termed his " iron style," through the assimilation of some of the suavity and feeling for beauty and colour that were engrained in the Venetians, while on the other hand Mantegna imparted some of his own sternness and his Florentine science to his brothers-in-law, of whom the younger, Giovanni, was the formative master of the later Venetian school.

§ 17. *The Painting of the Sixteenth Century: the Mastery of Form.*—If we examine a drawing of the human figure by Raphael, Michelangelo, or Correggio, and compare it with the finest examples of Greek figure design on the vases, we note at once that to the ancient artist the form presented itself as a silhouette, and he had to put constraint on himself to realize its depth; whereas the moderns, so to say, think in the third dimension of space and every touch of their pencil presupposes it. The lovely " Aphrodite riding on a Swan," on the large Greek kylix in the British Museum, is posed in an impossible position between the wing of the creature and its body, where there would be no space for her to sit. The lines of her figure are exquisite, but she is pure contour, not form. In a Raphael nude the strokes of the chalk come forward from the back, bringing with them into relief the rounded limb which grows into plastic fullness before our eyes. Whether the parts recede or approach, or sway from side to side, the impression on the eye is equally clear and convincing. The lines do not merely limit a surface but caress the shape and model it by their very direction and comparative force into relief. In other words, these 16th-century masters for the first time perfectly realize the aim which was before the eyes of the Greeks; and Raphael, who in grace and truth and composition may have been only the peer of Apelles, probably surpassed his great predecessor in this easy and instinctive rendering of objects in their solidity.

In so far as the work of these masters of the culminating period, in its relation to nature, is of this character it needs no further analysis, and attention should rather be directed to those elements in Italian design of the 16th-century which have a special interest for the after development of the art.

Not only was form mastered as a matter of drawing, but relief was indicated by a subtle treatment of light and shade. Foreshortening as a matter of drawing requires to be accompanied by correct modulation of tone and colour, for as the form in question recedes from the eye, changes of the most delicate kind in the illumination and hue of the parts present themselves for record and reproduction. The artist who first achieved mastery in these refinements of chiaroscuro was Leonardo da Vinci, while Correggio as a colourist added to Leonardesque modelling an equally delicate rendering of the modulation of local colour in relation to the incidence of light, and the greater or less distance of each part from the eye. This represented a great advance in the rendering of natural truth, and prepared the way for the masters of the 17th century. It is not only by linear perspective, or the progressive diminution in size of objects as they recede, that the effect of space and distance can be compassed. This depends more on what artists know as " tone " or " values," that is, on the gradual degradation of the intensity of light and shadow, and the diminishing saturation of colours, or, as we may express it in a word that is not however quite adequate, aerial perspective. That which Leonardo and Correggio had accomplished in the modelling, lighting and tinting of the single form in space had to be applied by succeeding artists to space as a whole, and this was the work not of the 16th but of the 17th century, and not of Italians but of the masters of the Netherlands and of Spain.

§ 18. *The Contribution of Venice.*—Before we enter upon this fourth period of the development of the art, something must be said of an all-important contribution that painting owes to the masters of Venice.

The reference is not only to Venetian colouring. This was partly, as we have seen, the result of the temperament and circumstances of the people, and we may ascribe also to the peculiar position of the city another Venetian characteristic. There is at Venice a sense of openness and space, and the artists seem anxious on their canvases to convey the same impression of a large entourage. The landscape background, which we have already found on early Flemish panels, becomes a feature of the pictures of the Venetians, but these avoid the meticulous detail of the Flemings and treat their spaces in a broader and simpler fashion. An indispensable condition however for the rich and varied effects of colour shown on Venetian canvases was the possession by the painters of an adequate technique. In the third part of this article an account is given of the change in technical methods due, not so much to the introduction of the oil medium by the Van Eycks, as to the exploitation at Venice of the unsuspected resources which that medium could be made to afford. Giovanni Bellini, not Hubert van Eyck, is really the primal painter in oil, because he was the first to manipulate it with freedom, and to play off against each other, the various effects of opaque and transparent pigment. His noble picture at Murano, representing the Doge Barbarigo adoring the Madonna, represents his art at its best (see fig. 21, Plate VI.).

Bellini rendered possible the painters of the culminating period of Venetian art, Giorgione, Titian, Tintoretto, with others hardly less great. Giorgione was the first who made the art, as an art of paint not merely of design, speak to the soul. His melting outlines and the crisp clean touches that wake the piece to life; his glowing hues and the pearly neutrals that give them repose and quality; the intimate appeal of his dreamy faces, his refined but voluptuous forms, and the large freedom of his spaces of sky and distance, all combine to impress us with a sense of the poetry and mystery of creation that we derive from the works of no other extant painter. The " Concert " of the Louvre, fig. 22, Plate VII. is typically Giorgionesque.

Tintoretto, more intellectually profound, more passionate, writes for us his message in his stormy brush-strokes, now shaking us with terror, now lifting our souls on the wings of his imagination; but with him as with the younger master it is always the painter who speaks, and always in the terms of colour and texture and handling. Lastly, between the two, unapproachable in his majestic calm, stands Titian. Combining the poetry of Giorgione with much of Tintoretto's depth and passion, he is the first, and still perhaps the greatest, of the supreme masters of the painter's art. His masterpiece is the great "Presentation" of the Venice Academy, fig. 23, Plate VII. Painting, it is true, has to advance in its development beyond the ideals of Titian's century, but it loses on the ethical side more than on the technical side it wins, and without the Venetians the world would have never known the full possibilities of the art that began so simply and at so early a stage of human civilization.

§ 19. *The Fourth Period: the Realization of the Truth of Space. Changed Relation of Painting to Nature.*—By the 17th century the development of painting had passed through all its stages, and the picture was no longer a mere silhouette or a transcript of objects against a flat background, but rather an enchanted mirror of the world, in which might be reflected space beyond space in infinite recession. With this transformation of the picture there was connected a complete change in the relation of the artist to nature. Throughout all the earlier epochs of the art that painter had concerned himself not with nature as a whole, but with certain selected aspects of nature that furnished him with his recognized subjects. These subjects were selected on account of their intrinsic beauty or importance, and as representing intrinsic worth they claimed to be delineated in the clearest and most substantial fashion. In the 17th century, not only was the world as a whole brought within the artist's view, but it presented itself as worthy in every part of his most reverent attention. In other words the art of the 17th century, and of the modern epoch in general, is democratic, and refuses to acknowledge that difference in artistic value among the aspects of nature which was at the basis of the essentially aristocratic art of the Greeks and Italians. It does not follow that selection is of any less importance in modern painting than it was of old; the change is that the basis of selection is not now a fixed intrinsic gradation amongst objects, but rather a variable difference dependent not on the object itself but on certain accidents of its position and lighting. The artist still demands that nature shall inspire him with her beauty, but he has learned that this beauty is so widely diffused that he may find it anywhere. It was a profound saying of John Constable that there is nothing ugly in nature, for, as he explained it, let the actual form and character of an object be what it would, the angle at which it might be viewed, and the effect upon it of light and colour, could always make it beautiful. It is when objects and groups of objects have taken on themselves this pictorial beauty, which only the artistically trained eye can discern, that the modern painter finds himself in the presence of his "subject," and he knows that this magical play of beauty may appear in the most casual and unlikely places, in mean and squalid corners, and upon the most ordinary objects of daily life. Sometimes it will be a heap of litter, sometimes a maiden's face, that will be touched with this pictorial charm. Things to the common eye most beautiful may be barren of it, while it may touch and glorify a clod.

The artist who was the first to demonstrate convincingly this principle of modern painting was Rembrandt. With Rembrandt the actual intrinsic character of the object before him was of small concern. Beauty was with him a matter of surface effect that depended on the combined influence of the actual local colour and superficial modelling of objects, with the passing condition of their lighting, and the greater or less clearness of the air through which they were seen. Behind the effect produced in this fortuitous fashion the object in itself vanished, so to say, from view. It was appearance that was important, not reality. Rembrandt's art was related essentially not to things as they were but as they seemed. The artists of the 15th century, whose careful delineation of objects gives them the title of the earliest realists, portrayed these objects in precise analytical fashion each for itself. More advanced painters regarded them not only in themselves but in their artistic relations as combining beauties of form and colour that together made up a pictorial effect. Rembrandt in his later work attended to the pictorial effect alone and practically annulled the objects, by reducing them to pure tone and colour. Things are not there at all, but only the semblance or effect or "impression" of things. Breadth is in this way combined with the most delicate variety, and a new form of painting, now called "impressionism," has come into being.

To give back nature just as she is seen, in a purely pictorial aspect, is the final achievement of the painter's craft, but as the differences of tone and colour on which pictorial beauty depends are extremely subtle, so it is only by a skill of touch that seems like the most accomplished sleight of hand that the required illusion can be produced, and in this way the actual handling of the brush assumes in modern painting an importance which in the old days it never possessed. The effect is produced not by definite statements of form and colour, but by what Sir Charles Eastlake termed "the judicious unfinish of a consummate workman," through which "the flat surface is transformed into space." Frans Hals of Haarlem, who was born in 1580, was perhaps the first to reveal the artistic possibilities of a free suggestive handling in oil paint, and Van Dyck is said to have marvelled how Hals was able to sketch in a portrait "with single strokes of the brush, each in the right place, without altering them and without fusing them together." In the wonderful late Velazquez at Vienna, the portrait of the Infant Philipp Prosper as a child of two years old, the white drapery, the minute fingers, the delicate baby face from which look out great eyes of darkest blue, are all indicated with touches so loosely thrown upon the canvas that seen near by they are all confusion—yet the life and truth are in them, and at the proper focal distance nature herself is before us. The touches combine to give the forms, the local colours, the depth, the solidity of nature, while at the same time the chief impression they convey is that of the opalescent play of changing tones and hues which, eluding the limitations of definite contours, make up to the painter's eye the chief beauty of the external world. Moreover it will be understood that this realization of the truth of space, which is the distinguishing quality of modern painting, does not mean that the artist is always to be rendering large views of sky and plain. The gift of setting objects in space, so that the atmosphere plays about them, and their relations of tone to their surroundings are absolutely correct and convincing, is shown just as well in a group of things close at hand as in a wide landscape. The backgrounds in the pictures by Velazquez of "The Surrender of Breda" and "Don Balthazar Carlos" at Madrid are magnificent in their limitless suggestion of the free spaces of earth and sky, but the artist's power in this respect is just as effectively shown in the creation of space in the interiors of "The Maids of Honour" and the "Spinners," and the skill with which he brings away the hand of the sitter from his white robe, in the "Innocent X." of the Doria Palace at Rome. The fact is that the scale on which the modern painter works, and the nature of his subjects, make no difference in the essential character of the result. A very few square feet of canvas were sufficient for Ruysdael to convey in his "Haarlem from the Dunes" the most sublime impression of infinity; and a Dutch interior by De Hooch gives us just as much feeling of air and distance as one of the vast panoramic landscapes of De Koningk or Rubens.

§ 20. *Impressionism.*—The term "impressionism," much heard in artistic discussions of to-day, is said to date from a certain exhibition in Paris in 1871, in the catalogue of which the word was often used; a picture being called *Impression de mon pot-à-feu*, or *Impression d'un chat qui se promène*, &c. An influential critic summed up these impressions, and dubbed the exhibition "Salon des Impressionistes" (Muther, *Modern Painting*, 1896, ii. 718). It is a mistake however to suppose that the style of painting denoted by this term is an invention of the day, for, in so far as it is practised seriously and with adequate artistic powers, it is essentially the same style as that of some of the greatest 17th-century masters, such as Rembrandt and Velazquez. Modern investigation into the reasons of things has provided the system with a scientific basis and justification, and we can see that it really corresponds with the experimentally determined facts of human vision. The act of "seeing" may mean one or two different things. We may (1) allow our glance to travel leisurely over the field of vision, viewing the objects one by one, and forming a clear picture to ourselves of each in turn; or (2) we may try to take in the whole field of vision at a glance, ignoring the special objects and trying to frame before ourselves a sort of summary representation of the whole; or again, (3) we may choose a single point in the field of vision, and focus on that our attention, allowing the surrounding objects to group themselves in an indistinct general mass. We can look at nature in any one of these three ways; each is as legitimate as the others; but since in most ordinary cases we look at things in order to gain information about them, our vision is usually of the first or analytical kind, in which we fix the objects successively, noting each by each their individual characteristics. As the object of painting is to reproduce what is seen as we see it, so in the majority of cases painting corresponds to this, our usual way, of viewing nature. That is to say, all painters of the early schools, and the majority of painters at all times, represent nature in a way that answers to this analytical vision. The treatment of groups of objects in the mass, though, as we have seen, occasionally essayed even in ancient times (see §§ 8, 9), does not become the painter's ideal till the 17th century. We find then, and we find here and there through all the later periods of the art, efforts on the part of the artist to reproduce the effect of vision of the other two kinds, to show how objects look when regarded all together and not one by one, or how they look when we focus our attention on one of them but notice at the same time how all the others that are in the field of vision group themselves round in a penumbra, in which they are seen and yet not seen. The special developments of impressionistic art in recent times in France and England are dealt with in the article on IMPRESSIONISM (see also the appendix to this article on *Recent Schools of Painting*), but it is mentioned here as a style of painting that is the logical outcome of the evolution of the art which has been traced from the earliest times to the 17th century. For the particular pictorial beauty, on which the modern painter trains his eye, is largely a beauty of relation, and depends on the mutual effect on each other of the elements in a group. Unless these are looked at in the mass their pictorial quality will be entirely missed. This word on impressionism, as corresponding to certain ways of looking at nature, is accordingly a necessary adjunct to the critique of modern painting since the 17th century.

§ 21. *Painting in the Modern Schools.*—The history of the art has been presented here as an evolution, the ultimate outcome of which was the impressionist painting of 17th-century masters such as Rembrandt and Velazquez. In this form of painting the artist is only concerned with those aspects of nature which give him the sense of pictorial beauty in tone and colour, and these aspects he reproduces on his canvas, not as a mere mirror would, but touched, pervaded, transfigured by his own artistic personality. It does not follow however that these particular ideals of the art have inspired modern painters as a body. No one who visits the picture exhibitions of the day, or even our galleries of older art, will fail to note that a good deal of modern painting since the 17th century has been academic and conventional, or prosaically natural, or merely popular in its appeal. With work of this kind we are not concerned, and accordingly, in the table (VIII.) which follows in Part II. of the article, the names with few exceptions are those of artists who embody the maturer pictorial aims that have been under discussion.

Of the schools of the 17th century that of Spain, owing much to the so-called Italian "naturalists," produced the incomparable Velazquez with one or two notable contemporaries, and later on in the 18th century the interesting figure of Goya; while the influence of Velazquez on Whistler and other painters of to-day is a more important fact connected with the school than the recent appearance in it of brilliant technical executants such as Fortuny.

The schools of Flanders and of France are closely connected, and both owe much to Italian influence. The land of Italy, rather than any works of Italian painters, has been the inspiration of the so-called classical landscapists, among whom the Lorrainer Claude and the French Poussin take the rank of captains of a goodly band of followers. In figure painting the Venetians inspire Rubens, and Raphael stands at the head of the academic draughtsmen and composers of "historical" pieces who have been especially numerous in France. Rubens and Raphael together formed Le Brun in the days of Louis XIV., David and Delaroche in the two succeeding centuries, and the modern decorative figure painters, such as Baudry, whose works adorn the public buildings of France. Flemish influence is also strong in the French painting in a gallant vein of the 18th century from the serious and beautiful art of Watteau (fig. 24, Plate VIII.) to the slighter productions of a Fragonard. Van Dyck, another Fleming of genius, is largely responsible for the British portraiture of the 18th century, which is affiliated to him through Kneller and Sir Peter Lely. There is something of the courtly elegance of Van Dyck in the beautiful Gainsborough at Edinburgh representing the Hon. Mrs Graham (fig. 25, Plate VIII.). On the whole, though the representative masters of these two schools are original, or at any rate personal, in technique, they are in their attitude towards nature largely dependent on the traditions established in the great Italian schools of figure-painting of the 16th century. The contrast when we turn from France and Flanders to Holland is extraordinary. This country produced at the close of the 16th century and in the first half of the 17th a body of painters who owed no direct debt at all to Italy, and, so far as appears, would have been what they were had Titian and Raphael and Michelangelo never existed. They took advantage, it is true, of the mastery over nature and over the material apparatus of painting which had been won for the world by the Italians of the 15th and 16th centuries, but there their debt to the peninsula ended, and in their outlook upon nature they were entirely original.

The Dutch school is indeed an epitome of the art in its modern phase, and all that has been said of this applies with special force to the painting of Holland. Democratic in choice of subject, subtle in observation of tone and atmosphere, refined in colour, free and yet precise in execution, sensitive to every charm of texture and handling, the Dutch painter of the first half of the 17th century represents the most varied and the most finished accomplishment in paint that any school can show. Such work as he perfected could not fail to exercise a powerful effect on later art, and accordingly we find a current of influence flowing from Holland through the whole course of modern painting, side by side with the more copious tide that had its fountain-head in Italy. Hogarth and Chardin and Morland in the 18th century, the Norwich painters and Constable in the 19th, with the French Barbizon landscapists who look to the last as their head, all owe an incalculable debt to the sincere and simple but masterly art of the countrymen of Rembrandt.

§ 22. *The Different Kinds of Painting represented in the Modern Schools.*—The fact that the Dutch painters have left us masterpieces in so many different walks of painting, makes it convenient that we should add here some brief notes on characteristic modern phases of the art on which they stamped the impress of their genius. The normal subject for the artist, as we have seen, up to the 17th century, was the figure-subject, generally in some connexion with religion. The Egyptian portrayed the men and women of his time, but the pictures, through their connexion with the sepulchre, had a quasi-religious significance. The Assyrian chronicled the acts of semi-divine kings. Greek artists, whether sculptors or painters, were in the majority of cases occupied with the doings of gods and heroes. Christian art, up to the 16th century, was almost exclusively devoted to religious themes. In all this art, as well as in the more secular figure-painting of the modern schools, the personages represented, with their doings and surroundings, were of intrinsic importance, and the portrayal of them was in a measure an act of service and of honour. *Portraiture* is differentiated from this kind of subject-picture through stages which it would be interesting to trace, but the portrait, though secular, is always treated in such a way as to exalt or dignify the sitter. Another kind of figure-piece, also differentiated by degrees from the subject-picture of the loftier kind, is the so-called *Genre Painting*, in which the human actors and their goings-on are in themselves indifferent, trivial, or mean and even repellent; and in which, accordingly, intrinsic interest of subject has disappeared to be replaced by an artistic interest of a different kind. *Landscape*, in modern times so important a branch of painting, is also an outcome of the traditional figure-piece, for at first it is nothing but a background to a scene in which human figures are prominent. *Marine Painting* is a branch of landscape art differentiated from this, but supplied at first in the same way with figure-interest.

The origin of *Animal Painting* is to be sought partly in figure-pieces, where, as in Egypt and Assyria, animals play a part in scenes of human life, and partly in landscapes, in which cattle, &c., are introduced to enliven the foreground. The *Hunting Picture*, combining a treatment of figures and animals in action with landscape of a picturesque character, gives an artist like Rubens a welcome opportunity, and the picture of *Dead Game* may be regarded as its offshoot. This brings us to the important class of *Still-Life Painting*, the relation of which to the figure-piece can be traced through the genre picture and the portrait. As a natural scene in the background, so on the nearer planes, a judiciously chosen group of accessory objects adds life and interest to the representation of a personage or scene from human life. Later on these objects, when regarded with the eyes of an artist fully opened to the beauty of the world, become in themselves fit for artistic, aye, even ideal, treatment; and a Vollon will by the magic of his art make the interior of a huge and polished copper caldron look as grand as if it were the very vault of heaven itself.

§ 23. *Portraiture.*—Attention has already been called in § 7 to the skill of the Egyptian artist in marking differences of species and race in animals and men. In the case of personages of special distinction, notably kings, individual lineaments were portrayed with the same freshness, the same accent of truth. There is less of this power among the artists of Assyria. The naturalism of Cretan and Mycenaean art is so striking that we should expect to find portraiture represented among its remains, and this term may be fairly applied to the gold masks that covered the faces of bodies in the tombs opened by Dr Schliemann. In early (historical) Greek art some archaic vases show representations of named personages of the day, such as King Arkesilas of Cyrene, that may fall under the same heading, and portraiture was no doubt attempted in the early painted tombstones. The ideal character of Greek art however kept portraiture in the background till the later period after Alexander the Great, whose effigy limned by Apelles was one of the most famous pictures in antiquity. Our collections of works of classical art have been recently enriched by a series of actual painted portraits of men and women of the late classical period, executed on mummy cases in Egypt, and discovered in Graeco-Egyptian cemeteries. An attempt has been made by comparison with coins to identify some of the personages represented with members of the Ptolemaic house, including the famous Cleopatra, but it is safer to regard them, with Flinders Petrie, as portraits of ordinary men and women of the earliest centuries A.D. Technically they are of the highest interest, as will be noticed in § 42. From the artistic point of view one notes their variety, their lifelike character, and the pleasing impression of the human personality which some of them afford. There are specimens in the London National Gallery and British Museum.

During the early Christian and early medieval periods portraits always existed. The effigies of rulers appeared, for example, on their coins, and there are some creditable attempts at portraiture on Anglo-Saxon pieces of money. In painting we find the most continuous series in the illuminated MSS. where they occur in the so-called dedicatory pictures, in MSS. intended for royal or distinguished persons, where the patron is shown seated in state and perhaps receiving the volume. The object here, as Woltmann says, " always appears to be to give a true portrait of the exalted personage himself " (*Hist. of Painting*, Eng. trans., i. 212). Julia Anicia, granddaughter of Valentinus III., in the 6th century; the Carolingian emperor, Lothair, in the 9th; the Byzantine emperors, Basil II. in the 10th, and Nikephoros Botaniates in the 11th, &c., appear in this fashion. Some famous mosaic pictures in S. Vitale, Ravenna, contain effigies of Justinian, Theodora, and the Ravennese bishop, Maximian. In very many medieval works of art a small portrait of the donor or the artist makes its appearance as an accessory.

With the rise of schools of painting in the 14th and 15th centuries, especially in the north, the portrait begins to assume greater prominence. The living personage of the day not only figures as donor, but takes his place in the picture itself as one of the actors in the sacred or historical scene which is portrayed. A good deal of misplaced ingenuity has been expended in older and more modern days in identifying by guess-work historical figures in old pictures, but there is no doubt that such were often introduced. Dante and some of his famous contemporaries make their appearance in a fresco ascribed to Giotto in the chapel of the Bargello at Florence. One is willing to see the face and form of the great Masaccio in the St Thomas with the red cloak, on the right of the group, in the fresco of the Tribute Money (see § 15). Dürer certainly paints himself as one of the Magi in his picture in the Uffizi. In Italy Ghirlandajo (see § 15) carried to an extreme this fashion, and thereby unduly secularized his biblical representations. The portrait proper, as an independent artistic creation, comes into vogue in the course of the 15th century both north and south of the Alps, and Jan van Eyck, Memlinc, and Dürer are in this department in advance of the Florentines, for whereas the latter almost confine themselves to flat profiles, Van Eyck introduces the three-quarter face view, which represents an improvement in the rendering of form. Mantegna and Antonello da Messina portray with great firmness, and to Uccello is ascribed an interesting series of heads of his contemporaries. It is Gentile and Giovanni Bellini however who may be regarded as the fathers of modern portrait painting. Venetian art was always more secular in spirit than that of the rest of Italy, and Venetian portraits were abundant. Those by Gentile Bellini of the Sultan Mahomet II., and by Giovanni of the Doge Loredano are specially famous. Vasari in his notice of the Bellini says that the Venetian palaces were full of family portraits going back sometimes to the fourth generation. Some of the finest portraits in the world are the work of the great Venetians of the 16th century, for they combine pictorial quality with an air of easy greatness which later painters find it hard to impart to their creations. Though greatly damaged, Titian's equestrian portrait of Charles V. at Madrid (fig. 26, Plate VIII.) is one of the very finest of existing works of the kind. It is somewhat remarkable that of the other Italian painters who executed portraits the most successful was the idealist Raphael, whose papal portraits of Julius II. and Leo X. are masterpieces of firm and accurate delineation. Leonardo's " Monna Lisa " is a study rather than a portrait proper.

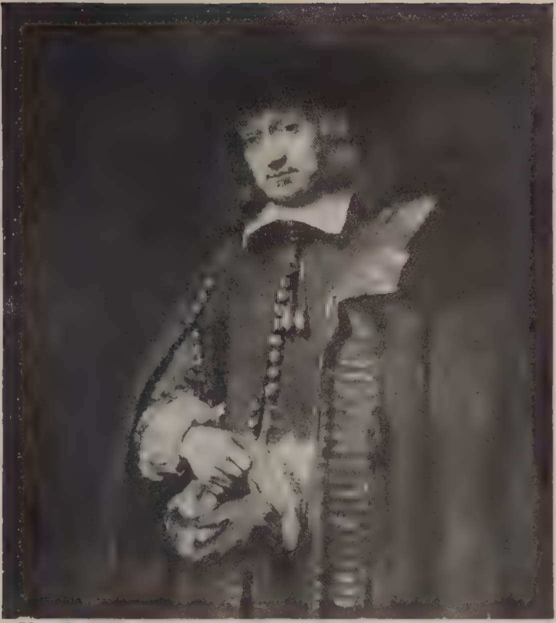
The realistic vein, which, as we have seen, runs through northern painting, explains to some extent the extraordinary merit in portraiture of Holbein, who represents the culmination of the efforts in this direction of masters like Jan van Eyck and Dürer. Holbein is one of the greatest delineators that ever lived, and in many of his portraits he not only presents his sitter in life-like fashion, but he surrounds him with accessory objects, painted in an analytical spirit, but with a truthfulness that has seldom been equalled. The portrait of Georg Gysis at Berlin represents this side of Holbein's art at its best (fig. 27, Plate VIII.). Some fine portraits by Italianizing Flemings such as Antonio Moro (see Table I.) bring us to the notable masters in portraiture of the 17th century. All the schools of the period were great in this phase of the art, but it flourished more especially in Holland, where political events had developed in the people self-reliance and a strong sense of individuality. As a consequence the Dutch men and women of the period from about 1575 to 1675 were incessantly having their portraits painted, either singly or in groups. The so-called " corporation picture " was a feature of the times. This had for its subject some group of individuals associated as members of a company or board or military mess. Such works are almost incredibly numerous in Holland, and their artistic evolution is interesting to trace. The earlier ones of the 16th century are merely collections of single portraits each treated for itself, the link of connexion between the various members of the group being quite arbitrary. Later on efforts, that were ultimately successful, were made to group the portraits into a single composition so that the picture became an artistic whole. Frans Hals of Haarlem, one of the most brilliant painters of the impressionist school that he did much to found, achieved remarkable success in the artistic grouping of a number of portraits, so that each should have the desired prominence while yet the effect of the whole was that of a unity. His masterpieces in this department in the town-hall at Haarlem have never been equalled.

As portraitists the other great 17th-century masters fall into two sets, Rembrandt and Velazquez contrasting with Rubens and his pupil Van Dyck. The portraits of the two former are individualized studies in which the sitter has been envisaged in an artistic aspect, retaining his personality though sublimated to a harmonious display of tone and colour. The Flemings are more conventional, and representing rather the type than the individual, are disposed to sacrifice the individuality of the sitter to their predetermined scheme of beauty. Both Velazquez and Rubens have left portraits of Isabel de Bourbon, first wife of Philip IV. of Spain, but whereas the Spaniard's version gives us an uncomely face but one full of character, that of the Fleming shows us merely the big-eyed buxom wench we are accustomed to meet on all his canvases. Rembrandt was much less careful than Velazquez or Holbein or Hals to preserve the individuality of the sitter. He did not however, like the Flemings, conventionalize to a type, but worked each piece into an artistic study of tone, colour and texture, in the course of which he might deal somewhat cavalierly with the actual facts of the piece of nature before him. The result, though incomparable in its artistic strength, may sometimes, in comparison with a Velazquez, seem laboured, but there is one Rembrandt portrait, that of Jan Six at Amsterdam, that is painted as directly as a Hals, and with the subtilty of a Velazquez, while it possesses a richness of pictorial quality in which Rembrandt surpasses all his ancient or modern compeers (see fig. 28, Plate IX.).

In the 18th century, though France produced some good limners and Spain Goya, yet on the whole England was the home of the best portraiture. Van Dyck had been in the service of Charles I., and foreign representatives of his style carried on afterwards the tradition of his essentially courtly art, but there existed at the same time a line of native British portraitists of whom the latest and best was Hogarth. One special form of portraiture, the *miniature* (*q.v.*), has been characteristically English throughout. The greater English and Scottish portraitists of the latter part of the 18th century, headed by Reynolds, owed much to Van Dyck, and their work was of a pronounced pictorial character. Every portrait, that is to say, was before everything beautiful as a work of art. Detail, either of features or dress, was not insisted on; and the effort was rather to generalize than to accentuate characteristic points. In a word, while the artist recognized the claims of the facts before him to adequate portrayal, he endeavoured to fuse all the elements of the piece into one lovely artistic unity, and in so doing he secured in his work the predominant quality of breadth. This style, handed on to painters of less power, died out in the first half of the 19th century in attenuated productions, in which harmony became emptiness. To this has succeeded in Britain, still the home of the best European portraiture, a more modern style, the dominant notes of which have been truth and force. While the older school was seen at its best when dealing with the softer forms of the female sex and of youth, these moderns excelled in the delineation of character in strongly-marked male heads, and some of them could hardly succeed wth a woman's portrait. The fine appreciation of character in portraiture shown by Sir John Watson Gordon about the middle of the 19th century marked the beginning of this forcible style of the later Victorian period, a style suited to an age of keen intellectual activity, of science and of matter-of-fact. More recently still, with the rapid development in certain circles of a taste for the life of fashion and pleasure, the portrait of the showily-dressed lady has come again into vogue, and if any special influence is here to be discerned it may be traced to Paris.

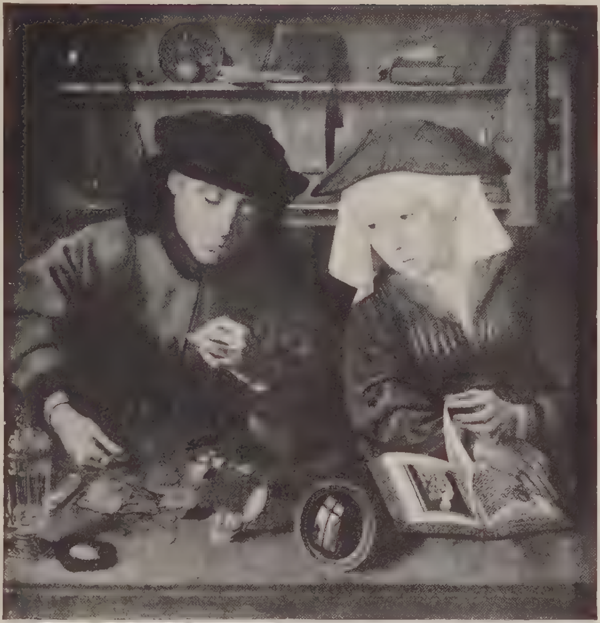
§ 24. *Genre Painting.* The term "genre" is elliptical—it stands for *genre bas*, and means the "low style," or the style in which there is no grandeur of subject or scale. A genre piece is a picture of a scene of ordinary human life without any religious or historical significance, and though it makes its appearance earlier, it was in the Netherland schools of the first half of the 17th century that it was established as a canonical form of the art. In Egypt we have seen that the subjects from human life have almost always a quasi-religious character, and the earliest examples of genre may be certain designs on early black-figured vases of the 6th century B.C. in Greece. Genre painting proper was introduced at a later period in Greece, and attracted special attention because of its contrast to the general spirit of classical art. It had a special name about which there is some difficulty but which seems to denote the same as *genre bas.* In early Christian and early medieval painting genre can hardly be recognized, but it makes its appearance in some of the later illuminated MSS. and becomes more common, especially north of the Alps, in the 15th century. It really begins in the treatment in a secular spirit of scenes from the sacred story. These scenes, in Italy, but still more among the prosaic artists of the north, were made more life-like and interesting when they were furnished with personages and accessories drawn from the present world. Real people of the day were as we have just seen introduced as actors in the scriptural events, and in the same way all the objects and accessories in the picture were portrayed from existing models. It was easy sometimes for the spectator to forget that he was looking at biblical characters and at saints and to take the scene from the standpoint of actuality. Rembrandt, one of whose chief titles to fame is derived from his religious pictures, often treats a Holy Family as if it were a mere domestic group of his own day. It was a change sure to come when the religious significance was abandoned, and the persons and objects reduced to the terms of ordinary life. This of course represented a break with a very long established tradition, and it was only by degrees, and in Germany and Flanders rather than in Italy, that the change was brought about. Thus for example, St Eloi, the patron of goldsmiths, might be portrayed as saint, but also as artificer with the impedimenta of the craft about him. The next stage, represented by a charming picture by Quintin Matsys at Paris, shows us a goldsmith, no longer a saint, but busy with the same picturesque accessories (fig. 29, Plate IX.). He has however his wife by his side and she is reading a missal which preserves to the piece a faint religious odour. Afterwards all religious suggestion is dropped, and we have the familiar goldsmith or money changer in his everyday surroundings, of which northern painting has furnished us with so many examples.

Genre painting, however, is something a little more special than is here implied. The term must not be made to cover all figure-pieces from ordinary life. There are pictures by the late Italian "naturalists" of this kind; Caravaggio's "Card Players" at Dresden is a familiar example. These are too large in scale to come under this heading, and the same applies to the *bodegones* or pictures of kitchens and shops full of pots and pans and eatables, which, largely influenced by the Italian pictures just noticed, were common in Spain in the early days of Velazquez. Nor again are the large and showy subject pictures, which constitute the popular items in the catalogues of Burlington House and the Salon, to be classed as "genre." The genre picture, as represented by its acknowledged masters, is small in scale, as suits the nature of its subject, but is studied in every part and finished with the most fastidious care. The particular incident or phase of life portrayed is as a rule of little intrinsic importance, and only serves to bring figures together with some variety of pose and expression and to motive their surroundings. It is rarely that the masters of genre charge their pictures with satiric or didactic purpose. Jan Steen in Holland and Hogarth in England are the exceptions that prove the rule. The interest is in the main an artistic one, and depends on the nice observance of relations of tone and colour, and a free and yet at the same time precise touch. All these qualities combine to lend to the typical genre picture an *intimité*, a sympathetic charm, that gives the masters of the style a firm hold on our affections. Probably the most



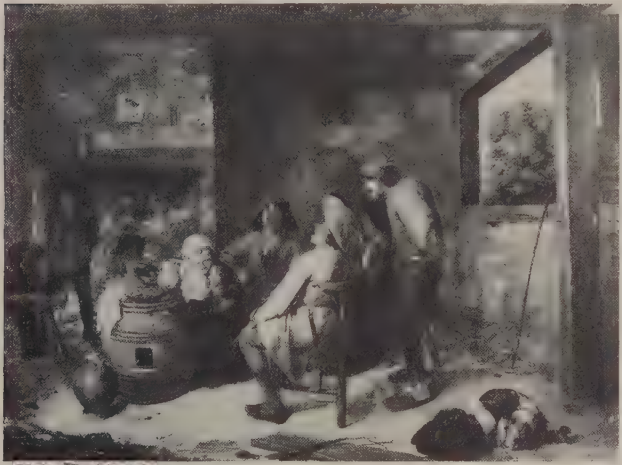
Photo, Bruckmann.

FIG. 28.—JAN SIX, REMBRANDT. Six Collection, Amsterdam.



By permission of Braun, Clément & Co., Dornach (Alsace) and Paris.

FIG. 29.—LE BANQUIER ET SA FEMME, QUINTIN MATSYS. ($28\frac{1}{2} \times 27$.) Louvre.



Photo, Hanfstaengl.

FIG. 30.—A SINGING PARTY, BROUWER. (16 × 21.) Munich.

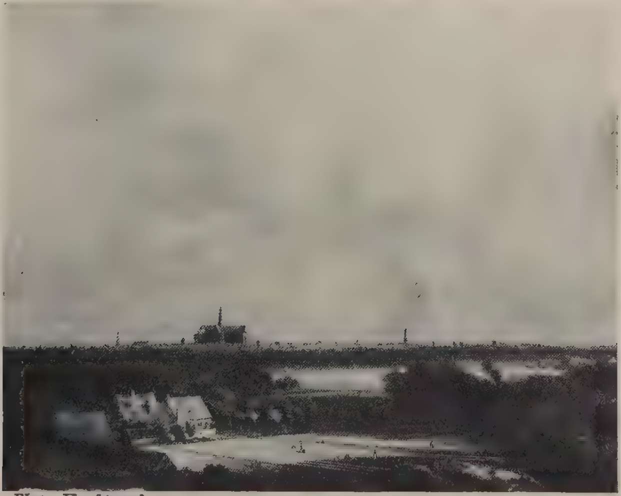


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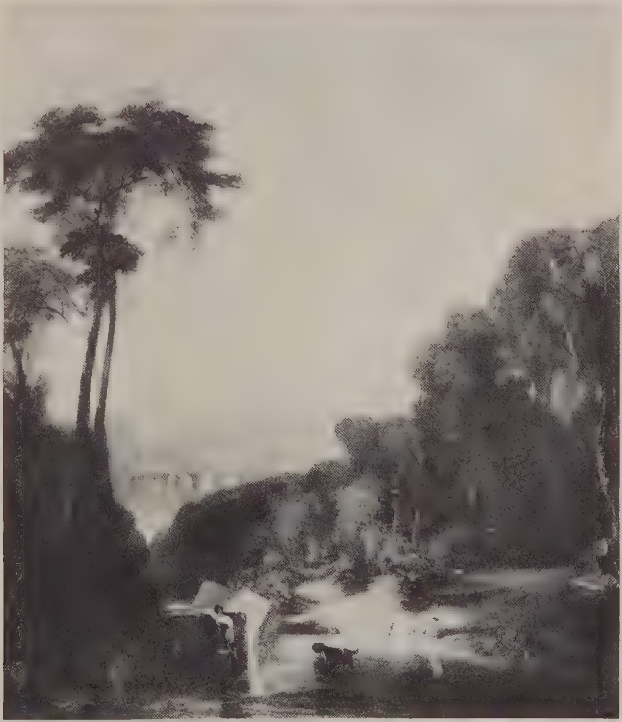
FIG. 31.—HAARLEM, FROM THE DUNES, RUYSDAEL. (20 × 24.) Hague.



Photo, Hanfstaengl.

FIG. 32.—CROSSING THE BROOK, TURNER. (76 × 65.) National Gallery, London.

PAINTING

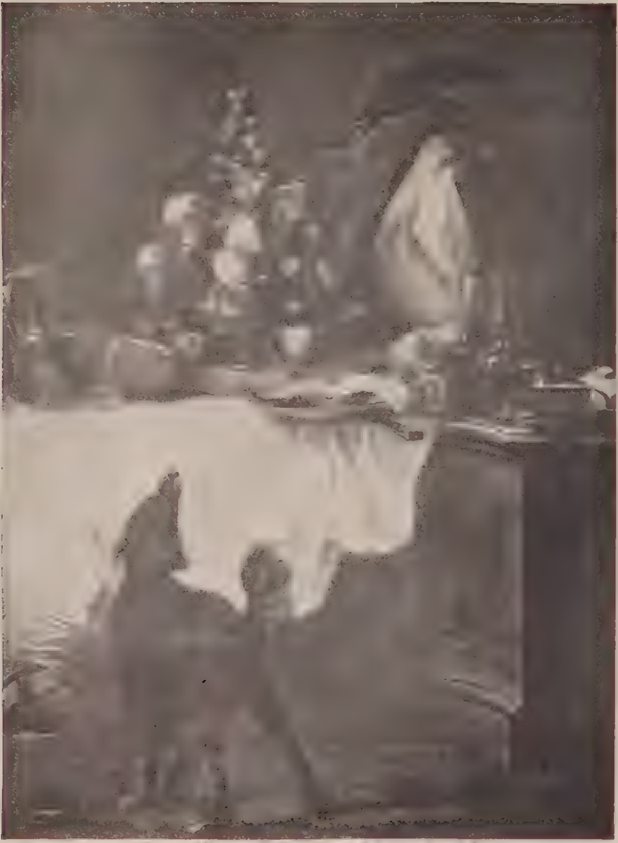


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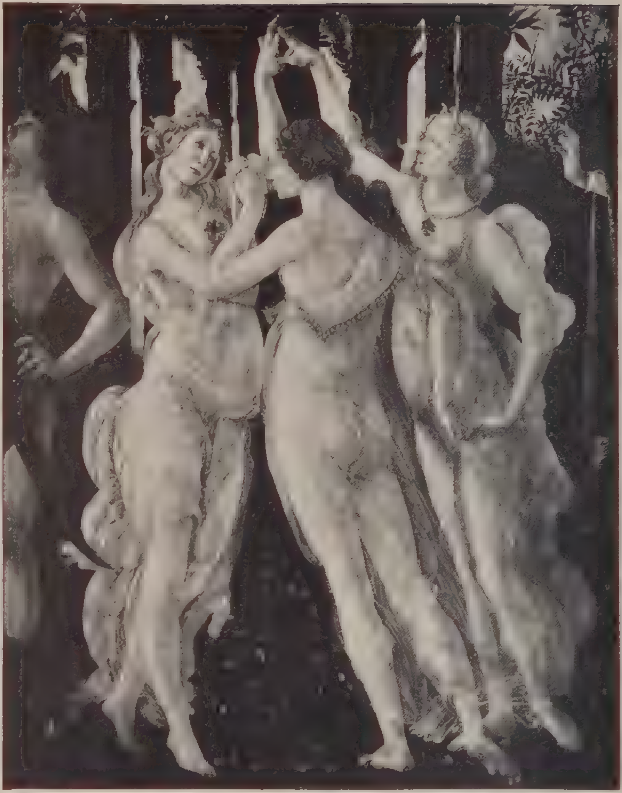
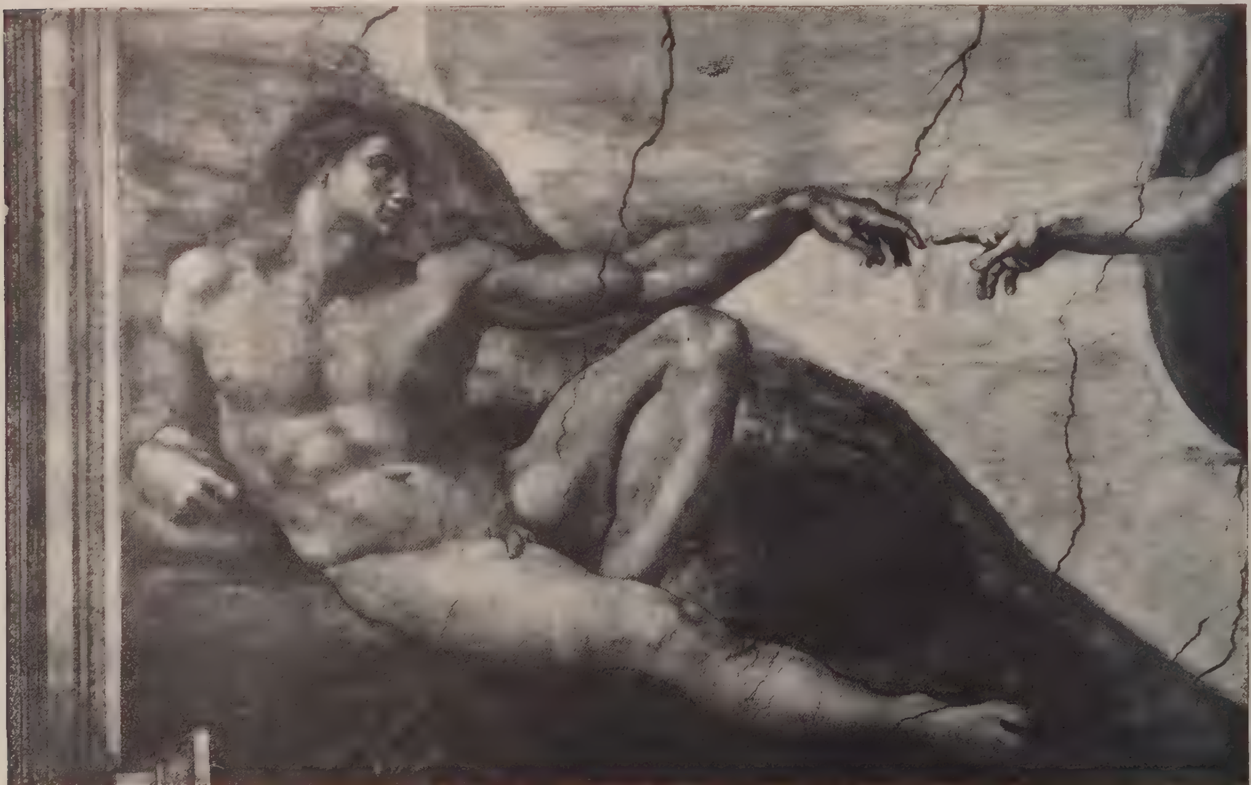
FIG. 33.—STILL LIFE, CHARDIN. (74×50.) Louvre.



Photo, Anderson.

FIG. 36.—THE THREE GRACES, BOTTICELLI.
Florence.



Photo, Anderson.

FIG. 34.—FIGURE OF ADAM, MICHELANGELO. Rome.

excellent painters of genre are Terborch, Metsu and Brouwer, the two first painters of the life of the upper classes, the last of peasant existence in some of its most unlovely aspects. The pictures of Brouwer are among the most instructive documents of modern painting. They are all small pictures and nearly all exhibit nothing but two or three boors drinking, fighting, or otherwise characteristically employed, but the artist's feeling for colour and tone, and above all his inimitable touch, has raised each to the rank of a masterpiece. He is best represented in the Munich Pinacotek, from which has been selected fig. 30, Plate IX. Hardly less admirable are Teniers in Flanders; De Hooch, Ver Meer of Delft, Jan Steen, A. van Ostade, in Holland, while in more modern times Hogarth, Chardin, Sir David Wilkie, Meissonier, and a host of others carry the tradition of the work down to our own day (see Table VIII.). Greuze may have the doubtful honour of having invented the sentimental figure-piece from ordinary life that delights the non-artistic spectator in our modern exhibitions.

§ 25. *Landscape and Marine Painting*. This is one of the most important and interesting of the forms of painting that belong especially to modern times. It is true that there is sufficient landscape in ancient art to furnish matter for a substantial book (Woermann, *Die Landschaft in der Kunst der alten Völker*, Munich, 1876), and the extant remains of Pompeian and Roman wall-painting contain a very fair proportion of works that may be brought under this heading. By far the most important examples are the half-dozen or so of pictures forming a series of illustrations of the *Odyssey*, that were found on the Esquiline at Rome in 1848, and are now in the Vatican library. As we shall see it to be the case with the landscapes of the late medieval period, these have all figure subjects on the nearer planes to which the landscape proper forms a background, but the latter is far more important than the figures. In some of these Odyssey landscapes there is a feeling after space and atmospheric effect, and in a few cases an almost modern treatment of light and shade, which give the works a prominent place among ancient productions which seem to prefigure the later developments of the art. In the rendering of landscape detail, especially in the matter of trees, nothing in antique art equals the pictures of a garden painted on the four walls of a room in the villa of Livia at Prima Porta near Rome. They are reproduced in *Antike Denkmäler* (Berlin, 1887, &c.). These may be the actual work of a painter of the Augustan age named Ludius or Studius, who is praised by Pliny (*Hist. Nat.* xxxv. 116) for having introduced a style of wall decoration in which "villas, harbours, landscape, gardens, sacred groves, woods, hills, fish-ponds, straits, streams and shores, any scene in short that took his fancy" were depicted in lively and facile fashion. Pompeian wall paintings exhibit many pieces of the kind, and we find the same style illustrated in the low reliefs in modelled stucco, of which the specimens found near the Villa Farnesina, and now in the Terme Museum at Rome, are the best known.

In medieval painting landscape was practically reduced to a few typical objects, buildings, rocks, trees, clouds, &c., which stood for natural scenery. Occasionally however in the MSS. these objects are grouped in pictorial fashion, as in a Byzantine Psalter of the 10th century in the National Library at Paris. The beginning of the 15th century may be reckoned as the time when the modern development of landscape art had its origin, and Masaccio here, as in other walks of painting, takes the lead. Throughout the century the landscape background, always in strict subordination to the figure interest, is a common feature of Flemish and Italian pictures, but, in the latter especially, the forms of natural objects are very conventional, and the impression produced on the city-loving Tuscan or Paduan of the time by mountain scenery is shown by the fact that rocks are commonly shown not only as perpendicular but overhanging. Titian is the first painter who, as mountain-bred, depicts the soaring peaks with real knowledge and affection (see the distance in fig. 22, Plate VII.), and the Venetians are the first to paint landscape with some breadth and sense of spaciousness, while, as we have seen, the Flemings, from Hubert van Eyck downwards, distinguish themselves by their minute rendering of details, in which they were followed later on by Dürer, who was fond of landscape, and by Altdorfer. Of Dürer indeed it has been said that some of his landscape sketches in water-colour are the first examples in which a natural scene is painted for its own sake alone. Some of the northern artists of the "Italianizing" school of the 16th century, such as Patinir, whom Dürer, about 1520, calls "Joachim the good landscape painter," Paul Bril later in the century, and Adam Elsheimer, who worked at Rome about 1600, with several of their contemporaries, must not be omitted in any sketch of the history of the art. South of the Alps, the late Italian Salvator Rosa treats the wilder aspects of nature with some imaginative power, and his work, as well as the scenery of his native land, had an influence in the rapid development of landscape art in the 17th century, which was in part worked out in the peninsula. What is known as "classical landscape" was perfected in the 17th century, and its most notable masters were the Lorrainer Claude Gelée and the French Poussin and Dughet, while the Italianizing Dutch painters Both and Berchem modify the style in accordance with the greater naturalism of their countrymen.

The landscapes of Claude are characteristic productions of the 17th century, because they convey as their primary impression that of space and atmosphere. The compositions, in which a few motives such as rounded masses of foliage are constantly repeated, are conventional; and there is little effort after naturalism or variety in detail; but the pictures are full of art, and reproduce in telling fashion some of the larger and grander aspects of the material creation. There are generally figures in the foreground, and these are often taken from classical fables or from scripture, but instead of the landscape, as in older Italian art, being a background to the figures, these last come in merely to enliven and give interest to the scenery. The style, in spite of a certain conventionality which offends some modern writers on art, has lived on, and was represented in our own country by Richard Wilson, the contemporary of Reynolds; and in some of his work, notably in the *Liber Studiorum*, by Turner. Even Corot, though so individual a painter, owes something to the tradition of classical landscape.

The prevailing tendency of modern landscape art, especially in more recent times, has been in the direction of naturalism. Here the masters of the Dutch school have produced the canonical works that exercise a perennial influence, and they were preceded by certain northern masters such as the elder Breughel, whose "Autumn" at Vienna has true poetry; Savary, Roghman, and Hercules Seghers. Several of the Dutch masters, even before the time of Rembrandt, excelled in the truthful rendering of the scenes and objects of their own simple but eminently paintable country; but it was Rembrandt, with his pupil de Koningk and his rival in this department Jacob Ruysdael, who were the first to show how a perfectly natural and unconventional rendering of a stretch of country under a broad expanse of sky might be raised by poetry and ideal feeling to the rank of one of the world's masterpieces of painting. Great as was Rembrandt in what Bode has called "the landscape of feeling," the "Haarlem from the Dunes" of Ruysdael (fig. 31, Plate IX.) with some others of this artist's acknowledged successes, surpass even his achievement.

Nearer our own time Constable caught the spirit of the best Dutch landscapists, and in robust naturalism, controlled by art and elevated to the ideal region by greatness of spirit, he became a worthy successor of the masters just named, while on the other side he furnished inspiration to the French painters of the so-called Barbizon school, and through them to many of the present-day painters in Holland and in Scotland.

To fix the place of J. M. W. Turner in landscape art is not easy, for the range of his powers was so vast that he covered the whole field of nature and united in his own person the classical and naturalistic schools. The special merits of each of these phases of the art are united in this artist's "Crossing the Brook" in the National Gallery, that is probably the most perfect landscape in the world (fig. 32, Plate IX.). In a good deal of Turner's later work there was a certain theatrical strain, and at times even a garishness in colour, while his intense idealism led him to strive after effects beyond the reach of human art. We may however put out of view everything in Turner's *œuvre* to which reasonable exception may on these grounds be taken, and there will still remain a body of work which for extent, variety, truth and artistic taste is like the British fleet among the navies of the world.

Among Turner's chief titles to honour is the fact that he portrayed the sea in all its moods with a knowledge and sympathy that give him a place alone among painters of marine. Marine painting began among the Greeks, who were fond of the sea, and the "Odyssey" and other classical landscapes are stronger on this side than the landscapes of the Tuscans or Umbrians, who cared as little for the ocean as for the mountains. The Venetians did less for the sea in their paintings than might have been expected, and in northern art not much was accomplished till the latter part of the 16th century, when the long line of the marine painters of Holland is opened by Hendrick Cornelius Vroom, who found a worthy theme for his art in the defeat of the Spanish Armada. Simon de Vlieger of Rotterdam, who was born about the beginning of the 17th century, was the master of W. Vandevelde the younger (1633–1707), who has never been equalled for his truthful representation of calm seas and shipping. He painted innumerable pictures of the sea-fights of the time between the English and the Dutch, those representing the victories of the Dutch being in Holland, while at Hampton Court the English are triumphant. There are exquisite artistic qualities in the painting of Vandevelde, who is reckoned the canonical master in this branch of art; but the few sea-pieces by Ruysdael, especially the "Dykes" of the Louvre, and the "Stormy Sea" at Berlin, exhibit the element under far more imaginative aspects. Besides Turner there are many British artists of modern days who have won fame in this branch of art that is naturally attractive to islanders.

§ 26. *Animal Painting.*—In all early schools of representative art from the time of the cave-dwellers downwards, the artist has done better with animals than with the human figure, and there is no epoch of the art at which the portrayal of animals has not flourished. (On Egyptian and Assyrian animals see § 7.) In Greece the representations of animals on coins are so varied and so excellent that we may be sure that the praise given to the pictures of the same creatures by contemporary artists is not overdrawn. In northern art animals have always played an important part, and the motives of medieval decoration are largely drawn from this source, while beast symbolism brings them into vogue in connexion with religious themes. In Italian and early Flemish and German art animals are as a rule only accessories, though some artists in all these schools take special delight in them; and when, early in the 17th century, they begin to take the chief place, the motive is often found in Paradise, where Adam and Eve lord it over the animal creation. If De Vlieger and Ruysdael are the first to show the sea in agitation, Rubens may have the same credit for revealing the passion and power of the animal nature in the violent actions of the combat or the chase. In this his contemporary Frans Snyders (1579–1657), and after Snyders Jan Fyt, specialized, and the first named is generally placed at the head of animal painters proper.

In Holland, in the 17th century, the animal nature presented itself under the more contemplative aspect of the ruminants in the lush water-meadows. True to their principle of doing everything they attempt in the best possible way, the Dutch paint horses (Cuyp, Wouwerman) and cattle (Cuyp, Adrian Vandevelde, Paul Potter) with canonical perfection, while Hondekoeter delineates live cocks and hens, and Weenix dead hares and moor-fowl, in a way that makes us feel that the last word on such themes has been spoken. There is a large white turkey by Hondekoeter in which the truth of mass and of texture in the full soft plumage is combined with a delicacy in the detail of the airy filaments, that is the despair of the most accomplished modern executant.

But animals have been treated more nobly than when shown in Flemish agitation or in Dutch phlegmatic calm. Leonardo da Vinci was specially famed for his horses, which he may have treated with something of the majesty of Pheidias. Dürer has a magnificent horse in the "Knight and Death," but this is studied from the Colleoni monument. Nearer our own time the painter of Napoleonic France, Géricault, gave a fine reading of the equine nature. Rembrandt's drawings of lions are notable features in his work, and in our own day in France and England the lion and other great beasts have been treated with true imaginative power.

§ 27. *Still-Life Painting.*—Like portraiture and landscape, the painting of objects on near planes, or as it is called still-life painting, is gradually differentiated from the figure-piece which was supreme in the early, and has been the staple product in all, the schools. Just as is the case with the other subsidiary branches of painting, it appears, though only as a by-product, in the history of ancient classical painting, passes practically out of existence in medieval times, begins to come to a knowledge of itself in the 15th and 16th centuries, and attains canonicity in the Dutch school of the first half of the 17th century. Still-life may be called the characteristic form of painting of the modern world, because the intrinsic worth of the objects represented is a matter of complete indifference when compared with their artistic treatment in tone, colour and texture. By virtue of this treatment it has been noted (§§ 19, 20) that a study of a group of ordinary objects, when seen and depicted by a Rembrandt, may have all the essential qualities of the highest manifestations of the art. There is no finer Rembrandt for pictorial quality than the picture in the Louvre representing the carcase of a flayed ox in a flesher's booth. As illustrating the principle of modern painting this form of the graphic art has a value and importance which in itself it could hardly claim. It is needless to repeat in this connexion what has been said on modern painting in general, and it will suffice here to indicate briefly the history of this particular phase of the art.

The way was prepared for it as has been noticed by the minute and forcible rendering of accessory objects in the figure-pieces and portraits of the early Flemish masters, of Dürer, and above all of Holbein. The painting of flower and fruit pieces without figure interest by Jan Breughel the younger, who was born in 1601, represents a stage onward, and contemporary with him were several other Dutch and Flemish specialists in this department, among whom Jan David de Heem, born 1603, and the rather older Willem Klaasz Heda may be mentioned. Their subjects sometimes took the form of a luncheon table with vessels, plate, fruit and other eatables; at other times of groups of costly vessels of gold, silver and glass, or of articles used in art or science, such as musical instruments and the like; and it is especially to be noted that the handling stops always short of any illusive reproduction of the actual textures of the objects, while at the same time the differing surfaces of stuffs and metal and glass, of smooth-rinded apples and gnarled lemons, are all most justly rendered. In some of these pieces we realize the beauty of what Sir Charles Eastlake has called the "combination of solidity of execution with vivacity and grace of handling, the elasticity of surface which depends on the due balance of sharpness and softness, the vigorous touch and the delicate marking—all subservient to the truth of modelling." In this form of painting the French 18th-century artist Chardin, whose impasto was fuller, whose colouring more juicy than those of the Dutch, has achieved imperishable fame (see fig. 33, Plate X.); and the modern French, who understand better than others the technical business of painting, have carried on the fine tradition which has culminated in the work of Vollon. The Germans have also painted still-life to good result, but the comparative weakness in technique of British painters has kept them in this department rather in the background.

PART II., §28.—SCHOOLS OF PAINTING

[In the following Tables are included the main facts in the history of Painting since about A.D. 1000, with the artists of the first, second and third rank in their schools and periods. The relative importance of the artists is shown by the size of the capitals in which their names are printed. Facts and names of minor importance have in the interest of clearness been excluded. The names are given as commonly used, and where they differ from the headings of the separate biographical articles identification can be made by the Index. Words indicating localities are in italics.]

I.

MEDIEVAL PAINTING & ITS OFFSHOOTS NORTH OF THE ALPS.

[From the Carolingian period till the XIIth century Germany is the chief European centre of artistic production. From about 1150 to 1300 France takes the lead. Italy is in the background till about 1250.]

Dates.				*ITALY.* (For Comparison.)	Dates.
1000 to 1200	Romanesque Wall and Panel Painting, *Reichenau*, *Brauweiler*, *Brunswick*, *Hildesheim*, *Soest*, &c. Romanesque Sculpture, *Hildesheim*, *Brunswick*, *Wechselburg*, *Freiberg i. S.*, &c.			*S. Angelo in Formis*, wall paintings of c. 1100.	1000
1150 to 1300	THE GOTHIC MOVEMENT IN *CENTRAL FRANCE* FROM 1150. Gothic decorative Sculpture, Stained Glass, Ivories, MS. Illuminations, &c. Qualities in the work:—Refinement, Tenderness of Feeling, Love of Nature. } 1150 to 1300			Byzantine panels imported. Proto-Renaissance, c. 1200–1300.	to 1300
1300 c. 1350	GOTHIC INFLUENCE ON NORTHERN PAINTING. Wall and Panel Paintings at *Ramersdorf*, *Cologne*, *Westminster*, &c. THE EARLIEST NORTHERN SCHOOLS.			Gothic characteristics in GIOTTO, 1267–1337.	1300
	GERMANY. Early Religious Schools (Gothic). *Prague*, from c. 1348. *Cologne*, MEISTER WILHELM, fl. c. 1360.	*HOLLAND.*	*FLANDERS.* HUBERT & JAN VAN EYCK. fl. c. 1380–1440.		
1400	HERMANN WYNRICH, fl. c. 1400. STEPHAN LOCHNER (Dombild, c. 1440). German Realism begins. MARTIN SCHONGAUER (*Colmar*), c. 1450–1488. Influenced by Van der Weyden. BARTH. ZEITBLOM (*Ulm*), c. 1450–c. 1520. HANS HOLBEIN THE ELDER (*Augsburg*), d. 1524.		Adoration of the Lamb, *Ghent*, 1432. ROGER VAN DER WEYDEN, 1399–1464 (*in Italy*, 1449). DIERICK BOUTS (*Haarlem*), 1400(?)–1475. (Perhaps author of the "Lieversberg Passion.") PETRUS CRISTUS, c. 1410–1472. HANS MEMLINC, c. 1430–1494. HUGO VAN DER GOES, c. 1435–1482. GERARD DAVID (*Oudewater*), c. 1450–1523.	MASACCIO, 1402–1429. Age of humanism begins.	1400
1500	ALBRECHT DÜRER (*Nuremberg*), 1471–1528. LUCAS CRANACH, 1472–1553. HANS BURGKMAIR, 1473–1531. MATHIAS GRUNEWALD, c. 1475–c. 1530. BARTH. BRUYN, c. 1493–c. 1555. Painter of Portraits. HANS HOLBEIN, 1497–1543. *England* his headquarters, 1526–1543. ADAM ELSHEIMER, 1578–1620. Influential at *Rome* c. 1600.	LUCAS VAN LEYDEN (*Leiden*). 1494–1533. { JAN SCHOREEL, 1495–1562 (*Alkmaar*). MARTEN VAN HEEMSKERK (*Haarlem*), 1498–1574.	QUINTIN MATSYS (*Antwerp*), c. 1466–1530. JOACHIM DE PATINIR, d. c. 1524. BREUGHEL THE ELDER, c. 1525–1570. The BREUGHEL Family. } Landscape and Genre. MABUSE (JAN GOSSART), c. 1472–c. 1533. FRANS FLORIS (DE VRIENDT) c. 1520–1570. } Figures ANTONIO MORO, c. 1512–c. 1575. Portraits. PAUL BRIL, 1554–1626. Landscape. } Italianisers.	RAPHAEL, d. 1520. The High Renaissance. TITIAN, d. 1576. TINTORETTO, 1518–1594.	1500
1600	German painting proper almost dies out in the XVIIth and early XVIIIth centuries.	For the Dutch School of the XVIIth century, see Table VII.	PETER PAUL RUBENS, b. 1577. For the Flemish School as headed by Rubens, see Table VIII.	For later Italian Painting, see Table VI.	1600

II.

THE PROTO-RENAISSANCE AND THE REVIVAL OF ART IN *ITALY*.

1200	CONDITION OF THE ART OF PAINTING IN *ITALY* BEFORE THE REVIVAL. Wall Paintings of poor style, with hard black outlines, devoid of any feeling for beauty or truth to nature. Panel Paintings, chiefly in the form of Enthroned Madonnas of Byzantine type, heavy but dignified; and painted Crucifixes, repulsive in aspect, with exaggeration of physical suffering, black outlines, green shadows, hatched lights. [Best Italian Sculpture, *e.g.* by Antellami at *Parma*, c. 1200, greatly inferior to contemporary work in France.]	1200
1250	REVIVAL FIRST SEEN IN SCULPTURE. NICCOLA PISANO inspired by the Proto-Renaissance of *Southern Italy*; his pulpit at *Pisa*, 1260. REVIVAL OF PAINTING UNDER THE INFLUENCE OF THE PROTO-RENAISSANCE. At *ROME*, PIETRO CAVALLINI "Last Judgment" at S. Cecilia, *Rome*, c. 1293; at *SIENA*, DUCCIO DI BUONINSEGNA, c. 1255–c. 1315, (probably) Ruccellai Madonna at *Florence*, and Madonna at *Siena*; at *FLORENCE*, CIMABUE, teacher of Giotto.	1250

Dates

III.

GOTHIC INFLUENCE ON THE ITALIAN REVIVAL.

1300

[Gothic Naturalism, Expressiveness, and Feeling in the Sculpture of Giovanni Pisano and Andrea Pisano.]

FLORENCE.	*SIENA.*
GIOTTO, 1267–1337, great in composition and in natural and dramatic treatment of sacred themes.	SIMONE MARTINI, c. 1283–1344, exhibits the pensive sweetness that marks Sienese painting. At *Siena* painters' company founded 1355.
Painting carried on on traditional lines by the Giottesques to the end of the century. At *Florence* painters' company founded 1349.	Sienese school preserves throughout its tender and devout feeling, and decorative charm.
TADDEO GADDI, STEFANO, MASO DI BANCO, BERNARDO DADDI, ANDREA ORCAGNA, AGNOLO GADDI, SPINELLO ARETINO, GIOVANNI DA MILANO, ANDREA DI FIRENZE, STARNINA, &c.	LIPPO MEMMI, BARTOLO DI FREDI, ANDREA VANNI. TADDEO BARTOLI influences art in *Umbria.* THE LORENZETTI, d. c. 1348. Painters of dramatic power.

CONTEMPORARY PAINTING *IN OTHER PARTS OF ITALY.*

Revival hardly begins in XIVth century. Best work done by ALLEGRETTO DI NUZIO of *Fabriano* and ALTICHIERO of *Verona.*

FRA ANGELICO DA FIESOLE, 1387–1455, sums up the purely religious art of the Gothic period.

IV.

1400

ITALIAN SCHOOLS OF THE FIFTEENTH CENTURY UNDER THE INFLUENCE OF THE RENAISSANCE.

Painting advances at *Florence*, declines at *Siena.* Other Italian schools begin to develop.

FLORENCE.	*SIENA.*	*UMBRIA.*	*NORTH ITALY.*	
			VERONA.	*VENICE.*
MASOLINO DA PANICALE, 1383–c. 1440 Teacher of MASACCIO, 1402–1429. Great as Giotto, with added knowledge and unique sense of the monumental in painting.	TADDEO BARTOLI 1363–1422. DOM. DI BARTOLO	GENTILE DA FABRIANO, c. 1370–c. 1450. Visits *Venice* and *Florence.*	VITTORE PISANO, d. 1456. Finest Italian medalist.	[GENTILE da FABRIANO Works at *Venice*, c. 1422.]
FILIPPO LIPPI, 1406–1469. Idyllic charm. SANDRO BOTTICELLI, 1444–1510. Sentiment and beauty. Treats classical subjects. FILIPPINO LIPPI, 1460–1505. Grace, classical details. BENOZZO GOZZOLI, 1424–1498. Copious in detail. COSIMO ROSSELLI, PIERO DI COSIMO. } Represent the popular side of XVth-cent. painting.	SANO DI PIETRO MAT. DI GIOVANNI FRAN. DI GIORGIO, &c., &c.	NICCOLO ALUNNO. BENEDETTO BONFIGLI. FIORENZO DI LORENZO. B. CAPORALI, &c., &c. Exhibit Umbrian suavity on Sienese lines. No progress.	*PADUA.* Native art begins with the school of FRANCESCO SQUARCIONE, 1394–1474. Classical remains studied. [DONATELLO & UCCELLO Work at *PADUA*, c. 1445.]	School of *MURANO*, influenced from *Germany*, and THE VIVARINI flourish, c. 1440–c. 1500.
PAOLO UCCELLO, $\frac{1397}{1475}$, devotee of Perspective AND. DEL CASTAGNO, c. 1390–1457. Vigour. DOM. VENEZIANO, c. 1400–(?) 1461, tries oil-paint? ALESSIO BALDOVINETTI, 1427–1499, realist. ANT. POLLAIUOLO $\frac{1429}{1498}$. Anatomy, nude, oil. } Work at the formal side of the XVth-cent. painting.	carry art through the century on the same lines as in the XIVth cent. Decline of Sienese Art.	PIERO DE' FRANCESCHI, c. 1416–1492, teacher of MELOZZO da FORLI, $\frac{1438}{1494}$, and of LUCA SIGNORELLI. $\frac{1442}{1524}$. Realists of Florentine type. Progressive.	From all these proceeds AND. MANTEGNA, $\frac{1431}{1506}$, Studies Tuscan Art and influences Venetian.	CARLO CRIVELLI, d. c. 1493. ANTONELLO da MESSINA, c. 1430 1479. In *Venice*, 1475–6. Oil painting introduced, c. 1473. CIMA DA CONEGLIANO, d. c. 1508. VITTORE CARPACCIO, d. c. 1522.
ANDREA DEL VERROCCHIO, 1435–1488. Great in sculpture. Teacher of Leonardo. DOM. DEL GHIRLANDAJO, 1449–1494. Master of monumental style in fresco.		GIOVANNI SANZIO, d. 1494. Father of Raphael.	*VICENZA.* MONTAGNA, 1475–1523. *FERRARA.* COSIMO TURA, d. c. 1496. LORENZO COSTA, 1460–1535.	THE BELLINI, Associated with Mantegna, JACOPO d. c. 1470,
FRA BARTOLOMMEO, $\frac{1475}{1517}$, AND. DEL SARTO, $\frac{1487}{1531}$. } Perfection of art on the formal side.	} All these fore-runners of the great masters. {	PIETRO PERUGINO, 1446–1524. Raphael's master.	*BOLOGNA.* FRANC. FRANCIA, 1450–1517.	GENTILE, $\frac{\text{c. }1429}{1507}$, GIOVANNI, $\frac{\text{c. }1430}{1516}$.

1500

V.

THE GREAT ITALIAN MASTERS OF THE SIXTEENTH CENTURY.

	FLORENCE.	*UMBRIA.*	*NORTH ITALY.*	*VENICE.*
	LEONARDO DA VINCI, $\frac{1452}{1519}$. At *Milan* 1482–1499. "Last Supper" finished c. 1497.	PERUGINO, SANZIO.	*MILAN.* BERNARDINO LUINI, $\frac{\text{c. }1465}{\text{c. }1540}$. Influenced by Leonardo.	GIOVANNI BELLINI. GIORGIONE, $\frac{\text{c. }1477}{1510}$. LORENZO LOTTO, c. 1480–c. 1556.
1500	MICHELANGELO BUONARROTI, 1475–1564. Sistine Chapel ceiling painted 1508–1512. "Last Judgment," c. 1540. Dome of St. Peter's, c. 1560. SEBASTIANO DEL PIOMBO, 1485–1547.	RAFFAEL SANZIO, 1483–1520. Umbrian period to 1504. Florentine period, 1504–1508. Roman period, 1508–1520. GIOVANNI DA UDINE.	*PARMA.* CORREGGIO, $\frac{1494}{1534}$. PARMIGIANO, 1504–1540. *BRESCIA.* MORETTO, c. 1498–1554.	PALMA VECCHIO, c. 1480–1528. TITIAN, died 1576, born 1476 (?) or some years later (?). First dated work, 1507. "Tribute Money," c. 1508 (Dürer at *Venice*, 1506). "Peter Martyr," 1530, influenced by Michelangelo. "Presentation in Temple," 1540.
1550	GIORGIO VASARI, 1511–1574. Wrote lives of the artists. The Michelangelesque affects Italian design in general.	GIULIO ROMANO, 1492–1546, PERINO DEL VAGA, &c., &c. Followers of Raphael.	*BERGAMO.* MORONI, c. 1510–1578.	PAUL VERONESE, 1528–1588. TINTORETTO, 1518–1594. "Paradise" begun, 1588.

Age of the mannerists.

VI.

THE LATER PHASES OF ITALIAN PAINTING.

Dates.	Eclectics. *BOLOGNA SCHOOL.*	Naturalists.	*VENICE (continued).*	Dates.
	THE CARACCI, $\frac{1580}{1620}$, LUDOVICO, AGOSTINO, ANNIBALE.	CARAVAGGIO, 1569–1609.	PARIS BORDONE, SCHIAVONE, THE BASSANI, THE BONIFAZI, &c., &c., all die before the end of XVIth century. PADOVANINO, 1590–1650.	
1600	GUIDO RENI, 1575–1642; DOMENICHINO, 1581–1641. BARBIERI (GUERCINO), 1591–1666; SASSOFERRATO, 1605–1685.	RIBERA (Spaniard), 1588–1653. Strong light and shade. SALVATOR ROSA, 1615–1673. Landscape.	G. B. TIEPOLO, 1692–1769. Decorative style. CANALETTO, 1697–1768. Views of *Venice*. LONGHI, 1702–1762; GUARDI, 1712–1793.	1600

VII.

THE DUTCH SCHOOL OF THE SEVENTEENTH CENTURY.

Artists of native type.

Portraitists and Painters of Corporation Pictures.

MIEREVELT, 1567–1641; RAVESTEYN, c. 1572–1657; DE KEYSER, 1596–1667.

Italianizers.

G. HONTHORST, 1590–1656.

PIETER LASTMAN, 1583–1633.

1600

REMBRANDT, $\frac{1606}{1669}$

FRANS HALS, $\frac{1580}{1666}$; VAN DER HELST, 1613–1670.

School of Rembrandt. { GERARD DOU, JAN VICTOR, GERBRANDT VAN DEN EECKHOUT, CAREL FABRITIUS, AART DE GELDER, FERD. BOL, GOVERT FLINCK, NICOLAS MAAS, Italianize after 1650. } School of Rembrandt.

(Poetic.)

DE HOOCH; VER MEER OF DELFT.

Genre. { (Aristocratic.) G. TERBORCH. G. METSU. (Satiric.) JAN STEEN. (Rustic.) A. VAN OSTADE. I. VAN OSTADE. (Cavalier.) P. WOUWERMAN. } Genre.

Landscape. { P. DE KONINGK, (Early landscapists, born before 1600.) ESAJAS VAN DE VELDE, J. VAN GOYEN. AERT VAN DER NEER. (Night scenes, moonlight.) RUYSDAEL, HOBBEMA, WYNANTS.

JAN BOTH, NICOLAES BERCHEM } Landscape.

(Cattle and Landscape.)

A. CUYP; A. VAN DE VELDE; PAUL POTTER. K. DU JARDIN.

(Marine painters.)

SIMON DE VLIEGER; W. VAN DE VELDE; L. BACKHUYSEN.

(Architecture.)

JAN VAN DER HEYDEN.

Still Life. { DE HEEM; HEDA. (Still life.) M. DE HONDEKOETER. (Poultry.) JAN WEENIX. (Dead game.) JAN VAN HUYSUM. (Flowers.)

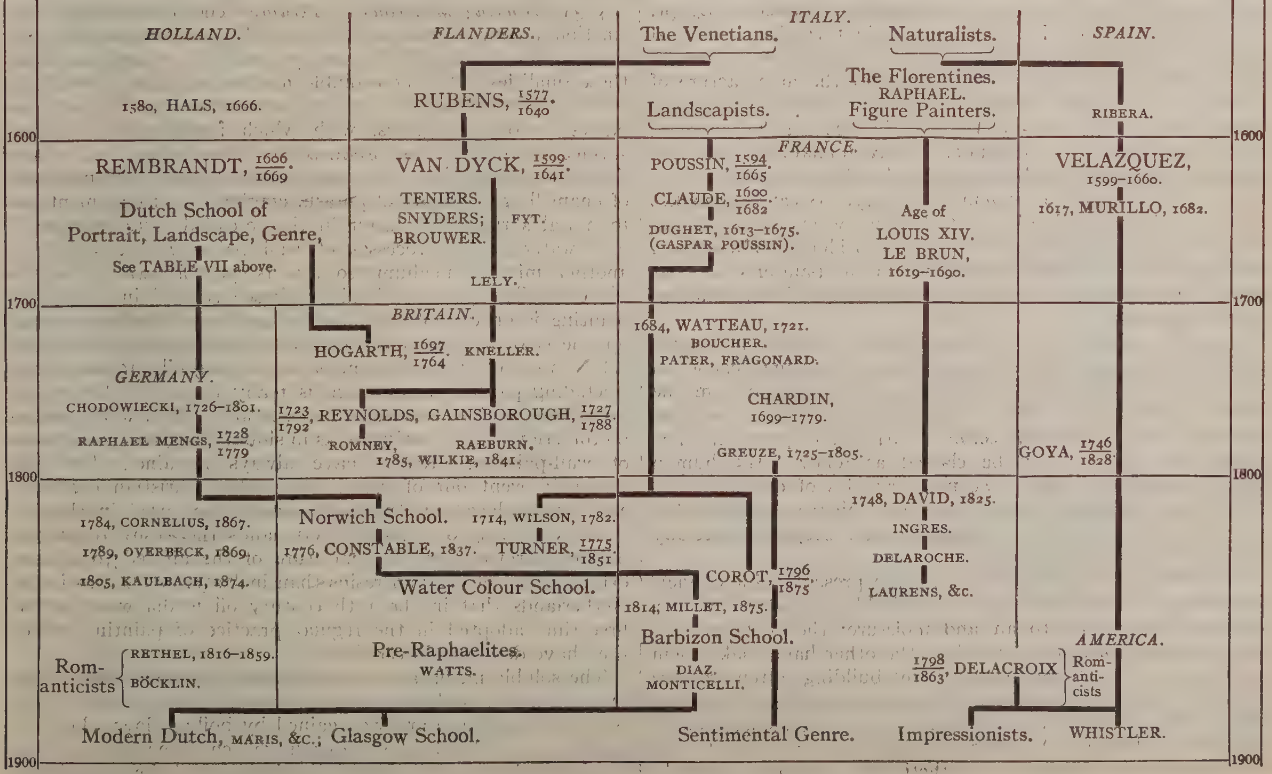
(Painters of the Decline.)

VAN MIERIS, C. NETSCHER, ADRIAN VAN DER WERFF.

1700

VIII.

CONSPECTUS OF THE MODERN SCHOOLS SINCE 1600.



Part III.—The Technique of Painting

§ 29. *The Materials of Painting.*—Painting begins, as we have seen, on the one side in outline delineation, on the other in the spreading of a coating of colour on a surface. For both these the material apparatus is ready at hand. Drawing may have begun merely with lines in the air, but lasting designs were soon produced either by indenting or marking any soft substance by a hard point, or by rubbing away a comparatively soft substance, such as a pointed piece of burnt wood, on a rough surface of harder grain. Almost all the materials in use for drawing are of primitive origin. Charcoal, coloured earths, and soft stones are natural or easily procured. Our plumbago was known to Pliny (xxxiv. 18) and to Cennino (ch. 34), but it was not in common use till modern times. The black-lead pencil is first described as a novelty in 1565 (Quellenschriften edition of Cennino, p. 143). A metal point of ordinary lead or tin was used in medieval MSS. for drawing lines on parchment, or on a wooden surface previously whitened with chalk (Theophilus, II. ch. xvii.). Silver-point drawing is only a refinement on this. The metal point is dragged over a surface of wood or parchment that has been grounded with finely powdered bone-dust, or, as in modern times, with a wash of Chinese white (Cennino, ch. 6 seq.; Church, 292), and through the actual abrasion of the metal leaves a dark line in its track. Pliny knows the technique (xxxiii. 98). When a coloured fluid was at hand a pointed stick might be used to draw lines with it, but a primitive pen would soon be made from a split reed or the wing-feather of a bird.

The coating of one substance by another of which the colour is regarded from the aesthetic standpoint is the second source of the art of painting. To manipulate the coating substance so that it will lie evenly; to spread it by suitable mechanical means; and to secure its continued adherence when duly laid, are by no means difficult. Nature provides coloured juices of vegetable or of animal origin, and it has been suggested that the blood of the slain quarry or foeman smeared by the victor over his person was the first pigment. To imitate these by mixing powdered earths or other tinted substances in water is a very simple process. Certain reeds, the fibres of which spread out in water, were used as paint-brushes in ancient Egypt. A natural hare's-foot is still employed in theatrical circles to lay on a certain kind of pigment, and no great ingenuity would be required on the part of the hunter for the manufacture of a brush from the hair or bristles of the slain beast. In the matter of securing the adhesion of the coating thus spread, nature would again be the guide. Many animal and vegetable products are sticky and ultimately dry hard, while heat or moisture thins them to convenient fluidity. Great heat makes mineral substances liquid that harden when cold. Hence binding materials offer themselves in considerable abundance, and they are of so great importance in the painter's art that they form the basis of current classifications of the different kinds of painting.

§ 30. *The Surfaces covered by the Painter.*—Many important questions connected with the technique of painting depend on the nature of surfaces; for the covering coat—though from the present point of view only of interest aesthetically—may, as we have seen, originally serve a utilitarian purpose. The surface in question may be classed as follows: the human body; implements, vessels, weapons, articles of dress; objects of furniture, including books; boats and ships; walls and other parts of buildings; panels and other surfaces prepared especially or entirely to be painted on.

The differences among these from the present point of view are obvious. The body could not suitably be covered with a substance impervious to air and moisture; the coatings of a clay vessel and of a boat should on the other hand make them waterproof. The materials used in building often require protection from the weather. The painting on the prepared panel needs to resist time and any special influence due to location or climate. All such considerations are prior to the questions of colour, design, or aesthetic effect generally, in these coatings; and on them depend the binding materials, or media, with which the colouring substances are applied. The case of one particular surface much employed for pictorial display is exceptional. This is the wall-plaster so abundantly used for clothing an unsightly, rough, or perishable building material, like rubble or crude brick. This function it performs perfectly when left of its natural white or greyish hue, but its plain unbroken surface has seemed to demand some relief through colouring or a pattern, and the recognition of this led to one of the most important branches of the art, mural painting. Now lime-plaster, if painted on while it is still wet, retains upon its surface after it has dried the pigments used, although these have not been mixed with any binding material. On all other surfaces the pigments are mixed with some binding material, and on the character of this the kind of painting depends. There is thus a primary distinction between the process just referred to and all others. In the former, pigments, mixed only with water, are laid on while the plaster is wet, and from this "freshness" of the ground the process is called by an Italian term, painting "a fresco" or "on the fresh," though in ordinary parlance the word "fresco" has come to be used as a noun, as when we speak of the "frescoes" of Giotto. Furthermore, as "fresco" is the wall-painter's process *par excellence* the word is unfortunately often employed inaccurately for any mural picture, though this may have been executed by quite a different process. In contradistinction to painting "a fresco" all other processes are properly described by the Italian term "a tempera," meaning "with a mixture." The word is used as a noun in the sense of a substance mixed with another; but it is to be regarded as the imperative of the verb *temperare*, which both in Latin and Italian means "to divide or proportion duly," "to qualify by mixing," and generally "to regulate." *Tempera* means strictly "mix," just as "recipe," also employed as a substantive, is an imperative meaning "take." In ordinary parlance, however, the word tempera is confined to a certain class of binding materials to the exclusion of others, so that the more general term "media" is the best to employ in the present connexion. We go on, therefore, to consider these various media in relation to different surfaces and conditions.

§ 31. *Binding Materials or Media.*—The fundamental distinction among media is their solubility or non-solubility in water, though, as will be seen presently, some possess both these qualities. The non-soluble media are (1) of mineral, (2) of vegetable origin. (1) Of the former kind are all vitreous pastes or pottery glazes, with which imperishable coloured surfaces or designs are produced on glazed tiles used in the decoration of buildings, on ceramic products, and in all processes of enamelling. Silicate of potash, employed to fix pigments on to mural surfaces of plaster in the so-called "stereochrome" or "water-glass" processes of wall painting (see § 37), is another mineral medium, so too is paraffin wax. In the process called (unscientifically) "fresco secco," in which the painting is on dry plaster, lime is used as a binding material for the colours. Its action here is a chemical one (see § 36). (2) Non-soluble vegetable media are drying oils, resins, waxes (including paraffin wax, which is really mineral). In ancient times wax, and to some small extent also resins, were used as a protection against moisture, as in shipbuilding and some forms of wall-painting. Resins have always remained, but wax gradually went out of use in the earlier Christian centuries, and was replaced by the new medium, not used in classical times, of drying oil. In northern lands the desire to protect painted surfaces from the moisture of the air led to a more extensive use of oils and resins than in Italy; and it was in the Netherlands that in the 15th century oil media were for the first time adopted in the regular practice of painting, which they have dominated ever since.

The soluble media are of animal and vegetable origin. Egg, yolk or white, or both combined, is the chief of the former. Next in importance are size, gained by boiling down shreds of parchment, and fish glue. Egg is the chief medium in what is specially known as "tempera" painting, while for the painting commonly called distemper or "gouache," of which scene-painting is typical, size is used. Milk, ox-gall, casein and other substances are also employed. Of soluble vegetable media the most used are gums of various kinds. These are common "temperas" or tempera media, and, with glycerin or honey, form the usual binding material in what is called "water-colour" painting. Wine, vinegar, the milk of fig-shoots, &c., also occur in old recipes.

Attention must be drawn to the fact that substances can be prepared for use in painting that unite soluble and insoluble media, but can be diluted with water. These substances are known as "emulsions." A wax emulsion, which is also called "saponified wax," can be made by boiling wax in a solution of potash [in the proportions 100 bleached wax, 10 potash, 250 distilled water (Berger, *Beiträge*, i. 100)] till the wax is melted. When the solution has cooled it can be diluted with cold water. An admixture of oil is also possible. This, according to Berger, is what Pliny and Vitruvius (vii. 9, 3) call "Punic wax," a material of importance in ancient painting.

An oil emulsion can be made by mixing drying oil with water through the intermediary of gum or yolk of egg. An intimate mechanical compound, not a chemical one, is thus effected, and the mixture can be diluted with water. If gum arabic be used the result is a "lean" emulsion of a milky-white colour, if yolk of egg a "fat" emulsion of a yellowish tint. When these wax or oil emulsions are dry they have the waterproof character of their non-soluble constituents.

Lastly, it must be noticed that certain substances used in the graphic arts—some of which possess in themselves a certain unctuousness—can be, as it were, rubbed into a suitably roughened, and at the same time yielding, ground, to which they will adhere, though loosely, without binding material. This is the case with charcoal, chalks and pencil. The same property is imparted by a little gum or starch to soft coloured chalks, with which is executed the kind of work called "pastel." These are now also made up with an oleaginous medium and are known as "oil pastels." Pictures can be carried out in ordinary or in oil pastels, and the work should rank as a kind of painting. The coloured films, rubbed off from the sticks of soft chalk on a suitably rough and sometimes tinted paper, are artistic in their texture and capable of producing very beautiful effects of colour. Professor Church notes also that the colours laid on in this fashion seem peculiarly durable (*Chemistry*, p. 293).

§ 32. *The Processes of Painting: Preliminary Note.*—These will be discussed from the point of view of the media employed, but certain departures from strict logical arrangement will be convenient. Thus, different processes of monumental painting on walls may be brought together though distinct media are employed. Tempera and early oil practice cannot be separated.

Painting by the use of vitreous glazes fused by heat may be noticed first, as the process comes within the scope of the article, though it has generally been applied in a purely decorative spirit, so as to be a branch of the art of ornament rather than strictly speaking of painting (see § 2).

In painting processes proper fresco takes the lead. It is in its theory the simplest of all, and at the same time it has produced some of the most splendid results recorded in the annals of the art. With the fresco process may be grouped for the sake of convenience other methods of wall-painting, which share with it at any rate some of its characteristics.

One of these subsidiary methods of wall-painting is that known as the wax process or "encaustic," used in ancient times and revived in our own. Painting in wax, not specially on walls, was an important technique among the ancient Greeks, and the consideration of it introduces some difficult archaeological questions, at which space will not allow more than a glance. The wax used in the process, softened or melted by heat or driven by fire into the painting ground—whence the name "encaustic" or "burning in"—is really a tempera or binding material, and we are brought here to the important subject of tempera painting in general. It will have to be noticed in this connexion what were the chief binding materials used in the so-named technique in different lands at the various stages of the art, and what conditions were imposed on the artist by the nature of his materials. Lastly, there is the all-important process in which the binding materials are oils and varnishes, a process to which attaches so much historical and artistic interest, while a form of tempera painting that has been specially developed in modern times, that known as water-colour, may claim a concluding word.

§ 33. *Historical Use of the Various Processes of Painting.*—The extent and nature of the employment of these processes at different periods may have here a brief notice.

Tempera painting has had a far longer history and more extended use than any other. The Spaniard Pacheco, the father-in-law and teacher of Velazquez, remarks on the veneration due to tempera because it had its birthday with art itself, and was the process in which the famous ancient artists accomplished such marvels. In the matter of antiquity, painting with vitreous glazes is its only rival: glazed tiles formed, in fact, the chief polychrome decoration for the exteriors of the palaces of Mesopotamia, and were used also in Egypt; but all the wall-paintings in ancient Egypt and Babylonia and Mycenaean Greece, all the mummy cases and papyrus rolls in the first-named country are executed in tempera, and the same is true of the wall-paintings in Italian tombs. In Greece Proper paintings on terra-cotta fixed by fire were very common in the period before the Persian wars. When monumental wall-painting came to the front just after that event it was almost certainly in tempera rather than in fresco that Polygnotus and his companions executed their masterpieces. It has been doubted whether these artists painted directly on plaster or on wooden panels fixed to the wall, but the discovery in Greece of genuine mural paintings of the Mycenaean period has set these doubts at rest. In Italy tomb-paintings actually on plaster exist from the 6th century B.C. The earlier panel painters of the 5th and 4th centuries B.C. also used tempera processes, though their exact media are not recorded. About the time of Alexander there seems to have been felt a demand for a style of painting in which could be obtained greater depth and brilliancy of colouring, with corresponding force in relief, than was possible in the traditional tempera; and this led to painting in a wax medium with which abundance of "body" could be secured. There are many puzzling questions connected with this ancient encaustic, but the discovery in recent years of actual specimens of the work, in the form of portraits on the late Egyptian mummy cases of the first centuries A.D. have assisted the study. Meanwhile a new technique to have been in process of evolution for use on walls, for the fresco process, in a complete or modified form, was certainly in use among the Romans.

The history of the fresco process, as will presently be seen, is somewhat puzzling. Vitruvius and Pliny knew it, and it is mentioned in the *Mount Athos Handbook*, which incorporates the technical traditions of the art of the Eastern Empire; it appears also to have been in use in the Christian catacombs, but was not practised by the wall painters who adorned the early medieval churches south and north of the Alps. The difficulties of the process, and another reason to be noticed directly, may have led to its partial disuse in the West, but we find it again coming into vogue in Italy in the 13th and 14th centuries. In the early Christian centuries its place was taken in the monumental decoration of walls by marble inlays, and especially by glass mosaic, which is in itself an important form of wall-painting and may have put painting on plaster, and with it the fresco process, into the shade; notice will however presently be taken of a theory that seeks to establish a close technical connexion between mosaic work and the fresco painting, which, on the decline in the later medieval period of mosaic, came forward again into prominence.

The tempera processes were accordingly in vogue in early medieval times for wall-paintings (except to some extent in the East), for portable panels, and on parchment for the decoration and illustration of manuscripts. Meanwhile the use of drying oils as painting media was coming to be known, and both on plaster and on wood these were to some extent employed through the later medieval period, though without seriously challenging the supremacy of tempera. From the beginning of the 15th century, however, oil painting rose rapidly in estimation, and from the end of that century to our own time it has practically dominated the art. Wall-painting in fresco continued to be practised till the last part of the 18th century, and has been revived and supplemented by various other monumental processes in the 19th, but even for mural work the oil medium has proved itself a convenient substitute. Water-colour painting in its present form is essentially an art of the last hundred years. The old tempera processes have been partly revived in our own time for picture-painting, but the chief modern use of tempera is in scene-painting, where it is more commonly called "distemper."

§ 34. *Painting with Coloured Vitreous Pastes.*—There is no single work that deals with the whole subject of this material and its different uses in transparent or opaque form in the arts, but details will be found in the special articles where these uses are described. (See CERAMICS; MOSAIC; ENAMEL; GLASS, STAINED.) On the subject of the substances and processes employed in the colouring of the various vitreous pastes information will be found in H. H. Cunynghame's *Art Enamelling on Metals* (2nd ed., London, 1906, ch. vi.), but the subject is a large and highly technical one.

Coloured vitreous pastes are among the most valuable materials at the command of the decorative artists, and are employed in numerous techniques, as for example for the glazes of ceramic products including wall or floor tiles; for painted glass windows; for glass mosaic, and for all kinds of work in enamels. The vitreous paste is tinged in the mass with various metallic oxides, one of the finest colours being a ruby red obtained from gold. Silver gives yellow, copper a blue green, cobalt blue, chromium green, nickel brown, manganese violet, and so on. Tin in any form has the curious property of making the vitreous paste opaque. It should be understood that though the vitreous substance and the metallic oxides are essentially the same in all these processes, yet the preparation of the coloured pastes has to be specially conditioned in accordance with the particular technique in view. There are generally various ways of producing reds and blues and greens, &c., from oxides of different metals. The material is generally lustrous, and it admits of a great variety in colours, some of which are highly saturated and beautiful. It is on the lustre and colour of the substance, rather than on the pictorial designs that can be produced by its aid, that its artistic value depends; but though this implies that it comes under the heading "Ornament" rather than "Painting," yet in certain forms and at particular periods it has been the chief medium for the production of pictorial results, and must accordingly have here a brief notice.

The difference between opaque and transparent coloured glass is the basis of a division among the arts that employ the material. If it be kept *transparent* the finest possible effect is obtained in the stained-glass window, where the colours are seen by transmitted light. The stained-glass window came into general use in the early Gothic period, and was a substitute for the wall-paintings which had been common in the Romanesque churches of the 11th and 12th centuries. Hence it is a form, and a very sumptuous and beautiful form, of the art of mural painting, representing that art in the later medieval buildings north of the Alps. In Italy, where the practice of wall-painting continued without a break from early medieval to Renaissance times, the stained-glass window was not a national form of art.

The most effective use of *opaque* coloured vitreous pastes is in ceramics (pottery) and in glass mosaic. The terra-cotta plaque, or tile-painted with designs in glazes of the kind was, as we have seen (§ 7), one of the chief forms of exterior mural decoration in ancient Mesopotamia. The best existing examples were found not long ago on the site of the ancient Susa ("Shushan the palace" of Scripture) and are now in the Louvre. Human figures, animals, and ornaments, are represented not only in lively colours but also in relief; that is to say, each separate glaze brick had its surface, measuring about 12 in. by 9 in., modelled as well as painted for the exact place it had to occupy in the design. On these bricks there are formed small ridges in relief intended to keep the different liquid glazes apart before they were fixed by vitrifaction in the kiln. Chemical analysis has shown that the yellow colour is an antimoniat of lead, the white is oxide of tin, similar to the well-known opaque white glaze used by the Della Robbia in Italy, the blues and greens are probably oxides of copper, the red a sub-oxide of copper (Semper, *Der Stil*, i. 332). This same region of the world has remained through all time a great centre for the production of coloured glazed tiles, but the use of "Persian," "Moresque," and other decorated plaques has been more ornamental than pictorial.

Glazed pottery only comes occasionally within the survey of the historian of painting. It does so in ancient Greece, because the earlier stages of the development of Greek painting can only be followed in this material; it does so, too, in a sense, in Italian faience and in some Oriental products, but these hardly fall within our view. The Greek vase was covered with a black glaze of extreme thinness and hardness, the composition of which is not known. Figure designs were painted in this on the natural clay of the vessel (see fig. 3, Plate IV.), or it was used for a background, the design being left the colour of the clay. Other colours, especially a red (oxide of iron) and white, were also employed to diversify the design and emphasize details, and these were also fixed by firing. A special kind of Greek vase was the so-called "polychrome lekuthos," a small upright vessel, the clay of which was covered with a white "slip" on which figure designs were painted in lively tints. The technique is not quite understood, but the colours were certainly fired. There is an article on "The Technical History of White Lecythi" in the *American Journal of Archaeology* for 1907; the processes are not, however, analysed.

In glass mosaic thin solid slabs of coloured vitreous pastes are broken up into little cubes of $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in size and set in some suitable cement. The artist works from a coloured drawing and selects his cubes accordingly. Any number of shades of all hues can be obtained, and the modern mosaic workers of Italy boast that they dispose of some 25,000 different tints. As it is of the essence of the work to be simple and monumental in effect, a limited palette is all that is needed; and the mosaics recently executed in St Paul's in London are done in about thirty colours. The worker should have at hand appliances to cut to shape any particular cube wanted for a special detail.

The ancients used the art, and the finest existing ancient picture is in a mosaic, not indeed of glass pastes, but of coloured marbles. This is the famous "Battle of Issus" found at Pompeii. Glass mosaic came in under the early Roman Empire, but its chief use was in early Christian times, when it was the chief material for mural decoration of a pictorial kind. Ravenna is the place where this form of painting is most instructively represented, and the 5th and 6th centuries A.D. are the times of its greatest glory. At Rome and Constantinople there is fine early work, while that at Venice and Palermo is later. In the earliest and best examples the design is very simple, and a few monumental forms of epic dignity, against a flat background commonly of dark blue, represents the persons and scenes of the sacred narratives. The effect of colour is always sumptuous. Gold, especially for the backgrounds, is in later work freely employed.

The subject of *enamel* work forms the theme of a separate article. Here it need only be said that pictures can be produced by painting on a ground, generally of metal, with coloured vitreous pastes that are afterwards fixed by fusing. Limoges in France has been the great centre of the art, but enamelling loses in artistic value when a too exclusively pictorial result is aimed at.

§ 35. *Fresco Painting.*—Vitruvius (*De Architectura*, bk. vii. chs. 2, 3; age of Augustus), *Mount Athos Handbook* (*Hermeneia*, chs. 54 seq.; date uncertain but based on early tradition); Cennino

Cennini (*Trattato della pittura*, chs. 67 seq., ed. Milanesi, 1859; Eng. trans. by Christiana J. Herringham, Lond., 1899); Leon Battista Alberti (*De re aedificatoria*, bk. vi. ch. 9; early and middle 15th century); Vasari (*Opere*, ed. Milanesi, i. 181; middle of 16th century)—all refer in general terms to the fresco process, as one generally understood in their times. Armenini (*Dei veri precetti della pittura*; Ravenna, 1587), and Palomino (*El Museo pictorico*; Madrid, 1715–1724), give more detailed accounts of the actual technical procedure, of which they had preserved the tradition. Much information of the highest value and interest was collected at the time when, in the forties of the 19th century, the project for the decoration in fresco of the new English Houses of Parliament was under discussion. This is contained in various communications by Sir Charles Eastlake, Mr Charles Heath Wilson, and others, printed with the successive *Reports of the Commissioners on the Fine Arts* from 1842 onwards. The experience obtained in the revived modern work in fresco by Cornelius, Hess, and other German artists encouraged by King Ludwig I. of Bavaria, which began at Rome in the second decade of the 19th century, was also drawn upon for the purpose of these *Reports*. A useful compendium was issued at the time by W. B. Sarsfield Taylor, *A Manual of Fresco and Encaustic Painting* (Lond., 1843). F. G. Cremer's *Vollständige Anleitung zur Fresco-Malerei* (Düsseldorf, 1891), may also be mentioned as a recent manual. The chemistry of the process is well explained by Professor Church in his *Chemistry of Paints and Paintings*.

The fresco process is generally regarded as a method for the production of a picture. It is better to look upon it in the first place as a colour-finish to plaster-work. What it produces is a coloured surface of a certain quality of texture and a high degree of permanence, and it is a secondary matter that this coloured surface may be so diversified as to result in a pattern or a picture.

We do not know among what people the discovery was first made that a wash of liquid pigment over a freshly laid surface of lime plaster remained permanently incorporated with it when all was dry, and added to it great beauty of colour and texture. The Egyptians, the Assyrians, the Phoenicians, the Mycenaean and later Greeks, the ancient Italians—all made extensive use of plaster as a coating to brickwork or masonry, but when they coloured it this was done after it was dry and with the use of some binding material or tempera.

The earliest notice of the fresco technique that we have in extant literature is contained in the third chapter of the seventh book of Vitruvius, and it is there treated as a familiar, well-understood procedure, the last stage in the construction and finish of a wall. Pliny also in several passages of his *Natural History* treats the technique as a matter of common knowledge. In Vitruvius the processes of plastering *albaria opera* are first described (vii. 2, 3), and it is provided that after the rough cast, *trullissatio*, there are to follow three coats of plaster made of lime and sand, each one laid on when the one below is beginning to dry, and then three of plaster in which the place of the sand is taken by marble dust, at first coarse, then finer, and in the uppermost coat of all in finest powder. It might now be (1) finished with a plain face, but one brought up to such an exquisite surface that it would shine like a mirror (chs. 3, 9); or (2) with stamped ornaments in relief or figure designs modelled up by hand; or (3) it might be completed with a coat of colour, and this would be applied by the fresco process, for which Pliny uses the formula *udo illinere*, "to paint upon the wet." The reason why the pigments mixed with water only, without any gum or binding material, adhere when dry to the plaster is a chemical one. It was first clearly formulated by Otto Donner von Richter in connexion with researches he made on the Pompeian wall-paintings and published in 1868 as an appendix to Helbig's *Campanische Wandgemälde*. He demonstrated that when limestone is burnt into lime all the carbonic acid is driven out of it. When this lime is "slaked" by being drenched with water it drinks this in greedily and the resultant paste becomes saturated with an aqueous solution of hydrate of lime. When this paste is mixed with sand or marble dust and laid on to the wall in the form of plaster this hydrate of lime in solution rises to the surface, and when the wet pigment is applied to this the liquid hydrate of lime or lime water, to use Professor Church's phrasing, "diffuses into the paint, soaks it through and through, and gradually takes up carbonic acid from the air, thus producing carbonate of lime, which acts as the binding material" (Church, p. 278). It is a mistake to speak of the pigment "sinking into the wet plaster." It remains as a fact upon the surface, but it is fixed there in a sort of crystalline skin of carbonate of lime—the element originally banished when the lime was burned—that has now re-formed on the surface of the plaster. This crystalline skin gives a certain metallic lustre to the surface of a fresco painting, and is sufficient to protect the colours from the action of external moisture, though on the other hand there are many causes chemical and physical that may contribute to their decay. If, however, proper care has been taken throughout, and conditions remain favourable, the fresco painting is quite permanent, and as Vitruvius says (vii. 3, 7), "the colours, when they have been carefully laid upon the wet plaster, do not lose their lustre but remain as they are in perpetuity . . . so that a plaster surface that has been properly finished does not become rough through time, nor can the colours be rubbed off, that is unless they have been carelessly applied or on a surface that has lost its moisture."

In the passage from which these words are taken Vitruvius gives useful hints as to the aesthetics of the fresco technique. Italian writers on the subject, such as Vasari, are generally so taken up with the pictorial design represented on the wall that the more essential characteristics of the process in itself are lost sight of. To Vitruvius the work is coloured plaster, not a picture on plaster, and he shows how important it is that the plaster should be finished with a fine surface of gleaming white so as to light up the transparent film of colour that clothes it. It is the result of such care in classical times that a surface of Pompeian plastering, self-tinted "a fresco," is beautiful without there being any question of pattern or design.

This beauty and polish of Pompeian, and generally of ancient Roman plaster, has recently been made the ground for calling in question the view accepted for a generation past that it was merely lime plaster painted on "a fresco," and for substituting a totally different technical hypothesis. The reference is to the treatment of ancient wall-painting generally in the first part of Berger's *Beiträge* (2nd ed., 1904, pp. 58 seq.). This writer denies that the well-known classical wall-paintings in question are frescoes, and evolves with great ingenuity a wholly new theory of this branch of ancient technique. It is his view that the plaster was prepared by a special process in which wax largely figured and which corresponds to, and indeed survives in, the so-called "stucco-lustro" of the modern Italians.

The process in question is described by L. B. Alberti (*De re aedificatoria*, vi. 9), who says that when the plaster wall surface has been carefully smoothed it must be anointed with a mixture of wax, resin and oil, which is to be driven in by heat, and then polished till the surface shines like a mirror. This is a classical process referred to by Vitruvius under the name "ganosis," as applied to the nude parts of marble statues, possibly to tone down the cold whiteness of the material. Now Vitruvius, and Pliny, who probably follows him, do as a fact prescribe this same process for use on plaster, but only in the one special case of a wall painted "a fresco" with vermilion, which was not supposed to resist the action of the light unless "locked up," in this way with a coating of this "Punic" or saponified wax. Neither writer gives any hint that the process was applied to plaster surfaces generally, or that the lustre of these was dependent on a wax polish, and Vitruvius's description is so clear that if wax had been in use he would certainly have said so.

Vitruvius prescribes so many successive coats of plaster, each one put on before the last was dry, and on the *wet* uppermost coat the colouring is laid. How can we with any reason substitute for this a method in which the plaster has to be made quite dry and then treated with quite a different material and process? Furthermore, Berger holds the astonishing theory that on the self-coloured surfaces of Pompeian and Roman plastered walls the colour was not applied, as in the fresco process, to the surface of the final coat, but was mixed up with the actual material of the *intonaco* so that this was a coat of coloured plaster. This is of course a matter susceptible of ocular proof, but the actual fragments of ancient coloured stucco referred to by Berger afford a very slender support to the hypothesis, whereas everyone who, like the present writer, possesses such fragments can satisfy himself that in almost every case the colour coat is confined to the surface. The writer has a fragment of such stucco from Rome, coloured with vermilion, and here there is clear evidence that some substance has soaked into the plaster to the depth of an eighth of an inch, as would be the case in the "ganosis" of Vitruvius. The part thus affected is yellowish and harder than the rest of the plaster. A careful chemical analysis, kindly made for the purpose of this article by Principal Laurie of Edinburgh shows that, although the small quantity of the material available makes it impossible to attain certainty, yet the substance may possibly be wax with the slight admixture of some greasy substance. On the other hand all the writer's other specimens show the colour laid on to all appearance "a fresco." The evidence of the coloured plaster in the house of about the 2nd century B.C. on Delos is wholly against Berger's view. The writer has many specimens of this, and they are all without exception coloured only on the surface. It is true that there are certain difficulties connected with Pompeian fresco practice, but the description of the process as a *wet* process in Vitruvius and Pliny is so absolutely unmistakable that Berger's theory must without hesitation be rejected.

The history of the fresco technique remains at the same time obscure. Here again Berger offers an interesting suggestion which cannot be passed over in silence. If the Pompeian technique, as he believes, be a wax process on dry plaster, followed by some form of tempera, how did the fresco technique, which is known both in East and West in the later medieval period, take its rise? The early medieval age was not a time when a difficult and monumental technique of the kind is likely to have been evolved, but Berger most ingeniously connects it with that of mosaic work. In mosaic the wall surface is at first rough plastered and a second and comparatively thin coat of cement is laid over it to receive and retain the cubes of coloured glass, only so much cement being laid each morning as the worker will cover with his tesserae before night. It was the practice sometimes to sketch in water-colours on the freshly laid patch of cement the design which was to be reproduced in mosaic, and Berger points to the incontestable fact if this sketch were allowed to remain without being covered with the cubes it would really be a painting in fresco. This is the way he thinks that the frescoe practice actually began, and the period would be that of the decline of mosaic work in the West as the middle ages advanced.

In spite of the attractiveness of these suggestions, we must reaffirm the view of this article that the testimony of Vitruvius is conclusive for the knowledge by the Romans of the early empire of the fresco technique. Why we do not find evidence of it far earlier cannot be determined, but it is worth noting that the success of the process depends on the plaster holding the moisture for a sufficient time, and this it can only do if it be pretty thick. In ancient Egypt and Mesopotamia, for example, the plaster used as painting ground was very thin, and especially in those hot climates would never have lent itself to fresco treatment. On the other side, the decline, and perhaps temporary extinction, of the technique in the early middle ages may be reasonably explained by the general condition of the arts after the break-up of the Roman Empire of the West.

To return now to the technical questions from which this historical digression took its rise, it will be easily seen that the process of painting in fresco must be a rapid one, for it must be completed before the plaster has had time to dry. Hence only a certain portion of the work in hand is undertaken at a time, and only so much of the final coat of plaster, called by the Italians *intonaco* is laid by the plasterer as will correspond to the amount the artist has laid out for himself in the time allowed him by the condition of the plaster. At the end of this time the plaster not painted on is cut away round the outline of the work already finished, and when operations are recommenced a fresh patch is laid on and joined up as neatly as possible to the old. In the making of these joints the ancient plasterer seems to have been more expert than the Italians of the Renaissance, and the seams are often pretty apparent in frescoes of the 15th and 16th centuries, so that they can be discerned in a good photograph. When they can be followed, they furnish information which it is often interesting to possess as to the amount that has been executed in a single day's work. Judging by this test, Mr Heath Wilson, in his *Life of Michelangelo*, computed that on the vault of the Sistine Michelangelo could paint a nude figure considerably above life size in two working days, the workmanship being perfect in every part. The colossal nude figures of young men on the cornice of the vault at most occupied four days each. The "Adam" (fig 34, Plate X.). was painted in four or perhaps in three. A day was generally occupied by the head of such figures, which were about 10 ft. high. Raphael, or rather his pupils, it is thus calculated, painted the *Incendio del Borgo*, containing about 350 sq. ft., in about forty days, the group of the young man carrying his father occupying three. The group of the Three Graces in the Villa Farnesina took five days at most. Luini, a most accomplished executant, could paint "more than an entire figure, the size of life, in one day" (Second *Report*, p. 37). It has been noticed as one of the difficulties about the Pompeian frescoes, that joints hardly occur, or at any rate that larger surfaces of plaster were covered by the painter at a single time than was the case among Renaissance artists, and a conjectural explanation has been offered based on the fact that the ancient plaster ground, laid on in many successive coats while in each case the previous one was still humid, was thicker and would hold more moisture than the more modern intonaco, and would accordingly allow the artist longer time in which to carry out his work. Alberti, Armenini, and Palomino only contemplate one or two thin coats over the original rough cast, while Cornelius and his associates, who revived the process early in the 19th century, speak of an intonaco over the rough cast only about a quarter of an inch thick. A piece of plaster ground from Raphael's *Loggie* in the Vatican was found to be quite thin, and Donner calculated that the ancient grounds were on an average 3 in. thick, the modern only a little over 1 in. On such grounds work had necessarily to be finished within the day, and Cennino expressly says (ch. 67): "Consider how much you can paint in a day; for whatever you cover with plaster you must finish the same day." Hence almost invariably in Italian fresco practice every join means a new day's work. At Pompeii the plaster, it is thought, might have remained damp over night. In the *Mount Athos Handbook* tow was to be mixed with the plaster, undoubtedly to retard its drying.

This necessarily rapid execution gives to well-handled frescoes a simplicity and look of directness in technique that are of the essence of the aesthetic effect of this form of the art. Hence Vasari is right when he extols the process in the words, "of all the ways in which painters work, wall-painting is the finest and most masterly, since it consists in doing upon a single day that which in other methods may be accomplished in several by going over again what has been done. . . . there are many of our craft who do well enough in other kinds of work, as for example in oil or tempera, but fail in this, for this is in truth the most manly, the safest, and most solid of all ways of painting. Therefore let those who seek to work upon the wall, paint with a manly touch upon the fresh plaster, and avoid returning to it when it is dry" (*Opere*, ed. Milanesi, i. 181).

The process gives the artist another advantage in that his painting, being executed in the very material of the surface itself, seems essentially a part of the wall. It is lime painting on a lime ground, and fabric and enrichment are one. This can be noted in the *Sala del Constantino* in the Vatican at Rome, one of the *stanze* or suite of rooms decorated by Raphael and his associates. There are two figures here painted on the walls in oil, and though there is a certain depth and richness of effect secured in this medium, they are too obviously something added as an afterthought, while the figures in fresco seem an integral part of the wall.

Work of this kind, finished in each part at a sitting, is what the Italians call *buon fresco* or "true fresco," and it has always been, as it was with Vitruvius, the ideal of the art, but at many periods the painters have had to rely largely on retouches and reinforcements after the plaster was dry. Cennino devotes the 67th chapter of his *Trattato* to a description of the process, and expressly tells us that the method he recommends is the one traditional in the school of Giotto, of which he himself was a direct scion. He is fully alive to the importance of doing as much as possible while the ground is wet, for "to paint on the fresh—that is, a fixed portion on each day—is the best and most permanent way of laying on the colour, and the pleasantest method of painting"; but an ordinary artist of the early part of the 15th century had not sufficient skill to do all that was required at the one moment. Observations made on the works executed by various Italian masters from the 14th to the 16th century show great varieties in this matter of retouching, but the subject need not be dwelt on as it involves no principle. Every painter of worthy ambition, who had entered into the spirit of his craft, would desire to do all he could "on the fresh," and would be satisfied with, and indeed glory in, the conditions and limitations of the noble technique. Masaccio, even at the beginning of the 15th century, is remarkable for the amount of fine pictorial effect he secured without reliance on retouching. It was second-rate artists, like Pinturicchio, who delighted to furbish up their mural pictures with stucco reliefs and gilding and to add touches of more brilliant pigments than could be used in the wet process. Giotto, Masaccio, Ghirlandajo, Michelangelo, Luini, are among the *frescanti* proper, who represent the true ideals of the craft.

The following notes upon the methods of the work are derived partly from observation of extant works and partly from the older treatises, but reference has also been made to modern practice in Germany and Italy, as information derived from this last source may be found useful by those who are disposed to-day to make essays in the process.

To avoid loss of time it is essential that the necessary drawing should all be accomplished beforehand. Pozzo, a painter and writer of the end of the 17th century says, "everyone knows that before beginning to paint it is necessary to prepare a drawing and well-studied coloured sketch, both of which are to be kept at hand in painting the fresco, so as not to have any other thought than that of the execution" (First *Report*, p. 35). In Cennino's time it seems to have been the practice to square out the work full size from the sketch on to the surface of the rough cast before the intonaco was laid. This at any rate enabled the artist to see how his work as a whole would come in relation to the space provided for it, but the actual intonaco had to be laid piece by piece over this general sketch and the drawing of each portion repeated on the new surface. In the palmy days of Italian painting, however, as well as in modern times, the design has been drawn out on a full-sized cartoon, and this cartoon, or a tracing from it, has been transferred piece by piece to the freshly laid intonaco on which the painting is about to be executed. The drawing may be nailed against the wall, and the outlines passed over with a blunt-pointed stylus of some hard material, that by dinting the paper impresses on the yielding plaster a line sufficient to guide the painter in his work; or the outlines of the cartoon may be pricked and "pounced" with a little bag of red or black powder that will leave a dotted outline on the wall.

The preparation of the intonaco itself is however a matter for much care. The lime should be prepared from a stone that is as far as possible pure carbonate of lime—the travertine of Tivoli, recommended by Vasari, is perfect for the purpose—and after it is burnt should be slaked with water and thoroughly macerated so that the lumps are all completely broken up. The slaked lime, of the consistency of a stiff paste, or as it is termed "putty," must be kept covered in from the air for a considerable period that varies according to different authorities from eight to twelve months to as many years. All experts, from Vitruvius downwards, are agreed on the necessity for this, but the exact scientific reason therefor does not seem to be quite clear. One advantage of the keeping is that the lime hydrate may take up a certain amount of carbonic acid, though not too much, from the air. Church says that, "not more than one-third or at most two-fifths of the lime should be converted into the carbonate" (p. 19); but Faraday (Fifth *Report*, p. 25) was of opinion that through lapse of time there was brought about a molecular change that divided the particles more thoroughly and gave the lime a finer texture so as to mix better with the pigments. At any rate, when Cornelius and his associates started the modern fresco revival at Rome, in 1815, an old workman who had been employed under Raphael Mengs directed their attention to this tradition, and they used lime that had been kept in a slaked condition, but still caustic—that is, still deprived of most of its carbonic acid, for twelve years! For mixing the plaster the proportions of lime to sand or marble dust vary; Cennino gives two of sand to one of "rich" or caustic lime, but the Germans used three of sand to one of lime. Whatever its exact constitution, the intonaco has to be carefully laid each morning over that part of the rough cast, previously well wetted, that corresponds to the amount laid out for the day's work. Contrary to the prescription of Vitruvius and Pompeian practice, which favours a polished surface, the moderns prefer a slight roughness or "tooth" on the intonaco. Painting should not begin, so Cornelius advised (First *Report*, p. 24), till "the surface is in such a state that it will barely receive the impression of the finger, but not so wet as to be in danger of being stirred up by the brush."

The pigments are ready mixed in little pots, on a tin palette with a rim round the edge, or on a table, and in old Italian practice each colour was compounded in three shades—dark, middle and light. The water should be boiled or distilled, or should be rain-water; for spring-water often contains carbonate of lime that would derange the chemistry of the process. Again, on account of the chemical action that takes place during the process, the pigments have to be carefully selected. The palette of the fresco painter is indeed a very restricted one, and this is another reason of the broad and simple effect of the work. Practically speaking only the earth colours, such as the ochres raw or burned, can be used with safety; even the white has to be pure white lime (in Italian, *bianco San-Giovanni*), since lead white used in oil painting (Italian, *biacca*) is inadmissible. Vegetable and animal pigments are as a rule excluded, "very few colours of organic origin withstanding the decomposing action of lime" (Church, p. 280). The brushes are of hog-bristles or otter-hair or sable, and have to be rather long in the hair. Round ones are recommended. According to early Italian practice, the painter would first outline the figures or objects, already drawn on the plaster, with a long-haired brush dipped in red ochre, and would then, *e.g.* in the case of the faces, lay in broadly with terre verte the shadows under the brows, below the nostrils, and round the chin, and bring down and fuse into these shadows the darkest of the three flesh-tints, with a dexterous blending of the wet pigments upon a surface that preserves their dampness. On the other side these half-tones are now modelled up into the lighter hues of the flesh. White may then be used in decided touches for the high lights, and the details of the eyes, mouth and other features put in without too much searching after accidents of local colour. Modern frescoists have found that "the tints first applied sink in and look faint, so that it is necessary sometimes to go over the surface repeatedly with the same colour before the full effect is gained" (First *Report*, p. 24), but it is well to allow in each case some minutes to elapse before touching any spot a second time. For the hair the Italians would make three tints suffice, the high lights again following with white. The draperies are broadly treated. After the whole has been laid in, in monochrome, with the green pigment, the folds would be marked out with the deepest of the three tints for shadow, and these shadows united by the middle tint. Lastly the lighter parts are painted up and finally reinforced with white. The work needs to be deftly touched, for too much handling of one spot may destroy the freshness of the tints and even rub up the ground. It is not necessary (as moderns have sometimes supposed) to put touch beside touch, never going twice over the same ground. So long as the pigments and the surface are wet the tints may be laid one over the other or fused at will, and may be "loaded" in some parts and in others thinly spread, the one essential being that a fresh and crisp effect shall not be lost. The wetness of the ground will always secure a certain softness in all touches, even those that give the strong high-lights, and so important is it that the plaster should not begin to dry, that it should be sprinkled if necessary with fresh water. The characteristic softness of the touches laid on "a fresco" is the more apparent when they are compared with those strokes of reinforcement which may be put on "a tempera" after the work is dry. Armenini says that the shadows may be finished and deepened by hatching, as in a drawing, with black and lake laid on with a soft brush with a medium of gum, size, or white and yolk of egg diluted with vinegar. Such retouches are always hard and "wiry," and are as much as possible to be avoided.

As examples of execution in fresco no works are better than those of Luini. He painted rapidly and thinly, securing thereby a transparency of effect that did not however preclude richness. Heath Wilson indeed says of his painting that, "it may be compared to that of Rubens; it is juicy, transparent, and clear; . . . his execution is light and graceful." No sounder model could be taken for modern work. The high-water mark of achievement in fresco painting was however reached by a greater than Luini—by Michelangelo in his painting of the Sistine Chapel roof. Considering that since his boyhood he had had no practical experience of the fresco process, and refused the commission as long as he could because he was not a painter but a sculptor, Buonarroti's technical success in the manipulation of the difficult process is still more astounding than the aesthetic result of the work as a creation of imaginative genius. He had to paint for the most part lying on his back in a sort of cradle, and working with his arms above his head, and had no skilled assistants; yet there is no quality in the work that strikes us more than its freshness and air of easy mastery, as if the artist were playing with his task. The fusion of the lights and shadows through the most delicate half-tones is accomplished in that melting fashion for which the Italians used the term *sfumato* or "misty," while at the same time the touches are crisp and firm, the accent here and there decided; and the artist's incomparable mastery of form gives a massive solidity to the whole (see fig. 34, Plate X.)

In our own times and in English-speaking circles the fresco process has been discredited owing to the comparative failure of the experiments connected with the Houses of Parliament. On the condition of the frescoes there, as well as on that of the pictures in various other media, a series of *Memoranda* were made by Professor Church, and a select committee of the House of Lords took evidence on the subject as late as December 1906. Most of the frescoes executed in the forties and fifties of the 19th century had got into a deplorable state; but Church's belief was that the main cause of the decay was the sulphurous acid with which, owing to the consumption of coal and gas, the air of London is so highly charged. The action of this acid—a million tons of which are said to be belched out into the London atmosphere in every year—turns the carbonate of lime which forms the surface of the fresco into a sulphate, and it ceases to retain its binding power over the pigments. "The chemical change," he reports, "is accompanied by a mechanical expansion which causes a disruption of the ground and is the main cause of the destruction of the painting." It is a remarkable fact, however, that one of the frescoes in question, Sir John Tenniel's "St Cecilia," completed in 1850, painted very thinly and on a smooth surface, lasted well, and opposed "a considerable measure of successful resistance for nearly half a century on the part of a pure fresco to the hostile influence of the London atmosphere" (Church, *Memorandum*, iv. 1896).

Abroad, experience was more favourable. The earliest frescoes of the modern revival—those by Cornelius and his associates from the Casa Bartholdy at Rome—are in a fairly good state in the National Gallery at Berlin. Such too is the condition of Cornelius's large fresco in the Ludwigskirche at Munich. The best modern frescoes, from the artistic point of view, in all Europe are those of about 1850 by Alfred Rethel in the town-hall at Aix-la-Chapelle, and they are well preserved. The exterior frescoes on the Pinacotek at Munich have on the other hand mostly perished; but the climate of that city is severe in winter, and nothing else was really to be expected. We must not expect carbonate of lime to resist atmospheric influences which affect to a greater or less degree all mineral substances.

§ 36. *Fresco-Secco.*—(See Charles Heath Wilson, in appendix to Second *Report of the Commissioners on the Fine Arts*, London, 1843, p. 40; Church, *Chemistry of Paints and Painting*, 1901, p. 278).

The process called "fresco-secco" is a method of lime painting on a plaster surface that has been allowed to dry. It is described by Theophilus in the *Schedula* of about A.D. 1100; and Mr Charles Heath Wilson in 1843 wrote of it as "extensively used in Italy at present and with great success." It is of course obvious that paintings must often be executed on walls the plastering of which is already dry, and on which the true fresco process is impracticable. Some kind of painting in tempera is thus needful, and "fresco-secco" uses for this the lime that is the very constituent of the plaster. The process is thoroughly to drench the dry surface of the plaster the night before with water with which a little lime or baryta water has been mixed, and to renew the wetting the next morning. The artist then fixes up his cartoon, pounces the outlines, and sets to work to paint with the same pigments as used in *buon fresco* mixed with lime or baryta water or with a little slaked lime. If the wall become too dry a syringe is used to wet it. The directions given by Theophilus (i. 15) correspond with this modern practice. "When figures or representations of other things," he says, "are to be delineated on a dry wall, it must be forthwith moistened with water till it is thoroughly wet. On this wet ground all the colours must be laid that are required, and they must be all mixed with lime, and will dry with the wall so that they adhere to it." Mr C. H. Wilson praises the work for its convenience, economy, and ease of execution, and notes that "for ornament it is a better method than real fresco, as in the latter art it is quite impossible to make the joinings at outlines owing to the complicated forms of ornaments," but says that "it is in every important respect an inferior art to real fresco. Paintings executed in this mode are ever heavy and opaque, whereas fresco is light and transparent." He declares also for its durability, but Professor Church states what seems obvious, that "the fixation of the pigments . . . is less complete" than in real fresco though depending on the same chemical conditions (Second *Report*, 1843, p. 40; *Chemistry*, p. 279).

§ 37. *Stereochromy or Water-Glass Painting.*—(See *Chemisch-technische Bibliothek*, Band lxxviii., *Die Mineral-Malerei*, von A. Keim, Wien, &c., 1881; Rev. J. A. Rivington in *Journal of the Society of Arts*, No. 1630, Feb. 15, 1884; Mrs Lea Merritt and Professor Roberts Austin in *Journal of the Society of Arts*, No. 2246, Dec. 6, 1895; F. G. Cremer, *Beiträge zur Technik der Monumental-Malverfahren*, Düsseldorf, 1895).

Akin to "fresco-secco," in that a mineral agent is used to secure the adhesion of the colouring matter to the plaster, is the process known as stereochromy or water-glass painting. It is not a traditional process, but an outcome of comparatively modern chemical research, and is not yet a century old. It is based on the properties of the substance called water-glass, a silicate of potassium or of soda, perfected by the German chemist Von Fuchs about 1825. A process of painting called "stereochromy" was soon after evolved, in which pigments of the same kind as those used in fresco, mixed only with distilled water and laid on a prepared plaster ground, were afterwards fixed and securely locked up by being drenched with this substance, which is equivalent to a soluble glass. Some of the mural paintings in the Houses of Parliament, notably those by Maclise, were executed in this process. Improvements were more recently effected in the process with which the names of Keim and Recknagel of Munich are connected, and in this form it has been used a good deal in Germany in the last quarter of the 19th century both in interiors and in the open air. For example, in 1881 Professor Schraudolph of Munich painted in this process the front of the Hôtel Bellevue in that city. This improved water-glass painting was introduced to notice in England in a paper read before the Society of Arts by the Rev. J. A. Rivington on the 13th of February 1884, and printed in the *Journal* of the society, No. 1630. A more recent description is contained in F. G. Cremer's *Beiträge*.

The recipe for the preparation of the actual medium is as follows: 15 parts pounded quartzsand, 10 parts refined potash, 1 part powdered charcoal are mixed together and fused for 6 to 8 hours in a glass furnace. The resultant mass when cold is reduced to powder and boiled for 3 or 4 hours in an iron vessel with distilled water till it dissolves and yields a heavy syrupy liquor of strongly alkaline reaction. This can be diluted with water, and in the process is applied hot.

The ground is very carefully prepared, and over a thoroughly sound and dry backing a thin coat of plaster is laid, composed of only 1 part lime to 5 or 8 parts selected sand and pounded marble with a slight admixture of infusorial earth. The object is to obtain a homogeneous porous ground that can be thoroughly permeated with the solution, and to help to secure this the intonaco when dry is sprayed with hydrofluo-silicic acid to dissolve away the crystalline skin of carbonate of lime formed on the surface and to "open the pores" of the plaster. The surface of the painting ground, which is left with a decided "tooth" upon it, is then well soaked with the solution, and when dry will be found "hard but perfectly absorbent and ready for painting."

The pigments consist in the usual ochres and earths; chrome reds, greens, and yellows; Naples yellow (antimoniate of lead); cobalt blue and green; and artificial ultramarine; terre verte, &c., with zinc white or baryta white.

It is important however to note, that the pigments (which can be supplied by Messrs Schirmer, late Faulstich, of Munich, and many other firms) are mixed with various substances so as to render uniform the action upon them of the fixing solution and neutralize the action of its alkalies. The operations of painting, in which only distilled water is used with the colours, are easy and admit of considerable freedom. "Every variety of treatment is possible, and the method adapts itself to any individual style of painting." The work can be left and resumed at will. After the painting is dry there comes the all-important final process of fixing with the water-glass solution. This is sprayed on in a hot state by means of a special apparatus, and the process is repeated till the wall can absorb no more, the idea being that the substance will penetrate right through to the wall, and when set will bind pigments, intonaco, rough plastering and wall into one hard mass of silicate that will be impervious to moisture or any injurious agencies. The last paragraph of the official account of the Keim process issued in 1883 for the guidance of those contemplating mural work runs as follows: "The fixing of the picture is accomplished by means of a hot solution of potash water-glass, thrown against the surface by means of a spray-producing machine in the form of a very fine spray. This fixing done, by several repetitions of the process, a solution of carbonate of ammonia is finally applied to the surface. The carbonate of potash, which is thus quickly formed, is removed by repeated washings with distilled water. Then the picture is dried by a moderate artificial heat. Finally a solution of paraffin in benzene may be used to enrich the colours and further preserve the painting from adverse influences."

§ 38. *Spirit Fresco or the "Gambier Parry" Process, with modifications by Professor Church.*—(See *Spirit Fresco Painting: an Account of the Process*, by T. Gambier Parry, London, 1883; Church, *Chemistry of Paints and Painting*, 288 seq.).

This process is also one of quite modern origin, but in Great Britain, at any rate, it is now very popular. Mr Gambier Parry, who invented and first put it into practice, claims for it that it "is not the mere addition of one or more medium to the many already known, but a system, complete from the first preparation of a wall to the last touch of the artist," and that the advantages it offers are "(1) durability (the principal materials being all but imperishable); (2) power to resist external damp and changes of temperature; (3) luminous effect; (4) a dead surface; (5) freedom from all chemical action on colours."

The theory of the process is much the same as that of stereochromy, the drenching of the ground with a solution that forms at the same time the medium of the pigments, so that the whole forms when dry a homogeneous mass. The solution or medium is however not a mineral one, but a combination of oils, varnishes and wax, the use of which makes the process nearly akin to that of oil painting. The objection to the use of oil painting proper on walls is the shininess of effect characteristic of that system, which is in mural work especially to be avoided, and "spirit fresco" aims at the elimination of the oleaginous element and the substitution of wax which gives the "matt" surface desired.

Mr Gambier Parry directs a carefully laid intonaco of ordinary plaster suitable for fresco on a dry backing, "the one primary necessity" being that the intonaco "should be left with its natural surface, its porous quality being absolutely essential. All smoothing process or 'floating' with plaster of Paris destroys this quality. All cements must be avoided." When dry the surface of the wall must be well saturated with the medium, for which the following is the recipe: pure white wax 4 oz. by weight; elemi resin 2 oz. by weight dissolved in 2 oz. of rectified turpentine; oil of spike lavender 8 oz. by measure; copal varnish about 20 oz. by measure. These ingredients are melted and boiled together by a process described in his paper, and when used for the wall the medium is diluted in one and a half its bulk of good turpentine. With this diluted solution the wall is well soaked, and the directions continue, "after a few days left for evaporation, mix equal quantities of pure white lead in powder and of gilder's whitening in the medium slightly diluted with about a third of turpentine, and paint the surface thickly, and when sufficiently evaporated to bear a second coat, add it as thickly as a brush can lay it. This when dry, for which two or three weeks may be required, produces a perfect surface" both white and absorbent.

The pigments, which are practically the same as those used in oil painting, must be ground in dry powder in the undiluted medium, and when prepared can be kept in tubes like oil colours. Solid painting with a good deal of body is recommended and pure oil of spike is freely used as painting medium. Pure spike oil may also be washed over the ground before painting "to melt the surface (hence the name Spirit *Fresco*) and prepare it to incorporate the colours painted *into* it." The spike oil is "the one common solvent of all the materials; . . . the moment the painter's brush touches the surface (already softened, *if necessary*, for the day's work) it opens to receive the colours, and on the rapid evaporation of the spike oil it closes them in, and thus the work is done." The oil of spike lavender, it may be noticed, is an essential oil prepared from *Lavandula spica*.

Professor Church has suggested improvement in the composition of the medium by eliminating the "doubtful constituents" elemi resin and bees'-wax and substituting paraffin wax, one of the safest of materials, dissolved in non-resinifiable oil of turpentine. This is mixed as before with copal varnish and used in the same way and with the same or better results as Mr Gambier Parry's medium.

§ 39. *Oil Processes of Wall Painting.*—The use of the oil medium for painting on plaster in medieval days opens up a much debated subject on which a word will be said in connexion with oil painting in general. In the later Renaissance period in Italy it came into limited use, and Leonardo essayed it in an imperfect form and with disastrous result in his "Last Supper" at Milan. Other artists, notably Sebastiano del Piombo, were more successful, and Vasari, who experimented in the technique, gives his readers recipes for the preparation of the plaster ground. This with Cennino (ch. 90) had consisted in a coat of size or diluted egg-tempera mixed with milk of fig-shoots, but later on there was substituted for this several coats of hot boiled linseed oil. This was still in common use in the 16th century, but Vasari himself had evolved a better recipe which he gives us in the 8th chapter of his "Introduction" to *Painting*. Over undercoatings of ordinary plaster he lays a stucco composed of equal parts of lime, pounded brick, and scales of iron mixed with white of egg and linseed oil. This is then grounded with white oil toned down with a mixture of red and yellow easily drying pigments, and on this the painting is executed.

In Edinburgh and other places Mrs Traquair has recently carried out wall paintings on dry plaster with oil colours much thinned with turpentine. The ground is prepared with several coats of white oil paint, and the finished work is finally varnished with the best copal carriage varnish.

In most cases oil painting intended for mural decoration has been executed on canvas, to be afterwards attached to the wall. This is the case more especially in France, and also in America at the Boston public library and other places. The effort here is to get rid of the shiny effect of oil painting proper by eliminating as far as practicable the oil. As this however serves as the binding material of the pigments the procedure is a risky one. To suppress the oil and to secure a "matt" surface Mr E. A. Abbey employed at Boston and elsewhere, as a medium for painting with ordinary oil colours, wax dissolved in spike oil and turpentine. In France Puvis de Chavannes used some preparation to secure a matt effect in his fine decorative oil painting on canvas.

§ 40. *Tempera Painting on Walls.*—This is a very ancient and widely diffused technique, but the processes of it do not differ in principle from those of panel painting in the same method. It is accordingly dealt with under tempera painting in general (§ 43).

§ 41. *Encaustic Painting on Walls.*—(See Schultze-Naumburg, *Die Technik der Malerei*, p. 122 seq.; Paillot de Montabert, *Traité complet de la peinture*, vol. ix.).

It has been already mentioned that wax is employed in modern mural painting in order to secure a matt surface. Many pictures have been carried out within the last century on walls in a regular wax medium that may or may not represent an ancient process. Hippolyte Flandrin executed his series of mural pictures in St Vincent de Paul and St Germain des Prés in Paris in a process worked out by Paillot de Montabert. Wax dissolved in turpentine or oil of spike is the main constituent of the medium with which the wall is saturated and the colours ground. Heat is used to drive the wax into the plaster.

A German recipe prepared by Andreas Müller in Düsseldorf has been used for mural paintings in the National Gallery, Berlin.

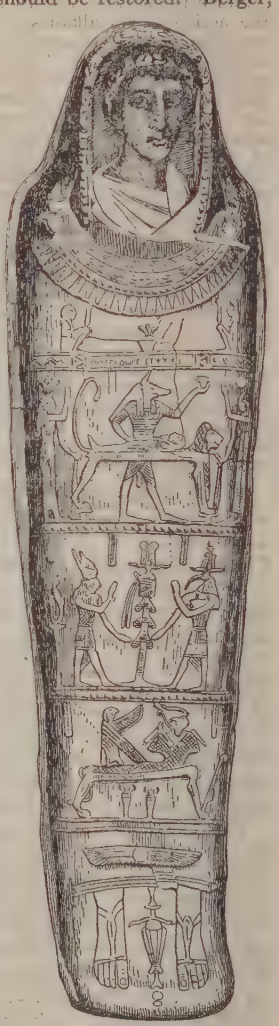
In this one part virgin wax is dissolved in two parts turpentine with a few drops of boiled linseed oil. The pigments are ground in boiled linseed oil with the addition of this medium. The plaster ground, well dried, is soaked with hot boiled linseed oil diluted with an equal quantity of turpentine. It is then grounded with several coats of oil paint for a priming and smoothed with pumice stone. The painting can be executed in a thin water colour technique or with a full body, and dries lighter than when wet and with a dead surface.

§ 42. *Encaustic Painting in general in Ancient and Modern Times.*—(See Cros and Henry, *L'Encaustique et les autres procédés de la peinture chez les anciens*, Paris, 1884; Flinders-Petrie, *Hawara*, &c., London, 1889; O. Donner v. Richter, *Über Technisches in der Malerei der Alten*, Munich, 1885; Berger, *Beiträge zur Entwickelungs-Geschichte der Maltechnik*, ii. 185 seq.; Munich, 1904).

Although in modern mural painting wax is employed to secure a matt surface, in ancient times it appears to have been valued rather from the depth and intensity it lent to colours when it was polished. It there represented an attempt to secure the same force and pictorial quality which in modern times are gained by the use of the oil medium. We are told of it by the ancients that it was a slow and troublesome process, and the name of it, meaning "burning in," shows that the inconvenience of a heating apparatus was inseparable from it; yet it seems at the same time to have been a generally accepted technique, and Greek writers from Anacreon to Procopius treat "wax" as the standard material for the painter. Nay more, hardly a day now passes without every one of us bearing testimony in the words he uses to the importance of the technique in antiquity. The *Etymologicum magnum* of the 12th century makes the process stand for painting generally (*ἐγκεκαυμένη-ἐξωγραφημένη*), and the name "encaustic" came to be applied not only to painting but also to sumptuous calligraphy. Then it was applied to writing in general, and the name still survives in the Italian *inchiostro* and our own familiar "ink" (Eastlake, *Materials*, i. 151).

The technique of ancient encaustic has given rise to much discussion which till recently was carried on chiefly on a literary basis. Fresh material has been contributed by the discovery, in the eighties of the 19th century, in Egypt of a series of portraits on mummy cases, executed for the most part in a wax process, and dating probably from the first two or three centuries A.D. Previous to this discovery there was little material of a monumental kind, though what appears to be the painting apparatus of a Gallo-Roman artist in encaustic was found in 1847 at St Médard-des-Prés in La Vendée, and has been often figured. It should be stated at the outset that the modern process of dissolving wax in turpentine or an essential oil like oil of spike was not known to the ancients, who however knew how to mix resinous substances with it, as in the case of ship-painting (Pliny xi. 16; Dioscorides i. 98). They also saponified wax by boiling it with potash so as to form what was called "Punic wax" (Pliny xxi. 84 seq.), and this emulsion may be reduced with water, and at the same time combines with oil and with size, gum, egg and other temperas. Wax, Pliny says, may be coloured and used for painting—*ad edendas similitudines* (*loc. cit.*); but as the name "encaustic" implies, and as we gather from another of Pliny's phrases, *ceris pingere ac picturam inurere* (xxxv. 122), heat was an essential part of the process. Hence the material must have been employed as a rule in a more or less solid form and liquefied each time for use, and not in the form of a diluted solution or emulsion which could be made serviceable cold. It is true that Punic wax mixed with a little oil is prescribed by Vitruvius (vii. 9, 3) as a solution for covering and locking up from the air a coat of the changeable pigment vermilion laid on a wall (see § 35), but the solution is used hot and driven in by application of a heating apparatus.

The accounts of the technique furnished to us by Pliny can be brought into connexion with the actual remains, and Berger and others have succeeded fairly well in imitating these by processes evolved from the ancient notices. It is unfortunate that the most important passage of Pliny (xxxv. 149) appears corrupt. It runs in the received text as follows: *Encausto pingendi duo fuere antiquitus genera, cera et in ebore cestro, id est vericulo, donec classes pingi coepere. Hoc tertium accessit resolutis igni ceris penicillo utendi, quae pictura navibus nec sole nec sale ventisve corrumpitur.* Here three kinds of encaustic painting are mentioned, two old and one new (the comparative chronology of the processes need not come into question), and in the two last cases the distinction is that between two instruments of painting, the *cestrum* and the *penicillus* or brush. It is natural to suggest that instead of the word *cera*, which, as wax is the material common to all encaustic processes, need not have been introduced and on manuscript authority may be suspected, some word for a third instrument of painting should be restored. Berger, with some philological likelihood, conjectures the word *cauterio*, which means properly a "branding-iron," but which he believes to be a sort of hollowed spatula or spoon with a large and a small end by which melted waxes of different colours might be taken up, laid on a ground, such as a wooden panel, and manipulated in a soft state as pictorial effect required. Instruments of the kind were found in the Gallo-Roman tomb in La Vendée. The second kind of painting with the *cestrum* or *vericulum* was on ivory and must have been on a minute scale. The "cestrum" was certainly a tool of corresponding size, and some have seen in it a sort of point or graver, such as that with which the incised outlines were made on the figured ivory plaques in the Kertch room at St Petersburg (see below); others a small lancet-shaped spatula like the tools that sculptors employ for working on plaster. The brush, with which melted waxes could be laid on in washes, as was the case on ships, needs no explanation.



(From a photograph by W. A. Mansell & Co.)

FIG. 35.—Mummy of Artemidorus with painted portrait, inscribed "O Artemidorus, Farewell." About A.D. 200. (Brit. Mus.).

An examination of the portraits from the mummy cases (see fig. 35) makes it quite clear that the brush was used with coloured melted waxes to paint in, in sketchy fashion, the draperies and possibly to underpaint the flesh and hair, while the flesh was executed in a more *pastos* style, with waxes in a soft condition laid on and manipulated with some spatula-like instrument, which we may if we like call "cauterium" or "cestrum." The marks of such a tool are on several of the heads unmistakably in evidence, and may be seen in specimens in the London National Gallery. There is a difference of opinion however as to the constitution of the wax. Donner von Richter holds that the wax was "Punic," *i.e.* a kind of emulsion, and was blended with oil and resinous balsams so as to be transformed into a soft paste which could be manipulated cold with the spatula. Heat for "burning in" (*picturam inurere*) he thinks was afterwards applied, with the effect of slightly fusing and blending the coloured waxes that had been in this way worked into a picture. Berger, on the other hand, believes that the coloured wax pastes were manipulated hot with the "cauterium," which would be maintained in a heated condition, and that there was no subsequent process of "burning in." Flinders Petrie is of opinion that, even in the case of the washes laid on with the brush, pure melted wax was employed and not a compound or emulsion, such as is generally assumed. Berger believes in a mixture of wax, oil and resin.

It is interesting to note that the distinguished modern painter, Arnold Böcklin, executed his picture of "Sappho" in coloured pastes composed of copal resin, turpentine and wax, manipulated with a curved spatula, and that he applied heat to fuse slightly the impasto. He believed he obtained in this way a brilliancy not to be compassed with oils.

The nature of the "cestron" technique on ivory is not known. The only existing artistic designs in ivory are executed by engraved lines, and these are sometimes filled in with coloured pastes. Exquisite work in this style exists in the Hermitage at St Petersburg, and there are examples in other museums, but this can hardly be termed encaustic painting. A better idea of the laboriously executed miniature portraits of which Pliny tells us can be gained from the small medallion portraits modelled in coloured wax that were common at the Renaissance period and are still executed to-day. In these however the smaller details are put in with the brush and pigment.

It is known from the evidence of the Erechtheum inscription that the encaustic process was employed for the painting of ornamental patterns on architectural features of marble buildings, but there is still considerable doubt as to the technique employed in such forms of decorative painting as the colouring of the white plaster that covered the surfaces of stonework on monumental buildings in inferior materials. Polychrome ornament on terra-cotta for architectural embellishment may have been fixed by the glaze as in ordinary vase painting, but Pliny says that Agrippa *figulinum opus encausto pinxit* in his Thermae (xxxvi. 189). The technique of the polychrome lecuthi and of the polychrome terra-cotta statuary is not certain.

The later history of wax painting after the fall of the Western Empire is of interest in connexion with the evolution of the painter's technique as a whole. Its possible relation to oil painting will be noticed later on. Here it is enough to note that the so-called *Lucca MS.* of the 8th century mentions the mingling of wax with colours, and the Byzantine *Mount Athos Handbook*, recording probably the practice of the 11th century, gives a recipe for an emulsion of partly saponified wax with size as a painting medium. A recipe of the 15th century quoted by Mrs Merrifield from the MSS. of Le Begue gives a similar composition that can be thinned with water and used to temper all sorts of colours.

§ 43. *Tempera Painting.* [Cennino's *Trattato*, in the English edition with terminal essays by Mrs Herringham (London, 1899), is the best work to consult on the subject. The Society of Painters in Tempera published in 1907 a volume of *Papers* on the subject. F. Lloyd's *Practical Guide to Scene Painting and Painting in Distemper* (London, 1879), is chiefly about the painting of theatrical scenery, and this subject is also dealt with in articles by William Telbin in the *Magazine of Art* (1889), pp. 92, 195.]

The binding substances used in the tempera processes may be classed as follows: (1) Size, preferably that made from boiling down cuttings of parchment. Fish-glue, gum, especially gum tragacanth and gum arabic (the Senegal gum of commerce); glycerin, honey, milk, wine, beer, &c. (2) Eggs, in the form of (i) the yolk alone, (ii) the white alone, (iii) the whole contents of the egg beaten up, (iv) the same with the addition of the milk or sap of young shoots of the fig-tree, (v) the contents of the egg with the addition of about the same quantity of vinegar [(iv) was used in the south, (v) north of the Alps]. (3) Emulsions, in which wax or oil is mingled with substances which bring about the possibility of diluting the mixture with water. Thus oil can be made to unite mechanically (not chemically) with water by the interposition either of gum or of the yolk of egg.

Of these materials it may be noted that a size or gum tempera is always soluble in water, and is moreover always of a rather thin consistency. The latter applies also to white of egg. On the other hand the yolk of an egg makes a medium of greater body, and modern artists, especially in Germany, have painted in it with a full impasto. The yolk of egg or the whole egg slightly beaten up may be used to temper powdered pigments without any dilution by means of water, and the stiffest body can in this way be obtained. The medieval artists seem however always to have painted with egg thinly, diluting the yolk with about an equal quantity of water. Their panels show this, and we can argue the same from the number of successive coats of paint prescribed by Cennino and other writers. The former (ch. 165) mentions seven or eight or ten coats of colours tempered with yolk alone, that must have been well thinned with water. This point will be returned to later on. The yolk of egg is really itself an emulsion as it contains about 30% of oil or fatty matter, though in its fluid state it combines readily with water. "Egg yolk," writes Professor Church (*Chemistry*, p. 74), "must be regarded as essentially an oil medium. As it dries the oil hardens," and ultimately becomes a substance not unlike leather that is quite impervious to moisture. Hence while size tempera when dry yields to water egg tempera will resist it. Sir William Richmond gave a proof of this in evidence before a committee of the House of Lords in November 1906, describing how he had exposed a piece of plaster painted with yolk of egg medium to all weathers for six months on the roof of a church and found it at the end perfectly intact. As to the milk of young fig-shoots, it is interesting to know from Principal Laurie ("Pigments and Vehicles of the Old Masters," in *Journal of the Society of Arts*, Jan. 15, 1892, p. 172) that "fig-tree belongs to the same family as the india-rubber tree, and its juice contains caoutchouc." He says, "doubtless the mixture of albumen and caoutchouc would make a very tough and protective medium."

With regard to the historical use of these different media, the medieval Italians used almost exclusively the yolk of egg medium, and this is also the favourite tempera of the moderns. In fact in Italy the word "tempera," as used by Vasari and other writers, generally means the egg medium. On the other hand size or gum was more common north of the Alps. It is in most cases very difficult to decide what temperas were in vogue in different regions and at the various epochs of the art, and the following must not be taken for more than an approximate statement of the facts. As far as it is known, the binding material in ancient Egypt was for the most part size, while Greek influence from about 600 B.C. onwards may have led to the use of wax emulsion (Punic wax). For paintings on mummy cases, and on papyrus scrolls, the medium may have been size or gum. Professor Flinders Petrie says it was acacia gum. The wall paintings of ancient Mesopotamia as well as those of India and the farther East generally were all in tempera, and it is noteworthy that recipes and technical practices of the East and of the West seem to be curiously alike. The exact media used are doubtful. The same doubt exists with regard to the exact processes of wall and panel painting in tempera in ancient Greece and Italy, in the East, in Byzantine times, and in the early middle ages both north and south of the Alps. The materials and processes mentioned by Pliny or in the various technical handbooks are on the whole clearly established, but it is very difficult to say in particular cases what was the actual technique employed. Any certainty in this matter must be based on the results not only of superficial examination but of analysis, and the very small quantities of the materials that can be placed at the disposal of the chemist make it often impossible to arrive at a satisfactory diagnosis.

A story in Pliny (xxxv. 102) shows that the Greek panel painters, when not "encaustae," used a water tempera, but whether size or egg was its main constituent we do not know. Apelles is said to have covered his finished panels with a thin coat of what Pliny calls "atramentum," which may have been a white of egg varnish, for spirit varnishes were not known in antiquity (Berger i. and ii. 183), and the Greeks do not seem to have used drying oils nor varnishes made with these. Byzantine panel painting, according to the *Mount Athos Handbook*, was executed as a rule in an egg tempera (Berger iii. 75), and this technique was followed later on in Italy. For Greek and Etruscan (Italian) wall-paintings of the pagan period; for late Roman wall-paintings north of the Alps, and for Romanesque and Gothic wall-paintings, we have to choose amongst the theories of size or egg tempera, wax tempera (emulsion), and the lime painting in "fresco secco" described by Theophilus. When we come to the panel painting from the 12th to the 15th century we are on surer ground. For the north we have the technical directions of Theophilus, for the south those of Cennino. Theophilus (i. ch. xxvii.) prescribes a tempera of gum from the cherry tree, and, with some pigments, white of egg. The finished panel was to be covered with an oil varnish (vernition). Cennino prescribes a tempera of the yolk of egg alone, half and half with the pigments, which have been finely ground in water and are very liquid, so that there might be in the ultimate compound about as much water as egg. A tempera of the whole egg with the milk of fig-shoots he recommends, not for panels, but for retouching fresco-work on the wall when it is dry. Tempera panels painted with egg yolk are, like the gum tempera panels of Theophilus, to be varnished with *vernice liquida* (oil varnish). In these media were executed all the fine tempera panels of the early Italian and early German schools of the 15th century, and these represent a limited, but within its bounds a very perfect and interesting, form of the painter's art.

A word or two may be said here about the various subsidiary processes connected with 14th and 15th century panel painting, which are of great interest as showing the conscientious, and indeed devotional spirit in which the operations were carried out. At the outset of his *Traitato* Cennino gives a list of the processes the panel painter has to go through, and in subsequent chapters he describes minutely each of these. The artist must "know how to grind colours, to use glue, to fasten the linen on the panel, to prime with gesso, to scrape and smooth the gesso, to make reliefs in gesso, to put on bole, to gild, to burnish, to mix temperas, to lay on grounding colours, to transfer by pouncing through pricked lines, to sharpen lines with the stylus, to indent with little patterns, to carve, to colour, to ornament the panel, and finally to varnish it." The preliminary operations, before the artificer actually begins to "colour" or paint, will take him six years to learn, and it requires with Cennino half a hundred chapters to describe them. The wooden panel is carefully compacted and linen is glued down over its face, and over this is laid, in many successive coats, a gesso ground of slaked plaster of Paris mixed with size, with which composition raised ornaments, such as the nimbi of saints, &c., can be modelled. Both these and the flat parts of the panel are scraped and smoothed till they are like ivory. The design of the picture is then drawn out on the panel, and the outlines sharpened up with the utmost precision. The gilding of the background and of the carved woodwork in which the panel is set now follows. Armenian bole, ground finely with white of egg diluted with water, is spread over the gesso and carefully burnished as a ground for water gilding with white of egg. The gold is then burnished till it appears almost dark (in the shadow) from its own refulgence. The delicate indented patterns which are so charming on the gilded grounds of the painted panels on East Anglian screens, such as that at Southwold, are stamped with little punches, and Cennino says this is one of the most beautiful parts of the art. In the actual painting, which is on the non-gilded part of the panel, the utmost attention is paid to the ornamentation of brocaded draperies, in which gold is used as a ground and is made to show in parts, while glazes of pigment mixed with drying oil are also used. Directions for painting the flesh, which is to be done after the draperies and background, are precise. There is an under-painting in a monochrome of terra verte and white, and over this in successive coats of great thinness the flesh-tints are spread, every tint being laid in its right position on the face, the darkest flesh-tint being shaded down to the terra verte and softened off in a tender *sfumato* manner. Many coats are superimposed, but the green ground is still to remain slightly visible. At the last the lightest flesh-tint is used to obtain the reliefs and the high lights are touched in in white. The outlines are sharpened up with red mixed with black. The varnishing process should be delayed for at least a year, and the varnish, which was evidently thick, is to be spread by the fingers over the painted surfaces, care being taken not to let the varnish go over the gold ground. This should be done if possible in the sun, but Cennino says that if the varnish be boiled it will dry without being placed in the sun.

The process thus described is not what we should call, in the modern sense, painting, for the precision and conventionality of the work and the great importance given to subsidiary details are quite opposed to the spirit of the art since the 16th century. Nevertheless, the naïve simplicity of the design and the exquisite delicacy of the finish have an unfailing charm. We feel, as Cennino says, that the artist has loved and delighted in his work, and regarded his patient manipulation as a religious act. A modern artist in tempera specially praises the old work for its "breadth, transparency and purity of colour," qualities "owing to the gradual bringing forward of the picture from a simple outline of extreme beauty." "This outline is never lost; its beautifully opposed and harmonizing lines and masses are retained to the end, even strengthened and accentuated, giving great distinctness at a distance, even when not actually visible. A perfectly modulated monochrome of light and shade fills the outline, apparent through the overlaid glory of colour, over which again is thrown a veil of atmosphere, a refulgence of light, a suggestion of palpitating space" (Mrs Herringham's *Cennino*, p. 218). A difficulty in the technique is the rapid drying of the medium, that prevents the fusing of the colours together in the impasto, which is possible in oil painting. Woltmann (*History of Painting*, Eng. trans. i. 406) thought that in the north honey was mixed with the white of egg or size to prevent too rapid drying, and he wrote, "this method rendered possible a liquid and softly gradated handling, and though the Italian variety of tempera allowed greater depth in the shadows, the northern gave on the whole greater brightness." In Italy, owing to the rapid drying of the egg-yolk, modelling was often secured by hatching, which is not so pleasing in its effect as the other method of superimposing thin coats of paint one over the other till the proper effect of shading is secured. One notable quality of tempera is its transparency, which is referred to by Cennino when he says that the original under-painting of terra verte is never to be wholly obliterated.

The well-known group of the "Three Graces," from Botticelli's large panel of the "Allegory of Spring," at Florence, gives the quality of tempera painting very aptly (see fig. 36, Plate X.). There is a Society of Painters in Tempera in London, and some artists are enthusiastic in their admiration of the process for its purity, sincerity and permanence.

Under the heading "tempera" should be noticed another style of painting with a water-medium that is executed as a rule on a large scale and in a comparatively slight fashion. Painting for the purposes of temporary decoration on canvas or wood, so much used in the Italian cities of the Renaissance period, is of this kind. Large cartoons in colour for mural pictures or tapestry, of which Raphael's cartoons are the most famous examples, are other examples; while in modern times the technique is chiefly employed in theatrical scene painting. The pigments are tempered with size or gum, and body is given to them by whitening, pipe-clay or similar substance. Work executed in this medium dries much lighter than when it is put on, and to execute it effectively, as in the case of stage scenery, requires much skill and practice. "In the study of the art of distemper painting a source of considerable embarrassment to the inexperienced eye is that the colours when wet present such a different appearance to what they do when dry." So writes F. Lloyds, but W. Telbin, though he recognizes this difficulty, extols the process. "A splendid material distemper! For atmosphere unequalled, and for strength as powerful as oil, in half an hour you can do with it that which in water or oil would take one or two days!" The English word "distemper" and the French "gouache" are commonly applied to this style of broad summary painting in body-colour. "Distemper" to English ears suggests house-decoration, "tempera" the work of the artist.

§ 44. *Oil Painting.*—(See Eastlake, *Materials for a History of Oil Painting* (London, 1847); Mérimée, *De la peinture à l'huile* (Paris, 1830); Berger, *Beiträge zur Entwicklungs-Geschichte der Maltechnik*, esp. iii. 221 sqq., and iv. (Munich, 1897), &c.; Dalbon, *Les Origines de la peinture à l'huile* (Paris, 1904); Ludwig, *Über die Grundsätze der Oelmalerei* (Leipzig, 1876); Lessing, *Über das Alter der Oelmalerei*, 1774.)

Oil painting is an art rather of the north than of the south and east, for its development was undoubtedly furthered by the demand for moisture-resisting media in comparatively damp climates, and, moreover, the drying oils on which the technique depends were but sparingly prepared in lands where olive oil, which does not dry, was a staple product.

Certain vegetable oils dry naturally in the air by a process of oxydization, and this drying or hardening is not accompanied by any considerable shrinking, nor by any change of colour; so that oil and substances mixed with it do not alter in volume nor in appearance as a consequence of the drying process. There may be a slow subsequent alteration in the direction of darkening or becoming more yellow; but this is another matter. Among these oils the most important is linseed oil extracted from the seeds of the flax plant, poppy oil from the seeds of the opium poppy, and nut oil from the kernels of the common walnut. With these oils, generally linseed, ordinary tube colours used by painters in oil are prepared, and oil varnishes, also used by artists, are made by dissolving in them certain resins. Their natural drying qualities can be greatly aided by subjecting them to heat, and also by mingling with them chemical substances known as "dryers," of which certain salts of lead and zinc are the most familiar. How far back in antiquity such oils and their properties were known is doubtful. Certain varnishes are used in Egypt on mummy cases of the New Empire and on other surfaces, and, though some of these are soluble in water, others resist it, and *may* be made with drying oils or essential oils, though the art of distilling these last cannot be traced back in Egypt earlier than the Roman imperial period. (See Berthelot, *La Chimie au moyen âge*, i. 138 (Paris, 1893). When Pliny tells us (xiv. 123) that all resins are soluble in oil, we might think he was contemplating a varnish of the modern kind. Elsewhere, however (xxiv. 34), he prescribes such a solution as a sort of emollient ointment for wounds, so it is clear that the oil he has in view is non-drying olive oil that would not make a varnish. In two passages of his *Natural History* (xv. 24–32, xxiii. 79–96) Pliny discourses at length on various oils, but does not refer to their drying properties. There is really no direct evidence of the use among the Greeks and Romans of drying oils and oil varnishes, though a recent writer (Cremer, *Untersuchungen über den Beginn der Oelmalerei*, Düss., 1899) has searched for it with desperate eagerness. The chief purpose of painting for which such materials would have been in demand is the painting of ships, but this we know was carried out in the equally waterproof medium of wax, with which resin or pitch was commingled by heat. The earliest mention of the use of a drying oil in a process connected with painting is in the medical writer Aetius, of the beginning of the 6th century A.D., who says that nut oil dries and forms a protective varnish over gilding or encaustic painting. From this time onwards the use of drying oils and varnishes in painting processes is well established. The *Lucca MS.* of the 8th or 9th century A.D. gives a receipe for a transparent varnish composed of linseed oil and resin. In the *Mount Athos Handbook* "peseri," or boiled linseed oil, appears in common use, and with resin is made into a varnish. In the same treatise also we find a clear description of oil painting in the modern sense; but since the dates of the various portions of the *Handbook* are uncertain, we may refer rather to Theophilus (about A.D. 1100), who indicates the same process with equal clearness. The passages in Theophilus (i. chs. xx. and xxvi.–xxviii.) are of the first importance for the history of oil painting. He directs the artificer to take the colours he wishes to apply, to grind them carefully without water in oil of linseed prepared as he describes in ch. xx., and to paint therewith flesh and drapery, beasts or birds or foliage, just as he pleases. All kinds of pigments can be ground in the oil and used on wooden panels, for *the work must be put out in the sun to dry*. It is noteworthy that Theophilus (ch. xxvii.) seems to confine this method of painting to movable works (on panel, *in opere ligneo*, in his *tantum rebus quae sole siccari possunt*) that can be carried out into the sun, but in ch. xxv. of the more or less contemporary third book of Heraclius (Vienna *Quellenschriften*, No. iv.) oil-paint may be dried either in the sun or by artificial heat. Heraclius, moreover, knows how to mix dryers (oxide of lead) with his oil, a device with which Theophilus is not acquainted. Hence to the latter the defect of the medium was its slow drying, and Theophilus recommends as a quicker process the gum tempera already described. In any case, whether the painting be in oil or tempera, the finished panel must be varnished in the sun with "vernition" (ch. xxi.), a varnish compounded by heat of linseed oil and a gum, which is probably sandarac resin. The *Mount Athos Handbook*, § 53, describes practically the same technique, but indicates it as specially used for flesh, the inference being that the draperies were painted in tempera or with wax. It is worth noting that the well-known "black Madonnas," common in Italy as well as in the lands of the Greek Church, may be thus explained. They are Byzantine icons in which the flesh has been painted in oil and the draperies in another technique. The oil has darkened with age, while the tempera parts have remained in contrast comparatively fresh. Some of them are probably the earliest oil paintings extant.

Oil painting accordingly, though in an unsatisfactory form, is established at least as early as A.D. 1100. What had been its previous history? Here it is necessary to take note of the interesting suggestion of Berger, that it was gradually evolved in the early Christian centuries from the then declining encaustic technique of classical times. We learn from Dioscorides, who dates rather later than the time of Augustus, that resin was mixed with wax for the painting of ships, and when drying oils came into use they would make with wax and resin a medium requiring less heat to make it fluid than wax alone, and one therefore more convenient for the brush-form of encaustic. Berger suspects the presence of such a medium in some of the mummy-case portraits, and points for confirmation to the chemical analysis of some pigments found in the grave of a painter at Herne St Hubert in Belgium of about the time of Constantine the Great (i. and ii. 230 seq.). One part wax with two to three parts drying (nut) oil he finds by experiment a serviceable medium. Out of this changing wax-technique he thinks there proceeded the use of drying oils and resins as media in independence of wax. If we hesitate in the meantime to regard this as more than a hypothesis, it is yet worthy of attention, for any hypothesis that suggests a plausible connexion between phenomena the origin and relations of which are so obscure deserves a friendly reception.

The *Trattato* of Cennino Cennini represents two or three centuries of advance on the *Schedula* of Theophilus, and about contemporary with it is the so-called Strassburg MS., which gives a view of German practice just as the *Trattato* does of Italian. This MS., attention to which was first called by Eastlake (*Materials*, i. 126 seq.), contains a remarkable recipe for preparing "oil for the colours." Linseed or hempseed or old nut oil is to be boiled with certain dryers, of which white copperas (sulphate of zinc) is one. This, when bleached in the sun, "will acquire a thick consistence, and also become as transparent as a fine crystal. And this oil dries very fast, and makes all colours beautifully clear and glossy besides. All painters are not acquainted with it: from its excellence it is called *oleum preciosum*, since half an ounce is well worth a shilling, and with this oil all colours are to be ground and tempered," while as a final process a few drops of varnish are to be added. The MS. probably dates rather before than after 1400.

Cennino's treatise, written a little later, gives avowedly the recipes and processes traditional in the school of Giotto throughout the 14th century. He begins his account of oil painting with the remark that it was an art much practised by the "Germans," thus bearing out what was said at the commencement of this section. He proceeds (chs. 90–94) to describe an oil technique for walls and for panels that sounds quite effective and modern. Linseed oil is to be bleached in the sun and mixed with liquid varnish in the proportion of an ounce of varnish to a pound of oil, and in this medium all colours are to be ground. "When you would paint a drapery with the three gradations," Cennino proceeds, "divide the tints and place them each in its position with your brush of squirrel hair, fusing one colour with another so that the pigments are thickly laid. Then wait certain days, come again and see how the paint covers, and repaint where needful. And in this way paint flesh or anything you please, and likewise mountains, trees and anything else." In other chapters Cennino recommends certain portions of a painting in tempera to be put in in oil, and nowhere does he give a hint that the work in oil gave any trouble through its unwillingness to dry. His medium appears, however, to have been thick, and perhaps somewhat viscous (ch. 92). This combination of oil paint and tempera on the same piece is a matter, as we shall presently see, of some significance.

In the *De re aedificatoria* of L. B. Alberti (written about 1450), vi. 9, there is a mention of "a new discovery of laying on colours with oil of linseed so that they resist for ever all injuries from weather and climate," which may have some reference to so-called "German" practice.

The next Italian writer who says anything to the purpose is

Filarete, who wrote a long treatise on architecture and the arts of design about 1464. It is published in the Vienna *Quellenschriften*, neue Folge, No. III. Like Cennino, Filarete (*loc. cit.* p. 641) speaks of oil painting as specially practised in "Germany," and says it is a fine art when anyone knows how to compass it. The medium is oil of linseed. "But is not this very thick?" he imagines some one objecting. "Yes, but there is a way of thinning it; I do not quite know how; but it will be stood out in a vessel and clarify itself. I understand however that there is a quicker way of managing this—but let this pass, and let us go on to the method of painting." Filarete's evident uncertainty about a process, which may be that of the Strassburg MS. for producing *oleum preciosum*, and his reference to "Germany," inclines us to look elsewhere than to Italy for knowledge about the oil technique. As a fact the evidence of the recipe books is borne out remarkably by that of other records which show that a great deal of oil painting of one kind or another went on in northern lands from the 13th century onwards. These records are partly in the form of accounts, showing large quantities of oil and resins furnished for the use of painters engaged in extensive works of decoration; and partly in the form of contracts for executing pictures "in good oil colours." It is true that oil might be merely employed in mordants for gilding or in varnishes, and for oil painting merely in house-decorator fashion over wood, or for colouring statues and reliefs in stone; nevertheless, with a use of proper critical methods, it has been possible for M. Dalbon and others to establish incontestably the employment in artistic wall and panel-painting of drying oils and varnishes before the 15th century, both north and, to a lesser extent, south of the Alps. These passages have been too often quoted to be cited here. (See Eastlake, *Materials*, p. 46 seq.; Berger, *Beiträge* iii. 206 seq., &c.) The earliest of the accounts, an English one, is dated 1239: "The king (Henry III.) to his treasurer and chamberlains. Pay from our treasury to Odo the goldsmith and Edward his son one hundred and seventeen shillings and tenpence for oil, sandarac resin, and colours bought, and for pictures executed in the Queen's Chamber at Westminster." Another, about 1275 (*temp.* Edward I.) runs: "To Robert King, for one cartload of charcoal for drying the painting in the King's Chamber, IIIs VIIId." In Flanders in 1304 there is an account (Dalbon, p. 43): "*Pour 10 los d'oile acatée pour faire destrempe as couleurs*," in 1373–1374 one for *XIII libvres d'olle de linnis à faire couleurs*" (p. 45). This was for the use of a certain painter Loys, who executed mural compositions of which some of the subjects are recorded. In the matter of contracts, Dalbon (p. 52) prints one of 1320 prescribing figure and landscape subjects, to be executed "*en la meilleur manière que il pourront estre faites en painture*," and concluding, "*et seront toutes ces choses faites à huille*," and he points convincingly to such wording as a proof that the work here under consideration must be regarded as artistic figure-painting and not mere house decoration. Lastly, just before 1400, the painter Jehan Malouel receives in 1399 oil with colours for "*la peinture de plusieurs tables et tableaux d'autel*," for the Carthusian convent of Champmol near Dijon, which proves the use of oil for panel as well as for mural painting.

The further question about the survival of actual remains of work of the class just noticed is a very difficult one. There seems no reason why all this mural and panel work in oil of the 14th century should have perished, unless the medium was faulty, and, as is natural, many attempts have been made to identify extant examples as representing these early phases of the oil technique. Mural work we need not perhaps expect to find, for we know from the later experience of the Italians of the 16th century that it was difficult even then to find a safe method for oil painting on plaster. With panels preservation would be more likely, and it is always possible that some datable work of the kind may be identified that will carry the monumental history of oil painting back into the 14th century. An exhibition of early English painted panels was held in 1896 in the rooms of the Society of Antiquaries of London, and some good judges believed at the time that certain 14th-century panels from St Michael at Plea, Norwich, were in oil, but this cannot be regarded as established.

If such then be the early history of oil painting, what attitude are we to adopt in face of the famous statement by Vasari that the technique was the invention of the Flemish painter Van Eyck in the year 1410? The statement was first made in the 21st chapter of Vasari's Introduction to his *Lives of the Artists* (1550), and runs as follows: "*Fu una bellissima inventione, ed un gran' commodità all' arte della pittura, il trovare il colorito a olio. Di che fu primo inventore in Fiandra Giovanni da Bruggia* (Jan van Eyck). In the life of Antonello da Messina, in the same edition, Vasari dresses up the bare fact he here relates, and gives it the personal anecdotal turn that accords with his literary methods. Here the "invention" follows on the incident of the splitting of a tempera panel varnished in oil, that according to traditional practice Van Eyck had put out in the sun to dry. This artist then turned his attention to devising some means for avoiding such mischances for the future, and, in Vasari's words, "being not less dissatisfied with the varnish than with the process of tempera painting, he began to devise means for preparing a kind of varnish which should dry in the shade, so as to avoid having to place his pictures in the sun. Having made experiments with many things both pure and mixed together, he at last found that linseed and nut oil, among the many which he had tested, were more drying than all the rest. These, therefore, boiled with other mixtures of his, made him the varnish which he had long desired." This varnish Vasari goes on to say he mixed with the colours and found that it "lit up the colours so powerfully that it gave a gloss of itself," without any after-coat of varnish.

Such is the famous passage in Vasari that has probably given rise to more controversy than any similar statement in the literature of the arts. The question is, in what did the "invention" of the Van Eycks, Hubert and Jan his younger brother, consist? and the first answer that would occur to anyone knowing alike the earlier history of the oil medium and Vasari's anecdotal predilections is the answer "There was no invention at all." The drying properties of linseed and nut oil and the way to increase these had long been known, as had also the preparation of sandarac oil-varnish, as well as a colourless (spirit?) varnish of which there is mention in accounts prior to the 15th century (Dalbon, p. 93). The mixing of varnish with oil for a medium was also known, and indeed the *oleum preciosum* may be the real "invention" of which Alberti and Filarete had only vaguely heard, and of which the Van Eycks later on received the credit. The epitaphs for the tombs of the two Van Eycks make no mention of such a feat as Vasari ascribes to them, and it is quite open to anyone to take up the position that it was no improvement in technique that brought to the Van Eycks their fame in connexion with oil painting, but rather an artistic improvement that consisted in using a traditional process to execute pictures which in design, finish, beauty and glow of colour far surpassed everything previously produced in the northern schools. Pliny writes of the works of a Greek painter of about 400 B.C. that they were the first that had the power "to rivet the gaze of the spectator," and in like manner we may say of the "Adoration of the Lamb" by the Van Eycks, the titular firstfruits of the oil painter's technique, that it impressed the world of its time so mightily through its artistic power and beauty as to elevate to a sort of mystic importance the very method in which the paints were mixed. There is much force in this view, but at the same time it is impossible to deny to the Van Eycks the credit of technical improvements. For one thing, an artist who has an exceptional feeling for colour, texture and delicacy of finish will certainly pay special attention to his technical media; for another, the Van Eycks had a reputation long before Vasari's time for researches into these media. In 1456, fifteen years after the death of the younger brother, Bartolommeo Facio, of Spezzia, wrote a tract *De viris illustribus* in which he speaks of a certain "Joannus Gallicus," who can be identified as Jan van Eyck, as specially "learned in those arts which contributed to the making of a picture, and was on that account credited with the discovery of many things in the properties of colours, which he had learned from ancient traditions recorded by Pliny and other writers." Filarete (*c.* 1464) also knew of the repute of Jan van Eyck in connexion with the oil technique. Hence we may credit the Van Eycks with certain technical improvements on traditional practices and preparations in the oil technique, though these can hardly be termed "inventions," while their artistic achievement was great enough to force into prominence whatever in the technical department they had accomplished.

Another and a more important question remains behind: What was, in fact, the practice in the matter of oil painting in vogue before the Van Eycks, altered or at any rate perfected by them and their successors, and in general use up to the time of Vasari; and how was it related to the older more widely diffused painting "a tempera"?

It is indisputable that the oil painting of the Van Eycks and the early Flemish school, together with that of the Florentines and Umbrians, and indeed of all the Italians up to Vasari's time, save the Venetians, Correggio, and some other north Italians, does not greatly differ in artistic effect, nor, as far as can be judged, in handling, from earlier or contemporary temperas. For example, at Venice in the 15th century, Crivelli paints always in tempera, Cima in oils, but the character of their surface is almost the same, and if anything the tempera is richer in effect than the oil. The contrary is no doubt the case with the tempera "Madonna with the Violet" in the Priests' Seminary at Cologne when compared with the somewhat later "Dombild," also by Stephan Lochner, which is believed to be painted in oils, but the two are still in technical character very nearly akin. The fact is that tempera panels were usually coated with an oil varnish, necessarily of a somewhat warm tint, and we could hardly expect to distinguish them from oil pictures painted in or covered by varnish, unless there were a difference in the handling of the pigments. The method of handling appears however to be on the whole the same, and there are many who believe that in all essentials it *is* the same. Tempera panels, as we have learned from Cennino, were not only varnished but in parts might be painted in oils (ch. 143), and it is one view of the technique of the early Flemings that it was only an over-painting in oils over a preparation in tempera. Berger is of the opinion that the process was something between the two, that is to say, that it was oil tempera, the medium being an emulsion of oil and water through the intermediary of a gum. Such a medium would, as he points out (*Beiträge*, iii. 247 seq.), combine the thinness and limpidity in manipulation characteristic of a water tempera with the property of drying hard and impervious to moisture. This is of course only a theory. Of far more weight is the suggestion made by Principal Laurie, of Edinburgh, who has carried on for years a series of careful experiments in the various pigments and media employed in oil painting. As one result of these experiments he has found that the ordinary drying oils and oil varnishes do not, as used to be assumed, "lock up" or completely cover and protect pigments so as to prevent the access of moisture and the gases of the atmosphere, but that this function is far more effectively performed by hard pine-balsams, such as Canada balsam, dissolved in an essential oil and so made into a varnish or painting medium. In pictures by Van Eyck Principal Laurie has detected what he believes to be the use of pigments of a notoriously fugitive character, and he is convinced that the most effectual medium for preserving these in the condition in which they have come down to us would be a natural pine-balsam, with probably a small proportion of drying oil; he suggests therefore that the introduction of these ingredients may be the real secret of the Van Eyck technique. There is as yet no proof that the Van Eycks really used such a medium, though it is a preparation possible at their time, and when thinned by a process of emulsification with egg, as Dr Laurie suggests, would be a serviceable one; but they and the other early oil painters certainly used a method, and in all probability media, that did not differ greatly as regards manipulation from those in vogue in tempera.

From the aesthetic point of view therefore we have to regard early oil painting as only another form of the older tempera, expressing exactly the same artistic ideals and dominated by the same view of the relation of art to nature. To Vasari the artistic advantage of the oil medium was, first, its convenience, and, next, the depth and brilliancy it lent to the colours, which he says it "kindled," while at the same time it lent itself to a soft fusing of tints in manipulation, so that artists could give to their figures in this technique the greatest charm and beauty combined with a force that made them seem to stand out in relief from the panel. Such a description applies very justly to work like that of the Van Eycks in the "Adoration of the Lamb," or the later panels of Antonello da Messina, who, according to Vasari's often-repeated story, introduced the Flemish system of oil-painting into Venice. The description does not however apply to the freer, more sweeping, more passionate handling of the brush by the greatest of the Venetians such as Titian or Veronese, and still less to the oil painting of 17th-century masters like Rubens or Rembrandt or Velazquez. It is quite clear that whatever improvements in oil technique were due to the early Flemings, oil painting in the modern sense owes still more to the Venetians, who first taught the world the full artistic possibilities of the process. Giovanni Bellini, whose noble altarpiece in S. Pietro at Murano may be called, in a phrase once applied to another of his pictures, "the canon of Venetian art," is probably entitled to be called the father of modern oil painting. Beginning as a painter in tempera and adopting the new process about 1475, Bellini was able so far to master the new medium that he handed it on with all its possibilities indicated to Giorgione, Palma and Titian. That Venetian oil painting however, with all its brilliancy and freedom, was a child of the older tempera technique is shown by its characteristic method, which consisted in an under-painting in dead colour, over which were superimposed the transparent glazes that secured the characteristic Venetian richness of colouring. Now all the recent writers on the Van Eyck technique agree that, whatever were the exact media employed, the tempera tradition, and perhaps the tempera vehicles, were maintained for the underpainting. In the old tempera-panel technique of Cennino there was a monochrome underpainting in a greenish pigment, over which the flesh tints were spread in thin layers so as never completely to obliterate the ground. Such an underpainting in a few simple colours, black, white and red, was employed by Titian and others of the Venetians, and over it were laid the rich juicy transparent pigments, till "little by little he would have covered with real living flesh these first abstracts of his intention" (Boschini). There is some evidence that in many cases these underpaintings were in tempera, which would have the advantage of drying more quickly than underpaintings in oil, and Boschini (*Le Ricche minere della pittura veneziana*, 1674) expressly says that the blues in Venetian paintings, *e.g.* by Veronese, were painted often *a guazzo.* There was a reason, however, why the Venetians would alter the traditional practice of the Flemish forerunners. The latter were almost entirely panel painters, while the Venetians used canvas. Now certain media, like the hard pine-balsams which Dr Laurie thinks were the basis of the Van Eyck medium, are suitable for the immovable surfaces of a well-grounded panel, but would be liable to crack on canvas which is more or less yielding. Hence the tougher oil vehicles were in advanced Venetian painting exclusively employed.

This distinction between the thin transparent pigments and those of an opaque body, which is as old as oil painting in any form, becomes in the hands of Bellini and the later Venetians the fundamental principle of the technique. The full advantage of this thinness and transparency is gained by the use of the pigments in question as "glazes" over a previously laid solid impasto. This impasto may be modelled up in monochrome or in any desired tints chosen to work in with the colours of the superimposed glazes. Effects of colour of great depth and brilliancy may thus be obtained, and after the glaze has been floated over the surface a touch of the thumb, where the underpainting is loaded and lights are required, will so far thin it as to let the underlying colour show through and blend with the deeper tint of the glaze in the shadows. Thus in the noble Veronese in the London National Gallery, called the "Consecration of St Nicholas," the kneeling figure of the saint is robed in green with sleeves of golden orange. This latter colour is evidently carried through as underpainting over the whole draped portions of the figure, the green being then floated over and so manipulated that the golden tint shows through in parts and gives the high lights on the folds.

Again the relation of the two kinds of pigment may be reversed, and the full-bodied ones mixed with white may be struck into a previously laid transparent tint. The practice of painting into a wet glaze or rubbing was especially characteristic of the later Flemings, with Rubens at their head, and this again, though a polar opposite to that of the Venetians, is also derived from the earlier tempera, or modified tempera, techniques. The older tempera panels, when finished, were, as we have seen, covered with a coating of oil varnish generally of a warm golden hue, and in some parts they were, as Cennino tells us, glazed with transparent oil paint. Now Van Mander tells us in the introduction to his *Schilderboek* of 1604, verse 17, that the older Flemish and German oil painters, Van Eyck, Dürer and others, were accustomed, over a slightly painted monochrome of water-colour in which the drawing was carefully made out, to lay a thin coat of semi-transparent flesh tint in oil, through which the underpainting was still visible, and to use this as the ground for their subsequent operations. In the fully matured practice of Rubens this thin glaze became a complete painting of the shadows in rubbings of deep rich transparent oily pigment, into which the half-tones and the lights were painted while it was still wet. Descamps, in his *Vie des peintres flamands* (Paris, 1753), describes Rubens's method of laying in his shadows without any use of white, which he called the poison of this part of the picture, and then painting into them with solid pigment to secure modelling by touches laid boldly side by side, and afterwards tenderly fused by the brush. Over this preparation the artist would return with the few decided strokes which are the distinctive signs-manual of the great master. The characteristic advantages of this method of work are, first, breadth, and second, speed. The under tint, often of a rich soft umber or brown, being spread equally over the canvas makes its presence felt throughout, although all sorts of colours and textures may be painted into it. Hence the whole preserves a unity of effect that is highly pictorial. Further, as the whole beauty of the work depends on the skill of hand by which the solid pigment is partly sunk into the glaze at the shadow side, while it comes out drier and stronger in the lights, and as this must be done rightly at once or not at all, the process under a hand like that of Rubens is a singularly rapid one. Exquisite are the effects thus gained when the under tint is allowed to peep through here and there, blending with the solid touches to produce the subtlest effects of tone and colour.

Of these two distinct and indeed contrasted methods of handling oil pigment, with solid or with transparent underpainting, that of the Flemings has had most effect on later practice. The technique dominated on the whole the French school of the 18th century, and has had a good deal of influence on the painting of Scotland. In general, however, the oil painting of the 17th and succeeding centuries has not been bound by any distinctive rules and methods. Artists have felt themselves free, perhaps to an undue extent, in their choice of media, and it must be admitted that very good results have been achieved by the use of the simplest vehicles that have been known throughout the whole history of the art. If Rembrandt begins in the Flemish technique, Velazquez uses at first solid underpaintings of a somewhat heavy kind, but when these masters attain to full command of their media they paint apparently without any special system, obtaining the results they desired, now by one process and now again by another, but always working in a free untrammelled spirit, and treating the materials in the spirit of a master rather than of a slave. In modern painting generally we can no longer speak of established processes and methods of work, for every artist claims the right to experiment at his will, and to produce his result in the way that suits his own individuality and the special nature of the task before him.

§ 45. *Water-Colour Painting.*—(Cosmo Monkhouse, *The Earlier English Water-Colour Painters*, 2nd ed., London, 1897; Redgrave, *A Century of Painters*; and Hamerton, *The Graphic Arts*, contain chapters on this subject.)

Water-colour painting, as has been said, is only a particular form of tempera, in which the pigments are mixed with gum to make them adhere, and often with honey or glycerin to prevent them drying too fast. The surface operated on is for the most part paper, though "miniature" painting is in water-colour on ivory. The technique was in use for the illustrated papyrus rolls in ancient Egypt, and the illuminated MSS. of the medieval period. As a rule the pigments used in the MSS. were mixed with white and were opaque or "body" colours, while water-colour painting in the modern sense is mostly transparent, though the body-colour technique is also employed. There is no historical connexion between the water-colour painting on the vellum of medieval MSS. and the modern practice. Modern water-colour painting is a development rather from the drawings, which the painters from the 15th to the 17th century were constantly executing in the most varied media. Among the processes employed was the reinforcement of an outline drawing with the pen by means of a slight wash of the same colour, generally a brown. In these so-called pen-and-wash drawings artists like Rembrandt were fond of recording their impressions of nature, and the water-colour picture was evolved through the gradual development in importance of the wash as distinct from the line, and by the gradual addition to it of colour. It is true that we find some of the old masters occasionally executing fully-tinted water-colour drawings quite in a modern spirit. There are landscape studies in body-colour of this kind by Dürer and by Rubens. These are, however, of the nature of accidents, and the real development of the technique did not begin till the 18th century, when it was worked out, for the most part in England, by artists of whom the most important were Paul Sandby and John Robert Cozens, who flourished during the latter half of the 18th century. First the wash, which had been originally quite flat, and a mere adjunct to the pen outline, received a certain amount of modelling, and the advance was quickly made to a complete monochrome in which the firm outline still played an important part. The element of colour was first introduced in the form of neutral tints, a transparent wash of cool grey being used for the sky and distance, and a comparatively warm tint of brown for the foreground. "The progress of English water-colour," writes Mr Monkhouse, "was from monochrome through neutral tint to full colour." Cozens produced some beautiful atmospheric effects with these neutral tints, though the rendering of nature was only conventional, but it was reserved for the second generation of English water-colour artists to develop the full resources of the technique. This generation is represented centrally by Thomas Girtin (1775–1802) and J. M. W. Turner (1775–1851), the latter of whom is by far the greatest representative of the art that has hitherto appeared. To Girtin, who died young and whose genius, like that of Masaccio, developed early, is due the distinction of creating water-colour painting as an art dealing with the tones and colours of nature as they had been dealt with in the older media. W. H. Pyne, a contemporary water-colour artist who also wrote on the art, says of Girtin that he "prepared his drawings on the same principle which had hitherto been confined to painting in oil, namely, laying in the object upon his paper with the local colour, and shading the same with the individual tint of its own shadow. Previous to the practice of Turner and Girtin, drawings were shaded first entirely through, whatever their component parts—houses, cattle, trees, mountains, foregrounds, middle-ground and distances, all with black or grey, and these objects were afterwards stained or tinted, enriched or finished, as is now the custom to colour prints. It was the new practice, introduced by these distinguished artists, that acquired for designs in water-colours upon paper the title of paintings."

Girtin "opened the gates of the art" and Turner entered in. If the palette of the former was still restricted, Turner exhausted all the resources of the colour box, and moreover enriched the art by adding to the traditional transparent washes the effects to be gained from the use of body colour. Body colours, however, were not only laid on by Turner with the solid impasto of the medieval illuminations. He was an adept at dragging thin films of them over a tinted ground so as to secure the subtle colour effects which can also be won in pastel. It would be useless to attempt any account of the technical methods of Turner or of the more modern practitioners in the art, for as in modern oil painting so here, each artist feels at liberty to adopt any media and processes which seem to promise the result he has in view. The varieties of paper used in modern water-colour practice are very numerous, and the idiosyncrasy of each artist expresses itself in the way he will manipulate his ground; superinduce one over the other his transparent washes; load with solid body colour; sponge or scratch the paper, or adopt any of the hundred devices in which modern practice of painting is so rife. (G. B. B.)

General Authorities on Technique.—Hamerton, *The Graphic Arts: A Treatise on the Varieties of Drawing, Painting and Engraving* (London, 1882), a work combining technical and artistic information, is the best single book on this subject. More archaeological is Berger, *Beiträge zur Entwickelungs-Geschichte der Maltechnik* (Munich, 1897–1904; partly in second editions. The last part is yet to come). The series *Quellenschriften für Kunstgeschichte und Kunsttechnik des Mittelalters und der Renaissance* (Vienna, various dates from 1871) contains many publications of much value, among them being, i., Cennino Cennini, *Das Buch von der Kunst*, German trans. of the *Trattato*, with note by Ilg; vii., Theophilus, *Schedula diversarum artium*, Ger. trans. by Ilg. Cennino's *Trattato* has also been edited in English by Mrs Herringham (London, 1899). Mrs Merrifield, *Ancient Practice of Painting* (2 vols., London, 1849), and Sir Charles Eastlake, *Materials for a History of Oil Painting* (2 vols., 1849 and 1869), are valuable standard works. Information as to Byzantine processes is to be found in the *Mount Athos Handbook* in "Manuel d'iconographie chrétienne grecque et latine," by Didron the elder (Paris, 1845). Church, *The Chemistry of Paints and Painting* (3rd ed., London, 1901), is by far the best book on its subject. *Vasari on Technique*, trans. by Miss Maclehose and edited with commentary by Baldwin Brown (London, 1907), contains a good deal of information. Paul Schultze-Naumburg, *Die Technik der Malerei* (Leipzig, no date); Vibert, *La Science de la peinture* (Paris, 1890), may also be mentioned.

RECENT SCHOOLS OF PAINTING

British.

At the beginning of the last quarter of the 19th century British art was held to be in a vigorous and authoritative position. During the years immediately preceding it had been developing with regularity and had displayed a vitality which seemed to be full of promise. It was supported by a large array of capable workers; it had gained the widest recognition from the public; and it was curiously free from those internal conflicts which diminish the strength of an appeal for popular appreciation. There were then few sharp divergences or subdivisions of an important kind. The leadership of the Royal Academy was generally conceded, and its relations with the mass of outside artists were little wanting in cordiality. One of the chief reasons for this understanding was that at this time an almost unprecedented approval was enjoyed by nearly all classes of painters. Picture-collecting had become a general fashion, and even the youngest workers received encouragement directly they gave evidence of a reasonable share of capacity. The demand was equal to the supply; and though the number of men who were adopting the artistic profession was rapidly increasing, there seemed little danger of over-production. Pictorial art had established upon all sorts of people a hold too strong, as it seemed, to be affected by change of fashion. All pointed in the direction of a permanent prosperity.

Subsequent events provided a curious commentary on the anticipations which were reasonable enough in 1875. That year is now seen to have been, not the beginning of an era of unexampled success for British pictorial art, but rather the culminating point of preceding activity. During the period which has succeeded we have witnessed a rapid decline in the popular interest in picture-painting and a marked alteration in the conditions under which artists have had to work. In the place of the former sympathy between the public and the producers, there grew up something which almost approached indifference to their best and sincerest efforts. Simultaneously there developed a great amount of internal dissension and of antagonism between different sections of the art community. As an effect of these two causes, a new set of circumstances came into existence, and the aspect of the British school underwent a radical change. Many art workers found other ways of using their energies. The slackening of the popular demand inclined them to experiment, and to test forms of practice which formerly were not accorded serious attention, and it led to the formation of detached hostile groups of artists always ready to contend over details of technical procedure. Restlessness became the dominant characteristic of the British school, along with some intolerance of the popular lack of sympathy.

The Grosvenor Gallery and the Academy.

The first sign of the coming change appeared very soon after 1875. The right of the Royal Academy to define and direct the policy of the British school was disputed in 1877, when the Grosvenor Gallery was started "with the intention of giving special advantages of exhibition to artists of established reputation, some of whom have previously been imperfectly known to the public." This exhibition gallery was designed not so much as a rival to the Academy, as to provide a place where could be collected the works of those men who did not care to make their appeal to the public through the medium of a large and heterogeneous exhibition. As a rallying place for the few unusual painters, standing apart from their fellows in conviction and method, it had good reason for existence; and that it was not regarded at Burlington House as a rival was proved by the fact that among the contributors to the first exhibition were included Sir Francis Grant, the President of the Royal Academy, and such artists as Leighton, Millais, G. F. Watts, Alma-Tadema, G. D. Leslie and E. J. Poynter, who were at the time Academicians or Associates. With them, however, appeared such men as Burne-Jones, Holman Hunt, Walter Crane, W. B. Richmond and J. McN. Whistler, who had not heretofore obtained the publicity to which they were entitled by the exceptional quality and intention of their work. There was doubtless some suggestion that the Academy was not keeping touch with the more important art movements, for shortly after the opening of the Grosvenor Gallery there began that attack upon the official art leaders which has been one of the most noteworthy incidents in recent art history in Great Britain. The initial stage of this conflict ended about 1886, when the vehemence of the attack had been weakened, partly by the withdrawal of some of the more prominent "outsiders," who had meanwhile been elected into the Academy, and partly by the formation of smaller societies, which afforded the more "advanced" of the younger men the opportunities which they desired for the exposition of their views. In a modified form, however, the antagonism between the Academy and the outsiders has continued. The various protesting art association continues to work in most matters independently of one another, with the common belief that the dominant influence of Burlington House is not exercised entirely as it should be for the promotion of the best interests of British art, and that it maintains tradition as against the development of individualism and a "new style."

The agitation in all branches of art effort was not entirely without result even inside Burlington House. Some of the older academic views were modified, and changes seriously discussed, which formerly would have been rejected as opposed to all the traditions of the society. Its calmness under attack, and its ostentatious disregard of the demands made upon it by the younger and more strenuous outsiders, have veiled a great deal of shrewd observation of passing events. It may be said that the Academy has known when to break up an organization in which it recognized a possible source of danger, by selecting the ablest leaders of the opposition to fill vacancies in its own ranks; it has given places on its walls to the works of those reformers who were not unwilling to be represented in the annual exhibitions; and it has, without seeming to yield to clamour, responded perceptibly to the pressure of professional opinion. In so doing, though it has not checked the progress of the changing fashion by which the popular liking for pictorial art has been diverted into other channels, it has kept its hold upon the public, and has not to any appreciable extent weakened its position of authority.

Changed Conditions of British Art.

It is doubtful whether a more definite participation by the Academy in the controversies of the period would have been of any use as a means of prolonging the former good relations between artists and the collectors of works of art. The change is the result of something more than the failure of one art society to fulfil its entire mission. The steady falling off in the demand for modern pictures has been due to a combination of causes which have been powerful enough to alter nearly all the conditions under which British painters have to work. For example, the older collectors, who had for some years anterior to 1875 bought up eagerly most of the more important canvases which came within their reach, could find no more room in their galleries for further additions; again, artists, with the idea of profiting to the utmost by the keenness of the competition among the buyers, had forced up their prices to the highest limits. But the most active of all causes was that the younger generation of collectors did not show the same inclination that had swayed their predecessors to limit their attention to modern pictorial art. They turned more and more from pictures to other forms of artistic effort. They built themselves houses in which the possibility of hanging large canvases was not contemplated, and they began to call upon the craftsman and the decorator to supply them with what was necessary for the adornment of their homes. At first this modification in the popular taste was scarcely perceptible, but with every successive year it became more marked in its effect.

Latterly more money has been spent by one class of collectors upon pictures than was available even in the best of the times which have passed away; but this lavish expenditure has been devoted not to the acquisition of works by modern men, but to the purchase of examples of the old masters. Herein may often be recognized the wish to become possessed of objects which have a fictitious value in consequence of their rarity, or which are "sound investments." Evidence of the existence of this spirit among collectors is seen in the prevailing eagerness to acquire works which inadequately represent some famous master, or are even ascribed to him on grounds not always credible. The productions of minor men, such as Henry Morland, who had never been ranked among the masters, have received an amount of attention quite out of proportion to what merits they possess, if only they can be proved to be scarce examples, or historically notorious. All this implies in the creed of the art patron a change which has necessarily reacted on living painters and on the conditions of their art production.

Portraiture.

Episodical Art.

These, then, are the conclusions to which we are led by a comparison of the movements which affected the British school between 1875 and the beginning of the 20th century. To a wide appreciation of all types of pictorial art succeeded a grudging and careless estimate of the value of the bulk of artistic endeavour. Only a few branches of production are still encouraged by anything approaching an efficient demand. Portraiture is the mainstay of the majority of the figure painters; it has never lost its popularity, and may be said to have maintained satisfactorily its hold upon all classes of society, for the desire to possess personal records is very general and is independent of any art fashion. It has persisted through all the changes of view which have been increasingly active in recent years. Episodical art, illustrating sentimental motives or incidents with some touch of dramatic action, has remained popular, because it has some degree of literary interest; but imaginative works and pictures which have been produced chiefly as expressions of an original regard for nature, or of some unusual conviction as to technical details, have found comparatively few admirers. The designers, however, and the workers in the decorative arts have found opportunities which formerly were denied to them. They have had more scope for the display of their ingenuity and more inducement to exercise their powers of invention. A vigorous and influential school of design developed which promised to evolve work of originality and excellence. British designers gained a hearing abroad, and earned emphatic approval in countries where a sound decorative tradition had been maintained for centuries.

Decorative Art.

Wane of pre-Raphaelitism and Rise of French Influence.

The one dominant influence, that of the Pre-Raphaelite Brotherhood, which in the 'fifties was altering the whole complexion of British art, had begun to wane early in the 'seventies, and it was rapidly being replaced by another scarcely less distinctive. The younger generation of artists had wearied, even before 1875, of the pre-Raphaelite precision, and were impatient of the restrictions imposed upon their freedom of technical expression by a method of practice which required laborious application and unquestioning obedience to a rather formal code of regulations. They yearned for greater freedom and boldness, and for a better chance of asserting their individual capacities. So they gave way to a strong reaction against the creed of their immediate predecessors, and cut themselves deliberately adrift.

With the craving of young artists for new forms of technique came also the idea that the "old-master traditions" were opposed to the exact interpretation of nature, and were based too much upon convention to be adapted for the needs of men who believed that absolute realism was the one thing worth aiming at in picture-production. So Paris instead of Rome became the educational centre. There was to British students, dissatisfied with the half-hearted and imperfect systems of teaching with which they were tantalized at home, a peculiarly exhilarating atmosphere in the French studios—an amount of enthusiasm and a love of art for its own sake without parallel elsewhere. They saw in operation principles which led by the right sequence of stages to sure and certain results. In these circumstances they allowed their sympathies with French methods to become rather exaggerated, and were somewhat reckless in their adoption of both the good and bad qualities of so attractive a school.

At first the results of this breaking away from all the older educational customs were not wholly satisfactory. British students came back from France better craftsmen, stronger and sounder draughtsmen, more skilful manipulators, and with an infinitely more correct appreciation of refinements of tone-management than they had ever possessed before; but they brought back also a disproportionate amount of French mannerism and a number of affectations which sat awkwardly upon them. In the first flush of their conversion they went further than was wise or necessary, for they changed their motives as well as their methods. The quietness of subject and reserve of manner which had been hitherto eminently characteristic of the British school were abandoned for foreign sensationalism and exaggeration of effect. An affectation of extreme vivacity, a liking for theatrical suggestion, even an inclination towards coarse presentation of unpleasant incidents from modern life —all of which could be found in the paintings of the French artists who were then recognized as leaders—must be noted as importations from the Paris studios. They were the source of a distinct degeneration in the artistic taste, and they introduced into British pictorial practice certain unnatural tendencies. Scarcely less evident was the depreciation in the instinctive colour-sense of British painters, which was brought about by the adoption of the French habit of regarding strict accuracy of tone-relation as the one important thing to aim at. Before this there had been a preference for rich and sumptuous harmonies and for chromatic effects which were rather compromises with, than exact renderings of, nature; but as the foreign influence grew more active, these pleasant adaptations, inspired by a sensuous love of colour for its own sake, were abandoned for more scientific statements. The colder and cruder tone-studies of the modern Frenchman became the models upon which the younger artists based themselves, and the standards against which they measured their own success. "Actuality" was gained, but much of the poetry, the delicacy, and the subtle charm which had distinguished British colourists were lost.

Danger of the French Influence.

For some while there was a danger that the art of Great Britain might become hybrid, with the French strain predominating. So many students had succumbed to the fascination of a system of training which seemed to supply them with a perfect equipment on all points, that they were inclined to despise not only the educational methods of their own country, but also the inherent characteristics of British taste. The result was that the exhibitions were full of pictures which presented English people and English landscape in a purely arbitrary and artificial manner, strictly in accordance with a French convention which was out of sympathy with British instincts, and indeed, with British facts. Ultimately a discreet middle course was found between the extreme application of the science of the French art schools and the comparative irresponsibility in technical matters which had so long existed in the British Isles. In the careers of men like Stanhope Forbes, H. S. Tuke, Frank Bramley, and other prominent members of the school, many illustrations are provided of the way in which this readjustment has been effected. Their pictures, if taken in a sufficiently long sequence, summarize instructively the course of the movement which became active about 1875. They prove how valuable the interposition of France has been in the matter of artistic education, and how much Englishmen have improved in their understanding of the technique of painting.

Weakening of the French Influence.

One noteworthy outcome of the triumph of common sense over fanaticism must be mentioned. Now that the exact relation which French teaching should bear to British thought has been adjusted, an inclination to revive the more typical of the forms of pictorial expression which have had their vogue in the past is becoming increasingly evident. Picturesque domesticity is taking the place of theatrical sensation, the desire to select and represent what is more than ordinarily beautiful is ousting the former preference for what was brutal and ugly, the effort to please is once again stronger than the intention to surprise or shock the art lover. Even the Pre-Raphaelite theories and practices are being reconstructed, and quite a considerable group of young artists has sprung up who are avowed believers in the principles which were advocated so strenuously in 1850.

Groups within the British School.

To French intervention can be ascribed the rise and progress of several movements which have had results of more than ordinary moment. There was a few years ago much banding together of men who believed strongly in the importance of asserting plainly their belief in the doctrines to which they had been converted abroad; and as a consequence of this desire for an offensive and defensive association, many detached groups were formed within the boundaries of the British school. Each of these groups had some peculiar tenet, and each one had a small orbit of its own in which it revolved, without concerning itself overmuch about what might be going on outside. Roughly, there were three classes into which the more thoughtful British artists could then be divided. One included those men who were in the main French in sympathy and manner; another consisted of those who were not insensible to the value of the foreign training, but yet did not wish to surrender entirely their faith in the British tradition; and the third, and smallest, was made up of a few individuals who were independent of all assistance from without, and had sufficient force of character to ignore what was going on in the art world. In this third class there was practically no common point of view: each man chose his own direction and followed it as he thought best, and each one was prepared to stand or fall by the opinion which he had formed as to the true function of the painter. Necessarily, in such a gathering there were several notable personalities who may fairly be reckoned among the best of English modern masters.

The Newlyn School.

Perhaps the most conspicuous of the groups was the gathering of painters who established themselves in the Cornish village of Newlyn (*q.v.*). This group—"The Newlyn School," as it was called—was afterwards much modified, and many of its most cherished beliefs were considerably altered. In its beginning it was essentially French in atmosphere, and advocated not only strict adherence to realism in choice and treatment of subject, but also the subordination of colour to tone-gradation, and the observance of certain technical details, such as the exclusive use of flat brushes and the laying on of pigments in square touches. The colony was formed, as it were, in stages; and as the school is to be reckoned in the future history of the British school, the order in which the adherents arrived may here be set on record. Edwin Harris came first, and was joined by Walter Langley. Then, in the following order, came Ralph Todd, L. Suthers, Fred Hall, Frank Bramley and T. C. Gotch, and Percy Craft and Stanhope Forbes together. H. Detmold and Chevallier Tayler next arrived; then Miss Elizabeth Armstrong (Mrs Stanhope Forbes), F. Bourdillon, W. Fortescue and Norman Garstin. Ayerst Ingram, H. S. Tuke, H. Martin and F. Millard were later visitors. Stanhope Forbes (b. 1857) was trained at the Lambeth School and at the Royal Academy, and afterwards in Bonnat's studio in Paris. His best known pictures are "A Fish Sale on a Cornish Beach" (1885), "Soldiers and Sailors" (1891), "Forging the Anchor" (1892), and "The Smithy" (1895). He was elected A.R.A. in 1892, and became full Member in 1910. Frank Bramley (b. 1867) studied art in the Lincoln School of Art and at Antwerp. He gained much popularity by his pictures, "A Hopeless Dawn" (1888), "For of such is the Kingdom of Heaven" (1891), and "After the Storm" (1896), and was elected an Associate in 1894. Of late years he had made a very definite departure from the technical methods which he followed in his earlier period. T. C. Gotch (b. 1854) had a varied art training, for he worked at the Slade School, then at Antwerp, and finally in Paris under Jean Paul Laurens. He did not long remain faithful to the Newlyn creed, but diverged about 1890 into a kind of decorative symbolism, and for some years devoted himself entirely to pictures of this type. The other men who must be ranked as supporters of the school adhered closely enough to the principles which were exemplified in the works of the leaders of the movement. They were faithful realists, sincere observers of the facts of the life with which they were brought in contact, and quite earnest in their efforts to paint what they saw, without modification or idealization.

The Impressionist School.

The New English Art Club.

Another group which received its inspiration directly from France was the Impressionist school (see IMPRESSIONISM). This group never had any distinct organization like that of the French Société des Impressionistes, but among the members of it there was a general agreement on points of procedure. They based themselves, more or less, upon prominent French artists like Manet, Renoir, Pissarro, and Claude Monet, and owed not a little to the example of J. A. M'N. Whistler, whose own art may be said to be in a great measure a product of Paris. One of the fundamental principles of their practice was the subdivision of colour masses into their component parts, and the rendering of gradated tints by the juxtaposition of touches of pure colour upon the canvas, rather than by attempting to match them by previously mixing them on the palette. In pictures so painted greater luminosity and more subtlety of aerial effects can be obtained. The works of the British Impressionists have been seen mostly in the exhibitions of the New English Art Club. This society was founded in 1885 by a number of young artists who wished for facilities for exhibition which they felt were denied to them in the other galleries. It drew the greater number of its earlier supporters from the men who had been trained in foreign schools, and a complete list of the contributors to its exhibitions includes the names of many of the best known of the younger painters. It was the meeting-place of numerous groups which advocated one or other of the new creeds, for among its members or exhibitors have been P. Wilson Steer, Fred Brown, J. S. Sargent (*q.v.*), Solomon J. Solomon, Stanhope Forbes, T. C. Gotch, Frank Bramley, Arthur Hacker, Francis Bate, Moffat Lindner, J. L. Henry, W. W. Russell, George Thomson, Arthur Tomson, Henry Tonks, C. W. Furse, R. Anning Bell, Walter Osborne, Laurence Housman, J. J. Shannon, W. L. Wyllie, H. S. Tuke, Maurice Greiffenhagen, G. P. Jacomb Hood, Alfred Parsons, Alfred East, J. Buxton Knight, C. H. Shannon, Mark Fisher, Walter Sickert, W. Strang, Frank Short, Edward Stott, Mortimer Menpes, Alfred Hartley, William Stott, J. R. Reid, Mouat Loudan, T. B. Kennington, H. Muhrman, A. D. Peppercorn, George Clausen and J. A. M'N. Whistler, and a number of the Scottish artists, like J. Lavery, J. Guthrie, George Henry, James Paterson, A. Roche, E. A. Walton, J. E. Christie and E. A. Hornel. A number of the men who have been more or less actively identified with it have been elected members of the Royal Academy, so that it may fairly claim to have exercised a definite influence upon the tendencies of modern art. It has certainly done much to prove the extent of the foreign influence upon the British school.

In its wider sense the Impressionist school may be said to include now all those students of nature who strive for the representation of broad effects rather than minute details, who look at the subject before them largely and comprehensively, and ignore all minor matters which would be likely to interfere with the simplicity of the pictorial rendering. To it can be assigned a number of artists who have never adopted, or have definitely abandoned, the prismatic analysis of colour advocated by the French Impressionists. These men were headed by J. A. M'N. Whistler (*q.v.*), born in America in 1834, and trained in Paris under Gleyre. His pictures have always been remarkable for their beauty of colour combination, and for their sensitive management of subtleties of tone. They gained for the artist a place among the chief modern executants, and have attracted to him a host of followers. Other notable painters who have places in the school are Mark Fisher, an American landscape painter who studied for a while in Gleyre's studio, one of the ablest interpreters in England of effects of sunlight and breezy atmosphere; A. D. Peppercorn, a pupil of Gérôme, who makes landscape a medium for the expression of a dignified sense of design and a carefully simplified appreciation of contrasts of tone; and P. Wilson Steer, an artist who began as a follower of Monet, and based upon his training in the École des Beaux Arts a style of his own, which he displays effectively in both landscapes and figure pictures.

The International Society.

The International Society of Sculptors, Painters, and Gravers, inaugurated in 1898, although not by its nature confined to British art and artists, who compose little more than half of the electorate, has its home in London. It succeeds in its object of setting before the British public the most modern and eccentric expressions of the art of the chief European countries. Its exhibitions are striking and the contributions for the most part serious and interesting; but while the freedom of the artist is insisted on it is doubtful if the more exaggerated displays by rebellious painters and sculptors have had much influence on the native school. The presidents have been J. A. M'N. Whistler and Auguste Rodin, and the vice-presidents John Lavery and William Strang: these personalities, considered along with their views and their vigour, sufficiently indicate the spirit and the politics of the society.

Figure Painters.

Generally speaking, the very large class of artists who fell only to a limited extent under the spell of French teaching includes most of the figure and landscape men and practically the whole of the portrait painters. In all sections of figure painting individual workers in improved technical methods have appeared, but most of them have gradually lost their distinguishing peculiarities of manner, and have year by year assimilated themselves more closely to their less advanced brethren. The section in which their energetic propagandism has been most effective is certainly that of imaginative composition. A definite mark has been made there by men like S. J. Solomon (b. 1860; A.R.A. 1896; R.A. 1906), trained at the Royal Academy, the Munich Academy and the École des Beaux Arts in Paris, and widely known by such pictures as "Samson" (1887), "The Judgment of Paris" (1890) and the "Birth of Love" (1895); and Arthur Hacker (b. 1858; A.R.A. 1894; R.A. 1910), educated at the Academy and in Bonnat's studio, and the painter of a considerable series of semi-historical and symbolical canvases. They exercised a considerable influence upon their contemporaries, and introduced some new elements into the later practice of the school. At the same time admirably effective work has been done in this section and others by many painters who have kept much more closely in touch with the older type of aesthetic belief, and have not associated themselves openly with any of the newer movements. Among the more prominent of these figure painters there are, or have been, some excellent craftsmen, whose contributions to the record of native British art can be accepted as full of permanent interest. In the school of historical incident good work was done by Sir John Gilbert (1817–1897; R.A. 1876), a robust and ingenious illustrator of romantic motives, with a never-failing capacity for picturesque invention; John Pettie (1839–1893; R.A. 1873), a fine colourist and a clever manipulator, whose scenes from the life of past centuries were full of rare vitality; P. H. Calderon (1833–1898; R.A. 1867), a graceful and sincere artist not wanting in originality; and H. Stacy Marks (1829–1898; R.A. 1879), who treated medieval motives with a touch of real humour. Besides these, there are Sir J. D. Linton (b. 1840), who has produced noteworthy compositions in oil and water colours; Frank Dicksee (b. 1853; A.R.A. 1881; R.A. 1891), who has gained wide popularity by pictures in which romance and sentiment are combined in equal proportions; A. C. Gow (b. 1848; R.A. 1881), whose "Cromwell at Dunbar" (1886), "Flight of James II. after the Battle of the Boyne" (1888), and "Crossing the Bidassoa" (1896) may be noted as typical examples of his performance; J. Seymour Lucas (b. 1849; A.R.A. 1886; R.A. 1898), trained at the Royal Academy Schools, and a brilliant painter of what may be called the by-play of history; W. Dendy Sadler (b. 1854), trained partly in London and partly at Düsseldorf, and well known by his quaintly humorous renderings of the lighter side of life in the olden times; G. H. Boughton (born in England, but educated first in America and afterwards in Paris; A.R.A. 1879; R.A. 1896), a specialist in paintings of old and modern Dutch subjects; the Hon. John Collier (b. 1850), trained at the Slade School, at Munich, and in Paris, and a capable painter both of the nude figure and of costume; and Edwin A. Abbey, an American (b. 1852), educated at the Pennsylvania Academy of the Fine Arts. Abbey came to England in 1876 with a great reputation as an illustrator, and did not begin to exhibit oil pictures until 1890; he was elected an Academician in 1898. Then there are to be noted classicists like Lord Leighton, Sir L. Alma-Tadema, and Sir E. J. Poynter's students of the East like Frederick Goodall (b. 1822; A.R.A. 1853; R.A. 1863; d. 1904), and idealists like Sir W. B. Richmond, K.C.B.; R.A. 1895—all of whom have done much to uphold the reputation of the British school for strength of accomplishment and variety of motive.

Painters of Sentiment.

The painters of sentiment have in the main adhered closely to the tradition which has been handed down through successive generations. Among these may be noted Marcus Stone (b. 1840), elected an Academician in 1887, an original artist whose dainty fancies are familiar to students of modern art. His pictures nearly all appeared in the exhibitions of the Royal Academy. Another popular artist is G. D. Leslie (b. 1835), elected an Associate in 1868 and an Academician in 1876, who has been responsible for a number of domestic old-world subject-pictures remarkable for freshness of treatment and delicacy of feeling. The list may also be held to include Henry Woods (b. 1846; A.R.A. 1882; R.A. 1893), and since 1877 a painter of scenes from Venetian life; R. W. Macbeth (b. 1848; A.R.A. 1883; R.A. 1903), whose elegant treatment of rustic subjects displays a very attractive individuality. Among the painters of sentiment should also be included Sir Luke Fildes (b. 1844), educated at the South Kensington and Royal Academy Schools, elected an Academician in 1887, the painter of such famous pictures as "The Casual Ward" (1874), "The Widower" (1876), "The Return of the Penitent" (1879), and "The Doctor" (1892); and Sir Hubert von Herkomer, C.V.O. (b. 1849; A.R.A. 1879; R.A. 1890; knighted 1907), famous not only by his many memorable canvases and by his extraordinary versatility in the arts, but also as a teacher and a leader in a number of educational movements.

Military Painting.

Not many military pictures of high merit have been produced during the period. The artists, indeed, who occupy themselves with this class of art are not numerous, and they mostly devote their energies to illustrative pictures rather than to large canvases. Lady Butler (*née* Elizabeth Thompson), whose "Roll Call," exhibited in 1874, brought her instant popularity, continued to paint subjects of the same type, among which "Quatre Bras" (1875), "The Defence of Rorke's Drift" (1881), "The Camel Corps" (1891) and "The Dawn of Waterloo" (1895) are perhaps the most worthy of record. Ernest Crofts (b. 1847; A.R.A. 1878; R.A. 1896), trained in London and Düsseldorf, has taken a prominent position by such pictures as "Napoleon at Ligny" (1875), "Napoleon leaving Moscow" (1887), "The Capture of a French Battery by the 53rd Regiment at Waterloo" (1896), and by many similar representations of historical battles. Occasional pictures have come also from A. C. Gow, R. Caton Woodville, W. B. Wollen, J. P. Beadle, John Charlton, and a few more men who are better known by their work in other directions.

Portraiture.

The number of artists who have devoted the greater part of their energies to portraiture has been steadily on the increase. Most of the men who have taken definite rank among the figure painters have made reputations by their portraits also, but there are many others who have kept almost exclusively to this branch of practice. Into the first division come such noted artists as Sir John Millais, Sir E. J. Poynter, G. F. Watts, Sir Luke Fildes, Sir Hubert von Herkomer, Sir L. Alma-Tadema, Sir W. B. Richmond, Seymour Lucas, the Hon. John Collier, S. J. Solomon, Arthur Hacker, Sir W. Q. Orchardson, J. A. M'N. Whistler, Frank Dicksee, Stanhope Forbes, Frank Bramley, H. S. Tuke, T. C. Gotch, P. W. Steer, John Bacon and Frank Holl. In the second must be reckoned J. S. Sargent (A.R.A. 1894; R.A. 1897), an American citizen (b. 1856), a pupil of Carolus Duran, who after 1885 was recognized as one of the most brilliant painters of the day; J. J. Shannon, also an American (b. 1862), trained at the South Kensington School, and elected an Associate in 1897, a graceful and accomplished artist, with a sound technical method and a delightful sense of style; A. S. Cope (b. 1857), trained in Paris, and elected an Associate in 1899, who carries on soundly the better traditions of the British school; James Sant (b. 1820), elected an Academician in 1870, a strong favourite of the public throughout a long career; W. W. Ouless (b. 1848; A.R.A. 1877; R.A. 1881), trained in the Royal Academy Schools, an industrious and prolific worker; H. T. Wells (b. 1828; A.R.A. 1866; R.A. 1870), trained in London and Paris, who produced a long series of portraits and portrait groups, and many miniatures; W. Llewellyn (b. 1860), educated at the South Kensington Schools and in Cormon's studio in Paris, an able draughtsman and a thorough executant; C. W. Furse (*q.v.*), trained first in the Slade School under Professor Legros and afterwards in Paris, whose early death removed a master of his art; and others like Walter Osborne, Richard Jack, Glyn Philpot and Gerald Kelly.

Individual Figure Painters.

Decorative Painters.

In the class of figure painters, who are individual in their work, and owe little or nothing to the suggestions of foreign teachers, a number of artists can be enumerated who have in common little besides a sincere desire to express their personal conviction in their own way. Among them are some of the most distinguished of modern artists, who stand out as the unquestioned chiefs of the school. Sir John Millais occupies a place in this group by virtue of his admirable pictorial work, and with him are W. Holman Hunt, Dante Gabriel Rossetti, G. F. Watts, Sir Edward Burne-Jones, Albert Moore and Ford Madox Brown, each one of whom may be regarded as a leader. There are also J. M. Strudwick (b. 1849), R. Spencer Stanhope (d. 1908) and Evelyn de Morgan, followers of Burne-Jones, and J. W. Waterhouse (A.R.A. 1885; R.A. 1895), in many ways the most original and inspired of English imaginative painters; and, again, M. Greiffenhagen, F. Cayley Robinson and Mrs Swynnerton. Into this class come also the decorative painters, Walter Crane (b. 1845), a prolific illustrator and picture-painter and the producer of an extraordinary amount of work in all branches of decoration; Frank Brangwyn, whose pictures and designs are marked by fine qualities of execution and by much sumptuousness of colour; and several others, like H. J. Draper, Harold Speed, R. Anning Bell, Gerald Moira and G. Spencer Watson. As a branch of the decorative school, a small group of artists who have revived the practice of tempera-painting must also be noted. It includes Mrs Adrian Stokes, J. D. Batten, J. E. Southall, Arthur Gaskin, and a few others with well-marked decorative tendencies.

The New Pre-Raphaelite School.

During recent years a movement has begun which apparently aims at the revival of Pre-Raphaelitism. It is headed by a few young artists, whose methods show a mingling together of the precision of the 19th-century Pre-Raphaelites and a kind of decorative formality. The most influential of the artists concerned in the formation of this new school is J. Byam Shaw (b. 1872), whose originality and quaintness of fancy give to his pictures a more than ordinary degree of persuasiveness. A strong colourist and an able draughtsman, he possesses in a high degree the faculty of imaginative expression, allied with humour that never degenerates into farce. His strongest preference is for symbolical subjects which embody some moral lesson. Other prominent members of the group are F. Cadogan Cowper (A.R.A. 1907) and Miss Eleanor Fortescue-Brickdale, who is in manner much like Byam Shaw, but yet does not sink her individuality in mere imitative effort.

Landscape Painters.

The painters of landscapes and sea-pictures have for the most part been little affected by the unrest which has caused so many new departures in figure-work. A love of nature has always been one of the best British characteristics, and it has proved itself to be strong enough to keep those artists who seek their inspiration out of doors from falling to any great extent under the control of particular technical fashions. Therefore there is in the school of "open-air" painting little evidence of any change in point of view, or of the growth of any modern feeling at variance with that by which masters of landscape were swayed a century or more ago. Impressionism has gained a few adherents, and the French Barbizon school—itself created in response to a suggestion from England—has reacted upon a section of the younger artists. But, on the whole, in this branch of art the British school has gained in power and confidence, without surrendering that sturdy independence which in the past produced such momentous results. The absence of any common convention, or of any set pattern of landscape which would lead to uniformity of effort, has left the students of nature free to express themselves in a personal way. The most devout believers in the value of French training, and in the infallibility of the dogmas which emanate from the Paris studios, have not, except in rare instances, demanded any radical remodelling of the British landscape school on French lines, as local conditions affecting the practice of this branch of art make impossible all drastic alterations. Most workers in the front rank can claim to be judged on individual merits, and not as members of a particular coterie. Still, it is convenient to divide the members of the landscape school into such classes as realists, romanticists and subjective painters of landscape.

Realistic Landscape.

Among the most notable of the first class are H. W. B. Davis (b. 1883; A.R.A. 1873; R.A. 1877), the painter of a long series of dainty scenes which suggest happily the charm of rural England; Peter Graham, elected an Academician in 1881, who has alternated for the greater part of his working life between Scottish moorland subjects, with cattle wandering on bare hillsides and pictures of coast scenery, with sea-gulls perched on dark rocks; David Murray (b. 1849; A.R.A. 1891; R.A. 1905), an artist whose career has been marked by consistent effort to interpret nature's suggestions with dignity and intelligence; Sir Ernest A. Waterlow (b. 1850; A.R.A. 1890; R.A. 1903), trained in the Royal Academy and afterwards President of the Royal Society of Painters in Water-Colours, a graceful painter, with a tender colour feeling and an excellent technical style; Yeend King (b. 1855), trained partly in England, and partly in Paris under Bonnat and Cormon, a sound craftsman who made a reputation by landscapes in which are introduced groups of figures on a fairly important scale; Alfred Parsons (b. 1847), elected an Associate in 1897, who paints rich river scenery with careful regard for actuality and with much minuteness and exquisiteness of detail, especially in the rendering of flowers; and Frank Walton (b. 1840), who chooses, as a rule, landscape motives which enable him to display unusual powers of accurate draughtsmanship. To the same class of realists belonged Vicat Cole, R.A.; Birket Foster, J. W. Oakes, A.R.A.; Keeley Halswelle, and perhaps Alfred W. Hunt, though in his case realism was tempered by a delicate poetic imagination.

Romantic and Pastoral Painters.

The romanticists and pastoral painters have in many cases been perceptibly affected by the example of the Barbizon school, but they owe much to such famous Englishmen as Cecil Lawson, John Linnell (both of whom died in 1882), George Mason (A.R.A. 1868; d. 1872) and Frederick Walker (A.R.A. 1871; d. 1875). The most prominent later member of the group is, perhaps, Sir Alfred East (b. 1849), trained first in the Glasgow School of Art and afterwards in Paris, elected an Associate in 1899, a painter endowed with an exceptional faculty for suggesting the poetry of nature and with an admirable sense of decorative arrangement; but there are, besides, Leslie Thomson (b. 1851), whose art is especially sound and sincere; J. Aumonier, a pastoral painter with very refined appreciation of subtleties of aerial colour; C. W. Wyllie, a painter of delicate vision and charm of presentation; J. S. Hill, whose sombre landscapes are distinguished in design and impressive in their depth of tone; R. W. Allan (b. 1852), who uses a robust technical method with equal skill in landscapes and coast subjects; J. Buxton Knight (b. 1842; d. 1908), a vigorous manipulator, with a liking for rich harmonies and low tones; Joseph Knight (b. 1838; d. 1909), whose well drawn and broadly painted pictures in oil and water-colour have been for many years appreciated by lovers of unaffected nature; Lionel P. Smythe (A.R.A. 1898), a colourist who handles exquisitely the most delicate atmospheric effects and is unusually successful in his rendering of diffused daylight; J. W. North (A.R.A. in 1893), a painter of fanciful landscapes in which definition of form is subordinated to modulations of decorative colour; Claude Hayes, who studied in the Royal Academy Schools, and carried on the tradition established by David Cox and his contemporaries; J. L. Pickering, a lover of dramatic light-and-shade contrasts and a student of romantic mountain scenery; A. D. Peppercorn, who gives breadth and dignity with sombre colour and delicate gradation of tone; Adrian Stokes (b. 1854; A.R.A. 1910) and M. Ridley Corbet (who died in 1902, only a few months after his election as an Associate of the Royal Academy), a classicist in landscape, in whose pictures can be perceived a definite reflection of the teaching of Professor Costa, the Italian master. There must also be noted, as leaders among the pastoral painters, George Clausen (b. 1852), trained first in the South Kensington School and afterwards in Paris under Bouguereau and Robert-Fleury, and elected an Associate in 1895 and R.A. in 1908, who began as a strict realist and afterwards developed into a rustic idealist; H. H. La Thangue, trained in the Royal Academy Schools and in Paris, elected an Associate in 1898, an artist of amazing technical vigour and an uncompromising interpreter of rural subjects; Edward Stott (A.R.A. 1906), trained in Paris under Carolus Duran and Cabanel, who paints delicately the more poetic aspects of the life of the fields; J. Arnesby Brown (b. 1866; A.R.A. 1903); Oliver Hall, Albert Goodwin, A. Friedenson and others.

Subjective Landscape.

The painters of landscape subjectively considered, who conventionalize nature with the idea of giving to their pictures a kind of sentimental as distinguished from emotional suggestion, are most strikingly represented by B. W. Leader (b. 1831), trained in the Worcester School of Design and in the Royal Academy Schools, and elected an Academician in 1898. He became a strong favourite of the public, and his academic and precise technical methods were widely admired by the many people who are not satisfied with unaffected transcriptions of natural scenes and of the passion of nature.

Marine Painting.

In marine painting no one has appeared to rival Henry Moore, perhaps the greatest student of wave-forms the world has seen; but good work has been done by the late Edwin Hayes, an Irish painter, whose powers showed no sign of failure up to his death in 1904, after some half-century of continuous labour; W. L. Wyllie (b. 1851; A.R.A. 1889; R.A. 1907), trained in the Royal Academy Schools, who paints sea and shipping with intelligent understanding; T. Somerscales, a self-taught artist, with an intimate knowledge of the ocean derived from long actual experience as a sailor; and especially C. Napier Hemy (b. 1841; A.R.A. 1898; R.A. 1910), trained at the Antwerp Academy and in the studio of Baron Leys, a powerful manipulator, with a preference for the dramatic aspects of his subject. J. C. Hook (d. 1907), retained into old age the subtle qualities which made his pictures notable among the best productions of the British school. Mention must be made of John Brett (1830–1902; A.R.A. 1881), the one Pre-Raphaelite sea painter, and Hamilton Macallum

(1841–1896), who painted rippling water in bright sunlight with delightful delicacy and charm of manner.

Animal Painting.

The school of animal painting is a small one, and includes only a few of marked ability. The chief members include Briton Riviere, (b. 1840; A.R.A. 1878; R.A. 1881), one of the most imaginative and inventive of living artists; J. M. Swan (1847–1910; A.R.A. 1894; R.A. 1905), trained first at Lambeth, and afterwards in Paris under Gérôme and Frémiet, a skilful manipulator and a sensitive draughtsman, and especially remarkable for his intimate understanding of animal character, mainly of the *felidae* (see also SCULPTURE); J.T. Nettleship (1841–1902), trained chiefly in the Slade School, whose studies of the greater beasts of prey are admirably sincere and well painted; Miss Lucy Kemp-Welch (b. 1869), trained in the Herkomer School at Bushey, who paints horses with unusual power; and John Charlton (b. 1849), trained in the South Kensington School, also well known by his pictures of horses and dogs.

Scottish Schools.

There are local schools which claim attention because of the value of their contributions to the aggregation of British art. The most active of these belong to the Scottish school, the centres of Glasgow, Edinburgh, and Aberdeen, which have produced some of the most distinguished British artists. The Royal Academy of London, indeed, with most of the other leading art societies, has been largely recruited from Scotland. There have been added to its modern roll the names of W. Q. Orchardson. Peter Graham, J. MacWhirter, J. Pettie, Erskine Nichol, T. Faed, David Murray, Colin Hunter, R. W. Macbeth, D. Farquharson, J. Farquharson, George Henry: all of them painters of well-established reputation; and there are many other well-known Scottish artists who have made London their headquarters, like Arthur Melville, a portrait and subject-painter and a masterly water-colourist; E. A. Walton, who is equally successful with portraits, landscapes, and decorative compositions; J. Coutts-Michie, who alternates between portraiture and landscapes of admirable quality; John Lorimer, who has exhibited a number of excellent subject-pictures and many fine portraits; T. Graham, an unaffected painter of sentiment, and a good colourist; Grosvenor Thomas, known best by his freely handled and expressive landscapes; T. Austen Brown, who paints semi-decorative pastorals with unusual vigour of statement; John Lavery, who has taken rank amongst the best of recent portrait painters; and Robert Brough, another portrait painter of vigour, with a subtle sense of colour, whose early and tragic death cut short a promising career. The most notable of the men who remained in Scotland include Alexander Roche, whose remarkable capacity has brought him many successes in portraiture, figure compositions, and decorative paintings on a large scale; W. Y. MacGregor, a leader of the school of landscape painters, fine in style and a master of effect; D. Y. Cameron, an admirable oil-painter and a famous etcher; and Sir James Guthrie, P.R.S.A. well known for his excellent portraits; James Paterson, R. B. Nisbet and Robert Noble, all landscape painters of marked originality and sound technical method; W. McTaggart (d. 1910), the brilliant impressionist; E. A. Hornel and W. Hole, decorative painters who have produced many canvases remarkable for robust originality and rare breadth of treatment; W. Mouncey, a landscape painter who united the dignity of the Barbizon school with a typically Scottish freedom of expression; and Sir George Reid, ex-P.R.S.A., one of the ablest and most distinguished of portrait painters.

Water-Colour.

The water-colour painters can fairly be said to have kept unchanged the essential qualities of their particular form of practice. They have departed scarcely at all from the executive methods which have been recognized as correct for nearly a century, but they have amplified them and have adapted them to a greater range of accomplishment, developing, it may be added, the "blottesque" or the accidental manner suggestive of summary decision. Latterly water-colour painting has come to rival oils in its application to all sorts of subjects; and it is used now with absolute freedom by a very large number of skilful artists. Many of the men who have done the best work in this medium are known as oil painters of the highest rank; and among living workers the same capacity to excel in either mode of expression is by no means uncommon. There have been in recent times such masters as Sir John Gilbert, Sir E. Burne-Jones, Ford Madox Brown, Dante Gabriel Rossetti, A. W. Hunt, H. G. Hine, Henry Moore, Albert Moore, C. E. Holloway, and perhaps should be included E. M. Wimperis, whose water-colours are at least as worthy of admiration as their oil pictures. As water-colourists, much credit is due to Sir E. J. Poynter for his landscapes, portraits, and figure drawings; Sir L. Alma-Tadema for his minutely detailed classic subjects; Sir J. D. Linton for his historical and romantic compositions; Sir E. A. Waterlow for his delicately expressive landscapes; Sir Hubert von Herkomer for his admirably handled figure subjects; George Clausen for pastorals charming in sentiment and distinguished by fine qualities of colour; J. Aumonier, A. D. Peppercorn, J. S. Hill, J. W. North, Leslie Thomson, Frank Walton and R. W. Allan for landscapes of special excellence; E. J. Gregory (d. 1909), and Cadogan Cowper, for figure compositions painted with amazing sureness of touch; Alfred Parsons for landscapes and flower studies; J. R. Reid, W. L. Wyllie, E. Hayes and C. N. Hemy for sea and coast pictures; R. W. Macbeth, Claude Hayes and Lionel Smythe for rustic scenes with figures in the open air; J. M. Swan for paintings of animals; and G. H. Boughton for costume subjects and delicately poetic fancies. Besides, there is a long list of noteworthy painters whose reputations have been chiefly or entirely made by their successful management of water-colour, and into this list come Birket Foster, the head of the old-fashioned school of dainty rusticity; Carl Haag, a wonderful manipulator, who occupied himself almost exclusively with Eastern subjects; Thomas Collier, A. W. Weedon, H. B. Brabazon, G. A. Fripp, P. J. Naftel, G. P. Boyce, Albert Goodwin, R. Thorne-Waite, F. G. Cotman, Harry Hine, Clarence Whaite and Bernard Evans, whose landscapes show thorough understanding of nature and distinctive individuality of method; Mrs Allingham, an artist of exquisite refinement, whose idealizations of country life have a more than ordinary degree of merit; Clara Montalba, an able painter of impressions of Venice; Kate Greenaway, unrivalled as an interpreter of the graces of childhood, and endowed with the rarest originality; Mrs Stanhope Forbes, an accomplished executant of well-imagined romantic motives; and J. R. Weguelin, one of the most facile and expressive painters of fantastic figure subjects. By the aid of these artists, and many others of at least equal ability, such as J. Crawhall, J. Paterson, R. Little, Edwin Alexander, Arthur Rackham and J. Walter West, traditions worthy of all respect have been maintained sincerely and with intelligent discrimination; and to their efforts has been accorded a larger measure of popular support than is bestowed upon any other form of pictorial production.

See Richard Muther, *History of Modern Painting* (Eng. ed., 1895); R. de la Sizeranne, *English Contemporary Art* (Eng. ed., 1898); Ernest Chesneau, *The English School of Painting* (2nd Eng. ed., 1885); Clement and Hutton, *Artists of the 19th Century* (Boston, U.S.A., 1885); David Martin and F. Newbery, *The Glasgow School of Painting* (1897); W. D. McKay, R.S.A., *The Scottish School of Painting* (London, 1906); E. Pinnington, *George Paul Chalmers and the Art of his Time* (1896); Gleeson White, *The Master Painters of Britain* (1897); E. T. Cook, *A Popular Handbook to the National Gallery*, vol. ii. (1901); J. E. Hodgson, R.A., *Fifty Years of British Art* (1887); A. G. Temple, *Painting in the Queen's Reign* (1897); Cosmo Monkhouse, *British Contemporary Artists* (1899); G. R. Redgrave, *History of Water-Colour Painting in England 1750–1889* (1889). Also the *Transactions* of the National Association for the Advancement of Art (Liverpool, 1888; Edinburgh, 1889; and Birmingham, 1890); the magazines devoted to the arts; and the principal reviews, such as "English Art in the Victorian Age" (*Quarterly Review*, January 1898). *The Year's Art* (1879–1910; ed. A. C. R. Carter) is an invaluable annual publication fully and accurately chronicling the art institutions and art movements in Great Britain. (M. H. S.)

FRANCE

The period between 1870 and the opening of the 20th century was singularly important in the history of France, and consequently of her art. The internal life of the people developed on new lines with a vigour that left a deep mark on the outcome of mental effort. Literature was foremost in this new movement. The novels of Balzac, Zola, Flaubert, the brothers de Goncourt, Daudet, Guy de Maupassant and the plays of Alexandre Dumas *fils*, filled as they are with the scientific spirit and social atmosphere of the time, opened the eyes of the young generation to appreciation of the visible beauty and the spiritual poetry of the world around them, and helped them to view it with more attentive eyes, more insight and more emotion. The aim of art was also to emancipate itself, by the growing efforts of independent artists, from the slavery of tradition, and to devote itself to a more personal contemplation and knowledge of contemporary life under every aspect. Modern French art tends to become more and more the art of the people—a mixture of naturalism and poetry, deriving its inspiration, by preference, from the world of the working man; no longer appealing only to a restricted and more or less fastidious public, but, on the contrary, adapting its aesthetic or moral teaching to popular apprehension. The whole past was not, of course, wiped out. The younger generation had to learn and profit by the lessons taught by their great precursors. To understand the true character of this recent development of French art it is needful, therefore, to glance at the past.

We need not dwell on the individual authorities who constitute the official hierarchy of the contemporary French school; these masters belong for the most part, by the date of their best work, to a former generation. Starting in many cases from very opposite points, but reconciled and united by time, they carried on, during the last quarter of the 19th century, with more or less distinction, the inevitable evolution of their personal gifts.

We still see the works of some of the staunch Romanticists: Jean Gigoux (d. 1892), Robert-Fleury (d. 1890), Jules Dupré (d. 1889), Lami (d. 1890), Cabat (d. 1893) and Isabey (d. 1886); and with these, though they did not follow quite the same road, may be named Français (d. 1897) and Charles Jacque (d. 1894). Next to them, Meissonier (d. 1891) crowded into the last twenty years of his life a mass of work which, for the most part, enhanced his fame; and Rosa Bonheur (d. 1899), working in retirement up to the age of seventy-seven, went on her accustomed way unmoved by external changes. Hébert, Harpignies, Ziem and Paul Flandrin survived. Among the generation which grew up under the Second Empire we find men of great intelligence and distinction; some, like Alexandre Cabanel (1824–1889), by pictures of historical genre, in a somewhat insipid and conventional style, but more particularly by female portraits, firm in flesh-painting and aristocratic in feeling; others, like Paul Baudry (1828–1886, *q.v.*), whose large decorative works, with their pure and lofty elegance, secured him lasting fame, and whose allegorical compositions were particularly remarkable; not less so his portraits, at first vivid, glowing and golden, but at the end of his life, under the influence of the new atmosphere, cooler in tone, but more eager, nervous and restless in feeling. Léon Gérôme (b. 1824, *q.v.*) was the originator, during the Second Empire, of the neo-Greek idea, an Orientalist and painter of historic genre, whose somewhat arid instinct for archaeological precision and finish developed to better ends in sculpture during later years. William Bouguereau (b. 1825, *q.v.*) painted symbolical and allegorical subjects in a sentimental style. Jules Lefebvre (b. 1836) had a brilliant career as a portrait painter, combined, in his earlier years, with admirable studies of the nude. These were followed by Benjamin Constant (d. 1902), a clever painter of past ages in the East and of modern Oriental life, who latterly directed his powers of vigorous and rapid brushwork to portrait-painting; Fernand Cormon, the inventive chronicler of primeval Gaul, and a solid and learned portrait painter; Aimé Morot, a man of versatile gifts, a painter of portraits full of life and ease. These formed the heart of the Institut. On the other hand, we find a group who betray a close affinity with the realist party—rejecting, like them, tradition at second-hand, though returning for direct teaching to some of the great masters: Léon Bonnat (b. 1833), educated in Spain, and preserving through a long series of official portraits an evident worship of the great realists of that nation; and again, under the same influence, Jean Paul Laurens (b. 1837), who has infused some return of vitality into historical painting by his clear and individual conceptions and realistic treatment. Jean Jacques Henner (b. 1829, *q.v.*), standing even more apart, lived in a Correggio-like dream of pale nude forms in dim landscape scenery; his love of exquisite texture, and his unvarying sense of beauty, with his refined dilettantism, link him on each side to the great groups of realists and idealists.

About the middle of the 19th century, after the vehement disputes between the partisans of line and the votaries of colour, otherwise the Classic and the Romantic schools, when a younger generation was resting from these follies, exhausted, weary, devoid even of any fine technique, two groups slowly formed on the opposite sides of the horizon—seers or dreamers, both protesting in different ways against the collapse of the French school, and against the alleged indifference and sceptical eclecticism of the painters who were regarded as the leaders. This was a revolt from the academic and conservative tradition. One was the group of original and nature-loving painters, keen and devoted observers of men and things, the realists, made illustrious by the three great personalities of Corot (*q.v.*), Millet (*q.v.*) and Courbet (*q.v.*), the real originators of French contemporary art. The other was the group of men of imagination, the idealists, who, in the pursuit of perfect beauty and an ideal moral standard, reverted to the dissimilar visions of Delacroix and Ingres, the ideals of rhythm as opposed to harmony, of style *versus* passion, which Théodore Chassériau had endeavoured to combine. Round Puvis de Chavannes (*q.v.*) and Gustave Moreau (*q.v.*) we find a group of artists who, in spite of the fascination exerted of their intelligence by the great works of the old masters, especially the early Florentines and Venetians, would not accept the old technique, but strove to record in splendid imagery the wonders of the spiritual life, or claimed, by studying contemporary individuals, to reveal the psychology of modern minds. Among them were Gustave Ricard (1821–1873), whose portraits, suggesting the mystical charm sometimes of Leonardo and sometimes of Rembrandt, are full of deep unuttered vitality; Elie Delaunay (1828–1891), serious and expressive in his heroic compositions, keen and striking in his portraits; Eugène Fromentin (1820–1876), acute but subtle and silvery, a man of elegant mind, the writer of *Les Maîtres d'autrefois*, of *Sahel* and of *Le Sahara*, the discoverer—artistically—of Algeria. And round the loud and showy individuality of Courbet—healthy, nevertheless, and inspiring—a group was gathered of men less judicious, but more stirring, more truculent, thoroughly original, but not less reverent to the old masters than they were defiant of contemporary authorities. They were even more ardent for a strong technique, but the masters who attracted them were the Dutch, the Flemish, the Venetians, who, like themselves, had aimed at recording the life of their day. Among these was François Bonvin (1817–1887), who, following Granet, carried on the evolution of a subdivision of genre, the study of domestic interiors. This Drolling, too, had done, early in the 19th century, his predecessors in France being Chardin and Le Nain. This class of subjects has not merely absorbed all genre-painting, but has become a very important factor in the presentment of modern life. Bonvin painted asylums, convent-life, studios, laboratories and schools. Alphonse Legros (*q.v.*), painter, sculptor and etcher, who settled in London, was of the same school, though independent in his individuality, celebrating with his brush and etching-needle the life of the poor and humble, and even of the vagabond and beggar. There were also Bracquemond, the reviver of the craft of etching; Fantin-Latour, the painter of highly romantic Wagnerian dreams, figure compositions grouped after the Dutch manner, and flower-pieces not surpassed in his day. Ribot, again, and Vollon, daring and dashing in their handling of the brush; Guillaume Régamey, one of the few military painters gifted with the epic sense; and even Carolus Duran, who, after painting "Murdered" (in the Lille Museum), combined with the professional duties of an official teacher a brilliant career as a portrait painter. A later member of this group, attracted to it by student friendship in the little drawing-school which under Lecoq de Boisbaudran competed in a modest way with the École des Beaux Arts, was J. C. Cazin, well known afterwards as a pronounced idealist. Finally, there was Manet, a connecting link between the realists and the impressionists. These two radiant focuses of imagination and of observation respectively were to be seen still intact during the later period, as represented by the most energetic of the masters who upheld them.

After the catastrophe of 1870, French art appeared to be reawakened by the disasters of the country; and at the great exhibition in Vienna in 1873 Count Andrassy exclaimed to Léon Bonnat, "After such a terrible crisis you are up again, and victorious!" Immense energy prevailed in the studios, and money poured into France in consequence. The output increased rapidly, and at the same time study became more strenuous, and ambition grew bolder and more manly. Renewed activity stirred in the public academies, and a crowd of foreign students came to learn. Two great facts give a characteristic stamp to this new revival of French art: I. In the class of imaginative painting, the renewed impulse towards monumental or decorative work. II. In the class of nature studies, the growth of landscape painting, which developed along two parallel lines—Impressionism; and III. the "Open-air" school.

I. *Decoration.*—In decorative painting two men were the soul of the movement: Puvis de Chavannes and Philippe de Chennevières Pointel. As we look back on the last years of the Second Empire we see decorative painting sunk in profound lethargy. After Delacroix, Chassériau and Hippolyte Flandrin, and the completion of the great works in the Palais Bourbon, the Senate

House, the Cour des Comptes and a few churches—St Sulpice, St Vincent de Paul and St Germain des Prés—no serious attempts had been made in this direction. Excepting in the Hôtel de Ville, where Cabanel was winning his first laurels, and in the Opera House, a work that was progressing in silence, a few chapels only were decorated with paintings in the manner of easel pictures. But two famous exceptions led to a decorative revival: Puvis de Chavannes's splendid scheme of decoration at Amiens (all, with the exception of the last composition, which is dated 1882, executed without break between 1861 and 1867), and his work at Marseilles and at Poitiers; Baudry, with his ceiling in the Opera House, begun in 1866 but not shown to the public till 1874. There was also a movement for reviving French taste in the industrial arts by following the example of systematic teaching set by some foreign countries, more particularly by England. Decorative painting felt the same impulse. Philippe de Chennevières, curator of the Luxembourg Gallery and directeur des Beaux Arts (from 1874 till 1879), determined to encourage it by setting up a great rivalry between the most distinguished painters, like that which had stimulated the zeal of the artists of the Italian Renaissance. Taking up the task already attempted by Chenavard under the Republic of 1848, but abandoned in consequence of political changes, M. de Chennevières commissioned a select number of artists to decorate the walls of the Panthéon. The panels were to record certain events in the history of France, with due regard to the sacred character of the building. Twelve of the most noted painters were named, with a liberal breadth of selection so as to include the most dissimilar styles: Millet and Meissonier, of whom one refused and the other did not carry out the work; Cabanel and Puvis de Chavannes. The last-named was the first to begin, in 1878, and he too was the painter who put the crowning end to this great work in 1898. His pictures of the "Childhood of Ste Geneviève" (the patron saint of Paris), simple, full of feeling and of innocent charm, appropriate to a popular legend, with their airy Parisian landscape under a pallid sky, made a deep impression. Thenceforward Puvis de Chavannes had a constantly growing influence over younger men. His magnificent work at Amiens, "Ludus pro Patria" (1881–1882), at Lyons and at Rouen, in the Sorbonne and the Hôtel de Ville, for the Public Library at Boston, U.S.A., and on to his last composition, "The Old Age of Ste Geneviève," upheld to the end of the 19th century the sense of lofty purpose in decorative painting. Besides the Panthéon, which gave the first impetus to the movement, Philippe de Chennevières found other buildings to be decorated: the Luxembourg, the Palace of the Legion of Honour and that of the Council of State. The paintings in the Palais de Justice, the Sorbonne, the Hôtel de Ville, the College of Pharmacy, the Natural History Museum, the Opéra Comique, and many more, bear witness to this grand revival of mural painting. Every kind of talent was employed—historical painters, portrait painters, painters of allegory, of fancy scenes, of real life and of landscape. Among the most important were: J. P. Laurens and Benjamin Constant, Bonnat and Carolus Duran, Cormon and Humbert, Joseph Blanc and L. Olivier Merson, Roll and Gervex, Besnard and Carrière, Harpignies and Pointelin, Raphaël Collin and Henri Martin.

II. *Impressionism.*—In 1874 common cause was made by a group of artists drawn together by sympathetic views and a craving for independence. Various in their tastes, they concentrated from every point of the compass to protest, like their precursors the realists, against the narrow views of academic teaching. Some had romantic proclivities, as the Dutchman Jongkindt, who played an important part in founding this group; others were followers of Daubigny, of Corot or of Millet; some came from the realistic party, whose influence and effort this new set was to carry on. Among these, Édouard Manet (1832–1883) holds a leading place; indeed, his influence, in spite of—or perhaps as a result of—much abuse, extended beyond his circle even so far as to affect academic teaching itself. He was first a pupil of Couture, and then, after Courbot, his real masters were the Spaniards—Velasquez, El Greco and Goya—all of whom he closely studied at the beginning of his career; but he soon felt the influence of Millet and of Corot. With a keen power of observation, he refined and lightened his style, striving for a subtle rendering of the exact relations of tone and values in light and atmosphere. With him, forming the original group, as represented by the Caillebotte collection in the Luxembourg, we find some landscape painters: Claude Monet, the painter of pure daylight, and the artist who by the title of one of his pictures, "An Impression," gave rise to the designation accepted by the group; Camille Pissarro, who at one time carried to an extreme the principle of dotting with pure tints, known as *pointillisme*, or dotwork; Sisley, Cézanne and others. Among those who by preference studied the human figure were Edgard Degas (*q.v.*) and Auguste Renoir. After long and violent antagonism, such as had already greeted the earlier innovators, these painters, in spite of many protests, were officially recognized both at the Luxembourg and at the great Exhibition of 1900. Their aims have been various, some painting Man and some Nature. In the former case they claim to have gone back to the principle of the greatest artists and tried to record the life of their own time. Manet, Degas and Renoir have shown us aspects of city or vulgar life which had been left to genre-painting or caricature, but which they have represented with the charm of pathos, or with the bitter irony of their own mood, frank transcripts of life with a feeling for style. For those who painted the scenery of nature there was an even wider field. They brought to their work a new visual sense, released from the clinging memories of past art; they endeavoured to fix the transient effects of moving life, changing under the subtlest and most fugitive effects of light and atmosphere, and the play of what may be called the elements of motion—sunshine, air and clouds—caring less for the exact transcript of motionless objects, which had hitherto been almost exclusively studied, such as the soil, trees and rocks, the inanimate features of the landscape. They introduced a fresh lightness of key, which had been too subservient to the relations of values; they discovered for their ends a new class of subjects essentially modern: towns, streets, railway stations, factories, coal-mines, ironworks and smoke, which they represent with an intelligent adaptation of Japanese art, taking new and audacious points of view, constantly varying the position of their horizon. This is indeed the very acme of naturalism, the last possible stage of modern landscape, covering the whole field of observation, doubling back to the starting-point of imagination. Notwithstanding—or because of—the outcry, of these views, peculiarities and tendencies soon penetrated schools and studios. Three artists in particular became conspicuous among the most individual and most independent spirits: Besnard, who had taken the Grand Prix de Rome, and carried to the highest pitch his inexhaustible and charming fancy in studies of the figure under the most unexpected play of light; Carrière, a pupil of Cabanel, who sought and found in mysterious gloom the softened spirit of the humble, the warm caress of motherhood; and Raffaëlli, a pupil of Gérôme, who brought to light the unrecognized picturesqueness of the lowest depths of humanity.

III. *The "Plein-air," or Open-air, School.*—The same causes explain the rise of the particular class of work thus commonly designated. Between Millet and Courbet, both redolent of the romantic and naturalistic influences of their time, though apart from them, stands an artist who had some share in establishing the continuity of the line of painters who combined figure-painting with landscape. This is Jules Breton (b. 1827, *q.v.*). More supple than his fellows, less harsh and less wilful, caring more for form and charm, he found it easier to treat "masses," and contributed to diffuse a taste for the artistic presentment and glorification of field labour. He was the chief link between a past style and Jules Bastien-Lepage (1848–1884, *q.v.*), who was in fact the founder of the school of open-air painting, a compromise between the academic manner and the new revolutionary ideas, a sort of academic continuation of the naturalistic evolution, which therefore exerted considerable influence on contemporary art. As a pupil of Cabanel and the Academy schools, enamoured of rustic life, he absorbed at an early stage, though not without hesitation, the love of atmospheric effects characteristic of Corot and of Manet. In his open-air heads and rural scenes he is seen as a conscientious nature worshipper, accurate and sincere, and, like Millet, imbued with a touch of mysticism which becomes even more evident in his immediate pupils. Round him there arose a little galaxy of painters, some more faithful to tradition, some followers of the best innovators, who firmly tread this path of light and modern life. These are Butin, Duez and Renouf, Roll and Gervex, Dagnan-Bouveret, Friant, Adolphe and Victor Binet and many more.

Immediately after the Exhibition of 1889 an event took place which was not without effect on the progress of French art. This was the schism in the Salon. The audacious work of the Société Nationale des Beaux Arts, which left anything that the Impressionists could do far behind, had accustomed the eyes of the public to the most daring attempts, while the numerous contributions of foreigners, especially from the north, where art aimed solely at a direct presentment of daily life, was a fresh encouragement to the study of modern conditions and of the lower classes. But, at the same time, the encroachment on space at the Exhibition (where no limit of number was imposed) by mere studies, hastened the reaction against the extravagances of the degenerate followers of Courbet, Manet and Bastien-Lepage. Remonstrances arose against their perverse and narrow-minded devotion to "truth," or rather to minute exactitude, their pedantry and affectation of documentation; sometimes derived from some old colourists who had not renounced their former ideal, sometimes from younger men impelled unconsciously by literature, which had as usual preceded art in the revolt. The protest was seen, too, in a modified treatment of landscape, which took on the warmer colours of sunset, and in a choice of religious subjects, such as a *pardon*, or a funeral, or a ceremonial benediction, and generally of more human and more pathetic scenes.

Bastien-Lepage, like his great precursor Millet, bore within him the germs of a reaction against the movement he had helped to promote. Dagnan-Bouveret, who began by painting "Sitting for a Photograph" (now at Lyons) and "An Accident," after painting "Le Pain bénit," ended with "The Pilgrims to Emmaus" and "The Last Supper." Friant, again, produced scenes of woe, "All Saints' Day" and "Grief"; and their younger successors, Henri Royer, Adler, Duvent and others, who adhered to this tradition, accommodated it to a more modern ideal, with more vivid colouring and more dramatic composition.

Still, this normal development could have no perceptible effect in modifying the purpose of painting. More was needed. A strong craving for imaginative work was very generally felt, and was revealing itself not merely in France but in Belgium, Scotland, America and Germany. This tendency ere long resulted in groups forming round certain well-known figures. Thus a group of refined dreamers, of poetic dilettanti and harmonious colourists, assembled under the leading of Henri Martin (a strange but attractive visionary, a pupil of Jean Paul Laurens and direct heir to Puvis de Chavannes, from whom he had much sound teaching) and of Aman-Jean, who had appeared at the same time, starting, but with more reserve, in the same direction. Some of this younger group affected no specific aim; the others, the larger number, leant towards contemporary life, which they endeavoured to depict, especially its aspirations and—according to the modern expression now in France of common usage—its "state of soul" typified by melody of line and the eloquent language of harmonies. Among them should be named, as exhibitors in the salons and in the great Exhibition of 1900, Ernest Laurent, Ridel and Hippolyte Fournier, M. and Mme H. Duhem, Le Sidaner, Paul Steck, &c. On the other hand, a second group had formed of sturdy and fervent naturalistic painters, in some ways resembling the school of 1855 of which mention has been made; young and bold, sometimes over-bold, enthusiastic and emotional, and bent on giving expression to the life of their own day, especially among the people, not merely recording its exterior aspects but epitomizing its meaning by broad and strong synthetical compositions. At their head stood Cottet, who combined in himself the romantic fire and the feeling for orchestrated colour of Delacroix with the incisive realism and bold handling of Courbet; next, and very near to him, but more objective in his treatment, Lucien Simon, a manly painter and rich colourist. Both by preference painted heroic or pathetic scenes from the life of Breton mariners. After them came René Ménard, a more lyrical artist, whose classical themes and landscape carried us back to Poussin and Dauchez, Prinet, Wéry, &c.

Foreign influences had meanwhile proved stimulating to the new tendencies in art. Sympathy with the populace derived added impulse from the works of the Belgian painters Constantin Meunier, Léon Frédéric and Struys; a taste for strong and expressive colouring was diffused by certain American artists, pupils of Whistler, and yet more by a busy group of young Scotsmen favourably welcomed in Paris. But the most unforeseen result of this reactionary movement was a sudden reversion to tradition. The cry of the realists of every shade had been for "Nature!" The newcomers raised the opposition cry of "The Old Masters!" And in their name a protest was made against the narrowness of the documentary school of art, a demand for some loftier scheme of conventionality, and for a fuller expression of life, with its complex aspirations and visions. The spirit of English Pre-Raphaelitism made its way in France by the medium of translations from the English poets Shelley, Rossetti and Swinburne, and the work of their followers Stephane Mallarmé and Le Sār Peladan; it gave rise to a little artificial impetus, which was furthered by the simultaneous but transient rage for the works of Burne-Jones, which were exhibited with his consent in some of the salons, and by the importation of William Morris's principles of decoration. The outcome was a few small groups of symbolists, the most famous being that of the Rose ✠ Croix, organized by Le Sār Peladan; then there was Henri Martin, and the little coterie of exhibitors attracted by a dealer, the late M. le Bare de Bouttiville, in which Cottet was for a short time entangled. But few interesting names are to be identified: Dulac (d. 1899), who became known chiefly for his mystical lithographs in colour; Maurice Denis and Bonnard, whose decorative compositions, with their refined and harmonious colouring, are not devoid of charm; Vuillard, &c. But it was in the school and studio of Gustave Moreau (1826–1898, *q.v.*) that the fire of idealism burned most hotly. This exceptional man and rare painter, locked up in his solitude, endeavoured, by a thorough and intelligent assimilation of all the traditions of the past, to find and create for himself a new tongue—rich, nervous, eloquent, strong and resplendent—in which to give utterance to the loftiest dreams that haunt the modern soul. He revived every old myth and rejuvenated every antique symbol, to represent in wonderful imagery all the serene magnificence and all the terrible struggles of the moral side of man, which he had explored to its lowest depths and most heroic heights in man and woman, in poetry and in death. Being appointed, towards the end of his life, to a professorship in the École des Beaux Arts, he regarded his duties as a real apostleship, and his teaching soon spread from his lecture-room and studio to those of the other masters. His own work, though hardly known to his pupils at the time, at first influenced their style; but, especially after his death, they were quickly disgusted with their own detestable imitation of subjects on which the master had set the stamp of his great individuality; they deserted the fabulous world of the Greek Olympus and the wonderful gardens of the Bible, to devote them to a passionate expression of modern life. Desvallières, indeed, remained conspicuous in his original manner; Sabatté, Maxence, Béronneau, Besson and many more happily worked out their way on other lines.

In trying to draw up the balance-sheet of French art at the beginning of the 20th century, it were vain to try to enter its work under the old-world headings of History, Genre, Portraits, Landscape. All the streams had burst their channels, all the currents mingled. Historical painting, reinstated for a time by Puvis de Chavannes and J. P. Laurens, in which Benjamin Constant and Cormon also distinguished themselves, had but a few adherents who tried to maintain its dignity, either in combination with landscape, like M. Tattegrain, or with the ineffectual aid of archaeology, like M. Rochegrosse. At certain times, especially just after 1870, the memory of the war gave birth to a special genre of military subjects, under the distinguished guidance of Meissonier (*q.v.*), and the peculiar talents of Alphonse de Neuville (*q.v.*), of Detaille (*q.v.*) and Protais. This phase of contemporary history being exhausted, gave way to pictures of military manœuvres, or colonial wars and incidents in recent history; it latterly went through a revival under a demand for subjects from the Empire and the Revolution, in consequence of the publication of many memoirs of those times. Side by side with "history," religious art formerly flourished greatly; indeed, next to mythology, it was always dear to the Academy. Apart from the subjects set for academical competitions, there was only one little revival of any interest in this kind. This was a sort of neo-evangelical offshoot, akin to the literature and stress of religious discussion; and its leader, a man of feeling rather than conviction, was J. C. Cazin (d. 1901). Like Puvis de Chavannes, and under the influence of Corot and Millet, of Hobbema, and yet more of Rembrandt, he attempted to renew the vitality of history and legend by the added charm of landscape and the introduction of more human, more living and more modern, elements into the figures and accessories. Following him, a little group developed this movement to extravagance. The recognized leader at the beginning of the 20th century was Dagnan-Bouveret.

Through mythology and allegory we are brought back to real life. No one now thinks in France of seeking any pretext for displaying the nude beauty of woman. Henner, perhaps, and Fantin-Latour, were the last to cherish a belief in Venus and Artemis, in naiads and nymphs. Painters go direct to the point nowadays; when they paint the nude, it is apart from abstract fancies, and under realistic aspects. They are content with the model. It is the living female. The whole motor force of the time lies in the expression, under various aspects, of real life. This it is which has given such a soaring flight to the two most primitive forms of the study of life, landscape and portraiture. Portraits have in fact adopted every style that can possibly be imagined: homely or fashionable, singly or in groups, by the fire or out of doors, in some familiar attitude and the surroundings of daily life, analytically precise, or synthetically broad, a literal transcript or a bold epitome of facts. As to landscape, no class of painting has been busier, more alive or more productive. It has overflowed into every other channel of art, giving them new spirit and a new life. It has led the van in every struggle and won every victory. Never was army more numerous or more various than that of the landscape painters, nor more independent. All the traditions find representatives among them, from Paul Flandrin to René Ménard. Naturalists, impressionists, open-air painters, learned in analysis or potent in invention. We need only name Harpignies, broadly decorative; Pointelin, thoughtful and austere; and Cazin, grave and tender, to give a general idea of the strength of the school.

Every quarter of the land has its painters: the north and the south, Provence and Auvergne, Brittany, dear to the young generation of colourists, the East, Algeria, Tunis—all contribute to form a French school of landscape, very living and daring, of which, as successors of Fromentin and Guillaumet, must be named Dinet, Marius Perret, Paul Leroy and Girardot. But it is more especially in the association of man and nature, in painting simple folk and their struggle for life amid their natural surroundings or by their homely hearth, in the glorification of humble toil, that the latest French art finds its most characteristic ideal life. (L. Be.)

Belgium

Belgium fills a great place in the realm of art; and while its painters show a preference for simple subjects, their technique is broad, rich and sound, the outcome of a fine tradition. Since 1855 international critics have been struck by the unity of effect produced by the works of the Belgian school, as expressed more especially by similarities of handling and colour. For the things which distinguish all Belgian painters, even in their most unpictorial divagations, are a strong sense of contrast or harmony of colouring, a free, bold style of brushwork, and a preference for rich and solid painting. It is the tradition of the old Flemish school. It would be more correct, indeed, to say traditions; for the modifications of each tendency, inevitably reviving when the success of another has exhausted itself, constantly show a reversion either to the domestic "Primitives" (or, as we might say, Pre-Raphaelites) of the Bruges school, or to the "decorative" painters of the later time at Antwerp, and no veneer of modern taste will ever succeed in masking this traditional perennial groundwork. In this way the prevailing authority of the French painter Louis David may be accounted for; as acknowledged at Brussels at the beginning of the 19th century, it was a reaction in antagonism to the heavy and flabby work of the late Antwerp school, an unconscious reversion perhaps to the finish and minuteness of the early painters of Bruges. Indeed, in France, Ingres, himself David's most devoted disciple, was reproached with trying to revive the Gothic art of Jean de Bruges. Then, when David's followers produced only cold and feeble work, Wappers arose to restore the methods of another tradition, for which he secured a conspicuous triumph. Classical tinsel made way, indeed, for romantic tinsel. The new art was as conventional as the old, but it had the advantage of being adaptable to the taste for show and splendour which characterizes the nation, and it also admitted the presentment of certain historical personages who survived in the memory of the people. The inevitable reaction from this theatrical art, with its affectation of noble sentiments, was to brutal realism. Baron Henri Leys (*q.v.*) initiated it, and the crudity of his style gave rise to a belief in a systematic purpose of supplanting the Latin tradition by Germanic sentimentality. Leys's archaic realism was transformed at Brussels into a realism of observation and modern thought, in the painting of Charles de Groux. The influence of Leys on this artist was merely superficial; for though he, too, affected painful subjects, it was because they appealed to his compassion. The principle represented by de Groux was destined to pioneer the school in a better way; at the same time, from another side the authority of Courbet, the French realist, who had been for some time in Brussels, and that of the great landscape painters of the Fontainebleau school, had suggested to artists a more attentive study of nature and a remarkable reversion in technique to bolder and firmer handling. At this time, among other remarkable men, Alfred Stevens appeared on the scene, the finished artist of whom Camille Lemonnier truly said that he was "of the race of great painters, and, like them, careful of finish"—that in him "the eye, the hand and the brain all co-operated for the mysterious elaboration" of impasto, colour and chiaroscuro, and "the least touch was an operation of the mind." A brief period ensued during which the greater number of Belgian artists were carried away by the material charms of brushwork and paint. The striving after brilliant efforts of colour which had characterized the painters of the last generation then gave way to a devout study of values; and at the same time it is to be noted that in Belgium, as in France, landscape painters were the first to discover the possibility of giving new life to the interpretation of nature by simplicity and sincerity of expression. They tried to render their exact sensations; and we saw, as has been said, "an increasingly predominant revelation of instinctive feeling in all classes of painting." Artists took an impartial interest in all they saw, and the endeavour to paint well eliminated the hope of expressing a high ideal; they now sought only to utter in a work of art the impression made on them by an external fact; and, too often, the strength of the effort degenerated into brutality.

These new influences, which, in spite of the conservative school, had by degrees modified the aspect of Belgian art in general, led to the formation at Brussels of an association under the name of the Free Society of Fine Arts. This group of painters had a marked influence on the development of the school, and hand in hand with the pupils of Portaels—a teacher of sober methods, caring more for sound practice than for theories—it encouraged not merely the expression of deep and domestic feeling which we find in the works of Leys and de Groux, but also the endeavour to paint nature in the broad light of open air. The example of the Free Society found imitators; various artistic groups were formed to organize exhibitions where new works could be seen and studied irrespective of the influence of dealers, or of the conservatism of the authorities which was increasingly conspicuous in the official galleries; till what had at first been regarded as a mere audacious and fantastic demonstration assumed the dignity of respectable effort. The "Cercle des Vingt" ("The Twenty Club") also exerted a marked influence. By introducing into its exhibitions works by the greatest foreign artists it released Belgian art from the uniformity which some too patriotic theorists would fain have imposed. The famous "principle of individuality in art" was asserted there in a really remarkable manner, for side by side with the experiments of painters bent on producing certain effects of light hung the works of men who clung to literary or abstract subjects. Other groups, again, were formed on the same lines; but then came the inevitable reaction from these elaborations of quivering light and subtle expression, pushed, as it seemed, to an extreme. The youngest generation of Brussels painters, in revolt against the lights and ultra-refinements of their immediate predecessors, seem to take pleasure in a return to gums and bitumen, and to seek the violent effects so dear to the romantic painters of a past time.

Brussels is the real centre of art in Belgium. Antwerp, the home of Rubens, is resting on the memory of past glories, after vainly trying to uphold the ideal formerly held in honour by Flemish painters. And yet, so great is the prestige of this ancient reputation, that Antwerp even now attracts artists from every land, and more especially the dealers who go thither to buy pictures as a common form of merchandise. At Ghent the wonderful energy of the authorities who get up the triennial exhibitions makes these the most interesting provincial shows of their kind; other towns, as Liége, Tournay, Namur, Mons and Spa also have periodical exhibitions.

From 1830, in the early days of the Belgian school of painting, we may observe a tendency to seek for the fullest qualities of colour, with delicate gradations of light and shade. In this Wappers led the way. At a time when his teachers in the Antwerp Academy would recognize nothing but the heavy brown tones of old paintings, he was already representing the transparent shadows of natural daylight. But heroic and sentimental romanticism was already making way for the serious expression of domestic and popular feeling, and thenceforward the prominence assumed by genre, and yet more by landscape, led to a deeper and more direct study of the various aspects of nature. At the same time a special sense of colour was the leading characteristic of the artists of the time, and it was truly said that "the ambition to be a fine painter was stronger than the desire for scrupulous exactitude." Artists evidently aimed, in the first place, at a solid impasto and glowing colour; an undertone, ruddy and golden, gleamed through the paler and more real hues of the over-painting. In this way we may certainly recognize the influence of the French colourists of Courbet's time; just as we may trace the influence of the grey tone prevalent in Manet's day in the effort to paint with more simple truth and fewer tricks of recipe, which became evident when the "Free Society" was founded at Brussels, and the pupils from Portaels's studio came to the front.

Among the artists who were then working the following must be named (with their best works in the Brussels Gallery): Alfred Stevens (*q.v.*), an incomparably charming painter, characterized by exquisite harmony of colour and marvellous dexterity with the brush. In the Brussels Gallery are his "The Lady in Pink," "The Studio," "The Widow," "A Painter and his Model," and "The Lady-Bird." Joseph Stevens, his brother, a master-painter of dogs, broad in his draughtsmanship, and painting in strong touches of colour, is represented by "The Dog-Market," "Brussels—Morning," "A Dog before a Mirror"; Henri de Braekeleer, the nephew and pupil of Leys, a fine painter of interiors, in warm and golden tones, by "The Geographer," "A Farm—Interior," "A Shop"; Lievin de Winne, a portrait painter, sober in style and refined in execution, by "Leopold I., King of the Belgians"; Florent Willems, archaic and elegant, by "The Wedding Dress"; Eugêne Smits, a refined colourist, always working with the thought of Venice in his mind, by "The Procession of the Seasons"; Louis Dubois, a powerful colourist with a full brush, striving to resemble Courbet, by "Storks," "Fish"; Alfred Verwée, a fine animal painter, with special love for a sheeny silkiness of texture, by "The Estuary of the Scheldt," "The Fair Land of Flanders," "A Zeeland Team"; Alfred Verhaeren, a pupil of L. Dubois, by some "Interiors"; Felicien Rops, an extraordinary artist, precise in drawing, sensual and incisive, by "A Parisienne"; Félix ter Linden, a restless, refined nature, always trying new subtleties of the brush and palette-knife, by "Captives." Amongst other painters may be named Camille van Camp, Gustave de Jonghe, Franz Verhas, and his brother Jan Verhas, the painter of the popular "School Feast" in the Brussels Gallery; and Jan van Beers, the clever painter of female coquettishness, represented by pictures in the Antwerp Gallery.

As landscape painters, the chief are: Hippolyte Boulenger, a refined draughtsman and a delicate colourist, represented in the Brussels Gallery by "View of Dinant," "The Avenue of Old Hornbeams at Tervueren," "The Meuse at Hastière"; Alfred de Knyff, noble and elegant, by "The Marl Pit," "A Heath—Campine"; Joseph Coosemans, by "A Marsh—Campine"; Jules Montigny, by "Wet Weather"; Alph. Asselbergs, by "A Marsh—Campine." There are also Xavier and César de Cock, painters in light gay tones of colour; Gustave Den Duyts, a lover of melancholy twilight, represented in the same gallery by "A Winter Evening"; Mme Marie Collart, a seeker after the more melancholy and concentrated impressions of nature, by "The Old Orchard"; and Baron Jules Gœthals.

Of the *Antwerp school*, François Lamorinière, archaic and minute, has in the Brussels Gallery his "View from Edeghem," and there is also Théodore Verstraete, sentimental, or frenzied.

As marine painters: Paul Jean Clays, who delights in vivid effects of colour, is represented at Brussels by "The Antwerp Roadstead," "Calm on the Scheldt"; Louis Artan, who prefers dark and powerful effects, by "The North Sea," besides Robert Mols, A. Bouvier, and Lemayeur.

As painters of town scenery may be named F. Stroobant, a draughtsman rather than a painter, who is represented in the Brussels Gallery by "The Grande Place at Brussels," and J. B. Van More, a colourist chiefly, by "The Cathedral at Belem."

The flower painter, Jean Robie, has in the Brussels Gallery "Flowers and Fruit."

Jean Portaels, the painter of "A Box at the Theatre," at Budapest, is represented in the Brussels Gallery by "The Daughter of Sion Insulted"; Émile Wauters, a master of free and solid brushwork, equally skilled in portraiture, historical composition and decorative portrait painting, by "The Madness of Hugo van der Goes"; Edouard Agneessens, a genuine painter, with breadth of vision and facile execution, by portraits; André Hennebicq, a painter of historical subjects, by "Labourers in the Campagna, Rome"; Isidore Verheyden, a landscapist and portrait painter, by "Woodcutters"; Eugène Verdyen and Émile Charlet should be mentioned, and the landscape painter Henri van der Hecht, whose "On the Sandhills" is in the Brussels Gallery.

The principal landscape painters of what is known as the "neutral tint" school (*l'École du gris*) are: Théodore Baron, faithful to the sterner features of Belgian scenery, represented in the Brussels Gallery by "A Winter Scene—Condroz"; Adrien Joseph Heymans, a careful student of singular effects of light, by "Springtime"; Jacques Rosseels, a painter of the cheerful brightness of the Flemish country, by "A Heath," besides Isidore Meyers and Florent Crabeels.

Some figure painters who may be added to this group are: Charles Hermans, whose picture "Dawn" (Brussels Gallery), exhibited in 1875, betrays the ascendancy of the principles upheld by the Free Society of Fine Arts; Jean de la Hoese, who has since made portraits his special line; Émile Sacré; Léon Philippet, represented in the Brussels Gallery by "The Murdered Man"; and Jan Stobbaerts, a masterly painter, powerful but coarse, by "A Farm—Interior."

Three more artists were destined to greater fame: Constantin Meunier, a highly respected artist, equally a painter and a sculptor, known as the Millet of the Flemish workman, who has depicted with noble feeling his admiration and pity for one contemporary state of the human race, and who is represented in the Brussels Gallery by "The Peasants' War"; Xavier Mellery, who tries to express in works of high artistic merit the inner life of men and things, and personifications of thought, by "A Drawing"; and Alexandre Struys, a strong and clever painter, expressing his sympathy with poverty and misfortune in works of remarkable ability.

Besides these, Charles Verlat, a powerful and skilled artist, painted a vast variety of subjects; his teaching was influential in the Antwerp Academy. In the Brussels Gallery he is represented by "Godfrey de Bouillon at the Siege of Jerusalem," "A Flock of Sheep attacked by an Eagle"; Alfred Cluysenaar, whose aim is to produce decorative work on an enormous scale, by "Canossa"; Albrecht de Vriendt, by "Homage done to Charles V. as a Child"; Juliaan de Vriendt, by "A Christmas Carol"; Victor Lagye, by

"The Witch." Franz Vinck, Wilhelm Geets, Karl Ooms, and P. van der Ouderaa, endeavour to perpetuate, while softening down, the style of historical painting so definitely formulated by Leys. Finally, Joseph Stallaert, a painter of classical subjects, is represented in the Brussels Gallery by "The Death of Dido." Eugène Devaux, a remarkable draughtsman, should also be named.

Works by all those artists were to be seen in the Historical Exhibition of Belgian Art at Brussels, 1880. Camille Lemonnier, in his *History of the Fine Arts in Belgium*, discussed this Exhibition very fully, pointing out three distinct periods in the history of the century. The first, romantic, literary and artificial, extended from 1830 till nearly 1850; the second was a period of transition, domestic in feeling, gradually developing to realism in the course of about twenty years; the third began in the 'seventies, a time of careful study, especially in landscape. This was followed by the beginning of a fourth period, characterized by a freer sense of light and atmosphere.

Apart from the exclusive tendency, inevitable under bureaucratic administration, the mere arrangement on an antiquated plan of the great academic salons was unsuited to the display of works intended to represent individual feeling or peculiarities of pictorial treatment. Hence it was that a great many painters came to prefer smaller and more eclectic shows, leading to the fashion, which still persists, of exhibitions by clubs or associations. The Fine Arts Club at Brussels had long since afforded opportunities for showing the pictures of the Société Libre, founded in 1868, which were condemned by the authorities as tending to "revolutionize" art. After this, two associations of young painters were formed at Brussels with a view to organizing their own exhibitions. The "*Chrysalide*" Club was founded in 1875, and the "*Essor*" (the "Soaring") Club in 1876. In 1882, however, the *Essor* obtained leave to open their exhibition in a room in the Palais des Beaux Arts at Brussels. This tolerance was all the more appreciated by the younger party because a new departure was in course of development, again a modification in the effort to represent light in painting. The "neutral tint" school had given way to the school of "whiteness"; a luminous effect was to be sought by a free use of brilliant colour with a very full brush. But ere long this method proved unsatisfactory, and attention was now turned towards a "sincerer and acuter perception of local values"; and again the influence of certain French painters was brought to bear—those of the group headed by C. Monet, preparing for that of the French painter G. Seurat, the first who carried into practice the systematic decomposition of colour by the process known as *pointillisme* (the intimate juxtaposition of dots of colour). In 1884, in consequence of a division in the *Essor* Club, the "XX" Club was founded, who, though thus limiting their number, reserved the right of "issuing yearly invitations, and thus testifying the sympathy they felt with the most independent artists of Belgium and with those foreign painters with whom they had the most pronounced affinity." For ten years the exhibitions of the "XX," whose careful and artistic arrangements were in themselves admirable, were the fount in Belgium of discussions on art. The limit of its existence to ten years was determined when the club was formed; but as it was desirable that the principle of liberty in art should still be held in honour, M. Octave Maus, the secretary of the "XX" Club, organized the exhibitions of the *Libre esthétique* in and since 1894. Other clubs had been formed in Brussels: the Fine Art Society in 1891 and the "Furrow" (*le Sillon*) in 1893. In 1894 another breach in the *Essor* Club, which, growing very weak, was soon to disappear—as the "Art Union" and the *Voorwaerts* Club had done—led to the formation of the Society "for Art" (*pour l'art*); and in 1896 a party of that club established a salon of idealist art which favoured an exaggeration of the intellectual tendency already begun in the exhibitions of the "XX." Subsequently, in the exhibitions of the *Sillon* and of the *Labeur* Clubs (founded in 1898) a reaction set in, in favour of heavy brown tones and ponderous composition. At Antwerp the influence of the local societies—the "*Als Ik Kan*," the Independent Art Club, and the "XIII"—was less sensibly felt; it was, however, enough to confirm certain waverers in the direction of purely disinterested effort.

It would be impossible to classify into definite groups those painters whose first distinctive appearance was subsequent to the Historical Exhibition in 1880. Only an approximate grouping can be attempted by assigning each to the association in whose exhibitions he made the best display of what he aimed at expressing. Thus it was chiefly in the rooms of the *Essor* Club that works were shown by the following: L. Frédéric, a remarkable painter, combining wonderful facility of execution with a sincerely simple sentiment of homely pathos, represented at the Brussels Gallery by "Chalk Sellers"; E. Hoeterickx, a painter of crowds in the streets and parks; F. Seghers, a pleasing colourist, who had made flower-painting his speciality; two animal painters, F. van Leemputten, "Return from Work" (Brussels Gallery), and E. van Damme-Sylva, as well as the marine painter, A. Marcette. The landscape painters include J. de Greet, almost brutal in style, "The Pool at Rouge-Cloître" (Brussels Gallery), C. Wolles, and Hamesse. L. Houyoux, F. Halkett, L. Herbo are known for their portraits. And there are E. van Gelder, J. Mayné, A. Crespin, a learned decorative painter and E. Duyck, a graceful draughtsman, "A Dream" (Brussels Gallery). As designers may be named A. Heins, a clever illustrator, and A. Lynen, of a thoroughly Brussels type, keenly observant and satirical.

At the exhibitions of the "XX" were pictures by the following: Fernand Khnopff ("Memories," a pastel, in Brussels Gallery), an admirer of the refined domesticity of English contemporary art, and of mystical art, as represented by Gustave Moreau; H. van der Velde, a well-known exponent of the new methods in applied art; J. Ensor, a whimsical nature, loving strange combinations of colour and inconsequent fancies (Brussels Gallery: "The Lamp Man"); Th. van Rysselberghe, a clever painter, especially in the technique of dot painting (*pointillisme*); W. Schlobach, a remarkable colourist of uncertain tendencies; Henry de Groux, son of Ch. de Groux, a seer of visions represented in violent tones and workmanship; G. Vogels, a painter of thaw and rain; G. van Strydonck, R. Wytsman, J. Delvin, F. Charlet, Mlle A. Boch, all of whom have striven to bring light into their pictures; W. Finch and G. Lemmen.

To the triennial salons, to the exhibitions of the "Artistic" clubs, to the House of Art (*Maison d'art*), at Brussels, and to the various Antwerp clubs, the following have contributed: F. Courtens, Rosseels's brilliant pupil, an astonishing painter with a heavy impasto (Brussels Gallery: "Coming out of Church"); J. de Lalaing, full of lofty aims, but showing in his painting the qualities of a sculptor (Brussels Gallery: "A Prehistoric Hunter"); E. Claus, a lover of bright colour, and a genuine landscape painter (Brussels Gallery: "A Flock on the Road"); A. Baertsoen, who delights in the quiet corners of old Flemish towns; H. Evenepoel, a fine artist whose premature death deprived the Belgian school of a highly distinguished personality (Brussels Gallery: "Child at Play"); G. Vanaise, a painter of huge historical subjects; Ch. Mertens, a refined artist; E. Motte, an interesting painter with a love of archaic methods (Brussels Gallery: "A Girl's Head"); A. Lévêque, an accomplished draughtsman with a distinctive touch; L. Wolles, an admirable draughtsman; J. Leempoels, elaborate and minute; H. Richir, a portrait painter; J. van den Eeckhout, a clever pupil of Verheyden; J. Rosier, a skilful follower of Verlat; L. Abry, a painter of military subjects; E. Carpentier, E. Vanhove, Luyten and Desmeth.

Essentially of the Antwerp School are F. van Kuyck, P. Verhaert, de Jans, and Brunin of Ghent, Ch. Doudelet, C. Montald and van Biesbroeck.

There is a group of artists at Liége whose sincerity and high technical qualities have been recognized: A. Donnay, A. Rassenfosse, E. Berchmans, F. Marechal, Dewitte. Of lady painters: Mmes E. Beernaert, L. Héger and J. Wytsman paint landscape; Mmes B. Art, A. Ronner, G. Meunier and M. De Bièvre paint flowers. Mmes A. d'Anethan, Lambert de Rothschild, M. Philippson, H. Calais and M. A. Marcotte paint figures and portraits.

The chief exhibitors at the *Société pour l'art* have been A. Ciamberlani, a painter of large decorative compositions in subdued tones; H. Ottevaere, a painter of night or twilight landscapes; O. Coppens, R. Janssens and A. Hannotiau, who study old houses, deserted churches and dead cities; F. Baes, an excellent pupil of Frédéric Fabry, O. and J. Dierickx, painters of decorative figures; H. Meunier, an ingeniously decorative draughtsman; J. Delville, founder of the salons of idealist art.

Leading exhibitors at the *Voorwaerts* Club have been E. Laermans, a strange artist, as it were a Daumier with anchylose joints, but a colourist (Brussels Gallery: "A Flemish Peasant"); V. Gilsoul, a clever pupil of Courtens (Brussels Gallery: "The Kennel"); J. du Jardin, the writer of *L'Art flamand*, an important critical work illustrated by J. Middeleer.

Contributors to the exhibitions of the *Sillon* Club comprise G. M. Stevens, P. Verdussen, P. Matthieu, J. Gouweloos, Bastien, Blieck, Wagemans and Smeers; and V. Mignot, ingenious in designing posters.

At the exhibitions of water-colours have been seen the works of Huberti, F. Bingé, V. Uytterschaut, Stacquet and H. Cassiers, who work with light washes or a clever use of body colour; Hagemans, who paints with broad washes; Delaunois, the painter of mysterious interiors; Th. Lybaert, minute in his brushwork; M. Romberg and Titz, correct draughtsmen.

Since 1870 several important works of decorative painting in public buildings have been carried out in Belgium. Guffens, Swerts and Pauwels have succumbed to the influences of German art, often cold and stiff; A. and J. Devriendt, V. Lagye, W. Geets and Van der Ouderaa have followed more or less in the footsteps of Leys. J. Stallaert has cleverly revived a classic style. Émile Wauters and A. Hennebicq have adopted the traditions of Historical Painting; and so too have L. Gallait, A. Cluysenaar, J. de Lalaing and A. Bourland, though with a more decorative sense of conception and treatment. But of all these works, certainly the most remarkable in its artistic and intelligent fitness is that of M. Delbeke, in the market-hall at Ypres.

See Camille Lemonnier, *Histoire des arts en Belgique*; A. J. Wauters, *La Peinture flamande*; J. du Jardin, *L'Art flamand*.

(F. K.*)

Holland

The entire Impressionist movement of the end of the 19th century failed to exercise the slightest influence upon the Dutch. They are only modern in so far as they again resort to the classics of their Fatherland. For a whole generation Josef Israels was at the head of Dutch art. Born in 1827 at Groningen, the son of a money-changer, he walked every day in his early years, with a linen money-bag under his arm, to the great banking house of Mesdag, a son of which became later the famous marine painter. During his student days in Amsterdam he lived in the Ghetto, in the house of a poor but orthodox Jewish family. He hungered in Paris, and was derided as a Jew in the Delaroche school there. Such were the experiences of life that formed his character. In Zantvoort, the little fishing village close to Haarlem, he made a similar discovery to that which Millet had already made at Barbizon. In the solitude of the remote village he discovered that not only in the pages of history, but also in everyday life, there are tragedies. Having at first only painted historical subjects, he now began to depict the hard struggle of the seafaring man, and the joys and griefs of the poor. He commenced the long series of pictures that for thirty years and more occupied the place of honour in all Dutch exhibitions. They do not contain a story that can be rendered into words; they only tell the tale of everyday life. Old women, with rough, toil-worn hands and good-natured wrinkled faces, sit comfortably at the stove. Weatherbeaten seamen wade through the water, splashed by the waves as they drag along the heavy anchors. A peasant child learns how to walk by the aid of a little cart. Again, the dawning light falls softly upon a peaceful deathbed, on which an old woman has just breathed her last. A sad and resigned melancholy characterizes and pervades all his works. His toilers do not stand up straight; they are broken, without hope, and humble, and accomplish their appointed task without pleasure and without interest. He paints human beings upon whom the oppressions of centuries are resting; eyes that neither gaze on the present nor into the future, but back on to the long, painful past. A Jew, bearing the Ghetto yet in his bosom, is talking to us; and in his painting of the lowly and oppressed he recounts the story of his own youth and the history of his own race.

The younger painters have divided Israels' subjects among them. Each has his own little field, which he tills and cultivates with industry and good sense; and paints one picture, to be repeated again and again during his lifetime. Christoph Birschop, born in Friesland, settled as an artist in the land of his birth, where the national costumes are so picturesque, with golden chains, lace caps and silver embroidered bodices. As in de Hoogh's pictures, the golden light streams through the window upon the floor, upon deep crimson table-covers; and upon a few silent human beings, whose lives are passed in dreamy monotony. Gerk Henkes paints the fogs of the canals, with boats gliding peacefully along. Albert Neuhuys selects simple family scenes, in cosy rooms with the sunlight peeping stealthily through the windows. Adolf Cortz, a pupil of Israels, loves the pale vapour of autumn, grey-green plains and dusty country roads, with silvery thistles and pale yellow flowers. The landscape painters, also, have more in common with the old Dutch classic masters than with the Parisian Impressionists. There, on the hill, Rembrandt's windmill slowly flaps its wings; there Potter's cows ruminate solemnly as they lie on the grass. There are no coruscation and dazzling brightness, only the grey-brownish mellowness that Van Goyen affected. Anton Mauve, Jacob Maris and Willem Maris (d. 1910), are the best known landscape men. Others are Mesdag, de Haas, Apol, Klinkenberg, Bastert, Blommers, de Kock, Bosboom, Ten Kate, du Chattel, Ter Meulen, Sande-Bakhuyzen. They all paint Dutch coast scenery, Dutch fields, and Dutch cattle, in excellent keeping with the old-master school, and with phlegmatic repose.

A few of the younger masters introduced a certain amount of movement into this distinguished, though somewhat somniferous, excellence. Breitner and Isaak Israels seem to belong rather to Manet's school than to that of Holland. The "suburb" pictures of W. Tholen, the flat landscapes bathed in light by Paul Joseph Gabriel, and Jan Veth's and Havermann's impressionistic portraits prove that, even among the Dutch, there are artists who experiment. Jan Toorop has even attained the proud distinction of being the *enfant terrible* of modern exhibitions, and his works appear to belong rather to the art of the old Assyrians than to the 19th century. But those who will endeavour to enter into their artistic spirit will soon discover that Toorop is deserving of more than a mere shrug of the shoulder; they will find that he is a great painter, who independently pursues original aims. At the present time all criticism of art is determined by the "line." All caprices and whims of the "line" are now ridden as much to death, and with the same enthusiasm, as were formerly those of "light." Toorop occupies one of the first places among those whose only aim consists in allowing the "line" to talk and make music. His astonishing power of physical expression may be noted. With what simple means, for example, he renders in his picture of the "Sphinx" all phases of hysterical desire; in that of "The Three Brides" nunlike resignation, chaste devotion and unbridled voluptuousness. If his mastery over gesture, the glance of the eye, be remarked—how each feature, each movement of the hand and head, each raising and closing of the eyelid, exactly expresses what it is intended to express—Toorop's pictures will no more be scoffed at than those of Giotto, but he will be recognized as one of the greatest masters of the "line" that the 19th century produced.

See Max Rooses, *Dutch Painters of the Nineteenth Century* (Eng. ed., London, 1898–1901). (R. Mr.)

Germany

The German school of painting, like that of France, entered on a new phase after the Franco-German War of 1870. An empire had been built up of the agglomeration of separate states. Germany needed no longer to gaze back admiringly at older and greater epochs. The historical painter became neglected. Not the heroic deeds of the past, but the political glories of the new empire were to be immortalized. This transition is particularly noticeable in the work of Adolf von Menzel. At the time of political stagnation he had recorded on his canvas the glories of Prussia in the past. Now that the present had achieved an importance of its own, he painted "The Coronation of King William at Königsberg" and "King William's Departure for the Army"; and ultimately he became the painter of popular subjects. The motley throng in the streets had a special fascination for him, and he loved to draw the crowd pushing its eager way to listen to a band on the promenade, in the market, at the doors of a theatre, or the windows of a café. He discovered the poetry of the builder's yard and the workshop. In the "Moderne Cyklopen" (ironworks), painted in 1876, he left a monumental mark in the history of German art; for in this picture he depicts a simple incident in daily life, without any attempt at genre; and this was indeed the characteristic of his work for the next few years. Humorous anecdote, as represented by Knaus (b. 1829), Vautier (1829–1898), Defregger (b. 1835) and Grützner (b. 1846), found little acceptance. Serious representations of modern life were required; resort was made to all the expedients of the great painters, and the 'seventies were years of artistic study for Germany. Every great colourist in the past was thoroughly studied and his secrets discovered. In Germany, Wilhelm Leibl (b. 1844), holds the same prominent place that Courbet does in France. Leibl, like Courbet, (*q.v.*), showed that the task of painting is not to narrate, but to depict by the most convincing means at its disposal. He even went farther than Courbet in close scrutiny of nature. With loving patience he strove to translate into colour everything that his keen eye observed: he studied nature with the devotion of the medieval artist. No feeling, strictly speaking, is discernible in his work. His greatest pictures are only of quiet life, with human accessories, and his painful accuracy divests his pictures of poetry. But when he first appeared, he was necessary. His painting of "Three Peasant Women in Church" is a grand documentary work of that period, whose first aim was to conquer the picturesque. Leibl taught artists to study detail, to master the secrets of flower, leaf and stalk.

A great number of pupils were encouraged by him to gain such a thorough mastery of every detail of technique as to be enabled to paint pictures that were thoroughly good in workmanship, irrespective of genre or anecdote. Among these, W. Trübner (b. 1851) stands pre-eminently as a painter. His works during the 'seventies are among the best painting done at Munich during that period; they are full and rich in colour, broad and bold in their treatment of the subject. A contemporary of his was Bruno Piglhein (b. 1848), a German Chaplin in this Courbet group, not heavy and matter-of-fact, but bold and witty. He revived the art of pastel painting and pointed the way to a new style in panoramic and decorative painting, whilst infusing beauty and grace into all his works.

The movement in applied arts which began at this time is also important. The revival of the German Empire led to a renaissance in German taste. The "old German dwelling-rooms," which now became the fashion, could only be hung with pictures in keeping with the style of the old masters, and this entailed a closer study and imitation of their works than had hitherto been customary. Wilhelm Diez (b. 1839) at the head of the group, was as well acquainted with the epoch from Dürer and Holbein to Ostade and Rembrandt as any art historian. In Harburger (b. 1846) Adrian Brouwer lived once more; and in Löfftz (b. 1845) Quintin Matsys. Claus Meyer (b. 1846) imitated all the artistic tricks of Pieter de Hooch and Van der Neer of Delft. Holbein's costume studies were at first models for Fritz August Kaulbach (b. 1850). Later, he extended his studies to Dolci and Van Dyck, to Watteau and Gainsborough. Adolf Lier (1827–1882) applied the beauty of tone beloved by the old masters to landscape, Von Lenbach's works show the zenith of old-master talent in Germany. He had educated himself as a copyist of classical masterpieces, and passed through a schooling in the study of old masters such as none of his contemporaries had enjoyed. The copies which, as a young man, he made for Count Schack in Italy and Spain are among the best the brush has ever accomplished. Titian and Rubens, Velazquez and Giorgione, were imitated by him with equal success. In like manner he gave to his own works their distinguished old-master charm. More than all other painters of historical subjects, Lenbach enjoys the distinction of having been the historian of his epoch. He gave the great men of the era of the emperor William I. the form in which they will live in German history, and beauty of colour is blended in all these pictures with their brilliant evidence of thought. The aspirations of a whole generation to restore the technique of the old masters found their realization in Lenbach.

Such was the position of things when there was imported from France the desire to paint light and sun. It was argued that the views which the old masters held concerning colour were in glaring contradiction to what the eye actually saw. The old masters, it was said, paid particular attention to the conditions of light and shade under which they did their work. The golden character of the Italian Renaissance was traceable to the old cathedrals lighted by stained-glass windows. The light and shade of the Netherlands were in keeping with the light and shadow of the artists' studios lighted by little panes, and due partly to the fact that their pictures were intended to hang in dreamy, brown panelled chambers. But was this golden or brown light suitable for the 19th century? Were we not illogical, when for the sake of reproducing the tones of the old masters, we darkened our studios and shut out the daylight by coloured glass windows and heavy curtains? Was not light one of the greatest acquisitions of recent times? When the Dutch painted the world used only little panes of glass. Now the daylight streamed into our rooms through great white sheets of crystal. When our grandfathers lived there were only candles and oil lamps. Now we had gas and electric light. Instead of imitating the old masters, let us paint the colouristic charms that were unknown to them. Let us do honour to the new marvels of colour. With such arguments as were advanced in France, did artists in Germany adopt the *plein-air* and abandon older methods; and a development like that which took place in France after the days of Manet ensued in Germany also. Daylight, which had so long been kept down, was now to be reproduced as clear and bright. After the art of painting strong effects full of daylight had been grappled with, other and more difficult problems of light effects were attempted. After the full blaze of sunshine had been successfully reproduced, such effects as the haze of early morning, the sultry vaporous atmosphere of the thunderstorm, the mysterious night, the blue-grey dawn, the delicate colours of variegated Chinese lanterns, the scintillation of gas and lamplight, and the dreamy twilight in the interior were dealt with.

Max Liebermann (b. 1849) was the first to join the new departure. In Paris he had learnt technique. Holland, the country of fogs, inspired him with the love for atmospheric effects, and its scenes of simple life provided him with many subjects. Perhaps the "Net Menders" in the Hamburg Kunsthalle is most typical of Liebermann's art. Frank Skarbina (b. 1849), who was the second to join the new movement in Berlin, proceeded to studies of twilight and artificial light effects.

Hans Herrman (b. 1858), who settled himself on quays and ports; Hugo Volgel, who endeavoured to utilize scenes from contemporary life for decorative pictures; and the two landscape painters, Ludwig Dettmann (b. 1865) and Walther Leistikow (b. 1865), are other representatives of modern Berlin art. Carlsruhe, in the 'eighties, produced some modern pictures of great merit, when Gustav Schönleber (b. 1851) and Hermann Baisch (b. 1846) showed daintily conceived pictures of Dutch landscapes. In later years Count Leopold Kalckreuth (b. 1855), whose powerfully conceived representations of peasant life belong to the best productions of German realism, and Victor Weishaupt (b. 1848), the animal painter, removed thence to Stuttgart, the residence also of Otto Reiniger (b. 1863), a landscape painter of great originality. At Dresden we find Gotthard Kuehl (b. 1850), long domiciled in Paris, who was one of the first to accept Manet's teaching. In North Germany, Worpswede became a German Barbizon; Ende (b. 1860), Vogeler, and Vinnen (b. 1863) also worked there. In Weimar, two landscape painters of great refinement must be mentioned—Theodor Hagen (b. 1842) and Gleichen-Russwurm (b. 1866). As far back as the 'seventies they rendered ploughed fields, hills enveloped in thin vapour at sunrise, waving fields of corn, and apple trees in full bloom trembling in the rays of the evening glow with a delicate understanding of natural effects.

But Munich still remains the headquarters of German art, which is there the first of all interests and pervades all circles. Almost all those who are working in other German towns receive in that city their inspirations and have indeed remained its citizens in heart. The international exhibitions have given a great European tone and impulse to creative work. Among the elders, Albert von Keller (b. 1841) has perhaps the greatest originality. He is one of those who practised the art of the brush as long ago as the 'seventies, and painted, not for the sake of historical subjects or for genre, but for the sole love of his art. He painted everything, never restricted himself to any fixed programme, and never became trivial. He is perhaps in Germany the only painter of female portraits who has caught in his pictures a little of the charm that betrays itself in the expression and movements of the modern woman. In the works of Freiherr von Habermann (b. 1849) this refinement of sentiment, as expressed in colour, is combined with a still more decided shade of eccentricity. Already in his "Child of Sorrow," which hangs in the National Gallery at Berlin, he struck that painful chord that always remained his favourite. However different the subjects he has painted, a morbid note pervades them all.

In Heinrich Zügel (b. 1850), the Munich school possesses an animal painter who rivals the great Frenchmen in original power. Ludwig Dill (b. 1848), whom one must still count as "Dachauer," in spite of his migration to Carlsruhe, had for some time past been famous as a painter of Venice, the lagoons and Chioggia, when the impressionist movement became for him the starting-point of a new development. He strove for still brighter light, tried to realize the most subtle shades of colour, and raised himself from a painter of natural impressions to free and poetical lyricism. Arthur Langhammer (b. 1855), Ludwig Herterich, Leo Samberger (b. 1851), Hans von Bartels (b. 1856), Wilhelm Keller-Reutlinger (b. 1854), Beno Becker, Louis Corinth (b. 1858), Max Slevogt, are others that may be mentioned among the later Munich artists.

Fritz von Uhde (b. 1848) occupies a peculiar position as being the first to apply the principles of naturalism to religious art. Immediately before him, Eduard von Gebhardt (b. 1838) had gone back to the angular style of the old northern masters, that of Roger van der Weyden and Albert Dürer, believing he could draw the old Biblical events closer to present times by relating them in Luther's language and representing them as taking place in the most powerful epoch of German ecclesiastical history. Now that historical paintings had been dispossessed by modern and contemporary subjects, it followed also that scenes from the life of Christ had to be laid in modern times. "I do not assert that only the commonplace occurrences of everyday life can be painted. If the historical past be painted, it should be represented in human garb corresponding to the life we see about us, in the surroundings of our own country, peopled with the people moving before our very eyes, just as if the drama had only been enacted the previous evening." Thus wrote Bastien-Lepage in 1879, when creating his "Jeanne d'Arc," and in this sense did Uhde paint. But besides the charm of feeling expressed in the subtlest hues, there is also the charm of the noble line.

At the time when, in England, Rossetti and Burne-Jones, and, in France, Puvis de Chavannes and Gustave Moreau, stepped into the foreground, in Germany Feuerbach (1829–1880), Marées (1837–1887), Thoma (b. 1839), and Böcklin (1827–1901) were discovered. Feuerbach's life was one series of privations and disappointments. His "Banquet of Plato," "Song of Spring," "Iphigenia" and "Pietà," and his "Medea" and "Battle of the Amazons," met with but scant recognition on their appearance. To some they appeared to lack sentiment, to others they were "not sufficiently German." When he died in Venice in 1880, he had become a stranger to his contemporaries. But posterity accorded him the laurel that his own age had denied him. Just those points in his pictures to which exception had been taken during his lifetime, the great solemn restfulness of his colouring and the calm dignity of his contours, made him appear contemporary.

Hans von Marées fulfilled a similar mission in the sphere of decorative art; his, likewise, was a talent that was not discovered until after his death. He is most in touch with Puvis de Chavannes. But the result was different. Puvis was recognized on his first appearance. Marées never had a chance of revealing his real strength. He was only 28 years of age when he first went to Rome; there in 1873, he was commissioned to paint some pictures for the walls of the Zoological Station at Naples. After that time, nothing more was heard of him until 1891, when four years after his death the works he had left behind him were exhibited and presented to the gallery of Schleissheim. The value of these works of art must not be sought in their technique. The art of Puvis rests on a firm realistic foundation, but Marées had finished his studies of nature too prematurely for the correctness of his drawing. In spite of this defect, they encourage as well as excite, owing to the principle which underlies them, and which they share in equal degree with those of Puvis. Like Puvis, Marées repudiated all illuminating efforts whereby forms might be brought into relief. He only retained what was intrinsically essential, the large lines in nature, as well as those of the human frame.

Next to these artists stands Hans Thoma, like one of the great masters of Dürer's time. In Marées and Feuerbach's works there is the solemn grandeur of the fresco; in those of Thoma there is nothing of Southern loveliness, but something of the homeliness of the old German art of woodcut; nay, something philistine, rustic, patriarchal—the simplicity of heart and childlike innocence that entrance us in German folklore, in the paintings of Moritz von Schwind (1804–1871) and Ludwig Richter (1803–1884). He had grown up at Bernau, a small village of the Black Forest. Blossoming fruit-trees and silver brooks, green meadows and solitary peasants' cottages, silent valleys and warm summer evenings, grazing cattle and the cackle of the farmyard, all lived in his memory when he went to Weimar to study the painter's art. This pious faithfulness to the home of his birth and touching affection for the scenes of his childhood pervade all his art and are its leading feature. Even when depicting classical subjects, the mythological marvels of the ocean and centaurs, Thoma still remains the simple-hearted German, who, like Cranach, conceives antiquity as a romantic fairy tale, as the legendary period of chivalry.

Whether it be correct to place Böcklin (*q.v.*) in the same category with these painters, or whether he has a right to a separate place, posterity may decide. The great art of the old masters has weighed heavily upon the development of that of our own age. Even the idealists, who have been mentioned, trace their pedigree back to the old masters. However modern in conception, they are to all intents and purposes "old" as regards the form they employed to express their modern ideas. Böcklin has no ancestor in the history of art; no stroke of his brush reminds us of a leader. No one can think of tracing him back to the Academy of Düsseldorf, to Lessing, or Schorner, as his first teacher. Even less can he be called an imitator of the old masters. His works are the result of nature in her different aspects; they have not their origin in literary or historical suggestion. The catalogue of his conceptions, of landscape in varying moods, is inexhaustible. But landscape does not suffice to express his resources. Knights on the quest for adventure, Saracens storming flaming citadels, Tritons chasing the daughters of Neptune in the billowy waves; such were the subjects which appealed to him. He endowed all fanciful beings that people the atmosphere, that live in the trees, on lonely rocks, or that move and have their being in the slimy bottom of the sea, with body and soul, and placed a second world at the side of the world of actuality. Yet this universe of phantasy was too narrow for the master mind. If it be asked who created on the continent of Europe the most fervid religious paintings of the 19th century; who alone exhausted the entire scale of sensations, from the placidity of repose to the sublimity of heroism, from the gayest laughter to tragedy; who possessed the most solemn and most serious language of form and, at the same time, the greatest poetry of colour—the name of Böcklin will most probably form the answer.

These masters were for their younger brethren the pioneers into a new world of art. It was momentous for the painter's art that in Germany, no less than in England and France, a new movement at this time set in—the so-called "arts and crafts." Hitherto the various branches of art had followed different courses. The most beautiful paintings were often hung in surroundings grievously lacking in taste. Now arose the ambition to make the room itself a work of art. The picture, as such, now no more stands in the foreground, but the different arts strive together to form a single piece of art. The picture is regarded as merely a decorative accessory.

Among the younger painters still to be mentioned, Max Klinger (b. 1857) is perhaps the most brilliant. He had begun with the etching-needle, and by its aid gave us entire novels, crisp little dramas of everyday life. But this realism was only a preliminary phase enabling him to pass on to a great independent art of form. His great picture, "Christ in Olympus," combines beauty of form with deep philosophical meaning. Ibsen in 1873, in his *Emperor and Galilean*, talked of a "third realm," combining heathen beauty with Christian profundity. Klinger's "Christ in Olympus" strikes the beholder as the realization of this idea. Stuck (b. 1863) shares with him the Hellenic serenity of form, the classical simplicity. Apart from this, his pictures are thoroughly different. It might almost be said "Klinger is the Nazarene who stepped into Olympus"; the thoughtful, deep son of the North who carries profound physical problems into the beauty-loving Hellenic worship of the senses. Stuck's art is, also, almost classical in its insensibility and petrified coldness. In his first picture (1889) "The Guardian of Paradise" he painted a slim wiry angel, who, like Donatello's "St George," in calm confidence and self-assurance points the sword before him. And similar rigid figures standing erect in steadiness—always portraits of himself—recur again and again in his works. Even his religious pictures—the "Pietà" and "The Crucifixion"—are, in reality, antique. One would seek in vain in them for the piety of the old masters or the Germanic fervour of Uhde. Grand in style and line, firm, solemn, serious in arrangement, they are yet hard and cold in conception.

Ludwig von Hoffmann (b. 1861) stands next to him, a gentle, dreamy German. In Stuck's work everything is strong and rugged: here all is soft and round. There the massiveness of sculpture and stiff heraldic lines: here all dissolved into variegated fairy tales, glowing harmonies. However classical he may appear, yet it is only the old yearning of the Germani for Hesperia—the song of Mignon—that rings throughout his works; the longing to emerge from the mist and the fog into the light, from the humdrum of everyday life into the remote fabulous world of fairydom, the longing to escape from sin and attain perfect innocence.

There are numerous others deserving of mention besides those already discussed. Josef Sattler (d. 1867), Melchior Lechter (b. 1871), and Otto Greiner (b. 1869), and likewise those who, such as Von Berlepsch (b. 1852) and Otto Eckmann (b. 1865), devoted their energies again to "applied art."

See R. Muther, *The History of Modern Painting* (London, 1895); *Deutsches Künstler-Lexikon der Gegenwart in biographischen Skizzen* (Leipzig, 1898); Mrs de la Mazelière, *La Peinture allemande au XIX^e siècle* (Paris, 1900). (R. Mr.)

Austria-Hungary

In Austria the influence of Makart (1840–1884) was predominant in the school of painting during the last quarter of the 19th century. He personified the classical expression of an epoch, when a long period of colour-blindness was followed by an intoxication of colour. Whilst Piloty's ambition stopped short at the presentation of correct historical pictures, his pupil, Makart felt himself a real painter. He does not interpret either deep thought or historical events, nor does he group his pictures together to suit the views of the art student. His work is essentially that of a colourist. Whatever his subject may be, whether he depicts "The Plague in Florence," "The Nuptials of Caterina Cornaro," "The Triumphal Entry of Charles V.," "The Bark of Cleopatra," or "The Five Senses," "The Chase of Diana," or "The Chase of the Amazons," his pictures are romances of brilliant dresses and human flesh. A few studies of the nude and sketches of colour, in which he merely touched the notes that were to be combined into chords, were the sole preliminaries he required for his historical paintings. Draperies, jewels, and voluptuous female forms, flowers, fruit, fishes and marble—everything that is full of life and sensuous emotion, and shines and glitters, he heaps together into gorgeous still-life. And because by this picturesque sensuousness he restored to Austrian art a long-lost national peculiarity, his appearance on the scene was as epoch-making as if some strong power had shifted the centre of gravity of all current views and ideas.

In estimating Makart, however, we must not dwell on his pictures alone. He did more than merely paint—he lived them. Almost prematurely he dreamed the beautiful dream which in later days came nearer realization, that no art can exist apart from life—that life itself must be made an art. His studio, not without reason, was called his most beautiful work of art. Whithersoever his travels led him—to Granada, Algiers, or Cairo—he made extensive purchases, and refreshed his eye with the luscious splendour of rich silks and the soft lustrous hues of velvets. He made collections of carved ivory and Egyptian mummies, Gobelins, armour and weapons, old chests, antique sculpture, golden brocades with glittering embroideries, encrusted coverlets and the precious textures of the East, columns, pictures, trophies of all ages and all climes. He scattered money broadcast in striving to realize his dream of beauty—to pass one night, one hour, in the world of Rubens, so bright in colour, so princely in splendour.

Uniting as he did these artistic qualities in his own person—not only because he was a painter, but because in no other besides did the great yearning for aesthetic culture find such powerful utterance—Makart exercised an influence in Austria far transcending the actual sphere of the painter's art. An intense fascination went forth from the little man with the black beard and penetrating glance. At that time Makart dominated not merely Viennese art, but likewise the whole cultured life of the capital. Not only the Makart hat and the Makart bouquet made their pilgrimage through the world, he became also the motive power in all intellectual spheres. When Charlotte Wolter acted Cleopatra or Messalina on the stage, she not only wore dresses specially sketched for her by Makart, but she also spoke in Makart's style, just as Hamerling wrote in it. A veritable Makart fever had, indeed, taken possession of Vienna. No other painter of the 19th century was so popular, the life of none other was surrounded by such princely sumptuousness. The scene when, during the festivals of 1879, he headed the procession of artists past the imperial box, mounted on a white steed glittering with gold, the Rubens hat with white feathers on his head, amidst the boisterous acclamations of the populace, is unique in the modern history of art. It is the greatest homage that a Philistine century ever offered an artist.

The life of August von Pettenkofen (1821–1889), who should, after Makart, be accounted the greatest Austrian painter of the last quarter of the 19th century, was passed much more modestly and serenely. He had grown up on one of his father's estates in Galicia, and had been a cavalry officer before becoming a painter. His place in Austria is that of Menzel in Germany. With Pettenkofen a new style appeared. The representation of modern subjects now began to take the place of historical painting, which had for so long a time been the ruling taste; not in the sense of the old-fashioned genre picture, but in that of artistic refined painting. Here, again, the distinctive Austrian note can be easily recognized. Pettenkofen's people are lazy, and yawn. All is contemplative and peaceful, full of dreamy, sleepy repose.

But neither Pettenkofen nor Makart has found followers. The great movement which, originating with Manet, took place in other centres of art, passed Austria by without leaving a trace. Hans Canon (b. 1829), who in his pictures transported the characters of the "Gründerzeit" to Venice of bygone days, and reproduced them as Venetian nobles and ladies of quality, is also a painter of note. So likewise is Rudolf Alt (b. 1812), still active with the brush in 1902, a refined painter in water-colours, who reproduces the beauties of Old Vienna in his subtle architectural sketches. Leopold Karl Müller (1834–1892), who had lived in Cairo with Makart, found his sphere of art in the variegated world of the Nile, and his ethnographical exactness, combined with his delicate colouring, made him for a long while much in request as a painter of Oriental scenes, and a popular illustrator of Egyptological works. Emil Schindler was a great landscape painter, who often rose from faithful interpretation of nature to an almost heroic height. Heinrich von Angeli (b. 1840), again, furnished—as he continued to do—the European courts with his representative pictures, combining refined conception with smooth elegant technique. These are the only artists who during the 'eighties rose above local mediocrity. After Makart died in 1884, the sun of Austrian art seemed to have set. Stagnation reigned supreme.

Only since the "Secession" from the old Society of Artists (*Künstlergenossenschaft*), which took place in 1896, has the former artistic life recommenced in Vienna. Theodor von Hermann, long domiciled in Paris, was the gifted initiator of the new movement, and succeeded in rousing a storm of discontent among the rising school of Viennese artists. They found a literary champion in their hero's father, who pleaded in eloquent language for a new Austrian culture. In November 1898 the

Secessionists opened their first exhibition in a building erected by Josef Olbrück on the Wienerzeil. At first the importance of these exhibitions lay almost exclusively in the fact that the Viennese were thus given an opportunity of making acquaintance with the famous foreign masters, Puvis de Chavannes, Segantini, Besnard, Brangwyn, Meunier, Khnopff, Henri Martin, Vischer, who had until then been practically unknown in Austria, so that the public only then realized the inferiority of their countrymen's artistic work. Thus while acquainting the Viennese public with the strivings of European art, the Secession endeavoured at the same time to produce, in rivalry with foreigners, works of equal artistic merit. Leading foreign masters now joined the movement, and Vienna, which had so long stood aside, through inability to be represented worthily at international exhibitions, became once more a factor in contemporary European art.

Among the painters of the Secession, Gustav Klint possesses, perhaps, the most powerful original talent. Refined portraits, subtle landscapes and decorative pictures, painted for the Tumba Palace and for the Vienna Hof Museum, first brought his name before the world. But he became famous in consequence of the controversy which arose around his picture "Philosophy." He had been commissioned to paint the large ceiling piece for the "aula" of the Vienna University, and instead of selecting a classical subject he essayed an independent work. The heavens open; golden and silvery stars twinkle; sparks of light gleam; masses of green cloud and vapour form clusters; naked human forms float about; a fiery head, crowned with laurel, gazes on the scene with large, serious eyes. Science climbs down to the sources of Truth: yet Truth always remains the inscrutable Sphinx. Klint paid the penalty of his bold originality by his work remaining dark and incomprehensible to most people. It has, notwithstanding, an historical importance for Austria corresponding to that which similar works of Besnard have for France. It embodies the first attempt to place monumental painting upon a purely colouristic basis, and to portray allegorical subjects as pure visions of colour. After Klint, Josef Engelhart (b. 1864) is deserving of notice. He is the true painter of Viennese life. On his first appearance his art was centred in his native place, and was strong in local colour, which was lacking in refinement. To acquire subtlety, he studied the great foreign masters and became a clever juggler with the brush, showing as much dexterity as any of them. Yet this virtuosity meant, in his case, only a good schooling, which should enable him to return with improved means to those subjects best suited to his talent. His works are artistic, but at the same time distinctly local.

Carl Moll (b. 1861) understands how to render with equal skill the play of light in a room and that of the sunbeams upon the fresh green grass. The rural pictures of Rist produce a fresh, cool and sunny effect upon the eye; like a refreshing draught from a cool mountain spring—a piece of Norway on Austrian soil. Zettel's landscapes are almost too markedly Swiss in colour and conception. Julius von Kollmann worked a long time in Paris and London, and acquired, in intercourse with the great foreign painters—notably Carrière and Watts—an exquisitely refined taste, an almost hyperaesthetical sense for discreetly toned-down colour and for the music of the line. In Friedrich König, M. von Schwind's romantic vein is revived. Even the simplest scenes from nature appear under his hand as enchanted groves whispering secrets. Everything is true and, at the same time, dreamy and mysterious. The mythical beings of old German legends—dragons and enchanted princesses—peer through the forest thicket. Ernst Nowak (b. 1851), compared with him, is a sturdy painter, who knows his business well. He sings no delicate lyric. When one stands close by, his pictures appear like masonry—like reliefs. Seen from a distance, the blotches of colour unite into large powerful forms. Bernatzik understands how to interpret with great subtlety twilight moods—moonshine struggling with the light of street lamps, or with the dawn. Ticky followed Henri Martin in painting solemn forest pictures. Ferdinand André leans towards the austere power of Millet. He tells us in his work of labour in the fields, of bronzed faces and hands callous with toil; and especially must his charcoal drawings be mentioned, in which the colour overlays the forms like light vapour, and which, small as they are, have a sculptural effect. Auchentelier—known for his female studies—and Hänisch and Otto Friedrich (b. 1862), refined and subtle as landscape painters, must also be mentioned.

In rivalry with the Secession, the "Künstlergenossenschaft" has taken a fresh upward flight. Among figure painters, Delug, Goltz (b. 1857), Hirschl and Veith are conspicuous; but still greater fascination is exercised by landscape painters such as Amesadan, Charlemont, &c., whose works show Austrian art in its most amiable aspect. Apart from Austrians proper, there are also representatives of the other nationalities which compose "the monarchy of many tongues." Bohemia takes the lead with a celebrity of European reputation—Gabriel Max (b. 1840), who, although of Piloty's school and residing in Munich, never repudiated his Bohemian origin. The days of his youth were passed in Prague; and Prague, the medieval, with its narrow winding alleys, is the most mysterious of all Austrian cities, enveloped in the breath of old memories and bygone legends. From this soil Max drew the mysterious fragrance that characterizes his pictures. His earliest work, the "Female Martyr on the Cross" (1867), struck that sweetly painful, half-tormenting, half-enchanting keynote that has since remained distinctively his. Commonplace historical painting received at Max's hands an entirely new *nuance*. The morbidness of the mortuary and the lunatic asylum, interspersed with spectres—something perverse, unnatural and heartrending—this is the true note of his art. His martyrs are never men—only delicate girls and helpless women. His colouring corresponds to his subjects. The sensations his pictures produce are akin to those which the sight of a beautiful girl lying in a mortuary, or the prison scene in *Faust* enacted in real life, might be expected to excite. He even applies the results of hypnotism and spiritualism to Biblical characters. In many of his pictures refinement in the selection of effects is missing. By over-production Max has himself vulgarized his art. Yet, despite his manner of depicting the mysteries of the realms of shadows, and the intrusion of the spirit-world into realism, he remains a modern master. A new province—the spectral—was opened up by him to art.

Hans Schwaiger is the real *raconteur* of Bohemian legends. He, likewise, passed his youth in a small Bohemian village, over which old memories still brooded. In Hradec, places upon which the gallows had stood were still pointed out. The lonely corridors and passages of the ruined castle were haunted by the shades of its old possessors. This is the mood that led Schwaiger to legend-painting. But underlying his fairy tales there are the gallows or the alchemy of Faust. The landscape with its gloomy skies, the wooden huts, turrets, dwarfed trees—such are ever the accompaniments of his figures.

Of the younger generation of painters, Emil Orlick (b. 1870) seems to be the most versatile. Having acquired technique in Paris and Munich, he practically discovered Old Prague to the world of art. The dark little alleys of the ancient town, swarming with life compressed within their narrow compass, fascinated him. In order to retain and convey all the impressions that crowded in upon him in such superabundant plenitude, he learned how to use the knife of the wood-carver, the needle of the etcher, and the pencil of the lithographer. His studio more resembles the workshop of a printer than the atelier of a painter. In the field of lithography he has attained remarkable results. Orlick has also made his own everything that can be learned from the Japanese. Besides these masters, Albert Hynais, the creator of decorative pictures almost Parisian in conception, must be mentioned. The landscape painters Wickener, Jansa, Slavicek, and Hudecek relate, in gentle melancholy tones of colour, the atmosphere and solitude of the wide plains of Bohemia.

In Poland, painting has its home at Cracow. Down to the year 1893 Johann Matejko was living there, in the capacity of director of the Academy. His pictures are remarkable for their originality and almost brutal force, and differ very widely from the conventional productions of historical painters. At the close of the 19th century Axentowicz, Olga Hojnanska, Mehoffer, Stanislawski and Wyotkowski attracted attention. Although apparently laying much less stress on their Polish nationality than their Russian countrymen, their works proclaim the soul of the Polish nation, with its chivalrous gallantry and mute resigned grief, in a much purer form.

Hungary in the spring of 1900 lost him whom it revered as the greatest of its painters—Michael Munkacsy. Long before his death his brush had become idle. To the younger generation, which seeks different aims, his name has become almost synonymous with a wrongly-conceived old-masterly coloration, and with sensation painting and hollowness. "The Last Day of the Condemned Prisoner," his first youthful picture, contained the programme of his art. Then came "The Last Moments of Mozart," and "Milton dictating *Paradise Lost*." These titles summon up before our eyes a period of all that is false in eclectic art, dominated by Delaroche and Piloty. Even the simple subjects of the Gospel were treated by Munkacsy in Piloty's meretricious style. "Christ before Pilate," "Ecce Homo," "The Crucifixion"—all these are gala representations, costume get-up, and, to that extent, a pious lie. But when we condemn the faults of his period, his personal merit must not be forgotten. When he first came to the fore, ostentation of feeling was the fashion. Munkacsy is, in this respect, the genuine son of the period. He was not one of those who are strong enough to swim against the stream. Instead of raising others to his level, he descended to theirs. But he has the merit of having painted spectacular scenes, such as the period demanded, with genuine artistic power. Like Rahl, Ribot, Roybet and Makart, he was a *maître-peintre*, a born genius with the brush. Von Uhde and Liebermann were disciples of his school. And if these two painters have left that period behind them, and if independent natural sight has followed upon the imitation of the old masters, it is Munkacsy who enabled them to take the leap. (R. Mr.)

ITALY

Modern Italy has produced one artist who towers over all the others, Giovanni Segantini (*q.v.*). Segantini owes as little to his period of study in Milan as Millet did to his sojourn at Delaroche's school. Both derived from their teachers a complete mastery of technique, and as soon as they were in possession of all the aids to art, they discarded them in order to begin afresh. Each painted what he had painted as a youth. They dwelt far from the busy world—Millet in Barbizon, Segantini at Val d' Albola, 5000 feet above the sea-level. They are equally closely allied in art. Millet, who rejected all the artifice of embellishment and perceived only beauty in things as they are, learned to see in the human body a heroic grandeur, in the movements of peasants a majestic rhythm, which none before him had discovered. Although representing peasants, his works resemble sacred pictures, so grand are they in their sublime solemn simplicity. The same is true of Segantini's works. Like Millet, he found his vocation in observing the life of poor, humble people, and the rough grandeur of nature, at all seasons and all hours. As there is in Millet's, so also is there in Segantini's work a primitive, almost classical, simplicity of execution corresponding to the simplicity of the subjects treated. His pictures, with their cold silvery colouring, remind us of the wax-painting of old times and of the mosaic style of the middle ages. They are made up of small scintillating strokes; they are stony and look hard like steel. This technique alone, which touches in principle but not in effect, that of the *pointillistes*, permitted of his rendering what he wished to render, the stony crags of Alpine scenery, the thin scintillating air, the firm steel-like outlines. Finally, he passed from realistic subjects to thoughtful, Biblical and symbolical works. His "Annunciation," the "Divine Youth," and the "Massacre of the Innocents" were products of an art that had abandoned the firm ground of naturalism and aimed at conquering supernatural worlds. This new aim he was unable to realize. He left the "Panorama of the Engadine," intended for the Paris Exhibition, in an unfinished state behind him. He died in his 42nd year, his head full of plans for the future. Modern Italy lost in him its greatest artist, and the history of art one of the rare geniuses.

Few words will suffice for the other Italian painters. The soil that had yielded down to Tiepolo's days such an abundant harvest was apparently in need of rest during the 19th century. At the Paris Exhibition of 1867 About called Italy "the tomb of art," and indeed until quite recent times Italian painting has had the character of mere pretty saleable goods. Francesco Vinea, Tito Conti, and Federigo Andreotti painted with tireless activity sleek drapery pictures, with Renaissance lords and smiling Renaissance ladies in them. Apart from such subjects, the comic, genre or anecdote ruled the fashion—somewhat coarse in colour and of a merrier tendency than is suitable for pictures of good taste. It was not until nearly the end of the 19th century that there was an increase in the number of painters who aim at real achievement. At the Paris Exhibition of 1900 only Detti's "Chest" and Signorini's "Cardinal" pictures reminded one of the comedy subjects formerly in vogue. The younger masters employ neither "drapery-mummeries" nor spicy anecdote. They paint the Italian country people with refined artistic discernment, though scarcely with the naturalism of northern nations. Apparently the calm, serious, ascetic, austere art initiated by Millet is foreign to the nature of this volatile, colour-loving people. Southern fire and delight in brilliant hues are especially characteristic of the Neapolitans. A tangle of baldacchinos, priests and choir boys, peasants making obeisance and kneeling during the passing of the Host, weddings, horse-races and country festivals, everything sparkling with colour and glowing in Neapolitan sunlight—such are the contents of Paolo Michetti's, Vincenzo Capri's, and Edoardo Dalbono's pictures. But Michetti, from being an adherent of this glittering art, has found his way to the monumental style. The Venetians acknowledge and honour as their leader Giacomo Favretto, who died very young. He painted drapery pictures, like most artists of the 'eighties, but they were never lackadaisical, never commonplace. The Venice of Canaletto and Goldoni, the magic city surrounded by the glamour of bygone splendour, rose again under Favretto's hands to fairylike radiance.

The older masters, Signorini, Tito Tommasi, Dall 'oca Branca, who depict the Piedmontese landscape, the light on the lagoons, and the colour charm of Venetian streets with so refined a touch, have numerous followers, whose pictures likewise testify to the seriousness that again took possession of Italian painters after a long period of purely commercial artistic industry. Side by side with these native Italians two others must be mentioned, who occupy an important place as interpreters of Parisian elegance and French art-history. Giuseppe de Nittis (born in Naples; died in Paris 1884) was principally known by his representations of French street life. The figures that enlivened his pictures were as full of charm as his rendering of atmospheric effects was refined. Giovanni Boldini, a Ferrarese living in Paris, also painted street scenes, full of throbbing life. But he excelled, besides, as a portrait-painter of ladies and children. He realized the aim of the Parisian Impressionists, which was to render life, and not merely mute repose. He understood in a masterly fashion how to catch the rapid movement of the head, the fleetest expression, the sparkling of the eye, a pretty gesture. From his pictures posterity will learn as much about the sensuous life of the 19th century as Greuze has told us about that of the 18th.

Among those who have been the leaders of modern Italian art, not already mentioned, are Domenico Morelli, Giovanni Costa, landscape painter; Sartorio, an Italian Pre-Raphaelite; Pasini, painter of the East; Muzzioli, a follower of Alma-Tadema; Barabino, historical painter; and most striking and original of all, Monticelli, whose glow of colours was often obtained, not only by palette-knife painting, but by squeezing the colour straight from the tubes on to the canvas.

See Ashton R. Willard, *History of Modern Italian Art* (London, 1898). (R. Mr.)

Spain and Portugal

Modern Spanish painting began with Mariano Fortuny (*q.v.*), who, dying as long ago as 1874, nevertheless left his mark even on the following generation of artists. During his residence in Paris in 1866 he had been strongly influenced by Meissonier, and subsequently selected similar subjects—scenes in 18th-century costume. In Fortuny, however, the French painter's elaborate finish is associated with something more intense and vivid, indicative of the southern Latin temperament. He collected in his studio in Rome the most artistic examples of medieval industry. The objects among which he lived he also painted with incisive spirit as a setting for elegant figures from the world of Watteau and of Goya, which are thrown into his pictures with amazing dash and sparkle; and this love of dazzling kaleidoscopic variety has animated his successors. Academic teaching tries to encourage historical painting. Hence, since the 'seventies, the chief paintings produced in Spain have been huge historical works, which have made the round of European exhibitions and then been collected in the Gallery of Modern Art at Madrid. There may be seen "The Mad Queen Juana," by Pradilla; "The Conversion of the Duke of Gandia," by Moreno Carbonero; "The Bell of Huesca," by Casado; "The Last Day of Numantia," by Vera; "Ines de Castro," by Cabello. It is possible, of course, to discern in the love of the horrible displayed in these pictures an element of the national character, for in the land of bull-fights even painting turns to murder and sudden death, poison and the rope. However, at least we must admit the great power revealed, and recognize the audacious colouring. But in point of fact these works are only variants on those executed in France from the time of Delaroche to Jean Paul Laurens, and tell their story in the style that was current in Parisian studios in the 'sixties. What is called the national garb of Spain is mainly the cast-off fashion of Paris. After all this magniloquent work Fortuny's rococo became the rage. The same painters who had produced the great historical pictures were now content to take up a brilliant and dazzling miniature style; either, like Fortuny himself, using small and motley figures in baroque subjects, or adapting the modern national life of Spain to the rococo style.

Here again we observe the acrobatic dexterity with which the painters, Pradilla especially, use the brush. But here again there is nothing essentially new—only a repetition of what Fortuny had already done twenty years before. The Spanish school, therefore, presented a very old-fashioned aspect at the Paris Exhibition of 1900. The pictures shown there were mostly wild or emotional. Bedouins fighting, an antique quadriga flying past, the inhabitants of Pompeii hastily endeavouring to escape from the lava torrent, Don Quixote's Rosinante hanging to the sail of the windmill, and the terrors of the Day of Judgment were the subjects; Alvarez Dumont, Benlliure y Gil, Ulpiano Checa, Manuel Ramirez Ibañez and Moreno Carbonero were the painters. Among the huge canvases, a number of small pictures, things of no importance, were scattered, which showed only a genre-like wit. Spain is a somewhat barren land in modern art. There painting, although active, is blind to life and to the treasures of art which lie unheeded in the road. Only one artist, Agrasot, during the 'seventies painted pictures of Spanish low life of great sincerity; and much later two young painters appeared who energetically threw themselves into the modern movement. One was Sorolla y Bastida, by whom there is a large fishing picture in the Luxembourg, which in its stern gravity might be the work of a Northern painter; the other was Ignacio Zuloaga, in whom Goya seems to live again. Old women, girls of the people, and *cocottes* especially, he has painted with admirable spirit and with breadth. Spain, which has taken so little part in the great movement since Manet's time, only repeating in old-fashioned guise things which are falsely regarded as national, seems at last to possess in Zuloaga an artist at once modern and genuinely national.

Portugal took an almost lower place in the Paris Exhibition. For whereas the historical Spanish school has endeavoured to be modern to some extent, at least in colour, the Portuguese cling to the blue-plush and red-velvet splendours of Delaroche in all their crudity. Weak pictures of monks and of visions are produced in numbers, together with genre pictures depicting the popular life of Portugal, spiced to the taste of the tourist. There are the younger men who aim at availing themselves of the efforts of the open-air painters; but even as followers of the Parisians they only say now what the French were saying long years ago through Bastien-Lepage, Puvis de Chavannes and Adrien Dumont. There is always a Frenchman behind the Portuguese, who guides his brush and sets his model. The only painter formed in the school is Carlos Reis, whose vast canvas "Sunset" has much in common with the first huge peasant pictures painted in Germany by Count Kalckreuth. One painter there is, however, who is quite independent and wholly Portuguese, a worthy successor of the great old masters of his native land, and this is Columbano, whose portraits of actors have a spark of the genius which inspired the works of Velazquez and Goya.

See A. G. Temple, *Modern Spanish Painting* (1908). (R. Mr.)

Denmark

Denmark resembles Holland in this: that in both, nature presents little luxury of emphasized colour or accentuated majesty of form. Broad flats are everywhere to be seen—vague, almost indefinable, in outline. Danish art is as demure and staid as the Danish landscape. As in Holland, the painters make no bold experiments, attempt no pretentious subjects, no rich colouring, nothing sportive or light. Like the Dutch, the Danes are somewhat sluggishly tranquil, loving dim twilight and the swirling mist. But Denmark is a leaner land than Holland, less moist and more thinly inhabited, so that its art lacks the comfortable self-satisfied character of Dutch art. It betrays rather a tremulous longing, a pleasing melancholy and delight in dreams, a trembling dread of contact with coarse and stern reality. It was only for a time, early in the 'seventies, that a touch of cosmopolitanism affected Danish art. The phase of grandiose historical painting and anecdotic genre was experienced there, as in every other country. In Karl Bloch (b. 1834), Denmark had a historical painter in some respects parallel with the German Piloty; in Axel Helsted (b. 1847), a genre painter reminding us of Ludwig Knaus. The two artists Laurits Tuxen (b. 1853) and Peter Kröyer (b. 1851), who are most nearly allied to Manet and Bastien-Lepage, have a sort of elegance that is almost Parisian. Kröyer, especially, has bold inventiveness and amazing skill. Open-air effects and twilight moods, the glare of sunshine and artificial light, he has painted with equal mastery. In portraiture, too, he stands alone. The two large pictures in which he recorded a "Meeting of the Committee of the Copenhagen Exhibition, 1887," and a "Meeting of the Copenhagen Academy of Sciences," are modern works which in power of expression may almost compare with those of Frans Hals. Such versatility and facile elegance are to be found in no other Danish painter. At the period of historic painting it was significant that next to Bloch, the cosmopolitan, came Kristian Zahrtmann (b. 1843), who painted scenes from the life of Eleonora Christina, a Danish heroine (daughter of Christian IV.), with the utmost simplicity, and without any emotional or theatrical pathos. This touching feeling for home and country is the keynote of Danish art. The Dane has now no sentiment but that of home; his country, once so powerful, has become but a small one, and has lost its political importance. Hence he clings to the little that is left to him with melancholy tenderness. Viggo Johansen (b. 1851), with his gentle dreaminess, is the best representative of modern Danish home-life. He shows us dark sitting-rooms, where a quiet party has met around the tea-table. "An Evening at Home," "The Christmas Tree," "Grandmother's Birthday," are typical subjects, and all have the same fresh and fragrant charm. He is also one of the best Danish landscape painters. The silvery atmosphere and sad, mysterious stillness of the island-realm rest on Johansen's pictures. Not less satisfactory in their little world are the rest: Holsöe (b. 1866), Lauritz Ring (b. 1854), Haslund, Syberg (b. 1862), Irminger (b. 1850), and Ilsted paint the pleasant life of Copenhagen. In Skagen, a fishing town at the extreme end of Jutland, we find painters of sea life: Michael Ancher (b. 1849), Anna Ancher (b. 1859), and C. Locher (b. 1851). The landscape painters Viggo Pederson (b. 1854), Philipsen (b. 1840), Julius Paulsen (b. 1860), Johan Rohde (b. 1856) have made their home in the villages round Copenhagen. Each has his own individuality and sees nature with his own eyes, and yet in all we find the same sober tone, the same gentle, tearful melancholy. The new Idealism has, however, been discernible in Denmark. Joakim Skovgaard (b. 1856), with his "Christ among the Dead" and "Pool of Bethesda," is trying to endow Denmark with a monumental type of art. Harald Slott-Möller (b. 1864) and J. F. Willumsen (b. 1863) affect a highly symbolical style. But even more than these painters, who aim at reproducing ancient folk-tales through the medium of modern mysticism, two others claim our attention, by the infusion into the old tradition of a very modern view of beauty approaching that of Whistler and of Carrière: one is Ejnar Nielsen, whose portraits have a peculiar, refined strain of gentle Danish melancholy; the other, V. Hammershöj, who has an exquisite sense of tone, and paints the magical effect of light in half-darkened rooms. Among the more noteworthy portrait painters, Aug. Jerndorff and Otto Bache should be included; and among the more decorative artists, L. Frölich; while Hans Tegner may be considered the greatest illustrator of his day. (R. Mr.)

SWEDEN

There is as great a difference between Danish and Swedish art as between Copenhagen and Stockholm. Copenhagen is a homely provincial town and life is confined to home circles. In Stockholm we find the whirl of life and all the elegance of a capital. It has been styled the Paris of the North, and its art also wears this cosmopolitan aspect. Düsseldorf, where in the 'sixties most painters studied their art, appeared to latter-day artists too provincial. Munich and, to a still greater extent, Paris became their "Alma Mater," Salmson (1843–1894) and Hagborg (b. 1852), who were first initiated into naturalism in Paris, adopted this city for a domicile. They paint the fishermen of Brittany and the peasants of Picardy; and even when apparently interpreting Sweden, they only clothe their Parisian models in a Swedish garb. Those who returned to Stockholm turned their Parisian art into a Swedish art, but they have remained cosmopolitan until this day. Whilst there is something prosy and homely about Danish art, that of Sweden displays nervous elegance and cosmopolitan polish. Simplicity is in her eyes humdrum; she prefers light and brilliant notes. There, a naturalness and simplicity allows us to forget the difficulties of the brush: here, we chiefly receive the impression of a cleverly solved problem. There, the greatest moderation in colour, a soft all-pervading grey: here, a cunning play with delicate tones and gradations—a striving to render the most difficult effects of light with obedient hand. This tendency is particularly marked in the case of the landscape painters: Per Ekström (b. 1844), Niels Kreuger (b. 1858), Karl Nordström (b. 1865), Prince Eugen of Sweden (b. 1855), Axel Sjöberg Wallander (b. 1862), and Wahlberg (b. 1864). Nature in Sweden has not the idyllic softness, the veiled elegiac character, it displays in Denmark. It is more coquettish, southern and French, and the painters regard it also with French eyes.

As a painter of animals, Bruno Liljefors (b. 1860) created a sensation by his surprising pictures. Whatever his subjects—quails, capercailzies, dogs, hares, magpies or thrushes—he has caught the fleetest motions and the most transitory effects of light with the cleverness of a Japanese. With this exception, the Swedish painters cannot be classified according to "subjects." They are "virtuosi," calling every technical aspect of art their own—as well in fresco as in portrait painting. Oscar Björek (b. 1860), Ernst Josephson (b. 1851), Georg Pauli (b. 1855), Richard Bergh (b. 1858), Hanna Hirsch now Pauli (b. 1864) are the best-known names. Carl Larsson's (b. 1853) decorative *panneaux* fascinate by their easy lightness and coquettish grace of execution. Ander Zorn (b. 1860), with his dazzling virtuosity, is as typical of Swedish as the prosaic simplicity of Johansen is of Danish art. His marine pictures, with their undulating waves and naked forms bathed in light, belong to the most surprising examples of the cleverness with which modern art can stereotype quivering motions; and the same boldness in handling his subjects, which triumphs over difficulties, makes his "interiors," his portraits and etchings, objects of admiration to every painter's eye. In his "Dance before the Window" all is vivacity and motion. His portrait of a "Peasant Woman" is a powerful harmony of sparkling yellow-red tones of colour. Besides these older masters who cleave to the most dazzling light effects, there are the younger artists of the school of Carl Larsson, who aspire more to decorative effects on a grander scale. Gustav Fjälstad (b. 1868) exhibited a picture in the Paris Exhibition of 1900 that stood out like mosaic among its surroundings. And great similarity in method has Hermann Normann, who, as a landscape painter, also imitates the classic style. (R. Mr.)

NORWAY

We enter a new world when in picture-galleries we pass to the Norwegian from the Swedish section. From the great city we are transported to nature, solemn and solitary, into a land of silence, where a rude, sparse population, a race of fishermen, snatches a scanty sustenance from the sea. The Norwegians also contributed for a time to the international market in works of art. They sent mainly genre pictures telling of the manners and customs of their country, or landscapes depicting the phenomena of Northern scenery. Adolf Tidemand (1814–1876) introduced his countrymen—the peasants and fishermen of the Northern coast—to the European public. We are introduced to Norwegian Christmas customs, accompany the Norseman on his nocturnal fishing expeditions, join the "Brudefaerd" across the Hardanger fjord, sit as disciples at the feet of the Norwegian sacristan. Ferdinand Fagerlin (b. 1825) and Hans Dahl are two other painters who, educated at Düsseldorf and settled in Germany, introduced the style of Knaus and Vautier to Norwegian art circles. Knud Badde (1808–1879), Hans Gude (b. 1825), Niels Björnsen Möller, Morten-Müller (b. 1828), Ludvig Munthe (1843–1896), and Adelsten Normann (b. 1848) are known as excellent landscape painters, who have faithfully portrayed the majestic mountain scenery and black pine forests of their native land, the cliffs that enclose the fjords, and the sparkling snowfields of the land of the midnight sun. But the time when actuality had to be well seasoned, and every picture was bound to have a spice of genre or the attraction of something out of the common to make it palatable, is past and gone. As early as the 'sixties Björnson was president of a Norwegian society which made it its chief business to wage war against the shallow conventionalities of the Düsseldorf school. Ibsen was vice-president. In the works of the more modern artists there is not a single trace of Düsseldorf influence. Especially in the 'eighties, when naturalism was at its zenith, we find the Norwegians its boldest devotees. They portrayed life as they found it, without embellishment; they did not trouble about plastic elegance, but painted the land of their home and its people in a direct, rough-hewn style. Like the people we meet in the North, giants with stalwart iron frames, callous hands, and sunburnt faces, with their sou'-westers and blue blouses, who resemble sons of a bygone heroic age, have the painters themselves—notably Niels Gustav Wentzel (b. 1859), Svend Jörgensen (b. 1861), Kolstoe (b. 1860), Christian Krohg—something primitive in the directness, in, one might almost say, the barbarous brutality with which they approach their subjects. They preferred the most glaring effects of *plein-air*; they revelled in all the hues of the rainbow.

But these very uncouth fellows, who treated the figures in their pictures with such rough directness, painted even in those days landscapes with great refinement; not the midnight sun and the precipitous cliffs of the fjords, by which foreigners were sought to be impressed, but austere, simple nature, as it lies in deathlike and spectral repose—lonely meres, whose surface is unruffled by the keel of any boat, where no human being is visible, where no sound is audible; the hour of twilight, when the sun has disappeared behind the mountains, and all is chill and drear; the winter, when an icy blast sweeps over the crisp snowfields; the spring, almost like winter, with its bare branches and its thin young shoots. Such were their themes, and painters like Amaldus Nilsen (b. 1838), Eilif Petersen (b. 1852), Christian Skredsvig (b. 1854), Fritz Thaulow (b. 1848), and Gerhard Munthe (b. 1849) arrested public attention by their exhibition of pictures of this character.

Latterly these painters have become more civilized, and have emancipated themselves from their early uncouthness. Jörgensen, Krohg, Kolstoe, Soot, Gustav Wentzel, no longer paint those herculean sailors and fishermen, those pictures of giants that formerly gave to Norwegian exhibitions their peculiar character. Elegance has taken possession of the Norwegian palette. This transformation began with Fritz Thaulow, and indeed his art threatened to relapse somewhat into routine, and even the ripples of his waters to sparkle somewhat coquettishly. Borgen (b. 1852), Hennig (b. 1871), Hjerlów (b. 1863), and Stenersen (b. 1862) were gifted recruits of the ranks of Norwegian painters, whilst Halfdan Strom (b. 1863), who depicts rays of light issuing from silent windows and streaming and quivering over solitary landscapes, dark blue streams and ponds, nocturnal skies, variegated female dresses, contrasting as spots of colour with dark green meadows, has a delicacy in colouring that recalls Cazin. Gerhard Munthe, who, as we have seen, first made a name by his delicate vernal scenery, has turned his attention to the classical side of art; and, finally Erik Werenskjold (b. 1855), who was also first known by his landscapes and scenes of country life, afterwards gained success as an illustrator of Norwegian folk-lore. (R. MR.)

RUSSIA

Until late in the 19th century modern Russian painting was unknown to western Europe. What had been seen of it in international exhibitions showed the traditions of primitive European art, with a distinct vein of barbarism. In the early 'fifties, painters were less bent on art than on political agitation; they used the brush as a means of propaganda in favour of some political idea. Peroff showed us the miserable condition of the serfs, the wastefulness and profligacy of the nobility. Vereschagin made himself the advocate of the soldier, painting the horrors of war long before the tsar's manifesto preached universal disarmament. Art suffered from this praiseworthy misapplication; many pictures were painted, but very few rose to the level of modern achievement in point of technique. It was only by the St Petersburg art journal *Mir Iskustwa*, and by a small exhibition arranged at Munich in 1892 by a group of Russian landscape painters, that it was realized that a younger Russian school had arisen, fully equipped with the methods of modern technique, and depicting Russian life with the stamp of individuality. At the Paris Exhibition of 1900 the productions of this young Russian school were seen with surprise. A florescence similiar to that which literature displayed in Pushkin, Dostoievsky and Tolstoy seemed to be beginning for Russian painting. Some of these young painters rushed into art with unbridled zest, painting with primitive force and boldness. They produced historical pictures, almost barbaric but of striking force; representations of the life of the people full of deep and hopeless gloom; the poor driven by the police and huddled together in dull indifference; the popes tramping across the lonely steppes, prayer-book in hand; peasants muttering prayers before a crucifix. There is great pathos in "The Karamasow Brothers," or "The Power of Darkness." At the same time we feel that a long-inherited tradition pervades all Russia. We find a characteristic ecclesiastical art, far removed from the productions of the *fin de siècle*, in which the rigid tradition of the Byzantines of the 3rd century still survives. And, finally, there are landscapes almost Danish in their bloodless, dreamy tenderness. Among the historical painters Elias Repin is the most impressive. In his pictures, "Ivan the Cruel," "The Cossacks' Reply to the Sultan," and "The Miracle of Saint Nicholas," may be seen—what is so rare in historical painting—genuine purpose and style. Terror is rendered with Shakespearean power; the boldness with which he has reconstituted the past, and the power of pictorial psychology which has enabled him to give new life to his figures, are equally striking in "Sowing on the Volga" and "The Village Procession." He was the first to paint subjects of contemporary life, and the work, while thoroughly Russian, has high technical qualities—the sense of oppression, subjection and gloom is all-pervading. But he does not "point the moral," as Peroff did; he paints simply but sympathetically what he sees, and this lends his pictures something of the resigned melancholy of Russian songs. Even more impressive than Repin is Philippe Maliavine. He had rendered peasants, stalwart figures of powerful build; and, in a picture called "Laughter," Macbeth-like women, wrapped in rags of fiery red, are thrown on the canvas with astonishing power. Among religious painters Victor Vasnezov, the powerful decorator of the dome in the church of St Vladimir at Kiev, is the most distinguished figure. These paintings seem to have been executed in the very spirit of the Russian church; blazing with gold, they depend for much of their effect upon barbaric splendour. But Vasnezov has painted other things: "The Scythians," fighting with lance and battle-axe; horsemen making their way across the pathless steppe; and woods and landscapes pervaded by romantic charm, the home of the spirits of Russian legend. Next to Vasnezov is Michael Nesterov, a painter also of monks and saints, but as different from him as Zurbaran from the mosaic workers of Venice; and Valentin Serov, powerful in portraiture and fascinating in his landscape. It is to be remarked that although these artists are austere and unpolished in their figure-painting, they paint landscape with delicate refinement.

Schischkin and Vassiliev were the first to paint their native land in all simplicity, and it is in landscape that Russian art at the present time still shows its most pleasing work. Savrassov depicts tender spring effects; Kuindshi light birch-copses full of quivering light; Sudkovski interprets the solemn majesty of the sea; Albert Benois paints in water-colour delicate Finnish scenery; Apollinaris Vasnezov has recorded the dismal wastes of Siberia, its dark plains and endless primeval forest, with powerful simplicity.

A special province in Russian art must be assigned to the Poles. It is difficult indeed to share to the full the admiration felt in Warsaw for the Polish painters. It is there firmly believed that Poland has a school of its own, owing nothing to Russia, Austria or Germany; an art which embodies all the chivalry and all the suffering of that land. The accessories are Polish, and so are the costumes. Jan Chelminski, Wojcliech Gerson, Constantine Gorski, Apolonius Kendzrierski, Joseph Ryszkievicz and Roman Szvoinicki are the principal artists. We see in their pictures a great deal of fighting, a great deal of weeping; but what there is peculiar to the Poles in the expression or technique of their works it is hard to discover.

Finland, on the other hand, is thoroughly modern. Belonging by descent to Sweden rather than to Russia, its painters' views of art also resemble those of the "Parisians of the North." They display no ungoverned power, but rather supple elegance. The play of light and the caprice of sunshine are rendered with much subtlety. Albert Edelfeldt is the most versatile artist of the group; Axel Gallen, at first naturalistic, developed into a decorative artist of fine style; Eero Jaernefelt charms with his airy studies and brilliant landscapes. Magnus Enckell, Pekka Halonen and Victor Vesterholm sustain the school with work remarkable for sober and tasteful feeling. (R. MR.)

BALKAN STATES

Until quite recent times the Balkan States had no part at all in the history of art. But at the Paris Exhibition of 1900 it was noted with surprise that even in south-eastern Europe there was a certain pulsation of new life. And there were also signs that painting in the Balkans, which hitherto had appeared only as a reflex of Paris and Munich art, would ere long assume a definite national character. At this Exhibition Bulgaria seemed to be the most backward of all, its painters still representing the manners and customs of their country in the style of the illustrated papers. Market-places are seen, where women with golden chains, half-nude boys and old Jews are moving about; or cemeteries, with orthodox clergy praying and women sobbing; military pageants, wine harvests and horse fairs, old men performing the national dance, and topers jesting with brown-eyed girls. Such are the subjects that Anton Mittoff, Raymund Ulrich and Jaroslav Vesin paint. More original is Mvkuicka. In his most important work he represented the late princess of Bulgaria sitting on a throne, solemn and stately, in the background mosaics rich in gild, tall slim lilies at her side. In his other pictures he painted Biblical landscapes, battlefields wrapped in sulphurous smoke, and old Rabbis—all with a certain uncouth barbaric power. The Bulgarian painters have not as yet arrived at the aesthetic phase. One of the best among them, who paints delicate pale green landscapes, is Charalampi Ilieff; and Nicholas Michailoff, at Munich, has executed pictures, representing nymphs, that arrest attention by their delicate tone and their beautiful colouring.

Quite modern was the effect of the small Croatian-Slavonic Gallery in the Exhibition. Looking at the pictures there, the visitor might imagine himself on the banks of the Seine rather than in the East. The French saying, "*Faire des Whistler, faire des Dagnan, faire des Carrière*," is eminently applicable to their work. Vlaho Bukovak, Nicola Masic, Csiks and Medovic all paint very modern pictures, and in excellent taste, only it is surprising to find upon them Croatian and not Parisian signatures.

Precisely the same judgment must be passed with regard to Rumania. Most of the painters live in Paris or Munich, have sought their inspiration at the feet of the advanced masters there, and paint, as pupils of these masters, pictures just as good in taste, just as cosmopolitan and equally devoid of character. Irène Deschly, a pupil of Carrière, illustrates the songs of François Coppée; Verona Gargouromin is devoted to the pale symbolism of Dagnan-Bouveret. Nicolas Grant paints bright landscapes, with apple trees with their pink blossoms, like Darnoye. Nicolas Gropeano appears as the double of Aman-Jean, with his female heads and pictures from fairy tales. Olga Koruca studied under Puvis de Chavannes, and painted Cleopatra quite in the tone of her master. A landscape by A. Segall was the only work that appeared to be really Rumanian, representing thatched huts.

Servia is in striking contrast to Rumania. No trace of modern influence has penetrated to her. There historical painting, such as was in vogue in France and Germany a generation ago, is the order of the day. Risto Voucanovitch paints his scenes from Servian history in brown; Paul Ivanovitch his in greyish *plein-air*. But in spite of this *paté* painting, the latter's works have no modern effect—as little as the sharply-drawn small landscapes of his brother Svatislav Ivanovitch. (R. Mr.)

United States

The history of painting in the United States practically began with the 19th century. The earlier years of the nation were devoted to establishing government, subduing the land and the aborigines, building a commonwealth out of primeval nature; and naturally enough the aesthetic things of life received not too much consideration. In Colonial times the graphic arts existed, to be sure, but in a feeble way. Painting was made up of portraits of prominent people; only an occasional artist was disposed towards historical pictures; but the total result added little to the sum of art or to the tale of history. The first artist of importance was J. S. Copley (1737–1815), with whom painting in America really began. Benjamin West (1738–1820) belongs in the same period, though he spent most of his life in England, and finally became President of the Royal Academy. As a painter he is not to be ranked so high as Copley. In the early part of the 19th century two men, John Trumbull (1756–1843), a historical painter of importance, and Gilbert Stuart (1755–1828), a pre-eminent portrait painter, were the leaders; and after them came John Vanderlyn (1776–1852), Washington Allston (1779–1843), Rembrandt Peale (1787–1860), J. W. Jarvis (1780–1834), Thomas Sully (born in England, 1783–1872)—men of importance in their day. The style of all this early art was modelled upon that of the British school, and indeed most of the men had studied in England under the mastership of West, Lawrence and others. The middle or second period of painting in the United States began with the landscape work of Thomas Doughty (1793–1856) and Thomas Cole (1801–1848). It was not a refined or cultivated work, for the men were in great measure self-taught, but at least it was original and distinctly American. In subject and in spirit it was perhaps too panoramic and pompous; but in the hands of A. B. Durand (1796–1886), J. F. Kensett (1818–1872) and F. E. Church (1826–1900), it was modified in scale and improved in technique.

A group of painters called the Hudson River school finally emerged. To this school some of the strongest landscape painters in the United States owe their inspiration, though in almost every case there has been the modifying influence of foreign study. Contemporary with Cole came the portrait painters Chester Harding (1792–1866), C. L. Elliott (1812–1868), Henry Inman (1801–1846), William Page (1811–1885), G. P. A. Healy (1813–1894), Daniel Huntington and W. S. Mount (1807–1868), one of the earliest genre painters. Foreign art had been followed to good advantage by most of these painters, and as a result some excellent portraits were produced. The excellence of the work was not, however, appreciated by the public generally because art knowledge was not at that time a public possession. Little was required of the portrait painter beyond a recognizable likeness. A little later the teachings of the Düsseldorf school began to have an influence upon American art through Leutze (1816–1868), who was a German pupil of Lessing, and went to America to paint historical scenes from the War of Independence. But the foreign influence of the time to make the most impression came from France in 1855 with two American pupils of Couture—W. M. Hunt (1824–1879) and Thomas Hicks (1823–1890). Hunt had also been a pupil of Millet at Barbizon, and was the real introducer of the Barbizon painters to the American people. After his return to Boston his teaching and example had much weight in moulding artistic opinion. He, more than any other, turned the rising generation of painters towards the Paris schools. Contemporary with Hunt and following him were a number of painters, some self-taught and some schooled in Europe, who brought American art to a high standard of excellence. George Fuller (1822–1884), Eastman Johnson, Elihu Vedder, produced work of much merit; and John La Farge and Winslow Homer were unquestionably the foremost painters in the United States at the opening of the 20th century. In landscape the three strongest men have passed away—A. H. Wyant, George Inness, and Homer Martin. Swain Gifford, Edward Gay, Thomas Moran, Jervis McEntee, Albert Bierstadt, are other landscape painters of note who belonged to the middle period and reflected the traditions of the Hudson River school to some extent. With the Centennial Exhibition at Philadelphia in 1876 a widespread and momentous movement in American art began to shape itself. The display of pictures at Philadelphia, the national prosperity, and the sudden development of the wealth of the United States had doubtless much to do with it. Many young men from all parts of the country took up the study of art and began going abroad for instruction in the schools at Munich, and, later, at Paris. Before 1880 some of them had returned to the United States and founded schools and societies of art, like the Art Students' League and the Society of American Artists. The movement spread to the Western cities, and in a few years museums and art schools began to appear in all the prominent towns, and a national interest in art was awakened. After 1870 the predominant influence, as regards technical training, was French. Many students still go to Paris to complete their studies, though there is a large body of accomplished painters teaching in the home schools, with satisfactory results as regards the work of their pupils. From their French training, many of the American artists have been charged with echoing Parisian art; and the charge is partly true. They have accepted French methods because they think them the best, but their subjects and motives are sufficiently original.

Under separate biographical headings a number of modern American artists are noticed. Some of the greatest Americans however can hardly be said to belong to any American school. James McNeill Whistler, though American-born, is an example of the modern man without a country. E. A. Abbey, John S. Sargent, Mark Fisher and J. J. Shannon are American only by birth. They became resident in London and must be regarded as cosmopolitan in their methods and themes. This may be said with equal truth of many painters resident in Paris and elsewhere on the Continent. However good as art it may be, there is nothing distinctively American about the work of W. T. Dannat, Alexander Harrison, George Hitchcock, Gari Melchers, C. S. Pearce, E. L. Weeks, J. L. Stewart and Walter Gay. If they owe allegiance to any centre or city, it is to Paris rather than to New York.

During the last quarter of the 19th century much effort and money were devoted to the establishment of institutions like the Metropolitan Museum in New York, the Carnegie Museum at Pittsburg, and the Art Institute in Chicago. Every city of importance in the United States now has its gallery of paintings. Schools of technical training and societies of artists likewise exist wherever there are important galleries. Exhibitions during the winter season and at great national expositions give abundant opportunity for rising talent to display itself; and, in addition, there has been a growing public patronage of painting, as shown by the extensive mural decorations in the Congressional Library building at Washington, in the Boston Public Library, in many colleges and churches, in courts of justice, in the reception-rooms of large hotels, in theatres and elsewhere.

(J. C. van D.)

PAISIELLO (or Paesiello), **GIOVANNI** (1741–1816), Italian musical composer, was born at Tarento on the 9th of May 1741. The beauty of his voice attracted so much attention that in 1754 he was removed from the Jesuit college at Tarento to the Conservatorio di S. Onofrio at Naples, where he studied under Durante, and in process of time rose to the position of assistant master. For the theatre of the Conservatorio, which he left in 1763, he wrote some intermezzi, one of which attracted so much notice that he was invited to write two operas, *La Pupilla* and *Il Mondo al Rovescio*, for Bologna, and a third, *Il Marchese di Tulipano*, for Rome. His reputation being now firmly established, he settled for some years at Naples, where, notwithstanding the popularity of Piccini, Cimarosa and Guglielmi, of whose triumphs he was bitterly jealous, he produced a series of highly successful operas, one of which, *L'Idolo cinese*, made a deep impression upon the Neapolitan public. In 1772 he began to write church music, and composed a requiem for Gennara Borbone. In the same year he married Cecilia Pallini, with whom he lived in continued happiness. In 1776 Paisiello was invited by the empress Catherine II. to St Petersburg, where he remained for eight years, producing, among other charming works, his masterpiece, *Il Barbiere di Siviglia*, which soon attained a European reputation. The fate of this delightful opera marks an epoch in the history of Italian art; for with it the gentle suavity cultivated by the masters of the 18th century died out to make room for the dazzling brilliancy of a later period. When, in 1816, Rossini set the same libretto to music, under the title of *Almaviva*, it was hissed from the stage; but it made its way, nevertheless, and under its changed title, *Il Barbiere*, is now acknowledged as Rossini's greatest work, while Paisiello's opera is consigned to oblivion—a strange instance of poetical vengeance, since Paisiello himself had many years previously endeavoured to eclipse the fame of Pergolesi by resetting the libretto of his famous intermezzo, *La Serva padrona*.

Paisiello quitted Russia in 1784, and, after producing *Il Re Teodoro* at Vienna, entered the service of Ferdinand IV. at Naples, where he composed many of his best operas, including *Nina* and *La Molinara*. After many vicissitudes, resulting from political and dynastic changes, he was invited to Paris (1802) by Napoleon, whose favour he had won five years previously by a march composed for the funeral of General Hoche. Napoleon treated him munificently, while cruelly neglecting two far greater composers, Cherubini and Méhul, to whom the new favourite transferred the hatred he had formerly borne to Cimarosa, Guglielmi and Piccini. Paisiello conducted the music of the court in the Tuileries with a stipend of 10,000 francs and 4800 for lodging, but he entirely failed to conciliate the Parisian public, who received his opera *Proserpine* so coldly that, in 1803, he requested and with some difficulty obtained permission to return to Italy, upon the plea of his wife's ill health. On his arrival at Naples Paisiello was reinstated in his former appointments by Joseph Bonaparte and Murat, but he had taxed his genius beyond its strength, and was unable to meet the demands now made upon it for new ideas. His prospects, too, were precarious. The power of the Bonaparte family was tottering to its fall; and Paisiello's fortunes fell with it. The death of his wife in 1815 tried him severely. His health failed rapidly, and constitutional jealousy of the popularity of others was a source of worry and vexation. He died on the 5th of June 1816.

Paisiello's operas (of which he is known to have composed 94) abound with melodies, the graceful beauty of which is still warmly appreciated. Perhaps the best known of these airs is the famous "Nel cor più" from *La Molinara*, immortalized by Beethoven's delightful variations. His church music was very voluminous, comprising eight masses, besides many smaller works; he also produced fifty-one instrumental compositions and many detached pieces. MS. scores of many of his operas were presented to the library of the British Museum by Dragonetti.

The library of the Gerolamini at Naples possesses an interesting MS. compilation recording Paisiello's opinions on contemporary composers, and exhibiting him as a somewhat severe critic, especially of the work of Pergolesi. His *Life* has been written by F. Schizze (Milan, 1833).

PAISLEY, CLAUD HAMILTON, Lord (*c.* 1543–1622), Scottish politician, was a younger son of the 2nd earl of Arran. In 1553 he received the lands of the abbey of Paisley, and in 1568 he aided Mary Queen of Scots to escape from Lochleven castle, afterwards fighting for her at the battle of Langside. His estates having been forfeited on account of these proceedings, Hamilton was concerned in the murder of the regent Murray in 1570, and also in that of the regent Lennox in the following year; but in 1573 he recovered his estates. Then in 1579 the council decided to arrest Claud and his brother John (afterwards 1st marquess of Hamilton) and to punish them for their past misdeeds; but the brothers escaped to England, where Elizabeth used them as pawns in the diplomatic game, and later Claud lived for a short time in France. Returning to Scotland in 1586 and mixing again in politics, Hamilton sought to reconcile James VI. with his mother; he was in communication with Philip II. of Spain in the interests of Mary and the Roman Catholic religion, and neither the failure of Anthony Babington's plot nor even the defeat of the Spanish Armada put an end to these intrigues. In 1589 some of his letters were seized and he suffered a short imprisonment, after which he practically disappeared from public life. Hamilton, who was created a Scottish baron as Lord Paisley in 1587, was insane during his concluding years. His eldest son James was created earl of Abercorn (*q.v.*) in 1606.

PAISLEY, a municipal and police burgh of Renfrewshire, Scotland, on the White Cart, 3 m. from its junction with the Clyde, 7 m. W. by S. of Glasgow by the Glasgow & South-Western and Caledonian railways. Pop. (1891), 66,425; (1901) 79,363. In 1791 the river, which bisects the town, was made navigable for vessels of 50 tons and further deepened a century later. It is crossed by several bridges—including the Abercorn, St James's and the Abbey Bridges—and two railway viaducts. The old town, on the west bank of the stream, contains most of the principal warehouses and mills; the new town, begun towards the end of the 18th century, occupies much of the level ground that once formed the domains of the abbey. To the munificence of its citizens the town owes many of its finest public buildings. Opposite to the abbey church (see below) stands the town hall (1879–1882), which originated in a bequest by George Aitken Clark (1823–1873), and was completed by his relatives, the thread manufacturers of Anchor Mills. The new county buildings (1891) possess a handsome council hall, and the castellated municipal buildings (1818–1821) were the former county buildings; the sheriff court house (1885) in St James Street, and the free library and museum (including a picture gallery) at the head of High Street, were erected (1869–1872) by Sir Peter Coats (1808–1890). In Oakshaw Street stands the observatory (1883), the gift of Thomas Coats (1809–1883). Besides numerous board schools, the educational establishments include the John Neilson Endowed Institute (1852) on Oakshaw Hill, the grammar school (founded, 1576; rebuilt, 1864), and the academy for secondary education, and the technical college, in George Street. Among charitable institutions are the Royal Alexandra Infirmary, the Victoria Eye Infirmary (presented by Provost Mackenzie in 1899), the burgh asylum at Riccartsbar, the Abbey Poorhouse (including hospital and lunatic wards), the fever hospital and reception house, the Infectious Diseases Hospital and the Gleniffer Home for Incurables. The Thomas Coats Memorial Church, belonging to the Baptist body, erected by the Coats family from designs by H. J. Blanc, R.S.A., is one of the finest modern ecclesiastical structures in Scotland. It is an Early English and Decorated cruciform building of red sandstone, with a tower surmounted by a beautiful open-work crown. Of parks and open spaces there are in the south, Brodie Park (22 acres), presented in 1871 by Robert Brodie; towards the north Fountain Gardens (7½ acres), the gift of Thomas Coats and named from the handsome iron fountain standing in the centre; in the north-west, St James Park (40 acres), with a racecourse (racing dates from 1620, when the earl of Abercorn and the Town Council gave silver bells for the prize); Dunn Square and the old quarry grounds converted and adorned; and Moss Plantation beyond the north-western boundary. There are the cemeteries at Hawkhead and at the west side of the town. Under the Reform Act of 1832 the burgh returns one member to Parliament. The town is governed by a council, with provost and bailies, and owns the gas and water supplies and the electric lighting. In the abbey precincts are statues to the poet Robert Tannahill (1774–1810) and Alexander Wilson (1766–1813), the American ornithologist, both of whom were born in Paisley, and, elsewhere, to Robert Burns, George Aitkin Clark, Thomas Coats and Sir Peter Coats.

Paisley has been an important manufacturing centre since the beginning of the 18th century, but the earlier linen, lawn and silk-gauze industries have become extinct, and even the famous Paisley shawls (imitation cashmere), the sale of which at one time exceeded £1,000,000 yearly in value, have ceased to be woven. The manufacture of linen thread, introduced about 1720 by Christian Shaw, daughter of the laird of Bargarran, gave way in 1812 to that of cotton thread, which has since grown to be the leading industry of the town. The Ferguslie mills (J. & P. Coats) and Anchor mills (Clark & Company) are now the dominant factors in the combination that controls the greater part of the thread trade of the world and together employ 10,000 hands. Other thriving industries include bleaching, dyeing, calico-printing, weaving (carpets, shawls, tartans), engineering, tanning, iron and brass founding, brewing, distilling, and the making of starch, cornflour, soap, marmalade and other preserves, besides some shipbuilding in the yards on the left bank of the White Cart.

The abbey was founded in 1163 as a Cluniac monastery by Walter Fitzalan, first High Steward of Scotland, the ancestor of the Scottish royal family of Stuart, and dedicated to the Virgin, St James, St Milburga of Much Wenlock in Shropshire (whence came the first monks) and St Mirinus (St Mirren), the patron-saint of Paisley, who is supposed to have been a contemporary of St Columba. The monastery became an abbey in 1219, was destroyed by the English under Aymer de Valence, earl of Pembroke, in 1307, and rebuilt in the latter half of the 14th century, the Stuarts endowing it lavishly. At the Reformation (1561) the fabric was greatly injured by the 5th earl of Glencairn and the Protestants, who dismantled the altar, stripped the church of images and relics, and are even alleged to have burnt it. About the same date the central spire, 300 ft. high, built during the abbacy of John Hamilton (1511–1571), afterwards archbishop of St Andrews, collapsed, demolishing the choir and north transept. In 1553 Lord Claud Hamilton, then a boy of ten, was made abbot, and the abbacy and monastery were erected into a temporal lordship in his favour in 1587. The abbey lands, after passing from his son the earl of Abercorn to the earl of Angus and then to Lord Dundonald, were purchased in 1764 by the 8th earl of Abercorn, who intended making the abbey his residence, but let the ground for building purposes. The abbey church originally consisted of a nave, choir without aisles, and transepts. The nave, in the Transitional and Decorated styles, with a rich mid-Pointed triforium of broad round arches, has been restored, and used as the parish church since 1862. The graceful west front has a deeply recessed Early Pointed doorway, surmounted by traceried windows and, above these, by a handsome Decorated stained-glass window of fire lights. Of the choir only the foundations remain to indicate its extent; at the east end stood the high altar before which Robert III. was interred in 1406. Over his grave a monument to the memory of the Royal House of Stuart was placed here by Queen Victoria (1888). The restored north transept has a window of remarkable beauty. The south transept contains St Mirren's chapel (founded in 1499), which is also called the "Sounding Aisle" from its echo. The chapel contains the tombs of abbot John Hamilton and of the children of the 1st lord Paisley, and the recumbent effigy of Marjory, daughter of Robert Bruce, who married Walter, the Steward, and was killed while hunting at Knock Hill between Renfrew and Paisley (1316).

About 3 m. S. of Paisley are the pleasant braes of Gleniffer, sung by Tannahill, and 2½ m. S.E., occupying a hill on the left bank of the Leven, stand the ruins of Crookston Castle. The castle is at least as old as the 12th century and belonged to Robert de Croc, who witnessed the charter of the foundation of Paisley Abbey. In the following century it passed into the possession of a branch of the Stewarts, who retained it until the murder of Darnley (1567). Afterwards it changed hands several times, but was finally acquired from the Montrose family by Sir John Maxwell of Pollok.

The Romans effected a settlement in Paisley in A.D. 84, and built a fort called *Vanduara* on the high ground (Oakshaw Hill) to the west of the White Cart. The place seems to have been first known as Paslet or Passeleth, and was assigned along with certain lands in Renfrewshire to Walter Fitzalan, founder of the abbey. The village grew up round the abbey, and by the 15th century had become sufficiently important to excite the jealousy of the neighbouring burgh of Renfrew. To protect it from molestation Abbot Schaw (or Shaw) induced James IV., a frequent visitor, to erect it into a burgh of barony in 1488, a charter which gave it the right to return a member to the Scots parliament.

See *Chartulary of the Monastery of Paisley*, published by the Maitland Club (1832); J. Cameron Lees, *The Abbey of Paisley* (1878); Swan, *Description of the Town and Abbey of Paisley* (1835); and Robert Brown, *History of Paisley* (1886).

PAITA, or PAYTA, a seaport of northern Peru, chief town of the province of Paita in the department of Piura. Pop. (1906 estimate), 3800. The town has one of the best natural harbours of the Peruvian coast, is a port of call for the regular mail steamers between Valparaiso and Panama, and is the port of the departmental capital, Piura, with which it is connected by a railway 60 m. long. It is also the Pacific terminus of the railway across the Andes to Puerto Limon, on the Marañon, or upper Amazon. Paita faces on the bay of Paita, and is sheltered from southerly winds by a headland called Punta Paita and by a large hill called the Silla de Paita. The water supply is brought from the river Chira (17 m. distant). The exports include cotton, tobacco, petroleum, cattle, hides and straw hats. Paita dates from the early years of the Spanish Conquest, and was a prosperous port in colonial times. It was nearly destroyed by Lord Anson's fleet in 1741.

PAJOL, CLAUDE PIERRE, COUNT (1772–1844), French cavalry general, was born at Besançon. The son of an advocate, he was intended to follow his father's profession, but the events of 1789 turned his mind in another direction. Joining the battalion of Besançon, he took part in the political events of that year, and in 1791 went to the army of the Upper Rhine with a volunteer battalion. He took part in the campaign of 1792 and was one of the stormers at Hochheim (1793). From Custine's staff he was transferred to that of Kléber, with whom he took part in the Sambre and Rhine Campaigns (1794–96). After serving with Hoche and Masséna in Germany and Switzerland (1797–99), Pajol took a cavalry command under Moreau for the campaign on the upper Rhine. In the short years of peace Pajol, now colonel, was successively envoy to the Batavian Republic, and delegate at Napoleon's coronation. In 1805, the emperor employed him with the light cavalry. He distinguished himself at Austerlitz, and, after serving for a short time in Italy, he rejoined the *grande armée* as a general of brigade, in time to take part in the campaign of Friedland. Next year (1808) he was made a baron of the Empire. In 1809 he served on the Danube, and in the Russian War of 1812 led a division, and afterwards a corps, of cavalry. He survived the retreat, but his health was so broken that he retired to his native town of Besançon for a time. He was back again in active service, however, in time to be present at Dresden, at which battle he played a conspicuous part. In 1814 he commanded a corps of all arms in the Seine Valley. On the fall of Napoleon, Pajol gave in his adhesion to the Restoration government, but he rejoined his old master immediately upon his return to France. His (I) corps of cavalry played a prominent part in the campaign of 1815, both at Ligny and in the advance on the Wavre under Grouchy. On receiving the news of Waterloo, Pajol disengaged his command, and by a skilful retreat brought it safe and unbeaten to Paris. There he and his men played an active part in the actions which ended the war. The Bourbons, on their return, dismissed him, though this treatment was not, compared to that meted out to Ney and others, excessively harsh. In 1830 he took part in the overthrow of Charles X. He suppressed, sternly and vigorously, *émeutes* in Paris in 1831 and 1832, 1834 and 1839. A general, and a peer of France, he was put on the retired list in 1842, and died two years later.

His son, Count CHARLES PAUL VICTOR PAJOL (1821–1891), entered the army and had reached the rank of general of division when he was involved in the catastrophe of Metz (1870). He retired in 1877. Besides being a good soldier, he was a sculptor of some merit, who executed statues of his father and of Napoleon, and he wrote a life of his father and a history of the wars under Louis XV. (Paris 1881–1891).

See Count C. P. V. Pajol: *Pajol général en chef* (Paris, 1874); Thomas, *Les Grands cavaliers du premier empire* (Paris, 1892); and Choppin, in the *Journal des sciences militaires* (1890).

PAJOU, AUGUSTIN (1730–1809), French sculptor, was born in Paris on the 19th of September 1730. At eighteen he won the *Prix de Rome*; at thirty he exhibited his *Pluton tenant Cerbère enchâiné* (now in the Louvre). His portrait busts of Buffon and of Madame Du Barry (1773), and his statuette of Bossuet (all in the Louvre), are amongst his best works. When B. Poyet constructed the Fontaine des Innocents from the earlier edifice of P. Lescot (see GOUJON) Pajou provided a number of new figures for the work. Mention should also be made of his bust of Carlin Bertinazzi (1763) at the Comédie Française, and the monument of Marie Leczinska, queen of Poland (in the Salon of 1769). Pajou died in Paris on the 8th of May 1809.

PAKHOI, or PEIHAI, a city and treaty port of China, in the west of the province of Kwang-tung, situated on a bay of the Gulf of Tong-king, formed by the peninsula running south-west from Lien-chow, in 21° 30′ N., 109° 10′ E. Pop. about 25,000. Dating only from about 1820–1830, and at first little better than a nest of pirates, Pakhoi rapidly grew into commercial importance, owing partly to the complete freedom which it enjoyed from taxation, and partly to the diversion of trade produced by the T'ai-p'ing rebellion. The establishment of a Chinese customhouse and the opening of the ports of Hanoi and Haiphong for a time threatened to injure its prospects; but, foreign trade being permitted in 1876–1877, it began in 1879 to be regularly visited by foreign steamers. The Chinese town stands on the peninsula and faces due north. From the bluff, on which all the foreign community lives, a partly cultivated plain extends. Liquid indigo, sugar, aniseed and aniseed oil, cassia-lignea and cassia oil, cuttle-fish and hides are the chief exports. With Macao especially an extensive junk trade is carried on. A large number of the inhabitants engage in fishing and fish-curing. The preparation of dried fish is a speciality of Pakhoi, the fish being exported to Hong Kong.

PAKINGTON, the name of a famous English Worcestershire family, now represented by the barony of Hampton. Sir John Pakington (d. 1560) was a successful lawyer and a favourite at court, and Henry VIII. enriched him with estates, including that of Westwood in Worcestershire. His grandnephew and heir, Sir John Pakington (1549–1625), was another prominent courtier, Queen Elizabeth's "lusty Pakington," famous for his magnificence of living. His son John (1600–1624) was created a baronet in 1620. His son, Sir John, the second baronet (1620–1680), played an active part on the royalist side in the troubles of the Great Rebellion and the Commonwealth, and was taken prisoner at Worcester in 1651; Lady Dorothy, his wife (d. 1679), daughter of the lord keeper Thomas Coventry, was famous for her learning, and was long credited with the authorship of *The Whole Duty of Man* (1658), which has more recently been attributed to Richard Allestree (*q.v.*). Their grandson, Sir John, the 4th baronet (1671–1727) was a pronounced high Tory and was very prominent in political life; for long he was regarded as the original of Addison's Sir Roger de Coverley, but the reasons for this supposition are now regarded as inadequate. The baronetcy became extinct with the death of Sir John Pakington, the 8th baronet, in January 1830, but it was revived in 1846 for his maternal nephew and heir, John Somerset Pakington (1799–1880), whose name was originally Russell. Born on the 20th of February 1799 and educated at Eton and at Oriel College, Oxford, Pakington had a long career as an active and industrious Conservative politician, being member of parliament for Droitwich from 1837 to 1874. He was secretary for war and the colonies in 1852; first lord of the admiralty in 1858–1859 and again in 1866–1867; and secretary of state for war in 1867–1868. In 1874 he was created Baron Hampton, and he died in London on the 9th of April 1880. From 1875 until his death Hampton was chief civil service commissioner. In 1906 his grandson Herbert Stuart (b. 1883) became 4th baron Hampton. It is interesting to note that in 1529 Henry VIII. granted Sir John Pakington the right of wearing his hat in the royal presence.

PAKOKKU, a district in the Minbu division of Upper Burma, lying west of the Irrawaddy river and south of Mandalay, with the line of the Chin hills as a general boundary on the west. It has an area of 6210 sq. m. and a population (1901) of 356,489. The part of the district along the Irrawaddy and Chindwin rivers is alluvial. Beyond this, however, the country rises gradually to the low Shinmadaung and Tangyi ridges, where it is very arid. To the westward there is a rapid drop to the well-watered valley of the Yaw River, and then a rise over broken, dry country before the valleys of the Myit-tha and Môn rivers are reached. The principal products are millet, sesamum and sugar produced from toddy-palms in the riverain districts, which also grow rice, grain, peas and beans. Tobacco and vegetables are also produced in some quantity, and maize is grown largely for the sake of the husk, which is used for native cheroot-wrappers, under the name of *yawpet*. The Yenangyat oil-fields, which produce quantities of petroleum, are in the south of the district, and iron used to be worked in a small way. There are 1151 sq. m. of reserved forests in the district. A good deal of teak and cutch is worked out. The cutch of the Yaw country is particularly esteemed. The average rainfall does not exceed 35 in. annually; and in many places water has to be carted for miles. West of the Pôndaung ridge, however, under the Chin hills, the rainfall exceeds 50 inches. The heat in May and June is very great, and the thermometer rises considerably above 100° F. in the shade.

The great majority of the population is Burmese, but in Yaw there is a peculiar race called Taungthas, who claim to be quite distinct from both Burmese and Chins. In 1901 the Taungthas numbered 5700.

The headquarters town, Pakokku, stands on the right bank of the Irrawaddy, and has grown into importance since the British occupation. It is the great boat-building centre of Upper Burma. The population in 1901 was 19,456. It may be described as the emporium of the trade of the Chindwin and Yaw river valleys. The steamers of the Irrawaddy Flotilla Company call here regularly, and it is the starting-point for the vessels plying on the Chindwin.

PAL, KRISTO DAS (1839–1884), Indian publicist, was born in Calcutta in 1839, of the Teli or oil-man's caste, which ranks low in the Hindu social hierarchy. He received an English education at the Oriental Seminary and the Hindu Metropolitan College, and at an early age devoted himself to journalism. In 1861 he was appointed assistant secretary (and afterwards secretary) to the British Indian Association, a board of Bengal landlords, which numbered among its members some of the most cultured men of the day. At about the same time he became editor of the *Hindu Patriot*, originally started in 1853 and conducted with ability and zeal by Harish Chandra Mukerji until his death in 1861. This journal having been transferred by a trust deed to some members of the British Indian Association, it henceforth became to some extent an organ of that body. Thus Kristo Das Pal had rare opportunities for proving his abilities and independence during an eventful career of twenty-two years. In 1863 he was appointed justice of the peace and municipal commissioner of Calcutta. In 1872 he was made a member of the Bengal legislative council, where his practical good sense and moderation were much appreciated by successive lieutenant-governors. His opposition, however, to the Calcutta Municipal Bill of 1876, which first recognized the elective system, was attributed to his prejudice in favour of the "classes" against the "masses." In 1878 he received the decoration of C.I.E. In 1883 he was appointed a member of the viceroy's legislative council. In the discussions on the Rent Bill, which came up for consideration before the council, Kristo Das Pal, as secretary to the British Indian Association, necessarily took the side of the landlords. He died on the 24th of July 1884. Speaking after his death, Lord Ripon said: "By this melancholy event we have lost from among us a colleague of distinguished ability, from whom we had on all occasions received assistance, of which I readily acknowledge the value. . . . Mr Kristo Das Pal owed the honourable position to which he had attained to his own exertions. His intellectual attainments were of a high order, his rhetorical gifts were acknowledged by all who heard him, and were enhanced when addressing this council by his thorough mastery over the English language." A full length statue of him was unveiled by Lord Elgin at Calcutta in 1894.

See N. N. Ghose, *Kristo Das Pal, a Study* (Calcutta, 1887).

PALACE (Lat. *Palatium*, the name given by Augustus to his residence on the Palatine Hill), primarily the residence of a sovereign or prince, but in England, Spain and France extended to the residence of a bishop, and in the latter country to buildings appropriated to the public service, such as courts of justice, &c. In Italy the name is given to royal residences, to public buildings, and to such large mansions as in France are either known as *châteaux* if in the country, or *hôtels* if in Paris.

The earliest palaces in Egypt are those built in the rear of the Temple of Karnak by Thothmes III. and near the Temple of Medinet Habu, both in Thebes; the earliest in Greece are those at Cnossus and Phaestus in Crete (*c.* 1500 B.C.), and at Tiryns in the citadel (*c.* 1200 B.C.). The most remarkable series are those erected by the Assyrians at Nimroud, Koyunjik and Khorsabad (859–667 B.C.), which were followed by the Persian palaces at Persepolis and Susa; the Parthian palaces at Al Hadhr and Diarbekr; and the Sassanian palaces of Serbistan, Firuzabad and Ctesiphon. The only palace known of the late Greek style is that found at Palatitza in Macedonia. Of the Roman period there are many examples, beginning with those on the Palatine Hill commenced by Augustus, continued and added to by his successors, Tiberius, Caligula, Domitian, Hadrian and Septimus Severus, which covered an area of over 1,000,000 sq. ft. The villa of Hadrian was virtually an immense palace, the buildings of which extended over 7 m. in length; of more modest proportions are the palace of Diocletian at Spalato and a fine example at Trèves in Germany. The palace of the Hebdomon at Constantinople, and a fragment at Ravenna of Theodoric's work, are all that remain of Byzantine palaces. Of Romanesque work the only examples are those at Gelnhausen built by Barbarossa, and the Wartburg in Germany. In the Gothic style in Italy, the best known examples are the ducal palace at Venice, and the Palazzi Vecchio and del Podesta (Bargello) at Florence; in France, the palace of the popes at Avignon, and the episcopal palaces of Beauvais, Laon, Poitiers and Lisieux; in England, the bishops' palaces of Wells, Norwich, Lincoln, portions of Edward the Confessor's palace at Westminster, and Wolsey's palace at Hampton Court; while such great country mansions as the "castles" of Alnwick, Kenilworth, Warwick, Rochester, Raglan and Stokesay, or Haddon Hall, come in the same category though the name is not employed. Belonging to the Mahommedan style are the palaces of the Alhambra and the Alcazar in Spain. Of the Renaissance period, numerous palaces exist in every country, the more important examples in Italy being those of the Vatican, the Quirinal and the Cancellaria, in Rome; the Caprarola near Rome; the palace of Caserta near Naples; the Pitti at Florence; the Palazzo del Te at Mantua; the court and eastern portion of the ducal palace of Venice, and the numerous examples of the Grand Canal; in France, the Louvre, the Tuileries (destroyed), and the Luxembourg, in Paris; Versailles and St Germain-en-Laye; and the châteaux of la Rochefoucauld, Fontainebleau, Chambord, Blois, Amboise, Chenonceaux and other palaces on the Loire; in Germany, the castle of Heidelberg, and the Zwinger palace at Dresden; in Spain, the palace of Charles V. at Grenada, the Escorial and the palace of Madrid; in England, the palace of Whitehall by Inigo Jones, of which only the banqueting hall was built, Windsor Castle, Blenheim, Chatsworth, Hampton Court; and in Scotland, the palaces of Holyrood and Linlithgow.

PALACIO VALDÉS, ARMANDO (1853–), Spanish novelist and critic, was born at Entralgo, in the province of Asturias, on the 4th of October 1853. His first writings were printed in the *Revista Europea*. These were pungent essays, remarkable for independent judgment and refined humour, and found so much favour with the public that the young beginner was soon appointed editor of the *Revista*. The best of his critical work is collected in *Los Oradores del Ateneo* (1878), *Los Novelistas españoles* (1878), *Nuevo viaje al Parnaso* and *La Literatura en 1881* (1882), this last being written in collaboration with Leopoldo Alas. In 1881 he published a novel, *El Señorito Octavio*, which shows an uncommon power of observation, and the promise of better things to come. In *Marta y María* (1883), a portrayal of the struggle between religious vocation and earthly passion, somewhat in the manner of Valera, Palacio Valdés achieved a very popular triumph which placed him in the first rank of contemporary Spanish novelists. *El Idilio de un enfermo* (1884), a most interesting fragment of autobiography, has scarcely met with the recognition which it deserves: perhaps because the pathos of the story is too unadorned. The publication of Pereda's *Sotileza* is doubtless responsible for the conception of *José* (1885), in which Palacio Valdés gives a realistic picture of the manners and customs of seafaring folk, creates the two convincing characters whom he names José and Leonarda, and embellishes the whole with passages of animated description barely inferior to the finest penned by Pereda himself. The emotional imagination of the writer expressed itself anew in the charming story *Riverita* (1886), one of whose attractive characters develops into the heroine of *Maximina* (1887); and from *Maximina*, in its turn, is taken the novice who figures as a professed nun among the personages of *La Hermana San Sulpicio* (1889), in which the love-passages between Zeferino Sanjurjo and Gloria Bermúdez are set off with elaborate, romantic descriptions of Seville. *El Cuarto poder* (1888) is, as its name implies, concerned with the details, not always edifying, of journalistic life. Two novels issued in 1892, *La Espuma* and *La Fe*, were enthusiastically praised in foreign countries, but in Spain their reception was cold. The explanation is to be found in the fact that the first of these books is an avowed satire on the Spanish aristocracy, and that the second was construed into an attack upon the Roman Catholic Church. During the acrimonious discussion which followed the publication of *La Espuma*, it was frequently asserted that the artist had improvised a fantastic caricature of originals whom he had never seen; yet as the characters in Coloma's *Pequeñeces* are painted in darker tones, and as the very critics who were foremost in charging Palacio Valdés with incompetence and ignorance are almost unanimous in praising Coloma's fidelity, it is manifest that the indictment against *La Espuma* cannot be maintained. Subsequently Palacio Valdés returned to his earlier and better manner in *Los Majos de Cádiz* (1896) and in *La Algería del Capitán Ribot* (1899). In these novels, and still more in *Tristán, ó el pesimismo* (1906), he frees himself from the reproach of undue submission to French influences. In any case he takes a prominent place in modern Spanish literature as a keen analyst of emotion and a sympathetic, delicate, humorous observer. (J. F.-K.)

PALACKÝ, FRANTIŠEK [FRANCIS] (1798–1876), Czech historian and politician, was born on the 14th of June 1798 at Hodslavice (Hotzendorf) in Moravia. His ancestors had been members of the community of the Bohemian Brethren, and had secretly maintained their Protestant belief throughout the period of religious persecution, eventually giving their adherence to the Augsburg confession as approximate to their original faith. Palacký's father was a schoolmaster and a man of some learning. The son was sent in 1812 to the Protestant gymnasium at Pressburg, where he came in contact with the philologist Šafařik and became a zealous student of the Slav languages. After some years spent in private teaching Palacký settled in 1823 at Prague. Here he found a warm friend in Dobrovský, whose good relations with the Austrian authorities shielded him from the hostility shown by the government to students of Slav subjects. Dobrovský introduced him to Count Sternberg and his brother Francis, both of whom took an enthusiastic interest in Bohemian history. Count Francis was the principal founder of the Society of the Bohemian Museum, devoted to the collection of documents bearing on Bohemian history, with the object of reawakening national sentiment by the study of the national records. Public interest in the movement was stimulated in 1825 by the new *Journal of the Bohemian Museum* (*Časopis českého Musea*) of which Palacký was the first editor. The journal was at first published in Czech and German, and the Czech edition survived to become the most important literary organ of Bohemia. Palacký had received a modest appointment as archivist to Count Sternberg and in 1829 the Bohemian estates sought to confer on him the title of historiographer of Bohemia, with a small salary, but it was ten years before the consent of the Viennese authorities was obtained. Meanwhile the estates, with the tardy assent of Vienna, had undertaken to pay the expenses of publishing Palacký's capital work, *The History of the Bohemian People* (5 vols., 1836–1867). This book, which comes down to the year 1526 and the extinction of Czech independence, was founded on laborious research in the local archives of Bohemia and in the libraries of the chief cities of Europe, and remains the standard authority. The first volume was printed in German in 1836, and subsequently translated into Czech. The publication of the work was hindered by the police-censorship, which was especially active in criticizing his account of the Hussite movement. Palacký, though entirely national and Protestant in his sympathies, was careful to avoid an uncritical approbation of the Reformers' methods, but his statements were held by the authorities to be dangerous to the Catholic faith. He was therefore compelled to make excisions from his narrative and to accept as integral parts of his work passages interpolated by the censors. After the abolition of the police-censorship in 1848 he published a new edition, completed in 1876, restoring the original form of the work. The fairest and most considerable of Palacký's antagonists in the controversy aroused by his narrative of the early reformation in Bohemia was Baron Helfert, who received a brief from Vienna to write his *Hus und Hieronymus* (1853) to counteract the impression made by Palacký's *History*. K. A. K. Höfler, a German professor of history at Prague, edited the historical authorities for the period in a similar sense in his *Geschichte der hussitischen Bewegung in Böhmen*. Palacký replied in his *Geschichte des Hussitenthumes und Professor Löffler* (Prague, 1868) and *Zur böhmischen Geschichtschreibung* (Prague, 1871).

The revolution of 1848 forced the historian into practical politics. He was deputed to the Reichstag which sat at Kroměřice (Kremsier) in the autumn of that year, and was a member of the Slav congress at Prague. He refused to take part in the preliminary parliament consisting of 500 former deputies to the diet, which met at Frankfort, on the ground that as a Czech he had no interest in German affairs. He was at this time in favour of a strong Austrian empire, which should consist of a federation of the southern German and the Slav states, allowing of the retention of their individual rights. These views met with some degree of consideration at Vienna, and Palacký was even offered a portfolio in the Pillersdorf cabinet. The collapse of the federal idea and the definite triumph of the party of reaction in 1852 led to his retirement from politics. After the liberal concessions of 1860 and 1861, however, he became a life member of the Austrian senate. His views met with small support from the assembly, and with the exception of a short period after the decree of September 1871, by which the emperor raised hopes for Bohemian self-government, he ceased to appear in the senate from 1861 onwards. In the Bohemian Landtag he became the acknowledged leader of the nationalist-federal party. He sought the establishment of a Czech kingdom which should include Bohemia, Moravia and Silesia, and in his zeal for Czech autonomy he even entered into an alliance with the Conservative nobility and with the extreme Catholics. He attended the Panslavist congress at Moscow in 1867. He died at Prague on the 26th of May 1876.

Among his more important smaller historical works are: *Würdigung der alten böhmischen Geschichtschreiber* (Prague, 1830), dealing with authors of many of whose works were then inaccessible to Czech students; *Archiv česky* (6 vols., Prague, 1840–1872); *Urkundliche Beiträge zur Geschichte des Hussitenkriegs* (2 vols., Prague, 1872–1874); *Documenta magistri Johannis Hus vitam, doctrinam, causam . . . illustrantia* (Prague, 1869). With Safarik he wrote *Anfänge der böhmischen Dichtkunst* (Pressburg, 1818) and *Die ältesten Denkmäler der böhmischen Sprache* (Prague, 1840). Three volumes of his Czech articles and essays were published as *Radhost* (3 vols., Prague, 1871–1873). For accounts of Palacký see an article by Saint René Taillandier in the *Revue des deux mondes* (April, 1855); Count Lützow, *Lectures on the Historians of Bohemia* (London, 1905).

PALADIN (Lat. *palatinus*), strictly a courtier, a member of a royal household, one connected with a palace. From being applied to the famous twelve peers of Charlemagne, the word became a general term in romance for knights of great prowess.

PALAEMON, QUINTUS REMMIUS, Roman grammarian, a native of Vicentia, lived in the reigns of Tiberius and Claudius. From Suetonius (*De grammaticis*, 23) we learn that he was originally a slave who obtained his freedom and taught grammar at Rome. Though a man of profligate and arrogant character, he enjoyed a great reputation as a teacher; Quintilian and Persius are said to have been his pupils. His lost *Ars* (Juvenal, vii. 215), a system of grammar much used in his own time and largely drawn upon by later grammarians, contained rules for correct diction, illustrative quotations and treated of barbarisms and solecisms (Juvenal vi. 452). An extant *Ars grammatica* (discovered by Jovianus Pontanus in the 15th century) and other unimportant treatises on similar subjects have been wrongly ascribed to him.

See C. Marschall, *De Remmii Palaemonis libris grammaticis* (1887); "Latin Grammar in the First Century" by H. Nettleship in *Journal of Philology*, vol. xv. (1886); J. E. Sandys, *Hist. of Classical Scholarship* (2nd ed., 1906).

PALAEOBOTANY. In the present article the subject of vegetable palaeontology is treated from a botanical point of view. The science of botany is concerned with the vegetable kingdom as a whole, and not merely with the flora now living. The remains of the plants of former periods, which have come down to us in the fossilized state, are almost always fragmentary, and often imperfectly preserved; but their investigation is of the utmost importance to the botanist, as affording the only direct evidence of the past history of vegetable organisms. Since the publication of the *Origin of Species* the general acceptance of the doctrine of evolution has given a vastly increased significance to palaeontological data. The determination of the course of descent has now become the ultimate problem for the systematist: this is an historical question, and the historical documents available are the remains of the ancient organisms preserved in the rocks. The palaeobotanist thus endeavours to trace the history of plants in the past, with the hope of throwing light on their natural affinities and on the origin of the various groups. His investigations must embrace not only the comparative morphology and anatomy of fossil plants, but also their distribution over the earth's surface at different periods—a part of the subject which, besides its direct biological interest, has obvious bearings on ancient climatology and geography.

Preservation.—Before considering the results of palaeobotanical research, some account must be given of the way in which the evidence is presented, or, in other words, of the modes of preservation of vegetable remains. These fall under two main heads. On the one hand, there is the mode of preservation which gives rise to casts, moulds and generally impressions, exhibiting the *superficial* features of the specimen. The great majority of vegetable fossils are of this kind, and the term *incrustation* is used as a general term to cover all such methods of fossilization. On the other hand, there are specimens in which the tissues of the plant have been permeated by some mineral in solution, which, subsequently setting hard, has fixed and preserved the internal structure, often with astonishing perfection of detail. This second method of fossilization is termed *petrifaction.* In the case of incrustation the whole substance of the fossilized specimen—*e.g.*, a stem of *Sigillaria*—may be replaced by mineral matter, such as sandstone or shale, giving a cast of the whole, on the outer surface of which the external markings, such as the bases of leaves and the scars left by their fall, are visible in their natural form. Usually the original organic substance remains as a thin carbonaceous layer forming the surface of the cast, but sometimes it has entirely disappeared. The surrounding matrix will of course show the *mould* of the cast, with its elevations and depressions reversed. In the case of thin, flat organs such as leaves, the whole organ may be spread out in the plane of stratification, leaving its impress on the overlying and underlying layers. Here there has not necessarily been any replacement of organic by inorganic material; the whole leaf, for example, may remain, though reduced to a carbonaceous film. In such carbonaceous impression not only are the form and markings, such as venation, perfectly preserved, but something of the actual structure may remain. The cuticularized epidermis, especially, is often thus preserved, and may be removed by the use of appropriate reagents and examined microscopically. If sporangia and spores are present they also may persist in a perfectly recognizable form, and in fact much of our knowledge of the fructification of fossil Ferns and similar plants has been derived from specimens of this kind.

In many cases *internal* casts have been formed, some large cavity, such as a fistular pith, having become filled with mineral substance, which has taken the impress of the surrounding structures, such as the wood. The common casts of Calamites are of this nature, representing the form of the hollow medulla, and bearing on their surface the print of the nodal constrictions and of the ridges and furrows on the inner surface of the wood. The whole organic substance may have been removed, or may persist merely as a thin carbonaceous layer. Mistakes have often arisen from confusing these *medullary* casts with those of the stem as a whole.

Although some information as to minute structure may often be gleaned from the carbonaceous coating of impressions, the fossils preserved by *petrifaction* are the main source of our knowledge of the structural characters of ancient plants. The chemical bodies which have played the most important part as agents of petrifaction are silicic acid and calcium carbonate, though other substances, such as magnesium carbonate, calcium sulphate and ferric oxide have also been concerned, either as the chief constituents of petrifactions, or mixed with other bodies. A large number of the most important remains of plants with structure preserved are silicious; this is the case, for example, with the famous French Permo-Carboniferous fossils of St Etienne, Autun, &c., which in the hands of Brongniart, Renault and others have yielded such brilliant scientific results. At a more recent horizon, the silicified specimens of the Mesozoic Gymnosperms from Great Britain, France, and especially North America, are no less important. Calcified specimens are especially characteristic of the British Carboniferous formation; their preservation is equally perfect with that of the silicified fossils, and their investigation by Witham, Binney, Williamson and others has proved no less fertile. In the Coal Measures of England and of certain German and Austrian districts (*e.g.* Langendreer in Westphalia; Ostrau in Moravia), calcareous nodules, crowded with vegetable fragments of every kind, occur in certain mines embedded in the substance of the coal and representing its raw material in a petrified condition. Even the most delicate tissues, such as cambium and phloem, the endosperm of seeds, or the formative tissue of the growing-point, are frequently preserved cell for cell, both in calcareous and silicious material. As a rule, the petrified remains, all-important for the revelation of structure, are fragmentary, and give little idea of the habit or external characters of the plants from which they were derived. Hence they must be brought into relation with the specimens preserved as casts or impressions, in order to gain a better conception of the plant as a whole. This is often a difficult task, and generally the fragmentary nature of practically all vegetable fossils is the chief hindrance to their investigation. Owing to this, it has become the common practice of palaeobotanists to give distinct generic names to detached parts of plants which may even have belonged to one and the same species. Thus the roots of *Sigillaria* are called *Stigmaria*, detached leaves *Sigillariophyllum*, and the fructifications *Sigillariostrobus*; the name *Sigillaria* applies to the stem, which, however, when old and partly decorticated has been called *Syringodendron*, while its woody cylinder has often been described under the name *Diploxylon.* This naming of portions of plants, however objectionable, is often not to be avoided; for detached organs constantly have to be described long before their relation to other parts is established—which, indeed, may never be accomplished. For example, the form and structure of *Stigmaria* have long been well known; but it is seldom possible to determine whether a given Stigmaria belonged to *Sigillaria*, *Lepidodendron* or some other genus. The correct piecing together of the fragmentary remains is one of the first problems of the palaeobotanist, and the gradual disappearance of superfluous names affords a fair measure of the progress of his science. The recent advance of fossil botany has depended in a very great degree on the study of petrified specimens with their structure preserved; so far, at least, as the older strata are concerned, it is, as a rule, only with the help of specimens showing structure that any safe conclusions as to the affinities of fossil plants can be arrived at.

The subject of coal (*q.v.*) is treated elsewhere. Here it need only be said that the masses of vegetable substance, more or less carbonized and chemically altered, of which coal is composed, frequently contain cells and fragments of tissue in a condition recognizable under the microscope, as for example spores (sometimes present in great quantities), elements of the wood, fibres of the bark, &c. These remnants, however, though interesting as revealing something of the sources of coal, are too fragmentary and imperfect to be of any botanical importance. In lignite, on the other hand, the organized structure is sometimes excellently preserved. In the Wealden of Belgium, for example, specimens of Ferns and Coniferae occur, in the form of lignite, which can be sectioned, like recent plants, with a razor, and exhibit an almost unaltered structure.

I.—PALAEOZOIC

The present section is concerned with the botany of the Palaeozoic age, from the oldest rocks in which vegetable remains have been found up to the close of the Permian period. The Glossopteris flora of India and the southern hemisphere, the age of which has been disputed, but is now regarded as for the most part Permo-Carboniferous, is, however, dealt with in the succeeding section, in connexion with the Mesozoic floras. The various groups of plants represented in the Palaeozoic rocks will first be considered in systematic order, after which some account will be given of the succession and distribution of the various floras during the period.

In dealing with the plants of such remote epochs, the relative importance of the various groups, so far as they are known to us, is naturally very different from that which they assume at the present day. There is no evidence that the Angiospermous flowering plants, now the dominant class, existed during the Palaeozoic period; they do not appear till far on in the Mesozoic epoch, and their earlier history is as yet entirely unknown. On the other hand, fern-like seed-plants, known as Pteridosperms, and Gymnosperms belonging almost entirely to families now extinct, were abundant, while the Pteridophyta attained a development exceeding anything that they can now show. Among the lower classes of plants we have scarcely any knowledge of Palaeozoic Bryophyta; Fungi were probably abundant, but their remains give us little information; while, even among the Algae, which are better represented, well characterized specimens are scanty.

Algae.

With few exceptions, the remains of Palaeozoic Algae are of comparatively little botanical interest. A vast number of "species" have been described, but, as has been said, "by far the greater number of the supposed fossil Algae have no claim to be regarded as authentic records of this class of Thallophytes" (Seward, 1898). The investigations of Nathorst, Williamson and others have shown that a very large proportion of the casts and impressions attributed to Algae had in all probability a totally different origin. Some represent the tracks or burrows of worms, crustaceans or other animals; others, the course of rills of water on a sandy or muddy shore; others, again, the marks left on the bottom by bodies drifted along by the waves. In cases of doubt, evidence may be obtained from traces of organic structure, from the presence of carbonaceous matter, or, as Zeiller has pointed out, by the remains of animals such as Bryozoa being attached to the cast, showing that it represents a solid body and not a mere cavity or furrow. Evidence from traces of organization is alone conclusive; the presence of carbonaceous matter, though a useful indication, may be deceptive, for the organic substance may have been derived from other sources than the body which left the impression. The mere external form of the supposed Algae is rarely so characteristic as to afford satisfactory evidence of their nature. Some of the better-attested examples, among which are a few of considerable interest, may now be considered. Of Cyanophyceae, as we should expect, the Palaeozoic remains are very doubtful. *Glioconis*, found by Renault in a coprolite of Permian age, was regarded by him as a Cyanophycean allied to *Gloeocapsa*; this may be so, but the argument drawn from the absence of nuclei, considering the extreme rarity of recognizable nuclei even in the best preserved fossil tissues, can hardly be taken seriously. *Girvanella*, found in Cambrian, Ordovician and Silurian rocks, as well as in later deposits, appears to have played a part in the origination of oölitic rock-structure. It consists of minute interwoven tubular filaments, and has been variously interpreted as possibly representing the sheaths of a Cyanophycean Alga, and as constituting a Siphoneous thallus of the type of the Codieae. The non-cellular order Siphoneae is fairly well represented in Palaeozoic strata, especially by calcareous verticillate forms referable to the family Dasycladeae; the separate tubular joints of the articulated thallus, bearing the prints of the whorled branches, are sometimes cylindrical (*Arthroporella*, *Vermiporella*, &c.), sometimes oval (*Sycidium*) or spherical (*Cyclocrinus*). These forms, and others like them, go back to the Silurian and Ordovician; while *Gyroporella*, from the Permian, is another fairly characteristic Siphoneous type. There can be no doubt that the verticillate Siphoneae, a group much isolated among recent organisms, are among the most ancient families of plants. The gigantic *Nematophycus*, to be described below, has been regarded as having Siphoneous affinities. Little trace of Confervaceae has been found; *Confervites chantransioides*, apparently consisting of branched cellular filaments, may perhaps represent a Cambrian Confervoid. *Cladiscothallus*, from the Culm of Russia, in which the filaments are united to form hemispherical or globular tufts, has been compared by Renault to a *Chaetophora*. This is one of the somewhat doubtful Algae occurring in boghead coal or torbanite, a carbonaceous rock the nature of which has been much disputed, in the law courts as well as in scientific literature. The boghead of Scotland, Autun and New South Wales is regarded by Renault and Bertrand as mainly composed of gelatinous Algae (*Pila* and *Reinschia*), having a hollow, saccate thallus formed of a single layer of cells. It may appear surprising that a body containing 65% of carbon should be so largely made up of gelatinous Algae in a comparatively little altered condition, but the material is rich in bitumen, which seems to have replaced the water contained in the organisms when alive. It has recently been stated, however, that the supposed Algae are in reality the megaspores of Vascular Cryptogams. Scarcely anything is known of Palaeozoic Florideae; *Solenopora*, ranging from the Ordovician to the Jurassic, resembles, in the structure of its thallus, with definite zones of growth, Corallinaceae such as *Lithothamnion*, and may probably be of the same nature. A branched filamentous organism from the Lower Carboniferous of Scotland, described by Kidston under the name of *Bythotrephis worstoniensis*, shows some remains of cellular structure, and may probably be a true Alga, resembling some of the filamentous Florideae in habit.

Apart from the multitude of supposed fossil Algae described as "Fucoids" but usually not of Algal nature, and never presenting determinable characters, very little remains that can be referred to Palaeozoic Brown Algae. The most striking of all fossil Algae, however, *Nematophycus*, may possibly be a Phaeophycean. The first species of the genus, *Nematophycus Logani*, was discovered by Dawson in 1856 in the Lower and Middle Devonian of Canada, and was described by him as a Conifer under the name of *Prototaxites*. Carruthers, however, in 1872 established its Algal nature, and gave it the more appropriate name of *Nematophycus*. In *N. Logani* the stem, which is found in a silicified state, may be as much as 3 ft. in diameter. The tissue is made up of large, unseptate, occasionally branching tubes, with an undulating vertical course, among which much smaller tubes are irregularly interwoven. Radially placed gaps in the tissue (at first erroneously interpreted as medullary rays, but subsequently more aptly compared to the air-spaces of large Algae) contain very sparse hyphae, which here branch more freely than elsewhere. The concentric rings of growth, which form a characteristic feature, are due to periodic variations in the size of the larger tubes. Transverse septa have occasionally, but rarely, been detected in the smaller hyphae. Penhallow maintains that these smaller tubes arise as branches from the larger, but other observers have failed to confirm this. In *N. Storriei*, from the Silurian (Wenlock) of South Wales, described by Barber, there is no sharp differentiation of the two kinds of tubes; they are rarely observed to branch, except in the gaps, which in this species are not radially directed. In *N. Ortoni* (Penhallow), from the Devonian of Canada, the tubes are quite uniform, and there are no spaces or concentric rings. The tubes have their cavity dilated at intervals, and Penhallow has therefore compared them with the trumpet-hyphae of Laminariaceae, but no transverse septa are anywhere visible. Several other species have been described. Carruthers compared the usually non-cellular structure of *Nematophycus* with that of Siphoneae such as *Halimeda*, while recognizing the points of resemblance to Laminariaceae (*e.g. Lessonia*) in the dimensions of the stem and its concentric rings of growth. Later writers, influenced by the occasional occurrence of transverse walls in the smaller hyphae, have laid more stress on Laminariaceous affinities. The existence of these gigantic Algae in Palaeozoic times, attested by such well-preserved specimens, is a fact of great interest, though their systematic position is still an open question. *Pachytheca*, a spherical organism, usually about the size of a small pea, found in rocks of Silurian and Devonian age, has been much investigated and discussed, without any decisive light having been thrown on its nature. It was once regarded as connected with *Nematophycus* (with which it sometimes occurs in association), possibly as its fructification. For this view however, there is no evidence, though the tissues of the two fossils are somewhat similar. *Pachytheca* is formed of cellular filaments resembling those of a *Cladophora*, irregularly interwoven in the central region, radiating towards the periphery, and often forked. In one case the spherical thallus was found seated in a cup-like receptacle. There can be little doubt of the Algal nature of the fossil, but beyond this it is impossible at present to carry its determination.

On the whole, it cannot be said that the Palaeozoic remains have as yet thrown much light on the evolution of the Algae, though we may not be prepared to maintain, with Zeiller, that plants of this class appear never to have assumed a form very different from that which they present at the present day.

Bacteria.

The first evidence for the existence of Palaeozoic Bacteria was obtained in 1879 by Van Tieghem, who found that in silicified vegetable remains from the Coal Measures of St Étienne the cellulose membranes showed traces of subjection to butyric fermentation, such as is produced at the present day by *Bacillus Amylobacter*; he also claimed to have detected the organism itself. Since that time a number of fossil Bacteria, mainly from Palaeozoic strata, have been described by Renault, occurring in all kinds of fossilized vegetable and animal débris. The supposed *Micrococci* present little that is characteristic; the more definite, rod-like form of the *Bacilli* offers a better means of recognition, though far from an infallible one; in a few cases dark granules, suggestive of endospores, have been found within the rods. On the whole, the occurrence of Bacteria in Palaeozoic times—so probable a priori—may be taken as established, though the attempt to discriminate species among them is probably futile.

Fungi.

Fungi were no doubt abundant among Palaeozoic vegetation. In examining the tissues of fossil plants of that epoch nothing is more common than to meet with mycelial hyphae in and among the cells; in many cases the hyphae are septate, showing that the higher Fungi (Mycomycetes), as distinguished from the more algoid Phycomycetes, already existed. An endophytic Fungus referred to the latter group (*Peronosporites antiquarius*, W. Smith) bears very definite terminal, or intercalary, spherical vesicles, which may probably be regarded as reproductive organs—either oögonia or sporangia. A minute Fungus bearing sporangia, found by Renault in the wood of a *Lepidodendron*, and named by him *Oöchytrium Lepidodendri*, is referred with much probability to the Chytridineae. Conceptacles containing Spores, and strongly suggesting the Chytridineous Fungus *Urophlyetis*, have recently been found, in petrified material, on the leaves of an *Alethopteris*, which appears to have undergone decay before fossilization set in. Small spores, almost certainly those of Fungi, are very common in the petrified tissues of Palaeozoic plants. Spherical sacs, bearing forked spines, described by Williamson under the name of *Zygosporites*, are frequent, usually in an isolated state.

Professor Seward, however, has found a *Zygosporites in situ*, terminating an apparently fungal hypha: he suggests a possible comparison with the mould *Mucor*. Bodies closely resembling the perithecia of Sphaeriaceous Fungi have often been observed on impressions of Palaeozoic plants, and may probably belong to the group indicated. Professor F. E. Weiss has obtained interesting evidence that the symbiotic association between roots and Fungi, known as "Mycorhiza," already occurred among Carboniferous plants. The few and incomplete data which we at present possess as to Palaeozoic Fungi do not as yet justify any inferences as to the evolution of these plants. The writer is not aware of any evidence for the occurrence of Palaeozoic Lichens.

Bryophyta.

The important class of the Bryophyta, which, on theoretical grounds, is commonly regarded as more primitive than the Pteridophyta, is as yet scarcely represented among known fossils of Palaeozoic age. In the Lower Carboniferous of Scotland Mr Kidston has found several specimens of a large dichotomous thallus, with a very distinct midrib; the specimens, referred to the provisional genus *Thallites*, much resemble the larger thalloid Liverworts. Similar fossils have been described from still older rocks. In one or two cases Palaeozoic plants, resembling the true Mosses in habit, have been discovered; the best example is the *Muscites polytrichaceus* of Renault and Zeiller, from the Coal Measures of Commentry. In the absence, however, both of reproductive organs and of anatomical structure, it cannot be said that there is at present conclusive evidence for the existence of either Hepaticae or Musci in Palaeozoic times.

Pteridophyta.

Our knowledge of the Vascular Cryptograms of the Palaeozoic period, though recent discoveries have somewhat reduced their relative importance, is still more extensive than of any other class of plants, and in fact it is here that the evidence of Palaeontology first becomes of essential importance to the botanist. They extend back through the Devonian, possibly to the Silurian system, but the systematic summary now to be given is based primarily on the rich materials afforded by the Carboniferous and Permian formations, from which our detailed knowledge of Palaeozoic plants has been chiefly derived.

In addition to the three classes, Equisetales, Lycopodiales and Filicales, under which recent Pteridophytes naturally group themselves, a fourth class, Sphenophyllales, existed in Palaeozoic times, clearly related to the Horsetails and more remotely to the Ferns and perhaps the Club-mosses, but with peculiarities of its own demanding an independent position. We further find that, whereas the Ferns of the present day form a well-defined and even isolated class, this was not the case at the time when the primary rocks were deposited. A great group of Palaeozoic fossils, showing evident affinity to Ferns, has proved to consist of seed-bearing plants allied to Gymnosperms, especially Cycads. This important class of plants will be described at the beginning of the Spermophyta under the name Pteridospermeae. The arrangement which we shall adopt for the Palaeozoic Pteridophyta is therefore as follows:—

I. *Equisetales*. II. *Sphenophyllales*.
III. *Lycopodiales*. IV. *Filicales*.

We must bear in mind that throughout the Palaeozoic period, and indeed far beyond it, vascular plants, so far as the existing evidence shows, were represented only by the Pteridophyta, Pteridosperms and Gymnosperms. Although the history of the Angiosperms may probably go much further back than present records show, there is no reason to suppose that they were present, as such, amongst the Palaeozoic vegetation. Consequently, the Pteridophytes, Gymnosperms and their allies had the field to themselves, so far as regards the higher plants, and filled places in nature which have now for the most part been seized on by families of more modern origin. Hence it is not surprising to find that the early Vascular Cryptograms were, beyond comparison, more varied and more highly organized than their displaced and often degraded successors. It is among the fossils of the Palaeozoic rocks that we first learn the possibilities of Pteridophytic organization.

I. *Equisetales.*—This class, represented in the recent flora by the single genus *Equisetum*, with about twenty species, was one of the dominant groups of plants in Carboniferous times. The Calamarieae, now known to have been the chief Palaeozoic representatives of the Horsetail stock, attained the dimensions of trees, reaching, according to Grand' Eury, a height of from 30 to 60 metres, and showed in all respects a higher and more varied organization than their recent successors.

Their remains occur in three principal forms of preservation. (1) carbonaceous impressions of the leafy branches, the fructifications and other parts; (2) casts of the stem; these are usually internal, or *medullary* casts, as described above. Around the cast the organic tissues may be represented by a carbonaceous layer, on the outer surface of which the external features, such as the remains of leaves, can sometimes be traced. More usually, however, the carbonaceous film is thin, and merely shows the impress of the medullary cast within; (3) petrified specimens of all parts—stem, roots, leaves and fructifications—showing the internal structure, more or less perfectly preserved. The correlation of these various remains presents considerable difficulties. Casts surrounded by wood, with its structure preserved, have sometimes been found, and have established their true relations. The position of the branches is shown both on casts and in petrified specimens, and has helped in their identification, while the petrified remains sometimes show enough of the external characters to allow of their correlation with impressions. Fructifications have often been found in connexion with leafy shoots, and the anatomical structure of the axis in sterile and fertile specimens has proved a valuable means of identification.

In *habit* the Calamarieae appear to have borne, on the whole, a general resemblance to the recent Equisetaceae, in spite of their enormously greater bulk. The leaves were constantly in whorls, and were usually of comparatively small size and of simple form. In the oldest known Calamarian, however, *Archaeocalamites* (Devonian and Lower Carboniferous), the leaves were repeatedly forked. There is evidence that in some, at least, of the Calamarieae the leaves of each verticil were united at the base to form a sheath. The free lamina, however, was always considerably more developed than in the recent family; in form it was usually linear or narrowly lanceolate. Different genera have been founded on leaf-bearing branches of Calamarieae; apart from *Archaeocalamites*, already mentioned, and *Autophyllites* (Grand' Eury), in both of which the leaves were dichotomous, we have *Annularia*, *Asterophyllites* and *Calamocladus* (in Grand' Eury's limited sense), with simple leaves. In some species of *Annularia* the extremely delicate ultimate twigs, bearing whorls of small lanceolate leaves, give a characteristic habit, suggesting that they may have belonged to herbaceous plants; other Annulariae, however, have been traced with certainty into connexion with the stems of large Calamites. In *Asterophyllites*, the generic distinction of which from *Annularia* is not always clear, the narrow linear leaves are in crowded whorls, and the ultimate branches distichously arranged; in the *Calamocladus* of Grand' Eury—characteristic of the Upper Coal Measures—the whorls are more remote, and the twigs polystichous in arrangement. In all these groups a leaf-sheath has been recognized.

The distribution of the branches on the main stem shows considerable variations, on which genera or sub-genera have been founded by C. E. Weiss. In *Archaeocalamites*, which certainly deserves generic rank, the branches may occur on every node, but only in certain parts of the stem; the ribs of successive internodes do not alternate, but are continuous, indicating that the leaves were superposed. Using *Calamites* as a generic name for all those Calamarian stems in which the ribs alternate at the nodes, we have, on Weiss's system, the following sub-genera: *Stylocalamites*, branches rare and irregularly arranged; *Calamitina*, branches in regular verticils, limited to certain nodes, which surmount specially short internodes; *Eucalamites*, branches present on every node. These distinctions can be recognized on petrified specimens, as well as on the casts, but their taxonomic value is somewhat doubtful. In many Calamites there is evidence that the aerial stem sprang from a horizontal rhizome, as in the common species *C.* (*Stylocalamites*) *Suckowi*; in other specimens the aerial stem has an independent, rooting base.

The *anatomical structure* of all parts of the plant is now known, in various Calamarieae, thanks more especially to the work of Williamson in England and of Renault in France. The stem has a structure which may be briefly characterized as that of an *Equisetum* with secondary growth in thickness (fig. 1, Plate). The usually fistular pith is surrounded by a ring of collateral vascular bundle, (see ANATOMY OF PLANTS, and PTERIDOPHYTA), each of which, with rare exceptions, has an intercellular canal at its inner edge, containing the disorganized spiral tracheae, just as in the recent genus. The cortex is often preserved; in certain cases it was strengthened by hypodermal strands of fibres, as in *Equisetum*. It is only in the rare cases where a very young twig is preserved that the primary structure of the stem is found unaltered. In all the larger specimens a broad zone of wood, with its elements in radial series, had been added. This secondary wood, in the true Calamites (*Arthropitys*, Goeppert), has a simple structure comparable to that of the simplest Coniferous woods; it is made up

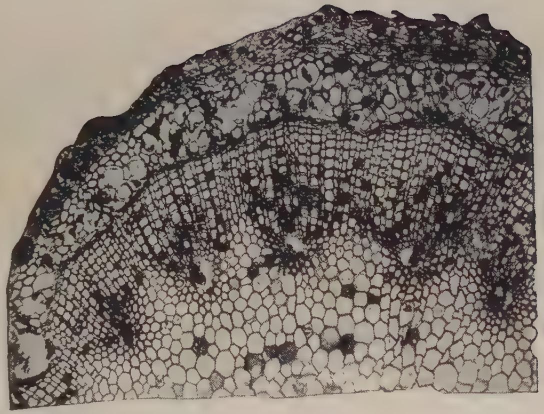


FIG. 1.—*Calamites*. Part of transverse section of a young stem, showing pith, vascular bundles with secondary wood, and cortex. (× about 40.) *From a photograph* (*Scott*, "*Studies*").

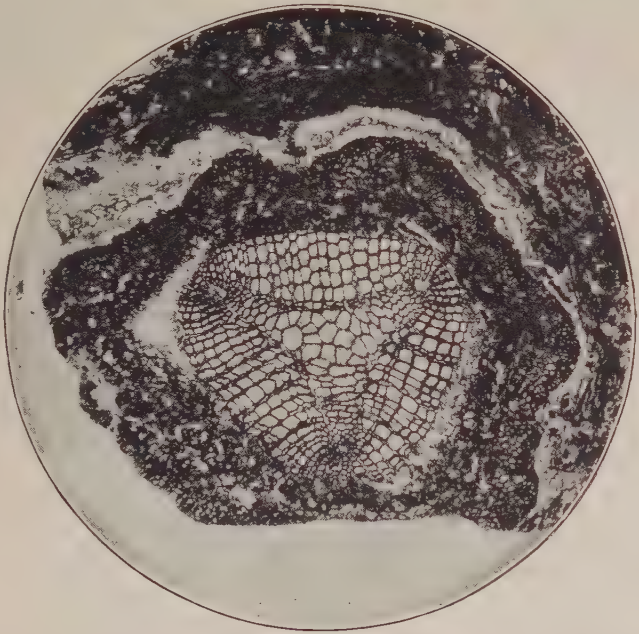


FIG. 5.—*Sphenophyllum insigne*. Transverse section of stem, showing triangular primary wood, secondary wood, remains of phloem, and primary cortex. (× about 30.) *From a photograph* (*Scott*, "*Studies*").

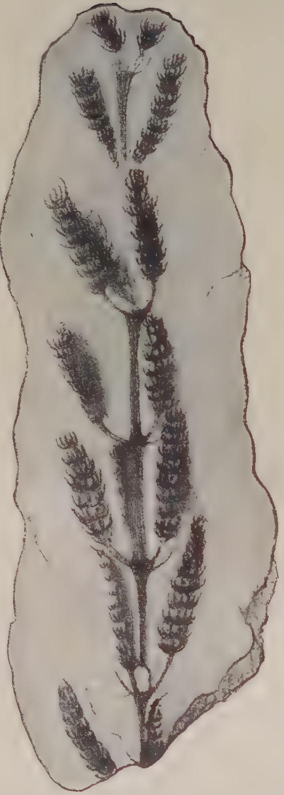


FIG. 4.—*Palaeostachya pedunculata*. Fertile shoot, bearing numerous cones and a few leaves. (⅔ of nat. size.) *After Williamson* (*Scott*, "*Studies*").

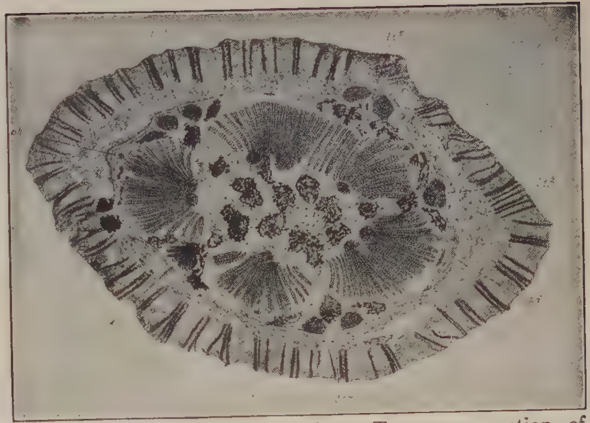


FIG. 22.—*Lyginodendron oldhamium*. Transverse section of stem, showing the pith containing groups of sclerotic cells, the primary xylem-strands, secondary wood and phloem, pericycle and cortex. lt^1-lt^5, leaf-traces, numbered according to the phyllotaxis, lt^5 belonging to the lowest leaf of the five; *ph*, a group of primary phloem; *pd*, periderm, formed from pericycle. (× 3.)

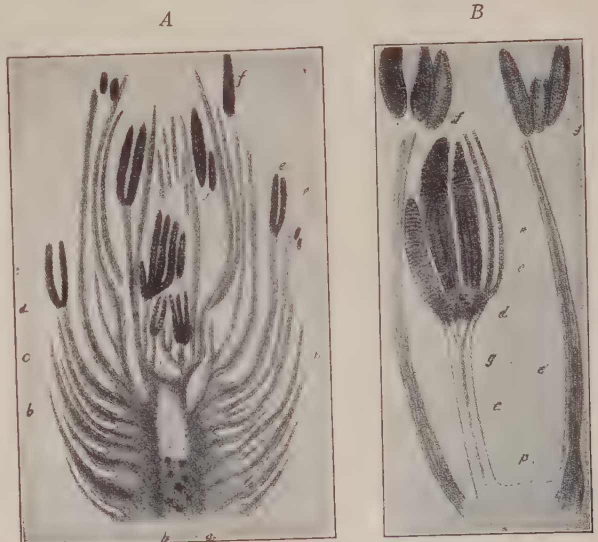


FIG. 31.—*Cordaianthus Penjoni*.—*A*, Male catkin in longitudinal section: *a*, axis; *b*, bracts; *c*, *d*, filaments of stamens, bearing the pollen-sacs (*e* and *f*) at the top; *v*, apex of axis. (× 6½.) *B*, Stamens more highly magnified: *g*, vascular bundle of filament; *e*, pollen-sac after dehiscence. (× 23.) *After Renault* (*Scott*, "*Studies*").

entirely of radial bands of tracheides interspersed with medullary rays. The pitting of the tracheides is more or less scalariform in character, and is limited to the radial walls. In favourable cases remains of the cambium are found on the outer border of the wood, and phloem is also present in the normal position, though it does not seem to have attained any considerable thickness. In the old stems the primary cortex was replaced by periderm, giving rise to a thick mass of bark. The above description applies to the stems of *Calamites* in the narrower sense (*Arthropitys* of the French authors), to which the specimens from the British Coal Measures mostly belong. *Archaeocalamites* appears to have had a similar structure, but in some specimens from the Lower Carboniferous of Burntisland, provisionally named *Protocalamites pettycurensis*, centripetal wood was present in the stem. In *Calamodendron* (Upper Coal Measures) the wood has a more complex structure than in *Calamites*, the principal rays including radial tracts of fibrous tissue, in addition to the usual parenchyma. *Arthrodendron* (Lower Coal Measures) approaches *Calamodendron* in this respect. The longitudinal course of the vascular bundles and their relation to the leaves in Calamarieae generally followed the *Equisetum* type, though more variable and sometimes more complex. The attachment of the branches was immediately above the node, and usually between two foliar traces, as in the recent genus. Where the structure of the leaves is preserved it proves to be of an extremely simple type; the narrow lamina is traversed by a single vascular bundle, separated by a sheath from the surrounding palisade-parenchyma. Stomata of the same structure as in *Equisetum* have been detected in the epidermis.

The roots (formerly described as a separate genus, *Astromyelon*) were borne directly on the nodes, not on short lateral branches as in *Equisetum*. They are of similar structure in all known Calamarieae, the main roots having a large pith, while the rootlets had little or none. The structure is in all respects that typical of roots, as shown by the centripetal primary wood, and the alternation of xylem and phloem groups observable in exceptionally favourable young specimens. A striking feature is the presence of large, radiating intercellular cavities in the cortex, suggesting an aquatic habit. The young roots show a double endodermis, just as in the recent *Equisetum*.

A considerable number of Calamarian *fructifications* are known, preserved, some as carbonaceous impressions, others as petrified specimens, exhibiting the internal structure. In many cases the cones have been found in connexion with branches bearing characteristic Calamarian foliage. Almost all strobili of the Calamarieae are constructed on the same general lines as those of *Equisetum*, with which some agree exactly; in most, however, the organization was more complex, the complexity consisting in the intercalation of whorls of sterile bracts, between those of the sporangiophores. In several cases heterospory, unknown among recent Equisetaceae, has been demonstrated in their Palaeozoic representatives.

Four main types of structure may be distinguished among Calamarian strobili.

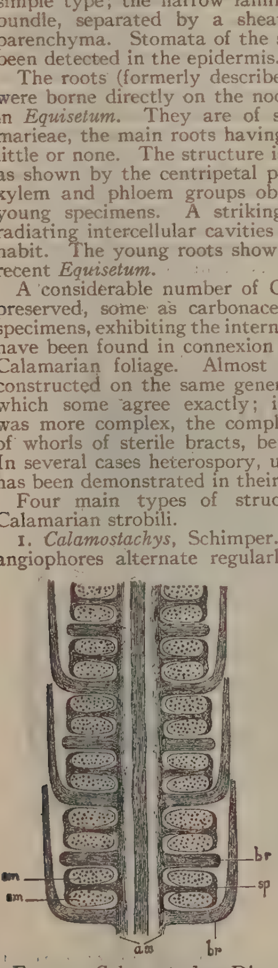
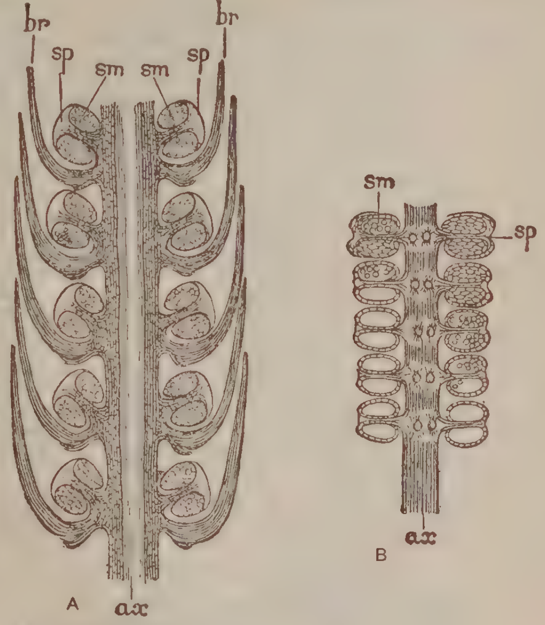


FIG. 2.—*Calamostachys*. Diagrammatic longitudinal section of the cone, showing the axis (*ax*) bearing alternate whorls of bracts (*br*) and peltate sporangiophores (*sp*) with their sporangia (*sm*). The upturned tips of the bracts are only shown in every alternate verticil.

1. *Calamostachys*, Schimper. Here the whorls of peltate sporangiophores alternate regularly with those of sterile bracts, the former being inserted on the axis midway between the latter (fig. 2). The sporangiophores, which are usually half as numerous in each verticil as the bracts, have the same form as in *Equisetum*, but each bears four sporangia only. The spores are frequently found to be still united in tetrads. In some species, *e.g.* the British *C. Binneyana*, numerous specimens have been examined and only one kind of spore observed; here, then, there is a strong presumption that the species was homosporous. In other cases, however, *e.g.* *C. Casheana*, Will., two kinds of spore occur, in different sporangia, but on the same strobilus and even on the same sporangiophore. The megaspores, of which there are many in the megasporangium, have a diameter about three times that of the microspores. The abortion of certain spores, which is known to have taken place both in the homosporeus *C. Binneyana* and in the megasporangia of *C. Casheana*, may throw some light on the origin of the heterosporous condition. The bracts were sometimes coherent in their lower part (*e.g.* *C. Binneyana*), sometimes free (*e.g.* *C. Ludwigi*); in all cases their free extremities formed a protection to the fertile whorl above. In some continental species (*e.g.* *C. Grand' Euryi*, Ren.) radial membranous plates hung down from each verticil of bracts, forming compartments in which the subjacent sporangiophores were enclosed. The anatomy of the axis is essentially similar to that of a young Calamarian twig, with some variations in detail. Strobili of the *Calamostachys* type occur in connexion both with *Annularia* and *Asterophyllites* foliage.

2. *Palaeostachya*, Weiss. Here, as in the previous genus, sterile and fertile verticils are ranged alternately on the axis of the cone. The main difference is that in *Palaeostachya* the sporangiophores, instead of standing midway between the whorls of bracts, are inserted immediately above them, springing, as it were, from the axil of the sterile verticil (fig. 3, A). This singular arrangement has suggested doubts as to the correctness of the current interpretation of the Equisetaceous sporangiophore as a modified leaf (cf. *Cheirostrobus* below). In most other respects the two genera agree; there is evidence for the occurrence of heterospory in some strobili referred to *Palaeostachya*. The anatomy of the axis is that of a young branch of a Calamite. According to Grand' Eury, the *Palaeostachya* fructification was most commonly associated with *Asterophyllites* foliage. The external aspect of a *Palaeostachya* is shown in *fig. 4* (*Plate*).



(After Renault. Scott, *Studies*.)

FIG. 3.

A, *Palaeostachya*. Diagrammatic longitudinal section of cone, showing the axis (*ax*) bearing the bracts (*br*) with peltate sporangiophores (*sp*) springing from their axils; *sm*, sporangia.

B, *Archaeocalamites*. Part of cone, showing the axis (*ax*) bearing peltate sporangiophores (*sp*) without bracts; *sm*, sporangia.

3. *Equisetum* type of strobilus. In certain cases the strobili of Palaeozoic Calamarieae appear to have had essentially the same organization as in the recent genus, the axis bearing sporangiophores only, without intercalated bracts. It is remarkable that fructifications apparently of this kind have been found by Renault in close association with the most ancient of the Calamarieae—*Archaeocalamites*. In these strobili the peltate scales, like the vegetative leaves of the plant, are in superposed verticils; each appears to have borne four sporangia (fig. 3, B). Other cones, however, namely, those known as *Pothocites*, have also been attributed on good grounds to the genus *Archaeocalamites*; they are long strobili, constricted at intervals, and it is probable that the succession of fertile sporangiophores was interrupted here and there by the intercalation of sterile bracts, which may also have been present, at long intervals, in Renault's species. Cones from the Middle Coal Measures, described by Kidston under the name of *Equisetum Hemingwayi*, but probably belonging to one of the Calamarieae, bear a striking external resemblance to those of a recent *Equisetum*.

4. *Cingularia*, Weiss. This form of strobilus, from the Coal Measures of Germany, is imperfectly known, and its relation to Calamarieae not beyond doubt. In the lax strobili the sporangiophores, which are not peltate, but strap-shaped, were borne, as C. E. Weiss first showed, immediately *below* the verticils of bracts, the position thus being the reverse of that in *Palaeostachya*.

The Palaeozoic Calamarieae, though so far surpassing recent Equisetaceae, both in stature and complexity of organization, clearly belonged to the same class of Vascular Cryptogams. There is no satisfactory evidence for attributing Phanerogamic affinities to any members of the group, and the view, of which Williamson was the chief advocate, that they form a homogeneous Cryptogamic family, is now fully established.

II. *Sphenophyllales.*—The class of *Sphenophyllales*, as known to us at present, is of limited extent, embracing the two genera *Sphenophyllum* and *Cheirostrobus*, which may serve as types of two families within the class. The characters of *Sphenophyllum* are known with some completeness, while our knowledge of *Cheirostrobus* is confined to the fructification; the former will therefore be described first.

1. *Sphenophyllum.*—The genus *Sphenophyllum*, of which a number of species have been described, ranging probably from the Middle Devonian, through the Carboniferous, to the Permian or even the Lower Triassic, consisted of herbaceous plants of moderate dimensions. The long, slender stems, somewhat tumid at the nodes, were ribbed, the ribs running continuously through the nodes, a fact correlated with the superposition of the whorled leaves, the number of which in each verticil was some multiple of 3, and usually 6. In the species on which the genus was founded the leaves, as the generic name implies, are cuneate and entire, or toothed on their anterior margin;[1] in other cases they are deeply divided by dichotomy into narrow segments, or the whorl consists of a larger number (up to 30) of apparently simple, linear leaves, which may represent the segments of a smaller number. The different forms of leaf may occur on the same plant, the deeply divided foliage often characterizing the main stem, while the cuneate leaves were borne on lateral shoots. A comparison, formerly suggested, with the two forms of leaf in Batrachian Ranunculi has not proved to hold good; the idea of an aquatic habit is contradicted by the anatomical structure, and the hypothesis that the plants were of scandent growth is more probable. The species of *Sphenophyllum* have a graceful appearance, which has been compared with that of the trailing Galiums of hedgerows. Branches sprang from the nodes, though perhaps not truly axillary in position. The cones, more or less sharply differentiated, terminated certain of the branches.

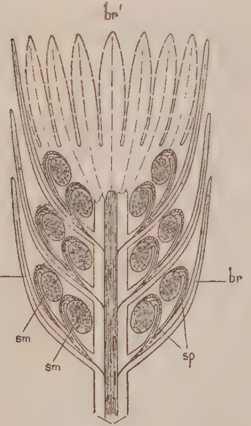
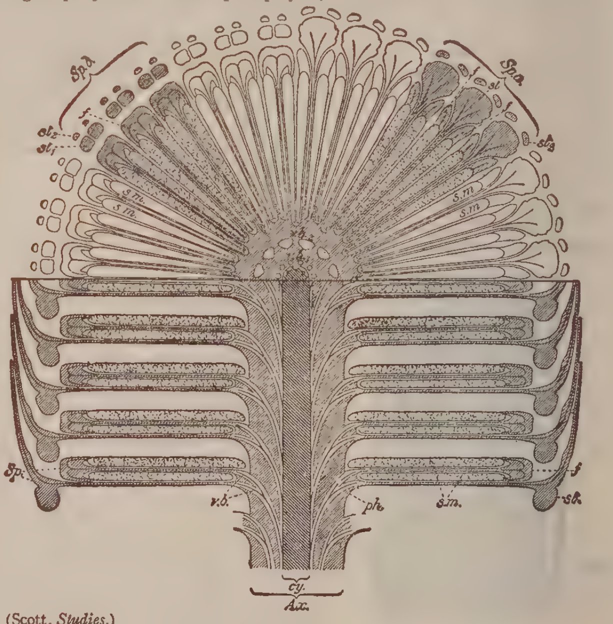


FIG. 6. — *Sphenophyllum Dawsoni.* Diagram of cone in longitudinal section.

ax, Axis.
br, Bracts.
sp, Sporangiophores, each bearing a sporangium, *sm*.
br', Whorl of bracts in surface view.

The *anatomy* of the stem of *Sphenophyllum*, investigated by Renault, Williamson and others, is highly characteristic (*fig. 5, Plate*). The stem is traversed by a single stele, with solid wood, without pith; the primary xylem is triangular in section, the spiral elements forming one or two groups at each angle, while the phloem occupied the bays, so that the structure resembles that of a triarch root. Two leaf-trace bundles started from each angle of the stele, and forked, in passing through the cortex, to supply the veins of the leaf, or its subdivisions. The cortex was deeply furrowed on its outer surface. The primary structure is only found unaltered in the youngest stems; secondary growth by means of a cambium set in very early, xylem being formed internally and phloem externally in a perfectly normal manner. At the same time a deep-seated periderm arose, by which the primary cortex was soon entirely cut off. The secondary wood in the Lower Carboniferous species, *S. insigne*, has scalariform tracheides, and is traversed by regular medullary rays, but in the forms from later horizons the tracheides are reticulately pitted, and the rays are for the most part replaced by a network of xylem-parenchyma. There are no recent stems with a structure quite like that of *Sphenophyllum*; so far as the primary structure is concerned, the nearest approach is among the *Psiloteae*, with which other characters indicate some affinity; the base of the stem in *Psilotum* forms some secondary wood. The diarch roots of a *Sphenophyllum* have been described by Renault, who has also investigated the leaves; they were strongly constructed mechanically, and traversed by slender vascular bundles branching dichotomously.

Fructification.—Williamson thoroughly worked out, in petrified specimens, the organization of a cone which he named *Bowmanites Dawsoni*; it was subsequently demonstrated by Zeiller that this fructification belonged to a *Sphenophyllum*, the cones of the well-known species *S. cuneifolium* having a practically identical structure. The type of fructification described by Williamson and now named *Sphenophyllum Dawsoni* consists of long cylindrical cones, in external habit not unlike those of some Calamarieae. The axis, which in structure resembles the vegetative stem in its primary condition, bears numerous verticils of bracts, those of each verticil being coherent in their lower part, so as to form a disc or cup, from the margin of which the free limbs of the bracts arise. The sporangia, which are about twice as numerous as the bracts, are seated singly on pedicels or sporangiophores springing from the upper surface of the bract-verticil, near its insertion on the axis (fig. 6). As a rule two sporangiophores belong to each bract. The sporangium is attached to the enlarged distal end of its pedicel, from which it hangs down, so as to suggest an anatropous ovule on its funiculus. Dehiscence appears to have taken place at the free end of the sporangium; the spores are numerous, and, so far as observed, of one kind only. Each sporangiophore is traversed throughout its length by a vascular bundle connected with that which supplies the subtending bract. This form of fructification appears, from Zeiller's researches, to have been common to several species of *Sphenophyllum*, but others show important differences. Thus *Bowmanites Römeri*, a fructification fully investigated by Solms-Laubach, differs from *S. Dawsoni* in the fact that each sporangiophore bears two sporangia, attached to a distal expansion approaching the peltate scale of the Equisetales. It is thus proved that the sporangiophore is not a mere sporangial stalk, but a distinct organ, in all probability representing a ventral lobe of the subtending bract. The recently discovered species, *Sphenophyllum fertile*, while resembling *Bowmanites Römeri* in its peltate, bisporangiate sporangiophores, is peculiar in the fact that both dorsal and ventral lobes of the sporophyll were fertile, dividing in a palmate manner into several branches, each of which constitutes a sporangiophore. Thus the sterile bracts of other species are here replaced by sporangium-bearing organs. In *Sphenophyllum majus*, where the cones are less sharply defined, the forked bract bears a group of four sporangia at the bifurcations, but their mode of insertion has not yet been made out.



(Scott, *Studies.*)

FIG. 7.—*Cheirostrobus.* Diagram of cone, the upper part in transverse, the lower in longitudinal section. In the transverse section six sporophylls, each showing three segments, are represented.

Sp.a, Section through sterile segments.
Sp.b, Section through sporangiophores.
st, Laminae of sterile segments.
f, Peltate expansions of sporangiophores.
sm, Sporangia.
v.b. Vascular bundles.
cy, Stele of axis (*Ax*).

In the longitudinal section the corresponding parts are shown.

2. *Cheirostrobeae.*—The family *Cheirostrobeae* is only known from the petrified fructification (*Cheirostrobus pettycurensis*) derived from the Lower Carboniferous of Burntisland in Scotland. The excellence of the preservation of the specimens has rendered it possible to investigate the complex structure in detail. The cone is of large size—3·5 cm. in diameter; the stout axis bears numerous whorls of compound sporophylls, the members of successive verticils being superposed. The sporophylls, of which there are eleven or twelve in a whorl, are each composed of six segments, three being inferior or dorsal, and three superior or ventral. The dorsal segments are sterile, corresponding to the bracts of *Sphenophyllum Dawsoni*, while the ventral segments constitute peltate sporangiophores, each bearing four sporangia, just as in a

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[1] In *S. speciosum* the leaves in a whorl were of unequal size.

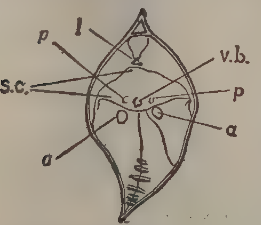
Calamarian fructification (fig. 7). The great length and slender proportions of the segments give the cone a peculiar character, but the relations of position appear to leave no doubt as to the homologies with the fructification of Sphenophylleae; as regards the sporangiophores, *Bowmanites Römeri* occupies exactly the middle place between *S. Dawsoni* and *Cheirostrobus*. The axis of the cone in *Cheirostrobus* contains a polyarch stele, with solid wood, from the angles of which vascular bundles pass out, dividing in the cortex, to supply the various segments of the sporophylls. In the peduncle of the strobilus secondary tissues are formed. While the anatomy has a somewhat Lycopodiaceous character, the arrangement of the appendages is altogether that of the Sphenophylleae; at the same time Calamarian affinities are indicated by the characters of the sporangiophores and sporangia.

The Sphenophyllales as a whole are best regarded as a synthetic group, combining certain characters of the Ferns and Lycopods with those of the Equisetales, while showing marked peculiarities of their own. Among existing plants their nearest affinities would appear to be with Psiloteae, as indicated not merely by the anatomy, but much more strongly by the way in which the sporangia are borne. There is good reason to believe that the ventral synangium of the Psiloteae corresponds to the ventral sporangiophore with its sporangia in the Sphenophyllales. Professor Thomas of Auckland, New Zealand, has brought forward some interesting variations in *Tmesipteris* which appear to afford additional support to this view.

Pseudobornia.—Professor Nathorst has described a remarkable Devonian plant, *Pseudobornia ursina* (from Bear Island, in the Arctic Ocean), which shows affinity both with the Equisetales and Sphenophyllales. The stem is articulated and branched, attaining a diameter of about 10 cm. The smaller branches bear the whorled leaves, probably four in each verticil. The leaves are highly compound, dividing dichotomously into several leaflets, each of which is deeply pinnatifid, with fine segments. When found detached these leaves were taken for the fronds of a Fern. The fructification consists of long, lax spikes, with whorled sporophylls; indications of megaspores have been detected in the sporangia. The discoverer makes this plant the type of a new class, the Pseudoborniales. At present only the external characters are known.

III. *Lycopodiales.*—In Palaeozoic ages the Lycopods formed one of the dominant groups of plants, remarkable alike for the number of species and for the great stature which many of them attained. The best known of the Palaeozoic Lycopods were trees, reaching 100 ft. or more in height, but side by side with these gigantic representatives of the class, small herbaceous Club-mosses, resembling those of the present day, also occurred. Broadly speaking, the Palaeozoic Lycopods, whatever their dimensions, show a general agreement in habit and structure with our living forms, though often attaining a much higher grade of organization. We will first take the arborescent Lycopods, as in every respect the more important group. They may all be classed under the one family Lepidodendreae, which is here taken to include *Sigillaria*.

Lepidodendreae.—The genus *Lepidodendron*, with very numerous species, ranging from the Devonian to the Permian, consisted of trees, with a tall upright shaft, bearing a dense crown of dichotomous branches, clothed with simple narrow leaves, ranged in some complex spiral phyllotaxis. In some cases the foliage is preserved *in situ*; more often, however, especially in the main stem and larger branches, the leaves had been shed, leaving behind them their scars and persistent bases, on which the characteristic sculpturing of the Lepidodendroid surface depends. The cones, often of large size, were either terminal on the smaller twigs, or, it is alleged, borne laterally on special branches of considerable dimensions. At its base the main stem terminated in dichotomous roots or rhizophores, bearing numerous rootlets. To these underground organs the name *Stigmaria* is applied; they are not clearly distinguishable from the corresponding parts of *Sigillaria*. The numerous described species of *Lepidodendron* are founded on the peculiarities of the leaf-cushions and scars, as shown on casts or impressions of the stem. The usually crowded leaf-cushions are spirally arranged, and present no obvious orthostichies, thus differing from those of *Sigillaria*. Each leaf-cushion is slightly prominent; towards its upper end is the diamond-shaped or triangular scar left by the fall of the actual leaf (fig. 8). On the scar are three prints, the central one alone representing the vascular bundle, while the lateral prints (*parichnos*) mark the position of merely parenchymatous strands. In the median line, immediately above the leaf-scar, is a print representing the ligule, or rather the pit in which it was seated. On the flanks of the cushion, below the scar, are two superficial prints, perhaps comparable to lenticels. In the genus *Lepidophloios* the leaf-cushions are more prominent than in *Lepidodendron*, and their greatest diameter is in the transverse direction; on the older stems the leaf-scar lies towards the lower side of the cushion. The genus *Bothrodendron*, going back to the Upper Devonian, differs from *Lepidodendron* in its minute leaf-scars and the absence of leaf-cushions, the scars being flush with the smooth surface of the stem. In the Lower Carboniferous of central Russia beds of coal occur consisting of the cuticles of a *Bothrodendron*, which are not fossilized, but retain the consistency and chemical composition of similar tissues in recent plants.

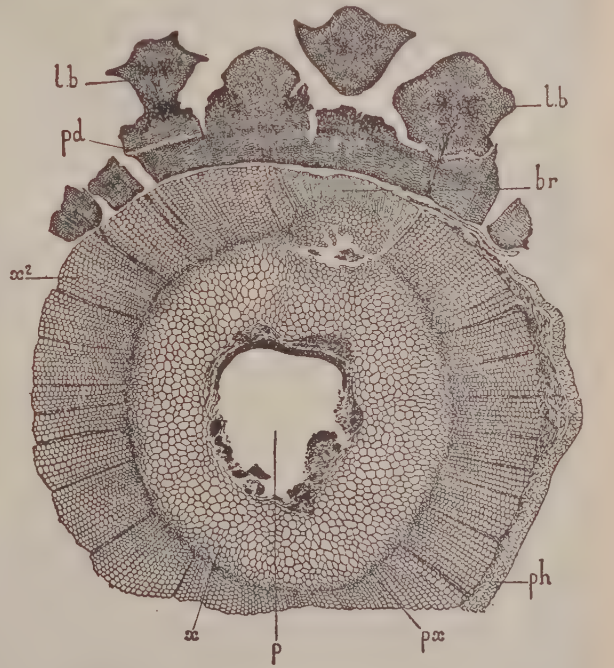


(After Stur. Scott, *Studies*.)

FIG. 8.—Leaf-base of a *Lepidodendron*.

s.c., Scar left by the leaf.
v.b., Print of vascular bundle.
p,p, Parichnos.
l, Ligule.
a,a, Superficial prints below scar.

The *anatomy* of *Lepidodendron* and its immediate allies is now well known in a number of species; the Carboniferous rocks of Great Britain are especially rich in petrified specimens, which formed the subject of Williamson's extensive investigations. The stem is in all cases monostelic; in most of the forms the central cylinder underwent secondary growth, and the distinction between primary and secondary wood is very sharply marked. In *L. Harcourtii*, however, the species earliest investigated (by Witham, 1833, and Brongniart, 1837), and in one or two other species, no secondary wood has yet been found. The primary wood of *Lepidodendron* forms a continuous cylinder, not broken up into distinct bundles; its development was clearly centripetal, the spiral elements forming more or less prominent peripheral groups. In the larger stems of most species there was a central pith, but in certain of the smaller branches, and throughout the stem in some species (*L. rhodumnense*, *L. selaginoides*), the wood was solid. A single leaf-trace, usually collateral in structure, passed out into each leaf. The primary structure of the stem was thus of a simple Lycopodiaceous type, resembling on a larger scale what we find in the upright stem of *Selaginella spinosa*. In most species (*e.g.* *L. selaginoides*, *L. Wunschianum*, *L. Veltheimianum*) secondary growth in thickness took place, and secondary wood was added, in the centrifugal direction, showing a regular radial arrangement, with medullary rays between the series of tracheides (fig. 9). The tissue thus formed often attained a considerable thickness. While



(Scott, *Studies*.)

FIG. 9.—*Lepidodendron Veltheimianum*. Transverse section of stem.

p, Pith, almost destroyed.
x, Zone of primary wood.
px, Protoxylem.
x^2, Secondary wood.
ph, Phloem and pericycle.
br, Stele of a branch.
pd, Periderm.
l.b, Leaf-bases.

The primary cortex between stele and periderm has perished. (×4¼.)

primary phloem can be recognized with certainty in favourable cases. the question of the formation of secondary phloem by the cambium is not yet fully cleared up. In the *Lepidodendron fuliginosum* of Williamson, shown by its leaf-bases to have been a *Lepidophloios*, the secondary wood is very irregular, and consists largely of parenchyma. The same is the case in *Lepidodendron obovatum*, one of the few species in which both external and internal characters are known. The occurrence of secondary growth in these plants, demonstrated by Williamson's researches, is a point of great interest. Some analogy among recent Lycopods is afforded by the stem of *Isoëtes*, and by the base of the stem in *Selaginella spinosa*; in the fossils the process was of a more normal type, but some of its details need further investigation. The cortex, often sharply differentiated into sclerotic and parenchymatous zones, is bordered externally by the persistent leaf-bases. The development of periderm was a constant feature, and this tissue attained a great thickness, consisting chiefly of a phelloderm, produced on the inner side of the formative layer, and no doubt subserving a mechanical function.

The structure of a *Bothrodendron* has recently been investigated and proves to be identical with that of the petrified stem which Williamson named *Lepidodendron mundum*. The anatomy is of the usual medullate Lepidodendroid type; no secondary growth has yet been detected in the stem.

The most interesting point in the structure of the leaf-base is the presence of a ligule, like that of *Isoëtes* or *Selaginella*, which was seated in a deep pit, opening on the upper surface of the cushion, just above the insertion of the lamina. The latter shows marked xerophytic adaptations; the single vascular bundle was surrounded by a sheath of short tracheides, and the stomata were sheltered in two deep furrows of the lower surface.

The *cones* of *Lepidodendron* and its immediate allies are for the most part grouped under the name *Lepidostrobus*. These cones, varying from an inch to a foot in length, according to the species, were borne either on the ordinary twigs, or, as was conjectured, on the special branches (*Ulodendron* and *Halonia*) above referred to. In Ulodendron the large circular, distichously arranged prints were supposed to have been formed by the pressure of the bases of sessile cones, though this interpretation of the scars is open to doubt, and it is now more probable that they bore deciduous vegetative branches; in the Halonial branches characteristic of the genus *Lepidophloios* the tubercles may perhaps mark the points of insertion of pedunculate strobili. The organization of *Lepidostrobus* is essentially that of a Lycopodiaceous cone. The axis, which in anatomical structure resembles a vegetative twig, bears numerous spirally arranged sporophylls, each of which carries a single large sporangium on its upper surface (fig. 10). The sporophyll, usually almost horizontal in position, has an upturned lamina beyond the sporangium, and a shorter dorsal lobe, so that the form of the whole is somewhat peltate. A ligule is present immediately below the lamina, its position showing that the whole of the elongated horizontal pedicel on which the sporangium is seated corresponds to the short base of a vegetative leaf. The sporangia, usually of very large size compared with those of most recent Lycopods, have a palisade-like outer wall, and contain either an immense number of minute spores or a very small number of exceedingly large spores (fig. 10). It is very doubtful whether any homosporous *Lepidostrobi* existed, but there is reason to believe that here, as in the closely allied *Lepidocarpon*, microsporangia and megasporangia were in some cases borne on different strobili. In other species (*e.g.* in the cone attributed to the Lower Carboniferous *Lepidodendron Veltheimianum*) the arrangement was that usual in *Selaginella*, the microsporangia occurring above and the megasporangia below in the same strobilus (diagram, fig. 10). The genus *Spencerites* (Lower Coal Measures) differs from *Lepidostrobus* mainly in the insertion of the sporangium, which, instead of being attached along the whole upper surface of the sporophyll, was connected with an outgrowth on its upper surface by a small neck of tissue towards the distal end. The spores of this genus are curiously winged, and intermediate in size between the microspores and megaspores of *Lepidostrobus*; the question of homospory or heterospory is not yet decided. The cones of *Bothrodendron* and another form named *Mesostrobus* are in some respects intermediate between *Lepidostrobus* and *Spencerites*. A more important deviation from ordinary Lepidostroboid structure is shown by the genus *Lepidocarpon*, from the English Coal Measures and the Lower Carboniferous of Scotland. In this fructification the organization is at first altogether that of a *Lepidostrobus*; in each megasporangium, however, only a single megaspore came to maturity, occupying almost the whole of the sporangial cavity (see fig. 12), but accompanied by the remains of its three abortive sister cells. An integument grew up from the superior surface of the sporophyll, completely enveloping the sporangium, except for a narrow crevice left open along the top. In favourable cases the prothallus is found preserved, within the functional megaspore or embryo-sac, and the whole appearance, especially as seen in a section tangential to the strobilus, is then remarkably seed-like (see diagram, fig. 11). The seed-like body was detached as a whole from the cone, and in this condition was known for many years under the name of *Cardiocarpon anomalum*, having been wrongly identified with a true Gymnospermous seed so named by Carruthers. The analogies with a seed are obvious; the chief difference is in the micropyle, which is not tubular, but forms a long crevice, running in a direction radial to the strobilus. *Lepidocarpon* affords a striking instance of homoplastic modification, for there is no reason to suppose that the Lycopods were on the line of descent of any existing Spermophyta. In a male cone, probably belonging to *Lepidocarpon Lomaxi*, the microsporangia are provided with incomplete integuments.

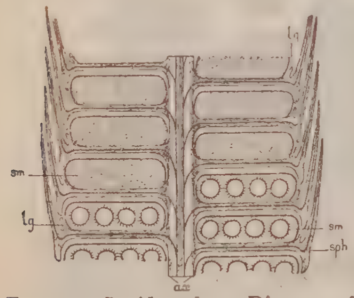


FIG. 10.—*Lepidostrobus*. Diagram of cone, in longitudinal section.

ax, Axis, bearing the sporophylls (*sph*), on each of which a sporangium (*sm*) is seated.
lg, Ligule.

The upper sporangia contain numerous microspores; in each of the lower sporangia four megaspores are shown.

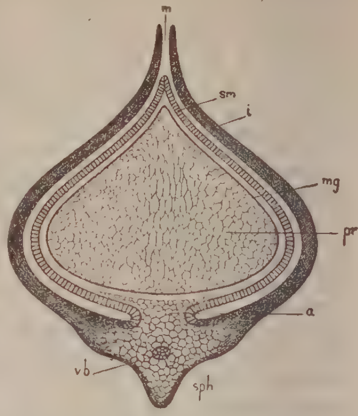
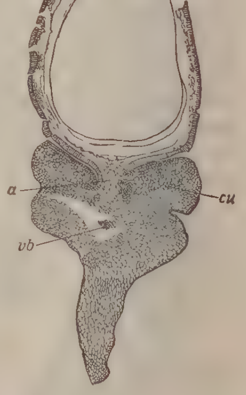


FIG. 11.—*Lepidocarpon Lomaxii*. Diagrammatic section of "seed" in plane tangential to the parent strobilus.

sph, Sporophyll.
vb, Its vascular bundle.
i, Integument.
m, Micropylar crevice.
a, Base.
sm, Wall of sporangium.
mg, Membrane of functional megaspore, which is filled by the prothallus, *pr*.

Another case of a "seed-bearing" Lycopod has lately been discovered by Miss Benson in *Miadesmia membranacea*, a slender Selaginella-like plant from the Lower Coal Measures of Lancashire. The female fructification is in the form of a rather lax strobilus. Each sporophyll bears a megasporangium, attached to its upper surface at the proximal end, containing a single large megaspore (fig. 13). The megasporangium is enclosed in an integument, which completely envelopes it, leaving only a narrow micropyle at the distal end (fig. 13). The long tentacles of the integument may have served to facilitate pollination. The seed-like character of the organ is even more striking in *Miadesmia* than in *Lepidocarpon*. There seems to be no near affinity between these genera in which the seed-habit must have arisen independently.



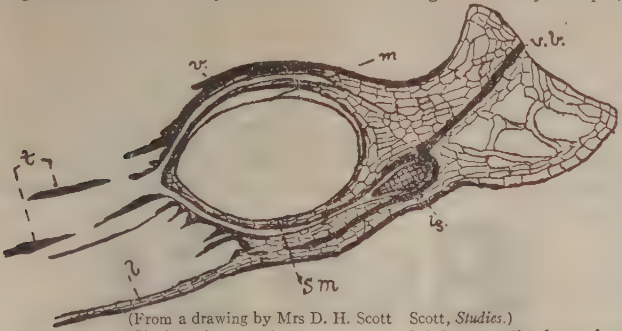
(Scott, *Studies*.)

FIG. 12.—*Lepidocarpon Lomaxii*. Sporangium and sporophyll before development of integument. (× about 12.)

cu, Lateral cushions on sporophyll.
vb, Vascular bundle.
wp, Palisade layer of sporangium-wall.
wi, Inner layer of wall.
a, Base of sporangium.
mg, Membrane of megaspore or embryo-sac.

Sigillaria.—The great genus *Sigillaria*, even richer in "species" than *Lepidodendron*, ranges throughout the Carboniferous, but has not yet been detected in earlier rocks. The Sigillariae, like the Lepidodendra, were large trees, but must have differed from those of the previous group in habit, for they appear to have branched sparingly or not at all, the lofty upright shaft terminating, like some modern *Xanthorrhaea*, in a great sheaf of long, grass-like leaves. The strobili were stalked, and borne on the main stem, among the leaves. The roots, or at least their functional representatives, resembled those of *Lepidodendron*. The chief distinctive character of *Sigillaria* lies in the arrangement of the leaf-scars, which form conspicuous vertical series on the surface of the stem.

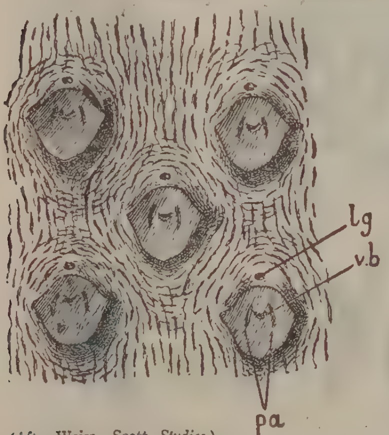
In one great division of the genus—the Eusigillariae—the stems are ribbed, each rib bearing a vertical row of leaf-scars; the ribbed Sigillariae were formerly divided into two sub-genera—*Rhytidolepis*, with the scars on each rib rather widely spaced, and *Favularia*, where they are approximated and separated by transverse furrows, each rib thus consisting of a series of contiguous leaf-bases. This distinction, however, has proved to have no constant taxonomic value, for both arrangements may occur on different parts of the same specimen. The species without ribs—Subsigillariae—were in like manner grouped under the two sub-genera *Clathraria* and *Leiodermaria*; in the former each scar is seated on a prominent cushion, while in the latter the surface of the stem (as in *Bothrodendron*) is perfectly smooth. Here also the distinction has proved not to hold good, *S. Brardi*, for example, showing both conditions on the same stem. All these names, however, are still in use as descriptive terms. Generally, the Eusigillariae are characteristic of the older Carboniferous strata, the Subsigillariae of the Upper Coal Measures and Permian. The leaf-scars throughout the genus show essentially the same prints as in *Lepidodendron*, differing only in details, and here also a ligule was present (fig. 14).



(From a drawing by Mrs D. H. Scott Scott, *Studies*.)

FIG. 13.—*Miadesmia membranacea*. Radial longitudinal section of seed-like organ. (× about 30.)

l, Lamina of sporophyll.
lg, Ligules.
vb, Vascular bundle.
sm, Sporangium-wall.
v, Velum or integument.
m, Membrane of megaspore.
t, Tentacles.



(After Weiss. Scott, *Studies*.)

FIG. 14.—*Sigillaria Brardi*. Part of surface of stem, showing five leaf-scars. (× 1½.)

vb, Print of vascular bundle.
pa, Parichnos.
lg, Ligule.

The *anatomy* of *Sigillaria* is not so well known as that of *Lepidodendron*, for specimens showing structure are comparatively rare, a fact which may be correlated with the infrequency of branching in the genus. The structure of a Clathrarian *Sigillaria* (*S. Menardi*), from the Permian of Autun, was accurately described by Brongniart as long ago as 1839, and a similar species, *S. spinulosa* (=*S. Brardi*) was investigated by Renault in 1875, but it was long before we had any trustworthy data for the anatomy of the ribbed forms. This gap in our knowledge has now been filled up, owing to Bertrand's investigation of a specimen referred by him to *S. elongata*, followed by the detailed researches of Kidston and Arber on *Sigillaria elegans*, *scutellata* and *mamillaris*. The structure of the ribbed Sigillariae, as at present known, essentially resembles that of a medullate *Lepidodendron*, though the ring of primary wood is narrower. Its outer margin is crenulated, the leaf-traces being given off from the middle of each bay. Secondary wood was formed in abundance, precisely as in most species of *Lepidodendron*. In the Subsigillarian species *S. Menardi* the primary wood is broken up into distinct bundles, while in *S. spinulosa* their separation is sometimes incomplete. The secondary cortex or periderm attained a great development, and in some cases shows considerable differentiation. On the whole, the anatomy of *Sigillaria* is closely related to that of the preceding group, and in fact a continuous series can be traced from the anatomically simplest species of *Lepidodendron* to the most modified *Sigillariae*. The leaves of *Sigillaria* are in some cases almost identical in structure with those of *Lepidodendron*, but in certain species (*S. scutellata* and *S. mamillaris*) there is evidence that they were of the *Sigillariopsis* type, the leaf being traversed by two parallel vascular strands, derived from the bifurcation of the leaf-trace.

The nature of the *fructification* of *Sigillaria* was first satisfactorily determined in 1884 by Zeiller, who found the characteristic Sigillarian leaf-scars on the peduncles of certain large strobili (*Sigillariostrobus*). The cones, of which several species have been described, bear a strong general resemblance to *Lepidostrobus*, differing somewhat in the form of the sporophylls and some other details. The megaspores (reaching 2 mm. or more in diameter) were found lying loose on the sporophylls by Zeiller; the sporangia containing them were first observed by Kidston, in a species from the Coal Measures of Yorkshire. That the cones were heterosporous there can be no doubt, though little is known as yet of the microsporangia. The discovery of *Sigillariostrobus*, which was the fructification of Subsigillariae as well as of the ribbed species, has finally determined the question of the affinities of the genus, once keenly discussed; *Sigillaria* is now clearly proved to have been a genus of heterosporous Lycopods, with the closest affinities to *Lepidodendron*.

Stigmaria.—On present evidence there is no satisfactory distinction to be drawn between the subterranean organs of *Sigillaria* and those of *Lepidodendron* and its immediate allies, though some progress in the identification of special forms of *Stigmaria* has recently been made. These organs, to which the name *Stigmaria* was given by Brongniart, have been found in connexion with the upright stems both of *Sigillaria* and *Lepidodendron*. In the Coal Measures they commonly occur in the underclay beneath the coal-seams. Complete specimens of the stumps show that from the base of the aerial stem four Stigmarian branches were given off, which took a horizontal or obliquely descending course, forking at least twice. These main Stigmarian axes may be 2 to 3 ft. in diameter at the base, and 30 or 40 ft. in length. Their surface is studded with the characteristic scars of their appendages or rootlets, which radiated in all directions into the mud. Petrified specimens of the main *Stigmaria* are frequent, and those of its rootlets extraordinarily abundant. The two parts are very different in structure: in the main axis, as shown in the common Coal Measure form *Stigmaria ficoides*, the centre was occupied by the pith, which was surrounded by a zone of wood, centrifugally developed throughout. In other species, however, the centripetal primary xylem is represented. Phloem, surrounding the wood, is recognizable in good specimens; in the cortex the main feature is the great development of periderm. The rootlets, which branched by dichotomy, contain a slender monarch stele exactly like that in the roots of *Isoëtes* and some *Selaginellae* at the present day; they possessed, however, a complex absorptive apparatus, consisting of lateral strands of xylem, connecting the stele with tracheal plates in the outer cortex. The morphology of *Stigmaria* has been much discussed; possibly the main axes, which do not agree perfectly either with rhizomes or roots, may best be regarded as comparable with the rhizophores of *Selaginellae*; they have also been compared with the embryonic stem, or protocorm, of certain species of *Lycopodium*; the homologies of the appendages with the roots of recent Lycopods appear manifest. It has been maintained by some palaeobotanists that the aerial stems of *Sigillaria* arose as buds on a creeping rhizome, but the evidence for this conclusion is as yet unconvincing.

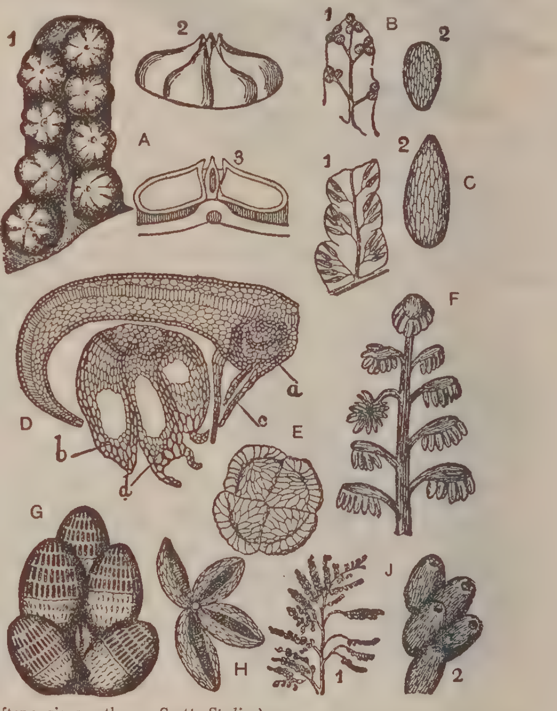
Lycopoditeae.—Under this name are included the fossil Lycopods of herbaceous habit, which occur occasionally, from the Devonian onwards. One such plant, *Miadesmia*, has already been referred to, as one of the seed-bearing Lycopods. In some Lycopoditeae the leaves were all of one kind, while others were heterophyllous, like most species of *Selaginella*. The genus *Selaginellites*, Zeiller, is now used to include those forms in which the fructification has proved to be heterosporous. In *Selaginellites Suissei* there was a definite strobilus bearing both micro- and megasporangia; in each of the latter from 16 to 24 megaspores were contained; in *Selaginellites primaevus*, however, the number of megaspores was only 4, and the resemblance to a recent *Selaginella* was thus complete. *Selaginellites elongatus*, another heterosporous species, is remarkable for having no differentiated strobilus, a condition not known in the recent genus. The antiquity of the *Selaginella* type indicates that this group had no direct connexion with the Lepidodendreae, but sprang from a distinct and equally ancient herbaceous stock. There is, however, some evidence that *Isoëtes*, which in several respects agrees more nearly with the Lepidodendreae, may actually represent their last degenerate survivors (see *Pleuromeia*, in § II., MESOZOIC). No homosporous Lycopoditeae have as yet been recognized.

IV. *Filicales*.—Of all Vascular Cryptogams the Ferns have best maintained their position down to the present day. Until recently it has been supposed that the class was well represented in the Palaeozoic period, and, indeed, that it was relatively, and perhaps absolutely far richer in species even than in the recent flora. Within the last few years, however, the position has completely changed, and the majority of the supposed Palaeozoic

Ferns are now commonly regarded as more probably seed-bearing plants, a conclusion for which, in certain cases, there is already convincing evidence. The great majority of specimens of fossil fern-like plants are preserved in the form of carbonaceous impressions of fronds, often of remarkable perfection and beauty. The characters shown by such specimens, however, when, as is usually the case, they are in the barren state, are notoriously unstable, or of small taxonomic value, among recent plants. Hence palaeobotanists have found it necessary to adopt a purely artificial system of classification, based on form and venation of the frond, in the absence of adequate data for a more natural grouping. The well-known form-genera *Pecopteris*, *Sphenopteris*, *Odontopteris*, &c., are of this provisional nature. The majority of these fronds have now fallen under suspicion and can no longer be accepted as those of Ferns; the indications often point to their having belonged to fern-like Spermophyta, as will be shown below.

It has thus become very difficult to decide what Palaeozoic plants should still be referred to the Filices. The fructifications by themselves are not necessarily decisive, for in certain cases the supposed sporangia of Marattiaceous Ferns have turned out to be in reality the microsporangia or pollen-sacs of seed-bearing plants (Pteridosperms). It is, however, probable that a considerable group of true Ferns, allied to Marattiaceae, existed in Palaeozoic times, side by side with simpler forms. In one respect the fronds of many Palaeozoic Ferns and Pteridosperms were peculiar, namely, in the presence on their rachis, and at the base of their pinnae, of anomalous leaflets, often totally different in form and venation from the ordinary pinnules. These curious appendages (*Aphlebiae*), at first regarded as parasitic growths, have been compared with the feathery outgrowths which occur on the rachis in the Cyatheaceous genus *Hemitelia*, and with the anomalous pinnules found in certain species of *Gleichenia*, at the points of bifurcation of the frond.

Marattiaceae.—A considerable number of the Palaeozoic fern-like plants show indications—more or less decisive—of Marattiaceous affinities; some account of this group will first be given. The reference of these ferns to the family Marattiaceae, so restricted in the recent flora, rests, of course, primarily on evidence drawn from the fructifications. Typically Marattiaceous sori, consisting of exannulate sporangia united to form synangia, are frequent, and are almost always found on fronds with the character of *Pecopteris*, large, repeatedly pinnate leaves, resembling those of Cyatheaceae or some species of *Nephrodium*. In certain cases the anatomical structure of these leaves is known, and found to agree generally with that of recent coriaceous fern-fronds. The petiole was usually traversed by a single vascular bundle, hippocrepiform in section—a marked point of difference from the more complex petioles of recent Marattiaceae. There is evidence that in many cases these Pecopteroid fronds belonged to arborescent plants, the stems on which they were borne reaching a height of as much as 60 ft. These stems, known as *Megaphytum* when the leaves were in two rows, and as *Caulopteris* in the case of polystichous arrangement, are frequent, especially in the Permian of the Continent; when petrified, so that their internal structure is preserved, the name *Psaronius* is employed. The structure is often a complex one, the central region containing an elaborate system of numerous anastomosing steles, accompanied by sclerenchyma; the cortex is permeated or coated by a multitude of adventitious roots, forming a thick envelope to the stem. The whole structure bears a general resemblance to that of recent Marattiaceae, though differing in detail. We will now describe some of the fructifications, which are grouped under generic names of their own; these genera, as having a more natural basis, tend to supersede the artificial groups founded on vegetative characters. The genus *Asterotheca* includes a number of Ferns, chiefly of Coal Measure age, with fronds of the *Pecopteris* type. The sori, or synangia, ranged in two series on the under-side of the fertile pinnules, are circular, each consisting of 3 to 6 sporangia, attached to a central receptacle and partly united to each other (fig. 15, A); the sporangia separated when mature, dehiscing by a ventral slit. Stur's genus *Hawlea* (fig. 15, H), characterized by the separation of the sporangia, may only represent an advanced stage of an *Asterotheca*. In *Ptychocarpus* the fusion of the sporangia to form the synangium was much more complete; *Scolecopteris* resembles *Asterotheca*, but each synangium is stalked. In all these genera there is an obvious similarity to the synangia of *Kaulfussia*, while in some respects *Marattia* or *Danaea* is approached. In another Pecopteroid genus, *Sturiella*, the synangia resemble those of *Asterotheca*, but each sporangium is provided with a band of enlarged cells of the nature of an annulus (fig. 15, D). As a similar differentiation, though less marked, appears in the recent genus *Angiopteris*, the presumption is in favour of the Marattiaceous affinities of *Sturiella*, which also shows some relation to the genus *Corynepteris* (see below, Botryopterideae). In the genus *Danaeites*, from the Coal Measures of the Saar, the synangia are much like those of the recent *Danaea*, each sporangium opening by an apical pore. In the *Grand' Eurya* of Stur the sporangia appear to have been free from each other, as in *Angiopteris*. On the whole there is thus good evidence for the frequency of Marattiaceae in the Palaeozoic period, though the possibility that the fructifications may really represent the microsporangia of fern-like spermophytes must always be borne in mind. In a certain number of genera the reference to Marattiaceae is much more doubtful. In *Dactylotheca*, for example (fig. 15, C), a Pecopteroid genus, ranging throughout the Carboniferous, the elongated sporangia individually resemble those of Marattiaceae, but they are completely isolated, the characteristic grouping in sori being absent; the same remark applies to the Sphenopteroid *Renaultia* of Zeiller (fig. 15, B); the foliage of *Sphenopteris*, one of the most extensive of Palaeozoic frond-genera, with many different types of fructification, resembled that of various species of *Asplenium* or *Davallia*. In many fern-like plants of this period the fronds were dimorphic, the fertile leaves or pinnae having a form quite different from that of the vegetative portions. This was the case in *Urnatopteris* (Kidston), with Sphenopteroid sterile foliage; the sporangia, borne on the filiform pinnules of the fertile rachis, appear to have dehisced by an apical pore (fig 15, J). The magnificent Devonian Fern *Archaeopteris hibernica*, with a somewhat Adiantiform habit, bore special fertile pinnae; the fructification is still imperfectly understood, but the presence of stipules, observed by Kidston, has been adduced in support of Marattiaceous affinities. In all these cases there is reason to suspect that the plants may have been Pteridosperms, rather than Ferns.



(After various authors. Scott, *Studies*.)

FIG. 15.—Group of Palaeozoic fructifications of Ferns or Pteridosperms.

A, *Asterotheca*. 1, Pinnule bearing 8 synangia. 2, Synangium in side view. 3, In section, magnified.

B, *Renaultia*. 1, Fertile pinnule, nat. size. 2, Sporangium, enlarged.

C, *Dactylotheca*, as in B.

D, *Sturiella*. Section of pinnule and synangium. *a*, Vascular bundle; *c*, hairs; *b*, *d*, annulus, magnified.

E, *Oligocarpia*. Sorus in surface-view, magnified.

F, *Crossotheca*. Fertile pinnule, bearing several tufts of microsporangia, magnified.

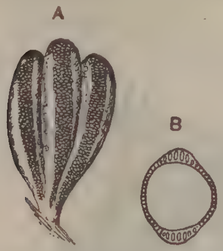
G, *Senftenbergia*. Group of annulate sporangia, magnified.

H, *Hawlea*. Synangium after dehiscence, magnified.

J, *Urnatopteris*. 1, Part of fertile pinna, nat. size. 2, Sporangia, showing apical pores, magnified.

Of the above, A, D, E, G and H, probably belong to true Ferns; F is the male fructification of a Pteridosperm (*Lyginodendron*); the rest are of doubtful nature.

Other Families.—The Marattiaceae are the only recent family of Ferns which can be supposed to have existed in anything like its present form in Palaeozoic times. Of other recent orders the indications are meagre and dubious, and there can be no doubt that a large proportion of Ferns from the older rocks (in so far as they were Ferns at all) belonged to families quite distinct from any which we recognize in the flora of our own day. Little or nothing is known of Palaeozoic Ophioglossaceae. Certain fructifications have been referred to Gleicheniaceae (*Oligocarpia*, fig. 15, E), Schizaeaceae (*Senftenbergia*, fig. 15, G), Hymenophyllaceae and Osmundaceae, and on good grounds, so far as the external characters of the sporangia are concerned; our knowledge of most of the Ferns in question is, however, far too incomplete to justify us in asserting that they actually belonged to the families indicated. In the case of the Osmundaceae there is good evidence, from anatomical characters, for tracing the family back to the Palaeozoic; their oldest members show a distinct relationship to the Botryopterideae, described in the next paragraph. Numerous more or less isolated fern-sporangia occur in the petrified material of the Carboniferous formation; the presence of an annulus is a frequent character among these specimens, while synangic sori are rare; it is thus certain that families remote from the Marattiaceae were abundantly represented during this period.



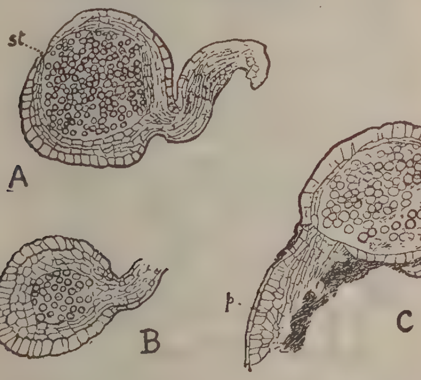
(After Renault.)

FIG. 16.—*Zygopteris pinnata.*

A, Group of sporangia, in surface view.

B, Single sporangium, in transverse section, showing annulus on both sides, magnified.

Botryopterideae.—The family *Botryopterideae*, first discovered by Renault, stands out with striking clearness among the Palaeozoic Ferns, and differs widely from any group now in existence. The *Botryopterideae* are chiefly known from petrified specimens; in the genus *Botryopteris* and certain species of *Zygopteris* we have a fairly complete knowledge of all parts of the plant. The type-genus *Botryopteris*, represented in the Permo-Carboniferous of France and in both the Lower and Upper Carboniferous of Great Britain, had a rhizome, with a very simple monostelic structure, bearing spirally arranged compound leaves, with lobed pinnules, probably of a somewhat fleshy texture. In the French species, *B. forensis*, the plant was covered with characteristic jointed hairs, which have served to identify the various organs on which they occur. The sporangia were large pyriform sacs, shortly stalked, and borne in tufts on the branches of the fertile rachis, which developed no lamina. Each sporangium had, on one side only, a longitudinal or slightly oblique annulus, several cells in width; the numerous spores were all of the same size; certain differences among them, which have been interpreted as indicating heterospory, have now proved to depend merely on the state of preservation. The genus *Zygopteris*, of which numerous Carboniferous and Permian species are known, likewise had a monostelic stem, but the structure of its vascular cylinder was somewhat complex, resembling that of the most highly differentiated Hymenophyllaceae, with which some species of *Zygopteris* also agreed in the presence of axillary shoots. There is evidence that the stem in some species was a climbing one; the pinnate leaves, arranged on the stem in a two-fifths spiral, were dimorphic, the sterile fronds resembling some forms of *Sphenopteris*. The petioles have a somewhat complex structure, the bundle often having, in transverse section, the form of an H; it has been proposed to subdivide the genus on the details of the petiolar structure. It is characteristic of *Zygopteris* and its near allies that two rows of pinnae were borne on each side of the rachis, at least in the fertile fronds. On the fertile rachis the sporangia were borne in tufts, much as in the preceding genus; they were still larger, reaching 2·5 mm. in length, and had a multiseriate annulus, extending, however, to both sides of the sporangium (see fig. 16, A and B). In *Stauropteris*, a genus showing some affinity with *Zygopteris*, the branched rachis of the fertile frond terminates in fine branchlets, each bearing a single, spherical sporangium, without any differentiated annulus (fig. 17). The spores in the sporangia have been found in a germinating condition; the stages of germination correspond closely with those observed in recent homosporous ferns (fig. 18). This fact strongly confirms the conclusion, drawn from morphological and anatomical characters, that the Botryopterideae were true Ferns. The genus *Corynepteris* of Baily is interesting from the fact that its sporangia, while individually similar to those of *Zygopteris*, were grouped in sori or synangia, resembling those of an *Asterotheca.* The family Botryopterideae appears to have included a number of other genera, though in most cases the evidence from vegetative structure is alone available. The genus *Diplolabis* of Renault, shows much in common with *Zygopteris* as regards anatomical structure, but resembles *Corynepteris* in possessing a synangic fructification. The genus *Asterochlaena* of Corda with a deeply-lobed stele, goes back to the Devonian. The family as a whole is of great interest, as presenting points of contact with various recent orders, especially Hymenophyllaceae, Osmundaceae and Ophioglossaceae; the group appears to have been a synthetic one, belonging to a primitive stock (the Primofilices of Arber) from which the later Fern families may have sprung.

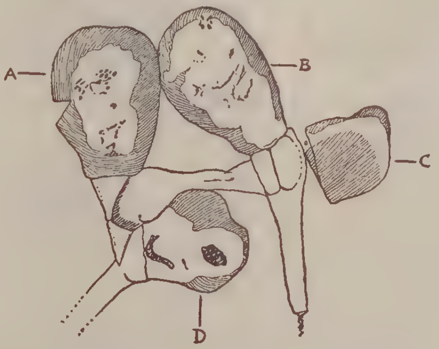


(From a drawing by Mrs D. H. Scott. Scott, *Studies.*)

FIG. 17.—*Stauropteris oldhamia.* Three sporangia borne on branchlets of the rachis. In A the stomium (*st*) or place of dehiscence is shown. B is cut tangentially. In C, *p* is the palisade tissue of the rachis. (× about 35.)

A number of genera of Palaeozoic "fern-fronds" have been described, of the fructification of which nothing is known. This is the case, for example, with *Diplotmema*, a genus only differing from *Sphenopteris* in the dichotomy of the primary pinnae, and with *Mariopteris*, which bears a similar relation to *Pecopteris.* The same holds good of the Pecopteroid Ferns included under *Callipteris* and *Callipteridium.* In such cases, as will be explained below, there is a strong presumption that the fronds were not those of Ferns, but of seed-bearing plants of the new class Pteridospermeae.

On the present evidence it appears that the class Filicales was well represented in the Palaeozoic flora, though by no means so dominant as was formerly supposed. The simpler Ferns (Primofilices) of the period are for the most part referred to the remarkable family Botryopterideae, a group very distinct from any of the more modern families, though showing analogies with them in various directions. On the other hand there was the far more complex Marattiaceous type, strikingly similar in both vegetative and reproductive characters to the recent members of the family. Although doubts have lately been cast on the authenticity of Palaeozoic Marattiaceae owing to the difficulty in distinguishing between their fructifications and the pollen-bearing organs of Pteridosperms, the anatomical evidence (stem of *Psaronius*) strongly confirms the opinion that a considerable group of these Ferns existed.



(From a drawing by Mr L. A. Boodle. Scott, *Studies.*)

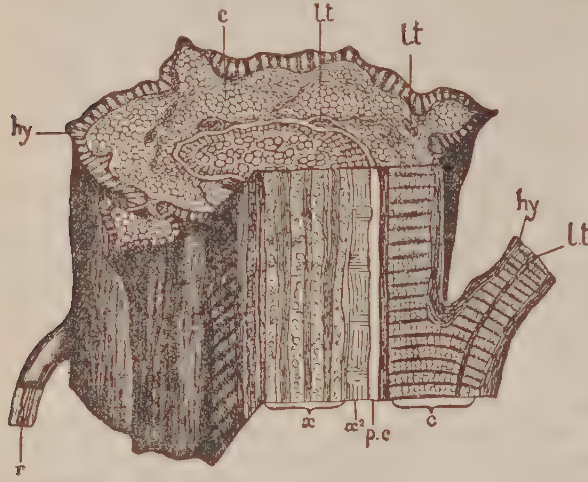
FIG. 18.—*Stauropteris oldhamia.* Four germinating spores from the interior of a sporangium. All four are putting out rhizoids. In C, lying horizontally, an additional cell has been cut off between rhizoid and spore. (× 335.)

Spermophyta.—The Pteridospermeae, for which Potonié's name *Cycadofilices* is still sometimes used, include all the fern-like plants which, on the evidence available, appear to

Pteridospermeae.

have been reproduced by means of seeds. The cases in which such evidence is decisive are but few, namely, *Lyginodendron oldhamium*, *Neuropteris heterophylla*, *Pecopteris Pluckeneti*, *Aneimites fertilis* and *Aneimites tenuifolius*. In the first-named plant the structure, both of the vegetative and reproductive organs, is known, and the evidence, from comparison and association, is sufficiently strong. In the other cases there is direct proof of continuity between seed and plant, but only the external characters are known. In a great number of forms, amounting to a majority of the Palaeozoic plants of fern-like habit, the indirect evidence is in favour of their having possessed seeds. We will begin with the Lyginodendreae, a group in which the anatomical characters indicated a systematic position between Ferns and Cycads, long before the reproductive organs were discovered.

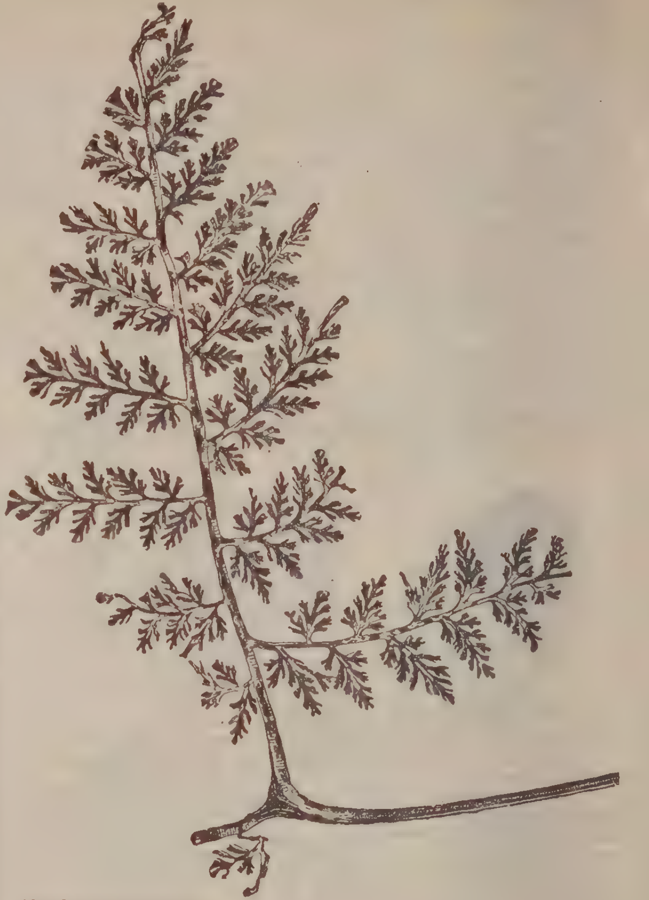
Lyginodendreae.—Of the genus *Heterangium*, which still stands very near the true Ferns, several species are known, the oldest being *H. Grievii*, of Williamson, from the Lower Carboniferous of Scotland. This plant had a long, somewhat slender, ridged stem, the ridges corresponding to the decurrent bases of the spirally arranged leaves (fig. 19). The specimens on which the genus was founded are petrified, showing structure rather than habit, but conclusive evidence has now been obtained that the foliage of *H. Grievii* was of the type of *Sphenopteris* (*Diplotmema*) *elegans* (fig. 20), and was thus in appearance altogether that of a Fern, with somewhat the habit of an *Asplenium*. The stem has a single stele, resembling in general primary structure that of one of the simpler species of *Gleichenia*; there is no pith, the wood extending to the centre of the stele. The leaf-traces, where they traverse the cortex, have the structure of the foliar bundles in Cycads, for they are of the collateral type, and their xylem is mesarch, the spiral elements lying in the interior of the ligneous strand. The leaf-traces can be distinguished as distinct strands at the periphery of the stele, as shown in fig. 21. Most of the specimens had formed a zone of secondary wood and phloem resembling the corresponding tissues in a recent Cycad; the similarity extended to minute histological details, as is shown especially in *H. tiliaeoides*, a Coal Measures species, where the preservation is remarkably perfect. The cortex was strongly constructed mechanically; in addition to the strands of fibres at the periphery, horizontal plates of stone-cells were present in the inner cortex, giving both stem and petiole a transversely striated appearance, which has served to identify the different parts of the plant, even in the carbonized condition (cf. figs. 19 and 20). The single vascular bundle which traversed the petiole and its branches was concentric, the leaves resembling those of Ferns in structure as well as in habit. *Heterangium* shows, on the whole, a decided preponderance of Filicinean vegetative characters, though in the leaf-traces and the secondary tissues the Cycads are approached. The organs of reproduction are not yet known, though there is a probability that an associated seed allied to *Lagenostoma* (see below) belonged to *Heterangium*. In the Coal Measure genus *Megaloxylon*, of Seward, which in structure bears a general resemblance to *Heterangium*, the primary wood consists for the most part of short wide tracheides; probably, as the secondary tissues increased, it had become superfluous for conducting purposes, and was adapted rather for water-storage. In the genus *Lyginodendron*, of which *L. oldhamium*, from the



(After Williamson. Scott, *Studies.*)

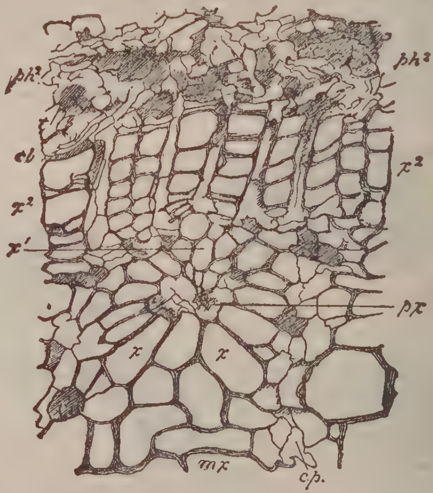
FIG. 19.—*Heterangium Grievii*. Restoration of Stem, shown partly in transverse and longitudinal section, partly in surface view.

x, Primary wood.
x^2, Secondary wood.
$p.c$, Phloem and pericycle.
c, Cortex.
hy, Hypoderma.
$l.t$, $l.t$, Leaf-traces.
r, Adventitious root. Several leaf-bases are shown.



(After Stur. Scott, *Studies.*)

FIG. 20.—*Sphenopteris elegans* (foliage of *Heterangium Grievii*). Part of frond. ($\frac{2}{3}$ nat. size.)

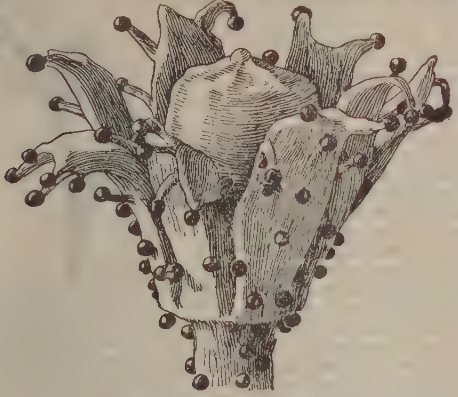


(Scott, *Studies.*)

FIG. 21.—*Heterangium Grievii*. Part of the stele of the stem in transverse section, showing a primary xylem-strand and adjacent tissues (× 135.)

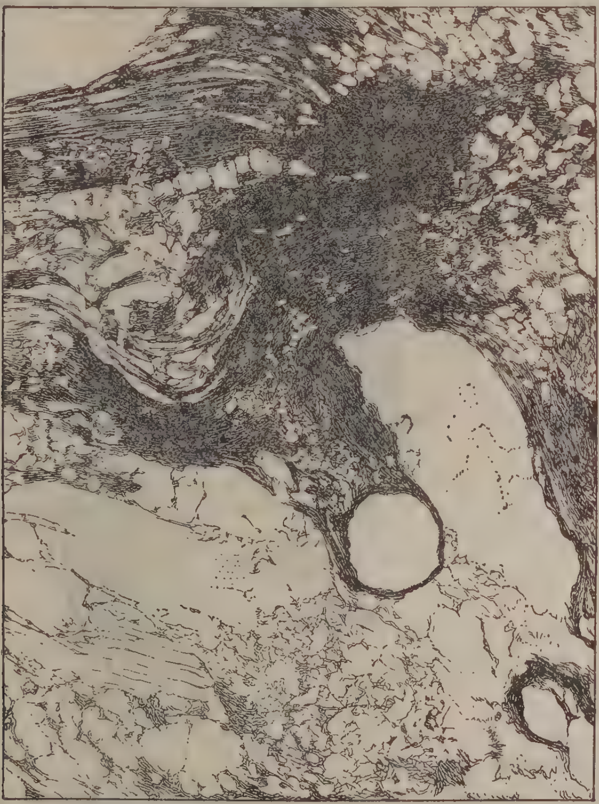
px, Protoxylem of strand.
x, Centripetal.
x^1, Centrifugal primary wood.
mx, Part of the internal wood.
$c.p$, Conjunctive tissue.
x^2, Secondary wood.
cb, Cambium.
ph^2, Phloem.

Coal Measures, is now the best-known of all Palaeozoic plants, the central wood has disappeared altogether and is replaced by pith; the primary wood is only represented in the leaf-trace strands, which form a ring of distinct collateral bundles around the pith; thus the "medullate-monostelic" structure characteristic of the higher plants was already attained. The individual bundles, however, have the same structure as in *Heterangium*, and agree closely with the foliar bundles of Cycads. The secondary tissues, which are highly developed, are also of a Cycadean character (fig. 22, Plate). The vegetative organs of the plant are very completely known; the foliage has proved to be that of a *Sphenopteris*, identical with the species long known under the name of *S. Höninghausi.* Apart from the important advance shown in the anatomy of the stem, *Lyginodendron* agrees structurally with *Heterangium.* There is reason to believe that *Lyginodendron oldhamium* was a climbing plant comparable in some respects to such recent Ferns as *Davallia aculeata.* The roots were at first like those of Marattiaceae but grew in thickness like the roots of Gymnosperms.



(From a model after Oliver.)

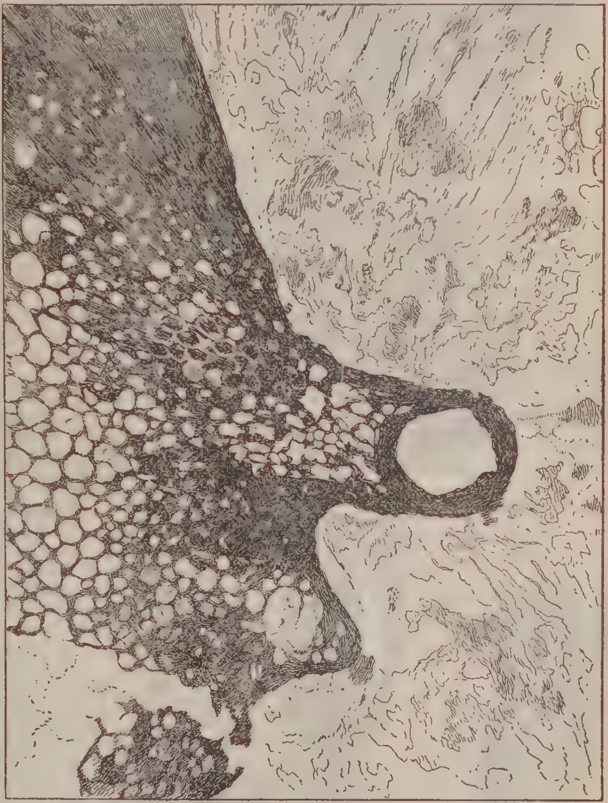
FIG. 23.—*Lagenostoma Lomaxii* (the seed of *Lyginodendron*). Restoration of a seed, enclosed in the lobed cupule, which bears numerous glands. (× about 15.)



(From a photograph. Scott, *Studies.*)

FIG. 24.—Capitate gland on the cupule of *Lagenostoma Lomaxii.* (× 70.)

The first definite evidence of the mode of reproduction of *Lyginodendron oldhamium* was due to F. W. Oliver, who in 1903 identified the seed, *Lagenostoma Lomaxii*, by means of the glands on its cupule, which agree exactly with those on the associated leaves and stems of the plant (cf. figs. 24 and 25). No similar glands are known on any other Palaeozoic plant. *Lagenostoma Lomaxii* is a small barrel-shaped seed (5·5 by 4·25 mm. when mature) enclosed in a husk or cupule, which completely enveloped it when young, but was ultimately open (figs. 23 and 26 and fig. 27 from another species). The seed was stalked, and there is an exact agreement in structure between the vascular strands of the stalk and cupule of the seed, and those of the rachis and leaflets of *Lyginodendron*, thus confirming the evidence from the glands. The seed itself is of a Cycadean type, and radially symmetrical. The single integument is united to the nucellus, except at the top, and is traversed by about nine vascular strands. In the apex of the nucellus, as in most Palaeozoic seeds and in recent Cycads, a pollen-chamber, for the reception of the pollen-grains or microspores, is excavated (fig. 26). In *Lagenostoma* the pollen-chamber has a peculiar structure, a solid column of tissue rising up in the middle, leaving only a narrow annular crevice, in which pollen-grains are found. The neck of the flask-shaped pollen-chamber projected a little from the micropyle and no doubt received the pollen directly. The seed, which need not be described in further detail, was a highly organized structure, showing little trace of the cryptogamic megasporangium from which we must suppose it to have been derived. From the structure of the seed-bearing stalk, and from the analogy of the similar form *Lagenostoma Sinclairi* (fig. 27) it appears that the seed was borne on a leaf, or part of a leaf, reduced to a branched rachis.

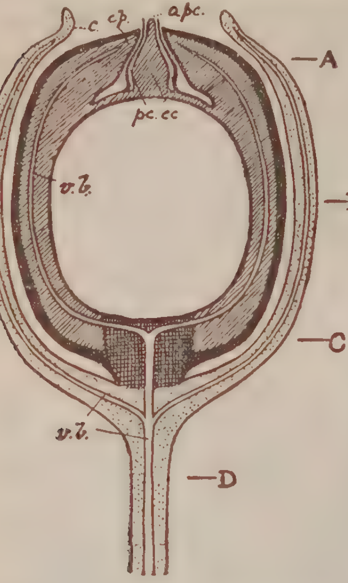


(From a photograph. Scott, *Studies.*)

FIG. 25.—Capitate Gland on the Petiole of *Lyginodendron oldhamium.* (× 70.)

The male organs of *Lyginodendron* were discovered by Kidston, a year or two after the seeds were identified. They are of the type known as *Crossotheca*, formerly regarded as a Marattiaceous fructification. The genus is characterized by the arrangement of the sporangia, which hang down from the lower surface of the little oval fertile leaflets, the whole resembling an epaulet with its fringe (fig. 15, F; fig. 28). In the case of *Lyginodendron* the *Crossotheca* occurs in connexion with the vegetative parts of the frond. Each fertile pinnule bore six, or rarely seven fusiform microsporangia, described as bilocular; not improbably each may represent a synangium The microspores are tetrahedral. This is the first case in which the pollen-bearing organs of a Pteridosperm have been identified with certainty

It will be seen that, while the seeds of *Lyginodendron* were of an advanced Cycadean type, the microsporangiate organs were more like those of a Fern, the reproductive organs thus showing the same combination of characters which appears in the vegetative structure. The family *Calamopityeae*, allied anatomically to Lyginodendreae, is of Devonian and Lower Carboniferous age.

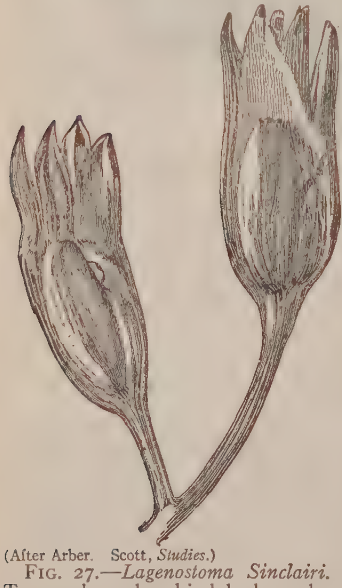


A, Micropylar region.
B, Body of seed.
C, Chalazal region.
D, Stalk.
c, Cupule, surrounding seed.
vb, Vascular bundles of stalk, cupule and integument.
cp, "Canopy," or water-reservoir, at top of integument.
pc, Cavity of pollen-chamber.
cc, Central column.
apc, Aperture of pollen-chamber.

(After Oliver. Scott, *Studies*.)

FIG. 26.—*Lagenostoma Lomaxii*. Diagram of seed in median longitudinal section.

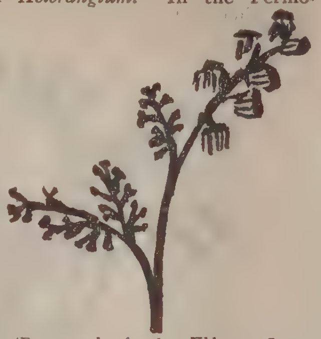
Cycadoxyleae.—A few Coal Measure and Permian stems (*Cycadoxylon* and *Ptychoxylon*) resemble *Lyginodendron* in the general character of their tissues, but show a marked reduction of the primary wood, together with an extensive development of anomalous wood and bast around the pith, a peculiarity which appears as an individual variation in some specimens of *Lyginodendron oldhamium*. It is probable that these stems belonged to plants with the fructification and foliage of Cycads, taking that group in the widest sense. It is only quite at the close of the Palaeozoic period that Cycads begin to appear. The Lyginodendreae type of structure, however, appears to have formed the transition not only to the Cycadales, but also to the extinct family Cordaiteae, the characteristic Palaeozoic Gymnosperms (see p. 107).



(After Arber. Scott, *Studies*.)

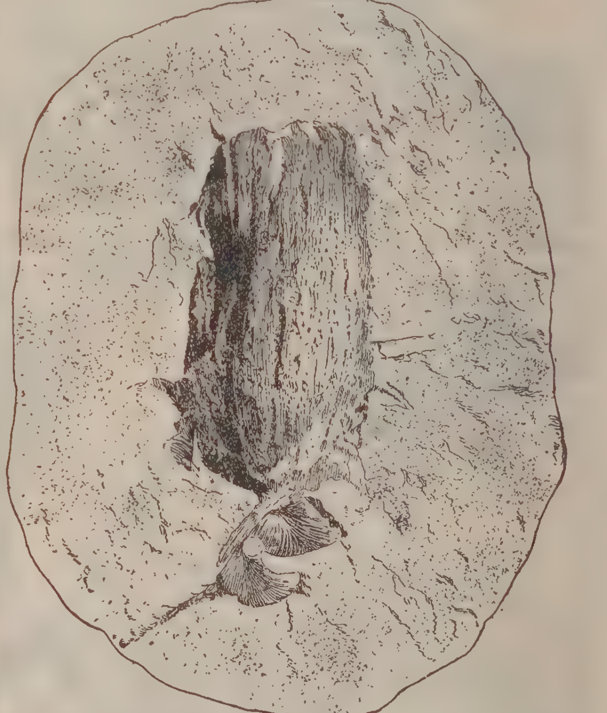
FIG. 27.—*Lagenostoma Sinclairi*. Two seeds, enclosed in lobed cupules and borne on branches of the rachis. (× 5.)

Medulloseae.—In some respects the most remarkable family of the Cycad-fern alliance is that of the Medulloseae, seed-bearing plants often of great size, with a fern-like foliage, and a singularly complex anatomical structure without parallel among recent plants. Some of the Medulloseae must have had a habit not unlike that of tree-ferns, with compound leaves of enormous dimensions, belonging to various frond-genera—especially, as has now been proved, to *Alethopteris* and *Neuropteris*; these are among the most abundant of the Carboniferous fronds commonly attributed to Ferns, and extend back to the Devonian. In habit some species of *Alethopteris* resembled the recent *Angiopteris*, while the *Neuropteris* foliage may be compared with that of an *Osmunda*. The *Medullosa* stems have been found chiefly in the Permo-Carboniferous of France and Germany, but a Coal Measures species (*M. anglica*) has been discovered in Lancashire. The great anatomical characteristic of the stem of the Medulloseae is its polystelic structure with secondary development of wood and bast around each stele. In *M. anglica*, the simplest species known, the steles are uniform, and usually only three in number; the structure of the stem is essentially that of a polystelic *Heterangium*. In the Permo-Carboniferous species, such as *M. stellata* and *M. Leuckarti*, the arrangement is more complicated, the steles showing a differentiation into a central and a peripheral system; the secondary growth was extensive and unequal, usually attaining its maximum on the outer side of the peripheral steles. In certain cases the structure was further complicated by the appearance of extrafascicular zones exterior to the whole stelar system. The spirally arranged petioles (*Myeloxylon*) were of great size, and their decurrent bases clothed the surface of the stem; their structure is closely similar to that of recent Cycadean petioles; in fact, the leaves generally, like those of *Stangeria* at the present day, while fern-like in habit, were Cycadean in structure. In the case of *Medullosa anglica* we have an almost complete knowledge of the vegetative organs—stem, leaf and root; Cycadean characters no doubt predominate, but the primary organization of the stem was that of a polystelic Fern. In the new genus *Sutcliffia*, also from the Coal Measures of Lancashire, the stem had a single, large central stele, from which smaller strands were given off, forming a kind of network, which gave rise to the numerous concentric leaf-traces which entered the petioles. This plant may be regarded as anatomically the most primitive of the Medulloseae.



(From a sketch after Kidston. Scott, *Studies*.)

FIG. 28.—*Crossotheca Höninghausi*, the male fructification of *Lyginodendron*. Fertile leaflets, bearing sporangia, and sterile leaflets on the rachis of the same leaf. (× 2.)



(After Kidston. Scott, *Studies*.)

FIG. 29.—*Neuropteris heterophylla*. Seed, attached to a branch of the rachis bearing two vegetative leaflets. (× 2.)

In one member of the Medulloseae, there is direct evidence of reproduction by seeds, for in *Neuropteris heterophylla* Kidston has demonstrated that large seeds, of the size of a hazel-nut, were borne on the frond (fig. 29). In this case the internal structure is not known, but another seed, *Trigonocarpus Parkinsoni*, associated with, and probably belonging to, the Alethopterid species, *Medullosa anglica*, occurs in the petrified condition and has been fully investigated. This is a large seed, with a very long micropyle; it has a beaked pollen-chamber, and a complex integument made up of hard and fleshy layers, closely resembling the seed of a modern Cycad; the nucellus, however, was free from the integument, each having its own vascular system. Various other seeds of the same type are known, and in a great number of instances Grand' Eury has found the fronds of Neuropterideae (Medulloseae) in close association with definite species of seeds, so there can be little doubt that the whole family was seed-bearing. Very little is known at present of the male organs. Some authors have been so much impressed by the similarity of this extinct family to the Cycads, that they have regarded them as being on the direct line of descent of the latter group; it is more probable, however, that they formed a short divergent phylum, distinct, though not remote, from the Cycadean stock.

Pecopterideae.—It has now been established that the form-genus *Pecopteris*, once regarded as representing the typical Marattiaceous foliage, was in part made up of seed-bearing plants. In 1905 Grand' Eury discovered the seeds of *Pecopteris Pluckeneti*, an Upper Coal Measure species, attached, in immense numbers, to the fronds, which are but little modified as compared with the ordinary vegetative foliage. The seeds are flat and winged, closely resembling those of some Cordaiteae (see below). Another form of fructification, compared to the sori of *Dicksonia*, appears to represent the male organs. There is reason to believe that other species of *Pecopteris* and similar genera, (*Callipteris* and *Mariopteris*) bore seeds, though the artificial group Pecopterideae probably also includes the fronds of true Marattiaceous Ferns.

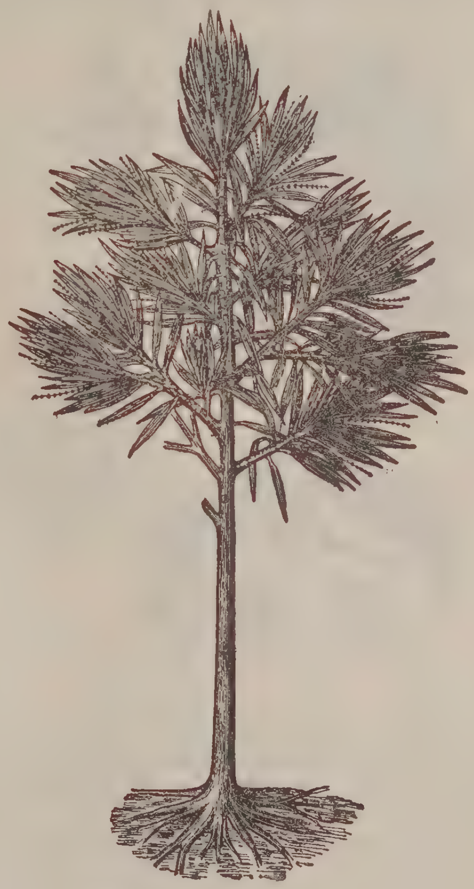
Aneimiteae.—The genus *Aneimites*, resembling the Maidenhair Ferns in habit, has now been transferred to the Pteridosperms, the seeds having been discovered in 1904 by David White. In *A. fertilis*, from the Pottsville beds (Millstone Grit) of West Virginia, the rhomboidal seeds, flattened and winged like those of Cordaiteae, are borne terminally on the lateral pinnae of a frond, which elsewhere bears the characteristic cuneiform leaflets. Continuity between seeds and frond was also demonstrated in another species, *A. tenuifolius*. The allied genus *Eremopteris* occurs in association with seeds of a similar platyspermic type.

The Pteridosperms, of which only a few examples have been considered, evidently constituted a group of vast extent in Palaeozoic times. In a large majority of the Fern-like fossils of that period the evidence is in favour of reproduction by seeds, rather than by the cryptogamic methods of the true Ferns. The class, though clearly allied to the typical Gymnosperms, may be kept distinct for the present on account of the relatively primitive characters shown in the anatomy and morphology, and may be provisionally defined as follows: plants resembling Ferns in habit and in many anatomical characters, but bearing seeds of a Cycadean type; seeds and microsporangia borne on fronds only slightly modified as compared with the vegetative leaves.

Gymnosperms.

Gymnospermous remains are common in Palaeozoic strata from the Devonian onwards. The investigations of the last quarter of the 19th century established that these early representatives of the class did not, as a rule, belong to any of its existing families, but formed for the most part a distinct group, that of the Cordaitales, which has long since died out. Specimens of true Cycads or Conifers are rare or doubtful until we come to the latest Palaeozoic rocks. Our knowledge of the Cordaiteae (the typical family of the class Cordaitales) is chiefly due to the French investigators, Grand' Eury and Renault, who successfully brought into connexion the various fragmentary remains, and made known their exact structure.

Cordaitales.—The discovery of the fossil trunks and of their rooted bases has shown that the Cordaiteae were large trees, reaching 30 metres or more in height; the lofty shaft bore a dense crown of branches, clothed with long simple leaves, spirally arranged. Fig. 30, founded on one of Grand' Eury's restorations, gives an idea of the habit of a tree of the genus *Dorycordaites*, characterized by its lanceolate acute leaves; in the typical *Cordaites* they were of a blunter shape, while in *Poacordaites* they were narrow and grass-like. The leaves as a rule far exceeded in size those of any of the Coniferae, attaining in some species a length of a metre. Of living genera, *Agathis* (to which the Kauri Pine of New Zealand belongs) probably comes nearest to the extinct family in habit, though at a long interval. The stem resembled that of Cycads in having a large pith, sometimes as much as 4 in. in diameter; the wood, however, was dense, and had the structure of that of an Araucarian Conifer; specimens of the wood have accordingly been commonly referred to the genus *Araucarioxylon*, and at one time the idea prevailed that wood of this type indicated actual affinity with Araucarieae. Other characters, however, prove that the Cordaiteae were remote from that family, and the name *Araucarioxylon* is best limited to wood from later horizons, where a near relationship to Araucarieae is more probable.[1] In some cases the external tissues of the Cordaitean stem are well preserved; the cortex possessed a system of hypodermal strands of fibres, comparable to those found in the Lyginodendreae. In most cases the leaf-traces passed out from the stem in pairs, as in the recent *Ginkgo*; dividing up further as they entered the leaf-base. In many Cordaiteae the pith was *discoid*, *i.e.* fistular and partitioned by frequent diaphragms, as in some species of *Pinus* and other plants at the present day. The curious, transversely-ribbed fossils known as *Sternbergia* or *Artisia* have proved to be casts of the medullary cavity of Cordaiteae; their true nature was first demonstrated by Williamson in 1850. In those stems which have been referred with certainty to the Cordaiteae there is no centripetal wood; the spiral elements are adjacent to the pith, as in a recent Conifer or Cycad; certain stems, however, are known which connect this type of structure with that of the Lyginodendreae; this, for example, is the case in the Permian genus *Poroxylon*, investigated by Bertrand and Renault, which in general structure has much in common with Cordaiteae, but possesses strands of primary wood, mainly centripetal, at the boundary of the pith, as in the case in *Lyginodendron*. Stems (*Mesoxylon*) intermediate in structure between *Poroxylon* and *Cordaites* have lately been discovered in the English Coal Measures. Corresponding strands of primary xylem have been observed in stems of the genus *Pitys* (Witham), of Lower Carboniferous age, which consisted of large trees, probably closely allied to *Cordaites*. There appears, in fact, so far as stem-structure is concerned, to have been no sharp break between the typical Palaeozoic Gymnosperms and pronounced Pteridosperms such as *Lyginodendron*.



(After Grand' Eury, modified. Scott, *Studies*.)

FIG. 30.—*Dorycordaites*. Restoration, showing roots, trunk and branches bearing long lanceolate leaves and fructifications. The trunk is shown too short.

The long, parallel-veined leaves of the Cordaiteae, which were commonly referred to Monocotyledons before their structure or connexion with other parts of the plant was known, have been shown by Renault to have essentially the same anatomy as a single leaflet of a Cycad such as *Zamia*. The vascular bundles, in particular, show precisely the characteristic collateral mesarch or exarch structure which is so constant in the recent family (see ANATOMY OF PLANTS). In fact, if the foliage alone were taken into account, the Cordaiteae might be described as simple-leaved Cycads. The reproductive organs, however, show that the two groups were in reality very distinct. Both male and female inflorescences have frequently been found in connexion with leaf-bearing branches (see restoration, fig. 30). The inflorescence is usually a spike bearing lateral cones or catkins, arranged sometimes distichously, sometimes in a spiral order. The investigation of silicified specimens has, in the hands of Renault, yielded striking results. A longitudinal section of a male *Cordaianthus* (the name applied to isolated fructifications) is shown in fig. 31, A, Plate. The organ figured is one of the catkins (about a centimetre in length) which were borne laterally on the spike. Some of the stamens are inserted between the bracts, in an apparently axillary position, while others are grouped about the apex of the axis. Each stamen consists of a long filament, bearing several erect, cylindrical pollen-sacs at its summit (cf. fig. 31, B, Plate). Some of the pollen-sacs had dehisced, while others still retained their pollen. The stamens are probably best compared with those of *Ginkgo*, but they have also been interpreted as corresponding to the male "flowers" of the Gnetaceae. In any case the morphology of the male Cordaitean fructification is clearly very remote from that of any of the Cycads or true Coniferae, though some resemblance to the stamens of Araucarieae may be traced. The female inflorescences vary considerably in organization; in some species the axis of the spike bears solitary ovules, each accompanied by a few bracts, while in others the lateral appendages are catkins, each containing from two to several ovules. In the catkin shown in longitudinal section in fig. 32, A, it appears that each ovule was borne terminally, on an extremely short axillary shoot, as in *Taxus* among recent Gymnosperms. The ovule consists of an integument (regarded by some writers as double) enclosing the nucellus. In the upper part of the nucellus is a cavity or pollen-chamber, with a narrow canal leading into it, precisely as in the ovules of *Stangeria* or other Cycads at the present day (fig. 32, B). Within the pollen-chamber, and in the canal, pollen-grains are found, agreeing with those in the anthers, but usually of larger size (fig. 32, C). It was in this case that Renault first made the exceedingly interesting discovery that each pollen-grain contains a group of cells, presumably representing an antheridium (fig. 32, C). Recent observations have completely confirmed Renault's interpretation of the facts, on which some doubt had been cast. In the isolated seeds of Cordaitales and Pteridosperms, pollen-grains are often found within the pollen-chamber, and the pluricellular structure of these pollen-grains has been repeatedly demonstrated. In the light of our present knowledge of *Ginkgo* and the Cycads, there can scarcely be a doubt that spermatozoids were formed in the cells of the antheridium of the Cordaitean pollen-grain and that of other Palaeozoic Spermophyta; the antheridium is much more developed than in any recent Gymnosperm, and it may be doubted whether any pollen-tube was formed. The morphology of the female inflorescence of Cordaiteae has not yet been cleared up, but *Taxus* and *Ginkgo* among recent plants appear to offer the nearest analogies. Much further investigation will be needed before the homologies between Cordaitean cones and the fructifications of the higher Cryptogams can be established. Anatomically the connexion of the family with the Pteridosperms (and through them, presumably, with some primitive group of Ferns) seems clear, but we have as yet no indications of the stages in the evolution of their reproductive organs. The class Cordaitales extends back to the Devonian, and it must be borne in mind that our knowledge of their fructifications is practically limited to representatives from the latest Palaeozoic horizons.

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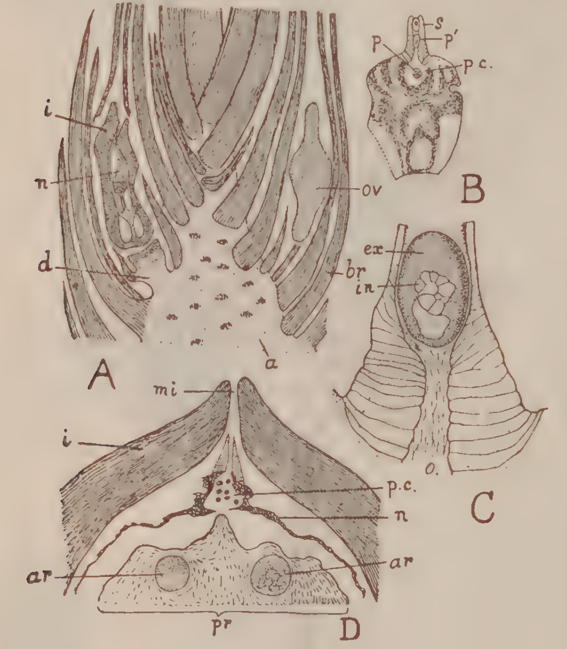
[1] Endlicher's name *Dadoxylon* is conveniently used for Palaeozoic specimens of the kind in question when nothing beyond the wood-structure is known.



(All after Renault.)

FIG. 32.—*Cordaianthus.*

A, *C. Williamsoni.* Part of longitudinal section of ♀ catkin; *a*, axis, showing v. bundles in tangential section; *br*, bracts; *d*, short axillary shoot, bearing a bracteole and a terminal ovule; *i*, integument; *n*, nucellus of ovule; *ov*, another ovule seen from the outside. (× about 10.)

B, *C. Grand' Euryi.* Nucellus of an ovule; *p.c*, pollen-chamber; *s*, canal leading to *p.c*; *p*, pollen-grains in *p.c*; *p'*, do. in canal. (× about 30.)

C, *C. Grand' Euryi.* Lower part of canal, enlarged; *o*, cavity of canal, surrounded by a sheath of cells, dilated towards the bottom of canal, in which a large pollen-grain is caught; *ex*, exterior of pollen-grain; *in*, internal group of prothallial or antheridial cells. (× 150.)

D, *Cycadinocarpus augustodunensis.* Upper part of seed, in longitudinal section; *i*, integument; *mi*, micropyle; *n*, remains of nucellus; *p.c*, pollen-chamber (containing pollen-grains), with its canal extending up to the micropyle; *pr*, part of prothallus; *ar*, archegonia. All figures magnified.

Isolated fossil seeds are common in the Carboniferous and Permian strata; in all cases they are of the orthotropous type, and resemble the seeds of Cycads or *Ginkgo* more nearly than those of any other living plants. Their internal structure is sometimes admirably preserved, so that the endosperm with its archegonia is clearly shown (fig. 32, D). It is a curious fact that in no case has an embryo been found in any of these seeds; probably fertilization took place after they were shed, and was followed immediately by germination. There is good evidence that many of the seeds belonged to Cordaitales, especially those seeds which had a flattened form, such as *Cardiocarpus*, *Cycadinocarpus*, *Samaropsis*, &c. Seeds of this kind have been found in connexion with the *Cordaianthus* inflorescences; the winged seeds of *Samaropsis*, borne on long pedicels, are attributed by Grand' Eury to the genus *Dorycordaites*. Many other forms of seed, and especially those which show radial symmetry, as for example *Trigonocarpus*, *Stephanospermum* and *Lagenostoma* belonged, as we have seen, to some of the plants grouped under Pteridospermeae, though other Pteridosperms had flattened seeds not as yet distinguishable from those of Cordaitales. The abundance and variety of Palaeozoic seeds, still so often of undetermined nature, indicate the vast extent of the spermophytic flora of that period.

The modern Gymnospermous orders have but few authentic representatives in Palaeozoic rocks. The history of the Ginkgoales will be found in the Mesozoic section of this article (see also GYMNOSPERMS); their nearest Palaeozoic representatives "were probably members of the Cordaitales, an extinct stock with which the Ginkgoaceae are closely connected" (Seward). Remains referable to Cycadophyta, so extraordinarily abundant in the succeeding period, are scanty. The curious genus *Dolerophyllum* (Saporta) may be mentioned in this connexion. This genus, from the Permo-Carboniferous of Autun, is represented by large, fleshy, reniform leaves or leaflets, with radiating dichotomous venation; the vascular bundles have in all respects the structure of those in the leaves of Cycads or Cordaiteae. The male sporophylls are similar in form to the vegetative leaves, but smaller; sunk in their parenchyma are numerous tubular loculi, containing large pollen-grains, which are pluricellular like those of *Cordaites*; the female fructification had not yet been identified with certainty. The curious male sporophylls may perhaps be remotely comparable to those recently discovered in Mesozoic Cycadophyta, of the group Bennettiteae. Some leaves of Cycadean habit (*e.g. Pterophyllum*, *Sphenozamites*) occur in the Coal Measures and Permian, and it is possible that the obscure Coal Measure genus *Noeggerathia* may have Cycadean affinities. A fructification from the Permian of Autun, named *Cycadospadix milleryensis* by Renault, appears to belong to this family.

Now that the numerous specimens of wood formerly referred to Coniferae are known to have belonged to distinct orders, but few true Palaeozoic Conifers remain to be considered. The most important are the upper Coal Measure or Permian genera *Walchia*, *Ullmannia* and *Pagiophyllum*, all of which resembled certain Araucarieae in habit. In the case of *Walchia* there is some evidence as to the fructifications, which in one species (*W. filiciformis*) appear to be comparable to female Araucarian cones. There are also some anatomical points of agreement with that family. It is probable, however, that under the same generic name very heterogeneous plants have been confounded. In the case of *Ullmannia* the anatomical structure of the leaf, investigated by Solms-Laubach, proves at any rate that the tree was Coniferous.

There is no proof of the existence of Gnetaceae in Palaeozoic times. The very remarkable plumose seeds described by Renault under the name *Gnetopsis* are of uncertain affinity, but have much in common with *Lagenostoma*, the seed of *Lyginodendron*.

Succession of Floras.

Our knowledge of vegetation older than the Carboniferous is still far too scanty for any satisfactory history of the Palaeozoic Floras to be even attempted; a few, however, of the facts may be advantageously recapitulated in chronological order.

No recognizable plant-remains, if we accept one or two doubtful Algal specimens, have so far been yielded by the Cambrian. From the Ordovician and Silurian, however, a certain number of authentic remains of Algae (among many more that are questionable) have been investigated; they are for the most part either verticillate Siphonae, or the large—possibly Laminariaceous—Algae named *Nematophycus*, with the problematical but perhaps allied *Pachytheca*. The evidence for terrestrial Silurian vegetation is still dubious; apart from some obscure North American specimens, the true nature of which is not established, Potonié has described well-characterized Pteridophytes (such as the fern-like *Sphenopteridium* and *Bothrodendron* among Lycopods) from supposed Silurian strata in North Germany; the horizon, however, appears to be open to much doubt, and the specimens agree so nearly with some from the Lower Carboniferous as to render their Silurian age difficult of credence. The high development of the terrestrial flora in Devonian times renders it probable that land-plants existed far back in the Silurian ages, or still earlier. Even in the Lower Devonian, Ferns and Lepidodendreae have been recognized; the Middle and Upper Devonian beds contain a flora in which all the chief groups of Carboniferous plants are already represented. Considering the comparative meagreness of the Devonian record, we can scarcely doubt that the vegetation of that period, if adequately known, would prove to have been practically as rich as that of the succeeding age. Among Devonian plants, Equisetales, including not only *Archaeocalamites*, but forms referred to *Asterophyllites* and *Annularia*, occur; *Sphenophyllum* is known from Devonian strata in North America and Bear Island, and *Pseudobornia* from the latter; Lycopods are represented by *Bothrodendron* and *Lepidodendron*; a typical *Lepidostrobus*, with structure preserved, has lately been found in the Upper Devonian of Kentucky. Fern-like plants such as Sphenopterideae, *Archaeopteris* and *Aneimites*, with occasional arborescent Pecopterideae, are frequent; many of the genera, including *Alethopteris*, *Neuropteris* and *Megalopteris*, probably belonged, not to true Ferns, but to Pteridosperms; although our knowledge of internal structure is still comparatively scanty, there is evidence to prove that such plants were already present, as for example, the genus *Calamopitys*. The presence of Cordaitean leaves indicates that Gymnosperms of high organization already existed, a striking fact, showing the immense antiquity of this class compared with the angiospermous flowering plants.

Any detailed account of the horizons of Carboniferous plants would carry us much too far. For our present purpose we may divide the formation into Lower Carboniferous and Lower and Upper Coal Measures. In the Lower Carboniferous (Culm of Continental authors) many Devonian types survive—*e.g.* *Archaeocalamites*, *Bothrodendron*, *Archaeopteris*, *Megalopteris*, &c. Among fern-like fronds *Diplotmema* and *Rhacopteris* are characteristic. Some of the Lepidodendreae appear to approach *Sigillariae* in external characters. Sphenophylleae are still rare; it is to this horizon that the isolated type *Cheirostrobus* belongs. Many specimens with structure preserved are known from the Lower Carboniferous, and among them Pteridosperms (*Heterangium*, *Calamopitys*, *Cladoxylon*, *Protopitys*) are well represented, if we may judge by the anatomical characters. Of Gymnosperms we have Cordaitean leaves, and the stems known as *Pitys*, which probably belonged to the same family.

The Lower Coal Measures (Westphalian) have an enormously rich flora, embracing most of the types referred to in our systematic description. Calamarieae with the *Arthropitys* type of stem-structure abound, and Sphenophylleae are now well represented. *Bothrodendron* still survives, but *Lepidodendron*, *Lepidophloios*, and the ribbed Sigillariae are the characteristic Lycopods. The heterogeneous "Ferns" grouped under Sphenopterideae are especially abundant. Ferns of the genera referred to Marattiaceae are common, but arborescent stems of the *Psaronius* type are still comparatively rare. Numerous fronds such as *Alethopteris Neuropteris*, *Mariopteris*, &c., belonged to Pteridosperms, of which specimens showing structure are frequent in certain beds. *Cordaites*, *Dorycordaites* and many stems of the *Mesoxylon* type represent Gymnosperms; the seeds of Pteridosperms and Cordaiteae begin to be common. The Upper Coal Measures (Stephanian) are characterized among the Calamarieae, now more than ever abundant, by the prevalence of the Calamodendreae; new species of *Sphenophyllum* make their appearance; among the Lycopods, *Lepidodendron* and its immediate allies diminish, and smooth-barked Sigillariae are the characteristic representatives. "Ferns" and Pteridosperms are even more strongly represented than before, and this is the age in which the supposed Marattiaceous tree-ferns reached their maximum development. Among Pteridosperms it is the family Medulloseae which is especially characteristic. Cordaiteae still increase, and Gymnospermous seeds become extraordinarily abundant. In the Upper Coal Measures the first Cycadophyta and Coniferae make their appearance. The Permian, so far at least as its lower beds are concerned, shows little change from the Stephanian; Conifers of the *Walchia* type are especially characteristic. The remarkable Permo-Carboniferous flora of India and the southern hemisphere is described in the next section of this article. During the earlier part of the Carboniferous epoch the vegetation of the world appears to have been remarkably uniform; while the deposition of the Coal Measures, however, was in progress, a differentiation of floral regions began. The sketch given above extends, for the later periods, to the vegetation of the northern hemisphere only.

AUTHORITIES.—Potonié, *Lehrbuch der Pflanzenpaläontologie* (Berlin, 1899); Renault, *Cours de botanique fossile*, vols. i.–iv. (Paris, 1881–1885); Scott, *Studies in Fossil Botany* (2nd ed., London, 1908–1909); "The present Position of Palaeozoic Botany," in *Progressus rei botanicae*, Band I. (Jena, 1907); Seward, *Fossil Plants* (in course of publication), vol. i. (Cambridge, 1898), vol. ii. (1910); Solms-Laubach, *Introduction to Fossil Botany* (Oxford, 1892); Zeiller, *Éléments de paléobotanique* (Paris, 1900). In these general works references to all important memoirs will be found.

(D. H. S.)

II.—MESOZOIC

The period dealt with in this section does not strictly correspond with that which it is customary to include within the limits of the Mesozoic system. The Mesozoic era, as defined in geological textbooks, includes the Triassic, Jurassic and Cretaceous epochs; but from the point of view of the evolution of plants and the succession of floras, this division is not the most natural or most convenient. Our aim is not simply to give a summary of the most striking botanical features of the several floras that have left traces in the sedimentary rocks, but rather to attempt to follow the different phases in the development of the vegetation of the world, as expressed in the contrasts exhibited by a comparison of the vegetation of the Coal period forests with that of the succeeding Mesozoic era up to the close of the Wealden period.

Towards the close of the Palaeozoic era, as represented by the Upper Carboniferous and Permian plant-bearing strata, the vegetation of the northern hemisphere and that of several regions in the southern hemisphere, consisted of numerous types of Vascular Cryptogams, with some members of the Gymnospermae, and several genera referred to the Pteridospermae and Cycadofilices (see section I. PALAEOZOIC). In the succeeding Permian period the vegetation retained for the most part the same general character; some of the Carboniferous genera died out, and a few new types made their appearance. The Upper Carboniferous and Permian plants may be grouped together as constituting a Permo-Carboniferous flora characterized by an abundance of arborescent Vascular Cryptogams and of an extinct class of plants to which the name Pteridosperms has recently been assigned—plants exhibiting a combination of Cycadean and filicinean characters and distinguished by the production of true gymnospermous seeds of a complex type. This flora had a wide distribution in North America, Europe and parts of

Asia; it extended to China and to the Zambesi region of tropical Africa (Map A, I. and II.).

Glossopteris Flora.

On the other hand, the plant-beds of the Permo-Carboniferous age in South Africa, South America, India and Australia demonstrate the existence of a widely distributed vegetation which agrees in age with the Upper Carboniferous and Permian vegetation of the north, but differs from it to such an extent as to constitute a distinct flora. We must begin by briefly considering this southern Palaeozoic province if we would trace the Mesozoic floras to their origin, and obtain a connected view of the vegetation of the globe as it existed in late Palaeozoic times and at the beginning of the succeeding era.

In Australia, South America and South Africa a few plants have been found which agree closely with Lower Carboniferous types of the northern hemisphere. In New South Wales, for example, we have such genera as *Rhacopteris* and *Lepidodendron* represented by species very similar to those recorded from Lower Carboniferous or Culm rocks in Germany, Austria, England, Spitzbergen, North and South America and elsewhere. It is, in short, clear that the Culm flora, as we know it in the northern hemisphere, existed in the extreme south, and it is probable that during the earlier part of the Carboniferous period the vegetation of the world was uniform in character. We may possibly go a step farther, and assume that the climatic conditions under which the Culm plants of the Arctic regions flourished were not very different from those which prevailed in Europe, Asia, Chile and South Australia. From strata in New South Wales overlying Devonian and Lower Carboniferous rocks certain plants were discovered in the early part of the 19th century which were compared with European Jurassic genera, and for several years it was believed that these plant-beds belonged to the Mesozoic period. These supposed Mesozoic plants include certain genera which are of special interest. Foremost among these is the genus *Glossopteris* (fig. 1), applied by Brongniart in 1828 to sub-lanceolate or tongue-shaped leaves from India and Australia, which have generally been regarded as the fronds of ferns characterized by a central midrib giving off lateral veins which repeatedly anastomose and form a network, like that in the leaves of *Antrophyum*, an existing member of the Polypodiaceae. The stems, long known from Australia and India as *Vertebraria*, have in recent years been proved to be the rhizomes of *Glossopteris*. It is only recently that undoubted sporangia have been found in close association with *Glossopteris* leaves. The genus possessed small broadly oval or triangular leaves in addition to the large fronds like that shown in fig. 1; it was with the smaller leaves that Mr Arber discovered sporangia exhibiting certain points of resemblance to the microsporangia of modern Cycads. We cannot as yet say whether these bodies represent a somewhat unusual type of fern sporangium or whether they are microsporangia: if the latter supposition is correct the plant must have been heterosporous; but we are still without evidence on this point. Associated with *Glossopteris* occurs another fern, *Gangamopteris*, usually recognized by the absence of a well marked midrib, though this character does not always afford a satisfactory distinguishing feature. In view of recent discoveries which have demonstrated the Pteridosperm nature of many supposed ferns of Palaeozoic age, we must admit the possibility that the term fern as applied to *Glossopteris* and *Gangamopteris* may be incorrect. An Equisetaceous plant, which Brongniart named *Phyllotheca* in 1828, is another member of the same flora; this type bears a close resemblance to *Equisetum* in the long internodes and the whorled leaves encircling the nodes, but differs in the looser leaf-sheaths and in the long spreading filiform leaf-segments, as also in the structure of the cones. *Phyllotheca* has been recognized in Europe in strata of Palaeozoic age, and Professor Zeiller has discovered a new species—*P. Rallii*—in Upper Carboniferous rocks in Asia Minor (Map A, VII.), which points to a close agreement between this genus and the well-known Palaeozoic *Annularia*. *Phyllotheca* occurs also in Jurassic rocks in Italy and in Siberian strata originally described as Jurassic, but which Zeiller has shown are no doubt of Permian age. Some examples of this genus, described by Etheridge from Permo-Carboniferous beds in New South Wales, differ in some respects from the ordinary form, and bear a superficial resemblance to the Equisetaceous genus *Cingularia* from the Coal Measures of Germany. Other genera characteristic of this southern flora are mentioned later. The extraordinary abundance of *Glossopteris* in Permo-Carboniferous rocks of Australia, and in strata of the same age in India and South Africa, gave rise to the term "Glossopteris flora" for the assemblage of plants obtained from southern hemisphere rocks overlying beds containing Devonian and Lower Carboniferous fossils. The Glossopteris flora of Australia occurs in certain regions in association with deposits which are now recognized as true boulder-beds, formed during widespread glacial conditions. In India the same flora occurs in a thick series of fresh-water sediments, known as the Lower Gondwana system, including basal boulder-beds like those of Australia. Similar glacial deposits occur also in South America, and members of the Glossopteris flora have been discovered in Brazil and elsewhere. In South Africa, *Glossopteris*, *Gangamopteris* and other genera, identical with those from Australia and India, are abundantly represented, and here again, as in India and South America, the plants are found in association with extensive deposits of undoubted glacial origin. To state the case in a few words: there is in South Africa, South America, Australia and India an extensive series of sediments containing *Glossopteris*, *Gangamopteris* and other genera, and including beds full of ice-scratched boulders. These strata are homotaxial with Permo-Carboniferous rocks in Europe and North America, as determined by the order of succession of the rocks, and by the occurrence of typical Palaeozoic shells in associated marine deposits. The most important evidence on which this conclusion is based is afforded by the occurrence of European forms of Carboniferous shells in marine strata in New South Wales, which are intercalated between Coal Measures containing members of the Glossopteris flora, and by the discovery of similar shells, many of which are identical with the Australian species, in strata in the north-west of India and in Afghanistan, forming part of a thick series of marine beds known as the Salt Range group. This group of sediments in the extra-peninsular area of India includes a basal boulder-bed, referred on convincing evidence to the same geological horizon as the glacial deposits of the Indian peninsula (Talchir boulder-beds), South Africa (Ecca boulder-beds), Australia and Tasmania (Bacchus Marsh boulder-beds, &c.), and South America, which are associated with Glossopteris-bearing strata. We have a flora of wide distribution in South Africa, South America, Borneo, Australia, Tasmania and India which is clearly of Permo-Carboniferous age, but which differs in its composition from the flora of the same age in other parts of the world. This flora appears to have abruptly succeeded an older flora in Australia and elsewhere, which was precisely similar to that of Lower Carboniferous age in the northern hemisphere. The frequent occurrence of ice-formed deposits at the base of the beds in which *Glossopteris* and other genera make their appearance, almost necessitates the conclusion that the change in the character of the vegetation was connected with a lowering of temperature and the prevalence of glacial conditions over a wide area in India and the southern hemisphere. There can be little doubt that the Indian Lower Gondwana rocks, in which the boulder-beds and the Glossopteris flora occur, must be regarded as belonging to a vast continental area of which remnants are preserved in Australia, South Africa and South America. This continental area has been described as "Gondwana Land," a tract of enormous extent occupying an area part of which has since given place to a southern ocean, while detached masses persist as portions of more modern continents, which have enabled us to read in their fossil plants and ice-scratched boulders the records of a lost continent in which the Mesozoic vegetation of the northern hemisphere had its birth. Of the rocks of this southern continent those of the Indian Gondwana system are the richest in fossil plants; the most prominent types recorded from these Permo-Carboniferous strata are *Glossopteris*, *Gangamopteris*, species referred to *Sphenopteris*, *Pecopteris*, *Macrotaeniopteris* and other Ferns; *Schizoneura* (fig. 2) and *Phyllotheca* among the Equisetales, *Naeggerathiopsis* and *Euryphyllum*, probably members of the Cordaitales (*q.v.* in section I. PALAEOZOIC); *Glossozamites* and *Pterophyllum* among the Cycadales, and various vegetative shoots recalling those of the coniferous genus *Voltzia*, a well-known Permian and Triassic plant of northern latitudes. The genera *Lepidodendron*, *Sigillaria*, *Stigmaria*, or *Calamites*, which played so great a share in the vegetation of the same age in the northern hemisphere, have not been recognized among the Palaeozoic forms of India, but examples of *Sigillaria*, *Lepidodendron* and *Bothrodendron* are known to have existed in South Africa in the Permo-Carboniferous era.

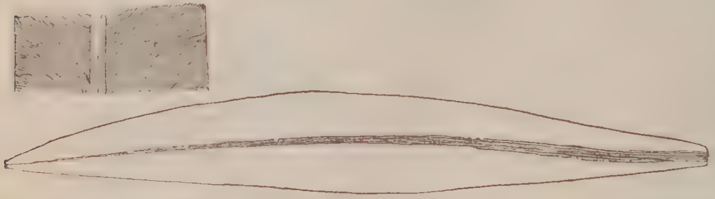
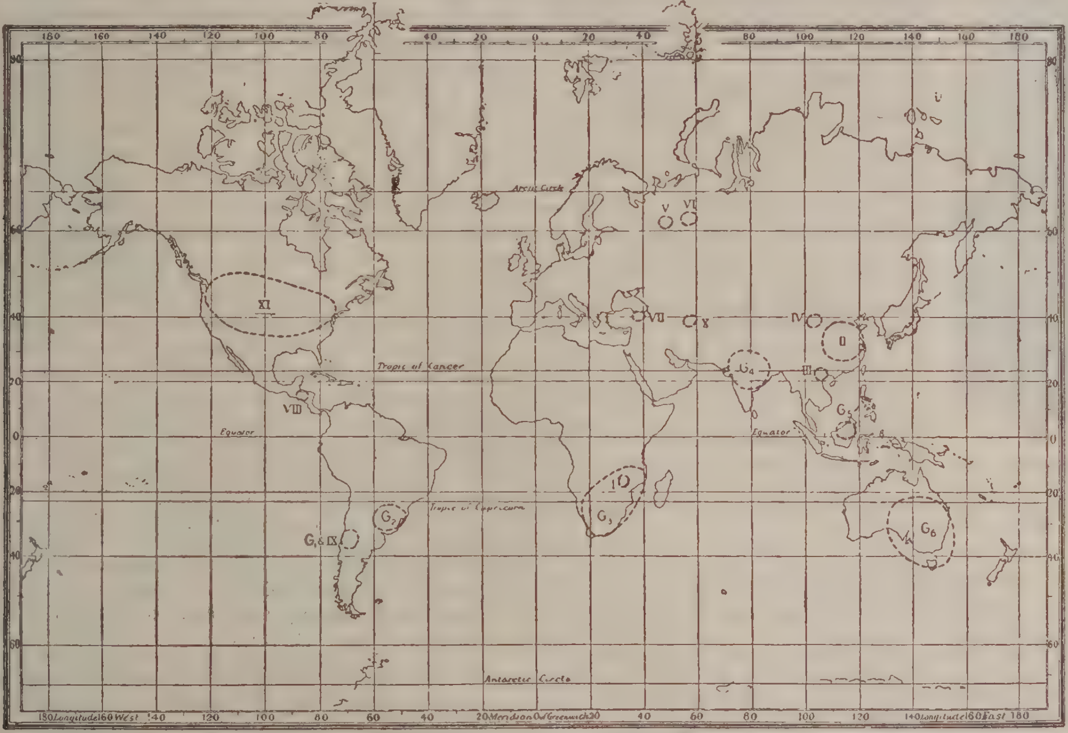


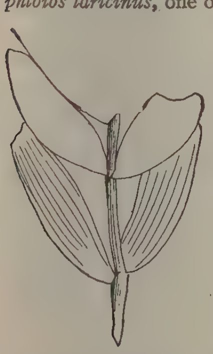
FIG. 1.—*Glossopteris* frond, with portion enlarged to show the venation. (Natural size = 36 cm. in length.) From Lower Gondwana rocks of India.

We may next inquire what types occur in the Glossopteris flora agreeing more or less closely with members of the rich Permo-Carboniferous vegetation of the north. The genus *Sphenophyllum*, abundant in the Coal Measures and Permian rocks of Europe and America, is represented by a single species recorded from India, *Sphenophyllum speciosum* (fig. 3), and a doubtful species from South Africa; *Annularia*, another common northern genus, is recorded from Australia, and the closely allied *Phyllotheca* constitutes another link between the two Permo-Carboniferous floras. The genus *Cordaites* may be compared, and indeed is probably identical with, certain forms recorded from India, South America, South Africa and Australia. While a few similar or even identical types may be recognized in both floras, there can be no doubt that, during a considerable period subsequent to that represented by the Lower Carboniferous or Culm rocks, there existed two distinct floras, one of which had its headquarters in the northern hemisphere, while the other flourished in a vast continental area in the south. Recent discoveries have shown that representatives of the two floras coexisted in certain regions; there was, in fact, a dovetailing between the northern and southern botanical provinces. In 1895 Professor Zeiller described several plants from the province of Rio Grande do Sul in South America (Map A, G_2), including a few typical members of the Glossopteris flora associated with a European species, *Lepidophloios laricinus*, one of the characteristic types of the Coal period, and with certain ferns resembling some species from European Permian rocks. A similar association was found also in Argentine rocks by Kurtz (Map A, G_1), and from South Africa *Sigillaria Brardi*, *Psygmophyllum*, *Bothrodendron* and other northern types are recorded in company with *Glossopteris*, *Glangamopteris* and *Naeggerathiopsis*.



MAP A.—G_1—G_6, Glossopteris Flora.

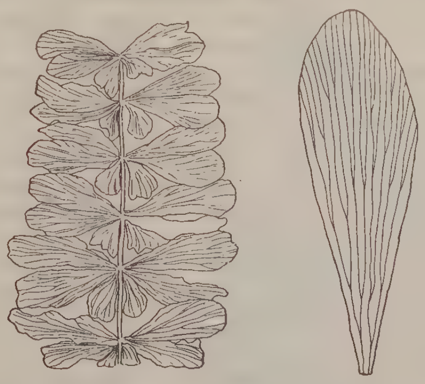
I, II. Upper Carboniferous plants of the northern hemisphere facies, in the Zambesi district and in China.
III. Rhaetic flora of Tongking (*Glossopteris*, &c.; associated with northern types).
IV. Carboniferous plants (prov. Kansu).
V. *Glossopteris*, &c., in Permian rocks in prov. Vologda.
VI. Permian (Pechora valley).
VII. Upper Carboniferous (Herakleion).
VIII. Rhaetic (Honduras).
IX. Lower Jurassic, Upper Gondwana (Argentine).
X. Rhaetic (Persia).
XI. Triassic—Cretaceous.



(After Feistmantel.)

FIG. 2.—*Schizoneura gondwanensis*, from Lower Gondwana rocks, India.

The Coal-bearing strata which occupy a considerable area in China (Map A, II.), contain abundant samples of a vegetation which appears to have agreed in their main features with the Permo-Carboniferous floras of the northern hemisphere. In his account of some plants from the Coal Measures of Kansu (Map A, IV.) Dr Krasser has drawn attention to the apparent identity of certain leaf-fragments with those of *Naeggerathiopsis Hislopi*, a typical member of the Glossopteris flora; but this plant, so far as the evidence of vegetative leaves may be of value, differs in no essential respects from certain species of a European genus *Cordaites*. A comparatively rich fossil flora was described in 1882 from Tongking (Map A, III. by Professor Zeiller—and this author has recently made important additions to his original account—which demonstrates an admixture of Glossopteris types with others which were recognized as identical with plants characteristic of Rhaetic strata in Europe. In the Tongking area, therefore, a flora existed during the Rhaetic period consisting in part of genera which are abundant in the older Glossopteris beds of the south, and in part of well-known constituents of European Rhaetic floras. A characteristic member of the southern botanical province, *Schizoneura gondwanensis* (fig. 2) of India, is represented also by a closely allied if not an identical species—*S. paradoxa*—in the Lower Trias (Bunter) sandstones of the Vosges Mountains, associated with European species which do not occur in the Glossopteris flora. Another plant found in the Vosges sandstones—*Neuropteridium grandifolium*—is also closely allied to species of the same "fern" recorded from the Lower Gondwana strata of India (fig. 4), South America and South Africa. These two instances—the Tongking beds of Rhaetic age and the Bunter sandstones of the Vosges—afford evidence of a

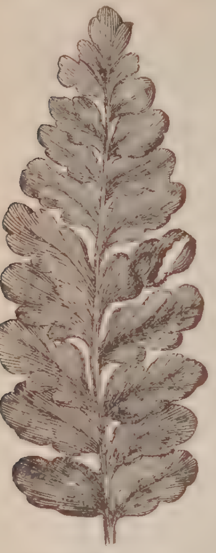


(After Feistmantel.)

A. B.

FIG. 3.—*Sphenophyllum speciosum*. From Lower Gondwana rocks, India.
A. nat. size. B. leaflet enlarged.

northern extension of Glossopteris types and their association with European species. In 1898 an important discovery was made by Professor Amalitzky, which carries us a step further in our search for a connexion between the northern and southern floras. Amalitzky found in beds of Upper Permian age in the province of Vologda (Russia) (Map A, V.) species of *Glossopteris* and *Naeggerathiopsis* typical members of the Glossopteris flora, associated with species of the ferns *Taeniopteris*, *Callipteris* and *Sphenopteris*, a striking instance of a commingling in the far north of the northern hemisphere Permian species with migrants from "Gondwana Land." This association of types clearly points to a penetration of representatives of the Glossopteris flora to the north of Europe towards the close of the Permian period. Evidence of the same northern extension is supplied by floras described by Schmalhausen from Permian rocks in the Pechora valley (Map A, VI.), the Siberian genus *Rhiptozamites* being very similar to, and probably generically identical with, *Naeggerathiopsis* of the Glossopteris flora. The Permo-Carboniferous beds of South Africa, India and Australia are succeeded by other plant-bearing strata, containing numerous species agreeing closely with members of the Rhaetic and Jurassic floras of the northern hemisphere. These post-Permian floras, as represented by the Upper Gondwana beds of India and corresponding strata in Australia, South Africa, and South America, differ but slightly from the northern floras, and point to a uniformity in the Rhaetic and Jurassic vegetation which is in contrast to the existence of two botanical provinces during the latter part of the Palaeozoic period. A few plants described by Potonié from German and Portuguese East Africa demonstrate the occurrence of *Glossopteris* and a few other genera, referred to a Permo-Triassic horizon, in a region slightly to the north of Tete in the Zambesi district (Map A, I.), where typical European plants agreeing with Upper Carboniferous types were discovered several years ago, and described by Zeiller in 1882 and 1901. The existence of Upper Gondwana plants, resembling Jurassic species from the Rajmahal beds of India, has been demonstrated in the Argentine by Dr Kurtz.



(After Feistmantel.)

FIG. 4.—*Neuropteridium validum.* From Lower Gondwana rocks, India.

Mesozoic Floras.

Having seen how the Glossopteris flora of the south gradually spread to the north in the Permian period, we may now take a brief survey of the succession of floras in the northern hemisphere, which have left traces in Mesozoic rocks of North America, Europe and Asia. Our knowledge of the Triassic vegetation is far from extensive; this is no doubt due in part to the fact that the conditions under which the Triassic rocks were deposited were not favourable to the existence of a luxuriant vegetation. Moreover, the Triassic rocks of southern Europe and other regions are typical marine sediments. The Bunter sandstones of the Vosges have afforded several species of Lower Triassic plants; these include the Equisetaceous genus *Schizoneura*—a member also of the Glossopteris flora—bipinnate fern fronds referred to the genus *Anomopteris*, another fern, described originally as *Neuropteris grandifolia*, which agrees very closely with a southern hemisphere type (*Neuropteridium validum*, fig. 4), some large Equisetaceous stems apparently identical, except in size, with modern Horsetails. With these occur several Conifers, among others *Voltzia heterophylla* and some twigs referred to the genus *Albertia*, bearing large leaves like those of *Agathis australis* and some of the Araucarias, also a few representatives of the Cycadales. Among plants from Lower Triassic strata there are a few which form connecting links with the older Permo-Carboniferous flora; of these we have a species, described by Blanckenhon as *Sigillaria oculina*, which may be correctly referred to that genus, although an inspection of a plaster-cast of the type-specimen in the Berlin Bergakademie left some doubt as to the sufficiency of the evidence for adopting the generic name *Sigillaria*. Another Triassic genus, *Pleuromeia*, is of interest as exhibiting, on the one hand, a striking resemblance to the recent genus *Isoetes*, from which it differs in its much larger stem, and on the other as agreeing fairly closely with the Palaeozoic genera *Lepidodendron* and *Sigillaria*. There is, however, a marked difference, as regards the floras as a whole, between the uppermost Palaeozoic flora of the northern hemisphere and such species as have been recorded from Lower Triassic beds. There is evidence of a distinct break in the succession of the northern floras which is not apparent between the Permian and Trias floras of the south. Passing over the few known species of plants from the middle Trias (Muschelkalk) to the more abundant and more widely spread Upper Triassic species as recorded from Germany, Austria, Switzerland, North America and elsewhere, we find a vegetation characterized chiefly by an abundance of Ferns and Cycads, exhibiting the same general facies as that of the succeeding Rhaetic and Lower Jurassic floras. Among Cycads may be mentioned species of *Pterophyllum* (*e.g. P. Jaegeri*), represented by large pinnate fronds not unlike those of existing species of *Zamia*, some Equisetaceous plants and numerous Ferns which may be referred to such families as Gleicheniaceae, Dipteridinae and Matonineae. Representatives of the Ginkgoales constitute characteristic members of the later Triassic floras, and these, with other types, carry us on without any break in continuity to the Rhaetic floras of Scania, Germany, Asia, Chile, Tonkin and Honduras (Map A, VIII.), and to the Jurassic and Wealden floras of many regions in both the north and south hemispheres. A comparative view of the plants found in various parts of the world, in beds ranging from the Upper Trias to the top of the Jurassic system, reveals a striking uniformity in the vegetation both in northern and southern latitudes during this long succession of ages. The Palaeozoic types are barely represented; the arborescent Vascular Cryptogams have been replaced by Cycads, Ginkgoales and Conifers as the dominant classes, while Ferns continue to hold their own. No undoubted Angiosperms have yet been found below the Cretaceous system. From the close of the Permian period, which marks the limit of the Upper Palaeozoic floras, to the period immediately preceding the apparently sudden appearance of Angiosperms, we have a succession of floras differing from one another in certain minor details, but linked together by the possession of many characters in common. It is impossible to consider in detail this long period in the history of plant-evolution, but we may briefly pass in review the most striking features of the vegetation as exhibited in the dominant types of the various classes of plants. Fragments of a Jurassic flora have recently been discovered by Dr Andersson, a member of Nordenskiold's Antarctic expedition, in Louis Philippe Land in lat. 63° 15′ S. Among other well-known Jurassic genera Nathorst has identified the following: *Equisetites*, *Cladophlebis*, *Todites*, *Thinnfeldia*, *Otozamites*, *Williamsonia pecten*, *Araucarites*. The discovery of this Antarctic flora is a further demonstration of the world-wide distribution of a uniform Jurassic flora.

Algae.

Under the head of Algae there is little of primary importance to record, but it is of interest to notice the occurrence of certain forms which throw light on the antiquity of existing families of Algae. Species referred on good evidence to the Charophyta are represented by a few casts of oögonia and stem fragments, found in Jurassic and Wealden beds, which bear a striking resemblance to existing species. There is some evidence for the occurrence of similar *Chara* "fruits" in middle Triassic rocks; some doubtful fossils from the much older Devonian rocks have also been quoted as possible examples of the Charophyta. The oldest known Diatoms are represented by some specimens found entangled in the spicules of a Liassic sponge, and identified by Rothpletz as species of the recent genus *Pyxidicula*. The calcareous Siphoneae are represented by several forms, identified as species of *Diplopora*, *Triploporella*, *Neomeris* and other genera, from strata ranging from the lower Trias limestones of Tirol to the Cretaceous rocks of Mexico and elsewhere. It is probable that the Jurassic *Goniolina*, described from French localities, and other genera which need not be mentioned, may also be reckoned among the Mesozoic Siphoneae. A genus *Zonatrichites*, compared with species of Cyanophyceae, has been described as a Calcareous alga from Liassic limestones of Silesia.

Bryophyta.

The geological history of Mosses and Liverworts is at present very incomplete, and founded on few and generally unsatisfactory fragments. It is hardly too much to say that no absolutely trustworthy examples of Mosses have so far been found in Mesozoic strata. Of Liverworts there are a few species, such as *Palaeohepatica Rostafinskii* from the Lower Jurassic rocks of Cracow, *Marchantites erectus* from the Inferior Oolite rocks of Yorkshire, and *M. Zeilleri* from the Wealden beds of Sussex. These fossil Hepaticae are unfortunately founded only on sterile fragments, and placed in the Liverworts on the strength of their resemblance to the thallus of *Marchantia* and other recent genera.

Equisetaceae.

The Palaeozoic Calamites were succeeded in the Triassic period by large *Equisetites*, differing, so far as we know, in no essential respect from existing Equisetums. The large stems represented by casts of Triassic age, *Equisetites arenaceus* and other species, probably possessed the power of secondary growth in thickness; the cones were of the modern type, and the rhizomes occasionally formed large underground tubers like those frequently met with in *Equisetum arvense*, *E. sylvaticum* and other species. *Equisetites Muensteri* is a characteristic and fairly widely spread Rhaetic and Liassic species, having a comparatively slender stem, with leaf-sheaths consisting of a few broad and short leaf-segments. *Equisetites columnaris*, a common fossil in the Jurassic plant-beds of the Yorkshire coast, represents another type with relatively stout and occasionally branched vegetative shoots, bearing leaf-sheaths very like those of *Equisetum maximum* and other Horsetails. In the Wealden strata more slender forms have been found—*e.g. Equisetites Burchardti* and *E. Lyelli*—in England, Germany, Portugal, Japan and elsewhere, differing still less in dimensions from modern species. Of other Equisetales there are *Schizoneura* and *Phyllotheca*; the former first appears in Lower Gondwana rocks as a member of the Glossopteris flora, migrating at a later epoch into Europe, where it is represented by a Triassic species. The latter genus ranges from Upper Carboniferous to Jurassic rocks; it occurs in India, Australia, and elsewhere in the "Gondwana Land" vegetation, as well as in Palaeozoic rocks of Asia Minor, in Permian rocks of Siberia, and in Jurassic plant-beds of Italy. This genus, like the allied *Calamites*, appears to have possessed cones of more than one type; but we know little of the structure of these Mesozoic Equisetaceous genera as compared with our much more complete knowledge of *Calamites* and *Archaeocalamites*. (See section I., PALAEOZOIC.)

Lycopodiales.

Reference has already been made to *Sigillaria oculina* and to the genus *Pleuromeia*. Palaeobotanical literature contains several records of species of *Lycopodites* and *Selaginellites*; nearly all of them are sterile fragments, bearing a more or less close resemblance to living Club-Mosses and Selaginellas, but lacking the more important reproductive organs. Nathorst has recently described a new type of lycopodiaceous cone, *Lycostrobus Scotti*, from Rhaetic rocks of Scania, from which he obtained both megaspores and microspores. An investigation by Miss Sollas of a plant long known from Rhaetic rocks in the Severn valley as *Naiadita acuminata* has shown that this genus is in all probability a small lycopodiaceous plant, and neither a Moss nor a Monocotyledon, as some writers have supposed. One of the best-known European species is *Lycopodites falcatus*, originally described by Lindley and Hutton from the Inferior Oolite of Yorkshire.

Filicales.

Among the large number of Mesozoic Ferns there are several species founded on sterile fronds which possess but little interest from a botanical standpoint. Some plants, again, have been referred by certain authors to Ferns, while others have relegated them to the Cycads. As examples of these doubtful forms may be mentioned *Thinnfeldia*, characteristic of Rhaetic and Lower Jurassic rocks; *Dichopteris*, represented by some exceptionally fine Jurassic specimens, described by Zigno, from Italy; and *Ctenis*, a genus chiefly from Jurassic beds, founded on pinnate fronds like those of *Zamia* and other Cycads, with linear pinnae characterized by anastomosing veins. Plants referred to Schimper's genus *Lomatopteris* and to *Cycadopteris* of Zigno afford instances of the difficulty of distinguishing between the foliage of Ferns and Cycads. The close resemblance between specimens from Jurassic rocks placed in one or other of the genera *Thinnfeldia*, *Dichopteris*, *Cycadopteris*, &c., illustrates the unsatisfactory custom of founding new names on imperfect fronds. It is of interest to note that some leaf-fragments recently found in Permian rocks of Kansas, and placed in a new genus *Glenopteris*, are hardly distinguishable from specimens of Jurassic and Rhaetic age referred to *Thinnfeldia* and other Mesozoic genera. The difficulty of distinguishing between Ferns and Cycads is a necessary consequence of the common origin of these two classes; in Palaeozoic times the Cycadofilicies and Pteridospermae (see section I., PALAEOZOIC) played a prominent part, and even among recent Cycads and Ferns we still see a few indications of their close relationship. There is reason to believe that compound or generalized types—partly Ferns and partly Cycads—persisted into the Mesozoic era; but without more anatomical knowledge than we at present possess, it is impossible to do more than to point to a few indications afforded by external, and to a slight extent by internal structure, of the survival of Cycadofilicinean types. The genus *Otozamites*, which it is customary and probably correct to include in the Cycadales, is represented by certain species, such as *Otozamites Beani* (fig. 5, A), a characteristic Yorkshire fossil of Jurassic age, which in the form of the frond, bearing broad and relatively short pinnae, exhibits a striking agreement with the sterile portions of the fronds of *Aneimia rotundifolia*, a member of the fern family Schizaeaceae. Again, another species of the same genus, *O. Bunburyanus* (fig. 5, B), suggests a comparison with fern fronds like that of the recent species *Nephrolepis Duffi*. The scaly ramenta which occur in abundance on the leaf-stalk bases of fossil Cycads constitute another fern-character surviving in Mesozoic Cycadales. Without a fuller knowledge of internal structure and of the reproductive organs, we are compelled to speak of some of the Mesozoic plants as possibly Ferns or possibly Cycads, and not referable with certainty to one or other class. It has been found useful in some cases to examine microscopically the thin film of coal that often covers the pinnae of fossil fronds, in order to determine the form of the epidermal cells which may be preserved in the carbonized cuticle; rectilinear epidermal cell-walls are usually considered characteristic of Cycads, while cells with undulating walls are more likely to belong to Ferns. This distinction does not, however, afford a safe guide; the epidermal cells of some ferns, *e.g. Angiopteris*, have straight walls, and occasionally the surface cells of a Cycadean leaf-segment exhibit a fern-like character. Leaving out of account the numerous sterile fronds which cannot be certainly referred to particular families of Ferns, there are several genera which bear evidence in their sori, and to some extent in the form of the leaf, of their relationship to existing types.

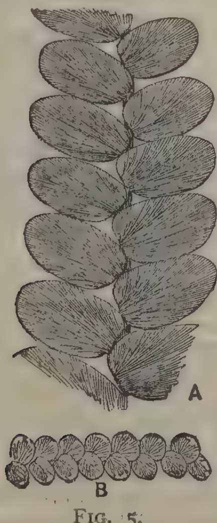


FIG. 5.
A, *Otozamites Beani.*
B, *O. Bunburyanus.*
Inferior Oolite, England.

Marattiaceae.

The abundance of Palaeozoic plants with sporangia and sori of the Marattiaceous type is in striking contrast to the scarcity of Mesozoic ferns which can be reasonably included in the Marattiaceae. One of the few forms so far recorded is that known as *Marattia Muensteri* from Rhaetic localities in Europe and Asia. Some species included in the genus *Danaeites* or *Danaeopsis* from Jurassic rocks of Poland, Austria and Switzerland may possibly be closely allied to the recent tropical genus *Danaea*. Of the Ophioglossaceae there are no satisfactory examples; one of the few fossils compared with a recent species, *Ophioglossum palmatum*, was described several years ago from Triassic rocks under the name *Cheiropteris*, but the resemblance is one of external form only, and practically valueless as a taxonomic criterion. It would appear that the eusporangiate Ferns suddenly sank to very subordinate position after the Palaeozoic era.

Osmundaceae.

The Osmundaceae, represented by a few forms of Palaeozoic age, played a more prominent part in the Mesozoic floras. A species described by Schenk from Rhaetic rocks of Franconia as *Acrostichites princeps* is hardly distinguishable from *Todites Williamsoni*, a widely distributed species in Inferior Oolite strata. This Jurassic species bore bipinnate fronds not unlike those of the South African, Australian, and New Zealand Fern *Todea barbara*, which were characterized by a stout rachis and short broad pinnules bearing numerous large sporangia covering the under surface of the lamina. Specimens of *Todites* have been obtained from England, Poland, and elsewhere, sufficiently well preserved to afford good evidence of a correspondence in the structure of their sporangia with those of recent Osmundaceae. This Jurassic and Rhaetic type occurs in England, Germany, Poland, Italy, East Greenland, North America, Japan, China and Persia (Map A, X.). Bipinnate sterile fronds of *Todites* have in some instances been described under the designation *Pecopteris whitbiensis*. This and other names, such as *Asplenium whitbiense*, *A. nebbense*, *Asplenites Roesserti*, &c., have been given to bipinnate fronds of a type frequently met with in different genera and families of recent Ferns, *e.g. Onoclea Struthiopteris*, species of *Cyathea*, *Asplenium*, *Gymnogramme*, &c. In most cases the Rhaetic, Jurassic and Wealden Ferns included under one or other of these names are sterile, and cannot be assigned to a particular family, but some are undoubtedly

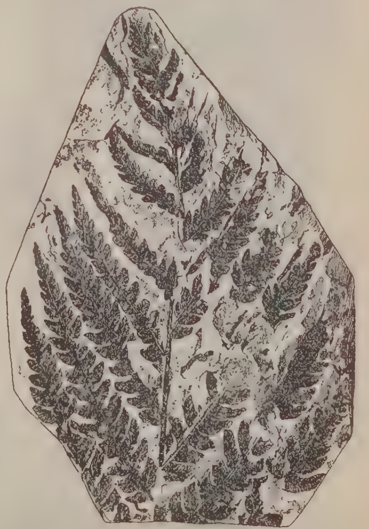


FIG. 6.—*Cladophlebis denticulata.*
Inferior Oolite, England.

the leaves of *Todites*, a genus which may often be recognized by the broad and relatively short bluntly-terminated pinnules. The Jurassic species *Cladophlebis denticulata* (fig. 6), recorded from several European localities, as well as from North America, Japan, China, Australia, India and Persia, affords an instance of a common type of bipinnate frond similar to *Todites Williamsoni*, which has been included in the Polypodiaceae; but such meagre evidence of the soral characters as we possess also points to a comparison with the recent fern *Todea barbara*. Our knowledge of the anatomy of fossil Osmundaceae has recently been considerably extended by Kidston and Gwynne-Vaughan. (For references, see Seward, *Fossil Plants*, vol. ii., 1910.)

Schizaeaceae.

The Schizaeaceae include a widely spread species, originally named *Pecopteris exilis*, and subsequently placed in a new genus, *Klukia* (fig. 7), which is characterized by tripinnate fronds with short linear ultimate segments, bearing a single row of sporangia with an apical annulus ("monangic sori" of Prantl) on either side of the midrib. This type occurs in Rhaetic and Lower Jurassic rocks of England, the Arctic regions, Japan and elsewhere. *Ruffordia Goepperti*, a Wealden type, and probably a member of the Schizaeaceae, has been recorded from England, Belgium, and other European countries, and Japan.

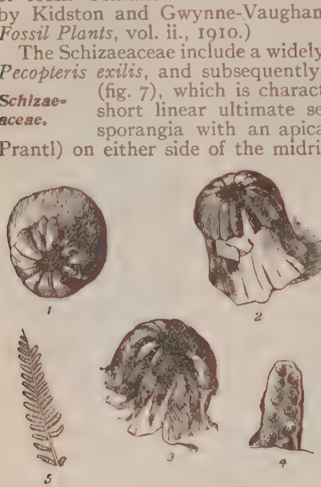


FIG. 7.—*Klukia exilis.*
1–3, Sporangia enlarged.
4, Single fertile pinnule slightly enlarged.
5, Fragment of pinna.
Inferior Oolite, England.

Gleicheniaceae.

The Gleicheniaceae appear to have been represented by Triassic species in North America and Europe, and more abundantly in Jurassic, Wealden, or Lower Cretaceous rocks in Belgium, Greenland, Poland and elsewhere. Some exceptionally perfect fragments of rhizomes have been found by Dr C. Bommer of Brussels in some Wealden deposits at Hainaut in Belgium; but these have not yet been fully described. The dichotomously-branched fronds of the type represented by several recent species of *Gleichenia*, *e.g. G. dichotoma*, &c., are abundant in Lower Cretaceous plant-beds of Greenland, and suggest that in the latter part of the Mesozoic period the Gleicheniaceae held a position in the vegetation of the far north similar to that which they now occupy in the southern tropics of India and other regions.

Matonineae.

The recent Malayan genus *Matonia* (Map B, Matonia), represented by two species, *M. pectinata* and *M. sarmentosa*, is clearly a survival in southern latitudes of a family which occupied an important place in the vegetation of the Rhaetic Jurassic and Wealden periods. The genera *Lacopteris* and *Matonidium* (fig. 8) may be cited as the two most important types, both as regards geographical and geological range, of this Mesozoic family; these ferns are recorded from England, France, Belgium, Germany, Austria, Portugal, Poland and Italy (Map B, M_1), also from Greenland (Map B, M_2), Spitsbergen (Map B, M^3), and Persia (Map B, M^4). From the southern Hemisphere, on the other hand, we know of one or two fragments only which can reasonably be referred to the Matonineae (Map B, M_6), a fact which may point to a northern origin for this family with its two surviving species almost confined to the Malayan region.

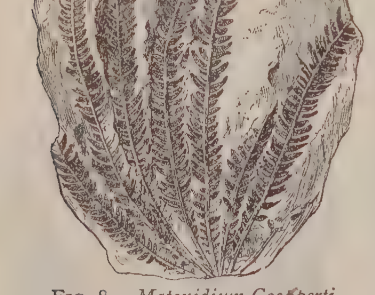
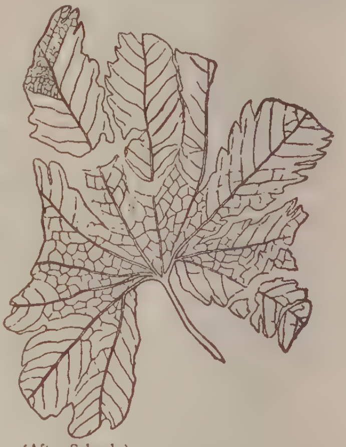


FIG. 8.—*Matonidium Goepperti.*
A, Summit of petiole.
B, Fertile pinnules.
Inferior Oolite, England.

Dipterinae.

The recent genus, *Dipteris*, with its four existing species, occurring chiefly in the Indo-Malayan region (Map B, Dipteris), is also a modern survival of several Mesozoic types represented by such genera as *Dictyophyllum* (fig. 9), *Hausmannia* and *Camptopteris*, which were abundant during the Rhaetic and Jurassic periods in England, Germany, Sweden and elsewhere in Europe (Map B, D). Important additions to our knowledge of the fertile leaves and rhizomes of certain Rhaetic species of *Dictyophyllum* and other genera have recently been made by Professor Nathorst of Stockholm, and Professor Richter of Quedlinburg has made a thorough investigation of the vegetative organs of *Hausmannia*, a genus possibly identical with *Protorhipis*, which is abundant in Lower Cretaceous and other strata in various European localities. The Dipteridinae are represented also by species from Mesozoic rocks of Persia (Map B, D_2), Greenland (Map B, D_3), North America (D_4), South America (D_5) and China (D_6).



(After Schenk.)

FIG. 9.—*Dictyophyllum.* Rhaetic rocks of Europe and Asia.

Cyatheaceae.

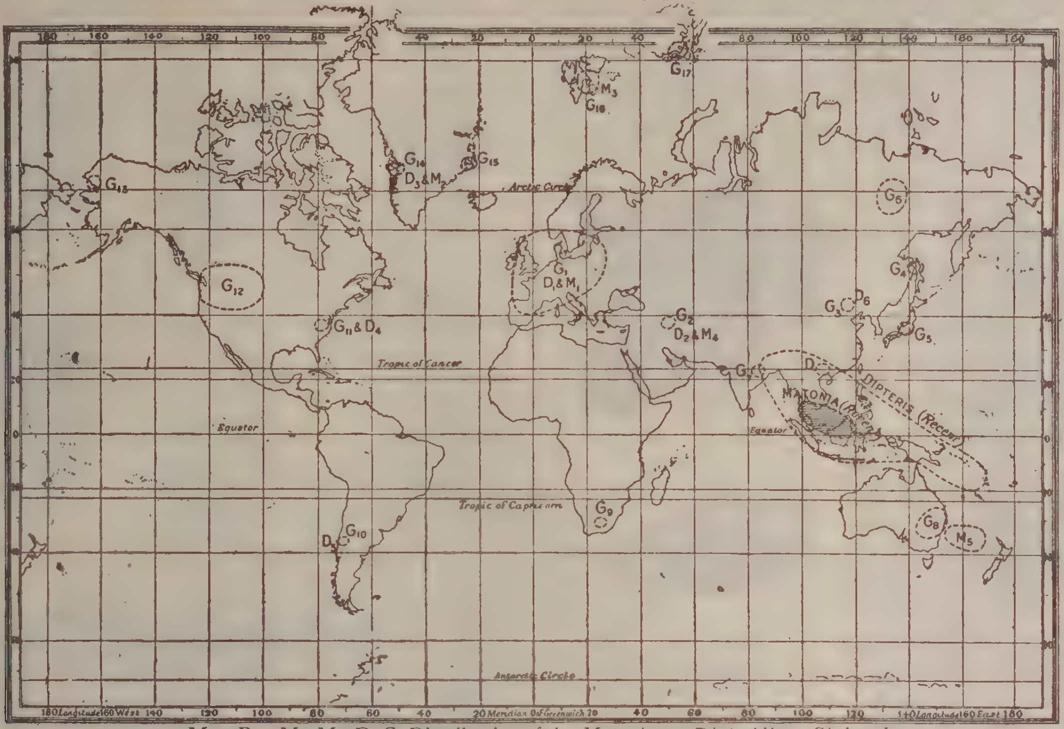
The Cyatheaceae constitute another family of leptosporangiate Ferns which had several representatives in Mesozoic floras. The numerous species of fronds from Jurassic and Wealden rocks of North America and Europe referred to *Thyrsopteris*, a recent monotypic genus confined to Juan Fernandez, are in the majority of cases founded on sterile leaves, and of little or no botanical value. On the other hand, there are several fossil Ferns of Jurassic age possessing cup-like sori like those of *Thyrsopteris* and other Cyatheaceous Ferns, which indicate a wide Mesozoic distribution for this family. Among Jurassic species which should probably be classed as Cyatheaceae, *Coniopteris hymenophylloides* is recorded from England, France, Russia, Poland, Bornholm, Italy, the Arctic regions, North America, Japan, China, Australia and India. A few tree-ferns which may be included in this family—such as *Protopteris*—have been described from Wealden and Lower Cretaceous rocks of England, Germany and Austria. It is by no means easy in dealing with fossil ferns to distinguish between certain Polypodiaceae—such as species of *Davallia*—and members of the Cyatheaceae.

Polypodiaceae.

It is a striking fact that among the numerous Mesozoic Ferns there are comparatively few that can with good reason be referred to the Polypodiaceae, a family which plays so dominant a rôle at the present day. The frequent occurrence of such names as *Asplenium*, *Adiantum*, *Davallia*, and other Polypodiaceous genera in lists of fossil ferns is thoroughly misleading. There are, indeed, a certain number of species which show traces of sori like those of modern species of *Asplenium* and other genera, but in most cases the names of recent ferns have been used on insufficient grounds. The Wealden and Jurassic genus, *Onychiopsis* of England, Portugal, Belgium, Germany, Japan, South Africa and Australia, bears a close resemblance to the recent *Onychium* (*Cryptogamme*). Other Jurassic Ferns described by Raciborski from Poland suggest a comparison with *Davallia*. The resemblance of the sporocarp-like bodies — discovered by Nathorst in association with Rhaetic Sagenopteris leaves, and more recently figured by Halle under a new generic name (*Hydropterangium*)—to the sporocarps of *Marsilia* is an argument in favour of including *Sagenopteris* in the Hydropterideae. The majority of the specimens included in the genus *Cladophlebis*, the Mesozoic representative of the Palaeozoic *Pecopteris* type of frond, are known only in a sterile condition, and cannot be assigned to their family position. A Wealden plant, *Weichselia Mantelli*, is worthy of mention as a species of very wide geographical distribution, and one of the most characteristic members of the Wealden flora. This type is distinguished by its large bipinnate fronds bearing long and narrow pinnae with close-set pinnules, characterized by the anastomosing secondary veins. No traces of sori have so far been found on the fronds. Similarly, the genus *Sagenopteris*, characterized by a habit like that of *Marsilia*, and represented by fronds consisting of a few spreading broadly oval or narrow segments, with anastomosing veins, borne on the apex of a common petiole, is abundant in rocks ranging from the Rhaetic to the Wealden, but has not so far been satisfactorily placed. The evidence adduced by Nathorst and some other writers is, however, not convincing; until we find well-preserved sporocarps in connection with vegetative fronds we prefer to keep an open mind as regards the position of *Sagenopteris*.

Cycadales.

The abundance of Cycadean plants is one of the most striking features of Mesozoic floras. In most cases we have only the evidence of sterile fronds, and this is necessarily unsatisfactory; but the occurrence of numerous stems and fertile shoots demonstrates the wealth of Cycadean plants in many parts of the world, more particularly during the Jurassic and Wealden periods. From Palaeozoic rocks a few fronds have been described, such as *Pterophyllum Fayoli*, *P. Combrayi*, *Plagiozamites* and



MAP B.—M_1–M_5, D, G, Distribution of the *Matonineae*, *Dipteridinae*, *Ginkgoales*.

D_1–D_6, Distribution of the *Dipteridinae*.
G_1–G_{17}, Distribution of the *Ginkgoales* during the Mesozoic and Tertiary Periods.
G_1 (Trias-Tertiary);
G_2, G_3 (Rhaetic-Jurassic);
G_4 (Tertiary, Sakhalin I.);
G_5 (Jurassic);
G_6 (Jurassic and Tertiary);
G_7 (Jurassic);
G_8 (Rhaetic-Jurassic);
G_9 (Trias-Rhaetic);
G_{10} (Rhaetic, Chile);
G_{11} (Trias);
G_{12} (Cretaceous-Tertiary);
G_{13} (Tertiary, Alaska);
G_{14} (Cretaceous-Tertiary);
G_{15} (Jurassic);
G_{16} (Jurassic, Spitsbergen);
G_{17} (Jurassic, Franz Josef Land).

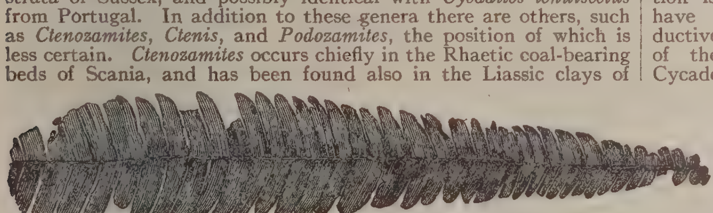


FIG. 10.—*Nilssonia compta.* Inferior Oolite, England.

Sphenozamites, chiefly from French localities, which are referred to the Cycads because of their similarity to the pinnate fronds of modern Cycadaceae. In the succeeding Triassic system Cycadean plants become much more abundant, especially in the Keuper period; from Rhaetic rocks a still greater number of types have been recorded, among which may be mentioned *Nilssonia* (fig. 10), *Anomozamites*, *Pterophyllum*, *Otozamites*, *Cycadites* (fig. 11). The species of *Nilssonia* shown in fig. 10 (*N. compta*) is a characteristic member of the Jurassic flora, practically identical with a form from Rhaetic rocks described as *Nilssonia polymorpha.* The large frond of *Cycadites* represented in fig. 11 (*C. Saportae*) is from the Wealden strata of Sussex, and possibly identical with *Cycadites tenuisectus* from Portugal. In addition to these genera there are others, such as *Ctenozamites*, *Ctenis*, and *Podozamites*, the position of which is less certain. *Ctenozamites* occurs chiefly in the Rhaetic coal-bearing beds of Scania, and has been found also in the Liassic clays of Dorsetshire and in the Inferior Oolite beds of Yorkshire, as well as in Rhaetic strata in Persia and elsewhere; it is characterized by its bipinnate fronds, and may be compared with the recent Australian genus *Bowenia*—peculiar among living Cycads in having bipinnate fronds. *Ctenis* has been incorrectly placed among the ferns by some authors, on account of the occurrence of supposed sporangia on its pinnae; but there is reason to believe that these so-called sporangia are probably nothing more than prominent papillose cells of the epidermis. *Podozamites* (fig. 12) is usually considered to be a Cycad, but the broad pinnae (or leaves) and their arrangement on the axis suggests a possible relationship with the southern coniferous genus *Agathis*, represented by the Kauri pine and other recent species. The considerable variation in the size of the pinnae of *Podozamites*, as represented by species from the Jurassic rocks in the Arctic regions and various European localities, recalls the variation in length and breadth of the leaves of *Agathis*. With regard to the distinguishing features and the distribution of the numerous Cycadean leaves of Mesozoic age, the most striking fact is the abundance of fronds, which there is good reason to refer to the Cycadales in Upper Triassic, Rhaetic, Jurassic and Wealden rocks in India, Australia, Japan, China and elsewhere in the southern hemisphere, as well in North America, Greenland, and other Arctic lands and throughout Europe. It is noteworthy that Tertiary plant-beds have yielded hardly any specimens that can be recognized as Cycads.

A more important question is, What knowledge have we of the reproductive organs and stems of these fossil Cycads? Cycadean stems have recently been found in great abundance in Jurassic and possibly higher strata in Wyoming, South Dakota, and other parts of the United States. Cycadean stems have been found also in the uppermost Jurassic, Wealden and Lower Cretaceous rocks of England, India and other parts of the world. An example of an Indian Cycadean stem from Upper Gondwana rocks is represented in fig. 13; the surface of the trunk is covered with persistent bases (fig. 13, A) of the fronds known as *Ptilophyllum cutchense*, which are practically the same as the European species *Williamsonia pecten* (fig. 17). In a section of the stem (fig. 13, B) a large pith is seen to occupy the axial region, and this is surrounded by a zone of secondary wood, which appears to differ from the characteristic wood of modern Cycads (see GYMNOSPERMS) in having a more compact structure. It is interesting to find that G. R. Wieland of

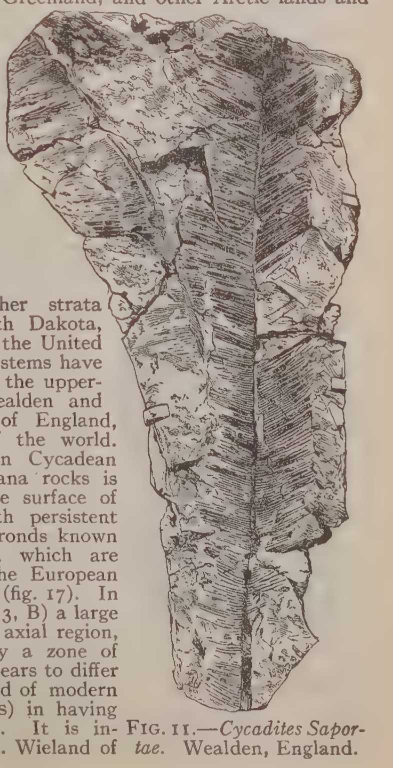


FIG. 11.—*Cycadites Saportae.* Wealden, England.

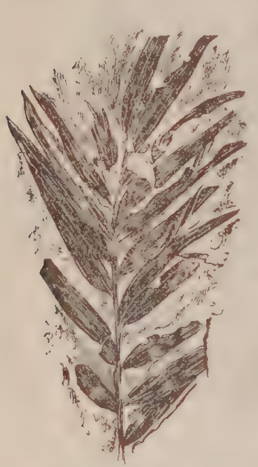


FIG. 12.—*Podozamites lanceolatus.* Inferior Oolite, England.

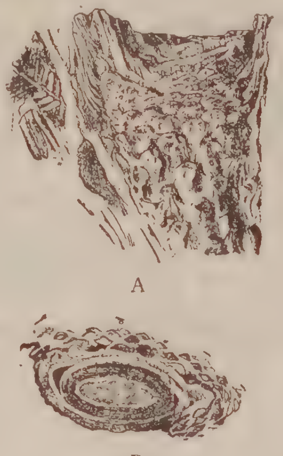


FIG. 13.—Cycadean stem, from Upper Gondwana rocks, India. A, Surface view; B, Transverse section of stem.

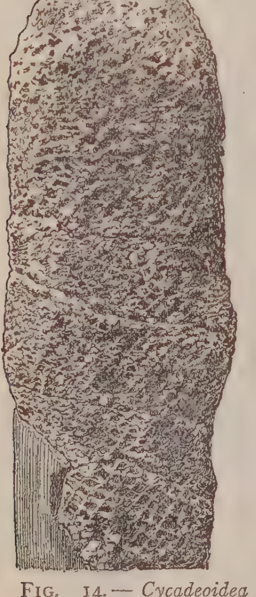


FIG. 14.—*Cycadeoidea gigantea.* Portland rocks, England.

Yale University has noticed in some of the Cycadean stems from the Black hills of Dakota and Wyoming that the wood appears to possess a similar structure, differing in its narrower medullary rays from the wood of modern Cycads. The lozenge-shaped areas external to the axis of the stem represent the sections of petioles, some of which are shown in fig. 13, A, attached to the stem. The majority of Mesozoic stems agree in external appearance with those of recent species of *Encephalartos*, *Macrozamia*, and some other genera; the trunk is encased in a mass of persistent petiole-bases separated from one another by a dense felt or packing of scaly ramenta. The structure of the leaf-stalks is like that of modern Cycads, but the ramenta, instead of having the form of long unicellular hairs like those on the petioles and bud-scales of existing species are exactly like the paleae or ramental scales characteristic of the majority of ferns. This fern-like character affords an interesting survival of the close relationship between Cycads and Ferns. Some examples of Jurassic Cycadean stems from Wyoming are characterized by an unusually rich development of ramental scales; the ramenta from the old leaf-bases form an almost complete covering over the surface of the trunk. Professor Lester Ward has instituted a new generic name, *Cycadella*, for these woolly forms. In a few cases the fossil stems show no trace of any lateral flowering shoots, and in that respect agree with modern forms: an instance of this is afforded by a large Cycadean trunk discovered some years ago in one of the Portland quarries, and named *Cycadeoidea gigantea* (fig. 14). In this stem the flowers may have been terminal, as in existing Cycads. As a rule, however, the fossil stems show a marked difference from modern forms in the possession of lateral shoots given off from the axils of leaves, and terminating in a flower of complex structure containing numerous orthotropous seeds. These reproductive shoots differ in many important respects from the flowers of recent Cycads, and chiefly on this account it is customary to include the plants in a separate genus, *Bennettites*, and in a separate group—the Bennettitales—distinct from that of the Cycadales including the existing Cycads. The best preserved specimens of the true *Bennettites* type so far described are from the Lower Greensand and Wealden of England, and from Upper Mesozoic strata in North America, Italy and France. A study of the anatomical structure of the vegetative stem, which on the whole is very similar to that of recent Cycads (fig. 15, 1 and 2), reveals certain characters which are not met with in modern Cycads. The chief distinguishing feature is afforded by the leaf-traces; in recent species (see GYMNOSPERMS) these pursue a somewhat complicated course as they pass from the petiole towards the vascular cylinder of the stem, but in *Bennettites* the vascular bundles from the leaves followed a more direct course through the cortex of the stem (fig. 15, 3). Among existing types the genus *Macrozamia* appears to show the nearest approach to this simpler structure of the leaf-traces. In a Floridan species of *Zamia* the leaf-traces are described as characterized by a more direct course from the stele of the stem to the leaves than in most modern genera, thus agreeing more closely with the extinct *Bennettites*. The typical *Bennettites* female flower (fig. 15, 4 and 7), as investigated in English French, Italian, and American specimens, may be briefly described as a short lateral shoot or peduncle, arising in a leaf-axil and terminating in a bluntly rounded apex, bearing numerous linear bracts enclosing a central group of appendages, some of which consist of slender pedicels traversed by a vascular strand and bearing a single terminal ovule enclosed in an integument, which forms a distal canal or micropyle. Associated with these seminiferous pedicels occur sterile appendages consisting of slender stalks, terminating in distal expansions, which form a fleshy covering over the surface of the flower, leaving small apertures immediately above the micropyles for the entrance of the pollen-grains. It has been suggested by some authors that the almost complete investment of the small *Bennettites* seeds by the surrounding swollen ends of the interseminal scales (fig. 15, 7) represents an approach to the angiospermous ovary. In *Bennettites* the ovules are left exposed at the apex, but they are by no means so distinctly gymnospermous as in recent Cycads and Conifers. The seeds have in some cases been preserved in wonderful perfection, enabling one to make out the structure of the embryo, with its bluntly conical radicle and two fleshy cotyledons filling the exalbuminous seed (fig. 15, 11).

Our knowledge of the reproductive organs of the Bennettitaceae has until recently been confined to the female flowers, as described by Carruthers, Solms-Laubach, Lignier, and others. The fortunate discovery of several hundred Cycadean stems in the United States, of Lower Cretaceous and Upper Jurassic age, has supplied abundant material which has lately been investigated and is still receiving attention at the hands of Mr Wieland. This investigator has already published a well-illustrated account of his discoveries, which give valuable information as to the morphology of the male organs, and lead us to expect additional results in the future of the greatest importance and interest. On some of the American stems flowers have been found, borne at the apex of lateral shoots, which possess fully developed male organs consisting of sporangia with spores (pollen-grains), surrounding a conical central receptacle bearing numerous small and probably functionless or immature ovules (fig. 15, 10). The structure of this type of flower may be briefly described as follows. In shape and size the flower is similar to that long known as the female flower of *Bennettites* and *Williamsonia*. A number of hairy linear bracts enclose the whole; internal to these occur 12 to 20 crowded pinnate leaves (sporophylls), with their apical portions bent over towards the axis of the flower, the bases of the petioles being fused laterally into a disk surrounding the base of the conical receptacle. Numerous pairs of pinnules are attached to the rachis of each sporophyll, and the larger pinnules bear 20 to 30 synangia (sori or plurilocular sporangia) (fig. 15, 8 and 9). The synangia consist of a stout wall composed of thick-walled cells, succeeded by a layer of more delicate and smaller elements; and internal to the wall occur two rows of sporangial loculi containing microspores. When the synangia are ripe dehiscence takes place along a median line between the two rows of loculi. In size, position, arrangement, and manner of dehiscence the sporangia bear a striking resemblance to those of *Marattia* and *Danaea* among recent Marattiaceae. The most important point elucidated by this discovery is the very close correspondence of the male organs of the *Bennettites* flower with the sporophylls and synangia of Marattiaceous ferns—a further relic of the common origin of Cycads and Ferns. It remains to be seen if the ovuliferous cone in the centre of the flower represents simply a functionless gynoecium, as in *Welwitschia* and abnormal cones of certain Coniferae, or if the flowers were hermaphrodite, with both male and female organs fully developed. We have a combination in the same flower of stalked ovules, the structure of which has already been described, and interseminal scales constituting a complex gynoecium, which exhibits in certain features an approach to the angiospermous type, and differs in structure from other Gymnosperm flowers, associated with male organs constructed on a plan almost identical with that of the sporophylls in Marattiaceae. In many of the flowers described by Mr Wieland the structure is identical in essential features with that of the female flowers of *Bennettites Gibsonianus* described by Carruthers and by Solms-Laubach, and with that of a French Liassic species described by Lignier: the whole consists of a convex receptacle bearing mature seeds at the tips of pedicels associated with interseminal scales (fig. 15, 7) as already described. Mr Wieland's researches have, however, demonstrated the existence in flowers of this type of the remains of a disk at the base of the receptacle, between the receptacle and the surrounding bracts, to which staminate leaves were originally attached. The flowers hitherto regarded as female were in some cases at least hermaphrodite.

but the male organs had been thrown off before the complete development of the gynoecium. This fact suggests the possibility that the flowers described by Mr Wieland, in which the male organs are mature and the gynoecium is composed of very short and immature ovuliferous stalks and interseminal scales, are not essentially distinct from those which have lost the staminate leaves and possess mature seeds. It is probable that the flowers of *Bennettites* were normally hermaphrodite, and they may have been markedly protandrous. We cannot decide at present whether the gynoecium in a flower, such as that represented in fig. 15, 7, has partially aborted or whether it would have matured later after the fall of the male organs.

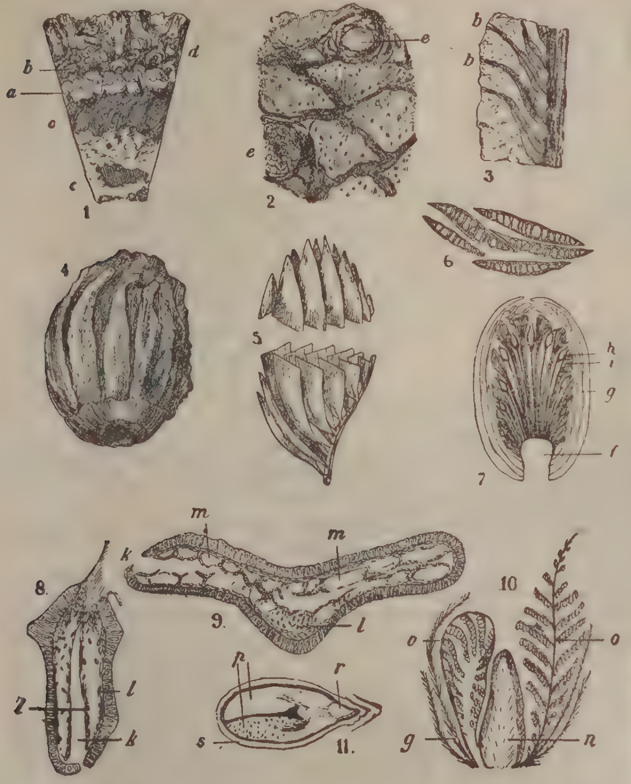


FIG. 15.

1, *Bennettites* stem: portion of transverse section of stem; *a*, vascular cylinder; *b*, leaf-traces; *c*, pith; *d*, cortex.
2, *Bennettites* stem, tangential section; *e*, flower-peduncles.
3, *Bennettites* stem, leaf-traces attached to the vascular cylinder and passing as simple strands through the cortex; *d*, cortex.
4, *Williamsonia*, Wealden, England.
5, Young leaf of *Bennettites*.
6, Ramenta of *Bennettites* in transverse section.
7, *Bennettites*, female flower in longitudinal section; *f*, apex of peduncle; *g*, bracts (shown in surface view in 4); *h*, seeds and seminiferous pedicels; *i*, interseminal scales.
8, *Bennettites*, synangium of male flower, showing line of dehiscence, *k*, and microspores, *l*.
9, Synangium, in transverse section, showing sporangial groups, *m*, and microspores, *l*.
10, *Bennettites* flower in vertical section, showing the central female portion, *n*, two sporophylls bearing synangia (male), *o*, and hairy bracts, *g*.
11, *Bennettites* seed in longitudinal section, showing the dicotyledonous embryo; *p*, cotyledons; *r*, radicle; *s*, testa.
(1–3, *after Carruthers*; 5, 8, 9 and 10, *after Wieland*; 7, *after Scott*; 11, *after Solms-Laubach*.)

It is clear that *Bennettites* differed in many essential respects from the few modern survivors of the Cycadophyta. Fossil flowers of a type more like that of modern Cycads are few in number, and it is not by any means certain that all of those described as Cycadean flowers and seeds were borne by plants which should be included in the Cycadophyta; a few female flowers have been described from Rhaetic rocks of Scania and elsewhere under the name *Zamiostrobus*—these consist of an axis with slender pedicels or carpophylls given off at a wide angle and bearing two ovules at the distal end; the structure is in fact similar to that of a *Zamia* female flower, in which the internodes of the peduncle have been elongated so as to give a looser arrangement to the carpels. It has been suggested that one at least of the flowers, that originally described by Mr Carruthers from the Inferior Oolite of Yorkshire as *Beania gracilis*, may have been borne by a member of the Ginkgoales. From Jurassic rocks of France and Italy a few imperfect specimens have been described as carpels of Cycads, like those of the recent genus *Cycas* (see GYMNOSPERMS); while a few of these may have been correctly identified, an inspection of some of the original examples in the Paris collections leads one to express the opinion that others are too imperfect to determine. Pinnate fronds of the *Cycas* type, characterized by the presence of a midrib and no lateral veins in the linear pinnae, are recorded from Rhaetic rocks of Germany, from Wealden strata in England (fig. 11) and Portugal, and from Liassic beds in Dorsetshire. One large specimen is figured by Heer from Lower Cretaceous rocks of Greenland, and by the side of the frond is shown a carpel with lateral ovules, as in the female flower of *Cycas*; but an examination of the type-specimen in the Copenhagen Museum led the present writer to regard this supposed carpel as valueless. Professor Nathorst, as the result of a more recent examination of Heer's specimen, found that the segments of the frond are characterized by the presence of two parallel veins instead of a single midrib, with a row of stomata between them; for this type of Cycadean leaf he proposed the generic name *Pseudocycas*. Another well-known Cycadean genus is *Williamsonia*, so named by Mr Carruthers in 1870, and now applied to certain pinnate fronds — *e.g.* those previously described as *Zamites gigas* (fig. 16), and others known under such names as *Pterophyllum* or *Ptilophyllum pecten*, &c., both common Jurassic species — as well as to stems bearing peduncles with terminal oval flowers, similar in form to those of *Bennettites*. There is good evidence for supporting Professor Williamson's conclusions as to the organic connexion between the flowers, originally described from Inferior Oolite rocks of Yorkshire and subsequently named *Williamsonia* (fig. 15, 4), and the fronds of *Zamites gigas*, now known as *Williamsonia gigas* (fig. 16). There can be little doubt that the majority of the Cycadean fronds of Jurassic and Wealden age, which are nearly always found detached from the rest of the plant, were borne on stems of the *Bennettites* type. Williamson was the first to express the opinion that the Bennettitean flowers known as *Williamsonia* were borne on the trunks which terminated in a crown of pinnate fronds of the type long known as *Zamites gigas*; this view was regarded by Saporta and others as incorrect, and the nature of the Bennettitean foliage was left an open question. A re-examination of the English material in the museums of Paris and elsewhere has confirmed Williamson's conclusions. Mr Wieland has also described young bipinnate fronds, very like those of recent species of *Zamia* and *Encephalartos*, attached to a *Bennettites* stem, and exhibiting the vernation characters of many recent Cycads (fig. 15, 5). In *Williamsonia* the stem bore comparatively long fertile shoots, which, in contrast to those of *Bennettites*, projected several inches beyond the surface of the main trunk, and terminated in a flower which appears to have resembled those of the true *Bennettites*. Nathorst has recently described specimens of *Williamsonia* from the Jurassic rocks of Whitby with micro-Sporophylls like those of Wieland's species. *Williamsonia* occurs in the Upper Gondwana rocks of India; it is recorded also from strata ranging from the Rhaetic to the Lower Cretaceous period in England, Portugal, Sweden, Bornholm, Greenland, Italy and North America. Professor Nathorst has described another type of stem from the Rhaetic beds of Scania. It consists of a comparatively small and repeatedly forked axis bearing in each fork a flower; the flowers, which are regarded as male and female, appear to be similar to those of *Bennettites*. The leaves, borne on the regions between the false dichotomies, are those of *Anomozamites minor*, a type of Cycadean frond originally determined

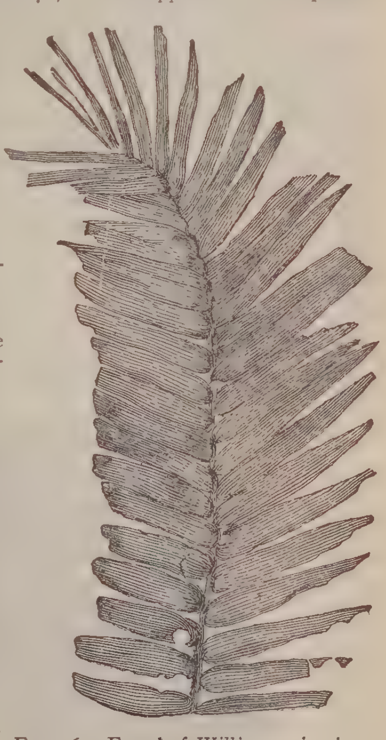


FIG. 16.—Frond of *Williamsonia gigas*. Inferior Oolite, England.

by Brongniart. The flowers, or some of them, were originally described by Nathorst as *Williamsonia angustifolia*. This form of stem, of a habit entirely different from that of recent Cycads and extinct *Bennettites*, points to the existence in the Mesozoic era of another type of Gymnosperm allied to the Bennettitales of the Jurassic and Cretaceous periods by its flowers, but possessing a distinctive character in its vegetative organs. There is no doubt that the Cycadophyta, using the term suggested by Nathorst in 1902, was represented in the Mesozoic period by several distinct families or classes which played a dominant part in the floras of the world before the advent of the Angiosperms. In addition to the bisporangiate reproductive shoots of *Bennettites*, distinguished by many important features from the flowers of recent Cycads, a few specimens of flowers have been discovered exhibiting a much closer resemblance to those of existing Cycads, *e.g. Androstrobus Balduini* from Bathonian rocks of France; *Zamites familiaris*, described many years ago by Corda, from Lower Cretaceous rocks of Bohemia, and *Androstrobus Nathorsti*, from Wealden beds in Sussex. The majority of the species were, however, characterized by flowers of a different type known as *Bennettites* and *Williamsonia*.

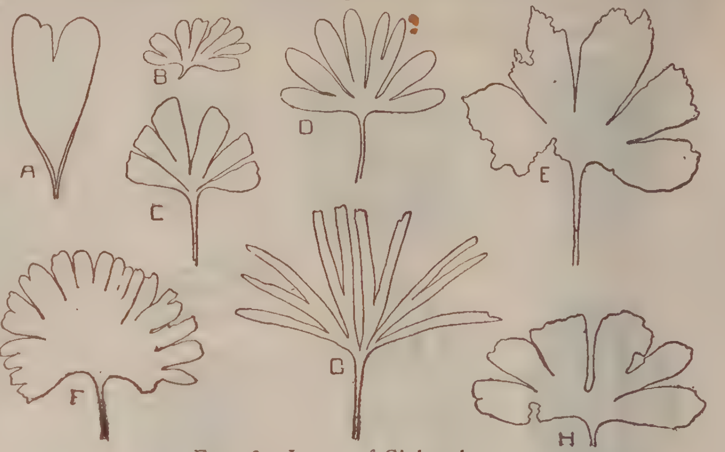


FIG. 18.—Leaves of Ginkgoales.

A, *Ginkgodium*, Japan (Jurassic).
B, C, D, E, F, H, *Ginkgo* leaves.—B, from Franz Josef Land (Jurassic); C, Greenland (Lower Cretaceous); D, Siberia (Jurassic); E, Germany (Wealden); F, England (Jurassic); H, China (Rhaetic).
G, *Baiera* leaf, Inferior Oolite, England.
(A, *after Yokoyama*; B, *after Nathorst*; C, D, *after Heer*; E. *after Schenk*; H, *after Krasser*. All the figures ½ nat. size.)

Ginkgoales. The living Maidenhair-tree (*Ginkgo biloba*) (see GYMNOSPERMS) remains, like *Matonia* and *Dipteris*, among the ferns, as an isolated relic in the midst of recent vegetation. In Rhaetic, Jurassic and Wealden floras, the Ginkgoales were exceedingly abundant (Map B, G_1–G_{17}); in addition to leaves agreeing almost exactly with those of the recent species (fig. 18), there are others separated as a distinct genus, *Baiera* (fig. 18, G), characterized by the greater number and narrower form of the segments, which may be best compared with such leaves as those of the recent fern *Actiniopteris* and of certain species of *Schizaea*. Male flowers, like those of *Ginkgo biloba*, but usually characterized by a rather larger number of oval pollen-sacs on the stamens, have been found in England, Germany, Siberia and elsewhere in association with *Ginkgo* and *Baiera* foliage. The occasional occurrence of three or even four pollen-sacs on the stamens of the recent species affords a still closer agreement between the extinct and living types. Seeds like those of *Ginkgo biloba* have also been recorded as fossils in Jurassic rocks, and it is possible that the type of flower known as *Beania*, from the Inferior Oolite rocks of Yorkshire, may have been borne by *Ginkgo* or *Baiera*.

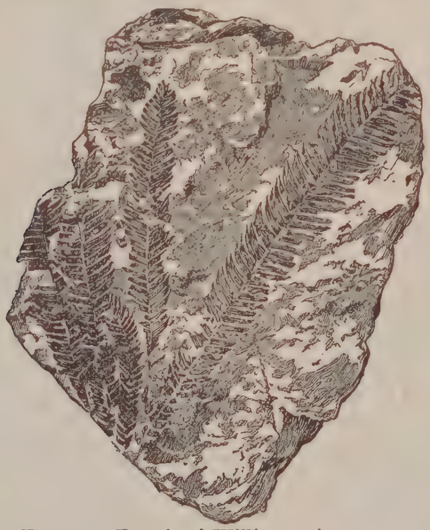


FIG. 17.—Fronds of *Williamsonia pecten*.

The regions from which satisfactory examples of Ginkgoales (*Baiera* or *Ginkgo*) have been recorded are shown in Map B (G_1–G_{17}). Both Tertiary and Mesozoic localities are indicated in the map.

Coniferales. An adequate account of fossil Mesozoic Conifers is impossible within the limits of this article. Coniferous twigs are very common in Mesozoic strata, but in most cases we are compelled to refer them to provisional genera, as the evidence of vegetative shoots alone is not sufficient to enable us to determine their position within the Coniferae. There are, however, several forms which it is reasonable to include in the Araucarieae; that this family was to the fore in the vegetation of the Jurassic period is unquestionable. We have not merely the striking resemblance of vegetative shoots to those of recent species of *Araucaria* and *Agathis*, *e.g.* species of *Nageiopsis*, abundantly represented in the Upper Jurassic beds of the Potomac area in North America, species of *Pagiophyllum* and other genera of Jurassic and Wealden age, but an abundance of fossil wood (*Araucarioxylon*) from Jurassic and Cretaceous strata in Europe, North America, Madagascar and elsewhere agreeing with that of recent Araucarieae, in addition to several well-preserved female flowers. C. A. Hollick and E. C. Jeffrey have recently shown that some Lower Cretaceous specimens of the well-known genus *Brachyphyllum* obtained from Staten Island, N.Y., possess wood of the Araucarian type. This genus has long been known as a common and widely spread Jurassic and Cretaceous conifer, but owing to the absence of petrified specimens and of well-preserved cones, it has been impossible to refer it to a definite position in the Coniferales. It is now clear that some at least of the species of *Brachyphyllum* must be referred to the Araucarieae. In a recently published paper Seward and Ford have given a general account of the Araucarieae, recent and extinct, to which reference may be made for further details as to the geological history of this ancient section of the Coniferales. Some of the fossils referred to the genus *Kaidocarpon*, and originally described as monocotyledonous inflorescences, are undoubted Araucarian cones; other cones of the same type have been placed in the genus *Cycadeostrobus* and referred to Cycads. *Araucarites Hudlestoni*, described by Mr Carruthers from the Coralline Oolite rocks of Malton in Yorkshire; *Araucarites sphaerocarpa* from the Inferior Oolite of Somerset; also another cone found in the Northampton Sands, which is probably specifically identical with *A. Hudlestoni*, and named by Carruthers *Kaidocarpon ooliticum*, afford good illustrations of British Araucarian flowers. A flower of a rather different type, *Pseudaraucaria major*, exhibiting in the occurrence of two seeds in each scale an approach to the cones of Abietineae, has been described by Professor Fliche from Lower Cretaceous rocks of Argonne. The well-known Whitby jet of Upper Liassic age appears to have been formed to a large extent from Araucarian wood. Among the more abundant Conifers of Jurassic age may be mentioned such genera as *Thuytes* and *Cupressites*, which agree in their vegetative characters with members of the Cupressineae, but our knowledge of the cones is far from satisfactory. Many of the small female flowers borne on shoots with foliage of the *Cupressus* type consist of spirally disposed and not verticillate scales, *e.g. Thuytes expansus*, a common Jurassic species.

Fossil wood, described under the name *Cupressinoxylon*, has been recorded from several Mesozoic horizons in Europe and elsewhere, but this term has been employed in a wide sense as a designation for a type of structure met with not only in the Cupressineae, but in members of other families of Coniferae. The Abietineae do not appear to have played a prominent part before the Wealden period; various older species, *e.g.* Rhaetic specimens from Scania, are recorded, but it is not until we come to the Upper Jurassic and Wealden periods that this modern family was abundantly represented. Fossil wood of the *Pinites* type (*Pityoxylon*) has been described from England, France, Germany, Sweden, Spitsbergen, North America and elsewhere; some of the best British examples have been obtained from the so-called Pine-raft, the remains of water-logged and petrified wood of Lower Greensand age, seen at low water near Brook Point in the Isle of Wight. Well-preserved Abietineous female flowers have been obtained from the Wealden rocks of England and Belgium, *e.g. Pinites Dunkeri*, *P. Solmsi*, &c.; specimens of seeds and vegetative shoots are recorded also from Spitsbergen and other regions. Hollick and Jeffrey have recently added to our knowledge of the anatomy of Cretaceous species of *Pinus*, and Miss Stopes and Dr Fujii have made important contributions on the structure of Cretaceous plants from Japan. Cones of Lower Cretaceous age have been described by Fliche from Argonne, which bear a close resemblance to the female flowers of recent species of *Cedrus*. The two surviving species of *Sequoia* afford an illustration of the persistence of an old type, but unfortunately most of the Mesozoic species referred to this genus do not possess sufficiently perfect cones to confirm their identification as examples of *Sequoia*. Some of the best examples of cones and twigs referred to *Sequoia* are those described by Heer from Cretaceous rocks of Greenland, and Professor D. P. Penhallow of Montreal has described the anatomical structure of the stem of *Sequoia Langsdorfii*, a Tertiary species occurring in Europe and North America.

There are a few points suggested by a general survey of the Mesozoic floras, which may be briefly touched on in conclusion. In following the progress of plant-life through those periods in the history of the earth of which records are left in ancient sediments, seams of coal or old land-surfaces, we recognize at certain stages a want of continuity between the floras of successive ages. The imperfection of the geological record, considered from the point of view of evolution, has been rendered familiar by Darwin's remarkable chapter in the *Origin of Species*. Breaks in the chain of life, as represented by gaps in the blurred and incomplete documents afforded by fragmentary fossils, are a necessary consequence of the general plan of geological evolution; they mark missing chapters rather than sudden breaks in an evolutionary series. On the other hand, a study of the plant-life of past ages tends to the conviction that too much stress may be laid on the imperfection of the geological record as a factor in the interpretation of palaeontological data. The doctrine of Uniformitarianism, as propounded by Lyell, served to establish geology on a firmer and more rational basis than it had previously possessed; but latterly the tendency has been to modify the Lyellian view by an admission of the probability of a more intense action of groups of forces at certain stages of the earth's history. As a definite instance a short review may be given of the evidence of palaeobotanical records as regards their bearing on plant-evolution. Starting with the Permo-Carboniferous vegetation, and omitting for the moment the Glossopteris flora, we find a comparatively homogeneous flora of wide geographical range, consisting to a large extent of arborescent lycopods, calamites, and other vascular cryptogams, plants which occupied a place comparable with that of Gymnosperms and Angiosperms in our modern forests; with these were other types of the greatest phylogenetic importance, which serve as finger-posts pointing to lines of evolution of which we have but the faintest signs among existing plants. Other types, again, which may be referred to the Gymnosperms, played a not unimportant part in the Palaeozoic vegetation. No conclusive proof has so far been adduced of the existence in those days of the Cycads, nor is there more than partial evidence of the occurrence of genera which can be placed with confidence in any of the existing families of Conifers. There are, moreover, no facts furnished by fossil plants in support of the view that Angiosperms were represented either in the low-lying forests or on the slopes of the mountains of the Coal period. Passing higher up the geological series, we find but scanty records of the vegetation that existed during the closing ages of the Permian period, and of the plants which witnessed the beginning of the Triassic period we have to be content with the most fragmentary relics. It is in rocks of Upper Triassic and Rhaetic age that abundant remains of rich floras are met with, and an examination of the general features of the vegetation reveals a striking contrast between the Lower Mesozoic plants and those of the Palaeozoic period. Arborescent Pteridophytes are barely represented, and such dominant types as *Lepidodendron*, *Sigillaria*, *Calamites* and *Sphenophyllum* have practically ceased to exist; Cycads and Conifers have assumed the leading rôle, and the still luxuriant fern vegetation has put on a different aspect. This description applies almost equally to the floras of the succeeding Jurassic and Wealden periods. The change to this newer type of vegetation was no doubt less sudden than it appears as read from palaeobotanical records, but the transition period between the Palaeozoic type of vegetation and that which flourished in the Lower Mesozoic era, and continued to the close of the Wealden age, was probably characterized by rapid or almost sudden changes. In the southern hemisphere the Glossopteris flora succeeded a Lower Carboniferous vegetation with a rapidity similar to that which marked the passage in the north from Palaeozoic to Mesozoic floras. This apparently rapid alteration in the character of the southern vegetation took place at an earlier period than that which witnessed the transformation in the northern hemisphere. The appearance of a new type of vegetation in India and the southern hemisphere was probably connected with a widespread lowering of temperature, to which reference has already been made. It was from this Glossopteris flora that several types gradually migrated across the equator, where they formed part of the vegetation of more northern regions. The difference between the Glossopteris flora and those which have left traces in the Upper Gondwana rocks of India, in the Wianamatta and Hawkesbury beds of Australia, and in the Stormberg series of South Africa is much less marked than that between the Permo-Carboniferous flora of the northern hemisphere and the succeeding Mesozoic vegetation. In other words, the change took place at an earlier period in the south than in the north. To return to the northern hemisphere, it is clear that the Wealden flora, as represented by plants recorded from England, France, Belgium, Portugal, Russia, Germany and other European regions, as also from Japan and elsewhere, carries on, with minor differences, the facies of the older Jurassic floras. It was at the close of the Wealden period that a second evolutionary wave swept over the vegetation of the world. This change is most strikingly illustrated by the inrush of Angiosperms, in the equally marked decrease in the Cycads, and in the altered character of the ferns. It would appear that in this case the new influence, supplied by the advent of Angiosperms, had its origin in the north. Unfortunately, our knowledge of the later floras in the southern hemisphere is very incomplete, but a similar transformation appears to have characterized the vegetation south of the equator. As to the nature of the chief factors concerned in the two revolutions in the vegetable kingdom, if it is admissible to use so strong a term, only a guess can be hazarded. Physical conditions no doubt played an important part, but whatever cause may have had the greatest share in disturbing the equilibrium of evolutionary forces, it would seem that the apparently sudden appearance of Cycads and other types at the close of the Palaeozoic period made a widespread and sudden impression on the whole character of the vegetation. At a later stage—in post-Wealden days—it was the appearance of Angiosperms, probably in northern latitudes, that formed the chief motive power in accelerating the transition in the facies of plant-life from that which marked what we have called the Mesozoic floras, to the vegetation of the Upper Cretaceous and Tertiary periods. With the advent of Angiosperms began, as the late marquis of Saporta expressed it, "Une révolution, ainsi rapide dans sa marche qu'universelle dans ses effets." From the floras of the Tertiary age we pass by gradual stages to those which characterize the present phase of evolutionary progress. Among modern floras we find here and there isolated types, such as *Ginkgo*, *Sequoia*, *Matonia*, *Dipteris* and the Cycads, persisting as more successful survivals which have held their own through the course of ages; these plants remain as vestiges from a remote past, and as links connecting the vegetation of to-day with that of the Mesozoic era.

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III.—TERTIARY

Lower Cretaceous.

After the Wealden period, and before the deposition of the lowest strata of the Chalk, so remarkable a change takes place in the character of the vegetation that this break must be taken as, botanically, the transition point from a Secondary to a Tertiary flora. A flora consisting entirely, with a single doubtful exception, of Gymnosperms and Cryptogams gives place to one containing many flowering plants; and these increase so rapidly that before long they seem to have crowded out many of the earlier types, and to have themselves become the dominant forms. Not only do Angiosperms suddenly become dominant in all known plant-bearing deposits of Upper Cretaceous age, but strangely enough the earliest found seem to belong to living orders, and commonly have been referred to existing genera. From Cretaceous times onwards local distribution may change; yet the successive floras can be analysed in the same way as, and compared with, the living floras of different regions. World-wide floras, such as seem to characterize some of the older periods, have ceased to be, and plants are distributed more markedly according to geographical provinces and in climatic zones. This being the case, it will be most convenient to discuss the Tertiary floras in successive order of appearance, since the main interest no longer lies in the occurrence of strange extinct plants or of transitional forms connecting orders now completely isolated.

The accurate correlation in time of the various scattered plant-bearing deposits is a matter of considerable difficulty, for plant-remains are preserved principally in lacustrine strata laid down in separate basins of small extent. This it is obvious must commonly be the case, as most leaves and fruits are not calculated to drift far in the sea without injury or in abundance; nor are they likely as a rule to be associated with marine organisms. Deposits containing marine fossils can be compared even when widely separated, for the ocean is continuous and many marine species are world-wide. Plants, on the other hand, like land and fresh-water animals, occupied areas which may or may not have been continuous. Therefore, without a knowledge of the physical geography of any particular period, we cannot know whether like or unlike floras might be expected in neighbouring areas during that period. If, however, we discover plant-bearing strata interstratified with deposits containing marine fossils, we can fix the period to which the plants belong, and may be able to correlate them in distinct areas, even though the floras be unlike. This clear stratigraphical evidence is, however, so rarely found that much uncertainty still remains as to the true age of several of the floras now to be described.

In rocks approximately equivalent to the Lower Greensand of England, or slightly earlier, Angiosperms make their first appearance; but as the only strata of this age in Britain are of marine origin, we have to turn to other countries for the evidence. The earliest Angiosperm yet found in Europe is a single monocotyledonous leaf of doubtful affinities, named by Saporta *Alismacites primaevus* (fig. 1), and found in the Valenginian strata of Portugal. These deposits seem to be equivalent to British Wealden rocks, though in the latter, even in their upper part, no trace of Angiosperms has been discovered. No other undoubted Angiosperm has yet been discovered in Europe in strata of this age, but Heer records a poplar-like leaf from Urgonian strata, a stage newer than the Valenginian, in Greenland, and Saporta has described from strata of the same date in Portugal a Euphorbiaceous plant apparently closely allied to the living *Phyllanthus* and named by him *Choffatia Francheti* (fig. 2). We must turn to North America for a fuller knowledge of the earlist flowering-plants.

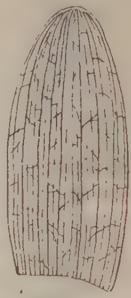

FIG. 1.—*Alismacites primaevus.*

American Cretaceous.

In S. Dakota a remarkable series has been discovered, lying unmistakably between marine Upper Jurassic rocks below and Upper Cretaceous above. There has been a certain amount of confusion as to the exact strata in which the plants occur, but this has now been cleared up by the researches of Lester F. Ward, who has shown how the Secondary flora gives place to one of Tertiary character.

The lower strata—*i.e.* those most allied to the Jurassic—contain only Gymnosperms and Cryptogams. The next division (Dakota No. 2 of Meek and Hayden) contains Gymnosperms and Ferns of Neocomian types, or even of Neocomian species; but mingled with these occur a few dicotyledonous leaves belonging to four genera. The specimens are very fragmentary, and all that can be said is that one of the forms may be allied to oak, another to fig, a third to *Sapindus*, and the fourth may perhaps be near to elm. The "Potomac Formation" of Virginia and Maryland is doubtless also mainly of Neocomian age, for though it rests unconformably on much older strata, the successive floras found in it are so allied to those of S. Dakota as to leave little doubt as to the general homotaxis of the series. Lester Ward records no fewer than 737 distinct forms, consisting chiefly of Ferns, Cycads, Conifers and Dicotyledons, the Ferns and Cycads being confined mainly to the Older Potomac, while the Dicotyledons are principally represented in the Newer Potomac, though occurring more rarely even down to the base of the series. Six successive stages have been defined in the Potomac formation. The Mount Vernon beds, which occur about the middle of the series, have as yet yielded only a small number of species, though these include the most interesting early Angiosperms. Among them are recorded a *Casuarina*, a leaf of *Sagittaria* (which however, as observed by Zeiller, may belong to *Smilax*), two species of poplar-like leaves with remarkably cordate bases, *Menispermites* (possibly a water-lily) and *Celastrophyllum* (perhaps allied to *Celastrus*). *Proteophyllum*, found in the same bed, and also in the Infra-Cretaceous of Portugal, seems to have belonged to a Proteaceous plant, though only leaves without fruits have yet been discovered in deposits of this early date. Whatever doubt may be left as to the exact botanical position of these early Lower Cretaceous Angiosperms, it is clear that both Monocotyledons and Dicotyledons are represented by several types of leaves, and that the flora extended over wide areas in North America and Greenland, and is found again at a few points in Europe. There is yet no clear evidence either of climatic zones or of the existence of geographical provinces during this period.

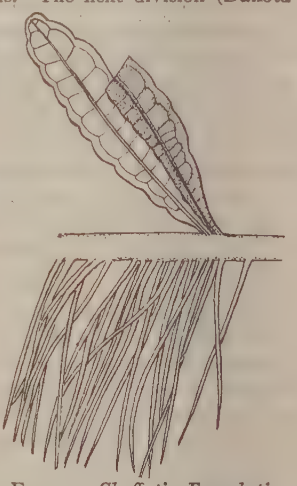

FIG. 2.—*Choffatia Francheti.*

The next strata, the Aquila Creek series, contain a well-marked dicotyledonous flora, in which both the form and nervation of the leaves begin to approximate to those of recent times. The leading characteristic of this Middle Potomac flora is the proportion of Dicotyledons. Notwithstanding this apparent passage-bed, there is a marked difference between the Older and the Newer Potomac floras, very few species passing from the one to the other. Only 15 out of 405 plants in the older series occur in the beds above though already more than 350 species have been determined from this newer series. The plants from the Amboy Clays, which form the most important division of the Newer Potomac series and were monographed in 1895 by J. S. Newberry, seem to belong to the commencement of the Upper Cretaceous period. It is remarkable that nearly 80% of the species are Dicotyledons, and that no Monocotyledons have been found. The mere enumeration of the genera will indicate how close the flowering plants are to living forms. Newberry records *Juglans*, *Myrica* (7 species), *Populus*, *Salix* (5 species), *Quercus*, *Planera*, *Ficus* (3 species), *Persoonia* and another extinct Proteaceous genus named *Proteoides*, *Magnolia* (7 species), *Liriodendron* (4 species), *Menispermites*, *Laurus* and allied plants, *Sassafras* (3 species), *Cinnamomum*, *Prunus*, *Hymenaea*, *Dalbergia*, *Bauhinia*, *Caesalpinia*, *Fontainea*, *Colutea* and other Leguminosae, *Ilex*, *Celastrus*, *Celastrophyllum* (10 species), *Acer*, *Rhamnites*, *Paliurus*, *Cissites*, *Tiliaephyllum*, *Passiflora*, *Eucalyptus* (5 species), *Hedera*, *Aralia* (8 species), *Cornophyllum*, *Andromeda* (4 species), *Myrsine*, *Sapotacites*, *Diospyros*, *Acerates*, *Viburnum* and various genera of uncertain affinities. The points that suggest themselves with regard to this flora are, that it includes a fair representation of the existing orders of warm-temperate deciduous trees; that the more primitive types—such as the *Amentaceae*—do not appear to preponderate to a greater extent than they do in the existing temperate flora; that the assemblage somewhat suggests American affinities; and that when we take into account deficient collecting, local conditions, and the non-preservation of succulent plants, there is no reason for saying that certain other orders must have been absent. The great rarity of Monocotyledons is a common characteristic of fossil floras known only, as this one is, from leaves principally belonging to deciduous trees. With regard to suggested American affinities, it must be borne in mind that the Neocomian Angiosperms are little known except in America and in Greenland, and that we therefore cannot yet say whether families now mainly American were not formerly of world-wide distribution. We know that this was the case with some, such as *Liriodendron*; and in *Eucalyptus* we see the converse, where a genus formerly American is now confined to a far distant region. The Neocomian flora has been collected from an area extending over about 30° of latitude; but there is little evidence of any corresponding climatic change. We cannot yet say, however, that the deposits are exactly contemporaneous, and the great climatic variations that have taken place in the northern hemisphere during the existence of our living flora should make us hesitate to correlate too minutely from the evidence of plants alone.

The highest division of the Dakota series (known as Dakota No. 1) which lies immediately beneath Upper Cretaceous strata with marine fossils, contains a flora so like that of the Tertiary deposits that only the clearest geological evidence has been considered sufficient to prove that Heer was wrong when he spoke of the plants as Miocene. These highest plant-bearing strata rest, according to Lester Ward, somewhat unconformably on the Dakota No. 2; they show also a marked difference in the included plants. The genera of Dicotyledons represented are *Quercus*, *Sassafras*, *Platanus*, *Celastrophyllum*, *Cissites*, *Viburnites*.

In the central parts of North America the lacustrine plant-bearing deposits are of enormous thickness, the Dakota series being followed by marine Cretaceous strata known as the Colorado and Montana groups, and these being succeeded conformably by a thousand feet or more of lacustrine shales, sandstones and coal-seams, belonging to the Laramie series. This also contains occasional marine Upper Cretaceous fossils, as well as reptiles of Cretaceous types. An extensive literature has grown up relating to these Laramie strata, for owing to the Tertiary aspect of the contained plants, geologists were slow to recognize that they could be truly contemporaneous and interbedded with others yielding Cretaceous animals. In addition to this, the earlier writers included in the Laramie series many deposits now known to be of later date and truly Tertiary, and the process of separation is even now only partially completed. It will be safest in these circumstances to accept as our guide to the true Laramie flora the carefully compiled "Catalogue" of F. H. Knowlton. According to this catalogue, the true Laramie flora includes about 250 species, more than half of which are deciduous forest trees, herbaceous Dicotyledons, Monocotyledons and Cryptogams, all being but poorly represented. Among the few Monocotyledons are leaves and fruits of palms, and traces of grasses and sedges. The Dicotyledons include several water-lilies, a somewhat doubtful *Trapa*, and many genera of forest trees still common in America. The genera best represented are *Ficus* (21 species), *Quercus* (16 species), *Populus* (11 species), *Rhamnus* (9 species), *Platanus* (8 species), *Viburnum* (7 species), *Magnolia* (6 species), *Cornus* (5 species), *Cinnamomum* (5 species), *Juglans* (4 species), *Acer* (4 species), *Salix* (4 species), *Aralia* (3 species), *Rhus* (3 species), *Sequoia* (3 species). Of trees now extinct in America, *Eucalyptus* and *Ginkgo* are perhaps the most noticeable. So large a proportion of the trees still belongs to the flora of North America that one is apt to overlook the fact that among the more specialized plants some of the largest American orders, such as the *Compositae*, are still missing from strata belonging to the Cretaceous period.

European Cretaceous.

The imperfection and want of continuity of the records in Europe have made it necessary in dealing with the Cretaceous floras for us to give the first place to America. But it is now advisable to return to Europe, where Upper Cretaceous plants are not uncommon, and the position of the deposits in the Cretaceous series can often be fixed accurately by their close association with marine strata belonging to definite subdivisions. As these divisions of Cretaceous time will have to be referred to more than once, it will be useful to tabulate them, thus showing which plant-beds seem to be referable to each, and what are the British strata of like age. It has not yet been found possible so closely to correlate the strata of Europe with those of America, where distance has allowed geographical differences in both fauna and flora to come into play; therefore, beyond the references to Lower or Upper Cretaceous, no classification of the American Cretaceous strata has here been given. In Europe the most commonly accepted divisions of the Cretaceous period are as follows:—

ENGLAND.	FRANCE, &c.
Wanting	Danian
Upper Chalk	Senonian
Middle Chalk	Turonian
Lower Chalk Upper Green-sand	Cenomanian
Gault	Albian
	Aptian
Lower Green-sand	Valenginian
	Urgonian
Wealden	Neocomian

In the continental classification the deposits from the Gault downwards are grouped as Lower Cretaceous; but in Great Britain there is a strong break below the Gault and none above; and the Gault is therefore classed as Upper Cretaceous. The limits of the divisions in other places do not correspond, the British and continental strata often being so unlike that it is almost impossible to compare them. The doubt as to the exact British equivalent of the Valenginian strata of Portugal, which yield the earliest Dicotyledon, has already been alluded to. The plant-bearing deposits next in age, which have yielded Angiosperms, appear to belong to the Cenomanian, though from Westphalia a few species belonging to the Cryptogams and Gymnosperms, found in deposits correlated with the Gault, have been described by Hosius and von der Marck.

In Great Britain the whole of the Upper Cretaceous strata are of marine origin, and have yielded no land-plants beyond a few fir-cones, drift-wood and rare Dicotyledonous leaves in the Lower Chalk. Most of the deposits which have yielded Angiosperms of Cretaceous age in central Europe correspond in age with the English Upper Chalk (Senonian), but a small Cenomanian flora has been collected from the Unter Quader in Moravia. Heer described from this deposit at Moletein 13 genera, of which 7 are still living, containing 18 species, viz.: 1 fern, 4 Conifers, 1 palm, 2 figs, 1 *Credneria*, 2 laurels, 1 *Aralia*, 1 *Chondrophyllum* (of uncertain affinities), 2 magnolias, 2 species of *Myrtaceae* and a species of walnut. Saxony yields from strata of this period at Niederschoena 42 species, described by Ettingshausen. This small flora is most remarkable, for no fewer than 6 genera, containing 8 species, are referred to the *Proteaceae*. The Cenomanian flora of Bohemia is larger and equally peculiar. Among the Dicotyledons described by Velenovsky are the following: *Credneria* (5 species), *Araliaceae* (17 species), *Proteaceae* (8 species), *Myrica* (2 species), *Ficus* (5 species), *Quercus* (2 species), *Magnoliaceae* (5 species), *Bombaceae* (3 species), *Laurineae* (2 species), *Ebenaceae* (2 species), *Verbenaceae*, *Combretaceae*, *Sapindaceae* (2 species), *Camelliaceae*, *Ampelideae*, *Mimoseae*, *Caesalpinieae* (5 species), *Eucalyptus* (2 species), *Pisonia*, *Phillyrea*, *Rhus*, *Prunus*, *Bignonia*,

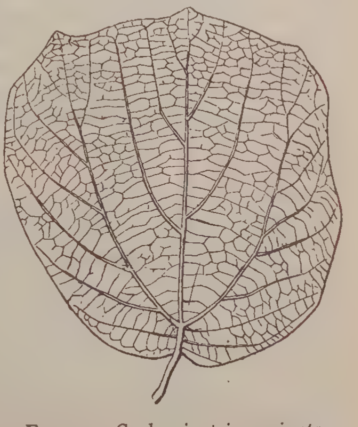

FIG. 3.—*Credneria triacuminata.*

Laurus, Salix, Benthamia. To this list Bayer adds *Aristolochia.* The Cenomanian flora of central Europe appears to be a subtropical one, with marked approaches to the living flora of Australia. The majority of its Dicotyledons belong to existing genera, but one of the most prolific and characteristic Cretaceous forms is *Credneria* (Fig. 3), a genus of doubtful affinities, which has been compared by different authors to the poplars, planes, limes and other orders.

The Cretaceous plant-beds of Westphalia include both Upper and Lower Senonian, the two floras being very distinct. Hosius and von der Marck describe, for instance, 12 species of oak from the Upper and 6 from the Lower strata, but no species is common to the two. The same occurs with the figs, with 3 species above and 8 below. The 6 species of *Credneria* are all confined to the older deposits. In fact, not a single Dicotyledon is common to these two closely allied divisions of the Cretaceous series; a circumstance not easy to explain, when we see how well the oaks and figs are represented in each. Four species of *Dewalquea*, a ranunculaceous genus allied to the hellebore, make their appearance in the Upper Senonian of Westphalia, other species occurring at Aix-la-Chapelle in deposits of about the same age. The Senonian flora of the last-named place, and that of Maestricht, are still only imperfectly known. It is unnecessary to trace the variations of the Upper Cretaceous flora from point to point; but the discoveries within the Arctic circle have been so surprising that attention must again be called to them. Besides the Lower Cretaceous plants already mentioned, Heer has described from Greenland a flora of Cenomanian age, and another belonging to the Senonian. The Cenomanian strata have yielded already 177 species, the different groups being represented in these proportions: Cryptogams, 37, 30 of which are Ferns; Cycads, 8; Conifers, 27; Monocotyledons, 8; Apetalous Dicotyledons, 31; other Dicotyledons, 66. The Senonian strata have yielded 118 species, 21 of which are Cryptogams, 11 Conifers, 5 Monocotyledons, 75 Dicotyledons. Forest trees, especially oaks, are plentiful, and many of the species are identical with those found in Cretaceous deposits in more southern latitudes. Both of these floras suggest, however, that the climate of Greenland was somewhat colder than that of Westphalia, though scarcely colder than warm-temperate.

The Cretaceous deposits just described are followed by a series of Tertiary formations, but in Europe the continuity between Cretaceous and Tertiary is not quite complete. The Tertiary formations have been assigned to six periods; these are termed—Paleocene, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, and each has its own botanical peculiarities.

Paleocene Plants.

During the Paleocene period the plants were not markedly different from those of the Upper Cretaceous. Its flora is still but imperfectly known, for we are dependent on two or three localities for the plants. There is found at Sézanne, about 60 m. east of Paris, an isolated deposit of calcareous tufa full of leaves, which gives a curious insight into the vegetation which flourished in Paleocene times around a waterfall. Sézanne yields Ferns in profusion, mingled with other shade-loving plants such as would grow under the trees in a moist ravine; its vegetation is comparable to that of an island in the tropical seas. Monocotyledons are rare, the only ones of much interest being some fragments of pandanaceous leaves. The absence of Gymnosperms is noticeable. The Proteaceae are also missing; but other Dicotyledons occur in profusion, many of them being remarkable for the large size of their deciduous leaves. Among the flowering plants are *Dewalquea*, a ranunculaceous genus already mentioned as occurring in the Upper Cretaceous, and numerous living genera of forest-trees, such as occur throughout the Tertiary period, and are readily comparable with living forms. Saporta has described about seventy Dicotyledons, most of which are peculiar to this locality.

The plant-bearing marls of Gelinden, near Liège, contain the débris of a Paleocene forest. The trees seemed to have flourished on neighbouring chalky heights. The most abundant species of this forest were the oaks and chestnuts, of which a dozen have been collected; laurels, *Viburnum*, ivy, several Aralias, *Dewalquea*, a *Thuja* and several Ferns may be added. This flora is compared by Saporta and Marion with that of southern Japan. Other deposits of this age in France have furnished plants of a more varied aspect, including myrtles, araucarias, a bamboo and several fan-leaved palms. Saporta points out the presence in these Paleocene deposits of certain types common, on the one hand, to the American Tertiary strata between the Missouri and the Rocky Mountains, and on the other, to the Tertiary flora of Greenland. The Paleocene deposits of Great Britain are of marine origin, and only yield pine-cones and fragments of *Osmunda.*

Eocene and Oligocene of Great Britain.

The British Eocene and Oligocene strata yield so large a flora, and contain plant-beds belonging to so many different stages, that it is unfortunate we have still no monograph on the subject, the one commenced by Ettingshausen and Gardner in 1879 having reached no farther than the Ferns and Gymnosperms. This deficiency makes it impossible to deal adequately with the British Eocene plants, most of the material being either unpublished or needing re-examination.

In the earliest Eocene plant-beds, in the Woolwich and Reading series, a small but interesting flora is found, which suggests a temperate climate less warm than that of earlier or of later periods. Leaves of planes are abundant, and among the plants recorded are two figs, a laurel, a *Robinia*, a *Grevillea* and a palm. Ferns are scarce, Ettingshausen and Gardner recording only *Aneimia subcretacea* and *Pteris* (?) *Prestwichii.* The only Gymnosperms determined are *Libocedrus adpressa*, which is close to *L. decurrens* of the Yosemite, and *Taxodium europaeum.* A few plants have been found in the next stage, the Oldhaven beds, and among these are fig and cinnamon. Gardner considers the plants to point to subtropical conditions. The London Clay has yielded a large number of plants, but most of the species are represented by fruits alone, not by leaves. This circumstance makes it difficult to compare the flora with that of other formations, for not only is it uncertain which leaves and fruits belong to the same plant, but there is the additional source of doubt, that different elements of the same flora may be represented at different localities. Of some plants only the deciduous leaves are likely to be preserved, whilst other succulent-leaved forms will only be known from their woody fruits. Among the 200 plants of the London Clay are no Ferns, but 6 genera of Gymnosperms—viz. *Callitris* (2 species), *Sequoia, Athrotaxis* (?) *Ginkgo, Podocarpus, Pinus*; and several genera of palms, of which the tropical *Nipa* is the most abundant and most characteristic, among the others being fan-palms of the genera *Sabal* and *Chamaerops.* The Dicotyledons need further study. Among the fruits Ettingshausen records *Quercus, Liquidambar, Laurus, Nyssa, Diospyros, Symplocos, Magnolia, Victoria, Hightea, Sapindus, Cupania, Eugenia, Eucalyptus, Amygdalus*; he suggests that the fruits of the London Clay of Sheppey may belong to the same plants as the leaves found at Alum Bay in the Isle of Wight.

The next stage is represented by the Lower Bagshot leaf-beds of Alum Bay. These pipeclays yield a varied flora, Ettingshausen recording 274 species, belonging to 116 genera and 63 families. Gardner, however, is unable to reconcile this estimated richness with our knowledge of the flora, and surmises that fossil plants from other localities must have been inadvertently included. He considers the flora to be the most tropical of any that has so far been studied in the northern hemisphere. Its most conspicuous plants are *Ficus Bowerbankii, Aralia primigenia, Comptonia acutiloba, Dryandra Bunburyi, Cassia Ungeri* and the fruits of *Caesalpinia.* The floras which it chiefly resembles are first, that of Monte Bolca, and second, that of the Gres du Soissonais, which latter Gardner thinks may be of the same age, and not earlier, as is generally supposed. The total number of species found at Alum Bay, according to this author, is only about 50 or 60.

To the Bagshot Sand succeeds the thick mass of sands with intercalated plant-beds seen in Bournemouth cliffs. Each bed yields peculiar forms, the total number of species amounting to many hundred, most of them differing from those occurring in the strata below. The plants suggest a comparison of the climate and forests with those of the Malay Archipelago and tropical America. At one place we find drifted fruits of *Nipa*, at another *Hightea* and *Anona.* Other beds yield principally palms, willows, laurels, *Eucalyptus* or Ferns; but there are no Cycads. As showing the richness of this flora, we may mention that in the only orders which have yet been monographed, Ferns are represented by 17 species and Gymnosperms by 10, though these are not the groups best represented. Gardner speaks of the Bournemouth flora as appearing to consist principally of trees or hard-wooded shrubs, comparatively few remains of the herbaceous vegetation being preserved. The higher Eocene strata of England—those above the Bournemouth Beds—are of marine origin, and yield only drifted fruits, principally fir-cones.

In the volcanic districts of the south-west of Scotland and the north-east of Ireland plant-beds are found intercalated between the lava-flows. These also, like the lignites of Bovey Tracey, have been referred to the Miocene period, on the supposed evidence of the plants; but more recent discoveries by Gardner tend to throw doubt on this allocation, and suggest that, though of various ages, the first-formed of these deposits may date back to early Eocene times. The flora found in Mull points distinctly to temperate conditions; but it is not yet clear whether this indicates a different period from the subtropical flora of the south of England, or whether the difference depends on latitude or local conditions. The plants include a Fern, *Onoclea hebridica*, close to a living American form; four Gymnosperms belonging to the genera *Cryptomeria, Ginkgo,* *Taxus* and *Podocarpus*; Dicotyledons of about 30 species, several of which have been figured. Among the Dicotyledons may be mentioned *Platanus*, *Acer* (?), *Quercus* (?), *Viburnum*, *Alnus*, *Magnolia*, *Corylus* (?), *Castanea* (?), *Zizyphus*, *Populus* and the nettle-like *Boehmeria antiqua*. The absence of the so-called cinnamon-leaves and the *Smilaceae*, which always enter into the composition of Middle Eocene and Oligocene floras, is noticeable. The Irish strata yield two ferns; 7 Gymnosperms, *Cupressus*, *Cryptomeria*, *Taxus*, *Podocarpus*, *Pinus* (2 species), *Tsuga*; and leaves of about 25 Dicotyledons. The most abundant leaf, according to Gardner, does not seem distinct from *Celastrophyllum Benedeni*, of the Paleocene strata of Gelinden; a water-lily, *Nelumbium Buchii*, occurs also in Oligocene beds on the Continent; the species of *MacClintockia* (fig. 4) is found both in the Arctic floras and at Gelinden. Among the other plants are an alder, an oak and a doubtful cinnamon.

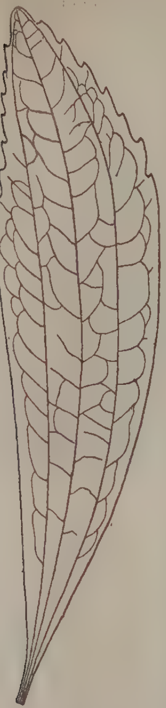
Fig. 4.—*MacClintockia trinervata.*

Leaving these Scottish and Irish deposits of doubtful age, we find in the Hampshire Basin a thick series of fluviatile, lacustrine and marine deposits undoubtedly of Lower and Middle Oligocene date. Their flora is still a singularly poor one, though plants have been obtained at many different levels; they perhaps indicate a somewhat cooler climate than that of the Bournemouth series. Among the more abundant plants are nucules of several species of *Chara*, and drifted fruits and seeds of water-lilies, of *Folliculites* (now generally referred to *Stratiotes*) and of *Limnocarpus* (allied to *Potamogeton*); there is little else mixed with these. Other seams are full of the twigs and cones of *Athrotaxis*, a Conifer now confined to Tasmania. Ferns are represented by *Gleichenia*, *Lygodium* and *Chrysodium Lanzaeanum*, which last has a very wide range in time; Monocotyledons, by a Sabal and a feather-palm, as well as by the two aquatic genera above mentioned; Gymnosperms, by the extinct araucarian genus *Doliostrobus*, by rare pine-cones, and by *Athrotaxis*. Dicotyledonous leaves are not plentiful, the genera recorded being *Andromeda*, *Cinnamomum*, *Zizyphus*, *Rhus*, *Viburnum*.

The lignite deposits and pipe-clays of Bovey Tracey in Devon, referred by Heer and Pengelly to the Miocene period, were considered by Gardner to be of the same age as the Bournemouth beds (Middle Eocene). Recent researches show, however, that Heer's view was more nearly correct. The flora of Bovey is like that of the lignite of the Wetterau, which is either highest Oligocene or lowest Miocene. Several species of *Nyssa* are common to the two districts, as are a climbing palm, two vines, a magnolia, &c. The common tree at Bovey is *Sequoia Couttsiae*, which probably grew in profusion in the sheltered valleys of Dartmoor, close to the lake. Above these strata in Great Britain there is a complete break, no species of plant ranging upwards into the next fossiliferous division.

Central and Southern France.

Space will not allow us to deal with the numerous scattered deposits which have yielded Tertiary plants. It will be more to the purpose to take distant areas, where the order of the strata is clear, and compare the succession of the floras with that met with in other geographical regions and in other latitudes. For this study it will be most convenient to take next south and central France, for in that area can be found a series of plant-bearing strata in which is preserved a nearly continuous history of the vegetation from Upper Eocene down to Pliocene. The account is taken mainly from the writings of Saporta.

The gypsum-deposit of Upper Eocene date at Aix in Provence commences this series, and is remarkable for the variety and perfect preservation of its organic remains. Among its Gymnosperms are numerous *Cupressineae* of African affinity belonging to the genera *Callitris* and *Widdringtonia*, and a juniper close to one indigenous in Greece. Fan-palms, several species of dragon-tree and a banana, like one living in Abyssinia, represent the more peculiar Monocotyledons. Among the noticeable Dicotyledons are the *Myricaceae*, *Proteaceae*, *Laurineae*, *Bombax*, the Judas-tree, *Acacia*, *Ailanthus*, while the most plentiful forms are the *Araliaceae*. Willows and poplars, with a few other plants of more temperate regions, are found rarely at Aix, and seemingly point to casual introduction from surrounding mountains. In a general way, spiny plants, with stiff branches and dry and coriaceous leaves, dominate the flora, as they now do in Central Africa, to which region on the whole Saporta considers the flora to be most allied.

The succeeding Oligocene flora appears to be more characterized by a gradual replacement of the Eocene species by allied forms, than by any marked change in the assemblage or in the climatic conditions. It forms a perfectly gradual transition to the still newer Miocene period, the newer species slowly appearing and increasing in number. Saporta considers that in central and southern Europe the alternate dry and moist heat of the Eocene period gave place to a climate more equally and more universally humid, and that these conditions continued without material change into the succeeding Miocene stage. Among the types of vegetation which make their appearance in Europe during the Oligocene period may be mentioned the Conifers *Libocedrus salicornioides*, several species of *Chamaecyparis* and *Sequoia*, *Taxodium distichum* and *Glyptostrobus europaeus*. The palms include *Sabal haeringiana*, *S. major* and *Flabellaria*. Among the *Myricaceae* several species of *Comptonia* are common. These new-comers are all of American type. Aquatic plants, especially water-lilies, are abundant and varied; the soil-dry *Callitris* and *Widdringtonia* become scarce.

Plants in Amber.

Though we do not propose to deal with the other European localities for Eocene and Oligocene plants, there is one district to which attention should be drawn, on account of the exceptional state of preservation of the specimens. On the Baltic shores of Prussia there is found a quantity of amber, containing remains of insects and plants. This is derived from strata of Oligocene age, and is particularly valuable because it preserves perfectly various soft parts of the plants, which are usually lost in fossil specimens. The tissues, in fact, are preserved just as they would be in Canada balsam. The amber yields such things as fallen flowers, perfect catkins of oak, pollen grains and fungi. It enables us to determine accurately orders and genera which otherwise are unknown in the fossil state, and it thus aids us in forming a truer idea of the flora of the period than can be formed at any locality where the harder parts alone are recognizable. No doubt this amber flora is still imperfectly known, but it is valuable as giving a good idea of the vegetation, during Oligocene times, of a mixed wood of pine and oak, in which there is a mixture of herbaceous and woody plants, such as would now be found under similar conditions.

The plants of which the floral organs or perfect fruits are preserved include the amber-bearing *Pinus succinifera*, *Smilax*, *Phoenix*, the spike of an aroid, 11 species of oak, 2 of chestnut, a beech, *Urticaceae*, 2 cinnamons and *Trianthera* among the *Lauraceae*, representatives of the *Cistaceae*, *Ternstroemiaceae*, *Dilleniaceae* (3 species of *Hibbertia*), *Geraniaceae* (*Geranium* and *Erodium*), *Oxalidaceae*, *Acer*, *Celastraceae*, *Olacaceae*, *Pittosporaceae*, *Ilex* (2 species), *Euphorbiaceae*, *Umbelliferae* (*Chaerophyllum*), *Saxifragaceae* (3 genera), *Hamamelidaceae*, *Rosaceae*, *Connaraceae*, *Ericaceae* (*Andromeda* and *Clethra*), *Myrsinaceae* (3 species), *Rubiaceae*, *Sambucus* (2 species), *Santalaceae*, *Loranthaceae* (3 species). We here discover for the first time various living families and genera, but there is still a noticeable absence of many of our most prolific existing groups. Whether this deficiency is accidental or real time will show.

Miocene.

The Miocene flora, which succeeds to that just described, is well represented in Europe; but till recently there has been an unfortunate tendency to refer Tertiary floras of all dates to the Miocene period, unless the geological position of the strata was so clear as obviously to forbid this assignment. Thus plant-beds in the basalt of Scotland and Ireland were called Miocene; and in the Arctic regions and in North America even plant-beds of Upper Cretaceous age were referred to the same period. The reason for this was that some of the first Tertiary floras to be examined were certainly Miocene, and, when these plants had been studied, it was considered that somewhat similar assemblages found elsewhere in deposits of doubtful geological age must also be Miocene. For a long time it was not recognized that changes in the marine fauna, on which our geological classification mainly depends, correspond scarcely at all with changes in the land plants. It was not suspected, or the fact was ignored, that the break between Cretaceous and Tertiary—made so conspicuous by striking changes in the aquatic animals—had little or no importance in botanical history. It was not realized that an Upper Cretaceous flora needed critical examination to distinguish it from one of Miocene age, and that the two periods were not characterized by a sweeping change of generic type, such as took place among the marine invertebrates. It may appear absurd to a geologist that any one could mistake a Cretaceous flora for one of Miocene date, since the marine animals are completely different and the differences are striking. In the case of the plants, however, the Tertiary generic types in large part appeared in Upper Cretaceous times. Few or no extinct types are to be found in these older strata—there is nothing among the plants equivalent to the unmistakably extinct *Ammonites*, *Belemnites*, and a hundred other groups, and we only meet with constant variations in the same genus or family, these variations having seldom any obvious relation to phylogeny.

The Miocene period is unrepresented by any deposits in Great Britain, unless the Bovey lignite should belong to its earliest stage; we will therefore commence with the best known region—that of central Europe and especially of Switzerland, whence a prolific flora has been collected and described by Oswald Heer. The Miocene lacustrine deposits are contained in a number of silted-up lake-basins, which were successively formed and obliterated during the uprise of the Alps and the continuous folding and bending of the earth's crust which was so striking a feature of the period. These undulations tended to transform valleys into chains of lakes, into which the plants and animals of the surrounding area fell or were washed. We thus find preserved in the Upper Miocene lacustrine deposits of Switzerland a larger flora than is known from any other period of similar length; in fact, an analysis of its composition suggests that the Miocene flora of Switzerland must have been both larger and more varied than that now living in the same country. The best known locality for the Upper Miocene plants is Oeningen, on the Lake of Constance, where have been collected nearly 500 species of plants, the total number of Miocene plants found in Switzerland being stated to be now over 900. Among the characteristics of this Miocene flora are the large number of families represented, the marked increase in the deciduous-leaved plants, the gradual decrease in the number of palms and of tropical plants, and the replacement of these latter by Mediterranean or North American forms. According to Heer, the tropical forms in the Swiss Miocene agree rather with Asiatic types, while the subtropical and temperate plants are allied to forms now living in the temperate zone in North America. Of the 920 species described by Heer, 114 are Cryptogams and 806 flowering plants. Mosses are extremely rare, Heer only describing 3 species. Vascular Cryptogams still include one or two large horsetails with stems over an inch thick, and also 37 species of Fern, amongst the most interesting of which are 5 species belonging to the climbing *Lygodium*, a genus now living in Java. The number of Ferns is just equal to that now found in Switzerland. Cycads are only represented by fragments of two species, and this seems to be the last appearance of Cycads in Europe. The Coniferae include no fewer than 94 species of *Cupressineae* and 17 of *Abietineae*, including several species of *Sequoia*. Monocotyledons form one-sixth of the known Miocene flora, 25 of them being grasses and 39 sedges; but most of these need further study, and are very insufficiently characterized. Heer records one species of rice and four of millet. Most of the other Monocotyledons call for little remark, though among them is an *Iris*, a *Bromelia* and a ginger. *Smilax*, as in earlier times, was common. Palms, referred to 11 species, are found, though they seem to have decreased in abundance; of them 7 are fan-palms, the others including *Phoenicites*—a form allied to the date—and a trailing palm, *Calamopsis*, allied to the canes and rattans. Among the Dicotyledons, the *Leguminosae* take the first place with 131 species, including *Acacia*, *Caesalpinia* and *Cassia*, each represented by several forms. The occurrence of 90 species of *Amentaceae* shows that, as the climate became less tropical, the relative proportion of this group to the total flora increased. Evergreen oaks are a marked characteristic of the period, more than half the Swiss species being allied to living American forms. Fig-trees referred to 17 species occur, all with undivided leathery leaves; one is close to the banyan, another to the indiarubber-tree. The *Laurineae* were plentiful, and include various true laurels, camphor-trees, cinnamon, *Persea* and *Sassafras*. The *Proteaceae*, according to Heer, are still common, the Australian genera *Hakea*, *Dryandra*, *Grevillea* and *Banksia*, being represented. Amongst gamopetalous plants several of our largest living families, including *Campanulaceae*, *Labiatae*, *Solanaceae* and *Primulaceae*, are still missing; and of *Boragineae*, *Scrophularineae*, *Gentianeae* and *Caprifoliaceae* there are only faint and doubtful indications. The *Compositae* are represented by isolated fruits of various species. Twining lianas are met with in a species of *Bignonia*; *Umbelliferae* *Ranunculaceae* and *Cruciferae*, are represented by a few fruits. These families, however, do not appear to have had anything like their present importance in the temperate flora, though, as they are mainly herbaceous plants with fruits of moderate hardness, they may have decayed and left no trace. The American *Liriodendron* still flourished in Europe. Water-lilies of the genera *Nymphaea* and *Nelumbium* occur. Maples were still plentiful, 20 species having been described. *Rosaceae* are rare, *Crataegus*, *Prunus* and *Amygdalus*, being the only genera recorded. It is obvious that many of these Swiss Miocene plants will need more close study before their specific characters, or even their generic position, can be accepted as thoroughly made out; still, this will not affect the general composition of the flora, with its large proportion of deciduous trees and evergreens, and its noticeable deficiency in many of our largest living families.

Tertiary of North America.

From Europe it will be convenient to pass to a distant region of similar latitude, so that we may see to what extent botanical provinces existed in Eocene and Oligocene times. It so happens that the interior of temperate North America is almost the only region outside Europe in which a series of plant-bearing strata give a connected history of these periods, and in which the plants have been collected and studied. It is unfortunately still very difficult to correlate even approximately the strata on the two sides of the Atlantic, and there is great doubt as to what strata belong to each division of the Tertiary period even in different parts of North America. This difficulty will disappear as the strata become better known; but at present each of the silted-up lakes has to be studied separately, for we cannot expect so close a correspondence in their faunas and floras as is found in the more crowded and smaller basins in central Europe.

Perhaps the most striking characteristic of the Tertiary floras of North America, as distinguished from those of Europe, is the greater continuity in their history and greater connexion with the existing flora of the same regions. This difference is readily explained when we remember that in Europe the main barriers which stop migration, such as the Alps and the Mediterranean, run east and west, while in America the only barriers of any importance run north and south. In consequence of this peculiarity, climatic or orographic changes in Europe tend to drive animals and plants into a *cul de sac*, from which there is no escape; but in America similar climatic waves merely cause the species alternately to retreat and advance. This difficulty in migration is probably the reason why the existing European flora is so poor in large-fruited trees compared with what it was in Miocene times or with the existing flora of North America. In America the contrast between the Eocene forests and those now living is much less striking, and this fact has led to the wrong assumption that the present American flora had its origin in the American continent. Such a conclusion is by no means warranted by the facts, for in Tertiary times, as we have seen, the European flora had a distinctly "American" facies. Therefore the so-called American forms may have originated in the Old World, or more probably, as Saporta suggests, in the polar regions, whence they were driven by the increase of cold southwards into Europe and into America. The American Tertiary flora is so large, and the geology of the deposits is so intricate, that it is out of the question to discuss them more fully within the limits of this article. We may point out, however, that the early Tertiary floras seem to indicate a much closer connexion and a greater community of species than is found between the existing plants of Europe and America. Or, rather, we should perhaps say that ancient floras suggest recent dispersal from the place of origin, and less time in which to vary and become modified by the loss of different groups in the two continents. Geographical provinces are certainly indicated by the Eocene flora of Europe and America, but these are less marked than those now existing.

Australia.

If we turn to a more isolated region, like Australia, we find a Lower Eocene flora distinctly related to the existing flora of Australia and not to that of other continents. Australasia had then as now a peculiar flora of its own, though the former wide dispersal of the Proteaceae and Myrtaceae, and also the large number of Amentaceae then found in Australia, make the Eocene plants of Europe and Australia much less unlike than are the present floras.

Arctic Regions.

Within the Arctic circle a large number of Tertiary plants have been collected. These were described by Heer, who referred them to the Miocene period; he recognized, in fact, two periods during which Angiosperms flourished within the Arctic regions, the one Upper Cretaceous, the other Miocene. To this view of the Miocene age of the plant-bearing strata in Greenland and Spitsbergen there are serious objections, which we will again refer to when the flora has been described.

The Tertiary flora of Greenland is of great interest, from the extremely high latitude at which the plants flourished, thirty of the species having been collected so far north as lat. 81°. Taking first this most northerly locality, in Grinnell Land, we find the flora to comprise 2 horsetails, 11 Conifers (including the living *Pinus Abies*), 2 grasses, a sedge, 2 poplars, a willow, 2 birches, 2 hazels, an elm, a *Viburnum*, a water-lily, and a lime. Such an assemblage at the present day would suggest a latitude quite 25° farther south; but it shows decidedly colder conditions than any of the European Eocene, Oligocene, or Miocene strata. From lat. 78° in Spitsbergen Heer records 136 species of fossil plants. More to the south, at Disco Island in lat. 70°, the Tertiary wood seem to have been principally composed of planes and Sequoias; but a large number of other genera occur, the total number of plants already recorded being 137. From various parts of Greenland they now amount to at least 280. Among the plants from Disco, more than a quarter are also found in the Miocene of central Europe. The plants of Disco include, besides the plane and Sequoia, such warm-temperate trees as *Ginkgo*, oak, beech, poplar, maple, walnut, lime and magnolia. If these different deposits are contemporaneous, as is not improbable, there is a distinct change in the flora as we move farther from the pole, which suggests that difference of latitude then as now was accompanied by a difference in the flora. But if this process is continuous from latitude to latitude, then we ought not to look for a flora of equivalent age in the warm-temperate Miocene deposits of central Europe, but should rather expect to find that the temperate plants of Greenland were contemporaneous with a tropical flora in central Europe. As Mr Starkie Gardner has pointed out, it does not seem reasonable to assume that the same flora could have ranged then through 40° of latitude; it is more probable that an Eocene temperate flora found in the Arctic regions travelled southwards as the climate became cooler, till it became the Miocene temperate flora of central Europe. Mr Gardner suggests, therefore, that the plant-beds of Greenland and Spitsbergen represent the period of greatest heat, and are therefore wrongly referred to the Miocene. At present the evidence is scarcely sufficient to decide the question, for if this view is right, we ought to find within the Arctic circle truly Arctic floras equivalent to the cool Lower Eocene and Miocene periods; but these have not yet been met with.

Pliocene.

A steady decrease of temperature marked the Pliocene period throughout Europe, and gradually brought the climatic conditions into correspondence with those now existing, till towards the end of the period neither climate nor physical geography differed greatly from those now existing. Concurrently with this change, the tropical and extinct forms disappeared, and the flora approached more and more nearly to that now existing in the districts where the fossil plants are found, though in the older deposits, at any rate, the geographical distribution still differed considerably from that now met with. At last, in the latest Pliocene strata (often called "pre-Glacial") we find a flora consisting almost entirely of existing species belonging to the Palaearctic regions, and nearly all still living in the country where the fossils are found. This flora, however, is associated with a fauna of large mammals, the majority of which are extinct.

The plants of the Older Pliocene period are unknown in Great Britain, and little known throughout Europe except in central France and the Mediterranean region. The forests of central France during this epoch showed, according to Saporta, a singular admixture of living European species, with trees now characteristic of the Canary Isles and of North America. For instance, of the living species found at Meximieux, near Lyons, one is American, eight at least belong to the Canaries (six being characteristic of those islands), two are Asiatic, and ten still live in Europe. Taking into account, however, the closest living allies of the fossil plants, we find about equal affinities with the floras of Europe, America, and Asia. There is also a decided resemblance to the earlier Miocene flora. Among the more interesting plants of this deposit may be mentioned *Torreya nucifera*, now Japanese; an evergreen oak close to the common *Quercus Ilex*; *Laurus canariensis*, *Apollonias canariensis*, *Persea carolinensis*, and *Ilex canariensis*; *Daphne pontica* (a plant of Asia Minor); a species of box, scarcely differing from the English, and a bamboo. To this epoch, or perhaps to a stage slightly later, and not to the Newer Pliocene period, as is generally supposed, should probably be referred the lignite deposits of the Val d'Arno. This lignite and the accompanying leaf-bearing clays underlie and are apparently older than the strata with Newer Pliocene mammals and mollusca. The only mammal actually associated with the plants appears to be a species of tapir, a genus which in Europe seems to be characteristically Miocene and Older Pliocene. The plants of the Val d'Arno have been described by Ristori; they consist mainly of deciduous trees, a large proportion of which are known Miocene and early Pliocene forms, nearly all of them being extinct. A markedly upland character is given to the flora of this valley through the abundance of pines (9 species) and oaks (16 species) which it contains; but this peculiarity is readily accounted for by the steep slopes of the Apennines, which everywhere surround and dominate the old lake-basin. Among the other noticeable plants may be mentioned *Betula* (3 species), *Alnus* (2 species), *Carpinus*, *Fagus* (4 species), *Salix* (4 species), *Populus* (2 species), *Platanus*, *Liquidambar*, *Planera*, *Ulmus* (2 species), *Ficus* (2 species), *Persoonia*, *Laurus* (5 species), *Persea*, *Sassafras*, *Cinnamomum* (5 species), *Oreodaphne*, *Diospyros* (2 species), *Andromeda*, *Magnolia*, *Acer* (3 species), *Sapindus*, *Celastrus* (2 species), *Ilex* (4 species), *Rhamnus* (3 species), *Juglans* (5 species), *Carya* (2 species), *Rhus*, *Myrtus*, *Crataegus*, *Prunus*, *Cassia* (3 species). These plants suggest a colder climate than that indicated by the plants of Meximieux—they might, therefore, be thought to belong to a later period. The difference, however, is probably fully accounted for when we take into consideration the biting winds still felt in spring in the valley of the Arno, and the probable large admixture of plants washed down from the mountains above. Somewhat later Pliocene deposits in the Val d'Arno, as well as the tuffs associated with the Pliocene volcanoes in central France, yield plants of a more familiar type, a considerable proportion of them still living in the Mediterranean region, though some are only now found at distant localities, and others are extinct. The flora, however, is essentially Palaearctic, American and Australian types having disappeared.

A somewhat later Pliocene flora is represented by the plants found at Tegelen, near Venloo, on the borders of the Netherlands and Germany. This deposit is of especial interest for the light it throws on the origin of the existing flora of Britain. The Tegelen plants are mainly north European; but there occur others of central and south Europe, and various exotic and extinct forms, nearly all of which, however, belong to the Palaearctic region, though some may now be confined to widely separated parts of it. For instance, *Pterocarya caucasica* does not grow nearer than the Caucasus, where it is associated with the wild vine—also found at Tegelen; *Magnolia Kobus* is confined to the north island of Japan; another species of *Magnolia* cannot be identified and may be extinct. An extinct water-lily, *Euryale limburgensis*, belongs to a monotypic genus now confined to Assam and China; an extinct sedge, *Dulichium vespiforme*, belongs to a genus only living in America, though the only living species once flourished also in Denmark; an extinct species of water-aloe (*Stratiotes elegans*) makes a third genus, represented only by a single living species, which was evidently better represented in Pliocene times. A large proportion of the plants, however, may still be found living in Holland and Britain; but there is a singular scarcity of Composites, though this order is fairly well represented in British strata of slightly later date.

The latest Pliocene, or pre-Glacial, flora of northern Europe is best known from the Cromer Forest-bed of Norfolk and Suffolk, a fluvio-marine deposit which lies beneath the whole of the Glacial deposits of these counties, and passes downwards into the Crag, many of the animals actually associated with the plants being characteristic Pliocene species which seem immediately afterwards to have been exterminated by the increasing cold. The plants contained in the Cromer Forest-bed, of which about 150 species have now been determined, fall mainly into two groups—the forest-trees, and marsh and aquatic plants. We know little or nothing at present of the upland plants, or of those of dry or chalky soils. Forest trees are well represented; they are, in fact, better known than in any of the later English deposits. We find the living British species of *Rhamnus*, maple, sloe, hawthorn, apple, white-beam, guelder-rose, cornel, elm, birch, alder, hornbeam, hazel, oak, beech, willow, yew and pine, and also the spruce. This is an assemblage that could not well be found under conditions differing greatly from those now holding in Norfolk; there is an absence of both Arctic and south European plants. The variety of trees shows that the climate was mild and moist. Among the herbaceous plants we find, mingled with a number that still live in Norfolk, *Hypecoum procumbens*, the water-chestnut (*Trapa natans*), and *Najas minor*, none of which is now British.

On the Norfolk coast another thin plant-bed occurs locally above the Forest-bed and immediately beneath the Boulder Clay. This deposit shows no trace of forest-trees, but it is full of remains of Arctic mosses, and of the dwarf willow and birch; in short, it yields the flora now found within the Arctic circle.

Pleistocene.

The incoming of the Glacial epoch does not appear to have been accompanied by any acclimatization of the plants—the species belonging to temperate Europe were locally exterminated, and Arctic forms took their places. The same Arctic flora reappears in deposits immediately above the highest Boulder Clay, deposits formed after the ice had passed away. These fossil Arctic plants have now been found as far south as Bovey Tracey in Devonshire, where Pengelly and Heer discovered the bear-berry and dwarf birch; London, where also *Betula nana* occurs; and at Deuben in Saxony, which lies nearly as far south as lat. 50°, but has yielded to Professor Nathorst's researches several Arctic species of willow and saxifrage. The cold period, however, was not continuous, for both in Great Britain and on the continent of Europe, as well as in Canada, it was broken by the recurrence of a milder climate and the reappearance of a flora almost identical with that now living in the same regions. This "inter-Glacial" flora, though so like that now found in the district, has interesting peculiarities. In England, for instance, it includes *Acer monspessulanum*, a southern maple which does not now extend nearer than central Europe, and *Cotoneaster Pyracantha*; also *Najas graminea* and *N. minor*, both southern forms not now native of Britain. *Brassenia peltata*, a water-lily found in the warmer regions almost throughout the world, except in Europe, occurs abundantly in north Germany, but not in Great Britain. Similar inter-Glacial deposits in Tirol contain leaves of *Rhododendron ponticum*.

Space will not permit us to enter into any full discussion of the recurrence of Glacial and inter-Glacial periods and the influence they may have had on the flora. It is evident, however, that if climatic alternations, such as those just described, are part of the normal routine that has gone on through all geological periods, and are not merely confined to the latest, then such changes must evidently have had great influence on the evolution and geographical distribution both of species and of floras. Whether this was so is a question still to be decided, for in dealing with extinct floras it is difficult to decide, except in the most general way, to what climatic conditions they point. We seem to find indications of long-period climatic oscillations in Tertiary times, but none of the sudden invasion of an Arctic flora, like that which occurred during more recent times. It should not be forgotten, however, that an Arctic flora is mainly distinguishable from a temperate one by its poverty and dwarfed vegetation, its deciduous leaves and small fruits, rather than by the occurrence of any characteristic genera or families. Careful and long-continued study would therefore be needed before we could say of any extinct dwarfed flora that it included only plants which could withstand Arctic conditions.

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PALAEOGRAPHY (Gr. *παλαιός*, ancient, and *γράφειν*, to write), the science of ancient handwriting acquired from study of surviving examples. While epigraphy is the science which deals with inscriptions (*q.v.*) engraved on stone or metal or other enduring material as memorials for future ages, palaeography takes cognisance of writings of a literary, economic, or legal nature written generally with stile, reed or pen, on tablets, rolls or codices. The boundary, however, between the two sciences is not always to be exactly defined. The fact that an inscription occurs upon a hard material in a fixed position does not necessarily bring it under the head of epigraphy. Such specimens of writing as the graffiti or wall-scribblings of Pompeii and ancient Rome belong as much to the one science as to the other; for they neither occupy the position of inscriptions set up with special design as epigraphical monuments, nor are they the movable written documents with which we connect the idea of palaeography. But such exceptions only slightly affect the broad distinction just specified.

The scope of this article is to trace the history of Greek and Latin palaeography from the earliest written documents in those languages which have survived. In Greek palaeography we have a subject which is self-contained. The Greek character, in its pure form, was used for one language only; but the universal study of that language throughout Europe and the wide diffusion of its literature have been the cause of the accumulation of Greek MSS. in every centre of learning. The field of Latin palaeography is much wider, for the Roman alphabet has made its way into every country of western Europe, and the study of its various developments and changes is essential for a proper understanding of the character which we write.

Handwriting, like every other art, has its different phases of growth, perfection and decay. A particular form of writing is gradually developed, then takes a finished or calligraphic style and becomes the hand of its period, then deteriorates, breaks up and disappears, or only drags on an artificial existence, being meanwhile superseded by another style which, either developed from the older hand or introduced independently, runs the same course, and in its turn is displaced by a younger rival. Thus in the history of Greek writing we see the literary uncial hand passing from early forms into the calligraphic stage, and then driven out by the minuscule, which again goes through a series of important changes. In Latin, the literary capital and uncial hands give place to the smaller character; and this, after running its course and developing national characteristics in the different countries of the West, deteriorates and is superseded almost universally by the Italian hand of the Renaissance.

Bearing in mind these natural changes, it is evident that a style of writing, once developed, is best at the period when it is in general use, and that the oldest examples of that period are the simplest, in which vigour and naturalness of handwriting are predominant. On the other hand, the fine execution of a MS. after the best period of the style has passed cannot conceal deterioration. The imitative nature of the calligraphy is detected both by the general impression on the eye, and by uncertainty and inconsistencies in the forms of letters. It is from a failure to keep in mind the natural laws of development and change that early dates, to which they have no title, have been given to imitative MSS.; and, on the other hand, even very ancient examples have been post-dated in an incredible manner.

Down to the time of the introduction of printing, writing ran in two lines—the natural cursive, and the set book-hand which was evolved from it. Cursive writing was essential for the ordinary business of life. MSS. written in the set book-hand filled the place now occupied by printed books, the writing being regular, the lines generally kept even by ruling or other guides, and the texts provided with regular margins. The set book-hand disappeared before the printing press; cursive writing necessarily remains.

In the study of handwriting it is difficult to exaggerate the great and enduring influence which the character of the material employed for receiving the script has had upon the formation of the written letters. The original use of clay by the Babylonians and Assyrians as their writing material was the primary cause of the wedge-shaped symbols which were produced by the natural process of puncturing so stiff and sluggish a substance. The clinging waxen surface of the tablets of the Greeks and Romans superinduced a broken and disconnected style of writing. The comparatively frail surface of papyrus called for a light touch and slenderly built characters. With the introduction of the smooth and hard-surfaced vellum, firmer and heavier letters, with marked contrasts of fine and thick strokes, became possible, and thence became the fashion. In the task which lies before us we shall have to deal mainly with MSS. written on the two very different materials, papyrus and vellum, and we shall find to how great an extent the general character and the detailed development of Greek and Latin writing, particularly for literary purposes, has been affected by the two materials.

The history of the ancient papyrus roll and of its successor, the medieval vellum codex, and the particulars of the mechanical arrangement of texts and other details appertaining to the evolution of the written book are described in the article MANUSCRIPT. In the present article our attention is confined to the history of the script.

The papyrus period of our subject, as regards literary works, ranges generally from the end of the 4th century B.C. to the 4th century of our era, when the papyrus roll as the vehicle for literature was superseded by the vellum codex. The vellum period extends from the 4th century to the 15th century, when the rise of the art of printing was the doom of the written book. Yet it must not be imagined that there is a hard and fast line separating the papyrus period from the vellum period. In the early centuries of our era there was a transitional period when the use of the two materials overlapped. The employment of vellum for literary purposes began tentatively quite at the beginning of that era; nor did the use of papyrus absolutely cease with the 4th century. But that century marks definitely the period when the change had become generally accepted.

In the case of non-literary documents, written in *cursive* hands, the papyrus period covers a still wider field. These documents range from the 3rd century B.C. down to the 7th century, and a certain number of examples even extend into the 8th century. The survival of cursive papyrus documents in large numbers is due to the fact that they are chiefly written in Egypt, where papyrus was the common writing material and where climatic conditions ensured their preservation. On the other hand, early cursive documents on vellum are scarce, for it must be borne in mind that, even allowing for the loss of such documents attributable to the perishable nature of that material in the humid climates of Europe, papyrus and waxen tablets were also the usual writing materials of the Greeks and Romans. The importance of the survival of Greek cursive papyri to so late a period is very great, for it enables us to trace the development of the Greek literary minuscule handwriting of the 9th century in a direct line from the cursive script of the papyri centuries earlier.

GREEK WRITING. I.—THE PAPYRI

In no branch of our subject has so great a development been effected since about 1875 as in that of the palaeography of Greek papyri. Before that time our knowledge was very limited. The material was comparatively meagre; and, though its increase was certainly only a matter of time, yet the most sanguine would hardly have dared to foretell the remarkable abundance of documents which the excavations of a few years would bring to light.

The history of Greek writing on papyrus can now be followed with more or less fullness of material for a thousand years. Actual dated examples range from the late years of the 4th century B.C. to the 7th century A.D. We have a fair knowledge of the leading features of the writing of the 3rd and 2nd centuries B.C.; a less perfect acquaintance with those of the 1st century B.C. For the first four centuries of the Christian era there is a fairly continuous series of documents; of the 5th century only a few examples have as yet been recovered, but there is an abundance of material for the 6th and early 7th centuries. Thus it will be seen that, while for some periods we may be justified in drawing certain conclusions and laying down certain rules, for others we are still in an imperfect state of knowledge. But our knowledge will no doubt almost yearly become more exact, as fresh material is brought to light from the excavations which are now continually proceeding; and those periods in which the lack of papyri breaks the chain of evidence will sooner or later be as fully represented as the rest. The material certainly lies buried in the sands; it is our misfortune that the exact sites have not yet been struck.

The first discovery of Greek papyri was made in Europe in 1752, when the excavations on the site of Herculaneum yielded a number of charred rolls, which proved to be of a literary character. All subsequent discoveries we owe to Egypt; and it is to be observed that the papyri which are found in that country have come down to us under different conditions. Some, generally of a literary nature, were carefully deposited with the bodies of their owners in the tomb with the express intention of being preserved; hence such MSS. in several instances have come to our hands in fairly perfect condition. On the other hand, by far the larger number of those recently brought to light have been found on the sites of towns and villages, particularly in the district of the Fayûm, where they had been either accidentally lost or purposely thrown aside as of no value, or had even been used up as material for other purposes besides their original one. These are consequently for the most part in an imperfect and even fragmentary condition, although not a few of them have proved to be of the highest palaeographical and literary importance.

The date of the first find of Greek papyri in Egypt was in 1778, when some forty or fifty rolls were discovered by some native diggers, who, however, kept only one of them. After this scarcely anything appeared until the year 1820, when was found on the site of the Serapeum at Memphis, as it was reported, a group of documents of the 2nd century B.C. Then followed a fruitful period, when several important literary papyri were secured: in 1821, the Bankes Homer, containing the last book of the *Iliad*; in 1847, the roll containing the Lycophron and other orations of Hypereides; in 1849 and 1850, the Harris Homer, bk. xviii. of the *Iliad*, and a MS. of bks. ii.–iv.; and, in 1856, the Funeral Oration of Hypereides.

But the great bulk of the Greek papyri from Egypt is the result of excavations undertaken during the last quarter of the 19th century and down to the present day. Within this time four very important discoveries of documents in large quantities have taken place. In 1877 a great mass of papyri was found on the site of Arsinoë in the Fayûm, being chiefly of a non-literary nature, and unfortunately in a very fragmentary state; they are also late in date, being of the Byzantine period. The greater number passed into the possession of the Archduke Rainer, and are now at Vienna; the rest are divided between London, Oxford, Paris and Berlin. After an interval this find was followed by the recovery in 1892, in the same neighbourhood, and chiefly on the site of a village named Socnopaei Nesus, of an extensive series of documents of the Roman period, ranging from the 1st century to the middle of the 3rd century. These papyri, being of an earlier date and in better condition than the Arsinoite collection, are consequently of greater palaeographical value. Most of them are now in Berlin; many are in the British Museum; and some are at Vienna, Geneva and elsewhere. The third and fourth great finds, and the most important of all, were made by Messrs Grenfell and Hunt when excavating, in the seasons 1896–1897 and 1905–1906, for the Egypt Exploration Fund, at Behnesa, the ancient Oxyrhynchus. Thousands of papyri were here recovered, including, among the non-literary material, a number of rolls in good condition, and comprising also a great store of fragments of literary works, among which occur the now well-known "Logia," or "Sayings of Our Lord," and fragments of the Scriptures, and in some instances of not inconsiderable portions of the writings of various classical authors. This great collection ranges in date from the 2nd century B.C. to the 7th century A.D.; but in what proportion the documents fall to the several centuries cannot be determined until the series of volumes in which they are to be described for the Graeco-Roman branch of the Egypt Exploration Fund shall have made some substantial progress.

These four great collections of miscellaneous documents have been supplemented by finds of other groups, which fit into them and serve to make more complete the chronological series. Such are the correspondence of a Roman officer named Abinnaeus, of the middle of the 4th century, shared between the British Museum and the library of Geneva in the year 1892; a miscellaneous collection, ranging from the 2nd century B.C. to the 3rd or 4th century A.D., acquired for the Egypt Exploration Fund and published by that society (*Fayûm Towns and their Papyri*, 1900); another collection obtained for the same society from the cartonnage of mummy-cases dating back to the 3rd century B.C. (*The Hibeh Papyri*, 1906); and a series recovered from excavations at Tebtunis for the University of California (*The Tebtunis Papyri*, 1902, 1906), generally of the 2nd century B.C. But of these lesser groups by far the most interesting is that which Mr Flinders Petrie extracted, in 1889–1890, from a set of mummy-cases found in the necropolis of the village of Gurob in the Fayûm. In the manufacture of these coffins numbers of inscribed papyri had been employed. The fragments thus recovered proved to be some of the most valuable documents for the history of Greek palaeography hitherto found, supplying us with examples of writing of the 3rd century B.C. in fairly ample numbers, and thus carrying back our fuller knowledge of the subject to a period which up to that time had remained almost a blank. Besides miscellaneous documents, there are included the remains of registers of wills entered up from time to time by different scribes, and thus affording a variety of handwritings for study; and, further, the value of the collection is enhanced by the presence of fragments of the *Phaedo* and *Laches* of Plato, and of the lost *Antiope* of Euripides and of other classical works.

The last decade of the 19th century was also distinguished by the recovery of several literary works of the first importance, inscribed on papyri which had been deposited with the dead, and had thus remained in a fairly perfect condition. In 1889 the trustees of the British Museum acquired a copy of the lost *Ἀθηναίων* Πολιτεία of Aristotle—a papyrus of the mimes of the poet Herodas, and a portion of the oration of Hypereides against Philippides; and in 1896 they had the further good fortune to secure a papyrus containing considerable portions of the odes of Bacchylides, the contemporary of Pindar. And to the series of the orations of Hypereides the Louvre was enabled to add, in 1892, a MS. of the greater part of the oration against Athenogenes.

But the most valuable discovery, from a palaeographical point of view, took place in the present century. In 1902 a papyrus roll containing the greater portion of the *Persae*, a lyrical composition of Timotheus of Miletus, was found at Abusir, near Memphis, and is now at Berlin. It is written in a large hand of a style which had hitherto been known from a document at Vienna entitled the "Curse of Artemisia," and assigned to the early part of the 3rd century B.C.; and from one or two other insignificant scraps. The new papyrus, however, appears to be even older, and may certainly be placed in the later years of the 4th century B.C.: the most ancient extant literary MS. in the Greek tongue. The ascription of this papyrus to the 4th century B.C. has received confirmation from the welcome discovery, in 1906, at Elephantine, of a document (a marriage contract) of the year 311–310 B.C., which is written in the same style of book-hand characters (*Aegypt. Urkunden d. kgl. Museen in Berlin, Elephantine Papyri*, 1907). Of quite recent date also is the recovery of a considerable part of a commentary on the *Theaetetus* of Plato, written in a fine uncial hand of the 2nd century, now in Berlin. Considerable fragments also of the *Paeans* of Pindar of the 1st or 2nd century; a papyrus containing an historical work attributed to Theopompus or Cratippus, perhaps of the early 3rd century; a copy of Plato's *Symposium* of the same period; and a portion of the *Panegyricus* of Isocrates, written in an uncial hand of the 2nd century, are printed in Part V. of the *Oxyrhynchus Papyri*. Further, many leaves of a papyrus codex containing fragments of four comedies of Menander were found in 1905 at Kom Ishkaou, the ancient Aphroditopolis. The recovery of so many great classical works within a few years may be accepted as an earnest of further finds of the same nature, now that excavations are being carried on systematically in Egypt.

From a study of the material thus placed at our disposal certain conclusions have been arrived at which satisfy us that the periodical changes which passed over the character of Greek writing as practised in Egypt coincide pretty nearly with the changes in the political administration of the country. The period of the rule of the Ptolemies from 323 to 30 B.C. has, in general, its own style of writing, which we recognize as the *Ptolemaic*; the period of Roman supremacy, beginning with the conquest of Augustus and ending with the reorganization of the empire by Diocletian in A.D. 284, is accompanied by a characteristic *Roman* hand; and with the change of administration which placed Egypt under the Byzantine division of the empire, and lasted down to the time of the Arab conquest in A.D. 640, there is a corresponding change to the *Byzantine* class of writing. These changes must obviously be attributed to the influence of the official handwritings of the time. A change of government naturally led to a change of the officials employed, and with the change of officials would naturally follow a change in the style of production of official documents. In illustration of this view, it is enough to call to mind the instances of such variations to be met with in the history of the palaeography of medieval Europe, due in the same way to political causes. It is interesting, too, to observe that in our own time the teaching in schools of a particular type of handwriting which finds favour in clerical examinations for the public service has not been without its influence on the general handwriting of the people.

Classifying, then, the writing of the papyri into the three groups—the Ptolemaic, the Roman, and the Byzantine—the next step is to determine, by a closer examination of the documents, the changes which characterize the several centuries traversed by those groups. In doing this, we cannot apply the exact terms which are employed in describing the MSS. of the middle ages. We have to do with writing which has not yet been cast into the formal literary moulds of the later times; and it has therefore been found necessary, as well as convenient, to divide the papyri simply into two series, representative of their contents and not of their style of production—namely literary papyri and non-literary papyri. Neither series, however, it is to be remembered, has a style of writing peculiar to itself. While the extant literary works are, as a rule, written with more or less formality, no doubt by professional scribes for the book-market, not a few of even the more valuable of them are copies in the ordinary cursive hands of the day. Conversely, while we find non-literary documents generally written in ordinary cursive hands, whether by official scribes or by private individuals, yet occasionally we meet with one produced in the formal style more proper to literary examples. Again, while applying to particular letters in papyri such technical terms as capitals, or uncials, or minuscules, we cannot convey by those terms the exact ideas which we convey when thus describing the individual letters of medieval manuscripts. For the letters of the papyrus period were not cast in finished moulds, while the uncial writing and the minuscule writing of the middle ages were settled literary hands. As will presently be seen, the early medieval uncial hand of the vellum codices developed directly from the literary writing of the papyri; the minuscule book-hand of the 9th century was a new type moulded from the cursive into a fixed literary style.

Necessarily, the non-literary papyri are much more numerous than the literary documents, and present a much greater variety of handwriting, being in fact the result of the daily transactions of ordinary life; and how very widespread was the knowledge of writing among the Greek-speaking population of Egypt is sufficiently testified by the surviving examples, coming as they do from the hands of all sorts and conditions of men. We will first examine these specimens of the current handwriting of the day before passing to the review of the more or less artificial book-writing of the literary papyri.

Non-Literary, Cursive, Hands.—As already stated, the oldest material for the study of Greek cursive writing is chiefly contributed by the papyri discovered at Gurob. Among them are not only the fragments of official registers, which have been mentioned, but also a variety of miscellaneous documents relating to private affairs, and in various hands of the 3rd century and early 2nd century B.C. The non-literary cursive papyri bear actual dates ranging from 270 to 186 B.C. But the discovery (1906) of papyri at Elephantine takes our dated series of cursive documents back to 285–284 B.C.; and in this collection also is the oldest dated Greek document yet found—the marriage contract of the year 311–310 B.C., already mentioned. In this instance, however, the writing is not cursive, but of the literary type.

The leading characteristic of Greek cursive writing of the 3rd century B.C. is its strength and facility. While it may not compare with some later styles in the precise formation of particular letters, yet its freedom and spontaneous air lend it a particular charm and please the eye, very much in the same way that a scholar's practised and unconscious handwriting of a good type is more attractive than the more exact formality of a clerk's hand. The letters generally are widely spread and shallow, and, particularly in the official hands, they are linked together with horizontal connecting strokes to such an extent that the text has almost the appearance of depending from a continuous horizontal line. The extreme shallowness or flatness of many of the letters is very striking. A significant indication of the antiquity of Greek cursive writing is found in connexion with the letter *alpha*, which is, even at this early period, in one of its forms reduced to a mere angle or wedge.

A few lines from an official order (fig. 1) of the year 250 B.C. will serve to convey an idea of the trained cursive style of this century:—

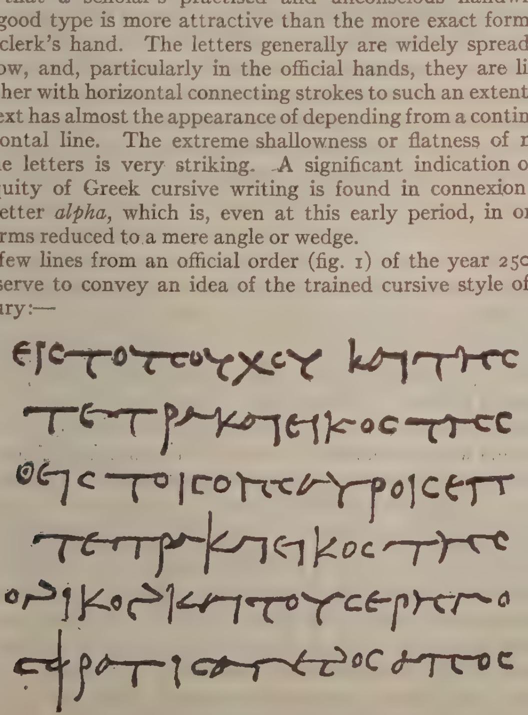

FIG. 1.—Official Order, 250 B.C.

(—εις τοπουχου και της—
—τετρα και εικοστης—
—θεις τοις θησαυροις επ—
—τετρα και εικοστης—
—ονικον και τους ερημο—
—σφραγισαμενος αποσ—)

As a contrast to this excellent hand, we give a facsimile of a section from a roughly written letter from a land steward to his employer, of about the same date:—

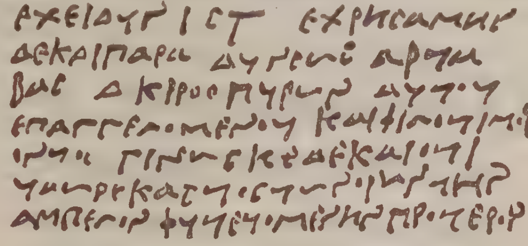

FIG. 2.—Letter of a Land Steward, 3rd century B.C.

(εχει δυνις γ εχρησαμην
δε και παρα δυνεως αρτα
βας δ κριθοπυρων αυτου
επαγγελομενου και φιλοτιμου
οντος γινωσκε δε και οτι
υδωρ εκαστος των ορων την
αμπελον φυτευομενην προτερον)

Here there is none of the linking of the letters which is seen in the other example: every letter stands distinct. But while the individual letters are clumsily written, the same laws govern their formation as in the other document. The shallow, wide-spread *mu*, the cursive *nu*, the small *theta*, *omikron*, and *rho*, are repeated. Here also is seen the *tau*, with its horizontal stroke confined to the left of the vertical instead of crossing it, and the undeveloped *omega*, which has the appearance of being clipped—both forms being characteristic of the 3rd century B C.

The trained clerical hands of the 2nd century B.C. (fig. 3) differ generally from those of the earlier century in a more perfect and less cursive formation, the older shallow type gradually disappearing, and the linking of letters by horizontal strokes being less continuous. But the Ptolemaic character marks the handwriting well through the century; and it is only towards the close of that period and as the next century is entered, that the hand begins to give way and to lose altogether its linked style and the peculiar crispness of the strokes which give it its distinctive appearance. The cursive hand in its best style (*e.g. N. et Extr.* pls. xxviii., xxix.) is very graceful and exact:—

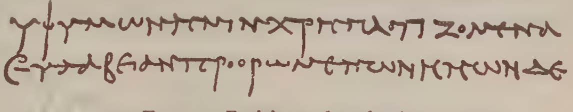

FIG. 3.—Petition, 163–162 B.C.

(υφ υμων ημιν χρηματιζομενα
ευλαβειαν προορωμενων ημων δε)

Towards the end of the Ptolemaic period material greatly fails. There are very few extant cursive documents between the years 80 and 20 B.C. But marks of decadence already appear in the examples of the beginning of the 1st century B.C. The general character of the writing becomes slacker, and the forms of individual letters are less exact. These imperfections prepare us for the great change which was to follow.

With the Roman period comes roundness of style, in strong contrast to the stiffness and rigid linking of the Ptolemaic hand. Curves take the place of straight strokes in the individual letters, and even ligatures are formed in pliant sweeps of the pen. This transition from the stiff to the flexible finds something of a parallel in the development of the curving and flexible English charterhand of the 14th century from the rigid hand of the 13th century; following, it would seem, the natural law of relaxation. Roundness of style, then, is characteristic of Greek cursive writing in the papyri of the first three centuries of the Christian era, however much individual hands, or groups of hands, might vary among themselves.

A specimen (fig. 4) of cursive writing of the general Roman type is selected from a papyrus (Brit. Mus. No. cxxxi.) which is of more than usual interest, as it is on the verso side of the rolls of which it is composed that the text of Aristotle's *Constitution of Athens* has been transcribed. It contains the farming accounts of the bailiff of Epimachus, son of Polydeuces, the owner of an estate in the nome of Hermopolis in the 9th and 10th years of the reign of Vespasian, that is A.D. 78–79:—

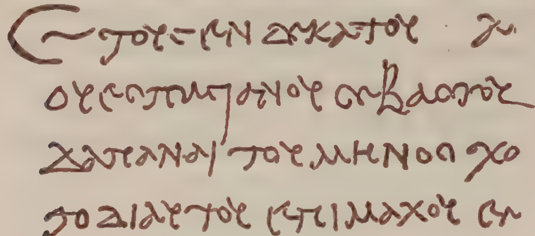

Fig. 4.—Farm Accounts, A.D. 78–79.
(ετους ενδεκατου α—
ουεσπασιανου σεβαστου—
δαπαναι του μηνος χ—
το δι αυτου επιμαχου ϵ—)

In the second half of the 1st century two styles of handwriting predominate in the cursive papyri. There is the clear and flowing hand, which may be termed the ordinary working hand; and there is also a small and very cursive style which appears in private correspondence and in legal contracts. The 2nd century follows on the same lines as the 1st century; but with the 3rd century decadence sets in; the writing begins to slope, and grows larger and rougher and tends to exaggeration.

This exaggeration of the writing of the later Roman period leads the way to the pedantic exaggeration and formalism characteristic of the Byzantine period. In this period the general style of writing is on a larger scale than in the Roman; exaggeration in the size of certain letters marks the progress of the 4th century. Material is wanting for full illustration of the changes effected in the 5th century; but the papyri of the 6th century show a further advance in formalism, the common style being upright and compressed and full of flourishes. In the 7th century the hand assumes a sloping style, which always seems to accompany decadence, and grows very irregular and straggling. A specimen of the fully developed Byzantine hand of a legal type is here shown in a few lines from a lease of a farm (fig. 5) in the 6th century (Brit. Mus. pap. cxiii 3):—

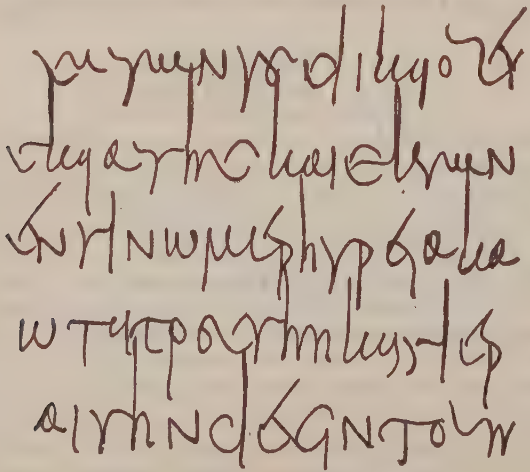

Fig. 5.—Lease of a Farm, 6th century.

(—ς αυτων του δικαιου ϵ—
—ς και αυτης και εκ των—
—εντινω μερη τρεια κα—
—ω τα προς την καλλιερ—
—αι την δεσιν του π—)

In the long range covered by the Greek papyri the formation of individual letters necessarily varied under different influences; but in not a few instances the original shapes were remarkably maintained. From those which thus remained conservative it is rash to attempt to draw conclusions as to the precise age of the several documents in which they occur. On the other hand, there are some which at certain periods adopted shapes which were in vogue for a limited time and then disappeared, never to be resumed. Such forms can very properly be regarded as sure guides to the palaeographer in assigning dates. We may therefore take a brief survey of the Greek cursive alphabet of the papyri and note some of the peculiarities of individual letters. The incipient form of the *alpha* which gradually developed into the minuscule letter of the middle ages may be traced back to the Ptolemaic documents of the 2nd century B.C., but the more cursive letter, which was a simple acute angle, representing only two of the three strokes of which the primitive letter was composed, was characteristic of the 3rd century B.C., and seems to have gone out of use within the Ptolemaic period. The development of the cursive *beta* is interesting. At the very beginning we find two forms in use: the primitive capital letter and a cursive shape somewhat resembling a small *n*, being in fact an imperfectly written *B* in which the bows are slurred. This form lasted through the Ptolemaic period. Then arose the natural tendency to reverse the strokes and to form the letter on the principle of *u*; but still the capital letter also continued in use, so that through the Roman and Byzantine periods the *u*-shape and the *B*-shape run on side by side. Analogously the letter *kappa*, formed on somewhat the same lines as the *beta*, runs a similar course in developing a cursive *u*-shaped form by the side of the primitive capital. *Delta* remained fairly true to its primitive form until the Byzantine period, when the elongation of the head into a flourish led on to the minuscule letter which is familiar to us in the medieval and modern alphabet. *Epsilon*, the most frequently recurring letter in Greek texts, departs less from its original rounded uncial form that might have been expected. Frequent and varied as its cursive formations are, yet the original shape is seldom quite disguised, the variations almost in all instances arising from the devices of the scribe to dispose swiftly and conveniently of the cross-bar by incorporating it with the rest of the letter. The tendency to curtail the second vertical limb of *eta*, leading eventually to the *h*-shape, is in evidence from the first. But in the development of this letter we have one of the instances of temporary forms which lasted only within a fixed period. In the 1st century, side by side with the more usual form, there appears a modification of it, somewhat resembling the contemporary *upsilon*, consisting of a shallow horizontal curve with a vertical limb slightly turned in at the foot, ᒍ. Its development from the original H is evident: the first vertical limb is slurred, and survives only in the beginning of the horizontal curve, while the cross-bar and the second vertical are combined in the rest of the letter. This form was in general use from the middle of the 1st to the middle of the 2nd century, becoming less common after about A.D. 160, and practically disappearing about A.D. 200. The letters formed wholly or in part by circles or loops, *theta*, *omikron*, *rho*, *phi*, in the earlier centuries have such circles or loops of a small size. Just as there is an analogy between *beta* and *kappa* in their developments, as already noticed, so also do *mu* and *pi* advance on somewhat similar lines. From the earliest time there is a resemblance between the broad shallow forms of the two letters in the 3rd century B.C., and particularly when they adopt the form of a convex stroke the likeness is very close; and again, in both Roman and Byzantine periods an *n*-shaped development appears among the forms of both letters. There is also one phase in the development of *sigma* which affords a useful criterion for fixing the date of documents within a fixed limit of time. In the Ptolemaic period the letter, always of the C-form, is upright, with a flattened horizontal head; in the Roman period a tendency sets in to curve the head, and in the course of the 1st century, by the side of the old stiffer form of the letter, another more cursive one appears, in which the head is drawn down more and more in a curve, Ϲ Ϲ. This form is in common use from the latter part of the 1st century to the beginning of the 3rd century. The cursive form of *tau*, in which the horizontal stroke is kept to the left of the vertical limb, without crossing it, is one of the early shapes of the letter. The formation of the letter *Xi* in three distinct horizontal strokes is characteristic of the Ptolemaic period, as distinguished from the later type of letter in which the bars are more or less connected. Lastly, the early Ptolemaic form of the ω-shaped *omega* is noticeable from having its second curve undeveloped, the letter having the appearance of being clipped.

Literary Hands.—Literary papyri written in book-hands, distinct from the cursive writing which has been under consideration (and in which literary works were also occasionally written), may be divided into two classes: those which were produced by skilled scribes, and therefore presumably for the market, and those which were written less elegantly, but still in a literary hand, and were probably copied by or for scholars for their own use.

Standing at the head of all, and holding that rank as the only literary papyrus of any extent which may be placed in the 4th century B.C., is the famous lyrical work of Timotheus of Miletus, entitled the *Persae*, which has already been referred to and of which a section of a few lines is here reproduced:—

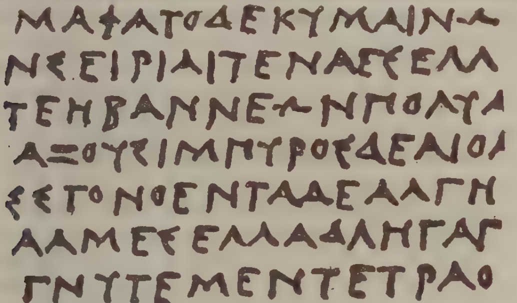

Fig. 6.—The *Persae* of Timotheus, late 4th century B.C.

(—μα φατο δε κυμαινω—
—ν σειριαι τε ναες ελλ—
—τε ηβαν νεων πολυα—
—αξουσιμ πυρος δε αιθα—
—ς στονοεντα δε αλγη—
—α α μ ες ελλαδα ηγαν—
—γνυτε μεν τετραο—)

The hand, as will be seen, is rather heavy and irregular, but written with facility and strength, and, though the papyrus, perhaps, is not to be classed among the calligraphic productions for the book market, it must rank as a well-written example of the literary script of the time. Capital forms of letters which afterwards assumed the rounded shapes known as uncial are here conspicuous. The exactly formed *alpha*, the square *epsilon* with projecting head-stroke, the irregular *sigma*, the small *theta* and *omikron* are to be remarked. Indeed, the only letter which departs essentially from the lapidary character of the alphabet is the *omega*, here a half-cursive form but still retaining the principle of the structure of the old horse-shoe letter and quite distinct from the ω-shape which was soon to be developed. Of this type of writing are also the two non-literary documents already mentioned above, viz. the "Curse of Artemisia" at Vienna, and the marriage contract of the year 311–310 B.C., found at Elephantine. In the latter the *sigma* appears in the rounded uncial form.

By rare good fortune important literary fragments were recovered in the Gurob collection, which yielded the most ancient dated cursive documents of the 3rd century B.C., so that, almost from the beginning, we start with coeval specimens of both the cursive and of the book-hand, and we are in a position to compare the two styles on equal terms, and thus approximately to date the literary papyri. Palaeographically, this is a matter of the first importance; for while cursive documents, from their nature, in most instances bear actual dates, the periods of literary examples have chiefly to be decided by comparison, and often by conjecture.

The literary fragments from Gurob fall into the two groups just indicated, MSS. written for sale and scholars' copies. Of the former are some considerable portions of two works, the *Phaedo* of Plato and the lost *Antiope* of Euripides. Both are written in carefully formed characters of a small type, but of the two the *Phaedo* is the better executed. As the cursive fragments among which they were found date back to before the middle of the 3rd century B.C., it is reasonable to place these literary remains also about the same period. Their survival is a particularly interesting fact in the history of Greek palaeography, for in them we have specimens of literary rolls which may be fairly assumed to differ very little in appearance from the manuscripts contemporary with the great classical authors of Greece. Indeed, the *Phaedo* was probably written within a hundred years of the death of the author.

In the facsimile (fig. 7) of a few lines from this papyrus here placed before the reader, the characteristics of the Ptolemaic cursive hand are also to some extent to be observed in the formal book-hand:—

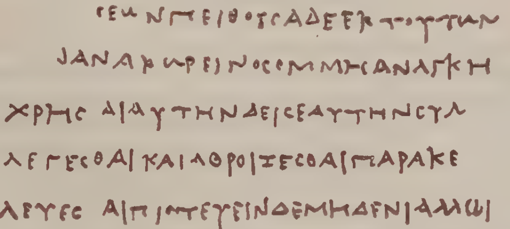

Fig. 7.—The *Phaedo* of Plato, 3rd century B.C.

(—σεων πειθουσα δε εκ τουτωμ
—ανακωρειν οσομ μη αναγκη
χρησ[θ]αι αυτην δ εις εαυτην συλ
λεγεσθαι και αθροιζεσθαι παρακε
λευεσ[θ]αι πιστευειν δε μηδενι αλλωι)

The general breadth of the square letters, the smallness of the letters composed of circles and loops, and the particular formation of such letters as *pi* and the clipped *omega*, are repeated. But the approach also of many of the letters to the lapidary capital forms, like those in the papyrus of Timotheus, is to be remarked, such as the precisely shaped *alpha*, and the *epsilon* in many instances made square with a long head-stroke. This mixture of forms seems to indicate an advance in the development of the book-hand of the 3rd century B.C., as contrasted with the archaic style of the older Timotheus.

Of the 2nd century B.C. there are extant only two papyri of literary works written in the formal book-hand, and both are now preserved in the Louvre. The one, a dialectical treatise containing quotations from classical authors, has long been known. The other is the oration of Hypereides against Athenogenes, which is an acquisition of comparatively recent date. The dialectical treatise must belong to the first half of the century, as there is on the verso side of the papyrus writing subsequently added in the year 160 B.C. The period of the Hypereides cannot be so closely defined; but the existence on the verso of later demotic writing, said to be of the Ptolemaic time, affords a limit, and the MS. has been accordingly placed in the second half of the century. While the writing of the earlier papyrus is of a light and rather sloping character, that of the Hypereides is firm and square and upright.

Passing to the 1st century B.C., the papyri which have been recovered from the ashes of Herculaneum come into account.

Many of them, the texts of which are of a philosophical nature, are written in literary hands, and are conjectured to have possibly formed part of the library of their author, the philosopher Philodemus; they are therefore placed about the middle of the century. To the same time are assigned the remains of a roll containing the oration of Hypereides against Philippides and the third Epistle of Demosthenes (Brit. Mus. papp. cxxxiii., cxxxiv.). But the most important addition to the period is the handsomely written papyrus containing the poems of Bacchylides (fig. 8), which retains in the forms of the letters much of the character of the Ptolemaic style, although for other reasons it can hardly be placed earlier than about the middle of the century:—

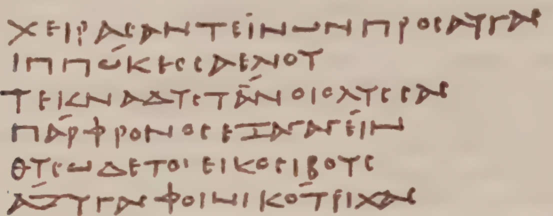

FIG. 8.—Bacchylides, 1st century B.C.

(χειρας αντεινων προς αυγας
ιππωκεος αελιου
τεκνα δυστανοιο λυσσας
παρφρονος εξαγαγειν
θυσω δε τοι εικοσι βους
αζυγας φοινικοτριχας)

With the latter half of the 1st century B.C. we quit the Ptolemaic period and pass to the consideration of the literary papyri of the Roman period; and it is especially in this latter period that our extended knowledge, acquired from recent discoveries, has led to the modification of views formerly held with regard to the dates to be attributed to certain important literary MSS. As in the case of non-literary documents, the literary writing of the Roman period differs from that of the Ptolemaic in adopting rounded forms and greater uniformity in the size of the letters.

Just on the threshold of the Roman period, near the end of the 1st century B.C., stands a fragmentary papyrus of the last two books of the *Iliad*, now in the British Museum (pap. cxxviii.), which is of sufficient extent to be noted. Then, emerging on the Christian era, we come upon a fine surviving specimen of literary writing, which we have satisfactory reason for placing near the beginning of the 1st century. It is a fragment of the third book of the *Odyssey* (fig. 9), the writing of which closely resembles that of an official document (Brit. Mus. pap. cccliv.) which happens to be written in a formal literary hand, and which from internal evidence can be dated within a few years of the close of the 1st century B.C. There can be no hesitation, therefore, in grouping the *Odyssey* with that document. The contrast between the round Roman style and the stiff and firm Ptolemaic hands is here well shown in the facsimiles from this papyrus (fig. 9) and the *Phaedo* and Bacchylides:—

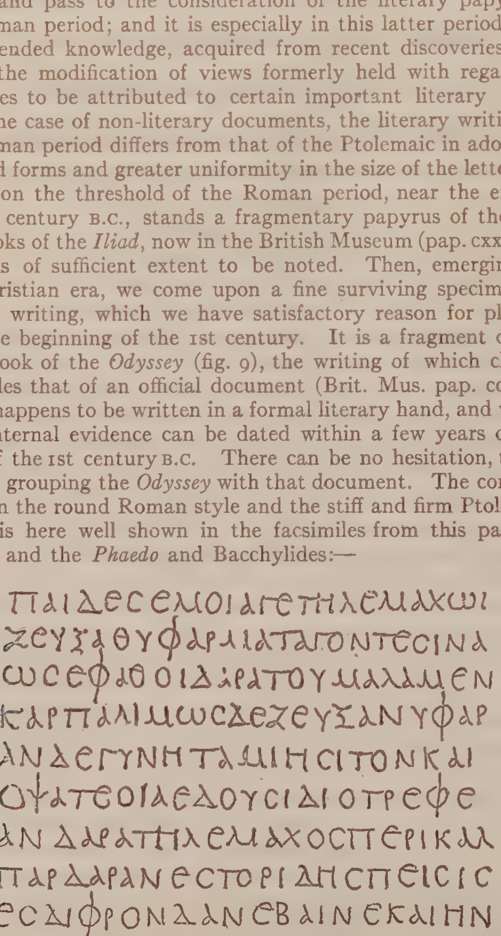

FIG. 9.—The *Odyssey*, beginning of 1st century.

(παιδες εμοι αγε τηλεμαχωι—
ζευξαθ υφ αρματ αγοντες ινα—
ως εφαθ οι δ αρα του μαλα μεν—
καρπαλιμως δ εξευξαν υφ αρ—
αν δε γυνη ταμιη σιτον και—
οψα τε οια εδουσι διοτρεφε—
αν δ αρα τηλεμαχος περικαλ—
παρ δ αρα νεστοριδης πεισισ
ες διφρον δ ανεβαινε και ην—

In a similar style of writing are two fragments of Hesiodic poems recently published, with facsimiles, in the *Sitzungsberichte* (1900, p. 839) of the Berlin Academy. The earliest of the two, now at Strassburg, may be assigned to the first half of the 1st century; the other, at Berlin, appears to be of the 2nd century.

At this point two MSS. come into the series, in regard to which there is now held to be reason for revising views formerly entertained. The papyrus known as the Harris Homer (Brit. Mus. pap. cvii.), containing portions of the eighteenth book of the *Iliad*, which was formerly placed in the 1st century B.C., it is thought should be now brought down to a later date, and should be rather assigned to the 1st century of the Christian era. The great papyrus, too, of Hypereides, containing his orations against Demosthenes and for Lycophron and Euxenippus, which has been commonly placed also in the 1st century B.C., and by some even earlier, is now adjudged to belong to the latter part of the 1st century A.D.

Within the 1st century also is placed a papyrus of great literary interest, containing the mimes of the Alexandrian writer Herodas, which was discovered a few years ago and is now in the British Museum. The writing of this MS. differs from the usual type of literary hand, being a rough and ill-formed uncial, inscribed on narrow, and therefore inexpensive, papyrus; and if the roll were written for the market, it was a cheap copy, if indeed it was not made for private use. Of the same period is a papyrus of Isocrates, *De pace* (Brit. Mus. pap. cxxxii.), written in two hands, the one more clerical than the other; and two papyri of Homer, *Iliad*, iii.–iv. (Brit. Mus. pap. cxxxvi.), and *Iliad*, xiii.–xiv. (Brit. Mus. pap. dccxxxii.), the first in a rough uneducated hand, but the latter a fine specimen of uncial writing. To about this period also is the Oxyrhynchus Pindar to be attributed, that is to the close of the 1st or beginning of the 2nd century. Then follows another famous papyrus, the Bankes Homer, containing the last book of the *Iliad*, which belongs to the 2nd century and is also written in a careful style of uncial writing. To these is to be added the beautiful papyrus at Berlin, containing a commentary on the *Theaetetus* of Plato, written in delicately formed uncials of excellent type of the 2nd century; and of the same age is the *Panegyricus* of Isocrates from Oxyrhynchus, in a round uncial hand. Three important papyri of the *Iliad*, written in large round uncials, of the 2nd century, are noticed below.

With regard to the later literary works on papyrus that have been recovered, the period which they occupy is somewhat uncertain. The following are, however, placed in the 3rd century, during which a sloping literary hand seems to have been developed, curiously anticipating a similar change which took place in the course of development of the uncial writing of the vellum MSS., the upright hand of the 4th to 6th centuries being followed by a sloping hand in the 7th and 8th centuries: a MS., now in the British Museum, of portions of bks. ii.–iv. of the *Iliad*, written on eighteen leaves of papyrus, put together in book-form, but inscribed on only one side; on the verso of some of the leaves is a short grammatical treatise attributed to Tryphon: portion of *Iliad* v., among the Oxyrhynchus papyri (No. ccxxiii.): a fragment of Plato's *Laws* (Ox. pap. xxiii.): a papyrus of Isocrates, *in Nicoclem*, now at Marseilles: a fragment of Ezekiel, in book-form, in the Bodleian Library: a fragment of the "Shepherd" of Hermas at Berlin: and a fragment of Julius Africanus, the *Hellenica* of Theopompus or Cratippus, and the *Symposium* of Plato, all found at Oxyrhynchus.

Of the 3rd century also are some fragments which are palaeographically of interest, as they are written neither in the recognized literary hand nor in simple cursive, but in cursive characters moulded and adapted in a set form for literary use—thus anticipating the early stages of the development of the minuscule book-hand of the 9th century from the cursive writing of that time.

With the 3rd century the literary hand on papyrus appears to lose most of its importance. We are within measurable distance of the age of vellum, and of the formal uncial writing of the vellum MSS. which is found in some existing examples of the 4th century and in more abundant numbers of the 5th century. We have now to see how the connexion can be established between the literary handwriting of the papyri and the firmer and heavier literary uncial writing of the vellum codices. The literary hands on papyrus which have been reviewed above are distinctly of the style inscribed with a light touch most suitable to the comparatively frail material of papyrus. In the Bankes Homer, however, one may detect some indication of the fullness that characterizes the vellum uncial writing. But it now appears that a larger and rounder hand was also employed on papyrus at least as early as the 1st century. In proof of this we are able to cite a non-literary document (fig. 10) bearing an actual date, which happens to be written in characters that, exclusive of certain less formally-made letters, are of a large uncial literary type. This writing, though not actually of the finished style familiar to us in the early vellum MSS., yet resembles it so generally that it may be assumed, almost as a certainty, that there was in the 1st century a full literary uncial hand formed on this pattern, which was the direct ancestor of the vellum uncial. The tendency to employ at this period a calligraphic style, as seen in the fragments of the *Odyssey* and one of the Hesiodic poems mentioned above, supports this assumption. The document now referred to is a deed of sale written in the seventh year of Domitian, A.D. 88 (Brit. Mus. pap. cxli.). The letters still retaining a cursive element are *alpha*, *upsilon*, and in some instances *epsilon*.

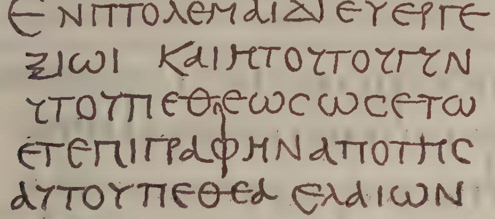

FIG. 10.—Deed of Sale, A.D. 88.

(—*εν πτολεμαιδι ευεργε*—
—*ξιωι και η τουτου γυν*—
—*υ του πεθεως ως ετω*—
—*ετεπιγραφην απο της*—
—*αυτου πεθεα ελαιων*—)

As evidence in support of this view that the uncial hand of the vellum MSS. is to be traced back to the period of the document just quoted, we have the important papyrus found by Mr Flinders Petrie at Hawara in Egypt, and now in the Bodleian Library, which contains a portion of the second book of the *Iliad*. The writing is of the large uncial type under consideration; and there is now full reason for assigning it to the 2nd century at latest. Before the discovery of the document of the year 88 there was nothing to give a clue to the real period of the Homer; and now the date which has been suggested is corroborated by a fragment of papyrus from Oxyrhynchus inscribed with some lines from the same book of the *Iliad* (fig. 11) in the same large uncial type (*Ox. Pap.* vol. i. no. 20, pl. v.). In this latter instance there can be no question of the early date of the writing as on the verso of the papyrus accounts of the end of the 2nd century or of the beginning of the 3rd century have been subsequently added. Yet a third example of the same character has more recently been found at Tebtunis (*Tebt. Pap.* vol. ii. no. 265, pl. i.): again a considerable fragment of the second book of the *Iliad*.

Thus, then, in the 1st and 2nd centuries there was in use a large uncial hand which was evidently the forerunner of the literary uncial hand of the early vellum codices. It is also to be noted that the literary examples just mentioned are MSS. of Homer; and hence one is tempted to suggest that, as in the production of sumptuous copies on papyrus of a work of such universal popularity and veneration as the *Iliad* this large and handsome uncial was specially employed, so also the use of a similar type for the early vellum copies of the sacred text of the Scriptures naturally followed.

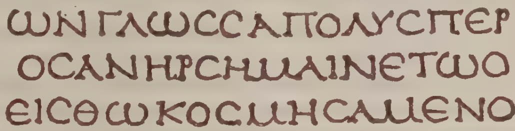

FIG. 11.—The *Iliad*, 2nd century.

(—*ων γλωσσα πολυσπερ*—
—*ος ανηρ σημ ινετω ο*—
—*εισθω κοσμησαμενο*—)

GREEK WRITING. II.—THE VELLUM CODICES

Uncial Writing.—It has been shown above how a round uncial hand had been developing in Greek writing on papyrus during the early centuries of the Christian era, and how even as early as the 2nd century a well-formed uncial script was in use, at least for sumptuous copies of so great and popular an author as Homer. We have now to describe the uncial hand as it appears in Greek MSS. written on vellum. This harder and firmer and smoother material afforded to the scribes better scope for a calligraphic style hardly possible on papyrus. With the ascendancy of the vellum codex as the vehicle for literature, the characters received the fixed and settled forms to which the name of uncial is more exactly attached than to the fluctuating letters of the early papyri. The term uncial has been borrowed from the nomenclature of Latin palaeography[1] and applied to Greek writing of the larger type, to distinguish it from the minuscule or smaller character which succeeded it in vellum MSS. of the 9th century. In Latin majuscule writing there exist both capitals and uncials, each class distinct. In Greek MSS. pure capital-letter writing was never employed (except occasionally for ornamental titles at a late time). As distinguished from the square capitals of inscriptions, Greek uncial writing has certain rounded letters, as *α*, *ϵ*, *ϲ*, *ω*, modifications in others, and some letters extending above or below the line.

It is not probable that vellum codices were in ordinary use earlier than the 4th century; and it is in codices of that age that the handsome calligraphic uncial above referred to was developed. A few years ago the 4th century was the earliest limit to which palaeographers had dared to carry back any ancient vellum codex inscribed in uncials. But the recovery of the Homeric papyri written in the large uncials of the 2nd century has led to a revision of former views on the date of one early vellum MS. in particular. This MS. is the fragmentary Homer of the Ambrosian Library at Milan, consisting of some fifty pieces of vellum cut out of the original codex for the sake of the pictures which they contain; and all of the text that has survived is that which happened to be on the back of the pictures. The Ambrosian Homer has hitherto been generally placed in the 5th century, and the difference of the style of the writing from that of the usual calligraphic type of uncial MSS. of that time, which had been remarked, was thought rather to indicate inferiority in age. But the similarity of the character of the writing (taller and more slender than is usual in vellum codices) to that of the large uncials of the papyrus Homers of the 2nd century from Hawara and Oxyrhynchus and Tebtunis is so striking that the

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[1] St Jerome's often quoted words, "uncialibus, ut vulgo aiunt, litteris" in his preface to the book of Job, have never been explained satisfactorily. Of the character referred to as "uncial" there is no question; but the derivation of the term is not settled.

Ambrosian Homer must be classed with them. Hence it is now held that that MS. may certainly be as early as the 3rd century. But, as that century was still within the period when papyrus was the general vehicle for Greek literature, it may be asked why that material should not in this instance also have been used. The answer may fairly be ventured that vellum was certainly a better material to receive the illustrative paintings, and on that account was employed. The Ambrosian Homer may therefore be regarded as a most interesting link between the papyrus uncial of the 2nd century and the vellum uncial of the 4th and 5th centuries.

With the introduction, then, of vellum as the general writing material, the uncial characters entered on a new phase. The light touch and delicate forms so characteristic of calligraphy on papyrus gave place to a rounder and stronger hand, in which the contrast of fine hair-lines and thickened down-strokes adds so conspicuously to the beauty of the writing of early MSS. on vellum. And here it may be remarked, with respect to the attribution to particular periods of these early examples, that we are not altogether on firm ground. Internal evidence, such, for example, as the presence of the Eusebian Canons in a MS. of the Gospel, assists us in fixing a limit of age, but when there is no such support the dating of these early MSS. must be more or less conjectural. It is not till the beginning of the 6th century that we meet with an uncial MS. which can be approximately dated; and, taking this as a standard of comparison, we are enabled to distinguish those which undoubtedly have the appearance of greater age and to arrange them in some sort of chronological order. But these codices are too few in number to afford material in sufficient quantity for training the eye by familiarity with a variety of hands of any one period—the only method which can give entirely trustworthy results.

Among the earliest examples of vellum uncial MSS. are the three famous codices of the Bible. Of these, the most ancient, the Codex Vaticanus, is probably of the 4th century. The writing must, in its original condition, have been very perfect as a specimen of penmanship; but nearly the whole of the text has been traced over by a later hand, perhaps in the 10th or 11th century, and only such words or letters as were rejected as readings have been left untouched. Written in triple columns, in letters of uniform size, without enlarged initial letters to mark even the beginnings of books, the MS. has all the simplicity of extreme antiquity (*Pal. Soc.* pl. 104). The Codex Sinaiticus (*Pal. Soc.* pl. 105) has also the same marks of age, and is judged by its discoverer, Tischendorf, to be even more ancient than the Vatican MS. In this, however, a comparison of the writing of the two MSS. leads to the conclusion that he was mistaken. The writing of the Codex Sinaiticus is not so pure as that of the other MS., and, if that is a criterion of age, the Vatican MS. holds the first place. In one particular the Codex Sinaiticus has been thought to approach in form to its possible archetype on papyrus. It is written with four columns to a page, the open book thus presenting eight columns in sequence, and recalling the long line of columns on an open roll. With regard to such general outward resemblances between the later papyrus literary rolls and the early vellum uncial MSS., we may cite such papyri as the Berlin commentary on the *Theaetetus* of Plato of the 2nd century and the Oxyrhynchus fragment of Julius Africanus of the 3rd century as forerunners of the style in which the two great codices here mentioned were cast.

The Codex Alexandrinus (fig. 12) is placed in the middle of the 5th century. Here we have an advance on the style of the other two codices. The MS. is written in double columns only, and enlarged letters stand at the beginning of paragraphs. But yet the writing is generally more elegant than that of the Codex Sinaiticus. Examining these MSS. with a view to ascertain the rules which guided the scribes in their work, we find simplicity and regularity the leading features; the round letters formed in symmetrical curves; Є and C, &c., finishing off in a hair-line sometimes thickened at the end into a dot; horizontal strokes fine, those of Є, H, and Θ being either in the middle or high in the letter; the base of Δ and the cross-stroke of Π also fine, and, as a rule, kept within the limits of the letters and not projecting beyond. Here also may be noticed the occurrence in the Codex Alexandrinus of Coptic forms of letters (*e.g.* ⲁ, ⲙ, *alpha* and *mu*) in the titles of books, &c., confirmatory of the tradition of the Egyptian origin of the MS.

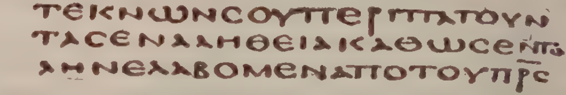

FIG. 12.—The Bible (Cod. Alex.), 5th century.

(*τεκνων σου περιπατουν*
τας εν αληθεια καθως εντο
λην ελαβομεν απο του π[*ατ*]*ρ*[*ο*]*s*).—2 John 4.

To the 5th century may also belong the palimpsest MS. of the Bible, known from the upper text as the Codex Ephraemi, at Paris (ed. Tischendorf, 1845), and the Octateuch (Codex Sarravianus), whose extant leaves are divided between Paris, Leiden and St Petersburg—both of which MSS. are probably of Egyptian origin. Perhaps of the end of the 5th or beginning of the 6th century is the illustrated Genesis of the Cottonian Library, now unfortunately reduced to fragments by fire, but once the finest example of its kind (*Cat. Anc. MSS.* i. pl. 8). And to about the same time belong the Dio Cassius of the Vatican (Silvestre, pl. 60) and the Pentateuch of the Bibliothèque Nationale (ibid. pl. 61).

In the writing of uncial MSS. of the 6th century there is a marked degeneration. The letters, though still round, are generally of a larger character, more heavily formed, and not so compactly written as in the preceding century. Horizontal strokes (*e.g.* in Δ, Π, T) are lengthened and finished off with heavy points or finials. The earliest example of this period which has to be noticed is the Dioscorides of Vienna (fig. 13), which is of particular value for the study of the palaeography of early vellum MSS. It is the first uncial example to which an approximate date can be given. There is good evidence to show that it was written early in the 6th century for Juliana Anicia, daughter of Flavius Anicius Olybrius, emperor of the West in 472. Here we already notice the characteristics of uncial writings of the 6th century, to which reference has been made. To this century also belong the palimpsest Homer under a Syriac text in the British Museum (*Cat. Anc. MSS.*, i. pl. 9); its companion volume, used by the same Syrian scribe, in which are fragments of St Luke's Gospel (ibid., pl. 10); the Dublin palimpsest fragments of St Matthew and Isaiah (T. K. Abbot, *Par Palimpsest*, Dubl.), written in Egypt; the fragments of the Pauline Epistles from Mount Athos, some of which are at Paris and others at Moscow (Silvestre, pls. 63, 64; Sabas, pl. A), of which, however, the writing has been disfigured by retracing at a later period; the Gospels (Cod. N) written in silver and gold on purple vellum, whose leaves are scattered in London (Cott. MS., Titus C. xv.), Rome, Vienna, St Petersburg, and its native home, Patmos; the fragmentary Eusebian Canons written on gilt vellum and highly ornamented, the sole remains

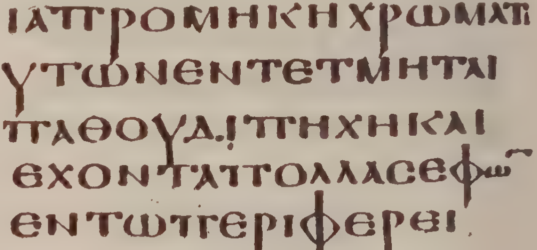

FIG. 13.—Dioscorides, early 6th century.

(—*ια προμηκη χρωματι*
—[*α*]*υτων ντετμηται*
—[*χα*]*παθου διπηκη και*
—*εχοντα πολλας εφ ω*[*ν*]
—*εν τω περιφερει*)

of some sumptuous volume (*Cat. Anc. MSS.* i. pl. 11); the Coislin Octateuch (Silvestre, pl. 65); the Genesis of Vienna, and the Codex Rossanensis, and the recently recovered Codex Sinopensis of the Gospels, instances of the very few early illustrated MSS. which have survived. Of the same period is the Codex Marchalianus of the Prophets, which, written in Egypt, follows in its style the Coptic form of uncial.

Reference may here be made to certain early bilingual Graeco-Latin uncial MSS., written in the 6th and 7th centuries, which, however, have rather to be studied apart, or in connexion with Latin palaeography; for the Greek letters of these MSS. run more or less upon the lines of the Latin forms. The best known of these examples are the Codex-Bezae of the New Testament, at Cambridge (*Pal. Soc.* pls. 14, 15), and the Codex Claromontanus of the Pauline Epistles, at Paris (*Pal. Soc.* pls. 63, 64), attributed to the 6th or 7th century; and the Laudian MS. of the Acts of the Apostles (*Pal. Soc.* pl. 80) of the 7th century. To these may be added the Harleian Glossary (*Cat. Anc. MSS.* i. pl. 13), also of the 7th century. A later example, of the 8th century, is the Graeco-Latin Psalter, at Paris, MS. Coislin 186 (Omont, *Facs. des plus anciens MSS. grecs*, pl. vii.).

An offshoot of early Greek uncial writing on vellum is seen in the Moeso-Gothic alphabet which Ulfilas constructed for the use of his countrymen in the 4th century, mainly from the Greek letters. Of the few extant remains of Gothic MSS. the oldest and most perfect is the Codex Argenteus of the Gospels, at Upsala, of the 6th century (*Pal. Soc.* pl. 118), written in characters which compare with purely written Greek MSS. of the same period. Other Gothic fragments appear in the sloping uncial hand seen in Greek MSS. of the 7th and following centuries.

About the year 600 Greek uncial writing passes into a new stage. We leave the period of the round and enter on that of the oval character. The letters Є, ⊖, ◯, ◯, instead of being symmetrically formed on the lines of a circle, are made oval; and other letters are laterally compressed into a narrow shape. In the 7th century also the writing begins to slope to the right, and accents are introduced and afterwards systematically applied. This slanting style of uncials continues in use through the 8th and 9th and into the 10th centuries, becoming heavier as time goes on. In this class of writing there is again the same dearth of dated MSS. as in the round uncial, to serve as standards for the assignment of dates. We have to reach the 9th century before finding a single dated MS. in this kind of writing. It is true that sloping Greek uncial writing is found in a few scattered notes and glosses in Syriac MSS. which bear actual dates in the 7th century, and they are so far useful as showing that this hand was firmly established at that time; but they do not afford sufficient material in quantity to be of really practical use for comparison (see the tables of alphabets in Gardthausen's *Griech. Paläog.*). Of more value are a few palimpsest fragments of the *Elements* of Euclid and of Gospel Lectionaries which occur also in the Syriac collection in the British Museum, and are written in the 7th and 8th centuries. There is also in the Vatican a MS. (Reg. 886) of the Theodosian code, which can be assigned with fair accuracy to the close of the 7th century (Gardth. *Gr. Pal.* p. 158), which, however, being calligraphically written, retains some of the earlier rounder forms. This MS. may be taken as an example of transitional style. In the fragment of a mathematical treatise (fig. 14) from Bobio, forming part of a MS. rewritten in the 8th century and assignable to the previous century, the slanting writing is fully developed. The formation of the letters is good, and conveys the impression that the scribe was writing a hand quite natural to him:—

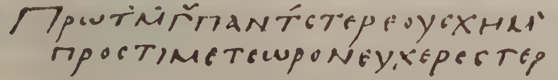

FIG. 14.—Mathemat. Treatise, 7th century.
(πρωτ[ον] μ[εν] γ[αρ] παντ[os] στερεου σχημ[ατοs]
προs τι μετεωρον ευχερεστερ—)

It should be also noticed that in this MS.—a secular one—there are numerous abbreviations (Wattenbach, *Script. gr. specim.* tab. 8). An important document of this time is also the fragment of papyrus in the Imperial Library at Vienna, which bears the signatures of bishops and others to the acts of the Council of Constantinople of 680. Some of the signatures are in slanting uncials (Wattenb., *Script. gr. specim.*, tabb. 12, 13; Gardth., *Gr. Pal.* tab. 1). Of the 8th century is the collection of hymns (Brit. Mus., Add. MS. 26,113) written without breathings or accents (*Cat. Anc. MSS.* i. pl. 14). To the same century belongs the Codex Marcianus, the Venetian MS. of the Old Testament, which is marked with breathings and accents. The plate reproduced from this MS. (Wattenb., *Script. gr. specim.*, tab. 9) contains in the second column a few lines written in round uncials, but in such a laboured style that nothing could more clearly prove the discontinuance of that form of writing as an ordinary hand. In the middle of the 9th century at length we find a MS. with a date in the Psalter of Bishop Uspensky of the year 862 (Wattenb. *Script. gr. specim.*, tab. 10). A little later in date is the MS. of Gregory of Nazianzus, written between 867 and 886 (Silvestre, pl. 71); and at the end of the 9th or beginning of the 10th century stands a lectionary in the Harleian collection (*Cat. Anc. MSS.* i. pl. 17). A valuable series of examples is also given by Omont (*Facsimiles des plus anc. MSS. grecs. de la Bibl. Nat.*). But by this time minuscule writing was well established, and the use of the more inconvenient uncial was henceforth almost entirely confined to church-service books. Owing to this limitation uncial writing now underwent a further calligraphic change. As the 10th century advances the sloping characters by degrees become more upright, and with this resumption of their old position they begin in the next century to cast off the compressed formation and again become rounder. All this is simply the result of calligraphic imitation. Bibles and service-books have always been the MSS. in particular on which finely formed writing has been lavished; and it was but natural that, when a style of writing fell into general disuse, its continuance, where it did continue, should become more and more traditional, and a work of copying rather than of writing. In the 10th century there are a few examples bearing dates. There are facsimiles from three of them, viz. a copy of the Gospels (fig. 15), in the Vatican, of 949 (*New Pal. Soc.* pl. 105), the Curzon Lectionary of 980, and the Harleian Lectionary of 995 (*Pal. Soc.* pls. 154, 26, 27). The Bodleian commentary on the Psalter (D. 4, 1) is likewise of great palaeographic value, being written partly in uncials and partly in minuscules of the middle of the 10th century (Gardth., *Gr. Pal.* p. 159, tab. 2, col. 4). This late form of uncial writing appears to have lasted to about the middle of the 12th century. (Omont. Facs. pl. xxii.). From it was formed the Slavonic writing in use at the present day:—

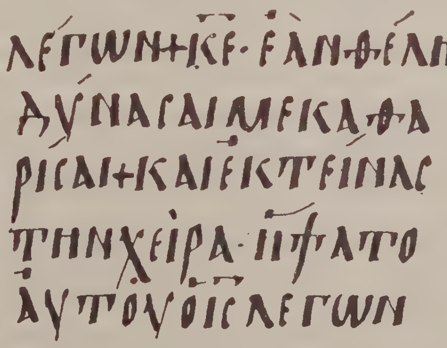

FIG. 15.—The Gospels (Vatican), A.D. 949.
(λέγων + κ[υρι]ε˙ ἐὰν θέλης˙
δύνασαί με καθα
ρίσαι + καὶ ἐκτείνας
τὴν χεῖρα˙ ἥψατο
αὐτοῦ ὁ ἰ[ησου]s λέγων)

Under the head of late uncial writing must be classed a few bilingual Graeco-Latin MSS. which have survived, written in a bastard kind of uncial in the west of Europe. This writing follows, wherever the shapes of the letters permit, the formation of corresponding Latin characters—the purely Greek forms being imitated in a clumsy fashion. Such MSS. are the Codex Augiensis of Trinity College, Cambridge, of the end of the 9th century (*Pal. Soc.* pl. 127) and the Psalter of St Nicholas of Cusa (pl. 128) and the Codex Sangallensis and Boernerianus of the 10th century (pl. 179). The same imitative characters are used in quotations of Greek words in Latin MSS. of the same periods.

Minuscule Writing.—The beautifully formed minuscule book-hand, which practically superseded the uncial book-hand in the 9th century, did not spring into existence all at once. Its formation had been the work of centuries. It was the direct descendant of the cursive Greek writing of the papyri. It has been shown above, in tracing the progress of the non-literary, cursive writing on papyrus, how the original forms of the letters of the Greek alphabet went through various modifications, always tending towards the creation of the forms which eventually settled down into the recognized minuscules or small letters of the middle ages and modern times. The development of these modifications is apparent from the first; but it was in the Byzantine period especially that the changes became more marked and more rapid. All the minuscule forms, as we know them in medieval literature, had been practically evolved by the end of the 5th century, and in the course of the next two hundred years those forms became more and more confirmed. In the large formal cursive writing of the documents of the 6th and 7th centuries we can pick out the minuscule alphabet in the rough. It only needed to be cast in a calligraphic mould to become the book-hand minuscule, the later development of which we have now to trace. This calligraphic mould seems to have been found in the imperial chancery, from whence issued documents written in a fine round minuscule hand on an ample scale, as appears from one or two rare surviving examples attributed to the 8th and 9th centuries (see the facsimile of an imperial letter, dated variously A.D. 756 or 839, in Wattenbach, *Script. graec. specim.*, pls. xiv., xv., and in Omont, *Facs. des plus anc. MSS. grecs.* pls. xxvi., xxvii.; and Brit. Mus. papyrus xxxii.). The fine hand only needed to be reduced in scale to become the caligraphic minuscule book-hand of the vellum MSS.

Thus, then, in the 9th century, the minuscule book-hand came into general use for literature, and, with the finely prepared vellum of the time ready to receive it, it assumed under the pens of expert calligraphers the requisite cast, upright, regular and symmetrical, which renders it in its earliest stages one of the most beautiful forms of writing ever created.

Greek MSS. written in minuscules have been classed as follow: (1) *codices vetustissimi*, of the 9th century and to the middle of the 10th century; (2) *vetusti*, from the middle of the 10th to the middle of the 13th century; (3) *recentiores*, from the middle of the 13th century to the fall of Constantinople, 1453; (4) *novelli*, all after that date.

Of dated minuscule MSS. there is a not inconsiderable number scattered among the different libraries of Europe. Gardthausen (*Gr. Pal.* 344 seq.) gives a list of some thousand, ending at A.D. 1500. But, as might be expected, the majority belong to the later classes.[1] Of the 9th century there are not ten which actually bear dates and of these all but one belong to the latter half of the century. In the 10th century, however, the number rises to nearly fifty, in the 11th to more than a hundred.

In the period of *codices vetustissimi* the minuscule hand is distinguished by its simplicity and purity. The period has been well described as the classic age of minuscules. The letters are symmetrically formed; the writing is compact and upright, or has even a slight tendency to slope to the left. In a word, the beauty of this class of minuscule writing is unsurpassed. But in addition to these general characteristics there are special distinctions which belong to it. The minuscule character is maintained intact, without intrusion of larger or uncial-formed letters. With its cessation as the ordinary literary hand the uncial character had not died out. We have seen that it was still used for liturgical books. It likewise continued to survive in a modified or half-uncial form for scholia, rubrics, titles, and special purposes—as, for example, in the Bodleian Euclid (fig. 16)—in minuscule written MSS. of the 9th and 10th centuries. These uses of the older character sufficed to keep it in remembrance, and it is therefore not a matter for surprise that some of its forms should reappear and commingle with the simple minuscule. This afterwards actually took place. But in the period now under consideration, when the minuscule had been cast into a new mould, and was, so to say, in the full vigour of youth, extraneous forms were rigorously excluded.

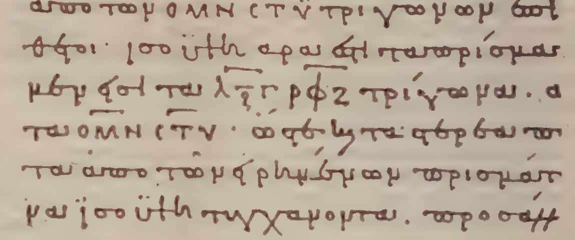

FIG. 16.—Euclid (Oxford), A.D. 888.

(*ἀπο τῶν* ΟΜΝ ΣΤΥ *τριγώνων επι—*
θετοι˙ ϊσοϋψη αρα εστι τα πρίσμα[τα]—
μεν εισι τα ΛΞΓ ΡΦΖ *τρίγωνα. α—*
τα ΟΜΝ ΣΤΫ˙ *ὥστε [αι]τα στερεα π—*
τα ἀπο τῶν ειρημένων πρισμάτ[ων]—
να ϊσοϋψη τυγχανοντα˙ προς ἀλλ[ηλα]—)

The breathings also of this class are rectangular, in unison with the careful and deliberate character of the writing; and there is but slight, if any, separation of the words. In addition, as far as has hitherto been observed, the letters run above, or stand upon, the ruled lines, and do not depend from them as at a later period. The exact time at which this latter mechanical change took place cannot be named; like other changes it would naturally establish itself by usage. But at least in the middle of the 10th century it seems to have been in use. In the Bodleian MS. of Basil's homilies of 953 A.D. (*Pal. Soc.* pl. 82) the new method is followed; and if we are to accept the date of the 9th century ascribed to a MS. in the Ambrosian Library at Milan (Wattenb., *Script. gr. specim.*, tab. 17), in which the ruled lines run above the writing, the practice was yet earlier. Certain scribal peculiarities, however, about the MS. make us hesitate to place it so early. In the Laurentian Herodotus (W and V., *Exempla*, tab. 31), which belongs to the 10th century, sometimes the one, sometimes the other system is followed in different parts of the volume; and the same peculiarity happens in the MS. of Gregory of Nazianzus of A.D. 972 in the British Museum (*Pal. Soc.* pl. 25; *Exempla*, tab. 7). The second half of the 10th century therefore appears to be a period of transition in this respect.

The earliest dated example of *codices vetustissimi* is the copy of the Gospels belonging to Bishop Uspensky, written in the year 835. A facsimile is given by Gardthausen (*Beiträge*) and repeated in the *Exempla* (tab. 1). Better specimens have been photographed from the Oxford Euclid of A.D. 888 (*Pal. Soc.* pls. 65, 66; *Exempla*, tab. 2) from a MS. of Saints' Lives at Paris of A.D. 890 (Omont, *Facs. des MSS. gr. datés*, pl. 1), and from the Oxford Plato (fig. 17) of A.D. 895 (*Pal. Soc.* pl. 81; *Exempla*, tab. 3). Sabas (*Specim. Palaeograph.*), has also given two facsimiles from MSS. of 880 and 899.

Of dated examples of the first half of the 10th century about a dozen facsimiles are available.

After the middle of the 10th century we enter on the period of the *codices vetusti*, in which the writing becomes gradually less compact. The letters, so to say, open their ranks; and, from this circumstance alone, MSS. of the second half of the century may generally be distinguished from those fifty years earlier. But alterations also take place in the shapes of the letters. Side by side with the purely minuscule forms those of the uncial begin to reappear, the cause of which innovation has already been explained. These uncial forms first show themselves at the end of the line, the point at which most changes first gained a footing, but by degrees they work back into the text, and at length become recognized members of the minuscule characters. In the 11th and 12th centuries they are well established, and become more and more prominent by the large or stilted forms which they assume. The change, however, in the general character of the writing of this class of *codices vetusti* is very gradual, uniformity and evenness being well maintained, especially in church books. On the other hand, a lighter and more cursive kind of minuscule is found contemporaneously in MSS. generally of a secular nature. In this hand many of the classical MSS. of the 10th or 11th centuries are written, as the MS. of Aeschylus and Sophocles, the Odyssey and the Apollonius Rhodius of the Laurentian Library at Florence, the Anthologia Palatina of Heidelberg and Paris, the Hippocrates of Venice (*Exempla*, tabb. 32–36, 38, 40), the Aristophanes of Ravenna (Wattenb., *Script. gr. specim.*, tab. 26), the Strabo of Paris (Omont, *Facs. des plus anc. MSS. grecs*, pl. 40), a Demosthenes (fig. 18) at Florence (*Pal. Soc.* ii. pl. 88, 89), &c. In a facsimile from a Plutarch at Venice (*Exempla*, tab. 44), the scribe is seen to change from the formal to the more cursive hand. This style of writing is distinguishable by its light and graceful character from the current writing into which the minuscule degenerated at a later time.

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[1] In Omont's *Facs. des MSS. grecs datés de la Bibl. Nat.* will be found a useful list of upwards of 300 facsimiles of dated Greek MSS. (including uncials).

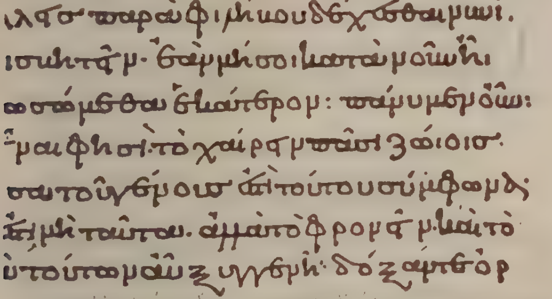

FIG. 17.—Plato (Oxford), A.D. 895.

(—[μέλ]λεις παρὰ φιλήβου δέχεσθαι νυνὶ.
—[αμφ]ισβητεῖν. ἐὰν μή σοι κατὰ νοῦν ἦι
—[συγκεφαλαι]ωσώμεθα ἑκάτερον: πάνυ μεν οὖν:
—[εἶ]ναι φησὶ. τὸ χαίρειν πᾶσι ξώιοις.
—[ὅ]σα τοῦ γένους ἐστὶ τούτου σύμφωνα˙
—ἐστι μὴ ταῦτα. ἀλλὰ τὸ φρονεῖν. καὶ τὸ
—[τὰ] τούτων αὖ ξυγγενῆ˙ δόξάν τε ὀρ)

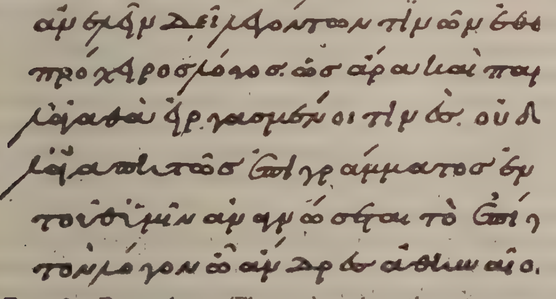

FIG. 18.—Demosthenes (Florence), early 11th century.

(ἀνελεῖν δεῖ λεγόντων τϊνῶν ἐθ[έλειν]—
πρόχειρος λόγος. ὡς ἄρα καὶ παρ'—
λ'ἀγαθὰ εἰργασμένοι τινὲς. οὐδ[ενὸς]—
λ'ἀγαπητῶς ἐπιγράμματος ἐν—
τοῦθ' ὑμῖν ἀναγνώσεται τὸ ἐπί[γραμμα]—
τὸν λόγον ὦ ἄνδρες ἀθηναῖοι)

The gradual rounding of the rectangular breathings takes place in this period. In the 11th century the smooth breathing, which would most readily lend itself to this modification, first appears in the new form. In the course of the 12th century both breathings have lost the old square shape; and about the same time contractions become more numerous, having been at first confined to the end of the line.

When the period of *codices recentiores* commences, the Greek minuscule hand undergoes extensive changes. The contrast between MSS. of the 13th century and those of a hundred years earlier is very marked. In the later examples the hand is generally more straggling, there is a greater number of exaggerated forms of letters, and marks of contraction and accents are dashed on more freely. There is altogether a sense of greater activity and haste. The increasing demand for books created a larger supply. Greater freedom and more variety appear in the examples of this class, together with an increasing use of ligatures and contractions. The general introduction of paper likewise assisted to break up the formal minuscule hand. To this rougher material a rougher style of writing was suited. Through the 14th and 15th centuries the decline of the set minuscule rapidly advances. The writing becomes even more involved and intricate, marks of contraction and accents are combined with the letters in a single action of the pen, and the general result is the production of a thoroughly cursive hand. In some respects, however, the change was not so rapid. Church books were still ordinarily written on vellum, which, as it became scarcer in the market (owing to the injury done to the trade by the competition of paper), was supplied from ancient codices which lay ready to hand on the shelves of libraries; and in these liturgical MSS. the more formal style of the minuscule was still maintained. In the 14th century there even appears a partial renaissance in the writing of Church MSS., modelled to some extent on the lines of the writing of the 12th century. The resemblance, however, is only superficial; for no writer can entirely disguise the character of the writing of his own time. And lastly there was yet another check upon the absolute disintegration of the minuscule book-hand in the 15th century exercised by the professional scribes who worked in Italy, and who in their calligraphical productions reverted again to the older style. The influence of the Renaissance is evident in many of the MSS. of the Italian Greeks, which served as models for the first Greek printing types.

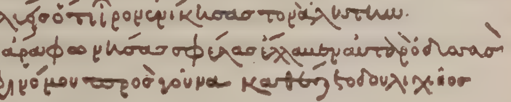

FIG. 19.—The Odyssey, 13th century.

(ἦ ἀλύεις ὅτι ἶρον ἐνίκησας τὸν ἀλήτην
ὣς ἄρα φωνήσας σφέλας ἔλλαβεν αὐτὰρ ὀδυσσεὺς
ἀμφινόμου πρὸς γοῦνα καθέζετο δουλιχιῆος)

The Greek minuscule book-hand had, then, by the end of the 15th century, become a cursive hand, from which the modern current hand is directly derived. We last saw the ancient cursive in use in the documents prior to the formation of the set minuscule book-hand, and no doubt it continued in use concurrently with the book-hand. But, as the latter passed through the transformations which have been traced, and gradually assumed a more current style, it may not unreasonably be supposed that it absorbed the cursive hand of the period, and with it whatever elements may have survived of the old cursive hand.

LATIN WRITING. I.—THE ROMAN CURSIVE

The course of Latin palaeography runs on the same lines as that of Greek palaeography. In regard to the former, as in regard to the latter, the documents fall into two main divisions: those which are written in the ordinary cursive hand of everyday life, and those which are written in the formal book-hand of literature. But Latin palaeography covers a wider ground than Greek. Greek writing being limited to the expression of the one language of a single people has a comparatively narrow and simple career. On the other hand, the Latin alphabet, having been adopted by the nations of western Europe, underwent many transformations in the course of development of the national handwritings of the different peoples, and consequently had a wide and varied career. But in one respect Latin palaeography is at a disadvantage as compared with the sister branch. As we have seen, Greek documents are extant dating back to the 4th century B.C., and the development of Greek writing can be fairly well illustrated by a series of examples of the succeeding centuries. There is no such series of Latin documents available to afford us the means of tracing the growth of Latin writing to the same remote period. No Latin document, either of a literary or of a non-literary character, has yet been recovered which can be placed with certainty earlier than the Christian era. Egypt, while giving up hundreds and thousands of documents in Greek, has hitherto yielded but little in Latin, even of the 1st century, and little too of the next following centuries. Indeed, for our knowledge of Latin writing of the 1st century we still have to depend chiefly upon the results of excavations at Pompeii and Herculaneum and in the Roman catacombs, upon the wall-scribblings which have been laid bare, and upon the waxen tablets and the few papyri which have thence been recovered.

At the time when we come into touch with the first extant examples of Roman writing, we find a few instances of a literary or book-hand as well as a fairly extensive variety of cursive hands. It will be convenient in the first place to examine the Roman cursive writing during the early centuries of our era. Then, for the moment suspending further research in this branch of our subject, we shall proceed to describe the literary script and to trace the development of the large form of book-hand, or majuscule writing, in its two divisions of capitals and uncials, and of the intermediate styles composed of a mixture of large and small letters, or consisting of a blend of the two classes of letters which has received the name of half-uncial. Then we shall turn to follow the development of the national hands, when it will be necessary to come into touch again with the Roman cursive, whence the western continental scripts were derived; and so we shall proceed to the formation of the minuscule writing of the middle ages.

The materials for the study of the early Roman cursive hand have been found in the wall-scribblings, or graffiti, of Pompeii and Herculaneum and Rome (collected in the *Corp. inscr. lat.* vol. iv.); in the series of 127 *libelli* or waxen tablets, consisting of *perscriptiones* and other deeds connected with sales by auction and tax receipts discovered in the house of the banker L. Caecilius Jucundus at Pompeii, and bearing dates of A.D. 15, 27, and 53–62 (published in *C.I.L.* iv., supplement); in a few scattered papyri from Egypt; and in a set of four-and-twenty waxen tablets bearing dates ranging from A.D. 131 to 167, which were found in ancient mining works in the neighbourhood of Alburnus Major (the modern Verespatak) in Dacia (*C. I. L.* iii.).

It will have been observed that in the case of the above documents there are three different kinds of material on which they have been inscribed: the plaster surface of walls, the waxen coatings of tablets, and the smooth surface of papyrus. The two former may be classed together as being of a nature which would offer a certain resistance to the free movement of the stilus; while in the case of papyrus the writing-reed or pen would run without impediment. Hence, in writing on the former materials there was a natural tendency to form the letters in disconnected strokes, to make them upright or even inclined to the left, and to employ vertical strokes in preference. The three following specimens from the graffiti and the two sets of tablets will demonstrate the conservative character of this kind of writing, covering as they do about a century and a half. This conservativeness may suggest the probability that the hand seen in the graffiti and the Pompeian tablets had not changed very materially from that practised a century or more earlier, and that it is practically the hand in which the Roman classical writers composed their works. When examining the alphabet of this early Roman cursive hand, we find (as we found in the early Greek cursive) the first beginnings of the minuscule writing of the middle ages. The slurring of the strokes, whereby the bows of the capital letters were lost and their more exact forms modified, led the way to the gradual development of the small letters. With regard to the particular forms of letters employed in the waxen tablets, compare the tables in *Corp. inscr. lat.*, vols. iii., iv. The letter A is formed by a main stroke supporting an oblique stroke above it and the cross bar is either omitted, or is indicated by a small vertical stroke dropping, as it were, out of the letter.

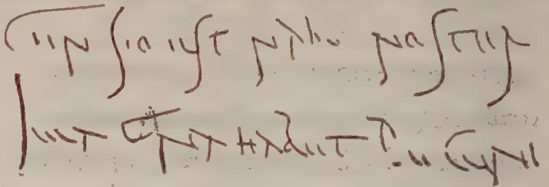

FIG. 20.—Wall inscription, 1st century.

(censio est nam noster
magna habet pecuni [am]).

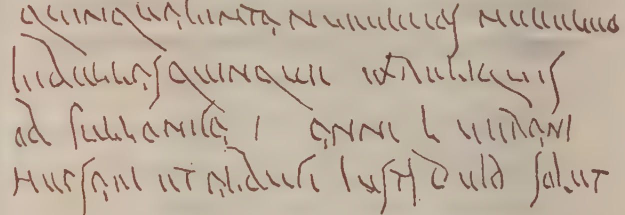

FIG. 21.—Pompeian Tablet, A.D. 59.

(quinquaginta nummos nummo
libellas quinque ex reliquis
ob fullonica . . . anni L. Verani
Hupsaei et Albuci Justi d.v.i.d. solut.)

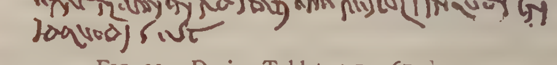

FIG. 22.—Dacian Tablet, A.D. 167.

(descriptum et recognitum factum ex libello—
erat Alb[urno] maiori ad statione Resculi in quo scri—
id quod i[nfra] s[criptum] est)

The main stroke of B dwindles to a slight curve, and the two bows are transformed into a long bent stroke so that the letter takes the shape of a stilted *a* or of a *d*. The D is chiefly like the uncial ꝺ; the E is generally represented by the old form || found in inscriptions and in the Faliscan alphabet. In the modified form of G the first outline of the flat-headed *g* of later times appears; H, by losing half of its second upright limb in the haste of writing, comes near to being the small *h*. In the Pompeian tablets M has the four-stroke form ||||, as in the graffiti; in the Dacian tablets it is a rustic capital, sometimes almost an uncial m. The hastily written O is formed by two strokes both convex, almost like *a*. As to the general character of the writing, it is close and compressed, and has an inclination to the left. There is also much combination or linking together of letters (*Corp. inscr. lat.* iii. tab. A). These peculiarities may, in some measure, be ascribed to the material and to the confined space at the command of the writer. The same character of cursive writing has also been found on a few tiles and potsherds inscribed with alphabets or short sentences—the exercises of children at school (*Corp. inscr. lat.* iii. 962).

In writing with the pen upon the smooth and unresisting surface of papyrus, the scribe would naturally write a more fluent hand. The disjointed writing of the graffiti and the tablets was changed for one which gradually became more consecutive and which naturally tended in course of time to slope to the right in the effort to be more current and to write letters in connexion without lifting the pen. One of the earliest available examples of Latin writing on papyrus to which an approximate date can be assigned is a fragment at Berlin containing portions of speeches delivered in the senate, said to be of the reign of Claudius, A.D. 41–54 (Steffens, *Lat. Pal.* taf. 101). The writing, though still somewhat restrained and admitting but little linking of the letters, is yet of a more flowing character than that of the contemporary tablets and graffiti.

We have to pass into the second century before finding the most perfect Latin document on papyrus as yet discovered (fig. 23). This is now in the British Museum, and records the purchase of a slave-boy by an officer in the Roman fleet of Misenum stationed on the Syrian coast, A.D. 166 (*Pal. Soc.* i. 190; *Archaeologia* liv. p. 433). The writing of the body of the document is in a formal cursive, generally of the same formation as the inscriptions on the Dacian waxen tablets of the 2nd century, as will be seen from the accompanying facsimile of a few lines (fig. 23).

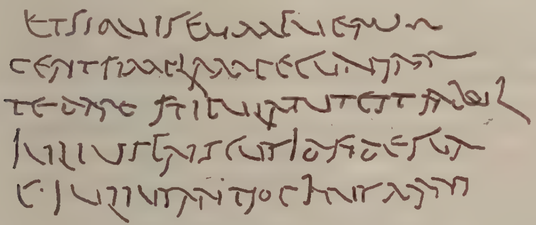

FIG. 23.—Sale of a slave, A.D. 166.

(—et si quis eum puerum
—cerit simplam pecuniam
—te dare stipulatus est Fabul
—Julius Priscus id fide sua
—C. Julius Antiochus mani—)

With this example of legal handwriting of the 2nd century it is interesting to compare two specimens of more ordinary cursive in different styles found in private letters of about the same time. The first (fig. 24) is taken from a fragmentary letter of the year 167 (Grenfell and Hunt, *Greek Papyri*, 2nd series, cviii.) and is a typical example of a hurried style.

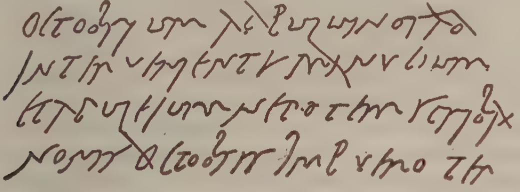

FIG. 24.—Letter, A.D. 167.

(Octobrium ad Puluinos ad—
interueniente Minucium—
et Apuleium nepotem scrib*am*—
nonis Octobris imp. Uero ter—)

The second (fig. 25) is from a letter written by one Aurelius Archelaus to Julius Domitius, *tribunus militum*, recommending a friend named Theon, of the 2nd century (*Oxyrhynchus Papyri*, i., xxxii.), an instance apparently of slow and imperfect penmanship, every letter painfully and separately formed, yet not in the detached strokes characteristic of the writing of the graffiti and the tablets.

In the examples above we recognize practically the same alphabet as in the graffiti and tablets, but with certain exceptions, particularly in the shape of the letter E, which is either normal or written very cursively as an acute-angled tick, and in the reversion of other letters to the more normal capital forms.

There is not sufficient material to trace step by step the development of the Roman cursive hand between the 2nd and the 5th centuries; but still, with the few scattered examples at hand, there seems to be reason for conjecture that Latin writing on papyrus passed through phases not very dissimilar to those of Greek writing on the same material. For, when we emerge from the 3rd century, we find an enlarged flowing hand, as in the Latin translation of the fables of Babrius in a fragmentary papyrus of the Amherst collection (No. xxvi.), ascribed to the 3rd or 4th century, and in a letter of recommendation from an Egyptian official of the 4th century, now at Strassburg (*Archiv. für Papyrusforschung*, iii. 2. 168); the handwriting of the latter recalling the large style of the Greek cursive of the Byzantine period (fig. 26). That there should be an affinity between the writing of Greek and that of Latin papyri emanating from Egypt is naturally to be expected.

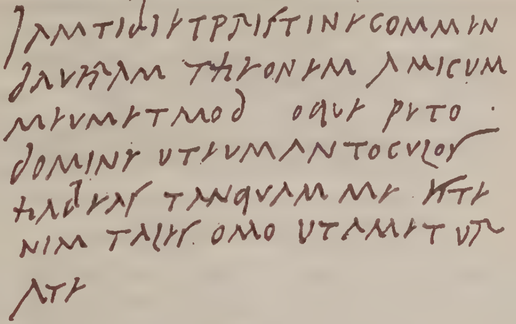

FIG. 25.—Letter, 2nd century.

(Jam tibi et pristine commen
daueram Theonem amicum
meum et mod[o qu]oque puto
domine ut eum ant oculos
habeas tanquam me est e
nim tales omo ut ametur
a te)

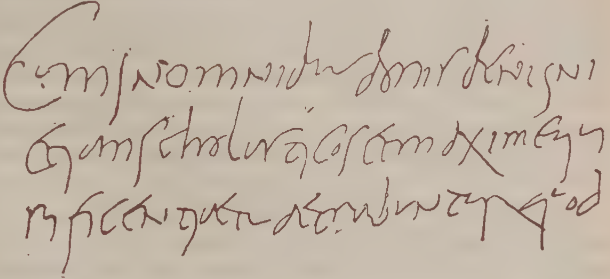

FIG. 26.—Letter of recommendation, 4th century.

(Cum in omnibus bonis benigni[tas]—
etiam scholasticos et maxime qui—
[hono]rificentiae tuae traduntur quod—)

This example shows what an immense advance had by this time been made in the formation of the minuscule hand, and but little more is required for its completion. It is to be noted, however, that the peculiar old form of letter B with the loop on the left still persists. But only a short time was now needed to bring this letter also in a new shape into line with the other members of the growing minuscule alphabet.

At this point must be noticed a very interesting and important class of the Roman cursive hand which stands apart from the general line of development. This is the official hand of the Roman Chancery, which is unfortunately represented by only two fragmentary papyri of the 5th century (fig. 27), and proves to be a curious moulding of the cursive in a calligraphic style, in which, however, the same characters appear as in other Roman cursive documents, if somewhat disguised. The papyri contain portions of two rescripts addressed to Egyptian officials, and are said to have been found at Phile and Elephantine. Both documents are in the same hand; and the fragments are divided between the libraries of Paris and Leiden. For a time the writing remained undeciphered, and Champollion-Figeac, while publishing a facsimile (*Chartes et MSS. sur papyrus*, 1840, pl. 14), had to confess that he was unable to read it. Massmann, however, with the experience gained in his work upon the waxed tablets, succeeded without much difficulty in reading the fragment at Leiden (*Libellus aurarius*, p. 147), and was followed by M. de Wailly, who published the whole of the fragments (*Mém. de l'Institut* (1842), xv. 399). Later, Mommsen and Jaffé have dealt with the text of the documents (*Jahrbuch des. gem. deut. Rechts* (1863), vi. 398), and compared in a table the forms of the letters with those of the Dacian tablets.

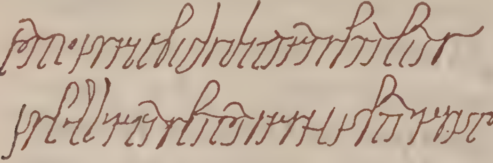

FIG. 27.—Deed of the Imperial Chancery, 5th century.
(portionem ipsi debitam resarcire
nec ullum precatorem ex instrumento)

The characters are large, the line of writing being about three-fourths of an inch deep, and the heads and tails of the long letters are flourished; but the even slope of the strokes imparts to the writing a certain uniform and graceful appearance. As to the actual shape of the letters, as will be seen from the reduced facsimile here given, there may be recognized in many of them only a more current form of those which have been described above. The A and R may be distinguished by noticing the different angle at which the top strokes are applied; the B, to suit the requirements of the more current style, is no longer the closed *d*-shaped letter of the tablets, but is open at the bow and more nearly resembles a reversed *b*; the tall letters *f*, *h*, *l*, and long *s* have developed loops; O and *v*-shaped U are very small, and written high in the line. The letters which seem to differ essentially from those of the tablets are E, M, N. The first of these is probably explained correctly by Jaffé as a development of the earlier || quickly written and looped, and may be compared with the tick-shaped letter noticed above. The M and N have been compared with the minuscule forms of the Greek *mu* and *nu*, as though the latter had been adopted; but they may with better reason be explained as merely cursive forms of the Latin capitals M and N. That this hand should have retained so much of the older formation of the Roman cursive is no doubt to be attributed to the fact of its being an official style of writing which would conform to tradition.

To continue the development which we saw attained in the letter of the 4th century above (fig. 26) we turn to the documents on papyrus from Ravenna, Naples, and other places in Italy, which date from the 5th century and are written in a looser and more straggling hand (fig. 28). Examples of this hand will be found in largest numbers in Marini's work specially treating of these documents (*I papiri diplomatici*), and also in the publications of Mabillon (*De re diplomatica*) Champollion-Figeac (*Chartes et MSS. sur papyrus*), Massmann (*Urkunden in Neapel und Arezzo*), Gloria (*Paleografia*), as well as in *Facs. of Ancient Charters in the British Museum*, pt. iv., 1878, Nos. 45, 46, and in the *Facsimiles* of the Palaeographical Society.

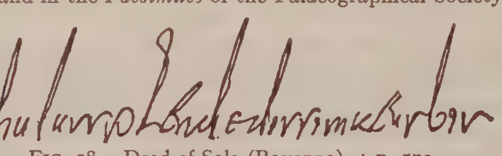

FIG. 28.—Deed of Sale (Ravenna), A.D. 572.
(huius splendedissimae urbis)

The letter *a* has now lost all trace of the capital; it is the open *u*-shaped minuscule, developed from the looped uncial (ɑ ɑ); the *b*, throwing off the loop or curve on the left which gave it the appearance of *d*, has at length developed one on the right, and appears in the form familiar in modern writing; minuscule *m*, *n*, and *u* are fully formed (the last never joining a following letter, and thus always distinguishable from *a*); *p*, *q*, and *r* approach to the long minuscules, and *s*, having acquired an incipient tag, has taken the form γ which it keeps long after.

This form of writing was widely used, and was not confined to legal documents. It is found in grammatical works, as in the second hand of the palimpsest MS. of Licinianus (*Cat. Anc. MSS.*, pt. ii., pls. 1, 2) of the 6th century, and in such volumes as the Josephus of the Ambrosian Library of the 7th century (*Pal. Soc.* pl. 59), and in the St Avitus of the 6th century and other MSS. written in France. It is indeed only natural to suppose that this, the most convenient, because cursive, hand, should have been employed for ordinary working MSS. which were in daily use. That so few of such MSS. should have survived is no doubt owing to the destruction of the greater number by the wear and tear to which they were subjected.

LATIN WRITING. II.—LITERARY HANDS

We have now to return to the 1st century, the date from which we started in the investigation of the Roman cursive writing, and take up the thread of the history of the book-hand of literature, a few rare examples of which have survived from the ruins of Herculaneum. That a Roman book-hand existed at a still earlier period is quite certain. The analogy of the survival of very ancient examples of a Greek literary hand is a sufficient proof; and it is a mere truism to say that as soon as there was a literature, there was likewise a book-hand for its vehicle. No work could be submitted for sale in the market that was not written in a style legible to all. Neatly written copies were essential, and the creation of a formal kind of writing fitted for the purpose naturally resulted. Such formal script must, however, be always more or less artificial as compared with the natural current hand of the time, and there must always be an antagonism between the two styles of script; and, as we have seen in Greek palaeography, the book-hand is always subject to the invading influence of the natural hand.

Capital Writing.—Among the Herculaneum fragmentary papyri, then, we find our earliest examples of the Roman literary hand, which must be earlier than A.D. 79, the year of the destruction of the city; and those examples prove to us that the usual literary hand was written in capital letters. Of these letters there are two kinds—the square and the rustic. Square capitals may be defined as those which have their horizontal lines at right angles with the vertical strokes; rustic letters are not less accurately formed, nor, as their title would seem to imply, are they rough in character, but, being without the exact finish of the square letters, and being more readily written, they have the appearance of greater simplicity. In capital writing the letters are not all of equal height; F and L, and in the rustic sometimes others, as B and R, overtop the rest. In the rustic alphabet the forms are generally lighter and more slender, with short horizontal strokes more or less oblique and wavy. Both styles of capital writing were obviously borrowed from the lapidary alphabets employed under the empire. Both styles were used for public notices inscribed on the walls of Pompeii and other places. But it has been observed that scribes with a natural conservatism would perpetuate a style some time longer in books than it might be used in inscriptions. We should therefore be prepared to allow for this in ascribing a date to a capital written MS., which might resemble an inscription older by a century or more. Rustic capitals, on account of their more convenient shape, came into more general use; and the greater number of the early MSS. in capitals which have survived are consequently found to be in this character. In the *Exempla codium latinorum* of Zangemeister and Wattenbach are collected specimens of capital writing.

The literary fragments of papyrus from Herculaneum are written generally in rustic capitals, either of the firm, solid character used in inscriptions, or of the lighter style employed in the fragments of a poem on the battle of Actium (fig. 29). As this poem is the earliest literary work in Latin, of any extent, written in the book-hand, a specimen of the writing is here given. Its period must necessarily lie between the year 31 B.C. the date of the battle and A.D. 79; and therefore we may place it at least early in the 1st century.

That the rustic capital hand was generally adopted for finely written literary MSS. from the period of our earliest examples onwards through the centuries immediately following may be assumed from the fact of that character being found so widely in favour when we come down to the period of the vellum MSS. Unfortunately no examples have survived to fill the gap between the first century and the oldest of the vellum codices written in rustic capitals of the 4th century. Of the three great MSS. of Virgil preserved in the Vatican Library, which are written in this character, the first in date is that known as the Schedae Vaticanae (*Exempla*, tab. 13; *Pal. Soc.* pl. 116, 117), a MS. famous for its series of well-finished illustrative paintings in classical style; it is ascribed to the 4th century. The other two MSS. are known as the Codex Romanus and the Codex Palatinus (*Exempla*, tab. 11, 12; *Pal. Soc.* pl. 113–115), and are now generally assigned to the 5th century. All three MSS. no doubt must always have been regarded as choice works; and the large scale of the writing employed, particularly in the case of the Romanus and the Palatinus, and the consequently magnificent size of the MSS. when complete, must indicate an unusual importance attaching to them. They were *éditions de luxe* of the great Roman poet. The writing of the Codex Palatinus (Fig. 30) especially is most exact, and is manifestly modelled on the best type of the rustic hand as seen in the inscriptions.

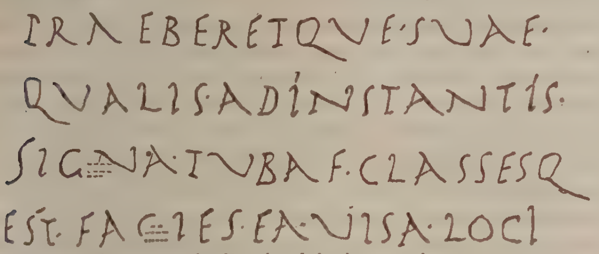

FIG. 29.—Poem on the Battle of Actium, early 1st century.

(praeberetque suae—
qualis ad instantis—
signa tubae classesq—
est facies ea visa loci—)

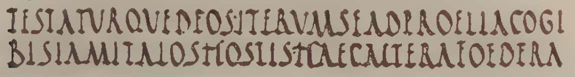

FIG. 30.—Virgil (Cod. Palatinus) 5th century.

(Testaturque deos iterum se ad proelia cogi
Bis iam Italos hostis haec altera foedera)

In assigning dates to the earliest MSS. of capital-writing, one feels the greatest hesitation, none of them bearing any internal evidence to assist the process. It is not indeed until the close of the 5th century that we reach firm ground—the Medicean Virgil of Florence having in it sufficient proof of having been written before the year 494. The writing is in delicately-formed letters, rather more spaced out than in the earlier examples (*Exempla*, tab. 10; *Pal. Soc.* pl. 86). Another ancient MS. in rustic capitals is the Codex Bembinus of Terence of the 4th or 5th century (*Exempla*, tab. 8, 9; *Pal. Soc.*, pl. 135), a volume which is also of particular interest on account of its marginal annotations, written in an early form of small hand. Among palimpsests the most notable is that of the Cicero *In Verrem* of the Vatican (*Exempla*, tab. 4).

Of vellum MSS. in square capitals the examples are not so early as those in the rustic character. Portions of a MS. of Virgil in the square letter are preserved in the Vatican, and other leaves of the same are at Berlin (*Exempla*, tab. 14). Each page, however, begins with a large coloured initial, a style of ornamentation which is never found in the very earliest MSS. The date assigned to this MS. is therefore the end of the 4th century. In very similar writing, but not quite so exact, are some fragments of another MS. of Virgil in the library of St Gall, probably of a rather later time (*Exempla*, tab. 14*a*; *Pal. Soc.*, pl. 208).

In the 6th century capital-writing enters on its period of decadence, and the examples of it become imitative. Of this period is the Paris Prudentius (*Exempla*, tab. 15; *Pal. Soc.* pls. 29, 30) in rustic letters modelled on the old pattern of early inscriptions, but with a very different result from that obtained by the early scribes. A comparison of this volume with such MSS. as the Codex Romanus and the Codex Palatinus shows the later date of the Prudentius in its widespread writing and in certain inconsistencies in forms. Of the 7th century is the Turin Sedulius (*Exempla*, tab. 16), a MS. in which uncial writing also appears—the rough and misshapen letters being evidences of the cessation of capital writing as a hand in common use. The latest imitative example of an entire MS. in rustic capitals is in the Utrecht Psalter, written in triple columns and copied, to all appearance, from an ancient example, and illustrated with pen drawings. This MS. may be assigned to the beginning of the 9th century. If there were no other internal evidence of late date in the MS. the mixture of uncial letters with the capitals would decide it. In the Psalter of St Augustine's Canterbury, in the Cottonian Library (*Pal. Soc.* pl. 19; *Cat. Anc. MSS.* ii. pls. 12, 13), some leaves at the beginning are written in this imitative style early in the 8th century; and again it is found in the Benedictional of Bishop Aethelwold (*Pal. Soc.* pl. 143) of the 10th century. In the sumptuous MSS. of the Carlovingian school it was continually used; and it survived for such purposes as titles and colophons for some centuries, usually in a degenerate form of the rustic letters.

Uncial Writing.—There was also another majuscule form of writing, besides capitals, employed as a literary book-hand at an early date, but not coeval with the early period of capital writing. This second book-hand was the so-called Uncial hand, a modification of the capital form of writing, in which the square angles of the original letters were rounded off and certain new curved shapes were introduced, the characteristic letters of the uncial alphabet being a, δ, ϵ, h, ო. The origin of some of these rounded letters may be traced in certain forms of the Roman cursive letters of the graffiti and the tablets. But a considerable length of time elapsed before the fully developed uncial alphabet was evolved from these incipient forms. In fact it is only in the vellum MSS. that we first find the firmly written literary uncial hand in perfect form. No doubt the new material, vellum, with its smooth hard surface, immediately afforded the means for the calligraphic perfection with which we find the uncial writing inscribed in these codices.

From the occurrence of isolated uncial forms in inscriptions, the actual period of growth of the finished literary hand has been determined to lie between the later part of the 2nd century and the 4th century. Uncial letters are especially prevalent in Roman-African inscriptions of the 3rd century; but certain letters of the uncial alphabet are not as yet therein matured; minuscule forms of a few letters, particularly *b* and *d*, are employed. The discovery also, at Oxyrhynchus, of a fragmentary papyrus of the 3rd century, containing a portion of an epitome of Livy, presents us with an example of the uncial hand in progress of formation for literary purposes, the text being composed mainly of letters of the uncial type, but including a certain proportion of letters, as *b*, *d*, *m*, *r*, of the minuscule or small character. At length in the 4th century, as already stated, the perfected uncial literary alphabet is found in the vellum codices.

There are still extant a very large number of Latin uncial MSS., a proof of the wide use of this form of literary writing in the early middle ages.

The *Exempla* of Zangemeister and Wattenbach, so often quoted above, contains a series of facsimiles which illustrate its progress through its career. The letter ო has been adopted by the editors as a test letter, in the earlier forms of which the last limb is not curved or turned in. The letter ϵ also in its earlier and purer form has the cross stroke placed high. But, as in every style of writing, when once developed, the earliest examples are the best, being written with a free hand and natural stroke. The Gospels of Vercelli (*Exempla*, tab. 20), said to have been written by the hand of Eusebius himself, and which may indeed be of his time, is one of the most ancient uncial MSS. Its narrow columns and pure forms of letters have the stamp of antiquity. To the 4th century also is assigned the palimpsest Cicero *De republica* in the Vatican (*Exempla*, tab. 17; *Pal. Soc.*

pl. 160), a MS. written in fine large characters of the best type; and a very ancient fragment of a commentary on an ante-Hieronymian text, in three columns, has also survived at Fulda (*Exempla*, tab. 21). Among the uncial MSS. of the 5th century of which good photographic facsimiles are available are the two famous codices of Livy, at Vienna (fig. 31) and Paris (*Exempla*, tab. 18, 19; *Pal. Soc.* pl. 31, 32, 183).

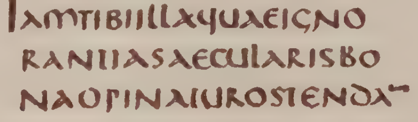

Fig. 31.—Livy (Vienna MS.), 5th century.

(Iam tibi illa quae igno
rantia saecularis bo
na opinatur ostenda*m*)

To distinguish between uncial MSS. of the 5th and 6th centuries is not very easy, for the character of the writing changes but little, and is free from sign of weakness or wavering. It may, however, be noticed that in MSS. which are assigned to the latter century there is rather less compactness, and occasionally, as the century advances, there is a slight tendency to artificiality.

When the 7th century is reached there is every evidence that uncial writing has entered on a new stage. The letters are more roughly and carelessly formed, and the compactness of the earlier style is altogether wanting. From this time down to the age of Charlemagne there is a continual deterioration, the writing of the 8th century being altogether misshapen. A more exact but imitative hand was, however, at the same time employed, when occasion required, for the production of calligraphic MSS., such as Biblical and liturgical books. Under the encouragement given by Charlemagne to such works, splendid uncial volumes were written in ornamental style, often in gold, several of which have survived to this day.

Mixed and Half-uncial Writing.—It is obvious that the majuscule styles of literary writing, viz. the square capital, the rustic capital and the uncial, were of too elaborate and too stately a character to serve all the many requirements of literature. The capital hands, as we have seen, appear to have been employed, at least in many instances, for codices produced on a grand scale, and presumably for special occasions; and if the uncial hand had a longer and wider career, yet in this case also there must often have been a sense that the employment of this fine character gave a special importance and value to the MS. It is not improbable that the survival of so large a number of uncial MSS. is due to the special care that they received at the hands of their owners. Other more manageable styles of writing were necessary, and concurrently with the majuscule hands other forms were developing. The hand which bears the name of Half-uncial was finally evolved, and had itself an important career as a book-hand as well as exercising a large influence on the medieval minuscule hand of literature.

From the first, as we have seen in the case of the graffiti and the tablets, a mingling of capital forms and minuscule forms was prevalent in the non-literary style of writing. There are indications that the same mingling of the two streams was allowed in writing of a literary character. It appears in a rudimentary state in a papyrus fragment from Herculaneum (*Exempla*, tab. 2 *b*); and it appears in the epitome of Livy of the 3rd century found at Oxyrhynchus, in which minuscule letters are interspersed among the uncial text. From the regularity and ease with which this MS. is written, it is to be assumed that the mixed hand was ordinarily practised at that time. It is often employed for marginal notes in the early vellum codices. It is used for the text of the Verona Gaius (*Exempla*, tab. 24) of the 5th century, in which, besides the ordinary uncial shapes, *d* is also found as a minuscule, *r* as the transitional r, and *s* as the tall letter v. Again, in the uncial Florentine Pandects of the 6th century appears a hand which contains a large admixture of minuscule forms (*Exempla*, tab. 54). From these and other instances it is seen that in uncial MSS. of a secular nature, as in works relating to law and grammar, the scribe did not feel himself restricted to a uniform use of the larger letters, as he would be in producing a church book or calligraphic MS.

But the mixed hand, although partaking something of the nature of the Half-uncial hand, was not actually that form of writing. The Half-uncial hand was not only a mingling of uncial and minuscule forms, but also a blending of them, the uncial element yielding more or less to the minuscule influence, while the minuscule element was reacted upon by the uncial sentiment of roundness and sweeping curves. In its full development the Half-uncial, or Roman Half-uncial as it is also called, were it not for a few lingering pure uncial forms, might equally well be described as a large-type minuscule hand. It has, in fact, been sometimes styled the pre-Carolingian minuscule. An early form of this writing is found in the papyrus fragment of Sallust's Catiline, perhaps of the early 5th century, recently recovered at Oxyrhynchus. In vellum codices of the 5th, 6th and 7th centuries Half-uncial writing of a very fine type is not uncommon. It is used for the marginal scholia of the Bembine Terence, of the 5th century. The MS. of the Fasti consulares, at Verona, brought down to 494 A.D. (*Exempla*, tab. 30), is also in this hand. But the earliest MS. of this class to which a more approximate date can be given is the Hilary of St Peter's at Rome (fig. 32), which was written in or before the year 509 or 510 (*Exempla*, tab. 52; *Pal. Soc.* pl. 136); the next is the Sulpicius Severus of Verona, of 517 (*Exempla*, tab. 32); and of the year 569 is a beautifully written MS. at Monte Cassino containing a Biblical commentary (*Exempla*, tab. 3).

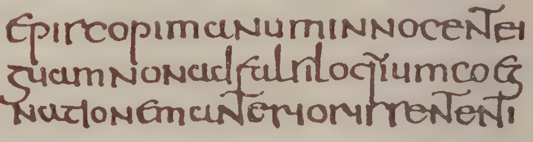

Fig. 32.—St Hilary, A.D. 509–510.

(episcopi manum innocente[m]—
[lin]guam non ad falsiloquium coeg[isti]—
nationem anterioris sententi[ae]—)

Other examples, of which good facsimiles may be consulted, are the Corbie MS. of Canons, at Paris (*Exempla*, tab, 41, 42), the St Severianus at Milan (*Pal. Soc.* pl. 161, 162), the Ashburnham St Augustine (*Pal. Soc.* ii. 9), and the Paris St Augustine (*New. Pal. Soc.* pl. 80), of the 6th century; and the Cologne MS. of Canons (*Exempla*, tab. 44), and the Josephus (*Pal. Soc.* pl. 138) and St Ambrose (*Pal. Soc.* pl. 137) of Milan, of the 6th or 7th century.

The influence which the Half-uncial literary hand exercised upon the minuscule book-writing of the 7th and 8th centuries may be traced in greater or less degree in the continental MSS. of that period. We shall find that it formed the basis for the beautiful national handwritings of Ireland and Britain; and it played an important part in the Carolingian reform of the book-hand of the Frankish Empire.

Latin Writing. III.—The National Hands

We have now to follow the rise and development of the national handwritings of western Europe, all of which were derived from the Roman hand, but from different phases of it. While the Roman Empire was the central power controlling its colonies and conquests, the Roman handwriting, however far apart might be the several countries in which it was current, remained practically one and the same. But, when the empire was broken up and when independent nationalities arose upon its ruins and advanced upon independent paths of civilization, the handwriting inherited from Rome gradually assumed distinctive characters and took the complexions of the several countries, unless from some accident the continuity of the effects of the Roman occupation was disturbed, as it was in Britain by the Saxon invasion. On the continent of western Europe, in Italy, in Spain, in Gaul, the Roman cursive hand had become the common form of writing, and it remained the framework on which the national hands of those countries developed. Thus grew the Lombardic hand of Italy, the Visigothic hand of Spain, and the Merovingian and, later, the Carolingian hand of the Frankish Empire. The earliest charters of the three national divisions, written in cursive hands directly descending from the Roman cursive, and dating generally from the 7th century, still remained related in their general style. It was in the book-hands, elaborated from the cursive character, that the lines of national demarcation became more clearly defined, although naturally there occur also many examples in mixed styles which it is difficult to assign to one or another country.

Lombardic Writing.—The national handwriting of Italy did not follow one and the same lines of development throughout the peninsula. In ordinary documents the cursive hand which is seen in the Ravenna deeds, the direct descendant of the Roman cursive, continued in use, growing, in course of time, more and more intricate and difficult to read, the earliest examples, down to the middle of the 9th century, being in the large straggling character of their prototype. The illegible scrawl into which the hand finally degenerated in notarial instruments of southern Italy was at length suppressed by order of Frederick II. (A.D. 1210–1250). But at an early date the Lombardic book-hand was being formed out of this material. In northern Italy new influences were brought into action by Charlemagne's conquest, the independent growth of the native hand was checked, and a mixed style in which the Merovingian type was interwoven with the Italian was produced, to which the name of Franco-Lombardic has been given (see below, fig. 39). But in the Lombardic duchies of the south the native Lombardic book-hand had an unimpeded growth. In such centres as the monasteries of Monte Cassino near Naples and La Cava near Salerno, it took in the 9th century a very exact and uniform shape. From this date the attention which it received as a calligraphic form of writing, accompanied with accessory ornamentation of initial letters, brought it to a high state of perfection in the 11th century, when by the peculiar treatment of the letters, they assume that strong contrast of light and heavy strokes which when exaggerated, as it finally became, received the name of broken Lombardic. This style of hand lasted to the 13th century.

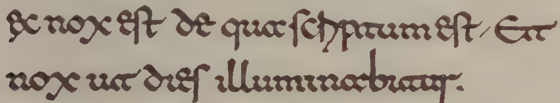

FIG. 33.—Exultat roll (Lombardic, 12th century).
([H]ec nox est de qua scriptum est Et
nox ut dies illuminabitur)

Papal Documents.—A word must be said in this place regarding the independent development of the hands used in the papal chancery, that great centre which had so wide an influence by setting the pattern for the handsome round-hand writing which became so characteristic of the Italian script. Specimens of a special style of writing, founded on the Lombardic and called *littera romana* (fig. 34) are to be seen in the early papal documents on papyrus dating from the latter part of the 8th century. In the earliest examples it appears on a large scale, and has rounded forms and sweeping strokes of a very bold character. Derived from the official Roman hand, it has certain letters peculiar to itself, such as the letter *a* made almost like a Greek *ω*, *t* in the form of a loop, and *e* as a circle with a knot at the top.

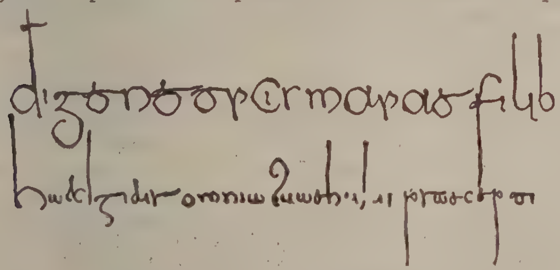

FIG. 34.—Bull of Pope John VIII. (much reduced, A.D. 876).
(Dei genetricis mariae filib—
haec igitur omnia quae huius praecepti)

This hand may be followed in examples from A.D. 788 through the 9th century (*Facs. de chartes et diplomes*, 1866; Ch. Figeac, *Chartes et doc. sur papyrus*, i–xii.; Letronne, *Diplom. merov. ætat.*, pl. 48. In a bull of Silvester II., dated in 999 (*Bibl. l'Ec. des chartes*, vol. xxxvii.), we find the hand becoming less round; and at the end of the next century, under Urban II., in 1097 (Mabillon, *De re dipl.* suppl. p. 115) and 1098 (Sickel, *Mon. graph.* v. 4), it is in a curious angular style, which, however, then disappears. During the 11th and 12th centuries the imperial chancery hand was also used for papal documents, and was in turn displaced by the exact and calligraphic papal Italian hand of the later middle ages.

Visigothic Writing.—The Visigothic writing of Spain ran a course of development not unlike that of the Lombardic. In the cursive hand attributed to the 7th century the Roman cursive has undergone little change in form; but another century developed a most distinctive character. In the 8th century appears the set book-hand in an even and not difficult character, marked by breadth of style and a good firm stroke. This style is maintained through the 9th century with little change, except that there is a growing tendency to calligraphy. In the 10th century the writing deteriorates; the letters are not so uniform, and, when calligraphically written, are generally thinner in stroke. The same changes which are discernible in all the handwritings of western Europe in the 11th century are also to be traced in the Visigothic hand—particularly as regards the rather rigid character which it assumes. It continued in use down to the beginning of the 12th century. Perhaps the most characteristic letter of the book-hand is the *q*-shaped *g*. The following specimens (figs. 35, 36) illustrate the Visigothic as written in a large heavy hand of the 9th century (*Cat. Anc. MSS.* ii. Plate 37), and in a calligraphic example of 1109 (*Pal. Soc.* Plate 48).

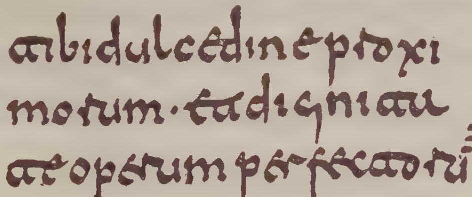

FIG. 35.—Prayers, 9th century.
(tibi dulcedine proxi
morum et dignita
te operum perfectoru*m*)

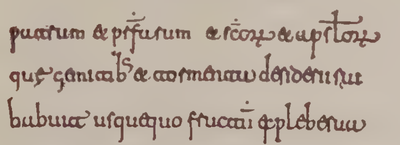

FIG. 36.—Beatus on the Apocalypse, A.D. 1109.
(patrum et pro*fet*arum et s*anct*orum et apo*stol*orum
que gemitibus et tormenta desiderii sui
habuit usquequo fructu*m* ex plebe sua)

Merovingian.—The early writing of the Frankish Empire, to which the title of Merovingian has been applied, had a wider range than the other two national hands already described. It had a long career both for diplomatic and literary purposes. In this writing, as it appears in documents, we see that the Roman cursive is subjected to a lateral pressure, so that the letters received a curiously cramped appearance, while the heads and tails are exaggerated to inordinate length.

Facsimiles of this hand, as used in the royal and imperial chanceries, are to be found scattered in various works; but a complete course of Merovingian diplomatic writing may be best studied in Letronne's *Diplomata*, and in the *Kaiserurkunden* of Professors Sybel and Sickel. In the earliest documents, commencing in the 7th century and continuing to the middle of the 8th century, the character is large and at first not so intricate as it becomes later in this period. The writing then grows into a more regular form, and in the 9th century a small hand is established, which, however, still retains the exaggerated heads and tails of letters. The direct course of this chancery hand may then be followed in the imperial documents, which from the second half of the 9th century are written in a hand more set and evidently influenced by the Carolingian minuscule. This form of writing, still accompanied by the lengthened strokes already referred to, continued in force, subject, however, to the varying changes which affected it in common with other hands, into the 12th century. Its influence was felt as well in France as in Germany and Italy; and certain of its characteristics also appear in the court-hand which the Normans brought with them into England.

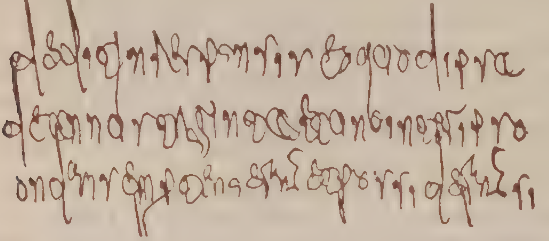

FIG. 37.—Merovingian diploma, A.D. 679–680.
(dedit in respunsis eo quod ipsa—
de annus triginta et uno inter ipso—
—ondam semp*er* tenuerant et possiderant si—)

The book-hand immediately derived from the early Merovingian diplomatic hand is seen in MSS. of the 7th and 8th centuries in a very neatly written but not very easy hand (*Cat. Anc. MSS.* ii. Plates 29, 30; Arndt, *Schrifttaf.* 28).

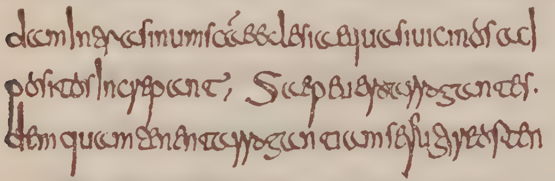

FIG. 38.—St Gregory's Moralia, 7th century.
Merovingian Writing, 7th century.
(—dam intra sinum s*anct*ae eclesiae quasi uicinos ad—
positos increpant. Saepe uero arrogantes—
—dem quam tenent arrogantiam se fugire osten—)

But other varieties of the literary hand as written in France are seen to be more closely allied to the Roman cursive. The earliest example is found in the papyrus fragments of writings of St Avitus and St Augustine of the 6th century (*Études paléogr. sur des papyrus du VI*^{me} *siècle*, Geneva, 1866); and other later MSS. by their diversity of writing show a development independent of the cursive hand of the Merovingian charters. It is among these MSS. that those examples already referred to occur which more nearly resemble the Lombardic type.

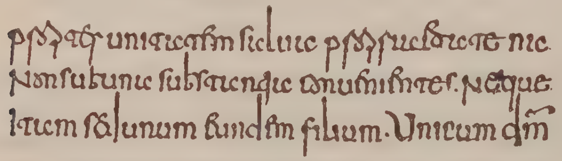

FIG. 39.—Ecclesiastical Canons (Franco-Lombardic), 8th century.
(propter unitatem salua propriaetate na—
non sub una substantia conuenientes, neque—
—itam sed unum eundem filium. Unicum d*eu*m)

The uncial and half-uncial hands had also their influence in the evolution of these Merovingian book-hands; and the mixture of so many different forms accounts for the variety to be found in the examples of the 7th and 8th centuries. In the *Notice sur un MS. Mérovingien d'Eugyppus* (1875) and the *Notice sur un MS. Mérovingien de la Bibl. d'Épinal* (1878), Delisle has given many valuable facsimiles in illustration of the different hands in these two MSS. of the early part of the 8th century. See also *Exempla Codd. Lat.* (tab. 57), and autotypes in *Cat. anc. MSS.* ii. There was, however, through all this period a general progress towards a settled minuscule writing which only required a master-hand to fix it in a purified and calligraphic form. How this was effected will be described below, after disposing of the early national writing of our own islands.

Irish Writing.—The early history of the palaeography of the British Isles stands apart from that of the continental schools. As was noticed above, the Roman handwriting which was used by the Roman settlers in Britain and was imparted by them to the native Britons was swept out of existence when the Saxon invasion abruptly destroyed the continuity of Roman civilization in these islands. Britain had to wait a long time for the reappearance of Roman writing in the country; but it was destined to reappear, though in a different phase, in book-form, not in cursive form; and not directly, but through another channel. That channel was Ireland.

It is evident that the civilization and learning which accompanied the establishment of an ancient Church in Ireland could not exist without a written literature. The Roman missionaries would certainly in the first place have imported copies of the Gospels and other books, and it cannot be doubted that through intercourse with England the Irish would obtain continental MSS. in sufficient numbers to serve as models for their scribes. From geographical and political conditions, however, no continuous intimacy with foreign countries was possible; and we are consequently prepared to find a form of writing borrowed in the first instance from a foreign school, but developed under an independent national system. In Ireland we have an instance how conservative writing may become, and how it will hand on old forms of letters from one generation to another when there is no exterior influence to act upon it. After once obtaining its models, the Irish school of writing was left to work out its own ideas, and continued to follow one direct line for centuries. The subsequent English conquest had no effect upon the national handwriting. Both peoples in the island pursued their own course. In MSS. in the Irish language the Irish character of writing was naturally employed; and the liturgical books produced in Irish monasteries by Irish monks were written in the same way. The grants and other deeds of the English settlers were, on the other hand, drawn up by English scribes in their then national writing. The Irish handwriting went on in its even uninterrupted course; and its consequent unchanging form makes it so difficult a matter to assign accurate dates to Irish MSS.

The early Irish handwriting is of two classes—the round and the pointed. The round hand is found in the earliest examples; the pointed hand, which also was developed at an early period became the general hand of the country, and survives in the native writing of the present day. Of the earliest surviving MSS. written in Ireland none are found to be in pure uncial letters. That uncial MSS. were introduced into the country by the early missionaries can hardly be doubted, if we consider that that character was so commonly employed as a bookhand, and especially for sacred texts. Nor is it impossible that Irish scribes may have practised this hand. The copy of the Gospels in uncials, found in the tomb of St Kilian, and preserved at Würzburg, has been quoted as an instance of Irish uncial. The writing, however, is the ordinary uncial, and bears no marks of Irish nationality (*Exempla*, tab. 58). The most ancient examples are in half-uncial letters, so similar in character to the continental half-uncial MSS. of Roman type noticed above, that there can be no hesitation in deriving the Irish from the Roman writing. We have only to compare the Irish MSS. of the round type with the continental MSS. to be convinced of the identity of their styles of writing. There are unfortunately no means of ascertaining the exact period when this style of hand was first adopted in Ireland. Among the very earliest surviving examples none bears a fixed date; and it is impossible to accept the traditional ascription of certain of them to particular saints of

Ireland, as St Patrick and St Columba. Such traditions are notoriously unstable ground upon which to take up a position. But an examination of certain examples will enable the palaeographer to arrive at certain conclusions. In Trinity College, Dublin, is preserved a fragmentary copy of the Gospels (*Nat. MSS. Ireland*, i. pl. ii.) vaguely assigned to a period from the 5th to the 7th century, and written in a round half-uncial hand closely resembling the continental hand, but bearing the general impress of its Irish origin. This MS. may perhaps be of the early part of the 7th century.

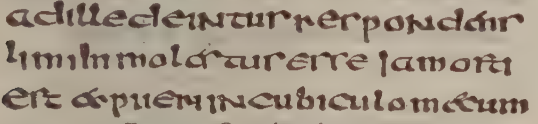

FIG. 40.—Gospels, 7th century.
(ad ille deintus respondens [dicit, No]li mihi molestus esse, iam osti[um clausum] est et pueri in cubiculo mecum [sunt])

Again, the Psalter (*Nat. MSS. Ireland*, i. pls. iii., iv.) traditionally ascribed to St Columba (d. 597), and perhaps of the 7th century, is a calligraphic specimen of the same kind of writing. The earliest examples of the continental half-uncial date back, as has been seen above, to the 5th century. Now the likeness between the earliest foreign and Irish MSS. forbids us to assume anything like collateral descent from a common and remote stock. Two different national hands, although derived from the same source, would not independently develop in the same way, and it may accordingly be granted that the point of contact, or the period at which the Irish scribes copied and adopted the Roman half-uncial, was not very long, comparatively, before the date of the now earliest surviving examples. This would take us back at least to the 6th century, in which period there is sufficient evidence of literary activity in Ireland. The beautiful Irish calligraphy, ornamented with designs of marvellous intricacy and brilliant colouring, which is seen in full vigour at the end of the 7th century, indicates no small amount of labour bestowed upon the cultivation of writing as an ornamental art. It is indeed surprising that such excellence was so quickly developed. The Book of Kells has been justly acknowledged as the culminating example of Irish calligraphy (*Nat. MSS. Ireland*, i. pls. vii.–xvii.; *Pal. Soc.* pls. 55, 56). The text is written in the large solid half-uncial hand which is again seen in the Gospels of St Chad at Lichfield (*Pal. Soc.* pls. 20, 21, 35), and, in a smaller form, in the English-written Lindisfarne Gospels (see below). Having arrived at the calligraphic excellence just referred to, the round hand appears to have been soon afterwards superseded, for general use, by the pointed; for the character of the large half-uncial writing of the Gospels of MacRegol, of about the year 800 (*Nat. MSS. Ireland*, i. pls. xxii.–xxiv.; *Pal. Soc.* pls. 90, 91), shows a very great deterioration from the vigorous writing of the Book of Kells, indicative of want of practice.

Traces of the existence of the pointed hand are early. It is found in a fully developed stage in the Book of Kells itself (*Pal. Soc.* pl. 88). This form of writing, which may be termed the cursive hand of Ireland, differs in its origin from the national cursive hands of the Continent. In the latter the old Roman cursive has been shown to be the foundation. The Irish pointed hand, on the contrary, had nothing to do with the Roman cursive, but was simply a modification of the round hand, using the same forms of letters, but subjecting them to a lateral compression and drawing their limbs into points or hair-lines. As this process is found developed in the Book of Kells, its beginning may be fairly assigned to as early a time as the first half of the 7th century; but for positive date there is the same uncertainty as in regard to the first beginning of the round hand. The Book of Dimma (*Nat. MSS. Ireland*, i. pls. xviii., xix.) has been attributed to a scribe of about A.D. 650; but it appears rather to be of the 8th century, if we may judge by the analogy of English MSS. written in a similar hand. It is not in fact until we reach the period of the Book of Armagh (*Nat. MSS. Ireland*, pls. xxv.–xxix.), a MS. containing books of the New Testament and other matter, and written by Ferdomnach, a scribe who died in the year 844, that we are on safe ground. Here is clearly a pointed hand of the early part of the 9th century, very similar to the English pointed hand of Mercian charters of the same time. The MS. of the Gospels of MacDurnan, in the Lambeth Library (*Nat. MSS. Ireland*, i. pls. xxx., xxxi.) is an example of writing of the end of the 9th or beginning of the 10th century, showing a tendency to become more narrow and cramped. But coming down to the MSS. of the 11th or 12th centuries we find a change. The pointed hand by this time has become moulded into the angular and stereotyped form peculiar to Irish MSS. of the later middle ages. From the 12th to the 15th centuries there is a very gradual change. Indeed, a carefully written MS. of late date may very well pass for an example older by a century or more. A book of hymns of the 11th or 12th century (*Nat. MSS. Ireland*, i. pls. xxxii.–xxxvi.) may be referred to as a good typical specimen of the Irish hand of that period; and the Gospels of Maelbrighte, of A.D. 1138 (*Nat. MSS. Ireland*, i. pls. xl.–xlii.; *Pal. Soc.* pl. 212), as a calligraphic one.

In Irish MSS. of the later period, the ink is black, and the vellum, as a general rule, is coarse and discoloured, a defect which may be attributed to inexperience in the art of preparing the skins and to the effects of climate.

When a school of writing attained to the perfection which marked that of Ireland at an early date, so far in advance of other countries, it naturally followed that its influence should be felt beyond it own borders. How the influence of the Irish school asserted itself in England will be presently discussed. But on the Continent also Irish monks carried their civilizing power into different countries, and continued their native style of writing in the monasteries which they founded. At such centres as Luxeuil in France, Würzburg in Germany, St Gall in Switzerland, and Bobbio in Italy, they were as busy in the production of MSS. as they had been at home. At first such MSS. were no doubt as distinctly Irish in their character as if written in Ireland itself; but, after a time, as the bonds of connexion with that country were weakened, the form of writing would become rather traditional, and lose the elasticity of a native hand. As the national styles also which were practised around them became more perfected, the writing of the Irish houses would in turn be reacted on; and it is thus that the later MSS. produced in those houses can be distinguished. Archaic forms are traditionally retained, but the spirit of the hand dies and the writing becomes merely imitative.

English Writing.—In England there were two sources whence a national hand could be derived. From St Columba's foundation in Iona the Irish monks established monasteries in the northern parts of Britain; and in the year 635 the Irish missionary Aidan founded the see of Lindisfarne or Holy Isle, where there was established a school of writing destined to become famous. In the south of England the Roman missionaries had also brought into the country their own style of writing direct from Rome, and taught it in the newly founded monasteries. But their writing never became a national hand. Such a MS. as the Canterbury Psalter in the Cottonian Library (*Pal. Soc.* pl. 18) shows what could be done by English scribes in imitation of Roman uncials; and the existence of so few early charters in the same letters (*Facs. of Anc. Charters*, pt. i., Nos. 1, 2, 7), among the large number which have survived, goes to prove how limited was the influence of that form of writing. The famous MS. of the Bible known as the Codex Amiatinus, now at Florence, which was written in uncials at Jarrow in Northumbria, about the year 700, was almost certainly the work of foreign scribes. On the other hand, the Irish style made progress throughout England, and was adopted as the national hand, developing in course of time certain local peculiarities, and lasting as a distinct form of writing down to the time of the Norman Conquest. But, while English scribes at first copied their Irish models with faithful exactness, they soon learned to give to their writing the stamp of a national character, and imparted to it the elegance and strength which individualized the English hand for many centuries to come.

As in Ireland, so here we have to follow the course of the round hand as distinct from the pointed character. The earliest and most beautiful MS. of the former class is the Lindisfarne Gospels (fig. 41) or "Durham Book" in the Cottonian Library (*Pal. Soc.* pls. 3–6, 22; *Cat. Anc. MSS.* pt. ii. pls. 8–11), said to have been written by Eadfrith, bishop of Lindisfarne, about the year 700. The text is in very exactly formed half-uncials, differing but slightly from the same characters in Irish MSS., and is glossed in the Northumbrian dialect by Aldred, a writer of the 10th century.

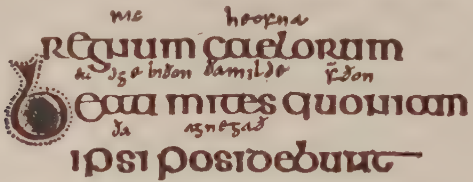

FIG. 41.—Lindisfarne Gospels, *c.* A.D. 700.
(regnum caelorum. Beati mites quoniam ipsi posidebunt.
ric heofna eadge biđon đa milde forđon đa agnegađ.)

MSS. in the same solid half-uncial hand are still to be seen in the Chapter Library of Durham, this style of writing having been practised more especially in the north of England. But in addition to this calligraphic book-writing, there was also a lighter form of the round letters which was used for less sumptuous MSS. or for more ordinary occasions. Specimens of this hand are found in the Durham Cassiodorus (*Pal. Soc.* pl. 164), in the Canterbury Gospels (*Pal. Soc.* pl. 7; *Cat. Anc. MSS.* pt. ii., pls. 17, 18), the Epinal Glossary (*E. Eng. Text Soc.*), and in a few charters (*Facs. Anc. Charters*, pt. i., 15; ii., 2, 3; *Pal. Soc.* 10), one of which, of A.D. 778, written in Wessex, is interesting as showing the extension of the round hand to the southern parts of England. The examples here enumerated are of the 8th and 9th centuries—the earlier ones being written in a free natural hand, and those of later date bearing evidence of decadence. Indeed the round hand was being rapidly displaced by the more convenient pointed hand, which was in full use in England in the middle of the 8th century. How late, however, the more calligraphic round hand could be continued under favouring circumstances is seen in the Liber Vitae or list of benefactors of Durham (*Cat. Anc. MSS.* pt. ii., pl. 25; *Pal. Soc.* pl. 238), the writing of which would, from its beautiful execution, be taken for that of the 8th century, did not internal evidence prove it to be of about the year 840.

The pointed hand ran its course through the 8th, 9th, and 10th centuries, until English writing came under the influence of the foreign minuscule. The leading characteristics of this hand in the 8th century are regularity and breadth in the formation of the letters and a calligraphic contrast of heavy and light strokes —the hand being then at its best. In the 9th century there is greater lateral compression, although regularity and correct formation are maintained. But in the 10th century there are signs of decadence. New forms are introduced, and there is a disposition to be imitative. A test letter of this latter century is found in the letter *a* with obliquely cut top, ɑ.

The course of the progressive changes in the pointed hand may be followed in the *Facsimiles of Ancient Charters in the British Museum* and in the *Facsimiles of Anglo-Saxon MSS.* of the Rolls Series. The charters reproduced in these works have survived in sufficient numbers to enable us not only to form a fairly accurate knowledge of the criteria of their age, but also to recognize local peculiarities of writing. The Mercian scribes appear to have been very excellent penmen, writing a very graceful hand with much delicate play in the strokes. On the other hand the writing of Wessex was heavier and more straggling and is in such strong contrast to the Mercian hand that its examples may be easily detected with a little practice. Turning to books in which the pointed hand was employed, a very beautiful specimen, of the 8th century, is a copy of Bede's *Ecclesiastical History* (fig. 42) in the University Library at Cambridge (*Pal. Soc.* pls. 139, 140), which has in a marked degree that breadth of style which has been referred to. Not much later is another copy of the same work in the Cottonian Library (*Pal. Soc.* pl. 141; *Cat. Anc. MSS.* pt. ii., pl. 19), from which the following facsimile is taken.

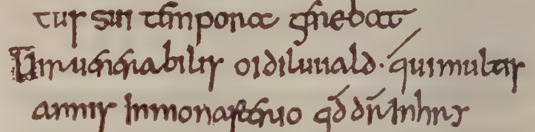

FIG. 42.—Bede, 8th century.
(tus sui tempora gerebat.
Uir uenerabilis oidiluuald, qui multis
annis in monasterio q*uod* d*icitur* Inhry——)

For an example of the beginning of the 9th century, a MS. of miscellanea, of A.D. 811–814, also in the Cottonian Library, may be referred to (*Pal. Soc.* pl. 165; *Cat. Anc. MSS.* pt. ii. Plate 24); and a very interesting MS. written in the Wessex style is the Digby MS. 63 of the middle of the century (*Pal. Soc.* pl. 168). As seen in the charters, the pointed writing of the 10th century assumes generally a larger size, and is rather more artificial and calligraphic. A very beautiful example of the book-hand of this period is found in the volume known as the Durham Ritual (*Pal. Soc.* pl. 240), which, owing to the care bestowed on the writing and the archaism of the style, might at first sight pass for a MS. of higher antiquity.

In the latter part of the 10th century the foreign set minuscule hand began to make its way into England, consequent on increased intercourse with the Continent and political changes which followed. In the charters we find the foreign and native hands on the same page: the body of the document, in Latin, in Carolingian minuscules; the boundaries of the land conveyed, in the English hand. The same practice was followed in books. The charter (in book form) of King Eadgar to New Minster, Winchester, A.D. 966 (*Pal. Soc.* pls. 46, 47), the Benedictional of Bishop Æthelwold of Winchester (pls. 142, 144) before A.D. 984, and the MS. of the Office of the Cross, A.D. 1012–1020 (pl. 60), also written in Winchester, are all examples of the use of the foreign minuscule for Latin. The change also which the national hand underwent at this period may certainly be attributed to this foreign influence. The pointed hand, strictly so-called, is replaced by a rounder or rather square character, with lengthened strokes above and below the line.

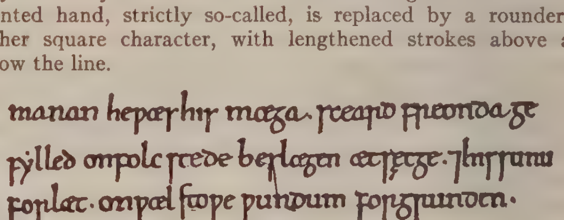

FIG. 43.—Chronicle, 11th century.
(manan he wæs his mæga. sceard freonda ge
fylled on folcstede beslægen æt sęcge. and his sunu
forlæt. on wælstowe wundum forgrunden.)

This style of writing becomes the ordinary English hand down to the time of the Norman Conquest. That event extinguished the national hand for official purposes—it disappears from charters; and the already established use of the Carolingian minuscule in Latin MSS. completed its exclusion as the handwriting of the learned. It cannot, however, be doubted that it still lingered in those parts of the country where foreign influence did not at once penetrate, and that Englishmen still continued to write their own language in their own style of writing. But that the earlier distinctive national hand was soon overpowered by foreign teaching is evident in English MSS. of the 12th century, the writing of which is of the foreign type, although the English letter thorn, þ, survived and continued in use down to the 15th century, when it was transformed to *y*.

LATIN WRITING. IV.—THE CAROLINGIAN REFORM AND THE MEDIEVAL MINUSCULE HAND

It has been stated above that in the Merovingian MSS. of the 8th century there was evident progress towards a settled minuscule book-hand which only required a master hand to fix it in a purified and calligraphic form. This was effected under Charlemagne, in whose reign the revival of learning naturally led to a reform in handwriting. An ordinance of the year 789 required the revision of Church books; and a more correct orthography and style of writing was the consequence. The abbey of St Martin of Tours was one of the principal centres from whence the reformation of the book-hand spread. Here, from the year 796 to 804, Alcuin of York presided as abbot; and it was specially under his direction that the Carolingian minuscule writing took the simple and graceful form which was gradually adopted to the exclusion of all other hands. In carrying out this reformation we may well assume that Alcuin brought to bear the results of the training which he had received in his youth in the English school of writing, which had attained to such proficiency, and that he was also beneficially influenced by the fine examples of the Lombard school which he had seen in Italy. In the new Carolingian minuscule all the uncouthness of the later Merovingian hand disappears, and the simpler forms of many of the letters found in the old Roman half-uncial and minuscule hands are adopted. The character of Carolingian writing through the 9th and early part of the 10th century is one of general uniformity, with a contrast of light and heavy strokes, the limbs of tall letters being clubbed or thickened at the head by pressure on the pen. As to characteristic letters (fig. 44) the *a*, following the old type, is, in the 9th century, still frequently open, in the form of *u*; the bows of *g* are open, the letter somewhat resembling the numeral 3; and there is little turning of the ends of letters, as *m* and *n*.

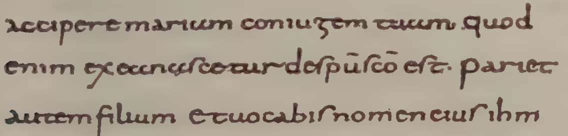

FIG. 44.—Gospels, 9th century.

(accipere mariam coniugem tuam quod
enim ex ea nascetur de sp*iritu* san*cto* est. Pariet
autem filium et uocabis nomen eius I*esum*)

In the 10th century the clubbing of the tall letters becomes less pronounced, and the writing generally assumes, so to say, a thinner appearance. But a great change is noticeable in the writing of the 11th century. By this time the Carolingian minuscule may be said to have put off its archaic form and to develop into the more modern character of small letter. It takes a more finished and accurate and more upright form, the individual letters being drawn with much exactness, and generally on a rather larger scale than before. This style continues to improve, and is reduced to a still more exact form of calligraphy in the 12th century, which for absolute beauty of writing is unsurpassed. In England especially (fig. 45) the writing of this century is particularly fine.

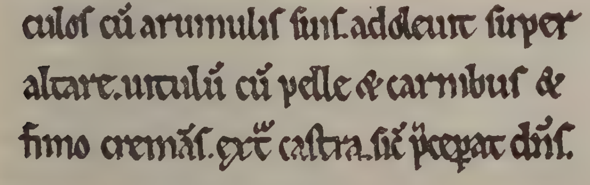

FIG. 45.—Leviticus, A.D. 1176.

(—culos cu*m* aruinulis suis adoleuit super
altare uitulu*m* cu*m* pelle et carnibus et
fimo crema*ns* ext*ra* castra sic*ut* p*re*ceperat d*omi*n*us*)

As, however, the demand for written works increased, the fine round-hand of the 12th century could not be maintained. Economy of material became necessary, and a smaller hand with more frequent contractions was the result. The larger and more distinct writing of the 11th and 12th centuries is now replaced by a more cramped though still distinct hand, in which the letters are more linked together by connecting strokes, and are more laterally compressed. This style of writing is characteristic of the 13th century. But, while the book-hand of this period is a great advance upon that of a hundred years earlier, there is no tendency to a cursive style. Every letter is clearly formed, and generally on the old shapes. The particular letters which show weakness are those made of a succession of vertical strokes, as *m*, *n*, *u*. The new method of connecting these strokes, by turning the ends and running on, made the distinction of such letters difficult, as, for example, in such a word as *minimi*. The ambiguity thus arising was partly obviated by the use of a small oblique stroke over the letter *i*, which, to mark the double letter, had been introduced as early as the 11th century. The dot on the letter came into fashion in the 14th century.

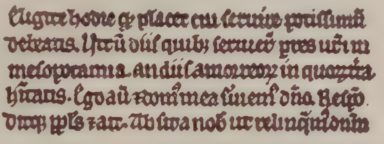

FIG. 46.—Bible, 13th century.

(Eligite hodie q*uod* placet cui seruire potissimu*m*
debeatis. Utrum diis quib*us* seruier*unt* patres u*est*ri in
mesopotamia, an diis amoreor*um* in quor*um* t*er*ra
h*ab*itatis. Ego au*tem* *et* dom*us* mea s*er*uiem*us* d*omi*no Respo*n*ditq*ue* p*opulus* *et* ait, Absit a nob*is* ut relinq*uamus* d*omi*n*um*)

In MSS. of the 14th century minuscule writing becomes slacker, and the consistency of formation of letters falters. There is a tendency to write more cursively and without raising the pen, as may be seen in the form of the letter *a*, of which the characteristic shape at this time is a, with both bows closed, in contrast with the earlier a. In this century, however, the hand still remains fairly stiff and upright. In the 15th century it becomes very angular and more and more cursive, but is at first kept within bounds. In the course of the century, however, it grows more slack and deformed, and the letters become continually more cursive and misshapen. An exception, however, to this disintegration of minuscule writing in the later centuries is to be observed in church books. In these the old set hand of the 12th and 13th centuries was imitated and continued to be the liturgical style of writing.

It is impossible to describe within limited space, and without the aid of plentiful illustrations, all the varieties of handwriting which were developed in the different countries of western Europe, where the Carolingian minuscule was finally adopted to the exclusion of the earlier national hands. In each country, however, it acquired, in a greater or less degree, an individual national stamp which can generally be recognized and which serves to distinguish MSS. written in different localities. A broad line of distinction may be drawn between the writing of northern and southern Europe from the 12th to the 15th century. In the earlier part of this period the MSS. of England, northern France and the Netherlands are closely connected. Indeed, in the 12th and 13th centuries it is not always easy to decide as to which of the three countries a particular MS. may belong. As a rule, perhaps, English MSS. are written with more sense of gracefulness; those of the Netherlands in darker ink. From the latter part of the 13th century, however, national character begins to assert itself more distinctly. In southern Europe the influence of the Italian school of writing is manifest in the MSS. of the south of France in the 13th and 14th centuries, and also, though later, in those of Spain. That elegant roundness of letter which the Italian scribes seem to have inherited from the bold characters of the early papal chancery, and more recently from Lombardic models, was generally adopted in the book-hand of those districts. It is especially noticeable in calligraphic specimens, as in church books—the writing of Spanish MSS. in this style being distinguished by the blackness of the ink. The medieval minuscule writing of Germany stands apart. It never attained to the beauty of the hands of either the north or the south which have been just noticed; and from its ruggedness and slow development German MSS. have the appearance of being older than they really are. The writing has also very commonly a certain slope in the letters which compares unfavourably with the upright and elegant hands of other countries. In western Europe generally the minuscule hand thus nationalized ran its course down to the time of the invention of printing, when the so-called black letter, or set hand of the 15th century in Germany and other countries, furnished models for the types. But in Italy, with the revival of learning, a more refined taste set in in the production of MSS., and scribes went back to an earlier time in search of a better standard of writing. Hence, in the first quarter of the 15th century, MSS. written on the lines of the Italian hand of the early 12th century begin to appear, and become continually more numerous. This revived hand was brought to perfection soon after the middle of the century, just at the right moment to be adopted by the early Italian printers, and to be perpetuated by them in their types.

English Cursive Charter-Hands.—It must also not be forgotten that by the side of the book-hand of the later middle ages there was the cursive hand of everyday use. This is represented in abundance in the large mass of charters and legal or domestic documents which remains. Some notice has already been taken of the development of the national cursive hands in the earliest times. From the 12th century downwards these hands settled into well defined and distinct styles peculiar to different countries, and passed through systematic changes which can be recognized as characteristic of particular periods. But, while the cursive hand thus followed out its own course, it was still subject to the same laws of change which governed the book-hand; and the letters of the two styles did not differ at any period in their organic formation. Confining our attention to the charter-hand, or court-hand, practised in England, a few specimens may be taken to show the principal changes which it developed. In the 12th century the official hand which had been introduced after the Norman Conquest is characterized by exaggeration in the strokes above and below the line, a legacy of the old Roman cursive, as already noted. There is also a tendency to form the tops of tall vertical strokes, as in *b*, *h*, *l*, with a notch or cleft. The letters are well made and vigorous, though often rugged.

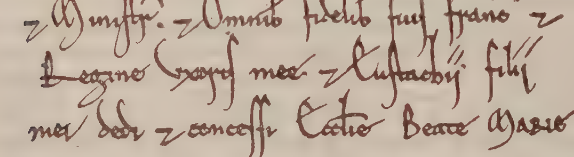

FIG. 47.—Charter of Stephen, A.D. 1136–1139.

(*et* ministr*is* et omnib*us* fidelibus suis Franc*is et*——
Regine uxoris mee *et* Eustachii filii ——
mei dedi *et* concessi ecclesie Beate Marie)

As the century advances, the long limbs are brought into better proportion; and early in the 13th century a very delicate fine-stroked hand comes into use, the cleaving of the tops being now a regular system, and the branches formed by the cleft falling in a curve on either side. This style remains the writing of the reigns of John and Henry III.

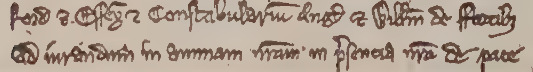

FIG. 48.—Charter of Henry III., A.D. 1259.

(uniuers*is* p*re*sentes litteras inspecturis sal*utem*. Noueritis q*uod*—
—ford *et* Essex*ie et* Constabulariu*m* Angl*ie et* Will*elmu*m de Fortib*us*
—ad iurandum in animam n*ost*ram in p*re*sencia n*ost*ra de pace)

Towards the latter part of the 13th century the letters grow rounder; there is generally more contrast of light and heavy strokes; and the cleft tops begin, as it were, to shed the branch on the left.

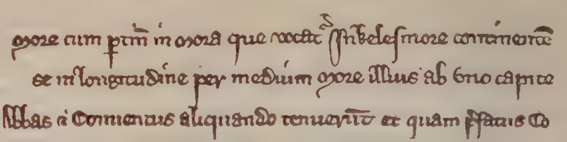

FIG. 49.—Charter of Edward I., A.D. 1303.

(More cum p*er*tin*enti*is in mora que vocat*ur* Inkelesmore continent*em*
—se in longitudine per medium more illius ab uno capite—
Abbas *et* Conuentus aliquando tenueru*nt* et quam p*re*fatus Co—)

In the 14th century the changes thus introduced make further progress, and the round letters and single-branched vertical strokes become normal through the first half of the century. Then, however, the regular formation begins to give way and angularity sets in. Thus in the reign of Richard II. we have a hand presenting a mixture of round and angular elements—the letters retain their breadth but lose their curves. Hence, by further decadence, results the angular hand of the 15th century, at first compact, but afterwards straggling and ill-formed.

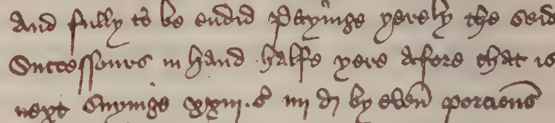

FIG. 50.—English Charter, A.D. 1457.

(and fully to be endid, payinge yerely the seid—
successours in hand halfe yere afore that is—
next suyinge xxiij. s. iiij. d. by evene porciou*n*s.)

In concluding these remarks on the medieval cursive English writing, it is only necessary to remind the reader that the modern English cursive hand owes its origin to the general introduction into the west of the fine round Italian cursive hand of the 16th century—one of the notable legacies bequeathed to us by the wonderful age of the Renaissance.

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The application of photographic processes to the reproduction of entire MSS. has received great impetus during the last few years, and will certainly be widely extended in the future. Many of the most ancient biblical and other MSS. have been thus reproduced; the librarians of the university of Leiden are issuing a great series comprising several of the oldest classical MSS.; and under the auspices of the pope and the Italian government famous MSS. in the Vatican and other libraries in Italy are being published by this method; not to mention the issue of various individual MSS. by other corporate bodies or private persons. (E. M. T.)

PALAEOLITHIC (Gr. παλαιός, old, and λίθος, stone), in anthropology, the characteristic epithet of the Drift or early Stone Age when Man shared the possession of Europe with the mammoth, the cave-bear, the woolly-haired rhinoceros and other extinct animals. The epoch is characterized by flint implements of the rudest type and never polished. The fully authenticated remains of palaeolithic man are few, and discoveries are confined to certain areas, *e.g.* France and north Italy. The reason is that interment appears not to have been practised by the river-drift hunters, and the only bones likely to be found would be those accidentally preserved in caves or rock-shelters. The first actual find of a palaeolithic implement was that of a rudely fashioned flint in a sandbank at Menchecourt in 1841 by Boucher de Perthes. Further discoveries have resulted in the division of the Palaeolithic Age into various epochs or sequences according to the faunas associated with the implements or the localities where found. One classification makes three divisions for the epoch, characterized respectively by the existence of the cave-bear, the mammoth and reindeer; another, two, marked by the prevalence of the mammoth and reindeer respectively. These divisions are, however, unsatisfactory, as the fauna relied on as characteristic must have existed synchronously. The four epochs or culture-sequences of G. de Mortillet have met with the most general acceptance. They are called from the places in France where the most typical finds of palaeolithic remains have been made—Chellian from Chelles, a few miles east of Paris; Mousterian from the cave of Moustier on the river Vézère, Dordogne; Solutrian from the cave at Solutré near Macon; and Madelenian from the rocky shelter of La Madeleine, Dordogne.

PALAEOLOGUS, a Byzantine family name which first appears in history about the middle of the 11th century, when George Palaeologus is mentioned among the prominent supporters of Nicephorus Botaniates, and afterwards as having helped to raise Alexius I. Comnenus to the throne in 1081; he is also noted for his brave defence of Durazzo against the Normans in that year. Michael Palaeologus, probably his son, was sent by Manuel II. Comnenus into Italy as ambassador to the court of Frederick I. in 1154; in the following year he took part in the campaign against William of Sicily, and died at Bari in 1155. A son or brother of Michael, named George, received from the emperor Manuel the title of *Sebastos*, and was entrusted with several important missions; it is uncertain whether he ought to be identified with the George Palaeologus who took part in the conspiracy which dethroned Isaac Angelus in favour of Alexius Angelus in 1195. Andronicus Palaeologus Comnenus was Great Domestic under Theodore Lascaris and John Vatatzes; his eldest son by Irene Palaeologina, Michael (*q.v.*), became the eighth emperor of that name in 1260, and was in turn followed by his son Andronicus II. (1282–1328). Michael, the son of Andronicus, and associated with him in the empire, died in 1320, but left a son, Andronicus III., who reigned from 1328 to 1341; John VI. (1355–1391), Manuel II. (1391–1425) and John VII. (1425–1448) then followed in lineal succession; Constantine XI. or XII., the last emperor of the East (1448–1453), was the younger brother of John VII. Other brothers were Demetrius, prince of the Morea until 1460, and Thomas, prince of Achaia, who died at Rome in 1465. A daughter of Thomas, Zoe by name, married Ivan III. of Russia. A younger branch of the Palaeologi held the principality of Monferrat from 1305 to 1533, when it became extinct.

See Roman Empire, Later, and articles on the separate rulers.

PALAEONTOLOGY (Gr. παλαιός, ancient, neut. pl. ὄντα, beings, and λογία, discourse, science), the science of extinct forms of life. Like many other natural sciences, this study dawned among the Greeks. It was retarded and took false directions until the revival of learning in Italy. It became established as a distinct branch in the beginning of the 19th century, and somewhat later received the appellation "palaeontology," which was given independently by De Blainville and by Fischer von Waldheim about 1834. In recent years the science of vegetable palaeontology has been given the distinct name of *Palaeobotany* (*q.v.*), so that "palaeontology" among biologists mainly refers to zoology; but historically the two cannot be disconnected.

Palaeontology both borrows from and sheds light upon geology and other branches of the physical history of the earth, each of which, such as palaeogeography or palaeometeorology, is the more fascinating because of the large element of the unknown, the need for constructive imagination, the appeal to other branches of biological and physical investigation for supplementary evidence, and the necessity of constant comparison with the present aspects of nature. The task of the palaeontologist thus begins with the appearance of life on the globe, and ends in close relation to the studies of the archaeologist and historian as well as of the zoologist and botanist. That wealth of evidence which the zoologist enjoys, including environment in all its aspects and anatomy in its perfection of organs and tissues, the palaeontologist finds partially or wholly destroyed, and his highest art is that of complete restoration of both the past forms and past environments of life (see Plates I. and II.; figs. 1, 2, 3, 4, 5). The degree of accuracy in such anatomical and physiographic restorations from relatively imperfect evidence will always represent the state of the science and the degree of its approach toward being exact or complete. Progress in the science also depends upon the pursuit of palaeontology as zoology and not as geology, because it was a mere accident of birth which connected palaeontology so closely with geology.

In order to illustrate the grateful services which palaeontology through restoration may render to the related earth sciences let us imagine a vast continent of the past wholly unknown in its physical features, elevation, climate, configuration, but richly represented by fossil remains. All the fossil plants and animals of every kind are brought from this continent into a great museum; the latitude, longitude and relative elevation of each specimen are precisely recorded; a corps of investigators, having the most exact and thorough training in zoology and botany, and gifted with imagination, will soon begin to restore the geographic and physiographic outlines of the continent, its fresh, brackish and salt-water confines, its seas, rivers and lakes, its forests, uplands, plains, meadows and swamps, also to a certain extent the cosmic relations of this continent, the amount and duration of its sunshine, as well as something of the chemical constitution of its atmosphere and the waters of its rivers and seas; they will trace the progressive changes which took place in the outlines of the continent and its surrounding oceans, following the invasions of the land by the sea and the re-emergence of the land and retreatal of the seashore; they will outline the shoals and deeps of its border seas, and trace the barriers which prevented intermingling of the inhabitants of the various provinces of the continent and the surrounding seas. From a study of remains of the mollusca, brachiopoda and other marine organisms they will determine the shallow water (littoral) and deep water (abyssal) regions of the surrounding oceans, and the clear or muddy, salt, brackish or fresh character of its inland and marginal seas; and even the physical conditions of the open sea at the time will be ascertained.

In such manner Johannes Walther (*Die Fauna der Solnhofener Platten Kalke Bionomisch betrachtet.* Festschrift zum 70ten Geburtstage von Ernst Haeckel, 1904) has restored the conditions existing in the lagoons and atoll reefs of the Jurassic sea of Solnhofen in Bavaria; he has traced the process of gradual accumulation of the coral mud now constituting the fine lithographic stones in the inter-reef region, and has recognized the periodic laying bare of the mud surfaces thus formed; he has determined the winds which carried the dust particles from the not far distant land and brought the insects from the adjacent Jurassic forests. Finally the presence of the flying lizards (*Pterydactylus*, *Rhamphorhynchus*) and the ancient birds (*Archaeopteryx*) is determined from remains in a most wonderful state of preservation in these ancient deposits.

Still another example of restoration, relating to the surface of a continent, may be cited. It has been discovered that at the beginning of the Eocene the lake of Rilly occupied a vast area east of the present site of Paris; a water-course fell there in cascades, and Munier-Chalmas has reconstructed all the details of that singular locality; plants which loved moist places, such as *Marchantia*, *Asplenium*, the covered banks overshadowed by lindens, laurels, magnolias and palms; there also were found the vine and the ivy; mosses (*Fontinalis*) and *Chara* sheltered the crayfish (*Astacus*); insects and even flowers have left their delicate impressions in the travertine which formed the borders of this lake. The Oligocene lake basin of Florissant, Colorado, has been reconstructed similarly by Samuel Hubbard Scudder and T. D. A. Cockerell, including the plants of its shores, the insects which lived upon them, the fluctuations of its level, and many other characteristics of this extinct water body, now in the heart of the arid region of the Rocky Mountains.

Such restorations are possible because of the intimate fitness of animals and plants to their environment, and because such fitness has distinguished certain forms of life from the Cambrian to the present time; the species have altogether changed, but the laws governing the life of certain kinds of organisms have remained exactly the same for the whole period of time assigned to the duration of life; in fact, we read the conditions of the past in a mirror of adaptation, often sadly tarnished and incomplete owing to breaks in the palaeontological record, but constantly becoming more polished by discoveries which increase the understanding of life and its all-pervading relations to the non-life. Therefore *adaptation* is the central principle of modern palaeontology in its most comprehensive sense.

This conception of the science and its possibilities is the result of very gradual advances since the beginning of the 19th century in what is known as the *method of palaeontology*. The history of this science, like that of all physical sciences, covers two parallel lines of development which have acted and reacted upon each other—namely, progress in exploration, research and discovery, and progress in philosophic interpretation. Progress in these two lines is by no means uniform; while, for example, palaeontology enjoyed a sudden advance early in the 19th century through the discoveries and researches of Cuvier, guided by his genius as a comparative anatomist, it was checked by his failure as a natural philosopher. The great philosophical impulse was that given by Darwin in 1859 through his demonstration of the theory of descent, which gave tremendous zest to the search for pedigrees (phylogeny) of the existing and extinct types of animal and plant life. In future the philosophic method of palaeontology must continue to advance step by step with exploration; it would be a reproach to later generations if they did not progress as far beyond the philosophic status of Cuvier, Owen and even of Huxley and Cope, as the new materials represent an advance upon the material opportunities which came to them through exploration.

To set forth how best to do our thinking, rather than to follow the triumphs achieved in any particular line of exploration, and to present the point we have now reached in the method or principles of palaeontology, is the chief purpose of this article. The illustrations will be drawn both from vertebrate and invertebrate palaeontology. In the latter branch the author is wholly indebted to Professor Amadeus W. Grabau of Columbia University. The subject will be treated in its biological aspects, because the relations of palaeontology to historical and stratigraphic geology are more appropriately considered under the article GEOLOGY. See also, for botany, the article PALAEOBOTANY. We may first trace in outline the history of the birth of palaeontological ideas, from the time of their first adumbration. But for full details reference must be made to the treatises on the history of the science cited in the bibliography at the end of the article.

I.—FIRST HISTORIC PERIOD

The scientific recognition of fossils as connected with the past history of the earth, from Aristotle (384–322 B.C.) *to the beginning of the 19th century, in connexion with the rise of comparative anatomy and geology.*—The dawn of the science covers the first observation of facts and the rudiments of true interpretation. Among the Greeks, Aristotle (384–322 B.C.) Xenophon (430–357 B.C.) and Strabo (63 B.C.–A.D. 24) knew of the existence of fossils and surmised in a crude way their relation to earth history. Similar prophetic views are found among certain Roman

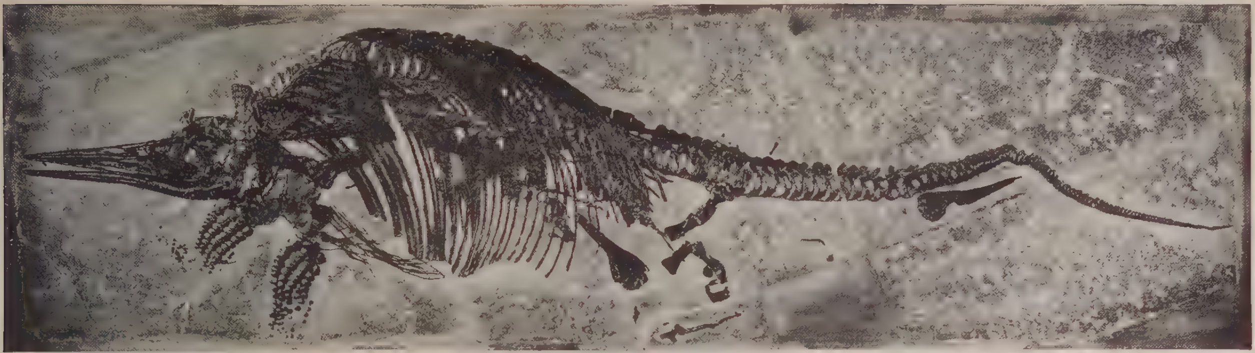
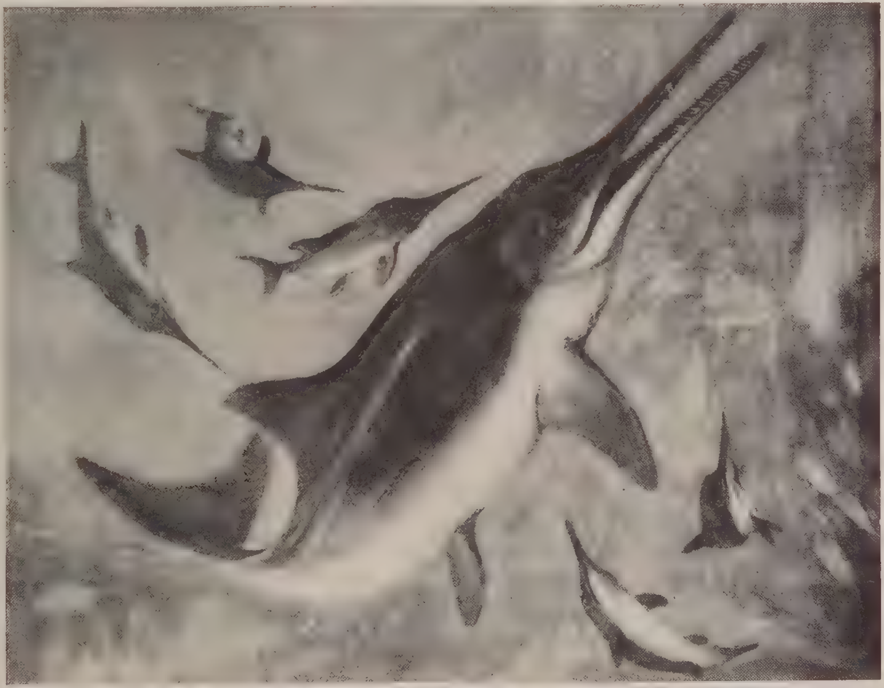


FIG. 1.—An ichthyosaur (*I. quadriscissus*) containing in the body cavity the partially preserved skeletons of seven young, proving that the young of the animal developed within the maternal body and were brought forth alive; *i.e.* that the ichthyosaur was a viviparous animal. (*Specimen presented to the American Museum of Natural History by the Royal Museum of Stuttgart through Professor Eberhard Fraas.*)

FIG. 2.—A hypothetical pictorial restoration of the mother ichthyosaur accompanied by five of its newly born young, from the information furnished by actual fossils.

(*From a drawing by Charles R. Knight made under the direction of Professor Osborn.*)



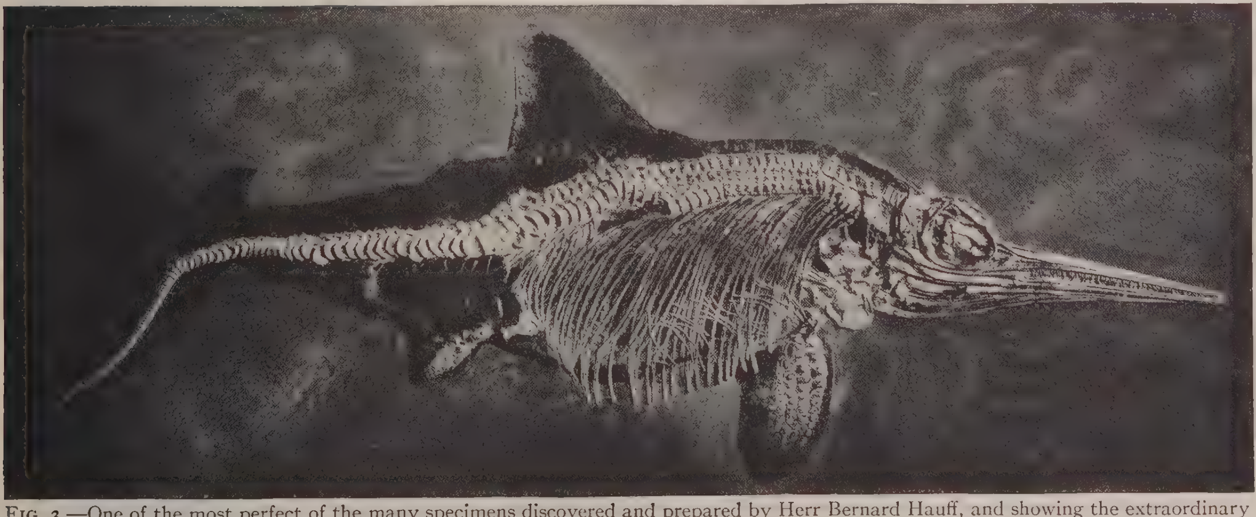


FIG. 3.—One of the most perfect of the many specimens discovered and prepared by Herr Bernard Hauff, and showing the extraordinary preservation of the epidermis of the ichthyosaur, which gives the complete contour of the body in silhouette, the outlines of the paddles, of the remarkably fish-like tail, and the great integumentary dorsal fin.

Materials for the Restoration of Ichthyosaurs.—This plate illustrates the exceptional opportunity afforded the palaeontologist through the remarkably preserved remains of Ichthyosaurs in the quarries of Holzmaden near Stuttgart, Württemberg, excavated for many years by Herr Bernard Hauff. (*Illustrations reproduced by permission from specimens in the American Museum of Natural History, New York.*)

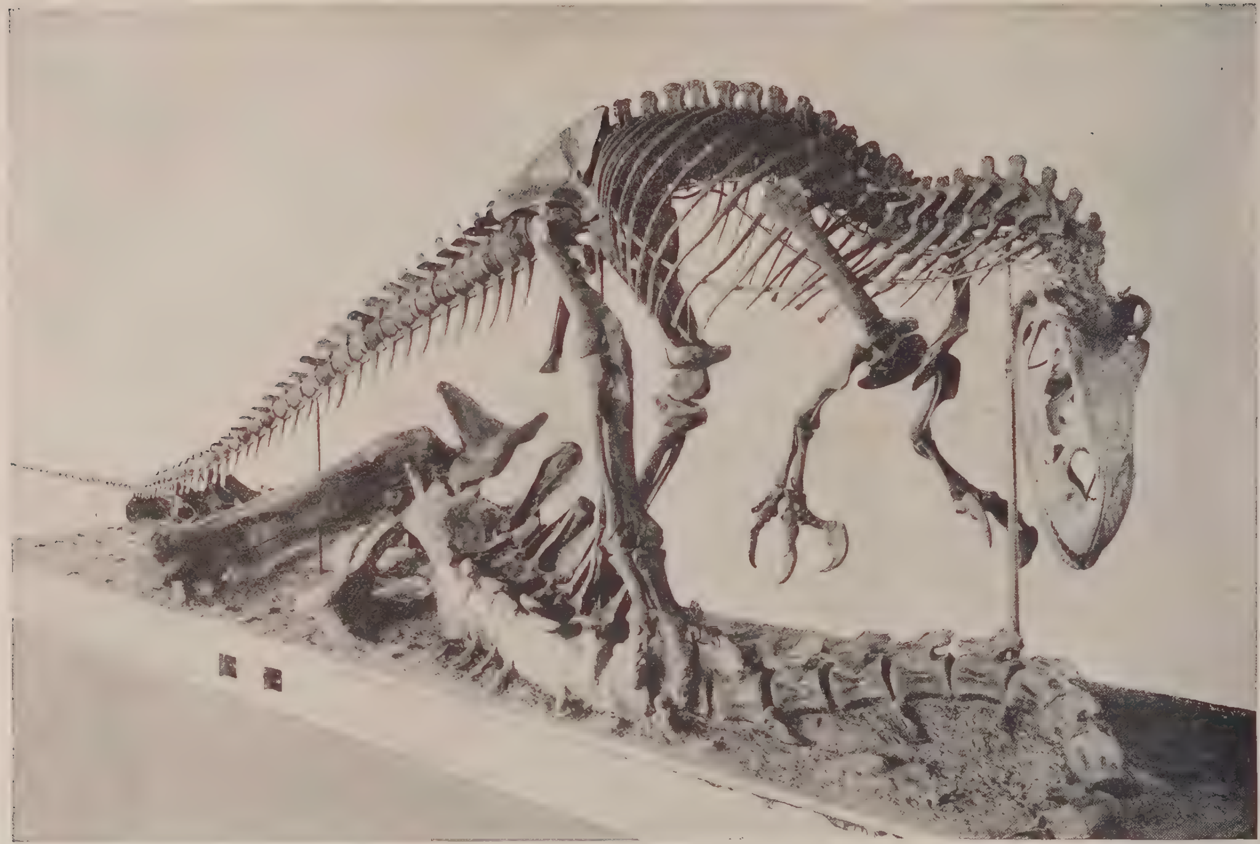


FIG. 4.—SKELETON OF ALLOSAURUS.

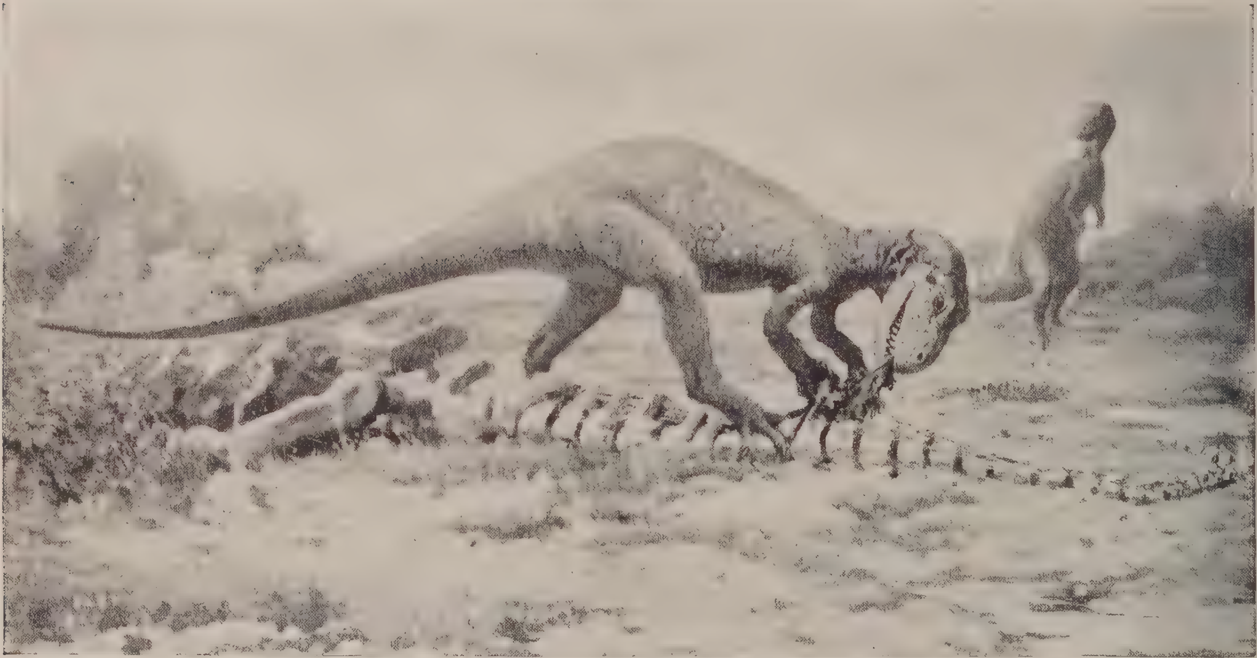


FIG. 5.—RESTORATION OF ALLOSAURUS.

Materials for the Restoration of Dinosaurs.—Carnivorous dinosaur (*Allosaurus*) of the Upper Jurassic period of North America, an animal closely related to the *Megalosaurus* type of England. The skeleton (fig. 4) was found nearly complete in the beds of the Morrison formation, Upper Jurassic of central Wyoming, U.S.A. Near it was discovered the posterior portion of the skeleton of a giant herbivorous dinosaur (*Brontosaurus Marsh*). It was observed that ten of the caudal vertebræ of the latter skeleton bore tooth marks and grooves corresponding exactly with the sharp pointed teeth in the jaw of the carnivorous dinosaur. This proved that the great herbivorous dinosaur had been preyed upon by its smaller carnivorous contemporary. Teeth of the carnivorous dinosaur scattered among the bones of the herbivorous dinosaur completed the line of circumstantial evidence. Upon this testimony the restoration (fig. 5) of the Megalosaur has been drawn by Charles R. Knight under the direction of Professor Osborn.

(*Originals reproduced by permission of the American Museum of Natural History.*)

writers. The pioneers of the science in the 16th and 17th centuries put forth anticipations of some of the well-known modern principles, often followed by recantations, through deference to prevailing religious or traditional beliefs. There were the retarding influences of the Mosaic account of sudden creation, and the belief that fossils represented relics of a universal deluge. There were crude medieval notions that fossils were "freaks" or "sports" of nature (*lusus naturae*), or that they represented failures of a creative force within the earth (a notion of Greek and Arabic origin), or that larger and smaller fossils represented the remains of races of giants or of pygmies (the mythical idea).

As early as the middle of the 15th century Leonardo da Vinci (1452–1519) recognized in seashells as well as in the teeth of marine fishes proofs of ancient sea-levels on what are now the summits of the Apennines. Successive observers in Italy, notably Fracastoro (1483–1553), Fabio Colonna (1567–1640 or 1650) and Nicolaus Steno (1638–*c.* 1687), a Danish anatomist, professor in Padua, advanced the still embryonic science and set forth the principle of comparison of fossil with living forms. Near the end of the 17th century Martin Lister (1638–1712), examining the Mesozoic shell types of England, recognized the great similarity as well as the differences between these and modern species, and insisted on the need of close comparison of fossil and living shells, yet he clung to the old view that fossils were sports of nature. In Italy, where shells of the sub-Apennine formations were discovered in the extensive quarrying for the fortifications of cities, the close similarity between these Tertiary and the modern species soon led to the established recognition of their organic origin. In England Robert Hooke (1635–1703) held to the theory of extinction of fossil forms, and advanced the two most fertile ideas of deriving from fossils a chronology, or series of time intervals in the earth's history, and of primary changes of climate, to account for the former existence of tropical species in England.

The 18th century witnessed the development of these suggestions and the birth of many additional theories. Sir A. Geikie assigns high rank to Jean Étienne Guettard (1715–1786) for his treatises on fossils, although admitting that he had no clear idea of the sequence of formations. The theory of successive formations was soundly developing in the treatises of John Woodward (1665–1728) in England, of Antonio Vallisnieri (1661–1730) in Italy, and of Johann Gottlob Lehmann (d. 1767) in Germany, who distinguished between the primary, or unfossiliferous, and secondary or fossiliferous, formations. The beginnings of palaeogeography followed those of palaeometeorology. The Italian geologist Soldani distinguished (1758) between the fossil fauna of the deep sea and of the shore-lines. In the same year Johann Gesner (1709–1790) set forth the theory of a great period of time, which he estimated at 80,000 years, for the elevation of the shell-bearing levels of the Apennines to their present height above the sea. The brilliant French naturalist Georges Louis Leclerc, comte de Buffon (1707–1788), in *Les Époques de la nature*, included in his vast speculations the theory of alternate submergence and emergence of the continents. Abraham Gottlob Werner (1750–1817), the famous exponent of the aqueous theory of earth formation, observed in successive geological formations the gradual approach to the forms of existing species.

II.—Second Historic Period

Invertebrate palaeontology founded by Lamarck, vertebrate palaeontology by Cuvier. Palaeontology connected with comparative anatomy by Cuvier. Invertebrate fossils employed for the definite division of all the great periods of time.—Although pre-evolutionary, this was the heroic period of the science, extending from the close of the 18th century to the publication of Darwin's *Origin of Species* in 1859. Among the pioneers of this period were the vertebrate zoologists and comparative anatomists Peter Simon Pallas, Pieter Camper and Johann Friedrich Blumenbach. Pallas (1741–1811) in his great journey (1768–1774) through Siberia discovered the vast deposits of extinct mammoths and rhinoceroses. Camper (1722–1789) contrasted (1777) the Pleistocene and recent species of elephants and Blumenbach (1752–1840) separated (1780) the mammoth from the existing species as *Elephas primigenius.* In 1793 Thomas Pennant (1726–1798) distinguished the American mastodon as *Elephas americanus.*

Political troubles and the dominating influence of Werner's speculations checked palaeontology in Germany, while under the leadership of Lamarck and Cuvier France came to the fore. J. B. Lamarck (1744–1829) was the founder of invertebrate palaeontology. The treatise which laid the foundation for all subsequent invertebrate palaeontology was his memoir, *Sur les fossiles des environs de Paris* . . . (1802–1806). Beginning in 1793 he boldly advocated evolution, and further elaborated five great principles—namely, the method of comparison of extinct and existing forms, the broad sequence of formations and succession of epochs, the correlation of geological horizons by means of fossils, the climatic or environmental changes as influencing the development of species, the inheritance of the bodily modifications caused by change of habit and habitat. As a natural philosopher he radically opposed Cuvier and was distinctly a precursor of uniformitarianism, advocating the hypothesis of slow changes and variations, both in living forms and in their environment. His speculations on phylogeny, or the descent of invertebrates and vertebrates, were, however, most fantastic and bore no relation to palaeontological evidence.

It is most interesting to note that William Smith (1769–1839), now known as the "father of historical geology," was born in the same year as Cuvier. Observing for himself (1794–1800) the stratigraphic value of fossils, he began to distinguish the great Mesozoic formations of England (1801). Cuvier (1769–1832) is famous as the founder of vertebrate palaeontology, and with Alexandre Brongniart (1770–1847) as the author of the first exact contribution to stratigraphic geology. Early trained as a comparative anatomist, the discovery of Upper Eocene mammals in the gypsum quarries of Montmartre found him fully prepared (1798), and in 1812 appeared his *Recherches sur les ossemens fossiles*, brilliantly written and constituting the foundation of the modern study of the extinct vertebrates. Invulnerable in exact anatomical description and comparison, he failed in all his philosophical generalizations, even in those strictly within the domain of anatomy. His famous "law of correlation," which by its apparent brilliancy added enormously to his prestige, is not supported by modern philosophical anatomy, and his services to stratigraphy were diminished by his generalizations as to a succession of sudden extinctions and renovations of life. His joint memoirs with Brongniart, *Essai sur la géographie minéralogique des environs de Paris avec une carte géognostique et des coupes de terrain* (1808) and *Description géologique des environs de Paris* (1835) were based on the wonderful succession of Tertiary faunas in the rocks of the Paris basin. In Cuvier's defence Charles Depéret maintains that the extreme theory of successive extinctions followed by a succession of creations is attributable to Cuvier's followers rather than to the master himself. Depéret points also that we owe to Cuvier the first clear expression of the idea of the increasing organic perfection of all forms of life from the lower to the higher horizons, and that, while he believed that extinctions were due to sudden revolutions on the surface of the earth, he also set forth the pregnant ideas that the renewals of animal life were by migration from other regions unknown, and that these migrations were favoured by alternate elevations and depressions which formed various land routes between great continents and islands. Thus Cuvier, following Buffon, clearly anticipated the modern doctrine of faunal migrations. His reactionary and retarding ideas as a special creationist and his advocacy of the cataclysmic theory of change exerted a baneful influence until overthrown by the uniformitarianism of James Hutton (1726–1797) and Charles Lyell (1797–1875) and the evolutionism of Darwin.

The chief contributions of Cuvier's great philosophical opponent, Étienne Geoffroy St Hilaire (1772–1844), are to be found in his maintenance with Lamarck of the doctrine of the mutability of species. In this connexion he developed his special theory of saltations, or of sudden modifications of structure through changes of environment, especially through the direct influences of temperature and atmosphere. He clearly set forth also the phenomena of analogous or parallel adaptation.

It was Alcide Dessalines d'Orbigny (1802–1857) who pushed to an extreme Cuvier's ideas of the fixity of species and of successive extinctions, and finally developed the wild hypothesis of twenty-seven distinct creations. While these views were current in France, exaggerating and surpassing the thought of Cuvier, they were strongly opposed in Germany by such authors as Ernst Friedrich von Schlotheim (1764–1832) and Heinrich Georg Bronn (1800–1862); and the latter demonstrated that certain species actually pass from one formation to another.

In the meantime the foundations of palaeobotany were being laid (1804) by Ernst Friedrich von Schlotheim (1764–1832), (1811) by Kaspar Maria Sternberg (1761–1838) and (1838) by Théophile Brongniart (1801–1876).

Following Cuvier's *Recherches sur les ossemens fossiles*, the rich succession of Tertiary mammalian life was gradually revealed to France through the explorations and descriptions of such authors as Croizet, Jobert, de Christol, Eymar, Pomel and Lartet, during a period of rather dry, systematic work, which included, however, the broader generalizations of Henri Marie Ducrotay de Blainville (1778–1850), and culminated in the comprehensive treatises on Tertiary palaeontology of Paul Gervais (1816–1879). Extending the knowledge of the extinct mammals of Germany, the principal contributors were Georg August Goldfuss (1782–1848), Georg Friedrich von Jaegar (1785–1866), Felix F. Plieninger (1807–1873) and Johann Jacob Kaup (1803–1873). As Cuvier founded the palaeontology of mammals and reptiles, so Louis Agassiz's epoch-making works *Recherches sur les poissons fossiles* (1833–1845) laid the secure foundations of palaeichthyology, and were followed by Christian Heinrich Pander's (1794–1865) classic memoirs on the fossil fishes of Russia. In philosophy Agassiz was distinctly a disciple of Cuvier and supporter of the doctrine of special creation, and to a more limited extent of cataclysmic extinctions. Animals of the next higher order, the amphibians of the coal measures and the Permian, were first comprehensively treated in the masterly memoirs of Christian Erich Hermann von Meyer (1801–1869) beginning in 1829, especially in his *Beiträge zur Petrefactenkunde* (1829–1830) and his *Zur Fauna der Vorwelt* (4 vols., 1845–1860). Successive discoveries gradually revealed the world of extinct Reptilia; in 1821 Charles König (1784–1851), the first keeper of the mineralogical collection in the British Museum, described *Ichthyosaurus* from the Jurassic; in the same year William Daniel Conybeare (1787–1857) described *Plesiosaurus*; and a year later (1822) *Mosasaurus*; in 1824 William Buckland described the great carnivorous dinosaur *Megalosaurus*; while Gideon Algernon Mantell (1790–1852) in 1848 announced the discovery of *Iguanodon*. Some of the fossil Reptilia of France were made known through St Hilaire's researches on the Crocodilia (1831), and those of J. A. Deslongchamps (1794–1867) and his son on the teleosaurs, or long-snouted crocodiles. Materials accumulated far more rapidly, however, than the power of generalization and classification. Able as von Meyer was, his classification of the Reptilia failed because based upon the single adaptive characters of foot structure. The reptiles awaited a great classifier, and such a one appeared in England in the person of Sir Richard Owen (1804–1892), the direct successor of Cuvier and a comparative anatomist of the first rank. Non-committal as regards evolution, he vastly broadened the field of vertebrate palaeontology by his descriptions of the extinct fauna of England, of South America (including especially the great edentates revealed by the voyage of the "Beagle"), of Australia (the ancient and modern marsupials) and of New Zealand (the great struthious birds). His contributions on the Mesozoic reptiles of Great Britain culminated in his complete rearrangement and classification of this group, one of his greatest services to palaeontology. Meanwhile the researches of Hugh Falconer (1808–1865) and of Proby Thomas Cautley (1802–1871) in the sub-Himalayas brought to light the marvellous fauna of the Siwalik hills of India, published in *Fauna antiqua Sivalensis* (London, 1845) and in the volumes of Falconer's individual researches. The ancient life of the Atlantic border of North America was also becoming known through the work of the pioneer vertebrate palaeontologists Thomas Jefferson (1743–1826), Richard Harlan (1796–1843), Jeffries Wyman (1814–1874) and Joseph Leidy (1823–1891). This was followed by the revelation of the vast ancient life of the western half of the American continent, which was destined to revolutionize the science. The master works of Joseph Leidy began with the first-fruits of western exploration in 1847 and extended through a series of grand memoirs, culminating in 1874. Leidy adhered strictly to Cuvier's exact descriptive methods, and while an evolutionist and recognizing clearly the genetic relationships of the horses and other groups, he never indulged in speculation.

The history of invertebrate palaeontology during the second period is more closely connected with the rise of historic geology and stratigraphy, especially with the settlement of the great and minor time divisions of the earth's history. The path-breaking works of Lamarck were soon followed by the monumental treatise of Gérard Paul Deshayes (1795–1875) entitled *Descriptions des coquilles fossiles des environs de Paris* (1824–1837), the first of a series of great contributions by this and other authors. These and other early monographs on the Tertiary shells of the Paris basin, of the environs of Bordeaux, and of the sub-Apennine formations of Italy, brought out the striking distinctness of these faunas from each other and from other molluscan faunas. Recognition of this threefold character led Deshayes to establish a threefold division of the Tertiary based on the percentage of molluscs belonging to types now living found in each. To these divisions Lyell gave in 1833 the names Eocene, Miocene and Pliocene.

James Hutton (1726–1797) had set forth (1788) the principle that during all geological time there has been no essential change in the character of events, and that uniformity of law is perfectly consistent with mutability in the results. Lyell marshalled all the observations he could collect in support of this principle, teaching that the present is the key to the past, and arraying all obtainable evidence against the cataclysmic theories of Cuvier. He thus exerted a potent influence on palaeontology through his persistent advocacy of uniformitarianism, a doctrine with which Lamarck should also be credited. As among the vertebrates, materials were accumulating rapidly for the great generalizations which were to follow in the third period. De Blainville added to the knowledge of the shells of the Paris basin; Giovanni Battista Brocchi (1772–1826) in 1814, and Luigi Bellardi (1818–1889) and Giovanni Michelotti (born 1812) in 1840, described the Pliocene molluscs of the sub-Apennine formation of Italy; from Germany and Austria appeared the epoch-making works of Heinrich Ernst Beyrich (1815–1896) and of Moritz Hoernes (1815–1868).

We shall pass over here the labours of Adam Sedgwick (1785–1873) and Sir Roderick Murchison (1792–1871) in the Palaeozoic of England, which because of their close relation to stratigraphy more properly concern geology; but must mention the grand contributions of Joachim Barrande (1799–1883), published in his *Système silurien du centre de la Bohème*, the first volume of which appeared in 1852. While establishing the historic divisions of the Silurian in Bohemia, Barrande also propounded his famous theory of "colonies," by which he attempted to explain the aberrant occurrence of strata containing animals of a more advanced stage among strata containing earlier and more primitive faunas; his assumption was that the second fauna had migrated from an unknown neighbouring region. It is proved that the specific instances on which Barrande's generalizations were founded were due to his misinterpretation of the overturned and faulted strata, but his conception of the simultaneous existence of two faunas, one of more ancient and one of more modern type, and of their alternation in a given area, was based on sound philosophical principles and has been confirmed by more recent work.

The greatest generalization of this second period, however, was that partly prepared for by d'Orbigny, as will be more fully explained later in this article, and clearly expressed by Agassiz —namely, the law of repetition of ancestral stages of life in the course of the successive stages of individual development. This law of recapitulation, subsequently termed the "biogenetic law" by Ernest Haeckel, was the greatest philosophic contribution of this period, and proved to be not only one of the bulwarks of the evolution theory but one of the most important principles in the method of palaeontology.

On the whole, as in the case of vertebrate palaeontology, the pre-Darwinian period of invertebrate palaeontology was one of rather dry systematic description, in which, however, the applications of the science gradually extended to many regions of the world and to all divisions of the kingdom of invertebrates.

III.—THIRD HISTORIC PERIOD

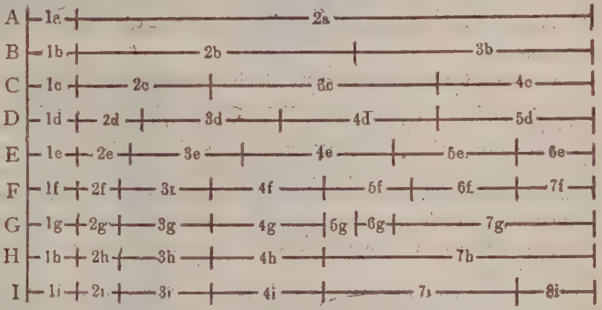
Beginning with the publication of Darwin's great works, "Narrative of the Surveying Voyages of H.M.S. 'Adventure' and 'Beagle'" (1839), *and "On the Origin of Species by Means of Natural Selection"* (1859).—A review of the two first classic works of Charles Robert Darwin (1809–1882) and of their influence proves that he was the founder of modern palaeontology. Principles of descent and other applications of uniformitarianism which had been struggling for expression in the writings of Lamarck, St Hilaire and de Blainville here found their true interpretation, because the geological succession, the rise, the migrations, the extinctions, were all connected with the grand central idea of evolution from primordial forms.

A close study of the exact modes of evolution and of the philosophy of evolution is the distinguishing feature of this period. It appears from comparison of the work in the two great divisions of vertebrate and invertebrate palaeontology made for the first time in this article that in accuracy of observation and in close philosophical analysis of facts the students of invertebrate palaeontology led the way. This was due to the much greater completeness and abundance of material afforded among invertebrate fossils, and it was manifested in the demonstration of two great principles or laws: first, the law of recapitulation, which is found in its most ideal expression in the shells of invertebrates; second, in the law of direct genetic succession through very gradual modification. It is singular that the second law is still ignored by many zoologists. Both laws were of paramount importance, as direct evidence of Darwin's theory of descent, which, it will be remembered, was at the time regarded merely as an hypothesis. Nevertheless, the tracing of phylogeny, or direct lines of descent, suddenly began to attract far more interest than the naming and description of species.

The Law of Recapitulation. Acceleration. Retardation.—This law, that in the stages of growth of individual development (ontogeny), an animal repeats the stages of its ancestral evolution (phylogeny) was, as we have stated, anticipated by d'Orbigny. He recognized the fact that the shells of molluscs, which grow by successive additions, preserve unchanged the whole series of stages of their individual development, so that each shell of a Cretaceous ammonite, for example, represents five stages of progressive modification as follows: the first is the *période embryonnaire*, during which the shell is smooth; the second and third represent periods of elaboration and ornamentation; the fourth is a period of initial degeneration; the fifth and last a period of degeneration when ornamentation becomes obsolete and the exterior smooth again, as in the young. D'Orbigny, being a special creationist, failed to recognize the bearing of these individual stages on evolution. Alpheus Hyatt (1838–1902) was the first to discover (1866) that these changes in the form of the ammonite shell agreed closely with those which had been passed through in the ancestral history of the ammonites. In an epoch-making essay, *On the Parallelism between the Different stages of Life in the individual and those in the entire group of the Molluscous Order Tetrabranchiata* (1866), and in a number of subsequent memoirs, among which *Genesis of the Arietidae* (1889) and *Phylogeny of an Acquired Characteristic* (1894) should be mentioned, he laid the foundations, by methods of the most exact analysis, for all future recapitulation work of invertebrate palaeontologists. He showed that from each individual shell of an ammonite the entire ancestral series may be reconstructed, and that, while the earlier shell-whorls retain the characters of the adults of preceding members of the series, a shell in its own adult stage adds a new character, which in turn becomes the pre-adult character of the types which will succeed it; finally, that this comparison between the revolutions of the life of an individual and the life of the entire order of ammonites is wonderfully harmonious and precise. Moreover, the last stages of individual life are prophetic not only of future rising and progressing derivatives, but in the case of senile individuals of future declining and degradational series.

Thus the recapitulation law, which had been built up independently from the observations and speculations on vertebrates by Lorenz Ofen (1779–1851), Johann Friedrich Meckel (1781–1833), St Hilaire, Karl Ernst von Baer (1792–1876) and others, and had been applied (1842–1843) by Karl Vogt (1817–1895) and Agassiz, in their respective fields of observation, to comparison of individual stages with the adults of the same group in preceding geological periods, furnished the key to the determination of the ancestry of the invertebrates generally.

Hyatt went further and demonstrated that ancestral characters are passed through by successive descendants at a more and more accelerated rate in each generation, thus giving time for the appearance of new characters in the adult. His "law of acceleration" together with the complementary "law of retardation," or the slowing up in the development of certain characters (first propounded by E. D. Cope), was also a philosophic contribution of the first importance (see fig. 6 and Plate III., fig. 7).



(From the *American Naturalist.*)

FIG. 6.

In the same year, 1866, Franz Martin Hilgendorf (1839–) studied the shells of *Planorbis* from the Miocene lake basin underlying the present village of Steinheim in Württemberg, and introduced the *method of examination of large numbers of individual specimens*, a method which has become of prime importance in the science. He discovered the actual transmutations in direct genetic series of species on the successive deposition levels of the old lake basin. This study of *direct genetic series* marked another great advance, and became possible in invertebrate palaeontology long before it was introduced among the vertebrates. Hyatt, in a re-examination of the Steinheim deposits, proved that successive modifications occur at the same level as well as in vertical succession. Melchior Neumayr (1845–1890) and C. M. Paul similarly demonstrated genetic series of *Paludina* (*Vivipara*) in the Pliocene lakes of Slavonia (1875).

The Mutations of Waagen. Orthogenesis.—In 1869 Wilhelm Heinrich Waagen (1841–1900) entered the field with the study of *Ammonites subradiatus*. He proposed the term "mutations" for the minute progressive changes of single characters in definite directions as observed in successive stratigraphic levels. Even when seen in minute features only he recognized them as constant progressive characters or "chronologic varieties" in contrast with contemporaneous or "geographic varieties," which he considered inconstant and of slight systematic value. More recent analysis has shown, however, that certain modifications observed within the same stratigraphic level are really grades of mutations which show divergences comparable to those found in successive levels. The collective term "mutation," as now employed by palaeontologists, signifies a type modified to a slight degree in one or more of its characters along a progressive or definite line of phyletic development. The term "mutation" also applies to a single new character and for distinction[1] may be known as "the mutation of Waagen." This definitely directed evolution, or development in a few determinable directions, has since been termed "orthogenetic evolution," and is recognized by all workers in invertebrate palaeontology and phylogeny as fundamental because the facts of invertebrate palaeontology admit of no other interpretation.

Among the many who followed the method of attack first outlined by Hyatt, or who independently discovered his method, only a few can be mentioned here—namely, Waagen (1869), Neumayr (1871), Württemberger (1880), Branco (1880), Mojsisovics (1882), Buckman (1887), Karpinsky (1889), Jackson (1890), Beecher (1890), Perrin-Smith (1897), Clarke (1898) and Grabau (1904). Melchior Neumayr, the great Austrian palaeontologist, especially extended the philosophic foundations of modern invertebrate palaeontology, and traced a number of continuous genetic series (*formenreihe*) in successive horizons. He also demonstrated that mutations have this special or distinctive character, that they repeat in the same direction without oscillation or retrogression. He expressed great reserve as to the causes of these mutations. He was the first to attempt a comprehensive treatment of all invertebrates from the genetic point of view; but unfortunately his great work, entitled *Die Stämme des Thierreichs* (Vienna and Prague, 1889), was uncompleted.

The absolute agreement in the results independently obtained by these various investigators, the interpretation of individual development as the guide to phyletic development, the demonstration of continuous genetic series, each mutation falling into its proper place and all showing a definite direction, constitute contributions to biological philosophy of the first importance, which have been little known or appreciated by zoologists because of their publication in monographs of very special character.

Vertebrate Palaeontology after Darwin.—The impulse which Darwin gave to vertebrate palaeontology was immediate and unbounded, finding expression especially in the writings of Thomas Henry Huxley (1825–1895) in England, of Jean Albert Gaudry (b. 1827) in France, in America of Edward Drinker Cope (1840–1897) and Othniel Charles Marsh (1831–1899). Fine examples of the spirit of the period as applied to extinct Mammalia are Gaudry's *Animaux fossiles et géologie de l'Attique* (1862) on the Upper Miocene fauna of Pikermi near Athens, and the remarkable memoirs of Vladimir Onufrievich Kowalevsky (1842–1883), published in 1873. These works swept aside the dry traditional fossil lore which had been accumulating in France and Germany. They breathed the new spirit of the recognition of adaptation and descent. In 1867–1872 Milne Edwards published his memoirs on the Miocene birds of central France. Huxley's development of the method of palaeontology should be studied in his collected memoirs (*Scientific Memoirs of Thomas Henry Huxley*, 4 vols., 1898). In Kowalevsky's *Versuch einer natürlichen Classification der Fossilen Hufthiere* (1873) we find a model union of detailed inductive study with theory and working hypothesis. All these writers attacked the problem of descent, and published preliminary phylogenies of such animals as the horse, rhinoceros and elephant, which time has proved to be of only general value and not at all comparable to the exact phylogenetic series which were being established by invertebrate palaeontologists. Phyletic gaps began to be filled in this general way, however, by discovery, especially through remarkable discoveries in North America by Leidy, Cope and Marsh, and the ensuing phylogenies gave enormous prestige to palaeontology.

Cope's philosophic contributions to palaeontology began in 1868 (see essays in *The Origin of the Fittest*, New York, 1887, and *The Primary Factors of Organic Evolution*, Chicago, 1896) with the independent discovery and demonstration among vertebrates of the laws of acceleration and retardation. To the law of "recapitulation" he unfortunately applied Hyatt's term "parallelism," a term which is used now in another sense. He especially pointed out the laws of the "extinction of the specialized" and "survival of the non-specialized" forms of life, and challenged Darwin's principle of selection as an explanation of the origin of adaptations by saying that the "survival of the fittest" does not explain the "origin of the fittest." He personally sought to demonstrate such origin, first, in the existence of a specific internal growth force, which he termed *bathmic force*, and second in the direct inheritance of acquired mechanical modifications of the teeth and feet. He thus revived Lamarck's views and helped to found the so-called neo-Lamarckian school in America. To this school A. Hyatt, W. H. Dall and many other invertebrate palaeontologists subscribed.

History of Discovery. Vertebrates.—In discovery the theatre of interest has shifted from continent to continent, often in a sensational manner. After a long period of gradual revelation of the ancient life of Europe, extending eastward to Greece, eastern Asia and to Australia, attention became centred on North America, especially on Rocky Mountain exploration. New and unheard-of orders of amphibians, reptiles and mammals came to the surface of knowledge, revolutionizing thought, demonstrating the evolution theory, and solving some of the most important problems of descent. Especially noteworthy was the discovery of birds with teeth both in Europe (*Archaeopteryx*) and in North America (*Hesperornis*), of Eocene stages in the history of the horse, and of the giant dinosauria of the Jurassic and Cretaceous in North America. Then the stage of novelty suddenly shifted to South America, where after the pioneer labours of Darwin, Owen and Burmeister, the field of our knowledge was suddenly and vastly extended by explorations by the brothers Ameghino (Carlos and Florentino). We were in the midst of more thorough examination of the ancient world of Patagonia, of the Pampean region and of its submerged sister continent Antarctica, when the scene shifted to North Africa through the discoveries of Hugh J. L. Beadnell and Charles W. Andrews. These latter discoveries supply us with the ancestry of the elephants and many other forms. They round out our knowledge of Tertiary history, but leave the problems of the Cretaceous mammals and of their relations to Tertiary mammals still unsolved. Similarly, the Mesozoic reptiles have been traced successively to various parts of the world from France, Germany, England, to North America and South America, to Australia and New Zealand and to northern Russia, from Cretaceous times back into the Permian, and by latest reports into the Carboniferous.

Discovery of Invertebrates.—The most striking feature of exploration for invertebrates, next to the world-wide extent to which exploration has been carried on and results applied, is the early appearance of life. Until comparatively recent times the molluscs were considered as appearing on the limits of the Cambrian and Ordovician; but Charles D. Walcott has described a tiny lamellibranch (*Modioloides*) from the inferior Cambrian, and he reports the gastropod (?) genus *Chuaria* from the pre-Cambrian. Cephalopod molluscs have been traced back to the straight-shelled nautiloids of the genus *Volborthella*, while true ammonites have been found in the inferior Permian of the Continent and by American palaeontologists in the true coal measures. Similarly, early forms of the crustacean sub-class Merostomata have been traced to the pre-Cambrian of North America.

Recent discoveries of vertebrates are of the same significance, the most primitive fishes being traced to the Ordovician or base of the Silurian,[2] which proves that we shall discover more

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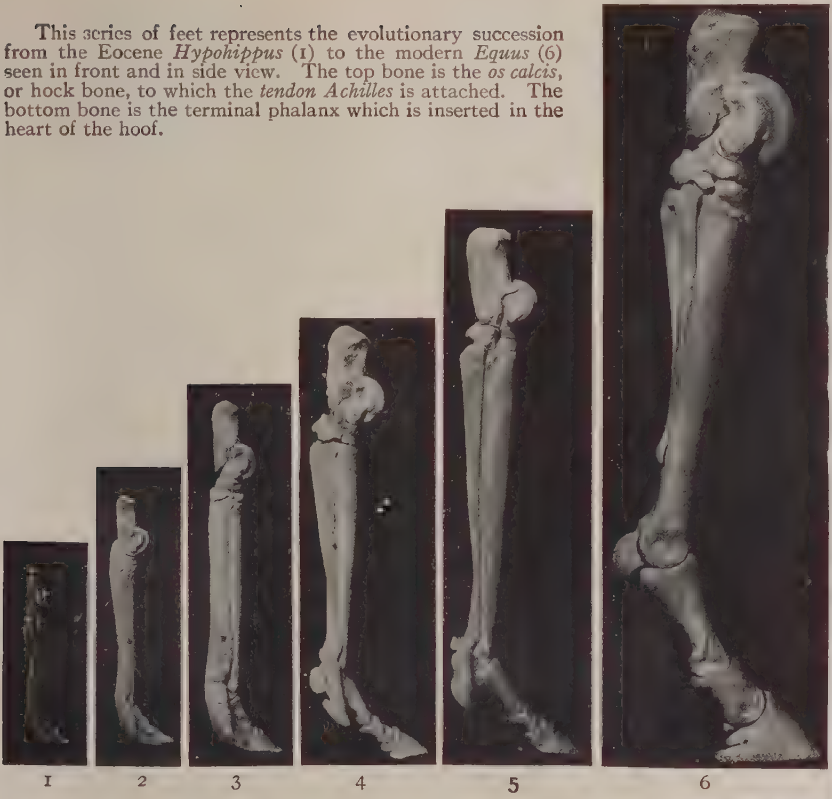
[1] The Dutch botanist, De Vries, has employed the term in another sense, to mean a slight jump or saltation.

[2] Professor Bashford Dean doubts the fish characters of these Ordovic Rocky Mountain forms. Frech admits their fish character but considers the rocks infaulted Devonic.

This series of feet represents the evolutionary succession from the Eocene *Hypohippus* (1) to the modern *Equus* (6) seen in front and in side view. The top bone is the *os calcis*, or hock bone, to which the *tendon Achilles* is attached. The bottom bone is the terminal phalanx which is inserted in the heart of the hoof.



The stages are as follows:

1. *Hypohippus*, Lower Eocene.
2. *Mesohippus*, Lower Oligocene.
3. *Parahippus*, Lower Miocene.
4. *Protohippus*, Upper Miocene.
5. *Neohipparion*, Upper Miocene.
6. *Equus*, Pleistocene and recent.

The evolution consists first in progressive increase in size; second, in the acceleration of the median digit and retardation of the lateral digits, the latter becoming more and more elevated from the ground until finally in *Equus* (6) they are the lateral splints, which in the embryonic condition have vestigial cartilages attached representing the last traces of the lateral phalanges.

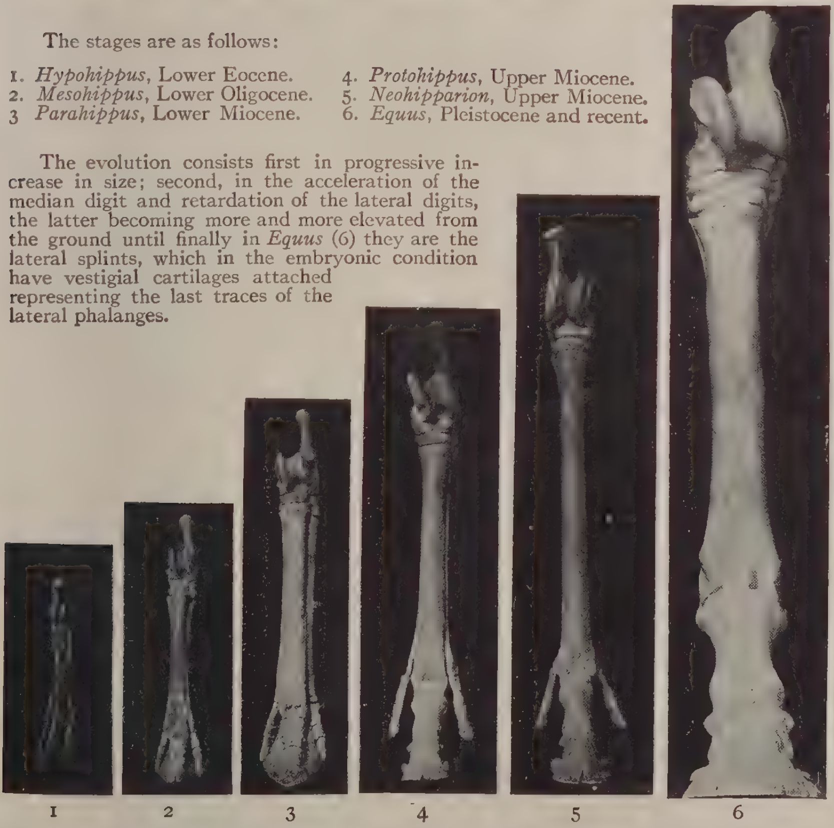


FIG. 7.—LAW OF ACCELERATION AND RETARDATION ILLUSTRATED IN THE EVOLUTION OF THE HIND FEET OF THE HORSE.

(From photos lent by the American Museum of Natural History.)

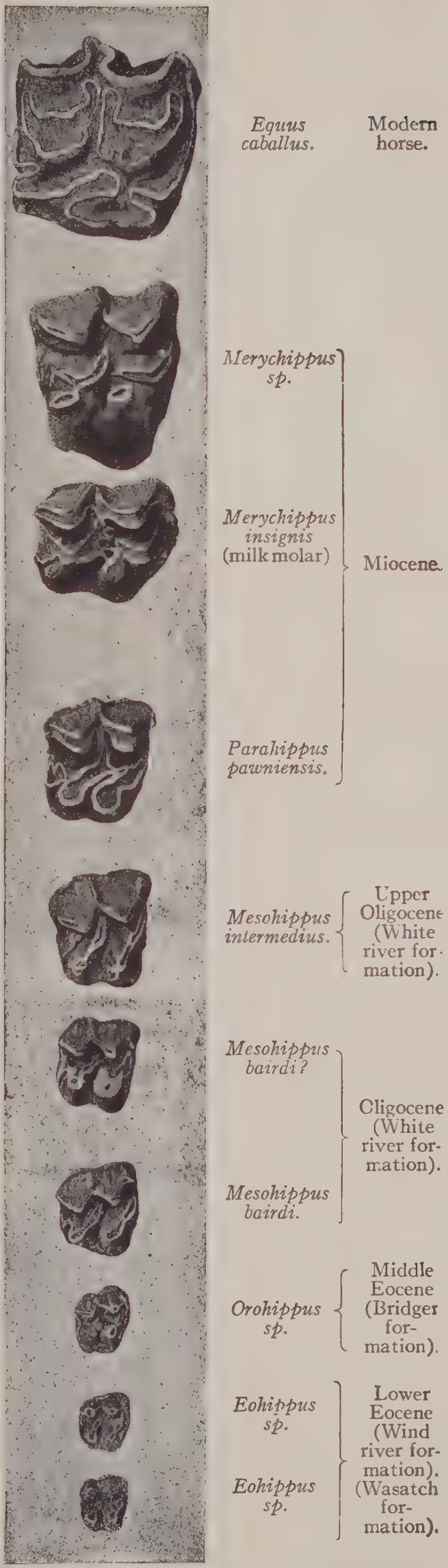

Equus caballus.
Modern horse.
Merychippus sp.
Merychippus insignis (milk molar)
Miocene.
Parahippus pawniensis.
Mesohippus intermedius.
Upper Oligocene (White river formation).
Mesohippus bairdi?
Oligocene (White river formation).
Mesohippus bairdi.
Orohippus sp.
Middle Eocene (Bridger formation).
Eohippus sp.
Eohippus sp.
Lower Eocene (Wind river formation). (Wasatch formation).

FIG. 8.—TEN STAGES IN THE EVOLUTION OF THE SECOND UPPER MOLAR TOOTH OF THE RIGHT SIDE, ARRANGED ACCORDING TO GEOLOGICAL LEVEL.

(Nos. 1-9 from "American Equidae.")

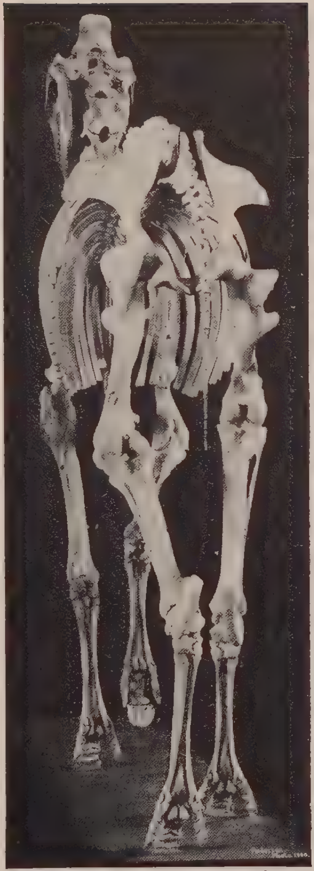


FIG. 12.—*Hypohippus*, a forest-living horse, rear view, showing large lateral digits, adapted to prevent the animal from sinking into the soft soil.

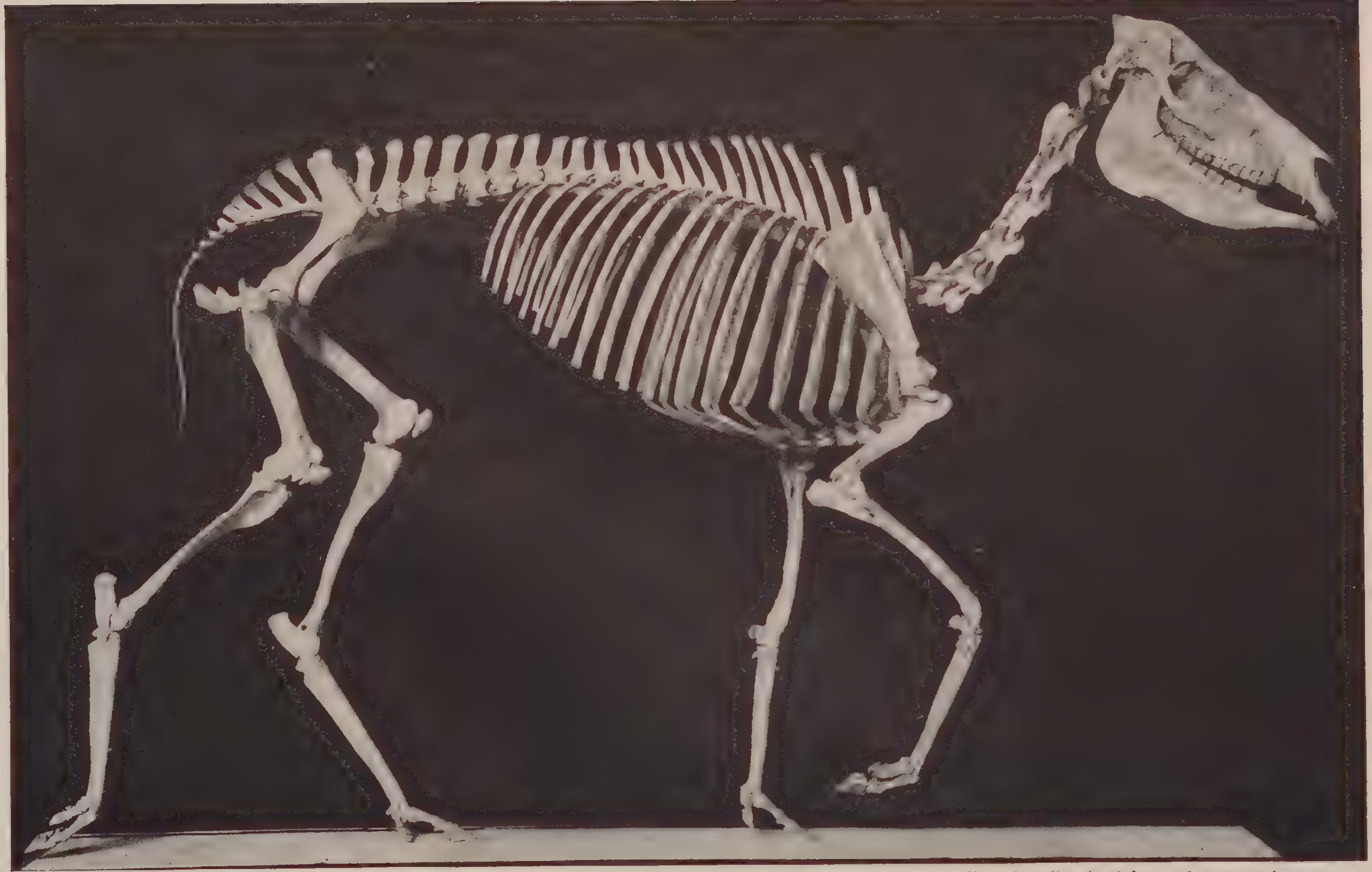


FIG. 13.—*Neohipparion*, a plains-living horse with very slender limbs and lateral digits small and well raised from the ground, adapted to a dry, hard soil.

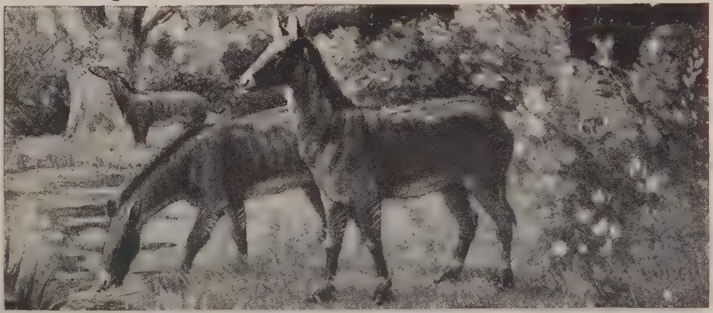


FIG. 14.—Restoration of *Hypohippus*. (*From a drawing by Charles R. Knight, made under the direction of Professor Osborn.*)

Laws of Local Adaptive Radiation and Polyphyletic Evolution, illustrated by two Upper Miocene Horses of the Plains Region of North America. These horses are of the same geologic age (Upper Miocene) and were found in the same geographic region (South Dakota, U.S.A.). One is supposed to have lived in the forests, the other in the open plains.

(*Illustrations reproduced by permission of the American Museum of Natural History, New York.*)

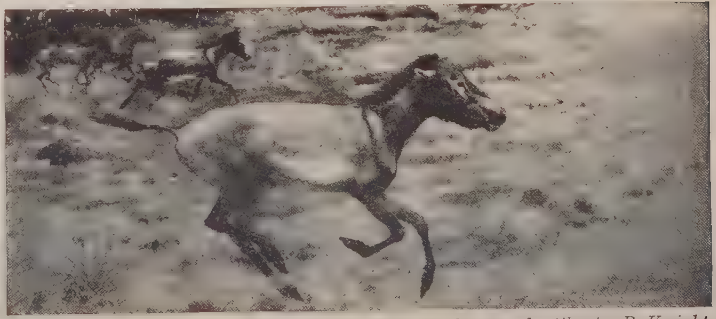


FIG. 15.—Restoration of *Neohipparion*. (*From a drawing by Charles R. Knight, made under the direction of Professor Osborn.*)

ancient chordates in the Cambrian or even pre-Cambrian. Thus all recent discovery tends to carry the centres of origin and of dispersal of all animal types farther and farther back in geological time.

IV.—Relations of Palaeontology to Other Physical Earth Sciences

Geology and Palaeophysiography.—Fossils are not absolute timekeepers, because we have little idea of the rate of evolution; they are only relative timekeepers, which enable us to check off the period of deposition of one formation with that of another. Huxley questioned the time value of fossils, but recent research has tended to show that identity of species and of mutations is, on the whole, a guide to synchroneity, though the general range of vertebrate and invertebrate life as well as of plant life is generally necessary for the establishment of approximate synchronism. Since fossils afford an immediate and generally a decisive clue to the mode of deposition of rocks, whether marine, lacustrine, fluviatile, flood plain or aeolian, they lead us naturally into palaeophysiography. Instances of marine and lacustrine analysis have been cited above. The analysis of continental faunas into those inhabiting rivers, lowlands, forests, plains or uplands, affords a key to physiographic conditions all through the Tertiary. For example, the famous bone-beds of the Oligocene of South Dakota have been analysed by W. D. Matthew, and are shown to contain fluviatile or channel beds with water and river-living forms, and neighbouring flood-plain sediments containing remains of plains-living forms. Thus we may complete the former physiographic picture of a vast flood plain east of the Rocky Mountains, traversed by slowly meandering streams.

As already intimated, our knowledge of *palaeometeorology*, or of past climates, is derivable chiefly from fossils. Suggested two centuries ago by Robert Hooke, this use of fossils has in the hands of Barrande, Neumayr, the marquis de Saporta (1895), Oswald Heer (1809–1883), and an army of followers developed into a sub-science of vast importance and interest. It is true that a great variety of evidence is afforded by the composition of the rocks, that glaciers have left their traces in glacial scratchings and transported boulders, also that proofs of arid or semi-arid conditions are found in the reddish colour of rocks in certain portions of the Palaeozoic, Trias and Eocene; but fossils afford the most precise and conclusive evidence as to the past history of climate, because of the fact that adaptations to temperature have remained constant for millions of years. All conclusions derived from the various forms of animal and plant life should be scrutinized closely and compared. The brilliant theories of the palaeobotanist, Oswald Heer, as to the extension of a sub-tropical climate to Europe and even to extreme northern latitudes in Tertiary time, which have appealed to the imagination and found their way so widely into literature, are now challenged by J. W. Gregory (*Climatic Variations, their Extent and Causes*, International Geological Congress, Mexico, 1906), who holds that the extent of climatic changes in past times has been greatly exaggerated.

It is to palaeogeography and zoogeography in their reciprocal relations that palaeontology has rendered the most unique services. Geographers are practically helpless as historians, and problems of the former elevation and distribution of the land and sea masses depend for their solution chiefly upon the palaeontologist. With good reason geographers have given reluctant consent to some of the bold restorations of ancient continental outlines by palaeontologists; yet some of the greatest achievements of recent science have been in this field. The concurrence of botanical (Hooker, 1847), zoological, and finally of palaeontological evidence for the reconstruction of the continent of Antarctica, is one of the greatest triumphs of biological investigation. To the evidence advanced by a great number of authors comes the clinching testimony of the existence of a number of varieties of Australian marsupials in Patagonia, as originally discovered by Ameghino and more exactly described by members of the Princeton Patagonian expedition staff; while the fossil shells of the Eocene of Patagonia as analysed by Ortmann give evidence of the existence of a continuous shore-line, or at least of shallow-water areas, between Australia, New Zealand and South America. This line of hypothesis and demonstration is typical of the palaeogeographic methods generally—namely, that vertebrate palaeontologists, impressed by the sudden appearance of extinct forms of continental life, demand land connexion or migration tracts from common centres of origin and dispersal, while the invertebrate palaeontologist alone is able to restore ancient coast-lines and determine the extent and width of these tracts. Thus has been built up a distinct and most important branch. The great contributors to the palaeogeography of Europe are Neumayr and Eduard Suess (b. 1831), followed by Frech, Canu, de Lapparent and others. Neumayr was the first to attempt to restore the grander earth outlines of the earth as a whole in Jurassic times. Suess outlined the ancient relations of Africa and Asia through his "Gondwana Land," a land mass practically identical with the "Lemuria" of zoologists. South American palaeogeography has been traced by von Ihring into a northern land mass, "Archelenis," and a southern mass, "Archiplata," the latter at times united with an antarctic continent. Following the pioneer studies of Dana, the American palaeontologists and stratographers Bailey Willis, John M. Clarke, Charles Schuchert and others have re-entered the study of the Palaeozoic geography of the North American continent with work of astonishing precision.

Zoogeography.—Closely connected with palaeogeography is zoogeography, the animal distribution of past periods. The science of zoogeography, founded by Humboldt, Edward Forbes, Huxley, P. L. Sclater, Alfred Russel Wallace and others, largely upon the present distribution of animal life, is now encountering through palaeontology a new and fascinating series of problems. In brief, it must connect living distribution with distribution in past time, and develop a system which will be in harmony with the main facts of zoology and palaeontology. The theory of past migrations from continent to continent, suggested by Cuvier to explain the replacement of the animal life which had become extinct through sudden geologic changes, was prophetic of one of the chief features of modern method—namely, the tracing of migrations. With this has been connected the theory of "centres of origin" or of the geographic regions where the chief characters of great groups have been established. Among invertebrates Barrande's doctrine of centres of origin was applied by Hyatt to the genesis of the Arietidae (1889); after studying thousands of individuals from the principal deposits of Europe he decided that the cradles of the various branches of this family were the basins of the Côte d'Or and southern Germany. Ortmann has traced the centre of dispersal of the fresh-water Crawfish genera *Cambarus*, *Potamobius* and *Cambaroides* to eastern Asia, where their common ancestors lived in Cretaceous time. Similarly, among vertebrates the method of restoring past centres of origin, largely originating with Edward Forbes, has developed into a most distinct and important branch of historical work. This branch of the science has reached the highest development in its application to the history of the extinct mammalia of the Tertiary through the original work of Cope and Henri Filhol, which has been brought to a much higher degree of exactness recently through the studies of H. F. Osborn, Charles Depéret, W. D. Matthew and H. G. Stehlin.

V.—Relations of Palaeontology to other Zoological Methods

Systematic Zoology.—It is obvious that the Linnaean binomial terminology and its subsequent trinomial refinement for species, sub-species, and varieties was adapted to express the differences between animals as they exist to-day, distributed contemporaneously over the surface of the earth, and that it is wholly inadapted to express either the minute gradations of successive generic series or the branchings of a genetically connected chain of life. Such gradations, termed "mutations" by Waagen, are distinguished, as observed, *in single characters;* they are the *nuances*, or grades of difference, which are the more gradual the more finely we dissect the geologic column, while the terms species, sub-species and variety are generally based upon a sum of changes in *several characters*. Thus palaeontology has brought to light an entirely new nomenclatural problem, which can only be solved by resolutely adopting an entirely different principle. This revolution may be accomplished by adding the term "mutation ascending" or "mutation descending" for the minute steps of transformation, and the term *phylum*, as employed in Germany, for the minor and major branches of genetic series. Bit by bit mutations are added to each other in different single characters until a sum or degree of mutations is reached which no zoologist would hesitate to place in a separate species or in a separate genus.

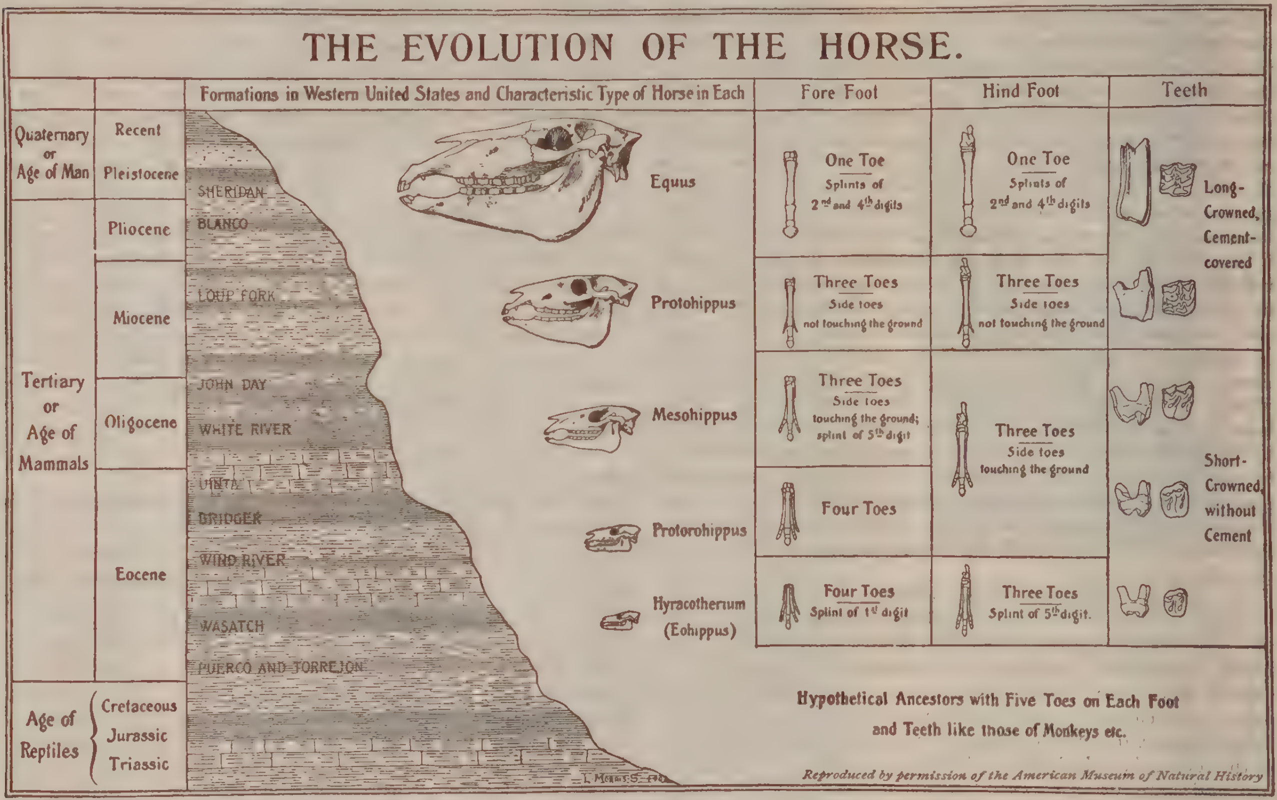

THE EVOLUTION OF THE HORSE.
Formations in Western United States and Characteristic Type of Horse in Each
Fore Foot
Hind Foot
Teeth
Quaternary or Age of Man
Recent
Pleistocene
SHERIDAN
BLANCO
Pliocene
LOUP FORK
Miocene
Tertiary or Age of Mammals
JOHN DAY
WHITE RIVER
Oligocene
UINTA
BRIDGER
WIND RIVER
WASATCH
PUERCO AND TORREJON
Eocene
Age of Reptiles
Cretaceous
Jurassic
Triassic
Equus
One Toe
Splints of 2nd and 4th digits
One Toe
Splints of 2nd and 4th digits
Long-Crowned, Cement-covered
Protohippus
Three Toes
Side toes not touching the ground
Three Toes
Side toes not touching the ground
Mesohippus
Three Toes
Side toes touching the ground; splint of 5th digit
Three Toes
Side toes touching the ground
Short-Crowned, without Cement
Protorohippus
Four Toes
Hyracotherium (Eohippus)
Four Toes
Splint of 1st digit
Three Toes
Splint of 5th digit.
Hypothetical Ancestors with Five Toes on Each Foot and Teeth like those of Monkeys etc.

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FIG. 9.

The minute gradations observed by Hyatt, Waagen and all invertebrate palaeontologists, in the hard parts (shells) of molluscs, &c., are analogous to the equally minute gradations observed by vertebrate palaeontologists in the hard parts of reptiles and mammals. The mutations of Waagen may possibly, in fact, prove to be identical with the "definite variations" or "rectigradations" observed by Osborn in the teeth of mammals. For example, in the grinders of Eocene horses (see Plate III., fig. 8; also fig. 9) in a lower horizon a cusp is adumbrated in shadowy form, in a slightly higher horizon it is visible, in a still higher horizon it is full-grown; and we honour this final stage by assigning to the animal which bears it a new specific name. When a number of such characters accumulate, we further honour them by assigning a new generic name. This is exactly the nomenclature system laid down by Owen, Cope, Marsh and others, although established without any understanding of the law of mutation. But besides the innumerable characters which are visible and measurable, there are probably thousands which we cannot measure or which have not been discovered, since every part of the organism enjoys its gradual and independent evolution. In the face of the continuous series of characters and types revealed by palaeontology, the Linnaean terminology, which is essentially based on a theory of interrupted or discontinuous characters, is inapplicable.

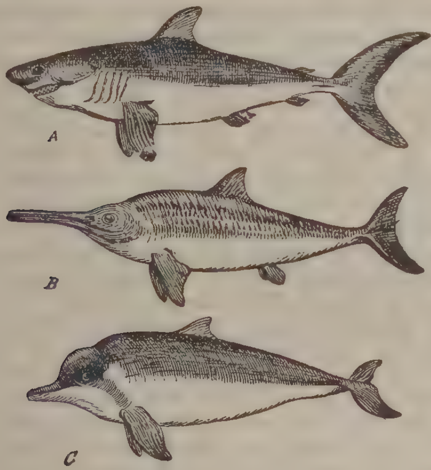
Embryology and Ontogeny.—In following the discovery of the law of recapitulation among palaeontologists we have clearly stated the chief contribution of palaeontology to the science of ontogeny—namely, the correspondences and differences between the individual order of development and the ancestral order of evolution. The mutual relations of palaeontology and embryology and comparative anatomy as means of determining the ancestry of animals are most interesting. In tracing the phylogeny, or ancestral history of organs, palaeontology affords the only absolute criterion on the successive evolution of organs *in time* as well as of (progressive) evolution *in form*. From comparative anatomy alone it is possible to arrange a series of living forms which, although structurally a convincing array because placed in a graded series, may be, nevertheless, in an order inverse to that of the actual historical succession. The most marked case of such inversion in comparative anatomy is that of Carl Gegenbaur (1826–1903), who in arranging the fins of fishes in support of his theory that the fin of the Australian lung-fish (*Ceratodus*) was the most primitive (or *Archipterygium*), placed as the primordial type a fin which palaeontology has proved to be one of the latest types if not the last. It is equally true that palaeontological evidence has frequently failed where we most sorely needed it. The student must therefore resort to what may be called a tripod of evidence, derived from the available facts of embryology, comparative anatomy and palaeontology.

VI.—THE PALAEONTOLOGIST AS HISTORIAN

The modes of change among animals, and methods of analysing them.—As historian the palaeontologist always has before him as one of his most fascinating problems phylogeny, or the restoration of the great tree of animal descent. Were the geologic record complete he would be able to trace the ancestry of man and of all other animals back to their very beginnings in the primordial protoplasm. Dealing with interrupted evidence, however, it becomes necessary to exercise the closest analysis and synthesis as part of his general art as a restorer.

The most fundamental distinction in analysis is that which must be made between homogeny, or true *hereditary resemblance*, and those multiple forms of *adaptive resemblance* which are variously known as cases of "analogy," "parallelism," "convergence" and "homoplasy." Of these two kinds of genetic and adaptive resemblance, homogeny is the warp composed of the vertical, hereditary strands, which connect animals with their ancestors and their successors, while analogy is the woof, composed of the horizontal strands which tie animals together by their superficial resemblances. This wide distinction between similarity of descent and similarity of adaptation applies to every organ, to all groups of organs, to animals as a whole, and to all groups of animals. It is the old distinction between homology and analogy on a grand scale.

Analogy, in its power of transforming unlike and unrelated animals or unlike and unrelated parts of animals into likeness, has done such miracles that the inference of kinship is often almost irresistible. During the past century it was and even now is the very "will-o'-the-wisp" of evolution, always tending to lead the phylogenist astray. It is the first characteristic of analogy that it is superficial. Thus the shark, the ichthyosaur, and the dolphin (fig. 10) superficially resemble each other, but if the outer form be removed this resemblance proves to be a mere veneer of adaptation, because their internal skeletal parts are as radically different as are their genetic relations, founded on heredity. Analogy also produces equally remarkable internal or skeletal transformations. The ingenuity of nature, however, in adapting animals is not infinite, because the same devices are repeatedly employed by her to accomplish the same adaptive ends whether in fishes, reptiles, birds or mammals; thus she has repeated herself at least twenty-four times in the evolution of long-snouted rapacious swimming types of animals. The grandest application of analogy is that observed in the adaptations of groups of animals evolving on different continents, by which their various divisions tend to mimic those on other continents. Thus the collective fauna of ancient South America mimics the independently evolved collective fauna of North America, the collective fauna of modern Australia mimics the collective fauna of the Lower Eocene of North America. Exactly the same principles have developed on even a vaster scale among the Invertebrata. Among the ammonites of the Jurassic and Cretaceous periods types occur which in their external appearance so closely resemble each other that they could be taken for members of a single series, and not infrequently have been taken for species of the same genus and even for the same species; but their early stages of development and, in fact, their entire individual history prove them to be distinct and not infrequently to belong to widely separated genetic series.



(After a drawing by Charles R. Knight, made under the direction of Professor Osborn.)

FIG. 10.—Analogous or convergent evolution in Fish, Reptile and Mammal.

The external similarity in the fore paddle and back fin of these three marine animals is absolute, although they are totally unrelated to each other, and have a totally different internal or skeletal structure. It is one of the most striking cases known of the law of analagous evolution.

A, Shark (*Lamna cornubica*), with long lobe of tail upturned.
B, Ichthyosaur (*Ichthyosaurus quadricissus*), with fin-like paddles, long lobe of tail down-turned.
C, Dolphin (*Sotalia fluviatilis*), with horizontal tail, fin or fluke.

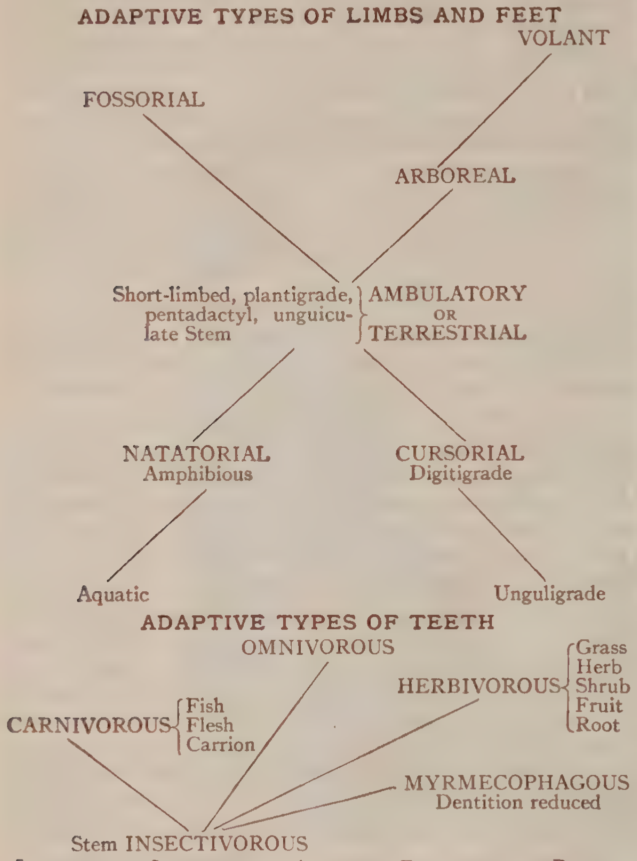
Homogeny, in contrast, the "special homology" of Owen, is the supreme test of kinship or of hereditary relationship, and thus the basis of all sound reasoning in phylogeny. The two joints of the thumb, for example, are homogenous throughout the whole series of the pentadactylate, or five-fingered animals, from the most primitive amphibian to man.

The conclusion is that the sum of homogenous parts, which may be similar or dissimilar in external form according to their similarity or diversity of function, and the recognition of former similarities of adaptation (see below) are the true bases for the critical determination of kinship and phylogeny.

Adaptation and the Independent Evolution of Parts.—Step by step there have been established in palaeontology a number of laws relating to the evolution of the parts of animals which closely coincide with similar laws discovered by zoologists. All are contained in the broad generalization that every part of an animal, however minute, has its separate and independent basis in the hereditary substance of the germ cells from which it is derived and may enjoy consequently a separate and independent history. The consequences of this principle when applied to the adaptations of animals bring us to the very antithesis of Cuvier's supposed "law of correlation," for we find that, while the end results of adaptation are such that all parts of an animal conspire to make the whole adaptive, there is no fixed correlation either in the form or rate of development of parts, and that it is therefore impossible for the palaeontologist to predict the anatomy of an unknown animal from one of its parts only, unless the animal happens to belong to a type generally familiar. For example, among the land vertebrates the feet (associated with the structure of the limbs and trunk) may take one of many lines of adaptation to different media or habitat, either aquatic, terrestrial, arboreal or aerial; while the teeth (associated with the structure of the skull and jaws) also may take one of many lines of adaptation to different kinds of food, whether herbivorous, insectivorous or carnivorous. Through this independent adaptation of different parts to their specific ends there have arisen among vertebrates an almost unlimited number of combinations of foot and tooth structure, the possibilities of which are illustrated in the accompanying diagram (see fig. 11; also Plate III., fig. 8). As instances of such combinations, some of the (probably herbivorous) Eocene monkeys with arboreal limbs have teeth so difficult to distinguish from those of the herbivorous ground-living Eocene horses with cursorial limbs that at first in France and also in America they were both classed with the hoofed animals. Again, directly opposed to Cuvier's principle, we have discovered carnivores with hoofs, such as *Mesonyx*, and herbivores with sloth-like claws, such as *Chalicotherium*. This latter animal is closely related to one which Cuvier termed *Pangolin gigantesque*, and had he restored it according to his "law of correlation" he would have pictured a giant "scaly anteater," a type as wide as the poles from the actual form of *Chalicotherium*, which in body, limbs and teeth is a modified ungulate herbivore, related remotely to the tapirs. In its claws alone does it resemble the giant sloths.

This independence of adaptation applies to every detail of structure; the six cusps of a grinding tooth may all evolve alike, or each may evolve independently and differently. Independent evolution of parts is well shown among invertebrates, where the shell of an ammonite, for example, may change markedly in form without a corresponding change in suture, or vice versa.

Similarly, there is no correlation in the rate of evolution either of adjoining or of separated parts; the middle digit of the foot of the three-toed horse is accelerated in development, while the lateral digits on either side are retarded. Many examples might be cited among invertebrates also.



Law of the Independent Adaptive Evolution of Parts.

Fig. 11.—Diagram demonstrating that there are an indefinite number of combinations of various adaptive types of limbs and feet with various adaptive types of teeth, and that there is no fixed law of correlation between the two series of adaptations.

All these principles are consistent with Francis Galton's law of particulate inheritance in heredity, and with the modern doctrine of "unity of characters" held by students of Mendelian phenomena.

Sudden versus Gradual Evolution of Parts.—There is a broad and most interesting analogy between the evolution of parts of animals and of groups of animals studied as a whole. Thus we observe persistent organs and persistent types of animals, analogous organs and analogous types of animals, and this analogy applies still further to the rival and more or less contradictory hypotheses of the sudden as distinguished from the gradual appearance of new parts or organs of animals, and the sudden appearance of new types of animals. The first exponent of the theory of sudden appearance of new parts and new types, to our knowledge, was Geoffroy St Hilaire, who suggested saltatory evolution through the direct action of the environment on development, as explaining the abrupt transitions in the Mesozoic Crocodilia and the origin of the birds from the reptiles.

Waagen's law of mutation, or the appearance of new parts or organs so gradually that they can be perceived only by following them through successive geologic time stages, appears to be directly contradictory to the saltation principle; it is certainly one of the most firmly established principles of palaeontology, and it constitutes the contribution *par excellence* of this branch of zoology to the law of evolution, since it is obvious that it could not possibly have been deduced from comparison of living animals but only through the long perspective gained by comparison of animals succeeding each other in time. The essence of Waagen's law is orthogenesis, or evolution in a definite direction, and, if there does exist an internal hereditary principle controlling such orthogenetic evolution, there does not appear to be any essential contradiction between its gradual operation in the "mutations of Waagen" and its occasional hurried operation in the "mutations of de Vries," which are by their definition discontinuous or saltatory (Osborn, 1907).

VII.—Modes of Change in Animals as a Whole or in Groups of Animals, and Methods of Analysing Them.

1. *Origin from Primitive or Stem Forms.*—As already observed, the same principles apply to groups of animals as to organs and groups of organs; an organ originates in a primitive and unspecialized stage, a group of animals originates in a primitive or stem form. It was early perceived by Huxley, Cope and many others that Cuvier's broad belief in a universal progression was erroneous, and there developed the distinction between "persistent primitive types" (Huxley) and "progressive types." The theoretical existence of primitive or stem forms was clearly perceived by Darwin, but the steps by which the stem form might be restored were first clearly enunciated by Huxley in 1880 ("On the Application of Evolution to the Arrangement of the Vertebrata and more particularly of the Mammalia," *Scient. Mem.* iv. 457) namely, by sharp separation of the primary or stem characters from the secondary or adaptive characters in all the known descendants or branches of a theoretical original form. The sum of the primitive characters approximately restores the primitive form; and the gaps in palaeontological evidence are supplied by analysis of the available zoological, embryological and anatomical evidence. Thus Huxley, with true prophetic instinct, found that the sum of primitive characters of all the higher placental mammals points to a stem form of a generalized insectivore type, a prophecy which has been fully confirmed by the latest research. On the other hand, Huxley's summation of the primitive characters of all the mammals led him to an amphibian stem type, a prophecy which has proved faulty because based on erroneous analysis and comparison. More or less independently, Huxley, Kowalevsky and Cope restored the stem ancestor of the hoofed animals, or ungulates, a restoration which has been nearly fulfilled by the discovery, in 1873, of the generalized type *Phenacodus* of northern Wyoming. Similar anticipations and verifications among the invertebrates have been made by Hyatt, Beecher, Jackson and others.

In certain cases the character stem forms actually survive in unspecialized types. Thus the analysis of George Baur of the ancestral form of the lizards, mosasaurs, dinosaurs, crocodiles and phytosaurs led both to the generalized *Palaeohatteria* of the Permian and indirectly to the surviving Tuatera lizard of New Zealand.

2. *Adaptations to Alternations of Habitat. Law of Irreversibility of Evolution.*—In the long vicissitudes of time and procession of continental changes, animals have been subjected to alternations of habitat either through their own migrations or through the "migration of the environment itself," to employ Van den Broeck's epigrammatic description of the profound and sometimes sudden environmental changes which may take place in a single locality. The traces of alternations of adaptations corresponding to these alternations of habitat are recorded both in palaeontology and anatomy, although often after the obscure analogy of the earlier and later writings of a palimpsest. Huxley in 1880 briefly suggested the arboreal origin, or primordial tree-habitat of all the marsupials, a suggestion abundantly confirmed by the detailed studies of Dollo and of Bensley, according to which we may imagine the marsupials to have passed through (1) a former terrestrial phase, followed by (2) a primary arboreal phase—illustrated in the tree phalangers—followed by (3) a secondary terrestrial phase—illustrated in the kangaroos and wallabies—followed by (4) a secondary arboreal phase—illustrated in the tree kangaroos. Louis Dollo especially has

contributed most brilliant discussions of the theory of alternations of habitat as applied to the interpretation of the anatomy of the marsupials, of many kinds of fishes, of such reptiles as the herbivorous dinosaurs of the Upper Cretaceous. He has applied the theory with especial ingenuity to the interpretation of the circular bony plates in the carapace of the aberrant leather-back sea-turtles (Sphargidae) by prefacing an initial land phase, in which the typical armature of land tortoises was acquired, a first marine or pelagic phase, in which this armature was lost, a third littoral or seashore phase, in which a new polygonal armature was acquired, and a fourth resumed or secondary marine phase, in which this polygonal armature began to degenerate.

Each of these alternate life phases may leave some profound modification, which is partially obscured but seldom wholly lost; thus the tracing of the evidences of *former* adaptations is of great importance in phylogenetic study.

A very important evolutionary principle is that in such secondary returns to primary phases lost organs are never recovered, but new organs are acquired; hence the force of Dollo's dictum that evolution is *irreversible* from the point of view of structure, while frequently reversible, or recurrent, in point of view of the conditions of environment and adaptation.

3. *Adaptive Radiations of Groups, Continental and Local.*—Starting with the stem forms the descendants of which have passed through either persistent or changed habitats, we reach the underlying idea of the branching law of Lamarck or the law of divergence of Darwin, and find it perhaps most clearly expressed in the words "adaptive radiation" (Osborn), which convey the idea of radii in many directions. Among extinct Tertiary mammals we can actually trace the giving off of these radii in all directions, for taking advantage of every possibility to secure food, to escape enemies and to reproduce kind; further, among such well-known quadrupeds as the horses, rhinoceroses and titanotheres, the modifications involved in these radiations can be clearly traced. Thus the history of continental life presents a picture of contemporaneous radiations in different parts of the world and of a succession of radiations in the same parts. We observe the contemporaneous and largely independent radiations of the hoofed animals in South America, in Africa and in the great ancient continent comprising Europe, Asia and North America; we observe the Cretaceous radiation of hoofed animals in the northern hemisphere, followed by a second radiation of hoofed animals in the same region, in some cases one surviving spur of an old radiation becoming the centre of a new one. As a rule, the larger the geographic theatre the grander the radiation. Successive discoveries have revealed certain grand centres, such as (1) the marsupial radiation of Australia, (2) the little-known Cretaceous radiation of placental mammals in the northern hemisphere, which was probably connected in part with the peopling of South America, (3) the Tertiary placental radiation in the northern hemisphere, partly connected with Africa, (4) the main Tertiary radiation in South America. Each of these radiations produced a greater or less number of analogous groups, and while originally independent the animals thus evolving as autochthonous types finally mingled together as migrant or invading types. We are thus working out gradually the separate contributions of the land masses of North America, South America, Europe, Asia, Africa, and of Australia to the mammalian fauna of the world, a result which can be obtained through palaeontology only.

4. *Adaptive Local Radiation.*—On a smaller scale are the local adaptive radiations which occur through segregation of habit and local isolation in the same general geographic region wherever physiographic and climatic differences are sufficient to produce local differences in food supply or other local factors of change. This local divergence may proceed as rapidly as through wide geographical segregation or isolation. This principle has been demonstrated recently among Tertiary rhinoceroses and titanotheres, in which remains of four or five genetic series in the same geologic deposits have been discovered. We have proof that in the Upper Miocene of Colorado there existed a forest-living horse, or more persistent primitive type, which was contemporaneous with and is found in the same deposits with the plains-living horse (*Neohipparion*) of the most advanced or specialized desert type (see Plate IV., figs. 12, 13, 14, 15). In times of drought these animals undoubtedly resorted to the same water-courses for drink, and thus their fossilized remains are found associated.

5. *The Law of Polyphyletic Evolution. The Sequence of Phyla or Genetic Series.*—There results from continental and local adaptive radiations the presence in the same geographical region of numerous distinct lines in a given group of animals. The polyphyletic law was early demonstrated among invertebrates by Neumayr (1889) when he showed that the ammonite genus *Phylloceras* follows not one but five distinct lines of evolution of unequal duration. The brachiopods, generally classed collectively as *Spirifer mucronatus*, follow at least five distinct lines of evolution in the Middle Devonian of North America, while more than twenty divergent lines have been observed by Grabau among the species of the gastropod genus *Fusus* in Tertiary and recent times. Vertebrate palaeontologists were slow to grasp this principle; while the early speculative phylogenies of the horse of Huxley and Marsh, for example, were mostly displayed monophyletically, or in single lines of descent, it is now recognized that the horses which were placed by Marsh in a single series are really to be ranged in a great number of contemporaneous but separate series, each but partially known, and that the direct phylum which leads to the modern horse has become a matter of far more difficult search. As early as 1862 Gaudry set forth this very polyphyletic principle in his tabular phylogenies, but failed to carry it to its logical application. It is now applied throughout the Vertebrata of both Mesozoic and Cenozoic times. Among marine Mesozoic reptiles, each of the groups broadly known as ichthyosaurs, plesiosaurs, mosasaurs and crocodiles were polyphyletic in a marked degree. Among land animals striking illustrations of this local polyphyletic law are found in the existence of seven or eight contemporary series of rhinoceroses, five or six contemporary series of horses, and an equally numerous contemporary series of American Miocene and Pliocene camels; in short, the polyphyletic condition is the rule rather than the exception. It is displayed to-day among the antelopes and to a limited degree among the zebras and rhinoceroses of Africa, a continent which exhibits a survival of the Miocene and Pliocene conditions of the northern hemisphere.

6. *Development of Analogous Progressive and Retrogressive Groups.*—Because of the repetition of analogous physiographic and climatic conditions in regions widely separated both in time and in space, we discover that continental and local adaptive radiations result in the creation of analogous groups of radii among all the vertebrates and invertebrates. Illustrations of this law were set forth by Cope as early as 1861 (see "Origin of Genera," reprinted in the *Origin of the Fittest*, pp. 95-106) in pointing out the extraordinary parallelisms between unrelated groups of amphibians, reptiles and mammals. In the Jurassic period there were no less than six orders of reptiles which independently abandoned terrestrial life and acquired more or less perfect adaptation to sea life. Nature, limited in her resources for adaptation, fashioned so many of these animals in like form that we have learned only recently to distinguish similarities of analogous habit from the similitudes of real kinship. From whatever order of Mammalia or Reptilia an animal may be derived, prolonged aquatic adaptation will model its outer, and finally its inner, structure according to certain advantageous designs. The requirements of an elongate body moving through the resistant medium of water are met by the evolution of similar entrant and exit curves, and the bodies of most swiftly moving aquatic animals evolve into forms resembling the hulls of modern sailing yachts (Bashford Dean). We owe especially to Willy Kükenthal, Eberhard Fraas, S.W. Williston and R. C. Osburn a summary of those modifications of form to which aquatic life invariably leads.

The law of analogy also operates in retrogression. A. Smith Woodward has observed that the decline of many groups of fishes is heralded by the tendency to assume elongate and finally eel-shaped forms, as seen independently, for example, among the declining Acanthodians or palaeozoic sharks, among the modern crossopterygian *Polypterus* and *Calamoichthys* of the Nile, in the modern dipneustan *Lepidosiren* and *Protopterus*, in the Triassic chondrostean *Belonorhynchus*, as well as in the bow-fin (*Amia*) and the garpike (*Lepidosteus*).

Among invertebrates similar analogous groups also develop. This is especially marked in retrogressive, though also well-known in progressive series. The loss of the power to coil, observed in the terminals of many declining series of gastropods from the Cambrian to the present time, and the similar loss of power among Natiloidea and Ammonoidea of many genetic series, as well as the ostraean form assumed by various declining series of pelecypods and by some brachiopods, may be cited as examples.

7. *Periods of Gradual Evolution of Groups.*—It is certainly a very striking fact that wherever we have been able to trace genetic series, either of invertebrates or vertebrates, in closely sequent geological horizons, or life zones, we find strong proof of evolution through extremely gradual mutation simultaneously affecting many parts of each organism, as set forth above. This proof has been reached quite independently by a very large number of observers studying a still greater variety of animals. Such diverse organisms as brachiopods, ammonites, horses and rhinoceroses absolutely conform to this law in all those rare localities where we have been able to observe closely sequent stages. The inference is almost irresistible that the law of gradual transformation through minute continuous change is by far the most universal; but many palaeontologists as well as zoologists and botanists hold a contrary opinion.

8. *Periods of Rapid Evolution of Groups.*—The above law of gradual evolution is perfectly consistent with a second principle, namely, that at certain times evolution is much more rapid than at others, and that organisms are accelerated or retarded in development in a manner broadly analogous to the acceleration or retardation of separate organs. Thus H. S. Williams observes (*Geological Biology*, p. 268) that the evolution of those fundamental characters which mark differences between separate classes, orders, sub-orders, and even families of organisms, took place in relatively short periods of time. Among the brachiopods the chief expansion of each type is at a relatively early period in their life-history. Hyatt (1883) observed of the ammonites that each group originated suddenly and spread out with great rapidity. Depéret notes that the genus *Neumayria*, an ammonite of the Kimmeridgian, suddenly branches out into an "explosion" of forms. Depéret also observes the contrast between periods of quiescence and limited variability and periods of sudden efflorescence. A. Smith Woodward ("Relations of Palaeontology to Biology," *Annals and Mag. Natural Hist.*, 1906, p. 317) notes that the fundamental advances in the growth of fish life have always been sudden, beginning with excessive vigour at the end of long periods of apparent stagnation; while each advance has been marked by the fixed and definite acquisition of some new anatomical character or "expression point," a term first used by Cope. One of the causes of these sudden advances is undoubtedly to be found in the acquisition of a new and extremely useful character. Thus the perfect jaw and the perfect pair of lateral fins when first acquired among the fishes favoured a very rapid and for a time unchecked development. It by no means follows, however, from this incontrovertible evidence that the acquisition either of the jaw or of the lateral fins had not been in itself an extremely gradual process.

Thus both invertebrate and vertebrate palaeontologists have reached independently the conclusion that the evolution of groups is not continuously at a uniform rate, but that there are, especially in the beginnings of new phyla or at the time of acquisition of new organs, sudden variations in the rate of evolution which have been termed variously "rhythmic," "pulsating," "efflorescent," "intermittent" and even "explosive" (Depéret).

This varying rate of evolution has (illogically, we believe) been compared with and advanced in support of the "mutation law of De Vries," or the theory of saltatory evolution, which we may next consider.

9. *Hypothesis of the Sudden Appearance of New Parts or Organs.*—The rarity of really continuous series has naturally led palaeontologists to support the hypothesis of brusque transitions of structure. As we have seen, this hypothesis was fathered by Geoffroy St Hilaire in 1830 from his studies of Mesozoic Crocodilia, was sustained by Haldemann, and quite recently has been revived by such eminent palaeontologists as Louis Dollo and A. Smith Woodward. The evidence for it is not to be confused with that for the law of rapid efflorescence of groups just considered. It should be remembered that palaeontology is the most unfavourable field of all for observation and demonstration of sudden saltations or mutations of character, because of the limited materials available for comparison and the rarity of genetic series. It should be borne in mind, first, that wherever a new animal suddenly appears or a new character suddenly arises in a fossil horizon we must consider whether such appearance may be due to the non-discovery of transitional links with older forms, or to the sudden invasion of a new type or new organ which has gradually evolved elsewhere. The rapid variation of certain groups of animals or the acceleration of certain organs is also not evidence of the sudden appearance of new adaptive characters. Such sudden appearances may be demonstrated possibly in zoology and embryology but never can be demonstrated by palaeontology, because of the incompleteness of the geological record.

10. *Decline or Senescence of Groups.*—Periods of gradual evolution and of efflorescence may be followed by stationary or senescent conditions. In his history of the *Arietidae* Hyatt points out that toward the close of the Cretaceous this entire group of ammonites appears to have been affected with some malady; the unrolled forms multiply, the septa are simplified, the ornamentation becomes heavy, thick, and finally disappears in the adult; the entire group ends by dying out and leaving no descendants. This is not due to environmental conditions solely, because senescent branches of normal progressive groups are found in all geologic horizons, beginning, for gastropods, in the Lower Cambrian. Among the ammonites the loss of power to coil the shell is one feature of racial old age, and in others old age is accompanied by closer coiling and loss of surface ornamentation, such as spines, ribs, spirals; while in other forms an arresting of variability precedes extinction. Thus Williams has observed that if we find a species breeding perfectly true we can conceive it to have reached the end of its racial life period. Brocchi and Daniel Rosa (1899) have developed the hypothesis of the progressive reduction of variability. Such decline is by no means a universal law of life, however, because among many of the continental vertebrates at least we observe extinctions repeatedly occurring during the expression of maximum variability. Whereas among many ammonites and gastropods smoothness of the shell, following upon an ornamental youthful condition, is generally a symptom of decline, among many other invertebrates and vertebrates, as C. E. Beecher (1856–1905) has pointed out (1898), many animals possessing hard parts tend toward the close of their racial history to produce a superfluity of dead matter, which accumulates in the form of spines among invertebrates, and of horns among the land vertebrates, reaching a maximum when the animals are really on the down-grade of development.

11. *The Extinction of Groups.*—We have seen that different lines vary in vitality and in longevity, that from the earliest times senescent branches are given off, that different lines vary in the rate of evolution, that extinction is often heralded by symptoms of racial old age, which, however, vary widely in different groups. In general we find an analogy between the development of groups and of organs; we discover that each phyletic branch of certain organisms traverses a geologic career comparable to the life of an individual, that we may often distinguish, especially among invertebrates, a phase of youth, a phase of maturity, a phase of senility or degeneration foreshadowing the extinction of a type.

Internal causes of extinction are to be found in exaggeration of body size, in the hypertrophy or over-specialization of certain organs, in the irreversibility of evolution, and possibly, although this has not been demonstrated, in a progressive reduction of variability. In a full analysis of this problem of internal and external causes in relation to the Tertiary Mammalia, H. F. Osborn (" Causes of Extinction of the Mammalia," *Amer. Naturalist*, 1906, pp. 769–795, 829–859) finds that foremost in the long series of causes which lead to extinction are the grander environmental changes, such as physiographic changes, diminished or contracted land areas, substitution of insular for continental conditions; changes of climate and secular lowering of temperature accompanied by deforestation and checking of the food supply; changes influencing the mating period as well as fertility; changes causing increased humidity, which in turn favours enemies among insect life. Similarly secular elevations of temperature, either accompanied by moisture or desiccation, by increasing droughts or by disturbance of the balance of nature, have been followed by great waves of extinction of the Mammalia. In the sphere of living environment, the varied evolution of plant life, the periods of forestation and deforestation, the introduction of deleterious plants simultaneously with harsh conditions of life and enforced migration, as well as of mechanically dangerous plants, are among the well-ascertained causes of diminution and extinction. The evolution of insect life in driving animals from feeding ranges and in the spread of disease probably has been a prime cause of extinction. Food competition among mammals, especially intensified on islands, and the introduction of Carnivora constitute another class of causes. Great waves of extinction have followed the long periods of the slow evolution of relatively inadaptive types of tooth and foot structure, as first demonstrated by Waldemar Kowalevsky; thus mammals are repeatedly observed in a *cul-de-sac* of structure from which there is no escape in an adaptive direction. Among still other causes are great bulk, which proves fatal under certain new conditions; relatively slow breeding; extreme specialization and development of dominant organs, such as horns and tusks, on which for a time selection centres to the detriment of more useful characters. Little proof is afforded among the mammals of extinction through arrested evolution or through the limiting of variation, although such laws undoubtedly exist. One of the chief deductions is that there are special dangers in numerical diminution of herds, which may arise from a chief or original cause and be followed by a conspiracy of other causes which are cumulative in effect. This survey of the phenomena of extinction in one great class of animals certainly establishes the existence of an almost infinite variety of causes, some of which are internal, some external in origin, operating on animals of different kinds.

VIII.—UNDERLYING BIOLOGICAL PRINCIPLES AS THEY APPEAR TO THE PALAEONTOLOGIST

It follows from the above brief summary that palaeontology affords a distinct and highly suggestive field of purely biological research; that is, of the causes of evolution underlying the observable modes which we have been describing. The net result of observation is not favourable to the essentially Darwinian view that the adaptive arises out of the fortuitous by selection, but is rather favourable to the hypothesis of the existence of some quite unknown intrinsic law of life which we are at present totally unable to comprehend or even conceive. We have shown that the direct observation of the origin of new characters in palaeontology brings them within that domain of natural law and order to which the evolution of the physical universe conforms. The nature of this law, which, upon the whole, appears to be purposive or teleological in its operations, is altogether a mystery which may or may not be illumined by future research. In other words, the origin, or first appearance of new characters, which is the essence of evolution, is an orderly process so far as the vertebrate and invertebrate palaeontologist observes it. The selection of organisms through the crucial test of fitness and the shaping of the organic world is an orderly process when contemplated on a grand scale, but of another kind; here the test of fitness is supreme. The only inkling of possible underlying principles in this orderly process is that there appears to be in respect to certain characters a potentiality or a predisposition through hereditary kinship to evolve in certain definite directions. Yet there is strong evidence against the existence of any law in the nature of an internal perfecting tendency which would operate independently of external conditions. In other words, a balance appears to be always sustained between the internal (hereditary and ontogenetic) and the external (environmental and selectional) factors of evolution.

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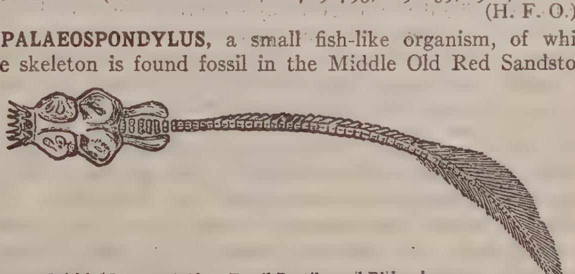
In preparing the present article the author has drawn freely on his own addresses: see H. F. Osborn, " The Rise of the Mammalia in North America " (*Proc. Amer. Assn. Adv. Science*, vol. xlii., 1893), " Ten Years' Progress in the Mammalian Palaeontology of North America " (*Comptes rendus du* 6^e *Congrès intern. de zoologie*, session de Bern, 1904), " The Present Problems of Palaeontology " (Address before Section of Zool. International Congress of Arts and Science, St Louis, Sept. 1904), " The Causes of Extinction of Mammalia " (*Amer. Naturalist*, xl. 769–795, 829–859, 1906). (H. F. O.)

PALAEOSPONDYLUS, a small fish-like organism, of which the skeleton is found fossil in the Middle Old Red Sandstone of Achanarras, near Thurso, Caithness. It was thus named (Gr. ancient vertebra) by Dr R. H. Traquair in 1890, in allusion to its well-developed vertebral rings; and its structure was



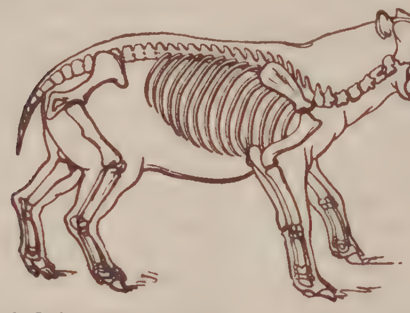
From British Museum *Guide to Fossil Reptiles and Fishes*, by permission of the Trustees.

Palaeospondylus gunni, restored by Dr R. H. Traquair. (Nearly twice nat. size.)

studied in detail in 1903 by Professor and Miss Sollas, who succeeded in making enlarged models of the fossil in wax. The skeleton as preserved is carbonized; and indicates an eel-shaped animal from 3 to 5 cm., in length. The skull, which must have consisted of hardened cartilage, exhibits pairs of nasal and auditory capsules, with a gill-apparatus below its hinder part, but no indications of ordinary jaws. The anterior opening of the brain-case is surrounded by a ring of hard cirri. A pair of "post-branchial plates" projects backwards from the head. The vertebral axis shows a series of broad rings, with distinct neural arches, but no ribs. Towards the end of the body both neural and haemal arches are continued into forked radial cartilages, which support a median fin. There are no traces either of paired fins or of dermal armour. The affinities of *Palaeospondylus* are doubtful, but it is probably related to the contemporaneous armoured Ostracoderms.

References.—R. H. Traquair, paper in *Proc. Roy. Phys. Soc. Edin.*, xii. 312, (1894); W. J. Sollas and I. B. J. Sollas, paper in *Phil. Trans. Roy. Soc.* (1903 B.). (A. S. Wo.)

PALAEOTHERIUM (*i.e.* ancient animal), a name applied by Cuvier to the remains of ungulate mammals recalling tapirs in general appearance, from the Lower Oligocene gypsum quarries of Paris. These were the first indications of the occurrence in the fossil state of perissodactyle ungulates allied to the horse, although it was long before the relationship was recognized. The palaeotheres, which range in size from that of a pig to that of a small rhinoceros, are now regarded as representing a family, *Palaeotheriidae*, nearly related to the horse-tribe, and having, in fact, probably originated from the same ancestral stock, namely, *Hyracotherium* of the Lower Eocene (see Equidae). The connecting link with *Hyracotherium* was formed by *Pachynolophus* (*Propalaeotherium*), and the line apparently terminated in *Paloplotherium*, which is also Oligocene. Representatives of the family occur in many parts of Europe, but the typical genus is unknown in North America, where, however, other forms occur.



(From the Paris gypsum.)

Restoration of *Palaeotherium magnum*. (About ⅛ nat. size.)

Although palaeotheres resemble tapirs in general appearance, they differ in having only three toes on the fore as well as on the hind foot. The dentition normally comprises the typical series of 44 teeth, although in some instances the first premolar is wanting. The cheek-teeth are short-crowned, generally with no cement, the upper molars having a W-shaped outer wall, from which proceed two oblique transverse crests, while the lower ones carry two crescents. Unlike the early horses, the later premolars are as complex as the molars; and although there is a well-marked gap between the canine and the premolars, there is only a very short one between the former and the incisors. The orbit is completely open behind. In other respects the palaeotheres resemble the ancestral horses. They were, however, essentially marsh-dwelling animals, and exhibit no tendency to the cursorial type of limb so characteristic of the horse-line. They were, in fact, essentially inadaptive creatures, and hence rapidly died out. (R. L.*)

PALAEOZOIC ERA, in geology, the oldest of the great time divisions in which organic remains have left any clear record. The three broad divisions—Palaeozoic, Mesozoic, Cainozoic—which are employed by geologists to mark three stages in the development of life on the earth, are based primarily upon the fossil contents of the strata which, at one point or another, have been continuously forming since the very earliest times. The precise line in the "record of the rocks" where the chronicle of the Palaeozoic era closes and that of the Mesozoic era opens—as in more recent historical documents—is a matter for editorial caprice. The early geologists took the most natural dividing lines that came within their knowledge, namely, the line of change in general petrological characters, *e.g.* the "Transition Series" (*Übergangsgebirge*), the name given to rocks approximately of Palaeozoic age by A. G. Werner because they exhibited a transitional stage between the older crystalline rocks and the younger non-crystalline; later in Germany these same rocks were said to have been formed in the "Kohlenperiode" by H. G. Bronn and others, while in England H. T. de la Beche classed them as a Carbonaceous and Greywacke group. Finally, the divisional time separating the Palaeozoic record from that of the Mesozoic was made to coincide with a great natural break or unconformity of the strata. This was the most obvious course, for where such a break occurred there would be the most marked differences between the fossils found below and those found above the physical discordance. The divisions in the fossil record having been thus established, they must for convenience remain, but their artificiality cannot be too strongly emphasized, for the broad stratigraphical gaps and lithological groups which made the divisions sharp and clear to the earlier geologists are proved to be absent in other regions, and fossils which were formerly deemed characteristic of the Palaeozoic era are found in some places to commingle with forms of strongly marked Mesozoic type. In short, the record is more nearly complete than was originally supposed.

The Palaeozoic or Primary era is divided into the following periods or epochs: Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian. The fact that fossils found in the rocks of the three earlier epochs—Cambrian, Ordovician, Silurian—have features in common, as distinguished from those in the three later epochs has led certain authors to divide this era into an earlier, Protozoic (Proterozoic) and a later Deuterozoic time. The rocks of Palaeozoic age are mainly sandy and muddy sediments with a considerable development of limestone in places. These sediments have been altered to shales, slates, quartzites, &c., and frequently they are found in a highly metamorphosed condition; in eastern North America, however, and in north-east Europe they still maintain their horizontality and primitive texture over large areas. The fossils of the earlier Palaeozoic rocks are characterized by the abundance of trilobites, graptolites, brachiopods, and the absence of all vertebrates except in the upper strata; the later rocks of the era are distinguished by the absence of graptolites, the gradual failing of the trilobites, the continued predominance of brachiopods and tabulate corals, the abundance of crinoids and the rapid development of placoderm and heterocercal ganoid fishes and amphibians. The land plants were all cryptogams, *Lepidodendron*, *Sigillaria*, followed by Conifers and Cycads. It is obvious from the advanced stage of development of the organisms found in the earliest of these Palaeozoic rocks that the beginnings of life must go much farther back, and indeed organic remains have been found in rocks older than the Cambrian; for convenience, therefore, the base of the Cambrian is usually placed at the zone of the trilobite *Olenellus*. (J. A. H.)

PALAEPHATUS, the author of a small extant treatise, entitled Περὶ 'Απίστων (On "Incredible Things"). It consists of a series of rationalizing explanations of Greek legends, without any attempt at arrangement or plan, and is probably an epitome, composed in the Byzantine age, of some larger work, perhaps the *Λύσεις τῶν μυθικῶς εἰρημένων*, mentioned by Suïdas as the work of a grammarian of Egypt or Athens. Suïdas himself ascribes a Περὶ 'Απίστων, in five books, to Palaephatus of Paros or Priene. The author was perhaps a contemporary of Euhemerus (3rd century B.C.). Suïdas mentions two other writers of the name: (1) an epic poet of Athens, who lived before the time of

Homer; (2) an historian of Abydus, an intimate friend of Aristotle.

See edition by N. Festa, in *Mythographi graeci* (1902), in the Teubner series, with valuable prolegomena supplementary to *Intorno all' opuscolo di Palefato de incredibilibus* (1890), by the same writer.

PALAESTRA (Gr. *παλαίστρα*), the name apparently applied by the Greeks to two kinds of places used for gymnastic and athletic exercises. In the one case it seems confined to the places where boys and youths received a general gymnastic training, in the other to a part of a gymnasium where the *athletae*, the competitors in the public games, were trained in wrestling (*παλαίειν*, to wrestle) and boxing. The boys' *palaestrae* were private institutions and generally bore the name of the manager or of the founder; thus at Athens there was a *palaestra* of Taureas (Plato, *Charmides*). The Romans used the terms *gymnasium* and *palaestra* indiscriminately for any place where gymnastic exercises were carried on.

PALAFOX DE MENDOZA, JUAN DE (1600–1659), Spanish bishop, was born in Aragon. He was appointed in 1839 bishop of Angelopolis (Puebla de los Angeles) in Mexico, and there honourably distinguished himself by his efforts to protect the natives from Spanish cruelty, forbidding any methods of conversion other than persuasion. In this he met with the uncompromising hostility of the Jesuits, whom in 1647 he laid under an interdict. He twice, in 1647 and 1649, laid a formal complaint against them at Rome. The pope, however, refused to approve his censures, and all he could obtain was a brief from Innocent X. (May 14, 1648), commanding the Jesuits to respect the episcopal jurisdiction. In 1653 the Jesuits succeeded in securing his translation to the little see of Osma in Old Castile. In 1694 Charles II. of Spain petitioned for his canonization; but though this passed through the preliminary stages, securing for Palafox the title of "Venerable," it was ultimately defeated, under Pius VI., by the intervention of the Jesuits.

See Antonio Gonzalez de Resende, *Vie de Palafox* (French trans., Paris, 1690).

PALAFOX Y MELZI, JOSE DE (1780–1847), duke of Saragossa, was the youngest son of an old Aragonese family. Brought up at the Spanish court, he entered the guards at an early age, and in 1808 as a sub-lieutenant accompanied Ferdinand to Bayonne; but after vainly attempting, in company with others, to secure Ferdinand's escape, he fled to Spain, and after a short period of retirement placed himself at the head of the patriot movement in Aragon. He was proclaimed by the populace governor of Saragossa and captain-general of Aragon (May 25, 1808). Despite the want of money and of regular troops, he lost no time in declaring war against the French, who had already overrun the neighbouring provinces of Catalonia and Navarre, and soon afterwards the attack he had provoked began. Saragossa as a fortress was both antiquated in design and scantily provided with munitions and supplies, and the defences resisted but a short time. But it was at that point that the real resistance began. A week's street fighting made the assailants masters of half the town, but Palafox's brother succeeded in forcing a passage into the city with 3000 troops. Stimulated by the appeals of Palafox and of the fierce and resolute demagogues who ruled the mob, the inhabitants resolved to contest possession of the remaining quarters of Saragossa inch by inch, and if necessary to retire to the suburb across the Ebro, destroying the bridge. The struggle, which was prolonged for nine days longer, resulted in the withdrawal of the French (Aug. 14), after a siege which had lasted 61 days in all. Palafox then attempted a short campaign in the open country, but when Napoleon's own army entered Spain, and destroyed one hostile army after another in a few weeks, Palafox was forced back into Saragossa, where he sustained a still more memorable second siege. This ended, after three months, in the fall of the town, or rather the cessation of resistance, for the town was in ruins and a pestilence had swept away many thousands of the defenders. Palafox himself, suffering from the epidemic, fell into the hands of the French and was kept prisoner at Vincennes until December 1813. In June 1814 he was confirmed in the office of captain-general of Aragon, but soon afterwards withdrew from it, and ceased to take part in public affairs. From 1820 to 1823 he commanded the royal guard of King Ferdinand, but, taking the side of the Constitution in the civil troubles which followed, he was stripped of all his honours and offices by the king, whose restoration by French bayonets was the triumph of reaction and absolutism. Palafox remained in retirement for many years. He received the title of duke of Saragossa from Queen Maria Christine. From 1836 he took part in military and political affairs as captain-general of Aragon and a senator. He died at Madrid on the 15th of February 1847.

A biographical notice of Palafox appeared in the Spanish translation of Thiers's *Hist. des consulates de l'empire*, by P. de Madrago. For the two sieges of Saragossa, see C. W. C. Oman, *Peninsular War*, vol. i.; this account is both more accurate and more just than Napier's.

PALAMAS, GREGORIUS (*c.* 1296–1359), Greek mystic and chief apologist of the Hesychasts (*q.v.*), belonged to a distinguished Anatolian family, and his father held an important position at Constantinople. Palamas at an early age retired to Mt Athos, where he became acquainted with the mystical theories of the Hesychasts. In 1326 he went to Skētē near Beroea, where he spent some years in isolation in a cell specially built for him. His health having broken down, he returned to Mt Athos, but, finding little relief, removed to Thessalonica. About this time Barlaam, the Calabrian monk, began his attacks upon the monks of Athos, and Palamas came forward as their champion. In 1341 and 1351 he took part in the two synods at Constantinople, which definitively secured the victory of the Palamites. During the civil war between John Cantacuzene and the Palaeologi, Palamas was imprisoned. After Cantacuzene's victory in 1347, Palamas was released and appointed archbishop of Thessalonica; being refused admittance by the inhabitants, he retired to the island of Lemnos, but subsequently obtained his see. Palamas endeavoured to justify the mysticism of the Hesychasts on dogmatic grounds. The chief objects of his attack were Barlaam, Gregorius Acindynus and Nicephorus Gregoras.

Palamas was a prolific writer, but only a few of his works have been published, most of which will be found in J. P. Migne, *Patrologia graeca* (cl., cli.). They consist of polemics against the Latins and their doctrine of the Procession of the Holy Ghost; Hesychastic writings; homilies; a life of St Peter (a monk of Athos); a rhetorical essay *Prosopopeia* (ed. A. Jahn, 1884), containing the accusations brought against the body by the soul, the defence made by the body, and the final pronouncement of the judges in favour of the body, on the ground that its sins are the result of inadequate teaching.

See the historical works of John Cantacuzene and Nicephorus Gregoras, the *Vita Palamae* by Philotheus, and the encomium by Nilus (both patriarchs of Constantinople); also C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897).

PALAMAU, a district of British India, in the Chota-Nagpur division of Bengal. It was formed out of Lohardaga, in 1894, and takes its name from a former state or chiefship. The administrative headquarters are at Daltonganj: pop. (1901), 5837. It consists of the lower spurs of the Chota-Nagpur plateau, sloping north to the valley of the Son. Area 4914 sq. m.; pop. (1901), 619,600, showing an increase of 3·8% in the decade; average density, 126 persons per sq. m., being the lowest in all Bengal. Palamau suffered severely from drought in 1897. A branch of the East Indian railway from the Son valley to the valuable coalfield near Daltonganj was opened in 1902. The only articles of export are jungle produce, such as lac and tussur silk. The forests are unprofitable.

See *Palamau District Gazetteer* (Calcutta, 1907).

PALAMCOTTAH, a town of British India, in the Tinnevelly district of Madras, on the opposite bank of the Tambraparni river to Tinnevelly town, with which it shares a station on the South Indian railway, 444 m. south of Madras. Pop. (1901), 39,545. It is the administrative headquarters of the district, and also the chief centre of Christian missions in south India. Among many educational institutions may be mentioned the Sarah Tucker College for Women, founded in 1895.

PALAMEDES, in Greek legend, son of Nauplius king of Euboea, one of the heroes of the Trojan War, belonging to the post-Homeric cycle of legends. During the siege of Troy, Agamemnon, Diomedes and Odysseus (who had been detected by Palamedes in an attempt to escape going to Troy by shamming madness) caused a letter containing money and purporting to come from Priam to be concealed in his tent. They then accused Palamedes of treasonable correspondence with the enemy, and he was ordered to be stoned to death. His father exacted a fearful vengeance from the Greeks on their way home, by placing false lights on the promontory of Caphareus. The story of Palamedes was first handled in the *Cypria* of Stasinus, and formed the subject of lost plays by Aeschylus (*Palamedes*), Sophocles (*Nauplius*), Euripides (*Palamedes*), of which some fragments remain. Sophists and rhetoricians, such as Gorgias and Alcidamas, amused themselves by writing declamations in favour of or against him. Palamedes was regarded as the inventor of the alphabet, lighthouses, weights and measures, dice, backgammon and the discus.

See Euripides, *Orestes*, 432 and schol.; Ovid, *Metam.* xiii. 56; Servius on Virgil, *Aeneid*, ii. 82, and Nettleship's note in Conington's edition; Philostratus, *Heroica*, 11; Euripides, *Frag.* 581; for different versions of his death see Dictys Cretensis ii. 15; Pausanias ii. 20, 3; x. 31, 2; Dares Phrygius, 28; monograph by O. Jahn (Hamburg, 1836).

PALANPUR, a native state of India, in the Gujarat division of Bombay, on the southern border of Rajputana. Area, 1766 sq. m.; pop. (1901), 222,627, showing a decrease of 19 % in the decade. The country is mountainous, with much forest towards the north, but undulating and open in the south and east. The principal rivers are the Saraswati and Banas. The estimated gross revenue is £50,000; tribute to the gaekwar of Baroda, £2564. The chief, whose title is diwan, is an Afghan by descent. The state is traversed by the main line of the Rajputana-Malwa railway, and contains the British cantonment of Deesa. Wheat, rice and sugar-cane are the chief products. The state has suffered severely of recent years from plague. The town of PALANPUR is a railway junction for Deesa, 18 m. distant. Pop. (1901), 17,799.

Palanpur also gives its name to a political agency, or collection of native states; total area, 6393 sq. m.; pop. (1901), 467,271, showing a decrease of 28 % in the decade, due to the effects of famine.

PALANQUIN (pronounced *palankeen*, a form in which it is sometimes spelled), a covered litter used in India and other Eastern countries. It is usually some eight feet long by four feet in width and depth, fitted with movable blinds or shutters, and slung on poles carried by four bearers. Indian and Chinese women of rank always travelled in *palanquim*, and they were largely used by European residents in India before the railways. The *norimono* of Japan and the *kiaotsu* of China differ from the Indian palanquin only in the method of attaching the poles to the body of the conveyance. The word came into European use through Port. *palanquim*, which represents an East Indian word seen in several forms, *e.g.* Malay and Javanese *palangki*, Hindostani *palkī*, Pali *pallanko*, &c., all in the sense of litter, couch, bed. The Sansk. *paryanka*, couch, bed, the source of all these words, is derived from *parī*, round, about, and *anka*, hook. The *New English Dictionary* points out the curious resemblance of these words with the Latin use of *phalanga* (Gr. φάλαγξ) for a bearing or carrying pole, whence the Span. *palanca* and *palanquino*, a bearer.

PALATE (Lat. *palatum*, possibly from the root of *pascere*, to feed), the roof of the mouth in man and vertebrate animals. The palate is divided into two parts, the anterior bony "hard palate" (see MOUTH), and the posterior fleshy "soft palate" (see PHARYNX). For the malformation consisting in a longitudinal fissure in the roof of the mouth, see CLEFT PALATE.

PALATINATE (Ger. *Pfalz*), a name given generally to any district ruled by a count palatine, but particularly to a district of Germany, a province of the kingdom of Bavaria, lying west of the Rhine. It is bounded on the N. by the Prussian Rhine province and the Hessian province of Rhein-Hessen; on the E. by Baden, from which it is separated by the Rhine; on the S. by the imperial province of Alsace-Lorraine, from which it is divided by the Lauter; and on the W. by the administrative districts of Trier and Coblenz, belonging to the Prussian Rhine province. It has an area of 2288 sq. m., and a population (1905) of 885,280, showing a density of 386·9 to the square mile. As regards religion, the inhabitants are fairly equally distributed into Roman Catholics and Protestants.

The rivers in this fertile tract of country are the Rhine, Lauter, Queich, Speirbach, Glan and Blies. The Vosges, and their continuation the Hardt, run through the land from south to north and divide it into the fertile and mild plain of the Rhine, together with the slope of the Hardt range, on the east, and the rather inclement district on the west, which, running between the Saarbrück carboniferous mountains and the northern spurs of the Hardt range, ends in a porphyrous cluster of hills, the highest point of which is the Donnersberg (2254 ft.). The country on the east side and on the slopes of the Hardt yield a number of the most varied products, such as wine, fruit, corn, vegetables, flax and tobacco. Cattle are reared in great quantity and are of excellent quality. The mines yield iron, coal, quicksilver and salt. The industries are very active, especially in iron, machinery, paper, chemicals, shoes, woollen goods, beer, leather and tobacco. The province is well served by railway communication and, for purposes of administration, is divided into the following 16 districts: Bergzabern, Dürkheim, Frankenthal, Germersheim, Homburg, Kaiserslautern, Kirchheimbolanden, Kusel, Landau, Ludwigshafen, Neustadt, Pirmasens, Rockenhausen, St Ingbert, Spires and Zweibrücken. Spires (Speyer) is the seat of government, and the chief industrial centres are Ludwigshafen on the Rhine, which is the principal river port, Landau, and Neustadt, the seat of the wine trade.

See A. Becker, *Die Pfalz und die Pfälzer* (Leipzig, 1857); Mehlis, *Fahrten durch die Pfalz* (Augsburg, 1877); Kranz, *Handbuch der Pfalz* (Spires, 1902); Hensen, *Pfalzführer* (Neustadt, 1905); and Näher, *Die Burgen der rheinischen Pfalz* (Strassburg, 1887).

History.—The count palatine of the Rhine was a royal official who is first mentioned in the 10th century. The first count was Hermann I., who ruled from 945 to 996, and although the office was not hereditary it appears to have been held mainly by his descendants until the death of Count Hermann III. in 1155. These counts had gradually extended their powers, had obtained the right of advocacy over the archbishop of Trier and the bishopric of Juliers, and ruled various isolated districts along the Rhine. In 1155 the German king, Frederick I., appointed his step-brother Conrad as count palatine. Conrad took up his residence at the castle of Juttenbuhel, near Heidelberg, which became the capital of the Palatinate. In 1195 Conrad was succeeded by his son-in-law Henry, son of Henry the Lion, duke of Saxony, who was a loyal supporter of the emperor Henry VI. After the latter's death in 1197 he assisted his own brother Otto, afterwards the emperor Otto IV., in his attempts to gain the German throne. Otto refused to reward Henry for this support, so in 1204 he assisted his rival, the German king Philip, but returned to Otto's side after Philip's murder in 1208. In 1211 Henry abdicated in favour of his son Henry, who died in 1214, when the Palatinate was given by the German king Frederick II. to Otto, the infant son of Louis I., duke of Bavaria, a member of the Wittelsbach family, who was betrothed to Agnes, sister of the late count, Henry. The break-up of the duchy of Franconia had increased the influence of the count palatine of the Rhine, and the importance of his position among the princes of the empire is shown by Roger of Hoveden, who, writing of the election to the German throne in 1198, singles out four princes as chief electors, among whom is the count palatine of the Rhine. In the *Sachsenspiegel*, a collection of German laws which was written before 1235, the count is given as the butler (dapifer) of the emperor, the first place among the lay electors.

The Palatinate was ruled by Louis of Bavaria on behalf of his son until 1228, when it passed to Otto who ruled until his death in 1253. Otto's possessions were soon afterwards divided, and his elder son Louis II. received the Palatinate and Upper Bavaria. Louis died in 1294 when these districts passed to his son Rudolph I. (d. 1319), and subsequently to his grandson Louis, afterwards the emperor Louis IV. By the Treaty of Pavia in 1329, Louis granted the Palatinate to his nephews Rudolph II. and Rupert I., who received from him at the same time a portion of the duchy of Upper Bavaria, which was called the upper Palatinate to distinguish it from the Rhenish, or lower Palatinate. Rudolph died in 1353, after which Rupert ruled alone until his death in 1390. In 1355 he had sold a portion of the upper Palatinate to the emperor Charles IV., but by various purchases he increased the area of the Rhenish Palatinate. His successor was his nephew Rupert II., who bought from the German king Wenceslaus a portion of the territory that his uncle had sold to Charles IV. He died in 1398 and was succeeded by his son Rupert III. In 1400 Rupert was elected German king, and when he died in 1410 his possessions were divided among his four sons: the eldest, Louis III., received the Rhenish Palatinate proper; the second son, John, obtained the upper Palatinate; while the outlying districts of Zweibrücken and Simmern passed to Stephen, and that of Mosbach to Otto.

When the possessions of the house of Wittelsbach were divided in 1255 and the branches of Bavaria and the Palatinate were founded, a dispute arose over the exercise of the electoral vote, and the question was not settled until in 1356 the Golden Bull bestowed the privilege upon the count palatine of the Rhine, who exercised it until 1623. The part played by Count Frederick V., titular king of Bohemia, during the Thirty Years' War induced the emperor Ferdinand II. to deprive him of his vote and to transfer it to the duke of Bavaria, Maximilian I. By the Peace of Westphalia in 1648 an eighth electorate was created for the count palatine, to which was added the office of treasurer. In 1777, however, the count resumed the ancient position of his family in the electoral college, and regained the office of steward which he retained until the formal dissolution of the empire in 1806.

To return to the history of the Palatinate as divided into four parts among the sons of the German king Rupert in 1410. John, the second of these brothers, died in 1443, and his son Christopher, having become king of Denmark in 1440, did not inherit the upper Palatinate, which was again united with the Rhenish Palatinate. Otto, the son of Otto (d. 1461), Rupert's fourth son, who had obtained Mosbach, died without sons in 1499, and this line became extinct, leaving only the two remaining lines with interests in the Rhenish Palatinate. After Rupert's death this was governed by his eldest son, the elector Louis III. (d. 1436), and then by the latter's sons, Louis IV. (d. 1449) and Frederick I. The elector Frederick, called the Victorious, was one of the foremost princes of his time. His nephew and successor, the elector Philip, carried on a war for the possession of the duchy of Bavaria-Landshut, which had been bequeathed to his son Rupert (d. 1504), but, when in 1507 an end was put to this struggle, Rupert's son, Otto Henry, only received Neuburg and Sulzbach. Louis V. and then Frederick II. succeeded Philip, but both died without sons and Otto Henry became elector. He too died without sons in 1559, when the senior branch became extinct, leaving only the branch descended from Rupert's third son, Stephen.

Already on Stephen's death in 1459 this family had been divided into two branches, those of Simmern and of Zweibrücken, and in 1514 the latter branch had been divided into the lines of Zweibrücken proper and of Veldentz. It was Frederick, count palatine of Simmern, who succeeded to the Palatinate on Otto Henry's death, becoming the elector Frederick III. The new elector, a keen but not a very bigoted Calvinist, was one of the most active of the Protestant princes. His son and successor, Louis VI. (d. 1583), was a Lutheran, but another son, John Casimir, who ruled the electorate on behalf of his young nephew, Frederick IV., from 1583 to 1592, gave every encouragement to the Calvinists. A similar line of action was followed by Frederick IV. himself after 1592. He was the founder and head of the Evangelical Union established to combat the aggressive tendencies of the Roman Catholics. His son, the elector Frederick V., accepted the throne of Bohemia and thus brought on the Thirty Years' War. He was quickly driven from that country, and his own electorate was devastated by the Bavarians and Spaniards. At the peace of Westphalia in 1648 the Palatinate was restored to Frederick's son, Charles Louis, but it was shorn of the upper Palatinate, which Bavaria retained as the prize of war.

Scarcely had the Palatinate begun to recover when it was attacked by Louis XIV. For six years (1673–79) the electorate was devastated by the French troops, and even after the Treaty of Nijmwegen it suffered from the aggressive policy of Louis. In August 1680 the elector Charles Louis died, and when his son and successor, Charles, followed him to the grave five years later the ruling family became extinct in the senior line. Mention has already been made of a division of this family into two lines after 1459, and of a further division of the Zweibrücken line in 1514, when again two lines were founded. The junior of these, that of Veldentz, became extinct in 1694, but the senior, that of Zweibrücken proper, was still very flourishing. Under Count Wolfgang (d. 1569) it had purchased Sulzbach and Neuburg in 1557, and in the person of his grandson, Wolfgang William (d. 1653) it had secured the coveted duchies of Juliers and Berg. It was Philip William of Neuburg, the son of Wolfgang William, who became elector palatine in succession to Charles in 1685.

The French king's brother, Philip, duke of Orleans, had married Charlotte Elizabeth, a sister of the late elector Charles, and consequently the French king claimed a part of Charles's lands in 1680. His troops took Heidelberg and devastated the Palatinate, while Philip William took refuge in Vienna, where he died in 1690. Then in 1697, by the Treaty of Ryswick, Louis abandoned his claim in return for a sum of money. Just before this date the Palatinate began to be disturbed by troubles about religion. The great majority of the inhabitants were Protestants, but the family which succeeded in 1685 belonged to the Roman Catholic Church. Philip William, however, gave equal rights to all his subjects, but under his son and successor, the elector John William, the Protestants were deprived of various civil rights until the intervention of Prussia and of Brunswick in 1705 gave them some redress. The next elector, a brother of the last one, was Charles Philip, who removed his capital from Heidelberg to Mannheim in 1720. He died without male issue in December 1742. His successor was his kinsman, Charles Theodore, count palatine of Sulzbach, a cadet of the Zweibrücken-Neuburg line, and now with the exception of one or two small pieces the whole of the Palatinate was united under one ruler. Charles Theodore was a prince of refined and educated tastes and during his long reign his country enjoyed prosperity. In 1777 on the extinction of the other branch of the house of Wittelsbach, he became elector of Bavaria, and the Palatinate was henceforward united with Bavaria, the elector's capital being Munich. Charles Theodore died without legitimate sons in 1799, and his successor was Maximilian Joseph, a member of the Birkenfeld branch of the Zweibrücken family, who later became king of Bavaria as Maximilian I.

In 1802 the elector was obliged to cede the portion of the Palatinate lying on the left bank of the Rhine to France, and other portions to Baden and to Hesse-Darmstadt. Much of this, however, was regained in 1815, and since that date the Palatinate has formed part of the kingdom of Bavaria.

See Widder, *Versuch einer vollständigen geographisch-historischen Beschreibung der Kurfürstlichen Pfalz* (Frankfort, 1786–1788); L. Häusser, *Geschichte der Rheinischen Pfalz* (Heidelberg, 1845); Nebenius, *Geschichte der Pfalz* (Heidelberg, 1874); Gümbel, *Geschichte der protestantischen Kirche der Pfalz* (Kaiserslautern, 1885); the *Regesten der Pfalzgrafen am Rhein, 1214–1508*, edited by Koch and Wille (Innsbruck, 1894); and Wild, *Bilderatlas zur badisch-pfälzischen Geschichte* (Heidelberg, 1904).

PALATINE (from Lat. *palatium*, a palace,) pertaining to the palace and therefore to the emperor, king or other sovereign ruler. In the later Roman Empire certain officials attending on the emperor, or discharging other duties at his court, were called *palatini*; from the time of Constantine the Great the term was also applied to the soldiers stationed in or around the capital to distinguish them from those stationed on the frontier of the empire. In the East Roman Empire the word was used to designate officials concerned with the administration of the finances and the imperial lands.

This use of the word palatine was adopted by the Frankish kings of the Merovingian dynasty. They employed a high official, the *comes palatinus*, who at first assisted the king in his judicial duties and at a later date discharged many of these himself. Other counts palatine were employed on military and administrative work, and the system was maintained by the Carolingian sovereigns. The word paladin, used to describe the followers of Charlemagne, is a variant of palatine. A Frankish capitulary of 882 and Hincmar, archbishop of Reims, writing about the same time, testify to the extent to which the judicial work of the Frankish Empire had passed into their hands, and one grant of power was followed by another. Instead of remaining near the person of the king, some of the counts palatine were sent to various parts of his empire to act as judges and governors, the districts ruled by them being called palatinates. Being in a special sense the representatives of the sovereign they were entrusted with more extended power than the ordinary counts. Thus comes the later and more general use of the word palatine, its application as an adjective to persons entrusted with special powers and also to the districts over which these powers were exercised. By Henry the Fowler and especially by Otto the Great, they were sent into all parts of the country to support the royal authority by checking the independent tendencies of the great tribal dukes. We hear of a count palatine in Saxony, and of others in Lorraine, in Bavaria and in Swabia, their duties being to administer the royal estates in these duchies. The count palatine in Bavaria, an office held by the family of Wittelsbach, became duke of this land, the lower title being then merged in the higher one; and with one other exception the German counts palatine soon became insignificant, although, the office having become hereditary, Pfalzgrafen were in existence until the dissolution of the Holy Roman Empire in 1806. The exception was the count palatine of the Rhine, who became one of the four lay electors and the most important lay official of the empire. In the empire the word count palatine was also used to designate the officials who assisted the emperor to exercise the rights which were reserved for his personal consideration. They were called *comites palatini caesarii*, or *comites sacri palatii*; in German, *Hofpfalzgrafen*.

From Germany the term palatine passed into England and Scotland, into Hungary and Poland. It appears in England about the end of the 11th century, being applied by Ordericus Vitalis, to Odo, bishop of Bayeux and earl of Kent. The word palatine came in England to be applied to the earls, or rulers, of certain counties, men who enjoyed exceptional powers. Their exceptional position is thus described by Stubbs (*Const. Hist.* vol. i.): They were "earldoms in which the earls were endowed with the superiority of whole counties, so that all the landholders held feudally of them, in which they received the whole profits of the courts and exercised all the regalia or royal rights, nominated the sheriffs, held their own councils and acted as independent princes except in the owing of homage and fealty to the king." The most important of the counties palatine were Durham and Chester, the bishop of the one and the earl of the other receiving special privileges from William I. Chester had its own parliament, consisting of barons of the county, and was not represented in the national assembly until 1541, while it retained some of its special privileges until 1830. The bishop of Durham retained temporal jurisdiction over the county until 1836. Lancashire was made a county, or duchy, palatine in 1351, and kept some of its special judicial privileges until 1873. Thus for several centuries the king's writs did not run in these three palatine counties, and at the present day Lancashire and Durham have their own courts of chancery. Owing to the ambiguous application of the word palatine to Odo of Bayeux, it is doubtful whether Kent was ever a palatine county; if so, it was one only for a few years during the 11th century. Other palatine counties, which only retained their exceptional position for a short time, were Shropshire, the Isle of Ely, Hexhamshire in Northumbria, and Pembrokeshire in Wales. In Ireland there were palatine districts, and the seven original earldoms of Scotland occupied positions somewhat analogous to that of the English palatine counties.

In Hungary the important office of palatine (Magyar *Nádor*) owes its inception to St Stephen. At first the head of the judicial system, the palatine undertook other duties, and became after the king the most important person in the realm. At one time he was chosen by the king from among four candidates named by the Diet. Under the later Habsburg rulers of Hungary the office was several times held by a member of this family, one of the palatines being the archduke Joseph. The office was abolished after the revolution of 1848.

In Poland the governors of the provinces of the kingdom were called palatines, and the provinces were sometimes called palatinates.

In America certain districts colonized by English settlers were treated as palatine provinces. In 1632 Cecilius Calvert, 2nd Lord Baltimore, received a charter from Charles I. giving him palatine rights in Maryland. In 1639 Sir Ferdinando Gorges, the lord of Maine, obtained one granting him as large and ample prerogatives as were enjoyed by the bishop of Durham. Carolina was another instance of a palatine province.

In addition to the authorities mentioned, see R. Schröder, *Lehrbuch der deutschen Rechtsgeschichte* (Leipzig, 1902); C. Pfaff, *Geschichte des Pfalzgrafenamtes* (Halle, 1847); G. T. Lapsley, *The County Palatine of Durham* (New York, 1900), and D. J. Medley, *English Constitutional History* (1907). (A. W. H.*)

PALATKA, a city and the county-seat of Putnam county, Florida, U.S.A., in the N.E. part of the state, on the W. bank of the St John's river, about 100 m. from its mouth, and at the head of deep-water navigation. Pop. (1905) 3950; (1910) 3779. Palatka is served by the Georgia Southern & Florida (of which it is the southern terminal), the Atlantic Coast Line, and the Florida East Coast railways, and also has connexion by water with Baltimore, New York and Boston. Palatka is situated in a rich agricultural, orange-growing and timber region, for which it is the distributing centre. Large quantities of cypress lumber are shipped from Palatka. Palatka was incorporated as a town in 1853, and in 1872 was chartered as a city.

PALAVER (an adaptation of Port. *palavra*, a word or speech; Ital. *parola*; Fr. *parole*, from the Low Lat. *parabola*, a parable, story, talk; Gr. παραβολή, literally "comparison"; the Low Lat. *parabolare*, "to talk," gives Fr. *parler*, "to speak," whence "parley," "parliament," &c.), the name used by the Portuguese traders on the African coast for their conversations and bargaining with the natives. It was introduced into English in the 18th century through English sailors frequenting the Guinea coast. It has now passed into general use among the negroes of West and West Central Africa for any conference, either among themselves or with foreigners. From the amount of unnecessary talk characteristic of such meetings with natives, the word is used of any idle or cajoling talk.

PALAWARAM, a town of British India, in Chingleput district, Madras, 11 m. S. of Madras city, with a station on the South Indian railway; pop. (1901), 6416. Formerly called the presidency cantonment, as containing the native garrison for Madras city, it is now a dépôt for native infantry and the residence of European pensioners. There are several tanneries.

PALAZZOLO ACREIDE, a town of Sicily, in the province of Syracuse, 28 m. by road W. of it, 2285 ft. above sea-level. Pop. (1901), 14,840. The town occupies the site of the ancient *Acrae*, founded by Syracuse about 664 B.C. It followed in the main the fortunes of the mother city. In the treaty between the Romans and Hiero II. in 263 B.C. it was assigned to the latter.

The ancient city lay on the hill above the modern town, the approach to it being defended by quarries, in which tombs of all periods have been discovered. The auditorium of the small theatre is well preserved, though nothing of the stage remains. Close to it are ruins of other buildings, which bear, without justification, the names Naumachia, Odeum (perhaps a bath establishment) and Palace of Hiero. The water supply was obtained by subterranean aqueducts. In the cliffs of the Monte Pineta to the south are other tomb chambers, and to the south again are the curious bas-reliefs called *Santoni* or *Santicelli*, mutilated in the 19th century by a peasant proprietor, which appear to be sepulchral also. Near here too is the necropolis of the Acrocoro della Torre, where many sarcophagi have been found. Five miles north lies Buscemi, near which a sacred grotto has been discovered; and also a church cut in the rock and surrounded by a cemetery.[1]

See G. Judica, *Antichità di Acre* (Messina, 1819). (Baron Judica's collection of antiquities was dispersed after his death.) J. Schubring, *Jahrbuch für Philologie*, Suppl. IV., 662–672.

PALE (through Fr. *pal*, from Lat. *palus*, a stake, for *paglus*, from the stem *pag-* of *pangere*, to fix; "pole" is from the same original source), a stake, particularly one of a closely set series driven into the ground to form the defensive work known as a "palisade"; also one of the lighter laths or strips of wood set vertically and fastened to a horizontal rail to form a "paling." Used as an historical term, a pale is a district marked off from the surrounding country by a different system of government and law or by definite boundaries. The best known of these districts was the "English Pale" in Ireland, dating from the reign of Henry II., although the word "pale" was not used in this connexion until the latter part of the 14th century. The Pale varied considerably, according to the strength or weakness of the English authorities, and in the time of Henry VIII. was bounded by a line drawn from Dundalk to Kells, thence to Naas, and from Naas E. to Dalkey, embracing, that is, part of the modern counties of Dublin, Louth, Meath, and Kildare. The Pale existed until the complete subjugation of Ireland under Elizabeth; the use of the word is frequent in Tudor times. There was an "English Pale" or "Calais Pale" also in France until 1558, extending from Gravelines to Wissant, and for a short time under the Tudors an English Pale in Scotland.

In heraldry a "pale" is a band placed vertically in the centre of a shield, hence "in pale" or "to impale" is used of the marshalling of two coats side by side on a shield divided vertically.

"Pale," in the sense of colourless, whitish, of a shade of colour lighter than the normal, is derived through O. Fr. *palle*, mod. *pâle*, from Lat. *pallidus*, *pallor*, *pallere*; and in that of a baker's shovel, or "peel" as it is sometimes called, from Lat. *pala*, spade, probably connected with the root of *pandere*, to spread out.

PALEARIO, AONIO (*c.* 1500–1570), Italian humanist and reformer, was born about 1500 at Veroli, in the Roman Campagna. Other forms of his name are Antonio Della Paglia, A. Degli Pagliaricci. In 1520 he went to Rome, where he entered the brilliant literary circle of Leo X. When Charles of Bourbon stormed Rome in 1527 Paleario went first to Perugia and then to Siena, where he settled as a teacher. In 1536 his didactic poem in Latin hexameters, *De immortalitate animarum*, was published at Lyons. It is divided into three books, the first containing his proofs of the divine existence, and the remaining two the theological and philosophical arguments for immortality based on that postulate. The whole concludes with a rhetorical description of the occurrences of the Second Advent. In 1542 a tract, written by him and entitled *Della Pienezza, sufficienza, et satisfazione della passione di Christo*, or *Libellus de morte Christi*, was made by the Inquisition the basis of a charge of heresy, from which, however, he successfully defended himself. In Siena he wrote his *Actio in pontifices romanos et eorum asseclas*, a vigorous indictment, in twenty "testimonia," against what he now believed to be the fundamental error of the Roman Church in subordinating Scripture to tradition, as well as against various particular doctrines, such as that of purgatory; it was not, however, printed until after his death (Leipzig, 1606). In 1546 he accepted a professorial chair at Lucca, which he exchanged in 1555 for that of Greek and Latin literature at Milan. Here about 1566 his enemies renewed their activity, and in 1567 he was formally accused by Fra Angelo the inquisitor of Milan. He was tried at Rome, condemned to death in October 1569, and executed in July 1570.

An edition of his works (*Ant. Palearii Verulani Opera*), including four books of *Epistolae* and twelve *Orationes* besides the *De immortalitate*, was published at Lyons in 1552; this was followed by two others, at Basel, and several after his death, the fullest being that of Amsterdam, 1696. A work, entitled *Benefizio di Cristo* ("The Benefit of Christ's Death"), has been attributed to Paleario on insufficient grounds. Lives by Gurlitt (Hamburg, 1805); Young (2 vols., London, 1860); Bonnet (Paris, 1862).

PALENCIA, an inland province of Spain, one of the eight into which Old Castile was divided in 1833; bounded on the N. by Santander, E. by Burgos, S. by Valladolid, and W. by Valladolid and Leon. Pop. (1900), 192,472; area, 3256 sq. m. The surface of the province slopes gradually S. to the Duero (Douro) valley. The principal rivers are the Pisuerga and the Carrion, which unite at Dueñas and flow into the Duero at Valladolid. The chief tributaries of the Pisuerga within the province are the Arlanzon, the Burejo, the Cioza, and the united streams of the Buedo and Abanades; the Carrion is joined on the right by the Cueza. The north is traversed by the Cantabrian Mountains, the highest summit being the culminating point of the Sierra del Brezo (6355 ft.). There are extensive forests in this region and the valleys afford good pasturage. The remainder of Palencia, the "Tierra de Campos," belongs to the great Castilian table-land. In the south is a marsh or lake, known as La Laguna de la Nava. The mountainous district abounds in minerals, but only coal and small quantities of copper are worked. The province is crossed in the south-east by the trunk railway connecting Madrid with France via Irun, while the line to Santander traverses it throughout from north to south; there are also railways from the city of Palencia to Leon, and across the north from Mataporquera in Santander to La Robla in Leon. A branch of the Santander line gives access to the Orbo coal-fields. The main highways are good; the other roads often bad. The Canal de Castilla, begun in 1753, and completed in 1832, connects Alar del Rey with Valladolid. Wheat and other cereals, vegetables, hemp and flax are extensively grown, except in the mountainous districts. Flour and wine are made in large quantities, and there are manufactures of linen and woollen stuffs, oil, porcelain, leather, paper and rugs. Palencia rugs are in great demand throughout Spain. The only town with more than 5000 inhabitants is Palencia (*q.v.*).

For the history, inhabitants, &c., see CASTILE.

PALENCIA, an episcopal city, and the capital of the Spanish province of Palencia; on the left bank of the river Carrion, on the Canal de Castilla, at the junction of railways from Leon and Santander, and 7 m. N. by W. of Venta de Baños on the Madrid-Irun line. Pop. (1900), 15,940. Palencia is built in the midst of the level plains called the Tierra de Campos, 2690 ft. above sea-level. Three bridges across the Carrion afford access to the modern suburbs on the right bank. The older and by far the more important part of the city is protected on the west by the river; on the other sides the old machicolated walls, 36 ft. high by 9 ft. in thickness, are in fairly good preservation, and beautified by *alamedas* or promenades, which were laid out in 1778. The cathedral was begun in 1321, finished in 1504, and dedicated to St Antolin; it is a large building in the later and florid Gothic style of Spain. The site was previously occupied by a church erected by Sancho III. of Navarre and Castile (1026–1035) over the cave of St Antolin, which is still shown. The cathedral contains some valuable paintings, old Flemish tapestry, and beautiful carved woodwork and stonework. The church of San Miguel is a good and fairly well-preserved example of 13th-century work; that of San Francisco, of the same date, is inferior and has suffered more from modernization. The hospital of San Lazaro is said to date in part from the time of the Cid (*q.v.*), who here married Ximena in 1074.

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[1] P. Orsi in *Notizie degli Scavi* (1899), 452–471; *Römische Quartalschrift* (1898), 624–631.

Much has been done for education. Palencia has also hospitals, a foundling refuge, barracks and a bull-ring. Local industries include iron-founding, and the making of rugs, alcohol, leather, soap, porcelain, linen, cotton, wool, machinery and matches.

Palencia, the Pallantia of Strabo and Ptolemy, was the chief town of the Vaccaei. Its history during the Gothic and Moorish periods is obscure; but it was a Castilian town of some importance in the 12th and 13th centuries. The university founded here in 1208 by Alphonso IX. was removed in 1239 to Salamanca.

PALENQUE, the modern name of a deserted city in Mexico, in the narrow valley of the Otolum, in the north part of the state of Chiapas, 80 m. S. of the Gulf port of Carmen. About 30 m. away, on the left bank of the Usumacinta river, stand the ruins of Men-ché or Lorillard city. The original name of Palenque has been lost, and its present name is taken from the neighbouring village, Santo Domingo del Palenque. Unlike the dead cities of the Yucatán plains, Palenque is surrounded by wooded hills and overgrown by tropical vegetation.

There is less stone carving on the exterior walls, door jambs and pillars of the buildings than on those of the Yucatán Peninsula; this is due to the harder and more uneven character of the limestone. Probably owing to the same cause, there is less cut stone in the walls, the Palenque builders using plaster to obtain smooth surfaces. There is, however, considerable carving on the interior walls, the best specimens being on the tablets, affixed to the walls with plaster. Modelling in stucco was extensively used. A few terra-cotta images have been found. Paint and coloured washes were liberally used to cover plastered surfaces and for ornamentation, and paints seem to have been used to bind plastered surfaces. The Palenque builders apparently used nothing but stone tools in their work.

The so-called Great Palace consists of a group of detached buildings, apparently ten in number, standing on two platforms of different elevations. Some of the interior structures and the detached one on the lower southern terrace are in a fair state of preservation. The plan of construction shows three parallel walls enclosing two corridors covered with the peculiar pointed arches or vaults characteristic of Palenque. The buildings appear to have been erected at different periods. A square tower rises from a central part of the platform to a height of about 40 ft., divided into a solid masonry base and three storeys connected by interior stairways. The Temple of Inscriptions, one of the largest and best preserved, is distinguished chiefly for its tablets, which contain only hieroglyphics. Sculptured slabs form balustrades to the steps leading up to the temple, and its exterior is ornamented with figures in stucco, the outer faces of the four pillars in front having life-size figures of women with children in their arms. The small Temple of Beau Relief stands on a narrow ledge of rock against the steep slope of the mountain. Its most important feature is a large stucco bas-relief, occupying a central position on the back wall of the sanctuary. It consists of a single figure, seated on a throne, beautifully modelled both in form, drapery and ornaments, with the face turned to one side and the arms outstretched, and is reproduced by H. H. Bancroft. The temples on the east side of the Otolum are distinguished by tall narrow vaults, perforated by numerous square openings giving the appearance of coarse lattice work. The Temple of the Sun stands upon a comparatively low pyramidal foundation. The interior consists of the usual pair of vaulted corridors. The sacred tablet on the back wall of the sanctuary is carved in low relief in limestone, and consists of two figures, apparently a priest and his assistant making offerings. There are rows of hieroglyphics on the sides and over the central design. The Temple of the Cross is a larger structure of similar design and construction. The tablet belonging to this temple has excited controversy, because the design contains a representation of a Latin cross. The Temple of the Cerro, called that of the Cross No. 2, because its tablet is very similar to that just mentioned, stands back against the slope of the mountain, and is in great part a ruin. (For history and further details see CENTRAL AMERICA; § *Archaeology*.)

PALERMO (Greek, Πάνορμος; Latin, *Panhormus, Panormus*), a city of Sicily, capital of a province of the same name, in the kingdom of Italy, and the see of an archbishop. Pop. (1906), town 264,036, commune 323,747. The city stands in the N.W. of the island, on a small bay looking E., the coast forming the chord of a semicircle of mountains which hem in the *campagna* of Palermo, called the Conca d'Oro. The most striking point is the mountain of Hiercte, now called Pellegrino (from the grotto of Santa Rosalia, a favourite place of pilgrimage) at the N. of this semicircle; at the S.E. is the promontory of Zaffarano, on which stood Soluntum (*q.v.*).

A neolithic settlement and necropolis were discovered in 1897 at the foot of Monte Pellegrino, on the N.E. side (E. Salinas in *Notizie degli Scavi*, 1907, 307). Palermo has been commonly thought to be an original Phoenician settlement of unknown date (though its true Phoenician name is unknown), but Holm (*Archivio storio siciliano*, 1880, iv. 421) has suggested that the settlement was originally Greek.[1] There is no record of any Greek colonies in that part of Sicily, and Panormus certainly was Phoenician as far back as history can carry us. According to Thucydides (vi. 2), as the Greeks colonized the E. of the island, the Phoenicians withdrew to the N.W., and concentrated themselves at Panormus, Motye, and Soluntum. Like the other Phoenician colonies in the west, Panormus came under the power of Carthage, and became the head of the Carthaginian dominion in Sicily. As such it became the centre of that strife between Europe and Africa, between Aryan and Semitic man, in its later stages between Christendom and Islam, which forms the great interest of Sicilian history. As the Semitic head of Sicily, it stands opposed to Syracuse, the Greek head. Under the Carthaginian it was the head of the Semitic part of Sicily; when, under the Saracen all Sicily came under Semitic rule, it was the chief seat of that rule. It was thrice won for Europe, by Greek, Roman and Norman conquerors—in 276 B.C. by the Epirot king Pyrrhus, in 254 B.C. by the Roman consuls Aulus Atilius and Gnaeus Cornelius Scipio, and in A.D. 1071 by Robert Guiscard and his brother Roger, the first count of Sicily. After the conquest by Pyrrhus the city was soon recovered by Carthage, but this first Greek occupation was the beginning of a connexion with western Greece and its islands which was revived under various forms in later times. After the Roman conquest an attempt to recover the city for Carthage was made in 250 B.C., which led only to a great Roman victory (see PUNIC WARS). Later, in the First Punic War, Hamilcar Barca was encamped for three years on Hiercte or Pellegrino, but the Roman possession of the city was not disturbed. Panormus received the privileges of autonomy and immunity from taxation. It seems probable that at the end of the republic the coinage for the west of Sicily was struck here (Mommsen, *Röm. Münzwesen*, 665). A colony was sent here by Augustus, and the place remained of considerable importance, though inferior to Catana. A fortunate chance has preserved to us a large number of the inscriptions set up in the Forum (Mommsen, *Corpus inscr. lat.* x. 752). The town was taken by the Vandal Genseric in A.D. 440. It afterwards became a part of the East-Gothic dominion, and was recovered for the empire by Belisarius in 535. It again remained a Roman possession for exactly three hundred years, till it was taken by the Saracens in 835. Panormus now became the Moslem capital. In 1062 the Pisan fleet broke through the chain of the harbour and carried off much spoil, which was spent on the building of the great church of Pisa. After the Norman conquest the city remained for a short time in the hands of the dukes of Apulia. But in 1093 half the city was ceded to Count Roger, and in 1122 the rest was ceded to the second Roger. When he took the kingly title in 1130 it became "Prima sedes, corona regis, et regni caput."

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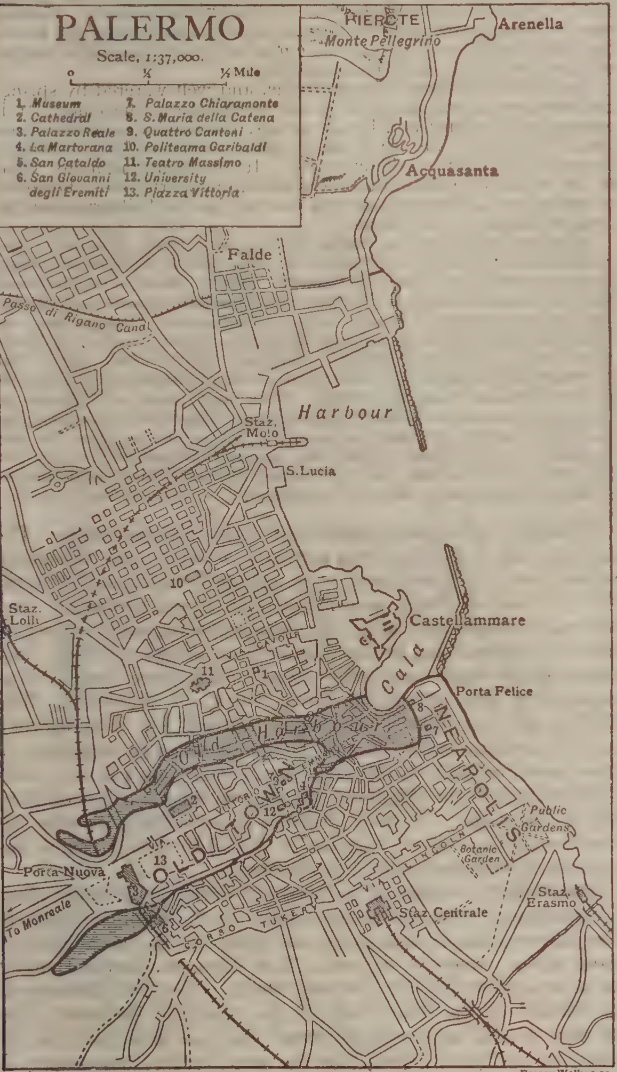
[1] The coins bearing the name of מחנת are no longer assigned to Panormus; but certain coins with the name ציץ (Ziz; about 410 B.C.) belong to it.

During the Norman reigns Palermo was the main centre of Sicilian history, especially during the disturbances in the reign of William the Bad (1154–1166). The emperor Henry VI. entered Palermo in 1194, and it was the chief scene of his cruelties. In 1198 his son Frederick, afterwards emperor, was crowned there. After his death Palermo was for a moment a commonwealth. It passed under the dominion of Charles of Anjou in 1266. In the next year, when the greater part of Sicily revolted on behalf of Conradin, Palermo was one of the few towns which was held for Charles; but the famous Vespers of 1282 put an end to the Angevin dominion. From that time Palermo shared in the many changes of the Sicilian kingdom. In 1535 Charles V. landed there on his return from Tunis. The last kings crowned at Palermo were Victor Amadeus of Savoy, in 1713, and Charles III. of Bourbon, in 1735. The loss of Naples by the Bourbons in 1798, and again in 1806, made Palermo once more the seat of a separate Sicilian kingdom. The city rose against Bourbon rule in 1820 and in 1848. In 1860 came the final deliverance, at the hands of Garibaldi; but with it came also the yet fuller loss of the position of Palermo as the capital of a kingdom of Sicily.



Site.—The original city was built on a tongue of land between two inlets of the sea. There is no doubt that the present main street, the Cassaro (Roman *castrum*, Arabic *Kasr*), Via Marmorea or Via Toledo (Via Vittorio Emmanuele), represents the line of the ancient town, with water on each side of it. Another peninsula with one side to the open sea, meeting as it were the main city at right angles, formed in Polybius's time the *Neapolis*, or new town, in Saracen times Khalesa, a name which still survives in that of Calsa. But the two ancient harbours have been dried up; the two peninsulas have met; the long street has been extended to the present coast-line; a small inlet, called the Cala, alone represents the old haven. The city kept its ancient shape till after the time of the Norman kings. The old state of things fully explains the name Πάνορμος.

There are not many early remains in Palermo. The Phoenician and Greek antiquities in the museum do not belong to the city itself. The earliest existing buildings date from the time of the Norman kings, whose palaces and churches were built in the Saracenic and Byzantine styles prevalent in the island. Of Saracen works actually belonging to the time of Saracen occupation there are no whole buildings remaining, but many inscriptions and a good many columns, often inscribed with passages from the Koran, which have been used up again in later buildings, specially in the porch of the metropolitan church. This last was built by Archbishop Walter (*fl.* 1170)—an Englishman sent by Henry II. of England as tutor to William II. of Sicily—and consecrated in 1185, on the site of an ancient basilica, which on the Saracen conquest became a mosque, and on the Norman conquest became a church again, first of the Greek and then of the Latin rite. What remains of Walter's building is a rich example of the Christian-Saracen style, disfigured, unfortunately, by the addition of a totally unsuitable dome by Ferinando Fuga in 1781–1801. This church contains the tombs of the emperor Frederick II. and his parents—massive sarcophagi of red porphyry with canopies above them—and also the royal throne, higher than that of the archbishop: for the king of Sicily, as hereditary legate of the see of Rome, was the higher ecclesiastical officer of the two. But far the best example of the style is the chapel of the king's palace (cappella palatina), at the west end of the city. This is earlier than Walter's church, being the work of King Roger in 1143. The wonderful mosaics, the wooden roof, elaborately fretted and painted, and the marble incrustation of the lower part of the walls and the floor are very fine. Of the palace itself the greater part was rebuilt and added in Spanish times, but there are some other parts of Roger's work left, specially the hall called Sala Normanna.

Alongside of the churches of this Christian-Saracen type, there is another class which follows the Byzantine type. Of these the most perfect is the very small church of San Cataldo. But the best, much altered, but now largely restored to its former state, is the adjoining church of La Martorana, the work of George of Antioch, King Roger's admiral. This is rich with mosaics, among them the portraits of the king and the founder. Both these and the royal chapel have several small cupolas, and there is a still greater display in that way in the church of San Giovanni degli Eremiti, which it is hard to believe never was a mosque. It is the only church in Palermo with a bell-tower, itself crowned with a cupola.

Most of these buildings are witnesses in different ways to the peculiar position of Palermo in the 12th century as the "city of the threefold tongue," Greek, Arabic, and Latin. King Roger's sun dial in the palace is commemorated in all three, and it is to be noticed that the three inscriptions do not translate one another. In private inscriptions a fourth tongue, the Hebrew, is also often found. For in Palermo under the Norman kings Christians of both rites, Mahommedans and Jews were all allowed to flourish after their several fashions. In Saracen times there was a Slavonic quarter on the southern side of the city, and there is still a colony of United Greeks, or more strictly Albanians.

The series of Christian-Saracen buildings is continued in the country houses of the kings which surround the city, La Favara and Mimnerno, the works of Roger, and the better known Ziza and Cuba, the works severally of William the Bad and William the Good. The Saracenic architecture and Arabic inscriptions of these buildings have often caused them to be taken for works of the ancient ameers; but the inscriptions of themselves prove their date. All these buildings are the genuine work of Sicilian art, the art which had grown up in the island through the presence of the two most civilized races of the age, the Greek and the Saracen. Later in the 12th century the Cistercians brought in a type of church which, without any great change of mere style, has a very different effect, a high choir taking in some sort the place of the cupola. The greatest example of this is the neighbouring metropolitan church of Monreale (*q.v.*); more closely connected with Palermo is the church of San Spirito, outside the city on the south side, the scene of the Vespers.

Domestic and civil buildings from the 12th century to the 15th abound in Palermo, and they present several types of genuine national art, quite unlike anything in Italy. Of palaces the finest is perhaps the massive Palazzo Chiaramonte, now used as the courts of justice, erected subsequently to 1307. One of the halls has interesting paintings of 1377–1380 on its wooden ceiling; and in the upper storey of the court is a splendid three-light Gothic window. The later houses employ a very flat arch, the use of which goes on in some of the houses and smaller churches of the Renaissance. S. Maria della Catena may be taken as an especially good example. But the general aspect of the streets is later still, dating from mere Spanish times. Still many of the houses are stately in their way, with remarkable heavy balconies. The most striking point in the city is the central space at the crossing of the main streets, called the Quattro Cantoni. Two of the four are formed by the ancient Via Marmorea, but the Via Macqueda, which supplies the other two, was cut through a mass of small streets in Spanish times.

The city walls are now to a great extent removed. Of the gates only two remain, the Porta Nuova and the Porta Felice; both are fine examples of the baroque style, the former was erected in 1584 to commemorate the return of Charles V. fifty years earlier, the latter in 1582. Outside the walls new quarters have sprung up of recent years, and the Teatro Massimo and the Politeama Garibaldi; the former (begun by G. B. Basile and completed by his son in 1897) has room for 3200 spectators and is the largest in Italy.

The museum of Palermo, the richest in the island, has been transferred from the university to the former monastery of the Filippini. Among the most important are the objects from prehistoric tombs and the architectural fragments from Selinus, including several metopes with reliefs, which are of great importance as illustrating the development of Greek sculpture. None of the numerous Greek vases and terra-cottas is quite of the first class, though the collection is important. The bronzes are few, but include the famous ram from Syracuse. There is also the Casuccini collections of Etruscan sarcophagi, sepulchral urns and pottery. Almost the only classical antiquities from Palermo itself are Latin inscriptions of the imperial period, and two large coloured mosaics with figures found in the Piazza Vittoria in front of the royal palace in 1869: in 1906 excavations in the same square led to the discovery of a large private house, apparently of the 2nd or 3rd century A.D., to which these mosaics no doubt belonged. Of greater local interest are the medieval and Renaissance sculptures from Palermo itself, a large picture gallery, and an extensive collection of Sicilian majolica, &c.

The university, founded in 1779, rose to importance in recent years (from 300 students in 1872 to 1495 in 1897), but has slightly lost in numbers since. The city wears a prosperous and busy appearance. The Marina, or esplanade at the south of the town, affords a fine sea front with a view of the bay; near it are beautiful public gardens. In the immediate neighbourhood of the city are the oldest church in or near Palermo, the Lepers' church, founded by the first conqueror or deliverer, Count Roger, and the bridge over the forsaken stream of the Oreto, built in King Roger's day by the admiral George. There are also some later medieval houses and towers of some importance. These all lie on to the south of the city, towards the hill called Monte Griffone (Griffon-Greek), and the Giant's Cave, which has furnished rich stores for the palaeontologist. On the other side, towards Pellegrino, is the new harbour of Palermo, round which a new quarter has sprung up, including a yard capable of building ships up to 475 ft. in length, and a dry dock for vessels up to 563 ft.

The steamship traffic at Palermo in 1906 amounted to 2035 vessels, with a total tonnage of 2,403,851 tons. Palermo is one of the two headquarters (the other being Genoa) of the Navigazione Generale Italiana, the chief Italian steamship company. The principal imports were 36,567 tons of timber (a large increase on the normal figures), 21,401[1] tons of wheat and 151,360 tons of coal; while the chief exports were 116,400 gallons of wine, 37,835 tons of sumach and 122,023 tons of oranges and lemons. Finding most of its valuable rates hypothecated to the meeting of old debts, the municipality of Palermo has embarked upon municipal ownership and trading in various directions.

The plain of Palermo is very fertile, and well watered by springs and streams, of the latter of which the Oreto is the chief. It is planted with orange and lemon groves, the products of which are largely exported, and with many palm-trees, the fruit of which, however, does not attain maturity. It also contains many villas of the wealthy inhabitants of Palermo, among the most beautiful of which is La Favorita, at the foot of Monte Pellegrino on the west, belonging to the Crown.

AUTHORITIES—Besides works dealing with Sicily generally, the established local work on Palermo is *Descrizione di Palermo antico*, by Salvatore Morso (2nd ed., Palermo, 1827). Modern research and criticism have been applied in *Die mittelälterliche Kunst in Palermo*, by Anton Springer (Bonn, 1869); *Historische Topographie von Panormus*, by Julius Schubring (Lübeck, 1870); *Studii di storia palermitana*, by Adolf Holm (Palermo, 1880). See also "The Normans in Palermo," in the third series of *Historical Essays*, by E. A. Freeman (London, 1879). The description of Palermo in the second volume of Gselfel's guide-book, *Unter-Italien und Sicilien* (Leipzig), leaves nothing to wish for. Various articles in the *Archivio storico siciliano* and the series of *Documenti per servire alla storia della Sicilia*, both published by the Società siciliana per la storia patria, may also be consulted. (E. A. F.; T. As.)

PALES, an old Italian goddess of flocks and shepherds. The festival called Parilia (less correctly Palilia) was celebrated in her honour at Rome and in the country on the 21st of April. In this festival Pales was invoked to grant protection and increase to flocks and herds; the shepherds entreated forgiveness for any unintentional profanation of holy places of which their flocks might have been guilty, and leaped three times across bonfires of hay and straw (Ovid, *Fasti*, iv. 731–805). The Parilia was not only a herdsmen's festival, but was regarded as the birthday celebration of Rome, which was supposed to have been founded on the same day. Pales plays a very subordinate part in the religion of Rome, even the sex of the divinity being uncertain. A male Pales was sometimes spoken of, corresponding in some respects to Pan; the female Pales was associated with Vesta and Anna Perenna.

PALESTINE, a geographical name of rather loose application. Etymological strictness would require it to denote exclusively the narrow strip of coast-land once occupied by the Philistines, from whose name it is derived. It is, however, conventionally used as a name for the territory which, in the Old Testament, is claimed as the inheritance of the pre-exilic Hebrews; thus it may be said generally to denote the southern third of the province of Syria. Except in the west, where the country is bordered by the Mediterranean Sea, the limit of this territory cannot be laid down on the map as a definite line. The modern subdivisions under the jurisdiction of the Ottoman Empire are in no sense conterminous with those of antiquity, and hence do not afford a boundary by which Palestine can be separated exactly from the rest of Syria in the north, or from the Sinaitic and Arabian deserts in the south and east; nor are the records of ancient boundaries sufficiently full and definite to make possible the complete demarcation of the country. Even the convention above referred to is inexact: it includes the Philistine territory, claimed but never settled by the Hebrews, and excludes the outlying parts of the large area claimed in Num. xxxiv. as the Hebrew possession (from the "River of Egypt" to Hamath). However, the Hebrews themselves have preserved, in the proverbial expression "from Dan to Beersheba" (Judg. xx. 1, &c.), an indication of the normal north-and-south limits of their land; and in defining the area of the country under discussion it is this indication which is generally followed.

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[1] The figures for 1905 (40,005 tons, almost entirely from Russia) were abnormally high, while those for 1906 are correspondingly below the average.

Taking as a guide the natural features most nearly corresponding to these outlying points, we may describe Palestine as the strip of land extending along the eastern shore of the Mediterranean Sea from the mouth of the Litany or Kasimiya River (33° 20′ N.) southward to the mouth of the Wadi Ghuzza; the latter joins the sea in 31° 28′ N., a short distance south of Gaza, and runs thence in a south-easterly direction so as to include on its northern side the site of Beersheba. Eastward there is no such definite border. The River Jordan, it is true, marks a line of delimitation between Western and Eastern Palestine; but it is practically impossible to say where the latter ends and the Arabian desert begins. Perhaps the line of the pilgrim road from Damascus to Mecca is the most convenient possible boundary. The total length of the region is about 140 m.; its breadth west of the Jordan ranges from about 23 m. in the north to about 80 m. in the south. According to the English engineers who surveyed the country on behalf of the Palestine Exploration Fund, the area of this part of the country is about 6040 sq. m. East of the Jordan, owing to the want of a proper survey, no figures so definite as these are available. The limits adopted are from the south border of Hermon to the mouth of the Mojib (Arnon), a distance of about 140 m.: the whole area has been calculated to be about 3800 sq. m. The territory of Palestine, Eastern and Western, is thus equal to rather more than one-sixth the size of England.

There is no ancient geographical term that covers all this area. Till the period of the Roman occupation it was subdivided into independent provinces or kingdoms, different at different times (such as Philistia, Canaan, Judah, Israel, Bashan, &c.), but never united under one collective designation. The extension of the name of Palestine beyond the limits of Philistia proper is not older than the Byzantine Period.

Physical Features.—Notwithstanding its small size, Palestine presents a variety of geographical detail so unusual as to be in itself sufficient to mark it out as a country of especial interest. The bordering regions, moreover, are as varied in character as is the country itself—sea to the west, a mountainous and sandy desert to the south, a lofty steppe plateau to the east, and the great masses of Lebanon to the north. In describing the general physical features of the country, the most significant point to notice is that (though it falls westward to the sea and rises eastward to an elevated plain) the rise from west to east is not continuous, but is sharply interrupted by the deep fissure of the Ghor or Jordan valley; which, running from north to south—for the greater part of its length depressed below sea-level—forms a division in the country of both physical and political importance. In this respect the function of the river Jordan in Palestine offers a strange contrast, often remarked upon, to that of the Nile in Egypt. The former is of no use for irrigation, except in the immediate neighbourhood of its banks, and is a barrier to cross which involves the labour of a considerable ascent at any point except its most northern section. The latter is at once the great fertilizer and the great highway of the country which it serves.

Western Palestine is a region intersected by groups of mountain peaks and ranges, forming a southern extension of the Lebanon system and running southward till they finally lose themselves in the desert. The watershed of this system is so placed that from two-thirds to three-fourths of the country is on its western side. This fact, taken in connexion with the great depth of the depression of the Ghor below the Mediterranean—already 682 ft. at the Sea of Galilee—has a peculiar effect on the configuration of the country. On the west side the slope is gradual, especially in the broad plain that skirts the coast for the greater part of its length; on the east side it is steep—precipitous indeed, towards the southern end—and intersected by valleys worn to a tremendous depth by the force of the torrents that once ran down them.

This territory of Western Palestine divides naturally into two longitudinal strips—the maritime plain and the mountain region. These it will be convenient to consider separately.

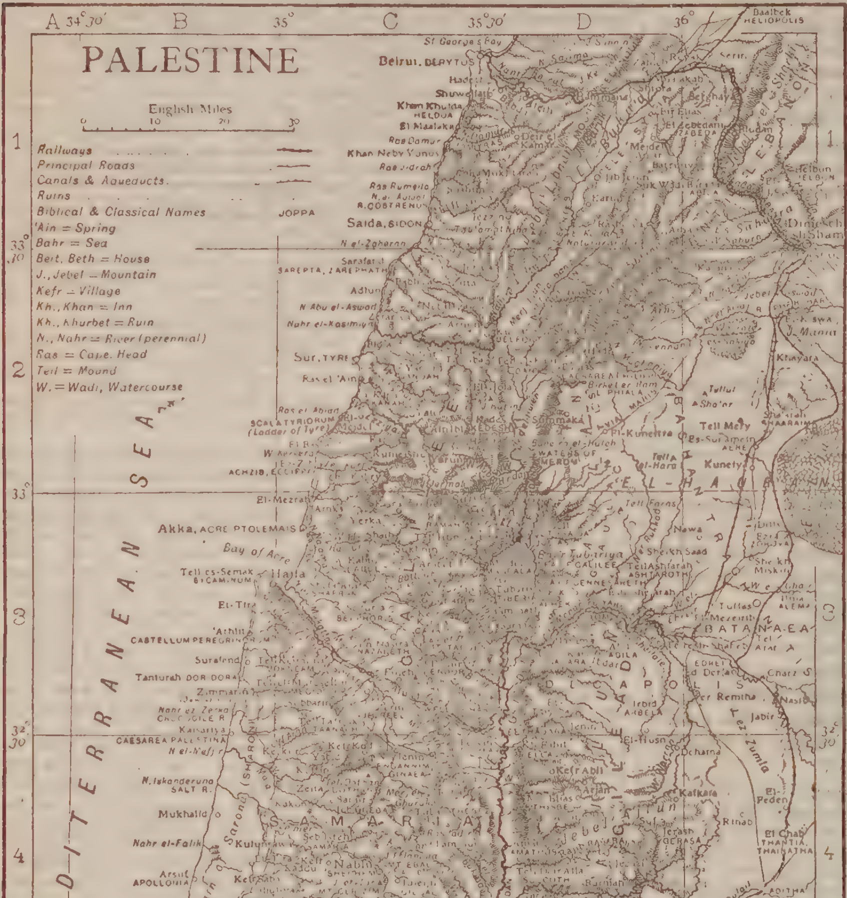
I. *The Maritime Plain*, which, with a few interruptions, extends along the Mediterranean coast from Lebanon to Egypt, is a strip of land of remarkable fertility. It is formed of raised beaches and sea-beds, ranging from the Pliocene period downwards, and resting on Upper Eocene sandstone. It varies greatly in width. At the mouth of the Kasimiya it is some 4 m. across, and this breadth it maintains to a short distance south of Tyre, where it suddenly narrows; until, at Ras el-Abiad, it has been necessary to cut a passage in the precipitous face of the cliff to allow the coast-road to be carried past it. This ancient work is the well-known "Ladder of Tyre." South of this promontory the plain begins to widen again; on the latitude of Acre (Akka), from which this part of the plain takes its name, it is from 4 to 5 m. across; while farther south, at Haifa, it is of still greater width, and opens into the extensive Merj Ibn ʽAmir (Plain of Esdraelon) by which almost the whole of Western Palestine is intersected. South of Haifa the promontory of Carmel once more effaces the plain; here the passage along the coast is barely 200 yds. in width. At ʽAthlit, 9 m. to the south, it is about 2 m.; from this point it expands uniformly to about 20 m., which is the breadth at the latitude of Ascalon. South of this it is shut in and broken up by groups of low hills. From the Kasimiya southwards the maritime plain is crossed by numerous river-beds, with a few exceptions winter torrents only. Among the perennial streams may be mentioned the Naʽaman, south of Acre; the Mukattaʽ Kishon, at Haifa; the Nahr ez-Zerka, sometimes called the Crocodile River—so named from the crocodiles still occasionally to be seen in it; the Nahr el-Falik; the ʽAujeh a few miles north of Jaffa and the Nahr Rubin. The surface of the plain rises gradually from the coast inland to an altitude of about 200 ft. It is here and there diversified by small hills.

II. *The Mountain Region*, the great plain of Esdraelon, which forms what from the earliest times has been recognized to be the easiest entrance to the interior of the country, cuts abruptly through the mountain system, and so divides it into two groups. Each of these may be subdivided into two regions presenting their own special peculiarities.

a. The Galilean Mountains, north of the plain of Esdraelon, fall into two regions, divided by a line joining Acre with the north end of the Sea of Galilee. The northern region (Upper Galilee) is virtually an outlier of the Lebanon Mountains. At the north end is an elevated plateau, draining into the Kasimiya. The mountains are intersected by a complex system of valleys, of which some thirty run down to the Mediterranean. The face toward the Jordan valley is lofty and steep. The highest point is Jebel Jermak, 3934 ft. above the sea; about it, on the eastern and northern sides, are lofty plateaus. The region is fruitful, and in places well wooded; it is beyond question the most picturesque part of Palestine. The southern region (Lower Galilee) shows somewhat different characteristics. It consists of chains of comparatively low hills, for the greater part running east and west, enclosing a number of elevated plains. The principal of these plains is El-Buttauf, a tract 400 to 500 ft. above sea-level, enclosed within hills 1700 ft. high and measuring 9 m. east to west and 2 m. north to south. It is marshy at its eastern end and very fertile. This is the plain of Zebulun or Asochis, of antiquity. The plain of Turʽan, south-east of El-Buttauf, is smaller, but equally fertile. Among the principal mountains of this district may be named Jebel Turʽan, 1774 ft. and Jebel et-Tur (Tabor) 1843 ft.; the latter is an isolated mass of regular shape which commands the plain of Esdraelon. Eastward the country falls to the level of the Ghor by a succession of steps, among which the lava-covered Sahel el-Ahma may be mentioned, which lies west of the cliffs overhanging the Sea of Galilee. The chief valleys of this region are the Nahr Naʽaman and its branches, which runs into the sea south of Acre, and the Wadi Mukattaʽ, or Kishon, which joins the sea at Haifa. On the east may be mentioned the Wadi er-Rubadiya, Wadi el-Hamam and Wadi Fajjas, flowing into the Sea of Galilee or else into the Jordan.

b. The great plain of Esdraelon is one of the most important and striking of the natural features of Western Palestine. It is a large triangle, having its corners at Jenin, Jebel et-Tur, and the outlet of the Wadi Mukattaʽ, by which last it communicates with the sea-coast. On the south-west it is bounded by the range of hills that terminates in the spur of Carmel. The modern name, as above-mentioned, is Merj Ibn ʽAmir ("the meadow-land of the son of ʽAmir"); in ancient times it was known as the Valley of Jezreel, of which name Esdraelon is a Greek corruption; and by another name (Har-Magedon) derived from that of the important town of Megiddo—it is referred to symbolically in Rev. xvi. 16. It is the great highway, and also the great battlefield, of Palestine. At the village of Afuleh its altitude is 260 ft. above the sea-level. In winter it is swampy, and in places almost impassable. The fertility of this region is proverbial. There are several small subsidiary plains that extend from it both north and south into the surrounding mountain region; of these we need only mention a broad valley running north-eastwards between Jebel Duhi, a range 15 m. long and 1690 ft. high, on the one side, and Mt Tabor and the hills of Nazareth on the other side. East of the watershed are a number of valleys running to the Ghor; the most remarkable of these are the Wadi el-Bireh and the Wadi Jalud, the latter containing the river that flows from the fine spring called ʽAin Jalud.

c. The second of the divisions into which we have grouped the mountain system lies south of the plain of Esdraelon. This is divisible into the districts of Samaria and Judaea. In the first of these the mountain ranges are complex, appearing to radiate from a centre at which lies Merj el-Ghuruk, a small plain about 4 m. east to west and 2 m. north to south. This plain has no outlet and is marshy in the rainy season. Connected with it are other small plains unnecessary to enumerate. For the greater part the principal mountains are near the watershed; they include Jebel Fuku'a (Gilboa), a range that forms the watershed at the eastern extremity of the plain of Esdraelon. The range of Carmel (highest point 1810 ft.) must also be included in this district; it runs from the central point above mentioned—though interrupted by many passes—to the end of the promontory which makes the harbour of Haifa, at its foot, the best on the Palestine coast. The highest mountains in the Samaria district are, however, in the neighbourhood of Nablus (Shechem). They include the rugged bare mass of Gerizim (2849 ft.), the smoother cactus-clad cone of Ebal (3077), and farther south Tell 'Asur (3318) at which point begins the Judaean range. On the eastern side of the watershed the most important feature is perhaps the great valley system that connects the Mukhnah (the plain south of Nablus) with the Ghor—beginning with the impressive Wadi Bilan and proceeding through the important and abundantly watered Wadi Far'a. Tell 'Asur stands a short distance north of Beitein (Bethel). South of it is the long zigzag range known as Jebel el-Kuds, named from Jerusalem (el-Kuds) the chief town built upon it. The highest point is Neby Samwil (Mizpah), 2935 ft. above the sea, north of Jerusalem. This city itself stands at an altitude of 2500 ft. To the south of it begins the subdivision of the Judaean mountains now known as Jebel el-Khalil, from Hebron (el-Khalil), which stands in an elevated basin some 500 ft. above the altitude of Jerusalem; it is here that the Judaean Mountains attain their greatest height. South of Hebron the ridge gradually becomes lower, and finally breaks up and loses itself in the southern desert.


PALESTINE
English Miles
0 10 20 30
Railways
Principal Roads
Canals & Aqueducts
Ruins
Biblical & Classical Names JOPPA
'Ain = Spring
Bahr = Sea
Beit, Beth = House
J., Jebel = Mountain
Kefr = Village
Kh., Khan = Inn
Kh., Khurbet = Ruin
N., Nahr = River (perennial)
Ras = Cape, Head
Tell = Mound
W. = Wadi, Watercourse
MEDITERRANEAN SEA
A 34°30′
B
35°
C
35°30′
D
36°
E
Long. E. 35° of Greenwich
Beirut, BERYTUS
Saida, SIDON
Sur, TYRE
Akka, ACRE PTOLEMAIS
Bay of Acre
Haifa
CAESAREA PALESTINA
Jaffa JOPPA
Ramleh
el-Kuds JERUSALEM
Nablus
SAMARIA
JUDAEA
GALILEE
Es-Salt
Dead Sea
Gaza
Askalan ASCALON
Bir es-Seba BEERSHEBA
Baalbek HELIOPOLIS
Kerak

On the west side of the watershed the mountainous district extends about half way to the sea, broken by deep valleys and passes. Among these the most important are the Wadi Selman (Valley of Aijalon) which seems to have been the principal route to Jerusalem in ancient times; the Wadi Isma'in south of this, along which runs the modern carriage road from Jaffa to Jerusalem; and the Wadi es-Surar, a higher section of the bed of the Nahr Rubin, along which now runs the railway line; farther to the south we may mention the Wadi es-Sunt, which opens up the country from Tell es-Safi (Gath?) eastward.

Between the mountainous country of Judaea and the maritime plain is an undulating region anciently known as the Shephelah. It is composed of horizontal strata of limestone, forming groups of hills intersected by a network of small and fertile valleys. In this region, which is of great historical importance, are the remains of many ancient cities. The adjacent part of the maritime plain is composed of a rich, light brown loamy soil. Although cultivated with most primitive appliances, and with little or no attempt at irrigation or artificial fertilization, the average yield is eight- to twelve-fold annually. This part of the plain is (in European nomenclature) divided into two at about the latitude of Jaffa, that to the north being the plain of Sarona (Sharon), the southern half being the plain of the Philistines.

On the east side of the watershed the ground slopes rapidly from its height of 2500 ft. above sea-level to a maximum depth of 1300 ft. below sea-level, within a distance of about 20 m. It is a waste, destitute of water and with but scanty vegetation. It has never been brought into cultivation; but in the first Christian centuries the caves in its valleys were the chosen refuge of Christian monasticism. It descends to the level of the Ghor by terraces, deeply cut through by profound ravines such as the Wadi es-Suweinit, Wadi Kelt, Wadi ed-Dabr, Wadi en-Nar (Kedron) and Wadi el 'Areijeh.

The southern district, which includes the white marl region of Beersheba, was in ancient times called the Negeb. It is a wide steppe region which (though it contains many remains of ancient towns and settlements, and was evidently at one time a territory of great importance) is now almost entirely inhabited by nomads. It should, however, be mentioned that the Turkish government has developed a town at Beersheba, under the jurisdiction of a Kaimmakam (lieutenant-governor), since the beginning of the 20th century.

The Ghor or Jordan valley is treated in a separate article (see JORDAN). There has been no systematic survey of Eastern Palestine such as was carried out in Western Palestine between 1875 and 1880 by the officers of the Palestine Exploration Fund. A good deal of work has been done by individual travellers, but the material for a full description of its physical character is as yet lacking. Two great rivers, the Yarmuk (Hieromax) and the Zerka (Jabbok), divide Eastern Palestine into three sections, namely Hauran (BASHAN, *q.v.*) with the Jaulan west of it; Jebel Ajlun (GILEAD, *q.v.*); and the Belk'a (the southern portion of Gilead and the ancient territory of the tribe of Reuben). The latter extends southward to the Mojib, which, as we have already seen, is the southern boundary of Eastern Palestine.

It is a matter of dispute whether Hauran should be included within Palestine proper, accepting its definition as the "ancient Hebrew territory." It is a large volcanic region, entirely covered with lava and other igneous rocks. Two remarkable rows of these run in lines from north to south, through the region of the Jaulan parallel to the Ghor, and from a long distance are conspicuous features in the landscape. The soil is fertile, and there are many remains of ancient wealth and civilization scattered over its surface. South of the Yarmuk the formation is Cretaceous, Hauran basalt being found only in the eastern portion. That region is much more mountainous than Hauran. South of the Zerka the country culminates in Jebel 'Osha, a peak of Jebel Jil'ad ("the mountain of Gilead"), 3596 ft. high. From this point southward the country assumes the appearance which is familiar to those who have visited Jerusalem—an elevated plateau, bounded on the west by the precipitous cliffs known as the mountains of Moab, with but a few peaks, such as Jebel Shihan (2781 ft.) and Jebel Neba (Nebo, 2643 ft.), conspicuous above the level of the ridge by reason of superior height.

Geology.—The oldest rocks consist of gneiss and schist, penetrated by dikes and bosses of granite, syenite, porphyry and other intrusive rocks. All of these are pre-Carboniferous in age and most of them probably belong to the Archean period. They are generally concealed by later deposits, but are exposed to view along the eastern margin of the Wadi Araba, at the foot of the plateau of Edom. Similar rocks occur also at one or two places in the desert of et-Tih, while towards the south they attain a greater extension, forming nearly the whole of Sinai and of the hills on the east side of the Gulf of Akaba. These ancient rocks, which form the foundation of the country, are overlaid unconformably by a series of conglomerates and sandstones, generally unfossiliferous and often red or purple in colour, very similar in character to the Nubian sandstone of Upper Egypt. In the midst of this series there is an inconstant band of fossiliferous limestone, which has been found in the Wadi Nasb and at other places on the southern border of et-Tih, and also along the western escarpment of the Edom plateau. The fossils include *Syringopora*, *Zaphrentis*, *Productus*, *Spirifer*, &c., and belong to the Carboniferous. The sandstone which lies below the limestone is also, no doubt, of Carboniferous age; but the sandstone above is conformably overlaid by Upper Cretaceous beds and is generally referred to the Lower Cretaceous. No unconformity, however, has yet been detected anywhere in the sandstone series, and in the absence of fossils the upper sandstone may represent any period from the Carboniferous to the Cretaceous. The Upper Cretaceous is represented by limestones with bands of chert, and contains Ammonites, Baculites, Hippurites and other fossils. It covers by far the greater part of Palestine, capping the table-lands of Moab and Edom, and forming most of the high land between the Jordan and the Mediterranean. It is overlaid towards the west by similar limestones, which contain nummulites and belong to the Eocene period; and these are followed near the coast by the calcareous sandstone of Philistia, which is referred by Hull to the Upper Eocene. Lava flows of basic character, belonging to the Tertiary period, cover extensive areas in Jaulan and Hauran; and smaller patches occur in the land of Moab and also west of the Jordan, especially near the Sea of Gennesareth. Of Recent deposits the most interesting are the raised beaches near the coast and the terraces of the Jordan-Araba depression. The latter indicate that at one period nearly the whole of this depression was filled with water up to a level somewhat above that of the Mediterranean.

The geological structure of the country is very simple in its broad features, but of exceptional interest. In general the stratified deposits lie nearly flat and in regular conformable succession, the lowest resting upon the floor of ancient crystalline rocks. There is, however, a slight dip towards the west, so that the newest deposits lie near the coast. Moreover, along the eastern side of the Jordan-Araba valley there is a great fault, and on the eastern side of this fault the whole series of rocks stands at a much higher level than on the west. Consequently, west of the Jordan almost the whole country is formed of the newer beds (Upper Cretaceous and later), while east of the Jordan the older rocks, sometimes down to the Archean floor, are exposed at the foot of the plateau. The western margin of the valley is possibly defined by another fault which has not yet been detected; but in any case it is clear that the great depression owes its extraordinary depth to faulting. A line of depressions of similar character has been traced by E. Suess as far south as Lake Nyasa.[1]

Climate.—Palestine belongs to the sub-tropical zone: at the summer solstice the sun is ten degrees south of the zenith. The length of the day ranges from ten to fourteen hours. The great variety of altitude and of surface characteristics gives rise to a considerable number of local climatic peculiarities. On the maritime plain the mean annual temperature is 70° F., the normal extremes being about 50° to about 90°. The harvest ripens about a fortnight earlier than among the mountains. Citrons and oranges flourish, as do melons and palms: the latter do not fruit abundantly, but this is less the fault of climate than of carelessness in fertilization. The rainfall is rather lower than among the mountains. In the mountainous regions the mean annual temperature is about 62°, but there is a great range of variation. In winter there are often several degrees of frost, though snow very rarely lies for more than a day or two. In summer the thermometer occasionally registers as much as 100° in the shade, or even a degree or two more: this however is exceptional, and 80°–90° is a more normal maximum for the year. The rainfall is about 28 in., sometimes less, and in exceptional years as much as 10 in. in excess of this figure has been registered. The vine, fig and olive grow well in this region. The climate of the Ghor, again, is different. Here the thermometer may rise as high as 130°. The rainfall is scanty, but as no civilized person inhabits the southern end of the Jordan valley throughout the year, and it has hitherto proved impossible to establish self-registering instruments, no systematic meteorological observations have been taken. In Eastern Palestine there is even a greater range of temperature; the loftier heights are covered in winter with snow. The thermometer may range within twenty-four hours from freezing-point to 80°.

The rainy season begins about the end of November, usually with a heavy thunderstorm: the rain at this part of the year is the "former rain" of the Old Testament. The earth, baked hard by the summer heat, is thus softened, and ploughing begins at once. The wettest month, as indicated by meteorological observation, is January; February is second to it, and December third; March is also a very wet month. In April the rains come to an end (the "latter rains") and the winter crops receive their final fertilization. The winter crops (barley and wheat) are harvested from April to June. The summer crops (millet, sesame, figs, melons, grapes, olives, &c.) are fertilized by the heavy "dews," which are one of the most remarkable climatic features of the country and to a large extent atone for the total lack of rain for one half the year. These crops are harvested from August to October.

Water Supply.—Notwithstanding the long drought, it must not be supposed that Palestine is a waterless country, except in certain districts. There are very few spots from which a spring of some sort is not accessible. Perennial streams are, and in the recent geological ages always have been, rare in the country. The whole face of the land is pitted with ancient cisterns; indeed, many hillsides and fields are on that account most dangerous to walk over by night, except for those who are thoroughly familiar with the landmarks. These cisterns are bell-shaped or bottle-shaped excavations, with a narrow circular shaft in the top, hollowed in the rock and lined with cement. Besides these, more ambitious works are to be found, all now more or less ruined, in various parts of the country (see AQUEDUCTS: *Ancient*). Such are the aqueducts, of which remains exist at Jericho, Caesarea and other places east and west of the Jordan; but especially must be mentioned the enormous reservoirs known as Solomon's Pools, in a valley between Jerusalem and Hebron, by which the former city was supplied with water through an elaborate system of conduits. Many of these aqueducts, as well as countless numbers of now leaky cisterns, could with but little trouble be brought into use again, and would greatly enhance the fertility of the country. The most abundant springs in Palestine are the sources of the Jordan at Banias and at Tell el-Kadi. A considerable number of springs in the country are brackish, being impregnated with chemicals of various kinds or (when near a town) with sewage. The latter is the case of the Virgin's Fountain (Ain Umm ed-Daraj), which is the only natural source of water in the neighbourhood of Jerusalem.

Hot springs are found in various parts of the country, especially at El-Hamma, about 1 m. south of Tiberias, where the water has a temperature of 140° F. This is still used for curative purposes, as it was in the days of Herod, but it is neglected and dirty. The spring of the Zerka Ma'in (Calirrhoe) has a temperature of 142° F. There are also hot sulphur springs on the west side of the Dead Sea. Those of El-Hamma, below Gadara, are from 104° to 120° F. in temperature.

Fauna.—It has been calculated that about 595 different species of vertebrate animals are recorded or still to be found in Palestine—about 113 being mammals (including a few now extinct), 348 birds (including 30 species peculiar to the country), 91 reptiles and 43 fishes. Of the invertebrata the number is unknown, but it must be enormous. The most important domestic animals are the sheep and the goat; the breed of oxen is small and poor. The camel, the horse and the donkey are the draught animals; the flesh of the first is eaten by the poorer classes, as is also occasionally that of the second. The dogs, which prowl in large numbers round the streets of towns and villages, are scarcely domesticated; much the same is true of the cats. Wild cats, cheetahs and leopards are found, but they are now rare, especially the latter. The lion, which inhabited the country in the time of the Hebrews, is now extinct. The most important wild animals are the hyena, wolf (now comparatively rare), fox and jackal. Bats, various species of rodents, and gazelles are very common, as is the ibex in the valleys of the Dead Sea. Among the most characteristic birds may be mentioned eagles, vultures, owls, partridges, bee-eaters and hoopoes; singing birds are on the whole uncommon. Snakes—many of them venomous—are numerous, and there are many varieties of lizards. The crocodile is seen (but now very rarely) in the Nahr ez-Zerka. Scorpions and large spiders are a universal pest.

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[1] See Lortet, *La Mer Morte* (Paris, 1877); E. Hull, *Mount Seir, Sinai and Western Palestine* (London, 1885); and *Memoir on the Geology and Geography of Arabia Petraea, Palestine and adjoining Districts* (London, 1886).

Flora.—The flora of Palestine has a considerable range and variety, owing to the variation in local climatic conditions. In the Jordan valley the vegetation has a semi-tropical character, consonant with the great heat, which here is normal. The coast-plain has another type, *i.e.* the ordinary vegetation of the Mediterranean littoral. In the mountains the flora is, naturally, scantier than in these two more favoured regions, but even here there is a rich variety. In all parts of the country the contrast between the landscape in early spring and later, when the cessation of rains and the increase of heat has burnt up the vegetation, is very remarkable.

Population.—The inhabitants of Palestine are composed of a large number of elements, differing widely in ethnological affinities, language and religion. It may be interesting to mention, as an illustration of their heterogeneousness, that early in the 20th century a list of no less than fifty languages, spoken in Jerusalem as vernaculars, was there drawn up by a party of men whose various official positions enabled them to possess accurate information on the subject.[1] It is therefore no easy task to write concisely and at the same time with sufficient fullness on the ethnology of Palestine.

There are two classes into which the population of Palestine can be divided—the nomadic and the sedentary. The former is especially characteristic of Eastern Palestine, though Western Palestine also contains its full share. The pure Arab origin of the Bedouins is recognized in common conversation in the country, the word "Arab" being almost restricted to denote these wanderers, and seldom applied to the dwellers in towns and villages. It should be mentioned that there is another, entirely independent, nomad race, the despised Nowar, who correspond to the gipsies or tinkers of European countries. These people live under the poorest conditions, by doing smith's work; they speak among themselves a Romani dialect, much contaminated with Arabic in its vocabulary.

The sedentary population of the country villages—the fellahin, or agriculturists—is, on the whole, comparatively unmixed; but traces of various intrusive strains assert themselves. It is by no means unreasonable to suppose that there is a fundamental Canaanite element in this population: the "hewers of wood and drawers of water" often remain undisturbed through successive occupations of a land; and there is a remarkable correspondence of type between many of the modern fellahin and skeletons of ancient inhabitants which have been recovered in the course of excavation. New elements no doubt came in under the Assyrian, Persian and Roman dominations, and in more recent times there has been much contamination. The spread of Islam introduced a very considerable Neo-Arabian infusion. Those from southern Arabia were known as the Yaman tribe, those from northern Arabia the Kais (Qais). These two divisions absorbed the previous peasant population, and still nominally exist; down to the middle of the 19th century they were a fruitful source of quarrels and of bloodshed. The two great clans were further subdivided into families, but these minor divisions are also being gradually broken down. In the 19th century the short-lived Egyptian government introduced into the population an element from that country which still persists in the villages. These newcomers have not been completely assimilated with the villagers among whom they have found a home; the latter despise them, and discourage intermarriage.

Some of the larger villages—notably Bethlehem—which have always been leavened by Christianity, and with the development of industry have become comparatively prosperous, show tangible results of these happier circumstances in a higher standard of physique among the men and of personal appearance among the women. It is not uncommon in popular writings to attribute this superiority to a crusader strain—a theory which no one can possibly countenance who knows what miserable degenerates the half-breed descendants of the crusaders rapidly became, as a result of their immoral life and their ignorance of the sanitary precautions necessary in a trying climate.

The population of the larger towns is of a much more complex nature. In each there is primarily a large Arab element, consisting for the greater part of members of important and wealthy families. Thus, in Jerusalem, much of the local influence is in the hands of the families of El-Khalidi, El-Husseini and one or two others, who derive their descent from the heroes of the early days of Islam. The Turkish element is small, consisting exclusively of officials sent individually from Constantinople. There are very large contingents from the Mediterranean countries, especially Armenia, Greece and Italy, principally engaged in trade. The extraordinary development of Jewish colonization has since 1870 effected a revolution in the balance of population in some parts of the country, notably in Jerusalem. There are few residents in the country from the more eastern parts of Asia—if we except the Turkoman settlements in the Jaulan, a number of Persians, and a fairly large Afghan colony that since 1905 has established itself in Jaffa. The Mutāwileh (Motawila), who form the majority of the inhabitants of the villages north-west of Galilee, are probably long-settled immigrants from Persia. Some tribes of Kurds live in tents and huts near Lake Huleh. If the inmates of the countless monastic establishments be excluded, comparatively few from northern or western Europe will remain: the German "Templar" colonies being perhaps the most important. There must also be mentioned a Bosnian colony established at Caesarea Palestina, and the Circassian settlements placed in certain centres of Eastern Palestine by the Turkish government in order to keep a restraint on the Bedouin: the latter are also found in Galilee. There was formerly a large Sudanese and Algerian element in the population of some of the large towns, but these have been much reduced in numbers since the beginning of the 20th century: the Algerians however still maintain themselves in parts of Galilee.

The most interesting of all the non-Arab communities in the country, however, is without doubt the Samaritan sect in Nablus (Shechem); a gradually disappearing body, which has maintained an independent existence from the time when they were first settled by the Assyrians to occupy the land left waste by the captivity of the kingdom of Israel.

The total population of the country is roughly estimated at 650,000, but no authentic official census exists from which satisfactory information on this point is obtainable. Some two-thirds of this number are Moslems, the rest Christians of various sects, and Jews. The largest town in Palestine is Jerusalem, estimated to contain a population of about 60,000. The other towns of above 10,000 inhabitants are Jaffa (45,000), Gaza (35,000), Safed (30,000), Nablus (25,000), Kerak (20,000), Hebron (18,500), Es-Salt (15,000), Acre (11,000), Nazareth (11,000).

The above remarks apply to the permanent population. They would be incomplete without a passing word on the non-permanent elements which at certain seasons of the year are in the principal centres the most conspicuous. Especially in winter and early spring crowds of European and American tourists, Russian pilgrims and Bokharan devotees jostle one another in the streets in picturesque incongruity.

Political Divisions.—Under the Ottoman jurisdiction Palestine has no independent existence. West of the Jordan, and to about half-way between Nablus and Jerusalem, is the southern portion of the vilayet or province of Beirut. South of this point is the sanjak[1] of Jerusalem, to which Nazareth with its immediate neighbourhood is added, so as to bring all the principal "Holy Places" under one jurisdiction. East of the Jordan the country forms part of the large vilayet of Syria, whose centre is at Damascus.

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[1] This list was intentionally made as exhaustive as possible, and included some languages (such as Welsh) spoken by one or two individual residents only. But even if, by omitting these accidental items, the list be reduced to thirty, a sufficient number will be left to indicate the cosmopolitan character of the city.

Communications.—Until 1892 communication through the country was entirely by caravan, and this primitive method is still followed over the greater part of its area. On the 26th of September of that year a railway between Jaffa and Jerusalem, with five intermediate stations, was opened, and has much facilitated transit between the coast and the mountains of Judaea. A railway from Haifa to Damascus was opened in 1905; it runs across the Plain of Esdraelon, enters the Ghor at Beisan, then, turning northwards, impinges on the Sea of Galilee at Samakh, and runs up the valley of the Yarmuk to join, at ed-Der'a, the line of the third railway. This was undertaken in 1901 to connect Damascus with Mecca; in 1906 it was finished as far as Ma'an, and in 1908 the section to Medina was completed. Carriage-roads also began to be constructed during the last decade of the 19th century. They are on the whole carelessly made and maintained, and are liable to go badly and more or less permanently out of repair in heavy rain. Of completed roads the most important are from Jaffa to Haifa, Jaffa to Nablus, Jaffa to Jerusalem, Jaffa to Gaza; Jerusalem to Jericho, Jerusalem to Bethlehem with a branch to Hebron, Jerusalem to Khan Labban—ultimately to be extended to Nablus; and Gaza to Beersheba. Other roads have been begun in Galilee (*e.g.* Haifa to Tiberias and to Jenin); but in this respect the northern province is far behind the southern. For the rest there is a network of tracks, all practically impassable by wheeled vehicles, extending over the country and connecting the towns and villages one with another.

Industries.—There are no mines and few manufactures of importance in Palestine: the country is entirely agricultural. Although the processes are primitive and improvements are discouraged, both by the policy of the government and by an indolence and suspiciousness of innovation natural to the people themselves, fine crops of cereals are yielded, especially in the large wheat-lands of Hauran. Besides wheat, the following crops are to a greater or less extent cultivated—barley, millet, sesame, maize, beans, peas, lentils, kursenni (a species of vetch used as camel-food) and, in some parts of the country, tobacco. The agriculturist has many enemies to contend with, the tax-gatherer being perhaps the most deadly; and drought, earthquakes, rats and locusts have at all periods been responsible for barren years.

The fruit trade is very considerable. The value of the oranges exported from Jaffa in 1906 was £162,000; this amount increases annually, and of course in addition a considerable quantity is retained for home consumption. Besides these are grown melons, mulberries, bananas, apricots, quinces, walnuts, lemons and citron. The culture of the vine—formerly an important staple, as is proved by the countless ancient wine-presses scattered over the rocky hillsides of the whole country—fell to some extent into desuetude, no doubt owing to the Moslem prohibition of wine-drinking. It is, however, rapidly returning to favour, principally under Jewish auspices, and numerous vineyards now exist at different centres. All over the country are olive-trees, the fruit and oil of which are a staple product of the country; the trade is however hampered by an excessive tax on trees, which not only discourages plantation, but has the unfortunate effect of encouraging destruction. Other fruit trees are abundant, though less so than those we have mentioned: such are pomegranates, pears, almonds, peaches, and, in the warmer part of the country, palms. Apples are few and poor in quality. The *kharrub* (*carob*) is common and yields a fruit eaten by the poorer classes.[2] Of ordinary table vegetables a considerable quantity and variety are grown: such are the cabbage, cauliflower, *solanum* (egg-plant), cucumber, *hibiscus* (bamieh), lettuce, carrot, artichoke, &c. The potato is also grown in considerable quantities.

Beside the agricultural there is a considerable pastoral industry, though it is principally confined to production for home consumption. Sheep and goats are bred throughout the country; but the breeding of the beasts of burden (donkeys, horses, camels) is chiefly in the hands of the Bedouin.

Of the manufactures the following call for mention: pottery (at Gaza, Ramleh and Jerusalem); soap (from olive oil, principally at Nablus); we may perhaps also extend the term to include the collecting of salt (from the Dead Sea). This last is a government monopoly, but illicit manufacture and smuggling are highly organized. Some of the minor industries, such as bee-keeping, are practised with success by a few individuals. Other industries of less importance are basket-making, weaving, and silk and cotton manufacture. Stone-quarrying has been fostered since 1900 by the great development of building at Jerusalem and other places. Wine is manufactured by several of the German and Jewish colonies, and by some of the monastic establishments. Regular industrial work is however handicapped by competition with the tourist trade in its several branches—acting as guides and camp servants, manufacture and sale of "souvenirs" (carved toys and trinkets in mother-of-pearl and olive-wood, forged antiquities and the like), and the analogous trade in *objets de piété* (rosaries, crosses, crude religious pictures, &c.) for pilgrims. Travellers in the country squander their money recklessly, and these trades, at once easy and lucrative, are thus fatally attractive to the indolent Syrian and prejudicial to the best interests of the country. (R. A. S. M.)

HISTORY

I.—*Old Testament History.*

Palestine is essentially a land of small divisions, and its configuration does not fit it to form a separate entity; it "has never belonged to one nation and probably never will."[3] Its position gives the key to its history. Along the west coast ran the great road for traders and for the campaigns which have made the land famous. The seaports (more especially in Syria, including Phoenicia), were well known to the pirates, traders and sea-powers of the Levant. The southernmost, Gaza, was joined by a road to the mixed peoples of the Egyptian Delta, and was also the port of the Arabian caravans. Arabia, in its turn, opens out into both Babylonia and Palestine, and a familiar route skirted the desert east of the Jordan into Syria to Damascus and Hamath. Damascus is closely connected with Galilee and Gilead, and has always been in contact with Mesopotamia, Assyria, Asia Minor and Armenia. Thus Palestine lay at the gate of Arabia and Egypt, and at the tail end of a number of small states stretching up into Asia Minor; it was encircled by the famous ancient civilizations of Babylonia, Assyria, South Arabia and Egypt, of the Hittites of Asia Minor, and of the Aegean peoples. Consequently its history cannot be isolated from that of the surrounding lands. Recent research in bringing to light considerable portions of long-forgotten ages is revolutionizing those impressions which were based upon the Old Testament—the sacred writings of a small fraction of this great area; and a broad survey of the vicissitudes of this area furnishes a truer perspective of the few centuries which concern the biblical student.[4] The history of the Israelites is only one aspect of the history of Palestine, and this is part of the history of a very closely interrelated portion of a world sharing many similar forms of thought and custom. It will be necessary here to approach the subject from a point of view which is less familiar to the biblical student, and to treat Palestine not merely as the land of the Bible, but as a land which has played a part in history for certainly more than 4000 years. The close of Old Testament history (the book of Nehemiah) in the Persian age forms a convenient division between ancient Palestine and the career of the land under non-oriental influence during the Greek and Roman ages. It also marks the culmination of a lengthy historical and religious development in the establishment of Judaism and its inveterate rival Samaritanism. The most important data bearing upon the first great period are given elsewhere in this work, and it is proposed to offer here a more general survey.[5]

Beginning of history.

To the prehistoric ages belong the palaeolithic and neolithic flints, from the distribution of which an attempt might be made to give a synthetic sketch of early Palestinian man.[6] A burial cave at Gezer has revealed the existence of a race of slight build and stature, muscular, with elongated crania, and thick and heavy skull-bones. The people lived in caves or rude huts, and had domesticated animals (sheep, cow, pig, goat), the bones of which they fashioned into various implements. Physically they are quite distinct from the normal type, also found at Gezer, which was taller, of stronger build, with well-developed skulls, and is akin both to the Sinaitic and Palestinian type illustrated upon Egyptian monuments from *c.* 3000 B.C., and to the modern native.[1] The study of Oriental ethnology in the light of history is still very incomplete, but the regular trend of events points to a mixture of races from the south (the home of the Semites) and the north. At what period Palestine first became the "Semitic" land, which it has always remained, is uncertain; nor can one decide whether the characteristic megalithic monuments, especially to the east of the Jordan, are due to the first wave which introduced the Semitic (Canaanite) dialect and the place-names. At all events during the last centuries of the third millennium B.C., remarkable for the high state of civilization in Babylonia, Egypt and Crete, Palestine shares in the active life and intercourse of the age; and while its fertile fields are visited by Egypt, Babylonia (under Gimil-Sin, Gudea and Sargon) claims some supremacy over the west as far as the Mediterranean.

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[1] A *sanjak* is usually a subordinate division of a *vilayet*, but that of Jerusalem has been independent ever since the Crimean War. This change was made on account of the trouble involved in referring all complications (arising from questions relating to the political standing of the holy places) to the superior officials of Beirut or Damascus, as had formerly been necessary.

[2] Sometimes imagined to be the "locusts" eaten by John the Baptist, on which account the tree is often called the locust-tree. But it was the insect which John used to eat; it is still eaten by the fellahin.

[3] G. A. Smith, *Hist. Geog. of the Holy Land*, p. 58. This and the author's art. "Trade and Commerce," *Ency. Bib.* vol. iv., and his *Jerusalem* (London, 1907), are invaluable for the relation between Palestinian geography and history. For the wider geographical relations, see especially D. G. Hogarth, *Nearer East* (London, 1902).

[4] See especially the writings of H. Winckler, in the 3rd ed. of Schrader's *Keilinschriften und das Alte Test.* (Berlin, 1903); his *Religionsgeschichtlicher u. geschichtlicher Orient* (1906), &c.

[5] See the articles on the surrounding countries and peoples, and, for the biblical traditions, art. JEWS.

[6] See H. Vincent, *Canaan d'après l'exploration récente* (Paris, 1907), pp. 374 sqq., also pp. 392-426.

Egyptian suzerainty.

A more definite stage is reached in the period of the Hyksos (*c.* 1700), the invaders of Egypt, whose Asiatic origin is suggested *inter alia* by the proper-names which include "Jacob" and "Anath" as deities.[2] After their expulsion it is very significant to find that Egypt forthwith enters upon a series of campaigns in Palestine and Syria as far as the Euphrates, and its successes over a district whose political fate was bound up with Assyria and Asia Minor laid the foundation of a policy which became traditional. Apart from rather disconnected details which belong properly to the history of Babylonia and Egypt, it is not until about the 16th century B.C. that Palestine appears in the clear light of history, and henceforth its course can be traced with some sort of continuity. Of fundamental importance are the Amarna cuneiform tablets discovered in 1887, containing some of the political correspondence between Western Asia and Egypt for a few years of the reigns of Amenophis III. and IV. (*c.* 1414–1360).[3] The first Babylonian dynasty, now well known for its Khammurabi, belonged to the past, but the cuneiform script and language are still used among the Hittites of Asia Minor (centring at Boghaz-keui) and the kings of Syria and Palestine. Egypt itself was now passing from its greatness, and the Hittites (*q.v.*)—the term is open to some criticism—were its rivals for the possession of the intervening lands. Peoples (apparently Iranian) of Hittite connexion from the powerful state of Mitanni (Northern Syria and Mesopotamia) had already left their mark as far south as Jerusalem, as may be inferred from the personal names,[4] and to the intercourse with (apparently) Aegean culture revealed by excavation, the letters add references to mercenaries and bands from Meluḫḫa (viz. Arabia), Mesopotamia and the Levant. The diminutive cities of this cosmopolitan Palestine were ruled by kings, not necessarily of the native stock; some were appointed—and even anointed—by the Egyptian king, and the small extent of these city-states is obvious from the references to the kings of such near-lying sites as Jerusalem, Gezer, Ashkelon and Lachish. Torn by mutual jealousy and intrigue, and forming little confederations among themselves, they were united by their common recognition of the Egyptian suzerain, their court of appeal, or in some short-lived attempt to withstand him. Apart from Jerusalem and a few towns on the coast, the real weight lay to the north, and especially in the state of Amor.[5] It is an age of internal disorganization and of heavy pressure by land and by sea from Northern Syria and Asia Minor. The land seethes with excitement, and Palestine, wavering between allegiance to Egypt and intrigues with the great movements at its north, is unable to take any independent line of action. The letters vividly describe the approach of the enemy, and, in appealing to Egypt, abound in protestations of loyalty, complaints of the disloyalty of other kings and excuses for the writers' suspicious conduct. Of exceptional interest are the letters from Jerusalem describing the hostility of the maritime coast and the disturbances of the Ḥabiru ("allies"), a name which, though often equated with that of the Hebrews, may have no ethnological or historical significance.[6] But Egypt was unable to help the loyalists, even ancient Mitanni lost its political independence, and the supremacy of the Hittites was assured. The history of the age illustrated by the Amarna letters is continued in the tablets found at Boghaz-keui, the capital of the old Hittite Empire.[7] Subsequent Egyptian evidence records that Seti I. (*c.* 1320) of the XIXth Dynasty led an expedition into Palestine, but struggles with the Hittites continued until Rameses II. (*c.* 1300) concluded with them an elaborate treaty which left him little more than Palestine. Even this province was with difficulty maintained: the disturbances in the Levant and in Asia Minor (which belong to Aegean and Hittite history) and the revival of Assyria were reshaping the political history of Western Asia.

Under Rameses III. (*c.* 1200–1169) we may recognize another age of disorganization in Palestine, in the movements with which the Philistines (*q.v.*) were concerned. Nevertheless, Egypt seems to have enjoyed a fresh spell of extended supremacy, and Rameses apparently succeeded in recovering Palestine and some part of Syria. But it was the close of a lengthy period during which Egypt had endeavoured to keep Palestine detached from Asia, and Palestine had realized the significance of a powerful empire at its south-western border. Somewhat later Tiglath-Pileser (*c.* 1100) pushed the limits of Assyrian suzerainty westwards over the lands formerly held by the great Hittite Empire. It is at this age, when the external evidence becomes extremely fragmentary, that new political movements were inaugurated and new confederations of states sprang into existence. Palestine had been politically part of Egypt or of the Hittite Empire; we now reach the stage where it becomes more closely identified with Israelite history.

The Amarna period.

Palestine had not as yet been absorbed by any of the great powers with whose history and culture it had been so closely bound up for so many centuries. In the "Amarna" age the little kings had a certain measure of independence, provided they guarded the royal caravan routes, paid tribute, refrained from conspiracy, and generally supported their suzerain and his agents. However profound the influence of Babylonia may have been, excavation has discovered comparatively few specific traces of it. Although cuneiform was used, the Palestinian letters show that the native language, as in the case of earlier proper-names, was most nearly akin to the later "Canaanite" (Hebrew, Moabite and Phoenician). In view of the relations subsisting among Palestine, Mitanni and the Hittites, it is evident that Babylonian influence could have entered indirectly; and until one can determine how much is specifically Babylonian the analogies and parallels cannot be made the ground for sweeping assertions. The influence of a superior power upon the culture of a people cannot of course be denied; but history proves that it depends upon the resemblance between the two peoples and their respective levels of thought, and that it is not necessarily either deep or lasting. A better case might be made for Egypt; yet notwithstanding the presence of its colonies, the cult of its gods, the erection of temples or shrines, and the numerous traces of intercourse exposed by excavation, Palestine was Asiatic rather than Egyptian. Indeed Asiatic influence made itself felt in Egypt before the Hyksos age, and later, and more strongly, during the XVIIIth and following Dynasties, and deities of Syro-Palestinian fame (Resheph, Baal, Anath, the Baalath of Byblos, Kadesh, Astarte) found a hospitable welcome. On the whole, there was everywhere a common foundation of culture and thought, with local, tribal and national developments; and it is useful to observe the striking similarity of religious phraseology throughout the Semitic sources, and its similarity with the ideas in the Egyptian texts. And this becomes more instructive when comparison is made between cuneiform or Egyptian sources extending over many centuries and particular groups of evidence (Amarna letters, Canaanite and Aramaean inscriptions, the Old Testament and later Jewish literature to the Talmud), and pursued to the customs and beliefs of the same area to-day. The result is to emphasize (*a*) the inveterate and indissoluble connexion between religious, social and political life, (*b*) the differences between the ordinary current religious conceptions and specific positive developments of them, and (*c*) the vicissitudes of these particular growths in their relation to history.[1]

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[1] For fuller treatment of the data see R. A. S. Macalister's complete memoir of the Gezer excavations.

[2] Reference may be made to Ed. Meyer's admirable survey of Oriental history down to this age, *Gesch. d. Altertums* (Berlin, 1909), also to J. H. Breasted, *Hist. of Egypt* (London, 1906), bks. i.–iv.; and L. W. King, *Hist. of Bab. and Ass* vol. i. (London, 1910). Some knowledge of the culture, religion, history and interrelations over the area of which Palestine formed part is indispensable for any careful study of the ages upon which we now enter.

[3] See the admirable edition by J. A. Knudtzon, with full notes by O. Weber (Leipzig, 1907–1910). For their bearing on Palestine, see especially P. Dhorme, *Rev. biblique* (1908), pp. 500–519; (1909), pp. 50–73, 368–385.

[4] Dhorme, *op. cit.* (1909), pp. 60 sqq.; H. R. Hall, *Proc. Soc. Bibl. Arch.* (1909), xxxi. 233 seq.; Weber, *op. cit.*, p. 1088 seq.; cf. A. H. Sayce, *Arch. of Cuneiform Inscr.* (1907), pp. 193 sqq.

[5] Amor (Ass. *Amurru*, Bibl. *Amorite*), lay north of Lebanon and behind Phoenicia; but the term fluctuates (Weber, *op. cit.*, 1132 sqq.). See art. AMORITES, and A. T. Clay, *Amurru* (Philadelphia, 1909).

[6] See H. Winckler, *Altor. Forschung.* (1902), iii. 22; W. M. Müller in I. Benzinger, *Heb. Archäol.* (1907), p. 445; B. Eerdmans, *Alttest. Stud.* (1908), ii. 61 sqq.; Dhorme, *op. cit.* (1909), pp. 677 sqq. The movement of the Ḥabiru cannot be isolated from that represented in other letters (where the enemy are not described by this term), and their steps do not agree with those of the invading Israelites in the book of Joshua (*q.v.*).

[7] H. Winckler, *Mitteil. d. deutschen Orient-Gesell. z. Berlin* (1907) No. 35; cf. J. Garstang, *Land of Hittites* (London, 1910), 326 sqq.

Religion.

There is reason to believe that the religion of Palestine in the Amarna age was no inchoate or inarticulate belief; like the material culture it had passed through the elementary stages and was a fully established though not, perhaps, a very advanced organism. There were doubtless then, as later, numerous local deities, closely connected with local districts, differing perhaps in name, but the centre of similar ideas as regards their relations to their worshippers. Commercial and political intercourse had also brought a knowledge of other deities, who were worth venerating, or who were the survivors of a former supremacy, or whose recognition was enforced. It is particularly interesting to find in the Amarna letters that the supremacy of Egypt meant also that of the national god, and the loyal Palestinian kings acknowledge that their land belonged to Egypt's king and god. In accordance with what is now known to be a very widespread belief, the kingship was a semi-divine function, and the Pharaoh was the incarnation of Amon-Re. This would bring a greater coherence of worship among the chaos of local cults. The petty kings naturally recognize the identity of the Pharaoh, and they hail him as their god and identify him with the heads of their own pantheon. Thus he is called—in the cuneiform letters—their Shamash or their Addu. The former, the sun-deity, god of justice, &c., was already well known, to judge from Palestinian place-names (Beth-Shemesh, &c.). The latter, storm or weather god, or, in another aspect, god of rain and therefore of fertility, is specifically West Asiatic, and may be equated with Hadad and Ramman (see below). He is presumably *the* Baal who is associated with thunder and lightning, and with the bull, and who was familiar to the Egyptians of the XIXth and XXth Dynasties in the adulations of their divine king. He is probably also "the lord of the gods" (the head of a pantheon) invoked in a private cuneiform tablet unearthed at Taanach.[2] Besides these gods, and others whose fame may be inferred (Dagon, Nebo, Nergal, &c.), there were the closely-related goddesses Ashira and Ishtar-Astarte (the Old Testament Asherah and Ashtoreth). Possibly the name Yahweh (see JEHOVAH) had already entered Palestine, but it is not prominent, and if, as in the case of certain other deities, the extension of the name and cult went hand-in-hand with political circumstances, these must be sought in the problems of the Hebrew monarchy.[3]

Rise of the Hebrew Monarchy.

Approach of Assyria.

At an age when there were no great external empires to control Palestine the Hebrew monarchy arose and claimed a premier place amid its neighbours (*c.* 1000). How the small rival districts with their petty kings were united into a kingdom under a single head is a disputed question; the stages from the half-Hittite, half-Egyptian land to the independent Hebrew state with its national god are an unsolved problem. Biblical tradition quite plausibly represents a mighty invasion of tribes who had come from Southern Palestine and Northern Arabia (Elath, Ezion-geber)—but primarily from Egypt—and, after a series of national "judges," established the kingship. But no place can be found for this conquest, *as it is described*, either before the "Amarna" age (the date, following 1 Kings vi. 1) or about the time of Rameses II. and Mineptah (see Exod. i. 11); and if the latter king (*c.* 1244) records the subjugation of the people (? or land) "Israel," the complicated history of names does not guarantee the absolute identity of this "Israel" either with the pure Israelite tribes which invaded the land or with the intermixed people after this event (see JEWS: §§ 6–8). Whatever may have been the extent of this invasion and the sequel, the rise and persistence of an independent Palestinian kingdom was an event which concerned the neighbouring states. Its stability and the necessary furtherance of commerce, usual among Oriental kings, depended upon the attitude of the maritime coast (Philistia and Phoenicia), Edom, Moab, Ammon, Gilead and the Syrian states; and the biblical and external records for the next four centuries (to 586) frequently illustrate situations growing out of this interrelation. The evidence of the course of these crucial years is unequal and often sadly fragmentary, and is more conveniently noticed in connexion with the biblical history (see JEWS: §§ 9–17). A conspicuous feature is the difficulty of maintaining this single monarchy, which, however it originated, speedily became two rival states (Judah and Israel). These are separated by a very ambiguous frontier, and have their geographical and political links to the south and north respectively. The balance of power moves now to Israel and now to Judah, and tendencies to internal disintegration are illustrated by the dynastic changes in Israel and by the revolts and intrigues in both states. As the power of the surrounding empires revived, these entered again into Palestinian history. As regards Egypt, apart from a few references in biblical history (*e.g.* to its interference in Philistia and friendliness to Judah, see PHILISTINE), the chief event was the great invasion by Sheshonk (Shishak) in the latter part of the 10th century; but although it appears to be an isolated campaign, contact with Egypt, to judge from the archaeological results of the excavations, was never intermittent. The next definite stage is the dynasty of the Israelite Omri (*q.v.*), to whom is ascribed the founding of the city of Samaria. The dynasty lasted nearly half a century, and is contemporary with the expansion of Phoenicia, and presumably therefore with some prominence of the south maritime coast. The royal houses of Phoenicia, Israel and Judah were united by intermarriage, and the last two by joint undertakings in trade and war (note also 1 Kings ix. 26 seq.). Meanwhile Assyria was gradually establishing itself westwards, and a remarkable confederation of the heirs of the old Hittite kingdom, "kings of the land of Ḥatti" (the Assyrian term for the Hittites) was formed to oppose it. Southern Asia Minor, Phoenicia, Ammon, the Syrian Desert and Israel (under Omri's son "Ahab the Israelite") sent their troops to support Damascus which, in spite of the repeated efforts of

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[1] Much confusion can be and has been caused by disregarding (*b*) and by supposing that the appearance of similar elements of thought or custom implied the presence of similar more complete organisms (*e.g.* totemism, astral religion, jurisprudence). Cf. p. 182, n. 4.

[2] See, most recently, Ungnad's translation in H. Gressmann, *Ausgrabungen in Pal. u. d. A. T.* (Tübingen, 1908), p. 19 seq. The title "lord of heaven"—whether the Sun or Addu, there was a tendency to identify them—was perhaps known in Palestine, as it certainly was in Egypt and among the Hittites.

[3] See S. A. Cook, *Expositor*, Aug. 1910, pp. 111–127.

Shalmaneser,[1] was evidently able to hold its own from 854 to 839. The anti-Assyrian alliance was, as often in west Asia, a temporary one, and the inveterate rivalries of the small states are illustrated, in a striking manner, in the downfall of Omri's dynasty and the rise of that of Jehu (842–*c.* 745); in the bitter onslaughts of Damascus upon Israel, leading nearly to its annihilation; in an unsuccessful attack upon the king of Hamath by Damascus, Cilicia and small states in north Syria; in an Israelite expedition against Judah and Jerusalem (2 Kings xiv. 13 seq.); and finally in the recovery and extension of Israelite power—perhaps to Damascus—under Jeroboam II. In such vicissitudes as these Palestinian history proceeds upon a much larger scale than the national biblical records relate, and the external evidence is of the greatest importance for the light it throws upon the varying situations. Syria could control the situation, and it in turn was influenced by the ambitions of Assyria, to whose advantage it was when the small states were rent by mutual suspicion and hostility. It is possible, too, that, as the states did not scruple to take advantage of the difficulties of their rivals, Assyria played a more prominent part in keeping these jealousies alive than the evidence actually states. Moreover, in the light of these moves and counter-moves one must interpret the isolated or incomplete narratives of Hebrew history.[2] The repeated blows of Assyria did not prevent the necessity of fresh expeditions, and later, Adad-Nirari III. (812–783) claims as tributary the land of Hatti, Amor, Tyre, Sidon, "the land of Omri" (Israel), Edom and Philistia. Israel at the death of Jeroboam was rent by divided factions, whereas Judah (under Uzziah) has now become a powerful kingdom, controlling both Philistia and the Edomite port of Elath on the gulf of ʿAkaba. The dependence of Judaean sovereignty upon these districts was inevitable; the resources of Jerusalem obviously did not rely upon the small district of Judah alone. If Ammon also was tributary (2 Chron. xxvi. 8, xxvii.), dealings with Israel and perhaps Damascus could probably be inferred.

Predominance of Assyria.

A new period begins with Tiglath-Pileser IV. (745–728): pro- and anti-Assyrian parties now make themselves felt, and when north Syria was taken in 738, Tyre, Sidon, Damascus (under Rezin), "Samaria" (under Menahem) and a queen of Aribi were among the tributaries. It is possible that Judah (under Uzziah and Jotham) had come to an understanding with Assyria; at all events Ahaz was at once encircled by fierce attacks, and was only saved by Tiglath-Pileser's campaign against Philistia, north Israel and Damascus. With the siege and fall of Damascus (733–32) Assyria gained the north, and its supremacy was recognized by the tribes of the Syrian desert and Arabia (Aribi, Tema, Sheba). In 722 Samaria, though under an Assyrian vassal (Hoshea the last king), joined with Philistia in revolt; in 720 it was allied with Gaza and Damascus, and the persistence of unrest is evident when Sargon in 715 found it necessary to transport into Samaria various peoples of the desert. Judah itself was next involved in an anti-Assyrian league (with Edom, Moab and Philistia), but apparently submitted in time; nevertheless a decade later (701), after the change of dynasty in Assyria, it participated in a great but unsuccessful effort from Phoenicia to Philistia to shake off the yoke, and suffered disastrously.[3] With the crushing blows upon Syria and Samaria the centre of interest moves southwards and the history is influenced by Assyria's rival Babylonia (under Marduk-baladan and his successors), by north Arabia and by Egypt. Henceforth there is little Samarian history, and of Judah, for nearly a century, few political events are recorded (JEWS: § 16). Judah was under Assyrian supremacy, and, although it was involved with Arabians in the revolt planned by Babylonia (against Assurbanipal), it appears to have been generally quiescent.

Revival of Egypt.

At this stage disturbances, now by Aramaean tribes, now by Arabia, combine with the new rise of Egypt and the weakness of Assyria to mark a turning-point in the world's history. Psammetichus (Psamtek) I. (663–609) with his Greeks, Carians, Ionians and soldiers from Palestine and Syria, re-established once more an Egyptian Empire, and replaced the fluctuating relations between Palestine and the small dynasts of the Delta by a settled policy. Trading intercommunication in the Levant and the constant passage to and fro of merchants brought Egypt to the front, and, in an age of archaic revival, the effort was made to re-establish the ancient supremacy over Palestine and Syria. The precise meaning of these changes for Palestinian history and life can only incompletely be perceived, and even the significance of the great Scythian invasion and of the greater movements with which it was connected is uncertain (see SCYTHIA). At all events, Egypt (under Necho, 609–593) prepared to take advantage of the decay of Assyria, and marched into Asia. Judah (under Josiah) was overthrown at Megiddo, where about nine centuries previously the victory of Tethmoses (Thutmose) III. had made Egypt supreme over Palestine and Syria. But Egypt was now at once confronted by the Neo-Babylonian or Chaldean Empire (under Nabopolassar), which, after annihilating Assyria with the help of the Medians, naturally claimed a right to the Mediterranean coast-lands. The defeat of Necho by Nebuchadrezzar at Carchemish (605) is one of the world-famous battles.

Babylonian Empire.

Although Syria and Palestine now became Babylonian, this revival of the Egyptian Empire aroused hopes in Judah of deliverance and led to revolts (under Jehoiachin and Zedekiah), in which Judah was apparently not alone.[4] They culminated in the fall of this kingdom in 586. Henceforth the history of Palestine is disconnected and fragmentary, and the few known events of political importance are isolated and can be supplemented only by inferences from the movements of Egypt, Philistia or Phoenicia, or from the Old Testament. According to the Chaldean Nabonidus (553) all the kings from Gaza to the Euphrates assisted in his buildings, and the Chaldean policy generally appears to have been favourable towards faithful vassals. Cyrus meanwhile was rising to lead the Persians against Media. After a career of success he captured Babylonia (553) and forthwith claimed, in his famous inscription, the submission of Amor. For the next 200 years Palestine remained part of the new Persian Empire which, with all its ramifications on land and on sea, embraced the civilized world from the Himalayas to the Levant, until the advent of Alexander the Great (see JEWS: § 19). Very gradually the face of history underwent a complete change. Egypt had resumed its earlier connexions with the Levantine heirs of the ancient Aegeans, the old empires of the Nearer East had practically exhausted themselves, and Palestine passed into the fresh life and thought of the Greeks. (See below, p. 617.)

Internal Conditions. Northern Influences.

In any consideration of the internal conditions in Palestine it must be observed that there is a continuity of thought, custom and culture which is independent of political changes and vicissitudes of names. With the establishment of an independent monarchy Palestine did not enter into a new world. Whatever internal changes ensued between the "Amarna" age and 1000 B.C., they have not left their mark upon the course of culture illustrated by the excavations. These still indicate communication with Egypt and the north (Syria, Asia Minor; Assyria and the Levant not excluded), and even when a novel culture presents itself, as in certain graves at Gezer, the affinities are with Cyprus and Asia Minor (Caria) of about the 11th or 10th century.[5] The use of

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[1] Recently found to be the third of that name (H. W. Hogg, *The Interpreter*, 1910, p. 329).

[2] So *e.g.* in references to Ammon, Damascus and Hamath, and in Judaean relations with Philistia, Moab and Edom.

[3] See art. HEZEKIAH. A recently published inscription of Sennacherib (of 694 B.C.) mentions enslaved peoples from Philistia and Tyre, but does not name Judah.

[4] Cf. Jer. xxvii. 2 seq., and the history of the Egyptian Hophra (Apries, 588–569).

[5] At present it is difficult as regards Palestine to distinguish Aegean influence (direct and indirect) from that of Asia Minor generally. Only after the old Cretan (Minoan) culture had passed its zenith and was already decadent does it suddenly appear in Cyprus (H. R. Hall, *Proc. Soc. Bibl. Arch.* xxxi. 227).

Alphabet.

The Gods.

iron came in about this time, perhaps from the north, and biblical history (1 Kings x. 28 seq., see the commentaries) even ascribes to Solomon the import of horses from Kue and Musri (Cilicia and Cappadocia). The cuneiform script, which continued in Egypt during the XIXth and XXth Dynasties, was perhaps still used in Palestine; it was doubtless familiar at least during the Assyrian supremacy. But in the meanwhile the "North Semitic" alphabet appears (from 850) with almost identical forms in extreme north Syria (*e.g.* Sam'al), in Cyprus, Gezer, and in Moab. The type is very closely related to the oldest European (Etruscan) forms, and, in a less degree, to the "South Semitic" (old Minaean and Sabaean); and since it at once begins (*c.* 700) to develop along separate paths (Canaanite and Aramaean), it may be inferred that the common ancestor was not of long derivation. This alphabet stands in contrast to the old varying types of the Aegean and Asia Minor area and can hardly be of local origin. Under what historical circumstances it was first distributed over Palestine and Syria is uncertain; it is a plausible conjecture that once more the north is responsible.[1] Too little is known of the north as a factor in Palestinian development to allow hasty inferences, but it is certainly noteworthy, at all events, that the names Amor and Ḥatti appear to move downwards, and that "Hittite" is applied to Palestine and Philistia by the Assyrians, and to Hebron in the Old Testament, and that Ezekiel (xvi. 3) calls Canaanite Jerusalem the offspring of an Amorite and a Hittite. It is to be observed, however, that the meaning of geographical and ethnical terms for culture in general must be properly tested—the term "Phoenician" is a conspicuous case in point. Thus, in north Syria the art has Assyrian and Hittite affinities, but is provincial and sometimes rough. Some of the personal names are foreign and find analogues in Asia Minor; but even as the Philistines appear in biblical history as a "Semitic" people, so inscriptions from north Syria (*c.* 800–700) are in Canaanite and early Aramaean dialects, and are in entire agreement with "Semitic" thought and ideas. The deities too generally bear familiar names. In Sam'al the kings Panammu and Q-r-l have non-Semitic names (Carian), but the gods include Hadad, El (God *par excellence*), Resheph and the Sun-deity. In Hamath we meet with the Baal of Heaven, Sun and Moon deities, gods of heaven and earth, and others. A god "Most High" (*ʽelyōn*) was perhaps already known in Hamath.[2] The "Baal of Heaven," reminiscent of the Egyptian title "lord of heaven," given long before to Resheph, appears in the pantheon of Tyre (*c.* 677). The reference here is probably to the inveterate Hadad who, in his Aramaean form Ramman (Rimmon), is found in Palestine. Among the Hebrews, Yahweh, some of whose features associate him with thunder, lightning and storm, and with the gifts of the earth, has now become the national god, like the Moabite Chemosh or the Ammonite Milcolm. (For the Edomite gods, see Edom.) The name is known in the form Ya'u in north Syria (8th century), and, so far as the Israelite kings are concerned, appears first in the family of Ahab. No images of Yahweh or of earlier Canaanite deities have been unearthed; but images belong to a relatively advanced stage in the development of religion, and the aniconic stage may be represented by the sacred pillars and posts, by the small models of heads of bulls, and by the evidence for calf-cults in the Old Testament.[3] Yahweh was by no means the only god. Intercourse and alliance introduced the cults of Chemosh, Milcom, the Baal of Tyre and the Astarte of Sidon. Excavation has brought to light figurines of the Egyptian Osiris, Isis, Ptah, Anubis and especially Bes. Assyrian conquest and domination influenced the cults at all events outside Judah and Israel, and when Sargon sent skilled men to teach "the fear of God and the king" (*cyl. inscr.* 72–74) the spread of Assyrian religious ideas among the Hebrews themselves is to be expected. Certainly about 600 the Queen of Heaven, who has Assyrian traits, was a favourite object of veneration (Jer. vii. 18, xliv. 17–19, 25); yet already a century earlier the goddess "Ishtar of heaven" was worshipped by a desert tribe (see Ishmael), and the titles "lady of heaven," "bride of the king of heaven," had been applied centuries before to west Asiatic goddesses (Anath, Kadesh, Ashira, &c.). Although no goddess is associated with the national god Yahweh, female deities abounded, as is amply shown by the numerous plaques of the great mother-goddess found in course of excavation. The picture which the evidence furnishes is as fundamental for our conception of Palestine during the monarchies as were the Amarna tablets for the age before they arose. The external evidence does not point to any intervening hiatus, and the archaeological data from the excavations do not reveal any dislocation of earlier conditions; earlier forms have simply developed and the evolution is a progressive one. Down to and at the time of the Assyrian supremacy, Palestine in religion and history was merely part of the greater area of mingled peoples sharing the same characteristics of custom and belief. This does not mean of course that the religion had no ethical traits—ethical motives are frequently found in the old Oriental religions—but they were bound up with certain naturalistic conceptions of the relation between deities and men, and herein lay their weakness.[4]

Sequel of the Assyrian Domination.

In the age of the Assyrian supremacy Palestine entered upon a series of changes, lasting for about three centuries (from about 740), which were of the greatest significance for its internal development. The sweeping conquests of Assyria were "as critical for religious as for civil history."[5] The brutal methods of warfare, the cruel treatment of vanquished districts or cities, and the redistribution of bodies of inhabitants, broke the old bonds uniting deities, people and land. The framework of society was shattered, communal life and religion were disorganized. As the flood poured over Syria and flowed south, Israel (Samaria) suffered grievously, and the gaps caused by war and deportation were filled up by the introduction of new settlers by Sargon, and by his successors in the 7th century. Unfortunately, there is very little evidence in the biblical history for the subsequent career of Samaria, but it is clear that the old Israel of the dynasties of Omri and Jehu received crushing blows. The fact that among the new settlers were desert tribes, suggests the introduction, not merely of a simpler culture, but also of simpler groups of ideas. In the nature of the case, as time elapsed the new population must have taken root as securely as—one must conclude—the invading Israelites had done some centuries earlier. As a matter of fact the prophets Jeremiah and Ezekiel by no means regarded the population lying to the north of Judah as strangers, and the latter in turn were ready to share the Judaean distress at the fall of Jerusalem (Jer. xli. 5), and in later years offered to assist in rebuilding Yahweh's temple. Indeed, since the Samaritans subsequently accepted the Pentateuch, and claimed to inherit the ancestral traditions of the Israelite tribes, it is of no little value in the study of Palestinian history to observe the manner in which this people of singularly mixed origin so thoroughly assimilated itself to the land and at first was virtually a Jewish sect. But Samaria was not the only land to suffer. Judah, towards the close of the 8th century, was obviously very closely bound up with Philistia, Edom and Egypt; and this and Hezekiah's dealings with the anti-Assyrian party at Ekron do not indicate that any feeling of national exclusiveness, or any abhorrence of the

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[1] On the points of contact with old Cretan and Anatolian scripts see A. J. Evans, *Scripta Minoa* (Oxford, 1909), p. 80 sqq. The persistence of evidence for the importance of Aegean and Asia Minor ("Hittite") peoples in the study of Palestine and surrounding lands is one of the most interesting features of recent discovery. Cf. H. Hogarth, *Ionia and the East* (Oxford, 1909), pp. 64 sqq.; E. Meyer, *Gesch. d. Altertums*, i. §§ 490, 523.

[2] So Dhorme interprets the place-name *Ur*(light of)-*ḫi-le-e-ni* (*Rev. Bibl.* 1910, p. 67).

[3] See Calf, Golden, and note the representation of a calf at er-Rummān (Ramman = Hadad) in east Jordan (Gressmann p. 35). It is obvious that the strict injunctions in Exod. xx. 4, Deut. iv. 16 sqq., 23, 25, and other references to idolatry, are the outcome of a reaction against images.

[4] W. R. Smith, *Rel. of the Semites* (London, 1894), p. 58.

[5] Ibid. p. 35; cf. pp. 65, 77 sqq., 358.

Inauguration of New Conditions.

"uncircumcised Philistines" predominated. From the description of Sennacherib's invasion it is clear that social and economic conditions must have been seriously, perhaps radically disturbed,[1] and the quiescence of Judah during the next few decades implies an internal weakness and a submission to Assyrian supremacy. During the 7th century new movements were coming from Arabia, and tribes growing ever more restless made an invasion east of the Jordan through Edom, Moab and Ammon. Although they were repulsed, this awakening of a land which has so often fed Palestine and Syria, when viewed with the increasing weakness of Assyria, and subsequent vicissitudes in the history of the Edomites, Nabataeans and East Jordan tribes, forbids us to treat the invasion as an isolated raid.[2] Later, the fall of the Judaean kingdom and the deportation of the leading classes brought a new social upheaval. The land was not denuded, and the fact that "some scores of thousands of Jews remained in Judah through all the period of the exile,"[3] even though they were "the poorest of the land," revolutionizes ordinary notions of this period. (See JEWS: § 18). But the Judaean historians have successfully concealed the course of events, although, as has long been recognized, there was some movement upwards from the south of Judah of groups closely related to Edomite and kindred peoples of South Palestine and Northern Arabia. The immigrants, like the new occupants of Samaria, gradually assimilated themselves to the new soil; but the circumstances can hardly be recovered, and even the relations between Judah and Samaria can only be inferred. In the latter part of the 6th century we find some restoration, some revival of the old monarchy in the person of Zerubbabel (520 B.C.); but again the course of events is problematical (JEWS, § 20).[4] Not until the middle of the 5th century do the biblical records (book of Nehemiah) furnish a foundation for any reconstruction. Here Jerusalem is in sore distress and in urgent need of reorganization. Zerubbabel's age is of the past, and any attempt to revive political aspirations is considered detrimental to the interests of the surrounding peoples and of the Persian Empire. Scattered evidence suggests that the Edomites were responsible for a new catastrophe. Amid internal and external difficulties Nehemiah proceeds to repair religious and social abuses, and there is an important return of exiles from Babylonia. The ruling classes are related partly to the southern groups already mentioned and partly to Samaria; but the kingship of old is replaced by a high-priest, and, under the influence of Babylonian Jews of the strictest principles, a breach was made between Judah and Samaria which has never been healed (JEWS: § 21 seq.). Biblical history itself recognizes in the times of Artaxerxes, Nehemiah and Ezra the commencement of a new era, and although only too much remains obscure we have in these centuries a series of vicissitudes which separate the old Palestine of Egyptian, Hittite, Babylonian and Assyrian supremacy from the land which was about to enter the circle of Greek and Roman civilization. This division, it may be added, also seems to leave its mark upon the lengthy archaeological history of Palestine from the earliest times to the Byzantine age. There is a certain poverty and decadence of art, a certain simplicity of civilization and a decline in the shape and decoration of pottery which seems to exhibit signs of derivation from skin prototypes elsewhere associated with desert peoples. This phase comes at a stage which severs the earlier phases (including the "Amarna" age) from those which are very closely connected with Seleucid and later times. Its appearance has been associated with the invasion of the Israelites or with the establishment of the independent monarchy, but on very inadequate grounds; and since it has been independently placed at the latter part of the monarchy, its historical explanation may presumably be found in that break in the career of Palestine when peoples were changed and new organizations slowly grew up.[5] The great significance of these vicissitudes for the course of internal conditions in Palestine is evident when it is observed that the subsequent cleavage between Judah and Samaria, not earlier than the 5th century, presupposes an antecedent common foundation which, in view of the history of the monarchies, can hardly be earlier than the 7th century. These centuries represent an age which the Jewish historians have partly ignored (as regards Samaria) and partly obscured (as regards the return from exile and the reconstruction of Judah); but since this age stands at the head of an historical development which leads on to Christianity and Rabbinical Judaism, it is necessary to turn from Palestine as a land in order to notice more particularly certain features of the Old Testament upon which the foregoing evidence directly bears.

Biblical Religion.

The Old Testament is essentially a Palestinian, an Oriental, work and is entirely in accord with Oriental thought and custom.[6] Yet, in its characteristic religion and legislation there are essential spiritual and ethical peculiarities which give it a uniqueness and a permanent value, the reality of which becomes more impressive when the Old Testament is viewed, not merely from a Christian or a Jewish teleology, but in the light of ancient, medieval and modern Palestine. The ideas which characterize the Old Testament are planted upon lower levels of thought, and they appear in different aspects (legal, prophetical, historical) and with certain developments both within its pages and in subsequent literature. To ignore or to obscure the features which are opposed to these ideas would be to ignore the witness of external evidence and to obscure the old Testament itself. The books were compiled and preserved for definite aims, and their teaching is directed now to the needs of the people as a whole—as in the ever popular stories of Genesis—now to the inculcation of the lessons of the past, and now to matters of ritual. They are addressed to a people whose mental processes and philosophy were primitive; and since teaching, in order to be communicable, must adapt itself to current beliefs of God, man and nature—and the inveterate conservatism of man must be born in mind—the trend of ideas must not be confused with the average standard of thought.[7] The teaching was not necessarily presented in the form of an over-elaborated moral lesson, but was associated with conceptions familiar to the land; and when these conceptions are examined from the anthropological standpoint, they are found to contain much that is strange and even abhorrent to modern convictions of a purely spiritual deity. There are moreover many traces of conflicting ideas and ideals, of cruder beliefs and customs, and of attempts to remove or elevate them. In Genesis and elsewhere there are examples of popular thought which have not the characteristic spirit of the prophets, and which, it is clear, could only gradually be purified. The notion of a Yahweh scarcely less limited in power than man, the naïve views of supernatural beings and their nearness to man, and the persistence of features which stand relatively low in the scale of mental culture, only serve to enhance the reality of the spirit which inspired the endeavour to reform. There were rites and customs which only after lapse of time were considered iniquitous. Magical practices and forms of sacred prostitution and human sacrifice were familiar, and the denunciations of the prophets and the lawgivers show very vividly the persistence of what was current religion but was hostile to their teaching.[1] There is an astonishing boisterousness (cf. Lam. ii. 7), joviality and sensualism, all in striking contrast to the austerity of nomad asceticism. There is a ferocity and fanaticism which manifests itself in the belief that war was a sacred campaign of deity against deity. Even if the account of the "ban" (utter destruction) at the Israelite conquest be unhistorical, it represents current ideas (cf. Josh. vi. 17 seq.; 1 Sam. xv. 3; 2 Kings xv. 16; 2 Chron. xxv. 12 seq.), and implies imperfect views of the Godhead at a more advanced stage of religion and morality.

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[1] See G. A. Smith, *Jerusalem*, ii. 160, 196 seq.

[2] See L. B. Paton, *Early Hist. of Syria and Pal.* (London, 1902), p. 269; Winckler, *Keilinschr. u. das A.T.*, p. 151.

[3] G. A. Smith, *Jerusalem*, ii. 269.

[4] On ordinary historical grounds it is probable that there was a political reorganization and a welding of the diverse elements throughout the land (J. A. Montgomery, *The Samaritans*, Philadelphia, 1907; p. 62 seq.). There is internal literary support for this in the criticism of Deuteronomy (which appears to have in view a comprehensive Israel and Judah at this period), and of various passages evidently earlier than Nehemiah's time (see R. H. Kennett, *Journ. of Theol. Stud.*, 1905, pp. 175–181; 1906, pp. 486, 498).

[5] For the late date, see F. Petrie, *Tell-el-Hesy* (1891), p. 47 seq., and Bliss and Macalister, *Excavations in Palestine* (1902), pp. 72, 74, 101, 124; and, for the suggestion in the text, S. A. Cook, *Expositor*, (Aug. 1909), pp. 104–114.

[6] See, e.g., E. Sellin, *Alttest. Relig. im Rahmen der andern altorientalischen* (Leipzig, 1908).

[7] On the characteristics of primitive thought, see G. F. Stout, *Manual of Psychology* (London, 1907), Bk. IV., especially pp. 574–579.

Holy Places.

Jerusalem and the Temple.

There are conflicting ideas of death and the dead, and among them the belief in the very human feelings and needs of the dead and in their influence for good or evil.[2] Moreover, the proximity of burial-place and sanctuary and the belief in the kindly care of the famous dead for their descendants reflect "primitive" and persisting ideas which find their parallel in the holy tombs of religious or secular heroes in modern Palestine, and exemplify the firmness of the link uniting local groups with local *numens*. "The permanence of religion at holy places in the East"[3] is one of the most important features in the relation between popular and national religion. The local centres will survive political and historical vicissitudes and the changes of national cults and sects, and may outlive the national deities. The supernatural beings may change their name and may vary externally under Greek, Roman, Mahommedan or Christian influence; but their relation to the local groups remains essentially the same, although there is no regression to earlier organic connexions. The inveterate local, one may perhaps say immediate, powers are felt to be nearer at hand than the national deity, who is more closely bound up with the changing national fortunes and with current philosophy. These smaller deities are, as it were, telluric, and the territory of each is virtually henotheistic—as also its traditions—and even as to-day the saints or patrons enjoy a more real veneration among the peasants than does the Allah of the orthodox, the long-established worship of the ancient local beings always hampered the reformers of Yahwism (cf. Jer. ii. 28, xi. 13).[4] Whether they could be regarded as so many manifestations of a single deity or as really distinct entities, there were at all events similar and well understood relations between each and its group; and although the cult was nature-worship and was attended with a licentiousness which drew forth the denunciations of the prophets, this is only one aspect of the local deity's place in the religious conceptions of his circle. The excavations (at Gezer, Megiddo, Jericho, &c.) indicate a persisting gross and cruel idolatry, utterly opposed to the demands of the law and the prophets.[5] Jerusalem and the surrounding district have ominous heathen associations.[6] Jerusalem itself lay off the main line of intercourse and one may look for a certain conservatism in its famous Temple. Temples, shrines and holy places were no novelty in Palestine, and the inauguration of the great centre of Judaism is ascribed to Solomon the son of the great conqueror David. Phoenician aid was enlisted to build it, and the Egyptian analogies to the construction accord with the known influence of Egypt upon Phoenician art. It is the dwelling-place of the deity, the centre of the nation and of the national hopes; the fall of the Temple follows after Yahweh left it, it is rebuilt and he returns (Zech. viii. 3). The Temple is merely part of the royal palace and the government buildings (cf. Ezek. xliii. 7 seq.), and this is as significant as the king's position in its management. It is in keeping with the old conceptions of the divine kingship, which, though they survive only in isolated biblical references, live on in the ideals of the Messianic king and his kingdom and in the post-exilic high priest.[7] The Temple is built, ornamented and furnished on lines which are quite incompatible with a spiritual religion. Mythical features abound in the cherubim and seraphim, the pillars of Jachin and Boaz, the mysterious Nehushtan, the bronze-sea and the lavers. These agree with the more or less clear allusions in the Old Testament to myths of creation, Eden, deluge, mountain of gods, Titanic folk, world-dragons, heavenly hosts, &c., and also with the unearthed seals, tablets, altars, &c. representing mythical ideas. The ideas occur in varying forms from Egypt to Babylonia and point to a considerable body of thought, which is not less impressive when one takes into account the instances in the Old Testament where myths have been rationalized, elevated, or otherwise removed from their older forms (*e.g.* the story of the birth of Moses, accounts of creation and deluge, &c.), or when one observes the subsequent uncompromising objection to a display of artistic meaning, implying that it aroused definite conceptions. To reinterpret all these features as mere symbols, the lumber of ancient days, is to avoid the problem of their introduction into the Temple, and to assume an advance of popular thought which is not confirmed by the retention and fresh developments of the old ideas both in the pseudepigraphical literature and in the literature of Rabbinical Judaism.[8] The horses of the sun-god (2 Kings xxiii. 11), too, belong to a group of ideas which may perhaps be associated with the plan of the Temple and with the old hymn of dedication (1 Kings viii. 12 seq.). At all events, when one considers the Babylonian-Assyrian conceptions of Shamash as the supreme and righteous judge, god of truth and justice, or the monotheism of Amenophis IV. and his fine hymn to the sun-god, it is certain that a corresponding Palestinian deity would not necessarily be without ethical and elevated associations.[9] In short, the place which the Temple held in religious thought (cf. especially Isaiah), the character of the reforms ascribed to Josiah (2 Kings xxiii.), the pictures drawn by Jeremiah and Ezekiel, and the latter's condemnation of the half-Hittite, half-Amorite capital, combine with the events of later history to prove that the religion of the national sanctuary must not be too narrowly estimated from the denunciations of more spiritual minds or from a priori views of the inevitable concomitants of either henotheism or monotheism or of a lofty ethical teaching.

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[1] See generally E. Meyer, *Gesch. d. Altertums* (Berlin, 1909), i. §§ 342 sqq. Ceremonial licentiousness was perhaps of northern origin (Meyer § 345), and as a preliminary to marriage seems to have been known not only in Assyria (Herod. i. 199), but also in Palestine ("a law of the Amorites"; *Test. of Judah*, ed. R. H. Charles, xxii. 2); cf. E. S. Hartland, *Anthropol. Essays . . . E. B. Tylor* (Oxford, 1907), pp. 189–202. (For miscellaneous material see J. G. Frazer, ibid. pp. 101–174: "Folk-lore in the Old Testament.")

[2] See P. Torge, *Seelenglaube u. Unsterblichkeitshoffnung im Alten Test.* (Leipzig, 1909).

[3] The title of an instructive essay by Sir W. M. Ramsay in the *Expositor*, Nov. 1906, pp. 454 sqq. The whole subject involves also the various forms and developments of hero- and saint-cults, on which cf. E. Lucius, *Anfänge d. Heiligenkultus*, &c. (Tübingen, 1904); P. Saintyves, *Saints successeurs des dieux* (Paris, 1907).

[4] On the old Baals of Palestine, see H. P. Smith, in *O. T. and Semitic Studies in Memory of W. R. Harper* (Chicago, 1908), i. 35–64. For the persistence of the "high places," see G. F. Moore, *Ency. Bib.* arts. "High Place," "Idolatry and Primitive Religion."

[5] Vincent, *Canaan*, p. 204; cf. S. R. Driver, *Modern Research as illustrating the Bible* (London, 1909), pp. 60 sqq., 90.

[6] Viz. the shrines of Chemosh, Moloch, Baal of Tyre and Astarte of Sidon (1 Kings xi. 1–8; 2 Kings xi. 18, xxiii.); the valley of Hinnom (see J. A. Montgomery, *Journ. Bibl. Lit.* xxvii. i, 24–47); and the place-names Anathoth ("Anaths"), Nob (Nebo?), Beth-ninib, Beth-shemesh. The name Jerusalem may be compounded with that of a deity (Winckler, *Keil. u. A.T.* 224 seq.; G. A. Smith, *Jerusalem*, ii. 25 seq.), and the deity Ṣedek is curiously associated with the names of the Jerusalem priests Zadok, Jehozadak (cf. Melchizedek of Salem, Gen. xiv.), and the kings Adonizedek and Zedekiah. The strange character of the names of the first kings in Israel and Judah (Saul, David and Solomon), noticed already by A. H. Sayce (*Modern Review*, 1884, pp. 158–169), cannot easily be explained.

[7] See A. B. Davidson, *Theol. of O. T.* (Edinburgh, 1904), p. 9; J. G. Frazer, *Adonis, Attis and Osiris* (London, 1907), pp. 12 sqq., 401. Cf. the title "The Anointed of Yahweh," the simile "as a messenger (angel) of Yahweh" (2 Sam. xiv. 17, xix. 27), and the idea of the king as the embodiment of his people's safety (2 Sam. xxi. 17; Lam. iv. 20). This absence of the deification of the king is characteristic of biblical religion which recognizes Yahweh as the only king; see H. Gressmann, *Ursprung d. israel.-jüd. Eschatologie* (Göttingen, 1905), pp. 250 sqq.

[8] For examples of the persistence of the interrelated ideas—whether of astral significance or not is another question—see A. Jeremias, *Babylon im Neuen Test.* (Leipzig, 1905), *Das Alte Test. im Lichte d. Alten Orients* (1906); E. Bischoff, *Bab. Astrales im Weltbilde d. Thalmud u. Midrasch* (1907).

[9] Cf. for an excellent example of Oriental religious thought, the fine Babylonian hymn to Ishtar (*i.e.* Astarte). L. W. King, *Seven Tablets of Creation* (London, 1907), pp. 222–237, and the specimens in R. W. Rogers, *Rel of Bab. and Ass. in its Relations to Israel* (London 1908), pp. 142–184. On ethical conceptions of heathen deities, see I. King, *Development of Religion* (New York, 1910), pp. 268–286.

Post-exilic Developments.

There is indeed a development, but it is none the less noteworthy that the post-exilic priestly ritual preserves in the worship of the universal and only God Yahweh, rites, practices and ideas which can be understood only in the light of other nature-religions, especially that of Babylonia, with which there are striking parallels.[1] For example, the ephod, an object of divination, is still retained, but it is now restricted to the high-priest; and his position as head of a theocratic state, and his ceremonial dress with its heathenish associations presuppose a past monarchy.[2] Clad in almost barbaric splendour (cf. Ecclus. xlv., l., and Jos. *Ant.* iii. 7, &c.) he embodies the glory of the worshipping body like the kings of old, and sometimes plays as important a part in the later political history. The priestly system, as represented in the Pentateuch, is not fitted for the desert, where its initiation is ascribed, but on independent internal critical grounds belongs to the post-exilic age, where it stands at the head of further developments. It is the adaptation of the prophets' conceptions of Yahweh to old religious ideas, the building up of new conceptions upon an old basis, a fusion " between old heathen notions and prophetic ideas," and " this fusion is characteristic of the entire priestly law."[3] The priestly religion bound together the community in a way that alone preserved Jewish monotheism; it stands at the head of a long, unintermittent history, and it is to be viewed, not so much as the climax of Old Testament religion, but as one of a series of inseparable stages. In concentrating the religious observances of the people upon Jerusalem, its Temple and its priesthood, it became less spontaneous, and its services more remote from ordinary life. It left room for rival schools and sects, both within and without the priestly circles, and for continued development of the older and non-priestly thought. These reacted upon this institutional religion, which readapted and reinterpreted itself from time to time, and when they did not help to build up another theology (as in Christianity), they ended by assuming too rigid and unprogressive a shape (see QARAITES), or, breaking away from long-tried convention, became a mysticism with mixed results (see KABBALAH). While these vicissitudes take us away from Palestine, the course of native religious thought is very significant for its relation to the earlier stages. Although the national God was at once a transcendent ruler of the universe and also near at hand to man, the unconscious religious feeling found an outlet, not only in the splendid worship at Jerusalem, but in the more immediate intercessors, divine agencies, and the like; and when Judaism left its native soil the local supernatural beings revived—as characteristically as when the old place-names threw off their Greek dress—and they still survive, under a veneer of Mahommedanism, as the modern representatives of the Baals of the distant past.[4]

Biblical Law.

The uniqueness of the Old Testament religion is stamped upon the Mosaic legislation, which combines in archaic manner ritual, ethical and civil enactments. As a whole, the economic conditions implied are pastoral and agricultural, and are relatively primitive; and the general rudimentary character of the legal ideas appears in the death penalty for the goring ox (Exod. xxi. 28), resort to ordeal (Num. v. 11–31), and in the treatment of murder, family, marriage, slaves and property. The use of writing is once contemplated (the " bill of divorce," Deut. xxiv. 3), but not in ordinary business; oaths and symbols are used instead of written contracts, and the commercial law is notably scanty. The simplicity of the legislation is also manifest in the land-system in Lev. xxv., which implies a fresh beginning and not a readjustment of earlier laws. In property succession there is a feeling of tribal aloofness which would not be favourable to a central authority; and in fact the legal machinery is rude, and the carrying out of the law depends not so much upon courts and officials as upon religious considerations. If there is a supreme court, it is priestly (Deut. xvii. 8–13), and the legislation is bound up with the worship of Yahweh, who avenges wrong. This legislation appears as that of the Israelites, newly escaped from bondage in Egypt, joined by an *ethical* covenant-relation with Yahweh, and waiting in the desert to enter and conquer the land of their ancestors. But it is remarkable that, although within the Old Testament itself there are certain different backgrounds, important variations and developments of law, these are relatively insignificant when we consider the profound changes from the 15th–13th centuries (apparent by the period of the conquest) to the close of Old Testament history. Yet, the conditions in Palestine during the monarchies reveal grave and complex social problems, marked class distinctions, and constant intercourse and commercial enterprise. There was no place for tribal exclusiveness, and the upkeep of a monarchy (including the Temple) and the occasional payment of tribute would require duly appointed officials and a central body. The pentateuchal laws relating to women belong to the country rather than to town life (note the picture of feminine luxury in Isa. iii. 16 sqq.; cf. Amos iv. 1–3). In general the pentateuchal legislation as a whole presupposes an undeveloped state of society, and would have been inadequate if not partly obsolete or unintelligible during the monarchies.[5] But more elaborate legal usages had long been known outside Palestine, and, to judge from the Talmud and the Syrian law-code (*c.* 5th century A.D.), long prevailed. Oriental law is primitive or advanced according to the social conditions, with the result that antiquity of ideas is no criterion of date, and modern desert custom is more archaic than the great code of the Babylonian king Khammurabi (*c.* 2000 B.C.). Common law is merely part of the national life, and where it is implicated with religion there is no uniformity over an area comprising different groups of people. In such a case there is resort to a controlling authority, whether self-imposed (like the divine Pharaoh of the Amarna age), or mutually agreed (as Mahomet and the Arabian clans).[6] It cannot be definitely said that the old Babylonian code was in force in Palestine. On the other hand, it is known that it was being diligently copied by Assur-bani-pal's scribes (7th century B.C.), and in view of the circumstances of the Assyrian domination, it is probable that, so far as Palestinian economic conditions permitted, a legislation more progressive than the Pentateuch

Social Evolution.

Babylonian Law.

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[1] The presence of parallels also in South Arabian and Phoenician cults suggests that the old Palestinian ritual was in general agreement with the Oriental religions. Specific influence on the part of Babylonia is not excluded; but the absence of striking points of agreement in other portions of the Old Testament may not be due to anything else than the particular character of the circles to which they belonged.

[2] See C. Westphal, *Jahwes Wohnstätten* (Giessen, 1908), pp. 137 sqq. A. Jeremias, *Hilprecht Anniversary Volume* (1910), pp. 223–242, and art. COSTUME: *Oriental*.

[3] C. G. Montefiore, in the *Hibbert Lectures*, 1892, p. 320, cf. p. 322 (" [the] marriage of heathen practice and monotheistic use is one of the oddest and saddest features of the whole priestly code "), cf. also p. 411, and, in general, Lectures vi.–ix.

[4] See Clermont-Canneau, *Pal. Explor. Fund, Quart. Statem.* (1875), pp. 209 sqq.; C. R. Conder, *Tent Work in Palestine* (London, 1878), ii. 218 sqq.; J. G. Frazer, *op. cit.*, p. 71, &c.; H. Gressmann, *Palästinas Erdgeruch in der israel. Relig.* (Berlin, 1909), pp. 16 sqq. In the above, and in other respects also, a survey of the history of Palestine suggests the necessity of modifying that " biological " treatment of the development of thought which pays insufficient attention to the persistence of the representatives of different stages by the side of or after the disappearance of the higher stages; see I. King, *op. cit.*, pp. 204 sqq.

[5] Cf. J.-M. Lagrange, *Hist. Crit. and the O. T.* (London, 1905), p. 176; H. M. Wiener, *The Churchman* (1908), p. 23.

[6] See W. R. Smith, *Rel. of Semites*, p. 70, who compares the judicial authority of Moses. Note also the British Indian legislation imposed upon the various castes and creeds each with their peculiar rites and customs.

Prophets and the Law.

Mosaic Code: Problems.

was in use. The discovery at Gezer of Assyrian contract-tablets (651 and 648 B.C.)—one relating to the sale of land by a certain Nethaniah—at least suggests the prevalence of Assyrian custom, and this is confirmed by the technical business methods illustrated in Jer. xxxii. Moreover, among the Jewish families settled in the 5th century B.C. in Egypt (Elephantine) and Babylonia (Nippur), the Babylonian-Assyrian principles are in vogue, and the presumption that they were not unfamiliar in Palestine is strengthened further by the otherwise unaccountable appearance of Babylonian-Assyrian elements later in the Talmudic law. The denunciations in the prophetical writings of gross injustice, oppression and maladministration seem to presuppose definite laws, which either were ignored or which fell with severity upon the poor and unfortunate. They point to a considerable amount of written law, which was evidently class-legislation of an oppressive character.[1] The Babylonian code is essentially class-legislation, and from the point of view of the idealism of the Old Testament prophets, which raises the rights of humanity above everything else, the steps which the code takes to safeguard the rights of property (slaves included therein) would naturally seem harsh. The code also regulates wages and prices, and shows a certain humanity towards debtors; and here any failure to carry out these laws would obviously be denounced. While the code, according to its own lights, aims at strict justice rather than charity, the Old Testament has reforming aims, and the religious, legislative and social ideals are characterized by the insistence upon a lofty moral and ethical standard. These ideals are more religious than democratic. The appeal of the prophets, "is not for better institutions but for better men, not for the abolition of aristocratic privileges but for an honest and godly use of them."[2] The writers have in view a people with individual and collective rights and responsibilities, united by feelings of the deepest loyalty and kindliness and by common adherence to their only God. There is a marked growth of refinement and of ideas of morality, and a condemnation of the shameless vice and oppression which went on amid a punctilious and splendid worship. It is extremely significant that between the teaching of the prophetical writings and the spirit of the Mosaic legislation there is an unmistakable bond. The Mosaic law, in its reforming aspect, is characterized by the denunciation of heathenism and heathenish usages which belong to the old religion. There is an insistence upon individual responsibility (Deut. xxiv. 16; 2 Kings xiv. 6; cf. Jer. xxxi. 29 seq.; Ezek. xviii., xxxiii.), the more noteworthy when one considers the tenacity of the savage *talio* and its retention, though with some modifications, in the Babylonian code. There is a tendency to mitigate slavery, and the law of fugitive slaves is a particularly instructive innovation (Deut. xxiii. 15 seq., subsequently confined to the slave from outside). Corporal punishment is kept within limits (xxv. 3), but its very existence points to state-life rather than to the desert. Some attempt is made to diminish the destructiveness of war (xx. 10–20), but the passage is a remarkable illustration of a barbarous age. The endeavour is also made to improve the monarchy of the future (xvii. 14 sqq.), but mainly on religious grounds, in order to diminish foreign intercourse. Noteworthy, again, is the appeal to religious and ethical considerations in order to prevent injustice to the widow and fatherless and to unhappy debtors; statutory laws are either unknown, or, more probably, are presupposed. The pentateuchal legislation as a whole is placed at the very beginning of Israelite national history. Amid constant periods of apostasy two epoch-making events stand out: (*a*) the rediscovery of the Book of the Law (Deuteronomy is meant) in the time of Josiah (2 Kings xxii.) followed by a reform of sundry religious abuses dating from the foundation of the temple, and (*b*) the promulgation by Ezra of the Law of Yahweh, the law of Moses (Ezra. vii. 10, 14; Neh. viii. 1), in the age of Nehemiah, at the very close of biblical history. This legislation, endorsing (in certain well-defined portions) priestly authority, excludes a monarchy and stands at the head of a lengthy development in the way of expansion and interpretation. Its true place in biblical history has been the problem of generations of scholars,[3] and the discovery (Dec. 1901–Jan. 1902) of the Babylonian code has brought new problems of relationship and of external influences. Although on various grounds there is a strong probability that the code of Khammurabi must have been known in Palestine at some period, the Old Testament does not manifest such traces of the influence as might have been expected. Pentateuchal law is relatively unprogressive, it is marked by a characteristic simplicity, and by a spirit of reform, and the persisting primitive social conditions implied do not harmonize with other internal and external data. The existence of other laws, however, is to be presupposed, and there appear to be cases where the Babylonian code lies in the background. An independent authority concludes that "the co-existing likeness and differences argue for an independent recension of ancient custom deeply influenced by Babylonian law."[4] The questions are involved with the reforming spirit in biblical religion and history. On literary-historical grounds the Pentateuch in its present form is post-exilic, posterior to the old monarchies and to the ideals of the earlier prophetical writings. The laws are (*a*) partly contemporary collections (chiefly of a ritual and ceremonial character) and (*b*) partly collections of older and different origin, though now in post-exilic frames. The antiquity of certain principles and details is undeniable—as also in the Talmud—but since one must start from the organic connexions of the composite sources, the problems necessitate proper attention to the relation between the stages in the literary growth (working backwards) and the vicissitudes which culminate in the post-exilic age. The simplicity of the legislation (traditionally associated with Moab and Sinai and with Kadesh in South Palestine), the humanitarian and reforming spirit, the condemnation of abuses and customs are features which, in view of the background and scope of Deuteronomy, can hardly be severed from the internal events which connect Palestine of the Assyrian supremacy with the time of Nehemiah.[5]

Character of O. T. History.

The introduction, spread and prominence of the *name* Yahweh, the development of conceptions concerning his nature, his supremacy over other gods and the lofty monotheism which denied a plurality of gods, are questions which, like the biblical legislative ideas, cannot be adequately examined within the narrow compass of the Old Testament alone.

The biblical history is a "canonical" history which looks back to the patriarchs, the exodus from Egypt, the law-giving and the covenant with Yahweh at Sinai, the conquest of Palestine by the Israelite tribes, the monarchy, the rival kingdoms, the fall and exile of the northern tribes, and, later, of the southern (Judah), and the reconstructions of Judah in the times of Cyrus, Darius and Artaxerxes. It is the first known example of continuous historical writing (Genesis to Kings, Chronicles-Ezra-Nehemiah), and represents a deliberate effort to go back from the days when the Judaeans separated from the Samaritans to the very beginning of the world. A characteristic tone pervades the history, even of the antediluvian age, from the creation of Adam; or rather, the history of the earliest times has been written under its influence. It reveals itself in the days of the Patriarchs, before the "Amarna" age—or rather in the narratives relating to these remote ancestors. It will be perceived that an objective attitude to the subjective writings must be adopted, the starting-point is the writings themselves and not individual preconceptions of the authentic history which they embody. Although there are various points of contact with Palestinian external history, there is a failure to deal with some events of obvious importance, and an emphasis upon others which are less conspicuous in any broad survey of the land. There are numerous conflicting details which unite to prove that various sources have been used, and that the structure of the compilation is a very intricate one, the steps in its growth being extremely obscure.[1] In studying the internal peculiarities and the different circles of thought involved, it is found that they often imply written traditions which have a perspective different from that in which they are now placed.

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[1] O. C. Whitehouse, *Century Bible*, on Isa. x. 1 seq.

[2] See W. R. Smith, *Old Test. in the Jew. Church* (London, 1892), pp. 348, 350 seq.

[3] See BIBLE: *Old Test. Criticism*; JEWS, §§ 16, 23.

[4] C. H. W. Johns, Hastings's *Dict. Bible*, v. 611 seq., who points out that the intrusion of priestly power into the law courts is a recrudescence under changed conditions of a state of things from which the Babylonian code shows an emancipation nearly complete. The view formerly maintained by the present writer (*Laws of Moses and Code of Hammurabi*, 1903, pp. 204 sqq., 279 seq., &c.) relied upon the difference between the exilic or post-exilic sources which unambiguously reflect Babylonian and related ideas, and the absence in other biblical sources of the features which an earlier comprehensive Babylonian influence would have produced, and it incorrectly assumed that the explanation might be found in the ordinary reconstructions of Israelite history. Cf. above, p. 182, n. 1.

[5] On the later history of the canonical law (Mishnah, Gemara, &c.) see TALMUD. The Talmud embodies law, which is related to the Babylonian code not only in content but also sometimes in spirit; see L. N. Dembitz, *Jew. Quart. Rev.* xix. (1906), pp. 109 sqq. For the efforts of the Rabbis to improve the legal principles in Galilee in the 2nd and 3rd centuries A.D., see A. Büchler, Publication No. 1, Jews' College, London. With the removal of Judaism from Palestine and internal social changes the archaic primitive law reappeared, now influenced, however, by Mahommedan legislation.

Pre-Monarchical Period.

As regards the pre-monarchical period, some evidence points to a settlement (apparently from Aramaean localities) of the patriarchs, and of Israel (Jacob) and his sons, *i.e.* the "children of Israel." It ignores a descent into Egypt and the subsequent invasion.[2] The parallel account in the book of Joshua of the entrance of the "children of Israel" is, in its present form, the sequel to the journey of the people along the east of Edom and Moab after the escape from Egypt, and after a sojourn at Kadesh (Exodus-Deuteronomy). But other evidence also points to an entrance from Kadesh into Judah, and associates the kin of Moses, Kenites, Calebites and others. Thus, the tradition of a residence in Egypt, implied also in the stories of Joseph, has certainly become the "canonical" view, but the recollection was not shared by all the mixed peoples of Palestine; and to this difference of historical background in the traditions must be added divergent traditions of the earlier population. Traditions, oral and written, with widely differing standpoints have been brought together and merged. Moreover, the elaborate account of the vast invasion and conquest, the expulsion, extermination and subjugation of earlier inhabitants, and the occupation of cities and fields, combine to form a picture which cannot be placed in Palestine during the 15th–12th centuries. It must not be denied that the recollection of some invasion may have been greatly idealized by late writers, but it happens that there were important immigrations and internal movements in the 8th–6th centuries, that is to say, immediately preceding the post-exilic age, when this composite account in the Pentateuch and Joshua reached its present form. An enormous gap severs the pre-monarchical period from this age, and while the tribal schemes and tribal traditions can hardly be traced during the monarchies, the inclusion of Judah among the "sons" of Israel would not have originated when Judah and Israel were rival kingdoms. Yet the tribes survive in post-exilic literature and their traditions develop henceforth in *Jubilees*, *Testament of the XII Patriarchs*, &c. During the changes from the 8th century onwards a non-monarchical constitution naturally prevailed, first in the north and then in the south, and while in the north the mingled peoples of Samaria came to regard themselves as Israelite, the southern portion, the tribe of Judah, proves in 1 Chron. ii. & iv. to be largely of half-Edomite blood. A common ground previous to the Samaritan schism is ignored; it is found only in the period before the rival kingdoms. The political history of these monarchies in the book of Kings is singularly slight considering the extensive body of tradition which may be pre-supposed, *e.g.* for the reigns of Jeroboam II. and Uzziah, or which may be inferred from the evidence for different sources dealing with other periods.

The Monarchies.

The scanty *political* data in the annalistic notices of the north kingdom are supplemented by more detailed narratives of a few years leading up to the rise of the last dynasty, that of Jehu. The historical problems involved point to a loss of perspective (Jews, § 11), and the particular interest in the stories of Elijah and Elisha in an historical work suggests that the political records passed through the hands of communities whose interest lay in these figures. Old tradition suggests the "schools of the prophets" at Jericho, Gilgal and Bethel, and in fact the proximity of these places, especially Bethel, to Judaean soil may be connected with the friendly and sometimes markedly favourable attitude to Judah in these narratives. The rise of the kingdom of Israel under Saul is treated at length, but more prominence is given to the influence of the prophet Samuel; and not only is Saul's history written from a didactic and prophetical standpoint (cf. similarly Ahab), but the great hero and ruler is handled locally as a petty king at Gibeah in Benjamin. The interest of the narratives clings around north Judah and Benjamin, and more attention is given to the rise of the Judaean dynasty, the hostility of Saul, and the romantic friendship between his son Jonathan and the young David of Bethlehem. The history of the northern and southern kingdoms is handled separately in Kings; but in Samuel the rise of each is closely interwoven, and to the greater glory of David. The account of his steps contains details touching Judah and its relation to Israel which cannot be reconciled with certain traditions of Saul and the Ephraimite Joshua. It combines amid diverse material a hero of Bethlehem and rival of Saul with the idea of a conqueror of this district; it introduces peculiar traditions of the ark and sanctuary, and it associates David with Hebron, Calebites and the wilderness of Paran.[3] The books of Samuel and Kings have become, in process of compilation, the natural sequel to the preceding books, but the conflicting features and the perplexing differences of standpoint recur elsewhere, and the relationship between them suggests that similar causes have been operative upon the compilation. The history of Judah is, broadly speaking, that of the Davidic dynasty and the Temple, and it begins at the time of the first king of the rival north. Care is taken to record the transference of secular power and of Yahweh's favour from Saul to David, and David accomplishes more successfully or on a larger scale the achievements ascribed to Saul. The religious superiority of Jerusalem over the idolatrous north and over the "high places" is the main theme, and with it is the supremacy of the native Zadokite priests of Jerusalem over others (*e.g.* of Shiloh), who are connected with the desert traditions. The political history is relatively slight and uneven, and the framework is rehandled in Chronicles upon more developed lines and from a later ecclesiastical standpoint, which suggests that many traditions of the monarchy were extant in a late dress. Both books represent the same general trend of political events, even where the "canonical" representation is most open to criticism.

Chronicles—Ezra—Nehemiah.

Chronicles, with the book of Ezra and Nehemiah, makes a continuity between the old Judah which fell in 586 and the return (time of Cyrus), the rebuilding of the temple (Darius), and the reorganization associated with Nehemiah and Ezra (Artaxerxes). Historical material after 586 is scanty in the extreme, and, apart from the records of Nehemiah and a few other passages, the interest lies in the religious history of the communities and reformers who returned from Babylonia. The late and composite book of Chronicles places at the head of the Israelite divisions, which ignore the exodus (1 Chron. vii.

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[1] In the art. Jews, §§ 1–24, the biblical history is taken as the foundation, and the internal historical difficulties are noticed from stage to stage. In the present state of biblical historical criticism this plan seemed more advisable than any attempt to reconstruct the history; the necessity for some reconstruction will, however, be clear to the reader on the grounds of both the internal intricacies and the external evidence.

[2] See, in the first instance, E. Meyer (and B. Luther), *Die Israeliten und ihre Nachbarstämme* (Halle, 1906); also art. Genesis.

[3] Whence the theory that David was of S. Judaean or S. Palestinian origin (Marquart, Winckler, Cheyne, *Ency. Bib.* cols. 1020, 2613 seq.), and, also, that he knit together the southern non-Judaean clans (see David, Judah). But it is preferable to recognize different traditions of distinct origin and to inquire what genuine elements of history each may contain.

14, 20–24); a Judah consisting of fragments of an older stock replenished with families of South Palestinian, Edomite and North Arabian affinity. This half-Edomite population, recognizable also in Benjamin, manifests its presence in the official lists, and more especially in the ecclesiastical bodies inaugurated by David, from whose time the supremacy of this Judah is dated. The historical framework contains traditions of the reconstruction and repair of temple and cult, of the hostility of southern peoples and their allies, and of conflicts between king and priests. This retrospect of the Judaean kingdom must be taken with the following books, where the crucial features are (*a*) the presence (*c.* 444) of an aristocracy, partly (at all events) of half-Edomite affinity, before the return of any important body of exiles (Neh. iii.); (*b*) the gaps in the history between the fall of Samaria (722) and Jerusalem (586) to the rise of the hierocracy, and (c) the relation between the hints of renewed political activity in Zerubbabel's time, when the Temple was rebuilt (*c.* 520–516), and the mysterious catastrophe (with perhaps another disaster to the Temple), probably due to Edom, which is implied in the book of Nehemiah (*c.* 444). (See JEWS, § 22.) These data lead to the fundamental problem of Old Testament history. Since 1870 (Wellhausen's *De gentibus . . . Judaeis*) it has been recognized that 1 Chron. ii. and iv. accord with certain details in 1 Samuel, and appear to refer to a half-Edomite Judah in David's time (*c.* 1000 B.C.).[1] More recently E. Meyer, on the basis of a larger induction, has pointed out the relation of this Judah to a large group of Edomite or Edomite-Ishmaelite tribes.[2] The stories in Genesis represent a southern treatment of Palestinian tradition, with local and southern versions of legends and myths, and with interests which could only belong to the south.[3] It has long been perceived that Kadesh in South Palestine was connected with a law-giving and with some separate movement into Judah of clans associated with the family of Moses, Caleb, Kenites, &c. (see EXODUS, THE). With this it is natural to connect the transmission and *presence in the Old Testament* of specifically Kenite tradition, of the "southern" stories in Genesis, and of the stories of Levi.[4] The rise of this new Judah is generally attributed to David, but the southern clans remain independent for some five centuries, only moving a few miles nearer Jerusalem; and this vast interval severs the old half-Edomite or Arabian Judah from the sequel—the association of such names as Korah, Ethan and Heman with temple-psalms and psalmody.[5] It has long been agreed that biblical religion and history are indebted in some way to groups connected with Edom and North Arabia, and repeated endeavours have been made to explain the evidence in its bearing upon this lengthy period.[6] The problem, it is here suggested, is in the first instance a literary one—the literary treatment by southern groups, who have become Israelite, of a lengthy period of history. When the whole body of evidence is viewed comprehensively, it would seem that there was some movement northwards of semi-Edomite blood, tradition and literature, the date of which may be placed during the internal disorganization of Palestine, and presumably in the 6th century. Such a movement is in keeping with the course of Palestinian history from the traditional entrance of the Israelite tribes to the relatively recent migration of the tribe of 'Amr.[7] In the Old Testament popular feeling knows of two phases: Edom, the more powerful brother of Jacob (or Israel)—both could share in the traditions of Abraham, Isaac and Jacob—and the hatred of the treacherous Edom in the prophetical writings. Earlier phases have not survived, and the last-mentioned is relatively late,[8] after the southern influence had left itself upon history, legend, the Temple and the ecclesiastical bodies. On these grounds, then, it would seem that among the vicissitudes of the 8th and following centuries may be placed a movement of the greatest importance for Israelite history and for the growth of the Old Testament, one, however, which has been reshaped and supplemented (in the account of the Exodus and Invasion) and deliberately suppressed or ignored in the history of the age (viz. in Ezra-Nehemiah).

Trend of Criticism.

The unanimous recognition on the part of all biblical scholars that the Old Testament cannot be taken as it stands as a trustworthy account of the history with which it deals, necessitates a hypothesis or, it may be, a series of hypotheses, which shall enable one to approach the more detailed study of its history and religion. The curious and popular tradition that Ezra rewrote the Old Testament (2 Esd. xiv.), the concessions of conservative scholars, and even the view that the Hebrew text is too uncertain for literary criticism, indicate that the starting-point of inquiry must be the present form of the writings. The necessary work of literary analysis reached its most definite stage in the now famous hypothesis of Graf (1865–1866) and especially Wellhausen (1878), which was made more widely known to English readers, directly and indirectly through W. Robertson Smith, in the 9th edition of this Encyclopaedia.[9] The work of literary criticism and its application to biblical history and religion passed into a new stage as external evidence accumulated, and, more particularly since 1900, the problems have assumed new shapes. The tendency has been to assign more of the Old Testament, in its present form, to the Persian age and later; and also to work upon lines which are influenced sometimes by the close agreement with Oriental conditions generally and sometimes by the very striking divergences. It is the merit of Hugo Winckler especially to have lifted biblical study out of the somewhat narrow lines upon which it had usually proceeded, but, at the time of writing (1910), Old Testament criticism still awaits a sound reconciliation of the admitted internal intricacies and of the external evidence for Palestine and that larger area of which it forms part. Upon the convergence of the manifold lines of investigation rest all reconstructions, all methodical studies of biblical religion, law and prophecy, and all endeavours to place the various developments in an adequate historical framework.

Preliminary Hypotheses.

The preliminary hypotheses, it would seem, must be both literary and historical. The varied standpoints (historical, social, legal, religious, &c.) combine with the fragmentary character of much of the evidence to suggest that the literature has passed through different circles, with excision or revision of older material, and with the incorporation of other material, sometimes of older origin and of independent literary growth. Consequently, one is restricted in the first instance to such literature as survives and in the form which the last editors or compilers gave it. Different views as regards history (*e.g.* invasions, tribal movements, rival kingdoms) and religion (*e.g.* the Yahweh of Kadesh, Sinai, Jerusalem, &c.), and different priestly, prophetical and popular ideas are only to be expected, considering the character of Palestinian population. Hence to weave the data into a single historical outline or into an orderly evolution of thought is to overlook the probability of bona fide divergences of tradition and to assume that more rudimentary or primitive thought was excluded by the admitted development of religious-social ideals. The oldest nucleus of historical tradition appears to belong to Samaria, but it has been adjusted to other standpoints or interests, which are apparently connected partly with the half-Edomite and partly with the old indigenous Judaean stock.[1] Genesis–Kings (incomplete; some further material in Jeremiah) and the later Chronicles—Nehemiah are in their present form posterior to Nehemiah's time. Unfortunately the events of his age are shrouded in obscurity, but one can recognize the return of exiles from Babylon to Jerusalem and its environs—now half-Edomite—and various internal rivalries which culminate in the Samaritan schism.[2] The ecclesiastical rivalries have left their mark in the Pentateuch and (the later) Chronicles, and the Samaritan secession appears to have coloured even the book of Kings. These sources then are "post-exilic," and the elimination of material first composed in that age leaves historical, legal and other material which was obviously in circulation (so, *e.g.*, the non-priestly portions of Genesis).[3] The relatively earlier group of books is now the result of two complicated and continuous redactions, "Deuteronomic" (Deut.–Kings) and "Priestly" (Genesis–Joshua, with traces in the following books). The former is exceptionally intricate, being in its various aspects distinctly earlier, and in parts even later than the "priestly." Its standpoint, too, varies, the phases being now northern or wider Israelite, now half-Edomite or Judaean, and now anti-Samarian.

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[1] "The population of South Judah was of half-Arab origin" (W. R. Smith, *Old Test. Jew. Church*, p. 279).

[2] Meyer and Luther, *op. cit.*, p. 446, *et passim.*

[3] So especially Meyer and Luther, *op. cit.*; cf. also H. Gressmann, *Zeit. f. alt-test. Wissens.* (1910), p. 28 seq. Note also the view that the grand book of Job (*q.v.*) has an Edomite background.

[4] A. R. Gordon, *Early Trad. of Gen.* (London, 1907), pp. 74, 188; Meyer, *op. cit.*, pp. 83, 85 (on the Levites); Gressmann, *loc. cit.*; S. A. Cook, *Amer. Journ. of Theol.* (1909), pp. 382 sqq. See GENESIS, LEVITES, and JEWS, § 20.

[5] On the names, see GENEALOGY: *Biblical*; LEVITES, § 2, end, and *Ency. Bib.* col. 1665 seq.

[6] W. R. Harper (*Amos and Hosea*, 1905, p. liv.) observes: "Every year since the work of W. R. Smith brings Israel into closer relationship with Arabia"; cf. also N. Schmidt's conclusions (*Hibbert Journal*, 1908, p. 342), and the Jerahmeelite theory of T. K. Cheyne, who writes (*Decline and Fall of the Kingdom of Judah*, London, 1908, p. xxxvii.) ". . . by far the greater part of the extant literary monuments of ancient Israel are precisely those monuments whose producers were most preoccupied by N. Arabia."

[7] J. Dissard, *Rev. Bibl.*, 1905, pp. 410–425. Some S. Pal. revolt is also reflected shortly before the rise of the Jehu dynasty (JEWS, § 11). A few centuries later, the Edomites (Idumaeans) were again closely connected with the Jews; an Idumaean dynasty—that of the Herods—ruled in Judah, and once more there must have been a considerable amount of intermixture.

[8] Cf. R. H. Kennett, *Journ. Theol. Stud.* (1906), p. 487; *Camb. Bibl. Essays* (ed. Swete), p. 117. For an Edomite invasion between 586 and the Greek period, see also H. Winckler, *Altor. Forsch.* (1900), pp. 428 sqq., 455.

[9] Especially Wellhausen's articles, "Pentateuch," "Israel," "Moab," and W. R. Smith's large series including "Bible," "David," "Decalogue," "Judges," "Kings," "Levites," "Messiah," "Priest," "Prophet," "Psalms," &c.

Moreover, there is a late incorporation of literature, sometimes untouched by and sometimes merely approximating to "Deuteronomic" language or thought. How very late the historical books are in their present text or form may be seen from the Septuagint version of Joshua, Samuel and Kings, and from their internal literary structure, which suggests that only at the last stages of compilation were they brought into their present shape.[4] The result as a whole tends to show that the "canonical" history belongs to the last literary vicissitudes, and that similar influences (which have not affected every book in the same manner) have been at work throughout.

Reshaping of Tradition.

The history of the past is viewed from rather different positions which, on the whole, are subsequent to the relatively recent changes that gave birth to new organizations in Samaria and Judah. Consequently, in addition to the ordinary requirements of historical criticism, biblical study has to take into account the intricate composite character of the sources and the background of these positions. It is the criticism of sources which have both a literary and an historical compositeness. Not only are the standpoints of local interest (Samaria, Benjamin, Judah and the half-Edomite Judah being involved), but there are remarkable developments in the ecclesiastical bodies (Zadokites of Jerusalem, country and half-Edomite priests, Aaronites) which have influenced both the writing and the revision of the sources (see LEVITES). Yet it is noteworthy that the traditions are usually reshaped, readjusted or reinterpreted, and are not replaced by entirely new ones. Thus, the Samaritans claim the traditions of the land; the Chronicler traces the connexion between "pre-exilic" and "post-exilic" Judaeans, ignoring and obscuring intervening events; the south Palestinian cycle of tradition is adapted to the history of a descent into and an exodus from Egypt; Zadokite priests are enrolled as Aaronites, and the hierarchical traditions reveal stages of orderly and active development in order to authorize the changing standpoints of different periods and circles.[5] This feature recurs in later Palestinian literature (see MIDRASH, TALMUD) where there are *later* forms of thought and tradition, some elements of which although often of older origin, are almost or entirely wanting in the Old Testament. Much that would otherwise be unintelligible becomes more clear when one realizes the readiness with which settlers adopt the traditional belief and custom of a land, and the psychological fact that teaching must be relevant and must satisfy the primary religious feelings and aspirations, that it must not be at entire variance with current beliefs, but must represent the older beliefs in a new form. Any comparison of the treatment of biblical figures or events in the later literature will illustrate the retention of certain old details, the appearance of new ones, and an organic connexion which is everywhere in accordance with contemporary thought and teaching. If this raises the presumption that even the oldest and most isolated biblical evidence may rest upon still older authority, it shows also that the fuller details and context cannot be confidently recovered, and that earlier forms would accord with earlier Palestinian belief.[6] Hence, although records may be most untrustworthy in their present form or connexion, one cannot necessarily deny that a romance may presuppose a reality of history or that it may preserve the fact of an event even at the period to which it is ascribed (*e.g.* Abraham and Amraphel in Gen. xiv.; the invasions before 1000 B.C., &c.). But in all such cases the *present* form of the material may be more profitably used for the study of the historical or religious conceptions of *its* age. At the same time, the complexity of the vicissitudes of traditions, exemplified in modern Palestine itself, cannot be ignored.[7] Finally, biblical history is an intentional and reasoned arrangement of material, based upon composite sources, for religious and didactic purposes. Regarded as an historical work there is a remarkable absence of proportion, and a loss of perspective in the relation between antediluvian, patriarchal, Mosaic and later periods. From the literary-critical results, however, it is not so much the history of consecutive periods as the account of consecutive periods by compilers who are not far removed from one another as regards dates, but differ in standpoints. There was, in one case, a retrospect which did not include the deluge, and in another the patriarchs were actual settlers, a descent into Egypt and subsequent exodus being ignored; moreover, the standpoints of those who did not go into exile and of those who did and returned would naturally differ. In weaving the sources together the compilers had some acquaintance of course with past history, but on the whole it manifests itself only slightly (see JEWS, § 24), and the complete chronological system belongs to the latest stage. Investigation must concern itself not with what was possibly or probably known, but with what is actually presented. The fact remains that when accepted tradition conflicts with more reliable evidence it stands upon a level by itself;[8] and it is certain that a compilation based upon the knowledge which modern research—whether in the exact sciences or in history—has gained would have neither meaning for nor influence upon the people whom it was desired to instruct. A considerable amount of earlier history and literature has been lost, and it is probable that the traditions of the origins of the composite Israelites, as they are now preserved, embody evidence belonging to the nearer events of the 8th–6th centuries. The history of these centuries is of fundamental importance in any attempt to "reconstruct" biblical history.[9] The fall of Samaria and Judah was a literary as well as a political catastrophe, and precisely how much earlier material has been preserved is a problem in itself. It is very noteworthy, however, that, while no care was taken to preserve the history of the Chaldean and Persian Empires—and consequently the most confused ideas subsequently arose—the days of the Assyrian supremacy leave a much clearer imprint (cf. even the apocryphal book of Tobit). It may perhaps be no mere chance that with the dynasties of Omri and Jehu the historical continuity is more firm, that older forms of prophetical narrative are preserved (the times from Ahab to Jehu), and that to the reign of the great Jeroboam (first half of the 8th century), the canonical writers have ascribed the earliest of the extant prophetical writings (Amos and Hosea).

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[1] A Samarian (or Ephraimite or N. Israelite) nucleus may be recognized in the books of Joshua–Kings; see the articles on these books, JEWS, § 6; cf. Meyer, pp. 478 n. 2, 486 seq., and K. Lincke, *Samaria u. seine Propheten* (1903), p. 24. These preserve old poetical literature (Judg. v., 2 Sam. i.), stories of conquest and settlement, and they connect with the liturgy in Deut, xxvii. Joshua's covenant at Shechem and the Shechemite covenant-god (cf. Kennett, *Journ. Theol. Stud.*, 1906, pp. 495 sqq.; Lincke, *op. cit.*, p. 89. W. Erbt, *Die Hebräer* (1906), pp. 27 sqq.; Meyer and Luther, pp. 542 sqq., 550 seq.).

[2] There seems to be both political and religious animosity, but it is not certain that Josephus is wrong in placing the schism at the close of the Persian period; see, on this point, J. Marquart, *Isr. u. Jüd. Gesch.* (1896), p. 57 seq.; C. Steuernagel, *Theolog. Stud. u. Krit.* (1909), p. 5; G. Jahn, *Bücher Esra u. Nehemia* (Leiden, 1909), pp. 173-176; C. C. Torrey, *Ezra Studies* (Chicago, 1910), pp. 321 sqq. Old priestly rivalries between Cutha and Babylon may explain why the mixed Samaritans became known as Cuthaeans; according to the prevailing theory their predecessors, the "ten tribes" had been exiled in the 8th century.

[3] The term "post-exilic" is applied to literature and history after the return of exiles and the religious reconstruction of Judah. This, on the traditional view, would be in 537, if there were then any prominent return. Failing this, one must descend to the time of Nehemiah, which the biblical history itself regards as epoch-making. The tendency to make the exile an abrupt and complete change in life is based upon the theory underlying Chronicles–Nehemiah and is misleading (see Torrey, *op. cit.* pp. 287 sqq., &c.).

[4] Cf. the "Deuteronomic" form of Samuel, and the dependence of the literary growth of Genesis and the account of the exodus and invasion of Palestine upon the "southern" cycle of tradition.

[5] Cf. S. A. Cook, *Critical Notes on Old Testament History* (1907), pp. 62 seq., 67, 75 sqq., 112 seq.

[6] This applies also to the prophetical writings, the study of which is complicated by their use of past history to give point to *later* ideas and by the recurrence in history of somewhat similar events. As regards the situations which presuppose the ruin of Jerusalem and a return of exiles, the obscure events after the time of Zerubbabel cannot be left out of account. (See JEWS, §§ 14, 17 [p. 282], 22 n. 5, and art. ZEPHANIAH.)

[7] Note the rapid growth and embellishment of tradition, the inextricable interweaving of fact and fiction, the circumstantial or rationalized stories of imaginary beings, the supernatural or mythical stories of thoroughly historical persons, the absolute loss of perspective, and a reliance not upon the merits of a tradition but upon the authority with which it is associated.

[8] Cf. the remarkable Arabian stories of their predecessors, or the mingling of accurate and inaccurate data in Manetho and Ctesias.

[9] The evidence for Jewish colonies at Elephantine in Upper Egypt (5th century B.C.) has opened up new paths for inquiry. According to some scholars it is probable that they were descended from the soldiers settled by Psamtek I. (7th century), and not only are they in touch with Judah and Samaria, but in Psamtek's time an effort was made by the Asiatic and other mercenaries to escape into Ethiopia (J. H. Breasted, *Eg. hist. doc.* iv. 506 seq.). It is already suggested that allusions to a sojourn in Egypt may refer, not to the remote times of Jacob and Moses but to the circumstances of the 7th century; see C. Steuernagel, *op. cit.* pp. 7-12; E. Meyer, *Sitzungsberichte* of the Berlin Academy, June 1908, p. 655. n. 1.

Summary.

External evidence for Palestine, in emphasizing the necessity for a reconsideration of the serious difficulties in the Old Testament, and in illustrating at once its agreement and still more perplexing disagreement with contemporary conditions, furnishes a more striking proof of its uniqueness and of its permanent value. The Old Testament preserves traces of forgotten history and legend, of strange Oriental mythology, and the remains of a semi-heathenish past. "Canonical" history, legislation and religion assumed their present forms, and, while the earlier stages can only incompletely be traced, the book stands at the head of subsequent literature, paving the way for Christianity and Rabbinical Judaism, and influencing the growth of Mahommedanism. In leaving the land of its birth it has been taken as a whole, and for many centuries has been regarded as an infallible record of divinely granted knowledge and of divinely shaped history. During what is relatively a very brief period deeper inquiry and newer knowledge have forced a slow, painful but steady readjustment of religious convictions. While the ideals and teaching of the Old Testament have always struck a responsive chord, scientific knowledge of the evolution of man, of the world's history and of man's place in the universe, constantly reveals the difference between the value of the old Oriental legacy for its influence upon the development of mankind and the unessential character of that which has had inevitably to be relinquished. Yet, wonderful as the Old Testament has ever seemed to past generations, it becomes far more profound a phenomenon when it is viewed, not in its own perspective of the unity of history—from the time of Adam, but in the history of Palestine and of the old Oriental area. It enshrines the result of certain influences, the teaching of certain truths, and the acquisition of new conceptions of the relations between man and man, and man and God. Man's primary religious feeling seeks to bring him into association with the events and persons of his race, and that which in the Old Testament appears most perishable, most defective, and which suffers most under critical inquiry, was necessary in order to adapt new teaching to the commonly accepted beliefs of a bygone and primitive people.[1] The place of the Old Testament in the general education of the world is at the close of one era and at the beginning of another. After a lengthy development in the history of the human race a definite stage seems to have been reached about 5000 B.C., which step by step led on to those great ancient cultures (Egyptian, Aegean, Babylonian) which surrounded Palestine.[2] These have influenced all subsequent civilization, and it was impossible that ancient Palestine could have been isolated from contemporary thought and history. After reaching an astonishing height (roughly 2500–1500 B.C.) these civilizing powers slowly decayed, and we reach the middle of the first millennium B.C.—the age which is associated with the "Deutero-Isaiah" (Isa. xl.–lv.), with Cyrus and Zoroaster, with Buddha and Confucius, and with Phocylides and Socrates.[3] This age, which comes midway between the second Egyptian dynasty (*c.* 3000 B.C.) and the present day, connects the decline of the old Oriental empires with the rise of the Persians, Greeks and Romans. In both Babylonia and Egypt it was an age of revival, but there was no longer any vitality in the old soil. In Palestine, on the other hand, the downfall of the old monarchies and the infusion of new blood gave fresh life to the land. There had indeed been previous immigrations, but the passage from the desert into the midst of Palestinian culture led to the adoption of the old semi-heathenism of the land, a declension, and a descent from the relative simplicity of tribal life.[4] Now, however, the political conditions were favourable, and for a time Palestine could work out its own development. In these vicissitudes which led to the growth of the Old Testament, in its preservation among a devoted people, and in the results which have ensued down to to-day, it is impossible not to believe that the history of the past, with its manifold evolutions of thought and action, points the way to the religion of the future. (S. A. C.)

II.—*From Alexander the Great to* A.D. *70.*

Alexander the Great.

After the taking of Tyre Alexander decided to advance upon Egypt. With the exception of Gaza, the whole of *Syria Palaestine* (as it was called) had made its submission. That—in summary form—is the narrative of the Greek historian Arrian (*Anabasis*, ii. 25). Apart from the facts contained in this statement, the phraseology is of some importance, as the district of "Palestinian Syria" clearly includes more than the territory of the Philistines, which the adjective properly denotes (Josephus, *Antiquities*, i. 6, 2, xiii. v. 10). From the military point of view—and Arrian drew upon the memoirs of two of Alexander's lieutenants—the significant thing was that not merely was the coast route from Tyre to Gaza open, but also there was no danger of a flank attack as the expeditionary force proceeded. Palestinian Syria, in fact, is here synonymous with what is commonly called Palestine. Similarly Josephus quotes from Herodotus the statement that the Syrians *in Palestine* are circumcised and profess to have learned the practice from the Egyptians (*C. Apionem*, i. 22, §§ 169, 171, Niese); and he comments that the Jews are the only inhabitants of Palestine who do so. These two examples of the wider use of the adjective and noun seem to testify to the forgotten predominance of the Philistines in the land of Canaan.

But, in spite of the statement and silence of Arrian, Jewish tradition, as reported by Josephus (*Ant.* xi. 8, 3 sqq.), represents the high priest at Jerusalem as refusing Alexander's offered alliance and request for supplies. The Samaritans—the Jews ignored in their records all other inhabitants of Palestine—courted his favour, but the Jews kept faith with Darius so long as he lived. Consequently a visit to Jerusalem is interpolated in the journey from Tyre to Gaza; and, Alexander, contrary to all expectation, is made to respect the high priest's passive resistance. He had seen his figure in a dream; and so he sacrificed to God according to his direction, inspected the book of Daniel, and gave them—and at their request the Jews of Babylon and Media—leave to follow their own laws. The Samaritans were prompt to claim like privileges, but were forced to confess that, though they were Hebrews, they were called the Sidonians of Shechem and were not Jews. The whole story seems to be merely a dramatic setting of the fact that in the new age inaugurated by Alexander the Jews enjoyed religious liberty. The Samaritans are the villains of the piece. But it is possible that Palestinian Jews accompanied the expedition as guides or exerted their influence with Jews of the Dispersion on behalf of Alexander.

It appears from this tradition that the Jews of Palestine occupied little more than Jerusalem. There were kings of Syria in the train of Alexander who thought he was mad when he bowed before the high priest. We may draw the inference that they formed an insignificant item in the population of a small province of the Persian Empire, and yet doubt whether they did actually refuse—alone of all the inhabitants of Palestine—to submit to the conqueror of the whole. At any rate they came into line with the rest of Syria and were included in the province of Coele-Syria, which extended from the Taurus and Lebanon range to Egypt. The province was entrusted first of all to Parmenio (Curtius iv. 1, 4) and by him handed over to Andromachus (Curtius iv. 5, 9). In 331 B.C. the Samaritans rebelled and burned Andromachus alive (Curtius iv. 8, 9): Alexander came up from Egypt, punished the rebels, and settled Macedonians in their city. The loyalty of the Jews he rewarded by granting them Samaritan territory free of tribute—according to a statement attributed by Josephus (*c. Apionem*, ii. § 43, Niese) to Hecataeus.

Ptolemy I.

After the death of Alexander (323 B.C.) Ptolemy Lagi, who became satrap and then king of Egypt by right of conquest (Diodorus xviii. 39), invaded Coele-Syria in 320 B.C. Then or after the battle of Gaza in 312 B.C. Ptolemy was opposed by the Jews and entered Jerusalem by taking advantage of the Sabbath rest (Agatharchides *ap. Jos. c. Apionem* i. 22, §§ 209 seq.; cf. *Ant.* xii. 1, 1). Whenever this occupation took place, Ptolemy became master of Palestine in 312 B.C., and though, as Josephus complains, he may have disgraced his title, *Soter*, by momentary severity at the outset, later he created in the minds of the Jews the impression that in Palestine or in Egypt he was—in deed as well as in name—their preserver. Since 315 B.C. Palestine had been occupied by the forces of Antigonus. Ptolemy's successful forward movement was undertaken by the advice of Seleucus (Diodorus xix. 80 sqq.), who followed it up by regaining possession of Babylonia. So the Seleucid era began in 312 B.C. (cf. *Maccabees*, i. 10) and the dynasty of Seleucus justified the "prophecy" of Daniel (xi. 2): "And the king of the south (Ptolemy) shall be strong, but one of his captains (Seleucus) shall be strong above him and have dominion" (see SELEUCID DYNASTY).

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[1] Cf. P. Gardner, *Hist. View of New Test.* (1904) 26, 44, sqq.

[2] See Meyer's interesting remarks, *Gesch. d. Alt.* i. §§ 592 sqq.

[3] Cf. A. P. Stanley, *Jewish Church* (1865), Lectures xlv. seq.; A. Jeremias, *Monoth. Strömungen* (Leipzig, 1904), p. 43 seq. Among the developments in Greek thought of this period, especially interesting for the Old Testament is the teaching associated with Phocylides of Miletus; see Lincke, *Samaria*, pp. 47 seq.

[4] Cf. G. A. Smith, *Hist. Geog.* pp. 85 sqq., also the Arab historian Ibn Khaldūn on the effects of civilization upon Arab tribes (see *e.g.* R. A. Nicholson, *Lit. Hist. of the Arabs* [London, 1907], pp. 439 sqq.)

Abandoned by his captain and future rival, Seleucus, Ptolemy retired and left Palestine to Antigonus for ten years. In 302 B.C., by terms of his alliance with Seleucus, Lysimachus and Cassander, he set out with a considerable force and subdued all the cities of Coele-Syria (Diodorus xx. 113). A rumour of the defeat of his allies sent him back from the siege of Sidon into Egypt, and in the partition of the empire, which followed their victory over Antigonus at Issus, he was ignored. But when Seleucus came to claim Palestine as part of his share, he found his old chief Ptolemy in possession and retired under protest. From 301 B.C.–198 B.C. Palestine remained, with short interruptions, in the hands of the Ptolemies.

Joseph, Son of Tobiah.

Of Palestine, as it was during this century of Egyptian domination, there is much to be learned from the traditions, reported by Josephus (*Ant.* xii. 4), in which the career of Joseph, the son of Tobiah, is glorified as the means whereby the national misfortunes were rectified. This Joseph was the nephew of Onias, son of Simon the Righteous, and high priest. Onias is described—in order to enhance the glory of Joseph—as a man of small intelligence and deficient in wealth. In consequence of this deficiency he failed to pay the tribute due from the people to Ptolemy, as his fathers had done, and is set down by Josephus as a miser who cared nothing for the protest of Ptolemy's special ambassador. Considering the character of Joseph as it was revealed by prosperity, one is tempted to find other explanations of his conduct than avarice. It is clearly indicated that the Jews as a whole were poor, and it is admitted that Onias was not wealthy. Perhaps it was the Sabbatical year, when no tribute was due. Perhaps Onias would not draw upon the sacred treasure in order to pay tribute to Ptolemy. In any case Joseph borrowed money from his friends in Samaria; and this point in the story proves that the Jews were supposed to have dealings with the Samaritans at the time and could require of them the last proof of friendship. Armed with his borrowed money, Joseph betook himself to Egypt; and there outbid the magnates of Syria when the taxes of the province were put up to auction. He had gained the ear of the king by entertaining his ambassador, and the representatives of the cities—the Greek cities of Syria—were discomfited. The king gave him troops and he borrowed more money from the king's friends. When he began to collect taxes he was met with refusal and insult at Ascalon and at Scythopolis, but he executed the chief men of each city and sent their goods to the king. Warned by these examples, the Syrians opened their gates to him and paid their taxes. For twenty-two years he held his office and was to all intents and purposes governor of Syria, Phoenicia and Samaria—"A good man" (Josephus calls him) "and a man of mind, who rescued the people of the Jews from poverty and weakness, and set them on the way to comparative splendour" (*Ant.* xii. 4, 10).

The story illustrates the rise of a wealthy class among the Jews of Palestine, to whom the tolerant and distant rule of the Ptolemies afforded wider opportunities. At the beginning it is said that the Samaritans were prosperous and persecuted the Jews, but this Jewish hero embracing his opportunities reversed the situation and presumably paid the tribute due from the Jews by exacting more from the non-Jewish inhabitants of his province. He is a type of the Jews who embraced the Greek way of life as it was lived at Alexandria; but his influence in Palestine was insidious rather than actively subversive of Judaism. It was different when the Jews who wished to be men of the world took their Hellenism from the Seleucid court and courted the favour of Antiochus Epiphanes.

Halfway through this century (249 B.C.) the desultory warfare between Egypt and the Seleucid power came to a temporary end (Dan. xi. 6). Ptolemy II. Philadelphus gave his daughter Berenice with a great dowry to Antiochus II. Theos. When Ptolemy died (247 B.C.), Antiochus' divorced wife Laodice was restored to favour, and Antiochus died suddenly in order that she might regain her power. Berenice and her son were likewise removed from the path of her son Seleucus. In the vain hope of protecting his sister Berenice, the new king of Egypt, Ptolemy III. Eugeretes I., invaded the Seleucid territory, "entered the fortress of the king of the north" (Dan. xi. 7 sqq.), and only returned—laden with spoils, images captured from Egypt by Cambyses, and captives (Jerome on Daniel *loc. cit.*)—to put down a domestic rebellion. Seleucis reconquered northern Syria without much difficulty (Justin xxxvii. 2, 1), but on an attempt to seize Palestine he was signally defeated by Ptolemy (Justin xxvii. 2, 4).

Antiochus III.

In 223 B.C. Antiochus III. the Great came to the throne of the Seleucid Empire and set about extending its boundaries in different directions. His first attempt on Palestine (221 B.C.) failed; the second succeeded by the treachery of Ptolemy's lieutenant, who had been recalled to Alexandria in consequence of his successful resistance to the earlier invasion. But in spite of this assistance the conquest of Coele-Syria was not quickly achieved; and when Antiochus advanced in 218 B.C. he was opposed by the Egyptians on land and sea. Nevertheless he made his way into Palestine, planted garrisons at Philoteria on the Sea of Galilee and Scythopolis, and finally stormed Rabbath-ammon (Philadelphia) which was held by partisans of Egypt. Early in 217 B.C. Ptolemy Philopater led his forces towards Raphia, which with Gaza was now in the hands of Antiochus, and drove the invaders back. The great multitude was given into his hand, but he was not to be strengthened permanently by his triumph (Dan. xi. 11 sqq.). Polybius describes his triumphal progress (v. 86): "All the cities vied with one another in returning to their allegiance. The inhabitants of those parts are always ready to accommodate themselves to the situation of the moment and prompt to pay the courtesies required by the occasion. And in this case it was natural enough because of their deep-seated affection for the royal house of Alexandria."

When Ptolemy Philopater died in 205 B.C., Antiochus and Philip of Macedon, his nominal friends, made a secret compact for the division of his possessions outside Egypt. The time had come of which Daniel (xi. 13 sqq.) says: "The king of the north shall return after certain years with a great army and with much riches. And in those times there shall many stand up against the king of the south; also the robbers of thy people shall exalt themselves to establish the vision; but they shall fall." Palestine was apparently allotted to Antiochus and he came to take it, while Philip created a diversion in Thrace and Asia Minor. Already he had allies among the Jews and, if Daniel is to be trusted, there were other Jews who rose up to shake off the yoke of foreign supremacy, Seleucid or Egyptian, and succeeded only in rendering the triumph of Antiochus easier of achievement. But in the year 200 B.C. Rome intervened with an embassy, which declared war upon Philip and directed Antiochus and Ptolemy to make peace (Polyb. xvi. 27). And in 198 B.C. Antiochus heard that Scopas, Ptolemy's hired commander-in-chief had retaken Coele-Syria (Polyb. xvi. 39) and had subdued the nation of the Jews in the winter. For these sufficient reasons Antiochus hurried back and defeated Scopas at Paneas, which was known later as Caesarea Philippi (Polyb. xvi. 18 seq.). After his victory he took formal possession of Batanaea, Samaria, Abila and Gadara; "and after a little the Jews who dwelt round about the shrine called Jerusalem came over to him" (Polyb. xvi. 39). Only Gaza withstood him, as it withstood Alexander; and Polybius (xvi. 40) pauses to

Antiochus and Rome.

praise their fidelity to Ptolemy. The siege of Gaza was famous; but in the end the city was taken by storm, and Antiochus, secure at last of the province, which his ancestors had so long coveted, was at peace with Ptolemy, as the Roman embassy directed. From Palestine Antiochus turned to the Greek cities of Asia Minor, and by 196 B.C. he was in Thrace. There he was confronted by the ambassadors of Rome, who expressed their surprise at his actions. Antiochus replied that he was recovering the territory won by Seleucus his ancestor, and inquired by what right did the Romans dispute with him about the free cities in Asia (Polyb. xviii. 33 seq.). The conference was broken off by a false report of Ptolemy's death, but war between Rome and Antiochus was clearly inevitable—and Antiochus was joined by Hannibal. After much diplomacy, Antiochus advanced into Greece and Rome declared war upon him in 191 B.C. (Livy xxxvi. 1). He was defeated on the seas and driven first out of Greece and then out of Asia Minor. His army was practically destroyed at Magnesia, and he was forced to accept the terms of peace, which the Romans had offered and he had refused before the battle. By the peace of Apamea (188 B.C.) he abandoned all territory beyond the Taurus and agreed to pay the whole cost of the war. He had stood in the beauteous land—the land of Israel—with destruction in his hand. He had made agreement with Ptolemy. He had turned his face unto the isles and had taken many. But now a commander had put an end to his defiance and had even returned his reproach unto him (Dan. xi. 16–18). After Magnesia men said "King Antiochus the Great *was*" (Appian, *Syr.* 37); and the by-word was soon justified in fact, for he plundered a temple of Bel at Elymais to replenish his exhausted treasury and met the fitting punishment from the gods at the hands of the inhabitants (Diodorus xxix. 15). He stumbled and fell and was not found (Dan. xi. 19).

Seleucus IV.

The need which drove Antiochus to this sacrilege rested heavily upon his successor Seleucus IV. (reigned 187–175 B.C.). The indemnity had still to be paid and Daniel designates Seleucus as "one that shall cause an exactor to pass through the glory of the kingdom" (xi. 20). A tradition preserved in 2 Macc. iii. describes the attempt of Heliodorus, the Seleucid prime minister, to plunder the temple at Jerusalem. The holy city lay in perfect peace and the laws were very well kept because of the piety of Onias the high priest. But one Simon, a Benjamite, who had become guardian of the temple, quarrelled with Onias about the city market, and reported to the governor of Coele-Syria and Phoenicia that the treasury was full of untold sums of money. The priests and people besought Heliodorus to leave this sacred treasure untouched, but he persisted and—in answer to their prayers—was overthrown by a horse with a terrible rider and scourged by two youths. Onias, fearful of the consequences, offered a sacrifice for his restoration, and the two youths appeared to him with the message that he was restored for the sake of Onias. The description of the previous tranquillity may be exaggerated, though it is clear that the Jews, like the other inhabitants of Palestine, must have been left very much to themselves; but the enmity between the adherents of Simon and the pious Jews, who supported and venerated Onias, seems to be a necessary precondition of the state of affairs soon to be revealed. There were already Jews who wished to make terms with their overlord at all costs.

Antiochus IV. and Jason.

When Antiochus IV. Epiphanes (175–164 B.C.) succeeded to the throne, Jason—whose name betrays a leaning towards Hellenism—the brother of Onias, offered the king a bribe for the high-priesthood and another for leave to convert Jerusalem into a Greek city (2 Macc. iv. 7 sqq.). Antiochus had spent his youth at Rome as a hostage, and the death of Seleucus found him filling the office of war minister at Athens. The Hellenistic Jews were, therefore, his natural allies, and allies were very necessary to him if he was to establish himself in Syria. Onias had proceeded to Antioch to explain the disorder and bloodshed due to Jason's followers, and so Jason, high priest of the Jews by grace of Antiochus, had his way. The existing privileges, which the Jews owed to their ambassador to Rome, were thrust aside. In defiance of the law a gymnasium was set up under the shadow of the citadel. The young men of the upper classes assumed the Greek hat, and were banded together into a gild of *ephebi* on the Greek model. In fact Jason established in Jerusalem the institutions which Strabo expressly describes as visible signs of the Greek way of life—"gymnasia and associations of *ephebi* and clans and Greek names borne by Romans" (v. p. 264, referring to Neapolis)—and that on his own initiative. The party who wished to make a covenant with the heathen (1 Macc. i. 11 sqq.) were in the majority; and so far and so long as they were in the ascendant Antiochus was rid of his chief danger in Palestine, the debatable land between Syria and Egypt. At first Egypt was well disposed to him, as Cleopatra his sister was regent. But she died in 173 B.C.

Hellenism.

The struggle for the possession of Palestine began in 170 B.C., when Rome was preoccupied with the war against Perseus of Macedonia. Antiochus sent an ambassador to Rome to protest that Ptolemy, contrary to all law and equity, was attacking him (Polyb. xxvii. 17). In self defence, therefore, Antiochus advanced through Palestine and defeated the Egyptian army near Pelusium on the frontier. At the news the young king, Ptolemy Philometor, fled by sea, only to fall into his uncle's hands; but his younger brother, Ptolemy Euergetes II., was proclaimed king by the people of Alexandria (Polyb. xxix. 8). Thus Antiochus entered Egypt as the champion of the rightful king and laid siege to Alexandria, which was held by the usurper. When he abandoned the siege and returned to Syria, Philometor, whom he had established at Memphis, was reconciled with his brother, being convinced of his protector's duplicity by the fact that he left a Syrian garrison in Pelusium. In 168 B.C. Antiochus returned and found that the pretext for his presence there was gone. Moreover the defeat of Perseus at Pydna set Rome free to take a strong line in Egypt. As he approached Alexandria Antiochus met the Roman ambassador, and, after a brief attempt at evasion, accepted his ultimatum on the spot. He evacuated Egypt and returned home cowed (Dan. xi. 30; cf. Polyb. xxix. 11). Later he could attend the celebration of the Roman triumph over Macedonia, and surpass it by a festival at Antioch in honour of his conquest of Egypt (Polyb. xxxi. 3–5); but the loss of Pelusium made it imperative that he should be sure of Palestine. His friends the Hellenizing Jews had split up into factions. Menelaus, the brother of Simon the Benjamite, had bought the high-priesthood over the head of Jason, who fled into the country of the Ammonites, in 172 B.C. (2 Macc. iv. 23 sqq.). To secure his position (for he was not even of the priestly tribe) Menelaus persuaded the deputy of Antiochus, who was dealing with a revolt at Tarsus, to put Onias to death. Antiochus, on his return, had his deputy executed and wept for the dead Onias. But Menelaus managed to retain his position, and his accusers were put to death. Antiochus could pity Onias, who had been tempted from the sanctuary at Daphne, but he needed an ally in Jerusalem—and money. Then, during the first or second invasion of Egypt, Jason, hearing that Antiochus was dead, returned suddenly and massacred all the followers of Menelaus who did not take refuge in the citadel. He had some claim to the loyalty of such pious Jews as remained, because he was of the tribe of Levi—in spite of the means he, like Menelaus, had employed to get the high-priesthood. His temporary success reveals the strength of the party who wished to adopt the Greek way of life without consenting to the complete substitution of the authority of Antiochus for the prescriptions of the Mosaic Law. It was also a warning to Antiochus, who returned to exact a bloody vengeance and to loot the Temple (169 or 168 B.C.). After the evacuation of Egypt, Antiochus followed out the policy which Jason had suggested to him at the first. Jerusalem was suddenly occupied by one of his captains, and a garrison was planted in a new fortress on Mount Zion. Then to coerce the Jews into conformity, the Law was outraged in the Holy Place. The worship of Zeus Olympius replaced the worship of Yahweh, and swine were offered as in the Eleusinian mysteries. At the same time the Samaritan temple at Shechem was made over to Zeus Xenius: it is probable that the Samaritans were, like the Jews, divided into two parties. The practice of Judaism was prohibited by a royal edict (1 Macc. i. 41–63; 2 Macc. vi.-vii. 42), and some of the Jews died rather than disobey the law of Moses. It is legitimate to suppose that this attitude would have surprised Antiochus if he had heard of it. His Jewish friends, first Jason and then Menelaus, had been enlightened enough to throw off their prejudices, and, so far as he could know, they represented the majority of the Jews. Zeus was for him the supreme god of the Greek pantheon, and the syncretism, which he suggested for the sake of uniformity in his empire, assuredly involved no indignity to the only God of the Jews. At Athens Antiochus began to build a vast temple of Zeus Olympius, in place of one begun by Peisistratus; but it was only finished by Hadrian in A.D. 130. Zeus Olympius was figured on his coins, and he erected a statue of Zeus Olympius in the Temple of Apollo at Daphne. More, he identified himself—Epiphanes, *God Manifest*—with Zeus, when he magnified himself above all other gods (Dan. xi. 37). To the minority of strict Jews he was therefore "the abomination of desolation standing where *he* ought not"; but the majority he carried with him and, when he was dying (165 B.C.) during his eastern campaigns, he wrote to the loyal Jews as their fellow citizen and general, exhorting them to preserve their present goodwill towards him and his son, on the ground that his son would continue his policy in gentleness and kindness, and so maintain friendly relations with them (2 Macc. ix.).

Jewish Revolt.

For the Jews who still deserved the name the policy of Antiochus wore a very different aspect. Many of them became martyrs for the Law, and for a time none would raise his hand to defend himself on the Sabbath if at all. No record remains of the success of the Athenian missionary whom Antiochus sent to preach the new Catholicism; but the soldiers at any rate did their work thoroughly. At last a priestly family at a village called Modein committed themselves to active resistance; and, when they suspended the Sabbath law for purposes of self defence, they were joined by the Hasidaeans (Assidaeans), who seem to have been the spiritual ancestors of the Pharisees. The situation was plain enough: unless the particular law of the Sabbath was suspended there would soon have been none to keep the Law at all in Palestine. Jerusalem had apostatized, but the country so far as it was populated by Jews was faithful. Under Judas Maccabeus the outlaws wandered up and down re-establishing by force their proscribed religion. In 165 B.C. they attained their end, the regent of Syria conceded the measure of toleration they required with the approval of Rome; and in 164 B.C. the temple was purged of its desecration. But Judas did not lay down his arms, and added to his resources by rescuing the Jews of Galilee and Gilead and settling them in Judaea (1 Macc. v.). The Nabataean Arabs and the Greeks of Scythopolis befriended them, but the province generally was hostile. In spite of their hostility Judas more than held his own until the regent defeated him at Bethzachariah. The rebels were driven back on Mount Zion and were there besieged (163 B.C.). The rumour of a pretender to the throne saved them from destruction, and they capitulated, exchanging the strongholds they had for their lives. At any rate the time of compulsory fusion with the Greeks was ended once for all. In 162 B.C. Demetrius, the son of Seleucus, escaped from Rome and was proclaimed king. Like Antiochus Epiphanes, who also had spent his youth as a hostage in Rome, he was inclined to listen to the Hellenizing Jews, whom he found assembled in full force at Antioch, and to support them against Judas, who was now supreme in Judaea. But he dealt more subtly with them: instead of a pagan missionary he sent them Alcimus, a legitimate high-priest, who detached the Hasidaeans from Judas. Indeed, Alcimus and his company did more mischief among the Israelites than the heathen (1 Macc. vii. 23) and Judas took vengeance upon those who deserted from him. Nicanor was appointed governor and prevailed upon Judas to settle down like an ordinary citizen. But Alcimus complained to the king and Judas fled just in time to escape being sent to Antioch as a prisoner. In the battle of Adasa, which soon followed, Nicanor was defeated and his forces annihilated, thanks to the Jews who came out from all the villages of Judaea (1 Macc. vii. 46). At this point (161 B.C.) Judas sent an embassy to Rome and an alliance was concluded (1 Macc. viii.), too late to save Judas from the determined and victorious attack of Demetrius. The death of Judas at Elasa left the field open to the apostates, and his followers were reduced to the level of roving brigands. The Syrian general made fruitless attempts to capture them, and build forts in Judaea whose garrisons should harass Israel (1 Macc. ix. 50–53), but Jonathan and Simon, brothers of Judas, found their power increase until Jonathan ruled at Michmash as judge and destroyed the godless out of Israel (1 Macc. ix. 73).

Alcimus.

Jonathan and Simon.

In 153 B.C. there appeared another of the series of pretenders to the Syrian throne, to whose rivalry Jonathan, and Simon after him, owed the position they acquired for themselves and their nation. Jonathan was recognized as the head of the Jews, and his prestige and power were such that the charges of the Hellenizing Jews received scant attention. As the years went on he became Strategus and the Syrian garrisons were withdrawn from all the strongholds except Jerusalem and Bethzur. In 147 B.C. he defeated the governor of Coele-Syria in another civil war and received Ekron as his personal reward—as it was said in the name of the prophet Zachariah (ix. 7), "and Ekron shall be as a Jebusite." The king for whom he fought was defeated; but his successor acceded to the demands of Jonathan, added three districts of Samaria to Judaea and freed the whole from tribute. The next king confirmed this and appointed Simon military commander of the district stretching from Tyre to Egypt. So with Syrian as well as Jewish troops the brothers set about subduing Palestine; and Jonathan sent ambassadors in the name of the high-priest and people of the Jews to Rome and Sparta. In spite of the treacherous murder of Jonathan by the Syrian general, the prosperity of the Jews was more than maintained by Simon. The port of Joppa, which was already occupied by a Jewish garrison, was cleared of its inhabitants and populated by Jews. Finally, in 141 B.C., the new era began: the yoke of the heathen was taken away from Israel and Simon was declared high-priest and general and ruler of the Jews for ever until there should arise a faithful prophet (1 Macc. xiii. 41, xiv. 41).

John Hyrcanus.

In 135 B.C. the political ambitions of the Jews were rudely checked: a new king of Syria, Antiochus Sidetes, resented their encroachments at Joppa and Gazara and drove them back into Jerusalem. In 134 famine compelled John Hyrcanus, who had succeeded his father Simon, to a belated compliance with the king's demands. The Jews laid down their arms, dismantled Jerusalem, and agreed to pay rent for Joppa and Gazara. But in 129 B.C. Antiochus died fighting in the East and for sixty-five years the Jews enjoyed independence. John Hyrcanus was not slow to take advantage of his opportunities. He conquered the Samaritans and destroyed the temple on Mount Gerizim. He subdued the Edomites and compelled them to become Jews. Soon after his death his sons stormed Samaria, which Alexander the Great had colonized with Macedonian soldiers, and razed it to the ground. Judas Aristobulus, who succeeded and was the first of the Hasmonaeans, called himself king and followed his father's example by compelling the Ituraeans to become Jews, and so creating the Galilee of New Testament times. In this case, as in that of the Edomites, it is natural to suppose that there existed already a nucleus of professing Jews which made the wholesale conversion possible. By this time (103 B.C.) it was clear that the Hasmonaeans were—from the point of view of a purist—practically indistinguishable from the Hellenizers whom Judas had opposed so keenly, except that they did not abandon the formal observances of Judaism, and even enforced them upon foreigners. Consequently the Jews were divided into two parties—Pharisees and Sadducees—of whom the Pharisees cared only for doing or enduring the will of God as revealed in Scripture or in the events of history. **Pharisees and Sadducees.** This division bore bitter fruit in the reign of Alexander Jannaeus (104–78 B.C.), who by a standing army achieved a territorial expansion which was little to the mind of the Pharisees. At first his attack upon Ptolemais brought him into conflict with Egypt, in which he was worsted, but the Jewish general who commanded the Egyptian army persuaded the queen to evacuate Palestine. Then he turned to the country east of the Jordan, and then to Philistia. Later he was utterly defeated by a king of Arabians and fled to Jerusalem, only to find that the Pharisees had raised his people against him and would only be satisfied by his death. The rebels' appeal to the Seleucid governor of part of Syria (88 B.C.) caused a revulsion in his favour, and finally he made peace by more than Roman methods. Aretas, the Arabian king, pressed him hard on the south and the east, but he was able to make some conquests still on the east of the Jordan. In spite of his quarrel with the Pharisees, he seems to have offered the cities he conquered the choice between Judaism and destruction (Jos. *Ant.* xiii. 15, 4). Under Alexandra, his widow (78–69 B.C.), the Pharisees ruled the Jews and no expansion of the kingdom was attempted. It was threatened by Tigranes, king of Armenia, who then held the Syrian Empire, but a bribe and the imminence of the Romans (Jos. *Ant.* xiii. 16, 4; *War* i. 5, 3) saved it. At her death a civil war began between her sons, which left the way open for Rome. **Pompey.** Pompey's lieutenant Scaurus entered Syria in 65 B.C., after the final defeat of Mithradates, and Pompey soon followed to take command of the situation. Three parties pleaded before him, the representatives of the rival kings and a deputation from the people who wished to obey no king, but only the priests of their God (Jos. *Ant.* xiv. 3, 2.) Pompey finally decided in favour of Hyrcanus, and entered Jerusalem by the aid of his party. The adherents of Aristobulus seized and held the temple mount against the Romans, but on the Day of Atonement of the year 63 B.C. their position was stormed and the priests were cut down at the altars (Jos. *Ant.* xiv. 4, 2—4; *War* i. 7). Hyrcanus was left as high-priest—*not* king of the Jews—and his territory was curtailed. The coast towns and the Decapolis, together with Samaria and Scythopolis, were incorporated in the new Roman province of Syria.

In 61 B.C. Pompey celebrated the third of a series of triumphs over Africa, Europe and Asia, and in his train, among the prisoners of war, was Aristobulus, king of Judaea. Palestine meanwhile remained quiet until 57 B.C., when Alexander, the son of Aristobulus, escaped from his Roman captivity and attempted to make himself master of his father's kingdom. Aulus Gabinius, the new proconsul of Syria, defeated his hastily gathered forces, besieged him in one of the fortresses he had managed to acquire, and induced him to abandon his attempt in return for his life. The impotence of Hyrcanus was so obvious that Gabinius proceeded to deprive him of all political power by dividing the country into five cantons, having Jerusalem, Gazara, Amathus, Jericho, and Sepphoris, as their capitals. Other raids, headed by Aristobulus, or his son, or his adherent Peitholaus, disturbed Palestine during the interval between 57 and 51 B.C. and served to create a prejudice against the Jews in the mind of their masters. But with the civil wars which began in 49 B.C. there came opportunities which Hyrcanus, at the instance of Antipater, used to ingratiate himself with Caesar. Once more, as in the days of Simon, the suzerain power was divided against itself, and, though Rome was as strong as the Seleucids had been weak, Caesar was grateful. For timely help in the Egyptian War of 47 B.C. Hyrcanus was rewarded by the title of Ethnarch, and Antipater with the Roman citizenship and the office of procurator of Judaea. The sons of Antipater became deputies for their father; and it appears that Galilee, which was entrusted to Herod, fell within his jurisdiction. **The Herods.** The power of this Idumaean family provoked popular risings and Antipater was poisoned. But Herod held his ground as governor of Coele-Syria and retained the favour of Cassius and Mark Antony in turn, despite the complaints of the Jewish nobility. In 42 B.C., however, the tyrant of Tyre encroached upon Galilean territory and in 40 B.C. Herod had to fly for his life before the Parthians. Even as a landless fugitive Herod could count upon Roman support. At the instance of Mark Antony, and with the assent of Octavian, the senate declared him king of Judaea, and after two years' fighting he made his title good. Antigonus, whom the Parthians had set upon his throne, was beheaded by his Roman allies (37 B.C.). As king of the Jews (37–4 B.C.) Herod was completely subject and eagerly subservient to his Roman masters. In 34 B.C. (for example) or earlier, Mark Antony gave Cleopatra the whole of Phoenicia and the coast of the Philistines south of Eleuthesus, with the exception only of Tyre and Sidon, part of the Arabian territory and the district of Jericho. Herod acquiesced and leased Jericho, the most fertile part of his kingdom, from Cleopatra. In the war between Antony and Octavian Cleopatra prevented Herod from joining Antony and so left him free to pay court to Octavian after Actium (31 B.C.). A year later Octavian restored to the Jewish kingdom Jericho, Gadara, Hippos, Samaria, Gaza, Anthedon, Joppa and Straton's Tower (Caesarea). Secure of his position, Herod began to build temples and palaces and whole cities up and down Palestine as visible embodiments of the Greek civilization which was to distinguish the Roman Empire from barbarian lands. A sedulous courtier, he was rewarded with the confidence of Augustus, who ordered the procurators of Syria to do nothing without taking his advice. But with the establishment of (relatively) universal peace Palestine ceased to be a factor in general history. Herod the Great enlarged his borders and fostered the Greek civilization of the cities under his sway. After his death his kingdom was dismembered and gradually came under the direct rule of Rome. Herod Agrippa (A.D. 41–44) revived the glories of the reign of Alexandra and won the favour of the Pharisees; but his attempt to form a confederacy of client-princes was nipped in the bud. Even the war which ended with the destruction of Jerusalem in A.D. 70, and the rebellion under Hadrian, which led to the edict forbidding the Jews to enter Jerusalem, are matters proper to the history of the Jews.

References to authorities other than Josephus are given in the course of the article; his *Antiquities* and *War* are the chief source for the period. All modern authorities are given by Schürer.

(J. H. A. H.)

III.—*From A.D. 70 to the Present Day.*

Owing to the peculiar conditions of the land and the varied interests involved in it, the later history may best be treated in four sections. In the first the general political history will be set forth; in the second a sketch will be given of the cult of the "holy places"; the third will contain some particulars regarding the history of modern colonization by foreigners, which, while it has not affected the political status of the country, has produced very considerable modifications in its population and life; and the fourth will consist of a brief notice of the progress of exploration and scientific research whereby our knowledge of the past and the present of the land has been systematized.

1. *Political History from A.D. 70.*—The destruction of Jerusalem was followed by the dispersal of the Jews, of whom till then it had been the religious and political centre. **The Dispersion.** The first seat of the sanhedrin was at Jamnia (Yebna), where the Rabbinic system began to be formulated. This extraordinary spiritual tyranny, for it seems little else, acquired a wonderful hold and exercised a singularly uniting power over the scattered nation. The sharp contrasts between its compulsory religious observances and those of the rest of the world prevented such an absorption of the Jewish people into the Roman Empire as had caused the disappearance of the ten tribes of Israel by their merging with the Assyrians.

It would appear that at first, after the destruction of the city, no specially repressive measures were contemplated by the conquering Romans, who rather attempted to reconcile the Jews to their subject state by a leniency which had proved successful in the case of other tribes brought by conquest within the empire.

But they had reckoned without the isolating influence of Rabbinism. Here and there small insurrections took place, in themselves easily suppressed, but showing the Romans that they had a turbulent and troublesome people to deal with. At last Hadrian determined to stamp out this aggressive Jewish nationalism. He issued an edict forbidding the reading of the law, the observance of the Sabbath, and the rite of circumcision; and determined to convert the still half-ruined Jerusalem into a Roman colony.

Bar-Cochebas.

The consequence of this edict was the meteor-like outbreak of Bar-Cochebas (*q.v.*) A.D. 132–135. The origin of this person and the history of his rise to power are unknown. Nor is it certain whether he himself at first made a personal claim to be the promised Messiah; but it was his recognition as such by the distinguished Rabbi Akiba, then the most influential Jew alive, which placed him in the command of the insurrection, with 200,000 men at his command. Jerusalem was captured, as well as a large number of strongholds and villages throughout the country. Julius Severus, sent with an immense army by Hadrian, came to quell the insurrection. He recaptured Jerusalem, at the siege of which Bar-Cochebas himself was slain. The rebels fled to Bether—the modern Bittir, near Jerusalem, where the fortress garrisoned by them still remains, under the name Khurbet el-Yahud, or "Ruin of the Jews"—and were there defeated and slaughtered in a sanguinary encounter. It is said that as many as 580,000 men were slain! Hadrian then turned Jerusalem into a Roman colony, changed its name to Aelia Capitolina, built a temple of Jupiter on the site of the Jewish temple and (it is alleged) a temple of Venus on the site of the Holy Sepulchre, and forbade any Jew, on pain of death, to appear within sight of the city.

Rabbinic Schools.

This disaster was the death-blow to hopes of a Jewish national independence, and the leaders of the people devoted themselves thenceforth to legal and religious study in the Rabbinical schools, which from A.D. 135 (the year of the suppression of the revolt) onwards developed in various towns in the hitherto despised province of Galilee. Shefa ʿAmr (Shafram), Shaʿarah (Shaaraim) and especially Tubariya (Tiberias) became centres of this learning: and the remains of synagogues of the 2nd or 3rd century which still exist in Galilee attest the strength of Judaism in that district during the years following the abortive attempt of Bar-Cochebas.

Palestine thus continued directly under Roman rule. In A.D. 105, under Trajan, Cornelius Palma added Gilead and Moab to the empire. In 295 Auranitis, Batanea and Trachonitis were added to the province.

The pilgrimage of the Empress Helena properly belongs to the second section into which we have divided this history; we therefore pass it over for the present. The conversion of Constantine to Christianity—or rather the profession of Christianity by Constantine—seemed likely to result in another Jewish persecution, foreshadowed by severe repressive edicts. This, however, was averted by the emperor's death.

The progress of the corrupt Christianity of the empire of Byzantium was checked for a while under Julian the Apostate, who, among other indications of his opposition to Christianity, rescinded the edicts against the Jews on his coming to the throne in 361, and gave orders for the restoration of the Jewish temple. The latter work was interrupted almost as soon as begun by an extraordinary phenomenon—the outburst of flames and loud detonations, easily explained at the time as a divine judgment on this direct attempt to falsify the prophecy of Christ. It has been ingeniously suggested in this more scientific generation that the explosion was due to the ignition of some forgotten store of oil or naphtha, such as was said to have been stored in the temple (2 Macc. i. 19–23, 36), and similar to a store discovered, with less disastrous consequences, in another part of the city early in the 19th century.[1]

On the partition of the empire in A.D. 395 Palestine naturally fell to the share of the emperor of the East. From this onward for more than two hundred years there is a period of comparative quiet in Palestine, with no external political interference. The country was nominally Christian; the only history it displays being that of the development of pilgrimage and of the cult of holy places and of relics, varied by occasional persecutions of the Jews. The elaborate building operations of Justinian (527–565) must not be forgotten. The "Golden Gate" of the Temple area and part of the church which is now the El-Aksa Mosque at Jerusalem, are due to him.

The later Empire.

Chosroes II.

Not till 611 do we find any event of importance in the uninteresting record of Byzantine sovereignty. But this and the following years were signalized by a series of catastrophes of the first magnitude. Chosroes II. (*q.v.*), king of Persia, made an inroad into Syria; joined by the Jews, anxious to revenge their misfortunes, he swept over the country, carrying plunder and destruction wherever he went. Monasteries and churches were burnt and sacked, and Jerusalem was taken; the Holy Sepulchre church was destroyed and its treasures carried off; the other churches were likewise razed to the ground; the patriarch was taken prisoner. It is alleged that 90,000 persons were massacred. Thus for a time the province of Syria with Palestine was lost to the empire of Byzantium.

The Emperor Heraclius reconquered the lost territory in 629. But his triumph was short-lived. A more formidable enemy was already on the way, and the final wresting of Syria from the feeble relics of the Roman Empire was imminent.

Rise of Islam.

The separate tribal units of Arabia, more or less impotent when divided and at war with one another, received for the first time an indissoluble bond of union from the prophet Mahomet, whose perfect knowledge of human nature (at least of Arab human nature) enabled him to formulate a religious system that was calculated to command an enthusiastic acceptance by the tribes to which it was primarily addressed. His successor, Abu Bekr, called on the tribes of Arabia to unite and to capture the fertile province of Syria from the Christians. Heraclius had not sufficient time to prepare to meet this new foe, and was defeated in his first engagement with Abu Bekr. (For the general history of this period see CALIPHATE). The latter seized Bostra and proceeded to march to Damascus. He died, however, before carrying out his design (A.D. 634), and was succeeded by Omar, who, after a siege of seventy days entered the city. Other towns fell in turn, such as Caesarea, Sebusteh (Samaria), Nablus (Shechem), Lydd, Jaffa.

Meanwhile Heraclius was not idle. He collected a huge army and in 636 marched against the Arabs. The latter retreated to the Yarmuk River, where the Byzantines met them. Betrayed, it is said, by a Christian who had suffered personal wrongs at the hands of certain of the Byzantine generals, the army of Heraclius was utterly defeated, and with it fell the Byzantine Empire in Syria and Palestine.

Omar.

After this victory Omar's army marched against Jerusalem, which after a feeble resistance capitulated. The terms of peace, though on the whole moderate, were of a galling and humiliating nature, being ingeniously contrived to make the Christians ever conscious of their own inferiority. Restrictions in church-building, in dress, in the use of beasts of burden, in social intercourse with Moslems, and in the use of bells and of the sign of the cross were enforced. When these terms were agreed upon and signed Omar, under the leadership of the Christian patriarch Sophronius, visited the Holy Rock (the prayer-place of David and the site of the Jewish temple). This he found to be defiled with filth, spread upon it by the Christians in despite of the Jews. Omar and his followers in person cleaned it, and established the place of prayer which, though later rebuilt, has borne his name ever since.

Abdalmalik.

Dissensions and rivalries soon broke out among the Moslem leaders, and in 661 Moawiya, the first caliph of the Omayyad dynasty, transferred the seat of the caliphate from Mecca to Damascus, where it remained till the Abbasids seized the sovereignty and transferred it to Bagdad

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[1] See *Palestine Expl. Fund Quarterly Statement*, 1902, p. 389.

(750). Rivals sprang up from time to time. In 684 Caliph Abdalmalik (ʿAbd el-Melek), in order to weaken the prestige of Mecca, set himself to beautify the holy shrine of Jerusalem, and built the *Kubbet es-Sakhrah*, or Dome of the Rock, which still remains one of the most beautiful buildings in the world (CALIPHATE: B 5). In 831 the Church of the Holy Sepulchre was restored; but about a hundred years later it was again destroyed as a result of the revolt of the Carmathians (*q.v.*), who in 929 pillaged Mecca. This produced a Moslem exodus to Jerusalem, with the consequence mentioned. The Carmathian revolt, one of the first of the great splits in the Moslem world, was followed by others: in 936 Egypt declared its independence, under a line of caliphs which claimed descent from Fatima, daughter of the prophet (see FATIMITES); and in 996 Hakim Bi-amrillah mounted the Egyptian throne. This madman caused the church of the Holy Sepulchre to be entirely destroyed: and giving himself out to be the incarnation of Deity, his cult was founded by two Persians, Darazi and Hamza ibn Ali, in the Lebanon; where among the Druses it still persists (see DRUSES).

The contentions between the Abbasid and Fatimite caliphs continued till 1072, when Palestine suffered its next invasion. This was that of the Seljuk Turkomans from Khorasan. On behalf of their king, the Khwarizmian general Atsiz invaded Palestine and captured Jerusalem and Damascus, and then marched on Egypt to carry out his original purpose of destroying the Fatimites. The Egyptians, however, repulsed the invaders and drove them back, retaking the captured Syrian cities.

The Crusades.

The sufferings of the Christians and the desecrations of their sacred buildings during these troubled times created wide-spread indignation through the west: and this indignation was inflamed into fury by Peter the Hermit, a native of Picardy, who in early life had been a soldier. In 1093 he went in pilgrimage to Jerusalem, and in his wrath at the miseries of the pilgrims he returned to Europe and preached the duty of the Church to rescue the "holy places" from the infidel. The Church responded, and under Peter's leadership a motley crowd, principally of French origin, set out in 1096 for the Holy Land. Others, under better generalship, followed; but of the 600,000 that started from their homes only about 40,000 succeeded in reaching Jerusalem, ill-discipline, famine and battles by the way having reduced their ranks. They captured Jerusalem, however, in July 1099, and the leader of the assault, Godfrey of Boulogne, was made king of Jerusalem.

Frankish Kingdom.

So was founded the Latin kingdom of Jerusalem, whose history is one of the most painful ever penned (see CRUSADES). It is a record of almost unredeemed "envy, hatred, and malice," and of vice with its consequent diseases, all rendered the more repulsive in that its transactions were carried on in the name of religion. For 88 turbulent years this feudal kingdom was imposed on the country, and then it disappeared as suddenly as it came, leaving no trace but the ruins of castles and churches, a few place-names, and an undying hereditary hatred of Christianity among the native population.

The abortive Second Crusade (1147), led by the kings of France and Germany, came to aid the rapidly weakening Latin kingdom after their failure to hold Edessa against Nureddin, the ruler of northern Syria.

In 1173 Nureddin died, and his kingdom was seized by Saladin (Salah ed-Din), a man of Kurdish origin, who had previously distinguished himself by capturing Egypt in company with Shirkuh, the general of Nureddin. Saladin almost immediately set himself to drive the Franks from the country. The Frankish king was the boy Baldwin IV., who had paid for the errors of his fathers by being afflicted with leprosy. After being defeated by Saladin at Banias, the Franks were compelled to make a treaty with the Moslem leader. The treaty was broken, and Saladin proceeded to take action. The wretched leper king meanwhile died, his successor, Baldwin V. also a young boy, was poisoned, and the kingdom passed to the worthless Guy de Lusignan, who in the following year (1187) was crushed by Saladin at the battle of Hattin, which restored the whole of Palestine to the Moslems.

The Third Crusade (1189) to recover Jerusalem was led by Frederick I. of Germany. Acre was captured, but quarrels among the chiefs of the expedition made the enterprise ineffective. It was in this crusade that Richard Coeur-de-lion was especially distinguished among the Frankish warriors.

Saladin died in 1193. In 1198 and 1204 took place the Fourth and Fifth Crusades—mere expeditions, as abortive as the third. And as though it were foreordained that no element of horror should be wanting from the history of the crusades, in 1212 there took place one of the most ghastly tragedies that has ever happened in the world—the Crusade of the Children. Fifty thousand boys and girls were persuaded by some pestilent dreamers that their childish innocence would effect what their immoral fathers had failed to accomplish, and so left their homes on an expedition to capture the Holy Land. The vast majority never returned; the happiest of them were shipwrecked and drowned in the Mediterranean. This event is of some historical importance in that it indicates how obvious to their contemporaries was the evil character of those engaged in the more serious expeditions.[1]

The other four crusades which took place from time to time down to 1272 are of no special importance, though there is a certain amount of interest in the fact that after the sixth crusade, in 1229, emperor Frederick II. was permitted to occupy Jerusalem for ten years. But a new element, the Mongolians of Central Asia, now bursts in on the scene. The tribes from east of the Caspian had conquered Persia in 1218. They were driven westward by pressure of the Tatars, and in 1228 had been called by the ruler of Damascus to his aid. In 1240, however, they transferred their alliance to the sultan of Egypt, and pillaged Northern Syria. Driven downward through Galilee they seized Jerusalem, massacred its inhabitants and plundered its churches. They then marched on to Gaza, where the Egyptians joined them, and together inflicted a crushing defeat on the Christians and Moslems of Syria, for once compelled to unite by the common danger. The Khwarizmians and Egyptians afterwards quarrelled, and the former were compelled to retire, leaving Palestine under the rule of the Mameluke[2] sultans of Egypt. Shortly afterwards however, another Central Asiatic invasion—that of the Tatar tribes, took place. Under their leader Hūlagū these tribes came by way of Bagdad, which they captured in 1258, and in 1260 they attacked and captured Damascus and ravaged Syria. Bibars (Beibars, Baibars), general of the Egyptian sultan Kotuz, met and drove them back; and having murdered his master, became sultan in his stead. He then proceeded to attack and destroy the relics of Christian possession in Palestine. One after another—Caesarea, Safed, Jaffa, Antioch—they fell, leaving at last Acre (Akka) only. Bibars died in 1277, and in 1291 Acre itself was captured by Khatēl son of Kalaʿūn, who thus put a final end to Frankish domination.

During the 14th century there is little of interest in the history of Palestine. The Christians made efforts to creep back to their former possessions and churches were rebuilt in Jerusalem, Bethlehem and Nazareth: but another devastation was the result of the ferocious inroads of the Mongolian Timur (Tamerlane) in 1400.

Turkish Dominion.

The last stage of the history of Palestine was reached in 1516, when the war between the Ottoman sultan and the Mamelukes of Egypt resulted in the transference of the country to the dominion of the Turks. This change of rulers did not produce much change in the administration or condition of the country. Local governors were appointed from headquarters: revenues were annually sent to Constantinople: various public works were undertaken, such as the rebuilding of the walls of Jerusalem by Suleiman the Magnificent (1537): but on the whole Palestine ceases for nearly three hundred years from this point to have a history, save the dreary record of the sanguinary quarrels of local sheiks and of oppression of the peasants by the various government officials. Few names or events stand out in the history of this period: perhaps the most interesting personality is that of the Druse prince Fakhr ud-Din (1595–1634), whose expulsion of the Arabs from the coast as far south as Acre and establishment of his own kingdom, in defiance of Ottoman authority—to say nothing of his dilettante cultivation of art, the result of a temporary sojourn in Italy—make him worth a passing notice. The German botanist, Leonhard Rauwolf (d. 1596 or 1606), who visited Palestine in 1575, has left a vivid description of the difficulties that then beset even so simple a journey as that from Jaffa to Jerusalem. The former town he found in ruins. A safe conduct had to be obtained from the governor of Ramleh before the party could proceed. At Yazur they were stopped by an official who extorted heavy blackmail on the ground that the sultan had given him charge of the "holy places" and had forbidden him to admit anyone to them without payment (!). Further on they had a scuffle with certain "Arabians"; and at last, after successfully accomplishing the passage of the "rough and stony" road that led to Jerusalem, they were obliged to dismount before the gate of the city till they should receive license from the governor to enter.

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[1] This story is probably the historic basis of the legend of the "Pied Piper of Hamelin."

[2] The Mamelukes were originally military slaves, who in Egypt succeeded in seizing the supreme power. See EGYPT: *History (Moslem period)*.

El-Jazzar.

Towards the close of the 18th century a chief of the family of Zaidan, named Dhaher el-Amir, rose to power in Acre. To him fled from Egypt an Albanian slave named Ahmed, who (from the expertness with which he had been wont to carry out his master's orders to get rid of inconvenient rivals) bore the surname *el-Jazzar*, "the butcher." He had, however, incurred punishment for refusing to obey a command of his master, Mahommed Bey, and so took refuge with the Palestinian sheik. After five years Mahommed Bey died and el-Jazzar returned to Egypt. Dhaher revolted against the Turkish government and el-Jazzar was commissioned to quell the rising; his long residence with Dhaher having given him knowledge which marked him out as the most suitable for the purpose. He was successful in his enterprise, and was installed as governor in Dhaher's place. He was a man of barbaric aesthetic tastes, and Acre owes some of its public buildings to him: but he was also capricious and tyrannical, and well lived up to his surname. Till 1791 the French had had factories and business establishments at Acre;[1] el-Jazzar ordered them in that year summarily to leave the town. In 1798 Napoleon, returning from his unsuccessful attempt at founding an empire on the Nile, came to stir up a Syrian rising against the Turkish authorities. He attacked el-Jazzar in Acre, after capturing Jaffa, Ramleh and Lydd. A detachment of troops was sent under General Jean Baptiste Kléber across the plain of Esdraelon to take Nazareth and Tiberias, and defeated the Arabs between Fuleh and Afuleh. Napoleon was however compelled by the English to raise the siege. El-Jazzar died in 1806 and was succeeded by his milder adopted son, Suleiman, who on his death in 1814 was followed by the fanatic Abdullah. This bigoted Moslem caused the Jewish secretary of his office to be murdered. The Jew had anticipated just such an event, and had secretly arranged that after his death an inventory of Abdullah's property should fall into the hands of the government—knowing that the latter had claims on the estates of el-Jazzar and Suleiman. The government accordingly pressed their claims: Abdullah refused to pay and was besieged in Acre. He called for the intervention of Mehemet Ali, governor of Egypt; the latter settled the dispute, but Abdullah then refused to discharge the claims of Mehemet Ali. The latter accordingly sent 20,000 men under the command of his son Ibrahim Pasha, who besieged Acre in 1831 and entered and plundered it. So began the short-lived Egyptian domination of Palestine. Mehemet Ali proved no less a tyrannical master than the Turks and the sheiks: the country revolted in 1834, but the insurrection was quelled. In 1840 Lebanon revolted; and in the same year the Turks, with the aid of France, England and Austria, regained Palestine and expelled the Egyptian governor.

Recent history.

From 1840 onwards the Ottoman government gradually strengthened its hold on Palestine. The power of the local sheiks was step by step reduced, till it at last became evanescent—to the unmixed advantage of the whole country; and the increase of European interests has led to the establishment of consulates and vice-consulates of the great powers in Jerusalem and in the ports.

The battle of religions still continued. In 1847 the dispute in the Church of the Nativity at Bethlehem about the right to mark with a star the birthplace of Christ became one of the prime causes of the Crimean war. In 1860 occurred a sudden anti-Christian outbreak in Damascus and the Lebanon, in which 14,000 Christians were massacred. On the other hand it may be mentioned that on the 30th of June 1855 the cross was for the first time since the crusades borne aloft through the streets of Jerusalem on the occasion of the visit of a European prince; and that in 1858 the sacred area of the Haramesh-Sherif—the mosque on the site of the Temple of Jerusalem—was for the first time thrown open to Christian visitors. The latter half of the 19th century is mainly occupied with the record of a very remarkable process of colonization and settlement—French and Russian monastic and other establishments, some of them semi-religious and semi-political; German colonies; fanatical American communities; Jewish agricultural settlements—all, so to speak, "nibbling" at the country, and each so intent upon gaining a step on its rivals as to be forgetful of the gathering storm. For in the background of all is the vast peninsula of Arabia, which at long intervals fills with its wild, untamable humanity to a point beyond which it cannot support them. This has been the origin of the long succession of Semitic waves—Babylonian, Assyrian, Canaanite, Hebrew, Nabataean, Moslem—that have flowed over Mesopotamia and Palestine; there is every reason to suppose that they will be followed by others, and that the Arab will remain master at the end, as he was in the beginning.

In 1896 Herzl (*q.v.*) issued his proposal for the establishment of a Jewish state in Palestine and in 1898 he came to the country to investigate its possibilities. The same year was signalized by the picturesque visit of the German emperor, William II., which gave a great stimulus to German interests in the Holy Land.

In 1902 Palestine was devastated by a severe epidemic of cholera. In 1906 arose a dispute between the British and Turkish governments about the boundary between Turkish and Egyptian territory, as the Turks had interfered with some of the landmarks. A joint commission was appointed, which marked out the boundary from Rafah, about midway between Gaza and El-Arish, in an almost straight line S.S.W. to Tabah in 29° 30′ on the west side of the gulf of Akaba. A map of the boundary will be found in the *Geographical Journal* (1907), xxix. 88.

2. *The Holy Places.*—To the vast majority of civilized humanity, Jewish, Christian and Moslem, the religious interest of the associations of Palestine predominates over every other, and at all ages has attracted pilgrims to its shrines. We need not here do more than allude to the centralization of Jewish ideas and aspirations in Jerusalem, especially in the holy rock on which tradition (and probably textual corruption) have placed the scene of Abraham's sacrifice of Isaac, and over which the Most Holy Place of the Temple stood. The same associations are those of the Moslem, whose religion has so strangely absorbed the prophets and traditions of the older faiths. Other shrines, such as the alleged tomb of Moses, and the mosque of Hebron over the cave of Machpelah, are the centres of Moslem pilgrimage. Christianity is however responsible for the greatest development of the cult of holy places, and it is to the sacred shrines of christendom that we propose to confine our attention.

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[1] When this French colony was established is uncertain; Maundrell found them there at the end of the 17th century.

There is no evidence that the earliest Christians were imbued with the archaeological spirit that interested itself in sites which the Risen Lord had vacated. The site of Golgotha and of the the Holy Sepulchre, of the manger or of the home at Bethany, were to them of no special moment in comparison with the one all-important fact that "Christ was risen." It was not till the clear-cut impress of the events of Christ's life, death and resurrection had with the lapse of years faded from human recollection, that there arose a desire to "seek the living among the dead." The story begins with Helena, mother of Constantine the Great, who became fired with zeal to fix definitely the spots where the great events of Christianity had taken place, and in A.D. 326 visited Palestine for the purpose.

The Holy Sepulchre.

Helena's pilgrimage was, as might be expected, attended with complete success. The True Cross was discovered; and by excavation conducted under Constantine's auspices, the Holy Sepulchre, "contrary to all expectation" as Eusebius naively says, was discovered also (see JERUSALEM; and SEPULCHRE, THE HOLY). The seed thus sown rapidly germinated and multiplied. The stream of pilgrimage to the Holy Land began immediately, and has been flowing ever since. Onwards from A.D. 333, when an anonymous pilgrim from Bordeaux visited the "holy places" and left a succinct account of his route and of the sights which came under his notice, we possess a continuous chain of testimony written by pilgrims relating what they heard and saw.

It is a pathetic record. No site, no legend, is too impossible for the unquestioning faith of these simple-minded men and women. And by comparing one record with another, we can follow the multiplication of "holy places," and sometimes can even see them being shifted from one spot to another, as the centuries pass. Not one of these devout souls had any shadow of suspicion that, except natural features (such as the Mount of Olives, the Jordan, Ebal, Gerizim, &c.) and *possibly* a very few individual sites (such as Jacob's well at Shechem), there was not a single spot in the whole elaborate system that could show even the flimsiest evidence of authenticity! The growth and development of "holy sites" can best be illustrated, in an article like the present, by a few figures. The account of the "holy places" seen in Palestine by the Bordeaux pilgrim, just mentioned, occupies twelve pages in the translation of the *Palestine Pilgrims' Text Society* (in whose publications the records of these early travellers can most conveniently be studied): and those twelve pages may be reduced to seven or eight as they are printed with wide margins, and have many footnotes added by the editor. On the other hand the experiences and observations of Felix Fabri, a Dominican monk who came to Palestine about A.D. 1480, occupies in the same series two large volumes of over 600 pages each![1]

This process of development has been illustrated in our own time—a single instance will suffice. In the so-called "Via Dolorosa" is a cave which was opened and planned about 1870. It subsequently became closed and forgotten, houses covering its entrance. In 1906 it was re-opened, the houses being cleared away, and a hospice for Greek pilgrims erected in place of them. During these works some local archaeologists attempted to penetrate the cave but were driven away by the labourers with curses. At last the hospice was finished and the cave opened for inspection. A pair of stocks was then shown beautifully cut in the rock, where no stocks appeared in the plan of 1870; with a crude painting suspended on the wall above, blasphemously representing the Messiah confined in them![2]

The Franciscans were nominated custodians of the "holy places" by Pope Gregory IX. in 1230. Certain sites have, however, always been held by the Oriental sects, and since 1808, when the Holy Sepulchre church was destroyed by fire, the number of these has greatly increased. Indeed the 19th century was disgraced, in Palestine, by a feverish "scramble" for sacred sites, in which the most rudimentary ethics of Christianity were forgotten in the all-mastering desire to oust rival sects and orders. Bribery, fraud, even violence, have in turn been employed to serve the end in view: and churches, chapels and monasteries, most of them in the worst architectural taste, have sprung up like mushrooms over the surface of the country, and are perpetuating the memory of pseudo-sanctuaries which from every point of view were best relegated to oblivion. The zeal and self-sacrificing devotion which some of these establishments, and their inmates, display, and their noble labours on behalf of the country, its people and its history throw into yet more painful relief the actions and attitudes of some of their fellow-Christians.

The authenticity of the "holy places" was first attacked seriously in the 18th century by a bookseller of Altona named Korte; and since he led the way, a steady fire of criticism has been poured at this huge mass of invention. The process of manufacturing new sites, however, continues unchecked. Even the Protestant churches are not exempt from blame in the matter; a small tomb near the Damascus Gate of Jerusalem has been fixed upon by a number of English enthusiasts as the true "Holy Sepulchre," an identification for which there is nothing to be said.

The monasteries of the Roman communion and their residents were under French protection until the disturbance between Greek and Franciscan monks in the Holy Sepulchre church (Nov. 4, 1901), which arose over the question as to the right to sweep a certain flight of stairs. Stones and other weapons were freely used, and several of the combatants and bystanders were seriously injured. As one result of the subsequent investigations, Latin monks of other countries were assigned to the protection of the consuls of those countries.

3. *Colonization.*—Down to the time of Mehemet Ali the only foreigners permanently resident in the country were the members of various monastic orders, and a few traders, such as the French merchants of Acre. The first protestant missionaries (those under the London Society for the Promotion of Christianity among the Jews), settled in Jerusalem in 1823; to them is due the inception of the trade in olive-wood articles, invented for the support of their converts. In 1846–1848 a remarkable religious brotherhood (the *Brüderhaus*, founded by Spittler of Basel) settled in Jerusalem: it was originally intended to be a settlement of celibate mechanics that would form a nucleus of mission work to evangelize the world. One of this community was Dr C. Schick, who lived over 50 years in Jerusalem, and made many valuable contributions to its archaeology. In 1849 came the first of several examples that have appeared in Palestine from time to time of that curious product of American religious life—a community of dupes or visionaries led by a prophet or prophetess with claims to divine guidance. The leader in this case was one Mrs Minor, who came to prepare the land for the expected Second Advent. Her followers quarrelled and separated in 1853. This event is of importance, as it had much to do with the remarkable development of Jewish colonization which is a special feature of the latter part of the history of the 19th century in Palestine. For Mrs Minor, having an interest in the Jewish people, was befriended by Sir Moses Montefiore; after her death her property was placed in charge of a Jew, and later passed into the hands of the Alliance Israélite Universelle. This body in 1870 established an agricultural colony for Jews on the road from Jaffa to Jerusalem ("Mikweh Israel").

Another visionary American colony, led by a certain Adams, came in 1866. They brought with them framed houses from America, which are still standing at Jaffa. But the Adamsites suffered from disease and poverty, and lost heart in a couple of years: returning to America, they sold their property to a German community, the *Tempelgemeinde*, a Unitarian sect led by Messrs Hoffmann and Hardegg who established themselves in Jaffa in 1868. Unlike the ill-fated American communities, these hardy Württemberg peasants have flourished in Palestine, and their three colonies—at Jaffa, Haifa, and Jerusalem—are the most important European communities now in the country

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[1] This comparison is made in full realization of the fact that the Bordeaux record is a dry catalogue, and that Fabri's work is swelled by the miscellaneous gossip and "padding" which makes it one of the most delightful books ever written in the middle ages.

[2] See the exposure in the *Revue Biblique* (the organ of the Dominican school of St Stephen at Jerusalem) for 1907.

Since 1870 there has been a steady development of Jewish immigration, consisting principally of refugees from countries where anti-Semitism is an important element in politics. Baron de Rothschild has invested large sums in Jewish colonies, but at the commencement of the present century he handed over their administration to the Jewish Colonization Association. Time alone can show how far these colonies are likely to be permanently successful, or how the subtly enervating influence of the climate will affect later generations.

4. *Exploration.*—Previous to the 19th century the turbulent condition of the country made exploration difficult, and, off the beaten track, impossible. There are many books written by early pilgrims and by more secular travellers who visited the country, which—when they are not devoted to the setting forth of valueless traditions, as is too often the case—give very useful and interesting pictures of the conditions of life and of travel in the country. Scientific exploration does not begin before Edward Robinson, an American clergyman, who, after devoting many years to study to fit himself for the work, made a series of journeys through the country, and under the title of *Biblical Researches in Palestine* (1841–1856) published his itineraries and observations. His work is marred by the hastiness of his visits and consequent superficiality of his descriptions of sites, and by some rash and untenable identifications: but it is at once a standard and the foundation of all subsequent topographical work in the country. He was worthily followed by Titus Tobler, who in 1853 and later years published volumes abounding in exact observation; and by V. Guerin, whose *Description géographique, historique, et archéologique de la Palestine*, in 7 vols. (1868–1880), contains an extraordinary mass of material collected in personal travel through the country.

In 1864 was founded the Palestine Exploration Fund, under the auspices of which an ordnance survey map of the country was completed (published 1881), and accompanied by volumes containing memoirs on the topography, orography, hydrography, archaeology, fauna and flora, and other details. A similar work east of the Jordan was begun but (1882) stopped by the Ottoman government. The same society initiated the scientific exploration of the mounds of Palestine. In 1891 it excavated Tell el-Hesi (Lachish); in 1896–1898 the south wall of Jerusalem; in 1898–1900 Tell es-Safi (Gath) and some smaller mounds in the Shephelah; all under the direction of Dr F. J. Bliss. In 1902 it began the excavation of Gezer under the direction of R. A. S. Macalister (see GEZER).

The example thus set has been followed by French, German and American explorers. The *Deutscher Palästina-Verein* was founded in 1878, and under its auspices important surveys have been carried out, especially those of G. Schumacher east of the Jordan; Tell el-Mutesellim (Megiddo) has also been excavated. The Austrian Dr E. Sellin, working independently, has excavated Tell Ta'nuk (Taanach), and in 1907 began work upon the mount of Jericho. An admirable biblical and archaeological school, under the control of the Dominican order, exists at Jerusalem; and German and American archaeological institutions, educational in purpose, are also there established. Valuable work in exploration is annually done by the directors of these schools and by their pupils. Under this head we must not omit to mention A. Musil's investigations of some remote parts of Eastern Palestine, and R. E. Brünnow's great survey of Petra, with part of Moab and Edom.

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(R. A. S. M.)

PALESTINE, a city and the county-seat of Anderson county, Texas, U.S.A., about 90 m. E. by N. of Waco. Pop. (1910 census) 10,482. It is served by two lines of the International & Great Northern railway, and by the Texas State railway. Palestine is the trade centre of a district which produces cotton, timber, fruit (especially peaches), an excellent grade of wrapper tobacco, petroleum, iron-ore and salt. It has various manufactures, including cotton gins, cotton-seed oil, cigars, lumber and brick. Its factory products were valued at $735,162 in 1905. About 2 m. south-west of Palestine a settlement (the first in the present Anderson county) was made in 1837, and there Fort Houston, a stockade fort, was built to protect the settlers from the Indians. Palestine was laid out and was made the county-seat in 1846; it was chartered as a city in 1875, and rechartered in 1905. In 1909 it adopted a commission government.

PALESTRINA, GIOVANNI PIERLUIGI DA (1526–1594), Italian composer, was born in Palestrina (the ancient Praeneste) at the foot of the Sabine mountains, in 1526. The various versions of his name make an interesting record. He appears as Palestina, Pellestrino, Gio. Palestina, Gianetto Palestrina, Gianetto da Palestrina, Gian Pierl. de Palestrina, Joh. Petrus Aloisius, Jo. Petraloys, Gianetto, Giov. Prenestini, Joannes Praenestinus, Joannes Petraloysius Prenestinus.

Palestrina seems to have been at Rome from 1540 to 1544, when he studied possibly under Gaudio Mell, but not under Goudimel as has erroneously been assumed. On the 12th of June 1547 he married Lucrezia de Goris. In 1551, by favour of Pope Julius III., he was elected Magister Cappellae and Magister Puerorum at the Cappella Giulia, S. Pietro in Vaticano, with a salary of six scudi per month, and a house. Three years later he published his *First Book of Masses*, dedicated to Pope Julius III., and beginning with the missa "Ecce sacerdos magnus." On the 13th of January 1555, Palestrina was enrolled, by command of Pope Julius III., among the singers of the Cappella Sistina. This honour involved the resignation of his office at the Cappella Giulia, which was accordingly bestowed upon his friend Animuccia. But the legality of the new appointment was disputed on the ground that Palestrina was married, and the father of four children, his wife, Lucrezia, being still alive; and, though, for the moment, the pope's will was law, the case assumed a different complexion after his death, which took place only five weeks afterwards. The next pope, Marcellus II., was succeeded after a reign of 23 days, by Paul IV.; and within less than a year (July 30, 1555) that stern reformer dismissed Palestrina, together with two other married singers, A. Ferrabosco and Bari, with a consolatory pension of six scudi per month to each. This cruel disappointment caused Palestrina a dangerous illness; but in October 1555 he was appointed maestro di cappella at the Lateran, without forfeiting his pension; and in February 1561 he exchanged this preferment for a similar one, with an allowance of 16 scudi per month, at Santa Maria Maggiore.

Palestrina remained in office at this celebrated basilica for ten years, and to this period is assigned an important chapter in the history of music. Many circumstantial details of this chapter are undoubtedly legends, due to the pious imagination of Baini and others. In 1562 the council of Trent censured the prevalent style of ecclesiastical music with extreme severity. In 1564 Pope Pius IV. commissioned eight cardinals to investigate the causes of complaint; and these proved to be so well founded that it was seriously proposed to forbid the use of all music in the services of the Church, except unisonous and unaccompanied plain-chant. In these circumstances Palestrina is said to have been invited by two of the most active members of the commission to come to the rescue. He accordingly submitted three masses to Cardinal Carlo Borromeo for approval. These were privately rehearsed, in presence of the commissioners, at the palace of Cardinal Vitellozzi; and the judges were unanimous in deciding that the third mass fulfilled, in the highest possible degree, all the conditions demanded. The private trial took place in June 1565, and on the 19th of that month the mass was publicly sung at the Sistine Chapel, in presence of Pope Pius IV., who compared its music to that heard by St John in his vision of the New Jerusalem. Parvi transcribed it, for the library of the choir, in characters of extraordinary size and beauty; and Palestrina was appointed by the pope composer to the Sistine Chapel, an office created expressly in his honour and confirmed to him by seven later pontiffs, though with the very insufficient honorarium of three scudi per month, in addition to the six which formed his pension.

In 1567 this mass was printed in Palestrina's *Liber secundus missarum*. The volume was dedicated to Philip II. of Spain, but the mass was called the *Missa Papae Marcelli*. This title, clearly given in honour of the short-lived pope Marcellus II., has given rise to an absurd story, told by Pellegrini and others, to the effect that the mass was composed by Pope Marcellus I., martyred early in the 4th century, and was only discovered by Palestrina. Of course in the 4th century such music was inconceivable. The *Missa Papae Marcelli* is now almost certainly known to have been composed in 1562, two years before Paul IV.'s commission. Its ineffable beauty had often been described in glowing terms by those who heard it in the Sistine Chapel, but it was only first heard in England in 1882, when the Bach choir, consisting of 200 unaccompanied voices, sang it at St James's Hall, under the direction of Mr Otto Goldschmidt.

Upon the death of Animuccia in 1571 Palestrina was re-elected to his appointment at the Cappella Giulia. He also succeeded Animuccia as maestro di cappella at the oratory of Philip Neri; but these appointments were far from lucrative, and he still remained a very poor man. A letter of thanks for 100 scudi, written on the 21st of March 1579 to the duke of Mantua, illustrates this situation. In 1580 he was much distressed by the death of his wife; and the loss of three promising sons, Angelo, Ridolfo and Silla, left him with one child only—Igino—a very unworthy descendant. In February 1581 he married the rich widow Virginia Dormuli. In 1586 Pope Sixtus V. wished to appoint him maestro to the pontifical choir, as successor to Antonio Boccapadule, then about to resign, and commissioned Boccapadule to prepare the choir for the change. Boccapadule, however, managed so clumsily that Palestrina was accused of having meanly plotted for his own advancement. The Pope was very angry, and punished the calumniators very severely; but Palestrina lost the appointment. These troubles, however, did not hinder his work, which he continued without intermission until the 2nd of February 1594, when he breathed his last in the arms of his friend, Filippo Neri. (W. S. R.)

In the articles, MUSIC, COUNTERPOINT, CONTRAPUNTAL FORMS, HARMONY, MASS, MOTET, and that portion of INSTRUMENTATION which deals with vocal music, the reader will find information as to many features of Palestrina's style and its relation to that of the 16th century in general. So simple are the materials of 16th-century music, and so close its limitations, that the difference between great and small artists, and still more the difference between one great artist and another, can be detected only by long and familiar experience. A great artist, working within limits so narrow and yet so natural, is fortunately apt to give us exceptional opportunities for acquiring the right kind of experience of his art, since his genius becomes far more prolific than a genius with a wider field for its energies. Yet all 16th-century masters seem to be illuminated by the infallibility of the normal musical technique of their time. This technique is no longer so familiar to us that its euphony and vivid tone can fail to impress us wherever we meet it. There is probably no respectable school piece of the 16th century, which, if properly performed in a Roman Catholic church, would be quickly distinguishable by ear from the style of Palestrina. But when we find that every addition to our acquaintance with Palestrina's works is an acquisition, not to our notions of the progressive possibilities of 16th-century music, but to our whole sense of style, we may then recognize that we are in the presence of one of the greatest artists of all time.

Palestrina's work has many styles. Within its narrow range there can be no such glaring contrasts as those of the "three styles" of Beethoven; yet the distinctions are as real as they are delicate. His early, or Flemish style, was apt to lead him into the notorious Flemish disregard of proportion. Yet in some of his greatest works, such as the *Missa brevis*, we find unmistakably Flemish features so idealized as to produce breadth of phrase (*Missa brevis*, Agnus Dei), remarkably modern firmness of form (ibid. second Kyrie), and close canonic sequence carried to surprising length resulting in natural unexpectedness of harmony and subtle swing of cross rhythm (*Amen* of Credo).

If we find it convenient to divide Palestrina's work roughly into three types, we shall be able to take the *Missa Papae Marcelli* as the crowning representative of his second style. It probably is his greatest work; at all events it continues to make that impression whenever it is read after a long course of his other works; yet there are many masses, too numerous to mention, which cannot easily be considered inferior to it. Indeed F. X. Haberl, the editor of the complete critical edition of Palestrina's works, prefers the *Missa Ecce ego Joannes*, first published by him in the 24th volume of that edition in 1887.

Palestrina-scholars will hardly think us singular for placing on the same plane as the *Missa Papae Marcelli* at least 16 out of Palestrina's 94 extant masses: *Missa brevis*, bk. 3, no. 3; *Dies sanctificatus*, bk. 6, no. 1; *Dilexi quoniam*, bk. 6, no. 5; *O admirabile commercium*, bk. 8, no. 3; *Dum complerentur*, bk. 8, no. 5; *Veni sponsa Christi*, bk. 9, no. 2; *Quinti toni*, bk. 10, no. 5; *Octavi toni*, bk. 11, no. 4; *Alma Redemptoris*, bk. 11, no. 5; *Ascendo ad Patrem*, bk. 12, no. 3; *Tu es Petrus*, bk. 12, no. 5; *Hodie Christus natus est*, bk. 13, no. 2; *Beatus Laurentius*, bk. 14, vol. 3; *Assumpta est Maria*, bk. 14, no. 5; *Tu es Petrus*, bk. 15, no. 5; *Ecce ego Joannes*, bk. 15, no. 6.

The third and most distinctive phase of Palestrina's style is that in which he relies entirely upon the beauty of simple masses of harmony without any polyphonic elaboration whatever. Sometimes, as in his four-part litanies, this simplicity is mainly a practical necessity; but it is more often used for the purpose of his profoundest expressions of sacramental or penitential devotion, as for instance in the motet *Fratres ego enim accepi*, the *Stabat Mater* and the first, really the latest, book of *Lamentations*.

Besides these three main styles there are numerous cross-currents. There is the interaction between the madrigal and ecclesiastical style, which Palestrina sometimes contrives to show without confusion or degradation, as in the mass *Vestiva i colli*. There is the style of the *madrigali spirituali*, including *Le Vergine* of Petrarca; which again distinguishes itself into a broader and a slighter manner. And there is lastly an astounding absorption of the wildest freaks of Flemish ingenuity into the loftiest polyphonic ecclesiastical style; the great example of which is the Missa *L'Homme armé*, a work much maligned by writers who know only its title and the part played by its secular theme in medieval music.

The works published in Palestrina's lifetime naturally contain a large proportion of his earlier compositions. After his death the publication of his works continued for some years. We are apt to read the musical history of the 17th century in the light of the works of its composers. But a somewhat different view of that time is suggested by the continual pouring out by influential publishers of posthumous works of Palestrina, in far greater quantities than Palestrina had either the influence or resource to publish in his lifetime. We regard the 17th-century monodists as triumphant iconoclasts; but it was not until their primitive efforts had been buried beneath the entirely new arts to which they led, that the style of Palestrina ceased to be upheld as the one artistic ideal. Moreover the posthumous works of Palestrina belong almost entirely to his latest and finest period; so that a study of Palestrina confined to the works which he himself was able to publish gives no adequate idea of the proportion which his greater works bear to the rest. It was not, then, the rise of monody that crowded 16th-century art out into a long oblivion. On the contrary, the Palestrina tradition was the one thing which gave 17th-century composers a practical basis for their technical training. Only in the 18th century did the new art, before coming to maturity under Bach and Handel, reduce the Palestrina style to a dead language.

In the middle of the 19th century that dead language revived in a renascence which has steadily spread throughout Europe. The *Musica divina* of Canon K. Proske of Regensburg, begun in 1853, was perhaps the first decisive step towards the restoration of Roman Catholic church music. The St Cecilia Verein, with Dr F. X. Haberl as its president, has carried on the publication and use of such music with the greatest energy in every civilized country. The difficulties of reintroducing it in its native home, Italy, were so enormous that it is arguable that they might not yet have been surmounted but for the adoption of less purely artistic methods by Don Lorenzo Perosi, who succeeded in crowding the Italian churches by the performance of compositions written in an artless manner which, by its mere negation of display, was fitted to produce upon unsophisticated listeners such devout impressions as might gradually wean them from the taste for theatrical modern church music. The pope's fiat has now inculcated the use of Gregorian and 16th-century church music as far as possible in all Roman Catholic churches, and the effect has been astonishing. Within eighteen months of Pius X.'s decree on church music, the choir of Cologne Cathedral, previously far less accustomed to a pure polyphonic style than most German Protestant choirs, at Easter of 1905 gave a very satisfactory performance of the *Missa Papae Marcelli*. The influence of what is henceforth an inevitable and continual familiarity of Palestrina's style, at least among Roman Catholics, cannot fail to have the profoundest effect upon modern musical culture.

Palestrina's works, as contained in the complete edition published by Breitkopf and Härtel, comprise 256 motets in 7 vols., the last two consisting largely of pieces hitherto unpublished, with one or two wrongly or doubtfully ascribed to Palestrina; 15 books of masses, of which only 6 were published in Palestrina's lifetime, the 7th being incompletely projected by him, and the 14th and 15th first collected by Haberl in 1887 and 1888; 3 books of magnificats, on all the customary tones; 1 vol. of hymns; 1 vol. (2 books) of offertories for the whole year; a volume containing 3 books of litanies and several 12-part motets; 3 books of lamentations; a very large volume of madrigals containing 2 early books and 30 later madrigals collected from mixed publications; 2 books of *Madrigali spirituali*, and 4 vols. of miscellaneous works, newly discovered, imperfectly preserved and doubtful. The fourth book of motets is not, like the first three, a collection of works written at different times, but a single scheme, being a setting of the Song of Solomon; and the fifth volume is, like the offertories, designed for use throughout the church year.

(D. F. T.)

PALETTE (the Fr. diminutive of *pale*, spade, blade of an oar, from Lat. *pala*, spade, baker's shovel or peel; cf. *pandere*, to spread), a term applied to many objects which are flat and thin, and specifically to a thin tablet made of wood, porcelain, or other material on which artists place their colours. The term is also used of the shallow box, with partitions for the different coloured *tesserae*, used by mosaic workers. By transference the colours which an individual artist employs are known as his "palette." The "palette-knife" is a thin flexible knife used for arranging the colours on the palette, &c., and also for the application of colour on the canvas in large masses.

PALEY, FREDERICK APTHORP (1815–1888), English classical scholar, was born at Easingwold in Yorkshire on the 14th of January 1815. He was the grandson of William Paley, and was educated at Shrewsbury school and St John's College, Cambridge (B.A. 1838). His conversion to Roman Catholicism forced him to leave Cambridge in 1846, but he returned in 1860 and resumed his work as "coach," until in 1874 he was appointed professor of classical literature at the newly founded Roman Catholic University at Kensington. This institution was closed in 1877 for lack of funds, and Paley removed to Boscombe, where he died on the 8th of December 1888. His most important editions are: Aeschylus, with Latin notes (1844–1847), the work by which he first attracted attention; Aeschylus (4th ed., 1879), Euripides (2nd ed., 1872), Hesiod (2nd ed., 1883), Homer's *Iliad* (2nd ed., 1884), Sophocles, *Philoctetes*, *Electra*, *Trachiniae*, *Ajax* (1880)—all with English commentary and forming part of the *Bibliotheca classica*; select private orations of Demosthenes (3rd ed., 1896–1898); Theocritus (2nd ed., 1869), with brief Latin notes, one of the best of his minor works. He possessed considerable knowledge of architecture, and published a *Manual of Gothic Architecture* (1846) and *Manual of Gothic Mouldings* (6th ed., 1902).

PALEY, WILLIAM (1743–1805), English divine and philosopher, was born at Peterborough. He was educated at Giggleswick school, of which his father was head master, and at Christ's College, Cambridge. He graduated in 1763 as senior wrangler, became fellow in 1766, and in 1768 tutor of his college. He lectured on Clarke, Butler and Locke, and also delivered a systematic course on moral philosophy, which subsequently formed the basis of his well-known treatise. The subscription controversy was then agitating the university, and Paley published an anonymous *Defence* of a pamphlet in which Bishop Law had advocated the retrenchment and simplification of the Thirty-nine Articles; he did not, however, sign the petition (called the "Feathers" petition from being drawn up at a meeting at the Feathers tavern) for a relaxation of the terms of subscription. In 1776 Paley was presented to the rectory of Musgrave in Westmorland, supplemented at the end of the year by the vicarage of Dalston, and presently exchanged for that of Appleby. In 1782 he became archdeacon of Carlisle. At the suggestion of his friend John Law (son of Edward Law, bishop of Carlisle and formerly his colleague at Cambridge), Paley published (1785) his lectures, revised and enlarged, under the title of *The Principles of Moral and Political Philosophy*. The book at once became the ethical text-book of the University of Cambridge, and passed through fifteen editions in the author's lifetime. He strenuously supported the abolition of the slave trade, and in 1789 wrote a paper on the subject. *The Principles* was followed in 1790 by his first essay in the field of Christian apologetics, *Horae Paulinae, or the Truth of the Scripture History of St Paul evinced by a Comparison of the Epistles which bear his Name with the Acts of the Apostles and with one another*, probably the most original of its author's works. It was followed in 1794 by the celebrated *View of the Evidences of Christianity*. Paley's latitudinarian views are said to have debarred him from the highest positions in the Church. But for his services in defence of the faith the bishop of London gave him a stall in St Paul's; the bishop of Lincoln made him subdean of that cathedral, and the bishop of Durham conferred upon him the rectory of Bishopwearmouth. During the remainder of his life his time was divided between Bishopwearmouth and Lincoln. In 1802 he published *Natural Theology, or Evidences of the Existence and Attributes of the Deity collected from the Appearances of Nature*, his last, and, in some respects, his most remarkable book. In this he endeavoured, as he says in the dedication to the bishop of Durham, to repair in the study his deficiencies in the church. He died on the 25th of May 1805.

In the dedication just referred to, Paley claims a systematic unity for his works. It is true that "they have been written in an order the very reverse of that in which they ought to be read"; nevertheless the *Natural Theology* forms "the completion of a regular and comprehensive design." The truth of this will be apparent if it is considered that the *Moral and Political Philosophy* admittedly embodies two presuppositions: (1) that "God Almighty wills and wishes the happiness of His creatures," and (2) that adequate motives must be supplied to virtue by a system of future rewards and punishments. Now the second presupposition depends, according to Paley, on the credibility of the Christian religion (which he treats almost exclusively as the revelation of these "new sanctions" of morality). The *Evidences* and the *Horae Paulinae* were intended as a demonstration of this credibility. The argument of these books, however, depends in turn upon the assumption of a benevolent Creator desirous of communicating with His creatures for their good; and the *Natural Theology*, by applying the argument from design to prove the existence of such a Deity, becomes the foundation of the argumentative edifice.

In his *Natural Theology* Paley has adapted with consummate skill the argument which Ray (1691) and Derham (1711) and Nieuwentyt[1] (1730) had already made familiar to Englishmen. "For my part," he says, "I take my stand in human anatomy"; and what he everywhere insists upon is "the necessity, in each particular case, of an intelligent designing mind for the contriving and determining of the forms which organized bodies bear." This is the whole argument, and the book consists of a mass of well-chosen instances marshalled in support of it. But by placing Paley's facts in a new light, the theory of evolution has deprived his argument of its force, so far as it applies the idea of special contrivance to individual organs or to species.

The *Evidences of Christianity* is mainly a condensation of Bishop Douglas's *Criterion* and Lardner's *Credibility of the Gospel History*. But the task is so judiciously performed that it would probably be difficult to get a more effective statement of the external evidences of Christianity than Paley has here presented. His idea of revelation depends upon the same mechanical conception of the relation of God to the world which dominates his *Natural Theology*; and he seeks to prove the divine origin of Christianity by isolating it from the general history of mankind, whereas later writers find their chief argument in the continuity of the process of revelation.

The face of the world has changed so greatly since Paley's day that we are apt to do less than justice to his undoubted merits. He is nowhere original, and nowhere profound, but his strong reasoning power, his faculty of clear arrangement and forcible statement, place him in the first rank of expositors and advocates. He masses his arguments, it has been said, with a general's eye. His style is perfectly perspicuous, and its "strong home-touch" compensates for what is lacking in elasticity and grace. Paley displays little or no spirituality of feeling; but this is a matter in which one age is apt to misjudge another, and Paley was at least practically benevolent and conscientiously attentive to his parish duties. The active part he took in advocating the abolition of the slave-trade is evidence of a wider power of sympathy. His unconquerable cheerfulness becomes itself almost religious in the last chapters of the *Natural Theology*, considering that they were written during the intervals of relief from the painful complaint which finally proved fatal to him.

For his life, see *Public Characters* (1802); Aikin's *General Biography*, vii. (1808); Lives, by G. W. Meadley (1809) and his son Edmund Paley, prefixed to the 1825 edition of his works; Leslie Stephen in *Dictionary of National Biography*; *Quarterly Review*, ii. (Aug. 1809), ix. (July 1813). On Paley as a theologian and philosopher, see Leslie Stephen, *English Thought in the Eighteenth Century*, i. 405 seq., ii. 121 seq.; R. Buddensieg, in Herzog-Hauck's *Realencyklopädie für protestantische Theologie*, xiv. (1904). See also ETHICS.

PALFREY, JOHN GORHAM (1796–1881), American historian, was born in Boston, Massachusetts, on the 2nd of May 1796. He graduated at Harvard, 1815, and became a Unitarian minister, being pastor of the Brattle Square church, Boston, 1818–1831. He was professor of sacred literature in the Harvard divinity school, 1830–1839. Entering politics, he was secretary of state of Massachusetts, 1844–1847; a representative in Congress, 1847–1849; and postmaster of Boston, 1861–1867. He was editor of the *North American Review*, 1835–1843. As a writer he is best known by his *History of New England* to the revolutionary war, in five volumes, of which the first appeared in 1859 and the last posthumously in 1890. He died at Cambridge, Massachusetts, on the 26th of April 1881.

PALFREY, a riding-horse, particularly one of smaller and lighter type than the war-horse, the "destrier" (Med. Lat. *dextrarius*, because led by the right hand till used), which was only ridden in battle or tournament. The palfrey was thus used on the march, &c., and also as a lady's riding-horse. "Palfrey" came into English through the O. Fr. *palefrei*, one of the numerous forms which the word took in its descent from the Late Lat. *paraveredus*, a hybrid word from Gr. *παρὰ*, in the sense of extra, and *veredus*, a post-horse, probably a Celtic word, for one who draws a *rheda* or carriage. The form *parafredus* gives the Mod. Ger. *Pferd*, horse, through the O.H.G. *pfarifrid*.

PALGHAT, a town of British India, in the Malabar district of Madras, on the Madras railway. Pop. (1901), 44,177. As the key to Travancore and Malabar from the East, it was formerly of considerable strategic importance. The fort fell into British hands in 1768, and subsequently formed the basis of many of the operations against Tippoo, which terminated in the storming of Seringapatam. The easy ascent by the Palghat Pass, formerly covered with teak forests, supplies the great route from the west coast to the interior. The municipality manages the Victoria college.

PALGRAVE, SIR FRANCIS (1788–1861), English historian, was the son of Meyer Cohen, a Jewish stockbroker, and was born in London in July 1788. He was educated privately and was so precocious a boy as to translate a Latin version of the *Battle of the Frogs and Mice* into French in 1796, which was published by his father in 1797. In 1803 Palgrave was articled to a firm of solicitors, but was called to the bar at the Middle Temple in 1827. On his marriage in 1823 with Elizabeth, daughter of Dawson Turner of Great Yarmouth, he had become a Christian, and had changed his name to Palgrave, the maiden name of his wife's mother. His work as a barrister was chiefly concerned with pedigree cases before the House of Lords. He edited for the Record Commission *Parliamentary Writs* (London, 1827–1834); *Rotuli curiae regis* (London, 1835); *The antient kalendars and inventories of the treasury of his majesty's exchequer* (London, 1836); and *Documents and records illustrating the history of Scotland* (London, 1837), which contains an elaborate introduction. In 1831 he published his *History of England, Anglo-Saxon Period*, later editions of which were published as *History of the Anglo-Saxons*; in 1832, his *Rise and Progress of the English Commonwealth*, pronounced by Freeman a "memorable book"; and in 1834 his *Essay upon the original authority of the king's council*. In 1832 he was knighted, and after serving as one of the municipal corporations commissioners, became deputy-keeper of the public records in 1838, holding this office until his death at Hampstead on the 6th of July 1861. Palgrave's most important work is his *History of Normandy and England*, which appeared in four volumes (London 1851–1864), and deals with the history of the two countries down to 1101.

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[1] Bernard Nieuwentyt (1654–1718) was a Dutch disciple of Descartes, whose work, *Regt gebruik der Werelt Beschouwingen*, published in 1716, was translated into English in 1730 by J. Chamberlayne under the title of *The Religious Philosopher*. A charge of wholesale plagiarism from this book was brought against Paley in the *Athenaeum* for 1848. Paley refers several times to Nieuwentyt, who uses the famous illustration of the watch. But the illustration is not peculiar to Nieuwentyt, and had been appropriated by many others before Paley. The germ of the idea is to be found in Cicero, *De natura deorum*, ii. 34 (see Hallam, *Literature of Europe*, ii. 385, note.) In the case of a writer whose chief merit is the way in which he has worked up existing material, a general charge of plagiarism is almost irrelevant.

He also wrote *Truths and Fictions of the Middle Ages* (London, 1837, and again 1844); *The Lord and the Vassal* (London, 1844); and *Handbook for Travellers in Northern Italy* (London, 1842, and subsequent editions).

Palgrave's four sons were: Francis Turner Palgrave (*q.v.*), sometime professor of poetry at Oxford; William Gifford Palgrave; Sir Robert Harry Inglis Palgrave (b. 1827), an authority upon banking and economics generally; and Sir Reginald Francis Douce Palgrave.

William Gifford Palgrave (1826–1888) went to India as a soldier after a brilliant career at Charterhouse School and Trinity College, Oxford; but, having become a Roman Catholic, he was ordained priest and served as a Jesuit missionary in India, Syria, and Arabia. Forsaking the priesthood about 1864, he was employed as a diplomatist by the British government in Egypt, Asia Minor, the West Indies, and Bulgaria, being appointed resident minister in Uruguay in 1884; he died at Montevideo on the 30th of September 1888. He wrote a romance, *Hermann Agha* (London, 1872), *A Narrative of a Year's Journey through Central and Eastern Arabia* (London, 1865), *Essays on Eastern Questions* (London, 1872), and other works.

Sir Reginald Palgrave (1829–1904) became a solicitor in 1851; but two years later was appointed a clerk in the House of Commons, becoming clerk of the House on the retirement of Sir Erskine May in 1886. He was made a K.C.B. in 1892, retired from his office in 1900, and died at Salisbury on the 13th of July 1904. Sir Reginald wrote *The Chairman's Handbook; The House of Commons: Illustrations of its History and Practice* (London, 1869); and *Cromwell: an appreciation based on contemporary evidence* (London, 1890). He also assisted to edit the tenth edition of Erskine May's *Law, Privileges, Proceedings and Usage of Parliament* (London, 1896).

PALGRAVE, FRANCIS TURNER (1824–1897), English critic and poet, eldest son of Sir Francis Palgrave, the historian, was born at Great Yarmouth, on the 28th of September 1824. His childhood was spent at Yarmouth and at his father's house in Hampstead. At fourteen he was sent as a day-boy to Charterhouse; and in 1843, having in the meanwhile travelled extensively in Italy and other parts of the continent, he proceeded to Oxford, having won a scholarship at Balliol. In 1846 he interrupted his university career to serve as assistant private secretary to Gladstone, but returned to Oxford the next year, and took a first class in Literae Humaniores. From 1847 to 1862 he was fellow of Exeter College, and in 1849 entered the Education Department at Whitehall. In 1850 he accepted the vice-principalship of Kneller Hall Training College at Twickenham. There he came into contact with Tennyson, and laid the foundation of a lifelong friendship. When the training college was abandoned, Palgrave returned to Whitehall in 1855, becoming examiner in the Education Department, and eventually assistant secretary. He married, in 1862, Cecil Grenville Milnes, daughter of James Milnes-Gaskell. In 1884 he resigned his position at the Education Department, and in the following year succeeded John Campbell Shairp as professor of poetry at Oxford. He died in London on the 24th of October 1897, and was buried in the cemetery on Barnes Common. Palgrave published both criticism and poetry, but his work as a critic was by far the more important. His *Visions of England* (1880–1881) has dignity and lucidity, but little of the "natural magic" which the greatest of his predecessors in the Oxford chair considered rightly to be the test of inspiration. His last volume of poetry, *Amenophis*, appeared in 1892. On the other hand, his criticism was always marked by fine and sensitive tact, quick intuitive perception, and generally sound judgment. His *Handbook to the Fine Arts Collection, International Exhibition, 1862*, and his *Essays on Art* (1866), though not free from dogmatism and over-emphasis, were sincere contributions to art criticism, full of striking judgments strikingly expressed. His *Landscape in Poetry* (1897) showed wide knowledge and critical appreciation of one of the most attractive aspects of poetic interpretation. But Palgrave's principal contribution to the development of literary taste was contained in his *Golden Treasury of English Songs and Lyrics* (1861), an anthology of the best poetry in the language constructed upon a plan sound and spacious, and followed out with a delicacy of feeling which could scarcely be surpassed. Palgrave followed it with a *Treasury of Sacred Song* (1889), and a second series of the *Golden Treasury* (1897), including the work of later poets, but in neither of these was quite the same exquisiteness of judgment preserved. Among his other works were *The Passionate Pilgrim* (1858), a volume of selections from Herrick entitled *Chrysomela* (1877), a memoir of Clough (1862) and a critical essay on Scott (1866) prefixed to an edition of his poems.

See Gwenllian F. Palgrave, *F. T. Palgrave* (1899).

PALI, the language used in daily intercourse between cultured people in the north of India from the 7th century B.C. It continued to be used throughout India and its confines as a literary language for about a thousand years, and is still, though in a continually decreasing degree, the literary language of Burma, Siam, and Ceylon. Two factors combined to give Pali its importance as one of the few great literary languages of the world: the one political, the other religious. The political factor was the rise during the 7th century B.C. of the Kosala power. Previous to this the Aryan settlements, along the three routes they followed in their penetration into India, had remained isolated, independent and small communities. Their language bore the same relation to the Vedic speech as the various Italian dialects bore to Latin. The welding together of the great Kosala kingdom, more than twice the size of England, in the very centre of the settled country, led insensibly but irresistibly to the establishment of a standard of speech, and the standard followed was the language used at the court at Sāvatthi in the Nepalese hills, the capital of Kosala. When Gotama the Buddha, himself a Kosalan by birth, determined on the use, for the propagation of his religious reforms, of the living tongue of the people, he and his followers naturally made full use of the advantages already gained by the form of speech current through the wide extent of his own country. A result followed somewhat similar to the effect, on the German language, of the Lutheran reformation. When, in the generations after the Buddha's death, his disciples compiled the documents of the faith, the form they adopted became dominant. But local varieties of speech continued to eixst.

The etymology of the word Pali is uncertain. It probably means "row, line, canon," and is used, in its exact technical sense, of the language of the canon, containing the documents of the Buddhist faith. But when Pali first became known to Europeans it was already used also, by those who wrote in Pali, of the language of the later writings, which bear the same relation to the standard literary Pali of the canonical texts as medieval does to classical Latin. A further extension of the meaning in which the word Pali was used followed in a very suggestive way. The first book edited by a European in Pali was the *Mahāvaṃsa*, or Great Chronicle of Ceylon, published there in 1837 by Turnour, then colonial secretary in the island. James Prinsep was then devoting his rare genius to the decipherment of the early inscriptions of northern India, especially those of Asoka in the 3rd century B.C. He derived the greatest assistance from Turnour's work not only in historical information, but also as regards the forms of words and grammatical inflexions. The resemblance was so close that Prinsep called the alphabet he was deciphering the Pali alphabet, and the language expressed in it he called the Pali language. This was so nearly correct that the usage has been followed by other European scholars, and is being increasingly adopted. It receives the support of Mahānāma, the author of the Great Chronicle, who wrote in Ceylon in the 5th century A.D. He says (p. 253, ed. Turnour) that Buddhaghosa translated the commentaries, then existing only in Sinhalese, into Pali. The name here used by the chronicler for Pali is "the Māgadhī tongue," by which expression is meant, not exactly the language spoken in Māgadha, but the language in use at the court of Asoka, king of Kosala and Māgadha. With this use of the word, philologically inexact, but historically quite defensible, may be compared the use of the word English, which is not exactly the language of the Angles, or of the word French, which is not exactly the language of the Franks. The question of Pali becomes therefore threefold: Pali before the canon, the canon, and the writings subsequent to the canon. The present writer has suggested that the word Pali should be reserved for the language of the canon, and other words used for the earlier and later forms of it;[1] but the usage generally followed is so convenient that there is little likelihood of the suggestion being followed. The threefold division will therefore be here adhered to.

For the history of Pali before the canonical books were composed we have no direct evidence. None of the pre-Buddhistic sites have as yet been excavated; and, with one doubtful exception, no inscriptions older than the texts have as yet been found. We have to argue back from the state of things revealed in the texts, of various dates from 450–250 B.C., and in the inscriptions from that date onwards. The inscriptions have now been subjected to a very full critical and philological analysis in Professor Otto Franke's *Pali und Sanskrit* (Strassburg, 1902). He shows that in the 3rd century B.C. the language used throughout northern India was practically one, and that it was derived directly from the speech of the Vedic Aryans, retaining many Vedic forms lost in the later classical Sanskrit. His list of such forms is much more complete than that given by Childers in the introduction to his *Dictionary of the Pali Language*. The particular form of this general speech which was used as the *lingua franca*, the Hindustani of the period, was the form in use in Kosala. Franke also shows that there were local peculiarities in small matters of spelling and inflexion, and that the particular form of the language used in and about the Avanti district, of which the capital was Ujjeni (a celebrated pre-Buddhistic city), was the basis of the language used in the sacred texts as we now have them. Long ago Westergaard, Rhys Davids and Ernst Kuhn,[2] had made the same suggestion, mainly on historical grounds, Mahinda, who took the texts to Ceylon, having been born at Vedisa in that district. The careful and complete collection, by Franke, of the philological evidence at present available, has raised this hypothesis into a practical certainty. The inscriptions are at present scattered through a number of learned periodicals; a complete list of all those that can be approximately dated between the 3rd century B.C. and the 2nd century A.D. is given in the first chapter of Franke's book. M. E. Senart has collected in his *Inscriptions de Piyadasi* (Paris, 1881–1886) those inscriptions of Asoka which were known up to the date of his work, subjecting them to a careful analysis, and providing an index to the words occurring in them. What is greatly needed is a new edition of this work including the Asoka inscriptions discovered during the last twenty years, and a similar edition of the other inscriptions. The whole of the Pali inscriptions so far discovered might fill somewhat more than a hundred pages of text. An outline of the history of the Pali alphabet has been given, with illustrations and references to the authorities, in Rhys Davids's *Buddhist India*, pp. 107–140.

The canonical texts are divided into three collections called Piṭakas, *i.e.* baskets. This figure of speech refers, not to a basket or box in which things can be stored, but to the baskets, used in India in excavations, as a means of handing on the earth from one worker to another. The first Piṭaka contains the *Vinaya*—that is, Rules of the Order; the second the *Suttas*, giving the doctrine, and the third the *Abhidhamma*, analytical exercises in the psychological system on which the doctrine is based. These have now nearly all, mainly through the work of the Pali Text Society, been published in Pali.

The Vinaya was edited in 5 vols. by H. Oldenberg; and the more important parts of it have been translated into English by Rhys Davids and Oldenberg in their *Vinaya Texts*.

The Sutta Piṭaka consists of five *Nikāyas*, four principal and one supplementary. The four principal ones have been published for the Pali Text Society, and some volumes have been translated into English or German. These four Nikāyas, sixteen volumes in all, are the main authorities for the doctrines of early Buddhism. The fifth Nikāya is a miscellaneous collection of treatises, mostly very short, on a variety of subjects. It contains lyrical and ballad poetry, specimens of early exegesis and commentary, lives of the saints, collections of edifying anecdotes and of the now well-known *Jātakas* or Birth Stories. Of these, eleven volumes had by 1910 been edited for the Pali Text Society by various scholars, the Jātakas and two other treatises had appeared elsewhere, and two works (one a selection of lives of distinguished early Buddhists, and the other an ancient commentary), were still in MS.

Of the seven treatises contained in the Abhidhamma Pitaka five, and one-third of the sixth, had by 1910 been published by the Pali Text Society; and one, the *Dhamma Sangaṇi*, had been translated by Mrs Rhys Davids. A description of the contents of all these books in the canon is given in Rhys Davids's *American Lectures*, pp. 44–86.

A certain amount of progress has been made in the historical criticism of these books. Out of the twenty-nine works contained in the three Piṭakas only one claims to have an author. That one is the *Kathā Vatthu*, ascribed to Tissa the son of Moggalī,[3] who presided over the third council held under Asoka. It is the latest book of the third Piṭaka. All the rest of the canonical works grew up in the schools of the Order, and most of them appear to contain documents, or passages, of different dates. In his masterly analysis of the Vinaya, in the introduction to his edition of the text, Professor Oldenberg has shown that there are at least three strata in the existing presentation of the Rules of the Order, the oldest portions going back probably to the time of the Buddha himself. Professor Rhys Davids has put forward similar views with respect to the Jātakas and the Sutta Nipāta in his *Buddhist India*, and with respect to the Nikāyas in general in the introduction to his *Dialogues of the Buddha*. And Professor Windisch has discussed the legends of the temptation in his *Māra und Buddha*, and those relating to the Buddha's birth in his *Buddha's Geburt*. It seems probable that the Vināya and the four Nikāyas were put substantially into the shape in which we now have them before the council at Vesāli, a hundred years after the Buddha's death; that slight alterations and additions were made in them, and the miscellaneous Nikāya and the Abhidhamma books completed, at various times down to the third council under Asoka; and that the canon was then considered closed. No evidence has yet been found of any alterations made, after that time, in Ceylon; but there were probably before that time, in India, other books, now lost, and other recensions of some of the above.

Of classical Pali in northern India subsequent to the canon there is but little evidence. Three works only have survived. These are the *Milinda-pañha*, edited by V. Trenckner, and translated by Rhys Davids under the title *Questions of King Milinda*; the *Netti Pakaraṇa*, edited by E. Hardy for the Pali Text Society in 1902; and the *Petaka Upadesa*. The former belongs to the north-west, the others to the centre of India, and all three may be dated vaguely in the first or second centuries A.D. The first, a religious romance of remarkable interest, may owe its preservation to the charm of its style, the others to the accident that they were attributed by mistake to a famous apostle. In any case they are the sole survivors of what must have been a vast and varied literature. Professor Takakusu has shown the possibility of several complete books belonging to it being still extant in Chinese translations,[1] and we may yet hope to recover original fragments in central Asia, Tibet, or Nepal.

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[1] *Journal* of the Royal Asiatic Society (1903), p. 398.

[2] Westergaard, *Über den ältesten Zeitraum der indischen Geschichte*, p. 87; Rhys Davids, *Transactions of the Philological Society* (1875), p. 70; Kuhn, *Beiträge zur Pali Grammatik*, 7–9.

[3] No doubt identical with Upagupta, the teacher of Asoka (cf. Vincent Smith, *Early History of India*, 2nd ed., 1908, and refs.).

At p. 66 of the *Gandha Vaṃsa*, a modern catalogue of Pali books and authors, written in Pali, there is given a list of ten authors who wrote Pali books in India, probably southern India. We may conclude that these books are still extant in Burma, where the catalogue was drawn up. Two only of these ten authors are otherwise known. The first is Dhammapāla, who wrote in Kāñcipura, the modern Conjevaram in south India, in the 5th century of our era. His principal work is a series of commentaries on five of the lyrical anthologies included in the miscellaneous Nikāya. Three of these have been published by the Pali Text Society; and Professor E. Hardy has discussed in the *Zeitschrift der deutschen morgenländischen Gesellschaft* (1897), pp. 105–127, all that is known about him. Dhammapāla wrote also a commentary on the Netti mentioned above. The second is Buddhadatta, who wrote the *Jinālankāra* in the 5th century A.D. It has been edited and translated by Professor J. Gray. It is a poem, of no great interest, on the life of the Buddha.

The whole of these Pali books composed in India have been lost there. They have been preserved for us by the unbroken succession of Pali scholars in Ceylon and Burma. These scholars (most of them members of the Buddhist Order, but many of them laymen) not only copied and recopied the Indian Pali books, but wrote a very large number themselves. We are thus beginning to know something of the history of this literature. Two departments have been subjected to critical study: the Ceylon chronicles by Professor W. Geiger in his *Mahāvaṃsa und Dīpavaṃsa*, and the earlier grammatical works by Professor O. Franke in two articles in the *Journal of the Pali Text Society* for 1903, and in his *Geschichte und Kritik der einheimischen Pali Grammatik*. Dr Forchhammer in his *Jardine Prize Essay*, and Dr Mabel Bode in the introduction to her edition of the *Sāsana-vaṃsa*, have collected many details as to the Pali literature in Burma.

The results of these investigations show that in Ceylon from the 3rd century B.C. onwards there has been a continuous succession of teachers and scholars. Many of them lived in the various *vihāras* or residences situate throughout the island; but the main centre of intellectual effort, down to the 8th century, was the Mahā Vihāra, the Great Minster, at Anwrādhapura. This was, in fact, a great university. Authors refer, in the prefaces to their books, to the Great Minster as the source of their knowledge. And to it students flocked from all parts of India. The most famous of these was Buddhaghosa, from Behar in North India, who studied at the Minster in the 5th century A.D., and wrote there all his well-known works. Two volumes only of these, out of about twenty still extant in MS., have been edited for the Pali Text Society. About a century before this the *Dīpa-vaṃsa*, or Island Chronicle, had been composed in Pali verse so indifferent that it is apparently the work of a beginner in Pali composition. No work written in Pali in Ceylon at a date older than this has been discovered yet. It would seem that up to the 4th century of our era the Sinhalese had written exclusively in their own tongue; that is to say that for six centuries they had studied and understood Pali as a dead language without using it as a means of literary expression. In Burma, on the other hand, where Pali was probably introduced from Ceylon, no writings in Pali can be dated before the 11th century of our era. Of the history of Pali in Siam very little is known. There have been good Pali scholars there since late medieval times. A very excellent edition of the twenty-seven canonical books has been recently printed there, and there exist in our European libraries a number of Pali MSS. written in Siam.

It would be too early to attempt any estimate of the value of this secondary Pali literature. Only a few volumes, out of several hundreds known to be extant in MS., have yet been published. But the department of the chronicles, the only one so far at all adequately treated, has thrown so much light on many points of the history of India that we may reasonably expect results equally valuable from the publication and study of the remainder. The works on religion and philosophy especially will be of as much service for the history of ideas in these later periods as the publication of the canonical books has already been for the earlier period to which they refer. The Pali books written in Ceylon, Burma and Siam will be our best and oldest, and in many respects our only, authorities for the sociology and politics, the literature and the religion, of their respective countries.

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PALIKAO, CHARLES GUILLAUME MARIE APPOLLINAIRE ANTOINE COUSIN MONTAUBAN, COMTE DE (1796 1878), French general and statesman, was born in Paris on the 24th of June 1796. As a cavalry officer young Montauban saw much service in Algeria, but he was still only a colonel when in 1847 he effected the capture of Abd-el-Kader. After rising to the rank of general of division and commanding the province of Constantine, he was appointed in 1858 to a command at home, and at the close of 1859 was selected to lead the French troops in the joint French and British expedition to China. His conduct of the operations did not escape criticism, but in 1862 he received from Napoleon III. the title of comte de Palikao (from the action of that name); he had already been made a senator. The allegation that he had acquired a vast fortune by the plunder of the Pekin summer palace seems to have been without foundation. In 1865 he was appointed to the command of the IV. army corps at Lyons, in the training of which he displayed exceptional energy and administrative capacity. In 1870 he was not given a command in the field, but after the opening disasters had shaken the Ollivier ministry he was entrusted by the empress-regent with the portfolio of war, and became president of the council (Aug. 10). He at once, with great success, reorganized the military resources of the nation. He claimed to have raised Marshal MacMahon's force at Châlons to 140,000 men, to have created three new army corps, 33 new regiments and 100,000 *gardes mobiles*, and to have brought the defences of the capital to a state of efficiency—all this in twenty-four days. He conceived the idea of sending the army of Châlons to raise the blockade of Metz. The scheme depended on a precision and rapidity of which the army of Châlons was no longer capable, and ended with the disaster of Sedan. After the capitulation of the emperor the dictatorship was offered to Palikao, but he refused to desert the empire, and proposed to establish a council of national defence, with himself as "lieutenant-general of government." Before a decision was made, the chamber was invaded by the mob, and Palikao fled to Belgium. In 1871 he appeared before the parliamentary commission of inquiry, and in the same year established *Un Ministère de la guerre de vingt-quatre jours*. He died at Versailles on the 8th of January 1878.

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[1] *Journal* of the Pali Text Society (1905), pp. 72, 86.

PALIMPSEST. The custom of removing writing from the surface of the material on which it had been inscribed, and thus preparing that surface for the reception of another text, has been practised from early times. The term palimpsest (from Gr. *πάλιν*, again, and *ψάω*, I scrape) is used by Catullus, apparently with reference to papyrus; by Cicero, in a passage wherein he is evidently speaking of waxen tablets; and by Plutarch, when he narrates that Plato compared Dionysius to a *βιβλίον παλίμψηστον*, in that his tyrant nature, being *δυσέκπλυτος*, showed itself like the imperfectly erased writing of a palimpsest MS. In this passage reference is clearly made to the washing off of writing from papyrus. The word *παλίμψηστος* can only in its first use have been applied to MSS. which were actually scraped or rubbed, and which were, therefore, composed of a material of sufficient strength to bear the process. In the first instance, then, it might be applied to waxen tablets; secondly, to vellum books. There are still to be seen, among the surviving waxen tablets, some which contain traces of an earlier writing under a fresh layer of wax. Papyrus could not be scraped or rubbed; the writing was washed from it with the sponge. This, however, could not be so thoroughly done as to leave a perfectly clean surface, and the material was accordingly only used a second time for documents of an ephemeral or common nature. To apply, therefore, the title of palimpsest to a MS. of this substance was not strictly correct; the fact that it was so applied proves that the term was a common expression. Traces of earlier writing are very rarely to be detected in extant papyri. Indeed, the supply of that material must have been so abundant that it was hardly necessary to go to the trouble of preparing a papyrus, already used, for a second writing.

In the early period of palimpsests, vellum MSS. were no doubt also washed rather than scraped. The original surface of the material, at all events, was not so thoroughly defaced as was afterwards the case. In course of time, by atmospheric action or other chemical causes, the original writing would to some extent reappear; and it is thus that so many of the capital and uncial palimpsests have been successfully deciphered. In the later middle ages the surface of the vellum was scraped away and the writing with it. The reading of the later examples is therefore very difficult or altogether impossible. Besides actual rasure, various recipes for effacing the writing have been found, such as to soften the surface with milk and meal, and then to rub with pumice. In the case of such a process being used, total obliteration must almost inevitably have been the result. To intensify the traces of the original writing, when such exist, various chemical reagents have been tried with more or less success. The old method of smearing the vellum with tincture of gall restored the writing, but did irreparable damage by blackening the surface, and, as the stain grew darker in course of time, by rendering the text altogether illegible. Of modern reagents the most harmless appears to be hydrosulphate of ammonia; but this also must be used with caution.

The primary cause of the destruction of vellum MSS. by wilful obliteration was, it need hardly be said, the dearth of material. In the case of Greek MSS., so great was the consumption of old codices for the sake of the material, that a synodal decree of the year 691 forbade the destruction of MSS. of the Scriptures or the church fathers—imperfect or injured volumes excepted. The decline of the vellum trade also on the introduction of paper caused a scarcity which was only to be made good by recourse to material already once used. Vast destruction of the broad quartos of the early centuries of our era took place in the period which followed the fall of the Roman Empire. The most valuable Latin palimpsests are accordingly found in the volumes which were remade from the 7th to the 9th centuries, a period during which the large volumes referred to must have been still fairly numerous. Late Latin palimpsests rarely yield anything of value. It has been remarked that no entire work has been found in any instance in the original text of a palimpsest, but that portions of many works have been taken to make up a single volume. These facts prove that scribes were indiscriminate in supplying themselves with material from any old volumes that happened to be at hand.

An enumeration of the different palimpsests of value is not here possible (see Wattenbach, *Schriftwesen*, 3rd ed., pp. 299–317); but a few may be mentioned of which facsimiles are accessible. The MS. in the Bibliothèque Nationale, Paris, known as the Codex Ephraemi, containing portions of the Old and New Testaments in Greek, attributed to the 5th century, is covered with works of Ephraem Syrus in a hand of the 12th century (ed. Tischendorf, 1843, 1845). Among the Syriac MSS. obtained from the Nitrian desert in Egypt, and now deposited in the British Museum, some important Greek texts have been recovered. A volume containing a work of Severus of Antioch of the beginning of the 9th century is written on palimpsest leaves taken from MSS. of the *Iliad* of Homer and the Gospel of St Luke, both of the 6th century (*Cat. Anc. MSS.* vol. i., pls. 9, 10), and the *Elements* of Euclid of the 7th or 8th century. To the same collection belongs the double palimpsest, in which a text of St John Chrysostom, in Syriac, of the 9th or 10th century, covers a Latin grammatical treatise in a cursive hand of the 6th century, which in its turn has displaced the Latin annals of the historian Granius Licinianus, of the 5th century (*Cat. Anc. MSS.* ii., pls. 1, 2). Among Latin palimpsests also may be noticed those which have been reproduced in the *Exempla* of Zangemeister and Wattenbach. These are—the Ambrosian Plautus, in rustic capitals, of the 4th or 5th century, re-written with portions of the Bible in the 9th century (pl. 6); the Cicero *De republica* of the Vatican, in uncials, of the 4th century, covered by St Augustine on the Psalms, of the 7th century (pl. 17; *Pal. Soc.*, pl. 160); the Codex Theodosianus of Turin, of the 5th or 6th century (pl. 25); the Fasti Consulares of Verona, of A.D. 486 (pl. 29); and the Arian fragment of the Vatican, of the 5th century (pl. 31). Most of these originally belonged to the monastery of Bobbio, a fact which gives some indication of the great literary wealth of that house. By using skill and judgment, with a favouring light, photography may be often made a useful agent in the decipherment of obscure palimpsest texts. (E. M. T.)

PALINDROME (Gr. *πάλιν*, again, and *δρόμος*, a course), a verse or sentence which runs the same when read either backwards or forwards. Such is the verse—

Roma tibi subito motibus ibit amor;

or

Signa te, signa, temere me tangis et angis;

or

νίψον ἀνομήματα μὴ μόναν ὄψιν.

Some have refined upon the palindrome, and composed verses each word of which is the same read backwards as forwards: for instance, that of Camden—

Odo tenet mulum, madidam mappam tenet Anna,
Anna tenet mappam madidam, mulum tenet Odo.

The following is still more complicated, as reading in four ways—upwards and downwards as well as backwards and forwards:—

SATOR
AREPO
TENET
OPERA
ROTAS

PALINGENESIS (Gr. *πάλιν*, again, *γένεσις*, becoming, birth), a term used in philosophy, theology and biology. In philosophy it denotes in its broadest sense the theory (*e.g.* of the Pythagoreans) that the human soul does not die with the body but is "born again" in new incarnations. It is thus the equivalent of metempsychosis (*q.v.*). The term has a narrower and more specific use in the system of Schopenhauer, who applies it to his doctrine that the will does not die but manifests itself afresh in new individuals. He thus repudiates the primitive metempsychosis doctrine which maintains the reincarnation of the particular soul. The word "palingenesis" or rather "palingenesia" may be traced back to the Stoics, who used the term for the continual re-creation of the universe by the Demiurgus (Creator) after its absorption into himself. Similarly Philo speaks of Noah and his sons as leaders of a "renovation" or "re-birth" of the earth. Josephus uses the term of the national restoration of the Jews, Plutarch of the transmigration of souls, and Cicero of his own return from exile. In the New Testament the properly theological sense of spiritual regeneration is found, though the word itself occurs only twice; and it is used by the church fathers, *e.g.* for the rite of baptism or for the state of repentance. In modern biology (*e.g.* Haeckel and Fritz Müller) "palingenesis" has been used for the exact reproduction of ancestral features by inheritance, as opposed to "kenogenesis" (Gr. καινός new), in which the inherited characteristics are modified by environment.

PALISSY, BERNARD (1510–1589), French potter (see CERAMICS), is said to have been born about 1510, either at Saintes or Agen, but both date and locality are uncertain. It has been stated, on insufficient authority, that his father was a glass-painter and that he served as his father's apprentice. He tells us that he was apprenticed to a glass-painter and that he also acquired in his youth the elements of land-surveying. At the end of his apprenticeship he followed the general custom and became a travelling workman; acquiring fresh knowledge in many parts of France and the Low Countries, perhaps even in the Rhine Provinces of Germany and in Italy.

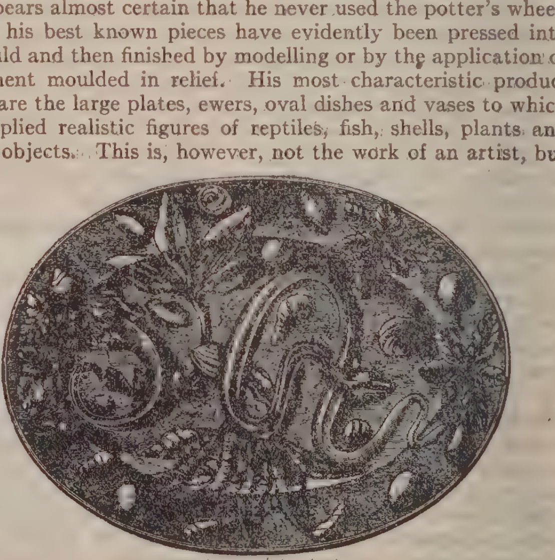
About 1539 it appears that he returned to his native district and, having married, took up his abode at Saintes. How he lived during the first years of his married life we have little record except when he tells us, in his autobiography, that he practised the arts of a portrait-painter, glass-painter and land-surveyor as a means of livelihood. It is known for instance that he was commissioned to survey and prepare a plan of the salt marshes in the neighbourhood of Saintes when the council of Francis I. determined to establish a salt tax in the Saintonge. It is not quite clear, from his own account, whether it was during his *Wanderjahr* or after he settled at Saintes that he was shown a white enamelled cup which caused him such surprise that he determined to spend his life—to use his own expressive phrase "like a man who gropes in the dark"—in order to discover the secrets of its manufacture. Most writers have supposed that this piece of fine white pottery was a piece of the enamelled majolica of Italy, but such a theory will hardly bear examination. In Palissy's time pottery covered with beautiful white tin-enamel was manufactured at many centres in Italy, Spain, Germany and the South of France, and it is inconceivable that a man so travelled and so acute should not have been well acquainted with its appearance and properties. What is much more likely is that Palissy saw, among the treasures of some nobleman, a specimen of Chinese porcelain, then one of the wonders of the European world, and, knowing nothing of its nature, substance or manufacture, he set himself to work to discover the secrets for himself. At the neighbouring village of La Chapelle-des-Pots he mastered the rudiments of peasant pottery as it was practised in the 16th century. Other equipment he had none, except such indefinite information as he presumably had acquired during his travels of the manufacture of European tin-enamelled pottery.

For nearly sixteen years Palissy laboured on in these wild endeavours, through a succession of utter failures, working with the utmost diligency and constancy but, for the most part, without a gleam of hope. The story is a most tragic one; for at times he and his family were reduced to the bitterest poverty; he burned his furniture and even, it is said, the floor boards of his house to feed the fires of his furnaces; sustaining meanwhile the reproaches of his wife, who, with her little family clamouring for food, evidently regarded these proceedings as little short of insanity. All these struggles and failures are most faithfully recorded by Palissy himself in one of the simplest and most interesting pieces of autobiography ever written. The tragedy of it all is that Palissy not only failed to discover the secret of Chinese porcelain, which we assume him to have been searching for, but that when he did succeed in making the special type of pottery that will always be associated with his name it should have been inferior in artistic merit to the contemporary productions of Spain and Italy. His first successes can only have been a superior kind of "peasant pottery" decorated with modelled or applied reliefs coloured naturalistically with glazes and enamels. These works had already attracted attention locally when, in 1548, the constable de Montmorency was sent into the Saintonge to suppress the revolution there. Montmorency protected the potter and found him employment in decorating with his glazed terra-cottas the château d'Ecouen. The patronage of such an influential noble soon brought Palissy into fame at the French court, and although he was an avowed Protestant, he was protected by these nobles from the ordinances of the parliament of Bordeaux when, in 1562, the property of all the Protestants in this district was seized. Palissy's workshops and kilns were destroyed, but he himself was saved, and, by the interposition of the all-powerful constable, he was appointed "inventor of rustic pottery to the king and the queen-mother"; about 1563, under royal protection, he was allowed to establish a fresh pottery works in Paris in the vicinity of the royal palace of the Louvre. The site of his kilns indeed became afterwards a portion of the gardens of the Tuileries. For about twenty-five years from this date Palissy lived and worked in Paris. He appears to have been a personal favourite of Catherine de' Medicis, and of her sons, in spite of his profession of the reformed religion.

Working for the court, his productions passed through many phases, for besides continuing his "rustic figulines" he made a large number of dishes and plaques ornamented with scriptural or mythological subjects in relief, and in many cases he appears to have made reproductions of the pewter dishes of François Briot and other metal workers of the period. During this period too he gave several series of public lectures on natural history—the entrance fee being one crown, a large fee for those days—in which he poured forth all the ideas of his fecund mind. His ideas of springs and underground waters were far in advance of the general knowledge of his time, and he was one of the first men in Europe to enunciate the correct theory of fossils.

The close of Palissy's life was quite in keeping with his active and stormy youth. Like Ambroise Paré, and some other notable men of his time, he was protected against ecclesiastical persecution by the court and some of the great nobles, but in the fanatical outburst of 1588 he was thrown into the Bastille, and although Henry III. offered him his freedom if he would recant, Palissy refused to save his life on any such terms. He was condemned to death when nearly eighty years of age, but he died in one of the dungeons of the Bastille in 1589.

Palissy's Pottery.—The technique of the various wares he made shows their derivation from the ordinary peasant pottery of the period, though Palissy's productions are, of course, vastly superior to anything of their kind previously made in Europe. It appears almost certain that he never used the potter's wheel, as all his best known pieces have evidently been pressed into a mould and then finished by modelling or by the application of ornament moulded in relief. His most characteristic productions are the large plates, ewers, oval dishes and vases to which he applied realistic figures of reptiles, fish, shells, plants and other objects. This is, however, not the work of an artist, but that of a highly gifted naturalist at the dawn of modern science, who delighted to copy, with faithful accuracy, all the details of reptiles, fishes, plants or shells. We may be sure that his fossil shells were not forgotten, and it has been suggested, with great probability, that these pieces of Palissy's were only



Rustic Plate by Palissy.

manufactured after his removal to Paris, as the shells are always well-known forms from the Eocene deposits of the Paris basin. Casts from these objects were fixed on to a metal dish or vase of the shape required, and a fresh cast of the whole formed a mould from which Palissy could reproduce many articles of the same kind. The various parts of each piece were painted in realistic colours, or as nearly so as could be reached by the pigments Palissy was able to discover and prepare. These colours were mostly various shades of blue from indigo to ultramarine, some rather vivid greens, several tints of browns and greys, and, more rarely, yellow. A careful examination of the most authentic Palissy productions shows that they excel in the sharpness of their modelling, in a perfect neatness of manufacture and, above all, in the subdued richness of their general tone of colour. The crude greens, bright purples and yellows are only found in the works of his imitators; whilst in the marbled colours on the backs of the dishes Palissy's work is soft and well fused, in the imitations it is generally dry, even harsh and uneven. Other pieces, such as dishes and plaques, were ornamented by figure subjects treated after the same fashion, generally scriptural scenes or subjects from classical mythology, copied, in many cases, from works in sculpture by contemporary artists.

Another class of designs used by Palissy were plates, *tazze* and the like, with geometrical patterns moulded in relief and pierced through, forming a sort of open network. Perhaps the most successful, as works of art, were those plates and ewers which Palissy moulded in exact facsimile of the rich and delicate works in pewter for which François Briot and other Swiss metal-workers were so celebrated. These are in very slight relief, executed with cameo-like finish, and are mostly of good design belonging to the school of metal-working developed by the Italian goldsmiths of the 16th century. Palissy's ceramic reproductions of these metal plates were not improved by the colours with which he picked out the designs.

Some few enamelled earthenware statuettes, full of vigour and expression, have been attributed to Palissy; but it is doubtful whether he ever worked in the round. On the whole his productions cannot be assigned a high rank as works of art, though they have always been highly valued, and in the 17th century attempts were made, both at Delft and Lambeth, to adapt his "rustic" dishes with the reliefs of animals and human figures. These imitations are very blunt in modelling and coarsely painted. They are generally marked on the back in blue with initials and a date—showing them to be honest adaptations to a different medium, not attempts at forgery such as have been produced during the last fifty years or so. One of the first signs of the revival of old French faience, a movement that was in great activity between 1840 and 1870, was the appearance of copies of Palissy's "Bestiole" dishes, made with great skill and success by Avisseau of Tours, and afterwards by Pull of Paris. Though both these men produced original works of their own, collectors have had great cause to regret the excellence of their copies, for many of the best, being unmarked, have found their way into good collections. The well-known potter, Barbizet, who set out to make "Palissys" for the million, flooded France for a time with rude copies that ought never to have deceived anyone.

The best collections of Palissy's ware are those in the museums of the Louvre, the Hôtel Cluny, and Sèvres; and in England that in the Victoria and Albert Museum, together with a few choice specimens in the British Museum and in the Wallace Collection.

As an author, Palissy was undoubtedly more successful than as a potter. A very high position amongst French writers is assigned to him by Lamartine (*B. Palissy*, 8vo., Paris, 1852). He wrote with vigour and simplicity on a great variety of subjects, such as agriculture, natural philosophy, religion, and especially in his *L'Art de terre*, where he gives an account of his processes and how he discovered them.

See Morley, *Life of Palissy* (1855); Marryat, *Pottery* (1850, pp. 31 seq.); A. Dumesnil, *B. Palissy, le potier de terre* (1851); A. Tainturier, *Terres émaillées de Palissy* (1863); Delecluze, *B. Palissy* (1838); Enjubault, *L'Art céramique de B. Palissy* (1858); Audiat, *Étude sur la vie . . . de B. Palissy* (1868); H. Delange, *Monographie de l'œuvre de B. Palissy* (1862). For Palissy as a Huguenot, see Rossignol, *Des Protestantes illustres*, No. iv. (1861). The best English account of Palissy as a potter is that given by M. L. Solon, the most distinguished pottery-artist of the 19th century, in his *History and Description of the Old French Faïence* (1903). (W. B.*)

PALITANA, a native state of India in the Kathiawar agency of the Bombay presidency. Area, 289 sq. m.; pop. (1901), 52,856, showing a decrease of 15% in the decade. The chief is a Gohel Rajput, with the title of Thakur Sahib. Gross revenue, £42,000; tribute jointly to the gaekwar of Baroda and the nawab of Junagarh, £700. The capital of the state is Palitana; pop. 12,800. Above the town to the west rises the hill of Satrunja, sacred to the Jains. On this hill, which is truly a city of temples, all the peculiarities of Jain architecture are found in a marked degree. Some of the temples are as old as the 11th century, and they are spread over the intervening period down to the present. The hill is visited by crowds of pilgrims every year.

See J. Burgess, *Notes of a Visit to Satrunjaya Hill* (Bombay, 1869).

PALK STRAITS, the channel lying between the mainland of India and the island of Ceylon. It is named after Robert Palk, governor of Madras (1755–1763). The straits lie north of the line of reefs called Adam's Bridge, while the Gulf of Manaar lies south of it. The two channels are connected by the Pamban passage.

PALL, a word the various meanings of which can be traced to the Latin word *pallium*, that is, a piece of cloth used either as a covering or as a garment. In the last sense the *pallium* was the *ἱμάτιον*, the square or oblong-shaped outer garment of the Greeks. In the sense of a garment the English usage of "pall" is confined to the ecclesiastical vestment (see PALLIUM) and to the supertunica or dalmatic, the *pallium regale* or imperial mantle, one of the principal coronation vestments of British sovereigns. The heraldic bearing known as a "pall" takes the form of the Y of the ecclesiastical vestment. The chief applications of the word, in the sense of a covering, are to an altar frontal, to a linen cloth used to veil the chalice in the Catholic service of the Eucharist, and to a heavy black, purple or white covering for a coffin or hearse. The livery companies of London possessed sumptuous state palls for the funerals of their members, of which some are still in existence. The Merchant Taylors' company have two examples of Italian workmanship. The so-called "Walworth pall" of the Fishmongers' company probably dates from the 16th century. The Vintners' pall is of cloth of gold and purple velvet, with a figure of St Martin of Tours, the company's patron saint.

An entirely different word is "to pall," to become or make stale, insipid or tasteless, hence to cease to interest from constant repetition; this is a shortened form of "appal" (O. Fr. *appallir*, to become pale; Lat. *pallidus*).

PALLA, PALA, or IMPALA, the native name of a red South African antelope of the size of a fallow-deer, characterized by the large black lyrate horns of the bucks, and the presence in both sexes of a pair of glands on the back of the hind feet bearing a tuft of black hairs. On the east side the palla (*Aepyceros melampus*) ranges as far north as the southern Sudan; but in Angola it is replaced by a species or race (*Ae. petersi*) with a black "blaze" down the face. Pallas associate in large herds on open country in the neighbourhood of water. (See ANTELOPE.)

PALLADIAN, the term given in English architecture to one of the phases of the Italian Renaissance, introduced into England in 1620 by Inigo Jones, a great admirer of the works of Andrea Palladio (*q.v.*). In 1716, Richard Boyle, 3rd earl of Burlington, who also admired the works of Palladio, copied some of them, the front of old Burlington House being more or less a reproduction of the Palazzo Porto at Vicenza, and the villa at Chiswick a copy of the Villa Capua near Vicenza. It is probably due to Lord Burlington that the title Palladian is the designation for the Italian style as practised in England. In 1862 Sir Gilbert Scott's Gothic design for the new government offices was rejected and Lord Palmerston selected in preference the Palladian style. In France and America, Barozzi Vignole (1507–1573), another Italian architect, holds a similar position as the chief authority on the Italian Renaissance.

PALLADIO, ANDREA (1518–1580), Italian architect, was born in Vicenza on the 30th of November 1518. The works of Vitruvius and Alberti were studied by him at an early period, and his student life was spent in Rome, where he was taken by his patron Count Trissino. In 1547 he returned to Vicenza, where he designed a very large number of fine buildings—among the chief being the Palazzo della Ragione, with two storeys of open arcades of the Tuscan and Ionic orders, and the Barbarano, Porti and Chieregati palaces. Most of these buildings look better on paper than in reality, as they are mainly built of brick, covered with stucco, now in a very dilapidated condition; but this does not affect the merit of their design, as Palladio intended them to have been executed in stone. Pope Paul III. sent for him to Rome to report upon the state of St Peter's. In Venice, too, Palladio built many stately churches and palaces, such as S. Giorgio Maggiore, the Capuchin church, and some large palaces on the Grand Canal. His last great work was the Teatro Olimpico at Vicenza, which was finished, though not altogether after the original design, by his pupil and fellow citizen Scamozzi.

In addition to his town buildings Palladio designed many country villas in various parts of northern Italy. The villa of Capra is perhaps the finest of these, and has frequently been imitated. Palladio was a great student of classical literature, and published in 1575 an edition of Caesar's *Commentaries* with notes. His *I quattro libri dell' architettura*, first published at Venice in 1570, has passed into countless editions, and been translated into every European language. The original edition is a small folio, richly illustrated with well-executed full-page woodcuts of plans, elevations, and details of buildings—chiefly either ancient Roman temples or else palaces designed and built by himself. Among many others, an edition with notes was published in England by Inigo Jones, most of whose works, and especially the palace of Whitehall, of which only the banqueting room remains, owed much to Palladio's inspiration. The style adopted and partially invented by Palladio expressed a kind of revolt against the extreme licence both of composition and ornament into which the architecture of his time had fallen. He was fascinated by the stateliness and proportion of the buildings of ancient Rome, and did not reflect that reproductions of these, however great their archaeological accuracy, could not but be lifeless and unsuited to the wants of the 16th century. Palladio's carefully measured drawings of ancient buildings are now of great value, as in many cases the buildings have altogether or in part ceased to exist.

AUTHORITIES.—Montanari, *Vita di Andrea Palladio* (1749); Rigato, *Osservazioni sopra Andrea Palladio* (1811); Magrini, *Memorie intorno la vita di Andrea Palladio* (1845); Milizia, *Memorie degli architetti*, ii. 35–54 (1781); Symonds, *Renaissance in Italy—Fine Arts*, pp. 94–99; Zanella, *Vita di Andrea Palladio* (Milan, 1880); Barichella, *Vita di Andrea Palladio* (Lonigo, 1880).

PALLADIUM (Gr. *παλλάδιον*), an archaic wooden image (*ξόανον*) of Pallas Athena, preserved in the citadel of Troy as a pledge of the safety of the city. It represented the goddess, standing in the stiff archaic style, holding a spear in her right hand, in her left a distaff and spindle or a shield. According to Apollodorus (iii, 12, 3) it was made by order of Athena, and was intended as an image of Pallas, the daughter of Triton, whom she had accidentally slain, Pallas and Athena being thus regarded as two distinct beings. It was said that Zeus threw it down from heaven when Ilus was founding the city of Ilium, Odysseus and Diomedes carried it off from the temple of Athena, and thus made the capture of Troy possible. According to some accounts, there was a second Palladium at Troy, which was taken to Italy by Aeneas and kept in the temple of Vesta at Rome. Many cities in Greece and Italy claimed to possess the genuine Trojan Palladium. Its theft is a frequent subject in Greek art, especially of the earlier time.

PALLADIUM [symbol Pd, atomic weight 106·7 (O=16)], in chemistry, a metallic element associated with the platinum group. It is found in platinum ores, and also in the native condition and associated with gold and silver in Brazilian gold-bearing sand. Many methods have been devised for the isolation of the metal from platinum ore. R. Bunsen (*Ann.*, 1868, 146, p. 265), after removing most of the platinum as ammonium platinochloride, precipitates the residual metals of the group by iron; the resulting precipitate is then heated with ammonium chloride and evaporated with fuming nitric acid, the residue taken up in water, and the palladium precipitated as potassium palladium chloride. This is purified by dissolving it in hot water and evaporating the solution with oxalic acid, taking up the residue in potassium chloride, and filtering off any potassium platinochloride formed. The filtrate deposits potassium palladium chloride, which on heating in a current of hydrogen leaves a residue of the metal. Roessler (*Zeit. f. chemie*, 1866, p. 175) precipitates both platinum and palladium as double chlorides, the resulting mixed chlorides being reduced to the metals by ignition in hydrogen, taken up in aqua regia, the solution neutralized, and the palladium precipitated by mercuric cyanide. See also T. Wilm (*Ber.*, 1880, 13, p. 1198; 1881, 14, p. 629; 1882, 15, p. 241) on its separation as palladosammine chloride, and Cox (*Phil. Mag.*, 1843, 23, p. 16) on the separation of palladium from Brazilian gold sand. Pure palladium may be obtained by the reduction of the double chloride $(NH_4)_2 PdCl_4$ in a current of hydrogen, or of palladious chloride with formic acid.

It is a ductile metal of silvery lustre, with a specific gravity of 11·97 (0°C.). It is the most easily fusible of the metals of the platinum group, its melting-point being about 1530–1550° C. (L. Holborn and F. Henning, *Sitzb. Akad. Berlin*, 1905, p. 311). It readily distils when heated in the electric furnace. Its mean specific heat between 0° and t°C. is $0·0582 + 0·000010t$ (J. Violle, *Comptes rendus*, 1879, 89, p. 702). Palladium finds application in the form of alloys for astronomical instruments, in dentistry, and in the construction of springs and movements of clocks. Native palladium is dimorphous. It is soluble in nitric acid, more especially if the acid contains oxides of nitrogen, and when obtained in the finely divided condition by reduction of its salts, it is to some extent soluble in hydrochloric acid. It also dissolves in boiling concentrated sulphuric acid and in hydriodic acid. It oxidizes when fused with caustic alkalis. It combines with fluorine and with chlorine at a dull red heat, but not with iodine, whilst bromine has scarcely any action on the metal. It combines with sulphur directly, and according to T. Wilm (*Ber.*, 1882, 15, p. 2225) forms the oxide Pd_2O, when heated in a current of air.

Two series of salts are known, namely, palladious salts and palladic salts, corresponding to the two oxides PdO and PdO_2. Of these the palladious salts only are stable, the palladic salts readily passing into the palladious form on boiling with water. The palladium compounds show a complete analogy with the corresponding platinum salts. All the salts of the metal when heated decompose and leave a residue of the metal; the metal may also be obtained from solutions of the salts by the addition of zinc, iron, formic acid, phosphorus and hot alcohol. Sulphuretted hydrogen gives with palladium salts a precipitate of palladium sulphide which is insoluble in ammonium sulphide; mercuric chloride gives the characteristic yellowish precipitate of palladious chloride, and potassium iodide the black palladious iodide which dissolves on addition of excess of the precipitant. These two latter reactions may be used for the recognition of palladium, as may also the behaviour of the salts with ammonia, this reagent giving a brown precipitate, which turns to a red shade, and is soluble in a large excess of the precipitant to a clear solution, from which by adding hydrochloric acid a yellow precipitate of palladosammine chloride, $Pd(NH_3)_2Cl_2$, is obtained. Palladium is permeable to hydrogen at a temperature of 240° C. and upwards. It absorbs hydrogen and other gases, the heat of occlusion being 4640 calories per gram of hydrogen. The occluded hydrogen is strongly bound to the metal, only traces of the gas being given off on standing *in vacuo*, but it is easily removed when heated to 100° C. T. Graham (*Phil. Mag.*, 1866–1869) was of the opinion that the occluded hydrogen underwent great condensation and behaved as a quasi-metal (to which he gave the name "hydrogenium"), forming an alloy with the palladium; but L. Troost and P. Hautefeuille (*Ann. chim. phys.*, 1874, (5) 2, p. 279) considered that a definite compound of composition Pd_2H was formed. The more recent work of C. Hoitsema (*Zeit. phys. chim.*, 1895, 17, p. 1) however, appears to disprove the formation of a definite compound (see also J. Dewar, *Phil. Mag.*, 1874, (4) 47, pp. 324, 342). A palladium hydride was obtained by Graham by the reduction of palladious sulphate with sodium hypophosphite. It is an unstable black powder, which readily loses hydrogen at 0° C. C. Paal and J. Gerum (*Ber.*, 1908, 41, p. 818) have shown that when palladium black is suspended in water one volume of the metal combines with 1204 volumes of hydrogen, or in the atomic proportion $Pd/H = 1/·98$.

Palladious oxide, PdO, is a black powder formed by heating spongy palladium to a dull red heat in a current of oxygen or by gentle ignition of the nitrate. It is insoluble in acids, is easily reduced, and decomposes when heated. Palladic oxide, PdO_2, is obtained in the hydrated condition, $PdO_2 \cdot nH_2O$, by the action of ozone on palladious chloride; by the electrolytic oxidation of palladious nitrate in slightly acid solution (L. Wöhler); and by the action of caustic potash on potassium palladio-chloride, the liquid being neutralized with acetic acid (I. Bellucci, *Zeit. anorg. Chem.*, 1905, 47, p. 287). It is a dark red or brown coloured powder, which loses oxygen on heating. When boiled with water it passes into the lower oxide. It is an energetic oxidizing agent, and when freshly prepared is soluble in dilute mineral acids. A hydrated form of the monoxide, $PdO \cdot nH_2O$, is obtained by hydrolyzing a faintly acid solution of the nitrate (L. Wöhler, *Zeit. anorg. Chem.*, 1905, 46, p. 323), or by the action of a slight excess of caustic soda on the double chloride K_2PdCl_6. It is a dark brown powder which loses its water of hydration when dried in air, and in the dry condition is difficultly soluble in acids. By the electrolytic oxidation of palladious nitrate L. Wöhler and F. Martin (Ib., 1908, 57, p. 398), obtained a hydrated oxide, $Pd_2O_3 \cdot nH_2O$, as a dark brown powder which dissolves in hydrochloric acid, forming an unstable chloride.

Palladious chloride, $PdCl_2$, is obtained as a deliquescent crystalline mass when spongy palladium is heated to dull redness in a current of dry chlorine. A hydrated form, of composition $PdCl_2 \cdot 2H_2O$, results on dissolving palladium in aqua regia, containing only a small proportion of nitric acid. It crystallizes from water as a reddish-brown solid. It absorbs hydrogen and is easily reduced. It combines with carbon monoxide to form compounds of composition $PdCl_2 \cdot 2CO$; $2PdCl_2 \cdot 3CO$; $PdCl_2 \cdot CO$ (E. Fink, *Comptes Rendus*, 1898, 126, p. 646), and can be used for the determination of the amount of carbon monoxide in air (Potain and R. Drouin, Ib., 1898, 126, p. 938). On treatment with dry ammonia gas it yields palladodiammine chloride, $Pd(NH_3)_4Cl_2$. Palladious chloride combines with hydroxylamine to form the compounds $Pd(NH_3O)_4Cl_2$ and $Pd(NH_3O)_2Cl_2$. The first results from the action of hydroxylamine on the chloride in the presence of sodium carbonate, and may be isolated as the free base. The other is thrown down as a yellow granular precipitate when a small quantity of dilute hydrochloric acid is added to the base, $Pd(NH_3O)_4(OH)_2$ (S. Feisel and A. Nowak, *Ann.*, 1907, 351, p. 439). The chloride $PdCl_4$ is only known in acid solution, and is obtained when palladium is dissolved in aqua regia or when palladic oxide is dissolved in concentrated hydrochloric acid. The solution is brown in colour and gradually loses chlorine, being converted into palladious chloride. Both chlorides combine with many other metallic chlorides to form characteristic double salts, the double potassium salts having the formulae K_2PdCl_4 and K_2PdCl_6. The former may be prepared by adding an excess of potassium chloride to palladious chloride, or by boiling K_2PdCl_6 with a large excess of water. It crystallizes in prisms which are readily soluble in water but are practically insoluble in absolute alcohol. It is decomposed by direct heating, and also by heating in a current of hydrogen. The latter compound is formed when chlorine is passed into a warm aqueous solution of the former or by dissolving palladium in aqua regia and saturating the solution with potassium chloride. It crystallizes in scarlet octahedra which darken on heating, and decompose when strongly heated. It is slightly soluble in cold water, but dissolves in warm dilute hydrochloric acid. When boiled with alcohol it is reduced to the metallic condition.

The *subsulphide*, Pd_2S, is obtained as a hard, green coloured mass when palladosammine chloride is fused with sulphur or when the sulphide PdS is fused with sulphur and ammonium chloride. It loses sulphur slowly when heated and is insoluble in acids. *Palladious sulphide*, PdS, is obtained by precipitation of the corresponding salts with sulphuretted hydrogen, or by the action of dry sulphuretted hydrogen gas on palladosammine chloride. As prepared in the dry way it is a hard, blue coloured, insoluble mass, but if obtained by precipitation is of a brownish-black colour and is soluble in nitric acid. When heated in air it oxidizes to a basic sulphate. The *disulphide*, PdS_2, is a brownish-black crystalline powder which is formed when the double ammonium palladium chloride $(NH_4)_2PdCl_6$ is heated to redness with caustic soda and sulphur. It combines with the alkaline sulphides. It gradually loses sulphur on heating, and is easily soluble in aqua regia. A sulphide of composition Pd_3S_4 has been described (R. Schneider, *Pogg. Ann.*, 1873, 148, p. 625).

Palladium sulphate, $PdSO_4 \cdot 2H_2O$, is obtained by dissolving the oxide in sulphuric acid, or by the action of nitric and sulphuric acids on the metal. It forms a reddish-brown, deliquescent, crystalline mass, and is easily soluble in water, but in the presence of a large excess of water yields a basic sulphate. *Palladium nitrate*, $Pd(NO_3)_2$, crystallizes in brownish-yellow deliquescent prisms and is obtained by dissolving the metal in nitric acid. It is very soluble in water, and its aqueous solution decomposes on boiling, with precipitation of a basic nitrate. *Palladium cyanide*, $Pd(CN)_2$, is obtained as a yellowish precipitate when palladium chloride is precipitated by mercuric cyanide. It is insoluble in water, and on heating decomposes into palladium and cyanogen. It is soluble in solutions of the alkaline cyanides, with formation of double cyanides of the type $K_2Pd(CN)_4$. On account of its insolubility and its stability it is useful for the separation of palladium from the other metals of the platinum group.

The palladium salts combine with ammonia to form characteristic compounds, which may be grouped into two main divisions: (1) the palladammines (palladosammines) of type $[Pd(NH_3)_2X_2]$, and (2) the palladodiammines $[Pd(NH_3)_4]X_2$. The palladosammines are obtained by adding a large excess of ammonia to the palladious salts, the resulting clear solution being then precipitated by the mineral acid corresponding to the salt used. This method of preparation serves well for the chloride, from which other salts may be obtained by double decomposition. These salts are fairly stable, and are red, yellow or orange in colour. The palladodiammine salts are mostly colourless, and are not very stable; acids convert them into the palladosammines, and they lose two molecules of ammonia very easily. They are formed by the action of a large excess of ammonia on the palladious salts or on the corresponding palladosammine salts in the presence of water.

Numerous determinations of the atomic weight of palladium have been made, the values obtained varying from 105·7 to 107·249 (see *Amer. Chem. Jour.*, 1899, 21, p. 943; *Ann.*, 1905, 341, p. 235; *Jour. Chem. Soc.*, 1894, 65, p. 20). The International Commission on Atomic Weights, 1909, recount several new determinations: Haas (*Dissertation*, Erlangen, 1908) from reduction of palladosammine bromide obtained the value 106·7; Kemmerer (*Thesis*, Pennsylvania, 1908), from reduction of the corresponding chloride and cyanide obtains a mean value of 106·434; whilst A. Gutbier and his collaborators, from analyses of palladosammine chloride and bromide, obtained the values 106·64 ± 0·03 and 106·65 ± 0·02 from the chloride, and 106·655 from the bromide (*Jour. pr. chem.*, 1909, ii. 79, pp. 235, 457).

PALLADIUS, RUTILIUS TAURUS AEMILIANUS, a Roman author of the 4th century A.D. He wrote a poem on agriculture (*De re rustica*) in fourteen books, the material being derived from Columella and other earlier writers. The work is conveniently arranged, but far inferior in every other respect to that of Columella.

There is a modern German edition by Schmitt (Leipzig, 1898).

PALLANZA, a small industrial town and summer and winter resort of the province of Novara, Piedmont, Italy, 659 ft. above sea-level. Pop. (1901), 4619 (town); 5247 (commune). It occupies a position of great natural beauty, on a promontory on the W. of Lago Maggiore, with a semicircle of mountains behind and the lake and Borromean Islands in front, 62 m. N. of Novara direct. The annual mean temperature is 55° Fahr.; January, 37·1°, July, 74°. There is a fine botanical garden.

PALLAS, PETER SIMON (1741–1811), German naturalist and traveller, was born in Berlin on the 22nd of September 1741, the son of Simon Pallas, surgeon in the Prussian army and professor of surgery in Berlin. He was intended for the medical profession, and studied at the universities of Berlin, Halle, Göttingen and Leiden. He early displayed a strong leaning towards natural history. In 1761 he went to England, where for a year he devoted himself to a thorough study of the collections and to a geological investigation of part of the coast; and at the age of twenty-three he was elected a foreign member of the Royal Society. He then spent some time in Holland, and the results of his investigations appeared at the Hague in 1766 in his *Elenchus Zoophytorum* and *Miscellanea Zoologica*, and in 1767–1804 in his *Spicilegia Zoologica* (Berlin). In 1768 he accepted the invitation of the empress Catharine II. to fill the professorship of natural history in the Imperial Academy of Science, St Petersburg, and in the same year he was appointed naturalist to a scientific expedition through Russia and Siberia, the immediate object of which was the observation of the transit of Venus in 1769. In this leisurely journey Pallas went by Kasan to the Caspian, spent some time among the Kalmucks, crossed the Urals to Tobolsk, visited the Altai mountains, traced the Irtish to Kolyvan, went on to Tomsk and the Yenisei, crossed Lake Baikal, and extended his journey to the frontiers of China. Few explorations have been so fruitful as this six years' journey. The leading results were given in his *Reisen durch verschiedene Provinzen des rüssischen Reichs* (3 vols., St Petersburg, 1771–1776), richly illustrated with coloured plates. A French translation in 1788–1793, in 8 vols., with 9 vols. of plates, contained, in addition to the narrative, the natural history results of the expedition; and an English translation in three volumes appeared in 1812. As special results of this great journey may be mentioned *Sammlungen historischer Nachrichten über die mongolischen Völkerschaften* (2 vols., St Petersburg, 1776–1802); *Novae species quadrupedum*, 1778–1779; Pallas's contributions to the dictionary of languages of the Russian empire, 1786–1789; *Icones insectorum, praesertim Rossiae Siberiaeque peculiarium*, 1781–1806; *Zoographia rosso-asiatica* (3 vols., 1831); besides many special papers in the *Transactions* of the academies of St Petersburg and Berlin. The empress bought Pallas's natural history collections for 20,000 roubles, 5000 more than he asked for them, and allowed him to keep them for life. He spent a considerable time in 1793–1794 in visiting the southern provinces of Russia, and was so greatly attracted by the Crimea that he determined to take up his residence there. The empress gave him a large estate at Simpheropol and 10,000 roubles to assist in equipping a house. Though disappointed with the Crimea as a place of residence, Pallas continued to live there, devoted to constant research, especially in botany, till the death of his second wife in 1810, when he removed to Berlin, where he died on the 8th of September 1811. The results of his journey in southern Russia were given in his *Bemerkungen auf einer Reise durch die südlichen Statthalterschaften des russischen Reichs* (Leipzig, 1799–1801; English translation by Blagdon, vols. v.–viii. of *Modern Discoveries*, 1802, and another in 2 vols., 1812). Pallas also edited and contributed to *Neue nordische Beiträge zur physikalischen Erd- und Völkerbeschreibung, Naturgeschichte, und Oekonomie* (1781–1796), published *Illustrationes plantarum imperfecte vel nondum cognitarum* (Leipzig, 1803), and contributed to Buffon's *Natural History* a paper on the formation of mountains.

See the essay of Rudolphi in the *Transactions* of the Berlin Academy for 1812; Cuvier's Eloge in his *Recueil des éloges historiques*, vol. ii.; and the Life in Jardine's *Naturalists' Library*, vol. iv. (Edin., 1843).

PALLAVICINO, FERRANTE (1618–1644), Italian writer of pasquinades, a member of the old Italian family of the Pallavicini, was born at Piacenza in 1618. He received a good education at Padua and elsewhere, and early in life entered the Augustinian order, residing chiefly in Venice. For a year he accompanied Ottavio Piccolomini, duke of Amalfi, in his German campaigns as field chaplain, and shortly after his return he published a number of clever but exceedingly scurrilous satires on the Roman curia and on the powerful house of the Barberini, which was so keenly resented at Rome that a price was set on his head. A Frenchman, Charles de Breche, decoyed him from Venice to the neighbourhood of Avignon, and there betrayed him. After fourteen months' imprisonment he was beheaded at Avignon on the 6th of March, 1644.

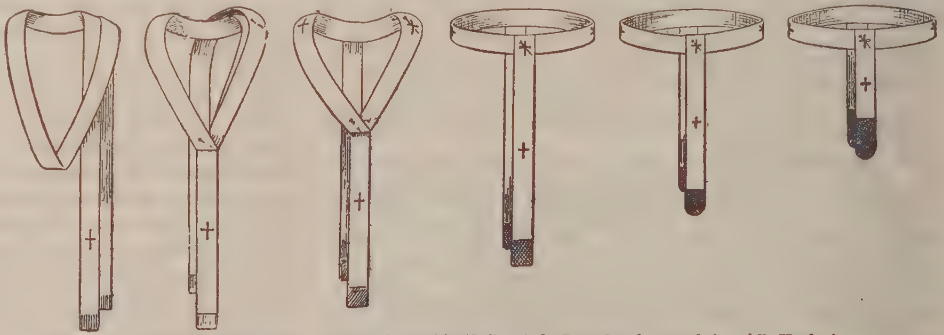
His *Opere permesse* was published at Venice in 1655, but being, as may be imagined, inferior in scurrility and grossness (Pallavicino's specialities), are much less prized by the curious than the *Opere scelte* (Geneva, 1660), which were more than once reprinted in Holland, and were translated into German in 1663.

PALLAVICINO (or Pallavicini), **PIETRO SFORZA** (1607–1667), Italian cardinal and historian, son of the Marquis Alessandro Pallavicino of Parma, was born at Rome in 1607. Having taken holy orders in 1630, and joined the Society of Jesus in 1638, he successively taught philosophy and theology in the Collegium Romanum; as professor of theology he was a member of the congregation appointed by Innocent X. to investigate the Jansenist heresy. In 1659 he was made a cardinal by Alexander VII. He died at Rome on the 5th of June 1667. Pallavicino is chiefly known by his history of the council of Trent, written in Italian, and published at Rome in two folio volumes in 1656–1657 (2nd ed., considerably modified, in 1666). In this he continued the task begun by Terenzio Alciati, who had been commissioned by Urban VIII. to correct and supersede the very damaging work of Sarpi on the same subject. Alciati and Pallavicino had access to many important sources from the use of which Sarpi had been precluded; the contending parties, however, are far from agreed as to the completeness of the refutation. The work was translated into Latin by a Jesuit named Giattinus (Antwerp, 1670–1673). There is a good edition of the original by Zaccharia (6 vols., Faenza, 1792–1799). It was translated into German by Klitsche in 1835–1837. He also wrote a life of Alexander VII. and a tragedy (*Ermenegildo*, 1644), &c.

His collected *Opere* were published in Rome in 1844–1848.

PALLIUM or Pall (derived, so far as the name is concerned, from the Roman *pallium* or *palla*, a woollen cloak), an ecclesiastical vestment in the Roman Catholic Church, originally peculiar to the pope, but for many centuries past bestowed by him on all metropolitans, primates and archbishops as a symbol of the jurisdiction delegated to them by the Holy See. The pallium, in its present form, is a narrow band, "three fingers broad," woven of white lamb's wool, with a loop in the centre resting on the shoulders over the chasuble, and two dependent lappets, before and behind; so that when seen from front or back the ornament resembles the letter Y. It is decorated with six purple crosses, one on each tail and four on the loop, is doubled on the left shoulder, and is garnished, back and front, with three jewelled gold pins. The two latter characteristics seem to be survivals of the time when the Roman *pallium*, like the Greek ὠμοφόριον was a simple scarf doubled and pinned on the left shoulder.

The origin of the pallium as an ecclesiastical vestment is lost in antiquity. The theory that explains it in connexion with the figure of the Good Shepherd carrying the lamb on his shoulders, so common in early Christian art, is obviously an explanation a posteriori. The ceremonial connected with the preparation of the pallium and its bestowal upon the pope at his coronation, however, suggests some such symbolism. The lambs whose wool is destined for the making of the *pallia* are solemnly presented at the altar by the nuns of the convent of St Agnes at Rome at mass on St Agnes' day, during the singing of the *Agnus Dei*. They are received by the canons of the Lateran church and handed over by them to the apostolic subdeacons, by whom they are put out to pasture till the time of shearing. The *pallia* fashioned of their wool by the nuns are carried by the subdeacons to St Peter's, where they are placed by the canons on the bodies of St Peter and St Paul, under the high altar, for a night, then committed to the subdeacons for safe custody. A pallium thus consecrated is placed by the archdeacon over the shoulders of the pope at his coronation, with the words "Receive the pallium," *i.e.* the plenitude of the pontifical office, "to the glory of God, and of the most glorious Virgin His Mother, and of the blessed apostles St Peter and St Paul, and of the Holy Roman Church."



(Drawn by Father J. Braun, and reproduced from his *Die liturgische Gewandung* by permission of B. Herder.)

Illustration of the Development of the Pallium.

The elaborate ceremonial might suggest an effort to symbolize the command "Feed My lambs!" given to St Peter and its transference to Peter's successors. Some such idea underlies the developed ceremonial; but the pallium itself was in its origin no more than an ensign of the episcopal dignity, as it remains in the East, where—under the name of *ὠμοφόριον* (ὦμος, shoulder, *φέρειν*, to carry)—it is worn by all bishops. Moreover, whatever symbolism may be evolved from the lambs' wool is vitiated, so far as origins are concerned, by the fact that the papal *pallia* were at one time made of white linen (see Johannes Diaconus, *Vita S. Gregorii M. lib. IV.* cap. 8, *pallium ejus bysso candente contextum*).[1]

The right to wear the pallium seems, in the first instance, to have been conceded by the popes merely as a mark of honour. The first recorded example of the bestowal of the pallium by the popes is the grant of Pope Symmachus in 513 to Caesarius of Arles, as papal vicar. By the time of Gregory I. it was given not only to vicars but as a mark of honour to distinguish bishops, and it is still conferred on the bishops of Autun, Bamberg, Dol, Lucca, Ostia, Pavia and Verona. St Boniface caused a reforming synod, between 840 and 850, to decree that in future all metropolitans must seek their pallium at Rome (see Boniface's letter to Cuthbert, 78, *Monumenta Germaniae, epistolae*, III.); and though this rule was not universally followed even until the 13th century, it is now uncanonical for an archbishop to exercise the functions proper to his office until the pallium has been received. Every archbishop must apply for it, personally or by deputy, within three months after his consecration, and it is buried with him at his death (see ARCHBISHOP). The pallium is never granted until after payment of considerable dues. This payment, originally supposed to be voluntary, became one of the great abuses of the papacy, especially during the period of the Renaissance, and it was the large amount (raised largely by indulgences) which was paid by Albert, archbishop of Mainz, to the papacy that roused Luther to protest. Though the pallium is thus a vestment distinctive of bishops having metropolitan jurisdiction, it may only be worn by them within their jurisdiction, and then only on certain solemn occasions. The pope alone has the right to wear everywhere and at all times a vestment which is held to symbolize the plenitude of ecclesiastical power.

See P. Hinschius, *Kirchenrecht*, II. 23 sqq.; Gresar, "Das römische Pallium und die ältesten liturgischen Schärpen" (in *Festschrift zum elfhundertjährigen Jubiläum des campo santo in Rom*, Freiburg, 1897); Du Cange, *Glossarium s.v.* "Pallium"; Joseph Braun, *Die liturgische Gewandung im Occident und Orient* (Freiburg-i-B., 1907).

PALL-MALL, an obsolete English game of French origin, called in France *paille-maille* (from *palla*, ball, and *malleus*, mallet). Sir Robert Dallington, in his *Method for Travel* (1598), says: "Among all the exercises of France, I prefer none before the Paille-Maille." James I., in his *Basilikon doron*, recommended it as a proper game for Prince Henry, and it was actually introduced into England in the reign of Charles I., or perhaps a few years earlier. Thomas Blount's *Glossographia* (ed. 1670) describes it as follows: "Pale Maille, a game wherein a round bowle is with a mallet struck through a high arch of iron (standing at either end of an alley), which he that can do at the fewest blows, or at the number agreed on, wins. This game was heretofore used in the long alley near St James's, and vulgarly called Pell-Mell." The pronunciation here described as "vulgar" afterwards became classic. A mallet and balls used in the game were found in 1845 and are now in the British Museum. The mallet resembles that used in croquet, but its head is curved and its ends sloped towards the shaft. The balls are of boxwood and about one foot in circumference. Pepys describes the alley as of hard sand "dressed with powdered cockle-shells." The length of the alley varied, that at St James's being about 800 yds. Some alleys had side walls.

PALLONE (Italian for "large ball," from *palla*, ball), the national ball game of Italy. It is descended, as are all other court games, such as tennis and pelota, from the two ball games played by the Romans, in one of which a large inflated ball, called *follis*, was used. The other, probably the immediate ancestor of pallone, was played with a smaller ball, the *pila*. Pallone was played in Tuscany as early as the 14th century, and is still very popular in northern and central Italy. It is played in a court (*sferisterio*), usually 100 yds. long and 17 yds. wide. A white line crosses the middle of the court, which is bounded on one side by a high wall, the spectators sitting round the other three sides, usually protected by wire screens. One end of the court is called the *battuta* and the other the *ribtattuta*. At the end of the *battuta* is placed a spring-board, upon which stands the player who receives the service. The implements of the game are the *pallone* (ball) and the *bracciale* (bat). The *pallone* is an inflated ball covered with leather, about 4⅜ in. in diameter. The *bracciale* is an oak gauntlet, tubular in shape, and covered with long spike-like protuberances. It weighs between five and six pounds and is provided with a grip for the hand. The game is played by two sides—blues and reds—of three men each, the *battitore* (batter), *spalla* (back) and *terzino* (third). At the beginning of a game the *battitore* stands on the spring-board and receives the ball thrown to him on the bound by a seventh player, the *mandarino*, who does duty for both sides. The batter may ignore the ball until it comes to him to his liking, when he runs down the spring-board and strikes it with his *bracciale* over the centre line towards his opponents. The game then proceeds until a player fails to return the ball correctly, or hits it out of bounds, or it touches his person. This counts a point for the adversary. Four points make a game, counting 15, 30, 40 and 50.

See *Il Giuoco del pallone*, by G. Franceschini (Milan, 1903).

PALM, JOHANN PHILIPP (1768–1806), German bookseller, a victim of Napoleonic tyranny in Germany, was born at Schorndorf, in Württemberg, on the 17th of November 1768. Having been apprenticed to his uncle, the publisher Johann Jakob Palm (1750–1826), in Erlangen, he married the daughter of the bookseller Stein in Nuremberg, and in course of time became proprietor of his father-in-law's business. In the spring of 1806 the firm of Stein sent to the bookselling establishment of Stage in Augsburg a pamphlet (presumably written by Philipp Christian Yelin in Ansbach) entitled *Deutschland in seiner tiefen Erniedrigung* ("Germany in her deep humiliation"), which strongly attacked Napoleon and the behaviour of the French troops in Bavaria. Napoleon, on being apprised of the violent attack made upon his régime and failing to discover the actual author, had Palm arrested and handed over to a military commission at Braunau on the Bavarian-Austrian frontier, with peremptory instructions to try and execute the prisoner within twenty-four hours. Palm was denied the right of defence, and after a mock trial on the 25th of August 1806 he was shot on the following day. A life-size bronze statue was erected to his memory in Braunau in 1866, and on the centenary of his death numerous patriotic meetings were held in Bavaria.

See F. Schultheis, *Johann Philipp Palm* (Nuremberg, 1860); and J. Rackl, *Der nürnberger Buchhändler Johann Philipp Palm* (Nuremberg, 1906).

PALM (Lat. *palma*, Gr. *παλάμη*), originally the flat of the hand, in which sense it is still used; from this sense the word was transferred as a name of the trees described below. The emblematic use of the word (= prize, honour) represents a further transference from the employment of the palm-leaves as symbols of victory.

The Palms (*Palmaceae*) have been termed the princes of the vegetable kingdom. Neither the anatomy of their stems nor the conformation of their flowers, however, entitles them to any such high position in the vegetable hierarchy. Their stems are not more complicated in structure than those of the common butcher's broom (*Ruscus*); their flowers are for the most part as simple as those of a rush (*Juncus*). The order Palmaceae

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[1] Father Joseph Braun, S.J., holds that the pallium, unlike other vestments, had a liturgical origin, and that it was akin to the scarves of office worn by priests and priestesses in pagan rites. See *Die pontificalen Gewänder des Abendlandes*, p. 174 (Freiburg-i-B. 1898).

is characterized among monocotyledonous plants by the presence of an unbranched stem bearing a tuft of leaves at the extremity only, or with the leaves scattered; these leaves, often gigantic in size, being usually firm in texture and branching in a pinnate or palmate fashion. The flowers are borne on simple or branching spikes, very generally protected by a spathe or spathes, and each consists typically of a perianth of six · greenish, somewhat inconspicuous segments in two rows, with six stamens, or pistil of 1–3 carpels, each with a single ovule and a succulent or dry fruit, never dehiscent (fig. 1, A and B). The seed consists almost exclusively of endosperm or albumen in a cavity in which is lodged the relatively very minute embryo (fig. 1, C). These are the general characteristics by which this very well-defined order may be discriminated, but, in a group containing considerably more than a thousand species, deviations from the general plan of structure occur with some frequency. As the characteristic appearances of palms depend to a large extent upon these modifications, some of the more important among them may briefly be noticed.

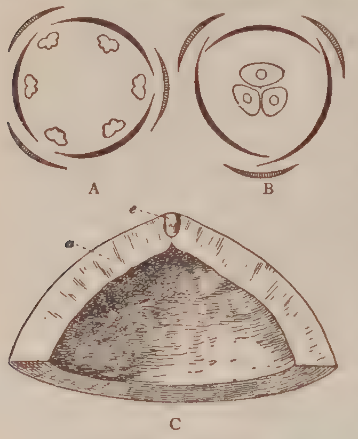


FIG. 1 A,B.—Floral diagrams of a Palm (*Chamaerops humilis*).
A, male flower. B, female-flower.
C, Upper portion of Coco-nut seed, showing *e*, embryo, embedded in *a*, endosperm.

Taking the stem first, we may mention that it is in very many palms relatively tall, erect, unbranched, regularly cylindrical, or dilated below so as to form an elongated cone, either smooth, or covered with the projecting remnants of the former leaves, or marked with circular scars indicating the position of those leaves which have now fallen away. It varies in diameter from the thickness of a reed (as in *Chamaedorea*) to a sturdy pillar-like structure as seen in the date-palm, Palmyra palm (fig. 7) or Talipot. In other cases the very slender stem is prostrate, or scandent by means of formidable hooked prickles which, by enabling the plant to support itself on the branches of neighbouring trees, also permit the stem to grow to a very great length and so to expose the foliage to the light and air above the tree-tops of the dense forests these palms grow in, as in the genus *Calamus*, the Rattan or Cane palms. In some few instances the trunk, or that portion of it which is above ground, is so short that the plant is in a loose way called "stemless" or "acaulescent," as in *Geonoma*, and as happens sometimes in the only species found in a wild state in Europe, *Chamaerops humilis*. The vegetable ivory (*Phytelephas*) of equatorial America has a very short thick stem bearing a tall cluster of leaves which appears to rise from the ground. In many species the trunk is covered with a dense network of stiff fibres, often compacted together at the free ends into spines. This fibrous material, which is so valuable for cordage, consists of the fibrous tissue of the leaf-stalk, which in these cases persists after the decay of the softer portions. It is very characteristic of some palms to produce from the base of the stem a series of adventitious roots which gradually thrust themselves into the soil and serve to steady the tree and prevent its overthrow by the wind. The underground stem of some species, *e.g.* of *Calamus*, is a rhizome, or root-stock, lengthening in a more or less horizontal manner by the development of the terminal bud, and sending up lateral branches like suckers from the root-stock, which form dense thickets of cane-like stems. The branching of the stem above ground is unusual, except in the case of the Doum palm of Egypt (*Hyphaene*), where the stem forks, often repeatedly; this is due to the development of a branch to an equal strength with the main stem. In other

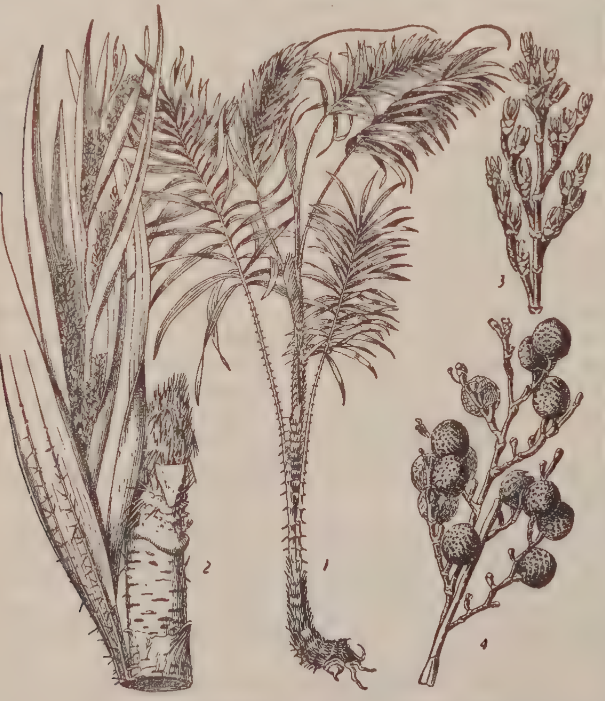
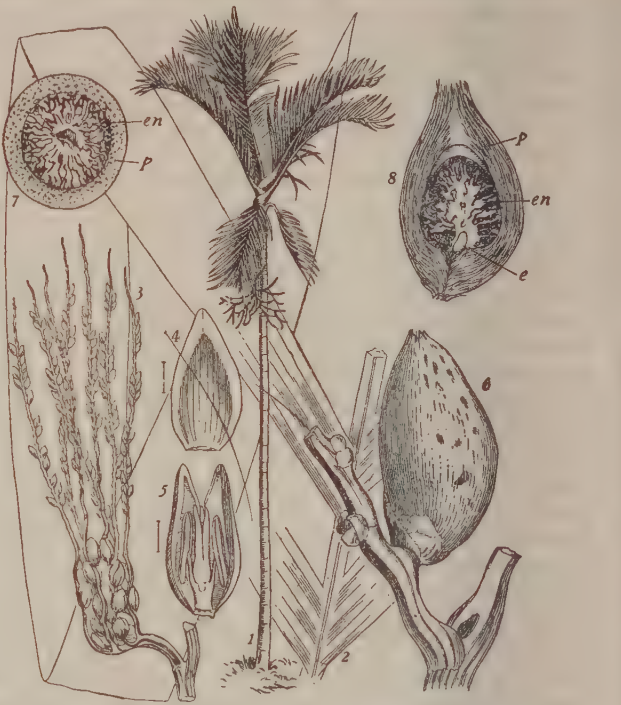


FIG. 2.—*Daemonorops Draco* (a Rattan Palm).
1, Young shoot much reduced. 2, Part of stem bearing male inflorescence. 3, Part of female inflorescence. 4, The same bearing ripe fruits.



(After Bentley and Trimen, *Medicinal Plants*, by permission of Messrs J. & A. Churchill.)

FIG. 3.—Areca Palm (*Areca Catechu*).

1, Tree, very much reduced.
2, Part of leaf.
3, Portion of inflorescence with male flowers above, female (larger) below.
4, Petal of a male flower.
5, Male flower opened by removal of a petal.
6, Fruit.
7, 8, Same cut across, and lengthwise. *p*, Fibrous pericarp; *en*, ruminated endosperm; *e*, embryo.

cases branching, when present, is probably the result of some injury to the terminal bud at the top of the stem, in consequence of which buds sprout out from below the apex.

The internal structure of the stem does not differ fundamentally from that of a typical monocotyledonous stem, the taller, harder trunks owing their hardness not only to the fibrous or woody skeleton but also to the fact that, as growth goes on, the originally soft cellular ground tissue through which the fibres run becomes hardened by the deposit of woody matter within the cells, so that ultimately the cellular portions become as hard as the woody fibrous tissue.

The leaves of palms are either arranged at more or less distant intervals along the stem, as in the canes (*Calamus*, *Daemonorops*, fig. 2, &c.), or are approximated in tufts at the end of the stem, thus forming those noble crowns of foliage (figs. 5, 6, 7) which are so closely associated with the general idea of a palm. In the young condition, while still unfolded, these leaves, with the succulent end of the stem from which they arise, form "the cabbage," which in some species is highly esteemed as an article of food.

The adult leaf very generally presents a sheathing base tapering upwards into the stalk or petiole, and this again bearing the lamina or blade. The sheath and the petiole very often bear stout spines, as in the rattan palms (see fig. 2); and when, in course of time, the upper parts of the leaf decay and fall off, the base of the leaf-stalk and sheath often remain, either entirely or in their fibrous portions only, which latter constitute the investment to the stem already mentioned. In size the leaves vary within very wide limits, some being only a few inches in extent, while those of the noble *Caryota* may be measured in tens of feet. In form the leaves of palms are very rarely simple; usually they are more or less divided, sometimes, as in *Caryota*, extremely so. In species of *Geonoma*, *Verschaffeltia* and some others, the leaf splits into two divisions at the apex and not elsewhere; but more usually the leaves branch regularly in a palmate fashion as in the fan-palms *Latania*, *Borassus* (fig. 7), *Chamaerops*, *Sabal*, &c., or in a pinnate fashion as in the feather-palms, *Areca* (fig. 3), *Kentia*, *Calamus*, *Daemonorops* (fig. 2), &c. The form of the segments is generally more or less linear, but a very distinct appearance is given by the broad wedge-shaped leaflets of such palms as *Caryota*, *Martinezia* or *Mauritia*. These forms run one into another by transitional gradations; and even in the same palm the form of the leaf is often very different at different stages of its growth, so that it is a difficult matter to name correctly seedling or juvenile palms in the condition in which we generally meet with them in the nurseries, or even to foresee what the future development of the plant is likely to be. Like the other parts of the plant, the leaves are sometimes invested with hairs or spines; and, in some instances, as in the magnificent *Ceroxylon andicola*, the under surface is of a glaucous white or bluish colour, from a coating of wax.

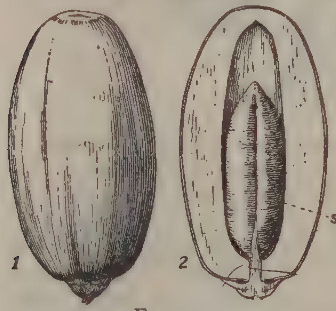


Fig. 4.
1, Fruit of date-palm (*Phoenix dactylifera*), nat. size.
2, Same cut lengthwise showing seed *s*.

The inflorescence of palms consists generally of a fleshy spike, either simple or much branched, studded with numerous, sometimes extremely numerous, flowers, and enveloped by one or more sheathing bracts called "spathes" (fig. 5). These parts may be small, or they may attain relatively enormous dimensions, hanging down from amid the crown of foliage like huge tresses, and adding greatly to the noble effect of the leaves. In some cases, as in the Talipot palm, the tree only flowers once; it grows for many years until it has become a large tree then develops a huge inflorescence, and after the fruit has ripened, dies.

The individual flowers are usually small (figs. 3, 6), greenish and insignificant; their general structure has been mentioned already. Modifications from the typical structure arise from difference of texture, and specially from suppression of parts, in consequence of which the flowers are very generally unisexual (figs. 1, 3, 6), though the flowers of the two sexes are generally produced on the same tree (monoecious), not indeed always in the same season, for a tree in one year may produce all male flowers and in the next all female flowers. Sometimes the flowers are modified by an increase in the number of parts; thus the usually six stamens may be represented by 12 to 24 or even by hundreds. The carpels are usually three in number, and more or less combined; but they may be free, and their number may be reduced to two or even one. In any case each carpel contains but a single ovule.

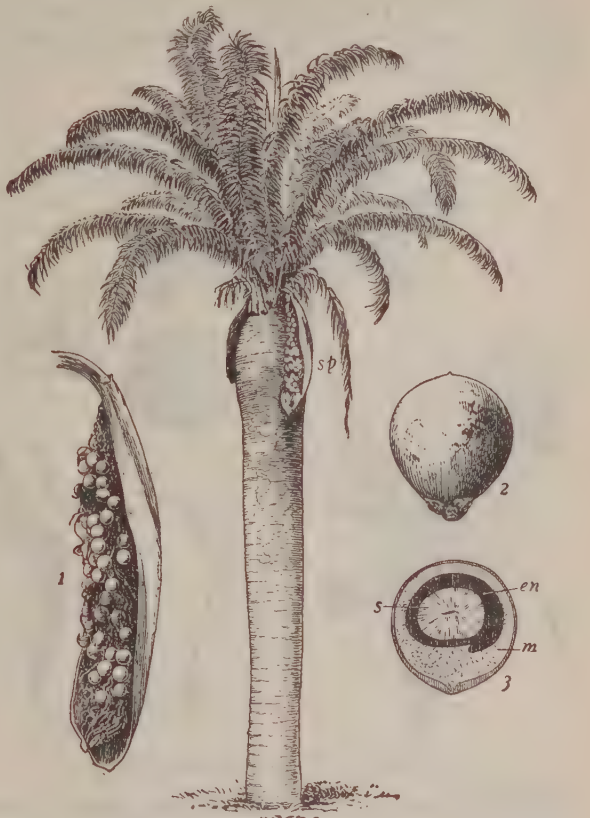


Fig. 5.—*Acrocomia sclerocarpa*, much reduced.

sp, Spathe enveloping the fruits, shown on a larger scale in 1.
2, A fruit.
3, The same cut lengthwise. *m*, Fibrous mesocarp; *en*, hard endocarp; *s*, seed.

Owing to the sexual arrangements before mentioned, the pollen has to be transported by the agency of the wind or of insects to the female flowers. This is facilitated sometimes by the elastic movements of the stamens and anthers, which liberate the pollen so freely at certain times that travellers speak of the date-palms of Egypt (*Phoenix dactylifera*) being at daybreak hidden in a mist of pollen grains. In other cases fertilization is effected by the agency of man, who removes the male flowers and scatters the pollen over the fruit-bearing trees. This practice has been followed in the case of the date from time immemorial; and it afforded one of the earliest and most irrefragable proofs by means of which the sexuality of plants was finally established. In the course of ripening of the fruit two of the carpels with their ovules may become absorbed, as in the coco-nut, the fruit of which contains only one seed though the three carpels are indicated by the three longitudinal sutures and by the presence of three germ-pores on the hard endocarp.

The fruit is various in form, size and character; sometimes, as in the common date (fig. 4) it is a berry with a fleshy rind enclosing a hard stony kernel, the true seed; the fruit of *Areca* (fig. 3) is similar; sometimes it is a kind of drupe as in *Acrocomia* (fig. 5), or the coco-nut, *Cocos nucifera*, where the fibrous central portion investing the hard shell corresponds to the fleshy portion of a plum or cherry, while the shell or nut corresponds to the stone of stone-fruits, the seed being the kernel. In *Borassus* the three seeds are each enclosed in a separate chamber formed by the stony endocarp (fig. 7). Sometimes, as in the species of *Metroxylon* (fig. 6), *Raphia*, *Daemonorops* (fig. 2), &c., the fruit is covered with hard, pointed, reflexed shining scales, which give it a very remarkable appearance.

The seeds show a corresponding variety in size and shape, but always consist of a mass of endosperm, in which is embedded a relatively very minute embryo (figs. 1, 3, 6). The hard stone of the date is the endosperm, the white oily flesh of the coco-nut is the same substance in a softer condition; the so-called "vegetable ivory" is derived from the endosperm of *Phytelephas*. In some genera the inner seed coat becomes thickened along the course of the vascular bundles and growing into the endosperm produces the characteristic appearance in section known as *ruminate*—this is well shown in the Areca nut (fig. 3).

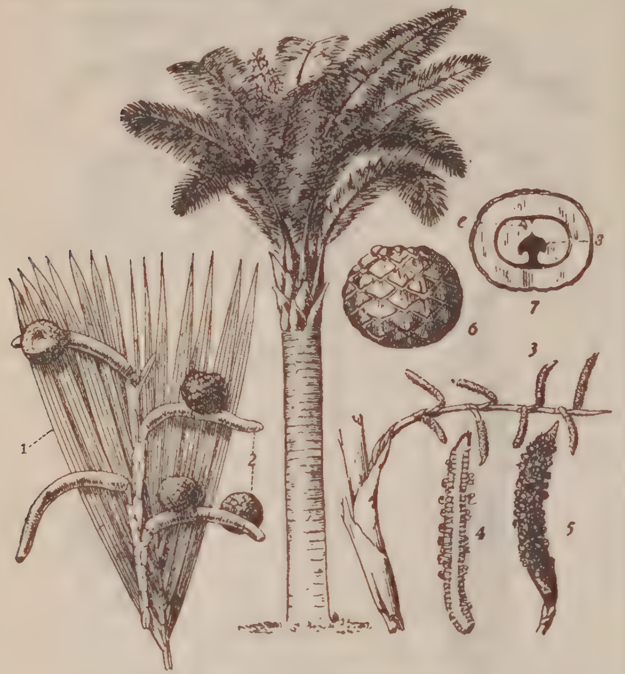


FIG. 6.—Sago Palm (*Metroxylon Sagus*).

1, Apex of leaf.
2, Branchlet of fruiting spadix.
3, Branchlet of male inflorescence.
4, Spike of male flowers.
5, Same cut lengthwise.
6, Fruit.
7, Fruit cut lengthwise, showing seed *s* and the minute embryo *e* which is embedded in a horny endosperm.

The order contains 132 genera with about 1100 species mainly tropical, but with some representatives in warm temperate regions. *Chamaerops humilis* is a native of the Mediterranean region, and the date-palm yields fruit in southern Europe as far north as 38° N. latitude. In eastern Asia the Palms, like other tropical families, extend along the coast reaching Korea and the south of Japan. In America a few small genera occur in the southern United States and California; and in South America the southern limit is reached in the Chilean genus *Jubaea* (the Chile coco-nut) at 37° S. latitude. The great centres of distribution are tropical America and tropical Asia; tropical Africa contains only 11 genera, though some of the species, like the Doum palm (*Hyphaene thebaica*) and the Deleb or Palmyra palm (*Borassus flabellifer*) have a wide distribution. With three exceptions Old and New World forms are distinct—the coco-nut (*Cocos nucifera*) is widely distributed on the coasts of tropical Africa, in India and the South Seas, the other species of the genus are confined to the western hemisphere. The oil palm (*Elaeis guineensis*) is a native of west tropical Africa, the other species of the genus is tropical American. *Raphia* has also species in both tropical Africa and tropical America.

The 132 genera of the order are ranged under seven tribes, distinguished by the nature of the foliage, the sexual conditions of the flower, the character of the seed, the position of the raphe, &c. Other characters serving to distinguish the minor groups are afforded by the habit, the position of the spathes, the "aestivation" of the flower, the nature of the stigma, the ovary, fruit, &c.

It is impossible to overestimate the utility of palms. They furnish food, shelter, clothing, timber, fuel, building materials, sticks, fibre, paper, starch, sugar, oil, wax, wine, tannin, dyeing materials, resin and a host of minor products, which render them most valuable to the natives and to tropical agriculturists. The Coco-nut palm, *Cocos nucifera*, and the Date palm, *Phoenix dactylifera*, have been treated under separate headings. Sugar and liquids capable of becoming fermented are produced by *Caryota urens*, *Cocos nucifera*, *Borassus flabellifer*, *Rhapis vinifera*, *Arenga saccharifera*, *Phoenix silvestris*, *Mauritia vinifera*, &c. Starch is procured in abundance from the stem of the Sago palm, *Metroxylon* (fig. 6) and others. The fleshy mesocarp of the fruit of *Elaeis guineensis* of western tropical Africa yields, when crushed and boiled, "palm oil." Coco-nut oil is extracted from the oily endosperm of the coco-nut. Wax is exuded from the stem of *Ceroxylon andicola* and *Copernicia cerifera*. A variety of "dragon's blood," a resin, is procured from *Daemonorops Draco* and other species. Edible fruits are yielded by the date, the staple food of some districts of northern Africa. The coco-nut is a source of wealth to its possessors; and many of the species, *e.g. Areca sapida* (Cabbage-palm and others), are valued for their "cabbage"; but, as this is the terminal bud whose removal causes the destruction of the tree, this is a wasteful article of diet unless care be taken by judicious planting to avert the annihilation of the supplies. The famous "coco de mer," or double coco-nut, whose floating nuts are the objects of so many legends and superstitions, is known to science as *Lodoicea seychellarum*. The tree is peculiar to the Seychelles, where it is used for many useful purposes. Its fruit is like a huge plum, containing a stone or nut like two coco-nuts (in their husks) united together. These illustrations must suffice to indicate the numerous economic uses of palms.

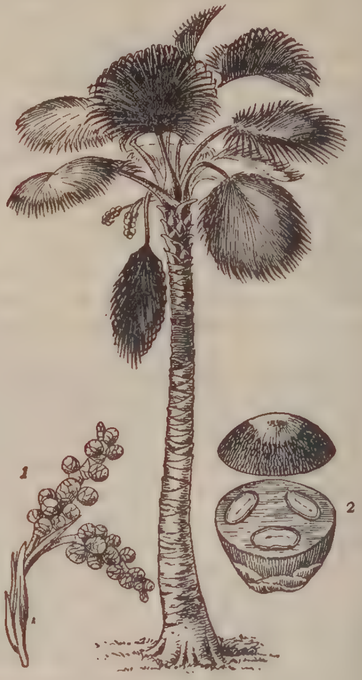


FIG. 7.—Palmyra Palm (*Borassus flabellifer*), a female tree.

1, Portion of female inflorescence showing young fruits.
2, Fruit cut across showing the three seeds, all much reduced.

The only species that can be cultivated in the open air in England, and then only under exceptionally favourable circumstances, are the European Fan palm, *Chamaerops humilis*, the Chusan palm, *Trachycarpus Fortunei*, &c., and the Chilean *Jubaea spectabilis*. The date palm is commonly planted along the Mediterranean coast. There are several low growing palms, such as *Rhapis flabelliformis*, *Chamaerops humilis*, &c., which are suited for ordinary green-house culture, and many of which, from the thick texture of their leaves, are enabled to resist the dry and often gas-laden atmosphere of living rooms.

PALMA, JACOPO (*c.* 1480–1528), Italian painter of the Venetian school, was born at Serinalta near Bergamo, towards 1480, and died at the age of forty-eight in July 1528. He is currently named Palma Vecchio (Old Palma) to distinguish him from Palma Giovane, his grand-nephew, a much inferior painter. His grandfather's name was Negretto. He is reputed to have been a companion and competitor of Lorenzo Lotto, and to some extent a pupil of Titian, after arriving in Venice early in the

16th century; he may also have been the master of Bonifazio. His earlier works betray the influence of the Bellini; but modifying his style from the study of Giorgione and Titian, Palma took high rank among those painters of the distinctively Venetian type who remain a little below the leading masters. For richness of colour he is hardly to be surpassed; but neither in invention nor vigorous draughtsmanship does he often attain any peculiar excellence. A face frequently seen in his pictures is that of his (so-called) daughter Violante, of whom Titian was said to be enamoured. Two works by Palma are more particularly celebrated. The first is a composition of six paintings in the Venetian church of S. Maria Formosa, with St Barbara in the centre, under the dead Christ, and to right and left SS. Dominic, Sebastian, John Baptist and Anthony. The second work is in the Dresden Gallery, representing three sisters seated in the open air; it is frequently named " The Three Graces." A third fine work, discovered in Venice in 1900, is a portrait supposed to represent Violante. Other leading examples are: the " Last Supper," in S. Maria Mater Domini; a " Madonna," in the church of S. Stefano in Vicenza; the " Epiphany," in the Brera of Milan; the " Holy Family, with a young shepherd adoring," in the Louvre; " St Stephen and other Saints," " Christ and the Widow of Nain," and the " Assumption of the Virgin," in the Academy of Venice; and "Christ at Emmaus," in the Pitti Gallery. The beautiful portrait of the National Gallery, London, with a background of foliage, originally described as " Ariosto " and as by Titian, and now reascribed to that master, was for some years assumed to be an unknown poet by Palma Vecchio. It is certainly much more like the work of Titian than of Palma. In 1907 the Staedel Institute in Frankfort acquired an important work by Palma Vecchio, identified by its director as an illustration of Ovid's second *Metamorphosis*, and named " Jupiter and Calisto."

Palma's grand-nephew, Palma Giovane, was also named Jacopo (1544 to about 1626). His works belong to the decline of Venetian art. (W. M. R.)

PALMA, or Palma de Mallorca, the capital of the Spanish province of the Balearic Islands, the residence of a captain-general, an episcopal see, and a flourishing seaport, situated 135 m. S.S.E. of Barcelona, on the south-west coast of Majorca, at the head of the fine Bay of Palma, which stretches inland for about 10 m. between Capes Cala Figuera and Regana. Pop. (1900), 63,937, including a colony of Jews converted to Christianity (*Chuetas*). Palma is the meeting place of all the highways in the island, and the terminus of the railway to Inca, Manacor, and Alcudia. The ramparts, which enclose the city on all sides except towards the port (where they were demolished in 1872), have a circuit of a little more than 4 m. Though begun in 1562, they were not finished till 1836. Palma underwent considerable change in the 19th century, and the fine old-world Moorish character of the place suffered accordingly. The more conspicuous buildings are the cathedral, the exchange, the royal palace, now occupied by the captain-general, and the law courts, the episcopal palace, a handsome late Renaissance building (1616), the general hospital (1456), the town-house (end of the 16th century), the picture gallery, and the college. The church of San Francisco is interesting for the tomb of Raimon Lull, a native of Palma. The cathedral was erected and dedicated to the Virgin by King James I. of Aragon as he sailed to the conquest of Majorca; but, though founded in 1230, it was not finished till 1601. The older and more interesting portions are the royal chapel (1232), with the marble sarcophagus of James II. (d. 1311) which was erected here in 1779; and the south front with the elaborately-sculptured doorway known as *del mirador* (1389). The exchange (*lonja*), a Gothic building begun in 1426, excited the admiration of the emperor Charles V. Palma has a seminary founded in 1700, a collection of archives dating from the 14th century, a school and museum of fine arts, a nautical school and an institute founded in 1836 to replace the old university (1503).

The harbour, formed by a mole constructed to a length of 387 yds. in the 14th century and afterwards extended to more than 650 yds., has been greatly improved since 1875 by dredging and a further addition to the mole of 136 yds. Previously it was not accessible to vessels drawing more than 18 ft. Palma has frequent and regular communication by steamer with Barcelona, Valencia and Alicante. Puertopí, about 2 m. south-west of the city, was once a good harbour, but is now fit only for small craft. Palma has a thriving trade in grain, wine, oil, almonds, fruit, vegetables, silk, foodstuffs and livestock. There are manufactures of alcohol, liqueurs, chocolate, starch, sugar, preserves, flour, soap, leather, earthenware, glass, matches, paper, linen, woollen goods and rugs.

Palma probably owes, if not its existence, at least its name (symbolized on the Roman coins by a palm branch), to Metellus Balearicus, who in 123 B.C. settled three thousand Roman and Spanish colonists on the island. The bishopric dates from the 14th century. About 1 m. south-west of Palma is the castle of Bellver or Belbez, the ancient residence of the kings of Majorca. Miramar, the beautiful country seat of the archduke Ludwig Salvator of Austria, is 12 m. north of Palma.

PALMA, or San Miguel de la Palma, a Spanish island in the Atlantic Ocean, forming part of the Canary Islands (*q.v.*). Pop. (1900), 41,994; area 280 sq. m. Palma is 26 m. long, with an extreme breadth of 16 m. It lies 67 m. W.N.W. of Teneriffe. It is traversed from north to south by a chain of mountains, the highest of which is 7900 ft. above sea-level. At the broadest part is a crater 9 m. in diameter, known as the Caldera (*i.e.* cauldron). The bottom of the crater has an elevation of 2300 ft., and it is overhung by peaks that rise more than 5000 ft. above it. Palma contains several mineral springs, but there is great want of fresh water. The only stream which is never dried up is that which issues from the Caldera. In 1677 an eruption, preceded by an earthquake, took place from a volcano at the southern extremity of the island, and much damage was done. Santa Cruz de la Palma (pop. 7024) on the eastern coast is the principal town. The anchorage is good.

PALM BEACH, a winter resort on the east coast of Florida, U.S.A., in Palm Beach county, about 264 m. S. of St Augustine; served by the Florida East Coast railway. It is situated on a peninsula (about 30 m. long and 1 m. wide) separated from the mainland by Lake Worth, an arm of the Atlantic Ocean, and derives its name from the groves of coco-nut palms which fringe the lake. The coco-nut was introduced here by chance, through the wrecking, off the coast, in January 1879, of a coco-nut-laden Spanish vessel. The Gulf Stream is within about 1 m. of the shore, and the climate is mild and equable, the winter temperature normally ranging between 70° and 75° F. On the Atlantic is the Breakers, a large hotel, and facing Lake Worth is the Royal Poinciana, the largest hotel in the southern states. Palm Beach has few permanent residents and is not incorporated. On the mainland just across the lake is the city of West Palm Beach (pop. in 1905, 1280; 1910, 1743), a pleasure resort and the county-seat of Palm Beach county (created in 1909).

PALM-CIVET, or Paradoxure, the name of the members of the civet-like genus *Paradoxurus*, represented by several species mainly from south-east Asia. (See Carnivora.) Palm-civets are mostly about the size of the domestic cat, or rather larger, chiefly arboreal in habits, with dark uniform, spotted or striped fur. The common Indian palm-civet (*P. niger*) ranges throughout India, wherever there are trees, frequently taking up its abodes in roof-thatch. Its diet consists of small mammals and reptiles, birds and their eggs, fruit and vegetables. From four to six young are brought forth at a litter, and are easily tamed. Other species are the Ceylonese *P. aureus*, the brown *P. jerdoni*, the Himalayan *P. grayi* and the Malayan *P. Hermaphroditus*. The small-toothed palm-civets, from the Malay Archipelago, Sumatra and Java, have been separated from the typical group to form the genus *Arctogale*. In Africa the group is represented by two species of *Nandinia*, which show several primitive characters.

PALMELLA, a town of Portugal, in the district of Lisbon (formerly included in the province of Estremadura); at the north-eastern extremity of the Serra da Arrabida, and on the Lisbon-Setubal railway. Pop. (1900), inclusive of the neighbouring village of Marateca, 11,478. Palmella is an ancient and picturesque town, still surrounded by massive but ruined walls and dominated by a medieval castle. Viticulture, market-gardening and fruit-farming are important local industries. Palmella was taken from the Moors in 1147 by Alphonso I. (Affonso Henriques), and entrusted in 1186 to the knights of Santiago. The title "duke of Palmella" dates from 1834, when it was conferred on the statesman Pedro de Sousa-Holstein, count of Palmella (1781–1850).

PALMER, SIR CHARLES MARK, Bart. (1822–1907), English shipbuilder, was born at South Shields on the 3rd of November 1822. His father, originally the captain of a whaler, removed in 1828 to Newcastle-on-Tyne, where he conducted a ship-owning and ship-broking business. Charles Palmer at the age of fifteen entered a shipping business in that town, whence, after six months, he went to Marseilles, where his father had procured him a post in a large commercial house, at the same time entrusting him with the local agency of his own business. After two years' experience at Marseilles he entered his father's business at Newcastle, and in 1842 he became a partner. His business capacity attracted the attention of a leading local colliery owner, and he was appointed manager of the Marley Hill colliery in which he became a partner in 1846. Subsequently he was made one of the managers of the associated collieries north and south of the Tyne owned by Lord Ravensworth, Lord Wharncliffe, the marquess of Bute, and Lord Strathmore, and in due course he gradually purchased these properties out of the profits of the Marley Hill colliery. Simultaneously he greatly developed the then recently-established coke trade, obtaining the coke contracts for several of the large English and continental railways. About 1850 the question of coal-transport to the London market became a serious question for north country colliery proprietors. Palmer therefore built, largely according to his own plans, the "John Bowes," the first iron screw-collier, and several other steam-colliers, in a yard established by him at Jarrow, then a small Tyneside village. He then purchased iron-mines in Yorkshire, and erected along the Tyne at Jarrow large shipbuilding yards, blast-furnaces, steel-works, rolling-mills and engine-works, fitted on the most elaborate scale. The firm produced war-ships as well as merchant vessels, and their system of rolling armour plates, introduced in 1856, was generally adopted by other builders. In 1865 he turned the business into Palmer's Shipbuilding and Iron Company, Limited. In 1886 his services in connexion with the settlement of the costly dispute between British ship-owners and the Suez Canal Company (of which he was then a director) were rewarded with a baronetcy. He died in London on the 4th of June 1907.

PALMER, EDWARD HENRY (1840–1882), English orientalist, the son of a private schoolmaster, was born at Cambridge, on the 7th of August 1840. He was educated at the Perse School, and as a schoolboy showed the characteristic bent of his mind by picking up the Romany tongue and a great familiarity with the life of the gipsies. From school he was sent to London as a clerk in the city. Palmer disliked this life, and varied it by learning French and Italian, mainly by frequenting the society of foreigners wherever he could find it. In 1859 he returned to Cambridge, apparently dying of consumption. He had an almost miraculous recovery, and in 1860, while he was thinking of a new start in life, fell in with Sayyid Abdallah, teacher of Hindustani at Cambridge, under whose influence he began his Oriental studies. He matriculated at St John's College in November 1863, and in 1867 was elected a fellow on account of his attainments as an orientalist, especially in Persian and Hindustani. During his residence at St John's he catalogued the Persian, Arabic and Turkish manuscripts in the university library, and in the libraries of King's and Trinity. In 1867 he published a treatise on *Oriental Mysticism*, based on the *Maksad-i-Aksā* of Aziz ibn Mohammad Nafasī. He was engaged in 1869 to join the survey of Sinai, undertaken by the Palestine Exploration Fund, and followed up this work in the next year by exploring the desert of El-Tih in company with Charles Drake (1846–1874). They completed this journey on foot and without escort, making friends among the Bedouin, to whom Palmer was known as "Abdallah Effendi." After a visit to the Lebanon and to Damascus, where he made the acquaintance of Sir Richard Burton, then consul there, he returned to England in 1870 by way of Constantinople and Vienna. At Vienna he met Arminius Vambéry. The results of this expedition appeared in the *Desert of the Exodus* (1871); in a report published in the journal of the Palestine Exploration Fund (1871); and in an article on the *Secret Sects of Syria* in the *Quarterly Review* (1873). In the close of the year 1871 he became Lord Almoner's Professor of Arabic at Cambridge, married, and settled down to teaching. His salary was small, and his affairs were further complicated by the long illness of his wife, who died in 1878. In 1881, two years after his second marriage, he left Cambridge, and joined the staff of the *Standard* newspaper to write on non-political subjects. He was called to the English bar in 1874, and early in 1882 he was asked by the government to go to the East and assist the Egyptian expedition by his influence over the Arabs of the desert El-Tīh. He was instructed, apparently, to prevent the Arab sheikhs from joining the Egyptian rebels and to secure their non-interference with the Suez Canal. He went to Gaza, without an escort made his way safely through the desert to Suez—an exploit of singular boldness—and was highly successful in his negotiations with the Bedouin. He was appointed interpreter-in-chief to the force in Egypt, and from Suez he was again sent into the desert with Captain William John Gill and Flag-Lieutenant Harold Charrington to procure camels and gain the allegiance of the sheikhs by considerable presents of money. On this journey he and his companions were led into an ambush and murdered (August 1882). Their remains, recovered after the war by the efforts of Sir Charles (then Colonel) Warren, now lie in St Paul's Cathedral.

Palmer's highest qualities appeared in his travels, especially in the heroic adventures of his last journeys. His brilliant scholarship is displayed rather in the works he wrote in Persian and other Eastern languages than in his English books, which were generally written under pressure. His scholarship was wholly Eastern in character, and lacked the critical qualities of the modern school of Oriental learning in Europe. All his works show a great linguistic range and very versatile talent; but he left no permanent literary monument worthy of his powers. His chief writings are *The Desert of the Exodus* (1871), *Poems of Behā ed Din* (Ar. and Eng., 1876–1877), *Arabic Grammar* (1874), *History of Jerusalem* (1871), by Besant and Palmer—the latter wrote the part taken from Arabic sources; *Persian Dictionary* (1876) and *English and Persian Dictionary* (posthumous, 1883); translation of the Koran (1880) for the *Sacred Books of the East* series, a spirited but not very accurate rendering. He also did good service in editing the *Name Lists* of the Palestine Exploration.

PALMER, ERASTUS DOW (1817–1904), American sculptor, was born at Pompey, New York, on the 2nd of April 1817. In his leisure moments as a carpenter he started by carving portraits in cameo, and then began to model in clay with much success. Among his works are: "The White Captive" (1858) in the Metropolitan Museum of Art, New York; "Peace in Bondage" (1863); "Angel at the Sepulchre" (1865), Albany, New York; a bronze statue of Chancellor Robert R. Livingston (1874), in Statuary Hall, Capitol, Washington; and many portrait busts. He died in Albany on the 9th of March 1904. His son, Walter Launt Palmer (b. 1854), who studied art under Carolus-Duran in Paris, became a member of the National Academy of Design (1897), and is best known for his painting of snow scenes.

PALMER, GEORGE (1818–1897), British biscuit-manufacturer, was born on the 18th of January 1818, at Long Sutton, Somersetshire, where his family had been yeomen-farmers for several generations. The Palmers were Quakers, and George Palmer was educated at the school of the Society of Friends at Sidcot, Somersetshire. About 1832 he was apprenticed to a miller and confectioner at Taunton, and in 1841, in conjunction with Thomas Huntley, set up as a biscuit-manufacturer at Reading. By the application of steam-machinery to biscuit-manufacture the firm of Huntley & Palmer in a comparatively short time built up a very large business, of which on the death of Huntley in 1857 George Palmer and his two brothers, Samuel and William Isaac Palmer, became proprietors. In the same year George

Palmer was elected mayor of Reading, and from 1878–1885 he was Liberal member of Parliament for the town. He died at Reading, to which he had been a most generous benefactor, on the 19th of August 1897. His sons, George William Palmer (b. 1851) and Sir Walter Palmer (b. 1858), displayed a like munificence, particularly in connexion with University College, Reading. George William Palmer, besides being mayor of Reading, represented the town in Parliament as a Liberal. Sir Walter Palmer, who was created a baronet in 1904, became Conservative member for Salisbury in 1900.

PALMER, JOHN McAULEY (1817–1900), American soldier and political leader, was born at Eagle Creek, Kentucky, on the 13th of September 1817. In 1831 his family removed to Illinois, and in 1839 he was admitted to the bar in that state. He was a member of the state constitutional convention of 1847. In 1852–1855 he was a Democratic member of the state Senate, but joined the Republican party upon its organization and became one of its leaders in Illinois. He was a delegate to the Republican national convention in 1856 and a Republican presidential elector in 1860. In 1861 he was a delegate to the peace convention in Washington. During the Civil War he served in the Union army, rising from the rank of colonel to that of major-general in the volunteer service and taking part in the capture of New Madrid and Island No. 10, in the battles of Stone River and Chickamauga, and, under Thomas, in the Atlanta campaign. He was governor of Illinois from 1869 to 1873. In 1872 he joined the Liberal-Republicans, and eventually returned to the Democratic party. In 1891–1897 he was a Democratic member of the United States Senate. In 1896 he was nominated for the presidency, by the "Gold-Democrats," but received no electoral votes. He died at Springfield, Illinois, on the 25th of September 1900.

See *The Personal Recollections of John M. Palmer—The Story of an Earnest Life*, published posthumously in 1901.

PALMER, RAY (1808–1887), American clergyman and hymn-writer, was born in Little Compton, Rhode Island, on the 12th of November 1808. He graduated at Yale College in 1830, and in 1832 was licensed to preach by the New Haven West Association of Congregational Ministers. In 1835–1850 he was pastor of the Central Congregational Church of Bath, Maine, and in 1850–1866 of the First Congregational Church of Albany, New York; and from 1866 to 1878 was corresponding secretary of the American Congregational Union. He died on the 29th of March 1887 in Newark, New Jersey, where, from 1881 to 1884 he had been assistant pastor of the Belleville Avenue Congregational Church. His most widely known hymn, beginning "My faith looks up to Thee, Thou Lamb of Calvary," was written in 1830, was set to the tune "Olivet" by Lowell Mason, and has been translated into many languages; his hymn beginning "Jesus, these eyes have never seen" (1858) is also well-known.

Among the hymns translated by him are those beginning: "O Christ, our King, Creator, Lord" (by Gregory the Great); "Come Holy Ghost in love" (by Robert II. of France); "Jesus, thou Joy of loving hearts" (by Bernard of Clairvaux); and "O, Bread to pilgrims given" (from the Latin). Other hymns (some of them translations from Latin) and poems were collected in his *Complete Poetical Works* (1876), followed in 1880 by *Voices of Hope and Gladness*. He also wrote *Spiritual Improvement* (1839), republished in 1851 as *Closet Hours; Hints on the Formation of Religious Opinions* (1860), and *Earnest Words on True Success in Life* (1873).

PALMER, SAMUEL (1805–1881), English landscape painter and etcher, was born in London on the 27th of January 1805. He was delicate as a child, but in 1819 he exhibited both at the Royal Academy and the British Institution; and shortly afterwards he became intimate with John Linnell, who introduced him to Varley, Mulready, and, above all, to William Blake, whose strange and mystic genius had the most powerful effect on Palmer's art. An illness led to a residence of seven years at Shoreham in Kent, and the characteristics of the scenery of the district are constantly recurrent in his works. Among the more important productions of this time are the "Bright Cloud" and the "Skylark," paintings in oil, which was Palmer's usual medium in earlier life. In 1839 he married a daughter of Linnell. The wedding tour was to Italy, where he spent over two years in study. Returning to London, he was in 1843 elected an associate and in 1854 a full member of the Society of Painters in Water Colours, a method to which he afterwards adhered in his painted work. His productions are distinguished by an excellent command over the forms of landscape, and by mastery of rich, glowing and potent colouring. Among the best and most important paintings executed by Palmer during his later years was a noble series of illustrations to Milton's *L'Allegro* and *Il Penseroso*. In 1853 the artist was elected a member of the English Etching Club. Considering his reputation and success in this department of art, his plates are few in number. Their virtues are not those of a rapid and vivid sketch; they aim rather at truth and completeness of tonality, and embody many of the characteristics of other modes of engraving—of mezzotint, of line, and of woodcut. Readily accessible and sufficiently representative plates may be studied in the "Early Ploughman," in *Etching and Etchers* (1st ed.), and the "Herdsman's Cottage," in the third edition of the same work. In 1861 Palmer removed to Reigate, where he died on the 24th of May 1881. One of his latest efforts was the production of a series of etchings to illustrate his English metrical version of Virgil's *Eclogues*, which was published in 1883, illustrated with reproductions of the artist's water-colours and with etchings, of which most were completed by his son, A. H. Palmer.

PALMER, a township of Hampden county, Massachusetts, U.S.A. Pop. (1910 U.S. census) 8610. It has an area of about 31 sq. m. of broken hill country. Its chief village, also named Palmer, about 15 m. east of Springfield, is on the Chicopee river, is served by the Boston & Albany and the Central Vermont railways, and by an electric line to Springfield, and has varied manufactures; the other villages are Thorndike, Bondsville, and Three Rivers. The principal manufactures are cotton goods, carpets and wire goods. Palmer was originally settled in 1716, but received a notable accession of population from a large Scotch-Irish colony which went from Ulster to Boston in 1718. Their settlement was followed, apparently, by immigration from Ireland in 1727. In 1752 the plantation was incorporated as a "district," and under a general state law of 1775 gained the legal rights of a township. Palmer was a centre of disaffection in the time of the Shays Rebellion.

See T. H. Temple, *History of the Town of Palmer . . . 1716–1889* (Palmer, 1889).

PALMER, a pilgrim who as a sign or token that he had made pilgrimage to Palestine carried a palm-branch attached to his staff, or more frequently a cross made of two strips of palm-leaf fastened to his hat. The word is frequently used as synonymous with "pilgrim" (see PILGRIMAGE). The name "palmer" or "palmer-worm" is often given to many kinds of hairy caterpillars, specifically to that of the destructive tineid moth, *Ypsilophus pometella*. The name is either due to the English use of "palm" for the blossom or catkin of the willow-tree, to which the caterpillars bear some resemblance, or to the wandering pilgrim-like habits of such caterpillars. Artificial flies used in angling, covered with bristling hairs, are known also as "palmers" or "hackles."

PALMERSTON, HENRY JOHN TEMPLE, 3RD VISCOUNT (1784–1865), English statesman, was born at Broadlands, near Romsey, Hants, on the 20th of October 1784. The Irish branch of the Temple family, from which Lord Palmerston descended, was very distantly related to the great English house of the same name, but these Irish Temples were not without distinction. In the reign of Elizabeth they had furnished a secretary to Sir Philip Sidney and to Essex in Sir William Temple (1555–1627), afterwards provost of Trinity College, Dublin, whose son, Sir John Temple (1600–1677), was master of the rolls in Ireland. The latter's son, Sir William Temple (*q.v.*), figured as one of the ablest diplomatists of the age. From his younger brother, Sir John Temple (1632–1704), who was speaker of the Irish House of Commons, Lord Palmerston descended. The eldest son of the speaker, Henry, 1st Viscount Palmerston (*c.* 1673–1757), was created a peer of Ireland on the 12th of March 1723, and was succeeded by his grandson, Henry the second viscount (1739–1802), who married Miss Mary Mee (d. 1805), a lady celebrated for her beauty.

The 2nd viscount's eldest son, Henry John, is mentioned by Lady Elliot in her correspondence as a boy of singular vivacity and energy. These qualities adhered to him through life, and he had scarcely left Harrow, at the age of eighteen, when the death of his father (April 17, 1802) raised him to the Irish peerage. It was no doubt owing to his birth and connexions, but still more to his own talents and character, that Lord Palmerston was thrown at a very early age into the full stream of political and official life. Before he was four-and-twenty he had stood two contested elections for the university of Cambridge, at which he was defeated, and he entered parliament for a pocket-borough, Newtown, Isle of Wight, in June 1807. Through the interest of his guardians Lord Malmesbury and Lord Chichester, the duke of Portland made him one of the junior lords of the Admiralty on the formation of his administration in 1807. A few months later he delivered his maiden speech in the House of Commons in defence of the expedition against Copenhagen, which he conceived to be justified by the known designs of Napoleon on the Danish court. This speech was so successful that when Perceval formed his government in 1809, he proposed to this young man of five-and-twenty to take the chancellorship of the exchequer. Lord Palmerston, however, preferred the less important office of secretary-at-war, charged exclusively with the financial business of the army, without a seat in the cabinet, and in this position he remained, without any signs of an ambitious temperament or of great political abilities, for twenty years (1809–1828). During the whole of that period Lord Palmerston was chiefly known as a man of fashion, and a subordinate minister without influence on the general policy of the cabinets he served. Some of the most humorous poetical pieces in the *New Whig Guide* were from his pen, and he was entirely devoted, like his friends Peel and Croker, to the Tory party of that day. Lord Palmerston never was a Whig, still less a Radical; he was a statesman of the old English aristocratic type, liberal in his sentiments, favourable to the march of progress, but entirely opposed to the claims of democratic government.

In the later years of Lord Liverpool's administration, after the death of Lord Londonderry in 1822, strong dissensions existed in the cabinet. The Liberal section of the government was gaining ground. Canning became foreign minister and leader of the House of Commons. Huskisson began to advocate and apply the doctrines of free trade. Roman Catholic emancipation was made an open question. Although Lord Palmerston was not in the cabinet, he cordially supported the measures of Canning and his friends. Upon the death of Lord Liverpool, Canning was called to the head of affairs; the Tories, including Peel, withdrew their support, and an alliance was formed between the Liberal members of the late ministry and the Whigs. In this combination the chancellorship of the exchequer was first offered to Lord Palmerston, who accepted it, but this appointment was frustrated by the king's intrigue with Herries, and Palmerston was content to remain secretary-at-war with a seat in the cabinet, which he now entered for the first time. The Canning administration ended in four months by the death of its illustrious chief, and was succeeded by the feeble ministry of Lord Goderich, which barely survived the year. But the "Canningites," as they were termed, remained, and the duke of Wellington hastened to include Palmerston, Huskisson, Charles Grant, Lamb (Lord Melbourne) and Dudley in his government. A dispute between the duke and Huskisson soon led to the resignation of that minister, and his friends felt bound to share his fate. In the spring of 1828 Palmerston found himself in opposition. From that moment he appears to have directed his attention closely to foreign affairs; indeed he had already urged on the duke of Wellington a more active interference in the affairs of Greece; he had made several visits to Paris, where he foresaw with great accuracy the impending revolution; and on the 1st of June 1829 he made his first great speech on foreign affairs. Lord Palmerston was no orator; his language was unstudied, and his delivery somewhat embarrassed; but he generally found words to say the right thing at the right time, and to address the House of Commons in the language best adapted to the capacity and the temper of his audience. An attempt was made by the duke of Wellington in September 1830 to induce Palmerston to re-enter the cabinet, which he refused to do without Lord Lansdowne and Lord Grey, and from that time forward he may be said to have associated his political fortunes with those of the Whig party. It was therefore natural that Lord Grey should place the department of foreign affairs in his hands upon the formation of the great ministry of 1830, and Palmerston entered with zeal on the duties of an office over which he continued to exert his powerful influence, both in and out of office, for twenty years.

The revolution of July 1830 had just given a strong shock to the existing settlement of Europe. The kingdom of the Netherlands was rent asunder by the Belgian revolution; Portugal was the scene of civil war; the Spanish succession was about to open and place an infant princess on the throne. Poland was in arms against Russia, and the northern powers formed a closer alliance, threatening to the peace and the liberties of Europe. In presence of these varied dangers, Lord Palmerston was prepared to act with spirit and resolution, and the result was a notable achievement of his diplomacy. The king of the Netherlands had appealed to the powers who had placed him on the throne to maintain his rights; and a conference assembled accordingly in London to settle the question, which involved the independence of Belgium and the security of England. On the one hand, the northern powers were anxious to defend the king of Holland; on the other hand a party in France aspired to annex the Belgian provinces. The policy of the British government was a close alliance with France, but an alliance based on the principle that no interests were to be promoted at variance with the just rights of others, or which could give to any other nation well-founded cause of jealousy. If the northern powers supported the king of Holland by force, they would encounter the resistance of France and England united in arms, if France sought to annex Belgium she would forfeit the alliance of England, and find herself opposed by the whole continent of Europe. In the end the policy of England prevailed; numerous difficulties, both great and small, were overcome by the conference, although on the verge of war, peace was maintained; and Prince Leopold of Saxe-Coburg was placed upon the throne of Belgium.

In 1833 and 1834 the youthful queens Donna Maria of Portugal and Isabella of Spain were the representatives and the hope of the constitutional party in those countries—assailed and hard pressed by their absolutist kinsmen Don Miguel and Don Carlos, who were the representatives of the male line of succession. Lord Palmerston conceived and executed the plan of a quadruple alliance of the constitutional states of the West to serve as a counterpoise to the northern alliance. A treaty for the pacification of the Peninsula was signed in London on the 22nd of April 1834; and, although the struggle was somewhat prolonged in Spain, it accomplished its object. France, however, had been a reluctant party to this treaty. She never executed her share in it with zeal or fidelity. Louis Philippe was accused of secretly favouring the Carlists, and he positively refused to be a party to direct interference in Spain. It is probable that the hesitation of the French court on this question was one of the causes of the extreme personal hostility Lord Palmerston never ceased to show towards the king of the French down to the end of his life, if indeed that sentiment had not taken its origin at a much earlier period. Nevertheless, at this same time (June 1834) Lord Palmerston wrote that "Paris is the pivot of my foreign policy." M. Thiers was at that time in office. Unfortunately these differences, growing out of the opposite policies of the two countries at the court of Madrid, increased in each succeeding year; and a constant but sterile rivalry was kept up, which ended in results more or less humiliating and injurious to both nations.

The affairs of the East interested Lord Palmerston in the highest degree. During the Greek War of Independence he had strenuously supported the claims of the Hellenes against the

"Turks and the execution of the Treaty of London. But from 1830 the defence of the Ottoman Empire became one of the cardinal objects of his policy. He believed in the regeneration of Turkey. "All that we hear," he wrote to Bulwer (Lord Dalling), "about the decay of the Turkish Empire, and its being a dead body or a sapless trunk, and so forth, is pure unadulterated nonsense." The two great aims he had in view were to prevent the establishment of Russia on the Bosporus and of France on the Nile, and he regarded the maintenance of the authority of the Porte as the chief barrier against both these aggressions. Against Russia he had long maintained a suspicious and hostile attitude. He was a party to the publication of the "Portfolio" in 1834, and to the mission of the "Vixen" to force the blockade of Circassia about the same time. He regarded the treaty of Unkiar Skelessi which Russia extorted from the Porte in 1832, when she came to the relief of the sultan after the battle of Konieh, with great jealousy; and, when the power of Mehemet Ali in Egypt appeared to threaten the existence of the Ottoman dynasty, he succeeded in effecting a combination of all the powers, who signed the celebrated collective note of the 27th of July 1839, pledging them to maintain the independence and integrity of the Turkish Empire as a security for the peace of Europe. On two former occasions, in 1833 and in 1835, the policy of Lord Palmerston, who proposed to afford material aid to the Porte against the pasha of Egypt, was overruled by the cabinet; and again, in 1839, when Baron Brunnow first proposed the active interference of Russia and England, the offer was rejected. But in 1840 Lord Palmerston returned to the charge and prevailed. The moment was critical, for Mehemet Ali had occupied Syria and won the battle of Nezib against the Turkish forces, and on the 1st of July 1839 the sultan Mohammed expired. The Egyptian forces occupied Syria, and threatened Turkey; and Lord Ponsonby, then British ambassador at Constantinople, vehemently urged the necessity of crushing so formidable a rebellion against the Ottoman power. But France, though her ambassador had signed the collective note in the previous year, declined to be a party to measures of coercion against the pasha of Egypt. Palmerston, irritated at her Egyptian policy, flung himself into the arms of the northern powers, and the treaty of the 15th of July 1840 was signed in London without the knowledge or concurrence of France. This measure was not taken without great hesitation, and strong opposition on the part of several members of the British cabinet. Lord Palmerston himself declared in a letter to Lord Melbourne that he should quit the ministry if his policy was not adopted; and he carried his point. The bombardment of Beirūt, the fall of Acre, and the total collapse of the boasted power of Mehemet Ali followed in rapid succession, and before the close of the year Lord Palmerston's policy, which had convulsed and terrified Europe, was triumphant, and the author of it was regarded as one of the most powerful statesmen of the age. At the same time, though acting with Russia in the Levant, the British government engaged in the affairs of Afghanistan to defeat her intrigues in Central Asia, and a contest with China was terminated by the conquest of Chusan, afterwards exchanged for the island of Hong-Kong.

Within a few months Lord Melbourne's administration came to an end (1841), and Lord Palmerston remained for five years out of office. The crisis was past, but the change which took place by the substitution of M. Guizot for M. Thiers in France, and of Lord Aberdeen for Lord Palmerston in England, was a fortunate event for the peace of the world. Lord Palmerston had adopted the opinion that peace with France was not to be relied on, and indeed that war between the two countries was sooner or later inevitable. Lord Aberdeen and M. Guizot inaugurated a different policy; by mutual confidence and friendly offices they entirely succeeded in restoring the most cordial understanding between the two governments, and the irritation which Lord Palmerston had inflamed gradually subsided. During the administration of Sir Robert Peel, Lord Palmerston led a retired life, but he attacked with characteristic bitterness the Ashburton treaty with the United States, which closed successfully some other questions he had long kept open. In all these transactions, whilst full justice must be done to the force and patriotic vigour which Lord Palmerston brought to bear on the questions he took in hand, it was but too apparent that he imported into them an amount of passion, of personal animosity, and imperious language which rendered him in the eyes of the queen and of his colleagues a dangerous minister. On this ground, when Lord John Russell attempted, in December 1845, to form a ministry, the combination failed because Lord Grey refused to join a government in which Lord Palmerston should resume the direction of foreign affairs. A few months later, however, this difficulty was surmounted; the Whigs returned to power, and Palmerston to the foreign office (July 1846), with a strong assurance that Lord John Russell should exercise a strict control over his proceedings. A few days sufficed to show how vain was this expectation. The French government regarded the appointment of Palmerston as a certain sign of renewed hostilities, and they availed themselves of a despatch in which Palmerston had put forward the name of a Coburg prince as a candidate for the hand of the young queen of Spain, as a justification for a departure from the engagements entered into between M. Guizot and Lord Aberdeen. However little the conduct of the French government in this transaction of the Spanish marriages can be vindicated, it is certain that it originated in the belief that in Palmerston France had a restless and subtle enemy. The efforts of the British minister to defeat the French marriages of the Spanish princesses, by an appeal to the treaty of Utrecht and the other powers of Europe, were wholly unsuccessful; France won the game, though with no small loss of honourable reputation.

The revolution of 1848 spread like a conflagration through Europe, and shook every throne on the Continent except those of Russia, Spain, and Belgium. Palmerston sympathized, or was supposed to sympathize, openly with the revolutionary party abroad. No state was regarded by him with more aversion than Austria. Yet his opposition to Austria was chiefly based upon her occupation of great part of Italy and her Italian policy, for Palmerston maintained that the existence of Austria as a great power north of the Alps was an essential element in the system of Europe. Antipathies and sympathies had a large share in the political views of Lord Palmerston, and his sympathies had ever been passionately awakened by the cause of Italian independence. He supported the Sicilians against the king of Naples, and even allowed arms to be sent them from the arsenal at Woolwich; and, although he had endeavoured to restrain the king of Sardinia from his rash attack on the superior forces of Austria, he obtained for him a reduction of the penalty of defeat. Austria, weakened by the revolution, sent an envoy to London to request the mediation of England, based on a large cession of Italian territory; Lord Palmerston rejected the terms he might have obtained for Piedmont. Ere long the reaction came; this straw-fire of revolution burnt itself out in a couple of years. In Hungary the civil war, which had thundered at the gates of Vienna, was brought to a close by Russian intervention. Prince Schwarzenberg assumed the government of the empire with dictatorial power; and, in spite of what Palmerston termed his "judicious bottle-holding," the movement he had encouraged and applauded, but to which he could give no material aid, was everywhere subdued. The British government, or at least Palmerston as its representative, was regarded with suspicion and resentment by every power in Europe, except the French republic; and even that was shortly afterwards to be alienated by Palmerston's attack on Greece.

This state of things was regarded with the utmost annoyance by the British court and by most of the British ministers. Palmerston had on many occasions taken important steps without their knowledge, which they disapproved. Over the Foreign Office he asserted and exercised an arbitrary dominion, which the feeble efforts of the premier could not control. The queen and the prince consort (see VICTORIA, QUEEN) did not conceal their indignation at the position in which he had placed them with all the other courts of Europe. When Kossuth, the

Hungarian leader, landed in England, Palmerston proposed to receive him at Broadlands, a design which was only prevented by a peremptory vote of the cabinet; and in 1850 he took advantage of Don Pacifico's very questionable claims on the Hellenic government to organize an attack on the little kingdom of Greece.[1] Greece being a state under the joint protection of three powers, Russia and France protested against its coercion by the British fleet, and the French ambassador temporarily left London, which promptly led to the termination of the affair. But it was taken up in parliament with great warmth. After a memorable debate (June 17), Palmerston's policy was condemned by a vote of the House of Lords. The House of Commons was moved by Roebuck to reverse the sentence, which it did (June 29) by a majority of 46, after having heard from Palmerston the most eloquent and powerful speech ever delivered by him, in which he sought to vindicate, not only his claims on the Greek government for Don Pacifico, but his entire administration of foreign affairs. It was in this speech, which lasted five hours, that Palmerston made the well-known declaration that a British subject—" Civis Romanus sum "—ought everywhere to be protected by the strong arm of the British government against injustice and wrong. Yet, notwithstanding this parliamentary triumph, there were not a few of his own colleagues and supporters who condemned the spirit in which the foreign relations of the Crown were carried on; and in that same year the queen addressed a minute to the prime minister in which she recorded her dissatisfaction at the manner in which Lord Palmerston evaded the obligation to submit his measures for the royal sanction as failing in sincerity to the Crown. This minute was communicated to Palmerston, who did not resign upon it. These various circumstances, and many more, had given rise to distrust and uneasiness in the cabinet, and these feelings reached their climax when Palmerston, on the occurrence of the *coup d'état* by which Louis Napoleon made himself master of France, expressed to the French ambassador in London, without the concurrence of his colleagues, his personal approval of that act. Upon this Lord John Russell advised his dismissal from office (Dec. 1851). Palmerston speedily avenged himself by turning out the government on a militia bill; but although he survived for many years, and twice filled the highest office in the state, his career as foreign minister ended for ever, and he returned to the foreign office no more. Indeed, he assured Lord Aberdeen, in 1853, that he did not wish to resume the seals of that department. Notwithstanding the zeal and ability which he had invariably displayed as foreign minister, it had long been felt by his colleagues that his eager and frequent interference in the affairs of foreign countries, his imperious temper, the extreme acerbity of his language abroad, of which there are ample proofs in his published correspondence, and the evasions and artifices he employed to carry his points at home, rendered him a dangerous representative of the foreign interests of the country. But the lesson of his dismissal was not altogether lost on him. Although his great reputation was chiefly earned as a foreign minister, it may be said that the last ten years of his life, in which he filled other offices, were not the least useful or dignified portion of his career.

Upon the formation of the cabinet of 1853, which was composed by the junction of the surviving followers of Sir Robert Peel with the Whigs, under the earl of Aberdeen, Lord Palmerston accepted with the best possible grace the office of secretary of state for the home office, nor was he ever chargeable with the slightest attempt to undermine that Government. At one moment he withdrew from it, because Lord John Russell persisted in presenting a project of reform which appeared to him entirely out of season; and he advocated, with reason, measures of greater energy on the approach of war, which might possibly, if they had been adopted, have averted the contest with Russia. As the difficulties of the Crimean campaign increased, it was not Lord Palmerston but Lord John Russell who broke up the government by refusing to meet Roebuck's motion of inquiry. Palmerston remained faithful and loyal to his colleagues in the hour of danger. Upon the resignation of Lord Aberdeen and the duke of Newcastle, the general sentiment of the House of Commons and the country called Palmerston to the head of affairs, and he entered, on the 5th of February 1855, upon the high office, which he retained, with one short interval, to the day of his death. Palmerston was in the seventy-first year of his life when he became prime minister of England.

A series of fortunate events followed his accession to power. In March 1855 the death of the emperor Nicholas removed his chief antagonist. In September Sevastopol was taken. The administration of the British army was reformed by a consolidation of offices. In the following spring peace was signed in Paris. Never since Pitt had a minister enjoyed a greater share of popularity and power, and, unlike Pitt, Palmerston had the prestige of victory in war. He was assailed in parliament by the eloquence of Gladstone, the sarcasms of Disraeli, and the animosity of the Manchester Radicals, but the country was with him. Defeated by a hostile combination of parties in the House of Commons on the question of the Chinese war in 1857 and the alleged insult to the British flag in the seizure of the lorcha " Arrow," he dissolved parliament and appealed to the nation. The result was the utter defeat of the extreme Radical party and the return of a more compact Liberal majority. The great events of the succeeding years, the Indian Mutiny, and the invasion of Italy by Napoleon III., belong rather to the general history of the times than to the life of Palmerston; but it was fortunate that a strong and able government was at the head of affairs. Lord Derby's second administration of 1858 lasted but a single year, Palmerston having casually been defeated on a measure for removing conspiracies to murder abroad from the class of misdemeanour to that of felony, which was introduced in consequence of Orsini's attempt on the life of the emperor of the French. But in June 1859 Palmerston returned to power, and it was on this occasion that he proposed to Cobden, one of his most constant opponents, to take office, and on the refusal of that gentleman Milner Gibson was appointed to the board of trade, although he had been the prime mover of the defeat of the government on the Conspiracy Bill. Palmerston had learnt by experience that it was wiser to conciliate an opponent than to attempt to crush him, and that the imperious tone he had sometimes adopted in the House of Commons, and his supposed obsequiousness to the emperor of the French, were the causes of the temporary reverse he had sustained. Although Palmerston approved the objects of the French invasion of Italy in so far as they went to establish Italian independence, the annexation of Savoy and Nice to France was an incident which revived his old suspicions of the good faith of the French emperor. About this time he expressed to the duke of Somerset his conviction that Napoleon III. "had at the bottom of his heart a deep and unextinguishable desire to humble and punish England," and that war with France was a contingency to be provided against. The unprotected condition of the principal British fortresses and arsenals had long attracted his attention, and he succeeded in inducing the House of Commons to vote nine millions for the fortification of those important points.

In 1856 the projects for cutting a navigable canal through the Isthmus of Suez was brought forward by M. de Lesseps, and resisted by Palmerston with all the weight he could bring to bear against it. He did not foresee the advantages to be derived by British commerce from this great work, and he was strongly opposed to the establishment of a powerful French company on the soil of Egypt. The concession of land to the company was reduced by his intervention, but in other respects the work proceeded and was accomplished. It may here be mentioned, as a remarkable instance of his foresight, that

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[1] David Pacifico (1784–1854) was a Portuguese Jew, born a British subject at Gibraltar. He became a merchant at Athens, and in 1847 his house was burnt down in an anti-Semitic riot. Pacifico brought an action, laying the damages at £26,000. At the same time George Finlay, the historian, was urging his own grievances against the Greek government, and as both claims were repudiated Palmerston took them up. Eventually Pacifico received a substantial sum.

Palmerston told Lord Malmesbury, on his accession to the foreign office in 1858, that the chief reason of his opposition to the canal was this: he believed that, if the canal was made and proved successful, Great Britain, as the first mercantile state, and that most closely connected with the East, would be the power most interested in it; that England would therefore be drawn irresistibly into a more direct interference in Egypt, which it was desirable to avoid because England had already enough upon her hands, and because intervention might lead to a rupture with France. He therefore preferred that no such line of communication should be opened.

Upon the outbreak of the American Civil War in 1861, Lord Palmerston acknowledged that it was the duty of the British government to stand aloof from the fray; but his own opinion led him rather to desire than to avert the rupture of the Union, which might have been the result of a refusal on the part of England and France to recognize a blockade of the Southern ports, which was notoriously imperfect, and extremely prejudicial to the interests of Europe. The cabinet was not of this opinion, and, although the belligerent rights of the South were promptly recognized, the neutrality of the Government was strictly observed. When, however, the Southern envoys were taken by force from the "Trent," a British packet, Palmerston did not hesitate a moment to insist upon a full and complete reparation for so gross an infraction of international law. But the difficulty with the American government over the "Alabama" and other vessels, fitted out in British ports to help the Southern cause, was only settled at last (see Alabama Arbitration) by an award extremely onerous to England.

The last transaction in which Palmerston engaged arose out of the attack by the Germanic Confederation, and its leading states Austria and Prussia, on the kingdom of Denmark and the duchies of Schleswig and Holstein. There was but one feeling in the British public and the nation as to the dishonest character of that unprovoked aggression, and it was foreseen that Austria would ere long have reason to repent her share in it. Palmerston endeavoured to induce France and Russia to concur with England in maintaining the Treaty of London, which had guaranteed the integrity of the Danish dominions. But those powers, for reasons of their own, stood aloof, and the conference held in London in 1864 was without effect. A proposal to send the British fleet into the Baltic was overruled, and the result was that Denmark was left to her own resources against her formidable opponents. In the following year, on the 18th of October 1865, Lord Palmerston expired at Brocket Hall, after a short illness, in the eighty-first year of his age. His remains were laid in Westminster Abbey.

Although there was much in the official life of Lord Palmerston which inspired distrust and alarm to men of a less ardent and contentious temperament, he had a lofty conception of the strength and the duties of England, he was the irreconcilable enemy of slavery, injustice and oppression, and he laboured with inexhaustible energy for the dignity and security of the Empire. In private life his gaiety, his buoyancy, his high breeding, made even his political opponents forget their differences; and even the warmest altercations on public affairs were merged in his large hospitality and cordial social relations. In this respect he was aided with consummate ability by the tact and grace of Lady Palmerston, the widow of the 5th Earl Cowper, whom he married at the close of 1839, and who died in 1869. She devoted herself with enthusiasm to all her husband's interests and pursuits, and she made his house the most attractive centre of society in London, if not in Europe. They had no children, and the title became extinct, the property descending to Lady Palmerston's second son by Earl Cowper, W. F. Cowper-Temple, afterwards Baron Mount Temple, and then to her grandson Evelyn Ashley (1836–1907) son of her daughter, who married the 7th earl of Shaftesbury—who was Lord Palmerston's private secretary from 1858 to 1865.

The *Life of Lord Palmerston*, by Lord Dalling (2 vols., 1870), with valuable selections from the minister's autobiographical diaries and private correspondence, only came down to 1847, and was completed by Evelyn Ashley (vol. iii., 1874; iv., v., 1876). The whole was re-edited by Mr Ashley, in two volumes (1879), the standard biography. The *Life* by Lloyd Sanders (1888) is an excellent shorter work.

PALMERSTON, the chief town of the Northern Territory of South Australia, in Palmerston county, on the E. shore of Port Darwin, 2000 m. direct N.N.W. of Adelaide. The town stands 60 ft. above the level of the sea, by which it is almost surrounded. There are a government house, a town hall, and an experimental nursery garden. Palmerston has a magnificent harbour, accessible to ocean-going vessels, and the jetty is connected by rail with Playford, 146 m. distant. Cool breezes blow almost continuously throughout the year. The mean annual rainfall is 62·21 in. Pop. (1901), 1973, mostly Chinese.

PALMETTO, in botany, a popular name for *Sabal Palmetto*, the Palmetto palm, a native of the southern United States, especially in Florida. It has an erect stem, 20 to 80 ft. high and deeply cut fan-shaped leaves, 5 to 8 ft. long; the fruit is a black drupe $\frac{1}{3}$ to $\frac{1}{2}$ in. long. The trunks make good piles for wharves, &c., as the wood resists the attacks of borers; the leaves are used for thatching. The palm is grown as a pot-plant in greenhouses.

PALMISTRY, (from "palmist," one who studies the palm, and the Teutonic affix *ry* signifying "art"; also called Chiromancy, from χείρ, the hand, and μαντεία, divination). The desire to learn what the future has in store is nearly as old as the sense of responsibility in mankind, and has been the parent of many empirical systems of fortune-telling, which profess to afford positive knowledge whereby the affairs of life may be regulated, and the dangers of failure foretold. Most of these systems come into the category of occult pursuits, as they are the interpretations of phenomena on the ground of fanciful presumptions, by an appeal to unreal or at least unverifiable influences and relations.

One of the oldest of this large family of predictive systems is that of palmistry, whereby the various irregularities and flexion-folds of the skin of the hand are interpreted as being associated with mental or moral dispositions and powers, as well as with the current of future events in the life of the individual. How far back in prehistoric times this system has been practised it is impossible to say, but in China it is said to have existed 3000 years before Christ,[1] and in Greek literature it is treated even in the most ancient writings as well-known belief. Thomas Blackwell[2] has collected some Homeric references: a work by Melampus of Alexandria is extant in several versions. Polemon, Aristotle and Adamantius may also be named as having dealt with the subject; as also have the medical writers of Greece and Rome—Hippocrates, Galen and Paulus Aegineta, and in later times the Arabian commentators on these authors. From references which can be gathered from patristic writings it is abundantly evident that the belief in the mystical meaning of marks on the "organ of organs" was a part of the popular philosophy of their times.

After the invention of printing a very considerable mass of literature concerning this subject was produced during the 16th and 17th centuries. Praetorius, in his *Ludicrum chiromanticum* (Jena, 1661)[3] has collected the titles of 77. Other works are quoted by Fulleborn and Hörst, and by writers on the history of philosophy and magic; altogether about 98 books on the subject published before 1700 are at present accessible. There is not very much variety among these treatises, one of the earliest, valuable on account of its rarity, is the block-book by Hartlieb, *Die Kunst Ciromantia*,[4] published at Augsburg about 1470 (probably, but it bears no imprint of place or date). In this there are colossal figures of hands, each of which has its regions marked out by inscriptions. Few of these works are of sufficient interest to require mention.

[1] Giles, in *Contemporary Review* (1905).

[2] *Proofs of the Inquiry into the Life and Writings of Homer*, p. 330 (London, 1736).

[3] This book is worthy of note on account of the quaint and sarcastic humour of its numerous acrostic verses.

[4] There is a copy in the Rylands Library, Manchester. See also Dibdin's *Bibliographical Decameron* (1817), i. 143.

The best are those by Pompeius, Robert Fludd, John de Indagine, Taisnierus, Baptista dalla Porta, S. Cardan, Goclenius, Cocles, Frölich, Summer, Rothmann, Ingebert, Pomponius Gauricus, and Tricassus Mantuanus. There are also early Hebrew works, of which one by Gedaliah is extant. An Indian literature is also said to exist. Some of these authors attempt to separate the physiognomical part of the subject (Chirognomia) from the astrological (Chiromantia); see especially Caspar Schott in *Magia naturalis universalis*, Bamberg, 1677. Since the middle of the 19th century, in spite of the enactments of laws in Britain and elsewhere against the practice, there has been a recrudescence of belief in palmistry, and a new literature has grown up differing little in essence from the older. The more important books of this series are K. G. Carus, *Über Grund u. Bedeutung der verschiedenen Formen der Hand*, 1846; Landsberg, *Die Handteller* (Posen, 1861); Adolf Desbarolles, *Les Mystères de la main* (1859); C. S. D'Arpentigny, *Chirognomie, la science de la main* (1865), of which an English version has been published by Heron Allen in 1886; G. Z. Gessmann, *Katechismus der Handlesekunst* (Berlin, 1889); Czynszi, *Die Deutung der Handlinien* (Dresden, 1893); R. Beamish, *The Psychonomy of the Hand* (1865); Frith and Allen, *The Science of Palmistry* (1883); Cotton, *Palmistry* and its practical uses (1890). Some of the older writers appealed to Scripture as supporting their systems, especially the texts Exod. xiii. 16; Job xxxvii. 7; and Prov. iii. 16. A considerable amount of literature *pro* and *con* was devoted to this controversy in the 17th and 18th centuries.

At the present day palmistry is practised in nearly all parts of China. The criteria of judgment used there are referred to in the article by Professor H. A. Giles, already quoted. It is also extensively practised in India, especially by one caste of Brahmins, the Joshi. In Syria and Egypt the palmist can be seen plying his trade at the cafés; and among the Arabs there are chiromantists who are consulted as to the probable success of enterprises. It is probably from their original Indian home that the traditional *dukkeripen* (fortune-telling) of the gipsies has been derived.

This system of divination has the charm of simplicity and definiteness, as an application of the "doctrine of signatures" which formed so extensive an element in the occult writings of the past six centuries. In the course of ages every detail has been brought under a formal set of rules, which only need mechanical application. There have been in past times considerable divergences in the practice, but at present there is a fairly uniform system in vogue. One school lays special stress on the general shape and outline of the hand. Corvaeus enumerates 70 varieties, Pamphilus cuts them down to 6, John de Indagine to 27, and Tricassus Mantuanus raises them to 80. The characters of softness or hardness, dryness or moisture, &c., are taken account of in these classifications. The lines of cardinal importance are (1) the rasceta or cross sulci, which isolate the hand from the forearm at the wrist, and which are the flexion folds between the looser forearm skin and that tied down to the fascia above the level of the anterior annular ligament. (2) The line which isolates the ball of the thumb, where the skin ceases to be tied to the front of the palmar fascia, is called the line of life. (3) A line starting above the head of the second metacarpal bone and crossing the hand to the middle of its ulnar border is the line of the head. (4) The transverse line below this which passes from the ulnar border a little above the level of the head of the fifth metacarpal and ends somewhere about the root of the index finger is the line of the heart. (5) The vertical line descending from the middle of the wrist to end about the base of the middle finger is the line of fortune. (6) The oblique line which begins at the wrist end of the line of life and descends towards the ulnar end of the line of the head is the line of the liver.

These lines isolate certain swellings or monticuli, the largest of which is (1) the ball of the thumb, called the mountain of Venus; (2) that at the base of the index finger is the mountain of Jupiter; (3) at the root of the middle finger is the mountain of Saturn, while those at the bases of ring and little finger are respectively the mountains of the (4) Sun and (5) of Mercury. Above the mountain of Mercury, and between the lines of head and heart is (6) the mountain of Mars, and above the line of the heart is (7) the mountain of the Moon. The relative sizes of these mountains have assigned to them their definite correlations with characters: the 1st with charity, love, libertinage; the 2nd with religiosity, ambition, love of honour, pride, superstition; the 3rd with wisdom, good fortune, prudence, or when deficient improvidence, ignorance, failure; the 4th when large makes for success, celebrity, intelligence, audacity, when small meanness or love of obscurity; the 5th indicates love of knowledge, industry, aptitude for commerce, and in its extreme forms on the one hand love of gain and dishonesty, on the other slackness and laziness. The 6th is related to degrees of courage, resolution, rashness or timidity; the 7th indicates sensitiveness, morality, good conduct, or immorality, overbearing temper and self-will.

The swellings on the palmar faces of the phalanges of the several fingers are also indicative, the 1st and 2nd of the thumb respectively, of the logical faculty and of the will; the 1st, 2nd and 3rd of the index finger, of materialism, law and order, idealism; those of the middle finger, humanity, system, intelligence; of the ring finger, truth, economy, energy; and of the little finger, goodness, prudence, reflectiveness.

Over and above these there are other marks, crosses, triangles, &c., of which more than a hundred have been described and figured by different authors, each with its interpretation; and in addition the back of the hand has its ridges. The Chinese combine podoscopy with chiromancy.

To the anatomist the roughnesses of the palm are of considerable interest. The folds are so disposed that the thick skin shall be capable of bending in grasping, while at the same time it requires to be tightly bound down to the skeleton of the hand, else the slipping of the skin would lead to insecurity of prehension, as the quilting or buttoning down of the covers of furniture by upholsterers keeps them from slipping. For this purpose the skin is tied by connecting fibres of white fibrillar tissue to the deep layer of the dermis along the lateral and lower edges of the palmar fascia and to the sheaths of the flexor tendons. The folds, therefore, which are disposed for the purpose of making the grasp secure, vary with the relative lengths of the metacarpal bones, with the mutual relations of the sheaths of the tendons, and the edge of the palmar fascia, somewhat also with the insertion of the palmaris brevis muscle. The sulci are emphasized because the subcutaneous fat, which is copious in order to pad the skin for the purpose of firmness of holding, being restricted to the intervals between the lines along which the skin is tied down, makes these intervals project, and these are the monticuli. The swelling of the mountain of Venus is simply the indication of the size of the muscles of the ball of the thumb, and can be increased by their exercise. Similarly the hypothenar muscles for the little finger underlie the three ulnar marginal mountains, the sizes of which depend on their development and on the prominence of the pisiform bone.

That these purely mechanical arrangements have any psychic, occult or predictive meaning is a fantastic imagination, which seems to have a peculiar attraction for certain types of mind, and as there can be no fundamental hypothesis of correlation, its discussion does not lie within the province of reason.

(A. Ma.)

PALMITIC ACID, *n*-Hexadecylic Acid, $CH_3(CH_2)_{14}CO_2H$, an organic acid found as a glyceride, palmitin, in all animal fats, and partly as glyceride and partly uncombined in palm oil. The cetyl ester is spermaceti, and the myricyl ester is largely present in beeswax. It is most conveniently obtained from olive oil, after removal of the oleic acid (*q.v.*), or from Japanese beeswax, which is its glyceride. Artificially it may be prepared by heating cetyl alcohol with soda lime to 270° or by fusing oleic acid with potassium hydrate.

PALM SUNDAY (*Dominica palmarum*), the Sunday before Easter, so called from the custom, still observed in the Roman Catholic Church, of blessing palm branches and carrying them in procession in commemoration of Christ's triumphal entry into Jerusalem. In the Western Church, Palm Sunday is counted as the first day of Holy Week, and its ceremonies usher in the series of services, culminating in those of Good Friday, which commemorate the Passion of the Lord.

The ceremonies on Palm Sunday as celebrated now in the Roman Catholic Church are divided in three distinct parts: (1) The solemn blessing of the palms, (2) the procession, (3) the mass.

Branches of palm, olive or sprouting willow (hence in England known as "palm") having been placed before the altar, or at the Epistle side, after Terce and the sprinkling of holy water, the priest, either in a purple cope or an alb without chasuble, proceeds to bless them. The ceremony begins with the singing by the choir of the anthem *Hosanna Filio David*; the collect follows; then the singing of a lesson from Exodus xv. by the subdeacon; then the Gradual, reciting antiphonally the conspiracy of the chief priests and Pharisees. and concluding with Christ's prayer on Mt Olivet; then the Gospel, sung by the deacon in the ordinary way, followed by a "continuation of the Holy Gospel" (Matt. xxi. and sqq.). After this the priest blesses the palms in a series of prayers, that those who receive them "may be protected in soul and body," and that "into whatever place they may be brought the inhabitants of that place may obtain Thy benediction: and all adversity being removed, &c." The priest then sprinkles the palms thrice with holy water, saying the prayer *Asperges me*, &c., and also incenses them thrice. The principal of the clergy present then approaches and gives a palm to the celebrant, who then, in his turn, distributes the branches, first to the principal of the clergy, then to the deacon and subdeacon, and to the other clergy in order of rank, and lastly to the laity, all of whom receive the palms kneeling, and kiss the palm and the hand of the celebrant. During the distribution antiphons are sung.

The deacon now turns to the people and says *Procedamus in pace*, and the procession begins. It is headed by a thurifer carrying a smoking thurible; then comes the sub-deacon carrying the cross between two acolytes with lighted tapers; the clergy next in order, the celebrant coming last with the deacon on his left, all carrying branches and singing antiphonally, so long as the procession lasts, the account of the entry into Jerusalem, ending with "*Benedictus qui venit in nomine Domini: Hosanna in excelsis.*" On returning to the church, two or four singers enter first and close the doors, then, turning towards the procession outside, sing the first two verses of the hymn "*Gloria, laus et honor*," those outside repeating them, and so on till the hymn is finished. This done, the subdeacon strikes the door with the staff of the cross, when it is immediately opened, and the procession enters singing. The mass that follows, characterized by all the outward signs of sorrow proper to Passion Week, is in striking contrast with the joyous triumph of the procession.

In the Orthodox Eastern Church Palm Sunday (*κυριακὴ* or *ἑορτὴ τῶν βαΐων, ἑορτὴ βαϊοφόρος*, or *ἡ βαϊοφόρος*) is not included in Holy Week, but is regarded as a joyous festival commemorating Christ's triumphal entry into Jerusalem. There is no longer a procession; but the palms (in Russia willow twigs) are blessed, and are held by the worshippers during the service.

The earliest extant account of a liturgical celebration of Palm Sunday is that given in the *Peregrinatio Silviae* (*Eleutheriae*),[1] which dates from the 4th century and contains a detailed account of the Holy Week ceremonies at Jerusalem by a Spanish lady of rank:—

> The actual festival began at one o'clock with a service in the church on the Mount of Olives; at three o'clock clergy and people went in procession, singing hymns, to the scene of the Ascension; two hours of prayer, singing and reading of appropriate Scriptures followed, until, at five o'clock the reading of the passage from the Gospel telling how "the children with olive branches and palms go to meet the Lord, and cry: 'Blessed is he that cometh in the name of the Lord'" gave the signal for the crowd to break up, and, carrying branches of olive and palm, to conduct the bishop, *in eo typo quo tunc Dominus deductus est*,[2] with cries of "Blessed is he that cometh in the name of the Lord!" to the Church of the Resurrection in Jerusalem, where a further service was held.

This celebration would seem to have been long established at Jerusalem, and there is evidence that in the 4th and 5th centuries it had already been copied in other parts of the East. In the West, however, it was not introduced until much later. To Pope Leo I. (d. 461) the present *Dominica palmarum* was known as *Dominica passionis*, Passion Sunday, and the Western Church treated it as a day, not of rejoicing, but of mourning. The earliest record in the West of the blessing of the palms and the subsequent procession is the *liber ordinum* of the West Gothic Church (published by Férotin, Paris, 1904, pp. 178 sqq.), which dates from the 6th century; this shows plainly that the ceremonial of the procession had been borrowed from Jerusalem. As to how far, and at what period, it became common there is very little evidence. For England, the earliest record is the mention by Aldhelm, bishop of Sherborne (d. 709), in his *De laudibus virginitatis* (cap. 30, Migne *Patrol. Lat.* 89, p. 128), of a *sacrosancta palmarum solemnitas*, which probably means a procession, since he speaks of the *Benedictus qui venit*, &c., being sung antiphonally. As the middle ages advanced the procession became more and more popular and increasingly a dramatic representation of the triumphal progress of Christ, the bishop riding on an ass or horse, as in the East.[3] Flowers, too, were blessed, as well as palms and willow, and carried in the procession (hence the names *pascha floridum*, *dominica florum et ramorum*, *les pâques fleuries*).

The origin of the ceremony of blessing the palms is more obscure. It is not essential to the dramatic character of the celebration and for centuries seems to have formed no usual part of it. Herr Drews (*Realencyklop.* XXI. p. 417, 40–60) ascribes to it an entirely separate and pagan origin. It is significant that olive and willow should have been chosen for benediction together with, or as substitutes for palm, and that an exorcizing power should have been ascribed to the consecrated branches: they were to heal disease, ward off devils, protect the houses where they were set up against lightning and fire, and the fields where they were planted against hail and storms. But healing power had been ascribed to the olive in pagan antiquity, and in the same way the willow had from time immemorial been credited by the Teutonic peoples with the possession of protective qualities. It was natural that olive and willow should have been chosen for the Palm Sunday ceremony, for they are the earliest trees to bud in the spring; their consecration, however, may be explained by the intention to Christianize a pagan belief, and it is easy to see how their mystic virtues came in this way to be ascribed to the palm also. When and where the custom first arose is unknown.

Of the reformed churches, the Church of England alone includes Palm Sunday in the Holy Week celebrations. The blessing of the palms and the procession were, however, abolished at the Reformation, and the name "Palm Sunday," though it survives in popular usage, is not mentioned in the Book of Common Prayer. The intention of the compilers of the Prayer-book seems to have been to restore the "Sunday next before Easter," as it is styled, to its earlier Western character of Passion Sunday, the second lesson at matins (Matt. xxvi. 5) and the special collect, Epistle (Phil. ii. 5) and Gospel (Matt. xxvii. 1) at the celebration of Holy Communion all dwelling on the humiliation and passion of Christ, with no reference to the triumphal entry into Jerusalem. The modern revival, in certain churches of an "advanced" type, of the ceremonies of blessing the palms and carrying them in procession has no official warrant, and is therefore without any significance as illustrating the authoritative point of view of the Church of England.

Of the Lutheran churches only that of Brandenburg seems to have kept the Palm Sunday procession for a while. This was prescribed by the Church order (*Kirchenordnung*) of 1540, but without the ceremony of blessing the palms; it was abolished by the revised Church order of 1572.

See the article "*Palmsonntag*" in Wetzer und Welte, *Kirchenlexikon* (2nd ed.), ix. 1319 sqq.; article "*Woche, grosse*," by Drews in Herzog-Hauck, *Realencyklopädie* (3rd ed., Leipzig, 1908), xxi. 415; Wiepen, *Palmsonntags prozessionen und Palmesel* (Bonn, 1903); L. Duchesne, *Origines du culte Chrétien* (2nd ed., Paris, 1898), p. 237. For ceremonies anciently observed in England on Palm Sunday see M. E. C. Walcott, *Sacred Archaeology* (1868) and J. Brand, *Popular antiquities* (ed. 1870).

PALMYRA, the Greek and Latin name of a famous city of the East, now a mere collection of Arab hovels, but still an object of interest on account of its wonderful ruins. In 2 Chron.

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[1] The text is published among the appendices to Duchesne's *Origines du culte Chrétien* (2nd ed., 1898), p. 486, "Procession du soir."

[2] Drews takes this to mean "riding on an ass."

[3] For curious instances of the part played by the ass in medieval church festivals see the article Fools, Feast of.

viii. 4, and in the native inscriptions, it is called Tadmor, and this is the name by which it is known among the Arabs at the present day (Tadmur, Tudmur).[1] The site of Palmyra lies 150 m. N.E. of Damascus and five days' camel journey from the Euphrates, in an oasis of the Syrian desert, 1,300 ft. above sea-level. At this point the great trade routes met in ancient times, the one crossing from the Phoenician ports to the Persian Gulf, the other coming up from Petra and south Arabia.

The earliest mention of Palmyra is in 2 Chron. viii. 4, where Solomon is said to have built "Tadmor in the wilderness"; 1 Kings ix. 18, however, from which the Chronicler derived his statement, reads "Tamar" in the Hebrew text, with "Tadmor" in the Hebrew margin; there can be no doubt that the text is right and refers to Tamar in the land of Judah (Ezek. xlvii. 19; xlviii. 28). The Chronicler, we must suppose, altered the name because Tadmor was a city more familiar and renowned in his day, or possibly because he wished to increase the extent of Solomon's kingdom. The date of the Chronicler may be placed about 300 B.C., so Palmyra must have been in existence long before then. There is reason to believe that before the 6th century B.C. the caravans reached Damascus without coming near the oasis of Tadmor; probably, therefore, we may connect the origin of the city with the gradual forward movement of the nomad Arabs which followed on the overthrow of the ancient nationalities of Syria by the Babylonian Empire (6th century B.C.). The Arabian tribes began to take possession of the partly cultivated lands east of Canaan, became masters of the Eastern trade, gradually acquired settled habits, and learned to speak and write in Aramaic, the language which was most widely current throughout the region west of the Euphrates in the time of the Persian Empire (6th–4th century B.C.). It is not till much later that Palmyra first appears in Western literature. We learn from Appian (*Bell. civ.* v. 9) that in 42–41 B.C. the city was rich enough to excite the cupidity of M. Antonius (Mark Antony), while the population was not too large to save itself by timely flight. The series of native inscriptions, written in Aramaic, begins a few years after; the earliest bears the date 304 of the Seleucid era, *i.e.* 9 B.C. (Cooke, *North-Semitic Inscriptions* No. 141 = Vogüé, [illegible] *Centrale* No. 30*a*); by this time Palmyra had become [illegible]rtant trade-post between the Roman and the Parthi[illegible] Its characteristic civilization grew out of a mixture of various elements, Arabic, Aramaic, Greek and Roman. The bulk of the population was of Arab race, and though Aramaic was used as the written language, in common intercourse Arabic had by no means disappeared. The proper names and the names of deities, while partly Aramaic, are also in part unmistakably Arabic: it is suggestive that a purely Arabic term (*fahd*, *NSI.* No. 136) was used for the septs into which the citizens were divided.

Originally an Arab settlement, the oasis was transformed in the course of time from a mere halting-place for caravans to a city of the first rank. The true Arab despises agriculture; but the pursuit of commerce, the organization and conduct of trading caravans, cannot be carried on without widespread connexions of blood and hospitality between the merchant and the leading sheiks on the route. An Arabian merchant city is thus necessarily aristocratic, and its chiefs can hardly be other than pure Arabs of good blood. Palmyra also possessed the character of a religious centre, with the worship of the Sun-god dominating that of inferior deities.

The chief luxuries of the ancient world, silks, jewels, pearls, perfumes, incense and the like, were drawn from India, China and southern Arabia. Pliny (*N. H.* xii. 41) reckons the yearly import of these wares into Rome at not less than three-quarters of a million of English money. The trade followed two routes: one by the Red Sea, Egypt and Alexandria, the other from the Persian Gulf through the Syro-Arabian desert. The latter, when the Nabataean kingdom of Petra (*q.v.*) came to an end (A.D. 105), passed into the hands of the Palmyrene merchants. Their caravans (συνοδίαι) travelled right across the desert to the great entrepôts on the Euphrates, Vologesias, about 55 m. south-east of Babylon, or Forath or Charax close to the Persian Gulf (*NSI.* Nos. 113–115). The trade was enormously profitable, not only to the merchants but to the town, which levied a rigorous duty on all exports and imports; at the same time formidable risks had to be faced both from the desert-tribes and from the Parthians, and successfully to plan or convoy a great caravan came to be looked upon as a distinguished service to the state, often recognized by public monuments erected by "council and people" or by the merchants interested in the venture. These monuments, a conspicuous feature of Palmyrene architecture, took the form of statues placed on brackets projecting from the upper part of the pillars which lined the principal thoroughfares. Thus arose, beside minor streets, the imposing central avenue which, starting from a triumphal arch near the great temple of the Sun, formed the main axis of the city from south-east to north-west for a length of 1240 yards, and at one time consisted of not less than 750 columns of rosy-white limestone, each 55 ft. high.

Local industries do not seem to have been important. One of the chief of them was the production of salt from the deposits of the desert;[2] another was no doubt the manufacture of leather; the inscriptions mention also a powerful gild of workers in gold and silver (*NSI.* No. 126); but Palmyra was not an industrial town, and the exacting fiscal system which drew profit even out of the bare necessaries of life—such as water, oil, wheat, salt, wine, straw, wool, skins (see *Tariff* ii. *b*, *NSI.* pp. 315 sqq.)—must have weighed heavily upon the artisan class. The prominent townsmen were engaged in the organization and even the personal conduct of caravans, the discharge of public offices such as those of *stratēgos*, secretary, guardian of the wells, president of the banquets of Bel, chief of the market (see *NSI.* Nos. 114, 115, 121, 122), sometimes the victualling of a Roman expedition. The capable performance of these functions, which often involved considerable pecuniary sacrifices, ensured public esteem, honorary inscriptions and statues; and to these honours the head of a great house was careful to add the glory of a splendid tomb, consecrated as the "long home" (lit. "house of eternity," cf. Eccles. xii. 5) of himself, his sons and his sons' sons for ever. These tombs, which lie outside the city and overlook it from the surrounding hills, a feature characteristically Arabic, remain the most interesting monuments of Palmyra. Some are lofty towers containing sepulchral chambers in stories;[3] others are house-like buildings with a single chamber and a richly ornamented portico; the sides of these chambers within are adorned with the names and sculptured portraits of the dead. As a rule the buildings of Palmyra do not possess any architectural individuality, but these tombs are an exception. The style of all the ruins is late classic and highly ornate, but without refinement.

The rise of Palmyra to a position of political importance may be dated from the time when the Romans established themselves on the Syrian coast. As early as the first imperial period the city must have admitted the suzerainty of Rome, for decrees respecting its custom-dues were issued by Germanicus (A.D. 17–19) and Cn. Domitius Corbulo (A.D. 57–66). At the same time the city had by no means surrendered its independence, for even in the days of Vespasian (A.D. 69–79) the distinctive position of Palmyra as an intermediate state between the two great powers of Rome and Parthia was recognized and carefully watched. The splendid period of Palmyra (A.D. 130–270), to which the greater part of the inscribed monuments belong, started from the overthrow of Petra (A.D. 105), which left Palmyra without a competitor for the Eastern trade. Hadrian treated the city with special favour, and on the occasion of his visit in A.D. 130, granted it the name of Hadriana Palmyra (הדרינא תדמר *NSI.* p. 322). Under the same emperor the customs were revised and a new tariff promulgated (April, A.D. 137), cancelling the loose system of taxation "by custom" which formerly had prevailed.[1] The great fiscal inscription, which still remains where it was set up, gives the fullest picture of the life and commerce of the city. The government was vested in the council (βουλή) and people (δῆμος), and administered by civil officers with Greek titles, the *proedros* (president), the *grammateus* (secretary), the archons, syndics and *dekaprōtoi* (a fiscal council of ten), following the model of a Greek municipality under the Roman Empire. At a later date, probably under Septimius Severus or Caracalla (beginning of 3rd century), Palmyra received the *Jus italicum* and the status of a colony; the executive officials of the council and people were called *stratēgoi*, equivalent to the Roman *duumviri* (*NSI.* Nos. 121, 127); and Palmyrenes who became Roman citizens began to take Roman names, usually Septimius or Julius Aurelius, in addition to their native names.

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[1] How the name Palmyra arose is obscure. The Greek for a *palm* is φοῖνιξ, and the Greek ending *-yra* could not have been affixed to the Latin *palma*. Schultens (*Vita Sal.*, Index geogr.) cites *Tatmur* as a variant of the Arabic name; this might mean "abounding in palms" (from the root *tamar*); otherwise Tadmor may have been originally an Assyrian name. See Lagarde, *Bildung der Nomina*, p. 125 *n*.

[2] "The soil of this marsh [east of Palmyra] is so impregnated with salt that a trench or pit sunk in it becomes filled in a short time with concentrated brine, the water of which evaporates in the intense sunshine and leaves an incrustation of excellent salt." Post, *Narrative of a Second Journey to Palmyra* in Pal. Expl. Fund's Qtly. St. (1892), p. 324.

[3] One of these tomb-towers, called Kasr eth-Thunīyeh, is 111 ft. high, 33½ ft. square at the base, 25 ft. 8 in. square above the basement; it contains six stories and places for 480 bodies. Opposite the entrance within is a hall with recesses for coffins and a richly panelled ceiling; underneath is an immense vault.

It was the Parthian wars of the 3rd century which brought Palmyra to the front, and for a brief period raised her to an almost dazzling position as mistress of the Roman East. A new career of ambition was opened to her citizens in the Roman honours that rewarded services to the imperial armies during their frequent expeditions in the East. One house which was thus distinguished had risen to a leading place in the city and before long played no small part in the world's history. Its members, as we learn from the inscriptions, prefixed to their Semitic names the Roman *gentilicium* of Septimius, which shows that they received the citizenship under Septimius Severus (A.D. 193–211), presumably in recognition of their services in connexion with his Parthian expedition. In the next generation Septimius Odainath or Odenathus, son of Hairan, had attained the rank of Roman senator (συγκλητικός, Vogüé No. 21, *NSI.* p. 285 *n.*). conferred no doubt when Alexander Severus visited Palmyra in A.D. 230–231; his son again, Septimius Hairan, seems to have been the first of the family to receive the title of Rās Tadmor ("chief of Tadmor") in addition to his Roman rank (*NSI.* No. 125); while his son—the relationship, though nowhere stated, is practically certain—the famous Septimius Odainath, commonly known as Odenathus (*q.v.*), the husband of Zenobia, received even higher rank, the consular dignity (ὑπατικός) which is given him in an inscription dated A.D. 258, in the reign of Valerian (*NSI.* No. 126). The East was then agitated by the advance of the Parthian Empire under the Sassanidae, and the Palmyrenes, in spite of their Roman honours and their Roman civilization, which did not really go much below the surface, were by no means prepared to commit themselves altogether to the Roman side.[2] But Parthian ambitions made it necessary for the Palmyrenes to choose one side or other, and their choice leaned towards Rome, both because they dreaded interference with their religious freedom and because the Roman emperor was further off than the Persian king. In the contests which followed there can be no doubt that the Palmyrene princes cherished the idea of an independent empire of their own, though they never threw over their allegiance to the Roman suzerain until the closing act of the drama. Their opportunity came with the disaster which befell the Roman army under Valerian (*q.v.*) at Edessa, a disaster, says Mommsen, which had nearly the same significance for the Roman East as the victory of the Goths at the mouth of the Danube and the fall of Decius; the emperor was captured (A.D. 260) and died in captivity. The Persians swept victoriously over Asia Minor and North Syria; not however without resistance on the part of Odenathus, who inflicted considerable losses on the bands returning home from the pillage of Antioch. It was probably not long after this that Odenathus, with a keen eye for his advantage, made an attempt to attach himself to Shapur I. (*q.v.*) the Persian king;[3] his gifts and letters, however, were contemptuously rejected, and from that time, as it seems, he threw himself warmly into the Roman cause. After the captivity and death of Valerian, Gallienus succeeded to a merely nominal rule in the East, and was too careless and self-indulgent to take any active measures to recover the lost provinces. Thereupon the two leading generals of the Roman army, Macrianus and Callistus, renounced their allegiance and proclaimed the two sons of the former as emperors (A.D. 261). During the crisis Odenathus remained loyal to Gallienus, and was rewarded for his fidelity by the grant of a position without parallel under ordinary circumstances; as hereditary prince of Palmyra he was appointed *dux Orientis*, a sort of vice-emperor for the East (A.D. 262). He started promptly upon the work of recovery. With his Palmyrene troops,[4] strengthened by what was left of the Roman army corps, he took the offensive against Shapur, defeated him at Ctesiphon, and in a series of brilliant engagements won back the East for Rome. During his absence at the wars, we learn from the inscriptions (A.D. 262–267) that Palmyra was administered by his deputy Septimius Worod, "procurator ducenarius of Caesar our lord," also styled "commandant," as being Odenathus' viceroy (ἀργαπέτης, *NSI.* Nos. 127–129). Then in the zenith of his success Odenathus was assassinated at Ḥomṣ (Emesa) along with his eldest son Herodes (A.D. 266–267). The fortunes of Palmyra now passed into the vigorous hands of ZENOBIA (*q.v.*), who had been actively supporting her husband in his policy. Zenobia seems to have ruled on behalf of her young son Wahab-allath or Athenodorus as the name is Graecized, who counts the years of his reign from the date of his father's death. Under Odenathus Palmyra had extended her sway over Syria and Arabia and perhaps also over Armenia, Cilicia and Cappadocia; but now the troops of Zenobia, numbering it is said 70,000, proceeded to occupy Egypt; the Romans under Probus resisted vigorously but without avail, and by the beginning of A.D. 270, when Aurelian succeeded Claudius as emperor, Wahab-allath was governing Egypt with the title of "king." His coins of 270 struck at Alexandria bear the legend *v(ir) c(onsularis) R(omanorum) im(perator) d(ux) R(omanorum)* and display his head beside that of Aurelian, but the latter alone is styled *Augustus.* Meanwhile the Palmyrenes were pushing their influence not only in Egypt but in Asia Minor; they contrived to establish garrisons as far west as Ancyra and even Chalcedon opposite Byzantium, while still professing to act under the terms of the joint rule conferred by Gallienus. Then in the course of the year A.D. 270–271 came the inevitable and open breach. In Palmyra Zenobia is still called "queen" (βασίλισσα, *NSI.* No. 131; cf. Wadd. 2628), but in distant quarters, such as Egypt, she and her son claim the dignity of Augustus;

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[1] The full text, both Greek and Palmyrene, with an English translation, is given in *NSI*, pp. 313–340. The tariff should be compared with the Greek Tariff of Coptos A.D. 90 (Flinders Petrie, *Koptos*, pp. 27 sqq.) and the Latin Tariff of Zarai (*Corp. inscr. lat.* viii. 4508).

[2] For the general history of the Period see PERSIA: *History*, A. § viii., "The Sassanian Empire."

[3] Petrus Patricius. *Fragm. hist. graec.* iv. 187.

[4] The Palmyrene archers were especially famous. Appian mentions them in connexion with M. Antony's raid in 41 B.C. (*Bell. civ.* v. 9). Later on a contingent served with the Roman army in Africa, Britain, Italy, Hungary, where grave-stones with Palmyrene and Latin inscriptions have been found; see Lidzbarski, *Nordsem. epigr.* p. 481 seq.; *Ephemeris*, ii. 92 (a Latin inscription of the time of Marcus Aurelius), and *NSI.* p. 312. The South Shields inscription, now in the Free Library of the town, was found in the neighbouring Roman camp; it is given in *NSI.* p. 250. The Palmyrene soldier who set it up was no doubt an archer. Jewish tradition had reason to remember these formidable Palmyrenes in the Roman armies; according to the Talmud 80,000 of them assisted at the destruction of the first temple, 8000 at that of the second! Talm. Jerus. *Taanith*, fol. 68 a, Midrash *Ekha*, ii. 2. For other references to Palmyra (called Tarmod) in the Talmud see Neubauer *Géogr. du Talm.* 301 sqq.

Wahab-allath (5th year) begins to issue coins at Alexandria without the head of Aurelian and bearing the imperial title; and Zenobia's coins bear the same. It was at this time (A.D. 271) that the two chief Palmyrene generals Zabdā and Zabbai, set up a statue to the deceased Odenathus and gave him the sounding designation of "king of kings and restorer of the whole city" (*NSI.* No. 130). These assumptions marked a definite rejection of all allegiance to Rome. Aurelian, the true Augustus, quickly grasped the situation, and took strenuous measures to deal with it. At the close of A.D. 270 Probus brought back Egypt into the empire, not without a considerable struggle; then in 271 Aurelian made preparations for a great campaign against the seat of the mischief itself. He approached by way of Cappadocia, where he reduced the Palmyrene garrisons, and thence through Cilicia he entered Syria. At Antioch the Palmyrene forces under Zabdā attempted to resist his advances, but they were compelled to fall back upon the great route which leads from Antioch through Emesa (mod. Ḥomṣ) to their native city. At Emesa the Palmyrenes were defeated in a stiffly contested battle. At length Aurelian arrived before the walls of Palmyra, which was captured probably in the spring of A.D. 272. In accordance with the judicious policy which he had observed in Asia Minor and at Antioch, he granted full pardon to the citizens; only the chief officials and advisers were put to death; Zenobia and her son were captured and reserved for his triumph when he returned to Rome. But the final stage in the conquest of the city was yet to come. A few months later, in the autumn of 272—the latest inscription is dated August 272 (Vogüé, No. 116)—the Palmyrenes revolted, killed the Roman garrison quartered in the city, and proclaimed one Antiochus as their chief. Aurelian heard of it just when he had crossed the Hellespont on his way home. He returned instantly before any one expected him, and took the city by surprise. Palmyra was destroyed and the population put to the sword. Aurelian restored the walls and the great Temple of the Sun (A.D. 273); but the city never recovered its splendour or importance.

Language.—The language spoken at Palmyra was a dialect of western Aramaic, and belongs to the same group as Nabataean and the Aramaic spoken in Egypt. In some important points, however, the dialect was related to the eastern Aramaic or Syrian (*e.g.* the plur. ending in *ē'*; the dropping of the final *ī* of the pronominal suffix third pers. sing. with nouns, and of the final *ū* of the third pers. pl. of the verb; the infin. ending *ū*, &c). But the relation to western Aramaic is closer; specially characteristic are the following features: the imperf. beginning with *y*, not as in Syriac and the eastern dialects with *n* or *l*; the plur. ending *-ayyā'*; the forms of the demonstrative pronouns, &c. As the bulk of the population was of Arab race, it is not surprising that many of the proper names are Arabic and that several Arabic words occur in the inscriptions. The technical terms of municipal government are mostly Greek, transliterated into Palmyrene; a few Latin words occur, of course in Aramaic forms. For further characteristics of the dialect see Nöldeke, *ZDMG.* xxiv. 85–109. The writing is a modified form of the old Aramaic character, and especially interesting because it represents almost the last stage through which the ancient alphabet passed before it developed into the Hebrew square character.

The names of the months were the same as those used by the Nabataeans, Syrians and later Jews, viz. the Babylonian. The calendar was the Syro-Macedonian, a solar, as distinct from the primitive lunar, calendar, which Roman influence disseminated throughout Syria; it was practically a reproduction of the Julian calendar. Dates were reckoned by the Seleucid era, which began in October 312 B.C.

Religion.—The religion of Palmyra did not differ in essentials from that of the north Syrians and the Arab tribes of the eastern desert. The chief god of the Palmyrenes was a solar deity, called Samas or Shamash ("sun"), or Bel, or Malak-bel,[1] whose great temple is still the most imposing feature among the ruins of Palmyra. Both Bel and Malak-bel were of Babylonian origin. Sometimes associated with the Sun-god was 'Agli-bol the Moon-god who is represented as a young Roman warrior with a large crescent attached to his shoulders (Rom. 1, and Vogüé pl. xii. No. 141). The great goddess of the Aramaeans, 'Athar-'atheh, in Greek Atargatis (*q.v.*), and Allath, the chief goddess of the ancient Arabs, were also worshipped at Palmyra. Another deity whose name occurs in votive inscriptions, is Baal-shamim, *i.e.* "B of the heavens," = Ζεὺς μέγιστος κεραύνιος, sometimes called "lord of eternity," but he was not included among the national gods of Palmyra, so far as we know, though he probably had a temple there. Another interesting divine name, lately discovered, is that of a distinctly Arabic deity "She'a-alqūm the good and bountiful god who does not drink wine" (*NSI.* No. 140 B); the name means "he who accompanies, the protector of, the people"—the divine patron of the caravan. A common formula in Palmyrene dedications runs "To him whose name is blessed for ever, the good and the compassionate"; out of reverence the name of the deity was not pronounced; was it Bel or Malak-bel? It is worth noticing that this epithet like "lord of eternity" (or, "of the world"), has a distinctly Jewish character. Altogether about 22 names of gods are found in Palmyrene; some of them, however, only occur in compound proper names.

After its overthrow by Aurelian, Palmyra was partially revived as a military station by Diocletian (end of 3rd century A.D.), as we learn from a Latin inscription found on the site. Before this time Christianity had made its way into the oasis, for among the fathers present at the Council of Nicaea (A.D. 325) was Marinus bishop of Palmyra. The names of two other bishops of the 5th and 6th centuries have come down to us. About A.D. 400, Palmyra was the station of the first Illyrian legion (*Not. dign.* i. 85, ed. Böcking); Justinian in 527 furnished it with an aqueduct, and built the wall of which the ruins still remain (Procopius, *De aedif*, ii. 11). At the Moslem conquest of Syria, Palmyra capitulated to Khālid (see CALIPHATE) without embracing Islam (Balādsorī [Balādhurī], 111 seq.; Yāqūṭ, i. 831). The town became a Moslem fortress and received a considerable Arab colony; for in the reign of Merwān II. (A.H. 127–132) it sent a thousand Kalbite horsemen to aid the revolt of Emesa, to the district of which it is reckoned by the Arabic geographers. The rebellion was sternly suppressed and the walls of the city destroyed (Ibn al-Athir, A.H. 127, ed. Tornberg V., 249; cf. *Frag. hist. ar.* 139, Ibn Wāḍih, ii. 230). In this connexion Yāqūṭ tells a curious story of the opening of one of the tombs by the caliph, which in spite of fabulous incidents, recalling the legend of Roderic the Goth, shows some traces of local knowledge. The ruins of Palmyra greatly interested the Arabs, and are commemorated in several poems quoted by Yāqūṭ and others; they are referred to by the early poet Nābigha as proofs of the might of Solomon and his sovereignty over their builders the Jinn (Derenbourg, *Journ. As.* xii. 269)—a legend which must have come from the Jews, who either clung to the ruins after the great overthrow or returned in the time of Diocletian. References to Palmyra in later times have been collected by Quatremère, *Sultans Mamlouks*, ii. pt. 1. p. 255 seq. All but annihilated by earthquake in the 11th century, it recovered considerable prosperity; when Benjamin of Tudela visited the city, which was still called Tadmor, he found 2000 Jews within the walls (12th century). It was still a wealthy place as late as the 14th century; but in the general decline of the East, and owing to changes in the trade routes, it sunk at length to a poor group of hovels gathered in the courtyard of the Temple of the Sun. The ruins first became known to Europe through the visit of Dr William Halifax of Aleppo in 1691; his *Relation of a voyage to Tadmor* has been printed from his autograph in the Pal. Explor. Fund's Quarterly Statement for 1890. Halifax not only took measurements, but copied 18 Greek and 4 Palmyrene texts. The architecture was carefully studied by Wood and Dawkins in 1751, whose splendid folio (*The Ruins of Palmyra*, London, 1753) also gave copies of inscriptions. But the epigraphic wealth of Palmyra was first opened to study by the collections of Waddington (vol. iii.) and De Vogüé (*La Syrie centrale*) made in 1861–1862. Since that time the most valuable document which has come to light is the great fiscal inscription discovered in 1882 by Prince Abamelek Lazarew.

See also A. D. Mordtmann, *Sitzungsb.* of the Munich Acad. (1875); Sachau, *ZDMG.* xxxv. 728 sqq.; D. H. Müller, *Palm. Inschr.* (1898); J. Mordtmann *Palmyrenisches* (1899); Clermont-Ganneau, *Études d'arch. or.* i., *Receuil. d'arch. or.* iii., v., vii.; Lidzbarski, *Ephemeris*, i. and ii.; Sobernheim, *Palm. Inschr.* (1905). The *Répertoire d'épigr. sém.* contains the new texts which have been published since 1900. For the coins von Sallet's *Fürsten von Palmyra* (1866) must be read with his later essay in the *Num. Zeitschr.* ii. 31 sqq. (1870). Critical discussions of the history will be found in Schiller, *Gesch. d. Römischen Kaiserzeit.*, i. 2 Teil (1883), pp. 823 sqq. and 857 sqq., and Mommsen, *Provinces of the Roman Empire*, (Eng. trans., 1886), pp. 92 sqq. (G. A. C.*)

PALNI HILLS, a range of hills in south India, in the Madura district of Madras. They are an offshoot from the Western Ghats, and, while distinct from the adjacent Anamalai Hills, form part of the same system. They contain the hill station of Kodaikanal (7200 ft.), which has a milder and more equable climate than Ootacamund in the Nilgiri Hills. There is some coffee cultivation on the lower slopes.

PALO ALTO, a city of Santa Clara county, California, U.S.A., between two of the coast ranges, about 28 m. S. of San Francisco, and about 18 m. from the sea. Pop. (1910) 4486. It is served by the coast division of the Southern Pacific railway, and is the railway station for Leland Stanford Jr. University (*q.v.*), which is about 1 m. south-west of the city. At Menlo Park is St Patrick's Theological Seminary (Roman Catholic). By all real estate deeds the sale of intoxicating liquors is for ever prohibited in the city; and an act of the state legislature in 1909 prohibited the sale of intoxicating liquor within 1½ m. of the grounds of the university. The name (Sp. "tall tree") was derived from a solitary redwood-tree standing in the outskirts of the city. Palo Alto was laid out in 1891, but had no real existence before 1893. It was incorporated as a town in 1894, having previously been a part of Mayfield township; in 1909 it was chartered as a city. Palo Alto suffered severely in the earthquake of 1906.

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[1] Transcribed Μαλαχβῆλος, Malagbelus, &c., and in the Palm. inscr. given in *NSI.*, p. 268, translated Sol sanctissimus; he was further identified with Ζεὺς. Malak-bel has been explained as "messenger of Bel"; but more probably *Malak* is the common Babylonian epithet *malik* given to various gods, and means "counsellor"; Malak-bel will then be the sun as the visible representative of Bel.

PALOMINO DE CASTRO Y VELASCO, ACISCLO ANTONIO (1653–1726), Spanish painter and writer on art, was born of good family at Bujalance, near Cordoba, in 1653, and studied philosophy, theology and law at that capital, receiving also lessons in painting from Valdes Leal, who visited Cordoba in 1672, and afterwards from Alfaro (1675). After taking minor orders he removed to Madrid in 1678, where he associated with Alfaro, Coello and Careño, and executed some indifferent frescoes. He soon afterwards married a lady of rank, and, having been appointed alcalde of the mesta, was himself ennobled; and in 1688 he was appointed painter to the king. He visited Valencia in 1697, and remained there three or four years, again devoting himself with but poor success to fresco painting. Between 1705 and 1715 he resided for considerable periods at Salamanca, Granada and Cordoba; in the latter year the first volume of his work on art appeared in Madrid. After the death of his wife in 1725 Palomino took priest's orders. He died on the 13th of August 1726.

His work, in 3 vols. folio (1715–1724), entitled *El Museo pictorico y escala optica*, consists of three parts, of which the first two, on the theory and practice of the art of painting, are without interest or value; the third, with the subtitle *El Parnaso español pintoresco laureado*, is a mine of important biographical material relating to Spanish artists, which, notwithstanding its faulty style, has procured for the author the not altogether undeserved honour of being called the "Spanish Vasari." It was partially translated into English in 1739; an abridgment of the original (*Las Vidas de los pintores y estatuarios españoles*) was published in London in 1742, and afterwards appeared in a French translation in 1749. A German version was published at Dresden in 1781, and a reprint of the entire work at Madrid in 1797.

PALTOCK, ROBERT (1697–1767), English writer, the only son of Thomas Paltock of St James's, Westminster, was born in 1697. He became an attorney and lived for some time in Clement's Inn, whence he removed, before 1759, to Back Lane, Lambeth. He married Anna Skinner, through whom his son, also named Robert, inherited a small property at Ryme Intrinseca, Dorset. There Robert Paltock, who died in London on the 20th of March 1767, was buried. Paltock owes his fame to his romantic *Life and Adventures of Peter Wilkins* (1751), which excited the admiration of men like Coleridge, Southey, Charles Lamb, Sir Walter Scott and Leigh Hunt. It has been several times reprinted, notably with an introduction by Mr A. H. Bullen in 1884. It was translated into French (1763) and into German (1767).

PALUDAN-MÜLLER, FREDERIK (1809–1876), Danish poet, was the third son of Jens Paludan-Müller, from 1830 to 1845 bishop of Aarhus, and born at Kjerteminde in Fünen, on the 7th of February 1809. In 1819 his father was transferred to Odense, and Frederik began to attend the Latin school there. In 1828 he passed to the university of Copenhagen. In 1832 he opened his poetical career with *Four Romances*, and a romantic comedy entitled *Kjærlighed ved hoffet* ("Love at Court"). This enjoyed a considerable success, and was succeeded in 1833 by *Dandserinden* ("The Dancing Girl"). Paludan-Müller was accepted by criticism without a struggle, and few writers have excited less hostility than he. He was not, however, well inspired in his lyrical drama of *Amor and Psyche* in 1834 nor in his Oriental tale of *Zuleimas flugt* ("Zuleima's Flight") in 1835, in each of which he was too vividly influenced by Byron. But he regained all that he had lost by his two volumes of poems in 1836 and 1838. From 1838 to 1840 Paludan-Müller was making the grand tour in Europe and his genius greatly expanded; in Italy he wrote *Venus*, a lyrical poem of extreme beauty. In the same year, 1841, he began to publish a great work on which he had long been engaged, and which he did not conclude until 1848; this was *Adam Homo*, a narrative epic, satirical, modern and descriptive, into which Paludan-Müller wove all his variegated impressions of Denmark and of love. This remains the typical classic of Danish poetical literature. In 1844 he composed three enchanting idylls, *Dryadens bryllup* ("The Dryad's Wedding") *Tithon* ("Tithonus") and *Abels död* ("The Death of Abel"). From 1850 a certain decline in the poet's physical energy became manifest and he wrote less. His majestic drama of *Kalanus* belongs to 1854. Then for seven years he kept silence. *Paradiset* ("Paradise") 1861; and *Benedikt fra Nurcia* ("Benedict of Nurcia") 1861; bear evidence of malady, both physical and mental. Paludan-Müller wrote considerably after this, but never recovered his early raptures, except in the very latest of all his poems, the enchanting welcome to death, entitled *Adonis*. The poet lived a very retired life, first in Copenhagen, then for many years in a cottage on the outskirts of the royal park of Fredensborg, and finally in a house in Ny Adelgade, Copenhagen, where he died on the 27th of December 1876. (E. G.)

PALWAL, a town of British India, in Gurgaon district, Punjab. Pop. (1901), 12,830. It is a place of great antiquity, supposed to figure in the earliest Aryan traditions under the name of Apelava, part of the Pandava kingdom of Indraprastha. Its importance is mainly historical, but it is a centre for the cotton trade of the neighbourhood, having a station on the Delhi-Agra branch of the Great Indian Peninsula railway.

PAMIERS, a town of south-western France, capital of an arrondissement in the department of Ariège, 40 m. S. by E. of Toulouse on the railway to Foix. Pop. (1906), town, 7728; commune, 10,449. Pamiers is the seat of a bishopric dating from the end of the 13th century. The cathedral (chiefly of the 17th century) with an octagonal Gothic tower, is a bizarre mixture of the Graeco-Roman and Gothic styles; the church of Notre-Dame du Camp (17th and 18th centuries) is noticeable for its crenelated and machicolated façade of the 14th century. Pamiers has a sub-prefecture, a tribunal of first instance, a communal college and a school of commerce and industry. Iron and steel of excellent quality, chains and carriage-springs are among its products. It has also tanneries and wool, flour, paper and saw mills, brickworks and lime-kilns, and commerce in grain, flour, fodder, fruit and vegetables. There are stone quarries and nursery gardens in the vicinity, and the white wine of the district is well known.

Pamiers was originally a castle built in the beginning of the 12th century by Roger II., count of Foix, on lands belonging to the abbey of St Antonin de Frédelas. The abbots of St Antonin, and afterwards the bishops, shared the authority over the town with the counts. This gave rise to numerous disputes between monks, counts, sovereigns, bishops and the consuls of the town. Pamiers was sacked by Jean de Foix in 1486, again during the religious wars, when the abbey of St Antonin was destroyed, and finally, in 1628, by Henry II. of Bourbon prince of Condé.

PAMIRS, a mountainous region of central Asia, lying on the north-west border of India. Since 1875 the Pamirs have probably been the best explored region in High Asia. Not only have many travellers of many nationalities directed their steps towards the Bam-i-dunya ("the Roof of the World") in search of adventure or of scientific information, but the government surveys of Russia and India have met in these high altitudes, and there effected a connexion which will help to solve many of the geodetic problems which beset the superficial survey of Asia. Since Wood first discovered a source of the Oxus in Lake Victoria in 1837, and left us a somewhat erroneous conception of the physiography of the Pamirs, the gradual approach of Russia from the north stimulated the processes of exploration from the side of India. Native explorers from India first began to be busy in the Pamirs about 1860, and continued their investigations for the following fifteen years. In 1874 the mission of Sir D. Forsyth to Yarkand led to the first systematic geographical exploitation of the Pamir country. In 1885 Ney Elias made his famous journey across the Pamirs from east to west, identifying the Rang Kul as the Dragon Lake of Chinese geographers—a distinction which has also been claimed by some geographers for Lake Victoria. Then Lockhart and Woodthorpe in 1886 passed along the Wakhan tributary of the Oxus from its head to Ishkashim in Badakshan, and completed an enduring record of most excellent geographical research. Bonvalot in 1887, Littledale in 1888, Cumberland, Bower and Dauvergne, followed by Younghusband in succeeding years, extending to 1890; Dunmore in 1892 and Sven Hedin in 1894–1895, have all contributed more or less to Pamir geography; but the honours of successful inquiry in those high altitudes still fall to Lord Curzon, whose researches in 1894 led to a singularly clear and comprehensive description of Pamir geography, as well as to the best map compilation that till then had existed. Meanwhile Russian explorers and Russian topographers had been equally busy from the north. The famous soldier Skobelev was probably the first European to visit the Great Kara Kul. He was followed by scientific missions systematically organized by the Russian government. In 1883 Putiata's mission started south. Gromchevsky was hard at work from 1888 to 1892. Yanov began again in 1891, after a short spell of rest, and has left his mark as a permanent record in the valley of Sarhad (or Wakhan), between the Baroghil pass and Bozai Gumbaz. Finally, in 1895, the Russian mission under General Shveikovsky met the British mission under General Gerard on the banks of Lake Victoria, and from that point to the Chinese frontier eastward demarcated the line which thereafter was to divide Russian from British interests in highest Asia. Since then other travellers have visited the Pamirs, but the junction of the Russian and British surveys (the latter based on triangulation carried across the Hindu Kush from India) disposes of any further claim to the honours of geographical exploration.

Pamir Conformation.

Our estimate of the extent of Pamir conformation depends much on the significance of the word Pamir. If we accept the Persian derivation of the term (which is advanced by Curzon as being perhaps the most plausible), *pai-mir*, or "the foot of mountain peaks," we have a definition which is by no means an inapt illustration of the actual facts of configuration. It has been too often assumed that the plateau of Tibet and the uplands of the Pamirs are analogous in physiography, and that they merge into each other. This is hardly the case. Littledale points out (*R. G. S. Journ.*, vol. vii.) that the high-level valleys of glacial formation which distinguish the Pamirs have no real counterpart in the Chang or plains of Tibet. The latter are 2000 ft. higher; they are intersected by narrow ranges, and are drained by no rivers of importance. They form a region of salt lakes and stagnant marshes, relieved by wide flat spaces of open plateau country. The absence of any vegetation beyond grass or scrub is a striking feature common to both Pamir and Chang. but there the resemblance ceases, and the physical conformation of mountain and valley to the east and to the west of the upper sources of the Zarafshan is radically distinct.

The Pamirs.

The axis, or backbone, of Pamir formation is the great meridional mountain chain of Sarikol—the ancient Taurus of tradition and history—on which stands the highest peak north of the Himalaya, the Muztagh Ata (25,000 ft.). This chain divides off the high-level sources of the Oxus on the west from the streams which sweep downwards into the Turkestan depression of Kashgar on the east. There are the true Pamirs (*i.e.* valleys reaching up in long slopes to the foot of mountain peaks) on either side, and the Pamirs on the west differ in some essential respects from those on the east. On the west the following are generally recognized as distinct Pamirs: (1) the Great Pamir, of which the dominant feature is Lake Victoria; (2) the Little Pamir, separated from the Great Pamir on the north by what is now known as the Nicolas range; (3) the Pamir-i-Wakhan, which is the narrow trough of the Wakhan tributary of the Oxus, the term Pamir applying to its upper reaches only; (4) the Alichur—the Pamir of the Yeshil Kul and Ghund—immediately to the north of the Great Pamir; (5) the Sarez Pamir, which forms the valley of the Murghab river, which has here found its way round the east of the Great Pamir and the Alichur from the Little Pamir, and now makes westwards for the Oxus. This branch was considered by many geographers as the main Oxus stream, and Lake Chakmaktin, at its head, was by them regarded as the Oxus source. At the foot of the Sarez Pamir stands the most advanced Russian outpost of Murghabi. To the north-east of the Alichur are the Rang Kul and the Kara Kul (or Kargosh) Pamirs. Rang Kul Lake occupies a central basin or depression; but the Kara Kul drains away north-eastwards through the Sarikol (as the latter, bending westwards, merges into the Trans-Alai) to Kashgar and the Turkestan plains. Similar characteristics distinguish all these Pamirs. They are hemmed in and separated by snow-capped mountain peaks and ridges, which are seamed with glaciers terminating in moraines and shingle slopes at the base of the foot-hills. Long sweeps of grassy upland bestrewn with boulders lead from the stream beds up to the snowfields, yellow, grey or vivid green, according to the season and the measure of sunlight, fold upon fold in interminable succession, their bleak monotony being only relieved by the grace of flowers for a short space during the summer months.

To the east of the Sarikol chain is the Taghdumbash Pamir, which claims many of the characteristics of the western Pamirs at its upper or western extremity, where the Karachukar, which drains it, is a comparatively small stream. But where the Karachukar, joining forces with the Khunjerab, stretches out northwards for a comparatively straight run to Tashkurghan, dividing asunder the two parallel ranges of Sarikol and Kandar, which together form the Sarikol chain, the appellation Pamir can hardly be maintained. This is the richest portion of the Sarikol province. Here are stone-built houses collected in scattered detachments, with a spread of cultivation reaching down to the river. Here are water-mills and many permanent appliances of civilization suited to the lower altitude (11,500 ft.; the average height of the upper Pamirs being about 13,000), and here we are no longer near the sources of the river at the foot of the mountain peaks. One other so-called Pamir exists to the east of Sarikol, separated therefrom by the eastern range (the Kandar) of the Sarikol, which is known as Màriom or Mariong. But this Pamir is situated nowhere near the sources of the Zarafshan or Raskam river, which it borders, and possesses little in common with the Pamirs of the west. The Mariom Pamir defines the western extremity of the Kuen Lun, which stretches eastwards for 250 m. before it becomes the political boundary of northern Tibet.

The Muztagh Chain and Karakoram Extension.

The Muztagh chain, which holds within its grasp the mightiest system of glaciers in the world, forms a junction with the Sarikol at the head of the Taghdumbash, where also another great system (that of the Hindu Kush) has its eastern roots. The political boundary between the extreme north of the Kashmir dependencies and the extreme south of Chinese Turkestan is carried by the Zarafshan or Raskam river which runs parallel to the Muztagh at its northern foot (its valley dividing the Muztagh from the Kuen Lun), to a point in about 79° 20′ E., where it is transferred to the watershed of the Kuen Lun. Within the limits of these partially explored highlands, lying between the Pamirs and the Tibetan table-land, exact geographical definition is impossible. But we may follow Godwin-Austen in accepting the main chain of the Muztagh as merging into the central mountain system of the Tibetan Chang, its axis being defined and divided by the transverse stream of the Shyok at its westward bend, whilst the Karakoram range, in which the Shyok rises, is a subsidiary northern branch. The pass over the Karakoram (18,500 ft.) is the most formidable obstacle on the main trade route between Leh and Kashgar.

The Taghdumbash Pamir.

The Taghdumbash Pamir occupies a geographical position of some political significance. One important pass (the Beyik, 15,100 ft.) leads from the Russian Pamirs into Sarikol across its northern border. A second pass (the Wakhjir, 16,150 ft.) connects the head of the Wakhan valley of Afghanistan with the Sarikol province across its western head, whilst a third (the Kilik, 15,600 ft.) leads into the head of the Hunza river and opens a difficult and dangerous route to Gilgit. The Taghdumbash is claimed both by China and Kanjut (or Hunza), and there is consequently an open boundary question at this corner of the Pamirs.

Boundary between Russia and Afghanistan.

From Lake Victoria of the Great Pamir the northern boundary of that extended strip of Afghanistan which reaches out to the head of the Taghdumbash from Badakshan north of the Hindu Kush is to be traced: westwards, in the Lake Victoria affluent of the Oxus; and eastwards, on the Nicolas range, dividing the Great and Little Pamirs, till it overlooks a point on the Aksu (or Murghab) river in about 74° 40′ E. Here it diverges southwards to the Sarikol chain, north of Taghdumbash. This eastward extension was laid down by the Pamir Boundary Commission of 1895. All the head of the Little Pamir, with the Wakhan valley, is consequently Afghan territory, but no military posts have been established so far. The Alichur, Rang Kul, Kargosh (Kara Kul) and Sarez are Russian Pamirs. The Mariom Pamir is Chinese.

Glacial Sources of the Oxus.

The Wakhan glaciers under the Wakhjir water-parting, Lake Chakmaktin near the sources of the Aksu, and Lake Victoria of the Great Pamir have all been claimed as indicating the true source of the Oxus. But detailed examination of their hydrographical conditions proves that neither of the two lakes, Victoria (13,400 ft.) or Chakmaktin (13,020 ft.), can justly be regarded as sources, both of them being derived from the same mighty system of glacial snowfields on the summit of the Nicolas range. Both may be regarded as incidents in the course of glacial streams (incidents which are diminishing in volume day by day), rather than original springs or sources. The same glacial beds of the Nicolas range send down tributary waters to the Panja or Wakhan river, below its junction with the ice stream from Wakhjir, and thus it becomes impossible to decide whether the glaciers of the Wakhjir or the glaciers of Nicolas should be regarded as effecting the most important contribution to the main stream. There is evidence also that glacial moraine formations from time to time may have largely affected the catchment area of these tributary streams. It would be as rash to assert that from Lake Victoria no waters could ever have issued with an eastward flow as it would be to state that from Chakmaktin none ever flow westwards. The measure of the veracity of Chinese pilgrims and geographers in the early centuries of our era must not be balanced on such points as these.

Population and Ethnography.

There is no evidence that the Pamirs were ever the support of permanent settlements. The few mud-built buildings which once existed at Chakmaktin and at Langar only decide recent occupation which could hardly have possessed a permanent character, and the few shrines and domed tombs which are scattered here and there about the empty desolation of the Pamir slopes are all of them of recent construction. The nomadic population which seeks pasturage during the summer months in these dreary altitudes is entirely Kirghiz, and we may take it for granted that it will soon be entirely Russian. The non-Russian population during the summer of 1895 could not have amounted to more than a few hundred souls—occupying a few encampments in the Little Pamir and in the Taghdumbash. The total population of the Russian Pamirs has been reckoned at 250 "kibitkas," or 1500 souls. There is no ethnographical distinction to be traced between the Kirghiz of the Alichur Pamir and the Kirghiz of the Taghdumbash.

Evidences of the Survival of Christian Symbols.

The Kirghiz are Sunni Mahommedans by faith, but amongst them there are curious survivals of an ancient ritual of which the origin is to be traced to those Nestorian Christian communities of Central Asia which existed in the middle ages. A Christian bishopric existed at Yarkand in Marco Polo's time, and is supposed to have survived for another century (1350). The last Gurkhan of the Kara Khitai Empire in the early part of the 13th century (the legendary Prester John) was a member of a Christian tribe called Naiman, which is one of the four chief tribal divisions mentioned by Ney Elias. The Naiman tribe claim kinship with the Kipchaks. It is curious that the same survival of Christian ceremonial should be found amongst the Sarikoli, a Shiah people of Aryan descent akin to the Tajiks of Badakshan, as may be traced amongst the Kirghiz. Christian symbols have been discovered in the southern towns of Chinese Turkestan by Sven Hedin.

Area of the Pamirs.

Trade Routes.

The total area of the Pamir country may be estimated as about 150 m. long by 150 m. broad, of which about one-tenth is grass pasture land and the rest mountainous. All of it once formed part of the ancient kingdom of Bolor, itself a survival of the yet more ancient empire of the Yue-chi, Tokharistan; and across it, in spite of its bleak inhospitality, there have been one or two recognized trade routes from east to west throughout all ages. The most important commercially was that which passed north-west via Tashkurghan and Rang Kul, from Chinese Turkestan to the khanates north of the Oxus; but the route via Tashkurghan and Lake Victoria to Badakshan was also well trodden. The great pilgrim route of Buddhist days was that which connects the ancient Buddhist cities of the Takla Makan in Chinese Turkestan with Chitral (Kashkar), by the Baroghil Pass across the Hindu Kush. This was but one link in a chain of devout peregrination which stretched from China to India, and which included every intervening Buddhist centre of note which existed in the early centuries of our era.

Climate of the Pamirs.

For six or seven months of the year (November to April) the Pamirs are covered with snow, the lakes are frozen, and the passes nearly impracticable. The mean temperature during the month of January recorded by Russian observers at the Murghabi—or Pamirski—post is −13° F. In July this rises to 62° F., the elevation of the station being 12,150 ft. During the spring and summer months the prevalence of fierce cutting winds, which are shaped by the conformation of the valleys into blasts as through a funnel, following the strike of the valleys either up or down, makes travelling painful and existence in camp most unpleasant. In the absence of wind the summer atmosphere is often bright and exhilarating, but there is a constant tendency to sudden squalls of wind and rain, which pass as quickly as they gather. The most settled record of the Pamir Boundary Commission of 1895 lasted from the 19th of August to the 11th of September, the maximum temperature being recorded at 77° on the 21st of August at Kizil Rabat (12,570 ft.); and yet on the 16th of August snow had fallen to the depth of 6 in. and the Beyik Pass was blocked. There were indications that monsoon influences extended as far north at least as the Great Pamir, and a definite analogy was established between the record of barometric pressure on the Pamirs and that of the outer ranges of the Himalaya.

AUTHORITIES.—Captain J. Wood, *A Journey to the Source of the Oxus* (new ed., London, 1872), *Report of the Forsyth Mission* (Calcutta, 1875); Colonel T. E. Gordon, *The Roof of the World* (London, 1876); Pitman (trans.), *Through the Heart of Asia* (London, 1889); Earl of Dunmore, *The Pamirs* (London, 1893); Major Cumberland, *Sport on the Pamirs* (London, 1895); Hon. G. N. Curzon, "The Pamirs and the Source of the Oxus," *R. G. S. Journ.*, vol. viii.; *Report of the Proceedings of the Pamir Boundary Commission* (Calcutta, 1897). (T. H. H.*)

PAMPA, LA, a territory of the southern pampa region of Argentina, bounded N. by Mendoza, San Luis and Cordoba, E. by Buenos Aires, S. by the territory of Rio Negro, from which it is separated by the river Colorado, and W. by Mendoza. Pop. (1904, official estimate), 52,150. It belongs geographically to the southern part of the great Argentine pampas, from which its name is derived, but in reality only a part of its surface belongs to the plain region. The western and southern part (perhaps the larger) is much broken by hills, swamps and sandy wastes, with occasional stretches of wooded country. The western half is crossed by a broad depression, extending from Mendoza south-east to an intersection with the valley of the Colorado, which was once the outlet of the closed drainage basin occupied by the provinces of Mendoza, San Juan and San Luis. This depression is partially filled with swamps and lakes, into which flow the rivers Atuel and Salado. An obscure continuation of these rivers, called the Chadi-leubu, flows south-east from the great swamps into the large lake of Urrelauquen, about 60 m. north of the Colorado. There are a great number of lakes in La Pampa, especially in the south-east. The eastern half is described as fertile and well adapted for grazing, although the rainfall is very light. Since the closing years of the 19th century there has been a large emigration of stock-raisers and agriculturists into La Pampa, and the territory has become an important producer of cattle and sheep, wheat, Indian corn, linseed, barley and alfalfa. The climate is excessively dry, and the temperature ranges from the severe frosts of winter to an extreme of 104° F. in summer. Strong, constant winds are characteristic of this region. Railways have been extended into the territory from Buenos Aires and Bahia Blanca, the latter being the nearest seaport. There is connexion also with the Transandine railway line on the north. The capital is General Acha (pop. about 2000 in 1905), and the only other places of importance are Santa Rosa de Toay and Victoríca, both small, uninteresting "camp" villages.

PAMPAS (Span. *La Pampa*, from a Quichua word signifying a level open space or terrace), an extensive plain of Argentina, extending from the Rio Colorado north to the Gran Chaco, and from the foothills of the Andes east to the Paraná and Atlantic coast.[1] It consists of a great calcareo-argillaceous sheet, once the bed of an ancient sea, covered on the west by shingle and sand, and on the east by deposits of estuary silt of irregular thickness brought down from the northern highlands. Its western and northern limits, formed by the foothills and talus slopes of the Andes, and by the south of the great forested depression of the Gran Chaco, cannot be accurately defined, but its area is estimated at 200,000 to 300,000 sq. m. Its greatest breadth is across the south, between the 36th and 37th parallels, and its least in the north, where the eastern ranges of the Andes project deeply into its north-western angle. Its surface is broken in the north-west by the *sierras* of Tucuman, Catamarca, San Luis and Cordoba, the latter rising from the midst of the plain, and by some small isolated *sierras* and hills on the south. It has a gradual slope from north-west to south-east, from an elevation above sea-level of 2320 ft. at Mendoza to 20 ft. at Buenos Aires on the La Plata—the distance across (between Mendoza and Buenos Aires) being about 635 m. There are other slight irregularities in its surface, such as the longitudinal depression on the west, the saline, arid depression west of the Cordoba *sierras*, the Mar de Chiquita depression N.E. of Cordoba, and some smaller areas elsewhere. Apart from these the plain appears perfectly level. The east, which is humid, fertile and grassy, has no natural arboreal growth, except in the vicinity of Cordoba and in the north, where algarrobas and some of the Chaco species are to be found. In the extreme south some species of low, thorny bushes cover considerable areas in the vicinity of the hill-ranges, otherwise the plain is destitute of native trees. Since the arrival of Europeans several species have been introduced successfully, such as the eucalyptus, poplar, *paraiso* (*Melia Azedarach*), peach, willow, *ombú* (*Pircunia*) and others.

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[1] There are other pampas in South America, such as the Pampas de Aullagas, in Bolivia, the Pampas del Sacramento between the Huallaga and Ucayali rivers in eastern Peru, and others less well known, but when the word Pampas is used alone the great Argentine plain is meant.

The distinctive vegetation of the grassy pampas is the tall, coarse-leaved "pampas grass" (*Gynerium argenteum*) whose feathery spikes often reach a height of eight or nine feet. It covers large areas to the exclusion of all other species except the trefoils and herbs that grow between its tussocks. The natural grasses of the pampas are popularly divided into *pasta dura* (hard pasturage), which includes the large, tussock-forming species, and *pasta molle* (soft pasturage), the tender undergrowth. Since the advent of Europeans other forage plants have been introduced, the most successful and profitable being alfalfa or lucerne (*Medicago sativa*), which is widely cultivated both for hay and for green pasturage for the fattening of market stock.

West of this region is a dry, sandy, semi-barren plain, called the "sterile pampas." It has large saline areas, brackish streams and lakes, and immense sandy deserts, and in singular contrast to the fertile, treeless region of the east it supports large areas of stunted trees and thorny bushes. Most prominent in this hardy but unattractive growth is the "chañar" (*Gurliaca* or *Gourliaca decorticans*), which is characteristic of the whole area, and led Professor Griesbach to suggest the substitution of "formacion del chañar" for "formacion del monte," the designation adopted by botanists for this particular region. The chañar is thorny and of low, irregular growth, and furnishes a strong durable wood and a sweet fruit.

The grassy plains are well watered by streams flowing to the Paraná, La Plata and coast, though some of these are brackish. There are large saline areas in northern Santa Fé, Santiago del Estero and Cordoba provinces, and throughout the greater part of the pampean plain wells cannot be sunk lower than 18 or 20 ft. without encountering brackish water. On the sterile pampas these conditions are still more common, the drainage southward through the Desaguadero and Salado being charged with saline matter. There are many saline lakes scattered over the pampas, the largest being the Mar de Chiquita, and Lake Porongos in Cordoba, the great swamps and lagoon on the lower Salado in Mendoza, and Lake Bebedero in San Juan.

The fauna of the pampas is limited to comparatively few species, all of which are found beyond its limits, also. These include the vizcacha (*Lagostomus trichodactylus*), Patagonian hare (*Dolichotis patagonica*), coypú (*Myopotamus coypú*), cui (*Cavia australis*), tucotuco (*Ctenomys magellanica*), jaguar (*Felis onça*), puma (*Felis concolor*), grass-cat (resembling *Felis catus*), wood-cat (*Felis geoffroyi*), a fox-like dog (*Felis pajeros*, Azara), aguará (akin to *Canis jubatus*), skunk, weasel (*Galictis barbara*), deer (*Cervus campestris*), four species of armadillo, and two of the opossum. Hudson considers the burrowing vizcacha, or biscacha, the most characteristic denizen of the pampas, though the large yellow opossum (*Didelphys crassicaudata*) seems to be singularly adapted to life on the level grassy plain. The avifauna is apparently richer, owing to migration. Hudson enumerates 18 species of storks, ibises, herons, spoon-bills and flamingoes, 20 species of ducks, geese and swans, 10 or 12 of the rallines, including the graceful ypicaha or dancing bird, and 25 of the Limicolae (13 of which are visitors from North America). Land birds are not numerous. Vultures and hawks are common, and there are a few owls, the best known of which is the "minera" (*Geositta cunicularia*), which inhabits the burrow of the vizcacha. Among other species of land birds, some 40 in number, are the military starling (*Sturnella*), whose red breast makes it a conspicuous object on the pampas, the white-banded mocking-bird, the *chakar* or "crested screamer" (*Chauna chavarria*), the tinamou, and the *rhea*, or South American ostrich. There are two species of the *tinamou*—the rufous and spotted—which are called partridges and are often hunted with snares by horsemen. The rhea, once very numerous, is now found farther inland than formerly, and is steadily diminishing in number.

Civilized occupation is working many changes in the character and appearance of the pampas. The first change was in the introduction of cattle and horses. Cattle were pastured on the open pampas and were guarded by men called *gauchos* or *mestizos*, who became celebrated for their horsemanship, their hardihood and their lawlessness. Attention was then turned to sheep-breeding, which developed another and better type of plainsmen—the Irish and Scotch shepherds. Then followed the extensive cultivation of cereals, forage crops, &c., which led to the general use of fences, the employment of immigrant labourers, largely Italian and Spanish, the building of railways and the growth of "camp" towns. The picturesque gaucho is slowly disappearing in the eastern provinces, and the herds and flocks are being driven farther inland. The rural population of the pampas is still sparse and the estancias are very large.

See W. H. Hudson, *The Naturalist in La Plata* (London, 1895); Charles Darwin, *Voyage of the Beagle* (London, 1839 and 1889); and Richardo Napp, *La republica argentina* (Buenos Aires, 1876; also in German).

PAMPERO, the cold south-west wind which blows over the great plains of southern Argentina. The term is somewhat loosely applied to any strong south-west wind in that region, but more strictly to a rain squall or thunderstorm arising suddenly in the prevailing currents from north and north-east. Pamperos are experienced at Buenos Aires on an average about a dozen times in the year, chiefly during October, November and January.

PAMPHILUS (1st century A.D.), a Greek grammarian, of the school of Aristarchus. He was the author of a comprehensive lexicon, in 95 books, of foreign or obscure words (γλῶτται ἤτοι λέξεις), the idea of which was credited to another grammarian, Zopyrion, himself the compiler of the first four books. The work itself is lost, but an epitome by Diogenianus (2nd century) formed the basis of the lexicon of Hesychius. A similar compilation, called Λειμών ("meadow"; cf. the *Prata* of Suetonius) from its varied contents, dealing chiefly with mythological marvels, was probably a supplement to the lexicon, although some scholars identify them. Pamphilus was one of the chief authorities used by Athenaeus in the *Deipnosophists*. Suidas assigns to another Pamphilus, simply described as "a philosopher," a number of works, some of which were probably by Pamphilus the grammarian.

See G. Thilo in Ersch and Gruber's *Allgemeine Encyclopädie*, M. Schmidt, appendix to his edition of Hesychius, (1862) vol. iv.; A. Westermann in Pauly's *Real-encyclopädie* (1848).

PAMPHILUS, an eminent promoter of learning in the early church, is said to have been born, of good family, in Phoenicia (Berytus?) in the latter half of the 3rd century. After studying at Alexandria under Pierius, the disciple of Origen, he was ordained presbyter at Caesarea in Palestine. There he established a theological school, and warmly encouraged students; he also founded, or at least largely extended, the great library to which Eusebius and Jerome were afterwards so much indebted. He was very zealous in the transcription and distribution of copies of Scripture and of the works of various Christian writers, especially of Origen; the copy of the complete works of the last-named in the library of Caesarea was chiefly in the handwriting of Pamphilus himself. At the outbreak of the persecution under Maximin, Pamphilus was thrown into prison (A.D. 307) and there, along with his attached friend and pupil Eusebius (sometimes distinguished as Eusebius Pamphili), he composed an *Apology for Origen*, in five books, to which a sixth was afterwards added by Eusebius. He was put to death in 309 by Firmilian, prefect of Caesarea.

Only the first book of the *Apology* of Pamphilus is extant, and that but in an imperfect Latin translation by Rufinus. It is printed in Lommatzsch's edition of Origen, vol. xxiv., and in Routh, *Rel. sac.* iv. 339 (cf. iii. 487,500, fragments). Photius (Codex 118) gives a short survey of the whole. Jerome mentions *Letters* to friends, and there may have been other works. Eusebius' memoir of Pamphilus has not survived. See E. Preuschen in Herzog-Hauck's *Realencyklopädie*, and A. Harnack, *Altchristl. Litteraturgesch.* I. 543.

PAMPHILUS, a Greek painter of the 4th century, of the school of Sicyon. He was an academic artist, noted for accurate drawing, and obtained such a reputation that not only could he charge his pupils great sums, but he was also successful in introducing drawing in Greece as a necessary part of liberal education.

PAMPHLETS. The earliest appearance of the word is in the *Philobiblon* (1344) of Richard de Bury, who speaks of "panfletos exiguos" (ch. viii.). In English we have "this leud pamflet" (*Test. of Love*, bk. iii.), Occleve's "Though that this pamfilet" (*Reg. of Pr.* 2060), Lydgate's "Whiche is a paunflet" (*Minor Poems*, 180) and Caxton's "paunflettis and bookys" (*Book of Eneydos*, 1490, Prologue). In all these examples pamphlet is used to indicate the extent of the production, and in contradistinction to book. A short codicil in a will of 1495 is called "this pampelet" (*Test. Ebor.* iv. 26). In the 17th century the word was used for single plays, poems, newspapers and news letters (Murray's *New English Dict.* vii. 410).

Not till the 18th century did pamphlet begin to assume its modern meaning of prose controversial tract. "Pamphlet" and "pamphlétaire" are of comparatively recent introduction into French from the English, and generally indicate fugitive criticism of a more severe, not to say libellous, character than with us. The derivation of the word is a subject of contention among etymologists. The supposed origin from the amatory poem of "Pamphilus," and a certain Pamphila, an author of the 1st century, may be dismissed as fanciful. The experts are also undecided as to what is actually understood by a pamphlet. Some bibliographers apply the term to everything, except periodicals, of quarto size and under, if not more than fifty pages, while others would limit its application to two or three sheets of printed matter which have first appeared in an unbound condition. These are merely physical peculiarities, and include academical dissertations, chap-books and broadsides, which from their special subjects belong to a separate class from the pamphlet proper. As regards its literary characteristics, the chief notes of a pamphlet are brevity and spontaneity. It has a distinct aim, and relates to some matter of current interest, whether personal, religious, political or literary. Usually intended to support a particular line of argument, it may be descriptive, controversial, didactic or satirical. It is not so much a class, as a form of literature, and from its ephemeral character represents the changeful currents of public opinion more closely than the bulky volume published after the formation of that opinion. The history of pamphlets being the entire record of popular feeling, all that is necessary here is to briefly indicate the chief families of political and religious pamphlets which have exercised marked influence, and more particularly in those countries—England and France—where pamphlets have made so large a figure in influencing thoughts and events. It is difficult to point out much in ancient literature which precisely answers to our modern view of the pamphlet. The *libelli famosi* of the Romans were simply abusive pasquinades. Some of the small treatises of Lucian, the lost *Anti-Cato* of Caesar, Seneca's *Apocolocyntosis* written against Claudius, Julian's Καίσαρες ἢ συμπόσιον and Ἀντιοχικὸς ἢ μισοπώγων, from their general application, just escape the charge of being mere satires, and may therefore claim to rank as early specimens of the pamphlet.

At the end of the 14th century the Lollard doctrines were widely circulated by means of the tracts and leaflets of Wyclif and his followers. The *Ploughman's Prayer* and *Lanthorne of Light*, which appeared about the time of Oldcastle's martyrdom, were extremely popular, and similar brief vernacular pieces became so common that it was thought necessary in 1418 to enact that persons in authority should search out and apprehend all persons owning English books. The printers of the 15th century produced many controversial tractates, and Caxton and Wynkin de Worde printed in the lesser form. It was in France that the printing-press first began to supply reading for the common people. During the last twenty years of the 15th century there arose an extensive popular literature of farces, tales in verse and prose, satires, almanacs, &c., extending to a few leaves apiece, and circulated by the itinerant booksellers still known as colporteurs. These folk-books soon spread from France to Italy and Spain, and were introduced into England at the beginning of the 16th century, doubtless from the same quarter, as most of our early chap-books are translations or adaptations from the French. Another form of literature even more transient was the broadside, or single sheet printed on one side only, which appears to have flourished principally in England, but which had been in use from the first invention of printing for papal indulgences, royal proclamations and similar documents. Throughout western Europe, about the middle of the 16th century, the broadside made a considerable figure in times of political agitation. In England it was chiefly used for ballads, which soon became so extremely popular that during the first ten years of the reign of Elizabeth the names of no less than forty ballad printers appear in the Stationers' registers.

The humanist movement at the beginning of the 16th century produced the famous *Epistolae obscurorum virorum*, and the leading spirits of the Reformation period—Erasmus, Hutten, Luther, Melanchthon, Francowitz, Vergerio, Curio and Calvin—found in tracts a ready method of widely circulating their opinions. The course of ecclesiastical events was precipitated in England by the *Supplicacyon for the Beggars* (1528) of Simon Fish, answered by Sir Thomas More's *Supplycacion of Poor Soulys*. In the time of Edward VI. brief tracts were largely used as a propagandist instrument in favour of the Reformed religion. The licensing of the press by Mary greatly hindered the production of this kind of literature. From about 1570 there came an unceasing flow of Puritan pamphlets, of which more than forty were reprinted under the title of *A parte of a register* (London, Waldegrave, 4to). In 1584 was published a tract entitled *A briefe and plaine Declaration concerning the desires of all those faithful ministers that have and do seeke for the discipline and reformation of the Church of Englande*, believed to have been written by W. Fulke D.D. Against this John Bridges, dean of Sarum, preached at Paul's Cross, and expanded his sermon into what he called *A defence of the government established in the church of England* (1587), which gave rise to *Oh read over D. John Bridges . . . . Printed at the cost and charges of M. Marprelate gentleman* (1588), which first gave the name to the famous Martin Marprelate tracts, whose titles sufficiently indicate their opposition to priestly orders and episcopacy. Bishop Cooper's *Admonition to the People of England* (1589) came next, followed on the other side by *Hay any worke for Cooper . . . by Martin the Metropolitane*, and by others from both parties to the number of about thirty-two. The controversy lasted ten years, and ended in the discomfiture of the Puritans and the seizure of their secret press. The writers on the Marprelate side are generally supposed to have been Penry, Throgmorton, Udal and Fenner, and their opponents Bishop Cooper, John Lilly and Nash.

As early as the middle of the 16th century we find ballads of news; and in the reigns of Elizabeth and James I. small pamphlets, translated from the German and French, and known as "newsbooks," were circulated by the so-called "Mercury-women." These were the immediate predecessors of weekly newspapers, and continued to the end of the 17th century. A proclamation was issued by Charles II., on the 12th of May 1680, "for suppressing the printing and publishing of unlicensed news-books and pamphlets of news."

In the 17th century pamphlets began to contribute more than ever to the formation of public opinion. Nearly one hundred were written by or about the restless John Lilburne, but still more numerous were those of the undaunted Prynne, who himself published above one hundred and sixty, besides many weighty folios and quartos. Charles I. found energetic supporters in Peter Heylin and Sir Roger L'Estrange, the latter noted for the coarseness of his pen. The most distinguished pamphleteer of the period was John Milton, who began his career in this direction by five anti-episcopal tracts (1641–1642) during the Smectymnuus quarrel. In 1643 his wife's desertion caused him to publish anonymously *Doctrine and discipline of divorce*, followed by several others on the same subject. He printed *Of Education; to Mr. Samuel Hartlib* in 1644, and, unlicensed and unregistered, his famous *Areopagitica—a speech for the liberty of unlicensed printing.* He defended the trial and execution of the king in *Tenure of kings and magistrates* (1648). The *Eikon Basilike* dispute was conducted with more ponderous weapons than the kind we are now discussing. When Monk held supreme power Milton addressed to him *The present means of a free commonwealth* and *Readie and easie way* (1660), both pleading for a commonwealth in preference to a monarchy. John Goodwin, the author of *Obstructors of Justice* (1649), John Phillipps, the nephew of Milton, and Abiezer Coppe were violent and prolific partisan writers, the last-named specially known for his extreme Presbyterian principles. The tract *Killing no murder* (1657), aimed at Cromwell, and attributed to Colonel Titus or Colonel Sexby, excited more attention than any other political effusion of the time. The history of the Civil War period is told day by day in the well-known collection made by George Thomason the bookseller, now preserved in the British Museum. It includes pamphlets, books, newspapers and MSS. relating to the Civil War, the Commonwealth and Restoration, and numbers 22,255 pieces ranging from 1640 to 1661, and is bound in 2008 volumes. Each article was dated by Thomason at the time of acquisition. William Miller was another bookseller famous for his collection of pamphlets (1600–1710), which were catalogued by Tooker. William Laycock printed a *Proposal for raising a fund* for buying them up for the nation.

The Catholic controversy during the reign of James II. gave rise to a multitude of books and pamphlets, which have been described by Peck (*Catalogue*, 1735) and by Jones (*Catalogue*, Chetham Society, 2 vols., 1859–1865). Politics were naturally the chief feature of the floating literature connected with the Revolution of 1688. The political tracts of Lord Halifax are interesting both in matter and manner. He wrote *The character of a trimmer* (1688), circulated in MS. as early as 1685. About the middle of the reign Defoe was introduced to William III., and produced the first of his pamphlets on occasional conformity. He issued in 1697 his two defences of standing armies in support of the government, and published sets of tracts on the partition treaty, the union with Scotland, and many other subjects. His *Shortest Way with the Dissenters* (1702) placed him in the pillory.

Under Queen Anne pamphlets arrived at a remarkable degree of importance. Never before or since has this method of publication been used by such masters of thought and language. Political writing of any degree of authority was almost entirely confined to pamphlets. If the Whigs were able to command the services of Addison and Steele, the Tories fought with the terrible pen of Swift. Second in power if not in literary ability were Bolingbroke, Somers, Atterbury, Prior and Pulteney. The government viewed with a jealous eye the free use of this powerful instrument, and St John seized upon fourteen booksellers and publishers in one day for "libels" upon the administration (see *Annals of Queen Anne*, Oct. 23, 1711). In 1712 a duty was laid upon newspapers and pamphlets, displeasing all parties, and soon falling into disuse. Bishop Hoadly's sermon on the kingdom of Christ (1717), denying that there was any such thing as a visible Church of Christ, occasioned the Bangorian controversy, which produced nearly two hundred pamphlets. Soon after this period party-writing declined from its comparatively high standard and fell into meaner and venal hands. Under George III. Bute took Dr Shebbeare from Newgate in order to employ his pen. The court party received the support of a few able pamphlets, among which may be mentioned *The consideration of the German War* against the policy of Pitt, and *The prerogative droit de Roy* (1764) vindicating the prerogative. We must not forget that although Samuel Johnson was a pensioned scribe he has for an excuse that his political tracts are his worst performances. Edmund Burke, on the other hand, has produced in this form some of his most valued writings. The troubles in America and the union between Ireland and Great Britain are subjects which are abundantly illustrated in pamphlet literature.

Early in the 19th century the rise of the quarterly reviews threw open a new channel of publicity to those who had previously used pamphlets to spread their opinions, and later on the rapid growth of monthly magazines and weekly reviews afforded controversialists a much more certain and extensive circulation than they could ensure by an isolated publication. Although pamphlets are no longer the sole or most important factor of public opinion, the minor literature of great events is never likely to be entirely confined to periodicals. The following topics, which might be largely increased in number, have each been discussed by a multitude of pamphlets, most of which, however, are likely to have been hopeless aspirants for a more certain means of preservation: the Bullion Question (1810), the Poor Laws (1828–1834), *Tracts for the Times* and the ensuing controversy (1833–1845), Dr Hampden (1836), the Canadian Revolt (1837–1838), the Corn Laws (1841–1848), Gorham Controversy (1849–1850), Crimean War and Indian Mutiny (1854–1859), Schleswig-Holstein (1863–1864), Ireland (1868–1869), the Franco-German War, with *Dame Europa's School* and its imitators (1870–1871), Vaticanism, occasioned by Mr Gladstone's *Vatican Decrees* (1874), the Eastern Question (1877–1880), the Irish Land Laws (1880–1882), Ireland and Home Rule (1885–1886), South African War (1899–1902) and Tariff Reform (1903).

France.—The activity of the French press in putting forth small tracts in favour of the Reformed religion caused the Sorbonne in 1523 to petition the king to abolish the diabolical art of printing. Even one or two sheets of printed matter were found too cumbersome, and single leaves or placards were issued in such numbers that they were the subject of a special edict on the 28th of September 1553. An *ordonnance* of February 1566 was specially directed against libellous pamphlets and those who wrote, printed or even possessed them. The rivalry between Francis I. and Charles V. gave rise to many political pamphlets, and under Francis II. the Guises were attacked by similar means. Fr. Hotman directed his *Epistre envoiée au tygre de France* against the Cardinal de Lorraine. The Valois and Henry III. in particular were severely handled in *Les Hermaphrodites* (*c.* 1605), which was followed by a long series of imitations. Between Francis I. and Charles IX. the general tone of the pamphlet-literature was grave and pedantic. From the latter period to the death of Henry IV. it became more cruel and dangerous.

The *Satyre Ménippée* (1594), one of the most perfect models of the pamphlet in the language, did infinite harm to the League. The pamphlets against the Jesuits were many and violent. Père Richeome defended the order in *Chasse du renard Pasquier* (1603), the latter person being their vigorous opponent Étienne Pasquier. On the death of the king the country was filled with appeals for revenge against the Jesuits for his murder; the best known of them was the *Anti-Coton* (1611), generally attributed to César de Plaix. During the regency of Mary de' Medici the pamphlet changed its severer form to a more facetious type. In spite of the danger of such proceeding under the uncompromising ministry of Richelieu, there was no lack of libels upon him, which were even in most instances printed in France. These largely increased during the Fronde, but it was Mazarin who was the subject of more of this literature than any other historical personage. It has been calculated that from the Parisian press alone there came sufficient *Mazarinades* to fill 150 quarto volumes each of 400 pages. Eight hundred were published during the siege of Paris (Feb. 8 to March 11, 1649). A collection of satirical pieces was entitled *Tableau du gouvernement de Richelieu, Mazarin, Fouquet, et Colbert* (1693). Pamphlets dealing with the amours of the king and his courtiers were in vogue in the time of Louis XIV., the most caustic of them being the *Carte géographique de la cour* (1668) of Bussy-Rabutin. The presses of Holland and the Low Countries teemed with tracts against Colbert, Le Tellier, Louvois and Père Lachaise. The first of the ever-memorable *Provinciales* appeared on the 23rd of January 1656, under the title of *Lettre de Louis de Montalte à un provincial de ses amis*, and the remaining eighteen came out at regular intervals during the next fifteen months. They excited extraordinary attention throughout Europe. The Jesuit replies were feeble and ineffectual. John Law and the schemes of the bubble period caused much popular raillery. During the long reign of Louis XV. the distinguished names of Voltaire, Rousseau, Montesquieu, Diderot, D'Alembert, D'Holbach, Helvétius and Beaumarchais must be added to the list of writers in this class.

The preliminary struggle between the parliament and the Crown gave rise to hundreds of pamphlets, which grew still more numerous as the Revolution approached. Linguet and Mirabeau began their appeals to the people. Camille Desmoulins came into notice as a publicist during the elections for the states-general; but perhaps the piece which caused the most sensation was the *Qu'est ce que le Tiers État* (1789) of the Abbé Sieyès. The *Domine salvum fac regem* and *Pange lingua* (1789) were two royalist brochures of unsavoury memory. The queen was the subject of vile attack and indiscreet defence (see H. d'Almeras, *Marie Antoinette et les pamphlets*, 1907). The financial disorders of 1790 occasioned the *Effets des assignats sur le prix du pain* of Dupont de Nemours; Necker was attacked in the *Criminelle Neckerologie* of Marat; and the *Vrai miroir de la noblesse* dragged the titled names of France through the mire. The massacre of the Champ de Mars, the death of Mirabeau, and the flight of the king in 1791, the noyades of Lyons and the crime of Charlotte Corday in 1793, and the terrible winter of 1794 have each their respective pamphlet literature, more or less violent in tone. Perhaps the most complete collection of French revolutionary pamphlets is that in the Bibliothèque Nationale; the British Museum possesses a wonderful collection formed by John Wilson Croker. Under the consulate and the empire the only writers of note who ventured to seek this method of appealing to the world were Mme de Staël, B. Constant and Chateaubriand. The royalist reaction in 1816 was the cause of the *Pétition* of Paul Louis Courier, the first of those brilliant productions of a master of the art. He gained the distinction of judicial procedure with his *Simple Discours* in 1821, and published in 1824 his last political work, *Le Pamphlet des pamphlets*, the most eloquent justification of the pamphlet ever penned. The *Mémoire à consulter* of Montlosier attacked the growing power of the Congregation. The year 1827 saw an augmentation of severity in the press laws and the establishment of the censure. The opposition also increased in power and activity, but found its greatest support in the songs of Béranger and the journalism of Mignet, Thiers and Carrel. M. de Comenin was the chief pamphleteer of the reign of Louis Philippe. The events of 1848 gave birth to a number of pamphlets, chiefly pale copies of the more virile writings of the first revolution. Among the few men of power Louis Veuillot was the Père Duchesne of the Clericals and Victor Hugo the Camille Desmoulins or Marat of the Republicans. After 1852 there was no lack of venal apologies of the *coup d'état.* The second empire suffered from many bitter attacks, among which may be mentioned the *Lettre sur l'histoire de France* (1861) of the Duc d'Aumale, *Propos de Labiénus* (1865) of Rogeard, *Dialogue aux enfers* (1864) of Maurice Joly and Ferry's *Comptes fantastiques d'Haussmann* (1868). In more recent times the Panama prosecutions and the Dreyfus case gave occasion to an immense pamphlet literature.

Germany.—In Germany, the cradle of printing, the pamphlet (*Flugschrift*) was soon a recognized and popular vehicle of thought, and the fierce religious controversies of the Reformation period afforded a unique opportunity for its use. The employment of the pamphlet in this connexion was characteristic of the new age. In coarse and violent language the pamphlets appealed directly to the people, whose sympathy the leaders of the opposing parties were most anxious to secure, and their issue on an enormous scale was undoubtedly one of the most potent influences in rousing the German people against the pope and the Roman Catholic Church. In general their tone was extremely intemperate, and they formed, as one authority has described those of a century later, "a mass of panegyric, admonition, invective, controversy and scurrility." Luther was one of the earliest and most effective writers of the polemical pamphlet. His adherents quickly followed his example, and his opponents also were not slow to avail themselves of a weapon which was proving itself so powerful. So intense at this time did this pamphlet war become that Erasmus wrote "apud Germanos, vix quicquam vendibile est praeter Lutherana ac anti Lutherana."

A remarkable feature was the coarseness of many of these pamphlets. No sense of decency or propriety restrained their writers in dealing either with sacred or with secular subjects, and this attracted the notice of the imperial authorities, who were also alarmed by the remarkable growth of disorder, attributable in part at least to the wide circulation of pamphlet literature. Accordingly the issue of libellous pamphlets was forbidden by order of the diet of Nuremberg in 1524, and again by the diets of Spires in 1529, of Augsburg in 1530 and of Regensburg in 1541, while in 1589 the emperor Rudolph II. fulminated against them.

The usual method of selling these pamphlets was by means of hawkers. J. Janssen (*History of the German People*, Eng. trans., vol. iii.) says these men "went about in swarms offering pamphlets, caricatures and lampoons for sale; in the larger towns vendors of every description of printed matter jostled each other in the street."

The controversies of the earlier period of the Thirty Years' War, when this struggle was German rather than international, produced a second flood of pamphlets, which possessed the same characteristics as the earlier one. In the disturbed years also which preceded the actual outbreak of war attempts were made in pamphlets to justify almost every action, however unjust or dishonourable, while at the same time those who held different opinions were mercilessly and scurrilously attacked. The leading German princes were among the foremost to use pamphlets in this connexion, especially perhaps Maximilian of Bavaria and Christian of Anhalt.

LITERATURE.—An excellent catalogue by W. Oldys of the pamphlets in the Harleian Library is added to the 10th volume of the edition of the *Miscellany* by T. Park; and in the *Biblioteca volante di G. Cinelli* (2nd ed., 4 vols. 4to, 1734–1747) may be seen a bibliography of pamphlet-literature, chiefly Italian and Latin, with notes. See also *Cat. of the three collections of books, pamphlets, &c., in the British Museum* on the French Rev., 1899; *Cat. of the Thomason books, pamphlets &c.*, 1908, 2 vols. A few of the more representative collections of pamphlets in English may be mentioned. These are. *The Phenix* (2 vols. 8vo, 1707); Morgan's *Phoenix britannicus* (4to, 1732); Bishop Edmund Gibson's *Preservative against Popery* (3 vols. folio, 1738, new ed., 18 vols. sm. 8vo, 1848–1849), consisting chiefly of the anti-Catholic discourses of James II.'s time; *The Harleian Miscellany* (8 vols. 4to, 1744–1753; new ed. by T. Park, 10 vols. 4to, 1808–1813, containing 600 to 700 pieces illustrative of English history, from the library of Edward Harley, earl of Oxford); *Collection of scarce and valuable tracts* [*known as Lord Somers' Tracts*] (16 parts 4to, 1748–1752, 2nd ed. by Sir W. Scott, 13 vols. 4to, 1809–1815), also full of matter for English history; *The Pamphleteer* (29 vols. 8vo, 1813–1828), containing the best pamphlets of that day; and Arthur Waugh, *The Pamphlet Library* (4 vols. 8vo, 1897–1898), giving examples of political, religious and literary pamphlets from Wyclif to Newman, with historical essays.

For the derivation of the word pamphlet consult Skeat's *Etymological Dict.*; Pegge's *Anonymiana*; *Notes and Queries*, 3rd series, vol. iv. pp. 315, 379, 462, 482, vol. v. pp. 167, 290; 6th series, vol. ii. p. 156; 7th series, vol. vi. pp. 261, 432; Murray's *New English Dict.* vol. vii. The general history of the subject may be traced in M. Davies, *Icon libellorum* (1715); W. Oldys, "History of the Origin of Pamphlets," in Morgan's *Phoenix Brit.* and Nichols's *Lit. Anecdotes*; Dr Johnson's Introduction to the *Harleian Miscellany*; D'Israeli, *Amenities of Literature*; *Revue des deux mondes* (April 1, 1846); *Irish Quart. Review*, vii. 267; *Edinburgh Review* (Oct. 1855); *Quarterly Review* (April 1908); *The Library*, new series, vol i. 298; Huth's *Ancient Ballads and Broadsides* (Philobiblon Soc.); W. Maskell, *Martin-Marprelate Controversy* (1845); E. Arber, *Sketch of Marprelate Controversy* (1895); W. Pierce, *Hist. Introd. to the Marprelate Tracts* (1908); T. Jones, *Cat. of collection of tracts for and against Popery—the whole of Peck's lists and his references* (Chetham Soc., 1856–1865); Blakey's *Hist. of Political Literature*; Andrews, *Hist. of British Journalism*; Larousse, *Grand Dict. Universel*; Nodier, *Sur la liberté de la presse*; Leber, *De L'état réel de la presse* (1834); Moreau, *Bibliographie des mazarinades* (1850–1851); *Bulletin du Bibliophile Belge* (1859–1862); Nisard, *Hist. des livres populaires* (1854); A. Germond de Lavigne, *Des Pamphlets de la fin de l'empire*, &c. *1814–1817*, Catalogue (Paris, 1879); *Paris, Bibl. nationale, catalogue des Factums, etc., anterieurs à 1790*, by A. Corda, Paris, 1890; A. Maire, *Répertoire des thèses de doctoratès lettres des universités françaises 1810–1900* (Paris, 1903); and the annual *Catalogue des Thèses et Écrits Académiques* (Hachette) 1885–1910. For German academical dissertations see G. Fock, *Catalogus dissertationum philologicorum classicarum* (Leipzig, 1894), and many special catalogues by Klussmann (1889–1903), Kukula (1892–1893), Milkan (for Bonn, 1818–1885), Pretzsch (for Breslau, 1811–1885) and others. For Dutch pamphlets see L. D. Petit, *Bibliotheck van nederlandsche Pamfletten* (2 vols. 4to, Hague, 1882–1884); and W. P. C. Knuttel, *Catalogus van de Pamfletten Verzameling berustende in de K. Bibliotheck 1486–1795* (5 parts 4to, Hague, 1889–1905). For methods of dealing with pamphlets in libraries, see various articles in *Library Journal* (1880, 1887, 1889, 1894). (H. R. T.)

PAMPHYLIA, in ancient geography, the region in the south of Asia Minor, between Lycia and Cilicia, extending from the Mediterranean to Mt Taurus. It was bounded on the N. by Pisidia and was therefore a country of small extent, having a coast-line of only about 75 m. with a breadth of about 30 m. There can be little doubt that the Pamphylians and Pisidians were the same people, though the former had received colonies from Greece and other lands, and from this cause, combined with the greater fertility of their territory, had become more civilized than their neighbours in the interior. But the distinction between the two seems to have been established at an early period. Herodotus, who does not mention the Pisidians, enumerates the Pamphylians among the nations of Asia Minor, while Ephorus mentions them both, correctly including the one among the nations on the coast, the other among those of the interior. The early Pamphylians, like the Lycians, had an alphabet of their own, partly Greek, partly "Asianic," which a few inscriptions on marble and coins preserve. Under the Roman administration the term Pamphylia was extended so as to include Pisidia and the whole tract up to the frontiers of Phrygia and Lycaonia, and in this wider sense it is employed by Ptolemy.

Pamphylia consists almost entirely of a plain, extending from the slopes of Taurus to the sea, but this plain, though presenting an unbroken level to the eye, does not all consist of alluvial deposits, but is formed in part of travertine. "The rivers pouring out of the caverns at the base of the Lycian and Pisidian ranges of the Taurus come forth from their subterranean courses charged with carbonate of lime, and are continually adding to the Pamphylian plain. They build up natural aqueducts of limestone, and after flowing for a time on these elevated beds burst their walls and take a new course. Consequently it is very difficult to reconcile the accounts of this district, as transmitted by ancient authors, with its present aspect and the distribution of the streams which water it. By the sea-side in the west of the district the travertine forms cliffs from 20 to 80 ft. high" (Forbes's *Lycia*, ii. 188). Strabo describes a river which he terms Catarractes as a large stream falling with a great noise over a lofty cliff. This is the cataract near Adalia. East of Adalia is the Cestrus, and beyond that again the Eurymedon, both of which were considerable streams, navigable in antiquity for some little distance from the sea. Near the mouth of the latter was a lake called Caprias, mentioned by Strabo; but it is now a mere salt marsh.

The chief towns on the coast are: Olbia, the first town in Pamphylia, near the Lycian frontier; Attalia (*q.v.*); and Side (*q.v.*). On a hill above the Eurymedon stood Aspendus (*q.v.*) and above the river Cestrus was Perga (*q.v.*). Between the two rivers, but somewhat farther inland, stood Sylleum, a strong fortress, which even ventured to defy the arms of Alexander. These towns are not known to have been Greek colonies; but the foundation of Aspendus was traditionally ascribed to the Argives, and Side was said to be a colony from Cyme in Aeolis. The legend related by Herodotus and Strabo, which ascribed the origin of the Pamphylians to a colony led into their country by Amphilochus and Calchas after the Trojan War, is merely a characteristic myth. The coins of Aspendus, though of Greek character, bear legends in a barbarous dialect; and probably the Pamphylians were of Asiatic origin and mixed race. They became largely hellenized in Roman times, and have left magnificent memorials of their civilization at Perga, Aspendus and Side. The district is now largely peopled with recent settlers from Greece, Crete and the Balkans.

The Pamphylians are first mentioned among the nations subdued by the Mermnad kings of Lydia, and afterwards passed in succession under the dominion of the Persian and Macedonian monarchs. After the defeat of Antiochus III. in 190 B.C. they were included among the provinces annexed by the Romans to the dominions of Eumenes of Pergamum; but somewhat later they joined with the Pisidians and Cilicians in piratical ravages, and Side became the chief centre and slave mart of these freebooters. Pamphylia was for a short time included in the dominions of Amyntas, king of Galatia, but after his death lapsed into a district of a Roman province, and its name is not again mentioned in history.

See C. Lanckomiski, *Les Villes de la Pamphylie et de la Pisidie* (1890). (D. G. H.)

PAMPLONA, or PAMPELUNA, the capital of the Spanish province of Navarre, and an episcopal see; situated 1378 ft. above sea-level, on the left bank of the Arga, a tributary of the Ebro. Pop. (1900), 28,886. Pamplona has a station on the Ebro railway connecting Alsasua with Saragossa. From its position it has always been the principal fortress of Navarre. The old outworks have been partly demolished and replaced by modern forts, while suburbs have grown up round the inner walls and bastions. The citadel, south-west of the city, was constructed by order of Philip II. (1556–1598), and was modelled on that of Antwerp. The streets of the city are regular and broad; there are three fine squares or plazas. The most attractive of these is the arcaded Plaza del Castillo, flanked by the hall of the provincial council and by the theatre. The cathedral is a late Gothic structure begun in 1397 by Charles III. (El Noble) of Navarre, who is buried within its walls; of the older Romanesque cathedral only a small portion of the cloisters remains. The fine interior is remarkable for the peculiar structure of its apse, and for the choir-stalls carved in English oak by Miguel Ancheta, a native artist (1530). The principal façade is Corinthian, from designs of Ventura Rodriguez (1783). The same architect designed the superb aqueduct by which the city is supplied with water from Monte Francoa, some nine miles off. The beautiful cloisters on the south side of the cathedral, and the chapter-house beyond them, as well as the old churches of San Saturnino (Gothic) and San Nicolas (Romanesque), are also of interest to the student of architecture. There are also the bull-ring, capable of accommodating 8000 spectators, the *pelota* court (*el Trinquete*) and several parks or gardens. The city is well provided with schools for both sexes; it has also a large hospital.

Pamplona has a flourishing agricultural trade, besides manufactures of cloth, linen stuffs, flour, soap, leather, cards, paper, earthenware, iron and nails. The yearly fair in connexion with the feast of San Fermin (July 7), the patron saint of the city, attracts a large concourse from all parts of northern Spain.

Originally a town of the Vascones, Pamplona was rebuilt in 68 B.C. by Pompey the Great, whence the name Pompaelo or Pompelo (Strabo). It was captured by Euric the Goth in 466 and by the Franks under Childebert in 542; it was dismantled by Charlemagne in 778, but repulsed the emir of Saragossa in 907. In the 14th century it was greatly strengthened and beautified by Charles III., who built a citadel on the site now occupied by the Plaza de Toros and by the Basilica de S. Ignacio, the church marking the spot where Ignatius de Loyola received his wound in defending the place against André de Foix in 1521. From 1808 it was occupied by the French until taken by Wellington in 1813. In the Carlist War of 1836–40 it was held by the Cristinos, and in 1875–76 it was more than once attacked, but never taken, by the Carlists.

PAN ("pasturer"), in Greek mythology, son of Hermes and one of the daughters of Dryops ("oak-man"), or of Zeus and the nymph Callisto, god of shepherds, flocks and forests. He is not mentioned in Homer or Hesiod. The most poetical account of his birth and life is given in the so-called Homeric hymn *To Pan*. He was born with horns, a goat's beard and feet and a tail, his person being completely covered with hair. His mother was so alarmed at his appearance that she fled; but Hermes took him to Olympus, where he became the favourite of the gods, especially Dionysus. His life and characteristics are typical of the old shepherds and goatherds. He was essentially a rustic god, "a wood-spirit conceived in the form of a goat," living in woods and caves, and traversing the tops of the mountains; he protected and gave fertility to flocks; he hunted and fished; and sported and danced with the mountain nymphs. A lover of music, he invented the shepherd's pipe, said to have been made from the reed into which the nymph Syrinx was transformed when fleeing from his embraces (Ovid, *Metam.* i. 691 sqq.). With a kind of trumpet formed out of a shell he terrified the Titans in their fight with the Olympian gods. By his unexpected appearance he sometimes inspires men with sudden terror—hence the expression "panic" fear. Like other spirits of the woods and fields, he possesses the power of inspiration and prophecy, in which he is said to have instructed Apollo. As a nature-god he was brought into connexion with Cybele and Dionysus, the latter of whom he accompanied on his Indian expedition. Associated with Pan is a number of Panisci, male and female forest imps, his wives and children, who send evil dreams and apparitions to terrify mankind. His original home was Arcadia; his cult was introduced into Athens at the time of the battle of Marathon, when he promised his assistance against the Persians if the Athenians in return would worship him. A cave was consecrated to him on the north side of the Acropolis, where he was annually honoured with a sacrifice and a torch-race (Herodotus vi. 105). In later times, by a misinterpretation of his name (or from the identification of the Greek god with the ram-headed Egyptian god Chnum, the creator of the world), he was pantheistically conceived as the universal god (τὸ πᾶν). The pine and oak were sacred to him, and his offerings were goats, lambs, cows, new wine, honey and milk. The Romans identified him with Inuus and Faunus.

In art Pan is represented in two different aspects. Sometimes he has goat's feet and horns, curly hair and a long beard, half animal, half man; sometimes he is a handsome youth, with long flowing hair, only characterized by horns just beginning to grow, the shepherd's crook and pipe. In bas-reliefs he is often shown presiding over the dances of nymphs, whom he is sometimes pursuing in a state of intoxication. He has furnished some of the attributes of the ordinary conception of the devil. The story (alluded to by Milton, Rabelais, Mrs Browning and Schiller) of the pilot Thamus, who, sailing near the island of Paxi in the time of Tiberius, was commanded by a mighty voice to proclaim that "Pan is dead," is found in Plutarch (*De orac. defectu*, 17). As this story coincided with the birth (or crucifixion) of Christ it was thought to herald the end of the old world and the beginning of the new. According to Roscher (in *Neue Jahrbücher für Philologie*, 1892) it was of Egyptian origin, the name Thamus being connected with Thmouis, a town in the neighbourhood of Mendes, distinguished for the worship of the ram; according to Herodotus (ii. 46), in Egyptian the goat and Pan were both called Mendes. S. Reinach suggests that the words uttered by the "voice" were Θαμοῦς, Θαμοῦς, πάνμεγας, τέθνηκε ("Tammuz, Tammuz, the all-great, is dead"), and that it was merely the lament for the "great Tammuz" or Adonis (see L. R. Farnell in *The Year's Work in Classical Studies*, 1907).

See W. Gebhard, *Pankultus* (Brunswick, 1872); P. Wetzel, *De Jove et Pane dis arcadicis* (Breslau, 1873); W. Immerwahr, *Kulte et Mythen Arkadiens* (1891), vol. i., and V. Bèrard, *De l'Origine des cultes arcadiens* (1894), who endeavour to show that Pan is a sun-god (φαν, φαίνω); articles by W. H. Roscher in *Lexikon der Mythologie* and by J. A. Hild in Daremberg and Saglio's *Dictionnaire des Antiquités*; E. E. Sikes in *Classical Review* (1895), ix. 70; O. Gruppe, *Griechische Mythologie* (1906), vol. ii.

PAN (common in various forms to many Teutonic languages, cf. Ger. *Pfanne*; it is generally taken to be an early adaptation in a shortened form of Lat. *patina*, shallow bowl or dish, from *patere*, to lie open), a term applied to various sorts of open, flat, shallow vessels. Its application has been greatly extended by analogy, *e.g.* to the upper part of the skull; to variously shaped objects capable of retaining substances, such as that part of the lock in early firearms which held the priming (whence the expression "flash in the pan," for a premature and futile effort); or the circular metal dish in which gold is separated from gravel, earth, &c., by shaking or washing (whence the phrase "to pan out," to obtain a good result). Small ice-floes are also called "pans," and the name is given to a hard substratum of soil which acts as a floor to the surface soil and is usually impervious to water. For "pan" or "pane" in architecture see HALF-TIMBER WORK.

The Hindostani *pān* is the betel-leaf, which, mixed with areca-nut, lime, &c., is chewed by the natives of the East Indies.

The common prefix "pan," signifying universal, all-embracing (Gr. πᾶς, all), is often combined with the names of races, nationalities and religions, conveying an aspiration for the political or spiritual union of all the units of the nation or creed; familiar examples are Pan-Slavonic, Pan-German, Pan-Islamism, Pan-Anglican, Pan-American.

PANA, a city of Christian county, Illinois, U.S.A., in the central part of the state. Pop. (1900) 5530 (727 being foreign-born); (1910) 6055. It is served by the Baltimore & Ohio Southwestern, the Cleveland, Cincinnati, Chicago & St Louis, the Illinois Central and the Chicago & Eastern Illinois railways. It is in the Illinois coal region, and coal-mining is the most important industry; the city is also a shipping point for hay and grain grown in the vicinity. Pana was incorporated in 1857, and was reincorporated in 1877. Its name is said to be a corrupted form of "Pani" (Pawnee), the name of a tribe of Indians.

PANACEA (Gr. πανάκεια, all-healing, from πᾶς, all, and ἀκεῖσθαι, to heal), a universal remedy, or cure for all diseases, a term applied in the middle ages to a mythical herb supposed to possess this quality. Many herbs have had the power of curing all diseases attributed to them, and have hence had the name of "all-heal"; such have been, among others, the mistletoe, the woundwort (*Stachys palustris*), the yarrow or milfoil, and the great valerian.

PANACHE, a French word adapted from Ital. *pennachio*, Lat. *penna*, feather, for a plume of feathers on a helmet or hat; the "panache" should be properly distinguished from the "plume," as being a large cluster of feathers fixed on the top of the helmet and flowing over it, the "plume" being a single feather at the side or front. The word "panache" is often used figuratively in French of a flamboyant piece of ornamentation, a "purple patch" in literature, or any exaggerated form of decoration.

PANAENUS, brother of Pheidias, a Greek painter who worked in conjunction with Polygnotus and Micon at Athens. He also painted the marble sides of the throne of the statue of Zeus erected by his brother at Olympia.

PANAETIUS (*c.* 185–180 to 110–108 B.C.), Greek Stoic philosopher, belonged to a Rhodian family, but was probably educated partly in Pergamum under Crates of Mallus and afterwards in Athens, where he attended the lectures of Diogenes the Babylonian, Critolaus and Carneades. He subsequently went to Rome, where he became the friend of Laelius and of Scipio the Younger. He lived as a guest in the house of the latter, and accompanied him on his mission to Egypt and Asia (143 or 141). He returned with Scipio to Rome, where he did much to introduce Stoic doctrines and Greek philosophy. He had a number of distinguished Romans as pupils, amongst them Q. Mucius Scaevola the augur and Q. Aelius Tubero. After the murder of Scipio in 129, he resided by turns in Athens and Rome, but chiefly in Athens, where he succeeded Antipater of Tarsus as head of the Stoic school. The right of citizenship was offered him by the Athenians, but he refused it. His chief pupil in philosophy was Posidonius of Apamea. In his teaching he laid stress on ethics; and his most important works, of which only insignificant fragments are preserved, were on this subject. They are as follow: Περὶ τοῦ καθήκοντος (*On Duty*), in three books, the original of the first two books of Cicero's *De officiis*; Ηερὶ προνοίας (*On Providence*), used by Cicero in his *De divinatione* (ii.) and probably in part of the second book of the *De Deorum natura*; a political treatise (perhaps called Ηερὶ πολιτικῆς), used by Cicero in his *De republica*; Ηερὶ εὐθυμίας (*On Cheerfulness*); Περὶ αἰρέσεων (*On Philosophical Schools*); a letter to Q. Aelius Tubero, *De dolore patiendo* (Cicero, *De finibus*, iv. 9, 23).

Edition of the fragments by H. N. Fowler (Bonn, 1885), and in F. van Lynden's monograph (Leiden, 1802). See also A. Schmekel, *Die Philosophie der mittleren Stoa* (1892); F. Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (1892), ii. 63–80; E. Zeller, "Beiträge zur Kenntniss des Stoikers Panätius" in *Commentationes philologae in honorem Th. Mommseni* (1877); on the use made of him by Cicero, R. Hirzel, *Untersuchungen zu Ciceros philosophischen Schriften* (1877–1883). For his importance in the Stoic succession and his philosophy generally, see STOICS.

PANAMA, a Central American republic, occupying the Isthmus of Panama, and lying approximately between 7° 15′ and 9° 39′ N. and between 77° 15′ and 83° 30′ W. It is bounded N. by the Caribbean Sea, E. by Colombia, of which it was formerly a part, S. by the Gulf (or Bay) of Panama, an arm of the Pacific, and W. by Costa Rica. Its area is estimated at from 31,500 to 33,800 sq. m.; its greatest width is 118 m. and its greatest length 430 m.; its land frontier is only about 350 m., but on the Caribbean it has a coast of 478 m. and on the Pacific a coast of 767 m.

Physical Features.—The Isthmus of Panama, coextensive with the republic, is the whole neck of land between the American continents; in another use the term "Isthmus of Panama" is applied to the narrow crossing between the cities of Colon and Panama, the other narrow crossings, further east, being the Isthmus of San Blas (31 m.) and the Isthmus of Darien (46 m.). The use of the term "Isthmus of Panama" to include the whole country is becoming more common. The Caribbean coast-line is concave, the Pacific deeply convex. The Mosquito Gulf is to the N.W., the Gulf of Darien to the N.E., and on the N. coast are several bays. Almirante Bay, near the Costa Rican boundary, is 2–13 m. wide, with many islands and good anchorage, protected by Columbus Island, about 8 m. long; immediately east of it, and connected with it, is Chiriqui lagoon (area about 320 sq. m.), 32 m. long, 12 m. wide at the widest point, with a maximum depth of 120 ft., protected on the sea side by Chiriqui Archipelago; immediately east of Colon, at the narrowest part of the isthmus, is the Gulf of San Blas, 20 m. long and 10 m. wide, protected by a peninsula and by the Mulatas Archipelago—low, sandy islands stretching about 80 m. along the coast—and having the excellent harbour of Mandinga in the south-west; still farther east is Caledonia Bay with another good harbour. On the north coast there are about 630 islands with a total area of about 150 sq. m. The Pacific coast is deeply indented by the Gulf of Panama, which is 100 m. wide between Cape Garachine and Cape Malo, and has the Bay of Parita (20 m. wide at its mouth) on its west side, north of Cape Malo, and the Gulf of San Miguel (15 m. wide at its mouth) on its east side, north of Cape Garachine. Darien Harbour, formed by the Tuira and Savannah rivers, is a part of the Gulf of San Miguel and is 11 m. long, 2–4 m. wide, and nearly landlocked. In the Gulf of Panama there are 16 large and about 100 smaller islands (the Pearl Islands), with a total area of 450 sq. m., the largest being Rey or San Miguel (15 m. long and 7 m. wide), and San José (25 sq. m.); both are well wooded. West of the Gulf of Panama and separated from it by Azuero Peninsula is the Gulf of Montijo, 20 m. long and 14 m. wide at its mouth, across which stretches Cebaco Island, 13½ m. long and 3 m. wide; west of Cebaco is Coiba, the largest island of the republic, 21 m. long and 4–12 m. wide.

The country has no lakes; the apparent exceptions are the artificial lakes, Bohio (or Gatun) and Sosa, of the Canal Zone. There are a few swamps, especially on the northern shore. But the drainage is good; about 150 streams empty into the Caribbean and some 325 into the Pacific. In the eastern part are three complicated drainage systems of rivers very largely tidal. The largest is that of the Tuira (formerly called Rio Darien), whose headwaters are near the Caribbean and which empties into the Pacific in the Gulf of San Miguel. The Chepo (or Bayano) also is a digitate system with a drainage area reaching from the Caribbean to the Pacific; it is navigable for about 120 m. by small boats. The Chagres flows from a source near the Pacific south-west and then north to the Caribbean; is a little more than 100 m. long and is navigable for about half that distance; it varies greatly in depth, sometimes rising 35 ft. in 24 hours (at Gamboa), and drains about 1000 sq. m. West of these three rivers are simpler and comparatively unimportant river systems, rising near the centre of the isthmus. Orographically the country is remarkable. The "exceedingly irregularly rounded, low-pointed mountains and hills covered by dense forests" (Hill) are Antillean, not Andean, and lie at right angles to the axes of the systems of North and South America. The only regular ranges in Panama are in the extreme western part where the Costa Rica divide continues into Panama, and, immediately south of this and parallel to it, the Cordillera of San Blas, or Sierra de Chiriqui, where the highest peaks are Chiriqui (11,265 ft.) and, on the Costa Rican boundary, Pico Blanco (11,740 ft.) and Rovalo (7020 ft.); there are two passes, 3600 and 4000 ft. high respectively. On the eastern boundary of the republic is the Serrania del Darien, an Andean range, partly in Colombia. The rough country between contains the following so-called "Sierras," which are not really ranges: in Veragua province, Sierra de Veragua, with Santiago (9275 ft.) near the Chiriqui range, and Santa Maria (4600 ft.), immediately north of the city of Santa Fé; in Los Santos province (Azuero Peninsula), bold hills rising 3000 ft., and in Panama province, the much-broken Sierra de Panama, which has a maximum height of 1700 ft. and a minimum, at the Culebra Pass, of 290 ft., the lowest point, except the interoceanic water-parting in Nicaragua, which is 153 ft., in the western continental system. There have been no active volcanoes since the Pliocene Tertiary time, but the country is still subject to dangerous earthquakes. There are a few plains, like that of David, in Chiriqui province, but irregular surface is normal; and this irregularity is the result of very heavy rains with a consequent extremely developed drainage system cutting river valleys down nearly to the sea-level, and of marine erosion, as may be seen by the bold and rugged islands, notably those in the Gulf of Panama. It is improbable that there has been any connexion by water between the two oceans here since Tertiary time.

Climate.—The mean temperature varies little throughout the republic, being about 80° F.: at Colon, where 68° is a low and 95° a high temperature, the mean is 79·1°; at Panama the mean is 80·6°. But this difference is not the usual one: normally the Caribbean coast is a degree or two warmer than the Pacific coast. There is a wet and a dry season; in the former, from the middle of April to the middle of December, there falls (in heavy, short rains) about 85% of the total annual precipitation, and south-east winds prevail. The north-east wind prevails in the dry season, which is dusty and bracing. The rainfall at Colon on the north coast varies from 85 to 155 in., with 125 as the mean; at Gamboa in the interior it varies from 75 to 140 in., with 92 as the mean; and at Panama on the south coast it varies between 47 and 90 (rarely 104 in.), the mean being 67 in.

Natural Resources.—Gold is mined to a small extent; the most productive mines are about Darien and in Cocle province. Copper has been found between the Plain of David and Bocas del Toro. There are valuable deposits of coal near Bocas del Toro and Golfo Dulce. There are important salt mines near Agua Dulce on Parita Bay. Iron is found in several parts of the Isthmus. Mineral springs are common, especially near former volcanoes.

There are valuable vegetable dye-stuffs, medicinal plants (especially sarsaparilla, copaiba and ipecacuanha), cabinet and building timber (mahogany, &c.), india-rubber, tropical fruits (especially bananas), and various palms; fish are economically important—the name Panama is said to have meant in an Indian dialect "rich in fish"—and on the Pacific coast, oysters and pearl "oysters" (*Meleagrina californica*)—the headquarters of the pearl fishery is the city of San Miguel on the largest of the Pearl Islands, and Coiba Island. There is little agriculture, though the soil is rich and fertile; bananas (occupying about one-half the area under cultivation and grown especially in the north-west), coffee (also grown especially on the Costa Rican border in Chiriqui province), cacao (growing wild in Bocas del Toro province), tobacco, and cereals are the largest crops. Stock-raising is favoured by the excellent grazing lands; blooded cattle are imported for breeding.

Soap and chocolate are manufactured in Panama City. Tobacco and salt manufactures are government monopolies. Sugar refineries are projected. In the canal zone there are great shops for the manufacture and repair of machinery.

Commerce and Communications.—The principal ports are Colon, Panama[1] and Bocas del Toro, the last being a banana-shipping port. In 1908 the country's imports were valued at $7,806,811 (vegetable products, $1,879,297; agricultural products, $1,258,900; textiles, $1,187,802; mineral products, $788,069; and wines and liquors, $675,703; the textiles mainly from Great Britain, all other imports largely from the United States); and the exports were valued at $1,757,135 (including vegetable products, mostly bananas, $1,539,395, animal products, $135,207, and mineral products, $79,620), of which $1,587,217 was the value of goods shipped to the United States, $113,038 of goods to Great Britain, and $34,495 to Germany. Besides bananas the largest exports are hides, rubber, coco-nuts, limes, native curios and quaqua bark. Transportation along the rivers from point to point on either coast is easy. The Panama railway, the only one in the country, is 47½ m. long, and runs between Colon and Panama; it was made possible by the rush of gold-miners across the isthmus in the years immediately after 1849; was financed by the New York house of Howland & Aspinwall—Aspinwall (later Colon) was named in honour of the junior member, William Henry Aspinwall, (1807–1875)—and was completed in February 1855 at an expense of $7,500,000. It was purchased by De Lesseps's Compagnie Universelle de Canal Interocéanique de Panama for $25,500,000; and, with the other holdings of the French company, 68,869 shares (more than 97% of the total) passed to the

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[1] Christobal, the port of Colon, and Balboa, the port of Panama, lie within the Canal Zone and are under the jurisdiction of the United States.

United States government. The line of railway is very nearly that of the canal, and the work of the railway engineers was of great value to the French engineers of the canal. There are several telegraphic and telephone systems; a wireless telegraph station at Colon; and telegraphic cables from Colon and Panama which, with a connecting cable across the isthmus, give an "all-cable" service to South America, to the United States and to Europe. There are two old wagon roads from Panama City, one, now little used, north to Porto Bello, and the other (called the royal road) 17 m. north-west to Cruces at the head of navigation on the Chagres River. Other roads are mere rough trails.

Inhabitants and Towns.—The population in 1909 was about 361,000. The inhabitants exhibit various degrees of admixture of Indian, negro and Spanish blood, with an increasing proportion of foreigners. The Indians are most numerous in the western part. The negroes, largely from Jamaica and the other West Indies, came in large numbers to work on the canal. The Spanish was the race that stood for civilization before North American influence became strong. Many Spanish peasants, Italians and Greeks came in to work on the canal, but this is not a permanent population. As elsewhere in Spanish America, there has been German colonization, notably in Cocle province, where a large tropical estate was established in 1894.

The principal cities in Panama are: Colon (*q.v.*), at the Caribbean end of the canal; Panama (*q.v.*), at the Pacific end of the canal, and near it, in the Canal Zone, the cities of Balboa and Ancon; Bocas del Toro (pop. about 4000), capital of the province of the same name, in the north-western corner of the country, with a large trade in bananas and good fishing in the bay; Porto Bello (pop. about 3000), formerly an important commercial city, in Colon province, on Porto Bello Bay, where Columbus established the colony of Nombre de Dios in 1502—the present city was founded in 1584, was often captured by the English (notably by Admiral Edward Vernon in 1753), and by buccaneers, and is the terminus of an old paved road to Panama, whence gold was brought to Porto Bello for shipment; Chagres (pop. about 2500), also in Colon province, formerly an important port, and now a fishing place; Agua Dulce, formerly called Trinidad (pop. about 2000), in Cocle province, on Parita Bay, the centre of the salt industry; and San Miguel, on an island of the same name in the Gulf of Panama, the principal pearl fishery. The larger inland cities are: Ciudad de David (pop. about 8000), the capital of Chiriqui, 12 m. from the Pacific, 60 m. east of the Costa Rican boundary, with a trade in cattle; Los Santos (pop. about 7200), the capital of Los Santos province; Santiago de Veragua (pop. about 7000), 300 ft. above the sea, with various manufactories, gold, silver and copper mines, and mineral springs and baths near the city; Las Tablas (pop. about 6500) and Pese (pop. about 5600) in Los Santos province; Penomene (pop. about 3000), on the river of that name in Cocle province (of which it is the capital), with a trade in straw hats, tobacco, cacao, coffee, cotton, rubber, cedar and cattle; and in the Canal Zone Gorgona (3000) and Obispo (2500), each with an American colony.

Administration.—By the constitution promulgated on the 13th of February 1904 the government is a highly centralized republic. All male citizens over 21 years of age have the right to vote, except those under judicial interdiction and those judicially inhabilitated by reason of crime. The president, who must be at least 35 years old, is elected by popular vote for four years, is ineligible to succeed himself and appoints cabinet members (secretaries of foreign affairs, government and justice, treasury, interior ["fomento"] and public instruction); five supreme court judges (who decide on the constitutionality of a bill vetoed by the president on constitutional grounds—their action, if favourable to the constitutionality of such a bill, makes the president's signature mandatory); diplomatic representatives; and the governors (annually) of the provinces, who are responsible only to him. The president's salary is $18,000 a year. There is no vice-president, but the National Assembly elects every two years three *designados*, the first of whom would succeed the president if he should die. The National Assembly is a single chamber, whose deputies (each at least 25 years old) are elected for four years by popular vote on the basis of 1 to every 10,000 inhabitants (or fraction over 5000); it meets biennially; by a two-thirds vote it may pass any bill over the president's veto—the president has five or ten days, according to the length of the bill, in which to veto any act of the legislature. At the head of the judiciary is the Supreme Court already referred to; the superior court and the circuit courts are composed of judges appointed for four years by the members of the Supreme Court. The municipal court justices are appointed by the Supreme Court judges for one year.

The seven provinces, restoring an old administrative division, are: Panama, with most of the territory east of the canal and a little (on the Pacific side) west of the canal; Colon, on either side of the canal, along the Caribbean; Cocle, west and south; Los Santos, farther west and south, on the Azuero Peninsula, west of the Gulf; Veraguas, to the north-west, crossing to the Mosquito Gulf; and Chiriqui, farthest west, on the Pacific, and Bocas del Toro on the Caribbean. The provinces are divided into municipal districts (*distritos municipales*), each of which has a municipal legislature (*consejo municipal*), popularly elected for two years, and an *alcalde*, who is the agent of the governor of the province and is appointed annually. By the treaty of the 18th of November 1908 Panama ceded to the United States the "Canal Zone," a strip of land reaching 5 m. on either side of the canal and including certain islands in the Gulf of Panama; from this cession were excluded the cities of Colon and Panama, over which the United States received jurisdiction only as regards sanitation and water-supply.

Education.—The system of public education dates from the independence of Panama only and has not been developed. But primary instruction has been greatly improved; there is a school of arts and trades at the capital, in which there are endowed scholarships for pupils from different provinces; a normal school has been established to train teachers for the Indians; high schools and training schools have been opened; and the government pays the expenses of several students in Europe.

Coinage and Finance.—In June 1904, under the terms of an agreement with the American Secretary of War, Panama adopted the gold standard with the balboa, equivalent to an American gold dollar, as the unit; and promised to keep in a bank in the United States a deposit of American money equal to 15% of its issue of fractional silver currency, which is limited to four and a half million balboas. This agreement put an end to the fluctuations of the paper currency previously used. Currency of Panama is legal tender in the Canal Zone, and that of the United States in the Republic of Panama.

The republic has no debt: it refused to accept responsibility for a part of the Colombian debt; and it has no standing army. On the 30th of June 1908 the total cash assets of the government were $7,860,697, of which $6,000,000 was invested in New York City real estate, and more than $1,500,000 was in deposits in New York. In the six months ending with that date the receipts were $1,259,574 (largely from import and export duties, and taxes on liquors, tobacco, matches, coffee, opium, salt, steamship companies and money changers), and the cash balance for the six months was $105,307.

History.—The Isthmus of Panama was probably visited by Alonso de Ojeda in 1499. In 1501 Rodrigo Bastidas coasted along from the Gulf of Venezuela to the present Porto Bello. Columbus in 1502 coasted along from Almirante Bay to Porto Bello Bay, where he planted a colony (Nombre de Dios) in November; the Indians destroyed it almost immediately; it was re-established in 1510, by Diego de Nicuessa, governor of the newly established province of Castilla del Oro, which included what is now Nicaragua, Costa Rica and Panama. In 1510 Martin Fernandez de Enciso, following Alonso de Ojeda to the New World, took the survivors of Ojeda's colony of Nueva Andalucia (near the present Cartagena and east of Panama) and founded on the Tuira river the colony of Santa Maria la Antigua del Darien (commonly called Darien). An insurrection against Enciso in December 1510 put in command Vasco Nuñez de Balboa, who had accompanied Rodrigo de Bastidas in the voyage of 1501. In September 1513 Nuñez crossed the isthmus and (on the 25th or 26th) discovered the Pacific. Immediately afterwards he was succeeded by Pedro Arias de Avila, by whom Nueva Andalucia and Castilla del Oro were united in 1514 under the name of Tierra Firma, and who founded in 1519 the city of Panama, now the oldest European settlement on the mainland in America. The portage between the two oceans was of great commercial importance, especially in the 16th century, when treasure from Peru (and treasure was the *raison d'être* of the Spanish settlements in Panama) was carried across the isthmus from Panama City. A Scotch settlement under letters patent from the Scotch Parliament was made by William Paterson (*q.v.*) in 1698 on the site of the present Porto Escoces (in the north-eastern part of the republic), but in 1700 the Spanish authorities expelled the few settlers still there. Panama was a part of the viceroyalty of New Granada created in 1718, and in 1819 became a part of the independent nation of Colombia and in 1831 of New Granada, from which in 1841 Panama and Veragua provinces seceded as the state (short-lived) of the Isthmus of Panama.

The constitution of the Granadine Confederation of 1853 gave the states the right to withdraw, and in 1857 Panama[1] again seceded, soon to return. When Nuñez in 1885 disregarded the constitution of 1863, which made the component states severally sovereign, he was strongly opposed by the people of Panama, who had no actual representation in the convention which made the constitution of 1886, an instrument allowing Panama (which it made a department and not a state) no local government. The large expenditures of the French canal company made the department singularly alluring to corrupt officials of the central government, and Panama suffered severely before the liquidation of the company in 1889. There were risings in 1895 and in 1898–1902, the latter ceasing with American interposition. The treaty of the United States in 1846 with New Granada, granting transportation facilities on the Isthmus to the United States, then preparing for war with Mexico, and guaranteeing on the part of the United States the sovereignty of New Granada in the Isthmus, has been considered the first step toward the establishment of an American protectorate over the Isthmus. In 1901 by the negotiation of the Hay-Pauncefote Treaty it became possible for the United States alone to build and control an interoceanic canal. The Hay-Herran Treaty of January 1903, providing that the United States take over the Panama Canal was not ratified by the Colombian Congress, possibly because it was hoped that settlement might be delayed until the concession to the company expired, and that then the payment from the United States would come directly to the Colombian government; and the Congress, which had been specially called for the purpose—there was no regular legislative government in Bogotá in 1898–1903—adjourned on the 31st of October. Three days later, on the 3rd of November, the independence of Panama was declared. Commander John F. Hubbard of the United States gunboat "Nashville" at Colon forbade the transportation of Colombian troops across the Isthmus, and landed 42 marines to prevent the occupation of Colon by the Colombian force; the diplomatic excuse for his action was that by the treaty of 1846 the United States had promised to keep the Isthmus open, and that a civil war would have closed it. On the 7th of November Panama was virtually recognized by the United States, when her diplomatic representative was received; and on the 18th of November a treaty was signed between the United States and Panama, ceding to the United States the "Canal Zone," for which and for the canal concession the United States promised to pay $10,000,000 immediately and $250,000 annually as rental, the first payment to be made nine years after the ratification of the treaty. On the 4th of January 1904, two months after the declaration of independence, a constitutional assembly was elected, which met on the 15th of January, adopted the constitution described above, and chose as president Manuel Amador Guerrero (1834–1909). He was succeeded in October 1908 by Domingo de Obaldia. In 1905 a treaty was made with Costa Rica for the demarcation of the boundary line between the two countries.

See Henri Pensa, *La République et le Canal de Panama* (Paris, 1906), devoted mainly to the question of international law; Valdés, *Geografia del istmo de Panama* (New York, 1905); R. T. Hill, "The Geological History of the Isthmus of Panama and Portions of Porto Rico" (1898), vol. 28, pp. 151–285, of the *Bulletin of the Museum of Comparative Zoology* of Harvard College; E. J. Cattell (ed.), *Panama* (Philadelphia, 1905), being pt. i, § 27 of the Foreign Commercial Guide of the Philadelphia Commercial Museum; and the publications on Panama of the International Bureau of American Republics.

PANAMA, the capital and the chief Pacific port of the republic of Panama, and the capital of the province of the same name, in the south-central part of the country, at the head of the Gulf of Panama, and at the south terminus of the Panama railway, 47½ m. from Colon, and of the Panama Canal. Pop. (1910), about 30,000, of whom nearly one-half were foreign-born or of foreign parentage. Panama is served by regular steamers to San Francisco, Yokohama and other Pacific ports. The city is built on a rocky peninsula jutting out to the east, near the mouth of the Rio Grande and at the foot of Mt Ancon (560 ft.). The harbour is good and is enclosed at the south by several rugged islands, the largest being Perico and Flamenco (belonging to the United States) and Taboga (935 ft.), which is a place of country residence for wealthy citizens. The main streets run north and south and are cut by the Avenida Central; nearly all the streets are narrow and crooked. The principal squares are Cathedral, Santa Ana, Bolivar and Lesseps. The city proper is almost entirely enclosed by the remains of a great granite wall (built in 1673, when the new city was established), on the top of which on the side facing the sea is Las Bovedas promenade. The public buildings include the cathedral (1760), the government palace, the municipal palace, the episcopal palace, the church of Santa Ana, a national theatre, a school of arts and trades, a foreign hospital, the former administration building of the Canal Company, Santo Tomas Hospital, the pesthouse of Punta Mala and various asylums. The houses are mostly of stone, with red tile roofs, two or three storeys high, built in the Spanish style around central patios, or courts, and with balconies projecting far over the narrow streets; in such houses the lowest floor is often rented to a poorer family. There are dwellings above most of the shops. The streets are lighted with electricity; and there are electric street railways and telephones in the city. The water supply and drainage systems were introduced by the United States government, which controls the sanitation of the city, but has no other jurisdiction over it. Two miles inland is Ancon, in the Canal Zone, in which are the hospitals of the Isthmian Canal Commission and the largest hotel on the isthmus. The city of Panama was formerly a stronghold of yellow fever and malaria, which American sanitary measures have practically eradicated. Panama has had an important trade: its imports, about twice as valuable as its exports, include cotton goods, haberdashery, coal, flour, silk goods and rice; the most valuable exports are gold, india-rubber, mother of pearl and cocobolo wood. As Balboa (3 m. west of the city, connected with it by railway, and formerly called La Boca), the port of Panama and the actual terminus of the canal, is in the Canal Zone and is a port under the jurisdiction of the United States, the commercial future of Panama is dependent upon American tariffs and the degree to which Panama and Balboa may be identified. At Balboa there are three wharves, one 985 ft. long and another 1000 ft. long, but their capacity is so insufficient that lighterage is still necessary. In the city there is one small dock which can be used only at full tide. Small vessels may coal at Naos, an island in the Gulf of Panama, which is owned by the United States. Soap and chocolate are manufactured. Founded in 1519 by Pedro Arias de Avila, Panama is the oldest European town on the mainland of America. In the 16th century the city was the strongest Spanish fortress in the New World, excepting Cartagena, and gold and silver were brought hither by ship from Peru and were carried across the Isthmus to Chagres, but as Spain's fleets even in the Pacific were more and more often attacked in the 17th century, Panama became less important, though it was still the chief Spanish port on the Pacific. In 1671 the city was destroyed by Henry Morgan, the buccaneer; it was rebuilt in 1673 by Alfonzo Mercado de Villacorta about five miles west of the old site and nearer the roadstead. The city has often been visited by earthquakes. In the city in June 1826 the Panama Congress met (see PAN-AMERICAN CONFERENCES).

PANAMA CANAL. When he crossed the Atlantic, the object Columbus had in view was to find a western passage from Europe to Cathay. It was with the greatest reluctance, and only after a generation of unremitting toil that the explorers who succeeded him became convinced that the American continent was continuous, and formed a barrier of enormous extent to the passage of vessels. The question of cutting a canal through this barrier at some suitable point was immediately raised. In 1550 the Portuguese navigator Antonio Galvao published a book to demonstrate that a canal could be cut at Tehuantepec,

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[1] The state of Panama, with boundaries nearly corresponding to those of the present republic, and including the province of Panama and other provinces, was created in 1855 by legislative enactment.

Nicaragua, Panama or Darien, and in 1551 the Spanish historian F. L. de Gomara submitted a memorial to Philip II. urging in forcible language that the work be undertaken without delay. But the project was opposed by the Spanish Government, who had now concluded that a monopoly of communication with their possessions in the New World was of more importance than a passage by sea to Cathay. It even discouraged the improvement of the communications by land. To seek or make known any better route than the one from Porto Bello to Panama was forbidden under penalty of death. For more than two centuries no serious steps were taken towards the construction of the canal, if exception be made of William Paterson's disastrous Darien scheme in 1698. In 1771 the Spanish government, having changed its policy, ordered a survey for a canal at Tehuantepec, and finding that line impracticable, ordered surveys in 1779 at Nicaragua, but political disturbances in Europe soon prevented further action. In 1808 the isthmus was examined by Alexander von Humboldt, who pointed out the lines which he considered worthy of study. After the Central American republics acquired their independence in 1823, there was a decided increase of interest in the canal question. In 1825 the Republic of the Centre, having received applications for concessions from citizens of Great Britain, and also from citizens of the United States, made overtures to the United States for aid in constructing a canal, but they resulted in nothing. In 1830 a concession was granted to a Dutch corporation under the special patronage of the king of the Netherlands to construct a canal through Nicaragua, but the revolution and the separation of Belgium from Holland followed, and the scheme fell through. Subsequently numerous concessions were granted to citizens of the United States, France and Belgium, both for the Nicaragua and the Panama lines, but with the exception of the concession of 1878 for Panama and that of 1887 for Nicaragua, no work of construction was done under any of them.

Knowledge of the topography of the isthmus was extremely vague until the great increase of travel due to the discovery of gold in California in 1848 rendered improved communications a necessity. A railroad at Panama and a canal at Nicaragua were both projected. Instrumental surveys for the former in 1849, and for the latter in 1850, were made by American engineers, and, with some small exceptions, were the first accurate surveys made up to that time. The work done resulted in geographical knowledge sufficient to eliminate from consideration all but the following routes: (1) Nicaragua; (2) Panama; (3) San Blas; (4) Caledonia Bay; (5) Darien; (6) Atrato river, of which last there were four variants, the Tuyra, the Truando, the Napipi and the Bojaya. In 1866, in response to an inquiry from Congress, Admiral Charles H. Davis, U.S. Navy, reported that "there does not exist in the libraries of the world the means of determining even approximately the most practicable route for a ship canal across the American isthmus." To clear up the subject, the United States government sent out, between 1870 and 1875, a series of expeditions under officers of the navy, by whom all of the above routes were examined. The result was to show that the only lines by which a tunnel could be avoided were the Panama and the Nicaragua lines; and in 1876 a United States Commission reported that the Nicaragua route possessed greater advantages and offered fewer difficulties than any other. At Panama the isthmus is narrower than at any other point except San Blas, its width in a straight line being only 35 m. and the height of the continental divide is only 300 ft., which is higher than the Nicaragua summit, but less than half the height on any other route. At Nicaragua the distance is greater, being about 156 m. in a straight line, but more than one third is covered by Lake Nicaragua, a sheet of fresh water with an area of about 3000 sq. m. and a maximum depth of over 200 ft., the surface being about 105 ft. above sea-level. Lake Nicaragua is connected with the Atlantic by a navigable river, the San Juan, and is separated from the Pacific by the continental divide, which is about 160 ft. above sea-level. At Nicaragua only a canal with locks is feasible, but at Panama a sea-level canal is a physical possibility.

By the Clayton-Bulwer Treaty of 1850 with Great Britain, by the treaty of 1846 with New Granada (Colombia), Article XXXV., and by the treaty of 1867 with Nicaragua, Article XV., the United States guaranteed that the projected canal, whether the Panama or the Nicaraguan, should be neutral, and, furthermore, that it be used and enjoyed upon equal terms by the citizens of both countries in each case. A modification of the Clayton-Bulwer Treaty being necessary to enable the United States to build the canal, a treaty making such modifications, but preserving the principle of neutrality, known as the Hay-Pauncefote Treaty, was negotiated with Great Britain in 1900; it was amended by the United States Senate, and the amendments not proving acceptable to Great Britain, the treaty lapsed in March 1901. A new treaty, however, was negotiated in the autumn, and accepted in December by the U.S. Senate.

The completion of the Suez Canal in 1869, and its subsequent success as a commercial enterprise, drew attention more forcibly than ever to the American isthmus. In 1876 an association entitled "Société Civile Internationale du Canal Interocéanique" was organized in Paris to make surveys and explorations for a ship canal. An expedition under the direction of Lieut. L. N. B. Wyse, an officer of the French navy, was sent to the isthmus to examine the Panama line. In May 1878 Lieut. Wyse, in the name of the association, obtained a concession from the Colombian government, commonly known as the Wyse Concession. This is the concession under which work upon the Panama Canal has been prosecuted. Its first holders did no work of construction.

First Panama Company.

In May 1879 an International Congress composed of 135 delegates from various nations—some from Great Britain, United States and Germany, but the majority from France—was convened in Paris under the auspices of Ferdinand de Lesseps, to consider the best situation for, and the plan of, a canal. After a session of two weeks the Congress decided that the canal should be at the sea-level, and at Panama. Immediately after the adjournment of the Congress the Panama Canal Company was organized under a general law of France, with Lesseps as president, and it purchased the Wyse Concession at the price of 10,000,000 francs. An attempt to float this company in August 1879 failed, but a second attempt, made in December 1880, was fully successful, 6,000,000 shares of 500 francs each being sold. The next two years were devoted to surveys and examinations and preliminary work upon the canal. The plan adopted was for a sea-level canal having a depth of 29½ ft. and bottom width of 72 ft., involving excavation estimated at 157,000,000, cub. yds. The cost was estimated by Lesseps in 1880 at 658,000,000 francs, and the time required at eight years. The terminus on the Atlantic side was fixed by the anchorage at Colon, and that on the Pacific side by the anchorage at Panama. Leaving Colon, the canal was to pass through low ground by a direct line for a distance of 6 m. to Gatun, where it intersected the valley of the Chagres river; pass up that valley for a distance of 21 m. to Obispo, where it left the Chagres and ascended the valley of a tributary, the Cumacho; cut through the watershed at Culebra, and thence descend by the valley of the Rio Grande to Panama Bay. Its total length from deep water in the Atlantic to deep water in the Pacific was about 47 m. It was laid out in such a way as to give easy curvature everywhere; the sharpest curve, of which there was but one, had a radius of 6200 ft., four others had a radius of 8200 ft., and all others had a radius of 9800 ft. or more. To secure this it was necessary to select a point for crossing the watershed where the height was somewhat greater than that of the lowest pass. The line was essentially the same as that followed by the Panama railroad, the concession for which granted a monopoly of that route; the Wyse Concession, therefore, was applicable only upon condition that the canal company could come to an amicable agreement with the railroad company.

The principal difficulties to be encountered in carrying out this plan consisted in the enormous dimensions of the cut to be made at Culebra, and in the control of the Chagres river, the valley of which is occupied by the canal for a large part of its length. This stream is of torrential character, its discharge varying from a minimum of about 350 cub. ft. to a maximum of over 100,000 cub. ft. per second. It rose at Gamboa on the 1st of December 1890, 18⅜ ft. in twelve hours, its volume increasing from 15,600 cub. ft. to 57,800 cub. ft. per second at the same time; and similar violent changes are not uncommon. To admit a stream of this character to the canal would be an intolerable nuisance to navigation unless space could be provided for its waters to spread out. For a canal with locks the remedy is simple, but for a sea-level canal the problem is much more difficult, and no satisfactory solution of the question was ever reached under the Lesseps plan.

Work under this plan continued until the latter part of 1887, the management being characterized by a degree of extravagance and corruption rarely if ever equalled in the history of the world. By that time it had become evident that the canal could not be completed at the sea-level with the resources of time and money then available. The plan was accordingly changed to one including locks, and work was pushed on with vigour until 1889, when the company, becoming bankrupt, was dissolved by a judgment of the Tribunal Civil de la Seine, dated the 4th of February 1889, a liquidator being appointed by the court to take charge of its affairs. One of the more important duties assigned to this official was to keep the property together and the concession alive, with a view to the formation of a new company for the completion of the canal. He gradually reduced the number of men employed, and finally suspended the works on the 15th of May 1889. He then proceeded to satisfy himself that the canal project was feasible, a question about which the failure of the company had caused grave doubts, and to this end caused an inquiry to be held by a commission of French and foreign engineers. This commission reported on the 9th of May 1890 that a canal with locks, for which they submitted a plan, could be built in eight years at a cost of 580,000,000 francs for the works, which sum should be increased to 900,000,000 francs to include administration and financing. They reported that the plant in hand was in good condition and would probably suffice for finishing the canal, and they estimated the value of the work done and of the plant in hand at 450,000,000 francs.

The time within which the canal was to be completed under the Wyse Concession having nearly expired, the liquidator sought and obtained from the Colombian government an extension of ten years. Twice subsequently the time was extended by the Colombian government, the date ultimately fixed for the completion of the canal being the 31st of October 1910. For each of these extensions the Colombian government exacted heavy subsidies.

The liquidator finally secured the organization of a new company on the 20th of October 1894. The old company and the liquidator had raised by the sale of stock and bonds the sum of 1,271,682,637 francs. The securities issued to raise this money had a par value of 2,245,151,200 francs, held by about 200,000 persons. In all about 72,000,000 cub. yds. had been excavated, and an enormous quantity of machinery and other plant had been purchased and transported to the isthmus at an estimated cost of 150,000,000 francs. Nearly all of the stock of the Panama railroad—68,534 of the 70,000 shares existing—also had been purchased, at a cost of 93,268,186 francs.

Second Panama Company.

The new company was regularly organized under French law, and was recognized by the Colombian government. It was technically a private corporation, but the great number of persons interested in the securities of the old company, and the special legislation of the French Chambers, gave it a semi-national character. By the law of the 8th of June 1888, all machinery and tools used in the work must be of French manufacture, and raw material must be of French origin. Its capital stock consisted of 650,000 shares of 100 francs each, of which 50,000 shares belonged to Colombia. It succeeded to all the rights of the old company in the concessions, works, lands, buildings, plant, maps, drawings, &c., and shares of the Panama railroad. For the contingency that the canal should not be completed, special conditions were made as to the Panama railroad shares. These were to revert to the liquidator, but the company had the privilege of purchasing them for 20,000,000 francs in cash and half the net annual profits of the road. The Panama railroad retained its separate organization as an American corporation.

Immediately after its organization in 1894 the new company took possession of the property (except the Panama railroad shares, which were held in trust for its benefit), and proceeded to make a new study of the entire subject of the canal in its engineering and commercial aspects. It resumed the work of excavation, with a moderate number of men sufficient to comply with the terms of the concession, in a part of the line—the Emperador and Culebra cuts—where such excavation must contribute to the enterprise if completed under any plan. By the middle of 1895, about 2000 men had been collected, and since that time the work progressed continuously, the number of workmen varying between 1900 and 3600. The amount of material excavated to the end of 1899 was about 5,000,000 cubic yards. The amount expended to the 30th of June 1899 was about 35,000,000 francs, besides about 6,500,000 francs advanced to the Panama Railroad Company for building a pier at La Boca.

The charter provided for the appointment by the company and the liquidator of a special engineering commission of five members, to report upon the work done and the conclusions to be drawn therefrom, this report to be rendered when the amounts expended by the new company should have reached about one-half its capital. The report was to be made public, and a special meeting of the stockholders was then to be held to determine whether or not the canal should be completed, and to provide ways and means. The time for this report and special meeting arrived in 1898. In the meanwhile the company had called to its aid a technical committee composed of fourteen engineers, European and American, some of them among the most eminent in their profession. After a study of all the data available, and of such additional surveys and examinations as it considered should be made, this committee rendered an elaborate report dated the 16th of November 1898. This report was referred to the statutory commission of five, who reported in 1899 that the canal could be built according to that project within the limits of time and money estimated. The special meeting of stockholders was called immediately after the regular annual meeting of the 30th of December 1899. It is understood that the liquidator (who held about one-fourth the stock) refused to take part in it, and that no conclusions were reached as to the expediency of completing the canal or as to providing ways and means. The engineering questions had been solved to the satisfaction of the company, but the financial questions had been made extremely difficult, if not insoluble, by the appearance of the United States government in the field as a probable builder of an isthmian canal. The company continued to conduct its operations in a provisional way, without appealing to the public for capital.

The plan adopted by the company involved two levels above the sea-level—one of them an artificial lake to be created by a dam at Bohio, to be reached from the Atlantic by a flight of two locks, and the other, the summit-level, to be reached by another flight of two locks from the preceding. The summit-level was to have its surface at high water 102 ft. above the sea, and to be supplied with water by a feeder leading from an artificial reservoir to be constructed at Alajuela in the upper Chagres valley; the ascent on the Pacific side to be likewise by four locks. The canal was to have a depth of 29½ ft. and a bottom width of about 98 ft., with an increased width in certain specified parts. Its general plan was the same as that adopted by the old company. The locks were to be double, or twin locks, the chambers to have a serviceable length in the clear of 738 ft., with a width of 82 ft. and a depth of 32 ft. 10 in., with lifts varying from 20 to 33 ft., according to situation and stage of water. The time required to build the canal was estimated at ten years, and its cost at 525,000,000 francs for the works, not including administration and financing.

Nicaragua Scheme.

The occupation of the Panama route by Europeans, and the prospect of a canal there under foreign control, was not a pleasing spectacle to the people of the United States. The favour with which the Nicaragua route had been considered since 1876 began to assume a partisan character, and the movement to construct a canal on that line to assume a practical shape. In 1884 a treaty, known as the Frelinghuysen-Zavala Treaty, was negotiated with Nicaragua, by the terms of which the United States Government was to build the canal without cost to Nicaragua, and after completion it was to be owned and managed jointly by the two governments. The treaty was submitted to the United States Senate, and in the vote for ratification, on the 29th of January 1885, received thirty-two votes in its favour against twenty-three. The necessary two-thirds vote not having been obtained, the treaty was not ratified, and a change of administration occurring soon afterwards, it was withdrawn from further consideration. This failure led to the formation in New York by private citizens in 1886 of the Nicaragua Canal Association, for the purpose of obtaining the necessary concessions, making surveys, laying out the route, and organizing such corporations as should be required to construct the canal. They obtained a concession from Nicaragua in April 1887, and one from Costa Rica in August 1888, and sent parties to survey the canal. An act for the incorporation of an association to be known as the Maritime Canal Company of Nicaragua passed Congress and was approved on the 20th of February 1889, and on the 4th of May 1889 the company was organized. It took over the concessions and, acting through a construction company, began work upon the canal in June 1889. Operations upon a moderate scale and mainly of a preliminary character were continued until 1893, when the financial disturbances of that period drove the construction company into bankruptcy and compelled a suspension of the work. It has not since been resumed. At that time the canal had been excavated to a depth of 17 ft and a width of 280 ft. for a distance of about 3000 ft. inland from Greytown; the canal line had been cleared of timber for a distance of about 20 m.; a railroad had been constructed for a distance of about 11 m. inland from Greytown; a pier had been built for the improvement of Greytown harbour and other works undertaken. In all, about $4,500,000 had been expended.

Congress continued to take an interest in the enterprise, and in 1895 provided for a board of engineers to inquire into the possibility, permanence, and cost of the canal as projected by the Maritime Canal Company. The report of this board, dated April 1895, severely criticized the plans and estimates of the company, and led to the appointment in 1897 of another board, to make additional surveys and examinations, and to prepare new plans and estimates. The second board recommended some radical changes in the plans, and especially in the estimates, but its report was not completed when the revival of the Panama scheme attracted the attention of Congress, and led to the creation in 1899 of the Isthmian Canal Commission. In the meanwhile the property of the Maritime Canal Company has become nearly worthless through decay, and its concession has been declared forfeited by the Nicaraguan government.

Isthmian Canal Commission.

The interest of the United States in an isthmian canal was not essentially different from that of other maritime nations down to about the middle of the 19th century, but it assumed great strength when California was acquired, and it has steadily grown as the importance of the Pacific States has developed. In 1848 and again in 1884, treaties were negotiated with Nicaragua authorizing the United States to build the canal, but in neither case was the treaty ratified. The Spanish War of 1898 gave a tremendous impetus to popular interest in the matter, and it seemed an article of the national faith that the canal must be built, and, furthermore, that it must be under American control. To the American people the canal appears to be not merely a business enterprise from which a direct revenue is to be obtained, but rather a means of unifying and strengthening their national political interests, and of developing their industries, particularly in the Pacific States; in short, a means essential to their national growth. The Isthmian Canal Commission created by Congress in 1899 to examine all practicable routes, and to report which was the most practicable and most feasible for a canal under the control, management and ownership of the United States, reported that there was no route which did not present greater disadvantages than those of Panama and Nicaragua. It recommended that the canal at Panama have a depth of 35 ft. and a bottom width 150 ft., the locks to be double, the lock chambers to have a length 740 ft., width 84 ft. and depth 35 ft. in the clear. The cost of a canal with these dimensions, built essentially upon the French plans, was estimated at $156,378,258. A plan, however, was recommended in which the height of the Bohio dam was increased about 20 ft., the level of Lake Bohio raised by that amount, the lake made the summit-level, and the Alajuela dam omitted. The cost upon this plan was estimated at $143,971,127.

According to the plan recommended by the Commission for Nicaragua the line began at Greytown on the Caribbean Sea, where an artificial harbour was to be constructed and follow the valley of the San Juan for 100 m. to Lake Nicaragua; thence across the lake about 70 m. to the mouth of Las Lajas river; then up the valley of that stream through the watershed, and down the valley of the Rio Grande, 17 m. to Brito on the Pacific, where also an artificial harbour was to be constructed. The distance from ocean to ocean is 187 m. About midway between the lake and the Caribbean the San Juan receives its most important affluent, the San Carlos, and undergoes a radical change in character. Above the junction it is a clear water stream, capable of improvement by locks and dams. Below, it is choked with sand, and not available for slack-water navigation. A dam across the San Juan above the mouth of the San Carlos was to maintain the water of the river above that point on a level with the lake. The line of the canal occupied essentially the bed of the river from the lake to the dam; from the dam to the Caribbean it followed the left bank of the river, keeping at a safe distance from it, and occasionally cutting through a high projecting ridge. The lake and the river above the dam constitute the summit-level, which would have varied in height at different seasons from 104 to 110 ft. above mean sea-level. It would have been reached from the Caribbean side by five locks, the first having a lift of 36½ ft., and the others a uniform lift of 18½ ft. each, making a total lift of 110½ ft. from low tide in the Caribbean to high tide in the lake. From the Pacific side the summit would have been reached by four locks having a uniform lift of 28½ ft. each, or a total lift of 114 ft. from low tide in the Pacific to high tide in the lake. The time required to build the canal was estimated at ten years, and its cost at $200,540,000.

The report of the commission, transmitted to Congress at the end of 1900, ended thus:—

> The Panama Canal, after completion, would be shorter, have fewer locks and less curvature than the Nicaragua Canal. The measure of these advantages is the time required for a vessel to pass through, which is estimated for an average ship at 12 hours for Panama and 33 hours for Nicaragua. On the other hand, the distance from San Francisco to New York is 377 m., to New Orleans 579 m. and to Liverpool 386 m. greater via Panama than via Nicaragua. The time required to pass over these distances being greater than the difference in the time of transit through the canals, the Nicaragua line, after completion, would be somewhat the more advantageous of the two to the United States, notwithstanding the greater cost of maintaining the longer canal.
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> The government of Colombia, in which lies the Panama Canal, has granted an exclusive concession, which still has many years to run. It is not free to grant the necessary rights to the United States, except upon condition that an agreement be reached with the New Panama Canal Company. The Commission believes that such agreement is impracticable. So far as can be ascertained, the company is not willing to sell its franchise, but will allow the United States to become the owner of part of its stock. The Commission considers such an arrangement inadmissible. The Governments of Nicaragua and Costa Rica, on the other hand, are untrammelled by concessions, and are free to grant to the United States such privileges as may be mutually agreed upon.
>
> In view of all the facts, and particularly in view of all the difficulties of obtaining the necessary rights, privileges and franchises on the Panama route, and assuming that Nicaragua and Costa Rica recognize the value of the canal to themselves, and are prepared to grant concessions on terms which are reasonable and acceptable to the United States, the Commission is of the opinion that "the most practicable and feasible route for" an isthmian canal, to be "under the control, management and ownership of the United States," is that known as the Nicaragua route.

Panama Route adopted.

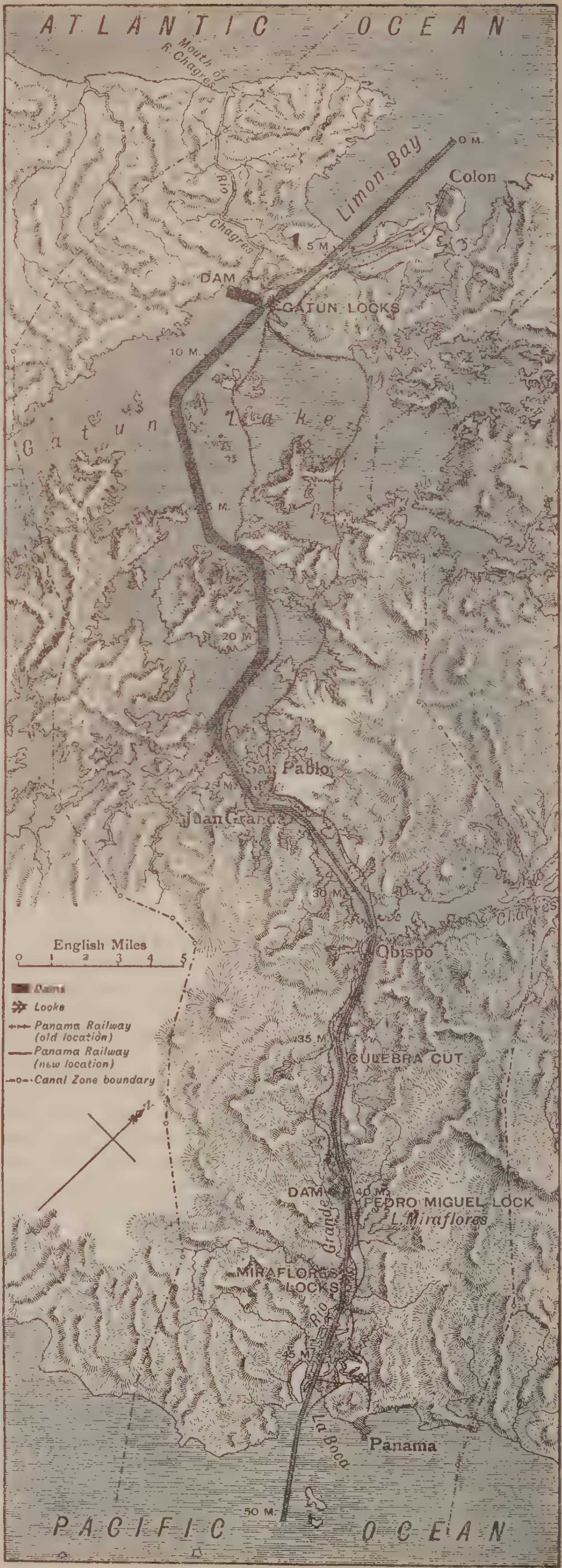
This report caused the New Panama Canal Company to view the question of selling its property in a new light, and in the spring of 1901 it obtained permission from the Colombian government to dispose of it to the United States. It showed itself, however, somewhat reluctant to name a price to the Canal Commission, and it was not till January 1902 that it definitely offered to accept $40,000,000. In consequence of this offer, the commission in a supplementary report issued on the 18th of January 1902 reversed the conclusion it had stated in its main report, and advised the adoption of the Panama route, with purchase of the works, &c., of the French company. A few days previous to this report the Hepburn bill authorizing the Nicaragua canal at a cost of $180,000,000, had been carried in the House of Representatives by a large majority, but when it reached the Senate an amendment—the so-called Spooner bill—was moved and finally became law on the 28th of June 1902. This authorized the president to acquire all the property of the Panama Canal Company, including not less than 68,869 shares of the Panama Railroad Company, for a sum not exceeding $40,000,000, and to obtain from Colombia perpetual control of a strip of land 6 m. wide; while if he failed to come to terms with the company and with Colombia in a reasonable time and on reasonable terms, he was by treaty to obtain from Costa Rica and Nicaragua the territory necessary for the Nicaragua canal.

Declaration of Panama Independence.

Negotiations were forthwith opened with Colombia, and ultimately a treaty (the Hay-Herran treaty) was signed in January 1903. The Colombian Senate, however, refused ratification, and it seemed as if the Panama scheme would have to be abandoned when the complexion of affairs was changed by Panama revolting from Colombia and declaring itself independent in November 1903. Within a month the new republic, by the Hay-Bunau-Varilla treaty, granted the United States the use, occupation and control of a strip of land 10 m. wide for the purposes of the canal. A few days after the ratification of this treaty by the United States Senate in February 1904—the concession of the French company having been purchased—a commission was appointed to undertake the organization and management of the enterprise, and in June Mr J. F. Wallace was chosen chief engineer. Work was begun without delay, but the commission's methods of administration and control soon proved unsatisfactory, and in April 1905 it was reorganized, three of its members being constituted an executive committee which was to be at Panama continuously. Shortly afterwards, at the end of June, Mr Wallace resigned his position as chief engineer and was succeeded by Mr John F. Stevens.

Construction Problems.

In connexion with the reorganization of the commission a board of consulting engineers, five being nominated by European governments, was appointed in June 1905 to consider the question, which so far had not been settled, whether the canal should be made at sea-level, without locks (at least except tidal regulating locks at or near the Pacific terminus), or should rise to some elevation above sea-level, with locks. The board reported in January 1906. The majority (eight members out of thirteen) declared in favour of a sea-level canal as the only plan "giving reasonable assurance of safe and uninterrupted navigation"; and they considered that such a canal could be constructed in twelve or thirteen years' time, that the cost would be less than $250,000,000, and that it would endure for all time. The minority recommended a lock canal, rising to an elevation of 85 ft. above mean sea-level, on the grounds that it would cost about $100,000,000 less than the proposed sea-level canal, that it could be built in much less time, that it would afford a better navigation, that it would be adequate for all its uses for a longer time, and that it could be enlarged if need should arise with greater facility and less cost. The chief engineer, Mr Stevens, also favoured the lock or high-level scheme for the reasons, among others, that it would provide as safe and a quicker passage for ships, and therefore would be of greater capacity; that it would provide, beyond question, the best solution of the vital problem how safely to care for the flood waters of the Chagres and other streams, that provision was made for enlarging its capacity to almost any extent at very much less expense of time and money than could be provided for by any sea-level plan; that its cost of operation, maintenance and fixed charges would be very much less than those of any sea-level canal; and that the time and cost of its construction would be not more than one-half that of a canal of the sea-level type. These conflicting reports were then submitted to the Isthmian Canal Commission for consideration, with the result that on the 5th of February, it reported, one member only dissenting, in favour of the lock canal recommended by the minority of the board of consulting engineers. Finally this plan was adopted by Congress in June 1906. Later in the same year tenders were invited from contractors who were prepared to undertake the construction of the canal. These were opened in January 1907, but none of them was regarded as entirely satisfactory, and



Emery Walker sc.

President Roosevelt decided that it would be best for the government to continue the work, which was placed under the more immediate control of the U.S.A. Corps of Engineers. At the same time the Isthmian Canal Commission was reorganized, Major G. W. Goethals, of the Corps of Engineers, becoming engineer in chief and chairman, in succession to Mr J. F. Stevens who, after succeeding Mr T. P. Shonts as chairman, himself resigned on the 1st of April.

The following are the leading particulars of the canal, the course of which is shown on the accompanying map. The length from deep water in the Atlantic to deep water in the Pacific will be about 50 m., or, since the distance from deep water to the shore-line is about 4½ m. in Limon Bay and about 5 m. at Panama, approximately 40½ m. from shore to shore. The summit level, regulated between 82 and 87 ft. above sea-level, will extend for 31½ m. from a large earth dam at Gatun to a smaller one at Pedro Miguel, and is to be reached by a flight of 3 locks at the former point. The Gatun dam will be 7200 ft. long along the crest including the spillway, will have a maximum width at its base of 2000 ft., and will be uniformly 100 ft. wide at its top, which will rise 115 ft. above sea-level. The lake (Lake Gatun) enclosed by these dams will be 164¼ sq. m. in area, and will constitute a reservoir for receiving the floods of the Chagres and other rivers as well as for supplying water for lockage. A smaller lake (Lake Miraflores), with a surface elevation of 55 ft. and an area of about 2 sq. m. will extend from a lock at Pedro Miguel to Miraflores, where the valley of the Rio Grande is to be closed by an earth dam on the west and a concrete dam with spillway on the east, and the canal is to descend to sea-level by a flight of two locks. All the locks are to be in duplicate, each being 110 ft. wide with a usable length of 1000 ft. divided by a middle gate. The channel leading from deep water in the Caribbean sea to Gatun will be about 7 m. long and 500 ft. broad, increasing to 1000 ft. from a point 4000 ft. north of the locks in order to form a waiting basin for ships. From Gatun locks, 0·6 m. in length, the channel is to be 1000 ft. or more in width for a distance of nearly 16 m. to San Pablo. Thence it narrows first to 800 ft., and then for a short distance to 700 ft., for 3½ m. to mile 27 near Juan Grande, and to 500 ft. for 4¼ m. from Juan Grande to Obispo (mile 31¼). From this point through the Culebra cut to Pedro Miguel lock, it will be only 300 ft. wide, but will widen again to 500 ft. through Miraflores lake, 1⅓ m. long, to Miraflores locks, the total length of which including approaches will be nearly a mile, and will thence maintain the same width for the remaining 8 m. to deep water on the Pacific. The minimum bottom width of the canal will thus be 300 ft., the average being 649 ft., while the minimum depth will be 41 ft.

In 1909 it was estimated that the construction of the canal would be completed by the 1st of January 1915, and that the total cost to the United States would not exceed $375,000,000 including $50,000,000 paid to the French Canal Company and the Republic of Panama, $7,382,000 for civil administration, and $20,053,000 for sanitation. The last was one of the most necessary expenditures of all, since without it disease would have greatly retarded the work or perhaps prevented it altogether.

See W. F. Johnson, *Four Centuries of the Panama Canal* (New York, 1906); *Report of the Board of Consulting Engineers for the Panama Canal* (Washington, 1906); *Annual Reports of the Isthmian Canal Commission* (Washington); Vaughan Cornish, *The Panama Canal and its Makers* (London, 1909).

PAN-AMERICAN CONFERENCES. At intervals delegates from the independent countries of North, Central and South America have met in the interests of peace and for the improvement of commercial relations and for the discussion of various other matters of common interest. A movement for some form of union among the Spanish colonies of Central and South America was inaugurated by Simon Bolivar while those colonies were still fighting for independence from Spain, and in 1825 the United States, which in May 1822 had recognized their independence and in December 1823 had promulgated the Monroe Doctrine, was invited by the governments of Mexico and Colombia to send commissioners to a congress to be held at Panama in the following year. Henry Clay, the secretary of state, hoped the congress might be the means of establishing a league of American republics under the hegemony of the United States, and under his influence President J. Q. Adams accepted the invitation, giving notice however that the commissioners from the United States would not be authorized to act in any way inconsistent with the neutral attitude of their country toward Spain and her revolting colonies. The principal objects of the Spanish-Americans in calling the congress were, in fact, to form a league of states to resist Spain or any other European power that might attempt to interfere in America and to consider the expediency of freeing Cuba and Porto Rico from Spanish rule; but in his message to the Senate asking that body to approve his appointment of commissioners Adams declared that his object in appointing them was to manifest a friendly interest in the young republics, give them some advice, promote commercial reciprocity, obtain from the congress satisfactory definitions of the terms "blockade" and "neutral rights" and encourage religious liberty. In the Senate the proposed mission provoked a spirited attack on the administration. Some senators feared that it might be the means of dragging the United States into entangling alliances; others charged that the President had construed the Monroe Doctrine as a pledge to the southern republics that if the powers of Europe joined Spain against them the United States would come to their assistance with arms and men; and a few from the slave-holding states wished to have nothing to do with the republics because they proposed to make Cuba and Porto Rico independent and liberate the slaves on those islands. The Senate finally, after a delay of more than ten weeks, confirmed the appointments. There was further delay in the House of Representatives, which was asked to make an appropriation for the mission; one of the commissioners, Richard C. Anderson (1788–1826), died on the way (at Cartagena, July 24), and when the other, John Sergeant (1779–1852), reached Panama the congress, consisting of representatives from Colombia, Guatemala, Mexico and Peru, had met (June 22), concluded and signed a "treaty of union, league and perpetual confederation" and adjourned to meet again at Tacubaya, near the City of Mexico. The governments of Guatemala, Mexico and Peru refused to ratify the treaty and the Panama congress or conference was a failure. The meeting at Tacubaya was never held.

Mexico proposed another conference in 1831, and repeated the proposal in 1838, 1839 and 1840, but each time without result. In December 1847, while Mexico and the United States were at war, a conference of representatives from Bolivia, Chile, Ecuador, New Granada and Peru met at Lima, gave the other American republics the privilege of joining in its deliberations or becoming parties to its agreements, continued to deliberate until the 1st of March 1848, and concluded a treaty of confederation, a treaty of commerce and navigation, a postal treaty and a consular convention; but with the exception of the ratification of the consular convention by New Granada its work was rejected. Representatives from Peru, Chile and Ecuador met at Santiago in September 1856 and signed the "Continental Treaty" designed to promote the union of the Latin-American republics, but expressing hostility toward the United States as a consequence of the filibustering expeditions of William Walker (1824–1860); it never became effective. In response to an invitation from the government of Peru to each of the Latin-American countries, representatives from Guatemala, Colombia, Venezuela, Ecuador, Peru, Bolivia and Argentina met in a conference at Lima in November 1864 to form a "Union." Colombia was opposed to extending the invitation to the United States lest that country should "embarrass the action of the Congress"; the conference itself accomplished little. In 1877–1878 jurists from Peru, Bolivia, Cuba, Chile, Ecuador, Honduras, Argentina, Venezuela and Costa Rica met at Lima and concluded a treaty of extradition and a treaty on private international law, and Uruguay and Guatemala agreed to adhere to them. War among the South American states prevented the holding of a conference which had been called by the government of Colombia to meet at Panama in September 1881 and of another which had been called by the government of the United States to meet at Washington in November 1882. In 1888–1889 jurists from Argentina, Bolivia, Brazil, Chile, Paraguay, Peru and Uruguay met at Montevideo and concluded treaties on international civil law, international commercial law, international penal law, international law of procedure, literary and artistic property, trade-marks and patents, several of which were subsequently ratified by the South American countries.

In May 1888 the Congress of the United States had passed an Act authorizing the President to invite the several Latin-American governments to a conference in Washington to consider measures for preserving the peace, the formation of a customs union, the establishment of better communication between ports, the adoption of a common silver coin, a uniform system of weights, measures, patent-rights, copyrights and trade-marks, the subject of sanitation of ships and quarantine, &c. All the governments except Santo Domingo accepted the invitation and this conference is commonly known as the first Pan-American Conference. It met on the 2nd of October 1889, was presided over by James G. Blaine, the American secretary of state, who had been instrumental in having the conference called, and continued its sessions until the 19th of April 1890. A majority of its members voted for compulsory arbitration, and recommendations were made relating to reciprocity treaties, customs regulations, port duties, the free navigation of American rivers, sanitary regulations, a monetary union, weights and measures, patents and trade-marks, an international American bank, an intercontinental railway, the extradition of criminals, and several other matters. Nothing came of its recommendations, however, except the establishment in Washington of an International Bureau of American Republics for the collection and publication of information relating to the commerce, products, laws and customs of the countries represented. At the suggestion of President McKinley the government of Mexico called the second Pan-American Conference to meet at the City of Mexico on the 22nd of October 1901. There was a full representation and the sessions were continued until the 31st of January 1902. The chief subject of discussion was arbitration, and after much wrangling between those who insisted upon compulsory arbitration and those opposed to it a majority of the delegations signed a project whereby their countries should become parties to the Hague conventions of 1899, which provide for voluntary arbitration. At the same time ten delegations signed a project for a treaty providing for compulsory arbitration. The conference also approved a project for a treaty whereby controversies arising from pecuniary claims of individuals of one country against the government of another should be submitted to the arbitration court established by the Hague convention. The conference ratified a resolution of the first conference recommending the construction of complementary lines of the proposed Pan-American railway.

At this conference, too, the International Bureau of American Republics was organized under a governing board of diplomatists with the secretary of state of the United States as chairman; it was directed to publish a monthly bulletin, and in several other respects was made a more important institution. Its governing board was directed to arrange for the third Pan-American Conference, and this body was in session at Rio de Janeiro from the 21st of July to the 26th of August 1906. Delegates attended from the United States, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, San Domingo, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Salvador and Uruguay; Haiti and Venezuela were not represented. The secretary of state of the United States, Elihu Root, though not a delegate, addressed the conference. The subjects considered were much the same as those at the two preceding conferences. With respect to arbitration this conference passed a resolution that the delegates from the American republics to the second conference at the Hague be instructed to endeavour to secure there "the celebration of a general arbitration convention so effective and definite that, meriting the approval of the civilized world, it shall be accepted and put in force by every nation." With respect to copyrights, patents and trademarks this conference re-affirmed the conventions of the second conference, with some modifications; with respect to naturalization it recommended that whenever a native of one country who has been naturalized in another again takes up his residence in his native country without intending to return to his adopted country he should be considered as having reassumed his original citizenship; and with respect to the forcible collection of public debts to which the "Drago Doctrine"[1] is opposed, the conference recommended that "the Governments represented therein consider the point of inviting the Second Peace Conference at the Hague to consider the question of the compulsory collection of public debts, and, in general, means tending to diminish between nations conflicts having an exclusively pecuniary origin." The fourth Conference met in Buenos Aires in July-August 1910, agreed to submit to arbitration such money claims as cannot be amicably settled by diplomacy, and renamed the Bureau the Bureau of Pan-American Union.[2]

The first Pan-American scientific congress met at Santiago, Chile, on the 25th of December 1908 for the consideration of distinctly American problems. It continued in session until the 5th of January 1909, and resolved that a second congress for the same purpose should meet at Washington in 1912.

See *International American Conference, Reports and Recommendations* (Washington, 1890), and especially the Historical Appendix.

PANATHENAEA, the oldest and most important of the Athenian festivals. It was originally a religious celebration, founded by Erechtheus (Erichthonius), in honour of Athena Polias, the patron goddess of the city. It is said that when Theseus united the whole land under one government he made the festival of the city-goddess common to the entire country, and changed the older name Athenaea to Panathenaea (Plutarch, *Theseus*, 24). The union (Synoecism) itself was celebrated by a distinct festival, called Synoecia or Synoecesia, which had no connexion with the Panathenaea. In addition to the religious rites there is said to have been a chariot race from the earliest times, in which Erechtheus himself won the prize. Considerable alterations were introduced into the proceedings by Peisistratus (*q.v.*) and his sons. It is probable that the distinction of Greater and Lesser Panathenaea dates from this period, the latter being a shorter and simpler festival held every year. Every fourth year the festival was celebrated with peculiar magnificence; gymnastic sports were added to the horse races; and there is little doubt that Peisistratus aimed at making the penteteric Panathenaea the great Ionian festival in rivalry to the Dorian Olympia. The penteteric festival was celebrated in the third year of each Olympiad. The annual festival, probably held on the 28th and 29th of Hecatombaeon (about the middle of August), consisted solely of the sacrifices and rites proper to this season in the cult of Athena. One of these rites originally consisted in carrying a new peplus (the state robe of Athena) through the streets to the Acropolis to clothe the ancient carved image of the goddess, a ceremonial known in other cities and represented by the writer of the *Iliad* (vi. 87) as being in use at Troy; but it is probable that this rite was afterwards restricted to the great penteteric festival. The peplus was a costly, saffron-coloured garment, embroidered with scenes from the battle between the gods and giants, in which Athena had taken part. At least as early as the 3rd century B.C. the custom was introduced of spreading the peplus like a sail on the mast of a ship, which was rolled on a machine in the procession. Even the religious rites were celebrated with much greater splendour at the Greater Panathenaea. The whole empire shared in the great sacrifice; every colony and every subject state sent a deputation and sacrificial animals. On the great day of the feast there was a procession of the priests, the sacrificial assistants of every kind, the representatives of every part of the empire with their victims, of the cavalry, in short of the population of Attica and great part of its dependencies. After the presentation of the peplus, the hecatomb was sacrificed. The subject of the frieze of the Parthenon is an idealized treatment of this great procession.

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[1] So named from a note (1902) directed by Dr Don Louis Maria Drago, the Argentine minister of foreign affairs, to the Argentine diplomatic representative at Washington at the time of the difficulties of Venezuela incident to the collection of debts owed to foreigners by that country.

[2] The Bureau is supported by contributions, varying in amount according to population, of the twenty-one American republics, Andrew Carnegie contributed $750,000 and the various republics $250,000 for the erection of a permanent home for the Bureau in Washington. The Bureau has a library of some 15,000 volumes, and publishes numerous handbooks, pamphlets and maps, in addition to its monthly *Bulletins*. Its executive head is a director, chosen by the Governing Board.

The festival which had been beautified by Peisistratus was made still more imposing under the rule of Pericles. He introduced a regular musical contest in place of the old recitations of the rhapsodes, which were an old standing accompaniment of the festival. This contest took place in the Odeum, originally built for this purpose by Pericles himself. The order of the *agones* from this time onwards was—first the musical, then the gymnastic, then the equestrian contest. Many kinds of contest, such as the chariot race of the *apobatai* (said to have been introduced by Erechtheus), which were not in use at Olympia, were practised in Athens. *Apobates* was the name given to the companion of the charioteer, who showed his skill by leaping out of the chariot and up again while the horses were going at full speed. There were in addition several minor contests: the *Pyrrhic*, or war dance, celebrating the victory of Athena over the giants; the *Euandria*, whereby a certain number of men, distinguished for height, strength and beauty, were chosen as leaders of the procession; the *Lampadedromia*, or torch-race; the *Naumachia* (Regatta), which took place on the last day of the festival. The proceedings were under the superintendence of ten *athlothetae*, one from each tribe, the lesser Panathenaea being managed by *hieropoei*. In the musical contests, a golden crown was given as first prize; in the sports, a garland of leaves from the sacred olive trees of Athena, and vases filled with oil from the same. Many specimens of these Panathenaic vases have been found; on one side is the figure of Athena, on the other a design showing the nature of the competition in which they were given as prizes. The season of the festival was the 24th to the 29th of Hecatombaeon, and the great day was the 28th.

See A. Mommsen, *Feste der Stadt Athen* (1898); A. Michaelis, *Der Parthenon* (1871), with full bibliography; P. Stengel, *Die griechischen Kultusaltertümer* (1898); L. C. Purser in Smith's *Dictionary of Antiquities* (3rd ed., 1891); L. R. Farnell, *Cults of the Greek States*; also article ATHENA and works quoted.

PANCH MAHALS (= Five Districts), a district of British India, in the northern division of Bombay. Area, 1606 sq. m., pop. (1901), 261,020, showing a decrease of 17% in the decade, owing to famine. The administrative headquarters are at Godhra, pop. (1901), 20,915. Though including Champaner, the old Hindu capital of Gujarat, now a ruin, this tract has no history of its own. It became British territory as recently as 1861, by a transfer from Sindhia; and it is the only district of Bombay proper that is administered on the non-regulation system, the collector being also political agent for Rewa Kantha. It consists of two separate parts, divided by the territory of a native state. The south-western portion is for the most part a level plain of rich soil; while the northern, although it comprises some fertile valleys, is generally rugged, undulating and barren, with but little cultivation. The mineral products comprise sandstone, granite and other kinds of building stone. Mining for manganese on a large scale has been begun by a European firm, and the iron and lead ores may possibly become profitable. Only recently has any attempt been made to conserve the extensive forest tracts, and consequently little timber of any size is to be found. The principal crops are maize, millets, rice, pulse and oilseeds; there are manufactures of lac bracelets and lacquered toys; the chief export is timber. Both portions of the district are crossed by the branch of the Bombay and Baroda railway from Anand, through Godhra and Dohad, to Ratlam; and a chord line, opened in 1904, runs from Godhra to Baroda city. The district suffered very severely from the famine of 1899–1900.

PANCREAS (Gr. πᾶν, all; κρέας, flesh), or sweetbread, in anatomy, the elongated, tongue-shaped, digestive gland, of a pinkish colour, which lies across the posterior wall of the abdomen about the level of the first lumbar vertebra behind, and of the transpyloric plane in front (see ANATOMY: *Superficial and Artistic*). Its right end is only a little to the right of the mid line of the abdomen and is curved down, round the superior mesenteric vessels, into the form of a ⊂. This hook-like right end is known as the head of the pancreas, and its curvature is adapted to the concavity of the duodenum (see fig.). The first inch of the straight limb is narrower from above downward than the rest and forms the neck. This part lies just in front of the beginning of the portal vein, just below the pyloric opening of the stomach and just above the superior mesenteric vessels. The next three or four inches of the pancreas, to the left of the neck, form the body and this part lies in front of the left kidney and adrenal body, while it helps to form the posterior wall of the "stomach chamber" (see ALIMENTARY CANAL). At its left extremity the body tapers to form the tail, which usually touches the spleen (see DUCTLESS GLANDS) just below the hilum, and above the basal triangle of that viscus where the splenic flexure of the colon is situated. On the upper border of the body, a little to the left of the mid line of the abdomen, is a convexity or hump, which is known as the tuber omentale of the pancreas, and touches the elevation (bearing the same name) on the liver.

The pancreas is altogether behind the peritoneum. In its greater part it is covered in front by the lesser sac (see COELOM AND SEROUS MEMBRANES), but the lower part of the front of the head and the very narrow lower surface of the body are in contact with the greater sac. There is one main duct of the pancreas, which is sometimes known as the duct of Wirsung; it is thin-walled and white, and runs the whole length of the organ nearer the back than the front. As it reaches the head it turns downward and opens into the second part of the duodenum, joining the common bile duct while they are both piercing the walls of the gut. A smaller accessory pancreatic duct is found, which communicates with the main duct and usually opens into the duodenum about three-quarters of an inch above the papilla of the latter. It drains the lower part of the head, and either crosses or communicates with the duct of Wirsung to reach its opening (see A. M. Schirmer, *Beitrag zur Geschichte und Anat. des Pancreas*, Basel, 1893).

The pancreas has no real capsule, but is divided up into lobules, which are merely held together by their ducts and by loose areolar tissue; the glands of which these lobules are made up are of the acino-tubular variety (see EPITHELIAL TISSUES). Small groups of epithelium-like cells without ducts (Islets of Langerhans) occur among the glandular tissue and are characteristic of the pancreas. In cases of diabetes they sometimes degenerate. In the centre of each acinus of the main glandular tissue of the pancreas are often found spindle-shaped cells (centro-acinar cells of Langerhans). For details of microscopic structure see *Essentials of Histology*, by E. A. Schäfer (London, 1907).

Embryology.—The pancreas is developed, by three diverticula, from that part of the foregut which will later form the duodenum. Of these diverticula the left ventral disappears early,[1] but the right ventral, which is really an outgrowth from the lower part of the common bile duct, forms the head of the pancreas. The body and tail are formed from the dorsal diverticulum, and the two parts, at first separate, join one another so that the ducts communicate, and eventually the ventral one takes almost all the secretion of the gland to the intestine, while that part of the dorsal one which is nearest the duodenum atrophies and forms the duct of Santorini. The main pancreatic duct (of Wirsung) is therefore formed partly by the ventral and partly by the dorsal diverticulum. As the diverticula grow they give off lateral branches, which branch again and again until the terminal buds form the acini of the gland. At first the pancreas grows upward, behind the stomach, between the two layers of the dorsal mesogastrium (see COELOM AND SEROUS MEMBRANES), but when the stomach and duodenum turn over to the right, the gland becomes horizontal and the opening of the right ventral diverticulum becomes more dorsal. Later, by the unequal growth of the duodenal walls, it comes to enter the gut on its left side where the papilla is permanently situated. After the turning over of the pancreas to the right the peritoneum is absorbed from its dorsal aspect. The islets of Langerhans are now regarded as portions of the glandular epithelium which have been isolated by the invasion and growth round them of mesenchyme (see Quain's *Anatomy*, vol. i., 1908).

Comparative Anatomy.—In the Acrania (Amphioxus) no representative of a pancreas has been found, but in the Cyclostomata (hags and lampreys) there is a small lobular gland opening into the bile duct which probably represents it. In the Elasmobranchs (sharks and rays) there is a definite compact pancreas of considerable size. In the Teleostomi, which include the true bony fish (Teleostei), the sturgeon and Polyterus, the pancreas is sometimes a compact gland and sometimes diffuse between the layers of the mesentery; at other times it is so surrounded by the liver as to be difficult to find.

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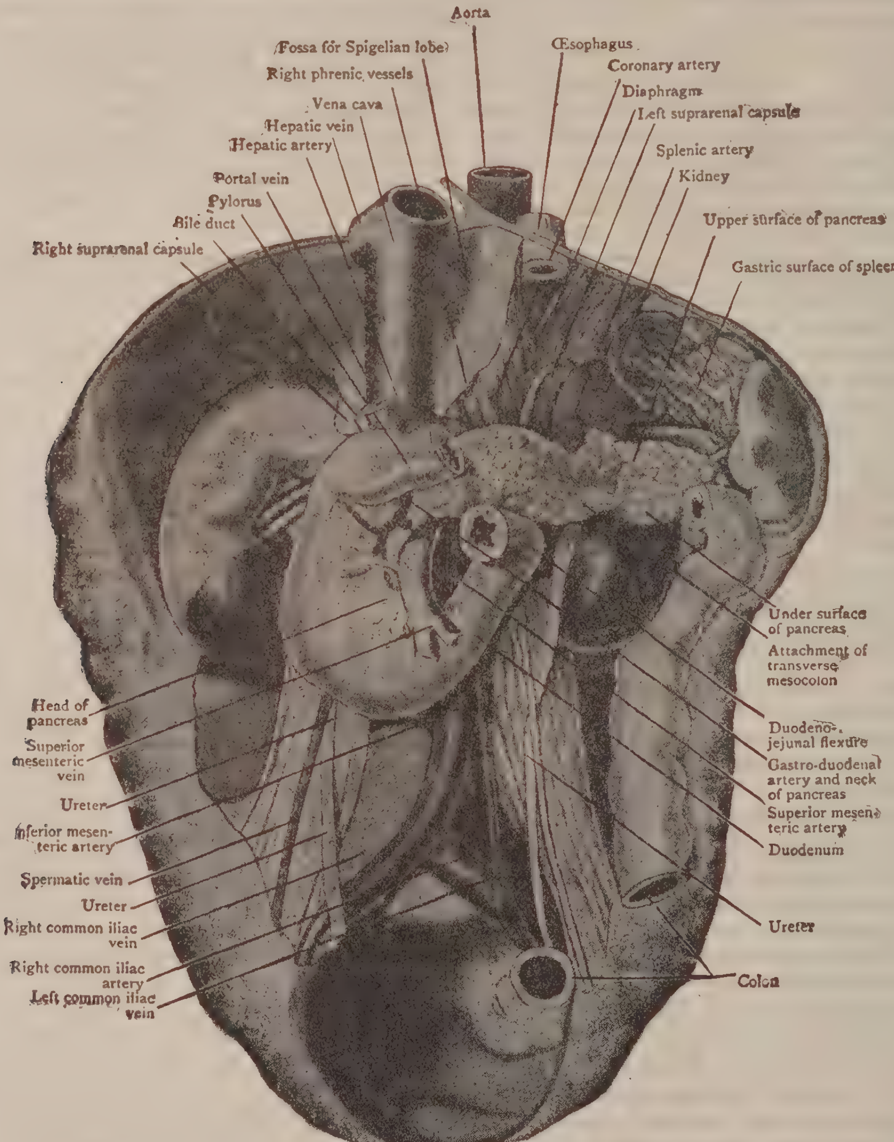
[1] N. W. Ingalls has shown (*Archiv. f. mik. Anat. und Entwickl.* Bd. 70, 1907), that in a human embryo of 4·9 mm. the two ventral buds persist and join one another below the liver bud.

Among the Dipnoi (mud fish), Protopterus has it embedded in the walls of the stomach and intestine.

The Amphibia have a definite compact pancreas which lies in the U-shaped loop between the stomach and duodenum, and is massed round the bile duct. In the Reptilia there are sometimes several ducts, as in the crocodile and the water tortoise (Emys), and this arrangement is also found in birds (the pigeon, for instance, has three ducts opening into the duodenum at very different levels). In mammals the gland is usually compact, though sometimes, as in the rabbit, it is diffuse. It usually has two ducts, as in man, though in many animals, such as the ox, sheep and goat, only one persists. When there is only one duct it may open with the common bile duct, *e.g.* sheep and cat, or may be very far away as in the ox and rabbit. (F. G. P.)



Aorta
Fossa for Spigelian lobe
Œsophagus
Right phrenic vessels
Coronary artery
Diaphragm
Vena cava
Left suprarenal capsule
Hepatic vein
Hepatic artery
Splenic artery
Portal vein
Kidney
Pylorus
Bile duct
Upper surface of pancreas
Right suprarenal capsule
Gastric surface of spleen
Under surface of pancreas
Attachment of transverse mesocolon
Head of pancreas
Duodeno-jejunal flexure
Superior mesenteric vein
Gastro-duodenal artery and neck of pancreas
Ureter
Superior mesenteric artery
Inferior mesenteric artery
Duodenum
Spermatic vein
Ureter
Right common iliac vein
Ureter
Right common iliac artery
Colon
Left common iliac vein

From Ambrose Birmingham, Cunningham's *Text Book of Anatomy.*

FIG. 1.—The Viscera and Vessels on the Posterior Abdominal Wall.

The stomach, liver and most of the intestines have been removed. The peritoneum has been preserved on the right kidney, and the fossa for the Spigelian lobe. In taking out the liver, the vena cava was left behind. The stomach-bed is well shown. (From a body hardened by chromic-acid injections.)

Diseases of the pancreas.—As the pancreas plays an important part in the physiology of digestion much attention has of late been paid to the question of its secretions. In sclerosis, atrophy, acute and chronic inflammatory changes and new growths in the pancreas an absence or lessening of its secretion may be evident. *Haemorrhage into the pancreas* is of some medico-legal importance as being a cause of death. The condition is rarely recognized in time for operative interference. *Acute haemorrhagic pancreatitis* is a combination of inflammation with haemorrhage in which the pancreas is found enlarged and infiltrated with blood. Violent pain, vomiting and collapse, are the chief features as is also the case in *pancreatic abscess* in which the abscess may be single or multiple. In the latter case operation has been followed by recovery. Haemorrhagic inflammation has been followed by *gangrene of the pancreas,* which usually terminates fatally. In two remarkable cases, however, reported by Chiari recovery followed on the discharge per rectum of the necrosed pancreas. *Chronic pancreatitis* is said by Mayo Robson to occur in connexion with the symptoms of catarrhal jaundice, which he suggests is due to the pressure on the common duct by the swollen pancreatic tissue. The organ is enlarged and very hard, and the symptoms are pain, dyspepsia, jaundice, loss of weight and the presence of fat in the stools. This latter sign is common to all forms of pancreatic disease. In connexion with all pancreatic diseases small yellowish patches are found in the pancreatic tissue, mesentery, omentum and abdominal fatty tissue generally, and the tissues appear to be studded with whitish areas often not larger than a pin's head. The condition, which was first observed by Balser, has been termed "fat-necrosis." The pancreas like other organs, is subject to the occurrence of new growths, tumours and cysts, syphilis and tuberculosis.

PANDA (*Aelurus fulgens*), a carnivorous mammal of the family *Procyonidae* (see Carnivora). This animal, rather larger than a cat, ranges from the eastern Himalaya to north-west China. In the former area it is found at heights of from 7000 to 12,000 ft. above the sea, among rocks and trees, and chiefly feeds on fruits and other vegetable substances. Its fur is of a remarkably rich reddish-brown colour, darker below; the face is white, with the exception of a vertical stripe of red from just above the eye to the gape; there are several pale rings on the tail, the tip of which is black.

PANDARUS, in Greek legend, son of Lycaon, a Lycian, one of the heroes of the Trojan war. He is not an important figure in Homer. He breaks the truce between the Trojans and the Greeks by treacherously wounding Menelaus with an arrow, and finally he is slain by Diomedes (Homer, *Iliad*, ii. 827, iv. 88, v. 290). In medieval romance he became a prominent figure in the tale of Troilus and Cressida. He encouraged the amour between the Trojan prince and his niece Cressida; and the word "pander" has passed into modern language as the common title of a lovers' go-between in the worst sense.

PANDECTS (Lat. *pandecta*, adapted from Gr. *πανδέκτης*, all-containing), a name given to a compendium or digest of Roman law compiled by order of the emperor Justinian in the 6th century (A.D. 530–533). The pandects were divided into fifty books, each book containing several titles, divided into laws, and the laws into several parts or paragraphs. The number of jurists from whose works extracts were made is thirty-nine, but the writings of Ulpian and Paulus make up quite half the work. The work was declared to be the sole source of non-statute law: commentaries on the compilation were forbidden, or even the citing of the original works of the jurists for the explaining of ambiguities in the text. See Justinian; and Roman Law.

PANDERMA (Gr. *Panormus*), a town of Asia Minor, on the south shore of the Sea of Marmora, near the site of Cyzicus. It has a trade in cereals, cotton, opium, valonia and boracite and is connected by a carriage road with Balikisri. Pop. 10,000 (7000 Moslems).

PANDHARPUR, a town of British India, in Sholapur district of Bombay, on the right bank of the river Bhima, 38 m. W. of Sholapur town. Pop. (1901), 32,405. Pandharpur is the most popular place of pilgrimage in the Deccan, its celebrated temple being dedicated to Vithoba, a form of Vishnu. Three assemblages are held annually. In 1906 a light railway was opened to Pandharpur from Barsi Road on the Great Indian Peninsula railway.

PANDORA (the "All-giving") in Greek mythology, according to Hesiod (*Theog.* 570–612) the first woman. After Prometheus had stolen fire from heaven and bestowed it upon mortals Zeus determined to counteract this blessing. He accordingly commissioned Hephaestus to fashion a woman out of earth, upon whom the gods bestowed their choicest gifts. Hephaestus gave her a human voice, Aphrodite beauty and powers of seduction, Hermes cunning and the art of flattery. Zeus gave her a jar (*πίθος*), the so-called "Pandora's box" (see below), containing all kinds of misery and evil, and sent her, thus equipped, to Epimetheus, who, forgetting the warning of his brother Prometheus to accept no present from Zeus, made her his wife. Pandora afterwards opened the jar, from which all manner of evils flew out over the earth (for parallels in other countries, see Frazer's *Pausanias*, ii. 320). Hope alone remained at the bottom, the lid having been shut down before she escaped. (Hesiod, *W. and D.* 54–105). According to a later story, the jar contained, not evils, but blessings, which would have been preserved for the human race, had they not been lost through the opening of the jar out of curiosity by man himself (Babrius, *Fab.* 58).

See J. E. Harrison, "Pandora's Box," in *Journal of Hellenic Studies*, xx. (1900), in which the opening of the jar is explained as an aetiological myth based on the Athenian festival of the Pithoigia (part of the Anthesteria, *q.v.*), and P. Gardner, "A new Pandora vase" (xxi., ibid., 1901). Pandora is only another form of the Earth goddess, who is conceived as releasing evil spirits from the *πίθος*, which served the purpose of a grave (cf. the removal of the *lapis manalis* from the *mundus*, a circular pit at Rome supposed to be the opening to the world below, on three days in the year, whereby an opportunity of revisiting earth was afforded the dead). See also O. Gruppe, *Griechische Mythologie* (1906), i. 94.

PANDUA, a ruined city in Malda district of Eastern Bengal and Assam, once a Mahommedan capital. It is situated 7 m. N.E. of Malda, and about 20 m. from the other great ruined city of Gaur (*q.v.*), from which it was largely built. It was probably originally an outpost of Gaur, and grew in importance as Gaur became unhealthy. In A.D. 1353 Haji Shamsuddin Ilyas, the first independent king of Bengal, transferred his capital from Gaur to Pandua; but the time of its prosperity was short, and in A.D. 1453 the capital was transferred back to Gaur. Its only celebrated building is the Adina Mosque, which was described by James Fergusson as the finest example of Pathan architecture in existence. This great mosque was built by Sikandar Shah in 1369 (see Indian Architecture). Pandua now, like Gaur, is almost entirely given over to the jungle.

PANDULPH [Pandolfo] (d. 1226), Roman ecclesiastical politician, papal legate to England and bishop of Norwich, was born in Rome, and first came to England in 1211, when he was commissioned by Innocent III. to negotiate with King John. Obtaining no satisfactory concessions, he is said to have produced the papal sentence of excommunication in the very presence of the king. In May 1213 he again visited England to receive the king's submission. The ceremony took place at Dover, and on the following day John, of his own motion, formally surrendered England to the representative of Rome to receive it again as a papal fief. Pandulph repaid this act of humility by using every means to avert the threatened French invasion of England. For nearly a year he was superseded by the cardinal-legate Nicholas of Tusculum; but returning in 1215 was present at the conference of Runnymede, when the great charter was signed. He rendered valuable aid to John who rewarded him with the see of Norwich. The arrival of the cardinal-legate Gualo (1216) relegated Pandulph to a secondary position; but after Gualo's departure (1218) he came forward once more. As representing the pope he claimed a control over Hubert de Burgh and the other ministers of the young Henry III.; and his correspondence shows that he interfered in every department of the administration. His arrogance was tolerated while the regency was still in need of papal assistance; but in 1221 Hubert de Burgh and the primate Stephen Langton successfully moved the pope to recall Pandulph and to send no other legate *a latere* in his place. Pandulph retained the see of Norwich, but from this time drops out of English politics. He died in Rome on the 16th of September 1226 but his body was taken to Norwich for burial.

See W. Shirley, *Royal and Other Historical Letters* ("Rolls series") vol. i.; Miss K. Norgate, *John Lackland* (1902); W. Stubbs, *Constitutional History* (1897) vol. i.

PANDURA (*tanboura*, *tanbur*, *tambora*, *mandore*, *pandore*, *bandora*, *bandoer*, &c.), an ancient oriental stringed instrument, a member of the lute family, having a long neck, a highly-vaulted back, and originally two or three strings plucked by the fingers. There were in antiquity at least two distinct varieties of pandura, or tanbur. (1) The more or less pear-shaped type used in Assyria and Persia and introduced by way of Asia Minor into Greece, whence it passed to the Roman Empire. In this type the body, when the graceful inward curves which led up gradually from base to neck were replaced by a more sloping outline, approximated to an elongated triangle with the corners rounded off. (2) The oval type, a favourite instrument of the Egyptians, also found in ancient Persia and among the Arabs of North Africa, who introduced it into Spain. Our definite knowledge of the pandura is derived from the treatise on music by Fārābī,[1] the Arab scholar who flourished in the 10th century. He mentions two kinds of *tanburs*, devoting to each a chapter, *i.e.* the tanbur of Khorasan, the Persian type, and the tanbur of Bagdad, the Assyrian variety; these differ in form, in length, and in the arrangement of the frets. Unfortunately, Farabi does not describe the shape of the body, being more concerned with the musical scale and compass of the instrument; but means of identification are supplied by ancient monuments. There is a tanbur on an Assyrian bas-relief of the reign of Assur-nasir-pal, *c.* 880 B.C. (British Museum), on a slab illustrating camp life; the musician is playing on a pear-shaped tanbur with a very long slender neck, which would have served for two strings at the most, while two men, disguised in the skins of wild beasts, are dancing in front of him.

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[1] See Michael Casiri, *Bibl. Arab. Hisp.*, i. 347.

There were in Farabi's day five frets at least, whereas on the tanbur of Khorasan there were no fewer than eighteen, which extended for half the length of the instrument. Five of these frets were fixed or invariable in position, the thirteen others being interpolated between them. The fixed frets, counting from the nut, gave an interval of one tone to the first, of a fourth to the second, of a fifth to the third, of an octave to the fourth, and of a major ninth to the fifth, thus providing a succession of fourths and fifths. The additional frets were placed between these, so that the octaves generally contained seventeen intervals of one-third tone each. The two principal accordances for the tanbur of Khorasan were the *marriage* when the strings were in unison, and the *lute* or accordance in fourths. Farabi mentions a tail-piece or *zobaïba*, to which the strings, generally two in number but sometimes three, were attached; they rested on a bridge provided with as many notches as there were strings. In the tanbur of Khorasan they were wound round pegs placed opposite each other in the two sides of the head, as in the modern violin.

Pollux[1] states that the pandura was invented by the Assyrians or Egyptians, and had three strings. Theodore Reinach[2] is of opinion that pandura was a generic term for instruments of the lute type during the Roman and Alexandrine periods. This may be the case, but from the modern standpoint we cannot in our classification afford to disregard the invariable characteristics observed in the modern, no less than in the ancient and medieval, tanburs or panduras.

To be able to identify the pandura it is as well to bear in mind the distinctive features of other instruments with which it might be confounded. The tanbur had a long neck resembling a section of a cylinder and a highly vaulted back, and its strings were plucked. In the rebab the neck was wanting or at best rudimentary, consisting of the gradual narrowing of the body towards the head, and during the middle ages in Europe, as rebec, it was always a bowed instrument. The early lutes had larger bodies than tanburs, the neck was short compared to the length of the body, the head was generally bent back at right angles, and the convex was not so deeply vaulted as that of the tanbur. The barbiton or bass lute had a long neck also, but wider, to take six, seven, or even nine strings, and from the back or profile view the general appearance was what is known as boat-shaped.

Under the Romans the pandura had become somewhat modified: the long neck was preserved but was made wider to take four strings, and the body was either oval[3] or slightly broader at the base, but without the inward curves of the pear-shaped instruments. A striking example of the former is to be seen among the marbles of the Townley Collection at the British Museum on a bas-relief illustrating the marriage feast of Eros and Psyche, a Roman sculpture assigned to *c.* 150 B.C. This example is of great value to the archaeology of music, for the instrument can be studied in full and in profile. The arrangement of the four pegs in the back of the head is Oriental.

The Persians had a six-stringed tanbur,[4] which they distinguished as the *scheschta*,[5] whereas a three-stringed variety was known as the *schrud*.

The tanbur survived during the middle ages and as late as the 18th century; it may be traced in the musical documents of several countries. In England the name of pandura or bandoer was given to an instrument with wire strings having no characteristic structural feature in common with the ancient tanbur but resembling the cittern (*q.v.*). The bandoer had a flat back and sound-board joined by ribs having a wavy outline. A smaller size of the same instrument was called *orphoreon*, and a larger and wider *penorcon*; these are described and figured by Praetorius,[6] who suggests that this instrument, invented in England as bandoer, is probably similar to the Greek πανδοῦρα. This bandora, we learn from an entry in Sir Philip Leycester's[7] index to his commonplace book of 1575, was invented by "John Rose dwellinge in Bridewell anno 4to Elizabeth, who left a sonne farre exceedinge himself in makinge instruments."

A 17th-century French MS. (Add. 30342, fol. 144) in the British Museum, containing drawings of musical instruments, gives the tambora, not the English hybrid, but a true descendant of the ancient Oriental tanbur, with nine strings, a rose sound-hole and seven frets; the French writer erroneously states that it is similar to the cistre (cittern). Filippo Bonanni[8] gives an illustration of the same kind of instrument, with ten strings in five pairs of unisons, and calls it pandura. (K. S.)

PANE (Fr. *pan*, Lat. *pannus*, a cloth, garment), originally a piece of cloth, especially one of a number of pieces of cloth or other material joined to form one piece for a garment; the word is thus also applied to the "slashes" in the material of a dress made to show a rich lining or the colour of a lining when different from the outer side of the garment. In this sense the word only survives in English in "counterpane," an outer coverlet for a bed. "Pane" is used frequently for the flat side of anything, especially in diamond-cutting of the sides to the "table" of a brilliant, or to the faces of a bolt nut or hammer-head. The most common use of the word now is that of a piece of glass filling a compartment in a window. In architecture the word is also applied to a bay of a window, compartment of a partition, side of a tower, turret, &c. (See BAY and HALF-TIMBER WORK.)

PANEGYRIC, strictly a formal public speech delivered in high praise of a person or thing, and generally high studied or undiscriminating eulogy. It is derived from πανηγυρικός (a speech) "fit for a general assembly" (πανήγυρις, *panegyris*). In Athens such speeches were delivered at national festivals or games, with the object of rousing the citizens to emulate the glorious deeds of their ancestors. The most famous are the *Olympiacus* of Gorgias, the *Olympiacus* of Lysias, and the *Panegyricus* and *Panathenaicus* (neither of them, however, actually delivered) of Isocrates. Funeral orations, such as the famous speech put into the mouth of Pericles by Thucydides, also partook of the nature of panegyrics. The Romans confined the panegyric to the living, and reserved the funeral oration exclusively for the dead. The most celebrated example of a Latin panegyric (*panegyricus*) is that delivered by the younger Pliny (A.D. 100) in the senate on the occasion of his assumption of the consulship, containing a somewhat fulsome eulogy of Trajan. Towards the end of the 3rd and during the 4th century, as a result of the orientalizing of the Imperial court by Diocletian, it became customary to celebrate as a matter of course the superhuman virtues and achievements of the reigning emperor. Twelve speeches of the kind (Pliny's included), eight of them by famous Gallic rhetoricians (Claudius Mamertinus, Eumenius, Nazarius, Drepanius Pacatus) and three of anonymous authorship, have been collected under the title of *Panegyrici veteres latini* (ed. E. Bährens, 1874). Speaking generally, they are characterized by a stilted, affected style and a tone of gross adulation. There are extant similar orations by Ausonius,

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[1] *Onomasticon*, iv. 60.

[2] See Daremberg and Saglio, *Dict. des antiquités grecques et romaines*, article "Lyre," p. 1450; also *Revue des études grecques*, viii. 371, &c., with illustrations, some of which the present writer would prefer to classify as early lutes, owing to the absence of the characteristic long neck of the tanburs.

[3] This instrument resembles the oval tanburs represented in the miniatures of musicians in the Cantigas di Santa Maria (13th century) having two strings, and on each side a group of three very small, round sound-holes, probably of Moorish origin. The MS. is numbered J. b. 2 in the Escorial; the miniatures are reproduced in J. F. Riaño's *Critical and Biogr. Notes on early Spanish Music* (London, 1887).

[4] In the miniatures of the Cantigas there are oval tanburs with six or seven strings, one played by a Moor; both have the tail-piece in the form of a crescent.

[5] See Hammer von Purgstall on the "Seven Seas," in *Jahrbücher der Literatur*, xxxvi. 290 (Vienna, 1826).

[6] *Syntagma musicum* (Wolfenbüttel, 1618), pl. xvii. and ch. 28, 63; reprint in *Publik. d. Ges. f. Musikforschung* (Berlin, 1884), Jahrgang XII.

[7] See Dr F. J. Furnivall's edition of *Captain Cox or Robert Laneham's letter*, Ballad Society (London, 1871), p. 67.

[8] See *Gabinetto armonico*, ch. 49, pl. 97 (Rome, 1722).

Symmachus and Ennodius, and panegyrics in verse by Claudian, Merobaudes, Priscian, Corippus and others.

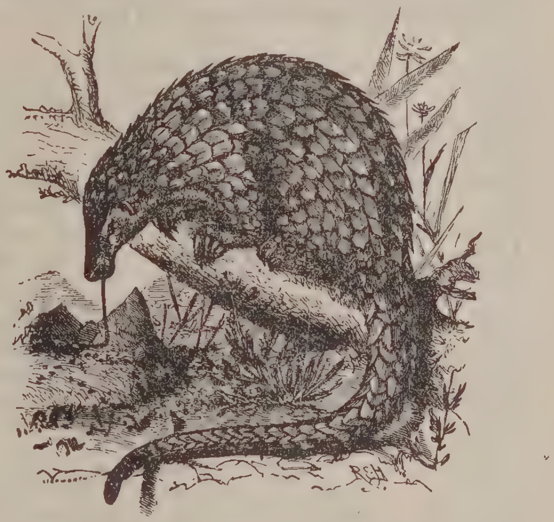
See C. G. Heyne, "Censura xii. panegyricorum veterum," in his *Opuscula academica* (1812), vi. 80–118; H. Rühl, *De xii panegyricis latinis* (progr. Greifswald, 1868); R. Pichin, *Les Derniers écrivains profanes* (Paris, 1906).

PANEL (O. Fr. *panel*, mod. *panneau*, piece of cloth, from Med. Lat. *pannellus*, diminutive of *pannus*, cloth), a piece of cloth, slip of parchment, or portion of a surface of wood or stone enclosed in a compartment. In the first sense the word survives in the use of "panel" or "pannel" for the cloth-stuffed lining of a saddle. From the slip of parchment on which the list of jurymen is drawn up by the sheriff, "panel" in English law is applied to a jury, who are thus said to be "empanelled." In Scots law the word is used of the indictment, and of the person or persons named in the indictment; "panel" is thus the equivalent of the English "prisoner at the bar." In building and architecture (Fr. *panneau;* Ital. *quadretto*, *formello*; Ger. *Feld*) "panel" is properly used of the piece of wood framed within the stiles and rails of a door, filling up the aperture; but it is often applied both to the whole square frame and the sinking itself, and also to the ranges of sunken compartments in cornices, corbel tables, groined vaults, ceilings, &c. In Norman work these recesses are generally shallow, and more of the nature of *arcades*. In Early English work the square panels are ornamented with quatrefoils, cusped circles, &c., and the larger panels are often deeply recessed, and form niches with trefoil heads and sometimes canopies. In the Decorated style the cusping and other enrichments of panels become more elaborate, and they are often filled with shields, foliages, and sometimes figures. Towards the end of this period the walls of important buildings were often entirely covered with long or square panels, the former frequently forming niches with statues. The use of panels in this way became very common in Perpendicular work, the wall frequently being entirely covered with long, short and square panels, which latter are frequently richly cusped, and filled with every species of ornament, as shields, bosses of foliage, portcullis, lilies, Tudor roses, &c. Wooden panellings very much resembled those of stone, except in the Tudor period, when the panels were enriched by a varied design, imitating the plaits of a piece of linen or a napkin folded in a great number of parallel lines. This is generally called the *linen pattern*. Wooden ceilings, which are very common, are composed of thin oak boards nailed to the rafters, collars, &c., and divided into panels by oak mouldings fixed on them, with carved bosses at the intersections.

PANENTHEISM, the name given by K. C. F. Krause (*q.v.*) to his philosophic theory. Krause held that all existence is one great unity, which he called *Wesen* (Essence). This Essence is God, and includes within itself the finite unities of man, reason and nature. God therefore includes the world in Himself and extends beyond it. The theory is a conciliation of Theism and Pantheism.

PANGOLIN, the Malay name for one of the species of the scaly anteaters, which belong to the order *Edentata* (*q.v.*), and typify the family *Manidae* and the genus *Manis*. These animals, which might be taken for reptiles rather than mammals, are found in the warmer parts of Asia and throughout Africa. Pangolins range from 1 to 3 ft. in length, exclusive of the tail, which may be much shorter than or nearly twice the length of the rest of the animal. Their legs are short, so that the body is only a few inches off the ground; the ears are very small; and the tongue is long and worm-like, and used to capture ants. Their most striking character, however, is the coat of broad overlapping horny scales, which cover the whole animal, with the exception of the under surface of the body, and in some species the lower part of the tip of the tail. Besides the scales there are generally, especially in the Indian species, a number of isolated hairs, which grow between the scales, and are scattered over the soft and flexible skin of the belly. There are five toes on each foot, the claws on the first toe rudimentary, but the others, especially the third of the forefoot, long, curved, and laterally compressed. In walking the fore-claws are turned backwards and inwards, so that the weight of the animal rests on the back and outer surfaces, and the points are thus kept from becoming blunted. The skull is long, smooth and rounded, with imperfect zygomatic arches, no teeth of any sort, and, as in other ant-eating mammals, with the bony palate extending unusually far backwards towards the throat. The lower jaw consists of a pair of thin rod-like bones, welded to each other at the chin, and rather loosely attached to the skull by a joint which, instead of being horizontal, is tilted up at an angle of 45°, the outwardly-twisted condyles articulating with the inner surfaces of the long glenoid processes in a manner unique among mammals.

The genus *Manis*, which contains all the pangolins, may be conveniently divided into two groups, distinguished by geographical distribution and certain convenient, though not highly important, external characters. The Asiatic pangolins are characterized by having the central series of body-scales continued to the extreme end of the tail, by having many isolated hairs growing between the scales of the back, and by their small external ears. They all have a small naked spot beneath the tip of the tail, which is said to be of service as an organ of touch. There are three species: viz. *Manis javanica*, ranging from Burma, through the Malay Peninsula and Java, to Borneo; *M. aurita*, found in China, Formosa and Nepal; and the Indian Pangolin, *M. pentadactyla*, distributed over the whole of India and Ceylon. The African species have the central series of scales suddenly interrupted and breaking into two at a point about 2 or 3 in. from the tip of the tail; they have no hair between the scales, and no external ears. The following four species belong to this group: the long-tailed pangolin (*M. macrura*), with a tail nearly twice as long as its body, and containing as many as forty-six caudal vertebrae, nearly the largest number known among Mammals; the white-bellied pangolin (*M. tricuspis*), closely allied to the last, but with longer three-lobed scales, and white belly hairs; and the short-tailed and giant pangolins (*M. temmincki* and *gigantea*), both of which have the tail covered entirely with scales. Those species with a naked patch on the under side of the tail can climb trees. The four species of the second group are found in West Africa, although some extend into south and eastern equatorial Africa.
(O. T.; R. L.*)


White-bellied Pangolin (*Manis tricuspis*).

PANIN, NIKITA IVANOVICH, Count (1718–1783), Russian statesman, was born at Danzig on the 18th of September 1718. He passed his childhood at Pernau, where his father was commandant. In 1740 he entered the army, and rumour had it that he was one of the favourites of the empress Elizabeth. In 1747 he was accredited to Copenhagen as Russian minister, but a few months later was transferred to Stockholm, where for the next twelve years he played a conspicuous part as the chief opponent of the French party. It is said that during his residence in Sweden Panin, who certainly had a strong speculative bent, conceived a fondness for constitutional forms of government. Politically he was a pupil of Alexis Bestuzhev; consequently, when in the middle 'fifties Russia suddenly turned Francophil instead of Francophobe, Panin's position became extremely difficult. However, he found a friend in Bestuzhev's supplanter, Michael Vorontsov, and when in 1760 he was unexpectedly appointed the governor of the little grand duke Paul, his influence was assured. He was on Catherine's side during the revolution of 1762, but his jealousy of the influence which the Orlovs seemed likely to obtain over the new empress predisposed him to favour the proclamation of his ward the grand duke Paul as emperor, with Catherine as regent only.

To circumscribe the influence of the ruling favourites he next suggested the formation of a cabinet council of six or eight ministers, through whom all the business of the state was to be transacted; but Catherine, suspecting in the skilfully presented novelty a subtle attempt to limit her power, rejected it after some hesitation. Nevertheless Panin continued to be indispensable. He owed his influence partly to the fact that he was the governor of Paul, who was greatly attached to him; partly to the peculiar circumstances in which Catherine had mounted the throne; and partly to his knowledge of foreign affairs. Although acting as minister of foreign affairs he was never made chancellor; but he was the political mentor of Catherine during the first eighteen years of her reign. Panin was the inventor of the famous "Northern Accord," which aimed at opposing a combination of Russia, Prussia, Poland, Sweden, and perhaps Great Britain, against the Bourbon-Habsburg League. Such an attempt to bind together nations with such different aims and characters was doomed to failure. Great Britain, for instance, could never be persuaded that it was as much in her interests as in the interests of Russia to subsidize the anti-French party in Sweden. Yet the idea of the "Northern Accord," though never quite realized, had important political consequences and influenced the policy of Russia for many years. It explains, too, Panin's strange tenderness towards Poland. For a long time he could not endure the thought of destroying her, because he regarded her as an indispensable member of his "Accord," wherein she was to supply the place of Austria, whom circumstances had temporarily detached from the Russian alliance. Poland, Panin opined, would be especially useful in case of Oriental combinations. All the diplomatic questions concerning Russia from 1762 to 1783 are intimately associated with the name of Panin. It was only when the impossibility of realizing the "Northern Accord" became patent that his influence began to wane, and Russia sacrificed millions of roubles fruitlessly in the endeavour to carry out his pet scheme.

After 1772, when Gustavus III. upset Panin's plans in Sweden, Panin, whose policy hitherto had been at least original and independent, became more and more subservient to Frederick II. of Prussia. As to Poland, his views differed widely from the views of both Frederick and Catherine. He seriously guaranteed the integrity of Polish territory, after placing Stanislaus II. on the throne, in order that Poland, undivided and as strong as circumstances would permit, might be drawn wholly within the orbit of Russia. But he did not foresee the complications which were likely to arise from Russia's interference in the domestic affairs of Poland. Thus the confederation of Bar, and the Turkish War thereupon ensuing, took him completely by surprise and considerably weakened his position. He was forced to acquiesce in the first partition of Poland, and when Russia came off third best, Gregory Orlov declared in the council that the minister who had signed such a partition treaty was worthy of death. Panin further incensed Catherine by meddling with the marriage arrangements of the grand duke Paul and by advocating a closer alliance with Prussia, whereas the empress was beginning to incline more and more towards Austria. Nevertheless, even after the second marriage of Paul Panin maintained all his old influence over his pupil, who, like himself, was now a warm admirer of the king of Prussia. There are even traditions from this period of an actual conspiracy of Panin and Paul against the empress. As the Austrian influence increased Panin found a fresh enemy in Joseph II., and the efforts of the old statesman to prevent a matrimonial alliance between the Russian and Austrian courts determined Catherine to get rid of a counsellor of whom, for some mysterious reason, she was secretly afraid. The circumstances of his disgrace are complicated and obscure. The final rupture seems to have arisen on the question of the declaration of "the armed neutrality of the North;" but we know that Potemkin and the English ambassador, James Harris (afterwards 1st earl of Malmesbury), were both working against him some time before that. In May 1781 Panin was dismissed. He died in Italy on the 31st of March 1783. Panin was one of the most learned, accomplished and courteous Russians of his day. Catherine called him "her encyclopaedia." The earl of Buckinghamshire declared him to be the most amiable negotiator he had ever met. He was also of a most humane disposition and a friend of Liberal institutions. As to his honesty and kindness of heart there were never two opinions. By nature a sybarite, he took care to have the best cook in the capital, and women had for him an irresistible attraction, though he was never married.

See anonymous *Life of Count N. I. Panin* (Rus.; St Petersburg, 1787); *Political correspondence* (Rus. and Fr.), Collections of Russian Histor. Society, vol. ix. (St Petersburg, 1872); V. A. Bilbasov, *Geschichte Katharina II.* (Berlin, 1891–1893); A. Brückner, *Materials for the Biography of Count Panin* (Rus.; St Petersburg, 1888).

(R. N. B.)

PANIPAT, a town of British India, in Karnal district of the Punjab, 53 m. N. of Delhi by rail. Pop. (1901), 26,914. The town is of great antiquity, dating back to the great war of the *Mahābhārata* between the Pāndavas and Kaurava brethren, when it formed one of the tracts demanded by Yudisthira from Duryodhana as the price of peace. In modern times, the plains of Panipat thrice formed the scene of decisive battles which sealed the fate of upper India—in 1526, when Bāber completely defeated the imperial forces; in 1556, when his grandson, Akbar, on the same battlefield, conquered Himu, the Hindu general of the Afghān Adil Shāh, thus a second time establishing the Mogul power; and finally, on the 7th of January 1761, when Ahmad Shāh Durāni shattered the Mahratta confederacy. The neighbourhood is a favourite manœuvring ground for British camps of instruction. The modern town stands near the old bank of the Jumna, on high ground composed of the débris of earlier buildings. It is a centre of trade, and has manufactures of cotton cloth, metal-ware and glass. There are factories for ginning and pressing cotton.

PANIZZI, SIR ANTHONY (1797–1879), English librarian, was born at Brescello, in the duchy of Modena, Italy, on the 16th of September 1797. After taking his degree at the university of Parma, Antonio Panizzi became an advocate. A fervent patriot, he was implicated in the movement set on foot in 1821 to overturn the government of his native duchy, and in October of that year barely escaped arrest by a precipitate flight. He first established himself at Lugano, where he published an anonymous and now excessively rare pamphlet, generally known as *I Processi di Rubiera*, an exposure of the monstrous injustice and illegalities of the Modenese government's proceedings against suspected persons. Expelled from Switzerland at the joint instance of Austria, France and Sardinia, he came to England in May 1823, in a state bordering upon destitution. His countryman, Ugo Foscolo, provided him with introductions to William Roscoe and Dr William Shepherd, a Unitarian minister in Liverpool, and he earned a living for some time by giving Italian lessons. Roscoe introduced him to Brougham, by whose influence he was made, in 1828, professor of Italian at University College, London. His chair was almost a sinecure; but his abilities rapidly gained him a footing in London; and in 1831 Brougham, then lord chancellor, used his *ex officio* position as a principal trustee of the British Museum to obtain for Panizzi the post of an extra assistant librarian of the Printed Book department. At the same time he was working at his edition of Boiardo's *Orlando innamorato*. Boiardo's fame had been eclipsed for three centuries by the adaptation of Berni; and it is highly to the honour of Panizzi to have redeemed him from oblivion and restored to Italy one of the very best of her narrative poets. His edition of the *Orlando innamorato* and the *Orlando furioso* was published between 1830 and 1834, prefaced by a valuable essay on the influence of Celtic legends on medieval romance. In 1835 he edited Boiardo's minor poems, and was about the same time engaged in preparing a catalogue of the library of the Royal Society.

The unsatisfactory condition and illiberal management of the British Museum had long excited discontent, and at length a trivial circumstance led to the appointment of a parliamentary committee, which sat throughout the sessions of 1835–1836, and probed the condition of the institution very thoroughly. Panizzi's principal contributions to its inquiries with regard to the library were an enormous mass of statistics respecting foreign libraries, and some admirable evidence on the catalogue of printed books then in contemplation. In 1837 he was appointed keeper of printed books. The entire collection, except the King's Library, had to be removed from Montague House to the new building, the reading-room service had to be reorganized, rules for the new printed catalogue had to be prepared, and the catalogue itself undertaken. All these tasks were successfully accomplished; but, although the rules of cataloguing devised by Panizzi and his assistants have become the basis of subsequent work, progress of the catalogue itself was slow. The first volume, comprising letter A, was published in 1841, and from that time, although the catalogue was continued and completed in MS., no attempt was made to print any more until 1881. The chief cause of this comparative failure was injudicious interference with Panizzi, occasioned by the impatience of the trustees and the public. Panizzi's appointment, as that of a foreigner, had from the first been highly unpopular. He gradually broke down opposition, partly by his social influence, but far more by the sterling merits of his administration and his constant efforts to improve the library. The most remarkable of these was his report, printed in 1845, upon the museum's extraordinary deficiencies in general literature, which ultimately procured the increase of the annual grant for the purchase of books to £10,000. His friendship with Thomas Grenville (1755–1846) led to the nation being enriched by the bequest of the unique Grenville library, valued even then at £50,000. In 1847–1849 a royal commission sat to inquire into the general state of the museum, and Panizzi was the centre of the proceedings. His administration, fiercely attacked from many quarters, was triumphantly vindicated in every point. Panizzi immediately became by far the most influential official in the museum, though he did not actually succeed to the principal librarianship until 1856. It was thus as merely keeper of printed books that he conceived and carried out the achievement by which he is probably best remembered—the erection of the new library and reading-room. Purchases had been discouraged from lack of room in which to deposit the books. Panizzi cast his eye on the empty quadrangle enclosed by the museum buildings, and conceived the daring idea of occupying it with a central cupola too distant, and adjacent galleries too low, to obstruct the inner windows of the original edifice. The cupola was to cover three hundred readers, the galleries to provide storage for a million of books. The original design, sketched by Panizzi's own hand on the 18th of April 1852, was submitted to the trustees on the 5th of May; in May 1854 the necessary expenditure was sanctioned by parliament, and the building was opened in May 1857. Its construction had involved a multitude of ingenious arrangements, all of which had been contrived or inspected by Panizzi, who had a genius for minute detail and a gift for mechanical invention.

Panizzi succeeded Sir Henry Ellis as principal librarian in March 1856. During his tenure of this post a great improvement was effected in the condition of the museum staff by the recognition of the institution as a branch of the civil service, and the decision was taken to remove the natural history collections to Kensington. Of this questionable measure Panizzi was a warm advocate; he was heartily glad to be rid of the naturalists. He had small love for science and its professors, and, as his friend Macaulay said, "would at any time have given three mammoths for one Aldus." Many important additions to the collections were made during his administration, especially the Temple bequest of antiquities, and the Halicarnassean sculptures discovered at Budrun (Halicarnassus) by C. T. Newton. Panizzi retired in July 1866, but continued to interest himself actively in the affairs of the museum until his death, on the 8th of April 1879. He had been created a K.C.B. in 1869.

Panizzi had become a naturalized Englishman, but his devotion to the British Museum was rivalled by his devotion to his native land, and his personal influence with English Liberal statesmen enabled him often to promote her cause. Throughout the revolutionary movements of 1848–1849, and again during the campaign of 1859 and the subsequent transactions due to the union of Naples to the kingdom of upper Italy, Panizzi was in constant communication with the Italian patriots and their confidential representative with the English ministers. He laboured, according to circumstances, now to excite, now to mitigate, the English jealousy of France; now to moderate their apprehensions of revolutionary excesses; now to secure encouragement or connivance for Garibaldi. The letters addressed to him by patriotic Italians, edited by his literary executor and biographer, L. Fagan, alone compose a thick volume. He was charitable to his exiled countrymen in England, and, chiefly at his own expense, equipped a steamer, which was lost at sea, to rescue the Neapolitan prisoners of state on the island of Santo Stefano. His services were recognized by the offer of a senatorship and of the direction of public instruction in Italy; these offers he declined, though in his latter years he frequently visited the land of his birth.

His administrative faculty was extraordinary: to the widest grasp he united the minutest attention to matters of detail. By introducing great ideas into the management of the museum he not only redeemed it from being a mere show-place, but raised the standard of library administration all over England. His moral character was the counterpart of his intellectual: he was warm-hearted and magnanimous; extreme in love and hate—a formidable enemy, but a devoted friend. His intimate friends included Lord Palmerston, Gladstone, Roscoe, Grenville, Macaulay, Lord Langdale and his family, Rutherfurd (lord advocate), and, above all perhaps, Francis Haywood, the translator of Kant. His most celebrated friendship, however, is that with Prosper Mérimée, who, having begun by seeking to enlist his influence with the English government on behalf of Napoleon III., discovered a congeniality of tastes which produced a delightful correspondence. Mérimée's part has been published by Fagan; Panizzi's perished in the conflagration kindled by the Paris commune.

See Fagan, *Life of Sir Anthony Panizzi* (Lon., 1880). (R. G.)

PANJABI (properly Pañjābī), the language of the Central Punjab (properly Panjāb). It is spoken by over 71,000,000 people between (approximately speaking) the 77th and 74th degrees of east longitude. The vernacular of this tract was originally an old form of the modern Lahndā, a member of the outer group of Indo-Aryan languages (*q.v.*), but it has been overlaid by the expansion of the midland Saurasēnī Prakrit (see Prakrit) to its east, and now belongs to the intermediate group, possessing most of the characteristics of the midland language, with occasional traces of the old outer basis which become more and more prominent as we go westwards. At the 74th degree of east longitude we find it merging into the modern Lahndā. The language is fully described in the article Hindostani.

PANJDEH, or Penjdeh, a village of Russian Turkestan, rendered famous by "the Panjdeh scare" of 1885. It is situated on the east side of the Kushk river near its junction with the

Murghab at Pul-i-Khishti. In March 1885 when the Russo-Afghan Boundary Commission should have been engaged in settling the boundary-line, this portion of it was in dispute between the Afghans and the Russians. A part of the Afghan force was encamped on the west bank of the Kushk, and on the 29th of March General Komarov sent an ultimatum demanding their withdrawal. On their refusal the Russians attacked them at 3 a.m. on the 30th of March and drove them across the Pul-i-Khishti Bridge with a loss of some 600 men. The incident nearly give rise to war between England and Russia; but the amir Abdur-Rahman, who was present at the Rawalpindi conference with Lord Dufferin at the time, affected to regard the matter as a mere frontier scuffle. The border-line subsequently laid down gives to Russia the corner between the Kushk and Murghab rivers as far as Maruchak on the Murghab, and the Kushk post has now become the frontier post of the Russian army of occupation.

PANNA, or PUNNA, a native state of Central India, in the Bundelkhand agency. Area, 2492 sq. m.; pop. (1901), 192,986, showing a decrease of 19% in the preceding decade due to famine; tribute £33,000. The chief, whose title is maharaja, is a rajput of the Bundela clan, descended from Chhatar Sal, the champion of the independence of Bundelkhand in the 18th century. The maharaja Lokpal Singh died in 1898, leaving an only son, Madho Singh, who, in 1902, was found guilty by a special commission on the charge of poisoning his uncle, and was deposed. The diamond mines, for which the state was formerly famous, are now scarcely profitable. There are no railways, but one or two good roads. The town of PANNA is 62 m. S. of Banda. Pop. (1901), 11,346. It has a fine modern palace and several handsome temples and shrines.

PANNAGE (O. Fr. *pasnage*, from Med. Lat. *pasnagium*, *pasnaticum* for *pastionaticum*, *pascio*; *pascere*, to feed), an English legal term for the feeding of swine in a wood or forest, hence used of a right or privilege to do this. The word is also used generally of the food, such as acorns, beech-mast, &c., on which the swine feed.

PANNIER (Fr. *panier*, Lat. *panarium*, a basket for carrying bread, *panis*), a basket for carrying bread or other provisions; more especially a broad, flat basket, generally slung in pairs across a mule, pony or ass for transport. The term has also been applied to an overskirt in a woman's dress attached to the back of the bodice and draped so as to give a "bunchy" appearance. At various times in the history of costume this appearance has been produced by a framework of padded whalebone, steel, &c., used to support the dress, such frameworks being known as "panniers." At the Inns of Court, London, there was formerly an official known as a "pannier man," whose duties were concerned with procuring provisions at market, blowing the horn before meals, &c. The office has been in many of the inns long obsolete, and was formally abolished at the Inner Temple in 1900. At the Inner Temple the robed waiters in hall have been called "panniers," and apparently were in some way connected with the officer above mentioned, but the proper duties of the two were in no way identical.

PANNONIA, in ancient geography a country bounded north and east by the Danube, conterminous westward with Noricum and upper Italy, and southward with Dalmatia and upper Moesia. It thus corresponds to the south-western part of Hungary, with portions of lower Austria, Styria, Carniola, Croatia, and Slavonia. Its original inhabitants (Pannonii, sometimes called Paeonii by the Greeks) were probably of Illyrian race. From the 4th century B.C. it was invaded by various Celtic tribes, probably survivors of the hosts of Brennus, the chief of whom were the Carni, Scordisci and Taurisci. Little is heard of Pannonia until 35 B.C., when its inhabitants, having taken up arms in support of the Dalmatians, were attacked by Augustus, who conquered and occupied Siscia (Sissek). The country was not, however, definitely subdued until 9 B.C., when it was incorporated with Illyria, the frontier of which was thus extended as far as the Danube. In A.D. 7 the Pannonians, with the Dalmatians and other Illyrian tribes, revolted, and were overcome by Tiberius and Germanicus, after a hard-fought campaign which lasted for two years. In A.D. 10 Pannonia was organized as a separate province—according to A. W. Zumpt (*Studia romana*), not till A.D. 20; at least, when the three legions stationed there mutinied after the death of Augustus (A.D. 14), Junius Blaesus is spoken of by Tacitus (*Annals*, i. 16) as legate of Pannonia and commander of the legions. The proximity of dangerous barbarian tribes (Quadi, Marcomanni) necessitated the presence of a large number of troops (seven legions in later times), and numerous fortresses were built on the bank of the Danube. Some time between the years 102 and 107, which marked the termination of the first and second Dacian wars, Trajan divided the province into Pannonia *superior* (ἡ ἄνω), the western, and *inferior* (ἡ κάτω), the eastern portion. According to Ptolemy, these divisions were separated by a line drawn from Arrabona (Raab) in the north to Servitium (Gradiska) in the south; later, the boundary was placed farther east. The whole country was sometimes called the Pannonias (*Pannoniae*). Pannonia *superior* was under the consular legate, who had formerly administered the single province, and had three legions under his control: Pannonia *inferior* at first under a praetorian legate with a single legion as garrison, after Marcus Aurelius under a consular legate, still with only one legion. The frontier on the Danube was protected by the establishment of the two colonies Aelia Mursia (Esse) and Aelia Aquincum (Alt-Ofen, modern Buda) by Hadrian.

Under Diocletian a fourfold division of the country was made. Pannonia *inferior* was divided into (1) Valeria (so called from Diocletian's daughter, the wife of Galerius), extending along the Danube from Altinum (Mohacs) to Brigetio (Ó-Szöny), and (2) Pannonia *secunda*, round about Sirmium (Mitrovitz) at the meeting of the valleys of the Save, Drave, and Danube. Pannonia *superior* was divided into (3) Pannonia *prima*, its northern, and (4) Savia (also called Pannonia *ripariensis*), its southern part. Valeria and Pannonia *prima* were under a *praeses* and a *dux*; Pannonia *secunda* under a *consularis* and a *dux*; Savia under a *dux* and, later a *corrector*. In the middle of the 5th century Pannonia was ceded to the Huns by Theodosius II., and after the death of Attila successively passed into the hands of the Ostrogoths, Longobards (Lombards), and Avars.

The inhabitants of Pannonia are described as brave and warlike, but cruel and treacherous. Except in the mountainous districts, the country was fairly productive, especially after the great forests had been cleared by Probus and Galerius. Before that time timber had been one of its most important exports. Its chief agricultural products were oats and barley, from which the inhabitants brewed a kind of beer named *sabaea*. Vines and olive-trees were little cultivated, the former having been first introduced in the neighbourhood of Sirmium by Probus. *Saliunca* (Celtic, *nard*) was a common growth, as in Noricum. Pannonia was also famous for its breed of hunting-dogs. Although no mention is made of its mineral wealth by the ancients, it is probable that it contained iron and silver mines. Its chief rivers were the Dravus (Drave), Savus (Save), and Arrabo (Raab), in addition to the Danuvius (less correctly, Danubius), into which the first three rivers flow.

The native settlements consisted of *pagi* (cantons) containing a number of *vici* (villages), the majority of the large towns being of Roman origin. In Upper Pannonia were Vindobona (Vienna), probably founded by Vespasian; Carnuntum (*q.v.*, Petronell); Arrabona (Raab), a considerable military station; Brigetio; Savaria or Sabaria (Stein-am-Anger), founded by Claudius, a frequent residence of the later emperors, and capital of Pannonia *prima*; Poetovio (Pettau); Siscia, a place of great importance down to the end of the empire; Emona (Laibach), later assigned to Italy; Nauportus (Ober-Laibach). In Lower Pannonia were Sirmium, first mentioned in A.D. 6, also a frequent residence of the later emperors; Sopianae (Fünfkirchen), seat of the *praeses* of Valeria, and an important place at the meeting of five roads; Aquincum, the residence of the *dux* of Valeria, the seat of *legio ii adjutrix*.

See J. Marquardt, *Römische Staatsverwaltung*, i. (2nd ed., 1881), 291; *Corpus inscriptionum latinarum*, iii. 415; G. Zippel, *Die römische Herrschaft in Illyrien* (Leipzig, 1877); Mommsen, *Provinces of the Roman Empire* (Eng. trans.), i. 22, 38; A. Forbiger, *Handbuch der alten Geographie von Europa* (Hamburg, 1877); article in Smith's *Dictionary of Greek and Roman Geography*, ii. (1873); Ptolemy, ii. 15, 16; Pliny, *Nat. Hist.* ii. 28; Strabo vii. 313; Dio Cassius xlix. 34–38, liv. 31–34, lv. 28–32; Vell Pat. ii. 110.

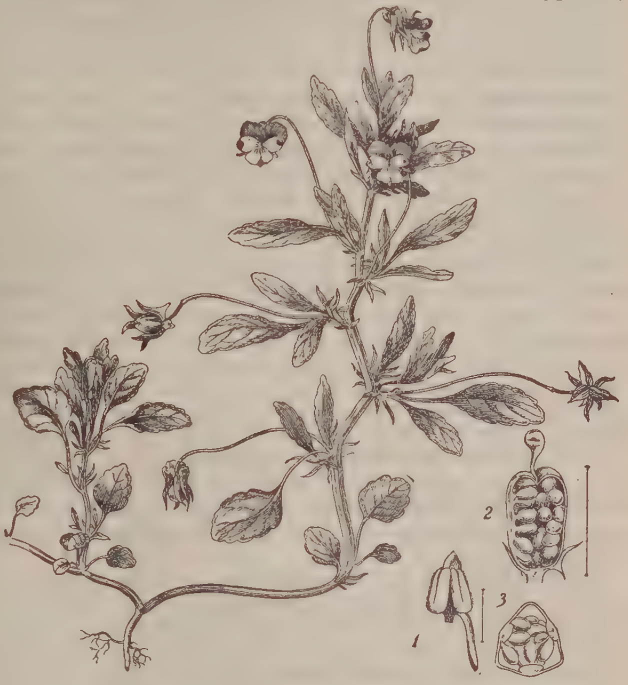
PANOPLY, a complete suit of armour. The word represents the Gr. *πανοπλία* (*πᾶs*, all, and *ὅπλα*, arms), the full armour of a hoplite or heavy-armed soldier, *i.e.* the shield, breastplate, helmet and greaves, together with the sword and lance. As applied to armour of a later date, "panoply" did not come into use till the end of the 16th and beginning of the 17th century, and was then used of the complete suits of plate-armour covering the whole body. The figurative use of the word is chiefly due to the phrase *ἡ πανοπλία τοῦ Θεοῦ*, "the whole armour of God" (Eph. vi. 11).

PANORAMA (Gr. *πᾶν*, all, and *ὅραμα*, view), the name given originally to a pictorial representation of the whole view visible from one point by an observer who in turning round looks successively to all points of the horizon. In an ordinary picture only a small part of the objects visible from one point is included, far less being generally given than the eye of the observer can take in whilst stationary. The drawing is in this case made by projecting the objects to be represented from the point occupied by the eye on a plane. If a greater part of a landscape has to be represented, it becomes more convenient for the artist to suppose himself surrounded by a cylindrical surface in whose centre he stands, and to project the landscape from this position on the cylinder. In a panorama such a cylinder, originally of about 60 ft., but now extending to upwards of 130 ft. diameter, is covered with an accurate representation in colours of a landscape, so that an observer standing in the centre of the cylinder sees the picture like an actual landscape in nature completely surround him in all directions. This gives an effect of great reality to the picture, which is skilfully aided in various ways. The observer stands on a platform representing, say, the flat roof of a house, and the space between this platform and the picture is covered with real objects which gradually blend into the picture itself. The picture is lighted from above, but a roof is spread over the central platform so that no light but that reflected from the picture reaches the eye. To make this light appear the more brilliant, the passages and staircase which lead the spectator to the platform are kept nearly dark. These panoramas, suggested by a German architectural painter named Breisig, were first executed by Robert Barker, an Edinburgh artist, who exhibited one in Edinburgh in 1788, representing a view of that city. A view of London and views of sea fights and battles of the Napoleonic wars followed, Panoramas gained less favour on the continent of Europe, until, after the Franco-German War, a panorama of the siege of Paris was exhibited in Paris. Since then some notable panoramas have been on view in the cities of Europe and America.

The name panorama, or panoramic view, is also given to drawings of views from mountain peaks or other points of view, such as are found in many hotels in the Alps, or, on a smaller scale, in guide-books to Switzerland and other mountainous districts. In photography a panoramic camera is one which enables a wide picture to be taken.

PANPSYCHISM (Gr. *πᾶν*, all; *ψυχή*, soul), a philosophical term applied to any theory of nature which recognizes the existence of a psychical element throughout the objective world. In such theories not only animals and plants but even the smallest particles of matter are regarded as having some rudimentary kind of sensation or "soul," which plays the same part in relation to their objective activities or modifications as the soul does in the case of human beings. Such theories are the modern scientific or semi-scientific counterparts of the primitive animism of savage races, and may be compared with the hylozoism of the Greek physicists. In modern times the chief exponents of panpsychist views are Thomas Carlyle, Fechner and Paulsen: a similar idea lay at the root of the physical theories of the Stoics.

PANSY, or HEARTSEASE. This flower has been so long cultivated that its source is a matter of uncertainty. As we now see it, it is a purely artificial production, differing considerably from any wild plant known. It is generally supposed to be merely a cultivated form of *Viola tricolor* (see VIOLET), a cornfield weed, while others assert it to be the result of hybridization between *V. tricolor* and other species such as *V. altaica*, *V. grandiflora*, &c. Some experiments of M. Carrière go to show that seeds of the wild *V. tricolor* will produce forms so like those of the cultivated pansy that it is reasonable to assume that that flower has originated from the wild plant by continuous selection. The changes that have been effected from the wild type are, however, more striking to the eye than really fundamental. Increase in size, an alteration in form, by virtue of which the narrow oblong petals are converted into circular ones, and variations in the intensity and distribution of the colour—these are the changes that have been wrought by continued selection, while the more essential parts of the flower have been relatively unaffected. The modern varieties of the pansy consist of the show varieties, and the fancy varieties, obtained from Belgium, and now very much improved. Show varieties are subdivided according to the colour of the flowers into selfs, white grounds and yellow grounds. The fancy or Belgian pansies have various colours blended, and the petals are blotched, streaked or edged. The bedding varieties, known as violas or tufted pansies, have been raised by crossing the pale-blue *Viola cornuta*, and also *V. lutea*, with the show pansies. They are hardier than the true pansies and are free-blooming sorts marked rather by effectiveness of colour in the mass than by quality in the individual flower; they are extremely useful in spring and summer flower-gardening.



Wild Pansy (*Viola tricolor*), about half nat. size.

1, Stamen, with spur.
2, Pistil, after fertilization, cut lengthwise, showing the numerous parietally attached ovules.
3, Transverse section of same.
1–3 enlarged.

The pansy flourishes in well enriched garden soil, in an open but cool situation, a loamy soil being preferable. Cow-dung is the best manure on a light soil. The established sorts are increased by cuttings, whilst seeds are sown to procure novelties. The cuttings, which should consist by preference of the smaller non-flowering growths from the base of the plant, may be inserted early in September, in sandy soil, under a hand-light or in boxes under glass, and as soon as rooted should be removed to a fresh bed of fine sandy soil. The seeds may be sown in July, August or September. The bed may be prepared early in September, to be in readiness for planting, by being well manured with cow-dung and trenched up to a depth of 2 ft. The plants should be planted in rows at about a foot apart. In spring they should be mulched with half-rotten manure, and the shoots as they lengthen should be pegged down into this enriched surface to induce the formation of new roots. If the blooms show signs of exhaustion by the inconstancy of their colour or marking, all the flowers should be picked off, and this top-dressing and pegging-down process performed in a thorough manner, watering in dry weather, and keeping as cool as possible. Successional beds may be put in about February, the young plants being struck later, and wintered in cold frames. The fancy pansies require similar treatment, but are generally of a more vigorous constitution.

When grown in pots in a cold frame, about half a dozen shoots filling out a 6-in. pot, pansies are very handsome decorative objects. The cuttings should be struck early in August, and the plants shifted into their blooming-pots by the middle of October; a rich open loamy compost is necessary to success, and they must be kept free of aphides. Both the potted plants and those grown in the open beds benefit by the use of liquid manure.

PANTAENUS, head of the catechetical school at Alexandria, *c.* A.D. 180–200, known chiefly as having been the master of Clement, who succeeded him, and of Alexander, bishop of Jerusalem. Clement speaks of him as the "Sicilian bee," but of his birth and death nothing is known. Eusebius and Jerome speak of him as having been, originally at least, a Stoic, and as having been sent, on account of his zeal and learning, as a missionary to "India." There is some reason to think that this means the Malabar coast. There was a considerable intercourse between south India and the east Mediterranean at the time, and Christian thought possibly did something to mould the great system of Tamil philosophy known as the *Saiva Siddhanta.* Pantaenus "expounded the treasures of divine doctrine both orally and in writing," but only a few brief reminiscences of his teaching are extant (see Routh, *Rel. sac.* i. 375–383). Lightfoot suggests that the conclusion of the well-known Epistle to Diognetus, chs. 11, 12, may be the work of Pantaenus. Clement thought highly of his abilities, and Origen appeals to his authority in connexion with the inclusion of philosophy in the theological course.

PANTALOON (Ital. *pantalone*), a character in the old Italian popular comedy, said to represent a Venetian, from the favourite Venetian saint San Pantaleone, and transferred from it to pantomime (*q.v.*). The Italian pantaloon was always a silly old man with spectacles and wearing slippers, and his character was maintained in pantomime and has also made his name a synonym for a tottering dotard, as in Shakespeare's *As You Like It* (II. vii. 158). From the Venetian usage the word "pantaloon" (whence "pants") has also been given to certain forms of garment for the legs, the exact meaning varying at different times.

PANTECHNICON, an invented word, from Gr. πᾶς, all, and τεχνικός, of or belonging to the arts (τέχναι), originally used as the name of a bazaar in which all kinds of artistic work was sold; it was established in Motcomb Street, Belgrave Square, London, early in the 19th century, but failed and was turned into a furniture depository, in which sense the word has now passed into general usage. The large vans used for removing furniture are hence known as pantechnicon vans or pantechnicons simply.

PANTELLERIA, or PANTALARIA (ancient *Cossyra*[1]), an island in the Mediterranean, 62 m. S. by W. of the south-western extremity of Sicily, and 44 m. E. of the African coast, belonging to the Sicilian province of Trapani. Pop. (1901), 8683. It is entirely of volcanic origin, and about 45 sq. m. in area; the highest point, an extinct crater, is 2743 ft. above sea-level. Hot mineral springs and ebullitions of steam still testify to the presence of volcanic activity. The island is fertile, but lacks fresh water. The principal town (pop. about 3000) is on the north-west, upon the only harbour (only fit for small steamers), which is fortified. There is also a penal colony here. The island can be reached by steamer from Trapani, and lies close to the main route from east to west through the Mediterranean. In 1905 about 300,000 gallons of wine (mostly sweet wine), and 1900 tons of dried raisins, to the value of £34,720, were exported.

On the west coast, 2 m. south-east of the harbour, a neolithic village was situated, with a rampart of small blocks of obsidian, about 25 ft. high, 33 ft. wide at the base, and 16 at the top, upon the undefended eastern side: within it remains of huts were found, with pottery, tools of obsidian, &c. The objects discovered are in the museum at Syracuse. To the south-east, in the district known as the Cunelíe, are a large number of tombs, known as *sesi*, similar in character to the *nuraghi* of Sardinia, though of smaller size, consisting of round or elliptical towers with sepulchral chambers in them, built of rough blocks of lava. Fifty-seven of them can still be traced. The largest is an ellipse of about 60 by 66 ft., but most of the sesi have a diameter of 20–25 ft. only. The identical character of the pottery found in the *sesi* with that found in the prehistoric village proves that the former are the tombs of the inhabitants of the latter. This population came from Africa, not from Sicily, and was of Iberian or Ibero-Ligurian stock. After a considerable interval, during which the island probably remained uninhabited, the Carthaginians took possession of it (no doubt owing to its importance as a station on the way to Sicily) probably about the beginning of the 7th century B.C., occupying as their acropolis the twin hill of San Marco and Sta Teresa, 1 m. south of the town of Pantelleria, where there are considerable remains of walls in rectangular blocks of masonry, and also of a number of cisterns. Punic tombs have also been discovered, and the votive terra-cottas of a small sanctuary of the Punic period were found near the north coast.

The Romans occupied the island as the Fasti Triumphales record in 255 B.C., lost it again the next year, and recovered it in 217 B.C. Under the Empire it served as a place of banishment for prominent persons and members of the imperial family. The town enjoyed municipal rights. In 700 the Christian population was annihilated by the Arabs, from whom the island was taken in 1123 by Roger of Sicily. In 1311 a Spanish fleet, under the command of Requesens, won a considerable victory here, and his family became princes of Pantelleria until 1553, when the town was sacked by the Turks.

See Orsi, "Pantelleria" (in *Monumenti dei Lincei* 1899, ix. 193–284). (T. As.)

PANTHEISM (Gr. πᾶν, all, θεός, god), the doctrine which identifies the universe with God, or God with the universe.[2] The term "pantheist" was apparently first used by John Toland in 1705, and it was at once adopted by French and English writers. Though the term is thus of recent origin, the system of thought or attitude of mind for which it stands may be traced back both in European and in Eastern philosophy to a very early stage. At the same time pantheism almost necessarily presupposes a more concrete and less sophisticated conception of God and the universe. It presents itself historically as an intellectual revolt against the difficulties involved in the presupposition of theistic and polytheistic systems, and in philosophy as an attempt to solve the dualism of the one and the many, unity and difference, thought and extension. Thus the pious Hindu, confronted by the impossibility of obtaining perfect knowledge by the senses or by reason, finds his sole perfection in the contemplation of the infinite (Brahma). In Greece the idea of a fundamental unity behind the plurality of phenomena was present, though vaguely, in the minds of the early physicists (see IONIAN SCHOOL), but the first thinker who focussed the problem clearly was Xenophanes. Unlike the Hindu, Xenophanes inclined to pantheism as a protest against the anthropomorphic polytheism of the time, which seemed to him improperly to exalt one of the many modes of finite existence into the place of the Infinite. Thus Xenophanes for the first time postulates a supreme God whose characteristic is primarily the negation of the Finite. A similar metaphysic from a different starting-point is found in Heraclitus, who postulates behind the perpetually changing universe of phenomena a One which remains. This attitude towards existence, expressing itself in different phraseology, has been prominent to a greater or less degree since Xenophanes and Heraclitus. Thus the metaphysic of Plato finds reality only in the "Idea," of which all phenomena are merely imperfect copies. Neoplatonism (and especially Plotinus) adopted a similar attitude. The Stoics, with the supreme object of giving to human life a definite unity and purpose, made the individual a part of the universe and sought to obliterate all differences. The universe to them is a manifestation of divine reason, while all things come from and return to (the ὁδὸς ἄνω κάτω) the πνεῦμα διάπυρον, the ultimate matter. The same problems in a different context confronted the monotheistic religions of Judaism and Christianity. We find Philo Judaeus endeavouring to free the concept of the Old Testament Yahweh from anthropomorphic characteristics and finite determinations. But though Philo sees the difficulties of the orthodox Judaism he cannot accept pantheism or mysticism so far as to give up the personality of God (see Logos).

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[1] The name is Semitic, but its meaning is uncertain.

[2] Strictly, pantheism is to identify the universe with God, while the term "pancosmism" (πᾶν, κόσμος, the universe) has frequently been used for the identification of God with the universe. For practical purposes this refinement is of small value, the two ideas being aspects of the same thing; cf. A. M. Fairbairn, *Studies in Philos. Relig. Hist.* (1877), p. 392. Both "Atheism" (*q.v.*) and "Acosmism" are used as contradictories.

With Neoplatonism we enter upon a somewhat different though closely allied attitude of mind. To Plotinus God lies beyond sense and imagination: all the theologian can do is to point the way in which the thinker must travel. Though the spirit and the language of Plotinus is closely allied to that of pantheism, the result of his thinking is not pantheism but mysticism. This may be briefly illustrated by a comparison with the greatest of modern pantheists, Spinoza. To him God is the immanent principle of the universe—"Deus sive Natura." On the principle that everything which is determined (finite) is "negated" ("determinatio est negatio"), God, the ultimate reality must be entirely undetermined. To explain the universe Spinoza proceeds to argue that God, though undetermined *ab extra*, is capable of infinite self-determination. Thus God, the *causa sui*, manifests himself in an infinite multiplicity of particular modes. Spinoza is, therefore, both pantheist and pancosmist: God exists only as realized in the cosmos: the cosmos exists only as a manifestation of God. Plotinus, on the other hand, cannot admit any realization or manifestation of the Infinite: God is necessarily above the world—he has no attributes, and is unthinkable. Such a view is not pantheism but mysticism (*q.v.*), and should be compared with the theology of Oriental races.

The semi-Oriental mysticism of the Neoplatonists and the Logos doctrines of the Stoics alike influence early Christian doctrine, and the pantheistic view is found frequently in medieval theology (*e.g.* in Erigena, Meister Eckhardt, Jakob Boehme). The Arabic scholar Averroës gave Aristotle to western Europe in a pantheistic garb, and thus influenced medieval scientists. So Bruno constructed a personified nature, and the scientific and humanistic era began. The pantheism of Spinoza, combining as it did the religious and the scientific points of view, had a wide influence upon thought and culture. Schelling (in his Identity-philosophy) and Hegel both carried on the pantheistic tradition, which after Hegel broke up into two lines of thought, the one pantheistic the other atheistic.

From the religious point of view there are two main problems. The first is to establish any real relation between the individual and God without destroying personality and with it the whole idea of human responsibility and free will: the second is to explain the infinity of God without destroying his personality. In what sense can God be outside the world (see Deism): in what sense in it (pantheism)? The great objection to pantheism is that, though ostensibly it magnifies the Creator and gets rid of the difficult dualism of Creator and Creation, it tends practically to deny his existence in any practical intelligible sense.

See, further, THEISM; DEISM; ATHEISM; ABSOLUTE.

PANTHEON (Lat. *pantheum* or *pantheon*; Gr. πάνθειον, all-holy, from πᾶς, all, and θεός god), the name of two buildings in Rome and Paris respectively; more generally, the name of any building in which as a mark of honour the bodies of the nation's famous men are buried, or "memorials" or monuments to them are placed. Thus Westminster Abbey is sometimes styled the British "Pantheon," and the rotunda in the Escorial where the kings of Spain are buried also bears the name. Near Regensburg (*q.v.*) is the pantheon of German worthies, known as the Valhalla. The first building to which the name was given was that built in Rome in 27 B.C. by Agrippa; it was burned later and the existing building was erected in the reign of Hadrian; since A.D. 609 it has been a Christian church, S Maria Rotunda. It was the Paris building that gave rise to the generic use of the term for a building where a nation's illustrious dead rest. The Pantheon in Paris was the church built in the classical style by Soufflot; it was begun in 1764 and consecrated to the patroness of the city, Sainte Geneviève. At the Revolution it was secularized under the name of *Le Panthéon*, and dedicated to the great men of the nation. It was reconsecrated in 1828 for worship, was again secularized in 1830, was once more a place of worship from 1851 to 1870, and was then a third time secularized. On the entablature is inscribed the words *Aux Grandes Hommes La Patrie Reconnaissante.* The decree of 1885 finally established the building for the purpose for which the name now stands.

PANTHER, another name for the leopard (*q.v.*), also used in America as the name of the puma (*q.v.*). The word is an adaptation of Lat. *panthera*; Gr. πάνθηρ, the supposed derivation of which from πᾶς, all, and θήρ, animal, gave rise to many tales and fables in medieval bestiaries and later scientific works. The panther was supposed to be a distinct animal from the *pardus*, pard, the leopard, to which also many legends were attached. In modern times a distinction had been unscientifically drawn between a larger type of leopard to which the name panther was given, and a smaller and more graceful specimen.

PANTIN, a town of northern France in the department of Seine, on the Canal d'Ourcq, adjoining the fortifications of Paris on the north-east. Pop. (1906), 32,604. The manufacture of boilers, railway wagons, machinery, oil, glass, chemicals, polish and perfumery, and the operations of dye-works, foundries and distilleries, represent some of the varied branches of its industrial activity. There is also a state-manufactory of tobacco.

PANTOGRAPH, or PANTAGRAPH (from the Greek πάντα, all, and γράφειν, to write), an instrument for making a reduced, an enlarged, or an exact copy of a plane figure.

In its commonest form it consists of two long arms, *AB* and *AC* (fig. 1), jointed together at *A*, and two short arms, *FD* and *FE*, jointed together at *F* and with the long arms at *D* and *E*; *FD* is made exactly equal to *AE* and *FE* to *AD*, so that *ADFE* is a parallelogram whatever the angle at *A*. The instrument is supported parallel to the paper on castors, on which it moves freely. A tube is usually fixed vertically at *c*, near the extremity of the long arm *AC*, and similar tubes are mounted on plates which slide along the short arms *BD* and *FD*; they are intended to hold either the axle pin on a weighted fulcrum round which the instrument turns, or a steel pointer, or a pencil, interchangeably. When the centres of the tubes are exactly in a straight line, as on the dotted line *bfc*, the small triangle *bfD* will always be similar to the large triangle *bcA*; and then, if the fulcrum is placed under *b*, the pencil at *f*, and the pointer at *c*, when the instrument is moved round the fulcrum as a pivot, the pencil and the pointer will move parallel to each other through distances which will be respectively in the proportion of *bf* to *bc*; thus the pencil at *f* draws a reduced copy of the map under the pointer at *c*; if the pencil and the pointer were interchanged an enlarged copy would be drawn; if the fulcrum and pencil were interchanged, and the sliders set for *f* to bisect *bc*, the map would be copied exactly. Lines are engraved on the arms *BD* and *FD*, to indicate the positions to which the sliders must be set for the ratios $\frac{1}{2}$, $\frac{1}{3}$. . . ., which are commonly required.

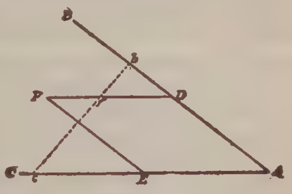

FIG. 1.

The square pantograph of Adrian Gavard consists of two graduated arms which are pivoted on a plain bar and connected by a graduated bar sliding between them throughout their entire length, to be set at any required distance from the plain bar; a sliding plate carrying a vertical tube, to hold either the axle of the fulcrum, the pencil, or the pointer, is mounted on one of the arms and on a prolongation of the plain bar beyond the other arm, and also on the graduated connecting bar; and an additional arm is provided by means of which reductions below or enlargements above the scales given on the instrument can be readily effected.

The *eidograph* (Gr. εἶδος, form) is designed to supersede the pantograph, which is somewhat unsteady, having several supports and joints. It is composed of three graduated bars, one of which is held over a fulcrum and carries the others, which are lighter, one at each extremity. The three bars are movable from end to end in box-sockets, each having an index and a vernier in contact with the graduated scale. The box-socket of the principal bar turns round the vertical axle of the fulcrum; that of each side bar is attached to a vertical axle, which also carries a grooved wheel of large diameter and turns in a collar at either end of the principal bar. The two wheels are of exactly the same diameter and are connected by a steel band fitting tightly into the grooves, so that they always turn together through identical arcs; thus the side bars over which they are respectively mounted, when once set parallel, turn with them and always remain parallel. A pointer is held at the end of one of the side bars and a pencil at the diagonally opposite end of the other. The bars may be readily set by their graduated scales to positions in which the distances of the pencil and the pointer from the fulcrum will always be in the ratio of the given and the required map scales.

Numerous other modifications have been proposed from time to time; many forms are described in G. Pellehn's Der *Pantograph* (Berlin, 1903).

PANTOMIME, a term which has been employed in different senses at different times in the history of the drama. Of the Roman *pantomimus*, a spectacular kind of play in which the functions of the actor were confined to gesticulation and dancing, while occasional music was sung by a chorus or behind the scenes, some account is given under DRAMA. In Roman usage the term was applied both to the actor of this kind of play and to the play itself; less logically, we also use the term to signify the method of the actor when confined to gesticulation. Historically speaking, so far as the Western drama is concerned there is no intrinsic difference between the Roman *pantomimus* and the modern "ballet of action," except that the latter is accompanied by instrumental music only, and that the personages appearing in it are not usually masked. The English "dumb-show," though fulfilling a special purpose of its own, was likewise in the true sense of the word pantomimic. The modern pantomime, as the word is still used, more especially in connexion with the English stage, signifies a dramatic entertainment in which the action is carried on with the help of spectacle, music and dancing, and in which the performance of that action or of its adjuncts is conducted by certain conventional characters, originally derived from Italian "masked comedy," itself an adaptation of the *fabulae Atellanae* of ancient Italy. Were it not for this addition, it would be difficult to define modern pantomime so as to distinguish it from the masque; and the least rational of English dramatic species would have to be regarded as essentially identical with another to which English literature owes some of its choicest fruit.

The contributory elements which modern pantomime contains very speedily, though in varying proportions and manifold combinations, introduced themselves into the modern drama as it had been called into life by the Renaissance. In Italy the transition was almost imperceptible from the pastoral drama to the opera; on the Spanish stage ballets with allegorical figures and military spectacles were known towards the close of the 16th century; in France ballets were introduced in the days of Marie de' Medici, and the popularity of the opera was fully established in the earlier part of the reign of Louis XIV. The history of these elements need not be pursued here, but there is a special ingredient in modern pantomime of which something more has to be said. From the latter part of the 16th century (Henry III. in 1596, sought to divert the dreaded states-general at Blois by means of the celebrated Italian company of the *Gelosi*) professional Italian comedy (*commedia dell' arte*, called *commedia all' improviso* only because of the skill with which the schemes of its plays were filled up by improvisation) had found its way to Paris with its merry company of characters, partly corresponding to the favourite types of regular comedy both ancient and modern, but largely borrowed from the new species of masked comedy—so called from its action being carried on by certain typical figures in masks—said to have been invented earlier in the same century by Angelo Beolco (Ruzzante) of Padua. These types, local in origin, included *Pantalone* the Venetian merchant, who survives in the uncommercial *Pantaloon*, the Bolognese *Dottore*. The *Zannis* (*Giovannis*) were the domestic servants in this species of comedy, and included among other varieties the *Arlecchino*. This is by far the most interesting of these types, and by far the best discussed. The *Arlecchino* was formerly supposed to have been, like the rest, of Italian origin. The very remarkable contribution (cited below) of Dr Otto Driesen to the literature of folk-lore as well as to that of the stage seems however to establish the conclusion (to which earlier conjectures pointed) that the word *Harlequin* or *Herlequin* is of French origin, and that the dramatic figure of Harlequin is an evolution from the popular tradition of the harlekin-folk, mentioned about the end of the 11th century by the Norman Ordericus Vitalis. The "damned souls" of legend became the comic demons of later centuries, the *croque-sots* with the devil's mask; they left the impress of their likeness on the hell-mouth of the religious drama, but were gradually humanized as a favourite type of the Parisian popular street-masques (*charivaris*) of the 14th and 15th centuries. Italian literature contains only a single passage before the end of the 16th century which can be brought into any connexion with this type—the *alichino* (cat's back) of canto xxi. of the *Inferno*. The French harlequin was, however, easily adopted into the family of Italian comedy, where he may, like his costume,[1] have been associated with early national traditions, and where he continued to diverge from his fellow *Zannis* of the stolid sort, the *Scapin* of French comedy-farce. From the time of the performances in France of the celebrated *Fedeli* company, which played there at intervals from the beginning to the middle of the 17th century onwards, performing in a court ballet in 1636, Tristran Martinelli had been its harlequin, and the character thus preceded that of the Parisian favourite Trivelin, whose name Cardinal de Retz was fond of applying to Cardinal Mazarin. There can be no pretence here of pursuing the French harlequin through his later developments in the various species of the comic drama, including that of the marionettes, or of examining the history of his supersession by Pierrot and of his ultimate extinction.

Students of French comedy, and of Molière in particular, are aware of the influence of the Italian players upon the progress of French comedy, and upon the works of its incomparable master. In other countries, where the favourite types of Italian popular comedy had been less generally seen or were unknown, popular comic figures such as the English fools and clowns, the German *Hanswurst*, or the Dutch *Pickelhering*, were ready to renew themselves in any and every fashion which preserved to them the gross salt favoured by their patrons. Indeed, in Germany, where the term pantomime was not used, a rude form of dramatic buffoonery, corresponding to the coarser sides of the modern English species so-called, long flourished, and threw back for centuries the progress of the regular drama. The banishment of *Hanswurst* from the German stage was formally proclaimed by the famous actress Caroline Neuber at Leipzig in a play composed for the purpose in 1737. After being at last suppressed, it found a commendable substitute in the modern *Zauberposse*, the more genial Vienna counterpart of the Paris *féerie* and the modern English extravaganza.

In England, where the masque was only quite exceptionally revived after the Restoration, the love of spectacle and other frivolous allurements was at first mainly met by the various forms of dramatic entertainment which went by the name of "opera." In the preface to *Albion and Albanius* (1685), Dryden gives a definition of opera which would fairly apply to modern extravaganza, or to modern pantomime with the harlequinade left out. Character-dancing was, however, at the same time largely introduced into regular comedy; and, as the theatres vied with one another in seeking *quocunque modo* to gain the favour of the public, the English stage was fully prepared for the innovation which awaited it. Curiously enough, the long-lived but cumbrous growth called pantomime in England owes its immediate origin to the beginnings of a dramatic species which has artistically furnished congenial delight to nearly two centuries of Frenchmen. Of the early history of *vaudeville* it must here suffice to say that the unprivileged actors, at the fairs, who had borrowed some of the favourite character-types of Italian popular comedy, after eluding prohibitions against the use by them of dialogue and song, were at last allowed to set up a comic opera of their own. About the second quarter of the 18th century, before these performers were incorporated with the Italians, the light kind of dramatic entertainment combining pantomime proper with dialogue and song enjoyed high favour with the French and their visitors during this period of peace. The *vaudeville* was cultivated by Le Sage and other writers of mark, though it did not conquer an enduring place in dramatic literature till rather later, when it had, moreover, been completely nationalized by the extension of the Italian types.

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[1] The traditional costume of the ancient Roman *mimi* included the *centunculus* or variegated (harlequin's) jacket, the shaven head, the sooty face and the unshod feet.

It was this popular species of entertainment which, under the name of pantomime, was transplanted to England before in France it had attained to any fixed form, or could claim for its productions any place in dramatic literature. Colley Cibber mentions as the first example, followed by "that Succession of monstrous Medlies," a piece on the story of Mars and Venus, which was still in dumb-show; for he describes it as "form'd into a connected Presentation of Dances in Character, wherein the Passions were so happily expressed, and the whole Story so intelligibly told, by a mute Narration of Gesture only, that even thinking Spectators allow'd it both a pleasing and a rational Entertainment." There is nothing to show that Harlequin and his companions figured in this piece. Genest, who has no record of it, dates the period when such entertainments first came into vogue in England about 1723. In that year the pantomime of *Harlequin Dr Faustus* had been produced at Drury Lane—its author being John Thurmond, a dancing master, who afterwards (in 1727) published a grotesque entertainment called *The Miser, or Wagner and Abericock* (a copy of this is in the Dyce Library). Hereupon, in December 1723, John Rich (1692–1761), then lessee of the theatre in Lincoln's Inn Fields, produced there as a rival pantomime *The Necromancer, or History of Dr Faustus*, no doubt, says Genest, "gotten up with superior splendour." He had as early as 1717 been connected with the production of a piece called *Harlequin Executed*, and there seem traces of similar entertainments as far back as the year 1700. But it was the inspiriting influence of French example and the keen rivalry between the London houses, which in 1723 really established pantomime on the English stage. Rich was at the time fighting a difficult battle against Drury Lane, and his pantomimes at Lincoln's Inn Fields, and afterwards at Covent Garden, were extraordinarily successful. He was himself an inimitable harlequin, and from Garrick's lines in his honour it appears that his acting consisted of "frolic gestures" without words. The favourite Drury Lane harlequin was Pinkethman (Pope's "poor Pinky"); readers of the *Tatler* (No. 188) will remember the ironical nicety with which his merits are weighed against those of his competitor Bullock at the other house. Colley Cibber, when described by Pope as "mounting the wind on grinning dragons" briskly denied having in his own person or otherwise encouraged such fooleries; in his *Apology*, however, he enters into an elaborate defence of himself for having allowed himself to be forced into countenancing the "gin-shops of the stage," pleading that he was justified by necessity, as Henry IV. was in changing his religion. Another butt of Pope's, Lewis Theobald, was himself the author of more than one pantomime; their titles already run in the familiar fashion, *e.g. A Dramatick Entertainment, call'd Harlequin a Sorcerer, with the Loves of Pluto and Proserpine* (1725; the "book of the words," as it may be called, is in the Dyce Library). In another early pantomime (also in the Dyce Library) called *Perseus and Andromeda, with the Rape of Colombine, or The Flying Lovers*, there are five "interludes, three serious and two comic." This is precisely in the manner of Fielding's dramatic squib against pantomimes, *Tumble-down Dick, or Phaeton in the Suds*, first acted in 1744, and ironically dedicated to "Mr John Lun," the name that Rich chose to assume as harlequin. It is a capital bit of burlesque, which seems to have been directly suggested by Pritchard's *Fall of Phaeton*, produced in 1736.

There seems no need to pursue further the history of English pantomime in detail. "Things of this nature are above criticism," as Mr Machine, the "composer" of *Phaeton*, says in Fielding's piece. The attempt was made more than once to free the stage from the incubus of entertainments to which the public persisted in flocking; in vain Colley Cibber at first laid down the rule of never giving a pantomime together with a good play; in vain his son Theophilus after him advised the return of part of the entrance money to those who would leave the house before the pantomime began. "It may be questioned," says the chronicler, "if there was a demand for the return of £20 in ten years." Pantomime carried everything before it when there were several theatres in London, and a dearth of high dramatic talent prevailed in all; and, allowing for occasional counter-attractions of a not very dissimilar nature, pantomime continued to flourish after the Licensing Act of 1737 had restricted the number of London play-houses, and after Garrick's star had risen on the theatrical horizon. He was himself obliged to satisfy the public appetite, and to disoblige the admirers of his art, in deference to the drama's most imperious patrons—the public at large.

In France an attempt was made by Noverre (*q.v.*) to restore pantomime proper to the stage as an independent species, by treating mythological subjects seriously in artificial ballets. This attempt, which of course could not prove permanently successful, met in England also with great applause. In an anonymous tract of the year 1789 in the Dyce Library, attributed by Dyce to Archdeacon Nares (the author of the *Glossary*), Noverre's pantomime or ballet *Cupid and Psyche* is commended as of very extraordinary merit in the choice and execution of the subject. It seems to have been without words. The writer of the tract states that "very lately the serious pantomime has made a new advance in this country, and has gained establishment in an English theatre"; but he leaves it an open question whether the grand ballet of *Medea and Jason* (apparently produced a few years earlier, for a burlesque on the subject came out in 1781) was the first complete performance of the kind produced in England. He also notes *The Death of Captain Cook*, adapted from the Parisian stage, as possessing considerable dramatic merit, and exhibiting "a pleasing picture of savage customs and manners."

To conclude, the chief difference between the earlier and later forms of English pantomime seems to lie in the fact that in the earlier Harlequin pervaded the action, appearing in the comic scenes which alternated throughout the piece with the serious which formed the backbone of the story. Columbine (originally in Italian comedy Harlequin's daughter) was generally a village maiden courted by her adventurous lover, whom village constables pursued, thus performing the laborious part of the policeman of the modern harlequinade. The brilliant scenic effects were of course accumulated, instead of upon the transformation scene, upon the last scene of all, which in modern pantomime follows upon the shadowy chase of the characters called the *rally*. The commanding influence of the clown, to whom pantaloon is attached as friend, flatterer and foil, seems to be of comparatively modern growth; the most famous of his craft was undoubtedly Joseph Grimaldi (1779–1837). His memory is above all connected with the famous pantomime of *Mother Goose*, produced at Covent Garden in 1806. The older British type of Christmas pantomime, which kept its place in London till the 'seventies, has been preserved from oblivion in Thackeray's *Sketches and Travels in London*. The species is not yet wholly extinct; but, by degrees, the rise of the music-halls and the popularity of a new type of music-hall performer influenced the character of the show which was given under the name of a Christmas pantomime at the theatres, and it became more of a burlesque "variety entertainment," dovetailed into a fairy play and with the "harlequinade" part (which had formed the closing scene of the older sort) sometimes omitted. The word had really lost its meaning. The thing itself survived rather in such occasional appearances of the Pierrot "drama without words" as charmed London playgoers in the early 'nineties in such pieces as *L'Enfant prodigue*.

Authorities.—For a general survey see K. F. F. Flögel, *Geschichte des Grotesk-Komischen*, revised ed. by F. W. Eveling (1867); A. Pougin, *Dictionnaire historique et pittoresque du théâtre* (Paris, 1885). As to the *commedia dell'arte*, masked, comedy, in Italy and France, and their influence on French regular comedy, see L. Moland, *Molière et la comédie italienne* (2nd ed., Paris, 1867); and O. Driesen's remarkable study, *Der Ursprung des Harlekin* (Berlin, 1904). As to the German *Hanswurst* and *Hanswurstiaden*, see G. Gervinus, *Geschichte der deutschen Dichtung*, vol. iii. (Leipzig, 1853); E. Devrient, *Gesch. der deutschen Schauspielkunst*, vol. ii. (Leipzig, 1848); and as to the German Harlequin, Lessing's *Hamburgische Dramaturgie*, no. 18 (1767), and the reference there to Justus Möser's *Harlekin oder Vertheidigung des Grotesk-Komischen* (1761). As to English pantomime, see Genest, *Account of the English Stage* (10 vols., Bath, 1832), especially vol. iii.; Dibdin, *Complete History of the Stage* (5 vols., London, 1800), especially vols. ii., iv., and v.; *Apology for the Life of Colley Cibber*, ed. R. W. Lowe (2 vols., London, 1889); P. Fitzgerald, *Life of Garrick* (2 vols., London, 1868).
(A. W. W.)

PANTÓN, a town of north-western Spain, in the province of Lugo; in a mountainous district, watered by the rivers Miño and Cabe. Pop. (1900), 12,988. Livestock is extensively reared, and large quantities of wheat, wine, oats and potatoes are produced. The other industries are distilling and linen manufacture. The nearest railway station is 6 m. east, at Montforte.

PANTRY (O. Fr. *paneterie*; Med. Lat. *panetaria*, a bread-shop, from *panis*, bread), originally a room in a house used for the storage of bread, hence "panter" or "pantler," an officer of a household in charge of the bread and stores. In the royal household of England the office was merged in that of butler. At coronations the office of "panneter" was held by the lord of the manor of Kibworth Beauchamp; it was his duty to carry the salt-cellar and carving-knives to the royal table, and he kept these as his fee. The last holder of the office was Ambrose Dudley, son of John, duke of Northumberland, at Elizabeth's coronation. At his death the manor reverted to the Crown. "Pantry" was early widened in meaning to include a room in a house used for the storing of all kinds of food, and is now restricted to the butler's or parlourmaid's room, where plate, china, glass, &c., for the use of the table is kept, and duties in connexion with the serving of the table are performed.

PANTUN (Pantoum), a form of verse of Malay origin. An imitation of the form has been adopted in French and also in English verse, where it is known as "pantoum." The Malay *pantun* is a quatrain, the first and third and the second and fourth lines of which rhyme. The peculiarity of the verse-form resides in the fact that the first two lines have as a rule no actual connexion, in so far as meaning is concerned, with the two last, or with one another, and have for their *raison d'être* a means of supplying rhymes for the concluding lines. For instance:—

Sēnūdoh kāyu di-rimba
Bēnang kārap bēr-simpul pūleh:
Sūnggoh dūdok ber-tindek riba,
Jāngan di-hārap kata-kan būleh.

The rhododendron is a wood of the jungle,
The strings within the frame-work of the loom are in a tangled knot.
It is true that I sit on thy lap,
But do not therefore cherish the hope that thou canst take any other liberty.

Here, it will be seen, the first two lines have no meaning, though according to the Malayan mind, on occasion, these "rhyme-making" lines are held to contain some obscure, symbolical reference to those which follow them. The Malay is not exacting with regard to the correctness of his rhymes, and to his ear *rimba* and *riba* rhyme as exactly as *pūleh* and *būleh*. It should also be noted that in the above example, as is not infrequently the case with the Malay *pantun*, there is a similar attempt at rhyme between the initial words of the lines as well as between the word with which they conclude, *senūdoh* and *sūnggoh*, *benang* and *jāngan*, and *kārap* and *hārap* all rhyming to the Malayan ear There are large numbers of well-known *pantun* with which practically all Malays are acquainted, much as the commoner proverbs are familiar to us all, and it is not an infrequent practice in conversation for the first line of a *pantun*—viz.: one of the two lines to which no real meaning attaches—to be quoted alone, the audience being supposed to possess the necessary knowledge to fit on the remaining lines for himself and thus to discover the significance of the allusion. Among cultured Malays, more especially those living in the neighbourhood of the raja's court, new *pantun* are constantly being composed, many of them being of a highly topical character, and these improvisations are quoted from man to man until they become current like the old, well-known verses, though within a far more restricted area. Often too, the *pantun* is used in love-making, but they are then usually composed for the exclusive use of the author and for the delectation of his lady-loves, and do not find their way into the public stock of verses. "Capping" *pantun* is also a not uncommon pastime, and many Malays will continue such contests for hours without once repeating the same verse, and often improvising quatrains when their stock threatens to become exhausted. When this game is played by skilled versifiers, the *pantun* last quoted, and very frequently the second line thereof, is used as the tag on to which to hang the succeeding verse.

The "*pantoum*" as a form of verse was introduced into French by Victor Hugo in *Les Orientales* (1829). It was also practised by Théodore de Banville and Leconte de Lisle. Austin Dobson's *In Town* is an example of its use, in a lighter manner, in English. In the French and English imitation the verse form is in four-line stanzas, the second and fourth line of each verse forming the first and third of the next, and so on to the last stanza, where the first and third line of the first stanza form the second and fourth line. (H. Cl.)

PANYASIS (more correctly, Panyassis), of Halicarnassus, Greek epic poet, uncle or cousin of Herodotus, flourished about 470 B.C. He was put to death by the tyrant Lygdamis (*c.* 454). His chief poems were the *Heracleias* in 14 books, describing the adventures of Heracles in various parts of the world, and the *Ionica* in elegiacs, giving an account of the founding and settlement of the Ionic colonies in Asia Minor. Although not much esteemed in his own time, which was unfavourable to epic poetry, he was highly thought of by later critics, some of whom assigned him the next place to Homer (see Quintilian, *Inst. orat.* x. I. 54). The few extant fragments show beauty and fullness of expression, and harmonious rhythm.

Fragments in G. Kinkel, *Epic. poet. fragmenta* (1877), ed. separately by J. P. Tzschirner (1842); F. P. Funcke, *De Panyasidis vita* (1837); R. Krausse, *De Panyasside* (1891).

PAOLI, CESARE (1840–1902), Italian historian and palaeographer, son of senator Baldassare Paoli, was born and educated in Florence. At the age of twenty-one he was given an appointment in the record office of his native city; from 1865 to 1871 he was attached to the Archives of Sienna, but eventually returned to Florence. In 1874 he was appointed first professor of palaeography and diplomatics at the Istituto di Studii Superiori in Florence, where he continued to work at the interpretation of MSS. In 1887 he became editor of the *Archivio storico italiano*, to which he himself contributed numerous articles. His works consist of a large number of historical essays, studies on palaeography, transcriptions of state and other papers, reviews, &c.

See C. Lupi, "Cesare Paoli," in the *Archivio storico italiano*, vol. xxix. (1902), with a complete list of his works.

PAOLI, PASQUALE (1725–1807), Corsican general and patriot, was born at Stretta in the parish of Rostino. He was the son of Giacinto Paoli, who had led the Corsican rebels against Genoese tyranny. Pasquale followed his father into exile, serving with distinction in the Neapolitan army; on his return to Corsica (*q.v.*) he was chosen commander-in-chief of the rebel forces, and after a series of successful actions he drove the Genoese from the whole island except a few coast towns. He then set to work to reorganize the government, introducing many useful reforms, and he founded a university at Corte. In 1767 he wrested the island of Capraia from the Genoese, who, despairing of ever being able to subjugate Corsica, again sold their rights over it to France. For two years Paoli fought desperately against the new invaders, until in 1769 he was defeated by vastly superior forces under Count de Vaux, and obliged to take refuge in England. In 1789 he went to Paris with the permission of the constituent assembly, and was afterwards sent back to Corsica with the rank of lieutenant-general. Disgusted with the excesses of the revolutionary government and having been accused of treason by the Convention, he summoned a *consulta*, or assembly, at Corte in 1793, with himself as president and formally seceded from France. He then offered the suzerainty of the island to the British government, but finding no support in that quarter, he was forced to go into exile once more, and Corsica became a French department. He retired to London in 1796, when he obtained a pension; he died on the 5th of February 1807.

See Boswell's *Life of Johnson*, and his *Account of Corsica and Memoirs of P. Paoli* (1768); N. Tommaseo, "Lettere di Pasquale de Paoli" (in *Archivio storico italiano*, 1st series, vol. xi.), and *Della Corsica, &c.* (ibid., nuova serie, vol. xi., parte ii.); Pompei, *De L'état de la Corse* (Paris, 1821); Giovanni Livi, "Lettere inedite di Pasquale Paoli" (in *Arch. stor. ital.*, 5th series, vols. v. and vi.); Bartoli, *Historia di Pascal Paoli* (Bastia, 1891); Lencisa, *P. Paoli e la guerra d'indipendenza della Corsica* (Milano, 1890); and Comte de Buttafuoco, *Fragments pour servir à l'histoire de la Corse de 1764 à 1769* (Bastia, 1859).

PAPACY[1] (a term formed on the analogy of "abbacy" from Lat. *papa*, pope; cf. Fr. *papauté* on the analogy of *royauté*. Florence of Worcester, A.D. 1044, quoted by Du Cange *s.v. Papa*, has the Latin form *papatia*; the *New Eng. Dict.* quotes Gower, *Conf.* i. 258, as the earliest instance of the word *Papacie*), the name most commonly applied to the office and position of the bishop or pope of Rome, in respect both of the ecclesiastical and temporal authority claimed by him, *i.e.* as successor of St Peter and Vicar of Christ, over the Catholic Church, and as sovereign of the former papal states. (See POPE and ROMAN CATHOLIC CHURCH.)

I.—*From the Origins to 1087.*

The Primitive Roman Church.

The Christian community at Rome, founded, apparently, in the time of the emperor Claudius (41–54), at once assumed great importance, as is clearly attested by the Epistle to the Romans (58). It received later the visit of Paul while a prisoner, and, according to a tradition which is now but little disputed, that of the apostle Peter. Peter died there, in 64, without doubt, among the Christians whom Nero had put to death as guilty of the burning of Rome. Paul's career was also terminated at Rome by martyrdom. Other places had been honoured by the presence and preaching of these great leaders of new-born Christianity; but it is at Rome that they had borne witness to the Gospel by the shedding of their blood; there they were buried, and their tombs were known and honoured. These facts rendered the Roman Church in the highest degree sacred. About the time that Peter and Paul died in Rome the primitive centre of Christianity—that is to say, Jerusalem—was disappearing amidst the disaster of the war of the Roman Empire with the Jews. Moreover, the Church of Jerusalem, narrowed by Jewish Christian particularism, was hardly qualified to remain the metropolis of Christianity, which was gradually gaining ground in the Graeco-Roman world. The true centre of this world was the capital of the Empire; the transference was consequently accepted as natural at an early date. The idea that the Roman Church is at the head of the other Churches, and has towards them certain duties consequent on this position, is expressed in various ways, with more or less clearness, in writings such as those of Clemens Romanus, Ignatius of Antioch and Hermas. In the 2nd century all Christendom flocked to Rome; there was a constant stream of people—bishops from distant parts, apologists or heresiarchs. All that was done or taught in Rome was immediately echoed through all the other Churches; Irenaeus and Tertullian constantly lay stress upon the tradition of the Roman Church, which in those very early days was almost without rivals, save in Asia, where there were a number of flourishing Churches, also apostolic in origin, forming a compact group and conscious of their dignity. The great reception given to Polycarp on his visit to Rome in A.D. 155 and the attitude of St Irenaeus show that on the whole the traditions of Rome and of Asia harmonized quite well. They came into conflict, however (*c.* A.D. 190), on the question of the celebration of the festival of Easter. The bishop of Rome, Victor, desired his colleagues in the various parts of the Empire to form themselves into councils to inquire into this matter. The invitation was accepted by all; and, the consultation resulting in favour of the Roman usage, Victor thought fit to exclude the recalcitrant Churches of Asia from the Catholic communion. His conduct in this dispute, though its severity may have been open to criticism,[2] indicates a very definite conception on his part of his authority over the universal Church. In the 3rd century the same position was maintained, and the heads of the Roman Church continued to speak with the greatest authority. We find cases of their intervention in the ecclesiastical affairs of Alexandria, of the East, of Africa, Gaul and Spain. Though the manner in which they wielded their authority sometimes meets with criticism (Irenaeus, Cyprian, Firmilianus), the principle of it is never questioned. However, as time went on, certain Churches became powerful centres of Christianity, and even when they did not come into conflict with her, their very existence tended to diminish the prestige of the Roman Church.

Early Authority of the Roman Bishops.

Centrifugal Forces in the Catholic Church.

After the period of the persecutions had passed by, the great ecclesiastical capitals Carthage, Alexandria, Antioch and Constantinople, as secondary centres of organization and administration, drew to themselves and kept in their hands a share in ecclesiastical affairs. It was only under quite exceptional circumstances that any need was felt for oecumenical decisions. Further, the direction of affairs, both ordinary and extraordinary, tended to pass from the bishops to the state, which was now christianized. The Eastern Church had soon *de facto* as its head the Eastern emperors. Henceforth it receded more and more from the influence of the Roman Church, and this centrifugal movement was greatly helped by the fact that the Roman Church, having ceased to know the Greek language, found herself practically excluded from the world of Greek Christianity.

In the West also centrifugal forces made themselves felt. After Cyprian the African episcopate, in proportion as it perfected its organization, seemed to feel less and less the need for close relations with the apostolic see. In the 4th century the Donatist party was in open schism; the orthodox party had the upper hand in the time of Aurelius and Augustine; the regular meeting of the councils further increased the corporate cohesion of the African Episcopal body. From them sprang a code of ecclesiastical laws and a whole judicial organization. With this organization, under the popes Zosimus, Boniface and Celestine the Roman Church came into conflict on somewhat trivial grounds, and was, on the whole, being worsted in the struggle, when the Vandal invasion of Africa took place, and for nearly a century to come the Catholic communities were subjected to very hard treatment. The revival which took place under Byzantine rule (6th and 7th centuries) was of little importance;

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[1] This article is a general history in outline of the papacy itself. Special periods, or aspects are dealt with in fuller detail elsewhere, *e.g.* in the biographical notices of the various popes, or in such articles as CHURCH HISTORY; ROMAN CATHOLIC CHURCH; INVESTITURES; CANON LAW; ECCLESIASTICAL JURISDICTION; ULTRAMONTANISM; or the articles on the various ecclesiastical councils.

[2] Victor's conduct in this matter was not approved by a number of bishops (including Irenaeus), who protested against it (ἀντιπαρακελεύονται) in the interests of peace and Christian love (Eusebius, *Hist. eccl.* v. 24).—[ED.]

but the autonomy which had been denied them under Aurelius was maintained to the end, that is to say, up till the Mahommedan conquest.

The Roman Church in the 4th Century.

During the 4th century it is to be noticed that, generally speaking, the Roman Church played a comparatively insignificant part in the West. From the time of popes Damasus and Siricius various affairs were referred to Rome from Africa, Spain or Gaul. The popes were asked to give decisions, and in answer to those demands drew up their first decretals. However, side by side with the Roman see was that of Milan, which was also the capital of the Western Empire. From time to time it seemed as if Milan would become to Rome what Constantinople was to Alexandria. However, any danger that menaced the prestige of Rome disappeared when the emperor Honorius removed the imperial residence to Ravenna, and still more so when the Western emperors were replaced in the north of Italy by barbarian sovereigns, who were Arians.

The Church in the Teutonic Kingdoms.

Restriction of the Papal Authority.

In Spain, Gaul, Brittany and the provinces of the Danube, similar political changes took place. When orthodox Christianity had gained the upper hand beyond the Alps and the Pyrenees, the episcopate of those countries grouped itself, as it had done in the East, around the sovereigns. In Spain was produced a fairly strong religious centralization around the Visigothic king and the metropolitan of Toledo. In Gaul there was no chief metropolitan; but the king's court became, even sooner than that of Spain, the centre of episcopal affairs. The Britons and Irish, whose remoteness made them free from restriction, developed still more decided individuality. In short, the workings of all the Western episcopates, from Africa to the ocean, the Rhine and the Danube, lay outside the ordinary influence of the Roman see. All of them, even down to the metropolitan sees of Milan and Aquileia, practised a certain degree of autonomy, and in the 6th century this developed into what is called the Schism of the Three Chapters. With the exception of this schism, these episcopates were by no means in opposition to the Holy See. They always kept up relations of some kind, especially by means of pilgrimages, and it was admitted that in any disputes which might arise with the Eastern Church the pope had the right to speak as representative of the whole of the Western Church. He was, moreover, the only bishop of a great see—for Carthage had practically ceased to count—who was at that time a subject of the Roman emperor.

This was the situation when St Gregory was elected pope in 590. We may add that in peninsular Italy, which was most clearly under his ecclesiastical jurisdiction, the Lombards had spread havoc and ruin; so that nearly ninety bishoprics had been suppressed, either temporarily or definitively. The pope could act directly only on the bishoprics of the coast districts or the islands. Beyond this limited circle he had to act by means of diplomatic channels, through the governments of the Lombards, Franks and Visigoths. On the Byzantine side his hands were less tied; but here he had to reckon with the theory of the five patriarchates which had been a force since Justinian. According to Byzantine ideas, the Church was governed—under the supreme authority, of course, of the emperor—by the five patriarchs of Rome, Constantinople, Alexandria, Antioch and Jerusalem. Rome had for a long time opposed this division, but, since some kind of division was necessary, had put forward the idea of the three sees of St Peter—Rome, Alexandria and Antioch—those of Constantinople and Jerusalem being set aside, as resulting from later usurpations. But the last named were just the most important; in fact the only ones which counted at all, since the monophysite secession had reduced the number of the orthodox in Syria and Egypt practically to nothing. This dissidence Islam was to complete, and by actually suppressing the patriarchate of Jerusalem to reduce Byzantine Christendom to the two patriarchates of Rome and Constantinople.

There was no comparison between the two from the point of view of the East. The new Rome, where the emperor reigned, prevailed over the old, which was practically abandoned to the barbarians. She was still by courtesy given the precedence, but that was all; the council in Trullo (692) even claimed to impose reforms on her. When Rome, abandoned by the distant emperors, was placed under the protection of the Franks (754), relations between her and the Greek Church became gradually more rare, the chief occasions being the question of the images in the 8th century, the quarrel between Photius and Ignatius in the 9th, the affairs of the four marriages of the emperor Leo VI. and of the patriarch Theophylact in the 10th. On these different occasions the pope, ignored in ordinary times, was made use of by the Byzantine government to ratify measures which it had found necessary to adopt in opposition to the opinion of the Greek episcopate.

Rome and Constantinople.

These relations were obviously very different from those which had been observed originally, and it would be an injustice to the Roman Church to take them as typical of her relations with other Christian bodies. She had done all she could to defend her former position. Towards the end of the 4th century, when southern Illyricum (Macedonia, Greece, Crete) was passing under the authority of the Eastern emperor, she tried to keep him within her ecclesiastical obedience by creating the vicariate of Thessalonica. Pope Zosimus (417) made trial of a similar organization in the hope of attaching the churches of the Gauls more closely to himself. It was also he who began the struggle against the autonomy of Africa. But it was all without effect. From the 6th century onwards the apostolic vicars of Arles and Thessalonica were merely the titular holders of pontifical honours, with no real authority over those who were nominally under their jurisdiction.

Gregory the Great, 590–604.

It was Gregory I. who, though with no premeditated intention, was the first to break this circle of autonomous or dissident Churches which was restricting the influences of the apostolic see. As the result of the missions sent to England by him and his successors there arose a church which, in spite of certain Irish elements, was and remained Roman in origin, and, above all, spirit and tendency. In it the traditions of old culture and religious learning imported from Rome, where they had almost ceased to bear any fruit, found a new soil, in which they flourished. Theodore, Wilfrid, Benedict Biscop, Bede, Boniface, Ecgbert, Alcuin, revived the fire of learning, which was almost extinct, and by their aid enlightenment was carried to the Continent, to decadent Gaul and barbarian Germany. The Churches of England and Germany, founded, far from all traditions of autonomy, by Roman legates, tendered their obedience voluntarily. In Gaul there was no hostility to the Holy See, but on the contrary a profound veneration for the great Christian sanctuary of the West. The Carolingian princes, when Boniface pointed them towards Rome, followed him without their clergy offering any resistance on grounds of principle. The question of reform having arisen, from the apostolic see alone could its fulfilment be expected, since in it, with the succession of St Peter, were preserved the most august traditions of Christianity.

The False Decretals.

The surprising thing is that, although Rome was then included within the empire of the Franks, so that the popes were afforded special opportunities for activity, they showed for the most part no eagerness to strengthen their authority over the clergy beyond the Alps. Appeals and other matters of detail were referred to them more often than under the Merovingians. They gave answers to such questions as were submitted to them; the machinery moved when set in motion from outside; but the popes did not attempt to interfere on their own initiative. The Frankish Church was directed, in fact, by the government of Charlemagne and Louis the Pious. When this failed, as happened during the wars and partitions which followed the death of Louis, the fate of this Church, with no effective head and under no regular direction, was very uncertain. It was then that a clerk who saw that there was but an uncertain prospect of help from the pope of his time, conceived the shrewd idea of appealing to the popes of the past, so as to exhort the contemporary generation through the mouth of former popes, from Clement to Gregory. This design was realized in the celebrated forgery known as the "False Decretals" (see DECRETALS).

Nicholas I., 858–867.

Hardly were they in circulation throughout the Frankish Empire when it happened that a pope, Nicholas I., was elected who was animated by the same spirit as that which had inspired them. There was no lack of opportunities for intervening in the affairs not only of the Western but of the Eastern Church, and he seized upon them with great decision. He staunchly supported the patriarch Ignatius against his rival, Photius, at Constantinople; he upheld the rights of Teutberga, who had been repudiated by her husband, Lothair II. of Lorraine, against that prince and his brother, the emperor Louis II.; and he combated Hincmar, the powerful metropolitan of Reims. It was in the course of this last dispute that the False Decretals found their way to Rome. Nicholas received them with some reserve; he refrained from giving them his sanction, and only borrowed from them what they had already borrowed from authentic texts, but in general he took up the same attitude as the forger had ascribed to his remote predecessors. The language of his successors, Andrian II. and John VIII., still shows some trace of the energy and pride of Nicholas. But the circumstances were becoming difficult. Europe was being split up under the influence of feudalism; Christendom was assailed by the barbarians, Norsemen, Saracens and Huns; at Rome the papacy was passing into the power of the local aristocracy, with whom after Otto I. it was disputed from time to time by the sovereigns of Germany. It was still being held in strict subjection by the latter when, towards the end of the 11th century, Hildebrand (Gregory VII.) undertook its enfranchisement and began the war of the investitures (*q.v.*), from which the papacy was to issue with such an extraordinary renewal of its vitality.

Schism of East and West.

In Eastern Christendom the papacy was at this period an almost forgotten institution, whose pretensions were always met by the combined opposition of the imperial authority, which was still preponderant in the Byzantine Church, and the authority of the patriarchate of Constantinople, around which centred all that survived of Christianity in those regions. To complete the situation, a formal rupture had occurred in 1054 between the patriarch Michael Cerularius and Pope Leo IX.

General Position of the Papacy in Theory.

In the West, Rome and her sanctuaries had always been held in the highest veneration, and the pilgrimage to Rome was still the most important in the West. The pope, as officiating in these holiest of all sanctuaries, as guardian of the tombs of St Peter and St Paul and the inheritor of their rank, their rights, and their traditions, was the greatest ecclesiastical figure and the highest religious authority in the West. The greatest princes bowed before him; it was he who consecrated the emperor. In virtue of the spurious donation of Constantine, forged at Rome in the time of Charlemagne, which was at first circulated in obscurity, but ended by gaining universal credit, it was believed that the first Christian emperor, in withdrawing to Constantinople, had bestowed on the pope all the provinces of the Western Empire, and that in consequence all sovereignty in the West, even that of the emperor, was derived from pontifical concessions. From all points of view, both religious and political, the pope was thus the greatest man of the West, the ideal head of all Christendom.

When it was necessary to account for this position, theologians quoted the text of the Gospels, where St Peter is represented as the rock on which the Church is built, the pastor of the sheep and lambs of the Lord, the doorkeeper of the kingdom of heaven. The statements made in the New Testament about St Peter were applied without hesitation to all the popes, considered as his successors, the inheritors of his see (*Petri sedes*) and of all his prerogatives. This idea, moreover, that the bishops of Rome were the successors of St Peter was expressed very early—as far back as the 2nd century. Whatever may be said as to its historical value, it symbolizes very well the great authority of the Roman Church in the early days of Christianity; an authority which was then administered by the bishops of Rome, and came to be more and more identified with them. The councils were also quoted, and especially that of Nicaea, which does not itself mention the question, but certain texts of which contained the famous gloss: *Ecclesia romana semper habuit primatum.* But this proof was rather insufficient, as indeed it was felt to be, and, in any case, nothing could be deduced from it save a kind of precedence in honour, which was never contested even by the Greeks. The Gospel and unbroken tradition offered a better argument.

In his capacity as head of the church, "and president of the Christian agape," as St Ignatius of Antioch would have said, the pope was considered to be the supreme president and moderator of the oecumenical assemblies. When the episcopate met in council the bishop of Rome had to be at its head. No decisions of a general nature, whether dogmatic or disciplinary, could be made without his consent. The appeal from all patriarchal or conciliary judgments was to him; and on those occasions when he had to depose bishops of the highest standing, notably those of Alexandria and Constantinople, his judgments were carried into effect. During the religious struggles between the East and West he was on a few occasions condemned (by the Eastern council of Sardica, by Dioscorus, by Photius); but the sentences were not carried out, and were even, as in the case of Dioscorus, considered and punished as sacrilegious attacks. In the West the principle, "prima sedes a nemine judicatur," was always recognized and applied.

Practical Applications of the Theory.

In ordinary practice this theoretically wide authority had only a limited application. The apostolic see hardly ever interfered in the government of the local Churches. Save in its own metropolitan province, it took no part in the nomination of bishops; the provincial or regional councils were held without its authorization; their judgments and regulations were carried out without any suggestion that they should be ratified by Rome. It is only after the False Decretals that we meet with the idea that a bishop cannot be deposed and his place filled without the consent of the pope. And it should be noticed that this idea was put forward, not by the pope with the object of increasing his power, but by the opinion of the Church with a view to defending the bishops against unjust sentences, and especially those inspired by the secular authority.

It was admitted, however, throughout the whole Church that the Holy See had an appellate jurisdiction, and recourse was had to it on occasion. At the council of Sardica (343) an attempt had been made to regulate the procedure in these appeals, by recognizing as the right of the pope the reversing of judgments, and the appointment of fresh judges. In practice, appeals to the pope, when they involved the annulling of a judgment, were judged by the pope in person.

But the intervention of the Holy See in the ecclesiastical affairs of the West, which resulted from these appeals, was only of a limited, sporadic and occasional nature. Nothing could have been more removed from a centralized administration than the condition in which matters stood with regard to this point. The pope was the head of the Church, but he exercised his authority only intermittently. When he did exercise it, it was far more frequently at the request of bishops or princes, or of the faithful, than of his own initiative. Nor had any administrative body for the supreme government of the Church ever been organized. The old Roman clergy, the deacons and priests of the church at Rome (*presbyteri incardinati, cardinales*) formed the pope's council, and when necessary his tribunal; to them were usually added the bishops of the neighbourhood. The body of ecclesiastical notaries served as the staff of the chancery.

Territorial Possessions of the Holy See.

The Roman Church had from a very early date possessed considerable wealth. Long before Constantine we find her employing it in aid of the most distant churches, as far afield as Cappadocia and Arabia. Her real property, confiscated under Diocletian, was restored by Constantine, and since then had been continually increased by gifts and bequests. In the 4th and 5th centuries, the Roman Church possessed property in all parts of the empire; but gradually, whether because the confiscations of the barbarian emperors had curtailed its extent, or because the popes had made efforts to concentrate it nearer to themselves, the property of the Holy See came to be confined almost entirely to Italy. In the time of St Gregory there subsisted only what lay in Byzantine Italy, the Lombards having confiscated the property of the Church as well as the imperial domains. During the quarrels between the papacy and the Byzantine Empire her domains in lower Italy and Sicily also disappeared as time went on, and the territorial possessions of the Roman Church were concentrated in the neighbourhood of Rome.

Beginnings of the Temporal Power.

It was then, towards the middle of the 8th century, that the pope, who already exercised a great influence over the government of the city and province of Rome, defending her peacefully and with difficulty against the advancing Lombard conquests, saw that he was forced, short of the protection of the Greek Empire, to put himself under the protection of the Frankish princes. Thus there arose a kind of sovereignty, disputed, it is true, by Constantinople, but which succeeded in maintaining itself. Rome, together with such of the Byzantine territories as still subsisted in her neighbourhood, was considered as a domain sacred to the apostle Peter, and entrusted to the administration of his successor, the pope. To it were added the exarchate of Ravenna and a few other districts of central Italy, which had been recently conquered by the Lombards and retaken by the Frankish kings Pippin and Charlemagne. Such was the foundation of the papal state.

The higher places in the government were occupied by the clergy, who for matters of detail made use of the civil and military officials who had carried on the administration under the Byzantine rule. But these lay officials could not long be content with a subordinate position, and hence arose incessant friction, which called for constant intervention on the part of the Frankish sovereigns. In 824 a kind of protectorate was organized, and serious guarantees were conceded to the lay aristocracy.

Shortly afterwards, in the partition of the Carolingian Empire, Italy passed under the rule of a prince of its own, Louis II., who, with the title of emperor, made his authority felt in political matters. Shortly after his death (875) fresh upheavals reduced to nothing the power of the Carolingian princes; the clergy of Rome found itself without a protector, exposed to the animosity of the lay aristocracy. The authority of the pontificate was seriously impaired by these circumstances. One of the great families of Rome, that of the *vestararius* Theophylact, took possession of the temporal authority, and succeeded in influencing the papal elections. After Theophylact the power passed to his daughter Marozia, a woman of the most debased character; then to her son Alberic, a serious-minded prince; and then to Alberic's son Octavius, who from "prince of the Romans" became pope (John XII.) when yet a mere boy. After Marozia and Alberic and the rest another branch of the same family, the Crescentii, exercised the temporal powers of the Holy See; and after them the same régime was continued by the counts of Tusculum, who were sprung from the same stock, which sometimes provided the Roman Church with the most unlikely and least honourable pontiffs.

Election of the Popes.

The pope, like all the bishops, was chosen by means of election, in which both the clergy and the laity took part. The latter were represented in the most essential functions of the election by the aristocracy: at first by the senate, and later by the *exercitus romanus*, or rather of its staff, composed of Byzantine officers. It was the latter which gave rise to the feudal aristocracy which we see appearing under the Carolingians. The new pope was chosen by the principal members of the clergy and nobles, and then set before the assembled people, who gave their decision by acclamation; and this acclamation was accepted as the vote of the assembly of the faithful. The pope-elect was then put in possession of the episcopal house, and after waiting till the next Sunday his consecration was proceeded with. This ceremony was at first celebrated in the Lateran, but from Byzantine times onwards it took place at St Peter's. It was also under the Byzantine régime that the condition was imposed that the pope should not be consecrated until the emperor had ratified his election. This had not been required under the old Latin emperors nor under the Gothic kings, and it disappeared of its own accord with the Byzantine régime. It was revived, however, by the emperor Louis the Pious, much to the disgust of the Romans, who resisted on several occasions. The Roman "princes" or "senators" in the 10th century went still further: it was they who actually nominated the pope. The same was the case with the Saxon emperors (Otto I., II. and III.), and in the 11th century of the lords of Tusculum, the latter nominating themselves and choosing members of their own family for the pontificate. When the emperor Henry III. (1046) put an end to this oppression it was only to substitute another. The popes of Tusculum did, at least, belong to the country, while the German kings chose bishops from the other side of the Alps. Such was the state of affairs up to the time of Hildebrand.

The Hildebrandine Reform.

The entry of Hildebrand into the counsels of the papacy marks the beginning of a great change in this institution. He cannot, however, claim the honour of having opened the way which he impelled his predecessors to follow even before following it himself. All good Christians were calling for reform; bishops, princes, and monks were in agreement on this point when they spoke or acted according to their convictions. Many of them had tried to effect something; but these isolated efforts were often countermined by incompatible aims, and had produced no serious results. It is in the supreme head of the Church that the movement ought to have found its origin and inspiration. There was no dispute as to his possessing the authority in spiritual matters necessary to impose reform and overbear the resistance which might arise; no one was better qualified than he to treat with the holders of the temporal power and obtain the support which was necessary from them. The Fathers of the Church had repeated times without number that the priesthood stands above even the supreme secular authority; the Bible was full of stories most aptly illustrating this theory; nobody questioned that, within the Church, the pope was the Vicar of Christ, and that, as such, his powers were unlimited; as proof positive could be cited councils and decretals—whether authentic or spurious; at any rate all authorized by long usage and taken as received authorities. It only remained to take possession of this incontestable power and use it with firmness and consistency. The example of Nicholas I., two centuries before, had shown the position which a pope could occupy in Christendom; but for a long time past the man had come short of the institution, the workman of his tool. Under Leo IX. (1048–1054) the pope suddenly came forward as the active and indefatigable champion of reform; simony and incontinence of the clergy were attacked by the one most qualified to purify the Church of them. Henceforth the way was open, and it became clear that, given good popes, the reform movement might be carried into effect. The choice of the pope was then subject to the pleasure of the sovereign of Germany, against whom the Roman feudal lords, devoted as they were to the old abuses, were in constant revolt. In the midst of the frequent changes of pope which went on during these years, and the political vicissitudes of Italy, Hildebrand took such measures as enabled him to checkmate the opposition of the Roman barons by turning against them, now the armed force of the Normans, now the influence of the German king.[1]

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[1] On the 5th of April 1058, six days after the death of Pope Stephen X., John, bishop of Velletri, the nominee of the Roman nobles, was enthroned as Pope Benedict X. Hildebrand set up Gerard, bishop of Florence, as a rival candidate, won over a part of the Romans to his cause, and secured the support of the empress regent Agnes at the Diet of Augsburg in June. Gerard was elected pope at Siena (as Nicholas II., *q.v.*) by those cardinals who had fled from Rome on the elevation of Benedict X. A synod was held at Sutri, at which the powerful Godfrey, duke of Lorraine and Spoleto, and margrave of Tuscany, and the chancellor Wibert were present. Measures were here concerted against Pope Benedict, who was driven out of Rome in January 1059, Nicholas II. being

Side by side with the general movement towards reform, he had set before himself the object of freeing the papacy, not only from its temporal oppressors but also from its protectors. He was successful at the council of 1059, the pontifical election was placed out of reach of the schemes of the local feudal lords and restored to the heads of the clergy; certain reservations were made with regard to those rights which the Holy See was considered to have conceded personally to Henry of Germany (the young king Henry IV., son of the emperor Henry III.), but nothing more. At the election of Alexander II. (1061–1073)—a rival to whom was for a long time supported by the German king—and even at the election of Hildebrand, this rule had its effect. Henceforth the elections remained entirely free from those secular influences which had hitherto been so oppressive. In 1073 Hildebrand was raised to the pontifical throne by the acclamation of the people of Rome, under the name of Gregory VII.

Gregory VII., 1053-1085.

The work of reform was now in a good way; the freedom of the pontifical elections had been assured, which gave some promise that the struggle against abuses would be conducted successfully. All that now remained was to go on following wisely and firmly the way that had already been opened. But this attitude was not likely to appeal to the exuberant energy of the new pope. Hitherto he had had to reckon with obstacles more powerful than those which were now left for him to conquer, and, what was more, with the fact that his authority depended upon the will of others. But now that his hands were no longer tied, he could act freely. The choice of the pope had been almost entirely removed from the sphere of secular influence, and especially from that of the German king. Gregory claimed that the same condition should apply to bishops, and these were the grounds of the dispute about investitures—a dispute which could find no solution, for it was impossible for the Teutonic sovereigns to renounce all interest in a matter of such importance in the workings of their state. Since the time of Clovis the German sovereigns had never ceased to intervene in such matters. But this question soon fell into the background. Gregory's contention was that the secular sovereigns should be entirely in the power of the head of the Church, and that he should be able to advance them or dispossess them at will, according to the estimate which he formed of their conduct. A terrible struggle arose between these obviously exorbitant demands and the resistance which they provoked. Its details cannot be described in this place (see INVESTITURES); we need only say that this ill-fated quarrel was not calculated to advance the reform movement, but rather to impede it, and, further, that it ended in failure. Gregory died far away from Rome, upon which he had brought incalculable evils; and not only Rome, but the papacy itself had to pay the penalty for the want of moderation of the pope. Great indeed was the difference between the state in which he received it and that in which he left it. We must not, however, let this mislead us. This struggle between spiritual and secular powers, owing to the tremendous sensation which it created throughout Christendom, showed the nations that at the head of the Church there was a great force for justice, always able to combat iniquity and oppression, and sometimes to defeat them, however powerful the evil and the tyrants might seem. The scene at Canossa, which had at the moment a merely relative importance, remained in the memories of men as a symbol which was hateful or comforting, according to the point of view from which it was considered. As to Gregory's political pretensions, zealous theorists were quick to transform them into legal principles; and though his immediate successors, somewhat deafened by the disturbance which they had aroused, seem to have neglected them at first, they were handed on to more distant heirs and reappeared in future struggles.

Gregory himself, in his last moments, seems to have felt that it was impossible to maintain them, for Didier, abbot of Monte-Cassino (Victor III., 1086–1087), whom he nominated as his successor, was well known for his moderation. It was no longer a question of continuing the policy of Gregory VII., but of saving the work of Hildebrand. (L. D.*)

II.—Period from 1087 to 1305.

The Work of Gregory VII.

Gregory VII. had clearly revealed to the world the broad lines of the religious and political programme of the medieval papacy, and had begun to put it into execution. To reform the Church in every grade and purge the priesthood in order to shield it from feudal influences and from the domination of lay sovereignties; to convert the Church thus regenerated, spiritualized, and detached from the world, into an organism which would be submissive to the absolute authority of the papal see, and to concentrate at Rome all its energies and jurisdictions; to establish the supremacy of the Roman see over all the Christian Churches, and win over to the Roman Church the Churches of the Byzantine Empire, Africa and Asia; to establish the temporal domain of St Peter, not only by taking possession of Rome and Italy, but also by placing all the crowns of Europe under the supreme sovereignty of the popes, or even in direct vassalage to them; and, finally, to maintain unity of faith in Christendom and defend it against the attacks of unbelievers, Mussulmans, heretics and pagans—these were the main features of his scheme. The task, however, was so gigantic that after 150 years of strenuous effort, at the period which may be considered as the apogee of its power, that is, in the first half of the 13th century, the papacy had attained only incomplete results. At several points the work remained unfinished, for decadence followed close upon the moment of extreme greatness. It is more particularly in the part of this programme that relates to the internal policy of the papacy, to the subjection of the Church to the Curia, and to the intensive concentration of the ecclesiastical forces in the hands of the leader of Christendom, that Gregory went farthest in the execution of his plan and approached nearest the goal. For the rest, so formidable were the external obstacles that, without theoretically renouncing his claims, he was unable to realize them in practice in a manner satisfactory to himself.

In order to give a clear idea of the vicissitudes through which the papal institution passed between the years 1087 and 1305 and to show the measure of its success or failure at different stages in its course, it is convenient to divide this section into four periods.

Urban II., 1088-1099.

Reform of the Church.

1. *Period from Urban II. to Calixtus II. (1087–1124).*—Gregory VII.'s immediate successors accomplished the most pressing work by liberating the Church from feudal subjection, either by force or by diplomacy. This was, indeed, the indispensable condition of its internal and external progress. The great figure of this period is unquestionably the French Cluniac Urban II., who led the Hildebrandine reformation with more vehemence than Gregory himself and was the originator of the crusades. Never throughout the middle ages was pope more energetic, impetuous or uncompromising. His inflexible will informed the movement directed against the enemy within, against the simoniacal prelate and the princely usurper of the rights of the Church, and prescribed the movement against the enemy without, against the infidel who held the Holy Sepulchre. Urban set his hand to reforms from which his predecessor Gregory had recoiled. He simultaneously excommunicated several sovereigns and mercilessly persecuted the archbishops and bishops who were hostile to reform. He took no pains to temper the zeal of his legates, but incited them to the struggle, and, not content with prohibiting lay investiture and simony, expressly forbade prelates and even priests to pay homage to the civil power. Distrusting the secular clergy, who were wholly sunk in the world, he looked to the regular clergy for support, and thus led the papacy into that course which it continued to pursue after his death. Henceforth the monk was to be the docile instrument of the wishes of Rome, to be

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regularly enthroned on the 24th of the same month. A synod assembled at the Lateran in April passed the famous new regulations for the elections to the papacy. (See CONCLAVE and LATERAN COUNCILS.)—[ED.]

The First Crusade.

opposed to the official priesthood according to Rome's needs. Urban was the first to proclaim with emphasis the necessity of a close association of the Curia with the religious orders, and this he made the essential basis of the theocratic government. As the originator of the first crusade, Urban is entitled to the honour of the idea and its execution. There is no doubt that he wished to satisfy the complaints that emanated from the Christians dwelling in Jerusalem and from the pilgrims to the Holy Sepulchre, but it is no less certain that he was disturbed by the fears aroused throughout the Latin world by the recrudescence of Mussulman invasions, and particularly by the victory won by the Almoravides over the Christian army at Zalaca (1086). The progress of these African Mussulmans into Spain and their incessant piracies in Italy were perhaps the occasional cause that determined Urban II. to work upon the imagination of the infidels by an expedition into Syria. The papacy of that time believed in the political unity of Islam, in a solidarity —which did not exist—among the Mussulmans of Asia Minor, Syria, Egypt and the Barbary coasts; and if it waited until the year 1095 to carry out this project, it was because the conflict with the Germanic Empire prevented the earlier realization of its dream. The essential reason of Urban II.'s action, and consequently the true cause of the crusade, was the ambition of the pope to unite with Rome and the Roman Church the Churches of Jerusalem, Antioch, Alexandria and even Constantinople, which the Greek schism had rendered independent. This thought had already crossed the minds of Leo IX. and Gregory VII., but circumstances had never allowed them to put it into execution. Armed by the reformation with a moral authority which made it possible to concentrate the forces of the West under the supreme direction of the Church and its leaders, Urban II. addressed himself with his customary decision to the execution of this enormous enterprise. With him, as with all his successors, the idea of a collective expedition of Europe for the recovery of the Holy Places was always associated with the sanguine hope of extinguishing the schism at Constantinople, its very centre, by the substitution of a Latin for a Byzantine domination. Of these two objects, he was only to realize the former; but the crusade may well be said to have been his own work. He created it and preached it; he organized it, dominated it, and constantly supervised it. He was ever ready to act, either personally or through his delegates, and never ceased to be the effective leader of all the feudal soldiers he enrolled under the banner of the Holy See. He corresponded regularly with his legates and with the military leaders, who kept him accurately informed of the position of the troops and the progress of the operations. He acted as intermediary between the soldiers of Christ and their brothers who remained in Europe, announcing successes, organizing fresh expeditions, and spurring the laggards to take the road to Jerusalem.

Settlement of the Investiture Quarrel.

The vast conflict aroused by the Hildebrandine reformation, and particularly the investiture quarrel, continued under the three successors of Urban II.; but with them it assumed a different character, and a tendency arose to terminate it by other means. The violence and disorders provoked by the struggle brought about a reaction, which was organized by certain prelates who advocated a policy of conciliation, such as the Frenchman Ivo, bishop of Chartres (*c.* 1040–1116). These conciliatory prelates were sincere supporters of the reformation, and combated simony, the marriage or concubinage of priests, and the immorality of sovereigns with the same conviction as the most ardent followers of Gregory VII. and Urban II.; but they held that the intimate union of Church and State was indispensable to the social order, and that the rights of kings should be respected as well as the rights of priests. The text they preached was harmony between the priesthood and the state. Dividing what the irreconcilables of the Hildebrandine party considered as an indissoluble whole, they made a sharp distinction between the property of the Church and the Church itself, between the political and territorial power of the bishops and their religious authority, and between the feudal investiture which confers lands and jurisdiction and the spiritual investiture which confers ecclesiastical rights. This doctrine gradually rallied all moderate minds, and finally inspired the directors of Christendom in Rome itself. It explains the new attitude of Paschal II. and Calixtus II., who were both sincere reformers, but who sought in a policy of compromise the solution of the difficult problem of the relations of Church and State.

Paschal II., 1099–1118.

History has not done sufficient justice to the Italian monk Paschal II., who was the equal of Urban in private virtues, personal disinterestedness, and religious conviction, but was surpassed by him in ardour and rigidity of conduct. Altered circumstances and tendencies of opinion called for a policy of conciliation. In France, Paschal granted absolution to Philip I.—who had many times been anathematized by his predecessors—and reconciled him solemnly with the Church, on the sole condition that he should swear to renounce his adulterous marriage. The pope could be under no delusion as to the value of this oath, which indeed was not kept; he merely regularized formally a state of affairs which the intractable Urban II. himself had never been able to prevent. As for the French question of the investitures, it was settled apparently without any treaty being expressly drawn up between the parties. The kings of France contemporary with Paschal II. ceased to practice spiritual investiture, or even to receive feudal homage from the bishops. They did not, however, renounce all intervention or all profit in the nominations to prelacies, but their intervention was no longer exhibited under the forms which the Hildebrandine party held to be illegal. In England, Paschal II. put an end to the long quarrel between the royal government and Anselm of Canterbury by accepting the Concordat of London (1107). The crown in England also abandoned investiture by the pastoral staff and ring, but, more fortunate than in France, retained the right of receiving feudal homage from the episcopate. As for Germany, the Emperor Henry V. wrung from the pope, by a display of force at Rome, concessions which provoked the indignant clamours of the most ardent reformers in France and Italy. It must not, however, be forgotten that, in the negotiations at Sutri, Paschal had pride and independence enough to propose to the emperor the only solution of the conflict that was entirely logical and essentially Christian, namely, the renunciation by the Church of its temporal power and the renunciation by the lay lords of all intervention in elections and investitures—in other words, the absolute separation of the priesthood and the state. The idea was contrary to the whole evolution of medieval Catholicism, and the German bishops were the first to repudiate it. At all events, it is certain that Paschal II. prepared the way for the Concordat of Worms. On the other hand, with more acuteness than his predecessors, he realized that the papacy could not sustain the struggle against Germany unless it could rely upon the support of another Christian kingdom of the West; and he concluded with Philip I. of France and Louis the Fat, at the Council of Troyes (1107), an alliance which was for more than a century the salvation of the court of Rome. It is from this time that we find the popes in moments of crisis transporting themselves to Capetian territory, installing their governments and convening their councils there, and from that place of refuge fulminating with impunity against the internal and external foe. Without sacrificing the essential principles of the reformation, Paschal II. practised a policy of peace and reaction in every way contrary to that of the two preceding popes, and it was through him that the struggle was once more placed upon the religious basis. He refused to retain Hugo, bishop of Die (d. 1106), as legate; like Urban and Gregory, he gave or confirmed monastic privileges without the protection he granted to the monks assuming a character of hostility towards the episcopate; and, finally, he gave an impulse to the reformation of the chapters, and, unlike Urban II., maintained the rights of the canons against the claims of the abbots.

Alliance with France.

Guy, the archbishop of Vienne, who had been one of the

Calixtus II., 1119–1124.

keenest to disavow the policy of Paschal II., was obliged to continue it when he assumed the tiara under the name of Calixtus II. By the Concordat of Worms, which he signed with the Emperor Henry V. in 1122, the investiture was divided between the ecclesiastical and the lay powers, the emperor investing with the sceptre, the pope with the pastoral staff and ring. The work did honour to the perseverance and ability of Calixtus, but it was merely the application of the ideas of Paschal II. and Ivo of Chartres. The understanding, however, between the two contracting parties was very far from being clear and complete, as each party still sought to attain its own aim by spreading in the Christian world divergent interpretations of the concordat and widely-differing plans for reducing it to its final form. And, again, if this transaction settled the investiture question, it did not solve the problem of the reconciliation of the universal power of the popes with the claims of the emperors to the government of Europe; and the conflict subsisted—slumbering, it is true, but ever ready to awake under other forms. Nevertheless, the two great Christian agitations directed by the papacy at the end of the 11th century and the beginning of the 12th—the reformation and the crusade—were of capital importance for the foundation of the immense religious monarchy that had its centre in Rome; and it is from this period that the papal monarchy actually dates.

Effect of the Latin Conquest of Jerusalem.

The entry of the Christians into Jerusalem produced an extraordinary effect upon the faithful of the West. In it they saw the most manifest sign of the divine protection and of the supernatural power of the pope, the supreme director of the expedition. At its inception the Latin kingdom of the Holy Land was within a little of becoming an ecclesiastical principality, ruled by a patriarch under the authority of the pope. Daimbert, the first patriarch of Jerusalem, was convinced that the Roman Church alone could be sovereign of the new state, and attempted to compel Godfrey of Bouillon to hand over to him by a solemn agreement the town and citadel of Jerusalem, and also Jaffa. The clergy, indeed, received a large share; but the government of the Latin principality remained lay and military, the only form of government possible for a colony surrounded by perils and camped in a hostile country. Not only was the result of the crusade extremely favourable to the extension of the Roman power, but throughout the middle ages the papacy never ceased to derive almost incalculable political and financial advantages from the agitation produced by the preachers and the crusading expeditions. The mere fact of the crusaders being placed under the special protection of the Church and the pope, and loaded with privileges, freed them from the jurisdiction, and even, up to a certain point, from the lordship of their natural masters, to become the almost direct subjects of the papacy; and the common law was then practically suspended for the benefit of the Church and the leader who represented it.

Subordination of the Episcopate to the Papal Monarchy.

As for the reformation, which under Urban II. and his immediate successors was aimed not only at the episcopate but also at the capitulary bodies and monastic clergy, it, too, could but tend to a considerable extension of the authority of the successors of St Peter, for it struck an irremediable blow at the ancient Christian hierarchy. The first manifest result of the change was the weakening of the metropolitans. The visible symptom of this decadence of the archiepiscopal power was the growing frequency during the Hildebrandine conflict of episcopal confirmations and consecrations made by the popes themselves or their legates. From an active instrument of the religious society, the archiepiscopate degenerated into a purely formal power; while the episcopate itself, which the sincere reformers wished to liberate and purge in order to strengthen it, emerged from the crisis sensibly weakened as well as ameliorated. The episcopate, while it gained in intelligence and morality, lost a part of its independence. It was raised above feudalism only to be abased before the two directing forces of the reformation, the papacy and the religious orders. To place itself in a better posture for combating the simoniacal and concubinary prelates, the court of Rome had had to multiply exemptions and accelerate the movement which impelled the monks to make themselves independent of the bishops. Even in the cities, the seats of the episcopal power, the reformation encouraged the attempts at revolt or autonomy which tended everywhere to diminish that power. The cathedral chapters took advantage of this situation to oppose their jurisdiction to that of the bishops, and to encroach on their prerogatives. When war was declared on the schismatic prelates, the reforming popes supported the canons, and, unconsciously or not, helped them to form themselves into privileged bodies living their own lives and affecting to recognize the court of Rome as their only superior authority. Other adversaries of the episcopate, the burgesses and the petty nobles dwelling in the city, also profited by these frequent changes of bishops, and the disorders that ensued. It was the monarchy of the bishops of Rome that naturally benefited by these attacks on the aristocratic principle represented by the high prelacies in the Church. By drawing to their side all the forces of the ecclesiastical body to combat feudalism, Urban II. and his successors, with their monks and legates, changed the constitution of that body, and changed it to their own advantage. The new situation of these popes and the growth of their authority were also manifested in the material organization of their administration and chancery. Under Urban II. the formulary of the papal bulls began to crystallize, and the letters amassed in the papal offices were differentiated clearly into great and little bulls, according to their style, arrangement and signs of validation. Under Paschal II. the type of the leaden seal affixed to the bulls (representing the heads of the apostles Peter and Paul) was fixed, and the use of Roman minuscule finally substituted for that of the Lombard script.

2. *Period from Honorius II. to Celestine III.* (*1124–1198*).—After the reformation and the crusade the papal monarchy existed, and the next step was to consolidate and extend it. This task fell to the popes of the 12th century. Two of them in particular—the two who had the longest reigns—viz. Innocent II. and Alexander III., achieved the widest extension of the power entrusted to them, and in many respects their pontificates may be regarded as a preparation for and adumbration of the pontificate of Innocent III. This period, however, is characterized not only by the thoroughgoing development of the authority of the Holy See, but also by the severe struggle the popes had to sustain against the hostile forces that were opposed to their conquests or to the mere exercise of what they regarded as their right.

The Papacy and the German Emperors.

Honorius II., 1124–1130.

In the secular contest, Germany and the imperialist pretensions of its leaders were invariably the principal obstacle. Until the accession of Adrian IV., however, there had been considerable periods of tranquillity, years even of unbroken peace and alliance with the Germanic power. Under Honorius II. the empire, represented by Lothair III. of Supplinburg, yielded to the papacy, and Lothair, who was elected by the clergy and protected by the legates, begged the pope to confirm his election. Before his coronation he had renounced the right, so jealously guarded by Henry V., of assisting in the election of bishops and abbots, and he even undertook to refrain from exacting homage from the prelates and to content himself with fealty. This undertaking, however, did not prevent him from bringing all his influence to bear upon the ecclesiastical nominations. When the schism of 1130 broke out he endeavoured to procure the cancellation of the clauses of the Concordat of Worms and to recover lay investiture by way of compensation for the support he had given to Innocent II., one of the competing popes. This scheme, however, was frustrated by the firmness of Innocent and St Bernard, and Lothair had to resign himself to the zealous conservation of the privileges granted to the Empire by the terms of the concordat. The ardour he had displayed in securing the recognition of Innocent and defending him against his enemies, particularly the anti-pope

Innocent II., 1130-1143.

Eugenius III., 1145-1153.

Anastasius IV., 1153-1154.

Adrian IV., 1154-1159.

Alexander III., 1159-1181.

Anacletus and the kingdom of the Two Sicilies, involved him in a course which was not precisely favourable to the imperial rights. Innocent II. was the virtual master of this monarch, whose championship of the papacy brought not the smallest advantage, not even that of being crowned emperor with the habitual ceremonial at the place consecrated by tradition. It may even be maintained that his elevation was due solely to his personal claims. This was a victory for Rome, and it was repeated in the case of the first Hohenstaufen, Conrad III., who owed his elevation (1138) mainly to the princes of the Church and the legate of Innocent II., by whom he was crowned. He also had to submit to the consequences of his origin on the occasion of a double election not foreseen by the Concordat of Worms, when he was forced to admit the necessity of appeal to Rome and to acknowledge the supremacy of the papal decision. The situation changed in 1152, under Eugenius III., when Frederick Barbarossa was elected German king. He notified his election to the pope, but did not seek the pope's approval. None the less, Eugenius III. felicitated the new sovereign on his election, and even signed the treaty of Constance with him (1153). The pope had need of Frederick to defend him against the revolted Romans and to help him to recover his temporal power, which had been gravely compromised. Anastasius IV. pursued the same policy, and summoned the German to Rome (1154). Frederick, however, was determined to keep the seat of the Empire for himself, to dispute Italy with the pope, and to oppose the divine right of kings to the divine right of priests. When he had taken Lombardy (1158) and had had the principles of the imperial supremacy proclaimed by his jurists at the diet of Roncaglia, the court of Rome realized that war was inevitable, and two energetic popes, Adrian IV. and Alexander III., resolutely sustained the struggle, the latter for nearly twenty years. Victims of the communal claims at Rome, they constituted themselves the champions of similar claims in northern Italy, and their alliance with the Lombard communes ultimately led to success. In his duel with Barbarossa, Alexander III., one of the greatest of medieval popes, displayed extraordinary courage, address and perseverance. Although it must be admitted that the tenacity of the Lombard republics contributed powerfully to the pope's victory, and that the triumph of the Milanese at Legnano (1176) was the determining cause of Frederick's submission at Venice, yet we must not exaggerate the importance of the solemn act by which Barbarossa, kneeling before his conqueror, recognized the spiritual supremacy of the Holy See, and swore fidelity and respect to it. In its final form, the truce of Venice was not only not unfavourable secularly to the Empire, but even granted it very extensive advantages. Nor must it be forgotten that, in the eyes of contemporaries, the scene at Venice had none of that humiliating character which later historians have attributed to it.

Alexander III. and Henry II. of England.

This was not the only success gained by Alexander III. over lay sovereigns. The conflict of the priesthood with the kingdoms and nations that were tending to aggrandize themselves by transcending the religious limits of the medieval theocracy took place on another theatre. The affair of Thomas Becket (*q.v.*) involved the papacy in a quarrel with the powerful monarchy of the Angevins, whose representative, Henry II., was master of England and of the half of France. Alexander's diplomatic skill and moral authority, reinforced by the Capetian alliance and the revulsion of feeling caused by the murder of Becket, enabled him to force the despotic Henry to yield, and even to do penance at the tomb of the martyr. The Plantagenet abjured the Constitutions of Clarendon, recognized the rights of the pope over the Church of England, and augmented the privileges and domains of the archbishopric of Canterbury. Although Becket was a man of narrow sympathies and by no means of liberal views, he had died for the liberties of his caste, and the aureole that surrounded him enhanced the prestige and ascendancy of the papacy.

The Papacy and the Emperor Henry VI.

Unfortunately for the papacy, the successors of Alexander III. lacked vigour, and their pontificates were too brief to allow them to pursue a strong policy against the Germanic imperialism. Never were the leaders of the Church in such jeopardy as during the reign of Barbarossa's son, Henry VI. This vigorous despot, whose ambitions were not all chimerical, had succeeded where his predecessors, including Frederick, had failed. His marriage with the heiress of the old Norman kings had made him master of Sicily and the duchy of Apulia and Calabria, and he succeeded in conquering and retaining almost all the remainder of the peninsula. Under Celestine III. the papal state was surrounded on every side by German soldiers, and but for the premature death of the emperor, whom Abbot Joachim of Floris called the "hammer of the world," the temporal power of the popes might perhaps have been annihilated.

The Papacy and the Norman Kingdom in South Italy.

The Norman kingdom, which had conquered Sicily and southern Italy at the end of the 11th century, was almost as grave a source of anxiety to the popes of this period. Not only was its very existence an obstacle to the spread of their temporal power in the peninsula, but it frequently acted in concert with the pope's enemies and thwarted the papal policy. The attempts of Honorius II. (1128) and Innocent II. (1139) to wrest Apulia and Calabria from King Roger II., and Adrian IV.'s war with William I. (1156), were one and all unsuccessful; and the papacy had to content itself with the vassalage and tribute of the Normans, and allowed them to organize the ecclesiastical government of their domains in their own fashion, to limit the right of appeal to Rome, and to curtail the power of the Roman legates. At this period, moreover, the "Norman Question" was intimately connected with the "Eastern Question." The Norman adventurers in possession of Palermo and Naples perpetually tended to look for their aggrandizement to the Byzantine Empire. In the interests of their temporal dominion, the 12th-century popes could not suffer an Italian power to dominate on the other side of the Adriatic and instal itself at Constantinople. This contingency explains the vacillating and illogical character of the papal diplomacy with regard to the Byzantine problem, and, *inter alia*, the opposition of Eugenius III. in 1150 to Roger II.'s projected crusade, which was directed towards the conquest of the Greek state. The popes were under the constant sway of two contrary influences—on the one hand, the seducing prospect of subduing the Eastern Church and triumphing over the schism, and, on the other, the apprehension of seeing the Normans of Sicily, their competitors in Italy, increasing their already formidable power by successful expeditions into the Balkan Peninsula. Dread of the Normans, too, explains the singular attitude of the Curia towards the Comneni, of whom it was alternately the enemy and the protector or ally.

The Papacy and the Commune of Rome.

Arnold of Brescia.

But, as regards its temporal aims on Italy, the most inconvenient and tenacious, if not the most dangerous, adversary of the 12th-century papacy was the Roman commune. Since the middle of the 12th century the party of municipal autonomy and, indeed, the whole of the European middle classes, who wished to shake off the feudal yoke and secure independence, had been ranged against the successor of St Peter. The first symptoms of resistance were exhibited under Innocent II. (1142), who was unable to stem the growing revolution or prevent the establishment of a Roman senate sitting in the Capitol. The strength of classical reminiscence and the instinct of liberty were reinforced by the support given to communal aspirations by the popular agitator and dangerous tribune, Arnold of Brescia (*q.v.*), whose theories arrived at an opportune moment to encourage the revolted commons. He denied the power of clerks to possess fiefs, and allowed them only religious authority and tithes. The successors of Innocent II. were even less successful in maintaining their supremacy in

Rome. Lucius II., when called upon to renounce all his regalian rights, fell mortally wounded in an attempt to drive the autonomists by force from the Capitol (1145). Under Eugenius III. the Romans sacked and destroyed the houses of the clerks and cardinals, besieged St Peter's and the Lateran, and massacred the pilgrims. The pope was forced to fly with the Sacred College, to escape the necessity of recognizing the commune, and thus left the field free to Arnold of Brescia (1145). On his return to Rome, Eugenius had to treat with his rebel subjects and to acknowledge the senate they had elected, but he was unable to procure the expulsion of the agitator. The more energetic Adrian IV. refused to truckle to the municipality, placed it under an interdict (1155), and allied himself with Frederick Barbarossa to quell an insurrection which respected the rights of emperors no more than the rights of popes. From the moment that Arnold of Brescia, absorbed in his chimerical project of reviving the ancient Roman republic, disregarded the imperial power and neglected to shelter himself behind the German in his conflict with the priesthood, his failure was certain and his fate foredoomed. He was hanged and burned, probably in pursuance of the secret agreement between the pope and the emperor; and Adrian IV. was reconciled with the Romans (1156). The commune, however, subsisted, and was on several occasions strong enough to eject the masters who were distasteful to it. Unfortunately for Alexander III. the Roman question was complicated during his pontificate with the desperate struggle with the Empire. The populace of the Tiber welcomed and expelled him with equal enthusiasm, and when his body was brought back from exile, the mob went before the *cortège* and threw mud and stones upon the funeral litter. All obeyed the pontiff of Rome—save Rome itself. Lucius III., who was pope for four years (1181–1185), remained in Rome four months, while Urban III. and Gregory VIII. never entered the city. At length the two parties grew weary of this state of revolution, and a régime of conciliation, the fruit of mutual concessions, was established under Clement III. By the act of 1188, the fundamental charter of the Roman commune, the people recognized the supremacy of the pope over the senate and the town, while the pope on his part sanctioned the legal existence of the commune and of its government and assemblies. Inasmuch as Clement was compelled to make terms with this new power which had established itself against him in the very centre of his dominion, the victory may fairly be said to have rested with the commune.

Development of the Centralized Organization.

Although, among other obstacles, the popes of the 12th century had experienced some difficulty in subduing the inhabitants of the city, which was the seat and centre of the Christian world, their monarchy did not cease to gain in authority, solidity and prestige, and the work of centralization, which was gradually making them masters of the whole ecclesiastical organism, was accomplished steadily and without serious interruption. If Rome expelled them, they always found a sure refuge in France, where Alexander III. carried on his government for several years; and the whole of Europe acknowledged their immense power. Under Honorius II. the custom prevailed of substituting legates *a latere*, simple priests or deacons of the Curia, for the regionary delegates, who had grown too independent; and that excellent instrument of rule, the Roman legate, carried the papal will into the remotest courts of Europe. The episcopate and the great monastic prelacies continued to lose their independence, as was shown by Honorius II. deputing a cardinal to Monte Cassino to elect an abbot of his choosing. The progress of the Roman power was especially manifested under Innocent II., who had triumphed over the schism, and was supported by the Empire and by Bernard of Clairvaux, the first moral authority of his time. He suspended an archbishop of Sens (1136) who had neglected to take into consideration the appeal to Rome, summoned an archbishop of Milan to Rome to receive the pallium from the pope's hands, lavished exemptions, and extended the right of appeal to such abnormal lengths that a Byzantine ambassador is reported to have exclaimed to Lothair III., "Your Pope Innocent is not a bishop, but an emperor." When the universal Church assembled at the second Lateran Council (1139), this leader of religion declared to the bishops that he was the absolute master of Christendom. "Ye know," he said, "that Rome is the capital of the world, that ye hold your dignities of the Roman pontiff as a vassal holds his fiefs of his sovereign, and that ye cannot retain them without his assent." Under Eugenius III., a Cistercian monk who was scarcely equal to his task, the papal absolutism grew sensibly weaker, and if we may credit the testimony of the usually well-informed German chronicler, Otto of Freising, there arose in the college of cardinals a kind of fermentation which was exceedingly disquieting for the personal power of the leader of the Church. In the case of a difference of opinion between Eugenius and the Sacred College, Otto relates that the cardinals addressed to the pope this astounding protest: "Thou must know that it is by us thou hast been raised to the supreme dignity. We are the hinges (*cardines*) upon which the universal Church rests and moves. It is through us that from a private person thou hast become the father of all Christians. It is, then, no longer to thyself but rather to us that thou belongest henceforth. Thou must not sacrifice to private and recent friendships the traditional affections of the papacy. Perforce thou must consult before everything the general interest of Christendom, and must consider it an obligation of thine office to respect the opinions of the highest dignitaries of the court of Rome." If we admit that the cardinals of Eugenius III. succeeded in restricting the omnipotence of their master for their own ends, it must invariably have been the Curia that dictated its wishes to the Church and to Europe. The papacy, however, recovered its ascendancy during the pontificate of Alexander III., and seemed more powerful than ever. The recently created royalties sought from the papacy the conservation of their titles and the benediction of their crowns, and placed themselves voluntarily in its vassalage. The practice of the nomination of bishops by the Curia and of papal recommendation to prebends and benefices of every kind grew daily more general, and the number of appeals to Rome and exemptions granted to abbeys and even to simple churches increased continually. The third Lateran Council (1179) was a triumph for the leader of the Church. At that council wise and urgent measures were taken against the abuses that discredited the priesthood, but the principle of appeals and exemptions and the question of the increasing abuse of the power wielded by the Roman legates remained untouched. The treatise on canon law known as the *Decretum Gratiani*, which was compiled towards the middle of the 12th century and had an enduring and far-reaching effect (see CANON LAW), merely gave theoretical sanction to the existing situation in the Church. It propagated doctrines in favour of the power of the Holy See, established the superiority of the popes over the councils, and gave legal force to their decretals. According to its author, "they (the popes) are above all the laws of the Church, and can use them according to their wish; they alone judge and cannot be judged."

Influence of Bernard of Clairvaux.

It was by its constant reliance on monachism that the papacy of the 12th century had attained this result, and the popes of that period were especially fortunate in having for their champion the monk St Bernard, whose admirable qualities enabled him to dominate public opinion. St Bernard completed the reformation, combated heresy, and by his immense moral ascendancy gained victories by which Rome benefited. As instances of his more direct services, he put an end to the schism of 1130 and attached Italy and the world to the side of Innocent III. Although he had saved the papal institution from one of the gravest perils it had ever encountered, the cardinals, the court of Rome and Innocent himself could not easily pardon him for being what he had become—a private person more powerful in the Church than the pope and the bishops, and holding that power by his personal prestige. He incurred their special reproaches by his condemnation of the irresistible evolution which impelled Rome to desire exclusive dominion over Catholic Europe and to devote her attention to earthly things. He did not condemn the temporal power of the popes in plain terms, but both his writings and his conduct proved that that power was in his opinion difficult to reconcile with the spiritual mission of the papacy, and was, moreover, a menace to the future of the institution. (See Bernard, Saint.)

Resistance to the Papal Exactions and Encroachments.

At the very moment when the papacy thus attained omnipotence, symptoms of discontent and opposition arose. The bishops resisted centralization. Archbishop Hildebert of Tours protested to Honorius II. against the appeals to Rome, while others complained of the exactions of the legates, or, like John of Salisbury, animadverted upon the excessive powers of the bureaucracy at the Lateran. In the councils strange speeches were heard from the mouths of laymen, who were beginning to carry to extreme lengths the spirit of independence with regard to Rome. When a question arose at Toulouse in 1160 as to the best means of settling the papal schism, this audacious statement was made before the kings of France and England: "That the best course was to side with neither of the two popes; that the apostolic see had been ever a burden to the princes; that advantage must be taken of the schism to throw off the yoke; and that, while awaiting the death of one of the competitors, the authority of the bishops was sufficient in France and England alike for the government of the churches." The ecclesiastics themselves, however, were the first to denounce the abuses at Rome. The treatises of Gerhoh of Reichersberg (1093–1169) abound in trenchant attacks upon the greed and venality of the Curia, the arrogance and extortion of the legates, the abuse of exemptions and appeals, and the German policy of Adrian IV. and Alexander III. In his efforts to make the papal institution entirely worthy of its mission St Bernard himself did not shrink from presenting to the papacy "the mirror in which it could recognize its deformities." In common with all enlightened opinion, he complained bitterly of the excessive multiplication of exemptions, of the exaggerated extension of appeals to Rome, of the luxury of the Roman court, of the venality of the cardinals, and of the injury done to the traditional hierarchy by the very extent of the papal power, which was calculated to turn the strongest head. In St Bernard's treatise *De consideratione*, addressed to Pope Eugenius III., the papacy receives as many reprimands and attacks as it does marks of affection and friendly counsel. To warn Eugenius against pride, Bernard reminds him in biblical terms that an insensate sovereign on a throne resembles "an ape upon a housetop," and that the dignity with which he is invested does not prevent him from being a man, that is, "a being, naked, poor, miserable, made for toil and not for honours." To his thinking, poison and the dagger were less to be feared by the pope than the lust of power. Ambition and cupidity were the source of the most deplorable abuses in the Roman Church. The cardinals, said Bernard, were satraps who put pomp before the truth. He was at a loss to justify the unheard-of luxury of the Roman court. "I do not find," he said, "that St Peter ever appeared in public loaded with gold and jewels, clad in silk, mounted on a white mule, surrounded by soldiers and followed by a brilliant retinue. In the glitter that environs thee, rather wouldst thou be taken for the successor of Constantine than for the successor of Peter."

Growth of Heretical Sects.

Rome, however, had greater dangers to cope with than the indignant reproofs of her friends the monks, and the opposition of the bishops, who were displeased at the spectacle of their authority waning day by day. It was at this period that the Catholic edifice of the middle ages began to be shaken by the boldness of philosophical speculation as applied to theological studies and also by the growth of heresy. Hitherto more tolerant of heresy than the local authorities, the papacy now felt compelled to take defensive measures against it, and especially against Albigensianism, which had made great strides in the south of France since the middle of the 12th century. Innocent II., Eugenius III. and Alexander III. excommunicated the sectaries of Languedoc and their abettors, Alexander even sending armed missions to hunt them down and punish them. But the preaching of the papal legates, even when supported by military demonstrations, had no effect; and the Albigensian question, together with other questions vital for the future of the papacy, remained unsettled and more formidable than ever when Innocent III. was elected.

Innocent III., 1198-1216.

3. *Period from Innocent III. to Alexander IV. (1198–1261).*—Under the pontificates of Innocent III. and his five immediate successors the Roman monarchy seemed to have reached the pinnacle of its moral prestige, religious authority and temporal power, and this development was due in great measure to Innocent III. himself. Between the perhaps excessive admiration of Innocent's biographer, Friedrich von Hurter, and the cooler estimate of a later historian, Félix Rocquain, who, after taking into consideration Innocent's political mistakes, lack of foresight and numerous disappointments and failures, concludes that his reputation has been much exaggerated, it is possible to steer a middle course and form a judgment that is at once impartial and conformable to the historical facts. Innocent was an eminent jurist and canonist, and never ceased to use his immense power in the service of the law. Indeed, a great part of his life was passed in hearing pleadings and pronouncing judgments, and few sovereigns have ever worked so industriously or shown such solicitude for the impartial exercise of their judicial functions. It is difficult to comprehend Innocent's extraordinary activity. Over and above the weight of political affairs, he bore resolutely for eighteen years the overwhelming burden of the presidency of a tribunal before which the whole of Europe came to plead. To him, also, in his capacity of theologian, the whole of Europe submitted every obscure, delicate or controverted question, whether legal problem or case of conscience. This, undoubtedly, was the part of his task that Innocent preferred, and it was to this, as well as to his much overrated moral and theological treatises, that he owed his enormous contemporary prestige. As a statesman, he certainly committed grave faults—through excess of diplomatic subtlety, lack of forethought, and sometimes even through ingenuousness; but it must with justice be admitted that, in spite of his reputation for pugnacity and obstinacy, he never failed, either by temperament or on principle, to exhaust every peaceful expedient in settling questions. He was averse from violence, and never resorted to bellicose acts or to the employment of force save in the last extremity. If his policy miscarried in several quarters it was eminently successful in others; and if we consider the sum of his efforts to achieve the programme of the medieval papacy, it cannot be denied that the extent of his rule and the profound influence he exerted on his times entitle him to be regarded as the most perfect type of medieval pope and one of the most powerful figures in history.

The Fourth Lateran Council, 1215.

A superficial glance at Innocent's correspondence is sufficient to convince us that he was pre-eminently concerned for the reformation and moral welfare of the Church, and was animated by the best intentions for the re-establishment in the ecclesiastical body of order, peace and respect for the hierarchy. This was one of the principal objects of his activity, and this important side of his work received decisive sanction by the promulgation of the decrees of the fourth Lateran Council (1215). At this council almost all the questions at issue related to reform, and many give evidence of great breadth of mind, as well as of a very acute sense of contemporary necessities. Innocent's letters, however, not only reveal that superior wisdom which can take into account practical needs and relax severity of principle at the right moment, as well as that spirit of tolerance and equity which is opposed to the excess of zeal and intellectual narrowness of subordinates, but they also prove that, in the internal government of the Church, he was bent on gathering into his hands all the motive threads, and that he stretched the absolutist tradition to its furthest limits, intervening in the most trifling acts in the lives of the clergy, and regarding it as an obligation of his office to act and think for all. The heretic peril, which increased during his pontificate, forced him to take decisive measures against the Albigenses in the south of France, but

The Albigensian Crusades

before proscribing them he spent ten years (1198–1208) in endeavouring to convert the misbelievers, and history should not forget the pacific character of these early efforts. It was because they did not succeed that necessity and the violence of human passions subsequently forced him into a course of action which he had not chosen and which led him further than he wished to go. When he was compelled to decree the Albigensian crusade he endeavoured more than once to discontinue the work, which had become perverted, and to curb the crusading ardour of Simon de Montfort. Failing in his attempt to maintain the religious character of the crusade, he wished to prevent it from ending secularly in its extreme consequence and logical outcome. On several occasions he defended the cause of moderation and justice against the fanatical crusaders, but he never had the energy to make it prevail. It is very doubtful whether this was possible, and an impartial historian must take into account the insuperable difficulties encountered by the medieval popes in their efforts to stem the flood of fanaticism.

Papal Imperialism under Innocent III.

It was more particularly in the definitive constitution of the temporal and political power of the papacy, in the extension of what may be called Roman imperialism, that chance favoured his efforts and enabled him to pursue his conquests farthest. This imperialism was undoubtedly of a special nature; it rested on moral authority and political and financial power rather than on material and military strength. But it is no less certain that Innocent attempted to subject the kings of Europe by making them his tributaries and vassals. He wished to acquire the mastery of souls by unifying the faith and centralizing the priesthood, but he also aspired to possess temporal supremacy, if not as direct owner, at least as suzerain, over all the national crowns, and thus to realize the idea with which he was penetrated and which he himself expressed clearly. He wished to be at once pope and emperor, leader of religion and universal sovereign. And, in fact, he exercised or claimed suzerain rights, together with the political and pecuniary advantages accruing, over the greater number of the lay sovereigns of his time. He was more or less effectively the supreme temporal chief of the kingdom of Sicily and Naples, Sardinia, the states of the Iberian peninsula (Castile, Leon, Navarre and Portugal), Aragon (which, under Peter II., was the type of vassal and tributary kingdom of the Roman power), the Scandinavian states, the kingdom of Hungary, the Slav states of Bohemia, Poland, Servia, Bosnia and Bulgaria, and the Christian states founded in Syria by the crusaders of the 12th century. The success of Roman imperialism was particularly remarkable in England, where Innocent was confronted by one of the principal potentates of the West, by the heir of the power that had been founded by two statesmen of the first rank, William the Conqueror and Henry II. In Richard I. and John he had exceptionally authoritative adversaries; but after one of the fiercest wars ever waged by the civil power against the Church, Innocent at length gained over John the most complete victory that has ever been won by a religious potentate over a temporal sovereign, and constrained him to make complete submission. In 1213 the pope became not only the nominal suzerain but, *de facto* and *de jure*, the veritable sovereign of England, and during the last years of John and the first years of Henry III. he governed England effectively by his legates. This was the most striking success of Innocent's diplomacy and the culminating point of his secular work.

Innocent III. and John of England.

Innocent III., Rome and Italy.

The papacy, however, encountered serious obstacles, at first at the very centre of the papal empire, at Rome, where the pope had to contend with the party of communal autonomy for ten years before being able to secure the mastery at Rome. His immense authority narrowly escaped destruction but a stone's-throw from the Lateran palace; but the victory finally rested with him, since the Roman people could not dispense with the Roman Church, to which it owed its existence. Reared in the nurture of the pope, the populace of the Tiber renounced its stormy liberty in 1209, and accepted the peace and order that a beneficent master gave; but when Innocent attempted to extend to the whole of Italy the régime of paternal subjection that had been so successful at Rome, the difficulties of the enterprise surpassed the powers even of a leader of religion. He succeeded in imposing his will on the nobles and communes in the patrimony of St Peter, and, as guardian of Henry VI.'s son Frederick, was for some time able to conduct the government of the kingdom of the Two Sicilies, but in his claims on the rest of Italy the failure of the temporal power was manifest. He was unable, either by diplomacy or force of arms, to make Italian unity redound to the exclusive benefit of the Holy See. Nor was his failure due to lack of activity or energy, but rather to the insuperable obstacles in his path—the physical configuration of Italy, and, above all, the invincible repugnance of the Italian municipalities to submit to the mastery of a religious power.

Innocent III. and the Empire.

As far as the Empire was concerned, chance at first favoured Innocent. For ten years a Germany weakened and divided by the rivalry of Philip of Swabia and Otto of Brunswick left his hands free to act in Italy, and his pontificate marks a period of comparative quiet in the ardent conflict between pope and emperor which continued throughout the middle ages. Not until 1210, when Otto of Brunswick turned against the pope to whom he owed his crown, was Innocent compelled to open hostilities; and the struggle ended in a victory for the Curia. Frederick II., the new emperor created by Innocent, began by handing over his country to Rome and sacrificing the rights of the Empire to the union of the two great authorities of the Christian world. In his dealings with Frederick, Innocent experienced grievous vicissitudes and disappointments, but finally became master of the situation. One nation only—the France of Philip Augustus—was able to remain outside the Roman vassalage. There is not a word, in the documents concerning the relations of Philip Augustus with Rome, from which we may conclude that the Capetian crown submitted, or that the papacy wished to impose upon it the effective suzerainty of the Holy See. Innocent III. had been able to encroach on France at one point only, when the Albigensian crusade had enabled him to exercise over the southern fiefs conquered by Simon de Montfort a political and secular supremacy in the form of collections of moneys. Finally, Innocent III. was more fortunate than his predecessors, and, if he did not succeed in carrying out his projected crusade and recovering the Holy Places, he at least benefited by the Franco-Venetian expedition of 1202. Europe refused to take any direct action against the Mussulman, but Latin feudalism, assembled at Venice, diverted the crusade by an act of formal disobedience, marched on Constantinople, seized the Greek Empire and founded a Latin Empire in its place; and Innocent had to accept the *fait accompli*. Though condemning it on principle, he turned it to the interests of the Roman Church as well as of the universal Church. With joy and pride he welcomed the Byzantine East into the circle of vassal peoples and kingdoms of Rome bound politically to the see of St Peter, and with the same emotions beheld the patriarchate of Constantinople at last recognize Roman supremacy. But from this enormous increase of territory and influence arose a whole series of new and difficult problems. The court of Rome had to substitute for the old Greek hierarchy a hierarchy of Latin bishops; to force the remaining Greek clergy to practise the beliefs and rites of the Roman religion and bow to the supremacy of the pope; to maintain in the Greco-Latin Eastern Church the necessary order, morality and subordination; to defend it against the greed and violence of the nobles and barons who had founded the Latin Empire; and to compel the leaders of the new empire to submit to the apostolic power and execute its commands. In his endeavours to carry out the whole of this programme, Innocent III. met with insuperable obstacles and many disappointments. On the one hand, the Greeks were unwilling to abandon their religion and national cult, and scarcely recognized the ecclesiastical supremacy of the papacy. On the other hand, the upstart Latin emperors, far from proving

Latin Conquest of Constantinople.

submissive and humble tools, assumed with the purple the habits and pretensions of the sovereigns they had dispossessed. Nevertheless, Innocent left his successors a much vaster and more stable political dominion than that which he had received from his predecessors, since it comprised both East and West; and his five immediate successors were able to preserve this ascendancy. They even extended the limits of Roman imperialism by converting the pagans of the Baltic to Christianity, and further reinforced the work of ecclesiastical centralization by enlisting in their service a force which had recently come into existence and was rapidly becoming popular—the mendicant orders, and notably the Dominicans and Franciscans. The Roman power was also increased by the formation of the universities—privileged corporations of masters and students, which escaped the local power of the bishop and his chancellor only to place themselves under the direction and supervision of the Holy See. Mistress of the entire Christian organism, Rome thus gained control of international education, and the mendicant monks who formed her devoted militia lost no time in monopolizing the professorial chairs. Although the ecclesiastical monarchy continued to gain strength, the successors of Innocent III. made less use than he of their immense power. Under Gregory IX. (1227–1241) and Innocent IV. (1243–1254) the conflict between the priesthood and the Empire was revived by the enigmatic Frederick II., the polyglot and lettered emperor, the friend of Saracens, the despot who, in youth styled "king of priests," in later years personified ideas that were directly opposed to the medieval theocracy; and the struggle lasted nearly thirty years. The Hohenstaufen succumbed to it, and the papacy itself received a terrible shock, which shook its vast empire to the foundations.

The Friars and the Universities.

Culmination of the Papal Power.

Nevertheless, the first half of the 13th century may be regarded as the grand epoch of medieval papal history. Supreme in Europe, the papacy gathered into a body of doctrine the decisions given in virtue of its enormous *de facto* power, and promulgated its collected decrees and *oracula* to form the immutable law of the Christian world. Innocent III., Honorius III. and Gregory IX. employed their jurists to collect the most important of their rulings, and Gregory's decrees became the definitive repository of the canon law. Besides making laws for the Christendom of the present and the future, these popes employed themselves in giving a more regular form to their principal administrative organ, the offices of the Curia. The development of the Roman chancery is also a characteristic sign of the evolution that was taking place. From the time of Innocent III. the usages of the apostolic scribes become transformed into precise rules, which for the most part remained in force until the 15th century.

4. *Period from Urban IV. to Benedict XI.* (*1261–1305*).—This period comprises 13 pontificates, all of short duration (three or four years at the most, and some only a few months), with the exception of that of Boniface VIII., who was pope for nine years. This accidental fact constitutes a prime difference in favour of the preceding period, in which there were only five pontiffs during the first sixty years of the 13th century. Towards the end of the 13th century the directors of the Christian world occupied the throne of St Peter for too short a time to be able to make their personal views prevail or to execute their political projects at leisure after ripe meditation. Whatever the merit of a Gregory X. or a Nicholas III., the brevity of their pontificates prevented any one of these ephemeral sovereigns from being a great pope.

Influence of the Power of France.

But other and far more important differences characterize this period. Although there was no theoretical restriction to the temporal supremacy and religious power of the papacy, certain historical facts of great importance contributed to the fatal diminution of their extent. The first of these was the preponderance of the French monarchy and nation in Europe. Founded by the conquests of Philip Augustus and Louis VIII. and legitimated and extended by the policy and moral influence of the crowned saint, Louis IX., the French monarchy enjoyed undisputed supremacy at the end of the 13th century and the beginning of the 14th; and this hegemony of France was manifested, not only by the extension of the direct power exercised by the French kings over all the neighbouring nationalities, but also by the establishment of Capetian dynasties in the kingdom of the Two Sicilies and in Hungary. From this time the sovereign of Rome, like other sovereigns, had to submit to French influence. But, whereas the pope was sometimes compelled to become the instrument of the policy of the kings of France or the adventurers of their race, he was often able to utilize this new and pervading force for the realization of his own designs, although he endeavoured from time to time, but without enduring success, to shake off the overwhelming yoke of the French. In short, it was in the sphere of French interests much more than in that of the general interests of Latin Christendom that the activities of these popes were exerted. The fact of many of the popes being of French birth and France the field of their diplomacy shows that the supreme pontificate was already becoming French in character. This change was a prelude to the more or less complete subjection of the papacy to French influence which took place in the following century at the period of the "Babylonish Captivity," the violent reaction personified by Boniface VIII. affording but a brief respite in this irresistible evolution. It was the Frenchman Urban IV. (1261–1264) who called Charles of Anjou into Italy to combat the last heirs of Frederick II. and thus paved the way for the establishment of the Angevin dynasty on the throne of Naples. Under Clement IV. (1265–1268) an agreement was concluded by which Sicily was handed over to the brother of St Louis, and the victories of Benevento (1266) and Tagliacozzo (1267) assured the triumph of the Guelph party and enabled the Angevins to plant themselves definitely on Neapolitan soil. Conradin's tragic and inevitable end closed the last act of the secular struggle between the Holy See and the Empire. Haunted by the recollection of that formidable conflict and lulled in the security of the Great Interregnum, which was to render Germany long powerless, the papacy thought merely of the support that France could give, and paid no heed to the dangers threatened by the extension of Charles of Anjou's monarchy in central and northern Italy. The Visconti Gregory X. (1271–1276) made an attempt to bring about a reaction against the tendency which had influenced his two immediate predecessors. He placed himself outside the theatre of French influence, and occupied himself solely with the task of giving to the papal monarchy that character of universality and political superiority which had made the greatness of an Alexander III. or an Innocent III. He opposed the aggrandizing projects of the Angevins, intervened in Germany with a view to terminating the Great Interregnum, and sought a necessary counterpoise to Capetian predominance in an alliance with Rudolph of Habsburg, who had become an emperor without imperilling the papacy. The Orsini Nicholas III. pursued the same policy with regard to the independence and greatness of the Roman See, but died too soon for the cause he upheld, and, at his death in 1280, the inevitable current revived with overpowering force. His successor, Martin IV. (1281–1285), a prelate of Champagne, brother of several councillors of the king of France, prebendary at Rouen and Tours, and one of the most zealous in favour of the canonization of Louis IX., ascended the papal throne under the auspices of Charles of Anjou, and undertook the government of the Church with the sole intention of furthering in every way the interests of the country of his birth. A Frenchman before everything, he abased the papal power to such an extent as to excite the indignation of his contemporaries, often slavishly subordinating it to the exigencies of the domestic and foreign policy of the Angevins at Naples and the reigning house at Paris. But he was prevented from carrying out this policy by an unforeseen blow, the Sicilian Vespers (March 1282), an event important both in itself and in its results. By rejecting the Capetian sovereign that Rome wished to thrust upon it to deliver it from the dynasty of Aragon, the little island of Sicily arrested the progress of French imperialism, ruined the vast projects of Charles of Anjou, and liberated the papacy in its own despite from a subjection that perverted and shook its power. Honorius IV. (1285–1287) and Nicholas IV. (1288–1292) were able to act with greater dignity and independence than their predecessors. Though remaining leagued with the Angevins in southern Italy, they dared to look to Germany and Rudolph of Habsburg to help them in their efforts to add to the papal dominion a part of northern Italy and, in particular, Tuscany. But they still continued to desire the restoration of the Angevin dynasty in Sicily and to assist the designs of France on Aragon by preaching a crusade against the masters of Barcelona and Palermo. The hopes of the Curia were frustrated by the resistance of the Aragonese and Sicilians, and Charles of Valois, to whom the Curia eventually destined the crown of Aragon, had to resign it for that of Constantinople, which he also failed to secure.

Boniface VIII. 1294–1303.

Subjection of the Papacy to France.

Boniface VIII. himself at the beginning of his pontificate yielded to the current, and, like his predecessors, adapted his external policy to the pretensions and interests of the great Capetian house, which, like all his predecessors, he at first countenanced. In spite of his instincts for dominion and the ardour of his temperament, he made no attempt to shake off the French yoke, and did not decide on hostilities with France until Philip the Fair and his legists attempted to change the character of the kingship, emphasized its lay tendencies, and exerted themselves to gratify the desire for political and financial independence which was shared by the French nation and many other European peoples. The war which ensued between the pope and the king of France ended in the complete defeat of the papacy, which was reduced to impotence (1303), and though the storm ceased during the nine months' pontificate of Benedict XI., the See of St Peter recovered neither its normal equilibrium nor its traditional character. The accession of the first Avignon pope, Clement V., marks the final subjection of the papal power to the Capetian government, the inevitable result of the European situation created in the preceding century.

Council of Lyons, 1274. Relations with the Eastern Church.

In other respects the papacy of this period found itself in a very inferior situation to that which it had occupied under Innocent III. and the popes of the first half of the 13th century. The fall of the Latin Empire and the retaking of Constantinople by the Palaeologi freed a great part of the Eastern world from the political and religious direction of Rome, and this fact necessarily engaged the diplomacy of Urban IV. and his successors in an entirely different direction. To them the Eastern problem presented a less complex aspect. There could no longer be any serious question of a collective expedition of Europe for the recovery of the Holy Places. The ingenuous faith of a Louis IX. was alone capable of giving rise to two crusades organized privately and without the influence or even the approval of the pope. Although all these popes, and Gregory X. especially, never ceased theoretically to urge the Christian world to the crusade, they were actuated by the desire of remaining faithful to tradition, and more particularly by the political and financial advantages accruing to the Holy See from the preaching and the crusading expeditions. The European state of mind no longer lent itself to such enterprises, and, moreover, under such brief pontificates, the attenuated Roman power could not expect to succeed where Innocent III. himself had failed. The main preoccupation of all these popes was how best to repair the injury done to orthodox Europe and to Rome by the destruction of the Latin Empire. Several of them thought of restoring the lost empire by force, and thus giving a pendant to the fourth crusade; but the Curia finally realized the enormous difficulties of such a project, and convinced themselves that the only practical solution of the difficulty was to come to an understanding with the Palaeologi and realize pacifically the long-dreamed union of the Greek and Latin Churches. The negotiations begun by Urban IV. and continued more or less actively by his successors were at last concluded in 1274 by Gregory X. The Council of Lyons proclaimed the union, which was destined to be effective for a few years at least and to be prolonged precariously in the midst of unfavourable circumstances. The Greek mind was opposed to the union; the acquiescence of the Byzantine emperors was but an ephemeral expedient of their foreign policy; and the peace between the Latins and Greeks settled on Byzantine soil could not endure for long. The principal obstacle, however, was the incompatibility of the popes' Byzantine and Italian policies. The popes were in favour of Charles of Anjou and his dynasty, but Charles was hostile to the union of the two Churches, since it was his intention to seize the Byzantine Empire and substitute himself for the Palaeologi. Almost all the successors of Urban IV. were compelled to exert their diplomacy against the aggrandizing aims of the man they had themselves installed in southern Italy, and to protect the Greek emperor, with whom they were negotiating the religious question. On several occasions between the years 1271 and 1273 the Angevins of Naples, who had great influence in Achaea and Albania and were solidly supported by their allies in the Balkan Peninsula, nearly carried out their project; and in 1274 the opposition of Charles of Anjou came near to compromising the operations of the council of Lyons and ruining the work of Gregory X. The papacy, however, held its ground, and Nicholas III., the worthy continuer of Gregory, succeeded in preserving the union and triumphing over the Angevin power. The Angevins took their revenge under Martin IV., who was a stanch supporter of the French. Three weeks after his coronation Martin excommunicated the Greek emperor and all his subjects, and allied himself with Charles of Anjou and the Venetians to compass his downfall. In this case, too, the Sicilian Vespers was the rock on which the hopes and pretensions of the sovereign of Naples suffered shipwreck. After Martin's death the last popes of the 13th century, and notably Boniface VIII., in vain thought to find in another Capetian, Charles of Valois, the man who was to re-establish the Latin dominion at Byzantium. But the East was lost; the union of 1274 was quickly dissolved; and the reconciliation of the two Churches again entered into the category of chimeras.

Decay of the Papacy.

During this period the papal institution, considered in its internal development, already showed symptoms of decadence. The diminution of religious faith and sacerdotal prestige shook it to its very foundations. The growth of the lay spirit continued to manifest itself among the burgesses of the towns as well as among the feudal princes and sovereigns. The social factors of communism and nationalism, against which Innocent III. and his successors had struggled, became more powerful and more hostile to theocratic domination. That a sovereign like St Louis should be able to associate himself officially with the feudalism of his realm to repress abuses of church jurisdiction; that a contemporary of Philip the Fair, the lawyer Pierre Dubois, should dare to suggest the secularization of ecclesiastical property and the conversion of the clergy into a class of functionaries paid out of the royal treasury; and that Philip the Fair, the adversary of Boniface VIII., should be able to rely in his conflict with the leader of the Church on the popular consent obtained at a meeting of the Three Estates of France—all point to a singular demoralization of the sentiments and principles on which were based the whole power of the pontiff of Rome and the entire organization of medieval Catholicism. Both by its attitude and by its governmental acts, the papacy of the later 13th century itself contributed to increase the discredit and disaffection from which it suffered. Under Urban IV. and his successors the great moral and religious sovereignty of former times became a purely bureaucratic monarchy, in which the main preoccupation of the governors appeared to be the financial exploitation of Christendom. In the registers of these popes, which are now being actively investigated and published, dispensations (licences to violate the laws of the Church); indulgences; imposts levied with increasing regularity on universal Christendom and, in particular, on the clerks; the settlement of questions relating to church debts; the granting of lucrative benefices to Roman functionaries; the divers processes by which the Curia acquired the immediate disposal of monastic, capitulary and episcopal revenues—in short, all financial matters are of the first importance. It was in the 14th century more especially that the Apostolic Chamber spread the net of its fiscal administration wider and wider over Christian Europe; but at the close of the 13th century all the preliminary measures had been taken to procure for the papal treasury its enormous and permanent resources. The continued efforts of the popes to drain Christian gold to Rome were limited only by the fiscal pretensions of the lay sovereigns, and it was this financial rivalry that gave rise to the inevitable conflict between Boniface VIII. and Philip the Fair.

Abuse of the Papal Power.

By thus devoting itself to material interests, the papacy contemporary with the last Capetians lost its moral greatness and fell in the opinion of the peoples; and it did itself no less injury by the abnormal extension of the bounds of its absolutism. By its exaggerated methods of centralization the papal monarchy had absorbed within itself all the living forces of the religious world and suppressed all the liberties in which the Church of old had lived. The subjection of the secular clergy was complete, while the episcopate retained no shadow of its independence. The decree of Clement IV. (1266), empowering the papacy to dispose of all vacant bishoprics at the court of Rome, merely sanctioned a usage that had long been established. But the control exercised by the Roman Curia over the episcopate had been realized by many other means. It was seldom that an episcopal election took place without a division in the chapter, in which resided the electoral right. In such an event, the competitors appealed to the Holy See and abdicated their right, either voluntarily or under coercion, *in manibus papae*, while the pope took possession of the vacant see. Nominations directly made by the court of Rome, especially in the case of dioceses long vacant, became increasingly numerous. The principle of election by canons was repeatedly violated, and threatened to disappear; and at the end of the 13th century the spectacle was common of prelates, whether nominated or confirmed by the pope, entitling themselves "bishops by the grace of the Holy See." The custom in force required bishops established by papal authority to take an oath of fidelity to the pope and the Roman Church, and this oath bound them in a particular fashion to the Curia. Those bishops, however, who had been elected under normal conditions, conformably to the old law, were deprived of the essential parts of their legitimate authority. They lost, for example, their jurisdiction, which they were seldom able to exercise in their own names, but in almost every case as commissaries delegated by the apostolic authority.

The regular clergy, who were almost wholly sheltered from the power of the diocesan bishops, found themselves, even more than the secular priesthood, in a state of complete dependence on the Curia. The papacy of this period continually intervened in the internal affairs of the monasteries. Not only did the monks continue to seek from the papacy the confirmation of their privileges and property, but they also referred almost all their disputes to the arbitration of the pope. Their elections gave rise to innumerable lawsuits, which all terminated at the court of Rome, and in most cases it was the pope himself who designated the monks to fill vacant posts in the abbeys. Thus the pope became the great ecclesiastical elector as well as the universal judge and supreme legislator. On this extreme concentration of the Christian power was employed throughout Europe an army of official agents or officious adherents of the Holy See, who were animated by an irrepressible zeal for the aggrandizement of the papacy. These officials originally consisted of an obedient and devoted militia of mendicant friars, both Franciscans and Dominicans, who took their orders from Rome alone, and whose efforts the papacy stimulated by lavishing exemptions, privileges, and full sacerdotal powers. Subsequently they were represented by the apostolic notaries, who were charged to exercise throughout Christendom the gracious jurisdiction of the leaders of the Church and to preside over the most important acts in the private lives of the faithful. These tools of Rome, both clerks and laymen, continued to increase in every diocese. They were not invested with their office until they had been examined by a papal chaplain, or sometimes even by the vice-chancellor of the Curia.

The sovereign direction of this enormous monarchy belonged to the pope alone, who was assisted in important affairs by the advice and collaboration of the College of Cardinals, who had become the sole electors to the papacy. Towards the close of the 13th century the necessity arose for an express ruling on the question of the exercise of this electoral right. In 1274 Gregory X., completing the measures taken by Alexander III. in the 12th century, promulgated the celebrated constitution by which the cardinal-electors were shut up in conclave and, in the event of their not having designated the new pope within three days, were constrained to perform their duty by a progressive reduction of their food-allowance (see CONCLAVE). But at the head of this vast body there existed a constant tendency which was opposed to the absorption of all the power by a single and unbridled will. In the last years of this period fresh signs appeared of a reaction that emanated from the Sacred College itself. The cardinal-electors endeavoured to derive from their electoral power a right of control over the acts of the pope elect. In 1294, and again in 1303, they laid themselves under an obligation, previously to the election, to subscribe to the political engagements which each promised rigorously to observe in the event of his becoming pope. In general, these engagements bore upon the limitation of the number of cardinals, the prohibition to nominate new ones without previous notification to the Sacred College, the sharing between the cardinals and the pope of certain revenues specified by a bull of Nicholas IV., and the obligatory consultation of the consistories for the principal acts of the temporal and spiritual government. It is conceivable that a pope of Boniface VIII.'s temperament would not submit kindly to any restriction of the discretionary power with which he was invested by tradition, and he endeavoured to make the cardinals dependent on him and even to dispense with their services as far as possible, only assembling them in consistory in cases of extreme necessity. This tendency of the Sacred College to convert the Roman Church into a constitutional monarchy, in which it should itself play the part of parliament, was a sufficiently grave symptom of the progress of the new spirit. But throughout the ecclesiastical society traditional bonds were loosened and anarchy was rife, and this at the very moment when the enemies of the priesthood and its leaders redoubled their attack. In fine, the decadence of the papal institution manifested itself in an irremediable manner when it had accomplished no more than the half of its task. The growth of national kingdoms, the anti-clerical tendencies of the emancipated middle classes, the competition of lay imperialisms, and all the other elements of resistance which had been encountered by the papacy in its progress and had at first tended only to shackle it, now presented an insurmountable barrier. The papacy was weakened by its contest with these adverse elements, and it was through its failure to triumph over them that its dream of European dominion, both temporal and spiritual, entered but very incompletely into the field of realities. (A. LU.)

III.—Period from 1305 to 1590.

Clement V. 1305–1314. Settlement at Avignon.

The accession of the Gascon Clement V. in 1305 marks the beginning of a new era in the history of the papacy; for this pope, formerly archbishop of Bordeaux, remained in France, without once crossing the threshold of the Eternal City. Clement's motive for this resolution was his fear that the independence of the ecclesiastical government might be endangered among the frightful dissensions and party conflicts by which Italy was then convulsed; while at the same time he yielded to the pressure exercised on him by the French king Philip the Fair. In March 1309, Clement V. transferred his residence to Avignon, a town which at that time belonged to the king of Naples, but was surrounded by the countship of Venaissin, which as early as 1228 had passed into the possession of the Roman See. Clement V. remained at Avignon till the day of his death, so that with him begins the so-called Babylonian Exile of the popes. Through this, and his excessive subservience to Philip the Fair, his reign proved the reverse of salutary to the Church. The pope's subservience was above all conspicuous in his attitude towards the proceedings brought against the order of the Temple, which was dissolved by the council of Vienne (see TEMPLARS). His possession of Ferrara involved Clement in a violent struggle with the republic of Venice, in which he was ultimately victorious.

John XXII. 1316–1334.

His successor John XXII. a native of Cahors, was elected as the result of very stormy negotiations, after a two years' vacancy of the see (1316). Like his predecessor he fixed his permanent residence at Avignon, where he had formerly been bishop. But while Clement V. had contented himself with the hospitality of the Dominican monastery at Avignon, John XXII. installed himself with great state in the episcopal palace, hard by the cathedral.

Character of the Avignon Papacy.

The essential features of this new epoch in the history of the papacy, beginning with the two popes mentioned, are intimately connected with this lasting separation from the traditional seat of the papacy, and from Italian soil in general: a separation which reduced the head of the Church to a fatal dependence on the French kings. Themselves Frenchmen, and surrounded by a College of Cardinals in which the French element predominated, the popes gave to their ecclesiastical administration a certain French character, till they stood in more and more danger of serving purely national interests, in cases where the obligations of their office demanded complete impartiality. And thus the prestige of the papacy was sensibly diminished by the view, to which the jealousy of the nations soon gave currency, that the supreme dignity of the Church was simply a convenient tool for French statecraft. The accusation might not always be supported by facts, but it tended to shake popular confidence in the head of the universal Church, and to inspire other countries with the feeling of a national opposition to an ecclesiastical régime now entirely Gallicized. The consequent loosening of the ties between the individual provinces of the Church and the Apostolic See, combined with the capricious policy of the court at Avignon, which often regarded nothing but personal and family interests, accelerated the decay of the ecclesiastical organism, and justified the most dismal forebodings for the future. To crown all, the feud between Church and Empire broke out again with unprecedented violence. The most prominent leaders of the opposition to the papacy, whether ecclesiastical or political, joined forces with the German king, Louis of Bavaria, and offered him their aid against John XXII.

Opposition to the Papacy.

The clerical opposition was led by the very popular and influential Minorites who were at that time engaged in a remarkably bitter controversy with the pope as to the practical interpretation of the idea of evangelical poverty. Their influence can be clearly traced in the appeal to a general council, issued by Louis in 1324 at Sachsenhausen near Frankfort-on-the-Main. This document, which confused the political problem with the theological, was bound to envenom the quarrel between emperor and pope beyond all remedy. Side by side with the Minorites, the spokesmen of the specifically political opposition to the papacy were the Parisian professors, Marsilius of Padua and John of Jandun, the composers of the "Defender of the Peace" (*defensor pacis*). In conjunction with the Minorites and the Ghibellines of Italy, Marsilius succeeded in enticing Louis to the fateful expedition to Rome and the revolutionary actions of 1328. The conferring of the imperial crown by the Roman populace, the deposition of the pope by the same body, and the election of an anti-pope in the person of the Minorite Pietro da Corvara, translated into acts the doctrines of the *defensor pacis*. The struggle, which still further aggravated the dependence of the pope on France, was waged on both sides with the utmost bitterness, and the end was not in sight when John XXII. died, full of years, on the 4th of December 1334.

Benedict XII, 1334–1342.

Even the following pope, Benedict XII., a man of the strictest morality, failed, in spite of his mild and pacific disposition, to adjust the conflict with Louis of Bavaria and the eccentric Fraticelli. King Philip VI. and the cardinals of the French party worked energetically against the projected peace with Louis; and Benedict was not endowed with sufficient strength of will to carry through his designs in the teeth of their opposition. He failed, equally, to stifle the first beginnings of the war between France and England; but it is at least to his honour that he exerted his whole influence in the cause of peace.

His efforts in the direction of reform, moreover, deserve recognition. In Avignon he began to erect himself a suitable residence, which, with considerable additions by later popes, developed into the celebrated papal castle of Avignon. This enormous edifice, founded on the cathedral rock, is an extraordinary mixture of castle and convent, palace and fortress. It was Benedict XII. also who elevated the doctrine of the beatific vision of the saints into a dogma.

Clement VI. 1342–1352.

Benedict XII. was again succeeded, in 1342, by a Frenchman from the south, Pierre Roger de Beaufort, who was born in the castle of Maumont, in the diocese of Limoges. He assumed the title of Clement VI. In contrast with his peace-loving predecessor, and in accordance with his own more energetic character, he pursued with decision and success the traditions of John XXII. in his dealings with Louis of Bavaria. With great dexterity he turned the feud between the houses of Luxemburg and Wittelsbach to the destruction of Louis; and the death-struggle between the two seemed about to break out, when Louis met his untimely end. To all appearances the victory of the papacy was decisive: but it was a Pyrrhic victory, as events were quickly to prove. In Rome there ensued, during the pontificate of Clement, the revolutions of the visionary Cola di Rienzo (*q.v.*) who restored the old republic, though not for long. By his purchase of Avignon, and the creation of numerous French cardinals, the pope consolidated the close connexion of the Roman Church with France: but the interests of that Church suffered severely through the riches and patronage which Clement lavished on his relatives, and through the princely luxury of his court. His generosity—which degenerated into prodigality—compelled him to open fresh sources of revenue; and in this he succeeded, though not without serious detriment to the interests of the Church.

Innocent VI. 1352–1362.

It was fortunate for the Church that Clement VI. was followed by a man of an entirely different temperament—Innocent VI. This strict and upright pope appears to have taken Benedict XII. for his example. He undertook, though not with complete success, a reformation of ecclesiastical abuses; and it was he who assisted in restoring the Empire at last to some measure of stability. But the culminating glory of his reign was the restoration of the almost ruined papal dominion in Italy, by means of the highly-gifted Cardinal Albornoz. The restoration of the Apostolic See to its original and proper seat was now possible; and the need for such a step was the more pressing, since residence in the castle at Avignon had become extremely precarious, owing to the ever-increasing confusion of French affairs. Innocent VI., in fact, entertained the thought of visiting Rome; but age and illness prevented his doing so.

Urban V. 1362–1370.

The intention of Innocent was put into execution by his successor—the learned and pious Urban V. Two events of the first magnitude make his reign one of the most memorable in the century. The first of these was the return to Rome. This was an object which the emperor Charles IV. had prosecuted with all his energies; which alone could revive the languishing reputation of the papacy,

Temporary Return to Rome.

by withdrawing it from the turmoils of the Anglo-French War, and bring within the bounds of possibility the much-needed reformation in ecclesiastical affairs. In 1367 it became an accomplished fact. Turning a deaf ear to the remonstrances of the French king and the French cardinals, the pope quitted Avignon on the 13th of April 1367; and on the 16th of October he entered Rome, now completely fallen to ruin. The ensuing year, after his return to the Eternal City, witnessed the second great landmark in the reign of Urban V.—the Roman expedition of Charles IV., and the renewal of amicable relations between the Empire and the Church. Unfortunately, the pope failed to deal satisfactorily with the highly complicated situation in Italy; and the result was that, on the 27th of September 1370, he returned to Avignon, where he died on the following 19th of December.

It was the opinion of Petrarch that, had Urban remained in Rome, he would have been entitled to rank with the most distinguished men of his era; and, if we discount this single act of weakness, he must be classed as one of the noblest and best of popes. Especial credit is due to his struggles against the moral corruptions of the day, though they proved inadequate to eliminate all traces of the prevalent disorders.

Gregory XI., 1370-1378.

Definite Return to Rome.

Gregory XI., though equally distinguished for his erudition and pure morals, his piety, modesty and wisdom, was fated to pay dearly for the weakness of his predecessor in abandoning Rome so early. He lived to see the national spirit of Italy thoroughly aroused against a papacy turned French. The disastrous error of almost exclusively appointing Provençals, foreigners ignorant of both the country and the people, to the government of the Papal States, now found a terrible Nemesis: and there came a national upheaval, such as Italy had not yet witnessed. The feud between Italian and Frenchman broke out in a violent form; and it was in vain that St Catherine of Siena proffered her mediation in the bloody strife betwixt the pope and the Florentine republic. The letters that she addressed to the pontiff, on this and other occasions, are documents, which are, perhaps, unique in their kind, and of great literary beauty. It was also St Catherine who prevailed on Gregory XI. to return to Rome. On the 13th of September 1376 he left Avignon; on the 17th of January 1377 he made his entry into the city of St Peter. Thus ended the exile in France; but it left an evil legacy in the schism under Gregory's successor. Gregory, the last pope whom France has given to the Church, died on the 27th of March 1378, after taking measures to ensure a speedy and unanimous election for his successor.

Urban VI., 1378-1389.

Election of Anti-pope Clement VII.

The conclave, which took place in Rome, for the first time for 75 years, resulted in the election of Bartolomeo Prignano (April 8, 1378), who took the name of Pope Urban VI. Canonically the election was perfectly valid;[1] so that the only popes, to be regarded as legitimate, are the successors of Urban. It is true that his election was immediately impugned by the cardinals on frivolous grounds; but the responsibility for this rests, partially at least, with the pope himself, whose reckless and inconsiderate zeal for reform was bound to excite a revolution among the worldly cardinals still yearning for the fleshpots of Avignon. This revolution could already be foreseen with tolerable certainty, when Urban embroiled himself even with his political friends—the queen of Naples and her husband, Duke Otto of Brunswick. Similarly, he quarrelled with Count Onorato Gaetano of Fondi. The cardinals, excited to the highest pitch of irritation, now knew where they could look for support. Thirteen of them assembled at Anagni, and thence, on the 9th of August, issued a passionate manifesto, announcing the invalidity of Urban's election, on the ground that it had been forced upon the conclave by the Roman populace. As soon as the rebellious cardinals were further assured of the protection of the French king, Charles V., they elected, with the tacit consent of the three Italian cardinals, Robert of Geneva as anti-pope (Fondi, Sept. 20). Robert assumed the style of Clement VII.; and thus Christendom was brought face to face with the worst misfortune conceivable—the Great Schism (1378-1417).

The Great Schism.

The chief responsibility for this rests with the worldly College of Cardinals, who were longing to return to France, and thence drew their inspiration. This college was a creation of the Avignon period; which must therefore, in the last resort, be considered responsible for this appalling calamity. Severe censure, moreover, attaches to Charles V., of France. There may be room for dispute, as to the extent to which the king's share in the schism was due to the instigation of the revolted cardinals; there can be not the slightest doubt that his attitude was the decisive factor in perpetuating and widening the breach. The anti-pope was recognized not only by Charles of France, but by the princes of the Empire dependent on him, by Scotland and Savoy, and finally by the Spanish dominions and Portugal. On the other hand, the emperor Charles IV. and his son Wenceslaus, the greater part of the Empire, England, Hungary, Poland, Denmark, Norway and Sweden, together with the majority of the Italian states—Naples excepted—remained loyal to the pope. Urban, in fact—who meanwhile had created a new College of Cardinals with members of different nationalities—enjoyed one great advantage; his rival failed to hold his own in Italy, with which country the actual decision virtually lay. Unfortunately, in the time that followed, Urban was guilty of the grossest errors, pursuing his personal interests, and sacrificing, all too soon, that universal point of view which ought to have governed his policy. The struggle against his powerful neighbour on the frontier, Queen Joanna of Naples, rapidly became his one guiding motive; and thus he was led into a perfect labyrinth of blunders. He excommunicated the queen as a stiff-necked adherent of the French anti-pope, and in 1381 conferred Naples on the ambitious Charles of Durazzo, with whom he was soon inextricably embroiled; while, a little later, he fell out with his new College of Cardinals. On the 15th of October 1389, he died, with few to lament him.

Boniface IX., 1389-1404.

After the death of Urban VI., fourteen cardinals of his obedience assembled, and after long negotiations elected the scion of a noble Neapolitan family, Cardinal Pietro Tomacelli (Nov. 2, 1389). The title which he took was that of Boniface IX. The new pope—a man of high moral character, great sagacity, eloquence, and of a kindly disposition—at once instituted an entirely different policy from that pursued by his predecessor. This was especially the case in his treatment of Naples. In May 1390 Ladislaus, the son of Charles of Durazzo, who had been assassinated in the February of 1386, received the royal crown at the hands of a papal legate. To his cause Boniface IX. closely attached himself; and his support of the king against the Angevins cost him enormous sums, without which Ladislaus could not have secured his victory over the French claimant. By these means, the schism was averted from Italy, and Naples won for the Roman obedience. The situation in the papal state, which Boniface found in the greatest confusion, was at the outset far more difficult to deal with. But here also he attained in time a considerable measure of success, although the methods employed were scarcely above criticism. His greatest success, however, was gained in the Eternal City itself; for he contrived, after many vicissitudes, to induce the Romans to annul their republican constitution and acknowledge the papal supremacy, even in municipal matters.

To give this supremacy a firmer basis, Boniface fortified the Vatican and the Capitol, and restored the castle of St Angelo—which had previously been used as a quarry—providing it with walls and battlements, and erecting a tower in the centre. This castle, indeed, yielded a safe shelter to the pope in January 1400, when the Colonnas made their attempt to surprise Rome. However, the adventure failed; and by the aid of Ladislaus, the castles of the Colonnas in the vicinity of Rome were destroyed. In 1401 this powerful family made its submission, accepting the favourable terms which the pope had had the good sense to offer. Henceforward quiet prevailed, and Boniface ruled as a stern master in Rome. But he was soon confronted with an extremely dangerous enemy, in the person of Duke Gian Galeazzo Visconti of Milan, who was aiming at the sovereignty of all Italy. In July 1402 he made himself master of Bologna; and his death in September of the same year was a stroke of good fortune for the pope. Bologna was now recovered for the Church (Sept. 2, 1403), and soon afterwards Perugia also surrendered.

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[1] See Pastor, *Geschichte der Päpste*, i., 121.

Thus Boniface IX., as a secular prince, occupies an important position; but as pope his activity must be unfavourably judged. Even if Dietrich of Niem frequently painted him too black, there is no question that the means which Boniface employed to fill the papal treasury seriously impaired the prestige of the highest spiritual office and the reverence due to it. His nepotism, again, casts a dark shadow over his memory: but most regrettable of all was his indifference towards the ending of the schism. Yet it should be borne in mind, that, when Clement VII. died suddenly on the 16th of September 1394, and the Avignon cardinals immediately elected the Spaniard Pedro de Luna as anti-pope (under the title of Benedict XIII.), Boniface IX. was left face to face with an extraordinarily skilful, adroit, and unscrupulous antagonist.

Innocent VII., 1404-1406.

On the death of Boniface (Oct. 1, 1404), the Roman cardinals once more elected a Neapolitan, Cosimo dei Migliorati, who, at the age of 65, assumed the name of Innocent VII. Innocent, who was animated by a great love for the sciences and all the arts of peace, enjoyed only a brief pontificate, but his reign is not without importance, if only as an example of the generous patronage which the papacy—even in its darkest days—has lavished on literature and science. Significant also is the foothold gained at this time in the Curia itself by the humanists—Poggio, Bruni and others. The appointment of these skilled humanist writers to the Chancery was a consequence of the difficult conditions of the time. The crisis which the Catholic Church underwent, during this terrible epoch, was the greatest in all her history: for while everything was thrown into the utmost confusion by the life and death struggles of the rival popes, while the ecclesiastical revenues and emoluments were used almost exclusively for the reward of partisan service, while everywhere the worldliness of the clergy had reached its highest pitch, heretical movements, by which the whole order of the Church was threatened with overthrow, were gaining strength in England, France, Italy, Germany and especially in Bohemia.

Gregory XII., 1406-1415.

The crisis came to a head in the pontificate of Gregory XII. This pope, so distinguished in many respects, owed his election mainly to the circumstance that he was considered a zealous champion of the restoration of unity within the Church: and he displayed, in fact, during the earlier portion of his reign, an exalted enthusiasm for this great task. Later his attitude changed; and the protracted negotiations for a conference with Benedict XIII. remained fruitless. The result of this change in the attitude of Gregory was the formation of a strong malcontent party in the College of Cardinals; to counteract whose influence, the pope—faithless to the conditions attached to his election—resorted to the plan of creating new members. Stormy discussions at Lucca followed; but they failed to prevent Gregory from nominating four fresh cardinals (May 9, 1408). The sequel was that seven of the cardinals attached to Gregory's Roman Curia withdrew to Pisa.

Benedict XIII. and France.

At the same period, the relations of Benedict XIII. with France suffered a significant modification. In that country, it became more and more manifest that Benedict had no genuine desire to heal the schism in the Church, in spite of the ardent zeal for union which he had displayed immediately before and after his election. In May 1408 France withdrew from his obedience; and it was not long before French policy succeeded in effecting a reconciliation and understanding between the cardinals of Benedict XIII. and those who had seceded from Gregory XII. Precisely as if the Holy See were vacant, the cardinals began to act as the actual rulers of the Church, and issued formal invitations to a council to be opened at Pisa on the Feast of the Annunciation (March 25) 1409. Both popes attempted to foil the disaffected cardinals by convening councils of their own; but their efforts were doomed to failure.

Council of Pisa.

On the other hand, the council of the cardinals—though, by the strict rules of canonical law, its convocation was absolutely illegal—attained the utmost importance. But these rules, and, in fact, the whole Catholic doctrine of the primacy were almost entirely obscured by the schism. Scholars like Langenstein, Gerson and Zabarella, evolved a new theory as to ecumenical councils, which from the point of view of Roman Catholic principles must be described as revolutionary. At the synod of the dissident cardinals assembled at Pisa, views of this type were in the ascendant; and, although protests were not lacking, the necessities of the time served as a pretext for ignoring all objections.

That the council was merely a tool in the hands of the ambitious and adroit Baldassare Cossa, was a fact unsuspected by its members who were animated by a fiery enthusiasm for the re-establishment of ecclesiastical unity; nor did they pause to reflect that an action against *both* popes could not possibly be lawful. Since whole universities and numerous scholars had pronounced in favour of the new theories, the Pisan synod dismissed all canonical scruples, and unhesitatingly laid claim to authority over both popes, one of whom was necessarily the legitimate pope. It was in vain that Carlo di Malatesta, a stanch adherent of Gregory, sought at the eleventh hour to negotiate a compromise between Gregory and the synod. It was in vain that this cultured prince, imbued with the principles of humanism, represented to the cardinals that this new path would lead quickly to the goal, but that this goal could not be unity but a triple schism. The council declared that it was canonically convened, ecumenical, and representative of the whole Catholic Church; then proceeded immediately to the trial and deposition of Benedict XIII. and Gregory XII. The synod grounded its procedure against the rival popes on a fact, ostensibly patent to all, but actually believed by none—that they were both supporters of the schism, and not merely this, but *heretics* in the truest and fullest sense of the word, since their attitude had impugned and subverted the article of faith concerning the one Holy, Catholic and Apostolic Church. On the ground of this extremely dubious declaration, designed to compensate for the absence of any authentic and firm foundation in ecclesiastical law, the Pisan assembly on the 5th of June announced the deposition of Gregory XII. and Benedict XIII., as manifest heretics and partisans of the schism.

Alexander V., 1409-1410.

The next step was to elect a new pope; and on the 26th of June 1409 the choice fell on the venerable cardinal-archbishop of Milan, the Greek Petros Filargis, who assumed the title of Alexander V.

The premature and futile character of these drastic and violent proceedings at Pisa was only too speedily evident. The powerful following which Gregory enjoyed in Italy and Germany, and Benedict in Spain and Scotland, ought to have shown from the very first that a simple decree of deposition could never suffice to overthrow the two popes. Thus, as the sentence of Pisa found recognition in France and England, as well as in many parts of Germany and Italy, the synod, which was to secure the restoration of unity, proved only the cause for worse confusion—instead of two, there were now three popes.

John XXIII., 1410-1415.

Alexander V., the pope of the council, died on the 3rd of May 1410. The cardinals at once elected his successor—Baldassare Cossa, who took the name of John XXIII. Of all the consequences of the disastrous Pisan council, the election of this man was the most unfortunate. True, it cannot be demonstrated that all the fearful accusations afterwards levelled at John XXIII. were based on fact: but it is certain that this cunning politician was so far infected with the corruption of his age that he was not in the least degree fitted to fulfil the requirements of the supreme ecclesiastical dignity. From him the welfare of the Church had nothing to hope. All eyes were consequently turned to the energetic German king, Sigismund, who was inspired by the best motives, and who succeeded in surmounting the formidable obstacles which barred the way to an ecumenical council. It was mainly due to Sigismund's indefatigable and magnificent activity, that the council of Constance met and was so numerously attended. It is remarkable how fortune seemed to assist his efforts. The capture of Rome by King Ladislaus of Naples had compelled John XXIII. to take refuge in Florence (June 1413), where that dangerous guest received a not very friendly welcome. Since John's most immediate need was now protection and assistance against his terrible opponent Ladislaus, he sent, towards the close of August 1413, Cardinals Chalant and Francesco Zabarella, together with the celebrated Greek Manuel Chrysoloras, to King Sigismund, and commissioned them to determine the time and place of the forthcoming council. The agreement was soon concluded. On the 9th of December John XXIII. signed the bull convening the council at Constance, and pledged his word to appear there in person. He might have hoped that his share in convening the synod would give him a certain right to regulate its proceedings, and that, by the aid of his numerous Italian prelates, he would be able to influence it more or less according to his views. But in this he was greatly deceived. So soon as he realized the true position of affairs he attempted to break up the council by his flight to Schaffhausen (March 20–21, 1415)—a project in which he would doubtless have succeeded but for the sagacity and energy of Sigismund.

Council of Constance.

In spite of everything, the excitement in Constance was unbounded. In the midst of the confusion, which reigned supreme in the council, the upper hand was gained by that party which held that the only method by which the schism could be ended and a reformation of ecclesiastical discipline ensured was a drastic limitation of the papal privileges. The limitation was to be effected by the general council: consequently, the pope must be brought under the jurisdiction of that council, and—in the opinion of many—remain under its jurisdiction for all time. Thus, in the third, fourth and fifth general sessions it was enacted, with characteristic precipitation, that an ecumenical council could not be dissolved or set aside by the pope, without its consent: the corollary to which was, that the present council, notwithstanding the flight of John XXIII., continued to exist in the full possession of its powers, and that, in matters pertaining to belief and the eradication of schism, all men—even the pope—were bound to obey the general council, whose authority extended over all Christians, including the pope himself.

By these decrees—which created as the supreme authority within the Church a power which had not been appointed as such by Christ[1]—the members of the council of Constance sought to give their position a theoretical basis before proceeding to independent action against the pope. But these declarations as to the superiority of an ecumenical council never attained legal validity, in spite of their defence by Pierre d'Ailly and Gerson. Emanating from an assembly without a head, which could not possibly be an ecumenical council without the assent of one of the popes (of whom one was necessarily the legitimate pope)—enacted, in opposition to the cardinals, by a majority of persons for the most part unqualified, and in a fashion which was thus distinctly different from that of the old councils—they can only be regarded as a *coup de main*, a last resort in the universal confusion. On the 29th of May the council deposed John XXIII.

Deposition of John XXIII.

The legitimate pope, Gregory XII., now consented to resign, but under strict reservation of the legality of his pontificate. By consenting to this, the synod indirectly acknowledged that its previous sessions had not possessed an ecumenical character, and also that Gregory's predecessors, up to Urban VI., had been legitimate popes. In presence of the council, reconstituted by Gregory, Malatesta announced the resignation of the latter; and the grateful assembly appointed Gregory *legatus a latere* to the marches of Ancona—a dignity which he was not destined to enjoy for long, as he died on the 18th of October 1417. (See CONSTANCE, COUNCIL OF.)

Resignation of Gregory XII.

From the abdication of Gregory XII. to the election of Martin V., the Apostolic See was vacant; and the council, newly convened and authorized by the legitimate pope before his resignation, conducted the government of the Church. After the condemnation and burning of John Huss (*q.v.*), the reformation of the Church, both in its head and members, claimed the main attention of the fathers of the council. Among the many difficulties which beset the question, not the least obvious was the length of time during which the Church must remain without a ruler, if—as Sigismund and the German nation demanded—the papal election were deferred till the completion of the internal reforms. The result was decided by the policy of the cardinals, who since May 1417 had openly devoted their whole energies to the acceleration of that election; and union was preserved by means of a compromise arranged by Bishop Henry of Winchester, the uncle of the English king. The terms of the agreement were that a synodal decree should give an absolute assurance that the work of reformation would be taken in hand immediately after the election; reforms, on which all the nations were already united, were to be published *before* the election; and the mode of the papal election itself was to be determined by deputies. When the last-named condition had been fulfilled on the 28th of October the conclave began, on the 8th of November 1417, in the *Kaufhaus* of Constance; and, no later than St Martin's day, the cardinal-deacon Oddo Colonna was elected Pope Martin V.

Vacancy of the Holy See.

Martin V., 1417-1431.

With the accession of Martin V. unity was at last restored to the Church, and contemporary Christendom gave way to transports of joy. Any secular power—a bitter opponent of the papacy admits—would have succumbed in the schism: but so wonderful was the organization of the spiritual empire, and so indestructible the conception of the papacy itself, that this (the deepest of all cleavages) served only to prove its indivisibility (Gregorovius, *Geschichte Roms* vi.). Martin V. appeared to possess every quality which could enable him to represent the universal Church with strength and dignity. In order to maintain his independence, he energetically repudiated all proposals that he should establish his residence in France or Germany, and once more took up his abode in Rome. On the 30th of September 1420 he made his entry into the almost completely ruinous town. To repair the ravages of neglect, and, more especially, to restore the decayed churches, Martin at once expended large sums; while, later, he engaged famous artists, like Gentile da Fabriano and Masaccio, and encouraged all forms of art by every means within his power. Numerous humanists were appointed to the Chancery, and the Romans were loud in their praise of the papal régime. But he was not content with laying the foundations for the renovation of the Eternal City: he was the architect who rebuilt the papal monarchy, which the schism had reduced to the verge of dissolution. To this difficult problem he brought remarkable skill and aptness, energy and ability. His temporal sovereignty he attempted to strengthen through his family connexions, and magnificent provision in general was made for the members of his house.

Nor was the activity of Martin V. less successful in political than in ecclesiastical reform, which latter included the combating of the Fraticelli, the amendment of the clergy, the encouragement of piety by the regulation of feast-days, the recommendation of increased devotion to the sacrament of the altar, and the strengthening of the conception of the Church by the great jubilee of 1423. At the same time the crowning reward of his labours was the effacing of the last traces of the schism. He prosecuted successfully the conflict with the adherents of Benedict XIII., who, till the day of his death[1] clung to the remnants of his usurped authority (see Benedict XIII.). An attempt on the part of Alphonso V. of Aragon to renew the schism failed; and, in 1429, the Spaniard was compelled to give up his anti-pope, Clement VIII. Count John of Armagnac, whom Martin had excommunicated as a protector of schismatics, was also driven to make submission. Martin rendered the greatest service by his admission of a whole series of distinguished men into the College of Cardinals; but he was less fortunate in his struggles against Hussitism. His death took place on the 20th of February 1431, and the inscription on his grave—still preserved in the Lateran church—styles him "the felicity of his age" (*temporum suorum felicitas*).

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[1] Here of course the author speaks of the papal supremacy and not of papal infallibility in matters of faith and morals—a doctrine which was formally declared a dogma of the Church only at the Vatican council in 1870.—[ED.]

Eugenius IV. 1431-1447 and the Council of Basel.

The Colonna pope was followed by the strict, moral and pious Gabriel Condulmaro, under the title of Eugenius IV. His pontificate was not altogether happy. At the very first, his violent and premature measures against the Colonna family, which had received such unbounded favour from his predecessor, embroiled him in a sanguinary feud. Far worse, however, were the conflicts which Eugenius had to support against the Council of Basel—already dissolved on the 18th of December 1431. At the beginning, indeed, a reconciliation between the pope and council was effected by Sigismund who, on the 31st of May 1433, was crowned emperor at Rome. But, as early as the 29th of May 1434 a revolution broke out in Rome, which, on the 4th of June, drove the pope in flight to Florence; where he was obliged to remain, while Giovanni Vitelleschi restored order in the papal state.

The migration of Eugenius IV. to Florence was of extreme importance; for this town was the real home of the new art, and the intellectual focus of all the humanistic movements in Italy. At Florence the pope came into closer contact with the humanists, and to this circumstance is due the gradual dominance which they attained in the Roman Curia—a dominance which, both in itself, and even more because of the frankly pagan leanings of many in that party, was bound to awaken serious misgivings.

The Italian troubles, which had entailed the exile of Eugenius IV., were still insignificant in comparison with those conjured up by the fanatics of the Council in Basel. The decrees enacted by that body made deep inroads on the rights of the Holy See; and the conflict increased in violence. On the 31st of July 1437 the fathers of Basel summoned Eugenius IV. to appear before their tribunal. The pope retorted on the 18th of September by transferring the scene of the council to Ferrara—afterwards to Florence. There, in July 1439, the union with the Greeks was effected: but it remained simply a paper agreement. On the 25th of June 1439 the synod—which had already pronounced sentence of heresy on Eugenius IV., by reason of his obstinate disobedience to the assembly of the Church—formally deposed him; and, on the 5th of November, a rival pontiff was elected in the person of the ambitious Amadeus of Savoy, who now took the title of Felix V. (See Basel, Council of, and Felix V.) Thus the assembly of Christendom at Basel had resulted, not in the reformation of the Church, but in a new schism! This, in fact, was an inevitable sequel to the attempt to overthrow the monarchical constitution of the Church. The anti-pope—the last in the history of the papacy—made no headway, although the council invested him with the power of levying annates to a greater extent than had ever been claimed by the Roman Curia.

Felix V. Anti-pope.

The crime of this new schism was soon to be expiated by its perpetrators. The disinclination of sovereigns and peoples to a division, of the disastrous consequences of which the West had only lately had plentiful experiences, was so pronounced that the violent proceeding of the Basel fathers alienated from them the sympathies of nearly all who, till then, had leaned to their side. While the prestige of the schismatics waned, Eugenius IV. gained new friends; and on the 28th of September 1443 his reconciliation with Alphonso of Naples enabled him to return to Rome. In consequence of the absence of the pope, the Eternal City was once more little better than a ruin; and the work of restoration was immediately begun by Eugenius.

During the chaos of the schism, France and Germany had adopted a semi-schismatic attitude: the former by the Pragmatic Sanction of Bourges (June 7, 1438); the latter by a declaration of neutrality in March 1438. The efforts of Aeneas Silvius Piccolomini brought matters into a channel more favourable to the Holy See; and an understanding with Germany was reached. This consummation was soon followed by the death of Eugenius (Feb. 23, 1447). No apter estimate of his character can be found than the words of Aeneas Silvius himself: "He was a great-hearted man; but his chief error was that he was a stranger to moderation, and regulated his actions, not by his ability, but by his wishes." From the charge of nepotism he was entirely exempt; and, to the present day, the purity of his life has never been impugned even by the voice of faction. He was a father to the poor and sick, in the highest sense of the word; and he left behind him an enduring monument in his amendment and regeneration, first of the religious orders, then of the clergy. Again, the patronage which he showed to art and artists was of the greatest importance. All that could be done in that cause, during this stormy epoch, was done by Eugenius. It was by his commission that Filarete prepared the still-extant bronzework of St Peter's, and the Chapel of the Holy Sacrament in the Vatican was painted by Fiesole.

Nicholas V. 1447-1455.

On the death of Eugenius IV. the situation was menacing enough, but, to the surprise and joy of all, Tomaso Parentucelli, cardinal of Bologna, was elected without disturbance, as Pope Nicholas V. With him the Christian Renaissance ascended the papal throne. He was the son of a physician from Sarzana, who was not too well endowed with the gifts of fortune; and the boy, with all his talents, could only prosecute his studies at great personal sacrifices. He was possessed of a deep-seated enthusiasm for science and art, of a sincerely pious and idealistic temperament, and of an ardent love for the Church. After his ordination, his great learning and stainless life led him to office after office in the Church, each higher and more influential than the last. Not only did he love the studies of the humanist, but he himself was a Christian humanist. Yet among all his far-reaching plans for the encouragement of art and science, Nicholas V. had always the well-being of the Church primarily in view; and the highest goal of his pontificate, which inaugurated the Maecenatian era of the popedom, was to ennoble that Church by the works of intellect and art. It is astonishing to contemplate how much he achieved, during his brief reign, in the cause of the Renaissance in both art and literature. True, his designs were even greater, but his term of government was too short to allow of their actual execution. A simply gigantic plan was drawn out, with the assistance of the celebrated Alberti, for the reconstruction of the Leonine City, the Vatican and St Peter's. The rebuilding of the last-named was rendered advisable by the precarious condition of the structure, but stopped short in the early stages. In the Vatican, however, Fiesole completed the noble frescoes, from the lives of St Stephen and St Lawrence, which are still preserved to us. Nicholas, again, lent the protection and encouragement of his powerful arm to science as well as art, till the papal court became a veritable domain of the Muses. He supported all scientific enterprises with unlimited generosity, and the most famous savants of all countries flocked to Rome. Yet it is surprising—and scarcely excusable—that Nicholas, while selecting the men whom he considered necessary for his literary work, passed over much which ought to have aroused grave suspicion in his mind. Thus the active humanistic life, called into existence by the enthusiasm of the pope, was not without its dark side. Quite apart from the fact that

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[1] May 23, 1423: *vide* the *Chronicle of Martin de Alpartil*, edited by Ehrle (1906).

Rome became the scene of a *chronique scandaleuse* among these scholars, there was something unnatural in the predominance of the humanists in the Curia.

The fostering care of the science-loving pope extended also to the field of ecclesiastical literature; and the greatest importance attaches to the energy he developed as a collector of manuscripts and books. His agents travelled as far as Prussia, and even into the East. All this activity served to enrich the Vatican library, the foundation of which is for Nicholas V. an abiding title to fame. In political and ecclesiastical affairs he similarly manifested great vigour; and his extraordinarily pacific disposition did more than anything else towards diminishing the difficulties with which he had to contend on his entry upon office. An agreement was very quickly concluded with King Alphonso of Naples. In the Empire the affairs of the Church were ameliorated—though not so quickly—by the Concordat of Vienna (1448). The Council of Basel was compelled to dissolve, and the anti-pope Felix V. to abdicate: and, though even after the termination of the synod men like Jacob of Jüterbogk (*q.v.*) were found to champion ecclesiastical parliamentarianism and the more advanced ideas of Basel, they were confronted, on the other hand, by an array of redoubtable controversialists, who entered the lists to defend, both in speech and writing, the privileges of the Apostolic See. Among these, Torquemada, Rodericus Sancius de Arevalo, Capistrano and Piero del Monte were especially active for the restoration of the papacy. Fortunate as Nicholas was in the *haute politique* of the Church, he was equally so in his efforts to re-establish and maintain peace in Rome and the papal state. In Poland, Bohemia, Hungary, Bosnia and Croatia—even in Cyprus itself—he was zealous for the peace of the Church.

Jubilee of 1450.

The long-hoped cessation of civil war within the Church had now come, and Nicholas considered that the event could not better be celebrated than by the proclamation of a universal jubilee—an announcement which evoked a thrill of joy in the whole of Christendom. A special point of attaction in this jubilee of 1450 was the canonization of Bernardino of Siena; and, in spite of the plague which broke out in Rome, the celebrations ran a brilliant course.

It was the wish of the pope that the jubilee should be followed by a revival of religious life in all Christian countries. To put this project into execution, the Church opened her " treasuries of grace," connected with the jubilee dispensation, for the peculiar benefit of those nations that had suffered most from the turmoils of the last few decades, or were prevented from visiting the Eternal City. Nicholas of Cusa was nominated legate for Germany, and began the work of reformation by travelling through every province in Germany dispensing blessings. It was under Nicholas V. that the last imperial coronation was solemnized at Rome. There is a touch of tragedy in the fact that, in the following year, the pope saw his temporal sovereignty—even his life—threatened by a conspiracy hatched among the adherents of the pseudo-humanism. The prime mover in the plot, Stefano Porcaro, was executed. Nicholas had scarcely recovered from the shock, when news came of the capture of Constantinople by the Turks; and his efforts to unite the Christian powers against the Moslem failed. This darkened the evening of his life, and he died in the night of the 24–25th of March 1455. From the universal standpoint of history the significance of Nicholas's pontificate lies in the fact that he put himself at the head of the artistic and literary Renaissance. By this means he introduced a new epoch in the history of the papacy and of civilization: Rome, the centre of ecclesiastical life, was now to become the centre of literature and art.

Calixtus III., 1455-1458.

The short reign of the Spaniard, Alphonso de Borgia, as Pope Calixtus III., is almost completely filled by his heroic efforts to arm Christendom for the common defence against Islam. Unfortunately all the warnings and admonitions of the pope fell on deaf ears, though he himself parted with his mitre and plate in order to equip a fleet against the Turks. The Mahommedans, indeed, were severely punished at Belgrade (1456), and in the sea-fight of Metelino (1457): but the indolence of the European princes, who failed to push home the victory, rendered the success abortive. Bitterly disillusioned, Calixtus died on the 14th of August 1458. His memory would be stainless but for the deep shadow cast on it by the advancement which he conferred upon his relatives.

Pius II., 1458-1464.

When Aeneas Sylvius Piccolomini was elected pope as Pius II. the papal throne was ascended by a man whose name was famous as poet, historian, humanist and statesman, and whose far-seeing eye and exact knowledge of affairs seemed peculiarly to fit him for his position. On the other hand, the troubled and not impeccable past of the new pontiff was bound to excite some misgiving; while, at the same time, severe bodily suffering had brought old age on a man of but 53 years. In spite of his infirmity and the brief duration of his reign, Pius II. accomplished much for the restoration of the prestige and authority of the Holy See. His indefatigable activity on behalf of Western civilization, now threatened with extinction by the Ottomans, excites admiration and adds an undying lustre to his memory. If we except the Eastern question, Pius II. was principally exercised by the opposition to papal authority which was gaining ground in Germany and France. In the former country the movement was headed by the worldly archbishop-elector Diether of Mainz;[1] in the latter by Louis XI., who played the autocrat in ecclesiastical matters. In full consciousness of his high-priestly dignity he set his face against these and all similar attempts; and his zeal and firmness in defending the authority and rights of the Holy See against the attacks of the conciliar and national parties within the Church deserve double recognition, in view of the eminently difficult circumstances of that period. Nor did he shrink from excursions in the direction of reform, now become an imperative necessity. His attempt to reunite Bohemia with the Church was destined to failure; but the one great aim of the pope during his whole reign was the organization of a gigantic crusade—a project which showed a correct appreciation of the danger with which the Church and the West in general were menaced by the Crescent. It is profoundly affecting to contemplate this man, a mere wreck from gout, shrinking from no fatigue, no labour, and no personal sacrifices; disregarding the obstacles and difficulties thrown in his way by cardinals and temporal princes, whose fatal infatuation refused to see the peril which hung above them all; recurring time after time, with all his intellect and energy, to the realization of his scheme; and finally adopting the high-hearted resolve of placing himself at the head of the crusade. Tortured by bodily, and still more by mental suffering, the old pope reached Ancona. There he was struck down by fever; and on the 15th of August 1464 death had released him from all his afflictions—a tragic close which has thrown a halo round his memory. In the sphere of art he left an enduring monument in the Renaissance town of Pienza which he built.

Paul II., 1464-1471.

The humanist Pius II. was succeeded by a splendour-loving Venetian, Pietro Barbo, the nephew of Eugenius IV., who is known as Pope Paul II. With his accession the situation altered; for he no longer made the Turkish War the centre of his whole activity, as both his immediate predecessors had done. Nevertheless, he was far from indifferent to the Ottoman danger. Paul took energetic measures against the principle of the absolute supremacy of the state as maintained by the Venetians and by Louis XI. of France; while in Bohemia he ordered the deposition of George Poděbrad (Dec. 1466). The widely diffused view that this pope was an enemy of science and culture is unfounded. It may be traced back to Platina, who, resenting his arrest, avenged himself by a biographical caricature. What the pope actually sought to combat by his dissolution of the Roman Academy was simply the non-Christian tendency of the Renaissance, standing as it did on a purely pagan basis—"the stench of heathendom," as Dante described it. In other respects Paul II. encouraged men of learning and the art of printing, and built the magnificent palace of San Marco, in which he established a noble collection of artistic treasures.

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[1] Diether von Isenburg (1412–1463), second son of Count Diether of Isenburg-Büdingen; rector of the university of Erfurt, 1434; archbishop of Mainz, 1459. He led the movement for a reform of the Empire and the opposition to the papal encroachments, supporting the theory of church government enunciated at Constance and Basel and condemned in Pius II.'s bull *Execrabilis*.—[Ed.]

Sixtus IV., 1471–1484.

The long pontificate of the Franciscan Francesco della Rovere, under the title of Pope Sixtus IV., displays striking contrasts of light and shade; and with him begins the series of the so-called "political popes." It remains a lamentable fact that Sixtus IV. frequently subordinated the Father of Christendom to the Italian prince, that he passed all bounds in the preferment of his own family, and in many ways deviated into all too worldly courses. The decay of ecclesiastical discipline grew to alarming proportions under Sixtus. During his reign crying abuses continued and grew in spite of certain reforms.

The nepotism in which the pope indulged is especially inexcusable. His feud with Lorenzo de' Medici culminated in the Pazzi conspiracy, the tragic sequel to which was the assassination of Giuliano de' Medici (April 26, 1478). That the pope himself was guiltless of any share in that atrocious deed is beyond dispute; but it is deeply to be regretted that his name plays a part in the history of this conspiracy. Sixtus was far from blind to the Turkish peril, but here also he was hampered by the indifference of the secular powers. Again, the close of his reign was marked by the wars against Ferrara and Naples, and subsequently against Venice and the Colonnas; and these drove the question of a crusade completely into the background. In the affairs of the Church he favoured the mendicant orders, and declared against the cruel and unjust proceedings of the Spanish Inquisition. His nominations to the cardinalate were not happy. The College of Cardinals, and the Curia in general, grew more and more infected with worldliness during his pontificate. On the other side, however, the pope did splendid service to art and science, while to men of letters he allowed incredible freedom. The Vatican library was enriched and thrown open for public use, Platina—the historian of the popes—receiving the post of librarian. The city of Rome was transfigured. At the papal order there arose the Ponte Sisto, the hospital of San Spirito, Santa Maria del popolo, Santa Maria della pace, and finally the Sistine Chapel, for the decoration of which the most famous Tuscan and Umbrian artists were summoned to Rome. This fresco-cycle, with its numerous allusions to contemporary history, is still preserved, and forms the noblest monument of the Rovere pope.

Innocent VIII., 1484–1492.

The reign of Innocent VIII. is mainly occupied by his troubles with the faithless Ferdinand of Naples. These sprang from his participation in the War of the Barons; but to this the pope was absolutely compelled. Innocent's bull concerning witchcraft (Dec. 5, 1484) has brought upon him many attacks. But this bull contains no sort of dogmatic decision on the nature of sorcery. The very form of the bull, which merely sums up the various items of information that had reached the pope, is enough to prove that the decree was not intended to bind anyone to belief in such things. Moreover the bull contained no essentially new regulations as to witchcraft. It is absurd to make this document responsible for the introduction of the bloody persecution of witches; for, according to the *Sachsenspiegel*, the civil law already punished sorcery with death. The action of Innocent VIII. was simply limited to defining the jurisdiction of the inquisitors with regard to magic. The bull merely authorized, in cases of sorcery, the procedure of the canonical inquisition, which was conducted exclusively by spiritual judges and differed entirely from that of the later witch-trials. Even if the bull encouraged the persecution of witches, in so far as it encouraged the inquisitors to take earnest action, there is still no valid ground for the accusation that Innocent VIII. introduced the trial of witches and must bear the responsibility for the terrible misery which was afterwards brought on humanity by that institution.

Alexander VI., 1492–1503.

During the last three decades of the 15th century the Roman Curia, and the College of Cardinals in particular, became increasingly worldly. This explains how on the death of Innocent VIII. (July 25, 1492), simoniacal intrigues succeeded in procuring the election of Cardinal Rodrigo Borgia, a man of the most abandoned morals, who did not change his mode of life when he ascended the throne as Pope Alexander VI. The beginning of his reign was not unpromising; but all too soon that nepotism began which attained its height under this Spanish pope, and dominated his whole pontificate. A long series of scandals resulted. The cardinals opposed to Alexander, headed by Giuliano della Rovere, found protection and support with Charles VIII. of France, who laid claim to Naples. In prosecution of this design the king appeared in Italy in the autumn of 1494, pursued his triumphant march through Lombardy and Tuscany, and, on the 31st of December, entered Rome. Charles had the word *reform* perpetually on his lips; but it could deceive none who were acquainted with the man. At first he threatened Alexander with deposition: but on the 15th of January 1495 an agreement was concluded between pope and king.

While the French were marching on Naples there arose a hostile coalition which compelled them to beat a hasty retreat—the Holy League of March 1495. All their conquests were lost; and the pope now determined to chastise the Orsini family, whose treachery had thrown him into the hands of the French. The project miscarried, and on the 25th of January 1497 the papal forces were defeated.

In June occurred the mysterious assassination of the duke of Gandia, which appeared for a while to mark the turning-point in Alexander's life. For some time he entertained serious thoughts of reformation; but the matter was first postponed and then forgotten. The last state now became worse than the first, as Alexander fell more and more under the spell of the infamous Cesare Borgia. One scandal followed hard on the other, and opposition naturally sprang up. Unfortunately, Savonarola, the head of that opposition, transgressed all bounds in his well-meant zeal. He refused to yield the pope that obedience to which he was doubly pledged as a priest and the member of an order. Even after his excommunication (May 12, 1497) he continued to exercise the functions of his office, under the shelter of the secular arm. In the end he demanded a council for the deposition of the pope. His fall soon followed, when he had lost all ground in Florence; and his execution on the 23rd of May 1498 freed Alexander from a formidable enemy (see SAVONAROLA). From the Catholic standpoint Savonarola must certainly be condemned: mainly because he completely forgot the doctrine of the Church that the sinful and vicious life of superiors, including the pope, is not competent to abrogate their jurisdiction.

After the death of Charles VIII. Alexander entered into an agreement and alliance with his successor Louis XII. The fruits of this compact were reaped by Cesare Borgia, who resigned his cardinal's hat, became duke of Valentinois, annihilated the minor nobles of the papal state, and made himself the true dictator of Rome. His soaring plans were destroyed by the death of Alexander VI., who met his end on the 18th of August 1503 by the Roman fever—not by poison.

The only bright pages in the dark chapter of Alexander's popedom are his efforts on behalf of the Turkish War (1499–1502), his activity for the diffusion of Christianity in America, and his judicial awards (May 3–4, 1493) on the question of the colonial empires of Spain and Portugal, by which he avoided a bloody war. It is folly to speak of a donation of lands which did not belong to the pope, or to maintain that the freedom of the Americans was extinguished by the decision of Alexander VI. The expression "donation" simply referred to what had already been won *under just title*: the decree contained a deed of gift, but it was an adjustment between the powers concerned and the other European princes, not a parcelling out of the New World and its inhabitants. The monarchs on whom the *privilegium* was conferred received a right of priority with respect to the provinces first discovered by them. Precisely as to-day inventions are guarded by patents, and literary and artistic creations by the law of copyright, so, at that period, the papal bull and the protection of the Roman Church were an effective means for ensuring that a country should reap where she had sown and should maintain the territory she had discovered and conquered by arduous efforts; while other claimants, with predatory designs, were warned back by the ecclesiastical censorship. In the Vatican the memory of Alexander VI. is still perpetuated by the Appartamenta Borgia, decorated by Pinturicchio with magnificent frescoes, and since restored by Leo XIII.

Pius III., 1503.

The short reign of the noble Pius III. (Sept. 22–Oct. 18, 1503) witnessed the violent end of Cesare Borgia's dominion. As early as the 1st of November Cardinal Giuliano della Rovere was elected by the conclave as Julius II. He was one of those personalities in which everything transcends the ordinary scale. He was endowed with great force of will, indomitable courage, extraordinary acumen, heroic constancy and a discriminating instinct for everything beautiful. A nature formed on great broad lines—a man of spontaneous impulses carrying away others as he himself was carried away, a genuine Latin in the whole of his being—he belongs to those imposing figures of the Italian Renaissance whose character is summarized in contemporary literature by the word *terribile*, which is best translated "extraordinary" or "magnificent."

Julius II., 1503–1513.

As cardinal Julius II. had been the adversary of Alexander VI., as pope he stood equally in diametrical opposition to his predecessor. The Borgia's foremost thought had been for his family; Julius devoted his effort to the Church and the papacy. His chief idea was to revive the world-dominion of the popedom, but first to secure the independence and prestige of the Holy See on the basis of a firmly established and independent territorial sovereignty. Thus two problems presented themselves: the restoration of the papal state, which had been reduced to chaos by the Borgias; and the liberation of the Holy See from the onerous dependence on France—in other words, the expulsion of the French "barbarians" from Italy. His solution of the first problem entitles Julius II. to rank with Innocent III. and Cardinal Albornoz as the third founder of the papal state. His active prosecution of the second task made the Rovere pope, in the eyes of Italian patriots, the hero of the century. At the beginning of the struggle Julius had to endure many a hard blow; but his courage never failed—or, at most, but for a moment—even after the French victory at Ravenna, on Easter Sunday 1512. In the end the Swiss saved the Holy See; and, when Julius died the power of France had been broken in Italy, although the power of Spain had taken its place.

The conflict with France led to a schism in the College of Cardinals, which resulted in the *conciliabulum* of Pisa. Julius adroitly checkmated the cardinals by convening a general council, which was held in the Lateran. This assembly was also designed to deal with the question of reform, when the pope was summoned from this world (Feb. 20–21, 1513). Of his ecclesiastical achievements the bull against simony at papal elections deserves the most honourable mention. Again, by his restoration of the papal state, after the frightful era of the Borgias, Julius became the saviour of the papal power. But this does not exhaust his significance; he was, at the same time, the renewer of the papal Maecenate in the domain of art. It is to his lasting praise that he took into his service the three greatest artistic geniuses of the time—Bramante, Michelangelo and Raphael—and entrusted them with congenial tasks. Bramante drew out the plan for the new cathedral of St Peter and the reconstruction of the Vatican. On the 18th of April 1506 the foundation-stone of the new St Peter's was laid; 120 years later, on the 18th of November 1626, Urban VIII. consecrated the new cathedral of the world, on which twenty popes had laboured, in conjunction with the first architects of the day, modifying in many points the grandiose original design of Bramante, and receiving the contributions of every Christian land.

The new St Peter's and the Vatican.

St Peter's, indeed, is a monument of the history of art, not merely within these 120 years from the zenith of the Renaissance till the transition into Baroque—from Bramante, Raphael, Michelangelo, to Maderna and Bernini—but down to the 19th century, in which Canova and Thorwaldsen erected there the last great papal monuments. But a still more striking period of art is represented by the Vatican, with its antique collections, the Sistine and the Stanze. Here, too, we are everywhere confronted with the name of Julius II. It was he who inaugurated the collection of ancient statues in the Belvedere, and caused the wonderful roof of the Sistine Chapel to be painted by Michelangelo (cf. Steinmann, *Die sixtin. Kapelle II.*, 1905). Simultaneously, on the commission of the pope, Raphael decorated the Vatican with frescoes glorifying the Church and the papacy. In the Camera della Segnatura he depicted the four intellectual powers—theology, philosophy, poetry and law. In the Stanza d'Eliodoro Julius II. was visibly extolled as the Head of the Church, sure at all times of the aid of Heaven.[1]

Leo X., 1513–1521.

As so often occurs in the history of the papacy, Julius II. was followed by a man of an entirely different type—Leo X. Though not yet 37 years of age, Giovanni de' Medici, distinguished for his generosity, mildness and courtesy, was elevated to the pontifical chair by the adroit manœuvres of the younger cardinals. His policy—though officially he declared his intention of following in the steps of his predecessor—was at first extremely reserved. His ambition was to play the rôle of peacemaker, and his conciliatory policy achieved many successes. Thus, in the very first year of his reign, he removed the schism which had broken out under Julius II. As a statesman Leo X. often walked by very crooked paths; but the reproach that he allowed his policy to be swayed exclusively by his family interests is unjustified. It may be admitted that he clung to his native Florence and to his family with warm affection; but the really decisive factor which governed his attitude throughout was his anxiety for the temporal and spiritual independence of the Holy See. The conquest of Milan by the French led to a personal interview at Bologna, where the "Concordat" with France was concluded. This document annulled the Pragmatic Sanction of Bourges, with its schismatic tendencies, but at the same time confirmed the preponderating influence of the king upon the Gallican Church—a concession which in spite of its many dubious aspects at least made the sovereign the natural defender of the Church and gave him the strongest motive for remaining Catholic. The war for the duchy of Urbino (1516–17) entailed disastrous consequences, as from it dates the complete disorganization of papal finance. It was, moreover, a contributing cause of the conspiracy of Cardinal Petrucci,[2] the suppression of which was followed (July, 1517) by the creation of 31 new cardinals in one day. This—the greatest of recorded creations—turned the scale once and for all in favour of the papal authority and against the cardinals. The efforts of Leo to promote a crusade, which fall mainly in the years 1517 and 1518, deserve all recognition, but very various opinions have been held as to the attitude of the pope towards the Imperial election consequent on the death of Maximilian I. The fundamental motive for his proceedings at that period was not nepotistic tendencies—which doubtless played their part, but only a secondary one—but his anxiety for the moral and temporal independence of the Holy See. For this reason Leo, from the very first, entertained no genuine desire for the selection either of Charles V. or Francis I. of France. By playing off one against the other he succeeded in holding both in suspense, and induced them to conclude agreements safeguarding the pope and the Medici. Of the two, the French king appeared the less dangerous, and the result was that Leo championed his cause with all his energies. Not till the eleventh hour, when the election of the Habsburg, to whom he was entirely opposed, was seen to be certain did he give way. He thus at least avoided an open rupture with the new emperor—a rupture which would have been all the more perilous on account of the religious revolution now imminent in Germany. There the great secession from Rome was brought about by Martin Luther; but, in spite of his striking personality, the upheaval which was destined to shatter the unity of the Western Church was not his undivided work. True, he was the most powerful agent in the destruction of the existing order; but, in reality, he merely put the match to a pile of inflammable materials which had been collecting for centuries (see REFORMATION). A main cause of the cleavage in Germany was the position of ecclesiastical affairs, which—though by no means hopeless—yet stood in urgent need of emendation, and, combined with this, the deeply resented financial system of the Curia. Thus Luther assumed the leadership of a national opposition, and appeared as the champion who was to undertake the much-needed reform of abuses which clamoured for redress. The occasion for the schism was given by the conflict with regard to indulgences, in the course of which Luther was not content to attack actual grievances, but assailed the Catholic doctrine itself. In June 1518 the canonical proceedings against Luther were begun in Rome; but, owing to political influences, only slow progress was made. It was not till the 15th of June 1520 that his new theology was condemned by the bull *Exsurge*, and Luther himself threatened with excommunication—a penalty which was only enforced owing to his refusal to submit, on the 3rd of January 1521.

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[1] The closer connexion of these frescoes with contemporary history was first elucidated by Pastor, in his *Geschichte der Päpste*, vol. iii., which also contains the most complete account of the reign of this the second Rovere pope.—[Ed.]

[2] Alfonso Petrucci (d. 1517), a Sienese. He was degraded from the cardinalate by Leo X.—[Ed.]

The state of Germany, together with the unwise behaviour of Francis I., compelled Leo X. to side with Charles V. against the French king; and the united forces of the empire and papacy had achieved the most brilliant success in upper Italy, when Leo died unexpectedly, on the 1st of December 1521. The character of the first Medician pope shows a peculiar mixture of noble and ignoble qualities. With an insatiable love of pleasure he combined a certain external piety and a magnificent generosity in his charities. His financial administration was disastrous, and led simply to bankruptcy. On music, hunting, expensive feasts and theatrical performances money was squandered, while, with unexampled optimism the pope was blind to the deadly earnestness of the times.

Leo's name is generally associated with the idea of the Medicean era as a golden age of science and art. This conception is only partially justified. The reputation of a greater Maecenas—ascribed to him by his eulogists—dwindles before a sober, critical contemplation, and his undeniable merits are by no means equal to those which fame has assigned to him. The love of science and literature, which animated the son of Lorenzo the Magnificent, frequently took the shape of literary dilettantism. In many respects the brilliance of this long and often vaunted Maecenate of Leo X. is more apparent than real. There are times when it irresistibly conveys the impression of dazzling fireworks of which nothing remains but the memory. The genuine significance of Leo lies rather in the stimulus which he gave. From this point of view his deserts are undoubtedly great; and for that reason he possesses an indefeasible right to a certain share in the renown of the papacy as a civilizing agent of the highest rank.

As a patron of art Leo occupies a more exalted plane. In this domain the first place must be assigned to the splendid achievements of Raphael, whom the pope entrusted with new and comprehensive commissions—the *Stanza dell' incendio*, the Logge, and the tapestry-cartoons, the originals of the last named being now in London. But, though illuminated by the rays of art, and loaded with the exuberant panegyrics of humanists and poets, the reign of the first Medicean pontiff, by its unbounded devotion to purely secular tendencies and its comparative neglect of the Church herself proved disastrous for the See of St Peter.

Adrian VI., 1522–1523.

By a wonderful dispensation the successor to this scion of the Medici was Adrian VI.—a man who saw his noblest task, not in an artistic Maecenate, nor in the prosecution of political designs, but in the reform of the Church in all its members. Careless of the glories of Renaissance art, a stranger to all worldly instincts, the earnest Netherlander inscribed on his banner the healing of the moral ulcers, the restoration of unity to the Church—especially in Germany—and the preservation of the West from the Turkish danger. How clearly he read the causes of religious decadence, how deeply he himself was convinced of the need of trenchant reform, is best shown by his instructions to Chieregati, his nuncio to Germany, in which he laid the axe to the root of the tree with unheard-of freedom. Unfortunately, it was all in vain. Luther and his adherents overwhelmed the noble pope with unmeasured abuse. The two great rivals, Francis I. and Charles V., were deaf to his admonitions to make common cause against the Turks. The intrigues of Cardinal Soderini led to a breach with France and drove Adrian into the arms of the Imperial league. Soon afterwards, on the 14th of September 1523, he died. Long misunderstood and slandered, Adrian VI., the last German pope, is now by all parties ranked among the most revered and most worthy of the popes. No one now denies that he was one of those exceptional men, who without self-seeking spend their lives in the service of a cause and fight bravely against the stream of corruption. Even though, in his all too brief pontificate, he failed to attain any definite results, he at least fulfilled the first condition of any cure by laying bare the seat of disease, gave an important impetus to the cause of the reform of the Church, and laid down the principles on which this was afterwards carried through. His activity, in fact, will always remain one of the brightest chapters in the history of the papacy.

Clement VII., 1523–1534.

Under Leo X. Cardinal Giulio de' Medici, the cousin of that pope, had already exercised a decisive influence upon Catholic policy; and the tiara now fell to his lot. Clement VII.—so the new pontiff styled himself—was soon to discover the weight of the crown which he had gained. The international situation was the most difficult imaginable, and altogether beyond the powers of the timorous, vacillating and irresolute Medician pope. His determination to stand aloof from the great duel between Francis I. and Charles V. failed him at the first trial. He had not enough courage and perspicacity to await in patience the result of the race between France and Germany for the duchy of Milan—a contest which was decided at Pavia (Feb. 24, 1525). The haughty victors found Clement on the side of their opponent, and he was forced into an alliance with the emperor (April 1, 1525). The overweening arrogance of the Spaniards soon drove the pope back into the ranks of their enemies. On the 22nd of May 1526 Clement acceded to the League of Cognac, and joined the Italians in their struggle against the Spanish supremacy. This step he was destined bitterly to repent. The tempest descended on the pope and on Rome with a violence which cannot be paralleled, even in the days of Alaric and Genseric, or of the Norman Robert Guiscard. On the 6th of May 1527 the Eternal City was stormed by the Imperial troops and subjected to appalling devastation in the famous sack. Clement was detained for seven months a prisoner in the castle of St Angelo. He then went into exile at Orvieto and Viterbo, and only on the 6th of October 1528 returned to his desolate residence. After the fall of the French dominion in Italy he made his peace with the emperor at Barcelona (June 29, 1529); in return for which he received the assistance of Charles in re-establishing the rule of the Medici in Florence. During the Italian turmoil the schism in Germany had made such alarming progress that it now proved impossible to bridge the chasm. With regard to the question of a council the pope was so obsessed by doubts and fears that he was unable to advance a single step; nor, till the day of his death could he break off his pitiful vacillation between Charles V. and Francis I. While large portions of Germany were lost to the Church the revolt from Rome proceeded apace in Switzerland

and the Scandinavian countries. To add to the disasters, the divorce of Henry VIII. led to the English schism. Whether another head of the Church could have prevented the defection of England is of course an idle question. But Clement VII. was far from possessing the qualities which would have enabled him to show a bold front to the ambitious Cardinal Wolsey and the masterful and passionate Henry VIII. At the death of Clement (Sept. 25, 1534), the complete disruption of the Church seemed inevitable.

When all seemed lost salvation was near. Even in the reign of the two Medici popes the way which was to lead to better things had been silently paved within the Church. Under Leo X. himself there had been formed in Rome, in the Oratory of the Divine Love, a body of excellent men of strictly Catholic sentiments. It was by members of this Oratory—especially St Gaetano di Tiene. Carafa (later Paul IV.), and the great bishop of Verona, Giberti—that the foundations of the Catholic reformation were laid. Under Clement VII. the establishment of new religious orders—Theatines, Somascians, Barnabites and Capuchins—had sown the seeds of a new life in the ancient Church. The harvest was reaped during the long pontificate of the Farnese pope, Paul III. With his accession devotion to religion and the Church began to regain their old mastery. True, Paul III. was not a representative of the Catholic reformation, in the full sense of the words. In many points, especially his great nepotism—witness the promotion of the worthless Pier Luigi Farnese—he remained, even as pope, a true child of the Renaissance period in which he had risen to greatness. Nevertheless he possessed the necessary adaptability and acumen to enable him to do justice to the demands of the new age, which imperatively demanded that the interests of the Church should be the first consideration. Thus, in the course of his long reign he did valuable work in the cause of the Catholic reformation and prepared the way for the Catholic restoration. It was he who regenerated the College of Cardinals by leavening it with men of ability, who took in hand the reform of the Curia, confirmed the Jesuit Order, and finally brought the Council of Trent into existence (Sessions I.-X. of the council, first period, 1545-1549). In order to check the progress of Protestantism in Italy Paul III. founded the Congregation of the Inquisition (1542). Political differences, and the transference of the council to Bologna in 1547, brought the pope into sharp collision with the emperor, who now attempted by means of the *Interim* to regulate the religious affairs of Germany according to his wishes—but in vain. The disobedience of his favourite Ottavio hastened the death of the old pope (Nov. 10, 1549).

Paul III., 1534-1549.

Under the Farnese pope art enjoyed an Indian summer. The most important work for which he was responsible is the "Last Judgment" of Michelangelo in the Sistine Chapel. In 1547 Michelangelo was further entrusted with the superintendence of the reconstruction of St Peter's. He utilized his power by rejecting the innovations of Antonio da Sangallo, saved the plan of Bramante, and left behind him sufficient drawings to serve the completion of the famous cupola. Titian painted Paul's portrait, and Guglielmo della Porta cast the bronze statue which now adorns his grave in St Peter's.

After a protracted conclave Giovanni Maria del Monte was elected, on the 7th of February 1550, as Pope Julius III. He submitted to the emperor's demands and again convened the council (Sessions XI.-XVI., second period), but was obliged to suspend it on the 22nd of April 1552, in consequence of the war between Charles V. and Maurice of Saxony. From this time onwards the pope failed to exhibit requisite energy. In his beautiful villa before the Porta del Popolo he sought to banish political and ecclesiastical anxieties from his mind. Yet even now he was not wholly inactive. The religious affairs of England especially engaged his attention; and the nomination of Cardinal Pole as his legate to that country, on the death of Edward VI. (1553), was an extremely adroit step. That the measure was fruitless was not the fault of Julius III., who died on the 23rd of March 1555.

Julius III., 1550-1555.

The feeble régime of Julius had made it evident that a pope of another type was necessary if the papal see were to preserve the moral and political influence which it had regained under Paul III. On the 10th of April 1555, after a conclave which lasted five days, the reform party secured the election of the distinguished Marcellus II. Unfortunately, on the 1st of May, an attack of apoplexy cut short the life of this pope, who seemed peculiarly adapted for the reformation of the Church.

Marcellus II., 1555.

On the 23rd of May 1555 Gian Pietro Carafa, the strictest of the strict, was elected as his successor, under the title of Paul IV. Though already 79 years of age, he was animated by the fiery zeal of youth, and he employed the most drastic methods for executing the necessary reforms and combating the advance of Protestantism. Always an opponent of the Spaniards, Paul IV., in the most violent and impolitic fashion, declared against the Habsburgs. The conflict with the Colonna was soon followed by the war with Spain, which, in spite of the French alliance, ended so disastrously, in 1557, that the pope henceforward devoted himself exclusively to ecclesiastical affairs. The sequel was the end of the nepotism and the relentless prosecution of reform within the Church. Protestantism was successfully eradicated in Italy; but the pope failed to prevent the secession of England. After his death the rigour of the Inquisition gave rise to an insurrection in Rome. The Venetian ambassador says of Paul IV. that, although all feared his strictness, all venerated his learning and wisdom.

Paul IV., 1555-1559.

The reaction against the iron administration of Paul IV. explains the fact that, after his decease, a more worldly-minded pope was again elected in the person of Cardinal Giovanni Angelo de' Medici—Pius IV. In striking contrast to his predecessor he favoured the Habsburgs. A suit was instituted against the Carafa, and Cardinal Carafa was even executed. To his own relatives, however, Pius IV. accorded no great influence, the advancement of his distinguished nephew, Carlo Borromeo (*q.v.*) being singularly fortunate for the Church. The most important act of his reign was the reassembling of the Council of Trent (Sessions XVII.-XXV., third period, 1562-1563). It was an impressive moment, when, on the 4th of December 1563, the great ecumenical synod of the Church came to a close. Till the last it was obliged to contend with the most formidable difficulties: yet it succeeded in effecting many notable reforms and in illuminating and crystallizing the distinctive doctrines of Catholicism. The breach with the Protestant Reformation was now final, and all Catholics felt themselves once more united and brought into intimate connexion with the centre of unity at Rome (see Trent, Council of).

Pius IV., 1559-1565.

The three great successors of Pius IV. inaugurate the heroic age of the Catholic reformation and restoration. All three were of humble extraction, and sprang from the people in the full sense of the phrase. Pius V., formerly Michele Ghisleri and a member of the Dominican Order observed even as pope the strictest rules of the brotherhood, and was already regarded as a saint by his contemporaries. For Rome, in especial, he completed the task of reform. The Curia, once so corrupt, was completely metamorphosed, and once more became a rallying point for men of stainless character, so that it produced a profound impression even on non-Catholics; while the original methods of St Philip Neri had a profound influence on the reform of popular morals. In the rest of Italy also Pius V. put into execution the reformatory decrees of Trent. In 1566 he gave publicity to the Tridentine catechism; in 1568 he introduced the amended Roman breviary; everywhere he insisted on strict monastic discipline, and the compulsory residence of bishops within their sees. At the same period Carlo Borromeo made his diocese of Milan the model of a reformed bishopric. The pope supported Mary Stuart with money; his troops assisted Charles IX. of France against the Huguenots; and he lent his aid to Philip II. against the Calvinists of the Netherlands. But his greatest joy was that he succeeded where Pius II. had failed, despite all his efforts,

Pius V., 1566-1572.

by bringing to a head an enterprise against the Turks—then masters of the Mediterranean. He negotiated an alliance between the Venetians and Spaniards, contributed ships and soldiers, and secured the election of Don John of Austria to the supreme command. He was privileged to survive the victory of the Christians at Lepanto; but on the 1st of May in the following year he died, as piously as he had lived. The last pope to be canonized, his pontificate marks the zenith of the Catholic reformation.

Gregory XIII., 1572-1585.

The renewed vigour which this internal reformation had infused into the Church was now manifest in its external effects; and Pius V., the pope of reform, was followed by the popes of the Catholic restoration. These, without intermitting the work of reformation, endeavoured by every means to further the outward expansion of Catholicism. On the one hand missions were despatched to America, India, China and Japan: on the other, a strenuous attempt was made to reannex the conquests of Protestantism. In a word, the age of the Catholic restoration was beginning—a movement which has been misnamed the counter Reformation. In this period, the newly created religious orders were the right arm of the papacy, especially the Jesuits and the Capuchins. In place of the earlier supineness, the battle was now joined all along the line. Everywhere, in Germany and France, in Switzerland and the Low Countries, in Poland and Hungary, efforts were made to check the current of Protestantism and to re-establish the orthodox faith. This activity extended to wider and wider areas, and enterprises were even set on foot to regain England, Sweden and Russia for the Church. This universal outburst of energy for the restoration of Catholicism, which only came to a standstill in the middle of the 17th century, found one of its most zealous promotors in Ugo Boncompagni—Pope Gregory XIII. Though not of an ascetic nature, he followed unswervingly in the path of his predecessors by consecrating his energies to the translation of the reformatory decrees into practice. At the same time he showed himself anxious to further the cause of ecclesiastical instruction and Catholic science. He created a special Congregation to deal with episcopal affairs, and organized the Congregation of the Index, instituted by Pius V. On behalf of the diffusion of Catholicism throughout the world he spared no efforts; and wherever he was able he supported the great restoration. He was especially active in the erection and encouragement of educational institutions. In Rome he founded the splendid College of the Jesuits; and he patronized the Collegium Germanicum of St Ignatius; while, at the same time, he found means for the endowment of English and Irish colleges. In fact, his generosity for the cause of education was so unbounded that he found himself in financial difficulties. Gregory did good service, moreover, by his reform of the calendar which bears his name, by his emended edition of the *Corpus juris canonici* and by the creation of nunciatures. That he celebrated the night of St Bartholomew was due to the fact that, according to his information, the step was a last resort to ensure the preservation of the royal family and the Catholic religion from the attacks of the revolutionary Huguenots. In his political enterprises he was less fortunate. He proved unable to devise a common plan of action on the part of the Catholic princes against Elizabeth of England and the Turks; while he was also powerless to check the spread of brigandage in the papal state.

Sixtus V., 1585-1590.

On the death of Gregory XIII., Felice Peretti, cardinal of Montalto, a member of the Franciscan order, ascended the Apostolic throne as Sixtus V. (April 1585–August 1590). His first task was the extirpation of the bandits and the restoration of order within the papal state. In the course of a year the drastic measures of this born ruler made this state the safest country in Europe. He introduced a strictly ordered administration, encouraged the sciences, and enlarged the Vatican library, housing it in a splendid building erected for the purpose in the Vatican itself. He was an active patron of agriculture and commerce: he even interested himself in the draining of the Pontine marshes. The financial system he almost completely reorganized. With a boldness worthy of Julius II., he devised the most gigantic schemes for the annihilation of the Turkish Empire and the conquest of Egypt and Palestine. Elizabeth of England he wished to restore to the Roman obedience either by conversion or by force; but these projects were shattered by the destruction of the Spanish Armada. Down to his death the pope kept a vigilant eye on the troubles in France. Here his great object was to save France for the Catholic religion, and, as far as possible, to secure her position as a power of the first rank. To this fundamental axiom of his policy he remained faithful throughout all vicissitudes.

In Rome itself Sixtus displayed extraordinary activity. The Pincian, the Esquiline, and the south-easterly part of the Caelian hills received essentially their present form by the creation of the Via Sistina, Felice, delle Quattro Fontane, di Sta Croce in Gerusalemme, &c.; by the buildings at Sta Maria Maggiore, the Villa Montalto, the reconstruction of the Lateran, and the aqueduct of the Felice, which partially utilized the Alexandrina and cost upwards of 300,000 scudi. The erection of the obelisks of the Vatican, the Lateran, the Piazza del Popolo and the square behind the tribune of Sta Maria Maggiore lent a lustre to Rome which no other city in the world could rival. The columns of Trajan and Antoninus were restored and bedecked with gilded statues of the Apostles; nor was this the only case in which the high-minded pope made the monuments of antiquity subservient to Christian ideas. His principal architect was Domenico Fontana, who, in conjunction with Guglielmo della Porta, completed the uniquely beautiful cupola of St Peter's which had already been designed by Michelangelo in a detailed model. In Santa Maria Maggiore the pope erected the noble Sistine Chapel, in which he was laid to rest. Indeed, the monumental character of Rome dates from this era. The organizing activity of Sixtus V. was not, however, restricted to the Eternal City, but extended to the whole administration of the Church. The number of cardinals was fixed at seventy—six bishops, fifty priests and fourteen deacons. In 1588 followed the new regulations with respect to the Roman Congregations, which henceforth were to be fifteen in number. Thus the pope laid the foundations of that wonderful and silent engine of universal government by which Rome still rules the Catholics of every land on the face of the globe.

When we reflect that all this was achieved in a single pontificate of but five years' duration, the energy of Sixtus V. appears simply astounding. He was, without doubt, by far the most important of the post-Tridentine popes, and his latest biographer might well say that he died overweighted with services to the Church and to humanity. (L. v. P.)

IV.—*Period from 1590 to 1870.*

The history of the papacy from 1590 to 1870 falls into four main periods: (1) 1590–1648; territorial expansion, definitely checked by the peace of Westphalia; (2) 1648–1789; waning prestige, financial embarrassments, futile reforms; (3) 1789–1814; revolution and Napoleonic reorganization; (4) 1814–1870; restoration and centralization.

1. 1590–1648. The keynote of the counter Reformation had been struck by the popes who immediately preceded this period. They sought to reconquer Europe for the Roman Catholic Church. In the overthrow of the Spanish Armada they had already received a great defeat; with the Peace of Westphalia the Catholic advance was baffled. Sixtus V. was succeeded in rapid succession by three popes: Urban VII., who died on the 27th of September 1590, after a papacy of only 12 days; Gregory XIV. (Dec. 1590 to Oct. 1591); Innocent IX. (Oct. to Dec. 1591).

Clement VIII., 1592-1605.

The first noteworthy pontiff of the period was Clement VIII., who gained a vast advantage by allying the papacy with the rising power of France. Since 1559 the popes had been without exception in favour of Spain, which, firmly possessed of Milan on the north and of Naples on the south, held the States of the Church as in a vice, and thereby dominated the politics of the peninsula. After Henry IV. had taken Paris at the price of a mass, it became possible for the popes to play off the Bourbons against the Habsburgs; but the transfer of favour was made so gradually that the opposition of the papacy to Spain did not become open till just before Clement VIII. passed off the stage. His successor, Leo XI., undisguisedly French in sympathy, reigned but twenty-seven days—a sorry return for the 300,000 ducats which his election is rumoured to have cost Henry IV. Under Paul V. Rome was successful in some minor negotiations with Savoy, Genoa, Tuscany and Naples; but Venice, under the leadership of Paolo Sarpi (*q.v.*), proved unbending under ban and interdict: the state defiantly upheld its sovereign rights, kept most of the clergy at their posts, and expelled the recalcitrant Jesuits. When peace was arranged through French mediation in 1607 the papacy had lost greatly in prestige: it was evident that the once terrible interdict was antiquated, wherefore it has never since been employed against the entire territory of a state.

Leo XI., 1605.

Paul V., 1605–1621.

During the second and third decades of the 17th century the most coveted bit of Italian soil was the Valtelline. If Spain could gain this Alpine valley her territories would touch those of Austria, so that the Habsburgs north of the Alps could send troops to the aid of their Spanish cousins against Venice, and Spain in turn could help to subdue the Protestant princes of Germany in the Thirty Years' War (1618–1648). From the Grisons, who favoured France and Venice, Spain seized the Valtelline in 1620, incidentally uprooting heresy there by the massacre of six hundred Protestants. Paul V. repeatedly lamented that he was unable to oppose such Spanish aggressions without extending protection to heretics. This scruple was, however, not shared by his successor, Gregory XV., who secured the consent of the powers to the occupation of the Valtelline by papal troops, a diplomatic victory destined, however, to lead ere long to humiliation. Gregory's brief but notable pontificate marks nevertheless the high-tide of the counter Reformation. Not for generations had the prospects for the ultimate annihilation of Protestantism been brighter. In the Empire the collapse of the Bohemian revolt led ultimately to the merciless repression of the Evangelicals in Bohemia (1627), and in the hereditary lands of Austria (1628), as well as to the transference of the electoral dignity from the Calvinistic elector of the Palatinate to the staunchly Catholic Maximilian of Bavaria. In France the Huguenots were shorn of almost all their military power, a process completed by the fall of La Rochelle in 1628. In Holland the expiration of the Twelve Years' Truce in 1621 forced the Dutch Protestants once more to gird on the sword. England, meanwhile, was isolated from her co-religionists. King James I., who had coquetted twenty years previously with Clement VIII., and then had avenged the Gunpowder Plot (1605) by the most stringent regulation of his Roman Catholic subjects, was now dazzled by the project of the Spanish marriage. The royal dupe was the last man in the world to check the advance of the papacy. That service to Protestantism was performed by Catholic powers jealous of the preponderance of the Habsburgs. In view of these antipathies the treaty of 1627 between France, Spain and the pope is but an episode: instructive, however, in that the project, originated apparently by the pope, provided that England should be dismembered, and that Ireland should be treated as a papal fief. The true tendency of affairs manifested itself in 1629, when the emperor Ferdinand II. (1619–1637), at the zenith of his fortunes, forced the Protestant princes of Germany to restore to the Roman hierarchy all the ecclesiastical territories they had secularized during the past seventy-four years. Then France, freed from the fear of domestic enemies, arose to help the heretics to harry the house of Habsburg. Arranging a truce between Poland and Sweden, she unleashed Gustavus Adolphus. Thus by diplomacy as well as by force of arms Catholic France made possible the continued existence of a Protestant Germany, and helped to create the balance of power between Catholic, Lutheran and Reformed within the Empire, that, crystallized in the Peace of Westphalia, fixed the religious boundaries of central Europe for upwards of two centuries.

Gregory XV., 1621–1623.

The Counter-Reformation.

If it was Richelieu and not the pope who was the real arbiter of destinies from 1624 to 1642, Urban VIII. was usually content. In Italy he supported France against Spain in the controversy over the succession to Mantua (1627–1631). In the Empire he manifested his antipathy to the overshadowing Habsburgs by plotting for a time to carry the next imperial election in favour of Bavaria. He is said to have rejoiced privately over Swedish victories, and certainly it was unerring instinct which told him that the great European conflict was no longer religious but dynastic. Anti-Spanish to the core, he became the greatest papal militarist since Julius II.; but Tuscany, Modena and Venice checkmated him in his ambitious attempt to conquer the duchy of Parma. Like most of the papal armies of the last three centuries, Urban's troops distinguished themselves by wretched strategy, cowardice in rank and file, and a Fabian avoidance of fighting which, discreet as it may be in the field of diplomacy, has invariably failed to save Rome on the field of battle.

Urban VIII., 1623–1644.

The States of the Church were enlarged during this period by the reversion of two important fiefs—namely, Ferrara (1598) and Urbino (1631). Increase of territory, so far from filling the papal treasury, but postponed for the moment the progressive pauperization of the people. After annexation, the city of Ferrara sank rapidly from her perhaps artificial prosperity to the dead level, losing two-thirds of her population in the process. The financial difficulties of Italy were due to many causes, notably to a shifting of trade routes; but those of the papal states seem caused chiefly by misgovernment. Militarism may account for much of the tremendous deficit under Urban VIII.; but the real cancer was nepotism. The disease was inherent in the body politic. Each pope, confronted by the spectre of feudal anarchy, felt he could rely truly only on those utterly dependent on himself; consequently he raised his own relations to wealth and influence. This method had helped the House of Valois to consolidate its power; but what was tonic for a dynasty was death to a state whose headship was elective. The relations of one pope became the enemies of the next; and each pontiff governed at the expense of his successors. Under Clement VIII. the Aldobrandini, more splendidly under Paul V. the Borghesi, with canny haste under the short-lived Gregory XV. the Lodovisi, with unparalleled rapacity Urban's Barberini enriched themselves from a chronically depleted treasury. To raise money offices were systematically sold, and issue after issue of the two kinds of *monti*-securities, which may be roughly described as government bonds and as life annuities, was marketed at ruinous rates. More than a score of years after the Barberini had dropped the reins of power Alexander VII. said they alone had burdened the state with the payment of 483,000 scudi of annual interest, a tremendous item in a budget where the income was perhaps but 2,000,000. For a while interest charges consumed 85% of the income of the government. Skilful refunding postponed the day of evil, but cash on hand was too often a temptation to plunder. The financial woes of the next period, which is one of decline, were largely the legacy of this age of glory.

The Papal States.

Nepotism.

The common people, as always, had to pay. The farming of exorbitant taxes, coupled as it was too often with dishonest concessions to the tax farmer, made the over-burdened peasantry drink the doubly bitter cup of exploitation and injustice. Economic distress increased the number of highway robberies, these in turn lamed commercial intercourse.

The tale of these glories, with their attendant woes, does not exhaust the history of the papacy. Not as diplomatists, not as governors, but as successive heads of a spiritual kingdom, did the popes win their grandest triumphs. At a time when the non-Catholic theologians were chiefly small fry, bent on

Controversial and Missionary Triumphs.

petty or sulphurous polemics, great Jesuit teachers like Bellarmine (d. 1621) laid siege to the very foundations of the Protestant citadel. These thinkers performed for the unity of the faith in France and in the Catholic states of Germany services of transcendent merit, exceeding far in importance those of their flourishing allies, the Inquisitions of Spain, Italy, and of the Spanish Netherlands (see Inquisition). But the most fundamental spiritual progress of the papacy was made by its devoted missionaries. While the majority of Protestant leaders left the conversion of the heathen to some remote and inscrutable interposition of Providence, the Jesuits, Franciscans, Dominicans and kindred orders were busily engaged in making Roman Catholics of the nations brought by Oriental commerce or American colonial enterprise into contact with Spain, Portugal and France. Though many of the spectacular triumphs of the cross in Asia and Africa proved to be evanescent, nevertheless South America stands the impressive memorial of the greatest forward movement in the history of the papacy: a solidly Roman continent.

2. 1648–1789. From the close of the Thirty Years' War to the outbreak of the French Revolution the papacy suffered abroad waning political prestige; at home, progressive financial embarrassment accompanied by a series of inadequate governmental reforms; and in the world at large, gradual diminution of reverence for spiritual authority. From slow beginnings these factors kept gaining momentum until they compassed the overthrow of the mighty order of the Jesuits, and culminated in the revolutionary spoliation of the Church.

Foreign Relations.

Jansenism and Gallicanism.

At the election of Innocent X. (1644–1655) the favour of the Curia was transferred from France, where it had rested for over forty years, to the House of Habsburg, where it remained, save for the brief reign of Clement IX. (1667–1669), for half a century. The era of tension with France coincides with the earlier years of Louis XIV. (1643–1715); its main causes were the Jansenist and the Gallican controversies (see Jansenism and Gallicanism). The French crown was willing to sacrifice the Jansenists, who disturbed that dead level of uniformity so grateful to autocrats; but Gallicanism touched its very prerogatives, and was a point of honour which could never be abandoned outright. The regalia controversy, which broke out in 1673, led up to the classic declaration of the Gallican clergy of 1682; and, when aggravated by a conflict over the immunity of the palace of the French ambassador at Rome, resulted in 1688 in the suspension of diplomatic relations with Innocent XI., the imprisonment of the papal nuncio, and the seizure of Avignon and the Venaissin. So pronounced an enemy of French preponderance did Innocent become that he approved the League of Augsburg, and was not sorry to see the Catholic James II., whom he considered a tool of Louis, thrust from the throne of England by the Protestant William of Orange. Fear of the coalition, however, led the Grand Monarch to make peace with Innocent XII. (1691–1700). The good relations with France were but a truce, for the Bourbon powers became so mighty in the 18th century that they practically ignored the territorial interests of the papacy. Thus Clement XI. (1700–1721), who espoused the losing Habsburg side in the War of the Spanish Succession, saw his nuncio excluded from the negotiations leading to the Peace of Utrecht, while the lay signatories disposed of Sicily in defiance of his alleged overlordship. Similarly Clement XII. (1730–1740) looked on impotently when the sudden Bourbon conquest of Naples in the War of the Polish Succession set at nought his claims to feudal sovereignty, and established Tannucci as minister of justice, a position in which for forty-three years he regulated the relations of church and state after a method most repugnant to Rome. No better fared Clement's medieval rights to Parma; nor could the sagacious and popular Benedict XIV. (1740–1758), who refused to press obsolete claims, either keep the foreign armies in the War of the Austrian Succession from trespassing on the States of the Church or prevent the ignoring at the Peace of Aix-la-Chapelle of the papal overlordship over Parma and Piacenza. In fact, since the doctrinaire protest of Innocent X. against the Peace of Westphalia, at almost every important settlement of European boundaries the popes had been ignored or otherwise snubbed. Not for two centuries had the political prestige of the papacy been lower. Moreover, a feeling of revulsion against the Jesuits was sweeping over western Europe: they were accused of being the incarnation of the most baneful principles, political, intellectual, moral; and though Clement XIII. (1758–1769) protected them against the pressure of the Bourbon courts, his successor Clement XIV. (1769–1774) was forced in 1773 to disband the army of the Black Pope (see Jesuits). The sacrifice of these trusted soldiers failed however to sate the thirst of the new age. Pius VI. (1775–1799), was treated with scant respect by his neighbours. Naples refused him tribute; Joseph II. of Austria politely but resolutely introduced fundamental Gallican reforms ("Josephism"); in 1786 at the Synod of Pistoia (*q.v.*) Joseph's brother Leopold urged similar principles on Tuscany, while in Germany the very archbishops were conspiring by the Punctation of Ems to aggrandize themselves like true Febronians, at the expense of the pope (see Febronianism). These aggressions of monarchy and the episcopate were rendered vain, outside the Habsburg dominions, by the revolution; and to the Habsburg dominions the clerical revolution of 1790 caused the loss of what is to-day Belgium. However, the deluge which shattered the opposition to Rome in the great national churches submerged for a time the papacy itself.

Suppression of the Jesuits.

The States of the Church.

In the States of the Church, during the first part of the period the outstanding feature in the history of the Temporal Power is the overthrow of nepotism; in the second, a dull conflict with debt. The chief enemies of nepotism were Alexander VII. (1655–1667), who dignified the secretaryship of state and gave it its present pre-eminence by refusing to deliver it up to one of his relations; and Innocent XII. (1691–1700), whose bull *Romanum decet pontificem* ordered that no pope should make more than one nephew cardinal, and should not grant him an income over twelve thousand scudi. Thus by 1700 nepotistic plunder had practically ceased, and with the exception of the magnificent peculations of Cardinal Coscia under Benedict XIII. (1724–1730), the central administration of finance has been usually considered honest. Nepotism, however, still left its scars upon the body politic, shown in the progressive decay of agriculture in the Campagna, causing Rome to starve in the midst of fertile but untilled nepotistic *latifundia*. The fight against the legacy of debt was slower and more dreary. One pope, Innocent XI. (1676–1789), threatened at first with bankruptcy, managed to leave a surplus; but this condition, the product of severe economy and oppressive taxation, could not be maintained. In the 18th century it became necessary to resort to fiscal measures which were often harmful. Thus Clement XI., at war with Austria in 1708, debased the currency; Clement XII. (1730–1740) issued paper money and set up a government lottery, excommunicating all subjects who put their money into the lotteries of Genoa or Naples; Benedict XIV. (1740–1758) found stamped paper a failure; and Clement XIII. (1758–1769) made a forced loan. The stoppage of payments from Bourbon countries during the Jesuit struggle brought the annual deficit to nearly 500,000 scudi. Under Pius VI. (1775–1799) the emission of paper money, followed by an unsuccessful attempt to market government securities, produced a panic. By 1783 the taxes had been farmed for years in advance and the treasury was in desperate straits. Retrenchment often cut to the bone; wise reforms shattered on the inexperience or corruption of officials. Grand attempts to increase the national wealth usually cost the government more in fixed charges of interest than they yielded in rentals or taxes. The States of the Church, like France, were on the brink of bankruptcy. From this disgrace they were saved by a more imminent catastrophe—the Revolution.

Intellectual Movement against the Papacy.

The revolt against spiritual authority belongs rather to the history of modern thought than to that of the papacy. The Renaissance and Protestantism had their effect in producing that Enlightenment which swept over western Europe in the 18th century. Although Descartes died in 1650 in the communion of the Church, his philosophy contained seeds of revolt; and the sensualism of Locke, popularized in Italy by Genovesi, prepared the way for revolution. In an age when Voltaire preached toleration and the great penologist Beccaria attacked the death-penalty and torture, in the States of the Church heretics were still liable to torture, the relapsed to capital punishment; and in a backward country like Spain the single reign of Philip V. (1700–1746) had witnessed the burning of over a thousand heretics. If ecclesiastical authority fostered what was commonly regarded as intolerant obscurantism, to be enlightened meant to be prepared in spirit for that reform which soon developed into the Revolution.

The Papacy and the Revolution.

Pius VII., 1800–1823.

Concordat of 1801.

3. 1789–1814. In the decade previous to the outbreak of the French Revolution the foreign policy of Pius VI. had been directed chiefly against decentralization, while his chief aim at home was to avoid bankruptcy by increasing his income. From 1789 on the French situation absorbed his attention. France, like the States of the Church, was facing financial ruin; but France did what the government of priests could not: namely, saved the day by the confiscation and sale of ecclesiastical property. It was not the aim of the Constituent Assembly to pauperize or annihilate the Church; it purposed to reorganize it on a juster basis. These reforms, embodied in the Civil Constitution of the Clergy, were part of the new Fundamental Law of the kingdom. The majority of the priests and bishops refused to swear assent to what they held to be an invasion of the divine right of the hierarchy, and after some months of unfortunate indecision Pius VI. (1775–1799) formally condemned it. Thenceforward France treated the papacy as an inimical power. The sullen toleration of the non-juring priests changed into sanguinary persecution. The harrying was halted in 1795; and soon after the directory had been succeeded by the consulate, the Catholic religion was re-established by the concordat of 1801. From 1790 on, however, the rising power of France had been directed against Rome. In September 1791 France annexed Avignon and the Venaissin, thus removing for ever that territorial pawn with whose threatened loss the French monarchs had for centuries disciplined their popes. In 1793 Hugon de Bassville (*q.v.*), a diplomatic agent of France, was murdered at Rome, a deed not avenged until the Italian victories of Bonaparte. In the peace of Tolentino (Feb. 1797) the pope surrendered his claims to Avignon, the Venaissin, Bologna, Ferrara and the Romagna; he also promised to disband his worthless army, to yield up certain treasures of art, and to pay a large indemnity. Bonaparte believed that after these losses the temporal power would collapse of its own weight; but so peaceful a solution was not to be. During republican agitation at Rome the French general Duphot was killed, a French army advanced on the city, and carried the aged pontiff a prisoner of war to Valence in Dauphiné, where he died on the 29th of August 1799. His successor Pius VII., elected at Venice on the 14th of the following March, soon entered Rome and began his reign auspiciously by appointing as secretary of state Ercole Consalvi (*q.v.*), the greatest papal diplomatist of the 19th century. The political juncture was favourable for a reconciliation with France. In the concordat of 1801 the papacy recognized the validity of the sales of Church property, and still further reduced the number of dioceses; it provided that the government should appoint and support the archbishops and bishops, but that the pope should confirm them; and France recognized the temporal power, though shorn of Ferrara, Bologna and the Romagna. The supplementary Organic Articles of April 1802, however, centralized the administration of the Church in the hands of the First Consul; and some of these one-sided regulations were considered by Rome to be minute and oppressive; nevertheless, the Napoleonic arrangements remained in force, with but brief exceptions, till the year 1905. The indignation of the pope and his advisers was not deep enough to prevent the ratification in 1803 of a somewhat similar concordat for the Italian Republic. In 1804 Pius consented to anoint Napoleon emperor, thus casting over a conquered crown the halo of legitimacy. The era of good feeling was, however, soon ended by friction, which arose at a number of points. At length, in 1809, Napoleon annexed the papal states; and Pius, who excommunicated the invaders of his territory, was removed to France. The captive was, however, by no means powerless; by refusing canonical institution to the French bishops he involved the ecclesiastical system of Napoleon in inextricable confusion. After the return from Moscow the emperor negotiated with his prisoner a new and more exacting concordat, but two months later the repentant pope abrogated this treaty and declared all the official acts of the new French bishops to be invalid. By this time Napoleon was tottering to his fall; shortly before the catastrophe of Elba he allowed the pope to return to the States of the Church. Pius entered Rome amid great rejoicing on the 24th of May 1814, a day which marks the beginning of a new era in the history of the papacy. In September of the same year, by the bull *Sollicitudo omnium ecclesiarum*, he reconstituted the Society of Jesus.

Secularizations of 1803.

Though the relations with France dominated the papal policy during the revolutionary period, the affairs of Germany received no small share of attention. The peace of Lunéville (1801) established the French boundary at the Rhine; and the German princes who thereby lost lands west of the river were indemnified by the secularization of ecclesiastical territories to the east. The scheme of readjustment, known as the Enactment of the Delegates of the Empire (*Reichsdeputationshauptschluss*) of 1803, secularized practically all the ecclesiastical states of Germany. Thus at one stroke there was broken the age-long direct political power of the hierarchy in the Holy Roman Empire; and the ultimate heir of the bulk of these lands was Protestant Prussia.

The Papacy and the Restoration.

4. 1814–1870. The foreign policy of the papacy so long as conducted by Consalvi, or in his spirit, was supremely successful. From 1814 to 1830 Europe witnessed the restoration of legitimate monarchy. The once exiled dynasties conscientiously re-established the legitimate Church, and both conservative powers made common cause against revolutionary tendencies. Throughout Europe the governing classes regarded this "union of throne and altar" as axiomatic. For the pope, as eldest legitimate sovereign and protagonist against the Revolution, Consalvi obtained from the Congress of Vienna the restitution of the States of the Church in practically their full extent. By concluding concordats with all the important Catholic powers save Austria he made it possible to crush Jansenism, Febronianism and Gallicanism. By bulls of circumscription, issued after consultation with various Protestant states of Germany, he rearranged their Catholic dioceses and readjusted ecclesiastical incomes. By unfailing tact he gained the good will of Great Britain, where before him no cardinal had set foot for two centuries, and secured that friendly understanding between the British government and the Vatican which has since proved so valuable to Rome. After Consalvi's retirement, Leo XII. (1823–1829) continued his policy and secured further advantageous concordats. In the sixteen months' reign of Pius VIII. (1829–1830) came the achievement of Catholic emancipation in England and the Revolution of 1830; and the pope departed from the principle of legitimacy by recognizing Louis Philippe as king of the French. The pontificate of Gregory XVI. (1831–1846) was singularly infelicitous. The controversy with Prussia about the education of children of whose parents but one was Roman Catholic led to the imprisonment of Droste-Vischering, archbishop of Cologne, and later of Dunin, archbishop of Gnesen-Posen; but the accession of the royal romanticist Frederick William IV. in 1840 brought a pacific reversal of the Prussian policy, sometimes

judged more benevolent than wise. In France agitation was directed chiefly against the Jesuits, active in the movement to displace ancient local catechisms and liturgies by the Roman texts, to enroll the laity in Roman confraternities, and to induce the bishops to visit Rome more frequently. To check this ultramontane propaganda the government secured from the papacy in 1845 the promise to close the Jesuit houses and novitiates in France.

In Italy, however, lay the chief obstacles to the success of all papal undertakings. The revolution of 1830, though somewhat tardily felt in the States of the Church, compelled Gregory to rest his rule on foreign bayonets. In return he was obliged to lend an ear to the proposals of France, and above all to those of Austria. This meant opposition to all schemes for the unification of Italy. In 1815 the Italian peninsula had been divided into seven small states. Besides the government of the pope there were three kingdoms: Sardinia, Lombardo-Venetia and Naples; and three duchies: Parma, Modena, Tuscany. To these regions the Napoleonic régime had given a certain measure of unity; but Metternich, dominant after 1815, held Italy to be merely a geographical term. To its unification Austria was the chief obstacle; she owned Lombardo-Venetia; she controlled the three duchies, whose rulers were Austrian princes; and she upheld the autocracy of the king of Naples and that of the pope against all revolutionary movements. To the Italian patriot the papacy seemed in league with the oppressor. The pope sacrificed the national aspirations of his subjects to his international relations as head of the Church; and he sacrificed their craving for liberty to the alliance with autocracy on which rested the continued existence of the temporal power. The dual position of the pope, as supreme head of the Church on earth and as a minor Italian prince, was destined to break down through its inherent contradiction; it was the task of Pius IX. to postpone the catastrophe.

Pius IX., 1846–1878.

The reign of Pius IX. falls into three distinct parts. Until driven from Rome by the republican agitation of 1848 he was a popular idol, open to liberal political views. From his return in 1850 to 1870 he was the reactionary ruler of territories menaced by the movement for Italian unity, and sustained only by French bayonets; yet he was interested primarily in pointing out to an often incredulous world that most of the vaunted, intellectual and religious progress of the 19th century was but pestilent error, properly to be condemned by himself as the infallible vicegerent of God. The third division of his career, from the loss of the temporal power to his death, inaugurates a new period for the papacy.

The Papacy and Italian Unity.

At the outset of his reign he faced a crisis. It was clear that he could not continue the repressive tactics of his predecessor. Italy and Europe were astir with the Liberal agitation, which in 1848 culminated in the series of revolutions by which the settlement of 1815 was destined to be profoundly modified. Liberal churchmen in Italy, while rejecting Mazzini's dream of a republic, had evolved projects for attaining national unity while preserving the temporal power. The exiled abbé Vincenzo Gioberti championed an Italian confederacy under the presidency of the pope; hand in hand with the unity of the nation should go the unity of the faith. In allusion to medieval partisans of the papacy this theory was dubbed Neo-Guelphism. Towards such a solution Pius IX. was at first not unfavourably inclined, but the revolution of 1848 cured him of his Liberal leanings. In November of that year he fled in disguise from his capital to Gaeta, in the kingdom of Naples, and when French arms had made feasible his restoration to Rome in April 1850 he returned in a temper of stubborn resistance to all reform; henceforth he was no longer open to the influence of men of the type of Rossi or Rosmini, but took the inspiration of his policy from Cardinal Antonelli and the Jesuits. The same pope who had signalized his accession by carrying out a certain number of Liberal reforms set his name in 1864 to the famous *Syllabus*, which was in effect a declaration of war by the papacy against the leading principles of modern civilization (see SYLLABUS).

As from 1849 to 1870 the fate of the papacy was determined not so much by domestic conditions, which, save for certain slight ameliorations, were those of the preceding reigns, as by foreign politics, it is necessary to consider the relations of Rome with each of the powers in turn; and in so doing one must trace not merely the negotiations of kings and popes, but must seek to understand also the aims of parliamentary parties, which from 1848 on increasingly determine ecclesiastical legislation.

Louis Napoleon and the Papacy.

French Capture of Rome.

Napoleon III. and the Papacy.

The chief ally of the papacy from 1849 to 1870 was France. The policy which made Louis Napoleon dictator forced him into mortal conflict with the republican parties; and the price of the parliamentary support of the Catholic majority was high. Even before Napoleon's election as president, Falloux, the Catholic leader, had promised to secure intervention in favour of the dispossessed pope. Napoleon, however, could not forget that as a young man he himself had vainly fought to obtain from Gregory XVI. those liberties which Pius IX. still refused to grant; he therefore essayed diplomacy, not arms. Nevertheless, to forestall the rescue of the pope by Austrian troops, he sent, in August 1849, an army corps under Oudinot to Civita Vecchia. By heading off reactionary Austria Napoleon hoped to conciliate the French Liberals; by helping the pope, to satisfy the Catholics; by concessions to be wrung both from Pius and from the Roman triumvirs, to achieve a bloodless victory. As neither party yielded, Oudinot listened to his Catholic advisers, attacked Rome, with which the French Republic was technically at peace—and was roundly repulsed by Garibaldi. To relieve their inglorious predicament the ministry hurried the Liberal diplomatist, Ferdinand de Lesseps, to Rome to prevent further conflict. At the moment when Lesseps had secured the signing of a treaty with the Roman Republic permitting peaceful occupation of the city by the French army, he was peremptorily recalled and Oudinot was as unexpectedly ordered to take the city by storm. This amazing reversal of policy was procured by the intrigues of Catholic diplomatists and German Jesuits, conveyed to Paris by Prince de la Tour d'Auvergne. For the honour of the army and the Church republican France thereupon destroyed the Roman republic. Napoleon lost 1200 in dead and wounded, actually secured not a single reform on which he had insisted, and drew upon himself the fateful obligation to mount perpetual guard over the Vatican. As the catspaw of clerical reaction he had also to acquiesce in that "Roman campaign at home" that resulted in the Falloux Act of 1850, which in the name of liberty of education put the university in bondage to the archbishops, militated against lay teachers in secondary and primary schools, and set them under clerical control, made it ominously easy for members of religious congregations to become instructors of youth, and cut the nerve of the communal school system. That education was delivered up to the Church was partly the result of the terror inspired in the middle classes by the socialistic upheavals of 1848. The bourgeoisie sought the support of the clergy, and irreligion became as unfashionable among them as it had been among the nobility after 1793. Religion was thought to be part of a fashionable education, and the training of girls came almost exclusively into the hands of the religious orders and congregations. So long as the alliance of the autocratic empire and the clergy lasted (1852–1860), intellectual reaction reigned; the university professorships of history and philosophy were suppressed. This alliance of the empire with the clergy was shaken by the Italian War of 1859, which resulted in the loss by the pope of two-thirds of his territories. Napoleon was evidently returning to the traditions of his youth, and in the September Convention of 1864 it looked as if he would abandon Rome to its manifest destiny. This solution was spoiled by the impatience of Garibaldi and the supineness of the Romans themselves. In 1867 Napoleon made himself once more guardian of the Holy See; but the wonders wrought by the new French *chassepots* at the battle of Mentana cost the friendship of Italy. Thereafter Napoleon was blindly staggering to his fall. He aimed at honour in upholding the pope, in driving the Austrian tyrant from Italy, in attacking Prussia. The Austrian support on which he relied confidently in 1870 proved delusive, for he could obtain nothing from Austria unless he had Italy with him, and nothing from Italy without the evacuation of Rome. Even after the war with Prussia had actually broken out he refused Italian aid at the price of the abandonment of the city, a step which he nevertheless reversed hurriedly twenty days too late. With Napoleon fell the temporal power; but the French hierarchy still kept his gifts in the shape of the congregations, the pro-Catholic colonial policy, and a certain control of education. Of these privileges the Church was to be deprived a generation later. The Third Republic can never forget that it was to the support of the temporal sovereignty of the pope that Napoleon III. owed his empire and France her deepest humiliation.

Italian Occupation of Rome.

On the withdrawal of the French garrison Rome was occupied by the troops of Victor Emmanuel. This monarch had always been a thorn in the side of the papacy. Under him Sardinia had adopted the Siccardi Laws of 1850, which had taken away the right of asylum and the jurisdiction of the Church over its own clergy. His reputation for sacrilege, increased five years later by the abolition of many monasteries, became notorious when the formation of the kingdom of Italy (1861) took away all the dominions of the pope except the patrimony of Peter, thereby reducing the papal provinces from twenty to five, and their population from over 3,000,000 to about 685,000. This act was followed in 1867 by the confiscation of church property, and on the 20th of September 1870 by the triumphant seizure of Rome.

The Papacy and the Spanish States.

If France was the right arm and Italy the scourge of the papacy under Pius IX., the Spanish-speaking countries were its obedient tools. Torn by civil wars, their harassed rulers sought papal recognition at a cost which more experienced governments would have refused. Thus Isabella II. of Spain in the concordat of 1851 confirmed the exclusive privileges of the Roman religion and gave the control of all education to the Church; but after the Revolution of 1868 Spain departed for the first time from the principle of the unity of the faith by establishing liberty of worship, which was, however, a dead letter. On the Spanish model concordats were arranged with various Central and South American republics, perhaps the most ironclad being that concluded with Ecuador in 1862 (abrogated 1878).

Concordat with Austria, 1855.

Among the more stable governments of Europe reaction in favour of conservatism and religion after 1848 was used by clerical parties to obtain concordats more systematic and thoroughgoing than had been concluded even after 1814. Austria, for instance, although long the political mainstay of the papacy, had never abandoned the broad lines of ecclesiastical policy laid down by Joseph II.; but the young Francis Joseph, seeking the aid of Rome in curbing heterogeneous nationalities, in 1855 negotiated a concordat whose paragraphs regarding the censorship, education and marriage were far-reaching. It was, moreover, the first document of the sort in which a first-class power recognized that the rights of the Church are based upon "divine institution and canon law," not upon governmental concession. Violated by the Liberal constitution of 1867, which granted religious liberty, depotentiated by laws setting up lay jurisdiction over matrimonial cases and state control of education, it was abrogated in 1870 by Austria, who alleged that the proclamation of papal infallibility had so altered the status of one of the contracting parties that the agreement was void.

Belgium.

Passing over Portugal, the remaining European state which is Roman Catholic is Belgium. Torn from Austria by the clerical revolution of 1790, after many vicissitudes it was united in 1815 with Holland and placed under the rule of the Protestant William I., king of the United Netherlands. The constitutional guarantee of religious liberty had from the outset been resisted by the powerful and resolute priesthood, supported by numerous sympathizers among the nobility. As the arbitrary king alienated the Liberal Catholics, who were still more or less under the spell of the French Revolution, the Catholic provinces took advantage of the upheavals of 1830 to form the independent kingdom of Belgium. Its Fundamental Law of 1831, conceived in the spirit of the English Whigs, and later imitated in the European countries, granted liberty of worship and of education. Strangely enough, this liberty meant increase of power for the Clericals; for besides putting an end to stringent state interference in the education of future priests, it made possible a free and far-reaching Catholic school system whose crown was the episcopally controlled university of Louvain (1834). The Education Act of 1842 led to the formation of the Liberal party, whose bond of union was resistance to clericalism, whose watchword was the "independence of the civil power." The Catholics and Liberals were alternately in control until 1894, when the tenfold enlargement of the electorate broke down the Liberal party completely. The chief theme of contention, developed through many a noteworthy phase, has been the question of schools. In the half-century from 1830 to 1880 the cloisters likewise prospered and multiplied fivefold. The result of this evolution is that Belgium is to-day the most staunchly Catholic land north of the Alps.

Holland.

In Holland, as in Belgium, the education question has been uppermost. Here, even after 1831 the Roman Catholics constituted three-eighths of the population. Allied with the Liberals against the orthodox Protestants, who were threatening religious liberty, the Catholics assisted in 1857 to establish a system of non-sectarian state schools, where attendance is not obligatory nor instruction gratuitous. Changing front, in 1868, in league with the orthodox, they tried to make these denominational; but as the Liberals defeated their attempt, they founded schools of their own.

Other non-Catholic Countries.

In the non-Catholic countries of Europe during the reign of Pius IX., and in fact during the whole 19th century, the important gains of Rome were in strategic position rather than in numbers. The spread of toleration, which always favours minorities, broke down between 1845 and 1873 the Lutheran exclusiveness of Norway, Denmark and Sweden; but as yet the Catholics form a disappearing fraction of the population. In European Russia, as a result of the partitions of Poland under Catherine II. (1762–1796), about one-tenth of the people are Roman Catholics. The Ruthenians had united with Rome at Brest in 1596, forming a group of Uniates distinct from the Poles, who belonged to the Latin rite. In spite of the assurances of Catherine, Russia has repeatedly persecuted the Ruthenian Uniates, in order to incorporate them into the Holy Orthodox Church; and she has occasionally taken drastic measures against the Poles, particularly after the revolts of 1830 and 1863. After more than a century of repression in 1905 the Edict of Toleration brought some relief.

The remarkable extension of the Catholic hierarchy by Pius IX. into Protestant lands, legally possible because of toleration, was in some cases made practicable because of immigration. Though this factor was perhaps not prominent in the case of Holland (1853) or Scotland (1878) it was Irish immigration which made it feasible in England (1850). For a time the Roman propaganda in England, which drew to itself High Churchmen like Newman and Manning, was viewed with apprehension; but though the Roman Catholic Church has grown greatly in influence in the country, the number of its adherents, in proportion to the growth of population, has not very greatly increased.

In the United States of America, however, the Catholic population has increased by leaps and bounds through immigration. The famines of the 'forties, with their subsequent political and economic difficulties, transferred to America millions of the Irish, whose genius for organization in politics has not fallen short of their zeal for religion. The German-speaking immigrants have also had a creditable share in the work of church extension, but the Italians have manifested no marked ardour for their faith. The losses in transplantation have been huge, but it is impossible to estimate them accurately, for even the current figures for the Catholic population are based on detailed estimates rather than on an actual count.

Summing up the history of the papacy from the Congress of Vienna to the fall of the temporal power, one finds statistical gains in Protestant countries offset perhaps by relative losses in Catholic lands, both largely due to the closely related forces of toleration and immigration. While the hold of the popes on the States of the Church was constantly weakening, their power over the domestic policies of foreign governments was increasing; and the transition from autocracy to parliamentary rule accelerated this process, at least in non-Catholic territories. The unparalleled spread of ultramontane ideas (see ULTRAMONTANISM) brought about a centralization of authority at Rome such as would have appalled the 18th century. This centralization was, however, for the time not so much legal as doctrinal. In 1854 Pius IX. by his sole authority established a dogma (see IMMACULATE CONCEPTION); and the infallibility implied in this act was openly acknowledged in 1870 by the Council of the Vatican (see VATICAN COUNCIL and INFALLIBILITY). Thus were the spiritual prerogatives of the papacy exalted in the very summer that the temporal power was brought low. (W. W. R.*)

V.—*Period from 1870 to 1900.*

Bismarck and the Temporal Power.

The few months that elapsed between the 18th of July 1870 and the 18th of January 1871 witnessed four events that have been fraught with more consequence to the papacy than anything else that had affected that institution for the past three centuries. They were as follows: (1) The proclamation of the Infallibility of the Pope on the 18th of July 1870; (2) the fall of the Napoleonic empire and the establishment of the third French republic on the 4th of September 1870; (3) the occupation of Rome by the Italian forces on the 20th of September 1870, resulting in the incorporation of the remaining states of the Church in the kingdom of Italy; and (4) the foundation of the German Empire by the proclamation, on the 18th of January 1871, of the king of Prussia as hereditary German emperor. These changes, which so greatly disturbed the current of all European relations, could not fail to react upon the papal policy in various ways. They brought its existing tendencies into greater relief, set before it new aims and diverted it into new channels. Essential modifications could not, of course, be at once effected or even indicated in a power whose life-blood is tradition, and whose main strength has always lain in calmly abiding the issue of events and in temporizing. The eight years that Pius IX. was permitted to see after the loss of his temporalities entirely harmonize with this character. The veil that hides the negotiations which, during the closing months of the Franco-German War, were carried on between Bismarck and the pope, through the agency of Cardinal Bonnhose, has not yet been lifted, and perhaps never will be. According to Prince Bismarck's own account of the matter, as given in his *Gedanken und Erinnerungen*, these negotiations were initiated by the chancellor, who, between the 5th and 9th of November 1870, entertained *pourparlers* with Archbishop Ledochowski on the question of the territorial interests of the pope. The chancellor, acting, as he himself says, in the spirit of the adage, "one hand washes the other," proposed to that prelate that the pope should give earnest of the relations subsisting between him and Germany by influencing the French clergy in the direction of the conclusion of peace. The cool reception his endeavours met with, both at the hands of the French ecclesiastics as well as in Rome, satisfied Bismarck "that the papal hierarchy lacked either the power or the good will to afford Germany assistance of sufficient value to make it worth while giving umbrage to both the German Protestants and the Italian national party, and risking a reaction of the latter upon the future relations between the two countries, which would be the inevitable result were Germany openly to espouse the papal cause in Rome." These utterances are eminently characteristic. They show how far Bismarck was (even at the close of 1870) from comprehending the traditional policy of the papacy towards Germany and German interests, and how little he conceived it possible to employ the relations between the future empire and the Vatican as a point of departure for a successful and consistent ecclesiastical policy. Rome, in a certain sense, showed itself possessed of far greater foresight. The German politicians and the Prussian diplomatists accredited to Rome had worked too openly at undermining the papal hierarchy, and had veiled their sympathies for Piedmont far too lightly to lead the Vatican to expect, after the 20th of September 1870, a genuine and firm intervention on the part of Prussia on behalf of the temporal power of the Holy See. To satisfy the demands of Bismarck in November 1870 would have cost the Vatican more than it would ever have gained. It could neither afford to trifle with the sympathies of the French Catholics nor to interrupt the progress of those elements, which would naturally be a thorn in the side of the young German Empire, thus undo Bismarck's work, and restore the Vatican policy to its pristine strength and vigour. It was soon to be perceived how carefully the Curia had made its calculations.

The address of the Catholic deputies to the emperor William in Versailles on the 18th of February 1871, pleading for the restoration of the States of the Church and the temporal sovereignty of the pope, and for the reconstitution of the Catholic group formed in the Prussian Landtag in 1860 as the *Centrum* or Centre Party in the new Reichstag (April 1871), must not be regarded as the origin but rather the immediate occasion of the *Kulturkampf*. The congratulations which the pope sent to the emperor William on receiving the announcement of the establishment of the German Empire (March 6, 1871) were a last exchange of civilities, and the abolition of the Catholic department in the Prussian ministry of public worship (July 8, 1871) quickly followed, together with the appointment of Falk as *Kultusminister* (Jan. 22, 1872), and the School Inspection Law of the 9th of February 1872.

The Kulturkampf.

On the 30th of January Bismarck took the opportunity of inveighing against the formation of the sectarian Centrum as being "one of the most monstrous phenomena in the world of politics," and he left no room for doubt in the minds of his hearers that he regarded the leadership of Windthorst as constituting, in his eyes, a peril to the national unity. In his *Memoirs* (ii. 126) he declares that the *Kulturkampf* was mainly initiated by him as a Polish question. This declaration, in view of the development of affairs, must appear as strange as the chancellor's confession (*Memoirs*, ii. 129 seq.) that he endeavoured to persuade the emperor of the advantage of having a nuncio accredited to Berlin (in lieu of the Catholic department of public worship). The refusal of the emperor William to entertain this project shows that in such matters his judgment was more correct than that of his counsellor, and the incident proves that the latter had anything but a clear insight into the historical position. He was drifting about with no higher aim than a "hand-to-mouth" policy, whilst the Holy See could feel the superiority with which the consciousness of centuries of tradition had endowed it, and took full advantage of the mistakes of its opponent. The chancellor never realized the gravity of the onslaught which, with his *Kulturkampf*, he was making upon the conscience and liberty of his Catholic fellow citizens. He dealt with the great question at issue from the standpoint of the diplomatist, rather than from that of the statesman well versed in ecclesiastical history and possessing an insight into what it implies; and by his violent, inconsiderate action he unwittingly drove into the ranks of Ultramontanism the moderate elements of the Catholic population. This conflict, moreover, brought Ultramontanism the enormous advantage that, even after the abolition of the May Laws, it had still left to it a well-disciplined press, an admirable organization, and a network of interests and interested parties; and all these combined to make the Centrum the strongest and the most influential political party in Germany for the remainder of the 19th century. Owing to these circumstances, the rise and further development of the

Kulturkampf were viewed in Jesuit and Vatican circles with feelings of the utmost complacency.

The purely ecclesiastical policy of Pius IX. was guided by the earnest desire to see the doctrine of Papal Infallibility brought to universal recognition. The definition of the Immaculate Conception (1854) and the proclamation of the Syllabus (1864) were finger-posts pointing the way to the Council of 1870. The pope had been persuaded that the proclamation of the new dogma would be effected without difficulty and without discussion; and when the pronouncement actually met with opposition, he was both surprised and embittered. For a moment the idea was entertained of giving way to the opposition and deferring a decision in the matter, or, in the manner of the fathers in the Council of Trent, adjourning it to the Greek kalends. But the party that needed for its purposes an infallible pope readily persuaded Pius IX. that if the council broke up without arriving at a decision favourable to the papacy, this would be tantamount to a serious defeat of the Holy See and an open victory for the Gallican system. The consequence was the bull *Pastor aeternus*, which Pius IX. issued on the 15th of July. This did not by any means represent all the demands of the Jesuits, and it was couched in terms which appeared not unacceptable to the majority of the Catholics. The fact that the bishops were prepared to forego their opposition was not unknown in Rome. It was anticipated by the authorities. But in Germany, as also in France, the waves of anti-Infallibility were rolling so high, that the further development of events was viewed with no small concern. Under normal conditions, the situation could not fail to terminate favourably for the Vatican. That the *Kulturkampf* had followed so rapidly upon the war was the greatest piece of good fortune that could have befallen the Holy See. The war demanded both in Germany and France the sacrifice of all available energy and public spirit; while the *Kulturkampf*, by bringing into relief the question of the external existence of the Church, thrust all internal dogmatic interests and problems completely into the background. The egregious blunder in the May Laws was the punitive clauses directed against the inferior clergy. Instead of enlisting them as friends, the Prussian government contrived by wild and wanton persecution to make them its enemies. The open protection it accorded to the Old Catholic movement contributed in no small measure to estrange those influential elements which, whilst favouring the suppression of Ultramontane tendencies, desired no schism in the Church, and viewed with horror the idea of a National Church in Bismarck's sense (see OLD CATHOLICS). Thus we find that the bitter years of the *Kulturkampf* extricated the Vatican from one of the most difficult situations in which it had ever been placed. Pius IX. could now fold his hands, so far as the future was concerned. It is well known that he fed on inspirations, and expected each day the advent of some supernatural occurrence which should bring about the triumph of the Church. In this frame of mind, on the 24th of June 1872, he addressed the German *Leseverein*, and referred to the stone that would soon fall from on high and crush the feet of the Colossus. Yet the stone has not fallen from the summit of the holy hill, and the Colossus of the German Empire has not crumbled into dust, which is more than can be said for the pope's inspirations, which led him to expect the sudden withdrawal of the Italians from Rome, and a solution of the Roman question in the sense inspired by his visionary policy. The Holy See directed all its energies towards the solution of the problem; in the event of its proving to be insoluble, it would take care that it should remain a festering sore in the body of the monarchy. (For the *Kulturkampf* see further GERMANY: *History*.)

The documents of the Vatican Council which have been published since 1870 leave no room for doubt that the proclamation of Papal Infallibility was intended to be followed by a further declaration, to the effect that the doctrine of the temporal power of the pope should be regarded as a revealed article of faith; yet the advantage and necessity of the temporal power were not to be regarded as a revealed dogma properly speaking, but as a truth guaranteed by the doctrinal body of the Holy Church. These articles, contained in the 5th Scheme, and zealously championed by the sectaries of the Jesuit order, reveal the immediate object for which the council of 1869–1870 was convened. The resolutions were devised to save the situation, in view of the impending loss of the temporalities. No one could expect that Pius IX. would recognize the annexation of Rome by Italy. Rome, even in the 19th century, had been a spectator of many changes in the political world. It had seen more than one kingdom rise and fall. No wonder, then, that the Vatican, confronted by a new Italy, observed a passive and expectant attitude, and sanctioned no jot or tittle that could infringe its rights or be interpreted as a renunciation of its temporal sovereignty. It was quite in keeping that Pius IX. availed himself to the full of the (for him) convenient clauses of the Italian Law of Guarantees (May 13, 1871), while refusing the civil list of three and a quarter million lire provided for his use, and inhibiting Italian Catholics from participating in the elections to the House of Deputies (*nè elettori nè eletti*).[1] This step was regarded in Italy as a natural one. Although the Liberal record of the pope was a thing of the past, and his policy had, since Gaeta, become firmly identified with the reactionary policy of Antonelli, yet the early years of his pontificate were in such lively recollection as to allow of Pius IX.'s appearing to some extent in the light of a national hero. And rightly; for he had always had a warm heart for Italy; and had it not been for the anti-ecclesiastical policy of the house of Piedmont, he would not, in the 'sixties, have been wholly averse from reconciliation. The hitherto unpublished correspondence of the pope with Victor Emmanuel contains remarkable proofs in support of this contention, and a further corroboration can also be preceived in the conciliatory attitude of Pius IX. on the death of the king.

The Papacy and the new Italian Kingdom.

Pius died on the 7th of February 1878, only a few weeks later than his opponent. He had long passed the traditional years of Peter's pontificate, had reigned longer than any previous wearer of the tiara, and had seen some brilliant days—days of illusory glory. On his death he left the Church shaken to its very foundations, and in feud with almost every government. In Italy the Holy See was surrounded by a hostile force, whose "prisoner" the lord of the Vatican declared himself to be. In Spain and Portugal, and also in Belgium, a Liberalism inimical to the Church was in power. Prussia, together with other German states, was in arms against pope and episcopate. In France the Conservative Monarchical party had just shown its inability to preserve the Crown, whilst the Republic had anchored itself firmly by denouncing the clergy as its enemy. There was hardly a sovereign or a government in Christendom against which Pius IX. had not either protested or against which he had not openly declared war. Such was the heritage that devolved upon Leo XIII. on his election on the 20th of February 1878.

Leo XIII., 1878-1903.

Leo XIII. brought to his new dignity many qualities that caused his election to be sympathetically received. In contrast to his predecessor, he was a man of slow and calm deliberation, and it was natural to suppose that he was little, if at all, accessible to impulses of the moment or to the persuasions of his entourage. He was endowed with a certain scholastic erudition, and enjoyed the reputation of being a good Latinist. As nuncio in Brussels he had become acquainted with the trans-Alpine world, and had been initiated into the working of the machinery of modern politics and modern parliamentary government. The fact that he had for so long been absent from Rome afforded ground for the belief that he was not inclined to identify himself with any of the parties at the Vatican court. These were the considerations that had caused the Moderates in the Sacred College to fix their eyes upon him. The appointment of Franchi as secretary of state was a bid for peace that was viewed by the Irreconcilables with ill-disguised vexation. The following years of Leo XIII.'s pontificate only tended to increase their dissatisfaction. The first care of the new pope was to pave the way for the restoration of peace with Russia and the German Empire, and it was owing to his patience, persistence and energy that these efforts for peace were crowned with success. In the case of Germany he made many concessions which appeared to the *Zelanti* to be excessive, and made even still greater ones to France and Russia, to the great distress of the Poles. But at last Leo XIII. could boast not only of having re-established diplomatic relations with most of the powers, but also of having entered into a convention with the great powers of the North, which accorded him, in conjunction with the three emperors, a leading position as champion of the conservative interests of humanity. How proud Leo XIII. was of his importance in this position is shown by the beautiful encyclical, *De civitatum constitutione christiana* ("Immortale Dei" of Nov. 1, 1885), in which he adopted the strongest attitude against the principle of the sovereignty of the people (*ex iis autem Pontificum præscriptis illud omnino intelligi necesse est, ortum publicæ potestatis a Deo ipso, non a multitudine repeti posse*), refuting the notion that the principle of public power emanates from the will of the people alone (*principatum non esse nisi populi voluntatem*), and absolutely rejecting the sovereignty of the people as such. But this attitude was adopted by Leo XIII. not as an end but as a means. The real aims of his rule were disclosed in the second phase of his pontificate.

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[1] By the Law of Guarantees the pope was recognized as an independent sovereign, with jurisdiction over his own palaces and their extensive precincts and the right to receive diplomatic representatives accredited to him. He also received the right to appoint bishops, who—except in Rome and the suburbicarian districts—were to be Italian subjects; and, with a significant exception, the *exequatur*, *placet regium*, and every form of government permission for the publication and execution of acts of ecclesiastical authority were abolished. (See also ITALY: *History*.)

Leo XIII. as Diplomatist.

At its very commencement, the pope in his first encyclical (Easter 1878) proclaimed the necessity of a temporal hierarchy. This was at the time regarded merely as a formality imposed by circumstances, and one not to be seriously entertained; but it became more and more evident that the recovery of the temporalities was the real mainspring of Leo's whole policy. In the negotiations with Germany, it was clearly seen that it was from that side that the pope expected intervention in favour of restitution; and, according to all appearances, Bismarck did for a while keep alive these representations, though with more tact than candour. After peace had been concluded, Leo, by the agency of Galimberti, reminded the chancellor of the settlement of the Roman question. Bismarck replied that he was "unaware of the existence of any such question." The two visits paid by Emperor William II. to the Vatican could not fail to remove any doubts in the mind of the pope as to the fact that Germany did not dream of giving him back Rome. The Austro-German-Italian triple alliance was a dire blow to his expectations, and Crispi's policy with its irritating and galling pin-pricks caused the cup to overflow.

Leo XIII. and the French Republic.

Thus slowly, but yet deliberately, between 1887 and 1893, a transformation took place in Leo's spirit and policy, and with it was brought about one of the most momentous changes in the attitude of the Church towards the problems of the times and their impelling forces. A *rapprochement* with France inevitably entailed not only an alliance with modern democracy, but also a recognition of its principles and aims. In Rome there was no room for both pope and king. The note of the pope to Rampolla of the 8th of October 1895, in consequence of the celebrations on the 20th of September, declared, in terms more decided than any that had until then been uttered, that the papacy required a territorial sovereignty in order to ensure its full independence, and that its interests were therefore incompatible with the existence of the kingdom of Italy as then constituted. The inevitable consequences ensued. Italy regarded the pope more than ever as a foe within its walls; and the policy of the pope, as regards Italy, aimed at replacing the kingdom by one or more republics, in which the temporal power should, in some form or other, find a place. But the continuance of the Republic in Paris was a condition precedent to the establishment of a republic in Rome, and the first had no chance of existence if the democracy in France did not remain in power. The result was the policy of the *Ralliement*. Instructions were given to the French Catholics to break with monarchical principles, and both externally and internally to cleave to the Republic as representing the best form of constitutional government. In carrying out the régime of Rampolla, which was, in every respect, a bad imitation of that of Antonelli, the Vatican left no stone unturned in its attempt to coerce the conscience of the French royalists; it did not even stop at dishonour, as was evidenced by the case of the unhappy Mgr d'Hulst, who, in order to evade the censorship of his pamphlet on Old Testament criticism, had to abandon both his king and his principles, only to die in exile of a broken heart. The case was characteristic of the whole Catholic monarchical party, which, owing to the pope's interference in French politics, became disintegrated and dissolved, a fate that was all the more painful seeing that the *Ralliement* failed to influence the course of events. The "atheistic" Republic did not for one moment think of putting on sackcloth, or even of giving the Church a single proof of esteem and sympathy.

The Pope and Social Democracy.

In one respect it was impossible for the papacy to continue on the path it had taken. In his first encyclical, Leo XIII. had sounded the clarion for battle against the Social Democracy; his encyclical *Novarum rerum* endeavoured to show the means to be employed, mainly in view of the condition of things in Belgium, for solving the social question on Christian lines. But the Christian Democracy, which, starting in Belgium and France, had now extended its activity to Italy, Austria and Germany, and was striving to arrive at this solution, degenerated everywhere into a political party. The leaders of this party came into close contact with the Social Democrats, and their relations became so cordial that Social Democracy everywhere declared the "Démocratie Chrétienne" to be its forerunner and pioneer. The electioneering alliances, which were everywhere in vogue, but particularly in Germany, between the Catholics and popular party and the Social Democrats, throw a lurid light upon the character of a movement that certainly went far beyond the intentions of the pope, but which it was now difficult to undo or to hold in check. For it is the essence of the matter that there were further considerations going far beyond the Roman question and forcing the Curia to adhere to the sovereignty of the people.

Alienation of the Educated Middle Class.

The external rehabilitation of the Church had become, in many points, a *fait accompli*, but, internally, events had not kept pace with it. Catholic romanticism had withered away in France, as it had in Germany. "Liberal Catholicism," which was its offspring, had died with Montalembert, after being placed under a ban by Rome. The national religious movement, associated in Italy with the great names of Rosmini and Gioberti, had similarly been disavowed and crushed. The development of the last decade of the 19th century had clearly shown that the educated *bourgeoisie*, the *tiers état*, in whose hands the supreme power had since 1848 become vested throughout Europe, was either entirely lost to the Church or, at all events, indifferent to what were called Ultramontane tendencies. The educated *bourgeoisie*, which controls the fields of politics, science, finance, administration, art and literature, does not trouble itself about that great spiritual universal monarchy which Rome, as heir of the Caesars, claimed for the Vatican, and to which the Curia of to-day still clings. This *bourgeoisie* and the modern state that it upholds stand and fall with the motion of a constitutional state, whose magna carta is municipal and spiritual liberty, institutions with which the ideas of the Curia are in direct conflict. The more the hope of being able to regain these middle classes of society disappeared, the more decidedly did the Curia perceive that it must seek the support and the regeneration of its power in the steadily growing democracy, and endeavour through the medium of universal suffrage to secure the influence which this new alliance was able to offer.

The pontificate of Leo XIII. in its first phase aimed at preserving a certain balance of power. Whilst not openly repelling

The Papacy and the Modern Democracy.

the tendencies of the Jesuits, Leo yet showed himself well disposed towards, and even amenable to, views of a diametrically opposite kind; and as soon as the Vatican threw itself into the arms of France, and bade farewell to the idea of a national Italy, the policy of equilibrium had to be abandoned. The second phase in Leo's policy could only be accomplished with the aid of the Jesuits, or rather, it required the submission of the ecclesiastical hierarchy to the mandates of the Society of Jesus. The further consequence was that all aspirations were subjected to the thraldom of the Church. The pontificate of Leo XIII. is distinguished by the great number of persecutions, prosecutions and injuries inflicted upon Catholic *savants*, from the prosecution of Antonio Rosmini down to the proscription directed against the heads of the American Church. Episodes, such as the protection so long extended to the Leo Taxil affair, and to the revelations of Diana Vaughan (the object of which last was to bring Italian freemasonry and its ostensible work, the unity of Italy, into discredit), together with the attitude of the Ultramontane press in the Dreyfus affair, and later towards England, the invigoration of political agitation by the Lourdes celebration and by anti-Semitism, were all manifestations that could not raise the "system" in the estimation of the cultured and civilized world. Perhaps even more dangerous was the employment of the whole ecclesiastical organization, and of Catholicism generally, for political purposes.

No one will be so foolish or so unjust as to hold Leo XIII. responsible for the excesses committed by the subordinate departments of his government, in disclosing prosecuting and sometimes even fraudulently misrepresenting his aims and ends. But all these details, upon which it is not necessary to dwell, are overshadowed beyond all doubt by the one great fact that the ecclesiastical régime had not only taken under its wing the solution of social questions, but also claimed that political action was within the proper scope of the Church, and, moreover, arrogated to itself the right of interfering by means of "Directives" with the political life of nations. This was nothing new, for as early as 1215 the English barons protested against it. But the weakening of the papacy had allowed this claim to lapse for centuries. To have revived it, and to have carried it out as far as is possible, was the work of Leo XIII.

It would be both presumptuous and premature to pass a final verdict upon the value and success of a policy to which, whatever else be said, must be accorded a certain meed of praise for its daring. Even in 1892 Spüller, in his essay upon Lamennais, pointed out how the latest evolution of Catholicism was taking the course indicated by Lamennais in his *Livre du peuple* (1837), and how the hermit of "La Chênaie," who departed this life in bitter strife with Rome, declared himself to be the actual precursor of modern Christian Socialism. He hinted that the work of Leo XIII. was, in his eyes, merely a new attempt to build up afresh the theocracy of the middle ages upon the ruins of the old monarchies, utilizing to this end the inexperience of the young and easily beguiled democracies of the dawning 20th century. To comprehend these views aright, we must first remember that what in the first half of the 19th century, and also in the days of Lamennais, was understood by Democracy was not coincident with the meaning of this expression as it was afterwards used, and as the Christian Socialists understood it. Down to 1848, and even still later, "Democracy" was used to cover the whole mass of the people, pre-eminently represented by the broad strata of the *bourgeoisie*; in 1900 the Democratic party itself meant by this term the rule of the labouring class organized as a nation, which, by its numerical superiority, thrust aside all other classes, including the *bourgeoisie*, and excluded them from participation in its rule. In like manner it would be erroneous to confuse the sense of the expression as it obtains on the continent of Europe with what is understood under this term in England and America. In this latter case the term "Democracy," as applied to the historical development of Great Britain and the United States, denotes a constitutional state in which every citizen has rights proportionate to his energy and intelligence. The socialistic idea, with which the "Démocratie Chrétienne" had identified itself both in France and Belgium, regards numbers as the centre of gravity of the whole state organism. As a matter of fact it recognizes as actual citizens only the labourer, or, in other words, the proletariat.

On surveying the situation, certain weak points in the policy of the Vatican under Leo XIII. were manifest even to a contemporary observer. They might be summed up as follows: (1) An unmistakable decline of religious fervour in church life. (2) The intensifying and nurturing of all the passions and questionable practices which are so easily encouraged by practical politics, and are incompatible in almost all points with the priestly office. (3) An ever-increasing displacement of all the refined, educated and nobler elements of society by such as are rude and uncultured, by what, in fact, may be styled the ecclesiastical "Trottori." (4) The naturally resulting paralysis of intelligence and scientific research, which the Church either proscribed or only sullenly tolerated. (5) The increasing decay and waxing corruption of the Romance nations, and the fostering of that diseased state of things which displayed itself in France in so many instances, such as the Dreyfus case, the anti-Semitic movement, and the campaign for and against the Assumptionists and their newspaper, the *Croix*. (6) The increasing estrangement of German and Anglo-Saxon feeling. As against these, noteworthy reasons might be urged in favour of the new development. It might well be maintained that the faults just enumerated were only cankers inseparable from every new and great movement, and that these excrescences would disappear in course of time, and the whole movement enter upon a more tranquil path. Moreover, in the industrial districts of Germany, for example, the Christian industrial movement, supported by Protestants and Catholics alike, had achieved considerable results, and proved a serviceable means of combating the seductions of Socialism. Finally, the Church had reminded the wealthy classes of their duties to the sick and toilers, and by making the social question its own it had gone a long way towards permeating all social and political conditions with the spirit of Christianity. (F. X. K.)

VI.—*Period from 1900 to 1910.*

Pius X.

On the 3rd of March 1903 Leo XIII. celebrated his Jubilee with more than ordinary splendour, the occasion bringing him rich tributes of respect from all parts of the world, Catholic and non-Catholic; on the 20th of July following he died. The succession was expected to fall to Leo's secretary of state, Cardinal Rampolla; but he was credited with having inspired the French sympathies of the late pope; Austria exercised its right of veto (see CONCLAVE, *ad fin.*), and on the 8th of August, Giuseppe Sarto, who as cardinal patriarch of Venice had shown a friendly disposition towards the Italian government, was elected pope. He took as his secretary of state Cardinal Raphael Merry del Val, a Spaniard of English birth and education, well versed in diplomacy, but of well-known ultramontane tendencies. The new pope was known to be no politician, but a simple and saintly priest, and in some quarters there were hopes that the attitude of the papacy towards the Italian kingdom might now be changed. But the name he assumed, Pius X., was significant; and, even had he had the will, it was soon clear that he had not the power to make any material departure from the policy of the first "prisoner of the Vatican." What was even more important, the new régime at the Vatican soon made itself felt in the relations of the Holy See with the world of modern thought and with the modern conception of the state.

The new pope's motto, it is said, was "to establish all things in Christ" (*instaurare omnia in Christo*); and since, *ex hypothesi*, he himself was Christ's vicar on earth, the working out of this principle meant in effect the extension and consolidation of the papal authority and, as far as possible, an end to the compromises by means of which the papacy had sought to make friends of the Mammon of unrighteousness. It was this spirit which informed such decrees as that on "mixed marriages"

(*Ne temere*) of 1907, which widened still further the social gulf between Catholics and Protestants (see Marriage: *Canon Law*), or the refusal to allow the French bishops to accept the Associations Law passed by the French government after the denunciation of the concordat and the separation of Church and State (see France: *History*): better that the Church in France should sink into more than apostolic poverty than that a tittle of the rights of the Holy See should be surrendered. Above all it was this spirit that breathed through every line of the famous encyclical, *Pascendi gregis*, directed against the "Modernists" (see Roman Catholic Church: *History*), which denounced with bitter scorn and irony those so-called Catholics who dared to attempt to reconcile the doctrine of the Church with the results of modern science, and who, presumptuously disregarding the authority of the Holy See, maintained "the absurd doctrine that would make of the laity the factor of progress in the Church." That under Pius X. the papacy had abandoned none of its pretensions to dominate consciences, not of Catholics only, was again proved in 1910 when, at the very moment when the pope was praising the English people for the spirit of tolerance which led the British government to introduce a bill to alter the form of the Declaration made by the sovereign on his accession into a form inoffensive to Roman Catholics, he was remonstrating with the government of Spain for abrogating the law forbidding the Spanish dissident churches to display publicly the symbols of the Christian faith or to conduct their services otherwise than semi-privately.

Church Reforms.

Reforms of Pius X.

In pursuance of the task of strengthening the Holy See, the Vatican policy under Pius X. was not merely one of defiance towards supposed hostile forces within and without the Church; it was also strenuous in pushing on the work of internal organization and reform. In 1904 a commission of cardinals was appointed to undertake the stupendous task of codifying the canon law (see Canon Law), and in 1908 an extensive reorganization of the Curia was carried out, in order to conform its machinery more nearly to present-day needs (see Curia Romana). In taking England, the United States and other non-Catholic states from under the care of the Congregation of the Propaganda, the pope raised the status of the Roman Catholic Church in those countries. All these changes tended to consolidating the centralized authority of the papacy. Other reforms were of a different character. One of the earliest acts of the new pontificate was to forbid the use in the services of the Church of any music later than Palestrina, a drastic order justified by the extreme degradation into which church music had fallen in Italy, but in general honoured rather in the spirit than in the letter. More important was the appointment in 1907 of a commission, under the presidency of Abbot Gasquet, to attempt the restoration of the pure text of the Vulgate as St Jerome wrote it.

Causes of the Revival of the Papacy.

Such activities might well be taken as proof that the papacy at the outset of the 20th century possessed a vigour which it was far from possessing a hundred years earlier. Under Pius VI. and Pius VII. the papacy had reached the lowest depths of spiritual and political impotence since the Reformation, and the belief was even widespread that the prisoner of Fontainebleau would be the last of the long line of St Peter's successors. This weakness was due not to attacks from without—for orthodox Protestantism had long since lost its aggressive force—but to disruptive tendencies within the Church; the Enlightenment of the 18th century had sapped the foundations of the faith among the world of intellect and fashion; the development of Gallicanism and Febronianism threatened to leave the Holy See but a shadowy pre-eminence over a series of national churches, and even to obliterate the frontier line between Catholicism and Protestantism. It was the Revolution, which at one moment seemed finally to have engulfed the papacy, which in fact preserved it; Febronianism, as a force to be seriously reckoned with, perished in the downfall of the ecclesiastical principalities of the old Empire; Gallicanism perished with the constitutional Church in France, and its principles fell into discredit with a generation which associated it with the Revolution and its excesses. In the reaction that followed the chaos of the Revolutionary epoch men turned to the papacy as alone giving a foothold of authority in a confused and quaking world. The Romantic movement helped, with its idealization of a past but vaguely realized and imperfectly understood, and Chateaubriand heralded in the Catholic reaction with his *Génie du Christianisme* (1801) a brilliant if superficial attack on the encyclopaedists and their neo-Paganism, and a glorification of the Christian Church as supreme not only in the regions of faith and morals, but also in those of intellect and art. More weighty was the *Du Pape* of Joseph de Maistre (1819), closely reasoned and fortified with a wealth of learning, which had an enormous influence upon all those who thought that they saw in the union of "altar and throne" the palladium of society. The Holy Empire was dead, in spite of the pope's protest at Vienna against the failure to restore "the centre of political unity"; Joseph de Maistre's idea was to set up the Holy See in its place. To many minds the papacy thus came to represent a unifying principle, as opposed to the disruptive tendencies of Liberalism and Nationalism, and the papal monarchy came to be surrounded with a new halo, as in some sort realizing that ideal of a "federation of the world" after which the age was dimly feeling.

The Papacy and Modern Thought.

So far as politics are concerned this sentiment was practically confined to certain classes, which saw their traditional advantages threatened by the revolutionary tendencies of the times; and the alliance between the throne and the altar, by confusing the interests of the papacy with those of political parties, tended—as Leo XIII. had the wit to realize—to involve the fate of the one with that of the other, as in France. Far stronger was the appeal made by the authoritative attitude of the papacy to all those who were disturbed by the scientific spirit of the age: the ceaseless questioning of all the foundations on which faith and morality had been supposed to rest. Biblical criticism, by throwing doubt on the infallibility of the Scriptures, was undermining the traditional foundation of orthodox Protestantism, and most of the Protestant Churches, divided between antagonistic tendencies, were ceasing to speak with a certain voice. To logical but timid minds, like that of J. H. Newman, which could not be content with a compromise with truth, but feared to face ultimate realities, the rigidly authoritative attitude of Rome made an irresistible appeal. The process, maybe, from the point of view of those outside, was to make a mental wilderness and call it peace; but from the papal point of view it had a double advantage: it attracted those in search of religious certainty, it facilitated the maintenance of its hold over the Catholic democracy. The methods by which it has sought to maintain this hold are criticized in the article Ultramontanism.

The Loss of the Temporal Power.

There can also be little doubt—though the Curia itself would not admit it—that the spiritual power of the papacy has been greatly increased by the loss of the temporal power. The pope is no longer a petty Italian prince who, in order to preserve his dominions, was necessarily involved in the tangle of European diplomacy; he is the monarch of a vast, admirably organized, spiritual world-empire, and when—as must needs happen—the overlapping of the spiritual and temporal spheres brings him into conflict with a secular power, his diplomacy is backed, wherever Catholic sentiment is strong, by a force which the secular power has much difficulty in resisting; for in spiritual matters (and the term covers a wide field) the Catholic, however loyal to his country he may be, must obey God, whose vicegerent is the pope, rather than man. Even Bismarck, in the end, had to "go to Canossa."

It is, indeed, possible to exaggerate this power. The fact that the Vatican presents a great force hostile to and obstructive of certain characteristic tendencies of modern life and thought has necessarily raised up a powerful opposition even in countries traditionally Catholic. France no longer deserves the title of eldest daughter of the Church; the Catholicism of Italy is largely superficial; even Spain has shown signs of restiveness. On the other hand, the great opportunity now open to the papacy on its spiritual side, is proved by the growing respect in which it has been held since 1870 in the English-speaking countries, where Roman Catholics are in a minority and their Church is in no sense established. Without doubt, opinion has been influenced in these countries by the fact that Rome has not been sufficiently strong to exercise any disturbing influence on the general course of national affairs, while in both its conspicuous members set a high example of private and civic conduct.

(W. A. P.)

List of the Pontiffs of the Roman Church.[1]

Date of Election or Consecration.		Date of Death.
c. 41	B. PETRUS	29 vi, *c.* 65–67
c. 67	S. Linus	† 23 ix, *c.* 79
c. 79	S. Cletus (*Anencletus*)	† 26 iv, *c.* 91
c. 91	S. Clemens I	† 23 xi, *c.* 100
*c.*100	S. Evaristus	† 26 x, *c.* 109
*c.*109	S. Alexander	† 3 v, *c.* 119
*c.*119	S. Sixtus (*Xystus*)	† 6 iv, *c.* 126
? 128	S. Telesphorus	† 5 i, 137
*c.*138	S. Hyginus	† 11 i, 142
*c.*142	S. Pius	† 11 vii, *c.* 156
*c.*157	S. Anicetus	† 17 iv, 167
168	S. Soter	† 22 iv, *c.* 176
177	S. Eleutherus	† 26 v, 189
*c.*190	S. Victor I.	† 20 iv, *c.* 202
*c.*202	S. Zephyrinus	† 26 viii, 217
218	S. Calixtus I.	† 14 x, 222
222	S. Urbanus I.	† 25 v, 230
230	S. Pontianus	*res.* 28 ix, 235
235 (21 xi, ord.)	S. Anterus	† 3 i, 236
236	S. Fabianus	† 20 i, 250
251 (iii. el.)	S. Cornelius	† 14 ix, 253
253 el.	S. Lucius	† 5 iii, 254
254 (12 v ?, el.)	S. Stephanus I.	† 2 viii, 257
257 viii	S. Sixtus (*Xystus*) II.	† 6 viii, 258
259 22 vii, el,	S. Dionysius	† 26 xii, 268
269 5 i, el.	S. Felix	† 30 xii, 274
275 *c.* 5 i	S. Eutychianus	† 8 xii, 283
283 17 xii	S. Gaius	† 22 iv, 296
296 30 vi	S. Marcellinus	† (? 25 x), 304
307 el.	S. Marcellus	† 15 i, 309
309 iv, el.	S. Eusebius	† 17 viii, 309
310 2 vii	S. Melchiades (*Miltiades*)	† 11 i, 314
314 31 i	S. Sylvester	† 31 xii, 335
336 18 i	S. Marcus	† 7 x, 336
337 6 ii, el.	S. Julius	† 12 iv, 352
352 22 v	S. Liberius	† 24 ix, 366
366 ix	S. Damasus	† 10 xii, 384
384 xii	S. Siricius	† 26 xi, 398
398 xi–xii	S. Anastasius I.	† *vert. anno* 401–2
402	S. Innocentius I.	† 12 iii, 417
417 18 iii, cs.	S. Zosimus	† 26 xii, 418
418 28 xii	S. Bonifacius I.	† 4 ix, 422
422 *c.* 10 ix	S. Coelestinus I.	† *c.* 26 vii, 432
432 31 vii	S. Sixtus III.	† 18 viii, 440
440 viii, el.	S. Leo I.	† 10 xi, 461
461 12 xi, cs.	S. Hilarus	† 21 ii, 468
468 25 ii, cs.	S. Simplicius	† 2 iii, 483
483	S. Felix III.	† *c.* 25 ii, 492
492 1 iii, cs.	S. Gelasius	† 19 xi, 496
496 *c.* 24 xi. cs.	S. Anastasius II.	† *et sep.* 19 xi, 498
498 22 xi	S. Symmachus	† *et sepult.* 19 vii, 514
514 20 vii, cs.	S. Hormisdas	† *sepult.* 7 viii, 523
523 13 viii	S. Joannes I.	† 18 v, 526
526 12 vii, cs.	S. Felix IV.	† *sepel.* 12 x (?) 530
530 17 ix, el.	Bonifacius II.	† *sepul.* 17 x, 532
532 31 xii, cs.	Joannes II.	† *sepel.* 27 v, 535
535 3 vi, cs.	S. Agapetus I.	† 22 iv, 536
536 8 vi, cs.	S. Silverius, *exul*	† *sepel.* 20 vi, *c.* 538
537 29 iii, cs.	Vigilus	† 7 vi, 555
555 *p.* 7 vi, cs.	Pelagius I.	† 3 iii, 560
560 14 vii, cs.	Joannes III.	† *sepel.* 13 vii, 573
574 3 vi, cs.	Benedictus I.	† 31 vii, 578
578 27 xi, cs.	Pelagius II.	† *sepel.* 6 ii, 590
590 3 ix, cs.	S. Gregorius I.	† *sepel.* 12 iii, 604
604 13 ix, cs.	Sabinianus	† 22 ii, 606
607 19 ii, cs.	Bonifacius III.	† *sepel.* 12 xi, 607
608 15 ix, cs.	S. Bonifacius IV.	† *sepel.* 25 v, 615
615 19 x, cs.	S. Deusdedit	† *sepel.* 8 xi, 618
619 23 xii, cs.	Bonifacius V.	† *sepel.* 25 x, 625
625 3 xi, cs.	Honorius	† *sepel.* 12 x, 638
640 28 v, cs.	Severinus	† *sepel.* 2 viii, 640
640 25 xii, cs.	Joannes IV.	† *sepel.* 12 x, 642
642 24 xi, cs.	Theodorus I.	† *sepel.* 14 v, 649
649 vi–vii, cs.	S. Martinus	† *exul* 16 ix, 655
654 10 viii, cs.	S. Eugenius I.	† *sepel.* 3 vi, 657
657 30 vii, cs.	S. Vitalianus	† *sepel.* 27 i, 672
672 11 iv, cs.	Adeodatus	† *sepel.* 16 vi, 676
676 2 xi, cs.	Donus	† *sep.* 11 iv, 678
678 vi–vii, cs.	S. Agatho	† *sep.* 10 i, 681
682 17 viii, cs.	S. Leo II.	† *sep.* 3 vii, 683
684 26 vi, cs.	S. Benedictus II.	† *sep.* 8 v, 685
685 23 vii, cs.	Joannes V.	† 2 viii, 686
686 21 x, cs.	Conon	† *sepel.* 22 ix, 687
687 x-xii, el.	S. Sergius I.	† *sepel.* 8 ix, 701
701 30 x, cs.	Joannes VI.	† *sepel.* 10–11 i, 705
705 1 iii, cs.	Joannes VII.	† *sep.* 18 x, 707
708 18 i (?)	Sisinnius	† *sep.* 7 ii, 708
708 25 iii, cs.	Constantinus I.	† 9 iv, 715
715 19 v, cs.	S. Gregorius II.	† *sepel.* 11 ii. 731
731 11 ii, el.	S. Gregorius III.	† *sep.* 29 xi, 741
741 3 xii, cs.	S. Zacharias	† *sep.* 15 iii, 752
752 iii, el.	Stephanus II.	† *ex.* iii, 752
752 *ex.* iii, el.	Stephanus III.	† *sep.* 26 iv, 757
757 29 v, cs.	S. Paulus I.	† 28 vi, 767
767 5 vii, cs.	Constantinus II.	*depos.* 6 viii, 768
768 7 viii, cs.	Stephanus IV	† 1 ii, 772
772 1 ii, el.	Hadrianus I.	† 25 xii, 795
795 26 xii, el.	S. Leo III.	† *sep.* 12 vi, 816
816 vi, el.	Stephanus V.	† 24 i, 817
817 25 i, cs.	S. Paschalis I.	† *c.* 14 v, 824
824 v–vi	Eugenius II.	† viii, 827
827	Valentinus	† *ex. ann.* 827
827 *ex. ann.*	Gregorius IV.	† i, 844
844 i	Sergius II.	† 27 i, 847
847 10 iv, cs.	S. Leo IV.	† 17 vii, 855
855 29 ix, cs.	Benedictus III.	† 7 iv, 858
858 24 iv, cs.	S. Nicolaus I.	† 13 xi, 867
867 14 xii, cs.	Hadrianus II.	† *c.* 1 xii, 872
872 14 xii	Joannes VIII.	† 15 xii, 882
882 *c.* xii	Marinus I.	† *c.* v, 884
884 *c.* v, el.	Hadrianus III.	† *c.* viii–ix, 885
885 *c.* ix, el.	Stephanus VI.	† *c.* ix, 891
891 *c.* ix	Formosus	† 23 v, 896
896 *c.* 23 v, el.	Bonifacius VI.	† *c.* 6 vi, 896
896 *a.* 11 vi,intrus	Stephanus VI. (VII.)	*amot.* † vii, 897
897 vii, cs.	Romanus	† *c.* xi, 897
897 *c.* xi	Theodorus II.	† *post* 20 *dies*
898 *c.* vi, cs.	Joannes IX.	† vii, 900
900 6–26 vii	Benedictus IV.	† viii, 903
903 *c.* viii	Leo V.	† *c.* ix, 903
903 *c.* x	Christophorus	*amot.* i, 904
904 29 i, cs.	Sergius III.	† *p* 4 ix, 911
911 *c.* ix, cs.	Anastasius III.	† *c.* xi, 913
913 *c.* xi, cs.	Lando	† *c.* v, 914
914 15 v, cs.	Joannes X.	† *in carcere* 929
928 *c.* vii, cs.	Leo VI.	† *c.* ii, 929
929 *c.* ii. cs.	Stephanus VIII.	† 15 iii, 931
931 *c.* iii, cs.	Joannes XI.	† i, 936
936 *a.* 9 i, cs.	Leo VI. (VII.)	† vii, 939
939 *a.* 19 vii, cons.	Stephanus IX.	† *c.* x, 942
942 *a.* 11 xi, cons.	Marinus II.	† *c.* iv, 946
946 *c.* iv	Agapetus II.	† *c.* 8 xi, 955
955 *c.* xi, cs.	Joannes XII.	(*amot.* 4 xii, 963) † 14 v, 964
963 4 xii, el.	Leo VIII.	† *c.* iii, 965
964 v, el.	Benedict V.	*exul* 965
965 1 x, cs.	Joannes XIII.	† 6 ix, 972
973 19 i, cs.	Benedict VI.	† *occis.* vii, 974
974 x	Benedictus VII.	† x, 983
983 *ex. ann.*	Joannes XIV.	† *occis.* 20 viii, 984
984	Bonifacius VII.	† vii, 985
985 1 ix, cs.	Joannes XV.	† *in.* iv, 996
996 3 v, cs.	Gregorius V.	† ii, 999
999 *in.* iv, cs.	Sylvester II. (*Gerbert*)	† 12 v, 1003
1003 13 vi, cs.	Joannes XVII. (*Sicco*)	† 7 xii, 1003
1003 25 xii, cs.	Joannes XVIII.	† vi, 1009
1009 *p.* 20 vi, cs.	Sergius IV.	† 16–22 vi, 1012
1012 22 vi, cs.	Benedict VIII.	† 7 iv, 1024
1024 24 vi–15 vii,cs.	Joannes XIX.	† i, 1033
1033 i, cs.	Benedictus IX.	*resignat.* 1 v, 1045
1045 1 v, intr.	Gregorius VI.	*resignat.* 20 xii, 1046
1046 25 xii, cs.	Clemens II.	† 9 x, 1047
1048 17 vii, cs.	Damasus II.	† 9 viii, 1048
1049 12 ii, cs.	S. Leo IX.	† 19 iv, 1054
1055 13 iv, cs.	Victor II.	† 28 vii, 1057
1057 2 viii, el.	Stephanus X.	† 29 iii, 1058
1058 5 iv, el.	Benedict X.	*expuls. c.* i, 1059

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[1] As recorded in the registers of the Roman Church (from P. B. Gams, *Series episcoporum Romanae ecclesiae*).

Date of Election or Consecration.		Date of Death.
1059 24 i, cs.	Nicolaus II.	† 27 vii, 1061
1061 1 x, el.	Alexander II.	† 21 iv, 1073
1073 22 iv, el.	S. Gregorius VII.	† 25 v, 1085
1086 24 v, el.	Victor III.	† 16 ix, 1087
1088 12 iii, el.	Urbanus II.	† 29 vii, 1099
1099 13 viii, el.	Paschalis II.	† 21 i, 1118
1118 24 i, el.	Gelasius II.	† 29 i, 1119
1119 2 ii, el.	Calixtus II.	† 13–14 xii, 1124
1124 15–16 xii, el.	Honorius II.	† 14 ii, 1130
1130 14 ii, el.	Innocentius II.	† 24 ix, 1143
1143 26 ix, el.	Coelestinus II.	† 8 iii, 1144
1144 12 iii, el.	Lucius II.	† 15 ii, 1145
1145 15 ii, el.	Eugenius III.	† 8 vii, 1153
1153 12 vii, cs.	Anastasius IV.	† 3 xii, 1154
1154 4 xii, el.	Hadrianus IV.	† 1 ix, 1159
1159 7 ix, el.	Alexander III.	† 30 viii, 1181
1181 1 ix	Lucius III.	† 25 xi, 1185
1185 25 xi	Urbanus III.	† 20 x, 1187
1187 21 x, el.	Gregorius VIII.	† 17 xii, 1187
1187 19 xii, el.	Clemens III.	† iii, 1191
1191 30 iii, el.	Coelestinus III.	† 8 i, 1198
1198 8 i	Innocentius III.	† 16 vii, 1216
1216 18 vii	Honorius III.	† 18 iii, 1227
1227 19 iii	Gregorius IX.	† 21 viii, 1241
1241 x	Coelestinus IV.	† 17–18 xi, 1241
1243 25 vi	Innocentius IV.	† 13 xii, 1254
1254 25 xii	Alexander IV.	† 25 v, 1261
1261 29 viii	Urbanus IV.	† 2 x, 1264
1265 5 ii	Clemens IV.	† 29 xi, 1268
1271 1 ix	Gregorius X.	† 11 i, 1276
1276 23 ii cs.	Innocentius V.	† 22 vi, 1276
1276 12 vii, el.	Hadrianus V.	† 17 viii, 1276
1276 13 ix	Joannes XXI.	† 16 v, 1277
1277 25 xi	Nicolaus III.	† 22 viii, 1280
1281 22 ii	Martinus IV.	† 28 iii, 1285
1285 2 iv	Honorius IV.	† 3 iv, 1287
1288 15 ii	Nicolaus IV.	† 4 iv, 1292
1294 5 vii	S. Coelestinus V. († 19 v, 1296)	*res.* 13 xii, 1294
1294 24 xii	Bonifacius VIII.	† 11 x, 1303
1303 22 x	Benedictus XI.	† 7 vii, 1304
1305 5 vi	Clemens V.	† 20 iv, 1314
1316 7 viii	Joannes XXII.	† 4 xii, 1334
1334 20 xii	Benedictus XII.	† 25 iv, 1342
1342 7 v, el.	Clemens VI.	† 6 xii, 1352
1352 18 xii	Innocentius VI.	† 12 ix, 1362
1362 28 x	Urbanus V.	† 19 xii, 1370
1370 30 xii	Gregorius XI.	† 27 iii, 1378
1378 8 iv	Urbanus VI.	† 15 x, 1389
[1378 20 ix	Clemens VII. *antipapa Aven.*	† 16 ix, 1394
1394 28 ix	Benedict XIII. (*amot* 26 vii) 1417	† 23 v, 1423]
1389 2 xi	Bonifacius IX.	† 1 x, 1404
1404 17 x	Innocentius VII.	† 6 xi, 1406
1406 2 xii	Gregorius XII. († 1419) *resignat.*	4 vii, 1415
1409 26 vi	Alexander V.	† 3 v, 1410
1410 17 v	Joannes XXIII. († 22 xi, 1419) *amot.*	24 v, 1415
1417 11 xi	Martinus V.	† 20 ii, 1431
1431 3 iii	Eugenius IV.	† 23 ii, 1447
1447 6 iii	Nicolaus V.	† 24 iii, 1455
1455 8 iv	Calixtus III.	† 6 viii, 1458
1458 19 viii	Pius II.	† 15 viii, 1464
1464 31 viii	Paulus II.	† 28 vii, 1471
1471 9 viii	Sixtus IV.	† 12 viii, 1484
1484 24 viii	Innocentius VIII.	† 25 vii, 1492
1492 11 viii	Alexander VI.	† 18 viii, 1503
1503 22 ix	Pius III.	† 18 x, 1503
1503 1 xi	Julius II.	† 21 ii, 1513
1513 15 iii	Leo X.	† 1 xii, 1521
1522 9 i	Hadrianus VI.	† 14 ix, 1523
1523 19 xi	Clemens VII.	† 25 ix, 1534
1534 13 x	Paulus III.	† 10 xi, 1549
1550 8 ii	Julius III.	† 23 iii, 1555
1555 9 iv	Marcellus II.	† 30 iv, 1555
1555 23 v	Paulus IV.	† 18 viii, 1559
1559 25 xii	Pius IV.	† 9 xii, 1565
1566 17 i, cs.	S. Pius V.	† 1 v, 1572
1572 26 v	Gregorius XIII.	† 10 iv, 1585
1585 1 v, cs.	Sixtus V.	† 27 viii, 1590
1590 15 ix, el.	Urbanus VII.	† 27 ix, 1590
1590 5 xii	Gregorius XIV.	† 15 x, 1591
1591 29 x, el.	Innocentius IX.	† 30 xii, 1591
1592 30 i, el.	Clemens VIII.	† 5 iii, 1605
1605 1 iv, el.	Leo XI.	† 27 iv. 1605
1605 16 v, el.	Paulus V.	† 28 i, 1621
1621 9 ii	Gregorius XV.	† 8 vii, 1623
1623 6 viii, el.	Urbanus VIII.	† 29 vii, 1644
1644 15 ix	Innocentius X.	† 7 i, 1655
1655 7 iv	Alexander VII.	† 22 v, 1667
1667 20 vi	Clemens IX.	† 9 xii, 1669
1670 29 iv	Clemens X.	† 22 vii, 1676
1676 21 ix	Innocentius XI.	† 12 vii, 1689
1689 6 x	Alexander VIII.	† 1 ii, 1691
1691 12 vii	Innocentius XII.	† 27 ix, 1700
1700 23 xi, el	Clemens XI.	† 19 iii, 1721
1721 8 v	Innocentius XIII.	† 7 iii, 1724
1724 29 v	Benedictus XIII.	† 21 ii, 1730
1730 12 vii	Clemens XII.	† 6 ii, 1740
1740 17 viii	Benedictus XIV.	† 3 v, 1758
1758 6 vii	Clemens XIII.	† 2 ii, 1769
1769 19 v	Clemens XIV.	† 22 ix, 1774
1775 15 ii	Pius VI.	† 29 viii, 1799
1800 14 iii	Pius VII.	† 20 viii, 1823
1823 28 ix	Leo XII.	† 10 ii, 1829
1829 31 iii	Pius VIII.	† 30 xi, 1830
1831 2 ii	Gregorius XVI.	† 1 vi, 1846
1846 16 vi, el.	Pius IX.	† 3 vi, 1877
1877 vi, el	Leo XIII.	† 20 vii, 1903
1903 4 viii, el.	Pius X.	

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General.—Of encyclopaedias may be mentioned the *New Schaff-Herzog Encyclopaedia of Religious Knowledge* (New York, 1908 sqq.); the *Catholic Encyclopaedia* (New York, 1907 sqq.); Herzog-Hauck, *Realencyklopadie* (3rd ed., Leipzig, 1896 sqq.); Wetzer and Welte, *Kirchenlexikon* (2nd ed., Freiburg-im-Breisgau, 1882–1901); G. Moroni, *Dizionario di erudizione storico-ecclesiastica* (Venice, 1840 sqq.), all of which contain articles on individual popes and subjects connected with the papacy, with bibliographies. For chronological detail, see Z. V. Lobkowitz, *Statistik der Päpste* (Freiburg i. B., 1905). Carefully indexed source materials in the original languages are given by C. Mirbt, *Quellen zur Geschichte des Papsttums und des römischen Katholizismus* (2nd enlarged ed., Tübingen, 1901); many fragments in translation under "Papacy" in *History for Ready Reference*, ed. by J. N. Larned (vols. iv., vi., vii. Springfield, 1895–1910). Helpful Church histories are F. X. Funk, *Lehrbuch der Kirchengeschichte* (5th ed., Paderborn, 1907); A. Knöpfler, *Lehrbuch der Kirchengeschichte* (4th ed., Freiburg i. B., 1906), both Roman Catholic; also the Lutheran work of J. H. Kurtz, *Lehrbuch der Kirchengeschichte*, ed. N. Bonwetsch and P. Tschackert (14th ed., Leipzig, 1906). (W. W. R.*)

Period I. To 1087.—A bibliography of the history of the papacy during the first eleven centuries would embrace all the vast number of works on the history of the Church during this period. Of these a selected list will be found in the bibliography to the article CHURCH HISTORY. Here it must suffice to mention certain modern works bearing more particularly on this period. Harnack, *Lehrbuch der Dogmengeschichte*, 3rd ed. i. 400 et seq.; Hinschius, *Kirchenrecht*, vol. i. §§ 22–25, 74; Sohm, *Kirchenrecht*, vol. i. § 29 et seq.; Löning, *Geschichte des deutschen Kirchenrechts* (1878); Duchesne, *Églises séparées* (1905), *Les Premiers temps de l'état pontifical* (1904). (L. D.*)

Period II. (a) From 1087 to 1124.—L. Paulot's *Un Pape français: Urbain II.* (Paris, 1903), which is written with a Catholic bias, is the only biography of Urban II. that is at all full. Cf. M. F. Stern, *Zur Biographie des Papstes Urbans II.* (Berlin, 1883). On Paschal II., see E. Franz, *Papst Paschalis II.* (Breslau, 1877); W. Schum, *Die Politik Papst Paschals II. gegen Kaiser Heinrich V. im Jahre 1112* (Erfurt, 1877); and the excellent "Étude des relations entre le Saint-Siège et le royaume de France de 1099 à 1108," published by Bernard Monod in the *Positions des thèses des élèves de l'École des Chartes* (1904). The *Bullarium* of Calixtus II. and the *History* (Paris, 1891) of his pontificate have been published by Ulysse Robert. Cf. M. Maurer, *Papst Calixt II.* (Munich, 1889). Besides these monographs, useful information on the history of the popes of this period will be found in the following: R. Röhricht, *Geschichte des Königreichs Jerusalem* (Innsbruck, 1898) and *Geschichte des ersten Kreuzzuges* (Innsbruck, 1901); H. von Sybel, *Geschichte des ersten Kreuzzugs* (2nd ed., Leipzig, 1881); H. Hagenmeyer, *Peter der Eremit* (Leipzig, 1879); F. Chalandon, *Essai sur le règne d'Alexis I. Comnène* (Paris, 1900); G. Meyer von Knonau, *Jahrbücher des deutschen Reiches unter Heinrich IV. und Heinrich V.* (Leipzig, 1890 et seq.); Carl Mirbt, *Die Publizistik im Zeitalter Gregors VII.* (Leipzig, 1894); Ernst Bernheim, *Zur Geschichte des Wormser Konkordates* (Göttingen, 1878); Martin Rule, *The Life and Times of St Anselm* (2 vols., London, 1883); and Klemm, *Der Investiturstreit unter Heinrich I.*

(*b*) *From 1124 to 1198.*—Monographs dealing expressly with the pontificates of this period are scarce. Mention, however, must be made of H. Reuter's *Geschichte Alexanders III. und der Kirche seiner Zeit* (3 vols., Berlin, 1860–1864). Much information on the policy of these popes will be found in the works on the great personages of the time: W. Bernhardi, *Lothar von Supplinburg* (Leipzig, 1879), and *Konrad III.* (Leipzig, 1883); H. Prutz, *Kaiser Friedrich I.* (3 vols., Danzig, 1871–1874); P. Scheffer-Boichorst, *Kaiser Friedrichs I. letzter Streit mit der Kurie* (Berlin, 1866); Julius Ficker, *Reinald von Dassel* (Cologne, 1850); Th. Toeche, *Kaiser Heinrich VI.* (Leipzig, 1867); J. Jastrow and G. Winter, *Deutsche Geschichte im Zeitalter der Hohenstaufen* (2 vols., Berlin, 1897–1901); F. von Raumer, *Geschichte der Hohenstaufen und ihrer Zeit* (5th ed., 6 vols., Leipzig, 1878); A. Hausrath, *Arnold von Brescia* (Leipzig, 1891); Dietr. Hirsch, *Studien zur Geschichte König Ludwigs VII. von Frankreich* (Leipzig, 1892); O. Cartellieri, *Abt Suger von Saint-Denis* (Berlin, 1898); F. Vacandard, *Vie de S. Bernard* (2 vols., Paris, 1895); J. Thiel, *Die politische Thätigkeit des Abtes Bernhard von Clairvaux* (Königsberg, 1885); A. Luchaire, *Louis VII., Philippe-Auguste, Louis VIII.* (vol. iii. pt. i. of Lavisse's *Histoire de France*); H. Böhmer, *Kirche und Staat in England und in der Normandie im XL. und XII. Jahrhundert.* (Leipzig, 1899); Kate Norgate, *England under the Angevin kings* (London, 1887); and P. Scheffer-Boichorst, "Hat Papst Hadrian IV. zu Gunsten des englischen Königs über Irland verfügt?" in *Mitteilungendes Instituts für österr. Geschichtsforschung* (supplementary vol. iv., 1893).

(*c*) *From 1198 to 1261.*—On the pontificate of Innocent III. in general, see F. von Hurter, *Geschichte Papst Innocenz III.* (3rd and 2nd ed., 4 vols., Hamburg, 1841–1844); and A. Luchaire, *Innocent III., Rome et l'Italie* (2nd ed., Paris, 1905), *Innocent III. la croisade des albigeois* (Paris, 1905), *Innocent III., la papauté et l'empire* (Paris, 1906), *Innocent III., la question d'orient* (Paris, 1906), and *Innocent III., les royautés vassales du Saint-Siège* (Paris, 1908). Cf. E. Winkelmann, *Philipp von Schwaben und Otto IV. von Braunschweig* (2 vols., Leipzig, 1873–1878); W. Norden, *Das Papsttum und Byzanz* (Berlin, 1903), a considerable part of which is devoted to Innocent III.; E. Gerland, *Geschichte des lateinischen Kaiserreiches von Konstantinopel* (Homburg, 1905); R. Davidsohn, *Philipp II. August von Frankreich und Ingeborg* (Stuttgart, 1888); R. Schwemer, *Innocenz III. und die deutsche Kirche während des Thronstreites von 1198–1208* (Strassburg, 1882); Else Gütschow, *Innocenz III. und England* (Munich, 1904); and many other detailed monographs. The pontificate of Honorius III. is dealt with by J. Clausen in his *Papst Honorius III.* (Bonn, 1895), and his registers have been published by P. Pressutti (3 vols., Rome, 1884 and 1888–1895). On Gregory IX., see J. Felten, *Papst Gregor IX.* (Freiburg i. Br., 1886); P. Balan, *Storia di Gregorio IX. e dei suoi tempi* (3 vols., Modena, 1872–1873); and J. Marx, *Die vita Gregorii IX.* (Berlin, 1889). The publication of the registers of this pope was begun by L. Auvray in the *Bibliothèque des écoles de Rome et d'Athènes* (Paris, 1890 et seq.). On Innocent IV., see E. Berger, *St Louis et Innocent IV.* (Paris, 1893); E. Winkelmann, *Kaiser Friedrich II.* (2 vols., Leipzig, 1889–1897); P. Aldinger, *Die Neubesetzung der deutschen Bistümer unter Papst Innocenz IV.* (Leipzig, 1901); and C. Rodenberg, *Innocenz IV. und das Königreich Sizilien* (Halle, 1892). The publication of the registers of Innocent IV. was undertaken by Elie Berger (1881 et seq.), and those of Alexander IV. by J. de Loye, A. Coulon and C. Bourel de la Roncière (1895 et seq.). As the history of the later Hohenstaufens is intimately bound up with that of the contemporary popes, mention must be made of F. W. Schirrmacher, *Die letzten Hohenstaufen* (Göttingen, 1871); A. Karst, *Geschichte Manfreds vom Ende Friedrichs II. bis zu seiner Krönung* (Berlin, 1897); and K. Hampe, *Geschichte Konradins von Hohenstaufen* (Innsbruck, 1894).

(*d*) *From 1261 to 1305.*—L. Dorez and J. Guiraud, members of the French school at Rome, began the publication of the registers of Urban IV. (1892 et seq.); E. Jordan, those of Clement IV. (1893 et seq.); and J. Guiraud and L. Cadier, those of Gregory X. (1892 et seq.). On Gregory X., see F. Walter, *Die Politik der Kurie unter Gregor X.* (Berlin, 1894). The pontificate of John XXI. has been dealt with by R. Stapper, *Papst Johannes XXI.* (Münster i. W., 1898), and that of Nicholas III. by A. Demski, *Papst Nikolaus III.* (Münster i. W., 1903), in vol. vi. of the *Kirchengeschichtliche Studien*, ed. by Knöpfler, Schrörs and Sdralek. The publication of the registers of Nicholas III. was undertaken by J. Gay (1898 et seq.). Much information on the policy of these popes will be found in the following: R. Sternfield, *Ludwigs des Heiligen Kreuzzug nach Tunis und die Politik Karls I. von Sizilien* (Berlin, 1896); Ch. V. Langlois, *Le Règne de Philippe III. le Hardi* (Paris, 1887); L. Leclère, *Les Rapports de la papauté et de la France sous Philippe III.* (Brussels, 1889); C. Minieri-Riccio, *Alcuni fatti riguardanti Carlo I. d' Angiò . . .* (Naples, 1874), and *Il Regno di Carlo I. d'Angiò*, in the *Archivio storico italiano* (3rd series, vols. xxii., xxiii., xxiv., xxv., xxvi.; 4th series, vols. ii., iii., iv., v., vii., 1875–1881); A. Busson, *Die Idee des deutschen Erbreichs und die ersten Habsburger* (Vienna, 1878); G. del Giudice, *La Famiglia di re Manfredi* (Naples, 1880); and H. Otto, *Die Beziehungen Rudolfs von Habsburg zu Papst Gregor X.* (Innsbruck, 1895). There is a good account of the policy of Martin IV. in O. Cartellieri, *Peter von Aragon und die sizilianischen Vesper* (Heidelberg, 1904). On Honorius IV., see introduction to the complete edition of his registers by Maurice Prou (1886–1888). E. Langlois has published the registers of Nicholas IV. (1886–1893), and Otto Schiff deals with his pontificate in his *Studien zur Geschichte Papst Nikolaus IV.* (1897). On Celestine V., see H. Schulz, *Peter von Murrhone* (*Papst Coelestin V.*), Berlin, 1894. The publication of the registers of Boniface VIII. was begun by G. Digard, M. Faucon and A. Thomas (1884 et seq.). Of the vast literature on this pontificate we must content ourselves with citing: Heinrich Finke, *Aus den Tagen Bonifaz' VIII.* (Münster i. W., 1902); Ch. V. Langlois, "St. Louis, Philippe le Bel, Les Derniers capétiens directs" (vol. iii., pt. ii. of Lavisse's *Histoire de France*); Ernest Renan, *Études sur la politique religieuse du règne de Philippe le Bel* (1899); A. Baudrillart, "Des Idées qu'on se faisait au XIV^e siècle sur le droit d'intervention du souverain pontife en matière politique," in the *Revue d'histoire et de littérature religieuses* (vol. iii., 1898); and R. Holtzmann, *Wilhelm von Nogaret* (Freiburg i. Br., 1898). The pontificate of Benedict XI. is dealt with by P. Funke in his *Papst Benedikt XI.* (Münster i. W., 1891). Cf. Ch. Grandjean, "Recherches sur l'administration financière du pape Benoît XI," in the *Mélanges d'archéologie et d'histoire* (vol. iii., 1883), published by the French School at Rome. Grandjean has published the registers of Benedict XI. (1883 et seq.).

Among works of a more general character that throw light on the history of the papacy during the 12th and 13th centuries, the first place must be given to Walter Norden's *Das Papsttum und Byzanz. Die Trennung der beiden Mächte und das Problem ihrer Wiedervereinigung bis zum Untergange des byzantinischen Reichs* (Berlin, 1903), which contains an account of the question of the East in its relations with the papal policy, from the rise of the schism down to the end of the middle ages. See also Félix Rocquain, *La Papauté au moyen âge* (Paris, 1881) and *La Cour de Rome et l'esprit de réforme avant Luther* (3 vols., Paris, 1893–1897); J. B. Sägmüller, *Die Thätigkeit und Stellung der Cardinäle bis Papst Bonifaz VIII.* (Freiburg i. Br., 1896); and A. Gottlob, *Die päpstlichen Kreuzzugssteuern des 13. Jahrhunderts* (Heiligenstadt, 1892) and *Kreuzablass und Almosenablass* (Stuttgart, 1906). (A. Lu.)

Period III. 1305–1590.—Baluze, *Vitae paparum avenioniensium* (*1305–1394*), 2 t. (Paris, 1693); Raynaldus, *Annales eccles. ab anno 1198* [to 1565], annotated and added to by J. D. Mansi (15 vols., Lucca, 1747–1756); Mansi, *Concil. collectio*; Theodericus of Niem, *De schismate*, ed. Erler (1890); Christophe, *Histoire de la papauté* (1873); Hefele, *Conciliengeschichte* (Freiburg i. B., 1855, seq.); Höfler, *Die avignonesischen Päpste* (1871); Creighton, *History of the Papacy* (1882, seq.); L. Pastor, *Geschichte der Päpste* (Freiburg i. B., 1886, seq., Eng. trans. by F. I. Antrobus, 1891, seq.); Pastor, *Acta pontific.* (1904); N. Valois, *La France et le grand schisme*, 4 t. (1896, seq.); Haller, *Papsttum und Kirchenreform* (1903). For the Papacy in connexion with the Renaissance, see E. Müntz, *Les Arts* (1892); Voigt, *Wiederbelebung des klassischen Altertums* (1893); J. Burkhardt, *Cultur der Renaissance in Italien*, 2 B. (ed. L. Geiger, 1907). For the palace at Avignon, see Ehrle, *Bibl. rom. pontif.* i. (1890).

To the authorities for the lives of individual popes attached to the biographies under their several headings, and to the articles on the councils of BASEL, CONSTANCE, TRENT, may be added: CLEMENT V.—Boutaric, *Philippe le Bel* (1861); König, *Päpstl. Kammer unter Clemens V. u. Johann XXII.* (1894); Finke, *Acta Aragonen.* (1908). JOHN XXII.—Böhmer, *Regest. Ludwigs des Baiern* (1839); *Vatikanische Acten* (1891); Riezler, *Literarische Widersacher* (1874); Müller, *Kampf Ludwigs mit der Curie* (1879–1880); Coulon, *Lettres secrètes de Jean XXII., relat. à la France*, i. (1907); Mollat, *Lettres commun. de Jean XXII.*, i.–iv. (1907). CLEMENT VI.—Werunsky, *Kaiser Karl IV.*, i. (1800), ii. (1882–1886); Papencordt, *Cola di Rienzo* (1841); Dèprez, *Lett. closes* 1901 seq. INNOCENT VI.—Werunsky, *Ital. Politik Innoc. VI. u. Karl IV.* (1878); id., *Karl IV.* ii. (1882–1886), iii. (1892); Cerasoli, *Archivio napolit. 22–23*; Kirsch, *Kollectorien* (1892); Daumet, *Innocent VI. et Blanche de Bourbon* (1899). URBAN V.—Magnan, *Urbain V.* (1863); Werunsky, *Karl IV.* iii. (1892); Prou, *Relat. polit. avec les rois de France* (1888); Wurm, *Albornoz* (1892); Kirsch, *Rückkehr der Päpste Urban V. und Gregor XI. nach Rom* (1898); Letacheux, *Lettres secrètes* (1903, seq.). GREGORY XI.—Mirot, *Retour du St Siège à Rome* (1899); Tommaseo, *Lettere di S. Caterina* (1860); M. A. Mignaty, *Catherine de Sienne* (1886). BONIFACE IX.—*Vita*, ap. Muratori, *Script.* iii. 2; *Cosmodromium*, Gobelini Persona, ed. Jansen (1900); Jansen, *Bonifacius IX. u. die deutsche Kirche* (1904). INNOCENT VII.—Gregory XII., schismatic popes, council of Constance, &c. *Monum. concil. gen. sacr. XV.* (1857–1896); Alpartilz, *Chronica*, ed. Ehrle (1906); Pliemetfrieder, *Literarische Polemik* (1909). MARTIN V.—*Vitae*, ap. Muratori, iii. 2; Ottenthal, *Bullenregister Martins V. u. Eugens IV.* (1885). EUGENIUS IV.—*Vita*, ap. Muratori, *Script.* iii. 2; *Repert. germanic.* i. (1897); Müntz, *Les Arts* (1878–1879); Valois, *Pragmatique sanction* (1907). NICHOLAS V.—Manetti, *Vita Nicolai V.*, ap. Muratori, *Script.* iii. 2; Vespasiano da Bisticci, *Vite* (1839); Georgius (1742); Müntz, *Les Arts* (1878–1879); Creighton, *Papacy* ii. (1882). PAUL II.—Ammanati, *Epistolae et commentarii* (1506); Gaspar Veronensis, *Vita*, ap. Marini, Archiatri ii. and Muratori iii. 2 (new ed. by Zippel, 1903); Canensius, *Vita*, ed. Quirini (1740); Creighton, *Papacy* iii. (1887); Müntz, *Les Arts* ii. (1879). SIXTUS IV.—Infessura, *Diario*, ed. Tommasini (1890); Notajo di Nantiporto, *Diarii*, ap. Muratori, *Script.* iii. 2; Jacobus Volaterranus, *Diarium*, ap. Muratori, *Script.* xxiii.; Schmarzow, *Melozzo da Forlì* (1886); Steinmann, *Sixtinische Capelle* i. (1901); Schlecht, *Andrea Zamometic* i. (1893). Innocent VIII.—Infessura, *op. cit.*; Burchardi, *Diarium* i.–ii. *ed. cit.* (also for Alexander VI.); Burchardi, *Diarium*, ed. Thuasne, i. (1883). Julius II.—Brosch, *Julius II. u. d. Kirchenstaat* (1878); Geymüller, *Entwürfe für St Peter* (1875–1880); Schulte, *Maximilian als Candidat für den päpstlichen Stuhl* (1906). Leo X.—Hergenröther, *Reg. Leonis X.* (1884–1891); Jovius, *Vita* (1548); Roscoe, *Leone X.*, ed. Bossi (1816); Janssen, *Gesch. d. deutschen Volks* i. 18–ii. 18 (1897); Schulte, *Fugger in Rom* (1904); Kalkoff, *Luthers römischer Prozess* (1906). Adrian VI.—Burmann, *Adrianus VI.* (1727). Clement VII.—Friedensburg, *Nuntiaturberichte* i. (1892); Ehses, *Documente zur Geschichte der Ehescheidung Heinrichs VIII.* (1893); Ehses, *Conc. trident.* iv. (1904); Fraikin, *Nonciatures de France* i. (1906). Paul III.—Friedensburg, *Nuntiaturberichte* ii. sqq. (1892–1908); *Venetianische Depeschen vom Kaiserhof* i. (1889); Ehses, *Concil. trident.* iv. (1904); Merkle, *Concil. trident. diaria* i.; Maurenbrecher, *Karl V.* (1865); de Leva, *Carlo V.* iii.–v. (1867 seq.); Pastor, *Reunionsbestrebungen Karls V.* (1879); Janssen, *Deutsche Geschichte* iii. 18. (1899). Julius III.—Massarelli, ap. Döllinger, *Concil. v. Trient* (1876); de Leva, *Carlo V.* v. (1890). Marcellus II.—Pollidorus, *Vita* (1744). Pius IV.—Pallavicini, *Concilio di Trento* (1656); Duruy, *Cardinal Carafa* (1888); Susta, *Curie und Concil.* i.–ii. (1904–1909); Steinherz, *Nuntiaturberichte* i. and iii. (1897–1903). Pius V.—Guglielmotti, *Marcantonio Colonna* (1862). Gregory XIII.—Theiner, *Annales ecclesiastici* (1856); Maffei, *Annali* (1746); Brosch, *Kirchenstaat* i. (1880); *Nuntiaturberichte*, ed. Hansen, and Schellhass, i. (1892); Steinhuber, *Collegium germanicum* i. 2–ii. 2 (1907); Duhr, *Jesuiten in Deutschland* i. (1907); Astrain, *Comp. de Jesus de España* (3 vols., 1902). Sixtus V.—*Memorie autografe*, ed. Cagnoni, Archivio d. Soc. Rom. (1882); *Nuntiaturberichte*, ed. Görresgesellschaft, i. seq. (1895); Balzani, in *Cambridge Modern History*; Hübner, *Sixte-Quinte* (1870).

(L. de P.)

Periods IV., V., VI. 1590 onwards.—In addition to the general works already mentioned, see M. Brosch, *Geschichte des Kirchenstaates* (Gotha, 1880–1882), utilizing Venetian archives; L. Ranke, *History of the Papacy in the 16th and 17th centuries* (1840 and frequently); A. R. Pennington, *Epochs of the Papacy* (London, 1881); F. Nippold, *The Papacy in the Nineteenth Century* (New York, 1900); B. Labanca, *Il Papato* (Torino, 1905), with Italian bibliography; F. Nielsen, The *History of the Papacy in the Nineteenth Century* (London, 1906), the scholarly and fascinating work of a Danish Lutheran bishop; A. Galton, *Church and State in France, 1300–1907* (London, 1907); E. Bourgeois and E. Clermont, *Rome et Napoléon III.* (Paris, 1907), exposing secret negotiations; A. Debidour, *L'Église catholique et l'état sous la troisième république* (Paris, 1906–1909), valuable though strongly anti-clerical; R. de Cesare, *Roma e lo stato del papa dal ritorno di Pio IX.* (2 vols., Rome, 1907); in abridged translation, *The Last Days of Papal Rome* (Boston, 1909). (W. W. R.*)

PAPEETE, the capital of the Pacific island of Tahiti, and the chief port and trading centre, and the seat of government of the French establishments in Oceania. Pop. 4280 (2500 French). The town, lying on the north-west coast of the island, on a beautiful harbour entered by two passages through the protecting reef, and backed by five mountains, is French in character as far as concerns the richer quarters. It has a cathedral, barracks and arsenal, government buildings and a botanical garden. The Chinese quarter and the picturesque native market contrast strongly with the European settlement. Of the entrances to the harbour, which is of fair extent and depth, that of Papeete has about seven fathoms depth; that of Taunoa is shallower, though wider and more convenient.

PAPENBURG, a town in the Prussian province of Hanover, 27 m. by rail S. by W. of Emden, and near the right bank of the Ems, with which it is connected by a canal 3 m. long. Pop. (1905), 7673. It lies in the centre of extensive moors and in appearance resembles a Dutch town. The industries include shipbuilding, oil and glass mills, and manufactures of chemicals, cement, nickel goods and machinery. It is a very prosperous port and its trade, carried on mainly by water, is mostly in the agricultural produce of the extensive moors and pasture lands which lie around it. Papenburg was founded in 1675 and became a town in 1860.

PAPER (Fr. *papier*, from Lat. *papyrus*), the general name for the substance commonly used for writing upon, or for wrapping things in. The origin and early history of paper as a writing material are involved in much obscurity. The art of making it from fibrous matter appears to have been practised by the Chinese at a very distant period. Different writers have traced it back to the 2nd century B.C. But, however remote its age may have been in eastern Asia, paper first became available for the rest of the world in the middle of the 8th century. In 751 the Arabs, who had occupied Samarkand early in the century, were attacked there by Chinese. The invasion was repelled by the Arab governor, who in the pursuit, it is related, captured certain prisoners who were skilled in paper-making and who imparted their knowledge to their new masters. Hence began the Arabian manufacture, which rapidly spread to all parts of the Arab dominions. The extent to which it was adopted for literary purposes is proved by the comparatively large number of early Arabic MSS. on paper which have been preserved dating from the 9th century.[1]

There has existed a not inconsiderable difficulty in regard to the material of which the Arab paper was composed. In Europe it has been referred to by old writers as *charta bombycina*, *gossypina*, *cuttunea*, *xylina*, *damascena* and *serica*. The last title seems to have been derived from its glossy and silken appearance; the title *damascena* merely points to its great central emporium, Damascus. But the other terms indicate an idea, which has been persistent, that the paper manufactured by the Arabs was composed of the wool from the cotton-plant, reduced to a pulp according to the method attributed to the Chinese; and it had been generally accepted that the distinction between Oriental paper and European paper lay in the fact that the former was a cotton-paper and the latter a rag-paper. But this theory has been disturbed by recent investigations, which have shown that the material of the Arab paper was itself substantially linen. It seems that the Arabs, and the skilled Persian workmen whom they employed, at once resorted to flax, which grows abundantly in Khorasan, as their principal material, afterwards also making use of rags, supplemented, as the demand grew, with any vegetable fibre that would serve; and that cotton, if used at all, was used very sparingly. Still there remain the old titles *charta bombycina*, &c., to be explained; and an ingenious solution has been offered that the term *charta bombycina*, or *χάρτης βομβύκινος*, is an erroneous reading of *charta bambycina*, or *χάρτης βαμβύκινος*, paper manufactured at the Syrian town of Bambyce or *βαμβύκη*, the Arab Mambidsch (Karabacek in *Mittheilungen aus der Sammlung der Papyrus Erzherzog Rainer*, ii.–iii. 87, iv. 117). Without accepting this as an altogether sufficient explanation of so widely used a term as the medieval *charta bombycina*, and passing from the question of material to other differences, paper of Oriental manufacture in the middle ages was usually distinguished by its stout substance and glossy surface, and was devoid of water-marks, the employment of which became universal in the European factories. Besides the titles referred to above, paper also received the names of *charta* and *papyrus*, transferred to it from the Egyptian writing material manufactured from the papyrus plant (see Papyrus).

It was probably first brought into Greece through trade with Asia, and thence transmitted to neighbouring countries. Theophilus presbyter, writing in the 12th century (*Schedula diversarum artium*, i. 23), refers to it under the name of Greek parchment, *pergamena graeca*. There is a record of the use of paper by the empress Irene at the end of the 11th or beginning of the 12th century, in her rules for the nuns of Constantinople. It does not appear, however, to have been very extensively used in Greece before the middle of the 13th century, for, with one doubtful exception, there are no extant Greek MSS. on paper which bear date prior to that period.

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[1] A few of the earliest dated examples may be instanced. The *Gharíbu 'l-Haídth*, a treatise on the rare and curious words in the sayings of Mahomet and his companions, written in the year 866, is probably one of the oldest paper MSS. in existence (*Pal. Soc.* Orient. Ser. pl. 6). It is preserved in the University Library of Leiden. A treatise by an Arabian physician on the nourishment of the different members of the body, of the year 960, is the oldest dated Arabic MS. on paper in the British Museum (Or. MS. 2600; *Pal. Soc.*, pl. 96). The Bodleian Library possesses a MS. of the *Díáwnu 'l-Adab*, a grammatical work of A.D. 974, of particular interest as having been written at Samarkand on paper presumably made at that seat of the first Arab manufacture (*Pal. Soc.* pl. 60). Other early examples are two MSS. at Paris, of the years 969 (*Fonds arabe, suppl.*, 952) and 980 (*Fonds arabe*, 55); a volume of poems written at Baghdad, A.D. 990, now at Leipzig, and the Gospel of St Luke, A.D. 993, in the Vatican Library (*Pal. Soc.*, pls. 7, 21). In the great collection of Syriac MSS., which were obtained from the Nitrian desert in Egypt and are now in the British Museum, there are many volumes written on paper of the 10th century. The two oldest dated examples, however, are not earlier than A.D. 1075 and 1084.

The manufacture of paper in Europe was first established by the Moors in Spain in the middle of the 12th century, the headquarters of the industry being Xativa, Valencia and Toledo. But on the fall of the Moorish power the manufacture, passing into the hands of the less skilled Christians, declined in the quality of its production. In Italy also the art of paper-making was no doubt established through the Arab occupation of Sicily. But the paper which was made both there and in Spain, was in the first instance of the Oriental quality. In the laws of Alphonso of 1263 it is referred to as cloth parchment, a term which well describes its stout substance. The first mention of rag-paper occurs in the tract of Peter, abbot of Cluny (A.D. 1122–1150), *adversus Judaeos*, cap. 5, where, among the various kinds of books, he refers to such as are written on material made "ex rasuris veterum pannorum."

A few words may here be said respecting MSS. written in European countries on Oriental paper or paper made in the Oriental fashion. Several which have been quoted as early instances have proved, on further examination, to be nothing but vellum. The ancient fragments of the Gospel of St Mark, preserved at Venice, which were stated by Maffei to be of paper, by Montfaucon of papyrus, and by the Benedictines of bark, are in fact written on skin. The oldest recorded document on paper was a deed of King Roger of Sicily, of the year 1102; and there are others of Sicilian kings, of the 12th century. A Visigothic paper MS. of the 12th century from Silos near Burgos is now in the Bibliothèque Nationale, Paris. A notarial register on paper, at Geneva, dates from 1154. The oldest known imperial deed on the same material is a charter of Frederick II. to the nuns of Goess in Styria, of the year 1228, now at Vienna. In 1231, however, the same emperor forbade further use of paper for public documents, which were in future to be inscribed on vellum. Transcripts of imperial acts of Frederick II. about A.D. 1241 are at Naples. In Venice the *Liber plegiorum*, the entries in which begin with the year 1223, is made of rough paper; and similarly the registers of the Council of Ten, beginning in 1325, and the register of the emperor Henry VII. (1308–1313) preserved at Turin, are also written on a like substance. In the British Museum there is an older example in a MS. (Arundel 268) which contains some astronomical treatises written on an excellent paper in an Italian hand of the first half of the 13th century. The autograph MS. of Albert de Beham, 1238–1255, at Munich, is on paper. In the Public Record Office there is a letter on paper from Raymond, son of Raymond, duke of Narbonne and count of Toulouse, to Henry III. of England, written within the years 1216–1222. The letters addressed from Castile to Edward I., in 1279 and following years (Pauli in *Bericht*, *Berl. Akad.*, 1854), are instances of Spanish-made paper; and other specimens in existence prove that in this latter country a rough kind of *charta bombycina* was manufactured to a comparatively late date.

In Italy the first place which appears to have become a great centre of the paper-making industry was Fabriano in the marquisate of Ancona, where mills were first set up in 1276, and which rose into importance on the decline of the manufacture in Spain. The earliest known water-marks in paper from this factory are of the years 1293 and 1294. The jurist Bartolo, in his treatise *De insigniis et armis*, refers to the excellent paper made there in the middle of the 14th century, an encomium which will be supported by those who have had occasion to examine the extant MSS. on Italian paper of that period. In 1340 a factory was established at Padua; another arose later at Treviso; and others followed in the territories of Florence, Bologna, Parma, Milan, Venice and other districts. From the factories of northern Italy the wants of southern Germany were supplied as late as the 15th century. As an instance the case of Görlitz has been cited, which drew its paper from Milan and Venice for the half century between 1376 and 1426. But in Germany also factories were rapidly founded. The earliest are said to have been set up between Cologne and Mainz, and in Mainz itself about 1320. At Nuremberg Ulman Stromer established a mill in 1390, with the aid of Italian workmen. Other places of early manufacture were Ratisbon and Augsburg. Western Germany, as well as the Netherlands and England, is said to have obtained paper at first from France and Burgundy through the markets of Bruges, Antwerp and Cologne. France owed the establishment of her first paper-mills to Spain, whence we are told the art of paper-making was introduced, as early as the year 1189, into the district of Hérault. At a later period, in 1406, among the accounts of the church of Troyes, paper-mills appear as *molins à toile*. The development of the trade in France must have been very rapid. And with the progress of manufacture in France that of the Netherlands also grew.

In the second half of the 14th century the use of paper for all literary purposes had become well established in all western Europe; and in the course of the 15th century it gradually superseded vellum. In MSS. of this latter period it is not unusual to find a mixture of vellum and paper, a vellum sheet forming the outer, or the outer and inner, leaves of a quire while the rest are of paper.

With regard to the early use of paper in England, there is evidence that at the beginning of the 14th century it was a not uncommon material, particularly for registers and accounts. Under the year 1310, the records of Merton College, Oxford, show that paper was purchased "pro registro," which Professor Rogers (*Hist. Agricul. and Prices*, i. 644) is of opinion was probably paper of the same character as that of the Bordeaux customs register in the Public Record Office, which date from the first year of Edward II. The college register referred to, which was probably used for entering the books that the fellows borrowed from the library, has perished. There is, however, in the British Museum a paper MS. (Add. 31,223), written in England, of even earlier date than the one recorded in the Merton archives. This is a register of the hustings court of Lyme Regis, the entries in which begin in the year 1309. The paper, of a rough manufacture, is similar to the kind which was used in Spain. It may have been imported direct from that country or from Bordeaux; and a seaport town on the south coast of England is exactly the place where such early relics might be looked for. Professor Rogers also mentions an early specimen of paper in the archives of Merton College, on which is written a bill of the year 1332; and some leaves of water-marked paper of 1333 exist in the Harleian collection. Only a few years later in date is the first of the registers of the King's Hall at Cambridge, a series of which, on paper, is preserved in the library of Trinity College. Of the middle of the 14th century also are many municipal books and records. The knowledge, however, which we have of the history of paper-making in England is extremely scanty. The first maker whose name is known is John Tate, who is said to have set up a mill in Hertford early in the 16th century; and Sir John Spilman, Queen Elizabeth's jeweller, erected a paper-mill at Dartford, and in 1589 obtained a licence for ten years to make all sorts of white writing-paper and to gather, for the purpose, all manner of linen rags, scrolls or scraps of parchment, old fishing nets, &c. (Dunkin, *Hist. of Dartford*, 305; Harl. MS. 2296, f. 124 *b*). But it is incredible that no paper was made in the country before the time of the Tudors. The comparatively cheap rates at which it was sold in the 15th century in inland towns seem to afford ground for assuming that there was at that time a native industry in this commodity.

As far as the prices have been observed at which different kinds of paper were sold in England, it has been found that in 1355–1356 the price of a quire of small folio paper was 5d., both in Oxford and London. In the 15th century the average price seems to have ranged from 3d. to 4d. for the quire, and from 3s. 4d. to 4s. for the ream. At the beginning of the 16th century the price fell to 2d. or 3d. the quire, and to 3s. or 3s. 6d. the ream; but in the second half of the century, owing to the debasement of the coinage, it rose, in common with all other commodities, to nearly 4d. the quire, and to rather more than 5s. the ream. The relatively higher price of the ream in this last period, as compared with that of the quire, seems to imply a more extensive use of the material which enabled the trader to dispose of broken bulk more quickly than formerly, and so to sell by the quire at a comparatively cheap rate.

Brown paper appears in entries of 1570–1571, and was sold in bundles at 2s. to 2s. 4d. Blotting paper is apparently of even earlier date, being mentioned under the year 1465. It was a coarse, grey, unsized paper, fragments of which have been found among the leaves of 15th-century accounts, where it had been left after being used for blotting. Early in the 16th century blotting-paper must have been in ordinary use, for it is referred to in W. Horman's *Vulgaria*, 1519 (p. 80 *b*): "Blottyng papyr serveth to drye weete wryttynge, lest there be made blottis or blurris"; and early in the next century "charta bibula" is mentioned in the *Pinacotheca* (i. 175) of Nicius Erythraeus. It is remarkable that, in spite of the comparatively early date of this invention, sand continued generally in use, and even at the present day continues in several countries in fairly common use as an ink absorbent.

A study of the various water-marks has yielded some results in tracing the different channels in which the paper trade of different countries flowed. Experience also of the different kinds of paper and a knowledge of the water-marks (the earliest of which is of about the year 1282) aid the student in fixing nearly exact periods of undated documents. European paper of the 14th century may generally be recognized by its firm texture, its stoutness, and the large size of its wires. The water-marks are usually simple in design; and, being the result of the impress of thick wires, they are therefore strongly marked. In the course of the 15th century the texture gradually becomes finer and the water-marks more elaborate. While the old subjects of the latter are still continued in use, they are more neatly outlined, and, particularly in Italian paper, they are frequently enclosed in circles. The practice of inserting the full name of the maker in the water-mark came into fashion early in the 16th century. But it is interesting to know that for a very brief period in the 14th century, from about 1307 to 1320, the practice actually obtained at Fabriano, but was then abandoned in favour of simple initial letters, which had already been used even in the 13th century. The date of manufacture appears first in the water-marks of paper made in 1545. The variety of subjects of water-marks is most extensive. Animals, birds, fishes, heads, flowers, domestic and warlike implements, armorial bearings, &c., are found from the earliest times. Some of these, such as armorial bearings, and national, provincial or personal cognizances, as the imperial crown, the crossed keys or the cardinal's hat, can be attributed to particular countries or districts; and the wide dissemination of the paper bearing these marks in different countries serves to prove how large and international was the paper trade in the 14th and 15th centuries.

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PAPER MANUFACTURE

In the modern sense "paper" may best be described as a more or less thin tissue composed of any fibrous material, whose individual fibres, first separated by mechanical action, are then deposited and felted together on wire cloth while suspended in water (see FIBRES). The main constituent in the structure of all plants is the fibre or cellulose which forms the casing or walls of the different cells; it is the woody portion of the plant freed from all foreign substances, and forms, so to speak, the skeleton of vegetable fibre to the amount of 75 to 78%. Its forms and combinations are extremely varied, but it always consists of the same chemical elements, carbon, hydrogen and oxygen, and in the same proportions. It is the object of the paper-maker to eliminate the glutinous, resinous, siliceous and other intercellular matters and to produce the fibre as pure and as strong as possible. Linen and cotton rags, having already undergone a process of manufacture, consist of almost pure fibres with the addition of fatty and colouring matters which can be got rid of by simple boiling under a low pressure of steam with a weak alkaline solution; but the substitutes for rags, esparto, wood, straw, &c., being used as they come from the soil, contain all the intercellular matter in its original form, which has to be dissolved by strong chemical treatment under a high temperature. The vegetable fibre or cellulose, being of a tougher and stronger nature, is untouched by the action of caustic soda (which is the chemical generally employed for the purpose), unless the treatment be carried too far, whilst animal fibres or other organic matters are rendered soluble or destroyed by it. The cellulose, after its resolution by chemical treatment, is still impregnated with insoluble colouring matters, which have to be eliminated or destroyed by treatment with a solution of chlorine or bleaching-powder. The object of the paper-maker in treating any one particular fibre is to carry the action of the dissolving and bleaching agents just so far as to obtain the fibre as free from impurities and as white in colour as is desired. The usefulness of a plant for a good white paper depends upon the strength and elasticity of its fibres, upon the proportion of cellular tissue contained in them, and upon the ease with which this can be freed from the encrusting and intercellular matters. Although experiments had previously been made with many fibrous materials, paper was made in Europe, until the middle of the 19th century, almost entirely from rags, either linen or cotton. At that period other fibres began to be adopted as substitutes, due in part, no doubt, to insufficient supply of rags for the increasing consumption of paper, and to the consequent rise in price. The most important of these substitutes are esparto-grass, wood and straw, and these, together with flax (linen), hemp, jute and cotton rags, form the principal raw material for the manufacture of paper.

Paper was first entirely made by hand, sheet by sheet, but in 1798 the invention of the paper machine by Louis Robert, a clerk in the employ of Messrs Didot, of the Essonne Paper Mills in France, gave a new impetus to the industry. The invention was introduced into England by Henry Fourdrinier (1766–1854), the proprietor of a mill at Dartford in Kent. He secured the assistance of Bryan Donkin (1768–1855), an engineer, and after much toil and perseverance, attended with great expense, for which he received no recompense, succeeded in 1803 in erecting a machine at Frogmore, Herts, which worked comparatively well. This machine, by the subsequent improvements of Dickinson, Causon, Crompton and others, has been brought to the state of perfection in which it now stands. It embraces a multitude of most ingenious and delicate operations, and produces in a few minutes, and in one continuous process from the prepared pulp, sheets of paper ready for use. Machine-made paper has now gradually supplanted that made by hand for all except special purposes, such as bank-note, ledger, drawing and other high-class papers—in one word, in cases where great durability is the chief requisite.

The various uses to which paper is put in the present day are multitudinous, but the main classes may be grouped into four: (1) writing and drawing papers; (2) printing and news-papers; (3) wrapping papers; (4) tissue and cigarette papers.

The process of paper manufacture consists of two main divisions: (1) the treatment of the raw material, including cleaning, dusting, boiling, washing, bleaching and reducing to pulp;

(2) the methods by which the prepared pulp or fibres are converted into paper ready for the market; this is paper-making proper, and includes the operations of beating, sizing, colouring, making the sheet or web, surfacing, cutting, &c.

Rags. Rags arrive at the mill from the rag merchants, either roughly sorted into grades or mixed in quality and material, and the first process is to free them from sand, dust and other impurities. To effect this they are usually passed in bulk through an ordinary revolving duster. They are then sorted into grades, and cut to a workable size about four inches square. For the best work, hand-cutting, done by women, is still preferred, but it is expensive and good machines have now been designed for this purpose. After further thrashing and dusting, the rags are ready for boiling, the object of which is not only to get rid of the dirt still remaining in them and to remove some of the colouring matter, but also to decompose a particular glutinous substance which would impair the flexibility of the fibres and render them too harsh and stiff for readily making into paper. Various forms of vessels are used for boiling, but usually they are made to revolve by means of suitable gearing, and are either cylindrical or spherical (fig. 1).

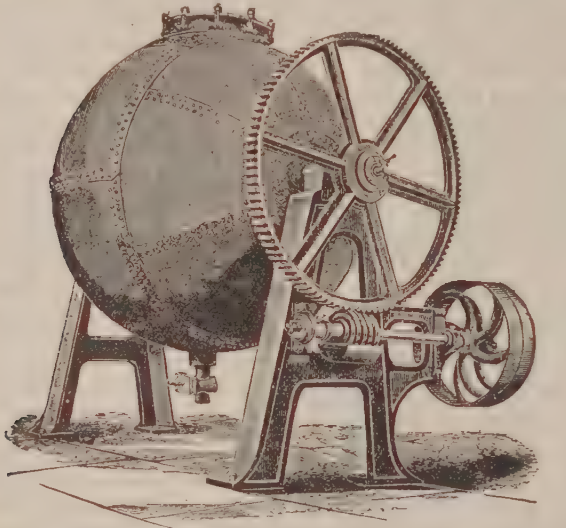


FIG. 1.—Revolving Spherical Rag Boiler.

In these the rags are boiled with an alkaline solution under a low steam pressure for six to twelve hours. The next step is that of washing and "breaking in," which takes place in an engine called the "breaker." This (fig. 2) is an oblong shallow vessel or trough with rounded ends and dished bottom, usually about 13 ft. long by 6 ft. wide, by about 2 ft. 6 in. in depth, but the size varies greatly. It is partly divided along the centre by a partition or "mid-feather," and furnished with a heavy cast-iron roll fitted round its circumference with knives or bars of steel in bunches or clumps. Underneath the roll and fixed in the bottom of the trough is the "plate," consisting of a number of parallel steel bars bedded in a wooden frame. The roll can be raised or lowered on the plate so as to increase or diminish, as desired, the cutting action of the bars and plate on the material. The duty of the roll is to cut and tease out the rags, and also to act as a lifter to cause the stuff to circulate round the trough. The breaker is half filled with water and packed with the boiled rags; an ample supply of clean water is run into the engine for washing the rags, the dirty water being withdrawn by the "drum-washer," a hollow cylinder fitted with buckets and covered with fine wire-cloth. During the washing process the roll is gradually lowered on the plate to tease out the rags into their original fibres; this operation takes from two to four hours. As soon as all signs of the textile nature of the material are destroyed, the washing water is turned off, the drum-washer lifted, and a solution of chlorine or bleach is run in to bring the pulp up to the degree of whiteness desired, after which the rag "half-stuff," as it is now called, is emptied into steeps or drainers, where it is stored ready for use.

Esparto. In treating esparto (the use of which for paper-making is almost confined to Great Britain) the object is to free it from all encrusting and intercellular matter. To effect this it is digested with a strong solution of caustic soda under a high temperature, in boilers which are almost invariably stationary. The most usual form is that known as Sinclair's patent (fig. 3). This boiler is constructed of wrought-iron or steel plates, and holds from 2½ to 3 tons of grass. It is charged through the opening at the top A, and the boiled material taken out from a door B at the side; the grass rests on a false bottom of perforated plates C, through which the liquor drains, and by means of two "vomiting" pipes, D, D, at the sides of the boiler, connecting the space at the bottom with a similar space at the top, a continuous circulation of steam and liquor is maintained through the grass. The steam pressure is kept up to 30 to 40 ℔ per sq. in. for three or four hours; then the strong liquor or lye, which contains all the resinous and intercellular matters dissolved by the action of the caustic soda, is run off and stored in tanks for subsequent recovery of the soda, while the grass is taken to the "potcher" or washing engine. In construction and working this is similar to the breaking engine used for rags; in it the grass is reduced to pulp, and washed for about twenty minutes to free it from the traces of soda liquor remaining after the partial washing in the boiler. As soon as the wash water is running clear it is shut off, and the necessary quantity of a solution of bleaching powder or chlorine (averaging about 6 to 8% on the raw material) is run into the potcher, and the contents are heated by steam to a temperature of about 90° F. After about four to six hours the bleaching is complete, the drum-washer is let down, fresh water run into the potcher, and the grass washed to free it from all traces of chlorine, an operation generally assisted by the use of a little antichlor or hyposulphite of soda. The esparto, as shipped in bales from the Spanish or African fields, is mixed with roots, weeds and other impurities; and as most of these do not boil or bleach as rapidly as the esparto they would, if not taken out of the pulp, show up in the finished paper as specks and spots. To get rid of them the esparto pulp when washed and bleached is run from the potcher into storage chests, from which it is pumped over a long, narrow serpentine settling table or "sand-table," made of wood and fitted with divisions, or "weirs," behind which the heavy impurities or weeds fall to the bottom and are caught. The pulp is next passed over what is known as a "presse-pâte" (fig. 4) or "half-stuff" machine, very similar to the wet end of a paper machine, consisting of strainers fitted with coarse-cut strainer plates, a short wire and a pair of couch and press rolls. The pulp is drawn by suction through the strainers, which keep back the finer impurities that have passed the sand-table, and then flows on to the wire-cloth in the form of a thick web of pulp. After passing through the couch and press rolls, the pulp leaves the machine with about 70% of moisture, and is ready for the beating engine, the first operation of paper-making proper. This is the usual process, though various modifications are introduced in different mills and for different purposes.

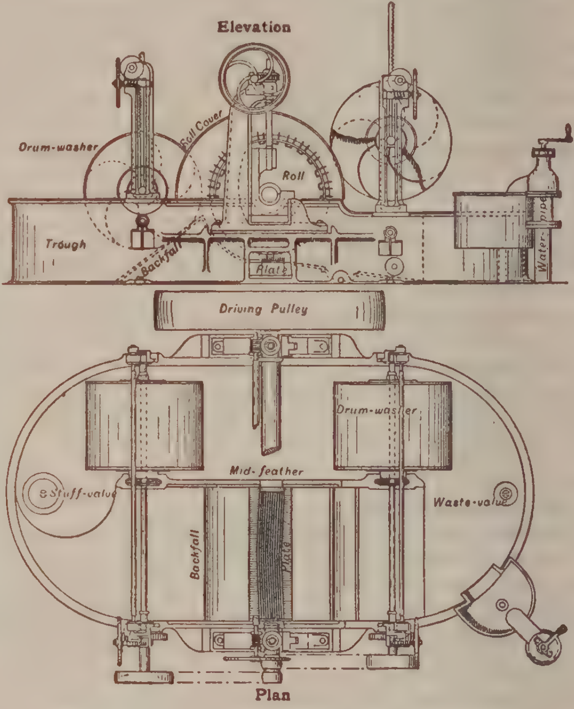


FIG. 2.—Rag-breaking Engine.

Straw. Most kinds of straw can be utilized for making into paper, the varieties generally used being rye, oat, wheat and barley; of these, the two former are the most important, as they give the largest yield in fibre. Germany and France are the two principal users of straw, which closely resembles esparto in its chemical constitution, and is reduced to a pulp by a somewhat similar process.

Scandinavia, Germany, the United States and Canada are the countries which mainly use wood as a material for paper-making.

Wood.

owing to their possession of large forest areas. They also export large quantities of wood-pulp to other countries. In Europe the Scotch fir (*Pinus sylvestris*), the spruce (*Picea excelsa*), the poplar (*Populus alba*) and the aspen (*Populus tremula*), are the timbers principally employed; and in America the black spruce (*Picea nigra*), the hemlock (*Tsuga canadensis*), the poplar (*Populus grandidentata*) and the aspen (*Populus tremuloides*). Two kinds of wood-pulp are used for paper manufacture, one prepared mechanically and the other chemically. The former is obtained by disintegrating the wood entirely by machinery without the use of chemicals, and is, as may readily be understood, a very inferior pulp. In the manufacture of chemical wood-pulp, very great advances have been made since 1880, and wood-pulp has grown to be one of the most important fibres for paper-making purposes. Two methods are in use, known respectively as the soda or alkaline process, and the sulphite or acid process, according as soda or sulphur (or rather sulphurous acid) forms the base of the reagent employed. Trees of medium age are usually selected, varying from seventy to eighty years' growth and running from 8 to 12 in. in diameter. They are felled in winter and reach the mill in logs about 4 ft. long. After being freed from bark and the knots taken out by machinery, the logs are cut into small cubical chips about ½ to ¾ in. in size by a revolving cutter. The chips are then bruised by being passed between two heavy iron rolls to allow the boiling solution thoroughly to penetrate them, and are conveyed to the boilers over a screen of coarse wire-cloth, which separates out the fine sawdust as well as any dirt or sand. In the soda process the wood is boiled in large revolving or upright stationary boilers for about seven or eight hours, in a similar manner to esparto and straw, though it requires much severer treatment. The steam pressure varies from 90 lb to as much as 150 lb per sq. in., and the amount of soda required is about 16% of Na_2O, estimated on the barked and cleaned wood. The essential feature of the sulphite process is the employment of a solution of sulphurous acid combined with a certain amount of base, either magnesia or lime. As the acid reaction of the bisulphite solution would attack any exposed ironwork with which it comes in contact, the boilers in all cases should be lined with lead. The type of boiler employed varies according to the process adopted. The principal patents connected with the sulphite process are those of Tilghman, Ekman, Francke, Ritter-Kellner, Mitscherlich, and Partington. The subsequent operations, in both the acid and alkaline processes of washing, bleaching and straining the pulp, are all very similar to those described for esparto. Wood-pulp produced by the sulphite process differs in a marked degree from that made by the soda process; the fibre in the former case is harsher and stronger, and papers made from it are characterized by their hardness and transparency, whereas those made from soda pulp are softer and more mellow, corresponding in some way to the difference between linen and cotton fibres. Each class of pulp is largely used, both alone and mixed with other materials.

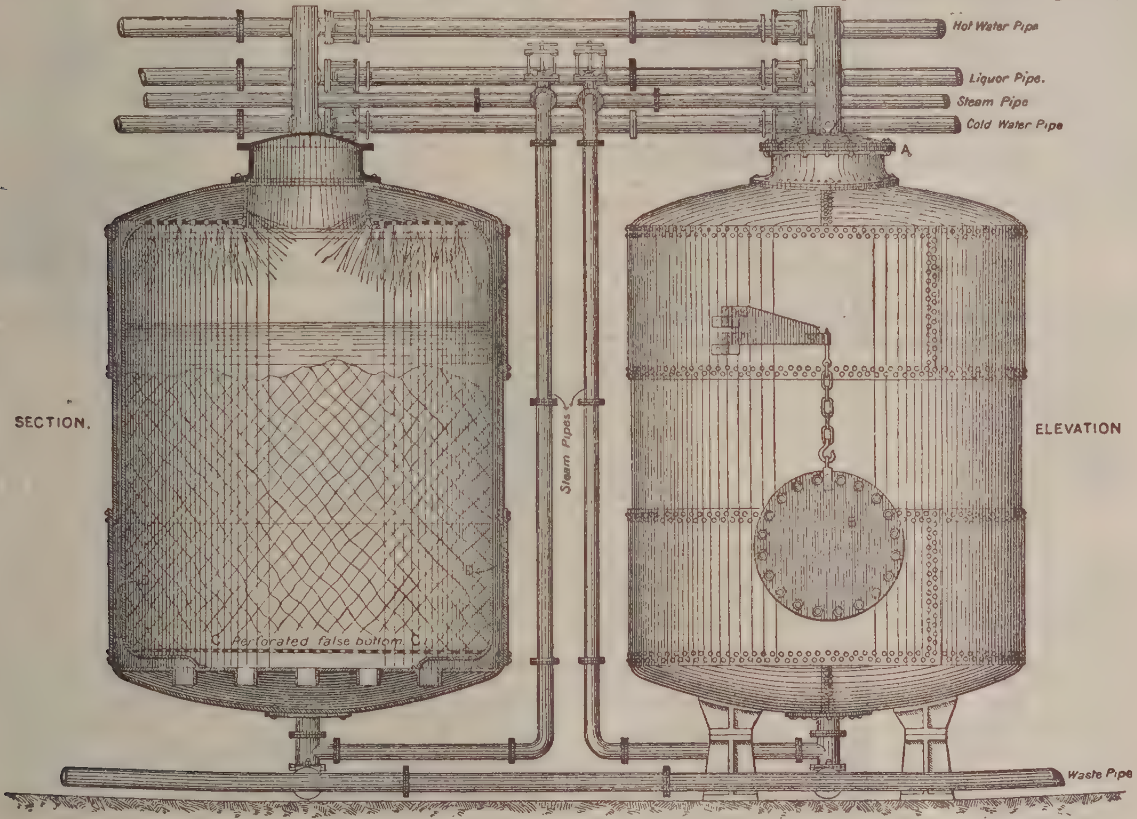


FIG. 3.—Sinclair Esparto Boiler.

Within recent years important modifications and improvements have been adopted in the preparation of esparto and wood half-stuff with a view to reduce the cost of manufacture and save waste of material. From the boiler to the beater the process becomes a continuous one, so that the prepared pulp requires practically no

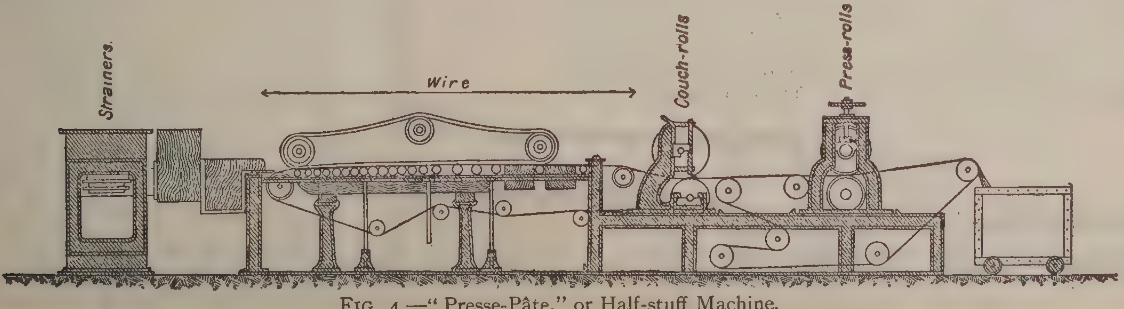
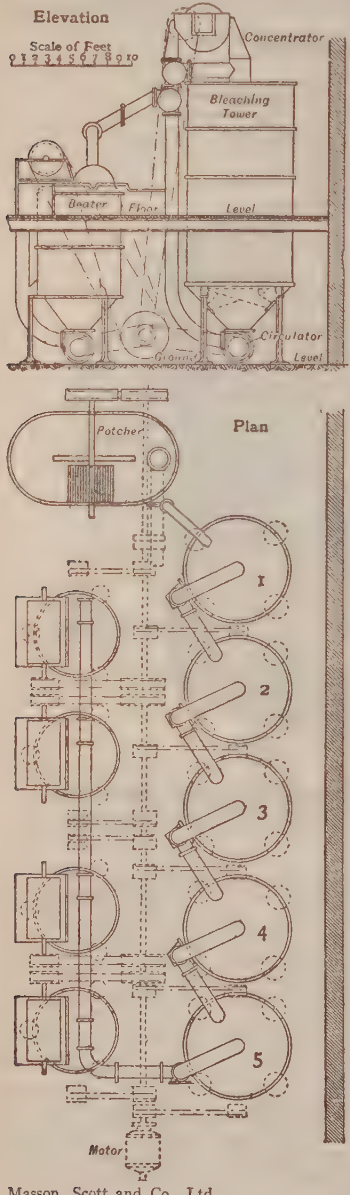


FIG. 4.—"Presse-Pâte," or Half-stuff Machine.

handling till it is made into finished paper at the end of the machine; this effects a considerable saving in cost of labour and reduces the waste of material incidental to a series of disconnected operations.

From the potcher or breaking engine the esparto or wood pulp is discharged, by means of a patent circulator or pump, into the first of a series of upright bleaching towers. These towers (fig. 5) are built up of wrought-iron rods and a special kind of cement. They are usually about 16 ft. high in the parallel by 8½ ft. in diameter; the bottom of the tower is conical and connected to a powerful circulator or pump, which discharges the pulp into the top of the tower and causes thereby a continuous circulation and a thorough mixing of the pulp and bleach. A special form of concentrator is fixed on the top of the first tower, which reduces the water in the pulp as it leaves the potcher to the minimum quantity necessary for perfect circulation in the tower; by this means a considerable saving is effected in the quantity of bleach required. After the necessary concentration of the pulp in No. 1 tower, the bleaching liquor is added and the circulator at the foot of the tower put in motion. A two-way valve in the discharge pipe allows the pulp to pass on to tower No. 2, and so on through the series. The circulator in each tower is only put in working for a short time once in every hour and there is never more than one circulator working in the series at one time. There is no manual labour in working the process, perfect cleanliness, and a great saving in power over the old process. Each tower will hold about two tons of dry pulp. When the pulp is fully bleached in the last tower of the series, fresh water is run into it, and a second concentrator, similar to the one on the first tower, is put in motion and washes out all traces of the bleach in about 25 to 30 minutes. These concentrators effect also another purpose, taking to some extent the place of the presse-pâte machine for removing roots, weeds and other impurities.

From the last tower and concentrator the bleached pulp is pumped through a line of pipes to the beaters, valves being fixed in the line of pipes to discharge into whichever beater is desired. These beaters are constructed in tower-form like the bleachers, the roll and plate being fixed on the top of the tower and the circulation effected in the same way as in the bleachers. Fig. 5 shows plan and elevation of such an arrangement of beaters and bleachers arranged in series. The beaters are made to hold each about 1500 ℔ of dry paper and a series of four of these can make from 55 to 60 tons of paper per week.



Masson, Scott and Co., Ltd.

FIG. 5.—Esparto Bleaching and Beating Plant.

Fibres like jute, hemp, manila, &c., are chiefly used for the manufacture of coarse papers where strength is of more importance than appearance, such as wrapping-papers, paper for telegraph-forms, &c. The boiling processes for them are similar to those used for esparto and straw.

Soda Recovery.

The alkaline liquors in which rags, esparto and other paper-making materials had been boiled were formerly run into the nearest water-course; but now, partly because it is insisted upon in England by the Rivers Pollution Acts, and partly because the recovery of the soda can be made remunerative, all these liquors are preserved and the soda they contain utilized. One of the best and most economical of the simple recovery plants is that invented by Porion, a French distiller, and named after him. This consists of an evaporating chamber A, on the floor of which a few inches of the liquid to be evaporated rest. By the action of fanners B, B revolving at a high speed and dipping into the liquid, it is thrown up in a fine spray through which the heated gases pass to the chimney. After being concentrated in the evaporating chamber the liquid flows into the incinerating furnaces C, C, where the remaining water is driven off by the heat of the fire D, and the mass afterwards ignited to drive off the carbonaceous matter. A considerable feature in this evaporator is Menzies and Davis's patent smell chamber E, a chamber filled with masonry in which the strongly-smelling gases from the incinerating furnace are allowed to remain at a red heat for a short time. After being recovered, the soda, in the form of crude carbonate, is lixiviated and re-causticized by boiling with milk of lime.

Porion's method is open, however, to the objection that the whole of the sulphur in the coal employed for the furnaces finds its way into the recovered soda, and forms sulphur compounds, thus reducing the value of the ash for boiling purposes; in addition, a considerable amount of soda is volatilized during the evaporation. By the application of the system of multiple-effect evaporation to the recovery of waste liquors these drawbacks disappear, and an important change has been made in the soda-recovery plant of the paper-mill. This system of multiple-effect evaporation, originally introduced by M. Rillieux, was perfected by the invention of Homer T. Yaryan, of Toledo, Ohio, U.S.A. This type may here be taken for description, though other types of evaporator are now also employed, notably the ordinary vertical tube multiple effect evaporator as used for concentrating sugar liquors. The Yaryan evaporator was originally applied in the United States to the concentration of the waste alkaline liquors of paper-mills; it then came into extensive use for the manufacture and refining of sugar, the production of glucose and a variety of other purposes. The principle of multiple-effect evaporation is to utilize the latent heat of a vapour given off from a liquid under a certain pressure to vaporize a further quantity of the liquid under a pressure maintained by mechanical means below that of the first. The essential feature which distinguishes the Yaryan evaporator consists in the boiling of the liquor to be treated while it is passing through a series of tubes, which constitute a coil and are heated externally by steam or vapour. The quantity of liquor entering the coil is so controlled that it is only permitted partially to fill the tubes, and thus leaves room for the instantaneous liberation of the vapour and its free escape.[1] As the liquor descends from tube to tube it becomes concentrated and reduced in volume until it ultimately passes into a "separator," where it impinges on a plate or disk, which causes a complete separation of the vapour and liquid; each then passes on to the next "effect," the liquid through the second coil of tubes and the vapour to the chamber enclosing them. This combination of a series of tubes, or coil, and separator constitutes a vessel or "effect," and the evaporator consists of a series, usually three or more, of these vessels, one above the other (fig. 7). The vital feature, it will be understood, is therefore that the latent heat of the original steam, after performing its function in the first effect, is passed on to the second and then to the third or more effects, in each of which an equal amount of work is done before passing to the final condenser, where a vacuum is maintained. Thus, if the total temperature be divided three times, the result is a triple-effect, if four times, a quadruple-effect. Taking an evaporation of 10 ℔ of water per pound of coal, a single-effect apparatus will evaporate 10 ℔ of water, a

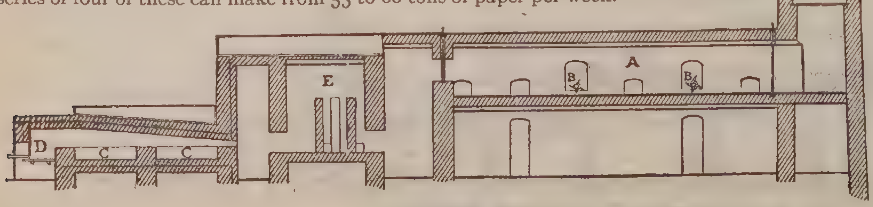


FIG. 6.—Porion Evaporator.

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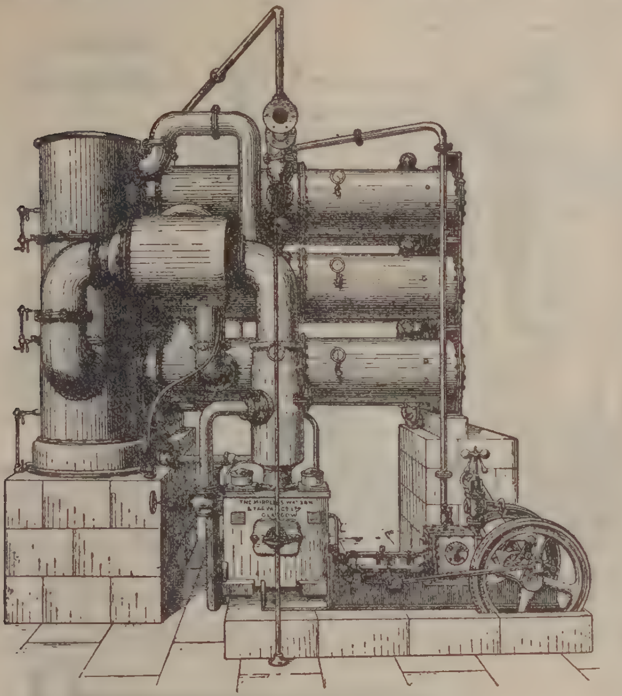
[1] In England, it should be stated, it is found that both for paper liquors and other liquors equally good evaporation results are obtained and the tubes kept cleaner by keeping them under a head of liquor, *i.e.* the liquor is fed into the bottom row of tubes and has to ascend row by row to the top row, from which it flows to the separator.

double-effect 20 lb, a triple-effect 30 lb, and so on.[1] The liquor to be concentrated is pumped from the storage tanks to the top or first effect of the Yaryan apparatus through a series of multiple-effect heaters, corresponding to the number of effects in the machine, by means of which the liquor is heated to as near the boiling point as possible of the liquor in the tubes of the first effect.



The Mirrlees Watson Co., Ltd.

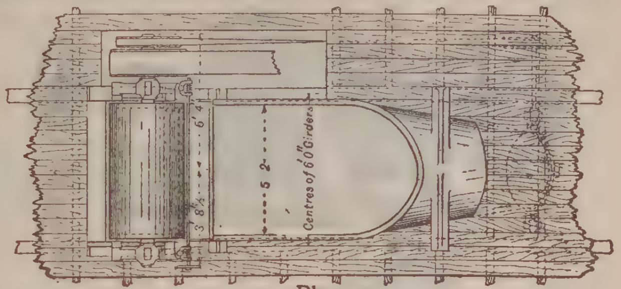
FIG. 7.—The Yaryan Patent Multiple Effect Evaporator.

Live steam is introduced into the chamber surrounding the tubes of the first effect, and from the separator of the last effect the concentrated liquor is pumped to the incinerator.

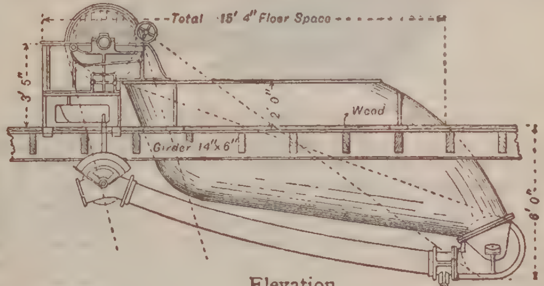
Any form of incinerating hearth can be used in conjunction with the multiple-effect evaporator, but one very suitable to the continuous work of, and the high degree of concentration produced by, the Yaryan machine is that known as the Warren rotary furnace. This consists of a revolving iron cylinder lined with brick, about 12 ft. long by 10 ft. in diameter. The lining being 6 in. thicker at the inlet[2] than at the discharge, the interior of the furnace is conical in form so that the ash gradually works forward and is eventually discharged fully burnt into trucks for storage, or on a travelling band, and so carried automatically to the dissolving or lixiviating tanks. The strong liquor runs in at one end in a slow continuous stream; by the rotation of the hearth the burning mass is carried up the sides and drops through the flame again to the bottom, much in the same manner as rags do in a revolving duster. In this way all the labour required to stir the ash of the ordinary hearth is dispensed with, and the burning material comes continuously in close contact with the flame, a complete and thorough combustion being the result. The fire-box is situated at the delivery end of the furnace, and is mounted on trucks[3] so that it can be run back when cleaning or repairing the brickwork. The waste heat is utilized in raising steam in a steam boiler set behind the furnace, and often in keeping the thick liquor hot after leaving the evaporator and before entering the rotary furnace.

Beating.

Paper-making proper from prepared pulp, whether of rags, esparto, wood or other raw material, may be said to begin with the operation technically known as "beating" which is carried out in one of the various forms of beating engine or "Holländer." The object of the beater is to reduce the fibres to suitable lengths and also to beat or bruise them into a stiff pulp of sufficient consistency to absorb and carry the water necessary to felt them together on the wire-cloth of the paper-machine. This operation is one of the most important and most delicate processes in the manufacture, requiring experience, skill and careful manipulation. Not only does every class of fibre demand its own special treatment, but this treatment has to be modified and varied in each case to suit the qualities and substances of the papers to be made from it.



Plan



Elevation

Masson, Scott & Co., Ltd.

FIG. 8.—Taylor's Patent Beater.

Although there are now in use a great many forms of beating engine, they are all, more or less, modifications of the original Holländer, which in its essential details differs little from the breaking engine already described. There are usually more bars in the roll and plate than in the breaker; the bars of the plate are set at a slight angle to the fly-bars of the roll to act as shears in a similar manner to a pair of scissors. Bars and plates of bronze are frequently used for the higher grades of paper to avoid rust and dirt and to produce a softer and less violent action on the fibres. The time required for the beating process varies from 3 to 4 hours up to 10 and 12 and even more. Beating engines fitted with mechanical circulation by pumps or otherwise have been extensively adopted, more particularly for working esparto and the other substitutes for rags. Fig. 8 shows one of these beaters, known as the Taylor beater; the roll and plate are fixed above the trough of the beater, which has no partition or mid-feather, and from the lower end a powerful circulator or pump circulates the pulp through the beater and discharges it through a pipe in a continuous stream in front of the roll. In the pipe is fixed a two-way valve, so that when the beating operation is complete the finished pulp can be run into the stuff-chests of the paper machine. The advantages of this form of beater are that a quicker and more thorough circulation of the pulp takes place than when the roll has to do the double duty of making the pulp travel and beating it up at the same time, and thus tends to reduce the time of the operation. Also more bars can be fixed in the roll, increasing its effect on the pulp, and less power is required than when the roll revolves in the middle of the stuff as in the ordinary form of beater.

Beating engines of quite a different construction are now largely used in American mills, and also to some extent in Great Britain. These are known as "refiners," and the most important forms are the Jordan and Kingsland beaters (so called from the names of the inventors), or modifications of them.

The first (fig. 9) consists of a conical plug or roll fixed on a shaft and revolving at a high rate of speed within an outer casing of corresponding shape; both the plug and the casing are furnished with steel bars parallel with the shaft, but set at slightly different angles, taking the place of the bars in the roll and plate of the ordinary beater. This conical plug or roll can be moved in either direction parallel to its axis and by this means the cutting action of the two sets of bars can be increased or reduced. The pulp flows into the top of the beater at the smaller end of the cone through a box provided with an arrangement for regulating the flow and passes out through an opening in the casing at the other end. The roll or plug revolves at from 350 to 400 revolutions per minute, and requires a power to drive it of from 25 to 40 h.p., according to the work to be done, and one engine is capable of passing as much as 1000 lb weight of dry pulp per hour. The Kingsland beater consists of a circular box or casing, on both inside faces of which are fixed a number of knives or bars of steel or bronze; inside the case is a revolving disk of metal fitted on both sides with corresponding and similar bars. The contact between the revolving and stationary bars can be regulated, as in the Jordan engine, to give the required amount of beating action on the pulp. The refiner is essentially a finishing process as an adjunct to the beating process proper. The advantages to be derived from its use are a considerable saving in the time occupied in beating and the production of a more uniform and evenly divided pulp, particularly where a mixture of different fibres is used. By the use of the refiner the time occupied in the beater can be reduced by nearly one-half, the half-beaten pulp passing through the refiner from the beater on its way to the paper-machine. It is not, however, generally employed for the best kinds of paper.

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[1] The figures given here are theoretical rather than actual. In practice a double effect is not capable of evaporating twice as much with 1 lb of coal as a single-effect, owing to loss of efficiency through radiation, &c.

[2] This was the original Warren principle, but has largely been abandoned in favour of a parallel brick lining throughout; the ash gradually works forward and is discharged as described.

[3] A later method is to build the fire-box on the descending side of the rotary furnace, while a specially constructed door and ash discharge shoot are provided at the ascending side, which gives access to the inside of the furnace and provides all the other essentials without the loss of heat which resulted from the portable fire-box, due to leakage between the box and the rotary furnace proper.

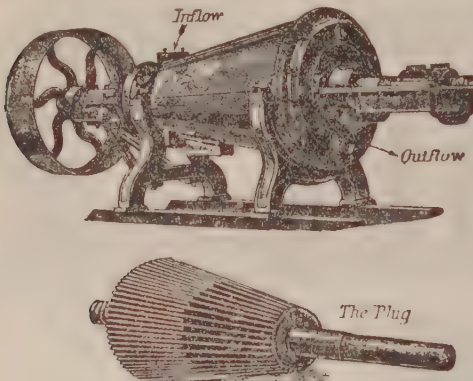

Fig. 9.—Jordan Beater.

During the operation of beating various materials and chemicals are added to the pulp for the purposes of sizing, loading, colouring, &c. Papers for writing and most of those for printing purposes must be rendered non-absorbent of ink or other liquid applied to them. To effect this some form of animal or vegetable size or glue must be applied to the paper, either as a coating on the finished web or sheet, or mixed with the pulp in the beating engine. The former, called "tub-sizing" will be described later; the latter which is known as "engine-sizing" consists in filling up the interstices of the fibres with a chemical precipitate of finely-divided resin, which, when dried and heated on the cylinders of the paper-machine, possesses the property of being with difficulty wetted with water. Except in the very best qualities of paper, it is usual to add to the pulp a certain quantity of cheap loading material, such as china-clay or kaolin, or pearl-hardening, a chemically precipitated form of sulphate of lime. The addition of such loading material to a moderate extent, say 10 to 15%, is not entirely in the nature of an adulterant, as it serves to close up the pores of the paper, and for ordinary writing, printing and lithographic papers renders the material softer, enabling it to take a much better and more even surface or glaze. But if added in excess it is detrimental to the strength and hardness of the sheet. Most materials, however well bleached, have a more or less yellowish tinge; to produce the desired white shade in the paper certain quantities of red and blue in the form of pigments or dyes must be added to the pulp. The blues usually employed are ultramarine, smalts and the aniline blues, while the red dyes are generally preparations of either cochineal or the aniline dyes. Other colours are required in the manufacture of papers of different tints, and with one or two exceptions they must be mixed with the pulp in the beater.

Paper Machine.

There are two distinct processes of producing the finished paper from the pulp, known respectively as "hand-made" and "machine-made." The expense of manufacture of hand-made paper and the consequent high price render it too costly for ordinary use; the entire process on the machine occupies a few minutes, while in the ordinary state of the weather it could not be done by hand in less than a week.

A brief description of the hand-made process will suffice and it will at the same time facilitate the right comprehension of the machine process. Only the finest qualities of rags are used for hand-made paper; and the preparation of the half-stuff is the same as that already described under treatment of rags. The pulp after being prepared in the beating engine is run into large chests from which the vat is supplied; before reaching this it is strained as on the paper-machine (see below). The sheet of paper is made on a mould of fine wire-cloth with a removable frame of wood to keep the pulp from running off, extending slightly above the surface of the mould, called the "deckel." To form the sheet, the paper-maker dips the mould into a vat (see fig. 10) containing the prepared pulp, lifting up just so much as will make a sheet of the required thickness; as soon as the mould is removed from the vat, the water begins to drain through the wire-cloth and to leave the fibres on the surface in the form of a coherent sheet, the felting or intertwining being assisted by a lateral motion or "shake" given to the mould by the workman; the movable deckel is then taken off, and the mould is given to another workman, called the "coucher," who turns it over and presses it against a felt, by this means transferring or "couching" the sheet from the wire to the felt. A number of the sheets thus formed are piled one above another alternately with pieces of felt, and the whole is subjected to strong pressure to expel the water; the felts are then removed and the sheets are again pressed and dried, when they are ready for sizing. Any pattern or name required in the sheet is obtained by making the wire-cloth mould in such a way that it is slightly raised in those parts where the pattern is needed (fig. 11); consequently less pulp lodges there and the paper is proportionately thinner, thus showing the exact counterpart of the pattern on the mould; such are known as "watermarks." The expense of manufacturing paper in this way is very much greater than by machinery; but the gain in strength, partly owing to the time allowed to the fibres to knit together, and partly to the free expansion and contraction permitted them in drying, still maintains a steady demand for this class of paper.

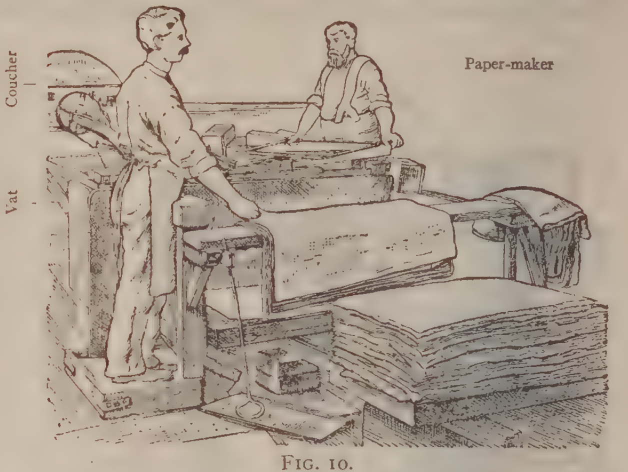

Fig. 10.

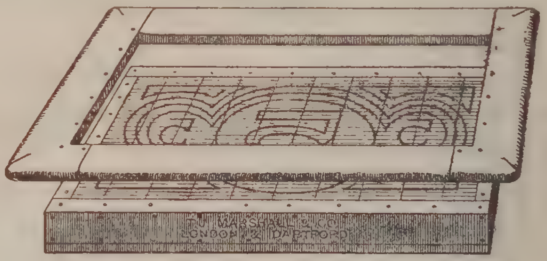

Fig. 11.—Mould and Deckel for hand-made paper.

The paper-machine (fig. 12) consists essentially of an endless mould of fine wire-cloth on which the pulp flows and on which a continuous sheet of paper is formed; the sheet then passes through a series of press rolls and over a number of steam-heated cylinders until it is dry. From the beating engines, the pulp is emptied into storage tanks or stuff-chests, fitted with revolving arms or agitators; from these the pulp is pumped into a long upright supply box at a higher level, called the stuff box, which communicates with the sand trap or table by means of a regulating valve. With the pulp a certain amount of water is allowed to flow on to the sand trap so as to dilute it sufficiently to form on the wire-cloth of the paper-machine. The sand trap consists of an elevated table in which is sunk a shallow serpentine channel lined on the bottom with rough felt and divided throughout its length by a number of small strips of wood, behind which the impurities collect as the pulp flows over them on its way to the strainers.

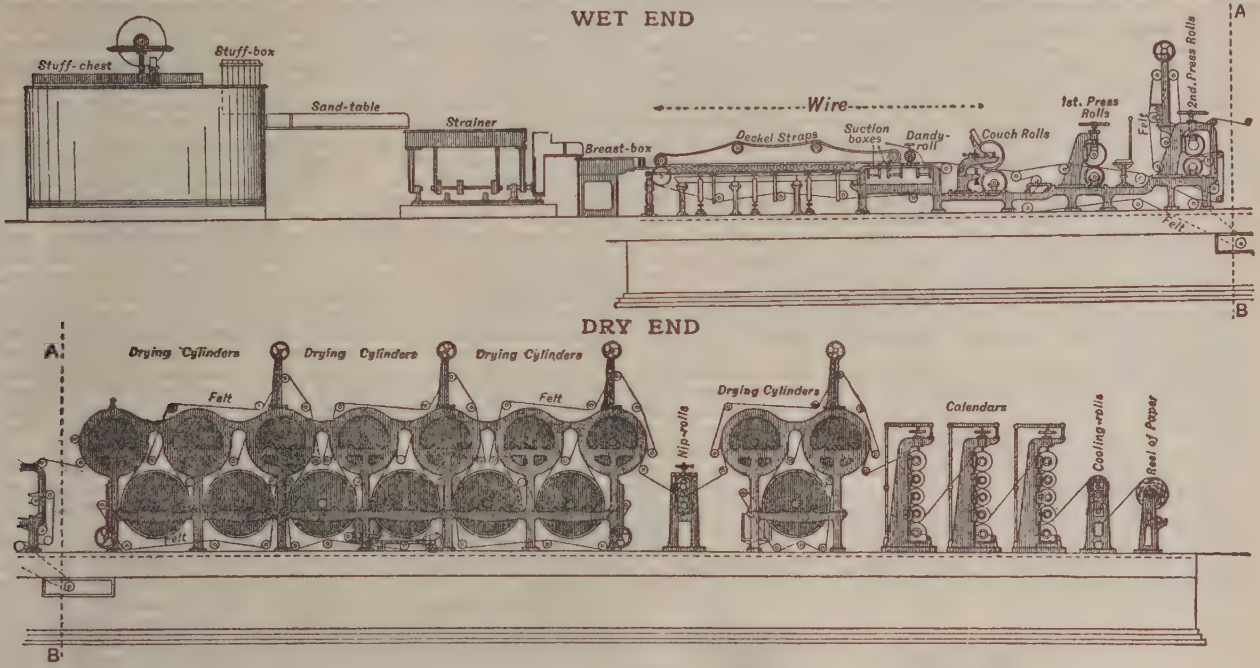

Fig. 12.—Paper-Making Machine.

Straining. The strainers are made of plates of brass or some hard and durable composition with fine parallel slits cut in them, through which the fibres pass, all knots and improperly divided portions remaining behind; the pulp is made to pass through them by the rapid vibration of the plates themselves or by a strong suction underneath them, or sometimes by a combination of the two. From the strainers the pulp flows into a long wooden box or trough, of the same width as the paper machine, called the "breast-box," and thence on to the wire-cloth. ***Forming the Sheet.*** The wire consists of a continuous woven brass cloth, supported horizontally by small brass rolls, called "tube-rolls," carried on a frame; it is usually 40 to 50 ft. long and is stretched tight over two rolls, one at each end of the frame, called respectively the "breast-roll" and the "lower-couch roll." The ordinary gauge for the wire-cloth is 66 meshes to the inch for writings and printings; finer wires are sometimes used, however, up to 80 to the inch; for lower grades the mesh is coarser. The water, mixed with the pulp, flows from the wire-cloth by gravitation along the lines of contact between it and the tube-rolls; this water, which contains a considerable percentage of fibre, especially from finely beaten pulps, drops into a flat copper or wooden tray, from which it flows into a tank and is pumped up with the water for diluting the pulp so that none of it shall be wasted. From the tube-rolls the wire conveys the pulp over a pair of suction-boxes for extracting the remaining water from the web. The width of the web of paper is determined by two continuous straps of vulcanized rubber about 1½ in. square, one on each side of the wire, called the "deckel-straps"; the distance between these straps can be increased or diminished; they serve to guide the pulp from the moment it spreads on the wire until it arrives at the first suction-box, where the web is sufficiently dry to retain its edges.

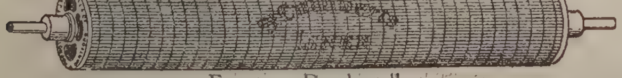

Fig. 13.—Dandy-roll.

Shake. The frame of the machine from the breast-roll to the first suction-box is hung on a pair of strong hinges, and is capable of a slight horizontal motion imparted by a horizontal connecting-rod, one end of which is eccentrically keyed on to the face of a rapidly-revolving disk driven by a pair of speed-cones, so that the speed of the shake can be altered. The object of this shake is to interlace the fibres together, but it also assists in keeping the water from passing through the wire too rapidly before the paper has been properly formed. Most machines have two suction-boxes with the "dandy-roll" revolving between them on the top of the pulp (so called because it can be made to give to the paper any desired water-marking). ***Watermarking and Couching.*** The "dandy-roll" (fig. 13) is a light skeleton cylinder covered with wire-cloth on which small pieces of wire are soldered representing the watermark to be reproduced in the paper. From the last suction-box the half-dried sheet of pulp passes between the "couch-rolls," so called from the corresponding operation of couching in hand-made paper, which, by pressing out most of the remaining moisture, impart sufficient consistency to the paper to enable it to leave the wire; both rolls are covered with a felt jacket, and the top one is provided with levers and weights to increase or diminish the pressure on the web. ***Pressing and Drying.*** The paper is now fully formed, and is next carried by means of endless felts between two and sometimes three pairs of press-rolls to extract the remaining moisture, and to obliterate as much as possible the impression of the wire-cloth from the under-side of the web. The web of paper is finally dried by passing it over a series of hollow steam-heated drying cylinders driven one from the other by gearing. The slower and more gradual the drying process the better, as the change on the fibres of the web due to the rapid contraction in drying is thereby not so excessive, and the heat required at one time is not so great nor so likely to damage the quality of the paper; the heating surface should therefore be as large as possible, and a great number of cylinders is required now that the machines are driven at high speeds. The cylinders are so placed that both surfaces of the web are alternately in contact with the heating surface. All the cylinders, except the first two or three with which the moist paper comes in contact and where the greatest evaporation occurs, are encased by continuous travelling felts. The drying cylinders are generally divided into two sets between which is placed a pair of highly polished chilled iron rolls heated by steam, called "nip-rolls," or "smoothers," the purpose of which is to flatten or smooth the surface of the paper while in a partially dry condition. ***Surfacing.*** Before being reeled up at the end of the machine the web of paper is passed through two or more sets of "calenders," according to the degree of surface or smoothness required. These calenders consist of a vertical stack of chilled iron rolls, generally five in number, revolving one upon another, and one or more of which are bored and heated by steam; pressure can be applied to the stack as required by means of levers and screws. The web of paper is now wound up in long reels at the end of the machine.

Paper-machines are now usually driven by two separate steam engines. The first, running at a constant speed, drives the strainers, pumps, shake motion, &c., while the second, working the paper-machine, varies in speed according to the rate at which it requires to be driven. The power consumed by the two engines will average from 40 to 100 h.p. The drying cylinders of the paper-machine form a convenient and economical condenser for the two steam-engines, and it is customary to exhaust the driving engine into the drying cylinders and utilize the latent heat in the steam for drying the paper, supplementing the supply when necessary with live steam. The speed of the machine has frequently to be altered while in motion. An alteration of a few feet per minute can be effected by changing the driving-speed of the steam-engine governor; for a greater change the machine must be stopped and other driving-wheels substituted. Arrangements are made in the driving-gear by which the various parts of the machine can be slightly altered in speed relatively to one another, to allow for the varying contraction or expansion of the paper web for different kinds and thicknesses of paper. The average speed of a paper-machine on fine writing-papers of medium weight is from 60 to 90 ft. per minute, but for printing-papers, newspapers, &c., the machine is driven from 120 up to as much as 300 and 400 ft. per minute. The width of machines varies greatly in different mills, from about 60 in. to as much as 150 in. wide. Mills running on higher classes of papers as a rule use narrow machines, as these make a closer and more even sheet of paper than wider ones. On fine writing-papers an average machine will make from 20 to 40 tons per week, while for common printing and newspapers the weekly output will amount to 50 to 70 tons.

Tub-sizing.

All hand-made papers, and many of the best classes of machine-made papers, instead of being sized in the beater with a preparation of resin are what is called "tub-sized," that is, coated with a solution of gelatin. Such papers, when machine-made, are reeled off the machine straight from the drying cylinders in the rough state. The web is then led slowly through a tub or vat containing a heated solution of animal glue or gelatin mixed with a certain amount of alum; after passing through a pair of brass rolls to squeeze out the superfluous size, the web is reeled up again and allowed to remain for some time for the size to set. The paper is then led by means of continuous travelling tapes over a long series of open skeleton drums, about 4 ft. in diameter, inside which revolve fans for creating a circulation of hot air; rows of steam-pipes underneath the line of drums furnish the heat for drying. Slow and gradual drying is essential to this process to get the full benefit of the sizing properties of the gelatin. In hand-made papers, the sheets are passed by handfuls of three or five on an endless felt through the gelatin solution and between a pair of rolls, and then slowly dried on rope lines or "tribbles" in a steam-heated and well-ventilated loft.

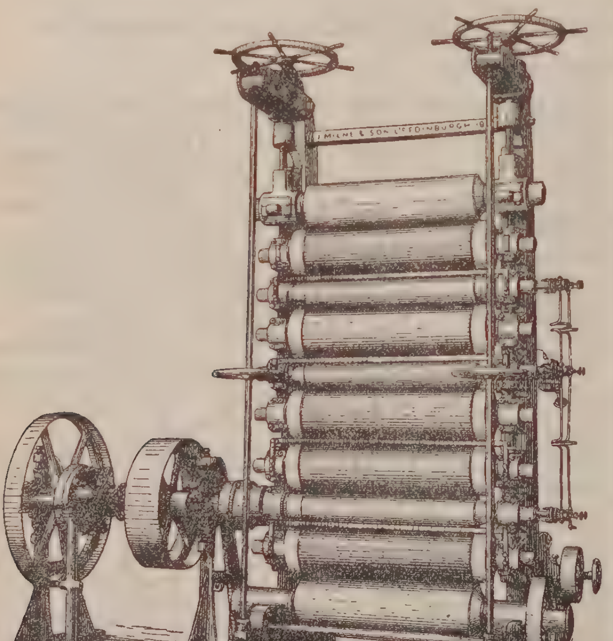
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FIG. 14.—Super-calender.

The bottom roll and the 3rd, 6th, 8th and 10th rolls, all reckoned from the bottom, are made of highly polished chilled cast-iron; the others of highly compressed paper.

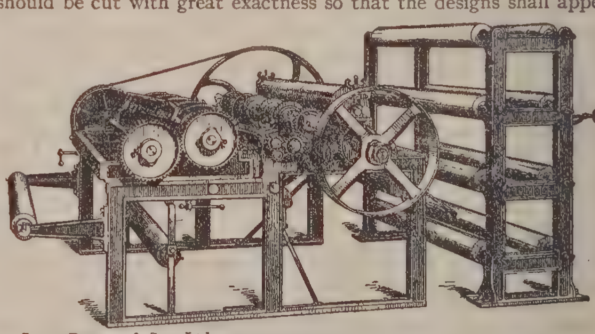
Glazing or Surfacing.

The cheaper kinds of paper are glazed on the paper-machine in the calenders as before described. For the better class or very highly-glazed papers and those that are tub-sized, a subsequent glazing process is required; this is effected by sheet or plate-glazing and by super-calendering or web-glazing. The plate-glazing process is adopted mainly for the best grades of writing-papers, as it gives a smoother, higher and more permanent gloss than has yet been imitated by the roll-calender. In this method each sheet is placed by hand between two zinc or copper plates until a pile of sheets and plates has been formed sufficient to make a handful for passing through the glazing-rolls; this handful of about two quires or 48 sheets of paper, is then passed backwards and forwards between two chilled-iron rolls gearing together. A considerable pressure can be brought to bear upon the top roll by levers and weights, or by a pair of screws; the pressure on the rolls, and the number of times the handful is passed through, are varied according to the amount of gloss required on the paper. The super-calender (see fig. 14) is used to imitate the plate-glazed surface, partly as a matter of economy in cost, but principally for the high surfaces required on papers for books and periodicals to show up wood-cuts and photographic illustrations. It usually consists of a stack of chilled cast-iron rolls, alternating with rolls of compressed cotton or paper so that the web at each nip is between cotton and iron; it will be seen from the illustration that there are two cotton rolls together in the stack for the purpose of reversing the action on the paper and so making both sides alike; pressure is applied to the rolls at the top by compound levers and weights or screws. A very high surface can be quickly given to paper by friction with the assistance of heat; the process is known as "burnishing," and is used mostly for envelope papers and wrappings where one surface only of the web is required to be glazed. It is produced by the friction of a chilled-iron roll on one of cotton or paper, the ratio of the revolutions being as 4 to 5; steam is admitted to the burnishing iron roll.

At the end of the 19th century a large and increasing demand sprang up for papers embossed with a special pattern, such as linen-finish, &c.; these are used principally for fancy writing-papers, programmes, menu-cards, &c. This embossing is effected usually on the plate-glazing machine, in the case of linen and similar finishes by enclosing each sheet of paper between two pieces of linen or other suitable material to give the desired texture or pattern on the surface of the sheet. Each sheet of paper with its two pieces of cloth is placed between zinc plates and passed backwards and forwards between the rolls of the machine as in plate-glazing.

Cutting.

Except for special purposes, such for example as for use in a continuous printing-machine, paper is usually sent from the mill in the form of sheets. A number of reels of paper is hung on spindles between two upright frames to feed the cutting-machine (see fig. 15): the various webs of paper are drawn forward together through two small rollers, and ripped into widths of the required size by means of a number of pairs of circular knives or "slitters"; they then pass between another pair of rollers, and over a long dead-knife fixed across the cutting-machine, on which they are cut into sheets by another transverse knife fastened to a revolving drum and acting with the dead-knife like a large pair of shears. The cut sheets then fall upon an endless travelling felt, from which they are stacked in piles by boys. It is often necessary, as in the case of water-marked papers, that the sheets should be cut with great exactness so that the designs shall appear in the centre of the sheet; the ordinary cutter cannot be relied upon for this purpose and in its place a machine called a "single-sheet cutter" is used. In this cutter only one web of paper is cut at a time; between the circular slitters and the transverse knives is placed a measuring-drum, which receives an oscillating motion and can be adjusted by suitable mechanism to draw the exact amount of paper forward for the length of sheet required.



James Bertram & Son, Ltd.

FIG. 15.—Reel Paper Cutter.

All that now remains to be done before the paper is ready for the market is overhauling or sheeting. This operation consists in sorting out all speckled, spotted or damaged sheets, or sheets of different shades of colour, &c.; this entails considerable time and expense as each sheet has to be passed in review separately.

Sheeting.

This sorting is usually performed by women. Papers are as a rule sorted into three different qualities, known in the trade respectively as "perfect," "retree" and "broke"; the best of the defective sheets form the second quality "retree," a term derived from the French word *retirer* (to draw out), and are sold at a reduced price; sheets that are torn or damaged or too badly marked to pass for the third quality "broke," are returned to the mill to be repulped as waste paper.

Sizes of Paper.

Paper is sold in sheets of different sizes and is made up into reams containing from 480 to 516 sheets; these sizes correspond to different trade names, such for example as foolscap, post, demy, royal, &c.; the following are the ordinary sizes:—

Writing Papers.		Drawing and Book Papers.		Printing Papers.	
	Inches.		Inches.		Inches.
Pott	12½ × 15	Demy	15½ × 20	Demy	17½ × 22½
Foolscap	13¼ × 16½	Medium	17¾ × 22½	Double demy	22½ × 35
Double foolscap	16½ × 26½	Royal	19 × 24	Quad demy	35 × 45
Foolscap and third	13¼ × 22	Super-royal	19¼ × 27	Double foolscap	17 × 27
Foolscap and half	13¼ × 24¾	Imperial	22 × 30	Royal	20 × 25
Pinched post	14½ × 18½	Elephant	23 × 28	Double royal	25 × 40
Small post	15¼ × 19	Double elephant	26½ × 40	Double crown	20 × 30
Large post	16½ × 21	Colombier	23½ × 34½	Quad crown	30 × 40
Double large post	21 × 33	Atlas	26 × 34	Imperial	22 × 30
Medium	18 × 23	Antiquarian	31 × 53		

Standards of Quality.

With the enormously increased production of paper and the great reduction in price within recent years, it has been found that the "science" of paper-making has scarcely advanced with the same rapid strides as the art itself. Although a sheet of paper made to-day differs little as a fabric from the papers of earlier epochs, the introduction of new and cheaper forms of vegetable fibres and the auxiliary methods of treating them have caused a great change in the quality, strength and lasting power of the manufactured article. The undue introduction of excessive quantities of mechanical or ground wood-pulp in the period 1870–1880 into the cheaper qualities of printing-papers, particularly in Germany, first drew attention to this matter, since it was noticed that books printed on paper in which much of this material had been used soon began to discolour and turn brown where exposed to the air or light, and after a time the paper became brittle. This important question began to be scientifically investigated in Germany about the year 1885 by the Imperial Testing Institution in Berlin. A scheme of testing papers has been formulated and officially adopted by which the chemical and physical properties of different papers are compared and brought to numerical expression. The result of these investigations has been the fixing of certain standards of quality for papers intended for different purposes. These qualities are grouped and defined under such heads as the following:—

Strength, expressed in terms of the weight or strain which the paper will support.

Elasticity and texture, measured by elongation under strain and resistance to crumpling or rubbing.

Bulk, expressed in the precise terms of specific gravity or weight per unit of volume.

Article.	Imports.		Exports.	
	Weight.	Value.	Weight.	Value.
	Tons.	£	Tons.	£
Paper, unprinted	268,036	3,917,954	87,055	2,342,420
Paper, printed	11,494	621,293		
Straw- and millboards	164,381	1,134,568		
	443,911	5,673,815		
Rags, linen and cotton	20,039	206,151	122,909 (including other paper making materials.)	752,739
Esparto and other vegetable fibres	202,523	738,834		
Wood-pulp—				
Chemical	282,098	2,396,856		
Mechanical	192,756	915,491		
	697,416	4,257,332		

Of not less importance are the qualities which belong to paper as a chemical substance or mixture, which are: (1) its actual composition; (2) the liability to change under whatever conditions of storage and use it may be subjected to. For all papers to be used for any permanent purpose these physical and chemical qualities must ultimately rank as regulating the consumption and production of papers.

In England and Wales in 1907 there were 207 mills, using 409 machines and 99 vats for hand-made paper; in Scotland, 59 mills and 111 machines; in Ireland, 7 mills and 11 machines. A rough estimate of the amount of capital embarked in the industry may be formed on the basis that average mills would represent from £20,000 to £30,000 and upwards per machine.

The table at foot of page shows the amounts and values of the British imports and exports of paper and paper-making materials in 1907.

AUTHORITIES.—Arnot, "Technology of the Paper-trade," Cantor Lectures, Society of Arts (London, 1877); Clapperton, *Practical Paper-Making* (London, 1894); Cross and Bevan, *Report on Indian Fibres and Fibrous Substances* (London, 1887); id., *Cellulose* (London, 1895–1905); id., *A Text-Book of Paper-Making* (London, 1888); Clayton Beadle, *Chapters on Paper-Making* (London); Davis, *The Manufacture of Paper* (Philadelphia, 1886); Dropisch, *Die Papier Machine* (Brunswick, 1878); id., *Papierfabrikation* (with atlas) (Weimar, 1881); Griffin and Little. *The Chemistry of Paper-making* (New York, 1894); Herzberg, *Papierprüfung* (Berlin, 1888; Eng. trans. by P. N. Evans, London); id., *Mikroskopische Untersuchung des Papiers* (Berlin, 1887); Hofmann, *Handbuch der Papier-fabrikation* (Berlin, 1897); Hoyer, *Fabrikation des Papiers* (Brunswick, 1886); Indian government, *Report on the Manufacture of Paper and Paper Pulp in Burmah* (London, 1906); Schubert, *Die Cellulose-fabrikation* (Berlin, 1897); id., *Die Praxis der Papierfabrikation* (Berlin, 1898); id., *Die Holzstoff-oder Holzschliff-fabrikation* (Berlin, 1898); Sindall, *Paper Technology* (London, 1904–1905); "Report of the Committee on the Deterioration of Paper," Society of Arts (London, 1898); Wyatt, "Paper-making," *Proc. Inst. C. E.*, lxxix. (London, 1885); id., "Sizing Paper with Rosin," *Proc. Inst. C.E.*, xci. (London, 1887); *Paper-Makers' Monthly Journal* (London, since 1872); *Paper-Trade Journal* (New York, since 1872); *Papier-Zeitung* (Berlin, since 1876). (J. W. W.)

India Paper.—This name is given to a very thin and light but tough and opaque kind of paper, sometimes used for printing books—especially Bibles—of which it is desirable to reduce the bulk and weight as far as possible without impairing their durability or diminishing their type. The name was originally given in England, about the middle of the 18th century, to a soft absorbent paper of a pale buff shade, imported from China, where it was made by hand on a paper-making frame generally similar to that used in Europe. The name probably originated in the prevailing tendency, down to the end of the 18th century, to describe as "Indian" anything which came from the Far East (cf. Indian ink). This so-called India paper was used for printing the earliest and finest impressions of engravings, hence known as "India proofs."

The name of India paper is now chiefly associated with European (especially British) machine-made, thin, opaque printing papers used in the highest class of book-printing. In 1841 an Oxford graduate brought home from the Far East a small quantity of extremely thin paper, which was manifestly more opaque and tough, for its weight, than any paper then made in Europe. He presented it to the Oxford University Press, and in 1842 Thomas Combe, printer to the University, used it for 24 copies of the smallest Bible then in existence—Diamond 24mo. These books were scarcely a third of the usual thickness, and were regarded with great interest; one was presented to Queen Victoria, and the rest to other persons. Combe tried in vain to trace the source of this paper. In 1874 a copy of this Bible fell into the hands of Henry Frowde, and experiments were instituted at the Oxford University paper-mills at Wolvercote with the object of producing similar paper. On the 24th of August 1875 an impression of the Bible, similar in all respects to that of 1842, was placed on sale by the Oxford University Press. The feat of compression was regarded as astounding, the demand was enormous, and in a very short time 250,000 copies of this "Oxford India paper Bible" had been sold. Many other editions of the Bible, besides other books, were printed on the Oxford India paper, and the marvels of compression accomplished by its use created great interest at the Paris Exhibition of 1900. Its strength was as remarkable as its lightness; volumes of 1500 pages were suspended for several months by a single leaf, as thin as tissue, and when they were examined at the close of the exhibition, it was found that the leaf had not started, the paper had not stretched, and the volume closed as well as ever. The paper, when subjected to severe rubbing, instead of breaking into holes like ordinary printing paper, assumed a texture resembling chamois leather, and a strip 3 in. wide was found able to support a weight of 28 lb without yielding.

The success of the Oxford India paper led to similar experiments by other manufacturers, and there were in 1910 nine mills (two each in England, Germany and Italy, one each in France, Holland and Belgium) in which India paper was being produced. India paper is mostly made upon a Fourdrinier machine in continuous lengths, in contradistinction to a hand-made paper, which cannot be made of a greater size than the frame employed in its production. The material used in its manufacture is chiefly rag, with entire freedom from mechanical wood pulp. The opacity of modern India paper, so remarkable in view of the thinness of the sheet, is mainly due to the admixture of a large proportion of mineral-matter which is retained by the fibres. The extraordinary properties of this paper are due, not to the use of special ingredients, but to the peculiar care necessary in the treatment of the fibres, which are specially "beaten" in the beating engine, so as to give strength to the paper, and a capacity for retaining a large percentage of mineral matter. The advantage gained by the use of India paper is the diminution of the weight and bulk of a volume—usually to about one-third of those involved by the use of good ordinary printing paper—without any alteration in the size and legibility of its type and without any loss of opacity, which is an absolute necessity in all papers used for high-class book printing to prevent the type showing through. (W. E. G. F.)

PAPHLAGONIA, an ancient district of Asia Minor, situated on the Euxine Sea between Bithynia and Pontus, separated from Galatia by a prolongation to the east of the Bithynian Olympus. According to Strabo, the river Parthenius formed the western limit of the region, which was bounded on the east by the Halys. Although the Paphlagonians play scarcely any part in history, they were one of the most ancient nations of Asia Minor (*Iliad*, ii. 851). They are mentioned by Herodotus among the races conquered by Croesus, and they sent an important contingent to the army of Xerxes in 480 B.C. Xenophon speaks of them as being governed by a prince of their own, without any reference to the neighbouring satraps, a freedom due, perhaps, to the nature of the country, with its lofty mountain ranges and difficult passes. At a later period Paphlagonia passed under the Macedonian kings, and after the death of Alexander the Great it was assigned, together with Cappadocia and Mysia to Eumenes. It continued, however, to be governed by native princes until it was absorbed by the encroaching power of Pontus. The rulers of that dynasty became masters of the greater part of Paphlagonia as early as the reign of Mithradates III. (302–266 B.C.), but it was not till that of Pharnaces I. that Sinope fell into their hands (183 B.C.). From this time the whole province was incorporated with the kingdom of Pontus until the fall of the great Mithradates (65 B.C.). Pompey united the coast districts of Paphlagonia with the province of Bithynia, but left the interior of the country under the native princes, until the dynasty became extinct and the whole country was incorporated in the Roman empire. All these rulers appear to have borne the name of Pylaemenes, as a token that they claimed descent from the chieftain of that name who figures in the *Iliad* as leader of the Paphlagonians. Under the Roman Empire Paphlagonia, with the greater part of Pontus, was united into one province with Bithynia, as we find to have been the case in the time of the younger Pliny; but the name was still retained by geographers, though its boundaries are not distinctly defined by Ptolemy. It reappears as a separate province in the 5th century (Hierocles, *Synecd.* c. 33).

The ethnic relations of the Paphlagonians are very uncertain. It seems perhaps most probable that they belonged to the same race as the Cappadocians, who held the adjoining province of Pontus, and were undoubtedly a Semitic race. Their language, however, would appear from Strabo to have been distinct. Equally obscure is the relation between the Paphlagonians and the Eneti or Heneti (mentioned in connexion with them in the Homeric catalogue) who were supposed in antiquity to be the ancestors of the Veneti, who dwelt at the head of the Adriatic. But no trace is found in historical times of any tribe of that name in Asia Minor.

The greater part of Paphlagonia is a rugged mountainous country, but it contains fertile valleys, and produces great abundance of fruit. The mountains are clothed with dense forests, which are conspicuous for the quantity of boxwood which they furnish. Hence its coasts were from an early period occupied by Greek colonies, among which the flourishing city of Sinope, founded from Miletus about 630 B.C., stood pre-eminent. Amastris, a few miles east of the Parthenius, became important under the Macedonian monarchs; while Amisus, a colony of Sinope, situated a short distance east of the Halys, and therefore not strictly in Paphlagonia as defined by Strabo, rose to be almost a rival of its parent city. The most considerable towns of the interior were Gangra, in ancient times the capital of the Paphlagonian kings, afterwards called Germanicopolis, situated near the frontier of Galatia, and Pompeiopolis, in the valley of the Amnias (a tributary of the Halys), near which were extensive mines of the mineral called by Strabo *sandarake* (red arsenic), which was largely exported from Sinope.

See Hommaire de Hell, *Voyage en Turquie* (Paris, 1854–1860); W. J. Hamilton, *Researches* (London, 1842); W. M. Ramsay, *Hist. Geog. of Asia Minor* (London, 1890).

PAPHOS, an ancient city and sanctuary on the west coast of Cyprus. The sanctuary and older town (Palaepaphos) lie at Kouklia, about 20 m. west of Limasol, about a mile inland on the left bank of the Diorizo River (anc. Bocarus), the mouth of which formed its harbour. New Paphos (Papho or Baffo), which had already superseded Old Paphos in Roman times, lies 10 m. farther west, and 1 m. south of modern Ktima, at the other end of a fertile coast-plain. Paphos was believed to have been founded either by the Arcadian Agapenor, returning from the Trojan War (*c.* 1180 B.C.), or by his reputed contemporary Cinyras, whose clan retained royal privileges down to the Ptolemaic conquest of Cyprus in 295 B.C., and held the Paphian priesthood till the Roman occupation in 58 B.C. The town certainly dates back to the close of the Mycenaean Bronze age, and had a king Eteandros among the allies of Assur-bani-pal of Assyria in 668 B.C.[1] A later king of the same name is commemorated by two inscribed bracelets of gold now in the Metropolitan Museum of New York. In Hellenic times the kingdom of Paphos was only second to Salamis in extent and influence, and bordered on those of Soli and Curium.

Paphos owes its ancient fame to the cult of the "Paphian goddess" (ἡ ΠαφίαΓάνασσα, or ἡ Παφία, in inscriptions, or simply ἡ θεὰ), a nature-worship of the same type as the cults of Phoenician Astarte, maintained by a college of orgiastic ministers, practising sensual excess and self-mutilation.[2] The Greeks identified both this and a similar cult at Ascalon with their own worship of Aphrodite,[3] and localized at Paphos the legend of her birth from the sea foam, which is in fact accumulated here, on certain winds, in masses more than a foot deep.[4] Her grave also was shown in this city. She was worshipped, under the form of a conical stone, in an open-air sanctuary of the usual Cypriote type (not unlike those of Mycenaean Greece), the general form of which is known from representations on late gems, and on Roman imperial coins;[1] its ground plan was discovered by excavations in 1888.[2] It suffered repeatedly from earthquakes, and was rebuilt more than once; in Roman times it consisted of an open court, irregularly quadrangular, with porticos and chambers on three sides, and a gateway through them on the east. The position of the sacred stone, and the interpretation of many details shown on the gems and coins, remain uncertain. South of the main court lie the remains of what may be either an earlier temple, or the traditional tomb of Cinyras, almost wholly destroyed except its west wall of gigantic stone slabs.

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[1] E. Schrader, *Abh. k. Preuss. Ak. Wiss.* (1879), pp. 31-36; *Sitzb. k. Preuss. Ak. Wiss.* (1890), pp. 337-344.

[2] Athan. *c. graecos*, 10. On all these cults see J. G. Frazer, *Adonis, Attis, Osiris* (London, 1906).

[3] Herod. i. 105; see further ASTARTE, APHRODITE.

[4] Oberhummer, *Die Insel Cypern* (Munich, 1903), pp. 108-110.

After the foundation of New Paphos and the extinction of the Cinyrad and Ptolemaic dynasties, the importance of the Old Town declined rapidly. Though restored by Augustus and renamed Sebastê, after the great earthquake of 15 B.C., and visited in state by Titus before his Jewish War in 79 B.C., it was ruinous and desolate by Jerome's time[3]; but the prestige of its priest-kings partly lingers in the exceptional privileges of the patriarch of the Cypriote Church (see CYPRUS, CHURCH OF).

New Paphos became the administrative capital of the whole island in Ptolemaic and Roman days, as well as the head of one of the four Roman districts; it was also a flourishing commercial city in the time of Strabo, and famous for its oil, and for "diamonds" of medicinal power. There was a festal procession thence annually to the ancient temple. In A.D. 960 it was attacked and destroyed by the Saracens. The site shows a Roman theatre, amphitheatre, temple and other ruins, with part of the city wall, and the moles of the Roman harbour, with a ruined Greek cathedral and other medieval buildings. Outside the walls lies another columnar building. Some rock tombs hard by may be of earlier than Roman date.

See W. H. Engel, *Kypros* (Berlin, 1841) (classical allusions); M. R. James and others, *Journ. Hellenic Studies*, ix. 147 sqq. (history and archaeology); G. F. Hill, *Brit. Mus. Cat. Coins of Cyprus* (London, 1904) (coins); art. "Aphrodite" in Roscher's *Lexicon der gr. u. röm. Mythologie*; also works cited in footnotes, and article CYPRUS. (J. L. M.)

PAPIAS, of Hierapolis in Phrygia, one of the "Apostolic Fathers" (*q.v.*). His *Exposition of the Lord's Oracles*, the prime early authority as to the Gospels of Matthew and Mark (see GOSPELS), is known only through fragments in later writers, chiefly Eusebius of Caesarea (*H. E.* iii. 39). The latter had a bias against Papias on account of the influence which his work had in perpetuating, through Irenaeus and others, belief in a millennial reign of Christ upon earth. He calls him a man of small mental capacity, who took the figurative language of apostolic traditions for literal fact. This may have been so to some degree; but Papias (whose name itself denotes that he was of the native Phrygian stock, and who shared the enthusiastic religious temper characteristic of Phrygia, see MONTANISM) was nearer in spirit to the actual Christianity of the sub-apostolic age, especially in western Asia, than Eusebius realized. In Papias's circle the exceptional in connexion with Christianity seemed quite normal. Eusebius quotes from him the resurrection of a dead person[4] in the experience of "Philip the Apostle"—who had resided in Hierapolis, and from whose daughters Papias derived the story—and also the drinking of poison ("when put to the test by the unbelievers," says Philip of Sidē, by "Justus, surnamed Barsabbas") without ill effect.[5] Papias also believed a revolting story as to the supernatural swelling of the body of Judas Iscariot. But if he was credulous of marvels, he was careful to insist on good evidence for what he accepted as Christ's own teaching, in the face of current unauthorized views. Papias was also a pioneer in the habit, later so general, of taking the work of the Six Days (*Hexaemeron*) and the account of Paradise as referring mystically to Christ and His Church (so says Anastasius of Sinai).

About his date, which is important in connexion with his witness, there is some doubt. Setting aside the exploded tradition that he was martyred along with Polycarp (*c.* A.D. 155), we have the witness of Irenaeus that he was "a companion (ἑταῖρος) of Polycarp," who was born not later than A.D. 69. We may waive his other statement that Papias was "a hearer of John," owing to the possibility of a false inference in this case. But the fact that Irenaeus thought of him as Polycarp's contemporary and "a man of the old time" (ἀρχαῖος ἀνήρ), together with the affinity between the religious tendencies described in Papias's Preface (as quoted by Eusebius) and those reflected in the Epistles of Polycarp and Ignatius, all point to his having flourished in the first quarter of the 2nd century. Indeed, Eusebius, who deals with him along with Clement and Ignatius (rather than Polycarp) under the reign of Trajan, and before referring at all to Hadrian's reign (A.D. 117–138), suggests that he wrote[6] about A.D. 115. It has been usual, however, to assign to his work a date *c.* 130–140, or even later. No fact is known inconsistent with *c.* 60–135 as the period of Papias's life. Eusebius (iii. 36) calls him "bishop" of Hierapolis, but whether with good ground is uncertain.

Papias uses the term "the Elders," or Fathers of the Christian community, to describe the original witnesses to Christ's teaching, *i.e.* his personal disciples in particular. It was their traditions as to the purport of that teaching which he was concerned to preserve. But to Irenaeus the term came to mean the primitive custodians of tradition derived from these, such as Papias and his contemporaries, whose traditions Papias committed to writing. Not a few such traditions Irenaeus has embodied in his work *Against Heresies*, so preserving in some cases the substance of Papias's *Exposition* (see Lightfoot, *Apostolic Fathers*, 1891, for these, as for all texts bearing on Papias).

See articles in the *Dict. of Christian Biog.*, *Dict. of Christ and the Gospels*, and Hauck's *Realencyklopädie*, xiv., in all of which further references will be found. (J. V. B.)

PAPIER MÂCHÉ (French for mashed or pulped paper), a term embracing numerous manufactures in which paper pulp is employed, pressed and moulded into various forms other than uniform sheets. The art has long been practised in the East. Persian papier mâché has long been noted, and in Kashmir under the name of *kar-i-kalamdani*, or pen-tray work, the manufacture of small painted boxes, trays and cases of papier mâché is a characteristic industry. In Japan articles are made by gluing together a number of sheets of paper, when in a damp condition, upon moulds. China also produces elegant papier mâché articles. About the middle of the 18th century papier mâché work came into prominence in Europe in the form of trays, boxes and other small domestic articles, japanned and ornamented in imitation of Oriental manufactures of the same class, or of lacquered wood; and contemporaneously papier mâché snuff-boxes ornamented in vernis Martin came into favour. In 1772 Henry Clay of Birmingham patented a method of preparing this material, which he used for coach-building, for door and other panels, and for many furniture and structural purposes. In 1845 the application of the material to internal architectural decoration was patented by C. F. Bielefeld of London, and for this purpose it has come into extensive use. Under the name of carton pierre a substance which is essentially papier mâché is also largely employed as a substitute for plaster in the moulded ornaments of roofs and walls, and the ordinary roofing felts, too, are very closely allied in their composition to papier mâché. Under the name of ceramic papier mâché, architectural enrichments are also made of a composition derived from paper pulp, resin, glue, a drying oil and acetate of lead. Among the other articles for which the substance is used may be enumerated masks, dolls' heads and other toys, anatomical and botanical models, artists' lay figures, milliners' and clothiers' blocks, mirror and picture-frames, tubes, &c.

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[1] G. F. Hill, *Brit. Mus. Cat. Coins of Cyprus* (London, 1904), pls. xv.–xviii. (coins of Paphos), pl. xxvi. (other coins and gems).

[2] M. R. James, E. A. Gardner, and others, *Journ. Hellenic Studies*, ix. 334, 147 sqq.

[3] Dio Cass. liv. 23, 7; Strabo 683; Tac. *Hist.* 2, 2 sqq.; Jerome, *Vit. Hilarionis*. For the "Paphian Diamonds" (Pliny, *Nat. Hist.* xxxvii. 58), see E. Oberhummer, *loc. cit.*, p. 185. For the fame of Paphian oil see Hom. *Od.* viii. 362 sqq.; *Hymn Aphr.* 58 sqq.; Isidore, *Origines*, xvii. 7, 64.

[4] "The mother of Manaim" (cf. Acts xiii. 1), according to the citation in Philip of Sidē.

[5] Perhaps this is the basis of a clause in the secondary ending to Mark's Gospel (xvi. 18).

[6] See further *Dict. of Christ and the Gospels*, *s.v.* The supposition that Philip of Sidē implies a date under Hadrian is a mistake. For the later date, see J. B. Lightfoot, *Essays on "Supernatural Religion"* (1889), pp. 142–216.

The materials for the commoner classes of work are old waste and scrap paper, repulped and mixed with a strong size of glue and paste. To this very often are added large quantities of ground chalk, clay and fine sand, so that the preparation is little more than a plaster held together by the fibrous pulp. Wood pulp (from Sweden) is now largely used for making papier mâché. For the finest class of work Clay's original method is retained. It consists of soaking several sheets of a specially made paper in a strong size of paste and glue, pasting these together, and pressing them in the mould of the article to be made. The moulded mass is dried in a stove, and, if necessary, further similar layers of paper are added, till the required thickness is attained. The dried object is hardened by dipping in oil, after which it is variously trimmed and prepared for japanning and ornamentation. For very delicate relief ornaments, a pulp of scrap paper is prepared, which after drying is ground to powder mixed with paste and a proportion of potash, all of which are thoroughly incorporated into a fine smooth stiff paste. The numerous processes by which surface decoration is applied to papier mâché differ in no way from the application of like ornamentation to other surfaces. Papier mâché for its weight is an exceedingly tough, strong, durable substance, possessed of some elasticity, little subject to warp or fracture, and unaffected by damp.

See L. E. Andés, *Die Fabrikation der Papiermaché- und Papierstoff-Waaren* (Vienna, 1900); A. Winzer, *Die Bereitung und Benützung der Papiermaché und ähnlicher Kompositionen* (4th ed., Weimar, 1907).

PAPIN, DENIS (1647–*c.* 1712), French physicist, one of the inventors of the steam-engine, was a native of Blois, where he was born on the 22nd of August 1647. In 1661 or 1662 he entered upon the study of medicine at the university of Angers, where he graduated in 1669. Some time prior to 1674 he removed to Paris and assisted Christiaan Huygens in his experiments with the air-pump, the results of which (*Expériences du Vuide*) were published at Paris in that year, and also in the form of five papers by Huygens and Papin jointly, in the *Philosophical Transactions* for 1675. Shortly after the publication of the *Expériences*, Papin, who had crossed to London, was hospitably received by Robert Boyle, whom he assisted in his laboratory and with his writings. About this time also he introduced into the air-pump the improvement of making it with double barrels, and replacing by the two valves the turncock hitherto used; he is said, moreover, to have been the first to use the plate and receiver. Subsequently he invented the condensing-pump, and in 1680 he was admitted, on Boyle's nomination, to the Royal Society. In the previous year he had exhibited to the society his famous "steam digester, or engine for softening bones," afterwards described in a tract published at Paris and entitled *La Manière d'amollir les os et de faire couire toutes sortes de viandes en fort peu de tems et à peu de frais, avec une description de la marmite, ses propriétés et ses usages.* This device consisted of a vessel provided with a tightly fitting lid, so that under pressure its contents could be raised to a high temperature; a safety valve was used, for the first time, to guard against an excessive rise in the pressure. After further experiments with the digester he accepted an invitation to Venice to take part in the work of the recently founded Academy of the Philosophical and Mathematical Sciences; here he remained until 1684, when he returned to London and received from the Royal Society an appointment as "temporary curator of experiments," with a small salary. In this capacity he carried on numerous and varied investigations. He discovered a siphon acting in the same manner as the "sipho wirtembergicus" (*Phil. Tr.*, 1685), and also constructed a model of an engine for raising water from a river by means of pumps worked by a water-wheel driven by the current. In November 1687 he was appointed to the chair of mathematics in the university of Marburg, and here he remained until 1696, when he removed to Cassel. From the time of his settlement in Germany he carried on an active correspondence with Huygens and Leibnitz, which is still preserved, and in one of his letters to Leibnitz, in 1698, he mentions that he is engaged on a machine for raising water to a great height by the force of fire; in a later communication he speaks also of a little carriage he had constructed to be propelled by this force. Again in 1702 he wrote about a steam "ballista," which he anticipated would "promptly compel France to make an enduring peace." In 1705 Leibnitz sent Papin a sketch of Thomas Savery's engine for raising water, and this stimulated him to further exertions, which resulted two years afterwards in the publication of the *Ars nova ad aquam ignis adminiculo efficacissime elevandam* (Cassel, 1707), in which his high-pressure boiler and its applications are described (see STEAM ENGINE). In 1707 he resolved to quit Cassel for London, and on the 24th of September of that year he sailed with his family from Cassel in an ingeniously constructed boat, propelled by paddle-wheels, to be worked by the crew, with which he apparently expected to reach the mouth of the Weser. At Münden, however, the vessel was confiscated at the instance of the boatmen, who objected to the invasion of their exclusive privileges in the Weser navigation. Papin, on his arrival in London, found himself without resources and almost without friends; applications through Sir Hans Sloane to the Royal Society for grants of money were made in vain, and he died in total obscurity, probably about the beginning of 1712. His name is attached to the principal street of his native town, Blois, were also he is commemorated by a bronze statue.

The published writings of Papin, besides those already referred to, consist for the most part of a large number of papers, principally on hydraulics and pneumatics, contributed to the *Journal des savans*, the *Nouvelles de la république des lettres*, the *Philosophical Transactions*, and the *Acta eruditorum*; many of them were collected by himself into a *Fasciculus dissertationum* (Marburg, 1695), of which he published also a translation into French, *Recueil de diverses pièces touchant quelques nouvelles machines* (Cassel, 1695). His correspondence with Leibnitz and Huygens, along with a biography, was published by Dr Ernst Gerland (*Leibnizens und Huygens Briefwechsel mit Papin, nebst der Biographie Papins* (Berlin, 1881). See also L. de la Saussaye and E. Péan, *La Vie et les ouvrages de Denis Papin* (Paris, 1869); and Baron Ernout, *Denis Papin, sa vie et ses ouvrages* (4th ed., 1888).

PAPINEAU, LOUIS JOSEPH (1786–1871), Canadian rebel and politician, son of Joseph Papineau, royal notary and member of the house of Assembly of Lower Canada, was born at Montreal on the 7th of October 1786. He was educated at the seminary of Quebec, where he developed the gift of declamatory and persuasive oratory. He was called to the bar of Lower Canada on the 19th of May 1810. On the 18th of June 1808 he was elected a member of the House of Assembly of the province of Lower Canada, for the county of Kent. In 1815 he became speaker of the house, being already recognized as the leader of the French Canadian party. At this time there were many grievances in the country which demanded redress; but each faction was more inclined to insist upon the exercise of its special rights than to fulfil its common responsibilities. In December 1820 Lord Dalhousie, governor of Lower Canada, appointed Papineau a member of the executive council; but Papineau, finding himself without real influence on the council, resigned in January 1823. In that year he went to England to protest on behalf of the French Canadians against the projected union of Upper and Lower Canada, a mission in which he was successful. Nevertheless his opposition to the government became more and more pronounced, till in 1827 Lord Dalhousie refused to confirm his appointment to the speakership, and resigned his governorship when the house persisted in its choice. The aim of the French Canadian opposition at this time was to obtain financial and also constitutional reforms. Matters came to a head when the legislative assembly of Lower Canada refused supplies and Papineau arranged for concerted action with William Lyon Mackenzie, the leader of the reform party in Upper Canada. In 1835 Lord Gosford, the new governor of Lower Canada, was instructed by the cabinet in London to inquire into the alleged grievances of the French Canadians. But the attitude of the opposition remained no less hostile than before, and in March 1837 the governor was authorized to reject the demand for constitutional reform and to apply public funds in his control to the purposes of government. In June a warning proclamation by the governor was answered by a series of violent speeches by Papineau, who in August was deprived of his commission in the militia.

Papineau had formerly professed a deep reverence for British institutions, and he had acquired a theoretical knowledge of the constitution, but he did not possess the qualities of a statesman, and consequently in his determination to apply the strict letter of the constitution he overlooked those elements and compensating forces and powers which through custom and usage had been incorporated in British institutions, and had given them permanence. In his earlier career he had voiced the aspirations of a section of the people at a time when it appeared to them that their national existence was threatened. In the course of time party strife became more bitter; real issues were lost sight of; and Papineau, falling in with the views of one O'Callaghan, who distrusted everything British, became an annexationist. Realizing that his cause was not advanced by persuasive eloquence, he adopted a threatening attitude which caused men of sober judgment to waver in their allegiance. These men he denounced as traitors; but a band of youthful enthusiasts encouraged their leader in his revolutionary course. The bishop of Montreal and of Quebec, and a large number of the citizens, protested, but nothing less than bloodshed would satisfy the misguided patriots. On the 23rd of October 1837 a meeting of delegates from the six counties of Lower Canada was held at St Charles, at which resistance to the government by force of arms was decided upon, and in which Papineau took part. In November preparations were made for a general stampede at Montreal, and on the 7th of the month Papineau's house was sacked and a fight took place between the "constitutionals" and the "sons of liberty." Towards the middle of November Colonel Gore was commanded to effect the arrest of Papineau and his principal adherents on a charge of high treason. A few hundred armed men had assembled at Saint Denis to resist the troops, and early on the morning of the 22nd of November hostilities commenced, which were maintained for several hours and resulted in many casualties. On the eve of the fray Papineau sought safety in flight, followed by the leading spirits of the movement. On the 1st of December 1837 a proclamation was issued, declaring Papineau a rebel, and placing a price upon his head. He had found shelter in the United States, where he remained in safety throughout the whole period of the fighting. The rebellion broke out afresh in the autumn of 1838, but it was soon repressed. Those taken in open rebellion were deported by Lord Durham to save them from the scaffold; and although 90 were condemned to death only 12 were executed.

Attempts have been made to transfer the responsibility for the act of violence to O'Callaghan and other prominent leaders in the revolt; but Papineau's own words, "The patriots of this city would have avenged the massacre but they were so poor and so badly organized that they were not fit to meet the regular troops," prove that he did not discountenance recourse to arms. Writing of the events of 1837 in the year 1848 he said: "The smallest success at Montreal or Toronto would have induced the American government, in spite of its president, to support the movement." It would thus seem that he was intriguing to bring about intervention by the United States with a view to annexation; and as the independence of the French Canadian race, which he professed to desire, could not have been achieved under the constitution of the American republic, it is inconsistent to regard his services to his fellow-countrymen as those of a true patriot. Papineau, in pursuing towards the end a policy of blind passion, overlooked real grievances, and prevented remedial action. After the rebellion relief was accorded because the obstacle was removed, and it is evident that a broad-minded statesman, or a skilful diplomat, would have accomplished more for French Canada than the fiery eloquence and dubious methods of a leader who plunged his followers into the throes of war, and deserted them at the supreme moment. From 1839 till 1847 Papineau lived in Paris. In the latter year an amnesty was granted to those who had participated in the rebellion in Canada; and, although in June 1838 Lord Durham had issued a proclamation threatening Papineau with death if he returned to Canada, he was now admitted to the benefit of the amnesty. On his return to Canada, when the two provinces were now united, he became a member of the lower house and continued to take part in public life, demanding "the independence of Canada, for the Canadians need never expect justice from England, and to submit to her would be an eternal disgrace." He unsuccessfully agitated for the re-division of upper and lower Canada, and in 1854 retired into private life. He died at Montebello, in the province of Quebec, on the 24th of September 1871.

See L. O. David, *Les Deux Papineau*; Fennings Taylor, *Louis Joseph Papineau* (Montreal, 1865); Alfred De Celles, *Papineau-Cartier* (Toronto, 1906); H. J. Morgan, *Sketches of Celebrated Canadians* (Quebec, 1862); Rose's *Cyclopaedia of Canadian Biography Annual Register*, 1836–1837; Sir Spencer Walpole, *History of England* (5 vols., London, 1878–1886), vol. iii. (A. G. D.)

PAPINIAN (AEMILIUS PAPINIANUS), Roman jurist, was *magister libellorum* and afterwards praetorian prefect under Septimius Severus. He was an intimate friend of the emperor, whom he accompanied to Britain, and before his death Severus specially commended his two sons to his charge. Papinian tried to keep peace between the brothers, but with no better result than to excite the hatred of Caracalla, to which he fell a victim in the general slaughter of Geta's friends which followed the fratricide of A.D. 212. The details are variously related, and have undergone legendary embellishment, but the murder of Papinian, which took place under Caracalla's own eyes, was one of the most disgraceful crimes of that tyrant. Little more is known about Papinian. He was perhaps a Syrian by birth, for he is said to have been a kinsman of Severus's second wife, Julia Domna; that he studied law with Severus under Scaevola is asserted in an interpolated passage in Spartian (*Caracal.* c. 8). Papinian's place and work as a jurist are discussed under ROMAN LAW.

PAPPENHEIM, GOTTFRIED HEINRICH, COUNT OF (1594–1632), imperial field marshal in the Thirty Years' War, was born on the 29th of May 1594 at the little town of Pappenheim on the Altmühl, now in Bavaria, the seat of a free lordship of the empire, from which the ancient family to which he belonged derived its name.[1] He was educated at Altdorf and at Tübingen, and subsequently travelled in southern and central Europe, mastering the various languages, and seeking knightly adventures. His stay in these countries led him eventually to adopt the Roman Catholic faith (1614), to which he devoted the rest of his life. At the outbreak of the great war he abandoned the legal and diplomatic career on which he had embarked, and in his zeal for the faith took service in Poland and afterwards under the Catholic League. He soon became a lieutenant-colonel, and displayed brilliant courage at the battle of the White Hill near Prague (Nov. 8, 1620), where he was left for dead on the field. In the following year he fought against Mansfeld in western

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[1] The family of Pappenheim is of great antiquity. In the 12th century they were known as the "marshals of Kalatin (Kalden)"; in the 13th they first appear as counts and marshals of Pappenheim, their right to the hereditary marshalship of the empire being confirmed to them by the emperor Louis IV. in 1334. After the Golden Bull of 1355 they held both marshalship and castle of Pappenheim as fiefs of the Saxon electorate. In the 17th century the family was represented by several lines: those of Pappenheim (which held the margraviate of Stühlingen till 1635), Treutlingen and Aletzheim, and the older branches (dating from the 13th and 14th centuries) of the marshals of Biberach and of Rechberg-Wertingen-Hohenreichen. Gottfried Heinrich, who belonged to the Treutlingen branch, was the only one of this ancient and widely-ramified family to attain great distinction, though many other members of it played a strenuous, if subordinate, part in the history of Germany. The family, mediatized under Bavaria in 1806, survives now only in the descendants of the Aletzheim branch.

Germany, and in 1623 became colonel of a regiment of cuirassiers, afterwards the famous "Pappenheimers." In the same year, as an ardent friend of Spain, the ally of his sovereign and the champion of his faith, he raised troops for the Italian war and served with the Spaniards in Lombardy and the Grisons. It was his long and heroic defence of the post of Riva on the Lake of Garda which first brought him conspicuously to the front. In 1626 Maximilian of Bavaria, the head of the League, recalled him to Germany and entrusted him with the suppression of a dangerous insurrection which had broken out in Upper Austria. Pappenheim swiftly carried out his task, encountering a most desperate resistance, but always successful; and in a few weeks he had crushed the rebellion with ruthless severity (actions of Efferdingen, Gmünden, Vöcklabruck and Wolfsegg, 15th–30th November 1626). After this he served with Tilly against King Christian IV. of Denmark, and besieged and took Wolfenbüttel. His hope of obtaining the sovereignty and possessions of the evicted prince was, after a long intrigue, definitely disappointed. In 1628 he was made a count of the empire. The siege and storm of Magdeburg followed, and Pappenheim, like Tilly, has been accused of the most savage cruelty in this transaction. But it is known that, disappointed of Wolfenbüttel, Pappenheim desired the profitable sovereignty of Magdeburg, and it can hardly be maintained that he deliberately destroyed a prospective source of wealth. At any rate, the sack of Magdeburg was not more discreditable than that of most other towns taken by storm in the 17th century. From the military point of view Pappenheim's conduct was excellent; his measures were skilful, and his personal valour, as always, conspicuous. So much could not be said of his tactics at the battle of Breitenfeld, the loss of which was not a little due to the impetuous cavalry general, who was never so happy as when leading a great charge of horse. The retreat of the imperialists from the lost field he covered, however, with care and skill, and subsequently he won great glory by his operations on the lower Rhine and the Weser in rear of the victorious army of Gustavus Adolphus. Much-needed reinforcements for the king of Sweden were thus detained in front of Pappenheim's small and newly-raised force in the north. His operations were far-ranging and his restless activity dominated the country from Stade to Cassel, and from Hildesheim to Maastricht. Being now a field marshal in the imperial service, he was recalled to join Wallenstein, and assisted the generalissimo in Saxony against the Swedes; but was again despatched towards Cologne and the lower Rhine. In his absence a great battle became imminent, and Pappenheim was hurriedly recalled. He appeared with his horsemen in the midst of the battle of Lützen (Nov. 6th–16th, 1632). His furious attack was for the moment successful. As Rupert at Marston Moor sought Cromwell as his worthiest opponent, so now Pappenheim sought Gustavus. At about the same time as the king was killed, Pappenheim received a mortal wound in another part of the field. He died on the following day in the Pleissenburg at Leipzig.

See *Kriegsschriften von baierischen Officieren* I. II. V. (Munich, 1820); Hess, *Gottfried Heinrich Graf zu Pappenheim* (Leipzig, 1855); Ersch and Grüber, *Allgem. Encyklopädie*, III. 11 (Leipzig, 1838); Wittich, in *Allgem. deutsche Biographie*, Band 25 (Leipzig, 1887), and works there quoted.

PAPPUS OF ALEXANDRIA, Greek geometer, flourished about the end of the 3rd century A.D. In a period of general stagnation in mathematical studies, he stands out as a remarkable exception. How far he was above his contemporaries, how little appreciated or understood by them, is shown by the absence of references to him in other Greek writers, and by the fact that his work had no effect in arresting the decay of mathematical science. In this respect the fate of Pappus strikingly resembles that of Diophantus. In his *Collection*, Pappus gives no indication of the date of the authors whose treatises he makes use of, or of the time at which he himself wrote. If we had no other information than can be derived from his work, we should only know that he was later than Claudius Ptolemy whom he often quotes. Suidas states that he was of the same age as Theon of Alexandria, who wrote commentaries on Ptolemy's great work, the *Syntaxis mathematica*, and flourished in the reign of Theodosius I. (A.D. 379–395). Suidas says also that Pappus wrote a commentary upon the same work of Ptolemy. But it would seem incredible that two contemporaries should have at the same time and in the same style composed commentaries upon one and the same work, and yet neither should have been mentioned by the other, whether as friend or opponent. It is more probable that Pappus's commentary was written long before Theon's, but was largely assimilated by the latter, and that Suidas, through failure to disconnect the two commentaries, assigned a like date to both. A different date is given by the marginal notes to a 10th-century MS., where it is stated, in connexion with the reign of Diocletian (A.D. 284–305), that Pappus wrote during that period; and in the absence of any other testimony it seems best to accept the date indicated by the scholiast.

The great work of Pappus, in eight books and entitled *συναγωγή* or *Collection*, we possess only in an incomplete form, the first book being lost, and the rest having suffered considerably. Suidas enumerates other works of Pappus as follows: *Χωρογραφία οἰκουμενική, εἰς τὰ τέσσαρα βιβλία τῆς Πτολεμαίου μεγάλης συντάξεως ὑπόμνημα, ποταμοὺς τοὺς ἐν Λιβύῃ, ὀνειροκριτικά.* The question of Pappus's commentary on Ptolemy's work is discussed by Hultsch, *Pappi collectio* (Berlin, 1878), vol. iii. p. xiii. seq. Pappus himself refers to another commentary of his own on the *Ἀνάλημμα* of Diodorus, of whom nothing is known. He also wrote commentaries on Euclid's *Elements* (of which fragments are preserved in Proclus and the Scholia, while that on the tenth Book has been found in an Arabic MS.), and on Ptolemy's *Ἁρμονικά.*

The characteristics of Pappus's *Collection* are that it contains an account, systematically arranged, of the most important results obtained by his predecessors, and, secondly, notes explanatory of, or extending, previous discoveries. These discoveries form, in fact, a text upon which Pappus enlarges discursively. Very valuable are the systematic introductions to the various books which set forth clearly in outline the contents and the general scope of the subjects to be treated. From these introductions we are able to judge of the style of Pappus's writing, which is excellent and even elegant the moment he is free from the shackles of mathematical formulae and expressions. At the same time, his characteristic exactness makes his collection a most admirable substitute for the texts of the many valuable treatises of earlier mathematicians of which time has deprived us. We proceed to summarize briefly the contents of that portion of the *Collection* which has survived, mentioning separately certain propositions which seem to be among the most important.

We can only conjecture that the lost book i., as well as book ii., was concerned with arithmetic, book iii. being clearly introduced as beginning a new subject.

The whole of book ii. (the former part of which is lost, the existing fragment beginning in the middle of the 14th proposition) related to a system of multiplication due to Apollonius of Perga. On this subject see Nesselmann, *Algebra der Griechen* (Berlin, 1842), pp. 125–134; and M. Cantor, *Gesch. d. Math.* i.^{2} 331.

Book iii. contains geometrical problems, plane and solid. It may be divided into five sections: (1) On the famous problem of finding two mean proportionals between two given lines, which arose from that of duplicating the cube, reduced by Hippocrates to the former. Pappus gives several solutions of this problem, including a method of making successive approximations to the solution, the significance of which he apparently failed to appreciate; he adds his own solution of the more general problem of finding geometrically the side of a cube whose content is in any given ratio to that of a given one. (2) On the arithmetic, geometric and harmonic means between two straight lines, and the problem of representing all three in one and the same geometrical figure. This serves as an introduction to a general theory of means, of which Pappus distinguishes ten kinds, and gives a table representing examples of each in whole numbers. (3) On a curious problem suggested by Eucl. i. 21. (4) On the inscribing of each of the five regular polyhedra in a sphere. (5) An addition by a later writer on another solution of the first problem of the book.

Of book iv. the title and preface have been lost, so that the programme has to be gathered from the book itself. At the beginning is the well-known generalization of Eucl. i. 47, then follow various theorems on the circle, leading up to the problem of the construction of a circle which shall circumscribe three given circles, touching each other two and two. This and several other propositions on contact, *e.g.* cases of circles touching one another and inscribed in the figure made of three semicircles and known as ἄρβηλος (*shoemaker's knife*) form the first division of the book. Pappus turns then to a consideration of certain properties of Archimedes's spiral, the conchoid of Nicomedes (already mentioned in book i. as supplying a method of doubling the cube), and the curve discovered most probably by Hippias of Elis about 420 B.C., and known by the name ἡ τετραγωνίζουσα, or quadratrix. Proposition 30 describes the construction of a curve of double curvature called by Pappus the helix on a sphere; it is described by a point moving uniformly along the arc of a great circle, which itself turns about its diameter uniformly, the point describing a quadrant and the great circle a complete revolution in the same time. The area of the surface included between this curve and its base is found—the first known instance of a quadrature of a curved surface. The rest of the book treats of the trisection of an angle, and the solution of more general problems of the same kind by means of the quadratrix and spiral. In one solution of the former problem is the first recorded use of the property of a conic (a hyperbola) with reference to the focus and directrix.

In book v., after an interesting preface concerning regular polygons, and containing remarks upon the hexagonal form of the cells of honeycombs, Pappus addresses himself to the comparison of the areas of different plane figures which have all the same perimeter (following Zenodorus's treatise on this subject), and of the volumes of different solid figures which have all the same superficial area, and, lastly, a comparison of the five regular solids of Plato. Incidentally Pappus describes the thirteen other polyhedra bounded by equilateral and equiangular but not similar polygons, discovered by Archimedes, and finds, by a method recalling that of Archimedes, the surface and volume of a sphere.

According to the preface, book vi. is intended to resolve difficulties occurring in the so-called μικρὸς ἀστρονομούμενος. It accordingly comments on the *Sphaerica* of Theodosius, the *Moving Sphere* of Autolycus, Theodosius's book on *Day and Night*, the treatise of Aristarchus *On the Size and Distances of the Sun and Moon*, and Euclid's *Optics* and *Phaenomena*.

The preface of book vii. explains the terms analysis and synthesis, and the distinction between theorem and problem. Pappus then enumerates works of Euclid, Apollonius, Aristaeus and Eratosthenes, thirty-three books in all, the substance of which he intends to give, with the lemmas necessary for their elucidation. With the mention of the *Porisms* of Euclid we have an account of the relation of porism to theorem and problem. In the same preface is included (*a*) the famous problem known by Pappus's name, often enunciated thus: *Having given a number of straight lines, to find the geometric locus of a point such that the lengths of the perpendiculars upon, or (more generally) the lines drawn from it obliquely at given inclinations to, the given lines satisfy the condition that the product of certain of them may bear a constant ratio to the product of the remaining ones*; (Pappus does not express it in this form but by means of composition of ratios, saying that if the ratio is *given* which is compounded of the ratios of pairs—one of one set and one of another—of the lines so drawn, and of the ratio of the odd one, if any, to a given straight line, the point will lie on a curve *given in position*); (*b*) the theorems which were rediscovered by and named after Paul Guldin, but appear to have been discovered by Pappus himself. Book vii. contains also (1), under the head of the *de determinata sectione* of Apollonius, lemmas which, closely examined, are seen to be cases of the involution of six points; (2) important lemmas on the *Porisms* of Euclid (see PORISM); (3) a lemma upon the *Surface Loci* of Euclid which states that the locus of a point such that its distance from a given point bears a constant ratio to its distance from a given straight line is a conic, and is followed by proofs that the conic is a parabola, ellipse, or hyperbola according as the constant ratio is equal to, less than or greater than 1 (the first recorded proofs of the properties, which do not appear in Apollonius).

Lastly, book viii. treats principally of mechanics, the properties of the centre of gravity, and some mechanical powers. Interspersed are some questions of pure geometry. Proposition 14 shows how to draw an ellipse through five given points, and Prop. 15 gives a simple construction for the axes of an ellipse when a pair of conjugate diameters are given.

AUTHORITIES.—Of the whole work of Pappus the best edition is that of Hultsch, bearing the title *Pappi alexandrini collectionis quae supersunt e libris manuscriptis edidit latina interpretatione et commentariis instruxit Fridericus Hultsch* (Berlin, 1876–1878). Previously the entire collection had been published only in a Latin translation, *Pappi alexandrini mathematicae collectiones a Federico Commandino Urbinate in latinum conversae et commentariis illustratae* (Pesaro, 1588) (reprinted at Venice, 1589, and Pesaro, 1602). A second (inferior) edition of this work was published by Carolus Manolessius.

Of books which contain parts of Pappus's work, or treat incidentally of it, we may mention the following titles: (1) *Pappi alexandrini collectiones mathematicae nunc primum graece edidit Herm. Jos. Eisenmann, libri quinti pars altera* (Parisiis, 1824). (2) *Pappi alexandrini secundi libri mathematicae collectionis fragmentum e codice MS. edidit latinum fecit notisque illustravit Johannes Wallis* (Oxonii, 1688). (3) *Apollonii pergaei de sectione rationis libri duo ex arabico MS*$_{to}$ *latine versi, accedunt eiusdem de sectione spatii libri duo restituti, praemittitur Pappi alexandrini praefatio ad VII*^{mum} *collectionis mathematicae, nunc primum graece edita: cum lemmatibus eiusdem Pappi ad hos Apollonii libros, opera et studio Edmundi Halley* (Oxonii. 1706). (4) *Der Sammlung des Pappus von Alexandrien siebentes und achtes Buch griechisch und deutsch*, published by C. I. Gerhardt, Halle, 1871. (5) The portions relating to Apollonius are reprinted in Heiberg's *Apollonius*, ii. 101 sqq. (T. L. H.)

PAPUANS (Malay *papúwah* or *puwah-puwah*, "frizzled," "woolly-haired," in reference to their characteristic hair-dressing), the name given to the people of New Guinea and the other islands of Melanesia. The pure Papuan seems to be confined to the north-western part of New Guinea, and possibly the interior. But Papuans of mixed blood are found throughout the island (unless the Karons be of Negrito stock), and from Flores in the west to Fiji in the east. The ethnological affinities of the Papuans have not been satisfactorily settled. Physically they are negroid in type, and while tribes allied to the Papuans have been traced through Timor, Flores and the highlands of the Malay Peninsula to the Deccan of India, these "Oriental negroes," as they have been called, have many curious resemblances with some East African tribes. Besides the appearance of the hair, the raised cicatrices, the belief in omens and sorcery, the practices for testing the courage of youths, &c., they are equally rude, merry and boisterous, but amenable to discipline, and with decided artistic tastes and faculty. Several of the above practices are common to the Australians, who, though generally inferior, have many points of resemblance (osteological and other) with Papuans, to whom the extinct Tasmanians were still more closely allied. It may be that from an indigenous Negrito stock of the Indian archipelago both negroes and Papuans sprang, and that the latter are an original cross between the Negrito and the immigrating Caucasian who passed eastward to found the great Polynesian race.[1]

The typical Papuan is distinctly tall, far exceeding the average Malay height, and is seldom shorter, often taller, than the European. He is strongly built, somewhat "spur-heeled." He varies in colour from a sooty-brown to a black, little less intense than that of the darkest negro. He has a small dolichocephalous head, prominent nose somewhat curved and high but depressed at the tip, high narrow forehead with projecting brows, oval face and dark eyes. The jaw projects and the lips are full. His hair is black and frizzly, worn generally in a mop, often of large dimensions, but sometimes worked into plaits with grease or mud. On some islands the men collect their hair into small bunches, and carefully bind each bunch round with fine vegetable fibre from the roots up to within about two inches from the end. Dr Turner[2] gives a good description of this process. He once counted the bunches on a young man's head, and found nearly seven hundred. There is usually little hair on the face, but chest, legs and fore-arms are generally hirsute, the hair short and crisp.

The constitution of society is everywhere simple. The

[1] Huxley believed that the Papuans were more closely allied to the negroes of Africa than any other race. Later scientists have endeavoured to identify the Papuans with the Negritos of the Philippines and the Semangs of the Malay Peninsula. Alfred Russel Wallace pronounced against this hypothesis in an appendix to his *Malay Archipelago* (1883 ed., p. 602), where he observes that "the black, woolly-haired races of the Philippines and the Malay Peninsula . . . have little affinity or resemblance to the Papuans." Dr A. B. Meyer, who spent several years in the Malay Archipelago and New Guinea, developed a contrary conclusion in his *Die Negritos der Philippinen* (1878), holding that the Negritos and Papuans are identical, and that possibly, or even probably, the former are an offshoot of the latter, like some other Polynesian islanders. A. C. Haddon, discussing, in *Nature* (September 1899), a later paper by Dr Meyer in English on the same subject (*The Distribution of the Negritos*, Dresden, 1899), practically adopted Meyer's views, after an independent examination of numerous skulls. As to how the Papuans, who are the aborigines of New Guinea, may have peopled other and much more distant islands, information is lacking.

[2] *Nineteen Years in Polynesia*, pp. 77, 78.

people live in village communities whose members appear to be more or less inter-related. There are no priests and no hereditary chiefs, though among the more advanced tribes rank is hereditary. Totemistic clans have been observed in Torres strait, and on the Finsch and west coasts. Chiefship is quite unrecognized, except on the Keriwina Islands. Possessions, such as gardens, houses, pigs, &c., belong to individuals and not to the community, and pass to the owner's heirs, who differ in relationship in different districts. The land within certain boundaries belongs to the tribe, but a member may take possession of any unappropriated portion. There are certain degrees of relationship within which a man may not marry. In some districts he may not marry into his own village, or into his mother's tribe; in others he may select a wife from certain tribes only. Payment, or a present, is always made for a wife to her father, brother or guardian (who is generally her maternal uncle). Presents are also often made to the bride. Polygamy is practised, but not frequently, and from the wife (or wives) there comes no opposition. The child belongs sometimes to the mother's, sometimes to the father's tribe. The Papuan woman, who is, as a rule, more modest than the Polynesian, is the household drudge, and does the greater part of the outdoor work, but the man assists in clearing new gardens and in digging and planting the soil.

Spirit-worship.

In western New Guinea, according to the Dutch missionaries, there is a vague notion of a universal spirit, practically represented by several malevolent powers, as *Manoin*, the most powerful, who resides in the woods; *Narwoje*, in the clouds, above the trees, a sort of Erl-König who carries off children; *Faknik*, in the rocks by the sea, who raises storms. As a protection against these the people construct—having first with much ceremony chosen a tree for the purpose—certain rude images called karwars, each representing a recently dead progenitor, whose spirit is then invoked to occupy the image and protect them against their enemies and give success to their undertakings. The karwar is about a foot high, with head disproportionately large; the male figures are sometimes represented with a spear and shield, the female holding a snake. They observe omens, have magicians and rain-makers, and sometimes resort to ordeal to discover a crime. Temples (so called) are found in the north and west, built like the houses, but larger, the piles being carved into figures, and the roof-beams and other prominent points decorated with representations of crocodiles or lizards, coarse human figures, and other grotesque ornamentation; but their use is not clear. Neither temples nor images (except small figures worn as amulets) occur among the people of the south-east; but they have a great dread of departed spirits, especially those of the hostile inland tribes, and of a being called Vata, who causes disease and death.

All Papuans believe that within them resides an invisible other self, or spirit, which may occasionally leave the body in the hours of sleep and after death hovers for some period at least round the scenes of its embodied life. This ghost acquires supernatural powers, which at any time it may return to exercise inimically to relations or acquaintances who offend it. In the dark, and in the depths of forests or mountains, malevolent—never embodied—spirits love to be abroad. These are the spirits which, taking up their abode in a village, cause disease and death; and to escape from such attacks the inhabitants may fly the village for good, and, by dwelling scattered in the recesses of the forest for a time before choosing a new site, they hope to throw their enemy off their trail. Spirits of evil, but not of good, therefore require to be propitiated. The powers of nature—thunder, lightning and storm, all supposed to be caused by evil and angry spirits—are held in the greatest dread. Under the category of religious observances may perhaps come those held previously to the departure of the great trading or *lakatoi* fleet: their taboo-proclaiming customs, their ceremonial and sacred initiation ceremonies for boys and girls on reaching puberty, when masks are worn and the "bull-roarer" swung, as also the harvest festivals, at which great trophies of the produce of field and forest are erected, preparatory to a big feast enlivened with music and dancing. In the north and north-east of New Guinea ancestor-worship is widely practised. Amulets are worn to ensure success in buying, selling, hunting, fishing and in war, as well as for protection against evil. Circumcision is practised in some regions. Although some of the coast peoples are nominally Mahommedans, and some few converts to Christianity have been made, the vast majority of Papuans remain pagan.

The dead are disposed of in various ways. The spirit is supposed not to leave the body immediately, and a corpse is either buried for a time, and then disinterred and the bones cleaned and deposited in or near the deceased's dwelling or in some distant cave; or the body is exposed on a platform or dried over a fire, and the mummy kept for a few years. Sometimes the head, oftener the jaw-bone and portions of the skeleton are preserved as relics. Little houses are frequently erected over the grave as a habitation for the spirit. Soon after death food is offered to the departed—with an infant a calabash of its mother's milk—and that he may have no wants, his earthly possessions, after being broken, are laid near his resting-place. A path through the jungle from the grave to the sea is often made so that the spirit may bathe. A widow must shave her head, smear her body with black and the exudations of the corpse, and wear mourning for a long time. The dead are referred to by some roundabout phrase, never by name, for this might have the dangerous result of bringing back the spirit. These dwell chiefly in the moon, and are particularly active at full moon. The houses which they haunt, and beneath or near which their bodies are buried, are deserted from time to time, especially by a newly-married couple or by women before child-birth.

Food.

Yams, taro and sweet potatoes constitute in some districts the main food of the people, while in others sago is the staple diet. Forest fruits and vegetables are also eaten. Maize and rice—which are not indigenous—are eagerly sought after. The Papuan varies his vegetable diet with the flesh of the wild pig, wallabi and other small animals, which are hunted with dogs. Birds are snared or limed. Fish abound at many parts of the coast, and are taken by lines, or speared at night by torch-light, or netted, or a river is dammed and the fish stupefied with the root of a milletia. Turtle and dugong are caught. The kima, a great mussel weighing (without shell) 20 to 30 lb, and other shell-fish, are eaten, as are also dogs, flying foxes, lizards, beetles and all kinds of insects. Food is cooked in various ways. Cooking-pots, made at various parts of the coast, form one of the great exchanges for sago; but where such vessels do not reach, food is cooked by the women on the embers, done up in leaves, or in holes in the ground over heated stones. The sexes eat apart. In the interior salt is difficult to get, and sea-water, which is carried inland in hollow bamboos, is used in cooking in place of it. Salt, too, is obtained from the ashes of wood saturated by sea-water. In the Fly River region, kava, prepared from *Piper methysticum*, is drunk without any of the ceremonial importance associated with it in Polynesia. As a rule the Papuans have no intoxicating drink and do not know the art of fermenting palm-sap or cane-juice. Tobacco is indigenous in some parts, and is smoked everywhere, except on the north-east coast and on the islands, where its use is quite unknown. In some few districts a species of clay is eaten.

Clothing and Ornaments.

The male Papuan is usually naked save for a loin-cloth made of the bark of the Hibiscus, Broussonetia and other plants, or a girdle of leaves. In the more civilized parts cotton garments are used. Papuans have usually a great dislike to rain and carry a mat of pandanus leaves as a protection against it. Except in one or two localities (on the north-east and west), the women are invariably decently clothed. The Papuan loves personal adornment and loses no chance of dressing himself up. His chief home-made ornaments are necklaces, armlets and ear-rings of shells, teeth or fibre, and cassowary, cockatoo, or bird of paradise feathers—the last two, or a flower, are worn through the septum of the nose. With his head encircled by a coronet of dogs' teeth, and covered with a network cap or piece of bark-cloth, the septum of the nose transfixed by a pencil of bone or shell, and perhaps a shell or fibre armlet or two, the Papuan is in complete everyday attire. On festal occasions he decks his well-forked-out and dyed hair with feathers and flowers, and sticks others in his ear-lobe holes and under his armlets; while a warrior will have *ovula* shells and various bones of his victims dangling from ringlets of his hair, or fixed to his armbands or girdle. The Papuan comb is characteristic. This is a long piece of bamboo split at one end into prongs, while the other projects beyond the forehead sometimes two feet or more, and into it are stuck the bright feathers of parrots and other birds. The fairer tribes at the east end tattoo, no definite meaning apparently being attached to the pattern, for they welcome suggestions from Manchester. For the women it is simply a decoration. Men are not tattooed till they have killed some one. Raised cicatrices usually take the place of tattooing with the darker races. Rosenberg says the scars on the breast and arms register the number of sea-voyages made.

Boat-building.

The Papuans build excellent canoes and other boats, and in some districts there are professional boat-builders of great skill, the best craft coming from East Cape and the Louisiades. These boats are either plain dug-outs, with or without out-riggers, or regularly built by planks tightly laced and well caulked to an excavated keel. The most remarkable of their vessels is the "lakatoi," composed of several capacious dug-outs, each nearly 50 ft. long, which are strongly lashed together to a width of some 24 ft., decked and fitted with two masts, each carrying a huge mat sail picturesquely fashioned. On the deck high crates are built for the reception of some thousands of pieces of pottery for conveyance annually to the Fly River district to exchange for sago.

Music.

Papuans are very fond of music, using Pan-pipes, a Jew's harp of the Papuans' own fabrication, and the flute; on occasions of ceremony the drum only is used—this instrument being always open at one end and tapped by the fingers. To the accompaniment of the drum, dancing—as a rhythmic but stationary movement of the feet or an evolutionary march—almost invariably goes, but rarely singing. All sorts of jingling sounds also are music to the ear, especially the clattering in time of strings of beans in their dry shells, and so these and other rattles are found attached to the drum, leg-bands and many of the utensils, implements and weapons.

Houses. Nearly all Papuan houses are built in Malay fashion on piles, and this not only on the coast but on the hillsides. In the north, the east and south-west of the island immense communal houses (*morong*) are met with. Some of these are between 500 and 700 ft. in length, with a rounded, boat-shaped roof thatched with palm-branches, and looking inside, when undivided, like dark tunnels. In some districts the natives live together in one of these giant structures, which are divided into compartments. Communal dwellings on a much smaller scale occur at Meroka, east of the Astrolabe mountains. As a rule elsewhere each family has its independent dwelling. On the north coast the houses are not built on piles; the walls, of bamboo or palm branches, are very low, and the projecting roof nearly reaches the ground; a barrier at the entrance keeps out pigs and dogs. A sort of table or bench stands outside, used by the men only, for meals and for the subsequent siesta. In east New Guinea sometimes the houses are two-storeyed, the lower part being used for stores. The ordinary house is 60 to 70 ft. long with a passage down the centre, and stands on a platform or veranda raised on piles, with the ridge-pole projecting considerably at the gables so that the roof may cover it at each end. Under this shade the inmates spend much of their time; here their meals, which are cooked on the ground beneath the house, are served. The furniture consists of earthen bowls, drinking-cups, wooden neck-rests, spoons, &c., artistically carved, mats, plaited baskets and boxes. The pottery is moulded and fire-baked. In a few districts villages are built at a short distance off the shore, as a protection against raids by the inland tribes. The interior villages are frequently situated on hill crests, or on top of steep-faced rocks as difficult of access as possible, whence a clear view all round can be had. Where such natural defences are wanting the village is protected by high palisades and by fighting platforms on trees commanding its approaches. The "dobbos," or tree-houses, built in high trees, are more or less peculiar to British New Guinea. On the north-east coast many of the villages are tastefully kept, their whole area being clean swept, nicely sanded, and planted with ornamental shrubs, and have in their centre little square palaver places laid with flat stones, each with an erect stone pillar as a back-rest. Excellent suspension bridges span some of the larger rivers, made of interlaced rattan ropes secured to trees on opposite banks, so very similar to those seen in Sumatra as to suggest some Malay influence.

Weapons. Papuan weapons are the bow and arrow (in the Fly River region, the north and north-east coasts); a beheading knife of a sharp segment of bamboo; a shafted stone club—rayed, disk-shaped or ball-headed (in use all over the island); spears of various forms, pointed and barbed; the spear-thrower (on the Finsch coast); and hardwood clubs and shields, widely differing in pattern and ornamentation with the district of their manufacture. The Papuan bow is rather short, the arrows barbed and tipped with cassowary or human bone. The Papuans are mostly ignorant of iron, but work skilfully with axes of stone or tridacna shell and bone chisels, cutting down trees 20 in. in diameter. Two men working on a tree trunk, one making a cut with the adze lengthwise and the other chopping off the piece across, will soon hollow out a large canoe. Every man has a stone axe, each village generally owning a large one. Their knives are of bamboo hardened by fire. In digging they use the pointed stick. In British New Guinea alone is the man-catcher (a rattan loop at the end of a handle with a pith spike projecting into it) met with. In the D'Entrecasteaux Islands the sling is in use. For war the natives smear themselves in grotesque fashion with lime or ochres, and in some parts hold in their teeth against the chin a face-like mask, supposed to strike terror into the foe, against whom they advance warily (if not timidly), yelling and blowing their war-trumpets. The war canoe (which is a long, narrow dug-out outrigger, capable of holding twenty-eight men) is only a transport, for they never fight in it. The conch-shell is the trumpet of alarm and call to arms. The vendetta—resulting, when successful, in the bringing back the head of the slain as a trophy to be set up as a house ornament—is widely practised. The eastern tribes salute by squeezing simultaneously the nose and stomach, and both there and on the north coast friendship is ratified by sacrificing a dog. In other places they wave green branches, and on the south coast, pour water over their heads, a custom noticed by Cook at Mallicolo (New Hebrides). Among other pets they keep little pigs, which the women suckle.

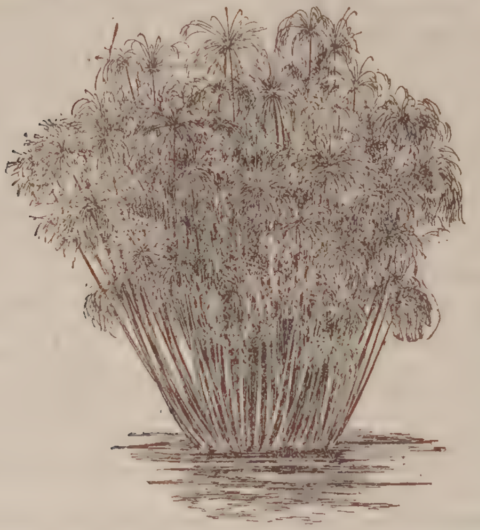
The Papuan numerals extend usually to 5 only. In Astrolabe Bay the limit is 6; with the more degraded tribes it is 3, or, as in Torres straits, they have names only for 1 and 2; 3 is 2+1.

Language.—The Papuan languages or dialects are very numerous, owing, doubtless, to the perpetual intertribal hostility which has fostered isolation. In grammatical structure there is considerable resemblance between these dialects, but the verbal differences have become great. Several dialects are sometimes found on one island. The following are some broad characteristics of the Papuan languages. Consonants are freely used, some of the consonantal sounds being difficult to represent by Roman characters. Many of the syllables are closed. There does not appear to be any difference between the definite and the indefinite article, except in Fiji. Nouns are divided into two classes, one of which takes a pronominal suffix, while the other never takes such a suffix. The principle of this division appears to be a near or remote connexion between the possessor and the thing possessed. Those things which belong to a person, as the parts of his body, &c., take the pronominal suffix; a thing possessed merely for use would not take it. Thus, in Fijian the word *luve* means either a son or a daughter—one's own child, and it takes the possessive pronoun suffixed, as *luvena*; but the word *ngone*, a child, but not necessarily one's own child, takes the possessive pronoun before it, as *nona ngone*, his child, *i.e.* his to look after or bring up. Gender is only sexual. Many words are used indiscriminately, as nouns, adjectives or verbs, without change; but sometimes a noun is indicated by its termination. In most of the languages there are no changes in nouns to form the plural, but an added numeral indicates number. Case is shown by particles, which precede the nouns. Adjectives follow their substantives. Pronouns are numerous, and the personal pronoun includes four numbers—singular, dual, trinal and general plural, also inclusive and exclusive. Almost any word may be made into a verb by using with it a verbal particle. The difference in the verbal particles in the different languages is very great. In the verbs there are causative, intensive or frequentative, and reciprocal forms.

See R. H. Codrington, *The Melanesians* (1891), *Melanesian Languages* (1885); B. Hagen, *Unter den Papuas* (Wiesbaden, 1899); G. von der Gabelentz and A. B. Meyer, *Beiträge zur Kenntniss der melanesischen, &c., Sprachen* (Leipzig, 1882); A. B. Meyer and R. Parkinson, *Album von Papúa Typen* (Dresden, 1894); F. S. A. de Clercq, *Ethnographische Beschrijving van de West-en Noordkust van N. N. G.* (Leiden, 1893); A. C. Haddon, *Decorative Art of British New Guinea* (Dublin, 1894).

PAPYRUS, the paper reed, the *Cyperus Papyrus* of Linnaeus, in ancient times widely cultivated in the Delta of Egypt, where it was used for various purposes, and especially as a writing material. The plant is now extinct in Lower Egypt, but is found in the Upper Nile regions and in Abyssinia. Theophrastus (*Hist. plant.* iv. 10) states that it likewise grew in Syria; and, according to Pliny, it was also a native plant of the Niger and Euphrates. Its Greek title *πάπυρος*, Lat. *papyrus*, appears to be of Egyptian origin. By Herodotus it is always called *βύβλος*. The first accurate description of the plant is given by Theophrastus, from whom we learn that it grew in shallows of 2 cubits (about 3 ft.) or less, its main root being of the thickness of a man's wrist and 10 cubits in length. From this root, which lay horizontally, smaller roots pushed down into the mud, and the stem of the plant sprang up to the height of 4 cubits, being triangular and tapering in form. The tufted head or umbel is likened by Pliny to a thyrsus.

The various uses to which the papyrus plant was applied are also enumerated by Theophrastus. Of the head nothing could be made but garlands for the shrines of the gods; but the wood of the root was employed in the manufacture of different utensils as well as for fuel. Of the stem of the plant were made boats, sails, mats, cloth, cords, and, above all, writing materials. Its pith was also a common article of food, and was eaten both cooked and in its natural state. Herodotus, too, notices its consumption as food (ii. 92), and incidentally mentions that it provided the material of which the priests' sandals were made (ii. 37). He likewise refers to the use of byblus as tow for caulking the seams of ships; and the statement of Theophrastus that King Antigonus made the rigging of his fleet of the same material is illustrated by the ship's cable, *ὅπλον βύβλινον*, wherewith the doors were fastened when Ulysses slew the suitors in his hall (*Odyss.* xxi. 390). That the plant was itself used also as the principal material in the construction of light skiffs suitable for the navigation of the pools and shallows of the Nile, and even of the river itself, is shown by sculptures of the fourth dynasty, in which men are represented building a boat with stems cut from a neighbouring plantation of papyrus (Lepsius, *Denkm.* ii. 12). It is to boats of this description that Isaiah probably refers in the "vessels of bulrushes upon the waters" (xviii. 2). If the Hebrew gōmer (גֹּמֶר) also is to be identified with the Egyptian papyrus, something may be said in favour of the tradition that the bulrushes of which the ark was composed in which the infant Moses was laid were in fact papyrus. But it seems hardly credible that the *Cyperus papyrus* could have sufficed for the many uses to which it is said to have been applied and we may conclude that several plants of the genus *Cyperus* were comprehended under the head of byblus or papyrus—an opinion which is supported by the words of Strabo, who mentions both inferior and superior qualities. The *Cyperus dives* is still grown in Egypt, and is used to this day for many of the purposes named by ancient writers.



The widespread use throughout the ancient world of the writing material manufactured from the papyrus plant is attested by early writers, and by documents and sculptures. Papyrus rolls are represented in ancient Egyptian wall-paintings; and extant examples of the rolls themselves are sufficiently numerous. The most ancient Egyptian papyrus now known contains accounts of the reign of King Assa (3580–3536 B.C.). The earliest literary papyrus is that known, from the name of its former owner, as the Prisse papyrus, and now preserved at Paris, containing a work composed in the reign of a king of the fifth dynasty, and computed to be itself of the age of upwards of 2500 years B.C. The papyri discovered in Egypt have often been found in tombs, and in the hands, or swathed with the bodies, of mummies. The ritual of the dead is most frequently the subject. Besides the ritual and religious rolls, there are the hieratic, civil and literary documents, and the demotic and enchorial papyri, relating generally to sales of property. Coptic papyri mainly contain Biblical or religious texts or monastic deeds. Papyrus was also known to the Assyrians, who called it "the reed of Egypt."

The early use of Papyrus among the Greeks is proved by the reference of Herodotus (v. 58) to its introduction among the Ionian Greeks, who gave it the name of διφθέραι, "skins," the material to which they had already been accustomed. In Athens it was doubtless in use for literary as well as for other purposes as early as the 5th century B.C. An inscription relating to the rebuilding of the Erechtheum in 407 B.C. records the purchase of two papyrus rolls, to be used for the fair copy of the rough accounts. The very large number of classical and other Greek papyri, of the Ptolemaic and later periods, which have been recovered in Egypt, are noticed in the article on PALAEOGRAPHY. The rolls found in the ruins of Herculaneum contain generally the less interesting works of writers of the Epicurean school.

Papyrus also made its way into Italy, but at how early a period there is nothing to show. It may be presumed, however, that from the very first it was employed as the vehicle for Roman literature. Under the Empire its use must have been extensive, for not only was it required for the production of books, but it was universally employed for domestic purposes, correspondence and legal documents. So indispensable did it become that it is reported that in the reign of Tiberius, owing to the scarcity and dearness of the material caused by a failure of the papyrus crop, there was a danger of the ordinary business of life being deranged (Pliny, *N.H.* xiii. 13).

The account which Pliny (*N.H.* xiii. 11–13) has transmitted to us of the manufacture of the writing material from the papyrus plant should be taken strictly to refer to the process followed in his own time; but, with some differences in details, the same general method of treatment had doubtlessly been practised from time immemorial. His text, however, is so confused, both from obscurity of style and from corruptions in the MSS., that there is much difference of opinion as to the meaning of many words and phrases employed in his narrative, and their application in particular points of detail. In one important particular, however, affecting the primary construction of the material, there can no longer be any doubt. The old idea that it was made from layers or pellicules growing between the rind and a central stalk has been abandoned, as it has been proved that the plant, like other reeds, contains only a cellular pith within the rind. The stem was in fact cut into longitudinal strips for the purpose of being converted into the writing material, those from the centre of the plant being the broadest and most valuable. The strips (*inae, philyrae*), which were cut with a sharp knife or some such instrument, were laid on a board side by side to the required width, thus forming a layer (*scheda*), across which another layer of shorter strips was laid at right angles. The two layers thus "woven"—Pliny uses the word *texere* in describing this part of the process—formed a sheet (*plagula* or net), which was then soaked in water of the Nile. The mention of a particular water has caused trouble to the commentators. Some have supposed that certain chemical properties of which the Nile water was possessed acted as a glue or cement to cause the two layers to adhere; others, with more reason, that glutinous matter contained in the material itself was solved by the action of water, whether from the Nile or any other source; and others again read in Pliny's words an implication that a paste was actually used. The sheet was finally hammered and dried in the sun. Any roughness was levelled by polishing with ivory or a smooth shell. But the material was also subject to other defects, such as moisture lurking between the layers, which might be detected by strokes of the mallet; spots or stains; and spongy strips (*taeniae*), in which the ink would run and spoil the sheet. When such faults occurred, the papyrus must be re-made. To form a roll the several sheets κολλήματα, were joined together with paste (glue being too hard), but not more than twenty sheets in a roll (*scapus*). As, however, there are still extant rolls consisting of more than the prescribed number of sheets, either the reading of *vicenae* is corrupt, or the number was not constant in all times. The *scapus* seems to have been a standard length of papyrus, as sold by the stationers. The best sheet formed the first or outside sheet of the roll, and the others were joined on in order of quality, so that the worst sheets were in the centre of the roll. This arrangement was adopted, not for the purpose of fraudulently selling bad material under cover of the better exterior, but in order that the outside of the roll should be composed of that which would best stand wear and tear. Besides, in case of the entire roll not being filled with the text, the unused and inferior sheets at the end could be better spared, and so might be cut off.

The different kinds of papyrus writing material and their dimensions are also enumerated by Pliny. The best quality, formed from the middle and broadest strips of the plant, was originally named *hieratica*, but afterwards, in flattery of the emperor Augustus, it was called, after him, *Augusta*; and the *charta Livia*, or second quality, was so named in honour of his wife. The *hieratica* thus descended to the third rank. The first two were 13 digiti, or about 9½ in. in width; the *hieratica*, 11 digiti or 8 in. Next came the *charta amphitheatrica*, named after the principal place of its manufacture, the amphitheatre of Alexandria, of 9 digiti or 6½ in. wide. The *charta Fanniana* appears to have been a kind of papyrus worked up from the *amphitheatrica*, which by flattening and other methods was increased in width by an inch, in the factory of a certain Fannius at Rome. The *Saitica*, which took its name from the city of Sais, and was probably of 8 digiti or 5⅜ in., was of a common description. The *Taeniotica*, named apparently from the place of its manufacture, a tongue of land (ταινία) near Alexandria, was sold by weight, and was of uncertain width, perhaps from 4⅜ to 5 in. And lastly there was the common packing-paper, the *charta emporetica*, of 6 digiti or 4⅜ in. Isidore (*Etymol.* vi. 10) mentions yet another kind, the *Corneliana*, first made under C. Cornelius Gallus, prefect of Egypt, which, however, may have been the same as the *amphitheatrica* or *Fanniana*. The name of the man who had incurred the anger of Augustus may have been suppressed by the same influence that expunged the episode of Gallus from the Fourth Georgic (Birt, *Antik. Buchwesen*, p. 250). In the reign of the emperor Claudius also another kind was introduced and entitled *Claudia*. It had been found by experience that the *charta Augusta* was, from its fineness and porous nature, ill suited for literary use; it was accordingly reserved for correspondence only, and for other purposes was replaced by the new paper.

The *charta Claudia* was made from a composition of the first and second qualities, the *Augusta* and the *Livia*, a layer of the former being backed with one of the latter; and the sheet was increased to nearly a foot in width. The largest of all, however, was the *macrocollon*, probably of good quality and equal to the hieratic, and a cubit or nearly 18 in. wide. It was used by Cicero (*Ep. ad Attic.* xiii. 25; xvi. 3). The width, however, proved inconvenient, and the broad sheet was liable to injury by tearing.

An examination of extant papyri has had the result of proving that sheets of large size, measuring about 12 in., were sometimes used. A large class of examples run to 10 in., others to 8 in., while the smaller sizes range from 4 to 6 in.

An interesting question arises as to the accuracy of the different measurements given by Pliny. His figures regarding the width of the different kinds of papyri have generally been understood to concern the width (or height) of the rolls, as distinguished from their length. It has, however, been observed that in practice the width of extant rolls does not tally in any satisfactory degree with Pliny's measurements; and a more plausible explanation has been offered (Birt, *Antik. Buchwesen*, pp. 251 seq.) that the breadth (not height) of the individual sheets of which the rolls are composed is referred to.

The first sheet of a roll was named *πρωτόκολλον*; the last, *ἐσχατοκόλλιον*. Under the Romans, the former bore the name of the *comes largitionum*, who had control of the manufacture, with the date and name of place. It was the practice to cut away the portion thus marked; but in case of legal documents this mutilation was forbidden by the laws of Justinian. On the Arab conquest of Egypt in the 7th century, the manufacture was continued, and the protocols were marked at first, as it appears, with inscriptions in both Greek and Arabic, and later in the latter language alone. There are several examples extant, some being in the British Museum, ranging between the years 670 and 715 (see facsimiles in C. H. Becker, *Papyri Schott-Reinhardt*, i. (Heidelberg, 1906); and cf. "Arabische Papyri des Aphroditofundes," in *Zeitsch. für Assyriologie*, xx. (1906), 68–104. The Arab inscriptions are accompanied by curious scrawls on each side, which may be imitated from words used in the Latin inscriptions of the Roman period.

Papyrus was cultivated and manufactured for writing material by the Arabs in Egypt down to the time when the growing industry of paper in the 8th and 9th centuries rendered it no longer a necessity (see PAPER). It seems to have entirely given place to paper in the 10th century. Varro's statement, repeated by Pliny, that papyrus was first made in Alexander's time, should probably be taken to mean that its manufacture, which till then had been a government monopoly, was relieved from all restrictions. It is not probable, however, that it was ever manufactured from the native plant anywhere but in Egypt. At Rome there was certainly some kind of industry in papyrus, the *charta Fanniana*, already referred to, being an instance in illustration. But it seems probable that this industry was confined to the re-making of material imported into Italy, as in the case of the *charta Claudia*. This second manufacture, however, is thought to have been detrimental to the papyrus, as it would then have been in a dried condition requiring artificial aids, such as a more liberal use of gum or paste, in the process. The more brittle condition of the Latin papyri found at Herculaneum has been instanced as the evil result of this re-making of the material.

As to cultivation of the plant in Europe, according to Strabo the Romans obtained the papyrus plant from Lake Trasimene and other lakes of Etruria, but this statement is unsupported by any other ancient authority. At a later period, however, a papyrus was cultivated in Sicily, which has been identified by Parlatore with the Syrian variety (*Cyperus syriacus*), far exceeding in height the Egyptian plant, and having a more drooping head. It grew in the east and south of the island, where it was introduced during the Arab occupation. It was seen in the 10th century, by the Arab traveller Ibn-Haukal, in the neighbourhood of Palermo, where it throve luxuriantly in the pools of the Papireto, a stream to which it lent its name. From it paper was made for the sultan's use. But in the 13th century it began to fail, and in 1591 the drying up of the Papireto caused the extinction of the plant in that district. It is still to be seen at Syracuse, but it was probably transplanted thither at a later time, and reared only as a curiosity, as there is no notice of it to be found previous to 1674. It is with this Syracusan plant that some attempts have been made in modern times to manufacture a writing material similar to ancient papyrus.

Even after the introduction of vellum as the ordinary vehicle for literature papyrus still continued to some extent in use outside Egypt, and was not entirely superseded until a late date. It ceased, however, to be used for books sooner than for documents. In the 5th century St Augustine apologizes for sending a letter written on vellum instead of the more usual substance, papyrus (*Ep.* xv.); and Cassiodorus (*Varr.* xi. 38), writing in the 6th century, indulges in a high-flown panegyric on the plant and its value. Of medieval literary Greek papyri very few relics have survived, but of documents coming down to the 8th and 9th centuries an increasing number is being brought to light among the discoveries in Egypt.

Medieval Latin MSS. on papyrus in book form are still extant in different libraries of Europe, viz.: the Homilies of St Avitus, of the 6th century, at Paris; Sermons and Epistles of St Augustine, of the 6th or 7th century, at Paris and Geneva; works of Hilary, of the 6th century, at Vienna; fragments of the Digests, of the 6th century, at Pommersfeld; the Antiquities of Josephus, of the 7th century, at Milan; Isidore, *De contemptu mundi*, of the 7th century, at St Gall; and the Register of the Church of Ravenna, of the 10th century, at Munich. The employment of this material in Italy for legal purposes is sufficiently illustrated by the large number of documents in Latin which were preserved at Ravenna, and date from the 5th to the 10th century. In the papal chancery it was used at an early date, evidence of its presence there being found in the biography of Gregory I. But of the extant papal deeds the earliest to which an authentic date can be attached is a bull of Adrian I. of the year 788, while the latest appears to be one of 1022. There is evidence to show that in the 10th century papyrus was used, to the exclusion of other materials, in papal deeds. In France it was a common writing substance in the 6th century (Gregory of Tours, *Hist. Franc.* v. 5). Of the Merovingian period there are still extant several papyrus deeds, the earliest of the year 625, the latest of 692. Under Charlemagne and his successors it was not used. By the 12th century the manufacture of papyrus had entirely ceased, as appears from a note by Eustathius in his commentary on the *Odyssey*, xxi. 390.

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PAR (Lat. *par*, equal), technically a commercial and banking term. When stocks, shares, &c., are purchasable at the price originally paid for them or at their nominal or face value they are said to be *at par*. When the purchase price is higher than the face value, they are *above par*, or *at a premium*; when below face value, they are *below par*, or *at a discount*. *Par of exchange* is the amount of money in the currency of one country which is equivalent to the same amount in the terms of another, both currencies being of the same metal and of a fixed standard of weight and purity. (See EXCHANGE.)

PARÁ, or GRÃO PARÁ, a northern state of Brazil, bounded N. by the three Guianas and the Atlantic, E. by the Atlantic and the states of Maranhão and Goyaz, S. by Goyaz and Matto Grosso and W. by Amazonas. It is the third largest state of the republic, having an area of 443,922 sq. m.; pop. (1890), 328,455, (1900), 445,356. The Amazon valley has its outlet to the ocean through the central part of the state, the outlet, or neck, being comparatively narrow and the territory on both sides rising to the level of the ancient plateau that covered this part of the continent. In the north is the Guiana plateau, sometimes called Brazilian Guiana, which is "blanketed" and made semi-arid by the mountain ranges on the Brazil-Guiana frontier. In the south the country rises in forested terraces and is broken by escarpments caused by the erosion of the northern slope of the great central plateau of Brazil. With the exception of the

Guiana highlands, and some grassy plains on the island of Marajó and in some other places, the state is densely forested, and its lowest levels are covered with a network of rivers, lakes and connecting channels.

The rivers of the state may be grouped under three general systems: the Amazon and its tributaries, the Tocantins and its tributaries and the rivers flowing direct to the Atlantic. The Amazon crosses the state in a general E.N.E. direction for about 500 m. Its channels, tributaries, *furos* (arms), *igarapés* (creeks, or literally, "canoe paths"), by-channels and reservoir lakes form an extremely complicated hydrographic system. From the north seven large tributaries are received—the Jamundá (which forms the boundary line with Amazonas), Trombetas, Maecurú, Jauary, Parú, Jary and Anauera-pucú. The first is, strictly speaking, a tributary of the Trombetas, though several *furos* connect with the Amazon before its main channel opens into the Trombetas. All these rivers have their sources on the Guiana highlands within the limits of the state, and flow southward to the Amazon over numerous rapids and falls, with comparatively short navigable channels before entering the great river. From the south two great tributaries are received—the Tapajos and Xingú—both having their sources outside the state (see AMAZON). The Pará estuary, usually called the Pará river, belongs to the Tocantins, although popularly described as a mouth of the Amazon. Very little Amazon water passes through it except in times of flood. It is connected with the Amazon by navigable tidal *furos*, in which the current is hardly perceptible. The estuary is about 200 m. long and 5 to 30 m. wide, and receives the waters of a large number of streams, the largest of which is the Guamá and its chief tributary, the Capim. A number of small rivers discharge into the Atlantic north and south of the Amazon, the largest of which are the Gurupy, which forms the boundary line with Maranhão, the Araguary, which drains a large area of the eastern slope of the Guiana highlands, and the Oyapok, which forms the boundary line with French Guiana.

Lying across the mouth of the Amazon and dividing it into three channels are the islands of Caviana and Mexiana, the first 47 m. and the second 27 m. in length, north-west to south-east, both traversed by the equator, and both devoted to cattle-raising. Somewhat different in character is the island of Marajó, or Joannes, which lies between the Amazon and Pará estuary. It is 162 m. long by 99 m. wide, and its area is about 15,000 sq. m. This island is only partly alluvial in character, a considerable area on its eastern and southern sides having the same geological formation as the neighbouring mainland. The larger part, the north-western, belongs to the flood-plains of the Amazon, being covered with swamps, forests and open meadows, and subject to annual inundations. There are several towns and villages on the island, and stock-raising, now in a state of decadence, has long been its principal industry. Of interest to archaeologists is the largest of its several lakes, called Arary, in the centre of which is a small island celebrated for its Indian antiquities, chiefly pottery. On the Atlantic coast the principal island is Maracá (lat. 2° N.), 26 m. long by 20 m. wide, which lies, in part, off the entrance to the Amapa river.

Pará is crossed by the equator, and its climate is wholly tropical, but there is a wide variation in temperature and rainfall. In general, it is hot and dry on the Guiana plateau, and hot and humid throughout the forested region. In the latter, there are two recognized seasons, wet and dry, which differ only in the amount of rainfall, a strictly dry season being unknown. The trade winds, which blow up the Amazon with much force, moderate the heat and make healthy most of the settlements on the great river itself; but the settlements along its tributaries, which are not swept by these winds, are afflicted with malaria. The population is concentrated at widely separated points on the coast and navigable rivers, except on Marajó island, where open country and pastoral pursuits have opened up inland districts. The principal occupation is the collecting and marketing of forest products such as rubber (from *Hevea brasiliensis*), gutta-percha, or *balata* (*Mimusops elata*), Brazil nuts (*Bertholetia excelsis*), sarsaparilla (*Smilax*), *cumaru* or tonka beans (*Dipterix odorata*), copaiba (*Copaifera officinarum*), *guaraná* (*Paulinia sorbilis*), *cravo* (an aromatic bark of *Dicypellium caryophillatum*) and many others. In earlier days cotton, sugar-cane, rice, tobacco, cacao and even coffee were cultivated, but the demand for rubber caused their abandonment in most places. Cacao (*Theobroma cacao*) is still widely cultivated, as also *mandioca* (*Manihot utilissima*) in some localities. Pará produces many kinds of fruits—the orange, banana, abrico, cajú, abacate (alligator pear), mango, sapotilha, fructa de Conde, grape, &c., besides a large number hardly known beyond the Amazon valley. The pastoral industries were once important in Pará, especially on the islands of Marajó, Caviana and Mexiana, and included the rearing of horses, cattle, and sheep. At present little is done in these industries, and the people depend upon importation for draft animals and fresh meat. There remain a few cattle ranges on Marajó and other islands, but the industry is apparently losing ground. Mining receives some attention on the Atlantic slope of the Guiana plateau, where gold washings of no great importance have been found in the Counani and other streams. There are no manufactures in the state outside the city of Pará (*q.v.*).

Transportation depends wholly on river craft, the one railway of the state, the Pará & Bragança, not being able to meet expenses from its traffic receipts. The capital of the state is Pará, or Belem do Pará, and its history is largely that of this city. Other important towns are Alemaquer (pop. about 1500; of the municipio in 1890, 7539), on a by-channel of the Amazon; Breves (mun. 12,593 in 1890), a river port in the south-west part of Marajó, on a channel connecting the Amazon with the Pará estuary; Bragança (mun. 16,046 in 1890), a small town in one of the few agricultural districts of the state, 147 m. by rail north-east of Pará, on the river Caeté, near the coast; Obidos (about 1000; mun. 12,666 in 1890), on the north bank of the Amazon at a point called the Pauxis narrows, a little over 1 m. wide, attractively situated on a hillside in a healthful locality; and Santarem (12,062 in 1890), on the right bank of the Tapajos, 2½ m. from the Amazon, dating from 1661, and the most prosperous and populous town between Pará and Manáos.

PARÁ (officially BELEM; sometimes BELEM DO PARÁ), a city and port of Brazil, capital of the state of Pará, and the see of a bishop, on a point of land formed by the entrance of the Guamá river into the Pará (86 m. from the Atlantic), in 1° 28′ S., 48° 28′ W. Pop. of the city and rural districts of the municipality (1890), 50,064; (1900, estimate), 100,000. There is a large Portuguese contingent in the population, and the foreign element, engaged in trade and transportation, is also important. The Indian admixture is strongly apparent in the Amazon valley and is noticeable in Pará. A small railway, built by the state, runs north-eastward in the direction of Bragança (112 m.), on the sea-coast. The Guamá river is enlarged at its mouth to form an estuary called the bay of Guajará, partially shut off from the Pará by several islands and forming the anchorage of the port, and the Pará is the estuary mouth of the Tocantins river. The Pará is about 20 m. wide here.

The city is built on an alluvial forested plain only a few feet above the level of the river, and its streets usually end at the margin of the impenetrable forest. The climate is hot and humid, but the temperature and diurnal changes are remarkably uniform throughout the year. The annual rainfall, according to Professor M. F. Draenert, is 70 in. (Reclus says 120 in.), of which 56 in. are credited to the rainy season (January to June). H. W. Bates gives the average temperature at 81° F., the minimum at 73°, and the maximum (2 p.m.) at 89° to 94°. These favourable climatic conditions tend to make the city healthy, but through defective drainage, insanitary habits and surroundings, and improper diet the death-rate is high. The plan of the city is regular and, owing to the density of the forest, it has no outlying suburbs. The streets are usually narrow, straight and well paved. Among the many public squares and gardens the largest are the Praça Caetano Brandão, with a statue of the bishop of that name; the Praça da Independencia, surrounded by government buildings and having an elaborate monument to General Gurjão; the Praça Visconde do Rio Branço, with a statue of José da Gama Melchior; the Praça de Baptista Campos, with artificial cascades, lake, island and winding paths; the Praça da Republica, with a monument representing the Republic; and the Praça de Prudente Moraes, named in honour of the first civilian president of Brazil. Another public outdoor resort is the Bosque, a tract of forest on the outskirts of the city. The public buildings and institutions are in great part relics of an older régime. The great cruciform cathedral, on the Praça Caetano Brandão, dates from the middle of the 18th century. In the vicinity, facing on the Praça da Independencia, are the government and municipal palaces—built by order of Pombal (*c.* 1766), when Portugal contemplated the creation of a great empire on the Amazon. The bishop's palace and episcopal seminary, near the cathedral, were once the Jesuits' college, and the custom-house on the water-front was once the convent and church of the Mercenarios. One of the most notable buildings of the city is the Theatro da Paz (Peace Theatre), which faces upon the Praça da Republica and was built by the government during the second empire. Other noteworthy buildings are the Caridade hospital, the Misericordia hospital (known as the "Santa Casa"), the military barracks occupying another old convent, and the Castello fort, a relic of colonial days. Pará has a number of schools and colleges, public and private, of secondary grade, such as the Ateneo Paranense, Instituto Lauro Sodré and Lyceu Benjamin Constant. There is an exceptionally fine museum (Museu Goeldi), with important collections in anthropology, ethnology, zoology and botany, drawn from the Amazon valley. The private dwellings are chiefly of the Portuguese one-storey type, with red tile roofs and thick walls of broken stone and mortar, generally plastered outside but sometimes covered with blue and white Lisbon tiles.

Pará is the entrepôt for the Amazon valley and the principal commercial city of northern Brazil. It is the headquarters of the Amazon Navigation Company, which owns a fleet of 40 river steamers, of 500 to 900 tons, and sends them up the Amazon to the Peruvian frontier, and up all the large tributaries where trading settlements have been established. Two or three coastwise companies also make regular calls at this port, and several transatlantic lines afford regular communication with Lisbon, Liverpool, Hamburg and New York. The port is accessible to large steamers, but those of light draft only can lie alongside the quays, the larger being obliged to anchor some distance out. Extensive port improvements have been undertaken. The exports of Pará include rubber, cacao, Brazil nuts and a large number of minor products, such as isinglass, palm fibre, fine woods, tonka beans, deerskins, balsam copaiba, annatto, and other forest products.

Pará was founded in 1615 by Francisco Caldeira de Castello-Branco, who commanded a small expedition from Maranhão sent thither to secure possession of the country for Portugal and drive out the Dutch and English traders. The settlement, which he named Nossa Senhora de Belem (Our Lady of Bethlehem), grew to be one of the most turbulent and ungovernable towns of Brazil. Rivalry with Maranhão, the capital of the Amazon dependencies, slave-hunting, and bitter controversies with the Jesuits who sought to protect the Indians from this traffic, combined to cause agitation. In 1641 it had a population of only 400, but it had four monasteries and was already largely interested in the Indian slave traffic. In 1652 the Pará territory was made a separate *capitania*, with the town of Pará as the capital, but it was reannexed to Maranhão in 1654. The final separation occurred in 1772, and Pará again became the capital, continuing as such through all the political changes that have since occurred. The bishopric of Pará dates from 1723. The popular movement in Portugal in 1820 in favour of a constitution and parliament (Cortes) had its echo in Pará, where in 1821 the populace and garrison joined in creating a government of their own and in sending a deputation to Lisbon. The declaration of Brazilian independence of 1822 and creation of an empire under Dom Pedro I. was not accepted by Pará, partly because of its influential Portuguese population, and partly through jealousy of Rio de Janeiro as the centre of political power. In 1823 a naval expedition under Lord Cochrane, then in the service of Brazil, took possession of Maranhão, from which place the small brig "Dom Miguel" under the command of Captain John Grenfell was sent to Pará. This officer conveyed the impression that the whole fleet was behind him, and on the 15th of August the *junta governativa* organized in the preceding year surrendered its authority and Pará became part of the newly created Brazilian empire. An uprising against the new government soon occurred, which resulted in the arrest of the insurgents, the execution of their leaders, and the incarceration of 253 prisoners in the hold of a small vessel, where all but four died from suffocation before morning. Conspiracies and revolts followed, and in 1835 an outbreak of the worse elements, made up chiefly of Indians and half-breeds, occurred, known as the "Revolução da Cabanagem," which was chiefly directed against the Portuguese, and then against the Freemasons. All whites were compelled to leave the city and take refuge on neighbouring islands. The Indians and half-breeds obtained the mastery, under the leadership of Antonio and Francisco Vinagres and Eduardo Angelim, and plunged the city and neighbouring towns into a state of anarchy, the population being reduced from 25,000 to 15,000. The revolt was overcome in 1836, but the city did not recover from its effects until 1848. But the opening of the Amazon to foreign trade in 1867 greatly increased the importance of the city, and its growth has gone forward steadily since that event. (A. J. L.)

PARABLE (Gr. παραβολή, a comparison or similitude), originally the name given by Greek rhetoricians to a literary illustration avowedly introduced as such. In late Greek it came to mean a fictitious narrative or allegory (generally something that might naturally occur) by which moral or spiritual relations are typically set forth, as in the New Testament. The parable differs from the apologue in the inherent probability of the story itself, and in excluding animals or inanimate creatures from passing out of their natural sphere and assuming the powers of man, but it resembles it in the essential qualities of brevity and definiteness, and also in its Eastern origin. There are many beautiful examples of the parable in the Old Testament, that of Nathan, for instance, in 2 Sam. xii. 1–9, that of the woman of Tekoah in 2 Sam. xiv. 1–13, and others in the Prophets.

PARABOLA, a plane curve of the second degree. It may be defined as a section of a right circular cone by a plane parallel to a tangent plane to the cone, or as the locus of a point which moves so that its distances from a fixed point and a fixed line are equal. It is therefore a conic section having its eccentricity equal to unity. The parabola is the curve described by a projectile which moves in a non-resisting medium under the influence of gravity (see MECHANICS). The general relations between the parabola, ellipse and hyperbola are treated in the articles GEOMETRY, ANALYTICAL, and CONIC SECTIONS; and various projective properties are demonstrated in the article GEOMETRY, PROJECTIVE. Here only the specific properties of the parabola will be given.

The form of the curve is shown in fig. 1, where P is a point on the curve equidistant from the fixed line AB, known as the *directrix*, and the fixed point F known as the *focus*. The line CD passing through the focus and perpendicular to the directrix is the *axis* or *principal diameter*, and meets the curve in the *vertex* G. The line FL perpendicular to the axis, and passing through the focus, is the *semilatus rectum*, the *latus rectum* being the focal chord parallel to the directrix. Any line parallel to the axis is a *diameter*, and the *parameter* of any diameter is measured by the focal chord drawn parallel to the tangent at the vertex of the diameter and is equal

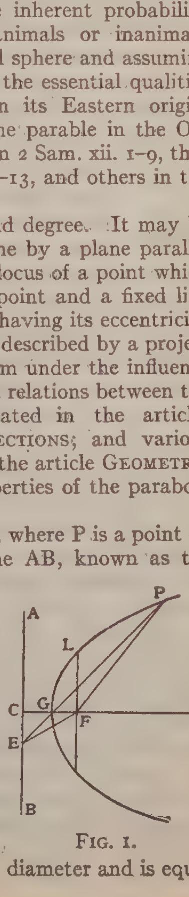

FIG. 1.

to four times the focal distance of the vertex. To construct the parabola when the focus and directrix are given, draw the axis CD and bisect CF at G, which gives the vertex. Any number of points on the parabola are obtained by taking any point E on the directrix, joining EG and EF and drawing FP so that the angles PFE and DFE are equal. Then EG produced meets FP in a point on the curve. By joining the points so obtained the parabola may be described. A mechanical construction, when the same conditions are given, consists in taking a rigid bar ABC bent at right angles at B (fig. 2), and fastening a string of length BC to C and F. Then if a pencil be placed along BC so as to keep the string taut, and the limb AB be slid along the directrix, the pencil will trace out the parabola.

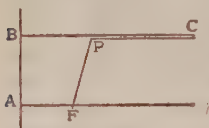

FIG. 2.

Properties which may be readily deduced by euclidian methods from the definition include the following: the tangent at any point bisects the angle between the focal distance and the perpendicular on the directrix and is equally inclined to the focal distance and the axis; tangents at the extremities of a focal chord intersect at right angles on the directrix, and as a corollary we have that the locus of the intersection of tangents at right angles is the directrix; the circumcircle of a triangle circumscribing a parabola passes through the focus; the subtangent is equal to twice the abscissa of the point of contact; the subnormal is constant and equals the semilatus rectum; and the radius of curvature at a point P is $2\,(\mathrm{FP})^{\frac{3}{2}}/a^{\frac{1}{2}}$ where a is the semilatus rectum and FP the focal distance of P.

A fundamental property of the curve is that the *line at infinity* is a tangent (see GEOMETRY, PROJECTIVE), and it follows that the centre and the second real focus and directrix are at infinity. It also follows that a line half-way between a point and its polar and parallel to the latter touches the parabola, and therefore the lines joining the middle points of the sides of a self-conjugate triangle form a circumscribing triangle, and also that the nine-point circle of a self-conjugate triangle passes through the focus. The orthocentre of a triangle circumscribing a parabola is on the directrix; a deduction from this theorem is that the centre of the circumcircle of a self-conjugate triangle is on the directrix ("Steiner's Theorem").

Analytic Geometry.

In the article GEOMETRY, ANALYTICAL, it is shown that the general equation of the second degree represents a parabola when the highest terms form a perfect square. This is the analytical expression of the projective property that the line at infinity is a tangent. The simplest equation to the parabola is that which is referred to its axis and the tangent at the vertex as the axes of co-ordinates, when it assumes the form $y^2=4ax$ where $2a$ = semilatus rectum; this may be deduced directly from the definition. An equation of similar form is obtained when the axes of co-ordinates are any diameter and the tangent at the vertex. The equations to the tangent and normal at the point $x'y'$ are $yy'=2a(x+x')$ and $2a(y-y')+y'(x-x')=0$, and may be obtained by general methods (see GEOMETRY, ANALYTICAL, and INFINITESIMAL CALCULUS). More convenient forms in terms of a single parameter are deduced by substituting $x'=am^2$, $y'=2am$ (for on eliminating m between these relations the equation to the parabola is obtained). The tangent then becomes $my=x+am^2$ and the normal $y=mx+2am-am^3$. The envelope of this last equation is $27ay^2=4(x-2a)^3$, which shows that the evolute of a parabola is a *semi-cubical parabola* (see below *Higher Orders*). The cartesian equation to a parabola which touches the co-ordinate axes is $\sqrt{ax}+\sqrt{by}=1$, and the polar equation when the focus is the pole and the axis the initial line is $r\cos^2\theta/2=a$.

The equation to a parabola in triangular co-ordinates is generally derived by expressing the condition that the line at infinity is a tangent in the equation to the general conic. For example, in trilinear co-ordinates, the equation to the general conic circumscribing the triangle of reference is $l\beta\gamma+m\gamma\alpha+n\alpha\beta=0$; for this to be a parabola the line $a\alpha+b\beta+c\gamma=0$ must be a tangent. Expressing this condition we obtain $\sqrt{la}\pm\sqrt{mb}\pm\sqrt{nc}=0$ as the relation which must hold between the co-efficients of the above equation and the sides of the triangle of reference for the equation to represent a parabola. Similarly, the conditions for the inscribed conic $\sqrt{l\alpha}+\sqrt{m\beta}+\sqrt{n\gamma}=0$ to be a parabola is $lbc+mca+nab=0$, and the conic for which the triangle of reference is self-conjugate $l\alpha^2+m\beta^2+n\gamma^2=0$ is $a^2mn+b^2nl+c^2lm=0$. The various forms in areal co-ordinates may be derived from the above by substituting λa for l, μb for m and νc for n, or directly by expressing the condition for tangency of the line $x+y+z=0$ to the conic expressed in areal co-ordinates. In tangential (p, q, r) co-ordinates the inscribed and circumscribed conics take the forms $\lambda qr+\mu rp+\nu pq=0$ and $\sqrt{\lambda p}+\sqrt{\mu q}+\sqrt{\nu r}=0$; these are parabolas when $\lambda+\mu+\nu=0$ and $\sqrt{\lambda}\pm\sqrt{\mu}\pm\sqrt{\nu}=0$ respectively.

The length of a parabolic arc can be obtained by the methods of the infinitesimal calculus; the curve is directly quadrable, the area of any portion between two ordinates being two thirds of the circumscribing parallelogram. The pedal equation with the focus as origin is $p^2=ar$; the first positive pedal for the vertex is the cissoid (*q.v.*) and for the focus the directrix. (See INFINITESIMAL CALCULUS.)

REFERENCES.—Geometrical constructions of the parabola are to be found in T. H. Eagles' *Plane Curves* (1885). See the bibliography to the articles CONIC SECTIONS; GEOMETRY, ANALYTICAL; and GEOMETRY, PROJECTIVE.

Higher Orders.

In the geometry of plane curves, the term parabola is often used to denote the curves given by the general equation $a^mx^n=y^{m+n}$, thus $ax=y^2$ is the quadratic or Apollonian parabola; $a^2x=y^3$ is the cubic parabola, $a^3x=y^4$ is the biquadratic parabola; *semi parabolas* have the general equation $ax^{n-1}=y^n$, thus $ax^2=y^3$ is the semicubical parabola and $ax^3=y^4$ the semibiquadratic parabola. These curves were investigated by René Descartes, Sir Isaac Newton, Colin Maclaurin and others. Here we shall treat only the more important forms.

The *cartesian parabola* is a cubic curve which is also known as the trident of Newton on account of its three-pronged form. Its equation is $xy=ax^3+bx^2+cx+d$, and it consists of two legs asymptotic to the axis of y and two parabolic legs (fig. 3). The simplest form is $axy=x^3-a^3$, in this case the serpentine position shown in the figure degenerates into a point of inflexion. Descartes used the curve to solve sextic equations by determining its intersections with a circle; mechanical constructions were given by Descartes (*Geometry*, lib. 3) and Maclaurin (*Organica geometrica*).

The *cubic parabola* (fig. 4) is a cubic curve having the equation $y=ax^3+bx^2+cx+d$. It consists of two parabolic branches tending in opposite directions. John Wallis utilized the intersections of this curve with a right line to solve cubic equations, and Edmund Halley solved sextic equations with the aid of a circle.

Diverging parabolas are cubic curves given by the equation $y^2=ax^3+bx^2+cx+d$. Newton discussed the five forms which arise from the relations of the roots of the cubic equation. When all the roots are real and unequal the curve consists of a closed oval and a parabolic branch (fig. 5). As the two lesser roots are made more and more equal the oval shrinks in size and ultimately becomes a real conjugate point, and the curve, the equation of which is $y^2=(x-a)^2(x-b)$ (in which $a>b$) consists of this point and a bell-like branch resembling the right-hand member of fig. 5. If two roots are imaginary the equation is $y^2=(x^2+a^2)\,(x-b)$ and the curve resembles the parabolic branch, as in the preceding case. This is sometimes termed the *campaniform* (or bell-shaped) parabola. If the two greater roots are equal the equation is $y^2=(x-a)\,(x-b)^2$ (in which $a<b$) and the curve assumes the form shown in fig. 6, and is known as the *nodated* parabola. Finally, if all the roots are equal, the equation becomes $y^2=(x-a)^3$; this curve is the *cuspidal* or *semi-cubical* parabola (fig. 7). This curve, which is sometimes termed the Neilian parabola after William Neil (1637–1670), is the evolute of the ordinary parabola, and is especially interesting as being the first

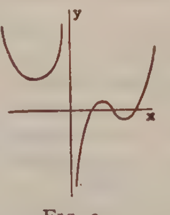

FIG. 3.

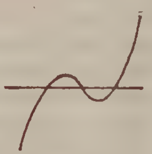

FIG. 4.

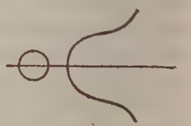

FIG. 5.

curve to be rectified. This was accomplished in 1657 by Neil in England, and in 1659 by Heinrich van Haureat in Holland. Newton showed that all the five varieties of the diverging parabolas may be exhibited as plane sections of the solid of revolution of the semicubical parabola. A plane oblique to the axis and passing below the vertex gives the first variety; if it passes through the vertex, the second form; if above the vertex and oblique or parallel to the axis, the third form; if below the vertex and touching the surface, the fourth form, and if the plane contains the axis, the fifth form results (see CURVE).

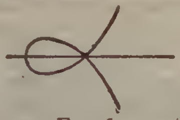
FIG. 6.

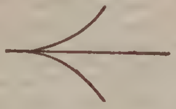
FIG. 7.

The biquadratic parabola has, in its most general form, the equation $y=ax^4+bx^3+cx^2+dx+e$, and consists of a serpentinous and two parabolic branches (fig. 8). If all the roots of the quartic in x are equal the curve assumes the form shown in fig. 9, the axis of x being a double tangent. If the two middle roots are equal, fig. 10 results. Other forms which correspond to other relations between the roots can be readily deduced from the most general form. (See CURVE; and GEOMETRY, ANALYTICAL.)

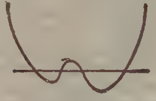
FIG. 8.

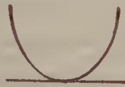
FIG. 9.

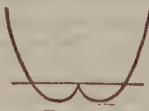
FIG. 10.

PARACELSUS (c. 1490–1541), the famous German physician of the 16th century, was probably born near Einsiedeln, in the canton Schwyz, in 1490 or 1491 according to some, or 1493 according to others. His father, the natural son of a grandmaster of the Teutonic order, was Wilhelm Bombast von Hohenheim, who had a hard struggle to make a subsistence as a physician. His mother was superintendent of the hospital at Einsiedeln, a post she relinquished upon her marriage. Paracelsus's name was Theophrastus Bombast von Hohenheim; for the names Philippus and Aureolus which are sometimes added good authority is wanting, and the epithet Paracelsus, like some similar compounds, was probably one of his own making, and was meant to denote his superiority to Celsus.

Of the early years of Paracelsus's life hardly anything is known. His father was his first teacher, and took pains to instruct him in all the learning of the time, especially in medicine. Doubtless Paracelsus learned rapidly what was put before him, but he seems at a comparatively early age to have questioned the value of what he was expected to acquire, and to have soon struck out ways for himself. At the age of sixteen he entered the university of Basel, but probably soon abandoned the studies therein pursued. He next went to J. Trithemius, the abbot of Sponheim and afterwards of Würzburg, under whom he prosecuted chemical researches. Trithemius is the reputed author of some obscure tracts on the great elixir, and as there was no other chemistry going Paracelsus would have to devote himself to the reiterated operations so characteristic of the notions of that time. But the confection of the stone of the philosophers was too remote a possibility to gratify the fiery spirit of a youth like Paracelsus, eager to make what he knew, or could learn, at once available for practical medicine. So he left school chemistry as he had forsaken university culture, and started for the mines in Tirol owned by the wealthy family of the Fuggers. The sort of knowledge he got there pleased him much more. There at least he was in contact with reality. The struggle with nature before the precious metals could be made of use impressed upon him more and more the importance of actual, personal observation. He saw all the mechanical difficulties that had to be overcome in mining; he learned the nature and succession of rocks, the physical properties of minerals, ores and metals; he got a notion of mineral waters; he was an eyewitness of the accidents which befel the miners, and studied the diseases which attacked them; he had proof that positive knowledge of nature was not to be got in schools and universities, but only by going to nature herself, and to those who were constantly engaged with her. Hence came Paracelsus's peculiar mode of study. He attached no value to mere scholarship; scholastic disputations he utterly ignored and despised—and especially the discussions on medical topics, which turned more upon theories and definitions than upon actual practice. He therefore went wandering over a great part of Europe to learn all that he could. In so doing he was one of the first physicians of modern times to profit by a mode of study which is now reckoned indispensable. The book of nature, he affirmed, is that which the physician must read, and to do so he must walk over the leaves. The humours and passions and diseases of different nations are different, and the physician must go among the nations if he will be master of his art; the more he knows of other nations, the better he will understand his own. And the commentary of his own and succeeding centuries upon these very extreme views is that Paracelsus was no scholar, but an ignorant vagabond. He himself, however, valued his method and his knowledge very differently, and argued that he knew what his predecessors were ignorant of, because he had been taught in no human school. "Whence have I all my secrets, out of what writers and authors? Ask rather how the beasts have learned their arts. If nature can instruct irrational animals, can it not much more men?" In this new school discovered by Paracelsus, and since attended with the happiest results by many others, he remained for about ten years. He had acquired great stores of facts, which it was impossible for him to have reduced to order, but which gave him an unquestionable superiority to his contemporaries. So in 1526 or 1527, on his return to Basel, he was appointed town physician, and shortly afterwards he gave a course of lectures on medicine in the university. Unfortunately for him, the lectures broke away from tradition. They were in German, not in Latin; they were expositions of his own experience, of his own views, of his own methods of curing, adapted to the diseases that afflicted the Germans in the year 1527, and they were not commentaries on the text of Galen or Avicenna. They attacked, not only these great authorities, but the German graduates who followed them and disputed about them in 1527. They criticized in no measured terms the current medicine of the time, and exposed the practical ignorance, the pomposity, and the greed of those who practised it.

The truth of Paracelsus's doctrines was apparently confirmed by his success in curing or mitigating diseases for which the regular physicians could do nothing. For about a couple of years his reputation and practice increased to a surprising extent. But at the end of that time people began to recover themselves. Paracelsus had burst upon the schools with such novel views and methods, with such irresistible criticism, that all opposition was at first crushed flat. Gradually the sea began to rise. His enemies watched for slips and failures; the physicians maintained that he had no degree, and insisted that he should give proof of his qualifications. Moreover, he had a pharmaceutical system of his own which did not harmonize with the commercial arrangements of the apothecaries, and he not only did not use up their drugs like the Galenists, but, in the exercise of his functions as town physician, he urged the authorities to keep a sharp eye on the purity of their wares, upon their knowledge of their art, and upon their transactions with their friends the physicians. The growing jealousy and enmity culminated in a dispute with Canon Cornelius von Lichtenfels, who, having called in Paracelsus after other physicians had given up his case, refused to pay the fee he had promised in the event of cure; and, as the judges, to their discredit, sided with the canon, Paracelsus had no alternative but to tell them his opinion of the whole case and of their notions of justice. So little doubt left he on the subject that his friends judged it prudent for him to leave Basel at once, as it had been resolved to punish him for the attack on the authorities of which he had been guilty. He departed in such haste that he carried nothing with him, and some chemical apparatus and other property were taken charge of by J. Oporinus (1507–1568), his pupil and amanuensis. He went first to Esslingen, where he remained for a brief period, but had soon to leave from absolute want. Then began his wandering life, the course of which can be traced by the dates of his various writings. He thus visited in succession Colmar, Nuremberg, Appenzell, Zurich, Pfäffers, Augsburg, Villach, Meran, Middelheim and other places, seldom staying a twelvemonth in any of them. In this way he spent some dozen years, till 1541, when he was invited by Archbishop Ernst to settle at Salzburg, under his protection. After his endless tossing about, this seemed a promise and place of repose. It proved, however, to be the complete and final rest that he found, for after a few months he died, on the 24th of September. The cause of his death, like most other details in his history, is uncertain. His enemies asserted that he died in a low tavern in consequence of a drunken debauch of some days' duration. Others maintain that he was thrown down a steep place by some emissaries either of the physicians or of the apothecaries, both of whom he had during his life most grievously harassed. He was buried in the churchyard of St Sebastian, but in 1752 his bones were removed to the porch of the church, and a monument of reddish-white marble was erected to his memory.

The first book by Paracelsus was printed at Augsburg in 1529. It is entitled *Practica D. Theophrasti Paracelsi, gemacht auff Europen*, and forms a small quarto pamphlet of five leaves. Prior to this, in 1526–1527, appeared a programme of the lectures he intended to deliver at Basel, but this can hardly be reckoned a specific work. During his lifetime fourteen works and editions were published, and thereafter, between 1542 and 1845, there were at least two hundred and thirty-four separate publications according to Mook's enumeration. The first collected edition was made by Johann Huser in German. It was printed at Basel in 1589–1591, in eleven volumes quarto, and is the best of all the editions. Huser did not employ the early printed copies only, but collected all the manuscripts which he could procure, and used them also in forming his text. The only drawback is that rather than omit anything which Paracelsus may have composed, he has gone to the opposite extreme and included writings with which it is pretty certain Paracelsus had nothing to do. The second collected German edition is in four volumes folio, 1603–1605. Parallel with it in 1603 the first collected Latin edition was made by Palthenius. It is in eleven volumes quarto, and was completed in 1605. Again, in 1616–1618 appeared a reissue of the folio German edition of 1603, and finally in 1658 came the Geneva Latin version, in three volumes folio, edited by Bitiskius.

The works were originally composed in Swiss-German, a vigorous speech which Paracelsus wielded with unmistakable power. The Latin versions were made or edited by Adam von Bodenstein, Gerard Dorn, Michael Toxites and Oporinus, about the middle of the 16th century. A few translations into other languages exist, as of the *Chirurgia magna* and some other works into French, and of one or two into Dutch, Italian and even Arabic. The translations into English amount to about a dozen, dating mostly from the middle of the 17th century. The original editions of Paracelsus's works are getting less and less common; even the English versions are among the rarest of their class. Over and above the numerous editions, there is a bulky literature of an explanatory and controversial character, for which the world is indebted to Paracelsus's followers and enemies. A good deal of it is taken up with a defence of chemical, or, they were called, "spagyric," medicines against the attacks of the supporters of the Galenic pharmacopoeia.

The aim of all Paracelsus's writing is to promote the progress of medicine, and he endeavours to put before physicians a grand ideal of their profession. In his attempts he takes the widest view of medicine. He bases it on the general relationship which man bears to nature as a whole; he cannot divorce the life of man from that of the universe; he cannot think of disease otherwise than as a phase of life. He is compelled, therefore, to rest his medical practice upon general theories of the present state of things; his medical system— if there is such a thing—is an adaptation of his cosmogony. It is this latter which has been the stumbling-block to many past critics of Paracelsus, and unless its character is remembered it will be the same to others in the future. Dissatisfied with the Aristotelianism of his time, Paracelsus turned with greater expectation to the Neoplatonism which was reviving. His eagerness to understand the relationship of man to the universe led him to the Kabbala, where these mysteries seemed to be explained, and from these unsubstantial materials he constructed, so far as it can be understood, his visionary philosophy. Interwoven with it, however, were the results of his own personal experience and work in natural history and chemical pharmacy and practical medicine, unfettered by any speculative generalizations, and so shrewd an observer as Paracelsus was must have often felt that his philosophy and his experience did not agree with one another.

Some of his doctrines are alluded to in the article MEDICINE (*q.v.*), and it would serve no purpose to give even a brief sketch of his views, seeing that their influence has passed entirely away, and that they are of interest only in their place in a general history of medicine and philosophy. Defective, however, as they may have been, and unfounded in fact, his kabbalistic doctrines led him to trace the dependence of the human body upon outer nature for its sustenance and cure. The doctrine of signatures, the supposed connexion of every part of the little world of man with a corresponding part of the great world of nature, was a fanciful and false exaggeration of this doctrine, but the idea carried in its train that of specifics. This led to the search for these, which were not to be found in the bewildering and untested mixtures of the Galenic prescriptions. Paracelsus had seen how bodies were purified and intensified by chemical operations, and he thought if plants and minerals could be made to yield their active principles it would surely be better to employ these than the crude and unprepared originals. He had besides arrived by some kind of intuition at the conclusion that the operations in the body were of a chemical character, and that when disordered they were to be put right by counter operations of the same kind. It may be claimed for Paracelsus that he embraced within the idea of chemical action something more than the alchemists did. Whether or not he believed in the philosopher's elixir is of very little consequence. If he did, he was like the rest of his age; but he troubled himself very little, if at all, about it. He did believe in the immediate use for therapeutics of the salts and other preparations which his practical skill enabled him to make. Technically he was not a chemist; he did not concern himself either with the composition of his compounds or with an explanation of what occurred in their making. If he could get potent drugs to cure disease he was content, and he worked very hard in an empirical way to make them. That he found out some new compounds is certain; but not one great and marked discovery can be ascribed to him. Probably, therefore, his positive services are to be summed up in this wide application of chemical ideas to pharmacy and therapeutics; his indirect and possibly greater services are to be found in the stimulus, the revolutionary stimulus, of his ideas about method and general theory. It is most difficult to appreciate aright this man of fervid imagination, of powerful and persistent convictions, of unbated honesty and love of truth, of keen insight into the errors (as he thought them) of his time, of a merciless will to lay bare these errors and to reform the abuses to which they gave rise, who in an instant offends us by his boasting, his grossness, his want of self-respect. It is a problem how to reconcile his ignorance, his weakness, his superstition, his crude notions, his erroneous observations, his ridiculous influences and theories, with his grasp of method, his lofty views of the true scope of medicine, his lucid statements, his incisive and epigrammatic criticisms of men and motives.

See Marx, *Zur Würdigung des Theophrastus von Hohenheim* (Göttingen, 1842); Mook, *Theophrastus Paracelsus, eine kritische Studie* (Würzburg, 1876); Hartman, *Life of P. T. Paracelsus* (London, 1887); Schubert und Sudhoff, *Paracelsus-Forschungen* (Frankfurt a.M., 1887–1889); Sudhoff, *Versuch einer Kritik der Echtheit der Paracelsischen Schriften* (Berlin, 1894); Waite, *The Hermetic and Alchemical Writings of Paracelsus* (London, 1894).

PARACHUTE (from Ital. *parare*, to shield, protect; cf. "parasol," "parapet," and Fr. *chute*, a fall), an instrument more or less resembling a large umbrella, which by the resistance it offers to the air enables an aeronaut attached to it to descend safely from a balloon or flying machine in the air. The principle of the parachute is so simple that the idea must have occurred to persons in all ages. Simon de la Loubère (1642–1729), in his *History of Siam* (Paris, 1691), tells of a person who frequently diverted the court by the prodigious leaps he used to take, having two parachutes or umbrellas fastened to his girdle. In 1783 Sébastien Lenormand practically demonstrated the efficiency of a parachute by descending from the tower of Montpellier observatory; but he merely regarded it as a useful means whereby to escape from fire. To J. P. Blanchard (1753–1809) is due the idea of using it as an adjunct to the balloon. As early as 1785 he had constructed a parachute to which was attached a basket. In this he placed a dog, which descended safely to the ground when the parachute was released from a balloon at a considerable elevation. It is stated that he descended himself from a balloon in a parachute in 1793; but, owing to some defect in its construction he fell too rapidly, and broke his leg. André Jacques Garnerin (1769–1823) was the first person who successfully descended from a balloon in a parachute, and he repeated this experiment so often that he may be said to have first demonstrated the practicability of using the machine, though his elder brother, J. B. O. Garnerin (1766–1849), also claimed a share in the merit of perfecting it. In 1793 he was taken prisoner at Marchiennes, and while in captivity at Bude (Budapest) thought out the means of descending from a balloon by means of a parachute. His first public experiment was made on the 22nd of October 1797. He ascended from the park of Monceau, at Paris, and at the height of about 1¼ m. he released the parachute, which was attached to the balloon in place of a car; the balloon, relieved suddenly of so great a weight, rose very rapidly till it burst, while the parachute descended very fast, making violent oscillations all the way. Garnerin, however, reached the earth in safety. He repeated his parachute experiment in England on the 21st of September 1802. The parachute was dome-shaped, and bore a resemblance to a large umbrella (fig. 1). The case or dome was made of white canvas, and was 23 ft. in diameter. At the top was a truck or round piece of wood 10 in. in diameter, with a hole in its centre, fastened to the canvas by 32 short pieces of tape. The parachute was suspended from a hoop attached to the netting of the balloon, and below it was placed a cylindrical basket, 4 ft. high and 2¼ ft. in diameter, which contained the aeronaut. The ascent took place at about six o'clock from North Audley Street, London; and at a height of about (it is believed) 8000 ft. Garnerin separated the parachute from the balloon. For a few seconds his fate seemed certain, as the parachute retained the collapsed state in which it had originally ascended and fell very rapidly. It suddenly, however, expanded, and the rapidity of its descent was at once checked, though oscillations were so violent that the car, which was suspended 20 ft. below, was sometimes on a level with the rest of the apparatus. Some accounts state that these oscillations increased, others that they decreased as the parachute descended; the latter seems the more probable. It came to the ground in a field at the back of St Pancras Church, the descent having occupied rather more than ten minutes. Garnerin was hurt a little by the violence with which the basket containing him struck the earth; but a few cuts and a slight nausea represented all the ill effects of his fall. A few years later, Jordaki Kuparento, a Polish aeronaut, made real use of a parachute. He ascended from Warsaw on the 24th of July 1808, in a fire-balloon, which, at a considerable elevation, took fire; but he was able to effect his descent in safety by means of his parachute.

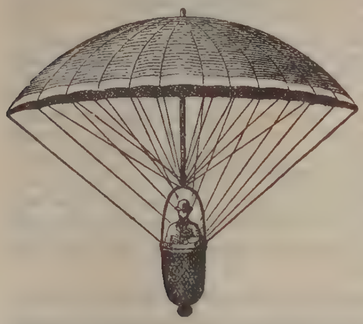

FIG. 1.—Parachute (Garnerin type).

The next experiment made with a parachute resulted in the death of Robert Cocking, who as early as 1814 had become interested in the subject. The great defect of Garnerin's umbrella-shaped parachute had been its violent oscillation during descent, and Cocking considered that if the parachute were made of a conical form (vertex downwards) the whole of this oscillation would be avoided; and if it were made of sufficient size there would be resistance enough to check too rapid a descent. He therefore constructed a parachute on this principle (fig. 2), the radius of which at its widest part was about 17 ft. It was stated in the public announcements previous to the experiment that the whole weighed 223 ℔; but from the evidence at the inquest it appeared that the weight must have been over 400 ℔ exclusive of Cocking's weight, which was 177 ℔. On the 24th of July 1837, the Nassau balloon, with Charles Green, the aeronaut, and Edward Spencer, a solicitor, in the car, and having suspended below it the parachute, in the car of which was Cocking, rose from Vauxhall Gardens, London, at twenty-five minutes to eight in the evening. A good deal of difficulty was experienced in rising to a suitable height, partly in consequence of the resistance to the air offered by the expanded parachute, and partly owing to its weight. Cocking wished the height to be 8000 ft.; but when the balloon reached the height of 5000 ft., nearly over Greenwich, Green called out to Cocking that he should be unable to ascend to the requisite height if the parachute was to descend in daylight. Cocking accordingly let slip the catch which was to liberate him from the balloon. The parachute for a few seconds descended very rapidly, but still evenly, until suddenly the upper rim seemed to give way and the whole apparatus collapsed (taking a form resembling an umbrella turned inside out, and nearly closed), and the machine descended with great rapidity, oscillating very much. When about 200 or 300 ft. from the ground the basket became disengaged from the remnant of the parachute, and Cocking was found in a field at Lee, literally dashed to pieces.

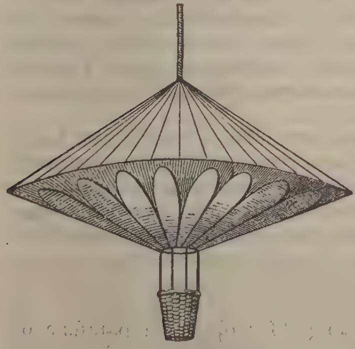

FIG. 2.—Cocking's Parachute.

Many objections were made to the form of Cocking's parachute; but there is little doubt that had it been constructed of sufficient strength, and perhaps of somewhat larger size, it would have answered its purpose. John Wise (1808–1879), the American aeronaut, made some experiments on parachutes of both forms (Garnerin's and Cocking's), and found that the latter always were much more steady, descending generally in a spiral curve.

A descending balloon half-full of gas either does rise, or can with a little management be made to rise, to the top of the netting and take the form of a parachute, thus materially lessening the rapidity of descent. Wise, in fact, having noticed this, once purposely exploded his balloon when at a considerable altitude, and the resistance offered to the air by the envelope of the balloon was sufficient to enable him to reach the ground without injury. In more recent times the use of the parachute has become fairly common, but a good many serious accidents have occurred.

PARADE (Fr. *parade*, an adaptation from Ital. *parata*; cf. Span. *parada*, from Lat. *parare*, to prepare, equip, furnish), a word of which the principal meanings are display, show, a military gathering of troops for a specific purpose, an assembly of people for a promenade, the place where the troops assemble, and a road or street where people may walk. In the military sense, a "parade" is a mustering of troops on the parade-ground for drill, for inspection, for the delivery of special orders, or for other purposes, either at regular stated hours or on special occasions.

PARADISE (Gr. παράδεισος), the name of a supernatural locality reserved for God and for chosen men, which occurs in the Greek Bible, both for the earthly "garden" of Eden (see EDEN), and for the heavenly "garden," where true Israelites after death see the face of God (4 Esdras viii. 52; Luke xxiii. 43; 2 Cor. xii. 4; Rev. ii. 7). The Hebrew *pardes* (פרדס), to which παράδεισος corresponds, occurs thrice in the Old Testament in late books, in the general sense of "park, grove"; it is derived somewhat hazardously from the Zend *pairidaêza*, an enclosure (once only in the *Avesta*), though another word (*Vara*) is used in the account of the mythical enclosure of Yima (see DELUGE). But what interests us most is not the name, but the conception and its imaginative vehicle. The conception is the original godlikeness of human nature, and the necessity of expecting a closer union between God and man in the future than is possible at present. The imaginative form which this conception takes is that before the present condition arose man dwelt near to God in God's own mountain home, and that when the mischief wrought by "the serpent" has been undone, man—or more strictly the true Israel—shall once more be admitted to his old privilege. According to the fullest Old Testament account (Ezek. xxviii. 12–19; see ADAM), the holy mountain was in a definite earthly region, and certainly it was appropriate for worshippers of Yahweh that it should be so (1 Kings xx. 23, 28). But there are traces in that account itself as well as in Gen. ii. that an earlier belief placed the divine home in heaven. Similarly the Zoroastrians speak of their Paradise-mountain Alburz both as heavenly and as earthly (*Bundahish*, xx. 1, with West's note). It appears that originally the Hebrew Paradise-mountain was placed in heaven, but that afterwards it was transferred to earth. It was of stupendous size; indeed, properly it was the earth itself.[1] Later on each Semitic people may have chosen its own mountain, recognizing, however, perhaps, that in primeval times it was of vaster dimensions than at present, just as the Jews believed that in the next age the "mountain of Yahweh's house" would become far larger (Isa. ii. 2 = Mic. iv. 1; Ezek. xl. 2; Zech. xiv. 10; Rev. xxi. 10); compare the idealization of the earthly Alburz of the Iranians "in revelation" (*Bund.* v. 3, viii. 2, xii. 1–8).

We now return to the accounts in Ezek. xxviii. and Gen. ii. The references in the former to the precious stones and to the "stones of fire" may be grouped with the references in Enoch (xviii. 6–8, xxiv.) to seven supernatural mountains each composed of a different beautiful stone, and with the throne of God on the seventh. These mountains are to be connected with the seven planets, each of which was symbolized by a different metal, or at least colour.[2] Ezekiel's mountain therefore has come to earth from heaven. And a similar result follows if we group the four rivers of Paradise in Gen. ii. with the phrase so often applied to Canaan, "flowing with milk and honey" (Exod. iii. 8; Num. xiii. 27, &c.). For this descriptive phrase is evidently mythical,[3] and refers to the belief in the four rivers of the heavenly Paradise which "poured honey and milk, oil and wine" (*Slavonic Enoch*, viii. 5; cf. *Vision of Paul*, xxiii.). In fact, the four rivers originally flowed in heavenly soil, and only when the mountain of Elohim was transferred to this lower earth could mythological geographers think of determining their earthly course, and whether Havilah, or Cush, or Canaan, or Babylonia, was irrigated by one or another of them. But what happened to Paradise when the affrighted human pair left it? One view (see *Eth. Enoch*, xxxii. 2, 3, lx. 8, lxxvii. 3, 4, &c.) was that its site was in some nameless, inaccessible region, still guarded by "the serpents and the cherubim" (*Eth. Enoch*, xx. 7), and that in the next age its gates would be opened, and the threatening sword (Gen. iii. 24) put away by the Messianic priest-king (*Testaments of the Twelve Patriarchs*, Levi, 18). This agrees with the story in Gen. ii., iii., except that the original narrator knew the site of the garden. It is a sufficiently reasonable view, for if Paradise lay in some definite earthly region, and if no one knows "the paths of Paradise" (4 Esdras iv. 7), it would seem that it must have ceased to exist visibly. This idea appears to be implied by those Jewish writers, who, especially after the fall of Jerusalem (A.D. 70), dwelt so much on the hope of the heavenly Paradise, reviving, partly under emotional pressure and partly as the result of a fresh influx of mythology, the old myth of a celestial garden of God. To notice only a few leading passages. In *Apoc. Bar.* iv. 3 it appears to be stated that when Adam transgressed, the vision of the city of God and the possession of Paradise were removed from him, and similarly the stress laid in 4 Esdras iv. 7, vi. 2, vii. (36), 53, viii. 52, on the heavenly Paradise seems to show that no earthly one was supposed to exist.[4] Beautiful, indeed, is the use made of that form of belief in these passages, with which we may group Rev. xxi. 1, xxii. 5, where, as in 4 Esdras viii. 52, Paradise and the city of God are combined.

Some strange disclosures on this subject are made by the *Slavonic Enoch* (c. viii.; cf. xlii. 3), according to which there are two Paradises. The former is in the third heaven, which explains the well-known saying of St Paul in 2 Cor. xii. 2, 4; the latter is conventionally called the Paradise of Eden. In fact, the belief in an earthly Paradise never wholly died. Medieval writers loved it. The mountain of Purgatory in Dante's poem is "crowned by the delicious shades of the terrestrial Paradise."

See further *The Apocalypse of Baruch* and *The Ethiopic and the Slavonic Enoch*, both edited by R. H. Charles; also Kautzsch's *Apocrypha*, and Volz, *Jüdische Eschatologie* (1903), pp. 374–8, whose full references are most useful. On the Biblical references, cf. Gunkel, *Genesis* (2), pp. 21–35; Cheyne, *Ency. Bib.*, "Paradise"; and on Babylonian views, Jeremias, "Hölle und Paradies" (in *Der alte Orient*). The Mahommedan's Paradise is a sensuous transformation of the Jewish; see especially *Koran*, Sura lv., and note the phrase "gardens of Firdaus," *Koran*, xviii. 107. For the Koran and the Zoroastrian books see the *Sacred Books of the East* (Oxford Series). The doorkeeper of the mountain-Paradise of the Parsees is the Amshaspand Vohu-manō (*Vendidad*, xix. 31). (T. K. C.)

PARADOS (Fr. = back cover), a term used in fortification, expressing a work the purpose of which is to cover the defenders of a line of trenches or parapet from reverse fire, *i.e.* fire from the rear.

PARADOX (Gr. παρά, beyond, contrary to, δόξα, opinion), a proposition or statement which appears to be at variance with generally-received opinion, or which apparently is self-contradictory, absurd or untrue, but either contains a concealed truth or may on examination be proved to be true. A "paradox" has been compared with a "paralogism" (παρά, λόγος, reason), as that which is contrary to opinion only and not contrary to reason, but it is frequently used in the sense of that which is really absurd or untrue.

PARAFFIN, the name given to a mineral wax and oil, and also used as a generic name of a particular series of hydrocarbons.

Commercial Paraffin.—Refined commercial paraffin is a white or bluish-white, translucent, waxy solid substance, of laminocrystalline structure, devoid of taste and smell, and characterized by chemical indifference. It consists of about 85% of carbon and 15% of hydrogen. Although the credit of having first (in 1830) investigated the properties of solid paraffin, obtained from wood-tar, belongs to Karl Reichenbach, the existence of paraffin in petroleum had been more or less hazily known for some time previous. In 1809 Fuchs found solid hydrocarbons in the Tegernsee oils, and in 1819 Buchner separated them from these oils in comparative purity. By the latter they were described as "mountain-fats," and they were identified with paraffin in 1835 by von Kobel. Reichenbach described the results of a series of experiments on the reactions between various substances and paraffin, and on account of the inert nature of the material gave to it its present name (from the Lat. *parum*, too little, and *affinitas*, affinity); he expressly stated that the accent should fall on the second "a," but usage has transferred it to the first.

Paraffin was obtained by Laurent in 1830 by the distillation of bituminous schist, and in 1835 by Dumas from coal-tar; but the product appears to have been regarded only as a curiosity, and Lord Playfair has stated that prior to 1850 he never saw a piece of more than one ounce in weight. Paraffin is asserted to have been made for sale by Reichenbach's process from wood-tar by John Thom, of Birkacre, before 1835. In 1833 Laurent suggested the working of the Autun shale, and products manufactured from this material were exhibited by Selligue in 1839.

According to F. H. Storer, the credit of having first placed the manufacture of paraffin on a commercial basis is deservedly given to Selligue, whose patent specifications, both in France and England, sufficiently clearly show that his processes of distilling bituminous schist, &c., and of purifying the distillate, had reached considerable perfection prior to 1845. In its present form, however, the paraffin or shale-oil industry owes its existence to Dr James Young. In 1850 he applied for his celebrated patent (No. 13,292) "for obtaining paraffine oil, or an oil containing paraffine, and paraffine from bituminous coals" by slow distillation. The process was extensively carried out in the United States under licence from Young, until crude petroleum was produced in that country in such abundance, and at so low a cost, that the distillation of bituminous minerals became unprofitable. The highly bituminous Boghead coal, or Torbanehill mineral, which yielded 120 to 130 gallons of crude oil per ton, was worked out in 1862, and since then the Scottish mineral oils and paraffin have been obtained from the bituminous shales of the coal-measures, the amount of such shale raised in Great Britain in 1907 being 2,690,028 tons.

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[1] It was the Babylonian "mountain of the lands," which meant not only mother earth, but the earth imagined to exist within the heaven; cf. Jeremias, *Atao*, pp. 11, 12, 28, and Jastrow, *Religion of Bab. and Ass.*, p. 558.

[2] See Zimmern, *K.A.T.* (3), pp. 616 sqq.

[3] See also 1 Esdras ii. 19. This explains Joel iv. 18; Isa. lv. 1 (wine and milk). See also *Yasna*, xlix. 5 (*Zendavesta*); and cf. Cheyne, *Ency. Bib.*, col. 2104, and especially Usener, *Rheinisches Museum*, lvii. 177–192.

[4] The statement in Gen. iii. 24 comes from a form of the story in which the "garden" was not geographically localized.

The following list represents an attempt to assign a geological age to the various occurrences of oil-shale and similar substances throughout the world:—

Geological System.	Locality.
OIL-SHALES	
Miocene	France (Vagnas), Servia.
Eocene	Brazil.
Cretaceous	Syria, Montana, New Zealand.
Neocomian	Spain.
Jurassic	Dorset, Württemberg.
Permian	France (Autun, &c.).
Carboniferous	Scotland, Yorkshire, Stafford, Flint, France, Nova Scotia.
KEROSENE-SHALE	
Permo-Carboniferous	Queensland, New South Wales, Tasmania.
TAR-LIGNITE	
Miocene	Moravia, Lower Austria, Bavaria. Rhenish Prussia, Hesse, Saxony.
Oligocene	Bohemia, Tirol.

Oil-Shale.—The oil-shale of Scotland is dark grey or black, and has a laminated or horny fracture. Its specific gravity is about 1·75, and 20 cub. ft. of it weigh rather less than a ton. The richer kinds yield about 30 gallons of oil per ton of shale, and in some cases as much as 40 gallons, but the higher yield is usually obtained at the expense of the solid paraffin and of the quality of the heavy oils. The inferior shales yield about 18 gallons of oil, but a much larger amount of sulphate of ammonia. The oil consists chiefly of members of the paraffin and olefine series, and thus differs essentially from that obtained from true coal-shales, in which the hydrocarbons of the benzene group are largely represented.

A full account of the Scotch shale-oil industry, as the most important and typical, will be given later, the corresponding industries in other countries and districts being dealt with first.

In addition to the Carboniferous oil-shales of Flint and Stafford, the Kimmeridge shale, a bluish-grey slaty clay, containing thin beds of highly bituminous shale, occurs in Dorsetshire, and has from time to time attracted attention as a possible source of shale-oil products. The so-called "Kerosene-shale" of New South Wales has been extensively mined, and the industry is now being developed by the Commonwealth Oil Corporation, Ltd. The French shale-oil industry is much older than that of Scotland, but has made far less progress, the amount of shale distilled in 1897 being 200,000 tons, as compared with 2,259,000 tons in Scotland. The shales of New Zealand have never been extensively worked, the production having decreased instead of increased. Oil-shale of good quality occurs in Servia, and has been found to yield from 43½ to 54½ gallons of oil per ton. The production of mineral oils and paraffin by the distillation of lignite is carried on in Saxony, the mineral worked being a peculiar earthy lignite, occurring within a small portion of the Saxon-Thuringian brown-coal formation. Other occurrences of this mineral have been indicated in the list of localities above.

The Shale-Oil Industry of Scotland.—The modern development of the shale-oil industry of Scotland dates from the commencement of Robert Bell's works at Broxburn in 1862.

The oil-shales are found in the Calciferous Sandstone series, lying between the Carboniferous Limestone and the Old Red Sandstone. They occur at several points in the belt of Carboniferous rocks across the centre of Scotland, for the most part in small synclinal basins, the largest of which is that at Pentland, where the levels are 2 m. long, without important faults. Mining is carried on, where the seams are over 4 ft. thick, by the "pillar and stall" system; seams under 4 ft. are worked by the "longwall" system. The shale is blasted down by gunpowder, and passed over a 1-in. riddle, the smalls being left underground. Before being retorted the shale is passed through a toothed breaker, which reduces it to flat pieces 6 in. square. These fall into a shoot, and thence into iron tubs of 10 to 25 cwt. capacity, which run on rails to the tops of the retorts.

The retorts in which the shale is distilled have undergone considerable variation and improvement since the foundation of the industry. Originally horizontal retorts, like those used in the manufacture of coal-gas, were employed, and the heavy oils and paraffin were burned as fuel. When the latter product became valuable vertical retorts were adopted, as the solid hydrocarbons undergo less dissociation under these conditions. Steam was employed to carry the oil vapours from the retort. The earliest form of vertical retort was circular (2 ft. in diameter) or oval (2 ft. by 1 ft. 4 in.) and 8 or 10 ft. long. Six or eight of these were grouped together, and the heating was so effected that the bottoms of the retorts were at the highest temperature. They were charged by means of hoppers at the top, the exhausted shale being withdrawn through a water-seal every hour and fresh added, whence this is known as the "continuous system."

In the first Henderson retort (1873) the spent shale was used as fuel. The retorts, which were oblong in cross-section, were arranged in groups of four, and had a capacity of 18 cwt. They were charged in rotation, as follows: when a sufficient temperature had been attained in the chamber containing them, one retort was charged from the top, and in four hours the one diagonally opposite to it was charged. After eight hours the one next to the first was charged, and after twelve hours the fourth. Up to the sixteenth hour only ordinary fuel was used in the furnace, but the spent shale from the first retort was then discharged into it. The other retorts were similarly discharged in the above order at intervals of four hours, each being at once recharged. The shale was black when discharged, but soon glowed brightly. Owing to the small amount of carbon in the spent shale, only a slow draught was kept up. The outlet for the oil vapours was at the lower and less heated end of the retorts, and steam, which had been superheated by passage through pipes arranged along one side of the retort chamber, was blown in copiously through pipes to aid in the uniform heating of the shale and to continuously remove the oil vapours, dissociation from overheating being thus minimized. It was believed that a temperature of about 800° F. produced the best results. This retort was worked on what is known as the "intermittent system."

The Pentland Composite retort (1882) and the later Henderson type (1889) were both continuous-working and gas-heated, the second being a modification of the first, designed with a view to obtaining a larger yield of sulphate of ammonia without detriment to the crude oil. In both the upper part of the retort was of cast iron and the lower of fire-clay. The upper portion was heated to a temperature of about 900° F. whilst the lower was maintained at about 1300° F. The charge in the retort gradually travelled down, owing to the periodical removal of spent shale at the bottom, and the descent was so regulated that no shale passed into the highly-heated part until it had parted with the oil it was capable of yielding. The shale, however, still contained nitrogen, which in the presence of steam produced ammonia at the higher temperature.

The three classes of retorts now employed in the distillation of shale in the Scottish oil-works are covered by the following patents:—

1. *In use at Pumpherston, Dalmeny and Oakbank*—No. 8371 of 1894; No. 7113 of 1895; No. 4249 of 1897.
2. *In use by Young's Paraffin Light and Mineral Oil Company, Ltd.*—No. 13,665 of 1897; No. 15,238 of 1899.
3. *In use by the Broxburn Oil Company, Ltd.*—No. 26,647 of 1901.

The objects of the invention for which patent No. 8371 of 1894 was granted to Bryson (of Pumpherston Oil Works), Jones (of Dalmeny Oil Works), and Fraser (of Pumpherston Oil Company, Ltd.), are described in the specification as "to so construct the retorts and provide them with means whereby fluxing or dandering of the substance being heated is prevented in the retorts: also to effect an intermittent, continuous, or nearly so, movement within the retort." In order to carry out these objects, the bottom of the retort is provided with a disk or table to support the material within the retort. Above the table there is a revolving arm or scraper, by the action of which a portion of the material is continuously swept off the table and discharged into the hopper below. The column of material within the retort is thus caused to move downwards, and the tendency of the material to flux or dander is thereby prevented or reduced. In order to pulverize the material before reaching the hopper, teeth may be formed upon the lower part of the retort and upon the table, and the revolving scraper may be similarly toothed. A short revolving worm or screw may be substituted for the table or scraper. As a modification, the table may be made convex and provided on each side with rocking-arms connected together above the table by a cross-arm or scraper.

The principal object of the invention for which patent No. 7113 of 1895 was granted to the same applicants is stated to be such arrangement of the parts of the retort as results in the retort, after being heated and started, requiring "practically no fuel to keep it going, owing to the great amount of heat generated in the retort by means of the effectual decomposition of the carbon contained in the waste material by means of one or more jets of steam (which may be superheated) being passed into the retort as near the outlet or discharge-door of the retort as possible, thus utilizing all, or nearly all, the heat contained in the waste material within the retort, thus saving labour, time and expense, as well as wear and tear of the retort."

The object of the invention for which patent No. 4249 of 1897 was granted to Bryson is stated to be "to so construct the hoppers of the retorts that one or more retorts can be drawn or discharged through one door, and also to provide simple and efficient means for operating the said door."

Patent No. 13,665 of 1897 was granted to William Young and John Fyfe for an invention the objects of which are described in the specification in the following words: "To reduce labour, save fuel, and increase the products, and to enable existing but worn-out retorts that have been erected in accordance with the above invention to be economically replaced upon existing foundations by similar retorts, provided with improved and enlarged multiple hoppers for the reception of the shale to pass through the retorts, and also enlarged chambers for the reception of the ash or exhausted shale; the retorts being provided with mechanical arrangements for the continuous passage of the fresh shale into them from the multiple hopper, and the continuous discharge of the ash or spent shale into the receiving chamber. Those improved mechanical alterations in the structure of the retorts greatly reduce the manual labour, enabling most of the work to be done during the day, the multiple hopper and spent-shale chamber being of such dimensions as will supply fresh shale and receive the spent shale during the night-shift, the only labour then required being the supervision, regulating temperature of the retorts, and seeing that the mechanical arrangements are working properly."

The multiple hoppers are constructed of mild steel plates with flat bottoms to which the retorts are bolted by flanges, the steel bottoms admitting of the differential expansion, to which the retorts are subject, taking place without damage to the retorts or hoppers. To ensure the shale regularly passing from the hoppers to the retorts, each hopper is provided with a rocking-shaft to which are attached rods or chains hanging into the mouths of the retorts, these rods or chains being thus made to rise or fall. The spent shale receiving-chambers at the lower end of each retort are of greatly enlarged size, and the lower end of each retort is provided with a mechanical device for the continuous discharge of the spent shale into these chambers. The improvements are stated to be specially applicable to retorts of the Young and Beilby (Pentland) type.

Patent No. 15,238 of 1899 was obtained by the same inventors for improvements designed to obviate objections found to attach to retorts constructed on the ordinary Young and Beilby system. In the use of such retorts, composed of an upper metallic section and a lower fire-brick section, with chambers or hoppers at their upper ends, these upper ends became gradually filled up with hard carbonaceous matter, and this necessitated the periodical stopping of the working to have such matter removed. Moreover, the shale residues became fluxed and fixed to the walls of the lower section of the retorts. The residues were further liable to pass through the retort in an imperfectly exhausted condition, and to pass more quickly down the front or side of the retort next the discharging door. It was also found that when air and steam were used difficulties arose in regulating the quantities and proportions of steam and air used to burn the carbon out of the shale residues while preventing obstructions due to fluxing of the residues. To overcome these drawbacks each retort is composed of four sections, viz. a hopper redistillation chamber at the top, a metallic section, a fire-brick chamber, and a combustion chamber of large capacity at the bottom. The combustion chamber is not externally heated, but receives the spent shale from the retort in a red-hot condition, and the further supply of heat in this chamber is wholly due to the burning of the carbon by the introduced air and steam, the danger of the fluxing and fixing of the shale residue to the walls of the chamber being thus minimized. To successfully burn the carbon remaining in the shale residue when it reaches the combustion chamber, so as to obtain the maximum yield of ammonia, careful regulation of the quantity and proportions of the air and steam is necessary, and a special device is provided for this.

The important construction of retorts for which patent No. 26,647 of 1901 was granted to N. M. Henderson of the Broxburn Oil Works, relates to such retorts as are described in the same inventor's previous patent, No. 6726 of 1889. The patentee dispenses with the chamber or space between the upper and lower retorts, the upper cast-iron retorts being carried direct on the upper end of the lower brick retorts, thus forming practically one continuous retort from top to bottom; and instead of one toothed roller being employed for the purpose of withdrawing the exhausted residue, a pair of toothed rollers is used for each retort. This improved construction is stated to give "better and larger results with less labour and expense in working and for repairs."

The vapour from these retorts, amounting to about 3000 cub. ft. per ton, is partially condensed by being passed through 70 to 100 vertical 4-in. pipes, whose lower ends fit into a chest. About one-third of the vapour is condensed, the liquid, consisting of about 75% of ammoniacal liquor and 25% of crude oil, flowing into a separating tank, whence the two products are separately withdrawn for further treatment. Part of the uncondensed gas is sometimes purified and used for illuminating purposes, when it gives a light of about 25 candle-power. The remainder is used as fuel, usually after compression or scrubbing to remove all condensable vapours.

Crude shale-oil is of dark green colour, has a specific gravity 0·860 to 0·890, and as at present manufactured, with the newer forms of retorts, has a setting point of about 90° F. It contains from 70 to 80% of members of the paraffin and olefine series, together with bases of the pyridine series, and some cresols and phenols. Beilby states that average Scotch shale-oil contains from 1·16 to 1·45% of nitrogen, mainly removable by sulphuric acid of specific gravity 1·220, and mostly remaining in the pitchy residues left on distillation. The lightest distillate, known as naphtha, contains from 60 to 70% of olefines and other hydrocarbons acted upon by fuming nitric acid, and the lubricating oils consist mainly of olefines. The paraffin wax chiefly distils over with the oil of specific gravity above 0·840.

In the refining of crude shale-oil, the greatest care is exercised to prevent dissociation of the paraffin, large volumes of superheated steam being passed into the still, through a perforated pipe, at a pressure of from 10 to 40 ℔, to facilitate distillation at the lowest possible temperature. The original system of intermittent distillation is now employed only at the works of Young's Company. The stills have cast-iron bottoms and malleable-iron upper parts, their former capacity being 1200 to 1400 gallons, but those now made usually holding 2000 to 2500 gallons. Each still has its own water-condenser, the flow of water being regulated according to the nature of the distillate. The usual condensing surface is 230 ft. of 4-in. pipe. The process now in general practice is, with slight variations, the Henderson system of continuous distillation (patent No. 13,014 of 1885). It consists of a primary wagon-still, connected with two side-stills, which are further connected with pot-shaped coking-stills. The oil is heated in feed-heaters by the gases evolved from the hottest still before passing into the first still, where the temperature is so regulated as to drive off only naphtha up to about 0·760 specific gravity. The heavier portion of the oil passes to the other stills, the outermost receiving the heaviest only.

In both these systems the naphtha is collected separately, while the remainder of the distillate, known as "once-run oil," is condensed without fractionation. This "once-run oil" is treated with sulphuric acid and alkali at a temperature of 100° F. in agitators of varying construction—some being horizontal cylinders with a shaft carrying paddles, while others take the form of vertical cylindrical tanks with egg-shaped bottoms—in which agitation is produced by means of compressed air. The loss of oil during the agitation is estimated at 1·5 to 2·0 %.

The oil is next fractionated, either by the intermittent or the continuous system. After the most volatile fractions have distilled off, steam is blown in through a pipe at the bottom of the still. In many cases the distillate, with a density up to

0·770, constitutes the crude naphtha, and that up to a density of 0·850 the burning oil. The remainder of the distillate, which solidifies at common temperatures, consists chiefly of lubricating oils and paraffin. These three fractions are delivered from the condensers into separate tanks. Although the crude-oil stills of Henderson may be employed for the continuous distillation of the once-run or other oils obtained in the process of refining, the inventor prefers another form of apparatus which he patented in 1883 (No. 540), and this is now generally used. This consists of three horizontal cylindrical stills, 7 ft. in diameter and 19 ft. in length. The oil enters through a pipe which passes through one end of the still and discharges at the opposite end, while the outlet-pipe is fitted below the inlet-pipe at the bottom of the end through which the latter passes, inlet and discharge being thus as far as possible from each other. The oil circulates as in the crude-oil stills. The burning oil is next treated with acid and alkali, and subsequently again fractionally distilled, the heavier portion yielding paraffin scale, while the residues are redistilled. The final chemical purification of the burning oil resembles that last referred to, but only half the quantity of acid is employed. The lighter products of these distillations form the crude shale naphtha, which is treated with acid and alkali, and redistilled, when the lightest fractions constitute the Scotch "gasoline" of commerce, and the remainder is known as "naphtha."

The solid paraffin, which is known in its crude state as paraffin scale, was formerly produced from the heavy oil obtained in the first, second and third distillations, that from the first giving "hard scale," while those from the second and third gave "soft scale." The hard scale was crystallized out in shallow tanks, and the contained oil driven out by compression of the paraffin in filter bags. Soft scale was obtained by refrigeration, cooled revolving drums being caused to dip into trays containing the oil, when the paraffin adhered to the drums and was scraped off by a mechanical contrivance. Later improved appliances have aimed at the slow cooling of oil in bulk, whereby large crystals of paraffin are produced. Several processes have been invented, the most generally used being that patented by Henderson (No. 9557 of 1884). His cooler consists of a jacketed trough having a curved bottom, and divided into a series of transverse casings by metal disks, each consisting of two thin plates bolted together, but with a space between, in which, as also in the jacket surrounding the trough, cold brine is circulated. The paraffin crystallizes on the cold surfaces, from which it is constantly removed by scrapers, so that successive portions of the oil are cooled. The solid paraffin accumulates in a well or channel, where it is stirred up by rotary arms, so that it may be readily drawn away by a pump to the filter-press, whereby the solid paraffin is freed from oil. In the improved process of cooling employed at the works of the Oakbank Oil Company the oil to be cooled is pumped through coils submerged in the expressed oil from the filter-presses into the inner space of vertical coolers formed of two cast-iron tubes, and thence direct to the filter-presses. In the inner chamber of the coolers are fitted revolving scrapers, while in the outer annular space compressed ammonia is expanded.

The crude paraffin is then refined, for which purpose the "naphtha treatment" was formerly employed, but this has now given place almost entirely to the "sweating process." In the former the paraffin is dissolved in naphtha and then crystallized out. The sweating process consists in heating the crude wax to such a temperature that the softer portions are melted and flow away with the oil. In the process patented by N. M. Henderson (Nos. 1291 of 1887 and 11,799 of 1891), a chamber, 52 ft. by 13 ft. by 10 ft. high, heated by steam-pipes, and provided with large doors and ventilators for cooling, is fitted with a number of superimposed trays, 21 ft. by 6 ft. by 6 in. deep. These rest on transverse heating pipes, and each tray has a diaphragm of wire gauze. The bottoms communicate with short pipes fitted with swivel nozzles, worked on a vertical shaft. The diaphragms are covered with ½ in. of water, and the crude paraffin is melted and pumped through charging-pipes on to its surface. When the paraffin has solidified, the water is drawn off, leaving the cake resting on the gauze. Doors and ventilators are then closed, and the chamber is heated, whereupon the liquefied impurities are drained off until the outflowing paraffin sets on a thermometer bulb at 130° F. The remainder is melted and decolorized by agitation with finely powdered charcoal. The charcoal is mainly separated by subsidence, and the paraffin drawn off into filters, whence, freed from the suspended charcoal, it runs into moulds, and is thus formed into cakes of suitable size for packing. The lubricating oils are refined by the use of sulphuric acid and alkali, substantially in the same manner as the burning oils.

The following table shows the average yield, in 1895, of the various commercial products from crude shale-oil at two of the principal Scottish refineries. The percentages are, however, often varied to suit market requirements:—

Young's Paraffin Light and Mineral Oil Co.

	%
Gasoline and naphtha	6·09
Burning oils	31·84
Intermediate and heavy oils	23·97
Paraffin scale	13·53
Total	75·43
Loss	24·57
	100·00

Broxburn Oil Co.

		%
Naphtha		3·0
Burning oil	30·0	
Gas oil	9·0	
		39·0
Lubricating oil		18·0
Paraffin		10·0
Loss		30·0
		100·0

From the ammoniacal liquor the ammonia is driven off by the application of heat in stills, the evolved vapour being conducted into "cracker-boxes," which are now usually of circular form, from 5 to 8 in. in diameter, and 6 to 12 in. in depth. In these boxes the ammonia is brought into contact with sulphuric acid of about 50° Tw., and is thus converted into sulphate. Wilton's form of cracker-box, which is now generally in use, is provided with an arrangement for the automatic discharge on to a drying table of the sulphate of ammonia as it is deposited in the well of the box, and the process is worked continuously. For the heating of the ammoniacal liquor the ordinary horizontal boiler-stills formerly used have been superseded by "column-" stills, in which the liquor is exposed over a large area, as it passes from top to bottom of the still, to the action of a current of steam. (B. R.)

PARAFFIN, in chemistry, the generic name given to the hydrocarbons of the general formula C_nH_{2n+2}. Many of these hydrocarbons exist as naturally occurring products, the lower (gaseous) members of the series being met with as exhalations from decaying organic matter, or issuing from fissures in the earth; and the higher members of the series occur in petroleum (chiefly American) and ozokerite. They may be synthetized by reducing the alkyl halides (preferably the iodides) with nascent hydrogen, using either sodium amalgam, zinc and hydrochloric acid, concentrated hydriodic acid (Berthelot, *Jour. prak. Chem.* 1868, 104, p. 103), aluminium amalgam (H. Wislicenus, ibid., 1896 (2), 54) or the zinc-copper couple (J. H. Gladstone and A. Tribe, *Ber.*, 1873, 6, p. 202 seq.) as reducing agents.

They may also be derived from alkyl halides by heating to 120–140° with aluminium chloride in the proportion of three molecules of alkyl halide to one molecule of aluminium chloride (B. Köhnlein, *Ber.*, 1883, 16, p. 560); by heating with zinc and water to 150–160° C. (E. Frankland, *Ann.*, 1849, 71, p. 203; 1850, 74, p. 41), $2\,RI+2Zn+2H_2O=2RH+ZnI_2+Zn(OH)_2$; by conversion into zinc alkyls, which are then decomposed by water, $ZnR_2+2H_2O=2\,RH+Zn(OH)_2$; by conversion into the Grignard reagent with metallic magnesium and decomposition of this either by water, dilute acids or preferably ammonium chloride (J. Houben, *Ber.*, 1905, 38, p. 3019), $RMgI+H_2O=RH+MgI(OH)$; by the action of potassium hydride (H. Moissan, *Comptes rendus*, 1902, 134, p. 389); and by the action of sodium, in absolute ether solution (A. Wurtz, *Ann. chim. phys.*, 1855 (3), 44, p. 275), $2RI+2Na=R{\cdot}R+2NaI$. They may also be obtained by the reduction of the higher fatty acids with hydriodic acid (F. Krafft, *Ber.*, 1882, 15, pp. 1687, 1711), $C_nH_{2n}O_2+6HI=C_nH_{2n+2}+2H_2O+3I_2$; by the conversion of ketones into ketone chlorides by the action of phosphorus pentachloride, these being then reduced by hydriodic acid,

$$(C_nH_{2n+1})_2\,CO \rightarrow (C_nH_{2n+1})_2CCl_2 \rightarrow (C_nH_{2n+1})_2CH_2;$$

by the reduction of unsaturated hydrocarbons with hydrogen in the presence of a "contact" substance, such, for example, as reduced nickel, copper, iron or cobalt (P. Sabatier and J. B. Senderens, *Ann. chim. phys.*, 1905 [8], 4, pp. 319, 433); by the elimination of carbon dioxide from the fatty acids on heating their salts with soda-lime or baryta, $CH_3CO_2Na+NaOH=CH_4+Na_2CO_3$, or by heating their barium salts with sodium methylate *in vacuo* (I. Mai, *Ber.*, 1889, 22, p. 2133); by the electrolysis of the fatty acids (H. Kolbe, *Ann.*, 1849, 69, p. 257), $2C_2H_4O_2=C_2H_6+2CO_2+H_2O$; and by the action of the zinc alkyls on the ketone chlorides, $(CH_3)_2CCl_2+Zn(CH_3)_2=C_5H_{12}+ZnCl_2$.

The principal members of the series are shown in the following table:—

Name.	Formula.	Melting-point.	Boiling-point.
Methane	CH_4	−184°	−164° (760 mm.)
Ethane	C_2H_6	−172·1°	−84·1° (749 ,,)
Propane	C_3H_8	−45°	−44·5°
Normal Butane . . .	C_4H_{10}	—	+1°
Isobutane	,,	—	−17°
Normal Pentane . . .	C_5H_{12}	—	+36·3°
Secondary Pentane . .	,,	—	+30·4°
Tertiary Pentane . .	,,	—	+9°
Hexane	C_6H_{14}	—	+69°
Heptane	C_7H_{16}	—	98–99°
Octane	C_8H_{18}	—	125–126°
Nonane	C_9H_{20}	−51°	150°
Decane	$C_{10}H_{22}$	−31°	173–4°
Undecane	$C_{11}H_{24}$	−26·5°	196°
Dodecane	$C_{12}H_{26}$	−12°	214–216°
Tridecane	$C_{13}H_{28}$	−6·2°	234°
Tetradecane	$C_{14}H_{30}$	+4°	252°
Pentadecane	$C_{15}H_{32}$	+10°	270°
Hexadecane	$C_{16}H_{34}$	+18°	287°
Heptadecane	$C_{17}H_{36}$	+22°	170° (15 mm.)
Octadecane	$C_{18}H_{38}$	+28°	317°
Nonadecane	$C_{19}H_{40}$	+32°	330°
Eicosane	$C_{20}H_{42}$	+37°	205° (15 mm.)
Heneicosane	$C_{21}H_{44}$	+40°	215° (,, ,,)
Docosane	$C_{22}H_{46}$	+44°	224° (,, ,,)
Tricosane	$C_{23}H_{48}$	+48°	234° (,, ,,)
Tetracosane	$C_{24}H_{50}$	+51°	243° (,, ,,)
Hexacosane	$C_{26}H_{54}$	+58°	—
Hentriacontane . . .	$C_{31}H_{64}$	+68°	302° (15 mm.)
Dotriacontane . . .	$C_{32}H_{66}$	+70·5°	331° (,, ,,)
Pentatriacontane. . .	$C_{35}H_{72}$	+75°	331° (,, ,,)
Dimyricyl	$C_{60}H_{122}$	+102°	—

The lowest members of the series are gases at ordinary temperature; those of carbon content C_5 to C_{15} are colourless liquids, and the higher members from C_{16} onwards are crystalline solids. The highest members only volatilize without decomposition when distilled under diminished pressure. They are not soluble in water, although the lower and middle members of the series are readily soluble in alcohol and ether, the solubility, however, decreasing with increase of molecular weight, so that the highest members of the series are almost insoluble in these solvents. The specific gravity increases with the molecular weight but always remains below that of water. The paraffins are characterized by their great inertness towards most chemical reagents. Fuming sulphuric acid converts the middle and higher members of the series into sulphonic acids and dissolves the lower members (R. A. Worstall, *Amer. Chem. Journ.*, 1898, 20, p. 664). Dilute nitric acid, when heated with the paraffins in a tube, converts them into secondary and tertiary nitro-derivatives (M. Konowalow, *Ber.*, 1895, 28, p. 1852), whilst long boiling with strong nitric acid or nitro-sulphuric acid converts the middle and higher members of the series partly into primary mono- and di-nitro compounds and partly oxidizes them to carbonic, acetic, oxalic and succinic acids (Worstall, ibid., 20, p. 202; 21, p. 211). Fuming nitric acid only reacts slowly with the normal paraffins at ordinary temperature, but with those containing a tertiary carbon atom the reaction is very energetic, oxidation products (fatty acids and dibasic acids) and a small quantity of polynitro compounds are obtained (W. Markownikow, *Centralblatt*, 1899, 1, p. 1064; *Ber.*, 1899, 32, p. 1441). Chlorine reacts with the paraffins, readily substituting hydrogen. Isomeric hydrocarbons in this series first appear with butane, the number increasing rapidly as the complexity of the molecule increases. For a means of determining the number of isomers see E. Cayley, *Ber.*, 1875, 8, p.1056; F. Hermann, *Ber.*, 1898, 31, p. 91.

For *Methane* see MARSH GAS. *Ethane*, C_2H_6, occurs in crude petroleum. It may be prepared by the general methods given above; by heating mercury ethyl with concentrated sulphuric acid (C. Schorlemmer, *Ann.*, 1864, 132, p. 234); or by heating acetic anhydride with barium peroxide (P. Schützenberger, *Zeit. für Chemie*, 1865, p. 703), $2(CH_3CO)_2O+BaO_2=C_2H_6+Ba(C_2H_3O_2)_2+2CO_2$. It is a colourless gas which can be liquefied at 4° C. by a pressure of 46 atmospheres. By slow combustion it yields first water and acetaldehyde, which then oxidizes to oxides of carbon and water (W. A. Bone; see FLAME), whilst in ozonized air at 100° it gives ethyl alcohol, together with acetaldehyde and traces of formaldehyde (Bone, *Proc. Chem. Soc.*, 1904, 29, p. 127).

Dimyricyl (hexacontane), $C_{60}H_{122}$, is prepared by fusing myricyl iodide with sodium (C. Hell and C. Hägele, *Ber.*, 1889, 22, p. 502). It is only very slightly soluble in alcohol and ether.

PARAGON, a term for that which is a model of excellence or pattern of perfection, hence some person or thing which has no equal. The word was adopted from the O. Fr. *paragon*, Mod. *parangon*, Ital. *paragone* and Span. *paragon*. The Spanish has usually been taken as the source, and the word explained as from the prepositional phrase *para con*, in comparison with. But the word first appears in Italian, meaning a "touchstone." The Italian word may be connected with the Gr. *παρακονᾶν*, to sharpen by the use of a whetstone (*ἀκονή*). The term has been used in several technical applications, *e.g.* in printing, of a large style of type between "great primer" and "double pica," now usually called "two-line long primer"; of a diamond weighing more than 100 carats; and formerly of a fabric used for hangings in the 17th and 18th centuries.

PARAGRAPH, a term for a section or division of written or printed matter, which, as beginning a new subject, marking a break in the subject, &c., is signified by beginning the section on a new line set back or indented; also by the symbol, now ¶, a reversed P, formerly ⸿ or Ð, to mark such a division. The Gr. *παραγραφός* (*παρὰ* and *γράφειν*, to write alongside or beside) was used of the short horizontal line or stroke which marked a line in a MS. where such a division occurs; and *παραγραφή* of a marginal note, also the division so marked. The word "paragraph," besides these technical typographical meanings, is also applied to the separate numbered sections in an affidavit or other legal document, or in a statute, &c., and in journalism to a short item of news or brief notice of events.

PARAGUAY, an inland republic of South America, between 20° 16′ 14″ and 26° 31′ S. and 54° 37′ and 62° W. It is bounded on the N.W. by Bolivia, N. and E. by Brazil, S.E., S. and W. by Argentina. Pop. (1905 estimate), 631,347, including 50,000 Iguassú Indians; area, about 97,700 sq. m.

By the treaty of 1872 the Brazilian frontier was drawn up the Paraná from the mouth of the Iguassú or Y-Guazú (25° 30′ S.) to the Salto Grande or Great Cataract of La Guayra (24° 7′), thence west along the watershed of the Sierra de Maracayú, north along the Sierra de Ambaya to the sources of the Apâ, and down that stream to its junction with the Paraguay. The Buenos Aires treaty of the 3rd of February 1876 fixed the frontier between Argentina and Paraguay, and assigned to Paraguay the portion of the Gran Chaco between Rio Verde and Bahia Negra; the appropriation of the portion between Rio Verde and the Pilcomayo was submitted to the arbitration of the president of the United States, who in 1878 assigned it to Paraguay. The frontier line towards Bolivia has long been in dispute.

Physical Features.—The river Paraguay, running from north to south, divides the republic into two sections, the eastern section, or Paraguay Oriental, being the most important. The western section forms part of the great plain called the Gran Chaco (see ARGENTINA), and is to a large extent unexplored. Paraguay proper, or the country between the Paraguay and the Paraná, is traversed from north to south by a broad irregular belt of highlands, which are known as the Cordillera Ambaya, Cordillera Urucury, &c., but partake rather of the character of plateaus, and form a continuation and outwork of the great interior plateau of Brazil. The elevation nowhere much exceeds 2200 ft. On the western side these highlands terminate with a more or less sharply defined edge, the country sloping gradually up to their bases in gentle undulations with open, ill-defined valleys; on the eastern side they send out broad spurs enclosing deep-cut valleys, and the whole country retains more of an upland character. The tributaries that flow westward to the Paraguay are consequently to some extent navigable, while those that run eastward to the Paraná are interrupted by rapids and falls, often of a formidable description. The Pilcomayo, the largest western tributary of the Paraguay, and an important frontier river, is only navigable in its upper and lower reaches. From the Asuncion plateau southwards, near the confluence of the Paraguay and Paraná, there is a vast stretch of marshy country, draining partly into the Ypoa lagoon, amd smaller tracts of the same character are found in other parts of the lowlands, especially in the valley of the Paraguay. Many parts of the country sloping to the Paraná are nearly covered with dense forest, and have been left in possession of the sparsely scattered native tribes. But the country sloping to the Paraguay, and comprising the greater part of the settled districts, is, in keeping with its proximity to the vast plains of Argentina, grassy and open, though the hills are usually covered with forest and clumps of trees are frequent in the lowlands. Except in the marshy regions and along the rivers, the soil is dry, porous and sandy.

Geology.—Little is known of the geology of Paraguay. A large part of the area is covered by Quaternary deposits, which completely conceal the solid foundation on which they rest. The hills and plateaus appear to be composed chiefly of the same sandstone series which in the Brazilian province of Rio Grande do Sul contains seams of coal, with plant remains similar to those of the Karharbāri series of India (Permian or Upper Carboniferous). It is probable, also, that the Palaeozoic rocks of Matto Grosso extend into the northern part of the country.

Minerals.—The gold mines said to have been concealed by the Jesuits may have had no existence; and though iron was worked by F. S. Lopez at Ibicuy (70 m. south-east of Asuncion), and native copper, oxide of manganese, marbles, lime and salt have been found, the real wealth of the country consists rather in the variety and value of its vegetable products.

Climate and Fauna.—The year in Paraguay is divided into two seasons—"summer," lasting from October to March, and "winter," from April to September. December, January and February are generally the hottest months, and May, June, July and August the coldest. The mean temperature for the year seems to be about 75° or 76°; for summer 81°, for winter 71°. The annual rainfall is about 46 in., fairly well distributed throughout the year, though the heaviest precipitation occurs in August, September and October. The prevailing winds blow from the north or south. The south wind is dry, cool and invigorating, and banishes mosquitoes for a time; the north wind is hot, moist and relaxing. Violent wind storms generally come from the south.

The fauna of Paraguay proper is practically the same as that of Brazil. Caymans, water-hogs (*capinchos*), several kinds of deer (*Cervus paludosus* the largest), ounces, opossums, armadillos, vampires, the American ostrich, the ibis, the jabiru, various species popularly called partridges, the *pato real* or royal duck, the *Palamedea cornuta*, parrots and parakeets, are among the more notable forms. Insect life is peculiarly abundant; the red stump-like ant-hills are a feature in every landscape, and bees used to be kept in all the mission villages.

Population.—The great majority of the inhabitants are of Indian (Guarani) descent, with very slight traces of foreign blood. Civilization has not made much progress, and the habits of the people are more primitive than those in the more advanced neighbouring republics. As a general rule the Paraguayans are indolent, especially the men. Climatic conditions obviate the necessity of any superfluity of clothing. A cotton chemise, and a white *manta* wrapped in Moorish fashion over head and body, constitute the dress of the women; a cotton shirt and trousers that of the men. Boots and shoes are worn only by the upper classes. Goitre and leprosy are the only endemic diseases; but the natives, being underfed, are prone to diarrhoea and dyspepsia. The common language of the country is Guarani, although in a few districts Tupi is spoken. The country people as a rule understand a little Spanish, if living near any trading centre. "New Australia" is a pastoral and agricultural settlement, originally founded in 1893 by immigrants from Australia as an experiment in communism. The colony failed at first, and was reconstituted in 1894. The settlers numbered 161 in 1908. Immigration is on a small scale (1024 in 1908), but tends to increase; it is encouraged by the government, which seeks to divert to Paraguay some portion of the Italian labour immigrant into Brazil and Argentina. In 1908 the total foreign population numbered about 18,000, half of whom were natives of Argentina. The principal towns are Asuncion, the capital (pop. 1905, 60,259), Villa Rica (25,000), Concepcion (15,000) and Villa del Pilar (10,000); these are described in separate articles. Encarnacion on the Paraná has a large transit trade.

Government.—The constitution of the republic was voted by a constituent assembly on the 25th of November 1870. Legislative power is vested in a Congress consisting of a Senate and a Chamber of Deputies, elected by universal manhood suffrage in the proportion of one senator for every 12,000 inhabitants and one deputy for every 6000. Every member of Congress receives a salary of about £200. The head of the executive is the president, chosen by an electoral college for four years, and only re-eligible after eight consecutive years. He is aided by a cabinet of five ministers, responsible to Congress. Should he die during his term, or otherwise become unable to fulfil his duties, the president is succeeded by the vice-president (similarly elected), who is *ex officio* chairman of the Senate. The highest judicial authority is the Supreme Court, which is empowered to decide upon the constitutional validity of acts passed by Congress; its three members are appointed for four years by Congress, subject to the approval of the president. There are five courts of appeal, and inferior tribunals in all the large towns. The civil and criminal codes at Argentina have been adopted, almost without change. For purposes of local administration the republic is divided into 23 counties (*partidos*), which are subdivided into communes.

Religion and Instruction.—Roman Catholicism is the established religion, but the constitution guarantees full liberty to all other creeds. Asuncion, the only bishopric in the state, is in the archiepiscopal province of Buenos Aires. Education is backward and was long neglected. By law it is free and compulsory, but in some districts the attendance of many children is impossible. In 1907 there were 554 primary schools with 41,000 pupils.

Defence.—In 1908 the standing army, including cavalry, infantry and artillery, numbered about 1150 men; and there were five government steamers used for transport and revenue purposes.

Finance.—The financial situation of Paraguay has been a source of anxiety for many years. In 1885, after interest had been unpaid for 11 years on bonds amounting to £1,505,400, an agreement was made for the issue of new scrip to the value of £850,000 in quittance of all claims for capital and arrears of interest, certain public lands being also ceded to the bondholders as compensation. In 1895 an arrangement was made for a reduction of the rate of interest, for the funding of the arrears, and for the creation of a sinking fund. The government were unable to meet their obligations under the new contract, and in 1898 the outstanding amount had risen to £994,600. Provision has now been made for the service of this foreign debt, and the authorities have been able regularly to meet the service of the coupons. The total outstanding on the 31st of December 1908 was £831,850. Besides the London debt, there are many other claims on Paraguay, including (1908) about £1,950,000 due to Brazil, about £2,500,000 due to Argentina, and an internal debt of £850,000. The guarantee debt due to the Paraguay Central railway exceeds £1,500,000; and the total indebtedness of the republic on the 31st of December 1908 may be estimated at £7,650,000.

The revenue is derived mainly from import duties, and the most important branches of expenditure are the salaries of public officials, the army, public instruction and debt. The estimated revenue and expenditure for the three years 1906–1908 are shown in the following table:—

	1906	1907	1908
Revenue	£452,812	£635,000	£599,828
Expenditure	454,564	677,982	506,502

The budget for 1906 remained in force in 1907 and 1908.

Industry.—The principal industries are the cultivation and preparation of *yerba maté* (Paraguayan tea), cattle-farming, fruit-growing, tobacco-planting and timber-cutting. *Yerba maté*, classified as *Ilex paraguayensis*, is a shrub. The leaves are stripped, withered, rolled and sorted, then packed in sacks and exported, chiefly to Argentina. Paraguayan tea is used in place of the ordinary tea or coffee in many parts of South America. Medical experts state that the beverage infused from the leaves has a stimulating effect, and is also slightly diuretic. The total amount exported from Paraguay in 1908 was 4133 tons. The majority of the *yerbales* (tea plantations) were formerly the property of the government, but have been acquired by private enterprise. An important feature about *yerba maté* is the small expense necessary for its production, and the cheap rate, notwithstanding the high tariff on its importation, at which it can be placed on the Argentine market as compared with ordinary tea or Brazilian coffee.

The cattle industry comes next in importance. The number of animals was estimated at 5,500,000 on the 31st of December 1908; an increase of about 45% since the census of 1899. The animals are small, but Durham and Hereford bulls have been introduced from Argentina to improve the breed. The increase in the herds has caused the owners of *saladero* establishments in Argentina and Uruguay to try the working of factories in Paraguay for the preparation of *tasajo* (jerked beef) and the manufacture of extract of meat. Both grasses and climate are against sheep-farming on a large scale.

Oranges are exported to Buenos Aires, Rosario and Montevideo, and are largely used for fattening hogs. The orange groves are often uncultivated, but yield abundantly; 10,700,000 dozens of oranges were exported in 1908. Pineapples are also exported, and sugar-cane, cotton, coffee and ramie are cultivated. Tobacco, although of inferior quality, is grown to a considerable extent; the quantity exported rose from about 35 tons in 1900 to 5014 tons in 1908. Tobacco is chiefly exported to Germany. The staple diet of the Paraguayans is still, as when the Spaniards first came, maize and mandioca (the chief ingredient in the excellent *chipa* or Paraguayan bread), varied, it may be, with the seeds of the *Victoria regia*, whose magnificent blossoms are the great feature of several of the lakes and rivers.

The forests abound in such timber as quebracho, cedar, curupey, lapacho and urundey. Some of these, such as the lapacho and quebracho, are of rare excellence and durability, as is shown by the wonderful state of preservation in which the woodwork of early Jesuit churches still remains. Fifteen plants are known to furnish dyes, and eight are sources of fibre—the caraguatay especially being employed in the manufacture of the exquisite *ñanduty* or spider web lace of the natives. Rum, sugar, bricks, leather, furniture and extract of meat are manufactured.

Commerce.—The commercial situation of Paraguay has improved in consequence of the investment of foreign capital in industrial enterprise. The principal articles imported are textiles, hardware, wines, rice, flour, canned goods and general provisions; the exports are *yerba maté*, hides, hair, dried meat, wood, oranges, tobacco. Most of the export trade is with Buenos Aires or Montevideo. The values for the five years 1904–1908 were:—

	1904	1905	1906	1907	1908
Imports	£713,146	£935,703	£1,253,439	£1,572,255	£814,591
Exports	639,252	566,602	539,028	647,222	773,419

Of the imports into Paraguay, 29% came from Germany in 1908, 21% from the United Kingdom and 19% from Argentina.

Communications.—Numerous ocean-going liners, most of which fly the Brazilian or the Argentine flag, ply on the Paraguay and the Paraná; smaller vessels ascend the tributary streams, which are also utilized for floating lumber down to the ports. Out of 1320 ships which entered Asuncion in 1908 and 1184 which cleared, none was of British or United States nationality. The Brazilian Lloyd S.S. Co. provides direct and regular communication between Asuncion and New York. The only railway in the republic is the Paraguay Central which was open in 1906 between Asuncion and Pirapó (154 m.). The completion of the line to Encarnacion was then undertaken (1906–1911), a train-ferry across the Paraná affording connexion with Posadas. These extensions, and the alteration of gauge to that of the Argentine North-Eastern, were carried out mainly at the cost of the Argentine government, which acquired a controlling interest in the Paraguay Central. They were intended to shorten the journey between Buenos Aires and Asuncion from 5 days to 36 hours. There are some fairly good wagon roads, and the government appropriates annually a considerable sum for their extension.

Post and Telegraph.—Paraguay entered the Universal Postal Union in 1884. Telegraph lines connect Asuncion with other towns, and two cables put the republic in communication with the rest of the world by way of Corrientes and Posadas.

Money and Credit.—The banks open for business in 1904 were the Mercantile Bank, the Territorial Bank, the Bank of Los Rios & Co., and the Agricultural Bank: the last named has a capital of £207,590, advanced by the government, and lends money to the agricultural and industrial classes. The Paraguayan Bank, with a capital of £600,000, was opened in 1905, and the state bank (Banco de la República), with a total authorized capital of £4,000,000, was opened on the 30th of June 1908. The Conversion Office, which is authorized to sell or lend gold, receives a fixed revenue of £30,000 from certain import and export dues; it was reorganized in 1903 for the administration of the public debt. In the same year the gold and silver coinage of Paraguay were legally standardized as identical with those of Argentina (5 gold dollars or pesos = £1); but paper money is about the only circulating medium, and gold commands a high premium (1600% in December 1908). The normal value of the paper or currency dollar is about 4s. 8d. (For purposes of conversion the gold dollar has been taken at 5 = £1 throughout this article, and the currency dollar at 50 = £1.)

Weights and Measures.—The metric system is officially adopted, but the weights in common use are the *tonelada* (2025 ℔), the *quintal* (101·4 ℔), the *arroba* (25·35 ℔), the *libra* (1·014 ℔) and the *onza* (·0616 ℔). The unit for liquid measure is the *cuarta* (·1665 gallon); for dry measure the *almud* (·66 bushel) and *fanega* (1½ bushels). The land measures are the *legua* (2·689 m.). the *sino* (69⅛ sq. yds.), and the *legua cuadrada* (12½ sq. m.).

History.—In 1527 Sebastian Cabot reached Paraguay and built a fort called Santo Espiritu. Asuncion was founded on the 15th of August 1535 by Juan de Ayolas, and his successor, Martinez de Irala, determined to make it the capital of the Spanish possessions east of the Andes. From this centre Spanish adventurers pushed east to La Guayra, beyond the Paraná, and west into the Gran Chaco; and before long vast numbers of the less warlike natives were reduced to serfdom. The name Paraguay was applied not only to the country between the Paraguay and the Paraná, but to the whole Spanish territory, which now comprises parts of Brazil, Uruguay and the Argentine provinces of Buenos Aires, Entre Rios, Corrientes, Misiones, and part of Santa Fé. It was not till 1620 that Paraguay proper and Rio de la Plata or Buenos Aires were separated as distinct governments, and they were both dependent on the vice-royalty of Peru till 1776, when Buenos Aires was erected into a vice-royalty, and Paraguay placed under its jurisdiction. The first Christian missions in Paraguay were established by the Franciscans—Armenta, Lebron, Solano (who was afterwards canonized as the "Apostle of Paraguay") and Bolanos—between 1542 and 1560; but neither they nor the first Jesuit missionaries, Salonio, Field and Ortega, were allowed to make their enterprise a permanent success. This fell to the lot of the second band of Jesuits, Cataldino, Mazeta and Lorenzana, who began work in 1605. Though they succeeded in establishing a kind of *imperium in imperio*, and were allowed to drill the natives to the use of arms, the Jesuits never controlled the government of Paraguay; indeed they had nearly as often to defend themselves from the hostility of the governor and bishop at Asuncion as from the invasions of the Paulistas or Portuguese settlers of São Paulo. It was only by the powerful assistance of Zabala, governor of Buenos Aires, that the anti-Jesuit and quasi-national party which had been formed under Antequera was crushed in 1735. In 1750, however, Ferdinand VI. of Spain ceded to the Portuguese, in exchange for the fortified village of Colonia del Sacramento (Uruguay), both the district of La Guayra and a territory of some 20,000 sq. m. east of the Uruguay. The Jesuits resisted the transference, and it was only after several engagements that they were defeated by the combined forces of Spain and Portugal. The treaty was revoked by Spain in 1761, but the missions never recovered their prosperity, and the Jesuits were finally expelled in 1769. In 1811 Paraguay declared itself independent of Spain; by 1814 it was a despotism in the hands of Dr J. G. R. Francia (*q.v.*). On Francia's death, in 1840, the chief power passed to his nephew, Carlos Antonio Lopez (*q.v.*), who in 1862 was succeeded by his son Francisco Solano Lopez. In 1864 a dispute arose between the younger Lopez and the Brazilian government, and Lopez marched an army through Argentine territory to invade southern Brazil.

This act induced the governments of Brazil, Uruguay and Argentina to combine for the purpose of suppressing Lopez. The invasion of Paraguay then took place, and a struggle involving an enormous sacrifice of life and treasure lasted for five years, only coming to a close when the Paraguayan forces were totally defeated and Lopez was killed at the battle of Aquidaban on the 1st of March 1870. During this warfare every male Paraguayan capable of bearing arms was forced to fight, whole regiments being formed of boys of from 12 to 15 years of age. Even women were used as beasts of burden to carry ammunition and stores, and when no longer capable of work were left to die by the roadside or murdered to avoid any ill consequences occurring from their capture. When the war broke out the population of Paraguay was 1,337,439; when hostilities ceased it consisted of 28,746 men, 106,254 women above 15 years of age, and 86,079 children. During the retreat of the Paraguayans the dictator ordered every town and village passed through to be razed to the ground, and every living animal for which no use could be found to be slaughtered. When the end came the country and people were in a state of absolute prostration.

After the death of Lopez the government was administered by a triumvirate consisting of Cirilo Rivarola, Carlos Loizaga and José Diaz de Bedoza, until, in November 1870, the present constitution was formulated. The policy of Brazil was for a time directed towards the annexation of Paraguay; the debt due to Brazil on account of the war was assessed at £40,000,000, a sum which Paraguay could never hope to pay; and it was not until 1876 that the Brazilian army of occupation was wholly withdrawn. But the rivalry between Brazil and Argentina, and the necessity of maintaining the balance of power among the South American republics, enabled Paraguay to remain independent. No violent constitutional change took place after 1870, though there have been spasmodic outbreaks of revolution, as in 1881, in 1894, in 1898, in December 1904—when a somewhat serious civil war was ended by the peace of Pilcomayo—in July 1908 and in September 1909. None of these disturbances deeply or permanently affected the welfare of the republic, nor were all of them accompanied by bloodshed. Under the presidency of J. B. Egusquiza (1894–1898) the boundary dispute with Bolivia became acute; but war was averted, largely owing to the success of the revolution, which forced the president to resign. The main interest of recent Paraguayan history is economic rather than political. In that history the gradual development of commerce, the financial reforms in 1895, and the extension of the Paraguay Central railway after 1906, were events of far greater importance than any political movement which took place between 1870 and 1910.

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PARAHYBA (PARAHIBA or PARAHYBA DO NORTE), a state of north-eastern Brazil, bounded N. by Rio Grande do Norte, E. by the Atlantic, S. by Pernambuco, and W. by Ceará. Pop. (1890), 457,232; (1900), 490,784. Area, 28,854 sq. m. It consists of a narrow coastal zone, 30 to 40 m. wide, along the seaboard, behind which the country rises sharply to a highland region forming part of the great central plateau of Brazil. The long, dry season (April to October), together with occasional devastating droughts (*sêccas*) lasting two or more years, prevents the development of forests and damages the agricultural and pastoral industries of the state. There is only one river of importance, the Parahyba do Norte, which crosses the southern part of the state from west to east with a course of about 240 m. The state is poorly watered and covered with a scanty vegetation suitable for pasturage only. Stock-raising is favoured by the existence of a bromeliaceous plant, called *mecambira*, which is sufficiently juicy to satisfy the thirst of the animals. On the low lands and along some of the river valleys agriculture is the chief occupation of the people; cotton and sugar are largely produced and some tobacco is grown. The exports include hides, skins, cotton, sugar and tobacco. Rubber of the Ceará type is also found and forms an item among the smaller exports. The eastern extremity of the state is served by a railway originally called the Conde d'Eu railway but now forming part of the Great Western of Brazil system, which runs westward and northward from Parahyba to Independencia (72 m.), where it connects with the extension of the Natal and Nova Cruz line, and a branch runs southward to Pilar, 15 m. from its junction and 46 m. from Parahyba. Another small branch runs westward from the station of Mulungú to Alagôa Grande (14 m.). The capital is Parahyba (*q.v.*), and other important towns, with the populations (in 1890) of their municipalities, which include large rural districts and sometimes several other towns, are: Arcia (26,590); Bananeiras (20,058); Campina Grande (21,475); Guarabira (26,625); Mananguape (20,754); Pilar (10,133, town); Pombal (12,804); and Souza (11,135).

Parahyba formed part of the original grant, known as the capitania of Itamaracá, from the Portuguese crown to Pero Lopes de Souza. It was not settled until 1584, when a fort was erected near the present port of Cabedello under the name of São Filippe.

PARAHYBA (PARAHYBA DO NORTE), a city and port of Brazil, capital of Parahyba state, on the right bank of the Parahyba do Norte river, 11 m. above its mouth and 65 m. N. of Recife. Pop. (1890), 18,645, including several suburbs and Cabedello; (1908, estimate), 30,000. Parahyba is the starting-point of the Conde d'Eu railway, now a part of the Great Western of Brazil system, which includes a main line to Independencia, where it connects with the Natal & Nova Cruz line of Rio Grande do Norte, and a branch to Cabedello. The entrance to the Parahyba do Norte River being obstructed by a stone reef and sand bars, only vessels drawing less than 14 ft. can effect an entrance. The "Varadouro," as the lower part of the city is called, is built on the margin of the river and is devoted principally to commerce. Behind this is a low hill on whose northern slope and broad summit the upper city is built, and a tramway line runs to the suburb of Trincheira. There are some good public buildings, including the parish church (*matriz*) of N.S. das Neves, the old Franciscan convent and church, the government palace, and the treasury. There are a normal school, a lyceum, a national gymnasium, and a school for marine apprentices. Parahyba was founded in 1585. It was called Frederickstadt by the Dutch, who occupied the Franciscan convent as a government house, and Felippéa in honour of the king of Spain when the Dutch were expelled. Its original name was resumed on the separation (1640) of Portugal and her colonies from Spanish rule.

PARAHYBA DO SUL, a river of Brazil, having its source on the *campos* of Bocaina, on the northern slope of the Serra do Mar in the western part of the state of São Paulo, and flowing at first south-westerly and then after a horse-shoe curve in the vicinity of Jacarehy in a general E.N.E. direction to the Atlantic in lat. 21° 38′ S. Its upper course for a distance of 80 m., or to the confluence of the Parahybuna, is known as the Parahytinga. The navigable channel from São Fidelis to the

Atlantic is 54 m. long, and the total length of the river, including the Parabytinga, is 540 m. Its source is about 4920 ft. above sea-level. The Parahyba passes through a fertile, long-settled country, a part of which was for many years the principal coffee-producing region of Brazil. Its lower course passes through the rich alluvial sugar-producing district of Campos. Among the towns on the Parahyba are Campos, São Fidelis, Parahyba do Sul, Juiz de Fora, Barra do Pirahy (railway junction), Rezende, Queluz and Lorena.

PARALDEHYDE, in medicine, a clear colourless liquid (for the chemistry see Aldehydes), soluble in 1 in 10 of water and freely in alcohol. Paraldehyde is a powerful hypnotic, giving a refreshing quiet sleep which is not followed by unpleasant after effects. As it does not depress the heart when used in medicinal doses, it may be given to patients suffering from cardiac disease. It is much used to produce sleep in the insane. As it is largely excreted by the lungs it may be found useful in bronchial asthma. When taken continuously the drug soon loses its power as a hypnotic. Its unpleasant taste usually prevents the formation of a paraldehyde habit, but it occasionally occurs with symptoms resembling delirium tremens. When taken in an overdose paraldehyde kills by producing respiratory failure.

PARALLAX (Gr. παραλλάξ, alternately), in astronomy, the apparent change in the direction of a heavenly body when viewed from two different points. Geocentric parallax is the angle between the direction of the body as seen from the surface of the earth and the direction in which it appears from the centre of the earth. Annual parallax is the angle between the direction in which a star appears from the earth and the direction in which it appears from the centre of the sun. For stellar parallaxes see Star; the solar parallax is discussed below.

Solar Parallax.—The problem of the distance of the sun has always been regarded as the fundamental one of celestial measurement. The difficulties in the way of solving it are very great, and up to the present time the best authorities are not agreed as to the result, the effect of half a century of research having been merely to reduce the uncertainty within continually narrower limits. The mutations of opinion on the subject during the last fifty years have been remarkable. Up to about the middle of the 19th century it was supposed that transits of Venus across the disk of the sun afforded the most trustworthy method of making the determination in question; and when Encke in 1824 published his classic discussion of the transits of 1761 and 1769, it was supposed that we must wait until the transits of 1874 and 1882 had been observed and discussed before any further light would be thrown on the subject. The parallax 8·5776″ found by Encke was therefore accepted without question, and was employed in the *Nautical Almanac* from 1834 to 1869. Doubt was first thrown on the accuracy of this number by an announcement from Hansen in 1862 that the observed parallactic inequality of the moon was irreconcilable with the accepted value of the solar parallax, and indicated the much larger value 8·97″. This result was soon apparently confirmed by several other researches founded both on theory and observation, and so strong did the evidence appear to be that the value 8·95″ was used in the *Nautical Almanac* from 1870 to 1881. The most remarkable feature of the discussion since 1862 is that the successive examinations of the subject have led to a continually diminishing value, so that at the present time it seems possible that the actual parallax of the sun is almost as near to the old value of Encke as to that which first replaced it. The value of 8·848″, determined by S. Newcomb, was used from 1882 to 1900; and since then the value 8·80″ has been employed, having been adopted at a Paris conference in 1896.[1]

Five fundamentally different methods of determining the distance of the sun have been worked out and applied. They are as follows:—

I. That of direct measurement.—From the measures of the parallax of either Venus or Mars the parallax of the sun can be immediately derived, because the ratios of distances in the solar system are known with the last degree of precision. Transits of Venus and observations of various kinds on Mars are all to be included in this class.

Methods of Determination.

II. The second method is in principle extremely simple, consisting merely in multiplying the observed velocity of light by the time which it takes light to travel from the sun to the earth. The velocity is now well determined; the difficulty is to determine the time of passage.

III. The third method is through the determination of the mass of the earth relative to that of the sun. In astronomical practice the masses of the planets are commonly expressed as fractions of the mass of the sun, the latter being taken as unity. When we know the mass of the earth in gravitational measure, its product by the denominator of the fraction just mentioned gives the mass of the sun in gravitational measure. From this the distance of the sun can be at once determined by a fundamental equation of planetary motion.

IV. The fourth method is through the parallactic inequality in the moon's motion. For the relation of this inequality to the solar parallax see Moon.

V. The fifth method consists in observing the displacement in the direction of the sun, or of one of the nearer planets, due to the motion of the earth round the common centre of gravity of the earth and moon. It requires a precise knowledge of the moon's mass. The uncertainty of this mass impairs the accuracy of the method.

Transits of Venus.

I. To begin with the results of the first method. The transits of Venus observed in 1874 and 1882 might be expected to hold a leading place in the discussion. No purely astronomical enterprise was ever carried out on so large a scale or at so great an expenditure of money and labour as was devoted to the observations of these transits, and for several years before their occurrence the astronomers of every leading nation were busy in discussing methods of observation and working out the multifarious details necessary to their successful application. In the preceding century reliance was placed entirely on the observed moments at which Venus entered upon or left the limb of the sun, but in 1874 it was possible to determine the relative positions of Venus and the sun during the whole course of the transit. Two methods were devised. One was to use a heliometer to measure the distance between the limbs of Venus and the sun during the whole time that the planet was seen projected on the solar disk, and the other was to take photographs of the sun during the period of the transit and subsequently measure the negatives. The Germans laid the greatest stress on measures with the heliometer; the Americans, English, and French on the photographic method. These four nations sent out well-equipped expeditions to various quarters of the globe, both in 1874 and 1882, to make the required observations; but when the results were discussed they were found to be extremely unsatisfactory. It had been supposed that, with the greatly improved telescopes of modern times, contact observations could be made with much greater precision than in 1761 and 1769, yet, for some reason which it is not easy to explain completely, the modern observations were but little better than the older ones. Discrepancies difficult to account for were found among the estimates of even the best observers. The photographs led to no more definite result than the observations of contacts, except perhaps those taken by the Americans, who had adopted a more complete system than the Europeans; but even these were by no means satisfactory. Nor did the measures made by the Germans with heliometers come out any better. By the American photographs the distances between the centres of Venus and the sun, and the angles between the line adjoining the centres and the meridian, could be separately measured and a separate result for the parallax derived from each. The results were:—

Transit of 1874: Distances; par. = 8·888″.
Pos. angles; „ = 8·873″.
Transit of 1882: Distances; „ = 8·873″.
Pos. angles; „ = 8·772″.

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[1] R. S. Ball, *Spherical Astronomy*, p. 303.

The German measures with the heliometer gave apparently concordant results, as follows:—

Transit of 1874: par. = 8·876″.
Transit of 1882: „ = 8·879″.

The combined result from both these methods is 8·857″, while the combination of all the contact observations made by all the parties gave the much smaller result, 8·794″. Had the internal contacts alone been used, which many astronomers would have considered the proper course, the result would have been 8·776″.

Planetary Parallaxes.

In 1877 Sir David Gill organized an expedition to the island of Ascension to observe the parallax of Mars with the heliometer. By measurements giving the position of Mars among the neighbouring stars in the morning and evening, the effect of parallax could be obtained as well as by observing from two different stations; in fact the rotation of the earth carried the observer himself round a parallel of latitude, so that the comparison of his own morning and evening observations could be used as if they had been made at different stations. The result was 8·78″. The failure of the method based on transits of Venus led to an international effort carried out on the initiative of Sir David Gill to measure the parallax by observations on those minor planets which approach nearest the earth. The scheme of observations was organized on an extended scale. The three bodies chosen for observation were: Victoria (June 10 to Aug. 26, 1889); Iris (Oct. 12 to Dec. 10, 1888); and Sappho (Sept. 18 to Oct. 25, 1888). The distances of these bodies at the times of opposition were somewhat less than unity, though more than twice as great as that of Mars in 1877. The drawback of greater distance was, however, in Gill's opinion, more than compensated by the accuracy with which the observations could be made. The instruments used were heliometers, the construction and use of which had been greatly improved, largely through the efforts of Gill himself. The planets in question appeared in the telescope as star-like objects which could be compared with the stars with much greater accuracy than a planetary disk like that of Mars, the apparent form of which was changed by its varying phase, due to the different directions of the sun's illumination. These observations were worked up and discussed by Gill with great elaboration in the *Annals of the Cape Observatory*, vols. vi. and vii. The results were for the solar parallax π:—

From Victoria, $\pi = 8{\cdot}801'' \pm 0{\cdot}006''$.
„ Sappho, $\pi = 8{\cdot}798'' \pm 0{\cdot}011''$.
„ Iris, $\pi = 8{\cdot}812'' \pm 0{\cdot}009''$.

The general mean result was 8·802″. From the meridian observations of the same planets made for the purpose of controlling the elements of motion of the planets Auwers found $\pi = 8{\cdot}806''$.

In 1898 the remarkable minor planet Eros was discovered, which, on those rare occasions when in opposition near perihelion, would approach the earth to a distance of 0·16. On these occasions the actual parallax would be six times greater than that of the sun, and could therefore be measured with much greater precision than in the case of any other planet. Such an approach had occurred in 1892, but the planet was not then discovered. At the opposition of 1900–1901 the minimum distance was 0·32, much less than that of any other planet. Advantage was taken of the occasion to make photographic measures for parallax at various points of the earth on a very large scale. Owing to the difficulties inherent in determining the position of so faint an object among a great number of stars, the results have taken about ten years to work out. The photographic right ascensions gave the values 8·80″ + 0·007″ ± 0·0027″ (Hinks) and 8·80″ + 0·0067″ ± 0·0025″ (Perrine); the micrometric observations gave the value 8·806″ ± 0·004 (Hinks).[1]

II. The velocity of light (*q.v.*) has been measured with all the precision necessary for the purpose. The latest result is 299,860 kilometres per second, with a probable error of perhaps 30 kilometres—that is, about the ten-thousandth part of the quantity itself. This degree of precision is far beyond any we can hope to reach in the solar parallax. The other element which enters into consideration is the time required for light to pass from the sun to the earth. Here no such precision can be attained. Both direct and indirect methods are available. The direct method consists in observing the times of some momentary or rapidly varying celestial phenomenon, as it appears when seen from opposite points of the earth's orbit. The only phenomena of the sort available are eclipses of Jupiter's satellites, especially of the first. Unfortunately these eclipses are not sudden but slowly changing phenomena, so that they cannot be observed without an error of at least several seconds, and not infrequently important fractions of a minute. As the entire time required for light to pass over the radius of the earth's orbit is only about 500 seconds, this error is fatal to the method. The indirect method is based upon the observed constant of aberration or the displacement of the stars due to the earth's motion. The minuteness of this displacement, about 20·50″, makes its precise determination an extremely difficult matter. The most careful determinations are affected by systematic errors arising from those diurnal and annual changes of temperature, the effect of which cannot be wholly eliminated in astronomical observation; and the recently discovered variation of latitude has introduced a new element of uncertainty into the determination. In consequence of it, the values formerly found were systematically too small by an amount which even now it is difficult to estimate with precision. Struve's classic number, universally accepted during the second half of the 19th century, was 20·445″. Serious doubt was first cast upon its accuracy by the observations of Nyrén with the same instrument during the years 1880–1882, but on a much larger number of stars. His result, from his observations alone, was 20·52″; and taking into account the other Puikowa results, he concluded the most probable value to be 20·492″. In 1895 Chandler, from a general discussion of all the observations, derived the value of 20·50″. Since then, two elaborate series of observations made with the zenith telescope for the purpose of determining the variation of latitude and the constant of aberration have been carried on by Professor C. L. Doolittle at the Flower Observatory near Philadelphia, and Professor J. K. Rees and his assistants at the observatory of Columbia University, New York. Each of these works is self-consistent and seemingly trustworthy, but there is a difference between the two which it is difficult to account for. Rees's result is 20·47″; Doolittle's, from 20·46″ to 20·56″. This last value agrees very closely with a determination made by Gill at the Cape of Good Hope, and most other recent determinations give values exceeding 20·50″. On the whole it is probable that the value exceeds 20·50″; and so far as the results of direct observation are concerned may, for the present, be fixed at 20·52″. The corresponding value of the solar parallax is 8·782″. In addition to the doubt thrown on this result by the discrepancy between various determinations of the constant of aberration, it is sometimes doubted whether the latter constant necessarily expresses with entire precision the ratio of the velocity of the earth to the velocity of light. While the theory that it does seems highly probable, it cannot be regarded as absolutely certain.

Mass of the Earth.

III. The combined mass of the earth and moon admits of being determined by its effect in changing the position of the plane of the orbit of Venus. The motion of the node of this plane is found with great exactness from observations of the transits of Venus. So exact is the latter determination that, were there no weak point in the subsequent parts of the process, this method would give far the most certain result for the solar parallax. Its weak point is that the apparent motion of the node depends partly upon the motion of the ecliptic, which cannot be determined with equal precision. The derivation of the distance of the sun by it is of such interest from its simplicity that we shall show the computation.

From the observed motion of the node of Venus, as shown by the four transits of 1761, 1769, 1874 and 1882, is found

$$\text{Mass of (earth+moon)} = \frac{\text{Mass of sun}}{332600}.$$

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[1] *Mon. Not. R.A.S.* (May 1909,) p. 544; ibid. (June 1910), p. 588.

In gravitational units of mass, based on the metre and second as units of length and time,

Log. earth's mass = 14·60052
„ moon's „ = 12·6895.

The sum of the corresponding numbers multiplied by 332600 gives

Log. sun's mass = 20·12773.

Putting a for the mean distance of the earth from the sun, and n for its mean motion in one second, we use the fundamental equation

$$a^3n^2 = M_0 + M',$$

M_0 being the sun's mass, and M' the combined masses of the earth and moon, which are, however, too small to affect the result. For the mean motion of the earth in one second in circular measure, we have

$$n = \frac{2\pi}{31558149}; \text{ log. } n = \bar{7}\cdot 29907$$

the denominator of the fraction being the number of seconds in the sidereal year. Then, from the formula

$$a^3 = \frac{M_0}{n^2} = \frac{[20\cdot 12773]}{-15\cdot 59814}$$

we find

Log. a in metres = 11·17653
Log. equat. rad. ⊕ 6·80470

Sine ⊙'s eq. hor. par. 5·62817
Sun's eq. hor. par. 8·762″.

Motion of Moon.

IV. The determination of the solar parallax through the parallactic inequality of the moon's motion also involves two elements—one of observation, the other of purely mathematical theory. The inequality in question has its greatest negative value near the time of the moon's first quarter, and the greatest positive value near the third quarter. Meridian observations of the moon have been heretofore made by observing the transit of its illuminated limb. At first quarter its first limb is illuminated; at third quarter, its second limb. In each case the results of the observations may be systematically in error, not only from the uncertain diameter of the moon, but in a still greater degree from the varying effect of irradiation and the personal equation of the observers. The theoretical element is the ratio of the parallactic inequality to the solar parallax. The determination of this ratio is one of the most difficult problems in the lunar theory. Accepting the definitive result of the researches of E. W. Brown the value of the solar parallax derived by this method is about 8·773″.

Motion of Earth.

V. The fifth method is, as we have said, the most uncertain of all; it will therefore suffice to quote the result, which is

$$\pi = 8\cdot 818''.$$

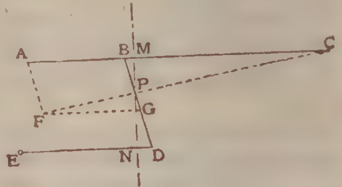
The following may be taken as the most probable values of the solar parallax, as derived independently by the five methods we have described:—

From measures of parallax	8·802″
„ velocity of light	8·781″
„ mass of the earth	8·762″
„ par. ineq. of moon	8·773″
„ lunar equation	8·818″

The question of the possible or probable error of these results is one on which there is a marked divergence of opinion among investigators. Probably no general agreement could now be reached on a statement more definite than this; the last result may be left out of consideration, and the value of the solar parallax is probably contained between the limits 8·77″ and 8·80.″ The most likely distance of the sun may be stated in round numbers as 93,000,000 miles. (S. N.)

PARALLELISM, PSYCHOPHYSICAL, in psychology, the theory that the conscious and nervous processes vary concomitantly whether or not there be any causal connexion between them; in other words "that modifications of consciousness emerge contemporaneously with corresponding modifications of nervous process" (Stout). The theory is the third possible alternative in considering the relation between mind and body, the others being interaction and one-sided action (*e.g.* materialism). It should be observed that this theory is merely a statement, not an explanation. (See PSYCHOLOGY.)

PARALLEL MOTION, a form of link-work invented by James Watt, and used in steam-engines (see STEAM-ENGINE, § 88), to connect the head of the piston rod, moving up and down in a vertical path, with the end of the beam, moving in the arc of a circle. An ordinary form is shown diagrammatically in figure. MN is the path in which the piston-rod head, or crosshead, as it is often called, is to be guided. ABC is the middle line of half the beam, C being the fixed centre about which the beam oscillates. A link BD connects a point in the beam with a radius link ED, which oscillates about a fixed centre at E. A point P in BD, taken so that BP : DP :: EN : CM, move in a path which coincides very closely with the straight line MPN. Any other point F in the line CP or CP produced is made to copy this motion by means of the links AF and FG, parallel to BD and AC. In the ordinary application of the parallel motion a point such as F is the point of attachment of the piston-rod, and P is used to drive a pump-rod. Other points in the line CP produced are occasionally made use of by adding other links parallel to AC and BD.



Watt's Parallel Motion.

Watt's linkage gives no more than an approximation to straight-line motion, but in a well-designed example the amount of deviation need not exceed one four-thousandth of the length of stroke. It was for long believed that the production of an exact straight-line motion by pure linkage was impossible, until the problem was solved by the invention of the Peaucellier cell. (See also MECHANICS: *Applied Mechanics*, §§ 77, 78.)

PARALLELS, in siegecraft, a term used to express the trenches drawn by besiegers in a generally parallel direction to the front of a fortress chosen for attack. Parallels are employed along with "zigzag approaches" in the "formal attack" or siege proper. They are traced in short zigzag lengths (the prolongation of each length falling clear of the hostile works), in order to avoid enfilade; but their obliquity is of course made as slight as is consistent with due protection in order to save time and labour. The "first parallel" is opened at a convenient distance from the fortress, by numerous working parties, who dig (under cover of night) a continuous line of entrenchments facing the point or points of attack. Zigzags are next dug to the rear (when necessary) to give sheltered access to the parallel, and from this new zigzags are pushed out towards the defenders, to be connected by a "second parallel," and so on until finally a parallel is made sufficiently close to the fortress to permit of an assault over the open, the parallels becoming stronger and more solid as they approach to closer range. This system of parallels provides, within range of the defenders' weapons, shelter in which the besieger can safely mass men and material for the prosecution of the attack. Parallels and approaches are constructed either by ordinary "trench work," executed simultaneously by a large number of men strung out along the intended line, or by "sapping" in which one trained "sapper," as it were, burrows a trench in the required direction, others following him to widen and improve the work.

PARALUS and SALAMINIA, the name of two ancient Athenian triremes used for sacred embassies, the conveyance of despatches and tribute money, the transportation of state criminals, and as flagships in time of war. It is probable that a third vessel of the same kind (called Delia) was used exclusively for Delian embassies, although it has been identified by some with the Salaminia.

PARALYSIS, or PALSY (from Gr. παραλύειν, to relax; Wycliffe has *palesy*, and another old form of the word is *parlesy*), a term which in its wider acceptation indicates abolition of motor, sensory, sensorial or vaso-motor functions, but in medical nomenclature is usually restricted to the loss or impairment of voluntary muscular power. Paralysis is to be regarded rather as a symptom than a disease *per se*; it may arise (1) from injury or disease of nervous and muscular structures, and is then termed *organic paralysis*; or (2) from purely dynamic disturbances in the nervous structures of the brain which preside over voluntary movement. The latter is *functional motor paralysis*, a symptom common in certain neuroses, especially hysteria. For *general paralysis of the insane*, see INSANITY.

Whether the loss of motor power be functional or organic in origin, it may be generalized in all the muscles of the body, or localized to one or many. The different forms of paralysis of the voluntary muscles which may arise from organic disease can be understood by a consideration of the motor path of voluntary impulses from brain to muscle. There are two neural segments in this path, an upper cerebral and a lower spinal; the former has its departure platform in the brain and its terminus in the whole of the anterior grey matter of the spinal cord, whence issues the lower spinal segment of the motor path to the muscles. The nerve fibres of the upper cerebral segment are prolongations of the large psycho-motor cells; the nerve fibres of the lower segment are prolongations by the anterior roots and motor nerves of the large cells in the grey matter of the cord. Disease or destruction of any part of the upper cerebral segment will give rise to loss of voluntary power, for the influence of the mind on the muscles is removed in proportion to the destruction of this efferent path (see diagram in NEUROPATHOLOGY). Disease or destruction of the lower spinal segment causes not only loss of voluntary power but an atrophy of the muscles themselves. Paralysis may therefore be divided into three great groups: (1) loss of voluntary power without muscular wasting except from disuse, and without electrical changes in the muscles due to injury or disease of the upper cerebral segment of the motor path of volition; (2) loss of muscular power with wasting and electrical changes in the muscles due to disease or injury of the lower spinal segment formed by the cells of the grey matter of the spinal cord, the anterior roots and the peripheral motor nerves; (3) primary wasting of the muscles.

The more common forms of paralysis will now be described.

1. *Hemiplegia*, or paralysis affecting one side of the body, is a frequent result of apoplexy (*q.v.*); there is loss of motion of the tongue, face, trunk and extremities on the side of the body opposite the lesion in the brain. In a case of severe complete hemiplegia both arm and leg are powerless; the face is paralysed chiefly in the lower part, while the upper part moves almost as well as on the unparalysed side, and the eye can be shut at will, unlike peripheral facial paralysis (Bell's palsy). The tongue when protruded deviates towards the paralysed side, and the muscles of mastication contract equally in ordinary action, although difficulty arises in eating, from food accumulating between the cheek and gums on the paralysed side. Speech is thick and indistinct, and when there is right-sided hemiplegia in a right-handed person, there may be associated various forms of aphasia (*q.v.*), because the speech centres are in the left hemisphere of the brain. Some muscles are completely paralysed, others are merely weakened, while others, *e.g.* the trunk muscles, are *apparently* unaffected. In many cases of even complete hemiplegia, improvement, especially in children, takes place after a few weeks or months, and is generally first indicated by return of movement in the muscles which are habitually associated in their action with those of the opposite unparalysed side; thus, movement of the leg returns first at the hip and knee joints, and of the arm at the shoulder and elbow, although the hand may remain motionless. The recovery however in the majority of cases is only partial, and the sufferer of hemiplegia is left with a permanent weakness of one side of the body, often associated with contracture and rigidity, giving rise to a characteristic gait and attitude. The patient in walking leans to the sound side and swings round the affected leg from the hip, the inner side of the toe of the boot scraping the ground as it is raised and advanced. The arm is adducted at the shoulder, flexed at the elbow, wrist and fingers, and resists all attempts at extension. According to the part of the brain damaged variations of paralytic symptoms may arise; thus occasionally the paralysis may be limited more or less to the face, the arm or the leg. In such case it is termed a *monoplegia*, a condition sometimes arising from cerebral tumour. Occasionally the face is paralysed on one side and the arm and leg on the other side; this condition is termed *alternate hemiplegia*, which is due to the fact that the disease has damaged the motor path from the brain to the leg and arm before it has crossed over to the opposite side, whereas the path to the face muscles is damaged after it has crossed. In rare cases both leg, arm and face on one side may be paralysed—*triplegia*; or all four limbs—*bilateral hemiplegia*. Infantile spastic paralysis, *infantile diplegia*, or as it is sometimes called Little's disease, is a *birth palsy* caused by injury from protracted labour, the use of forceps or other causes. The symptoms are generally not observed until long after birth. Convulsions are common, and the child is unable to sit up or walk long after the age at which it should do so.

Paraplegia is a term applied to paralysis of the lower extremities; there are many causes, but in the great majority of instances it arises from a local or general disease or injury of the spinal cord. A localized transverse myelitis will interrupt the motor and sensory paths which connect the brain with the spinal grey matter below the lesion, and when the destruction is complete, motor and sensory paralysis in all the structures below the injury results; thus fracture, dislocation and disease of the spinal column (*e.g.* tubercular caries, syphilitic disease of the membranes, localized tumours and haemorrhages) may cause compression and inflammatory softening, and the result is paralysis of the voluntary muscles, loss of sensation, loss of control over the bowel and bladder, and a great tendency to the development of bed-sores. The muscles do not waste except from disuse, nor undergo electrical changes unless the disease affects extensively the spinal grey matter or roots as well as the cerebral path. When it does so, as in the case of *acute spreading myelitis*, the symptoms are usually more severe and the outlook is more grave.

In cases of *focal myelitis* from injury or disease, recovery may take place and the return of power and sensation may occur to such an extent that the patient is able to walk long distances; this happy termination in cases of localized disease or injury of the spinal cord often takes place by keeping the patient on his back in bed, daily practising massage and passive movements, and so managing the case as to avoid bedsores and septic inflammation of the bladder—the two dangerous complications which are liable to arise.

2. Paralysis may result from acute inflammatory affections of the spinal cord involving the grey and white matter—*myelitis* (see NEUROPATHOLOGY).

Infantile or Essential Paralysis.—This is a form of spinal paralysis occurring with frequency in young children; in Scandinavian countries the disease is prevalent and sometimes assumes an epidemic form, whereby one is led to believe that it is due to an infective organism. The names *infantile* and *essential* paralysis were given before the true nature of the disease in the spinal cord was known; precisely the same affection may occasionally occur, however, in adults, and then it is termed *adult spinal paralysis*. The medical name for this disease is *acute anterior poliomyelitis* (Gr. πολιός, grey, and μυελός, marrow), because the anterior grey matter of the spinal cord is the seat of acute inflammation, and destruction of the spinal motor nerve path to the muscles. The extent of the spinal grey matter affected and the degree of destruction of the motor nerve elements which ensues determine the extent and permanency of the paralysis. The term *atrophic spinal paralysis* is sometimes employed as indicating the permanent wasting of muscles that results.

Infantile paralysis often commences suddenly, and the paralysis may not be observed until a few days have elapsed; the earliest symptoms noticeable are fever, convulsions and sometimes vomiting; and, if the child is old enough, it may complain of pains or numbness or tingling in the limb or limbs which are subsequently found to be paralysed. It is characteristic, however, of the disease that there is no loss of sensation in the paralysed limb. The whole of the limb is not necessarily paralysed, often it is only a group of muscles, and even if the paralysis affects both legs or the arm and leg on one side, it generally fails in the uniform distribution of the previously described paraplegia or hemiplegia. The affected muscles rapidly waste and become flaccid, the electrical reactions change, and finally the muscles may cease to respond to electrical stimulation whether of the continuous or interrupted current. In the less severe cases (and they are the most common) only a group of muscles undergo complete paralysis and atrophy, and there is always hope of some return of power in a paralysed limb. Associated with the withered condition of the limb due to the muscular atrophy is an enfeebled circulation, rendering the limb cold, blue and livid; the nutrition of the bones and other parts is involved, so that a limb paralysed in early infancy does not grow and is shorter than its fellow. Deformities arise, some the result of simply failing muscular support; others due to permanent changes in the position of the limbs, for example clubfoot. There is absence of bladder and bowel troubles, and bedsores do not occur; the disease itself is rarely, if ever, fatal. About a month after the onset of the disease local treatment of the atrophied muscles should be commenced, and every effort should be made by massage, by suitable positions and passive movements to promote the circulation and prevent deformities in the affected limbs. Should these measures fail, surgical aid should be sought.

Sub-acute and chronic forms of atrophic and spinal paralysis have been described, but some of them were undoubtedly cases of peripheral neuritis.

Wasting Palsy. Progressive Muscular Atrophy.—This is a chronic disease characterized by slow and insidious weakness and wasting of groups of muscles due to disease of the anterior spinal grey matter. It begins mostly in adult life between 25 and 45 years of age, and affects males more than females. In the majority of cases it commences in the upper extremities, and the small muscles of the hand are especially liable to be affected. The palmar eminences of the thumb and little finger, owing to the wasting of the muscles, gradually disappear, and a flat ape-like hand is the result; in extreme cases all the small muscles of the hand are atrophied, and a claw-like hand is the result. The muscles which are next most liable to atrophy are those of the shoulder and upper arm, and the atrophy may thence spread to the muscles of the neck and trunk, and the intercostals and even the diaphragm may be affected, causing serious difficulties of respiration. The lower extremities are less often and later affected by wasting. This disease generally runs a slow and progressive course; it may however be years before it spreads from the hand to the arm, and a period of arrest may occur before other muscles become involved. A characteristic feature of the disease is fibrillary twitching of the wasting muscles. The electrical excitability of the muscles is diminished rather than changed, except where the wasting is very extreme, when a partial reaction of degeneration may be obtained. Sensation is unaffected, as the disease is limited to the motor cells of the anterior grey matter (see NEUROPATHOLOGY). There is no affection of the bowel or bladder. Death usually occurs from intercurrent diseases, *e.g.* bronchitis, pneumonia, or broncho-pneumonia. Some patients die owing to failure of the respiratory muscles; others from the disease spreading to the medulla oblongata (the bulb of the brain) and causing bulbar paralysis. The chronic morbid process leading to decay and destruction of the spinal motor cells which is the essential pathological feature of this disease is generally accompanied, and sometimes preceded, by degeneration of the path of voluntary impulses from the brain. It is then called *amyotrophic lateral sclerosis*, a rapid form of progressive muscular atrophy.

Bulbar Paralysis.—A number of different morbid conditions may give rise to a group of symptoms, the principal features of which are paralysis of the muscles concerned in speech, swallowing, phonation and mastication. These symptoms may arise suddenly from vascular lesions or inflammatory processes, which involve the nuclei of origin of the cranial nerves supplying the muscles of the tongue, lips, pharynx and larynx. But there is also a slow degenerative insidious *progressive bulbar paralysis* affecting both sexes pretty equally; it came on between 40 to 60 years of age, and the cause is unknown. Slight indistinctness of speech, especially in the utterance of consonants requiring the elevation of the tip of the tongue to the dental arch and palate, is usually the first symptom. Later the explosive lip sounds are indistinctly uttered; simultaneously, owing to paralysis of the soft palate, the speech becomes nasal in character and sooner or later, associated with this difficulty of speech, there is a difficulty of swallowing, partly because the tongue is unable to convey the food to the back of the mouth, and it accumulates between the cheeks and gums. Moreover the pharyngeal muscles are unable to seize the food and start the process of swallowing on account of the paralysis of the soft palate; liquids are apt to regurgitate through the nostrils, the patient must therefore be nourished with soft semi-solid food. As the disease proceeds, the difficulty of speech and swallowing is increased by the affection of the laryngeal muscles; the pitch of the voice is lowered and the glottis is imperfectly closed during deglutition; there is consequently a tendency for liquids and food to pass into the larynx and set up fits of coughing, which, however, are ineffectual. Later the muscles of mastication are affected and the disease may extend to the respiratory centre, giving rise to attacks of dyspnoea. The intellectual faculties are as a rule unimpaired, although the facial expression and the curious emotional mobility of the countenance, with a tendency of the patient to burst into tears or laughter, would suggest weak-mindedness. Whilst the lower half of the face is strikingly affected, the upper half retains its normal expression and power of movement. This disease is usually rapidly fatal, since it affects the vital centres, and liability to broncho-pneumonia excited by the entrance of food into the air passages is also a constant danger in the later stages.

Bulbar Paralysis without Anatomical Change.—This condition is also termed “ myasthenia gravis ”; it differs from acute and chronic bulbar disease by the absence of muscular atrophy, by normal electrical excitability of the muscles, by a marked development of the paralysis by fatigue, and by considerable remissions of the symptoms. The bulbar symptoms are the most prominent, but all voluntary muscles are more or less affected, especially the eye-muscles. It is a rare disease affecting both sexes equally at almost any age, the causes and pathology of which are unknown.

3. Paralysis resulting from disease or injury of the motor path to the muscles in the peripheral nervous system.

Neuritis.—Paralysis may arise in a muscle, a group of muscles, a whole limb, the lower extremities, or there may be a generalized paralysis of voluntary muscles as a result of neuritis. A typical example of neuritis giving rise to paralysis owing to inflammatory swelling and compression is afforded by the facial nerve; this purely motor nerve as it passes out of the skull through a narrow bony passage is easily compressed and its function interfered with, causing a paralysis of the whole of one side of the face and *Bell's Palsy.* Exposure to a cold draught in a person with rheumatic diathesis is a frequent cause. As an example of simple mechanical compression producing paralysis, *crutch palsy* may be cited; it is the result of continuous compression of the musculo-spiral nerve as it winds round the bone of the upper arm.

Lead poisoning may give rise to a localized neuritis affecting the posterior inter-osseous nerve, especially in painters and in those whose occupations necessitate excessive use of the extensors of the forearm; the result is *wrist drop* or *lead palsy.*

Sciatica is a painful inflammatory condition of the sciatic nerve, in which there may be weakness of the muscles; but inability to move the limb is more on account of the pain it causes than on account of paralysis of the muscles. Exposure to cold and wet, *e.g.* sitting on a damp seat, may lead to sciatica in a gouty or rheumatic person.

Multiple neuritis is a painful generalized inflammation of the peripheral nervous system and arises in many toxic conditions of the blood; among the most important are lead, arsenic and chronic alcohol poisoning. It also occurs in diabetes, diphtheria, beri-beri and other conditions (see NEUROPATHOLOGY). A short description of the commonest form will be given. It occurs in chronic alcoholism and especially in women, and is most frequently due to a combination of a septic absorption from some internal disease and the abuse of alcohol. In a marked case the patient may suffer from *paraplegia*, but it is distinguished from the paraplegia of spinal disease by the fact that there is loss of control of the sphincters only when there is associated dementia, and that instead of the limbs being insensible they are extremely painful on deep pressure. There is wasting of the muscles, and electrical changes in them; frequently there is anaesthesia and analgesia of the skin, which takes a stocking-like distribution. In severe cases the upper limbs may be affected, and all the muscles of the body are more or less liable to be paralysed—even the heart may suffer. The mental condition in such a severe case is usually quite characteristic; there is delirium, the patient is the subject of hallucinations and delusions; there is loss of knowledge of time and place, and illusions of personal identity. A constant symptom is the loss of memory of recent events, while those of early life are easily recollected.

Paralyses—termed medically muscular dystrophies—may arise from a primary atrophy of muscle apparently independent of any discoverable change in the nervous system, but due to a *congenital* developmental defect of the muscles. Heredity plays an important part in the incidence of these diseases, members of the same family being affected with the same type of disease, and at the same period of life. There may be a tendency in a family to the affection of one sex and not the other; on the other hand, children of both sexes may suffer in the same family. It is curious that the majority of cases are males, and that it is transmitted by women who are not themselves its subjects. Many different clinical types have been described based upon the age of onset, the groups of muscles first affected, and the presence or absence of apparent hypertrophy; they are however all varieties of one affection, and in a case where there is an apparent enlargement of muscles there is really atrophy of the contractile muscle fibres and overgrowth of fat and interstitial fibrous tissue; consequently this form of the disease is called *pseudo-hypertrophic paralysis*.

The muscular dystrophies may be divided into two groups according to the period of life in which the malady manifests itself: (1) Those occurring in childhood; (2) those occurring in youth or adult life. In the first group the muscles may be atrophied or *apparently* hypertrophied. A progressive atrophy of muscles associated with progressive weakness and various disabilities of movement is soon recognized in the relation of cause and effect; but the parents whose first child looks like an infant Hercules, with abnormally large calves and buttocks, cannot for some time appreciate any connexion of this condition with a muscular weakness which is manifested in various ways. The child stands with its feet widely separated; it waddles along rather than walks; it falls easily and rises with difficulty, having to use the hands to push against the floor; it then rests one hand on the knee, and then the other hand on the other knee, and climbs, as it were, up its own thighs in order to assume the erect posture. In this pseudo-hypertrophic form of paralysis the outlook is very grave, and there is little hope of the patient reaching adult life.

Paralysis agitans, Shaking Palsy or *Parkinson's Disease* is a chronic progressive disease of the nervous system occurring late in life, and characterized by weakness, tremors and stiffness of the muscles associated with a peculiar attitude and gait. The first sign of the disease is weakness followed by tremor of one hand; this consists of continuous movements of the thumb and forefinger as in rolling a pill, or of movements of the hand like beating a tom-tom; then the other hand is affected, and later there is tremor at the ankle. In some cases there is a continual nodding movement of the head. These tremors are at the rate of five per second and cease during sleep. The attitude and gait are very characteristic; the head is bent forward, and the patient in beginning to walk takes slow steps, which soon become short and quick as if he were running after his centre of gravity. The intellect is clear and in marked contrast to the mask-like expression. This disease lasts for years, and but little can be done in the way of treatment, except passive movements of the limb to prevent contracture.

Treatment.—There are certain general principles in the treatment of all forms of paralysis which may be summarized as follows.

1. Rest in bed and attention to the vital functions of the body, the heart's action, the respiratory functions, nutrition and excretion. The pulse is the best guide to the administration of drugs and stimulants. As regards the respiratory function, one of the dangers of paralysis is an intercurrent pneumonia—sometimes unavoidable, often due, however, to attempts to give nourishment to a patient in an insensible state, with the result that some of the fluid enters the bronchial tubes, when either the reflex protective coughing is not excited or is ineffectual. Attention to the bowels and bladder is most important. A purge at the onset of paralysis is indicated when the pulse is full and of high tension, and the regular action of the bowels is necessary in all conditions. Retention of urine should be carefully avoided, if necessary by the passing of a catheter, but too much emphasis cannot be laid upon the importance of adopting aseptic precautions to avoid infection of the bladder. Daily inspection of the back should be made of all paralysed patients, and precautions taken to keep the skin of all parts exposed to pressure clean; the back should be laved with eau-de-Cologne or spirit to harden the skin. Any sign of a red spot on the back or buttock of the paralysed side should be a warning note of the possibility of a bedsore; zinc powder or ointment should be applied and the effect of pressure on the part be removed if possible by change of posture and by the use of a water-bed. It is important to cover all warm bottles with flannel, for owing to insensibility large blisters, which heal with difficulty, may result. In cases of paraplegia the legs should be covered with warm woollen hand-knitted stockings, and a cradle employed to protect the feet from the continuous weight of the bed-clothes, a fruitful source of foot drop.

2. As soon as the acute symptoms have passed off passive movement and massage may be employed with advantage; in some cases electrical treatment is indicated; but as a rule, especially in children, electrical treatment offers the disadvantage of being painful and not accomplishing more than can be effected by massage and passive movements. When the passive movements are being made the patient should be instructed by the operator to will the movement which he is performing, and thus try to re-establish the connexion of the brain with the muscles through the point of interruption or by a new path if that is not possible.

(F. W. Mo.)

PARAMARIBO, the capital of Dutch Guiana or Surinam (see GUIANA), in 5° 44′ 30″ N., 55° 12′ 54″ W., 20 m. from the sea on the right bank of the Surinam, here a tidal river nearly a mile broad and 18 ft. deep. Pop. (1905), 33,821. Built on a plateau about 16 ft. above low-water level, Paramaribo is well-drained, clean and in general healthy. The straight canals running at right angles to the river, the broad, straight tree-planted streets, the spacious squares, and the solid plain public buildings would not be unworthy of a town in the Netherlands.

The Indian village of Paramaribo became the site of a French settlement probably in 1640, and in 1650 it was made the capital of the colony by Lord Willoughby of Parham. In 1683 it was still only a "cluster of twenty-seven dwellings, more than half of them grog-shops," but by 1790 it counted more than a thousand houses. The town was partly burned down in 1821, and again in 1832.

PARAMECIUM, O. F. Müller, (often misspelt Paramaecium, Paramoecium), a genus of aspirotrochous ciliate Infusoria (*q.v.*), characterized by its slipper-like shape, common in infusions, especially when they contain a little animal matter. It has two dorsal contractile vacuoles, each receiving the mouths of five radiating canals from the inner layer of the ectosarc, and a large ovoid meganucleus, and one or two micronuclei. From its abundance, the ease with which it can be cultivated and observed, its relatively simple structure and adequately large size ($\frac{1}{125}$ in.), it is most frequently selected for elementary study and demonstration, as well as for purposes of research.

PARAMENT (Fr. *parement*, from Late Lat. *paramentum*, adornment, *parare*, to prepare, equip), a term applied by ancient writers to the hangings or ornaments of a room of state.

PARAMOUNT (Anglo-Fr. *paramont*, up above, *par à mont*, up or on top of the mountain), superior, supreme, holding the highest authority, or being of the greatest importance. The word was first used, as a term of feudal law, of the lord, the "lord paramount," who held his fief from no superior lord, and was thus opposed to "mesne lord," one who held from a superior. To those who held their fiefs from one who was not a "lord paramount" was given the correlative term "paravail," *par à val*, in the valley. The word was confused by English lawyers with "avail," help, assistance, profit, and applied to the actual working tenant of the land, the lowest tenant or occupier.

PARANÁ, a state of southern Brazil, bounded N. by São Paulo, E. by the Atlantic, S. by Santa Catharina and the republic of Argentina, and W. by Matto Grosso and the republic of Paraguay, with the Paraná river as its western boundary line. Area, 85,451 sq. m.; pop. (1890), 249,491; (1900), 327,136. It includes two dissimilar regions—a narrow coastal zone, thickly wooded, swampy, and semi-tropical in character, and a high plateau (2500 to 3000 ft.) whose precipitous, deeply eroded eastern escarpments are known as the Serra do Mar, or Serra do Cubatão. The southern part of the state is densely forested and has large tracts of Paraguay tea (*Ilex paraguayensis*), known in Brazil as *herva matê*, or *matte*. The plateau slopes westward to the Paraná river, is well watered and moderately fertile, and has a remarkably uniform climate of a mild temperate character. The larger rivers of the state comprise the Paranapanema and its tributaries the Cinza and Tibagy, the Ivahy, Piquiry, Jejuy-guassú, and the Iguassú with its principal tributary the Rio Negro. The Paranapanema and a small tributary, the Itarare, form the boundary line with São Paulo west of the Serra do Mar, and the Iguassú and Negro, the boundary line with Santa Catharina and Argentina—both streams having their sources in the Serra do Mar and flowing westward to the Paraná. The other streams have shorter courses, and all are obstructed by falls and rapids. Twenty miles above the mouth of the Iguassú are the Iguassú Falls, 215 ft. high, broken into twenty or more falls separated by rocks and islands, and surrounded by a wild, unsettled and wooded country. The falls are reached by occasional light-draught steamers on the Paraná between Posadas (Argentina) and the mouth of the Iguassú, and thence by canoe to the vicinity of the falls. The surface of the plateau is undulating and the greater part is adapted to agricultural and pastoral purposes. There are two railway systems—the Paranagua to Curityba (69 m.) with an extension to Ponta Grossa (118 m.) and branches to Rio Negro (55 m.), Porto Amazonas (6 m.) and Antonina (10 m.); and the São Paulo & Rio Grande, which crosses the state from north-east to south-west from Porto União da Victoria, on the Iguassú, to a junction with the Sorocabana line of São Paulo at Itarare. The upper Paraná is navigable between the Guayrá, or Sete Quedas, and the Urubu-punga Falls. The chief export of Paraná is Paraguay tea (a forest product). There is a large foreign element in the population owing to the immigrant colonies established on the uplands, and considerable progress has been made in small farming and education. Besides the capital, Curityba, the principal towns are Paranaguá; Antonina, at the head of the Bay of Paranaguá, with a population of 7739 in 1890; Campo Largo, 20 m. west of Curityba (pop. 10,642 in 1890); Castro, N.N.W. of the capital on the São Paulo & Rio Grande line (pop. of the municipio, 10,319 in 1890); and Ponta Grossa (pop. of municipio, 4774 in 1890), north-west of Curityba at the junction of the two railway systems of the state.

Paraná was settled by gold prospectors from São Paulo and formed part of that captaincy and province down to 1853, when it was made an independent province. The first missions of the Jesuits on the Paraná were situated just above the Guayrá Falls in this state and had reached a highly prosperous condition when the Indian slave hunters of São Paulo (called Mamelucos) compelled them to leave their settlements and emigrate in mass to what is now the Argentine territory of Misiones. The ruins of their principal mission, known as Ciudad Real, are overgrown with forest.

PARANÁ, a city and port of Argentina, capital of the province of Entre Rios, and the see of a bishopric, situated on the left bank of the Paraná river, 410 m. by navigable channels (about 240 m. direct) N.W. of Buenos Aires. Pop. (1895), 24,261; (1904, estimate), 27,000. The city occupies a gently rolling site 120 ft. above the river and about 2 m. from its riverside port of Bajada Grande, with which it is connected by railway, tramway and highway. It is classed as a seaport, and ocean-going vessels of not over 12 ft. draught can ascend to Bajada. There is also a daily ferry service across the river to Santa Fé (7 m. distant), which is connected by railway with Rosario and Buenos Aires. Paraná is also the western terminus of a provincial railway system, which connects with Concepción and Concordia, on the Uruguay river, and with other important towns of the province. The mean annual temperature is about 66° F. and the climate is bracing and healthful. Its port of Bajada Grande, on the river shore below the bluffs, has the custom-house and a fine wharf for the accommodation of the Entre Rios railway and river craft. Paraná was founded in 1730 by colonists from Santa Fé and was at first known as Bajada (a landing place). It was made the capital of the province by General Mansilla in 1821 (Concepción had previously been the capital), but in 1861 General Urquiza restored the seat of government to Concepción, where it remained until 1882, when Paraná again became the capital. Paraná was also the capital of the Argentine Confederation from 1852 to 1861.

PARANAGUÁ, a seaport of the state of Paraná, Brazil, on the southern shore of the Bay of Paranaguá, about 9 m. from the bar of the main channel. Pop. of the municipality (1890), 11,794, of which a little more than one half belonged to the town. Paranaguá is the principal port of the state, and is a port of call for steamers in the coastwise trade. It is the coastal terminus of a railway running to Curityba, the capital (69 m.), with extensions to other inland towns and a branch to Antonina, at the head of the bay, 10½ m. west of Paranaguá by water. Its exports consist chiefly of *matê*, or Paraguay tea. The town was founded in 1560.

The Bay of Paranaguá opens into the Atlantic in lat. 25° 32′ S. through three channels and extends westward from the bar about 19 m. It is irregular in outline, receives the waters of a large number of small streams, and is comparatively shallow. Light-draught steamers can ascend to Antonina at the head of the bay. The broad entrance to the bay, which is the gateway to the state of Paraná is nearly filled by the large Ilha do Mel (Honey Island) on which stands an antiquated fort commanding the only practicable channel.

PARANDHAR, a hill fort of British India, in Poona district, Bombay, 4472 ft. above the sea, 20 m. S.E. of Poona: pop. (1901), 944. It figures repeatedly in the rising of Sivaji against the Mahommedans, and was the favourite stronghold of the Peshwas whenever the unwalled city of Poona was threatened. It gave its name to a treaty with the Mahrattas, signed in 1776 but never carried into effect. It is now utilized as a sanatorium for British soldiers.

PARANOIA (Gr. παρά, beyond, and νοεῖν, to understand), a chronic mental disease, of which systematized delusions with or without hallucinations of the senses are the prominent characteristics. The delusions may take the form of ideas of persecution or of grandeur and ambition; these may exist separately or run concurrently in the same individual, or they may become transformed in the course of the patient's life from a persecutory to an ambitious character. The disease may begin during adolescence, but the great majority of the subjects manifest no symptoms of the affection until full adult life.

The prominent and distinguishing symptom of paranoia is the delusion which is gradually organized out of a mass of original but erroneous beliefs or convictions until it forms an integral part of the ordinary mental processes of the subject and becomes fused with his personality. This slow process of the growth of a false idea is technically known as "systematization," and the resulting delusion is then said to be "systematized." As such delusions are coherently formed there is no manifest mental confusion in their expression. Notwithstanding the fixity of the delusion it is subject in some cases to transformation which permits of the gradual substitution of delusions of grandeur for delusions of persecution. It happens also that periods of remission from the influence of the delusion may occur from time to time in individual cases, and it may even happen, though very rarely, that the delusion may permanently disappear.

It is necessary to point out that there is undoubtedly what may be called a paranoiac mental constitution, in which delusions may appear without becoming fixed or in which they may never appear. The characteristics of this type of mind are credulity, a tendency to mysticism and a certain aloofness from reality, combined, as the case may be, with timidity and suspicion or with vanity and pride. On such a soil it is easy to understand that, given the necessary circumstances, a systematized delusional insanity may develop.

The term paranoia appears to have been first applied by R. von Krafft-Ebing in 1879 to all forms of systematized delusional insanity. Werner in 1889 suggested its generic use to supplant *Wahnsinn* and *Verrücktheit*, the German equivalents of mental states which originally meant, respectively, the delusional insanity of ambition and the delusional insanity of persecution—terms which had become hopelessly confused owing to divergences in the published descriptions of various authors.

The rapid development of clinical study has now resulted in the isolation of a comparatively small group of diseases to which the term is applied and the relegation of other groups bearing more or less marked resemblances to it to their proper categories. Thus, for example, it had formerly been held that acute paranoia was frequently a curable disease. It is now proved that the so-called acute forms were not true paranoias, many of them being transitory phases of E. Kraepelin's dementia praecox, others being terminal conditions of acute melancholia, of acute confusional insanity, or even protracted cases of delirium tremens. While it removes from the paranoia group innumerable phases of delusional insanity met with in patients labouring under secondary dementia as a result of alcoholism or acute insanity, such a statement does not exclude patients who may have had, during their previous life, one or more attacks of some acute mental disease, such as mania, for the paranoiac mental constitution may be, though rarely, subject to other forms of neurosis. Attempts have been made to base a differential diagnosis of paranoia upon the presence or absence of a morbid emotional element in the mind of the subjects, with the object of referring to the group only such cases as manifest a purely intellectual disorder of mind. Though in some cases of the disease the mental symptoms may, at the time of observation, be of a purely intellectual nature, the further back the history of any case is traced the greater is the evidence of the influence of preceding emotional disturbances in moulding the intellectual peculiarities. Indeed it may be said that the fundamental emotions of vanity or pride and of fear or suspicion are the groundwork of the disease. We are justified therefore in ascribing the intellectual aberrations which are manifested by delusions, in part at least, to the preponderating influence of morbid emotions which alter the perceptive and aperceptive processes upon which depend the normal relation of the human mind to its environment. Although, generally speaking, paranoiacs manifest marked intellectual clearness and a certain amount of determination of character in the exposition of their symptoms and in their manner of reacting under the influence of their delusions, there is, without any doubt, an element of original abnormality in their mental constitution. Such a mental constitution is particularly subject to emotional disturbances which find a favourable field of operation in an innate mysticism allied with credulity which is impervious to the rational appeal of the intellect. In those respects the paranoiac presents an exaggeration of, and a departure from, the psychical constitution of normal individuals, who, while subject both to emotion and to mystic thought, retain the power of correcting any tendency to the predominance of these mental qualities by an appeal to reality. It is just here that the paranoiac fails, and in this failure lies the key to the pathological condition. For the present the question as to whether this defect is congenital or acquired owing to some superimposed pathological condition cannot be answered. However that may be, it is frequently ascertained from the testimony of friends and relatives that the patients have always been regarded as "queer," strange, and different from other people in their modes of thought. It is usually stated that nervous or mental diseases occur in the family histories of over 50% of the subjects of this affection.

Paranoia is classified for clinical purposes according to the form of delusion which the patients exhibit. Thus there are described the Persecutory, the Litigious, the Ambitious and the Amatory types. It will be observed that these divisions depend upon the prevalence of the primary emotions of fear or suspicion, pride or vanity and love.

According to V. Magnan, the course of paranoia is progressive, and each individual passes through the stages of persecution and ambition successively. Many authorities accept Magnan's description, which has now attained to the distinction of a classic, but it is objected to by others on the ground that many cases commence with delusions of ambition and manifest the same symptoms unchanged during their whole life, while other patients suffering from delusions of persecution never develop the ambitious form of the disease. Against these arguments Magnan and his disciples assert that the relative duration of the stages and the relative intensity of the symptoms vary widely; that in the first instance the persecutory stage may be so short or so indefinite in its symptoms as to escape observation; and that in the second instance the persecutory stage may be so prolonged as within the short compass of a human life to preclude the possibility of the development of an ambitious stage. As however there exist types of the disease which, admittedly, do not conform to Magnan's progressive form it will be more convenient to adopt the ordinary description here.

1. *Persecutory Paranoia.*—This form is characterized by delusions of persecution with hallucinations of a painful and distressing character. In predisposed persons there is often observed an anomaly of character dating from early life. The subjects are of a retiring disposition, generally studious, though not brilliant or successful workers. They prefer solitude to the society of their fellows and are apt to be introspective, self-analytical or given to unusual modes of thought or literary pursuits. Towards the commencement of the insanity the patients become gloomy, preoccupied and irritable. Suspicions regarding the attitude of others take possession of their minds, and they ultimately come to suspect the conduct of their nearest relatives. The conversations of friends are supposed by the patient to be interlarded with phrases which, on examination, he believes to contain hidden meanings, and the newspapers appear to abound in veiled references to him. A stray word, a look, a gesture, a smile, a cough, a shrug of the shoulders on the part of a stranger are apt to be misinterpreted and brooded over. The extraordinary prevalence of this imagined conspiracy may lead the patient to regard himself as a person of great importance, and may result in the formation of delusions of ambition which intermingle themselves with the general conceptions of persecution, or which may wholly supplant the persecutory insanity.

At this juncture, however, it generally happens that hallucinations begin to appear. These, in the great majority of instances, are auditory and usually commence with indefinite noises in the ears, such as ringing sounds, hissing or whistling. Gradually they assume a more definite form until isolated words and ultimately formed sentence are distinctly heard. There is great diversity in the completeness of the verbal hallucinations in different patients. Some patients never experience more than the subjective annoyance of isolated words generally of an insulting character, while others are compelled to listen to regular dialogues carried on by unknown voices concerning themselves. A not uncommon form of verbal hallucination is formulated in the complaint of the patients that "all their thoughts are read and proclaimed aloud." Even more than the enforced listening to verbal hallucinations this "thought reading" distresses the patient and often leads him to acts of violence, for the privacy of his inmost thoughts is, he believes, desecrated, and he often feels helpless and desperate at a condition from which there is no possible escape.

Though some of the subjects do not develop any other form of hallucination, it is unfortunately the lot of others to suffer, in addition, from hallucinations of taste, smell or touch. The misinterpretation of subjective sensations in these sense organs leads to the formulation of delusions of poisoning, of being subjected to the influence of noxious gases or powders, or of being acted on by agencies such as electricity. Such are the persons who take their food to chemists for analysis; who complain to the police that people are acting upon them injuriously; who hermetically seal every crevice that admits air to their bedrooms to prevent the entrance of poisonous fumes; or who place glass castors between the feet of their beds and the floor with the object of insulating electric currents. Such patients obtain little sleep; some of them indeed remain awake all night—for the symptoms are usually worse at night—and have to be content with such snatches of sleep as they are able to obtain at odd times during the day. It is obvious that a person tormented and distracted in the way described may at any moment lose self-control and become a danger to the community. But perhaps the most distressing and most distracting of all hallucinations are those which for want of a better name are termed "sexual." The subjects of these hallucinations, both male and female, under the belief that improper liberties are taken with them, are more clamant and threatening than any other class of paranoiac.

During the course of a disease so distressing in its symptoms the patient's suspicions as to the authors of his persecution vary much in indefiniteness. He often never fixes the direct blame upon any individual, but refers to his persecutors as "they" or a "society," or some corporate body such as "lawyers," "priests" or "freemasons." It not infrequently happens however, that suspicions gradually converge upon some individual or that from an early stage of the disease the patient has, generally under the influence of hallucinations, fixed the origin of his trouble upon one or two persons. When this takes place the matter is always serious from the point of view of physical danger to the inculpated person, especially if the patient is of a violent or vindictive disposition.

The persecutory type of the disease may persist for an indefinite period—even for twenty or thirty years—without any change except for the important fact that remissions in the intensity of the symptoms occur from time to time. These remissions may be so marked as to give rise to the belief that the patient has recovered, but in true paranoia this is hardly ever the case, and sooner or later the persecution begins again in all its former intensity.

2. *Ambitious Paranoia.*—After a long period of persecution a change in the symptoms may set in, in some cases, and the intensity of the hallucinations may become modified. At the same time delusions of grandeur begin to appear, at first faintly, but gradually they increase in force until they ultimately supplant the delusions of persecution. At the same time the hallucinations of a disagreeable nature fade away and are replaced by auditory hallucinations conformable to the new delusions of grandeur. Undoubtedly, however, this form of paranoia may commence, so far as can be observed, with delusions of grandeur, in which case there is seldom or never a transformation of the personality or of the delusions from grandeur to persecution, although delusions of persecution may engraft themselves or run side by side with the predominant ambitious delusions.

The emotional basis of ambitious paranoia is pride, and every phase of human vanity and aspiration is represented in the delusions of the patients. There is moreover considerably less logical acumen displayed in the explanations of their beliefs by such patients than in the case of the subjects of persecution. Many of them affect to be the descendants of historical personages without any regard for accurate genealogical detail. They have no compunction in disowning their natural parents or explaining that they have been "changed in their cradles" in order to account for the fact that they are of exalted or even of royal birth. Dominated by such beliefs paranoiacs have been known to travel all over the world in search of confirmation of their delusions. It is people of this kind who drop into the ears of confiding strangers vague hints as to their exalted origin and kindred, and who make desperate and occasionally alarming attempts to force their way into the presence of princes and rulers. The sphere of religion affords an endless field for the ambitious paranoiacs and some of them may even aspire to divine authority, but as a rule the true paranoiac does not lose touch with earth. The more extravagant delusions of persons who call themselves by divine names and assume omnipotent attributes are usually found in patients who have passed through acute attacks of insanity such as mania or dementia praecox and are mentally enfeebled.

A not uncommon form of paranoia combining both ambition and persecution is where the subject believes that he is a man of unbounded wealth or power, of the rights to which he is, however, deprived by the machinations of his enemies. These patients frequently obtain the knowledge on which they base their delusions through auditory hallucinations. They are often so troublesome, threatening and persistent in their determination to obtain redress for their imagined wrongs, that they have to be forcibly detained in asylums in the public interest.

On the whole, however, the ambitious paranoiac is not troublesome, but calm, dignified, self-possessed, and reserved on the subject of his delusions. He is usually capable of reasoning as correctly and of performing work as efficiently as ordinary people. Many of them, however, while living in society are liable to give expression to their delusions under the influence of excitement, or to behave so strangely and unconventionally on unsuitable occasions as to render their seclusion either necessary or highly desirable.

3. *Amatory Paranoia.*—A distinguishing feature of this form of paranoia is that the subjects are chivalrous and idealistic in their love. Some of them believe that they have been "mystically" married to a person of the opposite sex usually in a prominent social position. The fact that they may have never spoken to or perhaps never seen the person in question is immaterial. The conviction that their love is reciprocated and the relationship understood by the other party is unshakable, and is usually based upon suppositions that to a normal mind would appear either trivial or wholly unreal. The object of affection, if not mythical or of too exalted a position to be approached, is not infrequently persecuted by the admirer, who takes every opportunity of obtruding personally or by letter the evidences of an ardent adoration. The situation thus created can easily become complicated and embarrassing before it is realized that the persistent wooer is insane.

The failure of their schemes or repeated repulses may, in the case of some patients, originate delusions of persecution directed, not against the object of affection, but against those who are supposed to have conspired to prevent the success of the patient's desires. Under the influence of these delusions of persecution the patient may lose self-control and resort to violence against his supposed persecutors.

The subjects of this form of paranoia are in the majority of instances unmarried women well advanced in years who have led irreproachable lives, or men of a romantic disposition who have lived their mental lives more in the realm of chimeras than in the region of real facts. The delusions in this form of paranoia are never accompanied by hallucinations.

Closely allied, if not identical with amatory paranoia, is the form in which jealousy forms the basis of morbid suspicions with or without definite delusions. The subject is usually poor in mental resource, but proud, vindictive and suspicious. It is eminently a condition which arises spontaneously in certain persons whose mental constitution is of the paranoiac type, *i.e.* persons who are naturally credulous, mystical and suspicious. The subjects are extraordinarily assiduous in watching the objects of their jealousy, whether husbands, wives or sweethearts. Their conduct in this respect is fertile in producing domestic dispeace and unhappiness, and in the case of unmarried persons in creating complicated or delicate situations. It not infrequently happens, just as in the case of the class of amatory paranoiacs, that delusions of persecution establish themselves, usually directed towards persons who are believed to have secured the affections of the object of jealousy. The disease then follows the ordinary course of the insanity of persecution but usually without hallucinations of the senses. The subjects are highly dangerous and violent. Under the influence of their delusions murder and even mutilation may be resorted to by the male, and poisoning or vitriol-throwing by the female subjects.

4. *Litigious Paranoia* (*paranoia querulans*).—The clinical form of litigious paranoia presents uniform characteristic features which are recognized in every civilized community. The basic emotion is vanity, but added to that is a strong element both of acquisitiveness and avarice. Moreover the subjects are, as regards character, persistent, opinionative and stubborn. When these qualities are superadded to a mind of the paranoiac type, which as has been pointed out, is more influenced by the passions or emotions than by ordinary rational considerations, it can readily be appreciated that the subjects are capable of creating difficulties and anxieties which sooner or later may lead to their forcible seclusion in the interests of social order.

It is important to observe that the rights such people lay claim to or the wrongs they complain of may not necessarily be imaginary. But, whether imaginary or real, the statement of their case is always made to rest upon some foundation of fact, and is moreover presented, if not with ability, at any rate with forensic skill and plausibility. As the litigants are persons of one idea, and only capable of seeing one side of the case—their own—and as they are actuated by convictions which preclude feelings of delicacy or diffidence, they ultimately succeed in obtaining a hearing in a court of law under circumstances which would have discouraged any normal individual. Once in the law courts their doom is sealed. Neither the loss of the case nor the payment of heavy expenses have any effect in disheartening the litigant, who carries his suit from court to court until the methods of legal appeal are exhausted. The suit may be raised again and again on some side issue, or some different legal action may be initiated. In spite of the alienation of the sympathy of his relations and the advice of his friends and lawyers the paranoiac continues his futile litigation in the firm belief that he is only defending himself from fraud or seeking to regain his just rights. After exhausting his means and perhaps those of his family and finding himself unable to continue to litigate to the same advantage as formerly, delusions of persecution begin to establish themselves. He accuses the judges of corruption, the lawyers of being in the pay of his enemies and imagines the existence of a conspiracy to prevent him from obtaining justice. One of two things usually happens at this stage. Though well versed in legal procedure he may one day lose self-control and resort to threats of violence. He is then probably arrested and may on examination be found insane and committed to an asylum. Another not uncommon result is that finding himself non-suited in a court of law he commits a technical assault upon, it may be, some high legal functionary, or on some person in a prominent social position, with the object of securing an opportunity of directing public attention to his grievances. The only result is, as in the former instance, his medical certification and incarceration.

Paranoia is generally a hopeless affection from the point of view of recovery. From what has been stated regarding its genesis and slow development it is apparent that no form of ordinary medical treatment can be of the least avail in modifying its symptoms. The best that can be done in the interests of the patients is to place them in surroundings where they can be shielded from influences which aggravate their delusions and in other respects to make their unfortunate lot as pleasant and as easy to endure as possible.

As has been frequently stated, the subjects of most forms of paranoia are liable to commit crime, usually of violence, which may lead to their being tried for assault or murder. The question of their responsibility before the law is therefore one of the first importance (see also INSANITY: *Law*). The famous case of McNaghten, tried in 1843 for the murder of Mr Drummond, private secretary to Sir Robert Peel, is, in this connexion, highly important, for McNaghten was a typical paranoiac labouring under delusions of persecution, and his case formed the basis of the famous deliverance of the judges in the House of Lords, in the same year, on the general question of criminal responsibility in insanity. Answer 4 of the judges' deliverance contains the following statement of law: If "he labours under such *partial* delusion only and is not *in other respects insane* we think he must be considered in the same situation as to responsibility as if the facts to which the delusion exists were real. For example, if under the influence of his delusion he supposes another man to be in the act of attempting to take away his life, and he kills that man, as he supposes, in self-defence, he would be exempt from punishment. If his delusion was that the deceased had inflicted a serious injury to his character and fortune, and he killed him in revenge for such supposed injury, he would be liable to punishment."

In considering this deliverance it must be remembered that it was given under the influence of the enormous public interest created by the McNaghten trial. It has also to be remembered that in a criminal court the term responsibility means liability to legal punishment. The dictum laid down in answer 4 is open to several objections. (1) It is based upon the erroneous assumption that a person may be insane on one point and sane on every other. This is a loose popular fallacy for which there is no foundation in clinical medicine. The systematization of a delusion involves, as has been pointed out, the whole personality and affects emotion, intellect and conduct. The human mind is not divided into mutually exclusive compartments, but is one indivisible whole liable to be profoundly modified in its relation to its environment according to the emotional strength of the predominant morbid concepts. (2) It does not take into account the pathological diminution of the power of self-control. The influence of continued delusions of persecution, especially if accompanied by painful hallucinations, undermines the power of self-control and tends ultimately to reduce the subject towards the condition of an automaton which reacts reflexly and blindly to the impulse of the moment. (3) The opinion is further at fault in so far as it assumes that the test of responsibility rests upon the knowledge of right and wrong, which implies the power to do right and to avoid wrong, an assumption which is very far from the truth when applied to the insane. The number of insane criminals who possess no theoretical knowledge of right and wrong is very few indeed, so few that for practical purposes they may be disregarded.

The true paranoiac is a person of an anomalous mental constitution apart from his insanity; although he may to outward appearances be able, on occasion, to converse or to act rationally, the moment he is dominated by his delusions he becomes not partially but wholly insane; when in addition his mind is distracted by ideas of persecution or hallucinations, or both, he becomes potentially capable of committing crime, not because of any inherent vicious propensity but in virtue of his insanity. There is therefore no middle course, from the medical point of view, in respect to the criminal responsibility of the subjects of paranoia; they are all insane wholly, not partially, and should only be dealt with as persons of unsound mind.

See Bianchi, *Textbook of Insanity* (Eng. trans., 1906); Clouston, *Mental Diseases* (6th ed.); Krafft-Ebing, *Textbook of Insanity* (American trans., 1904); Kraepelin, *Psychiatrie* (6th ed., Leipzig,

1899); Magnan, *Le Délire chronique* (Paris, 1890); Stewart Paton, *Psychiatry* (Philadelphia, 1905); Percy Smith, "Paranoia," in *Journ. of Mental Science* (1904), p. 607. (J. Mn.)

PARAPET (Ital. *parapetto*, Fr. *parapet*, from *para*, imperative of Ital. *parare*, to cover, defend, and *petto*, breast, Lat. *pectus*; the German word is *Brustwehr*), a dwarf wall along the edge of a roof, or round a lead flat, terrace walk, &c., to prevent persons from falling over, and as a protection to the defenders in case of a siege. Parapets are either plain, embattled, perforated or panelled. The last two are found in all styles except the Romanesque. Plain parapets are simply portions of the wall generally overhanging a little, with a *coping* at the top and *corbel* table below. Embattled parapets are sometimes panelled, but oftener pierced for the discharge of arrows, &c. Perforated parapets are pierced in various devices—as circles, trefoils, quatrefoils and other designs—so that the light is seen through. Panelled parapets are those ornamented by a series of panels, either oblong or square, and more or less enriched, but are not perforated. These are common in the Decorated and Perpendicular periods.

PARAPHERNALIA (Lat. *paraphernalia*, *sc. bona*, from Gr. *παράφερνα*; *παρά*, beside, and *φερνή*, dower), a term originally of Roman law, signifying all the property which a married woman who was *sui juris* held apart from her dower (*dos*). A husband could not deal with such except with his wife's consent. Modern systems of law, which are based on the Roman, mainly follow the same principle, and the word preserves its old meaning. In English and Scottish law the term is confined to articles of jewelry, dress and other purely personal things, for the law relating to which see HUSBAND AND WIFE. The word is also used in a general sense of accessories, external equipment, cumbersome or showy trappings.

PARAPHRASE (Gr. *παράφρασις*, from *παραφράζειν*, to relate something in different words, *παρά*, beside, and *φράζειν*, speak, tell), a rendering into other words of a passage in prose or verse, giving the sense in a fuller, simpler or clearer fashion, also a free translation or adaptation of a passage in a foreign language. The term is specifically used in the Scottish and other Presbyterian churches of metrical versions for singing of certain passages of the Bible.

PARASCENIUM (Gr. *παρασκήνιον*), in a Greek theatre, the wall on either side of the stage, reaching from the back wall (*σκηνή*) to the orchestra.

PARASITE (From Gr. *παρά*, beside, *σῖτος* food), literally "mess-mate," a term originally conveying no idea of reproach or contempt, as in later times. The early parasites may be divided into two classes, religious and civil. The former were assistants of the priests, their chief duty being to collect the corn dues which were contributed by the farmers of the temple lands or which came in from other sources (Athenaeus vi. 235; Pollux vi. 35). Considerable obscurity exists as to their other functions, but they seem to have been charged with providing food for the visitors to the temples, with the care of certain offerings, and with the arrangement of the sacrificial banquets. In Attica the parasites appear to have been confined to certain demes (Acharnae, Diomeia), and were appointed by the demes to which the temples belonged. The "civil" parasites were a class of persons who received invitations to dine in the *prytaneum* and subsequently in the *tholos*) as distinguished from those who had the right to dine there *ex officio*. An entirely different meaning ("sponger") became attached to the word from the character introduced into the Middle and New Comedy, first by Alexis, and firmly established by Diphilus. The chief object of this class of parasites was a good dinner, for which they were ready to submit to almost any humiliation. Numerous examples occur in the comedies of Plautus; and Alciphron and Athenaeus (vi. 236 sqq.) give instances of the insults they had to put up with at the hands of both host and guests. Some of them played the part of professional jesters (like the later buffoons and court fools), and kept collections of witticisms ready for use at their patrons' table; others relied upon flattery, others again condescended to the most degrading devices (Plutarch, *De adulatore*, 23; *De educatione puerorum*, 17). The term parasite, from meaning a "hanger-on," has been transferred to any living creature which lives on another one.

See Juvenal v. 170 with J. E. B. Mayor's note, and the exhaustive article by M. H. Meier in Ersch and Gruber's *Allgemeine Encyclopädie*.

PARASITIC DISEASES. It has long been recognized that various specific pathological conditions are due to the presence and action of parasites (see PARASITISM) in the human body, but in recent years the part played in the causation of the so-called infective diseases by various members of the Schizomycetes—fission fungi—and by Protozoan and other animal parasites has been more widely and more thoroughly investigated (see BACTERIOLOGY). The knowledge gained has not only modified our conception of the pathology of these diseases, but has had a most important influence upon our methods of treatment of sufferers, both as individuals and as members of communities. For clinical and other details of the diseases mentioned in the following classification, see the separate articles on them; the present article is concerned mainly with important modern discoveries as regards aetiology and pathology. In certain cases indeed the aetiology is still obscure. Thus, according to Guarnieri, and Councilman & Calkins, there is associated with vaccinia and with small-pox a Protozoan parasite, *Cytoryctes variolae*, Guar. This parasite is described as present in the cytoplasm of the stratified epithelium of the skin and mucous membranes in cases of vaccinia, but in the nuclei of the same cells in cases of variola or small-pox, whilst it is suggested that there may be a third phase of existence, not yet demonstrated, in which it occurs as minute spores or germs which are very readily carried in dust and by air currents from point to point. In certain other conditions, such as mumps, dengue, epidemic dropsy, oriental sore—with which the Leishman-Donovan bodies (*Helcosoma tropicum*, Wright) are supposed to be closely associated (see also *Kála-ázar* below)—verruga, framboesia or yaws—with which is commonly associated a spirochaete (Castellani) and a special micrococcus (Pierez, Nicholls)—and beri-beri, the disease may be the result of the action of specific micro-organisms, though as yet it has not been possible to *demonstrate* any aetiological relationship between any micro-organisms found and the special disease. Such diseases as haemoglobinuric fever or black-water fever, which are also presumably parasitic diseases, are probably associated directly with malaria; this supposition is the more probable in that both of these are recognized as occurring specially in those patients who have been weakened by malaria.

The following classification is based partly upon the biological relations of the parasites and partly on the pathological phenomena of individual diseases:—

A.—Diseases due to Vegetable Parasites.

I.—TO SCHIZOMYCETES, BACTERIA OR FISSION FUNGI.

1. *Caused by the Pyogenetic Micrococci.*

Suppuration and Septicaemia.
Infective Endocarditis.
Erysipelas.
Gonorrhoea.

2. *Caused by Specific Bacilli.*

(a) Acute Infective Fevers.

Cholera.
Typhoid Fever.
Malta Fever.
Relapsing Fever.
Plague.
Pneumonia.
Infective Meningitis.
Influenza.
Yellow Fever and Weil's Disease.
Diphtheria.
Tetanus.

(b) More Chronic Infective Diseases (tissue parasites).

Tuberculosis.
Glanders.
Leprosy.

II.—TO HIGHER VEGETABLE PARASITES.

Actinomycosis, Madura Foot, Aspergillosis and other Mycoses.

B.—Diseases due to Animal Parasites.

I.—TO PROTOZOA.

Malaria.
Amoebic Dysentery.
Haemoglobinuric Fever.
Syphilis.
Kála-ázar.
Tsetse-fly Disease.
Sleeping Sickness.

II.—TO OTHER ANIMAL PARASITES.

Filariasis, &c.

PARASITIC DISEASES

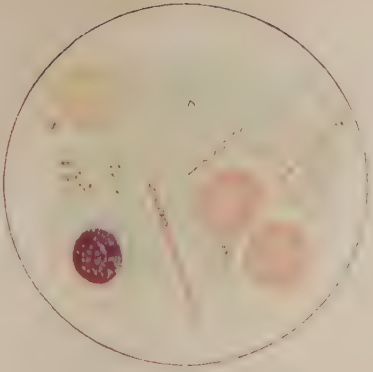


Fig. 1.

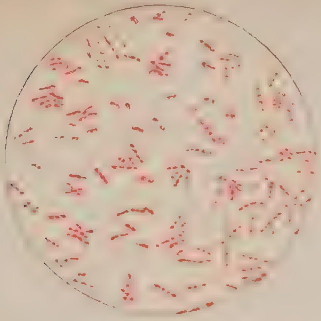
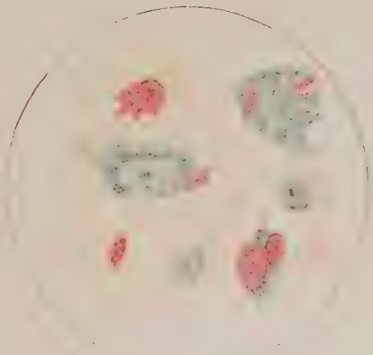


Fig. 2.



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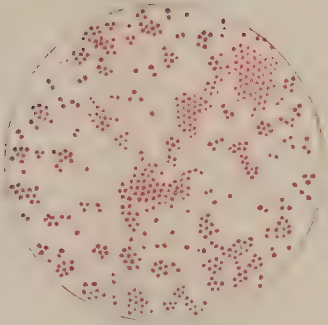
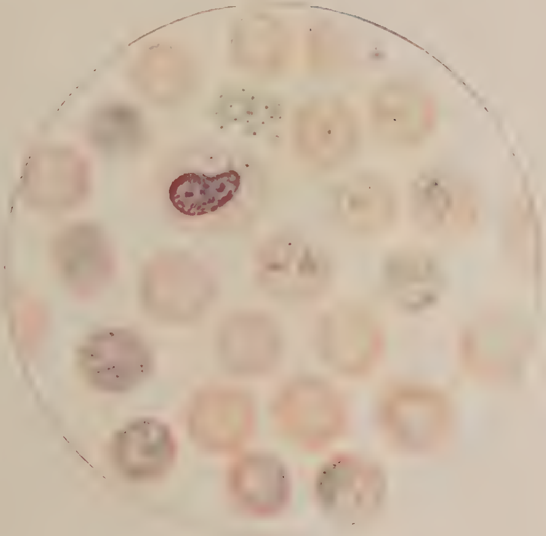


Fig. 4.



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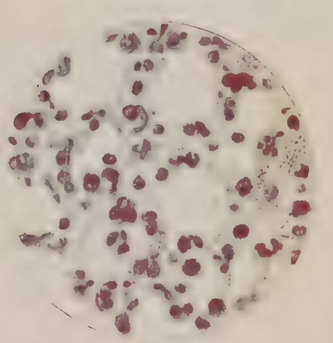

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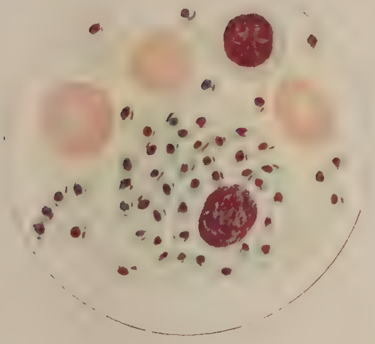

Fig. 7.

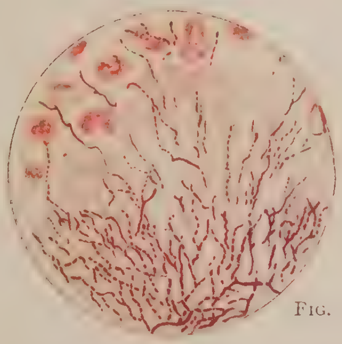

Fig. 8.

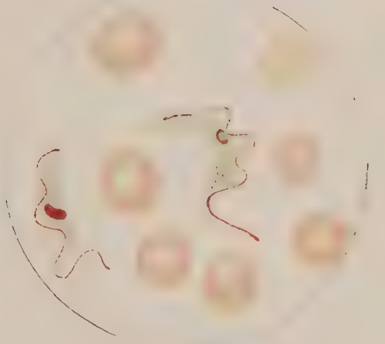

Fig. 9.

Drawn by Rd. Muir.

Fig. 1.—Spirochaeta pallida of Schaudinn (Spironema pallidum), the organism found in the early sores of syphilis; stained by Giemsa's stain. × 1000 diam.

“ 2.—Preparation of the Glanders bacillus (B. mallei), from a 12-hours' agar-agar culture. × 1000 diam.

“ 3.—Negri bodies (red with blue points) in and around the nerve cells of the cornu ammonis of a dog suffering from rabies. × 800 diam.

“ 4.—Staphylococcus pyogenes aureus from a 12-hours' agar culture. × 1000 diam.

“ 5.—Malaria. Life cycle, in the blood, of the Tertian malarial parasite commencing with the small amoebulae and passing through the spore-bearing stages. × 1000 diam.

“ 6.—Section of gland from a guinea-pig inoculated with the Glanders bacillus (B. mallei). × 1000 diam.

“ 7.—Leishman-Donovan bodies found in the scraping made from the cut surface of the spleen from a case of Kala-Azar. × 1000 diam.

“ 8.—Branched hyphal threads of the Ray fungus (Actinomyces, clubbed through thickening of the sheath.) × 1000 diam.

“ 9.—The Trypanosoma Gambiense, seen in a blood film taken from a case of sleeping sickness. × 1000 diam.

C.—Infective Diseases in which an organism has been found, but has not finally been connected with the disease.

Hydrophobia.	Scarlet Fever.

D.—Infective Diseases not yet proved to be due to micro-organisms.

Small-pox.	Mumps.
Typhus Fever.	Whooping Cough, &c.
Measles	

A.—Diseases due to Vegetable Parasites.

I.—To SCHIZOMYCETES, BACTERIA OR FISSION FUNGI.

1. *Caused by the Pyogenetic Micrococci.*

Suppuration and Septicaemia.—It is now recognized that although nitrate of silver, turpentine, castor oil, perchloride of mercury and certain other chemical substances are capable of producing suppuration, the most common causes of this condition are undoubtedly the so-called pus-producing bacteria. Of these perhaps the most important are the staphylococci (cocci arranged like bunches of grapes), streptococci (cocci arranged in chains), and pneumococci, though certain other organisms not usually associated with pus-formation are undoubtedly capable of setting up this condition, *e.g. Bacillus pyocyaneus*, *Bacillus coli communis*, and the typhoid bacillus. These organisms (the products of which, by chemical irritation, stimulate the leucocytes to emigration) bring about the death and digestion of the tissues and fluids (which no longer "clot") with which they come in contact, pus (matter) being thus formed: this accumulates in the tissues, in the serous cavities, or even on mucous surfaces; septicaemia or blood-poisoning, secondary infection of tissues and organs at a distance from the original site of infection, or pyaemia, with the formation of secondary abscesses, may thus be set up.

In septicaemia the pus-forming organisms grow at the seat of introduction, and produce special poisons or toxins, which, absorbed into the blood, give rise to symptoms of fever. From the point of introduction, however, the organisms may be swept away either by the lymph or by the blood, and carried to positions in which they set up further inflammatory or suppurative changes. In the streptococcal inflammations spreading by the lymph channels appears to be specially prevalent. In the blood the organisms, if in small numbers, are usually destroyed by the plasma, which has a powerful bactericidal action; should they escape, however, they are carried without multiplication into the capillaries of the general circulation, of the lung, or of the liver, where, being stopped, they may give rise to a second focus of infection, especially if at the point of impaction the vitality of the tissues is in any way lowered. Unless the blood is very much impoverished, its bactericidal action is usually sufficiently powerful to bring about the destruction of anything but comparatively large masses of pyogenetic organisms. This bactericidal power, however, may be lost; in such case the pus-forming organisms may actually multiply, a general haemic infection resulting. Should micro-organisms be conveyed by the veins to the heart, and there be deposited on an injured valve, an *infective endocarditis* is the result; from such a deposit numerous organisms may be continuously poured into the circulation. Simple thrombi or clots may also become infected with micro-organisms. Fragments of these, washed away, may form septic plugs in the vessels and give rise to abscesses at the points where they become impacted. A distinction must be drawn between sapraemia and septicaemia. In sapraemia the toxic products of saprophytic organisms are absorbed from a gangrenous or necrotic mass, from an ulcerating surface, or from a large surface on which saprophytic organisms are living and feeding on dead tissues: for example, we may have such a condition in the clots that sometimes remain after childbirth on the inner surface of the wall of the womb. So long as no micro-organisms follow the toxins, the condition is purely sapraemic, but should any organisms make their way into and multiply in the blood, the condition becomes one of septicaemia. The term pyaemia is usually associated with the formation of fresh secondary foci of suppuration in distant parts of the body. If the primary abscess occurs in the lungs, the secondary or metastatic abscesses usually occur in the vessels of the general or systemic circulation, and less frequently in other vessels of the lung. When the primary abscess occurs in the systemic area, the secondary abscess occurs first in the lung, and less frequently in the systemic vessels; whilst if the primary abscess be in the portal area (the veins of the digestive tract), the secondary abscesses are usually distributed over the same area, the lungs and systemic vessels being more rarely affected.

Infective Endocarditis.—Acute malignant or ulcerative endocarditis occurs in certain forms of septicaemia or of pyaemia. It is brought about by the Streptococcus pyogenes (see Plate II. fig. 2), the pneumococcus, or the *Staphylococcus pyogenes aureus* (see Plate I. fig. 4), or, more rarely, by the gonococcus, the typhoid bacillus or the tubercle bacillus, as they gain access to acute or chronic valvular lesions of the heart. The aortic and mitral valves are usually affected, the pulmonary and tricuspid valves much more rarely, though Washbourn states that the infective form occurs on the right side more frequently than does simple endocarditis. A rapid necrosis of the surface of the valve is early followed by a deposition of fibrin and leucocytes on the necrosed tissue; the bacteria, though not present in the circulating blood during life, are found in these vegetations which break down very rapidly; ulcerative lesions are thus formed, and fragments of the septic clot (*i.e.* the fibrinous vegetations with their enclosed bacteria) are carried in the circulating blood to different parts of the body, and, becoming impacted in the smaller vessels, give rise to septic infarcts and abscesses. The ulceration of the valves, or in the first part of the aorta, may be so extensive that aneurysm, or even perforation, may ensue.

In certain cases of streptococcic endocarditis the use of anti-streptococcic serum appears to have been attended with good results. Sir A. Wright found that the introduction of vaccines prepared from the pus-producing organisms after first lowering the opsonic index almost invariably, after a very short interval, causes it to rise. He found, too, that the vaccine is specially efficacious when it is prepared from the organisms associated with the special form of suppuration to be treated. Whenever the opsonic index becomes higher under this treatment the suppurative process gradually subsides: boils, acne, pustules, carbuncles all giving way to the vaccine treatment. The immunity so obtained is attributed to the increased activity of the serum as the result of the presence of an increased amount of opsonins. Further, Bier maintains that a passive congestion and oedema induced by constriction of a part by means of a ligature or by a modification of the old method of cupping without breaking the skin appears to have a similar effect in modifying localized suppurative processes, that is processes set up by pus-producing bacteria. Wright holds that this treatment is always more effective when the opsonic index is high and that the mere accumulation of oedematous fluid in the part is sufficient to raise the opsonic index of that fluid and therefore to bring about a greater phagocytic activity of the leucocytes that are found in such enormous numbers in the neighbourhood of suppurative organisms and their products.

Erysipelas.—In 1883 Fehleisen demonstrated that in all cases of active erysipelatous inflammation a streptococcus or chain of micrococci (similar to those met with in certain forms of suppuration) may be found in the lymph spaces in the skin. The multiplying streptococci found in the lymph spaces form an active poison, which, acting on the blood-vessels, causes them to dilate; it also "attracts" leucocytes, and usually induces proliferation of the endothelial cells lining the lymphatics. These cells—perhaps by using up all available oxygen—interfere with the growth of the streptococcus and act as phagocytes, taking up or devouring the dead or weakened micro-organisms. Both mild and severe phlegmonous cases of erysipelas are the result of the action of this special coccus, alone, or in combination with other organisms. It has been observed that cancerous and other malignant tumours appear to recede under an attack of erysipelas, and certain cases have been recorded by both Fehleisen and Coley in which complete cessation of growth and degeneration of the tumour have followed such an attack. As the streptococcus of erysipelas can be isolated and grown in pure culture in broth, it was thought by these observers that a subcutaneous injection of such a cultivation might be of value in the treatment of cancerous tumours. No difficulty was experienced in setting up erysipelas by inoculation, but in some cases the process was so acute that the remedy was more fatal than the disease. The virulence of the streptococcus of erysipelas, as pointed out by Fehleisen and Coley, is greatly exalted when the coccus is grown alongside the *Bacillus prodigiosus* and certain other saprophytic organisms which flourish at the body-temperature. It is an easier matter to control the action of a non-multiplying poison, even though exceedingly active, than of one capable, under favourable conditions, of producing an indefinite amount of even a weaker poison. The erysipelatous virus having been raised to as high a degree of activity as possible by cultivating it along with the *Bacillus prodigiosus*—the bacillus of "bleeding" bread—in broth, is killed by heat, and the resulting fluid, which contains a quantity of the toxic substances that set up the characteristic erysipelatous changes, is utilized for the production of an inflammatory process—which can now be accurately controlled, and which is said to be very beneficial in the treatment of certain malignant tumours. The accurate determination of the aetiology of erysipelas has led to the adoption of a scientific method of treatment of the disease. The *Streptococcus erysipelatis* is found, not specially in the zone in which inflammation has become evident, but in the tissues outside this zone: in fact, the streptococci appear to be most numerous in the lymphatics of the tissues in which there is little change. Before the appearance of any redness there is a dilatation of the lymph spaces with fluid, and the tissues become slightly oedematous. As soon, however, as the distension of vessels and the emigration of leucocytes, with the accompanying swelling and redness, become marked, the streptococci disappear or are imperfectly stained—they are undergoing degenerative changes—the inflammatory "reaction" apparently being sufficient to bring about this result.

If it were possible to set up the same reaction outside the advancing streptococci might not a barrier be raised against their advance? This theory was tested on animals, and it was found that the application of iodine, oil of mustard, cantharides and similar rubefacients would prevent the advance of certain micro-organisms. This treatment was applied to erysipelatous patients with the most satisfactory result, the spread of the disease being prevented whenever the zone of inflammation was extended over a sufficiently wide area. The mere "ringing" of the red patch by nitrate of silver or some other similar irritant, as at one time recommended, is not sufficient: it is necessary that the reaction should extend for some little distance beyond the zone to which the streptococci have already advanced.

Gonorrhoea.—A micro-organism, the gonococcus, is the cause of gonorrhoea. It is found in the pus of the urethra and in the conjunctiva lying between the epithelial cells, where it sets up considerable irritation and exudation; it occurs in the fluid of joints of patients affected with gonorrhoeal arthritis; also in the pleuritic effusion and in the vegetations of gonorrhoeal endocarditis. It is a small diplococcus, the elements of which are flattened or slightly concave disks apposed to one another; these, dividing transversely, sometimes form tetrads. They are found in large numbers, usually in the leucocytes, adherent to the epithelial cells or lying free. They stain readily with the basic aniline dyes, but lose this stain when treated by Gram's method. The gonococcus is best grown on human blood-serum mixed with agar (Wertheim), though it grows on ordinary solidified blood-serum or on blood-agar. Like the pneumococcus, it soon dies out, usually before the eighth or ninth day, unless reinoculations are made. It forms a semi-transparent disk-like growth, with somewhat irregular margins, or with small processes running out beyond the main colony. It acts by means of toxins, which have been found to set up irritative changes when injected, without the gonococci, into the anterior chamber of the eye of the rabbit.

2. *Caused by Specific Bacilli.*

(*a*) *Acute Infective Fevers.*

Cholera.—In 1884 Koch, in the report of the German Cholera Commission in Egypt and India, brought forward overwhelming evidence in proof of his contention that a special bacterium is the causal agent of cholera; subsequent observers in all countries in which cholera has been met with have confirmed Koch's observation. The organism described is the "comma" bacillus or vibrio, one of the spirilla, which usually occurs as a slightly curved rod 1 to 2μ in length and $0{\cdot}5$ to $0{\cdot}6\mu$ in thickness. These comma-shaped rods occur singly or in pairs; they may be joined together to form circles, half-circles, or "S"-shaped curves (see Plate II. fig. 3).

In cultivations in specially prepared media they may be so grouped as to form long wavy or spiral threads, each of which may be made up of ten, twenty, or even thirty, of the short curved vibrios; in the stools of cholera patients, especially during the earlier stages of the disease, they are found in considerable numbers; they may also be found in the contents of the lower bowel and in the substance of the mucous membrane of the lower part of the small intestine, especially in the crypts and in and around the epithelium lining the follicles. It is sometimes difficult, in the later stages of the disease, to obtain these organisms in sufficiently large numbers to be able to distinguish them by direct microscopic examination, but by using the Dunbar-Schottelius method they can be detected even when present in small numbers. A quantity of faintly alkaline meat broth, with 2 % of peptone and 1 % common salt, is inoculated with some of the contents of the intestine, and is placed in an incubator at a temperature of 35° C. for about twelve hours, when, if any cholera bacilli are present, a delicate pellicle, consisting almost entirely of short "comma" bacilli, appears on the surface. If the growth be allowed to continue, the bacilli increase in length, but after a time the pellicle is gradually lost, the cholera organisms being overgrown, as it were, by the other organisms. In order to obtain a pure culture of the cholera bacillus, remove a small fragment of the young film, shake it up thoroughly in a little broth, and then make gelatine-plate cultivations, when most characteristic colonies appear as small greyish or white points. Each of these, when examined under a low-power lens, has a yellow tinge; the margins are wavy or crenated; the surface is granular and has a peculiar ground-glass appearance; around the growing colony liquefaction takes place, and the colony gradually sinks to the bottom of the liquefying area, which now appears as a clear ring. The organism grows very luxuriantly in milk, in which, however, it gives rise to no very noticeable alteration; its presence can only be recognized by a faint aromatic and sweetish smell, which can scarcely be distinguished from the aromatic smell of the milk itself, except by the most practised nose.

The cholera bacillus may remain alive in water for some time, but it appears to be less resistant than many of the putrefactive and saprophytic organisms. It grows better in a saline solution (brackish water) than in perfectly fresh water; it flourishes in serum and other albuminous fluids, especially when peptones are present. Its power of forming poisonous substances appears to vary directly with the amount and nature of the albumen present in the nutrient medium; and though it grows most readily in the presence of peptone, it appears to form the most virulent poison when grown in some form or other of crude albumen to which there is not too free access of oxygen. From the experiments carried out by Koch, Nicati and Rietsch, and Macleod, there appears to be no doubt that the healthy stomach and intestine are not favourable breeding-grounds for the cholera bacillus. In the first place, it requires an alkaline medium for its full and active development, and the acid found in a healthy stomach seems to exert an exceedingly deleterious influence upon it. Secondly, it appears to be incapable of developing except when left at rest, so that the active peristaltic movement of the intestine interferes with its development. Moreover, it forms its poison most easily in the presence of crude albumen. It is interesting to note what an important bearing these facts have on the personal and general spread of cholera. Large quantities of the cholera bacillus may be injected into the stomach of a guinea-pig without any intoxicative or other symptoms of cholera making their appearance. Further, healthy individuals have swallowed, without any ill effect, pills containing the dejecta from cholera cases, although cases are recorded in which "artificial" infection of the human subject has undoubtedly taken place, whilst, as Metchnikoff demonstrated, very young rabbits, deriving milk from mothers whose mammary glands have been smeared with a culture of the cholera vibrio, soon succumbed, suffering from the classical symptoms of this disease.

If, however, previous to the injection of the cholera bacillus the acidity of the stomach be neutralized by an alkaline fluid, especially if at the same time the peristaltic action of the intestine be paralysed by an injection of morphia, a characteristic attack of cholera is developed, the animal is poisoned, and in the large intestine a considerable quantity of fluid faeces containing numerous cholera bacilli may be found. There appear to be slight differences in the cholera organisms found in connexion with different outbreaks, but the main characteristics are preserved throughout, and are sufficiently distinctive to mark out all these organisms as belonging to the cholera group. Amongst the known predisposing causes of cholera are the incautious use of purgative medicines, the use of unripe fruit, insufficient food and intemperance. These may be all looked upon as playing the part of the alkaline solution in altering the composition of the gastric juices, and especially as setting up alkaline fermentation in the stomach and small intestine; beyond this, however, the irritation set up may bring about an accumulation of inflammatory serous fluid, from the albumens of which, as we have seen, the cholera organism has the power of producing very active toxins.

The part played by want of personal cleanliness, overcrowding and unfavourable hygienic conditions may be readily understood if it be remembered that the cholera bacillus may grow outside the body. The number of cases in which epidemics of cholera have been traced to the use of drinking-water contaminated with the discharges from cholera patients is now considerable. The more organic matter present the greater is the virulence of water so contaminated; and the addition of such water to milk has, in one instance at least, led to an outbreak. If cholera dejecta be sprinkled on moist soil or damp linen, and kept at blood-heat, the bacillus multiplies at an enormous rate in the first twenty-four or thirty-six hours; but, as seen in the Dunbar-Schottelius method, at the end of three or four days it is gradually overcome by the other bacteria present, which, growing strongly and asserting themselves, cause it to die out. The importance of this saprophytic growth in the propagation of the disease can scarcely be over-estimated. Water which contains an ordinary amount of organic and inorganic matter in solution does not allow of the multiplication of this organism, which may soon die out; but when organic matter is present in excess, as at the margin of stagnant pools and tanks, development occurs, especially on the floating solid particles. This bacillus grows at a temperature of 30° C. on meat, eggs, vegetables and moistened bread; also on cheese, coffee, chocolate and dilute sugar solutions. In some experiments carried out by Cartwright Wood and the writer in connexion with the passage of the cholera organism through filters it remained alive in the charcoal filtering medium for a period of at least forty-two days, and probably for a couple of months. It must be remembered that cholera bacilli are gradually overcome or overgrown by other organisms, as only on this supposition can the immunity enjoyed by certain regions, even after the water and soil have been contaminated, provided that no fresh supply is brought in "to relight the torch," be explained. In most of the regions in which cholera remains endemic the wells are merely dug-out pits beneath the slightly raised houses, and are open for the reception of sewage and excreta at all times. These dejecta contain organic material which serves as a nutriment on which infective organisms, derived from the soil and ground-water, may flourish. Not only dejecta, but also the rinsings from soiled linen and utensils used by cholera patients should be removed as soon as possible, "without allowing them to come into contact with the surface of the soil, with wells," or with vegetables and the like. The discovery of Koch's comma bacillus has so altered our conceptions of the aetiology of this disease that we now study the conditions under which the bacillus can multiply and be disseminated, instead of concerning ourselves with the cholera itself as some definite entity. Telluric agencies become merely secondary factors, the dissemination of the disease by winds from country to country is no longer regarded as being possible, whilst the spread of cholera epidemics along the lines of human intercourse and travel is now recognized. The virulent bacillus requires the human organism to carry it from those localities in which it is endemic to those in which epidemics occur. The epidemiologist has come to look upon the study of the cholera organism and the conditions under which it exists as of more importance than mere local conditions, which are only important in so far as they contribute to the propagation and distribution of the cholera bacillus, and he knows that the only means of preventing its spread is the careful inspection of everything coming from cholera-stricken regions. He also recognizes that the herding together of people of depressed vitality, under unhygienic and often filthy conditions, in quarantine stations or ships, is one of the surest means of promoting an epidemic of the disease; that attention should be confined to the careful isolation of all patients, and to the disinfection of articles of clothing, feeding utensils, and the like; that the comma bacillus can only be driven out of rooms by means of light and fresh air; that thorough personal, culinary and household cleanliness is necessary; that all water except that known to be pure should be carefully boiled; and that all excess, both in eating and drinking, should be avoided. The object of the physician in such cases must be first to isolate as completely as possible all his cholera patients, and then to get rid of all predisposing causes in the patients themselves, causes which have already been indicated in connexion with the aetiology of the disease.

Attention has frequently been drawn to the fact that patients who have lived for some time in a cholera region, or who have already suffered from an attack of cholera, appear to enjoy a partial immunity against the disease. Haffkine, working on the assumption that the symptoms of cholera are produced by a toxin formed by the cholera organism, came to the conclusion that, by introducing first a modified and then a more virulent poison directly into the tissues under the skin, and not into the alimentary canal, it would be possible to obtain a certain insusceptibility to the action of this poison. He found that for this purpose the cholera bacillus, as ordinarily obtained in pure culture from the intestinal canal, is too potent for the preliminary inoculation, but is not sufficiently active for the second, if any marked protection is to be obtained. By allowing the organism to grow in a well-aerated culture the virulence is gradually diminished, and this virulence, once abolished, does not return even when numerous successive cultures are made on agar or other nutrient media. On the other hand, by passing the cholera bacillus successively through the peritoneal cavities of a series of about thirty guinea-pigs, he obtains a virus of great activity; this activity is soon lost on agar cultivations, and it is necessary, from time to time, again to pass the bacillus through guinea-pigs, three or four passages now being sufficient to reinforce the activity.

From these two cultures the vaccines are prepared as follows: The surface of a slant agar tube is smeared with the modified cholera organism. After this has been allowed to grow for twenty-four hours, a small quantity of sterile water is poured into the tube, and the surface-growth is carefully scraped off and made into an emulsion in the water; this is then poured off, and the process is repeated until the whole of the growth has been removed. The mixture is made up with water to a bulk of 8 c.c., so that if 1 c.c. is injected the patient receives ⅛ of a surface-growth; it is found that this quantity, when injected subcutaneously into a guinea-pig, gives a distinct reaction, but does not cause necrosis of the tissues. If the vaccine is to be kept for any length of time, the emulsion is made with 0·5 % carbolic acid solution, prepared with carefully sterilized water, and the mixture is made up to 6 c.c. instead of 8 c.c., since the carbolic acid appears to interfere slightly with the activity of the virus. The stronger virus is prepared in exactly the same way. The preliminary injection, which is made in the left flank, is followed by a rise in temperature and by local reaction.

After three or four hours there is noticeable swelling and some pain; and after ten hours a rise in temperature, usually not very marked, occurs. These signs soon disappear, and at the end of three or four days the second injection is made, usually on the opposite side. This is also followed by a rise of temperature, by swelling, pain and local redness: these, however, as before, soon pass off, and leave no ill effects behind. A guinea-pig treated in this fashion is now immune against some eight or ten times the lethal dose of cholera poison, and, from all statistics that can be obtained, a similar protection is conferred upon the human being.

Pfeiffer found that when a small quantity of the cholera vibrio is injected into the peritoneal cavity of a guinea pig highly immunized against cholera by Haffkine's or a similar method, these vibrios rapidly become motionless and granular, then very much swollen and finally "dissolve." This is known as Pfeiffer's reaction. A similar reaction may be obtained when a quantity of a culture of the cholera vibrio mixed with the serum derived from a guinea-pig immunized against the cholera vibrio, or from a patient convalescent from the disease, is injected into the peritoneal cavity of a guinea-pig not subjected to any preliminary treatment; and, going a step further, it was found that the dissolution of the cholera vibrio is brought about even when the mixture of vibrio and serum is made in a test tube. On this series of experiments as a foundation, the theory of acquired immunity has been reared.

Evidence has been collected that spirilla, almost identical in appearance with the cholera bacillus, may be present in water and in healthy stools, and that it is in many cases almost impossible to diagnose between these and the cholera bacillus; but although these spirilla may interfere with the diagnosis, they do not invalidate Koch's main contention, that a special form of the comma bacillus, which gives a *complete group* of reactions, is the cause of this disease, especially when these reactions are met with in an organism *that comes from the human intestine.*

Typhoid Fever.—Our information concerning the aetiology of typhoid fever was largely increased during the last twenty years of the 19th century. In 1880 Eberth and Klebs independently, and in 1882 Coats, described a bacillus which has since been found to be intimately associated with typhoid fever. This organism (Plate II. fig. 4) usually appears in the form of a short bacillus from 2 to 3μ in length and $0{\cdot}3$ to $0{\cdot}5\mu$ in breadth; it has slightly rounded ends and is stained at the poles; it may also occur as a somewhat longer rod more equally stained throughout. Surrounding the young organism are numerous long and well-formed flagella, which give it a very characteristic appearance under the microscope. At present there is no evidence that the typhoid bacillus forms spores. These bacilli are found in the adenoid follicles or lymphatic tissues of the intestine, in the mesenteric glands, in the spleen, liver and kidneys, and may also be detected even in the small lymphoid masses in the lung and in the post-typhoid abscesses formed in the bones, kidneys, or other parts of the body; indeed, it is probable that they were first seen by von Recklinghausen in 1871 in such abscesses. They undoubtedly occur in the dejecta of patients suffering from typhoid fever, whilst in recent years it has been demonstrated that they may also be found in the urine. It is evident, therefore, that the urine, as well as the faeces, may be the vehicle by means of which the disease has been unwittingly spread in certain otherwise inexplicable outbreaks of typhoid fever, especially as the bacillus may be present in the urine when the acute stage of the disease has gone by, and when it has been assumed that, as the patient is convalescent, he is no longer a focus from which the infection may be spread. Easton and Knox found typhoid bacilli in the urine of 21% of a series of their typhoid patients.

In 1906 Kayser demonstrated what had previously been suspected, that the typhoid bacilli may persist for considerable periods in the bile duct and gall bladder, whence they pass into the intestinal tract and are discharged with the evacuations. Patients in whom this occurs are spoken of as "typhoid carriers." They become convalescent and except that now and again they suffer from slight attacks of diarrhoea they appear to be perfectly healthy. It has been observed, however, especially during these attacks of diarrhoea, that typhoid bacilli may be found in the faeces. Curiously enough the bacilli are as virulent as are those isolated when the disease is at its height. Hence these typhoid carriers are exceedingly dangerous centres of infection, and as women act as "carriers" much more frequently than do men, although, as is well known, typhoid fever attacks men much more frequently than women, the facilities for the distribution of the disease are great, as women so frequently act as laundresses, cooks, housemaids, nurses and the like. Frosch states that out of 6708 typhoid patients 310 excreted bacilli for more than 10 weeks after convalescence; 144 of these were no longer infective at the end of three months; 64 had ceased to be infective at the end of a year, and 102 at the end of three and a-half years: further back than this no authentic records could be obtained, but from a critical examination of the histories of 25 such carrier cases he was convinced that 14 had been continuously infective for from four to nine years. Dr Donald Greig, in 1908, reported a case in which the patient appears to have been a typhoid carrier for fifty-two years from the time of convalescence. Frosch pointed out, what has now been fully confirmed, that the bacilli in these cases though often present in the faeces in enormous numbers may disappear and again reappear from time to time and that a continuous series of examinations is necessary before a convalescent patient can be acquitted of being a "typhoid carrier." In this connexion it is interesting to note that Blumenthal and Kayser have discovered typhoid bacilli in the interior of gall-stones. Drs Alexander and J. C. G. Ledingham, examining the 90 female patients and attendants in a Scottish asylum in which, during some four or five years, 31 cases of typhoid had occurred in small groups in which the source of infection could not be traced to any recognized channel, found amongst them three "typhoid carriers." The importance of such a discovery amongst asylum patients may be readily understood when the careless and uncleanly habits of insane patients are borne in mind. As it has been demonstrated that the typhoid bacillus is found, not merely in the lymphatic tissue but, in 75 % of the cases, actually circulating in the blood, the appearance of the bacillus in the secretions and excretions may be readily understood.

There can be little doubt that typhoid bacilli are not, as is very frequently assumed, present merely in the lymphatic glands and in the spleen (see Plate II. fig. 5): they may be found in almost any part of the lymphatic system, in lymph spaces, in the connective tissues, where they appear to give rise to marked proliferation of the endothelial cells, and especially in the various secreting organs. It is probable that the proliferation often noticed in the minute portal spaces in the liver, in cases of typhoid fever, is simply a type of a similar proliferation going on in other parts and tissues of the body. It was for long assumed that the typhoid bacillus could multiply freely in water, but recent experiments appear to indicate that this is not the case, unless a much larger quantity of soluble organic matter is present than is usually met with in water. The fact, however, that the organism may remain alive in water is of great importance; and, as in the case of cholera, it must be recognized that certain of the great epidemics of typhoid or enteric fever have been the result of "water-borne infection." The bacillus, a facultative parasite, grows outside the body, with somewhat characteristic appearances and reactions: it flourishes specially well on a slightly acid medium; in the presence of putrefactive organisms which develop strongly alkaline products it may gradually die out, but it appears to retain its vitality longer in the presence of acid-forming organisms. It may, however, be stated generally that after a time the typhoid bacillus becomes weakened, and may even die out, in the presence of rapidly growing putrefactive organisms. In distilled water it may remain alive for a considerable period—five or six weeks, or even longer. It grows on all the ordinary nutrient media. It does not coagulate milk; hence it may grow luxuriantly in that medium without giving rise to any alteration in its physical characters; contaminated milk, therefore, is specially dangerous affording as it does an excellent vehicle for the dissemination of the typhoid bacillus which may also be conveyed by food and even by water. To food the bacillus is readily conveyed by flies, on their limbs or by the proboscis, which become infected by the excrement on which they crawl and feed. The observations of physicians working amongst the British troops in South Africa afford abundant evidence that the typhoid bacillus may also be carried along with dust from excreta to fresh patients, for although these bacilli die very rapidly when they are desiccated, they remain alive sufficiently long to enable them to multiply and flourish when again brought into contact with moist food, milk, &c.

When inoculated on potato, careful examination will reveal the fact that certain almost invisible moist patches are present; these are made up of rapidly multiplying typhoid bacilli. The typhoid bacillus grows in gelatin, especially on the surface,

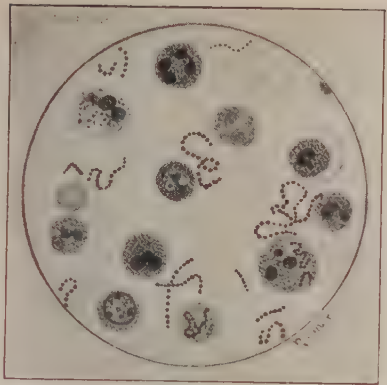

Fig. 2.

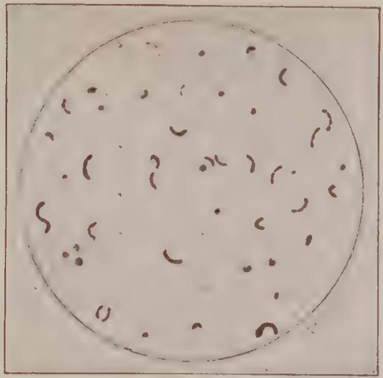

Fig. 3.

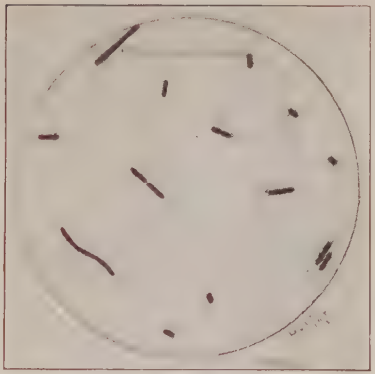

Fig. 4.

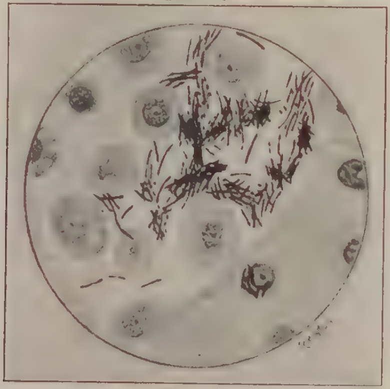

Fig. 5.

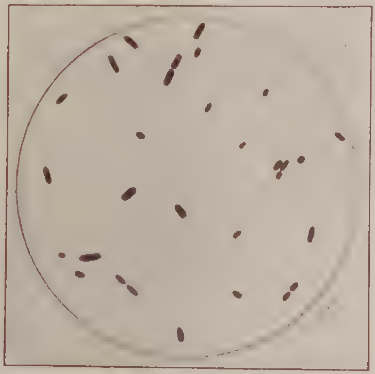

Fig. 7.

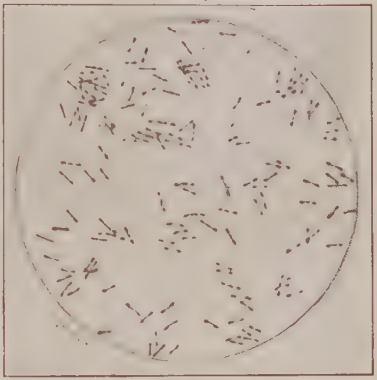

Fig. 9.

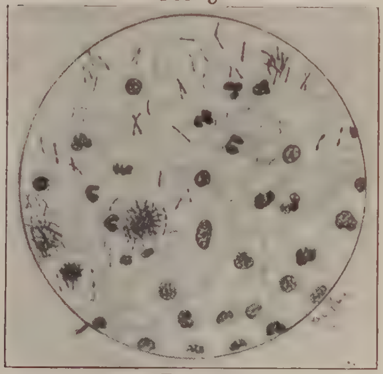

Fig. 10.

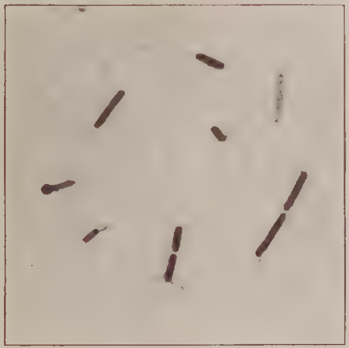

Fig. 11.

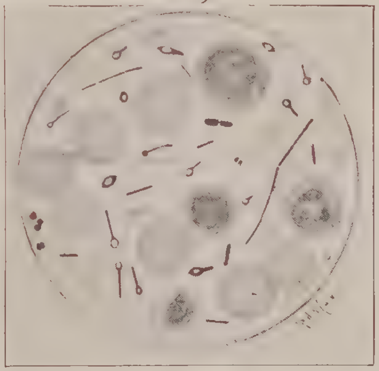

Fig. 12.

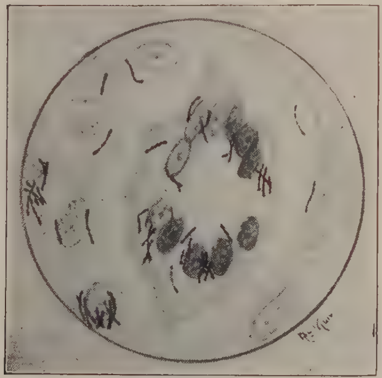

Fig. 15.

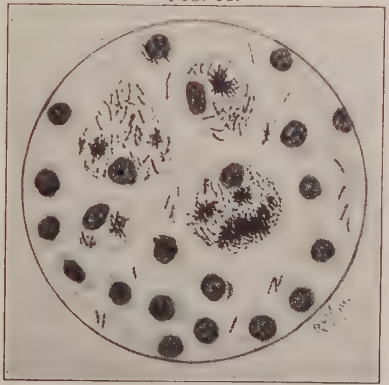

Fig. 16.

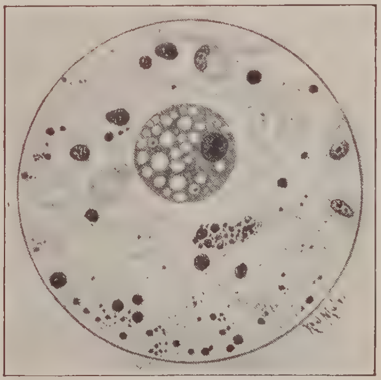

Fig. 19.

Fig. 2.—Streptococcus pyogenes, red blood corpuscles and pus cells in the pus from a case of empyaema. (× 1000 diams.) Fig. 3.—Cholera spirillum, from eight days' agar culture, showing many involution forms. Flagella well stained. (× 1000.) Fig. 4.—Bacillus typhi abdominalis (typhoid bacillus), with well-stained flagella. Young agar cultivation. (× 1000.) Fig. 5.—Group of typhoid bacilli, in a section of spleen. (× 1000.) Fig. 7.—Preparation from young cultivation of Bacillus pestis (plague bacillus). Flagella well stained (× 1000.) Fig. 9.—Bacillus diphtheriae, from twenty-four hours' culture. (× 1000.) Fig. 10.—Free edge of false membrane from case of diphtheria containing numerous diphtheria bacilli. (× 1000.) Fig. 11.—Bacillus tetani, with well-stained flagella. Twenty-four hours' culture. (× 1000.) Fig. 12.—Scraping from a wound in a case of tetanus, showing several spore-bearing and a few non-spore-bearing tetanus bacilli. (× 1000.) Fig. 15.—Bacillus tuberculosis. Bacilli in a giant-cell in the human liver in a case of acute tuberculosis. (× 1000.) Fig. 16.—Bacillus leprae. Bacilli in endothelial cells of splenic tissue. (× 1000.) Fig. 19.—Amoebae in wall of dysenteric abscess of liver, from specimen kindly lent by Professor Greenfield. (× 1000.)

somewhat like the bacillus coli communis, but with a less luxuriant growth. This organism, when taken from young broth cultures twelve to twenty-four hours old—during the period at which flagella are best seen—and examined microscopically, exhibits very lively movements. When, as pointed out by Gruber and Durham, blood-serum, in certain dilutions, from a case of typhoid fever is added to such a culture, the broth, at first turbid, owing to the suspended and moving micro-organisms, gradually becomes clear, and a deposit is formed which is found to be made up of masses or clumps of typhoid bacilli which have lost their motility. This reaction is so characteristic and definite, that when the mixture is kept under examination under the microscope, it is quite possible to follow the slowing-down movement and massing together of the organisms. It is found, moreover, that normal diluted blood-serum has no such effect on the bacilli. This property of the blood-serum is acquired at such an early date of the disease—sometimes even at the end of the first week—and occurs with such regularity, that typhoid fever may now actually be diagnosed by the presence or absence of this "agglutinating" property in the blood. If serum taken from a patient supposed to be suffering from typhoid fever, and diluted with saline solution to 1 in 10, to 1 in 50, or in still greater dilution, causes the bacilli to lose their motility and to become aggregated into clumps within an hour, it may be concluded that the patient is suffering from typhoid fever; if this agglutination be not obtained with a dilution of 1 in 10, in from 15 to 30 minutes, experience has shown that the patient is not suffering from this disease. Certain other diseases, such as cholera, give a similar specific serum reaction with their specific organisms. These sera have, in addition, a slight common action—a general agglutinating power—which, however, is not manifested except in concentrated solutions, the higher dilutions failing to give any clumping action at all, except with the specific bacillus associated with the disease from which the patient, from whom the serum is taken, is suffering.

Wright and Semple, working on Haffkine's lines, introduced a method of vaccination against typhoid, corresponding somewhat to that devised by Haffkine to protect against cholera. They first obtained a typhoid bacillus of fairly constant virulence and of such strength and power of multiplication that an agar culture of 24 hours' growth when divided into four, and injected hypodermically, will kill four fairly large guinea-pigs, each weighing 350 to 400 grammes. A similar culture emulsified in bouillon or saline solution and killed by heating for five minutes at 60° C. is a vaccine sufficient for from four to twenty doses. In place of the agar culture a bouillon culture heated for the same period may be used as the vaccine. In either case the vaccine is injected under the skin of the loin well above the crest of the ileum. This injection is usually followed by local tenderness and swelling within three or four hours, and swelling and tenderness in the position of the nearest lymphatic glands, marked malaise, headache, a general feeling of restlessness and discomfort and a rise of temperature. The blood of a patient so treated early causes agglutination of typhoid bacilli and acts on these bacilli much as does cholera serum in Pfeiffer's reaction. At the end of ten days a second and stronger dose is given. After each injection there is, according to Wright, a "negative phase" during which the patient is somewhat more susceptible to the attacks of the typhoid bacillus. This negative phase soon passes off and a distinct positive or protected phase appears. The practical outcome of this is that wherever possible a patient who is going into a typhoid infected area should be vaccinated some little time before he sets out. There seems to be no doubt that if this be done a very marked, though not complete, protection is conferred. For a time the agglutinative and lytic powers of the serum continue to rise and the patient so vaccinated is far less susceptible to the action of the typhoid bacillus. It is recorded in favour of this method of treatment that of 4502 soldiers of the Indian army inoculated 0·98 % contracted typhoid, while of 25,851 soldiers of the same army who were not inoculated over 2½ % (2·54) contracted typhoid. Similarly, at Ladysmith, of the whole of the besieged soldiers only 1705 had been inoculated, but of these only 2 % contracted typhoid, whilst of 10,529 uninoculated men 14 % were attacked. Wright, who has been indefatigable in carrying out and watching this method of treatment, has been able to accumulate statistics dealing with 49,600 individuals —of these 8600 were inoculated, and 2¼ % contracted typhoid, 12 % of these succumbing to the disease. Of the 41,000 uninoculated men 5¾ % contracted the disease, 21 % of those attacked succumbing.

Mediterranean or Malta Fever.—Until comparatively recently, Mediterranean fever was looked upon as a form of typhoid fever, which in certain respects it resembles; the temperature curve, however, has a more undulatory character, except in the malignant type, where the temperature remains high throughout the course of the attack. According to Hughes, this disease is widely distributed in the countries bordering upon the Mediterranean south of latitude 46° N., and along the Red Sea littoral. Analogous forms of fever giving a "specific" serum reaction with the micrococcus of this disease are also met with in parts of India, China, Africa and America.

The *Micrococcus melitensis vel Brucei* (1887), which is found most abundantly in the enlarged spleen of the patient suffering from Malta fever, is a very minute organism (0·33μ in diameter), ovoid or nearly round, arranged in pairs or in very short chains. If a drop of the blood taken directly from the spleen be smeared over the surface of agar nutrient medium, minute transparent colourless colonies appear; in thirty-six hours these have a slight amber tinge, and in four or five days from their first appearance they become opaque. These colonies, which flourish at the temperature of the human blood, cease to grow at the room-temperature except in summer, and if kept moist, soon die at anything below 60° F., though when dried they retain their vitality for some time. As the organism grows and multiplies in broth there is opacity of the medium at the end of five or six days, this being followed by precipitation, so that a comparatively clear supernatant fluid remains. It grows best on media slightly less alkaline than human blood; it is very vigorous and may resist desiccation for several weeks.

This organism is distinctly pathogenetic to monkeys, and its virulence may be so increased that other animals may be affected by it. Though unable to live in clean or virgin soil, it may lead a saprophytic existence in soil polluted with faecal matter. Hughes maintains that the "virus" leaves the body of goats and of man along with the faeces and urine. The importance of this in ambulatory cases is very evident, especially when it is remembered that goats feeding on grass, &c. which has come in contact with such urine are readily infected. It seldom appears to be carried for any considerable distance. Infection is not conveyed by the sputum, sweat, breath or scraping of the skin of patients, and infected dust does not seem to play a very important part in producing the disease. Hughes divides the fever into three types. In the malignant form the onset is sudden, there are headache, racking pain over the whole body, nausea and sometimes vomiting; the tongue is foul, coated and swollen, and the breath very offensive; the temperature may continue for some time at 103° to 105° F. The stools in the diarrhoea which is sometimes present may be most offensive. At the end of a few days the lungs become congested and pneumonic, the pulse weak, hyperpyrexia appears, and death ensues. A second type, by far the most common, is the "undulatory" type, in which there is remittent pyrexia, separated by periods in which the patient appears to be improving. These pyrexial curves, from one to seven in number, average about ten days each, the first being the longest,—eighteen to twenty-three days. In an intermittent type, in which the temperature-curve closely resembles the hectic pyrexial curve of phthisis or suppuration, the "undulatory" character is also marked. A considerable number of toxic symptoms make their appearance—localized neuritis, synovitis, anaemia, emaciation, bronchial catarrh, weakness of the heart, neuralgia, profuse night-sweats and similar conditions. Patients otherwise healthy usually recover, even after prolonged attacks of the disease, but the mortality amongst patients suffering from organic mischief of any kind may be comparatively high. The diagnosis from malaria, phthisis, rheumatic affections and pneumonia may, in most cases, be made fairly easily, but the serum agglutinating reaction (first demonstrated by Wright in 1897) with cultures of the *Micrococcus melitensis*, corresponding to the typhoid reaction with the typhoid bacillus, is sometimes the only trustworthy feature by which a diagnosis may be made between this fever and the above-mentioned diseases. About 50% of the goats in Malta give a positive agglutinative reaction and about 10% excrete milk which contains the micrococcus.

Sir David Bruce, in his investigations on the tsetse fly disease, pointed out that certain wild animals although apparently in good health might serve as reservoirs for, or storehouses of, the N'gana parasite. He was therefore quite prepared to find that the *Micrococcus melitensis* might similarly be "stored" in an animal which might show but slight, if any, manifestations of Malta fever. Indications as to the direction in which to look were given in the following fashion. There was a strike amongst the dairymen supplying the barracks in Malta and it became necessary to replace the goat's milk in the dietary of the troops by condensed milk. What followed? In the first half of the year 1906 there had been 144 cases (in 1905 there had been 750 cases), in the second half after the alteration of the milk supply, only 32 cases were recorded and in 1907, 7 cases during the whole year. In the navy during the same period there were, in 1905, 498 cases, in 1906, 248 cases and, from January to September 1907, not a single case.

The most common method of infection is by the ingestion of milk, but the milk when handled may also give rise to infection through finding its way into cuts, bruises, &c. In the goat the disease is of an extremely mild character, the clinical symptoms, which are present for two or three days only, being easily overlooked. In spite of this the goat is highly susceptible to the infection either by the various methods of inoculation or as the result of feeding with contaminated or infected material. The micrococcus is often found in the circulating blood from which it may be excreted along with the urine and faeces. In time, however, it disappears, first from the general circulation and most of the viscera, persisting longest in the spleen, kidneys and lymphatic glands. In the later stages of the disease the micrococcus is found in the milk even after it has disappeared from the above glands. It is during this stage that the milk of the goat is so dangerous, as now and again it may contain an enormous number of the specific micrococcus varying "within wide limits from day to day," although bearing "no relationship to the severity of the infection, air temperature, &c.; the presence of the *Micrococcus melitensis* in the milk appears to be merely the result of a mechanical flushing of the mammary glands by means of which the cocci multiplying therein are removed." As pointed out by the Mediterranean Fever Commission the micrococcus of Malta fever from its vantage ground in the milk may make its way to ordinary ice-creams and to native cheeses, in which it appears to retain its full virulence. Monkeys are especially susceptible to this disease, contracting it readily when they are fed with milk from an infected goat. In 1905 an interesting experiment was, unintentionally, carried out. An official of the United States Bureau of Animal Industry visiting Malta in the summer of that year purchased a herd of 61 milch-goats and four billy goats. These were shipped via Antwerp to the United States. On arrival at Antwerp the goats were transferred to a quarantine station, where they remained for five days and were then consigned by steamer to New York. On board the SS. "Joshua Nicholson," which took the goats from Malta to Antwerp, were twenty-three officers and men; ten out of the twenty-three were afterwards traced. One was found to have been infected by *M. melitensis* at an unknown date, and eight had subsequently suffered from febrile attacks, five yielding conclusive evidence of infection by *M. melitensis*. It is interesting to note, however, that two men who boiled the milk before drinking it, and an officer and a cabin-boy who disliked the milk and did not drink it at all, came off scot free.

These cases taken by themselves might leave the question somewhat open, as there was a possibility that the men attacked might have been in contact with infected patients in Malta. A far more conclusive case was the following. A woman at the quarantine station at Athenia, N. J., U.S.A., who partook freely of the mixed milk from several goats, over a considerable period, suffered from a typical attack of Mediterranean fever some nine or ten weeks after the goats had been landed in America. In this case "contact" with and other modes of exposure to infection by human patients could all be eliminated.

It may be held then that the *M. melitensis* leads a more or less passive existence in the body of the Maltese goat, only exercising its full pathogenic action when it gains entrance to the human body. There is some slight evidence that the *Micrococcus melitensis* may remain alive with its virulence unimpaired even when taken up by the mosquitoes Acartomyia and Stegomyia, and again in the common blood-sucking fly, Stomoxys, for a short period, four or five days. It can be recovered for a longer period and still in a fairly virulent condition from the excreta of these insects. In spite of this, transmission of the disease by these insects, though apparently possible, does not appear to be of very frequent occurrence. Inoculation with a vaccine prepared from the *Micrococcus melitensis* appears to exert a protective influence for a period of about four months, after which time there is a marked diminution in the immunity conferred by this vaccination.

Relapsing Fever.—The specific cause of relapsing fever (famine fever) appears to be the *Spirillum Obermeieri*, an organism which occurs in the blood (during the febrile stages) of patients suffering from this disease. Between the febrile stages are periods of intermission, during which the spirillum disappears from the blood and, apparently, retires to the spleen. This disease, in epidemic form, follows in the footsteps of famine and destitution, specially affecting young people between the ages of fifteen and twenty; it seldom attacks children under five years of age, but when it attacks patients over thirty it assumes a very virulent form. In monkeys inoculated with blood containing the *Spirillum Obermeieri* the first symptoms appear between the second and sixth days. In the human subject this incubation period may last as long as three weeks; then comes an attack of fever, which continues for about a week, and is followed by a similar period of apparent convalescence, on which ensues a pyrexial relapse, continuing about half as long as the first. The spirilla, the cause of this disease, are fine spirals with pointed ends, three or four times as long as the diameter of a red blood corpuscle. Although it has as yet been found impossible to cultivate these spirilla outside the body, human beings, and monkeys injected with blood containing them, contract the disease; and in monkeys it has been found that during the period before the relapse the spirilla have made their way into the cells of the spleen. As yet little is known as to the mode of development of these organisms, and of the method of their transmission from one patient to another, but it is thought that, as in the case of malaria and the tsetse-fly disease, they may be carried by bloodsucking insects. Relapsing fever is distinguished from typhoid fever by its sudden onset, and by the distinct intermissions; and from influenza by the enlargement of the spleen and liver. The most satisfactory method of diagnosis is the examination of the blood for the presence of the spirillum during the febrile stage. The *post-mortem* appearances are those of a toxic (bacterial) poisoning. Curious infarction-like masses, in which are numerous spirilla, are found in the spleen; in the liver there is evidence of acute interstitial hepatitis, with cloudy swelling of the liver cells; and similar changes occur in the kidney. Fatty degeneration of the heart and voluntary muscles may also be met with.

Plague.—During recent years opportunities for the study of plague have unfortunately been only too numerous. In patients suffering from this disease, a micro-organism, capable of leading either a saprophytic life or a parasitic existence in the human body, and in some of the lower animals, was described independently by Kitasato and Lowson and by Yersin, 1894, in Hong-Kong. It is a short moderately thick oval bacillus, with rounded ends, which stain deeply, leaving a clear band in the centre (see Plate II., fig. 7). It thus resembles the short diphtheria bacillus and the influenza bacillus. Certain other forms are met with—long rods and "large oval bacilli, pear-shaped or round, imperfectly stained pale involution forms"—but the above is the most characteristic. It grows readily on most media at the temperature of the body, but, like the glanders bacillus, soon loses its virulence in cultivations. It may be obtained in pure cultures from the lymph glands, and from the abscesses that are formed in the groin or other positions in which the glands become enlarged and softened. It may also be found in the spleen and in the blood, and, in the case of patients suffering from the pneumonic form of the disease, even in the lungs and in the sputum. It has also been found in the faeces and urine. (It is very important that these excretions from plague patients should always be most carefully disinfected.) This organism, when obtained in pure culture and inoculated into rats, mice, guinea-pigs or rabbits, produces exactly the same symptoms as does material taken fresh from the softened glands. The symptoms are local swelling, enlargement and softening of the lymphatic glands, and high fever.

The difficulty of explaining the spread of plague, at one time apparently almost insuperable, has at last been overcome, as it has been found that although the acute pneumonic plague is undoubtedly highly contagious, the spread of the bubonic and septicaemic forms could not be explained on the same hypothesis. As the pneumonic form is met with in only about 2·5% of the whole of the cases, transmission by direct contagion seems to be an utterly inadequate explanation. In the autumn of 1896, when the plague broke out in India, and those dealing with the outbreak came to the conclusion that certain houses were centres of infection, it was noticed that these houses were most infective at night, and that they might actually be centres of infection although uninhabited; indeed the infection seemed to spread to houses between which and the infected house there appeared to be no intercommunication of any kind. This seemed to be inexplicable except on the assumption that the infective agent, the *Bacillus pestis*, was, in some way or other, carried by animals. It had already been noted that rats disappeared from plague-stricken houses, many dying before the appearance of the plague in the human population. Simond, noting these conditions, suggested that the plague bacillus might be transmitted by the flea from rat to rat and from rat to man. Although he was not able to demonstrate this connexion he indicated a line of research to other observers, who, as knowledge accumulated, were able to complete each link in the chain of infection. The plague bacillus having been found in the rat, the next step was to demonstrate its presence in the flea, and living plague germs were found in the stomachs of fleas inhabiting plague-infected houses. Several species seem to be able to transmit this germ, but in none of them does the plague bacillus appear to undergo any special development—alternation of generations or the like—as in the case of the protozoon of malaria in its passage from and to the mosquito and the human subject—it simply passes unchanged through the alimentary canal of the flea, is excreted in the faeces, and is carried into the wound made by the epipharynx-mandibles of the flea.

At least three species of animals, two rats and the human subject, and three species of fleas are involved in this chain. The rat fleas are *Pulex cheopis* found in India, and *Ceratophyllus fasciatus*, the rat flea of northern Europe, and *Pulex irritans*, the common flea, all of which have the power of transmitting the disease. In India of course the *Pulex cheopis*, usually solely associated with rats, seems to play the most prominent part. The two rats involved are the *Mus decumanus*, or brown rat, which is found in the sewers and develops the plague first, and the *Mus rattus*, the common black house-rat. From the sewer-rat the house-rat is infected, and from the house-rat man. Under ordinary conditions rat fleas do not attack the human subject, but, as the rats are attacked by plague and die, the infected fleas, starve out as it were, leave them and transfer their attentions to other animals and the human subject, infecting many of those they bite. Colonel Bannerman maintains that this infection takes place in the majority of cases, by this chain of transmission, and that there is no evidence that the excreta of these rats infect food or contaminate the soil. Colonel Lamb, summarizing the experimental evidence on this question, writes:—

> "1. Close contact of plague-infected animals with healthy animals, if fleas are excluded, does not give rise to an epizootic among the latter. As the godowns (experimental huts) were never cleaned out, close contact includes contact with faeces and urine of infected animals, and contact with and eating of food contaminated with faeces and urine of infected animals as well as with pus from open plague ulcers; (2) close contact of young, even when suckled by plague-infected mothers, did not give the disease to the former; (3) if fleas are present, then the epizootic, once started, spreads from animal to animal, the rate of progress being in direct proportion to the number of fleas present; (4) an epizootic of plague may start without direct contact of healthy animal and infected animal; (5) the rat flea can convey plague from rat to rat; (6) infection can take place without any contact with contaminated soil; (7) aerial infection is excluded."

The experiments lead to the conclusion that fleas and fleas alone, are the transmitting agents of infection. Bannerman gives in concise form similar evidence in relation to naturally infected native houses. Infection is carried from place to place by fleas, usually on the body or in the clothing of the human being. Such fleas, fed on infected blood, may remain alive for three weeks, and of this period, we are told, may remain infective for fifteen days. At the first opportunity these fleas forsake the human host and return to their natural host the rat. In most of the epidemics there is a definite sequence of events. First the brown rats are attacked, then the black rats, then the human subject, and Colonel Lamb suggests that after the rat disappears the flea starves for about three days and then attacks the human subject. Then comes the incubation period of plague, three days. Following this is the period of average duration of the disease, five or six days. This time-table, he says, corresponds to the period—when the epidemics are at their height—that intervenes between the maximum death-rate in rats and the maximum death-rate in man, about ten to fourteen days. This history of the connexion between the flea, the rat, and the human subject reads almost like a fairy tale, but it is now one of the well-authenticated and sober facts of modern medicine.

In India, where the notions of cleanliness are somewhat different from those recognized in Great Britain, most of the conditions favourable to the spread of the plague bacillus are of the most perfect character. This organism may pass into the soil with faeces; it may there remain for some time, and then be taken into the body of one of the lower animals, or of man, and give rise to a fresh outbreak. Kitasato and Yersin were both able to prove that soil and dust from infected houses contain the bacillus, that such bacillus is capable of inducing an attack of plague in the lower animals, and that flies fed on the dejecta or other bacillus-containing material, die, and in turn contain bacilli which are capable of setting up infection. Hankin claims that ants may carry the plague to and from rats, and so to the human being. It has already been mentioned that the organism rapidly loses its virulence when cultivated outside the body; on the other hand, on being passed through a series of animals its virulence gradually increases. Thus may be explained the fact that in most outbreaks of plague there is an early period during which the death-rate is very low; after a time the percentage mortality is enormously increased, the virulence of the disease being very great and its course rapid. There seem to be notable differences in the degree of susceptibility of different races and different individuals, and those who have passed safely through an attack appear to have acquired a marked degree of immunity.

Two methods of treatment, both of which seem to have been attended with a certain degree of success, are now being tried. Haffkine, who was the first to produce a vaccine for the treatment of cholera, prepared a vaccine of a somewhat similar type for the treatment of plague. For this the *Bacillus pestis* is cultivated in flasks of bouillon; to this small drops or particles of ghee (Indian butter) are added; these form centres around which the organisms may develop. As the organisms multiply they grow down into the broth, but gradually becoming fewer in number as the floating mass on the surface is left, they fine down to a point and so come to resemble stalactites. These are broken off, from time to time, by shaking, others immediately beginning to form in their place. This may go on for six weeks. The flask with its contents is then well shaken and heated in a water bath to 70° C. for from one to three hours. On testing by culture the fluid should now be sterile, *i.e.* no bacilli should remain alive, and the fluid, ready for use, may be injected into the subcutaneous tissues of the arm in a dose of from 3 cc. for a man and 2 to 2½ cc. for a woman, children receiving relatively small amounts. A rise of temperature, followed by malaise and headache, which pass off in about 24 hours, is soon noted, and some local swelling and redness appear at the seat of injection. The Indian Plague Commission were satisfied that the use of this vaccine diminishes the incidence of attacks of plague, and that, although it does not confer a complete immunity against the disease, the case mortality is lowered. They are of opinion also that protection is not conferred at once, but Lieut.-Colonel Bannerman states that the protection is immediate and lasts for six or even twelve months. In the official report (Annual Report of the Sanitary Commissioner with the Government of India) for 1904 occurs the following: "That its value is great is certain, not only does it largely diminish the danger of plague being contracted, but, if it fails to prevent the attack, the probability of a fatal event is reduced by one-half."

This method of treatment, however, is of no avail in the case of patients already attacked; for such cases Yersin's serum treatment must be called in. Various other vaccines have been described, but all consist of some form of killed or attenuated bacilli, and the results attained do not vary very greatly. Yersin, who first demonstrated the plague bacillus also devised the method of preparing an "antipest serum." A horse was inoculated repeatedly, at intervals, and with gradually increasing doses of living plague bacilli. It was afterwards found that cultures sterilized by heat served equally well for this inoculation of the horse and of course were much more easily worked with. This process of preparation may have to be continued for from six months to a year. The horse is then bled and from the clot the serum is separated, care being taken to determine by injection of the blood into mice that no living bacilli have by accident made their way into, and remained in, the horse's blood. The serum is not considered to be sufficiently active until a drop and a half will protect the mouse against a dose of living bacilli fatal to a control mouse in from 48 to 60 hours. When this serum is injected in sufficiently large doses subcutaneously in mild cases, and subcutaneously and intravenously (*Lancet*, 1903, i. 1287) in more severe cases in doses of 150 to 300 cc. the results seem to be excellent, especially when the serum is injected into the tissues around the bubo or swellings formed in this disease. Calmette and Salimbeni used the serum in 142 cases in the Oporto outbreak. Amongst these they had a mortality of under 15%, whilst amongst 72 patients not so treated the death-rate was over 63%. This serum kills the bacilli and at the same time neutralizes the toxin formed during the course of the disease. The best results are obtained when large doses are given, and when the serum injected subcutaneously is thrown into the area in which the lymph flows towards the bubo. As in the case of the diphtheria antitoxic serum joint pains and rashes may follow its exhibition, but no other ill effects have been noted.

Pneumonia.—The case in favour of acute lobar pneumonia being an infective disease was a very strong one, even before it was possible to show that a special organism bore any aetiological relation to it. In 1880, Friedländer claimed that he had isolated such an organism, but the pneumo-bacillus then described appears to be inactive as compared with the pneumococcus isolated by Fraenkel and Talamon. This latter organism which is usually found in the sputum, is an encapsuled diplococcus. Grown on serum or agar over which sterile blood has been smeared, it occurs as minute, glistening, rather prominent points, almost like a fine spray of water or dew. When the organism is cultivated in broth the capsule disappears, and chains of diplococci are seen. It resembles the influenza bacillus in a most remarkable manner. It may be found, in almost every case of pneumonia, in the "rusty" or "prune-juice" sputum. Injected into rabbits, it produces death with very great certainty; and by passing the organism through these animals its virulence may be markedly increased. Like the influenza bacillus and even the diphtheria bacillus, this organism may be present in the mouth and lungs of perfectly healthy individuals, and it is only when the vitality of the system is lowered by cold or other depressing influences that pneumonia is induced; two factors, the presence of the bacillus and the lowered vitality, being both necessary for the production of this disease in the human subject. It is quite possible, however, that, as in the case of cholera, a slight inflammatory exudation may supply a nutrient medium in which the bacillus rapidly acquires greatly increased virulence, and so becomes a much more active agent of infection.

It is claimed by the brothers Klemperer, by Washbourn and by others, that they have been able to produce an anti-pneumococcic serum, by means of which they are able to treat successfully severe cases of pneumonia. The catarrhal pneumonia so frequently met with during the course of whooping-cough, measles and other specific infective fevers, is also in all probability due to the action of some organism of which the influenza bacillus and the *Diplococcus pneumoniae* are types.

Infective meningitis is, in most of the recent works on medicine, divided into four forms: (1) the acute epidemic cerebro-spinal form; (2) a posterior basic form, which, however, is closely allied to the first; (3) suppurative meningitis, usually associated with pneumonia, erysipelas, and pyaemia; and (4) tubercular meningitis, due to the specific tubercle bacillus.

1. The first form, acute infective or epidemic cerebro-spinal meningitis, is usually associated with Weichselbaum's *Diplococcus intracellularis meningitidis* (two closely apposed disks), which is found in the exudate, especially in the leucocytes, of the meninges of the brain and cord. It grows, as transparent colonies, on blood-agar at the temperature of the body, but dies out very rapidly unless reinoculated, and has little pathogenetic effect on any of the lower animals, though under certain conditions it has been found to produce meningitis when injected under the dura mater.

More or less successful attempts have been made to treat acute epidemic cerebro-spinal meningitis by means of antisera obtained from different sources. Flexner uses the serum of horses that have been highly immunized against numerous strains of the meningococcus, the process of immunization extending over four or five months. Meister, Lucius and Brüning supply Ruppel's antibacterial serum derived from animals immunized against several strains of meningococcus of high pathogenic activity. Both these sera may be looked upon as polyvalent sera. Ivy Mackenzie and Martin, pointing out that the cerebro-spinal fluid, even of patients who have recovered from this form of meningitis, contains no antibodies, tried and recommended injections of the patient's own blood serum into the spinal canal. In all cases the action seems to be much the same. These sera contain immune body and complement, and are distinctly bactericidal, acting on the meningococcus and rendering it much more easily taken up and digested by the white blood corpuscles. It is possible that these sera may also exert some slight antitoxic action. The serum is injected directly into the spinal canal, a corresponding quantity of the cerebro-spinal fluid having first been withdrawn by lumbar puncture. The treatment thus resembles the treatment of lockjaw, where the antitetanus serum is brought as directly as possible into contact with the nerve centres. The dose of these sera ranges from 15 to 40 cc. according to the severity of the disease. Although the general mortality of the disease is from 50 to 80%, it is stated that where Flexner's serum is used the mortality falls to 33%. The result corresponds somewhat closely to those obtained with antidiphtheria serum in diphtheria. In patients injected on the first day of the disease the mortality was only about 15%, on and from the fourth to the seventh day 22%, but after the seventh day 36%. From this it is evident that although the serum has a distinct effect in bringing about the phagocytosis of the meningococcus and the neutralization of the toxins produced, it cannot make good any damage already done to the tissues. Mackenzie and Martin treated 20 cases with the blood taken from patients suffering, or convalescent, from meningitis. Of 16 acute cases treated 14 received serum from patients who had already recovered from the disease, 8 of the patients recovered, 6 died, and 2 cases which received their own serum both recovered. In the presence of these anti-cerebro-spinal-fever sera the meningeal cocci become diminished in number and do not stain so readily, whilst, simultaneously, the polymorpho-nuclear leucocytes seem to be diminished in number. The serum should be given until the temperature becomes normal. Mackenzie and Martin assert that even normal human blood contains substances which are bactericidal to the meningeal coccus, but that these substances increase "in amount and activity in the blood serum of patients suffering from an acute or chronic meningococcic infection, and the serum of a patient recently recovered from an infection shows the evidence of the presence of these substances in a still greater degree." They were able to demonstrate, moreover, that the destructive action on the cocci depends on an immune body which requires the presence of a complement to complete the process. The cerebro-spinal fluid differs from the serum in that it does not contain substances which kill this meningeal coccus *in vitro*, nor are the immune body and complement present in the blood, found in this cerebro-spinal fluid. Hence the efficacy of the blood when it is called upon to replace the fluid in the cerebro-spinal canal.

2. *Posterior basic meningitis*, according to Dr Still, "is frequently seen during the first six months of life, a period at which tuberculous and epidemic cerebro-spinal meningitis are quite uncommon." The organism found in this disease resembles the *diplococcus intracellularis meningitidis* very closely, but differs from it in that it remains alive without recultivation for a considerably longer period. It is less pathogenetic than that organism, of which possibly it is simply a more highly saprophytic form. This is a somewhat important point, as it would account for the great resemblance that exists between the sporadic and the epidemic forms of meningitis.

3. In *suppurative meningitis* these two organisms may still be found in a certain proportion of the cases, but their place may be taken by the pneumococcus or *Diplococcus pneumoniae* or Fraenkel's pneumococcus—*Diplococcus lanceolatus*—which appears to grow in two forms. In the first it is an encapsulated organism, consisting of small oval cocci arranged in pairs or in short chains; the capsule is unstained. When the pneumococcus grows in chains—the second form—as when cultivated outside the body, on blood-serum or on agar over the surface of which a small quantity of sterile blood has been smeared, it produces very minute translucent colonies. Like Weichselbaum's bacillus, it must be recultivated every three or four days, otherwise it soon dies out. Unlike the other forms previously described, it may, when passed through animals, become extremely virulent, very small quantities being sufficient to kill a rabbit. Although the pneumococcus is found in the majority of these cases, especially in children, suppurative

meningitis may also accompany or follow the various diseases that are set up by the *Streptococcus pyogenes* and *Streptococcus erysipelatis*; whilst along with it staphylococci and the *Bacillus coli communis* have sometimes been found. In other cases, again, there is a mixed infection of the pneumococcus and the *Streptococcus pyogenes*, especially in cases of disease of the middle ear. As might be expected in meningitis occurring in connexion with the specific infective diseases, *e.g.* influenza and typhoid fever, the presence of the specific bacilli of these diseases may usually be demonstrated in the meningeal pus or fluid.

4. The fourth form, *tubercular meningitis* (acute hydrocephalus), is met with most frequently in young children. It is now generally accepted that this condition is the result of the introduction of the tubercle bacillus into the blood-vessels and lymph spaces of the meninges at the base of the brain, and along the fissures of Sylvius.

Influenza.—From 1889 up to the present time, influenza has every year with unfailing regularity broken out in epidemic form in some part of the United Kingdom, and often has swept over the whole country. The fact that the period of incubation is short, and that the infective agent is extremely active at a very early stage of the disease, renders it one of the most rapidly-spreading maladies with which we have to deal. The infective agent, first observed by Pfeiffer and Canon, is a minute bacillus or diplococcus less that 1μ in length and $0{\cdot}5\mu$ in thickness; it is found in little groups or in pairs. Each diplococcus is stained at the poles, a clear band remaining in the middle; in this respect it resembles the plague bacillus. It is found in the blood—though here it seems to be comparatively inactive—and in enormous numbers in the bronchial mucus. It is not easily stained in a solution of carbol-fuchsin, but in some cases such numbers are present that a cover-glass preparation may show practically no other organisms. Agar, smeared with blood, and inoculated, gives an almost pure cultivation of very minute transparent colonies, similar to those of the *Diplococcus pneumoniae*, but as a rule somewhat smaller. This organism, found only in cases of influenza, appears to have the power of forming toxins which continue to act for some time after recovery seems to have taken place; it appears to exert such a general devitalizing effect on the tissues that micro-organisms which ordinarily are held in check are allowed to run riot, with the result that catarrh, pneumonia and similar conditions are developed, especially when cold and other lowering conditions co-operate with the poison. This toxin produces special results in those organs which, through over-use, impaired nutrition or disease, are already only just able to carry on their work. Hence in cases of influenza the cause of death is usually associated with the failure of some organ that had already been working up to its full capacity, and in which the margin of reserve power had been reduced to a minimum. It is for this reason that rest, nutrition, warmth and tonics are such important and successful factors in the treatment of this condition.

Yellow Fever, endemic in the West Indies and the north-eastern coast of South America, may become epidemic wherever the temperature and humidity are high, especially along the seashore in the tropical Atlantic coast of North America. It appears to be one of the specific infective fevers in which the liver, kidney, and gastro-intestinal systems, and especially their blood-vessels, are affected. In 1897 Sanarelli reported, in the *Annales de l'Institut Pasteur*, that he had found a bacillus in the blood-vessels of the liver and kidneys, and in the cells of the peritoneal fluid, but never in the alimentary tract, of yellow fever patients. These, he maintained, were perfectly distinct from the putrefactive microbes occurring in the tissues in the later stages, their colonies not growing like those of the bacillus coli communis. They grow readily on all the ordinary artificial nutrient media, as short rods with rounded ends, usually about 2 to 4μ in length and about half as broad as they are long. They are stained by Gram's method and readily by most of the aniline dyes, are ciliated, and do not liquefy gelatine. They flourish specially well alongside moulds, in the dark, in badly-ventilated, warm, moist places, and remain alive for some time in sea-water: these facts, as Sanarelli points out, may afford an explanation of the special persistence of yellow fever in old, badly-ventilated ships, and in dark, dirty and insanitary sea-coast towns. Once the organism, whatever it may be, finds its way into the system, it soon makes its presence felt, and toxic symptoms are developed. The temperature rises; the pulse, at first rapid, gradually slows down; and after some time persistent vomiting of bile comes on. At the end of three or four days the temperature and pulse fall, and there is a period during which the patient appears comparatively well; this is followed in a few hours by icterus and scanty secretion of urine. There may be actual anuria, or the small quantity of urine passed may be loaded with casts and albumen; delirium, convulsions and haemorrhages from all the mucous surfaces may now occur, or secondary infections of various kinds, boils, abscesses, suppurations and septicaemia, may result. These often prove fatal when the patient appears to be almost convalescent from the original disease. As regards prognosis, it has been found that the "lower the initial temperature the milder will the case be" (Macpherson). An initial temperature of 106° F. is an exceedingly unfavourable sign. Patients addicted to the use of alcohol are, as a rule, much more severely affected than are others. Treatment is principally directed towards prevention and towards the alleviation of symptoms, though Sanarelli has hopes that an "anti"-serum may be useful. More recently S. Flexner, working with the American Commission, isolated another organism, which, he maintains, is the pathogenetic agent in the production of yellow fever; whilst Durham and Myers maintain that a small bacillus previously observed by G. M. Sternberg and others is the true cause of this disease.

Professor Boyce, enumerating the hypotheses as to the cause of yellow fever, points out that as in the case of malaria, suspicion turned to "that form of Miasm which was supposed to arise from the mixture, in a marsh or on a mud flat, of salt with fresh water." It was early recognized that yellow fever was not carried directly from person to person, but little of definite character was known as to the poison and the method of its dissemination, and Fergusson states that "it is a terrestrial poison which high atmospheric heat generates amongst the newly arrived, and without that heat it cannot exist." The following passage from Beauperthuy (see his collected papers published in 1891) is quoted by Boyce: "But rubbish! the small amount of sulphuretted hydrogen or marsh gas which might arise from a marsh could not possibly hurt a fly, much less a man. It is not that, it is a mosquito called in Cumana the 'Zancudo bobo,' the striped or domestic mosquito." Beauperthuy, recently as he wrote, then stood almost alone in this opinion. Now we know that yellow fever, in common with other specific diseases, is caused by the action of an organized virus. The search for a vegetable parasite, bacillus or micrococcus, as above indicated, has been very close and strenuous, but it may now be held that up to the present no bacillus or micrococcus, well authenticated as capable of causing yellow fever, has been discovered. Latterly a search has been made for protozoal organisms, organisms similar to those present in the blood of malarious patients and like conditions, or for spirochaetes similar to those associated with relapsing fever, and Boyce draws attention to the fact that a spirochaete has recently been identified in the tissues taken from cases of yellow fever. It has however been demonstrated that the virus, whatever it may be, is carried by a species of mosquito; this seems to favour the protozoan hypothesis, especially as it is found that the *Stegomyia fasciata*, Fab. (or *S. calopus*, Meig.), after taking the blood from an infected patient is not infective immediately but only becomes capable of infecting by its bite at the end of twelve days. It would appear therefore that residence in this mosquito is necessary for the material to become fully infective. During this period some special metamorphosis may occur, and metamorphosis essential to the development of the parasite, or, on the other hand, the time may be required for it to make its way to some position from which it may emerge from the mosquito when that insect "strikes." In the interval between the bite of an infected Stegomyia and the appearance of the disease (5 or 6 days) the blood of the patient contains a virus which, when taken into the mosquito, may develop into the infective material; moreover, this virus persists alive and active for three days after the disease is fully developed, but at the end of this time it disappears, so far, at any rate, as its infective power is concerned, from the blood, secretions and tissues of the patient. Further, there is no evidence that the infective virus is ever transmitted directly from the patient in secretions or in fact in anything but blood or blood-serum. The infective material, then, is present in the human subject for about eight days, during which the blood and even the blood-serum may serve as a vehicle for the infective agent. If during this period the patient is bitten by the Stegomyia the mosquito cannot distribute the infection for twelve days, but after this the power of transmitting reinfection persists for weeks and even months during cold weather when the insect is torpid. As soon, however, as the warm weather comes round and the mosquito becomes active and again begins to bite there is evidence that it still maintains its power of transmitting infection; indeed Boyce states that mosquitos infected in one year are capable of transmitting infection and starting a fresh epidemic in the following warm season. When it is remembered that a mosquito by a single bite is capable of setting up an attack of the disease, we see how important is this question.

The Stegomyia, known as the domestic or house mosquito, is spoken of as the "Tiger" mosquito, "Scots' Grey," or "Black and White Mosquito," from the fact that there is "a lyre-shaped pattern in white on the back of the thorax, transverse white bands on the abdomen, and white spots on the sides of the thorax; while the legs have white bands with the last hind tarsal joint also white" (Boyce). It is also spoken of as the "cistern mosquito," as it breeds in the cisterns, barrels, water butts, &c., containing the only water-supply of many houses. It may pass through its various stages of development in any small vessels, but the larvae are not usually found in natural collections of water, such as gutters, pools or wells, if the ovipositing insect can gain access to cleaner and purer water.

The egg of the Stegomyia deposited on the water develops in from 10 to 20 hours into the larval form, the so-called "wiggle-waggle." It remains in this stage for from 1 to 8 days, then becomes a pupa, and within 48 hours becomes a fully developed mosquito. The larvae can only develop if they are left in water, though a very small amount of water will serve to keep them alive. The eggs on the other hand are very resistant, and even when removed from water may continue viable for as long a period as three months. The Stegomyia affects clean water-butts and cisterns by preference. Consequently its presence is not confined to unhygienic districts; they may, however, "seek refuge for breeding purposes in the shallow street drains and wells in the town." The Stegomyia does not announce its advent and attack by a "ping" such as that made by the Anopheles, it works perfectly noiselessly and almost ceaselessly (from 3 p.m. to early morning) so that any human beings in its neighbourhood are not safe from its attacks either afternoon or night.

The most important prophylactic measures against the Stegomyia are ample mosquito nets "with a gauge of eighteen meshes to the inch" (Boyce), so arranged that the person sleeping may not come near the net; these nets should be used not only at night but at the afternoon siesta. Then the living room should be screened against the entrance of these pests, thorough ventilation should be secured; and all pools and stagnant waters, especially in the neighbourhood of houses, should be drained, water-butts and cisterns should be screened and all stagnant waters oiled with kerosene or petroleum, where drainage is impossible. What has been done through the carrying out of these and similar measures may be gathered from the record of the Panama Canal. In 1884 the French Panama Canal Company, employing from 15,000 to 18,000 men, lost by death 60 per 1000 annually (in 1885 over 70 per 1000). In 1904, when the Americans had taken over the work of construction, Col. W. C. Gorgas undertook to clear the country of the Stegomyia, and within two or three years yellow fever had been eradicated. The death-rate from malaria was also greatly diminished, and by the end of 1907 the death-rate per annum amongst 45,000 workers was only 18 per 1000, a lower death-rate than is met with in many large English towns. Similar examples might be cited from other places, but the above is sufficiently striking to carry conviction that the methods employed in carrying on the warfare against tropical diseases have been attended with unexampled success. These diseases, at one time so greatly feared, are now so much under control that some one has said "ere long we shall be sending our patients to the tropics in search of a health resort."

Weil's disease, a disease which may be considered along with acute yellow atrophy and yellow fever, is one in which there is an acute febrile condition, associated with jaundice, inflammation of the kidney and enlargement of the spleen. It appears to be a toxic condition of a less acute character, however, than the other two, in which the functions and structure of the liver and kidney are specially interfered with. There is a marked affection of the gastro-intestinal system, and the nervous system is also in some cases profoundly involved. Haemorrhage into the mucous and serous membranes is a marked feature. The liver cells and kidney epithelium undergo fatty changes, though in the earlier stages there is a cloudy swelling, probably also toxic in origin. Organisms of the Proteus group, which appear to have the power, in certain circumstances, of forming toxic substances in larger quantities than can be readily destroyed by the liver, and which then make their appearance in the kidney and spleen, are supposed to be the cause of this condition.

Diphtheria.—In regard to no disease has medical opinion undergone greater modification than it has in respect of diphtheria. Accurately applied, bacteriology has here gained one of its greatest triumphs. Not only have the aetiology and diagnosis of this disease been made clear, but knowledge acquired in connexion with the production of the disease has been applied to a most successful method of treatment. In 1875 Klebs described a small bacillus with rounded ends, and with, here and there, small clear unstained spaces in its substance. He, however, also described streptococci as present in certain cases of diphtheria, and concluded that there must be two kinds of diphtheria, one associated with each of these organisms. In 1883 he again took up the question; and in the following year Loeffler gave a systematic description of what is now known as the Klebs-Loeffler bacillus, which was afterwards proved by Roux and Yersin and many other observers to be the *causa causans* of diphtheria. This bacillus is a slightly-curved rod with rounded, pointed, or club-shaped end or ends (see Plate II. fig 9). It is usually from 1·2 to 5μ or more in length and from 0·3 to 0·5μ in breadth; rarely it may be considerably larger in both dimensions. It is non-motile, and may exhibit great variety of form, according to the age of the culture and the nature of the medium upon which it is growing. It is stained by Gram's method if the decolorizing process be not too prolonged, and also by Loeffler's methylene-blue method. Except in the very young forms, it is readily recognizable by a series of transverse alternate stained and unstained bands. The bacillus may be wedge-shaped, spindle-shaped, comma-shaped or ovoid. In the shorter forms the polar staining is usually well marked; in the longer bacilli, the transverse striation. Very characteristic club-shaped forms or branching filaments are met with in old cultures, or where there is a superabundance of nutritive material. In what may be called the handle of the club the banded appearance is specially well marked. These specific bacilli are found in large numbers on the surface of the diphtheritic membrane (Plate II. fig. 10), and may easily be detached for bacteriological examination. In certain cases they may be found by direct microscopic examination, especially when they are stained by Gram's method, but it is far more easy to demonstrate their presence by the culture method. On Loeffler's special medium the bacilli flourish so well at body-temperature—about 37° C.—that, like the cholera bacillus, they outgrow the other organisms present, and may be obtained in comparatively pure culture. Distinct colonies may often be found as early as the eighth or twelfth hour of incubation; in from eighteen to twenty-four hours they appear as rounded, elevated, moderately translucent, greyish white colonies, with a yellow tinge, the surface moist and the margins slightly irregular or scalloped. They are thicker and somewhat more opaque in the centre. When the colonies are few and widely separated, each may grow to a considerable size, 4 to 5 mm.; but when more numerous and closer together, they remain small and almost invariably discrete, with distinct intervals between them. In older growths the central opacity becomes more marked and the crenation more distinct, the moist, shiny appearance being lost. When the surface of the serum is dry, the growth, as a rule, does not attain any very large size.

These "pure" colonies, when sown in slightly alkaline broth, grow with great vigour; and if a small amount of such a 48 hours' culture be injected under the skin of a guinea-pig, the animal succumbs, with a marked local reaction and distinct symptoms of toxic poisoning very similar to those met with in cases of diphtheria of the human subject. Roux and Yersin demonstrated that the poison was not contained in the bodies of the bacilli, but that it was formed and thrown out by them from and into the nutrient medium. Moreover, they could produce all the toxic symptoms, the local reactions, and even the paralysis which often follows the disease in the human subject, by injecting the culture from which they had previously removed the whole of the diphtheria bacilli by filtration. This cultivation, then, contains a poisonous material, which, incapable of multiplying in the tissues, may be given in carefully graduated doses. If, therefore, there is anything in the theory that tissues may be gradually "acclimatized" to the poisons of these toxic substances, they saw that it should be possible to prove it in connexion with this disease. Behring, going still further, found that the tissues so acclimatized have the power of producing a substance capable of neutralizing the toxin, a substance which, at first confined to the cells, when formed in large quantities overflows into the fluids of the blood, with which it is distributed throughout the body. The bulk of this toxin-neutralizing substance remains in the blood-serum after separation of the clot. In proof of this he showed that (1) if this serum be injected into an animal before it is inoculated with even more than a lethal dose of the diphtheria bacillus or its products, the animal remains perfectly well; (2) a certain quantity of this serum, mixed with diphtheria toxin and injected into a guinea-pig, gives rise to no ill effects; and (3) that even when injected some hours after the bacillus or its toxins, the serum is still capable of neutralizing the action of these substances. In these experiments we have the germ of the present antitoxic treatment which has so materially diminished the percentage mortality in diphtheria. This serum may also be used as a prophylactic agent.

The antitoxic serum as now used is prepared by injecting into the subcutaneous tissues of a horse the products of the diphtheria bacillus. The bacillus, grown in broth containing peptone and blood-serum or blood-plasma, is filtered and heated to a temperature of 68° or 70° C. for one hour. It then contains only a small amount of active toxin, but injected into the horse it renders that animal highly insusceptible to the action of strong diphtheria toxins, and even induces the production of a considerable amount of antitoxin. This production of antitoxin, however, may be accelerated by subsequent repeated injections, with increasing doses of strong diphtheria toxin, which may be so powerful that ⅙ to ⅛ of a drop, or even less, is a fatal dose for a medium-sized guinea-pig. The antitoxic serum so prepared may contain 200, 400, 600 or even more "units" of antitoxin per c.c.—the unit being that quantity of antitoxin that will so far neutralize 100 lethal doses (a lethal dose is the smallest quantity that will kill a 250-gramme guinea-pig on the fifth day) of toxin for a 250-gramme guinea-pig, that the animal continues alive on the fifth day from the injection. This, however, is a purely arbitrary standard of neutralizing power, as it is found that, owing to the complicated structure of the toxin, the neutralizing and the lethal powers do not always go hand in hand; but as the toxin used in testing the antitoxin is always compared with the original standard, accurate results are easily obtained.

Diphtheria, though still prevalent in cities, has now lost many of its terrors. In the large hospitals under the Metropolitan Asylums Board the death-rate fell from nearly 40% in 1889 to under 10% in 1903; and if antitoxin be given as soon as the disease manifests itself, the mortality is brought down to a very insignificant figure. It has been maintained that as soon as antitoxin came into use the number of cases of paralysis increased rather than diminished. This may be readily understood when it is borne in mind that many patients recover under the use of antitoxin who would undoubtedly have succumbed in the pre-antitoxin days; and it cannot be too strongly insisted that although the antitoxin introduced neutralizes the free toxin and prevents its further action on the tissues, it cannot entirely neutralize that which is already acting on the cells, nor can it make good damage already done before it is injected. Even allowing that antitoxin is not accountable for the whole of the improvement in the percentage mortality statistics since 1896, it has undoubtedly accounted for a very large proportion of recoveries. Antitoxin often cuts short functional albuminuria, but it cannot repair damage already done to the renal epithelium before the antitoxin was given. The clinical evidence of the value of antitoxin in the relief that it affords to the patient is even more important than that derived from the consideration of statistics.

The diphtheria bacillus or its poison acts locally as a caustic and irritant, and generally or constitutionally as a protoplasmic poison, the most evident lesions produced by it being degeneration of nerves and muscles, and, in acute cases, changes in the walls of the blood-vessels. Other organisms, streptococci or staphylococci, when present, may undoubtedly increase the mortality by producing secondary complications, which end in suppuration. Diphtheria bacilli may also be found in pus, as in the discharges from cases of otorrhoea.

Tetanus (*Lockjaw*).—Although tetanus was one of the later diseases to which a definite micro-organismal origin could be assigned, it has long been looked upon as a disease typical of the "septic" group. In 1885 Nicolaier described an organism multiplying outside the body and capable of setting up tetanus, but this was only obtained in pure culture by Kitasato, a Japanese, and by the Italians in 1889. It has a very characteristic series of appearances at different stages of its development. First it grows as long, very slender threads, which rapidly break up into shorter sections from 4 to 5μ in length (see Plate II. fig. 11). In these shorter rods spores may appear on the second or up to the seventh day, according to the temperature at which the growth occurs. The rods then assume a very characteristic pin or drumstick form; they are non-motile, are somewhat rounded at the ends, and at one end the spore, which is of greater diameter than the rod, causes a very considerable expansion. Before sporulation the organisms are distinctly motile, occurring in rods of different lengths, in most cases surrounded by bundles of beautiful flagella, which at a later stage are thrown off, the presence of flagella corresponding very closely with the "motile" period. The bacillus grows best at the temperature of the body; it becomes inactive at 14° C. at the one extreme, and at from 42° to 43° C. at the other; in the latter case involution forms, clubs and branching and degenerated forms, often make their appearance. It is killed by exposure for an hour to a temperature of from 60° to 65° C.; the spores however are very resistant to the action of heat, as they withstand the temperature of boiling water for several minutes. The organism has been found in garden earth, in the excrement of animals—horses—and in dust taken from the streets or from living-rooms, especially when it has been allowed to remain at rest for a considerable period. It has also been demonstrated in, and separated from the pus of wounds (see Plate II. fig. 12) in patients suffering from lockjaw, though it is then invariably found associated with the micro-organisms that give rise to suppuration.

It is important to remember that this bacillus is a strict anaërobe, and can only grow when free oxygen has been removed from the cultivation medium. It may be cultivated in gelatine to which has been added from 2 to 3% of grape-sugar, when, along the line of the stab culture, it forms a delicate growth, almost like a fir-tree, the tip of which never comes quite to the surface of the gelatine. The most luxuriant growth—evidenced by the longest branches—occurs in the depth of the gelatine away from free oxygen. After a time the gelatine becomes sticky, and then undergoes slow liquefaction, the growth sinking and leaving the upper layers comparatively clear. This organism is not an obligate parasite, but a facultative; it may grow outside the body and remain alive for long periods.

Lockjaw is most common amongst agricultural labourers, gardeners, soldiers on campaign, in those who go about with bare feet, or who, like young children, are liable to get their knees or hands accidentally wounded by rough contact with the ground. Anything which devitalizes the tissues—such as cold, bruising, malnutrition, the action of other organisms and their products—may all be predisposing factors, in so far as they place the tissue at a disadvantage and allow of the multiplication and development of the specific bacillus of tetanus. In order to produce the disease, it is not sufficient merely to inoculate tetanus bacilli, especially where resistant animals are concerned: they must be injected along with some of their toxins or with other organisms, the presence of which seems to increase the power of, or assist, the tetanus organism, by diverting the activity of the cells and so allowing the bacillus to develop. The poison formed by this organism resembles the enzymes and diphtheria poison, in that it is destroyed at a temperature of 65° C. in about five minutes, and even at the temperature of the body soon loses its strength, although, when kept on ice and protected from the action of light, it retains its specific properties for months. Though slowly formed, it is tremendously potent, $\frac{1}{250000}$ part of a drop (the five-millionth part of a c.c.) of the broth in which an active culture has been allowed to grow for three weeks or a month being sufficient to kill a mouse in twenty-four hours, $\frac{1}{250}$ of a drop killing a rabbit, $\frac{1}{25}$ a dog, or $\frac{1}{10}$ of a drop a fowl or a pigeon; it is from 100 to 400 times as active as strychnine, and 400 times as poisonous as atropine. It has been observed that, quite apart from size, animals exhibit different degrees of susceptibility. Frogs kept at their ordinary temperature are exceedingly insusceptible, but when they are kept warm it is possible to tetanize them, though only after a somewhat prolonged incubation period, such as is met with in very chronic cases of tetanus in the human subject. In experimentally-produced tetanus the spasms usually commence and are most pronounced in the muscles near the site of inoculation. It was at one time supposed that this was because the poison acted directly upon the nerve terminations, or possibly upon the muscles; but as it is now known that it acts directly on the cells of the central nervous system, it may, as in the case of rabies, find its way along the lymphatic channels of the nerves to those points of the central nervous system with which these nerves are directly connected, spasms occurring in the course of the muscular distribution of the nerves that receive their impulses from the cells of that area. As the amount of toxin introduced may be contained in a very small quantity of fluid and still be very dilute, the local reaction of the connective-tissue cells may be exceedingly slight; consequently a very small wound may allow of the introduction of a strong poisonous dose. Many of the cases of so-called idiopathic tetanus are only idiopathic because the wound is trifling in character, and, unless suppuration has taken place, has healed rapidly after the poison has been introduced. In tetanus, as in diphtheria, the organisms producing the poison, if found in the body at all, are developed only at the seat of inoculation; they do not make their way into the surrounding tissues. In this we have an explanation of the fact that all the earlier experiments with the blood from tetanus patients gave absolutely negative results. It is sometimes stated that the production of tetanus toxin in a wound soon ceases, owing to the arrest of the development of the bacillus, even in cases that ultimately succumb to the disease. Roux and Vaillard, however, maintain that no case of tetanus can be treated with any prospect of success unless the focus into which the bacilli have been introduced is freely removed. The antitetanus serum was the first antitoxic serum produced. It is found, however, that though the antitetanic serum is capable of acting as a prophylactic, and of preventing the appearance of tetanic symptoms in animals that are afterwards, or simultaneously, injected with tetanus toxin, it does not give very satisfactory results when it is injected after tetanic symptoms have made their appearance. It would appear that in such cases the tetanus poison has become too firmly bound up with the protoplasm of the nerve cells, and has already done a considerable amount of damage.

(*b*) *More Chronic Infective Diseases* (*Tissue Parasites*).

Tuberculosis.—In no quarter of the field of preventive medicine have more important results accrued from the discovery of a specific infective organism than in the case of Koch's demonstration and separation in pure culture of the tubercle bacillus and the association of this bacillus with the transmission of tuberculosis. In connexion with diagnosis—both directly from observation of the organism in the sputum and urine of tuberculous patients, and indirectly through the tuberculin test, especially on animals—this discovery has been of very great importance; and through a study of the life-history of the bacillus and its relation to animal tissues much has been learned as to the prevention of tuberculosis, and something even as to methods of treatment. One of the great difficulties met with in the earlier periods of the study of this organism was its slow, though persistent, growth. At first cultivations in fluid media were not kept sufficiently long under observation to allow of its growth; it was exceedingly difficult to obtain pure cultures, and then to keep them, and in impure cultures the tubercle bacilli were rapidly overgrown. Taken directly from the body, they do not grow on most of the ordinary media, and it was only when Koch used solidified blood-serum that he succeeded in obtaining pure cultures. Though they may now be demonstrated by what appear to be very simple methods, before these methods were devised it was practically impossible to obtain any satisfactory results.

The principle involved in the staining of the tubercle bacillus is that when once it has taken up fuchsin, or gentian violet, it retains the stain much more firmly than do most organisms and tissues, so that if a specimen be thoroughly stained with fuchsin and then decolorized by a mineral acid—25% of sulphuric acid, say—although the colour is washed out of the tissues and most other organisms, the tubercle bacilli retain it; and even after the section has been stained with methylene-blue, to bring the other tissues and organisms into view, these bacilli still remain bright red, and stand out prominently on a blue background. If a small fragment of tuberculous tissue be pounded in a sterile mortar and smeared over the surface of inspissated blood-serum solidified at a comparatively low temperature, and if evaporation be prevented, dry scaly growths make their appearance at the end of some fourteen days. If these be reinoculated through several generations, they ultimately assume a more saprophytic character, and will grow in broth containing 5% of glycerin, or on a peptone beef-agar to which a similar quantity of glycerin has been added. On these media the tubercle bacillus grows more luxuriantly, though after a time its virulence appears to be diminished. On blood-serum its virulence is preserved for long periods if successive cultivations be made. It occurs in the tissues or in cultivations as a delicate rod or thread $1{\cdot}5$ to $3{\cdot}5\mu$ in length and about $0{\cdot}2$ to $0{\cdot}5\mu$ in thickness (see Plate II., fig. 15). It is usually slightly curved, and two rods may be arranged end to end at an open angle. There is some doubt as to whether tubercle bacilli contain spores, but little masses of deeply-stained protoplasm can be seen, alternating with clear spaces within the sheath; these clear spaces have been held to be spores. This organism is found in the lungs and sputum in various forms of consumption; it is met with in tuberculous ulcers of the intestine, in the lymph spaces around the vessels in tuberculous meningitis, in tuberculous nodules in all parts of the body, and in tuberculous disease of the skin—lupus. It is found also in the tuberculous lesions of animals; in the throat-glands, tonsils, spleen and bones of the pig; in the spleen of the horse; and in the lungs and pleura of the cow. Tuberculosis may be produced artificially by injecting the tubercle bacillus into animals, some being much more susceptible than others. Milk drawn from an udder in which there are breaking-down tuberculous foci, may contain an enormous number of active tubercle bacilli; and pigs fed upon this milk develop a typical tuberculosis, commencing in the glands of the throat, which can be traced from point to point, with the utmost precision. It must be assumed that what takes place in the pig may also take place in the human subject; and a sufficient number of cases are now on record to show that the swallowing of tuberculous material is a cause of tuberculosis, especially amongst children and adolescents. Inhaled tubercle bacilli from the recently-dried sputum of phthisical patients, like milk derived from tuberculous udders, may set up tuberculosis of the lungs or of the alimentary tract, especially when the epithelial layer is unhealthy or imperfect. The two main causes of the prevalence of tuberculosis in the human subject are: (1) tubercle bacilli may become so modified that they can flourish saprophytically; as yet it has not been possible to trace the exact conditions under which they live, but we are gradually coming to recognize that, although when they come from the body they are almost obligate parasites, they may gradually acquire saprophytic characters. (2) Many of the domestic animals are readily infected with tuberculosis, and in turn may become additional centres from which infection may radiate.

Koch's tuberculin has been of inestimable value in the early diagnosis of tuberculosis, especially in animals.

Tuberculin, from which the tuberculin test derives its name, consists of the products of the tubercle bacillus when grown for a month or six weeks in peptone meat-broth to which a small proportion, say 5 or 6%, of glycerin has been added. The tubercle bacilli are then killed at boiling-temperature, and are partially removed by sedimentation, and completely by filtration through a Berkfeld or Pasteur-Chamberland filter. If a large dose of this filtered fluid be injected under the skin of a healthy man or brute, it is possible to produce some local swelling and to induce a rise of temperature; but in a similar patient suffering from tuberculosis a very much smaller dose (one which does not affect the healthy individual in the slightest degree) is sufficient to bring about the characteristic swelling and rise of temperature. To obtain trustworthy results the dosage must always be carefully attended to. The reaction is only obtained under certain well-defined conditions. Driven animals seldom, if ever, react properly. Cattle to be tested should be allowed to remain at rest for some time; they should be well fed, and be carefully protected from cold or draughts. After an injection of tuberculin into the subcutaneous tissues (usually in front of the shoulder or on the chest-wall) they should be kept under the same conditions and should be watched very carefully; the temperature should be taken at the sixth hour, and every three hours afterwards up to the twenty-first or even twenty-fourth hour. If during this time the temperature rises to 104° F., there can be little doubt that the animal is tuberculous; but if it remains under 103°, the animal must be considered free from disease: if the temperature remains between these points the case is a doubtful one, and, according to Sir John M'Fadyean, should be retested at the end of a month. It is interesting to note that the test is not trustworthy in the case of animals in which tuberculosis is far advanced, especially when the temperature is already high—103° F. In such cases, however, it is an easy matter to diagnose the disease by the ordinary clinical methods. At first objections were raised to this test on two grounds: (1) that mistakes in diagnosis are sometimes made; (2) that tuberculin may affect the milk of healthy animals into which it is injected. As the methods of using the tuberculin have been perfected, and as the conditions under which the reaction is obtained have become better known, mistakes have rapidly become fewer; whilst it has been amply proved that tuberculin has not the slightest deteriorating effect on the quality of the milk.

Tuberculin and similar substances are sometimes used as specific reagents in the diagnosis of tuberculosis in the human subject. When small quantities of old tuberculin are injected subcutaneously into a tuberculous patient in whom, however, no tubercle bacilli may be demonstrable, the temperature begins to rise in six or eight hours and continues to rise for twelve hours or, in rare cases, for an even longer period, a rise of a single degree being considered sufficient to indicate the presence of the disease. Along with this there is usually some swelling and tenderness, with perhaps redness at the seat of injection, whilst there is also some evidence of a vascular congestion in the neighbourhood of any tuberculous lesion. A second method of applying tuberculin as a diagnostic reagent is that of Pirquet, who, after diluting old tuberculin with two parts of normal saline solution and one part of 5% carbolic glycerin, places a drop of the mixture on the skin and scrapes away the epidermis in lines with "a small dental burr." The skin is similarly treated with normal saline some 2 or 3 in. away from that at which the tuberculin is used. In the tuberculin area a little papule develops; this may become a vesicle, surrounded by slight redness and swelling (in the "saline" area nothing of the kind appears). The swelling begins about six hours after the scarification is made and continues to increase for 24 hours. Reactions, however, are obtained by this test in patients who are not suffering from any active tubercular lesion, whilst on the other hand in certain cases it fails to indicate the presence of tubercle when it is undoubtedly there. Calmette's or Wolff-Eisner's ophthalmic reaction test, a third method of using tuberculin, consists in dropping a weak solution of tuberculin into the conjunctival sac of one eye; this is followed by a mild attack of conjunctivitis or inflammation of the eye in the tuberculous patient, whilst in the normal patient no such inflammation should appear. Although this test appears to be of considerable value, it fails to give any information in cases of advanced tuberculosis, of general miliary tuberculosis and of tuberculous meningitis. It certainly possesses one great advantage over the others—it does not give any reaction in the presence of dormant tubercle in persons clinically sound and healthy. The inflammation of the eye may, however, be so acute, especially where strong solutions of tuberculin are used, that considerable damage may be done, more especially should there be any dormant disease of the eye. It must be remembered that in all these tests the exhibition of tuberculin increases for a time the sensitiveness of the patient each time it is administered. It sets up a negative phase, as already described, and renders the patient more susceptible to the action of a fresh dose. It is evident, therefore, that the careful worker wishing to obtain minimal effects will give small doses and gradually repeat these as he may find necessary.

In 1890 Koch, whose brilliant researches on tuberculosis had opened up a new field of investigation and had inspired new hope in the breasts of patients and physicians alike, followed up his method of diagnosis with a method of vaccination with the products of the tubercle bacillus separated from glycerinated broth culture after the vitality of the bacilli had been destroyed. As is frequently the case with new remedies, this was used so indiscriminately that it soon fell into disrepute. The results in certain cases, however, were so successful that careful investigations into the character and action of tuberculin and into the conditions under which it may be used with advantage were undertaken. Tuberculins composed of the triturated bodies of tubercle bacilli, of the external secretions of these bacilli, and of their various constituents in different combinations, were experimented with, but at the present time Koch's two tuberculins—especially his new tuberculin—hold the field. The "old tuberculin" consists of the glycerin broth culture of the tubercle bacilli mentioned above. The new tuberculin consists of the centrifugalized deposit from a saline solution of the extract of the triturated dead tubercle bacilli; this is stored in small tubes, each containing two milligrammes of solid substance. This is diluted with distilled water containing 20% of glycerin, great care being taken to maintain the sterility of the solution. The dose is usually from $\frac{1}{2000}$ to $\frac{1}{1000}$ of a milligramme for an adult, increasing to $\frac{1}{600}$; according to Sir A. Wright it should not go beyond this.

Perhaps no one has done more to rehabilitate the tuberculin treatment than Sir Almroth Wright, who after a long series of experiments devised what he called the tuberculo-opsonic index, about which a few words may be of interest. It is well-known that certain cells in the human blood have the power of taking bacteria into their substance and there digesting them. This, the so-called "phagocytic power" of Metchnikoff, was found to vary somewhat under different conditions, and Wright set himself to determine, if possible, what were the factors that modified this variability. He found that the white blood corpuscles, the polymorphonuclear cells, whether from healthy or tuberculous patients, always showed practically the same phagocytic activity when mixed with a fine emulsion of tubercle bacilli and the serum from a healthy patient. If, however, corpuscles from the same individuals, whether healthy or tuberculous, were allowed to act upon the bacilli in the presence of serum drawn from a tuberculous patient, one of three things might happen: (1) the bacilli might be taken up in smaller numbers than in the above series of experiments; (2) they might be taken up in larger numbers; or (3) they might be taken up in what might be called normal numbers. In (1) and (2) Wright holds there is evidence of a tuberculous condition, in (3) of course the evidence is negative. He found, however, that when a dose of tuberculin was injected into a tuberculous patient there was a distinct fall in the number of tubercle bacilli taken up by the leucocytes treated with the serum of the patient. This condition Wright speaks of as the "negative phase." Increased phagocytic activity of the cells is associated with what is spoken of as the positive phase. The theory is that the blood serum has the power of preparing bacteria to be eaten by the phagocytes in the same sense that boiling, say, prepares food for ready digestion by the human subject, and Wright applied the term *opsonin* to the unknown constituent or complex of constituents of the serum that exerts this action upon the bacteria. The opsonic index is obtained by comparing the average number of bacilli taken up by, say, 100 leucocytes, to which the serum from a tuberculous patient has been added, with the number of bacteria taken up by a hundred similar corpuscles to which normal serum has been added, the ratio between the two giving the opsonic index. Wright maintains that after the injection of small doses of tuberculin during a negative phase which first appears, *i.e.* whilst there is a fall in the number of bacilli taken up by the leucocytes of the blood, the patient is more susceptible than before to the attacks of the tubercle bacillus. Following this, however, there is a gradual rise in the opsonic index until it passes the normal and the patient enters a positive phase, during which the susceptibility to the attacks of the tubercle bacillus is considerably diminished. When the effects of this dose are passing off a fresh injection should be made; this again induces a negative phase, but one that should not be so marked as in the first instance, whilst the positive phase which succeeds should be still more marked than that first obtained. If this can be repeated systematically and regularly the patient should begin, and continue, to improve. The difficulties involved in the determination of the opsonic index are, however, exceedingly great, and the personal factor enters so largely into the question that some observers are very doubtful as to the practical utility of this method. In Wright's hands, however, and in the hands of those who work with him, very satisfactory results are obtained. The tuberculin treatment, fortunately, does not stand or fall by the success of the opsonic index determination, especially as most valuable information as to the course of the disease and the effects of the tuberculin may be obtained by a study of the daily temperature chart and of the general condition of the patient.

Tuberculin should not be injected more frequently than about once in 10 or 14 days, and it is well not to increase the dose too rapidly. Wherever the temperature continues high, even a degree beyond normal, and where the pulse is over 100, it is not wise to give tuberculin, nor does it seem to be of any great value where the disease is making rapid headway or has become generalized, especially where there is meningitis or bleeding from the lungs.

It is interesting to note, in connexion with the diagnostic significance of the opsonic index, that in non-tuberculous subjects the administration of a small dose of tuberculin is followed by no negative phase such as is met with in the tuberculous subject. The phagocytic power of the white blood corpuscles is determined by noting the number of organisms taken up by the leucocytes when mixed with equal parts of a standard emulsion of tubercle bacilli and blood serum incubated in fine glass tubes for 15 minutes at a temperature of 37° C. If the period of incubation is much shorter than this the results are irregular, whilst if the period is longer so many organisms are taken up that it becomes impossible to differentiate two sets of sera.

As an example we might adduce the following. Taking a tuberculous patient's serum + leucocytes + tubercle bacilli, let us say we have an average of 1·8 bacilli per leucocyte in 50 or 100 leucocytes counted; with normal serum + corpuscles + tubercle bacilli the average number of bacilli per leucocyte in the same number of cells counted is 3. From these figures the opsonic index obtained is $1{\cdot}8 \div 3 = 0{\cdot}6$ = opsonic index.

Leprosy.—Armauer Hansen in 1871, and Neisser in 1881, described a "leprosy bacillus" corresponding in size and in certain points of staining reaction to the tubercle bacillus, and it is now generally accepted that this bacillus is the direct and specific causal agent of leprosy. The discovery of this organism paved the way for the proof that the tubercular and anaesthetic forms of leprosy are essentially the same disease, or rather are the manifestations of the action of a common organism attacking different series of tissues.

To demonstrate the presence of the leprosy bacillus, tie an indiarubber ring firmly around the base of one of the leprosy tubercles. As soon as the blood is driven out, leaving the nodule pale, make a puncture with the point of a sharp knife. From this puncture a clear fluid exudes; this, dried on a cover-glass, stained with carbol-fuchsin, and rapidly decolorized with a weak mineral acid, shows bacilli stained red and very like tubercle bacilli; they differ from that organism, however, in that they are somewhat shorter, and that if the acid be too strong or be allowed to act on them for too long a time, the colour is discharged from them much more readily. These organisms, which are from 4 to 6μ in length and 0·3μ in breadth, are as a rule more rigid and more pointed than are the tubercle bacilli (see Plate II., fig. 16). It is doubtful whether they form spores. They are found in large numbers lying embedded in a kind of gelatinous substance in the lymphatics of the skin, in certain cells of which they appear to be taken up.

It is curious that these bacilli affect specially the skin and nerves, but rarely the lungs and serous membranes, thus being in sharp contrast to the tubercle bacillus, which affects the latter very frequently and the former more rarely. They are seldom found in the blood, though they have been described as occuring there in the later stages of the disease. It is stated that leprosy has been inoculated directly into the human subject, the patient dying some five or six years after inoculation; but up to the present no pure culture of the leprosy bacillus has been obtained; it has therefore been impossible to produce the disease by the inoculation of the bacillus only. What evidence we have at our disposal, however, is all in favour of the transmissibility of the disease from patient to patient and through the agency of the leprosy bacillus. None of the numerous non-bacillary theories of leprosy account at all satisfactorily for this transmissibility of the disease, for its progressive nature, and for the peculiar series of histological changes that are met with in various parts and organs of the leprous body. Leprosy occurs in all climates. It is found where no fish diet can be obtained, and where pork and rice are never used, though to these substances has been assigned the power of giving rise to the disease. Locality appears to influence it but little, and with improved sanitation and increased cleanliness it is being gradually eradicated. The only factor that is common in all forms of leprosy, and is met with in every case, is the specific bacillus; and in spite of the fact that it has yet been found impossible to trace the method of transmission, we must from what is known of the presence and action of bacilli, in other diseases, especially in tuberculosis, assign to the leprosy bacillus the rôle of leprosy-producer, until much stronger evidence than has yet been obtained can be brought forward in favour of any of the numerous other causes that have been assigned. Two cases are recorded in which people have contracted leprosy from pricking their fingers with needles whilst sewing a leper's clothes; and a man who had never been out of Dublin is said to have contracted the disease by sleeping with his brother, a soldier who had returned from India suffering from leprosy.

Glanders.—Farcy in the human subject resembles the same disease experimentally produced in animals with material from a glandered animal, and as there is no pathological distinction between the two, from the aetiological standpoint, they may be considered together. If the pus from a glanders abscess be mixed with a little sterile saline solution and spread over the cut surface of a boiled potato kept at the body-temperature, bright yellow or honey-coloured, thick, moist-looking colonies grow very rapidly and luxuriantly. These colonies gradually become darker in colour, until they assume a *café-au-lait*, or even a chocolate, tint. On examining one of them microscopically, it is found to be made up of bacilli 2 to 5μ long and ⅕ to ⅛ of their own length broad (see Plate I., fig. 2 and fig. 6). The bacillus is usually straight or slightly curved and rounded at one end; it appears to be non-motile. As first pointed out by Loeffler and Schütz, when a portion of a culture is inoculated subcutaneously, typical farcy, with the acute septicaemia or blood-poisoning so characteristic of certain cases of glanders and farcy, is the result. The human subject is usually inoculated through wounds or scratches, or through the application of the nasal discharge of a glandered animal to the mucous membrane of the nose or mouth. Man is not specially susceptible to the glanders virus, but as he frequently comes into contact with glandered horses a considerable number of cases of farcy in man are met with, although amongst knackers it is a comparatively rare disease. Cattle never contract it by the ordinary channels, and even when inoculated exhibit nothing more than localized ulceration. The goat appears to occupy an intermediate position between cattle and the horse in this respect; in sheep, which are fairly susceptible the disease runs its course slowly, and appears to resemble chronic farcy in man. In rabbits and the dog the disease runs a very slow and modified course. Although field-mice are extraordinarily susceptible, white mice and house mice, unless previously fed on sugar or with phloridzin, are unaffected by inoculation of the glanders bacillus. The pigeon is the only bird in which glanders has been produced. Lions and tigers are said to contract the disease, and to take it in a very severe and rapidly fatal form. The glanders organism soon loses its virulence and even its vitality. Dry, it dies in about ten days; placed in distilled water, in about five days; but kept moist, or on culture media, it retains its vitality for about a month, although its activity soon becomes considerably lessened. These bacilli are readily killed at a temperature of 55° C.; they can pass through the kidneys, even when there is no lesion to be made out either with the naked eye or under the microscope (Sherrington and Bonome).

The glanders bacillus grows best in the presence of oxygen, but it may grow anaërobically; it then appears to have the power of forming toxin, either more in quantity or of greater activity than when it has access to a free supply of oxygen. This poison (mallein) is used for the purpose of diagnosing the presence of glanders. A cultivation is made in peptonized bouillon to which a small portion of glycerin has been added. The bacillus is allowed to grow and multiply at the temperature of the body for a month or six weeks; the organisms are then killed by heat and 0·5% carbolic acid is added. The cultivation is then filtered through a porcelain filter in order to remove the bodies of the bacilli, and the resulting fluid, clear and amber-coloured, should have the power, when injected in quantities of 1 c.c., of giving the specific reaction in an animal suffering from glanders; in a healthy animal 6 c.c. will give no reaction. The suspected animal should be kept at rest and in a warm stable for twenty-four to forty-eight hours before the test is applied. The temperature should be normal, as no proper reaction is obtained in an animal in which the temperature is high. This reaction, which is a very definite one, consists in a rise of temperature of from 2° to 4° F., and the appearance of a swelling of from 3 to 4 in. in diameter and from 1 to 1½ in. in height, before the sixteenth or eighteenth hour; this swelling should continue to increase for some hours. It has been suggested that the injection of $\frac{1}{20}$ to $\frac{1}{15}$ c.c. of mallein, at intervals of two or three days, may be used with advantage in the treatment of glanders. Glandered horses seem to improve under this treatment, and then certainly do not react even to much larger doses of mallein. The mallein test has revealed the fact that glanders is a far more common and more widespread disease than was at one time supposed.

II.—To Higher Vegetable Parasites

Actinomycosis.—This disease is very prevalent in certain low-lying districts, especially amongst cattle, giving rise to the condition known as "sarcoma," "wooden tongue," "wens," "bony growths on the jaw," &c. It is characterized by the presence of a fungus, which, at first growing in the form of long slender threads that may be broken up into short rods and cocci, ultimately, as the result of a degenerative process, assumes the form of a "ray-fungus," in which a series of club-like rays are arranged around a common centre (see Plate I., fig. 8). It is probably a streptothrix—*Streptothrix Försteri.* Numerous cases have been observed in the human subject. Suppuration and the formation of fistulous openings, surrounded by exuberant granulations, "proud flesh," usually supervene where it is growing and multiplying in the tissues of the human body, and in the pus discharged are yellowish green or reddish brown points, each made up of a central irregular mycelium composed of short rods and spores, along with the clubs already mentioned. The mycelial threads may reach a considerable length (20 to 100μ); some of them become thicker, and are thus differentiated from the rest; the peripheral club is the result of swelling of the sheath; the filaments nearer the centre of the mycelial mass contain spores, which measure from 1 to 2μ in diameter. This fungus appears to lead a saprophytic existence, but it has the power of living in the tissues of the animal body, to which it makes its way through or around carious or loose teeth, or through abrasions of the tongue or tonsils. After the above positions, the abdomen, especially near the vermiform appendix, is a special seat of election, or in some cases the thorax, the lesions being traceable downwards from the neck. Any of the abdominal or thoracic organs may thus be affected. The process spreads somewhat slowly, but once started may extend in any direction, its track being marked by the formation of a large quantity of fibrous tissue, often around a long fistula. In the more recent growths, and in solid organs, cavities of some size, containing a soft semi-purulent cheesy-looking material, may be found, this mass in some cases being surrounded by dense fibrous tissue. When once a sinus is formed the diagnosis is easy, but before this the disease, where tumours of considerable size are rapidly formed, may readily be mistaken for sarcoma, or when the lungs are affected, for tuberculosis, especially as bronchitis and pleuritic effusion are frequently associated with both actinomycosis and tuberculosis.

Mycetoma, the Madura foot of India, is a disease very similar to actinomycosis, and, like that disease, is produced by a somewhat characteristic streptothrix. It usually attacks the feet and legs, however, and appears to be the result of infection through injured tissues. Under certain conditions and in long-standing cases the fungus appears to become pigmented (black) and degenerated.

Other forms of fungus disease or *Mycoses* are described. Aspergillosis, or pigeon-breeders' disease, is the result of infection with the *Aspergillus fumigatus.* Certain tumours appear to be the result of the action of a yeast, Blastomycosis or Saccharomycosis. The spores of the *Pencillium glaucum*, and of some of the Mucors, are also said to have the power of setting up irritation, which may end in the formation of a so-called granuloma or granulation tissue tumour. These, however, are comparatively rare.

B.—Diseases due to Animal Parasites.

I.—To Protozoa

Malaria.—Following Laveran's discovery, in 1880, of a parasite in the blood of patients suffering from malaria, our knowledge of this and similar diseases has increased by leaps and bounds, and most important questions concerning tropical diseases have now been cleared up. Numerous observations have been carried out with the object of determining the parasitic forms found in different forms of malaria—the tertian, quartan, and aestivo-autumnal fever—in each of which, in the red blood corpuscles, a series of developmental stages of the parasite from a small pale translucent amoebiform body may be followed. This small body first becomes lobulated, nucleated and pigmented; it then, after assuming a more or less marked rosette-shape with a deeply pigmented centre, breaks up into a series of small, rounded, hyaline masses of protoplasm, each of which has a central bright point. The number of these, contained in a kind of capsule, varies from 8 to 10 in the quartan, and from 12 to 20 in the tertian and aestivo-autumnal forms. There are certain differences in the arrangement of the pigment, which is present in larger quantities and distributed over a wider area in the somewhat larger parasites that are found in the tertian and quartan fevers. In the parasite of the aestivo-autumnal fever the pigment is usually found in minute dots, dividing near the pole at the point of division of the organism, along with it in the earlier stages (see Plate I., fig. 5). Here, too, the rosette form is not so distinct as in the parasite of tertian fever, and in the latter is not so distinct as in the quartan parasites. These dividing forms make their appearance immediately before the onset of a malarial paroxysm, and their presence is diagnostic. The process of division goes on especially in the blood-forming organs, and is therefore met with more frequently in the spleen and in bone-marrow than in any other situation. The parasites, at certain stages of their development, may escape from the red blood corpuscles, in which case (especially when exposed to the air for a few minutes) they send out long processes of protoplasm and become very active, moving about in the plasma and between the corpuscles, sometimes losing their processes, which, however, continue in active movement. In the aestivo-autumnal fever curious crescent-shaped or ovoid bodies were amongst the first of the parasitic organisms described as occurring in the blood, in the red corpuscles of which they develop. Manson maintains that from these arise the flagellate forms, all of which, he thinks, are developed in order that the life of the malarial parasite may be continued outside the human body. It is probable that most of the pigment found in the organs taken from malarial patients is derived from red blood corpuscles broken down by the malarial parasites; many of these, in turn, are devoured by leucocytes, which in malarial blood are usually greatly increased in number, and frequently contain much pigment, which they have obtained either directly from the fluid plasma or from the pigmented parasitic organism. The work recently carried out by Bruce on the tsetse-fly parasite, by A. J. Smith on Texas fever, and by W. S. Thayer and Hewitson on the blood parasites of birds, has opened up the way for the further study of the malarial parasites outside the human body. There can be no doubt as to the close relation of the multiplication and sporulation of the malarial parasite with the ague paroxysm: the anaemia results from the breaking down of blood corpuscles. Toxic substances are present in the blood during the setting free of the spores; of this we have proof in the increased toxicity of the urine during the paroxysmal stages of the disease; moreover necrotic areas, similar to those found in acute toxic fevers produced by other micro-organisms, are met with. It is well to bear in mind that the accumulation of débris of parasites and corpuscles in the capillaries may be an additional factor in this necrosis, especially when to this is added the impairment of nutrition necessarily involved by the impoverished condition of the malarial blood. It is interesting to note that, although, as pointed out by Nuttall, the Italian and Tirolese peasantry have long been firmly of the opinion that malaria is transmitted through the mosquito, and although the American, Dr Josiah Nott, in 1848 referred to malaria as if the mosquito theory had already been advanced, little attention was given to this question by most observers. Still earlier, Rasori (in 1846) had stated that "for many years I have held the opinion that intermittent fevers are produced by parasites, which renew the paroxysm by the act of their reproduction, which recurs more or less rapidly according to the variety of the species"; and this appears to be the first well-authenticated reference to this subject. Nuttall, who gives an excellent summary of the literature on the mosquito hypothesis of malaria, assigns to King the honour of again drawing attention to this question. Laveran in 1891, Koch in 1892, Manson in 1894, Bignami and Mendini in 1896, and Grassi in 1898, all turned their attention to this hypothesis. Manson, basing his hypothesis upon what he had observed as regards the transmission of Filaria by the mosquito, suggested a series of experiments to Major Ronald Ross. These were carried out in 1895, when it was found that in mosquitoes that had taken up blood containing amoeboid parasites, crescents, which were first described as cells, appeared in the stomach-wall after four or five days; these contained a number of stationary vacuoles and pigment granules, ten to twenty in number, bunched together or distributed in lines. Grassi, Bignami and Bastianelli confirm and supplement Ross's observations; they find that *Anopheles claviger*, taking the blood from a patient suffering from malaria, soon develops haemosporidia in the intestine. These parasites are then found between the muscular fibres of the stomach; they increase in size, become pigmented, and more and more vacuolated, until they project into the body-cavity. On the sixth day these large spheres contain an enormous number of minute bodies, refractive droplets like fat, and a diminishing amount of pigment. On the seventh day numerous filaments, arranged in rows around several foci, are seen. They are very delicate, are stained with difficulty, and appear to be perfectly independent of each other, though grouped within a capsule. After the capsule has ruptured, these thread-like "sporozooites," escaping into the body-cavity, gradually make their way to and accumulate in the cells or tubules of the salivary glands, whence their passage through the proboscis into the human blood is easily understood.

Development of the Malarial Parasite.

Thus two phases or cycles of existence have been demonstrated—one within the human body, the second in the mosquito. That within the human body appears to be capable of going on almost indefinitely as long as the patient lives, but that in the mosquito appears to be an offshoot or an intermediate stage. The minute specks of protoplasm, the amoebulae, which have already been described as occurring in the red blood corpuscles of the higher animals, increase in size, take up blood pigment, probably from the red corpuscles, and then become developed into sporocytes or gametocytes. The sporocyte is the form which, remaining in the body, ultimately breaks up, as already seen, into a series of minute spores or amoebulae, which in turn go through the same cycle again, increasing in size and forming spores, and so on indefinitely. Gametocytes (the true sexual form) are in certain species, to outward appearance, very similar to the sporocyte; but in others they assume the crescentic shape, and can thus be recognized. The male cell resembles the female cell very closely, except that the protoplasm is hyaline and homogeneous-looking, whilst that of the female cell is granular. It has already been noted that when the blood is withdrawn from the body certain of the malarial parasites become flagellated. These flagella may be looked upon as sperm elements, which, forming in the male gametocyte, are extruded from that cell, and, once set free, seek out the granular female gametocytes. A single flagellum becomes attached to a small projection that appears on the female cell; it then makes its way into the protoplasm of the female cell, in which rapid streaming movements are then developed. In certain species the female cell is somewhat elongated, and may be peculiarly constricted. It becomes motile, and appears to have the power of piercing the tissues. In this way the first stages of development in the mosquito are passed. The gametocytes, taken along with the blood into the stomach of this insect, pass through the various phases above mentioned, though the zygote form of the human malarial parasite has not yet been traced. In the blood of a patient bitten by an infected mosquito the ordinary malarial parasite may be demonstrated without any difficulty at the end of a week or ten days, and the cycle recommences.

This theory, now no longer a hypothesis, in which the mosquito acts as an intermediary host for one stage of the parasite and transmits the parasite to man, affords an explanation of many apparently anomalous conditions associated with the transmission of malaria, whilst it harmonizes with many facts which, though frequently observed, were very difficult of explanation. Malaria was supposed to be associated with watery exhalations and with the fall of dew, but a wall or a row of trees was seemingly quite sufficient to prevent the passage of infection. It was met with on wet soils, on broken ground, in marshes, swamps and jungles; on the other hand, it was supposed to be due to the poisonous exhalations from rocks. All this is now explained by the fact that these are the positions in which mosquitoes occur: wherever there are stagnant pools, even of a temporary nature, mosquitoes may breed. It has been observed that although the malarial "miasma" never produces any ill effects in patients living at more than a few feet from the surface of the ground, malaria may be found at a height of from 7000 to 9000 ft. above sea-level; and the fact that a belt of trees or a wall will stop the passage of the poison is readily explicable on the mosquito theory. These insects are incapable, owing to their limited power of flight, of rising more than a few feet from the ground, and cannot make their way through a belt of trees of even moderate thickness. Broken ground, such as is found in connexion with railway cuttings and canals, may be a focus from which malaria may spread. In such broken ground pools are of common occurrence, and afford the conditions for the development of the mosquito, and infected tools used in one area may easily convey the ova to another. All these facts afford further support of this theory. The conditions of climate under which malaria is most rife are those which are most suitable for the development of the mosquito. The protection afforded by fires, the recognized value of mosquito curtains, the simultaneous disappearance of Anopheles and malaria on the complete draining of a neighbourhood, the coincidence of malaria and mosquitoes, and the protection afforded by large expanses of water near walls and trees are also important in this connexion.

The mosquitoes specially associated with the transmission of malaria in the human subject belong apparently to the genus

Species of Mosquito Concerned.

Anopheles. *Anopheles claviger* (*maculipennis*) and *Anopheles bifurcatus* both are found in Great Britain; *Anopheles pictus* is another species found in Europe, but so far not in Great Britain. A member of the genus Culex, the grey mosquito or *Culex fatigans*, is the intermediate host of the proteosoma of birds, on which many of the intermediate phases of the life-history of these parasites have been studied. Ross describes a dappled-wing mosquito as the one with which he performed his experiments on birds in India. *Anopheles claviger* is interesting in view of the former prevalence of malaria in Great Britain.

The remedy for malaria appears to be the removal or spoiling of the breeding grounds of the mosquito, thorough drainage of pools and puddles, or, where this cannot be easily effected, the throwing of a certain amount "of kerosene on the surface of these pools" (Nuttall).

Amoebic Dysentery.—In addition to the dysentery set up by bacteria, a form—amoebic dysentery or amoebic enteritis—has been described which is said to be due to an animal parasite, and it has been proposed to separate the various types of dysentery according to their aetiology, in which case the amoebic group is probably more specific than any other. The amoeba (*Amoeba dysenteriae*, *Entamoeba histolytica*, of Schaudinn) supposed to give rise to this condition was first described by Lösch in 1875. Since then this amoeba has been described either as a harmless parasite or as a cause of dysentery in Europe, Africa, the United States and in Brazil, and more recently in India. This organism, which is usually placed amongst the rhizopods, consists of a small rounded, ovoid or pear-shaped globule of protoplasm, varying in size from 6 to 40μ, though, as Lafleur points out, these limits are seldom reached, the organism being usually from one and a half to three times the diameter of a leucocyte—from 12 to 26μ (see Plate II., fig. 19). Its margins are well defined, and the body appears to consist of a granular inner portion and a homogeneous outer portion, the latter being somewhat lighter in colour than the inner; in the resting stage this division cannot be made out. The organism appears to pass through at least two phases, one corresponding to a cystic, the other to an amoeboid, stage. In the latter stage, if the organism be examined on a warm stage, it is seen to send out processes, and, as in other amoebae, vacuoles may be seen as clear spaces lying in the granular and darker-coloured inner protoplasm. In the small vacuoles a deeply stained point may be seen. These vacuoles may be extruded through the ectoplasm. In some cases the vacuoles are so numerous that they occupy the whole of the space usually occupied by the granular protoplasm, and are merely surrounded by a zone of variable thickness, which "has the appearance of finely granular glass of a distinctly pale green tint" (Lafleur). In the cystic stage a nucleus which appears amongst the vacuoles may be made out, usually towards one side of the amoeba. This nucleus is of considerable size, *i.e.* nearly as large as a red blood corpuscle, and is readily distinguishable from the surrounding protoplasm. When stained by the Benda method (safranin and light green) a more deeply staining nucleolus may be seen in the nucleus. The nucleus is perhaps best seen when stained by this method, but it is always difficult to obtain well-stained specimens of this organism. If these amoebae can be kept under observation for some time evidence of amitotic division may sometimes be seen. Red blood corpuscles are often englobed by this amoeba, as are also micrococci and bacilli. The movements of the amoebae are most active at a temperature of about 90° to 98° F. From the fact that pigment is contained in these organisms, it is supposed that they take in the red blood corpuscles as nutritive material, and that other substances may be taken in to serve a similar purpose. Nothing is known of the method of multiplication of the amoeba, but it is supposed that it may be both by fission and by spore formation. These organisms are present in the early stage of the acute disease, and disappear at the later stages. Perhaps of some importance is the fact that the abscesses found in the liver and lung, which occur so frequently in cases of dysentery, usually contain, especially in the portions immediately adjoining the suppurating mass, a considerable number of these amoebae. In the very small abscesses the amoebae are numerous and active, and occupy the capillaries in the tissues. It is quite possible that this plugging of the capillaries with amoebae is the cause both of the haemorrhages and of the small areas of necrosed tissue, the supply of nutriment being cut off from the liver cells and from the lung tissues, and that suppuration occurs only as a secondary process, though Councilman and Lafleur maintain that the amoeba itself is the primary cause of suppuration. It is possible, of course, that the suppuration is due to the action of pus-forming organisms conveyed along with, or following, the amoeba, as we know that the growth of suppurating organisms can go on in dead tissues when these organisms have no chance of surviving in the healthy tissues and fluids of the body. Lafleur holds that the amoeba forms a toxic substance which exerts a direct devitalizing effect on the liver cells, and that the amoeba itself causes suppuration. The abscesses in the lung, which invariably extend directly from the liver and occur at the base of the right lung, also contain these amoebae. For these reasons this organism is looked upon as the cause of dysentery and of certain forms of dysenteric abscess.

They differ from the *Entamoeba coli*—often met with in the intestine—which has a more distinct nucleus containing larger chromatin masses and is surrounded by a highly refractile nuclear membrane. Further, in the *Entamoeba coli* the cytoplasm is of the same character throughout, there being no differentiation into ectoplasm and endoplasm. The *Amoeba histolytica* is often met with in a "resting phase," in which the nucleus is less distinctly marked, and may consist of small masses of chromatin distributed throughout the cell or penetrating small buds formed on the surface. Around each of these buds, three, four or more, a highly refractile cyst wall is formed, the cysts becoming separated from the rest of the cell, the remnant of which undergoes disintegration. These cysts are extremely resistant, and probably maintain the continuity of the species outside the body.

In the active phase, the amoeboid form appears able by its tough membranous pseudopodia to push its way into the mucous membrane of the large intestine, especially the rectum, the lower part of the ileum and the flexures. Once it is ensconced in these tissues, small soft oedematous looking swellings soon appear on the mucous surface. Marshall points out that the amoebae probably reach the liver by the portal circulation from the dysenteric lesions in which the amoebae are found. Other observers maintain that the amoebae may pass through the walls of the intestine, through the peritoneal cavity, and so on to the liver where they give rise to typical abscesses.

Syphilis.—It has long been recognized that syphilis is a specific infective disease, but although characterized by fever, anaemia, and increased growths of tissue followed by rapid degeneration and ulceration of tissue, it is only within quite recent years that a definite parasitic organism, present in all cases of typical syphilis, has been isolated and studied. Schaudinn and Hoffmann, followed by Metchnikoff and others, have described as of constant occurrence a spiral or screw-shaped organism in which are seen from half a dozen to a dozen well-defined, short, regular, almost semicircular curves. This organism, when examined fresh, in normal or physiological salt solution, exhibits active screw-like movements as it rotates along its long axis; from time to time it becomes more or less bow-shaped and then straightens out, the while moving about from point to point in the field of the miscroscope. It is not very strongly refractile, and can only be examined properly with the aid of special central illumination and in the presence of minute particles, by the movements of which the organism is more readily traced.

In order to obtain this organism for demonstration it is a good plan to wash the primary or secondary syphilitic sore thoroughly with alcohol; some of the clear fluid is then collected on a cover-glass; or, perhaps better still, the lymphatic gland nearest to one of these sores may be punctured with a hypodermic needle, the fluid being driven out on to a slide on which some normal saline solution has been placed. When the organism has been examined alive the film may be carefully dried and then stained by Giemsa's modification of the Romanowsky stain (see Plate I., fig. 1). This stain, which may be obtained ready prepared from Grübler, of Leipzig, under the name of "Giemsa'sche Lösung für die Romanowsky Färbung," is made as follows: Azur II.-eosin compound, 3 grms. and Azur II. 0·8 grm. are mixed and dried thoroughly in the desiccator over sulphuric acid; this mixture is then *very finely pulverized*, passed through a fine-meshed silk sieve and dissolved at 60° C. in Merck's glycerin, 250 grms., the mixture being well shaken; 250 grms. of methyl-alcohol (Kahlbaum I.), which has been previously heated to 60 C., is then added. The whole, after being well shaken, is allowed to stand for twenty-four hours and filtered. The solution, now ready for use, should be kept in a yellow glass bottle. To 1 c.c. of ammonia-free distilled water add 1 drop of this stain. Stain for from a quarter to three-quarters of an hour. Wash in running water, blot, dry, and mount in Canada balsam. Longer exposure to the action of a more dilute Giemsa fluid often gives excellent results.

The stained organisms may be seen as delicate, reddish, regular spirals with pointed extremities. They usually measure from 4 to 14μ in length, though they may reach 18 or 22μ; the breadth is about 0·25μ. In a section of the liver from a case of congenital syphilis an enormous number of these spirochaetes may be found.

Stain by Levaditi's method as follows: Fix fragments of tissue not more than 1 mm. thick in 10% formol solution for twenty-four hours. Rinse in distilled water and harden in 96% alcohol for twenty-four hours. Then wash in distilled water for some minutes, *i.e.* until the pieces fall to the bottom of the vessel, and transfer to a 1·5–3% solution of nitrate of silver (3% is preferable when the tissues have been obtained from the living patient). This impregnation should be carried on at a temperature of 38° C. for from three to five days, according to the nature of the tissue. "Reduce" the silver in the following solution: Pyrogallic acid, 2-4%, Formol, 5 c.c., Aq. dest., 100 c.c. Allow this solution to act on the tissues for from twenty-four to forty-eight hours at room temperature. Again wash in distilled water, dehydrate with alcohol, clear with xylol and cedar-oil, and embed in paraffin. The sections should not be more than 5μ thick. In a section so stained the spirochaetes are seen as dark spirals standing out against a pale yellow background. On staining with a weak counterstain many of the spirals may be seen actually within the liver cells.

This organism may be found in the lung, spleen and other visceral organs, and even in the heart of a patient suffering from syphilis. It has also been found in syphilitic lesions produced experimentally in the higher apes, especially the chimpanzee. As a result of these observations it is now generally accepted as being the primary cause of syphilitic lesions in the human subject. It is certainly present in the lesions usually met with in cases of primary and secondary syphilis of the human subject, and by its action on the blood and tissues of the body produces an antigen, a specific (?) substance, the presence of which has been utilized by Wassermann in the diagnosis of syphilis. He uses the method of deviation of complement by the antigen substances contained in the syphilitic fluid blood or cerebro spinal fluid—by which the lytic action of a haemolysing fluid is prevented.

Kála-ázar.—The non-malarial remittent fever, met with in China, known as dum-dum fever in India and as kála-ázar in Assam, is associated with peculiar parasitic bodies described by Donovan and Leishman (*Herpetomonas Donovani*) (? *Helcosoma tropicum*, Wright). This fever is characterized by its great chronicity, associated with very profound, and ultimately fatal, bloodlessness, in which there is not only a fall in the number of red blood corpuscles, but a marked diminution in the number of white blood corpuscles. Ulceration of the skin and mucous membrane, especially of the lower parts of the small intestine and of the first part of the colon is often present, this being accompanied by dropsy and by distinct enlargement of the liver and spleen. Leonard Rogers, who has given an excellent account of this condition, points out that there is a marked increase in the number of cells in the bone-marrow.

The Leishman-Donovan bodies have been found in large numbers, especially in the spleen (see Plate I., fig. 7); they may also be found in the ulcerating surfaces and wherever the cellular proliferation is marked. These organisms may be found in sections, or they may be demonstrated in film preparations made from the material scraped from the freshly-cut surface of the spleen.

The films are best stained by Leishman's method: Solution A.—Medicinal methylene-blue (Grübler), 1 part; distilled water, 100 parts; sodium carbonate, 1·5 parts. This mixture is heated to 65° C. for twelve hours and then allowed to stand at room temperature for ten days. Solution B.—Eosin extra B.A. (Grübler), 1 part; distilled water, 1000 parts. Mix equal parts of solutions A and B in a large open vessel and allow to stand for from six to twelve hours, stirring from time to time with a glass rod. Filter, and wash the precipitate which remains on the paper with a large volume of distilled water until the washings are colourless or only tinged a pale blue. Collect the insoluble residue, dry and pulverize.

Make a 0·15 % solution of the powder (which may also be obtained from Grübler & Co., Leipzig) in absolute methyl alcohol (Merck's "for analysis"), and transfer to a clean, dry, well stoppered bottle. Pour three or four drops of this stain on to the prepared film (blood, bone, marrow, &c.) and run from side to side. After about half a minute add six or eight drops of distilled water, and mix thoroughly by moving the slide or cover-glass. Allow the stain to act for five minutes longer or, if the film be thick, for ten. Wash with distilled water, leaving a drop or two on the glass for about a minute. Examine at once or after drying without heat and mounting in xylol balsam

These peculiar parasitic bodies appear as deeply stained points, rounded, oval or cockle-shaped, lying free or grouped in the large endothelial cells of the spleen. Examined under a magnification of 1000 diameters they are found to measure from 3·5 to 2·5μ, or even less, in diameter. Their protoplasm is stained, somewhat unequally, light blue; and from this light blue background two very deeply stained violet corpuscles of unequal size stand out prominently; the smaller of these is more deeply stained than the larger, is thinner, somewhat more elongated or rod-shaped, and parallel or running at right angles to the large corpuscle or obliquely from it. The larger corpuscle is rounded or oval, conical, or sometimes almost dumb-bell shaped. These bodies may appear to touch one another, though usually they are disconnected. Most of these Donovan-Leishman bodies are embedded in the protoplasm of the large endothelial or mononuclear splenic cells, of similar cells in the bone marrow, or of certain lymphatic glands. They may also be seen lying in the protoplasm of the endothelial cells lining the capillary vessels and lymphatics. They are considered by Leishman and Leonard Rogers to be organisms in an intermediate stage of development of either a Trypanosome or some form of Herpetomonas. Rogers, who succeeded in cultivating them outside the body, described changes which he considers are associated with this latter germ. Patton goes further than this, and states that the *Leishmania donovani* Lav. et Mesn. taken up by the bed bug closely resembles in its life cycle that of the Herpetomonas of the common house-fly. It is thought that the Leishman-Donovan bodies are the tissue parasite stage, and that the herpetomonas stage is probably to be sought for in the blood of the patient.

Tsetse-Fly Disease (*Trypanosomiasis*).—The interesting observations carried out by Sir David Bruce have invested the tsetse-fly with an entirely new significance and importance. In 1895 Bruce first observed that in the tsetse disease—*n'gana*—there may be found a flagellated haematozoon closely resembling the *Trypanosoma Evansii* found in Surra. This, like the Surra organism, is very similar in appearance to, but considerably smaller than, the haematozoon often found in the blood of the healthy rat. It has, however, as a rule a single flagellum only. A small quantity of blood, taken from an affected buffalo, wildebeest, koodoo, bushbuck or hyaena—in all of which animals it was found by Bruce—when inoculated into a horse, mule, donkey, cow, dog, cat, rabbit, guinea-pig, rat or mouse, produces a similar disease, the organisms being found sometimes in enormous numbers in the blood of the inoculated animal, especially in the dog and in the rat. He then found that the tsetse-fly can produce the disease in a healthy animal only when it has first charged itself with blood from a diseased animal, and he produced evidence that *Glossina morsitans* is not capable of producing the disease except by carrying the parasites from one animal to another in the blood that it takes through its proboscis into its stomach. The parasites taken in along with such blood may remain in the stomach and alive for a period of 118 hours, but shortly after that the stomach is found to be empty, and the parasites contained in the excrement no longer retain their vitality. The mode of multiplication of these organisms has been studied by Rose-Bradford and Plimmer, who maintain that the multiplication takes place principally in the spleen and lymphatic glands. The tsetse-fly parasite, however, is still imperfectly understood, though much attention is now being paid to its life-history and development.

Sleeping Sickness (*Trypanosomiasis*).—To the group of diseases caused by Trypanosomes must now be added sleeping sickness. This disease is due to the presence and action in the human body of a form known as *T. gambiense* (Dutton).

In order to demonstrate the parasite in the blood of a case of sleeping sickness, where they are very scanty and difficult to find, the best method is repeated centrifugalization of the blood (Bruce), 10 c.c. being treated at a time; then the sediment in a number of these tubes is collected and again centrifugalized. The living trypanosome may, as a rule, be distinguished in this final sediment, even under a low power of the microscope. The organism may be found in greater numbers in the cerebro-spinal fluid of a case in which the symptoms of sleeping sickness have been developed, though centrifugalization of from 10 to 15 c.c. of the cerebro-spinal fluid for half an hour may be necessary before they can be demonstrated. Greig and Gray, at Mott's suggestion, were able to find the organism in the fluid removed by means of a hypodermic syringe from the swollen lymph glands that appear as one of the earliest signs of infection. Examined fresh and in its native fluid or in normal saline solution it is seen as an actively motile, highly refractile, somewhat spindle-shaped organism (see Plate I., fig. 9). The anterior end is prolonged into a pointed flagellum, the posterior end being slightly blunted or rounded. This organism darts about rapidly between the red blood corpuscles or other corpuscles or particles, and shows rapid undulations, the flagellum beating quickly and the body following the flagellum. In this body a couple of very bright points may be seen. On staining by Leishman's stain (see under *Kála-ázar*) the general protoplasm of the body is stained blue and is somewhat granular. This trypanosome is from 15 to 25μ in length (without the flagellum, which is from 5 to 6μ) and from 1·5 to 2·5μ broad. In the centre of the spindle-shaped mass is a very distinct reddish purple oval corpuscle corresponding to the larger of the two bright points seen in the unstained specimen; this, the nucleus or macronucleus, is slightly granular. Near the posterior or blunt end of the organism is a second, but much smaller, deeply stained reddish purple point, the second of the bright spots seen in the unstained specimen; this is known as the micro-nucleus or centrosome. Around the micro-nucleus is a kind of court or area of less deeply stained protoplasm, arising from or near which and running along the margin of the body is a narrow band with a very sharply defined wavy free margin. This thin band of protoplasm seems to be continuous with the large spindle-shaped body of the trypanosome, but at the free margin it takes on the red tint of the micro-nucleus instead of the blue tint of the protoplasm. The undulatory membrane, as this band is called, is narrowest at the posterior end, getting broader and broader until the micro-nucleus is reached, beyond which it tapers off irregularly until finally it merges in the flagellum. In sleeping sickness the presence of this organism is usually associated with distinct anaemia, the red cells being diminished in number and the haemoglobin in quantity. Along with this there is an increase in the number of mononuclear leucocytes.

The trypanosome is carried to the human patient by the *Glossina palpalis*, in the proboscis of which the organisms may be seen for some short time after the insect has sucked blood from an infected patient. These trypanosomes have been found living and active in the stomach of this insect up to 118 hours, but after 140 hours no living parasites can be demonstrated. They undergo no metamorphoses in this intermediate host and are simply discharged in the intestinal excreta. It may be readily understood that the trypanosome under these conditions soon loses its virulence, and an animal cannot be infected through the bite of the Glossina for more than 48 hours after the infected blood has been ingested by the fly. The organism may remain latent in the human body for a considerable period. It certainly sets up very tardily any changes by which its presence can be detected. The first symptoms of its presence and activity are enlargement of the lymphatic glands, especially those behind the neck, a condition often accompanied by irregular and intermittent fever. After a time, in from three months to three years, according to Bruce, the organism gains access to the fluid in the cerebro-spinal canal. Accompanying this latter migration are languor, lassitude, a gradually increasing apathy, and finally profound somnolence.

The incubation period, or that between the time of infection and the appearance of the symptoms associated with trypanosomiasis may be as short as four weeks, or it may extend over several years. The inhabitants of the island of Senegal who have lived in Casamance do not consider themselves safe from the disease until at least seven years after they have left an infected area. At first, amongst negroes, according to Dutton and Todd, there is no external clinical sign of disease except glandular enlargement; in mulattoes and whites an irregular and intermittent fever may be the chief sign of infection, "the temperature being raised for two to four days, then falling to normal or below normal for four or five days." In other cases the fever is of the septic type, the temperature being normal in the morning but rising in the evening to 101·3° or 102·2° F., rarely to 104° F., the curve differing from that characteristic of malaria in which the rise usually takes place in the morning. Moreover, in sleeping sickness there are no rigors before the rise of temperature and but slight sweating, such as there is usually occurring at the end of the rise. Here again we have a distinction between the malarial condition and that of sleeping sickness. The respiration and the pulse rate are increased both during the febrile and the non-febrile attacks; the respiration is from 29 to 30 a minute, and the pulse rises to 90, and even up to 140, a minute, according to the degree of cardiac excitability which appears to be constantly present. The localized swelling and redness are seen as puffiness of the face, oedema of the eyelids and ankles and feet, congested erythematous patches on the face, trunk or limbs. Anaemia, general weakness and wasting, at first very slightly marked, gradually become prominent features, and headache is often present. The enlargement of the spleen appears to go on concurrently with enlargement of the lymphatic glands. Manson points out that trypanosomiasis may terminate fatally without the appearance of any characteristic symptoms of sleeping sickness, but as a rule the "sleeping" or second stage supervenes. The temperature now becomes of the hectic type, rising to 102·2° F. in the evening and falling to 98·6° F. in the morning. Here again there are no rigors or sweating. During the last stages of the disease the rectal temperature may fall as low as 95° and for the last day or two to 92° F., the pulse and respiration falling with the temperature. The irritability of the heart is still marked. Headache in the supraorbital region, and pain in the back, and even in the feet, have been described. Activity and intelligence give place to laziness, apathy and dullness; the face loses its brightness, the eyelids approximate, and the muscles around the mouth and nose become flabby and flaccid, the patient becomes drowsy, and when questioned replies only after a marked interval. Fibrillary tremors of the tongue and shaking of the hands and arms, distinct even during rest, become increased when any voluntary movement is attempted. These tremors may extend to the lower limbs and trunk. Epileptiform convulsions, general weakness and progressive emaciation come on, and shortly before death there is incontinence of urine and faeces. "The intellectual faculties gradually become impaired, the patient has a certain amount of difficulty in understanding what is said to him, and becomes emotional, often crying for no reason whatever; delirium is usually absent, the drowsiness increases and the patient's attitude becomes characteristic, the head falls forward on the chest and the eyelids are closed. At first the patient is easily aroused from this drowsy condition, but soon he reaches a stage in which he falls sound asleep almost in any attitude and under any conditions, especially after meals. These periods of sleep, which become gradually longer and more profound, lead eventually to a comatose condition from which the patient can be aroused only with the greatest difficulty. It is at this stage that the temperature becomes normal and death occurs." Nabarro points out, however, that this condition of drowsiness and sleep, leading eventually to coma, is by no means invariably present.

In the early part of the sleeping-sickness stage patients often sleep more than usual, but later do not sleep excessively. They become lethargic and indifferent to their surroundings, however, and often lie with their eyes closed. When spoken to they hear and understand what is said to them and after a longer or shorter interval give a very brief reply.

The leucocytosis that occurs during the course of this form of trypanosomiasis is due, apparently, to secondary or terminal bacterial infections so frequently associated with the disease in its later stages. The first stage of the disease, that of fever, may last for several years; the second or nervous stage with tremors, &c., for from four to eight months. It is quite exceptional for the disease to be prolonged for more than a year from the time that the nervous symptoms become manifest, though a European who contracted trypanosomiasis in Uganda, having delusions and becoming drowsy within the year, did not die of sleeping sickness until more than eighteen months from the onset of the nervous symptoms.

The *Glossina palpalis* is not found in swamps. It affects a belt of from ten to thirty yards broad along banks bounding water shaded by scrub and underwood. It may, however, follow or be carried by the animal or human subject it is attacking for a distance of, say, three hundred yards, but unless carried it will not cross an artificial clearing of more than thirty yards made in the natural fly belt. The authorities in the plague-stricken areas recommend, therefore, the clearance of belts thirty yards in width along portions of the lake side, at fords and in such other places as are frequented by natives. No infected person should be allowed to enter a " fly area," so that they may not act as centres from which the flies, acting as carriers, may convey infection. The provision of clothing for natives who are compelled to work in fly areas is an important precautionary measure.

There seems to be some doubt as to whether *Trypanosoma gambiense* of Dutton is the same organism and produces the same conditions as the Trypanosoma of Bruce and Nabarro from Uganda, but most observers seem to think that the two species are the same and yield the same results when inoculated into animals. It is supposed that this trypanosome may pass through certain stages of metamorphosis in the human or animal body, and different drugs have been recommended as trypanocides during these various stages, an arsenic preparation (atoxyl) first being given, and then, when the organisms have disappeared, injections of bichloride of mercury, this salt appearing to prevent the relapses which occur when atoxyl only is given over a prolonged period. Ehrlich, treating animals suffering from trypanosomiasis with parafuchsin, found that although the parasites disappeared from the blood they soon recurred. On the exhibition of another dose of parafuchsin they again disappeared. This was repeated for a considerable number of times, but after a time the parafuchsin lost its effect, the trypanosome having acquired an immunity against this substance; they had in fact become " fuchsin-fast." Such fuchsin-fast organisms injected into animals still retain their immunity against parafuchsin and may transmit it through more than 100 generations. Nevertheless, they cannot withstand the action of other trypanocidal drugs. The outcome of all this is that large doses of the trypanocidal drug should be given at once, and that the same drug should never be given over too long a period, a fresh drug often being effective even when the first drug has lost action.

II.—TO OTHER ANIMAL PARASITES

Filariasis.—Since Bancroft and Manson first described *Filaria nocturna* and its relation to the common form of filariasis, the most important contribution to our knowledge has been made, at the suggestion of the younger Bancroft, by Dr G. C. Low, who has demonstrated that the embryos of the filaria may be found in the proboscis of the mosquito (*Culex ciliaris*), whence they probably find their way into the circulating blood of the human subject. It appears that the filaria embryo after being taken, with the blood of the patient, into the stomach of the mosquito, loses its sheath; after which, leaving the stomach, it passes into the thoracic muscles of its intermediate host, and becomes more fully developed, increasing considerably in size and attaining a mouth, an alimentary canal, and the characteristic trilobed caudal appendage. It now leaves the thoracic muscles, and, passing towards the head, makes its way " into the loose cellular tissue which abounds in the prothorax in the neighbourhood of the salivary glands." Most of them then " pass along the neck, enter the lower part of the head," whence they may pass into the proboscis. Although it has never been demonstrated that the filaria is directly inoculated into the human subject from the proboscis of the mosquito, it seems impossible to doubt that when the mosquito " strikes," the filaria makes its way into the circulation directly from the proboscis. It is important to note that the mosquito, when fed on banana pulp, does not eject the filaria from its proboscis. This, however, is not to be wondered at, as the filaria is apparently unable to live on the juices of the banana; moreover, the consistence of the banana is very different from that of the human skin. The importance of this observation, as affording an additional reason for taking measures to get rid of the mosquito in districts in which filariasis is rife, can scarcely be over-estimated.

C.—Infective Diseases in which an Organism has been found, but has not finally been connected with the Disease.

Hydrophobia is usually contracted by man through inoculation of an abraded surface with the saliva of an animal affected with rabies—through the bite of a dog, the animal in which the so-called rabies of the streets occurs. The puppy is specially dangerous, as, although it may be suffering from rabies when the saliva contains an extremely exalted virus, the animal may exhibit no signs of the disease almost up to the time of its death. The other animals that may be affected " naturally " are wolves, cats, foxes, horses, cows and deer; but all warm-blooded animals may be successfully inoculated with the disease. The principal changes met with are found in the nervous system, and include distension of the perivascular lymphatic sheaths, congestion and oedema of the brain and spinal cord and of the meninges. Haemorrhages occur into the cerebral ventricles of the brain, especially in the floor of the fourth, and on the surface and in the substance of the medulla oblongata, and the spinal cord.

In addition to these small haemorrhages, collections of leucocytes are met with in hyperaemic areas in the medulla oblongata and pons, sometimes in the cortical cerebral tissue and in the spinal cord, in the perivascular lymphatics of the grey matter of the anterior horns and in the white matter of the postero-internal and postero-external columns. Here also the nerve cells are seen to be vacuolated, hyaline and granular, and often pigmented; thrombi may be present in some of the smaller vessels, and the collections of leucocytes may be so prominent, especially in the medulla, that they have been described as miliary abscesses. Haemorrhages are also common in the various mucous and serous membranes; hyaline changes in and around the walls of blood-vessels; proliferation of the endothelium; swelling and vacuolation of nerve cells; pericellular infiltration with leucocytes, and infiltration of the salivary glands with leucocytes (Coats). An increased number of leucocytes and microcytes in the blood has also been made out. The virus, whatever it may be, has a power of multiplying in the tissues, and of producing a toxic substance which, as in the case of tetanus toxin, appears to act specially on the central nervous system.

In recent years fresh interest has been aroused in the morbid histology of the brain and cord in hydrophobia by the appearance of Negri's description of " bodies " which he claims are found in the central nervous system only in hydrophobia or rabies (see Plate I., fig. 3). These bodies, which are rounded, oval, triangular, or slightly spindle- or sausage-shaped, when specially stained consist of a red (acidophile) basis in which stand out small blue (basophile) granules, rods and circles, often situated within vacuoles. A small central point which is surrounded by no clear space is supposed to correspond to the nucleus of a protozoan. But this can be little more than a suggestion. The Negri bodies are certainly present in the central nervous system in cases of hydrophobia, and have not been found in similar positions in any other disease. They are present in large numbers, even at an early stage of the disease, although they are then so small that they may easily escape detection, so small indeed that they may pass through the pores of a Berkefeld filter, the filtrate in such cases being capable of acting as a rabic virus. In the more chronic cases and in the later stages of the disease the Negri bodies may attain a considerable size and may be easily seen under the microscope. They are from $0·5\mu$ to 20μ in diameter—the longer the course of the disease the larger the bodies, these larger forms seldom if ever being met with in specially susceptible animals, which soon succumb to the disease. The Negri bodies may be constricted in the middle, or, if somewhat elongated, there may be two or three constrictions which give it the appearance of a string of sausages. They may be met with in almost all the nerve cells of the central nervous system in well-developed cases of hydrophobia, but they are most numerous and are found most readily in the cells of the cornu ammonis, and then in the Purkinje cells of the cerebellum.

Although there are several methods of preparing these organisms for microscopical examination, the following is perhaps the simplest. A fragment of the grey substance, say from the cornu ammonis, is taken from a section made at right angles to the surface and placed on a slide about one inch from the end. A coverslip is now " pressed upon it until it is spread out in a moderately thin layer; then the coverslip is moved slowly and evenly over the slide," leaving the first three-quarters of an inch of the slide clear. In making the smear only slight pressure is used, the pressure beginning on the edge of the coverslip away from the end of the slide towards which the coverslip is travelling, thus driving more of the nerve tissues along the smear "and producing more well-spread nerve cells." The smears are then air-dried, placed in methyl-alcohol for one minute, and then in a freshly-prepared mixture of 10 c.c. of distilled water, three drops of a saturated alcoholic solution of rose anilin violet, and six drops of Loeffler's alkaline methylene blue, which is warmed until steam rises; the stain is then poured from the specimen, which after being rinsed in water is allowed to dry and is then mounted in Canada balsam.

The nature of the disease produced by the inoculation of saliva from a rabid animal appears to depend upon (1) the quantity of the rabic virus introduced; (2) the point of its introduction; (3) the activity of the virus. Thus by diluting the poison with distilled water or saline solution and injecting small quantities, the period of incubation may be prolonged. Slight wounds of the skin, of the limbs and of the back are followed by a long incubation period; but when the inoculation takes place in the tips of the fingers or in the skin of the face, where nerves are numerous, and especially where the wound is lacerated or deep, the incubation period is much shorter and the attack usually more severe. This, as in tetanus, is accounted for by the fact that the lymphatics of the nerves are much more directly continuous with the central nervous system than are any other set of lymphatics. The poison appears to act directly upon the cells of the central nervous system.

Arising out of recent researches on hydrophobia, two methods of treatment—one of which, at any rate, has been attended by conspicuous success—have been put into practice. The first of these, Pasteur's, is based upon the fact that rabic virus may be intensified or attenuated at will. Pasteur found that although the virus taken from the cerebrospinal fluid of the dog always produces death in the same period when inoculated into the same animal, virus taken from other animals has not the same activity. If passed through a succession of monkeys it may become so attenuated that it is no longer lethal. If either the " monkey virus," which is not fatal to the rabbit, or the " dog virus," which kills in twelve to fourteen days, be passed through a series of rabbits, the virulence may be so exalted that it may kill in about six days: its activity cannot be increased beyond this point by any means at present at our disposal. This intensified virus was therefore named *virus fixe* by Pasteur, and it forms a standard from which to work. He found, too, that under certain conditions of temperature the virus may be readily attenuated, one hour at 50° or half an hour at 60° C. completely destroying it. A 5% solution of carbolic acid acting for half an hour, or a 1 per 1000 solution of bichloride of mercury or acetic acid or permanganate of potash, brings about the same result, as do also exposure to air and sunlight. The poison contained in the spinal cord of the rabbit exposed to dry air and not allowed to undergo putrefactive changes gradually loses its activity, and at the end of fourteen to fifteen days is incapable of setting up rabic symptoms. A series of cords from rabbits inoculated with the *virus fixe* are cut into short segments, which, held in series by the dura mater, are suspended in sterile glass flasks plugged with cotton-wool and containing a quantity of potassium hydrate—a powerful absorbent of water. At the end of twenty-four hours the activity of the virus is found to have fallen but slightly; at the end of forty-eight hours there is a still further falling off, until on the fourteenth or fifteenth day the virus is no longer lethal. With material so prepared Pasteur treated patients who had been bitten by mad dogs. On the first day of treatment small quantities of an emulsion of the cord exposed for thirteen or fourteen days in saline solution are injected subcutaneously, and the treatment is continued for from fifteen to twenty-one days, according to the severity of the bite, a stronger emulsion—*i.e.* an emulsion made of a cord that has been desiccated for a shorter period—being used for each succeeding injection, until at last the patient is injected with an emulsion which has been exposed to the air for only three days. In the human subject the period of incubation of the disease is comparatively prolonged, owing to the insusceptibility of the tissues to the action of this poison; there is therefore some chance of obtaining a complete protection or acclimatization of the tissues before the incubation period is completed. The virus introduced at the bite has then no more chance of affecting the nerve centres than has the strong virus injected in the late stages of the protective inoculation: the nerve centres, having become gradually acclimatized to the poisons of the rabic virus, are able to carry on their proper functions in its presence, until in time, as in the case of microbial poisons, the virus is gradually neutralized and eliminated from the body. Various modifications and improvements of this method have from time to time been devised, but all are based on, and are merely extensions of, Pasteur's original work and method. As soon as it was found that antitoxins were formed in the tissues in the case of an attack of tetanus, attention was drawn to the necessity of determining whether something similar might not be done in the production of an antirabic serum for the treatment of rabies. Babes and Lepp, and then Tizzoni and his colleagues Schwarz and Centanni, starting from *virus fixe*, obtained a series of weaker inoculating materials by submitting it for different periods to the action of gastric juice. Beginning with a weak virus so prepared, and from time to time injecting successively stronger emulsions (seventeen injections in twenty days) into a sheep, they succeeded in obtaining a serum of such antirabic power that if injected in the proportion of 1 to 25,000 of body-weight, an animal is protected against a lethal dose of *virus fixe*. The activity of this serum is still further reinforced if a fresh series of injections is made at intervals varying from two to five months, according to the condition of the animal, each series occupying twelve days. This antirabic substance stored in the blood has not only the power of anticipating (neutralizing?) the action of the poison, but also of acting as a direct curative agent; as a prophylactic agent, readily kept in stock and easily and rapidly exhibited, it possesses very great advantages over the inoculation method. It must be borne in mind that the longer the period after the infection the greater must be the amount of serum used to obtain a successful result.

As regards the necessity for any treatment it may be pointed out that although the saliva of a rabid dog may be infective three days before the manifestation of any symptoms of the disease death takes place almost invariably within six days of the first symptom. If therefore the animal remains alive for ten days after the patient is bitten, there is no necessity for the antirabic treatment to be applied and the patient need fear no evil results from the bite.

There can be little doubt that hydrophobia is a specific disease due to a multiplication of some virus in the nervous system, in the elements of which it is ultimately fixed; that it passes from the wound to the central nervous system by the lymphatics; and that, as in tetanus, the muscular spasms are the result of the action of some special poison on the central nervous system.

Scarlet Fever.—In scarlet fever recent observations have been comparatively few and unimportant. Crooke, and later Klein, and others have, however, shown that in the glands and throats of scarlet fever patients a streptococcus, to which is assigned the chief aetiological rôle in connexion with this disease, is present. On the other hand, it is maintained by many observers that these streptococci are nothing more than the streptococci found in puerperal fever, erysipelas, and similar infective conditions, and certainly the organisms described closely resemble *Streptococcus pyogenes.* In 1904 Mallory described certain "bodies" which he considers may be associated with scarlet fever, and which were sufficiently distinctive to justify him in suggesting that he was dealing with the "various stages in the developmental cycle of a protozoan." These bodies, which were demonstrated in four cases of scarlet fever, "occur in and between the epithelial cells of the epidermis and free in the superficial lymph vessels and spaces of the corium." They are small, varying from the size of a blood platelet to that of a red blood corpuscle, and "stained delicately but sharply with methylene blue." Well formed rosettes with numerous segments may be seen, forms which Mallory thinks may correspond to the phase of asexual development of the malarial parasite. He also describes "coarsely reticulated forms which may represent stages in sporogony or be due to degeneration of the other forms." He gives beautiful illustrations, both drawings and photographs, of these organisms, and without claiming that he has proved any aetiological relation between these bodies and scarlet fever, states that his personal opinion is that such relation exists.

D.—Infective Diseases not yet proved to be due to Micro-organisms.

Small-pox.—There have been few recent additions to our knowledge of the aetiology of small-pox, though Dr Monckton Copeman now holds that the small-pox organism, like that of vaccine, is probably a very minute bacillus, which, from its behaviour in the presence of glycerin, is possessed of the power of forming spores. If vaccine lymph, taken from the calf, be protected from all extraneous sporebearing organisms and treated with 50 % solution of glycerin, it, in time, becomes absolutely sterile as regards ordinary non-sporebearing organisms. Even the staphylococci and streptococci, usually found in calf lymph, cannot withstand the prolonged action of this substance, but sporebearing organisms still remain alive and active. Moreover, the lymph still retains its power of producing vaccine vesicles, so that the vaccine organism, in its powers of resistance, resembles the sporebearing, and not the non-sporebearing, organisms with which we are acquainted. This vaccine organism must be very minute; it is stated that it can be cultivated only on special media, though it multiplies freely in the superficial cutaneous tissues of the calf, the monkey and the human subject. Perhaps the most important outcome of Dr Monckton Copeman's work on this subject is that he has obtained a vaccine lymph from which are eliminated all streptococci and staphylococci, and, if the lymph be taken with reasonable care, any other organisms which could possibly give rise to untoward results.

Typhus Fever.—Although it is fully recognized that typhus must be one of the specific infective fevers brought about by the action of a special micro-organism, no definite information as to the bacterial aetiology of this condition has been obtained. It is always looked upon as a "filth" disease; and from the frequency of minute haemorrhages, and from the resemblance to the haemorrhagic septicaemias in other respects, it appears probable that the bacillus of typhus is the organism described by Mott in 1883 as an actively motile dumb-bell coccus, and ten years later by Dubieff and Bruhl as the *Diplococcus typhosus exanthematicus*; the polar staining and general resemblance to the diplococcus of fowl cholera, the plague bacillus, the diplococcus of "Wildseuche," certain forms of swine fever and hog cholera, and others of the haemorrhagic septicaemias, are sufficient to suggest the generic affinity of this organism to this septicaemic group. We have as yet, however (1910), no absolute proof of the aetiological relation of the bacillus to this disease.

Measles.—In measles, as in scarlet fever, micrococci have had ascribed to them the power of setting up the specific disease. Canon and Pielicke have, however, described minute bacilli somewhat resembling those described as occurring in vaccine lymph. These are found in the blood in the early stages of the disease, and also in the profuse catarrhal secretions so characteristic of this condition. There are no records of the successful inoculation of this minute bacillus, and until such evidence is forthcoming this organism must be looked upon as being an accessory, possibly, but not the prime cause, of measles.

Mumps.—It is generally accepted that mumps is probably caused by a specific micro-organism, the infective material making its way in the first instance through the ducts to the parotid and other salivary glands. It appears to bring about a peculiar oedematous inflammation of the interstitial tissue of the glands, but slight parenchymatous changes may also be observed. The virus is present in the tissues for some days before there is any manifestation of parotid swelling, but during this period it is extremely active, and the disease may be readily transmitted from patient to patient. The infectivity continues for some time, probably for nearly a week after naked-eye manifestations of the diseased condition have disappeared.

Whooping-Cough.—A diplococcus, a streptococcus, and various higher fungi have in turn been put down as the cause of this disease. It must, from its resemblance to the other specific infective fevers, be considered as an infective disease of microbic origin, which goes through a regular period of incubation and invasion, and in which true nervous lesions, especially of the pneumogastric and superior laryngeal nerves, are somewhat common.

Affanassieff, and later Koplick, have described a minute bacillus, with rounded ends and bi-polar staining, which occurs in the mucus discharged at the end of a paroxysm of whooping-cough. Koplick examined sixteen cases, and found this organism in thirteen of them. There can be little doubt that the infective material is contained in the expectoration. It may remain active for a considerable period, but is then usually attached to solid particles. It is not readily carried by the breath, and multiplies specially in the mucous membranes, setting up inflammation, probably through its toxic products, which appear to be absorbed, and, as in the case of the tetanus poison, to travel specially along the lymphatics of the local nerves. Affections of the lung—bronchitis and broncho-pneumonia—may be directly associated with the disease, but it is much more likely that these affections are the result of secondary infection of tissues already in a weakened condition.

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(G. S. W.)

PARASITISM, in biology, the condition of an organism which obtains its nourishment wholly or partially from the body of another living organism, and which usually brings about extensive modifications in both guest and host, a phenomenon widespread amongst animals and plants. The term has been appropriated by biologists as a metaphor from the Greek (see PARASITE). The lives of organisms are so closely intermeshed that if dependence on other organisms for food be the criterion of parasitism it is doubtful if any escape the taint. Green plants, it is true, build up their food from the inorganic elements of the air and the soil, and are farthest removed from the suspicion of dependence; but most, if not all, thrive only by the aid of living microbes either actually attached to their roots or swarming in the nutrient soil. Saprophytes, organisms that live on organic matter, are merely parasites of the dead, whilst all animals derive their nourishment from the bodies of plants, either directly or indirectly through one or more sets of other animals. It is plain, therefore, that if parasitism is to be employed as a scientific term it must connote something more than mere dependence on another living organism for nutrition. The necessary additional conceptions are two: the bodies of host and parasite must be in temporary or permanent physical contact other than the mere preying of the latter on the former; and the presence of the parasite must not be beneficial, and is usually detrimental to the host.

It is obvious that within the limits of the strictest definition of parasitism that will cover the facts many degrees occur. The terms *symbiosis* and *commensalism* have been applied to conditions really outside the definition of parasitism, but closely related and usually described in the same connexion. Both terms cover the physical consorting of organisms in such a fashion that mutual service is rendered.

The name symbiosis was invented by the botanist A. de Bary in 1879, and is applied to such an extraordinary community as the thallus of a lichen, which is composed of a fungus and an alga so intimately associated, physically and physiologically, that it was not until 1868 that the dual nature of the whole was discovered. The presence of chlorophyll, which had always been associated only with vegetable organisms, was detected by Max Schultze in 1851 in the animals *Hydra* and *Vortex*, and later on by Ray Lankester in *Spongilla* and by P. Geddes in some Turbellarian worms. On the theory that the chlorophyll occurs in independent vegetable cells embedded in the animal tissues, such cases form other instances of symbiosis, for the oxygen liberated by the green cells enables their animal hosts to live in fouler water, whilst the hosts provide shelter and possibly nitrogenous food to their guests.

The term commensalism was introduced in 1876 by P. J. Van Beneden to cover a large number of cases in which "animals have established themselves on each other, and live together on a good understanding and without injury." The most familiar instance is that of fishes of the genus *Fierasfer* which live in the digestive tube of sea-cucumbers (*Holuthuria*; see ECHINODERMA). A variety of commensalism was termed mutualism by Van Beneden and applied to cases where there appeared to be an exchange of benefits. A well-known instance of mutualism is the relation between sea-anemones and hermit crabs. The hermit crab occupies the discarded shell of a mollusc, and anemones such as *Sagartia* or *Adamsia* are attached to the outside of the shell. The bright colours of the anemone advertise its distasteful capacity for stinging, and secure protection for the crab, whilst the anemone gains by vicarious locomotion and possibly has the benefit of floating fragments from the food of the crab.

It is plain that such terms as symbiosis, commensalism and mutualism cannot be sharply marked off from each other or from true parasitism, and must be taken as descriptive terms rather than as definite categories into which each particular association between organisms can be fitted.

R. Leuckart has made the most useful attempt to classify true parasites. Occasional, or temporary, parasites are to be distinguished from permanent, or stationary, parasites. The former seek their host chiefly to obtain food or shelter and are comparatively little modified by their habits when compared with their nearest unparasitic relatives. They may infest either animals or plants, and as they attack only the superficial surfaces of their hosts, or cavities easy of access from the exterior, they correspond closely with another useful term introduced by Leuckart. They are Epizoa or Ectoparasites, as distinguished from Entozoa or Endoparasites. They include such organisms as plant-lice, and caterpillars which feed on the green parts of plants, and animals such as the flea, the bed-bug and the leech, which usually abandon their hosts when they have obtained their object. Many ectoparasites, however, pass their whole lives attached to their hosts; lice, for instance, lay their eggs on the hairs or feathers or in rugosities of the skin of birds and mammals; the development of the egg, the larval stages and the adult life are all parasitic. Permanent or stationary parasites are in the most cases endoparasitic, inhabiting the internal organs; bacteria, gregarines, nematodes and tapeworms are familiar instances. But here also there are no sharp lines of demarcation. Leuckart divided endoparasites according to the nature and duration of their strictly parasitic life: (1) Some have free-living and self-supporting embryos that do not become sexually mature until they have reached their host; (2) others have embryos which are parasitic but migratory, moving either to another part of their host, to another host, or to a free life before becoming mature; (3) others again are parasitic in every stage of their lives, remaining in the same host, and being without a migratory stage.

Origin of Parasitism.—Now that the theory of spontaneous generation has been disproved, the problem of parasitism is no more than detection of the various causes which may have led organisms to change their environment. Every kind of parasite has relations more or less closely akin which have not acquired the parasitic habit, and every gradation exists between temporary and permanent parasites, between creatures that have been only slightly modified and those that have been profoundly modified in relation to this habit. There are many opportunities for an animal or plant in its adult or embryonic stage to be swallowed accidentally by an animal, or to gain entrance to the tissues of a plant, whilst in the case of ectoparasites there is no fundamental difference between an organism selecting a dead or a living environment for food or shelter. If the living environment in the latter case prove to have special advantages, or if the interior of the body first reached accidentally in the former case prove not too different from the normal environment and provide a better shelter, a more convenient temperature, or an easier food supply, the accident may pass into a habit. From the extent to which parasitism exists amongst animals and plants it is clear that it must have arisen independently in an enormous number of cases, and it may be supposed that there must be many cases in which it has been of recent occurrence; E. Metchnikoff, indeed, has suggested that amongst parasites we are to look for the latest products of evolution. In any case it is impossible to suppose that parasites form a natural group; no doubt in many cases the whole of a group, as for instance the group of tapeworms, is parasitic, but indications point clearly to the tapeworms having had free-living ancestors. Parasitism is in short a physiological habit, which theoretically may be assumed by any organism, and which actually has been assumed by members of nearly every living group.

LIST OF PARASITES

A.—Animals.

Vertebrata.—These are rarely parasitic, and cases are unknown amongst mammals, birds, reptiles and amphibia. Amongst fish and cyclostomes, *Myxine* burrows into codfish, *Remora* attaches itself to the external surface of sharks; *Rhodens amarus*, the bitterling, a small, carp-like fresh-water fish, injects its eggs into the mantle-cavity of pond-mussels, where the fry develop, whilst the mollusc reciprocates by throwing off its embryos on the parent fish; *Stegophilus insidiosus*, a small colourless fish from Brazil and the Argentine, lives parasitically in the gill-cavity of large cat-fishes and sucks the blood in the gills of a large Silurid; *Vandellia cirrhosa*, the candiru of Brazil, a minute fish 60 mm. in length, enters and ascends the urethra of people bathing, being attracted by the urine; it cannot be withdrawn, owing to the erectile spines on its gill-covers. The natives in some parts of the Amazon protect themselves whilst in the water by wearing a sheath of minutely perforated coco-nut shell.

Mollusca.—Few if any are true parasites. The Gasteropods, *Eulimae*, *Styliferae* and *Entoconchae* lodge in Echinoderms, the latter at least being truly parasitic.

Protochorda and *Hemichorda.*—Most of these are sessile and may lodge on other animals, but are not parasitic.

Arachnida.—*Mites* and *Ticks* are Arachnids, the vast majority of which are parasitic, and species of which infest almost every vertebrate group, but there are some free-living forms. Pycnogonids are parasitic in their youthful stages on Hydroids, whilst the Pentastomids have been so much modified by parasitism that they were long regarded as worms; they may occur in most vertebrates.

Crustacea.—These contain an immense number of forms in all stages of parasitism. Some Copepods are amongst the most degenerate parasites known, the so-called fish-lice being for the most part Copepods with piercing mouth-organs, elaborate clinging apparatus, and degenerate organs of locomotion. In *Lernea*, the female, after becoming attached to its host, undergoes a retrogressive metamorphosis, losing almost completely the segmentation of the body and discarding the appendages and sense-organs, whilst the male, although not so degenerate in structure, is dwarfed in size and itself becomes a parasite of the female. The *Cirripeds* are all sessile in the adult condition. The *Lepadidae* are the least modified and are rarely parasitic; the *Balanidae* are more modified and frequently become embedded in the skin of whales. The *Abdominalia* live as parasites buried in the shells of other Cirripeds and of molluscs. The *Apoda* live as parasites in the mantle of other Cirripeds, whilst the *Rhizocephala* live chiefly on the abdomen of Decapod Crustacea, sending burrowing root-like nutritive processes into their tissues.

Insecta.—A very large number of insects are temporary or permanent parasites of animals or plants, the adult stages being chiefly ectoparasitic, the larval stages endoparasitic. The *Hemimeridae*, allies of the earwigs, are ectoparasites on rats. The *Mallophaga* or bird-lice are degenerate wingless insects spending their whole lives as ectoparasites on birds and mammals. The larvae of *Hemerobiinae* are parasitic on Aphides. The saw-flies are parasitic on plants. There are over 200,000 species known of the *Hymenoptera parasitica* or *Terebrantia*. The adults deposit their eggs in the eggs, caterpillars or adults of other insects, particularly Lepidoptera. The clothes-moth, for instance, is known to be subject to the attack of over sixty species of Hymenoptera. To such an extent has parasitism been developed in this group, that the parasites themselves are attacked by other parasites, giving rise to the phenomena known as hyperparasitism. The gall-flies (see GALLS) are included amongst the Terebrantia, but in their case the early stages are passed in vegetable galls more frequently than in the bodies of other insects. The ruby-flies (*Hymenoptera Tubulifera*), in the larval condition are parasitic on the larvae of wasps and bees. The *Denudatae* are bees that in the larval stage are parasitic on other bees, the larvae of the parasites being deposited in the food-cells prepared for their own larvae by other bees. Many of the fossorial Hymenoptera form no special nests for their young, but take advantage of the abodes and food-stores prepared by other insects. The very large number of Hymenopterous insects that collect living larvae to be shut up as provender for their developing young are in a sense parasitic. The complex relations of ants with other insects must be referred to in this connexion. The nests of many species are inhabited by foreign insects of various orders, such insects being termed myrmecophilous or ants'-nest insects. The relations between the ants and their guests are very complex, and the guests migrate with their hosts. *Aphidae*, *Coccidae* and other bugs that secrete sugary matter are cherished and tended by ants; so also the caterpillars of some Lycaenid butterflies are kept as a kind of domesticated animal for some useful purpose. There are also many Orthoptera, Hemiptera, and other insects, as well as some acarids and wood-lice found only in ants'-nests as cherished or tolerated guests. The relations between ants and plants is also interesting; the ants live as parasites on the plants or trees, but in return protect them from more harmful intruders. Such phenomena are on the border-line between symbiosis and true parasitism. Although most beetles live on decaying animal or vegetable matter, a large number are parasitic in the adult or larval condition on animals or plants. The curious beetle known as *Platypsyllus castoris* is known only as an ectoparasite of the beaver, whilst the *Leptinidae* are parasites of several species of mammals. The minute beetles of the families *Mordellidae* and *Rhipiphoridae* are endoparasites of wasps and cockroaches, whilst the larvae of many of the *Cantharidae* are parasites of locusts. The *Strepsiptera* are endoparasites of Hymenoptera and Hemiptera. The habits of the Diptera easily pass over into parasitism, and a very large number are temporary or permanent parasites in the adult or larval stages. Most of the larvae of the *Cecidomyiidae* live in plants and form galls or other deformities. The blood-sucking habits of mosquitoes and gnats and sand-flies have not led to any special development in the direction of parasitism. The larvae of *Bombyliidae* are endoparasites of the larvae of mason-bees, and some of the *Cyrtidae* similarly infest spiders, whilst the *Tachinidae* deposit their larvae in other living insects, caterpillars being especially selected. The larvae of some of the *Sarcophagidae* may be deposited in the nostrils of man and other animals, where they may cause death, whilst those of the South American genus *Lucilia* infest the nasal fossae and frontal sinuses of man, producing great suffering, and the larvae of the numerous kinds of bot-fly attack man and many animals. The very large group of Pupipara live by sucking the blood of mammals and birds, and many of them are reduced to wingless permanent parasites. The single member of the family *Braulidae* is a parasite of the bee. All the known fleas (Aphaniptera or Siphonaptera) are ectoparasites in the adult condition; the larval stages are usually to be found in organic refuse. The larvae of most Lepidoptera are temporary ectoparasites of plants, but a few attack other insects, such as coccids and aphids. All the Hemiptera (bugs) have sucking-mouth organs and the majority of them are temporary parasites of plants or other animals. Some, such as the bed-bug, have been so modified by parasitism as to be found only in human dwellings, others, such as the aphids or plant-lice, are permanent parasites of plants, many of them producing galls. The coccids, or scale insects, have been still further modified as plant ectoparasites. The *Pediculidae*, or lice, are the most completely parasitic of insects, and are degraded wingless insects found on almost any kind of bird or mammal, but in most cases so highly modified as to be capable of existence only on the particular species with which they are associated.

Lower Invertebrates.—No true Chaetopods are parasitic, but a few are commensal. The leeches are probably Chaetopods modified by parasitism; and Myzostomes are still more highly modified relatives of the group, very degenerate and parasitic on Crinoids. A few rotifers are ecto- and endo-parasites. No Brachiopods, Polyzoa or Echinoderms are true parasites. The flat-worms and round-worms contain the most characteristic endoparasites, and parasitism is so characteristic a feature of most of the groups that it is discussed in the separate articles dealing with the various natural assemblages of such worms. All the Cestodes (see TAPEWORM), most of the Trematodes (*q.v.*), and a few of the Planarians (*q.v.*) are parasites of animals. Most Nemertines are free-living, but *Cephalothrix galatheae* is endoparasitic in the ovaries of the Crustacean *Galathea strigosa*, whilst *Eunemertes* and *Tetrastemma* occur on Ascidians, and *Malacobdella* in lamellibranch Molluscs. The degraded Mesozoa (*q.v.*) are endoparasites of Planarians, Nemertines and Ophiurids. The Nematoda (*q.v.*) or typical round-worms, exhibit every degree from absolute free-life to absolute parasitism in animals and plants. The Echiuroidea (*q.v.*) are mostly free-living, but the male of *Bonellia* lives as a very degenerate parasite in the uterus and pharynx of the female. Although Coelentera and Porifera are usually sessile, very few are true parasites; young stages of the *Narcomedusae* are parasitic in the mouth of adults of different species, whilst *Mnestra parasites* is a degenerate medusa living on the pelagic mollusc *Phyllirhoe*. The Protozoa, from their minute size and capacity to live in fluids, naturally include an enormous number of parasitic forms, the importance of which in producing disease in their hosts is so great that a very large special literature on parasitic protozoology is being formed (see PATHOLOGY). Of the *Sarcodina* (*q.v.*) many forms of Amoeba such as *Amoeba coli* are associated with dysentery and kindred diseases. A very large number of the *Mastigophora* (*q.v.*), including such forms as the trypanosome of sleeping-sickness, are parasitic; in fact, observation by adequate means of the juices of almost any animal reveals the occasional presence of some kind of mobile protozoon, provided with a whip-like process. The enormous group of *Sporozoa* (*q.v.*) are entirely parasitic, and have been found in every group of animals except the Protozoa and Coelentera. *Infusoria* (*q.v.*) contain a considerable number of parasitic forms, some endoparasitic; others like the Suctoria, ectoparasitic.

B.—Plants.

Bacteria.—Every degree of adaptation to parasitism occurs amongst bacteria, a majority of which pass at least some stage of their lives in a parasitic condition.

Fungi.—As in the case of Bacteria, the absence of chlorophyll from the tissues of fungi makes it necessary that they should take up carbon compounds already assimilated by other organisms, and accordingly they are either saprophytes or parasites. The mycelium is, so to say, the parasitic organ of the fungus, ramifying in the tissues of the host. The plant may obtain access to its host by means of spores which enter usually by wounds in the case of animal and plant hosts, but occasionally by natural apertures such as the stomata of plants. The fungi that develop in the organs of warm-blooded animals reach the blood-stream through wounds, and thence spread to the tissues where germination takes place. Many fungi, especially those that are epiphytic, reach the tissues of their host by germ-tubes which emerge from the spore and penetrate either by a natural or artificial aperture, whilst in other cases the germ-tubes or hyphae actually penetrate uninjured tissues or membranes.

The fungi parasitic on animals are in most cases little known, and additions to the list, of which the pathological rather than the botanical features have been worked out, are constantly being made. A number of species of *Eurotium* and *Aspergillus*, usually saprophytic, may migrate to the bodies of animals, spreading in the tissues and exciting a disease known as mycosis or aspergillosis. They were first discussed in the disease of the human ear known as otomycosis, but they occur also in lungs and air-passages of mammals and birds. Recent pathological investigations conducted at the Prosectorium of the Zoological Society of London, show that mycosis is extremely frequent and fatal in birds and reptiles, and rather less frequent in mammals. Almost any organ of the body is liable to attack. The *Laboulbenieae* are probably Ascomycetes restricted to parasitism on insects, chiefly beetles and flies, sometimes forming a thick fur on the bodies and spreading by spores. The *Entomophthoreae*, possibly *Mucorini*, are also restricted to insects, the fungus that kills the common house-fly being the most familiar example. *Cordyceps militaris* and *Botrytis bassii* are familiar examples of Ascomycete fungi that attack the caterpillars of insects, the latter producing the fatal disease "muscardine" of the silkworm. The group of *Saprolegnieae* usually vegetate as saprophytes but readily settle on aquatic animals such as goldfish, salmon, salamanders and frogs, with fatal results. It is not yet entirely certain if diseases of this kind, of which the salmon disease is the most notorious, are produced on healthy animals, by the attacks of the fungi, or if some antecedent predisposing condition be necessary. There are a number of well-known fungi that produce diseases of the skin in man and other vertebrates. *Achorion Schoenleinii* produces favus in man, rabbits, cats, fowls and other birds and mammals. *Trichophyton tonsurans* (Malmsten), is the fungus of tinea or ringworm in man, oxen, horses, dogs and rabbits. *Saccharomyces albicans* (Reess), produces thrush of the mouth in young herbivora and birds. *Actinomyces bovis* (Harz) is associated with swellings on the jaw-bone of cattle and kangaroos, but has been found in pigs and human beings.

The fungi parasitic on plants are much better known and are responsible for a large number of diseases. They display every gradation from occasional to complete parasitism. Amongst the *Pyrenomycetes*, the group *Erysipheae* contain a large number of common parasites; the main body of the fungus is usually epiphytic as in various mildews (*q.v.*). Ergot (*q.v.*) is the most familiar example of the group. The *Discomycetes* are chiefly saprophytic, being common on dead fruits, roots and so forth, but many of them kill living plants: *Exoascus* on plums, peaches and cherries. *Sclerotinia* is most common on dead juicy fruits, but will destroy turnips in store, and has been known to attack living *Phaseolus* and *Petunia*. The *Hymenocytes* are naturally saprophytes, but when they gain access through wounds are the most destructive parasites of living timber. The *Ustilagineae* are endoparasites in Phanerogams, and are especially notorious for their attacks on grain-crops and grasses. The species of *Ustilego* set up hypertrophy in the tissues of their hosts, and the enlarged spaces thus formed become filled with the spores of the parasite. The *Uredineae* are also endoparasites of the higher plants and produce the diseases known as rusts which specially affect cultivated plants. The *Peronosporeae* are all parasites of plants and are the most destructive enemies of agriculture and horticulture. *Phytophthora infestans* (de Bary), the potato-disease fungus, is a typical example.

Algae.—The chlorophyll-containing green and yellow cells found in Hydroids and Planarians referred to in connexion with symbiosis and the small green algae that infest the hairs of sloths are on the border-line of parasitism. A species of *Nostoc* occurs in the intercellular spaces of other plants; *Chlorochytrium* is found in the tissues of *Lemna*, and *Phyllosiphon arisari* (Kühn) infests the parenchyma of *Arum arisarum.*

The flowering plants have a considerable number of representatives which have become epiphytes and which exhibit various degrees of parasitic degeneration. The Monotropeae allied to the heaths, are degenerate, with no chlorophyll and with scale-like leaves but the evidence as to their parasitism is more than doubtful; they are possibly only saprophytic. The allied Lennoaceae, a small group also devoid of chlorophyll and with scale-leaves, are true root-parasites. The genus *Cuscuta* of the Convolvulaceae consists of the true parasites known as dodders. They are destitute of chlorophyll and attach themselves to other plants by twining stems on which occur haustoria that penetrate the tissues of the host and absorb nutritive material. *Cuscuta europaea*, the great dodder, is a parasite of nettles and hops; *Cuscuta epilinum* is the flax dodder; *Cuscuta epithymum* attacks a number of low-growing plants; and *Cusculum trifolii* is very destructive to clover. Several genera of Scrophulariaceae are partially parasitic; they contain chlorophyll but have degenerate roots with haustoria. *Euphrasia*, the eyebright, attacks the roots of grasses; *Pedicularis*, the lousewort, *Rhinanthus*, the rattle, *Melampyrum*, the cow-wheat and *Bartsia* are all partly parasitic on the roots of other plants. The Orobanchaceae or broomworts, are all destitute of chlorophyll and have scale-leaves; they are parasitic on the roots of other plants, species attacking various Leguminosae, ivy, hemp and hazel. The *Cytinaceae* are true parasites devoid of chlorophyll and leaves, with deformed bodies and conspicuous flowers or inflorescences. Most of them are tropical, and the group is widely scattered throughout the world. The *Santalales* are all parasitic; some members like *Thesium linophyllum* (the bastard toad-flax), a root parasite, and *Viscum album* (the mistletoe), parasitic on branches, have chlorophyll, but rather degenerate leaves; others like the tropical Balanophoraceae are devoid of chlorophyll and foliage leaves and have deformed bodies. Of the Lauraceae, a few genera such as *Cassytha* (the tropical "dodder-laurels,") are true parasites, without chlorophyll and with twining stems.

Effect of Parasitism on Parasites.—The phenomena of parasitism occur so generally in the animal and vegetable kingdoms and are repeated in degrees so varying that no categorical statements can be laid down as to the effects produced on the organisms concerned. All living creatures have a certain degree of correspondence with the conditions of their environment, and parasitism is only a special case of such adaptation. The widest generalization that can be made regarding it is that parasitism tends towards a rigid adaptation to a relatively limited and stable environment, whilst free life tends towards a looser correspondence with a more varying environment. The *summum bonum* of a parasite is to reach and maintain existence in the limited conditions afforded by its host; the goal of the free-living organism is a varying or experimental fitness for varying surrounding conditions. And, if the metaphor be continued, the danger of parasitism for the parasite, is that if it become too nicely adjusted to the special conditions of its host, and fail to attain these, it will inevitably perish. The degeneration of parasites is merely a more precise adaptation; in the favourable environment the degenerate, or specialized parasite is best equipped for successful existence, but the smallest change of environment is fatal. Such a generalization as has been formulated covers nearly all the peculiarities of parasitism. Organs of prehension are notably developed; parasitic plants have twining stems, boring roots and special clinging organs; parasitic animals display hooks, suckers and boring apparatus. The normal organs of locomotion tend to disappear, whether these be wings or walking legs. Organs of sense, the chief purpose of which is to make animals react quickly to changes in the environment, become degenerate in proportion as the changes which the parasite may have to encounter are diminished. The changes correlated with nutrition equally conform with the generalization. The chlorophyll of the plant becomes unnecessary and tends to disappear; the stem has no longer to thrust a spreading crown of leaves into the tenuous air or groping rootlets into the soil, but absorbs already prepared nourishment from the tissues of its host through compact conduits. And so the parasitic higher plant tends to lose its division into stem and leaves and roots, and to acquire a compact and amorphous body. The animal has no longer to seek its food, and the lithe segmentation of a body adapted for locomotion becomes replaced by a squat or insinuating form. Jaws give place to sucking and piercing tubes, the alimentary canal becomes simplified, or may disappear altogether, the parasite living in the juices of its host, and absorbing them through the skin. So, also, parasites obtaining protection from the tissues of their host lose their intrinsic protective mechanisms.

The reproduction of parasites offers many peculiarities, all of which are readily correlated with our generalization. A creature rigidly adapted to a special environment fails if it does not reach that environment, and hence species most successful in reproduction are able to afford the largest number of misses to secure a few hits and so to maintain existence. High reproductive capacity is still more urgent when the parasites tend to bring to an end their own environment by killing their hosts. Reproduction in parasites, so far from being degenerate, displays an exuberance of activity, and an extraordinary efficiency. In parasitic flowering plants the flowers tend to be highly conspicuous, the seeds to be numerous, and specially adapted to ready diffusion. Amongst the fungi, the reproductive processes are most prolific, spores are produced by myriads, and very many special adaptations exist for the protection of the latter during their transference from host to host. It is notorious that the spores of bacteria and the higher fungi resist changes of temperature, desiccation, and the action of physical and chemical agents, to an astonishing extent. Vegetative reproduction is extremely active under favourable conditions, and resting reproductive bodies of varying morphological character are produced in great abundance. Amongst fungi, a phenomenon known as heteroecism is developed as a special adaptation to parasitic conditions, and recalls the similar adaptations in many animal parasites. At one stage of its existence, the fungus is adapted to one host, at another stage to another host. *Puccinia graminis*, the fungoid rust affecting many grasses, is a typical instance. It inhabits wheat, rye and other grasses, developing a mycelium in the tissues of young plants. During the summer, the mycelium gives rise to large numbers of simple processes which break through the tissues of the host and bud off orange-coloured *uredogonidia*. These small bodies are scattered by the wind, and reach other plants on which they germinate, enter the new host through the stomata and give rise to new mycelia. Towards autumn, when the tissues of the host are becoming hard and dry, darker-coloured *teleutogonidia* are produced, and these remain quiescent during the winter. In spring they germinate, produce small free-living mycelia on which in due course *sporidia* are formed. When these, scattered by the wind, fall on the leaf of the barberry-plant, they germinate, and entering the leaf-tissue of the new host by the stomata produce a mycelium bearing reproductive organs so different from those of the phase on the grass-plant, that it was described as a distinct fungus (*Aecidium berberidis*), before its relation with the rust of grasses was known. The spores of the *Aecidium* when they reach grasses give rise to the *Puccinia* stage again.

The reproductive processes of animal parasites are equally exuberant. In the first place, hermaphroditism is very common, and the animals in many cases are capable of self-fertilization. Parthenogenetic reproduction and various forms of vegetative budding are found in all stages of the life-history of animal parasites. The prolificness of many parasites is almost incredible. R. Leuckart pointed out that a human tapeworm has an average life of two years, and produces in that time about 1500 proglottides, each containing between fifty and sixty thousand eggs, so that the single tapeworm has over eighty million chances of successfully reproducing its kind. The devices for nourishing and protecting the eggs and embryos are numerous and elaborate, and many complex cases of larval migration and complicated cases of heteroecism occur. (See TREMATODE and TAPEWORM.)

The physiological adaptations of parasites are notable, especially in cases where the hosts are warm-blooded. The parasites tend to become so specialized as to be peculiar to particular hosts; ectoparasites frequently differ from species to species of host, and the flea of one mammal, for instance, may rapidly die if it be transferred to another although similar host. The larval and adult stages of endoparasites become similarly specialized, and although there are many cases in which the parasites that excite a disease in one kind of animal are able to infect animals of different species, the general tendency is in the direction of absolute limitation of one parasite, and indeed one stage of one parasite to one kind of host. The series of events seems to be a gradual progression from temporary or occasional parasitism to obligatory parasitism and to a further restriction of the obligatory parasite to a particular kind of host.

Effect of Parasitism on Hosts.—The intensity of the effect of parasitism on the hosts of the parasites ranges from the slightest local injury to complete destruction. Most animals and plants harbour a number of parasites, and seem to be unaffected by them. On the other hand, as special knowledge increases, the range of the direct and indirect effect of parasites is seen to be greater. It is probable that in a majority of cases, the tissues of animals and plants resist the entrance of microbes unless there is some abrasion or wound. In the case of plants the actual local damage caused by animal or vegetable ectoparasites may be insignificant, but the wounds afford a ready entrance to the spores or hyphae of destructive endoparasites. So also in the case of animals, it is probable that few microbes can enter the skin or penetrate the walls of the alimentary canal if these be undamaged. But as knowledge advances the indirect effect of parasites is seen to be of more and more importance. Through the wounds caused by biting-insects the microbes of various skin diseases and inflammations may gain entrance subsequently, or the insects may themselves be the carriers of the dangerous endoparasites, as in the cases of mosquitoes and malaria, fleas and plague, tsetse flies and sleeping sickness. Similarly the wounds caused by small intestinal worms may be in themselves trifling, but afford a means of entrance to microbes. It has been shown, for instance, that there is an association between appendicitis and the presence of small nematodes. The latter wound the coecum and allow the microbes that set up the subsequent inflammation to reach their nidus. It has been suggested that the presence of similar wounding parasites precedes tubercular infection of the gut.

The parasites themselves may cause direct mechanical injury, and such injury is greatly aggravated where active reproduction takes place on or in the host, with larval migrations. A tangled mass of Ascarid worms may occlude the gut; masses of eggs, larvae or adults may block bloodvessels or cause pressure on important nerves. The irritation caused by the movements or the secretions of the parasites may set up a reaction in the tissues of the host leading to abnormal growths (*e.g.* galls and pearls) or hypertrophies. Migrations of the parasites or larvae may cause serious or fatal damage. The abstraction of food-substances from the tissues of the host may be insignificant even if the parasites are numerous, but it is notable that in many cases the effect is not merely that of causing an extra drain on the food-supply of the host which might be met by increased appetite. The action is frequently selective; particular substances, such as glycogen, are absorbed in quantities, or particular organs are specially attacked, with a consequent overthrow of the metabolic balance. Serious anaemia out of all proportion to the mass of parasites present is frequently produced, and the hosts become weak and fail to thrive. A. Giard has worked out the special case which he has designated as "parasitic castration" and shown to be frequent amongst animal hosts. Sometimes by direct attacks on the primary sexual organs, and sometimes by secondary disturbance of metabolism, the presence of the parasites retards or inhibits sexual maturity, with the result that the secondary sexual characters fail to appear. The most usual and serious effect on their hosts of parasites is, however, the result of toxins liberated by them. (See PARASITIC DISEASES.)

Finally, the attacks of parasites have led to the development by the hosts of a great series of protective mechanisms. Such adaptations range from the presence of thickened cuticles, and hairs or spines, the discharge of waxy, sticky or slimy secretions, to the most elaborate reactions of the tissues of the host to the toxins liberated by the parasites.

History and Literature of Parasitism.—The history and literature of parasitism are inextricably involved with the history and literature of zoology, botany, medicine and pathology. Pliny recognized the mistletoe as a distinct parasitic plant and gave an account of its reproduction by seed. Until the 18th century little more was done. In 1755 Pfeiffer in his treatise on *Fungus melitensis* (in Linnaeus's *Amoenitat. acad.* Dissert. LXV. vol. iv.) made a group of parasitic flowering plants, but included epiphytes like the ivy. In 1832 A. de Candolle (*Physiol. végétale*, vol. iii.) attempted to divide and classify flowering parasites on morphological and physiological grounds, and since then, the study of parasitism has been a part of all botanical treatises. With regard to Fungi, A. de Bary's treatise on the *Comparative Morphology and Biology of the Fungi, Mycetozoa* and *Bacteria* (Eng. ed., 1887) remains the standard work. There is in addition a large special literature on bacteriology. With regard to animal parasites, the first real steps in knowledge were the refutation of spontaneous generation (see BIOGENESIS). Linnaeus traced the descent of the liver fluke of sheep from a free-living stage, and although his particular observations were erroneous, they laid the foundation on which later observers worked, and pointed the way towards discovery of larval migrations and heteroecism. O. Fr. Müller in 1773, and L. H. Bojanus in the beginning of the 19th century reached more nearly to a correct interpretation. J. J. Steenstrup in his famous monograph of which an English edition was published by the Ray Society in 1845 (*On the Alternation of Generations, or the Propagation and Development of Animals through Alternate Generations*) interpreted many scattered observations by a clear and coherent theory. Thereafter there was a steady and consistent progress, and the literature of animal parasites merges in that of general zoology. The two best-known names are those of T. S. Cobbold (*Entozoa: an Introduction to the Study of Helminthology*, 1869) and R. Leuckart (*The Parasites of Man*, Eng. trans., 1886), the former describing a very large number of types, and the latter adding enormously to scientific knowledge of the structure and life-history. Of more modern books, G. Fleming's Eng. ed. of L. G. Neumann's *Parasites and Parasitic Diseases of the Domesticated Animals*, and the Eng. ed. of Max Braun's *Animal Parasites of Man* (1906), are the most comprehensive. (P. C. M.)

PARASNATH, a hill and place of Jain pilgrimage in British India, in Hazaribagh district, Bengal; 4480 ft. above the sea; 18 m. from Giridih station on the East Indian railway. It derives its name from the last of the twenty-four Jain saints, who is believed to have here attained *nirvana* or beatific annihilation. It is crowded with temples, some of recent date; and the scruples of the Jains have prevented it from being utilized as a sanatorium, for which purpose it is otherwise well adapted.

PARASOL (Fr., from Ital. *parasole*: *pardre*, to shield, and *sole*, sun), a sunshade, a light or small form of umbrella, covered with coloured silk or other material. In Japan and China gaily coloured parasols of paper stretched on bamboo frames are used by all classes. The parasol of an elaborate and highly ornamented type has been the symbol of high honour and office in the East, being borne over rulers, princes and nobles. The negro chiefs of West Africa reserve to themselves the privilege of bearing parasols of considerable size and substantial construction, the size varying and denoting gradations in rank.

PARAVICINO Y ARTEAGA, HORTENSIO FELIX (1580–1633), Spanish preacher and poet, was born at Madrid on the 12th of October 1580, was educated at the Jesuit college in Ocaña, and on the 18th of April 1600 joined the Trinitarian order. A sermon pronounced before Philip III. at Salamanca in 1605 brought Paravicino into notice; he rose to high posts in his order, was entrusted with important foreign missions, became royal preacher in 1616, and on the death of Philip III. in 1621 delivered a famous funeral oration which was the subject of acute controversy. He died at Madrid on the 12th of December 1633. His *Oraciones evangélicas* (1638–1641) show that he was not without a vein of genuine eloquence, but he often degenerates into vapid declamation, and indulges in far-fetched tropes and metaphors. His *Obras pósthumas, divinas y humanas* (1641) include his devout and secular poems, as well as a play entitled *Gridonia*; his verse, like his prose, exaggerates the characteristic defects of Gongorism.

PARAY-LE-MONIAL, a town of east-central France in the department of Saone-et-Loire, 58 m. W.N.W. of Mâcon by the Paris-Lyon railway, on which it is a junction for Moulins, Lozanne, Clermont and Roanne. Pop. (1906), 3382. It lies on the slope of a hill on the right bank of the Bourbince and has a port on the Canal du Centre. The chief building in the town is the priory church of St Pierre. Erected in the 12th century in the Romanesque style of Burgundy, it closely resembles the abbey church of Cluny in the length of the transepts, the height of the vaulting and the general plan. The town is the centre of a district important for its horse-raising; bricks, tiles and mosaics are the chief manufactures of the town. In the 10th century a Benedictine priory was founded at Paray-le-Monial. In the 16th century the town was an industrial centre, but its prosperity was retarded by the wars of religion and still more by the revocation of the edict of Nantes. In 1685 the visions of Marguerite Marie Alacoque, a nun of the convent of the Visitation, who believed herself to possess the Sacred Heart of Jesus, attracted religious gatherings to the town, and yearly pilgrimages to Paray-le-Monial still take place.

PARCEL (Fr. *parcelle*, Ital. *particella*, Lat. *particula*, diminutive of *pars*, part), a small part or division of anything; particularly, in the law of real property and conveyancing, a portion of a manor or estate, and so the name of that portion of a legal document, such as a conveyance or lease relating to lands, which contains a description of the estate dealt with. The word is also used of a package of goods contained in a wrapping or cover for transmission by carriage, &c., or by post; hence the term "parcel-post" for the branch of the post-office service which deals with the transmission of such packages. "Parcel" was formerly used in an adverbial or quasi-adverbial sense, meaning "partly," "to some extent," thus "parcel-Protestant," "parcel-lawyer," &c. This use survives in "parcel-gilt," *i.e.* partly gilt, a term applied to articles made of silver with a gilt lining.

PARCHIM (PARCHEM), a town of Germany, in the grand duchy of Mecklenburg-Schwerin, on the Elde, which flows through it in two arms, 23 m. S.E. of Schwerin, on the railway from Ludwigslust to Neubrandenburg. Pop. (1905), 10,397. It was the birthplace of Moltke, to whom a monument was erected in 1876. It is an ancient place surrounded with walls, and contains a Gothic town hall and two interesting churches. Founded about 1210, Parchim was during part of the 14th century the residence of one branch of the family of the dukes of Mecklenburg. It became a prosperous industrial town during the 16th century, but this prosperity was destroyed by the Thirty Years' War. A revival, however, set in during the 19th century.

See Hübbe, *Zur topographischen Entwickelung der Stadt Parchim* (Parchim, 1899); and Weltzien, *Zur Geschichte Parchims* (Parchim, 1903).

PARCHMENT. Skins of certain animals, prepared after particular methods, have supplied writing material on which has been inscribed the literature of centuries. Such a durable substance, in most cases easily obtainable in fair abundance, would naturally suggest itself for the purpose, and we are therefore prepared for evidence of its use, and also for the survival of actual specimens, from very ancient times. The tradition of the employment of skins as writing material by the ancient Egyptians is to be traced back to the period of the Pharaohs of the IVth Dynasty, and in the British Museum and elsewhere there exist skin-rolls which date back to some 1500 years B.C. But the country which not only manufactured but also exported in abundance the writing material made from the papyrus plant (see PAPYRUS) hardly needed to make use of any other material, and the instances of skin-rolls inscribed in Egypt must at all times have been rare. But in western Asia the practice of using skins as writing material must have been widespread even at a very early period. The Jews made use of them for their sacred books, and it may be presumed for other literature also; and the old tradition has been maintained by this conservative race down to our own day, requiring the synagogue rolls to be inscribed on this time-honoured material. No doubt their neighbours the Phoenicians, so ready to adapt the customs of other nations to their own advantage, would also have followed the same practice. The Persians inscribed their annals on skins; and skins were employed by the Ionian Greeks, as proved by the words of Herodotus (v. 58). There is no evidence forthcoming that the same usage was followed by the western Greeks and by the Italic tribes; but it is difficult to suppose that at a remote period, before the importation of papyrus, such an obviously convenient writing material as skin was not used among the early civilized races of Greece and Italy.

The method of preparation of skins for the service of literature in those distant ages is unknown to us; but it may be assumed that it was more or less imperfect, and that the material was rather of the character of tanned leather than of the thinner and better prepared substance which was to follow at a later time. The improvement of the manufacture to which we refer was to be of a nature so thorough as to endow the material with a new name destined to last down to the present day.

The new manufacture was traditionally attributed to Eumenes II. of Pergamum, 197–158 B.C. The common story, as told by Pliny on the authority of Varro, is that Eumenes, when seeking to enlarge the library of his capital, was opposed by the jealousy of the Ptolemies, who forbade the export of papyrus from Egypt, thus hoping to check the growth of the rival library; and that the Pergamene king was thus compelled to revert to the old custom of using skins as writing material. It is needless to regard this story as literally true, or as other than a popular explanation of a great development of the manufacture of skin material for books in the reign of Eumenes. In former times the prepared skins had been known by the natural titles διφθέραι, μεμβράναι, the Latin *membranae*, and these were at first also attached to the new manufacture; but the latter soon received a special name after the place of its origin, and became known as περγαμηνή, *charta pergamena*, from which descends our English term parchment, through the French *parchemin*. The title of *pergamena* actually appears first in the edict *De pretiis rerum* of Diocletian (A.D. 301), and in a passage in one of St Jerome's Epistles.

The principal improvement in the new manufacture was the dressing of the skins in such a way as to render them capable of receiving writing on both sides, the older methods probably treating only one side for the purpose, a practice which was sufficient in times when the roll was the ordinary form of book and when it was not customary to write on the back as well as on the face of the material. The invention of parchment with its two surfaces, recto and verso, equally available for the scribe, ensured the development of the codex. (See MANUSCRIPT.)

The animals whose skins were found appropriate for the manufacture of the new parchment were chiefly sheep, goats and calves. But in course of time there has arisen a distinction between the coarser and finer qualities of the material; and, while parchment made from ordinary skins of sheep and goats continued to bear the name, the finer kinds of manufacture produced from the more delicate skins of the calf or kid, or of still-born or newly-born calves or lambs, came to be generally known as vellum (Fr. *velin*). The skin codices of the early and middle ages being for the most part composed of the finer kinds of material, it has become the custom to describe them as of vellum, although in some instances it would be more correct to call the material parchment.

The ordinary modern process of preparing the skins is by washing, liming, unhairing, scraping, washing a second time, stretching evenly on a frame, scraping a second time and paring down inequalities, dusting with sifted chalk and rubbing with pumice. Somewhat similar methods, no doubt varying in details, must have been employed from the first.

The comparatively large number of ancient and medieval MSS. that have survived enables us to gather some knowledge of the varieties of the material in different periods and in different countries. We know from references in Roman authors that parchment or vellum was entering into competition with papyrus as a writing material at least as early as the 2nd century of our era (see MANUSCRIPT), though at that time it was probably not so skilfully prepared as to be a dangerous rival. But the surviving examples of the 3rd and 4th centuries show that a rapid improvement must almost at once have been effected, for the vellum of that age is generally of a thin and delicate texture, firm and crisp, with a smooth and glossy surface. Here it should be noticed that there was always, and in some periods and in some countries more than in others, a difference in colour between the surface of the skin from which the hair had been removed and the inner surface next to the flesh of the animal, the latter being whiter than the other. This difference is generally more noticeable in the older examples, those of a later period having usually been treated more thoroughly with chalk and pumice. To obviate any unsightly contrast, it was customary, when making up the quires for a volume, to lay hair-side next to hair-side and flesh-side to flesh-side, so that, at whatever place the codex was opened, the tint of the open pages should be uniform.

As a rule, the vellum of early MSS., down to and including the 6th century, is of good quality and well prepared. After this, the demand increasing, a greater amount of inferior material came into the market. The manufacture necessarily varied in different countries. In Ireland and England the vellum of the early MSS. is usually of stouter quality than that of foreign examples. In Italy and Greece and in the European countries generally bordering on the Mediterranean, a highly polished surface came into favour in the middle ages, with the ill effect that the hardness of the material resisted absorption, and that there was always a tendency for ink and paint to flake off. On the other hand, in western Europe a soft pliant vellum was in vogue for the better classes of MSS. from the 12th century onwards. In the period of the Italian Renaissance a material of extreme whiteness and purity was affected.

Examples of uterine vellum, prepared from still-born or newly-born young, are met with in choice volumes. A remarkable instance of a codex composed of this delicate substance is the Additional MS. 23935, of the 13th and 14th centuries, in the British Museum, which is made up of as many as 579 leaves, without being a volume of abnormal bulk.

In conclusion, we must briefly notice the employment of vellum of a sumptuous character to add splendour to specially choice codices of the early middle ages. The art of dyeing the material with a rich purple colour was practised both in Constantinople and in Rome; and, at least as far back as the 3rd century, MSS., generally of the Scriptures, were produced written in silver and gold on the precious stained vellum: a useless luxury, denounced by St Jerome in a well-known passage in his preface to the Book of Job. A certain number of early examples still survive, in a more or less perfect condition: such as the MS. of the Gospels in the Old Latin version at Verona, of the 4th or 5th century; the celebrated codex of Genesis in the Imperial Library at Vienna; the Rossano MS. and the Patmos MS. of the Gospels in Greek; the Gothic Gospels of Ulfilas at Upsala, and others, of the 6th century, besides a few somewhat later specimens. In the revival of learning under Charlemagne a further encouragement was given to the production of such codices; but soon afterwards the art of purple-staining appears to have been lost or abandoned. A last trace of it is found in a few isolated instances of stained vellum leaves inserted for ornament in MSS. of the period of the Renaissance.

AUTHORITIES.—Particulars of the early manufacture and use of parchment and vellum are to be found in most of the handbooks on palaeography and book-development, such as W. Wattenbach, *Das Schriftwesen im Mittelalter* (3rd ed., 1896); G. Birt, *Das antike Buchwesen* (1882); Sir E. M. Thompson, *Handbook of Greek and Latin Palaeography* (3rd ed., 1906). See also La Lande. *Art de faire le parchemin* (1762); G. Peignot, *Essai sur l'histoire du parchemin et du velin* (1812); A. Watt, *The Art of Leather Manufacture* (1885). (E. M. T.)

PARCLOSE (from the O. Fr. *parclore*, to close thoroughly; Lat. *claudere*), an architectural term for a screen or railing used to enclose a chantry, tomb, chapel, &c., in a church, and for the space thus enclosed.

PARDAILLAN, the name of an old French family of Armagnac, of which several members distinguished themselves in the service of the kings of France in the 16th and 17th centuries. Antoine Arnaud de Pardaillan, *maréchal de camp*, served Henry IV. in Franche-Comté, Picardy and Savoy, and was created marquis de Montespan in 1612 and marquis d'Antin in 1615 under Louis XIII. His grandson Louis Henri, marquis de Montespan, was the husband of Mme de Montespan, the mistress of Louis XIV. Louis Antoine de Pardaillan de Gondrin (1665–1736), legitimate son of the famous marquise, became lieutenant-general of the armies of the king in 1702, governor of the Orléanais, director-general of buildings in 1708, lieutenant-general in Alsace, member of the council of regency, and minister of state. He was created duc d'Antin in 1711. The last duc d'Antin, Louis, died in 1757.

PARDESSUS, JEAN MARIE (1772–1853), French lawyer, was born at Blois on the 11th of August 1772. He was educated by the Oratorians, and then studied law, at first under his father, a lawyer at the *Présidial*, who was a pupil of Robert J. Pothier. In 1796, after the Terror, he married, but his wife died at the end of three years. He was thus a widower at the age of twenty-seven, but refused to remarry and so give his children a step-mother. He wrote a *Traité des servitudes* (1806), which went through eight editions, then a *Traité du contrat et des lettres de change* (1809), which pointed him out as fitted for the chair of commercial law recently formed at the faculty of law at Paris. The emperor, however, had insisted that the position should be open to competition. Pardessus entered (1810) and was successful over two other candidates, André M. J. J. Dupin and Persil, who afterwards became brilliant lawyers. His lectures were published under the title *Cours de droit commercial* (4 vols., 1813–1817). In 1815 Pardessus was elected deputy for the department of Loir-et-Cher, and from 1820 to 1830 was constantly re-elected; then, however, he refused to take the oath of allegiance to Louis Philippe, and was deprived of his office. After the publication of the first volume of his *Collection des lois maritimes antérieures au xviii^{e} siècle* (1828) he was elected a member of the Académie des Inscriptions et Belles Lettres. He continued his collection of maritime laws (4 vols., 1828–1845), and published *Les Us et coutumes de la mer* (2 vols., 1847). He also brought out two volumes of Merovingian diplomas (*Diplomata, chartae, epistolae, leges*, 1843–1849); vols. iv.–vi. of the *Table chronologique des diplomes*; and vol. xxi. of *Ordonnances des rois de France* (1849), preceded by an *Essai sur l'ancienne organisation judiciaire*, which was reprinted in part in 1851. In 1843 Pardessus published a critical edition of the *Loi salique*, followed by 14 dissertations, which greatly advanced the knowledge of the subject. He died at Pimpeneau near Blois on the 27th of May 1853.

See notices in *Journal général de l'instruction publique* (July 27, 1853), in the *Bibliothèque de l'école des chartes* (3rd series, 1854, v. 453), and in the "Histoire de l'académie des inscriptions et belles lettres" (vol. xx. of the *Mémoires de l'académie*, 1861).

PARDO BAZÁN, EMILIA (1851–), Spanish author, was born at Corunna, Spain, on the 16th of September 1851. Married in her eighteenth year to Sr D. José Quiroga, a Galician country gentleman, she interested herself in politics, and is believed to have taken an active part in the subterranean campaign against Amadeo of Savoy and, later, against the republic. In 1876 she came into notice as the successful competitor for a literary prize offered by the municipality of Oviedo, the subject of her essay being the Benedictine monk, Benito Jerónimo Feijóo. This was followed by a series of articles inserted in *La Ciencia cristiana*, a magazine of the purest orthodoxy, edited by Juan M. Orti y Lara. Her first novel, *Pascual López* (1879), is a simple exercise in fantasy of no remarkable promise, though it contains good descriptive passages of the romantic type. It was followed by a more striking story, *Un Viaje de novios* (1881), in which a discreet attempt was made to introduce into Spain the methods of French realism. The book caused a sensation among the literary cliques, and this sensation was increased by the appearance of another naturalistic tale, *La Tribuna* (1885), wherein the influence of Zola is unmistakable. Meanwhile, the writer's reply to her critics was issued under the title of *La Cuestión palpitante* (1883), a clever piece of rhetoric, but of no special value as regards criticism or dialectics. The naturalistic scenes of *El Cisne de Vilamorta* (1885) are more numerous, more pronounced, than in any of its predecessors, though the authoress shrinks from the logical application of her theories by supplying a romantic and inappropriate ending. Probably the best of Sra Párdo Bazán's work is embodied in *Los Pazos de Ulloa* (1886), the painfully exact history of a decadent aristocratic family, as notable for its portraits of types like Nucha and Julián as for its creation of characters like those of the political bravos, Barbacana and Trampeta. Yet perhaps its most abiding merit lies in its pictures of country life, its poetic realization of Galician scenery set down in an elaborate, highly-coloured style, which, if not always academically correct, is invariably effective. A sequel, with the significant title of *La Madre naturaleza* (1887), marks a further advance in the path of naturalism, and henceforward Sra Pardo Bazán was universally recognized as one of the chiefs of the new naturalistic movement in Spain. The title was confirmed by the publication of *Insolación* and *Morriña*, both issued in 1889. In this year her reputation as a novelist reached its highest point. Her later stories, *La Cristiana* (1890), *Cuentos de amor* (1894), *Arco Iris* (1895), *Misterio* (1903) and *La Quimera* (1905), though not wanting in charm, awakened less interest. In 1905 she published a play entitled *Verdad*, remarkable for its boldness rather than for its dramatic qualities. (J. F.-K.)

PARDOE, JULIA (1806–1862), English writer, was born at Beverley, Yorkshire, in 1806. When fourteen years old she published a volume of poems. In 1835 she went to Constantinople and her experiences there furnished her with material for vivid pictures of Eastern life in the *City of the Sultan* (1837), *Romance of the Harem* (1839) and *Beauties of the Bosphorus* (1839). Her other works, not always historically accurate, include *Louis XIV. and the Court of France in the Seventeenth Century* (1847); *The Court and Reign of Francis I.* (1849); *The Life and Memoirs of Marie de Medici* (1852); *Episodes of French History during the Consulate and the First Empire* (1859); and several sprightly and pleasant novels. In 1860 she was granted a civil list pension. She died on the 26th of November 1862.

PARDON (through the Fr. from Late Lat. *perdonare*, to remit a debt or other obligation on a penalty), the remission, by the power entrusted with the execution of the laws, of the penalty attached to a crime. The right of pardoning is coextensive with the right of punishing. In a perfect legal system, says Beccaria, pardons should be excluded, for the clemency of the prince seems a tacit disapprobation of the laws (*Dei Delitti e delle pene*, ch. xx.).[1] In practice the prerogative is extremely valuable, when used with discretion, as a means of adjusting the different degrees of moral guilt in crimes or of rectifying a miscarriage of justice. By the law of England pardon is the sole prerogative of the king, and it is declared by 27 Hen. VIII. c. 24 that no other person has power to pardon or remit any treasons or felonies whatsoever. This position follows logically from the theory of English law that all offences are breaches of the king's peace. Indictments still conclude with a statement that the offence was committed "against the peace of our lord king, his crown and dignity." The Crown by pardon only remits the penalty for an attack upon itself. The prerogative is in modern times exercised by delegation, the Crown acting upon the representation of the secretary of state for the home department in Great Britain, or of the lord lieutenant in Ireland. The prerogative of the Crown is subject to some restrictions: (1) The committing of a subject of the realm to a prison out of the realm is by the Habeas Corpus Act a *praemunire*, unpardonable even by the king (31 Car. II. c. 2, § 12). (2) The king cannot pardon an offence in a matter of private rather than of public wrong, so as to prejudice the person injured by the offence. Thus a common nuisance cannot be pardoned while it remains unredressed, or so as to prevent an abatement of it. A fine or penalty imposed for the offence may, however, be remitted. By an act of 1859 (22 Vict. c. 32) his majesty is enabled to remit wholly or in part any sum of money imposed upon conviction, and, if the offender has been imprisoned in default of payment, to extend to him the royal mercy. There are other statutes dealing with special offences, *e.g.* by the Remission of Penalties Act 1875 his majesty may remit any penalty imposed under 21 Geo. III. c. 49 (an act for preventing certain abuses and profanations on the Lord's Day called Sunday). (3) The king's pardon cannot be pleaded in bar of an impeachment. This principle, first asserted by a resolution of the House of Commons in the earl of Danby's case (May 5, 1679), forms one of the provisions of the Act of Settlement, 12 & 13 Will. III. c. 2. It is there enacted "that no pardon under the great seal of England shall be pleadable to an impeachment by the Commons in parliament," § 3. This provision does not extend to abridging the prerogative after the impeachment has been heard and determined. Thus three of the rebel lords were pardoned after impeachment and attainder in 1715. (4) In the case of treason, murder or rape a pardon is ineffectual unless the offence be particularly specified therein (13 Rich. II. c. 1, § 2). Before the Bill of Rights, 1 Will. & M. c. 2, § 2, this statute seems to have been frequently evaded by a *non obstante* clause. But, since by the Bill of Rights no dispensation by *non obstante* is allowed, general words contrary to the statute of Richard II. would seem to be ineffectual.

Pardon may be actual or constructive. Actual pardon is by warrant under the great seal, or under the sign-manual countersigned by a secretary of state (7 & 8 Geo. IV. c. 28, § 13). Constructive pardon is obtained by endurance of the punishment. By 9 Geo. IV. c. 32, § 3, the endurance of a punishment on conviction of a felony not capital has the same effect as a pardon under the great seal. This principle is reaffirmed in the Larceny Act 1861, § 109, and in the Malicious Injuries to Property Act 1861, § 67. Further, pardon may be free or conditional. A conditional pardon most commonly occurs where an offender sentenced to death has his sentence commuted to penal servitude or any less punishment. The condition of his pardon is the endurance by him of the substituted punishment. The effect of pardon, whether actual or constructive, is to put the person pardoned in the position of an innocent man, so that he may have an action against any one thenceforth calling him traitor or felon. He cannot refuse to give evidence respecting the offence pardoned on the ground that his answer would tend to criminate him. A pardon may be pleaded on arraignment in bar of an indictment (though not of an impeachment), or after verdict in arrest of judgment. No doubt it would generally be advantageous to plead it as early as possible.

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[1] See further, on the ethical aspect, Montesquieu, *Esprit des lois*, bk. vi. ch. 21; Bentham, *Principles of Penal Law*, bk. vi. ch. 4.

It is obvious that, though the Crown is invested with the right to pardon, this does not prevent pardon being granted by the higher authority of an act of parliament. Acts of indemnity have frequently been passed, the effect of which is the same as pardon or remission by the Crown. Examples of acts of indemnity are two private acts passed in 1880 to relieve Lords Byron and Plunket from the disabilities and penalties to which they were liable for sitting and voting in the House of Peers without taking the oath.

Civil rights are not divested by pardon. The person injured may have a right of action against the offender in spite of the pardon of the latter, if the right of action has once vested, for the Crown cannot affect private rights. In Scotland this civil right is specially preserved by various statutes. Thus 1593, c. 174, provides that, if any respite or remission happen to be granted before the party grieved be first satisfied, the same is to be null and of none avail. The assythment, or indemnification due to the heirs of the person murdered from the murderer, is due if the murderer has received pardon, though not if he has suffered the penalty of the law. The pardon transmitted by the secretary of state is applied by the supreme court, who grant the necessary orders to the magistrates in whose custody the convict is.

In the United States the president is empowered to pardon offences against the United States, except in cases of impeachments (U. S. Constitution, art. ii. § 2). The power of pardon is also vested in the executive authority of the different states, with or without the concurrence of the legislative authority, although in some states there are boards of pardon of which the governor is a member *ex officio*. Thus by the New York Code of Criminal Procedure the governor of the state of New York has power to grant reprieves, commutations and pardons, except in the case of treason, where he can only suspend the execution of the sentence until the case can be reported to the legislature, with whom the power of pardon in this case rests. The usual form of pardon in the United States is by deed under seal of the executive.

PARDUBITZ (Czech, *Pardubic*), a town of Bohemia, Austria, 65 m. E. of Prague by rail. Pop. (1900), 17,029, mostly Czech. The most interesting buildings are the old fortified château of the 16th century, with its Gothic chapel restored in 1880; the church of St Bartholomew, dating in its present form from 1538; the new town hall (1894); the Grünes Tor, also built in 1538; and the handsome new synagogue. Pardubitz has a tolerably active trade in grain and timber, and the horse-fairs attract numerous customers.

PARÉ, AMBROISE (1510–1590), French surgeon, was born at Laval, in the province of Maine, and died at Paris in 1590. His professional career and services to his art are described in the article SURGERY. A collection of his works was published at Paris in 1575 and they were afterwards frequently reprinted. Several editions have appeared in German and Dutch, and among the English translations was that of Thomas Johnson (1665).

See J. F. Malgaigne, *Œuvres complètes* (Paris, 1840); Le Paulmier, *Ambroise Paré d'après de nouveaux documents découverts aux archives nationales et de papiers de famille* (Paris, 1885); Stephen Paget, *Ambroise Paré and his Times* (London, 1897).

PAREJA, JUAN DE (1606–1670), Spanish painter, was born a slave in the West Indies about 1606, and in early life passed into the service of Velazquez, who employed him in colour-grinding and other menial work of the studio. By day he closely watched his master's methods, and by night stealthily practised with his brushes until he had attained considerable manipulative skill. The story goes that, having succeeded in producing a picture satisfactory to himself, he contrived furtively to place it among those on which Velazquez had been working, immediately before an expected visit of King Philip IV. The performance was duly discovered and praised, and Pareja forthwith received his freedom, which, however, he continued to devote to his former employer's service. His extant works are not very numerous; the best known, the "Calling of St Matthew," now in the Prado, Madrid, has considerable merit as regards technique, but does not reveal much originality, insight or devotional feeling. He died in 1670.

PARENT, SIMON NAPOLEON (1855–), Canadian politician, son of Simon Polycarpe Parent, merchant, was born in the village of Beauport, in the province of Quebec, on the 12th of September 1855. He was educated at Laval University, where he graduated in 1881. In the same year he was called to the bar of the province of Quebec. He married in 1877 Marie Louise Clara Gendron, of Beauport. In 1890 Parent was elected a member of the municipal council of Quebec, and served as mayor of the city from 1894 to 1906. From the year 1890 to 1905 he represented the county of Saint-Sauveur as a Liberal in the legislative assembly of his native province, and on the formation of the Marchand administration in 1897 he accepted the portfolio of minister of lands, forests and fisheries. After Marchand's death in September 1900 he was called by the lieutenant-governor to form a cabinet, and continued in office as prime minister until his retirement from public life in August 1905. Parent proved a capable administrator of provincial and municipal affairs. Under his administration the finances of the city of Quebec were improved, an electric car service was provided, public parks were opened, a system of electric light was established and the streets were well paved. In 1905 he became chairman of the Transcontinental railway of Canada.

PARENTHESIS (from Gr. παρεντιθέναι, put in alongside), the grammatical term denoting the insertion (and so also the signs for such insertion) of a word, phrase or sentence between other words or in another sentence, without interfering with the construction, and serving a qualifying, explanatory or supplementary purpose. In writing or printing such parenthetical words or sentences are marked off by commas, dashes, or, more usually, by square or semi-circular brackets.

PARENZO, a seaport of Austria, in Istria, 95 m. S. by W. of Trieste by rail. Pop. (1900), 9962, mostly Italian. It is situated on the west coast of Istria, and is built on a peninsula nowhere more than 5 ft. above the sea-level; and from the fact that the pavements of the Roman period are 3 ft. below the present surface it is inferred that this part of the coast is slowly subsiding. Parenzo has considerable historic and architectural interest, and its well-preserved cathedral of St Maurus, erected probably between 535 and 543, is one of the most interesting buildings in the whole of Austria. The basilican type is very pure; there are three naves; the apse is hexagonal without and round within. The total length of the church proper is only 120 ft.; but in front of the west entrance is a square atrium with three arches on each side; to the west of the atrium is a now roofless baptistery, and to the west of that rises the campanile; so that the total length from campanile to apse is about 230 ft. Mosaics, now greatly spoiled, form the chief decoration of both outside and inside. The high altar is covered with a noble baldachin, dating from 1277. The basilica is one of those churches in which the priest when celebrating mass stands behind the altar with his face to the west. An older church is referred to in the inscription of Euphrasius in the mosaic of the apse of the cathedral, and remains of its mosaic pavement and of its apse have been found under the floor of the present church; it belongs perhaps to the 5th century A.D.; while at a still lower level another pavement, perhaps of the 4th century A.D., has been discovered, belonging to the first church, which lay to the north of the present. Several inscriptions mention the name of donors of parts of it. The mosaic pavement of the present church was almost entirely destroyed in 1880, when the floor-level was raised. Small portions of two temples and an inscribed stone are the only remains of the ancient Roman city that readily catch the eye. Parenzo is the seat of the Provincial Diet of Istria, and is also an episcopal see.

Parenzo (Lat. *Parentium*), conquered by the Romans in 178 B.C., was made a colony probably by Augustus after the battle of Actium, for its title in inscriptions is Colonia Julia and not, as it has often been given, Colonia Ulpia. It grew to be a place of some note with about 6000 inhabitants within its walls and 10,000 in its suburbs. The bishopric, founded in 524, gradually acquired ecclesiastical authority over a large number of abbeys and other foundations in the surrounding country. The city, which had long been under the influence of Venice, formally recognized Venetian supremacy in 1267, and as a Venetian town it was in 1354 attacked and plundered by Paganino Doria of Genoa. The bishoprics of Pola and Parenzo were united in 1827.

See John Mason Neale, *Notes on Dalmatia, Istria, &c.* (London, 1861), with ground plan of cathedral; E. A. Freeman, *Sketches from the Subject and Neighbour Lands of Venice* (London, 1881); and Neumann, *Der Dom von Parenzo* (Vienna, 1902).

PARGA, a seaport of Albania, European Turkey, in the vilayet of Iannina, and on the Ionian Sea. Pop. (1905), about 5000, of whom the majority are Greeks. Parga has a rock-built citadel and a harbour formed by a mole which the Venetians constructed in 1572. It exports citrons, wool, oak, bark and skins. Originally occupying the site of the ancient Toryne (or Palaeo-Parga), a short distance to the west, Parga was removed to its present position after the Turkish invasion in the 15th century. Under Venetian protection, freely accepted in 1401, the inhabitants maintained their municipal independence and commercial prosperity down to the destruction of the Venetian republic in 1797, though on two occasions, in 1500 and 1560, their city was burned by the Turks. The attempts of Ali Pasha of Iannina to make himself master of the place were thwarted partly by the presence of a French garrison in the citadel and partly by the heroic attitude of the Pargiotes themselves, who were anxious to have their city incorporated with the Ionian Republic. To secure their purpose they in 1814 expelled the French garrison and accepted British protection; but the British Government in 1815 determined to go back to the convention of 1800 by which Parga was to be surrendered to Turkey, though no mosque was to be built or Mussulman to settle within its territory. Rather than subject themselves to the tyranny of Ali Pasha, the Pargiotes decided to forsake their country; and accordingly in 1819, having previously exhumed and burned the remains of their ancestors, they migrated to the Ionian Islands. The Turkish government was constrained to pay them £142,425 by way of compensation.

PARGETTING (from O. Fr. *pargeter* or *parjeter*; *par*, all over, and *jeter*, to throw, *i.e.* "rough cast"; other derivations suggested have been from Lat. *spargere*, to sprinkle, and from *paries*, a wall, the last due to writing the *parjet* in the form *pariet*), a term applied to the decoration in relief of the plastering between the studwork on the outside of half-timber houses, or sometimes covering the whole wall. The devices were stamped on the wet plaster. This seems generally to have been done by sticking a number of pins in a board in certain lines or curves, and then pressing on the wet plaster in various directions, so as to form geometrical figures. Sometimes these devices are in relief, and in the time of Elizabeth represent figures, birds, foliages, &c.; fine examples are to be seen at Ipswich, Maidstone, Newark, &c. (See PLASTER-WORK.) The term is also applied to the lining of the inside of smoke flues to form an even surface for the passage of the smoke.

PARIAH, a name long adopted in European usage for the "outcastes" of India. Strictly speaking the Paraiyans are the agricultural labourer caste of the Tamil country in Madras, and are by no means the lowest of the low. The majority are ploughmen, formerly *adscripti glebae*, but some of them are weavers, and no less than 350 subdivisions have been distinguished. The name can be traced back to inscriptions of the 11th century, and the "Pariah poet," Tiruvalluvar, author of the famous Tamil poem, the *Kurral*, probably lived at about that time. The accepted derivation of the word is from the Tamil *parai*, the large drum of which the Paraiyans are the hereditary beaters at festivals, &c. In 1901 the total number of Paraiyans in all India was 2¼ millions, almost confined to the south of Madras. In the Telugu country their place is taken by the Malas, in the Kanarese country by the Holeyas and in the Deccan by the Mahars. Some of their privileges and duties seem to show that they represent the original owners of the land, subjected by a conquering race. The Pariahs supplied a notable proportion of Clive's sepoys, and are still enlisted in the Madras sappers and miners. They have always acted as domestic servants to Europeans. That they are not deficient in intelligence is proved by the high position which some of them, when converted to Christianity, have occupied in the professions. In modern official usage the "outcastes" generally are termed Panchamas in Madras, and special efforts are made for their education.

See Caldwell, *Comparative Grammar of the Dravidian Languages* (pp. 540–554), and the Madras *Census Reports* for 1891 and 1901.

PARIAH DOG, a dog of a domesticated breed that has reverted, in a greater or less degree, to a half-wild condition. Troops of such dogs are found in the towns and villages of Eastern Europe, Asia and Africa; and they probably interbreed with wolves, jackals and wild dogs. The Indian breed is near akin to the Australian dingo.

PARIAN CHRONICLE (*Chronicon* or *Marmor Parium*), a marble tablet found in the island of Paros in 1627, now among the Arundel Marbles at Oxford. It originally embraced an outline of Greek history from the reign of Cecrops, legendary king of Athens, down to the archonship of Diognetus at Athens (264 B.C.). The Chronicle seems to have been set up by a private person, but, as the opening of the inscription has perished, we do not know the occasion or motives which prompted the step. The author of the Chronicle has given much attention to the festivals, and to poetry and music; thus he has recorded the dates of the establishment of festivals, of the introduction of various kinds of poetry, the births and deaths of the poets, and their victories in contests of poetical skill. On the other hand, important political and military events are often entirely omitted; thus the return of the Heraclidae, Lycurgus, the wars of Messene, Draco, Solon, Cleisthenes, Pericles, the Peloponnesian War and the Thirty Tyrants are not even mentioned. The years are reckoned backwards from the archonship of Diognetus, and the dates are further specified by the kings and archons of Athens. The reckoning by Olympiads is not employed. The Chronicle consists of 93 lines, written chiefly in the Attic dialect.

The Parian Chronicle (first published by Selden in 1628) is printed by A. Böckh in the *Corpus inscriptionum graecarum*, vol. ii., No. 2374, and by C. W. Müller in the *Fragmenta historicorum graecorum*, vol. i.; there are separate editions by J. Flach (1883) and F. Jacoby (1904). A New fragment was discovered in 1897, bringing the Chronicle down to the year 299 (ed. Crispi and Wilhelm in *Mittheilungen des archaeologischen Instituts, athenische Abtheilung*, vol. xxii., 1897). See also "Notes on the Text of the Parian Marble" and review of Jacoby's edition by J. A. R. Munro in *Classical Review* (March and October 1901 and June 1905).

PARINI, GIUSEPPE (1729–1799), Italian poet, was born at Bosio in the Milanese, on the 22nd of May 1729. His parents, who possessed a small farm on the shore of Lake Pusiano, sent him to Milan, where he studied under the Barnabites in the Academy Arcimboldi, maintaining himself latterly by copying manuscripts. In 1752 he published at Lugano, under the pseudonym of Ripano Eupilino, a small volume of *sciolto* verse which secured his election to the Accademia dei Trasformati at Milan and to that of the Arcadi at Rome. His poem, *Il Mattino*, which was published in 1763, and which marked a distinct advance in Italian blank verse, consisted of ironical instructions to a young nobleman as to the best method of spending his mornings. It at once established Parini's popularity and influence, and two years later a continuation of the same theme was published under the title of *Il Mezzogiorno*. The Austrian plenipotentiary, Count Firmian, interested himself in procuring the poet's advancement, appointing him in the first place, editor of the Milan *Gazette*, and in 1769, in despite of the Jesuits, to a specially created chair of belles lettres in the Palatine School. On the French occupation of Milan he was appointed magistrate by Napoleon and Saliceti, but almost immediately retired to resume his literary work and to complete *Il Vespro* and *La Notte* (published after his death), which with the two other poems already mentioned compose what is collectively entitled *Il Giorno*. Among his other poems his rather artificial *Odi*, composed between 1757 and 1795, have appeared in various editions. He died on the 15th of August 1799.

His works, edited by Reina, were published in 6 vols. 8vo (Milan, 1801–1804); and an excellent critical edition by G. Mazzoni appeared at Florence in 1897.

PARIS (also called ALEXANDROS), in Greek legend, the son of Priam, king of Troy and Hecuba. Before he was born his mother dreamed that she was delivered of a firebrand. The dream was interpreted that her child would ruin his country, and when Paris was born he was exposed on Mt Ida. His life was saved by the herdsmen, and he grew up among them, distinguished for beauty and strength, till he was recognized and received by his parents. He was said to have been called Alexandros from his bravery in defending the herds against raids. When the strife arose at the marriage of Peleus and Thetis between Hera, Athena and Aphrodite, each claiming the apple that should belong to the most beautiful, Paris was selected as the judge. The three rivals unveiled their divine charms before a mortal judge on Mt Ida. Each tried to bribe the judge, Hera by promising power, Athena wisdom, Aphrodite the most beautiful woman in the world. Paris decided in favour of Aphrodite, and thus made Hera and Athena bitter enemies of his country (Homer, *Iliad*, xxiv. 25; Euripides, *Troades*, 925; *Andromache*, 284; *Helena*, 23). To gain the woman whom Aphrodite had promised, Paris set sail for Lacedaemon, deserting his old love Oenone, daughter of the river-god Cebren, who in vain warned him of the consequences. He was hospitably received by Menelaus, whose kindness he repaid by persuading his wife Helen to flee with him to Troy (*Iliad*, vi. 290). The siege of Troy by the united Greeks followed. Paris proved a lazy and backward fighter, though not wanting in actual courage when he could be roused to exert himself. Before the capture of the city he was mortally wounded by Philoctetes with an arrow (Sophocles, *Philoctetes*, 1426). He then bethought him of the slighted nymph Oenone, who he knew could heal the wound. He was carried into her presence, but she refused to save him. Afterwards, when she found he was dead, she committed suicide (Apollodorus iii. 12). The judgment of Paris became a favourite subject in Greek art. Paris is represented as a beautiful young man, beardless, wearing the pointed Phrygian cap, and often holding the apple in his hand.

PARIS, ALEXIS PAULIN (1800–1881), French *savant*, was born at Avenay (Marne) on the 25th of March 1800. He published in 1824 an *Apologie pour l'école romantique*, and took an active part in Parisian journalism. His appointment, in 1828, to the department of manuscripts in the Bibliothèque royale left him leisure to pursue his studies in medieval French literature. Paulin Paris lived before minute methods of research had been generally applied to modern literature, and his chief merit is that by his numerous editions of early French poems he continued the work begun by Dominique Méon in arousing general interest in the then little-known epics of chivalry. Admitted to the Académie des Inscriptions et Belles Lettres in 1837, he was shortly afterwards appointed on the commission entrusted with the continuation of the *Histoire littéraire de la France*. In 1853 a chair of medieval literature was founded at the Collège de France, and Paulin Paris became the first occupant. He retired in 1872 with the title of honorary professor, and was promoted officer of the Legion of Honour in the next year. He died on the 13th of February 1881 in Paris.

His works include: *Manuscrits français de la bibliothèque du roi* (7 vols., 1836–1848); *Li Romans di Garin le Loherain, précédé d'un examen des romans carlovingiens* (1883–1885); *Li Romans de Berte aux grans piés* (1832); *Le Romancero français, histoire de quelques anciens trouvères et choix de leurs chansons* (1833); an edition of the *Grandes chroniques de France* (1836–1840): *La Chanson d'Antioche* (1848); *Les Aventures de maître Renart et d'Ysengrin* (1861) and *Les Romans de la table ronde* (1868–1877), both put into modern French.

His son Gaston Paris contributed a biographical notice to vol. xxix. of the *Histoire littéraire*.

PARIS, BRUNO PAULIN GASTON (1839–1903), French scholar, son of Paulin Paris, was born at Avenay (Marne) on the 9th of August 1839. In his childhood Gaston Paris learned to appreciate the Old French romances as poems and stories, and this early impulse to the study of Romance literature was placed on a solid basis by courses of study at Bonn (1856–1857) under Friedrich Diez, at Göttingen (1857–1858) and finally at the École des Chartes (1858–1861). His first important work was an *Étude sur le rôle de l'accent latin dans la langue française* (1862). The subject was developed later in his *Lettre à M. Léon Gautier sur la versification latine rhythmique* (1866). Gaston Paris maintained that French versification was a natural development of popular Latin methods which depended on accent rather than quantity, and were as widely different from classical rules as the Low Latin was from the classical idiom. For his degree as doctor he presented a thesis on the *Histoire poétique de Charlemagne* (1865). He succeeded his father as professor of medieval French literature at the Collège de France in 1872; in 1876 he was admitted to the Academy of Inscriptions and in 1896 to the French Academy; and in 1895 he was appointed director of the Collège de France. Gaston Paris won a European reputation as a Romance scholar. He had learnt German methods of exact research, but besides being an accurate philologist he was a literary critic of great acumen and breadth of view, and brought a singularly clear mind to bear on his favourite study of medieval French literature. His *Vie de Saint-Alexis* (1872) broke new ground and provided a model for future editors of medieval texts. It included the original text and the variations of it dating from the 12th, 13th and 14th centuries. Gaston Paris contributed largely to the *Histoire littéraire de la France*, and with Paul Meyer published *Romania*, a journal devoted to the study of Romance literature. Among his other numerous works may be mentioned *Les Plus anciens monuments de la langue française* (1875); a *Manuel d'ancien Français* (1888); an edition of the *Mystère de la passion d'Arnoul Greban* (1878), in collaboration with M. Gaston Raynaud; *Deux rédactions du roman des sept sages de Rome* (1876); a translation of the *Grammaire des langues romanes* (1874–1878) of Friedrich Diez, in collaboration with MM. Brachet and Morel-Fatio. Among his works of a more popular nature are *La Poésie du moyen âge* (1885 and 1895); *Penseurs et poètes* (1897); *Poèmes et légendes du moyen âge* (1900); *François Villon* (1901), an admirable monograph contributed to the "Grands Écrivains Français" series; *Légendes du moyen âge* (1903). His excellent summary of medieval French literature forms a volume of the Temple Primers. Gaston Paris endeared himself to a wide circle of scholars outside his own country by his unfailing urbanity and generosity. In France itself he trained at the École des Chartes and the Collège de France a band of disciples who continued the traditions of exact research that he established. Among them were: Léopold Pannier; Marius Sepet, the author of *Le Drame chrétien au moyen âge* (1878) and of the *Origines catholiques du théâtre moderne* (1901); Charles Joret; Alfred Morel-Fatio; Gaston Raynaud, who is responsible for various volumes of the excellent editions published by the *Société des anciens textes français*; Arsène Darmesteter and others. Gaston Paris died in Paris on the 6th of March 1903.

See "Hommage à Gaston Paris" (1903), the opening lecture of his successor, Joseph Bédier, in the chair of medieval literature at the Collège de France; A. Thomas, *Essais de philologie française* (1897); W. P. Ker, in the *Fortnightly Review* (July, 1904); M. Croiset, *Notice sur Gaston Paris* (1904); J. Bédier et M. Roques, *Bibliographie des travaux de Gaston Paris* (1904).

PARIS, FRANÇOIS DE (1690–1727), French theologian, was born in Paris on the 3rd of June 1690. He zealously opposed the bull *Unigenitus* (1713), which condemned P. Quesnel's annotated translation of the Bible. He gave further support to the Jansenists, and when he died (May 1, 1727) his grave in the cemetery of St Médard became a place of fanatical pilgrimage and wonder-working. The king ordered the churchyard to be closed in 1732, but earth which had been taken from the grave proved equally efficacious and helped to encourage the disorder which marked the close of the Jansenist struggle (see Jansenism).

Lives by B. de la Bruyère and B. Doyen (1731). See also P. F. Matthieu, *Histoire des miracles et des convulsionnaires de St Médard*; M. Tollemache, *French Jansenists* (London, 1893).

PARIS, LOUIS PHILIPPE ALBERT D'ORLÉANS, Comte de (1838–1894), son of the duc d'Orléans, the eldest son of King Louis Philippe, was born on the 24th of August 1838. His mother was the princess Helen of Mecklenburg-Schwerin, a Protestant. By the death of his father through a carriage accident in 1842, the count, who was then only four years of age, became heir-apparent to the French throne. On the deposition of Louis Philippe in 1848, the duchess of Orléans struggled to secure the succession to her son, and bore him through an excited populace to the chamber of deputies. The chamber itself was soon invaded, however, and the Republic proclaimed. The Orleanists were driven into exile, and the duchess proceeded with her two sons, the comte de Paris and the duc de Chartres, first to Eisenach in Saxony, and then to Claremont in Surrey. After his mother's death in 1858 the count made a long foreign tour. In 1861 he and his brother accompanied their uncle, the prince de Joinville, to the United States. The brothers were attached to the staff of General McClellan, commanding the "Army of the Potomac." In April 1862 the count took part in the siege of Yorktown, and was present at the action of Williamsburg on the 5th of May. He was also with McClellan at the battle of Fair Oaks, and was personally engaged in the sanguinary battle at Gaines Mill on the 27th of June. When difficulties arose between France and the United States with regard to the affairs of Mexico, the Orléans princes withdrew from the American army and returned to Europe. During the winter of 1862–1863 the count took a special interest in the organization of the Lancashire Cotton Famine Fund, and contributed an article to the *Revue des deux mondes* entitled "Christmas Week in Lancashire." On the 30th of May 1864 he married his cousin, the princess Marie Isabelle, daughter of the duc de Montpensier; and his son and heir, the duc d'Orléans, was born at York House, Twickenham, in 1869. The count was refused permission to serve in the Franco-Prussian War, but after the fall of Napoleon III. he returned to France. Abstaining from putting himself forward, he lived quietly on his estates, which had been restored to him by a vote of the Assembly. In August 1873 there was an important political conference at Frohsdorf, the result of which was that a fusion was effected, by which the comte de Paris agreed to waive his claims to the throne in favour of those of the comte de Chambord. By the death of the latter in 1883 the count became undisputed head of the house of Bourbon; but he did not show any disposition to push his claims. The popularity of the Orléans family, however, was shown on the occasion of the marriage of the comte de Paris's eldest daughter with the duke of Braganza, son of the king of Portugal, in May 1886. This so alarmed the French government that it led to a new law of expulsion, by which direct claimants to the French throne and their heirs were banished from France (June 11, 1886). The comte de Paris again retired to England, taking up his abode at Sheen House, near Richmond Park. Here he devoted his leisure to his favourite studies. In addition to his work *Les Associations ouvrières en Angleterre*, which was published in 1869 and translated into English, the count edited the letters of his father, and published at intervals in eight volumes his *Histoire de la guerre civile en Amérique*. In his later years the count seriously compromised the prospects of the Royalist party by the relations into which he entered with General Boulanger. He died on the 8th of September 1894.

PARIS, the capital of France and the department of Seine, situated on both banks of the Seine, 233 m. from its mouth and 285 m. S.S.E. of London by rail and steamer via Dover and Calais, in 48° 50′ 14″ N., 2° 20′ 14″ E. (observatory). It occupies the centre of the so-called Paris basin, which is traversed by the Seine from south-east to north-west, open towards the west, and surrounded by a line of Jurassic heights. The granitic substratum is covered by Jurassic, Cretaceous and Tertiary formations; and at several points building materials—freestone, limestone or gypsum—have been laid bare by erosion. It is partly, indeed, to the existence of such quarries in its neighbourhood, and to the vicinity of the grain-bearing regions of the Beauce and Brie that the city owes its development. Still more important is its position at the meeting-place of the great natural highways leading from the Mediterranean to the ocean by way of the Rhone valley and from Spain northwards over the lowlands of western France. The altitude of Paris varies between 80 ft. (at the Point du Jour, the exit of the Seine from the fortifications) and 420 ft. at the hill of Montmartre in the north of the city; the other chief eminence is the hill of Ste Geneviève, on the left bank. Since 1840 Paris has been completely surrounded by a wall, which since 1860 has served also as the limit for the collection of municipal customs dues (*octroi*). Proposals are constantly being brought forward to demolish this wall—which, with its talus, is encircled by a broad and deep ditch—either entirely or at least from the Point du Jour, where the Seine intersects the wall below the city, to Pantin, so as to extend the limits of the city as far as the Seine, which runs almost parallel with the wall for that distance. Within the wall the area of the city is 19,279 acres; the river runs through it from east to west in a broad curve for a distance of nearly 8 m.

Climate.—Paris has a fairly uniform climate. The mean temperature, calculated from observations extending over fifty years (1841–1890), is 49°·8 F. The highest reading (observed in July 1874 and again in July 1881) is 101° F., the lowest (in December 1879) is −14°. The monthly means for the fifty years 1841–1890 were: January 35°·9, February 38°·3, March 42°·3, April 49°·5, May 55°·6, June 61°·7, July 64°·6, August 63°·5, September 58°·2, October 49°·8, November 40°·2, December 36°·6. The Seine freezes when the temperature falls below 18°. It was frozen in nearly its whole extent from Bercy to Auteuil in the winters of 1819–1820, 1829–1830, 1879–1880 and 1890–1891. Rain falls, on an average, on about 200 days, the average quantity in a year being between 22 and 23 in. The rainfall from December to April inclusive is less than the average, while the rainfall from May to November exceeds the average for the whole year. The driest month is February, the rainiest June—the rainfall for these months being respectively 1·3 in. and 2·3 in. The prevailing winds are those from the south, south-west and west. The general character of the climate, somewhat continental in winter and oceanic in summer, has been more closely observed since the three observatories at different heights on the Eiffel Tower were added in 1889 to the old-established ones of the parks of St Maur and Montsouris.[1] The observatory at the old church-tower St Jacques (16th century) in the centre of the city, and since 1896 a municipal establishment, is of special interest on account of the study made there of the transparency and purity of the air. There are barely 100 days in the year when the air is very clear. Generally the city is covered by floating mists, possibly 1500 ft. in thickness. During the prevalence of north-easterly winds the sky is most obscured, since on that side lies the greatest number of factories with smoking chimneys.

Defences.—Paris, described in a recent German account as the greatest fortress in the world, possesses three perfectly distinct rings of defences. The two inner, the enceinte and the circle of detached forts around it, are of the bastioned type which French engineers of the Noizet school favoured; they were built in the time of Louis Philippe, and with very few additions sustained the siege of 1870–71. The outer works, of more modern type, forming an entrenched camp which in area is rivalled only by the Antwerp system of defences, were built after the Franco-German War.

The enceinte ("the fortifications" of the guide-books) is of plain bastion trace, without ravelins but with a deep dry ditch (escarp, but not counterscarp revetted). It is nearly 22 m. in perimeter and has 93 bastions, 67 gates and 9 railway passages. The greater part of the enceinte has, however, been given up, and a larger one projected—as at Antwerp—by connecting up the old detached forts.

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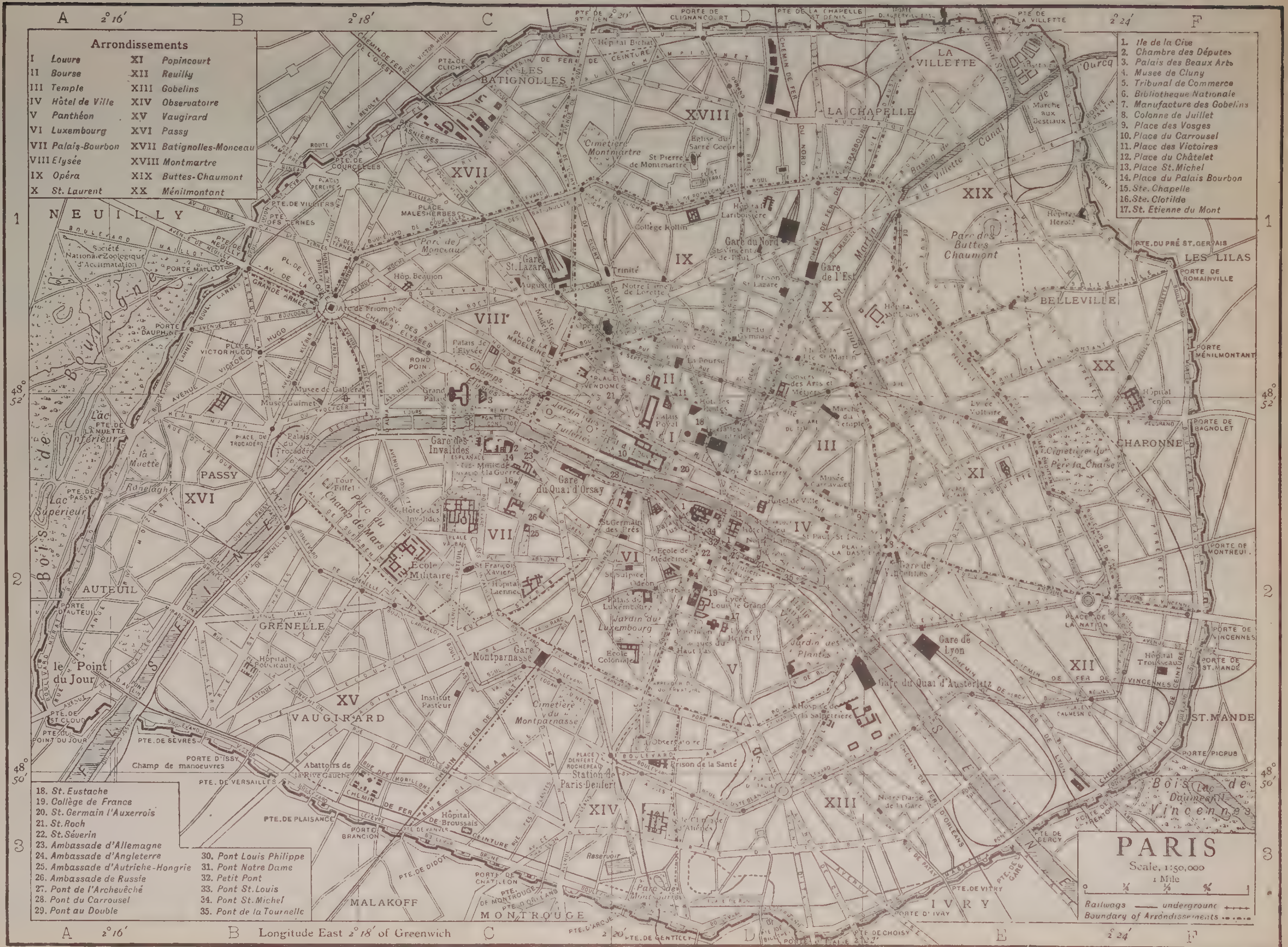
[1] The observatories of the Tour St Jacques and of Montsouris belong to the municipality of Paris; that of St Maur depends on the Central Bureau of Meteorology, a national institution.


PARIS
Scale, 1:50,000
1 Mile
¼
½
¾
Railways —— underground +-+-+
Boundary of Arrondissements -.-.-
Arrondissements
I Louvre
II Bourse
III Temple
IV Hôtel de Ville
V Panthéon
VI Luxembourg
VII Palais-Bourbon
VIII Elysée
IX Opéra
X St. Laurent
XI Popincourt
XII Reuilly
XIII Gobelins
XIV Observatoire
XV Vaugirard
XVI Passy
XVII Batignolles-Monceau
XVIII Montmartre
XIX Buttes-Chaumont
XX Ménilmontant
1. Ile de la Cité
2. Chambre des Députés
3. Palais des Beaux Arts
4. Musée de Cluny
5. Tribunal de Commerce
6. Bibliothèque Nationale
7. Manufacture des Gobelins
8. Colonne de Juillet
9. Place des Vosges
10. Place du Carrousel
11. Place des Victoires
12. Place du Châtelet
13. Place St. Michel
14. Place du Palais Bourbon
15. Ste. Chapelle
16. Ste. Clotilde
17. St. Etienne du Mont
18. St. Eustache
19. Collège de France
20. St. Germain l'Auxerrois
21. St. Roch
22. St. Séverin
23. Ambassade d'Allemagne
24. Ambassade d'Angleterre
25. Ambassade d'Autriche-Hongrie
26. Ambassade de Russie
27. Pont de l'Archevêché
28. Pont du Carrousel
29. Pont au Double
30. Pont Louis Philippe
31. Pont Notre Dame
32. Petit Pont
33. Pont St. Louis
34. Pont St. Michel
35. Pont de la Tournelle
A
B
C
D
E
F
1
2
3
2° 16′
2° 18′
2° 20′
2° 24′
48° 52′
48° 50′
Longitude East 2° 18′ of Greenwich
NEUILLY
LES BATIGNOLLES
LA CHAPELLE
LA VILLETTE
BELLEVILLE
LES LILAS
CHARONNE
ST. MANDE
IVRY
MONTROUGE
MALAKOFF
VAUGIRARD
GRENELLE
AUTEUIL
PASSY
Bois de Boulogne
Bois de Vincennes
SEINE

Emery Walker sc.

These forts, which endured the siege in 1870–71, have a perimeter of about 34 m. Each is designed as a miniature fortress with ample casemates and high cavaliers, the tenailles and ravelins, however, being as a rule omitted. On the north side there are three forts (connected by a plain parapet) around St Denis, one of these being arranged to control an inundation. Next, to the right, or eastward, comes Fort Aubervillers, which commands the approaches north of the wood of Bondy. These four works lie in relatively low ground. The eastern works are situated on higher ground (300–350 ft.); they consist of four forts and various small redoubts, and command the approaches from the great wood of Bondy. In low ground again at the narrowest point of the great loop of the Marne (near St Maur-les-Fosses) there are two redoubts connected by a parapet, and between the Seine and the Marne, in advance of their confluence, Fort Charenton. On the south side of the city, hardly more than a mile from the enceinte, is a row of forts, Ivry, Bicêtre, Montrouge, Vanves and Issy, solidly constructed works in themselves but, as was shown in 1870, nearly useless for the defences of the city against rifled guns, as (with the exception of Bicêtre) they are overlooked by the plateau of Châtillon. On the west side of Paris is the famous fortress of Mont Valérien, standing 536 ft. above the sea and about 450 above the river. This completes the catalogue of the inner fort-line. It is strengthened by two groups of works which were erected in "provisional" form during the siege,[1] and afterwards reconstructed as permanent forts—Hautes Bruyères on the plateau of Villejuif, 1 m. south of Fort Bicêtre, and the Châtillon fort and batteries which now prevent access to the celebrated plateau that overlooks Paris from a height of 600 ft., and of which the rear batteries sweep almost the whole of the ground between Bicêtre and Mont Valérien.

The new works are 11 m. from the Louvre and 8 from the enceinte. They form a circle of 75 m. circumference, and an army which attempted to invest Paris to-day would have to be at least 500,000 strong, irrespective of all field and covering forces. The actual defence of the works, apart from troops temporarily collected in the fortified area, would need some 170,000 men only.

The entrenched camp falls into three sections—the north, the east and the south-west. The forts (of the general 1874–1875 French type, see FORTIFICATION AND SIEGECRAFT) have from 24 to 60 heavy guns and 600 to 1200 men each, the redoubts, batteries and annexe-batteries generally 200 men and 6 guns. In the northern section a ridge crosses the northern extremities of the St Germain-Argenteuil loop of the Seine after the fashion of the armature of a horse-shoe magnet; on this ridge (about 560 ft.) is a group of works, named after the village of Cormeilles, commanding the lower Seine, the Argenteuil peninsula and the lower ground towards the Oise. At an average distance of 5 m. from St Denis lie the works of the Montlignon-Domont position (about 600–670 ft.), which sweep all ground to the north, cross their fire with the Cormeilles works, and deny the plateau of Montmorency-Méry-sur-Oise to an enemy. At Écouen, on an isolated hill, are a fort and a redoubt, and to the right near these Fort Stains and two batteries on the ceinture railway. The important eastern section consists of the Vaujours position, the salient of the whole fortress, which commands the countryside to the north as far as Dammartin and Claye, crosses its fire with Stains on the one hand and Villiers on the other, and itself lies on a steep hill at the outer edge of the forest of Bondy which allows free and concealed communication between the fort and the inner line of works. The Vaujours works are armoured. Three miles to the right of Vaujours is Fort Chelles, which bars the roads and railways of the Marne valley. On the other side of the Marne, on ground made historic by the events of 1870, are forts Villiers and Champigny, designed as a bridge-head to enable the defenders to assemble in front of the Marne. To the right of these is a fort near Boissy-St-Leger, and on the right of the whole section are the armoured works of the Villeneuve-St-Georges position, which command the Seine and Yères country as far as Brie and Corbeil. The left of the south-western section is formed by the powerful Fort Palaiseau and its annexe-batteries, which command the Yvette valley. Behind Fort Palaiseau, midway between it and Fort Châtillon, is the Verrières group, overlooking the valley of the Bièvre. To the right of Palaiseau on the high ground towards Versailles are other works, and around Versailles itself is a semi-circle of batteries right and left of the armoured Fort St Cyr. In various positions around Marly there are some seven or eight batteries.

Topography.—The development of Paris can be traced outwards in approximately concentric rings from the Gallo-Roman town on the Île de la Cité to the fortifications which now form its boundary. A line of boulevards known as the Grands Boulevards,[2] coinciding in great part with ramparts of the 14th, 16th and 17th centuries, encloses most of old Paris, a portion of which extends southwards beyond the Boulevard St Germain. Outside the Grands Boulevards lie the *faubourgs* or old suburbs, round which runs another enceinte of boulevards—*boulevards extérieurs*—corresponding to ramparts of the 18th century. Beyond them other and more modern suburbs incorporated with the city after 1860 stretch to the boulevards which line the present fortifications. On the north, east and south these are commercial or industrial in character, inhabited by the working classes and *petite bourgeoisie*, while here and there there are still areas devoted to market gardening; those on the west are residential centres for the upper classes (Auteuil and Passy). Of the *faubourgs* of Paris those to the north and east are mainly commercial (Faubourgs St Denis, St Martin, Poissonnière) or industrial (Faubourgs du Temple and St Antoine) in character, while to the west the Faubourg St Honoré, the Champs Élysées and the Faubourg St Germain are occupied by the residences of the upper classes of the population. The chief resorts of business and pleasure are concentrated within the Grands Boulevards, and more especially on the north bank of the Seine. No uniformity marks the street-plan of this or the other quarters of the city. One broad and almost straight thoroughfare bisects it under various names from Neuilly (W.N.W.) to Vincennes (E.S.E.). Within the limits of the Grands Boulevards it is known as the Rue de Rivoli (over 2 m. in length) and the Rue St Antoine and runs parallel with and close to the Seine from the Place de la Concorde to the Place de la Bastille. From the Eastern station to the observatory Paris is traversed N.N.E. and S.S.W. for 2½ m. by another important thoroughfare—the Boulevard de Strasbourg continued as the Boulevard de Sébastopol, as the Boulevard du Palais on the Île de la Cité, and on the south bank as the Boulevard St Michel. The line of the Grands Boulevards from the Madeleine to the Bastille, by way of the Place de l'Opéra, the Porte St Denis and the Porte St Martin (two triumphal arches erected in the latter half of the 17th century in honour of Louis XIV.) and the Place de la République stretches for nearly 3 m. It contains most of the large cafés and several of the chief theatres, and though its gaiety and animation are concentrated at the western end—in the Boulevards des Italiens, des Capucines and de la Madeleine—it is as a whole one of the most celebrated avenues in the world. On the right side of the river may also be mentioned the Rue Royale, from the Madeleine to the Place de la Concorde; the Malesherbes and Haussmann boulevards, the first stretching from the Place Madeleine north-west to the fortifications, the second from the Grands Boulevards near the Place de l'Opéra nearly to the Place de l'Étoile; the Avenue de l'Opéra, which unites the Place du Palais Royal, approximately the central point of Paris, with the Place de l'Opéra; the Rue de la Paix, connecting the Place Vendôme with the Place de l'Opéra, and noted for its fashionable dress-making establishments, and the Rue Auber and Rue du Quatre Septembre, also terminating in the Place de l'Opéra, in the vicinity of which are found some of the finest shops in Paris; the Rue St Honoré running parallel with the Rue de Rivoli, from the Rue Royale to the Central Markets; the Rue de Lafayette, one of the longest streets of Paris, traversing the town from the Opera to the Bassin de la Villette; the Boulevard Magenta, from Montmartre to the Place de la République; and the Rue de Turbigo, from this *place* to the Halles Centrales. On the left side of the river the main thoroughfare is the Boulevard St Germain, beginning at the Pont Sully, skirting the Quartier Latin, the educational quarter on the north, and terminating at the Pont de la Concorde after traversing a quarter mainly devoted to ministries, embassies and other official buildings and to the residences of the *noblesse*.

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[1] The plateau of Mont Avron on the east side, which was provisionally fortified in 1870, is not now defended.

[2] The word *boulevard* means "bulwark" or fortification and thus has direct reference to the old ramparts. But since the middle of the 19th century the title has been applied to new thoroughfares not traced on the site of an old enceinte.

Squares.—Some of the chief squares have already been mentioned. The finest is the Place de la Concorde, laid out under Louis XV. by J. A. Gabriel and noted as the scene of the execution of Louis XVI., Marie Antoinette and many other victims of the Revolution. The central decoration consists of an obelisk from the great temple at Luxor in Upper Egypt, presented to Louis Philippe in 1831 by Mehemet Ali, and flanked by two monumental fountains. The formation of the Place Vendôme was begun towards the end of the 17th century. In the middle there is a column surmounted by a statue of Napoleon I. and decorated with plates of bronze on which are depicted scenes from the campaign of 1805. The Place de l'Étoile is the centre of twelve avenues radiating from it in all directions. The chief of these is the fashionable Avenue des Champs Élysées which connects it with the Place de la Concorde; while on the other side the Avenue de la Grande Armée leads to the fortifications, the two forming a section of the main artery of Paris; the well-wooded Avenue du Bois de Boulogne forms the threshold of the celebrated park of that name. In the centre of the Place, the Arc de Triomphe de l'Étoile, the largest triumphal arch in the world (162 ft. high by 147 ft. wide), commemorates the military triumphs of the Revolutionary and Napoleonic troops. The finest of the sculptures on its façades is that representing the departure of the volunteers in 1792 by François Rude. The Place de la République, in which stands a huge statue of the Republic, did not receive its present form till 1879. The Place de la Bastille stands a little to the east of the site of the famous state prison. It contains the Colonne de Juillet erected in memory of those who fell in the revolution of July 1830. The Place du Carrousel, enclosed within the western wings of the Louvre and so named from a revel given there by Louis XIV., was enlarged about the middle of the 19th century. The triumphal arch on its west side commemorates the victories of 1805 and formed the main entrance to the Tuileries palace (see below). Facing the arch there is a stone pyramid forming the background to a statue of Gambetta. Other squares are the Place des Victoires, dating from 1685, with the equestrian statue of Louis XIV.; the Place des Vosges, formerly Place Royale, formed by Henry IV. on the site of the old Tournelles Palace and containing the equestrian statue of Louis XIII.; the Place de l'Hôtel de Ville, once the Place de Grève and the scene of many state executions from the beginning of the 14th century till 1830; the Place du Châtelet, on the site of the prison of the Grand Châtelet, pulled down in 1802, with a fountain and a column commemorative of victories of Napoleon, and the Place de la Nation decorated with a fountain and a bronze group representing the Triumph of the Republic, and with two columns of 1788 surmounted by statues of St Louis and Philip Augustus, corresponding at the east of the city to the Place de l'Étoile at the west.

South of the Seine are the Place St Michel, adorned with a monumental fountain, and one of the great centres of traffic in Paris; the Carrefour de l'Observatoire, with the monument to Francis Jarnier, the explorer, and the statue of General Ney standing on the spot where he was shot; the Place du Panthéon; the Place Denfert Rochereau, adorned with a colossal lion symbolizing the defence of Belfort in 1871; the Place St Sulpice, with a modern fountain embellished with the statues of the preachers Bossuet, Fénelon, Massillon and Fléchier; the Place Vauban, behind the Invalides; and the Place du Palais Bourbon, in front of the Chamber of Deputies. On the Île de la Cité in front of the cathedral is the Place du Parvis-Notre-Dame, with the equestrian statue of Charlemagne.

Besides those already mentioned, Paris possesses other monumental fountains of artistic value. The Fontaine des Innocents in the Square des Innocents belonged to the church of that name demolished in 1786. It is a graceful work of the Renaissance designed by Pierre Lescot and retains sculptures by Jean Goujon. On its reconstruction on the present site other carvings were added by Augustin Pajou. A fountain of the first half of the 18th century in the Rue de Grenelle is remarkable for its rich decoration, while another in the Avenue de l'Observatoire is an elaborate modern work, the central group of which by J. B. Carpeaux represents the four quarters of the globe supporting the terrestrial sphere. The Fontaine de Medicis (17th century) in the Luxembourg garden is a work of Salomon Debrosse in the Doric style; the fountain in the Place Louvois (1844) representing the rivers of France is by Louis Visconti. In 1872 Sir Richard Wallace gave the municipality fifty drinking-fountains which are placed in different parts of the city.

The Seine.—The Seine flows for nearly 8 m. through Paris. As it enters and as it leaves the city it is crossed by a viaduct used by the circular railway and for ordinary traffic; that of Point du Jour has two storeys of arches. Three bridges—the Passerelle de l'Estacade, between the Île St Louis and the right bank, the Pont des Arts and the Passerelle Debilly (close to the Trocadéro)—are for foot passengers only; all the others are for carriages as well. The most famous, and in its actual state the oldest, is the Pont Neuf, begun in 1578, the two portions of which rest on the extremity of the island called La Cité, the point at which the river is at its widest (863 ft.). On the embankment below the Pont Neuf stands the equestrian statue of Henry IV. Between La Cité and the left bank the width of the lesser channel is reduced to 95 ft. The river has a width of 540 ft. as it enters Paris and of 446 ft. as it leaves it. After its entrance to the city it passes under the bridges of Tolbiac, Bercy and Austerlitz, that of Sully, those of Marie and Louis Philippe between the Île St Louis and the right bank; that of La Tournelle between the Île St Louis and the left bank; that of St Louis between the Île St Louis and La Cité. The Cité communicates with the right bank by the Pont d'Arcole, the Pont Notre-Dame, built on foundations of the 15th century, and the Pont au Change, owing its name to the shops of the money-changers and goldsmiths which bordered its medieval predecessor; with the left bank by that of the Archevêché, the so-called Pont au Double, the Petit Pont and the Pont St Michel, the original of which was built towards the end of the 14th century. Below the Pont Neuf come the Pont des Arts, Pont du Carrousel, Pont Royal (a fine stone structure leading to the Tuileries), and those of Solférino, La Concorde, Alexandre III. (the finest and most modern bridge in Paris, its foundation-stone having been laid by the czar Nicholas II. in 1896), Invalides, Alma, Iéna (opposite the Champ de Mars), Passy, Grenelle and Mirabeau. The Seine has at times caused disastrous floods in the city, as in January 1910. (See SEINE.)

The houses of Paris nowhere abut directly on the river banks, which in their whole extent from the bridge of Austerlitz to Passy are protected by broad embankments or "quais." At the foot of these lie several ports for the unloading and loading of goods, &c.—on the right side Bercy for wines, La Rapée for timber, Port Mazas, the Port de l'Arsenal at the mouth of the St Martin canal,[1] the Port Henry IV., des Celestins, St Paul, des Ormes, de l'Hôtel de Ville (the two latter for fruit) and the Port St Nicolas (foreign vessels); on the left bank the Port de la Gare for petroleum, St Bernard for wines and the embarcation of sewage, and the ports of La Tournelle (old iron), Orsay (building material), the Invalides, Gros Caillou, the Cygnes, Grenelle and Javel (refuse). Besides the river ports, the port of Paris also includes the canals of St Martin and the portions of the canals of St Denis and the Ourcq within the walls. All three debouch in the busy and extensive basin of La Villette in the north-east of the city. The traffic of the port is chiefly in coal, building materials and stone, manure and fertilizers, agricultural produce and food-stuffs.

Promenades and Parks.—In the heart of Paris are situated the gardens of the Tuileries[2] (56 acres), designed by André Le Notre under Louis XIV. Though added to and altered afterwards they retain the main outlines of the original plan. They are laid out in parterres and bosquets, planted with chestnut trees, lindens and plane trees, and adorned with playing fountains and basins, and numerous statues mostly antique in subject. From the terrace along the river-side a fine view is to be had over the Seine to the park and palace of the Trocadéro; and from the terraces along the Place de la Concorde the eye takes in the Place and the Avenue of the Champs Élysées. The gardens of the Luxembourg,[1] planned by S. Debrosse (17th century) and situated in front of the palace occupied by the senate, are about the same size as those of the Tuileries; with less regularity of form they present greater variety of appearance. In the line of the main entrance extends the beautiful Observatory Walk, terminating in the monumental fountain mentioned above. Besides these gardens laid out in the French taste, with straight walks and regular beds, there are several in what the French designate the English style. The finest and most extensive of these, the Buttes-Chaumont Gardens, in the north-east of the city, occupy 57 acres of very irregular ground, which up to 1866 was occupied by plaster-quarries, limekilns and brickworks. The "buttes" or knolls are now covered with turf, flowers and shrubbery. Advantage has been taken of the varying relief of the site to form a fine lake and a cascade with picturesque rocks. The Montsouris Park, in the south of the city, 38 acres in extent, also consists of broken ground; in the middle stands the meteorological observatory, built after the model of the Tunisian palace of Bardo, and it also contains a monument in memory of the Flatters expedition to the Sahara in 1881. The small Monceau Park, in the aristocratic quarter to the north of the Boulevard Haussmann, is a portion of the old park belonging to King Louis Philippe, and contains monuments to Chopin, Gounod, Guy de Maupassant and others.

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[1] This canal (3 m. long) leaving the Seine below Austerlitz bridge, passes by a tunnel under the Place de la Bastille and Boulevard Richard Lenoir, and rises by sluices to the La Villette basin, from which the St Denis canal (4 m. long) descends to the Seine at St Denis. In this way boats going up or down the river can avoid passing through Paris. The canal de l'Ourcq, which supplies the two canals mentioned, contributes to the water-supply of Paris as well as to its transport facilities.

[2] These gardens are the property of the state, the other areas mentioned being the property of the town.

The Jardin des Plantes[1] (founded in the first half of the 17th century), about 58 acres in extent, combines both styles. Its museum of natural history (1793), with its zoological gardens, its hothouses and greenhouses, its nursery and naturalization gardens, its museums of zoology, anatomy, anthropology, botany, mineralogy and geology, its laboratories, and its courses of lectures by the most distinguished professors in all branches of natural science, make it an institution of universally acknowledged eminence.

Other open spaces worthy of mention are the Champs Élysées (west of the Place de la Concorde), begun at the end of the 17th century but only established in their present form since 1858; the Trocadéro Park, laid out for the exhibition of 1878, with its lakes, cascade and aquarium; the Champ de Mars (laid out about 1770 as a manœuvring ground for the École Militaire), containing the Eiffel Tower (*q.v.*); the gardens of the Palais Royal, surrounded by galleries; and the Ranelagh in Passy.

The Bois de Boulogne and Bois de Vincennes situated outside the fortifications are on a far larger scale than the parks within them. The Bois de Boulogne, commonly called the "Bois," is reached by the wide avenue of the Champs Élysées as far as the Arc de Triomphe and thence by the avenue of the Bois de Boulogne or that of the Grande Armée. The first of these, with its side walks for foot passengers and equestrians, grass-plots, flower-beds and elegant buildings, affords a wide prospect over the Bois and the hills of St Cloud and Mont Valérien. The Bois de Boulogne covers an area of 2100 acres, is occupied by turf, clumps of trees, sheets of water or running streams. Here are the two race-courses of Longchamp (flat races) and Auteuil (steeplechases), the park of the small château of Bagatelle, 1777, the grounds of the Polo Club and the Racing Club and the gardens of the Acclimatization Society, which, with their menageries, conservatories and aquarium, are largely visited by pleasure-seekers. Trees for the public parks and squares are grown in the municipal nurseries situated on the south border of the Bois. On the east it is adjoined by the Park of La Muette, with the old royal château. The Bois de Vincennes (see VINCENNES) is 2300 acres in area and is similarly adorned with streams, lakes and cascades.

Churches.—The most important church in Paris is the cathedral of Notre-Dame, founded in 1163, completed about 1240. Measuring 139 yds. in length and 52 yds. in breadth, the church consists of a choir and apse, a short transept, and a nave with double aisles which are continued round the choir and are flanked by square chapels added after the completion of the rest of the church. The central spire, 148 ft. in height, was erected in the course of a restoration carried out between 1846 and 1879 under the direction of Viollet le Duc. Two massive square towers crown the principal façade. Its three doors are decorated with fine early Gothic carving and surmounted by a row of figures representing twenty-eight kings of Israel and Judah. Above the central door is a rose window, above which is a third storey consisting of a graceful gallery of pointed arches supported on slender columns. The transept has two façades, also richly decorated with chiselled work and containing rose windows. Of the elaborate decoration of the interior all that is medieval is a part of the screen of the choir (the first half of the 14th century), with sculptures representing scenes from the life of Christ, and the stained glass of the rose windows (13th century). The woodwork in the choir (early 18th century), and a marble group called the "Vow of Louis XIII." (17th century) by Couston and Coysevox, are other noticeable works of art. The church possesses the Crown of Thorns and a fragment of the Cross, which attract numerous pilgrims.

Paris is poor in Romanesque architecture, which is represented chiefly in the nave and transept of St Germain-des-Prés, the choir of which is Gothic in tendency. The church, which once belonged to the celebrated abbey of St Germain founded in the 6th century, contains fine modern frescoes by Hippolyte Flandrin. The Transition style is also exemplified in St Pierre-de-Montmartre (12th century). Besides the cathedral there are several churches of the Gothic period, the most important being St Julien-le-Pauvre, now serving as a Greek church, which is contemporary with Notre-Dame; St Germain-l'Auxerrois (13th to 16th centuries), whose projecting porch is a graceful work of 1435; St Séverin (mainly of the 13th and 16th centuries); St Gervais, largely in the Flamboyant Gothic style with an interesting façade by S. Debrosse in the classical manner; and St Merry (1520–1612), almost wholly Gothic in architecture. St Gervais, St Merry and St Germain all contain valuable works of art, the stained glass of the two former being especially noteworthy.

St Étienne-du-Mont combines the Gothic and Renaissance styles in its nave and transept, while its choir is of Gothic, its façade of pure Renaissance architecture. In the interior, one of the most beautiful in the city, there is a fine rood-loft (1600–1609) by Pierre Biard and a splendid collection of stained windows of the 16th and early 17th centuries; a chapel contains part of the sarcophagus of Ste Geneviève, which is the object of a pilgrimage. St Eustache (1532–*c.* 1650), though its construction displays many Gothic characteristics, belongs wholly, with the exception of a Classical façade of the 18th century, to the Renaissance period, being unique in this respect among the more important of French churches. The church contains the sarcophagus and statue (by A. Coysevox) of Colbert and the tombs of other eminent men.

Of churches in the Classical style the principal are St Sulpice (1655–1777), almost equalling Notre-Dame in dimensions and possessing a façade by J. N. Servandoni ranking among the finest of its period; St Roch (1653–1740), which contains numerous works of art of the 17th and 18th centuries; St Paul-St Louis (1627–1641); and the church (1645–1665) of the former nunnery of Val-de-Grace (now a military hospital and medical school), which has a dome built after the model of St Peter's at Rome. All these churches are in the old city.

Of the churches of the 19th century, the most remarkable is that of the Sacré Cœur, an important resort of pilgrims, begun in 1876 and overlooking Paris from the heights of Montmartre. The Sacré Cœur is in the Romanesque style, but is surmounted by a Byzantine dome behind which rises a lofty belfry. The bell presented by the dioceses of Savoy and known as "la Savoyarde" weighs between 17 and 18 tons. Of the other modern churches the oldest is the Madeleine, built under Napoleon I. by Pierre Vignon on the foundations of a church of the 18th century and finished in 1842. It was intended by the emperor as a "temple of glory" and is built on the lines of a Roman temple with a fine colonnade surrounding it. The interior, consisting of a single nave bordered by chapels and roofed with cupolas, is decorated with sculptures and painting by eminent modern artists. Notre-Dame-de-Lorette (1823–1836) and St Vincent-de-Paul (1824–1844) are in the style of early Christian basilicas. Both contain good frescoes, the frieze of the nave in St Vincent-de-Paul being an elaborate work by Hippolyte Flandrin. Ste Clotilde, the most important representation of modern Gothic in Paris, dates from the middle of the century. St Augustin and La Trinité in the Renaissance style were both built between 1860 and 1870. With the exception of Ste Clotilde in the St Germain quarter and the Madeleine, the modern churches above mentioned are all in the northern quarters of Paris.

Civil Buildings.—The most important of the civil buildings of Paris is the palace of the Louvre (*Lupara*), the south front of which extends along the Seine for about half a mile. It owes its origin to Philip Augustus, who erected a huge keep defended by a rectangle of fortifications in what is now the south-west corner of the quadrangle, where its plan is traced on the pavement. The fortress was demolished by Francis I. and under that monarch and his successors Pierre Lescot built the portions of the wings to the south and west of the courtyard, which rank among the finest examples of Renaissance architecture. The rest of the buildings surrounding the courtyard date from the reigns of Louis XIII. and XIV., the most noteworthy feature being the colonnade (1666–1670) of the east façade designed by Claude Perrault. The two wings projecting westwards from the corners of the quadrangle, each consisting of two parallel galleries with pavilions at intervals, were built under Napoleon III., with the exception of the Grande Galerie and at right angles to it the Pavillon Henry IV., containing the Apollo gallery, which were erected on the river front by Cathérine de Medici and Henry IV. Of these two wings that on the north is occupied by the ministry of finance. The history of the palace of the Tuileries (so called in allusion to the tile kilns which occupied its site) is intimately connected with that of the Louvre, its origin being due to Cathérine de Medici and Henry IV. The latter built the wing, rebuilt under Napoleon III., which united it with the Grande Galerie, the corresponding wing on the north side dating from various periods of the 19th century. The palace itself was burnt by the Communists in 1871, with the exception of the terminal pavilion on the south (Pavillon de Flore); only the northern terminal pavilion (Pavillon de Marsan, now occupied by the museum of decorative arts) was rebuilt.

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[1] These gardens are the property of the state, the other areas mentioned being the property of the town.

Next in importance to the Louvre is the Palais de Justice (law courts), a huge assemblage of buildings covering the greater part of the Île de la Cité to the west of the Boulevard du Palais. During the Gallo-Roman period the site was occupied by a citadel which became the palace of the Merovingian kings and afterwards of the Capetian kings. In the 12th and 13th centuries it was altered and enlarged by the latter, and during part of that period was also occupied by the parlement of Paris, to which it was entirely made over under Charles V. In 1618, 1737 and 1776 the building was ravaged by fire, and in its present state is in great part the outcome of a systematic reconstruction begun in 1840. In the interior the only medieval remains are the Sainte-Chapelle, the Conciergerie, an old prison where Marie Antoinette and other illustrious victims of the Revolution were confined, and some halls and kitchens of the 13th century. All these are on the ground floor, a portion of which is assigned to the police. The courts, which include the Cour de Cassation, the supreme tribunal in France, the Court of Appeal and the Court of First Instance, are on the first floor, the chief feature of which is the fine Salle des Pas Perdus, the successor of the Grand' Salle, a hall originally built by Philip the Fair and rebuilt after fires in 1618 and 1871. The Sainte-Chapelle, one of the most perfect specimens of Gothic art, was erected from 1245 to 1248 by St Louis as a shrine for the crown of thorns and other relics now at Notre-Dame, and was restored in the 19th century. It comprises a lower portion for the use of the servants and retainers and the upper portion or royal chapel, the latter richly decorated and lighted by lofty windows set close together and filled with beautiful stained glass. The Palais de Justice presents towards the west a Greek façade by J. L. Duc (d. 1879), which is reckoned among the finest achievements of modern art. The façade towards the Seine embodies four towers which date in parts from the reconstruction under the Capetian dynasty. That at the east angle (the Tour de l'Horloge) contains a clock of 1370, said to be the oldest public clock in France. A handsome iron railing of 1787 separates the courtyard on the east side from the Boulevard du Palais.

About a quarter of a mile south of the Palais de Justice adjoining the Jardin de Cluny lies the Hôtel de Cluny, acquired in 1833 by the antiquarian A. du Sommerard as a repository for his collections and now belonging to the state. It is a graceful and well-preserved building in late Gothic style distinguished for the beautiful carving of the doors, dormer windows and open-work parapet. The mansion, which contains a rich Gothic chapel, was erected at the end of the 15th century by Jacques d'Amboise, abbot of Cluny. It stands on the site of a Roman palace said to have been built by the emperor Constantius Chlorus (d. 306), and ruins of the baths are still to be seen adjoining it.

The other civil buildings of Paris are inferior in interest and attraction. The Hôtel des Invalides on the left bank of the Seine opposite the Champs Élysées dates from the reign of Louis XIV.; by whom it was founded as a retreat for wounded and infirm soldiers, its inmates are few in number, and the building also serves as headquarters of the military governor of Paris. A garden and a spacious esplanade stretching to the Quai d'Orsay precede the north façade; the entrance to this opens into the Cour d'Honneur, a courtyard enclosed by a moat above which is a battery of cannon used for salutes on important occasions. On either side of the Cour d'Honneur lie the museums of military history and of artillery (weapons and armour). The parish church of St Louis, decorated with flags captured in the wars of the Second Empire, closes the south side of the Cour d'Honneur, while behind all rises a magnificent gilded dome sheltering another church, the Église royale, built by J. H. Mansart from 1693 to 1706. The central crypt of this church contains a fine sarcophagus of red porphyry in which lie the remains of Napoleon I., brought from St Helena in 1840, while close by are the tombs of his friends Duroc and Bertrand.

The Panthéon, on the left bank near the Luxembourg garden, was built to the plans of J. G. Soufflot in the last half of the 18th century under the name of Ste Geneviève, whose previous sanctuary it replaced. In 1791 the Constituent Assembly decreed that it should be no longer a church but a sepulchre for great Frenchmen. Voltaire and Mirabeau were the first to be entombed in the Panthéon as it then came to be called. Reconsecrated and resecularized more than once during the 19th century, the building finally regained its present name in 1885, when Victor Hugo was buried there. The Panthéon is an imposing domed building in the form of a Greek cross. The tympanum above the portico by David d'Angers and, in the interior, paintings of the life of Ste Geneviève by Puvis de Chavannes are features of its artistic decoration.

Various public bodies occupy mansions and palaces built under the ancient régime. The Palais Royal, built by Richelieu about 1630 and afterwards inhabited by Anne of Austria, the regent Philip II. of Orleans and Philippe Égalité, is now occupied by the Council of State and the Théâtre Français. The Palace of the Luxembourg stands on the site of a mansion belonging to Duke Francis of Luxembourg, which was rebuilt by Marie de Medici, wife of Henry IV. The architect, Salomon Debrosse, was ordered to take the Pitti Palace at Florence as his model, but notwithstanding the general plan of the building is French. The south façade facing the Luxembourg garden was rebuilt in the original style under Louis Philippe. The residence of various royal personages during the 17th and 18th centuries, the Luxembourg became during the revolutionary period the palace of the Directory and later of the Consulate. In the 19th century it was occupied by the senate of Napoleon I., by the chamber of peers under Louis Philippe, by the senate under Napoleon III., and since 1879 by the republican senate. The chamber of deputies meets in the Palais Bourbon, built in the 18th century for members of the Bourbon-Condé family. The façade, which faces the Pont de la Concorde, is in the style of an ancient temple and dates from the early years of the 19th century, when the corps législatif held their sittings in the building. The Palais de l'Élysée, the residence of the president of the republic, was built in 1718 for Louis d'Auvergne, count of Evreux, and was afterwards acquired by Madame de Pompadour; during the 19th century Napoleon I., Napoleon III., and other illustrious persons resided there. The building has been often altered and enlarged. The hôtel-de-ville (1873–1882), on the right bank of the Seine opposite the Île de la Cité, stands on the site of a town hall built from 1535 to 1628, much enlarged towards 1840, and destroyed by the Communists in 1871. It is an isolated building in the French Renaissance style, the west façade with its statuary, pilasters, high-pitched roofs and dormer windows being specially elaborate. The interior has been decorated by many prominent artists.

Certain of the schools and museums of Paris occupy buildings of architectural interest. The Conservatoire des Arts et Métiers, a technical school and museum of machinery, &c., founded by the engineer Vaucanson in 1775, is established in the old Cluniac priory of St Martin-des-Champs, enlarged in the 19th century. The refectory is a fine hall of the 13th century; the church with an interesting choir in the Transition style dates from the 11th to the 13th centuries. The Musée Carnavalet was built in the 16th century for François de Kernevenoy, whence its present name, and enlarged in 1660; Mme de Sévigné afterwards resided there. The national archives are stored in the Hôtel Soubise, a mansion of the early 18th century with 19th-century additions, standing on the site of a house built by Olivier de Clisson in 1370. It was afterwards added to by the family of Guise and rebuilt by François de Rohan, duke of Soubise. The palace of Cardinal Mazarin, augmented in modern times, contains the Bibliothèque Nationale. The Palais de l'Institut, formerly the Collège Mazarin, dates from the last half of the 17th century; it is the seat of the academies (except the Academy of Medicine, which occupies a modern building close to the École des Beaux-Arts) and of the Bureau des Longitudes, the great national astronomical council. The Military School overlooking the Champ de Mars is a fine building of the 18th century. The huge Sorbonne buildings date from the latter years of the 19th century with the exception of the church, which belonged to the college as reconstructed by Richelieu. The astronomical observatory, through the centre of which runs the meridian of Paris, is a splendidly equipped building erected under Louis XIV., according to the designs of Claude Perrault. The École des Beaux-Arts (facing the Louvre on the left bank of the Seine), with its interesting collections, partly occupies the site of an Augustine convent and comprises the old Hôtel Chimay. It was erected from 1820 to 1838 and added to later. The most striking feature is the façade of the principal building designed by F. L. J. Duban. The courtyard contains part of the façade of the Norman château of Gaillon (16th century), which was destroyed at the Revolution, and the portal of the château of Anet (erected by Philibert Delorme in 1548) has been adapted as one of the entrances. The Grand Palais des Beaux-Arts, where horse-shows, &c., as well as annual exhibitions of paintings and sculptures are held, and the Petit Palais des Beaux-Arts, which contains art collections belonging to the city, date from 1897–

1900. Both buildings stand close to the north end of the Pont Alexandre III.

The Bourse, built in imitation of an ancient temple, dates from the first half of the 19th century; the Tribunal of Commerce and the Palais du Trocadéro, built for the exhibition of 1878, are both imposing buildings of the latter half of that period, to which also belongs the Hôtel des Postes et Télégraphes.

Among the numerous historic mansions of Paris a few demand special mention. The so-called Maison de François I. (on the Cours la Reine overlooking the Seine) is a small but beautifully decorated building erected at Moret in 1527 and re-erected in Paris in 1826. In the St Gervais quarter are the Hôtel de Beauvais of the latter half of the 17th century and the Hôtel Lamoignon, built after 1580 for Diane de France, duchess of Angoulême, both of which have handsome courtyards; in the same quarter is the Hôtel de Sens, of the 15th century, residence of the archbishops of Sens, whose province then included the diocese of Paris. The Hôtel Lambert on the Île St Louis, built by L. Levau in the 17th century for Nicholas Lambert and afterwards inhabited by Mme du Châtelet and Voltaire and George Sand, has a magnificent staircase and many works of art. The Hôtel de Sully, built for the duke of Sully from 1624 to 1630, is in the Rue St Antoine and has an interesting courtyard. Of the fine mansion of the dukes of Burgundy the only relic is a tower of the early 15th century built by Jean Sans Peur.

Theatres, &c.—Of the theatres of Paris four—the Opéra, the Opéra-Comique, the Théâtre Français and the Odéon—receive state subventions, amounting in all to £51,000 per annum. The Opéra (entitled the National Academy of Music) was originally founded in 1671 by Pierre Perrin, from whom the management was taken over by J. B. Lully. After several changes of locale, it was eventually transferred from the Rue Le Peletier to the present opera-house. The building, which covers 2¾ acres, is one of the finest theatres in the world. The process of erection, directed by Charles Garnier, lasted from 1861 to 1875 and cost nearly 1½ million sterling. The front is decorated on the ground storey with allegorical groups (Music by Guillaume; Lyrical Poetry by Jouffroy; Lyrical Drama by Perraud; and Dancing by Carpeaux) and allegorical statues. Surmounting its angles are huge gilded groups representing music and poetry; and above it appears the dome which covers the auditorium. Behind that rises the vast pediment above the stage decorated at the corners with Pegasi by Lequesne. On the summit of the pediment an Apollo, raising aloft his lyre, is seen against the sky. The interior is decorated throughout with massive gilding, flamboyant scroll-work, statues, paintings, &c. The grand vestibule, with statues of Lully, Rameau, Gluck and Handel, the grand staircase, the *avant-foyer* or corridor leading to the *foyer*, and the *foyer* or crush-room itself are especially noteworthy. The last is a majestic apartment with a ceiling decorated with fine painting by Paul Baudry. The auditorium is seated for 2156; its ceiling is painted by J. E. Lenepveu. Behind the stage is the *foyer de la danse* or green-room for the ballet, adorned with large allegorical panels and portraits of the most eminent danseuses.

The Théâtre Français or Comédie Française was formed in 1681 under the latter name by the union of Molière's company with two other theatrical companies of the time. The name Théâtre Français dates from 1791, when part of the company headed by the tragedian Talma migrated to the south-west wing of the Palais Royal, which the company, reunified in 1799, has since occupied. Both the Théâtre Français and the less important Odéon, a building of 1782 twice rebuilt, close to the Luxembourg garden, represent the works of the classical dramatists and modern dramas both tragic and comic. The Opéra-Comique, founded in the early 18th century, occupies a building in the Boulevard des Italiens reconstructed after a fire in 1887. Serious as well as light opera is performed there.

Other theatres well known and long established are the Gymnase (chiefly comedy), the Vaudeville and the Porte St Martin (serious drama and comedy), the Variétés and the Palais Royal (farce and vaudeville); and the theatres named after and managed by Sarah Bernhardt and Réjane, the Théâtre Antoine, the Gaîté and the Ambigu may also be mentioned. The finest concerts in Paris are those of the Conservatoire de Musique et de Déclamation (Rue du Faubourg Poissonnière), while the Concerts Lamoureux and the Concerts Colonne are also of a high order. Musical and local performances of a more popular kind are given at the music halls, *cafés concerts* and *cabarets artistiques*, with which the city abounds.

Paris is the chief centre for sport in France, and the principal societies for the encouragement of sport have their headquarters in the city. Among these may be mentioned the *Société d'encouragement pour l'amélioration des races de chevaux en France* (associated with the Jockey Club), which is the chief authority in the country as regards racing, and the *Union des sociétés françaises de sports athlétiques*, which comprises committees for the organization of athletics, football, lawn tennis and amateur sport generally. The *Racing Club de France*, the *Stade français* and the *Union athlétique du premier arrondissement* are the chief Parisian athletic clubs. Race meetings are held at Longchamp and Auteuil in the Bois de Boulogne, and at Chantilly, Vincennes, St Cloud, St Ouen, Maisons-Laffitte and other places in the vicinity.

Museums.—Some of the more important museums of Paris require notice. The richest and most celebrated occupies the Louvre. On the ground floor are museums (1) of ancient sculpture, containing such treasures as the Venus of Milo, the Pallas of Velletri (the most beautiful of all statues of Minerva), the colossal group of the Tiber, discovered at Rome in the 14th century, &c.; (2) of Medieval and Renaissance sculpture, comprising works of Michelangelo, Jean Goujon, Germain Pilon, &c., and rooms devoted to early Christian antiquities and works by the Della Robbia and their school; (3) of modern French sculpture, with works by Puget, the brothers Coustou Coysevox, Chaude, Houdin, Rude, David of Angers, Carpeaux, &c.; (4) of Egyptian sculpture and inscriptions; (5) of antiquities from Assyria, Palestine, Phoenicia and other parts of Asia; (6) of engravings.

On the first floor are (1) the picture galleries, rich in works of the Italian painters, especially of Leonardo da Vinci (including his Mona Lisa), Raphael, Titian and Paolo Veronese; of the Spanish masters Murillo is best represented; and there are numerous works by Rubens, Van Dyck and Teniers, and by Rembrandt and Holbein. The examples of French art form about one-third of the collection, and include (1) the collection bequeathed in 1869 by Dr La Caze (chiefly works of the 18th century); (2) a collection of ancient bronzes; (3) a collection of furniture of the 17th and 18th centuries; (4) a rich museum of drawings by great masters; (5) a museum of Medieval, Renaissance and modern art pottery, objects in bronze, glass and ivory, &c.; (6) the Rothschild collection of objects of art; (7) smaller antiquities from Susiana, Chaldaea and Egypt; (8) a collection of ancient pottery embodying the Campana collection purchased from the Papal government in 1861; (9) the royal jewels and a splendid collection of enamels in the spacious Apollo gallery designed by Charles Lebrun. On the second floor are French pictures of the 19th century, the Thomy-Thiéry art-collection bequeathed in 1903, and the marine, ethnographical and Chinese museums. The Pavillon de La Trémoille contains a continuation of the Egyptian museum and antiquities brought from Susiana by Augustus De Morgan between 1897 and 1905. A museum of decorative art occupies the Pavillon de Marsan.

The museum of the Luxembourg, installed in a building near the palace occupied by the senate, is devoted to works of living painters and sculptors acquired by the state. They remain there for ten years after the death of the artists, that the finest may be selected for the Louvre.

The Cluny museum occupies the old mansion of the abbots of that order (see above). It contains about 11,000 examples of Medieval and Renaissance art-sculptures in marble, wood and stone, ivories, enamels and mosaics, pottery and porcelain, tapestries, bronzes, specimens of goldsmith's work, both religious and civil, including nine gold crowns of the 7th century found near Toledo, Venetian glass, furniture, iron-work, state carriages, ancient boots and shoes and pictures.

The Carnavalet museum comprises a collection illustrating the history of Paris. The Petit Palais des Beaux-Arts contains art-collections belonging to the city (especially the Dutuit collection). The house of Gustave Moreau, Rue Rochefoucauld, is now a museum of his paintings, and that of Victor Hugo, Place des Vosges, contains a collection of objects relating to the poet.

The Trocadéro Palace contains a museum of casts illustrating the progress of sculpture, chiefly that of France, from the 11th to the 18th century, it also possesses a collection of Khmer antiquities from Cambodia and an ethnographical museum. In the same neighbourhood are the Guimet museum, containing the collections of Oriental pottery, of objects relating to the Oriental religions and of antiquities presented to the state in 1885 by Émile Guimet of Lyons; and the Galliéra museum, erected by the duchess of Galliéra and containing a collection of tapestries and other works of art belonging to the city, The Cernuschi Oriental museum, close to the Monceau Park, was bequeathed to the city in 1895 by M. Cernuschi.

The collection of MSS., engravings, medals and antiques in the Bibliothèque Nationale are important, as also are the industrial and machinery exhibits of the Conservatoire des Arts et Métiers.

For libraries see LIBRARIES.

Population.—Paris is divided into twenty arrondissements. Only the first twelve belonged to it previous to 1860; the others correspond to the old suburban communes then annexed. The first four arrondissements occupy the space on the right of the river, extending from the Place de la Concorde to the Bastille, and from the Seine to the line of the Grands Boulevards; the 5th, 6th and 7th arrondissements lie opposite them on the left side; the 8th, 9th, 10th, 11th and 12th surround the first four arrondissements on the north; the 13th, 14th and 15th are formed out of the old suburban communes of the left side; and the 16th, 17th, 18th, 19th and 20th out of the old suburban communes of the right side.

The growth of the population during the 19th century is shown in the following table, which gives the population present on the census day, including the *population comptée à part*, *i.e.* troops, inmates of hospitals, prisons, schools, &c.

Years.	Population.	Years.	Population.
1801	547,756	1866	1,825,274
1817	713,966	1872	1,851,792
1831	785,862	1876	1,988,806
1836	899,313	1881	2,239,928
1841	935,261	1886	2,260,945
1846	1,053,897	1891	2,424,705
1851	1,053,262	1896	2,511,629
1856	1,174,346	1901	2,660,559
1861	1.696.141	1906	2.722.731

Below is shown the population of the arrondissements separately (in 1906), together with the comparative density of population therein. The most thickly populated region of Paris comprises a zone stretching northwards from the Île de la Cité and the Île St Louis to the fortifications, and including the central quarters of St Gervais with 400 inhabitants to the acre, Ste Avoie with 391 inhabitants to the acre, and Bonne-Nouvelle with 406 inhabitants to the acre. The central arrondissements on the north bank, which (with the exception of I., the Louvre) are among the most densely populated, tended in the latter part of the 19th century to decrease in density, while the outlying arrondissements (XII.–XX.), which with the exception of Batignolles and Montmartre are comparatively thinly populated, increased in density, and this tendency continued in the early years of the 20th century.

	Quarters.	Population.	Inhabitants per acre.
I. Louvre	St Germain l'Auxerrois, Halles, Palais Royal, Place Vendôme.	60,906	130
II. Bourse	Gaillon, Vivienne, Mail, Bonne-Nouvelle.	61,116	253
III. Temple	Arts-et-Métiers, Enfants-Rouges, Archives, Ste Avoie.	86,152	300
IV. Hôtel-de-Ville	St Merri, St Gervais, Arsenal, Notre-Dame.	96,490	249
V. Panthéon	St Victor, Jardin des Plantes, Val de Grace, Sorbonne.	117,666	191
VI. Luxembourg	Monnaie, Odéon, Notre-Dame des Champs, St Germain des Prés.	97,055	186
VII. Palais Bourbon	St Thomas d'Aquin, Invalides, Ecole-Militaire, Gros-Caillou.	97,375	98
VIII. Elysée	Champs Elysées, Faubourg-du-Roule, Madeleine, Europe.	99,769	106
IX. Opéra	St Georges, Chaussée d'Antin, Faubourg Montmartre, Rochechouart.	118,818	226
X. St Laurent	St Vincent de Paul, Porte St Denis, Porte St Martin, Hôpital St Louis.	151,697	215
XI. Popincourt	Folie-Méricourt, St Ambroise, Roquette, Ste Marguerite.	232,050	260
XII. Reuilly	Bel-Air, Picpus, Bercy, Quinze-Vingts.	138,648	99
XIII. Gobelins	Salpêtrière, Gare, Maison-Blanche, Croulebarbe.	133,133	86
XIV. Observatoire	Montparnasse, Santé, Petit-Montrouge, Plaisance.	150,136	131
XV. Vaugirard	St Lambert, Necker, Grenelle, Javel.	168,190	94
XVI. Passy	Auteuil, Muette, Porte-Dauphine, Chaillot.	130,719	75
XVII. Batignolles-Monceau	Ternes, Plaine-Monceau, Batignolles, Epinette.	207,127	188
XVIII. Montmartre	Grandes-Carrières, Clignancourt, Goutte-d'Or, Chapelle.	258,174	201
XIX. Buttes-Chaumont	Villette, Pont-de-Flandre, Amérique, Combat.	148,081	106
XX. Ménilmontant	Belleville, St Fargeau, Père-Lachaise, Charonne.	169,429	132

The birth-rate, which diminished steadily in the 19th century, is low—on an average 54,000 births per annum (1901–1905) or 20·2 per 1000 inhabitants as compared with 31·1 in 1851–1855. The death-rate also is low, 48,000 deaths per annum (1901–1905), averaging 17·9 deaths per 1000 inhabitants. This is accounted for by the fact that Paris is pre-eminently a town of adults, as the following figures, referring to the year 1908, show:—

Inhabitants under 1 year of age	41,107
,, from 1 to 19 years of age	676,995
,, ,, 20 ,, 39 ,, ,,	1,108,340
,, ,, 40 ,, 59 ,, ,,	663,435
,, of 60 years and over	223,836
,, ,, unknown age	9,018

In these circumstances there is nothing remarkable in the annual number of marriages in Paris (26,000), a high marriage rate (9·8 per 1000) for the total number of inhabitants, but a low one (28·4 per 1000) compared with the number of marriageable persons.

A large number of the inhabitants (on an average 636 out of every 1000) are not Parisians by birth. The foreign nationalities chiefly represented are Belgians, Germans, Swiss, Italians, Luxembourgers, English, Russians, Americans, Austrians, Dutch, Spaniards. The Belgians, Germans and Italians, mostly artisans, live chiefly in the industrial districts in the north and east of the city. The English and Americans, on the other hand, congregate in the wealthy districts of the Champs Élysées and Passy.

Municipal Administration.—Each arrondissement is divided into four quarters, each of which nominates a member of the municipal council. These 80 councillors, together with 21 additional councillors elected by the cantons of the rest of the department, form the departmental council. The chief functionaries of the arrondissement are a mayor (*maire*) and three deputies (*adjoints*) appointed by the president. The mayors act as registrars, draw up electoral and recruiting lists and superintend the poor-relief of their arrondissement. There is a justice of the peace (*juge de paix*) nominated by the government in each arrondissement. There is no elective mayor of Paris: the president of the municipal council, who is nominated by his colleagues, merely acts as chairman of their meetings. When occasion requires, the function of mayor of Paris is discharged by the prefect of Seine. The municipal council discusses and votes the budget of the city, scrutinizes the administrative measures of the two prefects and deliberates on municipal affairs in general. The prefect of Seine and the prefect of police (both magistrates named by the government, but each with a quite distinct sphere of action) represent the executive authority as opposed to the municipal council, which latter has no power, by refusing a vote of credit, to stop any public service the maintenance of which legally devolves on the city: in case of such refusal the minister of the interior may officially insert the credit in the budget. In like manner he may appeal to the head of the state to cancel any decision in which the council has exceeded its legal functions.

The prefecture of Seine comprises the following departments (*directions*), subdivided into *bureaux*:—

1. Municipal affairs, including bureaux for the supervision of city property, of provisioning, of cemeteries, of public buildings, &c.
2. Departmental affairs (including the bureau concerned with the care of lunatics and foundlings).
3. Primary education.
4. Streets and public works, including the bureau of water, canals and sewers, and the bureau of public thoroughfares, promenades and lighting.
5. Finance.

The administrative functions of the prefect necessitate a large technical staff of engineers, inspectors, &c., who are divided among the various *services* attached to the departments. There are also a number of councils and committees on special branches of public work attached to the prefecture (*commission des logements insalubres, de statistique municipale*, &c.). The administration of the three important departments of the *octroi*, poor-relief (*assistance publique*) and pawnbroking (the *mont-de-piété*) is also under the control of the prefect.

The prefecture of police includes the whole department of Seine and the neighbouring communes of the department of Seine-et-Oise—Meudon, St Cloud, Sèvres and Enghien. Its sphere embraces the apprehension and punishment of criminals (*police judiciaire*), general police-work (including political service) and municipal policing. The state, in view of the non-municipal functions of the Paris police, repays a proportion of the annual budget which this prefecture receives from the city. The budget of the prefect of police is voted *en bloc* by the municipal council.

Besides numerous duties consequent on the maintenance of order, the inspection of weights and measures, authority over public spectacles, surveillance of markets and a wide hygienic and sanitary authority belong to the sphere of this prefect. In the last connexion mention may be made of an important body attached to the prefecture of police—the Conseil d'Hygiène Publique et de Salubrité of the department of the Seine, composed of 24 members nominated by the prefect of police and 17 members called to it in virtue of their office. To it are referred such questions as the sources from which to obtain drinking-water for the town, the sanitary measures to be taken during important works, the work connected with the main sewers for the cleaning of the Seine and the utilization of the sewage water, the health of workpeople employed in factories, the sanitary condition of the occupants of schools and prisons, questions relating to the disinfection of infected districts, the heating of public vehicles and dwellings, the conveyance of infected persons, night shelters, &c. Board of health (*commissions d'hygiène*) in each of the twenty arrondissements act in co-operation with this control council. The municipal police, consisting of brigades of *gardiens de la paix*, are divided among the arrondissements in each of which there is an *officier de paix* in command. There are besides six brigades in reserve, one attached to the central markets, another entrusted with the surveillance of cabs, while the others are held in readiness for exceptional duties, *e.g.* to reinforce the arrondissement brigades at public ceremonies or in times of disorder. In nearly every quarter there is a *commissaire de police*, whose duties are of a semi-legal nature; the police require his sanction before they can commit an arrested individual to prison, and he also fulfils magisterial functions in minor disputes, &c.

Finance.—The chief item of ordinary expenditure is the service of the municipal debt, the total of which in 1905 was nearly £125,000,000. Its annual cost rose from £722,000 in 1860 to £3,583,000 in 1875 and £4,826,000 in 1905. In the latter year the other chief items of expenditure were:—

Poor relief	£1,490,000
Prefecture of police	1,448,000
Primary instruction	1,206,000
Streets and roads	916,000
Water and drainage	579,000
Collection of octroi	471,000

The general total of ordinary expenditure was £14,192,000, and of ordinary and extraordinary expenditure £16,995,000.

The chief of the ordinary sources of revenue are:—

Octroi (municipal customs)	£4,351,000
Communal centimes, dog tax and other special taxes	3,268,000
Revenue from gas company	969,000
Water rate and income from canals	943,000
Public vehicles	614,000
State contribution to, and receipts of prefecture of police	514,000
Revenue from public markets	367,000

The total of ordinary revenue was £14,365,000, and of all revenue, ordinary and extraordinary, £25,426,000.

Communications.—Passenger-transport is in the hands of companies. The ordinary omnibuses are the property of the Compagnie Générale des Omnibus, founded in 1855, which has a charter conferring a monopoly until 1910 in return for a payment of £80 per annum for each vehicle. The organization of the omnibus service is under the supervision of the prefect of the Seine. Since 1906 motor-driven omnibuses have been in use. The Compagnie Générale owns a number of tramways, and there are several other tramway companies. The cab companies, the chief of which are the Compagnie Générale des Voitures and the Compagnie Urbaine, have no monopoly. The use of the taximeter is general and motor-cabs are numerous. Cabs pay a license fee and are under the surveillance of the prefect of the Seine as regards tariff and the concession of stands. The steamers (*bateaux-omnibus*) of the Compagnie Générale des Bateaux Parisiens ply on the Seine between Charenton and Suresnes.

The great railways of France, with the exception of the Midi railway, have terminal stations in Paris. The principal stations of the northern, eastern and western systems (that of the latter known as the Gare St Lazare) lie near the outer boulevards in the north-centre of the city; the terminus of the Paris-Lyon-Méditerranée railway is in the south-east, close to the right bank of the Seine; opposite to it, on the left bank, is the station du Quai d'Austerlitz, and on the Quai d'Orsay the Gare du Quai d'Orsay, both belonging to the Orléans railway. The Gare Montparnasse, to the south-west of the Luxembourg, is used by the western and the state railways. Other less important stations are the Gare de Vincennes (line of the eastern railway to Vincennes), the Gares du Luxembourg and de Paris-Denfert (line of the Orleans railway to Sceaux and Limours), and the Gare des Invalides (line of western railway to Versailles).

Railway communication round Paris is afforded by the Chemin de Fer de Ceinture, which has some thirty stations along the line of ramparts or near it. The Métropolitain, an electric railway begun in 1898, and running chiefly underground, has a line traversing Paris from east to west (Porte Maillot to the Cours de Vincennes) and a line following the outer boulevards; within the ring formed by the latter there are transverse lines.

Streets.—The total length of the thoroughfares of Paris exceeds 600 m. For the most part, and especially in the business and industrial quarters where traffic is heavy and incessant, they are paved with stone, Yvette sandstone from the neighbourhood of Paris being the chief material. Wood and macadam come next in importance to stone, and there is a small proportion of asphalte roadway. The upkeep and cleansing is under the supervision of a branch of the department of public works (*service technique de la voie publique et de l'éclairage*), and for this purpose the city is divided into sections, each comprising two or three arrondissements. All streets having a width of 25 ft. or more are planted with rows of trees, chestnuts and planes being chiefly used for this purpose, and in many of the wide thoroughfares there are planted strips down the middle.

The upkeep (exclusive of cleansing) of the thoroughfares cost about £500,000, towards which the state, as usual, contributed £120,000 and the department £16,000. In the same year the cleansing cost about £450,000. The original cost of paving a street is borne by the owners of the property bordering it; but in the case of avenues of exceptional width they bear only a proportion of the outlay. Payments are exacted in return for the right to erect newspaper kiosks, &c., to place chairs and tables on the footways and similar concessions.

Water.—The water and sewage system of Paris is supervised by a branch of the public works department (*bureau des eaux, canaux et assainissement*). The water supply comprises a domestic supply of spring water and a supply for industrial and street cleansing purposes, derived from rivers and artesian wells. The domestic supply, which averaged 55,000,000 gallons daily in 1905, has three sources of origin:—

1. The springs of the Dhuis, to the east of Paris, whence the water is conveyed by an aqueduct 82 m. in length to a reservoir in the quarter of Ménilmontant.
2. The springs of the Vanne, south-east of Paris, whence the water comes by an aqueduct 108 m. in length to a reservoir near Montsouris Park. The springs of the Loing and Lunain, south-east of Paris, also supply the Montsouris reservoir.
3. The springs of the Avre, near Verneuil, to the west of the city, the aqueduct from which is 63 m. in length and ends at the St Cloud reservoir.

In addition, filtering installations at the pumping station of Ivry, St Maur and elsewhere make it possible to supplement the domestic supply with river water in hot summers.

Water for public and industrial purposes is obtained (1) from pumping stations at Ivry and other points on the banks of the Seine, and at St Maur on the Marne; (2) from the Ourcq canal, which starts at Mareuil on the Ourcq and ends in the Villette basin; (3) from artesian wells and the aqueduct of Arcueil from Rungis, the latter being of trifling importance. The water is stored in reservoirs in the higher localities of the city, which for the purposes of distribution is divided into zones of altitude; thus the water from the Vanne, stored at the Montsouris reservoir at an altitude of only 260 ft., is supplied to the central and lowest part of the city. The upper parts of the quarters of Montmartre, Belleville and Montrouge being too high to benefit by the supply from the ordinary reservoirs, are supplied from elevated reservoirs, to which the water is pumped by special works.

The water is distributed throughout the city by two systems: the low or variable pressure, carrying the river water for use in the streets, courts and industrial premises; the high pressure, taking the spring water to the various floors of buildings, and supplying hydraulic lifts, drinking fountains and fire-plugs. The total length of pipes is nearly 1600 m. The water arrives in all cases from two different directions, so that in case of accident the interruptions of the supply may be reduced to a minimum. Consumers are supplied by meter (*compteur*) at a price of 35 centimes the cubic metre (domestic supply) and at a minimum charge of 16 centimes for river water. In its dealings with individuals the municipality is represented by a company (*Compagnie générale des eaux*), which acts as a collecting agent and receives a commission on the takings. Its charter expires at the end of 1910. In 1905, for the first time, the gross takings reached £800,000.

Drainage.—The drainage system of Paris comprises four main collectors, with a length in all of nearly 20 m.; 27 m. of secondary collectors and several hundred miles of ordinary sewers. Its capacity is such that the Seine (except in certain cases of exceptional pressure, such as sudden and violent storms) is kept free from sewage water, which is utilized on sewage farms. The larger sewers, which vary between 9 and 20 ft. in width, are bordered by ledges, between which the water runs, and are cleansed by means of slides exactly fitting the channel and mounted on wagons or boats propelled by the force of the stream. Of the main collectors, that serving the north-eastern quarters of the city and debouching in the Seine at St Denis is the longest (7½ m.). The other main sewers converge at Clichy, on the right bank of the Seine, where a powerful elevator forces the sewage partly across the bridge, partly through a tunnel acting as a syphon below the river-level, to the left bank. Thence part of it is distributed over the estate of Gennevilliers, from which it returns purified, after having fertilized the plots, to the Seine. At Colombes a second elevator drives the surplus unused sewage to the hills above Argenteuil (right bank), where begins a conduit extending westwards. This conveys a portion of the sewage to a third elevator at Pierrelaye, whence it is distributed on the hills of Méry and the remainder to the Parc d'Achères (left bank), the irrigation fields of Carrières-sous-Poissy (right bank), and finally those of Mureaux, opposite Meulan. Certain parts of Paris lie too low for their drains to run into the main sewers, and special elevators are required to raise the sewage of the districts of Bercy, Javel and the Cité. The sewers are used as conduits for water-pipes, gas-pipes, telegraph and telephone wires and pneumatic tubes.

Lighting.—Gas-lighting in Paris is in the hands of a company whose operations are supervised and directed by municipal engineers. The company pays to the municipality an annual sum of £8000 for the privilege of laying pipes in the streets and 2 centimes for every cubic metre of gas consumed; in addition, the profits of the company, after a fixed dividend has been paid on the stock, are divided with the municipality. The company is bound to supply gas at 30 centimes per cubic metre to private consumers and at half that price for public services. In 1905 the total sum paid by the company amounted to nearly £1,000,000. It was provided that on the expiration of its charter the plant should be made over to the municipality. Electric light is supplied by a number of companies, to each of which in return for certain payments a segment (*secteur électrique*) of the city is assigned, though the concession carries with it no monopoly; the municipality has an electrical station of its own beneath the central markets.

Law and Justice (see FRANCE: *Justice*, for an account of the judicial system of the country as a whole).—Paris is the seat of four courts having jurisdiction over all France: (1) the Tribunal des Conflits, for settling disputes between the judicial and administrative authorities on questions as to their respective jurisdiction; (2) the Council of State, which includes a section for cases of litigation between private persons and public departments; (3) the Cour des Comptes; and (4) the Cour de Cassation. The first three sit in the Palais Royal, the fourth in the Palais de Justice, which is also the seat of (1) a *cour d'appel* for seven departments (seven civil chambers, one chamber of appeal for the correctional police, one chamber for preliminary proceedings); (2) a *cour d'assises*; (3) a tribunal of first instance for the department of Seine, comprising seven chambers for civil affairs, four chambers of correctional police; (4) a police court where each *juge de paix* presides in his turn assisted by a *commissaire de police*. Litigations between the departmental or municipal administrations and private persons are decided by the *conseil de préfecture*. Besides these courts there are *conseils de prud'hommes* and a tribunal of commerce. The *conseils de prud'hommes* settle differences between workmen and workmen, or between workmen and masters; the whole initiative, however, rests with the parties. There are four of these bodies in Paris (for the metal trades, the chemical trades, the textile trades and building industries), composed of an equal number of masters and men. The tribunal of commerce, sitting in a building opposite the Palais de Justice, is composed of business men elected by the "notables" of their order, and deals with cases arising out of commercial transactions; declarations of bankruptcy are made before it; it also acts as registrar of trade-marks and of articles of association of companies; and as court of appeal to the *conseils de prud'hommes*.

Prisons.—There are three places of detention in Paris—the Dépot of the prefecture of police (in the Palais de Justice), where persons arrested and not released by the commissaries of police are temporarily confined, the Conciergerie or *maison de justice*, for the reception of prisoners accused of crimes, who are there submitted to a preliminary examination before the president of the court of assizes, and the Santé (near the Place Denfert-Rochereau), for prisoners awaiting trial and for remanded prisoners. The old prisons of Mazas, Ste Pélagie and La Grande-Roquette, the demolition of which was ordered in 1894, have been replaced by the prison of Fresnes-lès-Rungis for condemned prisoners. The prisoners, kept in solitary confinement, are divided into three groups: those undergoing short sentences, those sentenced to hard labour while awaiting transference to their final place of detention or to sentences over a year, and sick prisoners occupying the central infirmary of the prison. The Petit Roquette (occupied by children) was replaced by the agricultural and horticultural colony of Montesson, inaugurated in 1896.

Education (see also FRANCE).—In 1905 there were 170 public *écoles maternelles* (kindergartens), with 57,000 pupils, and 48 private schools of the kind with 7800 pupils, besides a certain number of *écoles enfantines*, exclusively managed, as are the *écoles maternelles*, by women, and serving as a link between the latter and the *écoles primaires*, for timid and backward children of from 6 to 8 years of age. There were 374 public primary schools with 173,000 pupils, while over 63,000 children were educated in private primary schools. Subsidiary to the primary schools are the *caisses des écoles* (school treasuries), which give clothing, &c., to indigent children and maintain the *cantines scolaires* for the provision of hot mid-day meals; the *classes de garde* and the *garderies*, which look after children beyond the ordinary school hours; the *classes de vacances*, school camps and school colonies for children during the holidays; and the *internats primaires*, which for a small payment board and lodge children whose parents or guardians are unable to do so satisfactorily.

The higher primary schools (*écoles primaires supérieures*), which give a course of 3 or 4 years, number 86 for boys (Collége Chaptal,[1] *écoles*, J. B. Say, Turgot, Colbert, Lavoisier, Arago) and two for girls (Sophie Germain and Edgar Quinet). Supplementary courses take the place of these schools for children who can afford two years at most for schooling after leaving the primary school. Side by side with the higher primary school, the teaching in which has a commercial rather than an industrial bias, are the *écoles professionelles*, technical schools for the training of craftsmen. The École Diderot trains pupils in wood- and iron-working; the École Germain Pilon teaches practical drawing, and the École Barnard Palissy teaches applied art; the École Boulle trains cabinet-makers, and the École Estienne teaches all the processes connected with book-production. The school of physics and chemistry imparts both theoretical and practical knowledge of these sciences. The École Dorian is a school of the same type as the École Diderot, but is intended for very poor children, who are received from the age of seven and boarded and lodged. Six *écoles ménagères* train girls in the duties and employments of their sex. The municipality also provides gratuitous popular courses in scientific and historical subjects at the Hôtel de Ville, and there are numerous private associations giving courses of instruction (the Philotechnic Association, the Polytechnic Association, the *Union française de la jeunesse*, &c.). Teachers for the elementary primary schools are recruited from two training colleges in the city.

Secondary and Higher Education.—There are 13 lycées for boys and a municipal college—the Collége Rollin. These give classical and modern courses, and usually have classes preparing pupils for one or more of the government schools. For girls there are five lycées.

The five faculties of medicine, law, science, literature and Protestant theology, and the higher school of pharmacy, form the body of faculties, the association of which is known as the *University of Paris*. The faculties of science and literature, together with their library, are established at the Sorbonne, which is also the seat of the *académie*, of which Paris is the centre, and of the *École des chartes*. The faculty of medicine with its laboratories (*école pratique*) occupies separate buildings near the Sorbonne. The law school is also close to the Sorbonne. Of the 12,600 students at the university in 1905–1906 some 1260 were foreigners, Russians and Rumanians being most numerous among the latter. The faculty of law is the most largely attended, some 6000 students being enrolled therein. The *Collége de France*, founded by Francis I. and situated opposite the Sorbonne, gives instruction of a popular kind to adults of the general public; the various branches of learning are represented by over 40 chairs. The *Muséum d'histoire naturelle* gives instruction in the natural sciences; the *École pratique des hautes études*, whose students are instructed at the Sorbonne and other scientific establishments in the city, has for its object the encouragement of scientific research. In addition, there are several great national schools attached to various ministries. Dependent on the ministry of education are the *École normale supérieure*, for the training of teachers in lycées; the *École des chartes* (palaeography and the use of archives); the *École spéciale des langues orientales*, for the training of interpreters; the *École nationale et spéciale des beaux-arts* (painting, sculpture, architecture, &c.), in the various departments of which are conferred the *prix de Rome*, entitling their winners to a four years' period of study in Italy; the *Conservatoire national de musique et de déclamation* (music and acting), which also confers a *grand prix* and possesses a fine library and collection of musical instruments; the *École nationale des arts decoratifs* (art applied to the artistic industries); the *École du Louvre*, for the instruction of directors of museums. Depending on the ministry of war are the *École polytechnique*, which trains military, governmental and civil engineers; the *École supérieure de guerre* (successor of the officers' training school, founded in 1751) for advanced military studies. Attached to the ministry of commerce and industry are the *École centrale des arts et manufactures* for the training of industrial engineers, works managers, &c.; the *Conservatoire des arts et métiers*, which has a rich museum of industrial inventions and provides courses in science as applied to the arts. The *Institut national agronomique*, a higher school of scientific agriculture, is dependent on the ministry of agriculture, and the *École coloniale* for the instruction both of natives of French colonies and of colonial functionaries, on the ministry of the colonies. The *École nationale des ponts et chaussées* for the training of government engineers, and the *École nationale supérieure des mines* for mining engineers, are under the minister of public works. Of free institutions of higher education the most prominent are the *Catholic institute*, with faculties of law and theology and schools of advanced literary and scientific studies, the *Pasteur institute*, founded by Pasteur in 1886 and famous for the treatment of hydrophobia and for its research-laboratories, and the school of political science which prepares candidates for political and governmental careers. The two latter receive state subvention. There are numerous private associations giving courses of instruction, the more important being the Philotechnic Association, the Polytechnic Association and the *Union française de la jeunesse*.

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[1] The Collége Chaptal has a wider scope than the higher primary schools; it has in view general culture rather than commercial aptitude, and also prepares students for the great scientific schools (*école des mines*, *école polytechnique*, &c.).

Among the numerous learned societies of Paris the first in importance is the Institut de France (see ACADEMIES). The French Association for the advancement of the sciences, founded in 1872, is based on the model of the older British society, and, like it, meets every year in a different town.

In art Paris has long held a leading place. The Société des Artistes français holds an annual *salon* or exhibition in May and June at the Palais d'Industrie. It is open to artists of all nationalities. Works are selected and awards (including the *Prix de Rome*) made by a jury of experts selected by the exhibitors. The society was founded in 1872, but the *salon* takes its name from the academy exhibitions, which, first held in the Palais Royal in 1667, were transferred to the Salon Carré in the Louvre in 1669. As a result of dissension over the awards of 1889, the society of fine arts (Société Nationale des Beaux-Arts) established a separate *salon* in the Champ de Mars, in May, June and July. There is also a Société du Salon d'Automne.

Charity.—The administration of public charity is entrusted to a responsible director, under the authority of the Seine prefect, and assisted by a board of supervision, the members of which are nominated by the president. The funds at his disposal are derived (1) from the revenue of certain estates, houses, farms, woods, stocks, shares, (2) from taxes on seats in the theatres (one-tenth of the price), balls, concerts, the mont de piété, and allotments in the cemeteries; (3) from the municipal subsidy; (4) from other sources (including voluntary donations). The charges on the administration consist of (1) the treatment of the sick in the hospitals; (2) the lodging of old men and of incurables in the *hospices*; (3) the support of charity children; (4) the distribution of out-door relief (*secours à domicile*) by the *bureaux de bienfaisance*; (5) the dispensation of medical assistance *à domicile*.

The doctors, surgeons, chemists, both resident and non-resident, connected with the numerous hospitals, are all admitted by competitive examination. They are assisted by three grades of students, *internes* (who receive a salary), *externes* and *stagiaires* (probationers).

Of the *hospices* and similar institutions, the following are the chief: Bicêtre (men), less than a mile south of the fortifications; La Salpêtrière (women), Ivry (both sexes); *maisons de retraite* (for persons not without resources) Issy, La Rochefoucauld, Ste Périne; *fondations* (privately endowed institutions)—Brézins at Garches (for ironworkers), Devillas, Chardon-Lagache, Lenoir-Jousseran, Galignani (booksellers, printers, &c.), Alquier-Debrousse; and sections for the insane—Bicêtre (men), Salpêtrière (women), these being distinct from the ordinary departmental asylums controlled by the prefect.

Foundlings and orphans are sent to the *Hospice des enfants assistés*, which also receives children whose parents are patients in the hospitals or undergoing imprisonment. This institution is not intended as a permanent home. Infants are not kept in the institution, but are boarded out with nurses in the country; the older ones are boarded out with families or placed in technical schools. Up to thirteen years of age the children are kept at the expense of the department of Seine, after which they are apprenticed.

The following establishments in or near Paris belong to the nation and are dependent on the ministry of the interior: The Quinze-Vingts gives shelter to the 300 blind for whom it was founded by St Louis, and gives outdoor assistance besides. The blind asylum for the young (*Institution des jeunes aveugles*) has 250 pupils of both sexes. The deaf-mute institution (*Institution nationale des sourds-muets*) is for boys only, and they are generally paid for by the state, the departments and the communes. The Charenton asylum is for the insane. Those of Vincennes (for male patients) and Le Vesinet (for female patients) take in convalescents from the hospitals. The Vacassy asylum at Charenton is for workmen incapacitated by accident. The *Hôtel des invalides* is for old and infirm soldiers. Private bodies also maintain a great number of institutions.

Religion.—Some 75% of the population of Paris is Roman Catholic. The department of Seine forms the diocese of the archbishop of Paris, and the city is divided into 70 parishes. It has the important higher ecclesiastical seminary of St Sulpice, two lower seminaries and others for training the clergy for missionary and colonial work. Paris is also the seat of the central council of the Reformed Church and of the executive committee of the General Synod of the Lutheran Church, and forms a consistory of both these churches, whose adherents together number about 90,000. There are also some 50,000 Jews, Paris being the seat of the Grand Rabbinate of France and of the central consistory.

Industries.—The larger manufacturing establishments of Paris comprise engineering and repairing works connected with the railways, similar private works, foundries and sugar refineries. Government works are the tobacco factories of Gros Caillou and Reuilly, depending on the ministry of finance; the national printing establishment, under the ministry of justice; the mint (with a collection of medals and coins), established in an 18th century building close to the Pont Neuf and under the control of the ministry of finance; and the famous tapestry factory and dye-works (with a tapestry museum) of the Gobelins, under the minister of education. The list of minor establishments is varied, most of them being devoted to the production of the so-called *articles de Paris* (feathers, artificial flowers, dolls, toys and fancy goods in general), and carrying the principle of the division of labour to an extreme. The establishments which rank next to those above mentioned in the number of workmen are the pharmaceutical factories, the gasworks, the printing-offices, cabinet-makers' workshops, tailoring and dressmaking establishments (very numerous) and hat factories.

The textile industries hardly exist in Paris; there are a few tanneries on the Bièvre, but the leather industry is chiefly represented by the production of morocco leather goods classed as *articles de Paris*. Mention may be made here of the *bureaux de placement gratuit*, maintained by the municipality, where those in search of work or workers are put in touch with one another.

Markets.—The slaughter-houses, cattle-yards, and with few exceptions the markets of Paris, belong to the municipality. The chief slaughter-house is the *abattoir général* of La Villette, covering a space of 47 acres in the extreme north-east of the city on the bank of the Canal de l'Ourcq; adjoining it, with an area of about 55 acres, on the opposite bank of the canal, are the municipal cattle-yards and markets, which have accommodation for many thousands of animals, and are connected with the Ceinture railway so that the cattle-trucks are brought straight into the market. Cattle-traders and butchers pay dues for the use of these establishments. There are other less extensive slaughter-yards at Vaugirard. Most of the cattle come from Calvados, Maine-et-Loire, Vaucluse, Nièvre, Loire-Inférieure and Orne; sheep from Seine-et-Marne, Aveyron, Aisne, Seine-et-Oise, Lot and Cantal; pigs from Loire-Inférieure and other western departments; calves from Loiret, Eure-et-Loir and others of the northern departments. Dead meat, game, poultry, fruit, vegetables, fish and the other food-supplies have their centre of wholesale distribution at the Halles Centrales, close to the Louvre, which comprise besides a large uncovered space a number of pavilions of iron and glass covering some 10 acres. Close to the Halles is the Bourse de Commerce, which is a centre for transactions in alcohol, wheat, rye and oats, flour, oil and sugar; and a market for flour, the trade in which is more important than that in wheat, is held in the Place St Germain l'Auxerrois, sales being effected chiefly by the medium of samples. Most of the wines and spirits consumed in Paris pass through the entrepôts of Bercy and the wine-market on the Quai St Bernard, the first specially connected with the wine-trade, the second with the brandy-trade. In addition, there are other provision markets in various quarters of the city, owned and supervised by the municipality, as well as numerous flower-markets, bird-markets, a market for horses, carriages, bicycles and dogs, &c. Two fairs are still held in Paris—the *foire aux jambons* in the Boulevard Richard Lenoir during Holy week, and the *foire au pain d'épices* in the Place de la Nation and its vicinity at Easter time. Market and market-places are placed under the double supervision of the prefect of Seine and the prefect of police. The former official has to do with the authorization, removal, suppression, and holding of the markets, the fixing and collecting of the dues, the choice of sites, the erection and maintenance of buildings, and the location of vehicles. The latter maintains order, keeps the roads clear, and watches against fraud. There is a municipal laboratory, where any purchaser can have the provisions he has bought analysed, and can obtain precise information as to their quality. Spoiled provisions are seized by the agents of the prefecture.

The Chamber of Commerce occupies a building close to the Bourse.

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History.—At its first appearance in history there was nothing to foreshow the important part which Paris was to play in Europe and in the world. An island in the Seine, now almost lost in the modern city, and then much smaller than at present, was for centuries the entire site. The sole importance of the town lay in its being the capital of a similarly insignificant Gallic people, which navigated the lower course of the Seine, and doubtless from time to time visited the coasts of Britain. So few were its inhabitants that they early put themselves under the protection of their powerful neighbours, the Senones, and this vassalship was the source of the political dependence of Paris on Sens throughout the Roman period, and of a religious subordination which lasted till the 17th century. The capital did not at once take the name of the Parisii, whose centre it was, but long kept that of Lucetia, Lucotetia or Lutetia, of which Lutèce is the generally recognized French form.

During the War of Gallic Independence, after being subjugated by Caesar, who even in 53 B.C. made their territory the meeting-place of deputies from all Gaul, the Parisii took part in the great rising of the year 52, at the same time separating their cause from that of the Senones, who were held in check by Caesar's lieutenant, Labienus. They joined their forces to the army commanded by an Aulercian, the old Camulogenus, which in turn was to unite with the Bellovaci to crush Labienus advancing from Sens to attack the Parisians. Having marched along the right bank of the river till opposite Lutetia, Labienus learned that the Bellovaci were in arms, and, fearing to find himself between two armies at a distance from his headquarters, he sought to get rid of Camulogenus, who, posted on the left bank, endeavoured to bar his way. The bridges had been cut and the town burned by order of the Gallic chief. By means of a stratagem Labienus drew his opponent up the river to the district now occupied by the Jardin des Plantes, and quietly by night crossed the Seine lower down in the neighbourhood of Grenelle, near a place which Caesar calls Metiosedum, identified, but not conclusively, with Meudon. The Gauls, retracing their steps a little, met the Romans and allowed themselves to be routed and dispersed; their leader fell in the fore-front of the battle. Still unsubdued, the Parisii were called upon by the general council assembled in Alesia to furnish eight thousand men to help in raising the siege of that city. It is doubtful whether they were able to contribute the whole of this contingent, when their powerful neighbours the Bellovaci managed to send only two thousand of the ten thousand demanded of them. This was their last effort, and after the check at Alesia they took no part in the desperate resistance offered by the Bellovaci.

Lutetia was somewhat neglected under the Roman emperors of the first centuries. Its inhabitants continued quietly carrying on their river traffic, and devoted part of their wealth to the maintenance of a great temple to Jupiter built on the site of the present cathedral of Notre Dame. It is not known at what date Christianity was introduced into the future capital of France; but it is probable, judging by the use of the title "city," that Lutetia was the see of one of the earliest of the bishoprics of Gallia Celtica. The name of the founder of the church is known, but a keen controversy, not yet settled, has recently been raised with regard to the date when the first Roman missionary, St Dionysius or Denis, reached the banks of the Seine, along with his two deacons, Rusticus and Eleutherius. A pious belief, which, in spite of its antiquity, has its origin in nothing better than parochial vanity, identifies the first-named with Dionysius the Areopagite, who was converted by St Paul at Athens, and thus takes us back to the middle of the 1st century of the Christian era. Better founded in the opinion which dates the evangelization of the city two centuries later; the regular list of bishops, of whom, after Denis, the most famous was St Marcel, begins about 250.

Lutetia was in some sort the cradle of Christian liberty, having been the capital, from 292 to 306, of the mild Constantius Chlorus, who put an end to persecution in Brittany, Gaul and Spain, over which he ruled. This emperor fixed his residence on the banks of the Seine, doubtless for the purpose of watching the Germans without losing sight of Brittany, where the Roman authority was always unstable; perhaps he also felt something of the same fancy for Lutetia which Julian afterwards expressed in his works and his letters. Be that as it may, the fact that these two princes chose to live there naturally drew attention to the city, where several buildings now rose on the left side of the river which could not have been reared within the narrow boundaries of the island. There was the imperial palace, the remains of which, a magnificent vaulted chamber, beside the Hôtel de Cluny, are now known, probably correctly, as Julian's Baths. At some distance up the river, in the quarter of St Victor, excavations in 1870 and in 1883 laid bare the foundations of the amphitheatre, which was capable of holding about 10,000 spectators, and thus suggests the existence of a population of 20,000 to 25,000 souls. Dwelling-houses, villas, and probably also an extensive cemetery, occupied the slope of the hill of St Geneviève.

It was at Lutetia that, in 360, Julian, already Caesar, was in spite of himself proclaimed Augustus by the legions he had more than once led to victory in Germany. The troops invaded his palace, which, to judge by various circumstances of the mutiny, must have been of great extent. As for the city itself, it was as yet but a little town (πολίχνη) according to the imperial author in his *Misopogon.* The successive sojourns of Valentinian I. and Gratian scarcely increased its importance. The latest emperors preferred Trèves, Arles, and Vienne in Gaul, and, besides, allowed Paris, about 410, to be absorbed by the powerful Armorican league. When the patricians, Aetius, Aegidius and Syagrius, held almost independent sway over the small portion of Gaul which still held together, they dwelt at Soissons, and it was there that Clovis fixed himself during the ten or eleven years between the defeat of Syagrius (486) and the surrender of Paris (497), which opened its gates, at the advice of St Geneviève, only after the conversion of the Frankish king. In 508, at the return of his victorious expedition against the south, Clovis made Paris the official capital of his realm—*Cathedram regni constituit*, says Gregory of Tours. He chose as his residence the palace of the Thermae, and lost no time in erecting on the summit of the hill, as his future place of interment, the basilica of St Peter and St Paul, which became not long afterwards the church and abbey of St Geneviève. After the death of Clovis, in spite of the supremacy granted to the kingdom of Austrasia, or Metz, Paris remained the true political centre of the various Frankish states, insomuch that the four sons of Clothaire, fearing the prestige which would attach to whoever of them might possess it, made it a sort of neutral town, though after all it was seized by Sigebert, king of Austrasia, Chilperic, king of Neustria (who managed to keep possession for some time, and repaired the amphitheatre), and Guntram, king of Burgundy. The last sovereign had to defend himself in 585 against the pretender Gondovald, whose ambition aspired to uniting the whole of Gaul under his dominion, and marching on Paris to make it the seat of the half-barbarian half-Roman administration of the kingdom of which he had dreamed.

Numerous calamities befell Paris from 586, when a terrible conflagration took place, to the close of the Merovingian dynasty. During a severe famine Bishop Landry sold the church plate to alleviate the distress of the people, and it was probably he who, in company with St Eloi (Eligius), founded the Hôtel Dieu. The kings in the long run almost abandoned the town, especially when the Austrasian influence under the mayors of the palace tended to shift the centre of the Frankish power towards the Rhine.

Though the Merovingian period was for art a time of the deepest decadence, Paris was nevertheless adorned and enriched by pious foundations. Mention has already been made of the abbey of St Peter, which became after the death of Clovis the abbey of St Geneviève. On the same side of the river, but in the valley, Childebert, with the assistance of Bishop St Germain, founded St Vincent, known a little later as St Germain-des-Prés, which was the necropolis of the Frankish kings before St Denis. On the right bank the same king built St Vincent le Rond (afterwards St Germain l'Auxerrois), and in La Cité, beside the cathedral of St Etienne, the basilica of Notre Dame, which excited the admiration of his contemporaries, and in the 12th century obtained the title of cathedral. Various monasteries were erected on both sides of the river, and served to group in thickly-peopled suburbs the population, which had grown too large for the island.

The first Carolingian, Pippin the Short, occasionally lived at Paris, sometimes in the palace of Julian, sometimes in the old palace of the Roman governors of the town, at the lower end of the island; the latter ultimately became the usual residence. Under Charlemagne Paris ceased to be capital; and under Charles the Bald it became the seat of mere counts. But the invasions of the Northmen attracted general attention to the town, and showed that its political importance could no longer be neglected. When the suburbs were pillaged and burned by the pirates, and the city regularly besieged in 885, Paris was heroically defended by its "lords," and the emperor Charles the Fat felt bound to hasten from Germany to its relief. The pusillanimity which he showed in purchasing the retreat of the Normans was the main cause of his deposition in 887, while the courage displayed by Count Odo, or Eudes, procured him the crown of France; Robert, Odo's brother, succeeded him; and, although Robert's son, Hugh the Great, was only duke of France and count of Paris, his power counterbalanced that of the last of the Carolingians, shut up in Laon as their capital.

With Hugh Capet in 987 the capital of the duchy of France definitively became the capital of the kingdom, and in spite of the frequent absence of the kings, several of whom preferred to reside at Orleans, the town continued to increase in size and population, and saw the development of those institutions which were destined to secure its greatness. Henry I. founded the abbey of St Martin-des-Champs, Louis VI. that of St Victor, the mother-house of an order, and a nursery of literature and theology. Under Louis VII. the royal domain was the scene of one of the greatest artistic revolutions recorded in history: the Romanesque style of architecture was exchanged for the Pointed or Gothic, of which Suger, in his reconstruction of the basilica of St Denis, exhibited the earliest type. The capital could not remain aloof from this movement; several sumptuous buildings were erected; the Romanesque choir of St Germain-des-Prés was thrown down to give place to another more spacious and elegant; and when, in 1163, Pope Alexander III. had solemnly consecrated it, he was invited by Bishop Maurice de Sully to lay the first stone of Notre Dame de Paris, a cathedral on a grander scale than any previously undertaken. Paris still possesses the Romanesque nave of St Germain-des-Prés, preserved when the building was rebuilt in the 12th century; the Pointed choir, consecrated in 1163; and the entire cathedral of Notre Dame, which, completed sixty years later, underwent various modifications down to the beginning of the 14th century. The sacristy is modern; the site previous to 1831 was occupied by the episcopal palace, also built by Maurice de Sully, who by a new street had opened up this part of the island. It was Louis VII. also who granted to the Templars the piece of marshland on the left bank of the Seine on which the Paris Temple,[1] the headquarters of the order in Europe, was built (see TEMPLARS).

Philip Augustus may be considered the second founder of Paris. He seldom quitted it save for his military expeditions, and he there built for himself, near St Germain l'Auxerrois, the Louvre, the royal dwelling *par excellence*, whose keep was the official centre of feudalism. He created or organized a regular system of administration, with its headquarters at Paris; and under his patronage the public lectures delivered at Pré-aux-Clercs were regulated and grouped under the title of a university in 1200.

This university, the most famous and flourishing in Christendom, considerably augmented the local population, and formed as it were a new town on the left side of the river, where the great fortified precincts of the Templars, the important abbeys of Ste Geneviève, St Germain-des-Prés and St Victor, and a vast Carthusian monastery already stood. Colleges were erected to receive the students of the different countries, and became the great meeting-place of the studious youth of all Europe.

The right side of the river, where commerce and industry had taken up their abode, and where the Louvre, the abbey of St Martin, and a large number of secondary religious establishments were already erected, became a centre of activity at least as important as that on the left. The old suburbs, too, were now incorporated with the town and enclosed in the new line of fortifications constructed by Philip Augustus, which, however, did not take in the great abbeys on the left side of the river, and thus obliged them to build defensive works of their own.

Philip Augustus issued from the Louvre a celebrated order, that the streets of the town should be paved. Not far from his palace, on the site of the present Halles Centrales, he laid out an extensive cemetery and a market-place, which both took their name from the Church of the Innocents, a building of the same reign, destroyed at the Revolution. Fountains were placed in all the quarters. As for the lighting of the town, till the close of the 16th century the only lamps were those in front of the madonnas at the street corners. But the first "illumination" of Paris occurred under Philip Augustus: on his return from a victorious expedition to Flanders in 1214 he was welcomed by the Parisians as a conqueror; and the public rejoicings lasted for seven days, "interrupted by no night," says the chronicler, alluding to the torches and lamps with which the citizens lighted up the fronts of their houses. Ferrand, count of Flanders, the traitor vassal, was dragged behind the king to the dungeons of the Louvre.

In 1226 there was held at Paris a council which, by excommunicating Raymond VII., count of Toulouse, helped to prepare the way for the most important treaty which had as yet been signed in the capital. By this treaty (April 12, 1229) the regent, Blanche of Castile, the widow of Louis VIII., obtained from Raymond VII. a great part of his possessions, while the remainder was secured to the house of Capet through the marriage of Alphonse of Poitiers, brother of St Louis, with Jeanne, the heiress of Languedoc.

In affection for his capital St Louis equalled, or even surpassed, his grandfather Philip, and Paris reciprocated his goodwill. The head of the administration was at that time the provost of Paris, a judiciary magistrate and police functionary whose extensive powers had given rise to the most flagrant abuses. Louis IX. reformed this office and filled it with the judge of greatest integrity to be found in his kingdom. This was the famous Étienne Boileau, who showed such vigilance and uprightness that the capital was completely purged of evildoers; the sense of security thus produced attracted a certain number of new inhabitants, and, to the advantage of the public revenue, increased the value of the trade. It was Étienne Boileau who, by the king's express command, drew up those statutes of the commercial and industrial gilds of Paris which, modified by the necessities of new times and the caprice of princes, remained in force till the Revolution.

St Louis caused a partial restoration of St Germain l'Auxerrois, his parish church (completed in the 15th century, and deplorably altered under Louis XV.); and besides preferring the palace of La Cité to the Louvre, he entirely rebuilt it, and rendered it one of the most comfortable residences of his time. Of this edifice there still remain, among the buildings of the present Palais de Justice, the great guard-room, the kitchens with their four enormous chimneys, three round towers on the quay, and one of the marvels of the middle ages, the Sainte Chapelle, erected in 1248 to receive the crown of thorns sent from Constantinople. This church, often imitated during the 13th and 14th centuries, is like an immense shrine in open work; its large windows contain admirable stained glass of its own date, and its paintings and sculptures (restored in the 19th century by Viollet-le-Duc) give a vivid picture of the religious beliefs of the middle ages. It has a lower storey ingeniously arranged, which served as a chapel for the palace servants. The Sainte Chapelle was designed by Pierre de Montereau, one of the most celebrated architects of his time, to whom is attributed another marvel still extant, the refectory of the abbey of St Martin, now occupied by the library of the Conservatoire des Arts et des Métiers. This incomparable artist was buried in the abbey of St Germain-des-Prés, where, too, he had raised magnificent buildings now no longer existing. Under St Louis, Robert de Sorbon, a common priest, founded in 1253 an unpretending theological college which afterwards became the celebrated faculty of the Sorbonne, whose decisions were wellnigh as authoritative as those of Rome.

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[1] After the suppression of the Templars in 1312 the Temple was assigned to the Knights of St John. It was used as a state prison in the 14th century, and as barracks in the 16th. The church and the greater part of the other buildings survived in the 17th century. At the Revolution the keep (1265 or 1270) alone survived of the Templars' buildings. It was here that Louis XVI. and the royal family were imprisoned. It became a place of pilgrimage for the Royalists, and was, in consequence, pulled down under the Empire in 1811. Its site is occupied by the Place du Temple.

The capital of France had but a feeble share in the communal movement which in the north characterizes the 11th, 12th and 13th centuries. Placed directly under the central power, it was never strong enough to force concessions; and in truth it did not claim them, satisfied with the advantages of all kinds secured for it by its political position and its university. And, besides, the privileges which it did enjoy, while they could be revoked at the king's pleasure, were of considerable extent. Its inhabitants were not subjected to forced labour or arbitrary imposts, and the liberty of the citizens and their commerce and industry were protected by wise regulations. The university and all those closely connected with it possessed the fullest rights and liberties. There was a municipal or bourgeois militia, which rendered the greatest service to Philip Augustus and St Louis, but afterwards became an instrument of revolt. The communal administration devolved on *échevins* or *jurés*, who, in conjunction with the notables, chose a nominal mayor called provost of the merchants (*prévôt des marchands*). The powers of this official had been grievously curtailed in favour of the provost of Paris and his lieutenants, named by the sovereign. His main duties were to regulate the price of provisions and to control the incidence of taxation on merchandise. He was the chief inspector of bridges and public wells, superintendent of the river police, and commander of the guard of the city walls, which it was also his duty to keep in repair. And, finally, he had jurisdiction in commercial affairs until the creation of the consular tribunals by the chancellor Michel L'Hôpital. The violent attempts made by Étienne Marcel in the 14th century, and those of the communes of 1793 and 1871, showed what reason royalty had to fear too great an expansion of the municipal power at Paris.

The town council met in the 13th and 14th centuries in an unpretending house on Ste Geneviève, near the city walls on the left side of the river. The municipal assemblies were afterwards held near the Place de Grève, on the right side of the river, in the "Maison aux Piliers," which Francis I. allowed to be replaced by an imposing hôtel de ville.

The last of the direct descendants of Capet, and the first two Valois kings did little for their capital. Philip the Fair, however, increased its political importance by making it the seat of the highest court in the kingdom, the parlement, which he organized between 1302 and 1304, and to which he surrendered a part of his cité palace. Under the three sons of Philip the Fair, the Tour de Nesle, which stood opposite, on the site now occupied by the buildings of the Institute, was the scene of frightful orgies, equally celebrated in history and romance. One of the queens, who, if the chronicles are to be trusted, took part in these expiated her crimes in Château-Gaillard, where she was strangled in 1315 by order of her husband, Louis X. During the first part of the War of the Hundred Years, Paris escaped being taken by the English, but felt the effects of the national misfortunes. Whilst destitution excited in the country the revolt of the Jacquerie, in the city the miseries of the time were attributed to the vices of the feudal system, and the citizens seemed ready for insurrection. The provost of the merchants, Étienne Marcel, equally endowed with courage and intellect, sought to turn this double movement to account in the interest of the municipal liberties of Paris and of constitutional guarantees. The cause which he supported was lost through the violence of his own acts. Not content with having massacred two ministers under the very eyes of the dauphin Charles, who was regent whilst his father John lay captive in London, he joined the Jacquerie, and was not afraid to call into Paris the king of Navarre, Charles the Bad, a notorious firebrand, who at that time was making common cause with the English. Public sentiment, at first favourable to Marcel's schemes, shrank from open treason. A watch was set on him, and, at the moment when, having the keys of the town in his possession in virtue of his office, he was preparing to open one of the gates, he was assassinated by order of Jean Maillard, one of the heads of the *milice*, on the night of the 31st of July 1358. Marcel had enlarged Philip Augustus's line of fortifications on the right side of the river, and had begun a new one.

When he became king in 1364, Charles V. forgot the outrages he had suffered at the hands of the Parisians during his regency. He robbed the Louvre to some extent of its military equipment, in order to make it a convenient and sumptuous residence; his open-work staircases and his galleries are mentioned in terms of the highest praise by writers of the time. This did not, however, remain always his favourite palace; having built or rebuilt in the St Antoine quarter the mansion of St Paul or St Pol, he was particularly fond of living in it during the latter part of his life, and it was there that he died in 1380. It was Charles V. who, in conjunction with the provost of Paris, Hugues Aubriot, erected the famous Bastille to protect the St Antoine gate as part of an enlarged scheme of fortification. A library which he founded—a rich one for the times—became the nucleus of the national library. With the exception of some of the upper portions of the Sainte Chapelle, which were altered or reconstructed by this prince or his son Charles VI., there are no remains of the buildings of Charles V.

The reign of Charles VI. was as disastrous for the city as that of his father had been prosperous. From the very accession of the new king, the citizens, who had for some time been relieved by a great reduction of the taxes, and had received a promise of further alleviation, found themselves subjected to the most odious fiscal exactions on the part of the king's uncle, who was not satisfied with the well-stored treasury of Charles V., which he had unscrupulously pillaged. In March 1382 occurred what is called the revolt of the "Maillotins" (*i.e.* men with mallets). Preoccupied with his expedition against the Flemings, Charles VI. delayed putting down the revolt, and for the moment remitted the new taxes. On his victorious return on the 10th of January 1383, the Parisians in alarm drew up their forces in front of the town gates under the pretext of showing their sovereign what aid he might derive from them, but really in order to intimidate him. They were ordered to retire within the walls and to lay down their arms, and they obeyed. The king and his uncles, having destroyed the gates, made their way into Paris as into a besieged city; and with the decapitation of Desmarets, one of the most faithful servants of the Crown, began a series of bloody executions. Ostensibly through the intercession of the regents an end was put to that species of severities, a heavy fine being substituted, much larger in amount than the annual value of the abolished taxes. The municipal administration was suspended for several years, and its functions bestowed on the provost of Paris, a magistrate nominated by the Crown.

The calamities which followed were due to the weakness and incapacity of the government, given over, because of the madness of Charles VI., to the intrigues of a wicked queen and of princes who brought the most bloodthirsty passions to the service of their boundless ambition. First came the rivalry between the dukes of Orleans and Burgundy, brought to an end in 1407 by assassination of the former. Next followed the relentless struggle for supremacy between two hostile parties: the Armagnacs on one side, commanded by Count Bernard of Armagnac (who for a brief period had the title of constable), and supported by the nobles and burgesses; and on the other side the Burgundians, depending on the common people, and recognizing John the Fearless, duke of Burgundy, as their head. The mob was headed by a skinner at the Hôtel Dieu called Simon Caboche, and hence the name *Cabochiens* was given to the Burgundian party in Paris. They became masters of Paris in 1412 and 1413; but so violent were their excesses that the most timid rose in revolt, and the decimated bourgeoisie managed by a bold stroke to recover possession of the town. The Armagnacs again entered Paris, but their intrigues with England and their tyranny rendered them odious in their turn; the Burgundians were recalled in 1418, and returned with Caboche and a formidable band of pillagers and assassins. Perrinet Leclerc, son of a bourgeois guard, secretly opened the gates to them one night in May. The king resided in the Hôtel St Paul, an unconscious spectator of those savage scenes which the princes Louis and John, successively dauphins, were helpless to prevent.

The third dauphin, Charles, afterwards Charles VII., managed to put an end to the civil war, but it was by a crime as base as it was impolitic—the assassination of John the Fearless on the bridge of Montereau in 1419. Next year a treaty, from the ignominy of which Paris happily escaped, gave a daughter of Charles VI. to Henry V. of England, and along with her, in spite of the Salic law, the crown of France. The king of England made his entry into Paris in December 1420, and was there received with a solemnity which ill concealed the misery and real consternation of the poor people crushed by fifteen years of murders, pillage and famine. Charles VI. remained almost abandoned at the Hôtel St Paul, where he died in 1422, whilst his son-in-law went to hold a brilliant court at the Louvre and Vincennes. Henry V. of England also died in 1422. His son Henry VI., then one year old, came to Paris nine years later to be crowned at Notre Dame, and the city continued under the government of the duke of Bedford till his death in 1435.

The English rule was a mild one, but it was not signalized by the execution of any of those works of utility or ornament so characteristic of the kings of France. The choir of St Severin, however, shows a style of architecture peculiarly English, and Sauval relates that the duke of Bedford erected in the Louvre a fine gallery decorated with paintings. Without assuming the mission of delivering Paris, Joan of Arc, remaining with Charles VII. after his coronation at Reims, led him towards the capital; but the badly conducted and abortive enterprise almost proved fatal to the Maid of Orleans, who was severely wounded at the assault of the gate of St Honoré on the 8th of September 1429. The siege having been raised, Charles awaited the invitation of the Parisians themselves upon the defection of the Burgundians and the surrender of St Denis. The St Jacques gate was opened by the citizens of the guard to the constable de Richemont[1] on the 13th of April 1436; but the solemn entry of the king did not take place till November of the following year; subsequently occupied by his various expeditions or attracted by his residences in Berry or Touraine, he spent but little time in Paris, where he retired either to the Hôtel St Paul or to a neighbouring palace, Les Tournelles, which had been acquired by his father.

Louis XI. made equal use of St Paul and Les Tournelles, but towards the close of his life he immured himself at Plessis-les-Tours. It was in his reign, in 1469, that the first French printing-press was set up in the Sorbonne. Charles VIII. scarcely left Plessis-les-Tours and Amboise except to go to Italy; Louis XII. alternated between the castle at Blois and the palace of Les Tournelles, where he died on the 1st of January 1515.

Francis I. lived at Chambord, at Fontainebleau, at St Germain, and at Villers-Cotterets; but he proposed to form at Paris a residence in keeping with the taste of the Renaissance. Paris had remained for more than thirty years almost a stranger to the artistic movement begun between 1498 and 1500, after the Italian expedition. Previous to 1533, the date of the commencement of the Hôtel de Ville and the church of St Eustache, Paris did not possess, apart from the "Court of Accounts," any important building in the new style. Between 1527 and 1540 Francis I. demolished the old Louvre, and in 1541 Pierre Lescot began a new palace four times as large, which was not finished till the reign of Louis XIV. The buildings were not sufficiently advanced under Henry II. to allow of his leaving Les Tournelles, where in 1559 he died from a wound received at a tournament. His widow, Catherine de' Medici, immediately caused this palace to be demolished, and sent her three sons—Francis II., Charles IX. and Henry III.—to the unfinished Louvre. Outside the line of the fortifications she laid the foundations of the Château des Tuileries as a residence for herself.

Of the three brothers, it was Charles IX. who resided most at the Louvre; it was there that in 1572 he signed the order for the massacre of St Bartholomew. Henry III. remained for the most part at Blois, and hardly came to Paris except to be witness of the power of his enemies, the Guises.

Taking advantage of the absence of the kings, the League had made Paris a centre of opposition. The municipal militia were restored and reorganized; each of the 16 quarters or arrondissements had to elect a deputy for the central council, which became the council, or rather faction, of The Sixteen, and for four years, from 1587 to 1591, held the city under a yoke of iron. Henry III., having come to the Louvre in 1588, unwillingly received there the duke of Guise, and while endeavouring to take measures for his own protection provoked a riot known as the Day of the Barricades (May 12). It was with difficulty that he escaped from his palace, which at that time had no communication with the country, and which Henry IV. afterwards proposed to unite with the Tuileries in order to provide a sure means of escape in case of need.

When, after the murder of the duke of Guise at Blois at the close of 1588, Henry III. desired to return to Paris, he was not yet master of the city, and was obliged to besiege it in concert with his presumptive heir, the king of Navarre. The operations were suddenly interrupted on the 1st of August 1589, by the assassination of the king, and Henry IV. carried his arms elsewhere. He returned with his victorious forces in 1590. This second siege lasted more than four years, and was marked by terrible suffering, produced by famine and the tyranny of The Sixteen, who were supported by the intrigues of the king of Spain and the violent harangues of the preachers. Even the conversion of the king did not allay the spirit of fanaticism, for the king's sincerity was suspected, and the words (which history, however, fails to substantiate), "Paris is surely worth a mass," were attributed to him. But after the coronation of the king at Chartres the commonalty of Paris, weary of intriguing with strangers and Leaguers, gave such decided expression to its feelings that those of its leaders who had kept aloof, or broken off from the faction of The Sixteen attached themselves to the parlement, which had already evaded the ambitious designs of the king of Spain; and after various negotiations the provost of the merchants, L'Huillier, offered the keys of the city to Henry IV. on the 22nd of March 1594. The king met no resistance except on the part of a company of German landsknechts, which was cut in pieces, and the students of the university, who, steeped in the doctrines of the League, tried to hold their quarter against the royal troops, but were dispersed. The Spanish soldiers who had remained in the town decamped next day.

Henry IV., who carried on the building of the Louvre, was the last monarch who occupied it as a regular residence. Attempts on his life were made from time to time, and at last, on the 14th of May 1610, he fell under Ravaillac's knife near the market-house in Rue de la Ferronnerie.

Whether royalty gave it the benefit of its presence or not, Paris continued all the same to increase in political importance and in population. Here is the picture of the city presented about 1560 by Michel de Castelnau, one of the most celebrated chroniclers of the 16th century:—

> "Paris is the capital of all the kingdom, and one of the most famous in the world, as well for the splendour of its parlement (which is an illustrious company of thirty judges attended by three hundred advocates and more, who have reputation in all Christendom of being the best seen in human laws and acquainted with justice) as for its faculty of theology and for the other tongues and sciences,

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[1] Arthur, earl of Richmond, afterwards Arthur III. (*q.v.*), duke of Brittany.

which shine more in this town than in any other in the world, besides the mechanic arts and the marvellous traffic which render it very populous, rich and opulent; in such sort that the other towns of France and all the magistrates and subjects have their eyes directed thither as to the model of their decisions and their political administrations."

Castelnau spoke rather as a statesman and a magistrate, and did not look close enough to see that the university was beginning to decline. The progress of the sciences somewhat lessened the importance of its classes, too specially devoted to theology and literature; the eyes of men were turned towards Italy, which was then considered the great centre of intellectual advance; the colleges of the Jesuits were formidable rivals; the triumphs of Protestantism deprived it of most of the students, who used to flock to it from England, Germany and Scandinavia; and finally the unfortunate part it played in political affairs weakened its influence so much that, after the reign of Henry IV. it no longer sent its deputies to the states-general.

If the city on the left side of the river neither extended its circuit nor increased its population, it began in the 16th century to be filled with large mansions (hôtels), and its communications with the right bank were rendered easier and more direct when Henry IV. constructed across the lower end of the island of La Cité the Pont Neuf, which, though retaining its original name, is now the oldest bridge in Paris. On the right side of the river commerce and the progress of centralization continued to attract new inhabitants, and old villages become suburbs were enclosed within the line of a bastioned first enceinte, the ramparts of Étienne Marcel being, however, still left untouched. Although Louis XIII., except during his minority, rarely stayed much in Paris, he was seldom long absent from it. His mother, Mary de' Medici, built the palace of the Luxembourg, which, after being extended under Louis Philippe, became the seat of the senate.

Louis XIII. finished, with the exception of the eastern front, the buildings enclosing the square court of the Louvre, and carried on the wing which was to join the palace to the Tuileries. Queen Anne of Austria founded the Val de Grâce, the dome of which, afterwards painted on the interior by Mignard, remains one of the finest in Paris. Richelieu built for himself the Palais Royal, since restored, and rebuilt the Sorbonne, where now stands his magnificent tomb by Girardon. The island of St Louis above La Cité, till then occupied by gardens and meadows, became a populous parish, whose streets were laid out in straight lines, and whose finest houses still date from the 17th century. Building also went on in the Quartier du Marais (quarter of the marsh); and the whole of the Place Royale (now Place des Vosges), with its curious arcaded galleries, belongs to this period. The church of St Paul and St Louis was built by the Jesuits beside the ruins of the old Hôtel St Paul; the church of St Gervais received a façade which has become in our time too famous. St Étienne du Mont and St Eustache were completed (in the latter case with the exception of the front). The beautiful Salle des Pas-Perdus (Hall of Lost Footsteps) was added to the Palais de Justice. Besides these buildings and extensions Paris was indebted to Louis XIII. and his minister Richelieu for three important institutions—the royal printing press in 1620, the Jardin des Plantes in 1626, and the French Academy in 1635. The bishopric of Paris was separated from that of Sens and erected into an archbishopric in 1623.

As memorials of Mazarin Paris still possesses the Collège des Quatre-Nations, erected with one of his legacies immediately after his death, and since appropriated to the Institute, and the palace which, enlarged in the 19th century, now accommodates the national library.

The stormy minority of Louis XIV. was spent at St Germain and Paris, where the court was held at the Palais Royal. The intrigues of the prince of Condé, Cardinal de Retz, and (for a brief space) Turenne resulted in a siege of Paris, during which more epigrams than balls were fired off; but the cannon of the Bastille, discharged by order of Mademoiselle de Montpensier, enabled Condé to enter the city. Bloody riots followed, and came to an end only with the exhaustion of the populace and its voluntary submission to the king. Though Louis XIV. ceased to stay in Paris after he grew up, he did not neglect the work of embellishment. On the site of the fortifications of Étienne Marcel, which during the previous hundred years had been gradually disappearing, he laid out the line of boulevards connecting the quarter of the Bastille with that of the Madeleine. Though he no longer inhabited the Louvre (and it never was again the seat of royalty), he caused the great colonnade to be constructed after the plans of Claude Perrault. This immense and imposing façade, 548 ft. long, has the defect of being quite out of harmony with the rest of the building, which it hides instead of introducing. The same desire for effect, altogether irrespective of congruity, appears again in the observatory erected by the same Perrault, without the smallest consideration of the wise suggestions made by Cassini. The Place Vendôme, the Place des Victoires, the triumphal gates of St Denis and St Martin and several fountains, are also productions of the reign of Louis XIV. The hospital of La Salpêtrière, with its majestically simple dome, was finished by Libéral Bruant. The Hôtel des Invalides, one of the finest institutions of the grand monarque, was also erected, with its chapel, between 1671 and 1675, by Bruant; but it was reserved for the architect Hardouin Mansart to give to this imposing edifice a complement worthy of itself: it was he who raised the dome, admirable alike for its proportions, for the excellent distribution of its ornaments, and for its gilded lantern, which rises 344 ft. above the ground. "Private persons," says Voltaire, "in imitation of their king, raised a thousand splendid edifices. The number increased so greatly that from the neighbourhood of the Palais Royal and of St Sulpice there were formed in Paris two new towns much finer than the old one." All the aristocracy had not thought fit to take up their residence at Versailles, and the great geniuses of the century, Corneille, Racine, La Fontaine, Molière, Madame de Sévigné, had their houses in Paris; there also was the Hôtel de Rambouillet, so famous in the literary history of the 17th century.

The halls of the Palais Royal during the minority of Louis XV. were the scene of the excesses of the regency; later on the king from time to time resided at the Tuileries, which henceforward came to be customarily regarded as the official seat of the monarchy. To the reign of Louis XV. are due the rebuilding of the Palais Royal, the "Place" now called De la Concorde, the military school, the greater part of the church of Ste Geneviève, or Panthéon (a masterpiece of the architect Soufflot), the church of St Roch, the palace of the Élysée (now the residence of the president of the republic), the Palais Bourbon (with the exception of the façade), now occupied by the chamber of deputies, and the mint, a majestic and scholarly work by the architect Antoine, as well as the rebuilding of the Collège de France.

Louis XVI. finished or vigorously carried on the works begun by his grandfather. He did not come to live in Paris till compelled by the Revolution. That historical movement began indeed at Versailles on the 17th of June 1789, when the states-general were transformed into a constituent assembly; but the first act of violence which proved the starting-point of all its excesses was performed in Paris on the 14th of July 1789 when Paris inaugurated, with the capture of the Bastille, its "national guard," organized and then commanded by the celebrated La Fayette. At the same time the assassination of the last provost of the merchants, Jacques de Flesselles, gave the opportunity of establishing, with more extended powers, the *mairie* (mayoralty) of Paris, which was first occupied by Bailly, and soon became, under the title of commune, a political power capable of effectively counterbalancing the central authority.[1]

Paris had at that time once more outgrown its limits. The quarter on the left side of the river had more than doubled its extent by the accession of the great monasteries, the faubourgs of St Germain and St Marceau, the Jardin des Plantes, and the whole of Mont Ste Geneviève. The line of the new enceinte is still marked by a circuit of boulevards passing from the Champs de Mars at Pont d'Austerlitz by Place de l'Enfer and Place d'Italie. Similar enlargements, also marked out by a series of boulevards, incorporated with the town on the right side of the faubourgs of St Antoine and Poissonnière and the quarters of La Chaussée d'Antin and Chaillot. In 1784 was begun, instead of a line of fortifications, a simple customs-wall, with sixty propylaea or pavilions in a heavy but characteristic style, of which the finest are adorned with columns or pilasters like those of Paestum. In front of the Place du Trône (now Place de la Nation), which formed as it were a façade for Paris on the east side, there were erected two lofty rostral columns bearing the statues of Philip Augustus and St Louis. Towards the west, the city front was the Place Louis XV. (Place de la Concorde), preceded by the magnificent avenue of the Champs Élysées. Between the barriers of La Villette and Pantin, where the highways for Flanders and Germany terminated, was built a monumental rotunda flanked on the ground floor by four peristyles arranged as a Greek cross, and in the second storey lighted by low arcades supported by columns of the Paestum type. None of these works were completed till the time of the empire. It was also in the latter part of the reign of Louis XIV., and under the first republic, that the quarter of La Chaussée d'Antin was built.

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[1] Owing to the armed and organized revolutionary elements in the assemblies of the Sections, which enabled the revolutionary commune to direct and control popular *émeutes*.

The history of Paris during the Revolutionary period is the history rather of France, and to a certain extent of the whole world (see France: *History*; French Revolution; and the articles on the Jacobins and other clubs). During the Consulate hardly anything of note took place at Paris except the explosion of the infernal machine directed against Bonaparte on the 24th of December 1800.

The coronation of Napoleon by Pope Pius VII. was celebrated in Notre Dame on the 2nd of December 1804. Eight years later, during the Russian campaign, the conspiracy of General Malet, happily suppressed, was on the point of letting loose on all France a dreadful civil war. The empire, however, was then on the wane, and Paris was witness of its fall when, after a battle on the heights of Montmartre and at the *barrière de Clichy*, the city was obliged to surrender to the allies on the 30th of March 1814.

For the next two months the city was in the occupation of the allies and witnessed a hitherto unique assembly of sovereigns and statesmen. Their deliberations issued on the 30th of May 1814 in the first treaty of Paris (see Paris, *Treaties of*, below). So far as the city itself was concerned, the only permanent loss that it suffered through the occupation was that of the art treasures with which Napoleon had enriched it at the expense of other capitals; among these were many paintings and pieces of statuary from the Louvre, and the famous bronze horses from Venice, which were taken down from the triumphal arch of the Carrousel and restored to the façade of St Mark's. The expressed determination of Blücher and his Prussians to blow up the Pont de Jéna, built to commemorate Napoleon's crushing victory of 1806, was frustrated by the vigorous intervention of Wellington and of the emperor Alexander I.

Paris under the Restoration witnessed the revival of religious ceremonials to which it had long been unaccustomed, notably the great Corpus Christi procession, in which the king himself carried a candle. Then came Napoleon's return from Elba (March 1815) and the interlude of the Hundred Days. After Waterloo, though there was fighting round Paris, there was no effort to defend the city against the allied armies; for the Parisians had grown thoroughly weary of Napoleon, and Louis XVIII., though he returned "in the baggage train of the enemy," was received by the populace with rapturous acclamation (see Louis XVIII.). The second treaty of Paris was signed on the 20th of November of the same year (see below). It left France in the occupation of 150,000 foreign troops, and the crown and government under the tutelage of a committee of representatives of the foreign great powers in Paris.

Paris now became the centre of the royalist reaction, and of a political proscription which reflected, though without its popular excesses, the White Terror of the South. The most conspicuous event of this time was the tragedy of the trial and execution of Marshal Ney (*q.v.*). For the rest, the only event of note that occurred in Paris under Louis XVIII. was the assassination of the duke of Berry by Louvel on the 13th of February 1820. Ten years later the revolution of 1830,[1] splendidly commemorated by the Column of July in Place de la Bastile, put Charles X. to flight and inaugurated the reign of Louis Philippe, a troublous period which was closed by the revolution of 1848 and a new republic. It was this reign, however, that surrounded Paris with bastioned fortifications with ditches and detached forts, the outcome of the warlike fever aroused by the exclusion of France from the treaty of London of 1840 (see Mehemet Ali). The republic of 1848 brought no greater quiet to the city than did the reign of Louis Philippe. The most terrible insurrection was that of the 23rd–26th of June 1848, distinguished by the devotion and heroic death of the Archbishop Affre. It was quelled by General Cavaignac, who then for some months held the executive power. Prince Louis Napoleon next became president of the republic, and after dissolving the chamber of deputies on the 2nd of December 1851, caused himself to be proclaimed emperor just a year later.

The second empire completed that material transformation of Paris which had already been begun at the fall of the ancient monarchy. First came numerous cases of destruction and demolition caused by the suppression of the old monasteries and of many parish churches. A number of medieval buildings, civil or military, were cleared away for the sake of regularity of plan and improvements in the public streets, or to satisfy the taste of the owners, who thought more of their comfort or profit than of the historic interest of their old mansions or houses.

It was under the first empire that the new series of improvements were inaugurated which have made Paris a modern city. Napoleon began the Rue de Rivoli, built along this street the wing intended to connect the Tuileries with the Louvre, erected in front of the court of the Tuileries the triumphal arch of the Carrousel, in imitation of that of Septimius Severus at Rome. In the middle of the Place Vendôme was reared, on the model of Trajan's column, the column of the Grand Army, surmounted by the statue of the emperor. To immortalize this same Grand Army he ordered from the architect Pierre Vignon a Temple of Victory, which without changing the form of its Corinthian peristyle has become the church of the Madeleine; the entrance to the avenue of the Champs Élysées was spanned by the vast triumphal arch De l'Étoile (of the star), which owes its celebrity not only to its colossal dimensions and its magnificent situation, but also to one of the four subjects sculptured upon its faces—the *Chant du départ* or *Marseillaise*, one of the masterpieces of Rude and of modern sculpture. Another masterpiece was executed by David of Angers—the pediment of the Panthéon, not less famous than Soufflot's dome. The museum of the Louvre, founded by decree of the Convention on the 27th of July 1793, was organized and considerably enlarged; that of the Luxembourg was created in 1805, but was not appropriated exclusively to modern artists till under the Restoration. The Conservatoire des Arts et Métiers, due to the Convention, received also considerable additions in the old priory or abbey of St Martin des Champs, where the council of the Five Hundred had installed it in 1798.

Under the Restoration and under the government of July many new buildings were erected; but, with the exception of the Bourse, constructed by the architects Brongniart and Labarre, and the colonnade of the Chamber of Deputies, these are of interest not so much for their size as for the new artistic tendencies affected in their architecture. People had grown weary of the eternal Graeco-Roman compilations rendered fashionable by the Renaissance, and reduced under the empire to mere imitations, in producing which all inspiration was repressed. The necessity of being rational in architecture, and of taking full account of practical wants, was recognized; and more suggestive and plastic models were sought in the past. These were to be found, it was believed, in Greece; and in consequence the government under Louis Philippe saw itself obliged to found the French school at Athens, in order to allow young artists to study their favourite types on the spot. In the case of churches it was deemed judicious to revive the Christian basilicas of the first centuries, as at Notre Dame de Lorette and St Vincent de Paul; and a little later to bring in again the styles of the middle ages, as in the ogival church of St Clotilde.

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[1] Notable in the history of the city for the discovery by the populace of the effectiveness of barricades against regular troops. These had been last used in the Fronde.

Old buildings were also the object of labours more or less important. The Place de la Concorde was altered in various ways, and adorned with eight statues of towns and with two fountains; on the 25th of October 1836 the Egyptian obelisk, brought at great expense from Luxor, was erected in the centre. The general restoration of the cathedral of Notre Dame was voted by the Chamber in 1845, and entrusted to Viollet-le-Duc; and the palace of the Luxembourg and the Hôtel de Ville were considerably enlarged at the same time, in the style of the existing edifices.

But the great transformer of Paris in modern times was Napoleon III. To him or to his reign we owe the Grand Opéra, the masterpiece of the architect Garnier; the new Hôtel-Dieu; the finishing of the galleries which complete the Louvre and connect it with the Tuileries; the extension of the Palais de Justice and its new front on the old Place Dauphine; the tribunal of commerce; the central markets; several of the finest railway stations; the viaduct at Auteuil; the churches of La Trinité, St Augustin, St Ambroise, St François Xavier, Belleville, Ménilmontant, &c. For the first international Paris exhibition (that of 1855) was constructed the "palace of industry"; the enlargement of the national library was commenced; the museum of French antiquities was created by the savant Du Sommerard, and installed in the old "hôtel" built at the end of the 15th century for the abbots of Cluny.

All this is but the smallest part of the memorials which Napoleon III. left of his presence. Not only was the city traversed in all directions by new thoroughfares, and sumptuous houses raised or restored in every quarter, but the line of the fortifications was made in 1859 the limit of the city. The area was thus doubled, extending to 7450 hectares or 18,410 acres, instead of 3402 hectares or 8407 acres. It was otherwise with the population; to the 1,200,000 inhabitants which Paris possessed in 1858 the incorporation of the suburban zone only added 600,000.

Paris had to pay dear for its growth and prosperity under the second empire. This government, which, by straightening and widening the streets, thought it had effectually guarded against the attempts of its internal enemies, had not sufficiently defended itself from external attack, and at the first reverses of 1870 Paris found itself prepared to overthrow the empire, but by no means able to hold out against the approaching Prussians.

The two sieges of Paris in 1870–71 are among the most dramatic episodes of its history. The first siege began on the 19th of September 1870, with the occupation by the Germans of the heights on the left side of the river and the capture of the unfinished redoubt of Châtillon. Two days later the investment was complete. General Trochu, head of the French Government and governor of the city, had under his command 400,000 men—a force which ought to have been able to hold out against the 240,000 Germans by whom it was besieged, had it not been composed for the most part of hurried levies of raw soldiers with inexperienced officers, and of national guards who, never having been subjected to strict military discipline, were a source of weakness rather than of strength. The guards, it is true, displayed a certain warlike spirit, but it was for the sole purpose of exciting disorder. Open revolt broke out on the 31st of October; it was suppressed, but increased the demoralization of the besieged and the demands of the Prussians. The partial successes which the French obtained in engagements on both sides of the river were rendered useless by the Germans recapturing all the best positions; the severity of winter told heavily on the garrison, and the armies in the provinces which were to have co-operated with it were held in check by the Germans in the west and south. In obedience to public opinion a great sortie was undertaken; this, in fact, was the only alternative to a surrender; for, the empire having organized everything in expectation of victory and not of disaster, Paris, insufficiently provisioned for the increase of population caused by the influx of refugees, was already suffering the horrors of famine. Accidental circumstances combined with the indecision of the leaders to render the enterprise a failure. Despatches sent by balloon to the army of the Loire instructing it to make a diversion reached their destination too late; the bridge of Champigny over the Marne could not be constructed in time; the most advantageous positions remained in the hands of the Germans; and on the 2nd and 3rd of December the French abandoned the positions they had seized on the 29th and 30th of November. Another sortie made towards the north on the 21st of December was repulsed, and the besieged lost the Avron plateau, the key to the positions which they still held on that side. The bombardment began on the 17th of December, and great damage was done to the forts on the left of the Seine, especially those of Vanves and Issy, directly commanded by the Châtillon battery. A third and last sortie (which proved fatal to Regnault the painter) was attempted in January 1871, but resulted in hopeless retreat. An armistice was signed on the 27th of January, the capitulation on the 28th. The revictualling of the city was not accomplished without much difficulty, in spite of the generous rivalry of foreign nations (London alone sending provisions to the value of £80,000).

On the 1st of March the Germans entered Paris. This event, which marked the close of the siege, was at the same time the first preparation for the "commune;" for the national guard, taking advantage of the general confusion and the powerlessness of the regular army, carried a number of cannon to the heights of Montmartre and Belleville under pretext of saving them. President Thiers, appreciating the danger, attempted on the 18th of March to remove the ordnance; his action was the signal of an insurrection which, successful from the first, initiated a series of terrible outrages by the murder of the two generals, Lecomte and Thomas. The government, afraid of the defection of the troops, who were demoralized by failure and suffering, had evacuated the forts on the left side of the river and concentrated the army at Versailles (the forts on the right side were still to be held for some time by the Germans). Mont Valérien happily remained in the hands of the government and became the pivot of the attack during the second siege. All the sorties made by the insurgents in the direction of Versailles (where the National Assembly was in session from the 20th of March) proved unsuccessful, and cost them two of their improvised leaders—Generals Flourens and Duval. The incapacity and mutual hatred of their chiefs rendered all organization and durable resistance impossible. On Sunday the 21st of May the government forces, commanded by Marshal MacMahon, having already captured the forts on the right side of the river, made their way within the walls; but they had still to fight hard from barricade to barricade before they were masters of the city; Belleville, the special Red Republican quarter, was not assaulted and taken till Friday. Meanwhile the communists were committing the most horrible excesses: the archbishop of Paris (Georges Darboy, *q.v.*), President Bonjean, priests, magistrates, journalists and private individuals, whom they had seized as hostages, were shot in batches in the prisons; and a scheme of destruction was ruthlessly carried into effect by men and women with cases of petroleum (*pétroleurs* and *pétroleuses*). The Hôtel de Ville, the Palais de Justice, the Tuileries, the Ministry of Finance, the palace of the Legion of Honour, that of the Council of State, part of the Rue de Rivoli, &c., were ravaged by the flames; barrels of gunpowder were placed in Notre Dame and the Pantheon, ready to blow up the buildings; and the whole city would have been involved in ruin if the national troops had not gained a last and crowning victory in the neighbourhood of La Roquette and Père-la-Chaise on the 28th of May. Besides the large number of insurgents who, taken in arms, were pitilessly shot, others were afterwards condemned to death, to penal servitude, to transportation; and the survivors only obtained their liberty by the decree of 1879.

From this double trial Paris emerged diminished and almost robbed of its dignity as capital; for the parliamentary assemblies and the government went to sit at Versailles. For a little it was thought that the city would not recover from the blow which had fallen on it. All came back, however—confidence, prosperity, and, along with that, increasing growth of population and the execution of great public works. The Hôtel de Ville was rebuilt, the school of medicine adorned with an imposing façade, a vast school of pharmacy established in the old gardens of the Luxembourg, and boulevards completed. The exhibition of 1878 was more marvellous than those of 1855 and 1867, and left a lasting memorial—the palace of the Trocadéro. And the chambers in 1879 considered quiet sufficiently restored to take possession of their customary quarters in the Palais Bourbon and the Luxembourg. (A. S.-P.; W. A. P.)

The Universal Exhibition of 1878, destined to show Europe that France had recovered her material prosperity and moral power, attracted a large concourse. The number of admissions was about 13,000,000. A grand fête, full of gaiety and enthusiasm, was held on the 30th of June. This was the first public rejoicing since the war. The terrible winter of 1879–1880 was the severest of the century; the Seine, entirely frozen, resembled a sea of ice. The 14th of July, the anniversary of the taking of the Bastille, was adopted as the French national holiday and celebrated for the first time in 1880. A grand military review was held in the Bois de Boulogne, at which President Grévy distributed flags to all the regiments of the army. On the 17th of March 1881 a national loan of a thousand million francs was issued for the purpose of executing important public works. This loan was covered fifteen times, Paris alone subscribing for ten thousand millions. At the time of the legislative elections, on the 21st of August and the 4th of September 1881, several tumults occurred in the Belleville district, Gambetta, who was a candidate in the two wards of that district vainly tried to address the electors. The great orator died in the following year, on the 31st of December, from the effects of an accident, and his funeral, celebrated in Paris at the expense of the State, was attended by an immense gathering. A slight Legitimist agitation followed Gambetta's death. An unfortunate event occurred on the 29th of September 1883, the day when the king of Spain, Alphonso XII., returned from his visit to Berlin, where he had reviewed the 15th regiment of Prussian Uhlans, of which he was the honorary colonel. The cries of "Down with the Uhlan!" with which he was greeted by the Paris crowd, gave rise to serious diplomatic incidents. On the 26th of May 1885 the following decree was rendered: "The Pantheon is restored to its primitive and legal destination. The remains of the great men who have merited national recognition will be disposed therein." But it was only on the 4th of August 1899 that the ashes of Lazare Carnot, Hoche, Marceau, Latour d'Auvergne and Baudin were solemnly transported to the Pantheon. Victor Hugo's funeral was celebrated on the 1st of June 1885, and by an urgency vote they were made national obsequies. It was decided that the corpse should be exposed one day and one night under the Arc de Triomphe, veiled with an immense crape. A few days before, upon the occasion of the anniversary of the fall of the Commune, a tumultuous political manifestation had been made in front of the tomb of the Communists buried in Père Lachaise cemetery.

In 1886 the Monarchists renewed their political demonstrations; the most important one was the reception given by the Count of Paris at the Galliera mansion on the occasion of the marriage of his daughter with the King of Portugal. The Count of Paris had invited to this reception all the foreign ambassadors, and some disturbance having taken place, the Chamber of Deputies, on the 11th of June 1886, voted a law interdicting sojourn upon French territory to the Orleanist and Bonapartist pretenders to the throne of France, and also to their direct heirs. At that epoch Paris was in a state of agitation and discontent, and various catastrophes occurred. First of all came the disastrous bankruptcy of a large financial concern called the Union Générale; then the scandal concerning the traffic in decorations, in which M. Wilson, son-in-law of M. Jules Grévy, was compromised, and which eventually led to the resignation of the President; finally the deplorable Panama affair profoundly enervated the Parisians, and made them feel the necessity of shouting for a military master, some adventurer who would promise them a revenge. All this led to Boulangism. It was by wild acclamations and frantic shouts that General Boulanger was greeted, first at the review of the army on the 14th of July, then two days later at the opening of the Military Club, afterwards at the Winter Circus, where the Patriots' League held a mass meeting under the presidency of Paul Déroulède, and finally, on the 8th of July, at an immense demonstration at the Lyons railway station, when "le brav' Général" left Paris to take command of the 13th army corps at Clermont Ferrand. Popular refrains were sung in the streets in the midst of immense excitement on the 27th of January 1889 at the time of the election of General Boulanger as deputy for the Seine department. A majority of 80,000 votes had invested him with an immense moral authority, and he appeared as though elected as the candidate of the entire country; but he lacked the necessary audacity to complete his triumph, and the Government having decided to prosecute him for conspiracy against the security of the state, before the Senate acting as a High Court of Justice, he fled with his accomplices, Rochefort and Dillon. All three were condemned by default, on the 14th of August, to imprisonment in a fortified enclosure.

Other events had also troubled this astonishing interlude of Boulangism. On the 23rd of February 1887 a terrible fire destroyed the Opéra Comique during a performance, and a great many of the audience perished in the flames. The first performance of *Lohengrin*, which took place at the Eden Theatre on the 1st of May 1887, was also the cause of street rioting. In 1888 there were several strikes. That of the day labourers, which lasted more than a month, occasioned violent scenes, owing to the sudden death of Émile Eudes, a Communist, while he was speaking in favour of the strike at a public meeting. On the 2nd of December there were manifestations in memory of Baudin, a representative of the people, killed upon the barricades in 1851 while fighting in the defence of the Republic. But a calm finally came, and then the Parisians thought only of celebrating the centenary of the Revolution of 1789 by a universal exhibition. This exhibition contained a profusion of marvels such as had never before been seen, and indicated what enormous industrial progress had been accomplished. Sadi Carnot, who had succeeded M. Jules Grévy as President of the Republic on the 3rd of December 1887, officially opened the exhibition on the 6th of May 1889. Numerous fêtes were held in the grounds while the exhibition lasted. The Eiffel Tower and the illuminated fountains enraptured the crowd of visitors, while the Rue du Caire, with its Egyptian donkey-drivers, obtained a prodigious success. Most of the nations were represented at this exhibition. Germany alone confined her co-operation to the display of some paintings. The Shah of Persia, in honour of whom splendid fêtes were organized, and the King of Greece, the Prince of Wales, the Lord Mayor of London, several Russian grand dukes, Annamite, Tunisian, Moorish, Egyptian and African princes successively visited the Exhibition. There were 30,000,000 visitors. On the 18th of August a banquet was given in the Palais de l'Industrie by the Paris Municipal Council to all the mayors in France, and 15,000 of these officials were present.

In 1890 the duke of Orleans, having attained his majority, came to Paris to draw for military service with the youngest conscripts of his class. He was arrested, and placed, first in the Conciergerie, and later in the prison at Clairvaux, but was released after a few months' incarceration. The following years were remarkable for more strikes and several demonstrations by the students, which led in 1893 to conflicts with the police, in one of which a student was killed. On the 17th of October an enthusiastic welcome was extended to Admiral Avellan and the Russian sailors upon their arrival in Paris. It was about this time that dynamite began to be used by the Anarchists. After Ravachol, who commenced the sinister exploits of the "propaganda by acts," it was Vaillant who threw a bomb into the "Temple of the Laws" on the 9th of December 1893, and wounded forty-six deputies. Then there was a succession of these attacks during the two following months, for Ravachol and Vaillant had found emulators. Henry scattered fright and death among the peaceable customers of a brasserie, while bombs were thrown into the doorways and staircases of houses inhabited by wealthy people. Upon the steps of the Madeleine Church, Parvels, who was already the author of two dynamite plots, was struck down by the destructive machine that he was about to throw into the body of the church. Laurent Tailhade himself, who had celebrated with his pen the beauty of Vaillant's gesture, was subsequently wounded by dynamite thrown into the Café Foy, where he was lunching.

The visit of the emperor and empress of Russia, on the 5th, 6th and 7th of October 1896, was celebrated by incomparable fêtes. The Rue de la Paix was decorated with ropes and sails, stretched across the street like the rigging of a vast vessel, in honour of the Russian sailors. Nothing could be seen anywhere except flags, cockades and badges formed of the colours of the two friendly nations. In the evening there were open-air balls, with farandoles and orchestras at all the street corners. Popular enthusiasm was again manifested on the 31st of August, when President Faure returned from his visit to the Russian court. On the 4th of May 1897 the terrible conflagration at the Charity Bazaar in the Rue Jean Goujon threw into mourning one hundred and forty families of the nobility or the aristocracy of Paris, and spread sorrow among the class always considerate in its benevolence. Then all minds were again troubled and disturbances occurred in the streets for more than two years over the Dreyfus case, dividing the French people into two camps.

President Faure died suddenly on the 18th of February 1899. The very day of his funeral, Paul Déroulède and Marcel Habert tried to make a *coup d'état* by urging General Roget to lead his troops, which had formed part of the guard of honour at the obsequies, against the Elysée. Immediately arrested and put on trial, Déroulède and Habert were acquitted by a timorous jury.

M. Émile Loubet, President of the Senate, was chosen successor to M. Félix Faure. Upon his return to Paris from the Versailles Congress, where he had been elected President of the French Republic, he was greeted by hisses and cries of "Panama!" cries in no wise justifiable. Some time afterwards, Jules Guérin, by a desperate resistance against a summons of the police to give himself up, made the public believe for two months in the existence of an impregnable fortress in the Rue Chabrol, in the very centre of Paris. On the 4th of June there was a great scandal at the Auteuil Races, which President Loubet had been, according to custom, invited to attend. He was insulted and struck by Baron de Christiani, who was encouraged by the young royalists of the "Œillets Blancs" Association. A week later, the extraordinary and excessive police measures taken to prevent a disturbance at the Grand Prix occasioned the downfall of the Dupuy ministry. M. Waldeck-Rousseau then formed a cabinet, himself becoming president of the council. The new premier immediately took energetic measures against the enemies of the Republic. Compromising documents found in various domiciliary searches made among the Monarchists and Nationalists formed the basis of prosecutions before the High Court of Justice. The trial resulted in the condemnation of Jules Guérin to a term of imprisonment, and the banishment of Paul Déroulède, Marcel Habert, André Buffet and the Marquis de Lur Saluces, thereby ridding France of all these promoters of disorder, and opening a new era of peace, which lasted throughout the Universal Exhibition of 1900.

This exhibition covered an enormous space, including the slope of the Trocadéro, the Champ de Mars, the Esplanade of the Invalides and both sides of the Seine bordered by the Rue de Paris and the Rue des Nations. Seen from the new Alexandre III. bridge, the spectacle was as fairy-like as a stage setting. Close beside, at the left, were the palaces of the different nations, each one showing its characteristic architecture, and all being of an astonishing diversity. To the right were the pavilion of the city of Paris and the enormous greenhouses, and in the distance Old Paris, so picturesquely constructed by Robida. In short, exotic edifices and scintillating cupolas arose with unparalleled profusion, creating in the heart of Paris a veritable city of dreams and illusion. The most distant countries sent their art treasures or the marvels of their industry. The number of visitors was 51,000,000, and the personages of mark included the Shah of Persia, the King of Sweden, the King of the Belgians and the King of Greece, all of whom were successively the guests of France. On the 22nd of September 22,000 mayors accepted the invitation to the banquet offered in their honour by President Loubet, and thus solemnly affirmed their Republican faith. This admirably organized banquet was spread in the Tuileries Gardens. The exhibition of 1900, a brilliant epilogue of the closing century, was a grand manifestation of universal concord, of the union of peoples by art, science, industry, all branches of human genius. (De B.)

The bibliography of the history of Paris is immense, and it must suffice here, so far as authorities on the medieval period are concerned, to refer to the long list of works, &c., given by Ulysse Chevalier in his *Répertoire des sources historiques du moyen âge, topo-bibliographi* (Montbéliard, 1903), pp. 2267–2290. See also Lacombe, *Bibliographie parisienne, tableaux de mœurs, 1600–1880* (Paris, 1886), and Pessard, *Nouveau dict. hist. de Paris* (1904). Of general works may be mentioned specially J. C. Dulaure, *Hist. physique, civile et morale de Paris* (1821; new ed. continued by Leynadier and Roquette, 1874; Paul Robiquet, *Hist. municipale de Paris*, up to Henry IV. (1880–1904); J. Lebeuf, *Hist. de la ville et de tout le diocèse de Paris* (Paris, 1754–1758; new ed. revised and enlarged, by H. Cocheris, 1863–1867); and the *Hist. générale de Paris*, published under the authority of the municipality, of which vol. xxxix. was issued in 1906. Important special works on later periods are W. A. Schmidt, *Pariser Zustände während der Revolutionszeit, 1789–1800* (Jena, 1874–1876; French trans., *Paris pendant la révolution*, by P. Viollet, 1880–1894), and *Tableaux de la révolution française* (Leipzig, 1867–1870); F. Aulard, *Collection de documents relatifs à l'hist. de Paris pendant la révolution* (1899–1903); Lanzac de Laborie, *Paris sous Napoléon* (1905); Simond, *Paris de 1800 à 1900* (1902); Cilleuls, *Hist. de l'administration parisienne au xix*^{me} *siècle* (1900).

PARIS, TREATIES OF (1814–1815). Among the very many treaties and conventions signed at Paris those which bear the title of "treaties of Paris" *par excellence* are the two sets of treaties, both of the highest importance in the history of the international politics of Europe and the formation of its public law, signed in Paris on the 30th of May 1814 and the 20th of November 1815. The first embodied the abortive attempt made by the Allies and Louis XVIII. of France to re-establish lasting peace in Europe after the first abdication of Napoleon at Fontainebleau on the 11th of April 1814. The second contained the penal and cautionary measures which the Allies found it necessary to impose when the practically unopposed return of Napoleon from Elba, and his resumption of power, had proved the weakness of the Bourbon monarchy. (See Europe: *History*.)

The treaty of the 30th of May 1814 and the secret treaty which accompanied it, were signed by Talleyrand for France; by Lords Castlereagh, Aberdeen and Cathcart for Great Britain; by Counts Rasumovski and Nesselrode for Russia; by Prince Metternich and Count Stadion for Austria; and by Baron Hardenberg and W. von Humboldt for Prussia. Sweden and Portugal adhered later, and Spain adhered on the 20th of July to the public treaty, to which there were in all eight signatories. It is this public treaty which is known as the first treaty of Paris.

It was signed in eight instruments identical in substance. The Allies, who appear as acting in the most friendly co-operation with Louis XVIII., declare that their aim is to establish a lasting peace based on a just distribution of forces among the powers, and that as France has returned to "the paternal government of her kings" they no longer think it necessary to exact those guarantees which they had been regretfully compelled to insist on from her late government. The preamble is more than a flourish of diplomatic humanity; for the treaty is extraordinarily favourable to France. Putting aside as much of the treaty as is common form, and minute details for which the text must be consulted, it secured her in the possession of all the territory she held in Europe on the 1st of January 1792 (Art. II.); it restored her colonies, except Tobago, Santa Lucia, Île de France (Mauritius), Rodriguez, and the Seychelles, surrendered to England and the part of San Domingo formerly Spanish, which was to return to Spain (Art. VIII.). Sweden resigned her claim on Guadaloupe (Art. IX.); Portugal resigned French Guiana (Art. X.). The rectifications of the European frontier of France are detailed in the eight subsections of Art. III. They were valuable. France obtained (1) a piece of territory south of Mons; (2 and 3) a larger piece around Philippeville, on the Sambre and Meuse; (4) a rectification including Sarrelouis; (5) a piece of land to connect the formerly isolated fortress of Landau with her own dominions; (6) a better frontier on the east at Doubes; (7) a better frontier as against Geneva; (8) the subprefectures of Annecy and Chambéry (Savoy). By the same article she secured all the German *enclaves* in Alsace, Avignon, the Venaissin and Montbéliard. Art. VI. secured Holland to the house of Nassau, with an addition of territory, not defined in this instrument; asserted the independence, and right to federate of the German states, and the full sovereignty of all the states of Italy outside of the Italian dominions of Austria. Art. VII. gave Malta to Great Britain. By Art. XV. France was to retain two-thirds of all warships and naval stores existing in ports which had belonged to the empire of Napoleon, but were outside the borders of France, with exception of the Dutch ships. Arts. XVIII. to XXXI. dealt with pecuniary claims, return of documents, renunciation of all claims for compensation, &c. By Art. XXXII. the powers bind themselves to meet at Vienna within two months to arrange a final settlement of Europe. Additional articles provided for the settlement of pecuniary claims in the late grand-duchy of Warsaw, for the abrogation of treaties signed with Prussia since the Peace of Basel. By her additional article with Great Britain, France undertook to suppress the slave trade within five years, and to help to bring about its general suppression.

The separate and secret articles of the treaty (or "Secret Treaty" as they are commonly called), were meant to bind France to agree in principle to the readjustments and allotments of territory and population to be made at the approaching Congress of Vienna (*q.v.*).

The treaties of the 20th of November 1815 and their dependent instruments, were signed in very different circumstances. The representative of France was the duc de Richelieu; Great Britain was represented by Castlereagh and Wellington; Austria by Metternich and Count Wessenberg; Prussia by Hardenberg and W. von Humboldt; Russia by Rasumovski and Capo d'Istria. The preamble stated the altered spirit and purpose of the Allies. It insisted that, as the powers had saved France and Europe from Napoleon's last adventure, they were entitled to compensation and security for the future. They had decided to exact indemnities, partly pecuniary and partly territorial, such as could be exacted without injuring the essential interest of France. The territorial penalty imposed was moderate. France retained the *enclaves* she had secured by the previous treaty. She had to resign her gains on the north and eastern frontier, to surrender Philippeville, Marienbourg, Bouillon, Sarrelouis and Landau, to cede certain territories to Geneva, and she lost Annecy and Chambéry. The standard taken was the frontier of 1790 (Art. I.). By Art. III. she agreed to dismantle the fortress of Huningen near Basel. The most grievous articles of the treaty are those which imposed the payment of an indemnity, and the occupation of a part of French territory as security for payment. Art. IV. fixed the indemnity at 700,000,000 frs. Art. V. fixed the strength of the army of occupation at 150,000 under a commander-in-chief to be named by the powers, and specified the fortresses it was to hold in the north and north-east of France. The period of occupation was limited to five years, but might be reduced to three. All provisions of the treaty of the 30th of May 1814, and of the Final Act of the Congress of Vienna not expressly revoked were to remain in force. By an additional article the powers agreed to join Great Britain in suppressing the slave trade. Certain complimentary instruments were attached to the treaty. (1) A separate article with Russia in regard to pecuniary claims in Poland. (2) A convention as to payment of indemnity under Art. IV. (3) Convention as to the occupation and the rationing of the foreign troops. (4) A convention as to settlement of claims of British bondholders. The retrocession of the colonies was made dependent on the partial settlement of these claims. (5) A convention to arrange for settlement of claims under Art. XIX., &c., of the treaty of the 30th of May 1814.

On the day of the signing of the second treaty of Paris, a treaty of alliance, commonly spoken of as the treaty of the 20th of November 1815, was signed in Paris by Great Britain, Austria, Russia and Prussia. It contained six articles. The first declared the determination of the Allies to enforce the treaty signed with France; the second, third and fourth reaffirmed their determination to exclude the Bonaparte family from the throne, and specified the measures they were prepared to take to support one another. The fifth declared that the alliance for the purposes stated would continue when the five years' occupation of France was ended. The sixth article stated that in order to facilitate and assure the execution of the present treaty, the High Contracting Parties had decided to hold periodical meetings of the sovereigns or their ministers, for the examination of such measures as appeared to be salutary for the repose and prosperity of their peoples and the maintenance of the peace of Europe. It was in accordance with this last article that the congresses of Aix-la-Chapelle (1818), Troppau (1820), Laibach (1821), and Verona (1822) were held (see EUROPE: *History*).

BIBLIOGRAPHY.—See Sir E. Hertslet, *The Map of Europe by Treaty*, i. (London, 1875), and Martens, *Nouveau recueil de traités, &c.*, ii. (Göttingen, 1818).

PARIS, a city and the county seat of Edgar county, Illinois, U.S.A., in the E. part of the state, about 19 m. N.W. of Terre Haute, Ind. Pop. (1890), 4996; (1900), 6105, of whom 179 were foreign-born and 277 negroes; (1910) 7664. Paris is served by the Vandalia, and the Cleveland, Cincinnati, Chicago & St Louis (New York Central system) railways; the main line and the Cairo division of the latter intersect here, and the city is the transfer point for traffic from the E. and W. to the N. and S., and vice versa. It is in a rich farming region, of which Indian corn and oats are important products, and has a large trade. Paris was founded about 1825, was incorporated in 1853, and was re-incorporated in 1873.

PARIS, a city and the county-seat of Lamar county, Texas, U.S.A., about 93 m. N.E. of Dallas. Pop. (1890), 8254; (1900), 9358, of whom 3061 were negroes; (1910 census), 11,269. It is served by the St Louis & San Francisco (of which it is a terminus), the Gulf, Colorado & Santa Fé, the Texas & Pacific, and the Texas Midland railways. The city has cotton gins and a cotton compress, and various manufactures. In 1905 its factory products were valued at $854,930. Paris was settled in 1841, incorporated as a town in 1874, and chartered as a city in 1905.

PARISH (Gr. *παροικία*, district, neighbourhood; *πάροικος*, one dwelling near or beside, from *παρά*, *οἶκος*, house; Lat. *paroecia*, Late Lat. *parochia*; cf. Fr. *paroisse*), originally an episcopal district or diocese. In the early Christian Church each district was administered by a bishop and his attendant presbyters and deacons, and the word *parochia* was frequently applied to such a district (Du Cange, *sub. tit.*). Scattered congregations or churches within the *parochia* were served by itinerant presbyters. Towards the close of the 4th century it had become usual for the bishop to appoint resident presbyters to defined districts or territories, to which the term "parish" came gradually to be applied (see also Diocese). Parish, in English ecclesiastical law, may be defined as the township or cluster of townships which was assigned to the ministration of a single priest, to whom its tithes and other ecclesiastical dues were paid; but the word has now acquired several distinct meanings.

The Old Ecclesiastical Parish.—In the absence of evidence to the contrary, the ecclesiastical parish is presumed to be composed of a single township or vill, and to be conterminous with the manor within the ambit of which it is comprised. Before the process of subinfeudation became prevalent, the most ancient manors were the districts which we call by that name when speaking of the tenants, or "townships" when we regard the inhabitants, or "parishes" as to matters ecclesiastical. The parish as an institution is in reality later in date than the township. The latter has been in fact the unit of local administration ever since England was settled in its several states and kingdoms; the beginnings of the parochial system in England are attributed to Theodore of Tarsus, who was archbishop of Canterbury towards the close of the 7th century. The system was extended in the reign of Edgar, and it appears not to have been complete until the reign of Edward III. It has been considered that the intimate connexion of church and state militates against the view that the parochial system was founded as a national institution, since any legislation on the subject of the township and parochial systems would probably have resulted in the merging of the one into the other. "The fact that the two systems, the parish and the township, have existed for more than a thousand years side by side, identical in area and administered by the same persons, and yet separate in character and machinery, is a sufficient proof that no legislative act could have been needed in the first place; nor was there any lay council of the whole nation which could have sanctioned such a measure" (Stubbs, *Const. Hist.* i. 227). The boundaries of the old ecclesiastical parishes are usually identical with those of the township or townships comprised within its precinct; they are determined by usage, in the absence of charters or records, and are evidenced by perambulations, which formerly took place on the "gang-days" in Rogation week, but are now, where they still survive, for the most part held triennially, the Poor-Law Act of 1844 permitting the parish officers to charge the expense on the poor-rate, "provided the perambulations do not occur more than once in three years." The expense of preserving the boundary by land-marks or bound-stones is chargeable to the same rate. Many parishes contain more than one township, and this is especially the case in the northern counties, where the separate townships are organized for administrative purposes under an act passed in 1662. In the southern and midland districts the parishes are for the most part subdivided into hamlets or other local divisions known as "tythings," "boroughs," and the like; the distinction between a parish and a subordinate district lies chiefly in the fact that the latter will be found to have never had a church or a constable to itself. The select committee of 1873, appointed to inquire into parochial boundaries, reported to the effect that the parish bears no definite relation to any other administrative area, except indeed to the poor-law union. It may be situated in different counties or hundreds, and in many instances it contains, in addition to its principal district, several outlying portions intermixed with the lands in other parishes.

After the abolition of compulsory church rates in 1868 the old ecclesiastical parish ceased to be of importance as an instrument of local government. Its officers, however, have still important duties to perform. The rector, vicar or incumbent is a corporation-sole, in whom is vested the freehold of the church and churchyard, subject to the parishioners' rights of user; their rights of burial have been enlarged by various acts. The churchwardens are the principal lay officers. Their duties consist in keeping the church and churchyard in repair and in raising a voluntary rate for the purpose to the best of their power; they have also the duty of keeping order in church during divine service. The other officials are the parish clerk and sexton. They have freeholds in their offices and are paid by customary fees. The office of the clerk is regulated by an act of 1844, enabling a curate to undertake its duties, and providing facilities for vacating the office in case of misconduct. The only civil function of the parish clerk remaining in 1894 was the custody of maps and documents, required to be deposited with him under standing orders of parliament before certain public works were begun. By the Local Government Act 1894 they are now deposited with the chairman or clerk of a parish council.

The New Ecclesiastical Parish.—Under the powers given by the Church Building Acts, and acts for making new parishes, many populous parishes have been subdivided into smaller ecclesiastical parishes. This division has not affected the parish in its civil aspect.

The Civil Parish.—For purposes of civil government the term "parish" means a district for which a separate poor-rate is or can be made, or for which a separate overseer is or can be appointed; and by the Interpretation Act 1889 this definition is to be used in interpreting all statues subsequent to 1866, except where the context is inconsistent therewith. This district may of itself constitute a poor law union; but in the great majority of cases the unions, or areas under the jurisdiction of boards of guardians according to the Poor-Law Amendment Act of 1834, are made up of aggregated poor-law parishes. Each of these poor-law parishes may represent the extent of an old ecclesiastical parish, or a township separately rated by custom before the practice was stayed in 1819 or separated from a large parish under the act of 1662, or it may represent a chapelry, tything, borough, ward, quarter or hamlet, or other subdivision of the ancient parish, or, under various acts, an area formed by the merger of an extra-parochial place with an adjoining district by the union of detached portions with adjoining parishes, or by the subdivision of a large parish for the better administration of the relief of the poor. The civil importance of the poor-law parishes may be dated from the introduction of the poor law by the statute of 43 Elizabeth, which directed overseers of the poor to be appointed in every parish, and made the churchwardens into *ex-officio* overseers. The statute was preceded by tentative provisions of the same kind enacted in the reigns of Edward VI. and Mary and in the fifth year of Elizabeth, and after several renewals was made perpetual in the reign of Charles I. The chief part of the parochial organization was the vestry-meeting. It derived its name from the old place of assembly, the vestry room attached to the church or chapel. The vestry represented the old assembly of the township, and retained so much of its business as had not been insensibly transferred to the court-baron and court-leet. The freemen, now appearing as the ratepayers, elected the "parish officers," as the churchwardens and way-wardens, the assessors, the overseers, and (if required) paid assistant-overseers, a secretary or vestry-clerk, and a collector of rates if the guardians applied for his appointment. Common vestries were meetings of all the ratepayers assembled on a three days' notice; select vestries were regulated by local custom, or derived their power from the Vestries Act 1831 (Hobhouse's Act). The vestries could adopt various acts, and appoint persons to carry those acts into execution. The Local Government Act 1894 restored the parish to its position as the unit of local government by establishing parish councils. (See England: *Local Government.*)

The Parish in Scotland.—There can be little doubt that about the beginning of the 13th century the whole, or almost the whole, of the kingdom of Scotland was parochially divided. It seems probable (though the point is obscure) that the bishops presided at the first formation of the parishes—the parish being a subdivision of the diocese—and at any rate down to the date of the Reformation they exercised the power of creating new parishes within their respective dioceses (Duncan, *Parochial Law*, p. 4). After the Reformation the power of altering parishes was assumed by the legislature. The existing parochial districts being found unsuited to the ecclesiastical requirements of the time, a general act was passed in 1581, which made provision for the parochial clergy, and, *inter alia*, directed that "a sufficient and competent" district should be appropriated to each church as a parish (1581, cap. 100). Thereafter, by a series of special acts in the first place, and, subsequent to the year 1617, by the decrees of parliamentary commissions, the creation of suitable parochial districts was proceeded with. In the year 1707 the powers exercised by the commissioners were permanently transferred to the court of session, whose judges were appointed to act in future as "commissioners for the Plantation of Kirks and Valuation of Teinds" (Act, 1707, cap. 9). Under this statute the areas of parishes continued to be altered and defined down to 1844, when the act commonly known as Graham's Act was passed (7 & 8 Vict. c. 44). This act, which applied to the disjunction and erection of parishes, introduced a simpler form of procedure, and to some extent dispensed with the consent of the heritors, which had been required under the earlier statute.

The main division of parishes in Scotland was into civil and ecclesiastical, or, to speak more accurately, into parishes proper (*i.e.* for all purposes, civil and ecclesiastical) and ecclesiastical parishes. This division is expressed in legal language by the terms, parishes *quoad omnia* (*i.e. quoad civilia et sacra*) and parishes *quoad sacra*—*civilia* being such matters as church rates, education, poor law and sanitary purposes, and *sacra* being such as concern the administration of church ordinances, and fall under the cognizance of the church courts. There are other minor divisions which will be noticed below. (1) *The Parish Proper.*—In a number of instances it is difficult to determine the exact areas of such parishes at the present day. The boundaries of the old ecclesiastical parish were nowhere recorded, and the descriptions in the titles of private properties which appear to lie in the parish have sometimes to be taken as evidence, and sometimes the fact that the inhabitants attended a particular church or made payments in favour of a particular minister. Where there has been a union or disjunction and erection of parishes the evidence of the boundaries is the relative statute, order in council, or decree of commission or of court of teinds. The parishes proper vary to a great degree both in size and population. For ecclesiastical purposes, the minister and kirk-session constitute the parochial authority. The minister is vested with the manse and glebe, to be held by him for himself and his successors in office, and along with the kirk-session he administers church ordinances and exercises church discipline. The oldest governing authority was the meeting of the heritors or landowners of the parish. Though gradually shorn of much of its old importance, the heritors' meeting retained the power of imposing an assessment for the purpose of providing and maintaining a church and churchyard and a manse and glebe for the minister. It also possessed power to assess under the Parochial Buildings Acts of 1862 and 1866. Kirk-session and heritors were the educational authority until the establishment of school boards in 1872. (2) *Quoad Sacra Parishes.*—The ecclesiastical or *quoad sacra* parish is a modern creation. Under Graham's Act, above mentioned, a parish may be disjoined and erected *quoad sacra tantum* on the application of persons who have built and endowed a church, and who offer securities for its proper maintenance. By the Education Act of 1872 the *quoad sacra* parish was adopted as a separate school district. (3) *Extra-Burghal Parishes.*—For sanitary purposes, highways and some others, certain classes of burghs were made separate areas from the parishes in which they lay. This fact created a set of incomplete parishes, called extra-burghal. (4) *Burghal, Landward and Burghal-Landward* (*or Mixed*) *Parishes.*—This division of parishes depends, as the names imply, upon local character and situation of the parochial districts. The importance of the distinction arose in connexion with the rule of assessment adopted for various parochial burdens, and the nature of the rights of the minister and corresponding obligations of the parishioners. (5) *Combined Parishes.*—Under the Poor-Law, Education and Registration Acts power was given to the central authority to combine parishes for purposes of local administration. The Local Government (Scotland) Act 1894 reformed parish government, although not to the same extent as the corresponding English act. It established a local government board for Scotland, with a parish council in every parish, and abolished all parochial boards. The number of councillors for a parish council was fixed at not less than five nor more than thirty-one, the number being determined, in the case of landward parishes, by the county council; in the case of burghal parishes by the town council and, in the case of mixed parishes, by county and town councils jointly.

The Parish in the United States.—The term "parish" is not in use as a territorial designation except in Louisiana, the sixty parishes of which correspond to the counties of the other states of the Union. In the American Episcopal Church the word is frequently used to denote an ecclesiastical district.

Authorities.—The principal records from which information may be gained as to the oldest parochial system in England are the records called *Nomina villarum*, the *Taxatio papae Nicholai* made in 1291, the *Nonarum inquisitiones* relating to assessments made upon the clergy, the *Valor ecclesiasticus* of Henry VIII., the lay subsidies from the reign of Edward III. to that of Charles II., the hearth-tax assessments and the land-tax accounts. On the subject of the parish generally see Stubbs's *Constitutional History*; Glen's *Parish Law*; Steer's *Parish Law*; Toulmin Smith's work on the *Parish*; S. and B. Webb, *English Local Government*, vol. i.; Redlich and Hirst, *Local Government in England*; O. J. Reichel, *Rise of the Parochial System in England* (1905). For fuller information regarding the Scottish parish see Connell on *Teinds*; Duncan's *Parochial Ecclesiastical Law*; the Cobden Club essays on *Local Government and Taxation in the United Kingdom* (1882); Goudy and Smith's *Local Government in Scotland*; Atkinson, *Local Government in Scotland*.

PARISITE, a rare mineral, consisting of cerium, lanthanum, didymium and calcium fluo-carbonate, $(CeF)_2Ca(CO_3)_3$. It is found only as crystals, which belong to the hexagonal system and usually have the form of acute double pyramids terminated by the basal planes; the faces of the hexagonal pyramids are striated horizontally, and parallel to the basal plane there is a perfect cleavage. The crystals are hair-brown in colour and are translucent. The hardness is 4½ and the specific gravity 4·36. Light which has traversed a crystal of parisite exhibits a characteristic absorption spectrum. Until recently the only known occurrence of this mineral was in the famous emerald mine at Muzo in Colombia, South America, where it was found by J. J. Paris, who re-discovered and worked the mine in the early part of the 19th century; here it is associated with emerald in a bituminous limestone of Cretaceous age (see Emerald).

Closely allied to parisite, and indeed first described as such, is a mineral from the nepheline-syenite district of Julianehaab in south Greenland. To this the name synchysite (from Gr. συγχῦσις, confounding) has been given. The crystals are rhombohedral (as distinct from hexagonal; they have the composition $CeFCa(CO_3)_2$, and specific gravity 2·90. At the same locality there is also found a barium-parisite, which differs from the Colombian parisite in containing barium in place of calcium, the formula being $(CeF)_2Ba(CO_3)_3$: this is named cordylite on account of the club-shaped form (κορδύλη, a club) of its hexagonal crystals. Bastnäsite is a cerium lanthanum and didymium fluo-carbonate $(CeF)CO_3$, from Bastnäs, near Riddarhyttan, in Vestmanland, Sweden, and the Pike's Peak region in Colorado, U.S.A. (L. J. S.)

PARK, EDWARDS AMASA (1808–1900), American Congregational theologian, was born in Providence, Rhode Island, on the 29th of December 1808, the son of Calvin Park (1774–1847), a Congregational minister, professor from 1804 to 1825 at Brown University, and pastor at Stoughton, Massachusetts, in 1826–1840. The son graduated at Brown University in 1826, was a teacher at Braintree for two years, and in 1831 graduated from Andover theological seminary. He was co-pastor (with R. S. Storrs) of the orthodox Congregational church of Braintree in 1831–1833; professor of mental and moral philosophy at Amherst in 1835; and Bartlett professor of sacred rhetoric (1836–1847), and Abbot professor of Christian theology (1847–1881) at Andover. He died at Andover on the 4th of June 1900. An ardent admirer of Jonathan Edwards, whose great-grand-daughter he married, Park was one of the most notable American theologians and orators. He was the most prominent leader of the "new school" of "New England Theology." He left his theological impress on the *Bibliotheca sacra*, which he and Bela B. Edwards took over in 1844 from Edward Robinson, who had founded it in 1843, and of which Park was assistant editor until 1851 and editor-in-chief from 1851 to 1884. As a general statement of the position of orthodox Congregationalism he drew up and annotated the "Associate Creed of Andover Theological Seminary" (1883), and the anonymously published "Worcester Creed" of 1884 was his popularized and simplified statement. He edited in 1860 *The Atonement*, a collection of essays by various hands, prefaced by his study of the "Rise of the Edwardean Theory of the Atonement." Dr Park's sermon, "The Theology of the Intellect and that of the Feelings," delivered in 1850 before the convention of the Congregational ministers of Massachusetts, and published in the *Bibliotheca sacra* of July 1850, was the cause of a long and bitter controversy, metaphysical rather than doctrinal, with Charles Hodge. Some of Park's sermons were published in 1885, under the title *Discourses on Some Theological Doctrines as Related to the Religious Character*. With Austin Phelps and Lowell Mason he prepared *The Sabbath Hymn Book* (1858).

See *Professor Park and His Pupils* (Boston, 1899), a memorial of his 90th birthday, with articles by R. S. Storrs, G. R. W. Scott, Joseph Cook, G. Frederick Wright and others.

PARK, MUNGO (1771–1806?), Scottish explorer of the Niger, was born in Selkirkshire, Scotland, on the 20th of September 1771, at Foulshiels on the Yarrow—the farm which his father rented from the duke of Buccleuch. He was the seventh in a family of thirteen. Having received a good education, he was apprenticed to a surgeon named Thomas Anderson in Selkirk, and then attended the university of Edinburgh for three sessions (1789–1791), obtaining the surgical diploma. By his brother-in-law, James Dickson, a botanist of repute, he was introduced to Sir Joseph Banks, then president of the Royal Society, and through his good offices obtained the post of assistant-surgeon on board the "Worcester" East Indiaman. In this capacity he made the voyage in 1792 to Benkulen, in Sumatra, and on his return in 1793 he contributed a description of eight new Sumatran fishes to the *Transactions* of the Linnean Society.

Park in 1794 offered his services to the African Association, then looking out for a successor to Major Daniel Houghton, who had been sent out in 1790 to discover the course of the Niger and had perished in the Sahara. Supported by the influence of Sir Joseph Banks, Park was successful in his application. On the 21st of June 1795 he reached the Gambia and ascended that river 200 miles to a British trading station named Pisania. On the 2nd of December, accompanied by two negro servants, he started for the unknown interior. He chose the route crossing the upper Senegal basin and through the semi-desert region of Kaarta. The journey was full of difficulties, and at Ludamar he was imprisoned by a Moorish chief for four months. He escaped, alone and with nothing save his horse and a pocket compass, on the 1st of July 1796, and on the 21st of the same month reached the long-sought Niger at Segu, being the first European to gaze on its waters. He followed the river down stream 80 m. to Silla, where he was obliged to turn back, being without means and utterly exhausted. On his return journey, begun on the 30th of July, he took a route more to the south than that originally followed, keeping close to the Niger as far as Bamako, thus tracing the course of that stream in all for some 300 miles. At Kamalia he fell ill, and owed his life to the kindness of a negro in whose house he lived for seven months. Eventually he reached Pisania again on the 10th of June 1797, returning to England by way of America on the 22nd of December. He had been thought to be dead, and his return home with the news of the discovery of the Niger evoked great public enthusiasm. An account of his journey was at once drawn up for the African Association by Bryan Edwards, and a detailed narrative from his own pen appeared in 1799 (*Travels in the Interior of Africa*). Abundance of incident and an unaffected style rendered the work extremely popular, and it still holds its place as an acknowledged classic in this department of literature.

Settling at Foulshiels, Park in August 1799 married a daughter of his old master, Thomas Anderson. Two offers made to him to go to New South Wales in some official capacity came to nothing, and in October 1801 Park removed to Peebles, where he practised as a doctor. In the autumn of 1803 he was invited by the government to lead another expedition to the Niger. Park, who chafed at the hardness and monotony of life at Peebles, accepted the offer, but the starting of the expedition was delayed. Part of the waiting time was occupied in the perfecting of his Arabic—his teacher being Sidi Ambak Bubi, a native of Mogador; whose vagaries both amused and alarmed the people of Peebles. In May 1804 Park went back to Foulshiels, where he made the acquaintance of Sir Walter Scott, then living near by at Ashesteil, with whom he soon became on terms of warm friendship. In September he was summoned to London to leave on the new expedition; he parted from Sir Walter with the hopeful proverb on his lips, "Freits (omens) follow those that look to them." Park had at that time adopted the theory that the Niger and the Congo were one, and in a memorandum drawn up before he left England he wrote: "My hopes of returning by the Congo are not altogether fanciful." He sailed from Portsmouth for the Gambia on the 31st of January 1805, having been given a captain's commission as head of the government expedition. Alexander Anderson, his brother-in-law, was second in command, and on him was bestowed a lieutenancy. George Scott, a fellow Borderer, was draughtsman, and the party included four or five artificers. At Goree (then in British occupation) Park was joined by Lieutenant Martyn, R.A., thirty-five privates and two seamen. The expedition did not reach the Niger until the middle of August, when only eleven Europeans were left alive; the rest had succumbed to fever or dysentery. From Bamako the journey to Segu was made by canoe. Having received permission from the ruler of that town to proceed, at Sansandig, a little below Segu, Park made ready for his journey down the still unknown part of the river. Park, helped by one soldier, the only one left capable of work, converted two canoes into one tolerably good boat, 40 ft. long and 6 ft. broad. This he christened H.M. schooner "Joliba" (the native name for the Niger), and in it, with the surviving members of his party, he set sail down stream on the 19th of November. At Sansandig on the 28th of October, Anderson had died, and in him Park lost the only member of the party—except Scott, already dead—who had been of real use. Those who embarked in the "Joliba" were Park, Martyn, three European soldiers (one mad), a guide and three slaves. Before his departure Park gave to Isaaco, a Mandingo guide who had been with him thus far, letters to take back to the Gambia for transmission to England. The spirit with which Park began the final stage of his enterprise is well illustrated by his letter to the head of the Colonial Office:—

> "I shall," he wrote, "set sail for the east with the fixed resolution to discover the termination of the Niger or perish in the attempt . . . though all the Europeans who are with me should die, and though I were myself half dead, I would still persevere, and if I could not succeed in the object of my journey, I would at least die on the Niger."

To his wife he wrote stating his intention not to stop nor land anywhere till he reached the coast, where he expected to arrive about the end of January 1806. These were the last communications received from Park, and nothing more was heard of the party until reports of disaster reached the settlements on the Gambia. At length the British government engaged Isaaco to go to the Niger to ascertain the fate of the explorer. At Sansandig Isaaco found the guide who had gone down stream with Park, and the substantial accuracy of the story he told was later confirmed by the investigations of Hugh Clapperton and Richard Lander. This guide (Amadi) stated that Park's canoe descended the river to Yauri, where he (the guide) landed. In this long journey of about 1000 miles Park, who had plenty of provisions, stuck to his resolution of keeping aloof from the natives. Below Jenné, came Timbuktu, and at various other places the natives came out in canoes and attacked his boat. These attacks were all repulsed, Park and his party having plenty of firearms and ammunition and the natives having none. The boat also escaped the many perils attendant on the navigation of an unknown stream strewn with many rapids—Park had built the "Joliba" so that it drew only a foot of water. But at the Bussa rapids, not far below Yauri, the boat struck on a rock and remained fast. On the bank were gathered hostile natives, who attacked the party with bow and arrow and throwing spears. Their position being untenable, Park, Martyn, and the two soldiers who still survived, sprang into the river and were drowned. The sole survivor was one of the slaves, from whom was obtained the story of the final scene. Isaaco, and later Lander, obtained some of Park's effects, but his journal was never recovered. In 1827 his second son, Thomas, landed on the Guinea coast, intending to make his way to Bussa, where he thought his father might be detained a prisoner, but after penetrating some little distance inland he died of fever. Park's widow died in 1840.

J. Thomson's *Mungo Park and the Niger* (London, 1890) contains the best critical estimate of the explorer and his work. See also the Life (by Wishaw) prefixed to *Journal of a Mission into the Interior of Africa in 1805* (London, 1815); H. B., *Life of Mungo Park* (Edinburgh, 1835); and an interesting passage in Lockhart's *Life of Sir Walter Scott*, vol. ii.

PARK (Fr. *parc*; Ital. *parco*; Sp. *parque*; O.Eng. *pearroc*; connected with Ger. *pferch*, fold, and *pfarrei*, district, translating med. Lat. *parochia*, parish), a word ordinarily used in two senses: (*a*) an enclosed tract of ground, consisting of grass-land, planted with trees and shrubs, and surrounding a large country house; (*b*) a similar space in or near a town, laid out ornamentally, and used by the public as an "open space" for health or recreation.

The term "park" first occurs in English as a term of the forest law of England for a tract of ground enclosed and privileged for beasts of the chase, the distinguishing characteristics of which were "vert," *i.e.* the green leaves of trees, "venison," *i.e.* deer, and "enclosure." A "park" was a franchise obtained by prescription or by grant from the crown (see FOREST LAW; also DEER PARK).

The word has had a technical military significance since the early part of the 17th century. Originally meaning the space occupied by the artillery, baggage and supply vehicles of an army when at rest, it came to be used of the mass of vehicles itself. From this mass first of all the artillery, becoming more mobile, separated itself; then as the mobility of armies in general became greater they outpaced their heavy vehicles, with the result that faster moving transport units had to be created to keep up communication. A "park" is thus at the present day a large unit consisting of several hundred vehicles carrying stores; it moves several days' marches in rear of the army, and forms a reservoir from "whence the mobile ammunition and supply columns" draw the supplies and stores required for the army's needs. "Parking" vehicles is massing them for a halt. The word "park" is still used to mean that portion of an artillery or adminstrative troops' camp or bivouac in which the vehicles are placed.

PARKER, SIR GILBERT (1862–), British novelist and politician, was born at Camden East, Addington, Ontario, on the 23rd of November 1862, the son of Captain J. Parker, R.A. He was educated at Ottawa and at Trinity University, Toronto. In 1886 he went to Australia, and became for a while associate-editor of the *Sydney Morning Herald*. He also travelled extensively in the Pacific, and subsequently in northern Canada; and in the early 'nineties he began to make a growing reputation in London as a writer of romantic fiction. The best of his novels are those in which he first took for his subject the history and life of the French Canadians; and his permanent literary reputation rests on the fine quality, descriptive and dramatic, of his Canadian stories. *Pierre and his People* (1892) was followed by *Mrs Falchion* (1893), *The Trail of the Sword* (1894), *When Valmond came to Pontiac* (1895), *An Adventurer of the North* (1895), and *The Seats of the Mighty* (1896, dramatized in 1897). *The Lane that had no Turning* (1900) contains some of his best work. In *The Battle of the Strong* (1898) he broke new ground, laying his scene in the Channel Islands. His chief later books were *The Right of Way* (1901), *Donovan Pasha* (1902), *The Ladder of Swords* (1904), *The Weavers* (1907) and *Northern Lights* (1909). In 1895 he married Miss Van Tine of New York, a wealthy heiress. His Canadian connexion and his experience in Australia and elsewhere had made him a strong Imperialist in politics, and from that time he began to devote himself in large measure to a political career. He still kept up his literary work, but some of the books last mentioned cannot compare with those by which he made his name. He was elected to parliament in 1900 (re-elected 1906 and 1910) as Conservative member for Gravesend and soon made his mark in the House of Commons. He was knighted in 1902, and in succeeding years continually strengthened his position in the party, particularly by his energetic work on behalf of Tariff Reform and Imperial Preference. If he had given up to public life what at one time seemed to be due to literature, he gave it for enthusiasm in the Imperialist movement; and with the progress of that cause he came to rank by 1910 as one of the foremost men in the Unionist party outside those who had held office.

PARKER, SIR HYDE, BART. (1714–1782), British vice-admiral, was born at Tredington, Worcestershire, on the 25th of February, 1714, his father, a clergyman, being a son of Sir Henry Parker, Bart. His paternal grandfather had married a daughter of Bishop Alexander Hyde, of Salisbury. He began his career at sea in the merchant service. Entering the royal navy at the age of twenty-four, he was made lieutenant in 1744, and in 1748 he was made post-captain. During the latter part of the Seven Years' War he served in the East Indies, taking part in the capture of Pondicherry (1761) and of Manila (1762). In the latter year Parker with two ships captured one of the valuable Spanish plate ships in her voyage between Acapulco and Manila. In 1778 he became rear-admiral, and went to North American waters as second-in-command. For some time before Rodney's arrival he was in command on the Leeward Islands station, and conducted a skilful campaign against the French at Martinique. In 1781, having returned home and become vice-admiral, he fell in with a Dutch fleet of about his own force, though far better equipped, near the Dogger Bank (Aug. 5). After a fiercely contested battle, in which neither combatant gained any advantage, both sides drew off. Parker considered that he had not been properly equipped for his task, and insisted on resigning his command. In 1782 he accepted the East Indies command, though he had just succeeded to the family baronetcy. On the outward voyage his flagship, the "Cato" (60), was lost with all on board.

His second son, Admiral SIR HYDE PARKER (1739–1807), entered the navy at an early age, and became lieutenant in 1758, having passed most of his early service in his father's ships. Five years later he became a post-captain, and from 1766 onwards for many years he served in the West Indies and in North American waters, particularly distinguishing himself in breaking the defences of the North river (New York) in 1776. His services on this occasion earned him a knighthood in 1779. In 1778 he was engaged in the Savannah expedition, and in the following year his ship was wrecked on the hostile Cuban coast. His men, however, entrenched themselves, and were in the end brought off safely. Parker was with his father at the Dogger Bank, and with Howe in the two actions in the Straits of Gibraltar. In 1793, having just become rear-admiral, he served under Lord Hood at Toulon and in Corsica, and two years later, now a vice-admiral, he took part, under Hotham, in the indecisive fleet actions of the 13th of March and the 13th of July 1795. From 1796 to 1800 he was in command at Jamaica and ably conducted the operations in the West Indies. In 1801 he was appointed to command the fleet destined to break up the northern armed neutrality, with Nelson as his second-in-command. Copenhagen, the first objective of the expedition, fell on the 2nd of April to the fierce attack of Nelson's squadron, Parker with the heavier ships taking little part. Subsequently Parker hesitated to advance up the Baltic after his victory, a decision which was severely criticised. Soon afterwards he was recalled and Nelson succeeded him. He died in 1807.

The family name was continued in the navy in his eldest son, who became vice-admiral and was First Sea Lord of the Admiralty in 1853 (dying in 1854); and also in that son's son, who as a captain in the Black Sea was killed in 1854 when storming a Russian fort.

PARKER, JOHN HENRY (1806–1884), English writer on architecture, the son of a London merchant, was born on the 1st of March 1806. He was educated at Manor House School, Chiswick, and in 1821 entered business as a bookseller. Succeeding his uncle, Joseph Parker, as a bookseller at Oxford in 1832, he conducted the business with great success, the most important of the firm's publications being perhaps the series of the "Oxford Pocket Classics." In 1836 he brought out his *Glossary of Architecture*, which, published in the earlier years of the Gothic revival in England, had considerable influence in extending the movement, and supplied a valuable help to young architects. In 1848 he edited the fifth edition of Rickman's *Gothic Architecture*, and in 1849 he published a handbook based on his earlier volume and entitled *Introduction to the Study of Gothic Architecture*. The completion of Hudson Turner's *Domestic Architecture of the Middle Ages* next engaged his attention, three volumes being published (1853–1860). In 1858 he published *Medieval Architecture of Chester*. Parker was one of the chief advocates of the "restoration" of ecclesiastical buildings, and published in 1866 *Architectural Antiquities of the City of Wells*. Latterly he devoted much attention to explorations of the history of Rome by means of excavations, and succeeded in satisfying himself of the historical truth of much usually regarded as legendary. Two volumes of his *Archaeology of Rome* were published at Oxford in 1874 and 1876. In recognition of his labours he was decorated by the king of Italy, and received a medal from Pope Pius IX. In 1869 he endowed the keepership of the Ashmolean Museum with a sum yielding £250 a year, and under the new arrangement he was appointed the first keeper. In 1871 he was nominated C.B. He died at Oxford on the 31st of January 1884.

PARKER, JOSEPH (1830–1902), English Nonconformist divine, was born at Hexham-on-Tyne on the 9th of April 1830, his father being a stonemason. He managed to pick up a fair education, which in after-life he constantly supplemented. In the revolutionary years from 1845 to 1850 young Parker as a local preacher and temperance orator gained a reputation for vigorous utterance. He was influenced by Thomas Cooper, the Chartist, and Edward Miall, the Liberationist, and was much associated with Joseph Cowen, afterwards M. P. for Newcastle. In the spring of 1852 he wrote to Dr John Campbell, minister of Whitefield Tabernacle, Moorfields, London, for advice as to entering the Congregational ministry, and after a short probation he became Campbell's assistant. He also attended lectures in logic and philosophy at University College, London. From 1853 to 1858 he was pastor at Banbury. His next charge was at Cavendish Street, Manchester, where he rapidly made himself felt as a power in English Nonconformity. While here he published a volume of lectures entitled *Church Questions*, and, anonymously, *Ecce Deus* (1868), a work provoked by Seeley's *Ecce Homo*. The university of Chicago conferred on him the degree of D.D. In 1869 he returned to London as minister of the Poultry church, founded by Thomas Goodwin. Almost at once he began the scheme which resulted in the erection of the great City Temple in Holborn Viaduct. It cost £70,000, and was opened on the 19th of May 1874. From this centre his influence spread far and wide. His stimulating and original sermons, with their notable leaning towards the use of a racy vernacular, made him one of the best known personalities of his time. Dr Parker was twice chairman of the London Congregational Board and twice of the Congregational Union of England and Wales. The death of his second wife in 1899 was a blow from which he never fully recovered, and he died on the 28th of November 1902.

Parker was pre-eminently a preacher, and his published works are chiefly sermons and expositions, chief among them being *City Temple Sermons* (1869–1870) and *The People's Bible*, in 25 vols. (1885–1895). Other volumes include the autobiographical *Springdale Abbey* (1869), *The Inner Life of Christ* (1881), *Apostolic Life* (1884), *Tyne Chylde: My Life and Teaching* (1883; new ed., 1889), *A Preacher's Life* (1899).

See E. C. Pike, *Dr Parker and his Friends* (1905); *Congregational Year-Book* (1904).

PARKER, MARTIN (*c.* 1600–*c.* 1656), English ballad writer, was probably a London tavern-keeper. About 1625 he seems to have begun publishing ballads, a large number of which bearing his signature or his initials, "M.P.," are preserved in the British Museum. Dryden considered him the best ballad writer of his time. His sympathies were with the Royalist cause during the Civil War, and it was in support of the declining fortunes of Charles I. that he wrote the best known of his ballads, "When the King enjoys his own again," which he first published in 1643, and which, after enjoying great popularity at the Restoration, became a favourite Jacobite song in the 18th century. Parker also wrote a nautical ballad, "Sailors for my Money," which in a revised version survives as "When the stormy winds do blow." It is not known when he died, but the appearance in 1656 of a "funeral elegy," in which the ballad writer was satirically celebrated is perhaps a correct indication of the date of his death.

See *The Roxburghe Ballads*, vol. iii. (Ballad Soc., 9 vols., 1871–1899); Joseph Ritson, *Bibliographia Poetica* (London, 1802); *Ancient Songs and Ballads from Henry II. to the Revolution*, ed. by W. C. Hazlitt (London, 1877); Sir S. E. Brydges and J. Haslewood, *The British Bibliographer*, vol. ii. (London, 1810); Thomas Corser, *Collectanea Anglo-poetica* (London, 1860–1883).

PARKER, MATTHEW (1504–1575), archbishop of Canterbury, was the eldest son of William Parker, a citizen of Norwich, where he was born, in St Saviour's parish, on the 6th of August 1504. His mother's maiden name was Alice Monins, and a John Monins married Cranmer's sister Jane, but no definite relationship between the two archbishops has been traced. William Parker died about 1516, and his widow married a certain John Baker. Matthew was sent in 1522 to Corpus Christi College, Cambridge, where he is said by most of his biographers, including the latest, to have been contemporary with Cecil; but Cecil was only two years old when Parker went to Cambridge. He graduated B.A. in 1525, was ordained deacon in April and priest in June 1527, and was elected fellow of Corpus in the following September. He commenced M.A. in 1528, and was one of the Cambridge scholars whom Wolsey wished to transplant to his newly founded Cardinal College at Oxford. Parker, like Cranmer, declined the invitation. He had come under the influence of the Cambridge reformers, and after Anne Boleyn's recognition as queen he was made her chaplain. Through her he was appointed dean of the college of secular canons at Stoke-by-Clare in 1535. Latimer wrote to him in that year urging him not to fall short of the expectations which had been formed of his ability. In 1537 he was appointed chaplain to Henry VIII., and in 1538 he was threatened with prosecution by the reactionary party. The bishop of Dover, however, reported to Cromwell that Parker "hath ever been of a good judgment and set forth the Word of God after a good manner. For this he suffers some grudge." He graduated D.D. in that year, and in 1541 he was appointed to the second prebend in the reconstituted cathedral church of Ely. In 1544 on Henry VIII.'s recommendation he was elected master of Corpus Christi College, and in 1545 vice-chancellor of the university. He got into some trouble with the chancellor, Gardiner, over a ribald play, "Pammachius," performed by the students, deriding the old ecclesiastical system, though Bonner wrote to Parker of the assured affection he bore him. On the passing of the act of parliament in 1545 enabling the king to dissolve chantries and colleges, Parker was appointed one of the commissioners for Cambridge, and their report saved its colleges if there had ever been any intention to destroy them. Stoke, however, was dissolved in the following reign, and Parker received a pension equivalent to £400 a year in modern currency. He took advantage of the new reign to marry in June, 1547, before clerical marriages had been legalized by parliament and convocation, Margaret, daughter of Robert Harlestone, a Norfolk squire. During Kett's rebellion he was allowed to preach in the rebels' camp on Mousehold Hill, but without much effect; and later on he encouraged his chaplain, Alexander Neville, to write his history of the rising. His Protestantism advanced with the times, and he received higher promotion under Northumberland than under the moderate Somerset. Bucer was his friend at Cambridge, and he preached Bucer's funeral sermon in 1551. In 1552 he was promoted to the rich deanery of Lincoln, and in July 1553 he supped with Northumberland at Cambridge, when the duke marched north on his hopeless campaign against Mary.

As a supporter of Northumberland and a married man, Parker was naturally deprived of his deanery, his mastership of Corpus, and his other preferments. But he found means to live in England throughout Mary's reign without further molestation. He was not cast in a heroic mould, and he had no desire to figure at the stake; like Cecil, and Elizabeth herself, he had a great respect for authority, and when his time came he could consistently impose authority on others. He was not eager to assume this task, and he made great efforts to avoid promotion to the archbishopric of Canterbury, which Elizabeth designed for him as soon as she had succeeded to the throne. He was elected on the 1st of August 1559; but it was difficult to find the requisite four bishops willing and qualified to consecrate him, and not until the 17th of December did Barlow, Scory, Coverdale and Hodgkins perform that ceremony at Lambeth. The legend of an indecent consecration at the Nag's Head tavern in Fleet Street seems first to have been printed by the Jesuit, Christopher Holywood, in 1604; and it has long been abandoned by reputable controversialists. Parker's consecration was, however, only made legally valid by the plentitude of the royal supremacy; for the Edwardine Ordinal, which was used, had been repealed by Mary and not re-enacted by the parliament of 1559.

Parker owes his fame to circumstances rather than to personal qualifications. This wise moderation of the Elizabethan settlement, which had been effected before his appointment, was obviously not due to him; and Elizabeth could have placed Knox or Bonner in the chair of St Augustine had she been so minded. But she wanted a moderate man, and so she chose Parker. He possessed all the qualifications she expected from an archbishop except celibacy. He distrusted popular enthusiasm, and he wrote in horror of the idea that "the people" should be the reformers of the Church. He was not inspiring as a leader of religion; and no dogma, no original theory of church government, no prayer-book, not even a tract or a hymn is associated with his name. The 56 volumes published by the Parker Society include only one by its eponymous hero, and that is a volume of correspondence. He was a disciplinarian, a scholar, a modest and moderate man of genuine piety and irreproachable morals. His historical research was exemplified in his *De antiquitate ecclesiae*, and his editions of Asser, Matthew Paris, Walsingham, and the compiler known as Matthew of Westminster; his liturgical skill was shown in his version of the psalter and in the occasional prayers and thanksgivings which he was called upon to compose; and he left a priceless collection of manuscripts to his college at Cambridge.

He was happier in these pursuits than in the exercise of his jurisdiction. With secular politics he had little to do, and he was never admitted to Elizabeth's privy council. But ecclesiastical politics gave him an infinity of trouble. Many of the reformers wanted no bishops at all, while the Catholics wanted those of the old dispensation, and the queen herself grudged episcopal privilege until she discovered in it one of the chief bulwarks of the royal supremacy. Parker was therefore left to stem the rising tide of Puritan feeling with little support from parliament, convocation or the Crown. The bishops' *Interpretations* and *Further Considerations*, issued in 1560, tolerated a lower vestiarian standard than was prescribed by the rubric of 1559; the *Advertisements*, which Parker published in 1566, to check the Puritan descent, had to appear without specific royal sanction; and the *Reformatio legum ecclesiasticarum*, which Foxe published with Parker's approval, received neither royal, parliamentary nor synodical authorization. Parliament even contested the claim of the bishops to determine matters of faith. "Surely," said Parker to Peter Wentworth, "you will refer yourselves wholly to us therein." "No, by the faith I bear to God," retorted Wentworth, "we will pass nothing before we understand what it is; for that were but to make you popes. Make you popes who list, for we will make you none." Disputes about vestments had expanded into a controversy over the whole field of Church government and authority, and Parker died on the 17th of May, 1575, lamenting that Puritan ideas of "governance" would "in conclusion undo the queen and all others that depended upon her." By his personal conduct he had set an ideal example for Anglican priests, and it was not his fault that national authority failed to crush the individualistic tendencies of the Protestant Reformation.

John Strype's *Life of Parker*, originally published in 1711, and re-edited for the Clarendon Press in 1821 (3 vols.), is the principal source for Parker's life. A biographical sketch written from a different point of view was published by W. M. Kennedy in 1908. See also J. Bass Mullinger's scholarly life in *Dict. Nat. Biog.*; W. H. Frere's volume in Stephens and Hunt's *Church History*; Strype's *Works* (General Index); Gough's Index to *Parker Soc. Publ.* Fuller, Burnet, Collier and R. W. Dixon's Histories of the Church; Birt's *Elizabethan Settlement*; H. Gee's *Elizabethan Clergy* (1898); Froude's *Hist. of England*; and vol. vi. in Longman's *Political History*. (A. F. P.)

PARKER. SAMUEL (1640–1688), English bishop, was born at Northampton, and educated at Wadham College, Oxford. His Presbyterian views caused him to move to Trinity College, where, however, the influence of the senior fellow induced him to join the Church of England, and he was ordained in 1664. In 1665 he published an essay entitled *Tentamina physico-theologica de Deo*, dedicated to Archbishop Sheldon, who in 1667 appointed him one of his chaplains. He became rector of Chartham, Kent, in the same year. In 1670 he became archdeacon of Canterbury, and two years after he was appointed rector of Ickham, Kent. In 1673 he was elected master of Edenbridge Hospital. His *Discourse of Ecclesiastical Politie* (London, 1670), advocating state regulation of religious affairs, led him into controversy with Andrew Marvell (1621–1675). James II. appointed him to the bishopric of Oxford in 1686, and he in turn forwarded the king's policy, especially by defending the royal right to appoint Roman Catholics to office. In 1687 the ecclesiastical commission forcibly installed him as president of Magdalen College, Oxford, the fellows having refused to elect any of the king's nominees. He was commonly regarded as a Roman Catholic, but he would appear to have been no more than an extreme exponent of the High Church doctrine of passive obedience. After he became president the action of the king in replacing the expelled fellows with Roman Catholics agitated him to such a degree as to hasten his end; to the priests sent to persuade him on his death-bed to be received into the Roman Church he declared that he "never had been and never would be of that religion," and he died in the communion of the Church of England.

Parker's second son, SAMUEL PARKER (1681–1730), was the author of *Bibliotheca biblica*, or *Patristic Commentary on the Scriptures* (1720–1735), an abridged translation of Eusebius, and other works. He was also responsible during 1708 and 1709 for a monthly periodical entitled *Censura temporum*, or *Good and Ill Tendencies of Books*. He passed most of his life in retirement at Oxford. His younger son Richard founded the well-known publishing firm in Oxford.

See *Magdalen College and James II. 1686–1688*, by the Rev. J. R. Bloxam (Oxford Historical Society, 1886).

PARKER, THEODORE (1810–1860), American preacher and social reformer, was born at Lexington, Massachusetts, on the 24th of August 1810, the youngest of eleven children. His father, John Parker, a small farmer and skilful mechanic, was a typical New England yeoman. His mother took great pains with the religious education of her children, "caring, however, but little for doctrines," and making religion to consist of love and good works. His paternal grand-father, Captain John Parker (1729–1775), was the leader of the Lexington minute-men in the skirmish at Lexington. Theodore obtained the elements of knowledge in the schools of the district, which were open during the winter months only. During the rest of the year he worked on his father's farm. At the age of seventeen he became himself a winter schoolmaster, and in his twentieth year he entered himself at Harvard, working on the farm as usual (until 1831) while he followed his studies and going over to Cambridge for the examinations only. For the theological course he took up in 1834 his residence in the college, meeting his expenses by a small sum amassed by school-keeping and by help from a poor students' fund, and graduating in 1836. At the close of his college career he began his translation (published in 1843) of Wilhelm M. L. De Wette's *Beiträge zur Einleitung in das Alte Testament.* His journal and letters show that he had made acquaintance with a large number of languages, including Hebrew, Chaldee, Syriac, Arabic, Coptic, Ethiopic, as well as the classical and the principal modern European languages. When he entered the divinity school he was an orthodox Unitarian; when he left it, he entertained strong doubts about the infallibility of the Bible, the possibility of miracles, and the exclusive claims of Christianity and the Church. Emerson's transcendentalism greatly influenced him, and Strauss's *Leben Jesu* left its mark upon his thought. His first ministerial charge was over a small village parish, West Roxbury, a few miles from Boston; here he was ordained as a Unitarian clergyman in June 1837 and here he preached until January 1846. His views were slowly assuming the form which subsequently found such strong expression in his writing; but the progress was slow, and the cautious reserve of his first rationalistic utterances was in striking contrast with his subsequent rashness. But on the 19th of May 1841 he preached at Boston a sermon on "the transient and permanent in Christianity," which presented in embryo the main principles and ideas of his final theological position, and the preaching of which determined his subsequent relations to the churches with which he was connected and to the whole ecclesiastical world. The Boston Unitarian clergy denounced the preacher, and declared that the "young man must be silenced." No Unitarian publisher could be found for his sermon, and nearly all the pulpits of the city were closed against him. A number of gentlemen in Boston, however, invited him to give a series of lectures there. The result was that he delivered in the Masonic Hall, in the winter of 1841–1842, as lectures, substantially the volume afterwards published as the *Discourse of Matters pertaining to Religion.* The lectures in their published form made his name famous throughout America and Europe, and confirmed the stricter Unitarians in America in their attitude towards him and his supporters. His friends, however, resolved that he should be heard in Boston, and there, beginning with 1845, he preached regularly for fourteen years. Previous to his removal from West Roxbury to Boston Parker spent a year in Europe, calling in Germany upon Paulus, Gervinus, De Wette and Ewald, and preaching in Liverpool in the pulpits of James Martineau and J. H. Thom. After January 1846 he devoted himself exclusively to his work in Boston. In addition to his Sunday labours he lectured throughout the States, and prosecuted his wide studies, collecting particularly the materials for an *opus magnum* on the development of religion in mankind. Above all he took up the question of the emancipation of the slaves, and fearlessly advocated in Boston and elsewhere, from the platform and through the press, the cause of the negroes. He made his influence felt also by correspondence with political leaders and by able political speeches, one of which, delivered in 1858, contained the sentence, "Democracy is direct self-government, over all the people, by all the people, for all the people," which probably suggested Abraham Lincoln's oft-quoted variant. Parker assisted actively in the escape of fugitive slaves, and for trying to prevent the rendition of perhaps the most famous of them, Anthony Burns, was indicted, but the indictment was quashed. He also gave his aid to John Brown (*q.v.*). By his voice, his pen, and his utterly fearless action in social and political matters he became a great power in Boston and America generally. But his days were numbered. His mother had suffered from phthisis; and he himself now fell a victim to the same disease. In January 1859 he suffered a violent haemorrhage of the lungs, and sought relief by retreating first to the West Indies and afterwards to Europe. He died at Florence on the 10th of May 1860.

The fundamental articles of Parker's religious faith were the three "instinctive intuitions" of God, of a moral law, and of immortality. His own mind, heart and life were undoubtedly pervaded, sustained and ruled by the feelings, convictions and hopes which he formulated in these three articles; and he rationalized his own religious conceptions in a number of expositions which do credit to his sincerity and courage. But he was a preacher rather than a thinker, a reformer rather than a philosopher.

Parker's principal works are: *A Discourse of Matters pertaining to Religion* (1842); *Ten Sermons of Religion* (1853); and *Sermons of Theism, Atheism and the Popular Theology* (1853). A collected edition of his works was published in England by Frances Power Cobbe (14 vols., 1863–1870), and another—the Centenary edition—in Boston, Mass., by the American Unitarian Association (14 vols., 1907–1911); a volume of *Theodore Parker's Prayers*, edited by Rufus Leighton and Matilda Goddard, was published in America in 1861, and a volume of Parker's *West Roxbury Sermons*, with a biographical sketch by Frank B. Sanborn, was published in Boston, Mass., in 1892. A German translation of part of his works was made by Ziethen (Leipzig 1854–1857).

The best biographies are John Weiss's *Life and Correspondence of Theodore Parker* (New York, 1864); O. B. Frothingham's *Theodore Parker: a Biography* (Boston, 1874); and John White Chadwick's *Theodore Parker, Preacher and Reformer* (Boston, 1900), the last containing a good bibliography. Valuable reviews of Parker's theological position and of his character and work have appeared—by James Martineau, in the *National Review* (April 1860), and J. H. Thom, in the *Theological Review* (March 1864).

PARKERSBURG, a city and the county-seat of Wood county, West Virginia, U.S.A., on the Ohio river, at the mouth of the Little Kanawha, about 95 m. below Wheeling. Pop. (1890), 8408; (1900), 11,703, of whom 515 were foreign-born and 783 were negroes; (1910 census), 17,842. Parkersburg is served by the Baltimore & Ohio, the Baltimore & Ohio South-western, and the Little Kanawha railways, by electric railway to Marietta, Ohio, and by passenger and freight boats to Pittsburg, Cincinnati, intermediate ports, and ports on the Little Kanawha. Parkersburg is the see of a Protestant Episcopal bishop. Oil, coal, natural gas and fire-clay abound in the neighbouring region, and the city is engaged in the refining of oil and the manufacture of pottery, brick and tile, glass, lumber, furniture, flour, steel, and foundry and machine-shop products. In 1905 the value of the factory products was $3,778,139 (21·9% more than in 1900). Parkersburg was settled in 1789, was incorporated in 1820, and received a new charter in 1903, when its boundaries were enlarged. About 2 m. below the city is the island which was the home of Harman Blennerhassett (*q.v.*) and bears his name.

PARKES, SIR HARRY SMITH (1828–1885), English diplomatist, son of Harry Parkes, founder of the firm of Parkes, Otway & Co., ironmasters, was born at Birchills Hall, near Walsall in Staffordshire, in 1828. When but four years old his mother died and in the following year his father was killed in a carriage accident. Being thus left an orphan, he found a home with his uncle, a retired naval officer, at Birmingham. He received his education at King Edward's Grammar School. In 1837 his uncle died, and in 1841 he sailed for Macao in China, to take up his residence at the house of his cousin, Mrs Gutzlaff. At this time what was known as the "Opium War" had broken out, and Parkes eagerly prepared himself to take part in the events which were passing around him by diligently applying himself to the study of Chinese. In 1842 he received his first appointment in the consular service. Fortunately for him, he was privileged to accompany Sir Henry Pottinger in his expedition up the Yangtsze-kiang to Nanking, and after having taken part in the capture of Chinkiang and the surrender of Nanking, he witnessed the signing of the treaty on board the "Cornwallis" in August 1842. By this treaty the five ports of Canton, Amoy, Fuchow, Ningpo and Shanghai were opened to trade. After short residences at Canton and the newly opened Amoy, Parkes was appointed to the consulate at Fuchow. Here he served under Mr (afterwards Sir) Rutherford Alcock, who was one of the few Englishmen who knew how to manage the Chinese. In 1849 he returned to England on leave, and after visiting the Continent and doing some hard work for the foreign office he returned to China in 1851. After a short stay at Amoy as interpreter he was transferred in the same capacity to Canton. In May 1854 he was promoted to be consul at Amoy, and in 1855 was chosen as secretary to the mission to Bangkok, being largely instrumental in negotiating the first European treaty with Siam. In June 1856 he returned to Canton as acting consul, a position which brought him into renewed contact with Commissioner Yeh, whose insolence and obstinacy led to the second China War. Yeh had now met a man of even greater power and determination than himself, and when, in October 1856, as a climax to many outrages, Yeh seized the British lorcha "Arrow" and made prisoners of her crew, Parkes at once closed with his enemy. In response to a strongly worded despatch from Parkes, Sir John Bowring, governor of Hong-Kong, placed matters in the hands of Admiral Sir M. Seymour, who took Canton at the close of the same month but had not a sufficient force to hold it. In December 1857 Canton was again bombarded by Admiral Seymour. Parkes, who was attached to the admiral's staff, was the first man to enter the city, and himself tracked down and arrested Commissioner Yeh. As the city was to be held, an allied commission was appointed to govern it, consisting of two Englishmen, of whom one was Parkes, and a French naval officer. Parkes virtually governed this city of a million inhabitants for three years. Meanwhile the treacherous attack at Taku upon Sir Frederick Bruce led to a renewal of hostilities in the north, and Parkes was ordered up to serve as interpreter and adviser to Lord Elgin (July, 1860). In pursuance of these duties he went in advance of the army to the city of Tungchow, near Peking, to arrange a meeting between Lord Elgin and the Chinese commissioners who had been appointed to draw up the preliminaries of peace. While thus engaged he, Mr (afterwards Lord) Loch, Mr de Norman, Lord Elgin's secretary of legation, Mr Bowlby, the *Times* correspondent, and others, were treacherously taken prisoners (Sept. 18, 1860). Parkes and Loch were carried off to the prison of the board of punishments at Peking, where they were separately herded with the lowest class of criminals. After ten days' confinement in this den of iniquity they were removed to a temple in the city, where they were comfortably housed and fed, and from which, after a further detention, they were granted their liberty. For this signal instance of treachery Lord Elgin burned down the Summer Palace of the emperor. Towards the end of 1860 Parkes returned to his post at Canton. On the restoration (Oct. 1861) of the city to the Chinese he returned to England on leave, when he was made K.C.B. for his services; he had received the companionship of the order in 1860. On his return to China he served for a short time as consul at Shanghai, and was then appointed minister in Japan (1865). For eighteen years he held this post, and throughout that time he strenuously used his influence in support of the Liberal party of Japan. So earnestly did he throw in his lot with these reformers that he became a marked man, and incurred the bitter hostility of the reactionaries, who on three separate occasions attempted to assassinate him. In 1882 he was transferred to Peking. While in Peking his health failed, and he died of malarial fever on the 21st of March 1885. In 1856 Sir H. (then Mr) Parkes married Miss Fanny Plumer, who died in 1879.

The standard *Life* is by Stanley Lane-Poole (1894). (R. K. D.)

PARKES, SIR HENRY (1815–1896), Australian statesman, was born at Stoneleigh, in Warwickshire, on the 27th of May 1815. The son of parents in very humble circumstances, he received only a rudimentary education, and at an early age was obliged to earn his living as a common labourer. Failing to make his way in England, he emigrated to Australia in 1839, and after a time settled in Sydney as an ivory-turner. Conscious of his great powers, he worked unremittingly to repair the deficiencies of his education, and developed a genuine taste for literature, and a gift for versification which won the approval of so severe a judge as Tennyson. His first volume of poems was published in 1842, under the title of *Stolen Moments*. He now began to take an active part in politics, and soon showed himself the wielder of an incisive style as a leader-writer, and a popular orator of unrivalled influence. He took a prominent part in the movement against the transportation of convicts, and in 1849 started the *Empire* newspaper to inculcate his policy of attacking abuses while remaining loyal to the Crown. The paper at once made its mark, but owing to financial difficulties ceased to appear in 1858. One of the reforms for which Parkes fought most strenuously was the full introduction of responsible government. He was returned to the legislative council under the old constitution as member for Sydney, and on the establishment of a legislative assembly in 1856 was elected for East Sydney. His parliamentary career was twice interrupted by pecuniary embarrassments; indeed, he never acquired the art of making money, and in spite of a public subscription raised in 1887 died in absolute penury. He was elected for East Sydney in 1859 at the first general election under the new electoral act, and sat till 1861, when he was sent to England as a commissioner for promoting emigration. He made a prolonged stay in England, and described his impressions in a series of letters to the *Sydney Morning Herald*, some of which were reprinted in 1869 under the title of *Australian Views of England*. He returned to Australia in 1863, and, re-entering the Assembly, became colonial secretary in the Martin ministry from 1866 to 1868. He succeeded in passing the Public Schools Act of 1866, which for the first time instituted an efficient system of primary education in the colony. His great chance came in 1872, when the Martin ministry resigned on the question of the sum payable by Victoria in lieu of border duties. Parkes had for several years persistently advocated free imports as a remedy for the financial distress of the colony. He now became prime minister and colonial secretary; and rising to the height of his opportunity, he removed the cause of dispute by throwing the colony open to trade. He held office till 1875, and on the fall of the Robertson ministry again became premier and colonial secretary from March till August 1877. At the end of this year he was made K.C.M.G. Finding that the state of parties did not allow of the existence of a stable ministry, he formed a coalition with Sir John Robertson, and became premier and colonial secretary for the third time from December 1878 to January 1883. In 1882 and in 1883–1884 he paid prolonged visits to England. Already distinguished among Australian statesmen for breadth of outlook and passionate devotion to the Empire, he returned with those qualities enhanced. For a time he found himself almost in a position of isolation, but in 1887 the policy of protection adopted by his successors brought him again into office. His free trade policy was once more successful. Other important measures of his administration were the reform of the civil service, the prohibition of Chinese immigration, and the railways and public works acts. He fell from office in January 1889, but in the following March became for the fifth time premier and colonial secretary. The remainder of his life was chiefly devoted to the question of Australian federation. The Federal Convention at Melbourne in 1890 was mainly his work; and he presided over the convention at Sydney in 1891, and was chiefly responsible for the draft constitution there carried. Defeated in October 1891 on his refusal to accept an eight hours' day for coal-miners, he remained in opposition for the rest of his career, sacrificing even free trade in the hope of smoothing the path of federation. He died at Sydney on the 27th of April 1896; but though he did not live to see the realization of his efforts, he may justly be called the Father of the Australian Commonwealth.

He published, in addition to the works already named and numerous volumes of verse, a collection of speeches on the *Federal Government of Australia* (1890), and an autobiography, *Fifty Years in the making of Australian History* (1892).

PARKIN, GEORGE ROBERT (1846–), British Canadian educationist, was born at Salisbury, New Brunswick, on the 8th of February 1846. His father had gone to Canada from Yorkshire. Parkin was the youngest of a family of thirteen, and after attending the local schools he started at an early age as a teacher. Bent on improving his own education, he then entered the university of New Brunswick, where he carried off high honours in 1866–1868. From 1868 to 1872 he was head master of Bathurst grammar school; but he was not content with the opportunities for study open to him in Canada, and he went to England and entered Oxford. Here the enthusiastic young Canadian was not only profoundly affected himself by entering strenuously into the life of the ancient university (he was secretary of the Union when H. H. Asquith was president), but in his turn was instrumental in bringing the possibilities of British Imperialism to the minds of some of the ablest among his contemporaries—his juniors by six or eight years. It is hardly too much to say that in his intercourse at Oxford in the early 'seventies with men of influence who were then undergraduates the imperialist movement in England substantially began. On returning to Canada he became principal of the chief New Brunswick school at Fredericton (where in 1878 he married), and for fifteen years he did excellent work in this capacity. But in 1889 he was again drawn more directly into the imperialist cause. The federation movement had gone ahead in the meanwhile, and Parkin had always been associated with it; and now he became a missionary speaker for the Imperial Federation League, travelling for several years about the empire for that purpose. He also became Canadian correspondent of *The Times*, and in that capacity helped to make Canada better known in the mother country. In 1894 he was given the honorary degree of LL.D. by Oxford. In 1895 he returned to scholastic work as principal of Upper Canada College, Toronto, and retained this post till 1902; but he continued in the meanwhile to support the imperialist movement by voice and pen. When in 1902 an organizer was required for the Rhodes Scholarship Trust (see RHODES, CECIL), in order to create the machinery for working it in the countries to which it applied, he accepted the appointment; and his devotion to this task was largely responsible for the success with which Rhodes's idea was carried out at Oxford. His publications include *Reorganization of the British Empire* (1882), *Imperial Federation* (1892), *Round the Empire* (1892), *Life of Edward Thring* (1897), *Life of Sir John Macdonald* (1907).

PARKINSON, JAMES (d. 1824), English palaeontologist, was educated for the medical profession, and practised in Hoxton, from about the year 1785. He was a Fellow of the Royal College of Surgeons, and one of the original members of the Geological Society of London (1807). He was author of numerous chemical and medical books, the most important of which were *Organic Remains of a Former World* (3 vols., 1804, 1808, 1811), and *Outlines of Oryctology* (1822). Parkinson died in London, on the 21st of December 1824.

See *Hist. of Collections in Brit. Mus. Nat. Hist. Dep.* (1904), pp. 315–316.

PARKMAN, FRANCIS (1823–1893), American historian, was born in Boston on the 16th of September 1823. His great-grandfather, Ebenezer Parkman, a graduate of Harvard in 1721, was for nearly sixty years minister of the Congregational Church in Westborough, and was noted for his devotion to the study of history. One of this good clergyman's sons, Samuel Parkman, became an eminent merchant in Boston, and exhibited much skill in horticulture. Samuel's son, Francis Parkman, a graduate of Harvard in 1807, was one of the most eminent of the Boston clergymen, a pupil and friend of Channing, and noted among Unitarians for a broadly tolerant disposition. This Dr Parkman, a man of rare sagacity and exquisite humour, was the father of Francis Parkman, the historian. His mother was a descendant of the celebrated John Cotton. She was the daughter of Nathaniel Hall of Medford, member of a family which was represented in the convention that framed the constitution of Massachusetts in 1780.

Francis Parkman was the eldest of her six children. As a boy his health was delicate, so that it was thought best for him to spend much of his time at his grandfather Hall's home in Medford rather than in the city. That home was situated on the border of the Middlesex Fells, a rough and rocky woodland, 4000 acres in extent, as wild and savage in many places as the primeval forest. The place is within 8 m. of Boston, and it may be doubted if anywhere else can be found another such magnificent piece of wilderness so near to a great city. There young Parkman spent his leisure hours in collecting eggs, insects and reptiles, trapping squirrels and woodchucks, and shooting birds with arrows. This breezy life saved him from the artificial stupidity which is too often superinduced in boys by their school training. At the age of fourteen Parkman began to show a strong taste for literary composition. In 1841, while a student at Harvard, he made a rough journey of exploration in the woods of northern New Hampshire, where he had a taste of adventure slightly spiced with hardship. About this time he made up his mind to write a history of the last French war in America, which ended in the conquest of Canada, and some time afterwards he enlarged the plan so as to include the whole course of the American conflict between France and Great Britain; or, to use his own words, "The history of the American forest; for this was the light in which I regarded it. My theme fascinated me, and I was haunted with wilderness images day and night." The way in which true genius works could not be more happily described. In the course of 1842 an attack of illness led to his making a journey in Italy, where he spent some time in a monastery belonging to one of the strictest of all the monastic orders, the Passionists, brethren addicted to wearing hair shirts and scourging themselves without mercy. In the young historian's eyes these good brethren were of much value as living and breathing historic material. In 1844 he graduated at Harvard with high rank.

He now made up his mind to study the real wilderness in its gloom and vastness, and to meet face to face the dusky warriors of the Stone Age. To-day such a thing can hardly be done within the United States, for nowhere does the primitive wilderness exist save here and there in shreds and patches. So recently as the middle of the 19th century, however, it covered the western half of the continent, and could be reached by a journey of 1600 or 1700 miles from Boston to the plains of Nebraska. Parkman had become an adept in woodcraft and a dead shot with the rifle, and could do such things with horses, tame or wild, as civilized people never see done except in a circus. In company with his friend and classmate, Mr Quincy Shaw, he passed several months with the Ogillalah band of Sioux. Knowledge, intrepidity and tact carried Parkman through these experiences unscathed, and good luck kept him clear of encounters with hostile Indians, in which these qualities might not have sufficed to avert destruction. It was a very important experience in relation to his life-work. This outdoor life, however, did not suffice to recruit Parkman's health, and by 1848, when he began writing *The Conspiracy of Pontiac*, he had reached a truly pitiable condition. The trouble seems to have been some form of nervous exhaustion, accompanied with such hypersensitiveness of the eyes that it was impossible to keep them open except in a dark room. Against these difficulties he struggled with characteristic obstinacy. He invented a machine which so supported his hand that he could write legibly with closed eyes. Books and documents were read aloud to him, while notes were made by him with eyes shut, and were afterwards deciphered and read aloud to him till he had mastered them. After half an hour his strength would give out, and in these circumstances his rate of composition for a long time averaged scarcely six lines a day. The superb historical monograph composed under such difficulties was published in 1851. It had but a small sale, as the American public was then too ignorant to feel much interest in American history.

Undeterred by this inhospitable reception, Parkman took up at the beginning his great work on *France and England in the New World*, to which the book just mentioned was in reality the sequel. This work obliged him to trace out, collect, arrange, and digest a great mass of incongruous material scattered on both sides of the Atlantic, a large portion of which was in manuscript, and required much tedious exploration and the employment of trained copyists. This work involved several journeys to Europe, and was performed with a thoroughness approaching finality. In 1865 the first volume of the great work appeared, under the title of *Pioneers of France in the New World*; and then seven-and-twenty years more elapsed before the final volumes came out in 1892. Nowhere can we find a better illustration of the French critic's definition of a great life—a thought conceived in youth, and realized in later years. After the *Pioneers* the sequence is *The Jesuits in North America, La Salle and the Discovery of the Great West, The Old Régime in Canada, Frontenac and New France and Louis XIV., Montcalm and Wolfe, A Half Century of Conflict.* As one obstacle after another was surmounted, as one grand division of the work after another became an accomplished fact, the effect upon Parkman's condition seems to have been bracing, and he acquired fresh impetus as he approached the goal. There can be little doubt that his physical condition was much improved by his habit of cultivating plants in garden and conservatory. He was a horticulturist of profound attainments, and himself originated several new varieties of flowers. His work in this department made him an enthusiastic adherent of the views of Darwin. He was professor of horticulture in the agricultural school of Harvard in 1871-1872, and published a few books on the subject of gardening. He died at Jamaica Plain, near Boston, on the 8th of November 1893.

The significance of Parkman's work consists partly in the success with which he has depicted the North-American Indians, those belated children of the Stone Age, who have been so persistently misunderstood alike by romancers, such as Cooper, and by detractors like Dr Palfrey. Parkman was the first great literary author who really understood the Indian's character and motives. Against this savage background of the forest Parkman shows the rise, progress and dramatic termination of the colossal struggle between France and Great Britain for colonial empire. With true philosophic insight he shows that France failed in the struggle not because of any inferiority in the ability and character of the men to whom the work was entrusted, but chiefly by reason of her despotic and protective régime. There is no more eloquent commentary upon the wholesome results of British self-government than is to be found in Parkman's book. But while the author deals with history philosophically, he does not, like Buckle, hurl at the reader's head huge generalizations, or, like Carlyle, preach him into somnolence. With all its manifold instructiveness, his book is a narrative as entertaining as those of Macaulay or Froude. In judicial impartiality Parkman may be compared with Gardiner, and for accuracy of learning with Stubbs.

There is a good *Life* by G. H. Farnham (Boston, 1900). (J. Fi.)

PARLA KIMEDI, a town of British India, in Ganjam district of Madras. Pop. (1901), 17,336. It is the residence of a raja, who claims descent from the ancient kings of Orissa. His estate covers an area of 614 sq. m., and pays a revenue of £7000 out of an estimated income of £26,000. He maintains a college, and has constructed a light railway (25 m.) to the station of Naupada on the East Coast railway. There is a trade in rice, and mats and other articles are woven of reeds.

PARLEMENT (see Parliament), in O. Fr. the name given to any meeting for discussion or debate (*parler*, to speak), a sense in which it was still used by Joinville, but from the latter half of the 13th century employed in France in a special sense to designate the sessions of the royal court (*curia regis*). Finally, when the Parlement of Paris had become a permanent court of justice, having the supreme authority in cases brought before it, and especially in appeals against the sentences of the *baillis* and seneschals, it retained this name, which was also given to the other supreme courts of the same nature which were created after its model in the provinces.

The early Capetians had a custom, based upon ancient precedents, of summoning periodically to their court their principal vassals and the prelates of their kingdom. These gatherings took place on the occasion of one of the great festivals of the year, in the town in which the king was then in residence. Here they deliberated upon political matters and the vassals and prelates gave the king their advice. But the monarch also gave judgment here in those cases which were brought before him. These were few in number during the early days of the Capetian dynasty; for though the king always maintained the principle that he was judge, and even that his competence in this respect was general and unlimited, this competence was at the same time undefined and it was not compulsory to submit cases to the king. At this period, too, appeals, strictly so called, did not exist. Nevertheless when a suit was brought before the king he judged it with the assistance of his prelates and vassals assembled around him, who formed his council. This was the *curia regis*. But in law the king was sole judge, the vassals and prelates being only advisers. During the 12th and at the beginning of the 13th centuries the *curia regis* continued to discharge these functions, except that its importance and actual competence continued to increase, and that we frequently find in it, in addition to the vassals and prelates who formed the council, *consiliarii*, who are evidently men whom the king had in his entourage, as his ordinary and professional councillors. Under the reign of St Louis (which was also the period at which the name parlement began to be applied to these judicial sessions) the aspect of affairs changed. The judicial competence of the Parlement developed and became more clearly defined; the system of appeals came into existence, and appeals against the judgments of the *baillis* and seneschals were brought before it; cases concerning the royal towns, the *bonnes villes*, were also decided by it. Again, in the old registers of the Parlement at this period, the first *Olim* books, we see the names of the same councillors recurring from session to session. This suggests that a sufficient number of councillors was assured beforehand, and a list drawn up for each session; the vassals and prelates still figuring as a complementary body at the council.

Next came the series of ordinances regulating the tenure of the Parlement, those of 1278, 1291, 1296 and 1308, and the institution was regularized. Not only were the persons who were to constitute each Parlement named in advance, but those who were not placed on this list, even though vassals or prelates, were excluded from judging cases. The royal *baillis* had to attend the Parlement, in order to answer for their judgments, and at an early date was fixed the order of the different *bailliages*, in which the cases coming from them were heard. The *baillis*, when not interested in the case, formed part of the council, but were afterwards excluded from it. Before the middle of the 14th century the personnel of the Parlement, both presidents and councillors, became fixed *de facto* if not *de jure*. Every year a list was drawn up of those who were to hold the session, and although this list was annual, it contains the same names year after year; they are as yet, however, only annual commissaries (*commissaires*). In 1344 they became officials (*officiers*) fixed but not yet irremovable. At the same time the Parlement had become permanent; the number of the sessions had diminished, but their length had increased. In the course of the 14th century it became the rule for the Parlement to sit from Martinmas (Nov. 11) till the end of May; later the session was prolonged till the middle of August, the rest of the year forming the vacation. The Parlement had also become fixed at Paris, and, by a development which goes back to fairly early times, the presidents and councillors, instead of being merely the king's advisers, had acquired certain powers, though these were conferred by the monarch; they were, in fact, true magistrates. The king held his court in person less and less often, and it pronounced its decrees in his absence; we even find him pleading his cause before it as plaintiff or defendant. In the 14th century, however, we still find the Parlement referring delicate affairs to the king; but in the 15th century it had acquired a jurisdiction independent in principle. As to its composition, it continued to preserve one notable feature which recalled its origin. It had originally been an assembly of lay vassals and prelates; when its composition became fixed and consisted of councillor-magistrates, a certain number of these offices were necessarily occupied by laymen, and others by ecclesiastics, the *conseillers lais* and the *conseillers clercs*.

The Parlement was at the same time the court of peers (*cour des pairs*). This had as its origin the old principle according to which every vassal had the right to be tried by his peers, *i.e.* by the vassals holding fiefs from the same lord, who sat in judgment with that lord as their president. This, it is well known, resulted in the formation of the ancient college of the peers of France, which consisted of six laymen and six ecclesiastics. But although in strict logic the feudal causes concerning them should have been judged by them alone, they could not maintain this right in the *curia regis*; the other persons sitting in it could also take part in judging causes which concerned the peers. Finally the peers of France, the number of whom was increased in course of time by fresh royal creations of peerages, became *ex officio* members of the Parlement; they were the hereditary councillors, taking the oath as official magistrates, and, if they wished, sitting and having a deliberative function in the Parlement. In suits brought against them personally or involving the rights of their peerage they had the right of being judged by the Parlement, the other peers being present, or having been duly summoned.

While maintaining its unity, the Parlement had been subdivided into several *chambres* or sections. In the first place there was the *Grand Chambre*, which represented the primitive Parlement. To it was reserved the judgment in certain important cases, and in it a peculiar procedure was followed, known as *oral*, though it admitted certain written documents. Even after the offices of the Parlement had become legally saleable the councillors could only pass from the other chambers into the *Grand Chambre* by order of seniority. The *Chambres des enquêtes* and *des requêtes* originated at the time when it became customary to draw up lists for each session of the Parlement. The *enquêteurs* or *auditeurs* of the Parlement had at first been an auxiliary staff of clerks to whom were entrusted the inquests ordered by the Parlement. But later, when the institution of the appeal was fully developed, and the procedure before the various jurisdictions became a highly technical matter, above all when it admitted written evidence, the documents connected with other inquests also came before the Parlement. A new form of appeal grew up side by side with the older form, which had been mainly an oral procedure, namely the appeal by writing (*appel par écrit*). In order to judge these new appeals the Parlement had above all to study written documents, the inquests which had been made and written down under the jurisdiction of the court of first instance. The duty of the *enquêteurs* was to make an abstract of the written documents and report on them. Later the reporters (*rapporteurs*) were admitted to judge these questions together with a certain number of members of the Parlement, and from 1316 onwards these two kinds of member formed together a *chambre des enquêtes*. As yet, no doubt, the *rapporteur* only gave his opinion on the case which he had prepared, but after 1336 all those who formed part of the chamber were put on the same footing, taking it in turn to report and giving judgment as a whole. For a long time, however, the *Grand Chambre* received all cases, then sent them to the *Chambre des enquêtes* with directions; before it too were argued questions arising out of the inquiry made by the *Chambre des enquêtes*, to the decisions of which it gave effect and which it had the power to revise. But one by one it lost all these rights, and in the 16th century they are no longer heard of. Several *Chambres des enquêtes* were created after the first one, and it was they who had the greater part of the work.

The *Chambre des requêtes* was of an entirely different nature. At the beginning of the 14th century a certain number of those who were to hold the session of the Parlement were set apart to receive and judge the petitions (*requêtes*) on judicial questions which had been presented to the king and not yet dealt with. This eventually led to the formation of a chamber, in the strict sense of the word, the *Requêtes du palais*. But this became purely a jurisdiction for privileged persons; before it (or before the *Requêtes de l'hôtel*, as the case might be) were brought the civil suits of those who enjoyed the right of *Committimus*. The *Chambre des requêtes* had not supreme jurisdiction, but appeals from its decisions could be made to the Parlement proper.

The Parlement had also a criminal chamber, that of *La Tournelle*, which was not legally created until the 16th century, but was active long before then. It had no definite membership, but the *conseillers lais* served in it in turn.

Originally there was only one Parlement, that of Paris, as was indeed logical, considering that the Parlement was simply a continuation of the *curia regis*, which, like the king, could only be one. But the exigencies of the administration of justice led to the successive creation of a certain number of provincial parlements. Their creation, moreover, was generally dictated by political circumstances, after the incorporation of a province in the domain of the Crown. Sometimes it was a question of a province which, before its annexation, possessed a superior and sovereign jurisdiction of its own, and to which it was desired to preserve this advantage. Or else it might be a province forming part of feudal France, which before the annexation had had a superior jurisdiction from which the Crown had endeavoured to institute an appeal to the Parlement of Paris, but for which after the annexation it was no longer necessary to maintain this appeal, so that the province might now be given a supreme court, a parlement. Sometimes an intermediate régime was set up between the annexation of the province and the creation of its provincial parlement, under which delegates from the Parlement of Paris went and held assizes there. Thus were created successively the parlements of Toulouse, Grenoble, Bordeaux, Dijon, Rouen, Aix, Rennes, Pau, Metz, Douai, Besançon and Nancy. From 1762 to 1771 there was even a parlement for the principality of Dombes. The provincial parlements reproduced in a smaller scale the organization of that of Paris; but they did not combine the functions of a court of peers. They each claimed to possess equal powers within their own province. There were also great judicial bodies exercising the same functions as the parlements, though without bearing the name, such as the *Conseil souverain* of Alsace at Colmar, the *Conseil supérieur* of Roussillon at Perpignan; the provincial council of Artois had not the supreme jurisdiction in all respects.

The parlements, besides their judicial functions, also possessed political rights; they claimed a share in the higher policy of the realm, and the position of guardians of its fundamental laws. In general the laws did not come into effect within their province until they had been registered by the parlements. This was the method of promulgation admitted by the ancient law of France, but the parlements verified the laws before registering them, *i.e.* they examined them to see whether they were in conformity with the principles of law and justice, and with the interests of the king and his subjects; if they considered that this was not the case they refused their registration and addressed remonstrances (*remontrances*) to the king. In acting thus they were merely conforming to the duty of counselling (*devoir de conseil*) which all the superior authorities had towards the king, and the text of the ordinances (*ordonnances*) had often invited them to do so. It was natural, however, that in the end the royal will should seek to impose itself. In order to enforce the registration of edicts the king would send *lettres de cachet*, known as *lettres de jussion*, which were not, however, always obeyed. Or he could come in person to hold the parlement, and have the law registered in his presence in a *lit de justice*. This was explained in theory by the principle that if the king himself held his court, it lost, by the fact of his presence, all the authority which he had delegated to it; for the moment the only authority existing in it was that of the king, just as in the ancient *curia regis* there was the principle that *apparente rege cessat magistratus*. But, principally in the 18th century, the parlements maintained that only a voluntary registration, by the consent of the parlement, was valid.

The parlements had also a wide power of administration. They could make regulations (*pouvoir réglementaire*) having the force of law within their province, upon all points not settled by law, when the matter with which they dealt fell within their judicial competence, and for this it was only necessary that their interference in the matter was not forbidden by law. These were what were called *arrête de règlement*.

By this means the parlements took part in the administration, except in matters the cognisance of which was attributed to another supreme court as that of taxation was to the *cours des aides*. They could also, within the same limits, address injunctions (*injonctions*) to officials and individuals.

See La Roche-Flavin, *Treize livres des parlements de France* (1617); Felix Aubert, *Histoire du parlement de Paris, des origines à François I.* (2 vols., 1894); Ch. V. Langlois, *Textes relatifs à l'histoire du parlement depuis les origines jusqu'en 1314* (1888); Guilhiermoz, *Enquêtes et procès* (1892); Glasson, *Le Parlement de Paris, son rôle politique depuis le règne de Charles VII. jusqu'à la révolution* (2 vols., 1901). (J. P. E.)

PARLIAMENT (Anglo-Lat. *parliamentum*, Fr. *parlement*, from *parler*, to speak), the name given to the supreme legislature of the United Kingdom of Great Britain and Ireland. (For the old French *parlement*, see PARLEMENT; and for analogous foreign assemblies see the articles on their respective countries.) The word is found in English from the 13th century, first for a debate, then for a formal conference, and for the great councils of the Plantagenet kings; and the modern sense has come to be applied retrospectively. William the Conqueror is said in the Chronicle to have had "very deep speech with his Witan"; this "deep speech" (in Latin *colloquium*, in French *parlement*) was the distinguishing feature of a meeting between king and people, and thus gave its name to the national assembly itself. The Statute of Westminster (1275) first uses "parlement" of the great council in England.

The British Parliament consists of the King (or Queen regnant), the Lords spiritual and temporal, and the Commons[1]; and it meets in two houses, the House of Lords (the Upper or Second chamber) and the House of Commons.

The Crown, pre-eminent in rank and dignity, is the legal source of parliamentary authority. The sovereign virtually appoints the lords spiritual, and all the peerages of the lords temporal have been created by the Crown. The king summons parliament to meet, and prescribes the time and place of its meeting, prorogues and dissolves it, and commands the issue of writs for the election of members of the House of Commons. By several statutes, beginning with the 4 Edward III. c. 14, the annual meeting of parliament had been ordained; but these statutes, continually disregarded, were virtually repealed in the reigns of Charles II. and William and Mary (16 Ch. II. 31; 6 & 7 Will. & Mary, 32). The present statute law merely exacts the meeting of parliament once in three years; but the annual voting of supplies has long since superseded obsolete statutes. When parliament is assembled it cannot proceed to business until the king has declared the causes of summons, in person or by commission; and though the veto of the Crown on legislation has long been obsolete, bills passed by the two houses only become law on receiving the royal assent.

The House of Lords is distinguished by peculiar dignities, privileges and jurisdictions. Peers individually enjoy the rank and precedence of their several dignities, and are hereditary councillors of the Crown. Collectively with the lords spiritual they form a permanent council of the Crown; and, when assembled in parliament, they form the highest court of judicature in the realm, and are (in constitutional theory at all events) a co-equal branch of the legislature, without whose consent no laws can be made (see below, *House of Lords Question*). Their judicature is of various kinds, viz. for the trial of peers; for determining claims of peerage and offices of honour, under references from the Crown; for the trial of controverted elections of Scotch and Irish peers; for the final determination of appeals from courts in England, Scotland and Ireland; and lastly, for the trial of impeachments.

The House of Commons also has its own peculiar privileges and jurisdictions. Above all, it has the paramount right of originating the imposition of all taxes, and the granting of supplies for the service of the state. It has also enjoyed, from early times, the right of determining all matters concerning the election of its own members, and their right to sit and vote in parliament. This right, however, has been greatly abridged, as, in 1868, the trial of controverted elections was transferred to the courts of law; but its jurisdiction in matters of election, not otherwise provided for by statute, is still retained intact. As part of this jurisdiction the house directs the Speaker to issue warrants to the clerk of the Crown to make out new writs for the election of members to fill up such vacancies as occur during the sitting of parliament.

Privileges of Parliament.—Both houses are in the enjoyment of certain privileges, designed to maintain their authority, independence and dignity. These privileges are founded mainly upon the law and custom of parliament, while some have been confirmed, and others abridged or abrogated by statute. The Lords rely entirely upon their inherent right, as having "a place and voice in parliament"; but, by a custom dating from the 6th Henry VIII., the Commons lay claim, by humble petition to the Crown at the commencement of every parliament, "to their ancient and undoubted rights and privileges." Each house has its separate rights and jurisdictions; but privileges properly so-called, being founded upon the law and custom of parliament, are common to both houses. Each house adjudges whether any breach of privilege has been committed, and punishes offenders by censure or commitment. This right of commitment is incontestably established, and it extends to the protection of officers of the house, lawfully and properly executing its orders, who are also empowered to call in the assistance of the civil power. The causes of such commitments cannot be inquired into by courts of law, nor can prisoners be admitted to bail. Breaches of privilege may be summarized as disobedience to any orders or rules of the house, indignities offered to its character or proceedings, assaults, insults, or libels upon members, or interference with officers of the house in discharge of their duty, or tampering with witnesses. Such offences are dealt with as contempts, according to the circumstances of the respective cases, of which numerous precedents are to be found in the journals of both houses. The Lords may imprison for a fixed period, and impose fines; the Commons can only imprison generally, the commitment being concluded by the prorogation, and have long discontinued the imposition of fines.

Freedom of speech has been one of the most cherished privileges of parliament from early times. Constantly asserted, and often violated, it was finally declared by the Bill of Rights "that the freedom of speech, and debates and proceedings in parliament, ought not to be impeached or questioned in any court or place out of parliament." Such a privilege is essential to the independence of parliament, and to the protection of members in discharge of their duties. But, while it protects members from molestation elsewhere, it leaves them open to censure or other punishment by the house itself, whenever they abuse their privilege and transgress the rules of orderly debate.

Freedom from arrest is a privilege of the highest antiquity. It was formerly of extended scope, but has been reduced, by later legislation, within very narrow limits. Formerly not only the persons of members but their goods were protected, and their privilege extended to their servants. At present members are themselves free from arrest, but otherwise they are liable to all the processes of the courts. If arrested, they will be immediately discharged, upon motion in the court whence the process issued. Peers and peeresses are, by the privilege of peerage, free from arrest at all times. Members of the House of Commons are free only for forty days after prorogation and forty days before the next appointed meeting; but prorogations are so arranged as to ensure a continuance of the privilege. Formerly, even suits against members were stayed, but this offensive privilege has been abolished by statute. Exemption from attending as witnesses upon subpoena, once an acknowledged privilege, is no longer insisted upon; but immunity from service upon juries is at once an ancient privilege and a statutory right. The privilege of freedom from arrest is limited to civil causes, and has not been suffered to exempt members from the operation of the criminal law, nor even from commitments for contempt by other courts. But, whenever the freedom of a member is so interfered with, the courts are required immediately to inform the house of the causes of his commitment. Witnesses, suitors, counsel and agents in attendance upon parliament are protected from arrest and molestation, and from the consequences of statements made by them, or other proceedings in the conduct of their cases.

As both houses, in enforcing their privileges, are obliged to commit offenders or otherwise interfere with the liberty of the subject, the exercise of these privileges has naturally been called in question before the courts. Each house is the sole judge of its own privileges; but the courts are bound to administer the law, and, where law and privilege have seemed to be at variance, a conflict of jurisdiction has arisen between parliament and the courts. Many interesting controversies have arisen upon such occasions; but of late years privilege has been carefully restrained within the proper limits of the law, and the courts have amply recognized the authority of parliament.

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[1] Or rather, the representatives of the Commons (see REPRESENTATION); but the term has long been used for the deputies themselves collectively.

Parliamentary Procedure.—It will be convenient here to sketch the general lines of procedure. On the day appointed by royal proclamation for the meeting of a new parliament both houses assemble in their respective chambers, when the Lords Commissioners for opening the parliament summon the Commons to the bar of the House of Lords, by the mouth of Black Rod, to hear the commission read. The lord chancellor states that, when the members of both houses shall be sworn, the king will declare the causes of his calling this parliament; and, it being necessary that a Speaker of the House of Commons shall be first chosen, the Commons are directed to proceed to the appointment of a Speaker, and to present him, on the following day, for His Majesty's royal approbation. The Commons at once withdraw to their own house and proceed to the election of their Speaker. The next day the Speaker-elect proceeds, with the house, to the House of Lords, and, on receiving the royal approbation, lays claim, in the accustomed form, on behalf of the Commons, "to their ancient and undoubted rights and privileges." The Speaker, now fully confirmed, returns to the House of Commons, and, after repeating his acknowledgments, reminds the house that the first thing to be done is to take and subscribe the oath required by law. Having first taken the oath himself, he is followed by other members, who come to the table to be sworn. The swearing of members in both houses proceeds from day to day, until the greater number have taken the oath, or affirmation, when the causes of summons are declared by His Majesty in person, or by commission, in "the King's speech." This speech being considered in both houses, an Address (*q.v.*) in answer is agreed to, which is presented to His Majesty by the whole house, or by "the lords with white staves" in one house and privy councillors in the other.

The debate on the Address being over, the real business of the session now commences: the committees of supply and ways and means are set up; bills are introduced; motions are made; committees are appointed; and both houses are, at once, in full activity. The Lord Chancellor presides over the deliberations of the Lords, and the Speaker over those of the Commons. A quorum of the House of Lords, including the chancellor, is three (thirty for divisions); that of the House of Commons, including the Speaker, is forty.

Every matter is determined, in both houses, upon questions put from the chair, and resolved in the affirmative or negative, or otherwise disposed of by the withdrawal of the motion, by amendments, by the adjournment of the house, by reading the orders of the day, or by the previous question. Notices are required to be given of original motions; and the different stages of bills, and other matters appointed for consideration by the house, stand as orders of the day. Questions of privilege are allowed precedence of all the business on any day; but this rule, being liable to grave abuses, is guarded by strict limitations. Debates arise when a question has been proposed from the chair; and at the close of the debate (for the "closure" in the House of Commons, see below, *House of Commons, Internal Reforms*) the question is put, with or without amendment, as the case may be, and is determined, when necessary, by a division. No question or bill, substantially the same as one upon which the judgment of the house has already been given, may be again proposed during the same session.

Members claim to be heard in debate by rising in their places. When more than one member rises at the same time, in the Lords the member who is to speak is called by the house, in the Commons by the Speaker. Every member, when called, is bound to speak to the question before the house; and calls to order are very frequent. A member may speak once only to any question, except to explain, or upon a point of order, or to reply when a member has himself submitted a motion to the house, or when an amendment has been moved which constitutes a new question. He may not refer to past debates, nor to debates in the other house; nor may he refer to any other member by name, or use offensive and disorderly language against the king, either House of Parliament, or other members. Members offending against any of the rules of debate are called to order by the Speaker, or the attention of the chair is directed to the breach of order by another member. Order is generally enforced by the authority of the chair; but in extreme cases, and especially when obstruction is being practised, the offending member is named by the Speaker, and suspended by an order of the house, or otherwise punished at the discretion of the house.

At the conclusion of a debate, unless the motion be withdrawn, or the question (on being put from the chair) be agreed to or negatived, the house proceeds to a division, which effects the twofold purpose of ascertaining the numbers supporting and opposing the question, and of recording the names of members voting on either side. On each side of the house is a division lobby; and in the Lords the "contents" and in the Commons the "ayes" are directed to go to the right, and the "not contents" or "noes" to the left. The former pass into the right lobby, at the back of the Speaker's chair, and return to the house through the bar; the latter pass into the left lobby, at the bar, and return at the back of the chair. The opposing parties are thus kept entirely clear of one another. In each lobby there are two members acting as tellers, who count the members as they pass, and two division clerks who take down their names. After the division the four tellers advance to the table, and the numbers are reported by one of the tellers for the majority. In case of an equality of numbers, in the Lords the question is negatived in virtue of the ancient rule "semper praesumitur pro negante"; in the Commons the Speaker gives the casting vote.

Committees of the Whole House.—For the sake of convenience in the transaction of business there are several kinds of committees. Of these the most important is a committee of the whole house, which, as it consists of the entire body of members, can scarcely be accounted a committee. It is presided over by a chairman, who sits in the clerk's chair at the table, the mace, which represents the authority of the house itself, being for the time placed under the table. In this committee are discussed the several provisions of bills, resolutions and other matters requiring the consideration of details. To facilitate discussion, members are allowed to speak any number of times to the same question; otherwise the proceedings are similar to those of the house itself. In the Lords the chair is taken by the chairman of committees; and in the Commons by the chairman of the committee of ways and means, or in his absence by any other member. The quorum of such a committee is the same as that of the house itself. It reports from time to time to the house, but has no power of adjournment.

Grand and Standing Committees.—In the House of Commons there were formerly four grand committees, viz. for religion, for grievances, for courts of justice, and for trade. They were founded upon the valuable principle of a distribution of labours among several bodies of members; but, having fallen into disuse, they were discontinued in 1832. The ancient committee of privileges, in which "all who come are to have voices," is still appointed at the commencement of every session, but is rarely called into action, as it has been found more convenient to appoint a select committee to inquire into any question of privilege as it arises. In 1882 a partial revival of grand committees was effected by the appointment of two standing committees for the consideration of bills relating to law and courts of justice and to trade; and grand committees have since been considerably extended.

Select Committees.—In select committees both houses find the means of delegating inquiries, and the consideration of other matters, which could not be undertaken by the whole house. The reports of such committees have formed the groundwork of many important measures; and bills are often referred to them which receive a fuller examination than could be expected in a committee of the whole house. Power is given to such committees, when required, to send for persons, papers and records. In the Lords the power of examining witnesses upon oath has always been exercised, but it was not until 1871 that the same power was extended to the Commons, by statute.

Communications between the Two Houses.—In the course of the proceedings of parliament, frequent communications between the two houses become necessary. Of these the most usual and convenient form is that of a message. Formerly the Lords sent a message by two judges or two masters in chancery, and the Commons by a deputation of their own members; but since 1855 messages have been taken from one house to the other by one of the clerks at the table. A more formal communication is effected by a conference, in reference to amendments to bills or other matters; but this proceeding has been in great measure superseded by the more simple form of a message. The two houses are also occasionally brought into communication by means of joint committees and of select committees communicating with each other.

Communications between the Crown and Parliament.—Communications, in various forms, are also conducted between the Crown and both Houses of Parliament. Of these the most important are those in which the king, in person or by commission, is present in the House of Lords to open or prorogue parliament, or to give the royal assent to bills. His Majesty is then in direct communication with the three estates of the realm, assembled in the same chamber. The king also sends messages to both houses under the royal sign manual, when all the members are uncovered. Verbal messages are also sent, and the king's pleasure, or royal recommendation or consent to bills or other matters, signified through a minister of the Crown or a privy councillor. Messages under the sign manual are acknowledged by addresses, except where grants of money are proposed, in which case no address is presented by the Commons, who acknowledge them by making provision accordingly.

Both houses approach the Crown, sometimes by joint addresses, but usually by separate addresses from each house. Such addresses are presented to His Majesty, either by the whole house, or by the lords with white staves in one house and by privy councillors in the other. His Majesty answers, in person, addresses presented by the whole house; but, when presented otherwise, an answer is brought by one of the lords with white staves, or by one of the privy councillors, by whom the address has been presented. Resolutions of either house are also sometimes directed to be laid before His Majesty; and messages of congratulation or condolence are sent to other members of the royal family.

The Passing of Public Bills.—The passing of bills forms the most considerable part of the business of parliament; but a brief notice will suffice to explain the methods of procedure. These are substantially the same in both houses; but the privileges of the Commons, in regard to supply and taxation, require that all bills imposing a charge upon the people should originate in that house. On the other hand, the Lords claim that bills for restoration of honours or in blood, or relating to their own privileges and jurisdiction, should commence in their house. An act of grace, or general pardon, originates with the Crown, and is read once only in both houses. Bills are divided into public and private; but here the former only are referred to. In the Lords any peer is entitled to present a bill, but in the Commons a member is required to obtain the previous leave of the house to bring in the bill; and, in the case of bills relating to religion, trade, grants of public money, or charges upon the subject, a preliminary committee is necessary before such leave will be given. A bill, when presented, is read a first time, and ordered to be printed; and a day is appointed for the second reading. At this latter stage the principle of the bill is discussed; and, if disapproved of by an adverse vote, the bill is lost and cannot be renewed during the same session. If approved of, it is usually committed to a committee of the whole house where every provision is open to debate and amendment. When the bill has been fully considered it is reported to the house, with or without amendments, and is ready to pass through its remaining stages. Sometimes, however, the bill is first referred to a select committee; or to a grand committee and not to committee of the whole house.

When a bill has been reported from a committee of the whole house, or from a standing committee, with amendments, the bill, as amended, is ordered to be considered on a future day, when further amendments may be made, or the bill may be recommitted. The next and last stage is the third reading, when the principle of the measure, and its amended provisions, are open to review. Even at this stage the bill may be lost; but if the third reading be agreed to, it is at once passed and sent to the other house. There it is open to the like discussions and amendments, and may be rejected. If returned without amendment, the bill merely awaits the royal assent; but if returned with amendments, such amendments must be agreed to, or otherwise adjusted by the two houses, before it can be submitted for the royal assent. The royal assent consummates the work of legislation, and converts the bill into an act of parliament.

Petitions.—Both houses are approached by the people by means of petitions, of which prodigious numbers are presented to the House of Commons every session. They are referred to the committee on public petitions, under whose directions they are classified, analysed, and the number of signatures counted; and, when necessary, the petitions are printed *in extenso*.

Parliamentary Papers.—Another source of information is found in parliamentary papers. These are of various kinds. The greater part are obtained either by a direct order of the house itself, or by an address to the Crown for documents relating to matters in which the prerogatives of the Crown are concerned. Other papers, relating to foreign and colonial affairs and other public matters, are presented to both houses by command of His Majesty. Again, many papers are annually presented in pursuance of acts of parliament.

The Granting of Supplies.—The exclusive right of the Commons to grant supplies, and to originate all measures of taxation, imposes a very onerous service upon that house. This is mainly performed by two committees of the whole house—the committee of supply, and the committee of ways and means. The former deals with all the estimates for the public service presented to the house by command of His Majesty; and the latter votes out of the Consolidated Fund such sums as are necessary to meet the supplies already granted, and originates all taxes for the service of the year. It is here that the annual financial statement of the chancellor of the exchequer, commonly known as "the Budget," is delivered. The resolutions of these committees are reported to the house, and, when agreed to, form the foundation of bills, to be passed by both houses, and submitted for the royal assent; and towards the close of the session an Appropriation Act is passed, applying all the grants for the service of the year.

Elections.—The extensive jurisdiction of the Commons in matters of election, already referred to, formerly occupied a considerable share of their time, but its exercise has now been contracted within narrow limits. Whenever a vacancy occurs during the continuance of a parliament, a warrant for a new writ is issued by the Speaker, by order of the house during the session, and in pursuance of statutes during the recess. The causes of vacancies are the death of a member, his being called to the House of Peers, his acceptance of an office from the Crown, or his bankruptcy. When any doubt arises as to the issue of a writ, it is usual to appoint a committee to inquire into the circumstances of the case; and during the recess the Speaker may reserve doubtful cases for the determination of the house.

Controverted elections had been originally tried by select committees, afterwards by the committee of privileges and elections, and ultimately by the whole house, with scandalous partiality, but under the Grenville Act of 1770, and other later acts, by select committees, so constituted as to form a more judicial tribunal. The influence of party bias, however, too obviously prevailed until 1839, when Sir Robert Peel introduced an improved system of nomination, which distinctly raised the character of election committees; but a tribunal constituted of political partisans, however chosen, was still open to jealousy and suspicion, and at length, in 1868, the trial of election petitions was transferred to judges of the superior courts, to whose determination the house gives effect, by the issue of new writs or otherwise. The house, however, still retains and exercises its jurisdiction in all cases not relegated, by statute, to the judges.

Impeachments and Trial of Peers.—Other forms of parliamentary judicature still remain to be mentioned. Upon impeachments by the Commons, the Lords exercise the highest criminal judicature known to the law; but the occasions upon which it has been brought into action have been very rare in modern times. Another judicature is that of the trial of peers by the House of Lords. And, lastly, by a bill of attainder, the entire parliament may be called to sit in judgment upon offenders.

Private Bill Legislation.—One other important function of parliament remains to be noticed—that of private bill legislation. Here the duties of parliament are partly legislative and partly judicial. Public interests are promoted, and private rights secured. This whole jurisdiction has been regulated by special standing orders, and by elaborate arrangements for the nomination of capable and impartial committees. A prodigious legislative work has been accomplished—but under conditions most costly to the promoters and opponents of private bills, and involving a serious addition to the onerous labours of members of parliament.

History of the British Parliament

The Anglo-Saxon Polity.—The origin of parliament is to be traced to Anglo-Saxon times. The Angles, Saxons and other Teutonic races who conquered Britain brought to their new homes their own laws and customs, their settled framework of society, their kinship, their village communities, and a certain rude representation in local affairs. And we find in the Anglo-Saxon polity, as developed during their rule in England, all the constituent parts of parliament. In their own lands they had chiefs and leaders, but no kings. But conquest and territorial settlement were followed by the assumption of royal dignities; and the victorious chiefs were accepted by their followers as kings. They were quick to assume the traditional attributes of royalty. A direct descent from their god Woden, and hereditary right, at once clothed them with a halo of glory and with supreme power; and, when the pagan deity was deposed, the king received consecration from a Christian archbishop, and was invested with sacred attributes as "the Lord's anointed." But the Saxon monarch was a patriarchal king of limited authority, who acted in concert with his people; and, though his succession was hereditary, in his own family, his direct descendant was liable to be passed over in favour of a worthier heir. Such a ruler was a fitting precursor of a line of constitutional kings, who in later times were to govern with the advice and consent of a free parliament.

Meanwhile any council approaching the constitution of a House of Lords was of slow growth. Anglo-Saxon society, indeed, was not without an aristocracy. The highest in rank were æthelings—generally, if not exclusively, sons and brothers of the king. The ealdorman, originally a high officer, having the executive government of a shire, and a seat in the king's witan, became hereditary in certain families, and eventually attained the dignity of an earl. But centuries were to pass before the English nobility was to assume its modern character and denominations. At the head of each village was an eorl, the chief of the freemen, or ceorls—their leader in war and patron in peace. The king's gesiths and thegns formed another privileged class. Admitted to offices in the king's household and councils, and enriched by grants of land, they gradually formed a feudal nobility.

The revival of the Christian Church, under the Anglo-Saxon rule, created another order of rulers and councillors, destined to take a leading part in the government of the state. The archbishops and bishops, having spiritual authority in their own dioceses, and exercising much local influence in temporal affairs, were also members of the national council, or witenagemót, and by their greater learning and capacity were not long in acquiring a leading part in the councils of the realm. Ecclesiastical councils were also held, comprising bishops, abbots, and clergy, in which we observe the origin of convocation. The abbots, thus associated with the bishops, also found a place with them in the witenagemót. By these several orders, summoned to advise the king in affairs of state, was formed a council of magnates—to be developed, in course of time, into an upper chamber, or House of Lords.

The rise of the Commons (see Representation) as a political power in the national councils, was of yet slower development: but in the Anglo-Saxon moots may be discerned the first germs of popular government in England. In the town-moot the assembled freemen and cultivators of the "folk-lands" regulated the civil affairs of their own township, tithing, village or parish. In the burgh-moot the inhabitants administered their municipal business, under the presidency of a reeve. The hundred-moot assumed a more representative character, comprising the reeve and a selected number of freemen from the several townships and burghs within the hundred. The shire-moot, or shire-gemót, was an assembly yet more important. An ealdorman was its president, and exercised a jurisdiction over a shire, or district comprising several hundreds. Attended by a reeve and four freemen from every hundred, it assumed a distinctly representative character. Its members, if not *elected* (in the modern sense) by the popular voice, were, in some fashion, *deputed* to act on behalf of those whose interests they had come to guard. The shire-moot was also the general folk-moot of the tribe, assembled in arms, to whom their leaders referred the decision of questions of peace and war.

Superior to these local institutions was the witenagemót, or assembly of wise men, with whom the king took counsel in legislation and the government of the state. This national council was the true beginning of the parliament of England. Such a council was originally held in each of the kingdoms commonly known as the Heptarchy; and after their union in a single realm, under King Edgar, the witenagemót became the deliberative and legislative assembly, or parliament, of the extended estate. The witenagemót made laws, imposed taxes, concluded treaties, advised the king as to the disposal of public lands and the appointment and removal of officers of state, and even assumed to elect and depose the king himself. The king had now attained to greater power, and more royal dignities and prerogatives. He was unquestionably the chief power in the witenagemót; but the laws were already promulgated, as in later times, as having been agreed to with the advice and consent of the witan. The witan also exercised jurisdiction as a supreme court. These ancient customs present further examples of the continuity of English constitutional forms.

The constitution of the witenagemót, however, was necessarily less popular than that of the local moots in the hundred or the shire. The king himself was generally present; and at his summons came prelates, abbots, ealdormen, the king's gesiths and thegns, officers of state and of the royal household, and leading tenants in chief of lands held from the crown. Crowds sometimes attended the meetings of the witan, and shouted their acclamations of approval or dissent; and, so far, the popular voice was associated with its deliberations; but it was at a distance from all but the inhabitants of the place in which it was assembled, and until a system of representation (*q.v.*) had slowly grown up there could be no further admission of the people to its deliberations. In the town-moot the whole body of freemen and cultivators of the folk-lands met freely under a spreading oak, or on the village green; in the hundred-moot, or shire-gemót, deputies from neighbouring communities could readily find a place; but all was changed in the wider council of a kingdom. When there were many kingdoms, distance obstructed any general gathering of the Commons; and in the wider area of England such a gathering became impossible. Centuries were yet to pass before this obstacle was to be overcome by representation; but, in the meantime, the local institutions of the Anglo-Saxons were not without their influence upon the central council. The self-government of a free people informed the bishops, ealdormen, ceorls and thegns who dwelt among them of their interests and needs, their sufferings and their wrongs; and, while the popular forces were increasing with an advancing society, they grew more powerful in the councils of their rulers.

Another circumstance must not be overlooked in estimating the political influence of the people in Anglo-Saxon times. For five centuries the country was convulsed with incessant wars —wars with the Britons, whom the invaders were driving from their homes, wars between the several kingdoms, wars with the Welsh, wars with the Picts, wars with the Danes. How could the people continue to assert their civil rights amid the clash of arms and a frequent change of masters? The warrior-kings and their armed followers were rulers in the land which they had conquered. At the same time the unsettled condition of the country repressed the social advancement of its people. Agriculture could not prosper when the farm of the husbandman too often became a battlefield. Trade could not be extended without security to property and industry. Under such conditions the great body of the people continued as peasants, handicraftsmen and slaves. The time had not yet come when they could make their voice heard in the councils of the state.

The Norman Conquest.—The Anglo-Saxon polity was suddenly overthrown by the Norman Conquest. A stern foreign king had seized the crown, and was prepared to rule his conquered realm by the sword. He brought with him the absolutist principles of continental rulers, and the advanced feudal system of France and Normandy. Feudalism had been slowly gaining ground under the Saxon kings, and now it was firmly established as a military organization. William the Conqueror at once rewarded his warlike barons and followers with enormous grants of land. The Saxon landowners and peasants were despoiled, and the invaders settled in their homesteads. The king claimed the broad lands of England as his own, by right of conquest; and when he allowed his warriors to share the spoil he attached the strict condition of military service in return for every grant of land. An effective army of occupation of all ranks was thus quartered upon every province throughout the realm. England was held by the sword; a foreign king, foreign nobles, and a foreign soldiery were in possession of the soil, and swore fealty to their master, from whom they held it. Saxon bishops were deposed, and foreign prelates appointed to rule over the English Church. Instead of calling a national witenagemót, the king took counsel with the officers of his state and household, the bishops, abbots, earls, barons and knights by whom he was pleased to surround himself. Some of the forms of a national council were indeed maintained, and its counsel and consent were proclaimed in the making of laws; but, in truth, the king was absolute.

Such a revolution seemed fatal to the liberties and ancient customs of Saxon England. What power could withstand the harsh conqueror? But the indestructible elements of English society prevailed over the sword. The king grasped, in his own hands, the higher administration and judicature of the realm;

but he continued the old local courts of the hundred and the shire, which had been the basis of Saxon freedom. The Norman polity was otherwise destined to favour the liberties of the people, through agencies which had been designed to crush them. The powerful nobles, whom William and his successors exalted, became formidable rivals of the Crown itself; while ambitious barons were in their turn held in check by a jealous and exacting church. The ruling powers, if combined, would have reduced the people to slavery; but their divisions proved a continual source of weakness. In the meantime the strong rule of the Normans, bitter as it was to Englishmen, repressed intestine wars and the disorders of a divided realm. Civil justice was fairly administered. When the spoils of the conquerors had been secured, the rights of property were protected, industry and trade were left free, and the occupation of the soil by foreigners drove numbers of landowners and freemen into the towns, where they prospered as merchants, traders and artificers, and collected thriving populations of townsmen. Meanwhile, foreign rulers having brought England into closer relations with the Continent, its commerce was extended to distant lands, ports and shipping were encouraged, and English traders were at once enriched and enlightened. Hence new classes of society were growing, who were eventually to become the Commons of England.

The Crown, the Barons, the Church and the People.—While these social changes were steadily advancing, the barons were already preparing the way for the assertion of popular rights. Ambitious, turbulent and grasping, they were constantly at issue with the Crown. Enjoying vast estates and great commands, and sharing with the prelates the government of the state, as members of the king's council, they were ever ready to raise the standard of revolt. The king could always count upon barons faithful to his cause, but he also appealed for aid to the Church and the people. The baronage was thus broken by insurrections, and decimated by civil wars, while the value of popular alliances was revealed. The power of the people was ever increasing, while their oppressors were being struck down. The population of the country was still Saxon; they had been subdued, but had not been driven forth from the land, like the Britons in former invasions. The English language was still the common speech of the people; and Norman blood was being mingled with the broader stream of Saxon life. A continuous nationality was thus preserved, and was outgrowing the foreign element.

The Crown was weakened by disputed successions and foreign wars, and the baronage by the blood-stained fields of civil warfare; while both in turn looked to the people in their troubles. Meanwhile the Church was struggling, alike against the Crown and the barons, in defence of its ecclesiastical privileges and temporal possessions. Its clergy were brought by their spiritual ministrations into close relations with the people, and their culture contributed to the intellectual growth of English society. When William Rufus was threatened by his armed barons he took counsel with Archbishop Lanfranc, and promised good laws and justice to the people. His promises were broken; but, like later charters, as lightly set aside, they were a recognition of the political rights of the people. By the charter of Henry I. restoring to the people the laws of Edward the Confessor, the continuity of English institutions was acknowledged; and this concession was also proclaimed through Archbishop Anselm, the church and the people being again associated with the Crown against the barons. And throughout his reign the clergy and the English people were cordially united in support of the Crown. In the anarchic reign of Stephen—also distinguished by its futile charters—the clergy were driven into opposition to the king, while his oppressions alienated the people. Henry II. commenced his reign with another charter, which may be taken as a profession of good intentions on the part of the new king. So strong-willed a king, who could cripple his too powerful nobles, and forge shackles for the Church, was not predisposed to extend the liberties of his people; but they supported him loyally in his critical struggles; and his vigorous reforms in the administrative, judicial and financial organization of his realm promoted the prosperity and political influence of the Commons. At the same time the barons created in this and the two previous reigns, being no longer exclusively Norman in blood and connexion, associated themselves more readily with the interests and sympathies of the people. Under Richard I. the principle of representation was somewhat advanced, but it was confined to the assessment and collection of taxes in the different shires.

Magna Carta (*q.v.*).—It was under King John that the greatest progress was made in national liberties. The loss of Normandy served to draw the baronage closer to the English people; and the king soon united all the forces of the realm against him. He outraged the Church, the barons and the people. He could no longer play one class against another; and they combined to extort the Great Charter of their liberties at Runnymede (1215). It was there ordained that no scutage or aid, except the three regular feudal aids, should be imposed, save by the common council of the realm. To this council the archbishops, bishops, abbots, earls and greater barons were to be summoned personally by the king's letters, and tenants in chief by a general writ through the sheriff. The summons was required to appoint a certain place, to give 40 days' notice at least, and to state the cause of meeting. At length we seem to reach some approach to modern usage.

Growth of the Commons.—The improved administration of successive kings had tended to enlarge the powers of the Crown. But one hundred and fifty years had now passed since the Conquest, and great advances had been made in the condition of the people, and more particularly in the population, wealth and self-government of towns. Many had obtained royal charters, elected their own magistrates, and enjoyed various commercial privileges. They were already a power in the state, which was soon to be more distinctly recognized.

The charter of King John was again promulgated under Henry III., for the sake of a subsidy: and henceforth the Commons learned to insist upon the redress of grievances in return for a grant of money. This reign was memorable in the history of parliament.[1] Again the king was in conflict with his barons, who rebelled against his gross misgovernment of the realm. Simon de Montfort, earl of Leicester, was a patriot in advance of his age and fought for the English people as well as for his own order. The barons, indeed, were doubtful allies of the popular cause, and leaned to the king rather than to Simon. But the towns, the clergy, the universities and large bodies of the commonalty rallied round him, and he overthrew the king and his followers at Lewes. He was now master of the realm, and proclaimed a new constitution. Kings had made promises, and granted illusory charters; but the rebel earl called an English parliament (1265) into being. Churchmen were on his side, and a few barons; but his main reliance was upon the Commons. He summoned to a national council, or parliament, bishops, abbots, earls and barons, together with two knights from every shire and two burgesses from every borough. Knights had indeed been summoned to former councils; but never until now had delegates from the towns been invited to sit with bishops, barons and knights of the shire.

In the reign of Edward I. parliament assumed substantially its present form of king, lords and commons. The irregular and unauthorized scheme of Simon de Montfort was fully adopted; and in 1295 the king summoned to a parliament two knights from every shire chosen by the freeholders at the shire court, and two burgesses from every city, borough and leading town.[1] The rebel earl had enlarged the basis of the national council; and, to secure popular support, the politic king accepted it as a convenient instrument of taxation. The knights and freeholders had increased in numbers and wealth; and the towns, continually advancing in population, trade and commerce, had become valuable contributors to the revenue of the state. The grant of subsidies to the Crown, by the assembled baronage and representatives of the shires and towns, was a legal and comprehensive impost upon the entire realm.

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[1] In 1254 we have a distinct case of two knights summoned from each shire by royal writ. A war was going on in Gascony, and the king wanted money. He called the barons and asked if they would provide the necessary funds. The barons said that unfortunately the minor gentry were exceedingly unwilling to contribute, and the king sent to ask that two knights from each shire might be sent up to consult with him. In the result, the Commons refused to grant a subsidy, and the king had to fall back on the Church; but though the summoning of the knights of the shire was in form a small change from the previous practice of sending some one down to the counties to put pressure on them, the innovation is important as the first occasion on which their representatives met in a central assembly.—[H. Ch.]

Secession of the Clergy.—It formed part of Edward's policy to embrace the clergy in his scheme for the representation of all orders and classes of his subjects. They were summoned to attend the parliament of 1295 and succeeding parliaments of his reign, and their form of summons has been continued until the present time; but the clergy resolutely held aloof from the national council, and insisted upon voting their subsidies in their own convocations of Canterbury and York. The bishops retained their high place among the earls and barons, but the clergy sacrificed to ecclesiastical jealousies the privilege of sharing in the political councils of the state. As yet, indeed, this privilege seemed little more than the voting of subsidies, but it was soon to embrace the redress of grievances and the framing of laws for the general welfare of the realm. This great power they forfeited; and who shall say how it might have been wielded, in the interests of the Church, and in the legislation of their country? They could not have withstood the Reformation; they would have been forced to yield to the power of the Crown and the heated resolution of the laity; but they might have saved a large share of the endowments of the Church, and perhaps have modified the doctrines and formularies of the reformed establishment.

Reluctance of the Commons to Attend.—Meanwhile the Commons, unconscious of their future power, took their humble place in the great council of the realm. The knights of the shire, as lesser barons, or landowners of good social standing, could sit beside the magnates of the land without constraint; but modest traders from the towns were overawed by the power and dignity of their new associates. They knew that they were summoned for no other purpose than the taxing of themselves and their fellow townsmen; their attendance was irksome; it interrupted their own business; and their journeys exposed them to many hardships and dangers. It is not surprising that they should have shrunk from the exercise of so doubtful a privilege. Considerable numbers absented themselves from a thankless service; and their constituents, far from exacting the attendance of their members, as in modern times, begrudged the sorry stipend of 2s. a day, paid to their representatives while on duty, and strove to evade the burden imposed upon them by the Crown. Some even purchased charters, withdrawing franchises which they had not yet learned to value. Nor, in truth, did the representation of towns at this period afford much protection to the rights and interests of the people. Towns were enfranchised at the will or caprice of the Crown and the sheriffs; they could be excluded at pleasure; and the least show of independence would be followed by the omission of another writ of summons. But the principle of representation (*q.v.*), once established, was to be developed with the expansion of society; and the despised burgesses of Edward I., not having seceded, like the clergy, were destined to become a potential class in the parliaments of England.

Sitting of Parliament at Westminster.—Another constitutional change during this reign was the summoning of parliament to Westminster instead of to various towns in different parts of the country. This custom invested parliament with the character of a settled institution, and constituted it a high court for the hearing of petitions and the redress of grievances. The growth of its judicature, as a court of appeal, was also favoured by the fixity of its place of meeting.

Authority of Parliament recognized by Law.—Great was the power of the Crown, and the king himself was bold and statesmanlike; but the union of classes against him proved too strong for prerogative. In 1297, having outraged the Church, the barons, and the Commons, by illegal exactions, he was forced to confirm the Great Charter and the Charter of Forests, with further securities against the taxation of the people without their consent and, in return, obtained timely subsidies from the parliament. Henceforth the financial necessities of a succession of kings ensured the frequent assembling of parliaments. Nor were they long contented with the humble function of voting subsidies, but boldly insisted on the redress of grievances and further securities for national liberties. In 1322 it was declared by statute 15 Edw. II. that "the matters to be established for the estate of the king and of his heirs, and for the estate of the realm and of the people, should be treated, accorded, and established in parliament, by the king, and by the assent of the prelates, earls and barons, and the commonalty of the realm, according as had been before accustomed." The constitutional powers of parliament as a legislature were here amply recognized—not by royal charter, or by the occasional exercise of prerogative, but by an authoritative statute. And these powers were soon to be exercised in a striking form. Already parliament had established the principle that the redress of grievances should have precedence of the grant of subsidies; it had maintained the right of approving councillors of the Crown, and punishing them for the abuse of their powers; and in 1327 the king himself was finally deposed, and the succession of his son, Edward III., declared by parliament.

Union of Knights of the Shire and Burgesses.—At this period the constitution of parliament was also settling down to its later and permanent shape. Hitherto the different orders or estates had deliberated separately, and agreed upon their several grants to the Crown. The knights of the shire were naturally drawn, by social ties and class interests, into alliance with the barons; but at length they joined the citizens and burgesses, and in the first parliament of Edward III. they are found sitting together as "the Commons."

This may be taken as the turning point in the political history of England. If all the landowners of the country had become united as an order of nobles, they might have proved too strong for the development of national liberties, while the union of the country gentlemen with the burgesses formed an estate of the realm which was destined to prevail over all other powers. The withdrawal of the clergy, who would probably have been led by the bishops to take part with themselves and the barons, further strengthened the united Commons.

Increasing Influence of Parliament.—The reign of Edward III. witnessed further advances in the authority of parliament, and changes in its constitution. The king, being in continual need of subsidies, was forced to summon parliament every year, and in order to encourage its liberality he frequently sought its advice upon the most important issues of peace or war, and readily entertained the petitions of the Commons praying for the redress of grievances. During this reign also, the advice and consent of the Commons, as well as of the Lords spiritual and temporal, was regularly recorded in the enacting part of every statute.

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[1] It now appears that substantially this was effected as early as 1275. The transition period between Simon de Montfort's parliament of 1265 and the "model parliament" of 1295 was long a puzzle to historical students, since, except for two provincial councils in 1283, no trace was found in the records, between 1265 and 1295, of the representation—of cities or boroughs, or of representation of the counties between 1275 and 1290. But in 1910 Mr C. Hilary Jenkinson (see *English Historical Review*, for April) found in the Record Office some old documents which proved to be fragments of three writs and of returns of members for the Easter parliament of 1275. They make it certain that knights of the shire were then present, and that burgesses and citizens were summoned (not as in 1265 through the mayors, but as since 1295 through the sheriffs). The importance of the 1295 parliament thus appears to be smaller in English constitutional history, the full reforms appearing to have been adopted 20 years earlier. It is noteworthy, however, that in the writs of 1275 the instruction to the sheriff is "venire facias," not "eligi facias."—[H. Ch.]

Separation of the Two Houses.—But a more important event is to be assigned to this reign,—the formal separation of parliament into the two houses of Lords and Commons. There is no evidence—nor is it probable—that the different estates ever voted together as a single assembly. It appears from the rolls of parliament that in the early part of this reign, the causes of summons having been declared to the assembled estates, the three estates deliberated separately, but afterwards delivered a collective answer to the king. While their deliberations were short they could be conducted apart, in the same chamber; but, in course of time, it was found convenient for the Commons to have a chamber of their own, and they adjourned their sittings to the chapter-house of the abbot of Westminster, where they continued to be held after the more formal and permanent separation had taken place. The date of this event is generally assigned to the 17th Edward III.

The Commons as Petitioners.—Parliament had now assumed its present outward form. But it was far from enjoying the authority which it acquired in later times. The Crown was still paramount; the small body of earls and barons—not exceeding 40—were connected with the royal family, or in the service of the king, or under his influence; the prelates, once distinguished by their independence, were now seekers of royal favour; and the Commons, though often able to extort concessions in return for their contributions to the royal exchequer, as yet held an inferior position among the estates of the realm. Instead of enjoying an equal share in the framing of laws, they appeared before the king in the humble guise of petitioners. Their petitions, together with the king's answers, were recorded in the rolls of parliament; but it was not until the parliament had been discharged from attendance that statutes were framed by the judges and entered on the statute rolls. Under such conditions legislation was, in truth, the prerogative of the Crown rather than of parliament. Enactments were often found in the statutes at variance with the petitions and royal answers, and neither prayed for by the Commons nor assented to by the Lords. In vain the Commons protested against so grave an abuse of royal authority; but the same practice was continued during this and succeeding reigns. Henry V., in the second year of his reign, promised "that nothing should be enacted to the petitions of the Commons, contrary to their asking, whereby they should be bound without their assent;" but, so long as the old method of framing laws was adhered to, there could be no security against abuse; and it was not until the reign of Henry VI. that the introduction of the more regular system of legislating by bill and statute ensured the thorough agreement of all the estates in the several provisions of every statute.

Increasing Boldness of the Commons.—The Commons, however, notwithstanding these and other discouragements, were constantly growing bolder in the assertion of their rights. They now ventured to brave the displeasure of the king, without seeking to shelter themselves behind powerful barons, upon whose forwardness in the national cause they could not reckon. Notably in 1376 their stout Speaker, Peter de la Mare, inveighed, in their name, against the gross mismanagement of the war, impeached ministers of the realm, complained of the heavy burdens under which the people suffered, and even demanded that a true account should be rendered of the public expenditure. The brave Speaker was cast into prison, and a new parliament was summoned which speedily reversed the resolutions of the last. But the death of the king changed the aspect of affairs. Another parliament was called, when it was found that the spirit of the Commons was not subdued. Peter de la Mare was released from prison, and again elected to the chair. The demands of the former parliament were reiterated with greater boldness and persistence, the evil councillors of the late reign were driven out, and it was conceded that the principal officers of state should be appointed and removed, during the minority of Richard II., upon the advice of the lords. The Commons also insisted upon the annual assembling of parliament under the stringent provisions of a binding law. They claimed the right, not only of voting subsidies, but of appropriating them, and of examining public accounts. They inquired into public abuses, and impeached ministers of the Crown. Even the king himself was deposed by the parliament. Thus during this reign all the great powers of parliament were asserted and exercised. The foreign wars of Henry IV. and Henry V., by continuing the financial necessities of the Crown, maintained for a while the powers which parliament had acquired by the struggles of centuries.

Relapse of Parliamentary Influence.—But a period of civil wars and disputed successions was now at hand, which checked the further development of parliamentary liberties. The effective power of a political institution is determined, not by assertions of authority, nor even by its legal recognition, but by the external forces by which it is supported, controlled or overborne. With the close of the Wars of the Roses the life of parliament seems to have well-nigh expired.

To this constitutional relapse various causes contributed at the same period. The Crown had recovered its absolute supremacy. The powerful baronage had been decimated on the battlefield and the scaffold; and vast estates had been confiscated to the Crown. Kings had no longer any dread of their prowess as defenders of their own order or party, or as leaders of the people. The royal treasury had been enriched by their ruin; while the close of a long succession of wars with France and Scotland relieved it of that continual drain which had reduced the Crown to an unwelcome dependence upon parliament. Not only were the fortunes of the baronage laid low, but feudalism was also dying out in England as on the continent. It was no longer a force which could control the Crown; and it was being further weakened by changes in the art of war. The mailed horseman, the battle-axe and cross-bow of the burgher and yeoman, could not cope with the cannon and arquebus of the royal army.

In earlier times the Church had often stood forth against the domination of kings, but now it was in passive submission to the Throne. The prelates were attracted to the court, and sought the highest offices of state; the inferior clergy had long been losing their influence over the laity by their ignorance and want of moral elevation at a period of increasing enlightenment; while the Church at large was weakened by schisms and a wider freedom of thought. Hence the Church, like the baronage, had ceased to be a check upon the Crown.

Meanwhile what had become of the ever-growing power of the Commons? It is true they had lost their stalwart leaders, the armed barons and outspoken prelates, but they had themselves advanced in numbers, riches and enlightenment; they had overspread the land as knights and freeholders, or dwelt in populous towns enriched by merchandise. Why could they not find leaders of their own? Because they had lost the liberal franchises of an early age. All freeholders, or suitors present at the county court, were formerly entitled to vote for a knight of the shire; but in the eighth year of Henry VI. (1430) an act was passed (c. 37) by which this right was confined to 40s. freeholders, resident in the county. Large numbers of electors were thus disfranchised. In the view of parliament they were "of no value," and complaints had been made that they were under the influence of the nobles and greater landowners; but a popular element had been withdrawn from the county representation, and the restricted franchise cannot have impaired the influence of the nobles.

As for the cities and boroughs, they had virtually renounced their electoral privileges. As we have seen, they had never valued them very highly; and now by royal charters, or by the usurpation of small self-elected bodies of burgesses, the choice of members had fallen into the hands of town councils and neighbouring landowners. The anomalous system of close and nomination boroughs, which had arisen thus early in English history, was suffered to continue without a check for four centuries, as a notorious blot upon a free constitution.

All these changes exalted the prerogatives of the Crown. Amid the clash of arms and the strife of hostile parties the voice of parliament had been stifled; and, when peace was restored, a powerful king could dispense with an assembly which might prove troublesome, and from whom he rarely needed help. Hence for a period of two hundred years, from the reign of Henry VI. to that of Elizabeth, the free parliaments of England were in abeyance. The institution retained its form and constituent parts; its rights and privileges were theoretically recognized, but its freedom and national character were little more than shadows.

The Three Estates of the Realm.—This check in the fortunes of parliament affords a fitting occasion for examining the composition of each of the three estates of the realm.

Lords Spiritual and Temporal.—The archbishops and bishops had held an eminent position in the councils of Saxon and Norman kings, and many priors and abbots were from time to time associated with them as lords spiritual, until the suppression of the monasteries by Henry VIII. They generally outnumbered their brethren, the temporal peers, who sat with them in the same assembly.

The lords temporal comprised several dignities. Of these the baron, though now the lowest in rank, was the most ancient. The title was familiar in Saxon times, but it was not until after the Norman Conquest that it was invested with a distinct feudal dignity. Next in antiquity was the earl, whose official title was known to Danes and Saxons, and who after the Conquest obtained a dignity equivalent to that of count in foreign states. The highest dignity, that of duke, was not created until Edward III. conferred it upon his son, Edward the Black Prince. The rank of marquess was first created by Richard II., with precedence after a duke. It was in the reign of Henry VI. that the rank of viscount was created, to be placed between the earl and the baron. Thus the peerage consisted of the five dignities of duke, marquess, earl, viscount and baron. During the 15th century the number of temporal peers summoned to parliament rarely exceeded fifty, and no more than twenty-nine received writs of summons to the first parliament of Henry VII. There were only fifty-nine at the death of Queen Elizabeth. At the accession of William III. this number had been increased to about one hundred and fifty.

Life Peerages.—The several orders of the peerage are alike distinguished by the hereditary character of their dignities. Some life peerages, indeed, were created between the reigns of Richard II. and Henry VI., and several ladies had received life peerages between the reigns of Charles II. and George II. The highest authorities had also held that the creation of life peerages was within the prerogative of the Crown. But four hundred years had elapsed since the creation of a life peer, entitled to sit in parliament, when Queen Victoria was advised to create Sir James Parke, an eminent judge, a baron for life, under the title of Lord Wensleydale. The object of this deviation from the accustomed practice was to strengthen the judicature of the House of Lords, without unduly enlarging the numbers of the peerage. But the Lords at once took exception to this act of the Crown, and, holding that a prerogative so long disused could not be revived, in derogation of the hereditary character of the peerage, resolved that Lord Wensleydale was not entitled by his letters patent and writ of summons to sit and vote in parliament. His lordship accordingly received a new patent, and took his seat as an hereditary peer. But the necessity of some such expedient for improving the appellate jurisdiction of the House of Lords could not be contested; and in 1876 three lords of appeal in ordinary were constituted by statute, enjoying the rank of baron for life, and the right of sitting and voting in the House of Lords so long as they continue in office.

The Commons.—The Commons formed a more numerous body. In the reign of Edward I. there were about 275 members, in that of Edward III. 250, and in that of Henry VI. 300. In the reign of Henry VIII. parliament added 27 members for Wales and four for the county and city of Chester, and in the reign of Charles II. 4 for the county and city of Durham. Between the reigns of Henry VIII. and Charles II. 130 members were also added by royal charter.

Parliament under Henry VIII.—To resume the history of parliament at a later period, let us glance at the reign of Henry VIII. Never had the power of the Crown been greater than when this king succeeded to the throne, and never had a more imperious will been displayed by any king of England. Parliament was at his feet to do his bidding, and the Reformation enormously increased his power. He had become a pope to the bishops; the old nobles who had resisted his will had perished in the field or on the scaffold; the new nobles were his creatures; and he had the vast wealth of the Church in his hands as largesses to his adherents. Such was the dependence of parliament upon the Crown and its advisers during the Reformation period that in less than thirty years four vital changes were decreed in the national faith. Each of the successive reigns inaugurated a new religion.

Queen Elizabeth and her Parliaments.—With the reign of Elizabeth commenced a new era in the life of parliament. She had received the royal prerogatives unimpaired, and her hand was strong enough to wield them. But in the long interval since Edward IV. the entire framework of English society had been changed; it was a new England that the queen was called upon to govern. The coarse barons of feudal times had been succeeded by English country gentlemen, beyond the influence of the court, and identified with all the interests and sympathies of their country neighbours. From this class were chosen nearly all the knights of the shire, and a considerable proportion of the members for cities and boroughs. They were generally distinguished by a manly independence, and were prepared to uphold the rights and privileges of parliament and the interests of their constituents. A change no less remarkable had occurred in other classes of society. The country was peopled with yeomen and farmers, far superior to the cultivators of the soil in feudal times; and the towns and seaports had grown into important centres of commerce and manufactures. Advances not less striking had been made in the enlightenment and culture of society. But, above all, recent religious revolutions had awakened a spirit of thought and inquiry by no means confined to questions of faith. The Puritans, hostile to the Church, and jealous of every semblance of Catholic revival, were embittered against the state, which was identified, in their eyes, with many ecclesiastical enormities; and stubborn temper was destined to become a strong motive force in restoring the authority of parliament.

The parliaments of Elizabeth, though rarely summoned, displayed an unaccustomed spirit. They discussed the succession to the Crown, the marriage of the queen, and ecclesiastical abuses; they upheld the privileges of the Commons and their right to advise the Crown upon all matters of state; and they condemned the grant of monopolies. The bold words of the Wentworths and Yelvertons were such as had not been heard before in parliament. The conflicts between Elizabeth and the Commons marked the revival of the independence of parliament, and foreshadowed graver troubles at no distant period.

Conflicts of James I. with the Commons.—James I., with short-sighted pedantry, provoked a succession of conflicts with the Commons, in which abuses of prerogative were stoutly resisted and the rights and privileges of parliament resolutely asserted. The "remonstrance" of 1610 and the "protestation" of 1621 would have taught a politic ruler that the Commons could no longer be trifled with; but those lessons were lost upon James and upon his ill-fated son.

Charles I. and the Commonwealth.—The momentous struggles between Charles I. and his parliaments cannot be followed in this place. The earlier parliaments of this reign fairly represented the earnest and temperate judgment of the country. They were determined to obtain the redress of grievances and to restrain undue prerogatives; but there was no taint of disloyalty to the Crown; there were no dreams of revolution. But the contest at length became embittered, until there was no issue but the arbitrament of the sword. The period of the Great Rebellion and the Commonwealth proved the supreme power of the Commons, when supported by popular forces. Everything gave way before them. They raised victorious armies in the field, they overthrew the Church and the House of Lords, and they brought the king himself to the scaffold. It also displayed the impotence of a parliament which has lost the confidence of the country, or is overborne by mobs, by an army, or by the strong will of a dictator.

Political Agitation of this Period.—It is to this time of fierce political passions that we trace the origin of political agitation as an organized method of influencing the deliberations of parliament. The whole country was then aroused by passionate exhortations from the pulpit and in the press. No less than thirty thousand political tracts and newspapers during this period have been preserved. Petitions to parliament were multiplied in order to strengthen the hands of the popular leaders. Clamorous meetings were held to stimulate or overawe parliament. Such methods, restrained after the Restoration, have been revived in later times, and now form part of the acknowledged system of parliamentary government.

Parliament after the Restoration.—On the restoration of Charles II. parliament was at once restored to its old constitution, and its sittings were revived as if they had suffered no interruption. No outward change had been effected by the late revolution; but that a stronger spirit of resistance to abuses of prerogative had been aroused was soon to be disclosed in the deposition of James II. and "the glorious revolution" of 1688. At this time the full rights of parliament were explicitly declared, and securities taken for the maintenance of public liberties. The theory of a constitutional monarchy and a free parliament was established; but after two revolutions it is curious to observe the indirect methods by which the Commons were henceforth kept in subjection to the Crown and the territorial aristocracy. The representation had long become an illusion. The knights of the shire were the nominees of nobles and great landowners; the borough members were returned by the Crown, by noble patrons or close corporations; even the representation of cities, with greater pretensions to independence, was controlled by bribery. Nor were rulers content with their control of the representation, but, after the Restoration, the infamous system of bribing the members themselves became a recognized instrument of administration. The country gentlemen were not less attached to the principles of rational liberty than their fathers, and would have resisted further encroachments of prerogatives; but they were satisfied with the Revolution settlement and the remedial laws of William III., and no new issue had yet arisen to awaken opposition. Accordingly, they ranged themselves with one or other of the political parties into which parliament was now beginning to be divided, and bore their part in the more measured strifes of the 18th century. From the Revolution till the reign of George III. the effective power of the state was wielded by the Crown, the Church and the territorial aristocracy; but the influence of public opinion since the stirring events of the 17th century had greatly increased. Both parties were constrained to defer to it; and, notwithstanding the flagrant defects in the representation, parliament generally kept itself in accord with the general sentiments of the country.

Union of Scotland.—On the union of Scotland in 1707 important changes were made in the constitution of parliament. The House of Lords was reinforced by the addition of sixteen peers, representing the peerage of Scotland, and elected every parliament; and the Scottish peers, as a body, were admitted to all the privileges of peerage, except the right of sitting in parliament or upon the trial of peers. No prerogative, however, was given to the Crown to create new peerages after the union; and, while they are distinguished by their antiquity, their number is consequently decreasing. To the House of Commons were assigned forty-five members, representing the shires and burghs of Scotland.

Parliament under George III.—With the reign of George III. there opened a new period in the history of parliament. Agitation in its various forms, an active and aggressive press, public meetings and political associations, the free use of the right of petition, and a turbulent spirit among the people seriously changed the relations of parliament to the country. And the publication of debates, which was fully established in 1771, at once increased the direct responsibility of parliament to the people, and ultimately brought about other results, to which we shall presently advert.

Union of Ireland.—In this reign another important change was effected in the constitution of parliament. Upon the union with Ireland, in 1801, four Irish bishops were added to the lords spiritual, who sat by rotation of sessions, and represented the episcopal body of the Church of Ireland. But those bishops were deprived of their seats in parliament in 1869, on the disestablishment of the Church of Ireland. Twenty-eight representative peers, elected for life by the peerage of Ireland, were admitted to the House of Lords. All the Irish peers were also entitled to the privilege of peerage. In two particulars the Irish peerage was treated in a different manner from the peerage of Scotland. The Crown was empowered to create a new Irish peerage whenever three Irish peerages in existence at the time of the Union have become extinct, or when the number of Irish peers, exclusive of those holding peerages of the United Kingdom, has been reduced to one hundred. And, further, Irish peers were permitted to sit in the House of Commons for any place in Great Britain, forfeiting, however, the privilege of peerage while sitting in the lower house.

At the same time one hundred representatives of Ireland were added to the House of Commons. This addition raised the number of members to six hundred and fifty-eight. Parliament now became the parliament of the United Kingdom.

Schemes for Improving the Representation.—By the union of Scotland and Ireland the electoral abuses of those countries were combined with those of England. Notwithstanding a defective representation, however, parliament generally sustained its position as fairly embodying the political sentiments of its time. Public opinion had been awakened, and could not safely be ignored by any party in the state. Under a narrow and corrupt electoral system the ablest men in the country found an entrance into the House of Commons; and their rivalry and ambition ensured the acceptance of popular principles and the passing of many remedial measures. As society expanded, and new classes were called into existence, the pressure of public opinion upon the legislature was assuming a more decisive character. The grave defects of the representation were notorious, and some minor electoral abuses had been from time to time corrected. But the fundamental evils—nomination boroughs, limited rights of election, the sale of seats in parliament, the prevalence of bribery, and the enormous expense of elections—though constantly exposed, long held their ground against all assailants. So far back as 1770 Lord Chatham had denounced these flagrant abuses. "Before the end of this century," he said, "either the parliament will reform itself from within, or be reformed with a vengeance from without." In 1782, and again in 1783 and 1785, his distinguished son, William Pitt, condemned the abuses of the representation, and proposed schemes of parliamentary reform. In 1793 Mr Grey (afterwards Earl Grey) submitted a motion on the same subject; but the excesses of the French Revolution, political troubles at home, and exhausting wars abroad discouraged the supporters of reform for many years. Under more favourable conditions the question assumed greater proportions. Lord John Russell especially distinguished himself in 1820, and in several succeeding years, by the able exposure of abuses and by temperate schemes of reform. His efforts were assisted by the scandalous disclosures of bribery at Grampound, Penryn and East Retford. All moderate proposals were rejected; but the concurrence of a dissolution, on the death of George IV., with the French Revolution in 1830, and an ill-timed declaration of the duke of Wellington that the representation was perfect and could not be improved, suddenly precipitated the memorable crisis of parliamentary reform. It now fell to the lot of Earl Grey, as premier, to be the leader in a cause which he had espoused in his early youth.

The Reform Acts of 1832.—The result of the memorable struggle which ensued may be briefly told. By the Reform Acts of 1832 the representation of the United Kingdom was reconstructed. In England, fifty-six nomination boroughs returning one hundred and eleven members were disfranchised; thirty boroughs were each deprived of one member, and Weymouth and Melcombe Regis, which had returned four members, were now reduced to two. Means were thus found for the enfranchisement of populous places. Twenty-two large towns, including metropolitan districts, became entitled to return two members, and twenty less considerable towns acquired the right of returning one member each. The number of county members was increased from ninety-four to one hundred and fifty-nine, the larger counties being divided for the purposes of representation.

The elective franchise was also placed upon a new basis. In the boroughs a £10 household suffrage was substituted for the narrow and unequal franchises which had sprung up—the rights of freemen, in corporate towns, being alone respected. In the counties, copyholders and leaseholders for terms of years, and tenants at will paying a rent of £50 a year, were added to the 40s. freeholders.

By the Scottish Reform Act the number of members representing Scotland was increased from forty-five, as arranged at the union, to fifty-three, of whom thirty were assigned to counties and twenty-three to cities and burghs. In counties the franchise was conferred upon owners of property of £10 a year, and certain classes of leaseholders; in burghs, upon £10 householders, as in England.

By the Irish Reform Act, no boroughs, however small, were disfranchised; but the franchise was given to £10 householders, and county constituencies were enlarged. These franchises, however, were extended in 1850, when an £8 household suffrage was given to the boroughs, and additions were made to the county franchises. The hundred members assigned to that country at the union were increased to one hundred and five. Notwithstanding these various changes, however, the total number of the House of Commons was still maintained at six hundred and fifty-eight.

The legislature was now brought into closer relations with the people, and became more sensitive to the pressure of popular forces. The immediate effects of this new spirit were perceptible in the increased legislative activity of the reformed parliament, its vigorous grappling with old abuses, and its preference of the public welfare to the narrower interests of classes. But, signal as was the regeneration of parliament, several electoral evils still needed correction. Strenuous efforts were made, with indifferent success, to overcome bribery and corruption, and proposals were often ineffectually made to restrain the undue influence of landlords and employers of labour by the ballot; improvements were made in the registration and polling of electors, and the property qualification of members was abolished. Complaints were also urged that the middle classes had been admitted to power, while the working classes were excluded from the late scheme of enfranchisement. It was not till 1867 however that any substantial advance was made.

Increased Power of the Commons.—Prior to the reign of Charles I. the condition of society had been such as naturally to subordinate the Commons to the Crown and the Lords. After the Revolution of 1688 society had so far advanced that, under a free representation, the Commons might have striven with both upon equal terms. But, as by far the greater part of the representation was in the hands of the king and the territorial nobles, the large constitutional powers of the Commons were held safely in check. After 1832, when the representation became a reality, a corresponding authority was asserted by the Commons. For several years, indeed, by reason of the weakness of the Liberal party, the Lords were able successfully to resist the Commons upon many important occasions; but it was soon acknowledged that they must yield whenever a decisive majority of the Commons, supported by public opinion, insisted upon the passing of any measure, however repugnant to the sentiments of the upper house. And it became a political axiom that the Commons alone determined the fate of ministries.

Later Measures of Reform.—In 1852, and again in 1854, Lord John Russell introduced measures of parliamentary reform; but constitutional changes were discouraged by the Crimean War. In 1859 Lord Derby's Conservative government proposed another scheme of reform, which was defeated; and in 1860 Lord John Russell brought in another bill, which was not proceeded with; and the question of reform continued in abeyance until after the death of Lord Palmerston. Earl Russell, who succeeded him as premier, was prompt to redeem former pledges, and hastened to submit to a new parliament, in 1866, another scheme of reform. This measure, and the ministry by whom it was promoted, were overthrown by a combination of the Conservative opposition and the memorable "cave" of members of the Liberal party. But the popular sentiment in favour of reform, which had for some years been inert, was suddenly aroused by the defeat of a Liberal ministry and the triumph of the party opposed to reform. Lord Derby and his colleagues were now constrained to undertake the settlement of this embarrassing question; and by a strange concurrence of political events and party tactics a scheme far more democratic than that of the Liberal government was accepted by the same parliament, under the auspices of a Conservative ministry.

The Reform Acts of 1867–1868.—By the English Reform Act of 1867 four corrupt boroughs were disfranchised, and thirty-eight boroughs returning two members were henceforth to return one only. A third member was given to Manchester, Liverpool, Birmingham and Leeds; a second member to Merthyr Tydfil and Salford; the Tower Hamlets were divided into two boroughs, each returning two members; and ten new boroughs were created, returning one member each, with the exception of Chelsea, to which two were assigned. By these changes twenty-six seats were taken from boroughs, while a member was given to the university of London. But before this act came into operation seven other English boroughs were disfranchised by the Scottish Reform Act of 1868, these seats being given to Scotland. Thirteen new divisions of counties were erected, to which twenty-five members were assigned. In counties the franchise of copyholders and leaseholders was reduced from £10 to £5, and the occupation franchise from £50 to £12. In boroughs the franchise was extended to all occupiers of dwelling-houses rated to the poor-rates, and to lodgers occupying lodgings of the annual value of £10 unfurnished.

By the Scottish Reform Act of 1868, the number of members representing Scotland was increased from fifty-three to sixty—three new members being given to the shires, two to the universities, and two to cities and burghs. The county franchise was extended to owners of lands and heritages of £5 yearly value, and to occupiers of the rateable value of £14; and the burgh franchise to all occupiers of dwelling-houses paying rates, and to tenants of lodgings of £10 annual value unfurnished.

By the Irish Reform Act of 1868 no change was made in the number of members nor in the distribution of seats; but the boroughs of Sligo and Cashel, already disfranchised, were still left without representation. The county franchise was left unchanged; but the borough franchise was extended to occupiers of houses rated at £4, and of lodgings of the annual value of £10 unfurnished.

That these changes in the representation—especially the household suffrage in boroughs—were a notable advance upon the reforms of 1832, in the direction of democracy, cannot be questioned. The enlarged constituencies speedily overthrew the ministry to whom these measures were due; and the new parliament further extended the recent scheme of reform by granting to electors the protection of the ballot (*q.v.*), for which advanced reformers had contended since 1832. Nor was the existing representation long suffered to continue without question. First, it was proposed, in 1872, to extend the household franchise to counties, and this proposal found favour in the country and in the House of Commons; but, the Conservative party having been restored to power in 1874, no measure of that character could be promoted with any prospect of success. At the dissolution of 1880 a more general revision of the representation was advocated by leading members of the Liberal party, who were soon restored to power.

(T. E. M.; H. Ch.)

Acts of 1884–1885.—The Reform Act of 1884 was ultimately carried with the goodwill of both of the great political parties. The Conservatives resisted Mr Gladstone's attempt to carry a great extension of the franchise before he had disclosed his scheme of redistribution, and the bill was thrown out by the House of Lords in August 1884. But after a conference of Mr Gladstone with Lord Salisbury, to whom the whole scheme was confided, an agreement was reached, and the bill was passed in the autumn session. In the following session (1885) the Redistribution Act was passed.

A uniform household and lodger franchise was established in counties and boroughs. If a dwelling was held as part payment for service, the occupier was not deprived of his vote because his home was the property of his master. The obligation was thrown on the overseers of ascertaining whether any other man besides the owner was entitled to be registered as an inhabitant occupier, and the owner was bound to supply the overseers with information. The Registration Acts were otherwise widely amended. Polling-places were multiplied, so that little time need be lost in recording a vote. These and other beneficial changes went a long way towards giving a vote to every one who had a decent home. By the Redistribution of Seats Act 1885 all boroughs with less than 15,000 inhabitants ceased to return a member. These small towns were merged into their counties, and the counties were subdivided into a great number of single-member constituencies, so that the inhabitants of the disfranchised boroughs voted for the member for the division of the county in which they were situated. Boroughs with less than 50,000 inhabitants returning two members were in future to return only one, and towns of over 100,000 were divided into separate constituencies, and received additional members in proportion to their population. The members for the City of London were reduced to two, but Greater London, including Croydon, returned sixty. Divided Liverpool returned nine, Glasgow seven, Edinburgh, Dublin and Belfast each four, and so on. Six additional seats were given to England and twelve to Scotland, so that, allowing for a diminution by disfranchisement for corruption, the numbers of the House of Commons were raised to 670 members.

Results of Reform since 1832.—From a constitutional standpoint it is important to recognize the results of the successive Reform Acts on the working of parliament as regards the position of the executive on the one hand and the electorate on the other. Before 1832 the functions of ministers were mainly administrative, and parliament was able to deal much as it pleased with their rare legislative proposals without thereby depriving them of office. Moreover, since before that date ministers were, generally speaking, in fact as well as in theory appointed by the king, while the general confidence of the majority in the House of Commons followed the confidence not so much of the electorate as of the Crown, that house was able on occasions to exercise an effective control over foreign policy. Pitt, after 1784, was defeated several times on foreign and domestic issues, yet his resignation was neither expected nor desired. In 1788, when the regency of the prince of Wales appeared probable, and again in 1812, it was generally assumed that it would be in his power to dismiss his father's ministers and to maintain the Whigs in office without dissolving parliament. This system, while it gave to ministers security of tenure, left much effective freedom of action to the House of Commons. But the Reform Act of 1832 introduced a new order of things. In 1835 the result of a general election was for the first time the direct cause of a change of ministry, and in 1841 a House of Commons was elected for the express purpose of bringing a particular statesman into power. The electorate voted for Sir Robert Peel, and it would have been as impossible for the house then elected to deny him their support as it would be for the college of electors in the United States to exercise their private judgment in the selection of a president. As time went on, and the party system became more closely organized in the enlarged electorate, the voting power throughout the country came to exercise an increasing influence. The premier was now a party leader who derived his power in reality neither from the Crown nor from parliament, but from the electorate, and to the electorate he could appeal if deserted by his parliamentary majority. Unless it was prepared to drive him from the office in which it was elected to support him, that majority would not venture to defeat, or even seriously to modify, his legislative proposals, or to pass any censure on his foreign policy, for all such action would now be held to be equivalent to a vote of no confidence. From the passing of the Reform Act of 1867 down to 1900 (with a single exception due to the lowering of the franchise and the redistribution of seats) the electorate voted alternately for the rival party leaders, and it was the function of the houses elected for that purpose to pass the measures and to endorse the general policy with which those leaders were respectively identified. The cabinet (*q.v.*), composed of colleagues selected by the prime minister, had practically, though indirectly, become an executive committee acting on behalf of the electorate, that is to say, the majority which returned their party to office; and the House of Commons practically ceased to exercise control over ministers except in so far as a revolt in the party forming the majority could influence the prime minister, or force him to resign or dissolve. Meanwhile, the virtual identification of the electorate with the nation by the successive extensions of the franchise added immensely to its power, the chief limitation being supplied by the Septennial Act. The House of Lords, whatever its nominal rights, came henceforth in practice to exercise restriction rather on the House of Commons than on the will of the electorate, for the acquiescence of the upper house in the decision of the electors, when appealed to on a specific point of issue between the two houses, was gradually accepted by its leaders as a constitutional convention.

The history of parliament, as an institution, centres in this later period round two points, (A) the friction between Lords and Commons, resulting in proposals for the remodelling of the upper house, and (B) the changes in procedure within the House of Commons, necessitated by new conditions of work and the desire to make it a more business-like assembly. These two movements will be discussed separately.

A. *House of Lords Question.*—In the altered position of the House of Lords, the occasional checks given by it to the House of Commons were bound to cause friction with the representatives of the people. In the nature of things this was a matter of importance only when the Liberal party was in power and measures were proposed by the Liberal leaders which involved such extreme changes that the preponderantly Conservative upper house could amend or reject them with some confidence in its action being supported by the electorate. The frequent differences between the two houses during the parliament of 1880–1885, culminating in the postponement by the upper house of the Reform Bill, caused the status of that house to be much discussed during the general election of 1885, and proposals for its "mending or ending" to be freely canvassed on Radical platforms. On the 5th of March 1886 Mr Labouchere moved a resolution in the House of Commons condemning the hereditary principle. This was resisted by Mr Gladstone, then prime minister, on the ground that he had never supported an abstract resolution unless he was prepared to follow it up by action, and that the time for this had not arrived. On a division the motion was negatived by 202 votes against 166. The question of the constitution of the House of Lords was much agitated in 1888. The Conservatives were again in power, but many of them thought that it would be prudent to forestall by a moderate reform the more drastic remedies now openly advocated by their opponents. On the other hand, Radicals were disposed to resist all changes involving the maintenance of the hereditary principle, lest they should thereby strengthen the House of Lords. On the 9th of March Mr Labouchere again moved his resolution in the House of Commons. Mr W. H. Smith, the leader of the house, in resisting the motion, admitted that some changes were desirable, and agreed with a previous speaker that it was by the Conservatives that such changes ought to be effected. On the 19th of March in the same year Lord Rosebery, in the House of Lords, moved for a select committee to inquire into the subject. He took the opportunity to explain his own plan of reform. While he did not wish to abolish the hereditary principle, he desired that no peer, outside the Royal family, should be a member of the house by right of birth alone. To the representatives of the peers he proposed to add other men who had achieved distinction in a public career. He attached a high importance to the existence of a second chamber. His motion was negatived by 97 votes against 50. On the 26th of April Lord Dunraven withdrew a bill for the reform of the House of Lords on the promise of the government to deal with the matter, and on the 18th of June Lord Salisbury fulfilled this pledge. He introduced a bill on that day to provide for the creation of a limited number of life peers and for the exclusion of unworthy members from the house. Under this measure a maximum of five life-peerages in any one year might be created, but the total number was never to exceed fifty. In respect of three out of these five life-peers the choice of the Crown was restricted to judges, generals, admirals, ambassadors, privy councillors and ex-governors of colonies. The two additional life-peers were to be appointed in regard to some special qualification to be stated in the message to the house announcing the intention of the Crown to make the appointment. Power was also to be given to the house to expel members for the period of the current parliament by an address to the Crown praying that their writs of summons might be cancelled. The bill was read a second time on the 10th of July, but it met with a cold reception and was dropped. The only outcome of all that was written and said in this year was that in 1889, after the report of a select committee set up in 1888, the Lords made a few changes in their standing orders, among which the order establishing a quorum of thirty in divisions and those for the constitution of standing committees were the most important.

The parliament which met at Westminster in August 1892 was more democratic in its tendencies than any of its predecessors. At the beginning of the session of 1893, in the course of which the Home Rule Bill was passed by the House of Commons, government bills were introduced for quinquennial parliaments, for the amendment of registration, and for the limitation of each elector to a single vote. The introduction of these bills served merely as a declaration of government policy, and they were not further pressed. On the 24th of March a resolution in favour of payment of members was carried by 276 votes against 229, and again in 1895 by 176 to 158. But the rejection of the Home Rule Bill by the House of Lords, with the apparent acquiescence of the country, combined with the retirement of Mr Gladstone to weaken the influence of this House of Commons, and small importance was attached to its abstract resolutions. In the ensuing session of 1894 an amendment to the Address condemning the hereditary principle was moved by Mr Labouchere, and carried by 147 to 145. The government, however, holding that this was not the way in which a great question should be raised, withdrew the Address, and carried another without the insertion. In his last public utterance Mr Gladstone directed the attention of his party to the reform of the House of Lords, and Lord Rosebery endeavoured to concentrate on such a policy the energies of his supporters at the general election. But the result of the dissolution of 1895, showing, as it did, that on the chief political issue of the day the electorate had agreed with the House of Lords and had disagreed with the House of Commons, greatly strengthened the upper house, and after that date the subject was but little discussed until the Liberal party again came into power ten years later. The House of Lords claimed the right to resist changes made by the House of Commons until the will of the people had been definitely declared, and its defenders contended that its ultimate dependence on the electorate, now generally acknowledged, rendered the freedom from ministerial control secured to it by its constitution a national safeguard.

In 1907, under the Radical government of Sir H. Campbell-Bannerman (*q.v.*), the conflict between the Commons and the Lords again became more acute. And the prime minister in May obtained a large majority in the lower house for a resolution, on which a bill was to be founded, involving a complicated method of overriding the will of the Lords when the Commons had three times passed a bill. But no further immediate step was taken. In 1908 a strong committee of the House of Lords with Lord Rosebery as chairman, which had been appointed in consequence of the introduction by Lord Newton of a bill for reforming the constitution of the upper house, presented an interesting report in favour of largely restricting the hereditary element and adopting a method of selection.

So the question stood when in 1909 matters came to a head through the introduction of Mr Lloyd George's budget. It had always been accepted as the constitutional right of the House of Lords to reject a financial measure sent up by the Commons but not to amend it, but the rejection of the budget (which was, in point of form, referred to the judgment of the electorate) now precipitated a struggle with the Liberal party, who had persistently denied any right on the part of the upper house to force a dissolution. The Liberal leaders contended that, even if constitutional, the claim of the House of Lords to reject a budget was practically obsolete, and having been revived must now be formally abolished; and they went to the country for a mandate to carry their view into law. The elections of January 1910 gave an unsatisfactory answer, since the two principal parties, the Liberals and the Unionists, returned practically equal; but the Liberal government had also on their side the Irish Nationalist and the Labour parties, which gave them a majority in the House of Commons if they could concentrate the combined forces on the House of Lords question. This Mr Asquith contrived to do; and having introduced and carried through the House of Commons a series of resolutions defining his proposals, he had also tabled a bill which was to be sent up to the House of Lords, when the death of the king suddenly interrupted the course of the constitutional conflict, and gave a breathing-space for both sides to consider the possibility of coming to terms. In June Mr Asquith took the initiative in inviting the leaders of the Opposition to a conference with closed doors, and a series of meetings between four representatives of each side were begun. The government were represented by Mr Asquith, Mr Lloyd George, Mr Birrell and Lord Crewe. The Unionists were represented by Mr Balfour, Lord Lansdowne, Mr Austin Chamberlain and Lord Cawdor.

The situation on the Radical side at this juncture may be best understood by setting out the resolutions passed in the House of Commons, and the text of the parliament bill of which Mr Asquith had given notice:—

The Resolutions.—" 1. That it is expedient that the House of Lords be disabled by law from rejecting or amending a money bill, but that any such limitation by law shall not be taken to diminish or qualify the existing rights and privileges of the House of Commons.

" For the purpose of this resolution, a bill shall be considered a money bill if in the opinion of the Speaker it contains only provisions dealing with all or any of the following subjects—namely, the imposition, repeal, remission, alteration or regulation of taxation; charges on the Consolidated Fund or the provision of money by parliament; supply; the appropriation, control or regulation of public money; the raising or guarantee of any loan or the repayment thereof; or matters incidental to those subjects or any of them.

" 2. That it is expedient that the powers of the House of Lords, as respects bills other than money bills, be restricted by law, so that any such bill which has passed the House of Commons in three successive sessions and, having been sent up to the House of Lords at least one month before the end of the session, has been rejected by that house in each of those sessions, shall become law without the consent of the House of Lords, on the royal assent being declared: provided that at least two years shall have elapsed between the date of the first introduction of the bill in the House of Commons and the date on which it passes the House of Commons for the third time.

" For the purpose of this resolution a bill shall be treated as rejected by the House of Lords if it has not been passed by the House of Lords either without amendment or with such amendments only as may be agreed upon by both houses.

" 3. That it is expedient to limit the duration of parliament to five years."

The Parliament Bill, 1910.—" Whereas it is expedient that provision should be made for regulating the relations between the two Houses of Parliament: And whereas it is intended to substitute for the House of Lords as it at present exists a second chamber constituted on a popular instead of hereditary basis, but such substitution cannot be immediately brought into operation: And whereas provision will require hereafter to be made by parliament in a measure effecting such substitution for limiting and defining the powers of the new second-chamber, but it is expedient to make such provision as in this act appears for restricting the existing powers of the House of Lords: Be it therefore enacted by the king's most excellent majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present parliament assembled, and by the authority of the same, as follows:—

"1. (1) If a money bill, having been passed by the House of Commons, and sent up to the House of Lords at least one month before the end of the session, is not passed by the House of Lords without amendment within one month after it is so sent up to that house, the bill shall, unless the House of Commons direct to the contrary, be presented to His Majesty and become an act of parliament on the royal assent being signified, notwithstanding that the House of Lords have not consented to the bill.

"(2) A money bill means a bill which in the opinion of the Speaker of the House of Commons contains only provisions dealing with all or any of the following subjects—namely, the imposition, repeal, remission, alteration or regulation of taxation; charges on the consolidated fund or the provision of money by parliament; supply; the appropriation, control or regulation of public money; the raising or guarantee of any loan or the repayment thereof; or matters incidental to those subjects or any of them.

"(3) When a bill to which the House of Lords has not consented is presented to His Majesty for assent as a money bill, the bill shall be accompanied by a certificate of the Speaker of the House of Commons that it is a money bill.

"(4) No amendment shall be allowed to a money bill which, in the opinion of the Speaker of the House of Commons, is such as to prevent the bill retaining the character of a money bill.

"2. (1) If any bill other than a money bill is passed by the House of Commons in three successive sessions (whether of the same parliament or not), and, having been sent up to the House of Lords at least one month before the end of the session, is rejected by the House of Lords in each of those sessions, that bill shall, on its rejection for the third time by the House of Lords, unless the House of Commons direct to the contrary, be presented to His Majesty and become an act of parliament on the royal assent being signified thereto, notwithstanding that the House of Lords has not consented to the bill: provided that this provision shall not take effect unless two years have elapsed between the date of the first introduction of the bill in the House of Commons and the date on which it passes the House of Commons for the third time.

"(2) A bill shall be deemed to be rejected by the House of Lords if it is not passed by the House of Lords either without amendment or with such amendments only as may be agreed to by both houses.

"(3) A bill shall be deemed to be the same bill as a former bill sent up to the House of Lords in the preceding session if, when it is sent up to the House of Lords, it is identical with the former bill or contains only such alterations as are certified by the Speaker of the House of Commons to be necessary owing to the time which has elapsed since the date of the former bill, or to represent amendments which have been made by the House of Lords in the former bill in the preceding session.

"Provided that the House of Commons may, if they think fit, on the passage of such a bill through the house in the second or third session, suggest any further amendments without inserting the amendments in the bill, and any such suggested amendments shall be considered by the House of Lords, and if agreed to by that house, shall be treated as amendments made by the House of Lords and agreed to by the House of Commons; but the exercise of this power by the House of Commons shall not affect the operation of this section in the event of the bill being rejected by the House of Lords.

"3. Any certificate of the Speaker of the House of Commons given under this act shall be conclusive for all purposes, and shall not be questioned in any court of law.

"4. Nothing in this act shall diminish or qualify the existing rights and privileges of the House of Commons.

"5. Five years shall be substituted for seven years as the time fixed for the maximum duration of parliament under the Septennial Act 1715."

Meanwhile, in the House of Lords, Lord Rosebery had carried three resolutions declaring certain principles for the reform of the second chamber, which were assented to by the Unionist leaders; the policy opposed to that of the government thus became that of willingness for reform of the constitution of the Upper Chamber, but not for abolition of its powers.

Lord Rosebery's Resolutions.—(1) "That a strong and efficient Second Chamber is not merely an integral part of the British Constitution, but is necessary to the well-being of the State and to the balance of Parliament." (2) "Such a Chamber can best be obtained by the reform and reconstitution of the House of Lords." (3) "That a necessary preliminary to such reform and reconstitution is the acceptance of the principle that the possession of a peerage should no longer of itself give the right to sit and vote in the House of Lords."

During the summer and autumn the private meetings between the eight leaders were continued, until twenty had been held. But on the 10th of November Mr Asquith issued a brief statement that the conference on the constitutional question had come to an end, without arriving at an agreement. Within a few days he announced that another appeal would at once be made to the electorate. The Parliament Bill was hurriedly introduced into the House of Lords, with a statement by Lord Crewe that no amendments would be accepted. The dissolution was fixed for the 28th of November. Time was short for any declaration of policy by the Unionist peers, but it was given shape at once, first by the adoption of a further resolution moved by Lord Rosebery for the remodelling of the Upper House, and secondly by Lord Lansdowne's shelving the Parliament Bill by coupling the adjournment of the debate on it with the adoption of resolutions providing for the settlement of differences between a reconstituted Upper House and the House of Commons.

Lord Rosebery's additional resolution provided that "in future the House of Lords shall consist of Lords of Parliament: (*a*) chosen by the whole body of hereditary peers from among themselves and by nomination by the Crown; (*b*) sitting by virtue of offices and of qualifications held by them; (*c*) chosen from outside." The Lansdowne resolutions provided in effect that, when the House of Lords had been "reconstituted and reduced in numbers" in accordance with Lord Rosebery's plan, (1) any differences arising between the two houses with regard to a Bill other than a Money Bill, in two successive sessions, and within an interval of not less than one year, should be settled, if not adjustable otherwise, in a joint sitting composed of members of both houses, except in the case of "a matter which is of great gravity and has not been adequately submitted to the judgment of the people," which should then be "submitted for decision to the electors by Referendum"; (2) and as to Money Bills, the Lords were prepared to forgo their constitutional right of rejection or amendment, if effectual provision were made against "tacking," the decision whether other than financial matters were dealt with in the Bill resting with a joint committee of both Houses, with the Speaker of the House of Commons as chairman, having a casting vote only.

The general election took place in December, and resulted practically in no change from the previous situation. Both sides won and lost seats, and the eventual numbers were: Liberals 272, Labour 42, Irish Nationalists 84 (8 being "independents" following Mr William O'Brien), Unionists 272. Thus, including the doubtful votes of the 8 Independent Nationalists, Mr Asquith retained an apparent majority of 126 for the ministerial policy, resting as it did on the determination of the Irish Nationalists to pave the way for Home Rule by destroying the veto of the House of Lords.

B. *House of Commons Internal Reforms.*—We have already sketched the main lines of English parliamentary procedure. Until the forms of the House of Commons were openly utilized to delay the progress of government business by what became known as "obstruction" the changes made in the years following 1832 were comparatively insignificant. They consisted in (1) the discontinuance of superfluous forms, questions and amendments; (2) restrictions of debates upon questions of form; (3) improved arrangements for the distribution of business; (4) the delegation of some of the minor functions of the house to committees and officers of the house; and (5) increased publicity in the proceedings of the house. But with the entry of Mr Parnell and his Irish Nationalist followers into parliament (1875–1880) a new era began in the history of the House of Commons. Their tactics were to oppose all business of whatever kind, and at all hours.

It was not until February 1880 that the house so far overcame its reluctance to restrict liberty of discussion as to pass, in its earliest form, the rule dealing with "order in debate." It provided that whenever a member was named by the Speaker or chairman as "disregarding the authority of the chair, or abusing the rules of the house by persistently and wilfully obstructing the rules of the house," a motion might be made, to be decided without amendment or debate, for his suspension from the service of the house during the remainder of the sitting; and that if the same member should be suspended three times in one session, his suspension on the third occasion should continue for a week, and until a motion had been made upon which it should be decided, at one sitting, by the house, whether the suspension should then cease or not. The general election, which took place two months later, restored Mr Gladstone to power and to the leadership of the house. Mr Parnell returned to parliament with a more numerous following, and resumed his former tactics. In January 1881 the Protection of Persons and Property (Ireland) Bill was introduced. For twenty-two hours Parnell fought the motion giving precedence to the bill, and for four sittings its introduction. The fourth sitting lasted forty-one hours. Then Mr Speaker Brand intervened, and declined to call on any other member who might rise to address the house, because repeated dilatory motions had been supported by small minorities in opposition to the general sense of the house. He added: "A crisis has thus arisen which demands the prompt interposition of the chair and of the house. The usual rules have proved powerless to ensure orderly and effective debate. An important measure, recommended by Her Majesty nearly a month since, and declared to be urgent in the interests of the state by a decisive majority, is being arrested by the action of an inconsiderable minority, the members of which have resorted to those modes of obstruction which have been recognized by the house as a parliamentary offence. The dignity, the credit, and the authority of this house are seriously threatened, and it is necessary they should be vindicated. . . . Future measures for ensuring orderly debate I must leave to the judgment of the house. But the house must either assume more effectual control over its debates, or entrust greater powers to the chair." The Speaker then put the question, which was carried by an overwhelming majority. Then followed the decisive struggle. Mr Gladstone gave notice for the next day (Feb. 3) of an urgency rule, which ordered, "That if the house shall resolve by a majority of three to one that the state of public business is urgent, the whole power of the house to make rules shall be and remain with the Speaker until he shall declare that the state of public business is no longer urgent." On the next day a scene of great disorder ended in the suspension of the Nationalist members, at first singly, and afterwards in groups. The urgency rule was then passed without further difficulty, and the house proceeded to resolve, "That the state of public business is urgent." The Speaker laid upon the table rules of sufficient stringency, and while they remained in force progress in public business was possible. During this session the Speaker had to intervene on points of order 935 times, and the chairman of committees 939 times; so that, allowing only five minutes on each occasion, the wrangling between the chair and members occupied 150 hours.

The Closure.

The events of the session of 1881 and the direct appeal of the Speaker to the house proved the necessity of changes in the rules of procedure more drastic than had hitherto been proposed. Accordingly, in the first week of the session of 1882 Mr Gladstone laid his proposals on the table, and in moving the first resolution on 20th February, he reviewed, in an eloquent speech, the history of the standing orders. It was his opinion, on general grounds, that the house should settle its own procedure, but he showed that the numerous committees which, since 1832, had sat on the subject, had failed for the most part to carry their recommendations into effect from the lack of the requisite "propelling power," and he expressed his regret that the concentration of this power in the hands of the government had rendered it necessary that they should undertake a task not properly theirs. He noted two main features in the history of the case: (1) the constantly increasing labours of the house, and (2) its constantly decreasing power to despatch its duties; and while he declared that "the fundamental change which has occurred is owing to the passing of the first great Reform Bill," he pointed out that the strain had not become intolerable till the development in recent years of obstructive tactics. He defined obstruction as "the disposition either of the minority of the house, or of individuals, to resist the prevailing will of the house otherwise than by argument," and reached the conclusion that the only remedy for a state of things by which the dignity and efficiency of the house were alike compromised, was the adoption in a carefully guarded form of the process known on the Continent as the "clôture." He explained that in his early years the house was virtually possessed of a closing power, because it was possessed of a means of sufficiently making known its inclinations; and to those inclinations uniform deference was paid by members, but that since this moral sanction had ceased to be operative, it was necessary to substitute for it a written law. The power to close debate had been of necessity assumed by almost all the European and American assemblies, the conduct of whose members was shaped by no traditional considerations; and the entry into parliament of a body of men to whom the traditions of the house were as nothing made it necessary for the House of Commons to follow this example. He proposed, therefore, that when it appeared to the Speaker, or to the chairman of committees, during any debate to be the evident sense of the house, or of the committee, that the question be now put, he might so inform the house, and that thereupon on a motion being made, "That the question be now put," the question under discussion should be forthwith put from the chair, and decided in the affirmative if supported by more than 200 members, or, when less than 40 members had voted against it, by more than 100 members. This resolution was vehemently contested by the opposition, who denounced it as an unprecedented interference with the liberty of debate, but was eventually carried in the autumn session of the same year, after a discussion extending over nineteen sittings.

On the 20th of November the standing order of the 28th of February 1880, providing for the suspension of members who persistently and wilfully obstructed the business of the house or disregarded the authority of the chair, was amended by the increase of the penalty to suspension on the first occasion for one week, on the second occasion for a fortnight, and on the third, or any subsequent occasion, for a month. The other rules, framed with a view to freeing the wheels of the parliamentary machine, and for the most part identical with the regulations adopted by Mr Speaker Brand under the urgency resolution of 1881, were carried in the course of the autumn session, and became standing orders on the 27th of November.

Mr Gladstone's closure rule verified neither the hopes of its supporters nor the fears of its opponents. It was not put into operation until the 20th of February 1885, when the Speaker's declaration of the evident sense of the house was ratified by a majority of 207—a margin of but seven votes over the necessary quorum. It was clear that no Speaker was likely to run the risk of a rebuff by again assuming the initiative unless in the face of extreme urgency, and, in fact, the rule was enforced twice only during the five years of its existence.

In 1887 the Conservative government, before the introduction of a new Crimes Act for Ireland, gave efficiency to the rule by an important amendment. They proposed that any member during a debate might claim to move, "That the question be now put," and that with the consent of the chair this question should be put forthwith, and decided without amendment or debate. Thus the initiative was transferred from the Speaker to the house. Mr Gladstone objected strongly to this alteration, chiefly on the ground that it would throw an unfair burden of responsibility upon the Speaker, who would now have to decide on a question of opinion, whereas under the old rule he was only called upon to determine a question of evident fact. The alternative most generally advocated by the opposition was the automatic closure by a bare majority at the end of each sitting, an arrangement by which the chair would be relieved from an invidious responsibility; but it was pointed out that under such a system the length of debates would not vary with the importance of the questions debated. After fourteen sittings the closure rule was passed on the 18th of March and made a standing order.

In the next session, on the 28th of February 1888, the rule was yet further strengthened by the reduction of the majority necessary for its enforcement from 200 to 100, the closure rule remaining as follows:—

That, after a question has been proposed, a member rising in his place may claim to move, "That the question be now put," and, unless it shall appear to the chair that such motion is an abuse of the rules of the house or an infringement of the rights of the minority, the question, "That the question be now put," shall be put forthwith, and decided without amendment or debate.

When the motion "That the question be now put" has been carried, and the question consequent thereon has been decided, any further motion may be made (the assent of the chair as aforesaid not having been withheld), which may be requisite to bring to a decision any question already proposed from the chair; and also if a clause be then under consideration, a motion may be made (the assent of the chair as aforesaid not having been withheld), "That the question 'That certain words of the clause defined in the motion stand part of the clause,' or 'That the clause stand part of, or be added to, the bill,' be now put." Such motions shall be put forthwith, and decided without amendment or debate.

That questions for the closure of debate shall be decided in the affirmative, if, when a division be taken, it appears by the numbers declared from the chair that not less than one hundred members voted in the majority in support of the motion.

The Guillotine.

The closure, originally brought into being to defeat the tactics of obstruction in special emergencies, thus became a part of parliamentary routine. And, the principle being once accepted, its operation was soon extended. The practice of retarding the progress of government measures by amendments moved to every line, adopted by both the great political parties when in opposition, led to the use of what became known as the "guillotine," for forcing through parliament important bills, most of the clauses in which were thus undiscussed. The "guillotine," means that the house decides how much time shall be devoted to certain stages of a measure, definite dates being laid down at which the closure shall be enforced and division taken. On the 17th of June 1887, after prolonged debates on the Crimes Bill in committee, clause 6 only having been reached, the remaining 14 clauses were put without discussion, and the bill was reported in accordance with previous notice. This was the first use of the "guillotine," but the precedent was followed by Mr Gladstone in 1893, when many of the clauses of the Home Rule Bill were carried through committee and on report by the same machinery. To the Conservatives must be imputed the invention of this method of legislation, to their opponents the use of it for attempting to carry a great constitutional innovation to which the majority of English and Scottish representatives were opposed, and subsequently its extension and development (1906–1909) as a regular part of the legislative machinery.

Supply Rule.

The principle of closure has been extended even to the debates on supply. The old rule, that the redress of grievances should precede the granting of money, dating from a time when the minister of the Crown was so far from commanding the confidence of the majority in the House of Commons that he was the chief object of their attacks, nevertheless continued to govern the proceedings of the house in relation to supply without much resultant inconvenience, until the period when the new methods adopted by the Irish Nationalist party created a new situation. Until 1872 it continued to be possible to discuss any subject by an amendment to the motion for going into supply. In that year a resolution was passed limiting the amendments to matters relevant to the class of estimates about to be considered, and these relevant amendments were further restricted to the first day on which it was proposed to go into committee. This resolution was continued in 1873, but was allowed to drop in 1874. It was revived in a modified form in 1876, but was again allowed to drop in 1877. In 1879, on the recommendation of the Northcote committee, it was provided in a sessional order that whenever the committees of supply or of ways and means stood as the first order on a Monday, the Speaker should leave the chair without question put, except on first going into committee on the army, navy and civil service estimates respectively. In 1882 Thursday was added to Monday for the purposes of the order, and, some further exceptions having been made to the operation of the rule, it became a standing order. The conditions, however, under which the estimates were voted remained unsatisfactory. The most useful function of the opposition is the exposure of abuses in the various departments of administration, and this can best be performed upon the estimates. But ministers, occupied with their legislative proposals, were irresistibly tempted to postpone the consideration of the estimates until the last weeks of the session, when they were hurried through thin houses, the members of which were impatient to be gone. To meet this abuse, and to distribute the time with some regard to the comparative importance of the subjects discussed, Mr Balfour in 1896 proposed and carried a sessional order for the closure of supply, a maximum of twenty-three days being given to its consideration, of which the last three alone might be taken after the 5th of August. On the last but one of the allotted days at 10 o'clock the chairman was to put the outstanding votes, and on the last day the Speaker was to put the remaining questions necessary to complete the reports of supply. In 1901 Mr Balfour so altered the resolution that the question was put, not with respect to each vote, but to each class of votes in the Civil Service estimates, and to the total amounts of the outstanding votes in the army, navy and revenue estimates.

Other Changes in Methods.

It is only possible here to refer briefly to some other changes in the procedure of the house which altered in various respects its character as a business-like assembly. The chief of these is as regards the hours. On Mondays, Tuesdays, Wednesdays and Thursdays the house meets at 2.45 p.m., "questions" beginning at 3 and ending (apart from urgency) at 3.45; and opposed business ends at 11. On Fridays the house meets at 12 noon, and opposed business is suspended at 5 p.m.; this is the only day when government business has not precedence, and private members' bills have the first call, though at 8.15 p.m. on Tuesdays and Wednesdays up to Easter and on Wednesdays up to Whitsuntide the business is interrupted in order that private members' motions may be taken. These arrangements, which only date from 1906, represent a considerable change from the old days before 1879 when the standing order was formed that no opposed business, with certain exceptions, should be taken after 12.30 a.m., or 1888 when the closing hour was fixed at midnight. In fact the hours of the house have become generally earlier. Another important change has been made as regards motions for the adjournment of the house, which used to afford an opportunity to the private members at any time to discuss matters of urgent importance. Since 1902 no motion for the adjournment of the house can be made until all "questions" have been disposed of, and then, if forty members support it, the debate takes place at 8.15 p.m. This alteration has much modified the character of the debates on such motions, which used to be taken when feelings were hot, whereas now there is time for reflection. In other respects the most noticeable thing in the recent evolution of the House of Commons has been its steady loss of power, as an assembly, in face of the control of the government and party leaders. In former times the private members had far larger opportunities for introducing and carrying bills, which now have no chance, unless the government affords "facilities"; and the great function of debating "supply" has largely been restricted by the closure, under which millions of money are voted without debate. The house is still ruled by technical rules of procedure which are, in the main, dilatory and obstructive, and hamper the expression of views which are distasteful to the Whips or to the government, who can by them arrange the business so as to suit their convenience. It is true indeed that this dilatory character of the proceedings assists to encourage debate, within limits; but with the influx of a new class of representatives, especially the Labour members, there has been in recent years a rather pronounced feeling that the procedure of the house might well be drastically revised with the object of making it a more business-like assembly. Reform of the House of Commons has been postponed to some extent because reform of the House of Lords has, to professed reformers, been a better "cry"; but when reform is once "in the air" in parliament it is not likely to stop, with so large a field of antiquated procedure before it as is represented by many of the traditional methods of the House of Commons. (H. Ch.)

PARMA, a town and episcopal see of Emilia, Italy, capital of the province of Parma, situated on the Parma, a tributary of the Po, 55 m. N.W. of Bologna by rail. Pop. (1906), 48,523. Parma, one of the finest cities of northern Italy, lies in a fertile tract of the Lombard plain, within view of the Alps and sheltered by the Apennines, 170 ft. above sea-level. From south to north it is traversed by the channel of the Parma, crossed here by three bridges; and from east to west runs the line of the Via Aemilia, by which ancient Parma was connected on the one hand with *Ariminum* (Rimini), and on the other with *Placentia* (Piacenza). The old ramparts and bastions (excluding the circuit of the citadel of 1591, now in great part demolished, in the south-east) make an enceinte of about 4½ m., but the enclosed area is not all occupied by streets and houses.

In the centre of the city the Via Aemilia widens out into the Piazza Garibaldi, a large square which contains the Palazzo del Governo and the Palazzo Municipale, both dating from 1627. The cathedral of the Assumption (originally S. Herculanus), erected between 1064 and 1074, and consecrated in 1106 by Pope Paschal II., is a Lombardo-Romanesque building in the form of a Latin cross. The severe west front is relieved by three rows of semicircular arches, and has a central porch (there were at one time three) supported by huge red marble lions, sculptured no doubt with the rest of the façade by Giovanni Bono da Bissone in 1281. On the south side of the façade is a large brick campanile, and the foundations of another may be seen on the north. The walls and ceiling of the fine Romanesque interior are covered with frescoes of 1570, subdued in colour and well suited to the character of the building; those of the octagonal cupola representing the Assumption of the Virgin are by Correggio, but much restored. The crypt contains the shrine of the bishop S. Bernardino degli Uberti and the tomb of Bartolommeo Prato—the former by Prospero Clementi of Reggio. In the sacristy are fine intarsias. To the south-west of the cathedral stands the baptistery, designed by Benedetto Antelami; it was begun in 1196 and not completed till 1281. The whole structure is composed of red and grey Verona marble. Externally it is an irregular octagon, each face consisting of a lower storey with a semicircular arch (in three cases occupied by a portal), with sculptures by Antelami, four tiers of small columns supporting as many continuous architraves, and forming open galleries, and above these (an addition of the Gothic period) a row of five engaged columns supporting a series of pointed arches and a cornice. Internally it is a polygon of sixteen unequal sides, and the cupola is supported by sixteen ribs, springing from the same number of columns. The frescoes are interesting works of the early 13th century. In the centre is an octagonal font bearing date 1294. The episcopal palace shows traces of the building of 1232. To the east of the cathedral, and at no great distance, stands the church of S. Giovanni Evangelista, which was founded along with the Benedictine monastery in 981, but as a building dates from 1510, and has a façade erected by Simone Moschino early in the 17th century. The interior is an extremely fine early Renaissance work. The frescoes on the cupola representing the vision of S. John are by Correggio, and the arabesques on the vault of the nave by Anselmi. The Madonna della Steccata (Our Lady of the Palisade), a fine church in the form of a Greek cross, erected between 1521 and 1539 after Zaccagni's designs, contains the tombs and monuments of many of the Bourbon and Farnese dukes of Parma, and preserves its pictures, Parmigiano's "Moses Breaking the Tables of the Law" and Anselmi's "Coronation of the Virgin." S. Francesco, probably the earliest Franciscan church in northern Italy (1230–1298; now a prison), is a Gothic building in brick with a fine rose-window. The Palazzo della Pilotta is a vast and irregular group of buildings dating mainly from the 16th and 17th centuries; it now comprises the academy of fine arts (1752) and its valuable picture gallery. Among the most celebrated pictures here are Correggio's "Madonna di San Girolamo" and "Madonna della Scodella." The Teatro Farnese, a remarkable wooden structure erected in 1618–1619 from Aleotti d'Argenta's designs, and capable of containing 4500 persons, is also in this palace. There are other beautiful ceiling frescoes by Correggio in the former Benedictine nunnery of S. Paolo, executed in 1518–1519; in an adjoining chamber are fine arabesques by Araldi (d. 1528); thence come also some fine majolica tiles (1471–1482), now in the museum. The royal university of Parma, founded in 1601 by Ranuccio I., and reconstituted by Philip of Bourbon in 1768, has faculties in law, medicine and natural science, and possesses an observatory, and natural science collections, among which is the Eritrean Zoological Museum. A very considerable trade is carried on at Parma in grain, cattle and the dairy produce of the district. The *grana* cheese known as Parmesan is not now so well made at Parma as in some other parts of Italy—Lodi, for example.

From archaeological discoveries it would appear that the ancient town was preceded by a prehistoric settlement of the Bronze Age, the dwellings of which rested upon piles—one, indeed, of the so-called *terremare*, which are especially frequent in the neighbourhood of Parma. Parma became a Roman colony of 2000 colonists in 183 B.C., four years after the construction of the Via Aemilia, on which it lay. The bridge by which the Via Aemilia crossed the river Parma, from which it probably takes its name, is still preserved, but has been much altered. A bishop of Parma is mentioned in the acts of the council of Rome of A.D. 378. It fell into the power of Alboin in 569 and became the seat of a Lombard duchy; it was still one of the wealthiest cities of Aemilia in the Lombard period. During the 11th, 12th and 13th centuries Parma had its full share of the Guelph and Ghibelline struggles, in which it mainly took the part of the former, and also carried on repeated hostilities with Borgo San Donnino and Piacenza. Its bishop Cadalus (1046–1071) was elected to the papacy by the Lombard and German bishops in 1061, and marched on Rome, but was driven back by the partisans of Alexander III. To him is due the building of the cathedral. As a republic its government was mainly in the hands of the Rossi, Pallavicino, Correggio and Sanvitale families. The fruitless siege of Parma in 1248 was the last effort of Frederick II. In the cathedral flags captured in this siege are preserved. In 1307 the city became a lordship for Giberto da Correggio, who laid the basis of its territorial power by conquering Reggio, Brescello and Gaustalla, and was made commander-in-chief of the Guelphs by Robert of Apulia. The Correggio family never managed to keep possession of it for long, and in 1346 they sold it to the Visconti (who constructed a citadel, La Rocchetta, in 1356, of which some remains exist on the east bank of the river, while the later *tête du pont* may be seen on the west bank), and from them it passed to the Sforza. Becoming subject to Pope Julius II. in 1512, Parma remained (in spite of the French occupation from 1515 to 1521) a papal possession till 1545, when Paul III. (Alexander Farnese) invested his son Pierluigi with the duchies of Parma and Piacenza. There were eight dukes of Parma of the Farnese line—Pierluigi (d. 1547), Ottavio (1586), Alessandro (1592), Ranuccio I. (1622), Odoardo (1646), Ranuccio II. (1694), Francesco (1727), Antonio (1731). Antonio and Francesco both having died childless, the duchy passed to Charles of Bourbon (Don Carlos), infante of Spain, who, becoming king of Naples in 1734, surrendered Parma and Piacenza to Austria, but retained the artistic treasures of the Farnese dynasty which he had removed from Parma to Naples. Spain reconquered the duchies in the war of succession (1745); they were recovered by Austria in 1746; and Maria Theresa again surrendered them to Don Philip, infante of Spain, in 1748. Ferdinand, Philip's son, who succeeded under Dutillot's regency in 1765, saw his states occupied by the revolutionary forces of France in 1796, and had to purchase his life-interest with 6,000,000 lire and 25 of the best paintings in Parma. On his death in 1802 the duchies were incorporated with the French republic and his son Louis became "king of Etruria." Parma was thus governed for several years by Moreau de Saint-Méry and by Junot. At the congress of Vienna, Parma, Piacenza and Guastalla were assigned to Marie Louise (daughter of Francis I. of Austria and Napoleon's second consort), and on her death they passed in 1847 to Charles II. (son of Louis of Etruria and Marie Louise, daughter of Charles IV., king of Spain). The new duke, unwilling to yield to the wishes of his people for greater political liberty, was soon compelled to take flight, and the duchy was for a time ruled by a provisional government and by Charles Albert of Sardinia; but in April 1849 Baron d'Aspre with 15,000 Austrians took possession of Parma, and the ducal government was restored under Austrian protection. Charles II. (who had in 1820 married Theresa, daughter of Victor Emmanuel of Sardinia) abdicated in favour of his son Charles III., on the 14th of March, 1849. On the assassination of Charles III. in 1854, his widow, Marie Louise (daughter of Ferdinand, prince of Artois and duke of Berry), became regent for her son Robert. In 1860 his possessions were formally incorporated with the new kingdom of Italy.

The duchy of Parma in 1849 had an area of 2376 sq. m. divided into five provinces—Borgo San Donnino, Valditaro, Parma, Lunigiana Parmense and Piacenza. Its population in 1851 was 497,343. Under Marie Louise (1815–1847) the territory of Guastalla (50 sq. m.) formed part of the duchy, but it was transferred in 1847 to Modena in exchange for the communes of Bagnone, Filattiera, &c., which went to constitute the Lunigiana Parmense.

See Affó, *Storia di Parma* (1792–1795); Scarabelli, *Storia dei ducati di Parma, Piacenza, e Guastalla* (1858); Buttafuoco, *Dizion. corogr. dei ducati, &c.* (1853); *Mon. hist. ad provincias parmensem et placentinam pertinentia* (1855, &c.); L. Testi, *Parma* (Bergamo, 1905).

PARMENIDES OF ELEA (Velia) in Italy, Greek philosopher. According to Diogenes Laertius he was "in his prime" 504–500 B.C., and would thus seem to have been born about 539. Plato indeed (*Parmenides*, 127 B) makes Socrates see and hear Parmenides when the latter was about sixty-five years of age, in which case he cannot have been born before 519; but in the absence of evidence that any such meeting took place this may be regarded as one of Plato's anachronisms. However this may be, Parmenides was a contemporary, probably a younger contemporary, of Heraclitus, with whom the first succession of physicists ended, while Empedocles and Anaxagoras, with whom the second succession of physicists began, were very much his juniors. Belonging, it is said, to a rich and distinguished family, Parmenides attached himself, at any rate for a time, to the aristocratic society or brotherhood which Pythagoras had established at Croton; and accordingly one part of his system, the physical part, is apparently Pythagorean. To Xenophanes, the founder of Eleaticism—whom he must have known, even if he was never in any strict sense of the word his disciple—Parmenides was, perhaps, more deeply indebted, as the theological speculations of that thinker unquestionably suggested to him the theory of Being and Not-Being, of the One and the Many, by which he sought to reconcile Ionian "monism," or rather "henism," with Italiote dualism. Tradition relates that Parmenides framed laws for the Eleates, who each year took an oath to observe them.

Parmenides embodied his tenets in a short poem, called *Nature*, of which fragments, amounting in all to about 160 lines, have been preserved in the writings of Sextus Empiricus, Simplicius and others. It is traditionally divided into three parts—the "Proem," "Truth" (*τὰ πρὸς ἀλήθειαν*), and "Opinion" (*τὰ πρὸς δόξαν*). In "Truth," starting from the formula "the Ent (or existent) is, the Nonent (or non-existent) is not," Parmenides attempted to distinguish between the unity or universal element of nature and its variety or particularity, insisting upon the reality of its unity, which is therefore the object of knowledge, and upon the unreality of its variety, which is therefore the object, not of knowledge, but of opinion. In "Opinion" he propounded a theory of the world of seeming and its development, pointing out however that, in accordance with the principles already laid down, these cosmological speculations do not pretend to anything more than probability. In spite of the contemptuous remarks of Cicero and Plutarch about Parmenides's versification, *Nature* is not without literary merit. The introduction, though rugged, is forcible and picturesque; and the rest of the poem is written in a simple and effective style suitable to the subject.

Proem.—In the "Proem" the poet describes his journey from darkness to light. Borne in a whirling chariot, and attended by the daughters of the sun, he reaches a temple sacred to an unnamed goddess (variously identified by the commentators with Nature, Wisdom or Themis), by whom the rest of the poem is spoken. He must learn all things, she tells him, both truth, which is certain, and human opinions; for, though in human opinions there can be no "true faith," they must be studied notwithstanding for what they are worth.

Truth.—"Truth" begins with the declaration of Parmenides's principle in opposition to the principles of his predecessors. There are three ways of research, and three ways only. Of these, one asserts the non-existence of the existent and the existence of the non-existent [*i.e.* Thales, Anaximander and Anaximenes suppose the single element which they respectively postulate to be transformed into the various sorts of matter which they discover in the world around them, thus assuming the non-existence of that which is elemental and the existence of that which is non-elemental]; another, pursued by "restless" persons, whose "road returns upon itself," assumes that a thing "is and is not," "is the same and not the same" [an obvious reference, as Bernays points out in the *Rheinisches Museum*, vii. 114 seq., to Heraclitus, the philosopher of flux]. These are ways of error, because they confound existence and non-existence. In contrast to them the way of truth starts from the proposition that "the Ent is, the Nonent is not."

On the strength of the fundamental distinction between the Ent and the Nonent, the goddess next announces certain characteristics of the former. The Ent is uncreated, for it cannot be derived either from the Ent or from the Nonent; it is imperishable, for it cannot pass into the Nonent; it is whole, indivisible, continuous, for nothing exists to break its continuity in space; it is unchangeable [for nothing exists to break its continuity in time]; it is perfect, for there is nothing which it can want; it never was, nor will be, but only is; it is evenly extended in every direction, and therefore a sphere, exactly balanced; it is identical with thought [*i.e.* it is the object, and the sole object, of thought as opposed to sensation, sensation being concerned with variety and change].

As then the Ent is one, invariable and immutable, all plurality, variety and mutation belong to the Nonent. Whence it follows that all things to which men attribute reality, generation and destruction, being and not-being, change of place, alteration of colour are no more than empty words.

Opinion.—The investigation of the Ent [*i.e.* the existent unity, extended throughout space and enduring throughout time, which reason discovers beneath the variety and the mutability of things] being now complete, it remains in "Opinion" to describe the plurality of things, not as they are, for they are not, but as they seem to be. In the phenomenal world then, there are, it has been thought [and Parmenides accepts the theory, which appears to be of Pythagorean origin], two primary elements—namely, fire, which is gentle, thin, homogeneous, and night, which is dark, thick, heavy. Of these elements [which, according to Aristotle, were, or rather were analogous to, the Ent and the Nonent respectively] all things consist, and from them they derive their several characteristics. The foundation for a cosmology having thus been laid in dualism, the poem went on to describe the generation of "earth and sun, and moon and air that is common to all, and the milky way, and furthest Olympus, and the glowing stars"; but the scanty fragments which have survived suffice only to show that Parmenides regarded the universe as a series of concentric rings or spheres composed of the two primary elements and of combinations of them, the whole system being directed by an unnamed goddess established at its centre. Next came a theory of animal development. This again was followed by a psychology, which made thought [as well as sensation, which was conceived to differ from thought only in respect of its object] depend upon the excess of the one or the other of the two constituent elements, fire and night. "Such, opinion tells us, was the generation, such is the present existence, such will be the end, of those things to which men have given distinguishing names."

In the truism "the Ent is, the Nonent is not," *ὄν ἔστι, μὴ ὄν οὐκ ἔστι*, Parmenides breaks with his predecessors, the physicists of the Ionian succession. Asking themselves—What is the material universe, they had replied respectively—It is water, It is *μεταξύ τι*, It is air, It is fire. Thus, while their question meant, or ought to have meant, What is the single element which underlies the apparent plurality of the material world? their answers, Parmenides conceived, by attributing to the selected element various and varying qualities, reintroduced the plurality which the question sought to eliminate. If we would discover that which is common to all things at all times, we must, he submitted, exclude the differences of things, whether simultaneous or successive. Hence, whereas his predecessors had confounded that which is universally existent with that which is not universally existent, he proposed to distinguish carefully between that which is universally existent and that which is not universally existent, between ὄν and μὴ ὄν. The fundamental truism is the epigrammatic assertion of this distinction.

In short, the single corporeal element of the Ionian physicists was, to borrow a phrase from Aristotle, a permanent οὐσία having πάθη which change; but they either neglected the πάθη or confounded them with the οὐσία. Parmenides sought to reduce the variety of nature to a single material element; but he strictly discriminated the inconstant πάθη from the constant οὐσία, and, understanding by "existence" universal, invariable, immutable being, refused to attribute to the πάθη anything more than the semblance of existence.

Having thus discriminated between the permanent unity of nature and its superficial plurality, Parmenides proceeded to the separate investigation of the Ent and the Nonent. The universality of the Ent, he conceived, necessarily carries with it certain characteristics. It is one; it is eternal; it is whole and continuous, both in time and in space; it is immovable and immutable; it is limited, but limited only by itself; it is evenly extended in every direction, and therefore spherical. These propositions having been reached, apart from particular experience, by reflection upon the fundamental principle, we have in them, Parmenides conceived, a body of information resting upon a firm basis and entitled to be called "truth." Further, the information thus obtained is the sum total of "truth"; for, as "existence" in the strict sense of the word cannot be attributed to anything besides the universal element, so nothing besides the universal element can properly be said to be "known."

If Parmenides's poem had had "Being" for its subject it would doubtless have ended at this point. Its subject is, however, "Nature"; and nature, besides its unity, has also the semblance, if no more than the semblance, of plurality. Hence the theory of the unity of nature is necessarily followed by a theory of its seeming plurality, that is to say, of the variety and mutation of things. The theory of plurality cannot indeed pretend to the certainty of the theory of unity, being of necessity untrustworthy, because it is the partial and inconstant representation of that which is partial and inconstant in nature. But, as the material world includes, together with a real unity, the semblance of plurality, so the theory of the material world includes, together with the certain theory of the former, a probable theory of the latter. "Opinion" is then no mere excrescence; it is the necessary sequel to "Truth."

Thus, whereas the Ionians, confounding the unity and the plurality of the universe, had neglected plurality, and the Pythagoreans, contenting themselves with the reduction of the variety of nature to a duality or a series of dualities, had neglected unity, Parmenides, taking a hint from Xenophanes, made the antagonistic doctrines supply one another's deficiencies; for, as Xenophanes in his theological system had recognized at once the unity of God and the plurality of things, so Parmenides in his system of nature recognized at once the rational unity of the Ent and the phenomenal plurality of the Nonent.

The foregoing statement of Parmenides's position differs from Zeller's account of it in two important particulars. First, whereas it has been assumed above that Xenophanes was theologian rather than philosopher, whence it would seem to follow that the philosophical doctrine of unity originated, not with him, but with Parmenides, Zeller, supposing Xenophanes to have taught, not merely the unity of God, but also the unity of Being, assigns to Parmenides no more than an exacter conception of the doctrine of the unity of Being, the justification of that doctrine, and the denial of the plurality and the mutability of things. This view of the relations of Xenophanes and Parmenides is not borne out by their writings; and, though ancient authorities may be quoted in its favour, it would seem that in this case as in others, they have fallen into the easy mistake of confounding successive phases of doctrine, "construing the utterances of the master in accordance with the principles of his scholar—the vague by the more definite, the simpler by the more finished and elaborate theory" (W. H. Thompson). Secondly, whereas it has been argued above that "Opinion" is necessarily included in the system, Zeller, supposing Parmenides to deny the Nonent even as a matter of opinion, regards that part of the poem which has opinion for its subject as no more than a revised and improved statement of the views of opponents, introduced in order that the reader, having before him the false doctrine as well as the true one, may be led the more certainly to embrace the latter. In the judgment of the present writer, Parmenides, while he denied the real existence of plurality, recognized its apparent existence, and consequently, however little value he might attach to opinion, was bound to take account of it: "pour celui même qui nie l'existence réelle de la nature," says Renouvier, "il reste encore à faire une histoire naturelle de l'apparence et de l'illusion."

The teaching of Parmenides variously influenced both his immediate successors and subsequent thinkers. By his recognition of an apparent plurality supplementary to the real unity, he effected the transition from the "monism" or "henism" of the first physical succession to the "pluralism" of the second. While Empedocles and Democritus are careful to emphasize their dissent from "Truth," it is obvious that "Opinion" is the basis of their cosmologies. The doctrine of the deceitfulness of "the undiscerning eye and the echoing ear" soon established itself, though the grounds upon which Empedocles, Anaxagoras and Democritus maintained it were not those which were alleged by Parmenides. Indirectly, through the dialectic of his pupil and friend Zeno and otherwise, the doctrine of the inadequacy of sensation led to the humanist movement, which for a time threatened to put an end to philosophical and scientific speculation. But the positive influence of Parmenides's teaching was not yet exhausted. To say that the Platonism of Plato's later years, the Platonism of the *Parmenides*, the *Philebus* and the *Timaeus*, is the philosophy of Parmenides enlarged and reconstituted, may perhaps seem paradoxical in the face of the severe criticism to which Eleaticism is subjected, not only in the *Parmenides*, but also in the *Sophist*. The criticism was, however, preparatory to a reconstruction. Thus may be explained the selection of an Eleatic stranger to be the chief speaker in the latter, and of Parmenides himself to take the lead in the former. In the *Sophist* criticism predominates over reconstruction, the Zenonian logic being turned against the Parmenides metaphysic in such a way as to show that both the one and the other need revision: see 241 D, 244 B seq., 257 B seq., 258 D. In particular, Plato taxes Parmenides with his inconsistency in attributing (as he certainly did) to the fundamental unity extension and sphericity, so that "the worshipped ὄν is after all a pitiful μὴ ὄν" (W. H. Thompson). In the *Parmenides* reconstruction predominates over criticism—the letter of Eleaticism being here represented by Zeno, its spirit, as Plato conceived it, by Parmenides. Not the least important of the results obtained in this dialogue is the discovery that, whereas the doctrine of the "one" and the "many" is suicidal and barren so long as the "solitary one" and the "indefinitely many" are absolutely separated (137 C seq. and 163 B seq.), it becomes consistent and fruitful as soon as a "definite plurality" is interpolated between them (142 B seq., 157 B seq., 160 B seq.). In short, Parmenides was no idealist, but Plato recognized in him, and rightly, the precursor of idealism.

Bibliography.—The fragments have been skilfully edited by H. Diels, in *Parmenides Lehrgedicht, griechisch u. deutsch* (Berlin, 1897), with commentary; in *Poetarum philosophorum fragmenta* with brief Latin notes, critical and interpretative (Berlin, 1901); and in *Die Fragmente d. Vorsokratiker* (Berlin, 2nd ed., 1906), with German translation); and Diels' text is reproduced with a helpful Latin commentary in Ritter and Preller's *Historia philosophiae graecae* (8th ed., revised by E. Wellmann, Gotha, 1898). The philosophical system is expounded and discussed by E. Zeller, *D. Philosophie d. Griechen* (5th ed., Leipzig, 1892; Eng. trans., London, 1881); by T. Gomperz, *Griechische Denker* (Leipzig, 1896; Eng. trans., London, 1901); and by J. Burnet, *Early Greek Philosophy* (London, 1908). For the cosmology, see A. B. Krische, *D. theologischen Lehren d. griechischen Denker* (Göttingen, 1840). On the relations of Eleaticism and Platonism, see W. H. Thompson, "On Plato's *Sophist*," in the *Journal of Philology* viii. 303 seq. For other texts, translations, commentaries and monographs see the excellent bibliography contained in the *Grundriss d. Geschichte d. Philosophie* of Überweg and Heinze (10th ed., Berlin, 1909; Eng. Trans., London, 1880). (H. Ja.)

PARMENIO (*c.* 400–330 B.C.), Macedonian general in the service of Philip II. and Alexander the Great. During the reign of Philip Parmenio obtained a great victory over the Illyrians (356); he was one of the Macedonian delegates appointed to conclude peace with Athens (346), and was sent with an army to uphold Macedonian influence in Euboea (342). In 336 he was sent with Amyntas and Attalus to make preparations for the reduction of Asia. He led the left wing in the battles of the Granicus, Issus and Gaugamela. After the conquest of Drangiana, Alexander was informed that Philotas, son of Parmenio, was involved in a conspiracy against his life. Philotas was condemned by the army and put to death. Alexander, thinking it dangerous to allow the father to live, sent orders to Media for the assassination of Parmenio. There was no proof that Parmenio was in any way implicated in the conspiracy, but he was not even afforded the opportunity of defending himself.

See Arrian, *Anabasis*; Plutarch, *Alexander*; Diod. Sic. xvii.; Curtius vii. 2, 11; Justin xii. 5; for modern authorities see under ALEXANDER III., THE GREAT.

PARMIGIANO (1504–1540). The name of this celebrated painter of the Lombard school was, in full, Girolamo Francesco Maria Mazzuoli, or Mazzola; he dropped the name Girolamo, and was only known as Francesco. He has been more commonly named Il Parmigiano (or its diminutive, Il Parmigianino), from his native city, Parma. Francesco, born on the 11th of January 1504, was the son of a painter. Losing his father in early childhood, he was brought up by two uncles, also painters, Michele and Pier-Ilario Mazzola. His faculty for the art developed at a very boyish age, and he addicted himself to the style of Correggio, who visited Parma in 1519. He did not, however, become an imitator of Correggio; his style in its maturity may be regarded as a fusion of Correggio with Raphael and Giulio Romano, and thus fairly original. Even at the age of fourteen (Vasari says sixteen) he had painted a "Baptism of Christ," surprisingly mature. Before the age of nineteen, when he migrated to Rome, he had covered with frescoes seven chapels in the church of S. Giovanni Evangelista, Parma. Prior to starting for the city of the popes in 1523 he deemed it expedient to execute some specimen pictures. One of these was a portrait of himself as seen in a convex mirror, with all the details of divergent perspective, &c., wonderfully exact—a work which both from this curiosity of treatment and from the beauty of the sitter—for Parmigiano was then "more like an angel than a man" —could not fail to attract. Arrived in Rome, he presented his specimen pictures to the pope, Clement VII., who gladly and admiringly accepted them, and assigned to the youthful genius the painting of the Sala de' Pontefici, the ceilings of which had been already decorated by Giovanni da Udine. But while fortune was winning him with her most insinuating smiles, the utter ruin of the sack by the Constable de Bourbon and his German and other soldiers overtook both Rome and Parmigiano. At the date of this hideous catastrophe he was engaged in painting that large picture which now figures in the National Gallery, the "Vision of St Jerome" (with the Baptist pointing upward and backward to the Madonna and infant Jesus in the sky). It is said that through all the crash and peril of this barbarian irruption Parmigiano sat quietly before his vast panel, painting as if nothing had happened. A band of German soldiery burst into his apartment, breathing fire and slaughter; but, struck with amazement at the sight, and with some reverence for art and her votary (the other events of the siege forbid us to suppose that reverence for religion had any part in it), they calmed down, and afforded the painter all the protection that he needed at the moment. Their captain, being something of a connoisseur, exacted his tribute, however—a large number of designs. Rome was now no place for Parmigiano. He left with his uncle, intending apparently to return to Parma; but, staying in Bologna he settled down there for a while, and was induced to remain three or four years. Here he painted for the nuns of St Margaret his most celebrated altarpiece (now in the Academy of Bologna), the "Madonna and Child, with Margaret and other saints."

Spite of the great disaster of Rome, the life of Mazzola had hitherto been fairly prosperous—the admiration which he excited being proportionate to his charm of person and manner, and to the precocity and brilliancy (rather than depth) of his genius; but from this time forward he became an unfortunate, and it would appear a soured and self-neglected, man. In 1531 he returned to Parma, and was commissioned to execute an extensive series of frescoes in the choir of the church of S. Maria della Steccata. These were to be completed in November 1532; and half-payment, 200 golden scudi, was made to him in advance. A ceiling was allotted to him, and an arch in front of the ceiling; on the arch he painted six figures—two of them in full colour, and four in monochrome—Adam, Eve, some Virtues, and the famous figure (monochrome) of Moses about to shatter the tables of the law. But, after five or six years from the date of the contract, Parmigiano had barely made a good beginning with his stipulated work. According to Vasari, he neglected painting in favour of alchemy—he laboured over futile attempts to "congeal mercury," being in a hurry to get rich anyhow. It is rather difficult to believe that the various graphic and caustic phrases which Vasari bestows upon this theory of the facts of Mazzola's life are altogether gratuitous and wide of the mark; nevertheless the painter's principal biographer, the Padre Affò, undertook to refute Vasari's statements, and most subsequent writers have accepted Affò's conclusions. Whatever the cause, Parmigiano failed to fulfil his contract, and was imprisoned in default. Promising to amend, he was released; but instead of redeeming his pledge he decamped to Casal Maggiore, in the territory of Cremona. Here, according even to Vasari, he relinquished alchemy and resumed painting; yet he still hankered (or is said by Vasari to have hankered) after his retorts and furnaces, lost all his brightness, and presented a dim, poverty-stricken, hirsute and uncivilized aspect. He died of a fever on the 24th of August 1540, before he had completed his thirty-seventh year. By his own desire he was buried naked in the church of the Servites called La Fontana, near Casal Maggiore.

Grace has always and rightly been regarded as the chief artistic endowment of Parmigiano—grace which is genuine as an expression of the painter's nature, but partakes partly of the artificial and affected in its developments. "Un po'di grazia del Parmigianino" (a little, or, as we might say, just a spice, of Parmigianino's grace) was among the ingredients which Agostino Caracci's famed sonnet desiderates for a perfect picture. Mazzola constantly made many studies of the same figure, in order to get the most graceful attainable form, movement and drapery—the last being a point in which he was very successful. The proportions of his figures are over-long for the truth of nature—the stature, fingers and neck; one of his Madonnas, now in the Pitti Gallery, is currently named "La Madonna del collo lungo." Neither expression nor colour is a strong point in his works; the figures in his compositions are generally few—the chief exception being the picture of "Christ Preaching to the Multitude." He etched a few plates, being apparently the earliest Italian painter who was also an etcher; but the statement that he produced several woodcuts is not correct—he overlooked the production of them by other hands.

The most admired easel-picture of Parmigiano is the "Cupid Making a Bow," with two children at his feet, one crying, and the other laughing. This was painted in 1536 for Francesco Boiardi of Parma, and is now in the gallery of Vienna. There are various replicas of it, and some of these may perhaps be from Mazzola's own hand. Of his portrait-painting, two interesting examples are the likeness of Amerigo Vespucci (after whom America is named) in the Studj Gallery of Naples, and the painter's own portrait in the Uffizi of Florence. One of Parmigiano's principal pupils was his cousin, Girolamo di Michele Mazzola; probably some of the works attributed to Francesco are really by Girolamo.

See B. Bossi, *Disegni originali di Francesco Mazzuoli* (1789); A. S. Mortara, Della Vita di Francesco Mazzuoli (1846); Toschi, *Affreschi*, &c. (1846). (W. M. R.)

PARNAHYBA, or **PARNAHIBA**, a port of the state of Piauhy, Brazil, on the right bank of the Parnahyba river, 250 m. below the capital, Therezina. Pop. of the municipality (1890), 4415. Parnahyba is situated at the point where the most easterly of the delta outlets, or channels, called the Rio Iguarassú, branches off from the main stream. All the outlet channels of the river are obstructed by bars built up by the strong current along the Atlantic coast, and only vessels of light draught can enter. The town has some well-constructed buildings of the old Portuguese type, including two churches and a fine hospital. Parnahyba is the commercial entrepôt of the state. It exports hides, goat-skins, cotton and tobacco, chiefly through the small port of Amarração, at the mouth of the Rio Iguarassú, 11 m. distant.

PARNASSUS (mod. *Liákoura or Likeri*), a mountain of Greece, 8070 ft., in the south of Phocis, rising over the town of Delphi. It had several prominent peaks, the chief known as Tithorea and Lycoreia (whence the modern name). Parnassus was one of the most holy mountains in Greece, hallowed by the worship of Apollo, of the Muses, and of the Corycian nymphs, and by the orgies of the Bacchantes. Two projecting cliffs, named the Phaedriadae, frame the gorge in which the Castalian spring flows out, and just to the west of this, on a shelf above the ravine of the Pleistus, is the site of the Pythian shrine of Apollo and the Delphic oracle. The Corycian cave is on the plateau between Delphi and the summit.

PARNASSUS PLAYS, a series of three scholastic entertainments performed at St John's College, Cambridge, between 1597 and 1603. They are satirical in character and aim at setting forth the wretched state of scholars and the small respect paid to learning by the world at large, as exemplified in the adventures of two university men, Philomusus and Studioso. The first part, *The Pilgrimage to Parnassus*, describes allegorically their four year's journey to Parnassus, *i.e.* their progress through the university course of logic, rhetoric, &c., and the temptations set before them by their meeting with Madido, a drunkard, Stupido, a puritan who hates learning, Amoretto, a lover, and Ingenioso, a disappointed student. The play was doubtless originally intended to stand alone, but the favour with which it was received led to the writing of a sequel, *The Return from Parnassus*, which deals with the adventures of the two students after the completion of their studies at the university, and shows them discovering by bitter experience of how little pecuniary value their learning is. They again meet Ingenioso, who is making a scanty living by the press, but is on the search for a patron, as well as a new character, Luxurioso. All four now leave the university for London, while a draper, a tailor and a tapster lament their unpaid bills. Philomusus and Studioso find work respectively as a sexton and a tutor in a merchant's family, while Luxurioso becomes a writer and singer of ballads. In the meanwhile Ingenioso has met with a patron, a coxcombical fellow named Gullio, for whom he composes amorous verses in the style of Chaucer, Spenser and Shakespeare, the last alone being to the patron's satisfaction. Gullio is indeed a great admirer of Shakespeare, and in his conversations with Ingenioso we have some of the most interesting of the early allusions to him.

A further sequel, *The Second Part of the Return from Parnassus, or the Scourge of Simony*, is a more ambitious, and from every point of view more interesting, production than the two earlier pieces. In it we again meet with Ingenioso, now become a satirist, who on pretence of discussing a recently-published collection of extracts from contemporary poetry, John Bodenham's *Belvedere*, briefly criticizes, or rather characterizes, a number of writers of the day, among them being Spenser, Constable, Drayton, John Davies, Marston, Marlowe, Jonson, Shakespeare and Nashe—the last of whom is referred to as dead. It is impossible here to detail the plot of the play, and it can only be said that Philomusus and Studioso, having tried all means of earning a living, abandon any further attempt to turn their learning to account and determine to become shepherds. Several new characters are introduced in this part, real persons such as Danter, the printer, Richard Burbage and William Kemp, the actors, as well as such abstractions as Furor Poeticus and Phantasma. The second title of the piece, "The Scourge of Simony," is justified by a sub-plot dealing with the attempts of one, Academico, to obtain a living from an ignorant country patron, Sir Roderick, who, however, presents it, on the recommendation of his son Amoretto, who has been bribed, to a non-university man Immerito.

The three pieces have but small literary and dramatic value, their importance consisting almost wholly in the allusions to, and criticisms of contemporary literature. Their author is unknown, but it is fairly certain, from the evidence of general style, as well as some peculiarities of language, that they are the work of the same writer. The only name which has been put forward with any reasonable probability is that of John Day, whose claim has been supported with much ingenuity by Professor I. Gollancz (see full discussion in Dr A. W. Ward's *Eng. Dram. Lit.* ii. 640, note 2), but the question still awaits definitive solution.

As to the date there is more evidence. The three pieces were evidently performed at Christmas of different years, the last being not later than Christmas 1602, as is shown by the references to Queen Elizabeth, while the *Pilgrimage* mentions books not printed until 1598, and hence can hardly have been earlier than that year. The prologue of *2 Return* states that that play had been written for the preceding year, and also, in a passage of which the reading is somewhat doubtful, implies that the whole series had extended over four years. Thus we arrive at either 1599, 1600 and 1602, or 1598, 1599 and 1601, as, on the whole, the most likely dates of performance. Mr Fleay, on grounds which do not seem conclusive, dates them 1598, 1601 and 1602.

The question of how far the characters are meant to represent actual persons has been much discussed. Mr Fleay maintains that the whole is a personal satire, his identifications of the chief characters in *2 Return* being (1) Ingenioso, Thomas Nashe, (2) Furor Poeticus, J. Marston, (3) Phantasma, Sir John Davies, (4) Philomusus, T. Lodge, (5) Studioso, Drayton. Professor Gollancz identifies Judicio with Henry Chettle (*Proc. of Brit. Acad.*, 1903–1904, p. 202). Dr Ward, while rejecting Mr Fleay's identifications as a whole, considers that by the time the final part was written the author may have more or less identified Ingenioso with Nashe, though the character was not originally conceived with this intention. This is of course possible, and the fact that Ingenioso himself speaks in praise of Nashe, who is regarded as dead, is not an insuperable objection. We must not, however, overlook the fact that the author was evidently very familiar with Nashe's works, and that all three parts, not only in the speeches of Ingenioso, but throughout, are full of reminiscences of his writings.

BIBLIOGRAPHY.—The only part of the trilogy which was in print at an early date was *2 Return*, called simply *The Return from Parnassus, or the Scourge of Simony* (1606), two editions bearing the same date. This has been several times reprinted, the best separate edition being that of Professor Arber in the "English Scholars' Library" (1879). Manuscript copies of all three plays were found among T. Hearne's papers in the Bodleian by the Rev. W. D. Macray and were printed by him in 1886 (the last from one of the editions of 1606, collated with the MS.). A recent edition in modern spelling by Mr O. Smeaton in the "Temple Dramatists" is of little value. All questions connected with the play have been elaborately discussed by Dr W. Lühr in a dissertation entitled *Die drei cambridger Spiele vom Parnass* (Kiel, 1900). See also, Dr Ward's *English Dramatic Literature*, ii. 633-642; F. G. Fleay's *Biog. Chron. of the Eng. Drama*, ii. 347-355. (R. B. McK.)

PARNELL, CHARLES STEWART (1846–1891), Irish Nationalist leader, was born at Avondale, Co. Wicklow, on the 27th of June 1846. His father was John Henry Parnell, a country gentleman of strong Nationalist and Liberal sympathies, who married in 1834 Delia Tudor, daughter of Commodore Charles Stewart of the United States navy. The Parnell family was of English origin, and more than one of its members attained civic note at Congleton in Cheshire under the Stuarts and during the

Commonwealth. Among them was Thomas Parnell, who migrated to Ireland after the Restoration. He had two sons, Thomas Parnell the poet and John Parnell, who became an Irish judge. From the latter Charles Stewart Parnell was lineally descended in the fifth generation. Sir John Parnell, chancellor of the exchequer in Grattan's parliament, and one of O'Connell's lieutenants in the parliament of the United Kingdom, was the grandson of Parnell the judge. The estate of Avondale was settled on him by a friend and bequeathed by him to his youngest son William (grandfather of Charles Stewart Parnell). His eldest son was imbecile. His second son was Sir Henry Parnell, a noted politician and financier in the early part of the 19th century, who held office under Grey and Melbourne, and after being raised to the peerage as Baron Congleton, died by his own hand in 1842. William Parnell was a keen student of Irish politics, with a strong leaning towards the popular side, and in 1805 he published a pamphlet entitled "Thoughts on the Causes of Popular Discontents," which was favourably noticed by Sydney Smith in the *Edinburgh Review*. Thus by birth and ancestry, and especially by the influence of his mother, who inherited a hatred of England from her father, Charles Stewart Parnell was, as it were, dedicated to the Irish national cause. He was of English extraction, a landowner, and a Protestant. Educated at private schools in England and at Magdalen College, Cambridge, his temperament and demeanour were singularly un-Irish on the surface—reserved, cold, repellent and unemotional. He appears to have been rather turbulent as a school-boy, contentious, insubordinate, and not over-scrupulous. He was fond of cricket and devoted to mathematics, but had little taste for other studies or other games. He was subject to somnambulism, and liable to severe fits of depression—facts which, taken in connexion with the existence of mental affliction among his ancestors, with his love of solitude and mystery, and his invincible superstitions about omens, numbers and the like, may perhaps suggest that his own mental equilibrium was not always stable. He was as little at home in an English school or an English university as he was afterwards in the House of Commons. "These English," he said to his brother at school, "despise us because we are Irish; but we must stand up to them. That's the way to treat an Englishman—stand up to him."

Parnell was not an active politician in his early years. He found salvation as a Nationalist and even as a potential rebel over the execution of the "Manchester Martyrs" in 1867, but it was not until some years afterwards that he resolved to enter parliament. In the meanwhile he paid a lengthened visit to the United States. At the general election of 1874 he desired to stand for the county of Wicklow, of which he was high sheriff at the time. The lord-lieutenant declined to relieve him of his disqualifying office, and his brother John stood in his place, but was unsuccessful at the poll. Shortly afterwards a bye-election occurred in Dublin, owing to Colonel Taylor having accepted office in the Disraeli government, and Parnell resolved to oppose him as a supporter of Isaac Butt, but was heavily beaten. He was, however, elected for Meath in the spring of 1875.

Butt had scrupulously respected the dignity of parliament and the traditions and courtesy of debate. He looked very coldly on the method of "obstruction"—a method invented by certain members of the Conservative party in opposition to the first Gladstone Administration. Parnell, however, entered parliament as a virtual rebel who knew that physical force was of no avail, but believed that political exasperation might attain the desired results. He resolved to make obstruction in parliament do the work of outrage in the country, to set the church-bell ringing—to borrow Mr Gladstone's metaphor—and to keep it ringing in season and out of season in the ears of the House of Commons. He did not choose to condemn outrages to gratify the Pharisaism of English members of parliament. He courted the alliance of the physical force party, and he had to pay the price for it. He invented and encouraged "boycotting," and did not discourage outrage. When a supporter in America offered him twenty-five dollars, "five for bread and twenty for lead," he accepted the gift, and he subsequently told the story on at least one Irish platform. In the course of the negotiations in 1882, which resulted in what was known as the Kilmainham Treaty, he wrote to Captain O'Shea: "If the arrears question be settled upon the lines indicated by us, I have every confidence that the exertions we should be able to make strenuously and unremittingly would be effective in stopping outrages and intimidation of all kinds." This is at least an admission that he had, or could place, his hand on the stop-valve, even if it be not open to the gloss placed on it by Captain O'Shea in a conversation repeated in the House of Commons by Mr Forster, "that the conspiracy which has been used to get up boycotting and outrage will now be used to put them down."

In 1877 Parnell entered on an organized course of obstruction. He and Mr Joseph Gillis Biggar, one of his henchmen, were gradually joined by a small band of the more advanced Home Rulers, and occasionally assisted up to a certain point by one or two English members. Butt was practically deposed and worried into his grave. William Shaw, a "transient and embarrassed phantom," was elected in his place, but Parnell became the real leader of a Nationalist party. The original Home Rule party was split in twain, and after the general election of 1880 the more moderate section of it ceased to exist. Obstruction in Parnell's hands was no mere weapon of delay and exasperation; it was a calculated policy, the initial stage of a campaign designed to show the malcontents in Ireland and their kinsmen in other lands that Butt's strictly constitutional methods were quite helpless, but that the parliamentary armoury still contained weapons which he could so handle as to convince the Irish people and even the Fenian and other physical force societies that the way to Irish legislative independence lay through the House of Commons. The Fenians were hard to convince, but in the autumn of 1877 Parnell persuaded the Home Rule Confederation of Great Britain (an association founded by Butt, but largely supported by Fenians) to depose Butt from its presidency and to elect himself in his place. He defined his attitude quite clearly in a speech delivered in New York early in 1880: "A true revolutionary movement in Ireland should, in my opinion, partake both of a constitutional and illegal character. It should be both an open and a secret organization, using the constitution for its own purposes, but also taking advantage of its secret combination." Parnell's opportunity came with the general election of 1880, which displaced the Conservative government of Lord Beaconsfield and restored Mr Gladstone to power with a majority strong enough at the outset to overpower the Opposition, even should the latter be reinforced by the whole of Parnell's contingent. Distress was acute in Ireland, and famine was imminent. Ministers had taken measures to relieve the situation before the dissolution was announced, but Lord Beaconsfield had warned the country that there was a danger ahead in Ireland "in its ultimate results scarcely less disastrous than pestilence and famine. . . . A portion of its population is attempting to sever the constitutional tie which unites it to Great Britain in that bond which has favoured the power and prosperity of both. It is to be hoped that all men of light and leading will resist this destructive doctrine." The Liberal party and its leaders retorted that they were as strongly opposed to Home Rule as their opponents, but Lord Beaconsfield's manifesto undoubtedly had the effect of alienating the Irish vote in the English constituencies from the Tory party and throwing it on the side of the Liberal candidates. This was Parnell's deliberate policy. He would have no alliance with either English party. He would support each in turn with a sole regard to the balance of political power in parliament and a fixed determination to hold it in his own hands if he could. From the time that he became its leader the Home Rule party sat together in the House of Commons and always on the Opposition side.

In the government formed by Mr Gladstone in 1880 Lord Cowper became viceroy and Mr W. E. Forster chief secretary for Ireland. The outlook was gloomy enough, but the Gladstone government do not seem to have anticipated, as Peel anticipated in 1841, that Ireland would be their difficulty. Yet the Land League had been formed by Michael Davitt and others in the autumn of 1879 for the purpose of agrarian agitation, and Parnell after some hesitation had given it his sanction. He visited the United States at the close of 1879. It was then and there that the "new departure"—the alliance of the open and the secret organizations—was confirmed and consolidated. Parnell obtained the countenance and support of the Clan-na-Gael, a revolutionary organization of the American-Irish, and the Land League began to absorb all the more violent spirits in Ireland, though the Fenian brotherhood still held officially aloof from it. As soon as the general election was announced Parnell returned to Ireland in order to direct the campaign in person. Though he had supported the Liberals at the election, he soon found himself in conflict with a government which could neither tolerate disturbance nor countenance a Nationalist agitation, and he entered on the struggle with forces organized, with money in his chest, and with a definite but still undeveloped plan of action. The prevailing distress increased and outrages began to multiply. A fresh Relief Bill was introduced by the government, and in order to stave off a measure to prevent evictions introduced by the Irish party, Mr Forster consented to add a clause to the Relief Bill for giving compensation in certain circumstances to tenants evicted for non-payment of rent. This clause was afterwards embodied in a separate measure known as the Compensation for Disturbance Bill, which after a stormy career in the House of Commons was summarily rejected by the House of Lords.

The whole Irish question was once more opened up in its more dangerous and more exasperating form. It became clear that the land question—supposed to have been settled by Mr Gladstone's Act of 1870—would have to be reconsidered in all its bearings, and a commission was appointed for the purpose. In Ireland things went from bad to worse. Evictions increased and outrages were multiplied. Intimidations and boycotting were rampant. As the winter wore on, Mr Forster persuaded his colleagues that exceptional measures were needed. An abortive prosecution of Parnell and some of his leading colleagues had by this time intensified the situation. Parliament was summoned early, and a Coercion Bill for one year, practically suspending the Habeas Corpus Act and allowing the arrest of suspects at the discretion of the government, was introduced, to be followed shortly by an Arms Bill. Parnell regarded the measure as a declaration of war, and met it in that spirit. Its discussion was doggedly obstructed at every stage, and on one occasion the debate was only brought to a close, after lasting for forty-one hours, by the Speaker's claiming to interpret the general sense of the house and resolving to put the question without further discussion. The rules of procedure were then amended afresh in a very drastic sense, and as soon as the bill was passed Mr Gladstone introduced a new Land Bill, which occupied the greater part of the session. Parnell accepted it with many reserves. He could not ignore its concessions, and was not disposed to undervalue them, but he had to make it clear to the revolutionary party, whose support was indispensable, that he regarded it only as a payment on account, even from the agrarian point of view, and no payment at all from the national point of view. Accordingly the Land League at his instigation determined to "test" the act by advising tenants in general to refrain from taking their cases into court until certain cases selected by the Land League had been decided. The government treated this policy, which was certainly not designed to make the act work freely and beneficially, as a deliberate attempt to intercept its benefits and to keep the Irish people in subjection to the Land League; and on this and other grounds—notably the attitude of the League and its leaders towards crime and outrage—Parnell was arrested under the Coercion Act and lodged in Kilmainham gaol (October 17, 1881).

Parnell in prison at once became more powerful for evil than he had ever been, either for good or for evil, outside. He may have known that the policy of Mr Forster was little favoured by several of his colleagues, and he probably calculated that the detention of large numbers of suspects without cause assigned and without trial would sooner or later create opposition in England. Mr Forster had assured his colleagues and the House of Commons that the power of arbitrary arrest would enable the police to lay their hands on the chief agents of disturbance, and it was Parnell's policy to show that so long as the grievances of the Irish tenants remained unredressed no number of arrests could either check the tide of outrage or restore the country to tranquillity. Several of his leading colleagues followed him into captivity at Kilmainham, and the Land League was dissolved, its treasurer, Patrick Egan, escaping to Paris and carrying with him its books and accounts. Before it was formally suppressed the League had issued a manifesto, signed by Parnell and several of his fellow-prisoners, calling upon the tenants to pay no rents until the government had restored the constitutional rights of the people. Discouraged by the priests, the No-Rent manifesto had little effect, but it embittered the struggle and exasperated the temper of the people on both sides of the Irish Channel.

Lord Cowper and Mr Forster were compelled to ask for a renewal of the Coercion Act with enlarged powers. But there were members of the cabinet who had only accepted it with reluctance, and were now convinced not only that it had failed, but that it could never succeed. A *modus vivendi* was desired on both sides. Negotiations were set on foot through the agency of Captain O'Shea—at that time and for long afterwards a firm political and personal friend of Parnell, but ultimately his accuser in the divorce court—and after a somewhat intricate course they resulted in what was known as the Kilmainham Treaty. As a consequence of this informal agreement, Parnell and two of his friends were to be released at once, the understanding being, as Mr Gladstone stated in a letter to Lord Cowper, "that Parnell and his friends are ready to abandon 'No Rent' formally, and to declare against outrage energetically, intimidation included, if and when the government announce a satisfactory plan for dealing with arrears." Parnell's own version of the understanding has been quoted above. It also included a hope that the government would allow the Coercion Act to lapse and govern the country by the same laws as in England. Parnell and his friends were released, and Lord Cowper and Mr Forster at once resigned.

The Phoenix Park murders (May 6, 1882) followed (see IRELAND: *History*). Parnell was prostrated by this catastrophe. In a public manifesto to the Irish people he declared that "no act has ever been perpetrated in our country, during the exciting struggle for social and political rights of the past fifty years, that has so stained the name of hospitable Ireland as this cowardly and unprovoked assassination of a friendly stranger." Privately to his own friends and to Mr Gladstone he expressed his desire to withdraw from public life. There were those who believed that nevertheless he was privy to the Invincible conspiracy. There is some prima facie foundation for this belief in the indifference he had always displayed towards crime and outrage when crime and outrage could be made to serve his purpose; in his equivocal relation to the more violent and unscrupulous forms of Irish sedition, and in the fact that Byrne, an official of the Land League, was in collusion with the Invincibles, that the knives with which the murder was done had been concealed at the offices of the Land League in London, and had been conveyed to Dublin by Byrne's wife. But the maxim *is fecit cui prodest* disallows these suspicions. Parnell gained nothing by the murders, and seemed for a time to have lost everything. A new Crimes Bill was introduced and made operative for a period of three years. A régime of renewed coercion was maintained by Lord Spencer and Mr (afterwards Sir George) Trevelyan, who had succeeded Lord Frederick Cavendish in the office of chief secretary; Ireland was tortured for three years by the necessary severity of its administration, and England was exasperated by a succession of dynamite outrages organized chiefly in America, which Parnell was powerless to prevent. The Phoenix Park murders did more than any other incident of his time and career to frustrate Parnell's policy and render Home Rule impossible.

For more than two years after the Phoenix Park murders Parnell's influence in parliament, and even in Ireland, was only intermittently and not very energetically exerted. His health was indifferent, his absences from the House of Commons were frequent and mysterious, and he had already formed those relations with Mrs O'Shea which were ultimately to bring him to the divorce court. The Phoenix Park murderers were arrested and brought to justice early in 1883. Mr Forster seized the opportunity to deliver a scathing indictment of Parnell in the House of Commons. In an almost contemptuous reply Parnell repudiated the charges in general terms, disavowed all sympathy with dynamite outrages, their authors and abettors—the only occasion on which he ever did so—declined to plead in detail before an English tribunal, and declared that he sought only the approbation of the Irish people. This last was shortly afterwards manifested in the form of a subscription known as the "Parnell Tribute," which quickly reached the amount of £37,000, and was presented to Parnell, partly for the liquidation of debts he was known to have contracted, but mainly in recognition of his public services. The Irish National League, a successor to the suppressed Land League, was founded in the autumn of 1882 at a meeting over which Parnell presided, but he looked on it at first with little favour, and its action was largely paralysed by the operation of the Crimes Act and the vigorous administration of Lord Spencer.

The Crimes Act, passed in 1882, was to expire in 1885, but the government of Mr Gladstone was in no position to renew it as it stood. In May notice was given for its partial renewal, subject to changes more of form than of substance. The second reading was fixed for the 10th of June. On the 8th of June Parnell, with thirty-nine of his followers, voted with the Opposition against the budget, and defeated the government by a majority of 264 votes to 252. Mr Gladstone forthwith resigned. Lord Salisbury undertook to form a government, and Lord Carnarvon became viceroy. The session was rapidly brought to an end with a view to the dissolution rendered necessary by the Franchise Act passed in 1884—a measure which was certain to increase the number of Parnell's adherents in parliament. It seems probable that Parnell had convinced himself before he resolved to join forces with the Opposition that a Conservative government would not renew the Crimes Act. At any rate, no attempt to renew it was made by the new government. Moreover, Lord Carnarvon, the new viceroy, was known to Parnell and to some others among the Irish leaders to be not unfavourable to some form of Home Rule if due regard were paid to imperial unity and security. He sought and obtained a personal interview with Parnell, explicitly declared that he was speaking for himself alone, heard Parnell's views, expounded his own, and forthwith reported what had taken place to the Prime Minister. In the result the new cabinet refused to move in the direction apparently desired by Lord Carnarvon.

Parnell opened the electoral campaign with a speech in Dublin, in which he pronounced unequivocally in favour of self-government for Ireland, and expressed his confident hope "that it may not be necessary for us in the new parliament to devote our attention to subsidiary measures, and that it may be possible for us to have a programme and a platform with only one plank, and that one plank National Independence." This was startling to English ears. The press denounced Parnell; Lord Hartington (afterwards the duke of Devonshire) protested against so fatal and mischievous a programme; Mr Chamberlain repudiated it with even greater emphasis. Meanwhile Mr Gladstone was slowly convincing himself that the passing of the Franchise Act had made it the duty of English statesmen and English party leaders to give a respectful hearing to the Irish National demand, and to consider how far it could be satisfied subject to the governing principle of "maintaining the supremacy of the crown, the unity of the Empire, and all the authority of parliament necessary for the conservation of the unity." This was the position he took up in the Hawarden manifesto issued in September before the general election of 1885. Speaking later at Newport in October, Lord Salisbury treated the Irish leader with unwonted deference and respect. Parnell, however, took no notice of the Newport speech, and waited for Mr Gladstone to declare himself more fully in Midlothian. But in this he was disappointed. Mr Gladstone went no farther than he had done at Hawarden, and he implored the electorate to give him a majority independent of the Irish vote. Subsequently Parnell invited him in a public speech to declare his policy and to sketch the constitution he would give to Ireland subject to the limitations he had insisted on. To this Mr Gladstone replied, "through the same confidential channel," that he could not consider the Irish demand before it had been constitutionally formulated, and that, not being in an official position, he could not usurp the functions of a government. The reply to this was the issue of a manifesto to the Irish electors of Great Britain violently denouncing the Liberal party and directing all Irish Nationalists to give their votes to the Tories. In these circumstances the general election was fought, and resulted in the return of 335 Liberals, four of whom were classed as "independent," 249 Conservatives and 86 followers of Parnell.

Mr Gladstone had now ascertained the strength of the Irish demand, but was left absolutely dependent on the votes of those who represented it. Through Mr Arthur Balfour he made informal overtures to Lord Salisbury proffering his own support in case the Prime Minister should be disposed to consider the Irish demand in a "just and liberal spirit"; but he received no encouragement. Towards the close of the year it became known through various channels that he himself was considering the matter and had advanced as far as accepting the principle of an Irish parliament in Dublin for the transaction of Irish affairs. Before the end of January Lord Salisbury's government was defeated on the Address, the Opposition including the full strength of the Irish party. Mr Gladstone once more became prime minister, with Mr John Morley (an old Home Ruler) as chief secretary, and Mr Chamberlain provisionally included in the cabinet. Lord Hartington, Mr Bright and some other Liberal chiefs, however, declined to join him.

Mr Gladstone's return to power at the head of an administration conditionally committed to Home Rule marks the culminating point of Parnell's influence on English politics and English parties. And after the defeat of the Home Rule ministry in 1886, Parnell was naturally associated closely with the Liberal Opposition. At the same time he withdrew himself largely from active interposition in current parliamentary affairs, and relaxed his control over the action and policy of his followers in Ireland. He entered occasionally into London society—where in certain quarters he was now a welcome guest—but in general he lived apart, often concealing his whereabouts and giving no address but the House of Commons, answering no letters, and seldom fulfilling engagements. He seems to have thought that Home Rule being now in the keeping of an English party, it was time to show that he had in him the qualities of a statesman as well as those of a revolutionary and a rebel. His influence on the remedial legislation proposed by the Unionist government for Ireland was considerable, and he seldom missed an opportunity of making it felt. It more than once happened to him to find measures, which had been contemptuously rejected when he had proposed them, ultimately adopted by the government; and it may be that the comparative tranquillity which Ireland enjoyed at the close of the 19th century was due quite as much to legislation inspired and recommended by himself as to the disintegration of his following which ensued upon his appearance in the divorce court and long survived his death. No sooner was Lord Salisbury's new government installed in office in 1886, than Parnell introduced a comprehensive Tenants' Relief Bill. The government would have none of it, though in the following session they adopted and carried many of its leading provisions. Its rejection was followed by renewed agitation in Ireland, in which Parnell took no part. He was ill—"dangerously ill," he said himself at the time—and some of his more hot-headed followers devised the famous "Plan of Campaign," on which he was never consulted and which never had his approval. Ireland was once more thrown into a turmoil of agitation, turbulence and crime, and the Unionist government, which had hoped to be able to govern the country by means of the ordinary law, was compelled to resort to severe repressive measures and fresh coercive legislation. Mr Balfour became chief secretary, and early in the session of 1887 the new measure was introduced and carried. Parnell took no very prominent part in resisting it. In the course of the spring *The Times* had begun publishing a series of articles entitled "Parnellism and Crime," on lines following Mr Forster's indictment of Parnell in 1883, though with much greater detail of circumstance and accusation. Some of the charges were undoubtedly well founded, some were exaggerated, some were merely the colourable fictions of political prepossession, pronounced to be not proven by the special commission which ultimately inquired into them. One of the articles, which appeared on the 18th of April, was accompanied by the facsimile of a letter purporting to be signed but not written by Parnell, in which he apologized for his attitude on the Phoenix Park murders, and specially excused the murder of Mr Burke. On the same evening, in the House of Commons, Parnell declared the letter to be a forgery, and denied that he had ever written any letter to that effect. He was not believed, and the second reading of the Crimes Act followed. Later in the session the attention of the house was again called to the subject, and it was invited by Sir Charles Lewis, an Ulster member and a bitter antagonist of the Nationalists, to declare the charges of *The Times* a breach of privilege. The government met this proposal by an offer to pay the expenses of a libel action against *The Times* to be brought on behalf of the Irish members incriminated. This offer was refused. Mr Gladstone then proposed that a select committee should inquire into the charges, including the letter attributed to Parnell, and to this Parnell assented. But the government rejected the proposal. For the rest, Parnell continued to maintain for the most part an attitude of moderation, reserve and retreat, though he more than once came forward to protest against the harshness of the Irish administration and to plead for further remedial legislation. In July 1888 he announced that Mr Cecil Rhodes had sent him a sum of £10,000 in support of the Home Rule movement, subject to the condition that the Irish representation should be retained in the House of Commons in any future measure dealing with the question. About the same time the question of "Parnellism and Crime" again became acute. Mr F. H. O'Donnell, an ex-M.P. and former member of the Irish party, brought an action against *The Times* for libel. His case was a weak one, and a verdict was obtained by the defendants. But in the course of the proceedings the attorney-general, counsel for *The Times*, affirmed the readiness of his clients to establish all the charges advanced, including the genuineness of the letter which Parnell had declared to be a forgery. Parnell once more invited the House of Commons to refer this particular issue—that of the letter—to a select committee. This was again refused; but after some hesitation the government resolved to appoint by act of parliament a special commission, composed of three judges of the High Court, to inquire into all the charges advanced by *The Times*. This led to what was in substance, though not perhaps in judicial form, the most remarkable state trial of the 19th century. The commission began to sit in September 1888, and issued its report in February 1890. It heard evidence of immense volume and variety, and the speech of Sir Charles Russell in defence was afterwards published in a bulky volume. Parnell gave evidence at great length, with much composure and some cynicism. On the whole he produced a not unfavourable impression, though some of his statements might seem to justify Mr Gladstone's opinion that he was not a man of exact veracity. The report of the commission was a very voluminous document, and was very variously interpreted by different parties to the controversy. Their conclusions may be left to speak for themselves:—

"I. We find that the respondent members of parliament collectively were not members of a conspiracy having for its object to establish the absolute independence of Ireland, but we find that some of them, together with Mr Davitt, established and joined in the Land League organization with the intention, by its means, to bring about the absolute independence of Ireland as a separate nation.

"II. We find that the respondents did enter into a conspiracy, by a system of coercion and intimidation, to promote an agrarian agitation against the payment of agricultural rents, for the purpose of impoverishing and expelling from the country the Irish landlords, who were styled 'the English garrison.'

"III. We find that the charge that 'when on certain occasions they thought it politic to denounce, and did denounce, certain crimes in public, they afterwards led their supporters to believe such denunciations were not sincere,' is not established. We entirely acquit Mr Parnell and the other respondents of the charge of insincerity in their denunciation of the Phoenix Park murders, and find that the 'facsimile' letter, on which this charge was chiefly based as against Mr Parnell, is a forgery.

"IV. We find that the respondents did disseminate the *Irish World* and other newspapers tending to incite to sedition and the commission of other crime.

"V. We find that the respondents did not directly incite persons to the commission of crime other than intimidation, but that they did incite to intimidation, and that the consequence of that incitement was that crime and outrage were committed by the persons incited. We find that it has not been proved that the respondents made payments for the purpose of inciting persons to commit crime.

"VI. We find, as to the allegation that the respondents did nothing to prevent crime, and expressed no *bona fide* disapproval, that some of the respondents, and in particular Mr Davitt, did express *bona fide* disapproval of crime and outrage, but that the respondents did not denounce the system of intimidation that led to crime and outrage, but persisted in it with knowledge of its effect.

"VII. We find that the respondents did defend persons charged with agrarian crime, and supported their families; but that it has not been proved that they subscribed to testimonials for, or were intimately associated with, notorious criminals, or that they made payments to procure the escape of criminals from justice.

"VIII. We find, as to the allegation that the respondents made payments to compensate persons who had been injured in the commission of crime, that they did make such payments.

"IX. As to the allegation that the respondents invited the assistance and co-operation of, and accepted subscriptions of money from, known advocates of crime and the use of dynamite, we find that the respondents did invite the assistance and co-operation of, and accepted subscriptions of money from, Patrick Ford, a known advocate of crime and the use of dynamite; but that it has not been proved that the respondents, or any of them, knew that the Clan-na-Gael controlled the League, or was collecting money for the Parliamentary Fund. It has been proved that the respondents invited and obtained the assistance and co-operation of the Physical Force Party in America, including the Clan-na-Gael, and in order to obtain that assistance abstained from repudiating or condemning the action of that party."

The specific charges brought against Parnell personally were thus dealt with by the commissioners:—

"(*a*) That at the time of the Kilmainham negotiations Mr Parnell knew that Sheridan and Boyton had been organizing outrage, and therefore wished to use them to put down outrage.

"We find that this charge has not been proved.

"(*b*) That Mr Parnell was intimate with the leading Invincibles; that he probably learned from them what they were about when he was released on *parole* in April 1882; and that he recognized the Phoenix Park murders as their handiwork.

"We find that there is no foundation for this charge. We have already stated that the Invincibles were not a branch of the Land League.

"(*c*) That Mr Parnell on 23rd January 1883, by an opportune remittance, enabled F. Byrne to escape from justice to France.

"We find that Mr Parnell did not make any remittance to enable F. Byrne to escape from justice."

The case of the facsimile letter alleged to have been written by Parnell broke down altogether. It was proved to be a forgery. It had been purchased with other documents from one Richard Pigott, a needy and disreputable Irish journalist, who afterwards tried to blackmail Archbishop Walsh by offering, in a letter which was produced in court, to confess its forgery. Mercilessly cross-examined by Sir Charles Russell on this letter to the archbishop, Pigott broke down utterly. Before the commission sat again he fled to Madrid, and there blew his brains out. He had confessed the forgery to Mr Labouchere in the presence of Mr G. A. Sala, but did not stay to be cross-examined on his confession. The attorney-general withdrew the letter on behalf of *The Times*, and the commission pronounced it to be a forgery. Shortly after the letter had been withdrawn, Parnell filed an action against *The Times* for libel, claiming damages to the amount of £100,000. The action was compromised without going into court by a payment of £5000.

Practically, the damaging effect of some of the findings of the commission was neutralized by Parnell's triumphant vindication in the matter of the facsimile letter and of the darker charges levelled at him. Parties remained of the same opinion as before: the Unionists still holding that Parnell was steeped to the lips in treason, if not in crime; while the Home Rulers made abundance of capital out of his personal vindication, and sought to excuse the incriminating findings of the commission by the historic antecedents of the Nationalist cause and party. The failure to produce the books and papers of the Land League was overlooked, and little importance was attached by partisans to the fact that in spite of this default (leaving unexplained the manner in which over £100,000 had been expended), the commissioners "found that the respondents did make payments to compensate persons who had been injured in the commission of crime." Parnell and his colleagues were accepted as allies worthy of the confidence of an English party; they were made much of in Gladstonian Liberal society; and towards the close of 1889, before the commission had reported, but some months after the forged letter had been withdrawn, Parnell visited Hawarden to confer with Mr Gladstone on the measure of Home Rule to be introduced by the latter should he again be restored to power. What occurred at this conference was afterwards disclosed by Parnell, but Mr Gladstone vehemently denied the accuracy of his statements on the subject.

But Parnell's fall was at hand. In December 1889 Captain O'Shea filed a petition for divorce on the ground of his wife's adultery with Parnell. Parnell's intimacy with Mrs O'Shea had begun in 1881, though at what date it became a guilty one is not in evidence. Captain O'Shea had in that year challenged him to a duel, but was pacified by the explanations of Mrs O'Shea. It is known that Captain O'Shea had been Parnell's confidential agent in the negotiation of the Kilmainham Treaty, and in 1885 Parnell had strained his personal authority to the utmost to secure Captain O'Shea's return for Galway, and had quelled a formidable revolt among some of his most influential followers in doing so. It is not known why Captain O'Shea, who, if not blind to a matter of notoriety, must have been complaisant in 1885, became vindictive in 1889. No defence being offered, a decree of divorce was pronounced, and in June 1891 Parnell and Mrs O'Shea were married.

At first the Irish party determined to stand by Parnell. The decree was pronounced on the 17th of November 1890. On the 20th a great meeting of his political friends and supporters was held in Dublin, and a resolution that in all political matters Parnell possessed the confidence of the Irish nation was carried by acclamation. But the Irish party reckoned without its English allies. The "Nonconformist conscience," which had swallowed the report of the commission, was shocked by the decree of the divorce court. At a meeting of the National Liberal Federation held at Sheffield on the 21st of November, Mr John Morley was privately but firmly given to understand that the Nonconformists would insist on Parnell's resignation. Parliament was to meet on the 25th. Mr Gladstone tried to convey to Parnell privately his conviction that unless Parnell retired the cause of Home Rule was lost. But the message never reached Parnell. Mr Gladstone then requested Mr John Morley to see Parnell; but he could not be found. Finally, on the 24th, Mr Gladstone wrote to Mr Morley the famous and fatal letter, in which he declared his conviction "that, notwithstanding the splendid services rendered by Mr Parnell to his country, his continuance at the present moment in the leadership would be disastrous in the highest degree to the cause of Ireland," and that "the continuance I speak of would not only place many hearty and effective friends of the Irish cause in a position of great embarrassment, but would render my retention of the leadership of the Liberal party, based as it has been mainly upon the presentation of the Irish cause, almost a nullity." This letter was not published until after the Irish parliamentary party had met in the House of Commons and re-elected Parnell as its chairman without a dissentient voice. But its publication was a thunderclap. A few days later Parnell was requested by a majority of the party to convene a fresh meeting. It took place in Committee Room No. 15, which became historic by the occasion, and after several days of angry recrimination and passionate discussion, during which Parnell, who occupied the chair, scornfully refused to put to the vote a resolution for his own deposition, 45 members retired to another room and there declared his leadership at an end. The remainder, 26 in number, stood by him. The party was thus divided into Parnellites and anti-Parnellites, and the schism was not healed until several years after Parnell's death.

This was practically the end of Parnell's political career in England. The scene of operations was transferred to Ireland, and there Parnell fought incessantly a bitter and a losing fight, which ended only with his death. He declared that Ireland could never achieve her emancipation by force, and that if she was to achieve it by constitutional methods, it could only be through the agency of a united Nationalist party rigidly eschewing alliance with any English party. This was the policy he proclaimed in a manifesto issued before the opening of the sittings in Committee Room No. 15, and with this policy, when deserted by the bulk of his former followers, he appealed to the Fenians in Ireland—"the hillside men," as Mr Davitt, who had abandoned him early in the crisis, contemptuously called them. The Fenians rallied to his side, giving him their votes and their support, but they were no match for the Church, which had declared against him. An attempt at reconciliation was made in the spring, at what was known as "the Boulogne negotiations," where Mr William O'Brien endeavoured to arrange an understanding; but it came to nothing in the end. Probably Parnell was never very anxious for its success. He seems to have regarded the situation as fatally compromised by the extent to which his former followers were committed to an English alliance, and he probably saw that the only way to recover his lost position was to build up a new independent party. He knew well enough that this would take time—five years was the shortest period he allowed himself—but before many months were passed he was dead. The life he led, the agonies he endured, the labours he undertook from the beginning of 1891, travelling weekly to Ireland and intoxicating himself with the atmosphere of passionate nationalism in which he moved, would have broken down a much stronger man. He who had been the most impassive of men became restless, nervous, almost distracted at times, unwilling to be alone, strange in his ways and demeanour. He visited Ireland for the last time in September, and the last public meeting he attended was on the 27th of that month. The next day he sent for his friend Dr Kenny, who found him suffering from acute rheumatism and general debility. He left Ireland on the 30th, promising to return on the following Saturday week. He did return on that day, but it was in his coffin. He took to his bed shortly after his return to his home at Brighton, and on the 6th of October he died. His remains were conveyed to Dublin, and on Sunday, the 11th of October, they were laid to rest in the presence of a vast assemblage of the Irish people in Glasnevin Cemetery, not far from the grave of O'Connell.

The principal materials for a biography of Parnell and the history of the Parnellite movement are to be found in *Hansard's Parliamentary Debates* (1875–1891); in the *Annual Register* for the same period; in the *Report of the Special Commission* issued in 1890; in *The Life of Charles Stewart Parnell*, by R. Barry O'Brien; in *The Parnellite Movement*, by T. P. O'Connor, M.P.; and in a copious biography of Parnell contributed by an anonymous but well-informed writer to the *Dict. of Nat. Biog.*, vol. xliii.

(J. R. T.)

PARNELL, THOMAS (1679–1718), English poet, was born in Dublin in 1679. His father, Thomas Parnell, belonged to a family (see above) which had been long settled at Congleton, Cheshire, but being a partisan of the Commonwealth, he removed with his children to Ireland after the Restoration, and purchased an estate in Tipperary which descended to his son. In 1693 the son entered Trinity College, Cambridge, and in 1700 took his

M.A. degree, being ordained deacon in the same year in spite of his youth. In 1704 he became minor canon of St Patrick's Cathedral and in 1706 archdeacon of Clogher. Shortly after receiving this preferment he married Anne Minchin, to whom he was sincerely attached. Swift says that nearly a year after her death (1711) he was still ill with grief. His visits to London are said to have begun as early as 1706. He was intimate with Richard Steele and Joseph Addison, and although in 1711 he abandoned his Whig politics, there was no change in the friendship. Parnell was introduced to Lord Bolingbroke in 1712 by Swift, and subsequently to the earl of Oxford. In 1713 he contributed to the *Poetical Miscellanies* edited for Tonson by Steele, and published his *Essay on the Different Styles of Poetry*. He was a member of the Scriberlus Club, and Pope says that he had a hand in " An Essay of the learned Martinus Scriblerus concerning the Origin of Sciences." He wrote the " Essay on the Life and writings and learning of Homer"[1] prefixed to Pope's translations, and in the autumn of 1714 both were at Bath together. In 1716 Parnell was presented to the vicarage of Finglass, when he resigned his archdeaconry. In the same year he published *Homer's Battle of the Frogs and Mice. With the remarks of Zoilus. To which is prefixed, the Life of the said Zoilus*. Parnell was in London again in 1718, and, on the way back to Ireland, was taken ill and died at Chester, where he was buried on the 24th of October.

Parnell's best known poem is " The Hermit," an admirably executed moral *conte* written in the heroic couplet. It is based on an old story to be found in the *Gesta Romanorum* and other sources. He cannot in any sense be said to have been a disciple of Pope, though his verse may owe something to his friend's revision. But this and other of his pieces, " The Hymn to Contentment," " The Night Piece on Death," " The Fairy Tale," were original in treatment, and exercised some influence on the work of Goldsmith, Gray and Collins. Pope's selection of his poems was justified by the publication in 1758 of *Posthumous Works of Dr Thomas Parnell, containing Poems Moral and Divine, and on various other subjects*, which in no way added to his fame. They were contemptuously dismissed as unauthentic by Thomas Gray and Samuel Johnson, but there seems no reason to doubt the authorship.

In 1770 *Poems on Several Occasions* was printed with a life of the author by Oliver Goldsmith. His *Poetical Works* were printed in Anderson's and other collections of the *British Poets*. See *The Poetical Works* (1894) edited by George A. Aitken for the *Aldine Edition of the British Poets*. An edition by the Rev. John Mitford for the same series (1833) was reprinted in 1866. His correspondence with Pope is published in Pope's *Works* (ed. Elwin and Courthorpe, vii. 451–467).

PARNON (mod. Malevo), the mountain ridge on the east of the Laconian plain. Height 6365 ft. It is visible from Athens above the top of the Argive mountains.

PARNY, ÉVARISTE DÉSIRÉ DE FORGES, VICOMTE DE (1753–1814), was born in the Isle of Bourbon on the 6th of February 1753. He was sent to France at nine years old, was educated at Rennes, and in 1771 entered the army. He was, however, shortly recalled to the Isle of Bourbon, where he fell in love with a young lady whom he addresses as Éléonore. Her father refused to consent to her marriage with Parny, and she married some one else. Parny returned to France, and published his *Poésies érotiques* in 1778. He also published about the same time his *Voyage de Bourgogne* (1777), written in collaboration with his friend Antoine de Bertin (1752–1790); *Épître aux insurgents de Boston* (1777), and *Opuscules poétiques* (1779). In 1796 appeared the *Guerre des dieux*, a poem in the style of Voltaire's *Pucelle*, directed against Christianity. Parny devoted himself in his later years almost entirely to the religious and political burlesque. He was elected to the Academy in 1803, and in 1813 received a pension from Napoleon. In 1805 he produced an extraordinary allegoric poem attacking George III., his family and his subjects, under the eccentric title of " Goddam! Goddam! par un French-dog." Parny's early love poems and elegies, however, show a remarkable grace and ease, a good deal of tenderness, and considerable fancy and wit. One famous piece, the *Elegy on a Young Girl*, is scarcely to be excelled in its kind. Parny died in 1814.

His *Œuvres choisies* were published in 1827. There is a sketch of Parny in Sainte-Beuve's *Portraits contemporains*.

PARODY (Gr. *ταρῳδία*, literally a song sung beside, a comic parallel), an imitation of the form or style of a serious writing in matter of a meaner kind so as to produce a ludicrous effect. Parody is almost as old in European literature as serious writing. The *Batrachomyomachia*, or " Battle of the Frogs and Mice," a travesty of the heroic epos, was ascribed at one time to Homer himself; and it is probably at least as old as the 5th century B.C. The great tragic poetry of Greece very soon provoked the parodist. Aristophanes parodied the style of Euripides in the *Acharnians* with a comic power that has never been surpassed. The debased grand style of medieval romance was parodied in *Don Quixote*. Shakespeare parodied the extravagant heroics of an earlier stage, and was himself parodied by Marston, incidentally in his plays and elaborately in a roughly humorous burlesque of *Venus and Adonis*. The most celebrated parody of the Restoration was Buckingham's *Rehearsal* (1672), in which the tragedies of Dryden were inimitably ridiculed. At the beginning of the 18th century *The Splendid Shilling* of John Philips (1676–1709), which Addison said was " the finest burlesque poem in the English language," brilliantly introduced a fashion for using the solemn movement of Milton's blank verse to celebrate ridiculous incidents. In 1736, Isaac Hawkins Browne (1705–1760) published a volume, *A Pipe of Tobacco*, in which the poetical styles of Colley Cibber, Ambrose Philips, James Thomson, Edward Young and Jonathan Swift were delightfully reproduced. In the following century, Shelley and John Hamilton Reynolds almost simultaneously produced cruel imitations of the naiveté and baldness of Wordsworth's *Peter Bell* (1819). But in that generation the most celebrated parodists were the brothers Smith, whose *Rejected Addresses* may be regarded as classic in this kind of artificial production. The Victorian age has produced a plentiful crop of parodists in prose and in verse, in dramatic poetry and in lyric poetry. By common consent, the most subtle and dexterous of these was C. S. Calverley, who succeeded in reproducing not merely tricks of phrase and metre, but even manneristic turns of thought. In a later day, Mr Owen Seaman has repeated, and sometimes surpassed, the agile feats of Calverley.

PAROLE (shortened from the Fr. *parole d'honneur*, word of honour), a military term signifying the engagement given by a prisoner of war that if released he will not again take up arms against his captors during the term of the engagement or the war, unless previously relieved of the obligation by exchange. " Parole " is also used in the same sense as " word " to imply a watchword or password. The French word, formed from the Late Lat. *paraula*, *parabola*, Gr. παραβολή, story, parable, was also adopted into English as " parol," *i.e.* verbal, oral, by word of mouth, now only used in the legal term " parol evidence," *i.e.* oral as opposed to documentary evidence.

PAROPAMISUS, the name given by the Greeks to the parts of the Hindu Kush bordering Kohistan to the north-west of Kabul. It is now applied in a restricted sense to the waterparting between Herat and the Russian frontier on the Kushk river, which possesses no local name of its own. From Herat city to the crest of the Paropamisus, which is crossed by several easy passes, is a distance of about 36 m., involving a rise of 1000 ft.

PAROS, or PARO, an island in the Aegean Sea, one of the largest of the group of the Cyclades, with a population of 8000. It lies to the west of Naxos, from which it is separated by a channel about 6 m. broad, and with which it is now grouped together, in popular language, under the common name of Paronaxia. It is in 37° N. lat. and 25° 10′ E. long. Its greatest length from N.E. to S.W. is 13 m., and its greatest breadth

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[1] Pope acknowledged the essay with affectionate praise, but in 1720 he said it was written " upon such memoirs as I had collected," and later he complained of its defects, saying it had cost him more pains to revise than it would have done to write it.

10 m. It is formed of a single mountain about 2500 ft. high, sloping evenly down on all sides to a maritime plain, which is broadest on the north-east and south-west sides. The island is composed of marble, though gneiss and mica-schist are to be found in a few places. The capital, Paroekia or Parikia (Italian, *Parechia*), situated on a bay on the north-west side of the island, occupies the site of the ancient capital Paros. Its harbour admits small vessels; the entrance is dangerous on account of rocks. Houses built in the Italian style with terraced roofs, shadowed by luxuriant vines, and surrounded by gardens of oranges and pomegranates, give to the town a picturesque and pleasing aspect. Here on a rock beside the sea are the remains of a medieval castle built almost entirely of ancient marble remains. Similar traces of antiquity in the shape of bas-reliefs, inscriptions, columns, &c., are numerous in the town, and on a terrace to the south of it is a precinct of Asclepius. Outside the town is the church of Katapoliani (Ἡ Ἑκατονταπυλιανή), said to have been founded by the empress Helena; there are two adjoining churches, one of very early form, and also a baptistery with a cruciform font.

On the north side of the island is the bay of Naoussa (Naussa) or Agoussa, forming a safe and roomy harbour. In ancient times it was closed by a chain or boom. Another good harbour is that of Drios on the south-east side, where the Turkish fleet used to anchor on its annual voyage through the Aegean. The three villages of Tragoulas, Marmora and Kepidi (Κηπίδι, pronounced Tschipidi), situated on an open plain on the eastern side of the island, and rich in remains of antiquity, probably occupy the site of an ancient town. They are known together as the "villages of Kephalos," from the steep and lofty headland of Kephalos. On this headland stands an abandoned monastery of St Anthony, amidst the ruins of a medieval castle, which belonged to the Venetian family of the Venieri, and was gallantly though fruitlessly defended against the Turkish general Barbarossa in 1537.

Parian marble, which is white and semi-transparent, with a coarse grain and a very beautiful texture, was the chief source of wealth to the island. The celebrated marble quarries lie on the northern side of the mountain anciently known as Marpessa (afterwards Capresso), a little below a former convent of St Mina. The marble, which was exported from the 6th century B.C., and used by Praxiteles and other great Greek sculptors, was obtained by means of subterranean quarries driven horizontally or at a descending angle into the rock, and the marble thus quarried by lamplight got the name of Lychnites, Lychneus (from *lychnos*, a lamp), or Lygdos (Plin. *H. N.* xxxvi. 5, 14; Plato, *Eryxias*, 400 D; Athen. v. 205o; Diod. Sic. 2, 52). Several of these tunnels are still to be seen. At the entrance to one of them is a bas-relief dedicated to Pan and the Nymphs. Several attempts to work the marble have been made in modern times, but it has not been exported in any great quantities.

History.—The story that Paros was colonized by one Paros of Parrhasia, who brought with him a colony of Arcadians to the island (Heraclides, *De rubus publicis*, 8; Steph. Byz. *s.v.* Πάρος), is one of those etymologizing fictions in which Greek legend abounds. Ancient names of the island are said to have been Plateia (or Pactia), Demetrias, Zacynthus, Hyria, Hyleessa, Minoa and Cabarnis (Steph. Byz.). From Athens the island afterwards received a colony of Ionians (Schol. Dionys. *Per.* 525; cf. Herod. i. 171), under whom it attained a high degree of prosperity. It sent out colonies to Thasos (Thuc. iv. 104; Strabo, 487) and Parium on the Hellespont. In the former colony, which was planted in the 15th or 18th Olympiad, the poet Archilochus, native of Paros, is said to have taken part. As late as 385 B.C. the Parians, in conjunction with Dionysius of Syracuse, founded a colony on the Illyrian island of Pharos (Diod. Sic. xv. 13). So high was the reputation of the Parians that they were chosen by the people of Miletus to arbitrate in a party dispute (Herod. v. 28 seq.). Shortly before the Persian War Paros seems to have been a dependency of Naxos (Herod. v. 31). In the Persian War Paros sided with the Persians and sent a trireme to Marathon to support them. In retaliation, the capital Paros was besieged by an Athenian fleet under Miltiades, who demanded a fine of 100 talents. But the town offered a vigorous resistance, and the Athenians were obliged to sail away after a siege of twenty-six days, during which they had laid the island waste. It was at a temple of Demeter Thesmophorus in Paros that Miltiades received the wound of which he afterwards died (Herod. vi. 133–136). By means of an inscription Ross was enabled to identify the site of the temple; it lies, in agreement with the description of Herodotus, on a low hill beyond the boundaries of the town. Paros also sided with Xerxes against Greece, but after the battle of Artemisium the Parian contingent remained in Cythnos watching the progress of events (Herod. viii. 67). For this unpatriotic conduct the islanders were punished by Themistocles, who exacted a heavy fine (Herod. viii. 112). Under the Athenian naval confederacy, Paros paid the highest tribute of all the islands subject to Athens —30 talents annually, according to the assessment of Olymp. 88, 4 (429 B.C.). Little is known of the constitution of Paros, but inscriptions seem to show that it was democratic, with a senate (*Boule*) at the head of affairs (*Corpus inscript.* 2376–2383; Ross, *Inscr. ined.* ii. 147, 148). In 410 B.C. the Athenian general Theramenes found an oligarchy at Paros; he deposed it and restored the democracy (Diod. Sic. xiii. 47). Paros was included in the new Athenian confederacy of 378 B.C., but afterwards, along with Chios, it renounced its connexion with Athens, probably about 357 B.C. Thenceforward the island lost its political importance. From the inscription of Adule we learn that the Cyclades, and consequently Paros, were subject to the Ptolemies of Egypt. Afterwards they passed under the rule of Rome. When the Latins made themselves masters of Constantinople, Paros, like the rest, became subject to Venice. In 1537 it was conquered by the Turks. The island now belongs to the kingdom of Greece.

Among the most interesting discoveries made in the island is the Parian Chronicle (*q.v.*).

See Tournefort, *Voyage du Levant*, i. 232 seq. (Lyons, 1717); Clarke, *Travels*, iii. (London, 1814); Leake, *Travels in Northern Greece*, iii. 84 seq. (London, 1835); Prokesch, *Denkwürdigkeiten*, ii. 19 seq. (Stuttgart, 1836); Ross, *Reisen auf den griechischen Inseln*, i. 44 seq. (Stuttgart, and Tübingen, 1840); Fiedler, *Reise durch alle Theile des Königreiches Griechenland*, ii. 179 seq. (Leipzig, 1841); Bursian, *Geographie von Griechenland*, ii. 483 seq. (Leipzig, 1872). For the Parian Chronicle, *Inscriptiones graecae*, xii. 100 sqq.

PAROXYSM (Med. Lat. *paroxysmus*, from the Gr. παροξύνειν, to make sharp, ὀξύς), a violent outbreak or display of emotion or feeling. The term is used of a fit of laughter, pain, anger or fear, and particularly an acute stage in a disease is the earliest sense of the word.

PARQUETRY (Fr. *parqueterie*, from *parquet*, flooring, originally a small compartment), a term applied to a kind of mosaic of wood used for ornamental flooring. Materials contrasting in colour and grain, such as oak, walnut, cherry, lime, pine, &c. are employed; and in the more expensive kinds the richly coloured tropical woods are also used. The patterns of parquet flooring are entirely geometrical and angular (squares, triangles, lozenges, &c.), curved and irregular forms being avoided on account of the expense and difficulty of fitting. There are two classes of parquetry in use—veneers and solid parquet. The veneers are usually about a quarter of an inch in thickness, and are laid over already existing floors. Solid parquet of an inch or more in thickness consists of single pieces of wood grooved and tongued together, having consequently the pattern alike on both sides.

PARR, CATHERINE (1512–1548), the sixth queen of Henry VIII., was a daughter of Sir Thomas Parr (d. 1517), of Kendal, an official of the royal household. When only a girl she was married to Edward Borough, and after his death in or before 1529 to John Neville, Lord Latimer, who died in 1542 or 1543. Latimer had only been dead a few months when, on the 12th of July 1543, Catherine was married to Henry VIII. at Hampton Court. The new queen, who was regent of England during the king's absence in 1544, acted in a very kindly fashion towards her stepchildren; but her patience with the king did not prevent a charge of heresy from being brought against her. Henry, however, would not permit her arrest, and she became a widow for the third time on his death in January 1547. In the same year she married a former lover, Sir Thomas Seymour, now Lord Seymour of Sudeley. Soon after this event, on the 7th of September 1548, she died at Sudeley castle. Catherine was a pious and charitable woman and a friend of learning; she wrote *The Lamentation or Complaint of a Sinner*, which was published after her death.

See A. Strickland, *Lives of the Queens of England*, vol. iii. (1877).

PARR, SAMUEL (1747–1825), English schoolmaster, son of Samuel Parr, surgeon at Harrow-on-the-Hill, was born there on the 26th of January 1747. At Easter 1752 he was sent to Harrow School as a free scholar, and when he left in 1761 he began to help his father in his practice, but the old surgeon realized that his son's talents lay elsewhere, and Samuel was sent (1765) to Emmanuel College, Cambridge. From February 1767 to the close of 1771 he served under Robert Sumner as head assistant at Harrow, where he had Sheridan among his pupils. When the head master died in September 1771 Parr, after vainly applying for the position, started a school at Stanmore, which he conducted for five years. Then he became head master of Colchester Grammar School (1776–1778) and subsequently of Norwich School (1778–1786). He had taken priest's orders at Colchester, and in 1780 was presented to the small rectory of Asterby in Lincolnshire, and three years later to the vicarage of Hatton near Warwick. He exchanged this latter benefice for Wadenhoe, Northamptonshire, in 1789, stipulating to be allowed to reside, as assistant curate, in the parsonage of Hatton, where he took a limited number of pupils. Here he spent the rest of his days, enjoying his excellent library, described by H. G. Bohn in *Bibliotheca Parriana* (1827), and here his friends, Porson and E. H. Barker, passed many months in his company. The degree of LL.D. was conferred on him by the university of Cambridge in 1781. Parr died at Hatton vicarage on the 6th of March 1825.

Dr Parr's writings fill several volumes, but they are all beneath the reputation which he acquired through the variety of his knowledge and dogmatism of his conversation. The chief of them are his *Characters of Charles James Fox* (1809); and his unjustifiable reprint of the *Tracts of Warburton and a Warburtonian, not admitted into their works*, a scathing exposure of Warburton and Hurd. Even amid the terrors of the French Revolution he adhered to Whiggism, and his correspondence included every man of eminence, either literary or political, who adopted the same creed. In private life his model was Johnson. He succeeded in copying his uncouthness and pompous manner, but had neither his humour nor his real authority. He was famous as a writer of epitaphs and wrote inscriptions for the tombs of Burke, Charles Burney, Johnson, Fox and Gibbon.

There are two memoirs of his life, one by the Rev. William Field (1828), the other, with his works and his letters, by John Johnstone (1828); and E. H. Barker published in 1828–1829 two volumes of *Parriana*, a confused mass of information on Parr and his friends. An essay on his life is included in De Quincey's works, vol. v., and a little volume of the *Aphorisms, Opinions and Reflections of the late Dr Parr* appeared in 1826.

PARR, THOMAS (*c.* 1483–1635), English centenarian, known as "Old Parr," is reputed to have been born in 1483, at Winnington, Shropshire, the son of a farmer. In 1500 he is said to have left his home and entered domestic service, and in 1518 to have returned to Winnington to occupy the small holding he then inherited on the death of his father. In 1563, at the age of eighty, he married his first wife, by whom he had a son and a daughter, both of whom died in infancy. At the age of 122, his first wife having died, he married again. His vigour seems to have been unimpaired, and when 130 years old he is said to have threshed corn. In 1635 his fame reached the ears of Thomas Howard, 2nd earl of Arundel, who resolved to exhibit him at court, and had him conveyed to London in a specially constructed litter. Here he was presented to King Charles I., but the change of air and diet soon affected him, and the old man died at Lord Arundel's house in London, on the 14th of November 1635. He was buried in the south transept of Westminster Abbey where the inscription over his grave reads: "Tho: Parr of ye county of Salopp Born in Ao 1483. He lived in ye reignes of Ten Princes viz. K. Edw. 4, K. Ed. V. K. Rich. 3. K. Hen. 7. K. Hen. 8. K. Edw. 6. Q. Ma. Q. Eliz. K. Ja. and K. Charles, aged 152 yeares and was buried here Nov. 15. 1635." A post-mortem examination made by the king's orders by Dr William Harvey, revealed the fact that his internal organs were in an unusually perfect state, and his cartilages unossified.

PARR, a name originally applied to the small Salmonoids abundant in British rivers, which were for a long time considered to constitute a distinct species of fish (*Salmo salmulus*). They possess the broad head, short snout and large eye characteristic of young Salmonoids, and are ornamented on the sides of the body and tail with about eleven or more broad dark cross-bars, the so-called parr-marks. However, John Shaw proved, by experiment, that these fishes represent merely the first stage of growth of the salmon, before it assumes, at an age of one or two years, and when about six inches long, the silvery smolt-dress preparatory to its first migration to the sea. The parr-marks are produced by a deposit of black pigment in the skin, and appear very soon after the exclusion of the fish from the egg; they are still visible for some time below the new coat of scales of the smolt-stage, but have entirely disappeared on the first return of the young salmon from the sea. Although the juvenile condition of the parr is now universally admitted, it is a remarkable fact that many male parr, from 7 to 8 inches long, have their sexual organs fully developed, and that their milt has all the fertilizing properties of the seminal fluid of a full-grown and sexually matured salmon. On the other hand, no female parr has ever been obtained with mature ova. Not only the salmon, but also the other species of *Salmo*, the grayling, and probably also the *Coregoni*, pass through a parr-stage of growth. The young of all these fishes are barred, the salmon having generally eleven or more bars, and the parr of the migratory trout from nine to ten, or two or three more than the river-trout. In some of the small races or species of river-trout the parr-marks are retained throughout life, but subject to changes in intensity of colour.

PARRAMATTA, a town of Cumberland county, New South Wales, Australia, 14 m. by rail N.W. of Sydney. Pop. (1901) 12,568. It is situated on the Parramatta River, an arm of Port Jackson, and was one of the earliest inland settlements (1788), the seat of many of the public establishments connected with the working of the convict system. Many of these still remain in another form (the district hospital, the lunatic asylum, the gaol, two asylums for the infirm and destitute, the Protestant and Catholic orphan schools), involving a government expenditure which partly sustains the business of the town. Parramatta was one of the earliest seats of the tweed manufacture, but its principal industrial dependence has been on the fruit trade. With the exception of Prospect and Pennant Hills, where there is an outburst of trap rock, the surface soil is the disintegration of the Wainamatta shale, which is well suited for orangeries and orchards. The first grain grown in the colony was harvested at Parramatta, then called Rosehill. The earlier governors had their country residence near the town, but the domain is now a public park in the hands of the municipality. An early observatory, where in 1822 were made the observations for the *Parramatta Catalogue*, numbering 7385 stars, has long been abandoned. Parramatta was incorporated in 1861. It has one of the finest race-courses in Australia, and in the King's School, founded in 1832, the oldest grammar school in the colony.

PARRHASIUS, of Ephesus, one of the greatest painters of Greece. He settled in Athens, and may be ranked among the Attic artists. The period of his activity is fixed by the anecdote which Xenophon records of the conversation between him and Socrates on the subject of art; he was therefore distinguished as a painter before 399 B.C. Seneca relates a tale that Parrhasius bought one of the Olynthians whom Philip sold into slavery, 346 B.C., and tortured him in order to have a model for his picture of Prometheus; but the story, which is similar to one told of Michelangelo, is chronologically impossible. Another tale recorded of him describes his contest with Zeuxis. The latter painted some grapes so perfectly that birds came to peck at them. He then called on Parrhasius to draw aside the curtain and show his picture, but, finding that his rival's picture was the curtain itself, he acknowledged himself to be surpassed, for Zeuxis had deceived birds, but Parrhasius had deceived Zeuxis. He was universally placed in the very first rank among painters. His skilful drawing of outlines is especially praised. and many of his drawings on wood and parchment were preserved and highly valued by later painters for purposes of study. He first attained skill in making his figures appear to stand out from the background. His picture of Theseus adorned the Capitol in Rome. His other works, besides the obscene subjects with which he is said to have amused his leisure, are chiefly mythological groups. A picture of the Demos, the personified People of Athens, is famous; according to the story, which is probably based upon epigrams, the twelve prominent characteristics of the people, though apparently quite inconsistent with each other, were distinctly expressed in this figure.

PARRICIDE (probably for Lat. *patricidia*, from *pater*, father, and *caedere*, to slay), strictly the murder of a parent; the term however has been extended to include the murder of any relative or of an ascendant by a descendant. The first Roman law against parricide was that of the *Lex Cornelia de sicariis et veneficis* (*c.* 81 B.C.), which enacted that the murderer of a parent should be sewed up in a sack and thrown into the sea, and provided other punishments for the killing of near relatives. The *Lex Pompeia de parricidiis* (52 B.C.) re-enacted the principal provisions of the Lex Cornelia and defined parricide as the deliberate and wrongful slaying of ascendants, husbands, wives, cousins, brothers and sisters, uncles and aunts, stepfathers and mothers, fathers and mothers-in-law, patrons and descendants. For the murder of a father, mother, grandfather or grandmother, the Lex Pompeia ordained that the guilty person should be whipped till he bled, sewn up in a sack with a dog, a cock, a viper and an ape, and thrown into the sea. Failing water, he was either to be torn in pieces by wild beasts or burned.

English law has never made any legal distinction between killing a parent or other relative and simple murder, and the Netherlands and Germany follow in the same direction. French law has been exceptionally severe in its treatment of parricide. Before the Revolution, the parricide if a male, had to make a recantation of his crime, and then suffered the loss of his right hand; his body was afterwards burned and the ashes scattered to the winds. If the parricide was a female she was burned or hanged. After the Revolution the penalty became simply one of death, but the compilers of the penal code adjudged this insufficient and reintroduced some of the previous provisions: the parricide was brought to the place of execution clad in a shirt, bare-footed, and the head enveloped in a black veil. While he was exposed on the scaffold, an officer read aloud the decree of condemnation; the culprit then had his right hand cut off, and was immediately afterwards executed. On the revision of the penal code in 1832 the cutting off of the right hand was omitted, but the other details remained. Other continental European countries, following the example of France, treat the crime of parricide with exceptional severity.

PARROT (according to Skeat, from Fr. *Perrot* or *Pierrot*, the diminutive of the proper name *Pierre*[1]), the name given generally to a large and very natural group of birds, which for more than a score of centuries have attracted attention, not only from their gaudy plumage, but, at first and chiefly, it would seem, from the readiness with which many of them learn to imitate the sounds they hear, repeating the words and even phrases of human speech with a fidelity that is often astonishing. It is said that no representation of any parrot appears in Egyptian art, nor does any reference to a bird of the kind occur in the Bible, whence it has been concluded that neither painters nor writers had any knowledge of it. Aristotle is commonly supposed to be the first author who mentions a parrot; but this is an error, for nearly a century earlier Ctesias in his *Indica* (cap. 3),[2] under the name of βίττακος (*Bittacus*), so neatly described a bird which could speak an "Indian" language—naturally, as he seems to have thought—or Greek—if it had been taught so to do—about as big as a sparrow-hawk (*Hierax*), with a purple face and a black beard, otherwise blue-green (*cyaneus*) and vermilion in colour, so that there cannot be much risk in declaring that he must have had before him a male example of what is now commonly known as the Blossom-headed parakeet, and to ornithologists as *Palaeornis cyanocephalus*, an inhabitant of many parts of India. After Ctesias comes Aristotle's ψιττάκη (*Psittace*), which Sundevall supposes him to have described only from hearsay. There can be no doubt that the Indian conquests of Alexander were the means of making the parrot better known in Europe, and it is in reference to this fact that another Eastern species of *Palaeornis* now bears the name of *P. alexandri*, though from the localities it inhabits it could hardly have had anything to do with the Macedonian hero. That Africa had parrots does not seem to have been discovered by the ancients till long after, as Pliny tells us (vi. 29) that they were first met with beyond the limits of Upper Egypt by explorers employed by Nero. These birds, highly prized from the first, reprobated by the moralist, and celebrated by more than one classical poet, in the course of time were brought in great numbers to Rome, and ministered in various ways to the luxury of the age. Not only were they lodged in cages of tortoise-shell and ivory, with silver wires, but they were professedly esteemed as delicacies for the table, and one emperor is said to have fed his lions upon them! With the decline of the Roman Empire the demand for parrots in Europe lessened, and so the supply dwindled, yet all knowledge of them was not wholly lost, and they are occasionally mentioned by one writer or another until in the 15th century began that career of geographical discovery which has since proceeded uninterruptedly. This immediately brought with it the knowledge of many more forms of these birds than had ever before been seen. Yet so numerous is the group that even now new species of parrots are not uncommonly recognized.

The home of the vast majority of parrot-forms is unquestionably within the tropics, but the popular belief that parrots are tropical birds only is a great mistake. In North America the Carolina parakeet, *Conurus carolinensis*, at the beginning of the 19th century used to range in summer as high as the shores of lakes Erie and Ontario—a latitude equal to the south of France; and even much later it reached, according to trustworthy information, the junction of the Ohio and the Mississippi, though now its limits have been so much curtailed that its occurrence in any but the Gulf States is doubtful. In South America, at least four species are found in Chile or the La Plata region, and one, *Conurus patagonus*, is pretty common on the bleak coast of the Strait of Magellan. In Africa it is true that no species is known to extend to within some ten degrees of the tropic of Cancer; but *Pionias robustus* inhabits territories lying quite as far to the southward of the tropic of Capricorn. In India the northern range of the group is only bounded by the slopes of the Himalaya, and farther to the eastward parrots are not only abundant over the whole of the Malay Archipelago, as well as Australia and Tasmania, but two very well-defined families are peculiar to New Zealand and its adjacent islands (see KAKAPO and NESTOR). No parrot has recently inhabited the Palaearctic Region,[1] and but one (the *Conurus carolinensis*, just mentioned) probably belongs to the Nearctic; nor are parrots represented by many different forms in either the Ethiopian or the Indian Regions. In continental Asia the distribution of parrots is rather remarkable. None extend farther to the westward than the valley of the Indus,[2] which, considering the nature of the country in Baluchistan and Afghanistan, is perhaps intelligible enough; but it is not so easy to understand why none are found either in Cochin China or China proper; and they are also wanting in the Philippine Islands, which is the more remarkable and instructive when we find how abundant they are in the groups a little farther to the southward. Indeed, A. R. Wallace has well remarked that the portion of the earth's surface which contains the largest number of parrots, in proportion to its area, is undoubtedly that covered by the islands extending from Celebes to the Solomon group. "The area of these islands is probably not one-fifteenth of that of the four tropical regions, yet they contain from one-fifth to one-fourth of all the known parrots" (*Geogr. Distr. Animals*, ii. 330). He goes on to observe also that in this area are found many of the most remarkable forms—all the red Lories, the great cockatoos, the pigmy *Nasiternae* and other singularities. In South America the species of parrots, though numerically nearly as abundant, are far less diversified in form, and all of them seem capable of being referred to two, or, at most, three sections. The species that has the widest range, and that by far, is the common Ring-necked Parakeet, *Palaeornis torquatus*, a well-known cage-bird which is found from the mouth of the Gambia across Africa to the coast of the Red Sea, as well as throughout the whole of India, Ceylon and Burmah to Tenasserim.[3] On the other hand, there are plenty of cases of parrots which are restricted to an extremely small area—often an island of insignificant size, as *Conurus xantholaemus*, confined to the island of St Thomas in the Antilles, and *Palaeornis exsul* to that of Rodriguez in the Indian Ocean—to say nothing of the remarkable instance of *Nestor productus* (see NESTOR).

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[1] "Parakeet" (in Shakespeare, 1 *Hen. IV.* ii. 3, 88, "Paraquito") is said by the same authority to be from the Spanish *Periquito* or *Perroqueto*, a small Parrot, diminutive of *Perico*, a Parrot, which again may be a diminutive from *Pedro*, the proper name. Parakeet (spelt in various ways in English) is usually applied to the smaller kinds of Parrots, especially those which have long tails, not as *Perroquet* in French, which is used as a general term for all Parrots, *Perruche*, or sometimes *Perriche*, being the ordinary name for what we call Parakeet. The old English "Popinjay" and the old French *Papegaut* have almost passed out of use, but the German *Papagei* and Italian *Papagaio* still continue in vogue. These names can be traced to the Arabic *Babaghā*; but the source of that word is unknown. The Anglo-Saxon name of the Parret, a river in Somerset, is Pedreda or Pedrida, which at first sight looks as if it had to do with the proper name, Petrus; but Skeat believes there is no connexion between them—the latter portion of the word being *rið*, a stream.

[2] The passage seems to have escaped the notice of all naturalists except W. J. Broderip, who mentioned it in his article "Psittacidae," in the *Penny Cyclopaedia* (xix. 83).

The systematic treatment of this very natural group of birds has long been a subject of much difficulty. A few systematists, among whom C. L. Bonaparte was chief, placed them at the top of the class, conceiving that they were the analogues of the *Primates* among mammals. T. H. Huxley recognized the *Psittacomorphae* as forming one of the principal groups of Carinate birds, and they are now generally regarded as forming a suborder *Psittaci* of the Cuculiform birds (see BIRD). Owing to the erroneous number of forms and the close similarities of structure, the subdivision of the group has presented great difficulties. Buffon was unaware of the existence of some of the most remarkable forms of the group, in particular of *Strigops* and *Nestor*; but he began by making two great divisions of those that he did know, separating the parrots of the Old World from the parrots of the New, and subdividing each of these divisions into various sections somewhat in accordance with the names they had received in popular language—a practice he followed on many other occasions, for it seems to have been with him a belief that there is more truth in the discrimination of the unlearned than the scientific are apt to allow. In 1867–1868 Dr O. Finsch published at Leiden an elaborate monograph of the parrots,[4] regarding them as a family, in which he admitted 26 genera, forming 5 subfamilies: (1) that composed of *Strigops* (KAKAPO), only; (2) that containing the crested forms or cockatoos; (3) one which he named *Sittacinae*, comprising all the long-tailed species—a somewhat heterogeneous assemblage, made up of MACAWS (*q.v.*) and what are commonly known as parakeets; (4) the parrots proper with short tails; and (5) the so-called "brush-tongued" parrots, consisting of the LORIES (*q.v.*) and NESTORS (*q.v.*). In 1874 A. H. Garrod communicated to the Zoological Society the results of his dissection of examples of 82 species of parrots, which had lived in its gardens, and these results were published in its *Proceedings* for that year (pp. 586–598, pls. 70, 71). Summarily expressed, Garrod's scheme was to divide the parrots into two families, *Palaeornithidae* and *Psittacidae*, assigning to the former three subfamilies, *Palaeornithinae*, *Cacatuinae* and *Stringopinae*, and to the latter four, *Arinae*, *Pyrrhurinae*, *Platycercinae* and *Chrysotinae*. That each of these sections, except the *Cacatuinae*, is artificial any regard to osteology would show. In the *Journal für Ornithologie* for 1881 A. Reichenow published a *Conspectus Psittacorum*, founded, as several others[5] have been, on external characters only. He makes 9 families of the group, and recognizes 45 genera, and 442 species, besides subspecies. His grouping is generally very different from Garrod's, but displays as much artificiality: for instance, *Nestor* is referred to the family which is otherwise composed of the cockatoos.

The system now generally accepted is based on a combination of external and anatomical characters, and is due to Count T. Salvadori (*Cat. Birds, Brit. Mus.* XX., 1891), and H. F. Gadow (Bronn's *Thier-Reich, Aves*, 1893). About 80 genera with more than 500 species are recognized, divided into the family *Psittacidae* with the subfamilies *Stringopinae*, *Psittacinae* and *Cacatuinae*, and the family *Trichoglossidae* with the subfamilies *Cyclopsittacinae*, *Loriinae* and *Nestorinae*.

The headquarters of parrots are in the Australian Region and the Malay countries; they are abundant in South America; in Africa and India the number of forms is relatively small; in Europe and North Asia there are none now alive, in North America only one. Parrots are gregarious and usually feed and roost in companies, but are at least temporarily monogamous. Most climb and walk well; the flight is powerful but low and undulating in most. The food is varied but chiefly vegetable, whilst parrots are alone amongst birds in holding the food in the claws. The usual cry is harsh and discordant, but many softer notes are employed. A large number of forms learn in captivity to talk and whistle, the well-known red-tailed grey parrot (*Psittacus erithacus*) of tropical Africa being pre-eminent. The eggs are laid usually in holes in trees, rocks, or the ground, no lining being formed. The larger species produce one to three, the smaller as many as twelve, the colour being dull white. The young when hatched are naked and helpless. (A. N.)

PARROT-FISHES, more correctly called PARROT-WRASSES, marine fishes of the family *Scaridae* closely allied to the wrasses or *Labridae*. The family contains eight genera of which the principal are *Scarus*, *Pseudoscarus*, *Odan* and *Sparisama*. They are easily recognized by their large scales, of which there are from twenty-one to twenty-five in the lateral line, by having invariably nine spines and ten rays in the dorsal fin and two spines with eight rays in the anal, and especially by their singular dentition, of jaws as well as pharynx. The teeth of the jaws are soldered together, and form a sharp-edged beak similar to that of a parrot, but without a middle projecting point, and the upper and lower beak are divided into two lateral halves by a median suture. In a few species the single teeth can be still distinguished, but in the majority (*Pseudoscarus*) they are united into a homogeneous substance with polished surface. By this sharp and hard beak parrot-fishes are enabled to bite or scrape off those parts of coral-stocks which contain the polypes or to cut off branches of tough fucus, which in some of the species forms the principal portion of their diet. The process of triturating the food is performed by the pharyngeal teeth, which likewise are united, and form plates with broad masticatory surfaces, not unlike the grinding surface of the molars of the elephant. Of these plates there is one pair above, opposed to and fitting into the single one which is coalesced to the lower pharyngeal bone. The contents of the alimentary canal, which are always found to be finely divided and reduced to a pulp, prove the efficiency of this triturating apparatus; in fact, ever since the time of Aristotle it has been maintained that the *Scarus* ruminates. Nearly one hundred species of parrot-fishes are known from the tropical and sub-tropical parts of the Indo-Pacific and Atlantic Oceans; like other coral-feeding fishes, they are absent on the Pacific coasts of tropical America and on the coast of tropical West Africa. The most celebrated is the *Scarus* of the Mediterranean. Beautiful colours prevail in this group of wrasses, but are subject to great changes and variations in the same species; almost all are evanescent and cannot be preserved after death. The majority of parrot-fishes are eatable, some even esteemed; but they (especially the carnivorous kinds) not unfrequently acquire poisonous properties after they have fed on corals or medusae containing an acrid poison. Many attain to a considerable size, upwards of 3 ft. in length.

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[1] A few remains of a Parrot have been recognized from the Miocene of the Allier in France, by A. Milne-Edwards (*Ois. Foss. France*, vol. ii. p. 525, pl. cc.), and are said by him to show the greatest resemblance to the common Grey Parrot of Africa, *Psittacus erithacus*, through having also some affinity to the Ring-necked Parakeet of the same country, *Palaeornis torquatus*. He refers them, however, to the same genus as the former, under the name of *Psittacus verreauxi*.

[2] The statements that have been made, and even repeated by writers of authority, as to the occurrence of "a green parrot" in Syria (Chesney, *Exped. Survey Euphrates and Tigris*, ii. 443, 537) and of a parrot in Turkestan (*Jour. As. Soc. Bengal*, viii. 1007) originated with gentlemen who had no ornithological knowledge, and are evidently erroneous.

[3] It is right to state, however, that the African examples of this bird are said to be distinguishable from the Asiatic by their somewhat shorter wings and weaker bill, and hence they are considered by some authorities to form a distinct species or subspecies, *P. docilis*; but in thus regarding them the difference of locality seems to have influenced opinion, and without that difference they would scarcely have been separated, for in many other groups of birds distinctions so slight are regarded as barely evidence of local races.

[4] *Die Papageien, monographisch bearbeitet.*

[5] Such, for instance, as Kuhl's treatise with the same title, which appeared in 1820, and Wagler's *Monographia Psittacorum*, published in 1832—both good of their kind and time.

PARRY, SIR CHARLES HUBERT HASTINGS, Bart., English musical composer (1848–), second son of Thomas Gambier Parry, of Highnam Court, Gloucester, was born at Bournemouth on the 27th of February 1848. He was educated at Malvern, Twyford, near Winchester, Eton (from 1861), and Exeter College, Oxford. While still at Eton he wrote music, two anthems being published in 1865; a service in D was dedicated to Sir John Stainer. He took the degree of Mus.B. at Oxford at the age of eighteen, and that of B.A. in 1870; he then left Oxford for London, where in the following year he entered Lloyd's, abandoning business for art soon afterwards. He studied successively with H. H. Pierson (at Stuttgart), Sterndale Bennett and Macfarren; but the most important part of his artistic development was due to Edward Dannreuther. Among the larger works of this early period must be mentioned an overture, *Guillem de Cabestanh* (Crystal Palace, 1879), a pianoforte concerto in F sharp minor, played by Dannreuther at the Crystal Palace and Richter concerts in 1880, and his first choral work, the *Scenes from Prometheus Unbound*, produced at the Gloucester Festival, 1880. These, like a symphony in G given at the Birmingham Festival of 1882, seemed strange even to educated hearers, who were confused by the intricacy of treatment. It was not until his setting of Shirley's ode, *The Glories of our Blood and State*, was brought out at Gloucester, 1883, and the *Partita* for violin and pianoforte was published about the same time, that Parry's importance came to be realized. With his sublime eight-part setting of Milton's *Blest Pair of Sirens* (Bach Choir, 1887) began a fine series of compositions to sacred or semi-sacred words. In *Judith* (Birmingham, 1888), the *Ode on St Cecilia's Day* (Leeds, 1889), *L'Allegro ed il penseroso* (Norwich, 1890), *De Profundis* (Hereford, 1891), *The Lotus Eaters* (Cambridge, 1892), *Job* (Gloucester, 1892), *King Saul* (Birmingham, 1894), *Invocation to Music* (Leeds, 1895), *Magnificat* (Hereford, 1897), *A Song of Darkness and Light* (Gloucester, 1898), and *Te Deum* (Hereford, 1900), are revealed the highest qualities of music. Skill in piling up climax after climax, and command of every choral resource, are the technical qualities most prominent in these works; but in his orchestral compositions, such as the three later symphonies, in F, C and E minor, in two suites, one for strings alone, and above all in his *Symphonic Variations* (1897), he shows himself a master of the orchestra, and his experiments in modification of the conventional classical forms, such as appear in the work last named, or in the *Nineteen Variations for Pianoforte Solo*, are always successful. His music to *The Birds* of Aristophanes (Cambridge, 1883) and *The Frogs* (Oxford, 1892) are striking examples of humour in music; and that to *Agamemnon* (Cambridge, 1900) is among the most impressive compositions of the kind. His chamber music, exquisite part-songs and solo songs maintain the high standard of his greater works. At the opening of the Royal College of Music in 1883 he was appointed professor of composition and of musical history, and in 1894, on the retirement of Sir George Grove, Parry succeeded him as principal. He was appointed Choragus of Oxford University in 1883, succeeding Stainer in the professorship of the university in 1900. He received the honorary degree of Mus.D. at Cambridge 1883, Oxford 1884, Dublin 1891; and was knighted in 1898. Outside the domain of creative music, Parry's work for music was of the greatest importance: as a contributor of many of the most important articles on musical forms, &c., in Grove's dictionary, his literary work first attracted attention; in his *Studies of Great Composers* musical biography was treated, almost for the first time, in a really enlightened and enlightening way; and his *Art of Music* is a splendid monument of musical literature, in which the theory of evolution is applied to musical history with wonderful skill and success.

PARRY, SIR WILLIAM EDWARD (1790–1855), English rear-admiral and Arctic explorer, was born in Bath on the 19th of December 1790, the son of a doctor. At the age of thirteen he joined the flag-ship of Admiral Cornwallis in the Channel fleet as a first-class volunteer, in 1806 became a midshipman, and in 1810 was promoted to the rank of lieutenant in the "Alexander" frigate, which was employed for the next three years in the protection of the Spitzbergen whale fishery. He took advantage of this opportunity for the study and practice of astronomical observations in northern latitudes, and afterwards published the results of his studies in a small volume on *Nautical Astronomy by Night* (1816). From 1813–1817 he served on the North American station. In 1818 he was given the command of the "Alexander" brig in the Arctic expedition under Captain (afterwards Sir) John Ross. This expedition returned to England without having made any new discoveries, but Parry, confident, as he expressed it, "that attempts at Polar discovery had been hitherto relinquished just at a time when there was the greatest chance of succeeding," in the following year obtained the chief command of a new Arctic expedition, consisting of the two ships "Griper" and "Hecla." This expedition returned to England in November 1820 after a voyage of almost unprecedented Arctic success (see Polar Regions), having accomplished more than half the journey from Greenland to Bering Strait, the completion of which solved the ancient problem of a North-west Passage. A narrative of the expedition, entitled *Journal of a Voyage to discover a North-west Passage*, appeared in 1821. Upon his return Lieutenant Parry was promoted to the rank of commander. In May 1821 he set sail with the "Fury" and "Hecla" on a second expedition to discover a North-west Passage, but was compelled to return to England in October 1823 without achieving his purpose. During his absence he had in November 1821 been promoted to post rank, and shortly after his return he was appointed acting hydrographer to the navy. His *Journal of a Second Voyage*, &c., appeared in 1824. With the same ships he undertook a third expedition on the same quest in 1824, but was again unsuccessful, and the "Fury" being wrecked, he returned home in October 1825 with a double ship's company. Of this voyage he published an account in 1826. In the following year he obtained the sanction of the Admiralty for an attempt on the North Pole from the northern shores of Spitzbergen, and his extreme point of 82° 45′ N. lat. remained for 49 years the highest latitude attained. He published an account of this journey under the title of *Narrative of the Attempt to reach the*

North Pole, &c. (1827). In April 1829 he was knighted. He was subsequently selected for the post of comptroller of the newly created department of steam machinery of the Navy, and held this office until his retirement from active service in 1846, when he was appointed captain-superintendent of Haslar Hospital. He attained the rank of rear-admiral in 1852, and in the following year became a governor of Greenwich Hospital, and retained this post till his death on the 8th of July 1855. The religious side of Sir Edward Parry's character was strongly marked, and besides the journals of his different voyages he was also the author of a *Lecture to Seamen*, and *Thoughts on the Parental Character of God*.

See *Memoirs of Rear-Admiral Sir W. E. Parry*, by his son, Rev. Edward Parry (3rd ed., 1857).

PARRY (from Fr. *parer*, to ward off), to turn aside a blow from a weapon. The term is used especially of a defensive movement of the sword or foil in fencing, hence, by transference, to ward off any attack, to turn aside an objectionable question. (See FENCING, &c.)

PARSEES, or PARSIS, the followers in India of Zoroaster (Zarathustra), being the descendants of the ancient Persians who emigrated to India on the conquest of their country by the Arabs in the 8th century. They first landed at Sanjan on the coast of Gujarat, where the Hindu rulers received them hospitably. To this day their vernacular language is Gujarati, which they have cultivated in literature and journalism. Their settlement in Bombay dates only from the British occupation of that island. In 1901 the total number of Parsees in all India was 94,000, of whom all but 7000 were found in the Bombay presidency and the adjoining state of Baroda, the rest being widely scattered as traders in the large towns.

Among Parsees the men are well formed, active, handsome and intelligent. They have light olive complexions, a fine aquiline nose, bright black eyes, a well-turned chin, heavy arched eyebrows, thick sensual lips, and usually wear a light curling moustache. The women are delicate in frame, with small hands and feet, fair complexions, beautiful black eyes, finely arched eyebrows, and a profusion of long black hair, which they dress to perfection, and ornament with pearls and gems. The Parsees are much more liberal in their treatment of women than any other Asiatic race; they allow them to appear freely in public, and leave them the entire management of household affairs.

The characteristic costume of the Parsees (now frequently abandoned) is loose and flowing, very picturesque in appearance, and admirably adapted to the climate in which he lives. The head is covered with a turban, or a cap of a fashion peculiar to the Parsees; it is made of stiff material, something like the European hat, without any rim, and has an angle from the top of the forehead backwards. It would not be respectful to uncover in presence of an equal, much less of a superior. The colour is chocolate or maroon, except with the priests, who wear a white turban.

A Parsee must be born upon the ground floor of the house, as the teachings of their religion require life to be commenced in humility, and by " good thoughts, words and actions " alone can an elevated position be attained either in this world or the next. The mother is not seen by any member of the family for forty days. Upon the seventh day after the birth an astrologer is invited to cast the nativity of the child. He has first to enumerate the names which the child may bear, so that the parents may make choice of one of them. Then he draws on a wooden board a set of hieroglyphs in chalk, and his dexterity in counting or recounting the stars under whose region or influence the child is declared to be born is marvelled at by the superstitious creatures thronging around him. This document is preserved in the family archives as a guidance and encouragement to the child through life. At the age of seven or thereabouts, according to the judgment of the priest, the first religious ceremony is performed upon the young Parsee. He is first subjected to the process of purification, which consists of an ablution with *nīrang* (cow-urine). The ceremony consists in investing him with the *kusti*, or girdle of his faith. This is a cord, woven by women of the priestly class, composed of seventy-two threads, representing the seventy-two chapters of the *Yasna*, a portion of the Zend-Avestā, in the sacredness of which the young neophyte is figuratively bound. The priest ties the cord around the waist as he pronounces the benediction upon the child, throwing upon his head at each sentence slices of fruit, seeds, perfumes and spices. He is thus received into the religion of Zoroaster, and is henceforth considered morally accountable for his acts. If a child die before the performance of this ceremony he is considered to have gone back to Ahurā-Mazdā, who gave him, as pure as he entered into this world, having not reached the age of accountability.

The marriages of children engage the earliest attention of the parents. The wedding day having been fixed by an astrologer, who consults the stars for a happy season, a Parsee priest goes from house to house with a list of the guests to be invited, and delivers the invitations with much ceremony. The father of the bride waits upon near relatives and distinguished personages, soliciting the honour of their attendance. A little before sunset a procession is formed at the house of the bridegroom, and proceeds with a band of music, amid great pomp and ceremony, to the house of the bride's father. Here a number of relatives and friends are collected at the door to receive the bridegroom with due honour. Presents are sent before, according to the time-honoured custom of the East. Upon the arrival of the procession at the house of the bride the gentlemen gallantly remain outside, leaving room for the ladies to enter the house as the escort of the bridegroom. As he passes the threshold his future mother-in-law meets him with a tray filled with fruits and rice, which she strews at his feet. The fathers of the young couple are seated side by side, and between them stands the priest ready to perform the ceremony. The young couple are seated in two chairs opposite each other, their right hands tied together by a silken cord, which is gradually wound around them as the ceremony progresses, the bride in the meantime being concealed with a veil of silk or muslin. The priest lights a lamp of incense, and repeats the nuptial benediction first in Zend and then in Sanskrit. At the conclusion of the ceremony they each throw upon the other some grains of rice, and the most expeditious in performing this feat is considered to have got the start of the other in the future control of the household, and receives the applause of the male or female part of the congregation as the case may be. The priest now throws some grains of rice upon the heads of the married pair in token of wishing them abundance; bouquets of flowers are handed to the assembled guests, and rose-water is showered upon them. The bride and bridegroom now break some sweetmeats, and, after they have served each other, the company are invited to partake of refreshments. At the termination of this feast the procession re-forms, and with lanterns and music escorts the bridegroom back to his own house, where they feast until midnight. As midnight approaches they return to the house of the bride, and escort her, with her dowry, to the house of the bridegroom, and, having delivered her safely to her future lord and master, disperse to their respective homes. Eight days afterwards a wedding feast is given by the newly-married couple, to which only near relatives and particular friends are invited. This feast is composed entirely of vegetables, but at each course the wine is served, and toasts are proposed, as " happiness to the young couple," &c.

The funeral ceremonies of the Parsees are solemn and imposing. When the medical attendant declares the case hopeless a priest advances to the bed of the dying man, repeats sundry texts of the Zend-Avestā, the substance of which tends to afford him consolation, and breathes a prayer for the forgiveness of his sins. After life is extinct a funeral sermon is delivered by the priest, in which the deceased is made the subject of an exhortation to his relatives and friends to live pure, holy and righteous lives, so that they may hope to meet again in paradise. The body is then taken to the ground floor where it was born, and, after being washed and perfumed, is dressed in clean white clothes, and laid upon an iron bier. A dog is brought in to take a last look at his inanimate master in order to drive away the evil spirits. This ceremony is called *sagdād*. A number of priests attend and repeat prayers for the repose of the soul of the departed. All the male friends of the deceased go to the door, bow down, and raise their two hands from the floor to their heads to indicate their respect for the departed. The body, when put upon the bier, is covered over from head to foot. Two attendants bring it out of the house, holding it low in their hands, and deliver it to four pall-bearers, called *nasasalār*, clad in well-washed, white clothes. A procession is formed by the male friends of the deceased, headed by a number of priests in full dress, to follow the body to the *dakhma*, or "tower of silence." In Bombay these towers are erected in a beautiful garden on the highest point of Malabar Hill, amid trees swarming with vultures; they are constructed of stone, and rise some 25 ft. high, with a small door at the side for the entrance of the body. Upon arriving at the "tower of silence" the bier is laid down, and prayers are said in the *sagrī*, or house of prayer, containing a fire-sanctuary, which is erected near the entrance to the garden. The attendants then raise the body to its final resting-place, lay it upon its stony bed, and retire. A round pit about 6 ft. deep is surrounded by an annular stone pavement about 7 ft. wide, on which the body is exposed to the vultures, where it is soon denuded of flesh, and the bones fall through an iron grating into a pit beneath, from which they are afterwards removed into a subterranean entrance prepared for their reception. On the third day after death an assemblage of the relatives and friends of the deceased takes place at his late residence, and thence proceed to the *Atish-bahrām*, or "fire-temple." The priests stand before the urns in which the celestial fire is kept burning, and recite prayers for the soul of the departed. The son or adopted son of the deceased kneels before the high-priest, and promises due performance of all the religious duties and obsequies to the dead. The relatives and friends then hand the priest a list of the contributions and charities which have been subscribed in memory of the deceased, which concludes the ceremony of "rising from mourning," or "the resurrection of the dead." On each successive anniversary of the death of a Parsee funeral ceremonies are performed in his memory. An iron framework is erected in the house, in which shrubs are planted and flowers cultivated to bloom in memory of the departed. Before the frame, on iron stands, are placed copper or silver vases, filled with water and covered with flowers. Prayers are said before these iron frames two or three times a day. These ceremonies are called *mūktad*, or "ceremonies of departed souls."

The Parsees of India are divided into two sects, the Shenshahis and the Kadmīs. They do not differ on any point of faith; the dispute is confined to a quarrel as to the correct chronological date for the computation of the era of Yazdegerd, the last king of the Sassanian dynasty, who was dethroned by the caliph Omar about A.D. 640. The difference has been productive of no other inconvenience than arises from the variation of a month in the celebration of the festivals. The Parsees compute time from the fall of Yazdegerd. Their calendar is divided into twelve months of thirty days each; the other five days, being added for holy days, are not counted. Each day is named after some particular angel of bliss, under whose special protection it is passed. On feast days a division of five watches is made under the protection of five different divinities. In midwinter a feast of six days is held in commemoration of the six periods of creation. About the 21st of March, the vernal equinox, a festival is held in honour of agriculture, when planting begins. In the middle of April a feast is held to celebrate the creation of trees, shrubs and flowers. On the fourth day of the sixth month a feast is held in honour of Sahrēvar, the deity presiding over mountains and mines. On the sixteenth day of the seventh month a feast is held in honour of Mithra, the deity presiding over and directing the course of the sun, and also a festival to celebrate truth and friendship. On the tenth day of the eighth month a festival is held in honour of Farvardin, the deity who presides over the departed souls of men. This day is especially set apart for the performance of ceremonies for the dead. The people attend on the hills where the "towers of silence" are situated, and perform in the *sagrīs* prayers for the departed souls. The Parsee scriptures require the last ten days of the year to be spent in doing deeds of charity, and in prayers of thanksgiving to Ahurā-Mazdā. On the day of Yazdegerd, or New Year's Day, the Parsees emulate the western world in rejoicing and social intercourse. They rise early, and after having performed their prayers and ablutions dress themselves in a new suit of clothes, and sally forth to the "fire-temples," to worship the emblem of their divinity, the sacred fire, which is perpetually burning on the altar. Unless they duly perform this ceremony they believe their souls will not be allowed to pass the bridge "Chinvad," leading to heaven. After they have performed their religious services they visit their relations and friends, when the ceremony of *hamijur*, or joining hands, is performed. The ceremony is a kind of greeting by which they wish each other "a happy new year." Their relatives and friends are invited to dinner, and they spend the rest of the day in feasting and rejoicing; alms are given to the poor, and new suits of clothes are presented to servants and dependants.

There are only two distinct classes among the Parsees—the priests (*dastūrs*, or high priests; *mobeds*, or the middle order; and *herbads*, or the lowest order) and the people (*behadīn*, *behdīn*, or "followers of the best religion"). The priestly office is hereditary, and no one can become a priest who was not born such; but the son of a priest may become a layman.

The secular affairs of the Parsees are managed by an elective committee, or *panchāyat*, composed of six *dastūrs* and twelve *mobeds*, making a council of eighteen. Its functions resemble the Venetian council of ten, and its objects are to preserve unity, peace and justice amongst the followers of Zoroaster. One law of the *panchāyat* is singular in its difference from the custom of any other native community in Asia; nobody who has a wife living shall marry another, except under peculiar circumstances, such as the barrenness of the living wife, or her immoral conduct. Recently a serious difference arose among the Parsees of Bombay on the question of proselytism. A Parsee had married a French lady, who took the necessary steps to adopt the religion of her husband. But it was decided by the High Court, after prolonged argument, that, though the creed of Zoroaster theoretically admitted proselytes, their admission was not consistent with the practice of the Parsees in India.

Their religion teaches them benevolence as the first principle, and no people practise it with more liberality. A beggar among the Parsees is unknown, and would be a scandal to the society. The sagacity, activity and commercial enterprise of the Parsees are proverbial in the East, and their credit as merchants is almost unlimited. In this connexion may be mentioned the well-known names of Sir Jamsetjee Jeejeebhoy and Sir Dinshaw Petit, both baronets, and also of J. N. Tata, founder of the Institute of Scientific Research at Bangalore.

The Parsees have shown themselves most desirous of receiving the benefits of an English education; and their eagerness to embrace the science and literature of the West has been conspicuous in the wide spread of female education, and in the activity shown in studying their sacred writings in critical texts. In recent years many have taken to the professions of law and medicine, and a Parsee barrister was appointed a judge of the High Court at Bombay in 1906. Two Parsees have also been the only natives of India elected to the House of Commons.

See Menant, *Les Parsis* (Paris, 1898); Dosabhai Framji Karaka, *History of the Parsees* (London, 1884); Seervai and Patel, *Gujarat Parsees from the Earliest Times* (Bombay, 1898).

PARSIFAL BELL-INSTRUMENT (Ger. *Parsifal Klavier Instrument*), a stringed instrument ingeniously constructed by Schweisgut, of Carlsruhe, from Dr Mottl's design, as a substitute for the church bells in Wagner's *Parsifal*. This instrument has been constructed somewhat on the principle of the grand piano; the massive frame is shaped like a billiard table. There are five notes, each with six strings, three in unison giving the fundamental note and three an octave higher. The strings are struck by large hammers, covered with cotton-wool, which the performer sets in motion by a strong elastic blow from his fist. The hammers are attached to arms 22 in. long, screwed to a strong wooden span bridge placed horizontally above the strings at about two-fifths of the length from the front. On the point of the arm is the name of the note, and behind this the felt ledge struck by the fist. Two belly bridges and two wrest-plank bridges, one set for each octave, determine the vibrating length of the strings, and the belly bridge, as in other stringed instruments, is the medium through which the vibrations of the strings are communicated to the soundboard. The arrangement of pegs and wrest-pins is much the same as on the piano.

The realism demanded by modern dramatic music taxes the resources of the orchestra to the utmost when the composer aims at reproducing on the stage the effect of church bells, as, for instance, in the *Golden Legend*, *Cavalleria rusticana*, *Pagliacci*, *Rienzi* and *Parsifal*. The most serious difficulty of all arose in the last-mentioned drama, where the solemnity of the scene and its deep religious significance demand a corresponding atmosphere on the stage. Real church bells for the notes Wagner has scored in the familiar chime would overpower the orchestra. All substitutes for bells were tried in vain; no other instrument, leaving aside the question of pitch, gave a tone in the least similar to that of the bell. Independently of the rich harmonics composing the clang, the bell has two distinct simultaneous notes, first the *tap* tone, which gives the pitch, and the *hum* tone or lower accompanying note. On the interval separating the hum from the tap tone depend the dignity and beauty of the bell tone and the emotional atmosphere produced. A stringed instrument, similar to the one here described but with four notes only, was used at Bayreuth for the first performance of *Parsifal*, and with it tam-tams or gongs, but after many trials the following combination was adopted as the best makeshift: (1) the stringed instrument with four keys; (2) four tam-tams or gongs tuned to the pitch of the four notes composing the chime; (3) a bass-tuba, which plays the notes staccato in quavers to help make them more distinct; (4) a fifth tam-tam, on which a roll is executed with a drumstick.

The special peal of hemispherical bells constructed for Sir A. Sullivan's *Golden Legend* is the only other successful substitute known to the writer; the lowest of these bells is a minor tenth higher than the lowest note required for *Parsifal*, and the aggregate weight of the four bells is 11 cwt. The bells are struck with mallets and have both tap and hum tone. (K. S.)

PARSIMONY, LAW OF (Lat. *parsimonia*, from *parcere*, to save), the name given to William of Occam's principle "Entia non sunt multiplicanda praeter necessitatem," *i.e.* that it is scientifically unsound to set up more than one hypothesis at once to explain a phenomenon. This principle is known as "Occam's razor" (see Occam, William of).

PARSLEY, a hardy biennal herb known botanically as *Petroselinum sativum* (natural order Umbelliferae), the leaves of which are much used for garnishing and flavouring. It occurs as a garden escape in waste places in Britain and it is doubtful if it is known anywhere as a truly wild plant; A. de Candolle, however (*Origin of Cultivated Plants*) considers it to be wild in the Mediterranean region. It grows best in a partially shaded position, in good soil of considerable depth and not too light; a thick dressing of manure should be given before sowing. For a continuous supply three sowings should be made, as early in February as the weather permits, in April or early in May and in July—the last for the winter supply in a sheltered position with southern exposure. Sow thinly in drills from 12 to 15 in. apart and about 1 in. deep; thin out to 3 in. and finally to 6 in. each. In winter the plants should be protected by frames or hand-glasses. The curled and mossy-leaved varieties are preferable. The Hamburg or turnip-rooted variety is grown for the root, which is cut up and used for flavouring.

PARSNIP, botanically known as *Pastinaca sativa* (or *Peucedanum sativum*), a member of the natural order Umbelliferae, found wild in roadsides and waste places in England and throughout Europe and temperate Asia, and as an introduced plant in North America. It has been cultivated since the time of the Romans for the sake of its long fleshy whitish root, which has a peculiar but agreeable flavour. It succeeds best on a free sandy loam, which should be trenched and manured in the previous autumn, the manure being well buried. The seed should be sown thinly in March, in rows 15 to 18 in. apart, and finally thinned out to 1 ft. apart. The leaves will decay in October or November, when a portion of the roots may be taken up and stored in dryish sand for immediate use, the rest being left in the ground, to be taken up as required, but the whole should be removed by February to a dry cool place, or they will begin to grow. The best sorts are the Hollow-crowned, the Maltese and the Student. Dusting the ground with soot when sowing the seed and again when the leaves appear will keep the plants free from pests.

PARSON, a technical term in English law for the clergyman of the parish. It is a corruption of *persona*, the parson being, as it were, the *persona ecclesiae*, or representative of the Church in the parish. Parson imparsonee (*persona impersonata*) is he that as rector is in possession of a church parochial, and of whom the church is full, whether it be presentative or impropriate (Coke upon Littleton, 300 *b*). The word parson is properly used only of a rector. A parson must be in holy orders; hence a lay rector could not be called a parson. There are four requisites to the appointment of a parson, viz. holy orders, presentation, institution and induction. The parson is tenant for life of the parsonage house, the glebe, the tithes and other dues, so far as they are not appropriated.

See also Rector; Vicar; Benefice; and Tithes.

PARSONS (or Persons), **ROBERT** (1546–1610), English Jesuit and political agitator, son of a blacksmith, was born at Nether Stowey, Somerset, on the 24th of June 1546. The vicar of the parish gave him instruction and procured his entrance in 1563 as an exhibitioner to Balliol College, Oxford. He graduated B.A. in 1568, and M.A. in 1572. He was fellow, bursar and dean of his college, but in 1574 he resigned or was dismissed his fellowship and offices, for reasons which have been disputed, some alleging improprieties of conduct, and others suspected disloyalty. Soon after his resignation he went to London, and thence in June to Louvain, where he entered the Roman Catholic Church and spent some time in the company of Father William Good, a Jesuit. In July 1575 he entered the Jesuit Society at Rome. In 1580 he was selected, along with Edmund Campion, a former associate at Oxford, and others, to undertake a secret religious and political mission to England. The two emissaries engaged in political intrigue in England and on the Continent. In 1581 Campion was arrested, but Parsons made his escape to Rouen, whence he returned to Rome, where he continued to direct the English mission. In 1588 he went to Spain, where he remained for nine years, founding seminaries for the training of English priests at Valladolid, Lucar, Seville, Lisbon and St Omer. On the death of Cardinal Allen in 1594 he made strenuous efforts to be appointed his successor. He failed in this, but was made rector of the English college at Rome in 1597, and died there on the 18th of April 1610

Parsons was the author of over 30 polemical writings, mostly tracts. Among the more important are *Certayne Reasons why Catholiques refuse to goe to Church* (Douai, 1580), *A Christian Directorie guiding Men to their Saluation* (London, 1583–1591, 2 parts), *A Conference about the Next Succession to the Crowne of Ingland* (1594), *Treatise of the Three Conversions of England* (1603–1604, 3 parts), an answer to Foxe's *Acts and Monuments*. For portrait, see *Gentleman's Magazine*, lxiv.

PARSONS, THEOPHILUS (1750–1813), American jurist, was born in Byfield, Massachusetts, on the 24th of February 1750, the son of a clergyman. He graduated from Harvard College in 1769, was a schoolmaster at Falmouth (now Portland), Maine, in 1770–1773, studied law, and was admitted to the bar in 1774. In 1800 he removed to Boston. He was chief justice of the supreme court of Massachusetts from 1806 until his death in Boston on the 30th of October 1813. In politics he took an active part as one of the Federalist leaders in the state. He was a member of the Essex County convention of 1778, called to protest against the proposed state constitution, and as a member of the "Essex Junto" was probably the author of *The Essex*

Result, which helped to secure the rejection of the constitution at the polls. He was a member of the state constitutional convention of 1779–1780, and one of the committee of twenty-six which drafted the constitution; he was also a delegate to the state convention of 1788 which ratified the Federal Constitution; and according to tradition was the author of the famous "Conciliatory Resolutions," or proposed amendments to the constitution, which did much to win over Samuel Adams and John Hancock to the side of ratification. His *Commentaries on the Laws of the United States* (1836) contains some of his more important legal opinions.

His son Theophilus Parsons (1797–1882), who was Dane professor of law at Harvard from 1848 to 1870, is remembered chiefly as the author of a series of useful legal treatises, and some books in support of Swedenborgian doctrines; he wrote a life of his father (Boston, 1859).

PARSONS, a city of Labette county, in south-eastern Kansas, U.S.A., situated at the junction of the Big and Little Labette creeks, about 138 m. S. by W. of Kansas City. Pop. (1890), 6736; (1900), 7682, of whom 807 were negroes; (1905), 11,720; (1910), 12,463. It is served by the Kansas City, Fort Scott & Memphis (St Louis & San Francisco system) and the Missouri Kansas & Texas railways. The city has large machine shops of the Missouri Kansas & Texas railway and various manufactures. Natural gas is utilized for light and heat. The first settlement on the site of the city was made in 1869 and was called Mendota ("place of meeting"—*i.e.* of the creeks). In 1871 the city was chartered, and in 1910 government by commission went into effect. It was named in honour of Levi Parsons (1822–1887), the first president of the Missouri Kansas and Texas railway.

PARTABGARH, or Pertabgarh, a native state of India, in the Rajputana agency. Area, 886 sq. m.; pop. (1901), 52,025, showing a decrease of 40% in the decade, owing to the effects of famine. The inhabitants are mostly Bhils and other aboriginal tribes. Estimated revenue, £12,000. The town of Partabgarh (pop., 9819) is connected by a metalled road (20 m.) with the station of Mandasor on the Rajputana railway. It has a reputation for a special kind of enamelled jewelry.

PARTABGARH, Pertabgarh, or Pratapgarh, a district of British India in the Fyzabad division of the United Provinces. The administrative headquarters are at Bela. Area, 1442 sq. m.; pop. (1901), 912,848. The Ganges forms the south-western boundary line, while the Gumti marks the eastern boundary for a few miles. The only mineral products are salt, saltpetre and *kankar* or nodular limestone. The principal crops are rice, barley, pulse, millets, sugar-cane and poppy. The district is traversed by the branch of the Oudh & Rohilkhand railway from Rae Bareilly to Benares, opened in 1898. There are manufactures of sugar and a little silk; and grain, opium, oil-seeds, hemp and hides are exported.

See *Partabgarh District Gazetteer* (Allahabad, 1904).

PARTERRE, a term, taken from the French phrase *par terre*, *i.e.* on the surface of the ground, and used of an arrangement in a garden of beds of flowers with gravel or other paths and plots of grass; also of that part of the auditorium of a theatre which is occupied by the orchestra stalls.

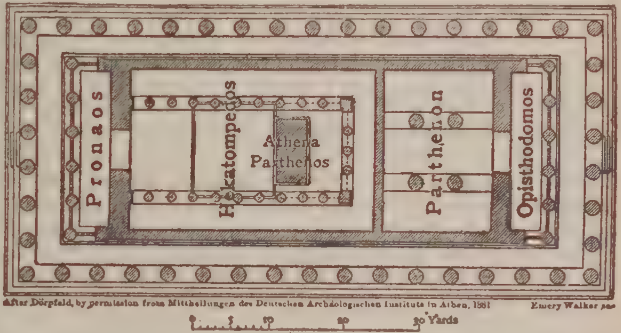
PARTHENAY, a town of western France, capital of an arrondissement in the department of Deux-Sèvres, 27 m. N.N.E. of Niort, on the railway between that town and Saumur. Pop. (1906), 5615. The town retains considerable portions of its fine 13th-century ramparts, including the Porte St Jacques, a fortified gateway guarding an old bridge over the Thouet. Amongst ancient buildings of interest are the church of Ste Croix, of the 12th century, restored in 1885, with a 15th-century belfry; the church of St Laurent, also restored in modern times, portions of whose walls date from the 11th century; the ruined Romanesque portal of Notre-Dame de la Couldre; and 1 m. south-west of the town the ancient church (12th century) of Parthenay-le-Vieux. The manufacture of woollen goods and wool-spinning are the principal local industries.

PARTHENIUS, of Nicaea in Bithynia, Greek grammarian and poet. He was taken prisoner in the Mithradatic War and carried to Rome (72 B.C.); subsequently he visited Neapolis, where he taught Virgil Greek. Parthenius was a writer of elegies, especially dirges, and of short epic poems. The pseudo-Virgilian *Moretum* and *Ciris* were imitated from his Μυττωτός and Μεταμορφώσεις. His Ἐρωτικὰ παθήματα is still extant, containing a collection of 36 love-stories which ended unhappily, taken from different historians and poets. As Parthenius generally quotes his authorities, these stories are valuable as affording information on the Alexandrian poets and grammarians.

See E. Martini in *Mythographi graeci*, vol. ii. (1902, in Teubner Series); poetical fragments in A. Meineke, *Analecta alexandrina* (1853).

PARTHENON (Παρθενών), the name generally given, since the 4th century B.C., to the chief temple of Athena on the Acropolis at Athens (*e.g.* Demosthenes, *c. Androt.* 13, 76). The name is applied in the official inventories of the 5th and early 4th centuries to one compartment of the temple, and this was probably its original meaning. It is certainly to be associated with the cult of Athena Parthenos, "the Virgin," though it is not clear why the name was given to this particular chamber.

The most convenient position for a temple upon the natural rock-platform of the Acropolis was occupied by the early temple of Athena. When it was decided to supersede this by a larger and more magnificent temple, it was necessary to provide a site for this new temple by means of a great substructure, which is on its south side about 40 ft. high. This substructure was not built for the present temple, but for an earlier one, which was longer and narrower in shape; there has been much discussion as to the date of this earlier temple; F. C. Penrose maintained that it was the work of Peisistratus. Some have thought that it dated from the time immediately after the Persian wars; but the fact that portions of its columns and entablature, damaged by fire, were built into the north wall of the Acropolis by Themistocles seems to prove that it dates from the 6th century, whether it be the work of the tyrants or of the renewed democracy under Cleisthenes.



After Dörpfeld, by permission from Mittheilungen des Deutschen Archäologischen Instituts in Athen, 1881

Emery Walker sc.

The extant temple was the chief among the buildings with which Pericles adorned the Acropolis. The supervision of the whole work was in the hands of Pheidias, and the architects of the temple were Ictinus and Callicrates. The actual building was not begun until 447 B.C., though the decision to build was made ten years earlier (Keil, *Anonynus argentorensis*). The temple must have been structurally complete by the year 438 B.C., in which the gold and ivory statue of Athena Parthenos was dedicated; but the work of decoration and finish was still going on in 433 B.C. The temple as designed by Ictinus was about 15 ft. shorter and about 6 ft. wider than the building for which the foundations were intended; it thus obtained a proportion of length to breadth of exactly 9:4. It is the most perfect example of the Doric order (see Architecture: *Greek*). The plan of the temple was peculiar. The cella, which was exactly 100 ft. long, kept the name and traditional measurement of the old Hecatompedon. It was surrounded on three sides by a Doric colonnade, and in the middle of it was the great basis on which the statue was erected. This cella was probably lighted only by the great doorway and by the light that filtered through the marble tiles. The common notion that there was a hypaethral opening is erroneous. At the back of the cella was a square chamber, not communicating with it, but entered from the west end of the temple; this was the Parthenon in the narrower sense. It seems to have been used only as a store-house, though it may have been originally intended for a more important purpose. The Prodomus and the Opisthodomus were enclosed by bronze gratings fixed between the columns, and were thus adapted to contain valuable offerings and other treasures. We have inventories on marble of the contents of these four compartments of the temple. The opisthodomus, in particular, probably served as a treasury for sacred and other money, though it has been disputed whether the opisthodomus mentioned in the inscriptions is part of the Parthenon or another building.

For the sculptures decorating the Parthenon and the statue by Pheidias in the cella, see article Greek Art. The metopes over the outer colonnade were all sculptured, and represented on the east the battle of gods and giants, on the west, probably, the battle of Greeks and Amazons on the south Greeks and Centaurs; those on the north are almost lost. The east pediment represented the birth of Athena, the west pediment her contest with Poseidon for the land of Attica. The frieze, which was placed above the cella wall at the sides, represented the Panathenaic procession, approaching on three sides the group of gods seated in the middle of the east side. These sculptures are all of them admirably adapted to their position on the building, and are, in themselves, the most perfect works that sculpture has ever produced.

The Parthenon probably remained intact until the 5th century of our era, when the colossal statue was removed, and the temple is said to have been transformed into a church dedicated to St Sophia. In the 6th century it was dedicated to the Virgin Mother of God (Θεοτόκος). The adaptation of the building as a church involved the removal of the inner columns and roof, the construction of an apse at the east end, and the opening of a door between the cella and the chamber behind it. These alterations involved some damage to the sculptures. In 1456 Athens was captured by the Turks, and the Parthenon was consequently changed into a mosque, apparently without any serious structural alterations except the addition of a minaret. In this state it was described by Spon and Wheler in 1676 and the sculpture was drawn by the French artist Carrey in 1674. In 1687 the Turks used the building as a powder magazine during the bombardment of the Acropolis by a Venetian army under Morosini, and a shell caused the explosion which blew out the middle of the temple and threw down the columns at the sides. Still further damage to the sculptures was done by Morosini's unsuccessful attempt to lower from the west pediment the chariot of Athena. Later a small mosque was constructed in the midst of the ruins; but nothing except gradual damage is to be recorded during the succeeding century except the visits of various travellers, notably of James Stuart (1713–1788) and Nicholas Revett (1720–1804), whose splendid drawings are the best record of the sculpture as it existed in Athens. In 1801 Lord Elgin obtained a firman authorizing him to make casts and drawings, and to pull down extant buildings where necessary, and to remove sculpture from them. He caused all the remains of the sculpture to be found on the ground or in Turkish houses, and a certain amount—notably the metopes—that was still on the temple, to be transported to England. Some fault has been found with his methods or those of his workmen; but there is no doubt that the result was the preservation of much that would otherwise have been lost. The Elgin marbles were bought by the British government in 1816, and are now in the British Museum. Certain other sculptures from the Parthenon are in the Louvre, Copenhagen or elsewhere, and much is still in Athens, either still on the temple or in the Acropolis museum.

The most accurate measurements of the temple, showing the exactness of its construction and the subtlety of the curvature of all its lines, was made by F. C. Penrose.

Authorities.—A. Michaelis, *der Parthenon* (Leipzig, 1871); J. Stuart and N. Revett, *Antiquities of Athens* (London, 1762–1815); F. C. Penrose, *Principles of Athenian Architecture* (London, 1851 and 1888); A. S. Murray, *The Sculptures of the Parthenon* (London, 1903); British Museum, Catalogue of Sculpture, vol. i. See also Greek Art. (E. Gr.)

PARTHIA, the mountainous country S.E. of the Caspian Sea, which extends from the Elburz chain eastwards towards Herat, and is bounded on the N. by the fertile plain of Hyrcania (about Astrabad) at the foot of the mountains in the corner of the Caspian and by the Turanian desert; on the S. by the great salt desert of central Iran. It corresponds to the modern Khorasan. It was inhabited by an Iranian tribe, the *Parthava* of the inscriptions of Darius; the correct Greek form is Παρθυαῖοι. Parthia became a province of the Achaemenian and then of the Macedonian Empire. Seleucus I. and Antiochus I. founded Greek towns: Soteira, Charis, Achaea, Calliope (Appian, *Syr.* 57; Plin. vi. 15; cf. Strabo xi. 516); the capital of Parthia is known only by its Greek name Hecatompylos ("The Hundred-gated") from the many roads which met there (Polyb. x. 28), and was, according to Appian, founded by Seleucus I. (cf. Curtius vii. 2). In 208 many Greek inhabitants are found in the towns of Parthia and Hyrcania (Polyb. x. 31, 11).

When about 255 B.C. Diodotus had made himself king of Bactria (*q.v.*) and tried to expand his dominions, the chieftain of a tribe of Iranian nomads (Dahan Scyths) east of the Caspian, the Parni or Aparni, who bore the Persian name Arsaces, fled before him into Parthia.[1] Here the satrap Andragoras appears to have shaken off the Seleucid supremacy, as he struck gold and silver coins in his own name, on which he wears the diadem, although not the royal title (Gardner, *Numism. Chronicle*, 1879–1881). In Justin xii. 4, 12, Andragoras is wrongly made satrap of Alexander, of Persian origin, and ancestor of Arsaces. He was slain by Arsaces (Justin xli. 4), who occupied Parthia and became the founder of the Parthian kingdom. The date 248 B.C. given by the list of the Olympionicae in Euseb. *Chron.* i. 207, and in his *Canon*, ii. 120 (cf. Appian, *Syr.* 65; Justin, xli. 4, gives wrongly 256 B.C.), is confirmed by numerous Babylonian tablets dated simultaneously from the Seleucid and Arsacid eras (cf. Mahler, in *Wiener Zeitschrift für die Kunde des Morgenlands*, 1901, xv. 57 sqq.; Lehmann Haupt in *Beiträge zur alten Geschichte*, 1905, v. 128 sqq.). The origin and early history of the Parthian kingdom, of which we possess only very scanty information, is surrounded by fabulous legends, narrated by Arrian in his *Parthica* (preserved in Photius, *cod.* 58, and Syncellus, p. 539 seq.). Here Arsaces and his brother Tiridates are derived from the royal house of the Achaemenids, probably from Artaxerxes II.; the young Tiridates is insulted by the prefect Agathocles or Pherecles; in revenge the brothers with five companions (corresponding to the seven Persians of Darius) slay him, and Arsaces becomes king. He is killed after two years and succeeded by his brother Tiridates, who reigns 37 years. There is scarcely anything historical in this account, perhaps not even the name Tiridates, for, according to the older tradition, Arsaces himself ruled for many years. The troubles of the Seleucid empire, and the war of Seleucus II. against Ptolemy III. and his own brother Antiochus Hierax, enabled him not only to maintain himself in Parthia, but also to conquer Hyrcania; but he was constantly threatened by Diodotus of Bactria (Justin xli. 4). When, about 238 B.C., Seleucus II. was able to march into the east, Arsaces fled to the nomadic tribe of the Aspasiacae (Strabo xi. 513; cf. Polyb. x. 48). But Seleucus was soon recalled by a rebellion in Syria, and Arsaces returned victorious to Parthia; "the day of this victory is celebrated by the Parthians as the beginning of their independence" (Justin xli. 4). Arsaces was proclaimed king at Asaak in the district of Astauene, now Kuchan in the upper Atrek (Attruck) valley (Isidor. Charac.), and built his residence Dara on a rock in a fertile valley in Apavarktikene (Justin xli. 5; Plin. vi. 46), now Kelat still farther eastward; the centre of his power evidently lay on the borders of eastern Khorasan and the Turanian desert. The principal institutions of the Parthian kingdom were created by him (cf. Justin xli. 2). The Scythian nomads became the ruling race; they were invested with large landed property, and formed the council of the king, who appointed the successor. They were archers fighting on horseback, and in their cavalry consisted the strength of the Parthian army; the infantry were mostly slaves, bought and trained for military service, like the janissaries and mamelukes. But these Scythians soon amalgamated with the Parthian peasants. They adopted the Iranian religion of Zoroaster (in the royal town Asaak an eternal fire was maintained), and "their language was a mixture of Scythian and Median" (*i.e.*, Iranian). Therefore their language and writing are called by the later Persians "Pehlevi," *i.e.* Parthian (Pehlevi is the modern form of *Parthawa*) and the magnates themselves Pehlevans, *i.e.* "Parthians," a term transferred by Firdousi to the heroes of the old Iranian legend. But the Arsacid kingdom never was a truly national state; with the Scythian and Parthian elements were united some elements of Greek civilization. The successors of Arsaces I. even founded some Greek towns, and when they had conquered Babylonia and Mesopotamia they all adopted the epithet "Philhellen."

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[1] Strabo xi. 515; cf. Justin xli. 4; the Parni are said by Strabo [ibid.] to have immigrated from southern Russia, a tradition wrongly transferred to the Parthians themselves by Justin xli. 1, and Arrian *ap.* Phot. *cod.* 58.

To Arsaces I. probably belong the earliest Parthian coins; the oldest simply bear the name Arsaces; others, evidently struck after the coronation in Asaak, have the royal title (βασιλέως Ἀρσάκου). The reverse shows the seated archer, or occasionally an elephant; the head of the king is beardless and wears a helmet and a diadem; only from the third or fourth king they begin to wear a beard after the Iranian fashion. In honour of the founder of the dynasty all his successors, when they came to the throne, adopted his name and officially (*e.g.* on the coins) are almost always called Arsaces, whereas the historians generally use their individual names.

Of the successors of Arsaces I. we know very little. His son, Arsaces II., was attacked by Antiochus III., the Great, in 209, who conquered the Parthian and Hyrcanian towns but at last granted a peace. The next king, whom Justin calls Priapatius, ruled 15 years (about 190–175); his successor, Phraates I., subjected the mountainous tribe of the Mardi (in the Elburz). He died early, and was succeeded not by one of his sons but by his brother, Mithradates I., who became the founder of the Parthian empire. Mithradates I. (*c.* 170–138) had to fight hard with the Greeks of Bactria, especially with Eucratides (*q.v.*); at last he was able to conquer a great part of eastern Iran. Soon after the death of Antiochus IV. Epiphanes (163) he conquered Media, where he refounded the town of Rhagae (Rai near Teheran) under the name of Arsacia; and about 141 he invaded Babylonia. He and his son Phraates II. defeated the attempts of Demetrius II. (139) and Antiochus VII. (129) to regain the eastern provinces, and extended the Arsacid dominion to the Euphrates.

For the later history of the Parthian empire reference should be made to PERSIA: *Ancient History*, and biographical articles on the kings. The following is a list of the kings, as far as it is possible to establish their succession.

The names of pretenders not generally acknowledged are put in brackets.

Arsaces I. (perhaps Tiridates I.)	248–*c.* 211
Arsaces II.	*c.* 211–190
Priapatius	*c.* 190–175
Phraates I.	*c.* 175–170
Mithradates I.	*c.* 170–138
Phraates II.	*c.* 138–127
Artabanus I.	*c.* 127–124
Mithradates II. the Great	*c.* 124–88[1]
Sanatruces I.	76–70
Phraates III.	70–57
Orodes I.	57–37
(Mithradates III.	57–54)
Phraates IV.	37–2
(Tiridates II.	32–31 and 26)
Phraates V. (Phraataces)	2 B.C.–A.D. 5
Orodes II.	A.D. 5–7
Vonones I.	8–11
Artabanus II.	*c.* 10–40
(Tiridates III.	36)
(Cinnamus	38)
(Vardanes I.	40–45)
Gotarzes	40–51
Vonones II.	51
Vologaeses I.	51–77
(Vardanes II.	55)
Vologaeses II.	77–79; 111–147
Pacorus	78–*c.* 105
(Artabanus III.	80–81)
Osroes	106–129
(Mithradates IV. and his son Sanatruces II., 115; Parthamaspates, 116–117; and other pretenders.)	
Mithradates V.	*c.* 129–147
Vologaeses III.	147–191
Vologaeses IV.	191–209
(Vologaeses V.	209–*c.* 222)
Artabanus IV.	209–229

AUTHORITIES.—Persian tradition knows very little about the Arsacids, who by it are called Ashkanians (from Ashak, the modern form of Arsaces.) Of modern works on the history of the Parthians (besides the numismatic literature) the most important are: G. Rawlinson, *The Sixth Oriental Monarchy* (1873), and A. von Gutschmid, *Geschichte Irans und seine Nachbarländer von Alexander d. Gr. bis zum Untergang der Arsaciden* (1888).

The principal works on the Arsacid coinage are (after the earlier publications of Longpérier, Prokesch-Ostan, &c.): Percy Gardner, *The Parthian Coinage* (London, 1877), and especially W. Wroth, *Catalogue of the Coins of Parthia* in the British Museum (London, 1903), who carefully revised the statements of his predecessors. Cf. also Petrowicz, *Arsacidenmünzen* (Vienna, 1904), and Allotte de la Fuye, "Classement des monnaies arsacides," in *Revue numismatique*, 4 *série*, vol. viii., 1904. (ED. M.)

PARTICK (formerly *Perdyc* or *Perthick*), a municipal and police burgh of the parish of Govan, Lanarkshire, Scotland. Pop. (1891), 36,538; (1901), 54,298. It lies on the north bank of the Clyde, and is continuous with Glasgow, from which it is separated by the Kelvin, and of which it is a large and wealthy residential suburb. Shipbuilding yards are situated in the burgh, which has also industries of paper-staining, flour-milling, hydraulic-machine making, weighing-machine making, brass-founding and galvanizing. The tradition is that the flour-mills and granaries—the Bunhouse Mills—as they are called locally, were given by the Regent Moray to the bakers of Glasgow for their public spirit in supplying his army with bread at the battle of Langside in 1568. Victoria Park contains a grove of fossil trees which were discovered in a quarry. The town forms the greater part of the Partick division of Lanarkshire, which returns one member to Parliament. Though it remained a village till the middle of the 19th century, it is an ancient place. Morken, the Pictish king who persecuted St Kentigern, is believed to have dwelt here and, in 1136, David I. gave the lands of Partick to the see of Glasgow. The bishop's palace stood by the side of the Kelvin, and was occupied—or a mansion erected for him on its site—by George Hutcheson (1580–1639), founder of the Hutcheson Hospital in the city.

PARTISAN, or PARTIZAN. (1) A thoroughgoing "party" man or adherent, usually in a depreciatory sense of one who puts his party before principles; (2) an irregular combatant or guerrilla soldier; (3) a weapon with a long shaft and a broad bladed head, of a type intermediate between the spear and the halberd (*q.v.*). In senses (1) and (2) the word is derived through the Fr. from Ital. *partigiano*, from *parteggiare*, to share, take part in, Lat. *pars*, part. The name for the weapon has also been attributed to the same origin, as being that used by "partisans," but there is no historical evidence for this. The form which the word now takes in French, *pertuisane*, has given rise to a connexion with *pertuis*, hole; Lat. *pertusus*, *pertundere*, to strike through. But the most probable derivation is from the Teutonic *parta*, *barta*, axe, which forms the last part of "halberd."

PARTITION, in law, the division between several persons of land or goods belonging to them as co-proprietors. It was a maxim of Roman law, followed in modern systems, that *in communione vel societate nemo potest invitus detineri*. Partition was either voluntary or was obtained by the *actio communi dividendo*. In English law the term partition applies only to the division of lands, tenements and hereditaments, or of chattels real between coparceners, joint tenants or tenants in common. It is to be noticed that not all hereditaments are capable of partition. There can be no partition of homage, fealty, or common of turbary, or of an inheritance of dignity, such as a peerage. Partition is either voluntary or compulsory. Voluntary partition is effected by mutual conveyances, and can only be made where all parties are *sui juris*. Since the Real Property Act 1845, § 3, it must be made by deed, except in the case of copyholds. Compulsory partition is effected by private act of parliament, by judicial process, or through the inclosure commissioners. At common law none but coparceners were entitled to partition against the will of the rest of the proprietors, but the Acts of 31 Henry VIII. c. 1 and 32 Henry VIII. c. 32 gave a compulsory process to joint tenants and tenants in common of freeholds, whether in possession or in reversion, by means of the writ of partition. In the reign of Elizabeth the court of chancery began to assume jurisdiction in partition, and the writ of partition, after gradually becoming obsolete, was finally abolished by the Real Property Limitation Act 1833. The court of chancery could not decree partition of copyholds until the passing of the Copyholds Act 1841. This act was repealed by the Copyholds Act 1894, which empowers the alienation of ancient tenements with the licence of the lord. By the Judicature Act 1873, § 34, partition is one of the matters specially assigned to the chancery division. An order for partition is a matter of right, subject to the discretion vested in the court by the Partition Act 1868 (amended by the Partition Act 1876). By § 3 of the act of 1868 the court may, on the request of a party interested, direct a sale instead of a partition, if a sale would be more beneficial than a partition. By § 12 a county court has jurisdiction in partition where the property does not exceed £500 in value. Under the powers of the Inclosure Act 1845, and the acts amending it, the inclosure commissioners have power of enforcing compulsory partition among the joint owners of any inclosed lands. An order of the inclosure commissioners or a private act vests the legal estate, as did also the old writ of partition. But an order of the chancery division only declares the rights, and requires to be perfected by mutual conveyances so as to pass the legal estate. Where, however, all the parties are not *sui juris*, the court may make a vesting order under the powers of the Trustee Act 1850, § 30.

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[1] The names of the following kings are not known; that one of them was called Artabanus II. is quite conjectural.

Partition is not a technical term of Scots law. In Scotland division of common property is effected either extra-judicially, or by action of declarator and division or division and sale in the court of session, or (to a limited extent) in the sheriff courts. Rights of common are not divisible in English law without an act of parliament or a decree of the inclosure commissioners, but in Scotland the act of 1695, c. 38, made all commonties, except those belonging to the king or royal burghs, divisible, on the application of any having interest, by action in the court of session. By the Sheriff Courts (Scotland) Act 1877, § 8, the action for division of common property or commonty is competent in the sheriff court, when the subject in dispute does not exceed in value £50 by the year, or £1000 value. Runrig lands, except when belonging to corporations, were made divisible by the act of 1695, c. 23. A decree of division of commonty, common property, or runrig lands has the effect of a conveyance by the joint proprietors to the several participants (Conveyancing [Scotland] Act 1874, § 35).

In the United States, "it is presumed," says Chancellor Kent, (4 *Comm.*, lect. lxiv.), "that the English statutes of 31 & 32 Henry VIII. have been generally re-enacted and adopted, and probably with increased facilities for partition." In a large majority of the states, partition may be made by a summary method of petition to the courts of common law. In the other states the courts of equity have exclusive jurisdiction. As between heirs and devisees the probate courts may in some states award partition. The various state laws with regard to partition will be found in Washburn, *Real Property*, bk. i. ch. xiii., § 7.

PARTNERSHIP (earlier forms, *partener*, *parcener*, from Late Lat. *partionarius* for *partitionarius*, from *partitio*, sharing, *pars*, part), in general, the voluntary association of two or more persons for the purpose of gain, or sharing in the work and profits of any enterprise. This general definition, however, requires to be further restricted, in law, according to the account given below.

The partnership of modern legal systems is based upon the *societas* of Roman law. *Societas* was either *universorum bonorum*, a complete communion of property; *negotiationis alicujus*, for the purpose of a single transaction; *vectigalis*, for the collection of taxes; or *rei unius*, joint ownership of a particular thing. The prevailing form was *societas universorum quae ex quaestu veniunt*, or trade partnership, from which all that did not come under the head of trade profit (*quaestus*) was excluded. This kind of *societas* was presumed to be contemplated in the absence of proof that any other kind was intended. *Societas* was a consensual contract, and rested nominally on the consent of the parties—really, no doubt (though this was not in terms acknowledged by the Roman jurists), on the fact of valuable consideration moving from each partner. No formalities were necessary for the constitution of a *societas*. Either property or labour must be contributed by the *socius*; if one party contributed neither property nor labour, or if one partner was to share in the loss but not in the profit (*leonina societas*), there was no true *societas*. *Societas* was dissolved on grounds substantially the same as those of English law (see below). The only ground peculiar to Roman law was change of *status* (*capitis deminutio*). Most of the Roman law on the subject of *societas* is contained in *Dig*. xvii. tit. 2, *Pro socio*.

Though the English law of partnership is based upon Roman law, there are several matters in which the two systems differ. (1) There was no limit to the number of partners in Roman law. (2) In *societas* one partner could generally bind another only by express *mandatum*; one partner was not regarded as the implied agent of the others. (3) The debts of a *societas* were apparently joint, and not joint and several. (4) The *heres* of a deceased partner could not succeed to the rights of the deceased, even by express stipulation. There is no such disability in England. (5) In actions between partners in Roman law, the *beneficium competentiae* applied—that is, the privilege of being condemned only in such an amount as the partner could pay without being reduced to destitution. (6) The Roman partner was in some respects more strictly bound by his fiduciary position than is the English partner. For instance, a Roman partner could not retire in order to enjoy alone a gain which he knew was awaiting him. (7) There was no special tribunal to which matters arising out of *societas* were referred.

Previous to the Partnership Act 1890 the English law of partnership was to be found only in legal decisions and in textbooks. It was mostly the result of judge-made law, and as distinguished from the law of joint stock companies was affected by comparatively few acts of parliament.

In 1890 the Partnership Act of that year was passed to declare and amend the law of partnership; the act came into operation on the 1st of January 1891. With one important exception (§ 23), it applies to the whole United Kingdom. It is not a complete code of partnership law; it contains no provisions regulating the administration of partnership assets in the event of death or bankruptcy, and is silent on the subject of goodwill. The existing rules of equity and common law continue in force, except so far as they are inconsistent with the express provisions of the act. Indeed, the act of 1890 has to be read in the light of the decisions which have built up these rules. On all points specifically dealt with by the act it is now the one binding authority. The act has made no important changes in the law, except in respect of the mode of making a partner's share of the partnership assets available for payment of his separate debts. This change does not affect Scotland. The act is divided into the four main divisions mentioned below.

I. *Nature of Partnership*.—Partnership is defined to be the "relation which subsists between persons carrying on a business in common with a view of profit." From this definition corporations and companies, such as joint-stock companies and cost-book mining companies, which differ from ordinary partnerships in many important respects, are expressly excluded. The act also contains several subsidiary rules for determining the existence of a partnership. These rules are of a fragmentary nature, and for the most part are expressed in a negative form; they have not introduced any change in the law. Co-ownership of property does not of itself create a partnership, nor does the sharing of gross returns. The sharing of profits, though not of itself sufficient to create a partnership, is prima facie evidence of one. This means that if all that is known is that two persons are sharing profits, the inference is that such persons are partners; but if the participation in profits is only one amongst other circumstances, all the circumstances must be considered, and the participation in profits must not be treated as raising a presumption of partnership, which has to be rebutted. To illustrate the rule that persons may share profits without being partners, the act gives statutory expression to the decision in *Cox* v. *Hickman* (1860, 8 H.L.C., 268), viz. that the receipt by a person of a debt or other fixed sum by instalments, or otherwise, out of the accruing profits of a business does not of itself make him a partner; and it re-enacts with some slight modification the repealed provisions of Bovill's Act (28 & 29 Vict. c. 86), which was passed to remove certain difficulties arising from the decision in *Cox* v. *Hickman*. Whenever the question of partnership or no partnership arises, it must not be forgotten (though this is not stated in the act) that partnership is a relation arising out of a contract; regard must be paid to the true contract and intention of the parties as appearing from the whole facts of the case. If a partnership be the legal consequence of the true agreement, the parties thereto will be partners, though they may have intended to avoid this consequence (*Adam* v. *Newbigging*, 1888, L.R. 13 App. Cas. 315). Partners are called collectively a "firm"; the name under which they carry on business is called the firm name. Under English law the firm is not a corporation, nor is it recognized as distinct from the members composing it; any change amongst them destroys the identity of the firm. In Scotland a firm is a legal person distinct from its members, but each partner can be compelled to pay its debts.

At common law there is no limit to the number of partners, but by the Companies Act 1862 (25 & 26 Vict. c. 89, § 4), not more than ten persons can carry on the business of bankers, and not more than twenty any other business, unless (with some exceptions) they conform to the provisions of the act. (See COMPANY, and also *Limited Partnerships* below.)

II. *Relations of Partners to Persons dealing with them.*—Every partner is an agent of the firm and of his co-partners for the purpose of the partnership business; if a partner does an act for carrying on the partnership business in the usual way in which businesses of a like kind are carried on—in other words, if he acts within his apparent authority—he thereby prima facie binds his firm. The partners may by agreement between themselves restrict the power of any of their number to bind the firm. If there be such an agreement, no act done in contravention of it is binding on the firm with respect to persons who have notice of the agreement. Such an agreement does not affect persons who have no notice of it, unless indeed they do not know or believe the person with whom they are dealing to be a partner; in that case he has neither real, nor, so far as they are concerned, apparent authority to bind his firm, and his firm will not be bound. If a partner does an act, *e.g.* pledges the credit of the firm, for a purpose apparently not connected with the firm's ordinary course of business, he is not acting in pursuance of his apparent authority, and whatever liability he may personally incur, his partners will not be bound unless he had in fact authority from them.

Apart from any general rule of law relating to the execution of deeds or negotiable instruments, a firm and all the partners will be bound by any act relating to the business of the firm, and done in the firm name, or in any other manner showing an intention to bind the firm, by any person thereto authorized. An admission or representation by a partner, acting within his apparent authority, is evidence against his firm. Notice to an acting partner of any matter relating to the partnership affairs is, apart from fraud, notice to his firm.

A firm is liable for loss or injury caused to any person not a partner, or for any penalty incurred by any wrongful act or omission of a partner acting in the ordinary course of the partnership business, or with the authority of his co-partners; the extent of the firm's liability is the same as that of the individual partner. The firm is also liable to make good the loss (*a*) where one partner, acting within his apparent authority, receives money or property of a third person and misapplies it; and (*b*) where a firm in the course of its business receives money or property of a third person, and such money or property while in the custody of the firm is misapplied by a partner. It is not sufficient, in order to fix innocent partners with liability for the misapplication of money belonging to a third party, merely to show that such money was employed in the business of the partnership, otherwise all the members of a firm would in all cases be liable to those beneficially interested therein for trust money improperly employed in this manner by one partner. This is not the case. To fix the other partners with liability, notice of the breach of trust must be brought home to them individually.

The liability of partners for the debts and obligations of their firm arising *ex contractu*, is joint, and in Scotland several also; the estate of a deceased partner is also severally liable in a due course of administration, but subject, in England or Ireland, to the prior payment of his separate debt. The liability of partners for the obligations of their firm arising *ex delicto*, is joint and several.

The authority of a partner to bind his co-partners commences with the partnership. A person therefore who enters into a partnership does not thereby become liable to the creditors of his partners for anything done before he became a partner. But a partner who retires from a firm does not thereby cease to be liable for debts or obligations incurred before his retirement. He may be discharged from existing liabilities by an agreement to that effect between himself and the members of the firm as newly constituted and the creditors. This agreement may be either express or inferred as a fact from the course of dealing between the creditors and the new firm. The other ways in which a partner may be freed from partnership liabilities incurred before his retirement are not peculiar to partnership liabilities, and are not therefore dealt with by the Partnership Act.

A continuing guaranty given to a firm, or in respect of the transactions of a firm, is, in the absence of agreement to the contrary, revoked as to the future by a change in the firm. The reason is that such a change destroys its identity.

Any person, not a partner in the firm, who represents himself (or, as the phrase is, "holds himself out"), or knowingly suffers himself to be represented, as a partner, is liable as a partner to any person who has given credit to the firm on the faith of the representation. The representation may be by words spoken or written, or by conduct. The liability will attach, although the person who makes the representation does not know that the person who has acted on it knew of it. The continued use of a deceased partner's name does not impose liability on his estate.

III. *Relations of Partners to one another.*—The mutual rights and duties of partners depend upon the agreement between them. Many of these rights and duties are stated in the Partnership Act; but, whether stated in the act or ascertained by agreement, they may be varied by the consent of all the partners; such consent may be express or inferred from conduct. Subject to any agreement, partners share equally in the capital and profits of their business, and must contribute equally to losses, whether of capital or otherwise; they are entitled to be indemnified by their firm against liabilities incurred in the proper and ordinary conduct of the partnership business, and for anything necessarily done for its preservation; they are entitled to interest at 5% on their advances to the firm, but not on their capital. Every partner may take part in the management of the partnership business, but no partner is entitled to remuneration for so doing. The majority can bind the minority in ordinary matters connected with the partnership business, but cannot change its nature nor expel a partner, unless expressly authorized so to do. No partner may be introduced into the firm without the consent of all the partners. The partnership books must be kept at the principal place of business, and every partner may inspect and copy them. Partners must render to each other true accounts and full information of all things affecting the partnership. A partner may not make use of anything belonging to his firm for his private purposes, nor may he compete with it in business. If he does so he must account to his firm for any profit he may make.

Partners may agree what shall and what shall not be partnership property, and can by agreement convert partnership property into the separate property of the individual partners, and vice versa. Subject to any such agreement, all property originally brought into the partnership stock, or acquired on account of the firm or for the purposes and in the course of its business, is declared by the act to be partnership property. Property bought with money of the firm is prima facie bought on account of the firm. Partnership property must be applied exclusively for partnership purposes and in accordance with the partnership agreement. Co-owners of land may be partners in the profits of the land without the land being partnership property; if such co-owners purchase other lands out of the profits, these lands will also belong to them (in the absence of any agreement to the contrary) as co-owners and not as partners. The legal estate in partnership land devolves according to the general law, but in trust for the persons beneficially interested therein. As between partners, and as between the heirs of a deceased partner and his executors or administrators, such land is treated as personal or movable estate, unless a contrary intention appears.

When no fixed term has been agreed upon for the duration of the partnership, it is at will, and may be determined by notice at any time by any partner. If a partnership for a fixed term is continued after the term has expired without any express new agreement, the rights and duties of the partners remain as before, so far as they are consistent with a partnership at will.

A partner may assign his share in the partnership either absolutely or by way of mortgage. The assignee does not become a partner; during the continuance of the partnership he has the right to receive the share of profits to which his assignor would have been entitled, but he has no right to interfere in the partnership business, or to require any accounts of the partnership transactions, or to inspect the partnership books. On a dissolution he is entitled to receive the share of the partnership assets to which his assignor is entitled as between himself and his partners, and for this purpose to an account as from the date of dissolution.

Since the act came into operation no writ of execution may issue in England or Ireland against any partnership property, except on a judgment against the firm. If in either of these countries a judgment creditor of a partner wishes to enforce his judgment against that partner's share in the partnership, he must obtain an order of court charging such share with payment of his debt and interest. The court may appoint a receiver of the partner's share, and may order a sale of such share. If a sale be ordered the other partners may buy the share; they may also at any time redeem the charge. The mode of making a partner's share liable for his separate debts in Scotland has not been altered by the act.

IV. *Dissolution of Partnership.*—A partnership for a fixed term, or for a single adventure, is dissolved by the expiration of the term or the termination of the adventure. A partnership for an undefined time is dissolved by notice of dissolution, which may be given at any time by any partner. The death or bankruptcy of any partner dissolves the partnership as between all its members. If a partner suffers his share in the partnership to be charged under the act for his separate debts, his partners may dissolve the partnership. The foregoing rules are subject to any agreement there may be between the partners. A partnership is in every case dissolved by any event which makes the partnership or its business unlawful. The court may order a dissolution in any of the following cases, viz.: When a partner is found lunatic or is of permanently unsound mind, or otherwise permanently incapable of performing his duties as a partner; when a partner has been guilty of conduct calculated to injure the partnership business, or wilfully or persistently breaks the partnership agreement, or so conducts himself in partnership matters that it is not reasonably practicable for his partners to carry on business with him; when the partnership can only be carried on at a loss; and lastly, whenever a dissolution appears to the court to be just and equitable. The act is silent as to the effect of the assignment by a partner of his share in the partnership as a cause of dissolution; probably it is now no more than a circumstance enabling the court, if it thinks fit, to grant a dissolution on the ground that it is just and equitable to do so. A dissolution usually is not complete as against persons who are not partners, until notice of it has been given; until then such persons may treat all apparent partners as still members of the firm. Consequently, if notice is not given when it is necessary, a partner may be made liable for partnership debts contracted after he ceased to be a partner. Notice is not necessary to protect the estate of a dead or bankrupt partner from partnership debts contracted after his death or bankruptcy; nor is notice necessary when a person not known to be a partner leaves a firm. If a person not generally known to be a partner is known to be so to certain individuals, notice must be given to them. Notice in the *Gazette* is sufficient as regards all persons who were not previously customers of the firm; notice in fact must be given to old customers. On a dissolution, or the retirement of a partner, any partner may notify the fact and require his co-partners to concur in doing so.

After a dissolution, the authority of each partner (unless he be a bankrupt) to bind the firm, and the other rights and obligations of the partners, continue so far as may be necessary to wind up the partnership affairs and to complete unfinished transactions. The partners are entitled to have the partnership property applied in payment of the debts of the firm, and to have any surplus divided between them. Before a partner can receive any part of the surplus, he must make good whatever may be due from him as a partner to the firm. To enforce these rights, any partner or his representatives may apply to the court to wind up the partnership business. It was well established before the act, and is still law, that in the absence of special agreement the right of each partner is to have the partnership property—including the goodwill of its business, if it be saleable—realized by a sale. The value of the goodwill depends largely on the right of the seller to compete with the purchaser after the sale. The act makes no mention of goodwill, but the rights of a seller in this respect were fully discussed in the House of Lords in *Trego* v. *Hunt* (L.R. 1896, App. Cas. 7). In the absence of special agreement, the seller may set up business in competition with, and in the immediate neighbourhood of, the purchaser, and advertise his business and deal with his former customers, but may not represent himself as carrying on his former business, nor canvass his former customers. The purchaser may advertise himself as carrying on the former business, canvass its customers, and trade under the old name, unless that name is or contains the name of the vendor, and the purchaser by using it without qualification would expose the vendor to the liability of being sued as a partner in the business. If, on a dissolution or change in the constitution of a firm, the goodwill belongs under the partnership agreement exclusively to one or more of the partners, the partner who is entitled to the goodwill has the rights of a seller, and those to whom the goodwill does not belong have the rights of a purchaser.

When a partner has paid a premium on entering into a partnership for a fixed term, and the partnership is determined before the expiration of the term, the court may, except in certain cases, order a return of the premium or of some part of it. In the absence of fraud or misrepresentation, the court cannot make such an order when the partnership was at will, or, being for a fixed term, has been terminated by death or by reason of the misconduct of the partner who paid the premium; nor can it do so if terms of dissolution have been agreed upon, and the agreement makes no provision for the return of premium.

When a person is induced by the fraud or misrepresentation of others to become a partner with them, the court will rescind the contract at his instance (*Adam* v. *Newbigging*, 1888, R. 13 App. Cas. 308). Inasmuch as such a person is under the same liability to third parties for liabilities of the firm incurred before rescission as he would have been under had the contract been valid, he is entitled on the rescission to be indemnified by the person guilty of the fraud or making the representation against these liabilities. He is also entitled, without prejudice to any other rights, to receive out of the surplus assets of the partnership, after satisfying the partnership liabilities, any money he may have paid as a premium or contributed as capital, and to stand in the place of the creditors of the firm for any payments made by him in respect of the partnership liabilities.

If a partner ceases to be a member of a firm, and his former partners continue to carry on business with the partnership assets without any final settlement of accounts, he, or, if he be dead, his estate, is, in the absence of agreement, entitled to such part of the subsequent profits as can be attributed to the use of his share of the partnership assets, or, if he or his representatives prefer it, to interest at 5% on the amount of his share. If his former partners have by agreement an option to purchase his share, and exercise the option and comply with its terms, he is not entitled to any further or other share in profits than that given him by the agreement. If, however, his former partners, assuming to exercise such an option, do not comply with its terms, they are liable to account for subsequent profits or interest to the extent mentioned above. Subject to any agreement between the partners, the amount due from the surviving or continuing partners to an outgoing partner, or the representatives of a deceased partner, in respect of his share in the partnership, is a debt accruing at the date of the dissolution or death.

In the absence of any special agreement on a final settlement of accounts between partners, losses (including losses of capital) are paid first out of profits, next out of capital, and lastly by the partners in the proportions in which they share profits. The assets of the firm, including all sums contributed to make up losses of capital, are applied in paying the debts and liabilities of the firm to persons who are not partners; then in paying to each partner rateably what is due from the firm to him, first for advances and next in respect of capital; and the ultimate residue (if any) is divisible among the partners in the proportion in which profits are divisible.

Limited Partnerships.—In the law of partnership as set out above, the Limited Partnership Act 1907 introduced a considerable innovation. By that act power was given to form limited partnerships, like the French *société en commandite*—that is, a partnership consisting not only of general partners, but of others whose liability is limited to the amount contributed to the concern. Such a limited partnership must not consist, in the case of a partnership carrying on the business of banking, of more than ten persons, and in the case of any other partnership of more than twenty persons. There must be one or more persons called general partners who are liable for all the debts and obligations of the firm, and limited partners, who on entering into partnership contribute a certain sum or property valued at a stated amount, beyond which they are not liable. Limited partners cannot withdraw or receive back any of their contributions; any withdrawal brings liability for the debts and obligations of the firm up to the amount withdrawn. A body corporate may be a limited partner. No limited partner can take part in the management of a partnership business; if he does so he becomes liable in the same way as a general partner, but he can at all times inspect the books of the firm and examine into the state and prospects of the business. Every limited partnership must be registered with the registrar of joint stock companies, and the following particulars must be given: (*a*) the firm name; (*b*) the general nature of the business; (*c*) the principal place of business; (*d*) the full name of each of the partners; (*e*) the term, if any, for which the partnership is entered into and the date of its commencement; (*f*) a statement that the partnership is limited, and the description of every limited partner as such; (*g*) the sum contributed by each limited partner, and whether paid in cash or how otherwise. If any change occurs in these particulars, a statement signed by the firm and specifying the nature of the change, must be sent within seven days to the registrar. An advertisement must also be inserted in the gazette of any arrangement by which a general partner becomes a limited partner or under which the share of a limited partner is assigned. Any person making a false return for the purpose of registration commits a misdemeanour and is liable to imprisonment with hard labour for a term not exceeding two years. The law of private partnership applies to limited partners except where it is inconsistent with the express provisions of the Limited Partnership Act.

See Sir Nathaniel [Lord] Lindley, *A Treatise on the Law of Partnership* (7th ed., London, 1905); Sir Frederick Pollock, *A Digest of the Law of Partnership, incorporating the Partnership Act 1890* (8th ed., London, 1905); also article on "Partnership" in the *Encyclopaedia of the Laws of England.*

Scots Law.—The law of Scotland as to partnership agrees in the main with the law of England. The principal difference is that Scots law recognizes the firm as an entity distinct from the individuals composing it. The firm of the company is either proper or descriptive. A proper or personal firm is a firm designated by the name of one or more of the partners.[1] A descriptive firm does not introduce the name of any of the partners. The former may sue and be sued under the company name; the latter only with the addition of the names of three at least (if there are so many) of the partners. A consequence of this view of the company as a separate person is that an action cannot be maintained against a partner personally without application to the company in the first instance, the individual partners being in the position of cautioners for the company rather than of principal debtors. The provisions of the Mercantile Law Amendment Act 1856 (19 & 20 Vict. c. 60, § 8), do not affect the case of partners. But, though the company must first be discussed, diligence must necessarily be directed against the individual partners. Heritable property cannot be held in the name of a firm; it can only stand in the name of individual partners. Notice of the retirement of even a dormant partner is necessary. The law of Scotland draws a distinction between joint adventure and partnership. Joint adventure or joint trade is a partnership confined to a particular adventure or speculation, in which the partners, whether latent or unknown, use no firm or social name, and incur no responsibility beyond the limits of the adventure. In the rules applicable to cases of insolvency and bankruptcy of a company and partners, Scots law differs in several respects from English. Thus a company can be made bankrupt without the partners being made so as individuals. And, when both company and partners are bankrupt, the company creditors are entitled to rank on the separate estates of the partners for the balance of their debts equally with the separate creditors. But in sequestration, by the Bankruptcy Scotland Act 1856, § 66, the creditor of a company, in claiming upon the sequestrated estate of a partner, must deduct from the amount of his claim the value of his right to draw payment from the company's funds, and he is ranked as creditor only for the balance. (See Erskine's *Inst.* bk. iii. tit. iii.; Bell's *Comm.* ii. 500–562; Bell's *Principles*, §§ 350–403.)

United States.—In the United States the English common law is the basis of the law. Most states have, however, their own special legislation on the subject. The law in the United States permits the existence of limited partnerships, corresponding to the *sociétés en commandite* established in France by the ordinance of 1673, and those legalized in England under the act of 1907 (see above). The State of New York was the first to introduce this kind of partnership by legislative enactment. The provisions of the New York Act have been followed by most of the other states. In many states there can be no limited partnerships in banking and insurance. In this form of partnership one or more persons responsible *in solido* are associated with one or more dormant partners liable only to the extent of the funds supplied by them. In Louisiana such partnerships are called partnerships *in commendam* (Civil Code, art. 2810).

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[1] In France, it is to be noted, the style of a firm must contain no names other than those of actual partners. In Germany it must, upon the first constitution of the firm, contain the name of at least one actual partner, and must not contain the name of any one who is not a partner; when once established the style of the firm may be continued notwithstanding changes.

In New York the responsible partners are called *general* partners, the others *special* partners. Such partnerships must, by the law of most states, be registered. In Louisiana universal partnerships (the *societates universorum bonorum* of Roman law) must be created in writing and registered (Civil Code, art. 2800). In some states the English law as it stood before *Cox* v. *Hickman* is followed, and participation in profits is still regarded as the test of partnership, *e.g. Leggett* v. *Hyde* (58 New York Rep. 272). In some states nominal partners are not allowed. Thus in New York, where the words "and Company" or "and Co." are used, they must represent an actual partner or partners. A breach of this rule subjects offenders to penalties. In most states claims against the firm after the death of a partner must, in the first instance, be made to the survivors. The creditors cannot, as in England, proceed directly against the representatives of the deceased. An ordinary partnership between miners for working a mine is not dissolved by the death of one of the partners, nor by the transfer by one of his interest in the concern. Contract is not deemed the basis of the relation between the partners, but rather a common property and co-operation in its exploitation (Parsons, *Principles of Partnership*, § 15). A corporation cannot become a partner in any mercantile adventure, unless specially authorized by charter or general statute. If it could, the management of its affairs would no longer be exclusively in the hands of its directors, to whom the law has entrusted it. Hence, corporations cannot associate for the formation of a "trust" to be managed by the associated partners.

See 3 Kent's *Comm.*, lect. xliii.; Story, *On Partnership*; Bates, *Law of Partnership* (1888); Burdick, *Law of Partnership* (1899).

PARTON, JAMES (1822–1891), American biographer, was born in Canterbury, England, on the 9th of February 1822. He was taken to the United States when he was five years old, studied in New York City and White Plains, New York, and was a schoolmaster in Philadelphia and then in New York. He removed (1875) to Newburyport, Massachusetts, where he died on the 17th of October 1891. Parton was the most popular biographer of his day in America. His most important books are *Life of Horace Greeley* (1855), *Life and Times of Aaron Burr* (1857), *Life of Andrew Jackson* (1859–1860), *Life and Times of Benjamin Franklin* (1864), *Life of Thomas Jefferson* (1874), and *Life of Voltaire* (1881). Among his other publications are *General Butler in New Orleans* (1863), *Famous Americans of Recent Times* (1867), *The People's Book of Biography* (1868); *Noted Women of Europe and America* (1883), and *Captains of Industry* (two series, 1884 and 1891), for young people. His first wife, Sara (1811–1872), sister of N. P. Willis, and widow of Charles H. Eldredge (d. 1846), attained considerable popularity as a writer under the pen-name "Fanny Fern." (See James Parton's *Fanny Fern: a Memorial Volume*, 1873). They were married in 1856. Her works include the novels, *Ruth Hall* (1854), reminiscent of her own life, and *Rose Clark* (1857); and several volumes of sketches and stories. In 1876 Parton married Ethel Eldredge, his first wife's daughter by her first husband.

PARTONOPEUS DE BLOIS, hero of romance. The French romance of *Partonopeus de Blois* dates from the 13th century, and has been assigned, on the strength of an ambiguous passage in the prologue to his *Vie seint Edmund le rei* to Denis Piramus. The tale is, in its essence a variation of the legend of Cupid and Psyche. Partonopeus is represented as having lived in the days of Clovis, king of France. He was seized while hunting in the Ardennes, and carried off to a mysterious castle, the inhabitants of which were invisible. Melior, empress of Constantinople, came to him at night, stipulating that he must not attempt to see her for two years and a half. After successful fighting against the "Saracens," led by Sornegur, king of Denmark, he returned to the castle, armed with an enchanted lantern which broke the spell. The consequent misfortunes have a happy termination. The tale had a continuation giving the adventures of Fursin or Anselet, the nephew of Sornegur. The name of Partonopeus or Partonopex is generally assumed to be a corruption of Parthenopaeus, one of the seven against Thebes. It has been suggested that the word might be derived from Partenay, a supposition coloured by the points of similarity between this story and the legend of Mélusine (see JEAN D'ARRAS) attached to the house of Lusignan, as the lords of these two places were connected.

BIBLIOGRAPHY.—The French romance was edited by G. A. Crapelet, with an introduction by A. C. M. Robert, as Partonopeus de Blois (2 vols., 1834); an English *Partonope of Blois*, by W. E. Buckley for the Roxburghe Club (London, 1862), and another fragment for the same learned society in 1873; the German *Partonopier und Melior* of Konrad von Würzburg by K. Bartsch (Vienna, 1871); the Icelandic *Partalópa saga* by O. Klockhoff in *Upsala Universitets Arsskrift* for 1887. See also H. L. Ward, *Catalogue of Romances*, (i. 689, &c.); E. Kölbing, *Die verschiedenen Gestaltungen der Partonopeus-Sage*, in *German. Stud.* (vol. ii., Vienna, 1875), in which the Icelandic version is compared with the Danish poem *Persenober* and the Spanish prose *Historia del conde Partinobles*; E. Pfeiffer, "Über die HSS des Part. de Blois" in Stengel's *Ausg. in Abh. vom phil.* (No. 25, Marburg, 1885).

PARTRIDGE, JOHN BERNARD (1861–), British artist, was born in London, son of Professor Richard Partridge, F.R.S., president of the Royal College of Surgeons, and nephew of John Partridge (1790–1872), portrait-painter extraordinary to Queen Victoria. He was educated at Stonyhurst College, and after matriculating at London University entered the office of Dunn & Hansom, architects. He then joined for a couple of years a firm of stained-glass designers (Lavers, Barraud & Westlake), learning drapery and ornament; and then studied and executed church ornament under Philip Westlake, 1880–1884. He began illustration for the press and practised water-colour painting, but his chief success was derived from book illustration. In 1892 he joined the staff of *Punch*. He was elected a member of the Royal Institute of Painters in Water-colours and of the Pastel Society. For some years he was well known as an actor under the name of "Bernard Gould."

PARTRIDGE, WILLIAM ORDWAY (1861–), American sculptor, was born at Paris, France, on the 11th of April 1861. He received his training as a sculptor in Florence (under Galli), in Rome (under Welonski), and in Paris. He became a lecturer and writer, chiefly on art subjects, and from 1894 to 1897 was professor of fine arts in Columbian University (now the George Washington University), Washington, D.C. Among his publications are: *Art for America* (1894), *The Song Life of a Sculptor* (1894), *The Technique of Sculpture* (1895), *The Angel of Clay* (1900), a novel, and *Nathan Hale, the Ideal Patriot* (1902). His sculptural works consist largely of portraiture.

PARTRIDGE (Du. *Patrijs*, Fr. *perdrix*, from Lat. *perdix*, apparently onomatopoeic from the call of the bird), a game-bird, whose English name properly denotes the only species indigenous to Britain, often nowadays called the grey partridge, the *Perdix cinerea* of ornithologists. The excellence of its flesh at table has been esteemed from the time of Martial. For the sport of partridge-shooting see SHOOTING.

The grey partridge has doubtless largely increased in numbers in Great Britain since the beginning of the 19th century, when so much down, heath, and moorland was first brought under the plough, for its partiality to an arable country is very evident. It has been observed that the birds which live on grass lands or heather only are apt to be smaller and darker in colour than the average; but in truth the species when adult is subject to a much greater variation in plumage than is commonly supposed, and the well-known chestnut horse-shoe mark, generally considered distinctive of the cock, is very often absent. In Asia the grey partridge seems to be unknown, but in the temperate parts of Eastern Siberia its place is taken by a very nearly allied form, *P. barbata*, and in Tibet there is a bird, *P. hodgsoniae*, which can hardly with justice be generically separated from it.

The common red-legged partridge of Europe, generally called the French partridge, *Caccabis rufa*, seems to be justifiably considered the type of a separate group. This bird was introduced into England in the last quarter of the 18th century, and has established itself in various parts of the country, notwithstanding a widely-spread, and in some respects unreasonable, prejudice against it. It has certainly the habit of trusting nearly as much to its legs as to its wings, and thus incurred the obloquy of old-fashioned sportsmen, whose dogs it vexatiously kept at a running point; but, when it was also accused of driving away the grey partridge, the charge only showed the ignorance of those who brought it, for as a matter of fact the French partridge rather prefers ground which the common species avoids—such as the heaviest clay-soils or the most infertile heaths. The French partridge has several congeners, all with red legs and plumage of similar character. In Africa north of the Atlas there is the Barbary partridge, *C. petrosa*; in southern Europe another, *C. saxatilis*, which extends eastward till it is replaced by *C. chukar*, which reaches India, where it is a well-known bird. Two very interesting desert-forms, supposed to be allied to *Caccabis*, are the *Ammoperdix heyi* of North Africa and Palestine and the *A. bonhami* of Persia; but the absence of the metatarsal knob, or incipient spur, suggests (in our ignorance of their other osteological characters) an alliance rather to the genus *Perdix*. On the other hand the groups of birds known as Francolins and Snow-Partridges are generally furnished with strong but blunt spurs, and therefore probably belong to the Caccabine group. Of the former, containing many species, there is only room here to mention the francolin, which used to be found in many parts of the south of Europe, *Francolinus vulgaris*, which also extends to India, where it is known as the black partridge. This seems to have been the *Attagas* or *Attagen* of classical authors,[1] a bird so celebrated for its exquisite flavour, the strange disappearance of which from all or nearly all its European haunts still remains inexplicable. It is possible that this bird has been gradually vanishing for several centuries, and if so to this cause may be attributed the great uncertainty attending the determination of the *Attagen*—it being a common practice among men in all countries to apply the name of a species that is growing rare to some other that is still abundant. Of the snow-partridges, *Tetraogallus*, it is only to be said here that they are the giants of their kin, and that nearly every considerable range of mountains in Asia seems to possess its specific form.

By English colonists the name Partridge has been very loosely applied, and especially so in North America. Where a qualifying word is prefixed no confusion is caused, but without it there is sometimes a difficulty at first to know whether the Ruffed Grouse (*Bonasa umbellus*) or the Virginia Quail (*Ortyx virginianus*) is intended. In South America the name is given to various Tinamous (*q.v.*). (A. N.)

PARTY WALL, a building term which, in England, apart from special statutory definitions, may be used in four different legal senses (*Watson* v. *Gray*, 1880, 14 Ch. D. 192). It may mean (1) a wall of which the adjoining owners are tenants in common; (2) a wall divided longitudinally into two strips, one belonging to each of the neighbouring owners; (3) a wall which belongs entirely to one of the adjoining owners, but is subject to an easement or right in the other to have it maintained as a dividing wall between the two tenements; (4) a wall divided longitudinally into two moieties, each moiety being subject to a cross easement, in favour of the owner of the other moiety. Outside London the rights and liabilities of adjoining owners of party walls are subject to the rules of common law. In London they are governed by the London Building Act 1894. A tenant in common of a party wall is entitled to have a partition vertically and longitudinally, so as to hold separately (*Mayfair Property Co.* v. *Johnston*, 1894, 1 Ch. 508); each owner can then use only his own part of the wall. By the London Building Act 1894, § 5 (16) the expression "party wall" means—(*a*) a wall forming part of a building and used or constructed to be used for separation of adjoining buildings belonging to different owners, or occupied or constructed or adapted to be occupied by different persons; or (*b*) a wall forming part of a building, and standing to a greater extent than the projection of the footings on lands of different owners. Section 87 regulates the rights of owners of adjoining lands to erect party walls on the line of junction. Sections 88–90 determine the rights of building owners to deal with party walls by underpinning, repairing or rebuilding. The act also contains provisions for settling disputes (§§ 91–92), and for bearing and recovering expenses (§§ 95–102). Part VI. of the act regulates the structure and thickness, height, &c., of party walls.

See A. R. Rudall, *Party Walls* (1907).

PARUTA, PAOLO (1540–1598), Venetian historian. After studying at Padua he served the Venetian republic in various political capacities, including that of secretary to one of the Venetian delegates at the Council of Trent. In 1579 he published a work entitled *Della Perfezione della vita politica*, and the same year he was appointed official historian to the republic, in succession to Luigi Contarini. He took up the narrative from where Cardinal Bembo had left it, in 1513, and brought it down to 1551. He was made *provveditore* to the Chamber of Loans in 1580, *savio del gran consiglio* in 1590, and governor of Brescia in the following year. In 1596 he was appointed *provveditore* of St Mark, and in 1597 superintendent of fortifications. He died a year later. His history, which was at first written in Latin and subsequently in Italian, was not published until after his death—in 1599. Among his other works may be mentioned a history of the War of Cyprus (1570–72), and a number of political orations.

See Apostolo Zeno's edition of Paruta's history (in the series *Degli Istorici delle cose veneziane*, Venice, 1718), and C. Monzani's edition of Paruta's political works (Florence, 1852).

PARVIS, PARVISE, or PARVYSE, an open space surrounded by an enceinte or stone parapet in front of buildings, particularly cathedrals or large churches; probably first used to keep the people from pressing on and confusing the marshalling of processions. The word "parvis" is French and is a corruption of Lat. *paradisus*, an enclosed garden or paradise (*q.v.*), which is sometimes also used instead of "parvis." The Lat. *paradisus* is defined by Du Cange (*Glossarium, s.v.*) as *atrium porticibus circumdatum ante aedes sacras*. At St Paul's in London the "parvis" was a place where lawyers met for consultation.

PARYSATIS, daughter of Artaxerxes I., married to her brother Ochus (Ctesias, *Pers.* 44), who in 424 B.C. became king of Persia under the name of Darius II. (*q.v.*). She had great influence over her husband, whom she helped by perfidy in the suppression of his brothers Secydianus, who was king before him, and Arsites, who rebelled against him (Ctes. *Pers.* 48–51). Her favourite son was Cyrus the Younger, whom she assisted as far as possible in his attempt to gain the throne. But when he was slain at Cunaxa (401) she nevertheless gained absolute dominion over the victorious Artaxerxes II. She was the evil genius of his reign. By a series of intrigues she was able to inflict the most atrocious punishment on all those who had taken part in the death of Cyrus. (ED. M.)

PASADENA, a city in the San Gabriel valley of Los Angeles county, in southern California, U.S.A., about 9 m. N.E. of Los Angeles and about 20 m. from the Pacific Ocean. Pop. (1880) 391; (1890) 4882; (1900) 9117, of whom 1278 were foreign-born; (1910 census) 30,291. Area about 11 sq. m. It is served by the Southern Pacific, the Santa Fé, and the San Pedro, Los Angeles & Salt Lake railway systems, and by interurban electric lines. The city lies at an altitude of 750–1000 ft., about 5 m. from the base of the Sierra Madre range. Some half-dozen mountain peaks in the immediate environs rise to heights of 3200 to more than 6000 ft., notably Mt Wilson (6666 ft.), whose base is about 5 m. north-east of Pasadena, Echo mountain (4016 ft.), and Mt Lowe (6100 ft). From Rubio canyon, near Pasadena, to the summit of Echo mountain, runs a steep cable railway, 1000 yds. long. On Echo mountain is the Lowe Observatory (3500 ft.), with a 16-in. equatorial telescope, and on Mt Wilson is the Solar Observatory (5886 ft.) of the Carnegie Institution of Washington, equipped with a 60-in. reflecting telescope and other instruments for stellar photography, a horizontal telescope for solar photography, a 60-ft. tower telescope (completed in 1907), and a second tower telescope of 150 ft. focal length (under construction in 1910). At this observatory important researches in solar and stellar spectroscopy have been carried on under the direction of George Ellery Hale (b. 1868), the inventor of the spectroheliograph. The physical laboratory, computers' offices and instrument construction shops of the Solar Observatory are in Pasadena. About 5 m. south-east of Pasadena, in the township of San Gabriel (pop. 2501 in 1900), is the Mission (monastery) de San Gabriel Arcangel, founded in 1771. Pasadena is one of the most beautiful places in southern California. Fruits and flowers and sub-tropical trees and small plants grow and bloom the year round in its gardens. On the first of January of every year a flower carnival, known as the "Tournament of Roses," is held. Among the principal public buildings are a handsome Romanesque public library, which in 1909 contained about 28,500 volumes, an opera house of considerable architectural merit, high school, and several fine churches. The surrounding country was given over to sheep ranges until 1874, when a fruit-growing colony, organized in 1873, was established, from which the city was developed. The sale of town lots began in 1882. Pasadena was first chartered as a city in 1886; by a clause in the present special free-holders' charter, adopted in 1901, saloons are prohibited in the city.

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[1] Many naturalists have held a different opinion, some making it a woodcock, a godwit, or even the hazel-hen or grouse; see the discussion by Lord Lilford in *Ibis* (1862), pp. 352–356.

PASARGADAE, a city of ancient Persia, situated in the modern plain of Murghab, some 30 m. N.E. of the later Persepolis. The name originally belonged to one of the tribes of the Persians, which included the clan of the Achaemenidae, from which sprang the royal family of Cyrus and Darius (Herod. i. 125; a Pasargadian Badres is mentioned, Herod. iv. 167). According to the account of Ctesias (preserved by Anaximenes of Lampsacus in *Steph. Byz. s.v.* Πασσαργάδαι; Strabo xv. 730, cf. 729; Nicol. Damasc. fr. 66, 68 sqq.; Polyaen. vii. 6, 1. 9. 45, 2), the last battle of Cyrus against Astyages, in which the Persians were incited to a desperate struggle by their women, was fought here. After the victory Cyrus built a town, with his palace and tomb, which was named Pasargadae after the tribe (cf. Curt. v. 6, 10; x. 1, 22). Every Persian king was, at his accession, invested here, in the sanctuary of a warlike goddess (Anaitis?), with the garb of Cyrus, and received a meal of figs and terebinths with a cup of sour milk (Plut. *Artax.* 3); and whenever he entered his native country he gave a gold piece to every woman of Pasargadae in remembrance of the heroic intervention of their ancestors in the battle (Nic. Damasc. *loc. cit.*; Plut. *Alex.* 69). According to a fragment of the same tradition, preserved by Strabo (xv. 729), Pasargadae lay "in the hollow Persis (*Coele Persis*) on the bank of the river Cyrus, after which the king changed his name, which was formerly Atradates" (in Nic. Damasc. this is the name of his father). The river Cyrus is the Kur of the Persians, now generally named Bandamir; the historians of Alexander call it Araxes, and give to its tributary, the modern Pulwar, which passes by the ruins of Murghab and Persepolis, the name Medos (Strabo xv. 729; Curt. v. 4, 7). The capital of Cyrus was soon supplanted by Persepolis, founded by Darius; but in Pasargadae remained a great treasury, which was surrendered to Alexander in 336 after his conquest of Persis (Arrian iii. 18, 10; Curt. v. 6, 10). After his return from India he visited Pasargadae on the march from Carmania to Persepolis, found the tomb of Cyrus plundered, punished the malefactors, and ordered Aristobulus to restore it (Arrian vi. 29; Strabo xv. 730). Aristobulus' description agrees exactly with the ruins of Murghab on the Bandamir, about 30 m. upwards from Persepolis; and all the other references in the historians of Cyrus and Alexander indicate the same place. Nevertheless, some modern authors[1] have doubted the identity of the ruins of Murghab with Pasargadae, as Ptolemy (vi. 4, 7), places Pasargada or Pasarracha south-eastwards of Persepolis, and mentions a tribe Pasargadae in Carmania on the sea (vi. 8, 12); and Pliny, *Nat. hist.* vi. 99, names a Persian river Sitioganus "on which one navigates in seven days to Pasargadae."[2] But it is evident that these accounts are erroneous. The conjecture of Oppert, that Pasargadae is identical with Pishiyauvāda, where (on a mountain Arakadri) the usurper Gaumāta (Smerdis) proclaimed himself king, and where his successor, the second false Smerdis Vahyazdāta, gathered an army (inscrip. of Behistun, i. 11; iii. 41), is hardly probable.

The principal ruins of the town of Pasargadae at Murghab are a great terrace like that of Persepolis, and the remainders of three buildings, on which the building inscription of Cyrus, "I Cyrus the king the Achaemenid" (*sc.* "have built this"), occurs five times in Persian, Susian and Babylonian. They were built of bricks, with a foundation of stones and stone door-cases, like the palaces at Persepolis; and on these fragments of a procession of tribute-bearers and the figure of a winged demon (wrongly considered as a portrait of Cyrus) are preserved. Outside the town are two tombs in the form of towers and the tomb of Cyrus himself, a stone house on a high substruction which rises in seven great steps, surrounded by a court with columns; at its side the remains of a guardhouse, in which the officiating Magians lived, are discernible. The ruins of the tomb absolutely correspond to the description of Aristobulus.

See Sir W. Gore-Ouseley, *Travels in Persia* (1811); Morier, Ker Porter, Rich and others; Texier, *Description de l'Armenie et la Perse*; Flandin and Coste, *Voyage en Perse*, vol. ii.; Stolze, *Persepolis*; Dieulafoy, *L'Art antique de la Perse*; and E. Herzfeld, "Pasargadae," in *Beiträge zur alten Geschichte*, vol. viii. (1908), who has in many points corrected and enlarged the earlier descriptions and has proved that the buildings as well as the sculptures are earlier than those of Persepolis, and are, therefore, built by Cyrus the Great. New photographs of the monuments are published by Fr. Sarre, *Iranische Felsreliefs* (unter Mitwirkung von E. Herzfeld, Berlin, 1908).

(Ed. M.)

PASCAL, BLAISE (1623–1662), French religious philosopher and mathematician, was born at Clermont Ferrand on the 19th of June 1623. His father was Étienne Pascal, president of the Court of Aids at Clermont; his mother's name was Antoinette Bégon. The Pascal family were Auvergnats by extraction as well as residence, had for many generations held posts in the civil service, and were ennobled by Louis XI. in 1478, but did not assume the *de*. The earliest anecdote of Pascal is one of his being bewitched and freed from the spell by the witch with strange ceremonies. His mother died when he was about four years old, and left him with two sisters—Gilberte, who afterwards married M. Perier, and Jacqueline. Both sisters are of importance in their brother's history, and both are said to have been beautiful and accomplished. When Pascal was about seven years old his father gave up his official post at Clermont, and betook himself to Paris. It does not appear that Blaise, who went to no school, but was taught by his father, was at all forced, but rather the contrary. Nevertheless he has a distinguished place in the story of precocious children, and in the much more limited chapter of children whose precocity has been followed by great performance at maturity, though he never became what is called a learned man, perhaps did not know Greek, and was pretty certainly indebted for most of his miscellaneous reading to Montaigne.

The Pascal family, some years after settling in Paris, had to go through a period of adversity. Étienne Pascal, who had bought some of the hôtel-de-ville *rentes*, protested against Richelieu's reduction of the interest, and to escape the Bastille had to go into hiding. He was, according to the story (told by Jacqueline herself), restored to favour owing to the good acting and graceful appearance of his daughter Jacqueline in a representation of Scudéry's *Amour tyrannique* before Richelieu. Mme d'Aiguillon's intervention in the matter was perhaps as powerful as Jacqueline's acting, and Richelieu gave Étienne Pascal (in 1641) the important and lucrative though somewhat troublesome intendancy of Rouen. The family accordingly removed to the Norman capital, though Gilberte Pascal shortly after, on her marriage, returned to Clermont. At Rouen they became acquainted with Corneille, and Blaise pursued his studies with such vehemence that he already showed signs of an injured constitution. Nothing, however, of importance happened till the year 1646. Then Pascal the elder was confined to the house by the consequences of an accident on the ice, and was visited by certain gentlemen of the neighbourhood who had come under the influence of Saint-Cyran and the Jansenists. It does not appear that up to this time the Pascal family had been contemners of religion, but they now eagerly embraced the creed, or at least the attitude of Jansenism, and Pascal himself showed his zeal by informing against the supposed unorthodoxy of a Capuchin, the Père Saint-Ange.

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[1] *E.g.* Weissbach in *Zeitschr. d. d. morgenl. Ges.*, *48*, pp. 653 sqq.; for the identification cf. Stolze, *Persepolis*, ii. 269 sqq.; Curzon, *Persia*, ii. 71 sqq.

[2] In vi. 116, he places "the Castle of Frasargida, where is the tomb of Cyrus, and which is occupied by the Magi"—*i.e.* the guard of Magians mentioned by Aristobulus, which had to protect the tomb—eastwards of Persepolis, and by a curious confusion joins it to Ecbatana.

His bodily health was at this time very far from satisfactory, and he appears to have suffered, not merely from acute dyspepsia, but from a kind of paralysis. He was, however, indefatigable in his mathematical work. In 1647 he published his *Nouvelles expériences sur le vide*, and in the next year the famous experiment with the barometer on the Puy de Dome was carried out for him by his brother-in-law Perier, and repeated on a smaller scale by himself at Paris, to which place by the end of 1647 he and his sister Jacqueline had removed, to be followed shortly by their father. In a letter of Jacqueline's, dated the 27th of September, an account of a visit paid by Descartes to Pascal is given, which, like the other information on the relations of the two, give strong suspicion of mutual jealousy. Descartes, however, gave Pascal the very sensible advice to stay in bed as long as he could (it may be remembered that the philosopher himself never got up till eleven) and to take plenty of beef-tea. As early as May 1648 Jacqueline Pascal was strongly drawn to Port Royal, and her brother frequently accompanied her to its church. She desired indeed to join the convent, but her father, who returned to Paris with the dignity of counsellor of state, disapproved of the plan, and took both brother and sister to Clermont, where Pascal remained for the greater part of two years. E. Fléchier, in his account of the *Grands Jours* at Clermont many years after, speaks of a "belle savante" in whose company Pascal had frequently been—a trivial mention on which, as on many other trivial points of scantily known lives, the most childish structures of comment and conjecture have been based. It is sufficient to say that at this time, despite the Rouen "conversion," there is no evidence to show that Pascal was in any way a recluse, an ascetic, or in short anything but a young man of great intellectual promise and performance, not indifferent to society, but of weak health. He, his sister and their father returned to Paris in the late autumn of 1650, and in September of the next year Étienne Pascal died. Almost immediately afterwards Jacqueline fulfilled her purpose of joining Port Royal—a proceeding which led to some soreness, finally healed, between herself and her brother and sister as to the disposal of her property. It has sometimes been supposed that Pascal, from 1651 or earlier to the famous accident of 1654, lived a dissipated, extravagant, worldly, luxurious (though admittedly not vicious) life with his friend the duc de Roannez and others. His *Discours sur les passions de l'amour*, a striking and characteristic piece, not very long since discovered and printed, has also been assigned to this period, and has been supposed to indicate a hopeless passion for Charlotte de Roannez, the duke's sister. But this is sheer romancing. The extant letters of Pascal to the lady show no trace of any affection (stronger than friendship) between them. It is, however, certain that in the autumn of 1654 Pascal's second "conversion" took place, and that it was lasting. He betook himself at first to Port Royal, and began to live a recluse and austere life there. Mme Perier simply says that Jacqueline persuaded him to abandon the world. Jacqueline represents the retirement as the final result of a long course of dissatisfaction with mundane life. But there are certain anecdotic embellishments of the act which are too famous to be passed over, though they are in part apocryphal. It seems that Pascal in driving to Neuilly was run away with by the horses, and would have been plunged in the river but that the traces fortunately broke. To this, which seems authentic, is usually added the tradition (due to the abbé Boileau) that afterwards he used at times to see an imaginary precipice by his bedside, or at the foot of the chair on which he was sitting. Further, from the 23rd of November 1654 dates the singular document usually known as "Pascal's amulet," a parchment slip which he wore constantly about him, and which bears the date followed by some lines of incoherent and strongly mystical devotion.

It must be noted that, though he lived much at Port Royal, and partly at least observed its rule, he never actually became one of its famous solitaries. But for what it did for him (and for a time his health as well as his peace of mind seems to have been improved) he very soon paid an ample and remarkable return. At the end of 1655 Arnauld, the chief light of Port Royal, was condemned by the Sorbonne for heretical doctrine, and it was thought important by the Jansenist and Port Royal party that steps should be taken to disabuse the popular mind. Arnauld would have undertaken the task himself, but his wiser friends knew that his style was anything but popular, and overruled him. It is said that he personally suggested to Pascal to try his hand, and that the first of the famous *Provinciales* (*Provincial Letters*, properly *Lettres écrites par Louis de Montalte à un provincial de ses amis*) was written in a few days, or, less probably, in a day. It was printed without the real author's name on the 23rd of January 1656, and, being immensely popular, and successful, was followed by others to the number of eighteen.

Shortly after the appearance of the *Provinciales*, on the 24th of May 1656, occurred the miracle of the Holy Thorn, a fragment of the crown of Christ preserved at Port Royal, which cured the little Marguerite Perier of a fistula lacrymalis. The Jesuits were much mortified by this Jansenist miracle, which, as it was officially recognized, they could not openly deny. Pascal and his friends rejoiced in proportion. The details of his later years after this incident are somewhat scanty. For years before his death we hear only of acts of charity and of, as it seems to modern ideas, extravagant asceticism. Thus Mme Perier tells us that he disliked to see her caress her children, and would not allow the beauty of any woman to be talked of in his presence. What may be called his last illness began as early as 1658, and as the disease progressed it was attended with more and more pain, chiefly in the head. In June 1662, having given up his own house to a poor family who were suffering from small-pox, he went to his sister's house to be nursed, and never afterwards left it. His state was, it seems, mistaken by his physicians, so much so that the offices of the Church were long put off. He was able, however, to receive the Eucharist, and soon afterwards died in convulsions on the 19th of August. A post mortem examination was held, which showed not only grave derangement in the stomach and other organs, but a serious lesion of the brain.

Eight years after Pascal's death appeared what purported to be his *Pensées*, and a preface by his nephew Perier gave the world to understand that these were fragments of a great projected apology for Christianity which the author had, in conversation with his friends, planned out years before. The editing of the book was peculiar. It was submitted to a committee of influential Jansenists, with the duc de Roannez at their head, and, in addition, it bore the imprimatur of numerous unofficial approvers who testified to its orthodoxy. It does not appear that there was much suspicion of the garbling which had been practised—garbling not unusual at the time, and excused in this case by the fact of a lull in the troubles of Port Royal and a great desire on the part of its friends to do nothing to disturb that lull. But as a matter of fact no more entirely factitious book ever issued from the press. The fragments which it professed to give were in themselves confused and incoherent enough, nor is it easy to believe that they all formed part of any such single and coherent design as that referred to above. But the editors omitted, altered, added, separated, combined and so forth entirely at their pleasure, actually making some changes which seem to have been thought improvements of style. This rifacimento remained the standard text with a few unimportant additions for nearly two centuries, except that, by a truly comic revolution of public taste, Condorcet in 1776 published, after study of the original, which remained accessible in manuscript, another garbling, conducted this time in the interests of *un*orthodoxy. It was not till 1842 that Victor Cousin drew attention to the absolutely untrustworthy condition of the text, nor till 1844 that A. P. Faugère edited that text from the MS. in something like a condition of purity, though, as subsequent editions have shown, not with absolute fidelity. But even in its spurious condition the book had been recognized as remarkable and almost unique. Its contents, as was to be expected, are of a very chaotic character—of a character so chaotic indeed that the reader is almost at the mercy of the arrangement, perforce an arbitrary arrangement, of the editors. But the subjects dealt with concern more or less all the great problems of thought on what may be called the theological side of metaphysics—the sufficiency of reason, the trustworthiness of experience, the admissibility of revelation, free will, foreknowledge, and the rest. The peculiarly disjointed and fragmentary condition of the sentiments expressed by Pascal aggravates the appearance of universal doubt which is present in the *Pensées*, just as the completely unfinished condition of the work, from the literary point of view, constantly causes slighter or graver doubts as to the actual meaning which the author wished to express. Accordingly the *Pensées* have always been a favourite exploring ground, not to say a favourite field of battle, to persons who take an interest in their problems. Speaking generally, their tendency is towards the combating of scepticism by a deeper scepticism, or, as Pascal himself calls it, Pyrrhonism, which occasionally goes the length of denying the possibility of any natural theology. Pascal explains all the contradictions and difficulties of human life and thought by the doctrine of the Fall, and relies on faith and revelation alone to justify each other.

Excluding here his scientific attainments (see below), Pascal presents himself for comment in two different lights, the second of which is, if the expression be permitted, a composite one. The first exhibits him as a man of letters, the second as a philosopher, a theologian, and simply a man, for in no one is the colour of the theology and the philosophy more distinctly personal. Yet his character as a man is not very distinct. The accounts of his sister and niece have the defect of all hagiology; they are obviously written rather with a view to the ideas and the wishes of the writers than with a view to the actual and absolute personality of the subject. Except from these interesting but somewhat tainted sources, we know little or nothing about him. Hence conjecture, or at least inference, must always enter largely into any estimate of Pascal, except a purely literary one.

On that side, fortunately, there is no possibility of doubt or difficulty to any competent inquirer. The *Provincial Letters* are the first example of French prose which is at once considerable in bulk, varied and important in matter, perfectly finished in form. They owe not a little to Descartes, for Pascal's indebtedness to his predecessor is unquestionable from the literary side, whatever may be the case with the scientific. But Descartes had had neither the opportunity, nor the desire, nor probably the power, to write anything of the literary importance of the *Provinciales*. The first example of polite controversial irony since Lucian, the *Provinciales* have continued to be the best example of it during more than two centuries in which the style has been sedulously practised, and in which they have furnished a model to generation after generation. The unfailing freshness and charm of the contrast between the importance, the gravity, in some cases the dry and abstruse nature, of their subjects, and the lightness, sometimes almost approaching levity in its special sense, of the manner in which these subjects are attacked is a triumph of literary art of which no familiarity dims the splendour, and which no lapse of time can ever impair. Nor perhaps is this literary art really less evident in the *Pensées*, though it is less clearly displayed, owing to the fragmentary or rather chaotic condition of the work, and partly also to the nature of the subject. The vividness and distinction of Pascal's phrase, his singular faculty of inserting without any loss of dignity in the gravest and most impassioned meditation what may be almost called quips of thought and diction, the intense earnestness of meaning weighting but not confusing the style, all appear here.

No such positive statements as these are, however, possible as to the substance of the *Pensées* and the attitude of their author. Hitherto the widest differences have been manifested in the estimate of Pascal's opinions on the main questions of philosophy, theology and human conduct. He has been represented as a determined apologist of intellectual orthodoxy animated by an almost fanatical "hatred of reason," and possessed with a purpose to overthrow the appeal to reason; as a sceptic and pessimist of a far deeper dye than Montaigne, anxious chiefly to show how any positive decision on matters beyond the range of experience is impossible; as a nervous believer clinging to conclusions which his clearer and better sense showed to be indefensible; as an almost ferocious ascetic and paradoxer affecting the *credo quia impossibile* in intellectual matters and the *odi quia amabile* in matters moral and sensuous; as a wanderer in the regions of doubt and belief, alternately bringing a vast though vague power of thought and an unequalled power of expression to the expression of ideas incompatible and irreconcilable. An unbiased study of the scanty facts of his history, and of the tolerably abundant but scattered and chaotic facts of his literary production, ought to enable any one to steer clear of these exaggerations, while admitting at the same time that it is impossible to give a complete and final account of his attitude towards the riddles of this world and others. He certainly was no mere advocate of orthodoxy; he as certainly was no mere victim of terror at scepticism; least of all was he a freethinker in disguise. He appears, as far as can be judged from the fragments of his *Pensées*, to have seized firmly and fully the central idea of the difference between reason and religion. Where the difficulty rises respecting him is that most thinkers since his day, who have seen this difference with equal clearness, have advanced from it to the negative side, while he advanced to the positive. In other words, most men since his day who have not been contented with a mere concordat, have let religion go and contented themselves with reason. Pascal, equally discontented with the concordat, held fast to religion and continued to fight out the questions of difference with reason. Surveying these positions, we shall not be astonished to find much that is surprising and some things that are contradictory in Pascal's utterances on "les grands sujets." The influence exercised on him by Montaigne is the one fact regarding him which has not been and can hardly be exaggerated, and his well-known *Entretion* with Sacy on the subject (the restoration of which to its proper form is one of the most valuable results of modern criticism) leaves no doubt possible as to the source of his "Pyrrhonian" method. But it is impossible for anyone who takes Pascal's *Pensées* simply as he finds them in connexion with the facts of Pascal's history to question his theological orthodoxy, understanding by theological orthodoxy the acceptance of revelation and dogma; it is equally impossible for any one in the same condition to declare him absolutely content with dogma and revelation. It is of the essence of an active mind like Pascal's to explore and state all the arguments which make for or make against the conclusion it is investigating.

To sum up, the *Pensées* are excursions into the great unknown made with a full acknowledgment of the greatness of that unknown. From the point of view that belief and knowledge, based on experience or reasoning, are separate domains with an unexplored sea between and round them, Pascal is perfectly comprehensible, and he need not be taken as a deserter from one region to the other. To those who hold that all intellectual exercise outside the sphere of religion is impious or that all intellectual exercise inside that sphere is futile, he must remain an enigma.

There are few writers who are more in need than Pascal of being fully and competently edited. The chief nominally complete edition at present in existence is that of Bossut (1779, 5 vols., and since reprinted), which not only appeared before any attempt had been made to restore the true text of the *Pensées*, but is in other respects quite inadequate. The edition of Lahure, 1858, is not much better, though the *Pensées* appear in their more genuine form. An edition promised for the excellent collection of *Les Grands écrivains de la France* by A. P. Faugère has been executed as far as the *Pensées* go by Léon Brunschvig (3 vols., 1904), who has also issued a one-volume edition. The *Œuvres complètes* appeared in three volumes (Paris, 1889). Meanwhile, with the exception of the *Provinciales* (of which there are numerous editions, no one much to be preferred to any other, for the text is undisputed and the book itself contains almost all the exegesis of its own contents necessary), Pascal can be read only at a disadvantage. There are five chief editions of the true *Pensées* earlier than Brunschvig's: that of Faugère (1844), the *editio princeps*; that of Havet (1852, 1867 and 1881), on the whole the best; that of Victor Rochet (1873), good, but arranged and edited with the deliberate intention of making Pascal first of all an orthodox apologist; that of Molinier (1877–1879), a carefully edited and interesting text, the important corrections of which have been introduced into Havet's last edition and that of G. Michelant (Freiburg, 1896). Unfortunately, none of these can be said to be exclusively satisfactory. The minor works must chiefly be sought in Bossut or reprints of him. Works on Pascal are innumerable: Sainte-Beuve's *Port Royal*, Cousin's writings on Pascal and his *Jacqueline Pascal*, and the essays of the editors of the *Pensées* just mentioned are the most noteworthy. Principal Tulloch contributed a useful little monograph to the series of *Foreign Classics for English Readers* (Edinburgh and London, 1878). Recent handlings are, in French, E. Boutroux's *Pascal* (Paris, 1903) and, in English, an article in the *Quarterly Review* (No. 407) for April 1906. (G. Sa.)

Pascal as Natural Philosopher and Mathematician.—Great as is Pascal's reputation as a philosopher and man of letters, it may be fairly questioned whether his claim to be remembered by posterity as a mathematician and physicist is not even greater. In his two former capacities all will admire the form of his work, while some will question the value of his results; but in his two latter capacities no one will dispute either. He was a great mathematician in an age which produced Descartes, Fermat, Huygens, Wallis and Roberval. There are wonderful stories on record of his precocity in mathematical learning, which is sufficiently established by the well-attested fact that he had completed before he was sixteen years of age a work on the conic sections, in which he had laid down a series of propositions, discovered by himself, of such importance that they may be said to form the foundations of the modern treatment of that subject. Owing partly to the youth of the author, partly to the difficulty in publishing scientific works in those days, and partly no doubt to the continual struggle on his part to devote his mind to what appeared to his conscience more important labour, this work (like many others by the same master hand) was never published. We know something of what it contained from a report by Leibnitz, who had seen it in Paris, and from a *résumé* of its results published in 1640 by Pascal himself, under the title *Essai pour les coniques*. The method which he followed was that introduced by his contemporary Girard Desargues, viz. the transformation of geometrical figures by conical or optical projection. In this way he established the famous theorem that the intersections of the three pairs of opposite sides of a hexagon inscribed in a conic are collinear. This proposition, which he called the mystic hexagram, he made the keystone of his theory; from it alone he deduced more than 400 corollaries, embracing, according to his own account, the conics of Apollonius, and other results innumerable.

Pascal also distinguished himself by his skill in the infinitesimal calculus, then in the embryonic form of Cavalieri's method of indivisibles. The cycloid was a famous curve in those days; it had been discussed by Galileo, Descartes, Fermat, Roberval and Torricelli, who had in turn exhausted their skill upon it. Pascal solved the hitherto refractory problem of the general quadrature of the cycloid, and proposed and solved a variety of others relating to the centre of gravity of the curve and its segments, and to the volume and centre of gravity of solids of revolution generated in various ways by means of it. He published a number of these theorems without demonstration as a challenge to contemporary mathematicians. Solutions were furnished by Wallis, Huygens, Wren and others; and Pascal published his own in the form of letters from Amos Dettonville (his assumed name as challenger) to Pierre de Carcavy. There has been some discussion as to the fairness of the treatment accorded by Pascal to his rivals, but no question of the fact that his initiative led to a great extension of our knowledge of the properties of the cycloid, and indirectly hastened the progress of the differential calculus.

In yet another branch of pure mathematics Pascal ranks as a founder. The mathematical theory of probability and the allied theory of the combinatorial analysis were in effect created by the correspondence between Pascal and Fermat, concerning certain questions as to the division of stakes in games of chance, which had been propounded to the former by the gaming philosopher De Méré. A complete account of this interesting correspondence would surpass our present limits; but the reader may be referred to Todhunter's *History of the Theory of Probability* (Cambridge and London, 1865), pp. 7–21. It appears that Pascal contemplated publishing a treatise *De aleae geometria*; but all that actually appeared was a fragment on the arithmetical triangle (*Traité du triangle arithmétique*, "Properties of the Figurate Numbers"), printed in 1654, but not published till 1665, after his death.

Pascal's work as a natural philosopher was not less remarkable than his discoveries in pure mathematics. His experiments and his treatise (written before 1651, published 1663) on the equilibrium of fluids entitle him to rank with Galileo and Stevinus as one of the founders of the science of hydrodynamics. The idea of the pressure of the air and the invention of the instrument for measuring it were both new when he made his famous experiment, showing that the height of the mercury column in a barometer decreases when it is carried upwards through the atmosphere. This experiment was made by himself in a tower at Paris, and was carried out on a grand scale under his instructions by his brother-in-law Florin Périer on the Puy de Dôme in Auvergne. Its success greatly helped to break down the old prejudices, and to bring home to the minds of ordinary men the truth of the new ideas propounded by Galileo and Torricelli.

Whether we look at his pure mathematical or at his physical researches we receive the same impression of Pascal; we see the strongest marks of a great original genius creating new ideas, and seizing upon, mastering, and pursuing farther everything that was fresh and unfamiliar in his time. We can still point to much in exact science that is absolutely his; and we can indicate infinitely more which is due to his inspiration. (G. Ch.)

PASCAL, JACQUELINE (1625–1661), sister of Blaise Pascal, was born at Clermont-Ferrand, France, on the 4th of October 1625. She was a genuine infant prodigy, composing verses when only eight years, and a five-act comedy at eleven. In 1646 the influence of her brother converted her to Jansenism. In 1652, she took the veil, despite the strong opposition of her brother, and subsequently was largely instrumental in the latter's own final conversion. She vehemently opposed the attempt to compel the assent of the nuns to the Papal bulls condemning Jansenism, but was at last compelled to yield her own. This blow, however, hastened her death, which occurred at Paris on the 4th of October 1661.

PASCHAL (Paschalis), the name of two popes, and one anti-pope.

Paschal I., pope from 817 to 824, a native of Rome, was raised to the pontificate by the acclamation of the clergy, shortly after the death of Stephen IV., and before the sanction of the emperor (Louis the Pious) had been obtained—a circumstance for which it was one of his first cares to apologize. His relations with the imperial house, however, never became cordial; and he was also unsuccessful in winning the sympathy of the Roman nobles. He died in Rome while the imperial commissioners were investigating the circumstances under which two important Roman personages had been seized at the Lateran, blinded and afterwards beheaded; Paschal had shielded the murderers but denied all personal complicity in their crime. The Roman people refused him the honour of burial within the church of St Peter, but he now holds a place in the Roman calendar (May 16). The church of St Cecilia in Trastevere was restored and St Maria in Dominica rebuilt by him; he also built the church of St Prassede. The successor of Paschal I. was Eugenius II. (L. D.*)

Paschal II. (Ranieri), pope from the 13th of August 1099 to the 21st of January 1118, was a native of Bieda, near Viterbo, and a monk of the Cluniac order. He was created cardinal-priest of S. Clemente by Gregory VII. about 1076, and was consecrated pope in succession to Urban II. on the 14th of August 1099. In the long struggle with the emperors over investiture, he zealously carried on the Hildebrandine policy, but with only partial success. In 1104 Paschal succeeded in instigating the emperor's second son to rebel against his father, but soon found Henry V. even more persistent in maintaining the right of investiture than Henry IV. had been. The imperial Diet at Mainz invited (Jan. 1106) Paschal to visit Germany and settle the trouble, but the pope in the Council of Guastalla (Oct. 1106) simply renewed the prohibition of investiture. In the same year he brought to an end the investiture struggle in England, in which Anselm, archbishop of Canterbury, had been engaged with King Henry I., by retaining himself exclusive right to invest with the ring and crozier, but recognizing the royal nomination to vacate benefices and oath of fealty for temporal domains. He went to France at the close of 1106 to seek the mediation of King Philip and Prince Louis in the imperial struggle, but, his negotiations remaining without result, he returned to Italy in September 1107. When Henry V. advanced with an army into Italy in order to be crowned, the pope agreed to a compact (Feb. 1111), by the terms of which the Church should surrender all the possessions and royalties it had received of the empire and kingdom of Italy since the days of Charlemagne, while Henry on his side should renounce lay investiture. Preparations were made for the coronation on the 12th of February 1111, but the Romans rose in revolt against the compact, and Henry retired taking with him pope and curia. After sixty-one days of harsh imprisonment, Paschal yielded and guaranteed investiture to the emperor. Henry was then crowned in St Peter's on the 13th of April, and after exacting a promise that no revenge would be taken for what had passed withdrew beyond the Alps. The Hildebrandine party was aroused to action, however; a Lateran council of March 1112 declared null and void the concessions extorted by violence; a council held at Vienna in October actually excommunicated the emperor, and Paschal sanctioned the proceeding. Towards the end of the pontificate trouble began anew in England, Paschal complaining (1115) that councils were held and bishops translated without his authorization, and threatening Henry I. with excommunication. On the death of the countess Matilda, who had bequeathed all her territories to the Church (1115), the emperor at once laid claim to them as imperial fiefs and forced the pope to flee from Rome. Paschal returned after the emperor's withdrawal at the beginning of 1118, but died within a few days on the 21st of January 1118. His successor was Gelasius II.

The principal sources for the life of Paschal II. are his Letters in the *Monumenta Germaniae historica. Epistolae*, vols. 3, 6, 7, 13, 17, 20–23, 25, and the *Vita* by Petrus Pisanus in the *Liber pontificalis*, ed. Duchesne (Paris, 1892). Important bulls are in J. A. G. von Pflugk-Harttung, *Die Bullen der Päpste bis zum Ende des zwölften Jahrhunderts* (Gotha, 1901), and a valuable digest in Jaffé-Wattenbach, *Regesta pontif. roman.* (1885–1888).

See J. Langen, *Geschichte der römischen Kirche von Gregor VII. bis Innocenz III.* (Bonn, 1893); K. J. von Hefele, *Conciliengeschichte*, vol. v. (2nd ed., 1873–1890); E. Franz, *Papst Paschalis II.* (Breslau, 1877); W. Schum, *Die Politik Papst Paschals II. gegen Kaiser Heinrich V. im Jahre 1112* (Erfurt, 1877); I. Röskens, *Heinrich V. und Paschalis II.* (Essen, 1885); C. Gernandt, *Die erste Romfahrt Heinrich V.* (Heidelberg, 1890); G. Peiser, *Der deutsche Investiturstreit unter Kaiser Heinrich V. bis zu dem päpstlichen Privileg vom 3 April 1111* (Berlin, 1883); and B. Monod, *Essai sur les rapports de Pascal II. avec Philippe I.* (Paris, 1907). There is an exhaustive bibliography with an excellent article by Carl Mirbt in Herzog-Hauck, *Realencyklopädie* (3rd ed., 1904). (C. H. Ha.)

Paschal III., anti-pope from 1164 to 1168, was elected the successor of Victor IV. on the 22nd of April 1164. He was an aged aristocrat, Guido of Crema. Recognized at once by the emperor Frederick I. he soon lost the support of Burgundy, but the emperor crushed opposition in Germany, and gained the co-operation of Henry II. of England. Supported by the victorious imperial army, Paschal was enthroned at St Peter's on the 22nd of July 1167, and Pope Alexander III., became a fugitive. Sudden imperial reverses, however, made Paschal glad in the end to hold so much as the quarter on the right bank of the Tiber, where he died on the 20th of September 1168. He was succeeded by the anti-pope Callixtus III.

See A. Hauck, *Kirchengeschichte Deutschlands*, Bd. IV. (Leipzig, 1903, 259-276); H. Böhmer in Herzog-Hauck, *Realencyklopadie*, Bd. XIV., 724 seq.; and Lobkowtiz, *Statistik der Päpste* (Freiburg, i. B. 1905). (W. W. R.*)

PASCHAL CHRONICLE (Chronicum Paschale, also Chronicum Alexandrinum or Constantinopolitanum, or Fasti Siculi), so called from being based upon the Easter canon, an outline of chronology from Adam down to A.D. 629, accompanied by numerous historical and theological notes. The work, which is imperfect at the beginning and end (breaking off in the year 627), is preceded by an introduction on the Christian methods of reckoning time and the Easter cycle. It was written during the reign of Heraclius (610–641), and is generally attributed to an unknown Byzantine cleric and friend of the patriarch Sergius, who is specially alluded to as responsible for the introduction of certain ritual innovations. The so-called Byzantine or Roman era (which continued in use in the Greek Church until its liberation from Turkish rule) was adopted in the *Chronicum* for the first time as the foundation of chronology, in accordance with which the date of the creation is given as the 21st of March, 5507. The author is merely a compiler from earlier works, except in the history of the last thirty years, which has the value of a contemporary record.

The chief authorities used were: Julius Sextus Africanus (3rd century); the consular *Fasti*; the *Chronicle* and *Church History* of Eusebius; John Malalas; the *Acta martyrum*; the treatise of Epiphanius, bishop of Constantia (the old Salamis) in Cyprus (*fl.* 4th century), on *Weights and Measures.* Editions: L. Dindorf (1832) in *Corpus scriptorum hist. byzantinae*, with Du Cange's preface and commentary; J. P. Migne, *Patrologia graeca*, xcii.; see also C. Wachsmuth, *Einleitung in das Studium der alten Geschichte* (1895); H. Gelzer, *Sextus Julius Africanus und die byzantinische Chronographie*, ii. 1 (1885); J. van der Hagen, *Observationes in Heraclii imperatoris methodum paschalem* (1736, but still considered indispensable); E. Schwarz in Pauly-Wissowa, *Realencyclopädie*, iii., pt. 2 (1899); C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897).

PAS-DE-CALAIS, a maritime department of northern France, formed in 1790 of nearly the whole of Artois and the northern maritime portion of Picardy including Boulonnais, Calaisis, Ardrésis, and the districts of Langle and Bredenarde, and bounded N. by the Straits of Dover ("Pas de Calais"), E. by the department of Nord, S. by that of Somme, and W. by the English Channel. Pop. (1906), 1,012,466; Area 2606 sq. m. Except in the neighbourhood of Boulogne-sur-Mer with its *côtes de fer* or "iron coasts," the seaboard of the department, which measures 65 m., consists of dunes. From the mouth of the Aa (the limit towards Nord) it trends west-south-west to Gris Nez, the point of France nearest to England; in this section lie the port of Calais, Cape Blanc Nez, rising 440 ft. above the sandy shores, and the port of Wissant (Wishant). The seaside resorts include Boulogne, Berck-sur-Mer, Paris-Plage, Wimereux, &c. Beyond Griz Nez the direction is due south; in this section are the small port of Ambleteuse, Boulogne at the mouth of the Liane, and the two bays formed by the estuaries of the Canche and the Authie (the limit towards Somme). The highest point in the department (700 ft.) is in the west, between Boulogne and St Omer. From the uplands in which it is situated the Lys and Scarpe flow east to the Scheldt, the Aa north to the German Ocean, and the Slack, Wimereux and Liane to the Channel. Farther south are the valleys of the Canche and the Authie, running E.S.E. and W.N.W., and thus parallel with the Somme. Vast plains, open and monotonous, but extremely fertile and well cultivated, occupy most of the department. To the north of the hills running between St Omer and Boulogne, to the south of Gravelines and the south-east of Calais, lies the district of the Wattergands, fens now drained by means of canals and dikes, and turned into highly productive land. The climate is free from extremes of heat and cold, but damp and changeable. At Arras the mean annual temperature is 47°; on the coast it is higher. The rainfall varies from 24 to 32 in., though at Cape Gris Nez the latter figure is much exceeded. Cereals are largely grown and give good yields to the acre; the other principal crops are potatoes, sugar-beet, forage, oil-plants and tobacco. Market gardening flourishes in the Wattergands. The rearing of livestock and poultry is actively carried on, and the horses of the Boulonnais are specially esteemed.

The department is the chief in France for the production of coal, its principal coal-basin, which is a continuation of that of Valenciennes, centring round Béthune. The manufacture of beetroot-sugar, oil and alcohol distilling, iron-working, dyeing, brewing, paper-making, and various branches of the textile manufacture, are foremost among the industries of the department. Boulogne, Calais and Étaples fit out a considerable number of vessels for the cod, herring and mackerel fisheries. Calais and Boulogne are important ports of passenger-transit for England; and Boulogne also carries on a large export trade in the products of the department. The canal system comprises part of the Aa, the Lys, the Scarpe, the Deûle (a tributary of the Lys passing by Lille), the Lawe (a tributary of the Lys passing by Béthune), and the Sensée (an affluent of the Scheldt), as well as the canals of Aire to Bauvin, Neuffossé, Calais, Calais to Ardres, &c., and in this way a line of communication is formed from the Scheldt to the sea by Béthune, St Omer and Calais, with branches to Gravelines and Dunkirk. The department is served by the Northern railway.

Pas-de-Calais forms the diocese of Arras (archbishopric of Cambrai), belongs to the district of the I. army corps, the educational division (académie) of Lille and the circumscription of the appeal court of Douai. There are six arrondissements (Arras, Béthune, Boulogne, Montreuil-sur-Mer, St Omer and St Pol-sur-Ternoise). The more noteworthy places are Arras, the capital, Boulogne, Calais, St Omer, Béthune, Lens, Montreuil-sur-Mer, Bruay, Berck, Étaples and Aire-sur-la-Lys, which are noticed separately. Besides some of the towns mentioned, Liévin (22,070), Hénin-Liétard (13,384), in the neighbourhood of Lens, are large centres of population. Other places of some importance are: Lillers (pop. 5341), which carries on boot-making and has a fine Romanesque church of the 12th century; Hesdin, which owes its regular plan to Charles V., by whom it was built; and St Pol, which has the remains of medieval fortifications and castles and gave its name to the famous counts of St Pol.

PASDELOUP, JULES ÉTIENNE (1819–1887), French conductor, was born in Paris, and educated in music at the *conservatoire.* He founded in 1851 a "société des jeunes artistes du conservatoire," and, as conductor of its concerts, did much to popularize the best new compositions of the time. His "popular concerts" at the Cirque d'hiver, from 1861 till 1884, had also a great effect in promoting French taste in music.

PASEWALK, a town of Germany, in the Prussian province of Pomerania, on the Ucker, 26 m. N.W. from Stettin by the railway to Strassburg. Pop. (1905), 10,519. Pasewalk became a town during the 12th century and was soon a member of the Hanseatic League. In 1359 it passed to the duke of Pomerania. Frequently ravaged during the wars which devastated the district, it was plundered several times by the imperialists during the Thirty Years' War; in 1657 it was burnt by the Poles and in 1713 by the Russians. By the peace of Westphalia in 1648 it was given to Sweden, but in 1676 it was conquered by Brandenburg, and in 1720, by the peace of Stockholm, it was definitely assigned to Brandenburg-Prussia.

See Hückstädt, *Geschichte der Stadt Pasewalk* (Pasewalk, 1883).

PASHA, also written "pacha" and formerly "pashaw," &c., a Turkish title, superior to that of bey (*q.v.*), borne by persons of high rank and placed after the name. It is in the gift of the sultan of Turkey and, by delegation, of the khedive of Egypt. The title appears, originally, to have been bestowed exclusively upon military commanders, but it is now given to any high official, and also to unofficial persons whom it is desired to honour. It is conferred indifferently upom Moslems and Christians, and is frequently given to foreigners in the service of the Turks or Egyptians. Pashas are of three grades, formerly distinguished by the number of horse-tails (three, two and one respectively) which they were entitled to display as symbols of authority when on campaign. A pashalik is a province governed by or under the jurisdiction of a pasha.

The word is variously derived from the Persian *pādshah,* Turkish *pādishah,* equivalent to king or emperor, and from the Turkish *bash,* in some dialects *pash,* a head, chief, &c. In old Turkish there was no fixed distinction between *b* and *p.* As first used in western Europe the title was written with the initial *b.* The English forms bashaw, bassaw, bucha, &c., general in the 16th and 17th centuries, were derived through the med. Lat. and Ital. *bassa.*

PASIG, a town and the capital of the province of Rizal, Luzon, Philippine Islands, about 6 m. E.S.E. of Manila. Pop. (1903), 11,287. The town, which covers a considerable area, is traversed by the Pasig river and its tributary, the Mariquino river, and for a short distance borders on Laguna de Bay. In the south-western part is Fort McKinley. Although built on low ground, Pasig is fairly healthy. It was formerly an important commercial centre, the inhabitants being largely engaged in a carrying and forwarding trade between Manila and the lake ports; but this trade was lost after the establishment of direct rail and steamboat service between these ports. The principal industries are rice-farming, the manufacture of a cheap red pottery, and fishing. The language is Tagalog.

PASITELES, the most important member of the Neo-Attic school of sculpture in the time of Julius Caesar. At that period there was at Rome a demand for copies of, or variations on, noted works of Greek sculpture: the demand was met by the workshops of Pasiteles and his pupils Stephanus and Menelaus and others, several of whose statues are extant. In working from early Dorian models they introduced refinements of their own, with the result that they produced beautiful, but somewhat vapid and academic types. Pastiteles is said by Pliny (*Nat. Hist.* xxxvi. 39) to have been a native of Magna Graecia, and to have been granted the Roman citizenship.

PASKEVICH, IVAN FEDOROVICH (1782–1856), count of Erivan, prince of Warsaw, Russian field marshal, descended from an old and wealthy family, was born at Poltava on the 19th (8th) of May 1782. He was educated at the imperial institution for pages, where his progress was rapid, and in 1800 received his commission in the Guards and was named aide-de-camp to the tsar. His first active service was in 1805, in the auxiliary army sent to the assistance of Austria against France, when he took part in the battle of Austerlitz. From 1807 to 1812 he was engaged in the campaigns against Turkey, and distinguished himself by many brilliant and daring exploits, being made a general officer in his thirtieth year. During the French War of 1812–14 he was present, in command of the 26th division of infantry, at all the most important engagements; at the battle of Leipzig he won promotion to the rank of lieutenant-general. On the outbreak of war with Persia in 1826 he was appointed second in command, and, succeeding in the following year to the chief command, gained rapid and brilliant successes which compelled the shah to sue for peace in February

1828. In reward of his services he was named by the emperor count of Erivan, and received a million of roubles and a diamond-mounted sword. From Persia he was sent to Turkey in Asia, and, having captured in rapid succession the principal fortresses, he was at the end of the campaign made a field marshal at the age of forty-seven. In 1830 he subdued the mountaineers of Daghestan. In 1831 he was entrusted with the command of the army sent to suppress the revolt of Poland, and after the fall of Warsaw, which gave the death-blow to Polish independence, he was raised to the dignity of prince of Warsaw, and created viceroy of the kingdom of Poland. On the outbreak of the insurrection of Hungary in 1848 he was appointed to the command of the Russian troops sent to the aid of Austria, and finally compelled the surrender of the Hungarians at Világos. In April 1854 he again took the field in command of the army of the Danube, but on the 9th of June, at Silistria, where he suffered defeat, he received a contusion which compelled him to retire from active service. He died on the 13th (1st) of February 1856 at Warsaw, where in 1869 a memorial was erected to him. He held the rank of field marshal in the Prussian and Austrian armies as well as in his own service.

See Tolstoy, *Essai biographique et historique sur le feld-maréchal Prince de Varsovie* (Paris, 1835); *Notice biographique sur le Maréchal Paskévitch* (Leipzig, 1856); and Prince Stcherbatov's *Life* (St Petersburg, 1888–1894).

PASLEY, SIR CHARLES WILLIAM (1780–1861), British soldier and military engineer, was born at Eskdale Muir, Dumfriesshire, on the 8th of September 1780. In 1796 he entered the Royal Military Academy, Woolwich; a year later he gained his commission in the Royal Artillery, and in 1798 he was transferred to the Royal Engineers. He was present in the defence of Gaëta, the battle of Maida and the siege of Copenhagen. In 1807, being then a captain, he went to the Peninsula, where his knowledge of Spanish led to his employment on the staff of Sir David Baird and Sir John Moore. He took part in the retreat to Corunna and the Walcheren Expedition, and received a severe wound while gallantly leading a storming party at Flushing. During his tedious recovery he employed himself in learning German. He saw no further active service, the rest of his life being devoted to the foundation of a complete science of military engineering and to the thorough organization and training of the corps of Royal Engineers. He was so successful that, though only a captain, he was allowed to act for two years as commanding royal engineer at Plymouth and given a special grant. The events of the Peninsular War having emphasized the need of a fully trained engineer corps, Pasley's views were adopted by the war office, and he himself placed at the head of the new school of military engineering at Woolwich. This was in 1812, and Pasley was at the same time gazetted brevet major. He became brevet lieutenant-colonel in 1813 and substantive lieutenant-colonel in 1814. The first volume of his *Military Instruction* appeared in 1814, and contained a course of practical geometry which he had framed for his company at Plymouth. Two other volumes completing the work appeared by 1817, and dealt with the science and practice of fortification, the latter comprising rules for construction. He published a work on *Practical Architecture*, and prepared an important treatise on *The Practical Operations of a Siege* (1829–1832), which was translated into French (1847). He became brevet colonel in 1830 and substantive colonel in 1831. From 1831–1834 the subject that engaged his leisure was that of standardization of coins, weights and measures, and he published a book on this in 1834. In 1838 he was presented with the freedom of the city of London for his services in removing sunken vessels from the bed of the Thames near Gravesend; and from 1839 to 1844 he was occupied with clearing away the wrecks of H.M.S. "Royal George" from Spithead and H.M.S. "Edgar" from St Helens. All this work was subsidiary to his great work of creating a comprehensive art of military engineering. In 1841 on promotion to the rank of major-general he was made inspector-general of railways. In 1846 on vacating this appointment he was made a K.C.B., and thenceforward up to 1855 was chiefly concerned with the East India Company's military academy at Addiscombe. He was promoted lieutenant-general in 1851, made colonel commandant of the Royal Engineers in 1853, and general in 1860. He died in London on the 19th of April 1861. His eldest son, Major-General Charles Pasley (1824–1890), was a distinguished Royal Engineer officer.

Amongst Pasley's works, besides those mentioned, were separate editions of his *Practical Geometry Method* (1822) and of his *Course of Elementary Fortification* (1822), both of which formed part of his *Military Instruction; Rules for Escalading Fortifications not having Palisaded Covered Ways* (1822; new eds. 1845 and 1854); descriptions of a semaphore invented by himself in 1804 (1822 and 1823); *A Simple Practical Treatise on Field Fortification* (1823); and *Exercise of the Newdecked Pontoons invented by Lieutenant-Colonel Pasley* (1823).

PASQUIER, ÉTIENNE (1529–1615), French lawyer and man of letters, was born at Paris, on the 7th of June 1529 by his own account, according to others a year earlier. He was called to the Paris bar in 1549. In 1558 he became very ill through eating poisonous mushrooms, and did not recover fully for two years. This compelled him to occupy himself by literary work, and in 1560 he published the first book of his *Recherches de la France*. In 1565, when he was thirty-seven, his fame was established by a great speech still extant, in which he pleaded the cause of the university of Paris against the Jesuits, and won it. Meanwhile he pursued the *Recherches* steadily, and published from time to time much miscellaneous work. His literary and his legal occupations coincided in a curious fashion at the Grands Jours of Poitiers in 1579. These Grands Jours (an institution which fell into desuetude at the end of the 17th century, with bad effects on the social and political welfare of the French provinces) were a kind of irregular assize in which a commission of the parlement of Paris, selected and despatched at short notice by the king, had full power to hear and determine all causes, especially those in which seignorial rights had been abused. At the Grands Jours of Poitiers of the date mentioned, and at those of Troyes in 1583, Pasquier officiated; and each occasion has left a curious literary memorial of the jests with which he and his colleagues relieved their graver duties. The Poitiers work was the celebrated collection of poems on a flea (see Southey's *Doctor*). In 1585 Pasquier was appointed by Henry III. advocate-general at the Paris cours des comptes, an important body having political as well as financial and legal functions. Here he distinguished himself particularly by opposing, sometimes successfully, the mischievous system of selling hereditary places and offices, which more perhaps than any single thing was the curse of the older French monarchy. The civil wars compelled Pasquier to leave Paris and for some years he lived at Tours, working steadily at his great book, but he returned to Paris in Henry IV.'s train in March 1594. He continued until 1604 at his work in the chambre des comptes; then he retired. He survived this retirement more than ten years, producing much literary work, and died after a few hours' illness on the 1st of September 1615.

In so long and so laborious a life Pasquier's work was naturally considerable, and it has never been fully collected or indeed printed. The standard edition is that of Amsterdam (2 vols. fol., 1723). But for ordinary readers the selections of Léon Feugère, published at Paris (2 vols. 8vo, 1849), with an elaborate introduction, are most accessible. As a poet Pasquier is chiefly interesting as a minor member of the Pléiade movement. As a prose writer he is of much more account. The three chief divisions of his prose work are his *Recherches*, his letters and his professional speeches. The letters are of much biographical interest and historical importance, and the *Recherches* contain in a somewhat miscellaneous fashion invaluable information on a vast variety of subjects, literary, political, antiquarian and other.

PASQUIER, ÉTIENNE DENIS, DUKE (1767–1862), French statesman, was born on the 22nd of April 1767. Descended from a family which had long been distinguished at the bar and in connexion with the parlements of France, he was destined for the legal profession and was educated at the college of Juilly. He then became a counsellor of the parlement of Paris, and witnessed many of the incidents that marked the growing hostility between that body and Louis XVI. in the years preceding the outbreak of the French Revolution in 1789. His views were those of a moderate reformer, who desired to renovate but not to end the institutions of the old monarchy; and his memoirs set forth in a favourable light the actions of that parlement, the existence of which was soon to be terminated amid the political storms of the close of the year 1789. For some time, and especially during the Reign of Terror (1793–1794), Pasquier remained in obscurity; but this did not save him from arrest in the year 1794. He was thrown into prison shortly before the *coup d'état* of Thermidor (July 1794) which overthrew Robespierre. In the reaction in favour of ordinary government which ensued Pasquier regained his liberty and his estates. He did not re-enter the public service until the period of the Empire, when the arch-chancellor Cambacérès used his influence with Napoleon to procure for him the office of "maître des requetês" to the council of state. In 1809 he became baron of the French Empire, and in February 1810 counsellor of state. Napoleon in 1810 made him prefect of police. The chief event which ruffled the course of his life at that time was the strange conspiracy of the republican general Malet (Oct. 1812), who, giving out that Napoleon had perished in Russia, managed to surprise and capture some of the ministers and other authorities at Paris, among them Pasquier. The collapse of this bold attempt enabled him, however, speedily to regain his liberty.

When Napoleon abdicated in April 1814 Pasquier continued to exercise his functions for a few days in order to preserve order, and then resigned the prefecture of police, whereupon Louis XVIII. allotted to him the control of roads and bridges. He took no share in the imperial restoration at the time of the Hundred Days (1815), and after the second entry of Louis XVIII. into Paris he became minister of the interior, but finding it impossible to work with the hot-headed royalists of the Chamber of Deputies (*La Chambre introuvable*), he resigned office. Under the more moderate ministers of succeeding years he again held various appointments, but refused to join the reactionary cabinets of the close of the reign of Charles X. After the July Revolution (1830) he became president of the Chamber of Peers—a post which he held through the whole of the reign of Louis Philippe (1830–1848). In 1842 he was elected a member of the French Academy, and in the same year was created a duke. After the overthrow of Louis Philippe in February 1848, Pasquier retired from active life and set to work to compile the notes and reminiscences of his long and active career. He died in 1862.

See *Mémoires du Chancelier Pasquier* (6 vols., Paris, 1893–1895; partly translated into English, 4 vols., London, 1893–1894). Also L. de Vieilcastel, *Histoire de la Restauration*, vols. i.–iv.

(J. Hl. R.)

PASQUINADE, a variety of libel or lampoon, of which it is not easy to give an exact definition, separating it from other kinds. It should, perhaps, more especially deal with public men and public things. The distinction, however, has been rarely observed in practice, and the chief interest in the word is its curious and rather legendary origin. According to the earliest version, given by Mazocchi in 1509, Pasquino was a schoolmaster (others say a cobbler), who had a biting tongue, and lived in the 15th century at Rome. His name, at the end of that century or the beginning of the next, was transferred to a statue which had been dug up in 1501 in a mutilated condition (some say near his shop) and was set up at the corner of the Piazza Navona, opposite the palace of Cardinal Caraffa. To this statue it became the custom to affix squibs on the papal government and on prominent persons. At the beginning of the 16th century Pasquin had a partner provided for him in the shape of another statue found in the Campus Martius, said to represent a river god, and dubbed Marforio, *a foro Martis*. The regulation form of the pasquinade then became one of dialogue, or rather question and answer, in which Marforio usually addressed leading inquiries to his friend. The proceeding soon attained a certain European notoriety, and a printed collection of the squibs due to it (they were long written in Latin verse, with an occasional excursion into Greek) appeared in 1509. In the first book of *Pantagruel* (1532 or thereabouts) Rabelais introduces books by Pasquillus and Marphurius in the catalogue of the library of St Victor, and later he quotes some utterances of Pasquin's in his letters to the bishop of Maillezais. These, by the way, show that Pasquin was by no means always satirical, but dealt in grave advice and comment. The original Latin pasquinades were collected in 1544, as *Pasquillorum tomi duo*, edited by Caelius Secundus Curio. The vogue of these lampoons now became general, and rose to its height during the pontificate of Sixtus V. (1585–1590). These utterances were not only called pasquinades (*pasquinate*) but simply pasquils (*pasquillus*, *pasquillo*, *pasquille*), and this form was sometimes used for the mythical personage himself. It was used in English for purposes of satire by Sir Thomas Elyot, in his *Pasquin the Plain* (1540) and by the anonymous author of *Pasquin in a Trance* (1566); but it was first made popular in England by Thomas Nash, who in 1589 began to sign his violent controversial pamphlets with the pseudonym of Pasquil of England. It continues to occur through the course of the Marprelate controversy as the title of the enemy of the Puritans. These English lampoons were in prose. The French pasquils (examples of which may be found in Fournier's *Variétés historiques et littéraires*) were more usually in verse. In Italy itself Pasquin is said not to have condescended to the vernacular till the 18th century. Contemporary comic periodicals, especially in Italy, still occasionally use the Marforio-Pasquino dialogue form. But this survival is purely artificial and literary, and pasquinade has, as noted above, ceased to have any precise meaning.

PASQUINI, BERNARDO (1637–1710), Italian musical composer, was born at Massa in Val di Nievole (Tuscany) on the 8th of December 1637. He was a pupil of Marcantonio Cesti and Loreto Vittori. He came to Rome while still young and entered the service of Prince Borghese; later he became organist of St Maria Maggiore. He enjoyed the protection of Queen Christina of Sweden, in whose honour an opera of his, *Dov' è amore è pieta*, was produced in 1679. During Alessandro Scarlatti's second sojourn in Rome (1703–1708), Pasquini and Corelli were frequently associated with him in musical performances, especially in connexion with the Arcadian Academy, of which all three were members. Pasquini died at Rome on the 22nd of November 1710, and was buried in the church of St Lorenzo in Lucina. He deserves remembrance as a vigorous composer for the harpsichord; and an interesting account of his music for this instrument will be found in J. S. Shedlock's *The Pianoforte Sonata*.

PASSACAGLIA, the name of an old Spanish dance, supposed to be derived from *pasar*, to walk, and *calle*, street, the tune being played by wandering musicians in the streets. It was a slow and rather solemn dance of one or two dancers. The dance tune resembled the "chaconne," and was, like it, constructed on a ground-bass. Brahms's Symphony in E Minor, No. 4, ends with an elaborate passacaglia.

PASSAGLIA, CARLO (1812–1887), Italian divine, was born at Lucca on the 2nd of May 1812. Passaglia was soon destined for the priesthood, and was placed under the care of the Jesuits at the age of fifteen. He became successively doctor in mathematics, philosophy and theology in the university of Rome. In 1844 he was made professor in the Collegio Romano, the well-known Jesuit college in Rome. In 1845 he took the vows as a member of the Jesuit order. In 1848, during the expulsion of the Jesuits from Rome which followed on the revolutionary troubles in the Italian peninsula, he paid a brief visit to England. On his return to Italy he founded, with the assistance of Father Curci and Luigi Taparelli d'Azeglio, the celebrated organ of the Jesuit order entitled the *Civiltá Cattolica*. In 1854 came the decision of the Roman Church on the long-debated question of the Immaculate Conception of the Virgin. Into the agitation for the promulgation of this dogma Passaglia threw himself with great eagerness, and by so doing recommended himself strongly to Pope Pius IX. But his favour with the pope was of short duration. In 1859, when the war between Austria and France (the first step towards the unification of Italy) broke out, Passaglia espoused the popular side. He took refuge at Turin, and under the influence of Cavour he wrote an *Epistola ad*

Episcopos Catholicos pro causa Italica, in which, like Liverani before him, he boldly attacked the temporal power of the pope. For this he was expelled from the order of Jesuits, his book was put on the *Index*, and his figure struck out, by the pope's order, from a picture painted to commemorate the proclamation of the dogma of the Immaculate Conception. A refuge from the anger of the pope was afforded him in the Casa Cavour at Turin, the house in which Cavour was born. There he laboured for Italian unity with indomitable energy in the north of Italy, in conjunction with Cardinal d'Andrea in the south, and he collected the signatures of 9000 priests to an address to the pope in opposition to the temporal power, and in favour of abandoning all resistance to the union of Italy under a king of the House of Savoy. He and the 9000 priests were excommunicated on the 6th of October 1862. Passagilia disregarded his excommunication, and continued his work as professor of moral philosophy at Turin, to which he had been appointed in 1861, and began a series of Advent addresses in the church of San Carlo at Milan. But on arriving in order to preach his second sermon he found himself met by an inhibition on the part of Mgr Caccia, the administrator of the archdiocese of Milan. Elected deputy in the Italian parliament, he still advocated strongly the cause of Italian independence, and at a later period wrote a defence of the rights of the episcopate under the title of *La Causa di sua eminenza il cardinale d'Andrea*. He also (1864) wrote against Renan's *Vie de Jésus*. Eight days before his death he endeavoured to be reconciled to the pope, and made a full retractation. He died at Turin on the 12th of March 1887.

PASSAIC, a city of Passaic county, New Jersey, U.S.A., at the head of navigation on the Passaic river, 5 m. S.S.E. of Paterson. (Pop. (1890), 13,028; (1900), 27,777, of whom 12,900 were foreign-born; (1910 census), 54,773. Passaic is served by the Erie and the Delaware, Lackawana & Western railways. The east part of the city is a plain occupied chiefly by factories, for which water-power is furnished by the river and a canal; the west part, which is almost wholly residential, extends over hills which command excellent views. Among the principal buildings are the city hall, and the Jane Watson Reid Memorial Library. The city's factory products increased in value from $12,804,805 in 1900 to $22,782,725 in 1905, or 77·9%. About one-half of the value in 1905 was in worsteds, cottons and woollens; other important manufactures are rubber goods and electrical supplies. There are large vineyards near the city. A settlement was established here by the Dutch in 1679, and was called Acquackanonk or Paterson Landing until the middle of the 19th century. Passaic was incorporated as a village in 1869, and in 1873 was chartered as a city.

See W. J. Pape and W. W. Scott, *The News History of Passaic* (Passaic, 1899).

PASSAU, a town and episcopal see of Germany, in the kingdom of Bavaria, picturesquely situated at the confluence of the Danube, the Inn and the Ilz, close to the Austrian frontier, 89 m. N.E. from Munich and 74 S.E. of Regensburg by rail. Pop. (1900), 18,003, nearly all being Roman Catholics. Passau consists of the town proper, lying on the rocky tongue of land between the Danube and the Inn, and of four suburbs, Innstadt on the right bank of the Inn, Ilzstadt on the left bank of the Ilz, Anger in the angle between Ilz and the Danube, and St Nikola. It is one of the most beautiful places on the Danube, a fine effect being produced by the way in which the houses are piled up one above another on the heights rising from the river. The best general view is obtained from the Oberhaus, an old fortress, now used as a prison, which crowns a hill 300 ft. high on the left bank of the Danube. Of the eleven churches, the most interesting is the cathedral of St Stephen, a florid, rococo edifice. It was built after a fire in the 17th century on the site of a church said to have been founded in the 5th century; it has two towers, and contains some valuable relics. Other churches are the Gothic church of the Holy Ghost; the churches of St Severin, of St Paul and of St Gertrude; the double church of St Salvator; the Romanesque church of the Holy Cross; the pilgrimage church of Our Lady of Succour (Mariahilf); the church of the hospital of St John; and the Romanesque Votiv Kirche. The post office occupies the site of a building in which in 1552 the Treaty of Passau was signed between the emperor Charles V. and Maurice, elector of Saxony. The fine Dom Platz contains a statue of the Bavarian king, Maximilian I. The old forts and bastions of the city have been demolished, but the two linked fortresses, the Oberhaus and the Niederhaus, are still extant. The former was built early in the 13th century by the bishop in consequence of a revolt on the part of the citizens; the latter, mentioned as early as 737, is now private property. The chief industries are the manufacture of tobacco, beer, leather, porcelain, machinery and paper. Large quantities of timber are floated down the Ilz. The well-known Passau crucibles are made at the neighbouring village of Obernzell.

Passau is of ancient origin. The first settlement was probably a Celtic one, *Boiudurum*; this was on the site of the present Innstadt. Afterwards the Romans established a colony of Batavian veterans, the *castra batava* here. It received civic rights in 1225, and soon became a prosperous place, but much of its history consists of broils between the bishops and the citizens. The strong fortress of the Oberhaus was taken by the Austrians in 1742, and again in 1805. The bishopric of Passau was founded by St Boniface in 738. The diocese was a large one, including until 1468 not only much of Bavaria, but practically the whole of the archduchy of Austria. About 1260 the bishop became a prince of the empire. Amongst the earlier bishops was Pilgrin or Piligrim (d. 991), and among the later ones were the Austrian archdukes, Leopold and Leopold William, the former a brother and the latter a son of the emperor Ferdinand II. In 1803 the bishopric was secularized, and in 1805 its lands came into the possession of Bavaria. The area, which was diminished in the 15th, and again in the 18th century, was then about 350 sq. m., and the population about 50,000. A new bishopric of Passau, with ecclesiastical jurisdiction only, was established in 1817.

See Erhart, *Geschichte der Stadt Passau* (Passau, 1862–1864); and Morin, *Passau* (1878). For the history of the bishopric see Schöller, *Die Bischöfe von Passau* (Passau, 1844); and Schrödl, *Passavia sacra. Geschichte des Bistums Passau* (Passau, 1879).

PASSERAT, JEAN (1534–1602), French poet, was born at Troyes, on the 18th of October 1534. He studied at the university of Paris, and is said to have had some curious adventures —at one time working in a mine. He was, however, a scholar by natural taste, and became eventually a teacher at the Collège de Plessis, and on the death of Ramus was made professor of Latin in 1572 in the Collège de France. In the meanwhile Passerat had studied law, and had composed much agreeable poetry in the Pléiade style, the best pieces being his short ode *Du Premier jour de mai*, and the charming villanelle, *J'ai perdu ma tourterelle*. His exact share in the *Satyre ménippée* (Tours, 1594), the great manifesto of the *politique* or Moderate Royalist party when it had declared itself for Henry of Navarre, is differently stated; but it is agreed that he wrote most of the verse, and the harangue of the guerrilla chief Rieux is sometimes attributed to him. The famous lines *Sur la journée de Senlis*, in which he commends the duc d'Aumale's ability in running away, is one of the most celebrated political songs in French. Towards the end of his life he became blind. He died in Paris on the 14th of September 1602.

See a notice by P. Blanchemain prefixed to his edition of Passerat's *Poésies françaises* (1880). Among his Latin works should be noticed *Kalendae januariae et varia quaedam poemata* (2 vols., 1606), addressed chiefly to his friend and patron Henri de Mesmes. For the *Satyre ménippée* see the edition of Charles Read (1876).

PASSION (post-classical Lat. *passio*, formed from *pati*, *passus*, to suffer, endure), a term which is used in two main senses: (1) the suffering of pain, and (2) feeling or emotion. The first is chiefly used of the sufferings of Jesus Christ, extending from the time of the agony in the garden until his death on the cross. In this sense *passio* was used by the early Christian writers, and the term is also applied to the sufferings and deeds of saints and martyrs, synonymously with *acta* or *gesta*, a book containing such being known as a "passional" (*liber passionalis*) or "passionary" (passionarius). The order of Passionist Fathers, the full title of which is the "Congregation of the Discalced Clerks of the Most Holy Cross and Passion of our Lord Jesus Christ," was founded by St Paul of the Cross (Paolo della Croce, 1694–1775; canonized 1867) in 1720, but full sanction was not obtained for the order till 1737, when the first monastery was established at Monte Argentario, Orbetello. The secondary sense of "passion" is due to the late use of *passio* to translate the Greek philosophical term πάθος, the classical Latin equivalent being *affectus*. The modern use generally restricts the term to strong and uncontrolled emotion.

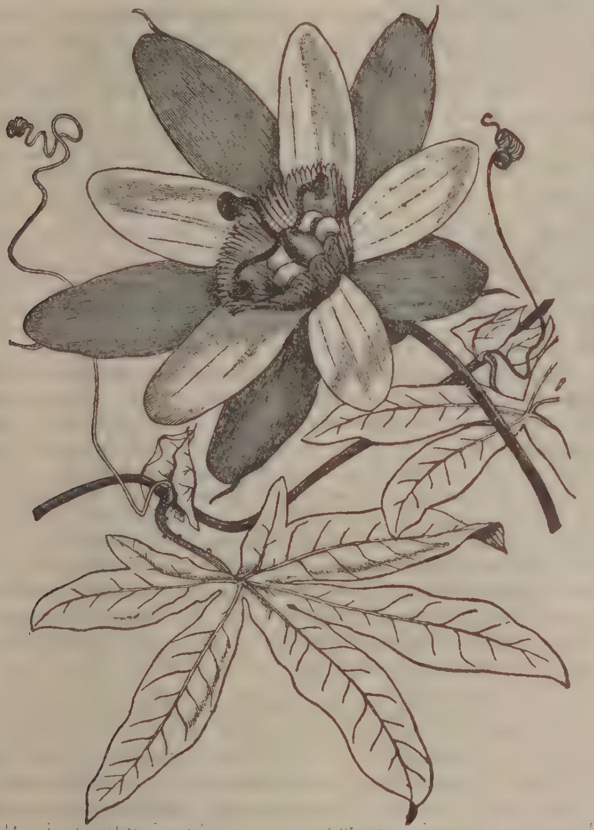


FIG. 1.—*Passiflora Coerulea*, showing Leaf with Stipules, Tendril, and detached Flower.

PASSIONFLOWER (*Passiflora*), the typical genus of the order to which it gives its name. The name passionflower—*flos passionis*—arose from the supposed resemblance of the corona to the crown of thorns, and of the other parts of the flower to the nails, or wounds, while the five sepals and five petals were taken to symbolize the ten apostles—Peter, who denied, and Judas, who betrayed, being left out of the reckoning. The species are mostly natives of western tropical South America; others are found in various tropical and sub-tropical districts of both hemispheres. The tacsonias, by some considered to form part of this genus, inhabit the Andes at considerable elevations. They are mostly climbing plants (fig. 1) having a woody stock and herbaceous or woody branches, from the sides of which tendrils are produced which enable the branches to support themselves at little expenditure of tissue. Some few form trees of considerable stature destitute of tendrils, and with broad magnolia-like leaves in place of the more or less palmately-lobed leaves which are most generally met with in the order. The leaf is usually provided at the base of the leaf-stalk with stipules, which are inconspicuous, or large and leafy; and the stalk is also furnished with one or more glandular excrescences, as in some cases are the leaf itself and the bracts. The inflorescence is of a cymose character, the terminal branch being represented by the tendril, the side branches by flower-stalks, or the inflorescence may be reduced to a single stalk. The bracts on the flower-stalk are either small and scattered or large and leafy, and then placed near the flower, forming a sort of outer calyx or epicalyx. The flower itself (seen in section in fig. 2) consists of a receptacle varying in form from that of a shallow saucer to that of a long cylindrical or trumpet-shaped tube, thin or fleshy in consistence, and giving off from its upper border the five sepals, the five petals (rarely these latter are absent), and the threads or membranous processes constituting the "corona." This coronet forms the most conspicuous and beautiful part of the flower of many species, and consists of outgrowths from the tube formed subsequently to the other parts, and having little morphological significance, but being physiologically useful in favouring the cross-fertilization of the flower by means of insects. Other outgrowths of similar character, but less conspicuous, occur lower down the tube, and their variations afford useful means of discriminating between the species. From the base of the inner part of the tube of the flower, but quite free from it, uprises a cylindrical stalk surrounded below by a small cup-like outgrowth, and bearing above the middle a ring of five flat filaments each attached by a thread-like point to an anther. Above the ring of stamens is the ovary itself, upraised on a prolongation of the same stalk which bears the filaments, or sessile.

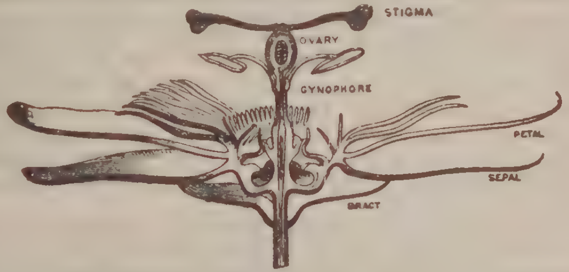


FIG. 2.—Flower of Passionflower cut through the centre to show the arrangement of its constituent parts.

The stalk supporting the stamens and ovary is called the "gynophore" or the "gynandrophore," and is a characteristic of the order. The ovary of passionflowers is one-celled with three parietal placentas, and bears at the top three styles, each capped by a large button-like stigma. The ovary ripens into a berry-like, very rarely capsular, fruit with the three groups of seeds arranged in lines along the walls, but imbedded in a pulpy arillus derived from the stalk of the seed. This succulent berry is in some cases highly perfumed, and affords a delicate fruit for the dessert-table, as in the case of the "granadilla" (*P. quadrangularis*), *P. edulis*, *P. macrocarpa*, and various species of *Tacsonia* known as "curubas" in Spanish South America; *P. laurifolia* is the water-lemon, and *P. maliformis* the sweet calabash of the West Indies. The fruits do not usually exceed in size the dimensions of a hen's or of a swan's egg, but that of *P. macrocarpa* is a gourd-like oblong fruit attaining a weight of 7 to 8 lb.

The tacsonias, which in cultivation are generally regarded as distinct, differ from *Passiflora* in having a long cylindrical calyx-tube, bearing two crowns, one at the throat, the other near the base; they are stove or greenhouse plants; *T. pinnatistipula*, with pale rose-coloured flowers, a native of Chile and Peru, has long been in cultivation; *T. Van-Volxemii*, with handsome scarlet flowers, is one of the finest species.

PASSION WEEK, the fifth week in Lent, beginning with Passion Sunday (*dominica passionis* or *de passione domini*), so called from very early times because with it begins the more special commemoration of Christ's passion. Passion week is often incorrectly identified with Holy week (*q.v.*). In the north of England Passion Sunday was formerly known as Carle or Carling Sunday, a name corrupted from "care," in allusion to the sorrowful season which the day heralds. It was the universal custom in medieval England to eat on this Sunday a grey pea steeped and fried in butter, which came to be called from its association "Carling Nut."

PASSOVER, a Hebrew spring festival, celebrated by the Jews in commemoration of the exodus from Egypt by a family feast in the home on the first evening, and by abstaining from leaven during the seven days of the feast. According to tradition, the first Passover ("The Passover of Egypt"), was preordained by Moses at the command of God. The Israelites were commanded to select on the tenth of Abib (Nisan) a he-lamb of the first year, without blemish, to kill it on the eve of the fourteenth and to sprinkle with its blood the lintel and sidepost of the doors of their dwellings so that the Lord should "pass over" them when he went forth to slay the first-born of the Egyptians. The lamb thus drained of blood was to be roasted and entirely consumed by the Israelites, who should be ready with loins girded, shoes on feet and staff in hand so as to be prepared for the exodus. In memory of this the Israelites were for all time to eat unleavened bread (*mazzoth*) for seven days, as well as keep the sacrifice of the Passover on the eve between the fourteenth and the fifteenth of Nisan. This evening meal was not to be attended by any stranger or uncircumcised person. "On the morrow of the Sabbath" a wave offering of a sheaf of barley was to be made. Those who were unable to perform the sacrifice of the Passover owing to impurity at the appointed time, were permitted to do so a month later.

Various theories have been from time to time proposed to account for this complex of enactments. J. Spencer in his *De legibus Hebraeorum* saw in the Passover a practical protest against the Egyptian worship of Apis. Vatke considered it a celebration of the spring solstice, Baur a means of removing the impurity of the old year. Lengerke recognized a double motive: the lamb for atonement, the unleavened bread as a trace of the haste of the early harvest. Ewald regarded the Passover as an original pre-Mosaic spring festival made to serve the interest of purity and atonement.

All these views have, however, been cast in the shade by more recent investigations based on minute literary analysis of the Pentateuch, begun by Graf, continued by Kuenen, and culminating in the work of Wellhausen and Robertson Smith. This view claims to determine the respective ages and relative chronological position of the various passages in which the Passover is referred to in the Pentateuch, and assumes that each successive stratum represents the practice in ancient Israel at the time of composition, laying great stress upon omissions as implying non-existence. The main passages and their contents are arranged chronologically in the following way:—

A. *In the Elohist Book of the Covenant* (Exod. xxiii.). The feast of unleavened bread to be kept seven days at the time appointed in the month Abib.

B. *In the Yahwist Source* (Exod. xxxiv. 18–21, 25). The feast of unleavened bread to be kept seven days, &c. All firstlings to be the Lord's. First-born sons to be redeemed; none to appear before the Lord empty; six days' work, seventh day rest, in the harvest; the sacrifice of the Passover shall not remain until the morning.

C. *In the Yahwistic History* (Exod. xii. 21–27, 29–36, 38–39, xiii. 3–16). Moses summons the elders of Israel and orders them to kill the Passover and besprinkle the lintel and sideposts with a bunch of hyssop dipped in blood so that the Lord will pass over the door. In later days when the children shall ask what this means it shall be said that this is the sacrifice of the Lord's Passover. At midnight all the first-born of the Egyptians are slain and Pharaoh sends the Israelites out of Egypt in haste, and the people took the dough before it was leavened upon kneading troughs upon their shoulders.

D. *The Deuteronomist* (Deut. xvi. 1–8, 16–17). Observe the month of Abib and keep the Passover because in that month God brought out the Israelites from Egypt. The sacrifice of the Passover of the flock and the herd shall be done in the place where God shall cause His name to dwell. No leaven shall be eaten with it for seven days, and bread of affliction shall be eaten because they came forth from Egypt in haste. Flesh shall not remain until the morning; the sacrifice must not be within their gates but in the place where the Lord shall cause His name to dwell. It shall be sodden and eaten, and in the morning they should go to their tents. Six days eat unleavened bread, on the seventh a solemn assembly. Reckon seven weeks from the time of putting the sickle to the standing corn.

E. *In the Holiness Code* (Lev. xxiii. 4–8, 9–14). The 14th of the first month at even is the Passover of the Lord; on the 15th of the same month is the feast of unleavened bread for seven days. First and seventh days shall be holy assembly, but a re-offering for seven days. On the morrow after the sabbath a wave offering and also a burnt offering of the he-lamb (with the corresponding meal and drink offering). Neither bread nor parched corn nor fresh ears shall be eaten until the oblation is made.

F. *In the Priestly History* (Exod. xii. 1–20, 28–31, xiii. 1–2). On the 10th day of the month every household shall take a firstling male without blemish, of sheep or goat, and should kill it on the 14th at even, and sprinkle the two sideposts and lintel with the blood, and eat the roasted flesh, not sodden, including head, legs and inwards; all remaining over until the morning to be burnt by fire. It should be eaten with loins girded, shoes on feet, and staff in hand because in haste. It is the Lord's Passover; when He sees the blood He will pass over you and there will be no plague upon you. As a memorial of this you shall eat unleavened bread seven days, on the 14th day at eve until the 21st day at eve; when children shall ask what this service means, you shall say that it is the Passover of the Lord.

G. *In the Secondary Sources of the Priestly Code* (Exod. xii. 40–41, 43–50, ix. 1–14, xiv. 16–25). No alien, sojourner or hired servant shall eat thereof, but a bought servant, if circumcised. It shall be eaten in haste; none of the flesh shall be carried forth, neither shall a bone be broken. If a sojourner should wish to keep the Passover, all his male shall be circumcised and he will be as one born in the land. The Passover was kept in the first month on the 14th day of the month at even in the wilderness of Sinai; but certain men, unclean by touching a dead body, asked what they should do; they were to keep it on the second month on the 14th day, eating it with unleavened bread and bitter herbs, leaving none of it until the morning, nor breaking a bone. The first month on the 14th day of the month is the Passover; the 15th day of this month shall be a feast; seven days unleavened bread to be eaten; first day a holy assembly with fire offering, two young bullocks and one lamb and seven firstling he-lambs without blemish, with appropriate meal offering and one he-goat for sin-offering; on the seventh day another holy assembly.

Many discrepancies have been observed among critics in the different portions of this series of enactments. Thus in the Elohist and in Deuteronomy the date of the festival is only vaguely stated to be in the month of Abib, while in the Holiness Code and in the Priestly History the exact date is given. In the Yahwist and Deuteronomist a solemn assembly is to be held on the seventh day, but in the Holiness Code and in the secondary sources of the Priestly Code both the first and the seventh day of the Feast of Unleavened Bread are to be solemn assemblies. In the Deuteronomist the Passover sacrifice can be from either flock or herd, whereas in the Holiness Code only lamb is mentioned, and in the Priestly Code either kid or lamb. In the Deuteronomist the lamb is to be sodden or boiled, whereas in the Priestly Code this is expressly forbidden. A still more vital contrast occurs concerning the place of sacrificing the Passover; as enjoined in Deuteronomy this is to be by the males of the family at Jerusalem, whereas both in the presumably earlier Yahwist and in the later Priestly Code the whole household joins in the festival which can be celebrated wherever the Israelites are settled. These discrepancies however are chiefly of interest in their bearing upon the problem of the Pentateuch, and really throw little light upon the origin of the two feasts connected together under the name of the Passover, to which the present remarks must be mainly confined. It may be observed however that the absence of a definite date in Deuteronomy must be accidental, since a common pilgrimage feast must be on a fixed day, and the reference to the seven weeks elapsing between Passover and Pentecost also implies the fixing of the date. So too even in the Elohist the time is appointed.

Reverting to the origin and the meaning of the feast, modern criticism draws attention to the different nature of the two observances combined with the name Passover, the pastoral sacrifice of the paschal lamb and the agricultural observance of a seven days' abstention from unleavened bread. It is assumed that the former arose during the pastoral period of Israelite history before or during the stay in Egypt, while the latter was adopted from the Canaanites after the settlement in Palestine. Against this may be urged that, according to the latest inquiries into the pastoral life, there is always connected with it some form of agriculture and a use of cereals, while, historically speaking, the Israelites while in Egypt were dependent on its corn. There is, further, the objection that no distinctive crisis in the agricultural era can be associated with the date of the Passover. The beginning of barley harvest is however generally associated with it, while the wheat harvest is connected with Pentecost. The "sheaf of the first-fruits of your harvest," mentioned in Lev. xxiii. 10, is associated in Jewish tradition with the barley harvest (Mishna, Menachoth x.). This, however, is not immediately connected with the Passover, and is of more significance as determining the exact date of Pentecost.

Considering however the two sections of the Passover separately, it is remarkable how many of the ceremonies associated either historically or ceremonially with the Passover have connexion with the idea of a covenant. The folk-etymology of the word Passover given in Exod. xii. 23 seems to connect the original of the feast with a threshold covenant (see Trumbull, *Threshold Covenant*, Philadelphia, 1902); the daubing of the side-posts and lintel with blood at the original Passover, which finds its counterpart in Babylonian custom (Zimmern, *Beit. z. Bab. Rel.* ii. 126–7) and in Arabic usage (Wákidí, ed. Kremer, p. 28), implies a blood covenant. The communion meal would, according to the views of Robertson Smith, also involve the idea of a covenant; while the fact that no person joining in the meal should be uncircumcised connects the feast with the covenant of Abraham. Finally, the association of the first-born with the festival specially referred to in the texts, and carried out both in Samaritan tradition, which marks the forehead of the first-born with the blood of the lamb, and in Jewish custom, which obliged the first-born to fast on the day preceding Passover, also connects the idea of the feast with the sacro-sanctity of the first-born. The Hebrew tradition further connects the revelation of the sacred name of the God of the Hebrews with this festival, which thus combines, in itself, all the associations connecting the Hebrews with their God. It is not surprising therefore that Hebrew tradition connects it with the Exodus, the beginning of the theocratic life of the nation. It seems easiest to assume that the festival, so far as the Passover itself is concerned, was actually connected historically with the Exodus.

With regard to the abstention from leavened bread, the inquiry is somewhat more complicated. As before remarked, there seems no direct connexion between the paschal sacrifice and what appears to be essentially an agricultural festival; the Hebrew tradition, to some extent, dissociates them by making the sacrifice on the 14th of Nisan and beginning the Feast of Unleavened Bread on the 15th. This seeming casual connexion, to some extent, confirms the historic connexion suggested by the text, that the Jews at the Exodus had to use bread prepared in haste; but not even Hebrew tradition attempts to explain why the abstention should last for seven days. The attempt of modern critics to account for the period as that in which the barley harvest was gathered in, during which the workers in the field could not prepare leavened bread, is not satisfactory. The first-fruits of the barley harvest are to be gathered on the "morrow of the sabbath" (Lev. xxiii. 11). This expression has formed the subject of dispute between Samaritans and other sectaries and the Jews, the former of whom regard it as referring to the first Sunday during the festival, the latter as a special expression for the second day of the festival itself (see Hoffmann, Lev. ii. 159–215). But whichever interpretation is taken, the connexion of the festival with the harvest is only secondary.

The suggestion has been made by Wellhausen and Robertson Smith that the Passover was, in its original form, connected with the sacrifice of the firstlings, and the latter points to the Arabic annual sacrifices called *'Atair*, which some of the lexicographers interpret as firstlings. These were presented in the month Rajab, corresponding to Nisan (Smith, *Religion of Semites*, p. 210). But the real Arabic sacrifice of firstlings was called *Fara'*; it might be sacrificed at any time, as was also the case with the Hebrews (Exod. xxii. 30). The paschal lamb was not necessarily a firstling, but only in the first year of its life (Exod. xii. 5). The suggestion of Wellhausen and Robertson Smith confuses the offering of firstlings (Arabic *Fara'*) and that of the first yeanlings of the year in the spring (Arabic *'Atair*). It is possible that the Passover was originally connected with the latter (cf. Wellhausen, *Reste arab. Heidentums*, pp. 94 seq.). As regards the Feast of Unleavened Bread, now indissolubly connected with the paschal sacrifice, no satisfactory explanation has been given either of its original intention or of its connexion with the Passover. It has been suggested that it was originally a *hag* or pilgrimage feast to Jerusalem, of which there were three in the year connected with the agricultural festivals (Exod. xxxiv. 17, 18). But the real agricultural occasion was not the eating of unleavened bread but the offering of the first sheaf of the barley harvest on the "morrow of the sabbath" in the Passover week (Lev. xxiii. 10, 11), and this occasion determined the second agricultural festival, the Feast of Weeks, fifty days later (Deut. xvi. 9; Lev. xxiii. 16; see PENTECOST). The suggestion that the eating of cakes of unleavened bread, similar to the Australian "damper," was due to the exigencies of the harvest does not meet the case, since it does not explain the seven days and is incongruous with the fact that the first sheaf of the harvest was put to the sickle not earlier than the third day of the feast. It still remains possible therefore that the seven days' eating of unleavened bread (and bitter herbs) is an historical reminiscence of the incidents of the Exodus, where the normal commissariat did not begin until a week after the first exit. On the other hand, the absence of leaven may recall primitive practice before its introduction as a domestic luxury; sacral rites generally keep alive primitive custom. There was also associated in the Hebrew mind a connexion of impurity and corruption with the notion of leaven which was tabu in all sacrifice (Exod. xxiii. 18; Lev. ii. 11).

According to Robertson Smith, the development of the various institutions connected with the Passover was as follows. In Egypt the Israelites, as a pastoral people, sacrificed the firstlings of their flocks in the spring, and, according to tradition, it was a refusal to permit a general gathering for this purpose that caused the Exodus. When the Israelites settled in Canaan they found there an agricultural festival connected with the beginnings of the barley harvest, which coincided in point of date with the Passover and was accordingly associated with it. At the time of the reformation under Josiah, represented by Deuteronomy, the attempt was made to turn the family thank-offering of firstlings into a sacrificial rite performed by the priests in the Temple with the aid of the males of each household, who had to come up to Jerusalem but left the next morning to celebrate the Feast of Unleavened Bread in their homes. During the exile this was found impossible, and the old home ceremonial was revived and was kept up even after the return of the exile. This is a highly ingenious hypothesis to explain the discrepancies of the text, but is, after all, nothing but hypothesis.

There appears to have been originally considerable variety in the mode of keeping the Passover, but the earliest mention in the historical narratives (Josh. v. 11) connects the paschal sacrifice with the eating of unleavened bread. But it is unsafe to assume, from 2 Kings xxiii. 22, that the festival was not kept in the time of the early kings, since Solomon appears to have kept up the three great pilgrimage festivals, 2 Kings ix. 25, and it is possibly referred to in Isa. i. 9. The complex of observances connected with the Passover and the very want of systemization observed in the literary sources would seem to vindicate the primitive character of the feast, which indeed is recognized by all inquirers.

At any rate the Samaritans have, throughout their history, observed the Passover with all its Pentateuchal ceremonial and still observe it down to the present day. They sacrifice the paschal lamb, which is probably the oldest religious rite that has been continuously kept up. In two important points they differ from later Jewish interpretation. The term "between the evenings" (Lev. xxiii. 5) they take as the time between sunset and dark, and the "morrow of the sabbath" (*v.* 11) they take literally as the first Sunday in the Passover week; wherein they agree with the Sadducees, Boethusians, Karaites and other Jewish sectaries. This would seem to point to a time when the fixing of the sabbath was determined by the age of the moon, so that the first day of the Passover, which is on the 15th of Nisan, would always occur on a sabbath.

During the existence of the Temple there was a double celebration of the Passover, a series of stipulated sacrifices being offered during the seven days in the Temple, details of which are given in Num. xxviii., but the family ceremonial was still kept up and gradually developed a special ritual, which has been retained among orthodox Jews up to the present day. The paschal lamb is no longer eaten but represented by the shank bone of a lamb roasted in the ashes; unleavened bread and bitter herbs (*haroseth*) are eaten; four cups of wine are drunk before and after the repast, and a certain number of Psalms are recited. The family service, termed *Hagada shel Pesach*, includes a description of the Exodus with a running commentary, and is begun by the youngest son of the house asking the father the reason for the difference in Passover customs.

It is stated in the gospels that the Last Supper was the Passover meal, though certain discrepancies between the accounts given in the Synoptics and in John render this doubtful. It is, at any rate, certain that Jesus came up to Jerusalem in order to join in the celebration of the Passover. When the Passover fell upon the sabbath, as occurred during his visit, a difficulty arose about the paschal sacrifice, which might involve work on the sabbath. There appears to have been a difference of practice between the Sadducees and the Pharisees on such occasions, the former keeping to the strict rules of the Law and sacrificing on the Friday, whereas the Pharisees did so on the Thursday. It has been suggested that Jesus followed the pharisaic practice, and ate the Passover meal (the Last Supper) on Thursday evening, which would account for the discrepancies in the gospel narratives (see Chwolson, *Das letzte Passahmal Jesu*, 2nd ed., St Petersburg, 1904). It seems probable in any case that the ritual of the Mass has grown out of that of the Passover service (see Bickell, *Messe und Pascha*, tr. W. F. Skene, Edinburgh, 1891). Up to the Nicene Council the Church kept Easter (*q.v.*) coincident with the Jewish Passover, but after that period took elaborate precautions to dissociate the two.

See the commentaries on Exodus and Leviticus; that of Kalisch on the latter book (vol. ii., London, 1871) anticipates much of the critical position. The article in Winer's *Bibl. Realwörterbuch* gives a succinct account of the older views. A not altogether unsuccessful attempt to defend the Jewish orthodox position is made by Hoffmann in his *Commentary on Leviticus* (Berlin, 1906, ii. 116–224). Wellhausen's views are given in his *Prolegomena*, ch. iii. A critical yet conservative view of the whole question is given by R. Schaefer, *Das Passah-Mazzoth-Fest* (Gutersloh, 1900) which has been partly followed above. For the general attitude towards the comparative claims of institutional archaeology and literary criticism adopted above see J. Jacobs, *Studies in Biblical Archaeology* (London, 1895). (J. Ja.)

PASSOW, FRANZ LUDWIG CARL FRIEDRICH (1786–1833), German classical scholar and lexicographer, was born at Ludwigslust in Mecklenburg-Schwerin on the 20th of September 1786. In 1807 he was appointed to the professorship of Greek literature at the Weimar gymnasium by Goethe, whose acquaintance he had made during a holiday tour. In 1815 he became professor of ancient literature in the university of Breslau, where he continued to reside until his death on the 11th of March 1833. His advocacy of gymnastic exercises, in which he himself took part, met with violent opposition and caused a quarrel known as the "Breslauer Turnfehde." Passow's great work was his *Handwörterbuch der griechischen Sprache* (1819–1824), originally a revision of J. G. Schneider's lexicon, which appeared in the fourth edition (1831) as an independent work, without Schneider's name (new ed. by Crönert, 1901). It formed the basis of Liddell and Scott's lexicon. Other works by him are *Grundzüge der griech. und röm. Literatur- und Kunstgeschichte* (2nd. ed., 1829) and editions of Persius, Longus, Tacitus *Germania*, Dionysius Periegetes, and Musaeus. His miscellaneous writings have been collected in his *Opuscula academica* (1835) and *Vermischte Schriften* (1843).

See *Franz Passow's Leben und Briefe* (1839), by L. and A. Wachler, which contains a full bibliography.

PASSPORT, or safe-conduct in time of war, a document granted by a belligerent power to protect persons and property from the operation of hostilities. In the case of the ship of a neutral power, the passport is a requisition by the government of the neutral state to suffer the vessel to pass freely with the crew, cargo, passengers, &c., without molestation by the belligerents. The requisition, when issued by the civil authorities of the port from which the vessel is fitted out, is called a sea-letter. But the terms passport and sea-letter are often used indiscriminately. A form of sea-letter (*literae salvi conductus*) is appended to the Treaty of the Pyrenees, 1659. The passport is frequently mentioned in treaties, *e.g.* the Treaty of Copenhagen, 1670, between Great Britain and Denmark. The violation of a passport, or safe conduct, is a grave breach of international law. The offence in the United States is punishable by fine and imprisonment where the passport or safe conduct is granted under the authority of the United States (Act of Congress, April 30, 1790). In its more familiar sense a passport is a document authorizing a person to pass out of or into a country, or a licence or safe-conduct to the person specified therein and authenticating his right to aid and protection. Although most foreign countries may now be entered without passports, the English foreign office recommends travellers to furnish themselves with them, as affording a ready means of identification in case of need. They are usually granted by the foreign office of a state, or by its diplomatic agents abroad. The English Foreign Office charges two shillings for a passport, whatever number of persons may be named in it. Passports granted in England are subject to a stamp duty of sixpence. They may be granted to naturalized as well as natural-born British subjects.

See "The Passport System," by N. W. Sibley, in *Jour. Comp. Leg.* new series, vol. vii. The regulations respecting passports issued by the English Foreign Office as well as the passport requirements of foreign countries will be found in the annual *Foreign Office List.*

PASTE (O. Fr. *paste*, modern *pâte*, Late Lat. *pasta*, whence also in Span., Port. and Ital., from Gr. *πάστη* or *παστά*, barley porridge, or salted pottage, *πάσσειν*, to sprinkle with salt), a mixture or composition of a soft plastic consistency. The term is applied to substances used for various purposes, as *e.g.* in cookery, a mixture of flour and water with lard, butter or suet, for making pies and pastry, or of flour and water boiled, to which starch or other ingredients to prevent souring are added, forming an adhesive for the affixing of wall-paper, bill-posting and other purposes. In technical language, the term is also applied to the prepared clay which forms the body in the manufacture of pottery and porcelain (see CERAMICS) and to the specially prepared glass, known also as "strass," from which imitation gems are manufactured. This latter must be the purest, most transparent and most highly refractive glass that can be prepared. These qualities are comprised in the highest degree in a flint glass of unusual density from the large percentage of lead it contains. Among various mixtures regarded as suitable for strass the following is an example: powdered quartz 300 parts, red lead 470, potash (purified by alcohol) 163, borax 22, and white arsenic 1 part by weight. Special precautions are taken in the melting. The finished colourless glass is used for imitation diamonds; and when employed to imitate coloured precious stones the strass is melted up with various metallic oxides. Imitation gems are easily distinguished from real stones by their inferior hardness and by chemical tests; they may generally be detected by the comparatively warm sensation they communicate to the tongue.

PASTEL, the name of a particular method of painting with dry pigments, so called from the "paste" into which they are first compounded. The invention of pastel, which used to be generally called "crayon," has frequently been accredited to Johann Alexander Thiele (1685–1752), landscape-painter and etcher of distinction, as well as to Mme Vernerin and Mlle Heid (1688–1753), both of Danzig. But the claim cannot be substantiated, as drawing in coloured chalks had been practised long before, *e.g.* by Guido Reni (1575–1642), by whom a head and bust in this manner exists in the Dresden Gallery. Thiele was perhaps the first to carry the art to perfection, at least in Germany, where it was extensively exploited in the

17th century; but his contemporary, Rosalba Carriera of Venice (1675–1757), is more completely identified with it, and in her practice of it made a European reputation which to this day is in some measure maintained. The Dresden Museum contains 157 examples of her work in this medium, portraits, subjects and the like. Thiele was followed by Anton Raphael Mengs (1728–1779) and his sister Theresia Mengs (afterwards Maron, 1725–1806), and by Johann Heinrich Schmidt (1749–1829).

When in 1720 Rosalba Carriera accepted an invitation to visit Paris, where she was received with general enthusiasm, she found the art of pastel-painting well established; that is to say, it was used to reproduce local colour with truth. She made it fashionable and combined truth with nature. Nearly a hundred years before Claude Lorrain had used coloured chalks as Dutch and Italian painters had used them, often with high finish, employing mainly red, blue and black, for the sake of prettiness of effect and not with the intention of reproducing with accuracy the actual colours of the head, the figure, or the landscape before them. This method of making drawings—*rehaussés*, as they were called—has remained in common use almost to the present day, especially for studies. It is necessary only to cite among many examples the series of heads by Holbein, the highly esteemed studies by Watteau, Boucher and Greuze, and of John Raphael Smith and Sir Thomas Lawrence, to indicate how general has been the employment of the coloured chalk. In 1747 Nattier (1685–1766) showed a pastel portrait of M. Logerot in the Paris Salon, and his son-in-law, Louis Tocqué (1696–1772), soon followed with similar work. Hubert Drouais (1699–1767) had preceded his rival Nattier in the Salon by a single year with five pastel portraits, and Chardin (1699–1779) followed in 1771. This great master set himself to work in emulation of Quentin de la Tour (1704–1788), who in spite of the ability of his rivals may be regarded as the most eminent pastellist France has produced. His portraits of Mme Boucher and himself appeared in the Salon in 1737; his full strength as a portrait-pastellist is to be gauged in the collection of eighty-five of his principal works now in the museum of St Quentin. Then followed Simon Mathurin Lantara (1729–1778), who was one of the first to paint pastel-pictures of landscapes, including sunsets and moonlights, as well as marines, into which the figures were drawn by Joseph Vernet, Casanova and others, and Jean Baptiste Perronneau (1731–1796), the best of whose heads have been often attributed to de la Tour and whose "Jeune fille au chat" in the Louvre, though not the finest, is perhaps the best known of his works, was the last pre-eminent French pastellist of the 18th century. Since then they have been legion; of these it is needful to mention only Girodet and the flower-painters, Jean Saint-Simon and Sprendonck.

Two Swiss painters had considerable influence in spreading the use of pastel—the experimentalist Dietrich Meyer (1572–1658), one of the first to make designs in coloured chalks (and reputed inventor of soft-ground etching), and Jean Étienne Liotard (1702 or 1704–1788), one of the most brilliant pastellists who ever lived. Two of his works are world-famous, "La Belle Chocolatière de Vienne," executed in 1745, now in the Dresden Museum, and "La Belle Liseuse" of the following year at the museum at Amsterdam. The latter is a portrait of his niece, Mlle Lavergne. In 1753, and again in 1772, Liotard visited England, where his brilliant work, portraits and landscapes, produced a great effect, almost equal to that of de la Tour twenty years before. To the Royal Academy between 1773 and 1775 Liotard contributed the portraits of Dr Thomson, himself, Lord Duncannon and General Cholmondely.

Crayon-painting was practised in England at an early date, and John Riley (1646–1691), many of whose finest works are attributed to Sir Peter Lely, produced numerous portraits in that medium. Francis Knapton (1698–1778), court painter, was a more prolific master, and he, with William Hoare of Bath (? 1707–1792) who had studied pastel in Italy and made many classic designs in that medium, exhibiting at the Royal Academy his "Boy as Cupid," "Prudence instructing her Pupil," "Diana," "A Zingara," and others, prepared the way for the triumph of Francis Cotes (? 1725–1770). Then for the first time pastel-painting was fully developed by an English hand. Before he became a painter in oil Cotes had worked under Rosalba Carriera, and, although he was rather cold and chalky in his tones, he produced portraits, such as his "Mr and Mrs Joah Bates" and "Lord Hawke," which testify to his high ability. He was, however, far surpassed by his pupil, John Russell, R.A. (1745–1806), who brought the art to perfection, displaying grace and good expression in all his pastel work, whether portrait, fancy picture, historical subject, group, or "conversation-piece." He had brought from Rosalba her four fine pictures representing "The Seasons," and in a great measure founded his style on them. He was strong and brilliant in colour, and when he was at his best his high, smooth finish in no way robbed his work of vigour. Romney (1734–1802) in his single pastel portrait, a likeness of William Cowper the poet, showed that he might have excelled in this medium, which, indeed, was particularly suited to his tender manner. Hugh D. Hamilton (*c.* 1734–1806) of the Royal Hibernian Academy, produced noteworthy portraits, mainly in grey, red and black, until on the suggestion of Flaxman he abandoned pastel for oil. Ozias Humphry, A.R.A. (1742–1810), painter and miniaturist, is an important figure among the pastellists, commonly believed to be the first in England who made a point of letting his colour strokes be seen (as by Emile Wauters and others in our own day), contrary to the practice of Russell and his predecessors, whose prime effort was to blend all into imperceptible gradations. Richard Cosway, R.A. (1742–1821) was mainly experimental in his pastels, but his portraits, such as that of George prince of Wales, are forcible and brilliant; those of his wife Maria Cosway (1759–1838) are more delicate. Daniel Gardner (? 1750–1805), whose pictures in oil have often been mitsaken for Reynolds's and Gainsborough's, gave rein to his exuberant fancy and his rather exaggerated taste in compositions which, in his arrangement of children, remind us of Sir Thomas Lawrence in his more fantastic mood. Gardner marked the deterioration of the art, which thereafter declined, Henry Bright (1814–1873) being almost the only pastellist of real power who followed him. Bright's landscapes have probably in their own line never been surpassed.

Since 1870 there has been a revival of the art of pastel, the result of a better understanding and appreciation on the part of the public. Grimm's denunciation of it to Diderot—"every one is agreed that pastel is unworthy the notice of a great painter"—which for many years had found general acceptance, is now seen to have been based on forgetfulness or ignorance of the virtues inherent in the method. It was thought that "coloured chalks," as it used to be called in English-speaking countries, promised nothing but sketches of an ephemeral kind, so fragile that they were at the mercy of every chance blow or every touch of dampness. The fact is, that with care no greater than is accorded to every work of art, pastel properly used is not more perishable than the oil-painting or the water-colour. Damp will affect it seriously, but so also will it ruin the water-colour; and rough usage is to be feared for the oil-picture not less than for the pastel. Moreover, pastel possesses advantages that can be claimed by neither oil-painting nor water-colour. That is to say, if pictures in these three mediums be hung side by side for a hundred years in a fair light and in a dry place, the oil-painting will have darkened and very probably have cracked; the water-colour will have faded; but the pastel will remain as bright, fresh, and pure as the day it was painted. If Time and Varnish, which Hogarth and Millais both declared the two greatest of the old masters, will do nothing to "improve" a pastel, neither will they ruin it—time passes it by and varnish must on no account be allowed to approach it. The pastel-painter, therefore, having no adventitious assistance to hope for, or to fear, must secure at once the utmost of which his method is capable.

The advantages of pastel are threefold: those of working, those of results, and those of permanence. The artist has at his command, without necessity of mixing his colours, every hue to be found in nature, so that freshness and luminosity can always be secured without fear of that loss of brilliancy commonly attendant on the mixing of colour on the palette. Moreover, the fact of pastel being dry permits the artist to leave his work and take it up again as he may choose; and he is free from many of the technical troubles and anxieties natural to oil and water-colour painting. Applied with knowledge, pastel, which has been likened for delicacy of beauty to "the coloured dust upon the velvet of butterflies' wings," will not fall off. It can, if desired—though this is hardly necessary or desirable—be "fixed," most commonly by a *fixatif*. If intending so to treat his work, the artist must paint in a somewhat lighter key, as the effect of the fixing medium is slightly to lower the general tone. The *fixatif Lacaze* is considered the best, but the general consensus of opinion among artists is against the use of any such device. This preparation has the advantage of leaving the colour unchanged, even though it dulls it; shellac *fixatif* has the effect of darkening the work.

The inherent qualities of pastel are those of charm, of subtlety, softness, exquisite depths of tone, unsurpassable harmonies and unique freshness of colour, sweetness, delicacy, mystery—all the virtues sought for by the artist of daintiness and refinement. Pastel-painting is essentially, therefore, the art of the colourist. Now, these very qualities suggest its limitations. Although it is unfair to relegate it—as fashion has foolishly done for so long—to the bunch of pretty triflings which Carlyle called "Pompadourisms," we must recognize that a medium which suggests the bloom upon the peach is not proper to be employed for rendering "grand," or even genre subjects, or for the covering of large surfaces of canvas. It is inappropriate to the painting of classic compositions, although in point of fact it has been so used, not without success. It is best adapted to the rendering of still life, of landscape and of portraiture. But in these cases it is not advisable to aim at that solidity which is the virtue of oil-painting, if only because oil can bring about a better result. The real reason is that, in securing solidity, pastel tends to forfeit that lightness and grace which constitute its special charm and merit. Strength belongs to oil, tenderness and subtlety to pastel, together with freshness and elegance.

The pre-eminent technical advantage, in addition to those already mentioned, is the permanence of the tones. In water-colours there is an admixture of gum and glycerine which may attract moisture from the air; and, besides, the pigment is used in very thin washes. In oil-painting not only does the oil darken with age but sometimes draws oxygen from a pigment and changes its hue. In pastel the colour is put on without any moist admixture, and can be laid on thick. Moreover, the permanence may arise from the method of manufacture. In a very rare work, *The Excellency of the Pen and Pencil* (1668), a chapter on "how to make pastils" [*sic*] "of several colours, for drawing figure, landskip, architecture, &c., on blew paper," describes the manner of grinding up the pigments with grease. This used to be the secret of pastel—that every grain of colour was separately and securely locked up in grease, and so was secured from any chemical change that might have come about through contact of the colours with one another or with the atmosphere. With pastel nothing of the kind could occur; and the works of Rosalba Carriera in Italy, of Quentin Latour, Peronneau, Watteau, St Jean, Paul Hoin and Chardin in France, and of Russell and Cotes in England—to name no others—testify to the permanency of the colours. Some manufacturers nowadays employ gum as the binding medium; others beeswax (which at one time was more frequently used than it is at present); others, again, a very small proportion of tallow, and sometimes a little soap. But this introduction of binding media is now adopted only in the case of certain colours. Whether the point or edge of the stick be used (as in pastel *drawing*), or the side of it, helped with the tips of the fingers (as in pastel *painting*), the result is equally permanent; and if, when the work is done, it be struck two or three times, and then touched up by hand-crayons, no dropping of colour from the paper need ever occur. The drawing is made on a grained paper that will hold the chalk, or on a specially manufactured toothed cloth. The French paper known as *gras gris bleuté* is employed by certain of the leading pastellists. The crisp touches of the pastel can be placed side by side, or the "vibrations" which the artist seeks may be obtained by glazes and superposed tones. It should here be mentioned that about the year 1900 M. Jean-François Raffaelli produced in Paris sticks of oil colours which he claimed would in a great measure replace painting with the brush. Although the system was widely tried and many good pictures painted in this method, it was found that the colours became dull, and such vogue as these "solid paints" enjoyed for a time has to a very great extent disappeared.

The art of pastel, as M. Roger Ballu expressed it, "was slumbering a little," until in 1870 the Société des Pastellistes was founded in France and met with ready appreciation. With many artists it was a matter of "coloured chalks," as, for example, with Millet, Lhermitte and Degas in France, and with Whistler in England. With the majority the full possibilities were seized, and a great number of artists abroad then practised the art for the sake of colour, among whom may be mentioned Adrien Moreau, A. Besnard, Émile Lévy, Machard, Pointelin, Georges Picard, de Nittis, Iwill, René Billotte, Jozan, Nozel, Raffäelli, Brochard (mainly upon vellum) and Lévy-Dhurmer in France; in Belgium, Émile Wauters (who has produced a great series of life-sized portraits of both men and women of amazing strength, vitality and completeness) and Fernand Khnopff; in Italy, C. Laurenti, P. Fragiacomo and Giovanni Segantini; in Holland, Josselin de Jong; in Germany, F. von Lenbach, Max Liebermann and Franz Stück; and in Norway, Fritz Thaulow.

In England the revival of pastel dates from 1880, when the first exhibition of the Pastel Society was held in the Grosvenor Gallery. The exhibition was a *succès d'estime*, but after a while the society languished until, in 1899, it was reconstituted, and obtained the adhesion of many of the most distinguished artists practising in the country, as well as of a score of eminent foreign painters. In that year, and since, it has held exhibitions of a high order; and intelligent public appreciation has been directed to the work of the most noteworthy contributors. Among these are E. A. Abbey, R.A.; M'Lure Hamilton, J. M. Swan, R.A.; J. Lorimer, R.S.A.; A. Peppercorn, R. Anning Bell, J. J. Shannon, R.A.; Sir James Guthrie, P.R.S.A.; H. Brabazon, Walter Crane, Melton Fisher, Edward Stott, A.R.A.; S. J. Solomon, R.A.; and W. Rothenstein.

See Karl Robert [Georges Meusnier], *Le Pastel* (Laurens, Paris, 1890); J. L. Sprinck, *A Guide to Pastel Painting* (Rowney, London); Henry Murray, *The Art of Painting and Drawing in Coloured Crayons* (Winsor & Newton, London). Among early works are: John Russell, R.A., *Elements of Painting with Crayons* (1776); M.P.R. de C.C., *Traité de la peinture au pastel avec les moyens de prévenir l'altération des couleurs* (Paris, 1788); Rosalba Carriera, *Diario degli anni 1720 e 1721 scritto di propria mano in Parigia, &c.* (Giovanni Vianelli, Venice, 1793, 4to); Girolamo Zanetti, *Elogio di Rosalba Carriera, pittrice* (Venice, 1818, 8vo). See also Henri Lapauze, *Les Pastels de M. Quentin de La Tour à St Quentin*, preface by Gustave Larroumet (Paris); George C. Williamson, *John Russell, R.A.* (London, 1894). (M. H. S.)

PASTEUR, LOUIS (1822–1895), French chemist, was born, on the 27th of December 1822, at Dôle, Franche-Comté, where his father carried on the business of a tanner. Shortly afterwards the Pasteur family removed to Arbois, where Louis attended the École primaire, and later the collège of that place. Here he apparently did not especially distinguish himself, belonging to the class of *bons ordinaires*. Fortunately at Arbois he came under the influence of an excellent teacher in the person of the director of the collège, who must have discerned in the quiet boy the germs of greatness, as he constantly spoke to him of his future career at the École normale in Paris. In October 1838 Louis was sent with a friend to the metropolis, to a school in the Quartier Latin, preparatory to the École normale. But he did not remain long in Paris, for, being a nervous and excitable boy, his health broke down, and he yearned for his home in Franche-Comté. "If only I could smell the tannery once more," said he to his companion, "I should feel well." So home he went, though not for long, as his ambition was still to become a *normalien*, and to this end he entered the Royal College of Besançon, "en attendant l'heureux jour où je serais admis à l'école normale." Step by step he attained his end; in 1840 he won his "bachelier ès lettres," and shortly afterwards he received an appointment as assistant mathematical master in the college. Two years later he passed the examination for the "baccalauréat ès sciences" enabling him to become candidate for the École normale. But here something (probably the examiner) was at fault, for a note was attached to Pasteur's diploma stating that he was only "mediocre" in chemistry. In those early days and early trials the dominant note of Pasteur's life was sounded. To his sisters he writes: "Ces trois choses, la volonté, le travail, le succès, se partagent toute l'existence humaine. La volonté ouvre la porte aux carrières brillantes et heureuses; le travail les franchit, et une fois arrivé au terme du voyage, le succès vient couronner l'œuvre." Throughout his life, and to the very end, "work" was his constant inspiration. On his deathbed he turned to the devoted pupils who watched over their master's last hours. "Où en êtes-vous?" he exclaimed. "Que faites-vous?" and ended by repeating his favourite words, "Il faut travailler."

The first incentive to his serious study of chemistry was given by hearing J. B. A. Dumas lecture at the Sorbonne; and ere long he broke new ground for himself, A. J. Balard having given him an opportunity for chemical work by appointing him to the post of laboratory assistant. A few words of explanation concerning Pasteur's first research are necessary to give the key to all his future work. What was the secret power which enabled him to bring under the domain of scientific laws phenomena of disease which had so far baffled human endeavour? It simply consisted in the application, to the elucidation of these complex problems, of the exact methods of chemical and physical research. Perhaps the most remarkable discovery of modern chemistry is the existence of compounds, which, whilst possessing an identical composition, are absolutely different bodies, judged of by their properties. The first of the numerous cases of isomerism now known was noted, but unexplained, by J. J. Berzelius. It was that of two tartaric acids, deposited from wine-lees. The different behaviour of these two acids to a ray of polarized light was subsequently observed by J. B. Biot. One possessed the power of turning the plane of the polarized ray to the right; the other possessed no rotary power. Still no explanation of this singular fact was forthcoming, and it was reserved for the young chemist from Franche-Comté to solve a problem which had baffled the greatest chemists and physicists of the time. Pasteur proved that the inactivity of the one acid depended upon the fact that it was composed of two isomeric constituents: one the ordinary or dextrorotary acid, and the other a new acid, which possessed an equally powerful left-handed action. The veteran Biot whose acquaintance Pasteur had made, was incredulous. He insisted on the repetition of the experiment in his presence; and when convinced of the truth of the explanation he exclaimed to the discoverer: "Mon cher enfant, j'ai tant aimé les sciences dans ma vie que cela me fait battre le cœur." Thus at one step Pasteur gained a place of honour among the chemists of the day, and was immediately appointed professor of chemistry at the Faculté of Science at Strasburg, where he soon afterwards married Mlle Laurent, who proved herself to be a true and noble helpmeet. Next he sought to prepare the inactive form of the acid by artificial means; and after great and long-continued labour he succeeded, and was led to the commencement of his classical researches on fermentation, by the observation that when the inactive acid was placed in contact with a special form of mould (*Penicillium glaucum*) the right-handed acid alone was destroyed, the left-handed variety remained unchanged. So well was his position as a leading man of science now established that in 1854 he was appointed professor of chemistry and dean of the Faculté des Sciences at Lille. In his inaugural address he used significant words, the truth of which was soon manifested in his case: "In the field of observation chance only favours those who are prepared." The diseases or sicknesses of beer and wine had from time immemorial baffled all attempts at cure. Pasteur one day visited a brewery containing both sound and unsound beer. He examined the yeasts under the microscope, and at once saw that the globules from the sound beer were nearly spherical, whilst those from the sour beer were elongated; and this led him to a discovery, the consequences of which have revolutionized chemical as well as biological science, inasmuch as it was the beginning of that wonderful series of experimental researches in which he proved conclusively that the notion of spontaneous generation is a chimera. Up to this time the phenomenon of fermentation was considered strange and obscure. Explanations had indeed been put forward by men as eminent as Berzelius and Liebig, but they lacked experimental foundation. This was given in the most complete degree by Pasteur. For he proved that the various changes occurring in the several processes of fermentation —as, for example, in the vinous, where alcohol is the chief product; in the acetous, where vinegar appears; and in the lactic, where milk turns sour—are invariably due to the presence and growth of minute organisms called ferments. Exclude every trace of these organisms, and no change occurs. Brewers' wort remains unchanged for years, milk keeps permanently sweet, and these and other complex liquids remain unaltered when freely exposed to air from which all these minute organisms are removed. "The chemical act of fermentation," writes Pasteur, "is essentially a correlative phenomenon of a vital act beginning and ending with it."

But we may ask, as Pasteur did, Why does beer or milk become sour on exposure to ordinary air? Are these invisible germs which cause fermentation always present in the atmosphere? or are they not generated from the organic, but the non-organized constituents of the fermentable liquid? In other words, are these organisms not spontaneously generated? The controversy on this question was waged with spirit on both sides; but in the end Pasteur came off victorious, and in a series of the most delicate and most intricate experimental researches he proved that when the atmospheric germs are absolutely excluded no changes take place. In the interior of the grape, in the healthy blood, no such germs exist; crush the grape, wound the flesh, and expose them to the ordinary air, then changes, either fermentative or putrefactive, run their course. But place the crushed fruit or the wounded animal under conditions which preclude the presence or destroy the life of the germ, and again no change takes place; the grape juice remains sweet and the wound clean. The application of these facts to surgical operations, in the able hands of Lord Lister, was productive of the most beneficent results, and has indeed revolutionized surgical practice.

Pasteur was now the acknowledged head of the greatest chemical movement of the time, the recipient of honours both from his own country and abroad, and installed at the École normale in Paris in a dignified and important post. Not, however, was it without grave opposition from powerful friends in the Academy that Pasteur carried on his work. Biot—who loved and admired him as a son—publicly announced that his enterprise was chimerical and the problem insoluble; Dumas evidently thought so too, for he advised Pasteur not to spend more of his time on such a subject. Yet he persevered: "Travailler, travailler toujours" was his motto, and his patience was rewarded by results which have not merely rendered his name immortal, but have benefited humanity in a way and to a degree for which no one could have ventured to hope. To begin with a comparatively small, though not unimportant, matter, Pasteur's discoveries on fermentation inaugurated a new era in the brewing and wine-making industries. Empiricism, hitherto the only guide, if indeed a guide at all, was replaced by exact scientific knowledge; the connexion of each phenomenon with a controllable cause was established, and rule-of-thumb and quackery banished for ever by the free gift to the world of the results of his researches.

But his powers of patient research and of quick and exact observation were about to be put to a severe test. An epidemic of a fatal character had ruined the French silk producers. Dumas, a native of the Alais district, where the disease was rampant, urged Pasteur to undertake its investigation. Up to that time he had never seen a silkworm, and hesitated to attempt so difficult a task; but at the reiterated request of his friend he consented, and in June 1865 went to the south of France for the purpose of studying the disease on the spot. In September of the same year he was able to announce results which pointed to the means of securing immunity from the dreaded plague. The history of this research, of the gradual elimination of the unimportant conditions, of the recognition of those which controlled the disease, is one of the most fascinating chapters of scientific discovery. Suffice it here to say that careful experiment and accurate observation succeeded in ascertaining the cause of the disease and in preventing its recurrence, thus bringing back to prosperity the silk trade of France, with all that this entails. "There is no greater charm," says Pasteur, "for the investigator than to make new discoveries; but his pleasure is heightened when he sees that they have a direct application to practical life." Pasteur had the good fortune, and just reward, of seeing the results of his work applied to the benefit both of the human race and of the animal world. It is to him that the world is indebted for the introduction of methods which have already worked wonders, and bid fair to render possible the preventive treatment of all infectious diseases. Just as each kind of fermentation possesses a definite organized ferment, so many diseases are dependent on the presence of a distinct microbe; and just as the gardener can pick out and grow a given plant or vegetable, so the bacteriologist can (in most cases) eliminate the adventitious and grow the special organism—in other words, can obtain a pure cultivation which has the power of bringing about the special disease. But by a process of successive and continued artificial cultures under different conditions, the virus of the organism is found to become attenuated; and when this weakened virus is administered, the animal is rendered immune against further attacks. The first disease investigated by Pasteur was that of chicken cholera, an epidemic which destroyed 10% of the French fowls; after the application of the preventive method the death-rate was reduced to below 1%. Next came the successful attempt to deal with the fatal cattle scourge known as anthrax. This is also caused by the presence of a microbe, of which the virus can also be attenuated, and by inoculation of this weakened virus the animal rendered immune. Many millions of sheep and oxen all over the world have thus been treated, and the rate of mortality reduced from 10 to less than 1%. As to the money value of these discoveries, T. H. Huxley gave it as his opinion that it was sufficient to cover the whole cost of the war indemnity paid by France to Germany in 1870.

The most interesting of Pasteur's investigations in preventive and curative medicine remains to be told. It is no less than a cure for the dread disease of hydrophobia in man and of rabies in animals; and the interest of the achievement is not only that he successfully combated one of the most mysterious and most fell diseases to which man is subject, but also that this was accomplished in spite of the fact that the special microbe causing the disease had not been isolated. To begin with, Pasteur, in studying the malady in dogs, came to the conclusion that the virus had its seat in the nerve centres, and he proved that the injection of a portion of the matter of the spinal column of a rabid dog into the body of a healthy one produces in the latter with certainty the symptoms of rabies. The next step was to endeavour so to modify and weaken the virus as to enable it to be used as a preventive or as an antitoxin. This, after long and serious labour, he effected; the dog thus inoculated proved to be immune when bitten by a rabid animal. But this was not enough. Would the inoculation of the attenuated virus have a remedial effect on an animal already bitten? If so, it might be possible to save the lives of persons bitten by mad dogs. Here again experiment was successful. A number of dogs were inoculated, the same number were untreated, and both sets were bitten by rabid animals. All the treated dogs lived; all the untreated died from rabies. It was, however, one thing to experiment on dogs, and quite another to do so on human beings. Nevertheless Pasteur was bold enough to try. The trial was successful, and by doing so he earned the gratitude of the human race. Then, on the 14th of November 1888, the Institut Pasteur was founded. Thousands of people suffering from bites from rabid animals, from all lands, have been treated in this institute, and the death-rate from this most horrible of all diseases has been reduced to less than 1%. Not only in Paris, but in many cities throughout the world, institutes on the model of the original one have been set up and are doing beneficent work, all arising from the genius and labour of one man. At the inauguration of the institute Pasteur closed his oration with the following words:—

"Two opposing laws seem to me now in contest. The one, a law of blood and death, opening out each day new modes of destruction, forces nations to be always ready for the battle. The other, a law of peace, work and health, whose only aim is to deliver man from the calamities which beset him. The one seeks violent conquests, the other the relief of mankind. The one places a single life above all victories, the other sacrifices hundreds of thousands of lives to the ambition of a single individual. The law of which we are the instruments strives even through the carnage to cure the wounds due to the law of war. Treatment by our antiseptic methods may preserve the lives of thousands of soldiers. Which of these two laws will prevail, God only knows. But of this we may be sure, that science, in obeying the law of humanity, will always labour to enlarge the frontiers of life."

Rich in years and in honours, but simple-minded and affectionate as a child, this great benefactor to his species passed quietly away near St Cloud on the 28th of September 1895.

Mention need only be made of Pasteur's chief works, as follows: *Études sur le vin* (1866), *Études sur le vinaigre* (1868), *Études sur la maladie des vers à soie* (1870), *Études sur la bière* (1876). He began the practice of inoculation for hydrophobia in 1885.

See *Vie de Pasteur*, by René Vallerey-Radot (Paris, 1900).
(H. E. R.).

PASTICCIO, an Italian word, now often Englished as "pastiche," formed from *pasta*, paste, for a composition in music, painting or other arts, made up of selections from fragments or imitations of the work of other artists, a medley or pot-pourri. The term has also been applied to a form of musical composition in which selections from various operas, &c., are pieced together to form a consecutive whole, special librettos being sometimes written for them.

PASTO, a city of Colombia and capital of the department of Nariño, about 36 m. from the boundary line with Ecuador, on one of the inland trade routes with that republic, and on a principal line of communication with the great forested regions of the Caquetá (Japurá), Putumayo and Napo. Pop. (1906 estimate), 6000. It stands on an elevated plain, 8347 ft. above the sea, at the eastern foot of the Pasto volcano, which rises above the city to a height of 13,990 ft. Wool is produced to some extent and is woven for the local market in the woollen factories of Pasto.

PASTON LETTERS, an invaluable collection of letters and papers, consisting of the correspondence of members of the Paston family, and others connected with them, between the years 1422 and 1509, and also including some state papers and other important documents. The bulk of the letters and papers were sold by William Paston, 2nd earl of Yarmouth, the last representative of the family, to the antiquary Peter Le Neve early in the 18th century. On Le Neve's death in 1729 they came into the possession of Thomas Martin of Palgrave, who married his widow; and upon Martin's death in 1771 they were purchased by John Worth, a chemist at Diss, whose executors sold them three years later to John Fenn of East Dereham. In 1787 Fenn published a selection of the letters in two volumes, and general interest was aroused by this publication. In 1789 Fenn published two other volumes of letters, and when he died in 1794 he had prepared for the press a fifth volume, which was published in 1823 by his nephew, Serjeant Frere. In 1787 Fenn had received a knighthood, and on this occasion, the 23rd of May, he had presented the originals of his first two volumes to King George III. These manuscripts soon disappeared, and the same fate attended the originals of the three other volumes. In these circumstances it is not surprising that some doubt should have been cast upon the authenticity of the letters. In 1865 their genuineness was impugned by Herman Merivale in the *Fortnightly Review*; but it was vindicated on grounds of internal evidence by James Gairdner in the same periodical; and within a year Gairdner's contention was established by the discovery of the originals of Fenn's fifth volume, together with other letters and papers, by Serjeant Frere's son, Philip Frere, in his house at Dungate, Cambridgeshire. Ten years later the originals of Fenn's third and fourth volumes, with ninety-five unpublished letters, were found at Roydon Hall, Norfolk, the seat of George Frere, the head of the Frere family; and finally in 1889 the originals of the two remaining volumes were discovered at Orwell Park, Ipswich, the residence of Captain E. G. Pretyman. This latter batch of papers are the letters which were presented to George III., and which possibly reached Orwell through Sir George Pretyman Tomline (1750–1827), the tutor and friend of William Pitt.

The papers which had been in the hands of Sir John Fenn did not, however, comprise the whole of the Paston letters which were extant. When the 2nd earl of Yarmouth died in 1732 other letters and documents relating to the Pastons were found at his seat, Oxnead Hall, and some of these came into the hands of the Rev. Francis Blomefield, who failed to carry out a plan to unite his collection with that of Martin. This section of the letters was scattered in various directions, part being acquired by the antiquary John Ives. The bulk of the Paston letters and documents are now in the British Museum; but others are at Orwell Park; in the Bodleian Library, Oxford; at Magdalen College, Oxford; and a few at Pembroke College, Cambridge.

Fenn's edition of the *Paston Letters* held the field until 1872, when James Gairdner published the first volume of a new edition. Taking Fenn's work as a basis, the aim of the new editor was to include all the letters which had come to light since this publication, and in his careful and accurate work in three volumes (London, 1872–1875) he printed over four hundred letters for the first time. Gairdner's edition, with notes and index, also contained a valuable introduction to each volume, including a survey of the reign of Henry VI.; and he was just completing his task when the discovery of 1875 was made at Roydon. An appendix gave particulars of this discovery, and the unpublished letters were printed as a supplement to subsequent editions. In 1904 a new and complete edition of the *Paston Letters* was edited by Gairdner, and these six volumes, containing 1088 letters and papers, possess a very valuable introduction, which is the chief authority on the subject.

The family of Paston takes its name from a Norfolk village about twenty miles north of Norwich, and the first member of the family about whom anything is known was living in this village early in the 15th century. This was one Clement Paston (d. 1419), a peasant, holding and cultivating about one hundred acres of land, who gave an excellent education to his son William, and enabled him to study law. Making good use of his opportunities, William Paston (1378–1444), who is described as "a right cunning man in the law," attained an influential position in his profession, and in 1429 became a justice of the common pleas. He bought a good deal of land in Norfolk, including some in Paston, and improved his position by his marriage with Agnes (d. 1479), daughter and heiress of Sir Edmund Berry of Harlingbury, Hertfordshire. Consequently when he died he left a large and valuable inheritance to John Paston (1421–1466), the eldest of his five sons, who was already married to Margaret (d. 1484), daughter of John Mauteby of Mauteby. At this time England was in a very distracted condition. A weak king surrounded by turbulent nobles was incapable of discharging the duties of government, and only the strong man armed could hope to keep his goods in peace. A lawyer like his father, Paston spent much time in London, leaving his wife to look after his business in Norfolk; and many of the *Letters* were written by Margaret to her husband, detailing the progress of affairs in the county. It is during the lifetimes of John Paston and his eldest son that the *Letters* are most numerous and valuable, not only for family matters, but also for the history of England. In 1448 Paston's manor of Gresham was seized by Robert Hungerford, Lord Moleyns (1431–1464), and although it was afterwards recovered, the owner could obtain no redress for the loss and injury he had sustained. More serious troubles, however, were at hand. Paston had become very intimate with the wealthy knight, Sir John Fastolf, who was probably related to his wife, and who had employed him on several matters of business. In 1459 Sir John died without children, leaving his affairs in rather a tangled condition. In accordance with the custom of the time, he had conveyed many of his estates in Norfolk and Suffolk to trustees, among whom were John Paston and his brother William, retaining the revenues for himself, and probably intending his trustees after his death to devote the property to the foundation of a college. However, it was found that a few days before his decease Fastolf had executed a fresh will in which he had named ten executors, of whom two only, John Paston and another, were to act; and, moreover, that he had bequeathed all his lands in Norfolk and Suffolk to Paston, subject only to the duty of founding the college at Caister, and paying 4000 marks to the other executors. At once taking possession of the lands, Paston soon found his rights challenged. Various estates were claimed by different noblemen; the excluded executors were angry and aggressive; and Paston soon found himself in a whirlwind of litigation, and exposed also to more violent methods of attack. Something like a regular warfare was waged around Drayton and Hellesdon between John de la Pole, duke of Suffolk, and the Pastons under Margaret and her eldest son, John; Caister Castle was seized by John Mowbray, 3rd duke of Norfolk (d. 1461); and similar occurrences took place elsewhere. Some compensation, doubtless, was found in the fact that in 1460, and again in 1461, Paston had been returned to parliament as a knight of the shire for Norfolk, and enjoying the favour of Edward IV. had regained his castle at Caister. But the royal favour was only temporary, and, having been imprisoned on three occasions, Paston died in May 1466, leaving the suit concerning Fastolf's will still proceeding in the church courts. John Paston left at least five sons, the two eldest of whom were, curiously enough, both named John, and the eldest of whom had been knighted during his father's lifetime. Sir John Paston (1442–1479) was frequently at the court of King Edward IV., but afterwards he favoured the Lancastrian party, and, with his brother John, fought for Henry VI. at the battle of Barnet. Meanwhile the struggle over Fastolf's estates continued, although in 1461 the king and council had decided that Paston's ancestors were not bondmen, and consequently that his title to his father's lands was good. Caister Castle was taken after a regular siege by John Mowbray, 4th duke of Norfolk (1444–1476), and then recovered by the Pastons, and retaken by the duke. But in 1474 an arrangement was made with William Waynflete, bishop of Winchester, the representative of the excluded executors, by which some of the estates were surrendered to the bishop for charitable purposes, while Paston was secured in the possession of others. Two years later the opportune death of the duke of Norfolk paved the way for the restoration of Caister Castle; but in 1478 a fresh quarrel broke out with the duke of Suffolk. Sir John, who was a cultured man, had shown great anxiety to recover Caister; but in general he had left the conduct of the struggle to his mother and to the younger John. Owing to his carelessness and extravagance the family lands were also diminished by sales; but nevertheless when he died unmarried in November 1479 he left a goodly inheritance to his brother John. About this time the *Letters* begin to be scanty and less interesting, but the family continued to flourish. The younger John Paston (d. 1503), after quarrelling with his uncle William over the manors of Oxnead and Marlingford, was knighted at the battle of Stoke in 1487. He married Margery, daughter of Sir Thomas Brews, and left a son, William Paston (*c.* 1479–1554), who was also knighted, and who was a prominent figure at the court of Henry VIII. Sir William's second son, Clement (*c.* 1515–1597), served his country with distinction on the sea, and was wounded at the battle of Pinkie. The family was continued by Sir William's eldest son, Erasmus (d. 1540), whose son William succeeded to his grandfather's estates in 1554, and to those of his uncle Clement in 1597. This William (1528–1610) was knighted in 1578. He was the founder of the Paston grammar-school at North Walsham, and made Oxnead Hall, near Norwich, his principal residence. Christopher Paston was Sir William's son and heir, and Christopher's grandson, William (d. 1663), was created a baronet in 1642; being succeeded in the title by his son Robert (1631–1683), who was a member of parliament from 1661 to 1673, and was created earl of Yarmouth in 1679. Robert's son William (1652–1732), who married a natural daughter of Charles II., was the second earl, and, like his father, was in high favour with the Stuarts. When he died in 1732 he left no son, and his titles became extinct, his estates being sold to discharge his debts.

The perturbed state of affairs revealed by the *Paston Letters* reflects the general condition of England during the period. It was a time of trouble. The weakness of the government had disorganized every branch of the administration; the succession to the crown itself was contested; the great nobles lived in a state of civil war; and the prevailing discontent found expression in the rising of Jack Cade and in the Wars of the Roses. The correspondence reveals the Pastons in a great variety of relations to their neighbours, friendly or hostile; and abounds with illustrations of the course of public events, as well as of the manners and morals of the time. Nothing is more remarkable than the habitual acquaintance of educated persons, both men and women, with the law, which was evidently indispensable to persons of substance.

In addition to the editions of the *Paston Letters* already mentioned, see F. Blomefield and C. Parkin, *History of Norfolk* (London, 1805–1810), and the article in *Dict. Nat. Biog.* (A. W. H.*)

PASTORAL (from Lat. *pastor*, a shepherd), the name given to a certain class of modern literature in which the "idyll" of the Greeks and the "eclogue" of the Latins are imitated. It was a growth of humanism at the Renaissance, and its first home was Italy. Virgil had been imitated, even in the middle ages, but it was the example of Theocritus (*q.v.*) that was originally followed in pastoral. Pastoral, as it appeared in Tuscany in the 16th century, was really a developed eclogue, an idyll which had been expanded from a single scene into a drama. The first dramatic pastoral which is known to exist is the *Favola di Orfeo* of Politian, which was represented at Mantua in 1472. This poem, which has been elegantly translated by J. A. Symonds, was a tragedy, with choral passages, on an idyllic theme, and is perhaps too grave in tone to be considered as a pure piece of pastoral. It led the way more directly to tragedy than to pastoral, and it is the *Il Sagrifizio* of Agostino Beccari, which was played at the court of Ferrara in 1554, that is always quoted as the first complete and actual dramatic pastoral in European literature.

In the west of Europe there were various efforts made in the direction of non-dramatic pastoral, which it is hard to classify. Early in the 16th century Alexander Barclay, in England, translated the Latin eclogues of Mantuanus, a scholastic writer of the preceding age. Barnabe Googe, a generation later, in 1563, published his *Eglogs, Epytaphes and Sonnettes*, a deliberate but not very successful attempt to introduce pastoral into English literature. In France it is difficult to deny the title of pastoral to various productions of the poets of the Pléiade, but especially to Rémy Belleau's pretty miscellany of prose and verse in praise of a country life, called *La Bergerie* (1565). But the final impulse was given to non-dramatic pastoral by the publication, in 1504, of the famous *Arcadia* of J. Sannazaro, a work which passed through sixty editions before the close of the 16th century, and which was abundantly copied. Torquato Tasso followed Beccari after an interval of twenty years, and by the success of his *Aminta*, which was performed before the court of Ferrara in 1573, secured the popularity of dramatic pastoral. Most of the existing works in this class may be traced back to the influence either of the *Arcadia* or of the *Aminta*. Tasso was immediately succeeded by Alvisio Pasqualigo, who gave a comic turn to pastoral drama, and by Cristoforo Castelletti, in whose hands it grew heroic and romantic, while, finally, Guarini produced in 1590 his famous *Pastor Fido*, and Ongaro his fishermen's pastoral of *Alceo* in 1591. During the last quarter of the 16th century pastoral drama was really a power in Italy. Some of the best poetry of the age was written in this form, to be acted privately on the stages of the little court theatres, that were everywhere springing up. In a short time music was introduced, and rapidly predominated, until the little forms of tragedy, and pastoral altogether, were merged in opera.

With the reign of Elizabeth a certain tendency to pastoral was introduced in England. In Gascoigne and in Whetstone traces have been observed of a tendency towards the form and spirit of eclogue. It has been conjectured that this tendency, combined with the study of the few extant eclogues of Clémont Marot, led Spenser to the composition of what is the finest example of pastoral in the English language, the *Shepherd's Calendar*, printed in 1579. This famous work is divided into twelve eclogues, and it is remarkable because of the constancy with which Spenser turns in it from the artificial Latin style of pastoral then popular in Italy, and takes his inspiration direct from Theocritus. It is important to note that this is the first effort made in European literature to bring upon a pastoral stage the actual rustics of a modern country, using their own peasant dialect. That Spenser's attempt was very imperfectly carried out does not militate against the genuineness of the effort, which the very adoption of such names as Willie and Cuddie, instead of the customary Damon and Daphnis, is enough to prove. Having led up to this work, the influence of which was to be confined to England, we return to Sannazaro's *Arcadia*, which left its mark upon every literature in Europe. This remarkable romance, which was the type and the original of so many succeeding pastorals, is written in rich but not laborious periods of musical prose, into which are inserted at frequent intervals passages of verse, contests between shepherds on the "humile fistula di Coridone," or laments for the death of some beautiful virgin. The characters move in a world of supernatural and brilliant beings; they commune without surprise with "i gloriosi spiriti degli boschi," and reflect with singular completeness their author's longing for an innocent voluptuous existence, with no hell or heaven in the background.

It was in Spain that the influence of the *Arcadia* made itself most rapidly felt outside Italy. The earliest Spanish eclogues had been those of Juan de Encina, acted in 1492. Gil Vicente, who was also a Portuguese writer, had written Spanish religious pastorals early in the 16th century. But Garcilaso de la Vega is the founder of Spanish pastoral. His first eclogue, *El Dulce lamentar de los pastores*, is considered one of the finest poems of its kind in ancient or in modern literature. He wrote little, and died early, in 1536. Two Portuguese poets followed him, and composed pastorals in Spanish, Francisco de Sá de Miranda, who imitated Theocritus, and the famous Jorge de Montemayor, whose *Diana* (1524) was founded on Sannazaro's *Arcadia*. Gaspar Gil Polo, after the death of Montemayor in 1561, completed his romance, and published in 1564 a *Diana enamorada*. It will be recollected that both these works are mentioned with respect, in their kind, by Cervantes. The author of *Don Quixote* himself published an admirable pastoral romance, *Galatea*, in 1584.

In France there has always been so strong a tendency towards a graceful sort of bucolic literature that it is hard to decide what should and what should not be mentioned here. The charming *pastourelles* of the 13th century, with their knight on horseback and shepherdess by the roadside, need not detain us further than to hint that when the influence of Italian pastoral began to be felt in France these earlier lyrics gave it a national inclination. We have mentioned the *Bergerie* of Rémy Belleau, in which the art of Sannazaro seems to join hands with the simple sweetness of the medieval *pastourelle*. But there was nothing in France that could compare with the school of Spanish pastoral writers which we have just noticed. Even the typical French pastoral, the *Astrée* of Honoré d'Urfé (1610), has almost more connexion with the knightly romances which Cervantes laughed at than with the pastorals which he praised. The famous *Astrée* was the result of the study of Tasso's *Aminta* on the one hand and Montemayor's *Diana* on the other, with a strong flavouring of the romantic spirit of the *Amadis*. To remedy the pagan tendency of the *Astrée* a priest, Camus de Pontcarré, wrote a series of Christian pastorals. Racon produced in 1625 a pastoral drama, *Les Bergeries*, founded on the *Astrée* of D'Urfé.

In England the movement in favour of Theocritean simplicity which had been introduced by Spenser in the *Shepherd's Calendar*, was immediately defeated by the success of Sir Philip Sidney's *Arcadia*, a romance closely modelled on the masterpiece of Sannazaro. So far from attempting to sink to colloquial idiom, and adopt a realism in rustic dialect, the tenor of Sidney's narrative is even more grave and stately than it is conceivable that the conversation of the most serious nobles can have ever been. Henceforward, in England, pastoral took one or other of these forms. It very shortly appeared, however, that the Sannazarian form was more suited to the temper of the age, even in England, than the Theocritean. In 1583 a great impetus was given to the former by Robert Greene, who was composing his *Morando*, and still more in 1584 by the publication of two pastoral dramas, the *Gallathea* of Lyly and the *Arraignment of Paris* of Peele. It is doubtful whether either of these writers knew anything about the *Arcadia* of Sidney, which was posthumously published, but Greene, at all events, became more and more imbued with the Italian spirit of pastoral. His *Menaphon* and his *Never too Late* are pure bucolic romances. While in the general form of his stories, however, he follows Sidney, the verse which he introduces is often, especially in the *Menaphon*, extremely rustic and colloquial. In 1589 Lodge appended some eclogues to his *Scilla's Metamorphosis*, but in his *Rosalynde* (1590) he made a much more important contribution to English literature in general, and to Arcadian poetry in particular. This beautiful and fantastic book is modelled more exactly upon the masterpiece of Sannazaro than any other in our language. The *Sixe Idillia* of 1588, paraphrases of Theocritus, are anonymous, but conjecture has attributed them to Sir Edward Dyer. In 1598 Bartholomew Young published an English version of the *Diana* of Montemayor.

In 1585 Watson published his collection of Latin elegiacal eclogues, entitled *Amyntas*, which was translated into English by Abraham Fraunce in 1587. Watson is also the author of two frigid pastorals, *Meliboeus* (1590) and *Amyntae gaudia* (1592). John Dickenson printed at a date unstated, but probably not later than 1592, a "passionate eclogue" called *The Shepherd's Complaint*, which begins with a harsh burst of hexameters, but which soon settles down into a harmonious prose story, with lyrical interludes. In 1594 the same writer published the romance of *Arisbas*. Drayton is the next pastoral poet in date of publication. His *Idea: Shepherd's Garland* bears the date 1593, but was probably written much earlier. In 1595 the same poet produced an *Endimion and Phoebe*, which was the least happy of his works. He then turned his fluent pen to the other branches of poetic literature; but after more than thirty years, at the very close of his life, he returned to this early love, and published in 1627 two pastorals, *The Quest of Cynthia* and *The Shepherd's Sirena*. The general character of all these pieces is rich, but vague and unimpassioned. The *Queen's Arcadia* of Daniel must be allowed to lie open to the same charge, and to have been written rather in accordance with a fashion than in following of the author's predominant impulse. The singular eclogue by Barnfield, *The Affectionate Shepherd*, printed in 1594, is an exercise on the theme "O crudelis Alexi, nihil mea carmina curas," and, in spite of its juvenility and indiscretion, takes rank as the first really poetical following of Spenser and Virgil, in distinction to Sidney and Sannazaro. Marlowe's pastoral lyric *Come live with Me*, although not printed until 1599, has been attributed to 1589. In 1600 was printed the anonymous pastoral comedy in rhyme, *The Maid's Metamorphosis*, long attributed to Lyly.

With the close of the 16th century pastoral literature was not extinguished in England as suddenly or as completely as it was in Italy and Spain. Throughout the romantic Jacobean age the English love of country life asserted itself under the guise of pastoral sentiment, and the influence of Tasso and Guarini was felt in England just when it had ceased to be active in Italy. In England it became the fashion to publish lyrical eclogues, usually in short measure, a class of poetry peculiar to the nation and to that age. The lighter staves of *The Shepherd's Calendar* were the model after which all these graceful productions were drawn. We must confine ourselves to a brief enumeration of the principal among these Jacobean eclogues. Nicholas Breton came first with his *Passionate Shepherd* in 1604. Wither followed with *The Shepherd's Hunting* in 1615, and Braithwaite, an inferior writer, published *The Poet's Willow* in 1613 and *Shepherd's Tales* in 1621. The name of Wither must recall to our minds that of his friend William Browne, who published in 1613–1616 his beautiful collection of Devonshire idylls called *Britannia's Pastorals*. These were in heroic verse, and less distinctly Spenserian in character than those eclogues recently mentioned. In 1614 Browne, Wither, Christopher Brook and Davies of Hereford united in the composition of a little volume of pastorals entitled *The Shepherd's Pipe*. Meanwhile the composition of pastoral dramas was not entirely discontinued. In 1606 Day dramatized part of Sidney's *Arcadia* in his *Isle of Gulls*, and about 1625 the Rev. Thomas Goffe composed his *Careless Shepherdess*, which Ben Jonson deigned to imitate in the opening lines of his *Sad Shepherd*. In 1610 Fletcher produced his *Faithful Shepherdess* in emulation of the *Aminta* of Tasso. This is the principal pastoral play in the language, and, in spite of its faults in moral taste, it preserves a fascination which has evaporated from most of its fellows. The *Arcades* of Milton is scarcely dramatic; but it is a bucolic ode of great stateliness and beauty. In the *Sad Shepherd*, which was perhaps written about 1635, and in his pastoral masques, we see Ben Jonson not disdaining to follow along the track that Fletcher had pointed out in the *Faithful Shepherdess*. With the *Piscatory Eclogues* of Phineas Fletcher, in 1633, we may take leave of the more studied forms of pastoral in England early in the 17th century.

When pastoral had declined in all the other nations of Europe, it enjoyed a curious recrudescence in Holland. More than a century after date, the *Arcadia* of Sannazaro began to exercise an influence on Dutch literature. Johan van Heemskirk led the way with his popular *Batavische Arcadia* in 1637. In this curious romance the shepherds and shepherdesses move to and fro between Katwijk and the Hague, in a landscape unaffectedly Dutch. Heemskirk had a troop of imitators. Hendrik Zoeteboom published his *Zaanlandsche Arcadia* in 1658, and Lambertus Bos his *Dordtsche Arcadia* in 1662. These local imitations of the suave Italian pastoral were followed by still more crude romances, the *Rotterdamsche Arcadia* of Willem den Elger, the *Walchersche Arcadia* of Gargon, and the *Noordwijker Arcadia* of Jacobus van der Valk. Germany has nothing to offer us of this class, for the *Diana* of Werder (1644) and *Die adriatische Rosamund* of Zesen (1645) are scarcely pastorals even in form.

In England the writing of eclogues of the sub-Spenserian class of Breton and Wither led in another generation to a rich growth of lyrics which may be roughly called pastoral, but are not strictly bucolic. Carew, Lovelace, Suckling, Stanley and Cartwright are lyrists who all contributed to this harvest of country song, but by far the most copious and the most characteristic of the pastoral lyrists is Herrick. He has, perhaps, no rival in modern literature in this particular direction. His command of his resources, his deep originality and observation, his power of concentrating his genius on the details of rural beauty, his interest in recording homely facts of country life, combined with his extraordinary gift of song to place him in the very first rank among pastoral writers; and it is noticeable that in Herrick's hands, for the first time, the pastoral became a real and modern, instead of being an ideal and humanistic thing. From him we date the recognition in poetry of the humble beauty that lies about our doors. His genius and influence were almost instantly obscured by the Restoration. During the final decline of the Jacobean drama a certain number of pastorals were still produced. Of these the only ones which deserve mention are three dramatic adaptations, Shirley's *Arcadia* (1640), Fanshawe's *Pastor Fido* (1646), and Leonard Willan's *Astraea* (1651). The last pastoral drama in the 17th century was Settle's *Pastor Fido* (1677). The Restoration was extremely unfavourable to this species of literature. Sir Charles Sedley, Aphra Behn and Congreve published eclogues, and the *Pastoral Dialogue between Thirsis and Strephon* of the first-mentioned was much admired. All of these, however, are in the highest degree insipid and unreal, and partook of the extreme artificiality of the age.

Pastoral came into fashion again early in the 18th century. The controversy in the *Guardian*, the famous critique on Ambrose Philips's *Pastorals*, the anger and rivalry of Pope, and the doubt which must always exist as to Steele's share in the mystification, give 1708 a considerable importance in the annals of bucolic writing. Pope had written his idylls first, and it was a source of infinite annoyance to him that Philips contrived to precede him in publication. He succeeded in throwing ridicule on Philips, however, and his own pastorals were greatly admired. Yet there was some nature in Philips, and, though Pope is more elegant and faultless, he is not one whit more genuinely bucolic than his rival. A far better writer of pastoral than either is Gay, whose *Shepherd's Week* was a serious attempt to throw to the winds the ridiculous Arcadian tradition of nymphs and swains, and to copy Theocritus in his simplicity. Gay was far more successful in executing this pleasing and natural cycle of poems than in writing his pastoral tragedy of *Dione* or his "tragi-comico pastoral farce" of *The What d'ye call it?* (1715). He deserves a very high place in the history of English pastoral on the score of his *Shepherd's Week*. Swift proposed to Gay that he should write a Newgate pastoral in which the swains and nymphs should talk and warble in slang. This Gay never did attempt; but a northern admirer of his and Pope's achieved a veritable and lasting success in Lowland Scotch, a dialect then considered no less beneath the dignity of verse. Allan Ramsay's *Gentle Shepherd*, published in 1725, was the last, and remains the most vertebrate and interesting, bucolic drama produced in Great Britain. It remained a favourite, a hundred and fifty years after, among Lowland reapers and milkmaids.

With the *Gentle Shepherd* the chronicle of pastoral in England practically closes. This is at least the last performance which can be described as a developed eclogue of the school of Tasso and Guarini. It is in Switzerland that we find the next important revival of pastoral properly so-called. The taste of the 18th century was very agreeably tickled by the religious idylls of Salomon Gessner, who died in 1787. His *Daphnis und Phillis* and *Der Tod Abels* were read and imitated throughout Europe. In German literature they left but little mark, but in France they were cleverly copied by Arnaud Berquin. A much more important pastoral writer is Jean Pierre Clovis de Florian, who began by imitating the *Galatea* of Cervantes, and continued with an original bucolic romance entitled *Estelle*. It has always been noticeable that pastoral is a form of literature which disappears before a breath of ridicule. Neither Gessner nor his follower Abbt were able to survive the laughter of Herder. Since Florian and Gessner there has been no reappearance of bucolic literature properly so-called. The whole spirit of romanticism was fatal to pastoral. Voss in his *Luise* and Goethe in *Hermann und Dorothea* replaced it by poetic scenes from homely and simple life.

Half a century later something like pastoral reappeared in a totally new form, in the fashion for *Dorfgeschichten*. About 1830 the Danish poet S. S. Blicher, whose work connects the grim studies of George Crabbe with the milder modern strain of pastoral, began to publish his studies of out-door romance among the poor in Jutland. Immermann followed in Germany with his novel *Der Oberhof* in 1839. Auerbach, who has given to the 19th-century idyll its peculiar character, began to publish his *Schwarzwälder Dorfgeschichten* in 1843. Meanwhile George Sand was writing *Jeanne* in 1844, which was followed by *La Mare au Diable* and *François le Champi*, and in England Clough produced in 1848 his remarkable long-vacation pastoral *The Bothie of Tober-na-Vuolich*. It seems almost certain that these writers followed a simultaneous but independent impulse in this curious return to bucolic life, in which, however, in every case, the old tiresome conventionality and affectation of lady-like airs and graces were entirely dropped. This school of writers was presently enriched in Norway by Björnson, whose *Synnöve Solbakken* was the first of an exquisite series of pastoral romances. But perhaps the best of all modern pastoral romances is Fritz Reuter's *Ut mine Stromtid*, written in the Mecklenburg dialect of German. In England the Dorsetshire poems of William Barnes and the Dorsetshire novels of Thomas Hardy belong to the same class. It will be noticed, of course, that all these recent productions have so much in common with the literature which is produced around them that they almost evade separate classification. It is conceivable that some poet, in following the antiquarian tendency of the age, may enshrine his fancy once more in the five acts of a pure pastoral drama of the school of Tasso and Fletcher, but any great vitality in pastoral is hardly to be looked for in the future. (E. G.)

PASTORAL EPISTLES, the name given to St Paul's letters to Timothy and Titus. The term seems to have originated with J. A. L. Wegscheider (1771–1849), professor at Halle. The three epistles mentioned are written to men rather than churches, and to men appointed to certain pastoral work. In this respect they differ from the personal and intimate note which Paul wrote to Philemon. They are closely related in origin, style, diction and thought, and occupy so distinct a place in these respects that the Pauline authorship of them has been much questioned. (See TIMOTHY, EPISTLES TO; TITUS, EPISTLE TO.)

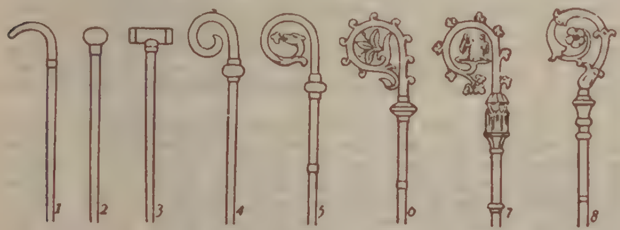
PASTORAL LETTER, an open letter addressed by a bishop to the clergy or laity of his diocese, or to both, containing either general admonition, instruction or consolation, or directions for behaviour in particular circumstances. In the Catholic Church such letters are also sent out regularly at particular ecclesiastical seasons, particularly at the beginning of fasts. In the non-episcopal Protestant churches the name "pastoral letter" is given to any open letter addressed by a pastor to his congregation, but more especially to that customarily issued at certain seasons, *e.g.* by the moderator of a Presbyterian assembly or the chairman of a Congregational or Baptist union.

PASTORAL STAFF, in the Christian Church, an ensign of office or dignity. It is some five feet long, ending at the top in a crook (*volute*) bent inwards, and made of metal, ivory or wood. If of metal, it is hollow; if of wood, it is usually covered with metal. The crook is usually richly ornamented, and is divided from the shaft by a boss; the shaft is commonly separated into sections by rings, so that it can be taken to pieces.

The pastoral staff is the ensign proper of cardinals (except cardinal-deacons) and bishops; but the former are entitled to use it only in the churches from which they derive their titles, the latter only in their dioceses. The pope so early as the time of Innocent III. did not carry the pastoral staff, and it would seem never to have been his custom. The *ferula* that the Ordo of Cencius Sabellius (ch. 48) speaks of was not a pastoral staff, but the symbol of authority over the papal palace, with which by its transference he was invested. This *ferula*, mentioned by Luitprand of Cremona in his account of the deposition of Benedict V., and the *baculus aureus* of the *Historia dedicationis ecclesiae cavensis* (*Acta Sanctorum*, 4 March, i. 354) are sceptres. Abbots carry the pastoral staff only when specially empowered by the pope to do so, and then only in the territory under the jurisdiction of their monastery and in the churches subordinated to it. With certain restrictions the pastoral staff is also sometimes conceded to dignitaries of cathedral and collegiate churches, but never to abbesses (*Sacra Congreg. Rit.* 29 Jan. 1656).

The pastoral staff, as its name implies, symbolizes the pastoral office and authority, a symbolism already known to Isidore of Seville (*De ecclesiast. off.* ii. 5). This symbolism is expressed in the words used, at least since the 10th century, by the consecrator in delivering the pastoral staff at the consecration of a bishop and the benediction of an abbot. The pastoral staff is carried in the left hand, in order that the right may remain free to give the blessing. The bishop is directed so to hold it (*Cerem. episc.* ii. 8, 25) that the crook is turned towards the people. It is used not only at pontifical High Mass but at all solemn pontifical functions, *e.g.* vespers, consecrations, processions. It is uncertain at what period the use of the pastoral staff was introduced; but the evidence tends to show that it was about the 5th century, in Gaul or Spain. The pastoral staff was certainly in use in Gaul in the 6th century (*Vita S. Caesar. Arelat.* ii. 18), in Spain at least as early as the 7th, and in Ireland also in the 7th; in Italy, so far as the available evidence shows, its introduction was comparatively late. It had originally nothing of its present liturgical character; this was given to it in the post-Carolingian period.

As regards the development of the form of the pastoral staff, there are four principal types: (1) staves with a simple crook, the oldest form, which survived in Ireland until the 12th century; (2) staves with a ball or knob at the top, a rare form which did not long survive as a pastoral staff; (3) staves with a horizontal crook, so-called Tau-staves, used especially by abbots and surviving until the 13th century; (4) staves with crook bent inwards. These last already appear in miniatures of the 9th century; from the 11th onwards they predominated; and in the 13th century they ousted all other forms. Originally plain, the crook was from the 11th century onwards often made in the form of a snake (5), which in richer staves encircled the Lamb of God or the representation of a figure. Since the 13th century the snake, under Gothic influence, developed into a boldly designed tendril set with leaves, which usually encircled a figure or group of figures, and the knob dividing shaft and crook into an elegant chapel (6 and 7). Finally, at the close of the middle ages, the lower part of the crook was bent outwards so that the actual volute came over the middle of the knob, the type that remained dominant from that time onwards (8). As a decoration, rather than for practical reasons, a fine folded cloth (*pannisellus*, *sudarium*, *velum*, Eng. veil), was from the 14th century onward often suspended from the knob of the pastoral staff. This was done both in the case of bishops' and of abbots' staves, but is now confined to the latter (*Cerem. episc.* i. 11, 5; *Decr. Alex. VII.* 27 Sept. 1659; *Sacr. Congr. Rit.* 27 Sept. 1847).



From the pastoral staff must be distinguished the staff of the *chorepiscopus* (director of the choir) and cantors, which is still in use here and there. This, which is also known as *bordonus*, was developed out of the choir-staves, originally no more than sticks to lean on during the long services.

The Reformation abolished the pastoral staff almost everywhere.[1] In the Church of England, however, it was retained among the episcopal ornaments prescribed by the first Prayer-book of Edward VI., and, though omitted in the second Prayer-book, its use seemed once more to be enjoined under the Ornaments Rubric of Elizabeth's Prayer-book. Whatever the theoretical value of this injunction may have been, however, in practice the use of the pastoral staff was discontinued until its gradual revival in the last decades of the 19th century.

In the Churches of the East, a pastoral staff (Gr. *ῥάβδος*, Russ. *possoch*, *paterissa*, Syr. and Nest. *chutra*, Arm. *gavazan hayrapetatz*, Copt. *šbot*) is borne among the Syrians only by the patriarch, in all the other rites by all bishops, in the Greek Church also by archimandrites and abbots, and in the Armenian Church also by the *vartapeds* (teachers). The staff of Armenian bishops is reminiscent of that of the West, from which it is apparently derived; that of the *vartapeds* is encircled at the upper end by one or two snakes. The Coptic patriarch uses an iron cross-staff. For the rest, the pastoral staff in the Oriental rites is T-shaped. It is of wood inlaid with ivory and mother-of-pearl. A veil is attached to the staff among the Greeks, Armenians and Copts. The bishops of the Coptic, Syrian and Nestorian Uniate Churches have adopted the Roman pastoral staff.

See Ch. Cahier et A. Martin, *Mélanges d'archéologie* (Paris, 1856), iv. 145 seq.; Rohault et Fleury, *La Messe* (Paris, 1889), vii. 75 seq. For the Anglican usage see the Report of the Sub-committee of Convocation on the Ornaments of the Church, &c. (London, 1908). (J. BRA.)

PATAGONIA, the name given to that portion of South America which, to the east of the Andes, lies mainly south of the Rio Negro (41° S.), and, to the west of the Andes, south of the Chilean province of Llanquihué (42° S.). The Chilean portion embraces the two provinces of Chiloe and Magallanes. East of the Andes the Argentine portion of Patagonia is divided into four territories: (1) Neuquen, 42,000 sq. m. approximately, including the triangle between the rivers Limay and Neuquen, and extending southward to the northern shore of Lake Nahuel-Huapi (41° S.) and northward to the Rio Colorado; (2) Rio Negro, 76,000 sq. m. approximately, extending from the Atlantic to the Cordillera of the Andes, to the north of 42° S.; (3) Chubut, 95,000 sq. m. approximately, embracing the region between 42° and 46° S.; and (4) that portion of the province of Santa Cruz which stretches from the last-named parallel as far south as the dividing line with Chile, and between Point Dungeness and the watershed of the Cordillera, an area approximately of 106,000 sq. m.

Physiography.—The general character of the Argentine portion of Patagonia is for the most part a region of vast steppe-like plains, rising in a succession of abrupt terraces about 300 ft. at a time, and covered with an enormous bed of shingle almost bare of vegetation. In the hollows of the plains are ponds or lakes of brackish and fresh water. Towards the Andes the shingle gives place to porphyry, granite and basalt lavas, animal life becomes more abundant and vegetation more luxuriant, acquiring the characteristics of the flora of the western coast, and consisting principally of the beech and conifers.

Among the depressions by which the plateau is intersected transversely, the principal are the Gualichu, south of the Rio Negro, the Maquinchau and Balchetā (through which previously flowed the waters of lake Nahuel-Huapi, which now feed the river Limay); the Senguerr, the Deseado. Besides these transverse depressions (some of them marking lines of ancient inter-oceanic communication), there are others which were occupied by more or less extensive lakes, such as the Yagagtoo, Musters and Colhuapi, and others situated to the south of Puerto Deseado, in the centre of the country. In the central region volcanic eruptions, which have taken part in the formation of the plateau from the Tertiary period down to the present era, cover a large part with basaltic lava-caps; and in the western third more recent glacial deposits appear above the lava. There, in contact with folded Cretaceous rocks, uplifted by the Tertiary granite, erosion, caused principally by the sudden melting and retreat of the ice, aided by tectonic changes, has scooped out a deep longitudinal depression, which generally separates the plateau from the first lofty hills, the ridges generally called the pre-Cordillera, while on the west of these there is a similar longitudinal depression all along the foot of the snowy Andean Cordillera. This latter depression contains the richest and most fertile land of Patagonia.

The geological constitution is in accordance with the orographic physiognomy. The Tertiary plateau, flat on the east, gradually rising on the west, shows Upper Cretaceous caps at its base. First come Lower Cretaceous hills, raised by granite and dioritic rocks, undoubtedly of Tertiary origin, as in some cases these rocks have broken across the Tertiary beds, so rich in mammal remains; then follow, on the west, metamorphic schists of uncertain age; then quartzites appear, resting directly on the primitive granite and gneiss which form the axis of the Cordillera. Porphyritic rocks occur between the schists and the quartzites. The Tertiary deposits are greatly varied in character, and there is considerable difference of opinion concerning the succession and correlation of the beds. They are divided by Wilckens[2] into the following series (in ascending order):—

1. Pyrotherium-Notostylops beds. Of terrestrial origin, containing remains of mammalia. Eocene and Oligocene.

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[1] Among curious exceptions is the pastoral staff still carried by the Lutheran abbot of Lokkum.

[2] O. Wilckens, "Die Meeresablagerungen der Kreide- und Tertiar-formation in Patagonien," in *Neues Jahrb. f. Min.*, Beilage-Band XXI. (1906), 98–195.

2. Patagonian Molasse. Partly marine, partly terrestrial. Lower Miocene. Wilckens includes in this series the coal of Punta Arenas, and the marine beds below it.

3. Santa Cruz series. Containing remains of mammals. Middle and Upper Miocene.

4. Paraná series. Sandstones and conglomerates with marine fossils. Pliocene. Confined to the eastern part of the region.

The Upper Cretaceous and Tertiary deposits have revealed a most interesting vertebrate fauna. This, together with the discovery of the perfect cranium of a chelonian of the genus *Myolania*, which may be said to be almost identical with *Myolania oweni* of the Pleistocene age in Queensland, forms an evident proof of the connexion between the Australian and South American continents. The Patagonian *Myolania* belongs to the Upper Chalk, having been found associated with remains of *Dinosauria*. Other specimens of the interesting fauna of Patagonia, belonging to the Middle Tertiary, are the gigantic wingless birds, exceeding in size any hitherto known, and the singular mammal *Pyrotherium*, also of very large dimensions. In the Tertiary marine formation a considerable number of cetaceans has been discovered. In deposits of much later date, formed when the physiognomy of the country did not differ materially from that of the present time, there have been discovered remains of pampean mammals, such as *Glyptodon*, and *Macrauchenia*, and in a cave near Last Hope Inlet, a gigantic ground sloth (*Grypotherium listai*), an animal which lived contemporaneously with man, and whose skin, well preserved, showed that its extermination was undoubtedly very recent. With the remains of *Grypotherium* have been found those of the horse (*Onoshippidium*), which are known only from the lower pampas mud, and of the *Arctotherium*, which is found, although not in abundance, in even the most modern Pleistocene deposits in the pampas of Buenos Aires. It would not be surprising if this latter animal were still in existence, for footprints, which may be attributed to it, have been observed on the borders of the rivers Tamango and Pista, affluents of the Las Heras, which run through the eastern foot-hills of the Cordillera in 47° S.

Glaciers occupy the valleys of the main chain and some of the lateral ridges of the Cordillera, and descend to lakes San Martin, Viedma, Argentino and others in the same locality, strewing them with icebergs. In Patagonia an immense ice-sheet extended to the east of the present Atlantic coast during the first ice age, at the close of the Tertiary epoch, while, during the second glacial age in modern times, the terminal moraines have generally stopped, 30 miles in the north and 50 miles in the south, east of the summit of the Cordillera. These ice-sheets, which scooped out the greater part of the longitudinal depressions, and appear to have rapidly retreated to the point where the glaciers now exist, did not, however, in their retirement fill up with their detritus the fjords of the Cordillera, for these are now occupied by deep lakes on the east, and on the west by the Pacific channels, some of which are as much as 250 fathoms in depth, and soundings taken in them show that the fjords are as usual deeper in the vicinity of the mountains than to the west of the islands. Several of the high peaks are still active volcanoes.

In so far as its main characteristics are concerned, Patagonia seems to be a portion of the Antarctic continent, the permanence of which dates from very recent times, as is evidenced by the apparent recent emergence of the islets around Chiloe, and by the general character of the pampean formation. Some of the promontories of Chiloe are still called *huapi*, the Araucanian equivalent for "islands"; and this may perhaps be accepted as perpetuating the recollection of the time when they actually were islands. They are composed of caps of shingle, with great, more or less rounded boulders, sand and volcanic ashes, precisely of the same form as occurs on the Patagonian plateau. From an examination of the pampean formation it is evident that in recent times the land of the province of Buenos Aires extended farther to the east, and that the advance of the sea, and the salt-water deposits left by it when it retired, forming some of the lowlands which occur on the littoral and in the interior of the pampas, are much more recent phenomena; and certain caps of shingle, derived from rocks of a different class from those of the neighbouring hills, which are observed on the Atlantic coasts of the same province, and increase in quantity and size towards the south, seem to indicate that the caps of shingle which now cover such a great part of the Patagonian territory recently extended farther to the east, over land which has now disappeared beneath the sea, while other marine deposits along the same coasts became converted into bays during the subsequent advance of the sea. There are besides, in the neighbourhood of the present coast, deposits of volcanic ashes, and the ocean throws up on its shores blocks of basaltic lava, which in all probability proceed from eruptions of submerged volcanoes now extinct. One fact, however, which apparently demonstrates with greater certainty the existence in recent times of land that is now lost, is the presence of remains of pampean mammals in Pleistocene deposits in the bay of San Julian and in Santa Cruz. The animals undoubtedly reached these localities from the east; it is not at all probable that they advanced from the north southwards across the plateau intersected at that time by great rivers and covered by the ice-sheet. With the exception of the discoveries at the inlet of Ultima Esperanza, which is in close communication with the Atlantic valley of Gallegos, none of these remains have been discovered in the Andean regions.

On the upper plains of Neuquen territory thousands of cattle can be fed, and the forests around Lakes Traful and Nahuel-Huapi yield large quantities of valuable timber. The Neuquen river is not navigable, but as its waters are capable of being easily dammed in places, large stretches of land in its valley are utilized; but the lands on each side of its lower part are of little commercial value. As the Cordillera is approached the soil becomes more fertile, and suitable districts for the rearing of cattle and other agricultural purposes exist between the regions which surround the Tromen volcano and the first ridges of the Andes. Chos Malal, the capital of the territory, is situated in one of these valleys. More to the west is the mining region, in great part unexplored, but containing deposits of gold, silver, copper and lignite. In the centre of the territory, also in the neighbourhood of the mining districts, are the valleys of Norquin and Las Lajas, the general camp of the Argentine army in Patagonia, with excellent timber in the forest on the Andean slope. The wide valleys occur near Rio Malleco, Lake Huechulafquen, the river Chimehuin, and Vega de Chapelco, near Lake Lacar, where are situated villages of some importance, such as Junin de los Andes and San Martin de los Andes. Close to these are the famous apple orchards supposed to have been planted by the Jesuits in the 17th and 18th centuries. These regions are drained by the river Collon-Cura, the principal affluent of the river Limay. Lake Lacar is now a contributary of the Pacific, its outlet having been changed to the west, owing to a passage having been opened through the Cordillera.

The Rio Negro runs along a wide transverse depression, the middle part of which is followed by the railway which runs to the settlement of Neuquen at the confluence of the rivers Limay and Neuquen. In this depression are several settlements, among them Viedma, the capital of the Rio Negro territory, Pringles, Conesa, Choele-Choel and Roca. To the south of the Rio Negro the Patagonian plateau is intersected by the depressions of the Gualicho and Maquinchau, which in former times directed the waters of two great rivers (now disappeared) to the gulf of San Matias, the first-named depression draining the network of the Collon-Cura and the second the Nahuel-Huapi lake system. In 42° S. there is a third broad transverse depression, apparently the bed of another great river, now perished, which carried to the Atlantic the waters of a portion of the eastern slope of the Andes, between 41° and 42° 30′ S.

Chubut territory presents the same characteristics as the Rio Negro territory. Rawson, the capital, is situated at the mouth of the river Chubut on the Atlantic (42° 30′ S.). The town was founded in 1865 by a group of colonists from Wales, assisted by the Argentine government; and its prosperity has led to the foundation of other important centres in the valley, such as Treleu and Gaiman, which is connected by railway with Porto Madryn on Bahia Nueva. Here is the seat of the governor of the territory, and by 1895 the inhabitants of this part of the territory, composed principally of Argentines, Welsh and Italians, numbered 2585. The valley has been irrigated and cultivated, and produces the best wheat of the Argentine Republic. Between the Chubut and the Senguerr there are vast stretches of fertile land, spreading over the Andean region to the foot of the Cordillera and the lateral ridges of the Pre-Cordillera, and filling the basins of some desiccated lakes, which have been occupied since 1885, and farms and colonies founded upon them. The chief of these colonies is that of the 16th of October (16 de Octobre), formed in 1886, mainly by the inhabitants of Chubut colony, in the longitudinal valley which extends to the eastern foot of the Cordillera. Other rivers in this territory flow into the Pacific through breaches in the Cordillera, *e.g.* the upper affluents of the Fetaleufu, Palena and Rio Cisnes. The principal affluent of the Palena, the Carrenleufu, carries off the waters of Lake General Paz, situated on the eastern slope of the Cordillera. Rio Pico, an affluent of the same river, receives nearly the whole of the waters of the extensive undulating plain which lies between the Rio Teka and the Rio Senguerr to the east of the Cordillera, while the remainder are carried away by the affluents of Rio Jehua, viz., the Cherque, Omkel and Appeleg. This region contains auriferous drifts, but these, like the auriferous deposits, veins of galena and lignite in the mountains farther west which flank the Cordillera, have not been properly investigated. At Lake Fontana there are auriferous drifts and lignite deposits which abound in fossil plants of the Cretaceous age. The streams which form the rivers Mayo and Chalia join the tributaries of the Rio Aisen, which flows into the Pacific, watering in its course extensive and valuable districts where colonization has been initiated by Argentine settlers. Colonies have also been formed in the basin of Lakes Musters and Colhué; and on the coasts near the Atlantic, along Bahia Camarones and the Gulf of San Jorge, there are extensive farms.

The territory of Santa Cruz is arid along the Atlantic coast and in the central portion between 46° and 50° S. With the exception of certain valleys at Puerto Deseado (Port Desire) and in the transverse basins which occur as far south as Puerto San Julian, and which contain several cattle farms, few spots are capable of cultivation, the pastures being poor, water insufficient and salt lagunas fairly numerous. Puerto Deseado is the outlet for the produce of the Andean region situated between Lakes Buenos Aires and Pueyrredon.

Into this inlet there flowed at the time of the conquest a voluminous river, which subsequently disappeared, but returned again to its ancient bed, owing to the river Fenix, one of its affluents, which had deviated to the west, regaining its original direction. Lake Buenos Aires, the largest lake in Patagonia, measuring 75 m. in length, poured its waters into the Atlantic even in post-Glacial times by means of the river Deseado; and it is so depicted on the maps of the 17th and 18th centuries; and so too did Lake Pueyrredon, which, through the action of erosion, now empties itself westward, through the river Las Heras, into the Calen inlet of the Pacific, in 48° S. San Julian on Puerto San Julian, where Ferdinand Magellan wintered, is the centre of a cattle farming colony, and colonists have pushed into the interior up the valley of a now extinct river which in comparatively recent times carried down to Puerto San Julian the waters of Lakes Volcan, Belgrano, Azara, Nansen, and some other lakes which now drain into the river Mayer and so into Lake San Martin. The valleys of the Rio Chico throughout their whole extent, as well as those of Lake Shehuen, afford excellent grazing, and around Lakes Belgrano, Burmeister and Rio Mayer and San Martin there are spots suitable for cultivation. In the Cretaceous hills which flank the Cordillera important lignite beds and deposits of mineral oils have been discovered. The Rio Santa Cruz, originally explored by Captain Fitzroy and Charles Darwin, is an important artery of communication between the regions bordering upon the Cordillera and the Atlantic. In Santa Cruz bay an important trade centre has been established. But the present cattle region *par excellence* of Patagonia is the department of Rio Gallegos, the farms extending from the Atlantic to the Cordillera. Puerto Gallegos itself is an important business centre, which bids fair to rival the Chilean colony of Punta Arenas, on the Straits of Magellan. Owing to the produce of the cattle farms established there, the working of coal in the neighbourhood, and the export of timber from the surrounding forests, the town of Punta Arenas is in a flourishing condition. Its population numbers about 4000. But the colonization of the western (Chilean) coast has generally failed, principally owing to the adverse climatic conditions of the Cordillera in those latitudes.

Climate.—The climate is less severe than was supposed by early travellers. The east slope is warmer than the west, especially in summer, as a branch of the southern equatorial current reaches its shores, whereas the west coast is washed by a cold current. At Puerto Montt, on the inlet behind Chiloe Island, the mean annual temperature is 52° F. and the average extremes 78° and 29·5°, whereas at Bahia Blanca near the Atlantic coast and just outside the northern confines of Patagonia the annual temperature is 59° and the range much greater. At Punta Arenas, in the extreme south, the mean temperature is 43° and the average extremes 76° and 28°. The prevailing winds are westerly, and the westward slope has a much heavier precipitation than the eastern; thus at Puerto Montt the mean annual precipitation is 97 in., but at Bahia Blanca it is 19 in. At Punta Arenas it is 22 in.

Fauna.—The guanaco, the puma, the zorro or Brazilian fox (*Canis azarae*), the zorrino or *Mephitis patagonica* (a kind of skunk), and the tuco-tuco or *Ctenomys magellanicus* (a rodent) are the most characteristic mammals of the Patagonian plains. The guanaco roam in herds over the country and form with the ostrich (*Rhea americana*, and more rarely *Rhea darwinii*) the chief means of subsistence for the natives, who hunt them on horseback with dogs and bolas. Bird-life is often wonderfully abundant. The carrancha or carrion-hawk (*Polyborus tharus*) is one of the characteristic objects of a Patagonian landscape; the presence of long-tailed green parakeets (*Conurus cyanolysius*) as far south as the shores of the strait attracted the attention of the earlier navigators; and humming-birds may be seen flying amidst the falling snow. Of the many kinds of water-fowl it is enough to mention the flamingo, the upland goose, and in the strait the remarkable steamer duck.

Population.—The natives of Patagonia are nearly extinct. Here and there one may find a Tehuelchian or Gennaken encampment, but natives of pure race are now very scarce, and the two races all told probably do not number more than 100 male individuals. The Tehuelches were the dominant race in Patagonia. These people, from whom the name of Tierra de Patagones was given by Magellan on observing their large footprints, are remarkable for their great stature, having an average height of 6 ft. to 6 ft. 4 in. They are not known to have applied any collective name to their various tribes; Tehuelche is the Araucanian name for them. They have been described as kindly in disposition, though sometimes quarrelsome; skilled in the chase, addicted to gambling and to drinking, though also capable of long endurance of privation. Their religion recognized a Great Spirit, and designated the new moon as an object of worship. The Gennakens differ in type and language from the Tehuelches. The remaining population is composed of Araucanians, a mixture of the Tehuelches and Gennaken. But these are not the only type of people who have dwelt in Patagonia. The ancient burial-places have yielded the bones of other races quite distinct from the present inhabitants, some of them having greatly resembled the primitive types which are met with more to the north, in the Argentine Chaco and in Brazil; while others, again, strongly resembled certain of the Pacific races, in that they possessed ethnic characteristics which have not been observed elsewhere in South America. Among these remains every type of artificial deformity of the skull hitherto known has been found, while at the present time the natives only practise the occipital deformation which is so common among the western tribes of America.

History.—Patagonia was discovered in 1520 by Ferdinand Magellan, who on his passage along the coast named many of the more striking features—Gulf of San Matias, Cape of 11,000 Virgins (now simply Cape Virgenes), &c. By 1611 the Patagonian god Setebos (Settaboth in Pigafetta) was familiar to the hearers of the *Tempest*. Rodrigo de Isla, despatched inland in 1535 from San Matias by Alcazava Sotomayor (on whom western Patagonia had been conferred by the king of Spain), was the first to traverse the great Patagonian plain, and, but for the mutiny of his men, he would have struck across the Andes to the Chilean side. Pedro de Mendoza, on whom the country was next bestowed, lived to found Buenos Aires, but not to carry his explorations to the south. Alonzo de Camargo (1539), Juan Ladrilleros (1557) and Hurtado de Mendoza (1558) helped to make known the western coasts, and Sir Francis Drake's voyage in 1577 down the eastern coast through the strait and northward by Chile and Peru was memorable for several reasons; but the geography of Patagonia owes more to Pedro Sarmiento de Gamboa (1579–1580), who, devoting himself especially to the south-west region, made careful and accurate surveys. The settlement which he founded at Nombre de Dios and San Felipe were neglected by the Spanish government, and the latter was in such a miserable state when Thomas Cavendish visited it in 1587 that he called it Port Famine. The district in the neighbourhood of Puerto Deseado, explored by John Davis about the same period, was taken possession of by Sir John Narborough in the name of King Charles II. in 1669. In the second half of the 18th century knowledge of Patagonia was augmented by Byron (1764–1765), S. Wallis (1766) and L. A. de Bougainville (1766); Thomas Falkner, a Jesuit who "resided near forty years in those parts," published his *Description of Patagonia* (Hereford, 1774); Francesco Viedma founded El Carmen, and Antonio advanced inland to the Andes (1782); and Basilio Villarino ascended the Rio Negro (1782). The "Adventure" and "Beagle" expeditions under Philip King (1826–1830) and Robert Fitzroy (1832–1836) were of first-rate importance, the latter especially from the participation of Charles Darwin; but of the interior of the country nothing was observed except 200 miles of the course of the Santa Cruz. Captain G. C. Musters in 1869 wandered in company with a band of Tehuelches through the whole length of the country from the strait to the Manzaneros in the north-west, and collected a great deal of information about the people and their mode of life. Since that date explorations have been carried on by F. P. Moreno, Ramon Lista, Carlos M. Moyano, A. Bertrand, H. Steffen, P. Krüger, R. Hauthal, C. Burckhardt, O. Nordenskiöld, J. B. Hatcher, the surveyors of the Argentine and Chilean Boundary Commissions and others.

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PATAN (="city"), the name of two historic cities in India. One of these, known as Anhilwada Patan, was the capital of the last Hindu dynasty of Gujarat, sacked by Mahmud of Ghazni and finally destroyed by the Mahommedans in 1298. Near its ruins, which are not considerable, has sprung up a modern town, in the state of Baroda (pop. 31,402), which contains many Jain temples (with palm-leaf MSS.) and has manufactures of fine cotton and silk textiles. The other Patan, known as Lalita Patan, was the capital of one of the three Newar kingdoms in the valley of Nepal, conquered by the Gurkhas at the end of the 18th century. It is situated close to Katmandu, on the opposite bank of the river Baghmati. The population is estimated at about 30,000, mostly Newars, who are Buddhists; and the buildings consist mainly of old Buddhist shrines and monasteries.

PATARA, an ancient town of Asia Minor, on the Lycian coast, 3 m. E. of the mouth of the Xanthus river (mod. Eshen Chai). It was noted from early times for its temple and oracle of Apollo, and, as the port of Xanthus and other towns of the same valley, had a large trade, and was regarded as the metropolis of Lycia. Enlarged by Ptolemy Philadelphus I. and renamed for a time Arsinoe, it was adorned by Vespasian with baths. St Paul changed there into a "ship of Phoenicia" on his way to Jerusalem in A.D. 60. Patara was the reputed birth-place of St Nicholas. The principal extant monuments are a triple triumphal arch, with inscription, through which ran the road to Xanthus, and the walls, discernible on either hand of it; the theatre, 265 ft. in diameter, built in A.D. 145 (as attested by an inscription) and wonderfully well preserved, though largely filled with drift sand; and the *thermae* built by Vespasian north of the harbour.

PATARENES, or Patarelli, a name apparently first used in Milan about 1058 to denote the extreme opponents of clerical marriages. The party was so called because, under the leadership of Arialdus, a deacon of Milan, its members used to assemble in the Pataria or ragmen's quarter of that city (*pates* being a provincial word for a rag). In the 13th century the name was appropriated by the Cathari, who said it came from *pati* (to suffer), because they endured hardship for their faith. See Bogomils.

PATAS MONKEY, a West African species of the guenon monkeys (see Guenon), characterized by its large size, the foxy-red colour of the upper parts, blue face and white belly. Scientifically it is known as *Cercopithecus* (*Erythrocebus*) *patas*, and typifies a section of its genus of which the other representative is the East African nisnas (*C.* [*E.*] *pyrrhonotus*). See Primates.

PATAVIUM (mod. *Padova*, Eng. Padua, *q.v.*), an ancient city of Venetia, Italy, 55 m. E. of Verona by road. Its central position gave it great importance. One road led from it south-west to Ateste, Hostilia (where the Po was crossed) and Bononia; another east-north-east to Altinum and Concordia. It was accessible by canals from the sea, a distance of about 30 m. The old town (40 ft. above sea-level) lay and lies on a peninsula surrounded by the Bacchiglione except on the south, where it was protected by a canal. Of the bridges which cross the canals by which Padua is now intersected, four go back to Roman times. Remains of a public building, possibly belonging to the forum, were found in the centre of the modern city in making the foundations of the Caffè Pedrocchi at the south-west angle of Piazza Cavour—possibly a colonnade of fine Corinthian architecture (see P. Selvatico, *Relazione dello Scavo . . . su la Piazzetta Pedrocchi*. A large mosaic with geometric designs was also recently discovered in the centre of the city. In imperial times the town spread even farther, as is shown by the position outside the town of the amphitheatre, built of blocks of local stone with brick courses, which was excavated in 1881 (G. Ghirardini in *Notizie degli Scavi*, 1881, 225). It measures 325 by 205 ft., and is the only Roman building of which visible remains exist. A so-called "paletta" (a bronze plate with a handle—possibly a bell or a votive axe or a simple pendant) with a figure of a horse on one side and a votive inscription on the other, belonging to the 5th or 4th century B.C., was found in 1899 at a great depth close to the church of S. Antonio (G. Ghirardini in *Notizie degli Scavi*, 1901, 314). The name of the town is probably connected with Padus (Po). According to the legend it was founded by the Trojan Antenor. The memory of the defeat of the Spartan king Cleonymus by the fleet of Patavium in 302 B.C. was perpetuated by Spartan spoils in the temple of Juno and a yearly sea-fight which took place on the river. On land Patavium was equally powerful (it had been able, we are told, to put 120,000 men into the field), and perpetually made war against its Celtic neighbours. Patavium acquired Roman citizenship with the rest of Gallia Transpadana in 49 B.C. Under Augustus, Strabo tells us, Patavium surpassed all the cities of the north in wealth, and in the number of Roman knights among its citizens in the census of Augustus was only equalled by Gades, which had also 500.

Its commercial importance was also great, being especially due to its trade in wool. The numerous inscriptions, however, as Th. Mommsen remarks (*Corp. inscr. latin.* v. 268), show remarkable dignity and simplicity and avoidance of pomposity; to this Pliny the younger and Martial testify. The importance of Patavium as a literary centre was also considerable. Livy, Q. Asconius Pedianus and Thrasea Paetus were natives of the town; and Quintilian speaks of the directness and simplicity of their diction as *Patavinitas*, comparing it with the artificial obscurity of the writers of Rome itself.

After the 2nd century A.D. it is hardly mentioned, and seems to have been outstripped by other cities, such as Milan and Aquileia. It was destroyed by the Lombards with fire and sword, and it was then that it lost practically all its monuments of the Roman period. (T. As.)

PATEL, FRAMJEE NASARWANJEE (1804–1894), Parsee merchant and philanthropist, was born in 1804, and had a sound vernacular education, with a smattering of English received in Bombay. At the age of fifteen he entered upon a business career, and its pursuit proved so congenial that by 1827 he had worked his way to a partnership in the firm of Frith, Bomanjee & Co. Banking facilities being then exceedingly scanty, such Parsees as had any capital at command acted as bankers and brokers to the rising English firms. Patel's experience enabled him in a few years to raise the status of his compatriots to the higher level of independent merchants, and he founded in 1844 a business house under the name of Wallace & Co., in which he was himself a partner with the English members of the firm. When he retired in 1858 he had amassed a large competence, and in the following year he established a firm on the same lines under the style of Framjee, Sands & Co., of which the members were some of his sons, together with English partners. It was, however, not so much for his success as a merchant, as for his spirit and liberality as an educationist, reformer and philanthropist, that his name is notable in the annals of western India. He entered on his civic labours in 1837, and in all public movements figured prominently as an accredited representative of his community. As a pioneer of education, both for boys and girls, his example inspired the younger men of his time, like Dadabhai Naoroji, at one time M.P. for East Finsbury, and Naoroji Fardoonjee and Sorabjee Shapurjee Bengallee. When Mountstuart Elphinstone, during his governorship, conceived the idea of concentrating the literary and educational activity which had arisen from isolated efforts on the part of men who had themselves been brought into contact with Western culture, among his chief collaborators were Framjee Cowasjee Banajee and Framjee Patel. To their initiative was due the establishment of the Elphinstone Institution, which comprised a high school and, after some years, a college, which continue to hold foremost rank among the similar academies since established in western India. But Mr Patel's most remarkable public service was performed in connexion with the Parsee Law Association, of which he was president. Since their exodus from Persia the domestic affairs of the Parsees had been in a very unsettled state. Matrimonial obligations and the rights of succession in cases of intestacy had fallen into hopeless confusion, and the adjudication of disputes in relation thereto was effected by certain elders of the community, who had neither the knowledge and help of fixed principles to guide their judgments, nor any authority to enforce their decisions. The case of *Ardesir Cursetjee* v. *Peeroxebai*, which came up on appeal before the privy council in England, brought to light the strange fact that even the supreme court of Bombay had no jurisdiction over matrimonial and ecclesiastical disputes among Parsees. This state of lawlessness was recognized by that community as intolerable, and the agitation which ensued thereupon led to the appointment of a commission, of which the distinguished jurist, Sir Joseph Arnould, was the president and Framjee Patel the chief Parsee member. The Parsee Law Association, under the guidance of Patel and Sorabjee Bengallee, rendered invaluable help to the commission, and their joint efforts resulted in the passing by the government of India of the Parsee Marriage and Divorce Act and the Parsee Intestate Succession Act (15 and 21 of 1865). These acts form the charter of matrimonial and ecclesiastical status for the Parsees. At the time of his death in 1894, at the ripe age of nearly ninety years, Framjee Patel was the most revered and best beloved of the distinguished natives of India, having during an eventful public life extending over sixty years worked in co-operation with three generations of the most prominent of his compatriots to better the condition of their country. His family surname refers to the title of *patel*, that is, "mayor," of Bombay, conferred on its founder for services rendered to the English in 1692. (M. M. Bh.)

PATEN (through the Fr. from Lat. *patina* or *patena*, Gr. *πατάνη*, a flat dish), the name of the shallow plate or dish used in the celebration of the Eucharist for the consecrated bread or wafer. The paten has from the first been almost always of a circular shape. There is a rare example of a rectangular one, dating from the 7th century, in the Cabinet des Medailles in Paris. The central portion of the paten is sometimes decorated with the engraved head of the Saviour, or commonly with a group of lobes.

PÂTENÔTRE DES NOYERS, JULES (1845–), French diplomatist, was born at Baye (Marne) on the 20th of April 1845. Educated at the École Normale Supérieure, he taught for some years in the lycée at Algiers before he joined the diplomatic service in 1871. His most important mission was in 1884, when he was sent as French minister to China to regularize the French dominion in Annam. After arranging at Hué with the king of Annam the condition of the French protectorate, he proceeded to Shanghai to settle with China the difficulties which had arisen over the evacuation of Tongking by the Chinese troops. The negotiation failed, and the French admiral resumed hostilities against China in August. Next year Pâtenôtre signed with Li Hung Chang a treaty of peace at Tien-tsin, by which the French protectorate in Annam and Tongking was recognized, and both parties agreed to remain within their own borders in the future. After serving as minister plenipotentiary in Morocco (1888–1891), M. Pâtenôtre was sent to Washington, where he was raised to the rank of ambassador in 1893. He was ambassador at Madrid from 1897 to 1902.

Pierre Loti in *Au Maroc* has described his diplomacy in Morocco. M. Pâtenôtre himself published some reminiscences in the *Revue des deux mondes*.

PATENTS, properly documents conferring some privilege, right, &c., short for "letters patent" (*q.v.*). Patents for inventions, instruments which formerly bore the great seal of the United Kingdom, are now issued at the Patent Office in London under the seal of that office. By their means inventors obtain a monopoly in their inventions for fourteen years, a term which, if insufficient to remunerate the inventor, can be extended. This monopoly is founded on exactly the same principle as the copyright enjoyed by authors and artists. There are persons who argue that no such privilege should be permitted; there are others who think that the most trifling exertions of the inventive faculties should be protected. The right course clearly lies between these extremes. To grant a very long term of exclusive possession might be detrimental to the public, since it would tend to stop the progress of improvement. A limited property must therefore be allowed—large enough to give the inventor an opportunity of reaping a fair reward, but not barring the way for an unreasonable period. And, when this compromise has been decided on, it will be seen how difficult it may be to determine beforehand what is the real merit of an invention, and apportion the time to that merit. Hence it has been found necessary to allot one fixed period for all kinds of inventions falling within the purview of the patent laws.

United Kingdom.—Formerly the reigning prince considered himself entitled, as part of his prerogative, to grant privileges of the nature of monopolies to any one who had gained his favour. These grants became so numerous that they were oppressive and unjust to various classes of the commonwealth; and hence, in the reign of James I., a statute was wrung from that king which declared all monopolies that were grievous and inconvenient to the subjects of the realm to be void. (See Letters Patent; Monopoly.) There was, however, a special exception from this enactment of all letters patent and grants of privilege of the "sole working or making of any manner of new manufacture within the realm to the true and first inventor of such manufacture, which others at the time of making such letters patent and grants should not use, so they be not contrary to law, nor mischievous to the state by raising of the prices of commodities at home or hurt of trade or generally inconvenient." Upon these words hangs the whole law of letters patent for inventions. Many statutes were afterwards passed, but these were all repealed by the Patent Act of 1883 (46 & 47 Vict. c. 57), which, besides introducing a new procedure, modified the law in several particulars. Subsequently acts amending the law were passed in 1885, 1886, 1888, 1901, 1902 and 1907. These acts, with the exception of certain sections of the act of 1883, were repealed by a consolidating act, the Patents and Designs Act 1907, which also introduced new provisions into English patent law. Where the law is not expressly laid down by act of parliament, it has to be gathered from the numerous decisions of the courts, for patent law is to no inconsiderable extent "judge-made law."

The inventions for which patents are obtained are chiefly either vendible articles formed by chemical or mechanical operations, such as cloth, alloys, vulcanized india-rubber, &c., or machinery and apparatus, or processes. It may be remarked here that a scientific principle cannot form the subject of a valid patent unless its application to a practical and useful end and object is shown. An abstract notion, a philosophical idea, may be extremely valuable in the realm of science, but before it is allowed to form a sound basis for a patent the world must be shown how to apply it so as to gain therefrom some immediate material advantage. With regard to processes, the language of the statute of James has been strained to bring them within the words "any manner of new manufacture," and judges on the bench have admitted that the exposition of the act has gone much beyond the letter. However, it is undoubted law that a process is patentable; and patents are accordingly obtained for processes every day.

The principal classes of patentable inventions seem to be these: (1) new contrivances applied to new ends, (2) new contrivances applied to old ends, (3) new combinations of old parts, whether relating to material objects or processes, (4) new methods of applying a well-known object.

With regard to a patent for the new application of a well-known object it may be remarked that there must be some display of ingenuity, some amount of invention, in making the application, otherwise the patent will be invalid on the ground that the subject-matter is destitute of novelty. For example, a fishplate, used before the introduction of railways to connect wooden beams could not be patented to connect the rails of a railway (*Harwood* v. *Great Northern Railway Co.*, 1860–1865, 11 H. L. C. 654); nor can a spring long used in the rear of a carriage be patented for use in the front (*Morgan* v. *Windover*, 1890, 7 R. P. C. 131). But a small amount of invention will suffice, so long as the improvement is manifest, either as saving time or labour (*Rickmann* v. *Thierry*, 1896, 14 R.P.C. 105: *Patent Exploitation, Ltd.* v. *Siemens & Co.*, 1904, 21 R.P.C. 549).

Whatever be the nature of the invention, it must possess the incidents of utility and novelty, else any patent obtained in respect of it will be invalid. The degree of utility need not, however, be great. As to novelty, this is the rock upon which most patents split; for, if it can be shown that other persons have used or published the invention before the date of the patent, it will fall to the ground, although the patentee was an independent inventor deriving his ideas from no one else. The difficulty of steering clear of this rock will be apparent at once. Suppose A in London patents an invention the result of his own ingenuity and patient study, and it afterwards appears that B, in some distant part of the kingdom, had been previously openly using the same thing in his workshop, A's patent is good for nothing. Thus, where the patent sued on was a lock, it was proved that a similar lock had been in use on a gate adjoining a public road for sixteen years prior to the patent, which was accordingly invalidated (*Carpenter* v. *Smith*, 1842, 1 Web. P.C. 540). It is therefore a very frequent subject of inquiry, whether an invention has been previously used to such an extent as to have been publicly used in the sense attached by the courts to this phrase. But whereas "user" in public is sufficient prior publication to invalidate a subsequent patent for the invention so used, publication in books, &c., will not be a bar to novelty unless its effect is to make the invention actually a part of public knowledge; and in dealing with alleged anticipations by patents that have never come into general use the courts will not invalidate a subsequent patent unless a person of ordinary knowledge of the subject, on having the alleged anticipation brought under his notice, would at once perceive, understand, and be able practically to apply the invention without making experiments or seeking for further information. The inventor himself is not allowed to use his invention, either in public or secretly, with a view to profit, before the date of the patent. Thus, if he manufactures an article by some new process, keeping the process an entire secret, but selling the produce, he cannot afterwards obtain a patent in respect of it. If he were allowed to do this he might in many cases easily obtain a monopoly in his invention for a much longer period than that allowed by law (*Morgan* v. *Seaward*, 1837, 1 Web. P.C. 192). The rule that an inventor's use of the invention invalidates a subsequent patent does not, however, apply to cases where the use was only by way of experiment with a view to improve or test the invention (*Elias* v. *Grovesend Tinplate Co.*, 1890, 7 P.O.R. 466). And it has been repeatedly decided that the previous experiments of other persons, if incomplete or abandoned before the realization of the discovery, will not have the effect of vitiating a patent. Even the prior discovery of an invention will not prevent another independent discoverer from obtaining a valid patent if the earlier inventor kept the secret to himself, the law holding that he is the "true and first inventor" who first obtains a patent.

The Patents Act 1883 provided that the exhibition of an invention at an industrial or international exhibition certified as such by the Board of Trade, or the publication of any description of the invention during the period of the holding of the exhibition, or its use for the purpose of the exhibition in the place where it is held, or during the period of the exhibition by any person elsewhere, without the privity or consent of the inventor, should not prejudice the right of the inventor or of his legal personal representative to apply for and obtain a patent, or the validity of any patent granted on the application, provided that two conditions are complied with, viz. (*a*) the exhibitor must, before exhibiting the invention, give the Comptroller-General a prescribed notice of his intention to do so; and (*b*) the application for the patent must be made before or within six months from the date of the opening of the exhibition. The Patents Act 1886, enabled the Sovereign, by order in council, to extend the provision above mentioned to industrial and international exhibitions held out of the United Kingdom. The act of 1907 re-enacted these provisions (§§ 45, 59). When an invention is the joint production of more persons than one, they must all apply for and obtain a joint patent, for a patent is rendered invalid on showing that a material part of the invention was due to some one not named therein. The mere suggestion of a workman employed by an inventor to carry out his ideas will not, however, require that he should be joined, provided that the former adds nothing substantial to the invention, but merely works out in detail the principle discovered by his employer.

Procedure.—The attributes of novelty and utility being possessed in due degree by an invention, it remains to put in motion the machinery for its protection. The Patents Act 1907, re-enacting former provisions, requires an application to be made in a prescribed form (the forms and stamps are on sale at all postal money order offices in the United Kingdom), and left at or sent by post to the patent office in the prescribed manner. The application must contain a declaration that the applicant is the true and first inventor, and it must be accompanied by either a provisional or complete specification. A provisional specification describes the nature of an invention, and a complete specification particularly describes and ascertains the nature of the invention and the manner in which it is to be performed. Since the introduction of the patent specification, it has been necessary that an invention protected by patent should be accurately described by the inventor. Formerly, when the condition on which letters patent issued was that the patentee should file a specification completely describing the nature of his invention within a certain time after the grant, the function of giving the necessary preliminary information on the subject was to some extent discharged by the title; at any rate, the validity of the grant was liable to be objected to on the ground of the title being too general. Under the present law the task of preliminary disclosure falls to the provisional specification, introduced by the Patent Law Amendment Act 1852, and continued by the Patents Acts of 1883 and 1907, although a patentee may, under the latter statutes, dispense with a provisional specification if he thinks proper to file a complete one in the first instance. Where however, these two specifications are filed, it becomes of vital moment to an inventor that the true relation between them should be maintained as defined above. The object of the provisional specification is to secure immediate protection, and to enable a patentee to work at and improve his invention without the risk of his patent being invalidated by premature publication. He is therefore entitled to embody in his complete specification any improved method of working his invention which he may discover in the interval; and he is indeed bound to do so, since, as we have said, the price that a man who desires a patent has to pay to the public for the privilege is that he should make a full disclosure of his invention in his complete specification. But there is a limit to what the patentee may do in this respect. He must not describe in his complete specification an invention different from that declared in the provisional. If he falls into this error there is said to be a "variance" or "disconformity" between the two specifications. The Patents Act 1883, § 9, made it the duty of the examiners of the Patent Office to consider the question of disconformity between specifications on applications for patents, but the only power the comptroller had, on discovery of disconformity, was to refuse to accept the specification until the disconforming parts had been eliminated. By the act of 1907, § 6, he may now refuse to accept the complete specification until it has been amended to his satisfaction, or (with the consent of the applicant) cancel the provisional specification and treat the application as having been made on the date at which the complete specification was left. Moreover, if the complete specification includes an invention not included in the provisional specification, the application may proceed as a whole, or may be divided, and the claim for the additional invention included in the complete specification be regarded as an application for that invention made on the date at which the complete specification was left. An act of 1902 (which, with the exception of a portion dealing with compulsory licences, came into operation on the 1st of January 1905) provided for an examination or search as to novelty, such investigation dealing with British complete specifications published and dated within fifty years prior to the date of the application. This search was re-enacted by the act of 1907 (§ 7) and power given to the comptroller to refuse the grant of a patent in cases in which the invention had been wholly and specifically claimed in specifications to which his search had extended.

The term for which a patent is originally granted is fourteen years, but a patentee may, after advertisement according to the rules of the Supreme Court, petition for a further term. The court, in considering its decision, takes regard of the nature and merit of the invention in relation to the public, of the profits made by the patentee as such, and of all the circumstances of the case. If it appears to the court that the patentee has been inadequately remunerated by his patent, it may extend the term of the patent to a further term not exceeding seven or, in exceptional cases, fourteen years, or may order the grant of a new patent for a certain term, with any restrictions or provisions it may think fit (Act of 1907, § 18).

Patent privileges, like most other rights, can be made the subject of sale. Partial interests can also be carved out of them by means of licences, instruments which empower other persons to exercise the invention, either universally and for the full time of the patent (when they are tantamount to an assignment of the patentee's entire rights), or for a limited time, or within a limited district. By an exclusive licence is meant one that restrains the patentee from granting other licences to any one else. By means of a licence a patentee may derive benefit from his patent without entering into trade and without running the risks of a partnership.

One of the regulations of the act of 1883 was that a patentee could be compelled by the Board of Trade to grant licences to persons who were able to show that the patent was not being worked in the United Kingdom, or that the reasonable requirements of the public with respect to the invention could not be supplied, or that any person was prevented from working or using to the best advantage an invention of which he was possessed. This regulation, however, remained practically a dead letter, for only three applications were made between the years 1883 and 1897, and these never proceeded to a hearing. After 1897 a few petitions were heard, but even so late as in 1908 there was only one petition and that was withdrawn by agreement between the parties. By § 3 of the act of 1902, the hearing of petitions for a grant of compulsory licences was transferred to the judicial committee of the privy council, but the act of 1907 substituted the High Court as the tribunal in the place of the judicial committee. It also laid down that the reasonable requirements of the public should not be deemed to be satisfied: (*a*) if by reason of the default of the patentee to manufacture to an adequate extent and supply on reasonable terms, the patented article or any parts thereof necessary for its efficient working or to carry on the patented process to an adequate extent or to grant licences on reasonable terms, any existing trade or industry or the establishment of any new trade or industry in the United Kingdom is unfairly prejudiced, or the demand for the patented article is not reasonably met; or (*b*) if any trade or industry in the United Kingdom is unfairly prejudiced by the conditions attached by the patentee before or after the passing of the act to the purchase, hire or use of the patented article or to the using or working of the patented process. Clause *b* is an endeavour to remedy an abuse by which patentees bound down purchasers and licences by all kinds of conditions. Section 38 of the act of 1907 contains also a further remedy, making it unlawful in any contract in relation to the sale or lease of, or licence to use or work, any patented article or process to insert conditions prohibiting or restricting the use of the patent or process from using articles supplied by a third person or requiring him to use other articles not protected by the patent. Such conditions are declared "null and void as being in restraint of trade and contrary to public policy."

Another new and very important provision of the act of 1907 is that dealing with the revocation of patents worked outside the United Kingdom. It may be stated here that in the year 1908 out of a total number of 16,284 patentees, 2819 were resident in the United States, 2516 in Germany, 822 in France, 334 in Austria-Hungary, 200 in Switzerland, 166 in the Australian Commonwealth, 159 in Belgium, 155 in Canada, 139 in Sweden and 134 in Italy. It had been a common practice to take out licences in the United Kingdom (especially in the dyeing industry) in order to close the British market to all except the patentees and their licensees, the patented articles or processes being worked entirely abroad. Section 27 of the act of 1907 enacted that at any time not less than four years after the date of a patent and not less than one year after the passing of the act, any person might apply to the comptroller for the revocation of a patent on the ground that the patented article or process is manufactured or carried on exclusively or mainly outside the United Kingdom. The comptroller is given power to make an order revoking the patent forthwith or after a reasonable interval, unless the patentee can show satisfactory reasons. The insertion of this provision resulted in the establishment of many factories in the United Kingdom.

Legal Remedies.—A patentee's remedy for an infringement of his rights is by civil suit, there being no criminal proceedings in such a case. In prosecuting such suit he subjects those rights to a searching examination, for the alleged infringer is at liberty to show that the invention is not new, that the patentee is not the true and first inventor, &c., as well as to prove that the alleged infringement is not really an infringement. But it may here be remarked that a patentee is not bound down (unless he chooses so to be) to the precise mode of carrying the invention into effect described in the specification. If the principle is new, it is not to be expected that he can describe every mode of working it; he will sufficiently secure the principle by giving some illustrations of it; and no person will be permitted to adopt some mode of carrying the same principle into effect on the ground that such mode has not been described by the patentee. On the other hand, when the principle is not new, a patentee can only secure the particular method which he has invented, and other persons may safely use other methods of effecting the same object. Instances of this occur every day; and it is well known that scores of patents have been taken out for screw-propellers, steam-hammers, water-meters, &c., each of which is limited to the particular construction described, and cannot be extended further. Again, where the invention patented consists of a combination of parts, some old and some new, the whole constituting a new machine or a new process, it is not open to the world to copy the new part and reject the rest. A man is not permitted to allege that the patent is for a combination, and that, the identical combination not having been used, there has been no infringement. If he has borrowed the substance of the invention, it will be held that he has infringed the patent. At common law a person who, alleging that he has a patent, threatens his rivals in trade, is liable to an action for damages, but the plaintiff cannot succeed without showing that the threats were made maliciously. The Patents Act 1883 provided another remedy—what is known as "the threats action." This has been incorporated in the act of 1907, § 36. The statute makes the good faith of the patentee threatening legal proceedings no answer to an action brought against him by any person aggrieved by his threats if the acts complained of are not in fact an infringement of the patent, and if the patentee fails with due diligence to commence and prosecute an action for infringement.

Extent and Construction.—The patent when sealed is to have effect in the United Kingdom and the Isle of Man. The act of 1907, unlike the Patent Law Amendment Act of 1852, does not extend the monopoly to the Channel Islands.

The patent business of the United Kingdom is transacted at the Patent Office in London under the superintendence of the comptroller, an officer appointed by the Board of Trade, under whose direction he performs his duties. At this office is kept a register of all patents issued, of assignments of patents, licences granted under them, &c. An illustrated journal of patent inventions is published at the same office, where printed copies of all specifications can also be obtained. The fees payable to government on patents were considerably reduced by an order of the Board of Trade which came into operation on the 1st of October 1892, and may now be paid by convenient annual instalments. The following are the present fees: before the expiration of the 4th year from the date of the patent, £5 instead of £10; of the 5th year, £6 instead of £10; of the 6th year, £7 instead of £10; of the 7th year, £8 instead of £10; of the 8th year, £9 instead of £15; of the 10th year, £11 instead of £20; of the 11th year, £12 instead of £20; of the 12th year, £13 instead of £20; and of the 13th year, £14 instead of £20. The preliminary fees amounting to £4 were left untouched by the order but under the Patent Rates of 1905 an additional fee of £1 is payable on the sealing of the patent. The entire cost of a patent is now reduced from £154 to £100.

A new Patent Office was constructed on the site of the old buildings, the frontage extending from Southampton Buildings into Staple Inn. The number of applications for patents, which sprang from 5993 in 1883 to 17,110 in 1884, culminated in a total of 30,952 for the year 1892, since which date a steady decline set in down to 1900, when the number was 23,924. But the numbers went up again, reaching 30,030 in 1906, but only 28,598 in 1908. The number of patents sealed on application for a given year shows less variation, the minimum being 8775 for 1885 against 16,060 in 1907. The proportion of seals to applications varies from about 46 to 50%. The receipts from patent fees in 1908 were £262,890, against a total expenditure of £179,531.

The official publications of the Patent Office deserve some notice, as, in the absence of official investigation into novelty, the onus of search rests with the applicant or his agent. The procedure has been greatly simplified by the publication, on a uniform system and at a low rate (1s. per volume), of illustrated abridgments of specifications. From 1877 practically to date the searcher obtains a chronological digest of all specifications falling within a given class. To these classes there is a reference index, known as the "abridgment class and index key," which at once directs the searcher to his proper class and index heading.

Patent Agents.—Patents are frequently obtained through the intervention of persons termed patent agents, who devote themselves to this branch of business. Their position is now regulated by statute. By the Patents Act 1888, it was provided that no person should, after July 1, 1889, be entitled to describe himself (and whoever does so knowingly incurs liability to a maximum penalty of £20) as a patent agent whether by advertisement, description of his place of business or otherwise, without being registered as such in pursuance of the act. But the act preserves the right to registration of every person who, to the satisfaction of the Board of Trade, shows that he had been bona fide practising as a patent agent before it passed. The Board of Trade is empowered by this statute to make from time to time general rules for the purpose of carrying out its provisions, and by rules issued in 1889, and reissued in 1891, the Board of Trade delegated to the Institute of Patent Agents (which obtained a royal charter in

1891) the care of the register of patent agents and the duty of holding the necessary examinations for entrance into the profession.

British Dominions.—The following notes on colonial law give the salient facts. Prior to 1852 British letters patent extended to all the colonies, but the act of 1852 restricted the rights granted to the United Kingdom, Channel Islands and Isle of Man.

Australia.—The Commonwealth Acts are No. 21 of 1903, and No. 19 of 1906. They are founded on the English act of 1883 and amending acts. They provide for a department of patents controlled by a commissioner "under the minister" (§ 10 of 1903). Any person, whether a British subject or not, may apply for a patent (§ 32 of 1903). The term of a patent is 14 years (§ 64 of 1903). The Commonwealth or a state may acquire patents compulsorily (§§ 93, 94 of 1903). The act creates a new class of "patent attorneys" (§ 101, 1903). There is an examination as to novelty (§ 41 of 1903). The renewal fees amount to a sum of £5 before the end of the 4th year, and £5 before the end of the 7th year from the date of the patent.

Bahama Islands.—The law is regulated by the following acts of the colony: 52 Vict. c. 23; 53 Vict. c. 2; 54 Vict. c. 12; and 63 Vict. c. 3. Duration of patent 7 years, with power in governor to renew for another 7 years, and thereafter for a third period of 7 years. The fees are £10 on filing specification, £10 for second renewal and £20 for third. Apparently there is no preliminary examination as to novelty.

Barbadoes.—Acts of 1903 (No. 31) and of 1908 (No. 10). Duration of patent 14 years. The governor in council has power to grant compulsory licences. Fees are £2, 10s. on filing specification, £50 before the end of the 4th year and £100 before the end of the 7th year. No preliminary examination as to novelty.

Bermuda.—Act of 1902 (No. 51), on the lines of that of Trinidad.

British Guiana.—The law is regulated by ordinance No. 31 of 1902 and is practically the same as the English act of 1883. The fees are $15 on filing specification and $100 before the end of 7 years.

British Honduras.—The law of the 10th of September 1862 has been re-enacted with slight modifications (see supplement to *Patent Laws of the World*, No. 4, 1900). There is no examination as to novelty.

British India.—The law is now governed by Act 5 of 1888, which applies to the whole of British India. Duration of patent is 14 years. A preliminary examination into novelty might apparently be ordered. The following taxes are payable: annual sums of Rs. 50 from the 4th to the 8th year, and of Rs. 100 from the 8th to the 13th year of the term.

British New Guinea.—The Queensland Patents Acts, No 13 of 1884 and No. 5 of 1886, have been adopted. See British New Guinea ordinance No. 6 of 1889, schedule A.

British North Borneo.—Straits Settlements law (No. 12 of 1871), adopted by Patents Proclamation 1887 (No. 1 of 1887).

Canada.—Patent legislation belongs exclusively to the Dominion Parliament [B.N.A. Act 1867, § 91 (22)]. The existing acts are c. 61 of 1886; 55 & 56 Vict. c. 24; 56 Vict. c. 34; and act of 1903. The duration of the patent is 18 years. At the time of application the applicant may pay the full fee required for that term (viz. $60) or the partial fee required for the term of 6 years ($20) or for the term of 12 years ($40). If a partial fee only is paid, the amount is stated in the patent, and the patent ceases at the end of the term covered by such partial payment, unless before the expiration of such term the patentee pays the fee required for the further term of 6 or 12 years, viz. $20 in the former case and $40 in the latter. There is a preliminary examination into novelty by examiners, with an appeal from the decision of the commissioner of patents to the governor in council. The patent is void unless it is worked in Canada within 2 years, or if after the expiration of 12 months, or any authorized extension of either of these periods, the patentee imports the invention into Canada, but conditions may be substituted for condition as to manufacture in Canada, as, for example, a licence to another to manufacture, &c.

Cape of Good Hope.—The law is regulated by act No. 17 of 1860, No. 24 of 1902 and No. 28 of 1904. There is no preliminary examination into novelty, and the act contains no provisions for compulsory working, or as to the importation of patented articles from abroad.

Ceylon.—The law is now regulated by act 15 of 1906. The duration of the patent is 14 years, with power vested in the governor in council to grant extensions of 7 and 14 years. There is a preliminary examination as to novelty, but there are no provisions as to compulsory working or the importation of patented articles from abroad. The renewal fees are Rs. 50 annually from before the expiration of the 4th to before the expiration of the 8th year from the filing of the specification, Rs. 100 after the expiration of the 8th and before the expiration of the 9th year, Rs. 150 after the expiration of the 9th and before the expiration of the 10th year, and Rs. 200 annually after the expiration of the 10th year to before the expiration of the 13th year.

Channel Islands.—These are not now included in grant of letters patent. See form of grant, schedule I., form D., Patents Act 1883.

Falkland Islands.—By ordinance No. 2 of 1903 letters patent for any invention may be granted to any person holding in the United Kingdom a valid patent for any invention or to any person to whom all interest in the patent has been assigned. The fee on application is £5.

Fiji Islands.—The law depends on ordinances No. 3 of 1879 and 7 of 1882, and order of December 29, 1890. The duration of the patent is 14 years. There is no preliminary examination, and there are no provisions as to compulsory working or importation from abroad. The patent is not subject to any payment after issue. A fee of 5 guineas is payable on deposit of petition and specification. The fee for provisional protection is 5 guineas; on obtaining letters patent the applicant pays 10 guineas.

Gambia.—An ordinance (No. 5 of 1900) is practically identical with the English act of 1883. No. 5 of 1904 made international arrangements for protection of patents.

Gibraltar.—There is no patent law in Gibraltar, but special ordinances are sometimes passed extending the privileges of British patentees to the dependency for the unexpired residues of the original terms. See as examples No. 5 of 1890, No. 1 of 1896, and No. 1 of 1898.

Gold Coast.—The law is now regulated by the Patents Ordinances 1900 to 1906; which closely resemble the Imperial Act.

Hong-Kong.—The law is regulated by ordinance No. 2 of 1892. The inventor or assignee of any invention patented in England may obtain protection in the colony for the unexpired residue of the original term. If the English patent is extended by the advice of the Judicial Committee, an extension of the colonial patent may be obtained, or a new patent granted for the extended period. A fee of $25 is payable on grant of patent, and another fee of the same amount on grant of extension or original letters in lieu of extension. There is no preliminary examination, and there are no provisions as to compulsory working or importation from abroad.

Jamaica.—The law is still in substance governed by c. 30 of 1857. But under ordinance No. 15 of 1891 the stamp duty on letters patent is now £2 instead of £6, 10s., and there is no longer any fee payable on the reference to the attorney-general. There is no preliminary examination as to novelty, and there are no provisions as to importation from abroad.

Lagos.—Ordinances of 1900 (No. 17) and 1902 (No. 2) introduce substantially the English law.

Leeward Islands.—Act No. 3 of 1906 has adopted the English act of 1883. The fees are on filing specification £2, 10s.; at end of 4th year £20; at end of 7th year £40.

Malta.—The law is governed by ordinance No. 11 of 1899 and No. 7. of 1907, the duration of the patent is 14 years. There is no express provision for a preliminary examination into novelty. Provision is made for compulsory assignation or licence, where the invention has not been put into use within 3 years subsequent to the grant or its working has been suspended for 3 years continuously. The annual fees are £5 before the expiration of the 4th year from the date of the patent; £6 before the expiration of the 5th; £7 and £8 respectively before the expiration of the 6th and 7th years; £9 and £10 before the expiration of the 8th and 9th; and from £11 to £14 before the expiration of the 10th, 11th, 12th and 13th years.

Mauritius.—The law is still regulated by ordinance No. 16 of 1875. There is no preliminary examination as to novelty, and there are no provisions for compulsory working or importation from abroad.

Natal.—The law is still regulated by No. 4 of 1870. But certain details of practice are amended by No. 2 of 1895. There is no preliminary examination as to novelty, and there are no provisions as to compulsory working or importation from abroad.

Newfoundland.—The law is contained in the Consolidated Statutes, t. xii. c. 109. There is no preliminary examination into novelty. In addition to the office fees, the patentee is required to deposit with the colonial secretary the sum of $25, to be paid by him to the receiver-general for the use of the colony.

New Zealand.—The law now depends on No. 12 of 1889, amended in details by No. 8 of 1897. The duration of a patent is 14 years. There is no preliminary examination as to novelty, and there are no provisions as to compulsory working or importation from abroad. The following fees are payable: £2 on obtaining letters patent, £5 before the expiration of the 4th year and £10 before the expiration of the 7th.

Nigeria, Northern.—No. 12 of 1902 introduces practically the English law of 1883.

Orange River Colony.—Up to the outbreak of war in 1899 the law was regulated by ordinance No. 10 of 1888 and no change has yet been made. The term of a patent was 14 years. No preliminary examination as to novelty. Compulsory licences might be obtained. No prohibition of the importation of patented articles. The fee for signing and sealing the patent was not less than £10 nor more than £50. Taxes of £5 and £10 were payable before or at the expiration of the 3rd and 7th years of the term respectively.

Rhodesia, Southern.—Ordinance No. 7 of 1904 adopts practically the English law.

St Helena.—The law is regulated by ordinance No. 3 of 1872. The grantee of an English patent, or his representatives, can have the grant extended to the colony. All cases of doubt and difficulty not provided for by the laws of the colony are governed by the law in force in England. A fee of one guinea is payable on filing copy of letters patent and specification with the registrar of the Supreme Court.

Sierra Leone.—No special regulations exist, but an ordinance practically identical with that of the Gold Coast is being adopted.

Straits Settlements.—The law is prescribed by ordinance No. 12 of 1871. The duration of a patent is 14 years. There is no preliminary examination as to novelty, and there are no provisions as to compulsory working or importation from abroad. There is a stamp duty of $50 on the petition. No renewal fees are payable.

Transvaal Colony.—Proclamations Nos. 22 and 29 of 1902 introduce substantially the English law.

Trinidad and Tobago.—The law is regulated by ordinance No. 10 of 1900 and No. 13 of 1905. The duration of the patent is 14 years. There is no preliminary examination into novelty, and there are no provisions as to compulsory working or importation from abroad. A fee of £10 is payable on application for a patent.

Turks and Caicos Islands.—The law of Jamaica has been extended to these islands by No. 7 of 1897. See supplement to *Patent Laws of the World*, No. 3 of 1900.

Windward Islands.—In the Windward Islands other than Barbadoes, viz. Grenada, St Lucia and St Vincent, patents for invention were granted until recently only by special ordinances. See, *e.g.* St Lucia, ordinance No. 41 of 1875 (Tooth's patent). A stamp duty of £10 was payable in this island on letters patent for inventions (No. 6 of 1881, schedule). But ordinances based on the Imperial Act have now been passed, St Vincent (No. 5 of 1898). Grenada (No. 4 of 1898) and St Lucia (No. 14 of 1899).

Foreign Patent Laws.—For the text of these see *Patent Laws of the World*, ed. 1899 and supplemental volumes. But the following are the essential facts.

Algeria.—French law applied by decree of June 5, 1850.

Argentine Republic.—The law of October 11, 1864, is still in force. There is no provision as to importation from abroad.

Austria.—A law of January 11, 1897, came into force on January 1, 1899. The principal changes introduced by this measure were these. A strict preliminary examination was made into novelty. The term of the patent was fixed at 15 years, and besides an application fee of 10 florins, annual fees were imposed rising from 20 florins for the 1st year to 340 florins for the 15th. The period for compulsory working was raised from 1 year to 3 years from the date of the publication of the grant of the patent in the patent journal. Provision was made for the conversion of patents under the old law of August 15, 1852 (extended to Hungary by law of June 27, 1878, and to Bosnia and Herzegovina by law of December 20, 1879) into patents under the present law.

Belgium.—The law is still governed by the law of May 24, 1854. Patents are granted, as in France, without guarantee of novelty.

Bolivia.—The patent law depends on a law of May 8, 1858. The duration of the grant is in the case of a patent of invention not less than 10 nor more than 15 years; in the case of an imported invention, 3 years if its establishment requires an outlay of $25,000, if it reaches $50,000, 6 years, and if $100,000 or more, 10 years. The novelty neither of patents for invention nor of patents for imported inventions is guaranteed. The patent lapses unless the invention is put into complete practice within a year and a day from the date of the privilege, unless the omission is excused by justifiable causes according to law.

Brazil.—Patents are granted under the law of October 14, 1882. The patent lapses unless the invention is brought into effective use within 3 years from the date of the grant, or if such use is suspended for more than a year, except by reason of *force majeure* admitted by government to be a sufficient excuse. Besides expenses and fees, patents of invention are subject to an annual and progressive tax, commencing at $20 and increasing at the rate of $10 a year. The patents issued are without guarantee of novelty or utility.

Chile.—The law is regulated by the law of September 9, 1840, decree of August 1, 1851, and laws of July 25, 1872, January 20, 1883, and January 20, 1888. There is a preliminary examination as to novelty and utility. Though the duration of a patent does not ordinarily exceed 10 years, the term may be extended to 20 years by the president of the republic, if the report of the experts on the nature and importance of the invention seem to justify it. There are no provisions as to importation from abroad.

Colombia.—Patents are granted under law No. 35 of 1869 and decree No. 218 of 1900. The term varies from 5 to 20 years at the option of the applicant. There is no preliminary examination as to novelty, and there is no provision as to importation from abroad. A patent for a new industry is void when such industry is idle for a whole year, unless inevitable circumstances have intervened. An applicant pays a sum of 20 pesos, which is forfeited if the patent is refused, and taken in part payment of the patent fee if it is granted. The patent tax is from 5 to 20 pesos a year for every year of the privilege.

Congo.—Patents are issued under a law of October 29, 1886, and a decree of October 30, 1886. They are of three kinds, patents of invention, of importation and of improvement. There is no preliminary examination as to novelty, and the patent expressly mentions that the grant is made without guarantee. The term of a patent of invention is 20 years. A patent of importation or of improvement expires in the former case with the foreign, in the latter with the principal patent. Patents of improvement are not liable to any tax; on other patents a payment of 100 francs is required. There are no provisions as to compulsory working or prohibiting the importation of patented articles.

Costa Rica.—Prior to June 26, 1896, applications for patents had to be made to the Constitutional Congress. The matter is now dealt with by a law of the above-mentioned date. The duration of the term is 20 years. There is apparently no preliminary examination into novelty. The period for compulsory working is 2 years, and a patent which ceases to be worked during any 3 consecutive years becomes public property.

Denmark.—Patents are now granted under a law of March 28, 1894. The duration of the patent is 15 years, and no extension can be granted. There is a preliminary examination into novelty. The patent may, on terms, be appropriated by the state if the public interest demands it. The period for compulsory working is 3 years, and the patent will also lapse if the exercise of the invention is discontinued for more than a year. The patent commission may release the patentee from the obligation of manufacturing the patented article in Denmark, if satisfied that the cost of such manufacture would be unreasonable, on condition that the patented article is always kept on sale in Denmark. The tax is an annual fee of 25 kroner for the first 3 years, 50 kroner for the next 3, 100 for the following 3; then for 3 years 200 kroner yearly, and for the last 3, 300 kroner yearly.

Ecuador.—Patents are granted under a law of October 18, 1880. The provisions are identical with those given for Bolivia.

Finland.—The law is regulated by ordinances of January 21, 1898. The term of the patent is 15 years. There is a preliminary examination into novelty. The period for compulsory working is 3 years, the penalty for non-compliance being an obligation on the part of the patentee to grant compulsory licences. The tax consists of annual fees, commencing with the second year of the patent, and of the following amounts: 20 marks yearly for the 2nd and 3rd years; 40 marks from the 4th to and including the 6th year; 50 marks from the 7th to and including the 9th; 60 marks from the 10th to and including the 12th year; and 70 marks from the 13th to and including the 15th.

France.—The law is still regulated by the law of July 5, 1844. The following additional points should be noted: The term of a patent of invention is 5, or 10, or 15 years, at the option of the patentee. Every such patent is subject to the following taxes, payable by annual instalments of 100 francs: 500 francs for a patent of 5 years, 1000 francs for a patent of 10 years, and 1500 francs for a patent of 15 years. A tax of 20 francs is payable on application for a patent of addition. Patents of addition are not subject to annual taxes. There is no preliminary examination as to novelty. A patentee is not obliged to mark patented articles as such, but, if he does, the words *Sans Garantie du Gouvernement*, or the initial letters of these words—S. G. D. G.—must be added, under liability to a penalty for omission of from 50 francs to 1000 francs. The provisions as to compulsory working (*exploitation*) are in the main so interpreted as to strike only at voluntary and calculated inactivity. The law of July 5, 1844 is applied to the French colonies by a decree of October 21, 1848, to Madagascar by decree of 1902, and as to French Indo-China, see decree of June 24, 1893.

Germany.—Patents (the law as to which is not affected by the civil code of 1900) are granted under a law of April 7, 1891. The duration of the patent is 15 years. There is a strict preliminary examination into novelty. The period for compulsory working is 3 years, but it is sufficient if the patentee has done everything that is necessary to ensure the carrying out of the invention. A tax of 30 marks has to be paid before the grant. In addition to this there has to be paid at the commencement of the second and every following year of the term a tax amounting to 50 marks for the first year and increasing by 50 marks every subsequent year. An act of 1900 regulates the profession of patent agents.

Greece.—No special patent law apparently exists. A private act is required, which can be introduced by a deputy and is treated like any other bill.

Guatemala.—Patents are granted under the law of May 21, 1886 and a decree of December 17, 1897. The term of the patent ranges from 5 to 15 years. An annual tax of 30 pesos is payable. The period of compulsory working is 1 year, and abandonment of working for a year forfeits the patent. There is apparently a preliminary examination as to novelty (see Art. 16 of the decree of Dec. 17, 1897), but there is no prohibition of the importation of patented articles.

Hawaiian Islands.—Patents were issued till 1900 under the civil code (§§ 255, 256) and a law of August 29, 1884, which were not at first affected by the annexation of the islands by the United States. There was a preliminary examination as to novelty.

The maximum duration of the patent was 10 years. On application a fee of $5 was payable, the commissioner of patents received $20 for his examination, and a fee of $5 was payable when the patent was issued. No further payments. Now the United States law applies.

Honduras.—No. 177 of March 10, 1898. Term not to exceed 20 years. Annual tax 5 to 10 *silver* pesos; in the case of foreigners 10 to 50 *gold* pesos.

Hungary.—The law in force is that of July 7, 1895. The duration of the patent is 15 years. The period for compulsory working is ordinarily 3 years. The annual taxes range from 40 kroner for the 1st year to 500 for the 15th.

Italy.—The law is still governed by that of January 31, 1864, extending the Sardinian law of October 30, 1859 to the whole kingdom. There is no preliminary examination into novelty, and there is no provision prohibiting the importation of patented articles. Patents are subject (i.) to a proportional tax of as many times 10 lire as the years for which the patent is applied for, and (ii.) to an annual tax of 40 lire for the first 3 years; 65 lire for the following 3; 90 lire for the 7th, 8th and 9th; 115 lire for the 10th and 11th; and 140 lire for the remaining 3 years.

Japan.—Patents are issued under an act which came into operation on July 16, 1899. The law as to subject matter resembles that of England and the United States. The term of a patent is 15 years from the date of registration. The patent may be annulled if the patentee has not worked his invention within 3 years from the date of the certificate of grant, or if, having discontinued such use for 3 years, he has refused a reasonable request by a third party for an assignment or a licence. An applicant not domiciled in the empire must appoint within 6 months a duly qualified agent by power of attorney. There is apparently a preliminary examination into novelty. The patent owner must affix his mark to the patent. The fees are calculated on a gradually ascending scale.

Liberia.—Patents are issued under a law of December 23, 1864. The maximum term is 20 years. There is a preliminary examination as to novelty. A sum of $25 or $50 is payable on application, according as the applicant is a citizen or an alien. An invention patented by an alien must be put in practical operation within 3 years. There is no prohibition of the importation of patented articles.

Luxemburg (law of June 30, 1880).—The term of the patent is 15 years. There is no preliminary examination as to novelty, and the importation of patented articles is not prohibited. An annual and progressive tax, commencing at 10 francs and increasing by 10 francs annually, is payable in advance. The period for compulsory working is 3 years, and after the expiration of that period compulsory licences may be ordered.

Mexico (law of Oct. 1, 1903).—The duration of a patent is 20 years, with possible extension for another 5 years. The act defines what is patentable and what is not patentable. There is on request of the interested party, an examination without guarantee as to novelty. There are no provisions as to compulsory working (but compulsory licences may be ordered) or prohibiting the importation of patented articles. The tax ranges from $50 to $150. The patentee must also at the end of each 5 years of the grant, in order to keep the patent in force for another 5 years, pay 50 pesos at the end of the first 5 years, 75 pesos at the end of 10 years, and at the end of 15 years, 100 pesos. The Patent Office publishes a special gazette—*La Gaceta Oficial de Patentes y Marcas.*

Nicaragua.—Patents were, as a general rule, until 1899, granted only by special Act of Congress. But see now supplement 720, No. 15, *Patent Laws of the World.*

Norway (law of June 10, 1885).—The term of the patent is 15 years. There is a preliminary examination into novelty. The invention must be worked within 3 years, and the working must not be discontinued for a year on pain of forfeiture. For each patent an annual tax is payable amounting to 10 crowns for the 2nd year and increasing by 5 crowns each year.

Panama.—Law 88 of 1904 adopts the rules prescribed by the laws of Colombia. The fee is an annual one of $20.

Peru (law of Jan. 28, 1869 and law of Jan. 3, 1896).—The maximum term of the patent is 10 years, and the tax is an annual sum of 100 dollars. There is no preliminary examination into novelty. The period for compulsory working is 2 years, and the importation of patented articles from abroad (except models of machinery whose introduction is authorized by the government) is prohibited.

Portugal (law of Dec. 15, 1894).—The maximum term is 15 years. The patent tax is 3000 reis, payable in advance, for each year of the term for which the privilege is granted or renewed. There is no preliminary examination into novelty. The period for compulsory working is 2 years, and discontinuance of working for any 2 years at a stretch forfeits the patent unless the inaction can be justified. The importation of patented articles from abroad is not prohibited.

Russia (law of May 20, 1896).—The maximum term is 15 years; the tax ranges from 15 roubles for the first year to 400 roubles for the fifteenth. There is apparently (see Arts. 3 and 13) a preliminary examination into novelty, but none into utility. The period for compulsory working is 5 years. There is no prohibition of importation of patented articles.

Spain.—Patents are issued under the law of June 7, 1902. There is no preliminary examination as to novelty, and the importation of patented articles is not prohibited. The duration of a patent is 20 years, and it is subject to an annual and progressive tax, as follows: 10 pesetas for the 1st year, 20 for the 2nd, 30 for the 3rd, and so on successively to the 5th or 20th year, for which the tax is respectively 50 and 200 pesetas.

Sweden (law of May 16, 1884).—The term is 15 years. The annual tax is 25 crowns for the 2nd, 3rd, 4th and 5th years; 50 crowns for each of the following 5 years; and 75 crowns for each of the remaining 5 years. There is a preliminary examination as to novelty, the period for compulsory working is 3 years, and discontinuance during any entire year entails forfeiture. There is no prohibition of the importation of patented articles.

Switzerland.—Federal law of June 21, 1907. The term of the patent is 15 years. There is an annual and progressive tax, rising from 20 francs for the 1st year by an annual increase of 10 francs up to 160 francs for the 15th. There is no preliminary examination as to novelty. The patent is forfeited if the invention has not been carried into practice by the end of the 3rd year, or if patented articles are imported from abroad, while at the same time the proprietor has refused applications on equitable terms for Swiss licences.

Tunis (law of 22nd Rabia-et-Tani, 1306; Dec. 26, 1888).—The term is either 5 years (fee 500 piastres) or 10 years (fee 1000 piastres) or 15 years (fee 1500 piastres). There is no preliminary examination as to novelty. The period for compulsory working is 2 years, and two consecutive years' discontinuance of such working, unless justified, forfeits the patent. So also does the importation of patented articles, but the introduction may be authorized (i.) of models of machines, and (ii.) of articles, made abroad, intended for public exhibitions or for trials.

Turkey.—Patents are still granted under the law of the 2nd of March 1880. There is no preliminary examination as to novelty, and a patentee who mentions his title as such without adding the words "without guarantee of government," is liable to a maximum penalty of 45 Turkish pounds.

United States.—The American law may be considered at greater length. The Federal Constitution empowered Congress "to promote the progress of science and useful arts by securing for limited times to . . . inventors the exclusive right to their . . . discoveries." The existing American patent law is based on a series of Acts of Congress passed in virtue of this provision in the constitution, and on the judicial interpretation of these statutes. Between American and English patent law there is, as will appear in the course of this sketch, a considerable degree of similarity. The fact is not surprising when it is remembered that the Statute of Monopolies (21 Jac. I. c. 3) was, except in limiting the maximum duration of letters patent for inventions at fourteen years, only declaratory of the common law, and therefore formed part of the original common law of America. The English and American patent systems further agree in this, that they contain no provision as to compulsory working, and no prohibition of the importation of patented articles. But there are important differences between the two systems, not merely in points of detail, but in matters affecting the theory and practical working of the law. In England the consideration for the grant of a patent has all along been mainly the benefit which the public derives from the introduction of a new manufacture. In America greater emphasis is placed on the right of an inventor to have his merits rewarded. Again, under the Statute of Monopolies an inventor's exclusive privilege arises only in regard to inventions not known or used at the date of the grant, although it should be observed that under the modern Patents Acts the date of a patent, once granted, relates back to the date of the application. In the United States, on the other hand, the right is conferred on inventors to an exclusive privilege in such inventions as were not known or used before their discovery by the patentees. The practical bearing of this difference is explained in an admirable note on "The Statute of Monopolies" in *Ruling Cases, sub tit.* "Patent" (xx. 5): "It shifts the point of view in the important question of novelty. Many good American inventions have been given away in England by the premature publication in America of the inventor's proceedings. He is interviewed, and an article in the New York *Sun*, or some other paper, in due time finds its way to England. This does no harm in America; on the contrary, it is good evidence of the date of the actual invention. But it is fatal to a subsequent application in England."

The definition of patentability in American law is contained in sect. 4886 of the Revised Statutes of the United States as amended by an act of the 3rd of March 1897. In the following passage the amendments are indicated by italics:—

"Any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof, not known or used by others in this country *before his invention or discovery thereof*, and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof *or more than two years prior to his application*, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law and other due proceedings had, obtain a patent therefor."

The effect of the two amendments made by the act of 1897 should first be noted: (i.) The old law failed to state at what time the invention should be known or used by others in America so as to bar a patent; whether before the application or before the invention. This ambiguity is removed by the use of the words "before his invention or discovery thereof." (ii.) Under the old law a foreign patentee could take out a patent in America for the same invention at any time during the life of the foreign patent, provided it had not been in use in America more than two years prior to his application, unless anticipated by a prior invention or publication. The words "or more than two years prior to his application," merely give the same force to a foreign patent or publication that had previously been given to prior use. An invention to be patentable must, according to American law, be both novel and useful. Utility may be evidence of novelty and vice versa, and commercial success is relevant evidence of utility. As in England, a bare principle is not patentable. A "process" is included under the words "useful art" in the above definition of patentability, and is good subject matter for a patent when the term is used to represent a practical method of producing a beneficial result or effect. The word "machine" in the definition includes every mechanical device or combination of devices for producing certain results. Such a device or combination is patentable when it possesses utility and novelty, and produces either a new result or an old result in a better form.

Under the law of 1790, which was exclusively American in spirit, the duty of granting letters patent for inventions was discharged by the secretary of state, the secretary of war and the attorney-general, or any two of them. The law from 1793 to 1836 was exclusively English in spirit, and during that period the duty fell to the secretary of state, subject to the attorney-general's approval. It was in 1837 that the marked divergence between the English and American patent system began. In that year the patent business of the United States had attained to such dimensions that the powers and duties of the secretary of state in regard to patents were transferred to a sub-department of the state department known as the Patent Office. The American Patent Office consists of a commissioner of patents, one assistant commissioner, and three examiners-in-chief, who are appointed by the President of the United States with the advice and consent of the Senate; and also of other examiners, and a staff of officers, clerks and employés, appointed by the secretary of the interior on the nomination of the commissioner of patents. The commissioner of patents, under the direction of the secretary of the interior, is charged with the superintendence or performance of all duties respecting the grant and issue of patents, and has the control and custody of all books, records, papers, &c., belonging to the Patent Office. He is authorized to make, from time to time, regulations not inconsistent with law, for the conduct of proceedings in the Patent Office, and prepares an annual report which is laid before Congress, and which is framed on the same lines as that of the comptroller-general in England. "He is the final judge, so far as the Patent Office is concerned, of all controverted questions arising in the office, and in granting or withholding patents he is not bound by the decisions of his inferiors" (Robinson on *Patents*, i. 84). The examiners-in-chief are required to be persons of competent legal knowledge and ability. Their duties are: On the written petition of inventors to revise and determine upon the validity of the adverse decisions of subordinate examiners, upon applications for patents, and for reissues of patents, and in interference cases, and when required by the commissioner of patents to hear and report upon claims for extension, and to do such other similar work as he may assign to them. The Patent Office publishes an *Official Gazette* corresponding to the English *Patent Office Illustrated Journal*, and discharges similar functions to those of the English Patent Office in regard to the public dissemination of information as to patented inventions. The number of original applications for patents in the period covered by the report of the commissioner of patents for 1906–1907 was 58,762; the number of patents granted was 36,620; the receipts amounted to $1,910,618, the expenditure to $1,631,458, leaving a surplus of $279,160.

The first step in the procedure to obtain a patent is the lodging by the inventor at the Patent Office of a written application, together with a specification of particular written description of his invention, and a claim distinctly pointing out and claiming what he alleges to be his invention or discovery. The specification and claim are signed by the inventor and attested by two witnesses. Drawings, specimens of ingredients, and models may be required to be furnished. On the filing of each original application for a patent, a fee of $15 is payable. The applicant is required to verify his claim to the invention on oath, taken, if he resides within the United States, before any person authorized by American law to administer oaths; if he resides in a foreign country, before any diplomatic or commercial agent of the United States, or any notary public of the foreign country in which the applicant may be. The commissioner of patents then causes an examination to be made into the novelty of the invention, and if the result is satisfactory the patent issues. On the issuing of each original patent, a fee of $20 is payable. A patent is issued in the name of the United States of America and under the seal of the Patent Office. It consists of a short title or description of the invention or discovery, correctly indicating its nature and design, and a grant to the patentee, his heirs and assigns. Patents, it may be observed in passing, may be granted and issued or reissued to the assignee of the inventor or discoverer, and every patent or any interest in it is assignable, the assignment being recorded in the Patent Office, for the term of seventeen years, of the exclusive right to make use of and vend the invention or discovery throughout the United States and the territories thereof. The rights of property in patents granted in Cuba, Porto Rico, the Philippines and other ceded territory under Spanish law are to be respected in those territories as if that law were still in force there. A patent is dated as of a day not later than three months from the time at which it was passed, and if the fee is not paid within six months the patent is withheld. In case, however, the issue of a patent has been prevented by a failure to pay the fee within the prescribed period, the application may be renewed within 2 years after the allowance of the original application. But the applicant has no right to damages for any use of the invention in the interval, and on the hearing of the renewed application abandonment may be considered as a question of fact. So far we have followed the procedure to obtain a patent where its course is uninterrupted. A double form of interruption is, however, possible. A claim for a patent may be rejected on the ground of want of novelty in the alleged invention. In this case, the fact of the rejection, together with the reasons for it, is communicated to the applicant by the commissioner; and if he persists in his claim a re-examination is ordered. Or, again, an application may appear to the commissioner to interfere with a pending application,[1] or with any expired patent. In these circumstances, he gives notice to the applicant, and directs the primary examiner to proceed to determine the question of priority of invention. This interruption of the course of the proceedings to obtain a patent is called an "interference." In either of the cases above mentioned an appeal lies, on payment of a fee of $10, from the primary examiner to the board of examiners-in-chief, and, on payment of a fee of $20, from the examiners-in-chief to the commissioner in person. An applicant for a patent, but not a party to an interference, may appeal from the decision of the commissioner to the supreme court of the District of Columbia sitting in banc. In interference cases the appeal lies to the District of Columbia court of appeals. There is an ultimate right of appeal, in cases involving the validity of a patent, to the Supreme Court of the United States. Patents are obtainable by bill in equity, although the commissioner of patents (or, on appeal, the supreme court of the District of Columbia) may have refused them. The circuit courts of the United States have original jurisdiction in all patent suits. Appellate jurisdiction is vested in the circuit court of appeals; and on the certificate of that court, or by *certiorari*, an appeal may be brought to the Supreme Court of the United States.

Section 4887 of the revised statutes provides that:—

"No person *otherwise entitled thereto* shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented *by the inventor or his legal representatives or assigns* in a foreign country, *unless the application for the said foreign patent was filed more than seven months prior to the filing of the application in this country, in which case no patent shall be granted in this country*."

The words italicized in the above section were added by an Amending Act of the 3rd of March 1897. In its original form the section provided that no person should be debarred from receiving a patent because the invention was first patented in a foreign country, whether he was otherwise entitled to the patent or not. The words "otherwise entitled to" merely postulate that no other bar to the issue of the patent shall exist. The words "by the inventor or his legal representatives or assigns" safeguard the inventor to some extent against fraud by third parties; while the provision requiring the application in the United States to be filed within seven months of the filing of the foreign patent is intended to carry out the provisions of the International Convention. It should be noted that the duration of an American patent for an invention already patented abroad is no longer limited by that of the prior foreign patent, but is granted for 17 years from the date of issue.

Patented articles are required to be marked as such, either by the word "patented," together with the day and the year the patent was granted, being affixed to them, or, when from the character of the article this cannot be done, by fixing to it, on the package containing one or more of such articles, a label containing the like notice; and in any suit for infringement by a party failing so to mark, no damages shall be recovered by the plaintiff, except on proof that the defendant was duly notified of the infringement, and continued after such notice to make, use or vend the article so patented. A penalty of not less than 100 dollars is attached to falsely marking or labelling articles as patented.

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[1] A citizen of the United States, or an alien who has within the preceding twelve months given notice of his intention to become one, may, by filing in the Patent Office a "caveat," the fee for which is $10, secure for himself notice of possibly conflicting applications.

When through inadvertence, accident or mistake, and without fraudulent or deceptive intention, a patentee has claimed more than he is entitled to, his patent is valid for all that part which is truly and justly his own; provided this is a material or substantial part of the thing patented and the patentee, or his heirs or assigns, on payment of the prescribed fee ($10) disclaim the surplusage. The disclaimer must be in writing, and attested by one or more witnesses; it is recorded in the Patent Office, and is thereafter considered a part of the original specification. But no disclaimer affects any action pending at the time of its being filed, except so far as may relate to the question of unreasonable neglect or delay in filing it.

In the same circumstance, or where a patent is inoperative or invalid by reason of a defective or insufficient specification, the patentee may surrender his patent, and the commissioner of patents may, on the application of the patentee and on payment of a fee of $30, issue a new patent in accordance with the amended specification.

Uruguay (law of 12th November 1885).—The term is 3, 6 or 9 years, at the option of the applicant. There is an annual tax of $25 for every year of the privilege. The invention must be worked within a time fixed by the executive, and the working must not be discontinued for a year, on pain of forfeiture. There is no preliminary examination as to novelty.

Venezuela.—A new law was promulgated by a decree of the 19th of March 1900, but revoked in January 1901 and the old law of 1882 substituted. The term is 5, 10 or 15 years. The tax is 80 francs (bolivars) a year if the patent is for an invention or discovery, and 60 francs (bolivars) a year if it relates to an improved process. There is no preliminary examination as to novelty, nor is there any compulsory working.

International Patents.—The International Convention for the protection of industrial property was signed at Paris on the 20th of March 1883; the necessary ratifications were exchanged on the 6th of June 1884, and the Convention came into force a month later. Provision was made by sections 103 and 104 of the Patents Act 1883 for carrying out the Convention in Great Britain by orders in council, applying it from time to time to (*a*) British possessions whose legislatures had made satisfactory arrangements for the protection of inventions patented in Great Britain; (*b*) foreign states with which the sovereign had made arrangements for the mutual protection of inventions. The following governments have signed the international convention: Australia, Austria-Hungary, Belgium, Brazil, Ceylon, Cuba, Denmark, France, Germany, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, San Domingo, Servia, Spain, Sweden, Switzerland, Trinidad and Tobago, Tunis and the United States. Under the powers of the Foreign Jurisdiction Act 1890 penalties have been imposed on British subjects committing offences against the Patents, &c., Acts 1883–1888, and the orders in council issued thereunder, in Africa, East Africa, Morocco, Persia, Persian coast and Zanzibar.

An international bureau in connexion with the Convention has been established at Bern, where an official monthly periodical, *La Propriété industrielle*, is published. Conferences were held under the Convention at Rome in April and May 1886, and at Madrid in April 1890. At the latter conference an important article was adopted, under which it is left to each country to define and apply "compulsory working" (*exploitation*) for the purposes of the convention in the sense that it chooses.

Authorities.—In addition to the works noted incidentally above, see Edmunds, *Patents* (London); Wallace and Williamson, *Patents* (London); Frost, *Patent Law and Practice* (London, 1898); Terrell, *Letters Patent* (London); Cunynghame, *Patents* (London); Lawson, *The Patents, &c., Acts* (London). For the old law, Webster, *Patent Cases* (London, 1844); Hindmarsh, *Patents* (London, 1846); and the very valuable Parliamentary Reports of 1829, 1851, 1865, 1872. Gordon, *Monopolies by Patents* (London, 1897); Gould and Tucker, *Notes on Rev Stat. of the U.S.*, vol. ii. (1887–1897); Robinson, *Patents* (3 vols., Boston, 1890); Whitman, *Patent Laws* (Washington, 1871); Law, *Copyright and Patent Laws of the United States, 1790–1866* (New York, 1866); Curtis, *Law of Patents* (4th ed., Boston and London, 1873); Campbell, *U. S. Patent System: a History* (Washington, 1891). (A. W. R.; T. A. I.)

PATENTS OF PRECEDENCE. A patent of precedence is a grant to an individual by letters patent (*q.v.*) of a higher social or professional position than the precedence to which his ordinary rank entitles him. The principal instance in modern times of patents of grants of this description has been the grant of precedence to members of the English bar. In the days when acceptance of the rank of king's counsel not only precluded a barrister from appearing against the Crown, but, if he was a member of parliament, vacated his seat, a patent of precedence was resorted to as a means of conferring similar marks of honour on distinguished counsel without any such disability attached to it. The patents obtained by Mansfield, Erskine, Scott and Brougham were granted on this ground. After the order of the coif lost its exclusive right of audience in the court of common pleas, it became customary to grant patents of precedence to a number of the serjeants-at-law, giving them rank immediately after counsel of the Crown already created and before those of subsequent creation. Mr Justice Phillimore was, on his appointment as a judge of the queen's bench division (in 1897) the only holder of a patent of precedence at the bar, except Serjeant Simon, who died in that year, and who was the last of the serjeants who held such a patent. See also Precedence.

In Canada patents of precedence are granted both by the governor-general and by the lieutenant-governor of the provinces under provincial legislation which has been declared *intra vires*. (*Att. Gen. for Canada* v. *Att. Gen. for Ontario*, 1898, A.C. p. 247; Todd, *Parliamentary Govt. in Canada*, 2nd ed. p. 333).

See Pulling's *Order of the Coif.*

PATER, WALTER HORATIO (1839–1894), English man of letters, was born at Shadwell on the 4th of August 1839. He was the second son of Richard Glode Pater, a medical man, of Dutch extraction, born in New York. Jean-Baptiste Pater, the painter, was probably of the same family. Richard Pater moved from Olney to Shadwell early in the century, and continued to practise there among the poorer classes. He died while his son Walter was yet an infant, and the family then moved to Enfield, where the children were brought up. In 1853 Walter Pater was sent to King's School, Canterbury, where he was early impressed by the aesthetic beauties of the cathedral. These associations remained with him through life. As a schoolboy he read *Modern Painters*, and was attracted to the study of art, but he did not make any conspicuous mark in school studies, and showed no signs of the literary taste which he was afterwards to develop. His progress was always gradual. He gained a school exhibition, however, with which he proceeded in 1858 to Queen's College, Oxford. His undergraduate life was unusually uneventful; he was a shy, "reading man," making few friends. Jowett, however, was struck by his promise, and volunteered to give him private tuition. But Pater's class was a disappointment, and he only took a second in literae humaniores in 1862. After taking his degree he settled in Oxford and read with private pupils. As a boy he had cherished the idea of entering the Anglican Church, but, under the influence of his Oxford reading, his faith in Christianity became shaken, and by the time he took his degree he had thoughts of graduating as a Unitarian minister. This project, too, he resigned; and when, in 1864, he was elected to a fellowship at Brasenose, he had settled down easily into a university career. But it was no part of his ambition to sink into academic torpor. With the assumption of his duties as fellow the sphere of his interests widened rapidly; he became acutely interested in literature, and even began to write articles and criticisms himself. The first of these to be printed was a brief essay upon Coleridge, which he contributed in 1866 to the *Westminster Review*. A few months later (January, 1867) appeared in the same review his now well-known essay on Winckelmann, the first expression of his idealism. In the following year his study of "Aesthetic Poetry" appeared in the *Fortnightly Review*, to be succeeded by essays on Leonardo da Vinci, Sandro Botticelli, Pico della Mirandola and Michelangelo. These, with other studies of the same kind, were in 1878 collected in his *Studies in the History of the Renaissance.* Pater was now the centre of a small but very interesting circle in Oxford. Such men as cherished aesthetic tastes were naturally drawn to him; and, though always retiring and, in a sense, remote in manner, he was continually spreading his influence, not only in the university, but among men of letters in London and elsewhere. The little body of Pre-Raphaelites were among his friends, and by the time that *Marius the Epicurean* appeared he had quite a following of disciples to hail it as a gospel. This fine and polished work, the chief of all his contributions to literature, was published early in 1885. In it Pater displays, with perfected fullness and loving elaboration, his ideal of the aesthetic life, his cult of beauty as opposed to bare asceticism, and his theory of the stimulating effect of the pursuit of beauty as an ideal of its own. In 1887 he published *Imaginary Portraits*, a series of essays in philosophic fiction; in 1889, *Appreciations, with an Essay on Style*; in 1893, *Plato and Platonism*; and in 1894, *The Child in the House*. His *Greek Studies* and his *Miscellaneous Studies* were collected posthumously in 1895; his posthumous romance of *Gaston de Latour* in 1896; and his *Essays from the "Guardian"* were privately printed in 1897. A collected edition of Pater's works was issued in 1901. Pater changed his residence from time to time, living sometimes at Kensington and in different parts of Oxford; but the centre of his work and influence was always his rooms at Brasenose. Here he laboured, with a wonderful particularity of care and choice, upon perfecting the expression of his theory of life and art. He wrote with difficulty, correcting and recorrecting with imperturbable assiduity. His mind, moreover, returned to the religious fervour of his youth, and those who knew him best believed that had he lived longer he would have resumed his boyish intention of taking holy orders. He was cut off, however, in the prime of his powers. Seized with rheumatic fever, he rallied, and sank again, dying on the staircase of his house, in his sister's arms, on the morning of Monday the 30th of July 1894. Pater's nature was so contemplative, and in a way so centred upon reflection, that he never perhaps gave full utterance to his individuality. His peculiar literary style, too, burnished like the surface of hard metal, was too austerely magnificent to be always persuasive. At the time of his death Pater exercised a remarkable and a growing influence among that necessarily restricted class of persons who have themselves something of his own love for beauty and the beautiful phrase. But the cumulative richness and sonorous depth of his language harmonized intimately with his deep and earnest philosophy of life; and those who can sympathize with a nervous idealism will always find inspiration in his sincere and sustained desire to "burn with a hard, gem-like flame," and to live in harmony with the highest. (A. Wa).

Mr Ferris Greenslet's *Walter Pater* (in the "Contemporary Men of Letters" series, 1904) is an interesting piece of criticism. Mr Arthur Benson's study in the "English Men of Letters" series is admirable. See too a sketch in Edmund Gosse's *Critical Kit-Kats*; and an estimate from a Roman Catholic standpoint in Dr William Barry's *Heralds of Revolt*, where Pater is compared with J. Addington Symonds. T. Wright's *Life of Walter Pater* (1907) is an elaborate but unsatisfactory piece of work.

PATERA, the Latin name for a shallow circular vessel used for drinking or for pouring libations. The Greek name for such a vessel was φιάλη. It has no foot or stem underneath, but occasionally a boss rising in the centre inside. The term is sometimes given incorrectly in architecture to a circular disk carved with a conventional rose, which is found in many early styles, the proper term being rosette.

PATERNÒ, a town of Sicily, in the province of Catania, 11 m. W.N.W. of Catania by rail, at the southern foot of Mt Etna. Pop. (1881), 15,230; (1901), 20,098 (town), 22,857 (commune). The castle, originally erected in 1073, upon the acropolis of the ancient Hybla Minor or Galeatis, has a square tower and a chapel with frescoes belonging to the 14th century. Some mosaic pavements still exist under the houses in the Strada dell' Ospedale, and remains of baths and of an ancient bridge over the Simeto on the road to Centuripa are to be seen in the neighbourhood. The place was unsuccessfully besieged by the Athenian forces in the summer of 415 B.C.

PATERSON, ROBERT (1715–1801), Scottish stone-mason, who suggested to Sir Walter Scott the character of "Old Mortality," was born near Hawick in 1715. Through the patronage of Sir Thomas Kirkpatrick, whose cook he had married, he obtained the lease of a quarry at Gatelawbrig, but in 1745 his house was plundered by the retreating Jacobites, and Paterson himself, a pronounced Cameronian, was carried off a prisoner. He subsequently devoted his life to cutting and erecting stones for the graves of the Covenanters, for 40 years wandering from place to place in the lowlands. He died in poverty in 1801, and a stone to his memory was erected by Scott's publishers in 1869 in Caerlaverock churchyard.

PATERSON, WILLIAM (1658–1719), British writer on finance, founder of the Bank of England and projector of the Darien scheme, was born in April 1658 at the farmhouse of Skipmyre, parish of Tinwald, Dumfriesshire. His parents occupied the farm there, and with them he resided till he was about seventeen. A desire to escape the religious persecution then raging in Scotland, and the immemorial ambition of his race, led him southward. He went through England with a pedlar's pack ("whereof the print may be seen, if he be alive," says a pamphleteer in 1700), settled for some time in Bristol, and then proceeded to America. There he lived chiefly in the Bahamas, and is said by some to have been a predicant or preacher, and by others a buccaneer. In truth his intellectual and moral superiority to his fellow-settlers caused his selection as their spiritual guide, whilst his thirst for knowledge led to intercourse with the buccaneers. It was here he formed that vast design which is known in history as the Darien scheme. On his return to England he was unable to induce the government of James II. to engage in his plan. He went to the continent and pressed it to no purpose in Hamburg, Amsterdam and Berlin, and on his return to London he engaged in trade and rapidly amassed a considerable fortune. About 1690 he was occupied in the formation in the Hampstead Water Company, and in 1694 he founded the Bank of England. The government required money, and the country, rapidly increasing in wealth, required a bank. The subscribers lent their money to the nation, and this debt became the bank stock. The credit of having formulated the scheme and persuaded its adoption is due to Paterson. He was one of the original directors, but in less than a year he fell out with his colleagues, and withdrew from the management. He had already propounded a new plan for an orphan bank (so called because the debt due to the city orphans by the corporation of London was to form the stock). They feared a dangerous rival to their own undertaking, and they felt some distrust for this eager Scotsman whose brain teemed with new plans in endless succession.

At that time the people of the northern kingdom were considering how best to share in that trade which was so rapidly enriching their southern neighbours. Paterson saw his opportunity. He removed to Edinburgh, unfolded his Darien (*q.v.*) scheme, and soon had the whole nation with him. He is the supposed author of the act of 1695 which formed the "Company of Scotland trading to Africa and the Indies." This company, he arranged, should establish a settlement on the Isthmus of Darien, and "thus hold the key of the commerce of the world." There was to be free trade, the ships of all nations were to find shelter in this harbour not yet erected, differences of race or religion were neglected; but a small tribute was to be paid to the company, and this and other advantages would so act that, at one supreme stroke, Scotland was to be changed from the poorest to the richest of nations.

On the 26th of July 1698 the first ships of the expedition set sail "amidst the tears and prayers and praises of relatives and friends and countrymen." Some financial transactions in which Paterson was concerned, and in which, though he had acted with perfect honesty, the company had lost, prevented his nomination to a post of importance. He accompanied the expedition as a private individual, and was obliged to look idly on whilst what his enemies called his "golden dream" faded away indeed like the "baseless fabric of a vision" before his eyes. His wife and child died, and he was seized with a dangerous illness, "of which, as I afterwards found," he says, "trouble of mind was not the least cause." It was noted that "he hath been so mightily concerned in this sad disaster, so that he looks now more like a skeleton than a man." Still weak and helpless, and yet protesting to the last against the abandonment of Darien, he was carried on board ship, and, after a stormy and terrible voyage, he and the remnant of the ill-fated band reached home in December 1699.

In his native air Paterson soon recovered his strength, and immediately his fertile and eager mind was at work on new schemes. He prepared an elaborate plan for developing Scottish resources by means of a council of trade, and then tried to induce King William, with whom he had frequent interviews, to enter on a new Darien expedition. In 1701 he removed to London, and here by conferences with statesmen, by writing, and by personal persuasion helped on the union. He was much employed in settling the financial relations of the two countries. One of the last acts of the Scots parliament was to recommend him to the consideration of Queen Anne for all he had done and suffered. The United Parliament, to which he was returned as a member for the Dumfries burghs, though he never took his seat, decided that his claim should be settled, but it was not till 1715 that an indemnity of £18,241 was ordered to be paid him. Even then he found considerable difficulty in obtaining his due. His last years were spent in Queen Square, Westminster, but he removed from there shortly before his death on the 22nd of January 1719.

As many as twenty-two works, all of them anonymous, are attributed to Paterson. These are classified by Bannister under six heads, as dealing with (1) finance, (2) legislative union, (3) colonial enterprise, (4) trade, (5) administration, (6) various social and political questions. Of these the following deserve special notice: (1) *Proposals and Reasons for constituting a Council of Trade* (Edinburgh, 1701).[1] This was a plan to develop the resources of his country. A council, consisting of a president and twelve members, was to be appointed. It was to have a revenue collected from a duty on sales, lawsuits, successions, &c. With these funds the council was to revive the Darien scheme, to build workhouses, to employ, relieve and maintain the poor, and to encourage manufactures and fisheries. It was to give loans without interest to companies and shippers, to remove monopolies, to construct all sorts of vast public works. Encouragement was to be given to foreign Protestants and Jews to settle in the kingdom, gold and silver were to be coined free of charge, and money kept up to its nominal standard. All export duties were to be abolished and import regulated on a new plan. Paterson believed that thus the late disasters would be more than retrieved. (2) *A Proposal to plant a Colony in Darien to protect the Indians against Spain, and to open the Trade of South America to all Nations* (1701). This was the Darien scheme on a new and broader basis. It points out in detail the advantages to be gained: free trade would be advanced over all the world, and Great Britain would largely profit. (3) *Wednesday Club Dialogues upon the Union* (London, 1706). These were imaginary conversations in a club in the city of London about the union with Scotland. Paterson's real opinions were put into the mouth of a speaker called May. Till the Darien business all Scots were for the union, and they were so still if reasonable terms were offered. Such terms ought to include an incorporating union with equal taxes, freedom of trade, and a proportionate representation in parliament. A union with Ireland, "as likewise with other dominions the queen either hath or shall have," is proposed. (4) Along with this another discussion of the same imaginary body, *An Inquiry into the State of the Union of Great Britain and the Trade thereof* (1717), may be taken. This was a consideration of the union, which, now "that its honeymoon was past," was not giving satisfaction in some quarters, and also a discussion as to the best means of paying off the national debt—a subject which occupied a great deal of Paterson's attention during the later years of his life.

Paterson's plans were vast and magnificent, but he was no mere dreamer. Each design was worked out in minute detail,[2] each was possible and practical. The Bank of England was a stupendous success. The Darien expedition failed from hostile attacks and bad arrangements. But the original design was that the English and Dutch should be partakers in it, and, if this had occurred, and the arrangements, against many of which Paterson in letter after letter in vain protested, had been different, Darien might have been to Britain another India. Paterson was a zealous almost a fanatic free-trader long before Adam Smith, and his remarks on finance and his argument against an inconvertible paper-currency, though then novel, now hold a place of economic orthodoxy. Paterson's works are excellent in form and matter; they are quite impersonal, for few men who have written so much have said so little about themselves. There is no reference to the scurrilous attacks made on him. They are the true products of a noble and disinterested as well as vigorous mind. There is singular fitness in the motto "Sic vos non vobis" inscribed under the only portrait of him we possess.

See *Life of W. Paterson*, by S. Bannister (Edinburgh, 1858); Paterson's *Works*, by S. Bannister (3 vols., London, 1859); *The Birthplace and Parentage of W. Paterson*, by W. Pagan (Edinburgh, 1865); *Eng. Hist. Review*, xi. 260. The brilliant account of the Darien scheme in the fifth volume of Macaulay's *History* is incorrect and misleading; that in Burton's *Hist. of Scotland* (vol. viii. ch. 84) is much truer. Consult also the memoir in Paul Coq, *La Monnaie de banque* (Paris, 1863), and J. S. Barbour, *A History of William Paterson and the Darien Company* (1907). For a list of fugitive writings on Paterson see Poole's *Index of Periodicals*. (F. Wa.)

PATERSON, a city and the county-seat of Passaic county, New Jersey, U.S.A., in the north-eastern part of the state, on the west bank of the Passaic river, and 16 m. N.W. of New York city. Pop. (1880), 51,031; (1890), 78,347; (1900), 105,171; (1906, estimate), 112,801; (1910), 125,600. Of the total in 1900, 38,791 were foreign-born. Paterson is served by the main lines of the Delaware, Lackawanna & Western, the Erie, and the New York, Susquehanna & Western railways, and by a number of inter-urban electric lines. The Morris Canal was formerly important for shipping freight between Paterson and Jersey City, but has fallen into disuse. The city lies along a bend of the Passaic river, the southern portion being in a plain and the extreme northern part lying among the hills that rise from the stream near the Great Falls. The river has a descent here of about 70 ft. (of which 50 ft. are in a perpendicular fall), and furnishes water-power for manufactories. The principal public buildings are the city-hall, the post office, the county court-house and the Danforth Memorial (public library) building. Paterson is pre-eminently a manufacturing centre. There were, in 1905, 513 factories employing a capital of $53,595,585, and furnishing work for 28,509 employés; and the total factory product was valued at $54,673,083. The city is the centre of silk manufacturing in the United States. In 1905 it contained 190 silk-mills, and the products were valued at $25,433,245. There were also, in 1905, 27 dyeing and finishing establishments, with products valued at $5,699,295; 39 foundries and machine shops, with products valued at $2,317,185; 3 wholesale slaughtering and packing houses, with products valued at $2,206,698; and 3 jute and jute-goods factories, with an output valued at $929,319. Among the machine works are two locomotive shops, with an average capacity of three locomotives per day, and a large steel mill.

Paterson had its origin in an act of the legislature of New Jersey on the 22nd of November 1791, incorporating the Society for Establishing Useful Manufactures, the plan for this society being drawn up by Alexander Hamilton. As the most suitable location for its enterprise the society in the following year selected the Great Falls of the Passaic river, and named the place Paterson, in honour of William Paterson (1745–1806), a member of the state Constitutional Convention in 1776, attorney-general of New Jersey in 1776–1783, a delegate to the Continental Congress in 1780–1781, and to the Constitutional Convention of

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[1] This work was attributed to John Law, who borrowed some of his ideas from it. To Law's, "system" Paterson was strongly opposed, and it was chiefly due to his influence that it made no way in Scotland.

[2] The books of the Darien Company were kept after a new and very much improved plan, believed to be an invention of Paterson's (Burton's *Hist. Scot.* viii. 36, note).

1787 (where he proposed the famous "New Jersey Plan"), a United States Senator in 1789–1790, governor of the state in 1790–1793, and an associate justice of the United States Supreme Court from 1793 until his death. Paterson was incorporated as a township in 1831, chartered as a city in 1851 and rechartered in 1861. Three great industries—the manufacture of cotton, machinery and silk—were established in Paterson almost contemporaneously with their introduction into the United States. In 1793 the first cotton yarn was spun at Paterson in a mill run by ox-power, and in the next year, when the dams and reservoir were completed, Paterson's first cotton factory began its operations. After 1840 the manufacture of machinery and of silk gradually supplanted that of cotton goods. Although an attempt was made to manufacture machinery in Paterson as early as 1800, there was little progress until after 1825. The building of the "Sandusky," Paterson's first locomotive, in 1837, marked the beginning of a new industry, and before 1860 the city was supplying locomotives to all parts of the United States and to Mexico and South America. By 1840 the silk industry had obtained a footing, and after this date there was a steady advance in the quantity and quality of the product. From 1872 to 1881 inclusive Paterson consumed two-thirds of the raw silk imported into the country.

See L. R. Trumbull, *History of Industrial Paterson* (Paterson, 1882).

PATEY, JANET MONACH (1842–1894), English vocalist, was born in London on the 1st of May 1842, her maiden name being Whytock. She had a fine alto voice, which developed into a contralto, and she studied singing under J. Wass, Pinsuti and Mrs Sims Reeves. Miss Whytock's first appearance, as a child, was made at Birmingham, and her first regular engagement was in 1865, in the provinces. From 1866, in which year she sang at the Worcester festival, and married John Patey, a bass singer, she was recognized as one of the leading contraltos; and on the retirement of Mme Sainton-Dolby in 1870 Mme Patey was without a rival whether in oratorio or in ballad music. She toured in America in 1871, sang in Paris in 1875, and in Australia in 1890. She died at Sheffield on the 28th of February 1894.

PATHAN, the name applied throughout India to the Afghans, especially to those permanently settled in the country and to those dwelling on the borderland. It is apparently derived from the Afghan name for their own language, Pushtu or Pukhtu, and may be traced back to the *Paktues* of Herodotus. In 1901 the total number of Pathans in all India was nearly $3\frac{1}{2}$ millions, but the speakers of Pushtu numbered less than $1\frac{1}{4}$ millions. The name is frequently, but incorrectly, applied to the Mahommedan dynasties that preceded the Moguls at Delhi, and also to the style of architecture employed by them; but of these dynasties only the Lodis were Afghans.

The Pathans of the Indian borderland inhabit the mountainous country on the Punjab frontier, stretching northwards from a line drawn roughly across the southern border of the Dera Ismail Khan district. South of this line are the Baluchis. The Pathans include all the strongest and most warlike tribes of the North-West frontier of India, such as the Afridis, Orakzais, Waziris, Mohmands, Swatis and many other clans. Those in the settled districts of the North-West Frontier Province (in 1901) numbered 883,779, or more than two-fifths of the population. Each of the principal divisions is dealt with separately in this work under its tribal name. The Pathans are split up into different tribes, each tribe into clans, and each clan into sections, so that the nomenclature is often very puzzling. The tribe, clan and section are alike distinguished by patronymics formed from the name of the common ancestor by the addition of the word *zai* or *khel*; *zai* being a corruption of the Pushtu word *zoe*, meaning son, while *khel* is an Arabic word meaning an association or company. Both terms are used indifferently for both the larger and smaller divisions. Pathans enlist largely in the native army of India; and since the frontier risings of 1897 they have been formed with increasing frequency into class-regiments and regiments of native militia. They make excellent soldiers. The greater part of the Pathan country was placed under British political control by the Durand agreement made with the Amir of Afghanistan in 1893.

PATHOLOGY (from Gr. πάθος, suffering), the science dealing with the theory or causation of disease. The term by itself is usually applied to animal or human pathology, rather than to vegetable pathology or Phytopathology (see PLANTS: *Pathology*).

The outstanding feature in the history of pathology during the 19th century, and more particularly of the latter half of it, was the completion of its rescue from the thraldom of abstract philosophy, and its elevation to the dignity of one of the natural sciences. Our forefathers, if one may venture to criticize them, were too impatient. Influenced by the prevailing philosophy of the day, they interpreted the phenomena of disease through its lights, and endeavoured from time to time to reduce the study of pathology to philosophical order when the very elements of philosophical order were wanting. The pathology of the present day is more modest; it is content to labour and to wait. Whatever its faults may be—and it is for our successors to judge of these—there is this to be said in its favour: that it is in nowise dogmatic. The eloquence of facts appeals to the scientific mind nowadays much more than the assertion of crude and unproven principles. The complexity and mystery of action inherent in living matter have probably been accountable for much of the vague philosophy of disease in the past, and have furnished one reason at least why pathology has been so long in asserting its independence as a science. This, indeed, holds good of the study of biology in general. There are other factors, however, which have kept pathology in the background. Its existence as a science could never have been recognized so long as the subjects of physics, chemistry and biology, in the widest acceptation of the term, remained unevolved. Pathology, in fact, is the child of this ancestry; it begins where they end.

Recent Progress.

Progress in the study of pathology has been greatly facilitated by the introduction of improved methods of technique. The certainty with which tissues can now be fixed in the state they were in when living, and the delicacy with which they can be stained differentially, have been the means of opening up a new world of exploration. Experimental pathology has benefited by the use of antiseptic surgery in operations upon animals, and by the adoption of exact methods of recording; while the employment of solid culture media in bacteriology—the product of Koch's fertile genius—is responsible for a great part of the extraordinary development which has taken place in this department of pathological research. The discoveries made in pathological bacteriology, indeed, must be held to be among the most brilliant of the age. Inaugurated by Pasteur's early work, progress in this subject was first marked by the discovery of the parasite of anthrax and of those organisms productive of fowl-cholera and septic disease. Then followed Koch's great revelation in 1882 of the bacillus of tubercle (fig. 22, Pl. II.), succeeded by the isolation of the organisms of typhoid, cholera, diphtheria, actinomycosis, tetanus, &c. The knowledge we now possess of the causes of immunity from contagious disease has resulted from this study of pathological bacteriology: momentous practical issues have also followed upon this study. Amongst these may be mentioned the neutralizing of the toxins in cases of diphtheria, tetanus and poisonous snake-bite; "serum therapeutics"; and treatment by "vaccines." By means of "vaccination" we are enabled to induce an active immunity against infection by certain pathogenic bacteria. The value of such protective inoculations is demonstrated in the treatment against small-pox (Jenner), cholera, plague (Haffkine) and typhoid (Wright and Semple). Pasteur's inoculation against hydrophobia is on the same principle. "Vaccines" are also used as a method of treatment during the progress of the disease. Sir A. Wright and others, in recent work on opsonins, have shown that, by injecting dead cultures of the causal agent into subjects infected with the organism, there is produced in the body fluids a substance (opsonin) which apparently in favourable conditions unites with the living causal bacteria and so sensitizes them that they are readily taken up and destroyed by the phagocytic cells of tissues. Before the discovery of the bacillus of tubercle, scrofula and tuberculosis were regarded as two distinct diseases, and it was supposed that the scrofulous constitution could be distinguished from the tubercular. It was always felt, however, that there was a close bond of relationship between them. The fact that the tubercle bacillus is to be found in the lesions of both has set at rest any misgiving on the subject, and put beyond dispute the fact that so-called scrofulous affections are simply local manifestations of tuberculosis. A knowledge of the bacteriology of scrofulous affections of bone and joints, such as caries and gelatinous degeneration, has shown that they also are tubercular diseases—that is to say, diseases due to the presence locally of the tubercle bacillus. At a very early period it was held by Virchow that the large cheesy masses found in tuberculosis of the lung are to be regarded as pneumonic infiltrations of the air-vesicles. Their pneumonic nature has been amply substantiated in later times; they are now regarded simply as evidence of pneumonic reaction to the stimulus of the tubercle bacillus. The caseous necrosis of the implicated mass of lung tissue, and indeed of tubercles generally, is held to be, in great measure, the result of the necrotic influence of the secretions from the bacillus. Tubercular pneumonia may thus be looked upon as comparable to pneumonia excited by any other specific agent.

In the "seventies" of the 19th century feeling ran somewhat high over the rival doctrines concerning the origin of pus-corpuscles, Cohnheim and his school maintaining that they were derived exclusively from the blood, that they were leucocytes which had emigrated through the walls of the vessels and escaped into the surrounding tissue-spaces, while Stricker and his followers, although not denying their origin in part from the blood, traced them, in considerable proportion, to the fixed elements, such as fibrous tissues and endothelia. Our present-day knowledge prompts the adoption of a middle course between the two theories. The cells found in an inflamed part are undoubtedly drawn from both sources, but while the blood leucocytes have a great tendency to become fatty and to die, those cells derived from the fixed tissues incline more to organization; the latter are, in fact, the source of the cicatrix which follows upon the cessation of suppuration (fig. 23, Pl. II. and figs. 31 and 32, Pl. III.). Organization and healing have been keenly inquired into, with results which seem to point the lesson that all methods of healing are to be regarded as extensions of the natural phenomena of growth. Normal cytology, of late, has become a science of itself, and has had a direct bearing upon that which is pathological.

At no time has so much been done to advance our knowledge of diseases of the nervous system as during the last thirty years of the 19th century. The localization of function in the cerebral and in the cerebellar cortex has doubtless been the main cause of this progress, and has proceeded *pari passu* with an extended insight into the structure and connexions of the parts concerned. The pathology of aphasia, as worked out by a combination of the experimental, the pathological and the anatomical lines of inquiry is a favourable example of what has been accomplished. The origin, nature, and propagation of neoplasms of all kinds, especially of those which are malignant, are engaging much attention. Much light has been thrown upon the functions and diseases of the blood-forming tissues. The origin of the corpuscles, previously a matter of so much difference of opinion, is now pretty fairly set at rest, and has proved the key to the interpretation of the pathology of many diseases of the blood, such as the different forms of anaemia, of leucocythaemia, &c.

It is largely to researches on the bone marrow that we owe our present knowledge of the origin and the classification of the different cellular elements of the blood, both erythrocytes or red corpuscles, and the series of granular leucocytes or white corpuscles. Whatever be the ancestral cell from which these cells spring, it is in the bone marrow that we find a differentiation into the various marrow cells from which are developed the mature corpuscles that pass from the marrow into the blood circulation. The healthy bone marrow reacts with remarkable rapidity to the demand for more blood cells which may be required by the organism; its reactions and variations in disease are very striking. If the demand be for the red cells owing to loss from haemorrhage or any of the anaemias, the fatty marrow is rapidly replaced by cellular elements; this is mainly an active proliferation of the nucleated red cells, and gives rise to the erythroblastic type of marrow. If the white cells be required, as in local suppurating abscess, general septicaemia, acute pneumonia, &c., there is an active proliferation of the myelocytes to form the polymorpho-nuclear leucocytes, so that we have in this condition a leucoblastic transformation of the fatty marrow.

The cytology of bone marrow, with the technique of blood examination, is of great assistance in the diagnosis of different pathological conditions. The deleterious influence of high blood-pressure has engaged the attention of physicians and pathologists in later years, and the conclusion arrived at is, that although it may arise from accidental causes, such as malcomposition of the blood, yet that in many instances it is a hereditary or family defect, and is bound up with the tendency to gout and cirrhotic degeneration of the kidney. The pathology of intra-cardiac and vascular murmurs has also been inquired into experimentally, the general impression being that these abnormal sounds result, in most cases at least, from the production of a sonorous liquid vein. Pneumonia of the croupous type has been proved to be, as a rule, a germ disease, the nature of the germ varying according to circumstances. The structural changes occurring in the bronchi in catarrhal bronchitis have also been ascertained, and, as in the case of pneumonia, have been shown to be frequently excited by the presence of a microphyte. The vexed question of the diagnosis of diphtheria is now a thing of the past. Quite irrespective of the nature of the anatomical lesion, the finding of the diphtheria bacillus on the part affected and the inoculability of this upon a suitable fresh soil are the sole means by which the diagnosis can be made certain.

The part played by the thyroid body in the internal economy of the organism has also received much attention. The gland evidently excretes, or at any rate gets rid of, a certain waste product of a proteid nature, which otherwise tends to accumulate in the tissues and to excite certain nervous and tissue phenomena. It wastes in the disease known as "myxoedema," and the above product gathers in the tissues, in that disease, to such an extent as to give rise to what has been termed a "solid oedema." It is questionable if the substance in question is mucoid. The pituitary body probably subserves a like purpose. When the pancreas is excised in an animal, or when it is destroyed in man by disease, grape-sugar appears in the urine. The gland is supposed to secrete a ferment, which, being absorbed into the portal circulation, breaks up a certain portion at least of the grape-sugar contained in the portal blood, and so prevents this overflowing into the circulation in general. The transplantation of a piece of living pancreas into the tissues of an animal, thus rendered artificially diabetic, is said to restore it to health.

Pathological chemistry has been remarkable chiefly for the knowledge we have obtained of the nature of bacterial poisons. Certain of these are alkaloids, others appear to be albumoses. The publication of Ehrlich's chemical, or rather physical, theory of immunity has thrown much light upon this very intricate and obscure subject.

Connexion with Biology.

Pathology is the science of disease in all its manifestations, whether structural or functional, progressive or regressive. In times past it has been the habit to look upon its sphere as lying really within that of practical medicine, and with human medicine more particularly; as something tagged on to the treatment of human disease, but unworthy of being studied for its own sake as a branch of knowledge. Such a view can recommend itself to only the narrowest of minds. A bearing, and of course an essential bearing on the study of medicine, it must always have. A system of medicine reared upon anything but a pathological basis would be unworthy of consideration. Yet it may well be asked whether this is the final goal to be aimed at. Our starting-point in this, as in all departments of biological study, must be the biological unit, and it is to the alterations to which this is subject, under varying conditions of nutrition and stimulation, that the science of pathology must apply itself. Man can never be the only object of appeal in this inquiry. The human organism is far too complex to enable us to understand the true significance of diseased processes. Our range must embrace a much wider area—must comprise, in fact, all living matter—if we are ever to arrive at a scientific conception of what disease really means. Hence not only must the study of our subject include the diseases peculiar to man and the higher animals, but those of the lowest forms of animal life, and of plant life, must be held equally worthy of attention. Modern research seems to show that living protoplasm, wherever it exists, is subject to certain laws and manifests itself by certain phenomena, and that there is no hard and fast line between what prevails in the two kingdoms. So it is with the diseased conditions to which it is a prey: there is a wonderful community of design, if the term may be used in such a sense, between the diseases of animals and plants, which becomes singularly striking and instructive the more they are inquired into. Utilitarian, or perhaps rather practical, considerations have very little to do with the subject from a scientific point of view—no more so than the science of chemistry has to do with the art of the manufacturing chemist. The practical bearings of a science, it will be granted, are simply, as it were, the summation of its facts, with the legitimate conclusions from them, the natural application of the data ascertained, and have not necessarily any direct relationship to its pursuit. It is when studied on these lines that pathology finds its proper place as a department of biology. Disease as an entity —as something to which all living matter is subject—is what the pathologist has to recognize and to investigate, and the practical application of the knowledge thus acquired follows as a natural consequence.

Health and Disease.

Since pathology is the science of disease, we are met at the very threshold by the question: What is disease? This may best be answered by defining what we understand by health. What do we mean when we talk of a healthy organism? Our ideas upon the subject are purely arbitrary, and depend upon our everyday experience. Health is simply *that condition of structure and function which, on examination of a sufficient number of examples, we find to be commonest.* The term, in fact, has the same significance as "the normal." Disease we may define, accordingly, as *any departure from the normal standard of structure or function of a tissue or organ.* If, for instance, we find that instead of the natural number of Malpighian bodies in the kidney there are only half that number, then we are entitled to say that this defect represents disease of structure; and if we find that the organ is excreting a new substance, such as albumen, we can affirm logically that its function is abnormal. Once grant the above definition of disease, and even the most trivial aberrations from the normal must be regarded as diseased conditions, quite irrespective of whether, when structural, they interfere with the function of the part or not. Thus an abortive supernumerary finger may not cause much, if any, inconvenience to the possessor, but nevertheless it must be regarded as a type of disease, which, trivial as it may appear, has a profound meaning in phylogeny and ontogeny.

Classification.—From the foregoing it will be gathered that the problems in pathology are many-sided and require to be attacked from all points of vantage; and the subject falls naturally into certain great divisions, the chief of which are the following:—

I. Morbid anatomy.
  (*a*) Naked-eye or macroscopic.
  (*b*) Morbid histology or microscopic.
II. Pathological physiology.
III. Pathogenesis.
IV. Aetiology.
V. Pathological chemistry.

The term "pathogenesis" has reference to the generation and development of disease, and that of "aetiology," in its present bearing, has to do with its causes. The use of the term "pathological physiology" may at first appear strange, for if we define physiology as the sum of the normal functions of the body or organism, it may be hard to see how there can be a physiology which is pathological. The difficulty, however, is more apparent than real, and in this sense, that if we start with a diseased organ as our subject of inquiry, we can quite properly, and without committing a solecism, treat of the functions of that organ in terms of its diseased state.

INFLUENCES WORKING FOR EVIL UPON THE ORGANISM

(1) *Malnutrition.*—When the blood supply is entirely cut off from a tissue the tissue dies, and in the act of dying, or afterwards, it suffers certain alterations dependent upon its surroundings. Thus, when the circulation to an external part is obstructed completely, as in the case of a limb where the main artery has been occluded and where the anastomatic communications have not sufficed to continue the supply of blood, the part becomes gangrenous (fig. 24, Pl. II.); that is to say, it dies and falls a prey to the organisms which excite putrefaction, just as would happen to any other dead animal tissue were it unconnected with the body. Fermentative changes are set up in it, characterized by the evolution of gas and the formation of products of suboxidation, some of which, being volatile, account for the characteristic odour. In the formation of these the tissues break down, and in course of time lose their characteristic histological features. The blood suffers first; its pigment is dissolved out and soaks into the surroundings, imparting to them the pink hue so diagnostic of commencing gangrene. Muscle and white fibrous tissue follow next in order, while elastic tissue and bone are the last to show signs of disintegration. The oil separates from the fat-cells and is found lying free, while the sulphuretted hydrogen evolved as one of the products of putrefaction reacts upon the iron of the blood and throws down a precipitate of sulphide of iron, which in course of time imparts to the limb a range of colour commencing in green and terminating in black.

The temperature at which the limb is kept, no doubt, favours and hastens the natural process of destruction, so that putrefaction shows itself sooner than would be the case with a dead tissue removed from the body and kept at a lower temperature. Nevertheless, gangrene is nothing more or less than *the putrefactive fermentation of an animal tissue still attached to the body.* If the amount of liquid contained in the tissue be small in quantity the part mummifies, giving rise to what is known as "dry gangrene." If the dead part be protected from the ingress of putrefactive organisms, however, it separates from that which is living without the ordinary evidences of gangrene, and is then known as an "aseptic slough." Should the portion of tissue deprived of its circulation be contained in an internal organ, as is so often the case where the obstruction in the artery is due to embolism, it becomes converted into what is known as an "infarction." These infarcts are most common in organs provided with a terminal circulation, such as prevails in the kidney and spleen. The terminal branches of the arteries supplying these organs are usually described as not anastomosing but many, if not all, of Cohnheim's end-arteries have minute collateral channels; which, however, are usually insufficient to completely compensate for the blocking that may occur in these arteries, therefore, when one of them is obstructed, the area irrigated by it dies from malnutrition. Being protected from the ravages of the organisms which induce putrefaction, however, it does not become gangrenous; it is only where the obstructing agent contains these organisms that a gangrenous slough follows, or, in the case of the contaminating organisms being of a suppurative variety, ends in the formation of a so-called "pyaemic abscess," followed by rapid dissolution of the dead tissue (fig. 24, Pl. II.). In ordinary circumstances, where the artery is obstructed by an agent free from such organismal contamination, the part becomes first red. This is due to intense engorgement of the vessels brought about through these minute existing collateral channels and results in a peripheral congested zone round the infarct. There may be haemorrhage from these vessels into the tissues. This collateral supply not being sufficient to keep up the proper flow of blood through the part the veins tend to become thrombosed, thus increasing the engorgement. The central part of the obstructed area very soon undergoes degenerative changes, and rapidly becomes decolourized. This necrosed area forms the pale infarct. Absorption of this infarcted zone is carried on by means of leucocytes and other phagocytic cells, and by new blood-vessels. If absorption be not complete the mass undergoes caseation and becomes surrounded by a capsule of fibrous tissue—being sharply cut off from the healthy tissue.

Where the malnutrition is the effect of poorness in the quality of the blood, the results are of course more widespread. The muscles suffer at an early period: they fall off in bulk, and later suffer from fatty degeneration, the heart being probably the first muscle to give way. Indeed, all tissues when under-nourished, either locally as the result of an ischaemia, or generally as from some impairment of the blood, such as that prevailing in pernicious anaemia, tend to suffer from fatty degeneration; and at first sight it seems somewhat remarkable that under-nourished tissues should develop fat in their substance (figs. 26 and 27, Pl. II.). The fatty matter, however, it must be borne in mind, is the expression of dissimilation of the actual substance of the proteids of the tissues, not of the splitting up of proteids or other carbonaceous nourishment supplied to them.

A part deprived of its natural nerve-supply sooner or later suffers from the effects of malnutrition. When the trigeminus nerve is divided (Majendie), or when its root is compressed injuriously, say by a tubercular tumour, the cornea begins to show points of ulceration, which, increasing in area, may bring about total disintegration of the eyeball. The earliest interpretation put upon this experiment was that the trophic influence of the nerve having been withdrawn, the tissue failed to nourish itself, and that degeneration ensued as a consequence. The subsequent experiments of Snellen, Senftleben, and, more lately, of Turner, seem to show that if the eyeball be protected from the impingement of foreign particles, an accident to which it is liable owing to its state of anaesthesia, the ulceration may be warded off indefinitely. If the eyeball be kept perfectly clean and no organism be admitted from the outside then ulceration will not follow. If, on the other hand, any pathogenic organisms be present the results are disastrous because the tissue, deprived of its nervous trophic supply, has greatly lessened resistance. The bed-sores which follow paralysis of the limbs are often quoted as proof of the direct trophic action of the nerve-supply upon the tissues, yet even here the evidence is somewhat contradictory. Still, there are facts which, for want of a better explanation. we are almost bound to conclude are to be accounted for on the direct nerve-control theory. The common variety of bed-sore is the result of continuous pressure on and irritation of the skin, the vitality and resisting power of which are lowered by a lesion of the cord cutting off the trophic supply to the skin affected. The acute bed-sore is, in some cases, a true trophic lesion occurring, as it may, on parts not subjected to continuous pressure or irritation. Trophic disturbance in the nutrition of the skin may be so great that a slight degree of external pressure or irritation is sufficient to excite even a gangrenous inflammation. Again, a fractured bone in a paralysed limb often fails to unite, while another in the opposite sound limb unites readily, and an ulcerated surface on a paralysed limb shows little healing reaction. A salivary gland degenerates when its nerve-supply is cut off; and the nerves leading up to the symmetrical sloughs in Raynaud's disease have been found in an advanced state of degeneration (Affleck and Wiglesworth). It is just a question, however, whether, even in instances such as these, the nutritional failure may not be explained upon the assumption of withdrawal of the local vasomotor control. There seems to be little doubt, notwithstanding, that one of the chief functions of the nerve cell is that of the propagation of a trophic influence along its axon. When a nerve-trunk is separated from its central connexion, the distal portion falls into a state of fatty degeneration (Wallerian or secondary degeneration). That special trophic nerves, however, exist throughout the body, seems to be a myth. It is much more likely, as Verworn alleges, that the nerves which influence the characteristic function of any tissue regulate thereby the metabolism of the cells in question—in other words, that every nerve serves as a trophic nerve for the tissues it supplies. It is a significant fact that neoplasms contain very few nerve-fibres, even although growing luxuriantly, and there is a doubt whether the few twigs contained in them may not merely have been dragged into their midst as the tumour mass expanded (Young).

Overwork.—The effect of overwork upon an organ or tissue varies in accordance with (*a*) the particular organ or tissue concerned, (*b*) the amount of nourishment conveyed to it, and (*c*) the power of assimilation possessed by its cells. In the case of muscle, if the available nourishment be sufficient, and if the power of assimilation of the muscle cells remain unimpaired, its bulk increases, that is to say, it becomes hypertrophied.

It may be advisable to define exactly what is meant by "hypertrophy," as the term is often used in a loose and insignificant sense. Mere enlargement of an organ does not imply that it is in a state of hypertrophy, for some of the largest organs met with in morbid anatomy are in a condition of extreme atrophy. Some organs are subject to enlargement from deposition within them of a foreign substance (amyloid, fat, &c.). This, it need hardly be said, has nothing to do with hypertrophy. The term hypertrophy is used when the individual tissue elements become bigger to meet the demands of greater functional activity; hyperplasia, if there is an increase in the number of these elements; and pseudo-hypertrophy, when the specific tissue element is largely replaced by another tissue.

There are conditions in which we have an abnormal increase in the tissue elements but which strictly should not be defined as hypertrophies, such as new-growths, abnormal enlargements of bones and organs due to syphilis, tuberculosis, osteitis deformans, acromegaly, myxoedema, &c. The enormously long teeth sometimes found in rodents also are not due to hypertrophy, as they are normally endowed with rapid growth to compensate for the constant and rapid attrition which takes place from the opposed teeth. Should one of these teeth be destroyed the opposed one loses its natural means of attrition and becomes a remarkable, curved tusk-like elongation. The nails of the fingers, or the hair of the scalp may grow to an enormous length if not trimmed.

True hypertrophy is commonly found in the hollow muscular organs such as the heart, bladder and alimentary canal. As any obstruction to the outflow of the contents throws an increased amount of work on the walls, in order to overcome the resistance, the intermittent strain, acting on the muscle cells, stimulates them to enlarge and proliferate, fig. 28, Pl. II., and gives rise to adaptive hypertrophy. Should there be much loss of tissue of an organ, the cells of the remaining part will enlarge and undergo an active proliferation (hyperplasia) so that it may be made up to the original amount. Or again, in the case of paired organs, if one be removed by operation, or destroyed by disease, the other at once undertakes to carry on the functions of both. To do so a general enlargement takes place until it may reach the size and weight equal to the original pair. This is known as compensatory hypertrophy.

Examples of physiological hypertrophy are found in the ovaries, uterus and mammary glands, where there is an increased functional activity required at the period of gestation. Local hypertrophy may also be due to stimulation resulting from friction or intermittent pressure, as one may see in the thickenings on the skin of the artisan's hands. The extreme development of the muscles in the weight-lifting athlete and in the arm of the blacksmith is the result of increased functional activity with a corresponding increase in the vascular supply; this exercise may produce an over-development so excessive as to be classed as abnormal.

In atrophy we have a series of retrograde processes in organs and tissues, which are usually characterized by a progressive diminution in size which may even end in their complete disappearance (fig. 29, Pl. II.). This wasting may be general or local—continuously from the embryonic period there is this natural process of displacement and decay of tissues going on in the growing organism. The functions of the thymus gland begin to cease after the second year from birth. The gland then slowly shrinks and undergoes absorption. From atrophy of their roots, caused by the pressure of the growing permanent teeth, the "milk teeth" in children become loose and are cast off. The ovaries show atrophic changes after the menopause. In old age there is a natural wearing out of the elements of the various tissues. Their physiological activities gradually fail owing to the constructive processes having become so exhausted from long use that the destructive ones are able to overtake them. As the cell fails and shrinks, so does it become more and more unable to make good the waste due to metabolism. This physiological wasting is termed senile atrophy.

General atrophy or emaciation is brought about by the tissues being entirely or partially deprived of nutriment, as in starvation, or in malignant, tubercular, and other diseases of the alimentary system which interfere with the proper ingestion, digestion or absorption of food material. The toxic actions produced in continued fevers, in certain chronic diseases, and by intestinal parasites largely aid in producing degeneration, emaciation and atrophy.

Atrophy may follow primary arrest of function—disuse atrophy. The loss of an eye will be followed by atrophy of the optic nerve; the tissues in a stump of an amputated limb show atrophic changes; a paralysed limb from long disuse shows much wasting; and one finds at great depths of the sea fishes and marine animals, which have almost completely lost the organs of sight, having been cut off for long ages from the stimuli (light) essential for these organs, and so brought into an atrophic condition from disuse.

Atrophy may also follow from overwork. Increased work thrown on to a tissue may produce hypertrophy, but, if this excessive function be kept up, atrophy will follow; even the blacksmith's arm breaks down owing to the hypertrophic muscle fibres becoming markedly atrophied.

From these causes a certain shrinkage is liable to occur, more evident in some parts of the body than in others. Thus the brain falls off in bulk, and the muscles become attenuated, and in no muscle is this more notable than in the case of the heart. A tendency to pigmentation also develops in certain tissues of the body, such as the nerve and muscle cells. As a result of these various degenerations the functions of the body deteriorate, the faculties become blunted, and the muscular energy of the body is below what it was in earlier life, while the secreting glands in certain instances become functionally obsolescent.

Continuous Over-pressure.—The tissues of an animal or plant are all under a certain pressure, caused, in the one case, by the expulsive action of the heart and the restraint of the skin and other elastic tissues, and, in the other case, by the force of the rising sap and the restraint of the periderm or bark. Under this normal amount of pressure they can live and grow. But whenever, from any cause, the degree of pressure which they are naturally intended to withstand is surpassed, they fail to nourish themselves, become granular, die, and, falling to pieces, are absorbed.

Deleterious Surroundings.—There can be little doubt that all unnatural and artificial modes of life tend to deterioration of the powers of resistance of the organism to disease. We see it exemplified in plant life in circumstances which are unnatural to the life of the plant, and the prevalence of certain constitutional tendencies among the inhabitants of crowded cities bears evidence to the same law.

Man, like other animals, was naturally intended to lead an outdoor life. He was originally a hunter and a tiller of the ground, breathing a pure atmosphere, living on a frugal diet, and exercising his muscles. Whenever these conditions are infringed his powers of resistance to disease are lessened, and certain tendencies begin to show themselves, which are generally termed constitutional. Thus the liability to tubercular infection is far commoner in the midst of a depraved population than in one fulfilling the primary laws of nature; rickets is a disease of great cities rather than of rural districts; and syphilis is more disastrous and protracted in its course in the depraved in health than in the robust. Cattle kept within-doors are in a large proportion of cases tubercular, while those leading an outdoor life are much less liable to infection. The improvement which has taken place in the general health of the inhabitants of cities during recent years, concurrent with hygienic legislation, is ample proof of the above assertions. The diminution in the number of deaths from tuberculosis during the last forty to fifty years of the 19th century of itself points in this direction. Every living organism, animal and vegetable, tends to maintain a normal state of health; it is when the natural laws of health are violated that the liability to disease begins to assert itself. If, in these circumstances, the food supply be also insufficient, the combination of influences is sure, in course of time, to bring about a physical deterioration of the race. Certain avocations have a direct and immediate influence in causing diseased states of body. Thus workers in lead suffer from the effects of this substance as a poison, those who work in phosphorus are liable to necrosis of bone and fatty degeneration of the blood vessels and organs, and the many occupations in which dust is inhaled (coal-mining, stone-dressing, steel-polishing, &c.; fig. 30, Pl. III.) are fraught with the greatest danger, owing to the destructive influence exerted upon the lungs by the inhaled particles. Among the most dangerous of the last class (the pneumokonioses) is perhaps that in which the dust particles take the form of finely divided freestone, as in stone-dressing and the dry-polishing on the grindstone of steel. The particles in this case set up a form of fibrosis of the lung, which, either of itself or by rendering the organ liable to tubercular infection, is extremely fatal. The abuse of alcohol may also be mentioned here as a factor in the poduction of disease.

Parasitism.—Of all external agents acting for evil, however, probably vegetable and animal micro-organisms with a pathogenic bent are most to be feared. When we consider that tuberculosis, diphtheria, cholera, tetanus, typhoid fever, anthrax, malaria and a host of other contagious diseases have each been proved to be of parasitical origin, an idea may be conveved of the range of the subject. The living organism may be regarded as constantly engaged in a warfare with these silent and apparently insignificant messengers of destruction and death, with the result that too often the battle ends in favour of the attacking enemy.

Heredity.—The *tendencies* to disease are in great part hereditary. They probably express a variation which may have occurred in a far-back ancestor, or in one more recent, and render the individual vulnerable to the attacks of parasitic fungi, or, it may be, become manifest as errors of metabolism. The psychopathic, the tubercular, the rickety, and the gouty constitution may all be transmitted through a line of ascendants, and only require the necessary exciting agents to render them apparent. A distinction must be drawn between the above and diseases, like syphilis and small-pox, in which the contagion of, not the tendency to, the disease is transmitted directly to the foetus *in utero*. (See HEREDITY.)

THE CELLULAR DOCTRINE IN PATHOLOGY

The cellular pathology is the pathology of to-day; indeed, protoplasm—its vital characteristics under abnormal influences and its decay—will be regarded most likely as the basis of pathology in all time. According to our present knowledge of physiological and pathological processes, we must regard the cell as the ultimate biological unit—a unit of structure and a unit of function; this was first put forward by Schleiden in 1838, and by Schwann in 1839, but we owe to Virchow the full recognition of the fundamental importance of the living cell in all the processes of life, whether in health or disease. When Virchow wrote, in 1850, "every animal presents itself as a sum of vital unities, every one of which manifests all the characteristics of life," he expressed a doctrine whose sway since then has practically been uninterrupted. The somatic cells represent communities or republics, as it were, which we name organs and tissues, but each cell possesses a certain autonomy and independence of action, and exhibits phenomena which are indicative of vitality.

Still, it must be borne in mind that this alleged autonomy of action is said to be founded upon an erroneous supposition, on the supposition that each cell is structurally, and it may be said functionally, separated from those in its neighbourhood. It is well known that in the vegetable kingdom the protoplasm of one cell frequently overflows into that of cells adjacent—that there is, as it were, a continuous network of protoplasm (idioplasm of Nägeli) prevailing throughout vegetable tissues, rather than an aggregation of isolated units. The same inter-communication prevails between adjacent cells in some animal tissues, and more particularly in those which are pathological, as in the case of the epithelial cells of cancer. Assuming, with Sedgwick and others, this amassed and bound condition of the tissues to be true, it would be necessary to reject the cell-doctrine in pathology altogether, and to regard the living basis of the organism as a continuous substance whose parts are incapable of living independently of the whole. Until, however, further evidence is forthcoming in support of this syncytial theory of structure, it would be unwise to regard it as established sufficiently to constitute a serviceable working hypothesis; hence, for the time being, we must accept the assertion that the cell represents the ultimate tissue-unit. Our present day definition of a cell is a minute portion of living organized substance or protoplasm.

Structure of Pathological Cells.

The cells met with in morbid parts which are in a state of active vitality are built up of the same components as those found in normal tissues (Pl. I.).[1] Thus they are provided with a nucleus which is the centre of cell activity; both of the reproductive and chemical (metabolic) processes which occur in the cell protoplasm. The executive centre varies in shape, but is usually round or oval, and is sharply defined by a nuclear membrane from the cytoplasm in which it lies. The nucleus in its vegetative stage shows a fine network throughout containing in the meshes the so-called nuclear-sap; attached to the network are the chromosomes, in the form of small irregular masses, which have a strong affinity for the "basic dyes." Embedded in the nucleus are one or more nucleoli (plasmosomes) having an affinity for the "acid dyes." The nucleolus shows an unstainable point at the centre known as the endonucleolus or nucleoluolus (Auerbach).

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[1] DESCRIPTION OF PLATE I.

SERIES OF FIGURES ILLUSTRATIVE OF IRREGULAR DIVISION OF CELLS.

Figs. 1 *to* 6 *are from the epithelial cells of a cancer of the mamma,* (*After Galeotti.*)

„ 7 *to* 21 *are from a sarcoma.* (*After Trambusti.*)

FIG. 1.—Resting epithelial cell.

The cell body, or cytoplasm, is apparently composed of a fine reticulum or network, containing within the meshes a soft viscid, transparent substance, the cell-sap, or hyaloplasm, which is probably a nutrient material to the living cell. Within the cytoplasm are found manifestations of functional activity, in the form of digestive vacuoles, granules, fat, glycogen, pigment, and foreign bodies. Usually the cytoplasm shows a marked affinity for the acid stains, but the different bodies found in the cell may show great variation in their staining reactions.

The centrosomes which play so important a part in cell division may be found either lying within or at one side of the nucleus in the vegetative condition of the cell. Centrosomes may be single, but usually two are lying close together in the attraction-sphere. When mitosis is about to take place, they separate from one another and pass to the poles of the nucleus, forming the achromatic spindle. After the division and cleavage of the chromosomes of the original nucleus have taken place they pass from the equator to the poles of the spindle, rearranging themselves close to the separated centrosomes to form daughter nuclei.

The cytoplasm of the cell now undergoes division in a line between the two daughter nuclei. When complete separation has taken place, we have two daughter cells formed from the original, each being a perfect cell-unit. Some pathological cells, such as the giant-cells of tumours, of bone, and those of tubercle, are polynucleated; in some instances they may contain as many as thirty or more nuclei. The only evidence we have in pathology of living structures in which apparently a differentiation into cell-body and nucleus does not exist, is in the case of bacteria, but then there comes the question whether they may not possess chromatin distributed through their substance, in the form of metachromatic points, as is the case in some infusoria (Trachelocerca, Gruber).

Although the methods of cell-division prevailing in normal structures are maintained generally in those which are pathological, yet certain modifications of these methods are more noticeable in the latter than in the former. Thus in the neoplasmata direct cell-division is more the rule than in healthy parts. In actively growing neoplasmata, certainly, the indirect method prevails largely, but seems to go on side by side with the direct.

A curious and interesting modification of the indirect method, known as "asymmetrical division," occurs frequently in epitheliomata, sarcomata, &c. (Hansemann). It consists in an unequal number of chromosomes passing over to each of the daughter nuclei, so that one may become hypochromatic, the other hyperchromatic. When this happens the resulting cleavage of the cytoplasm and nucleus is also unequal. Several explanations have been given of the meaning of these irregularly chromatic cells, but that which most lends itself to the facts of the case seems to be that they represent a condition of abnormal karyorhexis.

Fig. 2.—Asymmetrical diaster.
,, 3.—Tripolar division in which the splitting of the loops has commenced.
,, 4.—Tetrapolar karyokinesis.
,, 5.—Another form of tetrapolar division.
,, 6.—Cell in a state of degeneration and chromatolysis; the large rounded body in the cell is a cancer parasite.
,, 7.—Polynucleated cell with nuclei of normal size arising from multiple karyokinetic division.
,, 8.—Pigmented cell with resting nucleus. The attraction-sphere and centrosome lie in the cytoplasma in the neighbourhood of the nucleus.
,, 9.—Hypertrophic nucleolus.
,, 10.—Large cell with a single nucleus; nucleoli in a state of degeneration.
,, 11.—Multinucleated giant-cell, the nuclei small and produced amitotically.
,, 12.—Karyokinetic figure, the one centrosome much larger than the other.
,, 13.—Cell in process of karyokinetic division with retention of the nucleolus during the division.
,, 14.—Division of the nucleolus and formation of nuclear plate. The nucleolus is elongated, and its longest measurement lies in the direction of the equatorial plane of the nucleus.
,, 15.—Division of the nucleolus by elongation, construction, and equilateral division of the nucleus.
,, 16.—Division of the nucleolus without any evidence of division of the nucleus.
,, 17.—Nucleus with many nucleoli.
,, 18.—Direct division of nucleus.
,, 19.—Multiple direct division of the nucleus.
,, 20.—Nail-like nucleolus.
,, 21.—Fragmentation of the nucleus.

In many pathological cells undergoing indirect segmentation, centrosomes appear to be absent, or at any rate do not manifest themselves at the poles of the achromatic spindle. When they are present, that at one end of the spindle may be unusually large, the other of natural size, and they may vary in shape. In pathological cell-division it happens occasionally that the segmentation of the cytoplasm is delayed beyond that of the mitotic network. The daughter nuclei may have arrived at the anaphase stage, and have even gone the length of forming a nuclear membrane, without an equatorial depression having shown itself in the cell-body. Sometimes the equatorial depression fails entirely, and the separation, as in some vegetable cells, takes place through the construction of a cell-plate. Intranuclear plexuses are not usually found in giant-cells, but have been described in the giant-cells of sarcomata by Klebs and Hansemann, and in those of tubercle by Baumgarten. Some of the nuclei within multinucleated cells may occasionally be engaged in mitotic division, the others being in the resting state.

In the earlier accepted notion of direct segmentation, usually known as the schema of Remak, division was described as commencing in the nucleolus, as thereafter spreading to the nucleus, and as ultimately implicating the cell-substance. Trambusti, curiously, finds confirmatory evidence of this in the division of cells in sarcoma. Contrary, however, to the experience of others, he has never found that the attraction-spheres play an important part in direct cell-division, or, indeed, that they exert any influence whatever upon the mechanism of the process. Where pigment was present within the cells (sarcoma), the attraction-spheres were represented by quite clear unpigmented areas, sometimes with a centrosome in their midst.

REPAIR OF INJURIES

In the process of inflammation we have a series of reactions on the part of the tissues, and fluids of the body, to counteract the ill effects of irritation or injury, to get rid of the cause, and to repair its results. Injury and loss of tissue are usually followed by repair, and both the destructive and reparative changes are, as a rule, classified under the term inflammation. The irritants may be bacteria and their toxins, or they may be mechanical, chemical or thermic.

We do not now concur with the old view that inflammation was essentially an injurious process; rather do we look upon it as beneficial to the organism. In the various reactions of the tissues against the exciting cause of the injury we see a striking example of a beautifully organized plan of attack and defence on the part of the organism.

In some of the infective conditions the conflict fortifies the organism against future attacks of the same nature, as for example in the immunity following many of the acute infective diseases. This acquired immunity is brought about by the development of a protective body as a result of the struggle of the cells and fluids of the body with the invading bacteria and their toxins. This resistance may be more or less permanent. If the invasion is due to a pus-producing micro-organism which settles in some local part of the body, the result is an abscess (fig. 25, Pl. II.).

Abscesses.—One can easily demonstrate all the actions and reactions which take place in this form of acute inflammation. In such a conflict one can see the presence of these minute but dangerous foes in the tissues. At once they proceed to make good their hold on the position they have secured by secreting and throwing out toxins which cause more or less injury to the tissues in their immediate neighbourhood. These micro-organisms having found in the tissues everything favourable for their needs, rapidly multiply and very soon produce serious results. At this point one's attention is focused on the wonderful reactions possessed by the healthy tissues to combat these evil influences.

In a very short period—within three or four hours after infection—there appears to have been a message conveyed to the defenders of the body both as to the point of attack and the nature of the invasion. There is thus brought into play a series of processes on the part of the tissues—the vascular inflammatory changes—which is really the first move to neutralize the malign effects. We find at this early stage oedema of the part. This is an increased exudation of fluid from the engorged blood vessels which not only dilutes the toxins, but is supposed to contain substances which in some way act on these living micro-organisms and render them a more easy prey to the polymorpho-nuclear leucocytes (fig. 23, Pl. II.)—cells that are motile and extremely phagocytic to these bacteria. At this stage the

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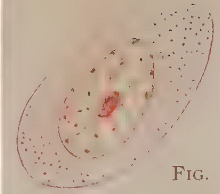
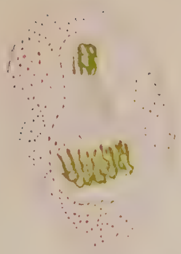


Fig. 1.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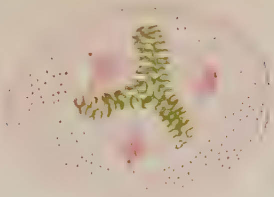
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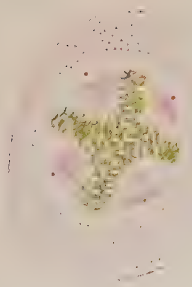
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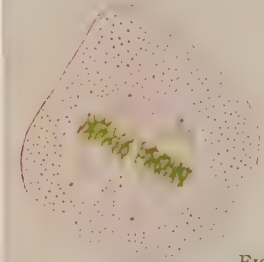
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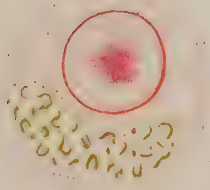
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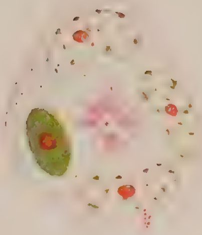


Fig. 7.

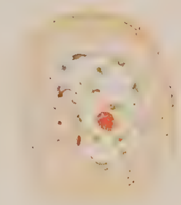
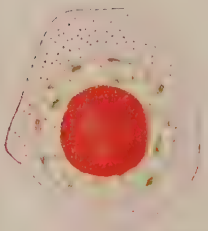


Fig. 8.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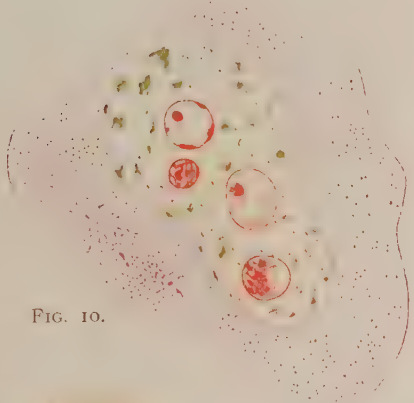
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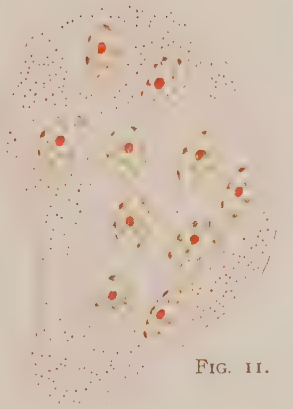
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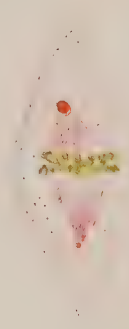
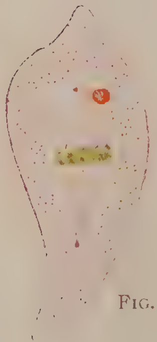


Fig. 12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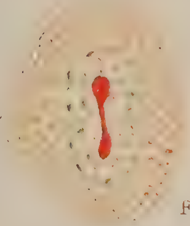
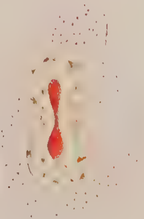


Fig. 15.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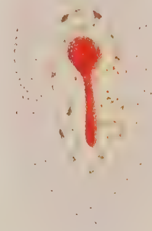
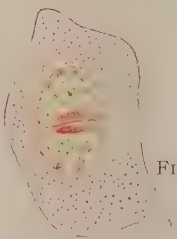


Fig. 20.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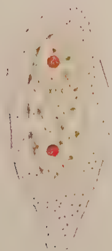
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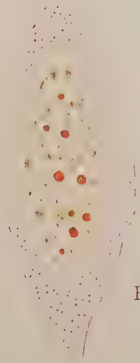
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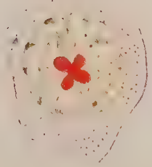
Fig. 19

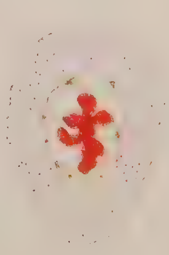
Fig. 21.

Drawn by Rd. Muir.

rapidity of the blood circulation has become greatly diminished. The polymorpho-nuclear leucocytes are seen in great numbers in the blood vessels.

In health these cells, belonging to our first army of defenders, are found continually circulating in the blood stream in fairly large numbers; they are ever ready to rush to the point of attack, where they at once leave the blood stream by passing through the vessel walls—emigration—into the tissues of the danger zone. There they show marked phagocytosis, attacking and taking up into their interior and destroying the micro-organisms in large numbers. At the same time large numbers of these cells perish in the struggle, but even the death of these cells is of value to the body, as in the process of breaking down there are set free ferments which not only act detrimentally to the bacteria, but also may stimulate the bringing forward of another form of cell defenders—the mononuclear leucocyte.

To replace this cellular destruction there has been a demand for reinforcements on the home centres of the polymorpho-nuclear leucocytes—the bone marrow. This call is immediately answered by an active proliferation and steady maturing of the myelocytes in the marrow to form the polymorpho-nuclear leucocytes. These then pass into the blood stream in very large numbers, and appear to be specially attracted to the point of injury by a positive chemiotactic action. This phenomenon, called *chemiotaxis*, has been studied by several investigators. Leber experimented with several chemical compounds to find what reaction they had on these cells; by using fine glass tubes sealed at the outer end and containing a chemical substance, and by introducing the open end into the blood vessels he found that the leucocytes were attracted—positive chemiotaxis—by the various compounds of mercury, copper, turpentin, and other substances. That quinine, chloroform, glycerin, alcohol, with others, had no attractive influence on them—negative chemiotaxis. It was also found that a weak solution may have a marked positive attraction whilst a strong solution of the same substance will have the opposite effect. It has been proved that the pyo-genic bacterial toxins, if not too concentrated, will attract the polymorpho-nuclear leucocytes, but if concentrated, may have a repelling influence.

Then we have the property of adaptation, in which the negative reaction may be changed into a positive; a given toxin may at first repel the cell, but by a gradual process the cell becomes accustomed to such a toxin and will move towards it.

On reaching the vicinity they leave the blood stream and join in the warfare—many performing their function of phagocytosis (*q.v.*), others falling victims to the toxins. The tissues of the part become disorganized or destroyed, and their place is taken by the mass of warring cellular elements now recognized as pus.

As soon as the fluids and the polymorpho-nuclear leucocytes have succeeded in diminishing the virulence of the micro-organism, the second line of defenders—the large mononuclear leucocytes (fig. 23, Pl. II.) make their appearance at the field of battle in ever increasing numbers. These are amoeboid cells and are extremely phagocytic, their power of digestion being greatly developed. Their principal function is to bring about the removal of foreign, dead or degenerating material. This they take up into their protoplasm, where it is rapidly digested by being acted on by some intracellular digestive ferment (fig. 31, Pl. III.). Where the material is too large to be taken up by an individual cell, the dissolution is brought about by the cells surrounding the material, to which they closely apply themselves, and by the secreting of the ferment, a gradual process of erosion is brought about with ultimate absorption.

If the abscess be deeply situated in some tissue and not able to open on to a free surface so allowing the contents to be drained off, the phagocytic cells play a very prominent part in the resolution of the abscess. They are seen pushing their way right into the field of conflict and greedily ingesting both friends and foes. The first defenders, the polymorpho-nuclear leucocytes, having performed their functions, are of no more use to the organism and are therefore removed by the mono-nuclear phagocytes as useless material (fig. 31, Pl. III.).

The tissues having now mobilized an army that completely surrounds the fighting zone, there is a gradual and general advance made from all sides. The vanguard of this advancing army is composed of a more or less compact layer of the mono-nuclear phagocytes (polyblasts) accompanied by numerous new vessels. These phagocytic cells carry out the complete removal of all the injured warring elements and the damaged tissues of the part. The vessels are only temporary channels by which is brought forward the food supply that is needed by the advancing army if it is successfully to carry on its function; they probably also drain off the deleterious fluid substances formed by the cellular disintegration that has taken place in the part. Closely on the advance of this army of phagocytes or scavenger cells follows the third line of defenders, the connective tissue cells or fibroblasts.

All these cells are probably of local origin and are now stimulated to make good the damage. The connective tissue cells or fibroblasts (fig. 32, Pl. III.) are seen in active proliferation around the phagocytic zone. First they are round or oval in shape; later they become spindle shaped, arranging themselves in layers. Then they develop definite fibrils which differentiate into fibrous laminae forming a zone which shuts off the abscess from the healthy tissue and so prevents the further invasion and injurious effects of the micro-organism. By the aid of the new fibroblasts this fibrous tissue zone gradually encroaches on the pus area and replaces the phagocytic layer of cells as they proceed with the absorption of the pus mass (fig. 33, Pl. III.). When complete removal of the pus mass has been accomplished by the process of absorption, the damaged area is replaced by the new fibrous tissue, which later becomes condensed and forms the cicatricial or scar tissue (fig. 35, Pl. III.)—a healed abscess.

Wounds.—The healing of wounds is brought about by similar processes to that seen in the evolution of an abscess.

If the injury be a small incised wound through the skin and subcutaneous tissues without any septic contamination, there usually follows a minimum of reaction on the part of the tissues. As the edges of the wound are brought into accurate apposition there is little or no blood lodged between them, so that an extremely narrow strip of fibrin glues the cut edges together. This strip is rapidly replaced, mainly by the connective tissue cells of the adjoining tissue growing across the temporary filled breach and firmly uniting the two cut surfaces. The vascular changes are practically absent in healing by first intention.

Healing by second intention, or granulation, is usually seen where there has been loss of tissue, or extensive damage. The reactions of the tissues vary in degrees according to the nature and severity of the injury. In resenting such insults, a remarkable uniformity and regularity in the processes is brought about by the different cells and fluids of the healthy tissues of the body. Although we have not reached a stage of certainty regarding their origin, function and destiny, recent investigations have brought forward evidence to elucidate the importance of the part played by the different cells in the various types of the inflammatory process.

If there be a loss of tissue brought about by severe injury to the skin and the deeper tissues, there is usually an extravasation of blood from the severed vessels. Along with the exuded serum this fills up the breach in the tissues and the whole is rapidly formed into a fibrinous mass due to the disintegration of the polymorpho-nuclear leucocytes setting free their ferment. The ferment thus set free brings about the coagulation of the serum, which acts as a protective and temporary scaffolding to the injured tissues. Lying between the fibrin mass and the healthy tissues is a zone of injured and degenerated tissue elements, the result of the trauma.

As early as six hours after the injury the polymorpho-nuclear leucocytes are seen passing in large numbers from the dilated and congested blood vessels of the tissues at the margin of the wound into the injured zone, where they carry on an active phagocytosis. It is believed also that they secrete bactericidal substances and ferments which bring about the liquefaction of the fibrin and the damaged tissues—histolysis—and thus assist the process of absorption. They appear to prepare the injured zone for the coming of the next series of cells. Their function being at an end they give way to these cells which carry on the process of absorption.

In a period varying from twenty-four to thirty hours there is marked evidence of the removal of the degenerated cellular elements in the damaged zone by the mono-nuclear phagocytes. Numerous fibroblasts, together with polyblasts, are visible in the fibrin mass, and the vessels at the periphery of the damaged zone are now seen to be sending out offshoots which assist in the process of absorption. These vascular buds grow out in various directions as little solid projections of cells; they then become channelled and form the new but temporary meshwork.

After two to four days these processes are more clearly emphasized. By these processes we reach the stage where the fibrin mass and damaged tissues have been completely removed, and replaced by a temporary vascular and cellular tissue, known as granulation tissue (fig. 34, Pl. III.), which in turn has to give way to the more firm and differentiated fibrous tissue. By this time the skin epithelium may have grown over the wound.

After five to seven days we find the connective tissue cells taking the principal part in the building up of the new permanent tissue, for at this stage there is an active proliferation of the fibroblasts. These cells of various shapes are seen in large numbers, mainly lying in a direction parallel to the new vessels and capillaries, which all run at right angles to the wound surface. The branching processes of these cells apparently anastomose with one another and form a delicate supporting network. It is from these cells that the fine fibrillar substance is formed, and from this stage onwards—eight to fifteen days—there is a steady increase in the new fibrils, giving more density to the new tissue. At the same time there is brought about an alteration in the arrangement of the position of the fibroblasts. These become spindle shaped with their long axis more and more assuming a position at right angles to the vessels (fig. 34, Pl. III.); the two edges of the wound are thus more firmly bound together. As their fibrils become more developed they gradually form fibrous laminae which are laid down first in the deeper part of the wound. When this process has reached a certain stage and all the absorption necessary has occurred the new blood vessels, from the increasing pressure of the successive fibrous layers, gradually dwindle and become obliterated, *i.e.* at a period corresponding to the condensation of the fibrous laminae and the disappearance of the cellular character of the granulation tissue. Thus is formed in the damaged area a permanent tissue known as scar tissue (fig. 35, Pl. III.).

Fibrosis.—Where a chronic inflammatory process has taken possession of an organ, or, let us say, has been located in periosteum or other fibrous part, there is a great tendency to the production of cicatricial fibrous tissue in mass. Thus it is laid down in large quantity in cirrhosis of the liver, kidney or lung, and reacts upon these organs by contracting and inducing atrophy. The term "cirrhosis" or "fibrosis" is usually applied to such a condition of organs (figs. 36 and 37, Pl. IV.), that of "sclerosis" is used when such a deposition of fibrous tissue occurs within the central nervous system. Gull and Sutton asserted that in particular states of body, and more especially in the condition associated with cirrhotic kidney, such a fibrosis becomes general, running, as they alleged it does, along the adventitia of arteries and spreading to their capillaries. They supposed that it was accompanied by a peculiar hyaline thickening of the arterial wall, usually of the tunica intima, and hence they termed the supposed diseased state "arterio-capillary fibrosis," and gave the fibrous substance the name "hyaline-fibroid." They held that the cirrhotic kidney is simply a local manifestation of a general fibrous disease. Their theory, however, has fallen into disfavour of late years.

Tumours or New Growths

The various definitions of the term "new growth" leave us with a definite conception of it as a new formation of tissue which appears to originate and to grow independently. We have already compared the body to a social community, each constituent element of which—the cell—lives its own life but subordinates its individuality to the good of the whole organism. The essential characteristic of a new growth is that this subordination is lost and the tissue elements, freed from the normal mutual restraint of their interdependence, give way to an abnormal growth. All the hypotheses about the causation of new growths seek to explain the secret of this individuality or "autonomy," as they recognize that the mystery of the origin of the great majority of tumours would be solved if we could trace how or why the tissue elements in which they develop first took on this abnormal growth.

Tumours are divided into two main groups—innocent and malignant. These differ only in degree and there is no hard and fast line between them. Innocent tumours are usually sharply defined from the surrounding tissues, and show no tendency to spread into them or to pass by means of lymphatics and blood-vessels to neighbouring parts (fig. 38, Pl. IV.). Malignant tumours, on the other hand, invade the adjacent tissues and pass by lymphatics and blood vessels to distant parts, where they set up secondary growths (fig. 39, Pl. IV.).

Tumours appear to arise spontaneously, *i.e.* without evident cause; they may develop in association with prolonged irritation or injury (later referred to in more detail). To heredity, as an indirect or predisposing cause, has probably been assigned too great importance, and the many facts brought forward of the relative frequency of cancer in members of one family only justify the conclusion that the tissue-resistance of certain families is lowered.

At the present time we have still before us the question, what is the essential cause of tumours (*q.v.*)? This, one of the most difficult problems of pathology, is being attacked by many able workers, who are all striving from different standpoints to elucidate the nature of these new formations, which spring from the normal tissues in which they develop and which they destroy. In spite of all the valuable research work that has been done within the last few years, the essential cause of new growths still remains unknown.

To the work carried on by the Imperial Cancer Research Fund in England, and to investigators in other countries, are due the present day scientific efforts made to systematize investigation and clear away many of the hypothetical speculations that have gathered round this most difficult subject. Their investigations on cancers found in the lower animals and the successful transplantation of such growths into a new host of the same species (mice and rats), have greatly advanced our knowledge of the etiology of this disease.

Many of the hypotheses of the past put forward to explain cancer must be discarded, in view of the facts brought to light by the comparative and experimental research of recent times. According to the hypothesis of Waldeyer and Thiersch there is perfect equilibrium between the normal epithelium and its supporting structure, the connective tissue, but with advancing age this balance is upset owing to the connective tissue gradually losing its restraining power. The epithelial cells are then able to pass from their normal position, in consequence of which they proliferate and at the same time revert to a more primitive type of cell. In this way they give rise to a malignant new growth.

Cohnheim's hypothesis of "embryonic residues" provides that early in the development of the embryo some of the cells, or groups of cells, are separated from their organic continuity during the various foldings that take place in the actively growing embryo. The separated cells become intermingled with other tissue elements amongst which they lie dormant with their inherent power of proliferation in abeyance. At a later date in the life of the individual, by some unknown stimuli, they resume their active power of proliferation and so give rise to new growths.

The "tissue-tension" hypothesis of Ribbert is a combination of the two foregoing. He holds that new growths arise, both before birth or at any subsequent period of life, by the separation of cells or clumps of cells from their normal position, and that in health there is a balance between the various tissues and tissue elements regulated by what he calls the "tissue-tension" of the part, *i.e.* that cells or groups of cells have a restraining power on one another which prevents any physiological over-activity.

From whatever cause the resisting power of the tissue elements is thus weakened, the invasion of other tissue elements is then allowed to take place. These being freed from the normal inhibiting power of the neighbouring elements, multiply and go on to the formation of a new growth. According to Ribbert it is the isolation, together with the latent capacity of isolated cells for unlimited poliferation, that gives rise to new growths.

Hansemann's "anaplasia" hypothesis seeks to find an explanation of the formation of new growths in the absence of the histological differentiation of the cell associated with a corresponding increase in its proliferative power and a suspension, or loss, of its functional activity.

The greater the degree of anaplasia the more the tumour cells conform in character and appearance to the embryonic type of cell and the more malignant is the new growth. A simple fibroma is a growth composed of fully formed fibrous tissue (fig. 40, Pl. IV.). The small round celled sarcoma is a malignant growth, and is composed of the primitive type of cell that goes to form fibrous tissue (fig. 41, Pl. IV.).

Then we have Beard's "germ-cell" hypothesis, in which he holds that many of the germ-cells in the growing embryo fail to reach their proper position—the generative areas—and settle down and become quiescent in some somatic tissue of the embryo. They may at some later date become active in some way, and so give rise to a cellular proliferation that may imitate the structure in which they grow, so giving rise to new growths.

Some workers regard certain appearances in dividing cells found in cancer as evidence of a reversion of the somatic cell to the germ-cell type (heterotypical), otherwise found only in the process which results in the formation of an embryo. These appearances are probably due to a pathological mitosis, commonly found in cancer, in which there is an irregular diminution in the number of chromosomes; some are cast out and become degenerated or some pass over to one of the daughter cells, leaving a reduced number in the other, and thus give rise to asymmetrical mitosis.

From the histological examination of tumour cells there is no evidence to show that they resemble the protozoal unicellular organisms in occasionally passing through a sexual process of reproduction, *i.e.* that nuclear conjugation between cells ever takes place.

In recent years the successful experimental transplantation of new growths, occurring sporadically in white mice and rats, into animals of the same species, has thrown a fresh light on all the features of malignant growths. From these experiments it is shown that cells taken from these growths and introduced into animals of the same species give rise to a cancerous growth, whose cells have acquired unlimited powers of proliferation. They are direct lineal descendants of the cells introduced, and are in no way formed from the tissue cells of the host in which they are placed and grow.

Not only is this true of epithelial cells, but the connective tissue-cells of the supporting structure of cancerous growth, after repeated transplantation, may become so altered that a gradual evolution of apparently normal connective tissue into sarcomatous elements takes place, these giving rise to "mixed tumours." The sarcomatous development may even completely outgrow the epithelial elements and so form and continue to grow as a pure sarcoma.

The fact that it is possible to propagate these cells of one animal for years in other animals of the same species, without any loss of their vegetative vitality, suggests that this continued growth is kept up by a growth-stimulating substance present in the proper species of animal; this substance, however, has not the power of transforming the normal tissue into a cancerous one.

Henser, Bencke, Adami, Marchand and others have also put forward hypotheses to account for the origin of new growths. These observers maintain that the cells from some cause lose, or may never have had developed, their functional activity, and thus

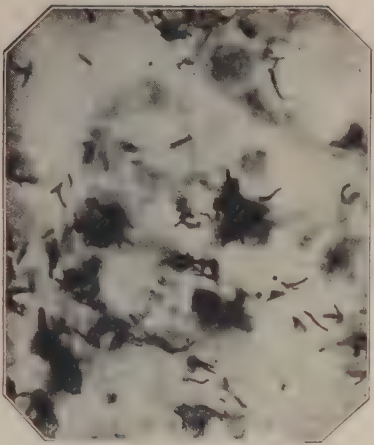

FIG. 22.—Tubercle bacilli in tissues from human lung in a case of acute phthisis. The bacilli are seen lying as short rods, singly and in clumps, in the caseous and degenerated tissues of the lung. (× 1000 diam.)

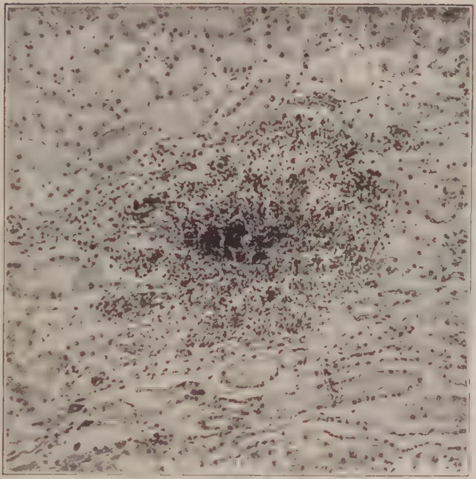

FIG. 25.—Acute abscess in the kidney. A small cellular area formed by emigrated polymorphonuclear leucocytes surrounding a central mass of bacteria. (× 75 diam.)

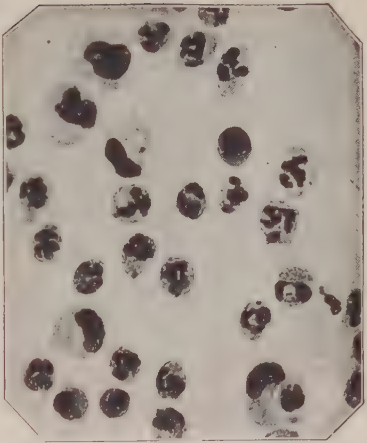

FIG. 23.—Inflammatory cells from acute exudate. Numerous polymorphonuclear leucocytes and a few mononuclear cells, one of which has taken up a leucocyte into its interior (phagocytosis). (× 600 diam.)

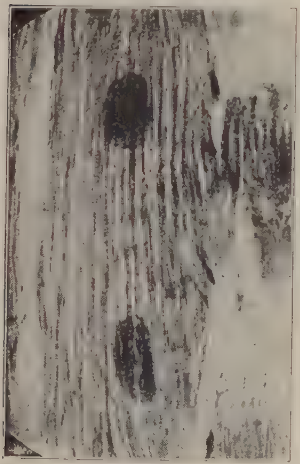

FIG. 28.—Muscle fibre greatly increased in size, from hypertrophied heart. (× 400 diam.)

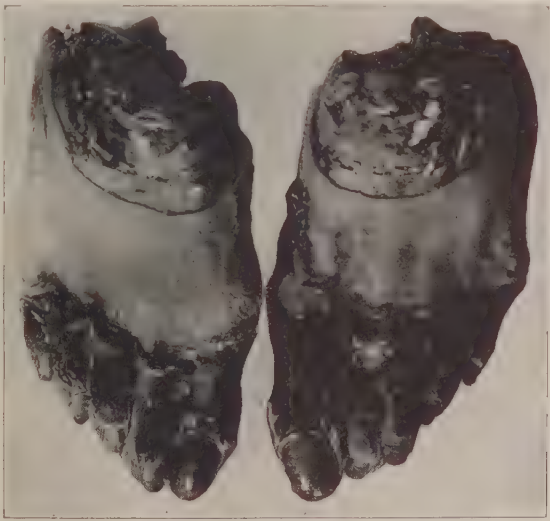

FIG. 24.—Symmetrical gangrene of toes (3 months' duration), showing the sharp "line of demarcation" between the mummified toes and the more healthy tissue.

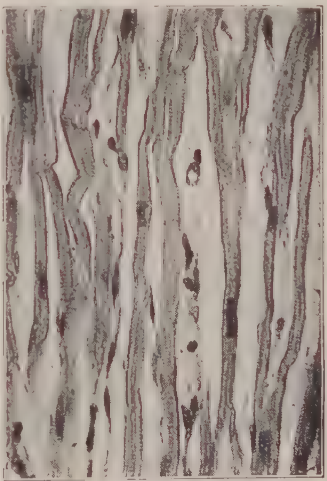

FIG. 29.—Muscle fibres from atrophied heart. (Contrast Fig. 28.) (× 400 diam.)

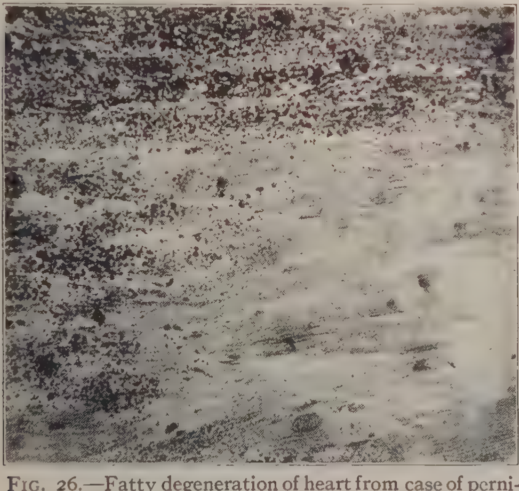

FIG. 26.—Fatty degeneration of heart from case of pernicious anaemia. Many of the muscle fibres show numerous droplets of oil seen as dark round granules. (× 200 diam.)

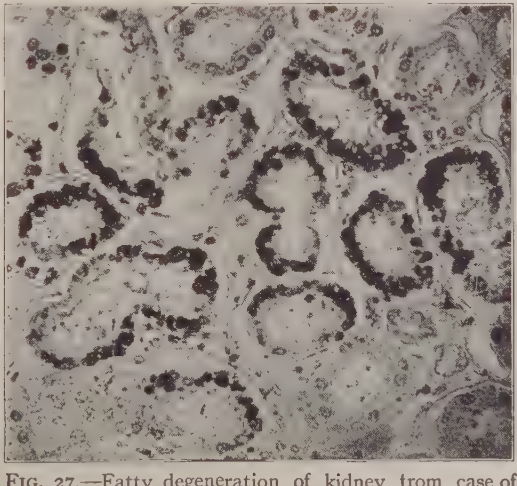

FIG. 27.—Fatty degeneration of kidney from case of starvation. Black droplets of oil are seen in the epithelial cells lining the secreting tubules. (× 250 diam.)

PATHOLOGY

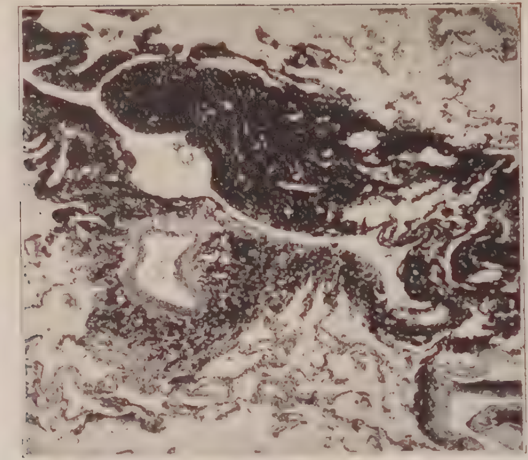

FIG. 30.—Anthracosis—coal-miner's lung—showing excessive accumulation of carbon pigment in the lymphatic spaces around the vessels of the lung. (× 50 diam.)

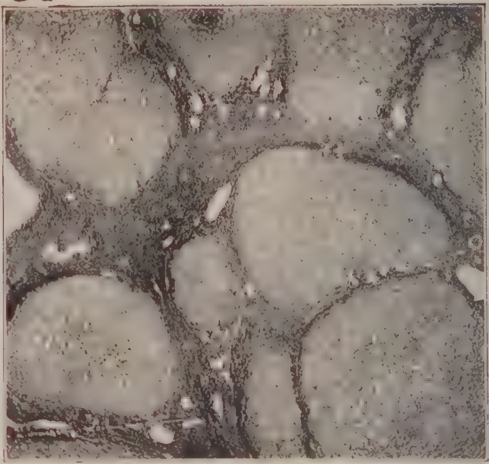

FIG. 36.—Polylobular cirrhosis, or "Gin-drinker's Liver," showing well-formed fibrous overgrowth which has divided up the liver tissue into irregular masses and caused atrophic and degenerative changes in the liver cells. (× 24 diam.)

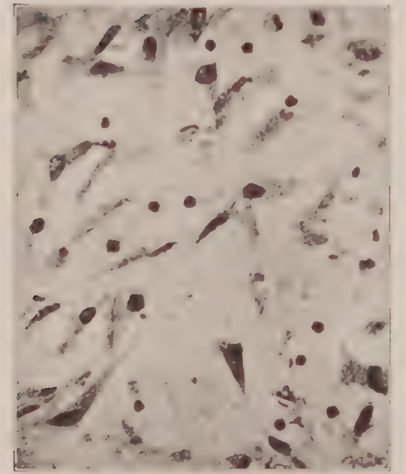

FIG. 32.—Fibroblasts in young temporary granulation tissue. These are spindle shaped and have long processes. It is from these cells the permanent fibrous tissue is formed. (× 400 diam.)

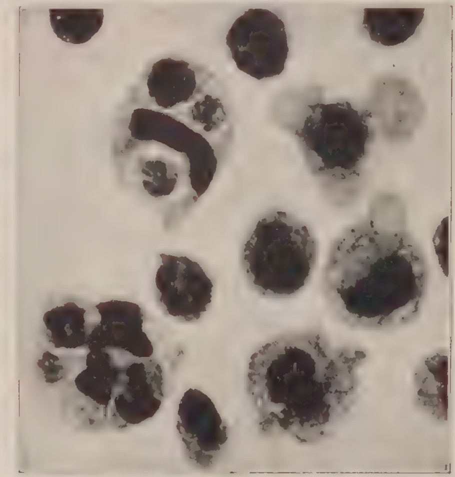

FIG. 31.—Cells from inflammatory exudate showing active phagocytosis. The mono-nuclear cells are ingesting and digesting many of the polymorpho-nuclear leucocytes. Note that these phagocytic cells are pushing out protoplasmic processes (pseudopodia) by which they grasp their victims. (× 1000 diam.)

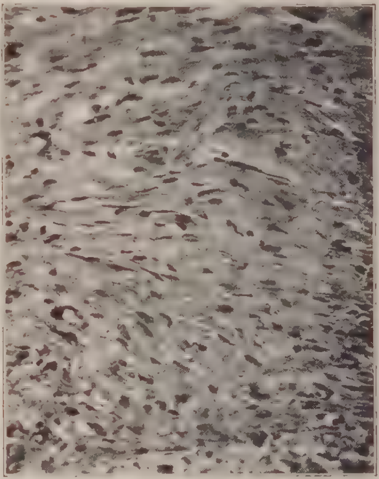

FIG. 35.—Scar tissue in a healed wound. Note the disappearance of blood-vessels and that the cellular character has diminished—the fibroblasts having now developed into well-formed fibrous tissue. (× 200 diam.)

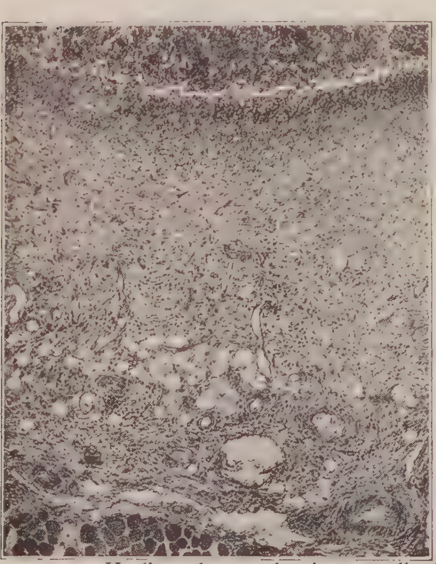

FIG. 33.—Healing abscess showing a wall of young cellular and vascular granulation tissue, which separates the pus area (top of Fig.) from the muscle fibres seen at lower part of Fig. (× 60 diam.)

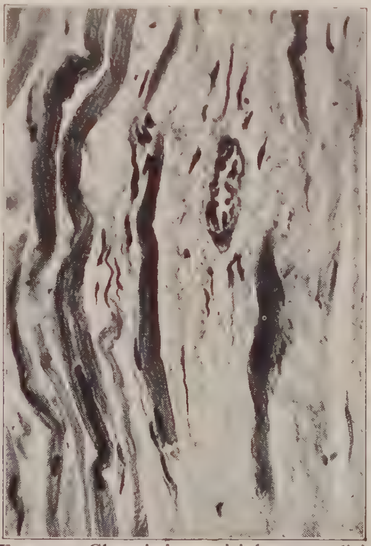

FIG. 37.—Chronic interstitial myocarditis, showing the muscle fibres in the heart wall being separated and becoming atrophied by a slow fibrous overgrowth of the connective tissue. (× 300 diam.)

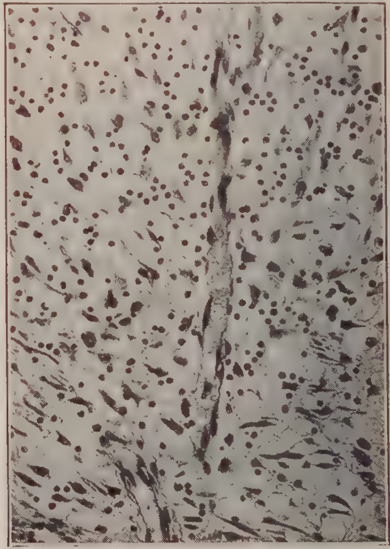

FIG. 34.—Granulation tissue showing the character and relation of the cellular elements to the new blood-vessels in the young temporary tissue. (× 200 diam.)

acquire the activity of growth. The descendants of such cells will become more and more undifferentiated, thereby developing an increased vegetative activity.

Oertel finds an explanation of this want of complete cell-differentiation, loss of function, and acquired vegetative activity in the non-homogeneous character of the nuclear chromatin elements of the cell, and maintains that the different properties of the cell are carried and handed down by the different orders of chromatin loops. We have analogies to this in the two nuclei of some of the protozoa, the one being solely for the purpose of propagation, the other being associated with the functional activities of the cell. Oertel thinks that in man we have these two different functions carried on by the one nucleus containing both chromatin orders. If, from whatever cause, any of the chromatin loops belonging to the functional order be lost the descendants of such a cell, being unable to restore these loops, will be minus the functional attributes associated with the lost elements. These, having the full equipment of the vegetative order, will now develop the inherent power of proliferation to a greater or lesser extent.

The foregoing hypotheses have all sought the origin of new growths in some intrinsic cause which has altered the characters of the cell or cells which gave rise to them, but none of them explain the direct exciting cause. The parasitic hypothesis postulates the invasion of a parasite from without, thus making a new growth an infective process. Many cancer-parasites have been described in cancerous growths, including bacteria, yeasts and protozoa, but the innumerable attempts made to demonstrate the causal infective organism have all completely failed.

It is well known that cancer may develop in places where there has been chronic irritation; an example may be found in cancer of the tongue following on prolonged irritation from a jagged tooth. Clay-pipes may also give rise to cancer of lips in males in England, while cancer of the mouth of both sexes is common in India where chewing a mixture of betel leaves, areca-nut, tobacco and slaked lime is the usual practice. In the case of the squamous epithelial cancer of the anterior abdominal wall found so frequently in the natives of Kashmir, the position of the cancer is peculiar to this people, and is due to the chronic irritation following on repeated burns from using the "kangri"—a small earthenware vessel containing a charcoal fire enclosed in basket-work, and suspended round the waist, to assist in maintaining warmth in the extreme cold of the hills of Kashmir.

The irritant may be chemical, as is seen in the skin cancers that develop in workers in paraffin, petroleum, arsenic and aniline. However close the relationship is between chronic irritation and the starting of cancer, we are not in a position to say that irritation, physical or chemical, by itself can give rise to new growths. It may merely act locally in some way, and so render that part susceptible to unknown tissue stimuli which impart to the cells that extraordinary power of proliferation characteristic of new growth.

At the present time we are quite uncertain what is the ultimate cause of new growths; in all probability there may be one or more aetiological factors at play disturbing that perfect condition of equilibrium of normal tissues. A defect in co-ordination allows the stimulated active vegetative cellular elements, or the more fully differentiated tissue, to over-develop and so form tumours, simple or malignant.

Other Tissue Products

Mucoid.—In many pathological conditions we have degenerative products of various kinds formed in the tissues. These substances may be formed in the cells and given out as a secretion, or they may be formed by an intercellular transformation. In the mucinoid conditions, usually termed "mucoid" and "colloid" degenerations, we have closely allied substances which, like the normal mucins of the body, belong to the glucoproteids, and have in common similar physical characters. There is neither any absolute difference nor a constancy in their chemical reactions, and there can be brought about a transition of the "colloid" material into the "mucoid," or conversely. By mucoid is understood a soft gelatinous substance containing mucin, or pseudomucin, which is normally secreted by the epithelial cells of both the mucous membranes and glands. In certain pathological conditions an excessive formation and discharge of such material is usually associated with catarrhal changes in the epithelium. The desquamated cells containing this jelly-like substance become disorganized and blend with the secretion. Should this take place into a closed gland space it will give rise to cysts, which may attain a great size, as is seen in the ovarian adenomata. In some of the adenoid cancers of the alimentary tract this mucoid material is formed by the epithelial cells from which it flows out and infiltrates the surrounding tissues; both the cells and tissues appear to be transformed into this gelatinous substance, forming the so-called "colloid cancer" (fig. 42, Pl. IV.).

The connective tissue is supplied normally with a certain amount of these mucinoid substances, no doubt acting as a lubricant. In many pathological conditions this tissue is commonly found to undergo mucoid or myxomatous degeneration, which is regarded as a reversion to a closely similar type—that of foetal connective tissue (fig. 43, Pl. IV). These changes are found in senile wasting, in metaplasia of cartilage, in many tumours, especially mixed growths of the parotid gland and testicle, and in various inflammatory granulation ulcers. In the wasting of the thyroid gland in myxoedema, or when the gland is completely removed by operation, myxomatous areas are found in the subcutaneous tissue of the skin, nerve-sheaths, &c.

Colloid.—This term is usually applied to a semi-solid substance of homogeneous and gelatinous consistence, which results partly from excretion and partly from degeneration of cellular structures, more particularly of the epithelial type. These cells become swollen by this translucent substance and are thrown off into the space where they become fused together, forming colloid masses. This substance differs from the mucins by being precipitated by tannic acid but not by acetic acid, and being endowed with a higher proportion of sulphur.

In the normal thyroid there is formed and stored up in the spaces this colloid material. The enlarged cystic goitres show, in the distended vesicles, an abnormal formation and retention of this substance (fig. 44, Pl. V.). Its character is readily changed by the abnormal activities which take place in these glands during some of the acute fevers; the semi-solid consistence may become mucoid or even fluid.

Serous degeneration is met with in epithelial cells in inflammatory conditions and following on burns. The vitality of these cells being altered there is imbibition and accumulation of watery fluid in their cytoplasm, causing swelling and vacuolation of the cells. The bursting of several of these altered cells is the method by which the skin vesicles are formed in certain conditions.

Glycogen is formed by the action of a ferment on the carbohydrates—the starches being converted into sugars. The sugars are taken up from the circulation and stored in a less soluble form—known as "animal starch"—in the liver and muscle cells; they play an important part in the normal metabolism of the body. The significance of glycogen in large amounts, or of its absence from the tissues in pathological conditions, is not clearly understood. It is said to be increased in saccharine diabetes and to be greatly diminished in starvation and wasting diseases.

Fat.—Fatty accumulations in the tissues of the body are found in health and in pathological conditions; these are usually recognized and described as fatty infiltrations and fatty degenerations, but there are intermediate conditions which make it difficult to separate sharply these processes.

The fatty accumulations known as infiltrations (figs. 45 and 46, Pl. V.) are undoubtedly the result of excessive ingestion of food material containing more neutral fats than the normal tissues can oxidize, or these, as a result of defective removal owing to enfeebled oxidative capacities on the part of the tissues, become stored up in the tissues.

In acute and chronic alcoholism, in phthisis, and in other diseases this fatty condition may be very extreme, and is commonly found in association with other tissue changes, so that probably we should look on these changes as a degeneration.

Adiposity or obesity occurs when we have an excessive amount of fat stored in the normal connective-tissue areas of adipose tissue. It may be caused by various conditions, *e.g.* over-nutrition with lack of muscular energy, beer-drinking, castration, lactation, disturbed metabolism, some forms of insanity, and may follow on some fevers.

Fatty degeneration is a retrogressive change associated with the deposit of fatty granules or globules in the cytoplasm, and is caused by disorganized cellular activity (figs. 26 and 27, Pl. II.). It is frequently found associated with, or as a sequel to, cloudy swelling in intense or prolonged toxic conditions. Over and above the bacterial intoxications we have a very extreme degree of fatty degeneration, widely distributed throughout the tissues, which is produced by certain organic and inorganic poisons; it is seen especially in phosphorus and chloroform poisoning. The changes are also common in pernicious anaemia, advanced chlorosis, cachexias, and in the later stages of starvation. In diabetes mellitus, in which there is marked derangement in metabolism, extreme fatty changes are occasionally found in the organs, and the blood may be loaded with fat globules. This lipoemic condition may cause embolism, the plugging especially occurring in the lung capillaries.

Fatty degeneration is common to all dead or decaying tissues in the body, and may be followed by calcification.

Autolysis is a disintegration of dead tissues brought about by the action of their own ferments, while degeneration takes place in the still living cell. The study of autolytic phenomena which closely simulates the changes seen in the degenerating cell has thrown much light on these degenerative processes.

These conditions may be purely physiological, *e.g.* in the mammary gland during lactation or in sebaceous glands, caused by increased functional activity. It may follow a diminished functional activity, as in the atrophying thymus gland and in the muscle cells of the uterus after parturition.

Any of the abnormal conditions that bring about general or local defective nutrition is an important factor in producing fatty degeneration.

The part played by fats and closely allied compounds in normal and abnormal metabolism need not here be discussed, as the subject is too complex and the views on it are conflicting. It will be sufficient to state briefly what appears to be the result of recent investigation.

The neutral fats are composed of fatty acids and glycerin. In the physiological process of intestinal digestion, the precursors of such fats are split up into these two radicles. The free fatty acid radicle then unites with an alkali, and becomes transformed into a soluble soap which is then readily absorbed in this fluid condition by the epithelial cells of the mucous membrane. There it is acted on by ferments (lipases) and converted into neutral fat, which may remain in the cell as such. By the reverse action on the part of the same ferments in the cell, these neutral fats may be redissolved and pass into the lacteals.

Many cells throughout the body contain this ferment. The soluble soaps which are probably conveyed by the blood will be quickly taken up by such cells, synthetized into neutral fats, and stored in a non-diffusible form till required. The fat in this condition is readily recognized by the usual microchemical and staining reactions. As fat is a food element essential to the carrying out of the vital energies of the cell, a certain amount of fatty matter must be present, in a form, however, unrecognizable by our present microchemical and staining methods.

Some investigators hold that the soaps may become combined with albumin, and that on becoming incorporated with the cytoplasm they can no longer be distinguished as fat. If from some cause the cell be damaged in such a way as to produce disintegration of the cytoplasm, there will be a breaking down of that combination, so that the fat will be set free from the complex protein molecule in which it was combined as a soap-albumin, and will become demonstrable by the usual methods as small droplets of oil. This splitting up of the fats previously combined with albumin in the cell by the action of natural ferments—lipases—and the setting free of the fats under the influence of toxins represent the normal and the pathological process in the production of so-called fatty degeneration.

Calcification.—Calcification and calcareous deposits are extremely common in many pathological conditions.

There are few of the connective tissues of the body which may not become affected with deposits of calcareous salts (fig. 47, Pl. V.). This condition is not so frequently seen in the more highly differentiated cells, but may follow necrosis of secreting cells, as is found in the kidney, in corrosive sublimate poisoning and in chronic nephritis. These conditions are quite distinct from the normal process of ossification as is seen in bone.

Many theories have been advanced to explain these processes, and recently the subject has received considerable attention. The old idea of the circulating blood being supersaturated with lime salts which in some way had first become liberated from atrophying bones, and then deposited, to form calcified areas in different tissues will have to be given up, as there is no evidence that this "metastatic" calcification ever takes place. In all probability no excess of soluble lime salts in the blood or lymph can ever be deposited in healthy living tissues.

At the present day both experimental and histological investigations seem to indicate that in the process of calcification there is a combination of the organic substances present in degenerated tissues, or in tissues of low vitality, with the lime salts of the body. From whatever cause the tissues become disorganized and undergo fatty degeneration, the fatty acids may become liberated and combine with the alkalies to form potash and soda soaps.

The potash and soda is then gradually replaced by calcium to form an insoluble calcium soap. The interaction between the soaps, the phosphates and the carbonates which are brought by the blood and lymph to the part results in the weaker fatty acids being replaced by phosphoric and carbonic acid, and thus in the formation of highly insoluble calcium phosphate and carbonate deposits in the disorganized tissues.

Pathological Pigmentations.—These pigmentary changes found in abnormal conditions are usually classified under (1) Albuminoid, (2) Haematogenous, (3) Extraneous.

1. The normal animal pigments and closely allied pigments are usually found in the skin, hair, eye, supra-renal glands, and in certain nerve cells. These represent the albuminoid series, and are probably elaborated by the cells from albuminous substances through the influence of specific ferments. This pigment is usually intracellular, but may be found lying free in the intercellular substance, and is generally in the form of fine granules of a yellowish-brown or brown-black colour. In the condition known as albinism there is a congenital deficiency or entire absence of pigment. Trophic and nervous conditions sometimes cause localized deficiency of pigment which produces white areas in the skin.

Excessive pigmentation of tissue cells (fig. 48, Pl. V.) is seen in old age, and usually in an accompaniment of certain atrophic processes and functional disorders. Certain degenerative changes in the supra-renal glands may lead to Addison's disease, which is characterized by an excessive pigmentary condition of the skin and mucous membranes. This melanin pigment is found in certain tumour growths, pigmented moles of the skin, and especially in melanatic sarcomata (fig. 49, Pl. V.) and cancer. The action of the sun's rays stimulates the cells of the skin to increase the pigment as a protection to the underlying tissues, *e.g.* summer bronzing, "freckles," and the skin of the negro.

The coloured fats, or lipochromes, are found normally in some of the cells of the internal organs, and under certain pathological conditions. This pigment is of a light yellow colour, and contains a fatty substance that reacts to the fat-staining reagents. Little is known regarding this class of pigment.

2. Haematogenous pigments are derived from the haemoglobin of the red blood corpuscles. These corpuscles may break down in the blood vessels, and their colouring material (haemoglobin) is set free in the serum. But their disintegration is more commonly brought about by "phagocytosis" on the part of the phagocytic cells in the different organs concerned with the function of haemolysis, *i.e.* the liver, spleen, haemolymph glands and other tissues.

The haemoglobin may be transformed into haematoidin, a pigment that does not contain iron, or into a pigment which does contain iron, haemosiderin.

The haematoidin pigment may vary in colour from yellowish or orange-red to a ruby-red, and forms granular masses, rhombic prisms or acicular crystals. It can be formed independently of cell activity, nor does it require oxygen. These crystals are extremely resistant to absorption, are found in old blood clots, and have been known to persist in old cerebral haemorrhages after many years. Haematoidin in normal metabolism is largely excreted by the liver in the form of bilirubin.

Haemosiderin, an iron-containing pigment (probably an hydrated ferrous oxide), is found in more or less loose combination with protein substances in an amorphous form as brownish or black granules. Cellular activity and oxygen appear to be essential for its development; it is found usually in the cells of certain organs, or it may be deposited in the intercellular tissues. Haemosiderin in the normal process of haemolysis is stored up in the cells of certain organs until required by the organism for the formation of fresh haemoglobin. In diseases where haemolysis is extreme, particularly in pernicious anaemia, there are relatively large quantities occasionally as much as ten times the normal amount of haemosiderin deposited in the liver.

In hepatogenous pigmentation (icterus or jaundice) we have the iron-free pigment modified and transformed by the action of the liver cells into bile pigment (bilirubin). If the discharge of this

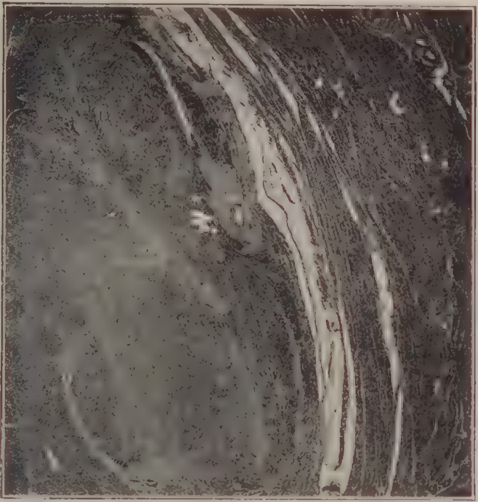

FIG. 38.—Myoma uteri. A simple fibro-myomatous tumour growing in the wall of the uterus. Note the sharp line of demarcation between the growth and the tissue in which it is growing. (× 24 diam.)

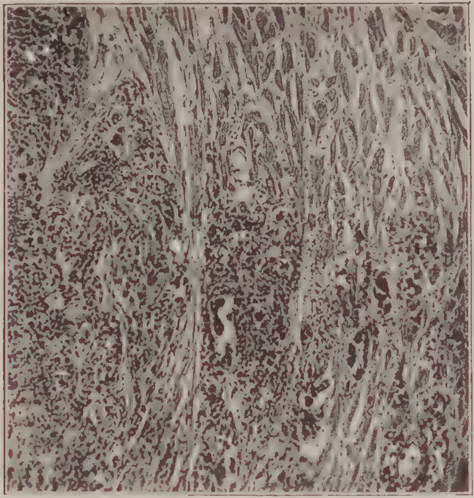

FIG. 39.—Secondary cancerous growth in heart wall. Note that the malignant cells are invading and destroying the muscle fibres of the heart. (× 75 diam.)

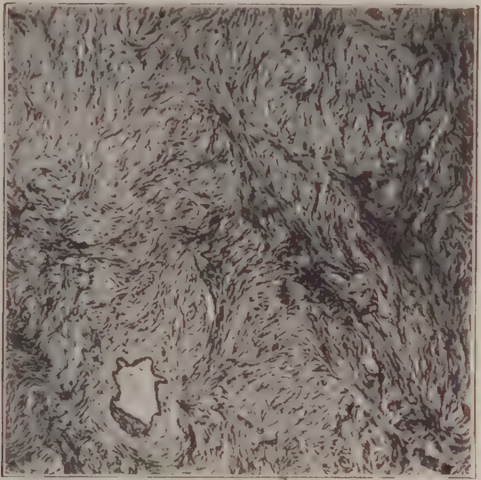

FIG. 40.—Fibroma. A simple tumour composed of well-differentiated fibrous tissue. The fibres are arranged in irregular bundles forming a dense firm tissue. (× 100 diam.)

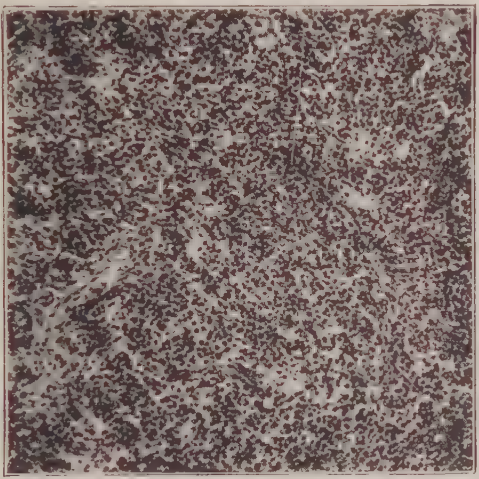

FIG. 41.—Small round-celled sarcoma. A malignant tumour composed of undifferentiated masses of cells. These cells are readily carried to distant parts and give rise to secondary growths. (× 100 diam.)

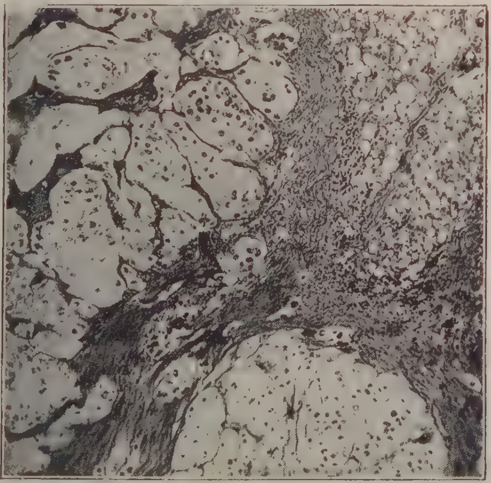

FIG. 42.—"Colloid cancer of stomach" showing the cancer cells in the spaces being transformed into the "colloid material." (× 75 diam.)

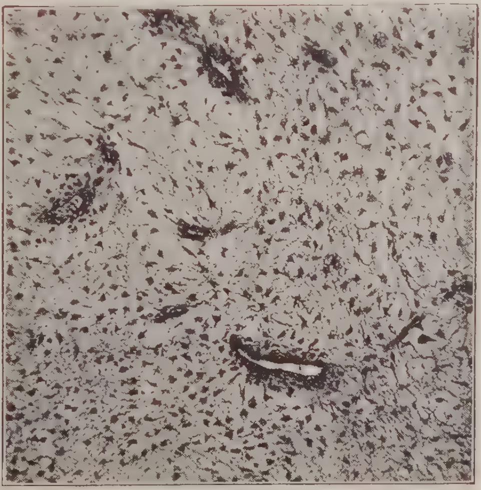

FIG. 43.—Myxoma showing the stellate and branching cells with their processes interlacing and forming a network. The mucinoid substance is contained in the fine meshes. (× 100 diam.)

PATHOLOGY

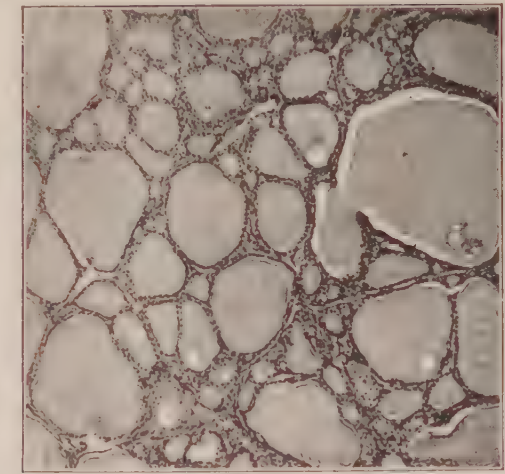

FIG. 44.—Thyroid gland—cystic goitre. The gland spaces vary in size and many may show marked cystic formation. These vesicles are filled with the colloid material. (× 90 diam.)

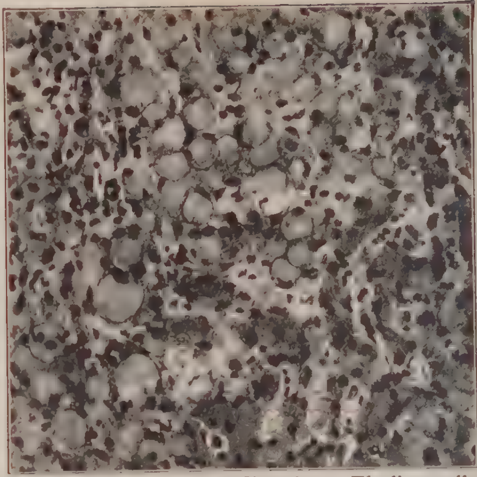

FIG. 45.—Liver. Fatty Infiltration. The liver cells are seen to contain a large globule of fat which pushes the cell nucleus to one side—giving the signet-ring appearance. (× 250 diam.)

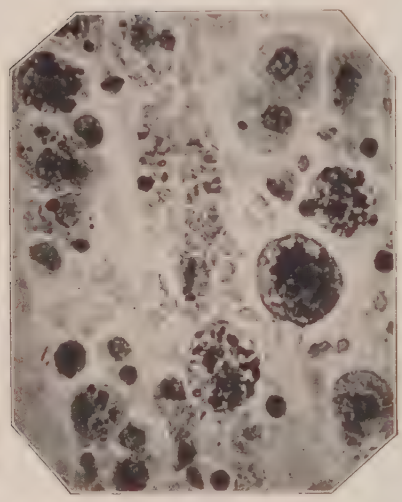

FIG. 50.—Phagocytic cells (in sputum) which have taken into their protoplasm particles of carbon pigment. (× 500 diam.)

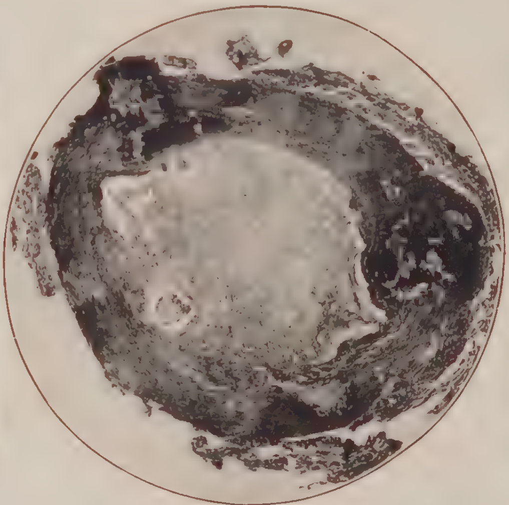

FIG. 47.—Pudic artery showing calcified areas in the muscular coat of the vessel. These degenerated parts are darkly stained owing to the calcareous particles having a strong affinity for the haemotoxylin stain. (× 35 diam.)

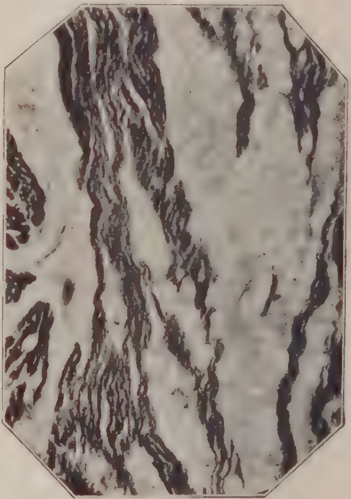

FIG. 46.—Heart. Fatty Infiltration. The fat cells are increased and infiltrate the connective tissue between the bundles of muscle fibres. These are pressed upon and become atrophied, and may ultimately be replaced by adipose tissue. (× 40 diam.)

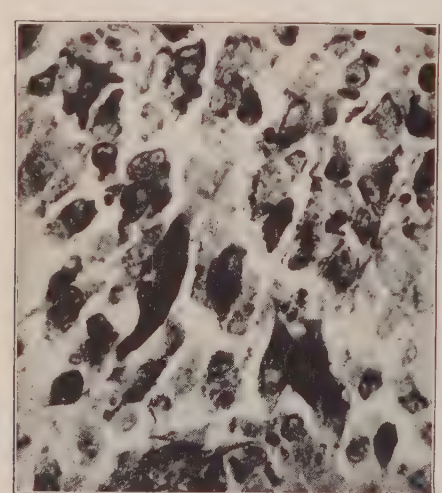

FIG. 49.—Melanotic sarcoma. Many of these malignant cells develop and accumulate in their protoplasm granules of melanin pigment. (× 300 diam.)

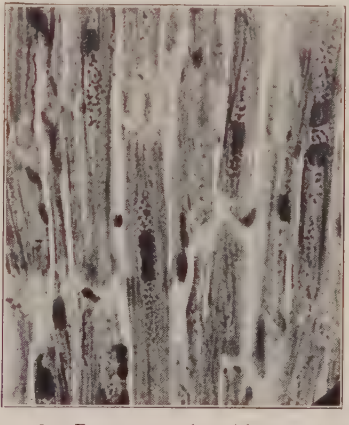

FIG. 48.—Brown atrophy of heart. The muscle fibres show the pigment granules, which are of a light yellow colour, situated specially at the poles of the fibre nucleus and extending short distance.
(× 400 diam.)

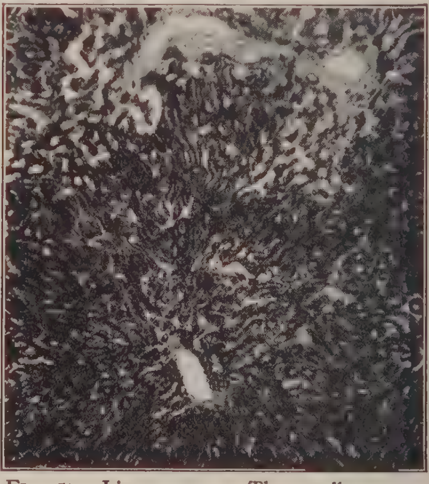

FIG. 51. Liver, waxy. The swollen waxy capillaries are pressing on the columns of liver cells and are causing marked atrophy. (× 75 diam.)

pigment from the liver by the normal channels be prevented, as by obstruction of the main bile ducts, the bile will accumulate until it regurgitates or is absorbed into the lymph and blood vessels, and is carried in a soluble state throughout the tissues, thus producing a general staining—an essential characteristic of jaundice.

3. In extraneous pigmentation we have coloured substances either in a solid or fluid state, gaining entrance into the organism and accumulating in certain tissues. The channels of entrance are usually by the respiratory or the alimentary tract, also by the skin. Pneumonokoniosis is due to the inhalation of minute particles of various substances—such as coal, stone, iron, steel, &c. These foreign particles settle on the lining membranes, and, by the activity of certain cells (fig. 50, Pl. V. and fig. 30, Pl. III.), are carried into the tissues, where they set up chronic irritation of a more or less serious nature according to the nature of the inhaled particles.

Certain metallic poisons give rise to pigmentation of the tissues, *e.g.* in the blue line on the gums around the roots of the teeth due to the formation of lead sulphide, or in chronic lead poisoning, where absorption may have taken place through the digestive tract, or, in the case of workers in lead and lead paints, through the skin. Prolonged ingestion of arsenic may cause pigmentary changes in the skin. If silver nitrate salts be administered for a long period as a medication, the skin that is exposed to light becomes of a bluish-grey colour, which is extremely persistent. These soluble salts combine with the albumins in the body, and are deposited as minute granules of silver albuminate in the connective tissue of the skin papillae, serous membranes, the intima of arteries and the kidney. This condition is known as argyria.

Various coloured pigments may be deposited in the tissues through damaged skin surface—note, for example, the well-known practice of "tattooing." Many workers following certain occupations show pigmented scars due to the penetration of carbon and other pigments from superficial wounds caused by gunpowder, explosions, &c.

Hyaline.—This term has been applied to several of the transparent homogeneous appearances found in pathological conditions. It is now commonly used to indicate the transparent homogeneous structureless swellings which are found affecting the smaller arteries and the capillaries. The delicate connective-tissue fibrillae of the inner coat of the arterioles are usually first and most affected. The fibrils of the outer coat also show the change to a less extent, while the degeneration very rarely spreads to the middle coat. This swelling of the walls may partly or completely occlude the lumen of the vessels.

Hyaline degeneration is found in certain acute infective conditions; the toxins specially act on these connective-tissue cell elements. It also seems to be brought about by chronic toxaemias, *e.g.* in subacute and chronic Bright's disease, lead poisoning and other obscure conditions. The hyaline material, unlike the amyloid, does not give the metachromatic staining reactions with methylene-violet or iodine. The chemical constitution is not certain. The substance is very resistant to the action of chemical reagents, to digestion, and possibly belongs to the glyco-proteids.

Amyloid.—The wax-like or amyloid substance has a certain resemblance to the colloid, mucoid and hyaline. It has a firm gelatinous consistence and wax-like lustre, and, microscopically, is found to be homogeneous and structureless, with a translucency like that of ground-glass. Watery solution of iodine imparts to it a deep mahogany-brown colour; iodine and sulphuric acid occasionally, but not always, an azure-blue, methyl-violet, a brilliant rose-pink and methyl-green gives a reaction very much like that of methyl-violet, but not so vivid. The reaction with iodine is seen best by direct light; the reactions with the other substances are visible only by transmitted light. The name "amyloid" was applied to it by Virchow on account of the blue reaction which it gives occasionally with iodine and sulphuric acid, resembling that given with vegetable cellulose. It is now known to have nothing in common with vegetable cellulose, but is regarded as one of the many albuminoid substances existing in the body under pathological conditions. Virchow's conjecture as to the starchy nature of the substance was disproved by Friedrich and Kekule, who confirmed Professor Miller's previous finding as to its albuminous or protein nature. Oddi in 1894 isolated from the amyloid liver a substance which Schmiedeberg had previously obtained from cartilage and named "chondroitinic-sulphuric acid" (*Chondroïtinschwefelsaure*). It also occurs in bones and elastic tissue, but is not present in the normal human liver. Oddi does not regard it as the essential constituent of amyloid, chiefly because the colour reactions are forthcoming in the residuum after the substance has been removed, while the substance itself does not give these reactions. Quite likely the amyloid may be a combination of the substance with a proteid. The soda combination of the acid as obtained from the nasal cartilage of pigs had the composition $C_{18}H_{25}Na_2NSO_{17}$.

Krawkow in 1897 clearly demonstrated it to be a proteid in firm combination with chrondroitin-sulphuric acid. As probably the protein constituent varies in the different organs, one infers that this will account for the varying results got from the analysis of the substance obtained from different organs in such cases.

This amyloid substance is slowly and imperfectly digested by pepsin—digestion being more complete with trypsin and by autolytic enzymes.

There is no evidence that this material is brought by the circulating blood and infiltrates the tissues. It is believed rather that the condition is due to deleterious toxic substances which act for prolonged periods on the tissue elements and so alter their histon proteins that they combine *in situ* with other protein substances which are brought by the blood or lymph.

Amyloid develops in various organs and tissues and is commonly associated with chronic phthisis, tubercular disease of bone and joints, and syphilis (congenital and acquired). It is known to occur in rheumatism, and has been described in connexion with a few other diseases. A number of interesting experiments, designed to test the relationship between the condition of suppuration and the production of amyloid, have been made of late years. The animal most suitable for experimenting upon is the fowl, but other animals have been found to react. Thus Krawkow and Nowak, employing the frequent subcutaneous injection of the usual organisms of suppuration, have induced in the fowl the deposition within the tissues of a homogeneous substance giving the colour reactions of true amyloid. When hardened in spirit, however, the greater part of this experimental amyloid in the fowl vanishes, and the reactions are not forthcoming. They were unable to verify any direct connexion between its production and the organism of tubercle. These observations have been verified in the rabbit, mouse, fowl, guinea-pig and cat by Davidsohn, occasionally in the dog by Lubarsch; and confirmatory observations have also been made by Czerny and Maximoff. Lubarsch succeeded in inducing it merely by the subcutaneous injection of turpentine, which produces its result, it is said, by exciting an abscess. Nowak, however, found later that he could generate it where the turpentine failed to induce suppuration; he believes that it may arise quite apart from the influence of the organisms of suppuration, that it is not a biological product of the micro-organisms of disease, and also that it has nothing to do with emaciation. It is a retrogressive process producing characteristic changes in the fine connective-tissue fibrils. The change appears to begin in the fibrils which lie between the circular muscle fibres of the middle coat of the smaller arterioles and extends both backwards and forwards along the vessels. It spreads forwards, affecting the supporting fibres outside the epithelium of the capillaries, and then passes to the connective-tissue fibrils of the veins. The secreting cells never show this change, although they may become atrophied or destroyed by the pressure and the disturbance of nutrition brought about by the swollen condition of the capillary walls. The circulation is little interfered with, although the walls of the vessels are much thickened by the amyloid material (fig. 51, Pl. V.).

Amyloid Bodies.—These are peculiar bodies which are found in the prostate, in the central nervous system, in the lung, and in other localities, and which get their name from being very like starch-corpuscles, and from giving certain colour reactions closely resembling those of vegetable cellulose or even starch itself. They are minute structures having a round or oval shape, concentrically striated, and frequently showing a small nucleus-like body or cavity in their centre. Iodine gives usually a dark brown reaction, sometimes a deep blue; iodine and sulphuric acid almost always call forth an intense deep blue reaction; and methyl-violet usually a brilliant pink, quite resembling that of true amyloid. They are probably a degeneration-product of cells.

Spurious Amyloid.—If a healthy spinal cord be hung up in spirit for a matter of six months or more, a glassy substance develops within it quite like true amyloid. It further resembles true amyloid in giving all its colour reactions. The reaction with methyl-violet, however, differs from that with true amyloid in being evanescent.

RESPONSE OF TISSUES TO STIMULATION

A stimulus may be defined as every change of the external agencies acting upon an organism; and if a stimulus come in contact with a body possessing the property of irritability, *i.e.* the capability of reacting to stimuli, the result is stimulation (Verworn). Stimuli comprise chemical, mechanical, thermal, photic and electrical changes in the environment of the organism. A stimulus may act on all sides and induce a general effect without direction of movement, but in the production of movement in a definite direction the stimulus must be applied unilaterally. Stimuli applied generally, not unilaterally, in most cases induce increased divisibility of the cells of the part.

Thus the poison of various insects induces in plants the cellular new formation known as a gall-nut; a foreign body implanted in a limb may become encysted in a capsule of fibrous tissue; septic matter introduced into the abdomen will cause proliferation of the lining endo(epi)thelium; and placing an animal (salamander, Galeotti) in an ambient medium at a higher temperature than that to which it is accustomed naturally, increases the rapidity of cell-division of its epithelium with augmentation of the number of karyokinetic figures. Hair and some other like structures grow luxuriantly on a part to which there is an excessive flux of blood. Bone (*e.g.* drill-bones) may develop in a soft tissue with no natural bone-forming tendencies, as a result of interrupted pressure, or a fatty tumour may arise in the midst of the natural subcutaneous fat in the same circumstances.

Among stimuli acting unilaterally, perhaps none has proved more interesting, in late times, than what is known as *Chemiotaxis*. By it is meant the property an organism endowed with the power of movement has to move towards or away from a chemical stimulus applied unilaterally, or, at any rate, where it is applied in a more concentrated state on the one side than on the others, and more particularly where the concentration increases gradually in one direction away from the living organism acted upon. Observed originally by Engelmann in bacteria, by Stahl in myxomycetes, and by Pfeffer in ferns, mosses, &c., it has now become recognized as a widespread phenomenon. The influence of the chemical substance is either that of attraction or repulsion, the one being known as positive, the other as negative chemiotaxis.

The female organs of certain cryptogams, for instance, exert a positive chemiotactic action upon the spermatozoids, and probably, as Pfeffer suggests, the chemical agent which exerts the influence is malic acid. No other substance, at least, with which he experimented had a like effect, and it is possible that in the archegonium which contains the ovum malic acid is present. Massart and Bordet, Leber, Metchnikoff and others have studied the phenomenon in leucocytes, with the result that while there is evidence of their being positively chemiotactic to the toxins of many pathogenic microbes, it is also apparent that they are negatively influenced by such substances as lactic acid.

From a pathological point of view the subject of chemiotaxis must be considered along with that of *phagocytosis*. Certain free mobile cells within the body, such as blood-leucocytes, as well as others which are fixed, as for instance the endothelium of the hepatic capillaries, have the property of seizing upon some kinds of particulate matter brought within their reach. Within a quarter of an hour after a quantity of cinnabar has been injected into the blood of the frog nearly every particle will be found engulfed by the protoplasm of the leucocytes of the circulating blood. Some bacteria, such as those of anthrax, are seized upon in the same manner, indeed; very much as small algae and other particles are incorporated and devoured by amoeba. Melanine particles formed in the spleen in malaria, which pass along with the blood through the liver, are appropriated by the endothelial cells of the hepatic capillaries, and are found embedded within their substance. If the particle enveloped by the protoplasm be of an organic nature, such as a bacterium, it undergoes digestion, and ultimately becomes destroyed, and accordingly the term "phagocyte" is now in common use to indicate cells having the above properties. This phagocytal action of certain cells of the body is held by Metchnikoff and his followers to have an important bearing on the pathology of immunity. Phagocytes act as scavengers in ridding the body of noxious particles, and more especially of harmful bacteria.

A further application of the facts of chemiotaxis and phagocytosis has been made by Metchnikoff to the case of *Inflammation*. It is well known that many attempts to define the process of inflammation have been made from time to time, all of them more or less unsatisfactory. Among the latest is that of Metchnikoff: "Inflammation generally," he says, "must be regarded as a phagocytic reaction on the part of the organism against irritants. This reaction is carried out by the mobile phagocytes sometimes alone, sometimes with the aid of the vascular phagocytes, or of the nervous system." Given a noxious agent in a tissue, such, let us say, as a localized deposit of certain bacteria, the phagocytes swarm towards the locality where the bacteria have taken up their residence. They surround individual bacteria, absorb them into their substance, and ultimately destroy them by digestion. The phagocytes are attracted from the blood vessels and elsewhere towards the noxious focus by the chemiotaxis exerted upon them by the toxins secreted by the bacteria contained within it. The chemiotaxis in this instance is positive, but the toxins from certain other bacteria may act negatively; and such bacteria are fraught with particular danger from the fact that they can spread through the body unopposed by the phagocytes, which may be looked upon as their natural enemies.

NATURAL PROTECTION AGAINST PARASITISM

The living organism is a rich storehouse of the very materials from which parasites, both animal and vegetable, can best derive their nourishment. Some means is necessary, therefore, to protect the one from the encroachments of the other. A plant or animal in perfect health is more resistant to parasitical invasion than one which is ill-nourished and weakly. Of a number of plants growing side by side, those which become infected with moulds are the most weakly, and an animal in low health is more subject to contagious disease than one which is robust. Each organism possesses within itself the means of protection against its parasitical enemies, and these properties are more in evidence when the organism is in perfect health than when it is debilitated.

One chief means employed by nature in accomplishing this object is the investment of those parts of the organism liable to be attacked with an armour-like covering of epidermis, periderm, bark, &c. The grape is proof against the inroads of the yeast-plant so long as the husk is intact, but on the husk being injured the yeast-plant finds its way into the interior and sets up vinous fermentation of its sugar. The root of the French vine is attacked by the Phylloxera, but that of the American vine, whose epidermis is thicker, is protected from it. The larch remains free from parasitism so long as its covering is intact, but as soon as this is punctured by insects, or its continuity interfered with by cracks or fissures, the Peziza penetrates, and before long brings about the destruction of the branch. So long as the epidermis of animals remains sound, disease germs may come in contact with it almost with impunity, but immediately on its being fissured, or a larger wound made through it, the underlying parts, the blood and soft tissues, are attacked by them. A very remarkable instance of an acquired means of protecting a wound against parasitical invasion is to be found in *granulations*. Should these remain unbroken they constitute a natural barrier to the penetration of most pathogenic and other forms of germ-life into the parts beneath. Bacteria of various kinds which alight upon their surfaces begin to fructify in abundance, but are rapidly destroyed as they burrow deeply. This is accomplished by a twofold agency, for while numbers of them are seized upon by the granulation phagocytes, others are broken up and dissolved by the liquid filling the granulation interspaces (Afanassieff). This latter, or histolytic, property is not confined to the liquid of granulations; normal blood-serum possesses it to a certain extent, and under bacterial influence it may become very much exalted. Jürgelünas makes out that when an animal is rendered immune to a particular micro-organism this histolytic property becomes exalted.

DROPSY

During conditions of health a certain quantity of lymphy liquid is constantly being effused into the tissues and serous cavities of the body, but in the case of the tissues it never accumulates to excess, and in that of the serous cavities it is never more than sufficient to keep them moist. When any excessive accumulation takes place the condition is known as "hydrops" or "dropsy." A "transudate" is a liquid having a composition resembling that of blood-serum, while the term "exudate" is applied to an effused liquid whose composition approaches that of the blood-plasma in the relationship of its solid and liquid parts, besides in most cases containing numbers of colourless blood-corpuscles. Exudates are poured out under inflammatory conditions, while none of the truly dropsical effusions are of inflammatory origin; and hence the class of exudates, as above defined, may be rejected from the category of liquids we are at present considering. Where the dropsical condition is more or less general the term "anasarca" is applied to it; if the tissues are infiltrated locally the term "oedema" is employed; and various names are applied, with a local significance, to dropsies of individual parts or cavities, such as "hydrothorax," "hydroperitoneum" or "ascites," "hydrocephalus," and so on. In "anasarca" the tissues which suffer most are those which are peculiarly lax, such as the lower eyelids, the scrotum, and the backs of the hands and feet. It is invariably the result of some cause acting generally, such as renal disease, valvular defect of the heart, or an impoverished state of the blood; while a mere oedema is usually dependent upon some local obstruction to the return of blood or lymph, or of both, the presence of parasites within the tissue, such as the filaria sanguinis hominis or trichina spiralis, or the poisonous bites of insects. Dropsy of the serous cavities is very commonly merely part of a general anasarca, although occasionally it may be, as in the case of ascites, the sequel to an obstruction in the venous return. Dropsical liquids are usually pale yellow or greenish, limpid, with a saltish taste and alkaline reaction, and a specific gravity ranging from 1005 to 1024. They all contain albumen and throw down a precipitate with heat and nitric acid. None of them, in man, coagulates spontaneously, although they contain fibrinogen. The addition of some of the liquid squeezed out from a blood-clot, of the squeezed blood-clot itself, or of a little blood-serum, is sufficient to throw down a fibrinous coagulum (Buchanan), evidently by these substances supplying the fibrin-ferment. The proteid constituents are very much like those of blood-serum, although they never come up to them in amount (Runeberg). The quantity of proteid matter in a purely dropsical effusion never amounts to that of an inflammatory exudation (Lassar). Certain peculiar substances, probably degenerative products, some of them reducing copper, are occasionally met with. The liquid of ascites sometimes contains chyle in abundance (hydrops lacteus), the escape having taken place from a ruptured receptaculum chyli.

In a given case of anasarca due to a cause acting generally, it will be found that the liquid of the pleural cavity always contains the highest percentage of proteid, that of the peritoneal cavity comes next, that of the cerebral ventricles follows this, and the liquid of the subcutaneous areolar tissue contains the lowest. The reason of this is apparently that the negative pressure of the pleural, and partly of the peritoneal, cavity tends to aspirate a liquid relatively thicker, so to speak, than that effused where no such extraneous mechanism is at work (James).

The subject of the conditions under which dropsical liquids are poured out opens up a very wide question, and one about which there is the greatest diversity of opinion. It turns in part, but in part only, upon the laws regulating the effusion of lymph, and physiologists are by no means at one in their conclusions on this subject. Thus Ludwig was of opinion that the lymph-flow is dependent upon two factors, first, difference in pressure of the blood in the capillaries and the liquid in the plasma spaces outside; and, secondly, chemical interchanges setting up osmotic currents through the vessel-walls. His results, so far, have been confirmed by Starling, who finds that the amount of lymph-flow from the thoracic duct is dependent upon difference in pressure. It varies with the increase of the intracapillary or decrease of the extra-capillary pressure, and is also in part regulated by the greater or lesser permeability of the vessel-walls. Heidenhain, on the other hand, rejected entirely the filtration view of lymph-formation, believing that the passage of lymph across the capillary wall is a true secretion brought about by the secretory function of the endothelial plates. Starling does not accept this view, and cannot regard as an article of faith Heidenhain's dictum that normally filtration plays no part in the formation of lymph. Lazarus-Barlow, again, looks upon the pouring out of lymph as evidence of the demands of the tissue-elements for nutrition. An impulse is communicated to the blood vessels in accordance with this demand, and a greater or smaller outflow is the result. He traces various local dropsies to the starvation from which the tissues are suffering, the liquid accumulating in excess in accordance with the demand for more nourishment. It may be asked, however, whether a dropsical tissue is being held in a high state of nutrition, and whether, on the contrary, the presence of lymph in excess in its interstices does not tend to impair its vitality rather than to lend it support. According to Rogowicz and Heidenhain, certain substances increase the quantity of lymph given off from a part by acting upon the cells of the capillary wall; they hold, in fact, that these substances are true lymphagogues. Heidenhain recognizes two classes, first, such substances as peptone, leech extract and crayfish extract; and, secondly, crystalloids such as sugar, salt, &c. Starling sees no reason to believe that members of either class act otherwise than by increasing the pressure in the capillaries or by injuring the endothelial wall. The members of the first class influence the endothelial plates of the capillaries injuriously, inducing thereby increased permeability; those of the second class (sugar, &c.), on injection into the blood, attract water from the tissues and cause a condition of hydraemic plethora with increased capillary pressure. The increased flow of lymph is due to the increased pressure in the abdominal capillaries.

It is now coming to be recognized that increase of blood pressure alone is not sufficient to account for all dropsical effusions. Much more important is the effect of the alteration in the amount of crystalloids in the tissues and blood and therefore of the alteration in the osmotic pressure between these. Loeb found experimentally that increase of metabolic products in muscle greatly raised its osmotic pressure, and so it would absorb water from a relatively concentrated sodium chloride solution. Welch produced oedema of the lungs experimentally by increasing the pressure in the pulmonary vessels by ligature of the aorta and its branches, but this raised the blood pressure only about one-tenth of an atmosphere, while in some of Loeb's experiments the osmotic pressure, due to retained metabolic products, was equal to over thirty atmospheres. Thus differences in osmotic pressure may be much more powerful in producing oedema than mere differences in blood pressure.

Now differences in the amount of crystalloids cause alteration in osmotic pressure while the proteid content affects it but little; and of the crystalloids the chlorides appear to be those most liable to variation.

Widal, Lemierre and other French observers have noted a diminution in the excretion of chlorides in nephritis associated with oedema; Widal and Javal found that a chloride-free diet caused diminution in the oedema and a chloride containing diet an increase of oedema. Oliver and Audibert published some cases of cirrhosis of the liver with ascites in which they got results comparable to those of Widal. Some other observers, however, have not got such good results with a chloride-free diet, and Märishler, Scheel, Limbecx, Dreser and others, dispute Widal's hypothesis of a retention of chlorides as being the cause of oedema, in the case of renal dropsy at all events; they assert that the chlorides are held back in order to keep the osmotic pressure of the fluid, which they assume to have been effused, equal to that of the blood and tissues. Certainly not all cases of renal dropsy show diminution in the excretion of chlorides. Bainbridge suggests that a retention of metabolic products may cause the oedema in renal disease, Bradford having previously shown that loss of a certain amount of renal tissue caused retention of metabolic products in the tissues. As sodium chloride is one of the most permeable of crystalloids it seems strange that damage to the renal tissue should impede its excretion. Cushny has shown experimentally that slowing of the blood-flow through renal tissue causes less sodium chloride to appear in the urine while the excretion of urea and sulphates remains unaffected; apparently the chloride, being more permeable, is reabsorbed and so only appears to be excreted in less quantity.

In the dropsy of cardiac disease, owing to the deficient oxidation from stagnation of blood, metabolic products must accumulate in the tissues; also lymph return must be impeded by the increased pressure in the veins and so dropsy results (Wells).

The local oedema seen in some nervous affections might be explained on the hypothesis of increased metabolic activity in these areas due to some local nervous stimulation.

Thus, while increased pressure in the blood or lymph vessels may be one factor, and increased permeability of the capillary endothelium another, increased osmotic pressure in the tissues and lymph is probably the most important in the production of dropsy. This increased osmotic pressure is again due to accumulation of crystalloids in the tissues, either products of metabolism due to deficient oxidation from alteration in the blood or other cause, or, it may be, as in some cases of nephritis, owing to a retention or reabsorption of chlorides in the tissues.

Practical Applications

Medicine and surgery have never been slow to appropriate and apply the biological facts of pathology, and at no period have they followed more closely in its wake than during the last quarter of the 19th century. When, for instance, the cause of septic infection had been revealed, the prophylaxis of the disease became a possibility. Seldom has it happened, since the discovery of the law of gravity, that so profound an impression has been made upon the scientific world at large as by the revelation of the part played by germ-life in nature; seldom has any discovery been fraught with such momentous issues in so many spheres of science and industry.

The names of Pasteur and Lister will descend to posterity as those of two of the greatest figures in the annals of medical science, and indeed of science in general, during the 19th century. The whole system of treatment of tubercular disease has been altered by the discovery of the tubercle microphyte. Previously consumptive individuals were carefully excluded from contact with fresh air, and were advised to live in rooms almost hermetically sealed and kept at a high temperature. The treatment of the disease has now gone off in the opposite direction. Sanatoria have started up all over Europe and elsewhere for its treatment on the open-air principle. Individuals suffering from pulmonary phthisis are encouraged to live night and day in the open, and with the best results. The rapid diagnosis of diphtheria, by recognizing its bacillus, has enabled the practitioner of medicine to commence the treatment early, and it has also enabled the medical officer of health to step in and insist on the isolation of affected persons before the disease has had time to spread. The discovery of the parasite of malaria by Laveran, and of the method by which it gains entrance to the human body, through the bite of a particular variety of mosquito, by Manson and Ross, promises much in the way of eradication of the disease in the future. One of the most remarkable practical outcomes of germ-pathology, however, has been the production of the immunized sera now employed so extensively in the treatment of diphtheria and other contagious diseases. By the continuous injections under the skin, in increasing doses, of the toxins of certain pathogenic micro-organisms, such as that of diphtheria, an animal—usually the horse—may be rendered completely refractory to the disease. Its serum in course of time is found to contain something (antitoxin) which has the power of neutralizing the toxin secreted by the organism when parasitical upon the body. This immunity can be transferred to a fresh host (*e.g.* man) by injecting such serum subcutaneously. The modern system of hygiene is in great part founded upon recent pathology. The recognition of the dangers accompanying the drinking of polluted water or milk, or of those attached to the breathing of a germ-polluted atmosphere, has been the natural sequence of an improved knowledge of pathology in its bacteriological relationships. Skin-grafting and regeneration of bone are among not the least remarkable applications of pathological principles to the combat with disease in recent times; and in this connexion may also be mentioned the daring acts of surgery for the relief of tumours of the brain, rendered practicable by improved methods of localization, as well as operations upon the serous cavities for diseased conditions within them or in their vicinity.

For the special pathological details of various diseases, see the separate articles on PARASITIC DISEASES; NEURO-PATHOLOGY; DIGESTIVE ORGANS; RESPIRATORY SYSTEM; BLOOD: *Circulation*; METABOLIC DISEASES; FEVER; BLADDER; KIDNEYS; SKIN DISEASES; EYE DISEASES; HEART DISEASE; EAR, &c.; and the articles on different diseases and ailments under the headings of their common names.

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Anat.* (1878), lxxii. 375; Wilson, *The Cell in Development and Inheritance* (London, 1896); Ziegler, "Entzündung," in Eulenburg's *Real Encyclopädie*, also *Text-Book of Special Pathological Anatomy* (Eng. trans., New York, 1897). (D. J. H.; R. MR.*)

PATIALA, or **PUTTIALA**, a native state of India, within the Punjab. It is the premier state of the Punjab, and chief of the three Sikh Phulkian states—Patiala, Natha and Jind. It consists of three detached blocks of territory, mostly in the plains, though one portion extends into the hills near Simla. Area 5412 sq. m.; pop. (1901), 1,596,692; estimated revenue, £440,000; military force (including Imperial Service troops), 3429 men. The state was founded by a Sikh chieftain about 1763, and came under British protection, with the other cis-Sutlej states, in 1809. Patiala remained conspicuously loyal to the British during the Mutiny of 1857, Narindar Singh, its ruler, setting an example to the other Sikh states which was of the utmost value. The maharaja, Rajendra Singh, who died in 1900, was devoted to riding and sport. He took part personally in the Tirah campaign of 1897–98, with a battalion of his own Imperial Service infantry and a field troop of Imperial Service lancers. In recognition of his services on this occasion he received the G.C.S.I. He was succeeded by his son, Bhupindar Singh, who was born in 1891. The town of Patiala has a station on the branch of the North-Western railway from Rajpura to Bhatinda. Pop. (1901), 53,545. It contains several fine modern buildings, including palaces, hospitals and schools.

See *Phulkian States Gazetteer* (Lahore, 1909).

PATIENCE, the name given to certain card-games played by a single person. Although known for centuries, they have seldom been mentioned by writers on playing-cards, and the rules have for the most part been handed down orally. There are two main varieties; in one luck alone prevails, since the player has no choice of play but must follow strict rules; in the other an opportunity is given for the display of skill and judgment, as the player has the choice of several plays at different stages of the game. The usual object is to bring the cards into regular ascending or descending sequences. The starting card is called the "foundation," and the "family" (sequence) is "built" upon it. In other varieties of Patience the object is to make pairs, which are then discarded, the game being brought to a successful conclusion when all the cards have been paired; or to pair cards which will together make certain numbers, and then discard as before. There are hundreds of Patience games, ranging from the simplest to the most complicated.

See Jarbart's *Games of Patience* in De la Rue's series of handbooks (1905); *Patience Games*, by "Cavendish" (London, 1890); *Cyclopædia of Card and Table Games*, by Professor Hoffmann (London, 1891); *Patience Games*, by Professor Hoffmann (London, 1892); *Games of Patience*, by A. Howard Cady (Spalding's Home Library, New York, 1896); *Dick's Games of Patience*, edited by W. B. and H. B. Dick (New York, 1898); *Games of Patience* (4 series), by Mary E. W. Jones (London, 1898); *Le Livre illustré des patiences*, by "Comtesse de Blancœur" (Paris, 1898).

PATINA (probably from the Latin word for a flat dish, from *patere*, to lie open; cf. "paten"), a thin coating or incrustation which forms on the surface of bronze after exposure to the air or burial in the ground. It is looked on as a great addition to the beauty of the bronze, especially when it is of the green colour found on antique bronzes (see BRONZE). By extension, the word is applied to the discoloured or incrusted surface of marble, flint, &c., acquired after long burial in the ground or exposure to the air, and also to the special colour given to wood surfaces by time.

PATIÑO, JOSÉ or JOSEF (1666–1736), Spanish statesman, was born at Milan, on the 11th of April 1666. His father, Don Lucas Patiño de Ibarra, Señor de Castelar, who was by origin a Galician, was a member of the privy council and inspector of the troops in the duchy of Milan for the king of Spain, to whom it then belonged. His mother's maiden name was Beatrice de Rosales y Facini. The Patiño family were strong supporters of the Bourbon dynasty in the War of the Spanish Succession. The elder brother Baltasar, afterwards marquis of Castelar, had a distinguished career as a diplomatist, and his son Lucas was a general of some note. José Patiño, who had been intended for the priesthood but adopted a secular career, was granted the reversion of a seat in the senate of Milan on the accession of Phillip V. in 1700, but on the loss of the duchy he was transferred to Spain, and put on the governing body of the military orders in 1707. During the War of Succession he served as intendent of Estremadura, and then of Catalonia from 1711 to 1718. In 1717 he was named intendent of the navy, which had just been reorganized on the French model. His capacity and his faculty for hard work secured him the approval of Alberoni, with whom, however, he was never on very friendly terms in private life. Patiño's Italian education, which affected his Spanish style, and caused him to fall into Italianisms all through his life, may have served to recommend him still further. Patiño profoundly distrusted the reckless foreign policy undertaken by Alberoni under the instigation of the king and his obstinate queen, Elizabeth Farnese. He foretold that it would lead to disaster, but as a public servant he could only obey orders, and he had the chief merit of organizing the various expeditions sent out to Sardinia, Sicily and Ceuta between 1718 and 1720. He became known to the king and queen in the latter year, while he was acting as a species of commissary-general during the disastrous operations against the French troops on the frontier of Navarre. It was not, however, until 1726 that he was fully trusted by the king. He and his brother, the marquis of Castelar, were the chief opponents of the adventurer Ripperdá, who captivated the king and queen for a time. On the fall of this remarkable person, Patiño was named secretary for the navy, the Indies—that is to say the colonies—and for foreign affairs. The war office was added to the other departments at a later date. From the 13th of May 1726 until his death on the 3rd of November 1736 Patiño was in fact prime minister. During the later part of his administration he was much engaged in the laborious negotiations with England in relation to the disputes between the two countries over their commercial and colonial rivalries in America, which after his death led to the outbreak of war in 1739.

In his *Patiño y Campillo* (Madrid, 1882), Don Antonio Rodriquez Villa has collected the dates of the statesman's life, and has published some valuable papers. But the best account of Patiño's administration is to be found in Coxe's *Memoirs of the Kings of Spain of the House of Bourbon* (London, 1815), which is founded on the correspondence of the English ministers at Madrid.

PATIO, the Spanish name for an inner court or enclosed space in a house, which is open to the sky. The "patio" is a common feature in houses in Spain and Spanish America. The word is generally referred to the Lat. *patere*, to lie open; cf. "patent," or to *spatium*, space.

PATKUL, JOHANN REINHOLD (1660–1707), Livonian politician and agitator, was born in prison at Stockholm, where his father lay under suspicion of treason. He entered the Swedish army at an early age and was already a captain when, in 1689, at the head of a deputation of Livonian gentry, he went to Stockholm to protest against the rigour with which the land-recovery project of Charles XI. was being carried out in his native province. His eloquence favourably impressed Charles XI., but his representations were disregarded, and the offensive language with which, in another petition addressed to the king three years later, he renewed his complaints, involved him in a government prosecution. To save himself from the penalties of high treason, Patkul fled from Stockholm to Switzerland, and was condemned *in contumaciam* to lose his right hand and his head. His estates were at the same time confiscated. For the next four years he led a vagabond life, but in 1698, after vainly petitioning the new king, Charles XII., for pardon, he entered the service of Augustus the Strong of Saxony and Poland, with the deliberate intention of wresting from Sweden Livonia, to which he had now no hope of returning so long as that province belonged to the Swedish Crown. The aristocratic republic of Poland was obviously the most convenient suzerain for a Livonian nobleman; so, in 1698, Patkul proceeded to the court of the king-elector at Dresden and bombarded Augustus with proposals for the partition of Sweden. His first plan was a combination against her of Saxony, Denmark and Brandenburg; but, Brandenburg failing him, he was obliged very unwillingly to admit Russia into the partnership. The tsar was to be content with Ingria and Esthonia, while Augustus was to take Livonia, nominally as a fief of Poland, but really as an hereditary possession of the Saxon house. Military operations against Sweden's Baltic provinces were to be begun simultaneously by the Saxons and Russians. After thus forging the first link of the partition treaty, Patkul proceeded to Moscow, and, at a secret conference held at Preobrazhenskoye, easily persuaded Peter the Great to accede to the nefarious league (Nov. 11, 1699). Thoughout the earlier, unluckier days of the Great Northern War, Patkul was the mainstay of the confederates. At Vienna, in 1702, he picked up the Scottish general George Benedict Ogilvie, and enlisted him in Peter's service. The same year, recognizing the unprofitableness of serving such a master as Augustus, he exchanged the Saxon for the Russian service. Peter was glad enough to get a man so famous for his talents and energy, but Patkul speedily belied his reputation. His knowledge was too local and limited. On the 19th of August 1704 he succeeded, at last, in bringing about a treaty of alliance between Russia and the Polish republic to strengthen the hands of Augustus, but he failed to bring Prussia also into the anti-Swedish league because of Frederick I.'s fear of Charles and jealousy of Peter. From Berlin Patkul went on to Dresden to conclude an agreement with the imperial commissioners for the transfer of the Russian contingent from the Saxon to the Austrian service. The Saxon ministers, after protesting against the new arrangement, arrested Patkul and shut him up in the fortress of Sonnenstein (Dec. 19, 1705), altogether disregarding the remonstrances of Peter against such a gross violation of international law. After the peace of Altranstädt (Sept. 24, 1707) he was delivered up to Charles, and at Kazimierz in Poland (Oct. 10, 1707) was broken alive on the wheel, Charles rejecting an appeal for mercy from his sister, the princess Ulrica, on the ground that Patkul, as a traitor, could not be pardoned for example's sake.

See O. Sjögren, *Johan Reinhold Patkul* (Swed.) (Stockholm, 1882); Anton Buchholtz, *Beiträge zur Lebensgeschichte J. R. Patkuls* (Leipzig, 1893). (R. N. B.)

PATMORE, COVENTRY KERSEY DIGHTON (1823–1896), English poet and critic, the eldest son of Peter George Patmore, himself an author, was born at Woodford in Essex, on the 23rd of July 1823. He was privately educated, being his father's intimate and constant companion, and derived from him his early literary enthusiasm. It was his first ambition to become an artist, and he showed much promise, being awarded the silver palette of the Society of Arts in 1838. In the following year he was sent to school in France, where he studied for six months, and began to write poetry. On his return his father contemplated the publication of some of these youthful poems; but in the meanwhile Coventry had evinced a passion for science and the poetry was set aside. He soon, however, returned to literary interests, moved towards them by the sudden success of Tennyson; and in 1844 he published a small volume of *Poems*, which was not without individuality, but marred by inequalities of workmanship. It was widely criticized, both in praise and blame; and Patmore, distressed at its reception, bought up the remainder of the edition and caused it to be destroyed What chiefly wounded him was a cruel review in *Blackwood*, written in the worst style of unreasoning abuse; but the enthusiasm of private friends, together with their wiser criticism, did much to help him and to foster his talent. Indeed, the publication of this little volume bore immediate fruit in introducing its author to various men of letters, among whom was Dante Gabriel Rossetti, through whose offices Patmore became known to Holman Hunt, and was thus drawn into the eddies of the pre-Raphaelite movement, contributing his poem "The Seasons" to the *Germ*. At this time Patmore's father became involved in financial embarrassments; and in 1846 Monckton Milnes secured for the son an assistant-librarianship in the British Museum, a post which he occupied industriously for nineteen years, devoting his spare time to poetry. In 1847 he married Emily, daughter of Dr Andrews of Camberwell. At the Museum he was austere and remote among his companions, but was nevertheless instrumental in 1852 in starting the Volunteer movement. He wrote an important letter to *The Times* upon the subject, and stirred up much martial enthusiasm among his colleagues. In the next year he republished, in *Tamerton Church Tower*, the more successful pieces from the *Poems* of 1844, adding several new poems which showed distinct advance, both in conception and treatment; and in the following year (1854) appeared the first part of his best known poem, "The Angel in the House," which was continued in "The Espousals" (1856), "Faithful for Ever" (1860), and "The Victories of Love" (1862). In 1862 he lost his wife, after a long and lingering illness, and shortly afterwards joined the Roman Catholic Church. In 1865 he married again, his second wife being Miss Marianne Byles, second daughter of James Byles of Bowden Hall, Gloucester; and a year later purchased an estate in East Grinstead, the history of which may be read in *How I managed my Estate*, published in 1886. In 1877 appeared *The Unknown Eros*, which unquestionably contains his finest work in poetry, and in the following year *Amelia*, his own favourite among his poems, together with an interesting, though by no means undisputable, essay on *English Metrical Law*. This departure into criticism he continued further in 1879 with a volume of papers, entitled *Principle in Art*, and again in 1893 with *Religio poetae*. Meanwhile his second wife died in 1880, and in the next year he married Miss Harriet Robson. In later years he lived at Lymington, where he died on the 26th of November 1896.

A collected edition of his poems appeared in two volumes in 1886, with a characteristic preface which might serve as the author's epitaph. "I have written little," it runs; "but it is all my best; I have never spoken when I had nothing to say, nor spared time or labour to make my words true. I have respected posterity; and should there be a posterity which cares for letters, I dare to hope that it will respect me." The obvious sincerity which underlies this statement, combined with a certain lack of humour which peers through its naïveté, points to two of the principal characteristics of Patmore's earlier poetry; characteristics which came to be almost unconsciously merged and harmonized as his style and his intention drew together into unity. In the higher flights, to which he arose as his practice in the art grew perfected, he is always noble and often sublime. His best work is found in the volume of odes called *The Unknown Eros*, which is full not only of passages but of entire poems in which exalted thought is expressed in poetry of the richest and most dignified melody. The animating spirit of love, moreover, has here deepened and intensified into a crystalline harmony of earthly passion with the love that is divine and transcending; the outward manifestation is regarded as a symbol of a sentiment at once eternal and quintessential. Spirituality informs his inspiration; the poetry is of the finest elements, glowing and alive. The magnificent piece in praise of winter, the solemn and beautiful cadences of "Departure," and the homely but elevated pathos of "The Toys," are in their various manners unsurpassed in English poetry for sublimity of thought and perfection of expression. Patmore is one of the few Victorian poets of whom it may confidently be predicted that the memory of his greater achievements will outlive all consideration of occasional lapses from taste and dignity. He wrote, at his best, in the grand manner, melody and thought according with perfection of expression, and his finest poems have that indefinable air of the inevitable which is after all the touchstone of the poetic quality. His son, Henry John Patmore (1860–1883), left a number of poems posthumously printed at Mr Daniell's Oxford Press, which show an unmistakable lyrical quality. (A. WA.)

The standard life of Patmore is the *Memoirs and Correspondence* (1901), edited by Basil Champneys. See also E. W. Gosse, *Coventry Patmore* (1905, "Literary Lives" series), and an essay by Mrs Meynell prefixed to the selection (1905) in the "Muses' Library."

PATMOS, an island in the east of the Aegean Sea, one of the group of the Sporades, about 28 m. S.S.W. of Samos, in 37° 20′ N. lat. and 26° 35′ E. long. Its greatest length from N. to S. is about 10 m., its greatest breadth 6 m., its circumference, owing to the winding nature of the coast, about 37 m. The island, which is volcanic, is bare and rocky throughout; the hills, of which the highest rises to about 800 ft., command magnificent views of the neighbouring sea and islands. The skill of the natives as seamen is proverbial in the archipelago. The deeply indented coast, here falling in huge cliffs sheer into the sea, there retiring to form a beach and a harbour, is favourable to commerce, as in former times it was to piracy. Of the numerous bays and harbours the chief is that of Scala, which, running far into the land on the eastern side, divides the island into two nearly equal portions—a northern and a southern. A narrow isthmus separates Scala from the bay of Merika on the west coast. On the belt of land between the two bays, at the junction between the northern and southern half of the island, stood the ancient town. On the hill above are still to be seen the massive remains of the citadel, built partly in polygonal style. The modern town stands on a hill top in the southern half of the island. A steep paved road leads to it in about twenty minutes from the port of Scala. The town clusters at the foot of the monastery of St John, which, crowning the hill with its towers and battlements, resembles a fortress rather than a monastery. Of the 600 MSS. once possessed by the library of the monastery only 240 are left. The houses of the town are better built than those of the neighbouring islands, but the streets are narrow and winding. The population is about 4000. The port of Scala contains about 140 houses, besides some old well-built magazines and some potteries. Scattered over the island are about 300 chapels.

Patmos is mentioned first by Thucydides (iii. 33) and afterwards by Strabo and Pliny. From an inscription it has been inferred that the name was originally Patnos. Another ancient inscription seems to show that the Ionians settled there at an early date. The chief, indeed the only, title of the island to fame is that it was the place of banishment of St John the Evangelist, who according to Jerome (*De scr. ill.* c. 9) and others, was exiled thither under Domitian in A.D. 95, and released about eighteen months afterwards under Nerva. Here he is said to have written the Apocalypse; to the left of the road from Scala to the town, about half-way up the hill, a grotto is still shown (*τὸ σπήλαιον τῆς Ἀποκαλύψεως*) in which the apostle is said to have received the heavenly vision. It is reached through a small chapel dedicated to St Anne. The Acts of St John, attributed to Prochorus, narrates the miracles wrought by the apostle during his stay on the island, but, strangely enough, while describing how the Gospel was revealed to him in Patmos, it does not so much as mention the Apocalypse. During the dark ages Patmos seems to have been entirely deserted, probably on account of the pirates. In 1088 the emperor Alexis Comnenus, by a golden bull, which is still preserved, granted the island to St Christodulus for the purpose of founding a monastery. This was the origin of the monastery of St John, which now owns the greater part of the southern half of Patmos, as well as farms in Crete, Samos and other neighbouring islands. The embalmed body of the saintly founder is to be seen to this day in a side chapel of the church. The number of the monks, which amounted to over a hundred at the beginning of the 18th century, is now much reduced. The abbot (*ἡγούμενος*) has the rank of a bishop, and is subject only to the patriarch of Constantinople. There is a school in connexion with the monastery which formerly enjoyed a high reputation in the Levant. The modern town was recruited by refugees from Constantinople in 1453, and from Crete in 1669, when these places fell into the hands of the Turks. The island is subject to Turkey; the governor is the pasha of Rhodes. The population is Greek. The women are chiefly engaged in knitting cotton stockings, which, along with some pottery, form the chief exports of the island.

See Tournefort, *Relation d'un voyage du Levant* (Lyons, 1717); Walpole, *Memoirs* (relating to Turkey) (London, 1820); Ross, *Reisen auf den griechischen Inseln* (Stuttgart and Halle, 1840–1852); Guérin, *Description de l'île de Patmos* (Paris, 1856); H. F. Tozer, *Islands of the Aegean*, pp. 178–195.

PATNA, a city, district, and division of British India, in the Behar province of Bengal. The city, which is the most important commercial centre in Bengal after Calcutta, lies on the right bank of the Ganges, a little distance below the confluence of the Sone and the Gogra, and opposite the confluence of the Gandak, with a station on the East Indian railway 332 m. N.W. of Calcutta. Municipal area, 6184 acres. Pop. (1901), 134,785. Including the civil station of Bankipur to the west, the city stretches along the river bank for nearly 9 miles. Still farther west is the military cantonment of Dinapur. A government college was founded in 1862. Other educational institutions include the Behar school of engineering organized in 1897.

Patna city has been identified with Pataliputra (the Palibothra of Megasthenes, who came as ambassador from Seleucus Nicator to Chandragupta about 300 B.C.). Megasthenes describes Palibothra as being the capital of India. He adds that its length was 80 stadia, and breadth 15; that it was surrounded by a ditch 30 cubits deep, and that the walls were adorned with 570 towers and 64 gates. According to this account the circumference of the city would be 190 stadia or 25¼ miles. Asoka built an outer masonry wall and beautified the city with innumerable stone buildings. The greater part of the ancient city still lies buried in the silt of the rivers under Patna and Bankipur at a depth of from 10 to 20 ft. The two events in the modern history of the district are the massacre of Patna (1763) and the Sepoy Mutiny in 1857. The former occurrence, which may be said to have settled the fate of Mahommedan rule in Bengal, was the result of a quarrel between the nawab, Mir Kasim, and the English authorities regarding transit duties, which ultimately led to open hostilities. The company's sepoys, who had occupied Patna city by the orders of the company's factor, were driven out by the nawab's troops and nearly all killed. The remainder afterwards surrendered, and were put into confinement, together with the European officers and the entire staff of the Cossimbazar factory, who had also been arrested on the first outbreak of hostilities. Mir Kasim was defeated in two pitched battles at Gheria and Udhanala (Oodeynullah) in August and September 1763, and in revenge ordered the massacre of all his prisoners, which was carried out with the help of a renegade in his employment named Walter Reinhardt, (afterwards the husband of the famous Begum Samru). About sixty Englishmen were murdered on this occasion, the bodies being thrown into a well belonging to the house in which they were confined. At the outbreak of the mutiny in May 1857 the three sepoy regiments stationed at Dinapur (the military cantonment of Patna, adjoining the city) were allowed to retain their arms till July, when, on an attempt being made to disarm them, they broke into open revolt. Although many who attempted to cross the Ganges in boats were fired into and run down by a pursuing steamer, the majority crossed by the Sone river into Shahabad, where they joined the rebels under Kuar Singh who were then besieging a small European community at Arrah.

The DISTRICT OF PATNA has an area of 2075 sq. m.; pop. (1901), 1,624,985. Throughout the greater part of its extent the district is a level plain; but towards the south the ground rises into hills. The soil is for the most part alluvial, and the country along the bank of the Ganges is peculiarly fertile. The general line of drainage is from west to east; and high ground along the south of the Ganges forces back the rivers flowing from Gaya district. The result is that during the rains nearly the whole interior of the district south of a line drawn parallel to the Ganges, and 4 or 5 m. from its bank, is flooded. In the south-east are the Rajgir Hills, consisting of two parallel ridges running south-west, with a narrow valley between, intersected by ravines and passes. These hills, which seldom exceed 1000 ft. in height, are rocky and clothed with thick low jungle, and contain some of the earliest memorials of Indian Buddhism. The chief rivers are the Ganges and the Sone. The only other river of any consequence is the Punpun, which is chiefly remarkable for the number of petty irrigation canals which it supplies. So much of the river is thus diverted that only a small portion of its water ever reaches the Ganges at Fatwa. The chief crops are rice, wheat, barley, maize and pulse; poppy and potatoes are also of importance. Apart from the Sone canal, irrigation is largely practised from private channels and also from wells. The district is traversed by the main line of the East Indian railway, with two branches south to Gaya and Bihar.

The Division of Patna extended across both sides of the Ganges. It comprised the seven districts of Patna, Gaya, Shahabad, Saran, Champaran, Muzaffarpur and Darbhanga. Total area, 23,748 sq. m.; pop. (1901), 15,514,987. In 1908 the four last districts north of the Ganges were formed into the new division of Tirhut; and the name of Patna division was confined to the three first districts south of the Ganges.

See L. A. Waddell, *Discovery of the Exact Site of Asoka's Classic Capital of Pataliputra* (1892); Vincent Smith, *Asoka* ("Rulers of India" series, 1901); *Patna District Gazetteer* (Calcutta, 1907).

PATNA, one of the Orissa tributary states in Bengal, with an area of 2399 sq. m. It lies in the basin of the Mahanadi river, and is divided by a forest-clad hilly tract into a northern and a southern portion, both of which are undulating and well cultivated. Pop. (1901), 277,748, showing a decrease of 16% in the decade, mainly due to the effects of famine in 1900. Nearly the whole population consists of Oriyas. The capital is Bolangir: pop. (1901), 3706. The principal crop is rice. The maharajas of Patna were formerly heads of a group of states known as the *athara garhjat* or "eighteen forts." They are Chauhban Rajputs, and claim to have been established in Patna for six centuries. Patna was the scene of a rebellion of the Khonds, followed by atrocities on the part of their rulers, in 1869, and, in consequence, came under British management in 1871. The maharaja Ramchandra Singh, installed in 1894, was insane and put an end to his own life in the following year, whereupon his uncle, Lal Dalganjan Singh, became chief, undertaking to administer with the assistance of a diwan or minister appointed by the British government. The powers of this official were extended in 1900 after a serious outbreak of dacoity. Till 1905 the state was included in the Central Provinces.

PATOIS, a French term strictly confined to the dialect of a district or locality in a country which has a common literary language, often used of the form of a common language as spoken by illiterate or uneducated persons, marked by vulgarisms in pronunciation, grammar, &c. The origin of the word is not certain. It has been taken to be a corruption of *patrois*, from Low Lat. *partriensis*, of or belonging to one's *patria*, or native country, fatherland.

PATON, JOHN BROWN (1830–), British Nonconformist divine, was born on the 17th of December 1830. He was educated at London, Poole and Spring Hill College, Birmingham; he graduated B.A. at London University in 1849, and was Hebrew and New Testament prizeman in 1850 and gold medallist in philosophy in 1854. He received the honorary degree of doctor of divinity from Glasgow University in 1881. When the Nottingham Congregational Institute was founded in 1863 he became the first principal, a post which he held till 1898, when he was succeeded by James Alexander Mitchell (1849–1905), who from 1903 till his death was general secretary of the Congregational Union. Paton became vice-president of the British and Foreign Bible Society in 1907. He took an active part in the foundation and direction of a number of societies for religious and social work, notably the National Home Reading Union Society and English Land Colonization Society, and was a constant contributor to literary reviews. His publications include *The Two-fold Alternative* (3rd ed., 1900), *The Inner Mission of the Church* (new ed., 1900), and two volumes of collected essays. His son, John Lewis Paton (b. 1863), who headed the Cambridge classical tripos in 1886, became head master of Manchester grammar school in 1903.

PATON, SIR JOSEPH NOEL (1821–1901), British painter, was born, on the 13th of December 1821, in Woolers Alley, Dunfermline, where his father, a fellow of the Scottish Society of Antiquaries, carried on the trade of a damask manufacturer. He showed strong artistic inclinations in early childhood, but had no regular art training, except a brief period of study in the Royal Academy School in 1843. He gained a prize of £200 in the first Westminster Hall competition, in 1845, for his cartoon "The Spirit of Religion," and in the following year he exhibited at the Royal Scottish Academy his "Quarrel of Oberon and Titania." A companion fairy picture, "The Reconciliation of Oberon and Titania" went to Westminster Hall in 1847, and for it and his picture of "Christ bearing the Cross" he was awarded a prize of £300 by the Fine Arts Commissioners. The two Oberon pictures are in the National Gallery of Scotland, where they have long been a centre of attraction. His first exhibited picture, "Ruth Gleaning," appeared at the Royal Scottish Academy in 1844. He began to contribute to the Royal Academy of London in 1856. Throughout his career his preference was for allegorical, fairy and religious subjects. Among his most famous pictures are "The Pursuit of Pleasure" (1855), "Mors Janua Vitae" (1866), "Oskold and the Ellé-maids" (1874), and "In Die Malo" (1882). Sir Noel Paton also produced a certain amount of sculpture, more notable for design than for searching execution. He was elected an associate of the Royal Scottish Academy in 1847, and a full member in 1850; he was appointed Queen's Limner for Scotland in 1866, and received knighthood in 1867. In 1878 the University of Edinburgh conferred upon him the degree of LL.D. He was a poet of distinct merit, as his *Poems by a Painter* (1861) and *Spindrift* (1867) pleasantly exemplified. He was also well known as an antiquary, his hobby, indeed, being the collection of arms and armour. Sir Noel died in Edinburgh on the 26th of December 1901. His eldest son, Diarmid Noel Paton (b. 1859), became regius professor of physiology in Glasgow in 1906; and another son, Frederick Noel Paton (b. 1861), became in 1905 director of commercial intelligence to the government of India.

PATRAS (Gr. *Patrai*), the chief fortified seaport town on the west coast of Greece, and chief town of the province of Achaea and Elis, on a gulf of the same name, 70 m. W.N.W. of Corinth. There are two railway stations, one in the north-east on the line to Athens (via Corinth), the other on the line to Pyrgos. Pop. (1889), 33,529; (1907), 37,401. It has been rebuilt since 1821 (the War of Independence), and is the seat of a Greek archbishop and an appeal court. It is the chief port of Greece, from which the great bulk of its currants are despatched. The port, formed by a mole and a breakwater, begun in 1880, offers a fair harbour for vessels drawing up to 22 ft. The exports consist of currants, sultanas, valonea, tobacco, olive oil, olives in brine, figs, citrons, wine, brandy, cocoons, and lamb, goat, and kid skins. The imports consist chiefly of colonial produce, manufactured goods and sulphate of copper. The two most interesting buildings are the castle, a medieval structure on the site of the ancient acropolis, and the cathedral of St Andrew, which is highly popular as the reputed burial-place of the saint.

The foundation of Patras goes back to prehistoric times, the legendary account being that Eumelus, having been taught by Triptolemus how to grow grain in the rich soil of the Glaucus valley, established three townships, Aroe (*i.e.* ploughland), Antheia (the flowery), and Mesatis (the middle settlement), which were united by the common worship of Artemis Triclaria at her shrine on the river Meilichus. The Achaeans having strengthened and enlarged Aroe, called it Patrae, as the exclusive residence of the ruling families, and it was recognized as one of the twelve Achaean cities. In 419 B.C. the town was, by the advice of Alcibiades, connected with its harbour by long walls in imitation of those at Athens. The whole armed force was destroyed by Metellus after the defeat of the Achaeans at Scarpheia, and many of the remaining inhabitants forsook the city; but after the battle of Actium Augustus restored the ancient name Aroe, introduced a military colony of veterans from the 10th and 12th legions (not, as is usually said, the 22nd), and bestowed the rights of coloni on the inhabitants of Rhypae and Dyme, and all the Locri Ozolae except those of Amphissa. Colonia Augusta Aroe Patrensis became one of the most populous of all the towns of Greece; its colonial coinage extends from Augustus to Gordian III. That the town was the scene of the martyrdom of St Andrew is purely apocryphal, but, like Corinth, it was an early and effective centre of Christianity; its archbishop is mentioned in the lists of the Council of Sardica in 347. In 551 it was laid in ruins by an earthquake. In 807 it was able without external assistance to defeat the Slavonians (Avars), though most of the credit of the victory was assigned to St Andrew, whose church was enriched by the imperial share of the spoils, and whose archbishop was made superior of the bishops of Methone, Lacedaemon and Corone. Captured in 1205 by William of Champlitte and Villehardouin, the city became the capital and its archbishop the primate of the principality of Achaea. In 1387 De Heredia, grand master of the order of the Hospital at Rhodes, endeavoured to make himself master of Achaea and took Patras by storm. At the close of the 15th century the city was governed by the archbishop in the name of the pope; but in 1428 Constantine, son of John VI., managed to get possession of it for a time. Patras was at length, in 1687, surrendered by the Turks to the Venetians, who made it the seat of one of the seven fiscal boards into which they divided the Morea. In 1714 it again fell, with the rest of the Morea, into Turkish hands. It was at Patras that the Greek revolution began in 1821; but the Turks, confined to the citadel, held out till 1828.

PATRIARCH (M.E. and O. Fr. *patriarche*, Lat. *patriarcha*, Gr. *πατριάρχης*, from *πατριά*, clan, and *ἀρχή*, rule), originally the father or chief of a tribe, in this sense now used more especially of the "patriarchs" of the Old Testament, *i.e.* Abraham, Isaac and Jacob, with their forefathers, and the twelve sons of Jacob. In late Jewish history the title "patriarch" (Heb. *nāsī*, prince, chief) was given to the head of the sanhedrim in Palestine, and is sometimes, though wrongly, applied to the "exilarch," a head of the Jewish college at Babylon.

In the early centuries of the Christian Church the designation "patriarch" was applied, like "archbishop," to bishops of the more important sees as a merely honorary style. It developed into a title implying jurisdiction over metropolitans, partly as a result of the organization of the empire into "dioceses," partly owing to the ambition of the greater metropolitan bishops, which had early led them to claim and exercise authority in neighbouring metropolitanates. At the Council of Chalcedon (451) the patriarchs still bore the title of "exarch"; it was not till the 7th century that that of "patriarch" was fixed as proper to the bishops of Constantinople, Alexandria, Antioch and Jerusalem, "exarch" being reserved for those of Ephesus and Caesarea, who had fallen to a lower rank. In the West the only patriarch in the fully developed sense of the Eastern Church has been the bishop of Rome, who is patriarch as well as pope.

PATRICIANS (Lat. *patricius*, an adjectival form from *pater*, father; not, as some say, from *pater* and *ciere*, to call), a term originally applied to the members of the old citizen families of ancient Rome (see I. below). Under the later Roman Empire the name was revived by the Byzantine emperors as the title of a new order of nobility. Subsequently it was used as a personal title of honour for distinguished servants of Constantine I. and his successors, and was conferred on barbarian chiefs (II. below). It was afterwards conferred by the popes on the Frankish kings. In the medieval Italian republics, *e.g.* Genoa and Venice, the term was applied to the hereditary aristocracy (*patrizio*), and in the free cities of the German Empire it was borne by distinguished citizens (*patrizier*). In Italy it is still used for the hereditary nobility. From these specific uses the word has come into general use as a synonym of "aristocrat" or "noble," and implies the possession of such qualities as are generally associated with long descent, hereditary good breeding and the like. In Church history a sect founded by Patricius (*c.* 387), teacher of Symmachus the Marcionite, are known as the Patricians; they believed that all flesh was made by the devil. The name is also, though rarely, applied to the Roman Catholic body in Ireland regarded as the followers of St Patrick.

I. From the earliest period known to us the free population of Rome contains two elements, patricians and plebeians, the former class enjoying all political privileges, the latter unprivileged. The derivation and significance of the two names have been established with certainty. The patricians (*patricii*) are those who can point to fathers, *i.e.* those who are members of the clans (*gentes*) whose members originally comprised the whole citizen body. The plebeians (*plebs*, *plebes*) are the complement (from root *pleo*, fill, see PLEBS) of the noble families possessing a genealogy, and include all the free population other than the patricians. It has been held by T. Mommsen that the plebeian order had its sole origin in the clients who attached themselves in a position of semi-freedom to the heads of patrician houses, and gradually evolved a freedom and citizenship of their own (see PATRON AND CLIENT). The logical consequence of this view is that the *plebs* as an order in the state is of considerably later growth than the beginning of the city, the patricians being originally the only freemen and the only citizens. But this view is untenable on two grounds. First, in the struggle between the two orders for political privilege we find the clients struggling on the side of the patricians against the main body of the plebeians (Livy ii. 56). Again, a method of taking up Roman citizenship which is well attested for a very early period reveals the possibility of a plebeian who does not stand in any relation to a patron. When an immigrant moved to Rome from one of the cities of the Latin league, or any city which enjoyed the *jus commercii* with Rome, and by the exercise of the right of voluntary exile from his own state (*jus exulandi*), claimed Roman citizenship, it is impossible to suppose that it was necessary for him to make application to a Roman patron to represent him in his legal transactions; for the *jus commercii* gave its holder the right of suing and being sued in his own person before Roman courts. Such an immigrant, therefore, must have become at once a free plebeian citizen of Rome. It may therefore be assumed that long before the clients obtained the right to hold land in their own names and appear in the courts in their own persons there was a free *plebs* existing alongside of the patricians enjoying limited rights of citizenship. But it is equally certain that before the time of Servius Tullius the rights and duties of citizenship were practically exercised only by the members of the patrician clans. This is perhaps the explanation of the strange fact that the clients, who through their patrons were attached to these clans, obtained political recognition as early as the plebeians who had no such semi-servile taint. At the time of the Servian reforms both branches of the *plebs* had a plausible claim to recognition as members of the state, the clients as already partial members of the *curia* and the *gens*, the unattached plebeians as equally free with the patricians and possessing clans of their own as solid and united as the recognized *gentes*.

But not only can it be shown that patricians and plebeians coexisted as distinct orders in the Roman state at an earlier date than the evolution of citizenship by the clients. It has further been established on strong archaeological and linguistic evidence that the long struggle between patricians and plebeians in early Rome was the result of a racial difference between them. There is reason to believe that the patricians were a Sabine race which conquered a Ligurian people of whom the plebeians were the survivors (see ROME: *History*). Apart from the definite evidence, the theory of a racial distinction gains probability from the fact that it explains the survival of the distinction between the *patricii*, men with a family and genealogy, and the rest of the citizens, for some time after the latter had acquired the legal status of *patres* and were organized in *gentes* of their own; for on this theory privilege would belong not to all who could trace free descent but only to those who could trace descent to an ancestor of the conquering race. The family organization of the conquering race was probably higher than that of the conquered, and was only gradually attained by the latter. Thus descent from a father would be distinctive enough of the dominant race to form the title of that race (*patricii*), and when that term had been definitely adopted as the title of a class its persistence in the same sense after the organization of the family and the clan by the unprivileged class would be perfectly natural.

The absurdity of excluding the plebeians from all but a merely theoretical citizenship, based on the negative fact of freedom, seems to have become apparent before the close of the monarchical period. The aim of the reforms associated with the name of Servius Tullius appears to have been the imposition of the duties of citizenship upon the plebeians. Incidentally this involved an extension of plebeian privilege in two directions. First, it was necessary to unify the plebeian order by putting the legal status of the clients on a level with that of the unattached plebeians; and again enrolment in the army involved registration in the tribes and centuries; and as the army soon developed into a legislative assembly meeting in centuries (*comitia centuriata*), the whole citizen body, including plebeians, now acquired a share of political power, which had hitherto belonged solely to the patricians. At the close of the monarchy, the plebeian possessed the private rights of citizenship in entirety, except for his inability to contract a legal marriage with a patrician, and one of the public rights, that of giving his vote in the assembly.[1] But in the matter of liability to the duties of citizenship, military service and taxation, he was entirely on a level with the patrician. This position was probably tolerable during the monarchy, when the king served to hold the power of the patrician families in check. But when these families had expelled the Tarquins, and formed themselves into an exclusive aristocracy of privilege, the inconsistency between partial privilege and full burdens came to be strongly felt by the plebeians.

The result was the long struggle for entire political equality of the two orders which occupies the first few centuries of the republic (see ROME: *History*, § II. “The Republic”). The struggle was inaugurated by the plebeians, who in 494 B.C. formed themselves into an exclusive order with annually elected officers (*tribuni plebis*) and an assembly of their own, and by means of this machinery forced themselves by degrees into all the magistracies, and obtained the coveted right of intermarriage with the patricians. Admission to the higher magistracies carried with it admission to the senate, and by the close of the struggle (about 300 B.C.) the political privilege of the two orders was equalized, with the exception of certain disabilities which, originally devised to break the political monopoly of the order, continued to be attached to the patricians after the victory of the *plebs*. They were excluded from the tribunate and the council of the *plebs*, which had become important instruments of government, and were only eligible for one place in the consulship and censorship, while both were open to plebeians. It is possible, though far from certain (see SENATE), that the powers of the *interregnum* and the senatorial confirmation (*patrum auctoritas*) necessary to give validity to decisions of the people, remained the exclusive privileges of the patrician members of the senate. But while the patrician disabilities were of a kind that had gained in importance with the lapse of centuries, these privileges, even if still retained, had become merely formal in the second half of the republican period. Since the plebeian element in the state had an immense numerical preponderance over the patrician these disabilities were not widely spread, and seem generally to have been cheerfully borne as the price of belonging to the families still recognized as the oldest and noblest in Rome. But the adoption of P. Clodius Pulcher into a plebeian family in 59 B.C. with a view to election to the tribunate shows that a rejection of patrician rights (*transitio ad plebem*) was not difficult to effect by any patrician who preferred actual power to the dignity of ancient descent. It was not so easy to recruit the ranks of the patricians. The traditions of early Rome indeed represent the patricians as receiving the Claudii by a collective act into their body; but the first authenticated instance of the admission of new members to the patriciate is that of the *lex Cassia*, which authorized Caesar as dictator to create fresh patricians. The same procedure was followed by Augustus. Later on, the right of creating patricians came to be regarded as inherent in the principate, and was exercised by Claudius and Vespasian without any legal enactment, apparently in their capacity as censor (Tac. *Ann.* xi. 25; *Vita M. Antonini*, i.). Patrician rank seems to have been regarded as a necessary attribute of the princeps; and in two cases we are told that it was conferred upon a plebeian princeps by the senate (*Vita Juliani*, 3; *Macrini*, 7). A comparison of this procedure with the original conception of the patriciate as revealed by the derivation of the word, is significant of the history of the conception of nobility at Rome, and illustrative of the tenacity with which the Romans clung to the name and form of an institution which had long lost its significance. After the political equalization of the two orders, noble birth was no longer recognized as constituting a claim to political privilege. Instead of the old hereditary nobility, consisting of the members of the patrician clans, there arose a nobility of office, consisting of all those families, whether patrician or plebeian, which had held curule office. It was now the tenure of office that conferred distinction. In the early days of Rome, office was only open to the member of a patrician *gens*. In the principate, patrician rank, a sort of abstract conception based upon the earlier state of affairs, was held to be a dignity suitable to be conferred on an individual holder of office. But the conferment of the rank upon an individual as distinct from a whole family (*gens*) is enough to show how widely the modern conception of patrician rank differed from the ancient. The explanation of this is that the plebeians had long been organized, like the patricians, in *gentes*, and nothing remained distinctive of the old nobility except a vague sense of dignity and worth. (A.M.CL.)

II. Under Constantine an entirely new meaning was given to the word Patrician. It was used as a personal title of honour conferred for distinguished services. It was a title merely of rank, not of office; its holder ranked next after the emperor and the consul. It naturally happened, however, that the title was generally bestowed upon officials, especially on the chief provincial governors, and even among barbarian chieftains whose friendship was valuable enough to call forth the imperial benediction. Among the former it appears to have become a sort of *ex officio* title of the Byzantine vicegerents of Italy, the exarchs of Ravenna; among the barbarian chiefs who were thus dignified were Odoacer, Theodoric, Sigismund of Burgundy, Clovis, and even in later days princes of Bulgaria, the Saracens, and the West Saxons. The word thus acquired an official connotation. The dignity was not hereditary and belonged only to individuals; thus a patrician family was merely one whose head enjoyed the rank of *patricius*. Gradually the root sense of “father” came to the front again, and the *patricius* was regarded as the “father of the emperor” (Ammian Marc. xxix. 2). With the word were associated such further titles as *eminentia*, *magnitudo*, *magnificentia*. Those patricians who were purely honorary were called *honorarii* or *codicillarii*; those who were still in harness were *praesentales*. They were all distinguished by a special dress or uniform and in public always drove in a carriage. The emperor Zeno enacted that no one could become *patricius* who had not been *praefectus militum*, *consul* or *magister militum*, but less careful emperors gave the title to their favourites, however young and undistinguished. The writ in which the title was conferred was called a *diploma*.

A further change in the meaning of the name is marked by its conferment on Pippin the Frank[2] by Pope Stephen. The idea of this extension originated no doubt in the fact that the Italian *patricius* of the 6th and 7th centuries had come to be regarded as the *defensor*, *protector*, *patronus* of the Church. At all events, the conferring of the title by a pope was entirely unprecedented; previously its validity had depended on the emperor solely. As a matter of fact it is clear that the patriciate of Pippin was a new office, especially as the title is henceforward generally *patricius Romanorum*, not *patricius* alone. It was subsequently conferred on Charlemagne at his coronation, and borne, as we gather from medieval documents, indiscriminately, not only by subsequent emperors, but also by a long line of Burgundian rulers and minor princes of the middle ages generally.[1] On the fall of the Carolingian house the title passed to Alberic II. Subsequently it was held by John Crescentius, and many leading men who received it from Otto III. (*e.g.* Boleslaw Chabri of Poland). In 1046 it returned to the German Henry III. The emperor Frederick Barbarossa was the last to wear the insignia (in 1167).

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[1] Cf. the privileges of the Athenians under the Solonian system see SOLON; ECCLESIA; ARCHON).

[2] The name is used of Charles Martel, but it was not apparently formally conferred upon him.

Bibliography.—(1) *The Ancient Patricians*: Th. Mommsen, *Staatsrecht III. passim* (3rd ed., Leipzig, 1887); *Römische Forschungen I.* (Berlin, 1864); P. Willems, *Le Droit public romain*, pt. i (Louvain, 1888). (2) *The Medieval Patricians*: J. B. Bury's *Later Roman Empire* (1889); Bryce, *Holy Roman Empire* (1904), pp. 40 seq.; Du Cange, *Glossarium med. et infim. latinitatis, s.v.* "Patricius"; and histories of Charlemagne (*q.v.*) and his successors. For the German *Patriziertum* see Roth von Schreckenstein, *Das Patriziat in den deutschen Städten, besonders Reichstädten* (2nd ed. Freiburg, 1886); Foltz, *Beiträge zur Gesch. des Patriziats in den deutschen Städten* (Marburg, 1899). (J. M. M.)

PATRICK, ST, the patron saint of Ireland,[2] was probably born about the year 389. He was the son of a deacon, Calpurnius, and the grandson of a presbyter named Potitus. His father was a middle-class landed proprietor and a decurion, who is represented as living at a place called Bannauenta. The only place of this name we know is Daventry, but it seems more probable that Patrick's home is to be sought near the Severn, and Rhys conjectures that one of the three places called Banwen in Glamorganshire may be intended. The British name of the future apostle was Sucat, to which Mod. Welsh *hygad*, "warlike," corresponds. His Roman name has also survived in a hibernicized form, Cothrige, with the common substitution of Irish *c* for Brythonic *p* (cf. Irish *casc*, Lat. *pascha*). Patrick was doubtless educated as a Christian and was imbued with reverence for the Roman Empire. When about sixteen years of age he was carried off by a band of Irish marauders. The latter were possibly taking part in the raid of the Irish king Niall Noigiallach, who met with his end in Britain in 405. Irish tradition represents the future apostle as tending the herds of a chieftain of the name of Miliucc (Milchu), near the mountain called Slemish in county Antrim, but Bury tries to show that the scene of his captivity was Connaught, perhaps in the neighbourhood of Croagh Patrick. His bondage lasted for six years. During this time he became subject to religious emotion and beheld visions which encouraged him to effect his escape. He fled, in all probability to the coast of Wicklow, and encountered a vessel which was engaged in the export of Irish wolf-dogs. After three days at sea the traders landed, possibly on the west coast of Gaul, and journeyed for twenty-eight days through a desert. At the end of two months Patrick parted from his companions and betook himself to the monastery of Lérins, where he probably spent a few years. On leaving the Mediterranean he seems to have returned home. It was doubtless during this stay in Britain that the idea of missionary enterprise in Ireland came to him. In a dream he saw a man named Victorious bearing innumerable epistles, one of which he received and read; the beginning of it contained the words "The Voice of the Irish"; whilst repeating these words he says, "I imagined that I heard in my mind the voice of those who were near the wood of Foclut (Fochlad), which is near the western sea, and thus they cried: 'We pray thee, holy youth, to come and walk again amongst us as before.'" The forest of Fochlad was in the neighbourhood of Killala Bay, but it is possible that it extended considerably to the south. Despite his natural diffidence, and opposition on the part of his relatives, Patrick resolved to return to Gaul in order to prepare himself for his mission. He proceeded to Auxerre—a place which seems to have had a close connexion with Britain and Ireland—and was ordained deacon by Bishop Amator, along with two others who were afterwards associated with him in spreading the faith in Ireland. The one was an Irishman called Fith, better known as Iserninus, the other Auxilius. Patrick must have spent at least fourteen years at Auxerre.

It seems not unlikely that Pelagianism had taken root among the Christian communities of Ireland, and it was found necessary to send a bishop to combat the heresy. Pope Celestine's choice fell on the deacon Palladius, who had taken a prominent part in stamping out the doctrine in Britain. The mission of Palladius (431–432), whom Zimmer has endeavoured to identify with Patrick, is obscure. Tradition associates his name with the mountains of Wicklow, and we are told that he retired to the land of the Picts in North Britain, where he died. Patrick probably felt great disappointment when Palladius was sent as the chosen envoy of Rome, but now Germanus seems to have decided that Patrick was the man for the task, and he was consecrated in 432. For the peculiar social conditions with which the Christian missionary would be confronted in Ireland see Brehon Laws and Ireland: *Early History*. Suffice it to say here that the land belonged to the tribes, and that the success of Patrick's undertaking depended entirely on his ability to gain the goodwill of the tribal kings and chiefs of clans. We are totally ignorant as to the extent and number of the pre-Patrician Christian communities in Ireland. It seems probable that they were, largely, if not wholly confined to the south-east of the island. Patrick landed at Inverdea, the mouth of the river Vartry in Wicklow, but we are not informed as to any of his doings in Leinster at this period. According to the story, he immediately proceeded northward to the kingdom of Ulidia (east Ulster), though a certain tradition represents him as going to Meath. Landing on the shores of Strangford Lough, he commenced his labours in the plain on the south-west side of that inlet. A convert chief named Dichu granted him a site for an establishment, and a wooden barn is stated to have been utilized for the purpose of worship, whence the modern Saul (Ir. *saball*, "barn"). Patrick's activity was bound to bring him sooner or later into conflict with the High-king Loigaire (reigned 428–467), son of Niall Noigiallach. Fedilmid, a brother of the monarch, is represented as having made over his estate at Trim to the saint to found a church, and thus the faith was established within Loigaire's territory. The story in picturesque fashion makes Patrick challenge the royal authority by lighting the Paschal fire on the hill of Slane on the night of Easter Eve. It chanced to be the occasion of a pagan festival at Tara, during which no fire might be kindled until the royal fire had been lit. A number of trials of skill between the Christian missionary and Loigaire's Druids ensue, and the final result seems to have been that the monarch, though unwilling to embrace the foreign creed, undertook to protect the Christian bishop. At a later date the saint was probably invited by Loigaire to take part in the codification of the *Senchus Mór* in order to represent the interests of the Christian communities. On another occasion Patrick is reported to have overthrown a famous idol known as *Cenn Cruaich* or *Cromm Cruaich* in the plain of Mag Slecht (county Cavan). Several churches seem to have been founded in the kingdom of Meath by the saint, but they cannot now be identified. Patrick is stated to have visited Connaught on three different occasions and to have founded churches, one of the most important being that at Elphin. As regards Ulster our information is very scanty, though we find him establishing churches in the three kingdoms of the province (Ailech, Oriel and Ulidia). Patrick's work is more closely identified with the north of Ireland than with the south. Traces of his mission, however, are to be found in Ossory and Muskerry. But his task in the south was doubtless rather that of an organizer, and a kind of circular letter has come down to us which was addressed by Patrick, Auxilius and Iserninus, to all the clergy of the island. There is some evidence that he made a journey to Rome (441–443) and brought back with him valuable relics. On his return he founded the church and monastery of Armagh, the site of which was granted him by Daire, king of Oriel, and it is probable that the see was intended by him to be specially connected with the supreme ecclesiastical authority. Some years before his death, which took place in 461, Patrick resigned his position as bishop of Armagh to his disciple Benignus, and possibly retired to Saul in Dalaradia, where he spent the remainder of his life. The place of his burial was a matter of dispute in early Ireland, but it seems most likely that he was interred at Saul.

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[1] We even find a feminine form, *patricissa*, for the wife of a *patricius*. The golden circlet worn on the head by the *patricius* as a symbol of his dignity was called a *patricialis circulus*.

[2] His career is involved in considerable obscurity. Widely varying views have been held by modern scholars with regard to his activity, some going so far as to treat all the accounts of his labours as the fictitious creation of a later age. In the present article Bury's reconstruction of the saint's life has been chiefly followed. Apart from its importance in other respects, Bury's treatment of the subject has at any rate the merit of defending the traditional view of St Patrick's career.

Two highly important documents purporting to have been written by Patrick have come down to us. Although the genuineness of these writings has been impugned on various occasions by different scholars, there seems to be no reason for assuming that they did not emanate from the saint's pen. The one is the Confession, which is contained in an imperfect state in the Book of Armagh (*c.* 807), but complete copies are found in later MSS. The Confession, written towards the end of his life, gives a general account of his career. Various charges had been brought against him by his enemies, among them that of illiteracy, the truth of which is borne out by the crudeness of his style, and is fully admitted by the writer himself. Before being admitted to deacon's orders he had communicated to a friend some fault which he had committed when about fifteen years of age. This friend had not considered it an obstacle to ordination. Later the secret was betrayed and came to the ears of persons who, as he says, "urged my sins against my laborious episcopate." It is impossible to ascertain who these detractors were—possibly British fellow-workers in Ireland. The other document is the so-called Letter to Coroticus. The soldiers of Coroticus (Ceretic), a British king of Strathclyde, had in the course of a raid in Ireland killed a number of Christian neophytes on the very day of their baptism while still clad in white garments. Others had been carried off into slavery, and a deputation of clergy which Patrick had sent to ask for their release had been subjected to ridicule. In his Letter the saint in very strong language urges the Christian subjects of the British king not to have any dealings with their ruler and his bloodthirsty followers until full satisfaction should have been made. The text of this letter occurs in a number of MSS. but is not contained in the Book of Armagh. It is however certain that it was known in the 7th century. A strange barbaric chant commonly known as the Lorica or Hymn of St Patrick is preserved in the *Liber hymnorum*. This piece, called in Irish the *Faed Fiada* or "Cry of the Deer," contains a number of remarkable grammatical forms, and the latest editors are of opinion that it may very well be genuine. From such slender material it is not easy to form a clear conception of the saint's personality. His was evidently an intensely spiritual nature, and in addition to the qualities which go to form a strong man of action he must have possessed an enthusiasm which enabled him to surmount all difficulties. His importance in the history of Ireland and the Irish Church consists in the fact that he brought Ireland into touch with western Europe and more particularly with Rome, and that he introduced Latin into Ireland as the language of the Church. His work consisted largely in organizing the Christian societies which he found in existence on his arrival, and in planting the faith in regions such as the extreme west of Connaught which had not yet come under the sway of the gospel.

Authorities.—Apart from the Letter and Epistle mentioned above our chief sources of information with regard to the life of St Patrick are contained in the Book of Armagh. The one is the memoir by Tírechán, a bishop who had been the disciple of Bishop Ultan of Ardbraccan in Meath (d. 657). The first part of this memoir, which was probably compiled about 670, deals with the saint's work in Meath, the second with his activity in Connaught. Various additions are appended to this compilation, and there are still further additional notes. The other biography was written towards the end of the 7th century by Muirchu Maccu Machtheni, who dedicated his work to Bishop Aed of Slébte (d. 700). The first portion deals with Patrick's career down to his arrival in Ireland and contains an unvarnished statement of fact. But when the story passes to Ireland Muirchu's narrative becomes full of the mythical element. The influence of Muirchu's work can be traced in all later biographies. Bury has shown that both Tírechán and Muirchu drew from written material which existed in part at any rate in Irish. Among later lives we may mention the hymn *Genair Patraicc*, commonly attributed to Fiacc, which is considered by the latest editors to have been originally composed about 800. Three anonymous Latin lives were published by Colgan in his *Trias Thaumaturga* (Louvain, 1645), and there exists an 11th-century Irish life in three parts published by Whitley Stokes for the Rolls series (1887). A Latin translation of a different copy of this work, now lost, was published by Colgan. Lastly a life by an otherwise unknown Irish writer named Probus occurs in the Basel edition of Bede's works (1563) and was reprinted by Colgan.

See J. B. Bury, *The Life of St Patrick and his Place in History* (London, 1905); J. H. Todd, *St Patrick the Apostle of Ireland* (Dublin, 1861); H. Zimmer, article "Keltische Kirche" in *Realencyklopädie für protestantische Theologie und Kirche* (1901; trans. by Miss Meyer, "The Celtic Church in Britain and Ireland," London, 1902); J. Gwynn, *Liber Ardmachanus*; Whitley Stokes, *The Tripartite Life of St Patrick* (London, 1887); N. J. D. White, "The Writings of St Patrick" (critical edition) in *Proceedings of the Royal Irish Academy* (1904). (E. C. Q.)

PATRICK, SIMON (1626–1707), English divine, was born at Gainsborough, Lincolnshire, on the 8th of September 1626. He entered Queen's College, Cambridge, in 1644, and after taking orders in 1651 became successively chaplain to Sir Walter St John and vicar of Battersea, Surrey. He was afterwards (1662) preferred to the rectory of St Paul's, Covent Garden, London, where he continued to labour during the plague. He was appointed dean of Peterborough in 1679, and bishop of Chichester in 1689, in which year he was employed, along with others of the new bishops, to settle the affairs of the Church in Ireland. In 1691 he was translated to the see of Ely, which he held until his death on the 31st of May 1707. His sermons and devotional writings, which are very numerous, were long held in high estimation, and his *Commentary on the Historical and Poetical Books of the Old Testament*, in 10 vols., brought down as far as the Song of Solomon, was reprinted as recently as 1853. His *Friendly Debate between a Conformist and a Nonconformist* was a controversial tract which excited considerable feeling at the time of its publication in 1668, but he lived long enough to soothe by his moderation and candour the exasperation it had caused. He also contributed to a volume of *Poems upon Divine and Moral Subjects* (1719).

The first collected edition of his works appeared at Oxford in 1859 (9 vols., 8vo); a small *Autobiography* was published also at Oxford in 1839.

PATRIZZI, FRANCESCO (Franciscus Patritius) (1529–1597), Italian philosopher and scientist, was born at Clissa, in Dalmatia, and died in Rome. He gained the patronage of the bishop of Cyprus, who brought him to Venice, where his abilities were immediately recognized by his appointment to the chair of philosophy at Ferrara. He was subsequently invited to Rome by Clement VIII. In spite of his almost incessant controversies with the Aristotelians, he found time to make a comprehensive study of contemporary science. He published in 15 books a treatise on the *New Geometry* (1587), and works on history, rhetoric and the art of war. He studied ancient theories of music, and is said to have invented the thirteen-syllable verse known subsequently as *versi martelliani*. In his philosophy he was mainly concerned to defend Plato against the followers of Aristotle.

His two great works, *Discussionum peripateticorum libri XV.* (Basel, 1571), and *Nova de universis philosophia* (Basel, 1591), developed the view that, whereas Aristotle's teaching was in direct opposition to Christianity, Plato, on the contrary, foreshadowed the Christian revelation and prepared the way for its acceptance. In the earlier treatise he attacks the life and character of Aristotle, impugns the authenticity of almost all his works, and attempts to refute his doctrines from a theological standpoint. In the second and greater work he goes back to the theories and methods of the Ionians and the pre-Socratics generally. His theory of the universe is that, from God there emanated Light which extends throughout space and is the explanation of all development. This Light is not corporeal and yet is the fundamental reality of things. From Light came Heat and Fluidity; these three together with Space make up the elements out of which all things are constructed. This cosmic theory is a curious combination of materialistic and abstract ideas; the influence of his master Telesio (*q.v.*), generally predominant, is not strong enough to overcome his inherent disbelief in the adequacy of purely scientific explanation.

PATROCLES (*c.* 312–261 B.C.), a Macedonian general and writer on geographical subjects, who lived during the reigns of Seleucus I. and Antiochus I. When in command of the fleet of Seleucus (285) he undertook a voyage of exploration on the Caspian Sea to discover possible trade routes, especially for communication with the peoples of northern India. He came to the conclusion that the Caspian was a gulf or inlet, and that it was possible to enter it by sea from the Indian Ocean. The only information as to his work (even the title is unknown) is derived from Strabo. After the death of Seleucus, Patrocles was sent by his successor Antiochus to put down a revolt in Asia Minor, and lost his life in an engagement with the Bithynians.

See Strabo ii. 68, 74, xi. 508, xv. 689; Diod. Sic. xix. 100; Plutarch, *Demetrius*, 47; Pliny, *Nat. Hist.* vi. 21; Photius, *cod.* 224 (on Memnon); C. W. Müller, *Fragmenta historicorum graecorum*, ii. 442; E. H. Bunbury, *Hist. of Ancient Geography*, vol. i. (1879); W. W. Tarn, “ Patrocles and the Oxo-Caspian Trade Route ” in *Journal of Hellenic Studies*, vol. xxi. (1901).

PATROL (Fr. *patrouiller*, connected with *patte*, foot), a verb meaning to move up and down or traverse a specified “ round ” or “ beat ” in a district in a town, camp or other place, or on a stretch of water on a river or sea, for the purpose of watching and protecting the same, or for reconnoitring the numbers or positions of an enemy. As a substantive the term is used of the detachment of troops or police employed.

PATRON, a word of which the various meanings in European languages are derived and transferred from that of the Lat. *patronus*, whose position in Roman law and antiquities is treated below (PATRON AND CLIENT). The most general application of the word in these transferred senses is that of an influential supporter or protector. The earliest use of the word in English appears to have been in the special ecclesiastical sense of the holder of an advowson, the right of presentation to a benefice. From this meaning is deduced that of the person in whom lies the right of presenting to public offices, privileges, &c., still surviving in the title of the Patronage Secretary of the Treasury in Great Britain. From the earliest Christian times the saints took the place of the pagan tutelary deities (*Di tutelares*) and were in this capacity called *tutelares* or *patroni*, patron-saints. To them churches and other sacred buildings are dedicated, and they are regarded as the protectors and guardians of countries, towns, professions, trades and the like. Further, a person may have a patron-saint, usually the one on or near whose festival he has been born, or whose name has been taken in baptism.

A full list of saints, with the objects of the peculiar patronage of each, is given in M. E. C. Walcott's *Sacred Archaeology* (1868).

PATRON AND CLIENT (Lat. *patronus*, from *pater*, father; *clientes* or *cluentes*, from *cluere*, to obey), in Roman law. Clientage appears to have been an institution of most of the Graeco-Italian peoples in early stages of their history; but it is in Rome that we can most easily trace its origin, progress and decay. Until the reforms of Servius Tullius, the only citizens proper were the members of the patrician and gentile houses; they alone could participate in the solemnities of the national religion, take part in the government and defence of the state, contract quiritarian marriage, hold property, and enjoy the protection of the laws. But alongside of them was a gradually increasing non-citizen population composed partly of slaves, partly of freemen, who were nevertheless not admitted to burgess rights. To the latter class belonged the clients, individuals who had attached themselves in a position of dependence to the heads of patrician houses as their patrons, in order thereby to secure attachment to a *gens*, which would involve a *de facto* freedom. Mommsen held that the *plebs* consisted originally of clients only; but the earliest records of Rome reveal the possibility of a man becoming a plebeian member of the Roman state without assuming the dependent position of clientship (see PATRICIANS); and long before the time of Servius Tullius the clients must be regarded as a section only of the plebeian order, which also contained members unattached to any *patronus*. The relationship of patron and client was ordinarily created by what, from the client's point of view, was called *adplicatio ad patronum*, from that of the patron, *susceptio clientis*—the client being either a person who had come to Rome as an exile, who had passed through the asylum, or who had belonged to a state which Rome had overthrown. According to Dionysius and Plutarch, it was one of the early cares of Romulus to regulate the relationship, which, by their account of it, was esteemed a very intimate one, imposing upon the patron duties only less sacred than those he owed to his children and his ward, more urgent than any he could be called upon to perform towards his kinsmen, and whose neglect entailed the penalty of death (*Tellumoni sacer esto*). He was bound to provide his client with the necessaries of life; and it was a common practice to make him a grant during pleasure of a small plot of land to cultivate on his own account. Further, he had to advise him in all his affairs; to represent him in any transactions with third parties in which, as a non-citizen, he could not act with effect; and, above all things, to stand by him, or rather be his substitute, in any litigation in which he might become involved. The client in return had not only generally to render his patron the respect and obedience due by a dependant, but, when he was in a position to do so and the circumstances of the patron required it, to render him pecuniary assistance. As time advanced and clients amassed wealth, we find this duty insisted upon in a great variety of forms, as in contributions towards the dowries of a patron's daughters, towards the ransom of a patron or any of his family who had been taken captive, towards the payment of penalties or fines imposed upon a patron, even towards his maintenance when he had become reduced to poverty. Neither might give evidence against the other—a rule we find still in observance well on in the 1st century B.C., when C. Herennius declined to be a witness against C. Marius on the ground that the family of the latter had for generations been clients of the Herennii (Plut. *Mar.* 5). The client was regarded as a minor member (*gentilicius*) of his patron's *gens*; he was entitled to assist in its religious services, and bound to contribute to the cost of them; he had to follow his patron to battle on the order of the *gens*; he was subject to its jurisdiction and discipline, and was entitled to burial in its common sepulchre. And this was the condition, not only of the client who personally had attached himself to a patron, but that also of his descendants; the patronage and the clientage were alike hereditary. The same relationship was held to exist between a freedman and his former owner; for originally a slave did not on enfranchisement become a citizen; it was a *de facto* freedom merely that he enjoyed; his old owner was always called his patron, while he and his descendants were substantially in the position of clients, and often so designated.

In the two hundred years that elapsed before the Servian constitutional reforms, the numerical strength of the clients, whether in that condition by *adplicatio*, enfranchisement or descent, must have become considerable; and it was from time to time augmented by the retainers of distinguished immigrants admitted into the ranks of the patriciate. There seems also to have been during this period a gradual growth of virtual independence on the part of the clients, and it is probable that their precarious tenure of the soil had in many cases come to be practically regarded as ownership, when a patron had not asserted his right for generations. The exact nature of the privileges conferred on the clients by Servius Tullius is not known. Probably this king guaranteed to the whole plebeian order, including the clients, the legal right of private ownership of Roman land. At the same time he imposed upon the whole order the duty of serving in the army, which was now organized on a basis of wealth. The client had previously been liable to military service at the command of the *gens*. Now he was called upon to take his part in it as a member of the state. As a natural corollary to this, all the plebeians seem to have been enrolled in the tribes, and after the institution of the plebeian assembly (*concilium plebis*) the clients, who formed a large part of the order, secured a political influence which steadily increased. It is not certain how soon they acquired the right to litigate in person on their own behalf, but their possession of this right seems to be implied in the XII. Tables, and may have been granted them at an earlier date. At any rate after 449 B.C. there were no disabilities in private law involved in their status. The relation of patron and client, it is true, still remained; the patron could still exact from his client respect, obedience and service, and he and his *gens* had still an eventual right of succession to a deceased client's estate. But the fiduciary duties of the patron were greatly relaxed, and practically little more was expected of him than that he should continue to give his client his advice, and prevent him falling into a condition of indigence; *sacer esto* ceased to be the penalty of protection denied or withheld, its application being limited to *fraus facta*, which in the language of the Tables meant positive injury inflicted or damage done.

So matters remained during the 4th, 3rd and 2nd centuries. In the 2nd and 1st a variety of events contributed still further to modify the relationship. The rapacity of patrons was checked by the lex Cincia (passed by M. Cincius Alimentus, tribune in 204 B.C.), which prohibited their taking gifts of money from their clients; marriages between patron and client gradually ceased to be regarded as unlawful, or as ineffectual to secure to the issue the status of the patron father. At the same time the remaining political disabilities of the clients were removed by their enrolment in all the tribes instead of only the four city tribes, and their admission to the magistracy and the senate. Hereditary clientage ceased when a client attained to a curule dignity; and in the case of the descendants of freedmen enfranchised in solemn forms it came to be limited to the first generation. Gradually but steadily one feature after another of the old institution disappeared, till by the end of the 1st century it had resolved itself into the limited relationship between patron and freedman on the one hand, and the unlimited honorary relationship between the patron who gave gratuitous advice on questions of law and those who came to consult him on the other. To have a large following of clients of this class was a matter of ambition to every man of mark in the end of the republic; it increased his importance, and ensured him a band of zealous agents in his political schemes. But amid the rivalries of parties and with the venality of the lower orders, baser methods had to be resorted to in order to maintain a patron's influence; the favour and support of his clients had to be purchased with something more substantial than mere advice. And so arose that wretched and degrading clientage of the early empire, of which Martial, who was not ashamed to confess himself a first-rate specimen of the breed, has given us such graphic descriptions; gatherings of idlers, sycophants and spendthrifts, at the levees and public appearances of those whom, in their fawning servility, they addressed as lords and masters, but whom they abused behind their backs as close-fisted upstarts—and all for the sake of the *sportula*, the daily dole of a dinner, or of a few pence wherewith to procure one. With the middle empire this disappeared; and when a reference to patron and client occurs in later times it is in the sense of counsel and client, the words patron and advocate being used almost synonymously. It was not so in the days of the great forensic orators. The word advocate, it is said, occurs only once in the singular in the pages of Cicero. But at a later period, when the bar had become a profession, and the qualifications, admission, numbers and fees of counsel had become a matter of state regulation, *advocati* was the word usually employed to designate the pleaders as a class of professional men, each individual advocate, however, being still spoken of as patron in reference to the litigant with whose interest he was entrusted. It is in this limited connexion that patron and client come under our notice in the latest monuments of Roman law.

Literature.—On the clientage of early Rome see T. Mommsen, "Die römische Clientel," *Röm. Forschungen*, i. 355 (Berlin, 1864); M. Voigt, "Ueber die Clientel und Libertinität," in *Ber. d. phil. histor. Classe d. königl. sächs. Gesellsch. d. Wissenschaften* (1878, pp. 147–219); J. Marquardt, *Privatleben d. Römer*, pp. 196–200 (Leipzig, 1879); M. Voigt, *Die XII. Tafeln.*, ii. 667–679 (Leipzig, 1883). Earlier literature is noted in P. Willems, *Le Droit public romain*, 4th ed., p. 26 (Louvain, 1880). On the clientage of the early empire see W. A. Becker, *Gallus*, vol. ii., Excursus 4 (London, 1849); L. Friedländer, *Sittengeschichte Roms*, i. 200–212 (Leipzig, 1901); Marquardt, *op. cit.* pp. 200–208. On the latest clientage, see T. Grellet-Dumazeau, *Le Barreau romain* (Paris, 1858).

(J. M.*; A. M. Cl.)

PATTEN (adapted from Fr. *patin*, in modern usage meaning a "skate"; Med. Lat. *patinus*, Ital. *pattino*, of unknown origin; cf. *patte*, paw), a kind of shoe which, varying in form at different times and places, raised the wearer from the ground in order to keep the feet out of mud or wet. Pattens were necessaries to women of all classes in the uncleaned and unpaved streets of the 16th, 17th and 18th centuries. They may still be found in use in rural parts of England. A wooden shoe or clog, a light strapped shoe with a very thick sole of wood or cork, and, more particularly, an iron ring supporting at a little distance from the ground a wooden sole with a strap through which the foot slips, have all been types which the patten has taken. An extraordinary kind of "patten" was fashionable in Italy and Spain in the 16th or 17th centuries. This was the *chopine*,[1] a loose slipper resting on a very thick sole of cork or wood. During the 17th century at Venice ladies wore "chopines" of exaggerated size. Coryat, in his *Crudities*, 1611 (vol. i. p. 400, ed. 1905), gives a description of these Venetian "chapineys." They were of wood covered with red, white and yellow leather, some gilt or painted, and reached a height sometimes of half a yard. Ladies wearing these exaggerated chopines had to be accompanied by attendants to prevent them falling. There is a 16th century Venetian "chopine" in the British Museum. The "Pattenmakers" Company is one of the minor Livery companies of London. The patten-makers were originally joined with the "Pouch and Galoche Makers," and are mentioned as early as 1400. They became a separate fraternity in 1469, but did not obtain a charter till 1670.

PATTER, properly a slang word for the secret or "cant" language used by beggars, thieves, gipsies, &c., hence the fluent plausible talk that a cheap-jack employs to pass off his goods, or a conjuror to cover up his tricks. It is thus used of any rapid manner of talking, and of a "patter-song," in which a very large number of words have to be sung at high speed to fit them to the music. The word, though in some of its senses affected by "patter," to make a series of rapid strokes or pats, as of raindrops, is derived from the quick, mechanical repetition of the *Paternoster*, or Lord's Prayer.

PATTERN, a model, that which serves as an original from which similar objects may be made, or as an example or specimen; in particular an artistic design serving as a sample or model, hence the arrangement or grouping of lines, figures, &c., which make up such a design. The word was taken from Fr. *patron*, Lat. *patronus*, a defender or protector. In medieval Latin *patronus* had the specific meaning of example, and in modern French both meanings of patron and pattern attach to *patron*. "Patron" in the sense of copy, example, began to be pronounced and spelled in England as "pattern" in the 16th century.

PATTESON, JOHN COLERIDGE (1827–1871), English missionary, bishop of Melanesia, was born in London on the 1st of April 1827, the eldest son of Sir John Patteson, justice of the King's Bench, and Frances Duke Coleridge, a near relative of Samuel Taylor Coleridge. He was educated at Ottery St Mary and at Eton, where he distinguished himself on the cricket-field. He entered Balliol College, Oxford, in 1845, graduated B.A. in 1848, and in 1852 became a fellow of Merton College. In 1853 he became curate of Alfington, Devon, and in the following year he was ordained priest. He then joined George Augustus Selwyn, bishop of New Zealand, in a mission to the Melanesian islands. There he laboured with great success, visiting the different islands of the group in the mission ship the "Southern Cross," and by his good sense and devotion winning the esteem and affection of the natives. His linguistic powers were exceptional, and he spoke 23 languages with ease. In 1861 he was consecrated bishop of Melanesia, and fixed his headquarters at Mota. He was killed by natives at Nukapu, in the Santa Cruz group, on the 20th of September 1871, the victim of a tragic error. The traders engaged in the nefarious traffic in Kanaka labour for Fiji and Queensland had taken to personating missionaries in order to facilitate their kidnapping; Patteson was mistaken for one of these and killed. His murderers evidently found out their mistake and repented of it, for the bishop's body was found at sea floating in a canoe, covered with a palm fibre matting, and a palm-branch in his hand. He is thus represented in the bas-relief erected in Merton College to his memory.

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[1] The word is taken from an obsolete French *chapine* or Spanish *chapin*, and is of doubtful origin. The Spanish *chapa*, flat plate, has been suggested. The word does not occur in Italian, though it is often Italianized in English in such forms as *cioppino*.

See *Life* by Charlotte M. Yonge (1873).

PATTI, ADELINA JUAÑA MARIA [BARONESS CEDERSTRÖM] (1843-), the famous vocalist, daughter of an Italian singer, Salvatore Patti, was born at Madrid on the 19th of February 1843. Her mother, also a singer, was Spanish, being known before her marriage as Signora Barili. Both the parents of Adelina went to America, where their daughter was taught singing by Maurice Strakosch, who married Amelia Patti, an elder sister. Gifted with a brilliant soprano voice, Adelina Patti began her public career at the age of seven in the concert halls of New York, where in 1859 she also made her first appearance as Lucia in Donizetti's opera, *Lucia di Lammermoor*. On the 14th of May 1861 she sang as Amina in Bellini's opera *La Sonnambula* at Covent Garden, and from this time she became the leading operatic *prima donna*, her appearances in London, Paris and the other principal musical centres being a long succession of triumphs, and her rôles covering all the great parts in Italian opera. In 1868 she married Henri, marquis de Caux, a member of Napoleon III.'s household, from whom she was divorced in 1885; she then married Nicolini, the tenor, who died in 1898; and in 1899 she became the wife of Baron Cederström, a Swede, who was naturalized as an Englishman. Madame Patti ceased to appear on the operatic stage in public after the 'eighties, but at Craig-y-Nos, her castle in Wales, she built a private theatre, and her occasional appearances at concerts at the Albert Hall continued to attract enthusiastic audiences, her singing of "Home, Sweet Home" becoming peculiarly associated with those events. Partly owing to her fine original training, partly to her splendid method and partly to her avoidance of Wagnerian rôles, Madame Patti wonderfully preserved the freshness of her voice, and she will be remembered as, after Jenny Lind, the greatest soprano of the 19th century.

PATTI, a town and episcopal see of Sicily, in the province of Messina, 42 m. W. by S. of Messina by rail. Pop. (1901), 5473 (town), 10,995 (commune). The cathedral, founded about 1300, has been modernized; it contains the tomb (restored in the 17th century) of Adelasia, widow of Count Roger of Sicily. The abandoned church of San Marco is built into the remains of a Greek temple.

PATTISON, MARK (1813-1884), English author and rector of Lincoln College, Oxford, was born on the 10th of October 1813. He was the son of the rector of Hauxwell, Yorkshire, and was privately educated by his father. In 1832 he matriculated at Oriel College, where he took his B.A. degree in 1836 with second-class honours. After other attempts to obtain a fellowship, he was elected in 1839 to a Yorkshire fellowship at Lincoln, an anti-Puseyite College. Pattison was at this time a Puseyite, and greatly under the influence of J. H. Newman, for whom he worked, helping in the translation of Thomas Aquinas's *Catena Aurea*, and writing in the *British Critic* and *Christian Remembrancer*. He was ordained priest in 1843, and in the same year became tutor of Lincoln College, where he rapidly made a reputation as a clear and stimulating teacher and as a sympathetic friend of youth. The management of the college was practically in his hands, and his reputation as a scholar became high in the university. In 1851 the rectorship of Lincoln became vacant, and it seemed certain that Pattison would be elected, but he lost it by a disagreeable intrigue. The disappointment was acute and his health suffered. In 1855 he resigned the tutorship, travelled in Germany to investigate Continental systems of education, and began his researches into the lives of Casaubon and Scaliger, which occupied the remainder of his life. In 1861 he was elected rector of Lincoln, marrying in the same year Emilia Francis Strong (afterwards Lady Dilke). The rector contributed largely to various reviews on literary subjects, and took a considerable interest in social science, even presiding over a section at a congress in 1876. The routine of university business he avoided with contempt, and refused the vice-chancellorship. But while living the life of a student, he was fond of society, and especially of the society of women. He died at Harrogate on the 30th of July 1884. His biography of *Isaac Casaubon* appeared in 1875; *Milton*, in Macmillan's English Men of Letters series in 1879. The 18th century, alike in its literature and its theology, was a favourite study, as is illustrated by his contribution (*Tendencies of Religious Thought in England*, 1688-1750) to the once famous *Essays and Reviews* (1860), and by his edition of Pope's *Essay on Man* (1869), &c. His *Sermons and Collected Essays*, edited by Henry Nettleship, were published posthumously (1889), as well as the *Memoirs* (1885), an autobiography deeply tinged with melancholy and bitterness. His projected *Life of Scaliger* was never finished. Mark Pattison possessed an extraordinary distinction of mind. He was a true scholar, who lived entirely in the things of the intellect. He writes of himself, excusing the composition of his memoirs, that he has known little or nothing of contemporary celebrities, and that his memory is inaccurate: "All my energy was directed upon one end—to improve myself, to form my own mind, to sound things thoroughly, to free myself from the bondage of unreason. . . If there is anything of interest in my story, it is as a story of mental development" (*Memoirs*, pp. 1, 2). The *Memoirs* is a rather morbid book, and Mark Pattison is merciless to himself throughout. It is evident that he carried rationalism in religion to an extent that seems hardly consistent with his position as a priest of the English Church.

Mark Pattison's tenth and youngest sister was Dorothy Wyndlow Pattison (1832-1878), better known as SISTER DORA, the name she took in 1864 on becoming a member of the Anglican sisterhood of the Good Samaritan at Coatham, Yorkshire. In 1865 she was sent as nurse to their cottage hospital in Walsall, and from 1867 to 1877 she was in charge of a new hospital there. She left the sisterhood in 1874, and their hospital in 1877, to take charge of the municipal epidemic hospital, where the cases were largely small-pox. She had meanwhile qualified herself thoroughly as a nurse and had acquired no mean skill as a surgeon. Her efforts greatly endeared her to those among whom she worked, and after her death a memorial window was erected in the parish church, and a marble portrait statue by F. J. Williamson in the principal square of Walsall.

See Margaret Lonsdale's *Sister Dora* (1887 ed.).

PATTON, FRANCIS LANDEY (1843-), American educationalist and theologian, was born in Warwick parish, Bermuda, on the 22nd of January 1843. He studied at Knox College and at the university of Toronto; graduated at Princeton Theological Seminary in 1865; was ordained to the Presbyterian ministry in June 1865; was pastor of the 84th Street Presbyterian Church, New York City, in 1865-1867, of the Presbyterian Church of Nyack, New York, in 1867-1870, of the South Church, Brooklyn, in 1871, and of the Jefferson Park Presbyterian Church, Chicago, in 1874-1881; and in 1872-1881 was professor in McCormick Seminary, Chicago. He was moderator of the General Assembly of the Presbyterian Church in 1878. In 1881-1888 he was Stuart professor "of the relation of philosophy and science to the Christian religion" (a chair founded for him) in Princeton Theological Seminary; in 1888-1902 he was president of the College of New Jersey, which in 1896 became Princeton University; in 1902 he became president of Princeton Theological Seminary. He brought charges of heresy in 1874 against David Swing, and was prosecuting attorney at Swing's trial. In 1891 and 1892 he was one of the opponents of Dr Charles A. Briggs at the time of the Briggs heresy case. Dr Patton was an opponent of the revision of the Confession of Faith. He was editor, with Dr Briggs, of the *Presbyterian Review*, in 1880–1888. He wrote *The Inspiration of the Scriptures* (1869), and *Summary of Christian Doctrine* (1874).

PAU, a city of south-western France, chief town of the department of Basses-Pyrénées, 66 m. E.S.E. of Bayonne on the southern railway to Toulouse. Pop. (1906), 30,315. It is situated on the border of a plateau 130 ft. above the right bank of the Gave de Pau (a left-hand affluent of the Adour), at a height of about 620 ft. above the sea. A small stream, the Hédas, flowing in a deep ravine and crossed by several bridges, divides the city into two parts. The modern importance of Pau is due to its climate, which makes it a great winter health-resort. The most striking characteristic is the stillness of the air, resulting from the peculiarly sheltered situation. The average rainfall is about 33 in., and the mean winter temperature is 43°, the mean for the year being 56°.

The town is built on a sandy soil, with the streets running east and west. The Place Royale (in the centre of which stands Nicolas Bernard Raggi's statue of Henry IV., with bas-reliefs by Antoine Etex) is admired for the view over the valley of the Gave and the Pyrenees; it is connected by the magnificent Boulevard des Pyrénées with the castle gardens. Beyond the castle a park of thirty acres planted with beech trees stretches along the high bank of the Gave. Access to the castle is obtained by a stone bridge built under Louis XV.; this leads to the entrance, which gives into a courtyard. On the left of the entrance is the *donjon* or *tour* de Gaston Phœbus. On the right are the *tour neuve*, a modern erection, and the Tour de Montauzet (Monte-Oiseau), the higher storeys of which were reached by ladders; the Tour de Bilhères faces north-west, the Tours de Mazères south-west. Another tower between the castle and the Gave, the Tour de la Monnaie, is in ruins.

In the gardens to the west of the castle stand a statue of Gaston Phœbus, count of Foix, and two porphyry vases presented by Bernadotte king of Sweden, who was born at Pau. On the ground-floor is the old hall of the estates of Béarn, 85 ft. long and 36 ft. wide, adorned with a white marble statue of Henry IV., and magnificent Flemish tapestries ordered by Francis I. Several of the upper chambers are adorned with Flemish, Brussels or Gobelins tapestry, but the most interesting room is that in which Henry IV. is said to have been born, containing his cradle made of a tortoise-shell, and a magnificent carved bed of the time of Louis XII. The churches of St Jacques and St Martin in the Gothic style are both modern. The *lycée* occupies a portion of the buildings of a Jesuit college founded in 1622. The prefecture, the law-court and the hôtel de ville present no remarkable features. Pau is the seat of a court of appeal and a court of assizes and has a tribunal of first instance, a tribunal of commerce and a chamber of arts and manufactures. There are training colleges for both sexes, a library, an art museum and several learned societies. Pau owes most of its prosperity to its visitors. The golf club, established 1856, has a course of 18 holes, on the Plaine de Billère, about a mile from the town. Among the industrial establishments are flour-mills, cloth factories and tanneries, and there is trade in wine, hams, horses and cloth.

Pau derives its name from the word *pal*, in allusion to the stakes which were set up on the site chosen for the town. It was founded probably at the beginning of the 11th century by the viscounts of Béarn. By the erection of the present castle in the latter half of the 14th century, Gaston Phœbus made the town a place of importance and after his death the viscounts of Béarn visited it frequently. Gaston IV. granted a charter to the town in 1464. François Phœbus, grandson and successor of Gaston, became king of Navarre in 1479, and it was not until 1512 that the loss of Spanish Navarre caused the rulers of Béarn to transfer their residence from Pampeluna to Pau, which till 1589 was their seat of government. Margaret of Valois, who married Henri d'Albret, made her court one of the most brilliant of the time. In 1553 her daughter Jeanne d'Albret gave birth to Henry IV. at Pau. It was the residence of Catherine, sister of Henry IV., who governed Béarn in the name of her brother. In 1620 when French Navarre and Béarn were reduced to the rank of province, the intendants took up their quarters there. In the 19th century Abd-el-Kader, during part of his captivity, resided in the castle.

PAUL, "the Apostle of the Gentiles," the first great Christian missionary and theologian. He holds a place in the history of Christianity second only to that of the Founder himself. It was no accident that one who has been styled "the second founder of Christianity" was born and bred a Pharisee. Rather it was through personal proof of the limitations of legal Judaism that he came to distinguish so clearly between it and the Gospel of Christ, and thereby to present Christianity as the universal religion for man as man, not merely a sect of Judaism with proselytes of its own. For this, and nothing less, was the issue involved in the problem of the relation of Christianity to the Jewish Law; and it was Paul who settled it once and for all.

A modern Jew has said, "Jesus seems to expand and spiritualize Judaism; Paul in some senses turns it upside down." The reason of this contrast is their respective attitudes to the Law as the heart of Judaism. Jesus seems never to have breathed the atmosphere of Rabbinic religion.[1] Hence his was a purely positive reinterpretation of the spirit of Old Testament religion as a whole. His attitude to the Law was one of habitual dutifulness to its ordinances, combined with sovereign freedom towards its letter when the interests of its spirit so required (cf. F. J. A. Hort, *Judaistic Christianity*, chap. ii.). To this the primitive apostles and their converts in the main adhered, without seeing far into their Master's principle in the matter; nor did they feel any great straitening of the spirit by the letter of the Mosaic, rather than the Rabbinic Law. But with Paul it was otherwise. As Saul the Pharisee he had taken the Mosaic *Thorah* as divine Law in the strictest sense, demanding perfect inner and outer obedience; and he had relied on it utterly for the righteousness it was held able to confer. Hence when it gave way beneath him as means of salvation—nay, plunged him ever more deeply into the Slough of Despond by bringing home his inability to be righteous by doing righteousness—he was driven to a *revolutionary* attitude to the Law *as method of justification.* "Through (the) Law" he "died unto (the) Law," that he "might live unto God" (Gal. ii. 19). By this experience not only Pharisaic Judaism, but the legal principle in religion altogether, was turned "upside down" within his own soul; and of this fact his teaching and career as an apostle were the outcome.

But Paul had in him other elements besides the Jewish, though these lay latent till after his conversion. As a native and citizen of Tarsus, he had points of contact with Greek culture and sentiment which help to explain the sympathy and tact with which he adapted his message to the Greek. As a Roman citizen likewise, conscious of membership in a world-wide system of law and order which overrode local and racial differences, he could realize the idea of a universal religious franchise, with a law and order of its own. Both these factors in his training contributed to the moulding of Paul the missionary statesman. In his mind the conception of the Church as something catholic as the Roman Empire first took shape; and through his wonderful labours the foundations of its actual realization were firmly laid. In giving some account of this man and of his teaching, we shall expound the latter mainly as it emerges in the course of his personal career.

Method.—Paul's own letters are our critical basis, as F. C. Baur and the Tübingen school made clear once for all. The book of Acts and other sources of information are to be used only so far as they are compatible with the letters,[1] as our only strictly contemporary documents. If our results to-day are far more positive than those of the Tübingen critics, this is due partly to the larger number of letters now generally acknowledged as Paul's (some eight or ten), and partly to a fuller knowledge both of Judaism and the Graeco-Roman world. These are seen to have embraced more varieties of religious thought and feeling than used to be assumed. The "particularist" tendency in Judaism was more limited than Baur supposed; while there was even a pre-Christian gnosticism, both Jewish and non-Jewish. Albrecht Ritschl in his *Altkath. Kirche* (2nd ed., 1857) did much to break through the hard-and-fast categories of the school in which he was trained, and in particular showed that Gentile Christians generally were far from Pauline in their modes of conceiving either Law or Gospel.

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[1] This, since the full success of the Maccabaean reaction more than a century before, was determined by the Pharisaic notion of the Law, as a rigorous and technical method of attaining "righteousness" before God by correctness of religious conduct. But this ideal represented only one stream of the religion of the original *Chasidim*, or "pious ones" of the Psalms (see ASSIDEANS). The simpler form in which their piety lived on in less official circles, was that amidst which John the Baptist and Jesus himself were reared. It breathes in the more popular literature of edification represented by the *Testaments of the Twelve Patriarchs*, as well as in Luke i., ii.

Chronology.—This has been discussed by Sir W. M. Ramsay in *Pauline and Other Studies* (1907), and by C. H. Turner in Hastings's *Dict. of the Bible* (article "Chronology of New Test."). Their results agree in the main for the period when precision first becomes possible, viz. between Paul's first missionary journey and his arrival in Rome. Here Turner antedates Ramsay by a year throughout. C. Clemen, in his *Paulus* i. 349–410, reaches rather different results. The pivot of the whole is Festus's succession to Felix as procurator, which Turner places in 58 and Ramsay in 59, while they agree in excluding 56 (Blass and Harnack), 57 (Bacon), 60 (Lightfoot, Zahn), as well as yet earlier and later extremes (Clemen argues for 61). On the chronology from Paul's conversion down to the Relief visit (Acts xi. 30), c. 45–47, hardly two scholars agree; but on the whole the tendency is to put his conversion rather earlier than was formerly usual.

I. *Paul's Life.*—"Saul, who is also Paul," was "a Hebrew, of Hebrews" born, *i.e.* of strict Jewish origin, and of the tribe of Benjamin (Phil. iii. 5; cf. 2 Cor. xi. 22). Yet, as his double name suggests, he was not reared on Jewish soil but amid the Dispersion, at Tarsus in Cilicia, the son of a Roman citizen (Acts xxii. 28; cf. xvi. 37, xxiii. 27). "Saul," his Jewish name, was a natural one for a Benjamite to bear, in memory of Israel's first king. "Paul" was his name for the non-Jewish world, according to a usage seen also in John Mark, Simeon Niger, &c. *Paulus* was not an uncommon name in Syria and eastern Asia Minor (see the *Index nominum* in Boeckh's *Corp. inscr. graec.*), and was a natural one for the son of a Roman citizen. Ramsey develops this point suggestively (*Pauline and Other Studies*, p. 65). "It is as certain that he had a Roman name and spoke the Latin language as it is that he was a Roman citizen. If, for example's sake, we could think of him sometimes as Gaius Julius Paulus—to give him a possible and even not improbable name—how completely would our view of him be transformed. Much of what has been written about him [as a narrow, one-sided Jew] would never have been written if Luke had mentioned his full name." Nor would much of the same sort have been written, if the influences due to his Tarsian citizenship[2] (xxi. 39), viewed in the light of the habits of Jewish life in Asian cities, had been kept in mind. Tarsus, it seems, was peculiarly successful "in producing an amalgamated society in which the Oriental and Occidental spirit in unison attained in some degree to a higher plane of thought and action" (id., *The Cities of St. Paul*, 89). Accordingly it is natural that Paul's letters should bear traces of Hellenic culture up to the level of a man of liberal education. Whether he went beyond this to a first-hand study of philosophy, particularly of the Stoic type for which Tarsus as a university was famous, is open to question.[3] In any case Paul had learnt, when he wrote his epistles, to value Greek "wisdom" at its true worth—the suggestiveness and sanity of its best thoughts, but at the same time its inadequacy to meet the deeper longings of the human spirit. Above all he felt the mental and moral shallowness of the verbal "show of wisdom" which marked current philosophical rhetoric.

In Tarsus.

Jewish Training.

Thanks to his letters, we can form some idea of the character and strength of the element in Paul's early life due to Judaism. Looking back, he says (Phil. iii. 4–7), "If any other man thinketh to have confidence in the flesh, I yet more. Circumcised the eighth day, . . . a Hebrew of Hebrews; as touching the Law, a Pharisee; as touching the righteousness which is in the Law, found blameless. Howbeit what things were gain to me, these have I counted loss for Christ." He came indeed to regard such inherited advantages as in themselves things of "the flesh," natural rather than spiritual (*vv.* 4, 9). Yet as advantages, tending to awaken the spirit's thirst for God, he did esteem them, seeing in them part of the preparation vouchsafed by divine providence to himself (Gal. i. 15). Upon the "advantage of the Jew," as "entrusted with the oracles of God" (Rom. iii. 1 seq.), he dwells in Rom. ii. 17 in a way suggestive of his own youthful attitude to "the name of a Jew." Thus we may imagine the eager boy in Tarsus, as developing, under the instructions of a father strictly loyal to the Law, and under the teaching of the synagogue, a typical Jewish consciousness of the more serious and sensitive order.

In Jerusalem.

A good deal depends on the age at which the young Saul passed from Tarsus to Jerusalem and the school of Gamaliel. If he felt his vocation as teacher of the Law at the earliest possible age, this great change may have come soon after his fifteenth year, when Rabbinic studies might begin. This would well accord with the likelihood that he never married. But in any case we must not exaggerate the contrast involved, since he came from a Pharisaic home and passed to sit at the feet of the leader of the more liberal Palestinian Rabbinism. The transition would simply accentuate the legal element in his religious life and outlook. Nor was it mere personal acceptance with God that floated before his soul as the prize of such earnestness. The end of ends was a righteous nation, worthy the fulfilment of the divine promises. But this too could come only by obedience to the Law. Thus all that the young Pharisee cared for most hung upon the Law of his fathers.

Outwardly he obtained the goal of legal blamelessness as few attained it; and for a time he may have felt a measure of self-satisfaction. But if so, a day came when the inner meaning of the Law, as extending to the sphere of desire and motive, came home to him in stern power, and his peace fled (Rom. vii. 9). For sin in his inner, real life was unsubdued; nay, it seemed to grow ever stronger, standing out more clearly and defiantly as insight into the moral life grew by means of the Law. To the Law he had been taught to look for righteousness. In his experience it proved but the means to "knowledge of sin," without a corresponding impulse towards obedience. Not only did it make him realize the latent possibilities of evil desire ("the evil heart," *Yetzer hara*), it also made him aware of a subtler evil, the reaction of self-will against the demands of the Law. While one element was in abiding harmony with the will of God, the other was in equal sympathy with "the law of sin." Could the Law achieve the separation, making the moral person "die" to "the flesh" and so escape its sway? No, answered Saul's experience: the Law rather adds power to sin as self-will (1 Cor. xv. 56; Rom. vii. 11, 13). Whence then is deliverance to come? It can only come with the Messianic age and through Messiah. The Law would reign inwardly as outwardly, being "written on the heart" as promised in prophecy.

First Impressions as to Jesus.

So may we conceive the position reached by Saul, though not with full consciousness, before he came into contact with Christianity. But as yet he did not realize that "through the Law he had died to the Law" (Gal. ii. 19), much less the logical bearing of this fact upon the nature and function of the Law. How then would the message, "Jesus is the Messiah," strike such a man? It would seem a blasphemous caricature of things most sacred. It is doubtful whether he had heard Jesus Himself (2 Cor. v. 16 has perhaps another meaning). He may even have been absent from Jerusalem in the first days of apostolic preaching, possibly as a rabbi in Tarsus. But if so, his ardent nature soon brought him on the scene, in time at least to hear Stephen and take part against him (Acts vii. 58, 60). If the simple message of the first witnesses, that one whose life and preaching were largely out of harmony with the Law as Saul understood it, had in fact been raised from the dead by Israel's God and so vindicated—to the condemnation of that generation of God's people—if this seemed to Saul mere madness, what was he to say to Stephen's views as to the Law and the people of the Law, both past and present? (see STEPHEN). Stephen could not be right in the views which still divided them. Perish the thought! Perish too all those who upheld the crucified Nazarene, the accursed of the Law! For His death could mean but one of two things. Either He was accursed of God also, or—awful alternative, yet inevitable to Saul's logical mind—the Law *relative to which He was accursed* was itself set aside. Saul turned from the suggestion as too shocking to his pride alike in his people and in its divine Law, for him seriously to consider its alleged credentials—the Resurrection, and the supernatural power and goodness of Him whose claims it was held to confirm. Why stay to weigh the evidence of Galilean common folk (*Am-ha-aretz*), themselves lax in their observance of *Thorah*, when over against it stood the whole weight of immemorial prescription, and the deliberate judgment of the custodians of the Law as to this man as " a deceiver "? No doubt they were self-deceived fanatics. But the logic of the movement had at length declared itself through the mouth of Stephen, and weak toleration must be abandoned.

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[1] The method which reverses this relation, using the "we" passages of Acts to discredit the epistles of Paul (as well as the rest of Acts), is a mere *tour de force*, which has received artificial vogue by incorporation in the *Encyclopaedia Biblica*, and to a less degree in the external and partial article "Saul of Tarsus" in the *Jewish Encyclopaedia*. The essential harmony of the epistles and *Acts* has been shown afresh by A. Harnack, *Die Apostelgeschichte* (1908).

[2] Probably as member of the Jewish "tribe" dating from the Seleucid colony planted there in 171 B.C. (Ramsay).

[3] The main difficulty in deciding on this, as on other points of contact between Paul and Hellenism, is the fact that he certainly got many of his Greek ideas through the medium of Judaeo-Greek or Hellenistic literature, like the *Wisdom of Solomon* (cf. Romans i. 18–ii. fin.). It is clear from the way in which he uses the Greek Bible, even where it diverges wrongly from the original, that he was reared on it rather than on the Hebrew text.

Saul the Persecutor.

So Saul was driven to persecute, driven by his acute sense of the radical issue involved, and perhaps hoping to find relief from his own bitter experience in such zeal for the Law. Yet the goading of unsatisfied intuitions did not cease. We may even suspect that Stephen's philosophy of Israel's history had made an impression on him, and was undermining his confidence in the infallibility of his nation's religious authorities. If mistaken before, why not again? This granted possible, all turned on the evidence as to the Resurrection of the crucified Prophet of Nazareth. Yet though the joyous mien of His followers, even when confronted with death, seemed to betoken a good conscience before God which could hardly fail to impress him, Saul felt the status of the Law to be too grave an issue to depend on the probabilities of human testimony. So he plunged on, in devotion to what still seemed the cause of God against impugners of His *Thorah*, but not without his own doubts. He was, in fact, finding it " hard to kick against the goad " (Acts xxvi. 14) plied in his deeper consciousness, as he followed his inherited and less personal beliefs. He was, in language which he later applied to his compatriots, loth to " submit himself to the righteousness of God " (Rom. x. 3), when it came in a manner humbling to his feelings. Still he was in the main honest (1 Tim. i. 13), and the hindrances to his belief were exceptional. Direct personal experience on the point on which all hinged, the alleged divine vindication of Jesus as Messiah following on the legal condemnation by the national authorities, was needful to open up a clear exit from his religious *impasse*.

The Vision at Damascus.

It was at this critical point in his inner history that, as he neared Damascus on a mission of persecution, there was granted him—as he believed ever after in the face of all challenge—a vision of Jesus, in risen and glorified humanity, as objective as those to the original witnesses with which in 1 Cor. xv. he classes it.

As to the sense in which this vision, so momentous in its issues, may be regarded as " objective," the following points deserve notice. On the one hand it is generally agreed (1) that Paul distinguished this appearance of the risen Jesus from his other " visions and revelations of the Lord," such as he refers to in 2 Cor. xii. 1 sqq., and classed it with those to the Twelve and others which first created the belief that Jesus had been " raised from the dead "; (2) that this belief included for Paul a transformed or spiritualized body (cf. the note of time, " on the third day," and the argument in 1 Cor. xv. 12 sqq., 35 sqq.), his own vision of which seems to colour his conception of the Resurrection body generally (Phil. iii. 21, though he had certain traditional notions on the subject to start with; cf. 2 Cor. v. 1 sqq. with *Apoc. Baruch*, xlix.–li., representing Jewish belief about A.D. 70–100, and see Dr R. H. Charles's ed.). On the other hand, analogies furnished by religious psychology, including a sudden vision amid light and the hearing of a voice as accompaniments of religious crisis in certain cases, affect our ability to take Saul's consciousness in the matter as a simple transcript of objective facts. There is indeed reason to believe that the dazzling light was such a fact, if it blinded Saul temporarily (Acts ix. 8–19) and affected his companions (xxii. 9, xxvi. 14). But beyond this physical prelude to his vision we cannot go critically. Thus the nature of the connexion between the light as an objective antecedent, and the vision subjective to Saul himself, remains doubtful on the plane of history. It is possible to penetrate further only by the aid of faith, with or without speculations based on certain psychical facts more and more establishing themselves to scientific minds. Religious faith, dwelling on the unique issues of the vision in the history of Christianity and arguing from effects to a cause as real as themselves, tends to postulate the objectivity which Saul himself asserts. Some do so in an absolute sense, in spite of the differences between Saul's experience and that of his companions (Acts ix. 7, xxii. 9). Others confine the objectivity to a divine act, producing by special action on Saul's brain a vision not due simply to the antecedents in himself. Thus it was not merely subjective, a mere vision in the sense of hallucination, but an objective vision or genuine revelation of the real, as Paul claimed. Such an objective-subjective revelation, being in this but a special form of what is involved in any real divine revelation, accords in general with modern research as to telepathy and phantasms of distant or deceased persons. But, after all, the main point for Paul's religious history—as well as the basis of all theories of the vision—is the question as to the degree of discontinuity between his thought before and after the event. On this Paul is clear and emphatic; nor can we here go behind the evidence of one whose writings prove him a master in introspective reflection. " There was no possibility that he should by any process of mere thinking come to realize the truth " as to Jesus, so rooted were the prejudices touching things divine which barred the way (see Ramsay, *Pauline and Other Studies*, p. 18).

Its Spiritual Content.

Important as is the question as to the nature of the vision which changed Saul's career, it is its spiritual content which bears most upon the story of his life. Jesus was, in spite of all, God's Messiah, His Righteous One, His Son, the type and ideal of righteousness in man, through spiritual union with whom like righteousness was to be attained, if at all. In a flash Saul's personal problem as to acceptance with God and victory over sin was changed. It became simply a question how spiritual union with the Messiah was to come about. He had vanquished and " condemned sin in the flesh " by His perfect obedience (Rom. viii. 3, v. 19), of which the Cross was now seen to be the crowning act. As for the Law as means of justification, it was superseded by the very fact that Messiah had realized His righteousness on another principle altogether than that of " works of the Law," and had in consequence been crucified by its action, as one already dead to it *as a dispensational principle*. This meant that those united to Him by faith were themselves sharers in His death to the Law as dispensational master and judge, and so were quit of its claims in that new moral world into which they were raised as sharers also in His Resurrection (Rom. vi. 1–vii. 6). Henceforth they " lived unto God " in and through Messiah, by the self-same Spirit by which He had lived the sinless life (viii. 9).

"All Things New."

Here we have at once Paul's mysticism and his distinctive gospel in germ, though the full working out in various directions came only gradually under the stimulus of circumstances. But already the old régime had dissolved. His first act was to make explicit, through confession and baptism, his submission and adhesion to Jesus as Messiah implicit in his cry from the ground, " What shall I do, Lord? " Thereby he formally " washed away his sins " (Acts xxii. 16; cf. Rom. x. 9). Then with new-born enthusiasm he began boldly to proclaim in the synagogues of Damascus that Jesus, whose followers he had come to root out, was verily the Messianic Son of God (ix. 20; cf. Matt. xvi. 16). Yet ere long he himself felt the need for quiet in which to think

The New Theory of the Law.

out the theory of his new position. He withdrew to some secluded spot in the region south of Damascus, then vaguely called Arabia (Gal. i. 17). Chief among the problems pressing for reinterpretation in the light of his recent experience was the place of the Law in God's counsels. While the Law could condemn, warn and in some degrees restrain the sinner from overt sins, it could not redeem or save him from the love of sin. In a word, it could not "give life" (Gal. iii. 21). Hence its direct remedial action was quite secondary. Its primary effect, and therefore divine purpose, was to drive men humbly to seek God's grace. It "shut up all unto (realized) disobedience, that God might have mercy upon all" (Rom. xi. 32; Gal. iii. 22). Thus the place of the Law in God's counsels was episodic. The radical egoism of the natural man could be transcended, and self-glorying excluded, not by the law, with its "law (principle) of works," but by the "law of faith" (Rom. iii. 27). In fine, the function of the Law was secondary, preparatory, temporary. The reign of the Law closed when its work in shutting up men to faith in Christ—the perfect form of faith, that of conscious sonship—was accomplished. It had a high place of honour as a dispensation for a limited end and time; but its day was over when Jesus accepted crucifixion at its hands, and so passed on as the inaugurator of a new dispensation marked by a final relation between man and God, the filial, the Spirit of which was already in the hearts of all Christian believers (Gal. iii. 23–iv. 7). Thus the Cross of Jesus was the satisfaction of the claims of Law *as a dispensation* or divinely sanctioned method, which had to be honoured even in the act of being transcended, "that God might be just (*i.e.* dispensationally consistent), while justifying the believer in Jesus" on a fresh basis (Rom. iii. 26). Such a view did but "establish the Law" (*v.* 31) within its own proper sphere, while pointing beyond it to one in which its final aim found fulfilment.

Its Universal Value.

Here lay the revolutionary element in Paul's thought in relation to Judaism, turning the latter "upside down" and marking his gospel off from the form in which Judaeo-Christians had hitherto apprehended the salvation in Jesus the Christ. It was the result of profound insight, and, historically, it saved Christianity from being a mere Jewish sect. But as it was conditioned by recoil from an overdriven use of the Law in the circles in which Saul was trained, so there was something one-sided in its emphasis on the pathological workings of the Law upon human nature in virtue of sinful egoism. Saul was the pioneer who secured mankind for ever against bondage to religious legalism. He it was who first detected that specific virus generated by Law in the "natural man," and also discovered the sovereign antidote provided in Christ. Nor is it as though Paul, even in those apologetic writings which present his antitheses to Law in the sharpest form, had the Jewish *Thorah* exclusively in view. He deals with it rather as the classic type of law in religion: it is really law *qua* law, even the unwritten law in conscience, as determining man's relations to God, that he has in mind in his psychological criticism of its tendencies in the human soul (see Sanday and Headlam, on Rom. ii. 12 seq.): "Nitimur in vetitum cupimusque negata." This is too often overlooked by his Jewish critics. Paul felt nothing but reverence for the *Thorah* in what he took to be its proper place, as secondary to faith and subordinate to Christ. In short, Paul first perceived and set forth the principle of inspiration to God-likeness by a personal ideal in place of obedience to an impersonal Law, as condition of salvation. The former includes the latter, while safeguarding the filial quality of religious obedience.

The above seems to meet part of the criticism directed by modern Jews against Paul's theory of the Law. Other criticisms (cf. C. G. Montefiore, *Jewish Quarterly Review*, vi. 428–474, xiii. 161–217) may just be noted. If Paul supports his theory by bad Scripture exegesis, that is a common Rabbinic failing. If it be said that it is monstrous to hold that God gave the Law mainly for another end than the ostensible one, viz. to lead to life by obedience, this holds so far; but one cannot exclude from the divine purpose the negative effect, viz. promotion of self-knowledge in sinful man and the breaking down of his self-confidence, conditions essential to a mature filial relation between man and God. Nor did Paul deny the positive or directly beneficent, though limited, function of the Law, so far as it was viewed in the light of the grace of God, as by prophets, psalmists, and others who "walked humbly with God," not as meriting His approval as of right by "works of law." But, objects the modern Jew, the notion of Rabbinic Judaism as generally tainted by "legalism" in any such sense, is a mere figment of Paul's. Nevertheless it is unproven and improbable that Paul unfairly represents the *prevailing tendency in the Pharisaic Judaism of his own day* as "legalistic" in the bad sense. He is really the one extant witness upon the point, as just defined, if we except certain apocalyptic writings (whose evidence modern Jews are anxious to discount), like the *Apocalypse of Baruch* and 4 *Ezra*, the latter of which suggests that already the humbling effect of the capture of Jerusalem was being felt. Finally the same liberal Jew who complains that Paul turns Judaism "upside down" by his doctrine of the Law, cites with approval his words, "There is no distinction between Jew and Greek," and adds, "Not till St Paul had written did the prophetic universalism attain its goal." Surely there is a vital connexion between these two things. "Universalism" was the true issue of the higher tendency in Hebraism, as seen in certain of Israel's prophets. But it was attained only through Jesus of Nazareth; and historically the main link between His supra-legal universalism and its actual outcome in the Christian Church was the ex-Pharisee Saul, with his anti-legal gospel.

The Christ of Paul.

Saul's conversion left Jesus the Christ as central to his new world as the Law had been to his old. All was summed up in Christ, and Him crucified. This was to him the essence of Christianity as distinct from Judaism. As, to the Jew, life was lived under the Law or in it as native element, so the Christian life was "in Christ" as element and law of being. Christ simply replaced the Law as form and medium of relations between God and man. In this Paul went far beyond the older apostles, whose simpler attitude to the Law had never suggested the problem of its dispensational relation to Messiah, though in fact they relied on Messiah alone for justification before God. The logic of this, as Paul later urged it on Peter of Antioch (Gal. ii. 15 sqq.), they did not yet perceive. To him it was clear from the first. But the contrast goes farther. The very form in which Jesus was known to Saul by direct experience, namely, as a spiritual being, in a body already glorified in virtue of a regnant "spirit of holiness"—revealed by the Resurrection as the essence of His personality (Rom. i. 4)—determined all his thought about Him. To this even Jesus' earthly life, real as it was, was subordinate. Paul was not indifferent to Jesus' words and deeds, as helping to bring home in detail the spirit of Him who by resurrection was revealed as the Son of God; but apart from insight into His redemptive work, knowledge of these things was of little religious moment. The extent of Paul's knowledge of the historical Jesus has been much debated. Few think that he had seen Jesus in the flesh; some even deny that he knew or cared for more than the bare facts to which he alludes in his epistles—the Davidic birth, the institution of the Supper, the Death and Resurrection. But beyond his express appeals to precepts of "the Lord" in 1 Cor. vii. 10, ix. 14 (cf. Rom. xii. 14), he "shows a marked insight into the character of Jesus as it is described in the Gospels" (see 2 Cor. x. 1; cf. Phil. ii. 5–8). The sources of such knowledge were no doubt oral, *e.g.* Peter (Gal. i. 18), Barnabas, Mark, as well as collections of Jesus' words, along with connected incidents in His life, used in *catechesis*. Thus Saul's attitude to Jesus was fixed by his own experience.

His Theology Rooted in Experience.

The varied theoretic expressions found in his writings as to Christ's relations to God, to mankind, and even to the universe, were to him but corollaries of this. The most persistent element in his conception of Christ's person, viz. as a heavenly being, who, though God's Son, voluntarily humbled Himself and suffered in fulfilment of God's will, and had in consequence been exalted to fresh glory, took its start from his own personal experience, although it included the speculative postulate of pre-existence in terms of some current Messianic form of thought. Paul's theory expressed the deeper sense of the all-inclusive significance of Christ, in keeping with his own experience. Hence, too, all his distinctive thoughts on religion, sometimes called

"Paulinism" (see below), were both experimental in origin and capable of statement in terms of his Christ. To him the Death and Resurrection of Christ were not isolated facts, nor yet abstractions. To this man of faith the crucial fact of Christ's Resurrection, in full spiritual humanity, had been brought within his own experience; so that here, and not in any second-hand facts touching Christ's earthly career, lay the real and verified basis of the whole Christian life. This makes his gospel so individual, and at the same time so universal —for those at least who at all share his religious experience.

His Early Apostolate.

It is unlikely that Saul began straightway to preach all his ideas or even those most prominent in his epistles, which belong only to some ten years at the end of a ministry of some thirty. In particular his special mission to the Gentiles dawned on him only gradually. No doubt as he looked back in writing Gal. i. 15 seq., he felt that the final purpose of God in "revealing His Son in him" had been that he "might preach Him among the Gentiles." But this does not prove that he saw it all at once as involved in "the heavenly vision." For one thing the contracted horizon afforded by the hope of a speedy second Advent (*Parousia*) would limit his outlook materially. Then too he was intensely Jewish in feeling; and the probability is that he would begin to declare salvation through Christ alone, apart from "works of the Law," to his compatriots. Only bitter experience convinced him (Rom. ix. 1 sqq., x. 1 sqq.) that the Jews as a people did not share his experience as to the Law, and spurned their proffered birthright in Messiah.

Saul began his preaching in the synagogues of Damascus, and made a deep impression, especially, we may suppose, after his return from Arabia (Acts ix. 22; Gal. i. 17). But finally his Jewish opponents planned to do away with him, by the connivance of the ethnarch of King Aretas (cf. 2 Cor. xi. 32 seq.). Then came his first visit to Jerusalem since his conversion, in the third year from that event, for the purpose of making the personal acquaintance of Peter (Gal. i. 18), presumably to hear first-hand about Jesus' earthly ministry and teaching, as well as to make the leading apostle directly acquainted with his own remarkable conversion and mission.[1] It was natural that Barnabas should help to break through the suspicion with which the arch-persecutor was at first regarded; also that such preaching as Saul did in Jerusalem should be directed to the Hellenists, *e.g.* his Cilician compatriots (ix. 29; cf. vi. 9). This led to his having to leave suddenly, apparently after a vision in the Temple which brought him fresh light as to the scope of his future ministry. During the ten or eleven years at least "in the regions of Syria and Cilicia" which ensued, it was still primarily to the Jews that he preached; for the news of him which reached "the churches of Judaea" from time to time (ἀκούοντες ἦσαν) was such that they "kept glorifying God" in him (Gal. i. 21–23), as they certainly would not have done had he all along addressed himself largely to Gentiles. His preaching, that is, was for the most part confined to the synagogue and its adherents of non-Jewish origin, whether circumcised or not. Of Saul's actual history, however, during these obscure years we gain only rare glimpses,[2] the first and most important being in connexion with the foundation at Antioch of a mixed Church of Jews and Gentiles. Whatever may have been the first beginnings of this new departure (a question which depends on the alternative readings[3] "Hellenists" and "Greeks" in Acts xi. 20), a situation soon arose which Barnabas, who had been sent from Jerusalem to supervise the work begun by certain Hellenist preachers, felt to call for Saul's co-operation. He sought him out in Tarsus; and "for a whole year" the two enjoyed the hospitality of the Antiochene Church and instructed numerous converts—including not a few uncircumcised Gentiles. It is not clear how far Saul continued to reside in Antioch after his first "whole year" of continuous work as colleague of Barnabas. It no doubt remained his headquarters.

His Apostolate Expands.

But we may imagine him evangelizing also in the region between Antioch and Tarsus (Gal. i. 21; cf. Acts xv. 23, 41). Whilst so engaged, whether at Antioch or elsewhere, he seems to have attained quite a fresh sense of the degree to which Gentiles were destined to form an integral part of that "Israel of God" which was being gathered through faith in Jesus as the Christ (cf. the name "Christians," Acts xi. 26). Writing about summer A.D. 56, he speaks of having had an overpowering revelation some thirteen years previously (2 Cor. xii. 2–4), that is, about 42–43, the very period now in question. He says nothing, it is true, as to its theme; but it can hardly have been unconnected with his central preoccupation, the scope of the Church, as set forth later in Eph. ii. 11, iii. 13.

Saul's relations with the Jerusalem community between his coming to Antioch and his final relinquishing of it as his headquarters about A.D. 50 (a period of some ten years), form a crucial point in his missionary life. The extreme Tübingen theory that Saul was now, and even later, in sharp conflict with the leaders in Judaea, is a thing of the past. But many problems remain, and what follows is offered only on its own merits, as seeming best to unify the relevant data in the light of all we know of Paul as a man and a missionary. Points of divergence from current views will be indicated as far as possible.

Second Visit to Jerusalem.

Such a new revelation would naturally lead to more definite efforts to win Gentiles as such, and this again to his second visit to Jerusalem, some eleven years after his former visit (or rather more than thirteen, if the interval in Gal. ii. 1 be reckoned from that visit and not from his conversion). He would come to feel the need of a clear understanding with Jerusalem touching his gospel, "lest perchance he should run in vain or have already so run" (ii. 2). Saul was not the man to wait for a foreseen evil to develop. "In accordance with a revelation" he induced Barnabas to accompany him to a private conference with the leaders in Jerusalem, to lay before them his gospel (ii. 2). The date of this was *c.* 43–45. His aim was to confer solely with leaders (contrast Acts xv. 4, 12) like James and Cephas and John, the "pillars" of the Jerusalem community. But certain persons who showed such a spirit as to make him describe them as "pseudo-brethren," managed to be present and demanded the circumcision of Titus, a Greek whom Saul had taken with him. In this demand he saw a blow at the heart of his gospel for Gentiles, and would not give way. The "pillars" themselves, too, felt that his distinctive mission was bound up with Gentile freedom from obligation to the Mosaic Law as such. They recognized Saul and Barnabas as entrusted with a specific Gentile mission, parallel with their own to Jews. Only, as pledge that the two should not diverge but remain sister branches of Messiah's Ecclesia, until He should return and remove all anomalies, they asked that the Gentile mission should prove the genuineness[4] of its piety by making it a habit to "remember the poor." Here was a proviso which Saul was as eager as they could be to get carried out; and this he was able to prove ere long in the special form of

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[1] Here Galatians (i. 18 sqq.) emphasizes its own special points of interest, in that Saul stayed only a fortnight and saw of the apostolic leaders none save Peter and James the Lord's brother; whereas Acts, in its popular account of the more public side of his visit, conveys a rather different effect, yet one not incompatible with what he himself relates.

[2] It is likely that some at least of the five scourgings in synagogues referred to in 2 Cor. xi. 24, befell him during this period. Many Jews would resent not only the preaching of a crucified Messiah, but also the filching from them of their proselytes.

[3] The present writer now believes that "Hellenists," the better supported reading (see ACTS), is yet secondary, being due to assimilation to preceding usage in vi. 1, ix. 29, and possibly also to misinterpretation of the turning to the Gentiles in xiii. 46.

[4] How essential a mark of true piety such conduct was in the eyes of Jews at this time is well known. A synonym for almsgiving was "righteousness" (cf. Matt. vi. 1 seq.); it is specially praised, in the *Pirke Aboth*, along with *Thorah* and divine worship, as the "three things on which the world rests"; while in *Baba Bathra* 10 b. we read, "As sin-offering makes atonement for Israel, so alms for the Gentiles." In the light of this, confirmed by Acts x. 2, 4, in the case of Cornelius, it seems that the reference in Gal. ii. 10 is to deeds of charity generally, as a token of genuine piety in Messianic proselytes, just as in ordinary Jewish ones; for the primitive Judaeo-Christian community was most earnest on the point: cf. Acts ii. 44 seq., iv. 32–37.

The Field Broadens.

relief to the poor in Judaea, which he and Barnabas fitly administered in person (Acts xi. 30, xii. 25). This relief visit took place about 45–46.[1] Having now reached an understanding with the leaders in Jerusalem as to his mission to the Gentiles Saul felt anxious to break fresh ground, and probably broached the subject to the local leaders. As they waited on God for guidance, the Spirit through one of the "prophets" directed that Barnabas and Saul be set apart for such an enterprise; and this was done in solemn form (xiii. 1–3). Naturally Barnabas thought of his native Cyprus; and thither they sailed, about spring A.D. 47, with Mark (*q.v.*) as their assistant. That they had at least one other companion is probable not only from the phrase "Paul and his company" (xiii. 13), but also from the traces of eyewitness in the narrative of Acts (see LUKE). Their work lay at first in synagogues. But at Paphos an unparalleled event occurred, to which due prominence is given. The Roman proconsul, Sergius Paulus, a man whose wide religious interest showed itself in having about his person a Jewish "prophet" with magical pretensions, sent for the new preachers. Barjesus, the *magus* or wizard (as his surname, Elymas, probably denotes), opposed the rivals to his patron's attention; and this brought Saul decisively to the front. His fitness for his part, as no mere Jew but in a sense Roman facing Roman, is indicated by the pointed description, "Saul, who is also Paulus." His intervention procured the confusion of the *magus* and the conversion of the proconsul. This incident—so significant of the future in many ways—marked the beginning of a new prominence of Paul in the conduct of the mission (cf. "Paul and his company"). Further, on leaving Cyprus the mission entered the region where Paul, not Barnabas, was most at home. At Perga in Pamphylia a fresh decision was reached as to the route now to be taken, and this led to Mark's withdrawing altogether (see MARK).

It does not seem that the personal factor weighed most with Mark; rather it was the nature of "the work" itself (xv. 38). Perhaps it had been tacitly assumed that the mission would not cross the Taurus range to the different world beyond, but keep to the coast-lands south of that great natural barrier, which were in close relation with Antioch and Syria generally. Accordingly, when Paul at last outlined the larger scheme, which had perhaps lain in principle in his own mind all along, Mark recoiled from its boldness. The natural thing indeed was to evangelize in Pamphylia, a country in close relations with Cilicia and Syria. Why then did Paul insist on pushing inland straight for the Taurus range and the high table-land some 3600 ft. above sea-level? Not to evangelize Pisidian Antioch, and the other cities in the south of Roman Galatia lying to the east of it; for Paul himself says that his preaching there was due to sickness (Gal. iv. 13), seemingly when on his way to other fields. These would be in the first instance certain cities in the south-east of the Roman province of "Asia," where Jews abounded and had a large Gentile following. Had the great cities of western Asia, and particularly Ephesus (cf. xvi. 6), been his primary aim, he would have taken the easier and more direct route running west-north-west through Laodicea. Sir W. M. Ramsay thinks that Paul sought the Galatian highlands on purpose to get rid of malarial fever, contracted in the lowlands of Pamphylia. But Mark would hardly have left under these conditions. It seems better to suppose that it was only on the arduous journey to Antioch, amid "perils of rivers, perils of robbers," or even after his arrival there, that the malaria (if such it was) so developed as to reduce Paul to the pitiable state, as of one smitten by the wrath of some deity, in which he preached to the Galatians in the first instance (Gal. iv. 13 seq.).

South Galatia.

It was in the late summer or autumn of A.D. 46 or 47 that Paul arrived in the Pisidian Antioch, a considerable Roman colony. Its population was typical of the Graeco-Oriental part of the empire. It included the native Anatolian, the Greek, and the Jewish elements,[2] so frequently found together in Asia Minor since the days of the Seleucid kings of the Hellenistic period, who used Jews as colonists attached to their cause. The Anatolian ground-stock had marked affinity with the Semitic peoples, though it was Hellenized in speech and education. It is in this light that we must view the enthusiasm with which Paul's gospel was received (xiii. 44 sqq.; Gal. iv. 14 seq.), and which marked an epoch in his ministry to the Gentiles. It was here and now that he uttered the memorable exclamation: "It was necessary that the word of God should first be spoken to you: seeing ye thrust it from you, and judge yourselves unworthy of eternal life, lo, we turn to the Gentiles" (xiii. 46). Yet even so he did not here and now give up all hope that the Jews of the Dispersion with their more liberal conception of Judaism, might be won over to a spiritual rather than a national fulfilment of "the promise made to the fathers" by "the voices of the prophets" (xiii. 26–28, 32 seq., 38 seq.). Primarily this "turning to the Gentiles" had for Paul only a local meaning, as he continued to begin in each city with the synagogue.[3] But the emphasis laid on the incident in Acts shows that to one looking back it had a more far-reaching meaning, since henceforth Paul's work was in fact to lie mainly among Gentiles.

Paul's experiences were much the same at Iconium, whither he and Barnabas betook themselves when expelled from Antiochene territory (probably after being scourged by the lictors, 2 Cor. xi. 25). There, too, Jews were at the bottom of the tumult raised against the missionaries ("apostles," xiv. 4, 14), which forced them to flee into the Lycaonian *regio* of the province. In this district, marked by the native pre-Greek village system, they made Lystra and Derbe successively their headquarters. In the former occurred the healing of the lame man at the word of Paul (cf. Rom. xv. 9; 2 Cor. xii. 12; Gal. iii. 5), with its sequel in the naïve worship offered to the strangers as gods manifest in human form. The story, told in a few graphic touches, sets before us Paul as the tactful missionary, meeting the needs of the simple Lycaonians with an elementary natural theology. Again his work was disturbed by Jews, this time his old foes from Antioch and Iconium, and he barely escaped death—one of those "deaths oft" to which he refers in 2 Cor. xi. 23, a passage which shows how far Acts is from exhausting the tale of Paul's hardships and dangers, either in Galatia or elsewhere (with xiv. 1 cf. 2 Tim. iii. 11). At Derbe, the frontier city of Galatia to the south-east, Paul was within easy reach of Tarsus, his old home. But the needs of his young converts drew him back to face fresh dangers in Lystra, Iconium and Antioch (where, however, new magistrates were now in office), in order to encourage "the disciples." To give them the support of responsible oversight, the apostles procured the election of "elders" in each church, probably on the model of the synagogue: for Paul had a due sense of the corporate life of each local brotherhood (Rom. xii. 4 seq.), and of the value of recognized leaders and pastors (1 Thess. v. 12 seq.; 1 Cor. xvi. 15 seq.; cf. Acts xx. 17, 28). Then, passing through Pamphylia they returned to Antioch, and reported to a church meeting "all that God had done with them, and how he had opened a door of faith unto the Gentiles."

The New Issue Raised.

So ended Paul's first missionary journey known to us in detail, the very first wherein his vocation as apostle of the Gentiles took marked effect. So far Gentile believers had been a mere minority, not essentially affecting the Jewish character and atmosphere of the Messianic Ecclesia, any more than the presence of proselytes was thought to affect Judaism even outside Palestine. But all this was menaced by the work accomplished, apparently under divine auspices, in Galatia. There uncircumcised Gentiles formed the majority of the heirs to Messianic salvation; and if expansion continued on these lines, the like would be true of the new Israel as a whole. Nay, a definite check to Jewish conversions would result from the prejudice created by a large influx of men not committed to the Law by their baptism into Christ. Now that the logic of facts was unfolding so as to jeopardize the Law

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[1] Sir W. M. Ramsay would identify the visit of Gal. ii. 1–10 with the relief visit itself (a view differing but little in effect from that given above); but most scholars identify it with Acts xv., in spite of Gal. i. 22 seq. compared with Acts xi. 30, xii. 25.

[2] For these, their history and significance in connexion with each of the cities studied, see Sir W. M. Ramsay, *The Cities of St Paul* (1907).

[3] Naturally Paul would have a regular address which he used with minor variations in beginning his mission in any local synagogue; and this Luke has in substance preserved for us here. For its authenticity, see Sir W. M. Ramsay, *op. cit.* 303 sqq.; compare A. Sabatier, *L'Apôtre Paul* (3rd ed., 1896), p. 89, for disproof of dependence on Stephen's speech.

in toto, it could not but appear to many Jewish Christians time to reconsider the situation, and boldly deny the reality of any Gentile's portion in Messianic salvation apart from circumcision (as binding to observance of the Law). So argued the stricter section, those with Pharisaic antecedents, who boldly invaded the headquarters of the liberal mission at Antioch, and began to teach the Gentile converts that circumcision and the Law were matters of life and death to them. Paul and Barnabas took up the gage; and as the judaizers no doubt claimed that they had the Judaean Church at their back, the local church felt that the issue would have to be decided in Jerusalem itself. So they sent up Paul and Barnabas "and certain others of their number" (Acts xv. 2; contrast Gal. ii. 1 seq.) to confer with "the apostles and elders" there. The fact that Paul consented to go at all, to the seeming prejudice of his direct divine commission, is best explained by his prior understanding with "the Pillars" of the Judaean Church itself (Gal. ii. 1–10). His object was twofold: to secure in the centre of Judaeo-Christianity that public vindication of Gentile freedom from "the yoke of the Law" on which he felt he could count, and at the same time to save the Church of Christ from outward schism.

On the main issue there could be no compromise. It was conceded, largely through the influence of Peter and James, that the good pleasure of the Holy Spirit (xv. 28[a]), in possessing Gentile hearts, settled the question. But as to the need of considering age-long Jewish sentiment on points where divergent practice would tend to prevent Jewish Christians from recognizing Gentile believers as brethren, as well as place a needless stumbling-block between Jews and a Messianic society in which unlimited "uncleanness" was tolerated—on this compromise was possible. The compromise was proposed by James (xv. 20 seq.) and accepted by Paul. Indeed he had less to sacrifice than the other side in the concordat. For his Gentile converts had only to limit their freedom a little, in the cause of considerate love; but their Jewish brethren had to surrender a long-standing superiority conferred by divinely instituted national law. For while the law of Moses was still observed by Jewish Christians, in the case of Gentile proselytes to Messianic Judaism it was to be waived, and a *minimum* of proselyte rules, indispensable (xv. 28) to a type of piety[1] essentially common to all "in Christ," taken as sufficient. Of the "abstinences" in question only that touching blood (in its two forms) was really a ritual matter, and it was one on which there was a good deal of scruple outside Judaism. The other two were obvious deductions from fundamental Christian ideas, as well as elements of proselyte piety. On the other hand, security against Gentile liberty undermining Jewish-Christian observance of the Law was felt to exist in the firmly rooted tradition of the synagogues of the Diaspora (xv. 21).

The above is only one reading of the case, though the simplest. Not a few scholars dispute that Paul could have been a party to such a concordat at all, and suppose that the letter embodying it is a fiction, probably composed by the author of Acts. Others hold that, if any such letter were ever sent, it was by James and the Jerusalem Church at a later date, without consulting Paul. In fact it was their solution of the deadlock to which interference with Peter's table-fellowship with Gentiles led in Antioch after the Jerusalem conference; but the author of Acts unhistorically fused it with the decision of that conference. Finally Harnack (*Die Apostelgeschichte*, 1908, pp. 188 sqq.) maintains that the reference to "things strangled" is an interpolation, not shared by early Western authorities for the text, and that "blood" meant originally homicide. Hence the rules had no reference to food apart from constructive idolatry. This theory—which does not remove the contradiction with Gal. ii. 10, on the assumption that Acts. xv.=Gal. ii. 1–10—seems at once textually improbable (feeling in the East being too anti-Jewish in the sub-apostolic age to allow of such an interpolation) and historically needless.

Paul's Conciliatory Spirit.

At no point in his career does Paul's greatness appear more strikingly than now in his relations with Judaeo-Christianity. Equally above the *doctrinaire* temper which cannot see its favourite principle practically limited by others, and a mere opportunism which snatches at any compromise as the line of least resistance, he acted as a true missionary statesman, with his eye both on the larger future and on the limiting present. As he himself obeyed the principle of loving concern for others' good by conforming to certain Jewish forms of piety (1 Cor. ix. 19 seq., 22), as being a Jew by training; so he was ready to enjoin on Gentiles, short of the point of compulsion, abstinence from blood simply as a thing abhorrent to Jewish sentiment. His was the spirit of a strong man, who can afford and loves to be generous for the greater good of all. This is the key to his conduct all along, leading him to interrupt his work on two later occasions simply to keep in touch with Jerusalem by conciliatory visits, as prejudice against him recurred owing to rumours of his free conduct on his Gentile missions.

Peter's Visit to Antioch.

On the other hand, it was the opposite side of his character, viz. inflexible courage in defence of vital principle, that was called into action soon after, owing to Peter's visit to Antioch (the abrupt reference to which in Gal. ii. 11 probably means that the judaizers were making capital of it in Galatia). There for a time Peter fell in readily with the local custom whereby Jewish and Gentile Christians ate together. But this was more than was understood even by James to be involved in alliance of the two missions. It was one thing not to force Judaism on Gentile Christians; it was another to sanction table-fellowship between Gentile and Jewish Christians, in consideration for the former as brethren. Let Peter, said James through his friends, remember Judaean feelings as well. Such a step was in advance of their convictions; and in any case it seemed wrong to break with the sentiment of the Mother Church in Judaea for the comfort of Gentile brethren on the spot, whom they had but recently regarded as by nature "unclean."

Paul's Protest.

One man, however, saw further into both the logic and the expediency of the case. Paul saw that by their very reliance on Christ rather than the Law for justification, Jewish Christians had in principle set aside the Law as the divinely appointed means of righteousness: that thereby they had virtually come down from their prerogative standing on the Law and classed themselves with "sinners of the Gentiles"; and finally that they had been led into this by Jesus the Messiah Himself. If that attitude were sinful "then was Christ the minister of sin." If righteousness depend after all on the Law, then why did Christ die? This penetrating analysis (Gal. ii. 14–21) of the implications of Christian faith was unanswerable as regards any legal observance as condition of justification. But was it not possible that the degree of sanctification to be hoped for depended, for Jews at least, upon adhering as closely as possible to the old law of holiness? This was probably the position of Peter and Barnabas and the rest, as it was certainly the theory with which the judaizers "bewitched" the Galatian converts for whose benefit Paul recounts the story (iii. 1–3). But for it too he had an answer, in his doctrine of an evangelical sanctification, homogeneous in nature and motives with the justification out of which it grows, as fruit from root (iii. 5, v. 16–26). But at Antioch he confined his protest to the vital matter of principle, the true relation of Christ and the Law, and the deadly danger of confusing their values and functions if both were to be treated as essential to Christian faith. Thus a higher expediency, for Jews in particular, told against the expediency alleged on the other side; while as for expediency in relation to the Gentiles, it was a matter not only of Antioch and the Jews and Gentiles there involved, but also of the Roman world and the relative numbers of potential converts from either class in it. This point is not made explicit in Gal. ii. 14 sqq.; but it was probably present to Paul's mind and added to the intensity of his feeling touching the gravity of the issue.

The standpoint of the *Epistle to the Galatians* is of great moment in judging of its historical retrospect. What Paul had to establish in the first instance was his independence up to the date of his evangelization of the Galatians, which God had obviously blessed (iii. 2, 5). It is therefore natural to regard all related in chapters i.–ii., including his rebuke of Peter, as prior to that cardinal fact. Next the logic of the case, as well as his explicit words in i. 22 sqq., rules out any visit to Jerusalem, including the relief visit to Judaea of Acts xi. 30, xii. 25, between his first visit and that of Gal. ii. 1 sqq. (this tells against the common view that Gal. ii. 1 sqq. = Acts xv.). Finally the reason why no explicit reference is made to the visit of Acts xv. is that it was already familiar to his readers from his own account of it on his second and recent visit to them (Acts xvi. 4–6), and was in fact the starting-point of the judaizers' case. As regards the "Galatians" addressed in this epistle, we assume with the majority of scholars, since Sir W. M. Ramsay's writings on the subject, that they were those evangelized in Acts xiii., xiv., not in xvi. 6. According to the above reading of this epistle it was written in the winter of Paul's first journey to Europe, *c.* 51–52, say in Corinth (so Rendall, Zahn, Bacon), which would explain not only the "so quickly" of i. 6., but also his inability to hasten to their side (iv. 20). This last condition seems to exclude as place of writing both Antioch on the eve of the second (McGiffert) or third (Ramsay) missionary journey, and Ephesus during Paul's long sojourn there. The one seeming alternative, viz. Antioch on the eve of the conference in Acts xv. (so V. Weber), is preferable only on the assumption that the epistle excludes all knowledge of this event (as the present writer formerly held).

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[1] For this as the spirit of these rules, whatever their exact origin, see Hort, *Judaistic Christianity*, pp. 68 sqq. They thus correspond to the "remembrance of the poor" in the earlier agreement between "the Pillars" and Paul in Gal. ii. 10.

Paul's Second Great Mission Tour.

Not long after this episode Paul proposed to Barnabas a visitation of the churches they had jointly founded. But Barnabas, perhaps feeling more than before the difference in their attitudes to the Law, made the reinstatement of John Mark as their helper a condition of co-operation. To this Paul demurred on the ground that he could not be relied upon in all emergencies; and the feeling caused by this difference as to Mark's fitness was sufficient to cause Paul and Barnabas to take separate lines. Each went to his own sphere of work, Barnabas to Cyprus and Paul towards Asia Minor, and we never again read of them as together, though Paul continued to refer to his old colleague in kindly terms (1 Cor. ix. 6 and Col. iv. 10). Paul found a colleague in Silas (Silvanus), a "leading" man in the Jerusalem church and a "prophet," but like himself a Roman citizen (Acts xvi. 37, 39); and started, with the goodwill of the Antiochene Church, probably in summer A.D. 50. His way lay through churches of his own foundation, in one of which he found a helper to replace Mark, Timothy of Lystra, who was to be as a son to him up to the very end. Confident in the conciliatory spirit of both sides in the Concordat, and anxious to show how ready he was to consider Jewish feeling where Gentile freedom was not involved, he circumcised this young semi-Jew before taking him as his associate into regions where work would still lie largely among Jews. In a similar spirit he also commended "the resolutions" of the Concordat to the observance of his churches in Galatia, though the circular letter of the conference did not make it apply to more than those of the Syro-Cilician region.

Judaizers in South Galatia.

But while the immediate result of this visit was good, the secondary issues were among the bitterest in Paul's life, owing to the unscrupulous action of judaizers who, taking advantage of his absence, soon began a vigorous, but subtle, propaganda amongst his converts in this region. They represented Paul as having changed his policy in deference to the Jerusalem authorities, to the extent of allowing that the Law had *some* claim upon Gentile believers in the Jewish Messiah. Otherwise why were the "abstinences" enjoined? Nay, more: these had been put forward as a bare *minimum* of what was expedient, to judge from the practice of those same Judaean authorities. But if so, surely it must at least be necessary to full Christian piety (Gal. iii. 3; cf. Peter's conduct at Antioch), though not perhaps to a bare place in the coming kingdom. Had not Paul himself confessed the value of circumcision (v. 11) in the case of Timothy, the son of a Gentile father? As for his earlier policy, it must have been due simply to a wish to humour his converts' prejudices (i. 10), to begin with. At any rate the gospel they now brought was the authentic Apostolic Gospel, and if Paul's did differ from it, so much the worse for his gospel, since it could in no case claim to be other than derived from theirs (i. 1–9, 11 seq.). How plausible must such a plea have seemed to inexperienced Gentile converts, "bewitching" their minds away from the central facts, Christ crucified and the free gift of the spirit through faith in Him. But how disingenuous as regards Paul's real position! Can we wonder at his indignation as he wrote in reply, and that he was goaded on to pass, in his final peroration, a counter-judgment upon their motives too sweepingly severe (vi. 12 seq.)? In any case the gross abuse by the judaizers of Paul's promulgation of the "abstinences" in Galatia fully explains his contrary practice elsewhere.

Paul enters Europe.

Paul left his Galatian converts about autumn A.D. 50, bound for the adjacent Asia. But not even yet was he to preach there, being diverted by something in which he saw the divine hand. Such as when, on his way northwards through the Phrygian region of Galatia,[1] he tried to enter Bithynia (where also were cities with a large Jewish element), he was again turned aside by "the Spirit of Jesus" (? a vision in the form of Jesus, xvi. 7, cf. xviii. 9, xxii. 17). Thus his course seemed open only westwards through Mysia (northern "Asia") to the coast, which was reached at Troas, the chief port in the north-west Aegean for intercourse between Asia and Macedonia. These were but sister provinces, united by the easy pathway of the sea. Yet in sentiment and in conditions of work it was a new departure to which Paul found himself summoned, when in a night-vision "a certain Macedonian" stood as if entreating him: "Come over into Macedonia and help us." Here was the positive guidance to which two negative divine interventions had been leading up. Paul hesitated not a moment, though the idea was bolder than that of his own frustrated plan. "Straightway," in the words of Luke, "we sought to go forth into Macedonia, concluding that God had called us for to preach the Gospel unto them" (xvi. 10). So, at this crucial point in Paul's mission to the Gentiles, Luke seems to preserve the thrill of emotion which passed from the leader to his companions, by breaking out into the first person plural (see Acts, for the psychological rather than literary reason of this "we," here and later).

Philippi.

The new mission began at Philippi, a Roman *colonia*. Here the Jewish settlement, in which as usual Paul sought first to gain a footing, was a small one, consisting in the main of women—who enjoyed much freedom in Macedonian society. But the normal extension of his work was cut short by an incident characteristic both of the age and of the way in which the fortunes of the Gospel were affected by the vested interests around it. The story of Paul's imprisonment, with the light it casts on his quiet mastery of any situation, is familiar in its vivid detail.

Thessalonica.

After being thus "shamefully treated" in Philippi (1 Thess. ii. 2), Paul passed on rapidly to Thessalonica, the real capital of the province and an admirable centre of influence (cf. 1 Thess. i. 8). In this great seaport there was at least one synagogue; and for three weeks he there discussed from the scriptures the cardinal points in his message (cf. 1 Cor. xv. 3 seq.), "that it behoved the Christ to suffer and to rise again from the dead," and that accordingly "this Jesus . . . is the Christ" (xvii. 2 seq.). Some Jews believed, "and of the Godfearing Greeks" (semi-proselytes) a large number, including not a few of the leading women. There was also successful work among those who turned directly "from idols, to serve a God living and real" (1 Thess. i. 9). This must have occupied several weeks beyond those specified above (cf. 1 Thess. i.–ii.; and the material help received more than once from Philippi, Phil. iv. 16).

But Jewish jealousy was aroused particularly by the loss of their converts; and at length in alliance with the rabble of the market place, it was able once more to cut short the preachers' work among the Gentiles. The charge made against them had a serious ring, since it involved not only danger to public order

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[1] The region to which some think the Epistle to the Galatians (see *s.v.*) was addressed—so modifying the older "North Galatian" theory of Bishop Lightfoot and others.

Confronting the Imperial Cult.

but treason against the emperor (*laesa majestas*). Thus at Thessalonica Paul had experience of the imperial system as rival to his gospel of the sovereignty of God and of His Christ, the true king of humanity. Yet it is doubtful if he was thinking of this[1] when he wrote to his converts touching "the mystery of lawlessness," working towards its final conflict with the divine principle also at work in the world. He seems in the whole passage (2 Thess. ii. 3–12) to view the empire in its positive aspect as a system of law and order rather than in its idolatry of its official head, the incarnation of worldly success and power; and he alludes to both emperor and empire (6 seq.) as the force at present restraining "the mystery of lawlessness" (ἀνομία). This phrase itself suggests something more abnormal than the world-principle latent in paganism, such as "the apostasy" of God's own people, the Jewish nation, as once before under Antiochus Epiphanes the prototype of "the man of lawlessness" seated in "the temple of God" (v. 4), of whom the late emperor Caligula might well seem a forerunner. Even so monstrous an issue of Jewish refusal of God's truth, in His Messiah, would be but the climax of so unhallowed an alliance as that which existed at Thessalonica between Jewish unbelief and paganism, seeing that the former was using the very Messianic idea itself to stir up the latter against the followers of Jesus (Acts xvii. 7; cf. 1 Thess. ii. 15 seq.). Paul and Silas withdrew by night, and began work in Beroea, a small city of Thessaly, in the hope of returning when excitement had subsided. But Jewish intriguers from Thessalonica stirred up the populace with the old charges, and Paul, as the prime actor, was forced to retire, first to the coast (whence he may have thought of a secret visit to Thessalonica, 1 Thess. ii. 18; cf. iii. 5), and then by sea to Athens.

Athens.

At Athens he was consumed with anxiety, and sent word to Silas and Timothy to join him with fresh news about his "orphans" in the faith. While waiting, however, he felt compelled by the signs of idolatry on every hand to preach his gospel. He began discussing in the synagogue with the Jews and their circle, and also in the Agora, after the manner of the place, in informal debate with casual listeners. The scope of his doctrine, the secret of right living, was such as to attract the notice of the Epicureans and Stoics. But its actual contents seemed to them a strange farrago of familiar Greek phrases and outlandish talk about a certain "Jesus" and some power associated with him styled "the Resurrection." To clear up this, the latest intellectual novelty of the Athenian quidnuncs, they carry him off to "the Areopagus," probably the council,[2] so called after its original place of meeting on Mars' Hill. This body seems still to have had in some sense charge of religion and morals in Athens; and before it this itinerant "sophist" seemed most likely to make his exact position plain. A mark of authenticity is the very fruitlessness of his attempt to adapt the gospel of Jesus to Greek "wisdom." One only of his audience, a member of the Areopagus, seems to have been seriously impressed. The real effect of the episode was upon Paul himself and his future ministry among typical Greeks.

Corinth.

Before Timothy's return Paul had moved on to Corinth, where he was to win success and to find material for such experiences, both when present and absent, as developed the whole range of his powers of heart and mind, (see Corinthians, Epistles to the). Corinth was more typical of the Graeco-Roman world than any other city, certainly of those visited by Paul. In addition to its large Jewish colony, it had Oriental elements of other kinds, especially mystic and ecstatic cults; and its worship of Venus under semi-oriental attributes added to the general sensuality of the moral atmosphere. Over all was a veneer of Greek intellect and polish; for in its way Corinth prided itself on its culture no less than did Athens. No wonder that Paul's first feeling in this microcosm was one of utter impotence. It was "in weakness, and in fear, and in much trembling," though in dauntless faith, that he began a most fruitful ministry of a year and a half. His guiding principle was to trust solely to the moral majesty of the gospel of the Cross, declared in all simplicity as to its form (1 Cor. ii. 1 sqq.), not heeding its first impression upon the Jew of intolerable humiliation, and on the Greek of utter folly (i. 18 sqq.). Most gladly then would he preach in such a way that "faith should not stand in the wisdom of men, but in the power of God" (ii. 5); "that no flesh should glory before God" (i. 29). How central this was to his gospel, especially as it defined itself over against Greek self-sufficiency of intellect, may be seen from his whole conception of the "spiritual" man in his letters to Corinth (esp. 1 Cor. ii. 1–iv. 7). Before his great work there began, Paul gained two fresh fellow-workers, whose share in parts at least of his later ministry was very great, Aquila, a Jew of Pontus, and his talented wife Priscilla. Probably they were already Christians, and as they too were tent-makers Paul shared their home and their work. That he was often in straitened circumstances is proved by his having to accept aid from Macedonia (2 Cor. xi. 9; cf. Phil. iv. 15). On the arrival of Silas and Timothy from that quarter, he began to preach with yet more intensity, especially to the Jews (xviii. 5). A breach with the synagogue soon followed. The definite turning to the Gentiles met with much success, and Paul was encouraged by a night vision to continue in Corinth for more than a year longer. An attempt of the Jews (cf. 1 Thess. ii. 15 seq; 2 Thess. iii. 1 seq.) to use Gallio, the new proconsul of Achaia, as a tool against him, not only failed but recoiled upon themselves.

First Missionary Letters.

It was during his first winter at Corinth, A.D. 51–52,[3] that he wrote his earliest extant missionary letters (see above for Galatians). Paul wrote not as a theologian but as the prince of missionaries. His gospel was always in essence the same; but the form and perspective of its presentation varied with the training, mental and moral, of his hearers or converts. It was no abstract, rigid system, presented uniformly to all. This warns us against hasty inferences from silence, in judging of Paul's own thought at the time represented by any epistle, and so limits our attempt to trace progress in his theology. But it bears also on our estimate of him as a man and an apostle, full of sympathy for others and asking from them only such faith as could be real to them at the time.

His Thessalonian converts had met with much social persecution. The bulk belonged to the working class (iv. 11, 2 Thess. iii. 10–12); and Paul must have endeared himself to them by sharing their lot and plying his own manual industry (Acts xviii. 3). However hard his double toil of teacher and tent-maker might be, no sordid suspicions, such as his Jewish foes were ready to suggest (1 Thess. ii. 9; 2 Thess. iii. 8), should gain any colour from his conduct. He would be to his converts as a father, and an embodiment of the new Christian ethics which he pressed upon his spiritual children as the essential "fruit of the Spirit," and also as a demonstration of the Gospel to "them that were without" (i. 7–12; cf. i. 6, iv. 1 seq.).

The special perspective of his first two epistles is affected by the brevity of his stay at Thessalonica and the severity of persecution there. Owing to the latter fact the Parousia, as a vindication of their cause, so near as reasonably to influence conduct (v. 11), had naturally been prominent in his teaching among them. So in these epistles he deals with it more fully than elsewhere (iv. 13 sqq.); and the moral fruits of the new life in the Spirit are here enjoined in a very direct manner (iv. 1–8).

We need not suppose that Paul himself or his assistants used a set of rules as elaborate as the "Two Ways" (of Life and Death) embodied, *e.g.* in the *Teaching of the Apostles*.[1] But to judge from these epistles (1 Thess. iv. 1 seq., 6; 2 Thess. ii. 15; iii. 6), and his reference to the "type of teaching" (bearing on "sin, unto death," and "obedience, unto righteousness") unto which the Roman Christians had been "committed" (Rom. vi. 16 seq.), Paul gave to his converts a fairly full outline of moral instruction, similar at least to that of Judaeo-Christian missionaries (note too the rather uniform lists of vices in Rom. i. 24 seq.; 1 Cor. v. 10 seq.; Gal. v. 19; Col. iii. 5; cf. E. von Dobschütz, *Christian Life in the Primitive Church*, app. 6).

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[1] As Sir W. M. Ramsay argues in his *Cities of St Paul*, pp. 425–429.

[2] This is the view favoured by archaeologists like Ernst Curtius (*Expositor*, vii. 4. 436 sqq.) and Sir W. M. Ramsay. On the whole it suits the narrative better than the view which regards the Hill of Ares simply as a good spot for one of those rhetorical "displays" in which Athenians delighted.

[3] This date (and so Ramsay's chronology from this point) is confirmed by a fresh inscription showing that Gallio was proconsul from 52–53 (spring), rather than 51–52; see *Expositor* for May 1909, pp. 467–469.

Paul as Ethical Teacher.

Pauline Antinomianism.

What was distinctive of Paul's ethical teaching was not any lack of positive precepts, but the intimate way in which he, like his Master, infused them with the spirit in which and by which they were to be realized, as aspects of the ideal of love to God and man. He was supremely concerned with the dynamic of conduct, as to which his own experience made him the most inspiring of teachers and the greatest interpreter of the mind of Christ. The master motive on which he relied for all, was the imitation of Christ in a peculiarly inward sense. To the believer Christ was no mere external example, but was already within him as the principle of his own new moral being, in virtue of the Holy Spirit indwelling as the Spirit of Christ. Here lay the secret of the new "power" so characteristic of the Gospel (Rom. i. 16), a power adequate to realize even the enhanced moral ideal revealed in Christ. The wonder of it was that this power annulled the moral past, giving the once vicious an equal freedom with the "virtuous." To this sovereign, emancipating influence of God's Holy Spirit, antagonizing "the flesh" and all its works, Paul confidently entrusted his converts for "sanctification" or progressive transformation (Gal. iii. 3, v. 16 sqq.) into "the image of Christ," the full actuality of the type already latent in Christian faith. Such teaching is implicit in the Thessalonian letters; but it is explicit in the Epistle to the Galatians. Here he announces in the clearest accents the secret of Christian conduct. "Walk by (the) Spirit, and desire of the flesh ye shall not fulfil." "If we live by the Spirit, by the Spirit let us also walk." "On the basis of freedom (from law as external to the conscience) were ye called; only turn not freedom into an opportunity for the flesh, but through love serve one another. For the whole Law stands fulfilled in this, Thou shalt love thy neighbour as thyself" (v. 13 sqq., 25). These are the watchwords of Paul's antinomianism, which had grown out of the soil of his own strict moral discipline, where the ethical ideal had become an instinct and a passion. But how would they be taken by raw Gentiles, say in Corinth, untutored to self-denial whether in the things of sense or spirit? That their egoism often perverted Paul's libertarianism into an apology for libertinism, in keeping with current habits, as well as for selfish individualism in the use of intellect or even "gifts of the Spirit," may be gathered from his letters to Corinth (see Corinthians, Epistles to the). What here concerns us, however, is the splendidly positive way in which Paul met such abuses, not by falling back upon legalism as a "safeguard" against licence, but by reapplying the laws of spirituality, both in relation to God as source of spiritual gifts, and to God's people as the appointed sphere of their exercise. He does not recede from his way of teaching; he insists that they shall understand it and abide by its real obligations. But while thinking of Paul's work in Corinth, we must note certain special religious conditions affecting both the reception of his gospel and the way in which it was afterwards conceived. Side by side with the religion of the city and of the family, both of them polytheistic and utilitarian in the main, stood the "mysteries" or esoteric cults, which were sought out and participated in by the individual for the satisfaction of essentially personal religious needs. Clearly those trained by such Mysteries would be more drawn than ordinary polytheists to his gospel, with its doctrine of mystical yet real union with the divine in Christ, and would less than others find the Cross, with its message of life through death, to be folly. This being so, we shall not be surprised to find, especially at Corinth, traces of the reaction of conceptions proper to the Mysteries upon the ideas and practices of Paul's converts (cf. 1 Cor. xv. 29), and even upon the language in which he set forth his meaning to them (see ii. 6 sqq.). Whether Paul himself was influenced by such ideas, *e.g.* in relation to the Sacraments, is a further question as to which opinions are divided.[2]

Visit to Jerusalem.

Ephesus.

Strong in Weakness.

After some eighteen months in Corinth, Paul felt the time had come to break fresh ground now at last perhaps at Ephesus, the key to the province of Asia. With this in view he took with him his fellow-workers Priscilla and Aquila, and left them at Ephesus while he himself visited Syria for ends of his own. That these ends were of high import we may be sure, else he would not have spent on them a period of months when the door seemed already opening in Asia (Acts xviii. 19–21). Acts gives no hint as to their nature, save the statement that "he went up" from Caesarea to Jerusalem, "and saluted the church," before he "went down to Antioch." But Paul's letters enable us to infer that he relied largely on this visit for counteracting rumours which represented him as an apostate from Judaism.[3] After some stay in Antioch Paul started before autumn A.D. 53 for his third great campaign, the centre of which he had already chosen in Ephesus, where Priscilla and Aquila were helping to prepare the ground. Passing through south Galatia, where he further fortified his converts (xviii. 23), he would reach Ephesus before winter closed in. Already his circle of helpers had gained a fresh member of great gifts, the Alexandrine Jew Apollos (*q.v.*), who had been brought into fuller sympathy with the Pauline gospel by Priscilla and Aquila, and who, learning from them the situation in Corinth, volunteered to try to overcome the prejudices of the Jews there (xviii. 24–28). At first Paul taught in the synagogue, until growing hostility drove him to "separate the disciples" and transfer his headquarters to "the school of Tyrannus." This was a lecture-room such as "sophists" or *rhetors* were wont to hire for their "displays." The change was not only one of place, but also of style of discourse, his appeal now being directly to the Gentiles, who would at first regard Paul as a new lecturer on morals and religion. The influence which went forth from this centre radiated throughout the whole province of Asia, partly through visitors to Ephesus on business or for worship at its great temple, and partly through Paul's lieutenants, such as Timothy and Epaphras (Col. i. 7; iv. 13). Witness to this extensive influence is afforded both by the friendly conduct of certain "Asiarchs" at the time of the riot (xix. 31), and by the fact that Paul later wrote a circular letter to this region, the so-called Epistle to the Ephesians. This result was due not only to Paul's persuasive speech but also to deeds of power,[4] connected with the superhuman gifts with which he felt himself to be endowed by the Spirit of God (Acts xix. 11; cf. Rom. xv. 18 seq.; 2 Cor. xii. 12). Nor can we feel Paul's full greatness unless we remember that he was tried by the searching test of supernormal psychical and physical powers operating through him, and that he came through all with an enhanced sense of the superiority of rational and moral gifts, and of love as the crown and touchstone of all, as well as with a deepened humility. That he suffered much before the final tumult, due to his success affecting trades dependent on the cult of the Ephesian Artemis is implied in his own words, "humanly speaking, I, fought the beasts at Ephesus" (1 Cor. xv. 32), which may mean that he was almost torn in pieces by mob fury. It was perhaps on this occasion that Aquila and his wife risked their lives for him (Rom. xvi. 3 seq.). Indeed he lived much of his time in Ephesus as one under daily sentence of death, so constant was his danger (1 Cor. xv. 30 seq.; cf. iv. 9; 2 Cor. i. 9; iv. 9–11). But this almost unbearable strain on his human frailty simply deepened his sense of dependent union with Jesus, both in His death and victorious life, and softened his strong nature into a wonderful gentleness and sympathy with suffering in others (2 Cor. i. 4 sqq.). It is no accident that it was from the midst of his Ephesian experiences that his Hymn of Love (1 Cor. xiii. esp. 6–8*a*, 13) sounded forth. His own spiritual life seems to have grown in Ephesus more than at any other period since the era of his conversion.

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[1] Yet compare "the Way" (Acts xix. 9, 23), or "the Way of the Lord" (xviii. 25) as a name for Christianity on its practical side. So Sergius Paulus was "astonished at the Teaching (*didache*) of the Lord," xiii. 12; cf. Tit. i. 8 seq.

[2] The affirmative is maintained by the so-called *Religionsgeschichtliche Schule* in particular. The more general verdict is "not proven."

[3] In this light his polling of his head before embarking at Cenchreae in token of a vow of special self-consecration (to be redeemed at the end of a month in Jerusalem itself; cf. Josephus, *Jewish War*, II. xv. 1), is significant of his feelings as to the critical nature of the visit, including danger from Jewish fanaticism during a voyage probably on the eve of a feast (say Pentecost), for which he went up on his later visit (Acts. xx. 16).

[4] We may doubt whether Paul himself countenanced the practices by which some believed that they drew magical virtue from his person (xviii. 12). But he did perform what he, in common with his age, believed to be the exorcism of evil spirits, as the story of Sceva's sons itself implies (xix. 13 sqq.).

The Corinthian Troubles.

This brings us to the most tragic episode in Paul's career, judged by his own feelings, a psychological crucifixion of which we have the vivid record in his correspondence with the Corinthian church. Reduced to its simplest terms the situation was as follows. The Corinthian church was suffering from the fermentation of ideas and ideals too heterogeneous for their powers of Christian assimilation. Paul had laid the foundation, and others had built on it with materials of varied kind and value (see CORINTHIANS). Specially dangerous was the intellectual and moral reaction of the typically Greek mind, starting from a deep-seated dualism between mind and matter, upon the facts and doctrines of the Gospel. Its issue was an exaggeration of Paul's own religious antithesis between "the flesh" and "the mind" into a metaphysical dualism, so that the conduct of the body, crudely identified with "the flesh," became a thing indifferent for the inner and higher life of the spirit illumined by the Spirit of God. There was not only divergent practice in morals and in religious usage; there was also a spirit of faction threatening to destroy the unity of church life, to which Paul attached the greatest importance. To lead them to realize their unity in Christ and in His spirit of love was the central aim of Paul's first extant letter to this church. He rises sheer above every manifestation of the sectional element in man—whether Jewish, Greek, intellectual, ritual, or ascetic—into the sphere of pure religion, the devotion of the whole personality to God and His ends, as realized once for all in Christ, the second Adam, the archetype of divine sonship. It is his enforcement of this idea, along with firm yet flexible application to the various disorders and errors at Corinth of certain other of his fundamental principles, such as the indwelling of the Holy Spirit in the individual and the community, that makes this epistle so significant for Paul's biography. Thus, while it gives a more complete picture of a Pauline church than all other sources of knowledge put together, it at the same time illustrates the rare balance of Paul's mind. But neither this letter nor the influence of Timothy (iv. 17), already on his way to Corinth with Erastus via Macedonia, on collection business (Acts xix. 22; 1 Cor. xvi. 1 seq., 10 seq.)—nor even, as some think, of Paul himself in person (2 Cor. ii. 1; xii. 14, 21; xiii. 1 seq.)—brought about an understanding on certain points involving Paul's authority. In this connexion the presence of interloping Jewish "apostles" with their claims for themselves and their insinuations as to Paul's motives (2 Cor. xii. 14–16), greatly complicated and embittered the situation on both sides.

Paul leaves for Macedonia.

When next the curtain rises, we gather that Paul had been forced to write a letter of protest in a tone of severity fitted to arouse his converts' better selves. It was in fact an ultimatum[1] that Titus carried to Corinth before Paul left Ephesus, his departure hastened by the great tumult. On leaving for Macedonia he "exhorted" the assembled disciples, and perhaps left Timothy to check the tendencies to error which he perceived at work (xx. 1, 1 Tim. i. 3). Then starting from Miletus, the chief port in the vicinity (cf. xx. 15),—where he had to leave Trophimus owing to sickness (2 Tim. iv. 20, probably a fragment from a brief note to Timothy written soon after)—he reached Troas. Here he intended to evangelize pending the return of Titus (1 Cor. ii. 12 seq.). But though "a door" of opportunity at once opened to him, growing anxiety as to the reception of his severe letter drove him forward to meet Titus half-way in Macedonia. There "fightings without" were added to "fears within" (vii. 5), until at last his meeting with Titus brought unspeakable relief. The bulk of the Corinthian church, in deep remorse for the way in which they had wounded him who after all was their "father" in Christ (1 Cor. iv. 15), had come out clearly as loyal to him, not only in word but also in discipline on the arch offender, whose contumacious conduct (now repudiated by the church) had so grieved him, but for whom Paul is now the first to bespeak loving treatment, "lest haply he be swallowed up of excessive grief" (ii. 5 sqq.; vii. 12). Accordingly in his next letter his heart overflows with gladness and affection, yet not so as to blind his clear eye to the roots of danger still remaining in the situation.

The interloping judaizing missionaries (xi. 4, seq., 13, 22; cf. x. 7) are still on the spot, glorifying themselves and glorying in their welcome on the field prepared by another's toils (x. 12–18); while in the church itself there are moral abuses yet unredressed, even unacknowledged (xii. 20 seq.), on which Paul felt bound still to press for confession and penitence (xiii. 1 sqq.), in spite of what some might brazenly insinuate, in reliance on his not having acted summarily on his former visit, when the church as a whole was not heartily with him. Hence Paul felt himself bound to act boldly (x. 1–6), if and when on his arrival he found the obedience of the majority full and complete (xii. 6). It is to prepare the way for this (xiii. 10) that Paul, while recognizing in the main the church's loyal affection, writes the second part of his letter (x.–xiii. 10) in so different a key, striving to complete the reaction against his foes, with their taunt as to his not daring openly to take an apostle's support from his converts at Corinth (xi. 12 sqq., xii. 11–18).

The Second Epistle to the Corinthians was written from Philippi or Thessalonica (ix. 2); and Timothy joins in its opening salutation. He had, it seems, been summoned to Paul's side from Ephesus by a hurried note, written after Titus's return from Corinth, in which he is informed that Erastus had remained in Corinth (? as now city-treasurer, Rom. xvi. 13), while Paul had been deprived also of the help of Trophimus, so that Timothy was unexpectedly needed at his side (this is embedded in an alien context in 2 Tim. iv. 20, 21^{a}, see below). One reason at least for Paul's need of Timothy is suggested by the reference to Erastus (cf. Acts xix. 22), viz. the business of the great collection from his churches in Galatia, Asia, Macedonia and Achaia. This had been some time in progress and was to be carried by delegates to Jerusalem on Paul's approaching visit, from which much was hoped in connexion with the unity of Jewish and Gentile Christianity. Another may have been the labour of inspecting the churches in those parts, which now reached at least as far as, if not into, Illyricum (Rom. xv. 19). In any case it was midwinter (56) before Paul became the guest of the hospitable Gaius in Corinth (Rom. xvi. 23).

The Epistle to the Romans.

Touching the resettlement of local church affairs during Paul's three months in Corinth, we know nothing. For us the great event of this visit is the writing of that epistle which shows that his mind was now bent on the extension of his mission westwards to the metropolis of the empire itself. To Rome his thoughts had been turned for many a year, but he had time and again checked the impulse to visit it (Rom. xv. 22 seq.). For the city had long been occupied by the Gospel in one form or another; and it was a point of honour with him to preach "where Christ was not named," not to build on others' foundations (xv. 20). But his eye was now fixed on Spain, if not also on south Gaul. It was, then, largely as basis for his mission to the western Mediterranean that Paul viewed Rome. Yet after all Rome was not like other places: it was the focus of the world. Hence Paul could not simply pass by it (i. 11 seq.). Very tactfully does he now offer his preliminary contributions to them—"by way of reminder," at least—emboldened thereto by the consciousness of a divine commission to the Gentiles, proved by what he had been enabled already to accomplish (xv. 15 sqq.).

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[1] On the question whether this letter has been lost (as here assumed), or on the other hand has been partially preserved in 2 Cor. x.–xiii, see CORINTHIANS.

But how could Paul write at length to a community he had never visited? Not to dwell on what he might have gathered from "Prisca and Aquila," the wonderful list of salutations by name, often with brief characterizations, proves how constant was the flow of Christian life between the capital and provincial centres like Ephesus and Corinth. But, beyond all this, there is the nature of the epistle itself as a great "tract for the times," applicable to the general situation at Rome, but typical also of the hour as reflected in Paul's consciousness. It has therefore a profound biographical significance for Paul himself, summing up all his thought so far, on the basis of his conversion as unfolded by his experiences as an apostle. It is his philosophy of religion and of history, the first worthy of the name, because the first deep-based upon the conception of the unity of humanity, as related to God, its source and the determining factor in its destiny. As such it also includes in broadest outline (viii. 18 sqq.) a philosophy of nature, as related to humanity, its crown and key. Thus it is in effect a universal philosophy in terms of the moral order, which Paul, like every Hebrew, regarded as the most real and significant element in the universe. At the centre of this grand survey stands the Jewish race, the chosen vessel for bearing God's treasure for mankind during the provisional period of human history; and at its spiritual heart, in turn, Jesus, Messiah of Israel, Saviour of mankind, in whom the distinction between the special and general spheres of revelation is transcended, while the law, "the middle wall of partition" between them, is broken down by the Cross.

Into the sweep of this high argument, as it is unfolded step by step, with an organic completeness or exposition peculiar to Romans among his writings (cf. Ephesians), there is wrought not only the problem of the Jew and Gentile (still the burning question of the time), but also the stubborn paradox of the actual rejection of Israel's Messiah by the nation as a whole. This forms a great appendix (ix.–xi.) to the more theoretic part of the epistle, and lays bare Paul's inmost heart, showing how truly a Jewish patriot he was. Even the categories in which he grapples, without formal success, with the problem of divine election and human responsibility, betray the Jew, to whom the final axioms are God's sovereignty and God's righteousness. Further into the contents of this most characteristic writing it is not ours to go (see ROMANS). Suffice it to say, he who apprehends it, as the issue of a real religious experience, already knows Paul as he knew himself and cared to be known. He who masters its thought knows the Pauline theology. Some indeed assume that Paul ceased really to progress beyond the point represented by Romans, and that certain of his later writings, if they be his at all, show a certain enfeeblement of grasp upon principle. But that is to confuse once more Paul's personal theology with the forms of instruction which experience showed him were expedient for the strengthening and development of feeble or undeveloped moral types.

Yet while the horizon of the Roman epistle was so universal in one sense, it was restricted in another. Owing to the foreshortening influence of the parousia hope, even Paul's programme of a world-mission meant simply seizing certain centres of influence, to serve as earnest of Messiah's possession of all mankind on His return to take His great power and reign. Evangelization on the farther side of the parousia was the greater part of the whole. So we gather from this very epistle, as well as from 1 Cor. xv. 23–25 (and yet more clearly from Col. i. 23). In other ways, too, the Christianity of Paul and his age was relative to the parousia, both in theory and in practice (*e.g.* in its "ascetic" or "other worldly" attitude to life). This difference of perspective, and the ancient view of the world of spirits operating upon human life, are the chief things to be allowed for in reading his epistles.

Paul's Care for Unity.

Last Visit to Jerusalem.

Thus viewing things, how eagerly Paul must have looked westwards at this time. Yet his heart turned also to Judaea, where he felt his line of march still threatened by the danger of disunion in the very Body of Christ. At all cost this must be averted. The best hope lay in a practical exhibition of Gentile sympathy with the Mother Church in Jerusalem, such as would be to it a token of the Holy Spirit as indwelling Paul's churches. The means for such a thankoffering for benefits received ultimately from Jerusalem (Rom. xv. 27) had been collected with much patient labour, and the delegates to accompany Paul with it had already assembled at Corinth (xx. 4). Paul had intended to cross the Aegean from Corinth with his party, by the direct route to Syria. But a Jewish plot, probably to take effect on the voyage, caused him to start earlier by the longer land-route, as far as Philippi, whence, after waiting to observe the Days of the Unleavened Bread,[1] he sailed to join his fellow-almoners at Troas. There is no need to follow all the stages of what follows (see Ramsay, *St Paul the Traveller*). But every personal touch is meant to tell, even Paul's walk from Troas to Assos, perhaps for solitary meditation, away from the crowded ship; and all serves to heighten the feeling that it was the path to death that Paul was already treading (xx. 23). This lies too at the heart of his impressive farewell to the Ephesian elders, a discourse which gives a vivid picture of his past ministry in Ephesus. Its burden, as Luke is at pains to emphasize by his comment upon the actual parting, is that "they should behold his face no more." The scene was repeated at Tyre; while at Caesarea, the last stage of all, the climax was reached, in Agabus's prophetic action and the ensuing dissuasion of all those about him. But Paul, though moved in his feelings, was not to be moved from his purpose. The party went forward, taking the precaution to secure Paul a trusty host on the road to Jerusalem in the person of Mnason, a Hellenist of Cyprus. He entered the holy city in good time to show his loyalty to the Jewish Feast of Pentecost.

Jerusalem.

He was well received by James and the elders of the church. So far scholars are agreed, since the "we" form of narrative which began again at Philippi (xx. 5), reaches to this point. But as to the historical value of what follows, before "we" reappears with the start for Rome from Caesarea there is large diversity of opinion. The present writer, holding that "we" is no exclusive mark of the eyewitness, sees no reason to doubt the substantial accuracy of the narrative in Acts xxi. 19–xxvi.[2] touching the Jewish outbreak against Paul and its sequel. Its significance for Paul's life is fairly clear, though we are not told what acceptance the Gentile offering of loyal love met with in the Jerusalem church as a whole. But that its general effect upon the comity of the two branches of the Messianic Ecclesia was good seems implied by the serene tone of Paul's later references to the unity of the Body (Eph. ii. 19–22; iii. 5 seq.). What does stand out clearly in Acts is all that bears on Paul's position as between the Jewish and the Roman authorities. Here we observe a gradual shifting of the charge against him, corresponding in part to the changes of venue. The more local elements recede, and those of interest to a Roman court emerge.

To the Jewish mob he is "the man that teacheth all men everywhere against the People, and the Law, and this place; and moreover he brought Greeks also into the Temple" (xxi. 28). Before Felix, Tertullus describes him as "a pestilent fellow, and a mover of tumults among all the Jews throughout the world, and a ringleader of the sect of the Nazarenes, who also tried to profane the Temple" (xxiv. 5 seq.). Similarly among "the many and grievous" offences alleged before Festus (xxv. 7 seq.) we gather that one or more were

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[1] This is a valuable datum not only for Paul's own loyalty to the usages of Jewish piety, but also for the chronology of his life, as showing in the light of what follows the day of the week on which Passover fell that year, and so tending to fix the year as 56 or 57 (see above, *Chronology*).

[2] These chapters contain passages as vivid and circumstantial as any in the "we" sections. As to the speeches, their fidelity naturally varies with the circumstances of delivery; but in all there is that which could not be Luke's free composition. The verisimilitude of the demonstration of Paul's personal loyalty to forms of Jewish piety in connexion with the four men under vows (xxi. 23–27) is complete, especially in view of Paul's own vow at Cenchreae and his regard for Jewish feasts; and even Paul's non-recognition of the high priest in what was not a regular session of the Sanhedrin (xxiii. 2–5), is quite probable. Other points hardly merit notice here; see Knowling's *Testimony of St Paul*, lect. xx.

"against Caesar," *i.e.* treason of one sort or another. Though the others weighed with a procurator like Felix (anxious to humour the Jews cheaply) sufficiently to keep Paul (in the absence of bribes) in prison for two years, it was the last class of charge that was most dangerous, especially when once the case was transferred from the provincial court to the appeal court at Rome. The last words of Agrippa, "This man could have been set at liberty had he not appealed to Caesar," are probably recorded with a touch of tragic irony.

Paul at Caesarea.

But what of Paul himself during the two years at Caesarea? Though he must have been in correspondence with his churches, at least through messengers, nothing from his pen has reached us. We can only infer from epistles written later how much this period contributed to his reflective life. The outlook was indeed stimulating to thought. Near at hand Judaea was sliding rapidly down the incline of lawlessness and fanatical resentment of Roman rule, towards a catastrophe which to Paul's eye, trained by Jewish Apocalyptic to regard certain things as signs of the days of Antichrist, would seem to betoken the prelude of the Parousia itself. Then, farther afield, the growing confederacy of Messiah's churches was stepping into the place vacated by "Israel after the flesh," as the people ready for God's Messiah.

Rome.

The journey to Rome calls for no detailed notice (see Ramsay, *St Paul the Traveller*). Its main interest for us is the impression of nobility, courage and power which Paul conveyed to the centurion Julius and his fellow-passengers generally; while the enthusiasm of the eyewitness[1] himself visibly reaches its climax as dangers thicken and Paul rises above them all. At last Italy is reached, and Paul is met by detachments of "brethren" from Rome, who came as far as thirty and forty miles to welcome him; "whom when Paul saw, he thanked God and took courage." From Paul's letters, however, we gather that if he looked for sympathy from the Roman Christians, he looked largely in vain. Whilst some welcomed and most regarded him as indeed a champion of the Gospel whose fearless testimony even in bonds emboldened many, including the judaizing section who wished him no good, to preach Jesus more openly than before; few, if any, really showed him brotherly love or cared for the interests of Christ outside Rome that were still on his heart (Phil. i. 12–17, ii. 21). Such absorption in their own local affairs struck Paul as strangely un-Christian in spirit, and added disappointment to his irksome confinement, chained as he was by one wrist to a praetorian soldier night and day. Yet he rose above it all. Only let "Christ be magnified" in his body, whether by life or death. Then should he not be ashamed, come what might.

The Epistle to Philippians.

The letter which makes us aware how things lay is Philippians, the most devotional of all his writings and the most Christlike. It is the perfect expression of personal "Paulinism" in his maturer and more positive manner. It flows from his heart as joyful thanks for tokens of continued mindfulness of him recently received from his old Philippian friends through Epaphroditus, one of their number. Touched and filled with spiritual joy the more that, save for his own personal circle, love was so scant around him, he turns to comfort his friends in their sorrow for him, out of the stores of Divine consolation received through his own fresh sense of need (cf. 2 Cor. i. 3 sqq.). "Rejoice in the Lord" is its recurring note. Here we get the word of the hour, both for Paul and for his converts. The date of Philippians is an open question, English scholars tending to place it early, while most foreign scholars put it late in the "two years" of Acts. The present writer would place it last of those written during the first year, *i.e.* last of all save 2 Timothy.

Letters to Asian Churches.

Of the remaining imprisonment epistles, the beautiful little note to Philemon touching his slave Onesimus casts fresh light on Paul "the Christian gentleman," by its humour and perfect considerateness of tone. The two larger ones do not seem at first sight to reflect his personality so much as his life as the father of churches, and the way in which he extended the lines of his gospel so as to bear on problems raised by ever fresh reactions upon it of the old traditions amid which his Asian converts still lived. Both aspects really blend; for the epistles are addressed to churches which were feeling certain effects of the seeming calamity that had overtaken him whom they in some sense regarded as their founder, and aim at raising them to the writer's own higher standpoint (Eph. iii. 13, vi. 19–22; Col. ii. 1 seq., iv. 8 seq.). It was just here that many of his Asian converts hesitated. They did not realize the all-sufficiency of Christ in the moral sphere; and they viewed their relations with the invisible world of ultimate or heavenly realities in keeping with this fact. They traced the hand of beings belonging to the supernal spheres in their earthly experiences of weal and woe. Hence they dreamed of supplementing what they derived from Christ by help from other spiritual beings. To judge from Colossians (see *s.v.*) it was largely along the lines of Jewish thought (cf. the *Testaments of the Twelve Patriarchs*), modified by Greek and other Pagan ideas, that this tendency operated. For at Colossae at least it issued in observance of ritual rules connected with the protection of good angels against evil ones, as taught by a sort of theosophy, probably basing itself on a legendary handling of pre-Mosaic Bible history in particular (cf. the Pastorals). Paul does not discuss how far "guardian angels" have any function left them in view of the all-sufficiency of Christ and His Spirit for believers. He obviously (Eph. vi. 11 sqq.) believed in the reality of angelic foes, because this hypothesis explained for him certain moral phenomena; but he had really stripped angelic helpers of all functions necessary to the Christian. Perhaps he was not sufficiently interested in the matter to think it out fully.

How does Paul deal with this situation of depressed faith and hope as to the power of Christ to confer all needful to the perfecting of the Christian's life on earth, in spite of the hostile forces, visible and invisible? All they need, he says, is to hold fast the Gospel which has already done so much for them—annulling the special privileges of the Jew, and quickening them as Gentiles "dead in sins" and under the full sway of the powers of ill, into a life of filial access to God as Father. Of Christ's ability to achieve God's purpose in all things, the wonderful progress of His Church "in all the world" is already witness (Col. i. 8, 23). Looking then to these things, visible to Christian *gnosis* based on spiritual experience, there is no cause for depression at the sufferings endured for Christ's sake by Christians, and least of all at his own. Both in Colossians and "Ephesians" (really a circular epistle to churches in Asia, including those of the Lycus valley and perhaps most of the Seven Churches of the Apocalypse (see EPHESIANS), he lays stress on "love, which is the bond of perfectness," and on "unity of the Spirit," as the atmosphere of life worthy the vocation he describes in inspiring terms.

The Ethical Emphasis in Paul's later Epistles.

In this respect, as in nearly every other, these epistles exhibit marked affinity with the next group claiming to come from Paul's pen, the so-called Pastoral Epistles, the supposed "moralism" of which is often urged against their authenticity. In both cases the development is quite natural in Paul the missionary, as it answers to growing defects among his churches in the sphere of conduct. Such errors, while twofold in effect, alike sprang from a defective sense for ethics as the essential form of piety (1 Tim. vi. 3–11; 2 Tim. iii. 5; cf. Jas. i. 27) flowing from Christian faith. A merely intellectual faith, instead of the genuinely Pauline type, involving enthusiastic moral devotion to Christ, tended in practice either to a negative and ritual piety, as at Colossae, or to moral laxity. The latter was sometimes defended on a dualistic theory of "flesh" and "spirit," as two realms radically opposed and morally independent.[2]

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[1] That he regarded Paul as endowed with superhuman powers, both of premonition and of healing (as in Malta), is evident, even if in his mind, like that of most ancients, "the line between the miraculous and the providential quite vanishes away"—as B. W. Bacon says (*Story of St Paul*, p. 214) relative to xxviii. 3–5, comparing also the case of Eutychus' "insensibility." But if so, why not apply this to the earthquake at Philippi also?

[2] Of this we have a hint in the "empty words" alluded to in Eph. v. 6 (perhaps also iv. 14), probably of the same sort as in

Paul meets both errors by his doctrine of the "new man," the new moral personality, God's workmanship, "created in Christ Jesus for good works" (Eph. ii. 10), whose nature it is to be fruitful unto holiness and love (cf. Gal. v. 6, vi. 15).

The Pastoral Epistles.

In the so-called Pastoral Epistles the same subject is handled similarly, yet more summarily, as befits one writing instructions to friends familiar with the spirit behind the concrete precepts. Allowing for this, and for the special circumstances presupposed, there is no more "moralism" about the "wholesome instruction" in the Christian walk given in these epistles (1 Tim. i. 10; cf. vi. 3; 2 Tim. iv. 3) than in the other group. "Moralism" is ethical precept divorced from the Christian motive of grateful love, or connected with the notion of salvation as "of works" rather than prevenient grace. But of this there is no real trace in the Pastorals, which are a type of letter by themselves, as regards their recipients and certain of the aspects of church life with which they deal. As dealing with methods of instruction and organization, which must have occupied increasingly the attention of those responsible for the daily course of church life, they contain nothing inappropriate to the last two years of Paul's life, when he was considering how his churches might best be safeguarded from errors in thought and practice in his absence or after his decease.

The main difficulties as to their substance have been imported by anachronistic reading of them, and are falling to the ground with the progress of exegesis and knowledge of the conditions of early church life. Our real difficulties in conceiving the Pastorals as what they purport to be, relate to their form, and "lie in the field of language and of ideas as embodied in language" (Hort, *Jud. Christ.* p. 131). But these, even as regards style and syntax, are reduced to narrow limits, when once due weight is given to the fresh analogies furnished by the now admitted Imprisonment Epistles (see also Ramsay, *Expositor*, 1909). This is specially the case with the use of new words of religious import, like "Saviour" or "Deliverer" (*Soter*, of God and Christ: see Eph. v. 23; Phil. iii. 20)—the idea of which springs naturally from Paul's own outward state, as well as from the trials of his readers; the "washing" or "laver" of baptism (Eph. v. 26; Tit. iii. 5); the Gospel as a revealed "mystery" (Eph. *passim*, esp. "the mystery" as "great," Eph. v. 32; 1 Tim. iii. 16); and the future "appearing" of Christ (so already in 2 Thess. ii. 8; cf. Col. iii. 4). As to the use of the last term for the incarnation in 2 Tim. i. 10, it has a parallel in the "was manifested" of 1 Tim. iii. 16, itself a fragment of a Christian hymn of praise to Christ, such as is implied in Eph. v. 19, and especially Col. iii. 16. Not only is the fragment in question one in type with that in Eph. v. 14, but may even be part of the same hymn. Nothing could be more natural than for Paul to weave into his epistle to Timothy the religious phraseology actually current among Pauline Christians in Asia, as we see him doing in his repeated citations of the hortatory parts of their hymnology, with the formula "Faithful is the (familiar) saying" (i. 15, iii. 1, 16, iv. 10; cf. 2 Tim. ii. 11 seq.). All this borrowed language, and much more that is virtually the parlance of the Asian churches, helps to explain a comparative lack of the *distinctively* Pauline element even in letters which contain highly characteristic passages. Hence there seem no insuperable difficulties to the authenticity of all three epistles—which most scholars recognize as at least partly from Paul's pen, though they disagree as to the exact limits of the genuine fragments—if only a natural historic setting can be found for them in Paul's life. But there is a general assumption that this cannot be found within the limits allowed by Acts. Accordingly some reject the situations implied in them as on the whole unhistorical, while others postulate a period in Paul's life of which Acts gives no hint, if it does not exclude it. This theory of a release after the "two whole years" with which Acts closes, and of a second imprisonment before the end really came, bases itself partly on the personal notices in the Pastorals themselves (for a suggested itinerary see *e.g.* Lightfoot, *Biblical Essays*), often full of verisimilitude, and partly on tradition. As regards the latter, the only evidence of real weight is the reference in a highly rhetorical passage of the Epistle of Clement (*c.* A.D. 96) to Paul as having come in his universal ministry, in East and West alike, "to the bound of the West." But, granting that Spain be meant, there is no sign that Clement thought of this visit as following on an imprisonment[1] in Rome, rather than as falling somewhere in his career, simply on the warrant of Rom. xv. 28: while nowhere do the Pastorals themselves point to any journey west of Rome. Further no early tradition is clear enough to override the almost certain implication of Acts (xx. 25 and 38, read in the light of the closing chapters, and especially of xxvi. 32, which suggests that the appeal to Caesar was a fatal step) that Paul never visited Asia after his farewell at Miletus. Accordingly room for the epistles must be found, if at all, before the spring of 62 in keeping with Acts.[2] The following is an attempt to show how this may be done.

Epistle to Titus.

The pastoral epistles reveal certain special aspects of Paul's life and work in Rome during the "two years" of Acts xxviii. *fin.* Addressed to intimate associates, they show him in the act of caring for his churches by deputy. In the case of Titus, indeed, the churches in question were apparently not of Paul's own foundation, but those in whose welfare he had become interested while sheltering on his voyage to Rome at Fair Havens in Crete (Acts xxvii. 8 seq.). This spot was nigh to a city named Lasea; and as they were detained "a considerable time," for men eager to be gone, we may well imagine Paul coming into touch with the local Christians and leaving Titus (whose presence is never alluded to in Acts, even when proved by Paul's letters) to set in order the defective conditions prevailing among them (Tit. i. 5). Now, about early summer 60, we seem to see him writing further instructions, on the basis of reports received from Titus. There is no talk of a journey to Spain, and to judge from Paul's plan to winter at Nicopolis (iii. 12) he expects his case to come on too late in autumn to admit of the visit to Asia which he had in mind only shortly before, as it seems, when referring more indefinitely to his hopes in 1 Tim. iii. 14, iv. 13. Possibly his further reference in iii. 13 to Apollos and Zenas "the lawyer" (bearers of the letter), as on a journey of urgency, may mean that a date for his trial was fixed in the interval, and that he was sending to the East to collect counter-evidence to that of the Jews of Asia (Acts xxi. 27; cf. the later plaint in 2 Tim. i. 15, that "all in Asia" had "turned their backs on him").

Paul's appeal case was not a safe topic for correspondence (cf. Col. iv. 7 seq.), and we gather little directly on the point from his epistles. The long delay in its hearing would be due in part to the accusers' desire to collect evidence sufficient to ensure success even before a tribunal thought to be less amenable to Jewish influence than a procurator's; and, once the first summer was past, the wintry sea (*mare clausum*) would postpone things for another six months. The delay seems to have been unexpected by Paul, and to have led him to mistaken forecasts during his first half year in Rome, in 1 Tim., Titus and Philemon. Somewhat later he expressed himself more guardedly (Phil. ii. 23 seq.; cf. i. 25). As to the charges on which all came to turn, we are left to intrinsic probabilities. They were no doubt those serious from the Roman rather than Jewish standpoint, viz. endangering public law and order by exciting the Jews throughout the world on religious matters, and fostering treason against the imperial cult generally (cf. the charge at Thessalonica). In defence Paul would urge the privileged position of a Jewish monotheist, and the Jews would be at pains to differentiate Christianity from Judaism, and so deprive it of the status of a legally recognized religion (*religio licita*). If they succeeded here, Paul's condemnation was only a matter of time. This is the most probable issue of the case (*pace* Sir W. M. Ramsay and others), both a priori and in the light of later phenomena, *e.g.* 1 Pet. (which in 62–63 seems to imply a recent impulse to persecution for the Name).

1 Timothy.

The rather earlier but vaguer situation implied in 1 Tim. is as follows. At the moment of Paul's appeal from Caesarea to Rome Timothy was perhaps on duty in Ephesus. There he would receive a message from Paul, possibly through Aristarchus (Acts xxvii. 2, 5 seq.), in terms of good hope as to his appeal. Timothy would in turn send word as to the situation in Ephesus, and at the same time express his desire to hasten to Paul's side. This would lead Paul, in

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1 Cor. vi. 12–14, just as the denial by Hymenaeus and Philetus in 2 Tim. ii. 17 seq. of any resurrection, save that of the spirit in conversion (cf. Eph. v. 14), finds its earlier parallel in 1 Cor. xv. 12, 32–34.

[1] Add the fact that Clement (ch. vi.) conceives Paul as being *joined* in the place of reward by the Neronian martyrs, and therefore as martyred not later than summer 64. No theory of the Pastorals, therefore, based on Clement's witness, can place Paul's death after this date.

[2] Also with 1 Pet., if Dr H. B. Swete (*Comm. on St Mark*, 1898, p. xvii.) is right in saying that it implies Paul's death; for 1 Pet. probably dates from 62–63 (see Dr Hort's *Comm.*).

sending him a letter of encouragement and specific instructions, to open with a sentence (characteristically wanting a grammatical conclusion) in which he recalls a parallel case, where he had exhorted Timothy to "stay on" in Ephesus[1] (*i.e.* in A.D. 56). Nor was the need less urgent now, owing to Judaic "fables" touching the primitive period of biblical history ("genealogies"), meant to bear on certain parts of the Law (i. 4-7) as of universal religious validity. At Ephesus (as also in Crete) much the same type of Judaism as was re-emerging at Colossae was reacting on local Christianity; while here and there were traces of dualistic antinomian theory (see i. 19 seq.; cf. 2 Tim. ii. 17 seq.). The general need of the hour was wholesome Christian ethics applied all round, supported by firmer organization in church life, especially with a view to check irresponsible teaching (1 Tim. v. 17, vi. 3; Tit. i. 9–11; 2 Tim. ii. 2, iv. 3). To the special local problems Paul addresses himself in this letter, but above all to the bracing of Timothy's somewhat sensitive nature to face the opposition which he must encounter as a Christian leader at such a time (note the similes of the soldier and athlete, both of whom face hardship readily, as part of their profession, i. 18, v. 8 sqq., vi. 12 seq., 20; 2 Tim. ii. 3 sqq., iv. 5). In this connexion occur also certain autobiographic passages, as well as solemn affirmations of his own divine commission (*e.g.* i. 1, 11 sqq., ii. 7), the aim of which is to reassure his disciple that his gospel will bear all the strain that is being put upon it, or can be in the future (cf. Eph. vi. 19 seq. for all this). Here Paul is answering challenges which he knows are being made in Timothy's hearing on every side, especially now that the apostle seemed less likely to return to Asia. He himself does not flinch, because he knows he had not run save "at the command of God" (i. 1), after being wondrously changed from his former self (i. 12 sqq.). Thus as to the authority of the Gospel "committed to his charge," however much it may be called in question (i. 10 seq., ii. 7), he has no shadow of doubt.

2 Timothy.

When the curtain rises for the last time, it is on the morrow of the long-expected hearing of Paul's appeal. The case stands adjourned, but he is no longer under any illusion as to its final issue. His one comfort is that by the Lord's support he had been delivered from the greatest danger, "the mouth of the lion" ready to "swallow up" (cf. 1 Pet. v. 8) his soul through craven fear, as he stood solitary before Caesar. From that the Lord had rescued him, and would yet rescue him from every "work of ill" (2 Tim. iv. 16–18). Yet his earthly work is done (iv. 6 seq.). So he writes to Timothy, his "beloved child," whom now he longs to see once more. But lest this should not be granted him, he prefixes to the summons a last will and testament, which may help Timothy to rise above the dismay which his death at the hands of Roman law is bound to cause. Let Timothy take up the Gospel torch as it falls from his own dying hand, and "do the work of an Evangelist," heeding not the hardship. Then after providing for the Gospel, he turns to more personal interests. "Hasten to me with all speed," he says in effect, "for I am all alone, save for Luke. My other trusty friends are away on various missions, and Demas has deserted the sinking ship. Tychicus I had already sent to Ephesus; he will replace you. Pick up Mark and bring him with you—he is so helpful. Bring my cloak, papers and books [copies of the Scriptures], lying in Carpus's hands at Troas"[2]—perhaps since Acts xx. 6 sqq. "Alexander the bronze-worker [an old Jewish foe at Ephesus, Acts xix. 33] did me many a bad turn in my case (*his* case is in the Lord's hands); be on thy guard against him." Then follow allusions to Paul's "first defence," unsupported by such as might have appeared on his behalf (especially from Asia; cf. i. 15); and next salutations to Prisca and Aquila, and to the house of Onesiphorus—an Ephesian who had sought Paul out in Rome (i. 16–18).

So the curtain falls for the last time. But Paul's fate is hardly obscure. He himself saw that the charge against him, unrebutted by independent evidence, must bring him to the executioner's sword, the last penalty for a Roman citizen. With this late 2nd-century tradition agrees (Tertullian, *De praescr. haer.* 36), naming the very spot on the Ostian Way, marked by a martyr-memorial (*tropaion*, Caius *ap.* Euseb. ii. 25), probably at the modern Tre Fontane, some three miles from Rome. But the traditional date (June 29) reaches us only on far later authority. Acts simply suggests the first half of A.D. 62; and we may imagine Timothy reaching Rome in time to share Paul's last days (cf. Heb. xiii. 23).

Early Tradition has little to say about Paul. Possibly the earliest reference outside the New Testament is a Christian addition to the *Testament of Benjamin*, xi., which describes a Benjamite as "enlightening with new knowledge the Gentiles." The notice in Clement's epistle (ch. v.) to Paul's having borne bonds "seven times" may be mere rhetoric (perhaps based on 2 Cor. xi. 23). Ignatius refers with reference (cf. Rom. iv. 3) to Paul as his example in martyrdom (*Ad Eph.* xii. 2); similarly Polycarp (*Ad Phil.* iii. 2) deprecates the notion that he, or any other like him, could rival "the wisdom of the blessed and glorious Paul," and refers to his letter(s) to the Philippians. The *Acts of Paul*, composed not long after A.D. 150 by an Asian presbyter, in order to glorify Paul by supplementing Luke's story, is striking evidence of the regard felt for him in certain circles; but it contains (so far as extant in the Coptic, which also enables us to identify other documents as once parts of these Acts) no fresh data, unless the episode dealing with Paul and Thekla echoes an original tradition belonging to Iconium and Pisidian Antioch. Its description of Paul as "a man small in size, bald, bow-legged, sturdy, with eyebrows meeting and a slightly prominent nose, full of grace" in expression, may or may not be based on local memories (see 2 Cor. x. 10; cf. *Dict. Christ. Antiq.* ii., 1621, for early representations of him). The hostile conception of him lying behind the Simon of our Clementine literature (*q.v.*) has no historic value; and the same may be said of all traditions not to be traced earlier than the 3rd century (cf. R. A. Lipsius, *Die apokr. Apostelgesch. u.s.w.*, and C. Clemen, *Paulus*, i. 331 sqq.).

Paul's personality is one of the most striking in history. No character of the distant past is known to us more fully, both from within and from without, thanks largely to the self-revealing quality of his letters. His was a deep, complex, many-sided nature, varying widely in mood, yet all so concentrated by moral unity of purpose that the variety of gift and sensibility is apt to escape notice. During his career every faculty comes into play, and we realize how largely human he was. "Even though Paul was an apostle," says Chrysostom, "still he was a man." A true picture of him must preserve the vital unity in which these two aspects appear in our sources. To judge him save through that vocation which he himself felt to determine all his being, is to fall into unreality. To view him as a mere individual is vain. He cannot be judged entirely by common standards, whether religious or ethical; for owing to his vocation his personality had an universal import which must needs put him out of ordinary human perspective at certain points. Further, we must allow for his limited temporal horizon, shut in for practical purposes by a near Parousia, conceived as bringing ordinary history to an abrupt close, and the hope of which foreshortened all issues. Bearing this in mind, we shall wonder, not so much at any otherworldly spirit or peremptoriness of tone, which were positive duties under such conditions, but rather at the sanity of temper and moral judgment which mark the apostle amid his consuming zeal "by all means to save some" from "the wrath" soon to be revealed against sin and unrighteousness (1 Thess. i. 10; Rom. i. 18). We must remember too that he lived in an atmosphere of intense "enthusiasm," in the most literal sense, among those who felt that "the powers of the coming age" (Heb. vi. 4 seq.) were already at work in "the saints," men possessed by the divine afflatus and made as it were but organs of the Spirit of God. Viewed in such an environment, Paul is seen to have been a great steadying influence, insisting on character as the normal fruit of the Spirit and the real ground of human worth (1 Cor. xiii. 1–3); insisting also that possession by the Spirit did not supersede responsibility for self-control (xiv. 32 seq.), and that the element of conscious reason was superior to blind ecstasy (xiv. 1 sqq.). He spoke from full personal experience; for he exercised every gift on the list in 1 Cor. xii. 8. Yet with clear and ever-growing emphasis he defined spirituality in moral terms, those of the will informed by love like that of Christ. How great this service was, none can say. It was his balanced attitude to the operations of the Spirit—outwardly the most distinctive thing in Christianity, as compared with Judaism—an attitude at once reverent and reasonable, that saved the Church from fanaticism on the one hand or moralism on the other. It was his own experience as a passionate seeker after righteousness which gave him the key to that reinterpretation of Jesus the Christ as at once moral ideal, master motive and immanent principle of life at work in the soul by the Spirit which was peculiarly his own and may be styled his ethical mysticism. This was his main contribution to Christianity; and as depending on his personal experience, it was bound up closely with his personality—a fact which makes his direct influence, while intense, yet rather limited in its area of appeal.

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[1] It is quite likely that Timothy left Ephesus for Rome before receiving 1 Tim., since he was with Paul when Colossians and Philippians were written, the former at least in the summer of 60 (see Philem. 22).

[2] It seems best to take iv. 13–15 as all part of this letter, rather than as part of the note from which iv. 20, 21^{a} probably comes (see above). The homely details follow naturally enough on the reference to Mark; while the reference to Alexander is so far borne out by Heb. xiii. 23, which suggests that Timothy was accused on his arrival in Rome.

At the root of Paul's nature lay the Hebrew capacity for personal devotion to the Divine as moral perfection, to an unbounded degree. It found its object in a concrete form, stirring both imagination and affections, in Jesus the Christ, "the image of the invisible God" whose spiritual glory man was created to reflect. This instinct for ideal devotion seems never to have been diverted, even for a season, into a single human channel, in the love of woman. From his early youth his soul was preoccupied by a passion for God and His will in His people. This he came to regard as a special divine gift or vocation (1 Cor. vii. 7), imposing on its possessor, in the face of the world's needs (cf. 29–31), a higher duty than could be fulfilled within the conditions of the closest of human relations (32–35). But the tenderness and chivalrous self-sacrifice which found no vent in the ordinary channel came to pour itself forth in an absorbing love for his churches, which were to him as his own spouse, though his aim was rather to "present them as a pure virgin to Christ" (2 Cor. xi. 2). This educated his human affections, and softened the outlines of a nature inflexibly loyal to principle and absorbed with the divine aspect of life. Thus it was through "the love of Christ" constraining him to look at all, as it were, through Christ's eyes, that Paul came to love men even to the point of a self-forgetfulness that seemed to some hardly sane (2 Cor. v. 13–16^a; cf. Mark iii. 21, "He is beside himself"). So too his proud, strong-willed spirit gradually put on "the meekness and conciliatoriness of Christ" to such a degree that during the Corinthian troubles his critics contrasted the vigour of his letters with the seeming feebleness of his outward bearing (2 Cor. x. 1, 10).

There is no good evidence that his presence was physically weak or unimpressive, even if his stature was small, as tradition has it (see above; cf. Acts xiv. 12). Nor is there any sign that he bore habitual traces of those periodic attacks of some nervous affection—allied to epilepsy,[1] but apparently not involving loss of consciousness—to which, as dating from a certain overpowering trance about 42–43, he refers in 2 Cor. xii. 7 sqq. These were most humiliating while they lasted (cf. Gal. iv. 14). But they seem not to have drained his vigour even for great and constant labours of body and mind. His energy indeed was portentous, as he himself felt, when he traced it to the divine power "energizing mightily" in him (1 Cor. xv. 10, Col. i. 29), and that most effectively when he felt weakest in himself (2 Cor. xii. 9 seq.).

Not only had Paul a supernormal spiritual force, marked by a rare combination of religious inspiration and reasoning power, which made him impressive both as speaker and writer, he had also a genius for adaptation to varied mental conditions, due partly to his Hellenistic training, but also to the fact that his message was one not of the letter but of spirit and power (cf. 2 Cor. iii. 4 sqq.). This showed itself as tact in relation to individuals and special audiences, and as statesmanlike breadth of view in handling large problems of principle, such as were constantly emerging in relation to the Jewish and Gentile types of Christianity, and again as to the Christian attitude to the pagan state (Rom. xiii. 1 sqq.). He combined grasp with vital flexibility in a degree which made him the prince of missionaries. He was the prophet in the originality of his message; he was the theologian in the reflective interpretation which he gave to it, in terms derived mainly from a profound knowledge of Jewish thought, liberalized by contact with another world, the Graeco-Roman; but above all he was the missionary in the attitude in which he stood to his gospel and to men as its subjects. There was in him nothing *doctrinaire*: to that, along with the legal attitude, he had been crucified with Christ, for both belonged to "the rudiments of the world" of sense (1 Cor. xiii. 8 sqq.; 2 Cor. x. 4 seq.; Col. ii. 20 seq.; Phil. iv. 7). Accordingly he was great as an organizer of a new order among his Gentile churches, where much was left to local instinct informed by the one Spirit, while yet he jealously cared for such unity in usages as seemed needful to the embodiment of the one life of the Spirit in all, Jew and Gentile alike (1 Cor. iv. 17, xv. 33, 36). In particular he showed his Christian largeness in his exertions to keep in communion the two sections of Christ's people, to the point of risking his life for this end.

In his more personal relations he had the power of feeling and inspiring friendship of the noblest order, a comradeship "in Christ" which fills his letters with delightful touches of loyal affection and trust, even of playfulness on occasion (Philem.). He was a man of heart, with rapid alternations of mood, with nothing of the Stoic in his self-mastery, which was an acquired grace, rooted in the "peace of God" (Phil. iv. 7, 10–13). Indeed it was in his impetuous, choleric temperament that there lurked "the last infirmity" of his soul, which at times betrayed him into vehemence of expression (Acts xxii. 4 seq.) and a sweeping harshness of judgment (cf. 2 Cor. vii. 8 seq.), especially where he had detected disingenuous conduct in those who were interfering with his work for Christ or imputing base motives to himself, like the judaizers in Galatia and Corinth (cf. Phil. iii. 2). As to the charge of egoism, based on the emphasis he lays on his own person as medium of Christ's mind and will, it can hold only so far as Paul can be shown to do this gratuitously, and not really in the interests of his vocation. By this latter standard alone can an apostle be judged. Paul is careful, moreover, to distinguish his ordinary and his vocational self (2 Cor. xii. 5), as well as what he says as quoting Christ, as speaking *qua* apostle (1 Cor. vii. 10, 12), and again as simply one found "faithful" (ib. 25). Such is not the way of egoists or fanatics.

In his *Epistles* Paul found a fitting vehicle for his personality, whereby to speak not only to his own age but also to kindred souls all down the ages, so coming to spiritual life again and again, when buried under convention and tradition. For the letter is the most spontaneous form of writing, nearest in nature to conversation, and leaving personality most free. No doubt Paul's letters followed current forms (cf. G. A. Deissmann, *Bible Studies*, 1901, ch. i.). But he transfigured what he used by the new fullness of meaning infused into address, salutation, final messages and benediction. His letters are indeed "the life-blood of a noble spirit," poured forth to nourish its spiritual offspring (cf. 1 Thess. ii. 7 seq.). They are data for his *Life* and form incidentally an immovable critical basis for historical Christianity, on which the hypercriticism of Van Manen and others (see *Ency. biblica, s.v.* "Paul") can make no real impression. On the other hand, as the sources of our knowledge of "Paulinism," they impose by their very form certain limits to our effort to reduce his thought to system. Canon R. J. Knowling's *Witness of the Epistles* (1892) and *The Testimony of St Paul to Christ* (1905) contain full summaries of all bearing on Paul's epistles. The history of the collection of Paul's letters into a *corpus* styled "The Apostle," for reading in Christian worship, is very significant, so far as we can trace it. The reference in 2 Pet. iii. 15 seq. would be of high value, were the date of 2 Pet. itself not so doubtful. The first definite notice we possess of a *canon* of Pauline epistles is that of the ultra-Pauline Marcion, who used ten Pauline epistles (*c.* 140). Certain apocryphal Pauline epistles appeared in early times, beginning with one *To the Alexandrines*, forged in the interests of Marcionism (Canon Murat), and an exchange of letters between the Corinthians and Paul, originally part of the *Acta Pauli* (ed. C. Schmidt, pp. 145–160). For the forged correspondence between Paul and Seneca, see Lightfoot, *Philippians*, pp. 329–333.

II. *Paulinism.*—Of recent years the ambiguity lurking in this term, as used to describe Paul's teaching as a whole, has been fully realized, and efforts have been made to distinguish what is distinctive and essential from what is traditional in form and relative in importance. For Paul, if "the first Christian theologian," was no systematic theologian. His mind was fundamentally semitic. It seized on one truth at a time, penetrating to the underlying principle with extraordinary power and viewing it successively from various sides. But, unlike a Greek thinker, he did not labour to reduce the sum of his principles to formal harmony in a system. In the absence of such critical testing of his thought by Paul himself, we must observe his relative emphasis and the varying causes of this, whether personal conviction or external occasion. Even when this is done it still remains to ask how much represents direct spiritual vision, due to "revelation," and how much traditional forms of thought or imagination, adopted by him as the most natural vehicle of expression occurring to his mind in a given mental environment. That Paul himself was conscious of the limitations here implied, is clear from what he says in 1 Cor. xiii. 9 sqq. as to the transience of the conceptions used by himself and others to body forth divine ideas and relations. After all, his was the theology of a prophet rather than a philosopher. Hence we have to distinguish what may be styled "personal Paulinism," the generalization of his own religious experience, from his apologetic exposition of it over against current Pharisaic Judaism if largely in its terms and also from the speculative setting which it took on in his mind, as his experience enlarged and the thoughts of his converts suggested fresh points of view.

It is mainly in this last sphere that development is traceable in Paulinism. Some idea of its nature and extent has already been given in connexion with Paul's life. If one must attempt to reproduce the Pauline "system" as a whole, it is best to take the form in which it appears in the Epistle to the Romans, and then supplement it with the fresh elements in the later epistles (so far as these seem really to be in terms of the writer's thought, rather than his readers'), instead of constructing an amalgam from the whole range of his epistles taken promiscuously. Paulinism, in the widest sense,[1] includes much that is not distinctively his at all; what can here be given is confined to Paul's specific contribution to Christianity.

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[1] See Lightfoot, *Galatians*, pp. 183 sqq., who cites King Alfred as a parallel; and Hastings's *Dict. Bible*, iii. 701. Sir W. M. Ramsay, *St Paul the Traveller*, pp. 94 sqq., prefers "a species of chronic malarial fever," connecting it specially with the attack mentioned in Gal. iv. 13 sqq.

i. Paulinism proper springs from an absorbing passion for a righteousness real from the heart outwards, real before God. This could not be satisfied by "works of the Law," *i.e.* deeds prompted by the categorical imperative of Law, itself viewed as the will of God and supported by sanctions of reward and penalty. Two things hindered; "the flesh," the sensuous element in human nature, positively prone to sin since the first man's trespass introduced an actual bias to evil (Rom. v. 12, 14, 19); and (the) Law itself, a form of divine claim which acted on man's sinful nature as a challenge and irritant to his egoism, so breeding either positive rebellion or self-confident pride, but in neither case real righteousness before God. Thus the main effect of Law was negative; it brought to light the sin latent in "the flesh," *i.e.* the personality as conditioned by the post-Adamic flesh. From this deliverance could come only by divine interposition or redemption, achieving at once reconciliation and regeneration by the removal of guilt and the creation of a new moral dynamic. Justification, then, or the placing of man in a state in which God could reckon him radically righteous, must be due to "grace" apart altogether from "works of law" and their desert. The medium of such grace was the Christ, in whom the claims of the dispensation of Law, in its typical form as the Jewish *Thorah*, were satisfied by death, while the Resurrection set the seal of God's approval upon Christ's fulfilment of righteousness (Rom. v. 17–19; 1 Cor. xv. 17) on the new and higher plane of filial obedience by love to God as Father.

Thus what the Law could not do, in its weakness in relation to the flesh, had been divinely achieved by God's Son, the Messiah, in virtue of "the Spirit of life" in Him, which annulled "sin and death" in human nature (Rom. viii. 2–4), first in the flesh of Christ Himself as second Adam, and then in the humanity which should be united to Him as spiritual Head (1 Cor. xv. 45). This union was affected by faith, a profound receptivity whereby the personality of the Saviour became as it were the germ of the new moral personality of the believer. He was "in Christ" and Christ "in him" by a mutual spiritual interpenetration, begun on Christ's side by vicarious self-sacrificing love, and consummated on the believer's side by self-surrendering trust under the influence of the Spirit of God and Christ (Gal. ii. 20; Rom. viii. 9, 15 seq.).

Such mystic union by faith (cf. Eph. iii. 16–19) is the very nerve of Paulinism, having two main aspects. In its initial aspect, it is the real basis of justification (as radical sanctification) and regeneration; in its abiding aspect, it is the secret of progressive sanctification or assimilation to the image of Christ, Himself "the image of God." To the one aspect corresponds the initial rite of baptism; to the other the recurring rite of communion in the Lord's Supper. These have both an essentially corporate significance. It is as members of the mystical Body of Christ—or rather of the mystic Christ, consisting of Christ the Head and of His Body the Church—that believers, already united to the Head by faith, partake in these sacraments (1 Cor. xii. 12 seq., x. 16 seq.)

The keystone of all this is the Christ of God, the glorified Christ who appeared to Paul at his conversion, and in the rays of whose heavenly glory the earthly life of Jesus of Nazareth was ever seen. Here, as elsewhere, the mode of Paul's conversion determined his whole perspective. It differentiated his emphasis from that of the older Judaeo-Christianity, which always started from the earthly manifestation, while it looked fixedly forward to the future manifestation in glory (of which the Resurrection appearances were the fore-gleams). To Paul the glorified Jesus or spirit-Christ (1 Cor. xv. 45; 2 Cor. iii. 18) of his vision became the Christ mystical of permanent, present Christian faith and experience. In union with Him the believer was already essentially "saved," because possessed of Christ's spirit of Sonship (Rom. viii. 9, 14–17, 30), although his redemption was not complete until the body was included, like the soul, in the penetrating "life" of the Spirit (viii. 23–25, 10 seq.). Accordingly he shifted the centre of gravity in Christian faith decisively from the future aspect of the Kingdom, to the present life of righteousness enjoyed by believers through "the first-fruits of the Spirit" in them. Here lay his great advance on Judaeo-Christianity, with its preponderant eschatological emphasis, along with a more external conception of Jesus, as Jewish Messiah, and of relation to Him. To this mode of thought Christ was not the very principle of the new filial righteousness. In a word, while Judaeo-Christianity only implicitly or unconsciously transcended legalism, Paulinism did so explicitly and consciously, thus safeguarding the future. For Paul's religion was Christocentric in a sense unknown before. Compared with this, his distinctive attitude of soul to Christ, the exact metaphysical conception he formed of Christ's pre-existence was secondary and conditioned by inherited modes of thought. His own specific contribution was his consciousness of Christ's complete religious efficacy, which marked Him as essentially Divine, the Son of God in the highest sense conceivable under human conditions.

ii. *Jesus and Paul.*—In calling Paulinism "Christocentric," one raises the question as to its relation to the Gospel proclaimed by Jesus. That Paul conceived himself as utterly dependent for his gospel upon Jesus the Christ, is not in doubt, but only how far he unconsciously modified the Gospel by making Christ its subject matter rather than its revealer. In one aspect this is but the question as to Paul's attitude to the historic Jesus over again: yet it is more. Granting that Paul felt his gospel to be in essential agreement with the words and deeds of Jesus of Nazareth, as known to him, it remains to ask whether he did not put all into so fresh a perspective as to change the relative emphasis on points central to the teaching of Jesus, and so alter its spirit. A school of writers, by no means unappreciative of Paul as they understand him, of whom W. Wrede may be taken as example, answer that Paul so changed Christianity as to become its "second founder"—the real founder of ecclesiastical Christianity as distinct from the Christianity of Jesus. They say, "either Jesus or Paul: it cannot be both at once." They urge not only that Paulinism is involved in certain "mythological" conceptions, by its view of sin, of redemption and of the pre-existent celestial person of the Redeemer; but also that, apart from the Rabbinic and anti-Rabbinic element in Paul, his whole mystical attitude towards Christ as the medium of redemption (an idea borrowed, they say, not from Jesus Himself but from the religion of the Mysteries) is alien to the sunny and sane teaching of Jesus as to God and man, and their true relations.

The essential issue here is this. Could Jesus the Messiah set forth the Gospel in the same perspective as a devoted disciple of His? Must not the personal embodiment of the life of the Messianic kingdom by Jesus Himself, and so His personality, become the prime medium through which this life in its essential features, and especially in its spirit of devoted love, attains and maintains its hold upon the souls of men? Surely the new life must appear most fully and movingly *sub specie Christi*; and the *imitatio Christi*, in an inner sense which finds in Him the very principle of the new Christian consciousness as to God and man, must be the most direct and morally potent means to the realization of the Christ-type. Thus to say that Paulinism is practically and proximately "Christocentric," is not to deny that it is ultimately and theoretically "Theocentric," if only Christ be regarded as the revealer of God the Father, and that in virtue of a special community of nature with Him as Son. It may be questioned whether Paul attained, or indeed had within his reach in that age, the best intellectual equivalent of his religious intuition of Christ as "mediator between God and man." But it is another matter to question whether his intuition that the personality of the Christ Himself was the secret of the spiritual power latent in His Gospel, be a true interpretation of the Gospel as it appears even in the Synoptics.[2] Thus the truth seems to lie rather with those who see in Paul "Jesus's most genuine disciple" (H. Weinel), the one who best understood and reproduced His thought. True, Jesus's Gospel is one seen through the sinless consciousness of the Saviour, while Paul's is one seen through the eyes of a conscious sinner. But that is the perspective in which mankind generally has to view the Gospel; and apart from the special intensity of Paul's personal experience of sin, the Gospel as it "found" him may surely be in principle the needful experimental complement to the Gospel as set forth in more ideal form by Jesus Himself. By restoring Jesus's own stress upon "eternal life" as present rather than future, and that on lines other than those of obedience to a divine law, Paul saved Christianity from a judaizing of the universal and spiritual religion with which Jesus had in fact inspired His personal disciples, but which they had not been able to grasp.

No doubt there is another side to all this, the side of Paul's idiosyncrasy, both religiously and as a thinker. The peculiar depth and form of Paul's religious experience, especially as regards sin, have proved a limitation to his direct and full influence. While "numberless men have discovered themselves in reading Paul," more have not been "found" by him; and of those who have felt the religious appeal of his writings, not a few have gravely misunderstood the theoretic setting of his message. Indeed misunderstanding, one way or another, was Paul's usual lot in the ancient Church,[3] as regards his most distinctive ideas, due partly to the difficult form in which some of those ideas were couched. But to say this is little more than saying that Paulinism is a less universal form of the Gospel than that given it by his Master Jesus Christ. To do full justice to Paulinism in this respect, we must compare it with other interpretations of Jesus and His Gospel in the age immediately ensuing. At the one extreme stands Judaeo-Christianity (so far as uninfluenced by Paul), with its ultra-conservatism and undeveloped spirituality; at the other Gnosticism, with its ultra-spiritualism, born of a rigid dualism and defective sense for historical continuity in revelation. Between these stands Paul, blending the positive ideas of both in a religious unity of immense ethical power and initiative; while the other and intermediate types represented in the New Testament—by 1 Peter, Hebrews and the Johannine writings—all testify to his pervasive influence.

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[1] One of the best critical summaries of "Pauline Theology" is that by E. Hatch in the *Ency. Brit.* 9th ed.

[2] The whole history of Christianity is proof that the personality of Jesus has counted for more in producing Christians than his teaching *per se*, that is, his Gospel in the narrower sense. And it was Paul, not the older apostles, who first concentrated attention on that personality as the type and pledge of man's potential sonship to God.

[3] See S. Means, *Saint Paul and the ante-Nicene Church* (1903).

Literature.—For this in anything like its immense range, reference may be made to the articles "Paul" in Hastings's *Dict. Bible*, the *Ency. Bib.*, A. Hauck's *Realencyklopädie* (Zahn); to R. J. Knowling's *Witness of the Epistles* (1892) and *The Testimony of St Paul to Christ* (1905), and C. Clemen, *Paulus* (1904), the footnotes of which are a mine of information on this subject. Besides these, the leading works on New Testament introduction or theology and on the apostolic age deal largely with Paul, and often contain bibliographies. The following works may be taken as fairly typical:—

1. For Paul's *Life*: A. Neander, *Gesch. der Pflanzung . . . der christl. Kirche*, vol. i. (4th ed., 1847; Eng. trans. in Bohn's Library), and Lives by F. C. Baur (1845, 1866); G. V. Lechler, *Das apost. . . . Zeitalter* (1851; 3rd ed., 1885; Eng. trans. 1886); E. Renan (1869); T. Lewin (1851, 1874, rich in archaeology); Conybeare and Howson (1852 and later); H. Ewald, *History of Israel* (vol. vi., 3rd ed., 1868); M. Krenkel (1869); A. Hausrath (2nd ed., 1872); F. W. Farrar (1879); A. Sabatier (2nd ed., 1881); K. Schmidt, *Die Apostelgesch.* (vol. i., 1882); C. Weizsäcker, *Das apost. Zeitalter* (1886; Eng. trans., 1894); W. M. Ramsay, *St Paul the Traveller and Roman Citizen* (1896); A. C. McGiffert, *The Apostolic Age* (1897); O. Cone (1898); C. Clemen (1904); B. W. Bacon (1905). Some of these deal largely with Paul's teaching.

2. For Paul's *Teaching*: L. Usteri, *Die Entwickelung des paulinischen Lehrbegriffs* (1824; 6th ed. 1851); Baur's *Paulus* (1845, 1866); A. Ritschl, *Die Entsteh. d. altkath. Kirche* (2nd ed., 1857); E. Reuss, *Hist. de la théol. chrét. au siècle apostolique*, tome ii. (3rd ed., 1864; Eng. trans., 1872); B. Jowett, essays in his *Epistles of St Paul to the Thess., &c.* (2nd ed., 1859); C. Holsten, *Zum Evang. d. Paulus u. Petrus* (1868), &c.; J. B. Lightfoot, dissertations in his *Commentaries*; Matthew Arnold, *St Paul and Protestantism* (1870); O. Pfleiderer, *Der Paulinismus* (1873; Eng. trans. 1877), also Hibbert Lecture (1885) and *Das Urchristentum*, vol. i. (2nd ed., 1902; Eng. trans., 1907); A. Sabatier, *L'Apôtre Paul* (1881); E. Ménégoz, *Le Péché et la rédemption d'après S. Paul* (1882); J. F. Clarke, *The Ideas of the Apostle Paul* (1884); G. B. Stevens, *The Pauline Theology* (1892); A. B. Bruce. *St Paul's Conception of Christianity* (1894); C. C. Everett, *The Gospel of Paul*; G. Matheson, *The Spiritual Development of St Paul*; P. Feine, *Das gesetzfreie Evang. des Paulus* (1899); brief sketches by W. Bousset, H. Weinel, W. Wrede, P. Wernle (also his *Anfänge unserer Religion*, 1901; Eng. trans., 1904), and A. Jülicher (in *Die Kultur der Gegenwart*, 1905, I. iv. i, 69–97); but especially W. Sanday, article "Paul" in *Dict. of Christ and the Gospels* (1908), where the literature bearing on "Jesus and Paul" will be found. For commentaries, see under the several epistles. (J. V. B.)

PAUL (Paulus), the name of five popes.

Paul I., pope from 757 to 767, succeeded his brother Stephen III. on the 29th of May 757. His pontificate was chiefly remarkable for his close alliance with Pippin, king of the Franks, to whom he made a present of books highly significant of the intellectual poverty of the times; and for his unsuccessful endeavours to effect a reconciliation with the iconoclastic emperor of the East, Constantine Copronymus. He died on the 28th of June 767. His successor was Stephen IV.

Paul II. (Pietro Barbo), pope from the 30th of August 1464 to the 26th of July 1471, was born at Venice in 1417. Intended for a business career, he took orders during the pontificate of his uncle, Eugenius IV., and was appointed successively archdeacon of Bologna, bishop of Cervia, bishop of Piacenza, protonotary of the Roman Church, and in 1440 cardinal-deacon of Sta Maria Nuova. He was made cardinal-priest of Sta Cecilia, then of St Marco by Nicholas V., was a favourite of Calixtus III. and was unanimously and unexpectedly elected the successor of Pius II. He immediately declared that election "capitulations," which cardinals had long been in the habit of affirming as rules of conduct for future popes, could affect a new pope only as counsels, not as binding obligations. He opposed with some success the domineering policy of the Venetian government in Italian affairs. His repeated condemnations of the Pragmatic Sanction of Bourges resulted in strained relations with Louis XI. of France. He pronounced excommunication and deposition against King George Podiebrad on the 23rd of December 1466 for refusal to enforce the Basel agreement against the Utraquists, and prevailed on Matthias Corvinus, king of Hungary, to declare war against him on the 31st of March 1468. Matthias was not particularly successful, but George Podiebrad died on the 22nd of March 1471. The pope carried on fruitless negotiations (1469) with the emperor Frederick III. for a crusade against the Turks. Paul endeavoured to make drastic reforms in the curia, and abolished the college of abbreviators (1466), but this called forth violent protests from the historian Platina, one of their number and subsequently librarian under Sixtus IV., who is responsible for the fiction that Paul was an illiterate persecutor of learning. It is true that the pope suppressed the Roman academy, but on religious grounds. On the other hand he was friendly to Christian scholars; he restored many ancient monuments; made a magnificent collection of antiquities and works of art; built the Palazzo di St Marco, now the Palazzo di Venezia; and probably first introduced printing into Rome. Paul embellished the costume of the cardinals, collected jewels for his own adornment, provided games and food for the Roman people and practically instituted the carnival. He began in 1469 a revision of the Roman statutes of 1363—a work which was not completed until 1490. Paul established the special tax called the *quindennium* in 1470, and by bull of the same year (April 19) announced the jubilee for every twenty-five years. He began negotiations with Ivan III. for the union of the Russian Church with the Roman see. Paul was undoubtedly not a man of quick parts or unusual views, but he was handsome, attractive, strong-willed, and has never been accused of promoting nephews or favourites. He died very suddenly, probably of apoplexy, on the 26th of July, 1471, and was succeeded by Sixtus IV.

The principal contemporary lives of Paul II., including that by Platina, are in L. Muratori, *Rerum ital. scriptores*, iii. pt. 2, and in Raynaldus, *Annales ecclesiastici* (1464–1471). The inventory of his personal effects, published by E. Müntz (*Les Arts*, ii., 1875), is a valuable document for the history of art. See also L. Pastor, *History of the Popes*, vol. iv.; trans. by F. I. Antrobus (London, 1898); M. Creighton, *History of the Papacy*, vol. iv. (London, 1901); F. Gregorovius, *Rome in the Middle Ages*, vol. vii. (trans. by Mrs G. W. Hamilton, London, 1900–1902); H. L'Épinois, *Paul II.*; F. Palacky, *Geschichte von Böhmen*, Bd. IV.–V. (Prague, 1860–1865); *Aus den Annalen-Registern der Päpste Eugen IV., Pius II., Paul II., u. Sixtus IV.*, ed. by K. Hayn (Cologne, 1896). There is an excellent article by C. Benrath in Hauck's, *Realencyklopädie* (3rd ed.), vol. xv. (C. H. Ha.)

Paul III. (Alessandro Farnese), pope from 1534 to 1549, was born on the 28th of February 1468, of an old and distinguished family. As a pupil of the famous Pomponius Laetus, and, subsequently, as a member of the circle of Cosmo de' Medici, he received a finished education. From Florence he passed to Rome, and became the father of at least two children, later legitimized. Upon entering the service of the Church, however, he lived more circumspectly. His advancement was rapid. To the liaison between his sister Giulia Farnese Orsini and Alexander VI. he owed his cardinal's hat; but the steady favour which he enjoyed under successive popes was due to his own cleverness and capacity for affairs. His election to the papacy, on the 13th of October 1534, to succeed Clement VII., was virtually without opposition.

The pontificate of Paul III. forms a turning-point in the history of the papacy. The situation at his accession was grave and complex: the steady growth of Protestantism, the preponderant power of the emperor and his prolonged wars with France, the advances of the Turks, the uncertain mind of the Church itself—all conspired to produce a problem involved and delicate. Paul was shrewd, calculating, tenacious; but on the other hand over-cautious, and inclined rather to temporize than to strike at the critical moment. His instincts and ambitions were those of a secular prince of the Renaissance; but circumstances forced him to become the patron of reform. By the promotion to the cardinalate of such men as Contarini, Caraffa, Pole and Morone, and the appointment of a commission to report upon existing evils and their remedy, the way was opened for reform; while by the introduction of the Inquisition into Italy (1542), the establishment of the censorship and the Index (1543), and the approval of the Society of Jesus (1540), most efficient agencies were set on foot for combating heresy.

But in the matter of a general council, so urgently desired by the emperor, Paul showed himself irresolute and procrastinating. Finally on the 13th of December 1545 the Council assembled in Trent; but when the victories of Charles V. seemed to threaten its independence it was transferred to Bologna (March 1547) and not long afterwards suspended (Sept. 1549). He concluded the truce of Nice (1538) between Charles and Francis, and contracted an alliance with each. But the peace of Crespy and the emperor's negotiations with the Protestants (1544) turned him against Charles, and he was suspected of desiring his defeat in the Schmalkaldic War. The most deplorable weakness of Paul was his nepotism. Parma and Piacenza, states of the Church, he bestowed upon his natural son Pier Luigi (1545). But in 1549 Pier Luigi was assassinated by his outraged subjects, and the emperor thereupon claimed the two duchies for his son-in-law Ottavio Farnese, Paul's grandson. This led to a family quarrel which greatly embittered the last days of the pope and hastened his death (Nov. 10, 1549). Parma and Piacenza continued to be a bone of contention for two hundred and fifty years.

Paul was gifted and cultured, a lover and patron of art. He began the famous Farnese Palace; constructed the Sala Regia in the Vatican; commissioned Michelangelo to paint the "Last Judgment," and to resume work upon St Peter's; and otherwise adorned the city. Easy-going, luxurious, worldly-minded, Paul was not in full sympathy with the prevailing influences about him.

See Panvinio, continuator of Platina, *De vitis pontiff. rom.*; Ciaconius, *Vitae et res gestae summorum pontiff. rom.* (Rome, 1601–1602, both contemporaries of Paul III.); Quirini, *Imago optimi . . . pontif. expressa in gestis Pauli III.* (Brixen, 1745); Ranke, *Popes* (Eng. trans., Austin), i. 243 seq.; v. Reumont, *Gesch. der Stadt Rom.*, iii. 2, 471 seq., 716 seq.; Brosch, *Gesch. des Kirchenstaates* (1880), i. 163 seq.; Ehses, "Kirchliche Reformarbeiten unter Paul III. vor dem Trienter Konzil," *Röm. Quartalschrift* (1901), xv. 153 seq.; Capasso, *La Politica di papa Paolo III. e l'Italia* (Camerino, 1901); and also the extensive bibliography in Herzog-Hauck, *Realencyklopädie*, *s.v.* "Paul III."

PAUL IV. (Giovanni Pietro Caraffa), pope from 1555 to 1559, was born on the 28th of June 1476, of a noble Neapolitan family. His ecclesiastical preferment he owed to the influence of an uncle, Cardinal Oliviero Caraffa. Having filled the post of nuncio in England and Spain, he served successive popes as adviser in matters pertaining to heresy and reform. But he resigned his benefices, and, in conjunction with Cajetan, founded the order of the Theatines (1524) with the object of promoting personal piety and of combating heresy by preaching. In 1536 Paul III. made him cardinal-archbishop of Naples and a member of the reform commission. After the failure of Contarini's attempt at reconciliation with the Protestants (1541) the papacy committed itself to the reaction advocated by Caraffa; the Inquisition and censorship were set up (1542, 1543), and the extermination of heresy in Italy undertaken with vigour. Elected pope, on the 23rd of May 1555, in the face of the veto of the emperor, Paul regarded his elevation as the work of God. With his defects of temper, his violent antipathies, his extravagant notion of papal prerogative, his pontificate was filled with strife. Blinded by ungovernable hatred he joined with France (1555) in order to drive the "accursed Spaniards" from Italy. But the victory of Philip II. at St Quentin (1557) and the threatening advance of Alva upon Rome forced him to come to terms and to abandon his French alliance. He denounced the peace of Augsburg as a pact with heresy; nor would he recognize the abdication of Charles V. and the election of Ferdinand. By insisting upon the restitution of the confiscated church-lands, assuming to regard England as a papal fief, requiring Elizabeth, whose legitimacy he aspersed, to submit her claims to him, he raised insuperable obstacles to the return of England to the Church of Rome.

Paul's attitude towards nepotism was at variance with his character as a reformer. An unworthy nephew, Carlo Caraffa, was made cardinal, and other relatives were invested with the duchies of Paliano and Montebello. It was Paul's hope in this way to acquire a support in his war with the Spaniards. But the defeat of his plans disillusioned him, and he turned to reform. A stricter life was introduced into the papal court; the regular observance of the services of the Church was enjoined; many of the grosser abuses were prohibited. These measures only increased Paul's unpopularity, so that when he died, on the 18th of August 1559, the Romans vented their hatred by demolishing his statue, liberating the prisoners of the Inquisition, and scattering its papers. Paul's want of political wisdom, and his ignorance of human nature aroused antagonisms fatal to the success of his cause.

See Panvinio, continuator of Platina, *De vitis pontiff. rom.*; Ciaconius, *Vitae et res gestae summorum pontiff. rom.* (Rome, 1601–1602, both contemporaries of Paul IV.); Caraccioli, *De vita Pauli IV. P.M.* (Cologne, 1612; for criticism see *Hist. Zeitschr.*, xliv. 460 seq.), whose rich collection of materials was used by Bromata, *Vita di Paolo IV.* (Ravenna, 1748), and Sanim, *Une Question ital. au seizième siècle* (Paris, 1861). See also Castaldo, *Vita del pontifice Paolo Quarto* (Modena, 1618); Ranke, *Popes* (Eng. trans. by Austin), i. 286 seq. (an excellent sketch); v. Reumont, *Gesch. der Stadt Rom.*, iii. 2, 513 seq. and Benrath, "G. P. Caraffa u. d. reformatorische Bewegung seiner Zeit.," in *Jahrb. für prot. Theol.* (1878), vol. i.; Ancel, *Disgrace et procès dès Caraffa* (1909); Riess, *Politik Pauls IV.* (1909).

PAUL V. (Camillo Borghese), successor of Leo XI., was born in Rome on the 17th of September 1552, of a noble family. He studied in Perugia and Padua, became a canon lawyer, and was vice-legate in Bologna. As a reward of a successful mission to Spain Clement VIII. made him cardinal (1596) and later vicar in Rome and inquisitor. Elevated to the papacy, on the 16th of May 1605, his extreme conception of papal prerogative, his arrogance and obstinacy, his perverse insistence upon the theoretical and disregard of the actual, made strife inevitable. He provoked disputes with the Italian states over ecclesiastical rights. Savoy, Genoa, Tuscany and Naples, wishing to avoid a rupture, yielded; but Venice resisted. The republic stood upon her right to judge all her subjects, and by her demands touching benefices, tithes and papal bulls showed her determination to be supreme in her own territory. Excommunication and interdict (April 17, 1606) were met with defiance. The cause of the republic was brilliantly advocated by Fra Paolo Sarpi, counsellor of state; the defenders of the papal theory were Cardinals Baronius and Bellarmine. The pope talked of coercion by arms; but Spain, to whom he looked for support, refused to be drawn into war, and the quarrel was finally settled by the mediation of France (March 22, 1607). Notwithstanding certain concessions, the victory remained with the republic (see SARPI).

Paul became involved in a quarrel with England also. After the Gunpowder Plot parliament required a new oath of allegiance to the king and a denial of the right of the pope to depose him or release his subjects from their obedience. Paul forbade Roman Catholics to take the oath; but to no purpose, beyond stirring up a literary controversy. By his condemnation of Gallicanism (1613) Paul angered France, and provoked the defiant declaration of the states general of 1614 that the king held his crown from God alone.

Paul encouraged missions, confirmed many new congregations and brotherhoods, authorized a new version of the Ritual, and canonized Carlo Borromeo. His devotion to the interests of his family exceeded all bounds, and they became enormously wealthy. Paul began the famous Villa Borghese; enlarged the Quirinal and Vatican; completed the nave, façade and portico of St Peter's; erected the Borghese Chapel in Sta Maria Maggiore; and restored the aqueduct of Augustus and Trajan ("Acqua Paolina"). He also added to the Vatican library, and began a collection of antiquities. Paul died on the 28th of January 1621, and was succeeded by Gregory XV.

See Bzovius (Bzowski), *De vita Pauli V.* (Rome, 1625; contained in Platina, *De vitis pontiff. rom.*, ed. 1626), who depicts Paul as a paragon of all public and private virtues; Vitorelli, continuator of Ciaconius, *Vitae et res gestae summorum pontiff. rom.* (a contemporary of the pope); Goujet, *Hist. du pontificat de Paul V.*, (1765); Ranke, *Popes* (Eng. trans. by Austin), ii. 330 seq., iii. 72 seq.; v. Reumont, *Gesch. der Stadt Rom,* iii. 2, 605 seq.; Brosch, *Gesch. des Kirchenstaates* (1880), i. 351 seq. The Venetian version of the quarrel with the pope was written by Sarpi (subsequently translated into English, London, 1626); see also Cornet, *Paolo V. et la repub. veneta* (Vienna, 1859); and Trollope, *Paul the Pope and Paul the Friar* (London, 1860). An extensive biography will be found in Herzog-Hauck, *Realencylkopädie, s.v.* "Paul V." (T. F. C.)

PAUL I. (1754–1801), emperor of Russia, was born in the Summer Palace in St Petersburg on the 1st of October (N.S.)—the 20th of September by the Russian calendar—1754. He was the son of the grand duchess, afterwards empress, Catherine. According to a scandalous report his father was not her husband the grand duke Peter, afterwards emperor, but one Colonel Soltykov. There is probably no foundation for this story except gossip, and the cynical malice of Catherine. During his infancy he was taken from the care of his mother by the empress Elizabeth, whose ill-judged fondness is believed to have injured his health. As a boy he was reported to be intelligent and good-looking. His extreme ugliness in later life is attributed to an attack of typhus, from which he suffered in 1771. It has been asserted that his mother hated him, and was only restrained from putting him to death while he was still a boy by the fear of what the consequences of another palace crime might be to herself. Lord Buckinghamshire, the English ambassador at her court, expressed this opinion as early as 1764. In fact, however, the evidence goes to show that the empress, who was at all times very fond of children, treated Paul with kindness. He was put in charge of a trustworthy governor, Nikita Panin, and of competent tutors. Her dissolute court was a bad home for a boy who was to be the sovereign, but Catherine took great trouble to arrange his first marriage with Wilhelmina of Darmstadt, who was renamed in Russia Nathalie Alexéevna, in 1773. She allowed him to attend the council in order that he might be trained for his work as emperor. His tutor Poroshin complained of him that he was "always in a hurry," acting and speaking without thinking. After his first marriage he began to engage in intrigues. He suspected his mother of intending to kill him, and once openly accused her of causing broken glass to be mingled with his food. Yet, though his mother removed him from the council and began to keep him at a distance, her actions were not unkind. The use made of his name by the rebel Pugachev in 1775 tended no doubt to render his position more difficult. When his wife died in childbirth in that year his mother arranged another marriage with the beautiful Sophia Dorothea of Württemberg, renamed in Russia Maria Feodorovna. On the birth of his first child in 1777 she gave him an estate, Pavlovsk. Paul and his wife were allowed to travel through western Europe in 1781–1782. In 1783 the empress gave him another estate at Gatchina, where he was allowed to maintain a brigade of soldiers whom he drilled on the Prussian model. As Paul grew his character became steadily degraded. He was not incapable of affection nor without generous impulses, but he was flighty, passionate in a childish way, and when angry capable of cruelty. The affection he had for his wife turned to suspicion. He fell under the influence of two of his wife's maids of honour in succession, Nelidov and Lapuknin, and of his barber, a Turkish slave named Koroïssov. For some years before Catherine died it was obvious that he was hovering on the border of insanity. Catherine contemplated setting him aside in favour of his son Alexander, to whom she was attached. Paul was aware of his mother's half-intention—for it does not appear to have been more—and became increasingly suspicious of his wife and children, whom he rendered perfectly miserable. No definite step was taken to set him aside, probably because nothing would be effective short of putting him to death, and Catherine shrank from the extreme course. When she was seized with apoplexy he was free to destroy the will by which she left the crown to Alexander, if any such will was ever made. The four and a half years of Paul's rule in Russia were unquestionably the reign of a madman. The excitement of the change from his retired life in Gatchina to omnipotence drove him below the line of insanity. His conduct of the foreign affairs of Russia plunged the country first into the second coalition against France in 1778, and then into the armed neutrality against Great Britain in 1801. In both cases he acted on personal pique, quarrelling with France because he took a sentimental interest in the Order of Malta, and then with England because he was flattered by Napoleon. But his political follies might have been condoned. What was unpardonable was that he treated the people about him like a shah, or one of the craziest of the Roman emperors. He began by repealing Catherine's law which exempted the free classes of the population of Russia from corporal punishment and mutilation. Nobody could feel himself safe from exile or brutal ill-treatment at any moment. If Russia had possessed any political institution except the tsardom he would have been put under restraint. But the country was not sufficiently civilized to deal with Paul as the Portuguese had dealt with Alphonso VI., a very similar person, in 1667. In Russia as in medieval Europe there was no safe prison for a deposed ruler. A conspiracy was organized, some months before it was executed, by Counts Pahlen and Panin, and a half-Spanish, half-Neapolitan adventurer, Admiral Ribas. The death of Ribas delayed the execution. On the night of the 11th of March 1801 Paul was murdered in his bedroom in the St Michael Palace by a band of dismissed officers headed by General Bennigsen, a Hanoverian in the Russian service. They burst into his bedroom after supping together and when flushed with drink. The conspirators forced him to the table, and tried to compel him to sign his abdication. Paul offered some resistance, and one of the assassins struck him with a sword, and he was then strangled and trampled to death. He was succeeded by his son, the emperor Alexander I., who was actually in the palace, and to whom Nicholas Zubov, one of the assassins, announced his accession.

See, for Paul's early life, K. Waliszewski, *Autour d'un trône* (Paris, 1894), or the English translation, *The Story of a Throne* (London, 1895), and P. Morane, *Paul I. de Russie avant l'avènement* (Paris, 1907). For his reign, T. Schiemann, *Geschichte Russlands unter Nikolaus I.* (Berlin, 1904), vol. i. and *Die Ermordung Pauls*, by the same author (Berlin, 1902).

PAUL OF SAMOSATA, patriarch of Antioch (260–272), was, if we may credit the encyclical letter of his ecclesiastical opponents preserved in Eusebius's *History*, bk. vii. ch. 30, of humble origin. He was certainly born farther east at Samosata, and may have owed his promotion in the Church to Zenobia, queen of Palmyra. The letter just mentioned is the only indisputably contemporary document concerning him and was addressed to Dionysius and Maximus, respectively bishops of Rome and Alexandria, by seventy bishops, priests and deacons, who attended a synod at Antioch in 269 and deposed Paul. Their sentence, however, did not take effect until late in 272, when the emperor Aurelian, having defeated Zenobia and anxious to impose upon Syria the dogmatic system fashionable in Rome, deposed Paul and allowed the rival candidate Domnus to take his place and emoluments. Thus it was a pagan emperor who in this momentous dispute ultimately determined what was orthodox and what was not; and the advanced Christology to which he gave his preference has ever since been upheld as the official orthodoxy of the Church. Aurelian's policy moreover was in effect a recognition of the Roman bishop's pretension to be arbiter for the whole Church in matters of faith and dogma.

Scholars will pay little heed to the charges of rapacity, extortion, pomp and luxury made against Paul by the authors of this letter. It also accuses him not only of consorting himself with two "sisters" of ripe age and fair to look upon; but of allowing his presbyters and deacons also to contract platonic unions with Christian ladies. No actual lapses however from chastity are alleged, and it is only complained that suspicions were aroused, apparently among the pagans.

The real gravamen against Paul seems to have been that he clung to a Christology which was become archaic and had in Rome and Alexandria already fallen into the background.

Paul's heresy lay principally in his insistence on the genuine humanity of Jesus of Nazareth, in contrast with the rising orthodoxy which merged his human consciousness in the divine Logos. It is best to give Paul's beliefs in his own words; and the following sentences are translated from Paul's *Discourses to Sabinus*, of which fragments are preserved in a work against heresies ascribed to Anastasius, and printed by Angelo Mai:—

> I. "Having been anointed by the Holy Spirit he received the title of *the anointed* (*i.e.* Christos), suffering in accordance with his nature, working wonders in accordance with grace. For in fixity and resoluteness of character he likened himself to God; and having kept himself free from sin was united with God, and was empowered to grasp as it were the power and authority of wonders. By these he was shown to possess over and above the will, one and the same activity (with God), and won the title of Redeemer and Saviour of our race."
>
> II. "The Saviour became holy and just; and by struggle and hard work overcame the sins of our forefather. By these means he succeeded in perfecting himself, and was through his moral excellence united with God; having attained to unity and sameness of will and *energy* (*i.e.* activity) with Him through his advances in the path of good deeds. This will be preserved inseparable (from the Divine), and so inherited the name which is above all names, the prize of love and affection vouchsafed in grace to him."
>
> III. "The different natures and the different persons admit of union in one way alone, namely in the way of a complete agreement in respect of will; and thereby is revealed the One (*or* Monad) in activity in the case of those (wills) which have coalesced in the manner described."
>
> IV. "We do not award praise to beings which submit merely in virtue of their nature; but we do award high praise to beings which submit because their attitude is one of love; and so submitting because their inspiring motive is one and the same, they are confirmed and strengthened by one and the same indwelling power, of which the force ever grows, so that it never ceases to stir. It was in virtue of this love that the Saviour coalesced with God, so as to admit of no divorce from Him, but for all ages to retain one and the same will and activity with Him, an activity perpetually at work in the manifestation of good."
>
> V. "Wonder not that the Saviour had one will with God. For as nature manifests the substance of the many to subsist as one and the same, so the attitude of love produces in the many an unity and sameness of will which is manifested by unity and sameness of approval and well-pleasingness."

From other fairly attested sources we infer that Paul regarded the baptism as a landmark indicative of a great stage in the moral advance of Jesus. But it was a man and not the divine Logos which was born of Mary. Jesus was a man who came to be God, rather than God become man. Paul's Christology therefore was of the Adoptionist type, which we find among the primitive Ebionite Christians of Judaea, in Hermas, Theodotus and Artemon of Rome, and in Archelaus the opponent of Mani, and in the other great doctors of the Syrian Church of the 4th and 5th centuries. Lucian the great exegete of Antioch and his school derived their inspiration from Paul, and he was through Lucian a forefather of Arianism. Probably the Paulicians of Armenia continued his tradition, and hence their name (see PAULICIANS).

Paul of Samosata represented the high-water mark of Christian speculation; and it is deplorable that the fanaticism of his own and of succeeding generations has left us nothing but a few scattered fragments of his writings. Already at the Council of Nicaea in 325 the Pauliani were put outside the Church and condemned to be rebaptized. It is interesting to note that at the synod of Antioch the use of the word *consubstantial* to denote the relation of God the Father to the divine Son or Logos was condemned, although it afterwards became at the Council of Nicaea the watchword of the orthodox faction.

LITERATURE.—Adolph Harnack, *History of Dogma*, vol. iii.; Gieseler's *Compendium of Ecclesiastical History* (Edinburgh, 1854), vol. i.; Routh, *Reliquiae sacrae*, vol. iii.; F. C. Conybeare, *Key of Truth* (Oxford); Hefele, *History of the Christian Councils* (Edinburgh, 1872), vol. i.; Ch. Bigg, *The Origins of Christianity* (Oxford, 1909), ch. xxxv. (F. C. C.)

PAULDING, JAMES KIRKE (1778–1860), American writer and politician, was born in Dutchess county, New York, on the 22nd of August 1778. After a brief course at a village school, he removed in 1800 to New York City, where in connexion with his brother-in-law, William Irving, and Washington Irving, he began in January 1807 a series of short lightly humorous articles, under the title of *The Salmagundi Papers*. In 1814 he published a political pamphlet, "The United States and England," which attracted the notice of President Madison, who in 1815 appointed him secretary to the board of navy commissioners, which position he held until November 1823. Subsequently Paulding was navy agent in New York City from 1825 to 1837, and from 1837 to 1841 was secretary of the navy in the cabinet of President Van Buren. From 1841 until his death on the 6th of April 1860 he lived near Hyde Park, in Dutchess county, New York. Although much of his literary work consisted of political journalism, he yet found time to write a large number of essays, poems and tales. From his father, an active revolutionary patriot, Paulding inherited strong anti-British sentiments. He was among the first distinctively American writers, and protested vigorously against intellectual thraldom to the mother-country. As a prose writer he is chaste and elegant, generally just, and realistically descriptive. As a poet he is gracefully commonplace, and the only lines by Paulding which survive in popular memory are the familiar—

"Peter Piper picked a peck of pickled peppers:
Where is the peck of pickled peppers Peter Piper picked?"

which may be found in *Koningsmarke*.

The following is a partial list of his writings: *The Diverting History of John Bull and Brother Jonathan* (1812); *The Lay of the Scottish Fiddle* (1813), a good-natured parody on *The Lay of the Last Minstrel*; *Letters from the South* (1817); *The Backwoodsman: a Poem* (1818); *Salmagundi* (2nd series, 1819–1820); *A Sketch of Old England, by a New England Man* (1822); *Koningsmarke, the Long Finne* (1823), a quiz on the romantic school of Walter Scott; *John Bull in America; or the New Munchausen* (1824), a broad caricature of the early type of British traveller in America; *The Merry Tales of the Three Wise Men of Gotham* (1826); *Chronicles of the City of Gotham, from the Papers of a Retired Common Councilman* (1830); *The Dutchman's Fireside* (1831); *Westward Ho!* (1832); *A Life of Washington* (1835), ably and gracefully written; *Slavery in the United States* (1836), in which he defends slavery as an institution; *The Book of Saint Nicholas* (1837), a series of stories of the old Dutch settlers; *American Comedies* (1847), the joint production of himself and his son William J. Paulding; and *The Puritan and his Daughter* (1849). The same son also published an edition of Paulding's *Select Works* (4 vols., 1867-1868), and a biography called *Literary Life of James K. Paulding* (New York, 1867).

PAULET, POULETT or POWLETT, an English family of an ancient Somersetshire stock, taking a surname from the parish of Pawlett near Bridgwater. They advanced themselves by a series of marriages with heirs, acquiring manors and lands in Somersetshire, Wiltshire, Devonshire and Hampshire. A match with a Denebaud early in the 15th century brought the manor of Hinton St George, still the seat of the elder line, the earls Poulett. An ancestor of this branch, Sir Amias Poulett or Paulet (d. 1537), knighted in 1487 after the battle of Stoke, was treasurer of the Middle Temple in 1521, when Wolsey, in revenge for an indignity suffered at the knight's hands when the future chancellor was a young parson at Limington, forbade his leaving London without leave. To propitiate the cardinal, Sir Amias, rebuilding the Middle Temple gate, decorated it with the cardinal's arms and badge. Sir Hugh Poulett, his eldest son, a soldier who had distinguished himself in 1544 at Boulogne in the king's presence, had, in 1551, a patent of the captaincy of Jersey with the governance of Montorgueil Castle. His wisdom and experience in the wars made Queen Elizabeth employ him at Havre in 1562 as adviser to the earl of Warwick. He died in 1572, having married, as his second wife, the wealthy widow of Sir Thomas Pope, founder of Trinity College, Oxford. Sir Amias Poulett (1536–1588), Sir Hugh's son and heir by a first marriage, is famous as the puritan knight into whose charge at Tutbury and Chartley was given the queen of Scots. After his prisoner's sentence at Fotheringhay, he beset Elizabeth's ministers with messages advising her execution, but he firmly withstood "with great grief and bitterness," the suggestion that she should be put to death secretly, saying that God and the law forbade. Sir Anthony Poulett (1562–1600), his eldest surviving son, succeeded him as governor of Jersey and was father of John Poulett (1586–1649) to whom Charles I. in 1627 gave a patent of peerage as Lord Poulett of Hinton St George. In spite of the puritan opinions of his family he declared for the king, raising for the royal army a brigade which he led in Dorsetshire and Devonshire. He was taken prisoner for the second time at the fall of Exeter in 1646 and suffered a heavy fine. His eldest son John, the second Lord Poulett (1615–1665) was taken with his father at Exeter. John, the fourth Lord Poulett (1663–1743), having been a commissioner for the union, was created in 1706 Viscount Hinton of Hinton St George and Earl Poulett. In 1710–1711 he was first lord of the treasury and nominal head of an administration controlled by Harley. A garter was given him in 1712. A moderate Tory, his places were taken from him at the accession of the house of Brunswick. The fifth earl (d. 1864) re-settled the family estates in 1853 in order to bar the inheritance of one William Turnour Thomas Poulett who, although born in wedlock of the wife of the earl's cousin William Henry Poulett, was repudiated by her husband, afterwards the sixth earl. In 1903 the sixth earl's son by a third marriage established his claim to the peerage, and in 1909 judgment was given against the claim of William Turnour Thomas Poulett, then styling himself Earl Poulett.

A younger line of the Paulets, sprung from William Paulet of Melcombe, serjeant-at-law (d. 1435), reached higner honours than an earldom. William Paulet, by his marriage with Eleanor Delamare (d. 1413), daughter of Philip Delamare and heir of her brother, acquired for his descendants Fisherton Delamare in Wiltshire and Nunney Castle in Somerset. Their son Sir John Paulet married Constance, daughter and coheir of Hugh Poynings, son and heir of Sir Thomas Poynings, Lord St John of Basing. Through this marriage came the lordship and manor of Basing, and the manor of Amport or Ham Port which is still with the descendants of Hugh de Port, its Norman lord at the time of the Domesday Survey. Sir John Paulet of Basing, by his cousin Alice Paulet of the Hinton line (his wife in or before 1467), was father of Sir William Paulet, who, during a very long and supple career as a statesman in four reigns—"I am sprung," he said, "from the willow and not from the oak"—raised his house to a marquessate. Henry VIII. rewarded his diplomatic and judicial services and his campaign against the Pilgrims of Grace with the site and lands of Netley Abbey, the revival of the St John barony, a garter and many high offices. The king's death found him lord president of the council and one of the executors of the famous will of the sovereign. The fall of the protector Somerset gave him the lord treasurership and a patent of the earldom of Wiltshire. He shared the advancement of Northumberland and was created in 1551 marquess of Winchester, but, although he delivered the crown jewels to the Lady Jane in 1553, he was with the lords at Baynard Castle who proclaimed Queen Mary. In spite of his great age he was in the saddle at the proclamation of Mary's successor and was speaker in two Elizabethan parliaments. Only his death in 1572 drove from office this tenacious treasurer, whose age may have been nigh upon a hundred years.

His princely house at Basing was held for King Charles by John, the fifth marquess, whose diamond had scratched "Aimez Loyauté" upon every pane of its windows. Looking on a main road, Basing, with its little garrison of desperate cavaliers, held out for two years against siege and assault, and its shattered walls were in flames about its gallant master when Cromwell himself stormed an entry. The old cavalier marquess died in 1675, his great losses unrecompensed, and his son Charles, a morose extravagant, had the dukedom of Bolton in 1689 for his desertion of the Stuart cause. This new title was taken from the Bolton estates of the Scropes, Lord Winchester having married a natural daughter of Emmanuel, earl of Sunderland, the last Lord Scrope of Bolton. Charles, second duke of Bolton (1661–1722), was made lord-lieutenant of Ireland in 1717. A third Charles, the 3rd duke, is remembered as an opponent of Sir Robert Walpole and as the husband of Lavinia Fenton, the Polly Peachum of Gay's opera. The sixth and last duke of Bolton, an admiral of undistinguished services, died in 1794 without legitimate issue. His dukedom became extinct, and Bolton Castle again passed by bequest to an illegitimate daughter of the fifth duke, upon whom it had been entailed with the greater part of the ducal estates. (O. Ba.)

PAULI, REINHOLD (1823–1882), German historian, was born in Berlin on the 25th of May 1823. He was educated at the universities of Bonn and Berlin, went to England in 1847, and became private secretary to Baron von Bunsen, the Prussian ambassador in London. Returning to Germany in 1855 he was professor of history successively at the universities of Rostock, Tübingen (which he left in 1866 because of his political views), Marburg and Göttingen. He retained his chair at Göttingen until his death at Bremen on the 3rd of June 1882. He was a careful and industrious student of the English records, and his writings are almost wholly devoted to English history.

His first work, *König Aelfred und seine Stellung in der Geschichte Englands* (Berlin, 1851), was followed by monographs on *Bischof Grosseteste und Adam von Marsh* (Tübingen, 1864), and on *Simon von Montfort* (Tübingen, 1867). He continued J. M. Lappenberg's *Geschichte von England* from 1154 to 1509 (Gotha, 1853–1858), and himself wrote a *Geschichte Englands* (Leipzig, 1864–1875), dealing with the period between 1814 and 1852. Two volumes of historical essays, *Bilder aus Alt-England* (Gotha, 1860 and 1876), and *Aufsätze zur englischen Geschichte* (Leipzig, 1869 and 1883), and numerous historical articles in German periodicals came from his pen; and he edited several of the English chroniclers for the *Monumenta Germaniae historica.*

See R. Pauli, *Lebenserinnerungen*, edited by E. Pauli (Halle, 1895); and the sketch of his life prefixed to O. Hartwig's edition of his *Aufsätze* (Leipzig, 1883).

PAULICIANS, an evangelical Christian Church spread over Asia Minor and Armenia from the 5th century onwards. The first Armenian writer who notices them is the patriarch Nerses II. in an encyclical of 553,[1] where he condemns those "who share with Nestorians in belief and prayer, and take their bread-offerings to their shrines and receive communion from them, as if from the ministers of the oblations of the Paulicians." The patriarch John IV. (*c.* 728)[2] states that Nerses, his predecessor, had chastised the sect, but ineffectually; and that after his death (*c.* 554) they had continued to lurk in Armenia, where, reinforced by Iconoclasts driven out of Albania of the Caucasus, they had settled in the region of Djirka, probably near Lake Van. In his 31st canon John identifies them with the Messalians, as does the Armenian Gregory of Narek (*c.* 950). In Albania they were always numerous. We come now to Greek sources. An anonymous account was written perhaps as early as 840 and incorporated in the *Chronicon* of Georgius Monachus. This (known as Esc.) was edited by J. Friedrich in the Munich Academy *Sitzungsberichte* (1896), from a 10th-century Escorial codex (Plut. 1, No. 1). It was also used by Photius (*c.* 867), bk. i., chs. 1–10 of his *Historia Manicheorum*, who, having held an inquisition of Paulicians in Constantinople was able to supplement Esc. with a few additional details; and by Petrus Siculus (*c.* 868). The latter visited the Paulician fortress Tephrike to treat for the release of Byzantine prisoners. His *History of the Manicheans* is dedicated to the archbishop of Bulgaria, whither the Paulicians were sending missionaries. Zigabenus (*c.* 1100), in his *Panoplia*, uses beside Esc. an independent source.

The Paulicians were, according to Esc., Manicheans, so called after Paul of Samosata (*q.v.*), son of a Manichean woman Callinicē. She sent him and her other son John to Armenia as missionaries, and they settled at the village of Episparis, or "seedplot," in Phanarea. One Constantine, however, of Mananali, a canton on the western Euphrates 60–70 m. west of Erzerūm, was regarded by the Paulicians as their real founder. He based his teaching on the Gospels and the Epistles of Paul, repudiating other scriptures; and taking the Pauline name of Silvanus, organized churches in Castrum Colonias and Cibossa, which he called Macedonia, after Paul's congregation of that

[1] In the Armenian *Letterbook of the Patriarchs* (Tiflis, 1901), p. 73.

[2] *Opera* (Venetiae, 1834), p. 89.

name. His successors were Simeon, called Titus; Gegnesius, an Armenian, called Timotheus; Joseph, called Epaphroditus; Zachariah, rejected by some; Baanes, accused of immoral teaching; lastly Sergius, called Tychicus. As Cibossa, so their other congregations were renamed, Mananali as Achaea, Argaeum and Cynoschôra as Colossae, Mopsuestia as Ephesus, and so on.

Photius and Petrus Siculus supply a few dates and events. Constantine was martyred 684 by Simeon whom Constantine Pogonatus had sent to repress the movement. His victim's death so impressed him that he was converted, became head of the sect, and was martyred in 690 by Justinian II. About 702 Paul the Armenian, who had fled to Episparis, became head of the church. His son Gegnesius in 722 was taken to Constantinople, where he won over to his opinions the iconoclast emperor, Leo the Isaurian. He died in 745, and was succeeded by Joseph, who evangelized Phrygia and died near Antioch of Pisidia in 775. In 752 Constantine V. transplanted many Paulicians from Germanicia, Doliché, Melitene, and Theodosiupolis (Erzerūm), to Thrace, to defend the empire from Bulgarians and Sclavonians. Early in the 9th century Sergius, greatest of the leaders, profiting by the tolerance of the emperor Nicephorus, began that ministry which, in one of the epistles canonized by the sect, but lost, he describes thus: "I have run from east to west, and from north to south, till my knees were weary, preaching the gospel of Christ." The iconoclast emperor Leo V., an Armenian, persecuted the sect afresh, and provoked a rising at Cynoschōra, whence many fled into Saracen territory to Argaeum near Melitene. For the next 50 years they continued to raid the Byzantine empire, although Sergius condemned retaliation. The empress Theodora (842–857) hung, crucified, beheaded or drowned some 100,000 of them, and drove yet more over the frontier, where from Argaeum, Amara, Tephriké and other strongholds their generals Karbeas and Chrysocheir harried the empire, until 873, when the emperor Basil slew Chrysocheir and took Tephriké.

Their sect however continued to spread in Bulgaria, where in 969 John Zimiskes settled a new colony of them at Philippopolis. Here Frederick Barbarossa found them in strength in 1189. In Armenia they reformed their ranks about 821 at Thonrak (Tendarek) near Diadin, and were numerous all along the eastern Euphrates and in Albania. In this region Smbat, of the great Bagraduni clan, reorganized their Church, and was succeeded during a space of 170 or 200 years by seven leaders, enumerated by the Armenian Grigor Magistros, who as duke of Mesopotamia under Constantine Monomachos harried them about 1140. Fifty years later they were numerous in Syria and Cilicia, according to the Armenian bishops Nerses the Graceful and Nerses of Lambron. In the 10th century Gregory of Narek wrote against them in Armenian, and in the 11th Aristaces of Lastivert and Paul of Taron in the same tongue. During these later centuries their propaganda embraced all Armenia. The crusaders found them everywhere in Syria and Palestine, and corrupted their name to Publicani, under which name, often absurdly conjoined with Sadducaei, we find them during the ages following the crusades scattered all over Europe. After 1200 we can find no notice of them in Armenian writers until the 18th century, when they reappear in their old haunts. In 1828 a colony of them settled in Russian Armenia, bringing with them a book called the *Key of Truth*, which contains their rites of name-giving, baptism and election, compiled from old MSS.,[1] we know not when.

Regarding Paulician beliefs we have little except hostile evidence, which needs sifting. Esc. gives these particulars:—

1. They anathematized Mani, yet were dualists and affirmed two principles—one the heavenly Father, who rules not this world but the world to come; the other an evil demiurge, lord and god of this world, who made all flesh. The good god created angels only. The Romans (*i.e.* the Byzantines) erred in confusing these two first principles. Similarly the Armenian writer Gregory Magistros (*c.* 1040) accuses the Thonraki of teaching that "Moses saw not God, but the devil," and infers thence that they held Satan to be creator of heaven and earth, as well as of mankind. The *Key of Truth* teaches that after the fall Adam and Eve and their children were slaves of Satan until the advent of the newly created Adam, Jesus Christ. Except Gregory Magistros none of the Armenian sources lays stress on the dualism of the Paulicians. John IV. does not hint at it.

2. They blasphemed the Virgin, allegorizing her as the upper Jerusalem in which the Lord came in and went out, and denying that he was really made flesh of her. John IV. records that in the orthodox Armenian Church of the 7th century many held Christ to have been made flesh *in*, but not *of*, the Virgin; and Armenian hymns call the Virgin mother church at once Theotokos and heavenly Jerusalem. It is practically certain that Paulicians held this view.

3. They allegorized the Eucharist and explained away the bread and wine of which Jesus said to His apostles, "Take, eat and drink," as mere words of Christ, and denied that we ought to offer bread and wine as a sacrifice.

Such allegorization meets us already in Origen, Eusebius and other early fathers, and is quite compatible with that use of a material Eucharist which Nerses II. attests among the Paulicians of the early 6th century, and for which the *Key of Truth* provides a form. The Thonraki, according to Gregory Magistros, held that "Jesus in the evening meal, spoke not of an offering of the mass, but of every table." We infer that the Paulicians merely rejected the Eucharistic rites and doctrine of the Greeks. According to Gregory Magistros the Thonraki would say: "We are no worshippers of matter, but of God; we reckon the cross and the church and the priestly robes and the sacrifice of mass all for nothing, and only lay stress on the inner sense."

4. They assailed the cross, saying that Christ is cross, and that we ought not to worship the tree, because it is a cursed instrument. John IV. and other Armenian writers report the same of the Armenian Paulicians or Thonraki, and add that they smashed up crosses when they could.

5. They repudiated Peter, calling him a denier of Christ, and would not accept his repentance and tears.[2] So Gregory

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[1] That this is so, is proved by the presence of a doublet in the text of the rite of baptism, the words "But the penitent" on p. 96, as far as "over the person baptized" on p. 97, repeating in substance the words "Next the elect one" on p. 97 to "am well-pleased" on p. 98. This rite therefore was compiled from at least two earlier MSS. In the colophon also the compiler (as he calls himself) excuses the errors of orthography and grammar on the ground that they are not due to himself but to earlier and ignorant copyists. The division (often inept) of the text into chapters, the references to chapter and verse of a printed N.T., and sundry pious stanzas which interrupt the context, are due to a later editor, perhaps to the copyist of the existing text of 1782. The controversial introduction is later than the Crusades; but the rituals, as far as the language is concerned, may belong to the remote age which alone suits the adoptionist Christology of the prayers.

[2] In a fragmentary Syriac homily by Mar Jochanis, found in a Sinai MS. written not later than the 10th century and edited by J. F. Stenning and F. C. Burkitt, *Anecdota oxon.* (Clarendon Press, 1896), the same hostility to Peter is expressed. Compare the following passages: "O Petros, thou wast convicted of fault by Paulos thy colleague. How do men say that upon Petros I have built the church? . . .

"The Lord said not to him, upon thee I build the church, but he said, upon this rock (the which is the body wherewith the Lord was clothed) I build my church. . . . Behold, I have made thee know from the N.T. that that rock was the Messiah. . . .

"O Petros, after that thou didst receive the keys of heaven, and the Lord was seen by thee after he rose from the dead, thou didst let go of the keys, and thy wage is agreed with thy master when thou saidst to him, Behold we have let go of everything and have come after thee. What then shall be to us? And the Lord said to him, Ye shall be sitting on twelve thrones and judging the tribes of Israel. And after all these signs, O Petros, thou wentest away again to the former catching of fish. Wast thou ashamed of me, O Petros?"

Yet the same homilist "concerning the one who is made a priest," writes thus: "Lo, thou seest the priest of the people, with what care the Lord instructed Peter! He said not to him once and stopped, but three times, Feed my sheep." The Syriac text is rendered from a Greek original of unknown age, which from its complete correspondence with the *Key of Truth* may be judged to have been a Paulician writing.

Magistros reports the Thonraki as saying, "We love Paul and excrecrate Peter." But in the *Key of Truth* there is little trace of extreme hostility to Peter. It merely warns us that *all* the apostles constitute the Church universal and not Peter alone; and in the rite of election, *i.e.* of laying on of hands and reception of the Spirit, the reader who is being elected assumes the ritual name of Peter. An identical rite existed among the 12th century Cathars (*q.v.*), and in the Celtic church of Gildas every presbyter was a Peter.

6. The monkish garb was revealed by Satan to Peter at the baptism, when it was the devil, the ruler of this world, who, so costumed, leaned forward and said, This is my beloved son. The same hatred of monkery characterized the Thonraki and inspires the *Key of Truth*. The other statements are nowhere echoed.

7. They called their meetings the Catholic Church, and the places they met in places of prayer, *προσευχαί*. The Thonraki equally denied the name of church to buildings of wood or stone, and called themselves the Catholic Church.

8. They explained away baptisms as "words of the Holy Gospel," citing the text "I am the living water." So the Thonraki taught that the baptismal water of the Church was "mere bath-water," *i.e.* they denied it the character of a reserved sacrament. But there is no evidence that they eschewed water-baptism. The modern Thonraki baptize in rivers, and in the 11th century when Gregory asked them why they did not allow themselves to be baptized, they answered: "Ye do not understand the mystery of baptism; we are in no hurry to be baptized, for baptism is death." They no doubt deferred the baptism which is death to sin, perhaps because, like the Cathars, they held post-baptismal sin to be unforgivable.

9. They permitted external conformity with the dominant Church, and held that Christ would forgive it. The same trait is reported of the Thonraki and of the real Manicheans.

10. They rejected the orders of the Church, and had only two grades of clergy, namely, associate itinerants (*συνέκδημοι*, Acts xix. 29) and copyists (*νοτάριοι*). A class of *Astati* (*ἄστατοι*) is also mentioned by Photius, i. 24, whom Neander regards as elect disciples of Sergius. They called their four original founders apostles and prophets—titles given also in the *Key of Truth* to the elect one. The *Synecdemi* and *Notarii* dressed like other people; the Thonraki also scorned priestly vestments.

11. Their canon included only the "Gospel and Apostle," of which they respected the text, but distorted the meaning. Gregory Magistros, as we have seen, attests their predilection for the apostle Paul, and speaks of their perpetually "quoting the Gospel and the Apostolon." These statements do not warrant us in supposing that they rejected 1 and 2 Peter, though other Greek sources allege it. The "Gospel and Apostle" was a comprehensive term for the whole of the New Testament (except perhaps Revelation), as read in church.

13. Their Christology was as follows: God out of love for mankind called up an angel and communicated to him his desire and counsel; then he bade him go down to earth and be born of woman. . . . And he bestowed on the angel so commissioned the title of Son, and foretold for him insults, blasphemies, sufferings and crucifixion. Then the angel undertook to do what was enjoined, but God added to the sufferings also death. However, the angel, on hearing of the resurrection, cast away fear and accepted death as well; and came down and was born of Mary, and named himself son of God according to the grace given him from God; and he fulfilled all the command, and was crucified and buried, rose again and was taken up into heaven. Christ was only a creature (*κτίσμα*), and obtained the title of Christ the Son of God in the reign of Octavius Caesar by way of grace and remuneration for fulfilment of the command.

The scheme of salvation here set forth recurs among the Latin Cathars. It resembles that of the *Key of Truth*, in so far as Jesus is Christ and Son of God by way of grace and reward for faithful fulfilment of God's command. But the *Key* lays more stress on the baptism. "Then, it says, he became Saviour of us sinners, then he was filled with the Godhead; then he was sealed, then anointed; then was he called by the voice, then he became the loved one." In this scheme therefore the Baptism occupies the same place which the Birth does in the other, but both are adoptionist.

The main difference then between the Greek and Armenian accounts of the Paulicians is that the former make more of their dualism. Yet this did not probably go beyond the dualism of the New Testament itself. They made the most of Paul's antithesis between law and grace, bondage to Satan and freedom of the Spirit. Jesus was a new Adam and a fresh beginning, in so far as he was made flesh in and not of his mother, to whom, as both Esc. and the *Key* insist, Jesus particularly denied blessedness and honour (Mark iii. 31-35), limiting true kinship with himself to those who shall do the will of God. The account of Christ's flesh is torn out of the *Key*, but it is affirmed that it was at the baptism that "he put on that primal raiment of light which Adam lost in the garden." And this view we also meet with in Armenian fathers accounted orthodox.

The Armenian fathers held that Jesus, unlike other men, possessed incorruptible flesh, made of ethereal fire, and so far they shared the main heresy of the Paulicians. In many of their homilies Christ's baptism is also regarded as his regeneration by water and spirit, and this view almost transcends the modest adoptionism of the Thonraki as revealed in the *Key of Truth*.

What was the origin of the name Paulician? The word is of Armenian formation and signifies a son of Paulik or of little Paul; the termination *-ik* must here have originally expressed scorn and contempt. Who then was this Paul? "Paulicians from a certain Paul of Samosata," says Esc. "Here then you see the Paulicians, who got their poison from Paul of Samosata," says Gregory Magistros. They were thus identified with the old party of the *Pauliani*, condemned at the first council of Nice in 325, and diffused in Syria a century later. They called themselves the Apostolic Catholic Church, but hearing themselves nicknamed Paulicians by their enemies, probably interpreted the name in the sense of "followers of St Paul." Certain features of Paulicianism noted by Photius and Petrus Siculus are omitted in Esc. One of these is the Christhood of the fully initiated, who as such ceased to be mere "hearers" (*audientes*) and themselves became vehicles of the Holy Spirit. As Jesus anointed by the Spirit became the Christ, so they became christs. So Gregory of Narck upbraids the Thonraki for their "anthropolatrous apostasy, their self-conferred contemptible priesthood which is a likening of themselves to Satan" (=Christ in Thonraki parlance). And he repeats the taunt which the Arab Emir addressed to Smbat their leader, as he led him to execution: "If Christ rose on the third day, then since you call yourself Christ, I will slay you and bury you; and if you shall come to life again after thirty days, then I will know you are Christ, even though you take so many days over your resurrection." Similarly (in a 10th-century form of renunciation of Bogomil error preserved in a Vienna codex[1]) we hear of Peter "the founder of the heresy of the Messalians or Lycopetrians or Fundaitae and Bogomils who called himself Christ and promised to rise again after death." Of this Peter, Tychichus (? Sergius) is reported in the same document to have been fellow initiate and disciple.

Because they regarded their Perfect or Elect ones as Christs and anointed with the Spirit, the medieval Cathars regularly adored them. So it was with Celtic saints, and Adamnan, in his life of St Columba, i. 37, tells how the brethren after listening to St Baithene, "still kneeling, with joy unspeakable, and with hands spread out to heaven, venerated Christ in the holy and blessed man." So in ch. 44 of the same book we read how a humble stranger "worshipped Christ in the holy man" (*i.e.* St Columba); but such veneration was due to every presbyter. In 1837 we read of how an elect one of the Thonraki sect in Russian Armenia addressed his followers thus: "Lo, I am the cross: on my two hands light tapers, and give me adoration. For I am able to give you salvation, as much as the cross and the saints"; and by the light of this we ought perhaps to interpret section ix. of Esc. "They blaspheme the precious cross, saying that the Christ is a cross." The Christ is an elect one, who, as the Cathars (*q.v.*) put it, having been consoled or become a Paraclete in the flesh, stands in prayer with his hands outspread in the form of a cross, while the congregation of hearers or *audientes* adore the Christ in him. The same idea that the perfect ones are christs as having received the Paraclete is met with in early Christian documents, and still survives among the Syriac-speaking shepherds on the hills north of Mardin. These have their christs, and Dr E. A. Wallis Budge, to whom the present writer owes his information, was shown the stream in which their last christ had been baptized. In modern Russia also survives a sect of Bogomils called *Christowschtschina*,[1] because one member of it is adored by the rest as Christ. It was because they believed themselves to have living christs among them that the Paulicians rejected the fetish worship of a material cross, in which orthodox Armenian priests imagined they had by prayers and anointings confined the Spirit of Christ. It is also likely enough that they did not consider sensible matter to be a vehicle worthy to contain divine effluence and holy virtues, and knew that such rites were alien to early Christianity. The former scruple, however, was not confined to Paulicians, for it inspires the answer made by Eusebius, bishop of Thessalonica, to the emperor Maurice, when the latter asked to have relics sent to him of Demetrius the patron saint of that city. It runs thus: "While informing your Reverence of the faith of the Thessalonicans and of the miracles wrought among them, I must yet, in respect of this request of yours, remark that the faith of the city is not of such a kind as that the people desire to worship God and to honour his saints by means of anything sensible. For they have received the faith from the Lord's holy testimonies, to the effect that God is a spirit, and that those who worship him must worship him in spirit and in truth."[2] Manicheans, Bogomils, Cathars and Paulicians for like reasons denied the name of church to material constructions of wood and stone. Among the later Cathars of Europe we find the repudiation of marriage defended on the ground that the only true marriage is of Christ with his bride the Virgin church, and perhaps this is why Paulicians and Thonraki would not make of marriage a religious rite or sacrament.

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[1] Cod. theol. gr. 306, fol. 32, edited by Thallóczy, in *Wissensch. Mittheil. aus Bosnien* (Vienna, 1895).

Did the Paulicians, like the later Cathars (who in so much resembled them), reject water baptism? And must we so interpret clause ix. of Esc? Perhaps they merely rejected the idea that the *numen* or divine grace can be confined by priestly consecration in water and by mere washing be imparted to persons baptized. The *Key of Truth* regards the water as a washing of the body, and sees in the rite no *opus operatum*, but an essentially spiritual rite in which "the king releases certain rulers[3] from the prison of sin, the Son calls them to himself and comforts them with great words, and the Holy Spirit of the king forthwith comes and crowns them, and dwells in them for ever." For this reason the Thonraki adhere to adult baptism, which in ancient wise they confer at thirty years of age or later, and have retained in its primitive significance the rite of giving a Christian name to a child on the eighth day from birth. It is hardly likely that the Thonraki of the 10th century would have rejected water-baptism and yet have retained unction with holy oil; this Gregory Magistros attests they did, but he is an unreliable witness.

It is then on the whole probable that the Paulicians who appear in Armenian records as early as 550, and were afterwards called Thonraki, by the Greeks by the Armenian name *Paulikiani*, were the remains of a primitive adoptionist Christianity, widely dispersed in the east and already condemned under the name of *Pauliani* by the council of Nice in 325. A renegade Armenian Catholicos of the 7th century named Isaac has preserved to us a document which sums up their tenets.[4] He adduces it as a sort of *reductio ad absurdum* of Christians who would model life and cult on Christ and his apostles, unencumbered by later church traditions. It runs thus: (1) Christ was thirty years old when he was baptized. Therefore they baptize no one until he is thirty years of age. (2) Christ, after baptism, was not anointed with myrrh nor with holy oil, therefore let them not be anointed with myrrh or holy oil. (3) Christ was not baptized in a font, but in a river. Therefore, let them not be baptized in a font. (4) Christ, when he was about to be baptized, did not recite the creed of the 318 fathers of Nice, therefore shall they not make profession of it. (5) Christ when about to be baptized, was not first made to turn to the west and renounce the devil and blow upon him, nor again to turn to the east and make a compact with God. For he was himself true God. So let them not impose these things on those to be baptized. (6) Christ, after he had been baptized, did not partake of his own body. Nor let them so partake of it. (7) Christ, after he was baptized, fasted 40 days and only that; and for 120 years such was the tradition which prevailed in the Church. We, however, fast 50 days before Pascha. (8) Christ did not hand down to us the teaching to celebrate the mystery of the offering of bread in church, but in an ordinary house and sitting at a common table. So then let them not offer the sacrifice of bread in churches. (9) It was after supper, when his disciples were sated, that Christ gave them to eat of his own body. Therefore let them first eat meats and be sated, and then let them partake of the mysteries. (10) Christ, although he was crucified for us, yet did not command us to adore the cross, as the Gospel testifies. Let them therefore not adore the cross. (11) The cross was of wood. Let them therefore not adore a cross of gold or silver or bronze or stone. (12) Christ wore neither humeral nor amice nor maniple nor stole nor chasuble. Therefore let them not wear these garments. (13) Christ did not institute the prayers of the liturgy or the Holy Epiphanies, and all the other prayers for every action and every hour. Let them therefore not repeat them, nor be hallowed by such prayers. (14) Christ did not lay hands on patriarchs and metropolitans and bishops and presbyters and deacons and monks, nor ordain their several prayers. Let them therefore not be ordained nor blessed with these prayers. (15) Christ did not enjoin the building of churches and the furnishing of holy tables, and their anointing with myrrh and hallowing with a myriad of prayers. Let them not do it either. (16) Christ did not fast on the fourth day of the week and on the *Paraskevê*. Let them not fast either. (17) Christ did not bid us pray towards the east. Neither shall they pray towards the east.

Literature.—Beside the works mentioned in the text see J. C. L. Gieseler. *Ecclesiastical History*, ii. 208 (Edinburgh, 1848) and "Untersuchungen über die Geschichte der Paulicianer" in *Theol. Studien u. Kritiken*, *Heft* I. s. 79 (Jahrg., 1829); Neander, *Ecclesiastical History*, vols. v. and vi.; Moshcim's *Ecclesiastical History*, Century IX. ii. 5; G. Finlay, *History of Greece*, vols. ii. and iii.; Gibbon, *History of the Decline and Fall of the Roman Empire*, ch. liv.; Ign. von Döllinger, *Sektengeschichte des Mittelalters*, chs. i.–iii.; Karapet Ter-Mkhrttschian, *Die Paulikianer* (Leipzig, 1893); Aršak Ter Mikelian, *Die armenische Kirche* (Leipzig, 1892); Basil Sarkisean, *A Study of the Manicheo-Paulician Heresy of the Thonraki* (Venice, San Lazaro, 1893, in Armenian); F. C. Conybeare, *The Key of Truth* (Oxford, 1898). (F. C. C.)

PAULINUS, SAINT, of Nola (353–431). Pontius Meropius Anicius Paulinus, who was successively a consul, a monk and a bishop, was born at Bordeaux in A.D. 353. His father, *praefectus praetorio* in Gaul, was a man of great wealth, who entrusted his son's education, with the best of results, to Ausonius. In 378 Paulinus was raised to the rank of *consul suffectus*, and in the following year he appears to have been sent as *consularis* into Campania. It was at this period, while present at a festival of St Felix of Nola, that he entered upon his lifelong devotion to the cult of that saint. He had married a wealthy Spanish lady named Therasia; this happy union was clouded by the death in infancy of their only child—a bereavement which, combined with the many disasters by which the empire was being visited, did much to foster in them that world-weariness to which they afterwards gave such emphatic expression. From Campania Paulinus returned to his native place and came into correspondence or personal intimacy with men like Martin of Tours and Ambrose of Milan, and ultimately (about 389) he was formally received into the church by bishop Delphinus of Bordeaux, whence shortly afterwards he withdrew with his wife beyond the Pyrenees. The asceticism of Paulinus and his liberality towards the poor soon brought him into great repute; and while he was spending Christmas at Barcelona the people insisted on his being forthwith ordained to the priesthood. The irregularity of this step, however, was resented by many of the clergy, and the occurrence is still passed lightly over by his Roman Catholic panegyrists. In the following year he went into Italy, and after visiting Ambrose at Milan and Siricius at Rome—the latter of whom received him somewhat coldly—he proceeded into Campania, where, in the neighbourhood of Nola, he settled among the rude structures which he had caused to be built around the tomb and relics of his patron saint. With Therasia (now a sister, not a wife), while leading a life of rigid asceticism, he devoted the whole of his vast wealth to the entertainment of needy pilgrims, to payment of the debts of the insolvent, and to public works of utility or ornament; besides building basilicas at Fondi and Nola, he provided the latter place with a much-needed aqueduct. At the next vacancy, not later than 409, he succeeded to the bishopric of Nola, and this office he held with ever-increasing honour until his death, which occurred shortly after that of Augustine, whose friend he was, in 431. He is commemorated by the Church of Rome on the 22nd of June.

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[1] "dass einer der Sektierer von den andern als Christus verehrt werde," K. K. Grass, *Die russischen Sekten* (Leipzig, 1906), Bd. 1, Lief. 3.

[2] From *Monuments of Early Christianity*, by F. C. Conybeare (London, 1894), p. 349.

[3] The term "rulers" appears to be derived from Manichean speculation, or from the same cycle of myth which is reflected in 1 Cor. ii. 6, 8. The title "elect one," used by the Armenian Paulicians also has a Manichean ring. It may be that under stress of common persecution there was a certain fusion in Armenia of Pauliani and Manicheans. The writings and tenets of Mani were widely diffused there. Such a fusion is probably reflected in the *Key of Truth*.

[4] See Fr. Combefis, *Historia heretiae monothelitarum* col. 317 (Paris, 1648), col. 317. In the printed text this document, entitled *An Invective Against the Armenians*, is dated 800 years after Constantine, but the author Isaac Catholicos almost certainly belonged to the earlier time.

The extant writings of Paulinus consist of some fifty *Epistolae*, addressed to Sulpicius Severus, Delphinus, Augustine, Jerome and others; thirty-two *Carmina* in a great variety of metre, including a series of hexameter "natales," begun about 393 and continued annually in honour of the festival of St Felix, metrical epistles to Ausonius and Gestidius, and paraphrases of three psalms; and a *Passio S. Genesii.* They reveal to us a kindly and cheerful soul, well versed in the literary accomplishments of the period, but without any strength of intellectual grasp and peculiarly prone to superstition.

His works were edited by Rosweyde and Fronton le Duc in 1622 (Antwerp, 8vo), and their text was reprinted in the *Bibl. max. patr.* (1677). The next editor was Le Brun des Marettes (2 vols. 4to, Paris, 1685), whose text was reproduced in substance by Muratori (Verona, 1736), and reprinted by Migne. The poems and letters are edited in the Vienna *Corpus script. eccl. lat.* vol. xxviii. See also P. Reinelt, *Studien über die Briefe d. h. Paulin von Nola* Breslau, 1904) and other literature cited in Herzog-Hauck, *Realencyk. für prot. Theol.* vol. xv.

PAULINUS (d. 644), first bishop of the Northumbrians and archbishop of York, was sent to England by Pope Gregory I. in 601 to assist Augustine in his mission. He was consecrated by Justus of Canterbury in 625 and escorted Æthelberg, daughter of Æthelberht, to the Northumbrian king Edwin (*q.v.*). In 627 Edwin was baptized and assigned York to Paulinus as his see. It was at Lincoln that he consecrated Honorius as archbishop of Canterbury. In 633 Edwin was slain at Hatfield Chase and Paulinus retired to Kent, where he became bishop of Rochester. The pallium was not sent him until 634, when he had withdrawn from his province. He died in 644.

See Bede, *Historia ecclesiastica* (ed. C. Plummer, Oxford, 1896).

PAULINUS, GAIUS SUETONIUS (1st century A.D.), Roman general. In 42, during the reign of Claudius, he put down a revolt in Mauretania, and was the first of the Romans to cross the Atlas range. He subsequently wrote an account of his experiences. From 59–62 he commanded in Britain, and, after a severe defeat, finally crushed the Iceni under Boadicea (Boudicca). A complaint having been made to the emperor that he was needlessly protracting hostilities, he was recalled, but he was consul (for the second time) in 66. During the civil war he fought on the side of Otho against Vitellius, and obtained a considerable success against Aulus Caecina Alienus (one of the Vitellian generals) near Cremona, but did not follow it up. When Caecina had been joined by Fabius Valens, Paulinus advised his colleagues not to risk a decisive battle, but his advice was disregarded, and Otho (*q.v.*) was utterly defeated at Bedriacum. After Vitellius had been proclaimed emperor, Paulinus asserted that it was in consequence of his own treachery that Otho's army had been defeated. Vitellius pretended to believe this, and eventually pardoned Paulinus, after which nothing further is heard of him.

See Dio Cassius lxii. 7–12; Tacitus, *Annals*, xiv. 30–39, *Histories*, i. 87, 90, ii. 23–41, 44, 60; Pliny, *Nat. Hist.* v. 1; Plutarch, *Otho.* 7, 8.

PAULSEN, FRIEDRICH (1846–1908), German philosopher and educationalist, was born at Langenhorn (Schleswig) and educated at Erlangen, Bonn and Berlin, where he became extraordinary professor of philosophy and pedagogy in 1878. In 1896 he succeeded Eduard Zeller as professor of moral philosophy at Berlin. He died on the 14th of August 1908. He was the greatest of the pupils of G. T. Fechner, to whose doctrine of panpsychism he gave great prominence by his *Einleitung in die Philosophie* (1892; 7th ed., 1900; Eng. trans., 1895). He went, however, considerably beyond Fechner in attempting to give an epistemological account of our knowledge of the psychophysical. Admitting Kant's hypothesis that by inner sense we are conscious of mental states only, he holds that this consciousness constitutes a knowledge of the "thing-in-itself"—which Kant denies. Soul is, therefore, a practical reality which Paulsen, with Schopenhauer, regards as known by the act of "will." But this "will" is neither rational desire, unconscious irrational will, nor conscious intelligent will, but an instinct, a "will to live" (*Zielstrebigkeit*), often subconscious, pursuing ends, indeed, but without reasoning as to means. This conception of will, though consistent and convenient to the main thesis, must be rigidly distinguished from the ordinary significance of will, *i.e.* rational desire. Paulsen is almost better known for his educational writings than as a pure philosopher. His *German Education, Past and Present* (Eng. trans., by I. Lorenz, 1907) is a work of great value.

Among his other works are: *Versuch einer Entwickelunggeschichte d. Kantischen Erkenntnistheorie* (Leipzig, 1875); *Im. Kant* (1898, 1899); "Gründung Organization und Lebensordnungen der deutschen Universitären im Mittelalter" (in Sybel's *Histor. Zeitschr.* vol. xlv. 1881); *Gesch. d. gelehrten Unterrichts auf d. deutschen Schulen und Universitäten* (1885, 1896); *System der Ethik* (1889, 1899; Eng. trans. [partial] 1899); *Das Realgymnasium u. d. humanist. Bildung* (1889); *Kant d. Philos. d. Protestantismus* (1899); *Schopenhauer, Hamlet u. Mephistopheles* (1900); *Philosophia militans* (1900, 1901); *Parteipolitik u. Moral* (1900).

PAULUS, HEINRICH EBERHARD GOTTLOB (1761–1851), German rationalistic theologian, was born at Leonberg, near Stuttgart, on the 1st of September 1761. His father, a Lutheran clergyman at Leonberg, dabbled in spiritualism, and was deprived of his living in 1771. Paulus was educated in the seminary at Tübingen, was three years master in a German school, and then spent two years in travelling through England, Germany, Holland and France. In 1789 he was chosen professor ordinarius of Oriental languages at Jena. Here he lived in close intercourse with Schiller, Goethe, Herder and the most distinguished literary men of the time. In 1793 he succeeded Johann Christoph Döderlein (1745–1792) as professor of exegetical theology. His special work was the exposition of the Old and New Testaments in the light of his great Oriental learning and according to his characteristic principle of "natural explanation." In his explanation of the Gospel narratives Paulus sought to remove what other interpreters regarded as miracles from the Bible by distinguishing between the *fact* related and the author's *opinion* of it, by seeking a naturalistic exegesis of a narrative, *e.g.* that ἐπὶ τῆς θαλάσσης (Matt. xiv. 25) means *by the shore* and not *on the sea*, by supplying circumstances omitted by the author, by remembering that the author produces as miracles occurrences which can now be explained otherwise, *e.g.* exorcisms. His *Life of Jesus* (1828) is a synoptical translation of the Gospels, prefaced by an account of the preparation for the Christ and a brief summary of His history, and accompanied by very short explanations interwoven in the translation. The form of the work was fatal to its success, and the subsequent *Exegetisches Handbuch* rendered it quite superfluous. In this *Handbuch* Paulus really contributed much to a true interpretation of the Gospel narratives. In 1803 he became professor of theology and *Consistorialrat* at Würzburg. After this he filled various posts in south Germany—school director at Bamberg (1807), Nuremberg (1808), Ansbach (1810)—until he became professor of exegesis and church history at Heidelberg (1811–1844). He died on the 10th of August 1851.

His chief exegetical works are his *Philologisch-kritischer und historischer Kommentar über das Neue Testament* (4 vols., 1800–1804); *Philologischer Clavis über die Psalmen* (1791); and *Philologischer Clavis über Jesaias* (1793); and particularly his *Exegetisches Handbuch über die drei ersten Evangelien* (3 vols., 1830–1833; 2nd ed., 1841–1842). He also edited a collected small edition of Baruch Spinoza's works (1802–1803), a collection of the most noted Eastern travels (1792–1803), F. W. J. Schelling's *Vorlesungen über die Offenbarung* (1843), and published *Skizzen aus meiner Bildungs- und Lebensgeschichte* (1839). See Karl Reichlin-Meldegg, *H. E. G. Paulus und seine Zeit* (1853), and article in Herzog-Hauck, *Realencyklopädie*; cf. F. Lichtenberger, *History of German Theology in the Nineteenth Century*, pp. 21–24.

PAULUS (older form PAULLUS), **LUCIUS AEMILIUS,** surnamed MACEDONICUS (*c.* 229–160 B.C.), Roman general, a member of a patrician family of the Aemilian gens, son of the consul of the same name who fell at Cannae. As consul for the second time (168) he was entrusted with the command in the Macedonian War, which the incapacity of previous generals had allowed to drag on for three years. He brought the war to a speedy termination by the battle of Pydna, fought on the 22nd of June (Julian calendar) 168. Macedonia was henceforward a Roman province, and Paulus, having made a tour through Greece, with the assistance of ten Roman commissioners arranged the affairs of the country. He enjoyed a magnificent triumph, which lasted three days and was graced by the presence of the captive king Perseus and his three children. He lost his two sons by his second wife, and was thus left without a son to bear his name, his two sons by his first wife having been adopted into the Fabian and Cornelian gentes. Paulus was censor in 164, and died in 160 after a long illness. At the funeral games exhibited in his honour the *Hecyra* of Terence was acted for the second and the *Adelphi* for the first time. An aristocrat to the backbone, he was yet beloved by the people. Of the vast sums brought by him into the Roman treasury from Spain and Macedonia he kept nothing to himself, and at his death his property scarcely sufficed to pay his wife's dowry. As a general he was a strict disciplinarian; as an augur he discharged his duties with care and exactness. He was greatly in sympathy with Greek learning and art, and was a friend of the historian Polybius.

See Plutarch, *Aemilius Paulus*; Livy xliv. 17–xlvi. 41; Polybius xxix.–xxxii.

PAULUS, surnamed SILENTIARIUS ("the silentiary," one of the ushers appointed to maintain silence within the imperial palace), Greek poet, contemporary and friend of Agathias, during the reign of Justinian. In addition to some 80 epigrams, chiefly erotic and panegyric in character, preserved in the Greek Anthology, there is extant by him a description (ἔκφρασις) of the church of St Sophia, and of its pulpit (ἄμβων), in all some 1300 hexameters after the style of Nonnus, with short iambic dedications to Justinian. The poem was recited at the second dedication of the church (A.D. 562), in the episcopal hall of the patriarchate. The poems are of importance for the history of Byzantine art in the 6th century. Another poem (also preserved in the Anthology) on the warm baths of Pythia in Bithynia, written in the Anacreontic rhythm, has sometimes been attributed to him.

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PAULUS DIACONUS, or WARNEFRIDI, or CASINENSIS (*c.* 720–*c.* 800), the historian of the Lombards, belonged to a noble Lombard family and flourished in the 8th century. An ancestor named Leupichis entered Italy in the train of Alboin and received lands at or near Forum Julii (Friuli). During an invasion the Avars swept off the five sons of this warrior into Illyria, but one, his namesake, returned to Italy and restored the ruined fortunes of his house. The grandson of the younger Leupichis was Warnefrid, who by his wife Theodelinda became the father of Paulus. Born between 720 and 725 Paulus received an exceptionally good education, probably at the court of the Lombard king Ratchis in Pavia, learning from a teacher named Flavian the rudiments of Greek. It is probable that he was secretary to the Lombard king Desiderius, the successor of Ratchis; it is certain that this king's daughter Adelperga was his pupil. After Adelperga had married Arichis, duke of Benevento, Paulus at her request wrote his continuation of Eutropius. It is possible that he took refuge at Benevento when Pavia was taken by Charlemagne in 774, but it is much more likely that his residence there was anterior to this event by several years. Soon he entered a monastery on the lake of Como, and before 782 he had become an inmate of the great Benedictine house of Monte Cassino, where he made the acquaintance of Charlemagne. About 776 his brother Arichis had been carried as a prisoner to France, and when five years later the Frankish king visited Rome, Paulus successfully wrote to him on behalf of the captive. His literary attainments attracted the notice of Charlemagne, and Paulus became a potent factor in the Carolingian renaissance. In 787 he returned to Italy and to Monte Cassino, where he died on the 13th of April in one of the years between 794 and 800. His surname Diaconus, or Levita, shows that he took orders as a deacon; and some think he was a monk before the fall of the Lombard kingdom.

The chief work of Paulus is his *Historia gentis Langobardorum*. This incomplete history in six books was written after 787 and deals with the story of the Lombards from 568 to the death of King Liutprand in 747. The story is told from the point of view of a Lombard patriot and is especially valuable for the relations between the Franks and the Lombards. Paulus used the document called the *Origo gentis Langobardorum*, the *Liber pontificalis*, the lost history of Secundus of Trent, and the lost annals of Benevento; he made a free use of Bede, Gregory of Tours and Isidore of Seville. In some respects he suggests a comparison with Jordanes, but in learning and literary honesty is greatly the superior of the Goth. Of the *Historia* there are about a hundred manuscripts extant. It was largely used by subsequent writers, was often continued, and was first printed in Paris in 1514. It has been translated into English, German, French and Italian, the English translation being by W. D. Foulke (Philadelphia, 1807), and the German by O. Abel and R. Jacobi (Leipzig, 1878). Among the editions of the Latin the best is that edited by L. Bethmann and G. Waitz, in the *Monumenta Germaniae historica. Scriptores rerum langobardicarum* (Hanover, 1878).

Cognate with this work is Paulus's *Historia romana*, a continuation of the *Breviarium* of Eutropius. This was compiled between 766 and 771, at Benevento. The story runs that Paulus advised Adelperga to read Eutropius. She did so, but complained that this heathen writer said nothing about ecclesiastical affairs and stopped with the accession of the emperor Valens in 364; consequently Paulus interwove extracts from the Scriptures, from the ecclesiastical historians and from other sources with Eutropius, and added six books, thus bringing the history down to 553. This work has little value, although it was very popular during the middle ages. It has been edited by H. Droysen and published in the *Monumenta Germaniae historica. Auctores antiquissimi*, Bd. ii. (1879).

Paulus wrote at the request of Angilram, bishop of Metz (d. 791), a history of the bishops of Metz to 766, the first work of its kind north of the Alps. This *Gesta episcoporum mettensium* is published in Bd. ii. of the *Monumenta Germaniae historica Scriptores*, and has been translated into German (Leipzig, 1880). He also wrote many letters, verses and epitaphs, including those of Duke Arichis and of many members of the Carolingian family. Some of the letters are published with the *Historia Langobardorum* in the *Monumenta*; the poems and epitaphs edited by E. Dümmler will be found in the *Poetae latini aevi carolini*, Bd. i. (Berlin, 1881). Fresh material having come to light, a new edition of the poems (*Die Gedichte des Paulus Diaconus*) has been edited by Karl Neff (Munich, 1908). While in France Paulus was requested by Charlemagne to compile a collection of homilies. He executed this after his return to Monte Cassino, and it was largely used in the Frankish churches. A life of Pope Gregory the Great has also been attributed to him.

See C. Cipolla, *Note bibliografiche circa l'odierna condizione degli studi critici sul testo delle opere di Paolo Diacono* (Venice, 1901); the *Atti e memorie del congresso storico tenuto in Cividale* (Udine, 1900); F. Dahn, *Langobardische Studien*, Bd. i. (Leipzig, 1876); W. Wattenbach, *Deutschlands Geschichtsquellen*, Bd. i. (Berlin, 1904); A. Hauck, *Kirchengeschichte Deutschlands*, Bd. ii. (Leipzig, 1898); P. del Giudice, *Studi di storia e diritto* (Milan, 1889); and U. Balzani, *Le Cronache italiane nel medio evo* (Milan, 1884).

PAUL VERONESE (1528–1588), the name ordinarily given to Paolo Caliari, or Cagliari, the latest of the great cycle of painters of the Venetian school, who was born in Verona in 1528 according to Zanetti and others, or in 1532 according to Ridolfi. His father, Gabriele Caliari, a sculptor, began to train Paolo to his own profession. The boy, however, showed more propensity to painting, and was therefore transferred to his uncle, the painter Antonio Badile, whose daughter he eventually married. According to Vasari, he was the pupil of Giovanni Carotto, a painter proficient in architecture and perspective; this statement remains unconfirmed. Paolo, in his early years, applied himself to copying from the engravings of Albert Dürer and the drawings of Parmigiano. He did some work in Verona, but found there little outlet for his abilities, the field being pretty well occupied by Ligozzi, Battista dal Moro, Paolo Farinato, Domenico Riccio, Brusasorci and other artists. Cardinal Ercole Gonzaga took him, when barely twenty years of age, to Mantua, along with the three last-named painters, to execute in the cathedral a picture of the "Temptation of St Anthony"; here Caliari was considered to excel his competitors. Returning to Verona, he found himself exposed to some envy and ill-will. Hence he formed an artistic partnership with Battista Zelotti, and they painted together in the territories of Vicenza and Treviso. Finally Paolo went on to Venice. In this city his first pictures were executed, in 1555, in the sacristy and church of S. Sebastiano, an uncle of his being prior of the monastery. The subjects on the vaulting are taken from the history of Esther; and these excited so much admiration that henceforward Caliari, aged about twenty-eight, ranked almost on a par with Tintoretto, aged about forty-five, or with Titian, who was in his eightieth year. Besides the Esther subjects, these buildings contain his pictures of the "Baptism of Christ," the "Martyrdom of St Marcus and St Marcellinus," the "Martyrdom of St Sebastian," &c. As regards this last-named work, dating towards 1563, there is a vague tradition that Caliari painted it when he had taken refuge in the monastery. He entered into a competition for painting the ceiling of the library of St Mark, and not only obtained the commission but executed it with so much power that his very rivals voted him the golden chain which had been tendered as an honorary distinction. At one time he returned to Verona, and painted the "Banquet in the House of Simon the Pharisee, with Jesus and Mary Magdalene"—a picture now in Turin. In 1560, however, he was in Venice again, working partly in the S. Sebastiano buildings and partly in the ducal palace. He visited Rome in 1563, in the suite of Girolamo Grimani, the Venetian ambassador, and studied the works of Raphael and Michelangelo, and especially the antique. Returning to Venice, he was overwhelmed with commissions. He was compelled to decline an invitation from Philip II. to go to Spain and assist in decorating the Escorial. One of his pictures of this period is the famous "Venice, Queen of the Sea," in the ducal palace. He died in Venice on the 20th (or perhaps 19th) of April 1588, and was buried in the church of S. Sebastiano, a monument being set up to him there by his two sons, Gabriele and Carlo, and his brother, Benedetto, all of them painters.

Beyond his magnificent performances as a painter, the known incidents in the life of Paul Veronese are very few. He was honoured and loved, being kind, amiable, generous and an excellent father. His person is well known from the portraits left by himself and others: he was a dark man, rather good-looking than otherwise, somewhat bald in early middle age, and with nothing to mark an exceptional energy or turn of character In his works the first quality which strikes one is their palatial splendour. The pictorial inspiration is entirely that of the piercing and comprehensive eye and the magical hand—not of the mind. The human form and face are given with decorous comeliness, often with beauty; but of individual apposite expression there is next to none. In fact, Paolo Veronese is pre-eminently a painter working pictorially, and in no wise amenable to a literary or rationalizing standard. He enjoys a sight much as Ariosto enjoys a story, and displays it in form and colour with a zest like that of Ariosto for language and verse. He was supreme in representing, without huddling or confusion, numerous figures in a luminous and diffused atmosphere, while in richness of draperies and transparency of shadows he surpassed all the other Venetians or Italians. In gifts of this kind Rubens alone could be pitted against him. In the moderation of art combined with its profusion he far excelled Rubens; for, dazzling as is the first impression of a great work by Veronese, there is in it, in reality, as much of soberness and serenity as of exuberance. By variety and apposition he produces a most brilliant effect of colour; and yet his hues are seldom bright. He hoards his primary tints and his high lights. He very rarely produced small pictures: the spacious was his element.

Of all Veronese's paintings the one which has obtained the greatest world-wide celebrity is the vast "Marriage at Cana," now in the Louvre. It contains about a hundred and twenty figures or heads—those in the foreground being larger than life. Several of them are portraits. Among the personages specified (some of them probably without sufficient reason) are the Marquis del Vasto, Queen Eleanor of France, Francis I., Queen Mary of England, Sultan Soleyman I., Vittoria Colonna, Charles V., Tintoretto, Titian, the elder Bassano, Benedetto Caliari and Paolo Veronese himself (the figure playing the viol). It is impossible to look at this picture without astonishment. The only point of view from which it fails is that of the New Testament narrative; for there is no relation between the Galilean wedding and Veronese's court-banquet. This stupendous performance was executed for the refectory of the monastery of S. Giorgio Maggiore in Venice, the contract for it being signed in June 1562 and the picture completed in September 1563. Its price was 324 silver ducats (=£160), along with the artist's living expenses and a tun of wine. There are five other great banquet-pictures by Caliari, only inferior in scale and excellence to this of Cana. One of them is also in the Louvre, a "Feast in the House of Simon the Pharisee," painted towards 1570–1575 for the refectory of the Servites in Venice. A different version of the same theme is in the Brera Gallery of Milan. "The Feast of Simon the Leper" (1570) was done for the refectory of the monks of St Sebastian, and the "Feast of Levi" (St Matthew) (1573), now in the Venetian academy, for the refectory of the monks of St John and St Paul. In each instance the price barely exceeded the cost of the materials. The Louvre contains ten other specimens of Veronese, notably the "Susanna and the Elders" and the "Supper at Emmaus." In the National Gallery, London, are ten examples. The most beautiful is "St Helena's Vision of the Cross," founded upon an engraving by Marcantonio after a drawing supposed to be the work of Raphael. Far more famous than this is the "Family of Darius at the Feet of Alexander the Great after the Battle of Issus"—the captives having mistaken Hephaestion for Alexander. It was bought for £13,560, and has even been termed (very unreasonably) the most celebrated of all Veronese's works. The principal figures are portraits of the Pisani family. It is said that Caliari was accidentally detained at the Pisani villa at Este, and there painted this work, and, on quitting, told the family that he had left behind him an equivalent for his courteous entertainment. Another picture in the National Gallery, "Europa and the Bull," is a study for the large painting in the imperial gallery of Vienna, and resembles one in the ducal palace of Venice. The Venetian academy contains fourteen works by Veronese. One of the finest is a comparatively small picture of the Battle of Lepanto, with Christ in heaven pouring light upon the Christian fleet and darkness on the Turkish. In the Uffizi Gallery of Florence are two specimens of exceptional beauty—the "Annunciation" and "Esther Presenting herself to Ahasuerus"; for delicacy and charm this latter work yields to nothing that the master produced. In Verona "St George and St Julian," in Brescia the "Martyrdom of St Afra," and in Padua the "Martyrdom of St Justina" are works of leading renown. Celebrated frescoes by Caliari are in four villas near Venice, more especially the Villa Masiera. His drawings are very fine, and he took pleasure at times in engraving on copper.

The brother and sons of Paolo already mentioned, and Battista Zelotti, were his principal assistants and followers. Benedetto Caliari, the brother, who was about ten years younger than Paolo, is reputed to have had a very large share in the architectural backgrounds which form so conspicuous a feature in Paolo's compositions. If this is not overstated, it must be allowed that a substantial share in Paolo's fame accrues to Benedetto; for not only are the backgrounds admirably schemed and limned, but they govern to a large extent the invention and distribution of the groups. Of the two sons Carlo (or Carletto), the younger, is the better known. He was born in 1570, and was sent to study under Bassano. He produced various noticeable works, and died young in 1596. Gabriele, born in 1568, attended, after Carlo's death, almost entirely to commercial affairs; his works in painting are rare. All three were occupied after the death of Paolo in finishing his pictures left uncompleted.

See Ridolfi, *Le Meraviglie dell' arte*, &c.; Dal Pozzo, *Vite de' pittori veronesi*, &c.; Zanetti, *Della Pittura veneziana*, &c.; and Lanzi; also, among recent works, the biographies by C. Yriarte (1888); F. H. Meisner (1897); and Mrs Arthur Bell (1904).

(W. M. R.)

PAUMOTU, TUAMOTU, or LOW ARCHIPELAGO, a broad belt of 78 atolls in the Pacific Ocean, belonging to France, between 14° and 24° S., and 131° and 149° W. They trend in irregular lines in a north-west and south-west direction, the major axis of the group extending over 1300 m. The largest atoll, Rangiroa, with a lagoon 45 m. long by 15 wide, is made up of twenty islets. Fakarava, the next in size, consists of fifteen islets, and its oblong lagoon affords the best anchorage in the group. Hau has fifty islets, and its lagoon is dangerously studded with coral. The symmetrically placed eleven islets of Anaa suggested to Captain Cook the name of Chain Island. Heavy storms sometimes greatly alter the form of the atolls. The first discovery of part of the archipelago was made by the Spaniard Pedro Fernandez Quiros in 1606. Many navigators subsequently discovered or rediscovered various parts of the group—among them may be mentioned Jacob Lemaire and Willem Schouten (1616), John Byron (1765), Philip Carteret (1767), Louis Antoine de Bougainville (1768), Captain James Cook (1769), Lieutenant Bligh (1792), Captain Wilson of the "Duff" (1797), Otto von Kotzebue (1815 and 1824), Fabian Gottlieb von Bellingshausen (1819–1820) and Charles Wilkes (1839) who made a detailed survey of the islands. As a result almost all the islands bear alternative names. The dates given are those of first discovery. In the north-west part of the chain are Rangiroa (Vliegen, Deans or Nairsa, this part of the group bearing the name of the Palliser Islands); Fakarava (Witgenstein, 1819), the seat of the French resident; Anaa (Chain, 1769), Makemo (Makima, Phillips, Kutusov, 1803), Hau (Hao, Harp, Bow, 1768). North and east of these are Manihi (Oahe, Waterlandt, 1616), Tikei (Romanzov, 1815), the Disappointment group (1765) of which Napuka is the chief island, Pukapuka (Henuake, Honden, Dog, 1616), Raroia (Barclay de Tolly, 1820), Angatau (Ahangatu, Arakchev, 1820), Akahaina (Fakaina, Predpriatie, 1824), Tatakoto (Narcissus, Egmont, Clerke, 1774), Pukaruha (Serle, 1797). In the southern part of the archipelago are Hereheretui (Bligh, Santablo, 1606), the Duke of Gloucester group (1767), Tematangi (Bligh Lagoon, 1792), Maruroa (Braburgh, Matilda, 1767), the Actaeon or Amphitrite group (discovered by the Tahitian trading vessel "Amphitrite" in 1833), Marutea (Lord Hood, 1791), and the Gambier or Mangareva group (1797), of which Mangareva (Gambier, Peard) is the chief member. To the south again are: Pitcairn (*q.v.*), Ducie, and a few other islets, which are British and do not properly belong to the Paumotu Archipelago. The Gambier Islands are a cluster of four larger and many smaller volcanic islets, enclosed in one wide reef. The wooded crags of Mangareva, the largest islet, 5 m. in length, rise to a height of 1315 ft. and are covered with a rich vegetation, quite Tahitian in character; but, as in the other Paumotus, there is a dearth of animal life.

The climate of the islands is healthy, and they have a lower mean temperature than Tahiti. The easterly trade winds prevail. Rain and fogs occur even during the dry season. The stormy season lasts from November to March, when devastating hurricanes are not uncommon and a south-westerly swell renders the western shores dangerous. Plants and animals are scantily represented. Coco-nut palms and the pandanus thrive on many of the islets, and the bread-fruit, banana, pine-apple, water-melon and yam have been introduced from Tahiti into the western islands. Mammals are represented by a few rats; among land-birds parakeets, thrushes and doves are noticeable; and of reptiles there are only lizards. Insects are scarce. But the sea and lagoons teem with turtle, fish, molluscs, crustaceans and zoophytes. Coral is luxuriant everywhere. From the abundance of pearl oysters the archipelago gets its traders' name of Pearl Islands.

The Paumotus are sparsely inhabited by a fine strong race of Polynesians, more muscular and mostly darker-skinned than that inhabiting Tahiti. In the west considerable intermixture with other races has taken place. In physique, language, religion and customs the Gambier Islanders closely resemble the Rarotongans. The pearl fisheries in the rocky and surf waters are a source of revenue, the pearls being sold in Tahiti. The best harbour of the group is that of Fakarava, which, together with Mangareva, is open to trade.

The land area of the entire group is about 330 sq. m., and the population is about 6000. The group passed under the protection of France in 1844, and was annexed in 1881, forming part of the dependency of Tahiti.

PAUNCEFOTE, JULIAN PAUNCEFOTE, 1ST BARON (1828–1902), English diplomatist, third son of Robert Pauncefote of Preston Court, Gloucestershire, was born on the 13th of September 1828. He was educated at Marlborough, Paris and Geneva, and called to the bar at the Inner Temple in 1852. He was for a short time secretary to Sir William Molesworth, secretary for the colonies, and in 1862 went out to Hong-Kong, where he was made attorney-general (1865) and then chief justice of the supreme court. He was appointed chief justice of the Leeward Islands in 1873, and, returning to England in the next year, became one of the legal advisers to the colonial office. Two years later he received a similar appointment in the foreign office, and in 1882 was made permanent under-secretary of state for foreign affairs. In 1885 he was one of the delegates to the Suez Canal international commission, and received the G.C.M.G. and the K.C.B. Lord Salisbury departed from precedent in choosing him to succeed Sir Lionel Sackville-West as British minister at Washington in 1889, but the event showed that his knowledge of international law made up for any lack of the ordinary diplomatic training. He did much during his term of office to maintain friendly relations between the two countries, especially during the Venezuelan crisis. The Bering Sea fishery dispute (1890–1892) was successfully negotiated by him; he arranged a draft treaty for Anglo-American arbitration, which was, however, quashed by the Senate; and carried through the revision of the Clayton-Bulwer Treaty on the subject of the Panama Canal. In 1893 the British minister at Washington was raised to the rank of ambassador, and Sir Julian Pauncefote became the doyen of the diplomatic corps. He died on the 26th of May 1902 at Washington. He had been made Baron Pauncefote of Preston in 1899 in recognition of his services at the Peace Conference at the Hague, and he was a member of the Court of Arbitration which resulted from the conference.

PAUPERISM (Lat. *pauper*, poor), a term meaning generally the state of being poor, poverty; but in English usage particularly the condition of being a "pauper," *i.e.* in receipt of relief administered under the poor law. In this sense the word is to be distinguished from "poverty." A person to be relieved under the poor law must be a destitute person, and the moment he has been relieved he becomes a pauper, and as such incurs certain civil disabilities. Statistics dealing with the state of pauperism in this sense convey not the amount of destitution actually prevalent, but the particulars of people in receipt of poor law relief.

PAUSANIAS (5th century B.C.), Spartan regent and commander, of the Agiad family, son of Cleombrotus and nephew of Leonidas, the hero of Thermopylae. Upon the death of the latter in 480 B.C. his son Pleistarchus became king, but as he was still a minor the regency devolved first on Leonidas's brother Cleombrotus, and after his death in 479 on Pausanias. He first distinguished himself as commander of the combined Greek forces in the victory of Plataea. In 478 he was appointed admiral of the Greek fleet, and succeeded in reducing the greater part of Cyprus, the strategic key of the Levant, and in capturing Byzantium from the Persians, thus securing the command of the Bosporus, and of the route by which Darius had invaded Europe. But he entered into treacherous negotiations with the Persian king, and his adoption of Oriental dress and customs, and his haughty behaviour to the Greeks under his command, roused their resentment and suspicion (see DELIAN LEAGUE). Pausanias was recalled by the ephors and, though acquitted on the main charge of Medism, was not again sent out in any official position. He returned to Byzantium, nevertheless, in a ship of Hermione and seized that town and, apparently, Sestos also. He was dislodged from both by the Athenians, to whom the allies had transferred from Sparta the naval hegemony. For some time he lived at Cleonae in the Troad, carrying on negotiations with Xerxes, but was again recalled to Sparta, where he incited the helots to revolt. When his schemes were almost matured, the evidence of a confidential slave led to the discovery of his plot by the ephors. He fled to the sanctuary of Athena Chalcioecus on the Spartan Acropolis: there he was immured, and when starvation and exposure had all but done their work he was dragged out to die. This crime against religion the state subsequently expiated by the burial of his body at the spot where he died and the dedication of two bronze statues. To commemorate Leonidas and Pausanias a yearly festival was held, at which speeches were made extolling their victories; this was still celebrated when the geographer Pausanias visited Sparta more than six centuries later (Paus. iii. 14). The date of the regent's death probably falls in 471 or 470, though some assign it to a later date on a very doubtful statement of Justin (ix. 1) that Pausanias held Byzantium for seven years.

See Herodotus v. 32, ix. 10–88; Thucydides i. 94–96, 128–134, ii. 71, 72, iii. 58; Diodorus Siculus xi. 30–47, 54; Cornelius Nepos, *Pausanias*; Justin ii. 15, ix. 1, 3; Pausanias iii. 4, 14, 17; Polyaenus viii. 51; Aristodemus ii., iv., vi.–viii.; Athenaeus xii. 535E, 536A; Plutarch, *Cimon* 6, *Themistocles* 23, *Aristides* 11–20, 23; N. Hanske, *Ueber den Königsregenten Pausanias* (Leipzig, 1873). (M. N. T.)

PAUSANIAS, Greek traveller and geographer of the 2nd century A.D., lived in the times of Hadrian, Antoninus Pius and Marcus Aurelius. He was probably a native of Lydia, and was possibly born at Magnesia ad Sipylum; he was certainly interested in Pergamum and familiar with the western coast of Asia Minor; but his travels extended far beyond the limits of Ionia. Before visiting Greece he had been to Antioch, Joppa and Jerusalem,[1] and to the banks of the river Jordan. In Egypt he had seen the pyramids and had heard the music of the vocal Memnon, while at the temple of Ammon he had been shown the hymn once sent to that shrine by Pindar. He had taken note of the fortifications of Rhodes and Byzantium, had visited Thessaly, and had gazed on the rivulet of "blue water" beside the pass of Thermopylae. In Macedonia he had almost certainly viewed the traditional tomb of Orpheus, while in Epirus he was familiar with the oracular oak of Dodona, and with the streams of Acheron and Cocytus. Crossing over to Italy, he had seen something of the cities of Campania, and of the wonders of Rome.

His *Description of Greece* (περιήγησις τῆς Ἑλλάδος) takes the form of a tour in the Peloponnesus and in part of northern Greece. It is divided into ten books: (i.) Attica and Megara; (ii.) Argolis, including Mycenae, Tiryns and Epidaurus; (iii.) Laconia; (iv.) Messenia; (v.) and (vi.) Elis, including Olympia; (vii.) Achaea; (viii.) Arcadia; (ix.) Boeotia, and (x.) Phocis, including Delphi.

Book i. was written after Herodes Atticus had built the Athenian Stadium (A.D. *c.* 143), but before he had built the Odeum (*c.* 160–161). There is reason to believe that this book was published some years before the rest. The statement in book v. (1, 2), that 217 years had elapsed since the restoration of Corinth (44 B.C.), shows that Pausanias was engaged on his account of Elis in the year A.D. 174, during the reign of Marcus Aurelius. He repeatedly refers to buildings erected by Hadrian, who died in A.D. 138. He had lived in that emperor's time, but had not actually seen that emperor's favourite, Antinoüs, who died about 130. He mentions the wars of Antoninus Pius against the Moors, and of Marcus Aurelius (in and after A.D. 166) against the Germans (viii. 43). The latest event which he records is the incursion of the robber-horde of the Costobocs (A.D. *c.* 176; x. 34, 5). Book i. having been published before 160, and books vi.–x. after 174, the composition of the whole must have extended over more than fourteen years.

The work has no formal preface or conclusion. It suddenly begins with the promontory of Sunium, the first point in Attica that would be seen by the voyager from the shores of Asia Minor, and it ends abruptly with an anecdote of a blind man of Naupactus. The author's general aim may be inferred from his saying at the close of his account of Athens and Attica: "Such (in my opinion) are the *most famous* of the Athenian *traditions* and *sights*; from the mass of materials I have aimed from the outset at selecting the really *notable*" (i. 39, 3). It is possibly in the hope of giving variety and interest to the topographical details of Athens that the author intersperses them with lengthy historical disquisitions; but the result is that the modern reader is tempted to omit the "history" and to hasten on to the "topography," on which the author is now a primary authority. In the subsequent books he introduces two improvements. His account of each important city begins with a sketch of its history; and, in his subsequent descriptions, he adopts a strictly topographical order. He takes the nearest road from the frontier to the capital; he there makes for the central point, *e.g.* the market-place, and describes in succession the several streets radiating from that centre. Similarly, in the surrounding district, he follows the principal roads in succession, returning to the capital in each case, until, at the end of the last road, he crosses the frontier for the next district. In the later books he supplies us with a few glimpses into the daily life of the inhabitants. He is constantly describing ceremonial rites or superstitious customs. He frequently introduces narratives from the domain of history and of legend and folk-lore; and it is only rarely that he allows us to see something of the scenery. But, happily, he notices the pine-trees on the sandy coast of Elis, the deer and the wild boars in the oak-woods of Phelloë, and the crows amid the giant oak-trees of Alalcomenae. He tells us that "there is no fairer river than the Ladon," "no reeds grow so tall as those in the Boeotian Asopus," and the rain that deluges the fallow plain of Mantinea vanishes into a chasm to rise again elsewhere. It is mainly in the last three books that he touches on the products of nature, the wild strawberries of Helicon, the date-palms of Aulis, and the olive-oil of Tithorea, as well as the bustards of Phocis, the tortoises of Arcadia and the "white blackbirds" of Cyllene. He is rather reticent as to the character of the roads, but he records, with the gratitude of a traveller, the fact that the narrow and perilous cornice of the Scironian way along the coast of Megara had been made wider and safer by Hadrian. He is inspired by a patriotic interest in the ancient glories of Greece, recognizing in Athens all that was best in the old Greek life, and lamenting the ruin that had befallen the land on the fatal field of Chaeronea. He is most at home in describing the religious art and architecture of Olympia and of Delphi; but, even in the most secluded regions of Greece, he is fascinated by all kinds of quaint and primitive images of the gods, by holy relics and many other sacred and mysterious things. He is interested in visiting the battlefields of Marathon and Plataea, and in viewing the Athenian trophy on the island of Salamis, the grave of Demosthenes at Calauria, of Leonidas at Sparta, of Epaminondas at Mantinea, and the colossal lion guarding the tomb of the Thebans on the Boeotian plain. At Thebes itself he views the shields of those who died at Leuctra, and the ruins of the house of Pindar; the statues of Hesiod and Arion, of Thamyris and Orpheus, in the grove of the Muses on Helicon; the portrait of Corinna at Tanagra, and of Polybius in the cities of Arcadia. At Olympia he takes note of the ancient quoit of Iphitus inscribed with the terms of the Olympic truce, the tablets recording treaties between Athens and other Grecian states, the memorials of the victories of the Greeks at Plataea, of the Spartans at Tanagra, of the Messenians at Naupactus, and even those of Philip at Chaeronea and of Mummius at Corinth. At Delphi, as he climbs the sacred way to the shrine of Apollo, he marks the trophies of the victories of the Athenians at Marathon and on the Eurymedon, of the united Greeks at Artemisium, Salamis and Plataea, of the Spartans at Aegospotami, of the Thebans at Leuctra, and the shields dedicated in memory of the repulse and defeat of the Gauls at Delphi itself. At Athens, he sees pictures of historic battles, portraits of famous poets, orators, statesmen and philosophers, and inscriptions recording the laws of Solon; on the Acropolis, the trophy of the Persian wars, the great bronze statue of Athena; at the entrance to the harbour of the Peiraeus, the grave of Themistocles; and, outside the city, the monuments of Harmodius and Aristogeiton, of Cleisthenes and Pericles, of Conon and Timotheus, and of all the Athenians who fell in battle, except the heroes of Marathon, "for these, as a meed of valour, were buried on the field."

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[1] The tomb of Helena at Jerusalem, which Pausanias viii. 16, 4–5, compares with the Mausoleum, is mentioned by Josephus, *Ant.* xx. 4, 3; *Bell. jud.* v. 2, 2; 3, 3; 4, 2; and Eusebius, *H.E.* ii. 12, 3. Helen, the daughter of Izates, king of Adiabene, sent large shiploads of provisions to Rome during the great famine in the time of Claudius (A.D. 44–48). Her tomb is identified by universal consent with the so-called "Tombs of the Kings," half a mile north of the Damascus gate. Cf. Schürer, *Geschichte des jüdischen Volkes*, 3rd ed., iii. 120–122; view of tomb in *Picturesque Palestine*, i. 103.

In the topographical part of his work, he is fond of digressions on the wonders of nature, the signs that herald the approach of an earthquake, the phenomena of the tides, the ice-bound seas of the north, and the noonday sun which at the summer solstice casts no shadow at Syene. While he never doubts the existence of the gods and heroes, he sometimes criticizes the myths and legends relating to them. His main interest is in the *monuments of ancient art*, and he prefers the works of the 5th and 4th centuries B.C. to those of later times. At Delphi he admires the pictures of Polygnotus, closing the seven chapters of his minute description with the appreciative phrase: "so varied and beautiful is the painting of the Thasian artist" (x. 31, 2). In sculpture his taste is no less severe. Even in the "uncouth" work of Daedalus, he recognizes "a touch of the divine" (ii. 4, 5). In architecture, he admires the prehistoric walls of Tiryns, and the "Treasury of Minyas," the Athenian Propylaea, the theatre of Epidaurus, the temples of Bassae and Tegea, the walls of Messene, the Odeum at Patrae, as well as the building of the same name lately built at Athens by Herodes Atticus (vii. 20, 6), and finally the Stadium which that munificent Athenian had faced with white marble from the quarries of Pentelicus. His descriptions of the monuments of art are plain and unadorned; they bear the impress of reality, and their accuracy is confirmed by the extant remains. He is perfectly frank in his confessions of ignorance. When he quotes a book at second hand he takes pains to say so.

He has been well described by J. G. Frazer as "a man made of common stuff and cast in a common mould; his intelligence and abilities seem to have been little above the average, his opinions not very different from those of his contemporaries." His literary style is "plain and unadorned yet heavy and laboured"; it is not careless or slovenly; the author tried to write well, but his "sentences are devoid of rhythm and harmony" (*Introduction*, pp. xlix., lxix.).

In considering his use of previous writers, we must draw a distinction between the *historical* and the *descriptive* parts of his work. In the former it was necessary for him to depend on written or oral testimony; in the latter it was not. In the historical passages, his principal poetic authority is Homer; he frequently quotes the *Theogony* of Hesiod, and he often refers to Pindar and Aeschylus. His writings are full of echoes of Herodotus, and his debt to Thucydides and Xenophon extends beyond the isolated mention of their names (i. 3, 4; vi. 19, 5). He has carefully studied the Elean register of the Olympic victors; he makes large use of inscriptions, and has generally examined them with care and copied them with accuracy. In the descriptive portion the question arises whether he derived his knowledge from personal observation, or from books, or from both. He does not profess to have seen everything, but he does not acknowledge that he has borrowed any of his descriptions from previous writers. He "cannot commend the men who took the measurements" of the Zeus at Olympia (v. 11, 9). "A certain writer," who states that a particular spring is the source of an Arcadian river, "cannot have seen the spring himself, or spoken with any one who had; I have done both" (viii. 41, 10). There are fifty passages in which he either directly states or implies that he had seen the things that he describes. All of these have been carefully collected and examined by R. Heberdey (1894), who, by using a distinctive type in marking on a map the places "seen" by Pausanias, and by joining those places by lines representing the routes described by him, has shown the large extent of the author's travels in Greece. The complicated coast of Hermionis has, however, been incorrectly described (ii. 34, 8 seq.), and there is some confusion in the account of the three roads leading to the north from Lepreüs, in the extreme south of Elis (v. 5, 3).

A greater difficulty has long been felt in connexion with the "Enneacrunus episode" in the description of Athens (i. 8, 6, and 14, 1–6). In the midst of the account of the market-place, north-west of the Acropolis, the reader is transported to the fountain of Enneacrunus and to some buildings in its neighbourhood, and is suddenly brought back to the market-place. It has been naturally assumed that the Enneacrunus can only be the fountain of that name in the bed of the Ilissus. If so, the description of the fountain is out of place, and its insertion at this point has been ascribed either to some confusion in the author's notes or to a dislocation in the text. On the other hand, it has been suggested that the description may really refer to some other fountain near the market-place, which was shown to Pausanias as the Enneacrunus. Thus it has been held by Dr Dörpfeld that the name Enneacrunus was originally applied to a spring west of the Acropolis, that the old name of this spring, Callirrhoë, had been abandoned from the time when Peisistratus converted it into a "fountain with nine jets," and that the names Callirrhoë and Enneacrunus were afterwards transferred to another fountain in the bed of the Ilissus. The evidence of his own excavations has led him to place the original Enneacrunus near the eastern foot of the hill of the Pnyx, and to identify certain adjacent remains with the buildings mentioned by Pausanias. If this opinion is correct, the account of the Enneacrunus, and the neighbouring buildings, in Pausanias, ceases to be an "episode," and falls into the natural sequence of the narrative. (The "episode" has been fully discussed by the expounders and translators of Pausanias, and by the writers on the topography of Athens. Dr Dörpfeld's views are clearly set forth in Miss J. E. Harrison's *Primitive Athens* (1906). A. Malinin's paper (Vienna, 1906), which assumes a dislocation of the text, has been answered by Dörpfeld (*Wochenschrift für kl. Philologie* (1907), p. 940 seq.).

The account of the law courts of Athens and of the altars at Olympia may have been derived from monographs on those subjects. In both cases the author departs from his usual method of following the order of place, and deals with a group of monuments belonging to the same class. But in the extant literature of antiquity (as J. G. Frazer has shown) no passage has been found agreeing in form or substance so closely with the description in Pausanias as to make it probable that he copied it. The theory that Pausanias borrowed largely from Polemon of Ilium, who flourished about 200–177 B.C., and wrote on the Acropolis and the eponymous heroes of Athens, on the treasuries of Delphi, and on other antiquarian topics, was incidentally suggested by Preller in his edition of the fragments (1838), and was revived by Professor von Wilamowitz-Moellendorff in 1877 (*Hermes*, xii. 346). It was subsequently maintained by A. Kalkmann (1886) that Pausanias slavishly copied from Polemon the best part of his descriptions of Athens, Delphi and Olympia, and described those places, not as they were in his own age, but as they had been in that of Polemon, some 300 years before. It is alleged that, in the notices of the monuments on the Acropolis of Athens, and of the sculptors and the athlete-statues of Olympia, the lower limit of Pausanias is practically 150 B.C.; it is inferred that the authority followed by him ended with this date, and it is more than suggested that his sole authority was Polemon. But the comparative neglect of works later than 150 B.C. might also be explained by the fact that the independence of Greece came to an end in 146. And, further, it so happens that Pausanias refers to very few sculptors for the 140 years (296–156 B.C.) *before* the age of his supposed authority, while some of the sculptors represented at Olympia have since been placed *after* that date, and not a few of the Athenian monuments described by Pausanias belong to the period between that date and the accession of Hadrian, or, approximately, the period between about 166 B.C. and A.D. 117 (Gurlitt, *Über Pausanias*, pp. 117 seq., 194 seq., 257–267). More than one hundred extracts from, or reference to, the works of Polemon have come down to us, and it has been shown by Mr Frazer that "the existing fragments hardly justify us in supposing that Pausanias was acquainted with the writings of his learned predecessor; certainly they lend no countenance to the view that he borrowed descriptions of places and monuments from them." Again, it has been urged that his brief description of the Peiraeus is not true of his own time, as it had been burnt by Sulla (86 B.C.), and was still lying desolate in the age of Augustus, but his account of the buildings and monuments has been confirmed by an inscription conjecturally ascribed to the time of Pausanias (Frazer ii. 14 seq.). It has also been stated that the description of Arcadia must have been borrowed from far earlier writers, because Strabo (p. 388) says that most of the famous cities of that land had either ceased to exist or had left hardly a trace behind them; but the evidence of coins has proved that at least seven of the eleven cities described by Pausanias were still in existence long after the death of Strabo. It has further been assumed that his account of the temple of Apollo at Delphi is "irreconcilable with the remains of the building" and with the inscriptions recently discovered by the French archaeologists. We are told that Pausanias describes the temple of the 6th century B.C. as if it still existed in his own time. On the contrary, he states that the first sculptures for the gables were executed by a pupil of Calamis, the pupil of a sculptor still at work in 427 B.C., and the shields that he saw suspended on the architrave were captured from the Gauls in 279. Again, his description of New Corinth, built in 44 B.C., more than a century after the time of Polemon, is most minute and systematic, and it is confirmed by coins of the imperial age. In at least one important point Pausanias compares favourably with Strabo. While Strabo erroneously declares that not a vestige of Mycenae remains, Pausanias gives a brief but accurate description of the Lion-gate and the existing circuit-wall of the Acropolis, with a notice of the tombs "within the wall" (ii. 16, 5–7), a notice which led to their discovery by Schliemann. In all parts of Greece the accuracy of his descriptions has been proved by the remains of the buildings which he describes; and a few unimportant mistakes (in v. 10, 6 and 9; viii. 37, 3, and 45, 5), and some slight carelessness in copying inscriptions, do not lend any colour to an imputation of bad faith. It has been stated with perfect justice by Frazer (p. xcv. seq.) that "without him the ruins of Greece would for the most part be a labyrinth without a clue, a riddle without an answer." "His book furnishes the clue to the labyrinth, the answer to many riddles. It will be studied so long as ancient Greece shall continue to engage the attention and awaken the interest of mankind."

Editions.—Siebelis (Leipzig, 1822); Schubart and Walz (1838); Teubner texts, Schubart (1862), and Spiro (1903). Text, Latin translation and index, L. Dindorf (Didot, Paris, 1845); text and German commentary, Hitzig and Blümner, books i.–ix., already published in five parts (Leipzig, 1896–1907). Special edition of *Descriptio arcis Athenarum*. Otto Jahn (Bonn, 1860), 3rd ed., with maps and plans, &c., A. Michaelis (1901). F. Imhoof-Blumer and Percy Gardner, "Numismatic Commentary on Pausanias," first published in *Journal of Hellenic Studies*, vi.–viii. (1885–1887); J. G. Frazer, *Pausanias's Description of Greece*, in six vols., introduction and translation (vol. i.), commentary (vols. ii.–v.), maps and index (vol. vi.) (Macmillan, London, 1898); introduction reprinted in Frazer's *Pausanias and other Greek Sketches* (1900).

Special Literature.—Wernicke, *De Pausaniae studiis herodoteis* (Berlin, 1884); Wilamowitz, "Thukydideslegende," in *Hermes* (1877), xii. 346; P. Hirt, *De fontibus Pausaniae in Eliacis* (Greifswald, 1878); A. Flasch, in Baumeister's *Denkmäler, s.v.* "Olympia," 90 pp. (1887); A. Kalkmann, *Pausanias der Perieget* (Berlin, 1886), and in *Archäologischer Anzeiger* (1895), p. 12; opposed by W. Gurlitt, *Über Pausanias* (Graz, 1890), 494 pp.; Bencker, *Anteil der Periegese an der Kunstschriftstellerei* (1890), and R. Heberdey, *Die Reisen des Pausanias in Griechenland*, with two maps (Vienna, 1894).

The present writer is much indebted to Gurlitt's comprehensive monograph, and to the admirable Introduction prefixed to J. G. Frazer's excellent Translation and Commentary. See also C. Robert, *Pausanias als Schriftsteller* (Berlin, 1909). (J. E. S.*)

PAUSIAS, a Greek painter of the 4th century, of the school of Sicyon. He introduced the custom of painting ceilings of houses. His great merit appears to have lain in the better rendering of foreshortening. The words in which Pliny (xxxv. 127) describes a bull painted by him should be quoted: "Wishing to display the length of the bull's body, he painted it from the front, not in profile, and yet fully indicated its measure. Again, while others fill in with white the high lights, and paint in black what is less salient, he painted the whole bull of dark colour, and gave substance to the shadow out of the shadow itself, with great skill making his figures stand out from a flat background, and indicating their shape when foreshortened." This passage well marks the state of painting at the time.

PAVANE, Pavan or Pavin, the name of a slow stately dance of the 16th and 17th centuries. The word has been variously derived: (1) from Lat. *pavo*, peacock; the dancers, as they wheel and turn, spread out their long cloaks, which they retained in this dance, like the tail of the bird; (2) from Padovana, *i.e.* of Padua, in Italy; the dance, however, is usually taken to have come from Spain. As an instrumental composition, common in the 16th and 17th centuries, the "pavane" was usually followed by the quick and lively "galliard," as the "gigue" followed the "saraband" in the later suite (see Dance).

PAVEMENT (Lat. *pavimentum*, a floor beaten or rammed hard, from *pavire*, to beat), a term originally applied to the covering of a road or pathway with some durable material, and so used of the paved footway at the side of a street—the "sidewalk" as opposed to the roadway proper. The term is also extended to the interior floor of churches and public buildings. It is probable that the earliest pavements consisted only of rammed clay, as in the "beehive" tombs of Mycenae, or of cement or stucco decorated with lines in coloured marbles, such as those mentioned in the Book of Esther (vi. 1) in the palace at Susa. W. M. Flinders Petrie discovered at Tell el'Amarna in the palace of Akhenaton the remains of a stucco pavement, decorated with foliage, flowers, birds, &c., and a complete naturalistic treatment. The threshold of the doors of the Assyrian palaces were of stone carved with patterns in imitation of those in a carpet. The pavements of Greek temples were either in stone or marble, and at Olympia the *pronaos* of the temple of Zeus was laid in mosaic representing tritons, and the floor of the *naos* was in coloured marbles. The Roman pavements were invariably in mosaic, sometimes of a very elaborate nature, as in the House of the Faun at Pompeii, where the mosaic represented the battle of Issus between Alexander the Great and Darius III., a reproduction probably of some Greek painting of the period. In Rome the palaces on the Palatine Hill and the thermae were all paved with mosaic, and numerous pavements have been found in Carthage, many of which are in the British Museum, as are also examples from the Roman villas in England. Perhaps the richest Roman pavements outside Italy are those at Trèves in Germany. The Roman tradition was continued by the Byzantine architects, who, throughout the East, paved their churches with mosaics, frequently of the same design and execution as those of the Romans, but with Christian symbols. The churches of the Romanesque, Gothic and Renaissance periods were all paved in marble, but of a different character from those of the earlier period (see Mosaic).

PAVIA (anc. *Ticinum, q.v.*), a town of Lombardy, Italy, capital of the province of Pavia, situated on the Ticino about 2 m. above its junction with the Po, 22½ m. S. of Milan by rail, 253 ft. above sea-level. Pop. (1906), 28,796 (town), 36,424 (commune). On the right bank of the river lies the small suburb of Borgo Ticino, connected with the town by a remarkable covered bridge dating from 1351–1354. In 1872 the city ceased to be a fortress, and the bastions have been transformed into boulevards and public gardens. The church of San Michele Maggiore is one of the finest specimens of the Lombard style in existence, and as it was within its walls that the crown was placed on the head of those "kings of Italy" from whom the house of Savoy claims descent it was by royal decree of 1863 given the title of Basilica Reale. S. Michele (for plan see Architecture: § *Romanesque and Gothic in Italy*) was originally constructed under the Lombard kings, but was burnt in 1004, and the present building dates from the latter part of the 11th (crypt, choir and transepts) and the first half of the 12th centuries (façade and nave with two aisles), and was completed in 1155. The lower part of the façade is adorned with three fine portals and with reliefs of a fantastic kind in sandstone, arranged in horizontal bands, and has arcading under the gable. The dome is octagonal. The interior is vaulted and has eight pillars, supporting double round arches. The interior has a mosaic pavement of the 12th–13th centuries. The cathedral church of San Martino is a Renaissance building begun in 1488 by Cristoforo Rocchi; it is a vast "central" structure, finely designed, with four arms, which remained for centuries unfinished until the dome (only surpassed by those of St Peter at Rome and the cathedral at Florence) and façade were completed in 1898 according to Rocchi's still extant model; adjoining the church is the massive Torre Maggiore, 258 ft. high, which is mentioned as early as 1330. The upper part is due to Pellegrino Tibaldi (1583). The cathedral contains the tomb of S. Syrus, first bishop of Pavia (2nd century); an altar-piece (1521), the best work of Giampietino (Rizzi), a pupil of Leonardo da Vinci; and another, the masterpiece of Bernardino Gatti of Parma (1531). The church of S. Pietro in Ciel d'Oro, the origin of which dates from the beginning of the 6th (?) century, but which as it stands was consecrated in 1132, is very similar to S. Michele in respect of its façade (though it has not the elaborate sculptures), dome and mosaic pavements. The use of disks of majolica may be noted in the decoration of the exterior. It has been carefully restored. It served as the burial place of the Lombard king Liutprand (711–744), whose bones were found there in 1896 (R. Majocchi in *Nuovo bulletino d'archeologia cristiana*, 1896, p. 139). The Arca di S. Agostino (after 1362) is a sumptuous tomb containing the relics of S. Augustine of Hippo brought hither by Liutprand from Sardinia. It was only restored to this, its original position, from the cathedral when the church itself was restored.

The church of S. Maria del Carmine is externally one of the most beautiful of the brick Gothic churches in northern Italy and dates from 1273 (or 1323?). S. Francesco has also a good façade after that of Chiaravalle near Milan. The church of S. Maria di Canepanova with its small dome was designed by Bramante. Near it are three tall, slender brick towers of the Gothic period. S. Teodoro with a 12th-century exterior has frescoes by Bartolommeo Suardi (Bramantino) after 1507. Outside the town on the west lie the churches of S. Salvatore (founded in the 7th century but rebuilt in the 15th and 16th), and of S. Lanfranc (or the Holy Sepulchre, 12th century) with the fine tomb of Bishop Lanfranco Beccari (d. 1189) by Giovanni Antonio Amedeo (1498), one of the best Lombard sculptors and architects of this period (1447–1522) and a native of Pavia, which has a few other works by him. He was for eighteen years in charge of the work at the Certosa. Interesting medieval views of Pavia exist in the churches of S. Teodoro and S. Salvatore; the former dating from 1522 has been published by P. Moiraghi in *Bullettino storico pavese* (1893), i. 41 sqq. (See Magenta, *I Visconti e gli Sforza nel castello di Pavia* (Milan, 1884), for other medieval plans.)

Of the secular buildings the most noteworthy is the university founded by Galeazzo II. in 1361 on the site of a law school probably founded by Lanfranc (d. 1089), though we find Pavia a centre of study as early as A.D. 825. The present imposing building was begun by Lodovico il Moro in 1490; in the library are preserved some of the ashes of Columbus, who was a student here. Volta made here his first electrical experiments. For the maintenance of a number of poor students there are two subsidiary colleges, the Borromeo and the Ghislieri founded by S. Carlo Borromeo (1563) and Pope Pius V. (1569); of the latter a colossal bronze statue has been erected in the piazza before his college. The university of Pavia has long been famous as a medical school, and has the oldest anatomical cabinet in Italy; in addition it has a natural history museum founded under Spallanzini in 1772, a botanical garden, begun in 1774, and excellent geological, palaeontological and mineralogical collections. The old castle of the Visconti built in 1360 for Galeazzo II. is used as barracks. The Museo Civico is housed in the Palazzo Malaspina and contains many interesting national relics and a small picture gallery, with a large collection of offprints on paper from niello plates, including a very fine "Fountain of Love" by Antonio Pollainolo; another fine old palace, the Palazzo Mezzabarba, is now used as the Municipio.

Pavia has a number of iron-foundries, military engineering and electrical production works, and other factories, as well as a large covered market, built in 1882. Pavia lies on the main line from Milan to Genoa (which crosses the Ticino by a bridge half a mile long, and shortly afterwards the Po), with several branch lines. Barges from Pavia can pass down the Po to the Adriatic or to Milan by canal. Five miles north of Pavia is the Carthusian monastery of Certosa di Pavia, one of the most magnificent in the world. Its founder Gian Galeazzo Visconti (also the founder of Milan Cathedral) laid the first stone in August 1396, and the nave was then begun in the Gothic style, but was not completed until 1465. However the influence of the Early Renaissance had meanwhile become supreme throughout Italy, and the rest of the church with its external arcaded galleries and lofty pinnacles (including the fine dome) and the cloisters were executed in the new style under Guiniforte Solari (1453–1481) with details in terra-cotta of great beauty and richness. Giovanni Antonio Amedeo was chief architect in 1481–1499, and the lower part of the façade was finished in 1507. It is perhaps the finest piece of elaborate and richly adorned Renaissance architecture in existence, and is the work of a number of different artists. In the south transept of the church is the tomb of the founder; the figure of Galeazzo guarded by angels lies under a marble canopy, with the Madonna in a niche above. It was begun in 1494–1497 by Giovanni Cristoforo Romano and Benedetto Briosco, but was not finished until 1562. In the north transept is the tomb of Lodovico Sforza, il Moro, and his wife, the figures on which were brought from S. Maria della Grazie in 1564 when the monument of the prince in that church was broken up and sold; these statues are considered to be one of the chief works of Cristoforo Solari. The church contains numerous other works of art. An elegant portal leads from the church into the small cloister, which has a pretty garden in the centre; the terra-cotta ornaments surmounting the slender marble pillars are the work of Rinaldo de Stauris (1463–1478), who executed similar decorations in the great cloister. This cloister is 412 ft. long by 334 ft. wide and contains 24 cells of the monks, pleasant little three-roomed houses each with its own garden. Within the confines of the monastery is the Palazzo Ducale which since 1901 has been occupied by the Certosa museum. The Carthusian monks, to whom the monastery was entrusted by the founder, were bound to employ a certain proportion of their annual revenue in prosecuting the work till its completion, and even after 1542 the monks continued voluntarily to expend large sums on further decoration. The Certosa di Pavia is thus a practical textbook of Italian art for wellnigh three centuries. The Carthusians were expelled in 1782 by the emperor Joseph II., and after being held by the Cistercians in 1784 and the Carmelites in 1789 the monastery was closed in 1810. In 1843 the Certosa was restored to the Carthusians and was exempted from confiscation in 1866, but it has since been declared a national monument.

History.—For earlier period see TICINUM. Under the name Papia (Pavia) the city became, as the capital of the Lombard kingdom, one of the leading cities of Italy. By the conquest of Pavia and the capture of Desiderius in 774 Charlemagne completely destroyed the Lombard supremacy; but the city continued to be the centre of the Carolingian power in Italy, and a royal residence was built in the neighbourhood (Corteolona on the Olona). It was in San Michele Maggiore in Pavia that Berengar of Friuli, and his quasi-regal successors down to Berengar II. and Adalbert II., were crowned "kings of Italy." Under the reign of the first the city was sacked and burned by the Hungarians, and the bishop was among those who perished. At Pavia was celebrated in 951 the marriage of Otto I. and Adelheid (Adelaide), which exercised so important an influence on the relations of the empire and Italy; but, when the succession to the crown of Italy came to be disputed between the emperor Henry II. and Arduin of Ivrea, the city sided strongly with the latter. Laid in ruins by Henry, who was attacked by the citizens on the night after his coronation in 1004, it was none the less ready to close its gates on Conrad the Salic in 1026. In the 11th and 12th centuries we find Pavia called the "Second Rome." The jealousy between Pavia and Milan having in 1056 broken out into open war, Pavia had recourse to the hated emperors, though she seems to have taken no part in the battle of Legnano; and for the most part she remained attached to the Ghibelline party till the latter part of the 14th century. From 1360, when Galeazzo was appointed imperial vicar by Charles IV., Pavia became practically a possession of the Visconti family and in due course formed part of the duchy of Milan. For its insurrection against the French garrison in 1499 it paid a terrible penalty in 1500, and in 1512, after the victory of Ravenna, Pavia presented to Louis XII., as a sign of fidelity, a magnificent standard: this however fell into the hands of Swiss mercenaries and was sent to Fribourg as a trophy of war (it no longer exists). Having been strongly fortified by Charles V., the city was in 1525 able to bid defiance to Francis I., who was so disastrously beaten in the vicinity, but two years later the French under Lautrec subjected it to a sack of seven days. In 1655 Prince Thomas of Savoy invested Pavia with an army of 20,000 Frenchmen, but had to withdraw after 52 days' siege. The Austrians under Prince Eugène occupied it in 1706, the French in 1733 and the French and Spaniards in 1743; and the Austrians were again in possession from 1746 till 1796. In May of that year it was seized by Napoleon, who, to punish it for an insurrection, condemned it to three days' pillage. In 1814 it became Austrian once more. The revolutionary movement of February 1848 was crushed by the Austrians and the university was closed; and, though the Sardinian forces obtained possession in March, the Austrians soon recovered their ground. It was not till 1859 that Pavia passed with the rest of Lombardy to the Sardinian crown.

At several periods Pavia has been the centre of great intellectual activity. It was according to tradition in a tower which, previous to 1584, stood near the church of the Annunziata that Boethius wrote his *De consolatione philosophiae*; the legal school of Pavia was rendered celebrated in the 11th century by Lanfranc (afterwards archbishop of Canterbury); Petrarch was frequently here as the guest of Galeazzo II., and his grandson died and was buried here. Columbus studied at the university about 1465; and printing was introduced in 1471. Two of the bishops of Pavia were raised to the papal throne as John XIV. and Julius III. Lanfranc, Pope John XIV., Porta the anatomist and Cremona the mathematician were born in the city.

See C. Dell' Acqua, *Guida illustrata di Pavia* (Pavia, 1900), and refs. there given; L. Beltrami, *La Chartreuse de Pavie* (Milan, 1899); *Storia documentata della Certosa di Pavia* (Milan, 1896). (T. As.)

PAVIA Y ALBUQUERQUE, MANUEL (1828–1895), Spanish general, was born at Cadiz on the 2nd of August 1828. He was the son of Admiral Pavia, a naval officer of some note in the early part of the 19th century. He entered the Royal Artillery College at Segovia in 1841; became a lieutenant in 1846, a captain in 1855 and major in 1862. Three years later he joined the staff of Marshal Prim, and took part in the two unsuccessful revolutionary movements concerted by Prim in 1866, and, after two years of exile, in the successful revolution of 1868. Pavia showed much vigour against the republican risings in the southern provinces; the governments of King Amadeus of Savoy, from 1871 to 1873, also showed him much favour. After the abdication of that prince, General Pavia put down the Carlists and the cantonal insurrections of the chief towns of the south. On three occasions during the eventful year 1873, as captain-general of Madrid, he offered his services to put an end to the anarchy that was raging in the provinces and to the disorganization prevalent in the Cortes. To all he used the same arguments, namely, that they had to choose between an Alphonsist restoration or a dictatorial, military and political republic, which would rally round its standard all the most conservative groups that had made the revolution of 1868. This he hoped to realize with Castelar, but the plan was interrupted by the military *pronunciamiento* for the purpose of dissolving the Cortes of 1873. As soon as the federal Cortes had defeated Castelar, Pavia made his *coup d'état* of the 3rd of January 1874, and after the *pronunciamiento* was absolute master of the situation, but having no personal ambition, he sent for Marshal Serrano to form a government with Sagasta, Martos, Ulloa and other Conservatives and Radicals of the revolution. Pavia sat in the Cortes of the Restoration several times, and once defended himself skilfully against Emilio Castelar, who upbraided him for the part he had played on the 3rd of January 1874. He died suddenly on the 4th of January 1895.

PAVILION, properly a tent, a late use of Lat. *papilio*, butterfly, from which the word is derived through the French. The term is chiefly used of a tent with a high pitched roof, a small detached building used as a summer-house, &c., and particularly for a building attached to a recreation ground for the use of players and members. In architecture the term pavilion is specifically applied to a portion of a building which projects from the sides or central part. It is a characteristic of French renaissance architecture. Where the buildings of a large institution are broken up into detached portions, as in St Thomas's Hospital, London, the term is generally applied to such detached buildings.

For the musical instrument known as the Chinese pavilion or Jingling Johnny, see CHINESE PAVILION.

PAVIS, or PAVISE, a large convex shield, some 4 to 5 ft. high and sufficiently broad to cover the entire body, used in medieval warfare, as a protection against arrows and other missiles. The word appears in innumerable forms in Old French, Italian and Medieval Latin, and is probably to be referred to Pavia, in Italy, where such shields were made. The term "pavisade" or "pavesade" was used of a portable screen of hurdles behind which archers might find protection, or of a similar defensive screen formed by linking together "pavises," especially on board a ship of war extending along the bulwarks, and hence in later times of a canvas screen similarly placed to conceal the rowers in a galley or the sailors on other types of ships.

PAVLOVO, a town of Russia, in the government of Nizhniy-Novgorod, 42 m. S.W. of the town of Nizhniy-Novgorod, on the Oka river. Pop. (1897), 12,200. It is the centre of a considerable cutlery, hardware and locksmith trade, which, carried on since the 17th century in cottages and small workshops, engages, besides Pavlovo itself, no less than 120 villages. There are also steel works and cotton, silk, soap and match factories. Pavlovo has a museum of cutlery models and a library.

PAVLOVO POSAD, or VOKHNA, a town of Russia, in the government of Moscow, 41 m. by rail E. of the city of Moscow, on the Klyazma river. Pop. (1897), 10,020. It is the centre of a manufacturing district, with silk, cotton and woollen mills, and dyeing and printing works.

PAVLOVSK, a town of Russia, in the government of St Petersburg 17 m. by rail S. of the city of St Petersburg. Pop. (1897), 4949. It has an imperial castle (1782–1803) standing in a beautiful park and containing a small fine art museum and gallery. In the vicinity are smaller imperial palaces and summer residences of St Petersburg families.

PAWN. (1) A pledge, an object left in the charge of another, as security for the repayment of money lent, for a debt or for the performance of some obligation (see PAWNBROKING). The word is an adaptation of O. Fr. *pan*, pledge, plunder, spoil. This has usually been identified with *pan*, from Lat. *pannus*, piece of cloth. The Teutonic words for pledge—such as Du. *pand*, Ger. *Pfand* have been also traced to the same source; on the other hand these Teutonic forms have been connected with the word which appears in O. Eng. as *pending*, a penny, Ger. *Pfennig*, but this too has been referred to *pannus*. (2) The smallest piece on the chessboard. This, in its early forms, *poun*, *pown*, &c., is taken from Fr. *poon* or *paon*, variants of *peon*, Med. Lat. *pedo*, *pedonis*, a foot soldier, from *pes*, foot.

PAWNBROKING (O. Fr. *pan*, pledge, piece, from Lat. *pannus*; for "broking" see BROKER), the business of lending money on the security of goods taken in pledge. If we desire to trace with minuteness the history of pawnbroking, we must go back to the earliest ages of the world, since the business of lending money on portable security (see MONEY-LENDING, and USURY) is one of the most ancient of human occupations. The Mosaic Law struck at the root of pawnbroking as a profitable business, since it forbade the taking of interest from a poor borrower, while no Jew was to pay another for timely accommodation. And it is curious to reflect that, although the Jew was the almost universal usurer and money-lender upon security of the middle ages, it is now very rare in Great Britain to find a Hebrew pawnbroker.

The Pledge System.

In China the pawnshop was probably as familiar two or three thousand years ago as it is to-day, and its conduct is still regulated quite as strictly as in England. The Chinese conditions, too, are decidedly favourable to the borrower. He may, as a rule, take three years to redeem his property, and he cannot be charged a higher rate than 3% per annum—a regulation which would close every pawnshop in England in a month. Both Rome and Greece were as familiar with the operation of pawning as the modern poor all the world over; indeed, from the Roman jurisprudence most of the contemporary law on the subject is derived. The chief difference between Roman and English law is that under the former certain things, such as wearing apparel, furniture, and instruments of tillage, could not be pledged, whereas there is no such restriction in English legislation. The emperor Augustus converted the surplus arising to the state from the confiscated property of criminals into a fund from which sums of money were lent, without interest, to those who could pledge valuables equal to double the amount borrowed. It was, indeed, in Italy, and in more modern times, that the pledge system which is now almost universal on the continent of Europe arose. In its origin that system was purely benevolent, the early *monts de piété* established by the authority of the popes lending money to the poor only, without interest, on the sole condition of the advances being covered by the value of the pledges. This was virtually the Augustan system, but it is obvious that an institution which costs money to manage and derives no income from its operations must either limit its usefulness to the extent of the voluntary support it can command, or must come to a speedy end. Thus as early as 1198 something of the kind was started at Freising in Bavaria; while in 1350 a similar endeavour was made at Salins in Franche Comté, where interest at the rate of 7½% was charged. Nor was England backward, for in 1361 Michael Northbury, or de Northborough, bishop of London, bequeathed 1000 silver marks for the establishment of a free pawnshop. These primitive efforts, like the later Italian ones, all failed. The Vatican was therefore constrained to allow the Sacri monti di pietà—no satisfactory derivation of the phrase has yet been suggested—to charge sufficient interest to their customers to enable them to defray expenses. Thereupon a learned and tedious controversy arose upon the lawfulness of charging interest, which was only finally set at rest by Pope Leo X., who, in the tenth sitting of the Council of the Lateran, declared that the pawnshop was a lawful and valuable institution, and threatened with excommunication those who should presume to express doubts on the subject. The Council of Trent inferentially confirmed this decision, and at a somewhat later date we find St Charles Borromeo counselling the establishment of state or municipal pawnshops.

Italian Monti di Pietà.

Long before this, however, monti di pietà charging interest for their loans had become common in Italy. The date of their establishment was not later than 1464, when the earliest of which there appears to be any record in that country—it was at Orvieto—was confirmed by Pius II. Three years later another was opened at Perugia by the efforts of two Franciscans, Barnabus Interamnensis and Fortunatus de Copolis. They collected the necessary capital by preaching, and the Perugian pawnshop was opened with such success that there was a substantial balance of profit at the end of the first year. The Dominicans endeavoured to preach down the "lending-house," but without avail. Viterbo obtained one of 1469, and Sixtus IV. confirmed another to his native town in Savona in 1479. After the death of Brother Barnabus in 1474, a strong impulse was given to the creation of these establishments by the preaching of another Franciscan, Father Bernandino di Feltre, who was in due course canonized. By his efforts monti di pietà were opened at Assisi, Mantua, Parma, Lucca, Piacenza, Padua, Vicenza, Pavia and a number of places of less importance. At Florence the veiled opposition of the municipality and the open hostility of the Jews prevailed against him, and it was reserved to Savonarola, who was a Dominican, to create the first Florentine pawnshop, after the local theologians had declared that there was "no sin, even venial," in charging interest. The readiness of the popes to give permission for pawnshops all over Italy, makes it the more remarkable that the papal capital possessed nothing of the kind until 1539, and even then owed the convenience to a Franciscan. From Italy the pawnshop spread gradually all over Europe. Augsburg adopted the system in 1591, Nuremberg copied the Augsburg regulations in 1618, and by 1622 it was established at Amsterdam, Brussels, Antwerp and Ghent. Madrid followed suit in 1705, when a priest opened a charitable pawnshop with a capital of fivepence taken from an alms-box.

Introduction in France.

The institution was, however, very slow in obtaining a footing in France. It was adopted at Avignon in 1577, and at Arras in 1624. The doctors of the once powerful Sorbonne could not reconcile themselves to the lawfulness of interest, and when a pawnshop was opened in Paris in 1626, it had to be closed within a year. Then it was that Jean Boucher published his *Défense des monts de piété*. Marseilles obtained one in 1695; but it was not until 1777 that the first mont de piété was founded in Paris by royal patent. The statistics which have been preserved relative to the business done in the first few years of its existence show that in the twelve years between 1777 and the Revolution, the average value of the pledges was 42 francs 50 centimes, which is double the present average. The interest charged was 10% per annum, and large profits were made upon the sixteen million livres that were lent every year. The National Assembly, in an evil moment, destroyed the monopoly of the mont de piété, but it struggled on until 1795, when the competition of the money-lenders compelled it to close its doors. So great, however, were the extortions of the usurers that the people began to clamour for its reopening, and in July 1797 it recommenced business with a fund of £20,000 found by five private capitalists. At first it charged interest at the rate of 36% per annum, which was gradually reduced, the gradations being 30, 24, 18, 15, and finally 12% in 1804. In 1806 it fell to 9%, and in 1887 to 7%. In 1806 Napoleon I. re-established its monopoly, while Napoleon III., as prince-president, regulated it by new laws that are still in force. In Paris the pledge-shop is, in effect, a department of the administration; in the French provinces it is a municipal monopoly; and this remark holds good, with modifications, for most parts of the continent of Europe.

Great Britain.

In England the pawnbroker, like so many other distinguished personages, "came in with the Conqueror." From that time, indeed, to the famous legislation of Edward I., the Jew money-lender was the only pawnbroker. Yet, despite the valuable services which the class rendered, not infrequently to the Crown itself, the usurer was treated with studied cruelty—Sir Walter Scott's Isaac of York was no mere creation of fiction. These barbarities, by diminishing the number of Jews in the country, had, long before Edward's decree of banishment, begun to make it worth the while of the Lombard merchants to settle in England. It is now as well established as anything of the kind can be that the three golden balls, which have for so long been the trade sign of the pawnbroker, were the symbol which these Lombard merchants hung up in front of their houses, and not, as has often been suggested, the arms of the Medici family. It has, indeed, been conjectured that the golden balls were originally three flat yellow effigies of byzants, or gold coins, laid heraldically upon a sable field, but that they were presently converted into balls the better to attract attention. In 1338 Edward III. pawned his jewels to the Lombards to raise money for his war with France. An equally great king—Henry V.—did much the same in 1415.

The Lombards were not a popular class, and Henry VII. harried them a good deal. In the very first year of James I. "An Act against Brokers" was passed and remained on the statute-book until Queen Victoria had been thirty-five years on the throne. It was aimed at "counterfeit brokers," of whom there were then many in London. This type of broker was evidently regarded as a mere receiver of stolen goods, for the act provided that "no sale or pawn of any stolen jewels, plate or other goods to any pawnbroker in London, Westminster or Southwark shall alter the property therein," and that "pawnbrokers refusing to produce goods to their owner from whom stolen shall forfeit double the value."

In the time of Charles I. there was another act which made it quite clear that the pawnbroker was not deemed to be a very respectable or trustworthy person. Nevertheless a plan was mooted for setting that king up in the business. The Civil War was approaching and supplies were badly needed, when a too ingenious Royalist proposed the establishment of a state "pawnhouse." The preamble of the scheme recited how "the intolerable injuries done to the poore subjects by brokers and usurers that take 30, 40, 50, 60, and more in the hundredth, may be remedied and redressed, the poor thereby greatly relieved and eased, and His Majestie much benefited." That the king would have been "much benefited" is obvious, since he was to enjoy two-thirds of the profits, while the working capital of £100,000 was to be found by the city of London. The reform of what Shakespeare calls "broking pawn" was in the air at that time, although nothing ever came of it, and in the early days of the commonwealth it was proposed to establish a kind of mont de piété. The idea was emphasized in a pamphlet of 1651 entitled *Observations manifesting the Conveniency and Commodity of Mount Pieteyes, or Public Bancks for Relief of the Poor or Others in Distress, upon Pawns.* No doubt many a ruined cavalier would have been glad enough of some such means of raising money, but this radical change in the principles of English pawnbroking was never brought about. It is said that the Bank of England, under its charter, has power to establish pawnshops; and we learn from *A Short History of the Bank of England*, published in its very early days, that it was the intention of the directors, "for the ease of the poor," to institute "a Lombard" "for small pawns at a penny a pound interest per month."

Throughout both the 17th and 18th centuries the general suspicion of the pawnbroker appears to have been only too well founded. It would appear from the references Fielding makes to the subject in *Amelia*, which was written when George II. was on the throne, that, taken in the mass, he was not a very scrupulous tradesman. Down to about that time it had been customary for publicans to lend money on pledges that their customers might have the means of drinking, but the practice was at last stopped by act of parliament. Nor was respect for the honesty of the business increased by the attempt of "The Charitable Corporation" to conduct pawnbroking on a large scale. Established by charter in 1707, "this nefarious corporation," as Smollett called it, was a swindle on a large scale. The directors gambled wildly with the shareholders' money, and in the end the common council of the city of London petitioned parliament for the dissolution of this dishonest concern, on the ground that "the corporation, by affording an easy method of raising money upon valuables, furnishes the thief and pickpocket with a better opportunity of selling their stolen goods, and enables an intending bankrupt to dispose of the goods he buys on credit for ready money, to the defrauding of his creditors." When the concern collapsed in 1731 its cashier was Mr George Robinson, M.P. for Marlow. In company with another principal official he disappeared, less than £30,000 being left of a capital which had once been twenty times as much.

Modern Regulations in England.

The pawnbroker's licence dates from 1785, the duty being fixed at £10 in London and £5 in the country; and at the same time the interest chargeable was settled at ½% per month, the duration of loans being confined to one year. Five years later the interest on advances over £2 and under £10 was raised to 15%. The modern history of legislation affecting pawnbroking begins, however, in 1800, when the act of 39 & 40 Geo. III. c. 99 (1800) was passed, in great measure by the influence of Lord Eldon, who never made any secret of the fact that, when he was a young barrister without briefs, he had often been indebted to the timely aid of the pawnshop. The pawnbrokers were grateful, and for many years after Lord Eldon's death they continued to drink his health at their trade dinners. The measure increased the rate of interest to a halfpenny per half-crown per month, or fourpence in the pound per mensem—that is to say, 20% per annum. Loans were to be granted for a year, although pledges might be redeemed up to fifteen months, and the first week of the second month was not to count for interest. The act worked well, on the whole, for three-quarters of a century, but it was thrice found necessary to amend it. Thus in 1815 the licence duties were raised to £15 and £7, 10s. for London and the country respectively; another act of 1840 abolished the reward to the "common informer" for reporting illegal rates of interest; while in 1860 the pawnbroker was empowered to charge a halfpenny for the pawn-ticket when the loan was under five shillings. As time went on, however, the main provisions of the act of 1800 were found to be very irksome, and the Pawnbrokers' National Association and the Pawnbrokers' Defence Association worked hard to obtain a liberal revision of the law. It was argued that the usury laws had been abolished for the whole of the community with the single exception of the pawnbroker who advanced less than £10. The limitations of the act of 1800 interfered so considerably with the pawnbrokers' profits that, it was argued, they could not afford to lend money on bulky articles requiring extensive storage room. In 1870 the House of Commons appointed a Select Committee on Pawnbrokers, and it was stated in evidence before that body that in the previous year 207,780,000 pledges were lodged, of which between thirty and forty millions were lodged in London. The average value of pledges appeared to be about 4s., and the proportion of articles pawned dishonestly was found to be only 1 in 14,000. Later official statistics show that of the forfeited pledges sold in London less than 20 per million are claimed by the police.

The result of the Select Committee was the Pawnbrokers Act of 1872, which repealed, altered and consolidated all previous legislation on the subject, and is still the measure which regulates the relations between the public and the "brokers of pawn." Based mainly upon the Irish law passed by the Union Parliament it put an end to the old irritating restrictions, and reduced the annual tax in London from £15 to the £7, 10s. paid in the provinces. By the provisions of the act (which does not affect loans above £10), a pledge is redeemable within one year, and seven days of grace added to the year. Pledges pawned for 10s. or under and not redeemed in time become the property of the pawnbroker, but pledges above 10s. are redeemable until sale, which must be by public auction. In addition to one halfpenny for the pawn-ticket—which is sometimes not charged for very small pawns—the pawnbroker is entitled to charge as interest one halfpenny per month on every 2s. or part of 2s. lent where the loan is under 40s., and on every 2s. 6d. where the loan is above 40s. "Special contracts" may be made where the loan is above 40s. at a rate of interest agreed upon between lender and borrower. Unlawful pawning of goods not the property of the pawner, and taking in pawn any article from a person under the age of twelve, or intoxicated, or any linen, or apparel or unfinished goods or materials entrusted to wash, make up, &c., are, *inter alia*, made offences punishable by summary conviction. A new pawnbroker must produce a magistrate's certificate before he can receive a licence; but the permit cannot be refused if the applicant gives sufficient evidence that he is a person of good character. The word "pawnbroker" must always be inscribed in large letters over the door of the shop. Elaborate provisions are made to safeguard the interests of borrowers whose unredeemed pledges are sold under the act. Thus the sales by auction may take place only on the first Monday of January, April, July and October, and on the following days should one not be sufficient. This legislation was, no doubt, favourable to the pawnbroker rather than to the borrower. The annual interest on loans of 2s. had been increased by successive acts of parliament from the 6% at which it stood in 1784 to 25% in 1800, and to 27 in 1860—a rate which was continued by the measure of 1872. The annual interest upon a loan of half-a-crown is now 260%, as compared with 173 in 1860 and 86 in 1784; while the extreme point is reached in the case of a loan of 1s. for three days, in which case the interest is at the rate of 1014% per annum. An English mont de piété was once projected by the Salvation Army, and in 1894 the London County Council considered the practicability of municipal effort on similar lines; but in neither case was anything done.

Scotland and Ireland.

The growth of pawnbroking in Scotland, where the law as to pledge agrees generally with that of England, is remarkable. Early in the 19th century there was only one pawnbroker in that country, and in 1833 the number reached only 52. Even in 1865 there were no more than 312. It is probable that at the present moment Glasgow and Edinburgh together contain nearly as many as that total. In Ireland the rates for loans are practically identical with those charged in England, but a penny instead of a halfpenny is paid for the ticket. Articles pledged for less than £1 must be redeemed within six months, but nine months are allowed when the amount is between 30s. and £2. For sums over £2 the period is a year, as in England. In Ireland, too, a fraction of a month is calculated as a full month for purposes of interest, whereas in England, after the first month, fortnights are recognized. In 1838 there was an endeavour to establish monts de piété in Ireland, but the scheme was so unsuccessful that in 1841 the eight charitable pawnshops that had been opened had a total adverse balance of £5340. But 1847 only three were left, and eventually they collapsed likewise.

United States.

The pawnbroker in the United States is, generally speaking, subject to considerable legal restriction, but violations of the laws and ordinances are frequent. Each state has its own regulations, but those of New York and Massachusetts may be taken as fairly representative. "Brokers of pawn" are usually licensed by the mayors, or by the mayors and aldermen, but in Boston the police commissioners are the licensing authority. In the state of New York permits are renewable annually on payment of $500, and the pawnbroker must file a bond with the mayor, executed by himself and two responsible sureties, in the sum of $10,000. The business is conducted on much the same lines as in England, and the rate of interest is 3% per month for the first six months, and 2% monthly afterwards. Where, however, the loan exceeds $100 the rates are 2 and 1% respectively. To exact higher rates is a misdemeanour. Unredeemed pledges may be sold at the end of a year. Pawnbrokers are not allowed to engage in any kind of second-hand business. New York contains one pawnshop to every 12,000 inhabitants, and most of the pawnbrokers are Jews. In the state of Massachusetts unredeemed pledges may be sold four months after the date of deposit. The licensing authority may fix the rate of interest, which may vary for different amounts, and in Boston every pawnbroker is bound to furnish to the police daily a list of the pledges taken in during the preceding twenty-four hours, specifying the hour of each transaction and the amount lent.

Municipal Pawnshops.

The fact that on the continent of Europe monts de piété are almost invariably either a state or a municipal monopoly necessarily places them upon an entirely different footing from the British pawnshop, but, compared with the English system, the foreign is very elaborate and rather cumbersome. Moreover, in addition to being slow in its operation, it is, generally speaking, based upon the supposition that the borrower carries in his pockets "papers" testifying to his identity. On the other hand, it is argued that the English borrower of more than £2 is at the mercy of the pawnbroker in the matter of interest, that sum being the highest for which a legal limit of interest is fixed. The rate of interest upon a "special contract" may be, and often is, high. For the matter of that, indeed, this system of obtaining loans is always expensive, either in actual interest or in collateral disadvantages, whether the lender be a pawnbroker intent upon profit, or the official of a mont de piété. In Paris the rate charged is 7%, and even then the business is conducted at a loss except in regard to long and valuable pledges. Some of the French provincial rates are as high as 12%, but in almost every case they are less than they were prior to the legislation of 1851 and 1852. The French establishments can only be created by decree of the president of the Republic, with the consent of the local conseil communal. In Paris the prefect of the Seine presides over the business; in the provinces the mayor is the president. The administrative council is drawn one-third each from the conseil communal, the governors of charitable societies, and the townspeople. A large proportion of the capital required for conducting the institutions has to be raised by loan, while some part of the property they possess is the product of gifts and legacies. The profits of the Paris mont de piété are paid over to the "Assistance Publique," the comprehensive term used by France to indicate the body of charitable foundations. Originally this was the rule throughout France, but now many of them are entirely independent of the charitable institutions. Counting the head office, the branches and the auxiliary shops, the Paris establishment has its doors open in some fifty or sixty districts; but the volume of its annual business is infinitely smaller than that transacted by the London pawnbrokers. The amount to be advanced by a municipal pawnshop is fixed by an official called the *commissaire-priseur*, who is compelled to load the scales against the borrower, since, should the pledge remain unredeemed and be sold for less than was lent upon it, he has to make good the difference. This official is paid at the rate of ½% upon loans and renewals, and 3% on the amount obtained by the sales of forfeited pledges. This is obviously the weakest part of the French system. The Paris mont de piété undertakes to lend four-fifths of the intrinsic value of articles made from the precious metals, and two-thirds of that of other articles. The maximum and minimum that may be advanced are also fixed. The latter varies in different parts of the country from one to three francs, and the former from a very small sum to the 10,000 francs which is the rule in Paris. Loans are granted for twelve months with right of renewal, and unredeemed pledges may then be sold by auction, but the proceeds may be claimed by the borrower at any time within three years. Pledges may be redeemed by instalments.

Somewhere between forty and fifty French towns possess municipal pawnshops, a few of which, like those of Grenoble and Montpellier, having been endowed, charge no interest. Elsewhere the rate varies from *nil* in some towns, for very small pledges, to 10%. The constant tendency throughout France has been to reduce the rate. The great establishment in Paris obtains part of its working capital—reserves and surplus forming the balance—by borrowing money at a rate varying from 2 to 3% according to the length of time for which the loan is made. Under a law passed in 1891 the Paris mont de piété makes advances upon securities at 6%, plus a duty of 5 centimes upon every hundred francs. The maximum that can be lent in this way is £20. Up to 80% is lent on the face value of government stock and on its own bonds, and 75% upon other securities; but 60% only may be advanced on railway shares. These advances are made for six months. Persons wishing to borrow a larger sum than sixteen francs from the Paris mont de piété have to produce their papers of identity. In every case a numbered metal check is given to the customer, and a duplicate is attached to the article itself. The appraising clerks decide upon the sum that can be lent, and the amount is called out with the number. If the borrower is dissatisfied he can take away his property, but if he accepts the offer he has to give full particulars of his name, address and occupation. The experts calculate that every transaction involving less than twenty-two francs results in a loss to the Paris mont de piété, while it is only those exceeding eighty-five francs which can be counted upon to be invariably profitable. The average loan is under thirty francs.

Holland and Belgium.

The borrowing of money on the security of goods deposited has been the subject of minute regulations in the Low Countries from an early date. So far back as the year 1600 the "archdukes" Albert and Isabella, governors of the Spanish Netherlands under Philip III., reduced the lawful rate of interest from 32½ to 21⅔%; but since extortion continued they introduced the mont de piété in 1618, and, as we have already seen, in the course of a dozen years the institution was established in all the populous Belgian towns, with one or two exceptions. The interest chargeable to borrowers was fixed originally at 15%, but was shortly afterwards reduced, to be again increased to nearly the old level. Meanwhile various towns possessed charitable funds for gratuitous loans, apart from the official institutions. Shortly after the mont de piété was introduced in the Spanish provinces, the prince-bishop of Liége (Ferdinand of Bavaria) followed the example set by the archdukes. He ordained that the net profits were to accumulate, and the interest upon the fund to be used in reduction of the charges. The original rate was 15%, when the Lombard money-lenders had been charging 43; but the prince-bishop's monts de piété were so successful that for many years their rate of interest did not exceed 5%—it was, indeed, not until 1788 that it was increased by one-half. These flourishing institutions, along with those in Belgium proper, were ruined by the French Revolution. They were, however, re-established under French dominion, and for many years the laws governing them were constantly altered by the French, Dutch and Belgian governments in turn. The whole subject is now regulated by a law of 1848, supplemented by a new constitution for the Brussels mont de piété dating from 1891.

The working capital of these official pawnshops is furnished by charitable institutions or the municipalities, but the Brussels one possesses a certain capital of its own in addition. The rate of interest charged in various parts of the country varies from 4 to 16%, but in Brussels it is usually less than half the maximum. The management is very similar to that of the French monts de piété, but the arrangements are much more favourable to the borrower. The ordinary limit of loans is £120. In Antwerp there is an "anonymous" pawnshop, where the customer need not give his name or any other particulars. In Holland private pawnbrokers flourish side by side with the municipal "Banken van Leening," nor are there any limitations upon the interest that may be charged. The rules of the official institutions are very similar to those of the monts de piété in the Latin countries, and unredeemed pledges are sold publicly fifteen months after being pawned. A large proportion of the advances are made upon gold and diamonds; workmen's tools are not taken in pledge, and the amount lent varies from 8d. upwards. On condition of finding such sum of money as may be required for working capital over and above loans from public institutions, and the "caution money" deposited by the city officials, the municipality receives the profits.

Germany and Austria.

Pawnbroking in Germany is conducted at once by the state, by the municipalities, and by private enterprise; but of all these institutions the state loan office in Berlin is the most interesting. It dates from 1834, and the working capital was found, and still continues to be in part provided, by the Prussian State Bank. The profits are invested, and the interest devoted to charitable purposes. The maximum and minimum rates of interest are fixed, but the rate varies, and often stands at about 12%. Two-thirds of the estimated value is the usual extent of a loan; four-fifths is advanced on silver, and five-sixths on fine gold. State and municipal bonds may be pledged up to a maximum of £150, the advance being 80% of the value, and a fixed interest of 6% is charged upon these securities. The values are fixed by professional valuers, who are liable to make good any loss that may result from over-estimation. The bulk of the loans are under £5, and the state office is used less by the poor than by the middle classes. Loans run for six months, but a further six months' grace is allowed for redemption before the article pledged can be sold by auction. The net annual profit usually amounts to little more than 1% upon the capital employed. The pawnbroking laws of Austria-Hungary are very similar to those which prevail in England. Free trade exists, and the private trader, who does most of the business, has to obtain a government concession and deposit caution-money varying in amount from £80 to £800, according to the size of the town. He has, however, to compete with the monts de piété or Versatzaemter, which are sometimes municipal and sometimes state institutions. The chief of these is the imperial pawn office of Vienna, which was founded with charitable objects by the emperor Joseph I. in 1707, and one-half of the annual surplus has still to be paid over to the Vienna poor fund. Here, as in Berlin, the profits are relatively small. Interest is charged at the uniform rate of 10%, which is calculated in fortnightly periods, however speedily redemption may follow upon pawning. For small loans varying from two to three kronen, 5% only is charged. The Hungarian state and municipal institutions appear, on the whole, to compete somewhat more successfully with the private firms than is the case in Vienna.

Italy.

In Italy, the "country of origin" of the mont de piété, the institution still flourishes. It is, as a rule, managed by a committee or commission, and the regulations follow pretty closely the lines of the one in Rome, which never lends less than 10d. or more than £40. Four-fifths of the value is lent upon gold, silver and jewels, and two-thirds upon other articles. The interest, which is reckoned monthly, varies with the amount of the loan from 5 to 7%, but no interest is chargeable upon loans up to 5 lire. A loan runs for six months, and may be renewed for similar periods up to a maximum of five years. If the renewal does not take place within a fortnight of the expiration of the ticket, the pledge is sold, any surplus there may be being paid to the pawner. When more than 10 lire is lent there is a charge of 1% for the ticket. Agencies of the mont de piété are scattered about Rome, and carry on their business under the same rules as the central office, with the disadvantage to the borrower that he has to pay an "agent's fee" of 2%, which is deducted from the loan. Private pawnshops also exist in Italy, under police authority; but they charge very high interest.

Spain and Portugal.

The monts de piété in Spain have for a generation past been inseparably connected with the savings banks. We have already seen that the institution owes its origin in that country to the charitable exertions of a priest who charged no interest, and the system grew until in 1840, a century after his death, the mont de piété began to receive the sums deposited in the savings bank, which had just been established, for which it paid 5% interest. In 1869 the two institutions were united. This official pawnshop charges 6% upon advances which run for periods varying from four to twelve months, according to the nature of the article pledged, and a further month's grace is allowed before the pledges are sold by auction. Private pawnbrokers are also very numerous, especially in Madrid; but their usual charges amount to about 60% per annum. They appear, however, to derive advantage from making larger advances than their official rivals, and from doing business during more convenient hours. In Portugal the monte pio is an amalgamation of bank, benefit society and pawnshop. Its business consists chiefly in lending money upon marketable securities, but it also makes advances upon plate, jewelry and precious stones, and it employs officially licensed valuers. The rate of interest varies with the bank rate, which it slightly exceeds, and the amount advanced upon each article is about three-fourths of its certified value. There is in Portugal a second class of loan establishment answering exactly to the English pawnshop. The pawnbroker is compelled to deposit a sum, in acceptable securities, equal to the capital he proposes to embark, and the register of his transactions must be submitted quarterly to the chief of the police for examination. As regards small transactions, there appears to be no legal limit to the rate of interest. The sale of unredeemed pledges is governed by the law affecting the "monte pio geral."

Russia.

In Russia the state maintains two pawnbroking establishments, one at St Petersburg and the other at Moscow, but only articles of gold and silver, precious stones and ingots of the precious metals are accepted by them. Advances are made upon such securities at 6% per annum, and the amounts of the loans are officially limited. Loans run for twelve months, with a month's grace before unredeemed pledges are put up to auction. The bulk of this class of business in Russia is, however, conducted by private companies, which advance money upon all descriptions of movable property except stocks and shares. The interest charged is not allowed to exceed 1% per month, but there is an additional charge of ½% per month for "insurance and safe keeping." The loan runs for a year, with two months' grace for redemption before sale. There are also a certain number of pawnshops conducted by individuals, who find it very difficult to compete with the companies. These shops can only be opened by a police permit, which runs for five years, and security, varying from £100 to £700, has to be deposited; 2% per month is the limit of interest fixed, and two months' grace is allowed for redemption after the period for which an article is pledged.

Denmark and Norway.

Pawnbroking in Denmark dates from 1753, when the Royal Naval Hospital was granted the monopoly of advancing money on pledges and of charging higher interest than the law permitted. The duration of a loan is three months, renewals being allowed. The old law was extended in 1867, and now all pawnbrokers have to be licensed by the municipalities and to pay a small annual licence fee. The rate of interest varies from 6 to 12% according to the amount of the loan, which must not be less than 7d., and unredeemed pledges must be sold by auction. In Sweden there are no special statutes affecting pawnbroking, with the exception of a proclamation by the governor of Stockholm prohibiting the lending of money upon articles which may be suspected of having been stolen. Individuals still carry on the business on a small scale, but the bulk of it is now conducted by companies, which give general satisfaction. For many years there was in Stockholm a municipal establishment charging 10% for loans paid out of the city funds. The cost of administration was, however, so great that there was an annual loss upon its working, and the opportunity was taken to abolish it when, in 1880, a private company was formed called the "Pant Aktie Bank," to lend money on furniture and wearing apparel at the rate of 3 öre per krone a month, and 2 öre per krone a month on gold, silver and other valuables: a krone, which equals 1s. 1½d., contains 100 öre. Some years later an opposition was started which charged only half these rates, with the result that the original enterprise reduced its interest to the same level, charging, however, 2 öre per krone per mensem for bulky articles—a figure which is now usual for pledges of that description. The money is lent for three months, and at the end of five months the pledge, if unredeemed, is sold by auction under very carefully prescribed conditions. In Norway a police licence is required for lending money on pawn where the amount advanced does not exceed £4, 10s. Beyond that sum no licence is necessary, but the interest charged must not exceed such a rate as the king may decide.

Switzerland.

The fate of pawnbroking in Switzerland appears to be not very dissimilar from that of the Jew who is fabled to have once started in business at Aberdeen. Nevertheless the cantons of Bern and Zürich have elaborate laws for the regulation of the business. In Zürich the broker must be licensed by the cantonal government, and the permit can be refused only when the applicant is "known to be a person undeserving of confidence." Regular books have to be kept, which must be at all times open to the inspection of the police, and not more than 1% interest per month must be charged. A loan runs for six months, and unredeemed pledges may be sold by auction a month after the expiration of the fixed period, and then the sale must take place in the parish in which the article was pledged. No more than two persons at a time have ever been licensed under this law, the business being unprofitable owing to the low rate of interest. In the canton of Bern there were once two pawnbrokers. One died and the other put up his shutters. The Zürich cantonal bank, however, conducts a pawnbroking department, which lends nothing under 4s. or over £40 without the special sanction of the bank commission. Loans must not exceed two-thirds of the trade value of the pledge, but 80% may be lent upon the intrinsic value of gold and silver articles. The establishment makes practically no profit. The Swiss disinclination to go to the pawnshop is, perhaps, accounted for in some measure by the growing number of dealers in second-hand articles, to whom persons in want of ready money sell outright such things as are usually pledged, in the hope of subsequently buying them back. Since, however, the dealer is at liberty to ask his own price for repurchase, the expectation is often illusory, and can usually be fulfilled only upon ruinous terms. (J. P.-B.)

PAWNEE (perhaps from the native word for "horn," in allusion to their scalping lock, which was "dressed" so as to stand straight up), a tribe of North-American Indians of Caddoan stock. They formerly lived on the Platte river in Nebraska. They call themselves *Skihiksihiks* ("men of men"). They were a brave, war-loving tribe, whose history was one of continual strife with their neighbours. In 1823 their village was burned by the Delawares, and in 1838 the tribe suffered severely from small-pox, the death-roll being, it is said, 2000. By treaty in 1833 they had ceded their territory south of the Platte, and in 1858 they surrendered all their remaining land except a strip on the Loup River. Here they lived till 1874, when they moved to a reservation in Indian Territory (now Oklahoma), where they now are.

PAWTUCKET, a city of Providence county, Rhode Island, U.S.A., on the Blackstone river (known below the Pawtucket Falls here as the Pawtucket or Seekonk river), 4 m. N. of Providence, and near the city of Central Falls. Pop. (1905, state census), 43,381, of whom 14,369 were foreign-born, including 4273 English, 3484 Irish, 2706 French Canadians, and 1198

Scotch; (1910), 51,622. Pawtucket is served by the New York, New Haven & Hartford railroad; and the river is navigable below the falls. The city lies on both sides of the river and its land area in 1906 was nearly 8·6 m. The east bank of the river rises quite abruptly 15–30 ft., but back of this the surface is level or only slightly undulating. On the west side the surface is more diversified. The Blackstone River here makes a picturesque plunge of nearly 50 ft. (Pawtucket Falls) over an irregular mass of rocks, providing a good water-power. The most attractive public building is the Sayles Memorial library, erected (1899–1902) by Frederick Clark Sayles (1835–1902) in memory of his wife. The city has a park of 181 acres in the east end, a park of 55 acres on the west side, three small parks near the business centre, a soldiers' monument, a home for the aged, an emergency hospital, and a state armoury. Manufacturing is the principal industry, and the value of the factory products increased from $19,271,582 in 1900 to $25,846,899 in 1905, or 34·1%. More than one-half the value for 1905 was represented by textiles. Other important manufactures in 1905 were foundry and machine-shop products, packed meats, and electrical machinery, apparatus and supplies. The commerce of the city has been much increased by the deepening and widening of the channel of the Pawtucket river by the United States government. In 1867 the river could not be navigated at low water by boats drawing more than 5 ft. of water, but by March 1905 the government had constructed a channel 100 ft. wide and 12 ft. deep at low water, and Congress had passed an act for increasing the depth to 16 ft.; in 1907 the Federal Congress and the general assembly of the state made appropriations to complete the work.

That portion of Pawtucket which lies east of the river was originally a part of the township of Rehoboth, Massachusetts, but in 1812 the township of Seekonk was set apart from Rehoboth, in 1828 the township of Pawtucket was set apart from Seekonk, and in 1862 almost all of the Massachusetts township of Pawtucket was transferred to Rhode Island. The portion west of the river was taken from the township of North Providence and annexed to the township of Pawtucket in 1874, and in 1885 Pawtucket was chartered as a city. The first settlement within the present city limits was made about 1670 on the west side by Joseph Jenks (*c.* 1632–1717), a manufacturer of domestic iron implements. His manufactory was destroyed during King Philip's War, but he rebuilt it, and until a century later the industries on the west side were managed largely by his family. In 1790 Samuel Slater reproduced here the Arkwright machinery for the manufacture of cotton goods; this was the first manufactory of the kind that had any considerable success in the United States, and his old mill is still standing in Mill Street.

See R. Grieve, *An Illustrated History of Pawtucket, Central Falls, and Vicinity* (Pawtucket, 1897).

PAX (Lat. for "peace"), the name given in ecclesiastical usage to a small panel or tablet decorated usually with a representation of the Crucifixion, which in the Roman ritual was kissed at the eucharistic service by the celebrating priest, then by the other priests and deacons, and then by the congregation. The "Pax" is also known by the names *osculatorium*, *tabula pacis* and *pax-bred* (*i.e.* "pax-board"). The use of the "pax" dates from the 13th century, and it is said to have been first introduced in England in 1250 by Archbishop Walter of York. It took the place of the actual "kiss of peace" (*csculum sanctum*, or *osculum pacis*) which was in the Roman Mass given by the bishop to the priests, and took place after the consecration and before communion. In the Greek Church the kiss (*εἰρήνη*, *ἀσπασμός*) takes place at the beginning of the service, and now consists in the celebrating priest kissing the oblation and the deacon kissing his stole (see F. E. Brightman, *Liturgies Eastern and Western*, 1896). Owing to disputes over questions of precedence the kissing of the pax at the service of the Mass was given up. It is still used at times of prayer by religious communities or societies. In the 15th and 16th centuries much artistic skill was lavished on the pax, and beautiful examples of enamelled paxes with chased gold and silver frames are in the British Museum. Though the Crucifixion is most usually represented, other religious subjects, such as the Virgin and Child, the Annunciation, the figures of patron saints and the like, are found. In the "Inventarie of the Plate, Jewells . . . and other Ornaments appertayning to the Cathedrall Churche of Sayncte Paule in London," 1552, we find two paxes mentioned; one "with the ymage of the Crucifix and of Marie and John all gylte with the Sonn alsoe and the Moone, the backsyde whereof is crymosin velvett," and another "with the ymage of our Ladie sett aboughte with x greate stones the backsyde whereof is grene velvett" (*Hierurgia anglicana*, pt. i., 1902).

PAXO [Paxos], one of the Ionian Islands (*q.v.*), about 8 m. S. of the southern extremity of Corfu, is a hilly mass of limestone 5 m. long by 2 broad, and not more than 600 ft. high. Pop. about 5000. Though it has only a single stream and a few springs, and the inhabitants were often obliged, before the Russians and English provided them with cisterns, to bring water from the mainland, Paxo is well clothed with olives, which produce oil of the very highest quality. Gaion (or, less correctly, Gaia), the principal village, lies on the east coast, and has a small harbour. Towards the centre, on an eminence, stands Papandi, the residence of the bishop of Paxo, and throughout the island are scattered a large number of churches, whose belfries add greatly to the picturesqueness of the views. On the west and south-west coasts are some remarkable caverns, of which an account will be found in Davy's *Ionian Islands*, i. 66–71. Ancient writers—Polybius, Pliny, &c.—do not mention Paxos by itself, but apply the plural form Paxi (Παξοί) to Paxos and the smaller island which is now known as Antipaxo (the Propaxos of the *Antonine Itinerary*). Paxos is the scene of the curious legend, recorded in Plutarch's *De defectu oraculorum*, of the cry "Pan is dead" (see Pan).

PAXTON, SIR JOSEPH (1801–1865), English architect and ornamental gardener, was born of humble parents at Milton Bryant, near Woburn, Bedfordshire, on the 3rd of August 1801, and was educated at the grammar school of that town. Having served his apprenticeship as gardener from the age of fifteen, and himself constructed a large lake when gardener to Battlesden in 1821, he was in 1823 employed in the arboretum at Chiswick, the seat of the duke of Devonshire, and eventually became superintendent of the duke's gardens and grounds at Chatsworth, and manager of his Derbyshire estates. In 1836 he began to erect a grand conservatory 300 ft. in length, which was finished in 1840, and formed the model for the Great Exhibition building of 1851. In this year Paxton received the honour of knighthood. Perhaps his most interesting design was that for the mansion of Baron James de Rothschild at Ferrières in France, but he designed many other important buildings. His versatility was shown in his organization of the Army Works Corps which served in the Crimea, his excellent capacity as a man of business in railway management, and his enterprising experiments in floriculture. In 1854 he was chosen M.P. for Coventry, which he continued to represent in the Liberal interest till his death at Sydenham on the 8th of June 1865. Paxton was elected in 1826 a fellow of the Horticultural Society. In the following year he married Sarah Bown. In 1833 he became a fellow of the Linnean Society, and in 1844 he was made a knight of the order of St Vladimir by the emperor of Russia.

He was the author of several contributions to the literature of horticulture, including a *Practical Treatise on the Culture of the Dahlia* (1838), and a *Pocket Botanical Dictionary* (1st ed., 1840). He also edited the *Cottage Calendar*, the *Horticultural Register* and the *Botanical Magazine*.

PAYMASTER-GENERAL, in England, a public officer and a member of the ministry for the time being. The office was, by statutes passed in 1835 and 1848, consolidated with other offices through which moneys voted by parliament were previously paid. The paymaster-general is appointed by sign manual warrant, he is unpaid, and does not require to offer himself for re-election on acceptance of office. The money appropriated by parliament for the various services of the country is placed by order of the Treasury to the account of the paymaster-general, and a communication to that effect made to the comptroller and auditor-general. The paymaster-general then makes all payments required by the various departments in accordance with the parliamentary vote. The duties of the office are carried out by a permanent staff, headed by an assistant paymaster-general, acting on powers granted by the paymaster-general.

PAYMENT (Fr. *paiement*, from *payer*, to pay; Lat. *pacare*, to appease, *pax*, peace), the performance of an obligation, the discharge of a sum due in money or the equivalent of money. In law, in order that payment may extinguish the obligation it is necessary that it should be made at a proper time and place, in a proper manner, and by and to a proper person. If the sum due be not paid at the appointed time, the creditor is entitled to sue the debtor at once, in spite of the readiness of the latter to pay at a later date, subject, in the case of bills and notes, to the allowance of days of grace. In the common case of sale of goods for ready money, a right to the goods vests at once upon sale in the purchaser, a right to the price in the seller; but the seller need not part with the goods till payment of the price.

Payment may be made at any time of the day upon which it falls due, except in the case of mercantile contracts, where the creditor is not bound to wait for payment beyond the usual hours of mercantile business. If no place be fixed for payment, the debtor is bound to find, or to use reasonable means to find, the creditor, unless the latter be abroad. Payment must be made in money which is a legal tender (see below), unless the creditor waive his right to payment in money by accepting some other mode of payment, as a negotiable instrument or a transfer of credit. If the payment be by negotiable instrument, the instrument may operate either as an absolute or as a conditional discharge. In the ordinary case of payment by cheque the creditor accepts the cheque conditionally upon its being honoured; if it be dishonoured, he is remitted to his original rights. If payment be made through the post, in a letter properly directed, and it be lost, the debt is discharged if there was a direction so to transmit the money. The creditor has a right to payment in full, and is not bound to accept part payment unless by special agreement. Part payment is sufficient to take the debt out of the Statute of Limitation. It is a technical rule of English law that payment of a smaller sum, even though accepted by the creditor in full satisfaction, is no defence to a subsequent action for the debt. The reason of this rule seems to be that there is no consideration for the creditor foregoing his right to full payment. In order that payment of a smaller sum may satisfy the debt, it must be made by a person other than the person originally liable, or at an earlier date, or at another place, or in another manner than the date, place, or manner contracted for. Thus a bill or note may be satisfied by money to a less amount, or a money debt by a bill or note to a less amount; a debt of £100 cannot be discharged by payment of £90 (unless the creditor execute a release under seal), though it may be discharged by payment of £10 before the day appointed, or by a bill for £10. Payment must in general be made by the debtor or his agent, or by a stranger to the contract with the assent of the debtor. If payment be made by a stranger without the assent of the debtor, it seems uncertain how far English law regards such payment as a satisfaction of the debt. If the debtor ratify the payment, it then undoubtedly becomes a satisfaction. Payment must be made to the creditor or his agent. A bona fide payment to an apparent agent may be good, though he has in fact no authority to receive it. Such payment will usually be good where the authority of the agent has been countermanded without notice to the debtor. The fact of payment may be presumed, as from lapse of time. Thus payment of a testator's debts is generally presumed after twenty years. A written receipt is only presumptive and not conclusive evidence of payment. By the Stamp Act 1891 a duty of one penny is imposed upon a receipt for or upon the payment of money amounting to £2 or upwards, and also a fine of £10 upon any person who, in any case where a receipt would be liable to duty, refuses to give a receipt duly stamped. If payment be made under a mistake of fact, it may be recovered, but it is otherwise if it be made under a mistake of law, for it is a maxim of law that *ignorantia legis neminem excusat*. Money paid under compulsion of law, even though not due, cannot generally be recovered where there has been no fraud or extortion. For appropriation of payments see APPROPRIATION.

Payment Into and Out of Court.—Money is generally paid into court to abide the result of pending litigation, as where litigation has already begun, as security for costs or as a defence or partial defence to a claim. Payment into court does not necessarily (except in actions for libel and slander) operate as an admission of liability. Payment into court is regulated by the *Rules of the Supreme Court*, O. xxii. The fact that money has been paid into court may not be mentioned to a jury. Money may sometimes be paid into court where no litigation is pending, as in the case of trustees. Payment of money out of court is obtained by the order of the court upon petition or summons or otherwise, or simply on the request or the written authority of the person entitled to it.

Payment of Wages.—The payment of wages to labourers and workmen otherwise than in coin is prohibited. See LABOUR LEGISLATION: *Truck*. Domestic or agricultural servants are excepted. Payment of wages in public-houses (except in the case of domestic servants) is illegal.

Tender.—This is payment duly proffered to a creditor, but rendered abortive by the act of the creditor. In order that a tender may be good in law it must as a rule be made under circumstances which would make it a good payment if accepted. The money tendered must be a legal tender, unless the creditor waive his right to a legal tender, as where he objects to the amount and not the mode of tender. Bank of England notes are legal tender for any sum above £5, except by the bank itself. Gold is legal tender to any amount, silver up to 40s., bronze up to 1s. (Coinage Act 1870). Any gold coinage, whether British, colonial or foreign, may be made legal tender by proclamation. The effect of tender is not to discharge the debt, but to enable the debtor, when sued for the debt, to pay the money into court and to get judgment for the costs of his defence.

Scotland.—The law of Scotland as to payment agrees in most points with that of England. Where a debt is constituted by writ payment cannot be proved by witnesses; where it is not constituted by writ, payment to the amount of £100 Scots may be proved by witnesses; beyond that amount it can only be proved by writ or oath of party. The term tender seems to be strictly applied only to a judicial offer of a sum for damages and expenses made by the defender during litigation, not to an offer made by the debtor before litigation. Bank of England notes are not a legal tender in Scotland or in Ireland.

United States.—In the United States the law as a rule does not materially differ from English law. In some states, however, money may be recovered, even when it has been paid under a mistake of law. The question of legal tender has been an important one. In 1862 and 1863 Congress passed acts making treasury notes legal tender (see GREENBACKS). After much litigation, the Supreme Court of the United States decided in 1871 (*Knox* v. *Lee*) in favour of the constitutionality of these acts, both as to contracts made before and after they were passed. These notes are legal tender for all purposes except duties on imports and interest on the public debt. All gold coins and standard silver dollars are legal tender to any amount. Silver coins below the denomination of a dollar are legal tender up to $10, and cent and 5-cent pieces legal tender to an amount not exceeding 25 cents. It falls exclusively within the jurisdiction of Congress to declare paper or copper money a legal tender. By the constitution of the United States, "no state shall . . . make anything but gold and silver coin a tender in payment of debts" (art. i. § 10). (T. A. I.)

PAYMENT OF MEMBERS. From time to time proposals have been made to reintroduce in the English parliamentary system a practice which is almost universally adopted in other countries, that of paying a state salary to members of the legislative body. In the earlier history of the English parliament the payment of commoners or representatives of the people was for long the practice. They had first been summoned to the great council of the realm in 1265 in the reign of Henry III. The shires and boroughs they represented paid them for their services, and reimbursed the expenses they were put to in journeying to and from the place of meeting. In 1322, by a statute of Edward II., the salary of a knight was fixed at 4s. a day, and that of a citizen or burgher at 2s. a day. These payments could be enforced by writs issued after the dissolution of each parliament, and there are many instances of the issue of such writs down to the reign of Henry VIII.; while the last known instance is that of one Thomas King, who in 1681 obtained a writ for his salary against the corporation of Harwich. The practice of the payment of members of parliament gradually fell into desuetude, and in the second parliament of Charles II. strong disapproval was expressed of the practice. Its gradual abandonment was due first to the difficulty of securing representatives in the early parliaments. Men of business were unwilling to detach themselves from their affairs, as travel was slow and dangerous; in addition to the perils of the journey there was the almost certain knowledge that a safe return from parliament would be followed by the ill will of the member's neighbours, for every meeting of parliament was but a device on the part of the sovereign for inflicting some new form of taxation, and a refusal to vote such taxation was but to incur the royal displeasure. The towns themselves were equally disinclined to bear the burden of their member's maintenance, and some even went so far as to obtain their disfranchisement. In the second place, the growing influence of parliament in the 16th century brought about a revulsion of feeling as to parliamentary services, and the increase in the number of candidates led first to bargaining on their part in the shape of undertaking to accept reduced wages and expenses, and, finally, to forego all. A step further was reached when the constituency bargained as to what it should receive from its representative, resulting in wholesale bribery, which required legislation to end it (see CORRUPT PRACTICES).

In England, the House of Commons has on various occasions carried resolutions in favour of the principle, more especially on the 24th of March 1893 (by 276 votes to 229), and on the 22nd of March 1895 (by 176 to 158). On these occasions the resolutions simply specified an "adequate allowance"; but on the 7th of March 1906 a resolution was carried (by 348 votes to 110) in favour of an allowance "at the rate of £300 per annum."

Appended are the salaries paid to legislators in various countries in 1910.

British Colonies

South Africa.—Before the South Africa Act 1909, which brought about the union of Cape Colony, Natal, Orange River Colony and the Transvaal, each colony had its own legislature. For purposes of comparison, the salaries which were paid to the members of these state legislatures are given below. The act of 1909 reduced the colonies to the position of dependent provinces, entrusted only with local administration by means of provincial councils. The act of 1909 (§ 76) enacts that the members of provincial councils shall receive such allowances as shall be determined by the governor-general in council. Members of the new South African legislature receive £400 a year, subject to a deduction of £3 a day for each day's non-attendance.

Cape Colony.—Members of either house were paid 21s. a day, and those residing more than 15 m. from Cape Town an additional 15s. a day, for a period not exceeding 90 days.

Natal.—Members of the legislature were not paid, but those residing more than 2 m. from the seat of government received a travelling allowance of £1 a day during the session.

Orange River Colony.—At the end of the session each member received £150, and an additional £2 for each day of actual attendance, but not more than £300 in all.

Transvaal Colony.—As in the Orange River Colony.

Canada.—Federal government. Members of both houses are paid $2500 per session, but subject to a deduction of $15 a day for each day of non-attendance.

Ontario.—Members of the Legislative Assembly are paid mileage and an allowance of $6 a day for 30 days, with a maximum of $1000.

Quebec.[1]—Members of the Legislative Assembly are paid $6 a day during the session.

Nova Scotia.—Members are paid an indemnity of $500 for the session.

New Brunswick.—Members of the Legislative Assembly receive $500 per session and travelling expenses.

Manitoba.—Members of the Legislative Assembly receive $1000 per session and travelling expenses.

British Columbia.—Members of the Legislative Assembly receive $1200 per session and travelling expenses.

Prince Edward Island.—Members of the Legislative Assembly receive $160 per annum and travelling expenses, with an additional $12 for postage.

Australian Commonwealth.—Members of parliament receive £600 per annum.

New South Wales.—Members of the Legislative Assembly receive £300 per annum, and free travel over all government railways and tramways. They are also given official stamped envelopes for their postage purposes.

Victoria.—Members of the Legislative Assembly receive £300 per annum and free passes over all railways.

Queensland.—Members of the Legislative Assembly receive £300 per annum, with travelling expenses.

South Australia.—Members both of the Legislative Council and of the House of Assembly receive £200 per annum and free passes over all government railways.

Western Australia.—Members of the Legislative Council receive £200 a year and free travel on all government railways.

Tasmania.—Members of both houses receive £100 a year and free railway passes.

New Zealand.—Members of the Legislative Council are paid £200 per annum. Members of the House of Representatives are paid £25 a month.

United States

Federal Government.—Senators, representatives or delegates receive $7500 a year, and travelling expenses.

Alabama.—There is a session once in four years, such session being limited to 50 days, during which senators and representatives receive $4 a day and mileage.

Arizona Territory.—A biennial session of 60 days' duration, during which members of the council and representatives receive $4 a day and mileage.

Arkansas has a biennial session of 60 days' duration, for which senators and representatives receive $6 a day and mileage.

California's legislature meets biennially, but there is no fixed length for the session. Senators and members of the Assembly receive $1000 and mileage for the term.

Colorado's session is biennial and limited to 90 days. Senators and representatives receive $7 a day and mileage during session.

Connecticut gives senators and representatives $300 and mileage for their term of two years.

Delaware has biennial sessions of 60 days, and may have extra sessions limited to 30 days. Senators and representatives receive $5 a day during sessions.

Florida has biennial sessions of 60 days. Senators and representatives receive $6 a day during the session and mileage.

Georgia has annual sessions limited to 50 days. Senators and representatives receive $4 a day and mileage.

Idaho's senators and representatives receive mileage and $5 a day during the session, which is biennial.

Illinois has a biennial session, for which senators and representatives receive $1000 a year and mileage. For extraordinary sessions they receive $5 a day.

Indiana has biennial sessions limited to 60 days. Senators and representatives receive $6 a day and mileage.

Iowa has biennial sessions of unlimited length. Senators and representatives receive $550 for the session, with mileage.

Kansas has biennial sessions limited to 50 days. Senators and representatives receive $3 a day during the session, with mileage.

Kentucky has biennial sessions limited to 60 days. Senators and representatives receive $5 a day and mileage.

Louisiana has biennial sessions limited to 60 days. Senators and representatives receive $5 a day during the session with mileage.

Maine's senators and representatives receive $300 a year and mileage. Sessions are biennial and of no fixed length.

Maryland has biennial sessions limited to 90 days. Senators and delegates receive $5 a day during the session and mileage.

Massachusetts has an annual session, for which senators and representatives receive each a lump sum of $750 and mileage.

Michigan has biennial sessions not of fixed length, and senators and representatives are paid $800 a year and mileage.

Minnesota has biennial sessions limited to 90 days. Senators and representatives receive $1000 a year besides limited travelling expenses.

Mississippi has a session every four years, unlimited in length. Special sessions, also, limited to 30 days, are held in alternate years. Senators and representatives receive a sum of $400 for each session.

Missouri has biennial sessions of no fixed length. Senators and representatives receive $5 a day for the first 70 days of each session, and $1 a day for each succeeding day.

Montana has biennial sessions limited to 60 days. Senators and representatives receive $12 a day during session.

Nebraska has biennial sessions unlimited in length. Senators and representatives are paid $5 a day and mileage (10 cents a mile) for not more than 60 days of any one session. If extraordinary sessions are held the total days paid for must not exceed 100 during the two years for which they sit.

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[1] Quebec and Nova Scotia have each two chambers. The other Canadian provinces have only one chamber.

Nevada has biennial sessions limited to 60 days, but special sessions limited to 20 days may be held. Senators and representatives receive $10 a day and mileage during sessions.

New Hampshire has biennial sessions, which last until prorogued by the governor. The duration is usually about three months. Senators and representatives receive $200 for the session and mileage.

New Jersey has an annual session, unlimited in length. Senators and members of the General Assembly receive $500 a year.

New Mexico has biennial sessions of 60 days. Members of the Council and representatives receive $4 a day.

New York has an annual session. Members of the Senate and of the Assembly receive $1500 a year.

North Carolina has biennial sessions limited to 60 days. Senators and representatives receive $4 a day during the session, and mileage.

North Dakota has biennial sessions limited to 60 days. Senators and representatives receive $5 a day during the session and mileage.

Ohio has biennial sessions not limited in length. Senators and representatives receive $1000 a year.

Oklahoma has biennial sessions. Senators and representatives receive $6 a day for the first 60 days—thereafter $2 a day—and mileage (10 cents a mile).

Oregon has biennial sessions limited to 240 days. Senators and representatives receive $3 a day during the session and mileage.

Pennsylvania has biennial sessions. Senators and representatives receive $1500 for the session with mileage, with an extra allowance of $150 for stationery and postage.

Rhode Island has an annual session unlimited in length. Senators and representatives receive $5 a day during the session.

South Carolina has an annual session unlimited in length. Senators and representatives receive $4 a day for the first 40 days.

South Dakota has biennial sessions of 60 days. Senators and representatives receive $5 for each day's attendance, and travelling expenses.

Tennessee has biennial sessions. Senators and representatives receive $4 a day for not more than 75 days a session and mileage (16 cents a mile). If absent they do not receive pay, unless they are physically unable to be present.

Texas has biennial sessions, unlimited in length. Senators and representatives receive mileage and $5 a day for the first 60 days of the session; for succeeding days $2 a day.

Utah has biennial sessions limited to 60 days. Senators and representatives receive $4 a day during the session, and mileage.

Vermont has biennial sessions unlimited in length. Senators and representatives receive $4 a day during the session and mileage.

Virginia has biennial sessions limited to 60 days. Senators and delegates receive $500 for the session and mileage.

Washington has biennial sessions limited to 60 days. Senators and representatives receive $5 a day for each day's attendance and travelling expenses.

West Virginia has biennial sessions limited to 45 days, which can be added to by a two-thirds majority. Senators and delegates receive $4 a day during the session and mileage.

Wisconsin has biennial sessions. Senators and members of the Assembly receive $500 for the session, and travelling expenses at the rate of 10 cents a mile.

Wyoming has biennial sessions limited to 40 days. Senators and representatives receive $8 a day during the session and mileage.

Foreign Countries

Argentina.—Both senators (30) and members of the House of Deputies (120) receive £1060 a year.

Austria.—Members of the Lower House (516) receive 16s. 8d. for each day's attendance, with travelling expenses.

Belgium.—Members of the Chamber of Representatives (166) receive £160 a year and a free pass over railways.

Bolivia.—Senators (16) and deputies (69) receive £40 a month during sessions, which last from 60 to 90 days.

Bulgaria.—Members of the Legislature receive 16s. a day during the session, which nominally lasts from the 15th of October to the 15th of December.

Denmark.—Members both of the Landsthing (66) and of the Folkething (114) receive 11s. 1d. a day for the first six months of the session, and 6s. 8d. for each additional day of the session. They receive also second-class free passes on all railways.

France.—Members of both the Senate (300) and of the Chamber of Deputies (584) receive £600 a year.

German Empire.—Members both of the Bundesrat (58) and of the Reichstag (397) receive £150 for the session, but have deducted £1 for each day's absence. They receive also free passes over the German railways during the session.

Baden pays members of its Second Chamber and such members of the Upper Chamber as have not got hereditary seats 12s. a day and travelling expenses, but to those members who reside in the capital 9s. a day only.

Bavaria pays members of the Lower House (163) £180 for a regular session. They are also allowed free travel over the government railways.

Hesse.—Members of the Second Chamber (50) and non-hereditary members of the Upper Chamber who reside more than 1⅛ m. from the place of meeting receive 9s. a day and 3s. for each night, besides a refund of their travelling expenses.

Prussia.—Members of the Lower Chamber (433) receive travelling expenses and diet money (according to a fixed scale) of 15s. a day.

Saxe-Coburg.—Members of the Second Chamber residing in Coburg or Gotha receive 6s. a day; other members receive 10s. a day and travelling expenses.

Saxony.—Members of the Second Chamber (82) and non-hereditary members of the Upper Chamber receive 12s. a day (6s. a day if they live in the place of meeting) and an allowance for travelling.

Württemberg.—Members of both chambers receive 15s. a day for actual attendance; also free passes over the railways.

Greece.—The members (235) receive £72 for the session, also free passes on railway and steamship lines.

Hungary.—Members of the House of Representatives (453) receive £200 a year, with allowance of £66 13s. for house rent.

Italy.—Members of the Legislature receive no payment, although attempts have been made from 1862 onwards to introduce payment of members. It was last brought forward in 1908, the amount suggested being 24s. for every sitting attended.

Japan.—Members of the House of Representatives (379) and non-hereditary members of the House of Peers receive £210 a year, besides travelling expenses.

Mexico.—Both senators (56) and representatives (340) receive $3000 a year.

Netherlands.—Members of the First Chamber (50) not residing in the Hague receive 16s. 8d. a day during the session; members of the Second Chamber (100) receive £166 a year, besides travelling expenses.

Norway.—Members of the Storting (123) receive 13s. 4d. a day during the session, besides travelling expenses.

Paraguay.—Both senators and deputies receive £200 a year.

Portugal.—Deputies have been unpaid since 1892, but deputies for the colonies, whose homes are in the colonies, receive £20 a month or 13s. 4d. a day during sittings of the Chamber, and £10 a month when the Chamber is not sitting.

Rumania.—Both senators (120) and deputies (183) receive 16s. 8d. for each day of attendance, besides free railway passes.

Russia.—Members of the Duma receive 21s. a day during the session, and travelling expenses.

Servia.—Deputies (120) receive 12s. a day and travelling expenses.

Spain.—Members of the Legislature receive no salary, but deputies on their election receive a railway ticket for 2480 m. travel.

Sweden.—Members of both the First Chamber (150) and the Second Chamber (230) receive £66 for each session of 4 months, besides travelling expenses.

Switzerland.—Members of the State Council are paid by the canton they represent, and their salary varies according to the wealth or liberality of the canton. The salary ranges thus from 12s. 6d. to 25s. a day, the average of the whole being 16s. a day. Members of the National Council (167) are paid from Federal funds. They receive 16s. 8d. a day for each day they are present, with travelling expenses. (T. A. I.)

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